Hazardous Area Classifications and Protections

The intent of this document is to provide a broad overview of hazardous area classifications and the types of protection techniques involved. The information provided in this bulletin is for educational purposes and should not be used in place of any other source or governing documents.

Not all approvals are covered in this bulletin. Contact your Emerson sales office for information on approvals not covered in this bulletin.

Contact your Emerson sales office for product specific hazardous area approval information or visit Fisher.com.

Hazardous Area Classifications

When electrical equipment is used in, around, or near an atmosphere that has flammable gases or vapors, flammable liquids, combustible dusts, ignitable fibers or flyings, there is always a possibility or risk that a fire or explosion might occur. Those areas where the possibility or risk of fire or explosion might occur due to an explosive atmosphere and/or mixture is often called a hazardous (or classified) location/area. Currently there are two systems used to classify these hazardous areas; the Class/Division system and the Zone system. The Class/Division system is used predominately in the United States and Canada, whereas the rest of the world generally uses the Zone system. However, the United States and Canada are trending more towards the Zone System.

Class/Division System

Hazardous locations per the Class/Division system are classified according to the Class, Division, and Group.

1. Class—The Class defines the general nature (or properties) of the hazardous material in the surrounding atmosphere which may or may not be in sufficient quantities.

    a. Class I—Locations in which flammable gases or vapors may or may not be in sufficient quantities to produce explosive or ignitable mixtures.

    b. Class II—Locations in which combustible dusts (either in suspension, intermittently, or periodically) may or may not be in sufficient quantities to produce explosive or ignitable mixtures.

    c. Class III—Locations in which ignitable fibers may or may not be in sufficient quantities to produce explosive or ignitable mixtures.

2. Division—The Division defines the probability of the hazardous material being able to produce an explosive or ignitable mixture based upon its presence.

    a. Division 1 indicates that the hazardous material has a high probability of producing an explosive or ignitable mixture due to it being present continuously, intermittently, or periodically or from the equipment itself under normal operating conditions.

    b. Division 2 indicates that the hazardous material has a low probability of producing an explosive or ignitable mixture and is present only during abnormal conditions for a short period of time.

3. Group—The Group defines the type of hazardous material in the surrounding atmosphere. Groups A, B, C, and D are for gases (Class I only) while groups E, F, and G are for dusts and flyings (Class II or III).

    a. Group A—Atmospheres containing acetylene.

    b. Group B—Atmospheres containing a flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor whose MESG is less than 0.45 mm or MIC ratio is less than 0.40.

Typical gases include hydrogen, butadiene, ethylene oxide, propylene oxide, and acrolein.

c. Group C—Atmospheres containing a flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor whose MESG is greater than 0.45 mm but less than or equal to 0.75 mm or MIC ratio is greater than 0.40 but less than or equal to 0.80. Typical gases include ethyl either, ethylene, acetaldehyde, and cyclopropane.

d. Group D—Atmospheres containing a flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor whose MESG is greater than 0.75 mm or MIC ration is greater than 0.80. Typical gases include acetone, ammonia, benzene, butane, ethanol, gasoline, methane, natural gas, naphtha, and propane.

e. Group E—Atmospheres containing combustible metal dusts such as aluminum, magnesium, and their commercial alloys.

f. Group F—Atmospheres containing combustible carbonaceous dusts with 8% or more trapped volatiles such as carbon black, coal, or coke dust.

g. Group G—Atmospheres containing combustible dusts not included in Group E or Group F. Typical dusts include flour, starch, grain, wood, plastic, and chemicals.

Zone System

Hazardous locations per the Zone system are classified according to its Zone which can be gas or dust. For gas atmospheres electrical equipment is further divided into Groups and Subgroups.

Zone—The Zone defines the probability of the hazardous material, gas or dust, being present in sufficient quantities to produce explosive or ignitable mixtures.

1. Gas

a. Zone 0—Ignitable concentrations of flammable gases or vapors which are present continuously or for long periods of time.

b. Zone 1—Ignitable concentrations of flammable gases or vapors which are likely to occur under normal operating conditions.

c. Zone 2—Ignitable concentrations of flammable gases or vapors which are not likely to occur under normal operating conditions and do so only for a short period of time.

2. Dust

a. Zone 20—An area where combustible dusts or ignitable fibers and flyings are present continuously or for long periods of time.

b. Zone 21—An area where combustible dusts or ignitable fibers and flyings are likely to occur under normal operating conditions.

c. Zone 22—An area where combustible dusts or ignitable fibers and flyings are not likely to occur under normal operating conditions and do so only for a short period of time.

Group—Electrical equipment is divided into three groups .

- Group I—Equipment intended for use in mines susceptible to firedamp (flammable mixture of gases naturally occurring in a mine).

- Group II—Equipment intended for use in places with an explosive gas atmosphere other than mines susceptible to firedamp. Group II equipment is subdivided into three subgroups.

  - Group IIA—Atmospheres containing propane, or gases and vapors of equivalent hazard.

  - Group IIB—Atmospheres containing ethylene, or gases and vapors of equivalent hazard.

  - Group IIC—Atmospheres containing acetylene or hydrogen, or gases and vapors of equivalent hazard.

- Group III—Equipment intended for use in places with an explosive dust atmosphere. Group III equipment is subdivided into three subgroups.

  - Group IIIA—Atmospheres containing combustible flyings.

  - Group IIIB—Atmospheres containing non-conductive dust.

  - Group IIIC—Atmospheres containing conductive dust.

Protection Techniques and Methods

Various protection techniques and methods have been developed and employed, thus reducing or minimizing the potential risks of explosion or fire from electrical equipment located in hazardous locations. Not all methods are listed.

Class/Division system

- Explosion-proof—A type of protection that utilizes an enclosure that is capable of withstanding an explosive gas or vapor within it and or preventing the ignition of an explosive gas or vapor that may surround it and that operates at such an external temperature that a surrounding explosive gas or vapor will not be ignited thereby.

- Intrinsically Safe—A type of protection in which the electrical equipment under normal or abnormal conditions is incapable of releasing sufficient electrical or thermal energy to cause ignition of a specific hazardous atmospheric mixture in its most easily ignitable concentration.

- Dust Ignition-proof—A type of protection that excludes ignitable amounts of dust or amounts that might affect performance or rating and that, when installed and protected in accordance with the original design intent, will not allow arcs, sparks or heat otherwise generated or liberated inside the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust.

- Non-incendive—A type of protection in which the equipment is incapable, under normal conditions, of causing ignition of a specified flammable gas or vapor-in-air mixture due to arcing or thermal effect.

Zone system

The below concepts are high-level protection concepts. There are also sub-levels of protection that may or not be applicable to each type. Also, some equipment may combine multiple types of protection.

- Flame-proof—A type of protection in which an enclosure can withstand the pressure developed during an internal explosion of an explosive mixture and that prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure and that operates at such an external temperature that a surrounding explosive gas or vapor will not be ignited there. This type of protection is referred to as “Ex d”.

- Intrinsically Safe—A type of protection in which the electrical equipment under normal or abnormal conditions is incapable of releasing sufficient electrical or thermal energy to cause ignition of a specific hazardous atmospheric mixture in its most easily ignitable concentrations. This type of protection is referred to as “Ex i”.

- Increased Safety—A type of protection in which various measures are applied to reduce the probability of excessive temperatures and the occurrence of arcs or sparks in the interior and on the external parts of electrical apparatus that do not produce them in normal service. Increased safety may be used with flame-proof type of protection. This type of protection is referred to as “Ex e”.

- Type n—A type of protection applied to electrical equipment such that in normal operation it is not capable of igniting a surrounding explosive atmosphere. This type of protection is referred to as “Ex n”.

- Type t—A type of protection in which the electrical equipment is equipped with an enclosure providing dust ingress protection and a means to limit surface temperatures. This type of protection is referred to as “Ex t”.

- Type h—Refers to one of three different types of protection: (1) where constructional measures are applied to protect against the possibility of ignition from hot surfaces, sparks and compression generated by moving parts; (2) ignition protection where mechanical or electrical devices are used in conjunction with nonelectrical equipment to manually or automatically reduce the likelihood of a potential ignition source from becoming an effective ignition source; or (3) protection where potential ignition sources are made ineffective or separated from the explosive atmosphere by either totally immersing them in a protective liquid, or by partially immersing and continuously coating their active surfaces with a protective liquid in such a way that an explosive atmosphere which may be above the liquid, or outside the equipment enclosure, cannot be ignited. Non-electrical equipment often apply "Ex h" protection methods.

Equipment Protection Level (EPL) Markings

The EPL marking indicates the level of protection that is given to equipment based on the likelihood of its becoming a source of ignition and distinguishing the difference between explosive gas atmospheres, explosive dust atmospheres, and the explosive atmospheres in mines susceptible to firedamp.

Temperature Code (T Code)

A mixture of hazardous gases and air may be ignited by coming into contact with a hot surface. The conditions under which a hot surface will ignite a gas depends on surface area, temperature, and the concentration of the gas. The same can be said about combustible dusts. The T code of a product denotes the maximum surface temperature that a given product will not exceed under a specified ambient temperature. For example, a product with a T code of T3 means that its maximum surface temperature will not exceed 200°C provided it is operated in a ambient temperature defined by the manufacturer.

Nomenclature

Class/Division system

Approved equipment is marked according to which Class (I, II, or III), Division (1 or 2), Group (A, B, C, D, E, F, or G), and temperature code (T1 through T6) that it is rated for. For intrinsically safe equipment the words "Intrinsically Safe" or "IS" will precede the actual approval marking to indicate it as being intrinsically safe. Examples are listed below:

Class I Division 1 Group B,C,D T5
CL I Div 2 GP ABCD T5
IS CL I,II,III Div 1 GP ABCDEFG
CL II,III Div 1,2 GP EFG T4

Zone system

Approved equipment is marked according to the protection concept for which it has been designed (Ex i, Ex d, Ex n, and etc.), the group (I, IIA, IIB, IIC, IIIA, IIIB, or IIIC), and temperature code (T1 through T6) that it is rated for. For the United States it will be preceded by which Class and Zone it is approved for. Examples are listed below:

Ex ia IIC T5
Ex d IIB+H2 T6
Ex nA IIC T6
Class I Zone 2 AEx nC IIC T5

Additional Terminology

Although the following terminology is not permitted for markings it is commonly used to describe the various types of approvals or when speaking of them.

XP—Flameproof approval for Class I Division 1
EXP—Flameproof approval for Class I Division 1
NI—Non-incendive approval for Class I Division 2
DIP—Dust Ignition Proof approval for Class II Division 1
S—"Suitable For" for Class II Division 2
IS—Intrinsically Safe

Approval Agencies

Generally speaking, most countries require that products intended for installation in a hazardous location be approved by a recognized authority or approval agency (governmental or independent) which that country has established by various laws, regulations, or codes. See table 1 for an overview of approvals and approval agencies.

North American Approvals

Of the 15 national testing laboratories (NRTL's) in the United States, only a few are qualified to approve products for use in hazardous locations. Two such agencies are; Factory Mutual (FM) and Underwriters Laboratories (UL). In Canada, products are approved by the Canadian Standards Association (CSA).

European Approvals

Each country belonging to the European Union has established one or more “Notified Bodies” for product approval. Notified Bodies not only approve products for use within their own country, commonly called national certifications/approvals, but also for any other country within the union, known as CENELEC certifications/approvals. CENELEC is the acronym for European Committee for Electrotechnical Standardization. A product which has been CENELEC certified or approved by any of the Notified Bodies is automatically accepted for use within all of the participating union countries. In July 2003 a European Directive, called the ATEX Directive, which pertains to equipment for explosive atmospheres, was adopted. All equipment intended for use in explosive atmospheres must comply with the ATEX Directive in order to be sold into the European Union.

International Approvals

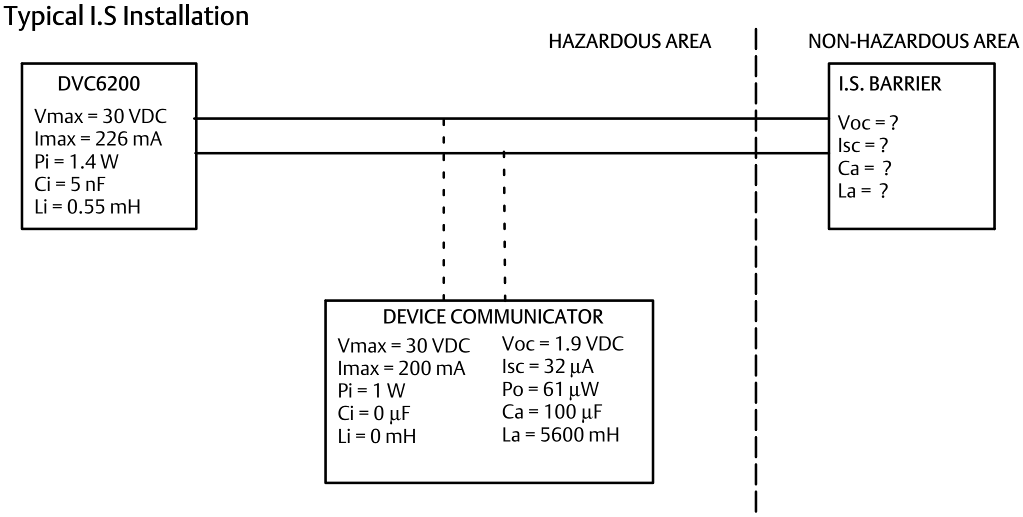
Countries participating in the IECEx Scheme (International Electrotechnical Commission on explosion protected equipment, known as “Ex”) can issue either an international certification or a national certification of explosion protected equipment. Each country within the IECEx scheme establishes an ExCB (Ex Certification Body) which can approve products. ExCB's can issue the national certification for their country based upon the IECEx standards (including any national deviations) and the international certification. Currently, Australia is the only country accepting international certifications for use in their country.

Table 1. Approval Agencies

Approvals[1]	Approval Agencies Used[2]	Approvals Accepted
FM	FM—Factory Mutual	North America
CML	CML—Certification Management Limited	Japan
CSA	CSA—Canadian Standards Association	North America
ATEX	Baseefa—British Approvals Service for Electrical Equipment in Flammable Atmospheres KEMA—NV tot Keuring van Elektrotechnische Materialen LCIE—Laboratorie Central des Industries Electriques	European Union
IECEx	CSA—Canadian Standards Association Baseefa—British Approvals Service for Electrical Equipment in Flammable Atmospheres	International
SAA	SAA—Standards Association of Australia	Australia
NEPSI	NEPSI—National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation	China
TIIS	TIIS—Technology Institution of Industrial Safety	Japan
INMETRO	INMETRO—National Institute of Metrology, Quality and Technology	Brazil
CUTR	FGUP Certification Centre: SC VSI VNIIFTRI Certification Body: OS VSI VNIFFTRI	Russia, Belarus, Kazakhstan, and Armenia

1. Fisher™ products may carry additional approvals. Contact your Emerson sales office for additional approval information.
2. Fisher product approvals may be certified by other agencies. Contact your Emerson sales office for additional information.

Figure 1. Typical I.S Installation



Guidelines for Selecting Intrinsic Safety Barriers Using Entity Ratings

Selecting an intrinsic safety barrier with the required entity ratings depends upon the combined effects of the instrument, its cabling, and any instrument accessories such as the AMS Trex™ Device Communicator. Determine the barrier entity ratings using the following guidelines:

$V_{oc} \leq V_{max}$
$I_{sc} \leq I_{max}$
$C_a \geq C_i + C_{cable}$
$L_a \geq L_i + L_{cable}$

where:

V_{oc} = Barrier open circuit voltage

V_{max} = Instrument Vmax

I_{sc}= Barrier short circuit current

I_{max} = Instrument Imax

C_a = Barrier acceptable connected capacitance

C_i = Instrument total unprotected internal capacitance

Ccable = Signal cable total capacitance

L_a = Barrier acceptable connected inductance

L_i = Instrument total unprotected internal inductance

L_{cable} = Signal cable total inductance

The values V_{oc}, I_{oc}, C_a, and L_a are specified by the barrier manufacturer for any given barrier. The values of C_{cable} and L_{cable} for the signal cable must be determined for the specific cable used.

Example barrier entity ratings calculation

A system is comprised of a FIELDVUE™ DVC6200 digital valve controller (FM approved), a Device Communicator (FM approved), and 1000 feet of cable with 60 pF/ft capacitance and 0.2 µH/ft inductance. Calculate the barrier entity ratings.

Figure 1 shows a typical I.S. installation.

Calculate C_{cable} and L_{cable}

C_{cable} = 60 pF/ft x 1000 ft

= 60 nF

L_{cable} = 0.2 µH/ft x 1000 ft

= 0.2 mH

Determine C_a and L_a for the barrier

$C_a \geq C_{i(DVC6200)} + C_{i(Trex)} + C_{cable}$

$\geq$ 5 nF + 0 nF + 60 nF

$C_a \geq$ **65 nF**

$L_a \geq L_{i(DVC6200)} + L_{i(Trex)} + L_{cable}$

$\geq$ 0.55 mH + 0 mH + 0.2 mH

$L_a \geq$ **0.75 mH**

Determine V_{oc} and I_{sc} of the barrier. Note that in this example the output of the Trex ($V_{oc(Trex)}$ and $I_{sc(Trex)}$)

must also be considered because it can also add energy to the loop besides just the barrier itself. V_{oc} of the barrier plus any additional voltage that could be added to the loop from each device must be subtracted from V_{max} for each device. I_{sc} of the barrier plus any additional current that could be added to the loop from each device must not exceed I_{max} for each device.

Voc of the barrier must meet all of the following conditional requirements.

1) $V_{oc} \leq V_{max(DVC6200)} - V_{oc(Trex)} \rightarrow$ 30 VDC - 1.9 VDC $\rightarrow$ 28.1 VDC

2) $V_{oc} \leq V_{max(DVC6200)} \rightarrow$ 30 VDC

3) $V_{oc} \leq V_{max(Trex)} \rightarrow$ 30 VDC

$V_{oc} \leq$ 28.1 VDC

Isc of the barrier must meet all of the following conditional requirements.

1) $I_{sc} \leq I_{max(DVC6200)} + I_{sc(Trex)} \rightarrow$ 226 mA + 0.032 mA $\rightarrow$ 226.032 mA

2) $I_{sc} \leq I_{max(DVC6200)} \rightarrow$ 226 mA

3) $I_{sc} \leq I_{max(Trex)} \rightarrow$ 200 mA

$I_{sc} \leq$ 200 mA

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Fisher™ FIELDVUE™ DLC3010 Digital Level Controller

The FIELDVUE DLC3010 digital level controller is used with level sensors to measure liquid level, the level of the interface between two liquids, or liquid specific gravity (density). Changes in level or specific gravity exert a buoyant force on a displacer, which rotates a torque tube shaft. The digital level controller converts this rotational motion to an electronic signal.

W7977-2

The DLC3010 is a communicating, microprocessor-based instrument that can be configured to sense the level, interface level, or density of liquids. In addition to the normal function of providing a 4 to 20 milliampere current signal, the DLC3010, using HART® communications protocol, gives easy access to information critical to process operation. You can obtain information about the process, instrument, or sensor using an Emerson Field Communicator. The DLC3010 can be used in analog or HART digital signaling mode with the Emerson Automation Solutions DeltaV™ system.

The connection for HART communication may be made at any point in the field wiring that meets the HART impedance requirements. Configuration, calibration, diagnostics, parameter review, signal monitoring and alert monitoring are all available through the HART protocol. Information from the field can be integrated into control systems or be received on a single loop basis.

The DLC3010 digital level controller is designed to directly replace standard pneumatic and electronic level transmitters. It mounts on a wide variety of Fisher 249 caged and cageless level sensors.

DLC3010 Digital Level Controller Specifications

Available Configurations

DLC3010 Digital Level Controller:
Mounts on caged and cageless 249 sensors. See tables 4 and 5 and sensor description.

Function: Transmitter

Communications Protocol: HART

Input Signal

Level, Interface, or Density: Rotary motion of torque tube shaft proportional to changes in liquid level, interface level, or density that change the buoyancy of a displacer.

Process Temperature: Interface for 2- or 3-wire 100 ohm platinum RTD for sensing process temperature, or optional user-entered target temperature to permit compensating for changes in specific gravity

Output Signal

Analog: 4 to 20 milliamperes DC (■ direct action—increasing level, interface, or density increases output; or ■ reverse action—increasing level, interface, or density decreases output)

High saturation: 20.5 mA
Low saturation: 3.8 mA
High alarm: 22.5 mA
Low Alarm: 3.7 mA

Only one of the above high/low alarm definitions is available in a given configuration. NAMUR NE 43 compliant when high alarm level is selected.

Digital: HART 1200 Baud FSK (frequency shift keyed)

HART impedance requirements must be met to enable communication. Total shunt impedance across the master device connections (excluding the master and transmitter impedance) must be between 230 and 600 ohms. The transmitter HART receive impedance is defined as:
Rx: 42K ohms and
Cx: 14 nF

In point-to-point configuration, analog and digital signalling are available. The instrument may be queried digitally for information, or placed in Burst mode to regularly transmit unsolicited process information digitally. In multi-drop mode, the output current is fixed at 4 mA, and only digital communication is available.

Performance

Performance Criteria	DLC3010 Digital Level Controller(1)	w/ 3-Inch 249W, Using a 14-inch Displacer	w/ All Other 249 Sensors
Independent Linearity	±0.25% of output span	±0.8% of output span	±0.5% of output span
Hysteresis	<0.2% of output span	- - -	- - -
Repeatability	±0.1% of full scale output	±0.5% of output span	±0.3% of output span
Dead Band	<0.05% of input span	- - -	- - -
Hysteresis plus Deadband	- - -	<1.0% of output span	<1.0% of output span

NOTE: At full design span, reference conditions.
1. To lever assembly rotation inputs.

Note: At effective proportional band (PB)<100%, linearity, dead band, repeatability, power supply effect, and ambient temperature influence are potentially derated by the factor (100%/PB)

Operating Influences

Power Supply Effect: Output changes <±0.2% of full scale when supply varies between minimum and maximum voltage specifications.

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DLC3010 Digital Level Controller Specifications (continued)

Transient Voltage Protection: The loop terminals are protected by a transient voltage suppressor. The specifications are as follows:

Pulse Waveform		Max V_{CL} (Clamping Voltage) (V)	Max I_{PP} (Pulse Peak @ Current) (A)
Rise Time (μs)	Decay to 50% (μs)		
10	1000	93.6	16
8	20	121	83

Note: μs = microsecond

Ambient Temperature: The combined temperature effect on zero and span without the 249 sensor is less than 0.03% of full scale per degree Kelvin over the operating range -40 to 80°C (-40 to 176°F)

Process Temperature: The torque rate is affected by the process temperature (see figure 1). The process density may also be affected by the process temperature.

Process Density: The sensitivity to error in knowledge of process density is proportional to the differential density of the calibration. If the differential specific gravity is 0.2, an error of 0.02 specific gravity units in knowledge of a process fluid density represents 10% of span.

Electromagnetic Compatibility

Meets EN 61326-1:2013 and EN 61326-2-3:2006
Immunity—Industrial locations per Table 2 of EN 61326-1 and Table AA.2 of EN 61326-2-3. Performance is shown in table 1 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Supply Requirements (See figure 3)

12 to 30 volts DC ⎓ ; 22.5 mA
Instrument has reverse polarity protection.

A minimum compliance voltage of 17.75 is required to guarantee HART communication.

Compensation

Transducer compensation: for ambient temperature.
Density parameter compensation: for process temperature (requires user-supplied tables).
Manual compensation: for torque tube rate at target process temperature is possible.

Digital Monitors

Linked to jumper-selected Hi (factory default) or Lo analog alarm signal:
Torque tube position transducer: Drive monitor and signal reasonableness monitor
User-configurable alarms: Hi-Hi and Lo-Lo Limit process alarms

HART-readable only:
RTD signal reasonableness monitor: When RTD installed
Processor free-time monitor.
Writes-remaining in Non Volatile Memory monitor.
User-configurable alarms: Hi and Lo limit process alarms, Hi and Lo limit temperature alarms, Hi and Lo limit electronics temperature alarms

Diagnostics

Output loop current diagnostic.
LCD meter diagnostic.
Spot specific gravity measurement in level mode: used to update specific gravity parameter to improve process measurement
Digital signal-tracing capability: by review of "troubleshooting variables", and
Basic trending capability for PV, TV and SV.

LCD Meter Indications

LCD meter indicates analog output on a percent scale bar graph. The meter also can be configured to display:

Process variable in engineering units only.
Percent range only.
Percent range alternating with process variable or
Process variable, alternating with process temperature (and degrees of pilot shaft rotation).

Electrical Classification

Pollution Degree IV, Overvoltage Category II per IEC 61010 clause 5.4.2 d

Hazardous Area:

CSA— Intrinsically Safe, Explosion-proof, Division 2, Dust Ignition-proof

FM— Intrinsically Safe, Explosion-proof, Non-incendive, Dust Ignition-proof

ATEX— Intrinsically Safe, Type n, Flameproof

IECEx— Intrinsically Safe, Type n, Flameproof

Refer to tables 8, 9, 10, and 11 for additional approval information.

Electrical Housing:
CSA— Type 4X
FM— NEMA 4X
ATEX— IP66
IECEx— IP66

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DLC3010 Digital Level Controller Specifications (continued)

Other Classifications/Certifications

CML— Certification Management Limited (Japan)

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

INMETRO— National Institute of Metrology, Standardization, and Industrial Quality (Brazil)

KTL— Korea Testing Laboratory (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

Contact your Emerson sales office for classification/certification specific information

Minimum Differential Specific Gravity

With a nominal 4.4 degrees torque tube shaft rotation for a 0 to 100 percent change in liquid level (specific gravity=1), the digital level controller can be adjusted to provide full output for an input range of 5% of nominal input span. This equates to a minimum differential specific gravity of 0.05 with standard volume displacers.

See 249 sensor specifications for standard displacer volumes and standard wall torque tubes. Standard volume for 249C and 249CP is ~980 cm^3 (60 in^3), most others have standard volume of ~1640 cm^3 (100 in^3).

Operating at 5% proportional band will degrade accuracy by a factor of 20. Using a thin wall torque tube, or doubling the displacer volume will each roughly double the effective proportional band. When proportional band of the system drops below 50%, changing displacer or torque tube should be considered if high accuracy is a requirement.

Mounting Positions

Digital level controller can be mounted right- or left-of-displacer, as shown in figure 8.

Instrument orientation is normally with the coupling access door at the bottom, to provide proper drainage of lever chamber and terminal compartment, and to limit gravitational effect on the lever assembly. If alternate drainage is provided by user, and a small performance loss is acceptable, the instrument could be mounted in 90 degree rotational increments around the pilot shaft axis. The LCD meter may be rotated in 90 degree increments to accommodate this.

Construction Materials

Case and Cover: Low-copper aluminum alloy
Internal: Plated steel, aluminum, and stainless steel; encapsulated printed wiring boards; Neodymium Iron Boron Magnets

Electrical Connections

Two 1/2-14 NPT internal conduit connections; one on bottom and one on back of terminal box. M20 adapters available.

Options

■ Heat insulator ■ Mountings for Masoneilan, Yamatake and Foxboro/Eckhardt displacers available ■ Level Signature Series Test (Performance Validation Report) available (EMA only) for instruments factory-mounted on 249 sensor ■ Factory Calibration: available for instruments factory-mounted on 249 sensor, when application, process temperature and density(s) are supplied ■ Device is compatible with user-specified remote indicator

Operating Limits

Process Temperature: See table 3 and figure 2.
Ambient Temperature and Humidity: See below

Conditions	Normal Limits(1)(2)	Transport and Storage Limits(1)	Nominal Reference(1)
Ambient Temperature	-40 to 80°C (-40 to 176°F)	-40 to 85°C (-40 to 185°F)	25°C (77°F)
Ambient Relative Humidity	0 to 95%, (non-condensing)	0 to 95%, (non-condensing)	40%

1. LCD meter may not be readable below -20°C (-4°F)
2. Contact your Emerson sales office or application engineer if temperatures exceeding these limits are required.

Altitude Rating

Up to 2000 meters (6562 feet)

Weight

Less than 2.7 Kg (6 lb)

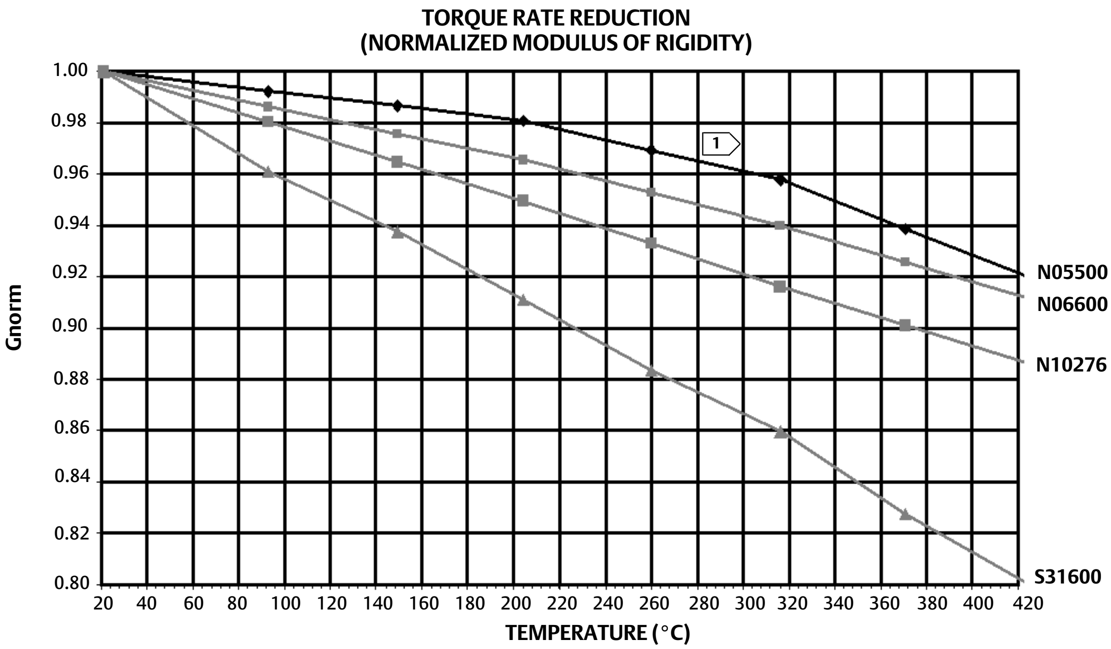
NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.

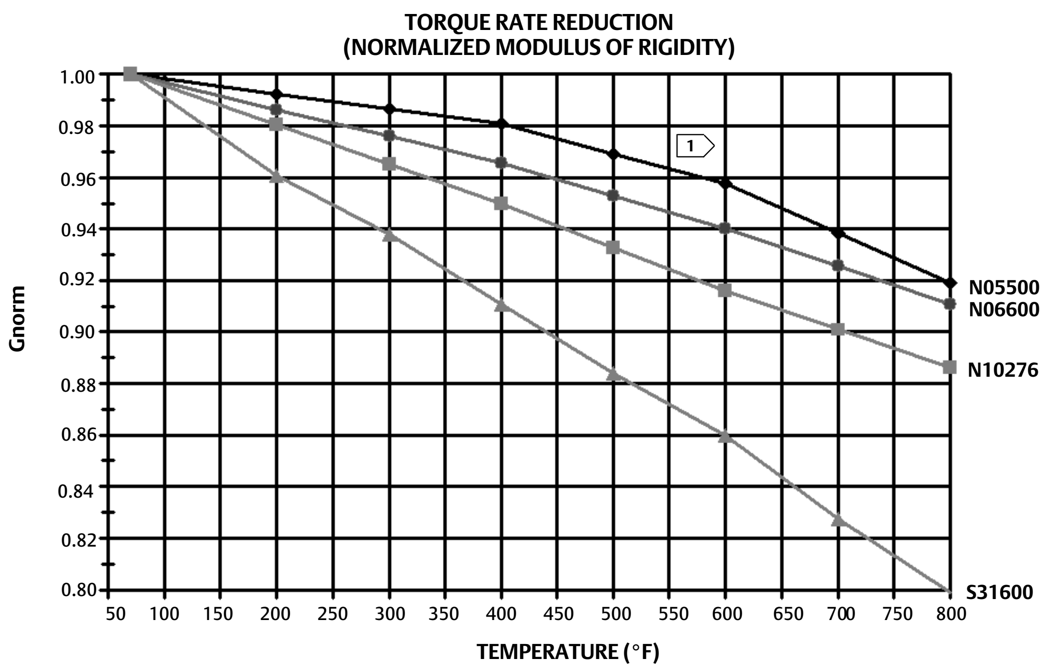
Table 1. EMC Summary Results—Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(1)(2)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A
I/O signal/control	Burst	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

Note: RTD wiring must be shorter than 3 meters (9.8 feet)
1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering. Specification limit = +/- 1% of span.
2. HART communication was considered as “not relevant to the process” and is used primarily for configuration, calibration, and diagnostic purposes.

Figure 1. Theoretical Reversible Temperature Effect on Common Torque Tube Materials





Note:
1 Due to the permanent drift that occurs near and above 260°C (500°F), N05500 is not recommended for temperatures above 232°C (450°F).

Features

- **Simplified Setup and Calibration**—For quick analog transmitter replacement (4-20 mA out only), the instrument may be configured with default sensor data, zero Level Offset, differential process SG, and zero/span procedure only. For full compensation and diagnostic capabilities, complete sensor data entry and calibration is recommended.

  Using Guided Setup, digital level controller start-up is straightforward and fast. Level and temperature alarms, specific gravity tables, calibration trim and trending are readily configurable. The DLC3010 also supports re-ranging without a fluid reference.

- **Responsive to Small Process Changes**—Accurate, high-gain analog-to-digital conversion enables measurement of small changes in the process variable. This allows the DLC3010 to be used in difficult liquid level, interface, or density applications. In addition, an adjustable input filter and output damping help to attenuate displacer-induced ripple in the output signal due to liquid turbulence.

- **Reduced Temperature Effects**—An internal temperature sensor enables consistent performance of the digital level controller despite ambient temperature changes. With a temperature input signal, either via HART protocol or an RTD connected to the instrument, the digital level controller can also automatically compensate for specific gravity changes due to temperature. A user-supplied table of up to ten linear segments may be entered to implement this feature. (A sample water/steam table is provided in the DLC3010 instruction manual (D102748X012). The measured torque tube rate may be manually pre-compensated for a target process temperature using the data available in the DLC3010 Device Description (DD).

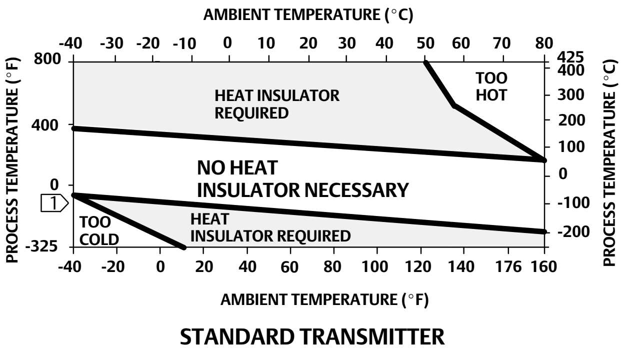
- **Additional Compensation**—The instrument measurement algorithm corrects for the small motion of the displacer as buoyancy changes, allowing it to calculate the true cage or vessel level. This provides additional accuracy on the shorter displacers.

- **Rugged Construction**—Mechanical safeguards designed into the digital level controller help it to withstand physical abuse often incurred during installation or in transport, without compromising performance. The fully encapsulated printed wiring boards resist the effects of vibration, temperature, and corrosive atmospheres. The lever assembly is pinned at the neutral position when the coupling access door is open, providing shipping stabilization for a separate transmitter purchase. Locking set screws are provided for covers and the access door handle.

- **Easy Maintenance**—Field wiring connections are in a compartment separated from the electronics. This protects the electronics from any moisture brought into the housing by the field wiring. This also eases installation and maintenance. The digital level controller does not have to be removed to facilitate troubleshooting or service. Modular construction (figure 4) allows servicing in the field. However, if it is necessary to remove the digital level controller for in-shop maintenance and calibration, field wiring does not need to be disconnected.

- **Alarm Jumper**—The DLC3010 digital level controller includes self-diagnostics that detect an error (e.g. electronics failure) that would render the process variable measurement inaccurate. The instrument can also be configured to indicate a process variable high or low alarm. When a process variable alarm or an error is detected the analog output signal is driven either above or below the normal 4 to 20 mA range, depending on the user-selectable position of the alarm jumper. The unit ships from the factory with the jumper in the high position.

Figure 2. Guidelines for Use of Optional Heat Insulator Assembly



Notes:
1 For process temperature below -29° (C-20°F) and above 204°C (400°F) sensor materials must be appropriate for the process [refer to Fisher Bulletin 34.2:2500 (D200037X012)].
2. If ambient dew point is above process temperature, ice formation might cause instrument malfunction and reduce insulator effectiveness.

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Figure 3. Power Supply Requirements and Load Resistance

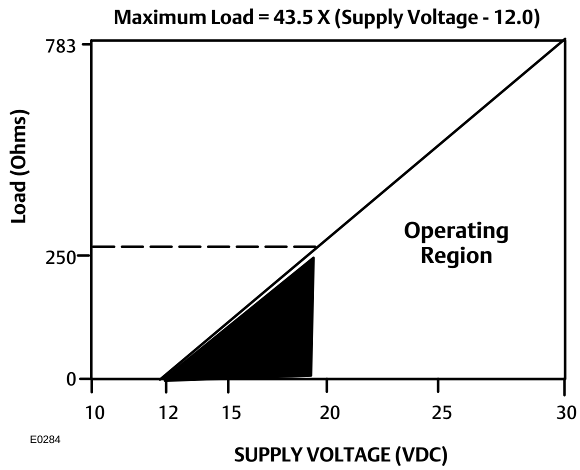
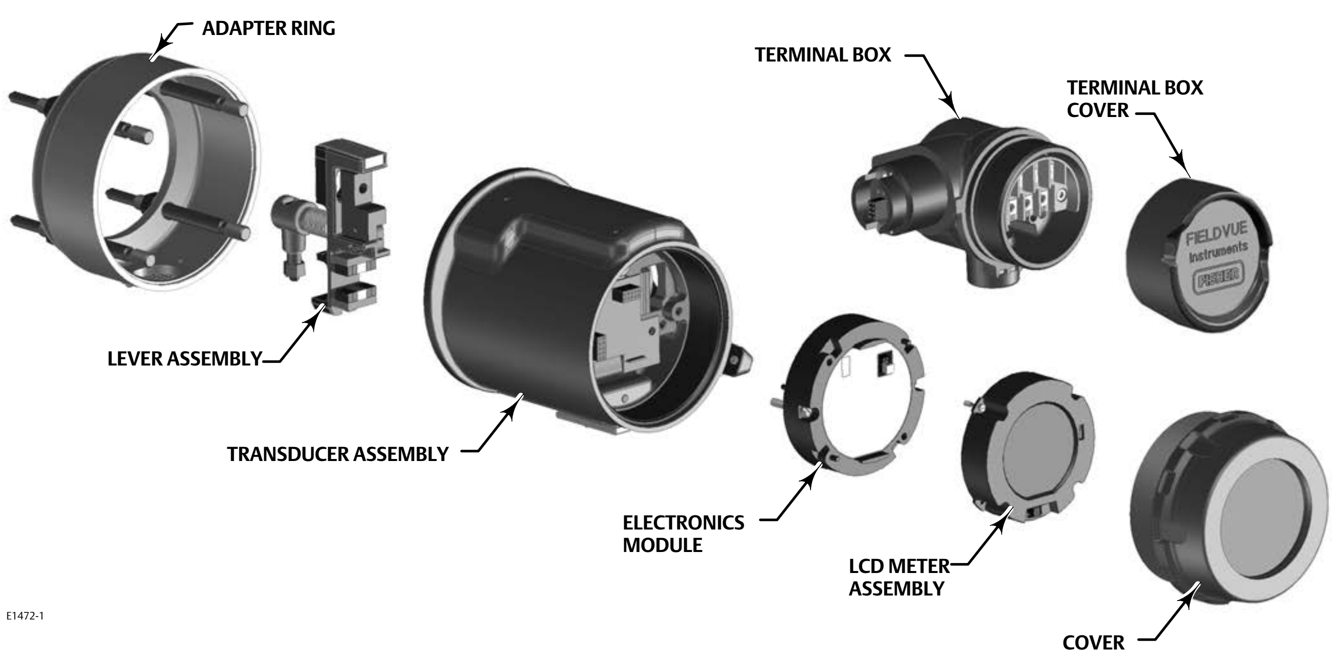


Figure 4. FIELDVUE DLC3010 Digital Level Controller Assembly



Principle of Operation

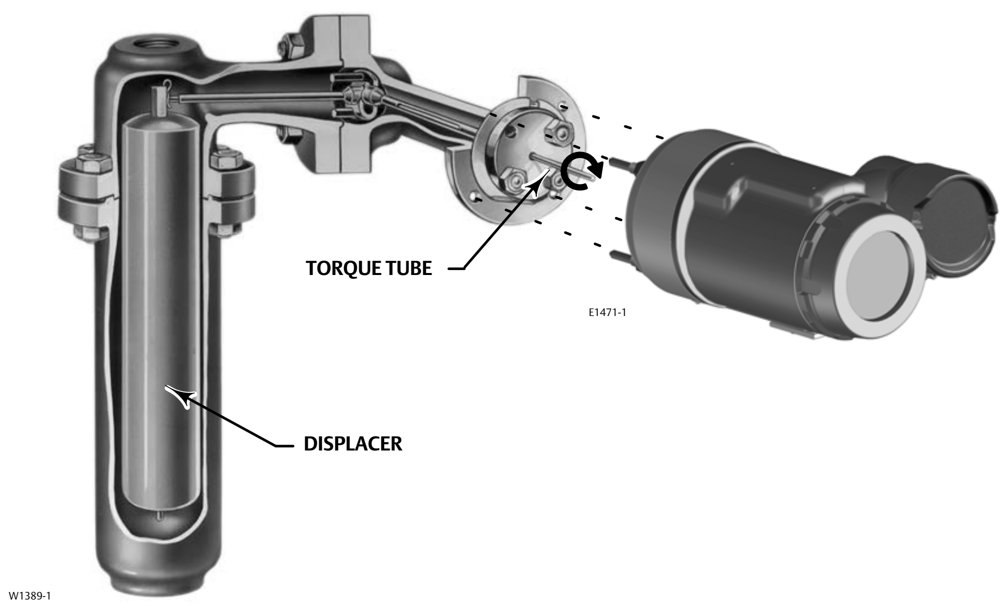
The DLC3010 digital level controller is a loop-powered instrument that measure changes in liquid level, level of an interface between two liquids, or density of a liquid. A level, density, or interface level change in the measured fluid causes a change in the displacer buoyancy (figure 5). This change is transferred to the torque tube assembly. As the measured fluid changes, the torque tube assembly rotates.

The rotary motion of the torque tube is transferred to the digital level controller lever assembly (figure 5). The rotary motion moves a magnet attached to the lever assembly, changing the magnetic field that is sensed by the Hall-effect sensor. The sensor converts the magnetic field signal to a varying electronic signal, which is processed digitally to provide linearity corrections, sensitivity adjustment, and temperature compensation.

The signal is interpreted as a buoyancy change by reference to the stored torque rate, coupling point, and moment arm data. The buoyancy change in turn is interpreted as a level, interface, or density change by reference to stored displacer volume, specific gravity, and displacer length data. In level or interface modes, the correction for displacer motion is then added, as well as user-supplied offset to change the PV reference from the bottom of the displacer or correct for a coupling point error.

The resultant primary variable (PV) is then compared to PV alarm thresholds (if enabled) and used to set status bits and/or trigger the analog alarm current. If the alarm is not triggered, the PV is used to generate 4-20 mA analog and 0-100% range digital signals by reference to the stored upper and lower range values. The resultant analog command is limited at the saturation values to allow discrimination between saturated and alarm signals.

Figure 5. Cutaway View of Fisher 249 Displacer Sensor with FIELDVUE DLC3010 Digital Level Controller



249 Level Sensors Specifications

Input Signal

Liquid Level or Liquid-to-Liquid Interface Level: From 0 to 100 percent of displacer length
Liquid Density: From 0 to 100 percent of displacement force change obtained with given displacer volume—standard volumes are ■ 980 cm^3 (60 $inches^3$) for 249C and 249CP sensors or ■ 1640 cm^3 (100 $inches^3$) for most other sensors; other volumes available depending upon sensor construction

Sensor Displacer Lengths

See tables 4 and 5 footnotes

Sensor Working Pressures

Consistent with applicable ASME pressure/temperature ratings for the specific sensor constructions shown in tables 4 and 5

Caged Sensor Connection Styles

Cages can be furnished in a variety of end connection styles to facilitate mounting on vessels; the equalizing connection styles are numbered and are shown in figure 7.

Mounting Positions

Most level sensors with cage displacers have a rotatable head. The head may be rotated through 360 degrees to any of eight different positions, as shown in figure 8.

Construction Materials

See tables 2, 4, and 5

Operative Ambient Temperature

See table 3.
For ambient temperature ranges, guidelines, and use of optional heat insulator, see figure 2.

Options

■ Heat insulator ■ Gauge glass for pressures to 29 bar at 232°C (420 psig at 450°F), and ■ Reflex gauges for high temperature and pressure applications

249 Level Sensors

249 level sensors used with the DLC3010 digital level controller are available in both caged and cageless configurations. Figure 6 shows a DLC3010 mounted on a caged 249 sensor. Caged sensors provide more stable operation than do cageless sensors for vessels with internal obstructions or considerable internal turbulence. Cageless sensors are generally used on specific gravity and interface control applications requiring large displacers that are more easily accommodated by flange connections up to 8 inches. The availability of many different displacer stem lengths permits lowering the displacer down to the most advantageous depth in the vessel.

Figure 6. FIELDVUE DLC3010 Digital Level Controller and Fisher 249B Level Sensor

Table 2. Displacer and Torque Tube Materials

Part	Standard Material	Other Materials
Displacer	304 Stainless Steel	316 Stainless Steel, N10276, N04400, Plastic, and Special Alloys
Displacer Stem, Driver Bearing, Displacer Rod and Driver	316 Stainless Steel	N10276, N04400, other Austenitic Stainless Steels, and Special Alloys
Torque Tube	N05500[1]	316 Stainless Steel, N06600, N10276

1. N05500 is not recommended for spring applications above 232°C (450°F). Contact your Emerson sales office or application engineer if temperatures exceeding this limit are required.

Table 3. Allowable Process Temperatures for Common Fisher 249 Sensor Pressure Boundary Materials

MATERIAL	PROCESS TEMPERATURE	
	Min.	Max.
Cast Iron	-29°C (-20°F)	232°C (450°F)
Steel	-29°C (-20°F)	427°C (800°F)
Stainless Steel	-198°C (-325°F)	427°C (800°F)
N04400	-198°C (-325°F)	427°C (800°F)
Graphite Laminate/SST Gaskets	-198°C (-325°F)	427°C (800°F)
N04400/PTFE Gaskets	-73°C (-100°F)	204°C (400°F)

Table 4. Caged Displacer Sensors[1]

TORQUE TUBE ORIENTATION	SENSOR	STANDARD CAGE, HEAD, AND TORQUE TUBE ARM MATERIAL	EQUALIZING CONNECTION		PRESSURE RATING[2]
			Style	Size (NPS)	
Torque tube arm rotatable with respect to equalizing connections	249[3]	Cast Iron	Screwed	1-1/2 or 2	CL125 or 250
			Flanged	2	
	249B, 249BF[4]	Steel	Screwed or optional socket weld	1-1/2 or 2	CL600
			Raised face or optional ring type joint flanged	1-1/2	CL150, 300, or 600
				2	CL150, 300, or 600
	249C[3]	316 Stainless Steel	Screwed	1-1/2 or 2	CL600
			Raised face flanged	1-1/2	CL150, 300, or 600
				2	CL150, 300, or 600
	249K	Steel	Raised face or optional ring type joint flanged	1-1/2 or 2	CL900 or 1500
	249L	Steel	Ring type joint flanged	2[5]	CL2500

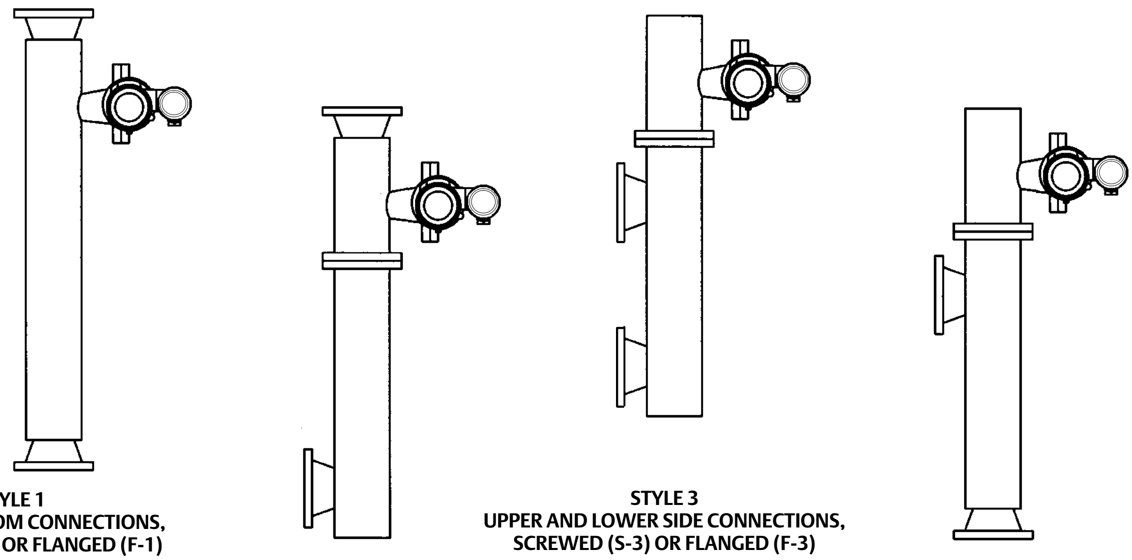
1. Standard displacer lengths for all styles (except 249) are 14, 32, 48, 60, 72, 84, 96, 108 and 120 inches. The 249 uses a displacer with a length of either 14 or 32 inches.
2. DIN flange connections available in EMA (Europe, Middle East and Africa).
3. Not available in EMA.
4. 249BF available in EMA only. Also available in DIN size DN40 with PN10 to PN100 flanges and size DN50 with PN10 to PN63 flanges.
5. Top connection is 1-inch ring-type joint flanged for connection styles F1 and F2.

Table 5. Cageless Displacer Sensors[1]

Mounting	Sensor	Standard Head[2], Wafer Body[6], and Torque Tube Arm Material	Flange Connection	Pressure Rating[3]
Mounts on top of vessel	249BP[4]	Steel	NPS 4 raised face or optional ring type joint	CL150, 300, or 600
			NPS 6 or 8 raised face	CL150 or 300
	249CP	316 Stainless Steel	NPS 3 raised face	CL150, 300, or 600
	249P[5]	Steel or Stainless Steel	NPS 4 raised face or optional ring type joint	CL900 or 1500 (EN PN 10 to DIN PN 250)
			NPS 6 or 8 raised face	CL150, 300, 600, 900, 1500, or 2500
Mounts on side of vessel	249VS	Cast Iron, Cast Steel or CF8M (316 Stainless Steel)	For NPS 4 raised face or flat face	CL125, 150, 250, 300, 900, or 1500 (EN PN 10 to DIN PN 160
			For NPS 4 butt weld end, XXS	CL2500
Mounts on top of vessel or on customer supplied cage	249W	WCC (steel) or CF8M	For NPS 3 raised face	CL150, 300, or 600
		LCC (steel) or CF8M	For NPS 4 raised face	CL150, 300, or 600

1. Standard displacer lengths are 14, 32, 48, 60, 72, 84, 96, 108, and 120 inches.
2. Not used with side-mounted sensors.
3. DIN flange connections available in EMA (Europe, Middle East and Africa).
4. Not available in EMA.
5. 249P available in EMA only.
6. Wafer Body only applicable to 249W.

Figure 7. Style Number of Equalizing Connections



Installation

A 249 sensor may be shipped with the DLC3010 digital level controller installed or they may be shipped separately.

When shipping a skid mounted system, where the displacer cannot be restrained, it is recommended that the transmitter be uncoupled and the lever assembly locked to prevent damage. The transmitter must be re-coupled at commissioning, and a zero-trim will be required.

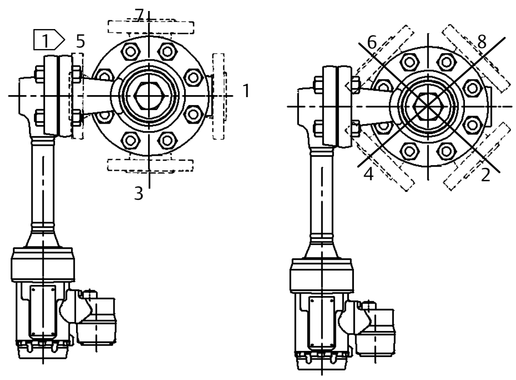
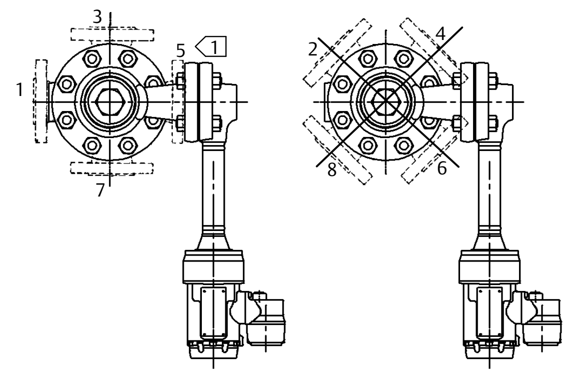
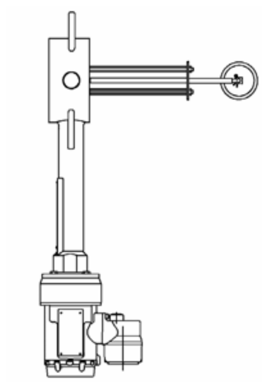
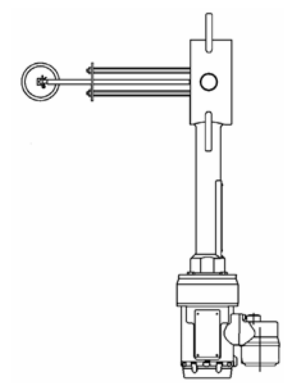
Dimensions for the DLC3010 and 249 sensor product construction are shown in figure 9 and tables 6 and 7. Dimensions of other combinations are available upon request.

Ordering Information

When ordering, specify:

- Process temperature and pressure and ambient air temperature
- Application
- Liquid level service (specific gravity)
- Interface level service (specific gravity of both liquids and minimum differential gap or span required)
- Density service (minimum and maximum specific gravity required)

Figure 8. Typical Mounting Positions for FIELDVUE DLC3010 Digital Level Controller on Fisher 249 Sensors

SENSOR	LEFT-OF-DISPLACER	RIGHT-OF-DISPLACER
CAGED		
CAGELESS		
1 Not available for 249C and 249K.		

Construction

Refer to the specifications tables. Review the descriptions below each specification and in the referenced tables and figures; specify the desired choice whenever there is a selection to be made.

Heat Insulator

DLC3010 Digital Level Controller

If the DLC3010 and the 249 sensor are ordered as an assembly, and a heat insulator is required for the application, order the heat insulator as a 249 sensor option. If the DLC3010 is ordered separately, the heat insulator is available as a kit.

Figure 9. Dimensions for FIELDVUE DLC3010 Digital Level Controller Mounted on a Fisher 249B Sensor (also see tables 6 and 7)

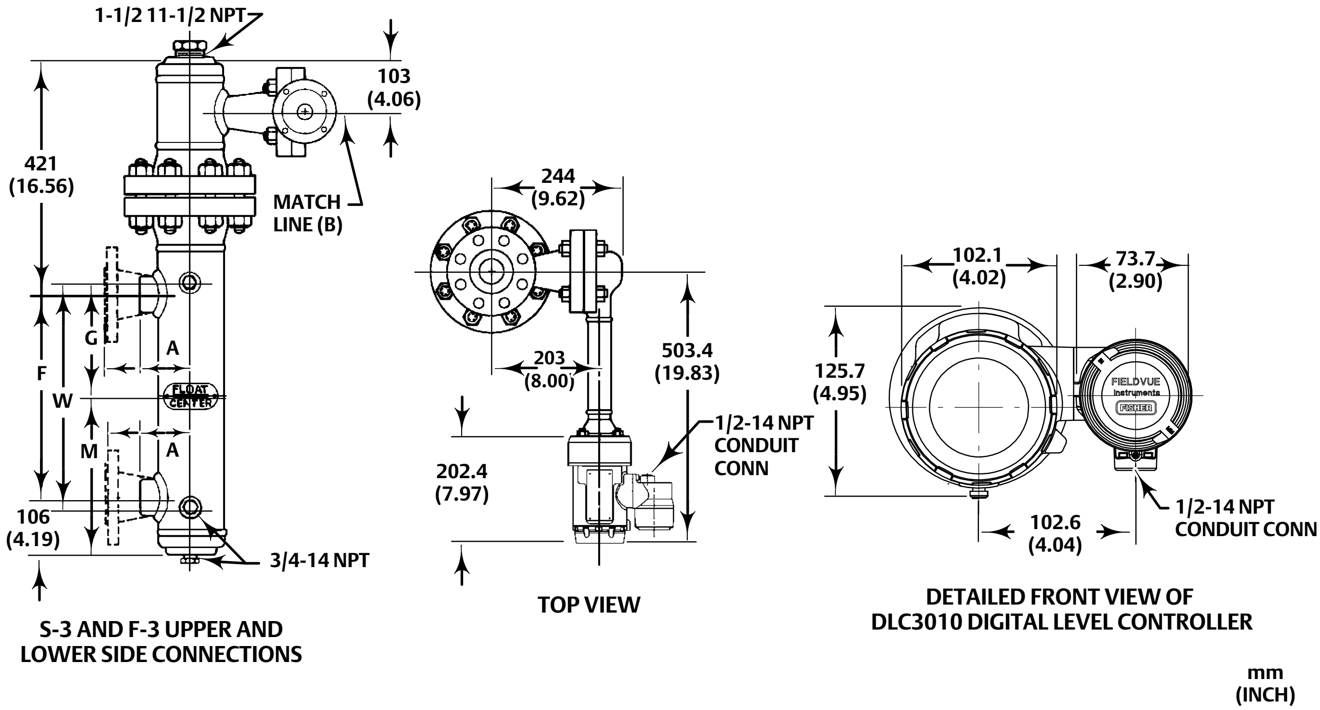


Table 6. Dimension A for FIELDVUE DLC3010 Digital Level Controller Mounted on a Fisher 249B Sensor

SIZE (NPS)	A													
	Screwed NPT		CL150 RF		CL150 RTJ		CL300 RF		CL300 RTJ		CL600 RF		CL600 RTJ	
	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
1-1/2	121	4.75	145	5.69	152	6.00	148	5.81	154	6.06	154	6.06	159	6.25
2	121	4.75	145	5.69	151	5.94	148	5.81	155	6.12	157	6.19	159	6.25

DIN(1)				
SIZE	PN10/PN16	PN25/PN40	PN63	PN100
	mm	mm	mm	mm
DN40	143	145	153	153
DN50	145	147	153	---

1. Dimension A for 249BF with din flanges.

Table 7. Dimensions F, G, M, and W for FIELDVUE DLC3010 Digital Level Controller Mounted on a Fisher 249B Sensor

DISPLACER LENGTH		F		G		M		W	
mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
356	14	356	14.00	197	7.75	284	11.19	394	15.50
813	32	813	32.00	425	16.75	513	20.19	851	33.50

Table 8. Hazardous Area Classifications for Canada—CSA

Certification Body	Certification Obtained	Entity Rating	Temperature Code
CSA	Ex ia Intrinsically Safe Class I, Division 1, 2 Groups A, B, C, D Class II, Division 1, 2 Groups E, F, G Class III T6 per drawing 28B5744	Vmax = 30 VDC Imax = 226 mA Ci = 5.5 nF Li = 0.4 mH	T6 (Tamb ≤ 80°C)
	Explosion-proof Class I, Division 1 GP B,C,D T5/T6	- - -	T5 (Tamb ≤ 80°C) T6 (Tamb ≤ 78°C)
	Class I Division 2 GP A,B,C,D T5/T6	- - -	T5 (Tamb ≤ 80°C) T6 (Tamb ≤ 78°C)
	Class II Division 1, 2 GP E,F,G T5/T6 Class III T5/T6	- - -	T5 (Tamb ≤ 80°C) T6 (Tamb ≤ 78°C)

Table 9. Hazardous Area Classifications for United States—FM

Certification Body	Certification Obtained	Entity Rating	Temperature Code
FM	IS Intrinsically Safe Class I,II,III Division 1 GP A,B,C,D,E,F,G T5 per drawing 28B5745	Vmax = 30 VDC Imax = 226 mA Pi = 1.4 W Ci = 5.5 nF Li = 0.4 mH	T5 (Tamb ≤ 80°C)
	XP Explosion-proof Class I Division 1 GP B,C,D T5 NI Non-incendive Class I Division 2 GP A,B,C,D T5 DIP Dust Ignition-proof Class II Division 1 GP E,F,G T5 S Suitable for Use Class II, III Division 2 GP F,G	- - -	T5 (Tamb ≤ 80°C)

Table 10. Hazardous Area Classifications—ATEX

Certificate	Certification Obtained	Entity Rating	Temperature Code
ATEX	Intrinsically Safe Ex II 1 G D Gas Ex ia IIC T5 Ga Dust Ex ia IIIC T83°C Da IP66	Ui = 30 VDC Ii = 226 mA Pi = 1.2 W Ci = 5.5 nF Li = 0.4 mH	T5 (Tamb ≤ 80°C)
	Flameproof Ex II 2 G D Gas Ex d IIC T5 Gb Dust Ex tb IIIC T83°C Db IP66	- - -	T5 (Tamb ≤ 80°C)
	Type n Ex II 3 G D Gas Ex nA IIC T5 Gc Dust Ex t IIIC T83°C Dc IP66	- - -	T5 (Tamb ≤ 80°C)

Table 11. Hazardous Area Classifications—IECEx

Certificate	Certification Obtained	Entity Rating	Temperature Code
IECEx	Intrinsically Safe Gas Ex ia IIC T5 Ga Dust Ex ia IIIC T83°C Da IP66	Ui = 30 VDC Ii = 226 mA Pi = 1.2 W Ci = 5.5 nF Li = 0.4 mH	T5 (Tamb ≤ 80°C)
	Flameproof Gas Exd IIC T6 Gb Dust Ex t IIIC T83°C Db IP66	- - -	T5 (Tamb ≤ 80°C)
	Type n Gas Ex nA IIC T5 Gc Dust Ex t IIIC T83°C Dc IP66	- - -	T5 (Tamb ≤ 80°C)

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DLC3020f Digital Level Controller
D103433X012

Product Bulletin
11.2:DLC3020f
August 2017

Fisher™ FIELDVUE™ DLC3020f Digital Level Controller for FOUNDATION™ fieldbus

The FIELDVUE DLC3020f digital level controller is a fieldbus communicating instrument used to measure liquid level or the level of interface between two liquids using displacement sensor technology.

In addition to the normal function of reporting process level PV, the DLC3020f, using FOUNDATION fieldbus protocol, gives easy access to information critical to process operation and will readily integrate into a new or existing control system. AMS Suite: Intelligent Device Manager or the 475 Field Communicator can be used to configure, calibrate, or test the digital level controller.

The DLC3020f is also designed to directly replace pneumatic, analog, or HART® transmitters/ controllers. It can be mounted on a wide variety of 249 cageless and caged level sensors as well as on other displacer type level sensors through the use of mounting adaptors.

W9954-2

Features

- **Ease of Use** The DLC3020f, a fieldbus level or interface transmitter, features the latest in user interface technology. In addition to reporting the PV, the DLC3020f can act as a PID controller or level switch.

- **Guided Setup and Calibration** Leads you through instrument setup, process fluid selection, and calibration in an easy-to-use format.

- **Dynamic Temperature Compensation** Integration of process fluid temperature, when needed, enables density compensation to maintain PV accuracy.

- **Simple Process Fluid Configuration** The capability to easily select/define process fluids allows for fluid changes without requiring re-calibration.

- **Calibration/Setup Logs Saved in Instrument** Logs, including calibration, instrument setup, and process fluid data, can be saved for future reference or re-use in batch or continuous applications. The instrument stores up to 30 logs.

- **Performance/Reliability** State-of-the-art Emerson advanced electronics provide increased performance and reliability.

Specifications

Available Configurations

Mounts on 249 caged and cageless sensors. Refer to Fisher Bulletin 11.2:Level (D103219X012) or 34.2:2500 (D200037X012) for information on 249 sensors.

Function: Transmitter, Controller, Switch

Communications Protocol: FOUNDATION fieldbus

Digital Communication Protocol

FOUNDATION fieldbus registered device (ITK 5)

Supply Requirements

9 to 32 volts DC, 17.7 mA DC;
instrument is not polarity sensitive

Device Inputs

Level Sensor Input (required)
Rotary motion of torque tube shaft is proportional to buoyant force of the displacer caused by changes in liquid level or interface level

Process Temperature Compensation Input (optional)
RTD—interface for 2- or 3-wire 100 ohm platinum RTD
AO Block—FOUNDATION fieldbus temperature transmitter
Manual—compensation values manually entered in the device

LCD Meter Indications

Process Variable in engineering units
Process Variable in percent (%) only
Alternating Process Variable in engineering units and percent (%)
Optional: Alerts as configured

Function Block Suite

AI, PID, DI (two), AO (three), ISEL, and an ARTH function block

Block Execution Times

AI, PID, DI, AI, ISEL: 15 ms
ARTH: 25 ms

Fieldbus Device Capabilities

Backup Link Active Scheduler (BLAS)

Performance

Performance Criteria	DLC3020f(1)
Independent Linearity	±0.1% of output span
Accuracy	±0.15%
Repeatability	<0.1% of full scale output
Hysteresis	<0.10% of output span
Deadband	<0.05% of input span
Humidity	±0.10% (RH9.2% to 90%)

Note: At full design span, reference conditions.
1. To lever assembly rotation inputs.

Minimum Differential Specific Gravity

0.1 SGU with standard volume displacers

Ambient Temperature Effect

The combined temperature effect on zero and span is less than 0.01% of full scale per degree Celsius over the operating range -40 to 80°C (-40 to 176°F)

Process Temperature Effect

Temperature compensation can be implemented to correct for fluid density changes due to process temperature variations

Electromagnetic Compatibility

Meets EN 61326-1:2013 and EN 61326-2-3:2006
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard and Table AA.0 of EN 61326-2-3
Emissions—Class A
ISM equipment rating: Group 1, Class A

-continued-

Specifications (continued)

Alerts and Diagnostics

Electronic Alerts advise when there is an electronic error in memory

Operational Range Alerts notify when PV range and sensor range changes might affect calibration

Rate Limit Alerts indicate rapid rise or fall in displacer, which can signify abnormal operating conditions

RTD Alerts show health and condition of connected RTD

Sensor Board Alerts indicate if the device is operating above or below maximum recommended limits; advises if the electronic sensor electronics cannot communicate properly

Input Compensation Error Alerts advise of "Bad" or "Uncertain" status of AO connection or setup.

Simulate Function

Simulate Active, when enabled, simulates an active alert without making it visible.

Operating Limits

Process Temperature: See figure 1

Ambient Temperature[1] and Humidity

Conditions	Normal Limits	Transport and Storage Limits	Nominal Reference
Ambient Temperature	-40 to 80°C (-40 to 176°F)	-40 to 85°C (-40 to 185°F)	25°C (77°F)
Ambient Relative Humidity	0 to 95% (non-condensing)		40%

Electrical Classification

Hazardous Area

CSA— Intrinsically Safe, Explosion-proof, Division 2, Dust Ignition-proof

FM— Intrinsically Safe, Explosion-proof, Non-Incendive, Dust Ignition-proof

ATEX— Intrinsically Safe, Flameproof, Type n

IECEx— Intrinsically Safe, Flameproof, Type n

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

INMETRO— National Institute of Metrology, Quality, and Technology (Brazil)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

Electrical Housing

CSA— Type 4X

FM— NEMA 4X, IP66

ATEX— IP66

IECEx— IP66

Mounting Positions

Digital level controllers can be mounted right- or left-of-displacer (the position of the instrument when you are looking at the LCD relative to the displacer)

Construction Materials

Case and Cover: Low-copper aluminum alloy
Internal: Plated steel, aluminum, and stainless steel; encapsulated printed wiring boards; Neodymium Iron Boron Magnets

Electrical Connections

Two 1/2-14 NPT internal conduit connections; one on bottom and one on back of terminal box. M20 adapters available.

Weight

Less than 2.7 Kg (6 lbs)

Dimensions

Refer to Fisher Bulletin 34.2:249 (D200039X012) for sensor, level controller, and transmitter dimensions

Options

■ Heat insulator ■ Mountings for Masoneilan™, Yamatake, and Foxboro™-Eckhardt sensors available

1. The pressure/temperature limits in this manual and any applicable standard or code limitation for valve should not be exceeded.

Ordering Information

When ordering, specify:

1. Type of measurement

   ■ Level or ■ Interface

2. Process fluid type

   ■ Water, ■ Saline water, ■ Saturated water, ■ Saturated steam,■ Crude oil, ■ Refined product, ■ Gas well condensate, or ■ Customer specified fluid

Note

If Interface indicate both upper and lower fluid types.

3. Process operating conditions

   Temperature ______________________

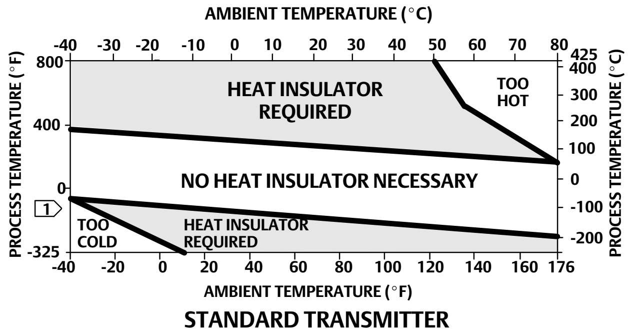
   Fluid density or SG ___________________

Note

If Interface indicate fluid density or SG for both upper and lower fluids.

4. Tag number, as required ________________

Figure 1. Guidelines for Use of Optional Heat Insulator Assembly



Notes:
1 For process temperatures below -29°C (-20°F) and above 204°C (400°F) sensor materials must be appropriate for the process (refer to bulletin 34.2:2500)
2. If ambient dew point is above process temperature, ice formation might cause instrument malfunction and reduce insulator effectiveness.

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Optional Heat Insulator

If the DLC3020f and a 249 sensor are ordered as an assembly, and a heat insulator is required for the application, order the heat insulator as a 249 sensor option. If the DLC3020f is ordered separately, the heat insulator is available as a kit. Figure 1 contains guidelines for use of the optional heat insulator.

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Fisher™ FIELDVUE™ DLC3100 and DLC3100 SIS Digital Level Controllers

FIELDVUE DLC3100 and DLC3100 SIS digital level controllers are HART® communicating instruments that are used with level sensors to measure liquid level, level of the interface between two liquids, or liquid density (not applicable to DLC3100 SIS). The DLC3100 converts this measurement into 4-20 mA transmitter signal.

Unless otherwise noted, the information in this document applies to both DLC3100 and DLC3100 SIS. However, for simplicity, the DLC3100 model name will be used throughout.

X1456

Features

Safety

- The DLC3100 SIS is certified to be SIL2 capable (HFT=0) in accordance to IEC61508 standard. It is designed and capable to be used in safety function to achieve a tolerable risk for a process hazard. It allows potential risk reduction for people, systems, devices and processes. The DLC3100 SIS is identified by a label affixed to the terminal box cover.

Ease of Use

- Intuitive Local User Interface with four push buttons and LCD allow you to setup and calibrate the device without external tool.

- Using Guided Device Setup digital level controller start-up is straightforward and fast. Level and temperature alarms, specific gravity tables, calibration trim and trending are readily configurable.

Dynamic Temperature Compensation

- Integration of process fluid temperature when needed, enables density compensation to maintain process variable accuracy.

- An Internal Temperature Sensor enables consistent performance of the digital level controller despite ambient temperature changes. With a temperature input signal, either via HART protocol or an RTD connected to the instrument, the digital level controller can also automatically compensate for specific gravity changes due to temperature. A user-supplied table of up to ten linear segments may be entered to implement this feature.

Maintenance Assistance

- HART registered DLC3100 provides device diagnostics and recommended actions to restore instrument functionality.

Alert History

- Alert Record saved in the instrument helps you to troubleshoot when there are abnormalities.

Rugged Construction

- Mechanical safeguards designed into the digital level controller help it to withstand physical abuse often incurred during installation or in transport, without compromising performance. The lever assembly is pinned at the neutral position when the coupling access door is open, providing shipping stabilization for a separate transmitter purchase.

Integration

- Modular design allows interchangeable of components. Part kits are available for spare parts replacement.

- The DLC3100 is designed to be mounted on a wide variety of 249 caged and cageless level sensors as well as on 3rd party non-Emerson displacers from Masoneilan, Foxboro-Eckardt, and Yamatake, through the use of mounting adaptors.

Reliability

- Accurate, high-gain analog-to-digital conversion enables measurement of small changes in the process variable. This allows the DLC3100 to be used in difficult liquid level, interface, or density applications. In addition, an adjustable input filter and output damping help to attenuate displacer-induced ripple in the output signal due to liquid turbulence.

Figure 1. View of Fisher 249 Displacer Sensor with FIELDVUE DLC3100 Digital Level Controller

X1390

- The DLC3100 instrument has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres. An IP66 wiring terminal box isolates field wiring connections from other areas of the instrument.

Specifications

Available Configurations

Mounts on caged and cageless 249 sensors

Function: Transmitter

Communications Protocol: HART

Input Signal

Level, Interface, or Density(1)**:** Rotary motion of torque tube shaft proportional to changes in liquid level, interface level, or density that change the buoyancy of a displacer

Process Temperature: Interface for 2- or 3-wire 100 ohm platinum RTD for sensing process temperature, or optional user-entered target temperature to permit compensating for changes in specific density

Output Signal

Analog: 4 to 20 mA DC
■ Direct action—increasing level, interface, or density increases output; or
■ Reverse action—increasing level, interface, or density decreases output

High saturation: 20.5 mA
Low saturation: 3.8 mA
High alarm(2)*:* > 21.0 mA
Low Alarm(2)*:* < 3.6 mA

Digital: HART 1200 Baud Frequency Shift Keyed (FSK)

HART impedance requirements must be met to enable communication. Total shunt impedance across the master device connections (excluding the master and transmitter impedance) must be between 230 and 600 ohms.

The transmitter HART receive impedance is defined as:
Rx: 30.2k ohms and
Cx: 5.45 nF

Supply Requirements (see figure 3)

12 to 30 volts DC; 25 mA
Instrument has reverse polarity protection.

A minimum compliance voltage of 17.75 VDC (due to HART impedance requirement) is required to guarantee HART communication

Transient Voltage Protection

Pulse Waveform		Max V_{CL} @ I_{pp} (Clamping Voltage) (V)	I_{pp} (Peak Pulse Current) (A)
Rise Time (μs)	Decay to 50% (μs)		
10	1000	48.4	12.4

Electrical Classification

Overvoltage Category II per IEC 61010 clause 5.4.2 d
Pollution Degree 4
For ATEX/IECEx application equipment shall be used in an area of at least Pollution Degree 2

Altitude Rating

Up to 2000 meters (6562 feet)

Ambient Temperature

The combined temperature effect on zero and span without the 249 sensor is less than 0.02% of full scale per degree Celsius over the operating range -40 to 80°C (-40 to 176°F)

LCD operating temperature limits

-20 to 70°C (-4 to 158°F)(3)

Process Temperature

The process density and torque rate are affected by the process temperature (see figure 5). Temperature compensation can be implemented to correct for process density changes.

Process Density

The sensitivity to error in knowledge of process density is proportional to the differential density of the calibration. If the differential specific gravity is 0.2, and error of 0.02 specific gravity units in knowledge of a process fluid density represents 10% of span.

Hazardous Area Approvals

CSA
Class/Division: Intrinsically Safe, Explosion-proof(4), Division 2, Dust Ignition-proof
Zone: Intrinsically Safe, Flameproof, Type n, Dust by intrinsic safety and Enclosure

ATEX/IECEx—Flameproof, Intrinsic Safety, Dust by Intrinsic Safety, Type n and Dust by Enclosure

-continued-

Specifications (continued)

Other Classifications / Certifications

CML— Certification Management Limited (Japan)

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA—Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

NESPI—National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE—Petroleum and Explosives Safety Organization - Chief Controller of Explosives (India)

Electrical Housing

IP66, Type 4X

Electrical Connections
Two 1/2-14 NPT internal conduit connections. Both are at the bottom of terminal box.

Electromagnetic Compatibility

DLC3100 meets EN61326-1:2013
Performance is shown in table 1

DLC3100 SIS meets EN61326-3-2:2008
Performance is shown in table 2

DLC3100 SIS Safety Instrumented System Classification

SIL2 capable - certified by exida Consulting LLC

Performance

Performance Criteria	DLC3100 Digital Level Controller(1)	w/ NPS 3 249W, Using a 14-inch Displacer	w/ All Other 249 Sensors
Independent Linearity	±0.25% of output span	±0.8% of output span	±0.5% of output span
Hysteresis	<0.2% of output span	- - -	- - -
Repeatability	±0.1% of full scale output	±0.5% of output span	±0.3% of output span
Dead Band	<0.05% of input span	- - -	- - -
Hysteresis plus Deadband	- - -	<1.0% of output span	<1.0% of output span

NOTE: At full design span, reference conditions.
1. To lever assembly rotation inputs.

Minimum Differential Specific Gravity

0.05 SGU

Construction Materials

Housing and Cover: Low-copper aluminum die casting alloy
Internal: Aluminum, and stainless steel; encapsulated printed circuit board
Lever assembly: Plated steel, neodymium iron boron magnets
Hall Guard: Thermoplastic elastomer
At effective proportional band (PB)<100%, linearity, dead band, and repeatability are derated by the factor (100%/PB)

Weight

Less than 3.45 kg (7.57 lb)

Options

■ Sunshade ■ Heat insulator[5] (see figure 2 for use guidelines) ■ Mountings for Masoneilan, Yamatake and Foxboro-Eckhardt sensors

1. Density application is not available in DLC3100 SIS.
2. Only one of the High/Low alarm definition is available in a given configuration. Both alarms are NAMUR NE43 compliance.
3. Outside of this limit, LCD will not be readable but it will not affect the functionality of DLC3100 if the temperature is still within the operating limits. Push buttons will be disabled when instrument temperature is below -20°C (-4°F) or above 70°C (158°F) where LCD display might be intermittent.
4. Not for use in Ester and Ketone atmospheres.
5. If the DLC3100 and a 249 sensor are ordered as an assembly, and a heat insulator is required for the application, order the heat insulator as a 249 sensor option. If the DLC3100 is ordered separately, the heat insulator is available as a kit.

Table 1. DLC3100 EMC Summary Results—Immunity per EN61326-1

Port	Phenomenon	Basic Standard	Test Level	Test Results(1)(2)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Radiated power frequency magnetic field	IEC 61000-4-8	30 A/m at 50 and 60 Hz	A
I/O signal/control	Burst	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A
Protective earth	Burst	IEC 61000-4-4	2 kV	A
	Surge	IEC 61000-4-5	2 kV (line to ground only)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

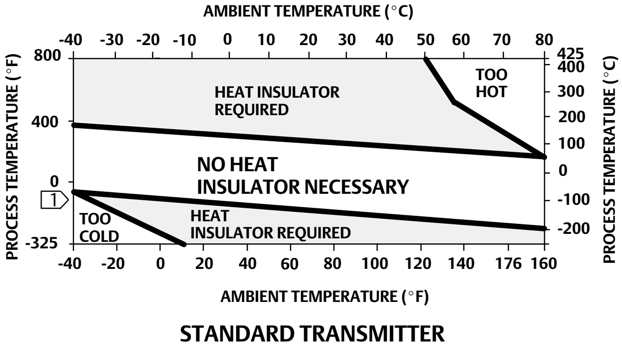
1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering. Specification limit = +/- 1% of span.
2. HART communication was considered as “not relevant to the process” and is used primarily for configuration, calibration, and diagnostic purposes.

Table 2. DLC3100 SIS EMC Summary Results—Immunity per EN61326-3-2

Port	Phenomenon	Basic Standard	Test Level	Test Results(1)(2)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	6 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 10V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 3V/m with 1 kHz AM at 80%	A
	Radiated power frequency magnetic field	IEC 61000-4-8	100 A/m at 50 and 60 Hz	A
I/O signal/control	Burst	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	FS
	Conducted RF	IEC 61000-4-6	10 kHz to 80 MHz at 10 Vrms	A
Protective earth	Burst	IEC 61000-4-4	2 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only)	A
	Conducted RF	IEC 61000-4-6	10 kHz to 80 MHz at 10 Vrms	A

1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering. FS = Fail Safe. Specification limit = +/- 2% of span.
2. HART communication was considered as “not relevant to the process” and is used primarily for configuration, calibration, and diagnostic purposes.

Figure 2. Guidelines for Use of Optional Heat Insulator Assembly



Notes:
1 For process temperature below -29° (C-20°F) and above 204°C (400°F) sensor materials must be appropriate for the process (refer to Fisher Bulletin 34.2:2500 [D200037X012] and table 4).
2. If ambient dew point is above process temperature, ice formation might cause instrument malfunction and reduce insulator effectiveness.

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Figure 3. Power Supply Requirements and Load Resistance

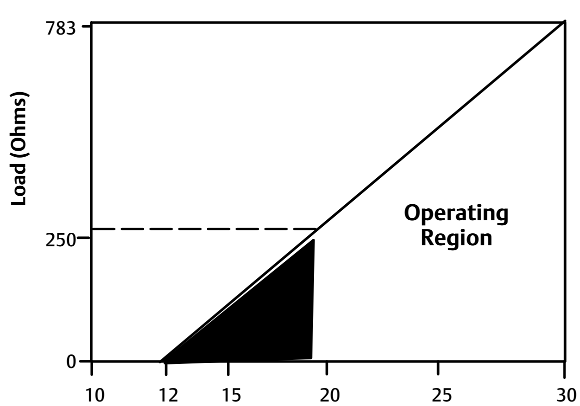


Figure 4. Fisher DLC3100 Overview

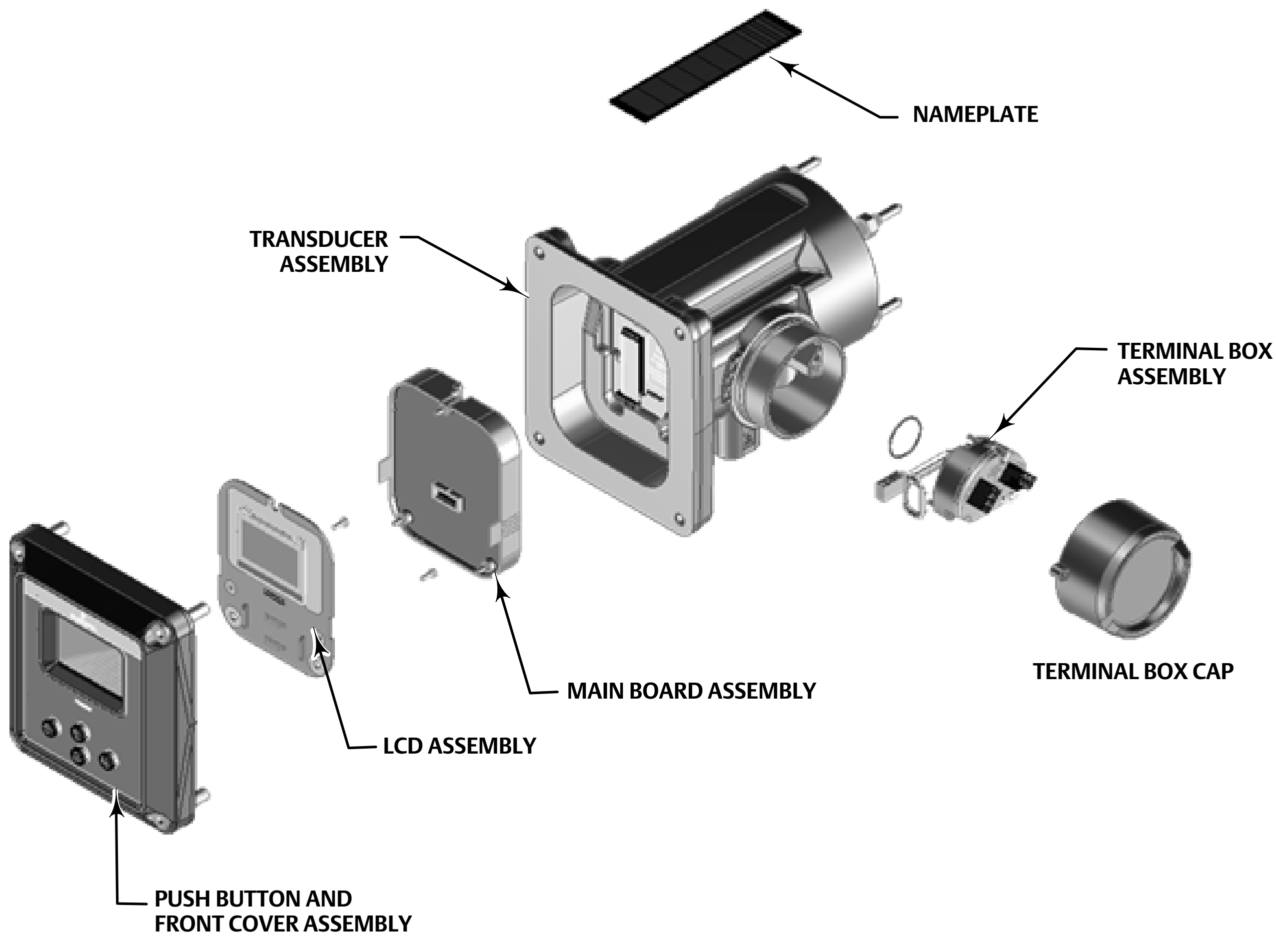
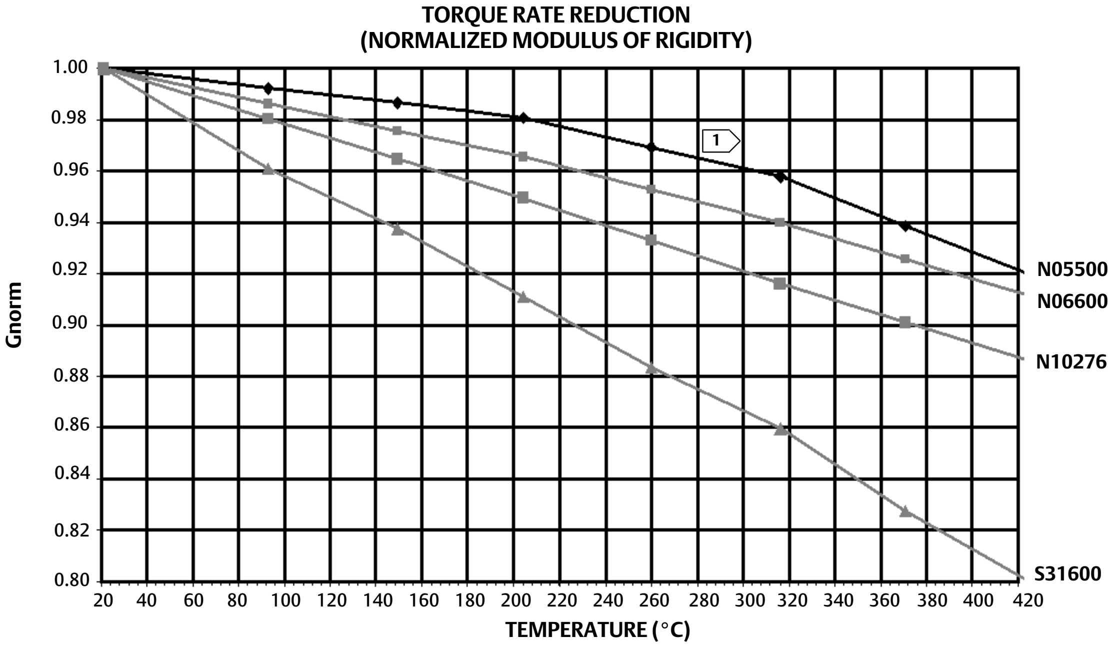
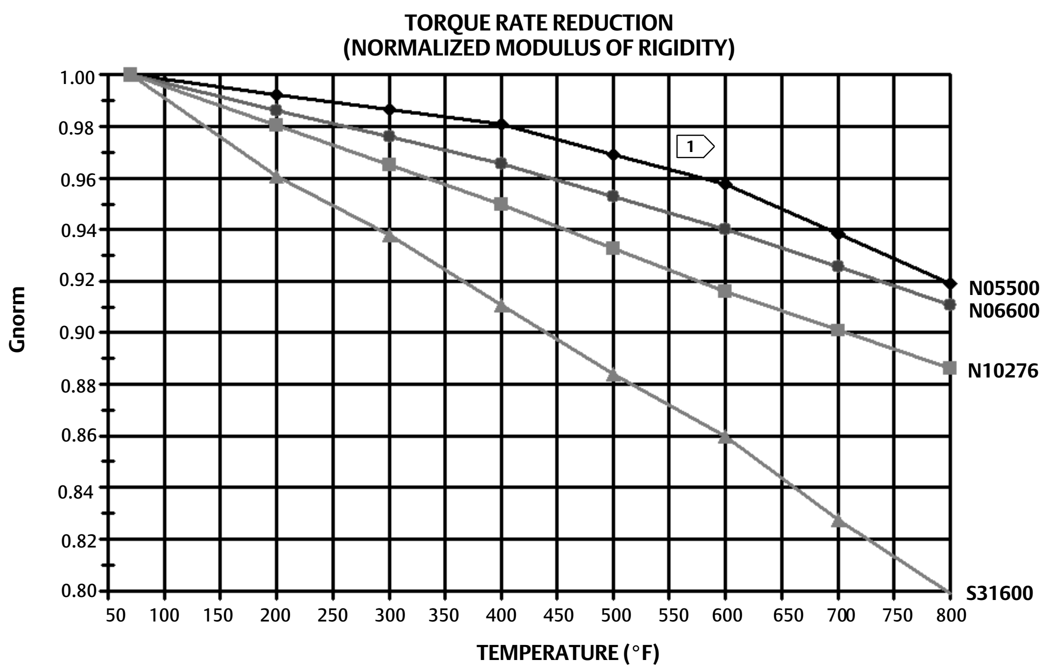


Figure 5. Theoretical Reversible Temperature Effect on Common Torque Tube Materials





Note:
1 Due to the permanent drift that occurs near and above 260°C (500°F), N05500 is not recommended for temperatures above 232°C (450°F).

Principle of Operation

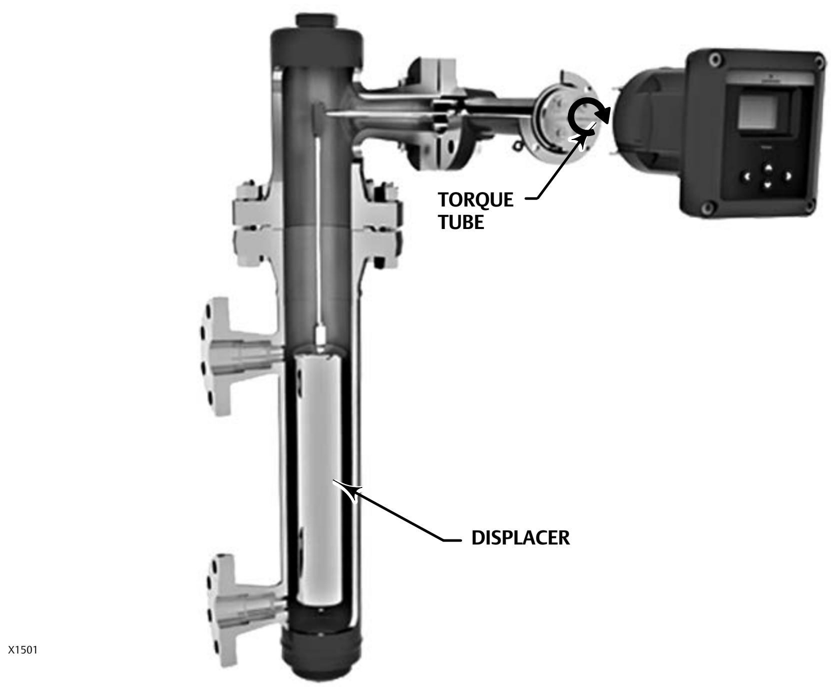
The DLC3100 digital level controller is a loop-powered instrument that measure changes in liquid level, level of an interface between two liquids, or density of a liquid. A level, density, or interface level change in the measured fluid causes a change in the displacer buoyancy (figure 6). This change is transferred to the torque tube assembly. As the measured fluid changes, the torque tube assembly rotates.

The rotary motion of the torque tube is transferred to the digital level controller lever assembly (figure 6). The rotary motion moves a magnet attached to the lever assembly, changing the magnetic field that is sensed by the Hall-effect sensor. The sensor converts the magnetic field signal to a varying electronic signal, which is processed digitally to provide linearity corrections, sensitivity adjustment, and temperature compensation.

The signal is interpreted as a buoyancy change by reference to the stored torque rate, coupling point, and moment arm data. The buoyancy change in turn is interpreted as a level, interface, or density change by reference to stored displacer volume, specific gravity, and displacer length data. In level or interface modes, the correction for displacer motion is then added, as well as user-supplied offset to change the PV reference from the bottom of the displacer or correct for a coupling point error.

The resultant primary variable (PV) is then compared to PV alarm thresholds (if enabled) and used to set status bits and/or trigger the analog alarm current. If the alarm is not triggered, the PV is used to generate 4-20 mA analog and 0-100% range digital signals by reference to the stored upper and lower range values. The resultant analog command is limited at the saturation values to allow discrimination between saturated and alarm signals.

Figure 6. Cutaway View of Fisher 249 Displacer Sensor with FIELDVUE DLC3100 Digital Level Controller



249 Level Sensors Specifications

Input Signal

Liquid Level or Liquid-to-Liquid Interface Level: From 0 to 100 percent of displacer length
Liquid Density: From 0 to 100 percent of displacement force change obtained with given displacer volume—standard volumes are ■ 980 cm^3 (60 $inches^3$) for 249C and 249CP sensors or ■ 1640 cm^3 (100 $inches^3$) for most other sensors; other volumes available depending upon sensor construction

Sensor Displacer Lengths

See tables 5 and 6 footnotes

Sensor Working Pressures

Consistent with applicable ASME pressure/temperature ratings for the specific sensor constructions shown in tables 5 and 6

Caged Sensor Connection Styles

Cages can be furnished in a variety of end connection styles to facilitate mounting on vessels; the equalizing connection styles are numbered and are shown in figure 8.

Mounting Positions

Most level sensors with cage displacers have a rotatable head. The head may be rotated through 360 degrees to any of eight different positions, as shown in figure 9.

Construction Materials

See tables 3, 5, and 6

Operative Ambient Temperature

See table 4.
For ambient temperature ranges, guidelines, and use of optional heat insulator, see figure 2.

Options

■ Heat insulator ■ Gauge glass for pressures to 29 bar at 232°C (420 psig at 450°F), and ■ Reflex gauges for high temperature and pressure applications

249 Level Sensors

249 level sensors used with the DLC3100 digital level controller are available in both caged and cageless configurations. Figure 7 shows a DLC3100 mounted on a caged 249 sensor. Caged sensors provide more stable operation than do cageless sensors for vessels with internal obstructions or considerable internal turbulence. Cageless sensors are generally used on specific gravity and interface control applications requiring large displacers that are more easily accommodated by flange connections up to 8 inches. The availability of many different displacer stem lengths permits lowering the displacer down to the most advantageous depth in the vessel.

Figure 7. FIELDVUE DLC3100 Digital Level Controller and Fisher 249 Level Sensor

Table 3. Displacer and Torque Tube Materials

Part	Standard Material	Other Materials
Displacer	304 Stainless Steel	316 Stainless Steel, N10276, N04400, Plastic, and Special Alloys
Displacer Stem, Driver Bearing, Displacer Rod and Driver	316 Stainless Steel	N10276, N04400, other Austenitic Stainless Steels, and Special Alloys
Torque Tube	N05500[1]	316 Stainless Steel, N06600, N10276

1. N05500 is not recommended for spring applications above 232°C (450°F). Contact your Emerson sales office or application engineer if temperatures exceeding this limit are required.

Table 4. Allowable Process Temperatures for Common Fisher 249 Sensor Pressure Boundary Materials

MATERIAL	PROCESS TEMPERATURE	
	Min.	Max.
Cast Iron	-29°C (-20°F)	232°C (450°F)
Steel	-29°C (-20°F)	427°C (800°F)
Stainless Steel	-198°C (-325°F)	427°C (800°F)
N04400	-198°C (-325°F)	427°C (800°F)
Graphite Laminate/SST Gaskets	-198°C (-325°F)	427°C (800°F)
N04400/PTFE Gaskets	-73°C (-100°F)	204°C (400°F)

Table 5. Caged Displacer Sensors[1]

TORQUE TUBE ORIENTATION	SENSOR	STANDARD CAGE, HEAD, AND TORQUE TUBE ARM MATERIAL	EQUALIZING CONNECTION		PRESSURE RATING[2]
			Style	Size (NPS)	
Torque tube arm rotatable with respect to equalizing connections	249[3]	Cast Iron	Screwed	1-1/2 or 2	CL125 or 250
			Flanged	2	
	249B, 249BF[4]	Steel	Screwed or optional socket weld	1-1/2 or 2	CL600
			Raised face or optional ring type joint flanged	1-1/2	CL150, 300, or 600
				2	CL150, 300, or 600
	249C[3]	316 Stainless Steel	Screwed	1-1/2 or 2	CL600
			Raised face flanged	1-1/2	CL150, 300, or 600
				2	CL150, 300, or 600
	249K	Steel	Raised face or optional ring type joint flanged	1-1/2 or 2	CL900 or 1500
	249L	Steel	Ring type joint flanged	2[5]	CL2500

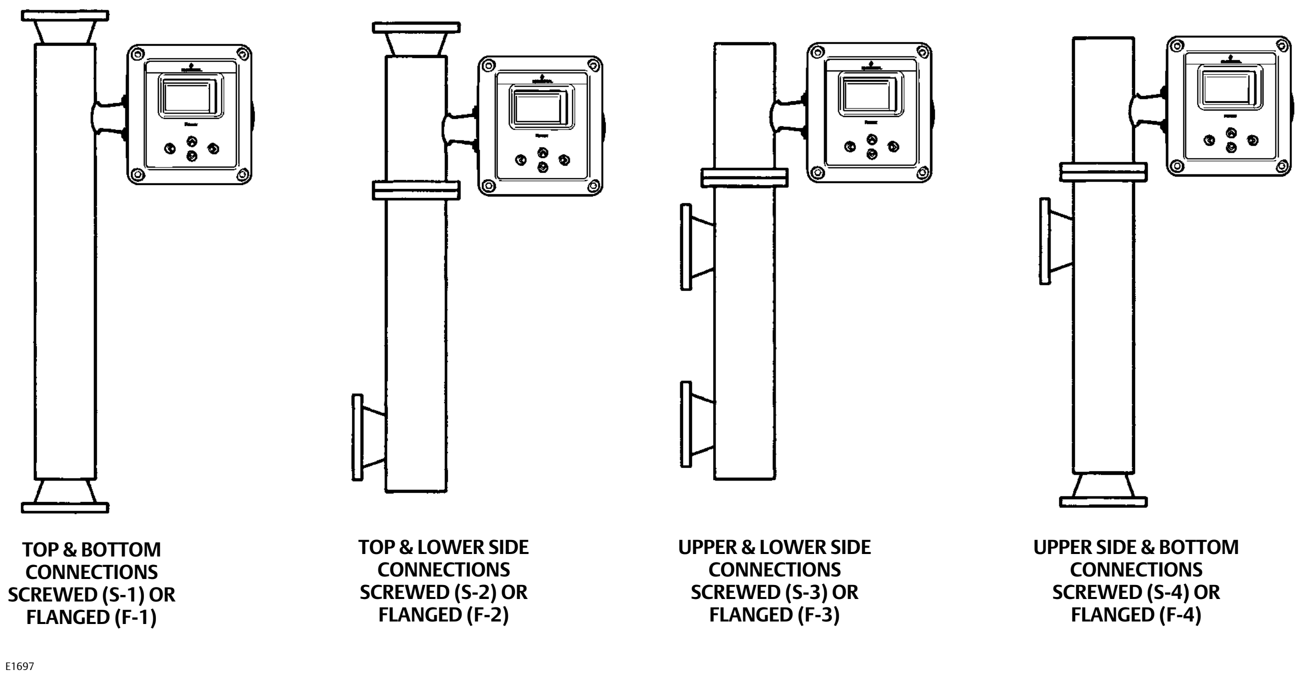
1. Standard displacer lengths for all styles (except 249) are 14, 32, 48, 60, 72, 84, 96, 108 and 120 inches. The 249 uses a displacer with a length of either 14 or 32 inches.
2. DIN flange connections available in EMA (Europe, Middle East and Africa).
3. Not available in EMA.
4. 249BF available in EMA only. Also available in DIN size DN40 with PN10 to PN100 flanges and size DN50 with PN10 to PN63 flanges.
5. Top connection is 1-inch ring-type joint flanged for connection styles F1 and F2.

Table 6. Cageless Displacer Sensors[1]

Mounting	Sensor	Standard Head[2], Wafer Body[6], and Torque Tube Arm Material	Flange Connection	Pressure Rating[3]
Mounts on top of vessel	249BP[4]	Steel	NPS 4 raised face or optional ring type joint	CL150, 300, or 600
			NPS 6 or 8 raised face	CL150 or 300
	249CP	316 Stainless Steel	NPS 3 raised face	CL150, 300, or 600
	249P[5]	Steel or Stainless Steel	NPS 4 raised face or optional ring type joint	CL900 or 1500 (EN PN 10 to DIN PN 250)
			NPS 6 or 8 raised face	CL150, 300, 600, 900, 1500, or 2500
Mounts on side of vessel	249VS	Cast Iron, Cast Steel or CF8M (316 Stainless Steel)	For NPS 4 raised face or flat face	CL125, 150, 250, 300, 900, or 1500 (EN PN 10 to DIN PN 160
			For NPS 4 butt weld end, XXS	CL2500
Mounts on top of vessel or on customer supplied cage	249W	WCC (steel) or CF8M	For NPS 3 raised face	CL150, 300, or 600
		LCC (steel) or CF8M	For NPS 4 raised face	CL150, 300, or 600

1. Standard displacer lengths are 14, 32, 48, 60, 72, 84, 96, 108, and 120 inches.
2. Not used with side-mounted sensors.
3. DIN flange connections available in EMA (Europe, Middle East and Africa).
4. Not available in EMA.
5. 249P available in EMA only.
6. Wafer Body only applicable to 249W.

Figure 8. Style Number of Equalizing Connections



Installation

A 249 sensor may be shipped with the DLC3100 digital level controller installed or they may be shipped separately.

When shipping a skid mounted system, where the displacer cannot be restrained, it is recommended that the transmitter be uncoupled and the lever assembly locked to prevent damage. The transmitter must be re-coupled at commissioning, and a zero-trim will be required.

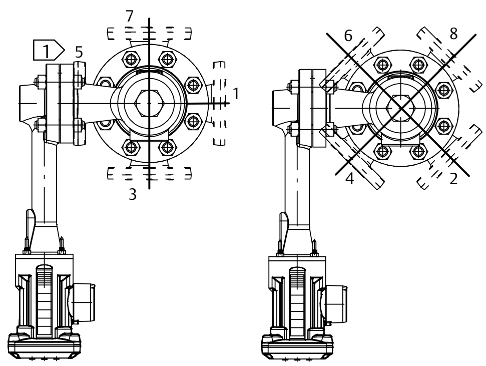
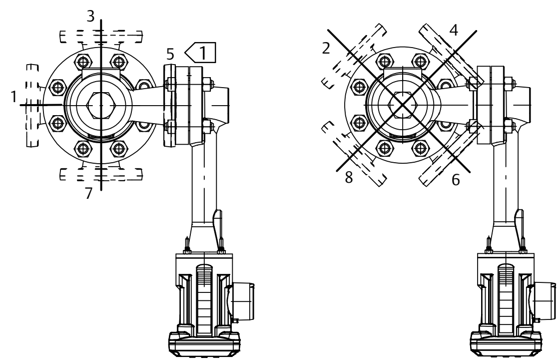
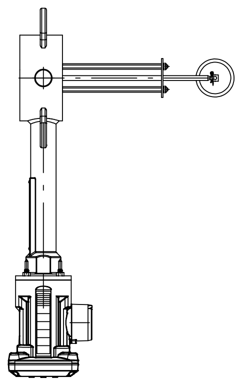
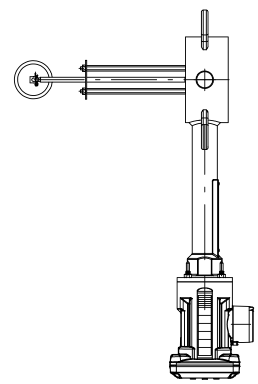
Dimensions for the DLC3100 are shown in figure 10.

Ordering Information

When ordering, specify:

- Process temperature and pressure and ambient air temperature
- Application
- Liquid level service (specific gravity)
- Interface level service (specific gravity of both liquids and minimum differential gap or span required)
- Density service (minimum and maximum specific gravity required)
- Liquid(s) Category (Water/Steam, Hydrocarbon, H2SO4, Custom Fluid)
- Liquid(s) Type (Water, Saline, Saturated Water, Saturated Steam, Crude Oil, Refined Product, Gas Well Condensate, H2SO4 %)

Figure 9. Typical Mounting Positions for FIELDVUE DLC3100 Digital Level Controller on Fisher 249 Sensors

SENSOR	LEFT-OF-DISPLACER	RIGHT-OF-DISPLACER
CAGED		
CAGELESS		
1 Not available for 249C and 249K.		

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Construction

Refer to the specifications tables. Review the descriptions below each specification and in the referenced tables and figures; specify the desired choice whenever there is a selection to be made.

Heat Insulator

DLC3100 Digital Level Controller

If the DLC3100 and the 249 sensor are ordered as an assembly, and a heat insulator is required for the application, order the heat insulator as a 249 sensor option. If the DLC3100 is ordered separately, the heat insulator is available as a kit.

Sunshade

Although the DLC3100 is not affected by sunlight, a sunshade kit is available, to be mounted on a 249 torque tube arm, if there is concern about direct sunlight shining on the instrument. See figure 11 and 12.

Figure 10. Dimensions for FIELDVUE DLC3100 Digital Level Controller

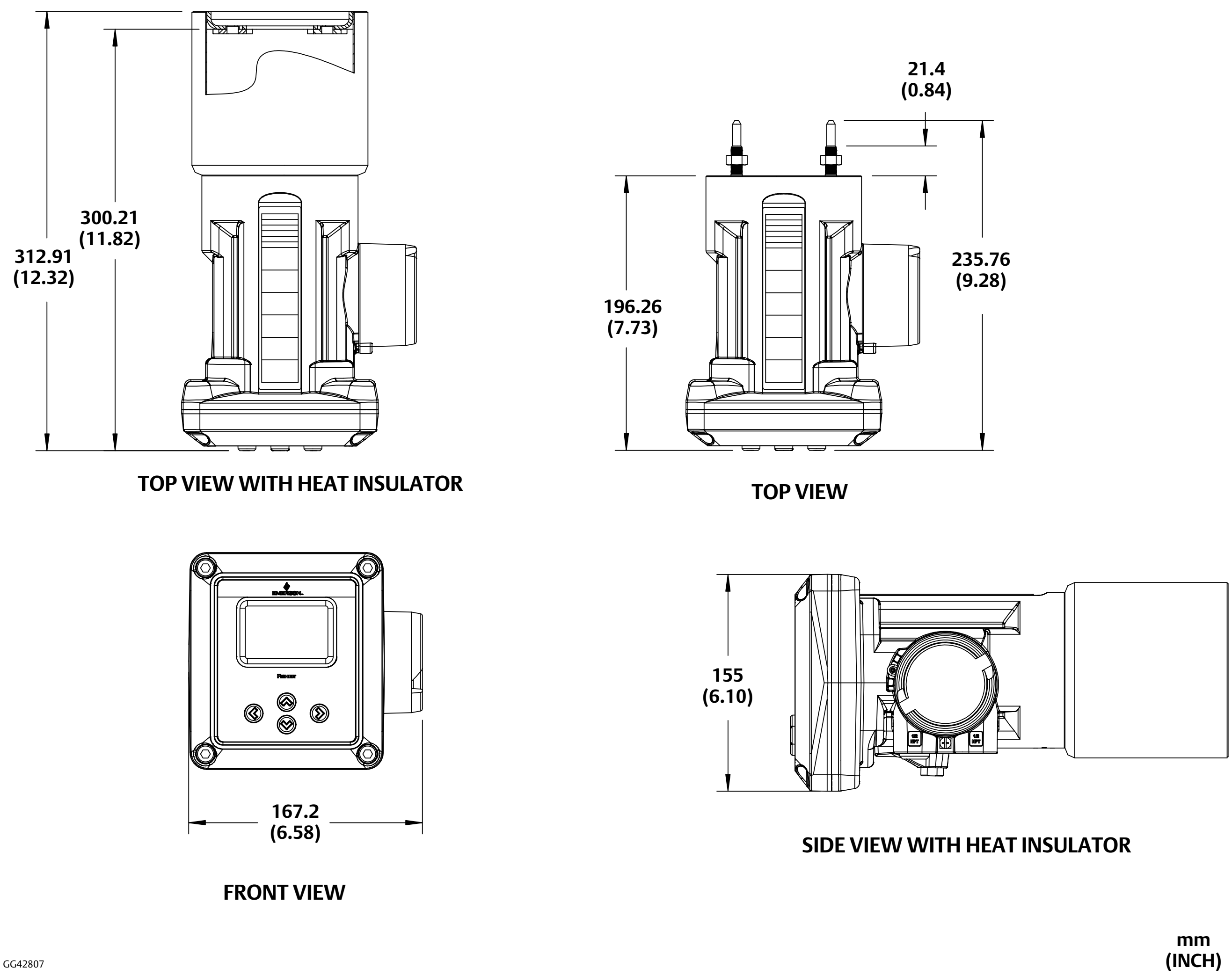


Figure 11. FIELDVUE DLC3100 with GRP Sunshade

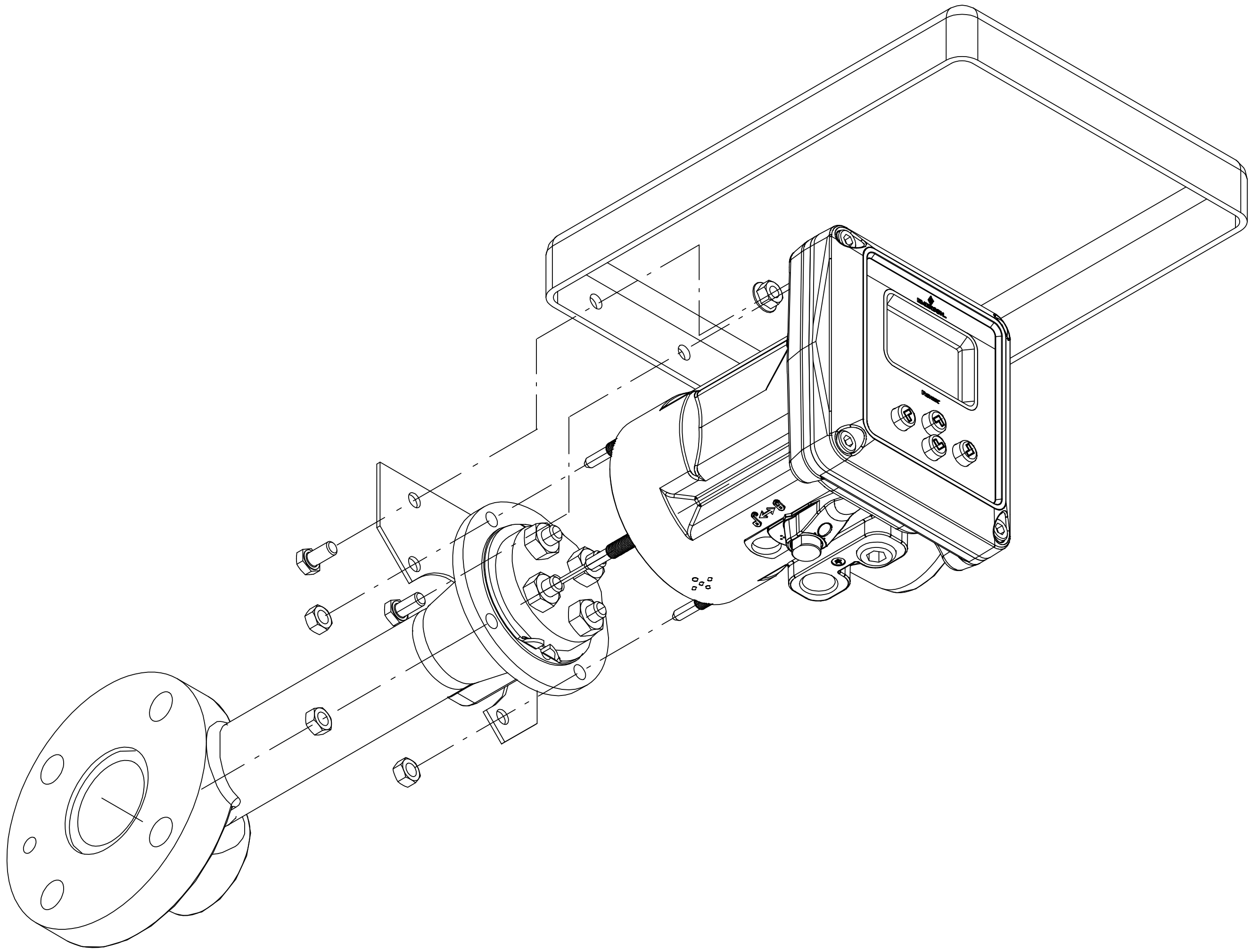
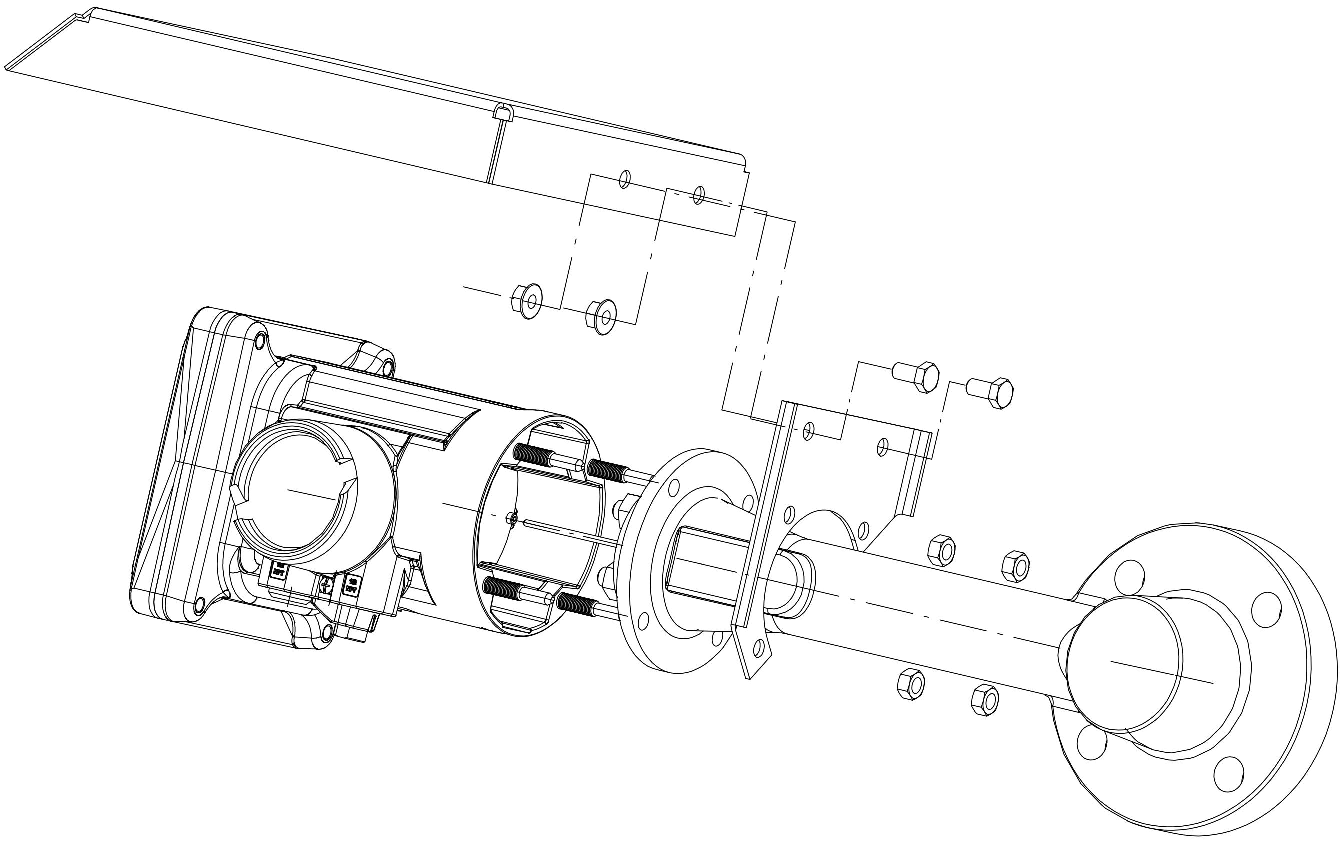


Figure 12. FIELDVUE DLC3100 with 316SST Sunshade



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Fisher™ Level Instruments

FIELDVUE DLC3010 DIGITAL LEVEL CONTROLLER IN COMBINATION WITH A FISHER 249W SENSOR

FISHER 2100E ELECTRIC LEVEL SWITCH

FISHER *L2* PNEUMATIC LEVEL CONTROLLER

FISHER *L2e* ELECTRIC LEVEL CONTROLLER

- FIELDVUE™ Digital Level Instruments— Microprocessor-based, communicating digital level transmitter for liquid level, specific gravity (density), and liquid level interface. Using HART® or FOUNDATION™ Fieldbus communications protocol, the DLC3010/DLC3020f digital level controller gives easy access to information critical to process operation. Available in combination with a 249 sensor to meet mounting requirements.

- Fisher 2100E electric switch and 2100 on-off pneumatic switch— Sense high or low liquid levels. Typically, these switches electrically or pneumatically operate safety shutdown systems for field processing equipment in oil and gas industry applications

- Liquid Level Controllers— Displacer type sensors used to detect liquid level or interface of two liquids of different specific gravities. The *L2e* electric level controller, in conjunction with the Fisher easy-Drive™ actuator, can provide a fully electric level control loop; the *L2* pneumatic level controller offers snap-acting, throttling control, while the on-off/direct acting *L2sj* controller features a low-bleed relay to help to conserve natural gas to reduce emissions.

- Pneumatic Liquid Level Instruments— Proportional control mode. The 2500 controller/transmitter receives the change in fluid level or fluid-to-fluid interface level from the change in buoyant force the fluid exerts on the sensor displacer. Available in combination with a 249 sensor to meet mounting requirements.

FIELDVUE Digital Level Instruments

FIELDVUE DLC3010 digital level controllers (figures 1 and 3) are loop-powered instruments. In conjunction with a 249 sensor, they measure changes in liquid level, the level of an interface between two liquids, or liquid specific gravity (density). The DLC3020f is a fieldbus-powered instrument that measures liquid level or interface between two liquids. A level, density, or interface level change in the measured fluid causes a change in the displacer position.

This change is transferred to the torque tube assembly and to the digital level controller lever assembly. The rotary motion moves a magnet attached to the lever assembly, changing the magnetic field that is sensed by the Hall-effect sensor. In the DLC3010, the sensor converts the magnetic field signal to a varying electronic signal, which is converted to a 4-20 mA output signal. In the DLC3020f, the sensor converts the changing magnetic field to a digital signal, which is ambient temperature compensated, linearized, and sent to the electronics assembly.

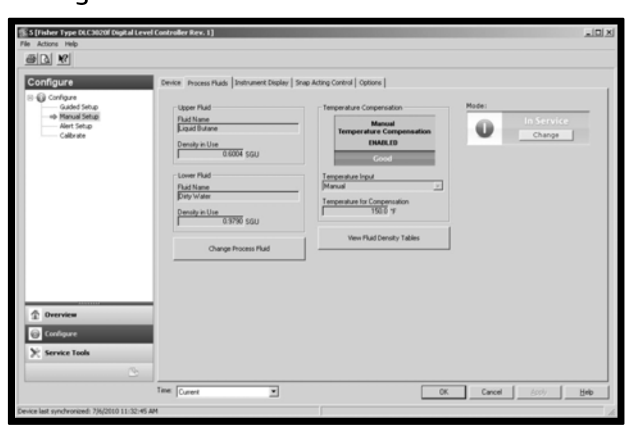
Standard or Custom Configuration... the DLC3010 digital level controller in combination with a 249W sensor enables users to install digital level transmitters to a variety of industry standard or custom process vessel connections. The sensor consists of a wafer body, torque tube assembly and displacer and is rated for CL150, 300, and 600. The wafer body mounts between NPS 3 or 4 raised face flanges. Custom configurations are also available to meet your specific application requirements. Refer to the DLC3010/DLC3020f specifications in tables 1, 2, 3, and 9, and the 249 specifications in tables 4, 5, 6, 7, 8, and 9 for product line capabilities and options.

HART/AMS Compliant... The DLC3010 uses HART protocol to interface with the Field Communicator (see figure 1) for field interface operations. Advanced user-interface capabilities are enabled by AMS Suite: Intelligent Device Manager.

FOUNDATION fieldbus/AMS Compliant... The DLC3020f uses FOUNDATION fieldbus protocol to interface with the Field Communicator (see figure 1) for field interface operations. Advanced user-interface capabilities are enabled by AMS Suite: Intelligent Device Manager (see figure 2).

Figure 1. Fisher DLC3010 Digital Level Controller in Combination with a 249W Sensor —Installed in a Typical Customer-Supplied Cage

Figure 2. AMS Suite: Intelligent Device Manager Configuration Screen



Simplified Setup and Calibration... With the electronic Device Setup, digital level controller startup is straightforward and fast. Level and temperature alarms, specific gravity tables, calibration trim, and trending are readily configurable. DLC3010/DLC3020f digital level controllers also support re-ranging without a fluid reference.

Responsive to Small Process Change... Accurate, high-gain analog-to-digital conversion enables measurement of small changes in the process variable. In addition, an input filter and output damping may be adjusted by the user to attenuate noise from mechanical disturbance or liquid turbulence at the displacer.

Easy Maintenance... Field wiring connections are in a compartment separated from the electronics. This helps to protect the electronics from any moisture brought into the housing by the field wiring. This also eases installation and maintenance. The digital level controller does not have to be removed to facilitate troubleshooting or service. However, if it is necessary to remove the digital level controller for in-shop maintenance and calibration, field wiring does not need to be disconnected.

Figure 3. FIELDVUE DLC3020f Digital Level Controller

W9954-2

Note

Mountings for Masoneilan, Yamatake and Foxboro/Eckhardt sensors are available. Contact your Emerson sales office for mounting kit information.

Table 1. FIELDVUE DLC3010 General Specifications

Controller Selections(1)	For use with 249 caged and uncaged displacer sensors	DLC3010
Input Signal		**Level, Interface or Density:** Rotary motion of the torque tube shaft proportional to changes in liquid lever, interface level, or density that change the buoyancy of the displacer. **Process Temperature:** Interface for 2- or 3-wire 100 ohm platinum RTD for sensing process temperature, or optional user-entered target temperature to permit compensating for changes in specific gravity
Output Signal	**Analog**	4-20 mA DC direct (increasing input increases output) or reverse action
	Digital	HART 1200 baud FSK (frequency shift keyed)
Supply		12-30 VDC; the instrument has reverse-polarity protection
Ambient Relative Humidity		0 to 95% non-condensing
Approximate Weight (Controller)		2.7 kg (6 pounds)
Option		Heat insulator
Electrical Housing		NEMA 4X, CSA Enclosure, IP66
Hazardous Area Classification(2)		CSA—Intrinsically Safe, Explosion-proof, Division 2, Dust Ignition-proof
		FM—Intrinsically Safe, Explosion-proof, Non-incendive, Dust Ignition-proof
		ATEX—Intrinsically Safe, Type n, Flameproof
		IECEx—Intrinsically Safe, Type n, Flameproof

1. Also refer to tables 4, 5, 6, and 7.
2. Other Certifications/Classifications available. Contact your Emerson sales office for additional information.

Table 2. FIELDVUE DLC3020f General Specifications

Controller Selections(1)	**For use with 249 caged and uncaged displacer sensors**	DLC3020f
Device Inputs		**Level Sensor Input:** Rotary motion of the torque tube shaft proportional to buoyant force of the displacer caused by changes in liquid level or interface level. **Process Temperature:** Interface for 2- or 3-wire 100 ohm platinum RTD for sensing process temperature; AO Block - Foundation fieldbus temperature transmitter; Manual - compensation values entered manually in the device
Digital Communication Protocol		Foundation fieldbus registered device (ITK 5)
Supply		9 to 32 volts DC, 17.7 mA DC; instrument is not polarity sensitive
Ambient Relative Humidity		0 to 95% non-condensing
Approximate Weight (Controller)		2.7 kg (6 pounds)
Option		Heat insulator
Electrical Housing		Type 4X, NEMA 4X, IP66
Hazardous Area Classification(2)		CSA—Intrinsically Safe, Explosion-proof, Division 2, Dust Ignition-proof
		FM—Intrinsically Safe, Explosion-proof, Non-incendive, Dust Ignition-proof
		ATEX—Intrinsically Safe, Type n, Flameproof
		IECEx—Intrinsically Safe, Type n, Flameproof

1. Also refer to tables 4, 5, 6, and 7.
2. Other Certifications/Classifications available. Contact your Emerson sales office for additional information.

Table 3. FIELDVUE DLC3010/DLC3020f Performance(1)

Performance Criteria		**Stand-Alone**		DLC3010 w/ NPS 3 249W, Using a14-inch Displacer	DLC3010 w/ All Other 249 Sensors
		DLC3010	DLC3020f(2)		
Independent Linearity		± 0.25% of output span	± 0.1% of output span	± 0.8% of output span	± 0.5% of output span
Hysteresis		< 0.2% of output span	< 0.50% of output span	- - -	- - -
Repeatability		± 0.1% of full scale output	< 0.10% of output span	± 0.5% of output span	± 0.3% of output span
Dead Band		< 0.05% of input span	± 0.10% (RH9.2% to 90%)	- - -	- - -
Hysteresis and Dead Band		- - -	- - -	< 1.0% of output span	< 1.0% of output span
Accuracy		- - -	± 0.15%	- - -	- - -
Process Sensor Range (Input Signal)	Fluid Level or Fluid Interface Level	From 0 to 100 percent of displacer length(3)—standard lengths for all sensors are 356 mm (14 inches) or 813 mm (32 inches); other lengths available depending on sensor construction			
	Fluid Density (DLC3010)	From 10 to 100 percent of displacement force change obtained with given displacer volume—standard volumes are 1016 cm^3 (62 in^3) for 249C and 249CP sensors and 1622 or 1360 cm^3 (99 or 83 in^3) for most other sensors; other volumes available depending upon sensor construction			
Allowable Specific Gravity (Standard)	Fluid Level or Fluid Interface Level	Specific gravity range, 0.05 to 1.10; Minimum differential specific gravity 0.05(4)			
	Fluid Density (DLC3010)	Specific gravity range, 0.1 to 1.10; Minimum change in specific gravity 0.05(4)			
Zero Adjustment	Fluid Level or Fluid Interface Level	Continuously adjustable to position span of less than 100 percent anywhere within displacer length, and report the value in engineering units with any desired bias.			
	Fluid Density (DLC3010)	Continuously adjustable to position span of less than 90 percent anywhere within 10 to 100 percent of displacement force change obtained with given displacer volume.			

1. At full design span, reference conditions.
2. To lever assembly rotation inputs.
3. The torque tube and the displacer must be properly sized for the application in order for 0 to 100% of displacer length to be available.
4. With a nominal 4.4 degrees torque tube shaft rotation for a 0 to 100 percent change in liquid level (specific gravity=1), the digital level controller can be adjusted to provide full output for an input range of 5% of nominal input span. This equates to a minimum differential specific gravity of 0.05 with standard volume displacers. Operating at 5% proportional band will degrade accuracy by a factor of 20. Using a thin wall torque tube, or doubling the displacer volume will each roughly double the effective proportional band. When proportional band of the system drops below 50%, changing displacer or torque tube should be considered if high accuracy is a requirement.

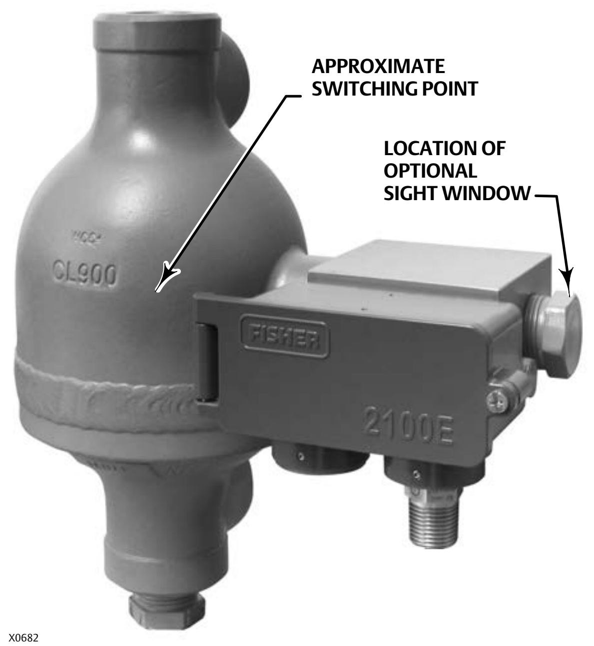


Figure 4. Fisher 2100E Electric Liquid Level Switch

Figure 5. Fisher 2100 Pneumatic Liquid Level Switch

Fisher 2100 Liquid Level Switches

Typically, 2100E and 2100 switches electrically or pneumatically operate safety shutdown systems for field processing equipment in oil and gas industry applications

Switch construction comes in a left-hand as well as a right-hand mounting version. The explosion-proof, hermetically sealed 2100E switch is offered as both a factory mounting and as an electric switch retrofit to the proven 2100 switch.

With the 2100E switch rising liquid level exerts a buoyant force on the torque tube that either activates or deactivates an electrical SPDT or DPDT switch depending on the switching action desired. Falling liquid level deactivates or activates the same switch depending on the action desired.

When the 2100 switch is in the normal position with the flapper against the nozzle, output pressure cannot bleed off and remains the same as full supply pressure. Rising liquid level exerts a buoyant force on the displacer, producing a torque on the torque tube. When the torque transmitted by the torque tube exceeds the torque exerted on the flapper by the magnet, the flapper snaps away from the nozzle, allowing output pressure to bleed through the nozzle faster than supply pressure can enter through the bleed orifice. The reduced pressure in the output signal line activates the shutdown or alarm system. When the liquid level lowers, the falling displacer forces the flapper into the field of the magnet, letting the magnet snap the flapper against the nozzle and causing output pressure to build to full supply pressure.

Fisher *L2*, *L2e*, and *L2sj* Liquid Level Controllers

Rugged *L2*, *L2e*, and *L2sj* liquid level controllers use a displacer type sensor to detect liquid level or the interface of two liquids of different specific gravities.

The reliability of the design make these controllers well suited for high pressure liquid level applications in natural gas production, compression, and processing industries.

The *L2* and *L2sj* devices deliver a pneumatic output signal to a control valve.

The *L2e* device uses a single pole double throw (SPDT) dry contact electric switch to provide differential gap (DG) control or liquid monitoring. It can be used to provide an electric control signal to an electrically actuated control valve.

The sensor uses a threaded 2 NPT connection to the vessel. Standard constructions use materials that comply with the requirements of NACE MR0175-2002.

L2, *L2e*, and *L2sj* controllers, in combination with the sensor, work on the principle that a body immersed in liquid will be buoyed up by a force equal to the weight of the liquid displaced. The buoyant force and resultant movement of the displacer in the liquid is transmitted to the controller which delivers the signal to a control valve.

L2 Liquid Level Controllers

Snap-Acting or Throttling Control... One standard controller available as either throttling or snap-acting.

Field-Reversible Output... The controller can be adjusted in the field for direct or reverse action without additional parts. The controller also has adjustable gain sensitivity.

Easy Maintenance... Both the controller and the sensor can be easily disassembled to inspect the process seals and for maintenance.

Figure 6. Fisher *L2* Liquid Level Controller

W8418-1

L2e Electric Level Controllers

Effective Level Loop Tuning... Intuitive Zero and Span adjustments allow flexibility in setting loop performance over a level range of 5.0 to 559 mm (0.2 to 22 inches).

More Reliable Control... Premium quality hermetically-sealed switch with gold contacts and advanced knife-edge sensing provide highly dependable and accurate liquid level control.

Environmentally Responsible... Replacing a conventional pneumatic level loop with fully electric level control eliminates controller and dump valve venting and requires less maintenance.

Figure 7. Fisher *L2e* Liquid Level Controller

X0660

L2sj Liquid Level Controllers

Designed for use with Natural Gas... The *L2sj* controller is intended for use with natural gas as the pneumatic supply.

Reduced Carbon Footprint... Low-bleed relay helps to conserve natural gas to reduce greenhouse gas emissions.

Reduced Operating Costs, Increased Revenue... Integral action relay with rugged metal seats requires less maintenance and provides more dependable liquid level control, which can improve uptime. Reduced emissions result in an increase in natural gas available to the sales line.

Figure 8. Fisher *L2sj* Liquid Level Controller

W9331

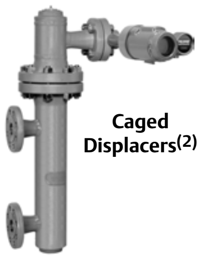
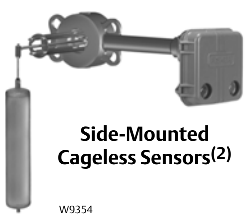
Fisher 249 Sensors

249 sensors, in conjunction with either DLC3010/ DLC3020f digital level controllers or 2500 controllers and transmitters, are designed to measure changes in liquid level, liquid interface level, or density/specific gravity inside a process vessel.

249 level sensors are available in both caged and cageless configurations, as shown in the table below. Caged sensors provide more stable operation than do cageless sensors for vessels with internal obstructions or considerable internal turbulence. Cageless sensors are generally used on applications requiring large displacers that are accommodated by large flange connections. Different displacer stem lengths permit lowering the displacer to the desired depth.

Refer to table 4, 5, 6, 7, 8, and 9 for product line capabilities and options.

Table 4. Fisher 249 Sensor Displacer Diameters, Sensor Connections, and Ratings

Sensor Type Number[1]		Pressure Rating	Connection Size	Connection Type
 **Caged Displacers[2]** W8171-1	249	CL125 or 250	NPS 1-1/2 or 2	Screwed or flanged
			NPS 2	Flanged
	249B 249BF	PN 10/40 or 63/100	DN 40	Flanged
		PN 10/16, 25/40, or 63	DN 50	
		CL600	NPS 1-1/2 or 2	NPT or socket-welding ends
		CL150, 300, or 600		Raised-face flanged or ring-type joint flanged
	249C	CL600	NPS 1-1/2 or 2	Screwed
		CL150, 300, or 600	NPS 1-1/2	Raised-face
			NPS 2	
	249K	CL1500	NPS 1-1/2 or 2	Raised-face flanged or ring-type joint flanged
	249L	CL2500	NPS 2 (if a top connection is specified, it will be NPS 1 flanged)	Ring-type joint flanged
 **Top-Mounted Cageless Sensors[2]** W8334-1	249BP	CL150, 300, or 600	NPS 4	Raised-face flanged or ring-type joint flanged
		CL150 or 300	NPS 6 or 8	Raised-face flanged
	249CP	CL150, 300, or 600	NPS 3	Raised-face flanged
	249P	PN 10/16, 25/40, or 63 (Ratings to PN 250 also available)	DN 100	Flanged
		CL900 or 1500	NPS 4	Raised-face flanged or ring-type joint flanged
		CL150 through 2500	NPS 6 or 8	Raised-face flanged
 **Side-Mounted Cageless Sensors[2]** W9354	249VS	PN 10 to PN 160	NPS 4	Raised-face or flat-face
		CL125, 150, 250, 300, 900, or 1500	NPS 4	Raised-face or flat-face
		CL600, 900, or 2500	NPS 4	Butt weld end
 **Customer-Supplied Cage[2]** W8678-2	249W	PN 10/16, 25/40 Type B flange	DN 80	Raised-face flanged
		PN 25/40 Type B flange	DN 100	
		CL150, 300, 600	NPS 3	
			NPS 4	

1. Not all sensor types are available in all world areas. Contact your Emerson sales office for information on sensor availability.
2. 249 sensors may be mounted on either DLC3010/DLC3020f instruments, or 2500 controllers/transmitters.

Table 5. Fisher 249 Sensors Displacer Lengths

Sensor Type Number	Standard Displacer Length	
	mm	Inches
Caged Displacers	356 or 813	14 or 32
249		
249B, 249C, 249BF, 249K, 249L	356, 813, 1219, 1524, 1829, 2134, 2438, 2743, 3048	14, 32, 48, 60, 72, 84, 96, 108, 120
Top-Mounted Cageless Sensors		
249BP, 249CP, 249P		
Side-Mounted Cageless Sensors		
249VS		
Top-Mounted or on Customer Supplied Cage		
249W		

Table 6. Fisher 249 Sensor Construction Materials

Part	Type Number	Material	Notes
Cage, head, torque tube arm	249	Cast iron	For optional materials, and parts not shown, contact your Emerson sales office.
	249B and 249BP	WCC (steel)	
	249BF	Carbon steel	
	249C and 249CP	CF8M (316 stainless steel)	
	249K	Steel standard	
	249L	Steel standard	
	249P	Carbon Steel	
	249VS	LCC (steel), WCC, CF8M	
Wafer body, torque tube arm	249W NPS 3 NPS 4	WCC, CF8M LCC, CF8M	
Standard Trim(1)	All	S31600	
Bolting	All	Steel grade B7 studs or cap screws and grade 2H nuts (standard),	

1. Trim parts include displacer rod, driver bearing; displacer stem parts, and stem connection parts.

Table 7. Fisher 249 Displacer and Torque Tube Materials

Part	Standard Material	Other Materials
Displacer	304 Stainless Steel 316 Stainless Steel for 249C, 249CP	316 Stainless Steel, N10276, N04400, Plastic, and Special Alloys
Displacer Stem, Driver Bearing, Displacer Rod and Driver	316 Stainless Steel	N10276, N04400, other Austenitic Stainless Steels, and Special Alloys
Torque Tube	N05500(1) 316 SST for 249C, 249CP	316 Stainless Steels, N06600, N10276

1. N05500 is not recommended for spring applications above 232°C (450°F). Contact your Emerson sales office or application engineer if temperatures exceeding this limit are required.

Table 8. Maximum Unbuoyed Displacer Weight

Sensor Type	Torque Tube Wall Thickness	Displacer Weight W_T (lb)
249, 249B, 249BF, 249BP, 249W	Thin Standard Heavy	3.3 5.0 9.5
249C, 249CP	Standard Heavy	4.0 6.4
249VS	Thin Standard	3.0 5.5
249L, 249P(1)	Thin Standard	4.5 8.5
249K	Thin Standard	3.8 7.3

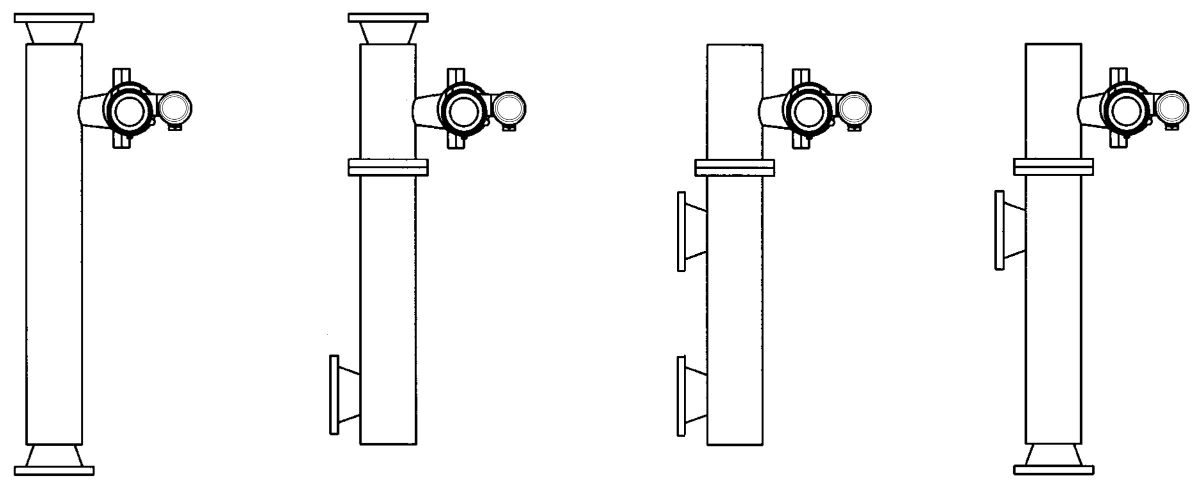
1. High pressure CL900 through 2500.

Table 9. Temperatures

Temperature	Type or Material	Temperature Capability		Notes
		°C	°F	
Ambient	DLC3010 / DLC3020f	−40 to 80	−40 to 176	For process temperatures below -29°C (-20°F) and for guidance on the need for a heat insulator, contact your [Emerson sales office](). If the ambient dew point is higher than the process temperature, ice might form and cause instrument malfunction and reduce insulator effectiveness.
	Standard 2500	-40 to 71	-40 to 160	
	High-temperature 2500	-18 to 104	0 to 220	
Process	Cast iron sensor parts	−29 to 232	−20 to 450	
	Steel sensor parts	−29 to 427	−20 to 800	
	Stainless steel sensor parts	−198 to 427	−325 to 800	
	N04400	−198 to 427	−325 to 800	
	Graphite/stainless steel gaskets	−198 to 427	−325 to 800	
	N04400/PTFE gaskets	−73 to 204	−100 to 400	
Combination of ambient and process	Some combinations of process and ambient temperatures within the above ranges require an optional heat insulator to protect the instrument from high or low temperatures. For example, an ambient temperature of 30°C or 86°F and a process temperature of 200°C or 392°F require a heat insulator.			

Connection Styles and Positions

Figure 9. Cage Connection Styles (also see table 10)



STYLE 1 STYLE 2 STYLE 3 STYLE 4

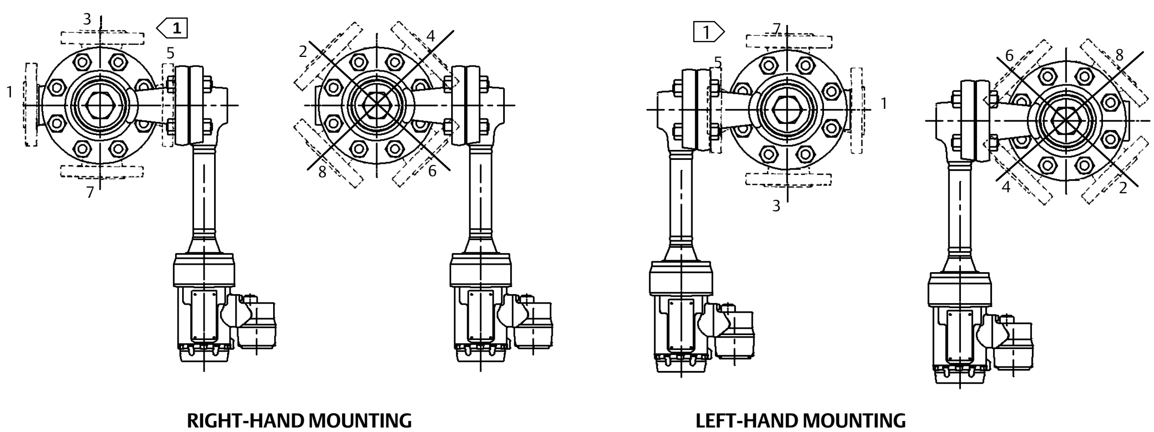
Note:
Cage connections shown illustrate the DLC3010/DLC3020f. Cage connections are also applicable to 2500 controllers/transmitters.

28B5536-1
B1820-2

Table 10. Cage Connection Styles (also see figure 9)

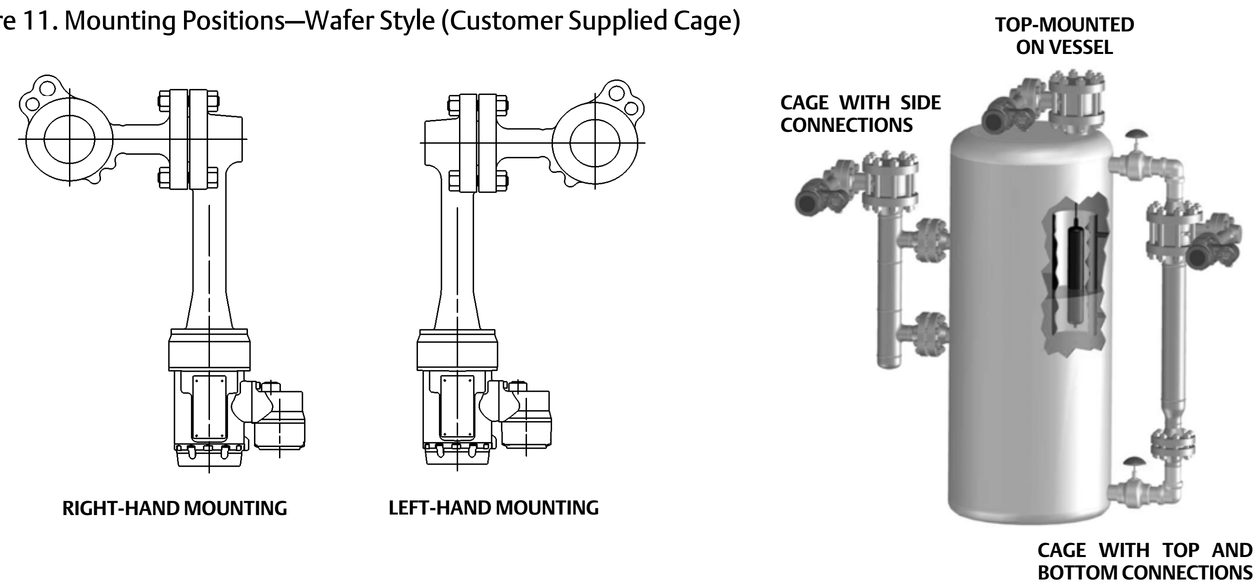
Connection Types:	S = Screwed F = Flanged SW = Socket welding			
Connection Locations:	Style 1	Style 2	Style 3	Style 4
	Top and bottom	Top and lower side	Upper side and lower side	Upper side and bottom
Example:	F-1 means flanged connections at the top and bottom of the cage.			

Figure 10. Mounting Positions—Caged Displacers



Note:
Mounting positions shown illustrate the DLC3010/DLC3020f. Mounting positions are also applicable to 2500 controllers/transmitters.
1 Position 5 is not available for NPS 2 CL300 and 600 249C.

Figure 11. Mounting Positions—Wafer Style (Customer Supplied Cage)



Note:
Mounting positions shown illustrate the DLC3010/DLC3020f. These positions are also applicable to 2500 controllers/transmitters.

Pneumatic Liquid Level Instruments

Fisher 2500 controllers and transmitters (figures 12 and 13) are rugged, dependable, and simply constructed pneumatic instruments. In conjunction with a 249 sensor, they sense liquid level or interface level in a vessel, and produce a standard pneumatic output signal proportional to the process variable.

Standard or Custom Configuration... The 2500 controller in combination with a 249W sensor enables users to install pneumatic level controllers to a variety of industry standard or custom process vessel connections. The sensor consists of a wafer body, torque tube assembly and displacer and is rated for CL150, 300, and 600. The wafer body mounts between NPS 3 or 4 raised face flanges. Custom configurations are also available to meet your specific application requirements. Refer to the 2500 specifications in tables 9, 11, 12, and 13, and the 249 specifications in tables 4, 5, 6, 7, 8, and 9.

Easy Adjustment... Simple dial-knobs make set point and proportional valve opening changes straightforward and easy.

Simple, Durable Construction... Few moving parts are used. Knife-edged driver bearing in sensor, and plated brass instrument case ball bearing for torque tube rotary shaft help provide low friction operation.

Reduced Maintenance and Operating Costs... Spring-out wire provides for in-service cleaning of relay orifice. Supply pressure conservation is enhanced because relay exhaust opens only when output pressure is being reduced.

Figure 12. Fisher 2500 Controller in Combination with a 249W Sensor— Installed in a Typical Customer-Supplied Cage

W8679

Table 11. Fisher 2500 Controller/Transmitter General Specifications

Controller and Transmitter Selections[1]	**2500**	Proportional pneumatic controller
	2502	Proportional-plus-reset pneumatic controller
	2502F	Proportional-plus reset pneumatic controller with anti-reset windup
	2500T	Proportional pneumatic transmitter
	2500S	Differential gap (on-off) pneumatic controller with full adjustment
	2503	Differential gap (on-off) pneumatic controller with limited adjustment
Process Sensor Range (Input Signal)	Fluid level or fluid interface level	From 0 to 100 percent of displacer length[2]—standard lengths for all sensors are 356 mm (14 inches) or 813 mm (32 inches); other lengths available depending on sensor construction
	Fluid density	From 0 to 100 percent of displacement force change obtained with given displacer volume—standard volumes are 1016 cm^3 (62 in^3) for 249C and 249CP sensors and 1622 or 1360 cm^3 (99 or 83 in^3) for most other sensors; other volumes available depending upon sensor construction
Allowable Specific Gravity (Standard)	Fluid level or fluid interface level	2503 and 2503R: Specific gravity range, 0.25 to 1.10 All other types: Specific gravity range, 0.20 to 1.10
	Fluid density	2503 and 2503R: Minimum change in specific gravity, 0.25 All other types: Minimum change in specific gravity, 0.20
Set Point Adjustment (Controllers only)		Continuously adjustable to position control point or differential gap of less than 100 percent anywhere within displacer length (fluid or interface level) or displacement force change (density)
Zero Adjustment (Transmitters only)		Continuously adjustable to position span of less than 100 percent anywhere within displacer length (fluid or interface level) or displacement force change (density)
Reset Adjustment (Proportional-Plus-Reset Controllers Only)		Continuously adjustable from 0.005 to over 0.9 minutes per repeat (from 200 to under 1.1 repeats per minute)
Anti-Reset Differential Relief (2502F and 2502FR Controllers Only)		Continuously adjustable from 0.14 to 0.48 bar (2 to 7 psi) differential to relieve excessive difference between proportional and reset pressures
Output Signal--Direct (Increasing Level Increases Output) or Reverse Action	Proportional or reset controllers and transmitters	0.2 to 1.0 or 0.4 to 2.0 bar (3 to 15 or 6 to 30 psig)
	Differential gap controllers with full adjustment	0 and 1.4 or 0 and 2.4 bar (0 and 20 or 0 and 35 psig)
	Differential gap controllers with limited adjustment	0 and full supply pressure
Hazardous Area Classification	2500 controllers/transmitters comply with the requirements of ATEX Group II Category 2 Gas and Dust CE Ex II 2 G D	
Options	Stainless steel heat insulator assembly Liquid level sight gauges Mechanical level indicator	

1. Also refer to tables 4, 5, 6, and 7.
2. The torque tube and the displacer must be properly sized for the application in order for 0 to 100% of displacer length to be available.

Table 12. Fisher 2500 Controller/Transmitter Performance

Independent Linearity (Transmitters Only)	1 percent of output pressure change at span of 100 percent
Hysteresis	0.6 percent of output pressure change at 100 percent of proportional band, differential gap, or span
Repeatability	0.2 percent of displacer length or displacement force change
Deadband (Except Differential Gap Controllers)	0.05 percent of proportional band or span
Typical Frequency Response	4 Hz and 90-degree phase shift at 100 percent of proportional band, diferential gap, or span with output pipe to typical instrument bellows using 6.1 meters (20 feet) of 6.3 mm (1/4-inch) tubing

Table 13. Fisher 2500 Controller/Transmitter Supply Pressure

Output Signal	Standard Supply and Output Pressure Gauge Indications(1)	Normal Operating Supply Pressure(2)		Air Consumption at Normal Operating Supply Pressure(3)			
				Normal m^3/h(4)		Scfh(4)	
		Bar	Psig	Min(5)	Max(6)	Min(5)	Max(6)
0.2 to 1.0 bar (3 to 15 psig), except 0 and 1.4 bar (0 and 20 psig)(2) for on-off controllers	0 to 30 psig	1.4	20	0.11	0.72	4.2	27
0.4 to 2.0 bar (6 to 30 psig), except 0 and 2.4 bar (0 and 35 psig)(2) for on-off controllers	0 to 60 psig	2.4	35	0.19	1.1	7	42

1. Consult your Emerson sales office about gauges in other units.
2. Control and stability may be impaired if this pressure is exceeded (except 2503 or 2503R controller without proportional valve).
3. Except 2503 or 2503R controller, which bleeds only when relay is open at exhaust position.
4. Normal m^3/hr=normal cubic meters per hour at 0°C and 1.01325 bar. Scfh=standard cubic foot per hour at 60°F and 14.7 psia.
5. At zero or maximum proportional band or span setting.
6. At setting in middle of proportional band or span range.

Figure 13. Typical Controller

W8333

W0656-1

Related Documents

Other documents containing information related to level instruments include:

- FIELDVUE DLC3010 Digital Level Controller (Bulletin 11.2:DLC3010) D102727X012
- FIELDVUE DLC3020f Digital Level Controller (Bulletin 11.2:DLC3020f) D103433X012
- Fisher 2100 Pneumatic and 2100E Electric Liquid Level Switches (Bulletin 32.2:2100) D200032X012
- Fisher L2 Liquid Level Controller (Bulletin 34.2:L2) D103034X012
- Fisher L2e Electric Level Controller (Bulletin 34.2:L2e) D103532X012
- Fisher L2sj Liquid Level Controller (Bulletin 34.2:L2sj) D103229X012
- Fisher 2500-249 Pneumatic Controllers and Transmitters (Bulletin 34.2:2500) D200037X012
- Fisher 249 Sensor, Level Controller, and Transmitter Dimensions (Bulletin 34.2:249) D200039X012

These documents are available from your Emerson sales office Also visit our website at Fisher.com.

Emerson Automation Solutions
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Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 2100 Pneumatic and 2100E Electric Liquid Level Switches

Fisher 2100 on-off pneumatic switch and 2100E electric switch sense (shown in figure 1) high or low liquid levels. Typically, these switches pneumatically or electrically operate safety shutdown systems for field processing equipment in oil and gas production applications. 2100 and 2100E switches both use a displacer-style sensor located in an external cage that mounts on the outside of a vessel.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

FISHER 2100 PNEUMATIC LIQUID LEVEL SWITCH

Features

- Proven Rugged Construction—The switch is isolated and sealed from the process through a corrosion-resistant displacer and torque tube assembly for maximum reliability. The displacer can withstand up to 1-1/2 times the maximum working pressure, allowing it to remain in the cage during hydrostatic testing.

- Sour Service Capability—Materials are available for applications handling sour fluids and gases. These constructions comply with the metallurgical requirements of NACE MR0175-2002. Environmental restrictions may apply.

- Application Versatility—The 2100 and 2100E switch construction comes in a left-hand as well as a right-hand mounting version. The explosion-proof, hermetically sealed 2100E switch is offered as both a factory mounting and as an electric switch retrofit to the proven 2100 switch.

- Installation Versatility—The displacer cage has two 1 NPT pipe plugs that you can remove and relocate for horizontal instead of vertical equalizing piping, or for installation of a bleed or drain valve.

- Easy Reversibility—Switching action for both the 2100 and 2100E switches is field-reversible from high-level to low-level or vice versa without additional parts.

Specifications

Input Signal

Liquid level

Minimum Process Liquid Specific Gravity

0.5 (consult your Emerson sales office or Local Business Partner for specific gravities below this value)

Output Signal

2100: Equal to the supply pressure when the switch is in the normal position (flapper against nozzle) and reduced to approximately atmospheric pressure, depending upon the bleed orifice size and the piping configuration, when the switch is activated
2100E: Same as supply signal

Supply Signal

2100: ■ 2.1 to 4.1 bar (30 to 60 psig), ■ 4.1 to 6.9 bar (60 to 100 psig) or ■ 6.9 to 10.3 bar (100 to 150 psig)
2100E: 11 amperes, 1/4 horsepower at 125/250 volts ac; 5 amperes resistive, 3 amperes inductive at 28 volts DC

Supply Medium (2100)

Air or Natural Gas

Steady-State Air Consumption[1] (2100)

Less than 0.03 normal m^3/hour (1.0 scfh) for all supply pressures when the liquid level is 25.4 mm (1 inch) below the normal switch position (flapper against nozzle) for high-level switching or 25.4 mm (1 inch) above the normal switch position for low-level switching

Maximum Working Pressure[2]

■ 153 bar (2220 psig) WOG[3] except ■ 24 bar (350 psig) WOG is the maximum working pressure for sight window construction

Operative Temperature Range[2]

2100: –29 to 204°C (–20 to 400°F)
2100E: –29 to 82°C (–20 to 180°F)

Displacer Diameter

102 mm (4 inches)

Process Connection Size

153 bar (2220 psig) WOG[3]: ■ 1 NPT internal
■ DN 50 (NPS 2) Schedule 80 buttwelding ends, or
■ DN 50 (NPS 2) Schedule 160 buttwelding ends

2100 Switch Supply Pressure Connection Size

1/4 NPT internal

2100E Switch Electrical Connection Size

1/2 NPT external

Hazardous Area Classification for 2100 Switch

The 2100 pneumatic switch complies with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D

The 2100 pneumatic switch meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

II Gb c T*X
III Db c T*X

Hazardous Area Classification for 2100E Switch

Approvals on the electrical switch component in the 2100E, supplied by ITT NEO-DYN are as follows:

CSA— Class I Division 1, Groups A,B,C,D
Class II Division 1, Groups E,F,G ; Dual Seal

FM— XP - Class I Division 1 Groups A,B,C,D
DIP - Class II Division 1 Groups E,F,G

UL— Class I Division 1 Groups A,B,C,D
Class II Division 1 Groups E,F,G

ATEX— Ex d IIC, Ex tb IIIC

IECEx— Ex d IIC, Ex tb IIIC

Approvals on the complete 2100E assembly are as follows:

CUTR— Customs Union (Russia, Belarus, Kazakhstan and Armenia), 1Ex d IIC

Contact your Emerson sales office or Local Business Partner if additional information is required.

-continued -

Specifications (continued)

Construction Materials

Cage: ■ SA216 Cast Steel (WCC), ■ SA216 Cast Steel (WCC) (NACE MR0175-2002) and ■ SA351 316 SST (CF8M)
Displacer: ■ S30400 stainless steel (standard) ■ S31603 solution annealed stainless steel (NACE MR0175-2002)
Torque Rod & Tube Assembly: N05500
Bearing: Glass-filled PTFE
O-Rings: Fluorocarbon
Cover Gasket:
2100: Chloroprene
2100E: Silicone rubber
Other Gaskets: Silicone rubber
Nozzle Block Assembly (2100 only): Aluminum & stainless steel
Nozzle (2100 only): Stainless steel
Flapper & Clamp Assembly (2100 only): Stainless steel
Flapper Seat (2100 only): Fluorocarbon
Magnet (2100 only): Special material
Body Block: Steel
Cover:
2100: Clear plastic
2100E: Aluminum
Housing (2100E only): Aluminum
Other Metal Parts: Stainless steel

Options

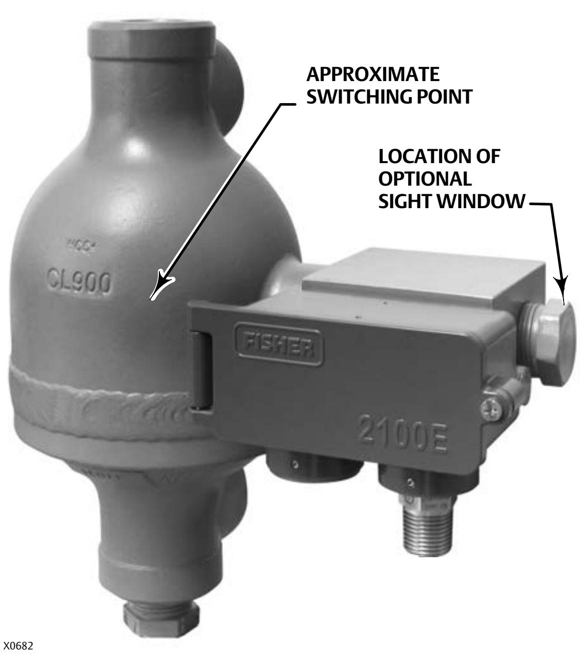
2100 Switch Option: Individual street tee and bleed orifice (when it is not desired to supply several level switches from one common block and bleed restriction)
Sight Window Option: A sight window is available for either the 2100 or 2100E that installs in place of the pipe plug, as illustrated in figure 1.
NACE Option: Constructions are available which comply with the metallurgical requirements of NACE MR0175-2002. Environmental restriction may apply.

Shipping Weights

17.2 kg (38 pounds)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Normal m^3/--normal cubic meters per hour at 0°C, 1.01325 bar, absolute (Scfh--standard cubic feet per hour at 60°F, 14.7 psia)
2. Pressure and temperature limits in this document and any applicable standards or code limitations should not be exceeded.
3. Water, Oil, Gas maximum working pressure. Corresponds to Cold Working Pressure: the maximum pressure rating allowed under normal ambient temperature conditions, which are usually understood to be -29 to 38°C (-20 to 100°F). Refer to MSS SP-25.

Figure 1. Fisher 2100E Electric Liquid Level Switch



Principle of Operation

Figure 2 shows the 2100 switch with the nozzle, flapper, and magnet positioned for high level activation. When the switch is in the normal position with the flapper against the nozzle, output pressure cannot bleed off and remains the same as full supply pressure. Rising liquid level exerts a buoyant force on the displacer, producing a torque on the torque tube. When the torque transmitted by the torque tube exceeds the torque exerted on the flapper by the magnet, the flapper snaps away from the nozzle, allowing output pressure to bleed through the nozzle faster than supply pressure can enter through the bleed orifice. The reduced pressure in the output signal line activates the shutdown or alarm system. When the liquid level lowers, the falling displacer forces the flapper into the field of the magnet, letting the magnet snap the flapper against the nozzle and causing output pressure to build to full supply pressure.

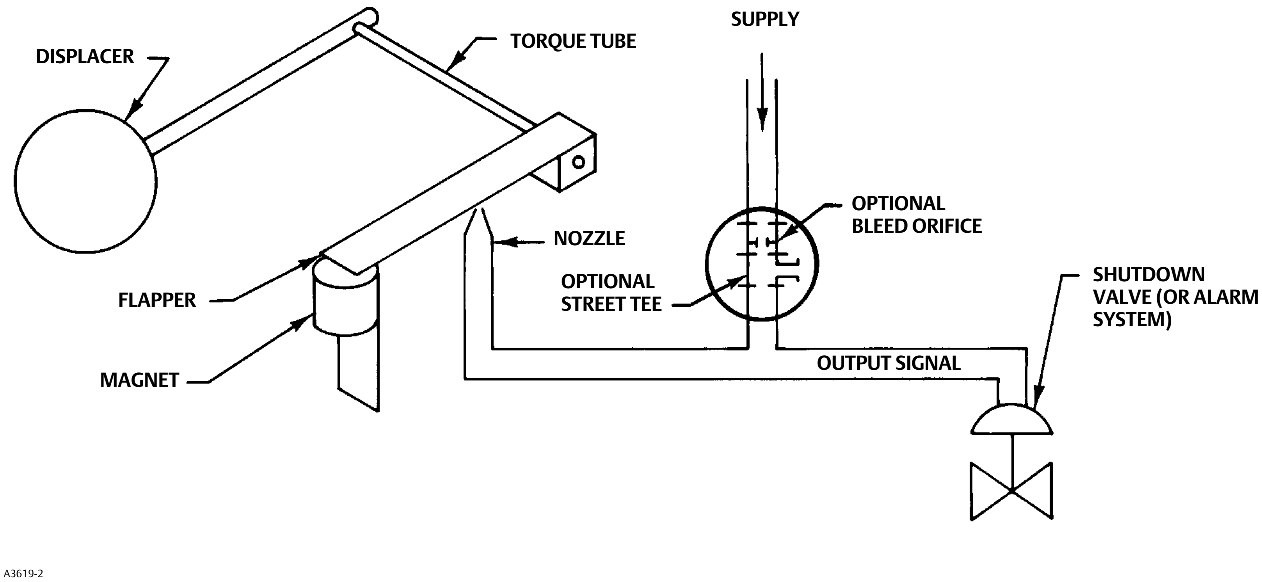


Figure 2. Principle of Operation for High-Level Fisher 2100 Switch

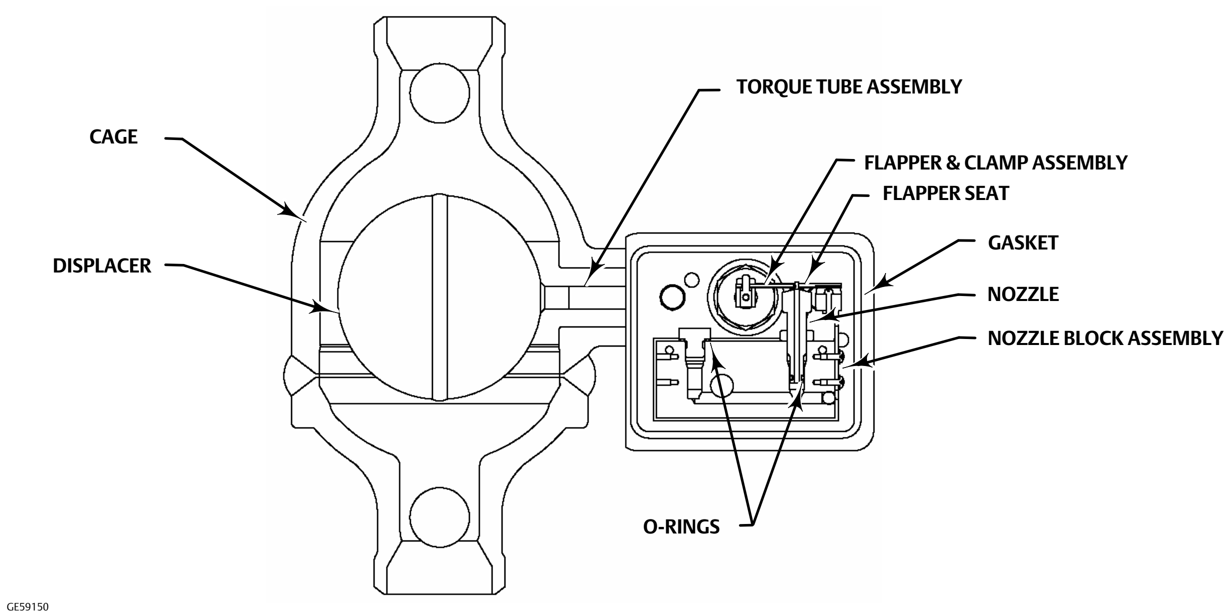


Figure 3. Construction Details of Low-Level Fisher 2100 Switch

Figure 4. Construction Details of Fisher 2100E Switch

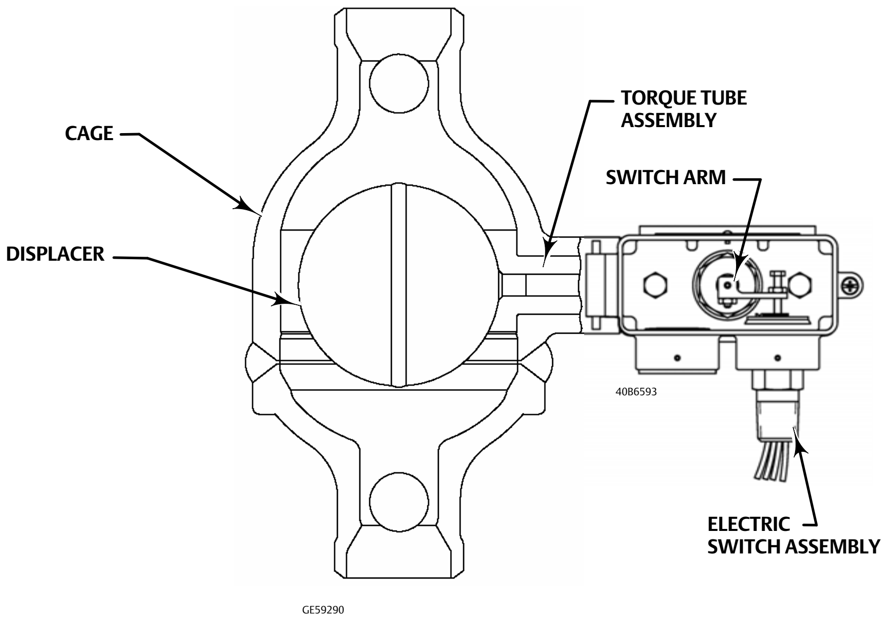


Figure 3 shows a sectional view of the 2100 switch positioned for low level activation. The nozzle, flapper, and magnet are on the opposite side of the torque tube, so that downward displacer travel moves the flapper away from the nozzle.

With the 2100E switch (figure 4), rising liquid level exerts a buoyant force on the torque tube that either activates or deactivates an electrical SPDT or DPDT switch depending on the switching action desired. Falling liquid level deactivates or activates the same switch depending on the action desired.

Installation

The forged-in horizontal line on a 2100 or 2100E displacer cage indicates the approximate switching point. When mounted, the 2100 or 2100E switch is positioned so that the horizontal line corresponds to the level at which switching is desired. Isolating valves should be installed in the equalizing piping between the tank and the cage. Dimensions are shown in figure 5 and table 1.

Ordering Information

Application

When ordering, specify:

- Supply pressure (2100 switch only)
- SPDT or DPDT switch construction (2100E switch only)
- Maximum working pressure and temperature
- Switching action for high or low level alarming

Construction

Refer to the specifications. Review the information under each specification and in the referenced figures; specify the desired selection whenever there is a choice to be made. High level switching and right-hand mounting will be supplied automatically unless otherwise specified. Always specify the complete type number of the desired equipment.

Figure 5. Dimensions (also see table 1)

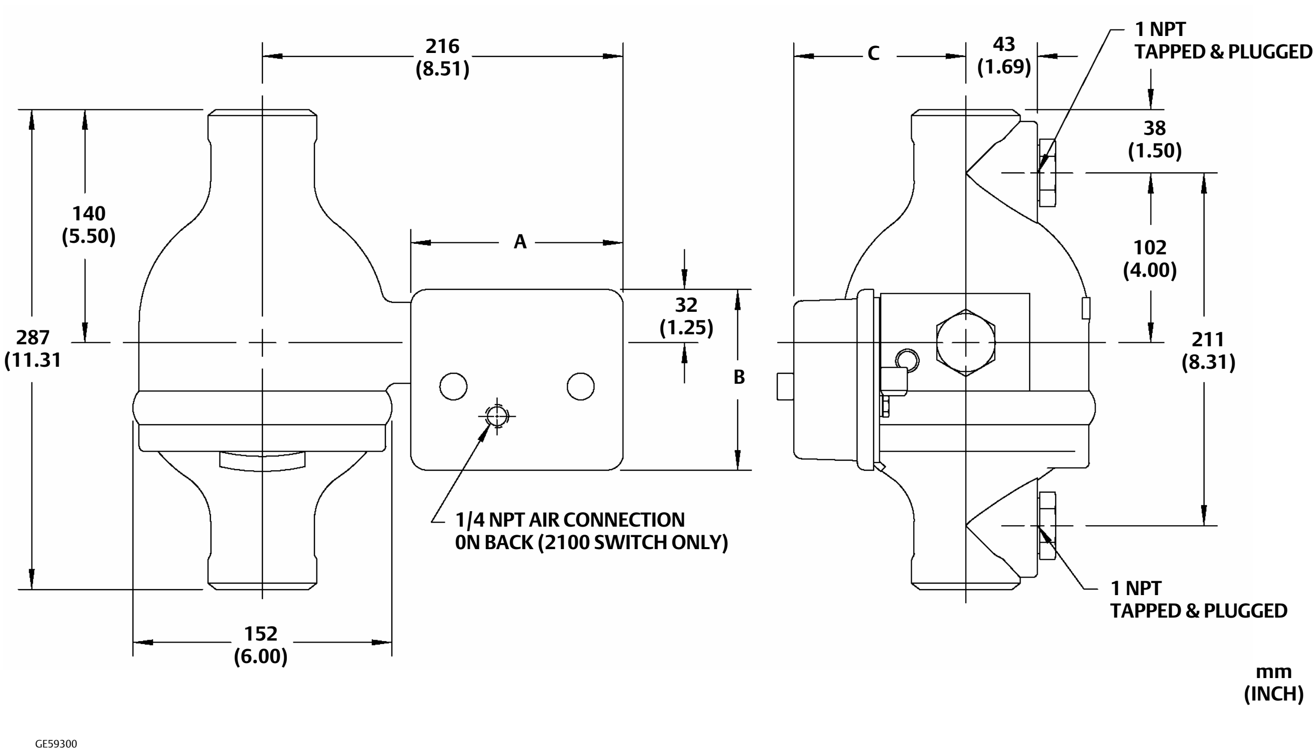


Table 1. Dimensions

TYPE	DIMENSIONS					
	mm			Inches		
	A	B	C	A	B	C
2100	127	108	103	5.00	4.25	4.06
2100E	130	57	111	5.12	2.25	4.38

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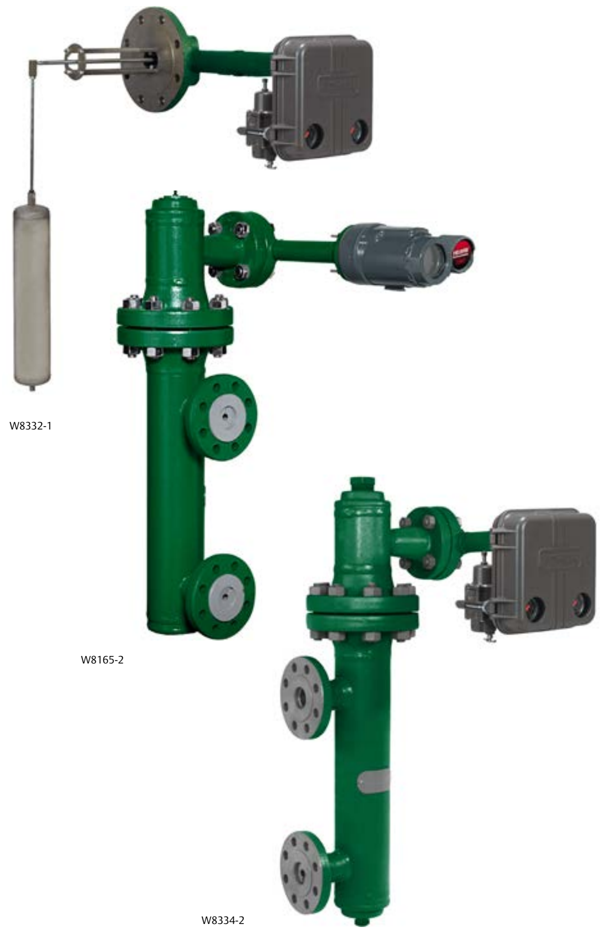
Fisher™ 249 Sensor, Level Controller, and Transmitter Dimensions

This bulletin contains dimensional information for Fisher displacer-type sensors and for controllers and transmitters used with these sensors. Dimensions are subject to change and certified dimensions should be requested for construction projects. Some of the abbreviations used in this document are as follows: NPT = National Pipe Thread, NPS = Nominal Pipe Size, FF = Flat Face Flange, RF = Raised Face Flange, and RTJ = Ring Type Joint Flange.

Flange specification references are ASME B16.1 for CL125 and 250 and ASME 16.5 for CL150, 300, 600, 900, 1500 and 2500.



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W8165-2

W8334-2

Contents

Caged Displacer for External Vessel Mounting

249: figure 1 and 2; tables 1, 2, 3, and 4

249B and 249BF: figure 3; tables 5, 6, 7, and 8

249C and 249K: figure 4; tables 9, 10, and 11

249L: figure 5

Cageless Displacer for Internal Vessel Mounting

Top Mounted

249BP and 249P: figure 6; tables 12 and 13

249CP: figure 7; tables 14 and 15

Side Mounted

249VS: figure 8, 9, 10, and 11

Cageless Displacer for Mounting on Customer Supplied Cage or on Top of Vessel

249W: figure 12

Controllers and Transmitters

Fisher 2500 Controller / Transmitter: figure 13

FIELDVUE™ DLC3010 / DLC3020f Digital Level Controller: figure 14

249

Figure 1. Fisher 249 Top View

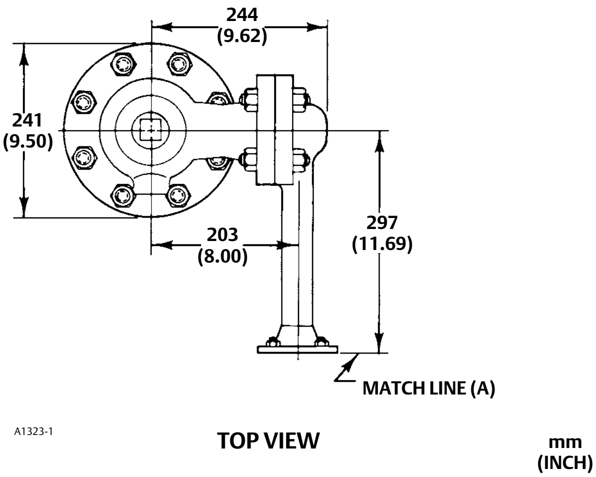


Table 1. Fisher 249 Dimensions F, M, and W for S-1 and F-1 Connections[1]

S-1 AND F-1 CONNECTIONS							
Displacer Length	F			M			W
	CL125 FF	Scrd NPT	CL250 RF	Scrd NPT	CL125 FF	CL250 RF	
mm							
356 813	562 1019	495 953	575 1032	241 470	279 508	286 514	406 864
Inches							
14 32	22.12 40.12	19.50 37.50	22.62 40.62	9.50 18.50	11.00 20.00	11.25 20.25	16.00 34.00

1. Scrd is 1-1/2 and 2 NPT. Flanges in NPS 2 only.

Table 2. Fisher 249 Dimensions F, M, and W for S-2 Connections

S-2 CONNECTIONS: 1-1/2 NPT, CL250							
Displacer Length		F		M		W	
mm	Inch	mm	Inch	mm	Inch	mm	Inch
356	14	657	25.88	241	9.50	394	15.5

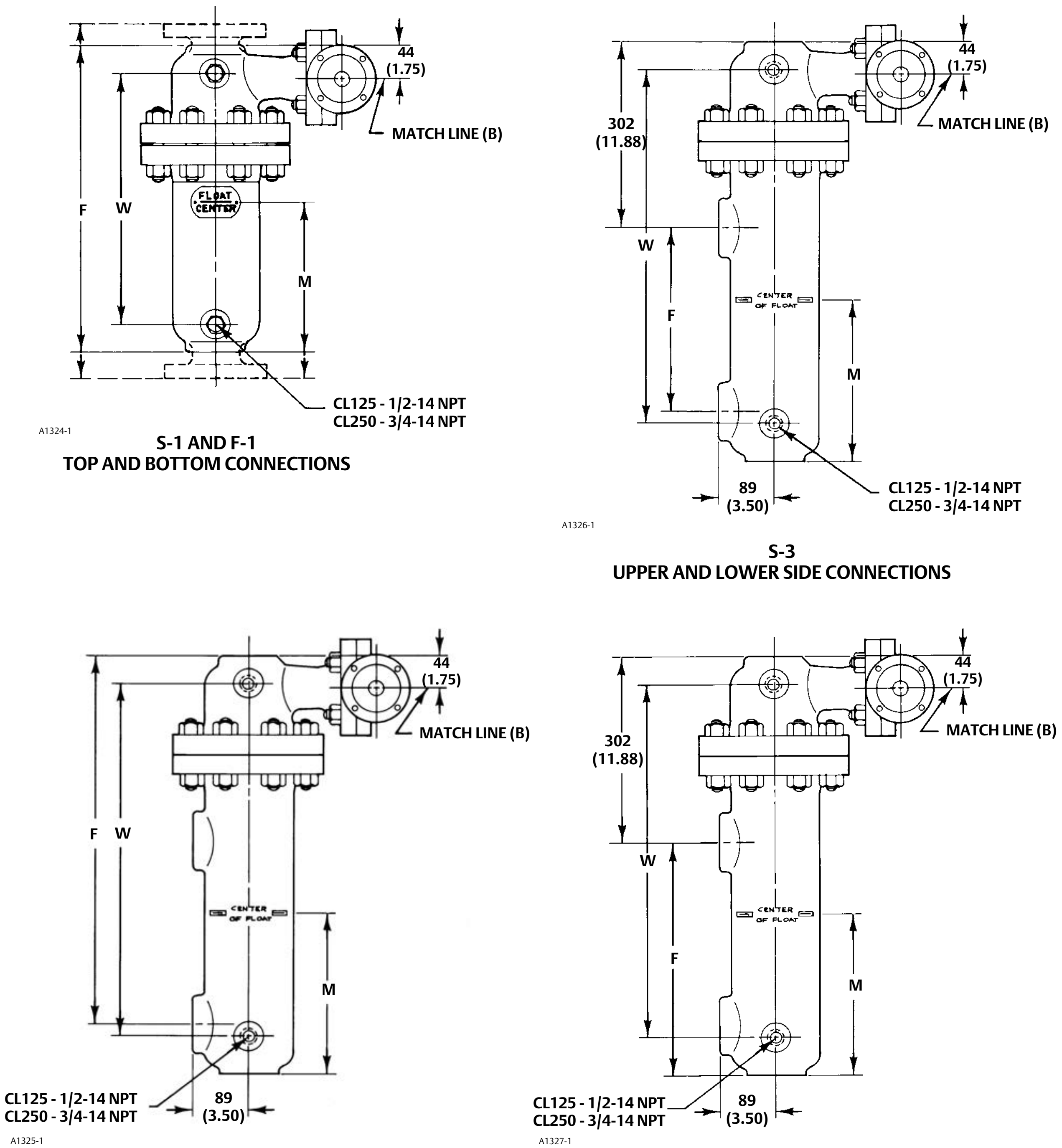
Table 3. Fisher 249 Dimensions F, M, and W for S-3 Connections

S-3 CONNECTIONS: 1-1/2 NPT, CL250							
Displacer Length		F		M		W	
mm	Inch	mm	Inch	mm	Inch	mm	Inch
356	14	356	14.00	241	9.50	394	15.5

Table 4. Fisher 249 Dimensions F, M, and W for S-4 Connections

S-4 CONNECTIONS: 1-1/2 NPT, CL250							
Displacer Length		F		M		W	
mm	Inch	mm	Inch	mm	Inch	mm	Inch
356	14	445	17.50	241	9.50	394	15.5

Figure 2. Fisher 249 Side View (see tables 1, 2, 3, and 4)



S-1 AND F-1
TOP AND BOTTOM CONNECTIONS

S-3
UPPER AND LOWER SIDE CONNECTIONS

S-2
TOP AND LOWER SIDE CONNECTIONS

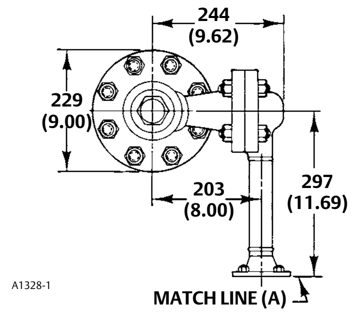
S-4
UPPER SIDE AND BOTTOM CONNECTIONS

SIDE VIEW

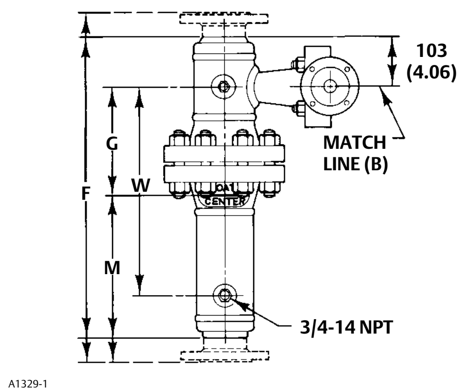
mm
(INCH)

249B and 249BF (NPS 1-1/2 and 2 End Connections)

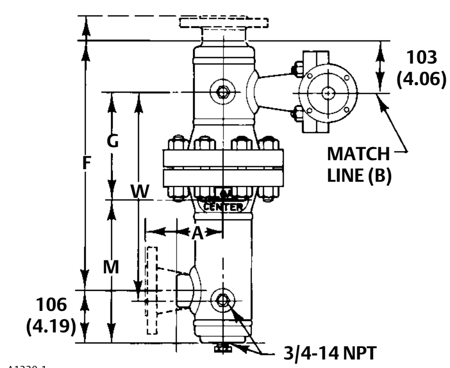
Figure 3. Fisher 249B and 249BF (see tables 5, 6, 7, and 8)



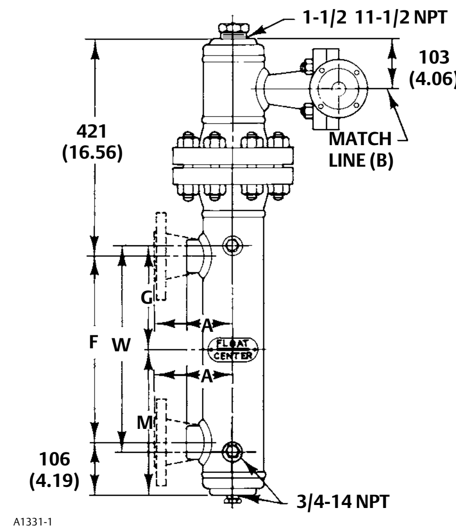
TOP VIEW



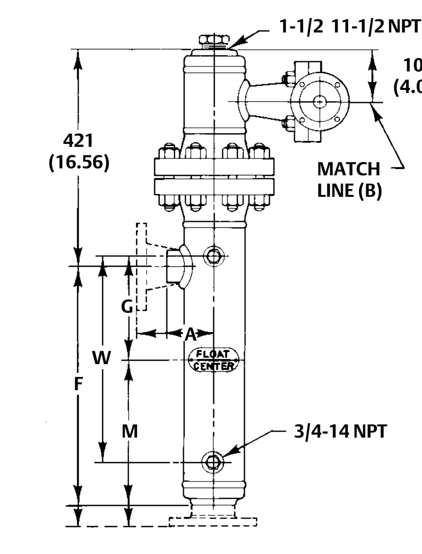
S-1 AND F-1
TOP AND BOTTOM CONNECTIONS



S-2 AND F-2
TOP AND LOWER SIDE CONNECTIONS



S-3 AND F-3
UPPER AND LOWER SIDE CONNECTIONS



S-4 AND F-4
UPPER SIDE AND BOTTOM CONNECTIONS

mm
(INCH)

SIDE VIEW

Table 5. Fisher 249B and 249BF S-1, F-1, S-4, and F-4 Connections

Conn. Style	Dis-placer Length	F							M						
		Scrd NPT	CL150		CL300		CL600		Scrd NPT	CL150		CL300		CL600	
			RF	RTJ	RF	RTJ	RF	RTJ		RF	RTJ	RF	RTJ	RF	RTJ
S-1 and F-1 (mm)	356	586	662	675	668	684	687	691	284	322	329	325	333	335	337
	813	1043	1119	1132	1126	1141	1145	1148	513	551	557	554	562	564	565
	1219	1449	1526	1538	1532	1548	1551	1554	716	754	760	757	765	767	768
	1524	1754	1830	1843	1836	1853	1856	1859	866	907	913	910	917	919	921
	1829	2058	2135	2148	2141	2157	2160	2164	1021	1059	1065	1062	1070	1072	1073
	2134	2364	2440	2453	2446	2462	2465	2469	1173	1211	1218	1214	1222	1224	1226
	2438	2669	2745	2757	2751	2767	2770	2773	1326	1364	1370	1367	1375	1376	1378
	2743	2973	3050	3062	3056	3072	3075	3078	1478	1516	1522	1519	1527	1529	1530
	3048	3278	3354	3367	3361	3377	3380	3383	1630	1669	1675	1672	1679	1681	1683
S-1 and F-1 (Inch)	14	23.06	26.06	26.56	26.31	26.94	27.06	27.19	11.19	12.69	12.94	12.81	13.12	13.19	13.25
	32	41.06	44.06	44.56	44.31	44.94	45.06	45.19	20.19	21.69	21.94	21.81	22.12	22.19	22.25
	48	57.06	60.06	60.56	60.31	60.94	61.06	61.19	28.19	29.69	29.94	29.81	30.12	30.19	30.25
	60	69.06	72.06	72.56	72.31	72.94	73.06	73.19	34.19	35.69	35.94	35.81	36.12	36.19	36.25
	72	81.06	84.06	84.56	84.31	84.94	85.06	85.19	40.19	41.69	41.94	41.81	42.12	42.19	42.25
	84	93.06	96.06	96.56	96.31	96.94	97.06	97.19	46.19	47.69	47.94	47.81	48.12	48.19	48.25
	96	105.06	108.06	108.56	108.31	108.94	109.06	109.19	52.19	53.69	53.94	53.81	54.12	54.19	54.25
	108	117.06	120.06	120.56	120.31	120.94	121.06	121.19	58.19	59.69	59.94	59.81	60.12	60.19	60.25
	120	129.06	132.06	132.56	132.31	132.94	133.06	133.19	64.19	65.69	65.94	65.81	66.12	66.19	66.25
S-4 and F-4 (mm)	356	462	500	506	503	511	513	514	284	322	329	325	333	335	337
	813	919	957	964	960	968	970	972	513	551	557	554	562	564	565
	1219	1326	1364	1370	1367	1375	1376	1378	716	754	760	757	765	767	768
	1524	1630	1669	1675	1672	1679	1681	1683	866	907	913	910	917	919	921
	1829	1935	1973	1980	1976	1984	1986	1988	1021	1059	1065	1062	1070	1072	1073
	2134	2240	2278	2284	2281	2288	2291	2292	1173	1211	1218	1214	1222	1224	1226
	2438	2545	2583	2589	2586	2593	2596	2597	1326	1364	1370	1367	1375	1376	1378
	2743	2850	2888	2894	2891	2899	2900	2902	1478	1516	1522	1519	1527	1529	1530
	3048	3154	3193	3199	3196	3203	3265	3267	1630	1669	1675	1672	1679	1681	1683
S-4 and F-4 (Inch)	14	18.19	19.69	19.94	19.81	20.12	20.19	20.25	11.19	12.69	12.94	12.81	13.12	13.19	13.25
	32	36.19	37.69	37.94	37.81	38.12	38.19	38.25	20.19	21.69	21.94	21.81	22.12	22.19	22.25
	48	52.19	53.69	53.94	53.81	54.12	54.19	54.25	28.19	29.69	29.94	29.81	30.12	30.19	30.25
	60	64.19	65.69	65.94	65.81	66.12	66.19	66.25	34.19	35.69	35.94	35.81	36.12	36.19	36.25
	72	76.19	77.69	77.94	77.81	78.12	78.19	78.25	40.19	41.69	41.94	41.81	42.12	42.19	42.25
	84	88.19	86.69	89.94	89.81	90.12	90.19	90.25	46.19	47.69	47.94	47.81	48.12	48.19	48.25
	96	100.19	101.69	101.94	101.81	102.12	102.19	102.25	52.19	53.69	53.94	53.81	54.12	54.19	54.25
	108	112.19	113.69	113.94	113.81	114.12	114.19	114.25	58.19	59.69	59.94	59.81	60.12	60.19	60.25
	120	124.19	125.69	125.94	125.81	126.12	126.19	126.25	64.19	65.69	65.94	65.81	66.12	66.19	66.25

Table 6. Fisher 249B and 249BF S-2, F-2, S-3, and F-3 Connections

S-2 AND F-2 CONNECTIONS									S-3 AND F-3 CONNECTIONS	
F								M	F	M
Displacer Length	Scrd NPT	CL150		CL300		CL600				
		RF	RTJ	RF	RTJ	RF	RTJ			
mm	mm									
356	480	518	524	521	529	530	532	284	356	284
813	937	975	981	978	986	988	989	513	813	513
1219	1343	1381	1387	1384	1392	1394	1395	716	1219	716
1524	1648	1686	1692	1689	1697	1699	1700	866	1524	866
1829	1953	1991	1997	1994	2002	2004	2005	1021	1829	1021
2134	2258	2296	2302	2299	2307	2308	2310	1173	2134	1173
2438	2562	2600	2607	2604	2611	2613	2615	1326	2438	1326
2743	2867	2905	2911	2908	2916	2918	2919	1478	2743	1478
3048	3172	3210	3216	3213	3221	3223	3224	1630	3048	1630
Inches	Inches									
14	18.88	20.38	20.62	20.50	20.81	20.88	20.94	11.19	14.00	11.19
32	36.88	38.38	38.62	38.50	38.81	38.88	38.94	20.19	32.00	20.19
48	52.88	54.38	54.62	54.50	54.81	54.88	54.94	28.19	48.00	28.19
60	64.88	66.38	66.62	66.50	66.81	66.88	66.94	34.19	60.00	34.19
72	76.88	78.38	78.62	78.50	78.81	78.88	78.94	40.19	72.00	40.19
84	88.88	90.38	90.62	90.50	90.81	90.88	90.94	46.19	84.00	46.19
96	100.88	102.38	102.62	102.50	102.81	102.88	102.94	52.19	96.00	52.19
108	112.88	114.38	114.62	114.50	114.81	114.88	114.94	58.19	108.00	58.19
120	124.88	126.38	126.62	126.50	126.81	126.88	126.94	64.19	120.00	64.19

Table 7. Fisher 249B and 249BF Dimension A

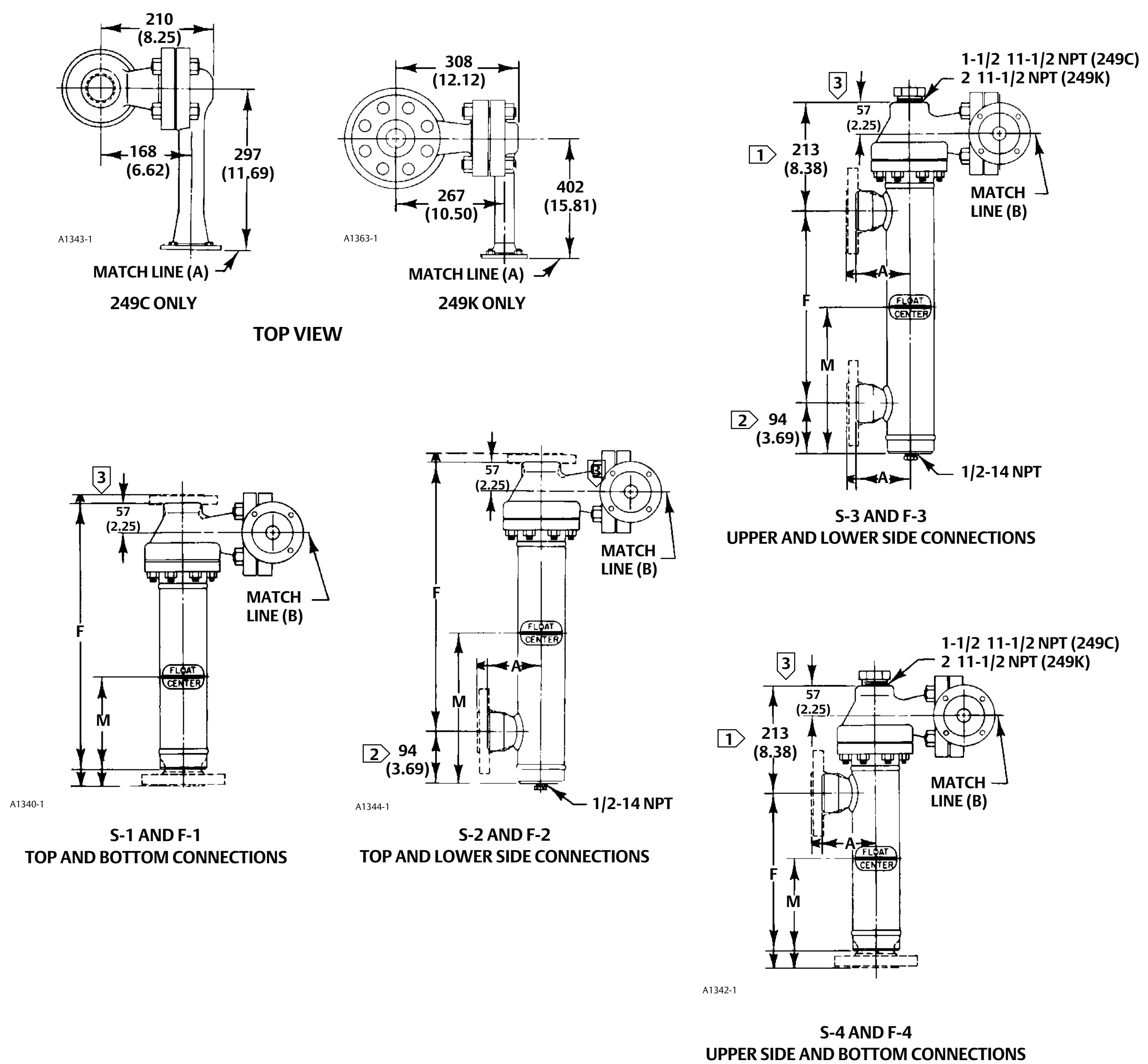
A (COMMON DIMENSION)													
Scrd NPT		CL150 RF		CL150 RTJ		CL300 RF		CL300 RTJ		CL600 RF		CL600 RTJ	
mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
121	4.75	145	5.69	151	5.94	148	5.81	155	6.12	157	6.19	159	6.25

Table 8. Fisher 249B and 249BF Dimensions W and G

COMMON DIMENSION					
Displacer Length		W		G	
mm	Inch	mm	Inch	mm	Inch
356	14	394	15.50	197	7.75
813	32	851	33.50	425	16.75
1219	48	1257	49.50	629	24.75
1524	60	1562	61.50	781	30.75
1829	72	1867	73.50	933	36.75
2134	84	2172	85.50	1086	42.75
2438	96	2477	97.50	1238	48.75
2743	108	2781	109.50	1391	54.75
3048	120	3086	121.50	1543	60.75

249C and 249K (NPS 1-1/2 & 2 End Connections)

Figure 4. Fisher 249C and 249K (see tables 9, 10, and 11)



Notes:
1 389 (15.31) for 249K
2 119 (4.69) for 249K
3 102 (4.00) for 249K

mm
(INCH)

Table 9. Fisher 249C and 249K Dimensions F and M, S-1, F-1, S-4, and F-4 Connections

Conn. Style	Dis-placer Length	249C														249K		
		F							M							F		M
		Scrd NPT	CL150		CL300		CL600		Scrd NPT	CL150		CL300		CL600		NPS 1-1/2 Flg.	NPS 2 Flg.	Flg.
			RF	RTJ	RF	RTJ	RF	RTJ		RF	RTJ	RF	RTJ	RF	RTJ			
S-1 and F-1 (mm)	356	489	530	543	546	559	560	560	235	257	264	264	270	272	272	645	654	305
	813	946	988	1000	1003	1016	1018	1018	464	486	492	492	498	500	500	1102	1111	533
	1219	1353	1394	1407	1410	1422	1424	1424	667	689	695	695	702	703	703	---	---	---
	1524	1357	1699	1711	1715	1727	1729	1729	819	841	848	848	854	856	856	---	---	---
	1829	1962	2004	2016	2019	2032	2034	2034	972	994	1000	1000	1006	1008	1008	---	---	---
	2134	---	2308	---	2324	2337	---	---	---	1146	---	1153	1159	---	---	---	---	---
	2438	2826	2613	---	2781	---	---	---	127	1298	---	1305	---	---	---	---	---	---
S-1 and F-1 (In.)	14	19.25	20.88	21.38	21.50	22.00	22.06	22.06	9.25	10.12	10.38	10.38	10.62	10.69	10.69	25.38	25.75	12.00
	32	37.25	38.88	39.38	39.50	40.00	40.06	40.06	18.25	19.12	19.38	19.38	19.62	19.69	19.69	43.38	43.75	21.00
	48	53.25	54.88	55.38	55.50	56.00	56.06	56.06	26.25	27.12	27.38	27.38	27.62	27.69	27.69	---	---	---
	60	65.25	66.88	67.38	67.50	68.00	68.06	68.06	32.25	33.12	33.38	33.38	33.62	33.69	33.69	---	---	---
	72	77.25	78.88	79.38	79.50	80.00	80.06	80.06	38.25	39.12	39.38	39.38	39.62	39.69	39.69	---	---	---
	84	---	90.88	---	91.50	92.00	---	---	---	45.12	---	45.38	45.62	---	---	---	---	---
	96	111.25	102.88	---	109.50	---	---	---	50.25	51.12	---	51.38	---	---	---	---	---	---
S-4 and F-4 (mm)	356	409	432	438	438	445	446	446	232	254	260	260	267	268	268	483	483	305
	813	867	889	895	895	902	903	903	460	483	489	489	495	497	497	940	940	533
	1219	1273	1295	1302	1302	1308	1310	1310	667	686	692	692	699	700	700	---	---	---
	1524	1518	1600	1607	1607	1613	1614	1614	816	838	845	845	851	852	852	---	---	---
	1829	1883	1905	1911	1911	1918	1919	1919	968	991	997	997	1003	1005	1005	---	---	---
	2134	---	2210	---	---	---	---	---	---	1143	---	---	---	---	---	---	---	---
	2438	---	2515	---	---	---	---	---	---	1295	---	---	---	---	---	---	---	---
S-4 and F-4 (In.)	14	16.12	17.00	17.25	17.25	17.50	17.56	17.56	9.12	10.00	10.25	10.25	10.50	10.56	10.56	19.00	19.00	12.00
	32	34.12	35.00	35.25	35.25	35.50	35.56	35.56	18.12	19.00	19.25	19.25	19.50	19.56	19.56	37.00	37.00	21.00
	48	50.12	51.00	51.25	51.25	51.50	51.56	51.56	26.12	27.00	27.25	27.25	27.50	27.56	27.56	---	---	---
	60	62.12	63.00	63.25	63.25	63.50	63.56	63.56	32.12	33.00	33.25	33.25	33.50	33.56	33.56	---	---	---
	72	74.12	75.00	75.25	75.25	75.50	75.56	75.56	38.12	39.00	39.25	39.25	39.50	39.56	39.56	---	---	---
	84	---	87.00	---	---	---	---	---	---	45.00	---	---	---	---	---	---	---	---
	96	---	99.00	---	---	---	---	---	---	51.00	---	---	---	---	---	---	---	---

Table 10. Fisher 249C and 249K, Dimensions F and M, S-2, F-2, S-3, and F-3 Connections

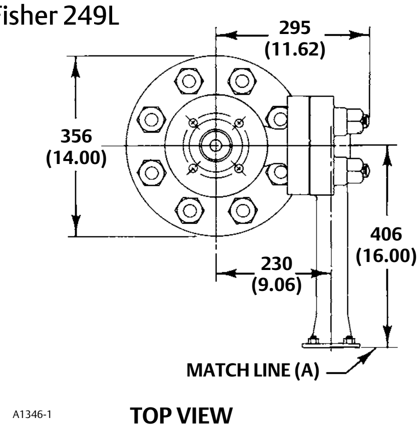
Dis-placer Length	S-2 AND F-2 CONNECTIONS											S-3 AND F-3 CONNECTIONS			
	249C								249K			249C		249K	
	F							M	F		M	F	M	F	M
	Scrd NPT	CL150		CL300		CL600			NPS 1-1/2 Flg.	NPS 2 Flg.					
		RF	RTJ	RF	RTJ	RF	RTJ								
mm															
356	432	451	457	460	467	467	467	272	518	527	297	356	272	356	297
813	889	908	914	917	924	924	924	500	975	984	526	813	500	813	526
1219	1295	1314	1321	1324	1330	1330	1330	703	---	---	---	1219	703	---	---
1524	1600	1619	1626	1629	1635	1635	1635	856	---	---	---	1524	856	---	---
1829	1905	1924	1930	1933	1940	1940	1940	1008	---	---	---	1829	1008	---	---
2134	---	2229	---	2238	---	---	---	1161	---	---	---	2134	1161	---	---
2438	---	---	---	---	---	---	---	---	---	---	---	2438	1313	---	---
Inches															
14	17.00	17.75	18.00	18.12	18.38	18.38	18.38	10.69	20.38	20.75	11.69	14.00	10.69	14.00	11.69
32	35.00	35.75	36.00	36.12	36.38	36.38	36.38	19.69	38.38	38.75	20.69	32.00	19.69	32.00	20.69
48	51.00	51.75	52.00	52.12	52.38	52.38	52.38	27.69	---	---	---	48.00	27.69	---	---
60	63.00	63.75	64.00	64.12	64.38	64.38	64.38	33.69	---	---	---	60.00	33.69	---	---
72	75.00	75.75	76.00	76.12	76.38	76.38	76.38	39.69	---	---	---	72.00	39.69	---	---
84	---	87.75	---	88.12	---	---	---	45.69	---	---	---	84.00	45.69	---	---
96	---	---	---	---	---	---	---	---	---	---	---	96.00	51.69	---	---

Table 11. Fisher 249C and 249K Dimension A

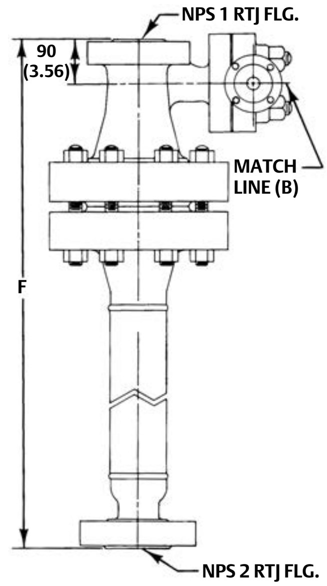
END CONNECTION SIZE		249C SCREWED		249C CL150 RF		249C CL150 RTJ CL300 RF		249C CL300 RTJ		249C CL600 RF or RTJ		249K CL1500 FLANGES	
DN	NPS	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
40	1-1/2	102	4.00	111	4.38	117	4.62	122	4.81	125	4.94	148	5.81
50	2	102	4.00	111	4.38	117	4.62	125	4.94	125	4.94	168	6.62

249L

Figure 5. Fisher 249L



TOP VIEW

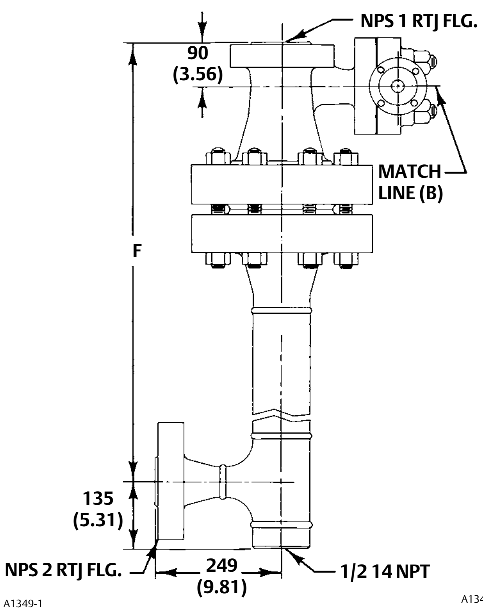


F1
TOP AND BOTTOM CONNECTIONS

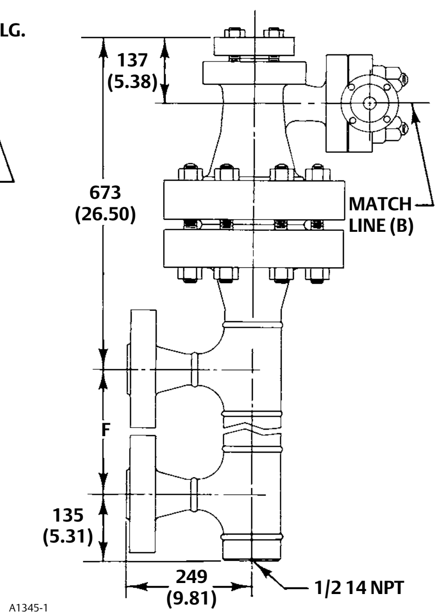
A1347-1

DISPLACER LENGTH	DIMENSION F			
	F-1(1)	F-2(1)	F-3(1)	F-4(1)
mm				
356 813	783 1240	629 1086	356 813	510 967
INCHES				
14 32	30.81 48.81	24.75 42.75	14.00 32.00	20.06 38.06

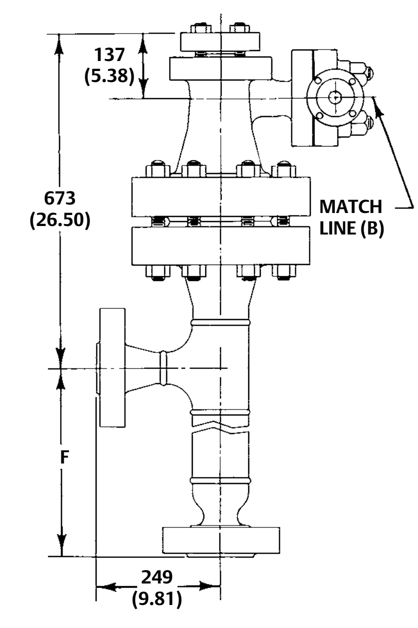
1. 249L Sensor has CL2500 RTJ flanges.



F2
TOP AND LOWER SIDE CONNECTIONS



F3
UPPER AND LOWER SIDE CONNECTION
(NPS 2 RTJ FLG.)



F4
UPPER SIDE AND BOTTOM CONNECTIONS
(NPS 2 RTJ FLG.)

SIDE VIEW

mm
(INCH)

249BP and 249P

Figure 6. Fisher 249BP and 249P (see tables 12 and 13)

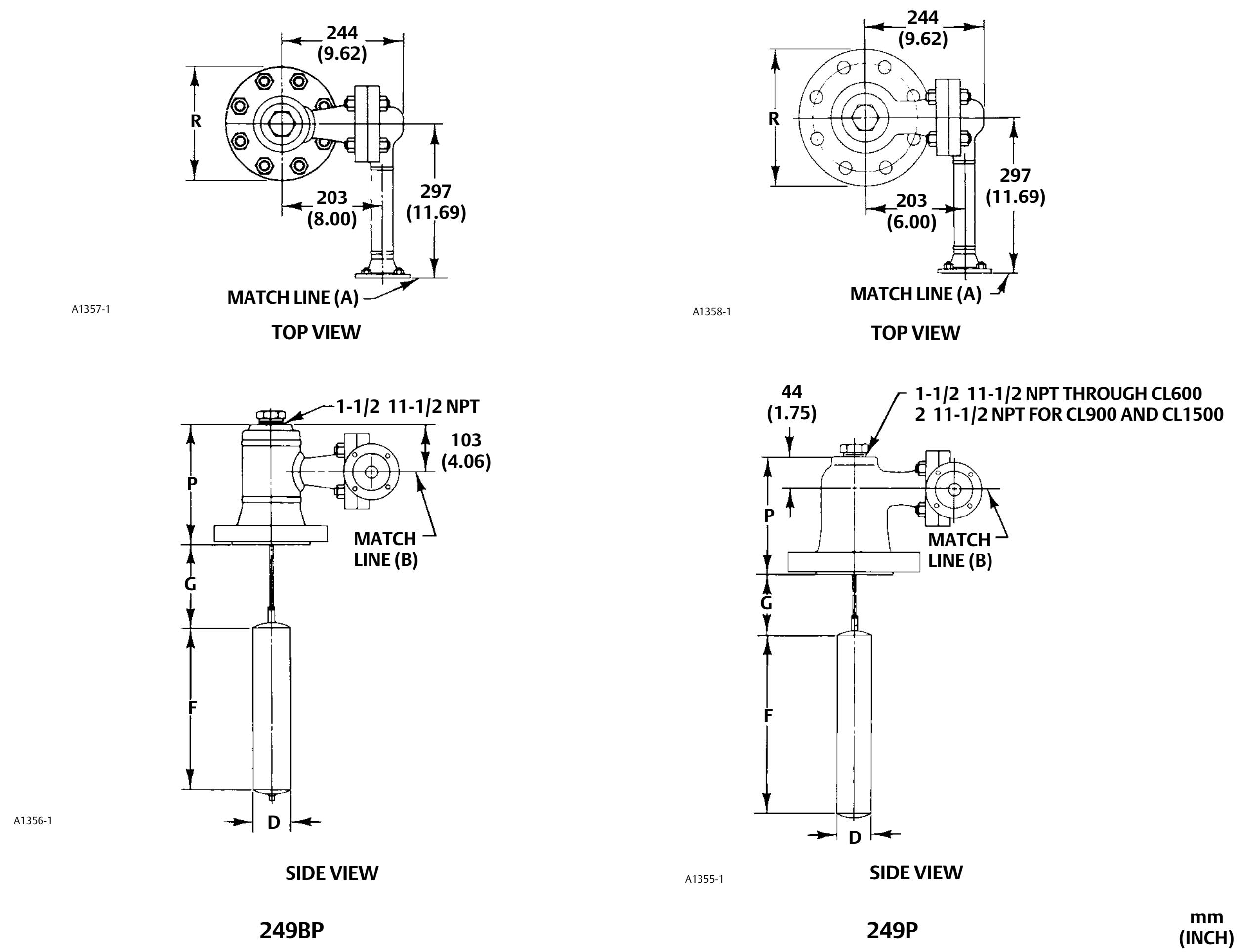


Table 12. Fisher 249BP and 249P Dimension D, F, and G

STANDARD DISPLACER AND STEM COMBINATIONS				
D		F		G(1)
mm	Inch	mm	Inch	
76	3.00	356	14.00	Specify. Maximum length is 1372 mm (54 inch)
51	2.00	813	32.00	
41	1.62	1219	48.00	
38	1.50	1524	60.00	
35	1.38	1829	72.00	
32	1.25	2134	84.00	
29	1.12	2438	96.00	
25	1.00	2743	108.00	
25	1.00	3048	120.00	

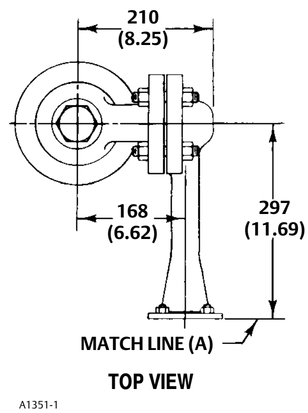
1. If not specified, G dimension will be 305 mm (12 inches).

Table 13. Fisher 249BP and 249P Dimension P and R

DIMENSION	TYPE NO.	FLANGE SIZE, NPS	CL125	CL250	CL150		CL300		CL600		CL900		CL1500	
			FF	RF	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ
			mm											
P	249BP	4	---	---	238	244	256	270	272	---	---	---	---	---
		6	---	---	240	---	---	---	---	---	---	---	---	---
		8	---	---	243	---	---	---	---	---	---	---	---	---
R		4	---	---	229	229	254	254	273	273	---	---	---	---
		6	---	---	279	---	318	---	---	---	---	---	---	---
		8	---	---	343	---	381	---	---	---	---	---	---	---
P	249P	4	214	222	214	221	222	230	---	236	303	305	313	314
		6	216	227	216	---	227	---	244	---	---	---	---	---
		8	219	232	219	---	232	---	---	---	---	---	---	---
R		4	229	254	229	---	254	254	---	273	292	292	311	311
		6	279	318	279	---	318	---	356	---	---	---	---	---
		8	343	381	343	---	381	---	---	---	---	---	---	---
DIMENSION	TYPE NO.	FLANGE SIZE, NPS	Inches											
P	249BP	4	---	---	9.38	9.62	9.74	10.06	10.62	10.69	---	---	---	---
		6	---	---	9.44	---	9.94	---	---	---	---	---	---	---
		8	---	---	9.56	---	10.12	---	---	---	---	---	---	---
R		4	---	---	9.00	9.00	10.00	10.00	10.75	10.75	---	---	---	---
		6	---	---	11.00	---	12.50	---	---	---	---	---	---	---
		8	---	---	13.50	---	15.00	---	---	---	---	---	---	---
P	249P	4	8.44	8.75	8.44	8.69	8.75	9.06	---	9.31	11.94	12.00	12.31	12.38
		6	8.50	8.94	8.50	---	8.94	---	9.62	---	---	---	---	---
		8	8.62	9.12	8.62	---	9.12	---	---	---	---	---	---	---
R		4	9.00	10.00	9.00	9.00	10.00	10.00	---	10.75	11.50	11.50	12.25	12.25
		6	11.00	12.50	11.00	---	12.50	---	14.00	---	---	---	---	---
		8	13.50	15.00	13.50	---	15.00	---	---	---	---	---	---	---

249CP (NPS 3 RF Flanged)

Figure 7. Fisher 249CP (see tables 14 and 15)



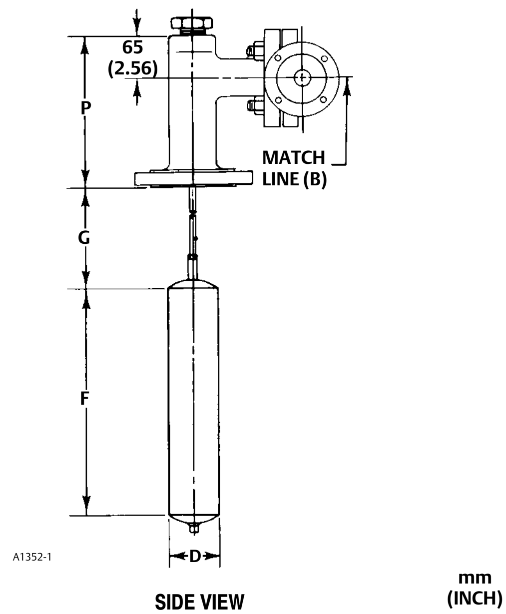


Table 14. Fisher 249CP Dimensions D, F, and G

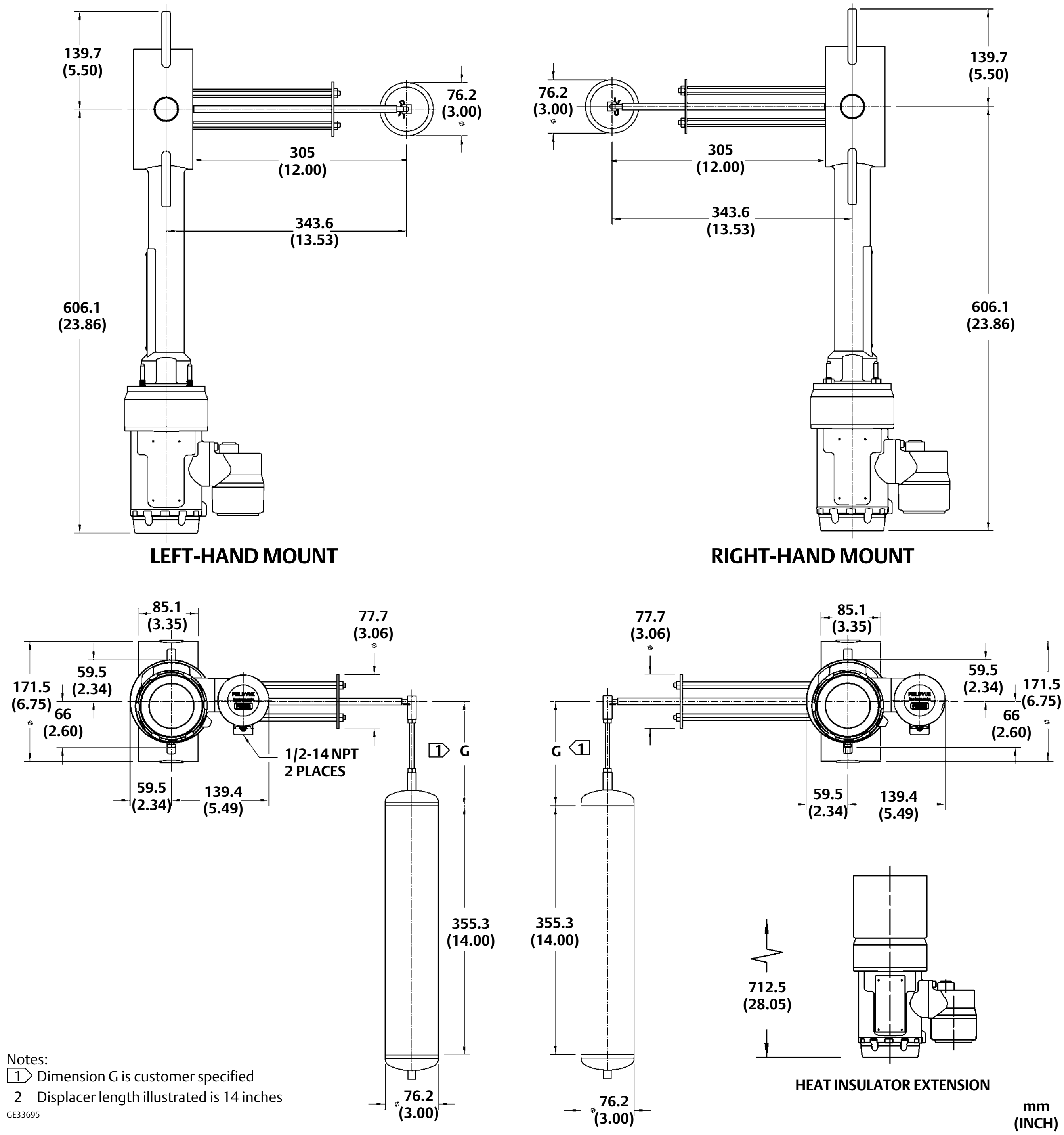
STANDARD DISPLACER AND STEM COMBINATIONS				
D		F		G(1)
mm	Inch	mm	Inch	
60 38 32	2.38 1.50 1.25	356 813 1219	14.00 32.00 48.00	Specify. Maximum length is 1372 mm (54 inches)
1. If not specified, G dimension will be 305 mm (12 inches).				

Table 15. Fisher 249CP Dimension P

P					
CL150 RF		CL300 RF		CL600 RF	
mm	Inch	mm	Inch	mm	Inch
191	7.50	200	7.88	210	8.25

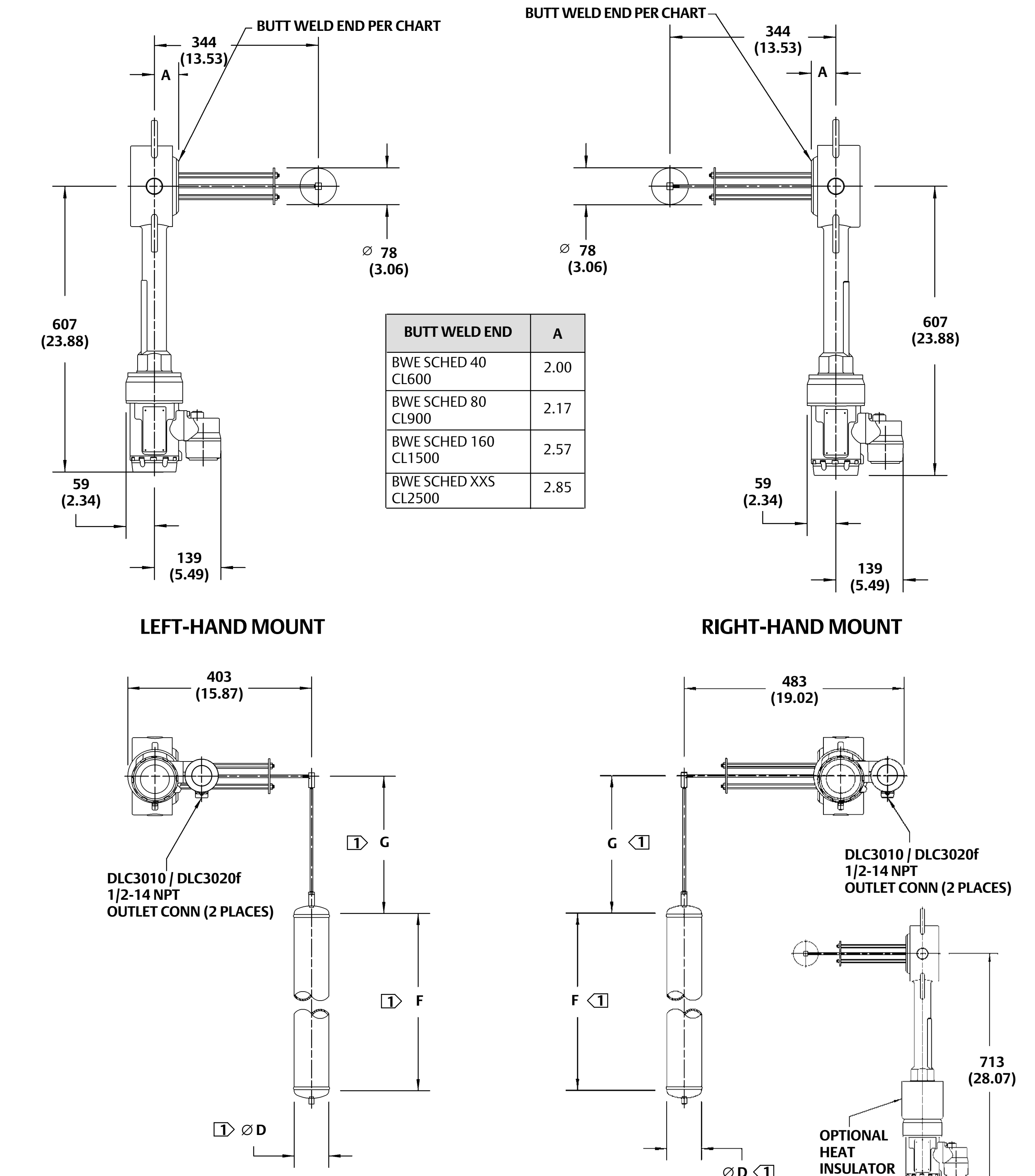
249VS

Figure 8. Fisher 249VS with DLC3010 / DLC3020f Digital Level Controller Controller Envelope Dimensions; Flanged Connections



Notes:
1 Dimension G is customer specified
2 Displacer length illustrated is 14 inches
GE33695

Figure 9. Fisher 249VS with DLC3010 / DLC3020f Digital Level Controller Envelope Dimensions; Butt Weld End



BUTT WELD END	A
BWE SCHED 40 CL600	2.00
BWE SCHED 80 CL900	2.17
BWE SCHED 160 CL1500	2.57
BWE SCHED XXS CL2500	2.85

Note:
1 Dimension D, F, and G are customer specified

Figure 10. Fisher 249VS with 2500 Transmitter Envelope Dimensions; Flanged Connections

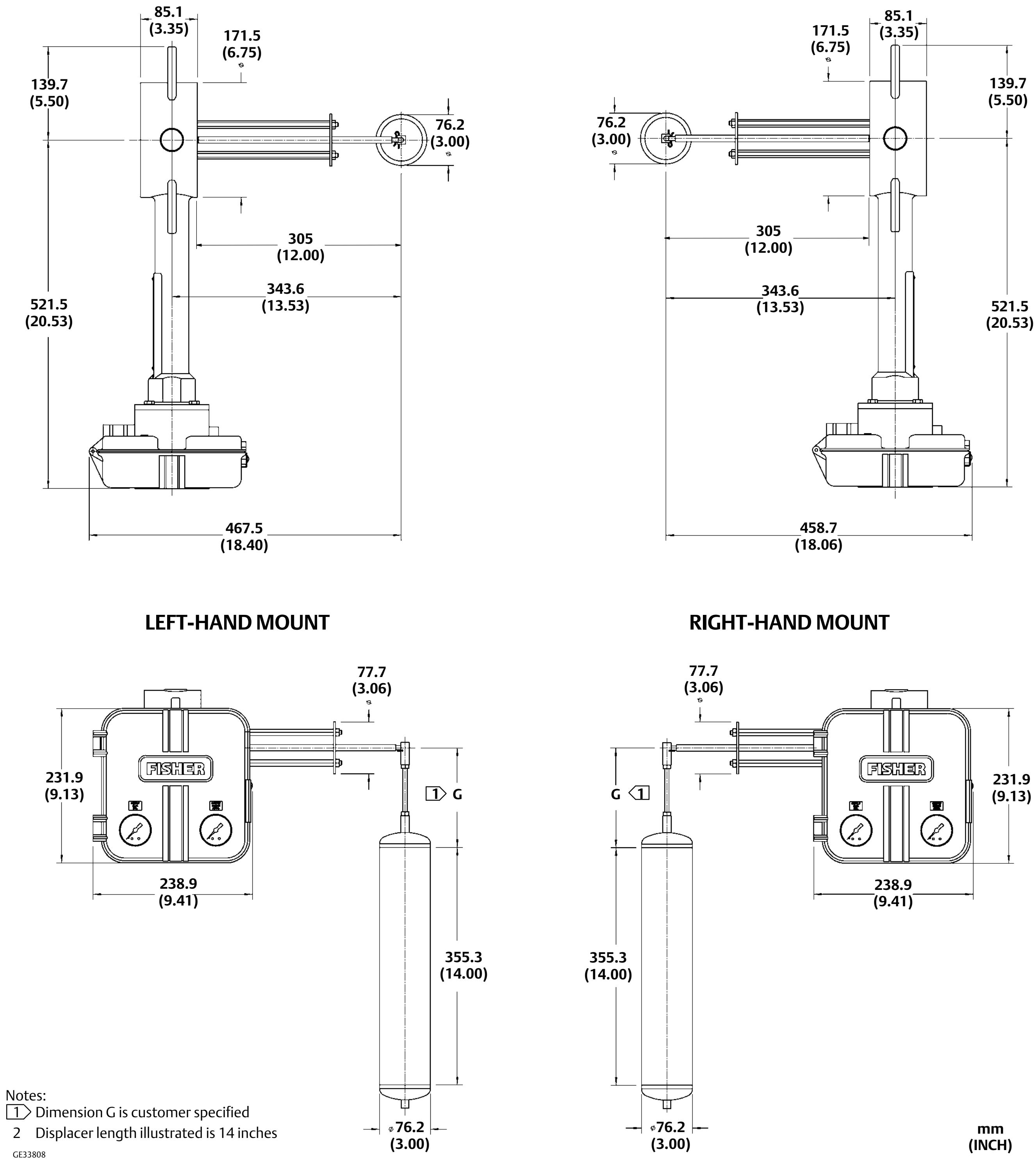
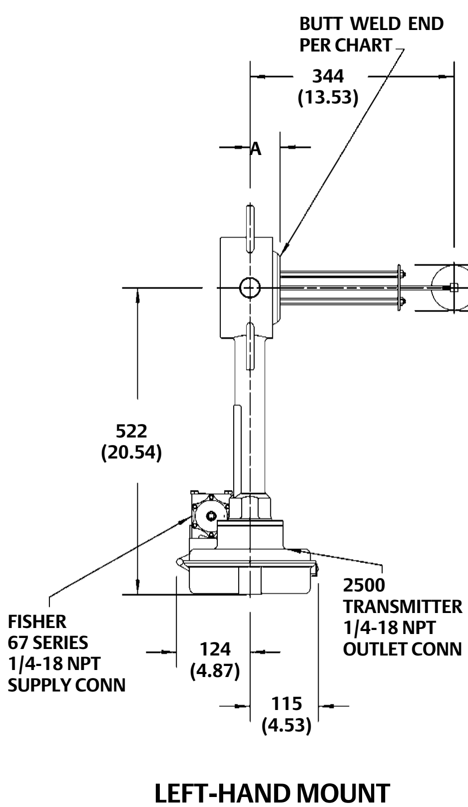
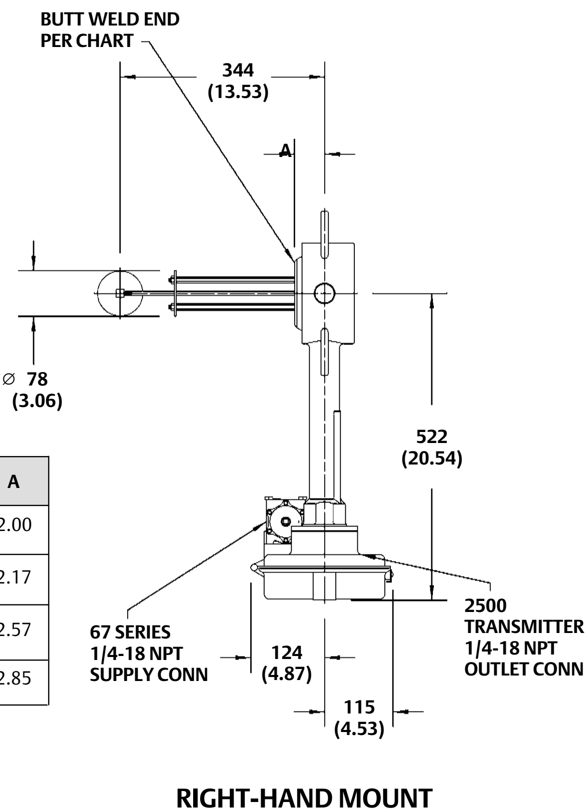
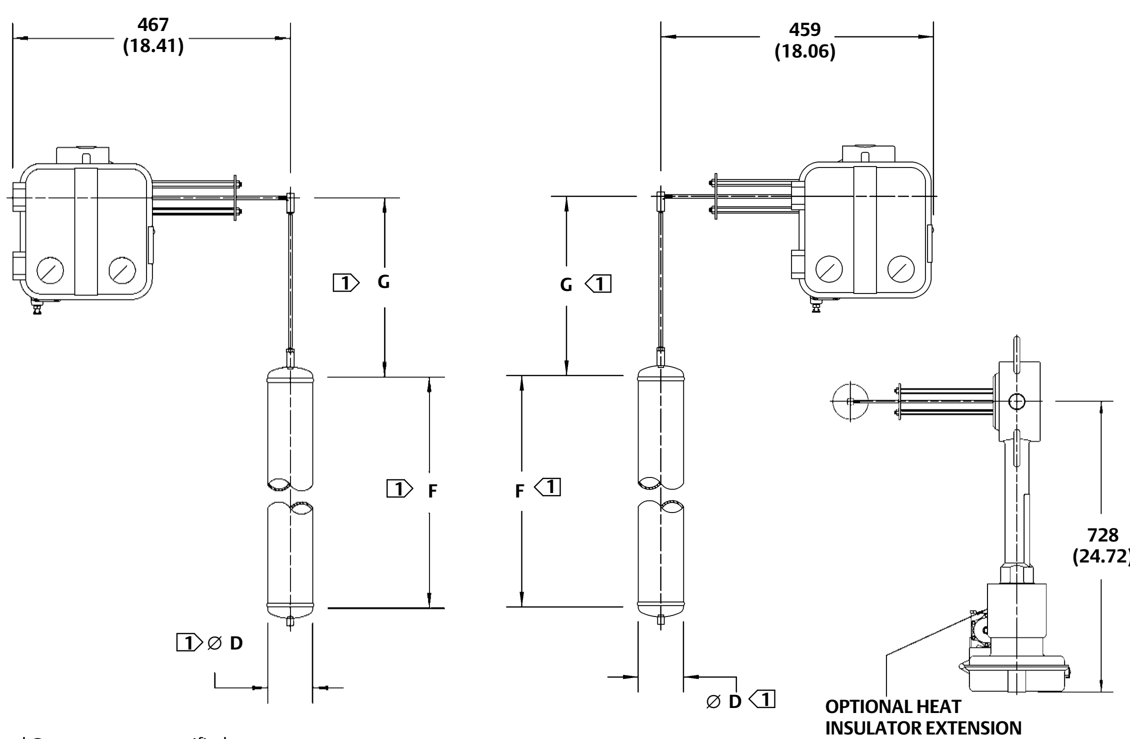


Figure 11. Fisher 249VS with 2500 Transmitter Envelope Dimensions; Butt Weld End



BUTT WELD END	A
BWE SCHED 40 CL600	2.00
BWE SCHED 80 CL900	2.17
BWE SCHED 160 CL1500	2.57
BWE SCHED XXS CL2500	2.85





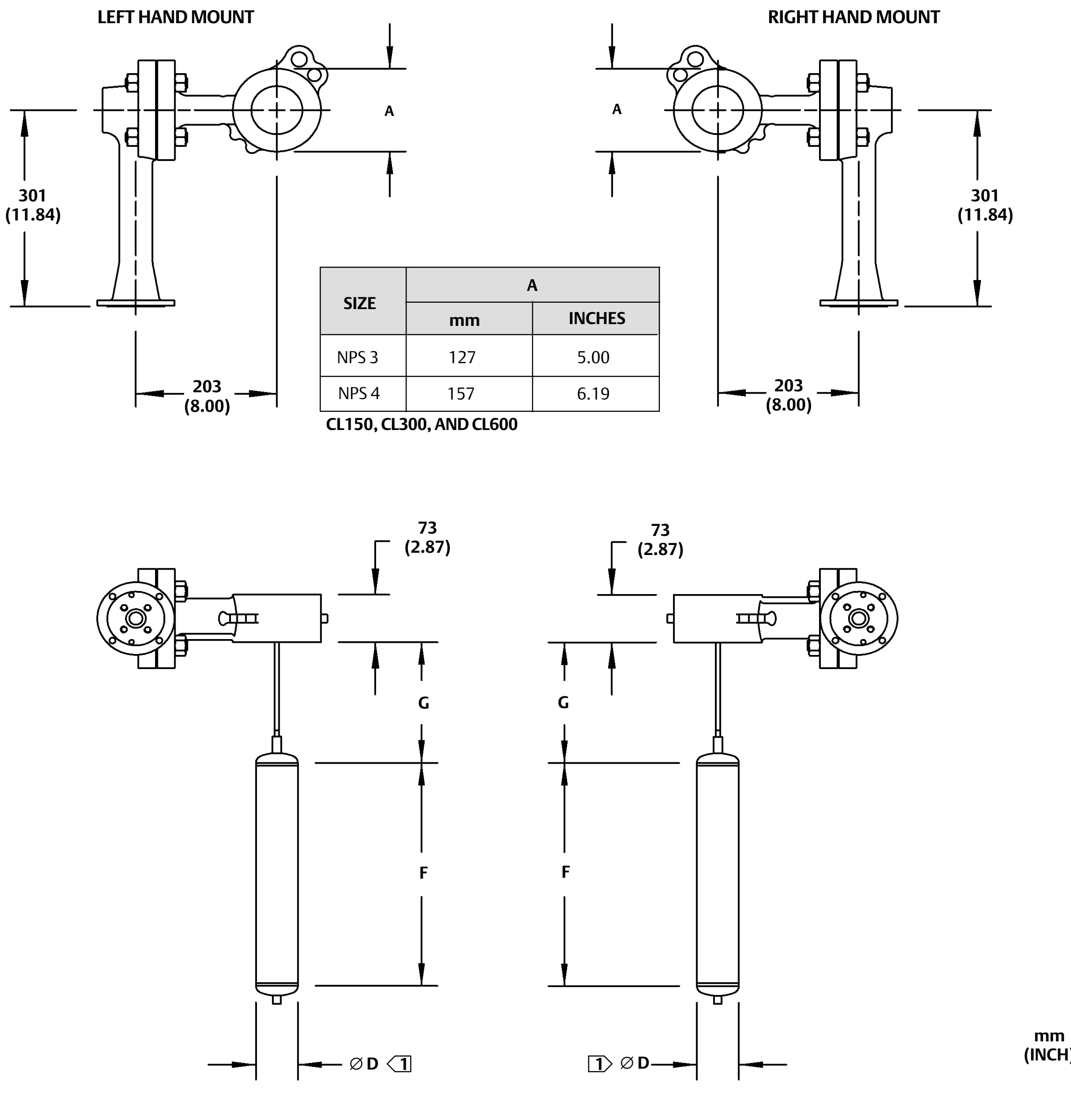
Note:
1 Dimension D, F, and G are customer specified

GE45166-A

mm
(INCH)

249W

Figure 12. Fisher 249W Dimensions for Mounting on Customer Supplied Cage



SIZE	A	
	mm	INCHES
NPS 3	127	5.00
NPS 4	157	6.19

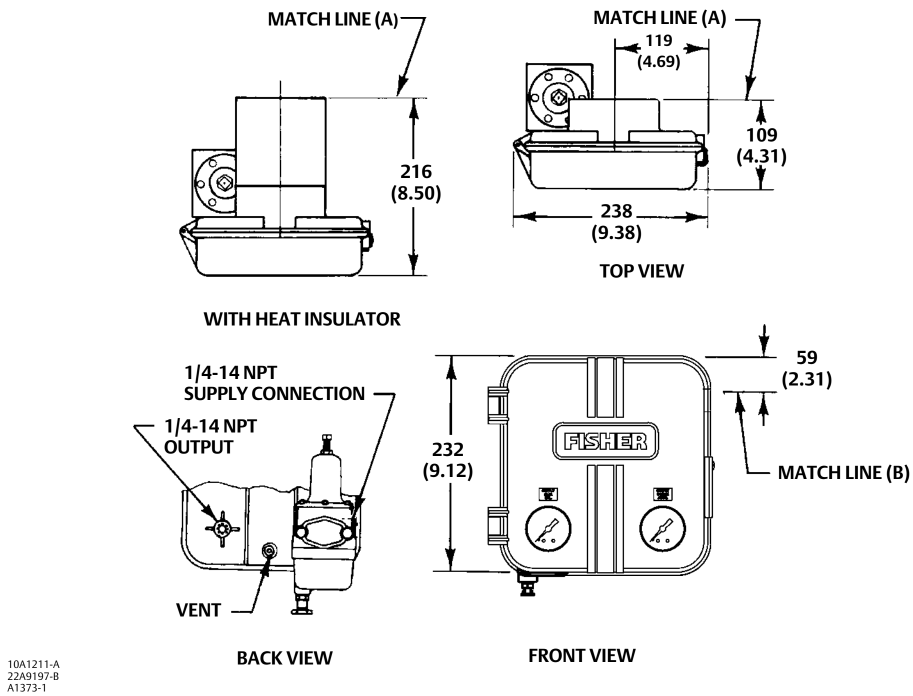
CL150, CL300, AND CL600

Note:
1 Dimensions D, F, and G are customer defined

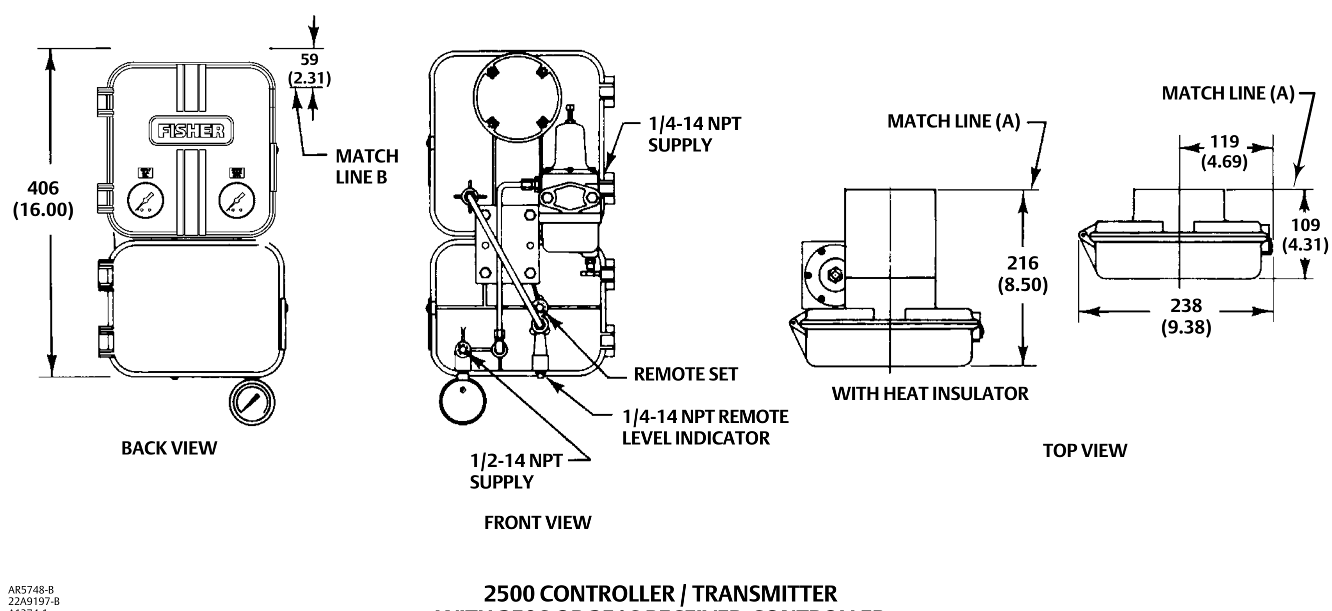
GE09610-A

Controllers and Transmitters

Figure 13. Controller and Transmitter Dimensions; Fisher 2500 Controller / Transmitter



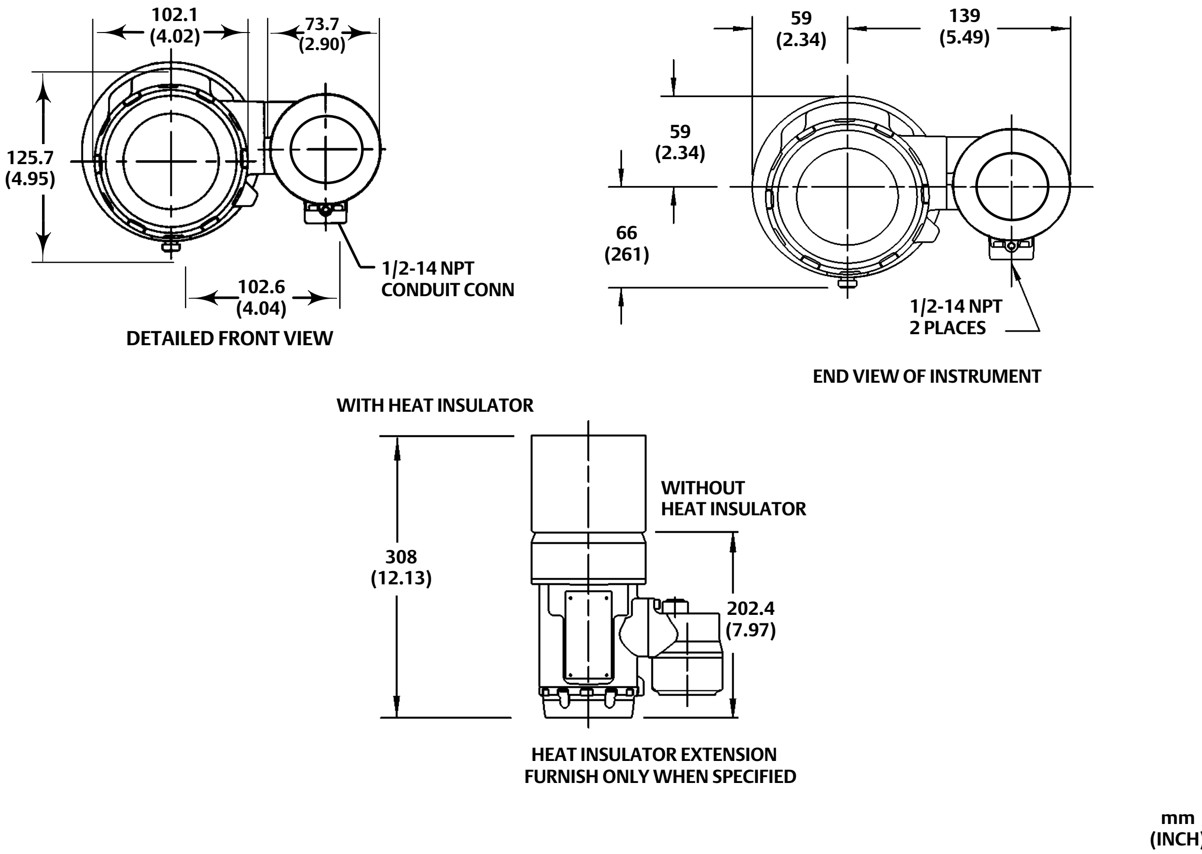
2500 CONTROLLER / TRANSMITTER



2500 CONTROLLER / TRANSMITTER
WITH 2506 OR 2516 RECEIVER-CONTROLLER

mm
(INCH)

Figure 14. Controller and Transmitter Dimensions; FIELDVUE DLC3010 / DLC3020f Digital Level Controller



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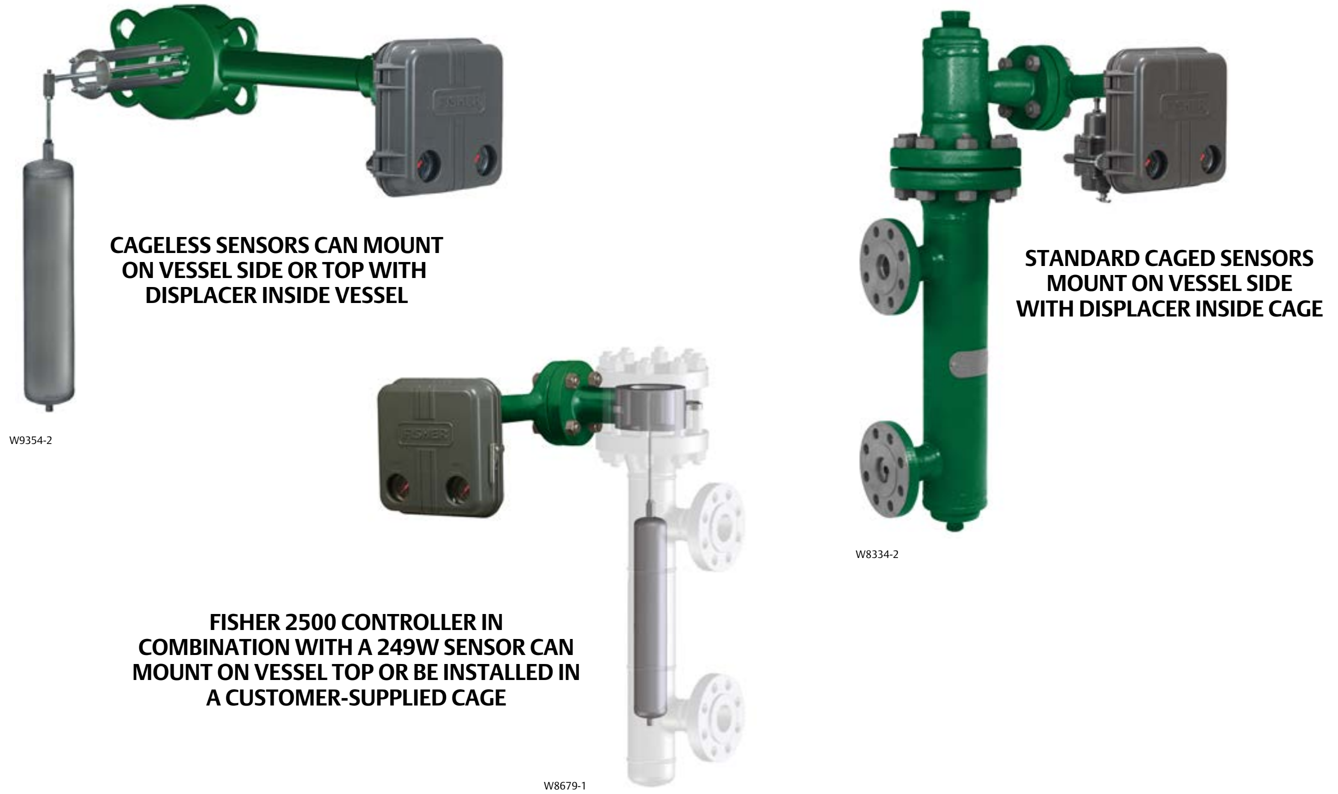
Fisher™ 2500-249 Pneumatic Controllers and Transmitters

Fisher 2500, 2500C, 2500R, 2500S, 2500T, 2502, 2502C, 2502F, and 2503 instruments are part of the 2500 controller/ transmitter series. Typical caged and cageless sensor/instrument configurations are shown below and in figure 1. Caged sensors (figure 2) provide more stable operation than do cageless sensors (figure 3) for vessels with internal obstructions or considerable internal turbulence. Cageless sensors are generally used on specific gravity and interface control applications requiring large displacers that are more easily accommodated by flange connections up to NPS 8. The availability of many different displacer stem lengths permits lowering the displacer down to the most advantageous depth in the vessel.

Fisher pneumatic controllers and transmitters are used wherever rugged, dependable, and simply constructed displacer-style pneumatic instrumentation is required in liquid level, interface level, or density service. The ruggedness of these products is demonstrated by their use in many kinds of demanding applications, including those in the power, chemical process, oil and gas production, and petrochemical industries.



Specifications

Available Configurations

See tables 1, 5, and 6

Input Signal

Fluid Level or Fluid-to-Fluid Interface Level: From 0 to 100 percent of displacer length—standard lengths for all sensors are ■ 356 mm (14 inches) or ■ 813 mm (32 inches); other lengths available depending on sensor construction
Fluid Density: From 0 to 100 percent of displacement force change obtained with given displacer volume—standard volumes are
■ 980 cm^3 (60 $inches^3$) for 249C and 249CP sensors or ■ 1640 cm^3 (100 $inches^3$) for most other sensors; other volumes available depending upon sensor construction

Allowable Specific Gravity

Specific gravity with standard volume displacers and standard wall torque tubes:
Fluid Level and Fluid-to-Fluid Interface
2500 Controllers, except 2503 and 2503R: Specific gravity range, 0.20 to 1.10
2503 and 2503R: Specific gravity range, 0.25 to 1.10
Fluid Density
2500 Controllers, except 2503 and 2503R: Minimum change in specific gravity, 0.20
2503 and 2503R: Minimum change in specific gravity, 0.25

Contact your Emerson sales office for information on non-standard applications

Output Signal

See table 1

Output Action

■ Direct (increasing fluid or interface level or specific gravity increases output pressure) or
■ Reverse (increasing fluid or interface level or specific gravity decreases output pressure)

Area Ratio of Relay Diaphragms

3:1

Supply Pressure(1)

Normal Operation: See table 4

Maximum to Prevent Internal Part Rupture(2): 3 bar (45 psig)

Steady-State Air Consumption

See table 4

Proportional Band, Differential Gap, or Span

See table 1

Set Point (Controllers Only)

Continuously adjustable to position control point or differential gap of less than 100 percent anywhere within displacer length (fluid or interface level) or displacement force change (density)

Zero Adjustment (Transmitters Only)

Continuously adjustable to position span of less than 100 percent anywhere within displacer length (fluid or interface level) or displacement force change (density)

Performance

Independent Linearity (Transmitters Only): 1 percent of output pressure change at span of 100 percent
Hysteresis: 0.6 percent of output pressure change at 100 percent of proportional band, differential gap, or span
Repeatability: 0.2 percent of displacer length or displacement force change
Deadband (Except Differential Gap Controllers(3)): 0.05 percent of proportional band or span
Typical Frequency Response: 4 Hz and 90-degree phase shift at 100 percent of proportional band, differential gap, or span with output piped to typical instrument bellows using 6.1 meters (20 feet) of 6.4 mm (1/4-inch) tubing
Ambient Temperature Error: ±1.5 percent of output pressure change per 28°C (50°F) of temperature change at 100 percent of proportional band, differential gap, or span when using sensor with standard wall N05500 torque tube
Reset (Proportional-Plus-Reset Controllers Only): Continuously adjustable from 0.005 to over 0.9 minutes per repeat (from 200 to under 1.1 repeats per minute)
Anti-Reset Differential Relief (2502F and 2502FR Controllers Only): Continuously adjustable from 0.14 to 0.48 bar (2 to 7 psi) differential to relieve excessive difference between proportional and reset pressures

-continued-

Specifications (Continued)

Standard Tubing Connections

1/4 NPT internal

Sensor Connection Sizes

See tables 5 and 6

Maximum Working Pressures (Sensors Only)(1)

Consistent with applicable ASME pressure/temperature ratings for the specific sensor constructions shown in tables 5 and 6

Operative Ambient Temperatures(1)

Controller
■ Standard: -40 to 71°C (-40 to 160°F)
■ High Temperature: -18 to 104°C (0 to 220°F)

Sensor
See table 2
For ambient temperature ranges, guidelines, and use of optional heat insulator, see figure 4

Standard Supply and Output Pressure Gauge Indications

See table 4

Allowable Process Temperatures(1)

See table 2

Hazardous Area Classification

2500 controllers comply with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D

Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T4, T5, T6
Dust: T85...T104

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

II Gb c T*X
III Db c T*X

Construction Materials

See tables 2, 3, and 7

Mounting Positions

See figure 9

Caged Sensor Connection Styles

See figure 10

Options

See Options section

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any applicable code or standard should not be exceeded.
2. Also see Supply Pressure Overpressure Protection section.
3. For 2500S, 2500SC, and 2503 adjusting the differential gap is equivalent to adjusting the deadband.

Table of Contents

Table 1. Additional Specifications for Selected Fisher 2500 Controller Configurations

Control or Transmission Mode		Controller(1)	Full Output Signal Change Obtainable Over Input Of:	Output Signal
Proportional control		2500, 2500C(2)	Proportional band of 0 to 100 percent of displacer length or displacement force change (10 to 100 percent recommended)	0.2 to 1.0 bar (3 to 15 psig) or 0.4 to 2.0 bar (6 to 30 psig)
Proportional-plus-reset control		2502, 2502C(2)	Proportional band of 0 to 200 percent of displacer length or displacement force change (20 to 200 percent recommended)	
Proportional-plus-reset control with anti-reset windup		2502F		
Differential Gap (On-off) Control	With proportional valve and full differential gap adjustment	2500S, 2500SC(2)	Differential gap of 0 to 100 percent of displacer length	0 and 1.4 bar (0 and 20 psig) or 0 and 2.4 bar (0 and 35 psig)
	Without proportional valve - has limited differential gap adjustment	2503	Differential gap of approximately 25 to 40 percent of displacer length, when a 356 millimeter (14-inch) ideal-volume displacer is used on 1.0 specific gravity liquid level service and a standard 1.4 bar (20 psig) supply regulator setting is varied between 1.0 and 1.7 bar (15 and 25 psig)(3)	0 and full supply pressure(4)
Proportional transmission		2500T, 2500TC(2)	Span of 0 to 100 percent of displacer length or displacement force change (20 to 100 percent recommended)	0.2 and 1.0 bar (3 to 15 psig) or 0.4 to 2.0 bar (6 to 30 psig)

1. The suffix R is added to the type number for reverse action, and all types have a 67CFR supply regulator mounted as standard.
2. The suffix C is added to the type number for indicator assembly.
3. Other displacer lengths and volumes, or service conditions, will result in other differential gaps.
4. 1.4 bar (20 psig) and 2.4 bar (35 psig) are the standard factory-set supply regulator pressures, but these values will vary whenever the supply pressure is changed to adjust the differential gap.

Table 2. Allowable Process Temperatures for Common Fisher 249 Sensor Component Materials

MATERIAL	PROCESS TEMPERATURE	
	Minimum	Maximum
Cast Iron(1)	-29°C (-20°F)	232°C (450°F)
Steel	-29°C (-20°F)	427°C (800°F)
Stainless Steel	-198°C (-325°F)	427°C (800°F)
N04400	-198°C (-325°F)	427°C (800°F)
Aluminum	-195°C (-320°F)	99°C (210°F)
Gaskets		
Graphite Laminate/SST	-198°C (-325°F)	427°C (800°F)
N04400/PTFE	-73°C (-100°F)	204°C (400°F)
Soft Iron Gasket	-29°C (-20°F)	427°C (800°F)
Bolting		
B7 steel	-46°C (-50°F)	427°C (800°F)
B7M steel	-29°C (-20°F)	427°C (800°F)
B8M stainless steel	-198°C (-325°F)	427°C (800°F)

1. Cast iron may be used to -73°C (-100°F) provided a heat insulator is used below -18°C (0°F) and stainless steel studs and nuts are used below -46°C (-50°F).

Table 3. Displacer and Torque Tube Materials

Part	Standard Material	Other Material
Displacer	304 Stainless Steel	316 Stainless Steel, N10276, N04400, Plastic, and Special Alloys
Displacer Stem, Driver Bearing, Displacer Rod and Driver	316 Stainless Steel	N10276, N04400, other Austenitic Stainless Steels, and Special Alloys
Torque Tube	N05500(1)	316 Stainless Steel, N06600, N10276

1. N05500 is not recommended for spring applications above 232°C (450°F). Contact your Emerson sales office or application engineer if temperatures exceeding this limit are required.

Table 4. Supply Pressure Data

OUTPUT SIGNAL	STANDARD SUPPLY AND OUTPUT PRESSURE GAUGE INDICATIONS(1)	NORMAL OPERATING SUPPLY PRESSURE(2)		AIR CONSUMPTION AT NORMAL OPERATING SUPPLY PRESSURE(3)			
				Normal m^3/h(6)		Scfh(6)	
		Bar	Psig	Min(4)	Max(5)	Min(4)	Max(5)
0.2 to 1.0 bar (3 to 15 psig), except 0 and 1.4 bar (0 and 20 psig)(2) for on-off controllers	0 to 30 psig	1.4	20	0.11	0.72	4.2	27
0.4 to 2.0 bar (6 to 30 psig), except 0 and 2.4 bar (0 and 35 psig)(2) for on-off controllers	0 to 60 psig	2.4	35	0.19	1.1	7	42

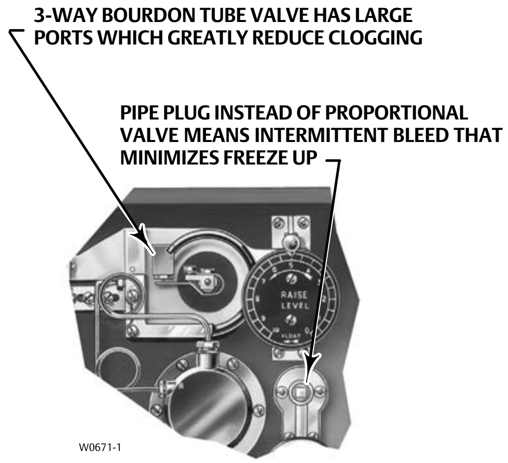
1. Consult your Emerson sales office about gauges in other units.
2. Control and stability may be impaired if this pressure is exceeded (except 2503 or 2503R controller without proportional valve).
3. Except 2503 or 2503R controller, which bleeds only when relay is open at exhaust position.
4. At zero or maximum proportional band or span setting.
5. At setting in middle of proportional band or span range.
6. Normal m^3/hr=normal cubic meters per hour at 0°C and 1.01325 bar. Scfh=standard cubic foot per hour at 60°F and 14.7 psia.

Features

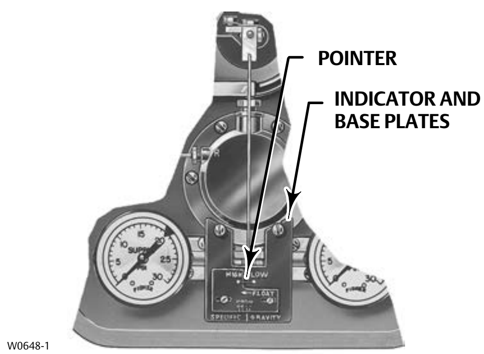
- Easy Adjustment—Set point, proportional valve opening, and reset changes are made with simple dial-knob controls.
- Simple, Durable Construction—Few moving parts are used. Knife-edged driver bearing in sensor and plated brass instrument case ball bearing for torque tube rotary shaft help provide low-friction operation. Sensors are available in ratings up to CL2500.
- Mounting Versatility—Caged sensors are available in a variety of orientations and connection styles, and all sensors can be either right- or left-hand mounted.
- Sensitive to Small Changes—Displacer reaction to small specific gravity changes allows these instruments to be used for density applications and in other applications where a response to low levels of input signal change is required.
- Easy Reversibility—Action is field reversible from direct to reverse or vice versa without additional parts.
- Reduced Maintenance Costs—Spring-out wire provides for in-service cleaning of relay orifice (figure 1). Torque tube can be replaced without removing torque tube arm.
- Reduced Operating Costs—Supply pressure conservation is enhanced in all constructions because relay exhaust opens only when output pressure is being reduced.
- Smaller Vessel Sizes Required for Stable Control—Caged 249 sensors come standard with a liquid damping orifice in the lower equalizing connection that helps stability where vessel capacitance is small and permits narrower proportional valve settings.

Figure 1. Typical Fisher 2500 Controller Constructions with Right-Hand Mounting Shown

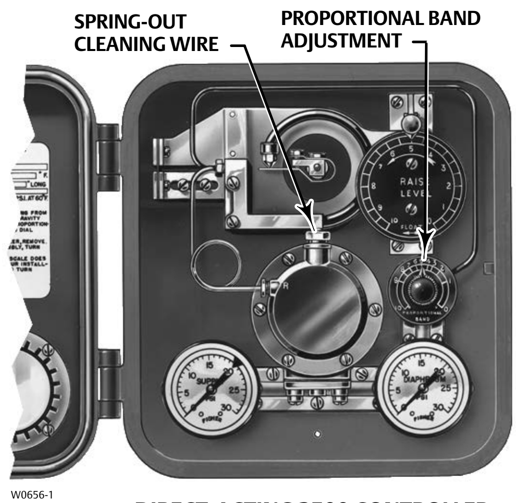
DETAIL OF DIRECT ACTING 2502 PROPORTIONAL-PLUS RESET CONTROLLER



DETAIL OF REVERSE-ACTING 2503R ON-OFF CONTROLLER



INDICATOR ASSEMBLY DETAIL



DIRECT-ACTING 2500 CONTROLLER

Figure 2. Fisher 249B Caged Sensor (Typical of all Rotatable-Head Caged Sensors)

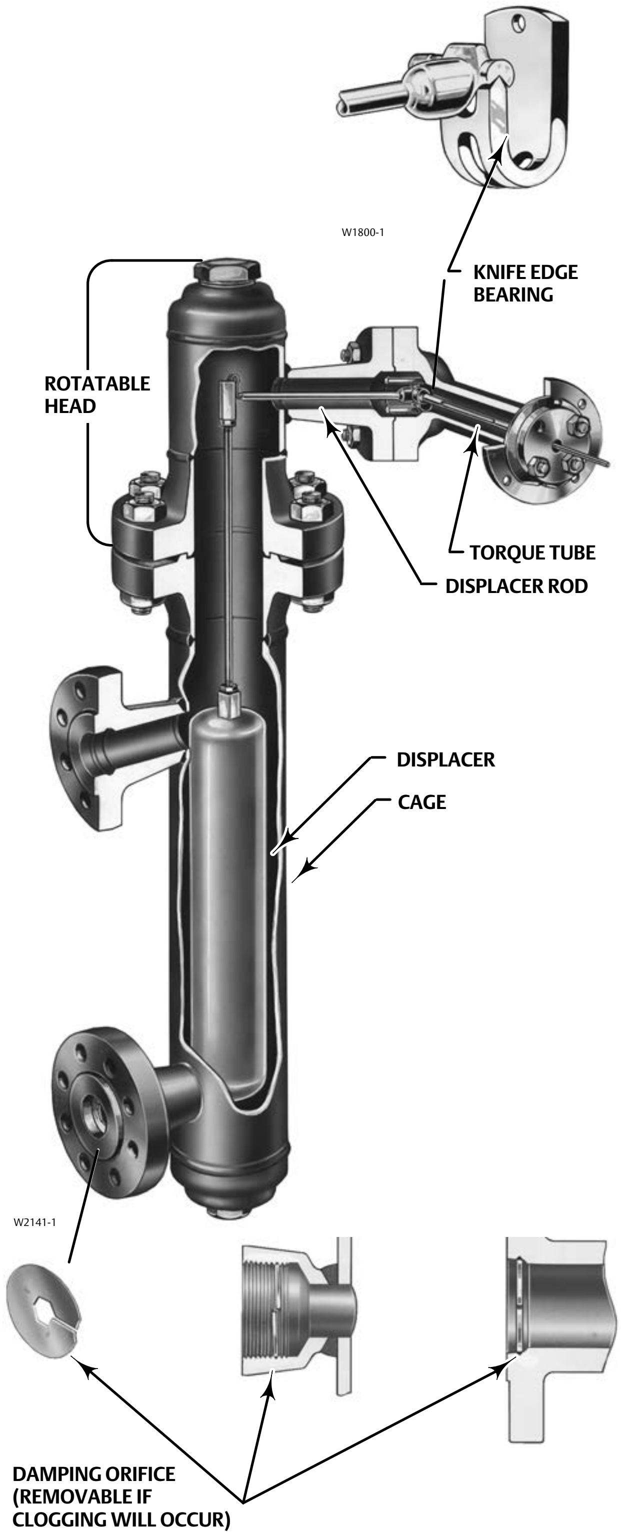
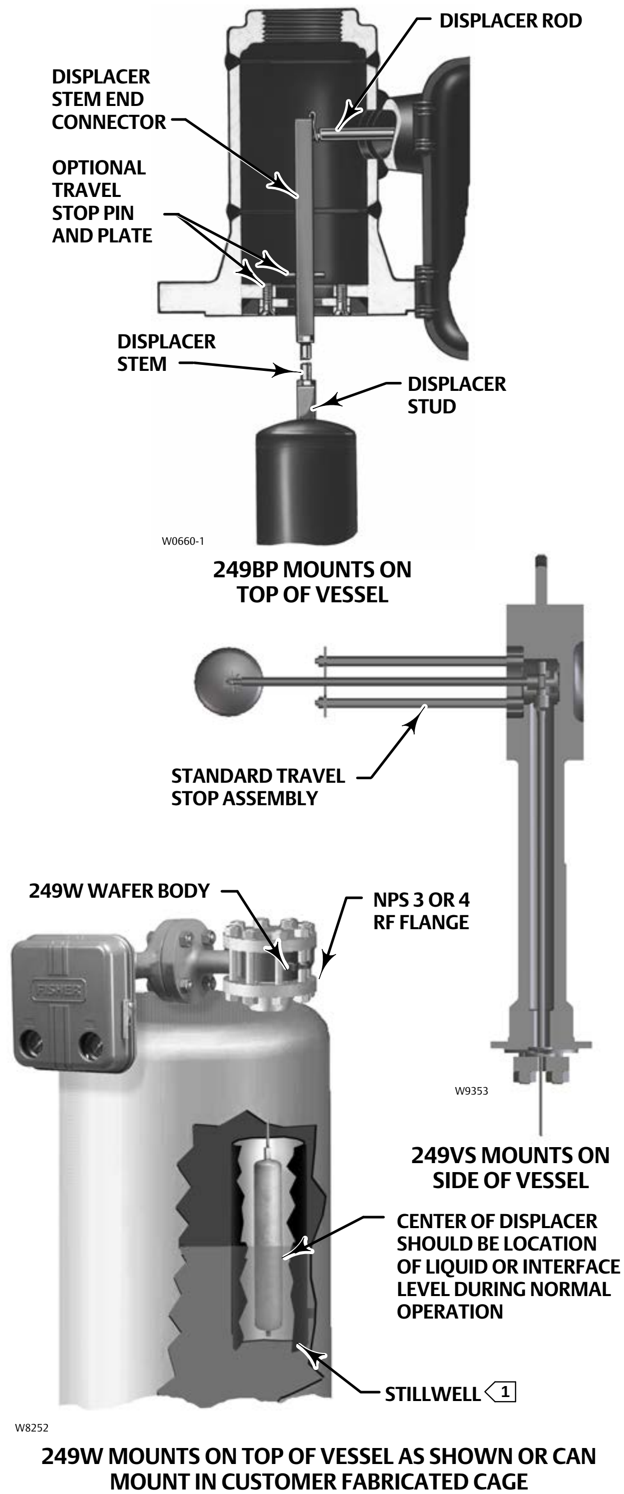


Figure 3. Typical Cageless Sensors



Note:
1 Stillwell required around displacer if the fluid is in a state of continuous agitation

Table 5. Caged Displacer Sensors(1)

SENSOR		EQUALIZING CONNECTION Style	Size (NPS)	PRESSURE RATING(2)
Torque tube arm rotatable with respect to equalizing connections	249(3)	Screwed	1-1/2 or 2	CL125 or 250
		Flanged	2	
	249B or 249BF(4)	Screwed or optional socket weld	1-1/2 or 2	CL600
		Raised face or optional ring-type joint flanged	1-1/2	CL150, 300, or 600
			2	CL150, 300, or 600
	249C(2)	Screwed	1-1/2 or 2	CL600
		Raised face	1-1/2	CL150, 300, or 600
			2	CL150, 300, or 600
	249K	Raised face or optional ring-type joint flanged	1-1/2 or 2	CL1500
	249L	Ring-type joint flanged	2(5)	CL2500

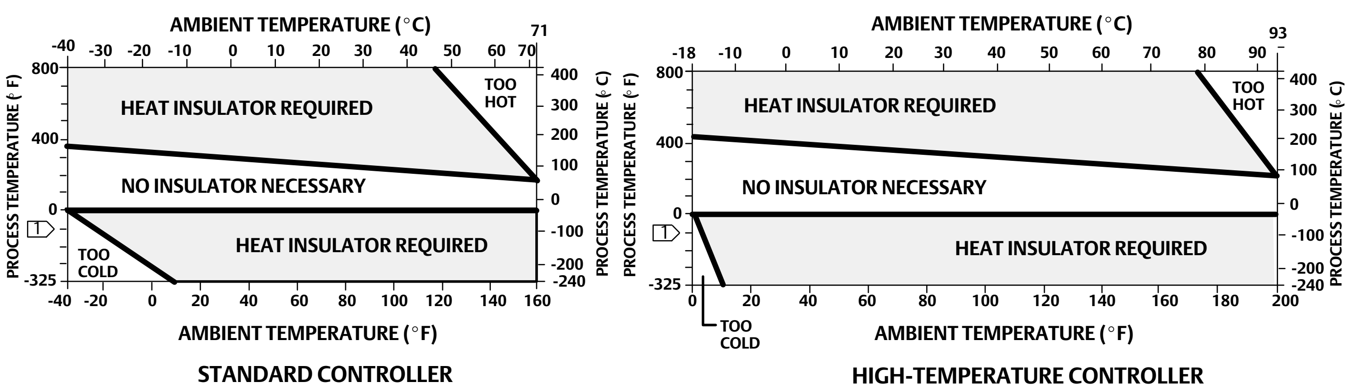
1. Standard displacer lengths for all styles (except 249) are 14, 32, 48, 60, 72, 84, 96, 108, and 120 inches. The 249 uses a displacer with a length of either 14 or 32 inches.
2. PN flange connections available in EMA (Europe, Middle East, and Africa).
3. Not available in EMA.
4. 249BF available in EMA only. Also available in EN size DN 40 with PN 10 to PN 100 flanges and size DN 50 with PN 10 to PN 63 flanges.
5. Top connection is NPS 1 ring-type joint flanged for connection styles F1 and F2.

Table 6. Cageless Displacer Sensors(1)

Mounting	Sensor	Flange Connection (Size)	Pressure Rating(2)
Mounts on top of vessel	249BP(3)	NPS 4 raised face or optional ring-type joint	CL150, 300, or 600
		NPS 6 or 8 raised face	CL150 or 300
	249CP	NPS 3 raised face	CL150, 300, or 600
Mounts on top of vessel	249P(4)	NPS 4 raised face or optional ring-type joint	CL900 or 1500 (EN PN 10 to DIN PN 250)
		NPS 6 or 8 raised face	CL150, 300, 600, 900, 1500, or 2500
Mounts on side of vessel	249VS	For NPS 4 raised face or flat face	CL125, 150, 250, 300, 600, 900, or 1500 (EN PN 10 to DIN PN 160)
		For NPS 4 butt weld end, XXS	CL2500
Mounts on top of vessel or on customer supplied cage	249W	For NPS 3 or 4 raised face	CL150, 300, or 600

1. Standard displacer lengths are 14, 32, 48, 60, 72, 84, 96, 108, and 120 inches.
2. PN flange connections available in EMA (Europe, Middle East, and Africa).
3. Not available in EMA.
4. 249P with NPS 6 and 8 flanges and PN flanges are available in EMA only.

Figure 4. Guidelines for Use of Optional Heat Insulator Assembly



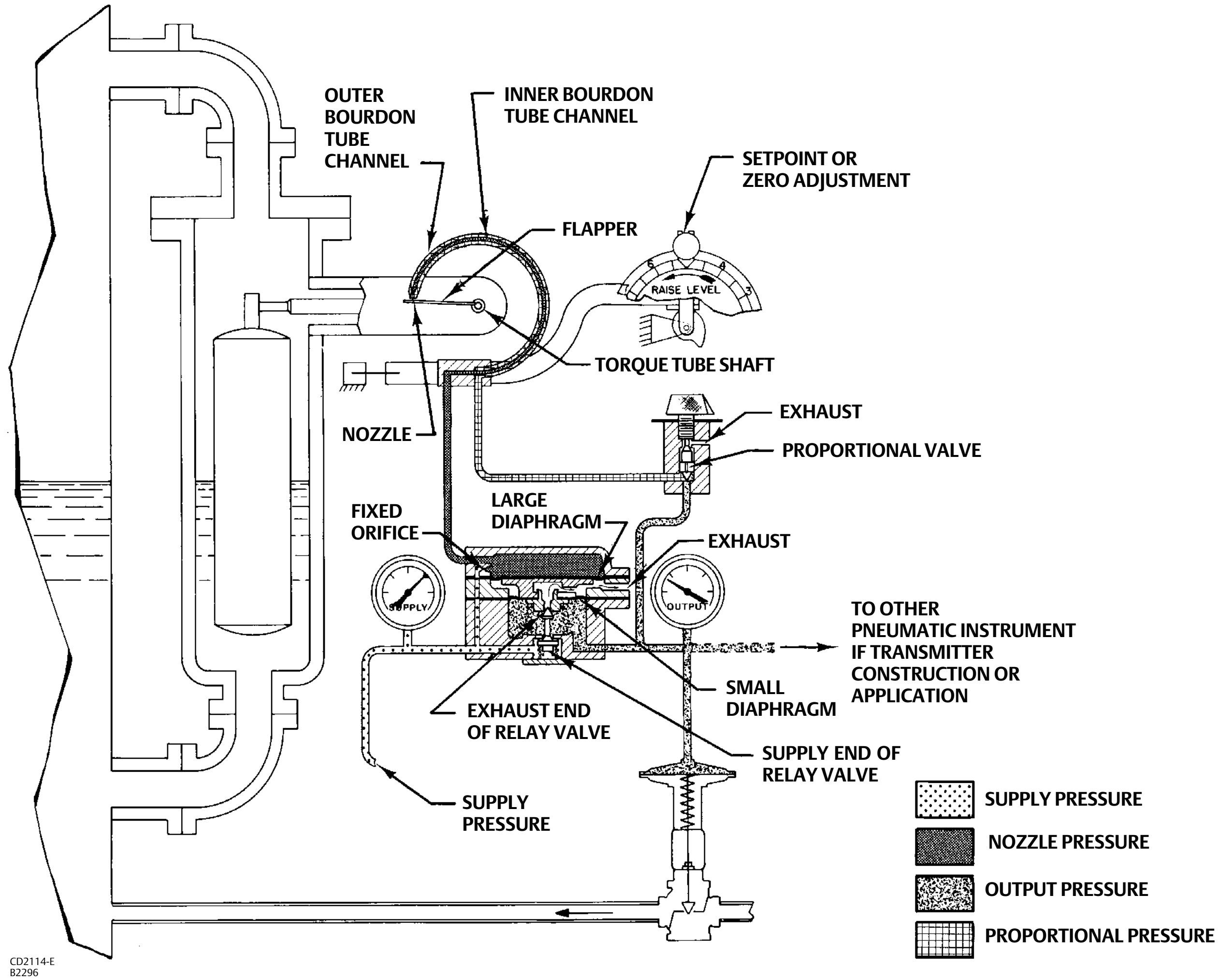
Note:
If ambient dewpoint is above process temperature, ice formation might cause instrument malfunction and reduce insulator effectiveness.
1 For process temperatures below -29°C (-20°F) and above 204°C (400°F) sensor materials must be appropriate for the process - see table 2.
B1413-1A

Table 7. Construction Materials

Part		Sensor	Material
In contact with process	Cage, head, torque tube arm	249	Cast iron
		249B, 249BF(1)	Carbon steel
		249C and 249CP	CF8M (316 stainless steel) standard, CF3M (316L stainless steel), CF8 (304 stainless steel), CF3 (304L stainless steel), LCC (steel), C5 (steel), LC3 (3.5 percent nickel steel), M35-1, CN7M (Alloy 20)
		249K	Steel standard, CF8, CF8M, CF3M, LCC, C5, LC3, WC1 (chrome moly steel), M35-1, CN7M optional
		249L	Steel standard, CF8M, C5, WC1, LCC
		249BP	Carbon Steel
		249P	Carbon Steel
		249VS	LCC, WCC (steel), CF8M
	Wafer body, torque tube arm	249W NPS 3 NPS 4	WCC, CF8M LCC, CF8M
	Torque tube	249, 249B, 249BF(1), 249K, 249L, 249P, 249VS, 249W	N05500 standard
		249C, 249CP, stainless steel 249VS, 249W	S31600 (316 stainless steel) standard
		All	S30403 (304L stainless steel), S31603 (316L stainless steel), N06600, N08020 (Alloy 20) optional
	Displacer	249, 249B, 249BF(1), 249K, 249VS, 249W	S30400 (304 stainless steel) standard
		249C, 249CP, 249W	S31600 (316 stainless steel) standard
		249L	A91100F (solid aluminum) standard
		All	Solid PTFE, N04400 or other special materials
	Standard trim(2)	All	S31600
	Bolting	All	Steel grade B7 studs or cap screws and grade 2H nuts (standard), steel grade B7M studs and grade 2M nuts optional on 249B and WCC 249W sensor
	Standard torque tube end gasket	All	316 stainless steel/graphite laminate, except 304 stainless steel/graphite laminate for 249K sensor
	Standard torque tube arm and cage gasket, if used	All	Composition, except soft iron for the 249L sensor
	Optional trim and gasketing	All	316 stainless steel trim with 316L stainless steel gasketing or soft iron gasketing; 317 stainless steel or N06600 trim with composition gasketing; 304, 304L or 316L stainless steel, N04400 or N08020 trim and gasketing
In contact with supply pressure	Bourdon tube or bellows		Brass, plus SST 3-way valve for 2503 or 2503R controller
	Tubing		Stainless steel
	Relay diaphragms		Nitrile (standard) or polyacrylate (high-temperature)
	Relay O-ring		Nitrile
	Gasketing		Chloroprene (standard) or rubber (high-temperature)
	Seal ring O-rings (and reset relief valve O-rings if used)		Nitrile (standard) or fluorocarbon (high-temperature)
Other	Case		Aluminum
	Cover		Aluminum with glass gauge windows and nitrile cover gasket
	Retaining flange		Steel

1. Available only in EMA.
2. Trim parts include displacer rod, driver bearing; displacer stem parts, and stem connection parts.

Figure 5. Schematic of Direct-Acting Fisher 2500-249 Proportional Controller (or Transmitter) Shown with Right-Hand Mounting



Supply Pressure Overpressure Protection

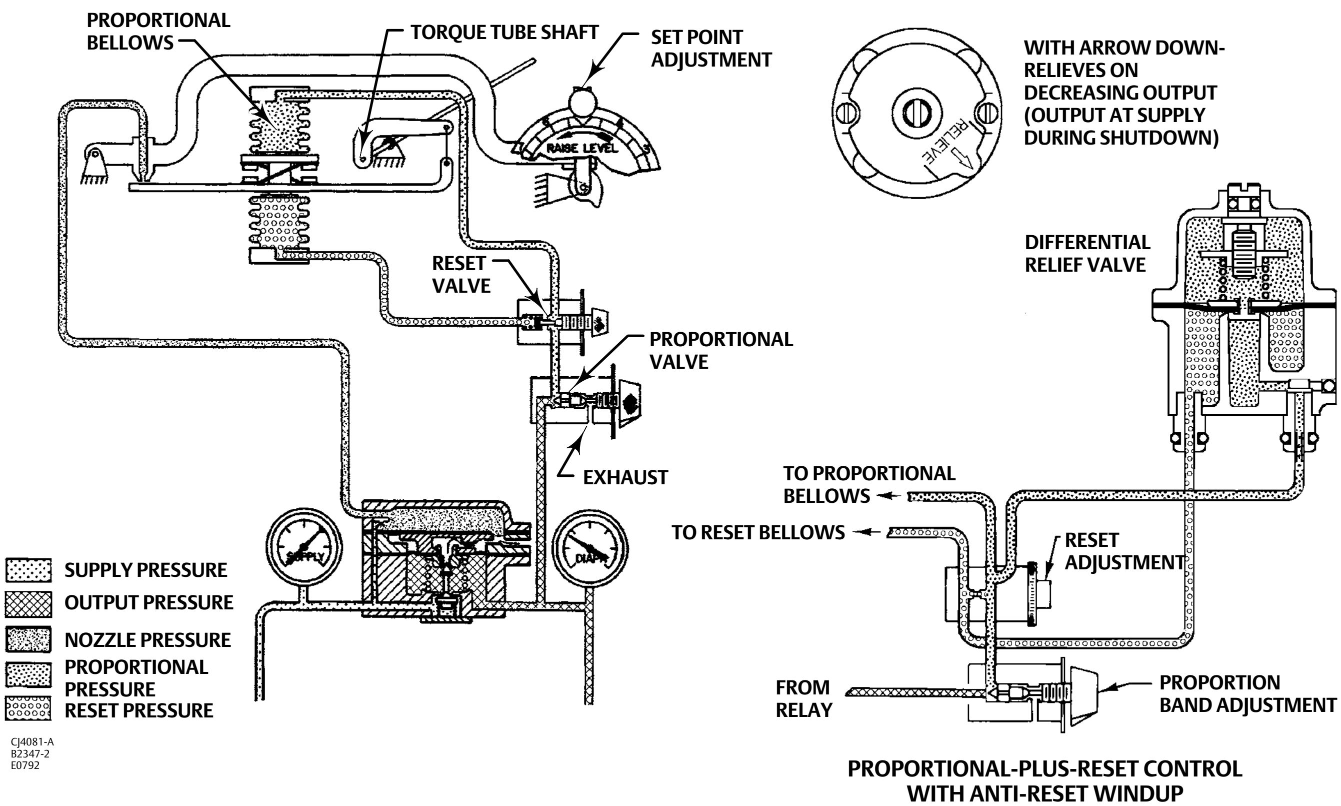
Applying excessive pressure to any portion of a controller, transmitter or connected equipment may cause leakage, part damage, or personal injury due to bursting of pressure-containing parts. Although the standard 67CFR supply regulator for 2500 instruments has internal relief to provide very limited overpressure protection, complete overpressure protection between the supply regulator outlet and the instrument case is needed if a malfunctioning supply regulator can deliver a supply pressure that exceeds 3.4 bar (50 psig).

Principle of Operation

All 2500 controllers and transmitters use the same basic pressure-balanced relay with a yoked double-diaphragm assembly. Supply pressure either passes through the fixed orifice and bleeds out the nozzle (figure 5 or 6) or directly enters the Bourdon tube valve (figure 7). Nozzle pressure registers on the large relay diaphragm, and output pressure on the small relay diaphragm.

The following descriptions show how the various controller and transmitter constructions work in conjunction with displacer action.

Figure 6. Schematic of Direct-Acting Proportional-Plus-Reset Controller



Proportional Controller or Transmitter

As long as the process remains constant, the displacer will hold the torque tube shaft and attached flapper steady in relation to the nozzle. The nozzle-flapper opening will be such as to permit pressure to bleed from the nozzle as fast as it enters through the fixed orifice of the relay, keeping the pressure loading on the large relay diaphragm at the amount necessary to balance the output pressure loading on the small relay diaphragm.

A process variable change (such as a variation in downstream demand that affects liquid outflow and thus the level of the tank shown in figure 5) changes the buoyant force acting on the displacer and moves the flapper with respect to the nozzle. An increasing buoyant force with direct action, or decreasing buoyant force with reverse action, produces a nozzle-flapper restriction that increases nozzle pressure on the large relay diaphragm. This opens the supply end of the relay valve and increases relay output pressure. But a decreasing buoyant force with direct action, or increasing buoyant force with reverse action, produces a nozzle-flapper opening that bleeds off nozzle pressure on the large relay diaphragm and opens the exhaust end of the relay valve to let output pressure (and thus actuator loading pressure) bleed away. The relay diaphragm pressure differential equalizes and a new output pressure is maintained according to the change in displacer position.

Proportional-Plus-Reset Controller

All 2502 controllers (figure 6) have a two-way reset restriction valve that channels proportional pressure into a reset bellows to oppose proportional bellows action. This automatically slows the canceling effect of any proportional action by a set amount per time interval, as long as there is a deviation from the control point. Action of this reset pressure occurs on a delayed basis, and the reset valve can be adjusted to vary the time of delay.

If a prolonged difference exists between the set point and the process variable, output pressure with a proportional-plus-reset controller will either drop to zero or rise to the maximum delivered by the supply regulator. This condition is called reset windup.

Anti-Reset Windup

2502F and 2502FR controllers additionally have anti-reset windup to minimize the delay in returning the controlled variable to the set point. This capability is provided by a reversible differential relief valve with adjustable spring. As shown in figure 6, proportional pressure registers rapidly on the spring side of the relief valve diaphragm as well as in the proportional bellows. Reset pressure registers slowly on the opposite side of the diaphragm. As long as the output pressure changes are slow enough for normal proportional and reset action, the relief valve spring prevents opening of the relief valve diaphragm.

A large or rapid decrease in controller output pressure decreases the pressure in the proportional system, and on the spring side of the relief diaphragm. If the decrease on the spring side of the diaphragm is greater than the relief valve spring setting, the diaphragm moves off the relief valve orifice and permits reset pressure on the opposite side of the relief valve diaphragm to bleed rapidly into the proportional system. The differential relief valve can also be reversed to relieve with an increasing output pressure.

On-Off Controller With Proportional Valve

This construction has the same flapper, relay, and proportional valve responses to a level or density change as does a proportional 2500 controller. However, the Bourdon tube is constructed (figure 1) so that output pressure change feedback moves the nozzle in the opposite direction from the way the flapper is moving. This reinforcement completely opens the relay valve either to full supply pressure or to full exhaust of output pressure, allowing no in-between throttling.

On-Off Controller Without Proportional Valve

As long as vessel level or density remains above the lower snapping point on a direct-acting controller (or below the upper snapping point on a reverse-acting controller), the flapper remains far enough away to keep the exhaust port of the Bourdon tube valve closed and prevent any pressure escape from the Bourdon tube. The relay valve remains closed at the exhaust end and open at the supply end, allowing full output pressure into the control valve actuator.

When level or density sufficiently decreases with direct action or increases with reverse action, the flapper pushes the Bourdon tube valve in enough to seal the inner Bourdon tube channel (figure 7). This opens the exhaust port of the valve and permits exhaust of pressure from the actuator, initiating the appropriate control action. This control action continues until the level or density change again moves the flapper away enough to permit closing of the Bourdon tube valve exhaust port and the full application of output pressure to the actuator.

Options

- **Stainless Steel Heat Insulator Assembly**—Refer to figure 8. Available for mounting between the torque tube arm of any 249 sensor and the instrument. Recommended for applications where combination of process and environmental temperatures would result in controller temperatures in excess of safe limits (figure 4).

- **Jerguson™ Gages**—Permit direct observation of process level and other relevant characteristics. These gages are described in the Jerguson Gages supplement (D200038X012). The 249 sensor cage comes standard with suitable bosses that can be tapped for gage installation. All other sensors require the gages to be installed at the factory. When specified, the bosses will be tapped 1/2 NPT on the CL125 249 sensor, and 3/4 NPT on the CL250 249.

Installation

Although it can be shipped alone for separate installation, a 249 sensor usually is shipped with a controller or transmitter installed. During shipment, displacers are detached from cageless sensors and optional tubular gauge glasses are detached from caged sensors.

Equalizing piping, stillwells, or other equipment may be required for installation. Emerson Automation Solutions does not provide this equipment.

Complete dimensions and case connection information for all 249 constructions can be found in Fisher product bulletin 34.2:249 (D200039X012).

Figure 7. Schematic of Reverse-Acting Fisher 2503R Controller

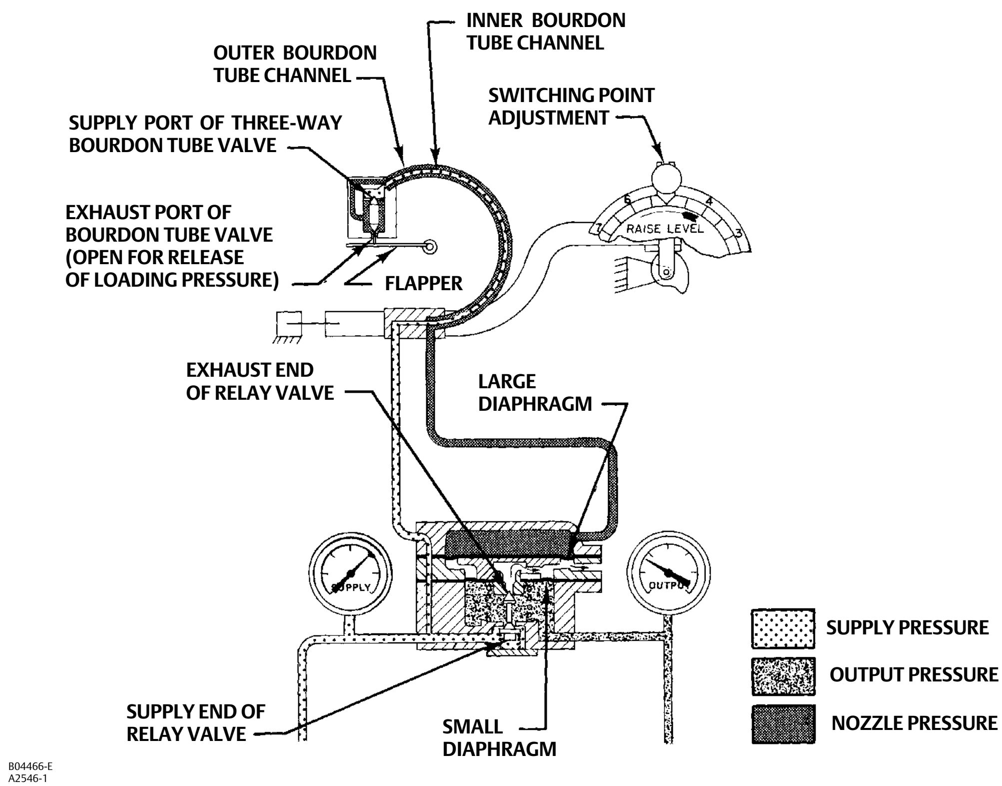


Figure 8. Optional Heat Insulator Assembly

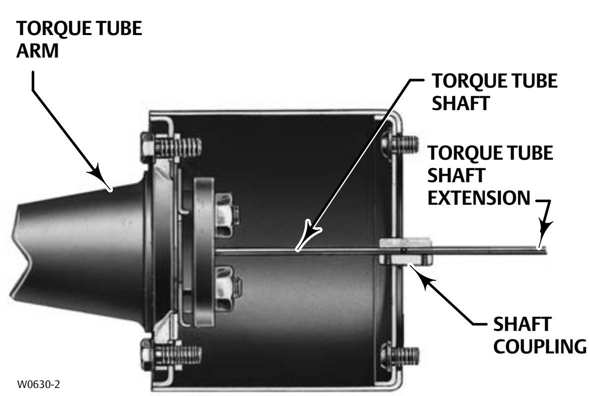


Figure 9. Torque Tube Arm Mounting Positions

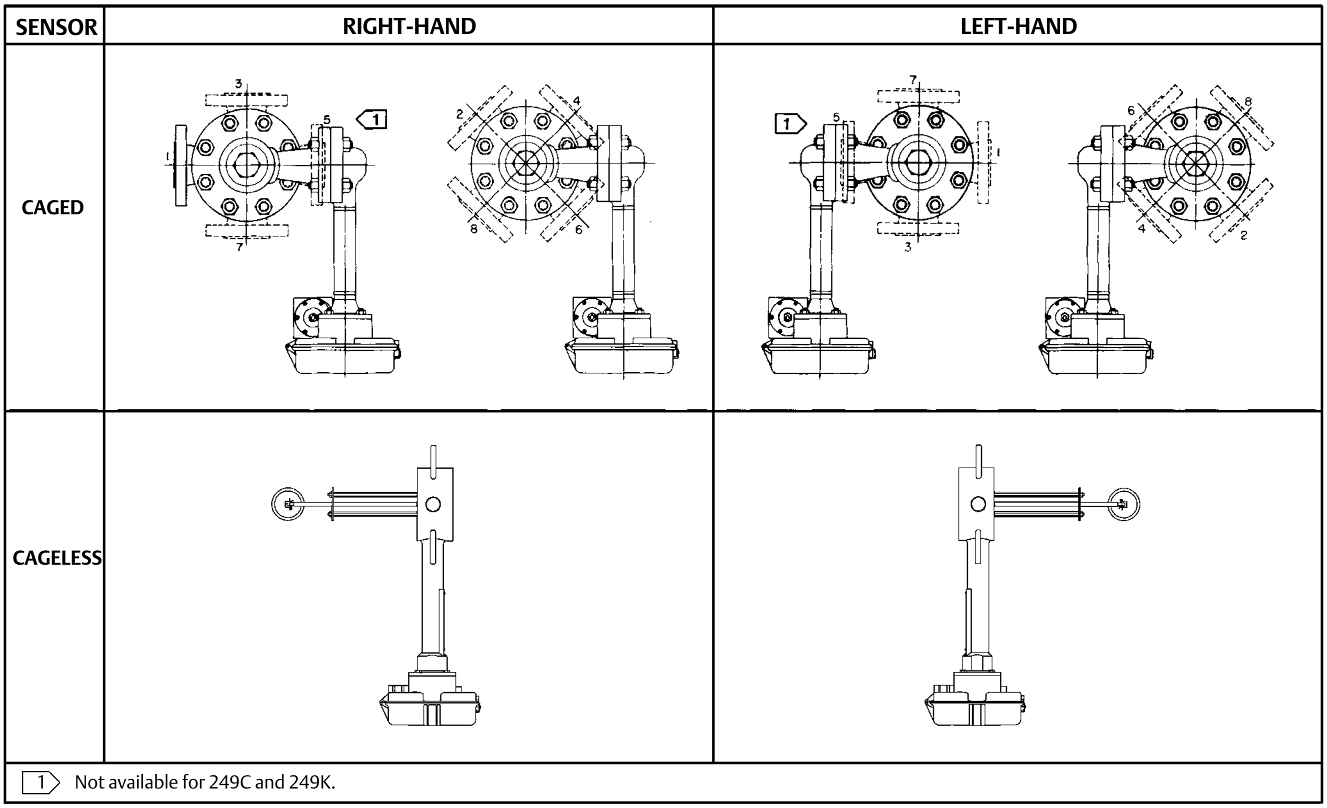
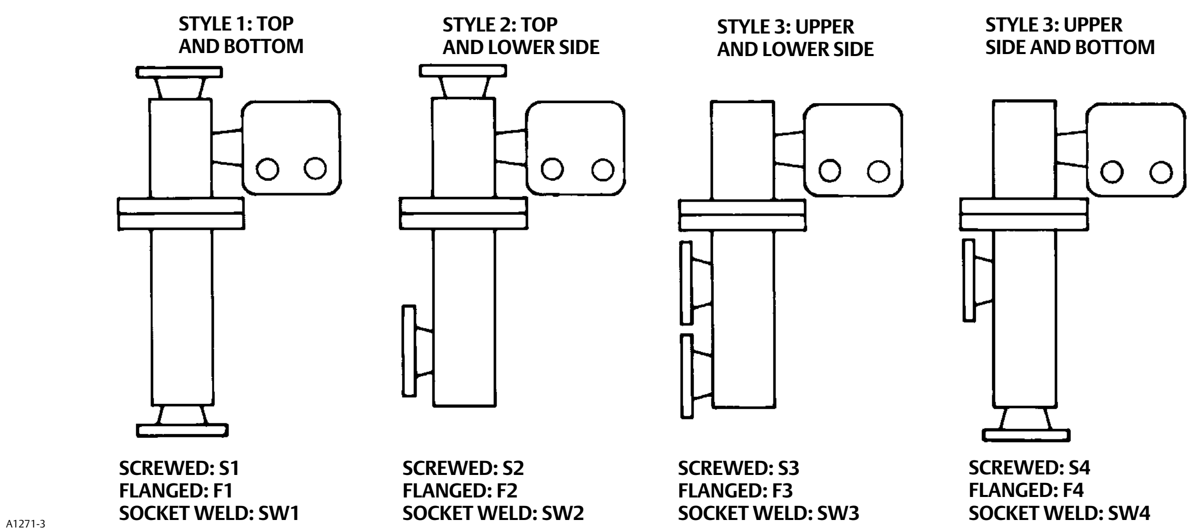


Figure 10. Cage Connection Styles



Ordering Information

Application

When ordering, specify:

- Control (proportional, proportional-plus-reset, or on-off), or transmission mode
- Liquid level service (give type, pressure, temperature and specific gravity)
- Interface level service (give specific gravity of both liquids and minimum proportional band, differential gap, or span required)
- Density service (give minimum and maximum specific gravity required)

Construction

Refer to the specifications and the Options section. Review the descriptions for each specification, under each option, and in the referenced tables and figures; specify the desired selection whenever there is a choice to be made. Right-hand mounting (with position 1 if appropriate) will be supplied automatically unless some other mounting method is specified. Unless another length is specified, 305 millimeters (12 inches) will be used as the standard cageless sensor length from flange face—or displacer rod—to displacer top.

Always specify the complete type number (including the R suffix for reverse action) of the controller or transmitter, sensor, supply pressure regulator, and other desired equipment. On differential relief controllers, specify whether relief is to occur with excessive proportional or with excessive reset pressure.

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Jerguson™ Gages for Fisher™ Displacer Cages

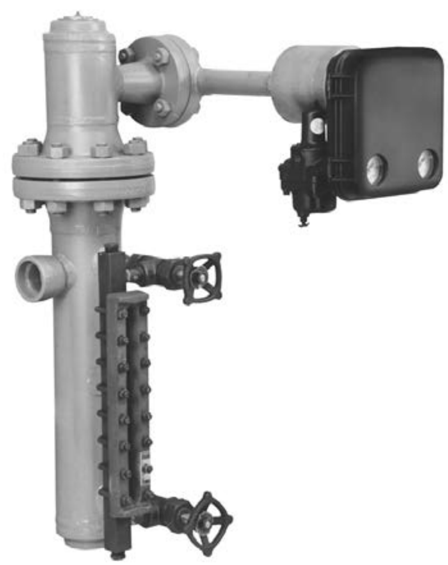
Jerguson gages are used on the displacer cages of liquid level sensors to provide a visual indication of liquid level interface. Jerguson offers two styles of flat-glass gages (reflex and transparent) and a tubular glass gage. The reflex gage gives a clean line of separation, with the liquid showing black in contrast to the mirror-like surface. The transparent gage shows the level and also the color and/or the interface of the liquid. The flat glass gages have metal enclosures to provide gage glass protection. Standard tubular glass gages are equipped with four guard rods and holders.

Jerguson steel gage valves are equipped with stainless steel ball checks, located upstream from the seats to immediately shut off the flow in case of gage glass breakage.

Refer to tables 1, 2, and 3 for specific information describing gage types and pressure/temperature limits. For saturated steam ratings above the values listed, consult your Emerson sales office or Local Business Partner. Dimensions for the reflex, transparent, and tubular gages are shown in figure 1 and tables 4 and 5.

W2252-1

TYPICAL TUBULAR GLASS GAGE



W2269-1

TYPICAL FLAT GLASS GAGE (REFLEX OR TRANSPARENT)

Table 1. Flat Glass Gages and Gage Valves for Mid-Range Pressure/Temperature Applications (Used on Fisher 249 and 249B Displacer Cages)

JERGUSON GAGE		GAGE VALVE TYPE NUMBER	DISPLACER LENGTH	PRESSURE RATINGS AT GIVEN TEMPERATURES						PRESSURE RATINGS FOR SATURATED STEAM(1)
Type Number	Style			38°C (100°F)	93°C (200°F)	150°C (300°F)	205°C (400°F)	260°C (500°F)	315°C (600°F)	
19-RCH-20	Reflex	64	14 Inches (356 mm)	155 bar (2250 psig)	148 bar (2150 psig)	138 bar (2000 psig)	128 bar (1850 psig)	117 bar (1700 psig)	107 bar (1550 psig)	20.7 bar (300 psig)
37-RCH-20	Reflex	67	32 Inches (813 mm)	173 bar (2510 psig)	164 bar (2380 psig)	153 bar (2220 psig)	142 bar (2060 psig)	131 bar (1900 psig)	119 bar (1730 psig)	20.7 bar (300 psig)
19-TMCH-20	Transparent	64	14 Inches (356 mm)	69.0 bar (1000 psig)	65.5 bar (950 psig)	62.1 bar (900 psig)	58.6 bar (850 psig)	51.7 bar (750 psig)	46.5 bar (675 psig)	24.1 bar (350 psig)

1. For saturated steam ratings above the listed values, contact your Emerson sales office or Local Business Partner.

Table 2. Flat Glass Gages and Gage Valves for Heavy-Duty High Pressure/Temperature Applications (Used on Fisher 249 and 249B Displacer Cages)

JERGUSON GAGE		GAGE VALVE TYPE NUMBER	DISPLACER LENGTH	PRESSURE RATINGS AT GIVEN TEMPERATURES							PRESSURE RATINGS FOR SATURATED STEAM(1)
Type Number	Style			38°C (100°F)	93°C (200°F)	150°C (300°F)	205°C (400°F)	260°C (500°F)	315°C (600°F)	371°C (700°F)	
19-TMCH-32	Transparent	64	14 Inches (356 mm)	207 bar (3000 psig)	201 bar (2920 psig)	197 bar (2850 psig)	192 bar (2780 psig)	179 bar (2600 psig)	159 bar (2310 psig)	139 bar (2020 psig)	51.7 bar (750 psig)

1. For saturated steam ratings above the listed values, contact your Emerson sales office or Local Business Partner.

Table 3. Tubular Glass Gages(1)

Jerguson Gage Valve Type Number	Displacer Length	Type of Glass	Pressure/Temperature Ratings
136	14 Inches (356 mm)	Standard Wall Glass	13.8 bar at 65°C (200 psig at 150°F)
			6.9 bar at 224°C (100 psig at 425°F)

1. Do not use tubular glass gages on steam service.

Table 4. Dimensions A and B (also see figure 2)

Displacer Length	Type Number	Style	A (Visible Length)	B	
14 Inches (356 mm)	19-RCH-20	Reflex	321 mm (12.62 Inches)	406 mm(1) (16.00 Inches)	394 mm(2) (15.50 Inches)
	19-TMCH-20	Transparent	321 mm (12.62 Inches)		
	19-TMCH-32				
	---	Tubular Glass	289 mm(1) (11.38 Inches)		
			251 mm(2) (9.88 Inches)		
32 Inches (813 mm)	37-RCH-20	Reflex	857 mm (33.75 Inches)	---	851 mm(2) (33.50 Inches)

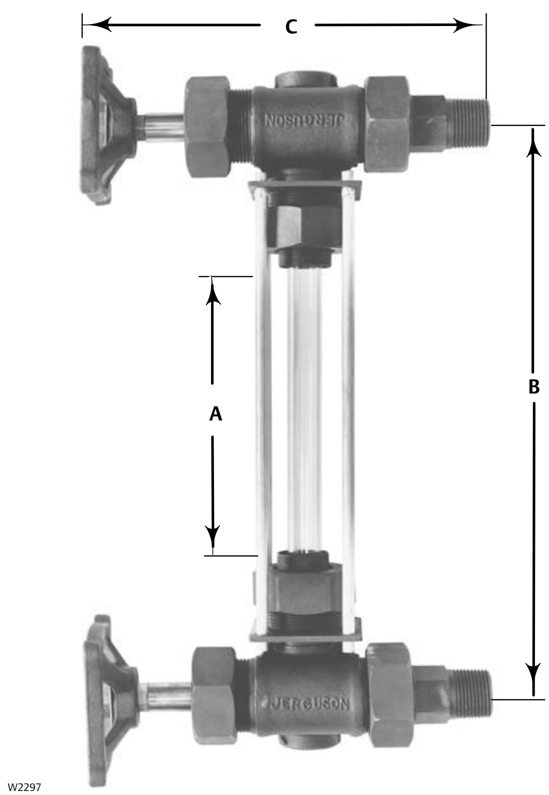
1. For 249 displacer cages.
2. For 249B displacer cages.

Table 5. Dimension C (also see figure 2)

Gage Valve Type Number(1)	Dimension
64	233 mm (9.2 Inches)
67	233 mm (9.2 Inches)

1. Gage valve is in the closed position.

Figure 1. Typical Gage Dimensions (also see tables 4 and 5)



Ordering Information

Specify the following information when ordering a gage and gage valves:

1. Process temperature and pressure.
2. Jerguson gage type:
    a. Reflex,
    b. Transparent, or
    c. Tubular
3. Jerguson gage valve type number.
4. Fisher displacer type number and length.

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EMERSON

Fisher™ L2 Liquid Level Controller

Fisher L2 and L2 Snap level controllers are part of the rugged L2 series of liquid level controllers. They use a displacer type sensor to detect liquid level or the interface of two liquids of different specific gravities. These controllers are ideal for controlling level on gas separators and scrubbers. The reliability of the L2 design makes it well suited for liquid level applications in natural gas production, compression, and processing. The device delivers a pneumatic output signal to a control/dump valve. The sensor uses a threaded 2 NPT or an NPS 2 CL150 through 1500 slip-on flange connection to the vessel.

W8418-1

Features

- More Reliable Control—Two-stage proportional relay with integral action provides more dependable liquid level control.
- Snap-Acting or Throttling Control—One standard controller available as either throttling or snap-acting.
- Vibration Resistant Sensor Dynamics— O-ring friction and process pressure sensitivity are minimal. Performance stays constant with process pressure changes and controller remains vibration resistant.
- NACE Service Ready—Standard construction uses materials that comply with the requirements of NACE MR0175-2002.
- Field-Configurable Vertical or Horizontal Displacer—Displacer may be adjusted in the field for vertical or horizontal operation without additional parts.
- Field-Reversible Output—The controller can be adjusted in the field for direct or reverse action without additional parts. The controller also has adjustable gain sensitivity.
- CL1500 Pressure Rating—Sensor assembly is designed and specified for ASME B16.34 CL1500 service when using a Polyvinylchloride (PVC) displacer. For PED (97/23/EC) maximum pressure is limited to 200 bar (2900 psig).
- Vent-Away Case—The ability to pipe away exhaust permits using natural gas as the operating medium.
- Easy Maintenance—Both the controller and the sensor can be easily disassembled to inspect the process seals and for maintenance.

Specifications

Available Configurations

Controllers: Snap-acting or throttling
Sensor: Displacer-type liquid level sensor for mounting to side of tank. Displacer travel is transmitted to controller by pivotal movement of displacer rod

Input Signal

Type: Liquid level or liquid-to-liquid interface

Level Change Required for Full Change in Output Signal in a 1.0 Specific Gravity Liquid, with 1.4 bar (20 psig) Supply Pressure, Direct Action, and Standard 1-7/8 X 12-Inch (48 x 305 mm) Vertical Displacer with Standard Lever Arm Length:

Control Mode	Minimum Span Level Change, mm (Inches)(1)	Maximum Span Level Change, mm (Inches)(1)
Throttling	102 (4)	305 (12)
On-off	127 (5)	305 (12)
Snap-acting	13 (0.5)	20 (0.8)

Minimum Specific Gravity(2)

Minimum specific gravity, or specific gravity differential for interface applications
Throttling Controllers: 0.4
On/Off Controllers: 0.45
Snap-Acting Controllers: 0.1

Output Signal

Pneumatic ■ on/off or ■ proportional pressure signal
Ranges:
Throttling: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)
On/Off: 0 (off) or full supply pressure (on)
Action: Field-reversible between direct (increasing level increases output signal) and reverse (increasing level decreases output signal)

Supply Pressure Requirements

Throttling and On/Off Controller:
Throttling: 1.4 bar (20 psig) for 0.2 to 1.0 bar (3 to 15 psig) output signal and 2.4 bar (35 psig) for 0.4 to 2.0 bar (6 to 30 psig) output signal
On/Off: Any desired pressure between 1.4 and 3.4 bar (20 and 50 psig)
Snap-Acting Controller: Any desired pressure between 1.4 and 5.2 bar (20 and 50 psig) direct, and 1.4 and 2.4 bar (20 and 35 psig) reverse

Do not use supply pressure below 1.4 bar (20 psig)

Supply Pressure Medium

Air or Natural Gas

Steady-State Air Consumption(3)

Throttling Controller: ≤0.03 normal m^3/hr (1.0 scfh) at 1.4 bar (20 psig) supply pressure
Snap-Acting Controller: ≤0.03 normal m^3/hr (1.0 scfh) at 1.4 bar (20 psig) supply pressure or ≤0.04 normal m^3/hr (1.5 scfh) at 2.4 bar (35 psig) supply pressure in tripped condition; air consumption increases during trip

Sensor to Vessel Connection

■ 2 NPT threaded or ■ NPS 2 CL150 through 1500 slip-on flange connection(4)

Controller Connections

Supply: 1/4 NPT internal located on the bottom of the case
Output: 1/4 NPT internal located on the top of the case
Case Vent: 1/4 NPT internal with vent screen assembly located on the back of the case

Standard Displacer Size

48 x 305 mm, 541 cm^3 (1-7/8 x 12 inches, 33 in^3)

Maximum Displacer Insertion Length(5)

Standard lever arm length plus one 6-inch extension, horizontal or vertical

Displacer Material and Maximum Sensor Working Pressure(6)

PVC Displacer: Consistent with CL1500 pressure temperature ratings per ASME B16.34 up to maximum pressure of 258.5 bar (3750 psig)
For PED (97/23/EC) maximum pressure limited to 200 bar (2900 psig)

S31603 SST Displacer: CL600 pressure temperature ratings per ASME B16.34 up to maximum pressure of 99.3 bar (1440 psig)

Note: For slip-on flange connection, maximum sensor working pressure must be consistent with the flange ratings

-continued-

Specifications (continued)

Displacer Material and Sensor Temperature Limits(6)

PVC Displacer: -29 to 79°C (-20 to 175°F)
S31603 SST Displacer: -40 to 204°C (-40 to 400°F)

Operative Ambient Temperature Limits(6)

Controller: -29 to 71°C (-20 to 160°F)

Standard Supply, and Output Pressure Gauge Indications

Triple scale gauges in 0 to 60 psig/0 to 0.4 MPa/ 0 to 4.0 bar

Construction Materials

Controller:
Case and Cover: Marine grade aluminum
Relay Body: Thermoplastic
Relay Trim: Stainless steel, nitrile
Span Levers: Stainless steel

Sensor:
Sensor Body: LCC
O-Rings: Fluorocarbon
Pivot Assembly: Stainless steel
Displacer: ■ Polyvinylchloride (PVC) or ■ S31603 SST
Sensor Spring: Stainless steel

Dimensions

Refer to figure 1

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

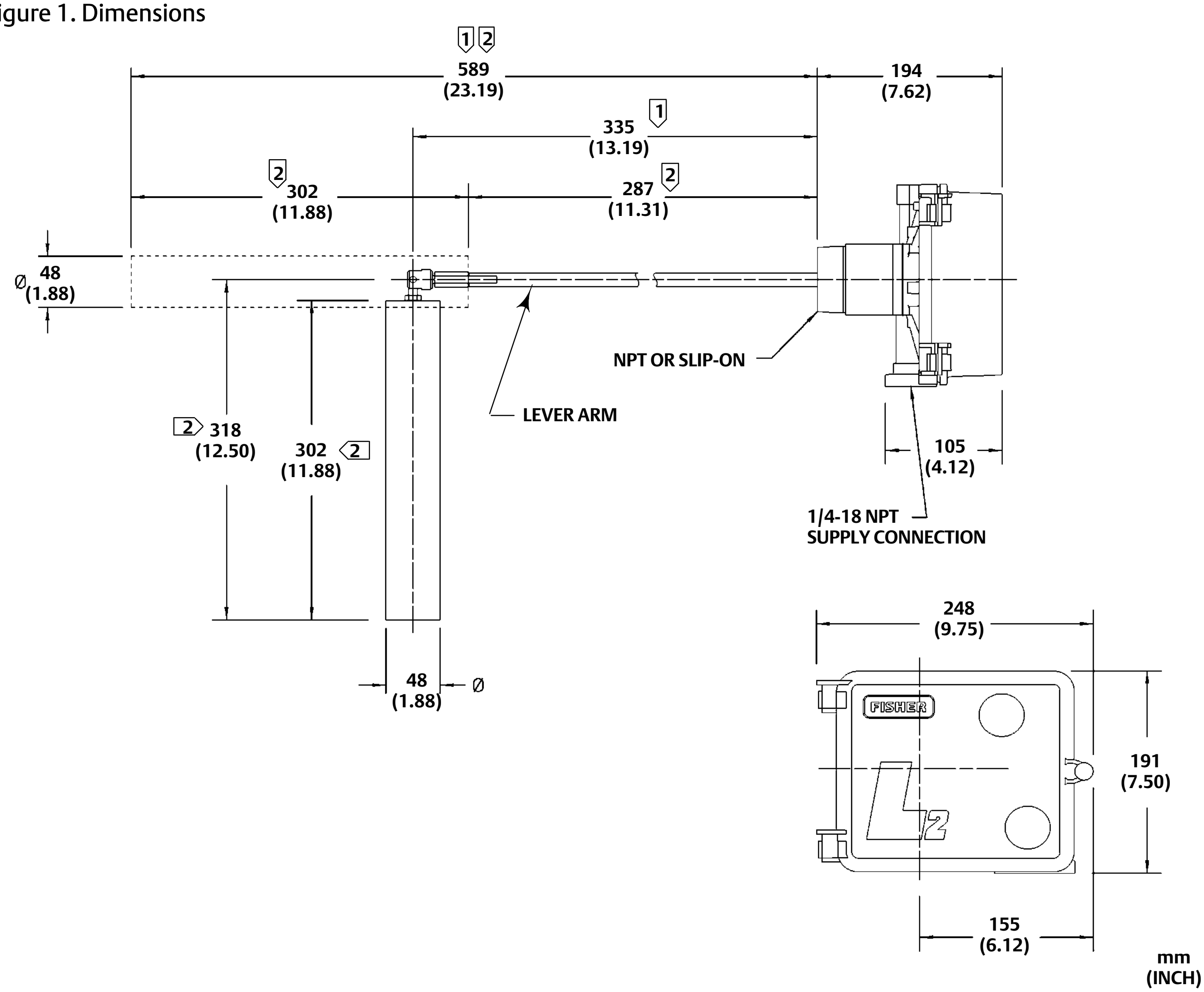
II 2 G D

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

II Gb c T*X
III Db c T*X

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Any deviation from the standard construction described in the input signal specification above requires special displacer sizing considerations. Contact your Emerson sales office for information.
2. Minimum specific gravity values apply to both horizontal and vertical displacers with standard lever arm length (see dimension in figure 1).
3. Normal m^3/hr-Normal cubic meters per hour (0°C and 1.01325 bar, absolute). Scfh-Standard cubic feet per hour (60°F and 14.7 psia).
4. Converting from a threaded NPT connection to a flange connection is to be done by the end-user. Refer to Converting a Threaded NPT Connection to a Flange Connection instruction Manual Supplement (D103277X012), available at Fisher.com or from your Emerson sales office.
5. Standard lever arm length. See figure 1.
6. The pressure and temperature limits in this document and any applicable code limitations should not be exceeded.

Figure 1. Dimensions



Notes:
1 Dimensions include one standard 152 mm (6-inch) extension. Contact your Emerson sales office for optional extension lengths.
2 Dimensions valid with standard displacers only.

GE08174-A

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Fisher™ L2e Electric Level Controller

The rugged Fisher L2e electric on-off level controller uses a displacer type sensor to detect liquid level or the interface of two liquids of different specific gravities. This controller is ideal for controlling level in oil and gas separators, treaters, and scrubbers. The reliability of the L2e force balanced sensor design makes it well suited for applications in the oil and natural gas production, compression, and processing industries.

SCAN OR CLICK THE QR CODE FOR L2e AND easy-Drive ELECTRIC LEVEL LOOP FIELD SUPPORT

Features

- **Repeatable Electric Level Control**—In conjunction with the Fisher easy-Drive™ electric actuator, a fully electric level control loop is tunable for a wide variety of applications (see figure 1).
- **Effective Level Loop Tuning**—Intuitive Zero and Span adjustments allow flexibility in setting loop performance over a level range of 5.0 to 305 mm (0.2 to 12 inches).
- **More Reliable Control**—Premium quality hermetically-sealed switch with gold contacts and advanced knife-edge sensing provide highly dependable and accurate liquid level control.
- **On-Line Field Support**—QR code on inside cover gives instrument technicians instant access to wiring, setup, calibration, tuning, and trouble-shooting.
- **Environmentally Responsible**—Replacing a conventional pneumatic level loop with fully electric level control eliminates controller and dump valve venting and requires less maintenance.
- **Consumes No Electrical Power**—Quality of design and components help ensure no leakage current.
- **Vibration Resistant Sensor Dynamics**—Controller performance and reliability does not degrade in high vibration installations, such as on compressor scrubbers.
- **Field-Configurable Vertical or Horizontal Displacer**—Displacer may be adjusted in the field for vertical or horizontal operation without additional parts.
- **Field Technician Friendly**—The sensor can be easily disassembled to inspect or replace process seals. The controller, with no repairable or replaceable parts, is easily replaced in the field.
- **NACE Service Ready**—Standard construction uses materials that comply with the requirements of NACE MR0175-2002.
- **CL1500 Pressure Rating**—Sensor assembly is designed and specified for ASME B16.34 CL1500 service when using a Polyvinylchloride (PVC) displacer. For PED (97/23/EC) maximum pressure is limited to 200 bar (2900 psig).

Specifications

Available Configurations

Controller: On/Off electric control action with intuitive Zero and Span Adjustments in SPDT dry contact configuration
Sensor: Displacer-type liquid level sensor for mounting to side of vessel

Input

Type: Liquid level or liquid-to-liquid interface

Level Change Required for Full Change in State of Output: 5.0 to 305 mm (0.2 to 12 inches)

Vessel level differential gap (DG) is dependant on factors such as valve sizing, actuator speed, rate, liquid out flow, and vessel size. Contact your Emerson sales office or Local Business Partner for Fisher Electric Level Loop performance optimization

Specific Gravity Limits

Minimum SG: 0.15

Maximum SG
PVC Displacer: 1.3
SST Displacer: 1.1

Electrical Rating (Output)

■ easy-Drive actuator application: 7 mA@5 VDC
■ Other applications: 1 amp resistive, 0.5 amp inductive/28 VDC

Note: Use with easy-Drive after first being used in other high power application is not recommended.

Power Consumption

Switch consumes no power to operate, so it has no current leakage or voltage drop

Sensor to Vessel Connection

■ 2 NPT threaded or ■ NPS 2 CL150 through 1500 slip-on flange connection(1)

Controller Connection

Electrical 1/2-14 NPT external conduit connection with 18 inches of 18 AWG lead wires, located at the bottom of the case

Displacer Sizes

■ 48 X 305 mm, 541 cm^3 (1-7/8 X 12 inches, 33 in^3)
■ 76 X 152 mm, 688 cm^3 (3 X 6 inches, 42 in^3)

Maximum Displacer Rod Length(2), Horizontal or Vertical

1-7/8 x 12 Displacer with one 6-inch extension (optional use)
3 x 6 Displacer with one 3-inch extension (optional use)

Displacer Material and Maximum Sensor Working Pressure(3)

PVC Displacer: Consistent with CL1500 pressure temperature ratings per ASME B16.34 up to maximum pressure of 258.5 bar (3750 psig)
For PED (97/23/EC) maximum pressure limited to 200 bar (2900 psig)
S31603 SST Displacer: CL600 pressure temperature ratings per ASME B16.34 up to maximum pressure of 99.3 bar (1440 psig)

Note: For slip-on flange connection, maximum sensor working pressure must be consistent with the flange ratings

Operative Ambient Temperature Limits(3)

Controller: -40 to 75°C (-40 to 167°F)

Operative Process Temperature Limits(3)

Sensor:
■ PVC Displacer: -18 to 71°C (0 to 160°F)
■ S31603 SST Displacer: -40 to 204°C (-40 to 400°F)

Construction Materials

Controller:
Case and Cover: Marine grade aluminum
Switch: Stainless steel
Span Levers: Stainless steel
Springs: Stainless steel

Sensor:
Sensor Body: LCC
O-Rings: Fluorocarbon
Pivot Assembly: Stainless steel
Displacer: ■ Polyvinylchloride (PVC) or ■ S31603 SST
Sensor Spring: Stainless steel

Hazardous Area Classifications Available

Switch Only

cCSAus
Explosion-proof, Class I Division 1, Groups ABCD
Dust Ignition-proof Class II Division 1, Groups EFG
Dual Seal

-continued-

Specifications (continued)

Hazardous Area Classifications Available (continued)

Switch Only

ATEX Ex II 2 GD
Flameproof Ex d IIC T6 (Ta=-40°C to + 75°C)
Dust Ex tb IIIC T85°C Db IP6X (Ta = -40° to +75°C)
1 A Max

IECEx
Flameproof Ex d IIC T6 (Ta=-40°C to + 75°C)
Dust Ex tb IIIC T85°C Db IP6X (Ta = -40° to +75°C)
1 A Max

Other Classification/Certification Available

Switch Only

CUTR—Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

Canadian Registration (CRN)

The L2e utilizes the same sensor unit pressure component as the L2 pneumatic controller version. Refer to L2 CRN which is deemed applicable to the L2e.

Dimensions

Refer to figure 2

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Converting from a threaded NPT connection to a flange connection is to be done by the end-user. Refer to Converting a Threaded NPT Connection to a Flange Connection instruction Manual Supplement (D103277X012), available at Fisher.com or from your Emerson sales office or Local Business Partner.
2. Maximum span setting with 1-7/8 x 12 inch horizontal displacer plus 6 inch extension is not recommended due to potentially insufficient zero adjustment.
3. The pressure and temperature limits in this document and any applicable code limitations should not be exceeded.

Figure 1. Electric Level Loop Solutions

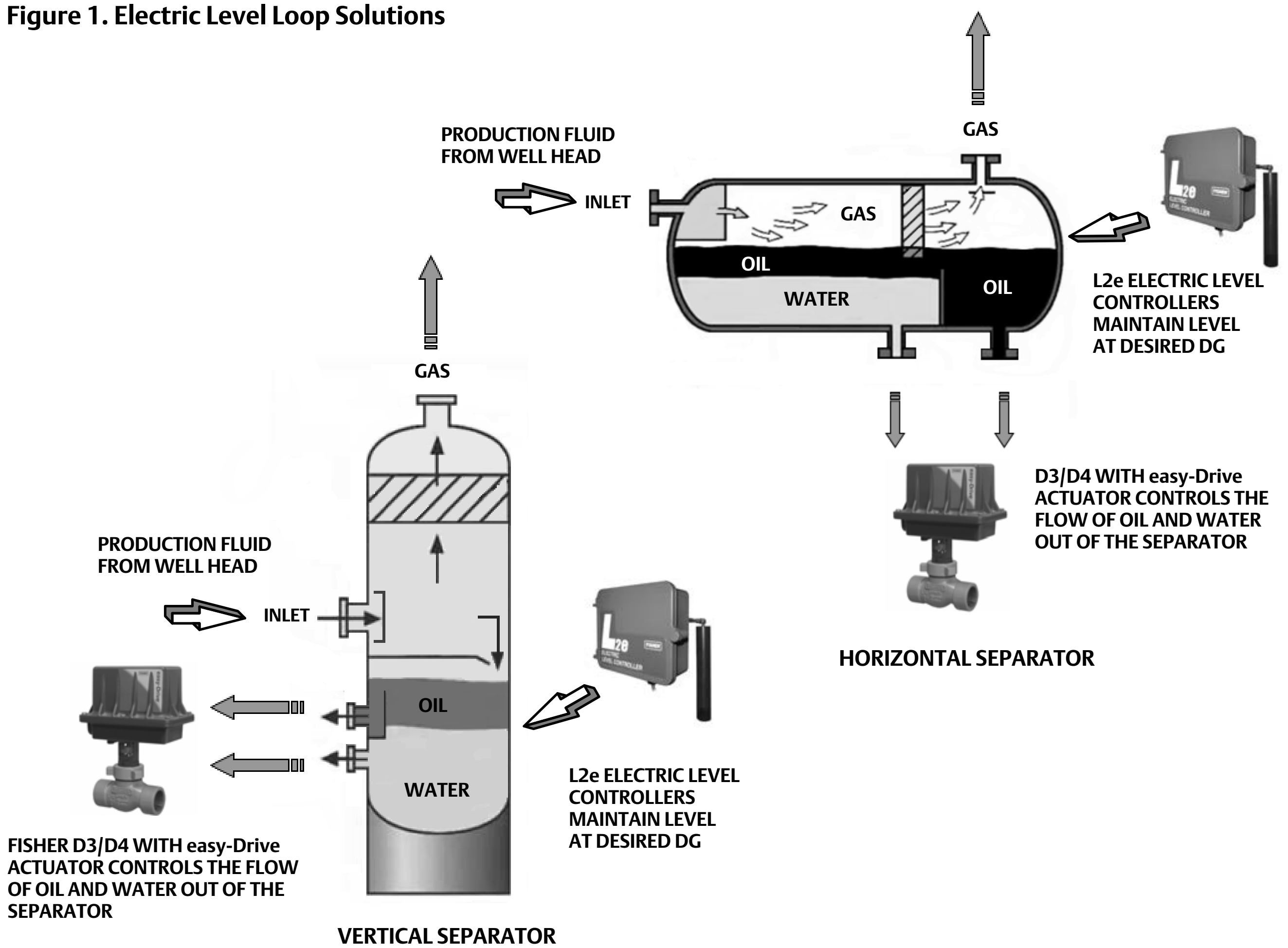
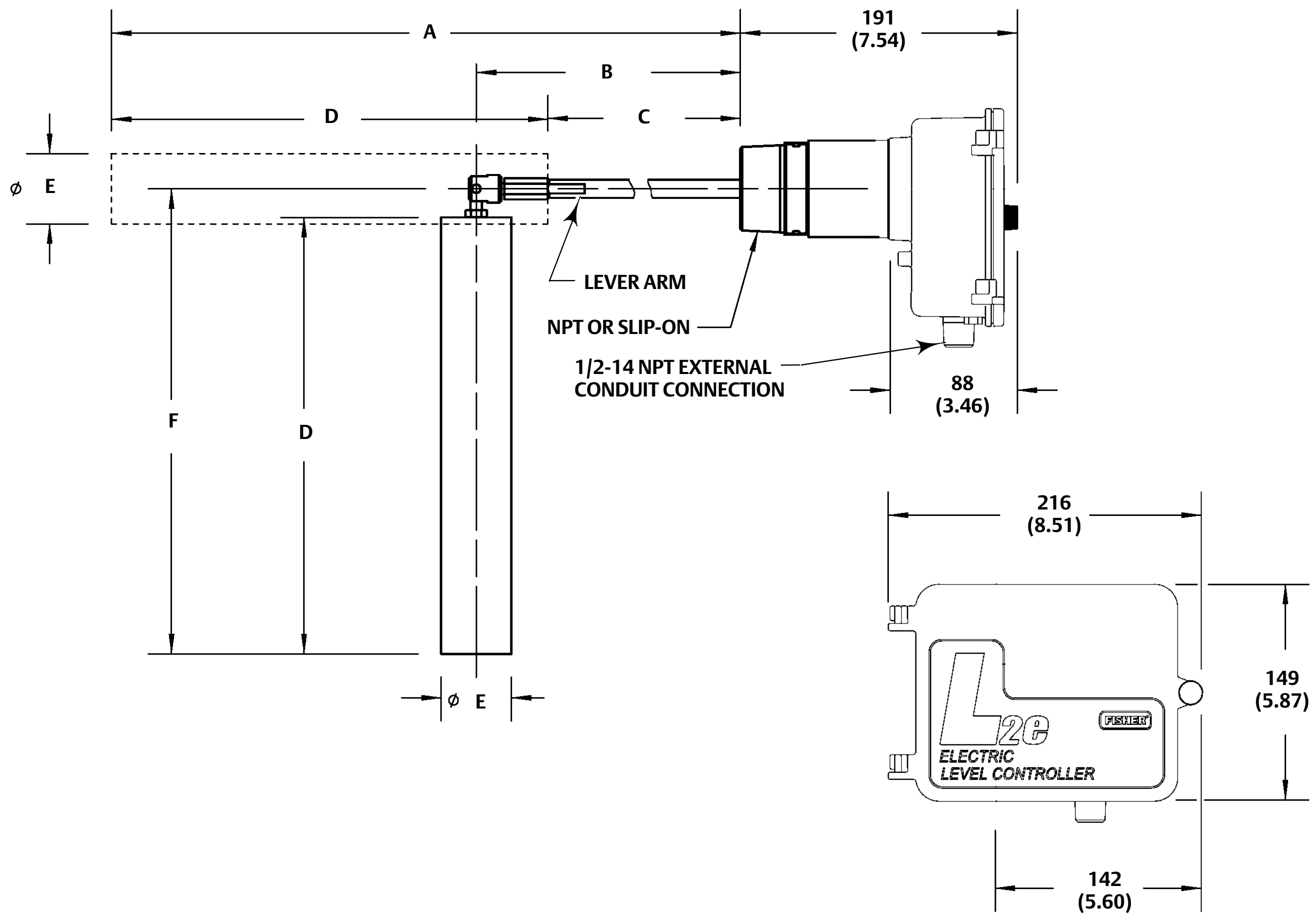


Figure 2. Dimensions



Sensor Configuration with Optional Extensions	A	B	C	D	E	F
	mm (Inch)					
1-7/8 x 12 PVC Displacer with one 6-inch Extension	589 (23.19)	335 (13.19)	287 (11.31)	302 (11.88)	48 (1.88)	318 (12.50)
3 x 6 PVC Displacer with one 3-inch Extension	363.4 (14.31)	258.7 (10.19)	211 (8.31)	152.4 (6.00)	76.2 (3.00)	168.1 (6.62)

mm
(INCH)

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EMERSON

Fisher™ *L2sj* Low Emission Liquid Level Controller

The rugged Fisher *L2sj* low emission liquid level controller uses a displacer type sensor to detect liquid level. This controller features a rugged, low emission proportional relay with integral action. The device delivers a direct acting on/off pneumatic output signal to a control/dump valve.

Features

- **Designed for use with Natural Gas**—The *L2sj* controller is intended for use with natural gas as the pneumatic supply.
- **Increased Revenue**—Reduced emissions result in an increase in natural gas available to the sales line.
- **Reduced Operating Costs**—Integral action relay with rugged metal seats requires less maintenance and provides more dependable liquid level control, which can improve uptime.
- **Reduced Carbon Footprint**—A low-bleed relay helps to conserve natural gas to reduce greenhouse gas emissions. The relay provides a steady state consumption rate that is less than the 6 scfh requirement set for the oil and gas industry by the US Environmental Protection Agency (New Source Performance Standards Subpart OOOO, EPA-HQ-QAR-2010-0505).
- **NACE Service Ready**—Sensor and vessel connection complies with the requirements of NACE MR0175-2002.
- **Ease of Field Setup**—Simplified dry and wet setup and adjustments. Setup and Adjustments illustrated inside L2sj cover as shown in figure 6.
- **Field-Configurable Vertical or Horizontal Displacer**—Displacer may be adjusted in the field for vertical or horizontal operation without additional parts.
- **Vibration Resistant Sensor Dynamics**— O-Ring friction and process pressure sensitivity are minimal. Performance stays constant with process pressure changes and controller remains vibration resistant.
- **Low Supply Pressure**—Can operate down to 0.34 bar (5 psi) instrument supply pressure for coal seam applications.

Specifications

Available Configuration

Controller: On/Off / Direct Acting
Sensor: Displacer-type liquid level sensor for mounting to side of vessel.

Input Signal

Liquid Level (gas over liquid)

Liquid Level Span(1)

See table 1

Minimum Specific Gravity

3 x 6 inch displacer: 0.6
1-7/8 x 12 inch displacer: 0.75

Output Signal

Control: Pneumatic On/Off
Range: 0 psi (off) or full supply pressure (on)
Action: Direct acting (increasing level increases output signal)

Supply Pressure Requirements

Any desired pressure between 0.34 and 2.4 bar (5 and 35 psig).

Supply Medium

Air or Natural Gas

Steady-State Air Consumption(2)

< 0.01 normal m^3/hr (< 0.3 scfh) at 1.4 bar (20 psig) supply pressure

Sensor to Vessel Connection

■ 2 NPT threaded or ■ NPS 2 CL150 through 1500 slip-on flange connection

Controller Connections

Supply: 1/4 NPT internal located on the bottom of the case
Output: 1/4 NPT internal located on the top of the case

Case Vent: 1/4 NPT internal with vent screen assembly located on the back of the case

Displacer Size

■ 48 x 305 mm, 541 cm^3 (1-7/8 x 12 inches, 33 in^3)(3) or ■ 76 x 152 mm, 688 cm^3 (3 x 6 inches, 42 in^3)(4)

Displacer Insertion Length

See figure 7 and 8

Maximum Sensor Working Pressure(5)

PVC Displacer Consistent with CL1500 pressure temperature ratings per ASME B16.34 up to maximum pressure of 258.5 bar (3750 psig)
For PED (97/23/EC) maximum pressure limited to 200 bar (2900 psig)

S31603 SST Displacer: CL600 pressure temperature ratings per ASME B16.34 up to maximum pressure of 99.3 bar (1440 psig)

Note: For slip-on flange connection, maximum sensor working pressure must be consistent with the flange ratings

Sensor Temperature Limits(5)

PVC Displacer: -29 to 79°C (-20 to 175°F)

S31603 SST Displacer: -40 to 204°C (-40 to 400°F)

Operative Ambient Temperature Limits(5)

Controller: -29 to 71°C (-20 to 160°F)

Standard Supply, and Output Pressure Gauge Indications

Triple scale gauges in 0 to 60 psig / 0 to 0.4 MPa / 0 to 4.0 bar

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

CE Ex II 2 G D

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

Ex II Gb c T*X
III Db c T*X EAC

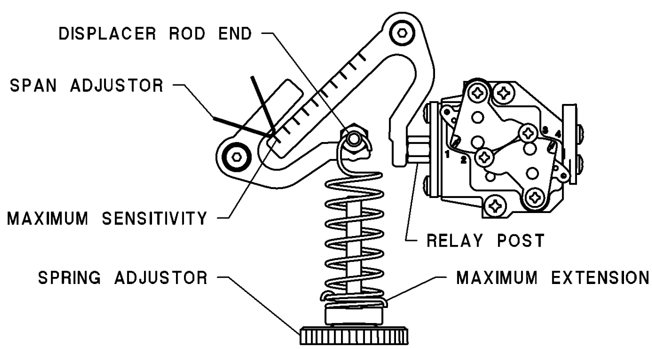
NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Level change required for full change in output signal.
2. Normal m^3/hr - Normal cubic meters per hour (0°C and 1.01325 bar, absolute) Scfh - Standard cubic feet per hour (60°F and 14.7 psia).
3. Supplied with one 6 inch extension.
4. Supplied with one 3 inch extension.
5. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.

Table 1. Liquid Level Span

SENSOR	SPECIFIC GRAVITY OF LIQUID		
	0.6	**0.75**	**1**
Vertical Displacer	**Span, mm (Inch)**		
1-7/8 x 12 inch Displacer with 6 inch extension	n/a	135 (5.3)	102 (4.0)
3 x 6 inch Displacer 3 inch extension	57 (2.25)	46 (1.8)	35 (1.35)
Horizontal Displacer	**Span, mm (Inch)**		
3 x 6 inch Displacer with 3 inch extension	22 (0.85)	17 (0.67)	13 (0.5)

Notes
1. Level change required for full change in output signal.
2. Span adjuster set for maximum sensitivity.
3. 1.4 bar (20 psig) supply pressure.
4. For vessels with fast dump cycles, actual liquid span will be larger

Figure 6. Setup and Adjustments Label (Inside Fisher L2sj Cover)



SETUP AND ADJUSTMENTS

DRY DISPLACER SETUP

1. SET SUPPLY PRESSURE TO 25 PSIG.
2. SET SPAN ADJUSTOR TO THE MAXIMUM SENSITIVITY.
3. TURN SPRING ADJUSTOR TO TIGHTEN THE SPRING TO IT'S MAXIMUM EXTENSION.
   IF THE OUTPUT PRESSURE RISES, LOOSEN THE SPRING UNTIL THE OUTPUT PRESSURE EXHAUSTS TO 0 PSIG.
4. CHECK THE SETUP:
   A. PRESS DOWN FIRMLY ON THE DISPLACER ROD END AND OBSERVE THE AMOUNT OF TIME IT TAKES FOR THE OUTPUT PRESSURE TO REACH SUPPLY PRESSURE.
   B. SLOWLY RELEASE THE DISPLACER ROD AND OBSERVE THE AMOUNT OF TIME IT TAKES FOR THE OUTPUT PRESSURE TO EXHAUST TO 0 PSIG.
   C. THE TIME OBSERVED IN STEP A SHOULD EQUAL THE TIME IN STEP B. IF NOT, LOOSEN THE SPRING FOR QUICKER EXHAUST ACTION.

WET DISPLACER ADJUSTMENTS

- TO RAISE THE POSITION WHERE THE L2sj CATCHES A RISING LEVEL, LOOSEN THE SPRING.
- TO LOWER THE POSITION WHERE THE L2sj CATCHES A RISING LEVEL, TIGHTEN THE SPRING.
  IF THE SPRING IS AT IT'S MAXIMUM EXTENSION, EXTEND THE RELAY POST SLIGHTLY.
- TO INCREASE THE LEVEL SPAN, DECREASE THE SENSITIVITY BY SLIDING THE SPAN ADJUSTOR TO THE RIGHT.

NOTE: ALWAYS OBSERVE ONE OR MORE DUMP CYCLES TO VERIFY L2sj SETTINGS AND ADJUSTMENTS.

GE16844

Figure 7. Dimensions: 76 x 152 mm (3 x 6 inches) with 76 mm (3 Inch) Extension

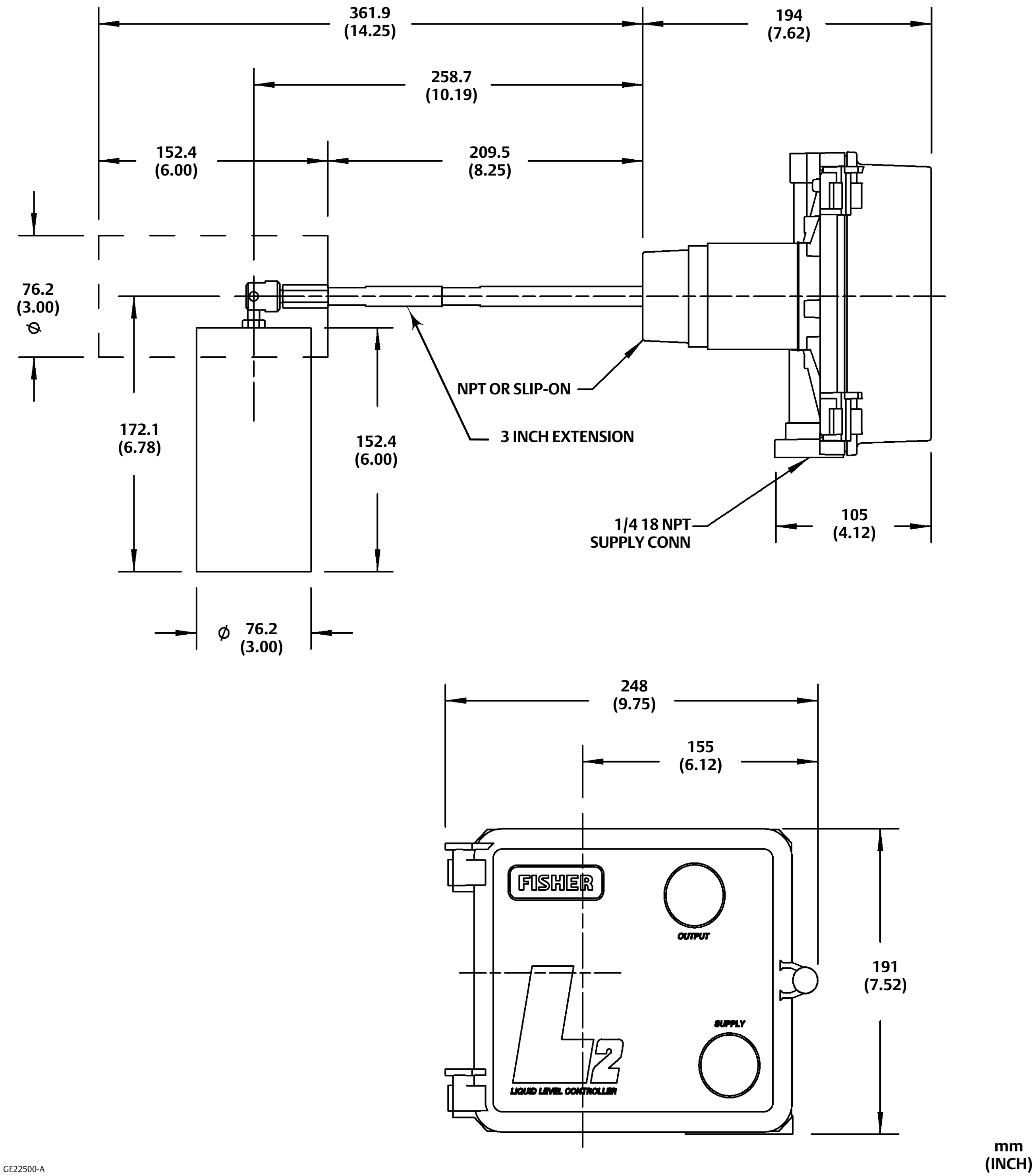
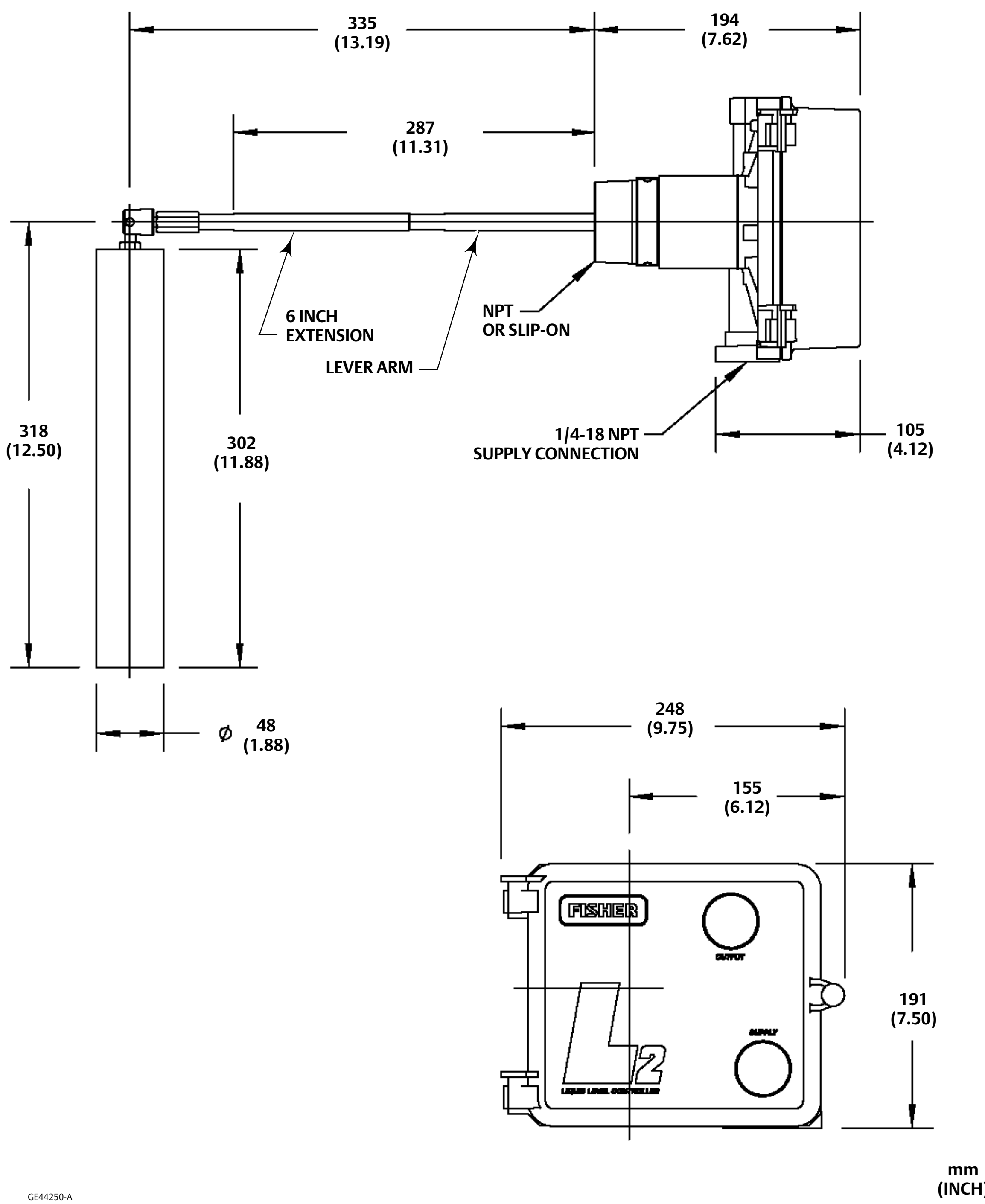


Figure 8. Dimensions: 48 x 305 mm (1-7/8 x 12 inches) with 152 mm (6 Inch) Extension



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Fisher™ 2506 and 2516 Receiver-Controllers

The 2506 receiver-controller takes the input from a pneumatic transmitter, matches it against the adjustable set point, and provides a proportional pneumatic output to a control valve actuator. The 2506 receiver-controller may be used in conjunction with a remote receiving indicator or recorder also using the output from the transmitter.

The 2516 receiver-controller has both proportional band and reset control. The reset adjustment efficiently brings the set point back to its original position.

Features

- Easy Maintenance—Simple design of the receiver-controller allows fast, easy maintenance and minimal spare parts inventory.
- Easy Adjustment—Proportional band and reset adjustment is accomplished quickly and without special tools. The control set point is manually adjustable in the case or through remote air loading (figures 2 and 3).
- Application Versatility—Reset may be added to a receiver-controller originally furnished without it.
- Mounting Versatility—2506 and 2516 receiver-controllers may be attached to the casing or yoke of a control valve actuator, or placed anywhere between the transmitter and valve.
- Stable Control—A pressure balanced relay provides intermittent bleed and gives accurate, stable control. The addition of reset action on the 2516 unit offers drift compensation, yet provides smooth, stable control.
- Easy Reversibility—2506 and 2516 receiver-controllers may be changed from direct to reverse action, or vice-versa, by simply repositioning the reversing switch.

W4687

FISHER 2506 RECEIVER-CONTROLLER

W4688

FISHER 2516 RECEIVER-CONTROLLER

Specifications

Available Configurations

For additional information, refer to table 2
2506: A receiver-controller that is set for either proportional or snap action (S) control or is set for either direct or reverse (R) action
2516: A 2506 that also provides proportional-plus-reset control
2516F: A 2516 that also provides anti-reset windup control

Input Signal

■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)

Output Signal(1)

See table 1

Output Action

Direct Action: An increasing fluid, interface level, or density increases output pressure or,
Reverse Action: An increasing fluid, interface level, or density decreases output pressure

Remote Set Point Signal

From a control device, provide a remote set point signal that is 0.2 to 1.0 bar (3 to 15 psig) or 0.4 to 2.0 bar (6 to 30 psig) that matches the receiver-controller input signal range

Supply Pressure(2)

Normal Operating Pressure: See table 1
Maximum Pressure to Prevent Internal Part Rupture(1): 3.4 bar (50 psig)

Steady State Air Consumption

See figure 1

Proportional Band, Reset, and Anti-Reset Windup

See table 2

Performance

Hysteresis: 0.6 percent of output pressure change at 100 percent of proportional band, or differential gap

Standard Supply and Output Pressure Gauge Indications

See table 1

Standard Tubing Connections

1/4 NPT internal

Operative Ambient Temperature Limits(2)

Standard: -40 and 71°C (-40 and 160°F)
High Temperature: -18 and 104°C (0 and 220°F)

Hazardous Area Classification

2506/2516 receiver-controllers comply with the requirements of ATEX Group II Category 2 Gas and Dust

CE Ex II 2 G D   Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T4, T5, T6
Dust: T85...T104

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

Ex II Gb c T*X
III Db c T*X EAC

Construction Materials

Case and Cover: Die-cast aluminum
Flapper: K93600 nickel alloy
Bellows: ■ Bronze (standard) or ■ stainless steel (optional)
Nozzle: C36000 (Brass)
Proportional Band Valve Body, Seat, and Plug: Brass
Gaskets: ■ Chloroprene (standard) or ■ silicone (high temperature)
Relay Body: Aluminum/brass
Relay Valve Plug and Seats: Brass
Relay Diaphragm: ■ Nitrile (standard) or ■ polyacrylate (high temperature)
Reset Valve Body, if Used: Die-case zinc
Reset Valve Plug and Seat Ring, if Used: 18-8 stainless steel

-continued-

Specifications (continued)

Approximate Weight

4.53 kg (10 pounds)

Dimensions

Refer to figure 5

Options

■ Reverse action; ■ Instrument pressure gauge; ■ stainless steel bellows; Gauge markings in ■ bar, ■ kg/cm^2, ■ kPa, or ■ Psig/kPa; and ■ High temperature gasket and relay materials

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Either direct or reverse acting.
2. The pressure/temperature limits in this document and any other applicable standard or code limitation should not be exceeded.

Table 1. Supply Pressure Data

OUTPUT SIGNAL	STANDARD SUPPLY AND OUTPUT PRESSURE GAUGE INDICATIONS(1)	NORMAL OPERATING SUPPLY PRESSURE(2)	
		Bar	Psig
0.2 to 1.0 bar (3 to 15 psig)	0 to 30 psig	1.5	20
0.4 to 2.0 bar (6 to 30 psig)	0 to 60 psig	2.4	35

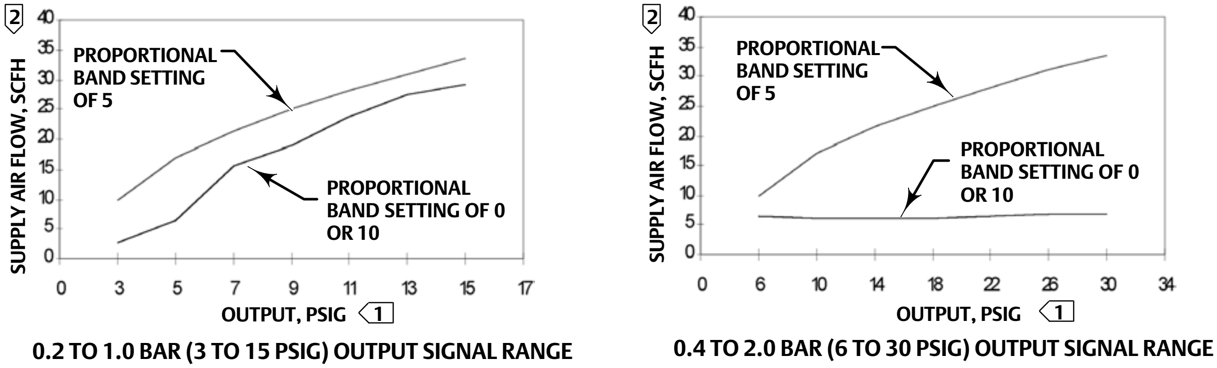
1. Consult your Emerson sales office about gauges in other units.
2. Control and stability may be impaired if this pressure is exceeded.

Table 2. Additional Information

Control Mode(1)	Full Output Change Obtainable Over Output Of:	Output Signal
Proportional control (2506)	**Proportional Band:** Adjustable from 0 to 100% of transmitter signal.	0.2 to 1.0 bar (3 to 15 psig) or 0.4 to 2.0 bar (6 to 30 psig)
Snap action control (2506)	**Snap Action:** Control output is at 0 or 100% of input supply pressure. Switching depends on position of sensor and is adjustable.	0 to 1.4 bar (0 to 20 psig) or 0 to 2.4 bar (0 to 35 psig)
Proportional-plus-reset control (2516)	**Proportional Band:** Adjustable from 0 to 200% of transmitter signal. Recommended setting is from 20 to 200%. **Reset:** Adjustable from 0.01 to 74 minute per repeat with standard reset valve setting.	0.2 to 1.0 bar (3 to 15 psig) or 0.4 to 2.0 bar (6 to 30 psig)
Proportional-plus-reset with anti-reset windup (2516F)	**Proportional Band:** Adjustable from 0 to 200% of transmitter signal. Recommended setting is from 20 to 200%. **Reset:** Adjustable from 0.01 to 74 minute per repeat with standard reset valve setting. **Anti-Reset Windup:** Provides relief when output pressure falls or when output pressure rises depending on valve adjustment.	

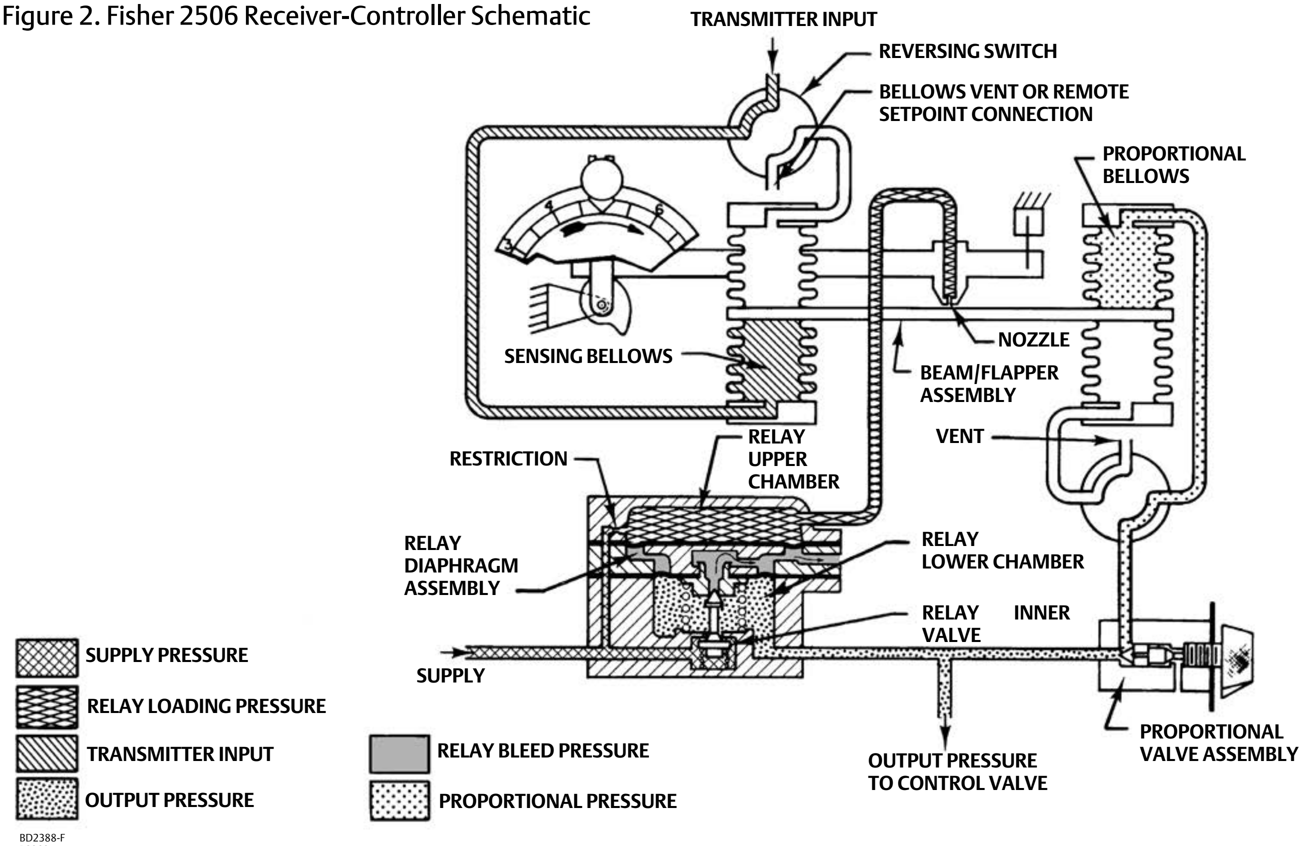
1. Proportional control is continuously active between 0 and 100 percent of the transmitter signal span. Differential gap provides snap action between 0 and 100 percent of the transmitter signal. Do not use reset controllers in snap action.

Figure 1. Steady-State Air Consumption



Notes
1 To convert psig to bar, multiply by 0.06895.
2 Scfh—standard cubic feet per hour (60°F and 14.7 psia). To convert to normal M³/hr—normal cubic meteres per hour (0°C and 1.01325 bar, absolute), multiply by 0.0268
A7242

Figure 2. Fisher 2506 Receiver-Controller Schematic



Principle of Operation

2506 Receiver-Controller

The principle of operation for the direct acting 2506 receiver-controller is illustrated in figure 2.

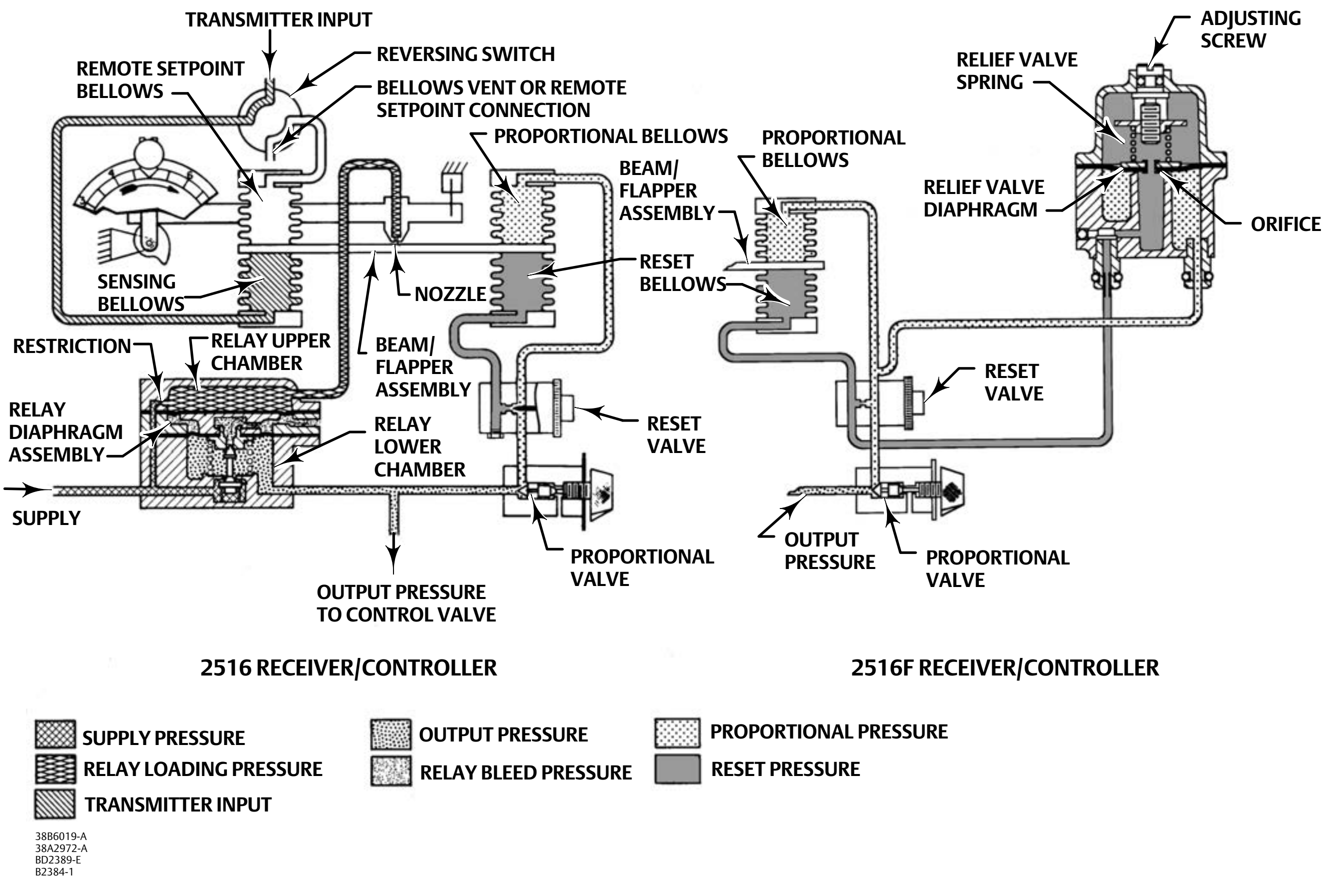
Supply pressure enters the inlet side of the relay and input pressure from the transmitter enters the reversing switch. Output pressure from the receiver-controller is delivered to the diaphragm of the control valve actuator.

As long as the transmitter input pressure and process level remain constant, the bellows beam remains motionless. This allows the supply pressure to bleed through the nozzle as fast as it enters the relay through the fixed restriction.

If there is an increase in pressure from the transmitter, pressure increases in the sensing bellows assembly, tending to push the beam toward the nozzle. This action builds up pressure in the relay's upper chamber as air continues to pass through the fixed restriction. The buildup of pressure in the upper chamber pushes the relay diaphragm assembly downward, opening the relay supply valve. Supply pressure then flows into the relay's lower chamber until the relay diaphragm assembly is pushed back to its original position and the relay valve is closed again. The increased pressure in the lower chamber is transmitted to the diaphragm of the control valve actuator.

At this same time, pressure in the proportional bellows assembly is being increased through the 3-way proportional valve assembly, which causes the beam to move away from the nozzle, thus stopping the pressure buildup in the relay's upper chamber. The receiver-controller is again in equilibrium with an increased input from the transmitter and an increased output to the diaphragm of the control valve actuator. If a decrease in transmitter input pressure occurs, the reverse of the above cycle takes place, with a decrease in output pressure.

Figure 3. Fisher 2516 Receiver-Controller Schematic



2516 Receiver-Controller

The principle of operation for the 2516 receiver-controller is the same as the 2506 receiver-controller, but includes a reset adjustment. Refer to figure 3.

Note from the principle of operation of the 2506 receiver-controller that an increase in pressure from the transmitter increases the pressure in the sensing bellows, moves the beam toward the nozzle, increases the pressure to the control valve, and at the same time increases the pressure through the proportional valve to the proportional bellows, thus stopping the pressure buildup to the control valve.

With the 2516 receiver-controller, the pressure in the line leading to the proportional bellows slowly passes through the reset valve and builds up the pressure in the reset bellows. Pressure buildup in the reset bellows pushes the beam toward the

nozzle, again increasing the pressure throughout the system to the control valve actuator and proportional bellows. Increased pressure to the control valve actuator increases pressure through the reset valve to the reset bellows and starts another increase in the pressure throughout the system and to the control valve. This pressure buildup in the system continues until the pressure from the transmitter is decreased and the system is brought back to the set point.

If a change in the system causes a decrease in outlet pressure, the reverse of the above cycle takes place.

The above pressure changes are simultaneous and are described above as a step-by-step sequence for explanation purposes only.

The reset adjustment dial on the 2516 receiver-controller is calibrated in minutes per repeat. This is the time in minutes required for the reset action to produce a quantity correction which is equal to the correction produced by proportional control action. In other words, this is the time in minutes required for the controller to increase its output pressure by an amount equal to previous proportional increase caused by a change in control conditions.

2516F Receiver-Controller

During a prolonged difference between set point and the controlled variable, such as encountered with intermittent control applications (e.g., batch temperature control or wide open monitors on pressure control), reset ramps the controller output to either zero or full supply pressure; this condition is reset windup. When the controlled variable crosses the set point, there will be a delay before the controller output responds to the change in controlled variable. Anti-reset windup minimizes this delay and permits returning the controlled variable to set point more quickly with minimal overshoot.

The 2516 receiver-controller also has an anti-reset windup relief valve (2516F). Refer to figure 3. This valve provides differential pressure relief to prevent proportional pressure from exceeding reset pressure by more than a set value. The valve consists of two pressure chambers separated by a spring-loaded diaphragm. Reset pressure registers on the spring side of the diaphragm and proportional pressure registers on the other side. As long as controlled pressure changes are slow enough for normal proportional and reset action, the relief valve spring will keep the relief valve diaphragm from opening. However, a large or rapid increase in controller pressure will cause the relay to increase loading pressure to the control device. The increase in controller pressure also causes the pressure to increase in the proportional system and on the proportional side of the relief valve diaphragm. If this increase is greater than the relief valve spring setting, the relief diaphragm moves off the orifice in the differential relief valve. This allows the pressure on the proportional side of the diaphragm to bleed into the reset system. This action provides quick relief of excessive proportional pressure and reduces the time required by the system to return to the control point. A user can reverse the differential relief action to relieve on decreasing output pressure.

Installation

Figure 4 illustrates the installation of a 2506 or 2516 receiver-controller on a Fisher 2500 transmitter. In this case, the receiver-controller input connection and the supply pressure connection are made at the factory. To complete the installation, a 1/4-inch line is run from the connection marked on the back of the receiver-controller case (figure 5) to the connection on the diaphragm case of the actuator.

Figure 6 illustrates the mounting of the 2506 or 2516 receiver-controller on the yoke of an actuator. In this case, the diaphragm connection is made at the factory. The supply pressure line should be connected to the 1/4 NPT INPUT connection of the regulator, if used, mounted on the yoke of the actuator. Also, a 1/4-inch line is run from the INSTRUMENT connection on the back of the receiver-controller case (figure 5) to the OUTPUT connection of the transmitter.

Figure 5 illustrates the dimensions for the 2506 and 2516 receiver-controller.

Ordering Information

When ordering, specify:

Application

1. Description of the service, such as throttling or on-off

2. Pressure range, composition, and temperature of the process fluid

3. Ambient temperature

Construction

Refer to the specifications. Carefully review each specification, indicating your choice whenever a selection is to be made.

Figure 4. Receiver-Controller Mounted on a Fisher 2500 Controller/Transmitter

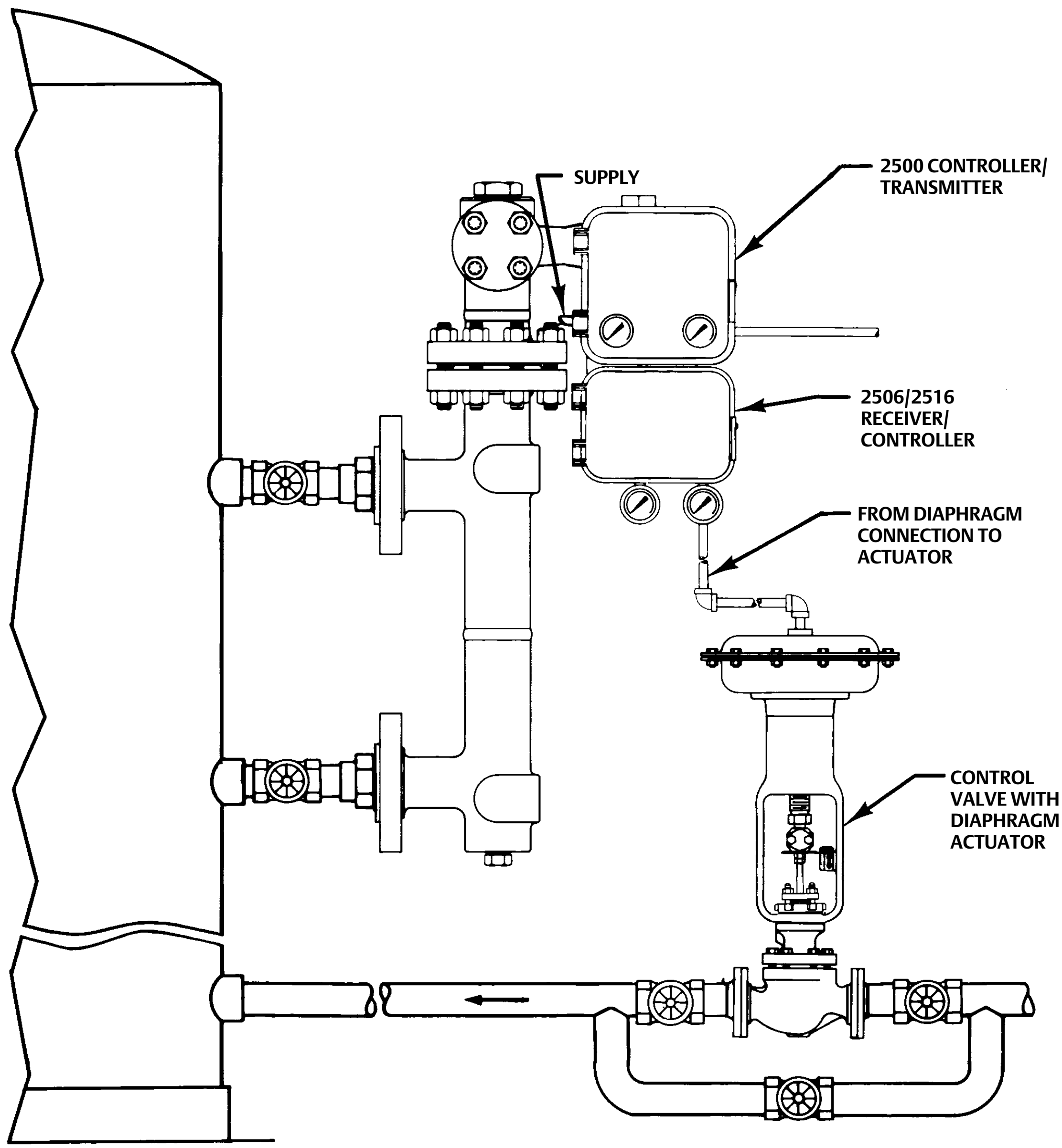


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Figure 5. Dimensions

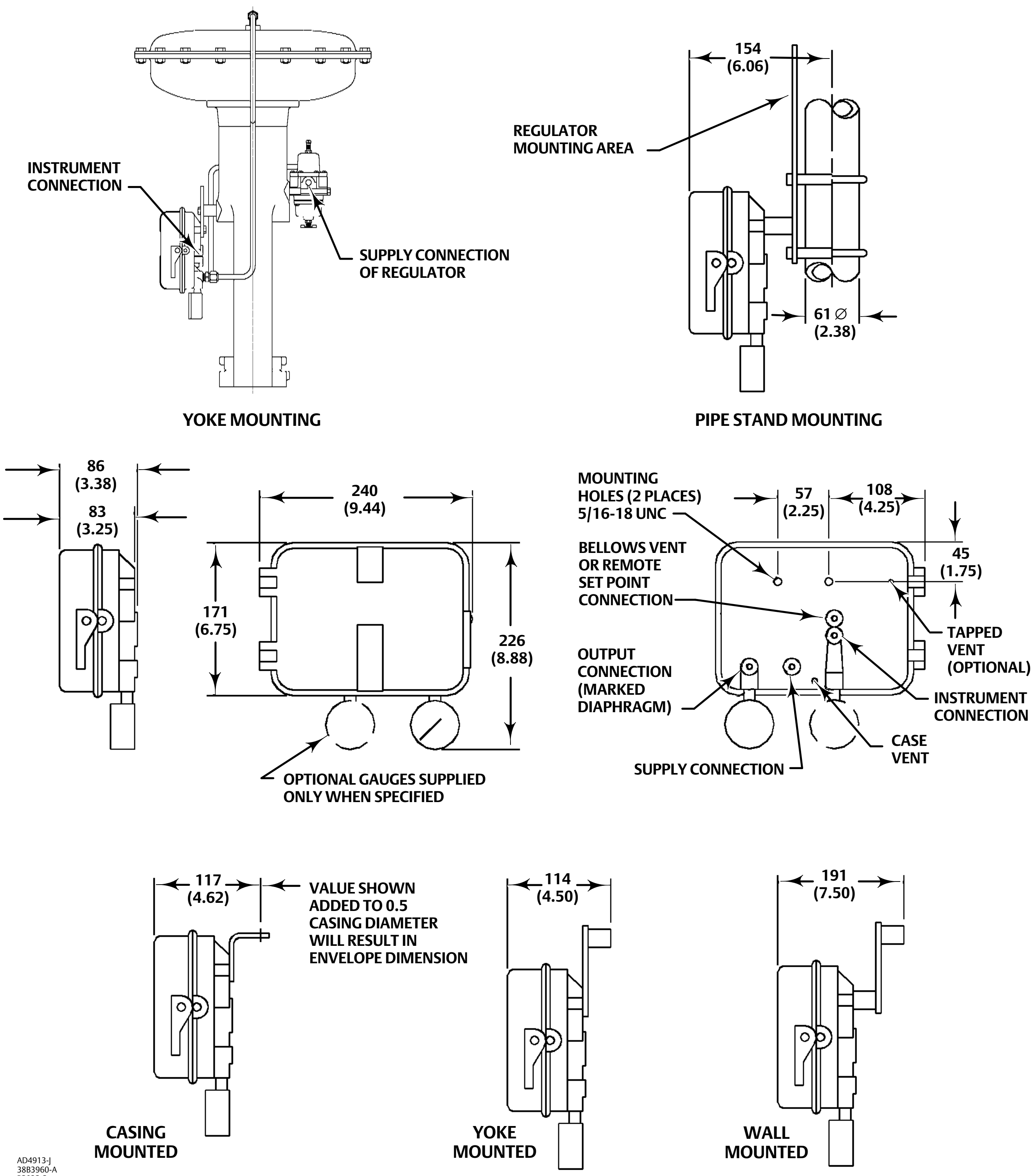
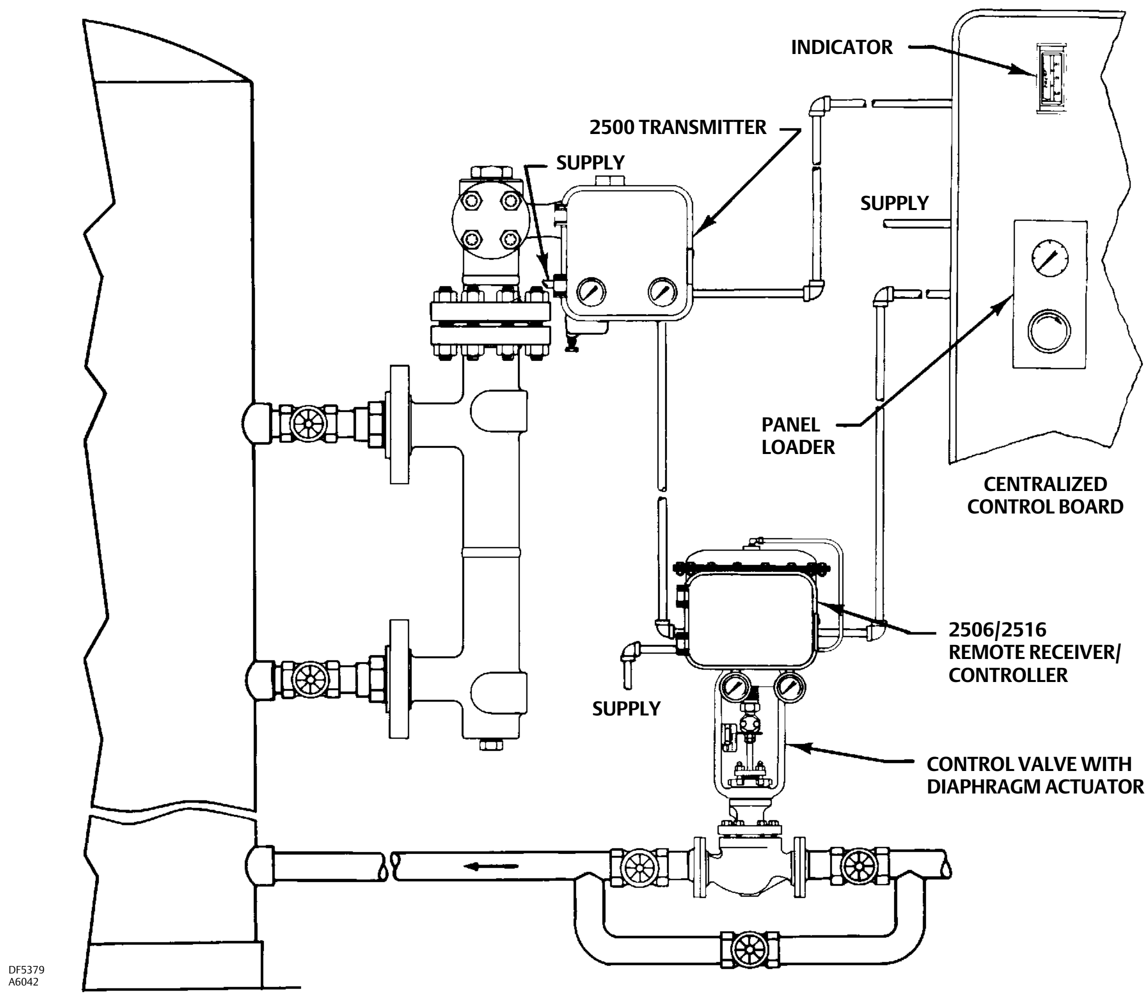


Figure 6. Receiver-Controller Mounted on the Actuator Yoke



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Fisher™ C1 Pneumatic Controllers and Transmitters

Fisher C1 controllers and transmitters continue the tradition of durable and dependable Fisher pressure instrumentation while addressing air/gas consumption concerns. The C1 is used wherever durable and dependable pressure instrumentation is required. The use of this product in demanding applications, such as those found in chemical process, gas, and oil production industries, demonstrates its versatility. The C1 can reduce steady-state air/gas consumption to as little as 1/10th that of previous products.

C1 controllers compare sensed process pressure (or differential pressure) with an operator-adjusted set point, and send a pneumatic signal to an adjacent control element that maintains the process pressure at or near the set point value. C1 transmitters sense process variables and send out a pneumatic signal, usually to an indicating or recording device that directly indicates the process measurement.

Unless otherwise noted, all NACE references are to NACE MR0175 / ISO15156 & NACE MR0103.

FISHER C1 PNEUMATIC CONTROLLER
YOKE-MOUNTED ON CONTROL VALVE ACTUATOR

W9263-1

Features

- **Wide Range of Sensing Elements**—A Bourdon tube is available for high pressures or bellows for vacuum and low pressures. Either kind of sensing element can be installed in the case with the controller or transmitter. Two interchangeable ranges of output bellows and gauges also are available.

- **Reduced Air/Gas Consumption**—The C1 pneumatic controller is an energy efficient choice, helping to improve profits and uptime. Steady-state consumption rate is less than the 6 scfh requirement set for the oil and gas industry by the US Environmental Protection Agency (New Source Performance Standards Subpart OOOO, EPA-HQ-QAR-2010-0505).

- **Sour Service Capability**—Materials are available for applications handling sour process fluids. These constructions comply with the metallurgical requirements of NACE MR0175 / ISO15156 & NACE MR0103. Environmental restrictions may apply.

- **Mounting Versatility**—Install the case on a panel, wall or pipestand, as well as directly on the control valve actuator.

- **Reduced Maintenance Costs**—A spring-out cleaning wire, shown in figure 4, provides for in-service cleaning of the relay orifice.

- **Proportional-Only, Proportional-Plus-Reset, and Differential Gap Configurable**—The C1 controller can be configured to provide various modes of control.

(Features continued on page 3)

Specifications

Available Configurations

See table 1

Input Signal

Pressure

Type: ■ Gauge pressure, ■ vacuum, ■ compound pressure, or ■ differential pressure of a liquid or gas
Limits: See table 2 or 3

Output Signal

Proportional or Proportional-Plus-Reset Controllers and Transmitters: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig) pneumatic pressure signal
Differential Gap Controllers: ■ 0 and 1.4 bar (0 and 20 psig) or ■ 0 and 2.4 bar (0 and 35 psig) pneumatic pressure signal
Action: Control action is field reversible between ■ direct (increasing sensed pressure produces increasing output signal) and ■ reverse (increasing sensed pressure produces decreasing output signal).

Supply Pressure Requirements(1)

See table 4

Supply Pressure Medium

Air or Natural Gas

Supply medium must be clean, dry, and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1.

A maximum 40 micrometer particle size in the air system is acceptable. Further filtration down to 5 micrometer particle size is recommended. Lubricant content is not to exceed 1 ppm weight (w/w) or volume (v/v) basis. Condensation in the air supply should be minimized

Steady-State Air Consumption(2)(3)

0.2 to 1.0 bar (3 to 15 psig): 0.08 normal m^3/hour (3 scfh)
0.4 to 2.0 bar (6 to 30 psig): 0.12 normal m^3/hour (4.5 scfh)

Supply and Output Connections

1/4 NPT internal

Supply and Output Pressure Gauge Ranges

See table 5

Proportional Band Adjustment

For Proportional-Only Controllers: Full output pressure change adjustable from ■ 2% to 100% of the sensing element range for 0.2 to 1.0 bar (3 to 15 psig) or ■ 4% to 100% of the sensing element range for 0.4 to 2.0 bar (6 to 30 psig)

For Proportional-Plus-Reset Controllers: Full output pressure change adjustable from ■ 3% to 100% of the sensing element range for 0.2 to 1.0 bar (3 to 15 psig), or ■ 6% to 100% of the sensing element range for 0.4 to 2.0 bar (6 to 30 psig)

Differential Gap Adjustment

For Differential Gap Controllers: Full output pressure change adjustable from 15% to 100% of sensing element range

Reset Adjustment

For Proportional-Plus-Reset Controllers: Adjustable from 0.01 to 74 minutes per repeat (100 to 0.01 repeats per minute)

Zero Adjustment (Transmitters Only)

Continuously adjustable to position span of less than 100% anywhere within the sensing element range

Span Adjustment (Transmitters Only)

Full output pressure change adjustable from 6 to 100% of process sensing element range

Performance

Repeatability: 0.5% of sensing element range
Dead Band (Except Differential Gap Controllers(4)): 0.1% of sensing element range
Typical Frequency Response at 100% Proportional Band:
Output to Actuator: 0.7 Hz and 110 degree phase shift with 1850 cm^3 (113 $inches^3$) volume actuator at mid-stroke
Output to Positioner Bellows: 9 Hz and 130 degree phase shift with 0.2 to 1.0 bar (3 to 15 psig) output to 33 cm^3 (2 $inches^3$) bellows

-continued-

Specifications (continued)

Ambient Operating Temperature Limits[1]

■ **Standard Construction:** -40 to 71°C (-40 to 160°F)
■ **High Temperature Construction:** -18 to 104°C (0 to 220°F)

Anti-reset windup (differential pressure relief) and process pressure gauge options are only available in the standard construction

Typical Ambient Temperature Operating Influence

Proportional Control only: ±3.0% of output span for each 28°C (50°F) change in temperature between -40 and 71°C (-40 and 160°F) for a controller set at 100% proportional band
Reset Control only: ±2.0% of output span for each 28°C (50°F) change in temperature between -40 and 71°C (-40 and 160°F) for a controller set at 100% proportional band
Transmitters only: ±3.0% of output span for each 28°C (50°F) change in temperature between -40 and 71°C (-40 and 160°F) for a transmitter set at 100% span

Housing

Designed to NEMA 3 (Weatherproof) and IEC 529 IP54 Specifications

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D

Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T4, T5, T6
Dust: T85...T104

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

II Gb c T*X
III Db c T*X

Construction Materials

See tables 2, 3, and 6

Approximate Weight

8.2 kg (18 pounds)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure and temperature limits in this document, and any applicable standard or code limitation should not be exceeded.
2. Normal m^3/hr: normal cubic meters per hour (m^3/hr, 0°C and 1.01325 bar, absolute). Scfh: standard cubic feet per hour (ft^3/hr, 60°F and 14.7 psig).
3. To convert from air flow rate to natural gas flow rate multiply by 1.29.
4. An adjustable differential gap (differential gap controllers) is equivalent to an adjustable deadband.

Table 1. Available Configurations

DESCRIPTION[1]		AVAILABLE CONFIGURATIONS		
		Pressure		
		Bourdon Tube Sensing Element (Gauge Pressure Only)	Bellows Sensing Element	
			Gauge Pressure	Differential Pressure
Proportional controller		C1P	C1B	C1D
Proportional-plus-reset controller	Without anti-reset windup			
	With anti-reset windup			- - -
Differential-gap controller				- - -
Transmitter				C1D

1. See figure 4 and 5 for construction details.

Features (continued)

■ **Field Reversible**—Switch action from direct to reverse or vice versa without additional parts. As illustrated in figure 3, transfer the reversing block to the opposite side of the flapper, invert the proportional band assembly and change the feedback bellows tubing connections.

■ **Easy, More Accurate Adjustments**—Make pressure set point, proportional band, and reset changes with simple dial-knob controls that help to assure positive settings.

■ **Sensitive Response**—Area ratio of large relay diaphragm to small relay diaphragm permits small nozzle pressure changes to induce much greater output pressure changes.

Table 2. Bourdon Tube Pressure Ranges and Materials

PRESSURE RANGES(1)		MAXIMUM ALLOWABLE STATIC PRESSURE LIMITS(2)				MATERIAL(4)
		Standard		With Optional Travel Stop(3)		
Bar	Psig	Bar	Psig	Bar	Psig	
0 to 2.0	0 to 30	2.0	30	3.3	48	316 Stainless Steel
0 to 4.0	0 to 60	4.0	60	6.6	96	
0 to 7.0	0 to 100	7.0	100	11	160	
0 to 14	0 to 200	14	200	19	280	
0 to 20	0 to 300	20	300	29	420	
0 to 40	0 to 600	40	600	50	720	
0 to 70	0 to 1000	70	1000	83	1200	
0 to 100	0 to 1500	100	1500	115	1650	
0 to 200	0 to 3000	200	3000	230	3300	
0 to 350	0 to 5000	350	5000	380	5500	
0 to 550	0 to 8000	550	8000	550	8000	
0 to 700	0 to 10,000	700	10,000	700	10,000	

1. Range marked on Bourdon tube may be in kPa (1 bar = 100 kPa).
2. Bourdon tube may be pressured to limit shown without permanent zero shift.
3. With travel stop set at 110% of the range.
4. Bourdon tubes are also available in NACE compliant material. Contact your Emerson sales office for additional information.

Table 3. Bellows Pressure Ranges and Materials

PRESSURE RANGES			MAXIMUM ALLOWABLE STATIC PRESSURE LIMITS(1)			
			Brass Construction		Stainless Steel Construction	
			Bar	Psig	Bar	Psig
Gauge pressure	Vacuum	0 to 150 mbar (0 to 60 inch wc)	1.4	20	- - -	- - -
		0 to 340 mbar (0 to 10 inch Hg)	2.8	40	- - -	- - -
		0 to 1.0 bar (0 to 30 inch Hg)	2.8	40	6.9	100
	Compound pressure	75 mbar vac. to 75 mbar (30 inch wc vac. to 30 inch wc)	1.4	20	6.9	100
		500 mbar vac. to 500 mbar (15 inch Hg vac. to 7.5 psig)	2.8	40	6.9	100
		1.0 bar vac. to 1.0 bar (30 inch Hg vac. to 15 psig)	2.8	40	- - -	- - -
	Positive pressure	0 to 150 mbar (0 to 60 inch wc)	1.4	20	- - -	- - -
		0 to 250 mbar(2) (0 to 100 inch wc)	1.4	20	- - -	- - -
		0 to 350 mbar(3) (0 to 140 inch wc)	2.8	40	- - -	- - -
		0 to 0.35 bar (0 to 5 psig)	2.8	40	- - -	- - -
		0 to 0.5 bar (0 to 7.5 psig)	2.8	40	- - -	- - -
		0 to 0.7 bar (0 to 10 psig)	2.8	40	- - -	- - -
		0 to 1.0 bar (0 to 15 psig)	2.8	40	6.9	100
		0 to 1.4 bar (0 to 20 psig)	2.8	40	- - -	- - -
		0 to 2.0 bar (0 to 30 psig)	2.8	40	6.9	100
Differential pressure(4)		0 to 200 mbar (0 to 80 inch wc)	1.4	20	- - -	- - -
		0 to 0.7 bar (0 to 10 psi)	2.8	40	- - -	- - -
		0 to 1.4 bar (0 to 20 psi)	2.8	40	- - -	- - -
		0 to 2.0 bar (0 to 30 psi)	- - -	- - -	6.9	100

1. Bellows may be pressured to limit shown without permanent zero shift.
2. C1B transmitter only.
3. Except C1B transmitter.
4. The overrange limit for these sensing elements is a differential pressure equal to the maximum allowable static pressure limit.

Table 4. Supply Pressure Data

Output Signal		Normal Operating Supply Pressure(1)	Maximum Allowable Supply Pressure To Prevent Internal Part Damage(2)
Bar	0.2 to 1.0 or 0 and 1.4 (differential gap)	1.4	2.8
	0.4 to 2.0 or 0 and 2.4 (differential gap)	2.4	2.8
Psig	3 to 15 or 0 and 20 (differential gap)	20	40
	6 to 30 or 0 and 35 (differential gap)	35	40

1. If this pressure is exceeded, control may be impaired.
2. If this pressure is exceeded, damage to the controller may result.

Table 5. Supply and Output Pressure Gauge Ranges

Gauge Scale	0.2 to 1.0 Bar (3 to 15 Psig) or 0 and 1.4 Bar (0 and 20 Psig) Output	0.4 to 2.0 Bar (6 to 30 Psig) or 0 and 2.4 Bar (0 and 35 Psig) Output
Single	0 to 30 psig 0 to 2 kg/cm^2 0 to 200 kPa	0 to 60 psig 0 to 4 kg/cm^2 0 to 400 kPa
Dual	0 to 30 psig/0 to 200 kPa	0 to 60 psig/0 to 400 kPa
Triple	0 to 30 psig/0 to 2 kg/cm^2/0 to 2 bar	0 to 60 psig/0 to 4 kg/cm^2/0 to 4 bar

Table 6. Construction Materials

Part		Material
In contact with process	Bourdon tube	Stainless steel or NACE compliant N04400 nickel alloy(1)
	Sensing bellows	Brass or stainless steel
	Pressure block	Stainless steel or NACE compliant stainless steel(1)
	Control tubing (from pressure block to sensing element and to optional process pressure gauge)	Stainless steel or NACE compliant stainless steel(1)
In contact with operating medium	All other interior tubing	Stainless steel
	Exterior tubing	Copper (with or without PVC plastic lining), stainless steel, or synthetic rubber
	Exterior fittings	Brass or stainless steel
	Nozzle and reversing block	Zinc/stainless steel
	Relay springs and spring plate	Steel
	Relay diaphragms	Nitrile/nylon (standard) or polyacrylate/nylon (high-temperature)
	Other metal relay parts, proportional bellows, and exhaust/reset bellows	Aluminum/stainless steel
	Reset valve assembly and differential relief valve if used	Zinc/steel/ceramic
	O-rings	Nitrile (standard) or fluorocarbon (high-temperature)
	Gaskets	Chloroprene (standard) or silicone (high-temperature)
Other	Case and adjustment dial	Aluminum
	Cover	Aluminum, except glass for gauge windows
	Flapper	Stainless steel
	Control link	N04400 nickel alloy and/or stainless steel
	Flexure and pressure/ setting adjustment assemblies	Aluminum/steel/stainless steel/plastic
	Calibration adjustor	Zinc
	O-rings	Nitrile

1. NACE materials compliant with the latest versions of NACE MR0175/ISO 15156 and MR0103.

Principle of Operation

The pressure connections to the controller depend upon the type of pressure sensing, gauge or differential. Gauge pressure controllers use either a Bourdon tube or bellows as the sensing element. Differential pressure controllers use two bellows to sense differential pressure.

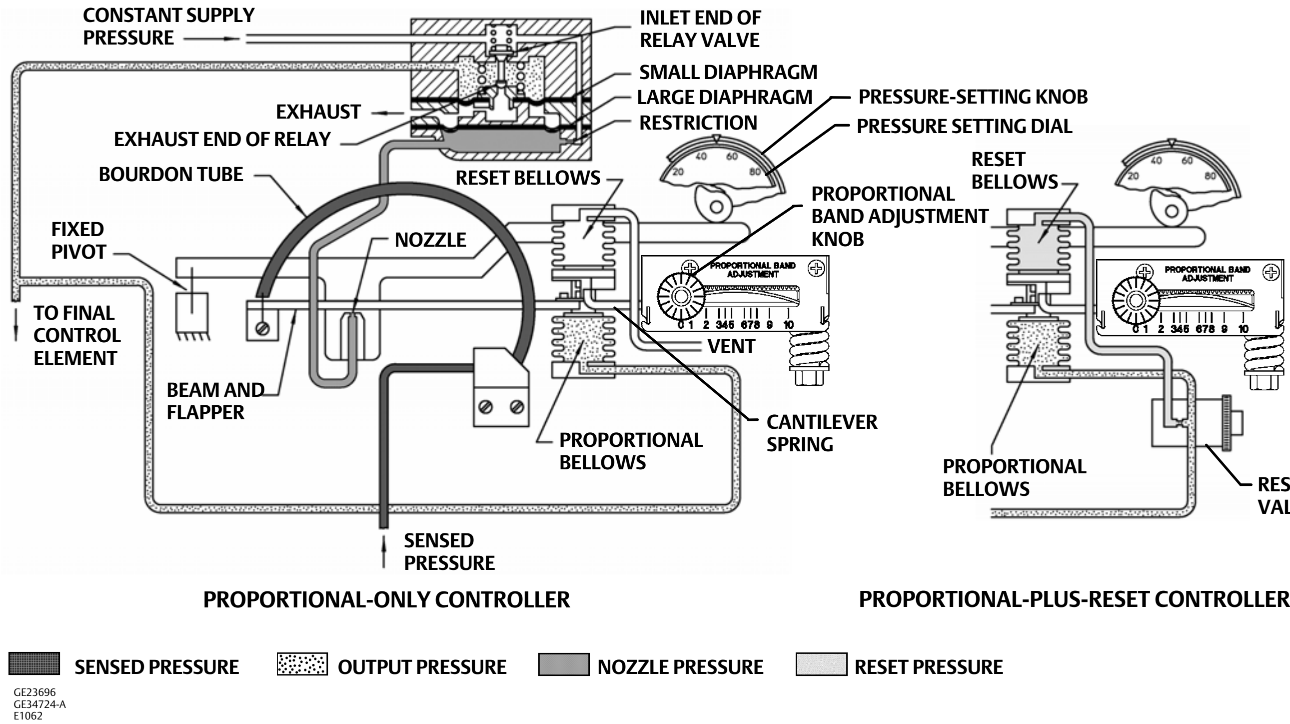
The key to C1 controller operation is the pressure-balanced relay with its yoked double-diaphragm assembly, shown in figure 1 or 2.

The relay is connected so that supply pressure bleeds through the fixed orifice before escaping through the nozzle. The nozzle pressure registers on the large relay diaphragm, and loading pressure (controller output) on the small relay diaphragm.

Steady-state sensed process pressure holds the Bourdon tube steady in relation to the nozzle. This allows pressure to escape between the nozzle and beam-flapper assembly at the same rate it bleeds through the orifice.

A change in the process pressure moves the beam and flapper with respect to the nozzle by either expanding or contracting the Bourdon tube arc. An increasing process pressure with direct action (or decreasing pressure with reverse action) produces a nozzle-flapper restriction that increases the loading on the large relay diaphragm. This causes the relay valve to close at the exhaust end and to open at the inlet end. Additional supply pressure flows through the relay chamber to increase the loading pressure on the

Figure 1. Schematic of Reverse-Acting Proportional-Only and Proportional-Plus-Reset Controllers



control valve actuator. A decreasing process pressure with direct action (or increasing pressure with reverse action) produces a nozzle-flapper opening that bleeds off pressure on the large relay diaphragm. This causes the relay valve inlet to close and the exhaust to open, thus exhausting loading pressure from the actuator.

Proportional-Only Controllers

The controller output pressure change feeds back to the proportional bellows, countering the pressure change in the nozzle and equalizing the relay diaphragm pressure differential. The relay valve maintains a new loading pressure according to the change in sensed pressure.

If the proportional band adjustment is at its maximum setting, the cantilever spring in the proportional band assembly has a low spring rate, allowing more feedback motion to be transferred from the proportional bellows for a change in output pressure. As the effective length of the cantilever is reduced, its spring rate increases, causing less feedback motion from proportional bellows. Setting the proportional band knob to its maximum results in a proportional band of 100%. The lower the proportional band adjustment, the shorter the effective length of the cantilever spring. The spring rate of the cantilever spring increases as its length shortens, allowing less motion to be transferred from the bellows to the beam and flapper for a given change in output pressure.

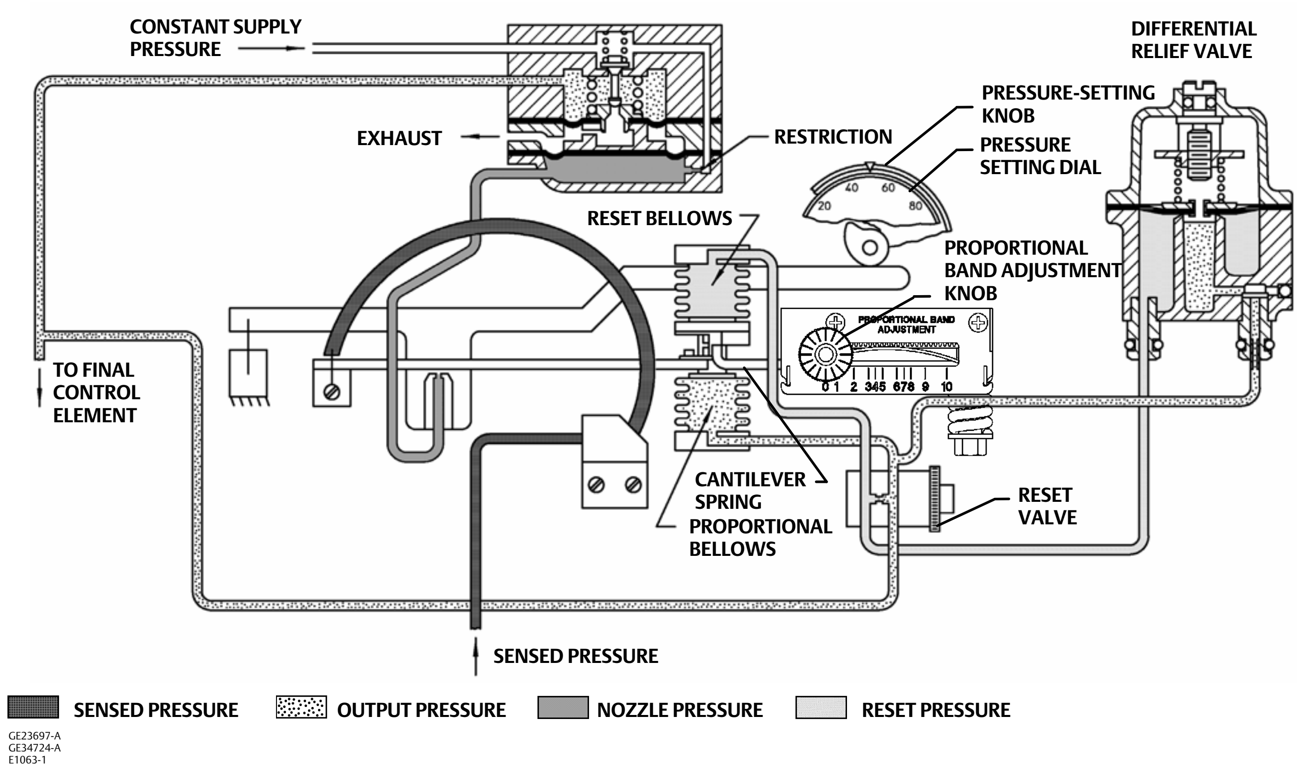
Proportional-Plus-Reset Controllers

Additionally, all proportional-plus-reset C1 controllers have a two-way reset restriction valve that channels proportional pressure into a reset bellows to oppose the proportional bellows action. The action of this reset pressure occurs on a delayed basis. The reset valve can be adjusted to vary the time of delay.

Anti-Reset Windup

C1 controllers with anti-reset windup have an adjustable and reversible differential relief valve to provide anti-reset windup. As shown in figure 2, the proportional pressure registers rapidly on the spring side of the relief valve diaphragm as well as in the proportional bellows. Reset pressure registers slowly on the opposite side of the relief valve diaphragm. As long as controller output pressure changes are slow enough for normal proportional and reset action, the relief valve spring keeps the relief valve diaphragm from opening. However, a large or rapid decrease in

Figure 2. Schematic of Reverse-Acting Proportional-Plus-Reset Controller with Anti-Reset Windup



controller output pressure causes the relay to rapidly exhaust loading pressure from the control element, and also from the proportional system and spring side of the relief diaphragm. If this decrease on the spring side of the diaphragm is greater than the relief valve spring setting, the diaphragm will move off the relief valve orifice and permit the reset pressure on the opposite side of the relief valve diaphragm to bleed rapidly into the proportional system. The anti-reset windup action also can be reversed to relieve with an increasing proportional pressure.

Differential Gap Controllers

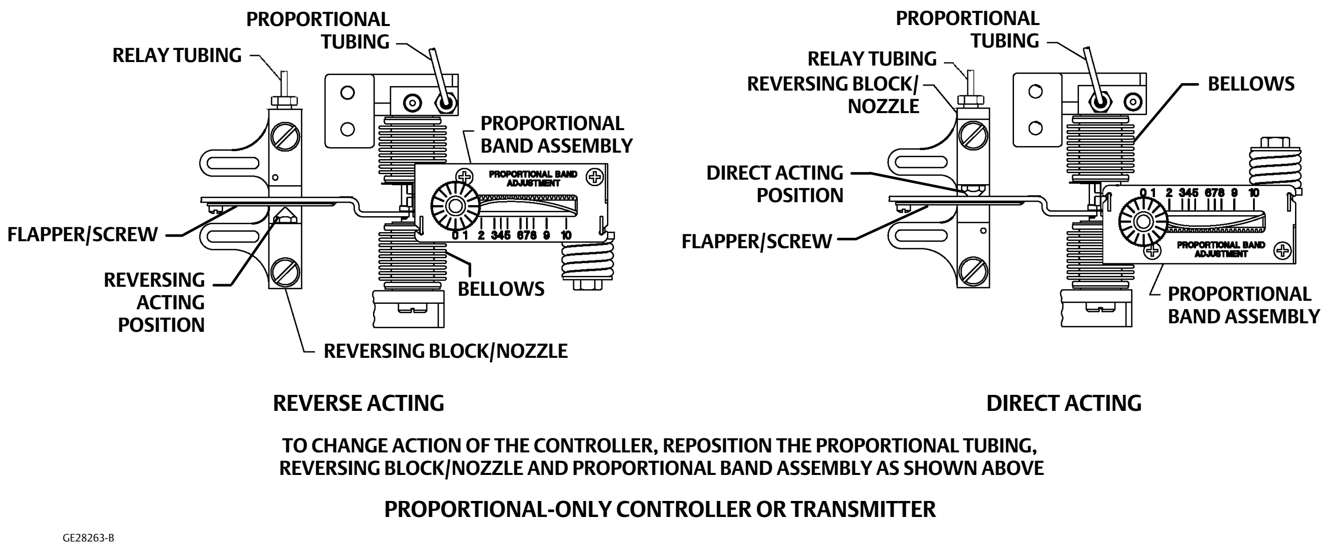
In C1 differential gap controllers, feedback pressure does not counteract the change in flapper position. Instead, the output pressure is piped to the bellows located on the side of the beam and flapper opposite the nozzle. Feedback pressure now reinforces the flapper movement by the sensed pressure change.

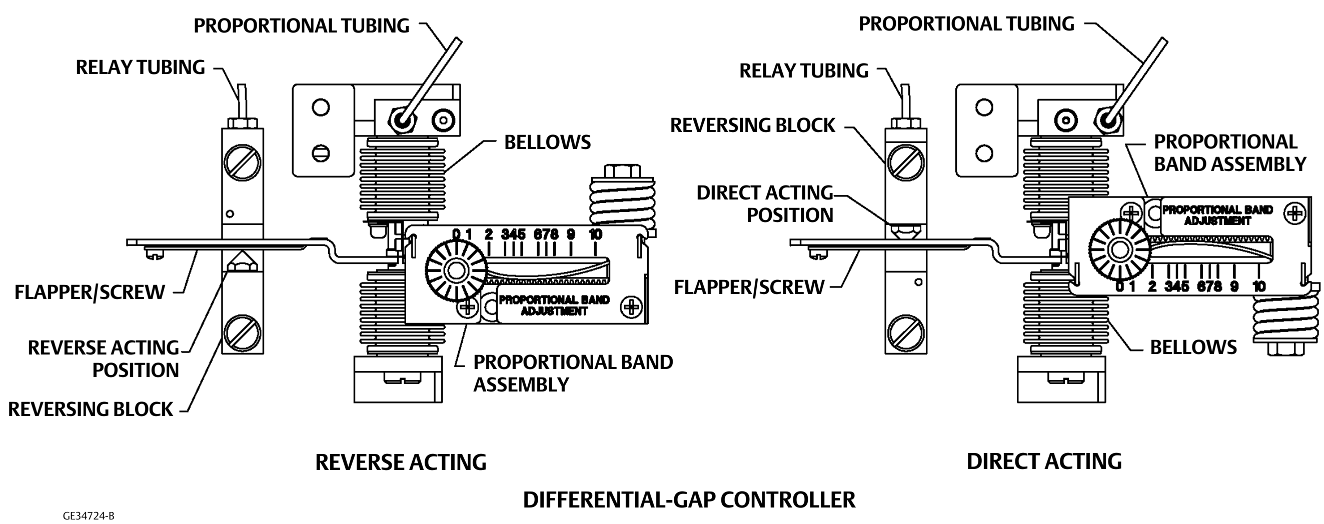
This construction causes the controller output to switch from full supply pressure to zero pressure or vice versa. The difference between the process pressure when the controller output switches to zero and the process pressure when the controller switches to maximum is the differential gap. Adjusting the proportional band adjustment adjusts the width of the gap; adjusting the set point positions the gap within the process pressure range.

Transmitters

Action of a pneumatic transmitter is similar to that of a proportional-only controller. Since the output pressure of the transmitter has no effect on the process pressure, transmitter output pressure is a proportional measure of the process pressure. The proportional band adjustment determines the span of the transmitter and the pressure setting mechanism determines the zero of the transmitter.

Figure 3. Conversion from Reverse to Direct Action or Proportional to Differential Gap





Construction Features

Rugged Service Capability

The case and cover are made of weather resistant, die-cast aluminum. Stainless steel tubing and fitting materials provide the capability for operation in ammonia and similar corrosive service conditions. Optional materials for relay diaphragms and other soft parts permit operation at ambient temperatures up to 93°C (200°F).

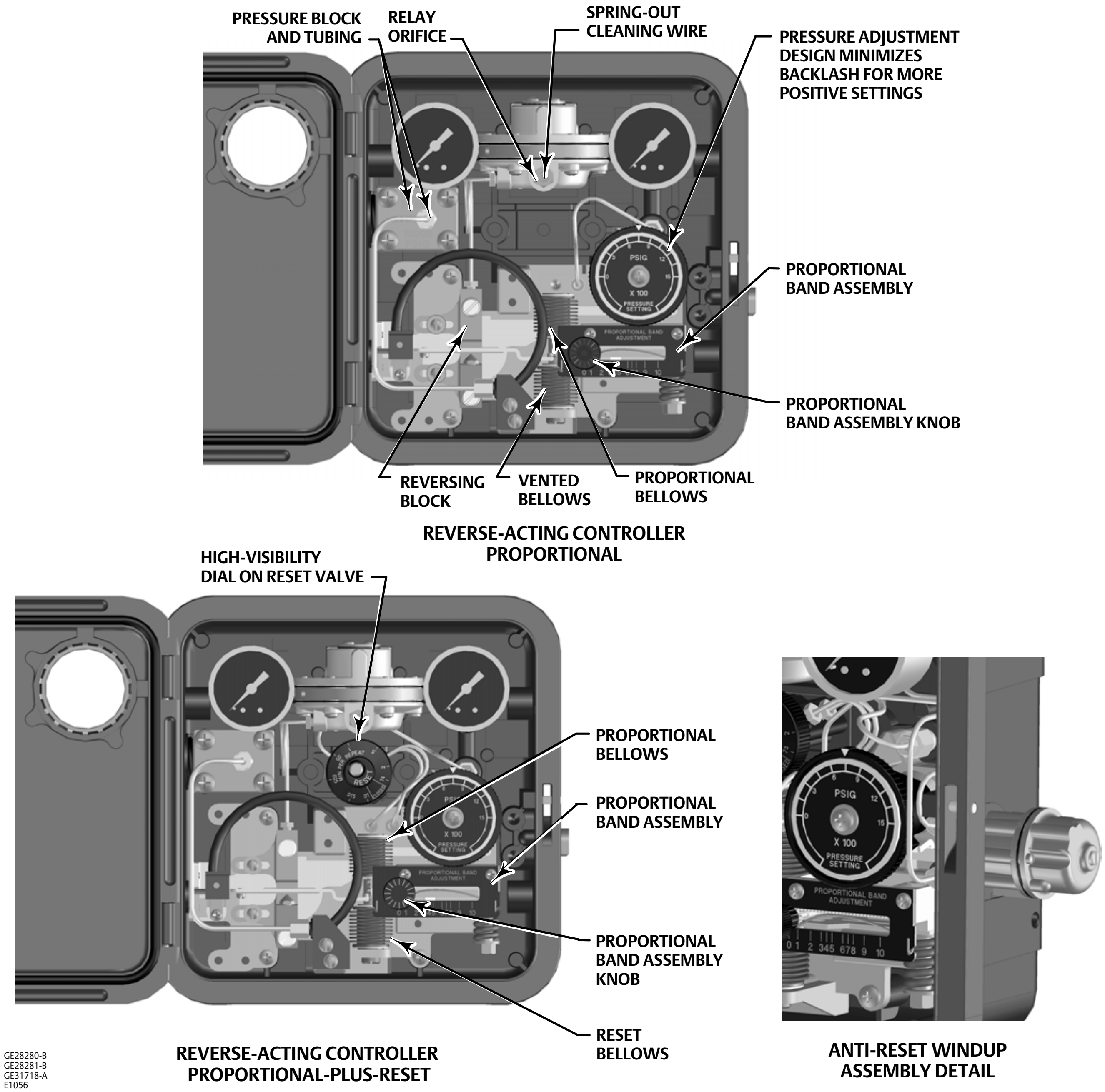
Low-Pressure Precision

Bellows sensing constructions provide better accuracy in low-pressure, vacuum, or compound ranges. Two sensing bellows are used where an important variable is the difference between two sensed pressures.

Conversion From Proportional To Differential Gap Control

The C1 controller can be configured to provide differential gap (on-off control) rather than proportional control. The proportional bellows is connected so that feedback pressure pushes the beam

Figure 4. Fisher C1 Constructions

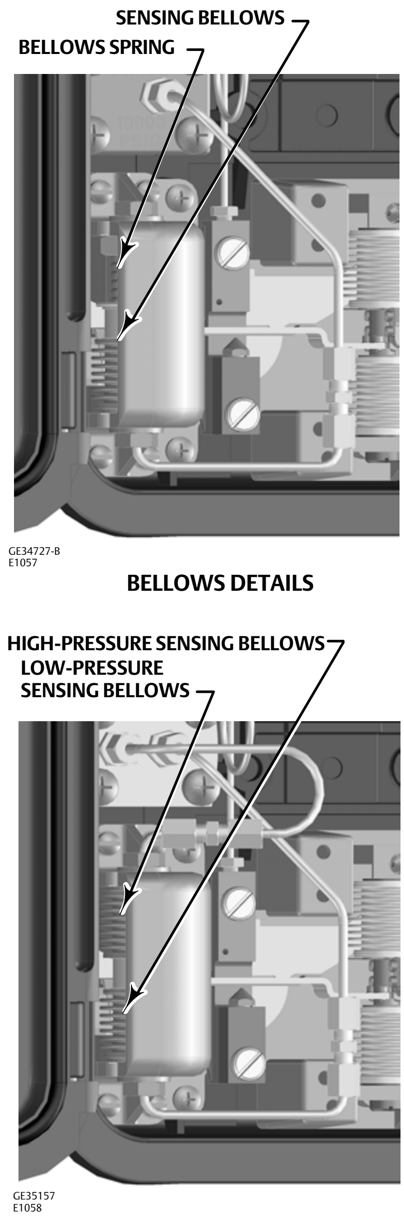


and flapper in the same direction as caused by the sensed pressure change. This reinforcement completely opens the relay valve either to full supply pressure or to full exhaust, allowing no in-between throttling. To change from a proportional to a differential gap controller, or vice versa, just reverse the tubing connection on the mounting base and invert the proportional band assembly, as shown in figure 3.

Reverse/Direct Conversion

Switching the action from reverse to direct or vice versa is done by moving the reversing block and feedback bellows connection and inverting the proportional band assembly as shown in figure 3.

Figure 5. Bellows Details



Anti-Reset Windup

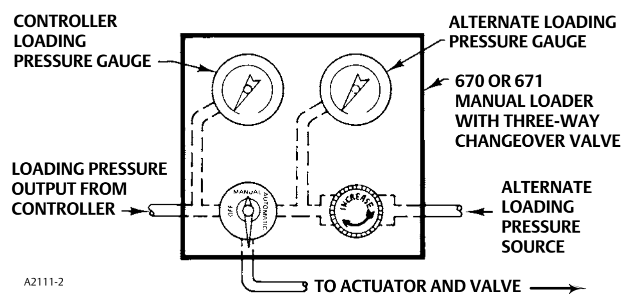
The anti-reset windup capability of C1 controllers provides quick equalization of reset and proportional pressures. This capability reduces overshoot and the time required for a system to return to the pressure setting after large changes in sensed pressure. This feature is useful when slow reset and broad proportional band settings are used.

The differential relief valve has a range of 0.14 to 0.4 bar (2 to 7 psig) and, unless ordered otherwise, is set by the factory to relieve at a 0.3 bar (5 psi) difference between proportional and reset pressures.

Manual Backup

As shown in figure 6, a Fisher 670 or 671 panel-mounted loading regulator with changeover valve permits switching to an alternate loading pressure, if a C1 controller experiences supply pressure failure or other malfunction.

Figure 6. Schematic of Manual Backup Changeover Hookup



Continuous Indication of Process Pressure

Replacing the supply pressure gauge on a pressure controller or transmitter by a process pressure gauge permits indicating process pressure in one of the ranges shown in table 7. To obtain a supply pressure indication, install a gauge on the supply regulator. The process pressure gauge must be specially ordered and comes with brass trim standard in all ranges and stainless steel trim optional in some ranges. Adding a process pressure gauge in the field also requires a special control pressure block. A process pressure gauge cannot be added to controllers or transmitters that use a differential bellows for sensing pressure.

Table 7. Optional Process Pressure Gauges

Sensing Element	Gauge Range[1]	
Bourdon tube	Positive pressure	0 to 30 psig[2] 0 to 60 psig 0 to 160 psig
		0 to 300 psig[2] 0 to 600 psig 0 to 1000 psig
Bellows	Positive pressure	0 to 30 psig[2]

1. Consult your Emerson sales office for gauges in other units.
2. Also available in stainless steel trim.

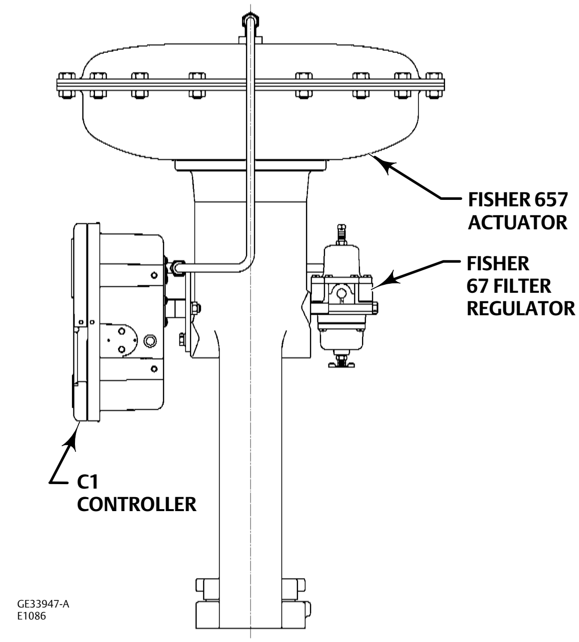
Bourdon Tube Protection

All Bourdon tube constructions are available with one or both of the following protective devices:

- **Barrier Protector for Corrosive or Clogging Process Fluids**—A sealed and fluid-filled barrier (described in Fisher product bulletin 39:025, D200057X012) may be installed between the process and the Bourdon tube. The barrier fluid transmits sensed pressure on a one-to-one basis into the Bourdon tube.

- **Travel Stop for Bourdon Tube**—The stop limits Bourdon tube overtravel when momentary surges in the sensed pressure exceed the Bourdon tube rating. Although it does not permit accurate control or transmission of a pressure higher than the upper range limit listed in table 2, this stop does permit Bourdon tube overpressuring to the maximum static pressure shown in table 2 without damage.

Figure 7. Typical Yoke Mounting



Installation

A C1 controller or transmitter normally comes installed on a final control element or indicating device or equipped for separate surface or pipestand mounting. Usually, a control valve with just a controller or transmitter and one supply regulator has the controller/transmitter and regulator yoke-mounted on opposite sides of the actuator as shown in figure 7. Nipple mounting of the supply regulator (if desired) is available. Specify such mounting if the opposite yoke boss of an actuator will be occupied by a positioner.

Install the controller or transmitter so that the vent points down. Figure 8 illustrates the vent location, the location of all case connections, dimensions, and mounting information.

Ordering Information

Application

When ordering, specify:

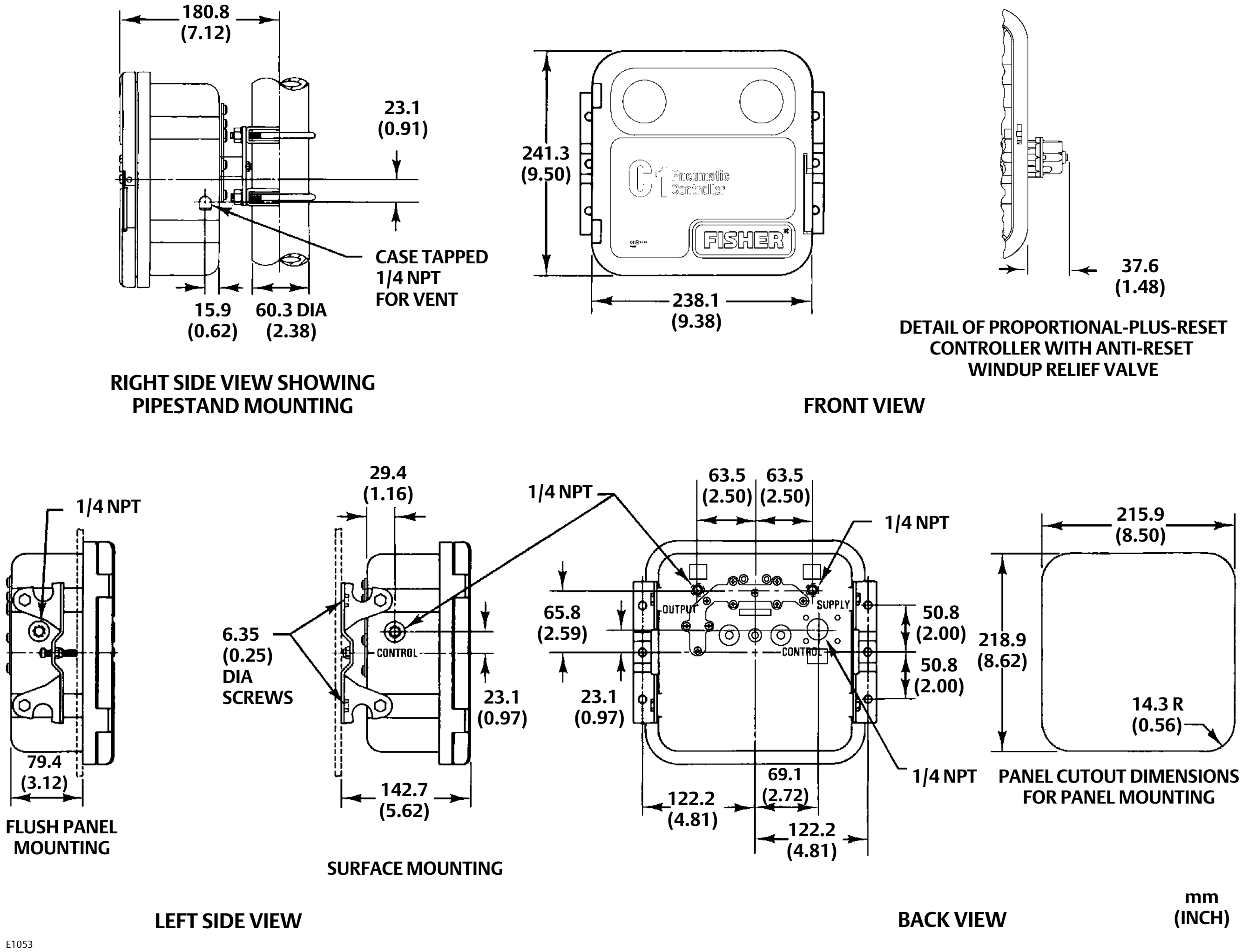
1. Type of service, such as pressure reduction or pressure relief, throttling or differential gap.
2. Composition, pressure, and temperature of measured variable(s).
3. Ambient temperature
4. Pressure in process vessel (if closed)
5. Type number, orientation, and other applicable descriptions of control or indicating device(s).

Construction

Refer to the Specifications and the Construction Features sections. Review the description for each specification, construction feature, and in the referenced tables. Specify the desired selection whenever there is a choice.

Always specify the complete type number of the C1 controller or transmitter, direct or reverse action, supply pressure regulator, and other desired equipment. On controllers with anti-reset windup, specify whether the differential relief valve is to relieve with falling or rising output.

Figure 8. Dimensions



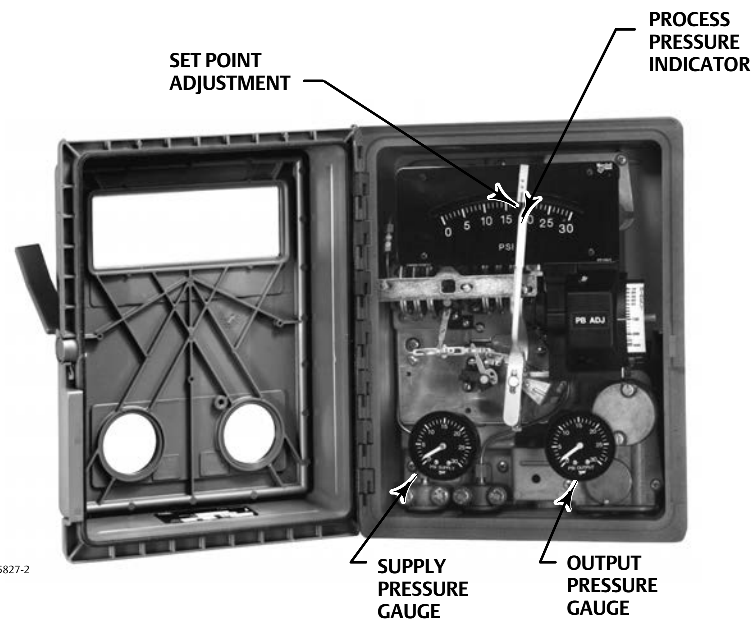
Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 4194 Differential Pressure Indicating Controllers

Fisher 4194 (low pressure) differential pressure indicating controllers show process differential pressure and set point on an easy-to-read process scale. The controllers sense two different pressures and compare the difference between these pressures with an operator-adjusted set point. A pneumatic signal is then delivered to a control element to change the process differential pressure toward the set point. The controllers use a capsular element for differential pressure up to 2.0 bar (30 psi). They are available for proportional only, proportional-plus-reset, and differential gap control. The controller is also available (see table 1) with anti-reset windup, internal auto/manual station, and remote set point adjustability (see table 1). 4194 controllers are used in industry where process monitoring and accurate measurement of differential pressures are required.

CONTROLLER YOKE-MOUNTED ON ACTUATOR OF CONTROL VALVE



INTERIOR OF CONTROLLER

Specifications

Available Configurations

See table 1

Sensing Element Range (Input Signal)

See table 2

Process Scale

■ Linear, ■ square root, or ■ others on request(1)

Process Connections

Standard: 1/4 NPT internal stainless steel (all input ranges)
Optional: 1/2 NPT external stainless steel

Output Signal

Proportional or Proportional-Plus-Reset Range: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)

Differential Gap Output: ■ 0 and 1.4 bar (0 and 20 psig) or ■ 0 and 2.4 bar (0 and 35 psig)

Action: Field-reversible between ■ direct (increasing sensed pressure increases output pressure) or ■ reverse (increasing sensed pressure decreases output pressure)

Supply and Output Connections

1/4 NPT internal

Supply Pressure Requirements(2)

See table 3

Supply Pressure Medium

Air or non-corrosive Natural Gas

Remote Set Point Pressures

■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)

Construction Materials

See table 4

Controller Adjustments

Proportional Band: 5 to 500% of process scale range
Reset: Adjustable from 0.01 to more than 74 min per repeat (from 100 to less than 0.0135 repeats per min)

Differential Gap Controllers: Adjustable from 1 to 100% of process scale range

Set Point: Continuously adjustable from 0 to 100% of the scale range.
■ *Internal Set Point Adjustment (standard):* Internal adjustment knob

Controller Performance(3)

Repeatability: 0.09% of process scale range
Dead Band: Less than 0.2% of process scale range
Typical Frequency Response: 1.5 Hz and 90 deg phase shift with 3.05 m (10 feet) of 6.44 mm (1/4 inch) tubing and 1639 cm^3 (100 $in.^3$) volume

Steady-State Air Consumption(3)(4)

0.2 to 1.0 Bar (3 to 15 psig) Output: 0.08 m^3/hr (2.8 scfh)
0.4 to 2.0 Bar (6 to 30 psig) Output: 0.07 m^3/hr (2.5 scfh)

Operative Ambient Temperature Limits(2)(5)

−40 to 70°C (−40 to 160°F)

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

CE Ex II 2 G D   Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T6
Dust: T70

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

Ex II Gb c T*X
III Db c T*X   EAC

Mounting

Controller can be mounted on ■ actuator, ■ panel, ■ wall, or ■ pipestand

Approximate Weight

4.5 kg (10 lb)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Consult your Emerson sales office for additional information.
2. The pressure/temperature limits in this document, and any applicable code or standard should not be exceeded.
3. Normal m^3/hr--normal cubic meters per hour (m^3/hr, 0°C and 1.01325 bar, absolute). Scfh--standard cubic feet per hour (ft^3/hr, at 60°F and 14.7 psig).
4. Without auto/manual switch. With auto/manual switch add 0.01 normal m^3/hr (0.5 scfh).
5. Also for transportation and storage limits.

Table 1. Available Configurations

TYPE NUMBER[1]	CONFIGURATIONS						
	Proportional-Only	Proportional-Plus Reset	Proportional-Plus Reset-Plus-Rate[2]	Differential Gap	Anti-Reset Windup	Remote Set Point	Internal Auto/ Manual Station
4194A	X	- - -	- - -	- - -	- - -	- - -	- - -
4194AE	X	- - -	- - -	- - -	- - -	- - -	X
4194AM	X	- - -	- - -	- - -	- - -	X	- - -
4194AME	X	- - -	- - -	- - -	- - -	X	X
4194B	- - -	X	- - -	- - -	- - -	- - -	- - -
4194BE	- - -	X	- - -	- - -	- - -	- - -	X
4194BF	- - -	X	- - -	- - -	X	- - -	- - -
4194BFE	- - -	X	- - -	- - -	X	- - -	X
4194BM	- - -	X	- - -	- - -	- - -	X	- - -
4194BME	- - -	X	- - -	- - -	- - -	X	X
4194BFM	- - -	X	- - -	- - -	X	X	- - -
4194BFME	- - -	X	- - -	- - -	X	X	X
4194C	- - -	- - -	X	- - -	- - -	- - -	- - -
4194CE	- - -	- - -	X	- - -	- - -	- - -	X
4194CF	- - -	- - -	X	- - -	X	- - -	- - -
4194CFE	- - -	- - -	X	- - -	X	- - -	X
4194CM	- - -	- - -	X	- - -	- - -	X	- - -
4194CME	- - -	- - -	X	- - -	- - -	X	X
4194CFM	- - -	- - -	X	- - -	X	X	- - -
4194CFME	- - -	- - -	X	- - -	X	X	X
4194S	- - -	- - -	- - -	X	- - -	- - -	- - -
4194SE	- - -	- - -	- - -	X	- - -	- - -	X
4914HSM	- - -	- - -	- - -	X	- - -	X	- - -
4194SME	- - -	- - -	- - -	X	- - -	X	X

1. Reverse-acting constructions are designated by an R added to the type number.
2. Consult your Emerson sales office for information on rate.

Features

- **Easy Maintenance**—Simple design of the controller allows fast, easy maintenance and minimal spare parts inventory.

- **Easy Adjustment**—Adjusting the set point and the zero and span of the process pointer and switching between direct and reverse action are accomplished quickly and without special tools. Also, the set point and proportional band can be adjusted with no interaction between the two adjustments.

- **Vibration Resistant**—Simple design and low mass of internal parts allow the controller to withstand vibration encountered in most plant environments.

- **Low Air/Gas Consumption**—The relay and nozzle design reduces the steady-state consumption rate to as low as 0.07 m^3/hr (2.5 scfh); less than the 6 scfh requirement set for the oil and gas industry by the US Environmental Protection Agency (New Source Performance Standards Subpart OOOO, EPA-HQ-QAR-2010-0505).

- **Corrosion Resistant**—Tough plastic housing resists corrosive environments. Internal constructions are available to resist a corrosive supply pressure media.

- **Mounting Versatility**—The controller can mount directly on the actuator or it can mount on a pipestand, on a wall, or in a panel.

- **Highly Visible Display**—Two red pointers on a 114 mm (4-1/2 inch) long white-on-black scale show differential pressure and deviation from set point at a glance. Two other gauges monitor supply and output pressures.

Table 2. Process Sensor (Capsular Element) Ranges, and Pressure Ratings

AVAILABLE CAPSULAR ELEMENT RANGES		MINIMUM(1) DIFFERENTIAL SPAN		MAXIMUM ALLOWABLE(2) DIFFERENTIAL PRESSURE		STATIC PRESSURE OPERATING RANGE				MAXIMUM ALLOWABLE(3) STATIC PRESSURE	
						Minimum		Maximum			
Bar	Psid	Bar	Psid	Bar	Psid	Bar	Inches of Mercury	Bar	Psig	Bar	Psig
0 to 0.4	0 to 5	0.2	2.5	0.4	5	-0.4	-10	0.4	5	0.5	7.5
0 to 0.7	0 to 10	0.4	5.0	0.7	10	-0.7	-20	0.7	10	1.0	15.0
0 to 1.4	0 to 20	0.7	10.0	1.4	20	-1.0	-30	1.4	20	2.1	30.0
0 to 2.0	0 to 30	1.0	15.0	2.0	30	-1.0	-30	2.0	30	3.1	45.0

1. Span is adjustable between minimum shown and maximum of the capsular element operating range and can be positioned anywhere within this range. For example, if a (0 to 2.0 bar (0 to 30 psid) capsular element is used and the minimum span of 1.0 bar (15 psid) is set, the process indication can be calibrated to a range of 0 to 1.0 bar (0 to 15 psid), 1.0 to 2.0 bar (15 to 30 psid), or any value between the minimum and maximum values of the operating range.
2. Maximum difference between the two input supply pressures.
3. Capsular element may be pressured to this valve (after reaching travel stop at upper range limit) without permanent zero shift of structural damage to controller components.

Table 3. Supply Pressure Data

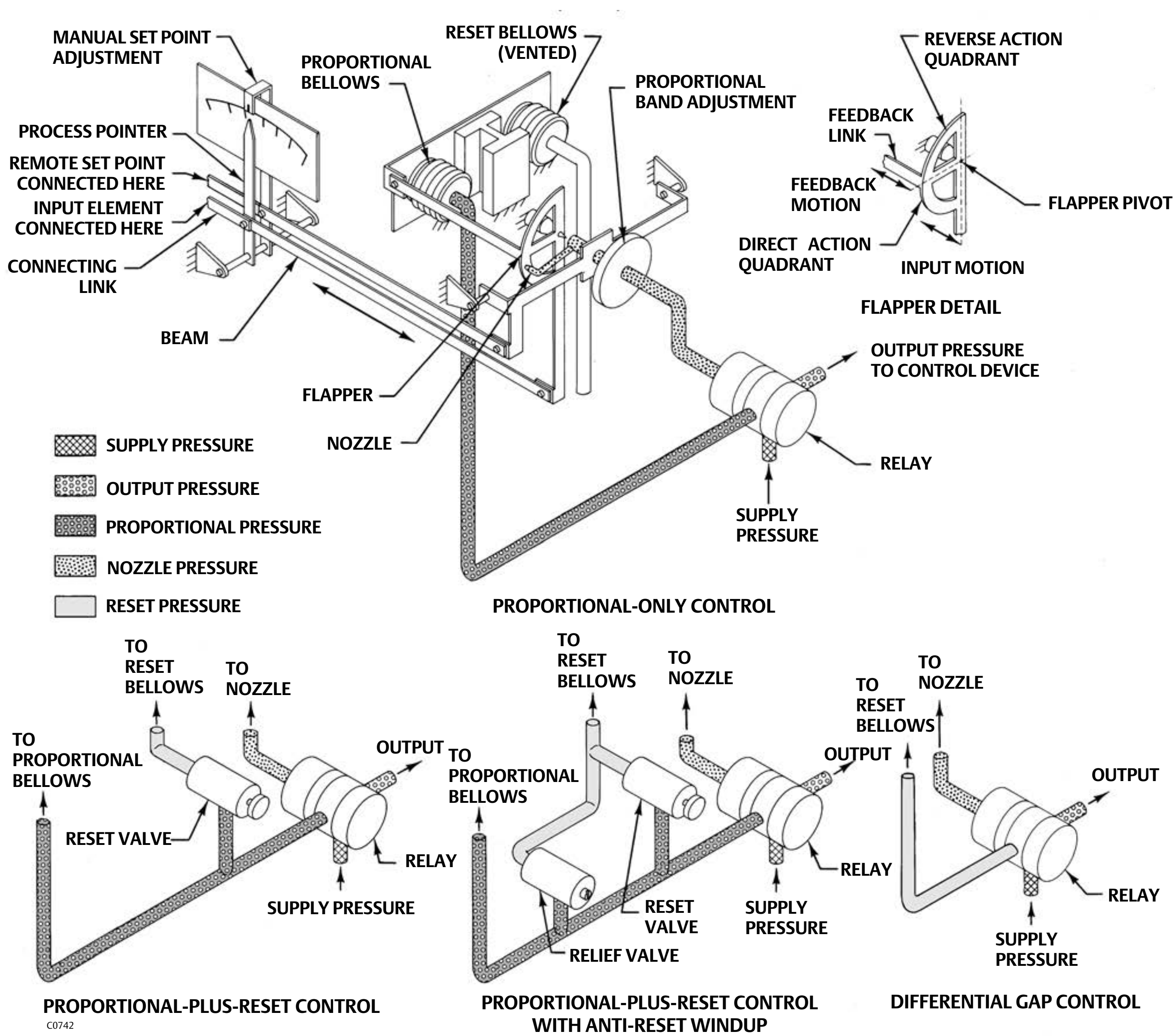
Output Signal Range		Normal Operating Supply Pressure(1)	Maximum Pressure to Prevent Internal Damage(2)
Bar	0.2 to 1.0 or 0 and 1.4 (differential gap)	1.4	3.4
	0.4 to 2.0 or 0 and 2.4 (differential gap)	2.4	3.4
Psig	3 to 15 or 0 and 20 (differential gap)	20	50
	6 to 30 or 0 and 35 (differential gap)	35	50

1. If this pressure is exceeded, control stability may be impaired.
2. If this pressure is exceeded, damage to the controller may result.

Table 4. Construction Materials

Part	Standard Material	Optional Material
Case and cover	Polyester plastic	---
Exterior tubing	Copper	Aluminum, stainless steel, steel, or polyethylene
Exterior fittings	C36000 (brass)	Aluminum, stainless steel, steel, or polyethylene
Interior tubing	S30400 (304 stainless steel)	---
Capsular element	N09902 (Nickel alloy)	---
Nozzle	S30300 (303 stainless steel)	---
Flapper	S31600 (316 stainless steel)	---
Relay springs	S30200 (302 stainless steel) or steel	---
Relay O-rings	Nitrile	---
Relay diaphragms	Nitrile	---
Other relay metal parts	Aluminum or stainless steel	---
Feedback bellows assembly	C51000 (bronze)	S32100 (321 stainless steel)
Supply and output gauges	Brass (wetted parts only)	Stainless steel (wetted parts only)
Remote set point bellows	N09902	---

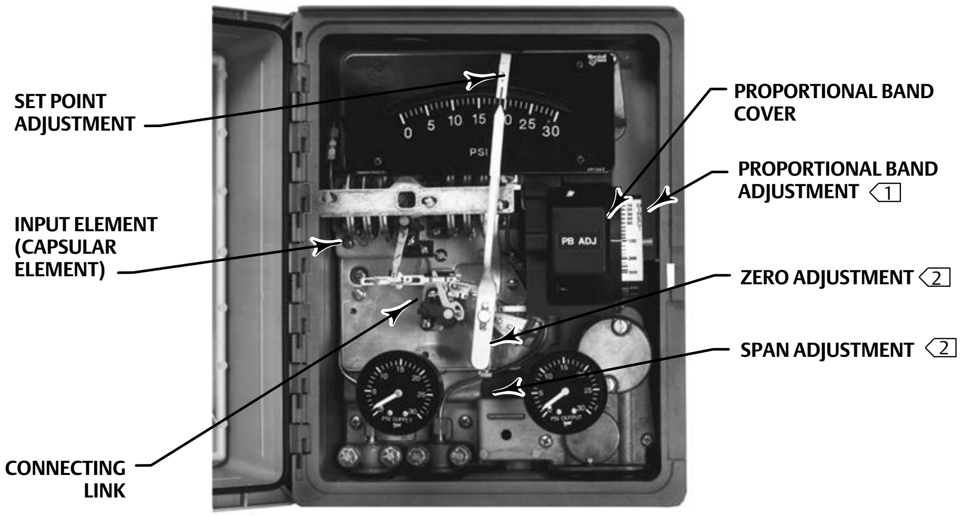
Figure 1. Operational Schematic of Fisher 4194 Differential Pressure Controllers



Principle of Operation

Refer to figure 1 (proportional-only control). The input element is connected to the process pointer and flapper by a connecting linkage. As the process differential pressure increases (in a direct-acting controller), the flapper moves toward the nozzle, restricting flow through the nozzle and increasing nozzle pressure. When this occurs, relay action increases the output pressure (delivery) of the controller. Output pressure is fed back to the proportional bellows. The action of the proportional bellows counters the flapper movement that resulted from the process differential pressure change, and backs the flapper away from the nozzle. Set point adjustment also changes the proximity of the nozzle and flapper; however, when the set point is changed, the nozzle moves with respect to the flapper. When the controller is in the reverse-acting mode (see flapper detail in figure 1), an increase in process differential pressure causes a decrease in output pressure.

Figure 2. Controller Construction Detail



Notes:
1 White portion of adjustment enables direct controller action; black portion enables reverse controller action.
2 For the process pointer.

W3612-1

In addition to the proportional-only (4194A) version, a controller is available for proportional-plus-reset control (4194B). In this controller, output pressure is fed back to the reset bellows as well as to the proportional bellows.

Anti-reset windup is available on all controllers with reset. Remote set point is available on all controllers.

The 4194S controller provides differential gap control. In this version, feedback pressure is piped directly to the reset bellows, reinforcing the change in flapper position rather than counteracting it. This construction causes the controller output to switch from full supply pressure to zero pressure or vice versa.

The schematic diagram (figure 1) emphasizes detail of construction variations between control modes. Refer to table 1 for a complete description of type number suffixes.

Construction Features

Simplified Relay Maintenance

A clean-out wire provides a fast, easy means of cleaning the relay primary orifice during service.

Pressure Protection for the Case

A rubber plug in the plastic case pops out to prevent excessive pressure buildup from occurring inside the case before structural damage can take place.

Easy Direct/Reverse Switching

Controller action can be switched from direct to reverse or vice versa by simply loosening the screws on the proportional band cover and moving the cover out to rotate the proportional band knob to the desired action (see figure 2).

Figure 3. Typical Yoke Mounting

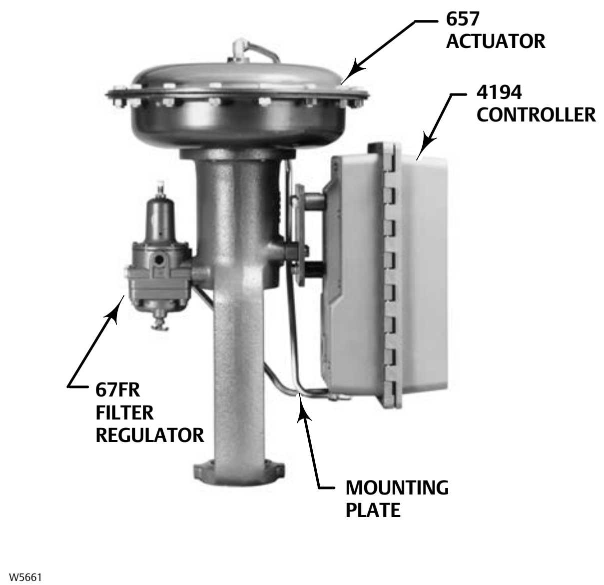
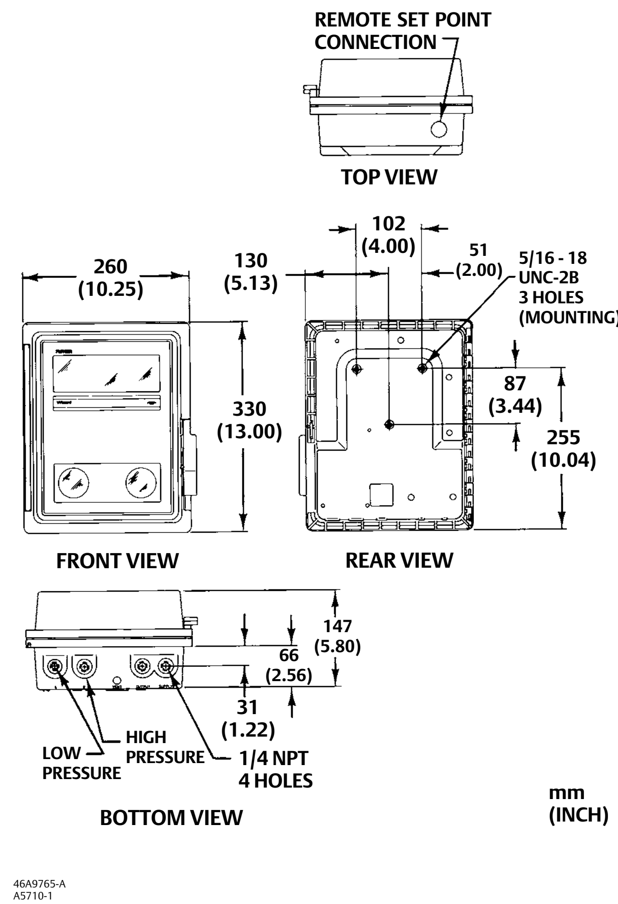


Figure 4. Controller Dimensions



Easy Mode Conversion

Conversion from proportional to proportional-plus-reset control requires the addition of a reset valve and two pieces of tubing. Conversion from proportional to differential gap control requires the addition of one piece of tubing.

Anti-Reset Windup

Anti-reset windup is available with proportional-plus-reset controllers. Relief valve may be installed to limit reset windup in either direction.

Remote Set Point

The capability of adjusting the set point from a remote location is available as an option on 4194 controllers.

Auto/Manual Capability

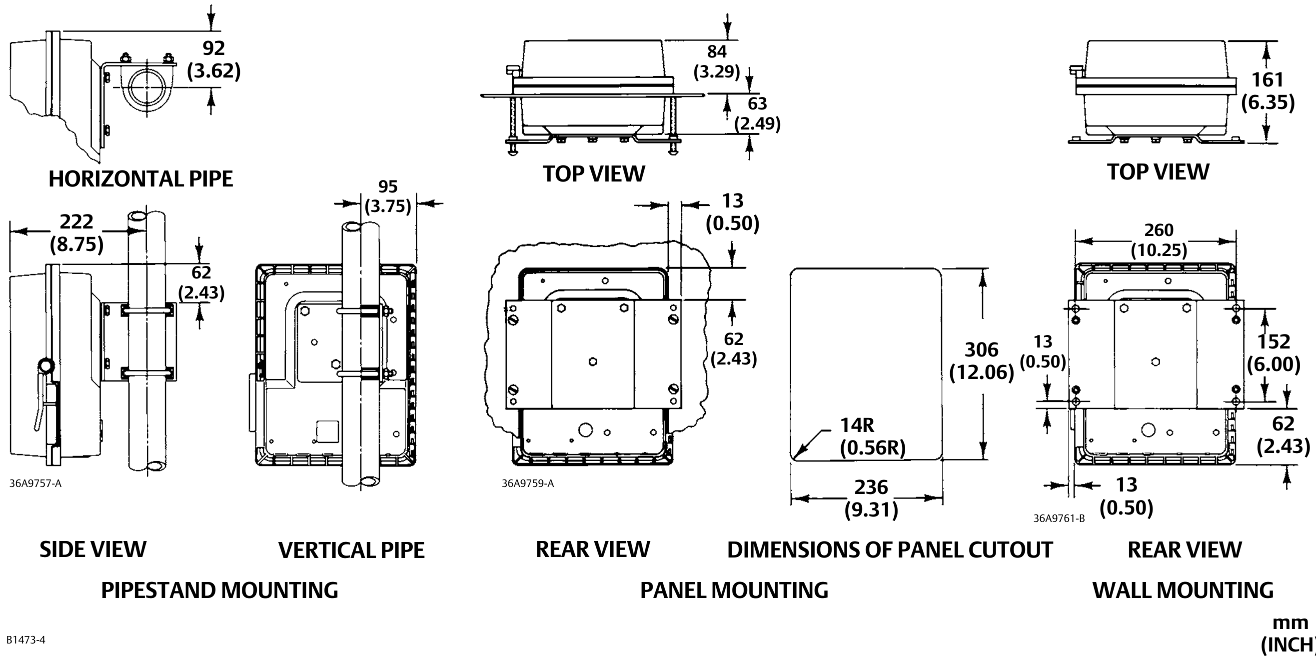
An internal auto/manual station is available for smooth bumpless transfer from automatic to manual and manual to automatic control of the controller output.

Installation

The 4194 differential pressure controllers may be shipped alone for a separate installation or for installation on a control valve actuator. The controllers can also be mounted on a pipe stand, on a wall, or in a panel. When a controller is mounted on an actuator and a positioner is not used, the controller will usually be opposite the supply regulator as shown in figure 3. If a positioner is used, the supply regulator can be mounted on the actuator casing.

The controller must be installed so that the vent opening faces down. Basic controller dimensions are shown in figure 4. Dimensions for specific mounting methods are shown in figure 5.

Figure 5. Mounting Dimensions



Ordering Information

When ordering, specify:

Application

1. Description of the service, such as throttling or on-off
2. Pressure range, composition, and temperature of process fluid
3. Ambient temperature

Construction

Refer to the specifications and the Construction Features section. Carefully review each specification and feature, indicating your choice whenever a selection is to be made. Refer to table 1 for type numbers; add R to any type number if reverse action is desired.

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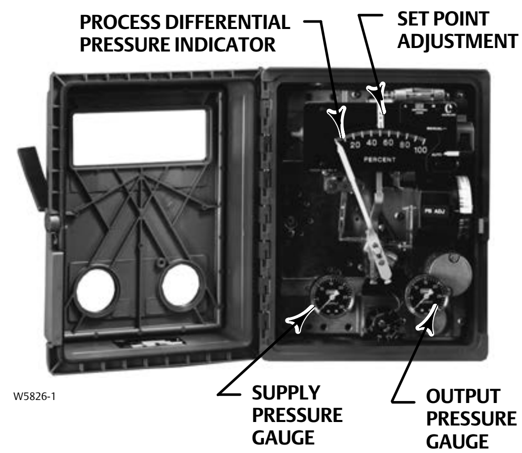
Fisher™ 4194H Differential Pressure Indicating Controllers

Fisher 4194H differential pressure indicating controllers show process differential pressure and set point on an easy-to-read process scale. These high static pressure controllers sense two different pressures and compare the difference between these pressures with an operator-adjusted set point. A pneumatic signal is then delivered to a control element to change the process differential pressure toward the set point. 4194H controllers use a differential pressure unit such as the Barton™ 199 for differential pressure up to 5.2 bar (75 psi). The product line includes proportional-only, proportional-plus-reset, and differential gap controllers.

The controllers are also available with anti-reset windup, internal auto/manual station, and remote set point adjustability (see table 1). 4194H controllers are used throughout industries where process monitoring and accurate measurement of differential pressure are required.

CONTROLLER WITH DIFFERENTIAL PRESSURE UNIT



INTERIOR OF CONTROLLER

Features

- Easy Maintenance—Simple design of the controller allows fast, easy maintenance and minimal spare parts inventory.

- Easy Adjustment—Adjustments of set point and zero and span of the process pointer, and switching between direct and reverse action are accomplished quickly and without special tools. Also, the set point and proportional band can be adjusted with no interaction between the two adjustments.

- Highly Visible Display—Two red pointers on a 114 mm (4.50 inch) long white-on-black scale show differential pressure and deviation from set point at a glance. Two other gauges monitor supply and output pressures.

- Low Air/Gas Consumption—The relay and nozzle design reduces the steady-state consumption rate to as low as 0.07 m^3/hr (2.5 scfh); less than the 6 scfh requirement set for the oil and gas industry by the US Environmental Protection Agency (New Source Performance Standards Subpart OOOO, EPA-HQ-QAR-2010-0505).

- Corrosion Resistant—Thermoplastic housing withstands a broad range of corrosive environments. Internal constructions are available to resist a corrosive supply pressure media.

Specifications

Available Configurations

See table 1

Sensing Element Range (Input Signal)

See table 2

Process Scale

■ Linear, ■ square root, or ■ others on request(1)

Process Connections

Standard: 1/4 NPT internal stainless steel (all input ranges)

Optional: 1/2 NPT external stainless steel

Output Signal

Proportional or Proportional-Plus-Reset Range:
■ 0.2 to 1.0 bar (3 to 15 psig) or
■ 0.4 to 2.0 bar (6 to 30 psig)

Differential Gap Output:
■ 0 and 1.4 bar (0 and 20 psig) or
■ 0 and 2.4 bar (0 and 35 psig)

Action: Field-reversible between ■ direct (increasing sensed pressure increases output pressure) or ■ reverse (increasing sensed pressure decreases output pressure)

Supply and Output Connections

1/4 NPT internal

Supply Pressure Requirements(2)

See table 4

Supply Pressure Medium

Air or non-corrosive Natural Gas

Remote Set Point Pressures

■ 0.2 to 1.0 bar (3 to 15 psig) or
■ 0.4 to 2.0 bar (6 to 30 psig)

Construction Materials

See table 3

Controller Adjustments

Proportional Band: 5 to 500% of process scale range

Reset: Adjustable from 0.01 to more than 74 min per repeat (from 100 to less than 0.0135 repeats per min)

Differential Gap Controllers: Adjustable from 1 to 100% of process scale range

Set Point: Continuously adjustable from 0 to 100% of the scale range

Controller Performance(3)

Repeatability: 0.4% of process scale range
Dead Band: Less than 0.2% of process scale range

Steady-State Air Consumption(4)(5)

0.2 to 1.0 bar (3 to 15 psig) Output:
0.08 m^3/hr (2.8 scfh)

0.4 to 2.0 bar (6 to 30 psig) Output:
0.07 m^3/hr (2.5 scfh)

Operative Ambient Temperature Limits(2)(6)

–40 to 70°C (–40 to 160°F)

(continued)

Table of Contents

Specifications (continued)

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D

Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T6
Dust: T70

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

II Gb c T*X
III Db c T*X

Housing

Designed to NEMA 3 (Weatherproof) and IEC 529 IP54 Specifications

Mounting

Controller is mounted on a pipestand

Approximate Weight

Controller: 4.5 kg (10 lb) without the differential pressure unit

Differential Pressure Unit: 21.5 kg (47 lb)

Total Weight (controller and differential pressure unit): 26 kg (57 lb) (with a Barton 199 Differential Pressure Unit)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Consult your Emerson sales office for additional information.
2. The pressure/temperature limits in this document and any applicable standard or code limitation for valve should not be exceeded.
3. With Barton 199 differential pressure unit.
4. Normal m^3/hr--normal cubic meters per hour (m^3/hr, 0°C and 1.01325 bar, absolute). Scfh--standard cubic feet per hour (ft^3/hr, at 60°F and 14.7 psig).
5. Without auto/manual switch. With auto/manual switch, add 0.01 m^3/hr (0.5 scfh)
6. Also for transportation and storage limits.

Table 1. Available Configurations

TYPE NUMBER(1)	CONFIGURATIONS						
	Proportional-Only	Proportional-Plus Reset	Proportional-Plus Reset-Plus-Rate(2)	Differential Gap	Anti-Reset Windup	Remote Set Point	Internal Auto/ Manual Station
4194HA	X	---	---	---	---	---	---
4194HAE	X	---	---	---	---	---	X
4194HAM	X	---	---	---	---	X	---
4194HAME	X	---	---	---	---	X	X
4194HB	---	X	---	---	---	---	---
4194HBE	---	X	---	---	---	---	X
4194HBF	---	X	---	---	X	---	---
4194HBFE	---	X	---	---	X	---	X
4194HBM	---	X	---	---	---	X	---
4194HBME	---	X	---	---	---	X	X
4194HBFM	---	X	---	---	X	X	---
4194HBFME	---	X	---	---	X	X	X
4194HC	---	---	X	---	---	---	---
4194HCE	---	---	X	---	---	---	X
4194HCF	---	---	X	---	X	---	---
4194HCFE	---	---	X	---	X	---	X
4194HCM	---	---	X	---	---	X	---
4194HCME	---	---	X	---	---	X	X
4194HCFM	---	---	X	---	X	X	---
4194HCFME	---	---	X	---	X	X	X
4194HS	---	---	---	X	---	---	---
4194HSE	---	---	---	X	---	---	X
4914HSM	---	---	---	X	---	X	---
4194HSME	---	---	---	X	---	X	X

1. Reverse-acting constructions are designated by an R added to the type number.
2. Consult your Emerson sales office for information on rate.

Table 2. Process Sensor (Barton 199) Ranges and Pressure Ratings

AVAILABLE DIFFERENTIAL PRESSURE UNIT OPERATING RANGES		STATIC PRESSURE OPERATING RANGE	
mbar	**Inch wc**	**Bar**	**Psig**
0 to 50 0 to 63 0 to 125 0 to 188 0 to 250	0 to 20 0 to 25 0 to 50 0 to 75 0 to 100	- - -(1)	- - -(1)
Bar	Psi		
0 to 1.0 0 to 3.4 0 to 5.2	0 to 15 0 to 50 0 to 75		
1. Available in ranges of 0 to 70 bar (0 to 1000 psig), 0 to 172 bar (0 to 2500 psig), and 0 to 413 bar (0 to 6000 psig). Actual static pressure depends on differential pressure unit rating and materials.			

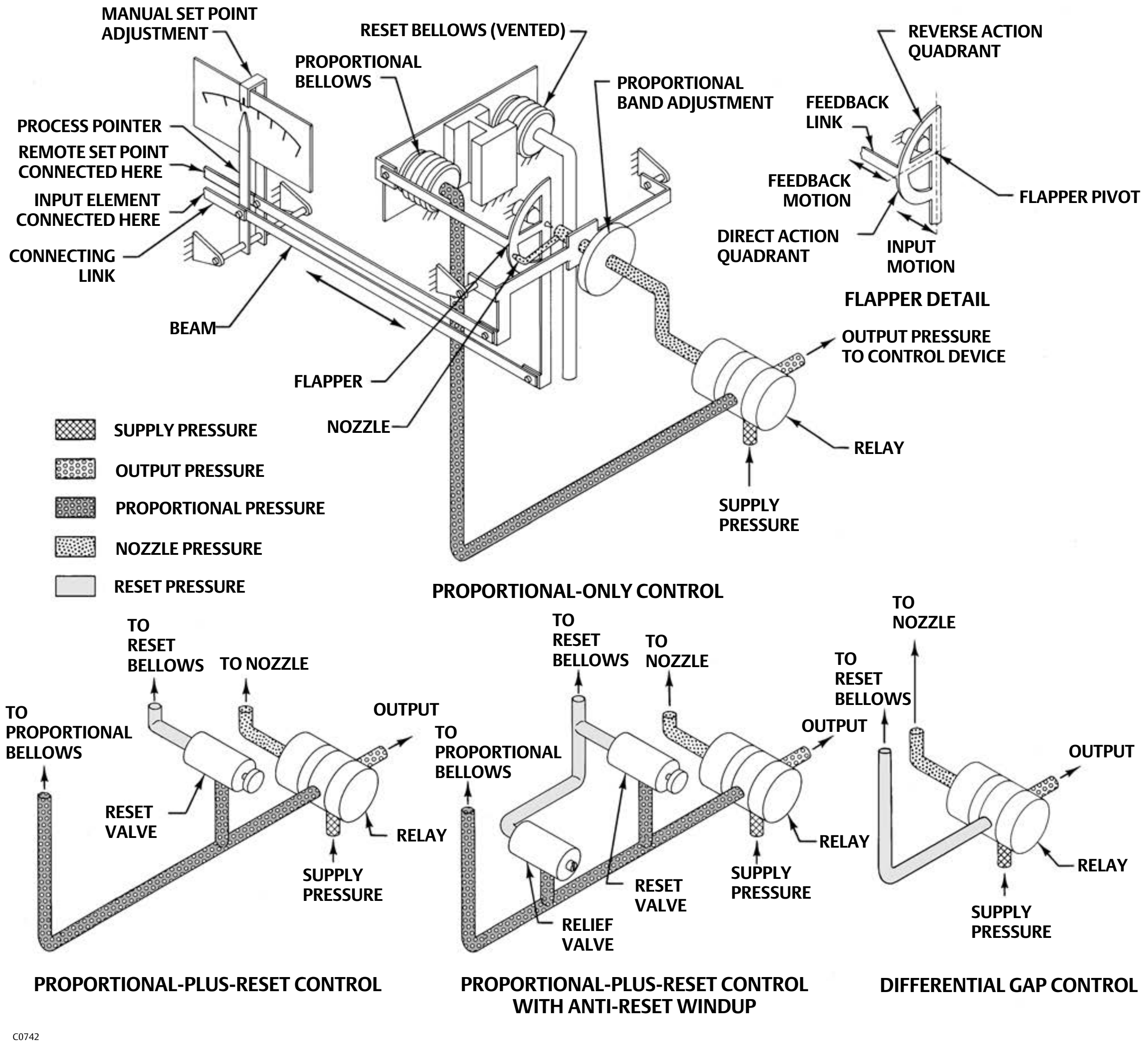
Table 3. Construction Materials

Product	Part	Standard Material	Optional Material
4194H Controllers	Case and cover	Polyester plastic	- - -
	Exterior tubing	Copper	Aluminum,stainless steel, steel, polyethylene
	Exterior fittings	C36000 (brass)	Aluminum, stainless steel, steel, polyethylene
	Interior tubing	Copper	S30400 (304 stainless steel)
	Nozzle	S30300 (303 stainless steel)	- - -
	Flapper	S31600 (316 stainless steel)	- - -
	Relay springs	S30200 (302 stainless steel), steel	- - -
	Relay O-rings	Nitrile	- - -
	Relay diaphragms	Nitrile	- - -
	Other relay metal parts	Aluminum, stainless steel	- - -
	Feedback bellows assembly	C51000 (bronze)	S32100 (321 stainless steel)
	Supply and output gauges	Brass (wetted parts only)	Stainless steel (wetted parts only)
	Remote set point bellows	N09902 (nickel alloy)	- - -
Barton 199 Differential Pressure Unit	Mounting plates	Zinc-plated steel	- - -
	Bellows	Stainless steel	- - -
	Housing	Steel	Stainless steel

Table 4. Supply Pressure Data

Output Signal Range		Normal Operating Supply Pressure(1)	Maximum Pressure to Prevent Internal Damage(2)
Bar	0.2 to 1.0 or 0 and 1.4 (differential gap)	1.4	3.4
	0.4 to 2.0 or 0 and 2.4 (differential gap)	2.4	3.4
Psig	3 to 15 or 0 and 20 (differential gap)	20	50
	6 to 30 or 0 and 35 (differential gap)	35	50
1. If this pressure is exceeded, control stability may be impaired. 2. If this pressure is exceeded, damage to the controller may result.			

Figure 1. Operational Schematic of Fisher 4194H Differential Pressure Controllers



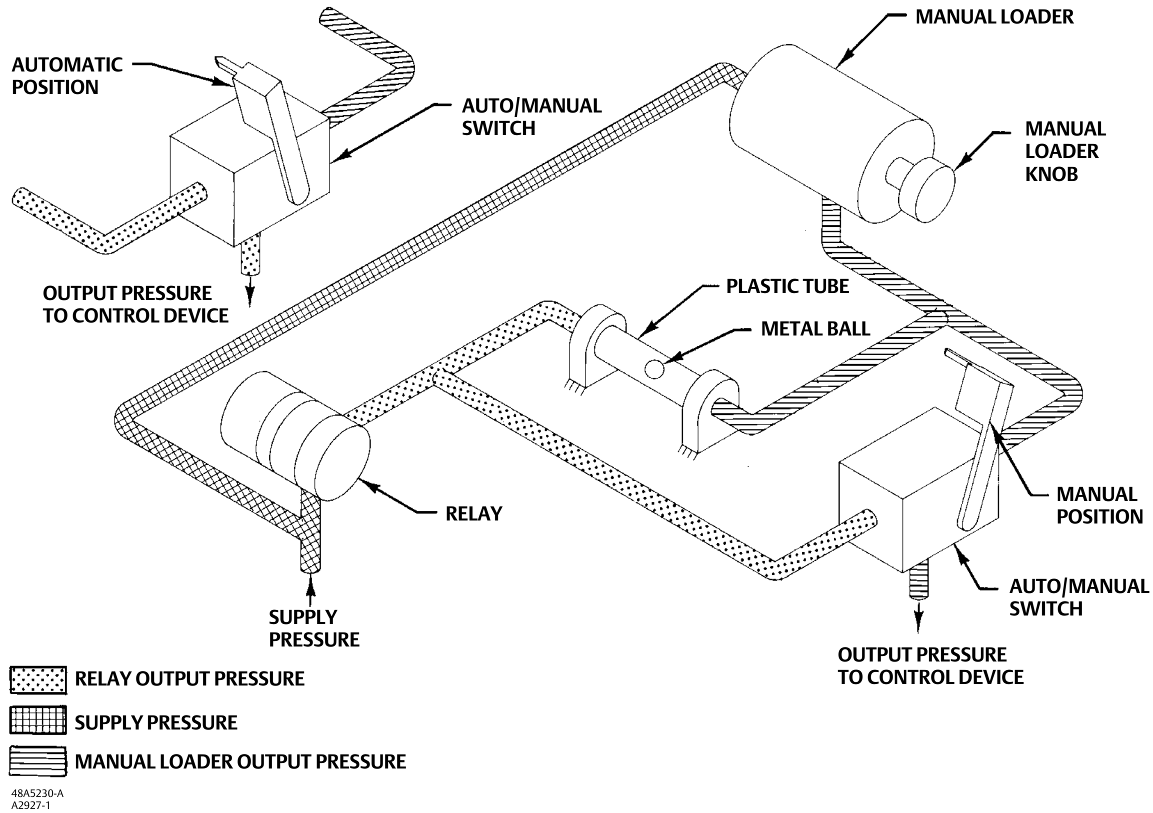
Principle of Operation

4194H Controllers

Refer to the proportional-only control diagram in figure 1. The input element is connected to the process pointer and flapper by a connecting linkage.

As the process differential pressure increases in a direct-acting controller, the flapper moves toward the nozzle, restricting flow through the nozzle and increasing nozzle pressure. When this occurs, relay action increases the output pressure (delivery) of the controller. Output pressure is fed back to the proportional bellows. The action of the proportional bellows counters the flapper movement that resulted from the process differential pressure change, and backs the flapper away from the nozzle. Set point adjustment also changes the proximity of the nozzle and flapper; however, when the set point is changed, the nozzle moves with respect to the flapper. When

Figure 2. Schematic of Auto/Manual Option



the controller is in the reverse-acting mode (see flapper detail in figure 1), an increase in process differential pressure causes a decrease in output pressure.

In addition to the 4194HA (proportional-only) version, the 4194HB controller is available for proportional-plus-reset control. In this controller, output pressure is fed back to the reset bellows as well as to the proportional bellows. Remote set point is available on all controllers. Anti-reset windup is available on all controllers with reset.

The 4194HS controller provides differential gap control. In this version, feedback pressure is piped directly to the reset bellows, reinforcing the change in flapper position rather than the counteracting it.

This construction causes the controller output to switch from full supply pressure to zero pressure or vice versa.

The schematic diagram (figure 1) emphasizes detail of construction variations between control modes. Refer to table 1 for a complete description of type number suffixes.

Auto/Manual Option

Controllers with the auto/manual option have piping on the output side of the relay as shown in figure 2. Supply pressure to the relay is also applied to the manual loader. The manual loader, functioning as a regulator, applies pressure to one side of the plastic tube and to the auto/manual switch. Output pressure from the relay registers on the other side of the plastic tube as well as in the auto/manual switch.

When the auto/manual switch is in the MAN position, the output of the manual loader, which is adjustable by the manual loader knob, is channelled through the auto/manual switch and becomes the output of the controller. When the auto/manual switch is in the AUTO position, the output of the relay is channelled through the switch to become the output of the controller.

Before the auto/manual switch is operated, the output of the relay must equal the output of the manual loader to avoid bumping the process. Adjusting the set point varies the pressure on the left-hand side of the plastic tube. Adjusting the manual loader knob varies the pressure on the right-hand side. When the pressures are equal, the metal ball is centered in the tube. Pressure imbalance will force the ball to one end of the tube where it forms a seal, blocking air flow through the tube.

Construction Features

Simple Relay Maintenance

A clean-out wire provides a fast, easy means of cleaning the relay primary orifice during service.

Pressure Protection for the Case

A rubber plug in the plastic case pops out to prevent excessive pressure buildup inside the case, thus preventing structural damage.

Easy Direct/Reverse Switching

Controller action can be switched from direct to reverse or vice versa by simply loosening the screws on the proportional band cover and moving the cover out to rotate the proportional band knob to the desired action (see figure 4).

Easy Mode Conversion

Conversion from proportional to proportional-plus-reset control requires the addition of a reset valve and two pieces of tubing. Conversion from proportional to differential gap control requires the addition of one piece of tubing.

Anti-Reset Windup

Anti-reset windup is available with proportional-plus-reset controllers. Relief valve may be installed to limit reset windup in either direction.

Remote Set Point

The capability of adjusting the set point from a remote location is available as an option on the 4194H controllers.

Auto/Manual Capability

An internal auto/manual station is available for smooth bumpless transfer from automatic to manual and manual to automatic control of the controller output. The two-position switch, showing either automatic or manual mode, is clearly visible with the controller cover closed.

External Feedback

In controller override applications, this option minimizes reset windup in the secondary controller (see figure 3). This option is available only with the two-mode (4194HB) controllers.

Figure 3. Schematic of External Feedback Option

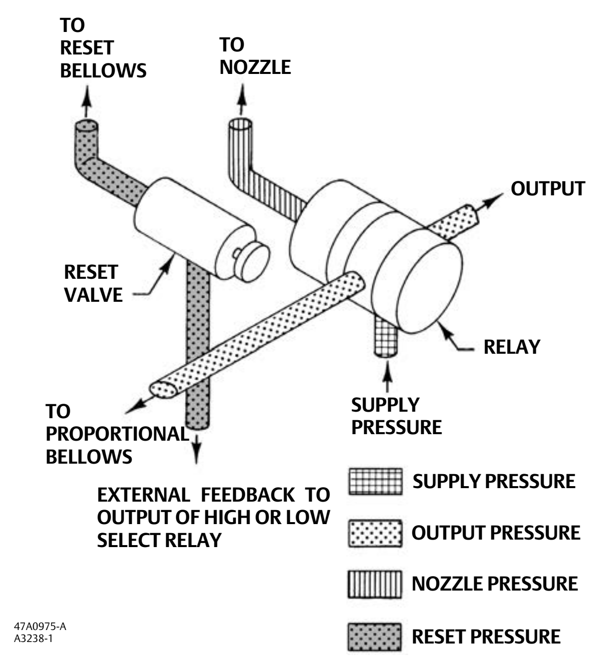
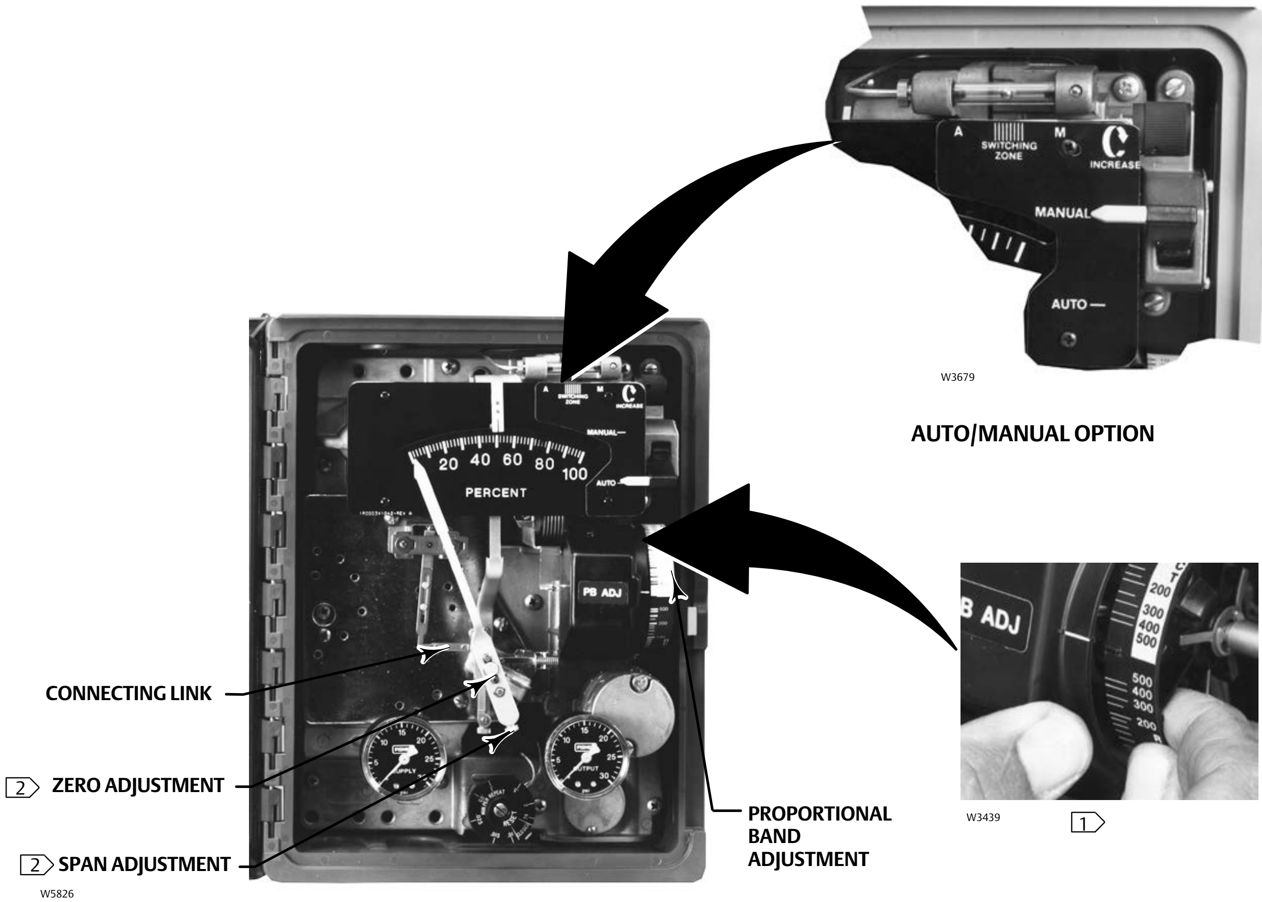
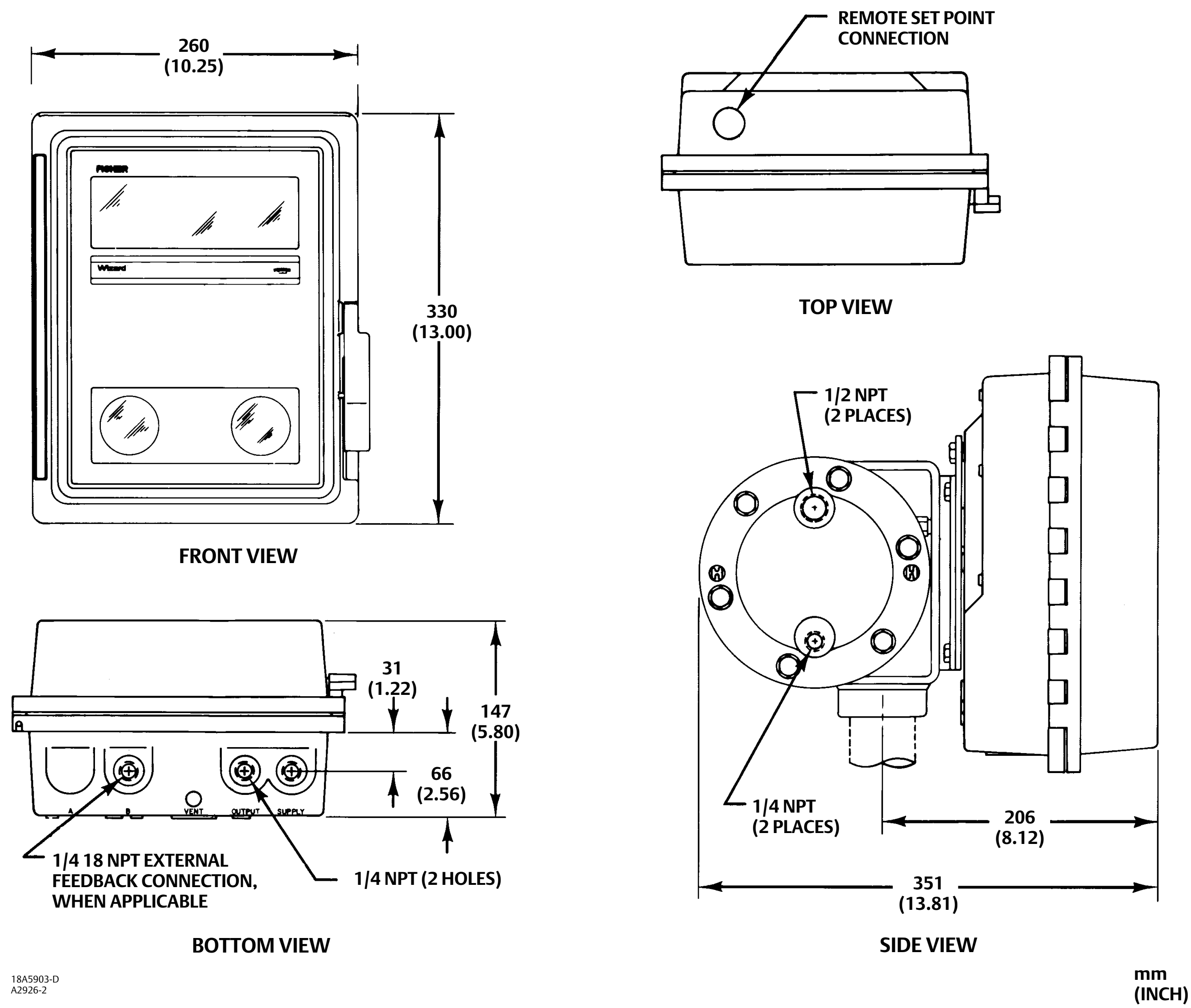


Figure 4. Controller Construction Details



Notes:
1 White portion of adjustment enables direct controller action; black portion enables reverse controller action.
2 For the process pointer.

Figure 5. Dimensions



Installation

A 4194H controller mounts on a pipestand and must be installed with the vent opening facing down. The coupling is secured to the pipestand by set screws. Figure 5 shows controller dimensions including those necessary for installation.

Ordering Information

When ordering, specify:

Application

1. Description of the service, such as throttling or on-off
2. Pressure range, composition, and temperature of process fluid
3. Ambient temperature

Construction

Refer to the specifications and the Construction Features section. Carefully review each specification and feature, indicating your choice whenever a selection is to be made. Refer to table 1 for type numbers; add R to any type number if reverse action is desired.

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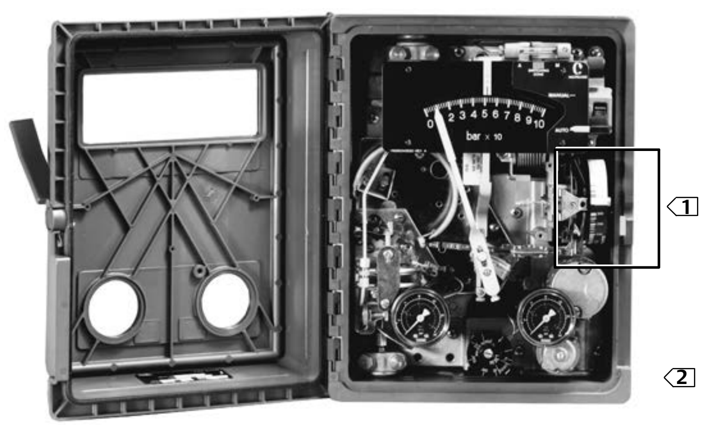
Fisher™ 4195K Gauge Pressure Indicating Controllers

Fisher 4195K gauge pressure indicating controllers show process pressure and set point on an easy-to-read process scale. The controllers compare process pressure with an operator-adjusted set point and delivers a pneumatic signal to a control element so that process pressure changes toward the set point. Controller types are available for proportional-only, proportional-plus-reset, proportional-plus-reset-plus-rate, and differential gap for on-off control. 4195K controllers are used in industries where accurate pressure control and process monitoring are required.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

W5663-1

YOKE-MOUNTED CONTROLLER



W5660-1

INTERIOR OF A FISHER 4195KBME CONTROLLER

Notes:
1 An internal cover protects the proportional band adjustment mechanism. In this photograph, the cover has been removed.
2 Controller components are indicated in figure 1.

Specifications

Available Configurations

See table 1

Process Sensor Range (Input Signal)

Lower and Upper Range Limits:
As shown in tables 2 and 5
Maximum Allowable Pressure:
As shown in tables 2 and 5

Process Scale

Standard scale is matched to the range of the sensing element, with exception of receiver controllers. Optional scales available(1).

Process Connections

Standard: 1/4 NPT internal stainless steel (all input ranges)
Optional: 1/2 NPT adaptors (see table 3)

Output Signal

Proportional, Proportional-Plus-Reset, or Proportional-Plus-Reset-Plus-Rate Range: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)
Differential Gap Range: ■ 0 to 1.4 bar (0 to 20 psig) or ■ 0 to 2.4 bar (0 to 35 psig)
Action: Field-reversible between ■ direct (increasing sensed pressure increases output pressure), and ■ reverse (increasing sensed pressure decreases output pressure) action

Supply and Output Connections

1/4 NPT internal

Supply Pressure Requirements(2)

See table 4

Supply Pressure Medium

Air or non-corrosive Natural Gas

Remote Set Point Pressures

■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)

Construction Materials

See table 6

Controller Adjustments

Proportional Band: 5 to 500% of process scale span
Reset: Adjustable from 0.01 to more than 74 minutes per repeat (from 100 to less than 0.0135 repeats per minute)
Rate: Adjustable from 0 to 20 minutes
Differential Gap Controllers: Adjustable from 5 to 100% of process scale span
Set Point: Adjustable from 0 to 100% of the scale span

Controller Performance

Repeatability: 0.4% of output span
Dead Band: Less than 0.4% of process scale span
Typical Frequency Response: 1.5 hertz and 90 degree phase shift with 3.05 m (10 feet) of 6.4 mm (1/4-inch) tubing and 1639 cm^3 (100 cubic inch) volume

Steady-State Air Consumption(3)(4)

0.2 to 1.0 Bar (3 to 15 Psig) Output:
0.08 m^3/hr (2.8 scfh)
0.4 to 2.0 Bar (6 to 30 Psig) Output:
0.07 m^3/hr (2.5 scfh)

Operative Ambient Temperature Limits(2)(5)

-40 to 71°C (–40 to 160°F)

(continued)

Table of Contents

Specifications (continued)

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D
Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T6
Dust: T71

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

II Gb c T*X
III Db c T*X

Housing

Designed to NEMA 3 (Weatherproof) and IEC 529 IP54 Specifications

Mounting

Controller can be mounted on ■ actuator, ■ panel, ■ wall, or ■ pipestand

Approximate Weight

4.5 kg (10 pounds)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Consult your Emerson sales office for additional information.
2. The pressure/temperature limits in this document and any applicable code or standard should not be exceeded.
3. Normal m^3/hr--normal cubic meters per hour (m^3/hr, 0°C and 1.01325 bar, absolute). Scfh--standard cubic feet per hour (ft^3/hr, at 60°F and 14.7 psig).
4. Without auto/manual station. With auto/manual station add 0.01 m^3/hr (0.5 scfh).
5. Also use these temperatures for transportation and storage limits.

Table 1. Available Configurations

TYPE NUMBER(1)	MODES				OPTIONS		
	Proportional-Only	Proportional-Plus-Reset	Proportional-Plus-Reset-Plus-Rate	Differential Gap	Anti-Reset Windup (suffix letter F)	Remote Set Point (suffix letter M)	Internal Auto/ Manual Station (suffix letter E)
4195KA	X	---	---	---	---	---	---
4195KAE	X	---	---	---	---	---	X
4195KAM	X	---	---	---	---	X	---
4195KAME	X	---	---	---	---	X	X
4195KB	---	X	---	---	---	---	---
4195KBE	---	X	---	---	---	---	X
4195KBF	---	X	---	---	X	---	---
4195KBFE	---	X	---	---	X	---	X
4195KBM	---	X	---	---	---	X	---
4195KBME	---	X	---	---	---	X	X
4195KBFM	---	X	---	---	X	X	---
4195KBFME	---	X	---	---	X	X	X
4195KC	---	---	X	---	---	---	---
4195KCE	---	---	X	---	---	---	X
4195KCF	---	---	X	---	X	---	---
4195KCFE	---	---	X	---	X	---	X
4195KCM	---	---	X	---	---	X	---
4195KCME	---	---	X	---	---	X	X
4195KCFM	---	---	X	---	X	X	---
4195KCFME	---	---	X	---	X	X	X
4195KS	---	---	---	X	---	---	---
4195KSE	---	---	---	X	---	---	X
4195KSM	---	---	---	X	---	X	---
4195KSME	---	---	---	X	---	X	X

1. Reverse-acting constructions are designated by the suffix letter R in the type number.

Features

- Easy Maintenance—Simple design allows fast, easy maintenance and minimal spare parts inventory.

- Easy Adjustment—Adjusting the set point, the zero and span of the process pointer, and switching between direct and reverse action are accomplished quickly and without special tools. Additionally, the set point and proportional band can be adjusted with no interaction between the two adjustments.

- Application Versatility—Either a Bourdon tube or capsular input element is available to control a wide range of positive pressures, vacuum pressures, or compound pressures.

- Mounting Versatility—A 4195K controller can be mounted directly on the actuator or it can mount on a pipestand, wall, or in a panel.

- Vibration Resistance—The simple design and low mass of internal parts allow a 4195K controller to withstand the vibration levels encountered in most plant environments.

- High-Visibility Display—Two red pointers on a 114 mm (4 1/2-inch) long, white-on-black scale show process pressure and deviation from set point at a glance. Two other gauges monitor supply pressure and output pressure.

- Low Air/Gas Consumption—The relay and nozzle design reduces the steady-state consumption rate to as low as 0.07 m^3/hr (2.5 scfh); less than the 6 scfh requirement set for the oil and gas industry by the US Environmental Protection Agency (New Source Performance Standards Subpart OOOO, EPA-HQ-QAR-2010-0505).

- Corrosion Resistance—Tough, plastic housing resists such corrosive environments as chemical plants and the salt spray atmosphere on an offshore oil platform. Internal constructions are available to resist a corrosive supply pressure media.

Construction Features

Simplified Relay Maintenance

A clean-out wire provides a fast, easy means of cleaning the relay primary orifice during service.

Pressure Protection for the Case

A rubber plug in the plastic case pops out to relieve excessive pressure buildup inside the case.

Easy Direct/Reverse Switching

Controller action can be switched from direct to reverse or vice versa by simply loosening the screws on the proportional band cover and moving the cover out to rotate the proportional band knob to the desired action (see figure 1).

Easy Mode Conversion

Conversion from proportional to proportional-plus-reset control requires the addition of a reset valve and two pieces of tubing. Conversion from proportional to proportional-plus-reset-plus-rate control requires the addition of a reset/rate valve and three pieces of tubing. Conversion from proportional to differential gap for on/off control requires the addition of one piece of tubing.

Anti-Reset Windup

Anti-reset windup is available with proportional-plus-reset controllers. A relief valve may be installed to limit reset windup in either direction.

Remote Set Point

The capability to adjust the set point from a remote location is available as an option on 4195K controllers.

Auto/Manual Capability

An optional internal auto/manual station permits smooth, bumpless transfer between automatic control and manual operation without disturbing the controller output. A positive-acting, two-position switch, showing either automatic or manual control mode, is clearly visible with the controller cover closed.

Table 2. Process Sensor (Capsular Element) Pressure Ratings

CAPSULE MATERIAL	CAPSULAR STANDARD RANGES			SPAN(1)		OPERATING RANGE		OPERATING LIMIT(2)
				Min	Max	Min	Max	
N09902 Nickel Alloy	Metric units	Positive pressure	0 to 150 mbar	100 mbar	160 mbar	-350 mbar	350 mbar	510 mbar
			0 to 400 mbar	350 mbar	700 mbar	-1 bar	1 bar	1.5 bar
			0 to 0.6 bar	0.35 bar	0.7 bar	-1 bar	1 bar	1.5 bar
			0.2 to 1 bar	0.4 bar	0.8 bar	-1 bar	1.4 bar	2 bar
			0 to 1 bar	0.5 bar	1 bar	-1 bar	1.4 bar	2 bar
			0 to 1.4 bar	0.7 bar	1.4 bar	-1 bar	1.7 bar	2.5 bar
			0 to 1.6 bar	1 bar	2 bar	-1 bar	2.4 bar	3.5 bar
			0.4 to 2 bar	0.8 bar	1.6 bar	-1 bar	2 bar	3 bar
			0 to 2 bar	1 bar	2 bar	-1 bar	2.4 bar	3.5 bar
		Vacuum	-150 to 0 mbar	85 mbar	170 mbar	-350 mbar	350 mbar	510 mbar
			-340 to 0 mbar	170 mbar	340 mbar	-480 mbar	480 mbar	724 mbar
			-400 to 0 mbar	350 mbar	700 mbar	-1 bar	1 bar	1.5 bar
			-0.6 to 0 bar	0.35 bar	0.7 bar	-1 bar	1 bar	1.5 bar
			-1 to 0 bar	0.5 bar	1 bar	-1 bar	1.4 bar	2 bar
		Compound	-50 to 100 mbar	100 mbar	160 mbar	-350 mbar	350 mbar	510 mbar
			-175 to 175 mbar	175 mbar	350 mbar	-480 mbar	480 mbar	724 mbar
			-150 to 250 mbar	350 mbar	700 mbar	-1 bar	1 bar	1.5 bar
			-0.2 to 0.4 bar	0.35 bar	0.7 bar	-1 bar	1 bar	1.5 bar
			-0.4 to 0.6 bar	0.5 bar	1 bar	-1 bar	1.4 bar	2 bar
			-0.6 to 0.8 bar	0.7 bar	1.4 bar	-1 bar	1.7 bar	2.5 bar
			-1 to 0.6 bar	1 bar	2 bar	-1 bar	2.4 bar	3.5 bar
			-1 to 1 bar	1 bar	2 bar	-1 bar	2.4 bar	3.5 bar
	U.S. units	Positive pressure	0 to 60 inch wc	40 inch wc	60 inch wc	-10 inch Hg	5 psig	7.5 psig
			0 to 5 psig	2.5 psig	5 psig	-14 inch Hg	7 psig	10.5 psig
			0 to 10 psig	5 psig	10 psig	-30 inch Hg	15 psig	22.5 psig
			3 to 15 psig	6 psig	12 psig	-30 inch Hg	20 psig	30 psig
			0 to 15 psig	7.5 psig	15 psig	-30 inch Hg	20 psig	30 psig
			0 to 20 psig	10 psig	20 psig	-30 inch Hg	25 psig	37.5 psig
			6 to 30 psig	12 psig	24 psig	-30 inch Hg	30 psig	45 psig
			0 to 30 psig	15 psig	30 psig	-30 inch Hg	35 psig	52.5 psig
		Vacuum	-5 to 0 inch Hg	2.5 inch Hg	5 inch Hg	-10 inch Hg	5 psig	7.5 psig
			-10 to 0 inch Hg	5 inch Hg	10 inch Hg	-14 inch Hg	7 psig	10.5 psig
			-20 to 0 inch Hg	10 inch Hg	20 inch Hg	-30 inch Hg	15 psig	22.5 psig
			-30 to 0 inch Hg	15 inch Hg	30 inch Hg	-30 inch Hg	20 psig	30 psig
		Compound	-30 to 30 inch wc	40 inch wc	60 inch wc	-10 inch Hg	5 psig	7.5 psig
			-5 inch Hg to 2.5 psig	2.5 psig	5 psig	-14 inch Hg	7 psig	10.5 psig
			-10 inch Hg to 5 psig	5 psig	10 psig	-30 inch Hg	15 psig	22.5 psig
			-15 inch Hg to 7.5 psig	7.5 psig	15 psig	-30 inch Hg	20 psig	30 psig
			-20 inch Hg to 10 psig	10 psig	20 psig	-30 inch Hg	25 psig	37.5 psig
			-30 inch Hg to 15 psig	15 psig	30 psig	-30 inch Hg	35 psig	52.5 psig

1. Minimum or maximum span or any span in between may be positioned anywhere within the operating range. For example, if a 0 to 350 mbar (0 to 5 psig) sensing element is used and the minimum span of 175 mbar (2.5 psig) is set, the process indication can be calibrated to a range of 340 mbar to 203 mbar (10 inch Hg to 6 inch Hg), 0 to 172 mbar (0 to 2.5 psig), 172 to 345 mbar (2.5 to 5 psig), 305 to 480 mbar (4.5 to 7 psig), or any value between minimum and maximum values of operating range.
2. Capsules with the travel stops set may be pressured to this value without permanent zero shift.

Table 3. Optional Process Connection Adaptors

BAR INPUT RANGE	PSIG INPUT RANGE	CONNECTION	
		Size	Material
Up to 0 to 400	Up to 0 to 5000	■ 1/2 NPT external or ■ 1/2 NPT internal	■ steel or ■ stainless steel
0 to 400 to 0 to 600	0 to 5000 to 0 to 10,000	1/2 NPT internal	stainless steel
0 to 400 to 0 to 600	0 to 5000 to 0 to 10,000	1/2 NPT external	stainless steel

Table 4. Supply Pressure Data

Output Signal Range		Normal Operating Supply Pressure(1)	Maximum Pressure Limit(2)
Bar	0.2 to 1.0 or 0 and 1.4 (diff gap)	1.4	2.8
	0.4 to 2.1 or 0 and 2.4 (diff gap)	2.4	2.8
Psig	3 to 15 or 0 and 20 (diff gap)	20	40
	6 to 30 or 0 and 35 (diff gap)	35	40

1. If this pressure is exceeded, control stability may be impaired.
2. If this pressure is exceeded, damage to controller components may result.

Table 5. Process Sensor (Bourdon Tube) Pressure Ratings and Materials

BOURDON TUBES		SPAN[1]		OPERATING RANGE[2]		OPERATING LIMITS[4]	STANDARD MATERIAL
		Minimum	Maximum	Minimum	Maximum[3]		
				Bar			
Metric units	0 to 1.6	1	2	-1	3	3.3	S31600 (316 SST)
	0 to 2.5	2	4	-1	6	6.6	
	0 to 4	2	4	-1	6	6.6	
	0 to 6	3.5	7	-1	10	11	
	0 to 10	7	14	-1	20	22	
	0 to 25	20	40	0	60	66	
	0 to 40	20	40	0	60	66	
	0 to 60	55	70	0	90	103	
	0 to 100	76	100	0	135	155	
	0 to 160	160	200	0	270	310	
	Psig	**Psig**	**Psig**	**In. Hg**	**Psig**	**Psig**	**Standard Material**
U.S. units	0 to 30	15	30	-30	42	48	S31600
	0 to 60	30	60	-30	84	96	
	0 to 100	50	100	-30	140	160	
	0 to 200	100	200	-30	280	320	
	0 to 300	150	300	-30	420	480	
	0 to 600	300	600	0	840	960	
	0 to 1000	750	1000	0	1300	1500	
	0 to 1500	1100	1500	0	1950	2250	
	0 to 3000	2200	3000	0	3900	4500	
	0 to 5000	3700	5000	0	6000	7000	

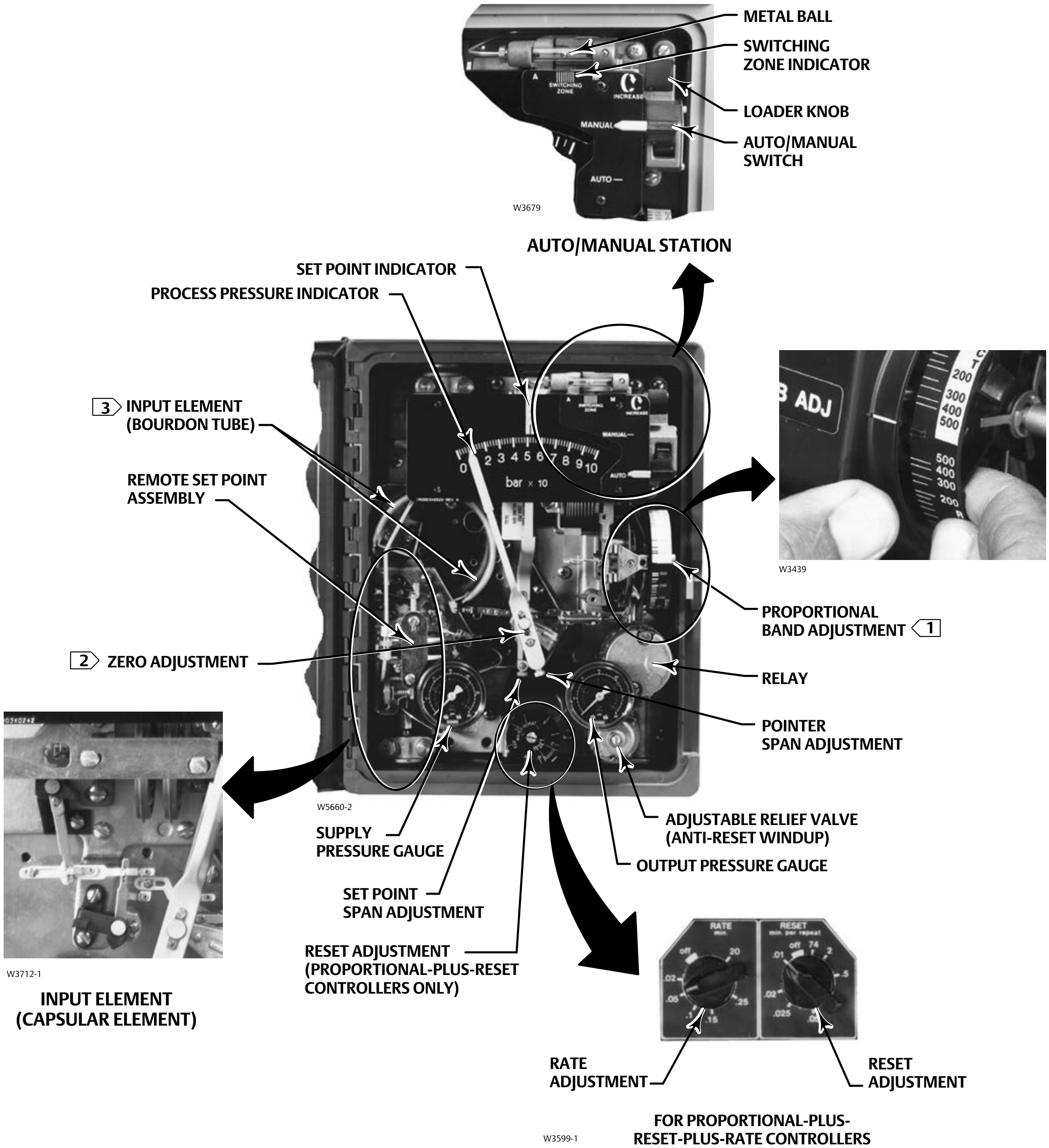
1. Minimum or maximum span or any span in between may be positioned anywhere within the operating range. For example, if a 0 to 2 bar (0 to 30 psig) sensing element is used and the minimum span of 1 bar (15 psig) is set, the process indication can be calibrated to a range of 1 to 0 bar (30 in. Hg to 0 psig), 0 to 1 bar (0 to 15 psig), 1 to 2 bar (15 to 30 psig), 2 to 3 bar (27 to 42 psig) or any value between minimum and maximum values of operating range.
2. Travel stops should be used when the maximum or minimum process pressure will be 5% over or under the calibrated range. For example, a 0 to 2 bar (0 to 30 psig) sensing element is calibrated for 0.7 to 2 bar (10 to 30 psig), the desired range. The minimum expected pressure is 0 psig and the maximum expected pressure is 2.8 bar (40 psig). Travel stops must be used to prevent excessive overtravel and undertravel since the maximum allowable overpressure and underpressure is higher than 5% of the 1.4 bar (20 psig) span which is ±70 mbar (1 psig).
3. Bourdon tube without travel stops may be pressured to this value without permanent zero shift.
4. Bourdon tube with travel stops set may be pressured to this value without permanent zero shift.

Table 6. Construction Materials

Part	Standard Material	Optional Material
Case and cover	Polyester plastic	- - -
Exterior tubing	Copper	■ stainless steel, ■ polyethylene
Exterior fittings	C36000 (brass)	■ stainless steel, ■ polyethylene
Interior tubing	Copper	S30400 (304 stainless steel)
Bourdon tube[1]	S31600 (316 stainless steel)	■ N09902 nickel alloy, ■ N05500 nickel alloy (for NACE applications)
Nozzle	S30300 (303 stainless steel)	- - -
Flapper	S31600	- - -
Relay springs	■ S30200 (302 stainless steel), ■ steel	- - -
Relay O-rings	Nitrile	- - -
Relay diaphragms	Nitrile	- - -
Other relay metal parts	■ Aluminum, ■ stainless steel	- - -
Feedback bellows assembly	C51000 (bronze)	S32100 (321 stainless steel)
Supply, output gauges	Brass (wetted parts only)	stainless steel (wetted parts only)
Remote set point element	■ N09902 nickel alloy ■ S30300	- - -
Capsular input element	N09902 nickel alloy	S31600

1. Consult your Emerson sales office for information on other materials.

Figure 1. Controller Construction Details



Notes:
1 White portion of proportional band adjustment enables direct controller action; black portion enables reverse controller action.
2 For the process pointer.
3 Input element is a bourdon tube or a capsular element (as shown in inset) depending on input range. See tables 2 and 5.

Principle of Operation

Refer to the schematic diagrams in figures 2, 3, and 4. Refer to table 1 for a complete description of type number suffixes.

Proportional-Only Controllers (4195KA)

The input element is connected to the process pointer and to the flapper by connecting links. As the process pressure increases (in a direct-acting controller), the flapper moves toward the nozzle, restricting flow through the nozzle and increasing nozzle pressure. When this occurs, relay action increases the output pressure (delivery) of the controller. Output pressure is fed back to the proportional bellows. The action of the proportional bellows counteracts the flapper movement that resulted from the process pressure change and backs the flapper away from the nozzle until equilibrium is reached.

The set point adjustment changes the proximity of the nozzle and flapper as does a change in process pressure except that when the set point is changed, the nozzle moves with respect to the flapper.

The proportional band adjustment knob positions the nozzle on the flapper. Increasing (widening) the proportional band moves the nozzle to a position on the flapper where less input and more feedback motion occurs, which decreases the gain of the controller.

Decreasing (narrowing) the proportional band moves the nozzle toward a position where more input and less feedback motion occurs, which increases the gain. The controller action is changed from direct to reverse by turning the proportional band adjustment knob to position the nozzle on the flapper quadrant to a point where the direction of the flapper motion versus input motion is reversed (see flapper detail in figure 2). With the controller in the reverse-acting mode, an increase in process pressure causes a decrease in output pressure.

Proportional-Plus-Reset and Proportional-Plus- Reset-Plus-Rate Controllers (4195KB and KC)

The operation of proportional-plus-reset controllers (4195KB) is similar to that of proportional-only controllers (described above). However, in 4195KB controllers, output pressure is fed back to the reset bellows as well as to the proportional bellows. In operation, proportional-plus-reset controllers minimize the offset between the process pressure and set point.

As the process pressure increases (in a direct-acting controller), the flapper moves toward the nozzle, restricting flow through the nozzle and increasing nozzle pressure. When this occurs, relay action increases the output pressure (delivery) of the controller. Output pressure is fed back to the proportional bellows and to the reset bellows.

The action of the proportional bellows quickly counteracts the flapper movement that resulted from the process pressure change and backs the flapper away from the nozzle. Pressure in the reset bellows opposes the action of the proportional bellows and slowly moves the flapper closer to the nozzle. Thus, when the process pressure changes, proportional action temporarily reduces the gain of the controller for improved stability. The process pressure then slowly returns to set point, as pressure in both bellows equalizes via the reset action.

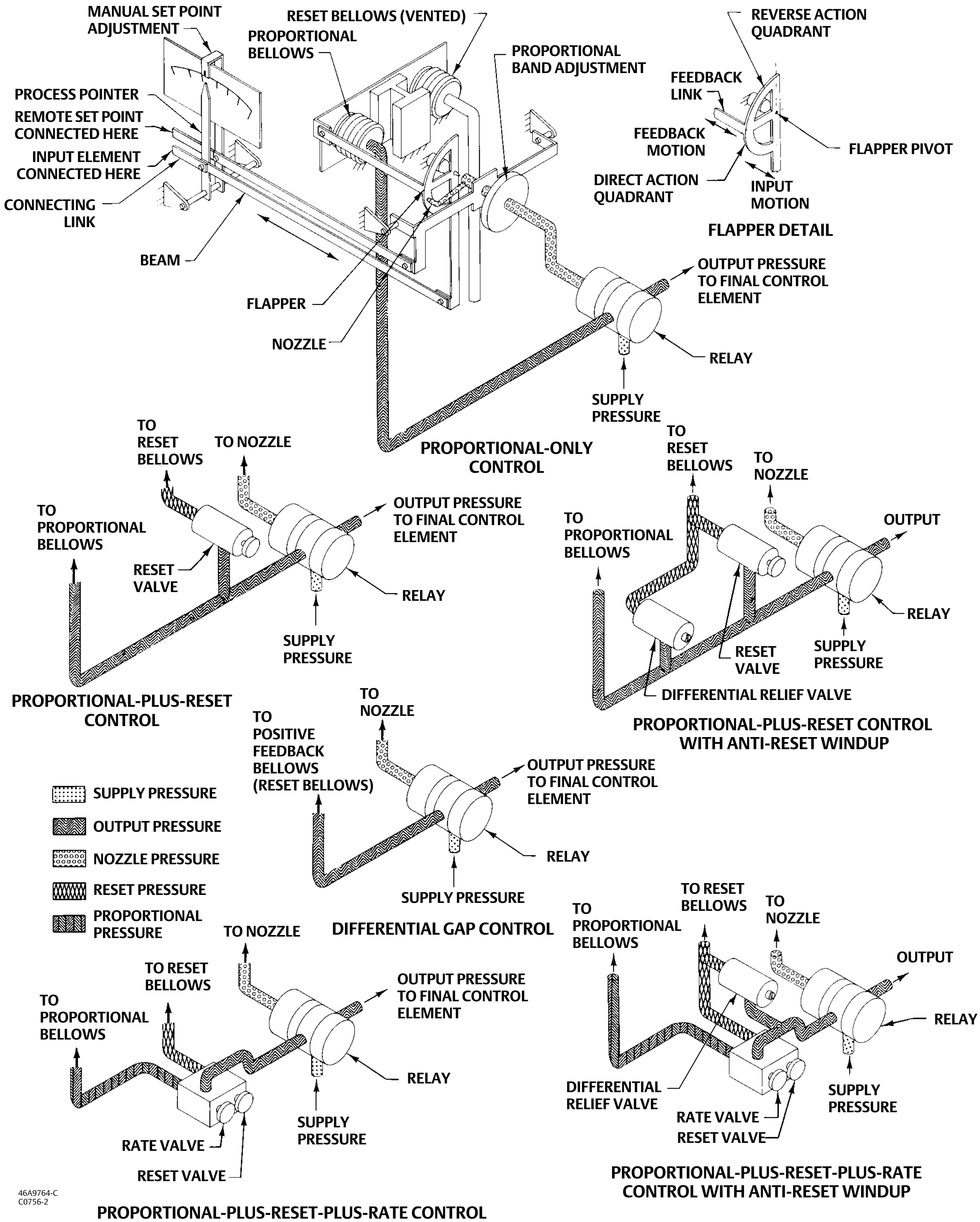
The set point adjustment changes the proximity of the nozzle and flapper as does a change in process pressure. However, when the set point changes, the nozzle moves with respect to the flapper.

The proportional band adjustment knob positions the nozzle on the flapper. Increasing (widening) the proportional band moves the nozzle to a position on the flapper where less input and more feedback motion occurs, which decreases the gain of the controller. Decreasing (narrowing) the proportional band moves the nozzle toward a position where more input and less feedback motion occurs, which increases the gain.

The controller action is changed from direct to reverse by turning the proportional band adjustment knob to position the nozzle on the flapper quadrant to a point where the direction of the flapper motion versus input motion is reversed. With the controller in the reverse-acting mode, an increase in process pressure causes a decrease in output pressure.

A 4195KC controller also has a rate valve, which is an adjustable restriction that momentarily increases the controller gain to accelerate the corrective action for slow pressure systems. A proportional-plus-reset-plus-rate controller responds to a change in process pressure as follows: First, the rate action delays the proportional action just long enough to allow the

Figure 2. Schematic of Fisher 4195K Controllers



controller to respond to the change quickly with high gain, but not long enough for the high gain to cause instability. Then, the low gain provided by the proportional action keeps the system stable. Finally, reset action slowly increases the gain and returns the process pressure toward the set point.

Differential Gap (For On-Off Control) Controllers (4195KS)

The operation of differential gap controllers (4195KS) is similar to that of proportional-only controllers (described above). However, in 4195KS controllers, as the process pressure increases, approaching the upper switching point, the flapper moves toward the nozzle (in a direct-acting controller). This movement restricts the flow through the nozzle and increases nozzle pressure. When this occurs, relay action increases the output pressure (delivery) of the controller. Output pressure is fed back to the positive feedback bellows. The action of the positive feedback bellows moves the flapper closer to the nozzle, increasing nozzle pressure, which in turn, increases the relay output. Output pressure to the final control element switches to full supply pressure.

As the process pressure decreases, approaching the lower switching point, the flapper moves away from the nozzle (in a direct-acting controller) reducing nozzle pressure. Through relay action, pressure to the positive feedback bellows is reduced, moving the flapper farther away from the nozzle, and further reducing nozzle pressure. Output pressure to the final control element switches to zero.

The set point adjustment changes the proximity of the nozzle and flapper as does a change in process pressure except that, when the set point is changed, the nozzle moves with respect to the flapper. The set point adjustment moves both the upper and lower switching points.

The proportional band knob positions the nozzle on the flapper. Increasing (widening) the proportional band moves the nozzle away from the input connection. When the proportional band adjustment moves the nozzle across the feedback connection, the controller action changes between direct and reverse. On a direct-acting controller, changing the proportional band adjustment will widen or narrow the differential gap between the two switching points. This is accomplished by moving the position of the lower switching point. On a reverse-acting controller, changing the proportional band adjustment will widen or narrow the differential gap between the two switching points by moving the position of the upper switching point.

Remote Set Point Option (Suffix Letter M)

The capability to adjust the controller set point from a remote location is available for all 4195KA controllers. With this option, a control pressure is applied to the capsular element within the remote set point assembly. The expansion and contraction of the capsule moves the set point adjustment via connecting linkage. Increasing the control pressure to the capsule increases the set point setting, and decreasing the control pressure reduces the set point setting. This option is designated by the letter M in the type number.

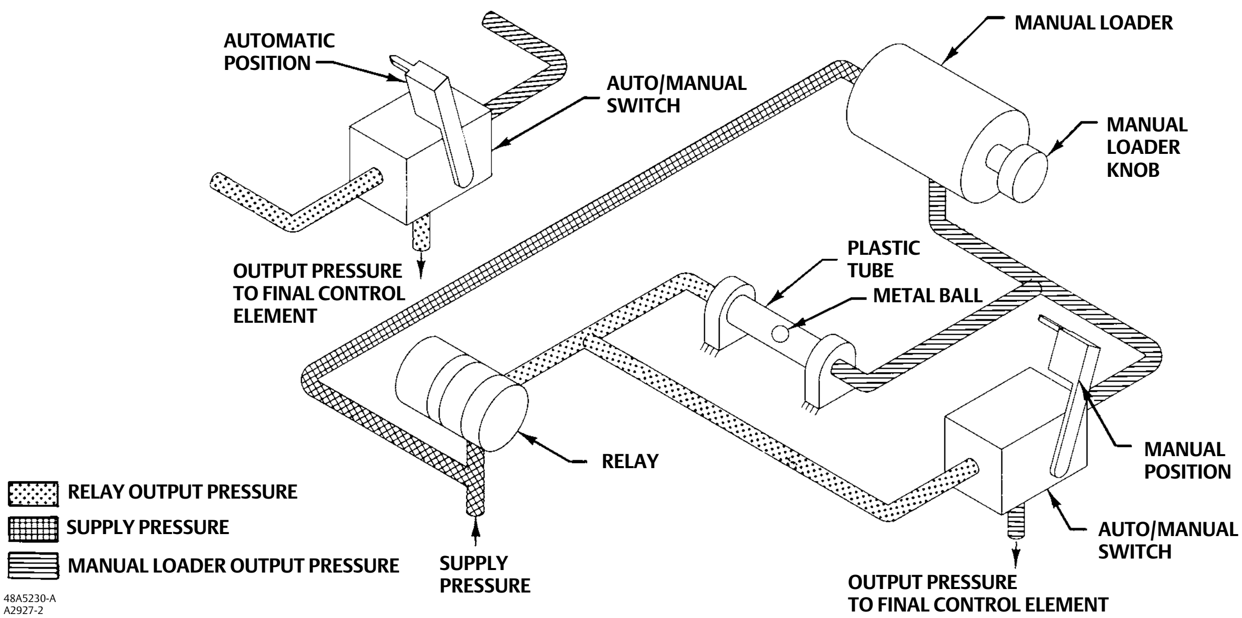
Auto/Manual Station Option (Suffix Letter E)

A controller with the auto/manual option (designated by the letter E in the type number) has piping on the output side of the relay as shown in figure 3. Supply pressure to the relay is also applied to the manual loader. The manual loader, functioning as a regulator, applies pressure to one side of the plastic tube and to the auto/manual switch. Output pressure from the relay registers on the other side of the plastic tube as well as in the auto/manual switch.

When the auto/manual switch is in the MANUAL position, the manual loader output is channeled through the auto/manual switch and becomes the controller output. When the auto/manual switch is in the AUTO position, the relay output is channeled through the switch to become the controller output.

Before the auto/manual switch is operated, the relay output must equal the manual loader output to avoid bumping the process. Adjusting the set point varies the pressure on the left-hand side of the plastic tube. Adjusting the manual loader knob varies the pressure on the right-hand side of the plastic tube. When the pressures are equal, the metal ball is centered in the tube and is held in place by a small magnet. Pressure imbalance forces the ball to one end of the tube where it forms a seal, blocking air flow through the tube.

Figure 3. Schematic of Auto/Manual Station



Anti-Reset Windup Option (Suffix Letter F)

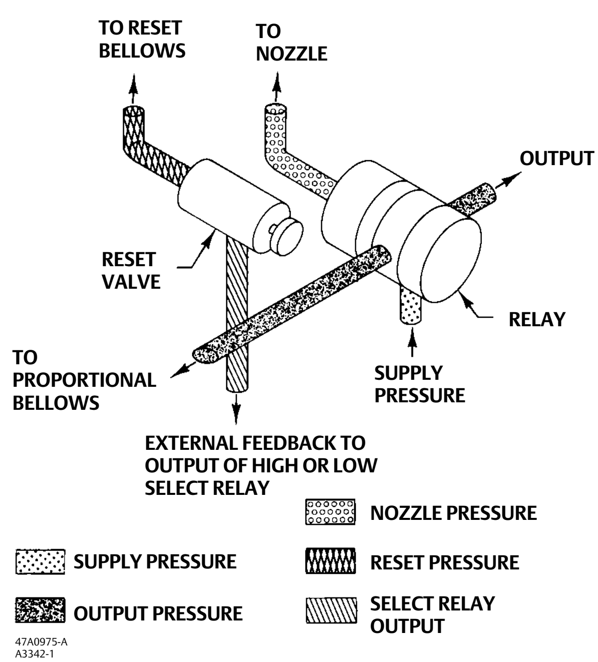
Anti-reset windup is available for all 4195KB and KC controllers and is designated by the letter F in the type number. The differential relief valve operates when the difference between the proportional bellows pressure and the reset bellows pressure reaches a predetermined value. Anti-reset windup reduces overshoot of the process pressure that can result from a large or prolonged deviation from set point.

External Feedback Option

External feedback is available for all 4195KB controllers. Controllers with this option have an external connection on the bottom of the controller case (see figure 6). This connection breaks the positive feedback (reset) loop inside the controller and brings it outside (see figure 4).

The connection allows the positive feedback loops of two controllers (primary and secondary) to be tied together when the controllers are used in an override application. When connected, the secondary controller reset pressure tracks the primary controller output pressure, minimizing reset windup in the secondary controller.

Figure 4. Schematic of External Feedback Option

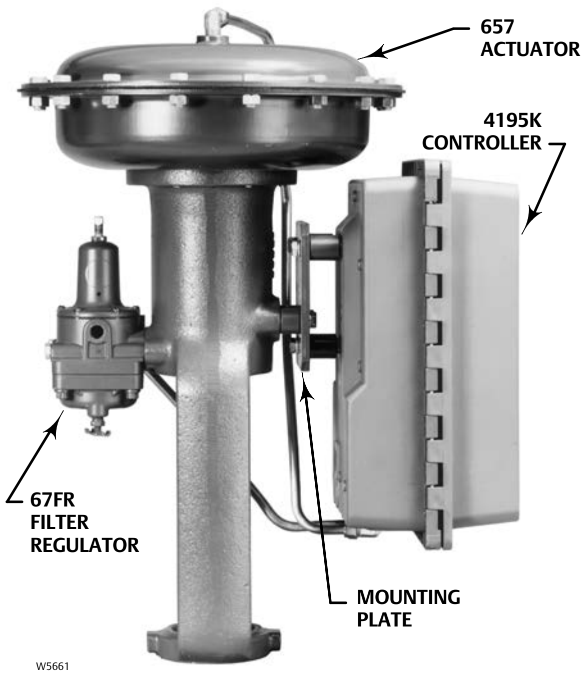


Installation

4195K gauge pressure controllers can be shipped alone for a separate installation or for installation on a control valve actuator. The controllers can also be mounted on a pipe stand, on a wall, or in a panel. When a controller is mounted on an actuator and a positioner is not used, the controller will usually be opposite the supply regulator as shown in figure 5. If a positioner is used, the supply regulator can be mounted on the actuator casing.

The controller must be installed so the vent points down. Basic controller dimensions are shown in figure 6. Dimensions for specific mounting configurations are shown in figure 7.

Figure 5. Typical Yoke Mounting



Ordering Information

When ordering a 4195K controller, specify:

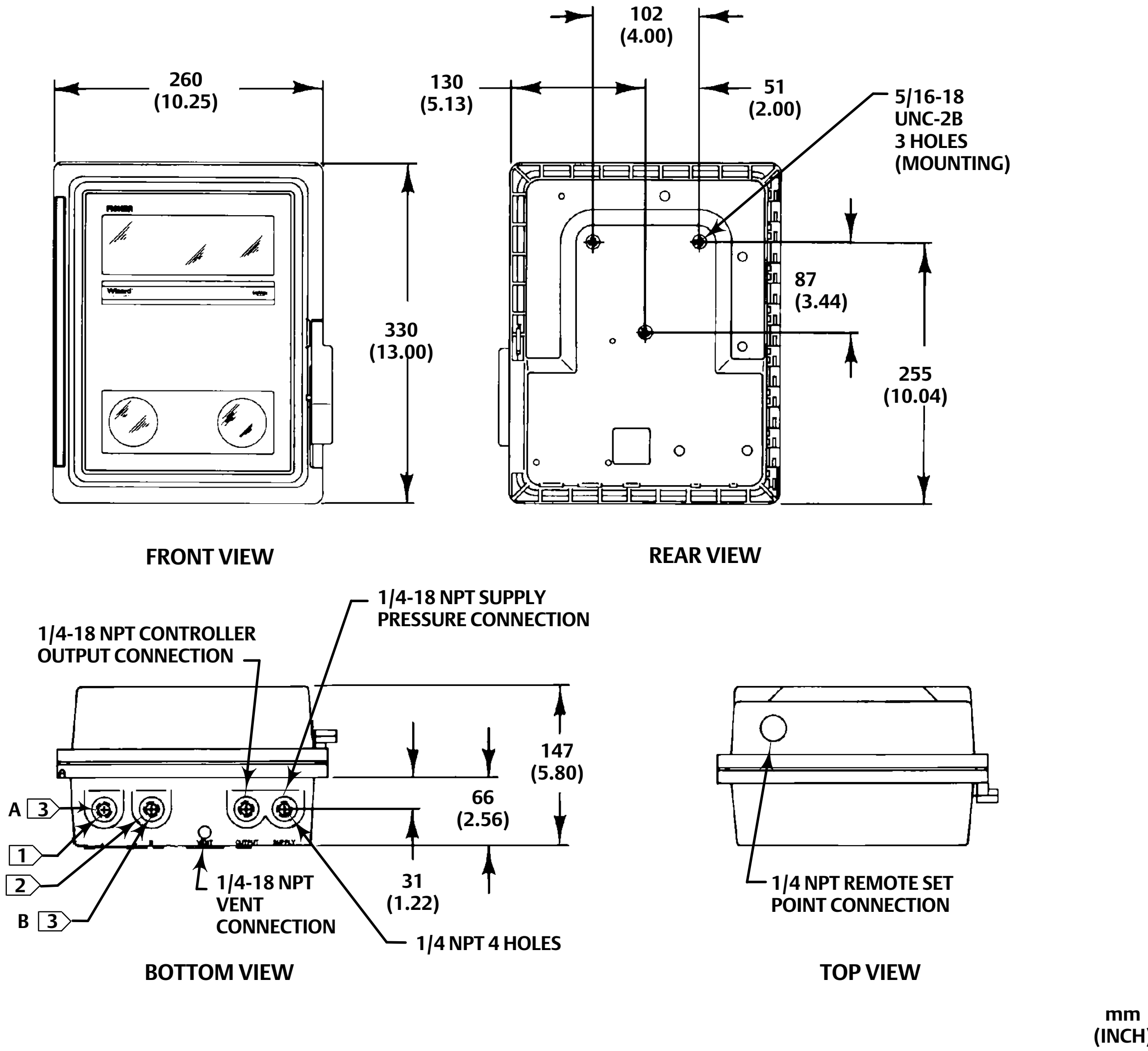
Application

1. Description of the service, such as throttling or on-off
2. Pressure range, composition, and temperature of process fluid
3. Ambient temperature

Construction

Refer to the specifications and to the Construction Features section. Carefully review each specification and feature, indicating your choice whenever a selection is to be made. Refer to table 1 for type numbers; add an R to any type number if reverse action is desired.

Figure 6. Controller Dimensions and Connections

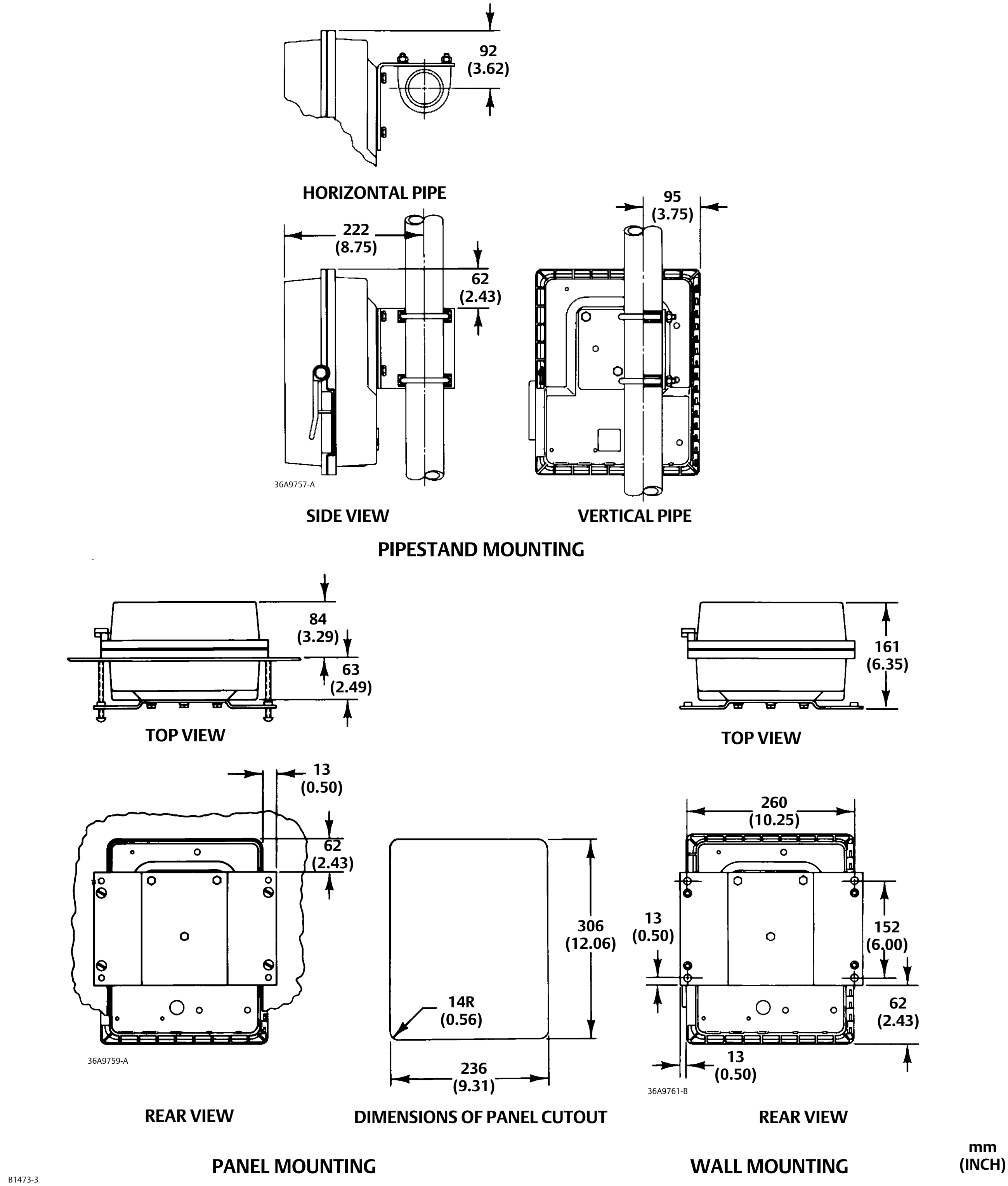


Notes:

1. 1/4-18 NPT process connection (marked A) for all bourdon tube controllers and for those capsular element controllers used in vacuum pressure applications.
2. 1/4-18 NPT process connection (marked B) for capsular element controllers used in positive and compound pressure applications.
3. For the external feedback connections (4195KB controllers only), either the A or B connection is used, depending on the location of the process connection.

46A9765-A
A2892-4

Figure 7. Mounting Dimensions



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Dubai, United Arab Emirates
Singapore 128461 Singapore

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Fisher™ 4660 High-Low Pressure Pilot

The Fisher 4660 pneumatic high-low pressure pilot activates safety shutdown systems for flowlines, production vessels, and compressors. This pilot is available with either single or dual set point capability, using switch points to maintain full output pressure when the process pressure is within the set point range. If the process pressure is outside this range, the pilot switches from full output pressure to zero output pressure.

The primary switching mechanism in this pilot is a block-and-bleed relay assembly. This construction can be used in both block-and-bleed and bleed-only systems.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

FISHER 4660 HIGH-LOW PRESSURE PILOT WITH BLOCK AND BLEED RELAY

Features

- **Safety Certification**—The 4660 is certified for use in Safety Instrumented System (SIS) applications. Certification is by exida Consulting LLC, a global provider of functional safety and control system security (see figure 1). SIS certification is identified on the product by a label affixed to the case.

  The functional safety assessment was performed to the requirements of IEC 61508: ed2, 2010, SIL3 for mechanical components.

- **Superior Performance**—Repeatability meets the U.S. Minerals Management Service test tolerances referenced in Outer Continental Shelf (OCS) Order No. 5 and defined in the American Petroleum Institute (API) RP14C standard.

- **Cost-Effective Design**—One pilot provides either a high-low function or a single switch point, whichever the application requires.

Figure 1. exida Certificate


exida

Certificate / Certificat
Zertifikat / 合格証
EPM 1209016 C001
exida hereby confirms that the:
4660 High-Low Pressure Pilot
Emerson Automation Solutions
Fisher Controls International, LLC
Marshalltown, IA - USA
Has been assessed per the relevant requirements of:
IEC 61508 : 2010 Parts 1-7
and meets requirements providing a level of integrity to:
Systematic Capability: SC 3 (SIL 3 Capable)
Random Capability: Type A, Route 2_H Device
PFD_{AVG} and Architecture Constraints must be verified for each application

Safety Function:
The 4660 pneumatic high-low pressure pilot activates safety shutdown systems for flowlines, production vessels, and compressors.

Application Restrictions:
The unit must be properly designed into a Safety Instrumented Function per the Safety Manual requirements.

CERTIFIED · IEC 61508 · SIL 3 CAPABLE · exida

Revision 2.0 26 December, 2016
Surveillance Audit Due
January 1, 2020

Evaluating Assessor
Certifying Assessor

ANSI
ANSI Accredited Program
PRODUCT CERTIFICATION

Page 1 of 2

- NACE Conformance—A NACE compliant Bourdon tube is available for those applications where the pilot must meet the requirements of NACE MR0175-2002.

- Environmental Packaging—Construction materials have been selected to protect the pilot from corrosive environments such as the salt spray atmosphere of offshore platforms.

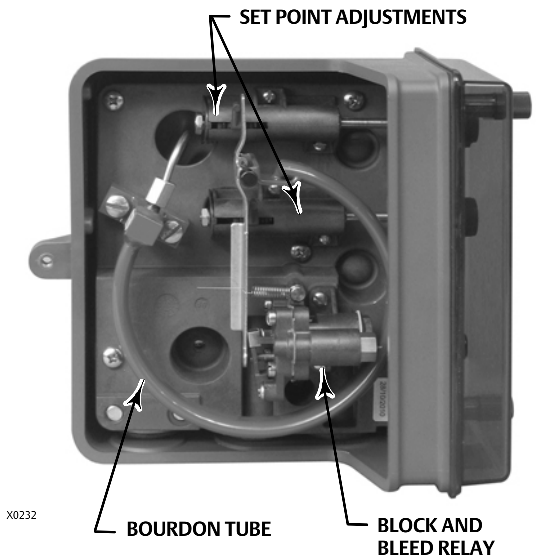
- Reliable Operation—The pilot uses a field-proven Bourdon tube process pressure sensing element, shown in figure 2, that reduces maintenance by eliminating the need for wetted dynamic O-rings.

- Reduced Air/Gas Consumption—The 4660 pneumatic high-low pressure pilot is an energy efficient choice. The low bleed relay provides a steady state consumption rate that is less than the 6 scfh requirement set for the oil and gas industry by the US Environmental Protection Agency (New Source Performance Standards Subpart OOOO, EPA-HQ-QAR-2010-0505).

- Vibration Resistance—The rugged Bourdon tube sensing element and shock-absorbing switch points dampen the effects of vibration while maintaining performance.

- Set Point Accuracy—Standard high-resolution set point adjustments are easy to set, non-interactive, and can be locked in place to maintain the desired set point. The optional set point indication assemblies on the front panel are easy to read and let you simply dial in the desired set point.

Figure 2. Fisher 4660 High-Low Pressure Pilot with Block and Bleed Relay; Left Side with Case Cover Off



- Easy Maintenance—Simple modular construction plus a line of prepackaged parts kits makes pilot maintenance fast and easy.

- Installation Versatility—Panel, rack, pipestand, or actuator mounting is available to meet field requirements.

- Operational Indications—A supply pressure test function is provided. The optional output indicator lets you check at a glance whether the pilot output pressure is at full output or zero output pressure.

Table of Contents

Specifications

Available Configurations

■ High-low, ■ low-only, or ■ high-only set point capability

Input Signal

Type: Process pressure sensed with a Bourdon tube
Bourdon Tube Ratings: See table 1 or 2
Overpressure Protection: Maximum allowable emergency process pressures and maximum allowable process pressures to ensure set point readjustability are shown in table 3

Output Signal

■ Zero pressure or ■ full supply pressure (automatically resets)

Supply Pressure(1)

Normal Operating Pressure: 1.4 to 4.4 bar (20 to 65 psig)

Medium: Air or Natural Gas

Supply medium must be clean, dry, and noncorrosive

Steady-State Air Consumption(2)

Output Signal at 0 psig: ≤0.134 normal m^3/hr (≤5 scfh)
Output Signal at Full Supply Pressure: ≤0.00134 normal m3/hr (≤0.05 scfh)

Set Point Adjustments

Continuously adjustable between 3% and 97% of Bourdon tube rating; see table 1 or 2 for ranges

Performance in Percentage of Bourdon Tube Rating

Repeatability: ≤0.25%
Set Point ΔP_{min}
(See table 1 or 2)
Single High-Low Unit: 10% for up to 170 bar (2500 psig) Bourdon tubes; 15% for 350, 500, and 700 (NACE) bar (5000, 7500, and 10,000 (NACE) psig) Bourdon tubes
Low-Only and High-Only Pair: 3%

Trip-to-Reset Zone: ≤1.5% (see table 1 or 2)

Exhaust Capacity

C_g ≥15

Construction Materials

Case and Cover: Polyester
Front Cover: Tinted polycarbonate with scratch-resistant coating
Base: Hard-anodized nickel-sealed aluminum alloy
Bourdon Tube: ■ S31600 SST or ■ NACE compliant material
Relay Body, Relay Flange, Nozzle/Flapper Assembly Orifice Block, and Switch Point Housings: Glass-filled polyphenylene sulfide
Relay Diaphragm: Fluorosilicone/Polyester
Relay Discs: Fluorosilicone
Process Pressure Block, Tubing, Front Plate, Flapper, Linkages, and Other Major Metal Parts: Stainless steel
Gaskets: Chloroprene and nitrile
O-Rings
Relay: Nitrile
Switchpoint Assembly: Nitrile impregnated with molybdenum disulphide
Base/Case: Nitrile

Operating Conditions(1)

Condition	Normal Operating Limits	Nominal Reference
Ambient Temperature	-59 to 71°C (-75 to 160°F)	21°C (70°F)

Operating Influences on Switch Point Sensitivity

Supply Pressure: ≤0.05% of Bourdon tube rating for a 10% change in supply pressure

Ambient Temperature: ≤2% of Bourdon tube rating throughout normal operating limits with nominal reference

Time: ≤1% of Bourdon tube rating over 30 days at ambient temperature nominal reference

Process Pressure: Range shift or set point drift can occur if process pressure exceeds the Bourdon tube rating

Pressure Connections

1/4 NPT internal

Mounting

■ Panel, ■ rack, ■ pipestand, or ■ actuator

-continued-

Specifications (continued)

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

CE Ex II 2 G D
Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T6
Dust: T71

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

Ex II Gb c T*X
III Db c T*X EAC

Safety Instrumented System Classification

SIL3 capable - certified by exida Consulting LLC

Approximate Weight

2.3 kg (5 pounds)

Options

■ Visual output indication ■ stainless steel panel mounting flange, ■ set point indication, and ■ tamper-resistant front cover

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any applicable standard or code limitation for valve should not be exceeded.
2. Normal m^3/h--Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh--Standard cubic feet per hour at 60°F and 14.7 psia.

Table 1. Additional Specifications, Bar

BOURDON TUBE RATING(1)	SET RANGE(1)	SET POINT ΔP_{MIN} (MINIMUM ALLOWABLE DIFFERENCE BETWEEN HIGH AND LOW SETTINGS)		TRIP-TO-RESET ZONE
		Single High-Low Unit	High-Only/ Low-Only Pair	
7	0.3 to 6.6	0.7	0.2	≤0.1
17	0.6 to 16.6	1.7	0.5	0.3
35	1.1 to 33.4	3.5	1.0	0.5
70	2.1 to 67.9	6.9	2.1	1.0
100	3.2 to 100.2	10.3	3.1	1.6
170	5.2 to 167.2	17.2	5.2	2.6
350	10.4 to 334.4	51.7	10.3	5.2
500	15.6 to 501.5	70.7	15.5	7.8
700(2)	20.7 to 668.8	103.4	20.7	10.3

1. Rating indicated on Bourdon tube and set range on front panel are in kPa (1 bar = 100 kPa).
2. Available in NACE compliant material only.

Table 2. Additional Specifications, Psig

BOURDON TUBE RATING	SET RANGE	SET POINT ΔP_{MIN} (MINIMUM ALLOWABLE DIFFERENCE BETWEEN HIGH AND LOW SETTINGS)		TRIP-TO-RESET ZONE
		Single High-Low Unit	High-Only/ Low-Only Pair	
100	3 to 97	10	3.0	≤1.5
250	8 to 242	25	7.5	3.8
500	15 to 485	50	15	7.5
1000	30 to 970	100	30	15
1500	45 to 1455	150	45	23
2500	75 to 2425	250	75	38
5000	150 to 4850	750	150	75
7500	225 to 7275	1025	225	113
10,000(1)	300 to 9700	1500	300	150

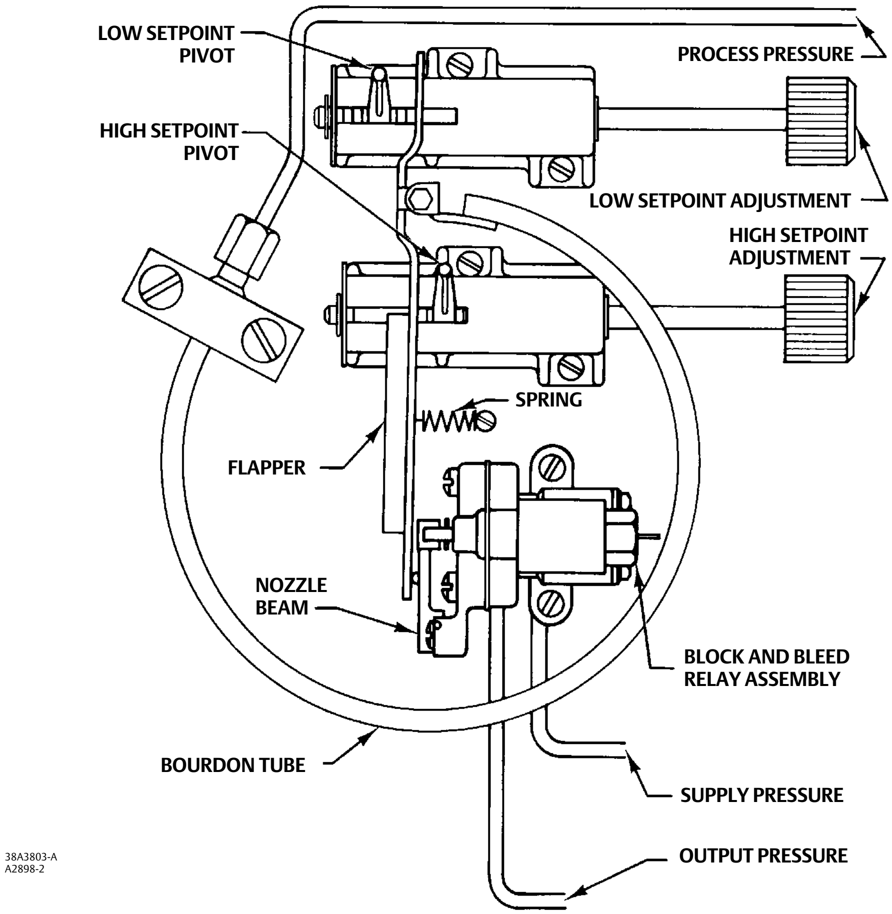
1. Available in NACE compliant material only.

Table 3. Maximum Allowable Process Pressure(1)

BOURDON TUBE RATING		MAXIMUM ALLOWABLE EMERGENCY PROCESS PRESSURE			
		Stainless Steel Bourdon Tubes		NACE Compliant Bourdon Tubes	
Bar(2)	Psig	Bar(2)	Psig	Bar(2)	Psig
6.9	100	13.8	200	13.8	200
17.2	250	34.2	500	34.2	500
34.5	500	69.0	1000	69.0	1000
69.0	1000	138.0	2000	138.0	2000
103.4	1500	206.8	3000	206.8	3000
172.4	2500	344.8	5000	258.6	3750
344.8	5000	517.2	7500	430.9	6250
517.2	7500	646.3	9375	568.8	8250
689.5	10,000	N/A	N/A	758.5	11,000
Maximum Allowable Process Pressure to Ensure Set Point Readjustability(3)					
6.9	100	13.8	200	13.8	200
17.2	250	34.8	500	22.3	325
34.5	500	51.7	750	53.4	775
69.0	1000	103.5	1500	89.7	1300
103.4	1500	155.1	2250	124.0	1800
172.4	2500	172.4	2500	227.5	3300
344.8	5000	517.2	7500	344.8	5000
517.2	7500	646.3	9375	517.2	7500
689.5	10,000	N/A	N/A	689.5	10,000

1. Normal operating process pressures should not exceed the Bourdon tube rating.
2. Ratings indicated on Bourdon tube are in psig and kPa (1 bar = 100 kPa).
3. Values listed for the NACE compliant Bourdon tubes are for a 2% deviation from set point due to overpressure.

Figure 3. Principle of Operation Schematic



Principle of Operation

Refer to figure 3.

Process pressure is connected to the Bourdon tube sensing element. While the process pressure remains in the adjusted set ranges (between the low set point and the high set point), the flapper does not contact either set point pivot. This keeps the nozzle capped and maintains full output pressure.

As the process pressure decreases below the low set point value, the radius of arc of the Bourdon tube contracts. This causes the flapper to contact the low set point pivot and uncap the nozzle, which blocks supply pressure and vents (bleeds) output pressure. As the process pressure increases above the high set point value, the radius of arc of the Bourdon tube extends. This causes the flapper to contact the high set point pivot, also uncapping the nozzle and providing block-and-bleed action. When the process pressure returns to the set range, the nozzle is again capped, switching the relay back to maintain full output pressure.

Performance

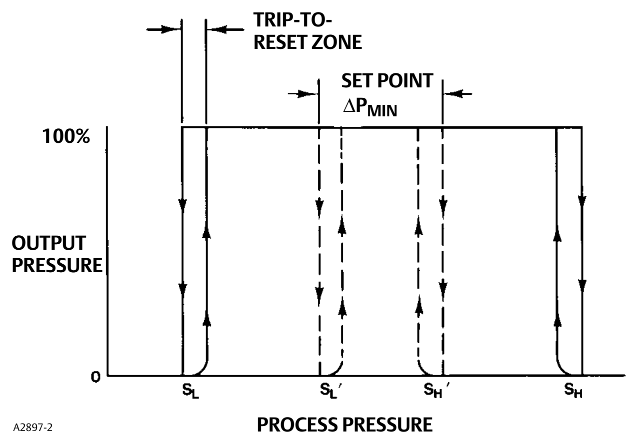
The performance characteristics discussed in the Performance in Percentage of Bourdon Tube Rating specification on page 3 and shown in figure 4 illustrate several important functional parameters.

S_L represents the low set point and S_H represents the high set point. The set range capability is 3 to 97 percent of the Bourdon tube rating. However, with a single high-low unit or a high-only/low-only pair, there is a limit on how close to each other the set points can be adjusted. This limit is defined as set point ΔP_{MIN} and is shown as S_L' and S_H'.

Trip-to-reset is the combined effect of pilot deadband and hysteresis. After the pilot has tripped, it automatically resets when the process pressure returns to the set range. However, full output pressure is not instantaneous. The difference between the set point and reset to full output pressure is the trip-to-reset zone. This parameter is also a function of the Bourdon tube rating as shown in figure 4 and discussed in the Performance in Percentage of Bourdon Tube Rating specification on page 3.

Repeatability is the switch point deviation around the set point as a percentage of the Bourdon tube rating.

Figure 4. Performance Characteristics



Applications

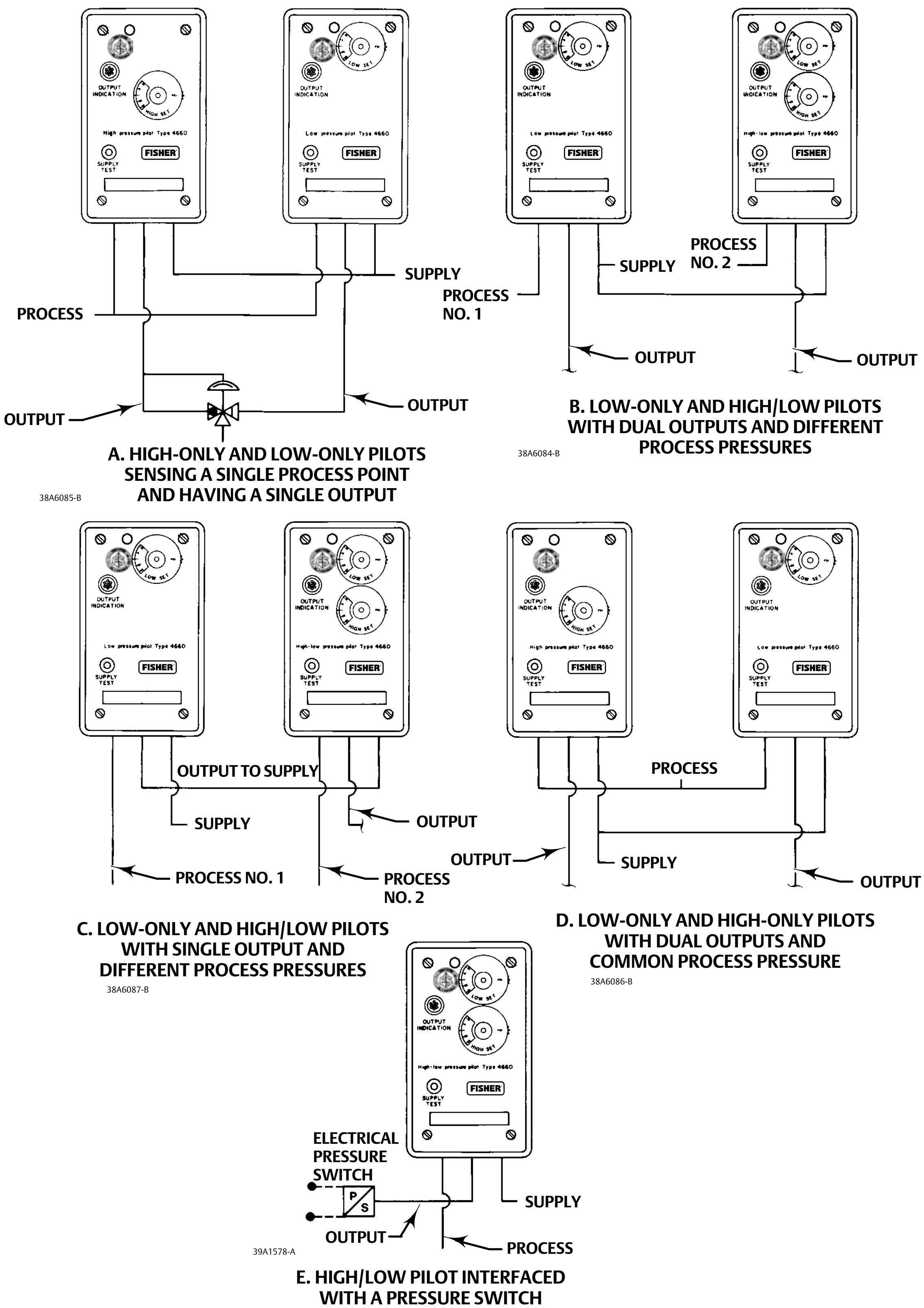
Figure 5 shows some of the many ways in which the 4660 high-low pressure pilot may be connected to accommodate requirements for single and dual outputs as well as single and dual process pressure lines. Examples A and D in figure 5 show how a pair of high-only and low-only pilots are connected to obtain closer set points as specified by the set point ΔP_{MIN} values in tables 1 and 2. Example B or C shows connections for a two-segment flow line configuration that adheres to API Specification RP14C. Example E shows a typical connection to an electrical pressure switch.

Installation

Normal installation is with the pilot mounted vertically and the connections for process pressure, supply pressure, and output pressure facing down. The supply medium should be regulated dry air or natural gas with solid particles removed.

Figures 6 and 7 illustrate the mounting dimensions and the location of the pressure connections.

Figure 5. Typical Connection Schematics



A. HIGH-ONLY AND LOW-ONLY PILOTS SENSING A SINGLE PROCESS POINT AND HAVING A SINGLE OUTPUT

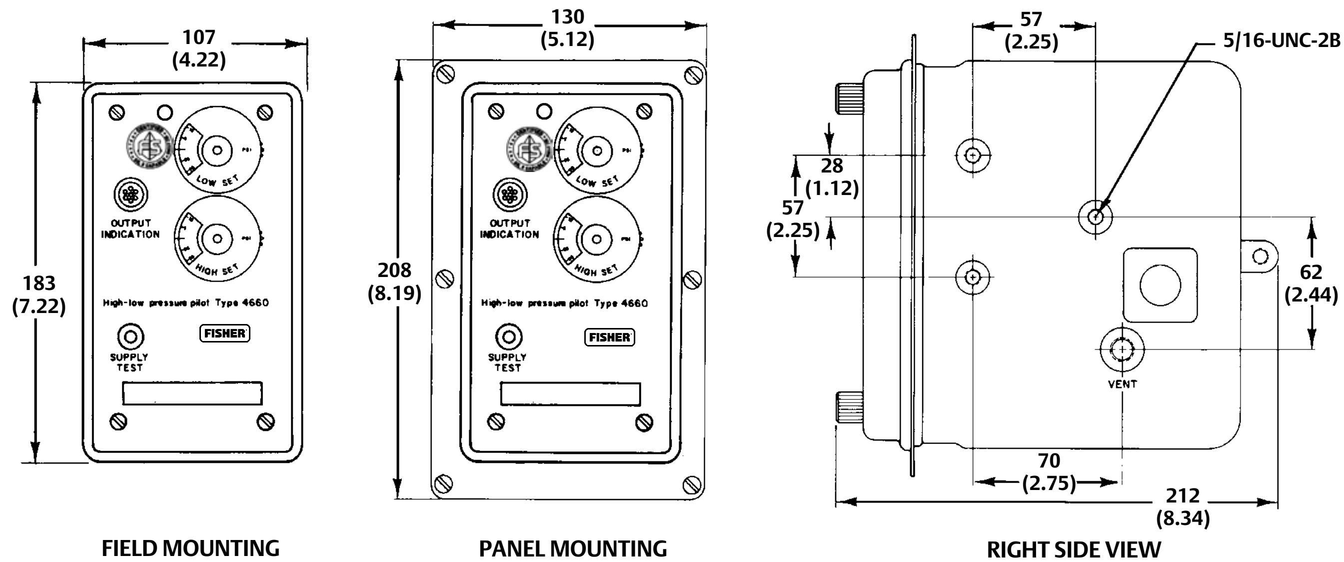
B. LOW-ONLY AND HIGH/LOW PILOTS WITH DUAL OUTPUTS AND DIFFERENT PROCESS PRESSURES

C. LOW-ONLY AND HIGH/LOW PILOTS WITH SINGLE OUTPUT AND DIFFERENT PROCESS PRESSURES

D. LOW-ONLY AND HIGH-ONLY PILOTS WITH DUAL OUTPUTS AND COMMON PROCESS PRESSURE

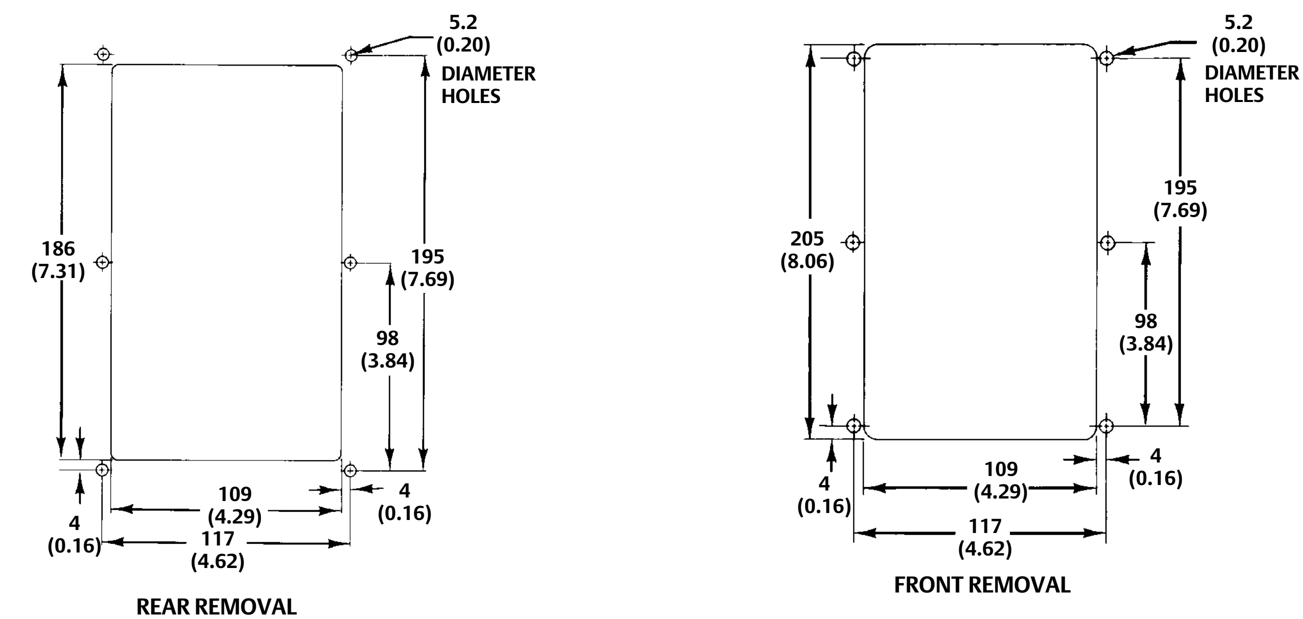
E. HIGH/LOW PILOT INTERFACED WITH A PRESSURE SWITCH

Figure 6. Panel Mounting Dimensions



Note:
All connection are 1/4 NPT.

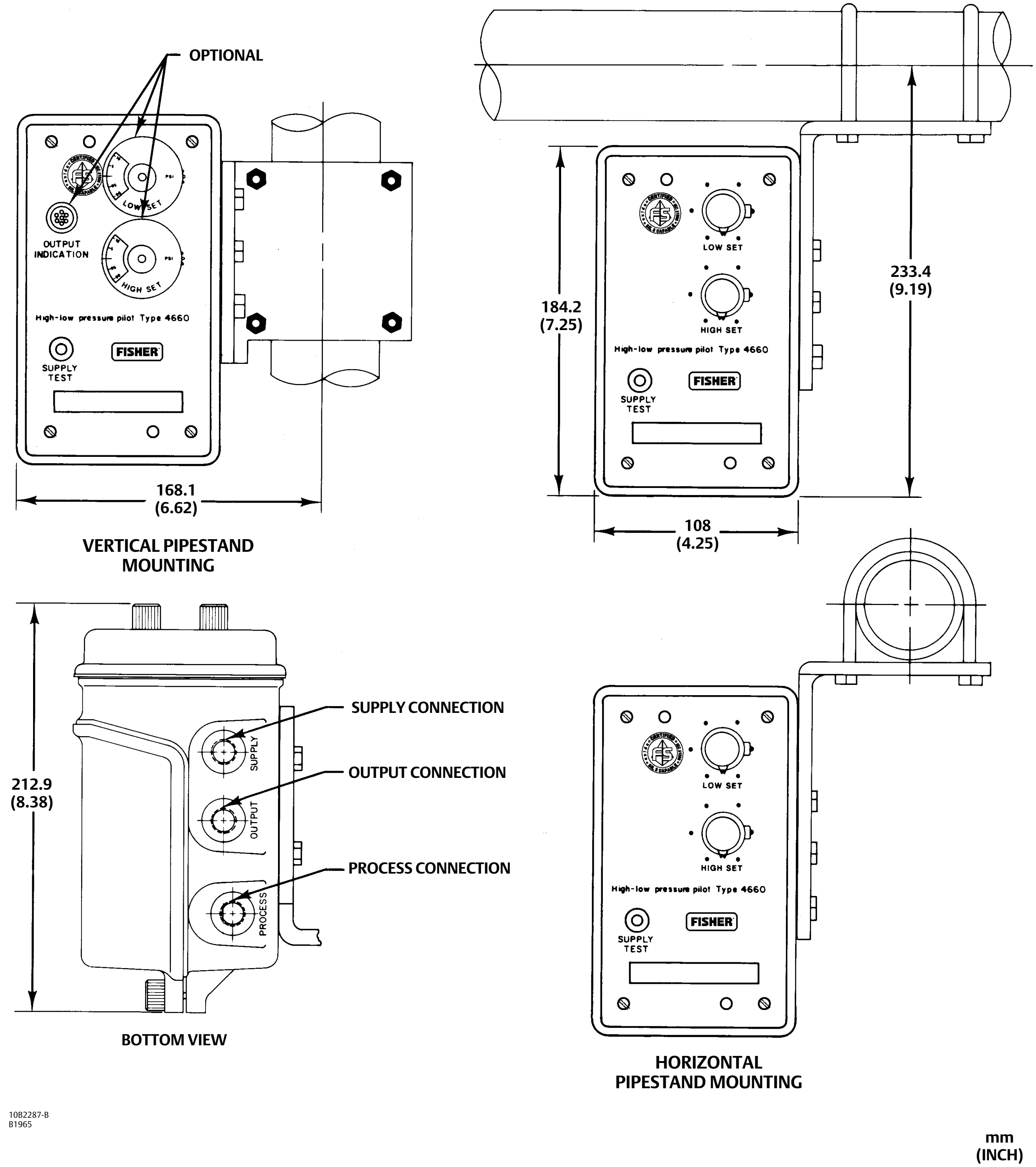
39A1578-A
18A3804-G
B1589-3



18A3804-F
A3299-1

mm
(INCH)

Figure 7. Pipestand Mounting Dimensions



Ordering Information

When ordering, specify:

Application

- Bourdon tube rating and material
- Composition, pressure, and temperature of the process fluid
- Ambient temperature range
- Description of application

Construction

Refer to the Specifications table. Review the information under each specification and in the referenced tables; specify the desired selection whenever there is a choice to be made.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

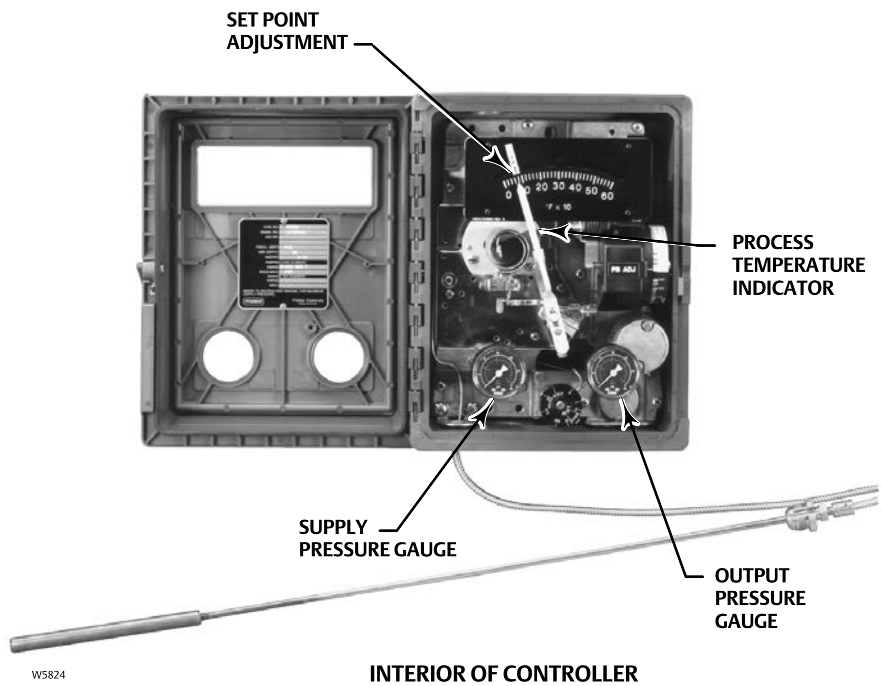
Fisher™ 4196 Temperature Indicating Controllers

Fisher 4196 temperature indicating controllers show process temperature and set point on an easy-to-read process scale. The controllers are used in industries requiring accurate process monitoring and temperature control.

A temperature bulb (figure 6) measures process temperature. A 4196 controller then compares process temperature with an operator- adjusted set point. The controller delivers a pneumatic signal to a control element. The control element changes the process temperature toward the set point.

Controller types are available for proportional-only, proportional-plus-reset, proportional-plus-reset-plus-rate, and differential gap for on-off control.

PIPESTAND-MOUNTED CONTROLLER



INTERIOR OF CONTROLLER

Specifications

Available Configurations

See table 1

Process Sensor Range (Input Signal)

Type: Temperature between -73 and 371°C (-100 and 700°F). See table 2 for available ranges
Minimum Span: 60°C or 100°F
Maximum Span: 300°C or 600°F

Output Signal

Proportional or Proportional-Plus-Reset Range: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)

Differential Gap Output: ■ 0 and 1.4 bar (0 and 20 psig) or ■ 0 and 2.4 bar (0 and 35 psig)

Action: Field-reversible between ■ direct (increasing sensed temperature increases output pressure) or ■ reverse (increasing sensed temperature decreases output pressure)

Process Scale

Matched to the range of the sensing element as standard. Optional(1) scales available.

Supply and Output Connections

1/4 NPT internal

Supply Pressure Requirements(2)

See table 3

Supply Pressure Medium

Air or non-corrosive Natural Gas

Remote Set Point Pressures

■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)

Maximum Allowable Pressure in Closed Vessel (For Temperature Element Assembly)(3)

9.7 mm (3/8-Inch) Diameter Temperature Bulb: 69 bar (1000 psig)

14.3 mm (9/16-Inch) Diameter Temperature Bulb: 34.5 bar (500 psig)

Construction Materials

See table 4

Controller Adjustments

Proportional Band: 5 to 500% of process scale range
Reset: Adjustable from 0.01 to more than 74 min per repeat (from 100 to less than 0.0135 repeats per min)
Differential Gap Controllers: Adjustable from 1 to 100% of process scale range
Set Point: Continuously adjustable from 0 to 100% of the scale range

Controller Performance

Repeatability: 0.4% of output span
Dead Band: Less than 0.4% of process scale range
Time Constant of Temperature Bulb: 6 to 12 seconds for a 93°C (200°F) span (bare bulb in agitated liquid)

Steady-State Air Consumption(4)(5)

0.2 to 1.0 Bar (3 to 15 psig) Output: 0.08 m^3/hr (2.8 scfh)
0.4 to 2.0 Bar (6 to 30 psig) Output: 0.07 m^3/hr (2.5 scfh)

Operative Ambient Temperature Limits(2)(6)

–40 to 70°C (–40 to 160°F)

-continued-

Table of Contents

Specifications (continued)

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T6
Dust: T70

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

II Gb c T*X
III Db c T*X

Housing

Designed to NEMA 3 (Weatherproof) and IEC 529 IP54 specifications

Mounting

Controller can be mounted on ■ actuator, ■ panel, ■ wall, or ■ pipestand

Approximate Weight

4.5 kg (10 lb)

Note: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Consult your Emerson sales office for additional information.
2. The pressure/temperature limits in this document and any applicable standard or code limitation should not be exceeded.
3. At 40°C (100°F)
4. Normal m^3/hr--normal cubic meters per hour (m^3/hr, 0°C and 1.01325 bar, absolute). Scfh--standard cubic feet per hour (ft^3/hr, at 60°F and 14.7 psig).
5. Without auto/manual switch. With auto/manual switch add 0.01 m^3/hr (0.5 scfh).
6. Also for transportation and storage limits.

Table 1. Available Configurations

TYPE NUMBER(1)	CONFIGURATIONS						
	Proportional-Only Suffix Letter A	Proportional-Plus Reset Suffix Letter B	Proportional-Plus Reset-Plus-Rate Suffix Letter C	Differential Gap Suffix Letter S	Anti-Reset Windup Suffix Letter F	Remote Set Point Suffix Letter M	Internal Auto/ Manual Station Suffix Letter E
4196A	X	---	---	---	---	---	---
4196AE	X	---	---	---	---	---	X
4196AM	X	---	---	---	---	X	---
4196AME	X	---	---	---	---	X	X
4196B	---	X	---	---	---	---	---
4196BE	---	X	---	---	---	---	X
4196BF	---	X	---	---	X	---	---
4196BFE	---	X	---	---	X	---	X
4196BM	---	X	---	---	---	X	---
4196BME	---	X	---	---	---	X	X
4196BFM	---	X	---	---	X	X	---
4196BFME	---	X	---	---	X	X	X
4196C	---	---	X	---	---	---	---
4196CE	---	---	X	---	---	---	X
4196CF	---	---	X	---	X	---	---
4196CFE	---	---	X	---	X	---	X
4196CM	---	---	X	---	---	X	---
4196CME	---	---	X	---	---	X	X
4196CFM	---	---	X	---	X	X	---
4196CFME	---	---	X	---	X	X	X
4196S	---	---	---	X	---	---	---
4196SE	---	---	---	X	---	---	X
4914HSM	---	---	---	X	---	X	---
4196SME	---	---	---	X	---	X	X

1. Reverse-acting constructions are designated by an R added to the type number.

Table 2. Available Temperature Ranges of Temperature Bulbs[1]

TEMPERATURE SPAN			ELEMENT RANGE	OPERATING RANGE	TEMPERATURE BULB DIAMETER	OVERRANGE LIMITS[2]		MAXIMUM TEMPERATURE[3]
	°C Minimum	°C Maximum	°C	°C	mm	°C Minimum	°C Maximum	°C
Metric Units	100	100	0 to 100	-15 to 150	9.5	-10	150	230
			50 to 150			40	200	
			-15 to 85			-25	135	
	150	150	0 to 150	-30 to 160		-15	225	
	60	60	-20 to 40	-30 to 95	14.3	-26	70	190
			0 to 60	-30 to 95		-6	90	
			60 to 120	38 to 150		54	150	
	150	150	-75 to 75	-75 to 135		-90	150	400
			50 to 200	-5 to 200		35	275	
	170	200	0 to 200	-75 to 230		-20	300	
	275	300	0 to 300	-75 to 370		-30	450	590
	°F Minimum	°F Maximum	°F	°F	Inch	°F Minimum	°F Maximum	°F
U. S. Units	175	200	0 to 200	0 to 300	3/8	-20	300	450
			50 to 250			30	350	
			100 to 300			80	400	
	250	300	0 to 300	-25 to 325		-30	450	
	100	100	0 to 100	-25 to 200	9/16	-10	150	375
			50 to 150			40	200	
			100 to 200	75 to 300		65	250	
	125	150	50 to 200	-25 to 225		35	275	
	270	300	100 to 400	25 to 400		70	550	750
	300	400	0 to 400	-100 to 450		-40	600	
	525	600	0 to 600	-100 to 700		-60	900	1100

1. Contact your Emerson sales office about other spans and ranges.
2. All temperature bulbs are tested to +50 percent of overrange limits. With travel stops in place, if the overrange limits are exceeded, the controller may require recalibration.
3. With travel stops in place, temperatures in excess of these values may cause permanent damage to the temperature element.

Features

- **Easy Maintenance**—Simple design allows fast, easy maintenance and minimal spare parts inventory.
- **Easy Adjustment**—Adjusting the set point, adjusting the zero and span of the process pointer, and switching between direct and reverse action are accomplished quickly and without special tools. Also, no interaction occurs when the set point and proportional band are adjusted.
- **Vibration Resistance**—The simple design and low mass of internal parts allow the controller to withstand the vibrations found in most plant environments.
- **Highly Visible Display**—Two red pointers on a 114 mm (4-1/2 inch), white-on-black scale show process temperature and deviation from set point at a glance. Two other gauges monitor supply and output pressures.
- **Low Air/Gas Consumption**—The relay and nozzle design reduces the steady-state consumption rate to as low as 0.07 m^3/hr (2.5 scfh); less than the 6 scfh requirement set for the oil and gas industry by the US Environmental Protection Agency (New Source Performance Standards Subpart OOOO, EPA-HQ-QAR-2010-0505).
- **Corrosion Resistance**—Tough plastic housing resists corrosive environments. Internal constructions are available to resist corrosive supply pressure media such as sour gas.

Table 3. Supply Pressure Data

Output Signal Range		Normal Operating Supply Pressure(1)	Maximum Pressure to Prevent Internal Damage(2)
Bar	0.2 to 1.0 or 0 and 1.4 (differential gap)	1.4	2.8
	0.4 to 2.0 or 0 and 2.4 (differential gap)	2.4	2.8
Psig	3 to 15 or 0 and 20 (differential gap)	20	40
	6 to 30 or 0 and 35 (differential gap)	35	40

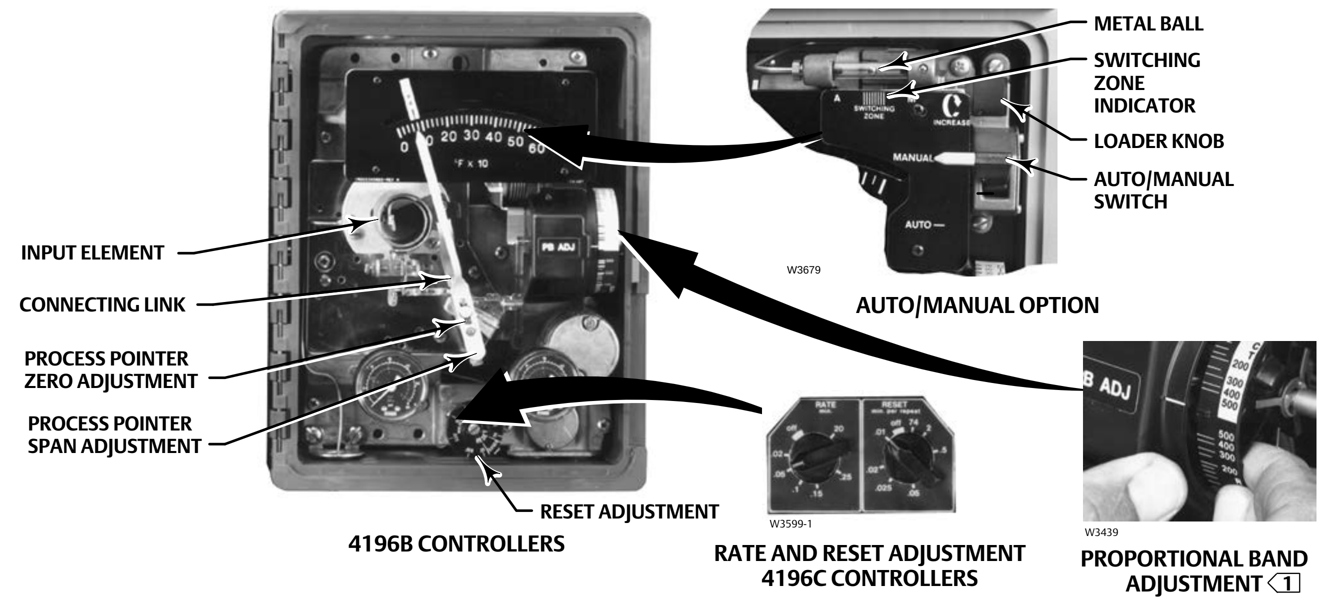
1. If this pressure is exceeded, control stability may be impaired.
2. If this pressure is exceeded, damage to the controller may result.

Table 4. Construction Materials

Part	Standard Material	Optional Material
Thermal element assembly	N09902 nickel alloy and S30300 (303 stainless steel)(1)	- - -
Case and cover	Polyester plastic	- - -
Exterior tubing	Copper	■Stainless steel or ■polyethylene
Exterior fittings	C36000 (brass)	■Stainless steel or ■polyethylene
Interior tubing	S30400 (304 stainless steel)	- - -
Nozzle	S30300	- - -
Flapper	S31600 (316 stainless steel)	- - -
Relay springs	■S30200 (302 stainless steel) or ■steel	- - -
Relay O-rings	Nitrile	- - -
Relay diaphragms	Nitrile	- - -
Other relay metal parts	■Aluminum or ■stainless steel	- - -
Feedback bellows assembly	C51000 (bronze)	S32100 (321 stainless steel)
Supply and output gauges	Brass (wetted parts only)	Stainless steel (wetted parts only)
Bushing	Stainless steel	- - -
Thermowell	Stainless steel	■Carbon steel or ■N04400 nickel alloy
Remote set point element	■N09902 nickel alloy or ■S30300	- - -

1. For the temperature bulb, capillary tube, and armor.

Figure 1. Controller Construction Detail



Note:
1 White portion of proportional band adjustment enables direct controller action; black portion enables reverse controller action.
W5824

Construction Features

Simplified Relay Maintenance

A clean-out wire provides a fast, easy means of cleaning the relay primary orifice during service.

Pressure Protection for the Case

A rubber plug in the plastic case pops out to vent excessive pressure buildup inside the case before structural damage can occur.

Easy Direct/Reverse Switching

Controller action can be switched from direct to reverse or vice versa by simply loosening the screws on the proportional band cover and moving the cover out to rotate the proportional band knob to the desired action (see figure 1).

Easy Mode Conversion

Conversion from proportional to proportional-plus-reset control requires the addition of a reset valve and two pieces of tubing. Conversion from proportional to proportional-plus-reset-plus-rate control requires the addition of a reset/rate valve and three pieces of tubing. Conversion from proportional to differential gap control requires the addition of one piece of tubing. These conversions require removing the controller from the case.

Anti-Reset Windup

Anti-reset windup is available with proportional-plus-reset and proportional-plus-reset-plus-rate controllers. A relief valve can be adjusted to limit reset windup on either increasing or decreasing output.

Remote Set Point

The capability of adjusting the set point from a remote location is available as an option with all 4196 controllers.

Auto/Manual Capability

An optional internal auto/manual station permits smooth, bumpless transfer between automatic control and manual operation without disturbing the controller output. A positive-acting, two-position switch, showing either automatic or manual control mode, is clearly visible with the controller cover closed.

External Feedback

In controller override applications, this option minimizes reset windup in the secondary controller. This option is available only with the two-mode (4196B) controllers.

Principle of Operation

The schematic diagram in figure 2 emphasizes detail of construction variations between control modes. Refer to table 1 to relate type number suffixes to the construction variations.

Proportional-Only Controllers (4196A)

The input element is connected to the process pointer and to the flapper by connecting links. As the process temperature increases (in a direct-acting controller), the flapper moves toward the nozzle, restricting flow through the nozzle and increasing nozzle pressure. When this occurs, relay action increases the output pressure (delivery) of the controller. Output pressure is fed back to the proportional bellows. The action of the proportional bellows counters the flapper movement that resulted from the process temperature change and backs the flapper away from the nozzle until the controller reaches a point of equilibrium.

The set point adjustment changes the proximity of the nozzle and flapper as does a change in process temperature except that, when the set point is changed, the nozzle moves with respect to the flapper.

The proportional band adjustment knob positions the nozzle on the flapper. Increasing (widening) the proportional band moves the nozzle to a position on the flapper where less flapper motion occurs, decreasing the gain of the controller. Decreasing (narrowing) the proportional band moves the nozzle toward a position where more flapper motion occurs, increasing the gain. Controller action is changed from direct to reverse by turning the proportional band adjustment knob to position the nozzle to a point on the flapper where the direction of the flapper motion versus input motion is reversed (see flapper detail in figure 2). With the controller in the reverse-acting mode, an increase in process temperature causes a decrease in output pressure.

Proportional-Plus-Reset Controllers (4196B)

This controller operation is similar to that of proportional-only controllers except that output pressure is fed back to the reset bellows as well as to the proportional bellows. In operation, proportional-plus-reset controllers minimize the offset between the process temperature and set point.

Proportional-Plus-Reset-Plus-Rate Controllers (4196C)

Figure 3 shows details of the reset/rate option. Controllers with this option have a rate valve, an adjustable restriction that momentarily maintains the controller gain to accelerate the corrective action for slow temperature systems. A proportional-plus-reset-plus-rate controller responds to a change in process temperature as follows:

First, the rate action delays the gain reduction just long enough to allow the system to respond to the change, but not long enough for the system to become unstable. Then, the low gain provided by the proportional action keeps the system stable. Finally, reset action slowly increases the gain and returns the process temperature toward set point.

Differential Gap Controllers (4196S)

In this version, feedback pressure does not counteract the change in flapper position. Instead, the change is reinforced because feedback pressure is piped directly to the reset bellows only. This construction causes the controller output to switch from full supply pressure to zero pressure or vice versa.

Anti-Reset Windup Option

Anti-reset windup is available on all 4196B and 4196C controllers and is designated by the suffix letter F in the type number. The differential relief valve operates when the difference between proportional bellows pressure and reset bellows pressure reaches a predetermined value. Anti-reset windup reduces overshoot of the process temperature that can result from large or prolonged deviation from set point. This option can be adjusted to operate on either increasing or decreasing output pressure.

Figure 2. Schematic of Fisher 4196 Temperature Controllers

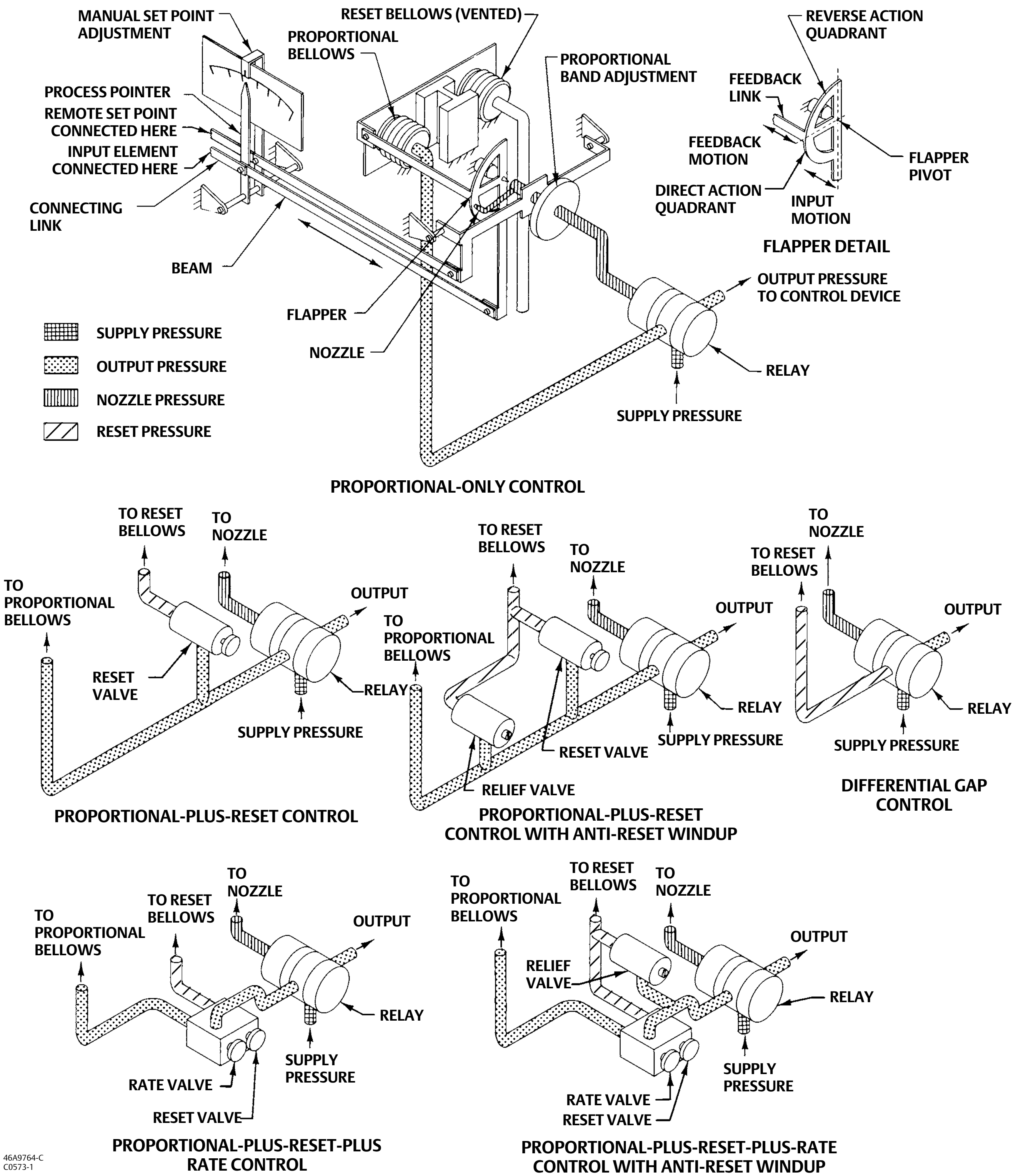
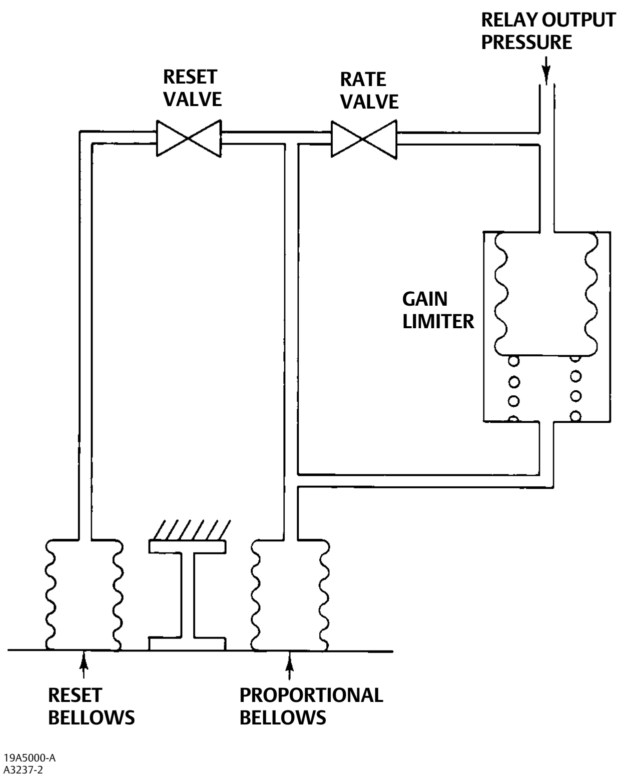


Figure 3. Schematic of Reset/Rate Option



Remote Set Point Option

The optional capability to change the controller set point from a remote location is available with all 4196 controllers. This option is designated by the suffix letter M in the type number.

Auto/Manual Option

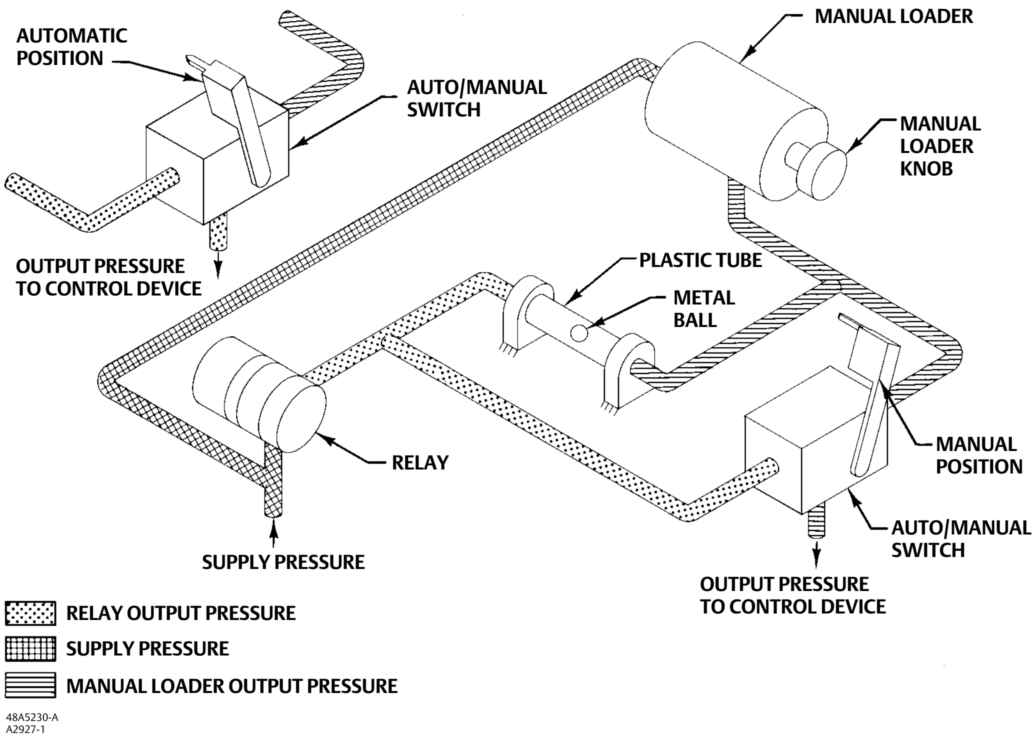
Controllers with the auto/manual option (designated by the suffix letter E in the type number) have piping on the output side of the relay as shown in figure 4. Supply pressure to the relay is also applied to the manual loader. The manual loader, functioning as a regulator, applies pressure to one side of the plastic tube and to the auto/manual switch. Output pressure from the relay registers on the other side of the plastic tube as well as in the auto/manual switch.

When the auto/manual switch is in the MANUAL position, the output of the manual loader becomes the output of the controller. The output of the manual loader is adjustable using the manual loader knob.

When the auto/manual switch is in the AUTO position, the output of the relay is channeled through the switch to become the output of the controller.

Before the auto/manual switch is operated, the output of the relay must equal the output of the manual loader to avoid bumping the process. Adjusting the set point varies the pressure on the left-hand side of the plastic tube. Adjusting the manual loader knob varies the pressure on the right-hand side. When the pressures are equal, the metal ball is centered in the tube. Pressure imbalance will force the ball to one end of the tube where it forms a seal, blocking air flow through the tube.

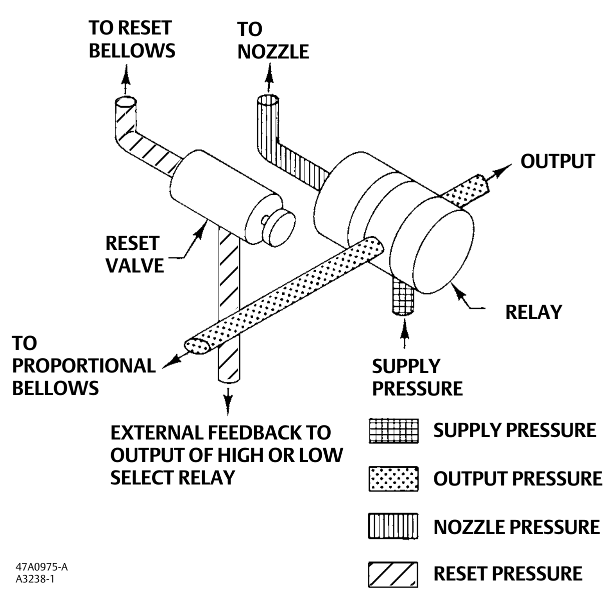
Figure 4. Schematic of Auto/Manual Option



External Feedback Option

External feedback is available with all 4196B controllers. Controllers with this option have an external process connection on the bottom of the controller case (see figure 8). This connection breaks the positive feedback (reset) loop inside the controller and brings it outside (see figure 5). The connection allows the positive feedback loops of two controllers (primary and secondary) to be tied together when the controllers are used in an override application. Thus connected, the feedback loop of the secondary controller tracks the primary controller, minimizing reset windup.

Figure 5. Schematic of External Feedback Option



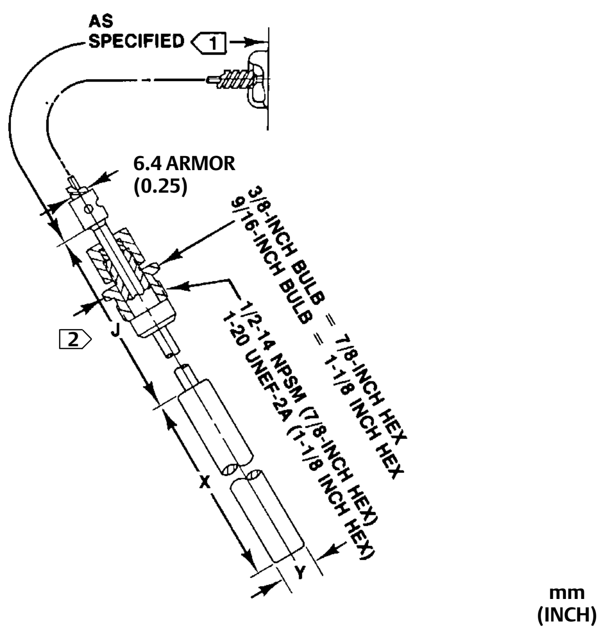
Installation

In a typical installation, a 4196 temperature controller mounts on a pipestand. The capillary tube length determines the installation site.

When installing a controller, the vent must point down. When the temperature bulb (dimensions shown in table 5 and figure 6) is used within a closed vessel, the bulb screws into a bushing (see figure 7) that penetrates the vessel. Where pressure within the closed vessel exceeds the limits of the temperature bulb or when the process fluid is corrosive, the temperature bulb screws into a thermowell (see figure 7) that penetrates the vessel. Lag type bushings and thermowells (also shown in figure 7) are used where extra length is required, such as installation in a process vessel that is coated with insulation. Dimensions for bushings and thermowells are shown in figure 7 and tables 6 and 7.

See figure 8 for basic controller dimensions. Figure 9 shows dimensions for specific mounting configurations.

Figure 6. Dimensions for Temperature Bulb with Adjustable Union (also see table 5)



Notes:
1 Available in 4.6 and 7.6 m (15 and 25 foot) lengths. Minimum bending radius is 25 mm (1 inch).
2 Bendable extension length, Minimum bending radius is 32 mm (1-1/4 inch).
3. Temperature bulb may be used with either bushing or thermowell connection parts per SAMA RC6-10.

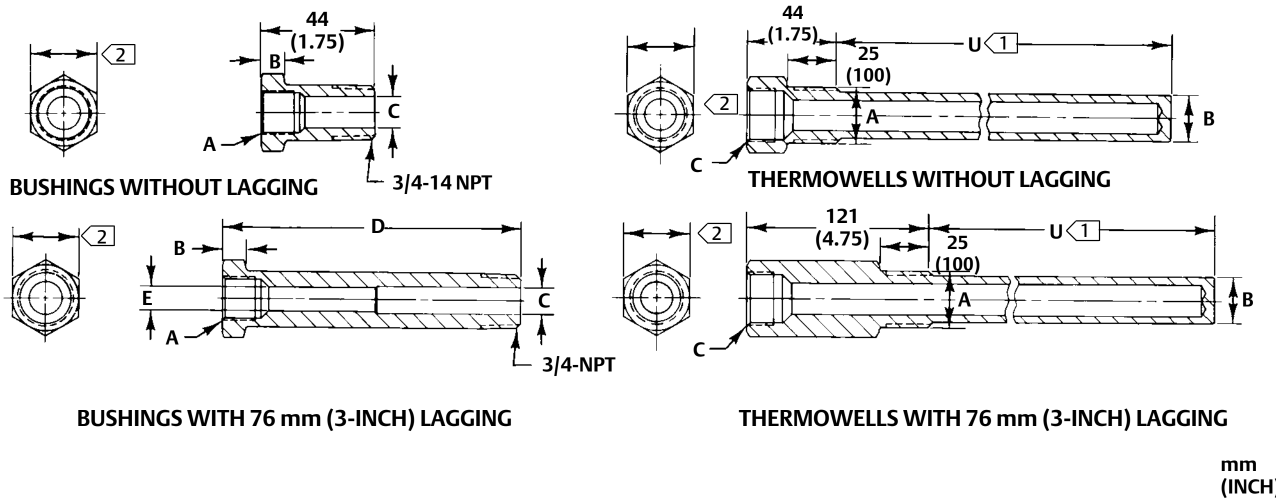
38A2273-E
A6921-1

Table 5. Dimensions for Temperature Bulb with Adjustable Union

SAMA STYLE	TEMPERATURE SPANS		DIMENSION						
	°C	°F	B(1)	J		X		Y	
				mm	Inch	mm	Inch	mm	Inch
Adjustable Union (Standard Construction)	100 and 150 60, 150 through 300	200 and 300, 100 and 150, 300 through 600	1/2-14 NPSM 1-20 UNEF-2A	445 584	17.50 23.00	145 178	5.70 7.00	10 14	0.38 0.56

1. NPSM--National Straight Pipe Threads for Mechanical Joints; UNEF--Unified Thread-Extra

Figure 7. Bushing and Thermowell Dimensions (also see tables 6 and 7)



Notes:
1 Tolerances for this dimension are as follows:
± 1.5 mm (0.06 inch) when length is 305 mm (12 inches) or less
± 3.2 mm (0.125 inch) when length is greater than 305 mm (12 inches)
2 7/8-inch hex for 3/8-inch temperature bulb; 1-1/8-inch hex for 9/16-inch temperature bulb
A3240-3

Table 6. Bushing Dimensions

TEMPERATURE BULB DIAMETER		A(1)	BUSHINGS WITHOUT LAGGING				BUSHINGS WITH LAGGING							
			B		C		B		C		D		E	
mm	Inch		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
10	3/8	1/2-14 NPSM	11	0.44	11	0.44	11	0.44	12	0.47	113	4.44	11	0.44
14	9/16	1-20 UNEF	19	0.75	16	0.63	19	0.75	17	0.66	121	4.75	16	0.63

1. Seat area per SAMA Standard RC-17-10.

Table 7. Thermowell Dimensions

TEMPERATURE BULB DIAMETER		A	B		C(1)	U (INSERTION LENGTH)	
mm	Inch		mm	Inch		mm	Inch
10	3/8	1/2-14 NPT 3/4-14 NPT	16 20	0.63 0.77	1/2-14 NPSM-2B	191 267 206	7.5 10.5 16
14	9/16	3/4-14 NPT	22	0.88	1-20 UNEF-2B	191 267 406 610	7.5 10.5 16 24

1. Seat area per SAMA Standard RC-17-10.

Figure 8. Controller Dimensions

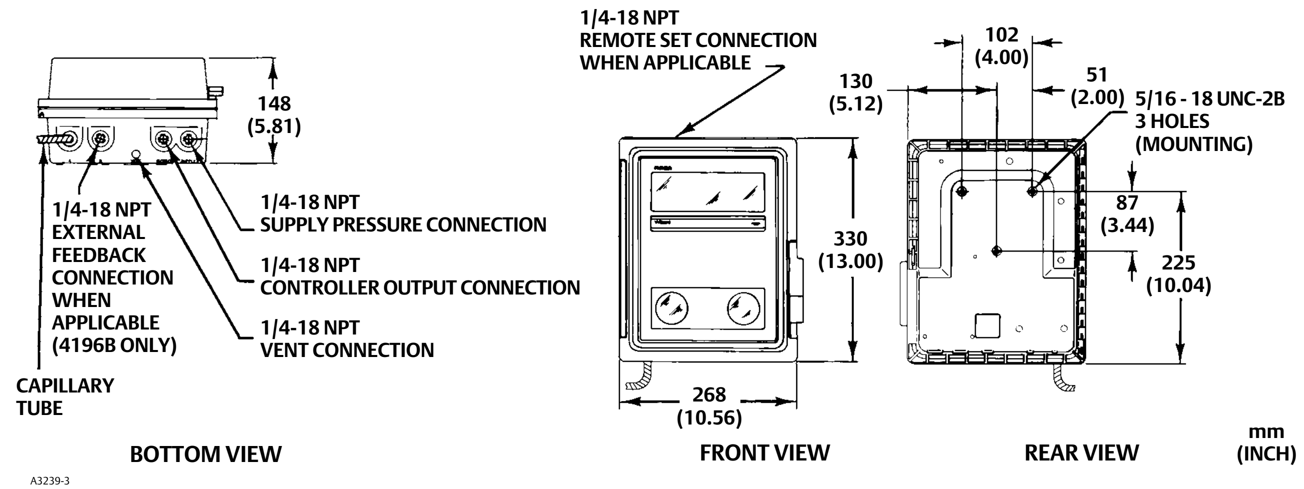
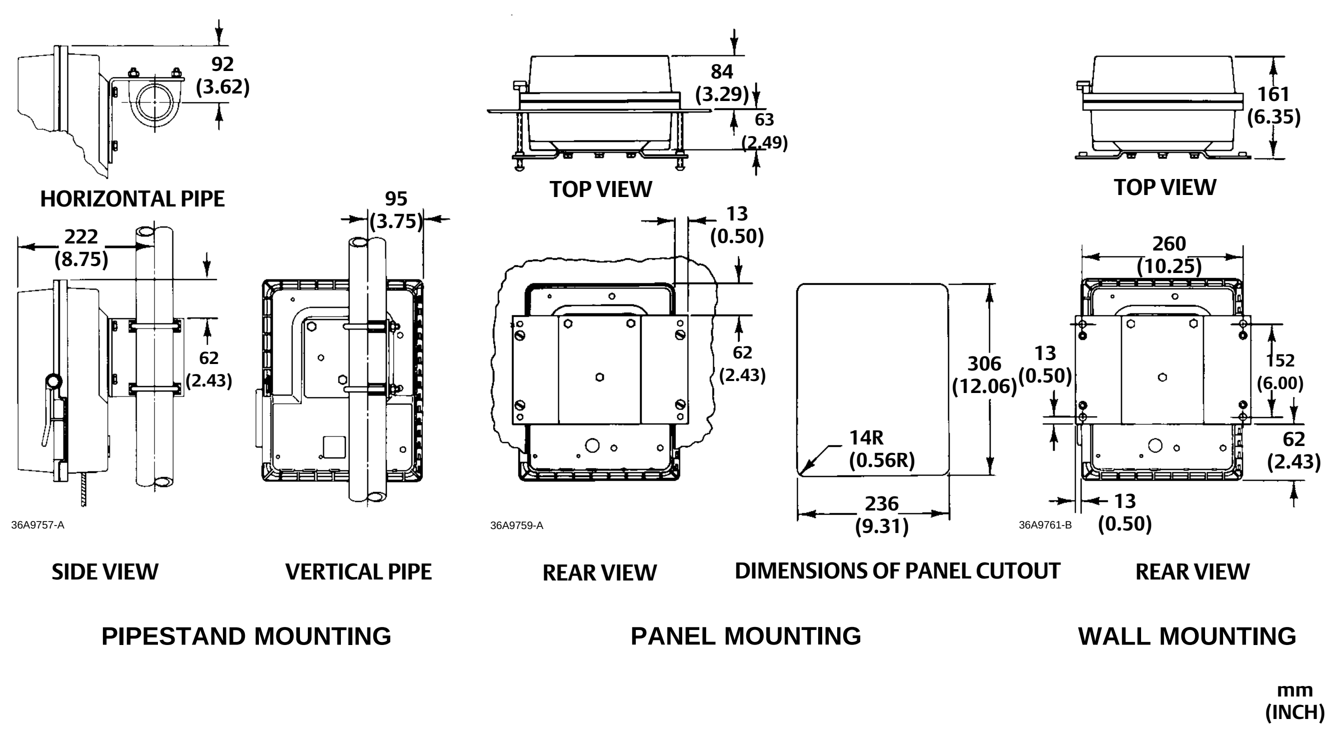


Figure 9. Mounting Dimensions



Ordering Information

Applications

When ordering, specify:

1. Description of the service
2. Temperature range of the process
3. Ambient temperature
4. Velocity of the process fluid (if measuring the temperature of a process fluid flowing through a pipe)
5. Pressure in the process vessel (if closed)
6. Bushing or thermowell. Specify either busing or thermowell (If required) when the temperature bulb is used in a closed vessel. Refer to figure 7 for available sizes. Specify straight-shank or tapered-shank thermowell. Tapered-shank thermowells, with their high strength-to-weight ratio, permit operation in higher process fluid velocities than do straight-shank thermowells.

Construction

Refer to the Specifications section and the Construction Features section. Carefully review each specification and feature, specifying your choice whenever a selection is offered. Pipestand mounting hardware will be supplied unless some other mounting method is specified.

Refer to table 1 for type numbers (add R to any type number if reverse action is desired).

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Customer Drawings Product Selection

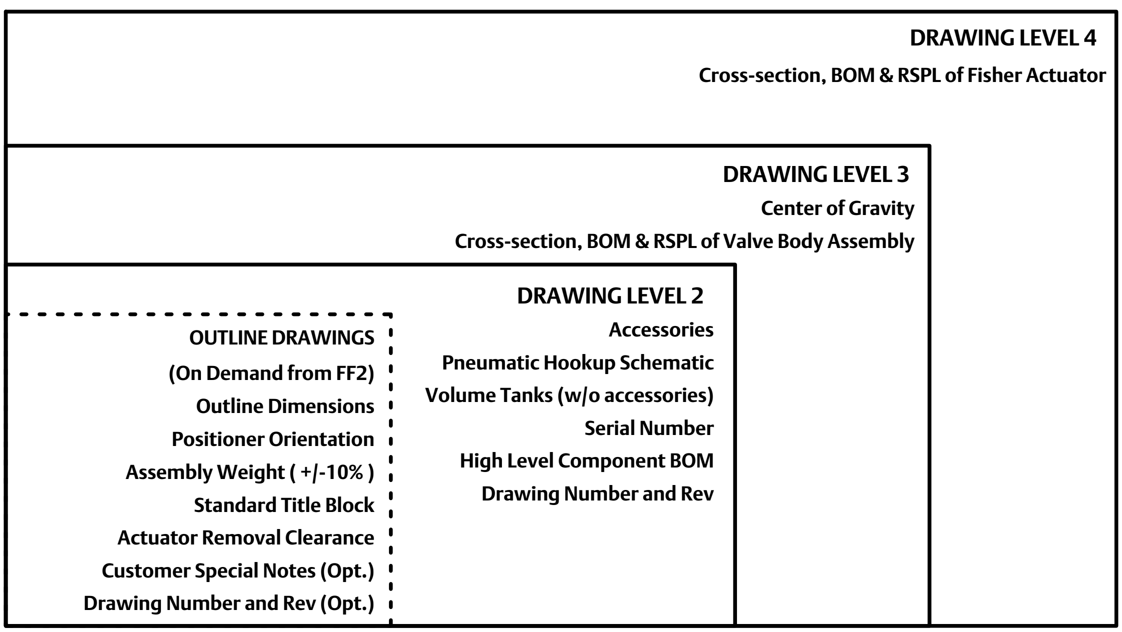
Emerson offers a wide selection of drawing products; to include 2D drawings, 3D models, CAD files and Dimensional Data for Piping (DDP) to support all customer engineering, inspection and maintenance needs. This bulletin provides information and insight to help you select the correct Fisher Customer Drawing product properly to address your specific needs.

Drawing Levels

Traditional flat sheet Drawings are organized by drawing levels and content increases with successive drawing levels. Based on your needs, drawing products have been organized into four levels of 2D base drawings with each successive level showing an expanded set of details. The most basic information is included in Outline Drawings that are created on demand by Emerson Sales Office using Fisher First 2 Quote to Order tool (FF2). Other drawing levels need to be selected and ordered using the FF2 ordering process. Refer to table 1 for detailed information.

Outline Drawings

Outline Drawings are an exterior view drawing of Fisher valve product or product assembly up to valve, actuator, positioner and regulator (if selected with positioner component). These drawings are dimensioned to show necessary installation and "envelope" information needed to complete piping design work in projects or for final customer drawings direct from FF2. Users have the ability to insert any special notes and/or assign drawing number/revision as may be required per customer specification. Refer to figure 8 and 9 for sample Outline Drawings.



Note: Each higher level of drawing includes features from the lower levels.
Drawing levels are different from processing levels and the two are not inter-related.

Table 1. Drawing Selection Matrix

Drawing Content	Outline	Level 2	Level 3	Level 4
Outline Dimensions	✓	✓	✓	✓
Positioner Orientation	✓	✓	✓	✓
Actuator Clearance Height	✓	✓	✓	✓
Assembly Weight +/-10%	✓	✓	✓	✓
Standard Title Block	✓	✓	✓	✓
Drawing Number & Rev.	●	✓	✓	✓
Customer Special Notes	●	✓	✓	✓
Accessories		✓	✓	✓
Pneumatic Hookup Schematic		✓	✓	✓
Volume Tanks (w/o accessories)		✓	✓	✓
High Level Component BOM		✓	✓	✓
Serial Number		✓	✓	✓
Center of Gravity		●	✓	✓
Cross Section Valve Body Assembly			✓	✓
BOM & RSPL Valve Body Assembly			✓	✓
Cross Section Fisher Actuator				✓
BOM & RSPL Fisher Actuator				✓
Special Butt Weld End Prep		●	●	●
Nameplate / Warning Tags		●	●	●
Lubricant Call-Outs			●	●
Volume Tank Accessories / Rep Accessories		●	●	●
Dual Dimensions		●	●	●
Customer Title Block		●	●	●
Other Languages		●	●	●
Wiring Diagram (Customer Provided)		●	●	●
After-Shipment Drawing Requests		●	●	●
✓ = Standard Content in Base Drawing ● = Content Available as Option				

LEVEL 2 Drawings

Level 2 Drawings are an exterior view drawing of Fisher valve, actuator, positioner and other accessories (as ordered). This drawing also includes pneumatic hook up schematic, volume tank (if vol. tank accessories need to be shown in the drawing, appropriate option needs to be selected) and a high level BOM (list of components ordered in the assembly). Drawings are pictorially unique to the customer's order. Drawing number, revision levels and serial numbers are assigned in the title block. Refer to figure 10, 11, and 12 for sample Level 2 Drawings.

LEVEL 3 Drawings

In addition to details included in base Level 2 Drawings, these drawings include a cross-sectional view of valve body, bonnet, packing and trim parts including a BOM showing Fisher part numbers, part names and material specification for parts shown along with recommended spares. This drawing may be used for product/part traceability. Refer to figure 13 and 14 for sample Level 3 Drawings.

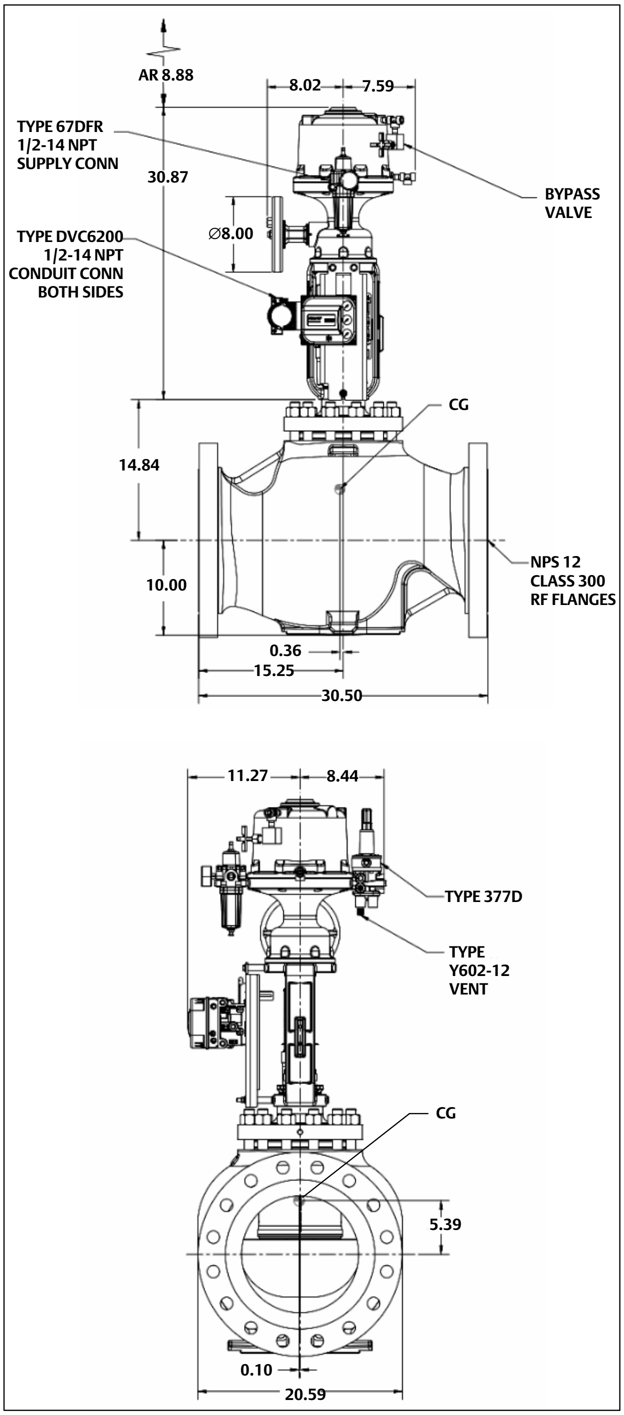
LEVEL 4 Drawings

In addition to details included in base Level 3 Drawings, these drawings include a cross-sectional view of Fisher actuator, BOM showing Fisher part numbers, part names and material specification along with recommended spares. This drawing may be used for product/part traceability. Refer to figure 15 and 16 for sample Level 4 Drawings.

Orderable Option Definitions

Center of Gravity: The point at which the entire weight of a body may be considered as concentrated so that if supported at this point the body would remain in equilibrium in any position. Refer to figure 1.

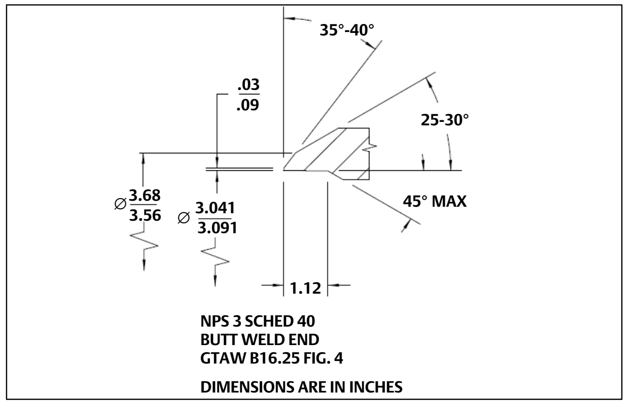
Figure 1. Center of Gravity



Special Butt Weld End Preparation:

ASME B16.25 covers the preparation of butt welding ends of piping components to be joined into a piping system by welding. It includes requirements for welding bevels. Options can be selected for any valve with Butt weld end connection to show the end preparation details. See figure 2.

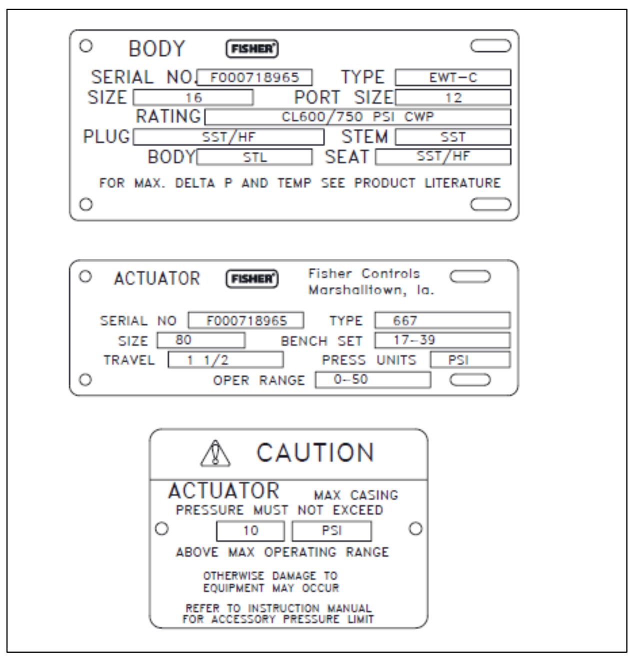
Figure 2. Butt Weld End Preparation



Nameplate / Warning Tags:

Name plates, warning and caution tags added to drawing content. See figure 3.

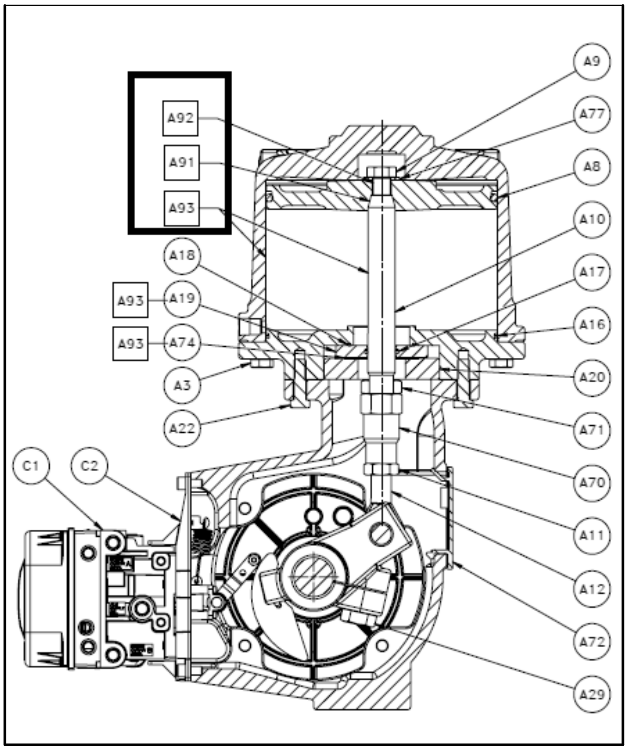
Figure 3. Nameplates and Warning Tags



Lubricant Call-Outs:

Details marking the area for lubrication, this helps the user in correct application of lubricants. See figure 4.

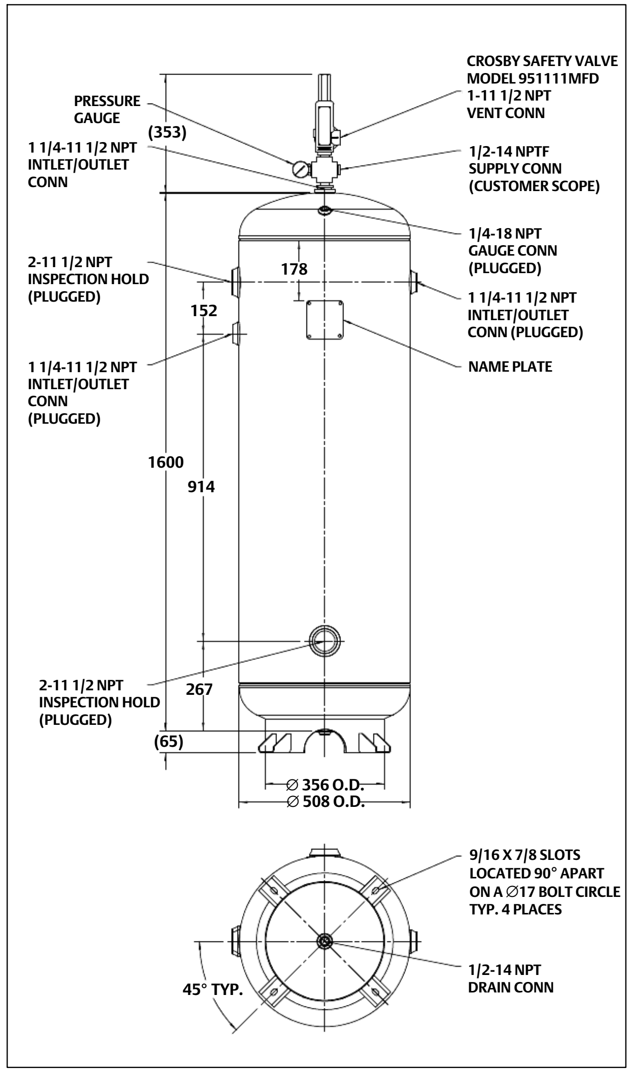
Figure 4. Lubricant Call-Outs



Volume Tank Accessories

Details of connection sizes, mounted accessories - like safety relief valves and gauges. Mounting leg configuration details. See figure 5.

Figure 5. Volume Tank Accessories



Dual Dimensions:

Standard drawing requests require users to specify either Metric or English/Imperial (inches) units for dimension markings. If this option is selected, dimensions will be provided in both metric and inches.

Customer Title Block:

Customer required title block can be added in addition to title block. Customer responsible to provide a CAD file with their title block format to be include in the drawing.

Other Languages:

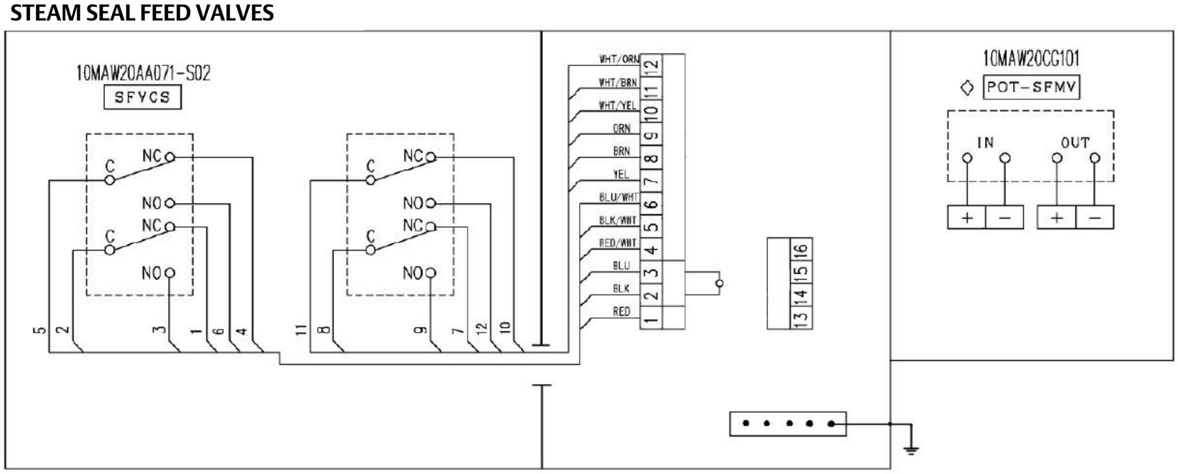
Default language used in our drawings is English. Choices of other languages are offered through price book options.

Wiring Diagram (Customer Provided):

CAD file must be provided for wiring diagrams that need to be shown in the drawing. You are responsible for content and accuracy of information of the supplied CAD file. See figure 6.

Figure 6. Customer Provided Wiring Diagram

STEAM SEAL FEED VALVES



SYMBOL	CONTACT	OPEN	CLOSE
SFVCS	C-NC		
	C-NO		X

After Shipment Drawing Requests:

In case drawings need to be requested for hardware that has already shipped from factory, our after-shipment process may be used to request such drawings, contact your Emerson sales office or Local Business Partner for more details.

Drawing Formats:

Drawing Formats	Outline	Level 2	Level 3	Level 4
PDF (Electronic)	✔	✔	✔	✔
Paper Copies		✔	✔	✔
2D CAD (.DWG or .DXF)	✔	✔	✔	✔
DDP (Standard)	✔			
DDP (Special)	✔			
3D CAD (.STP or other formats)	✔			

Note

For most standard constructions, FF2 users will be able to self-serve Outline Drawings in PDF, 2D CAD or Standard DDP formats on demand. Non-standard constructions and other formats will have to be requested from a Fisher product factory.

Default and most popular format for all of our drawings is .PDF. Due to Adobe and other companies offering free PDF reader programs and the format's utility in preserving the graphic appearance in online and print versions, this format is widely used and acceptable to our customers. Our PDF drawings are searchable, allowing users to search for and locate any keyword in their drawing documents.

Paper Copies: You still have the option of ordering paper copies of Level drawings through Emerson if required.

2D CAD (.DWG or .DXF): For customers who may want to open and import our 2D drawings in their CAD software, they can order Level drawings in widely used .DWG or .DXF format. Refer to figure 17 for sample 2D CAD drawing.

DDP (Standard): In projects, many of our customers may be using a design solution like SmartPlant® Instrumentation (or SPI). They may use a standard DDP (Dimensional Data for Piping) data file out of FF2 in .csv format. This output file also contains the control valve spec sheet data (as per SPI Form 90). Intergraph SPI/SPF/ S3D are pre-set up to easily import this standard DDP data and display 3D control valve shapes. Refer to figure 18 for sample DDP data file.

DDP (Special): It is possible for customers to be following different conventions for DDP depending on the particular design solution adopted by them. In this case, an Excel or a .csv data file and reference drawing(s) will be provided by the customer. The reference drawing defines each dimension variable. Fisher will manually populate the data file and return to customer.

3D Models: 3D envelope models may be requested for various Fisher components and assemblies to assist customers doing CAD work in 3D environment. Default output will be in .STP format but other formats may be supported on request. Refer to figure 7.

Figure 7. Sample 3D Model

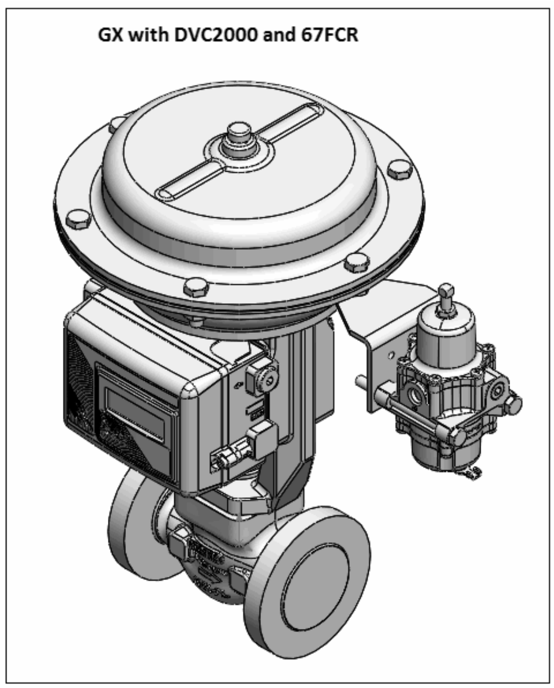


Figure 8. OUTLINE Drawing - Sliding-Stem

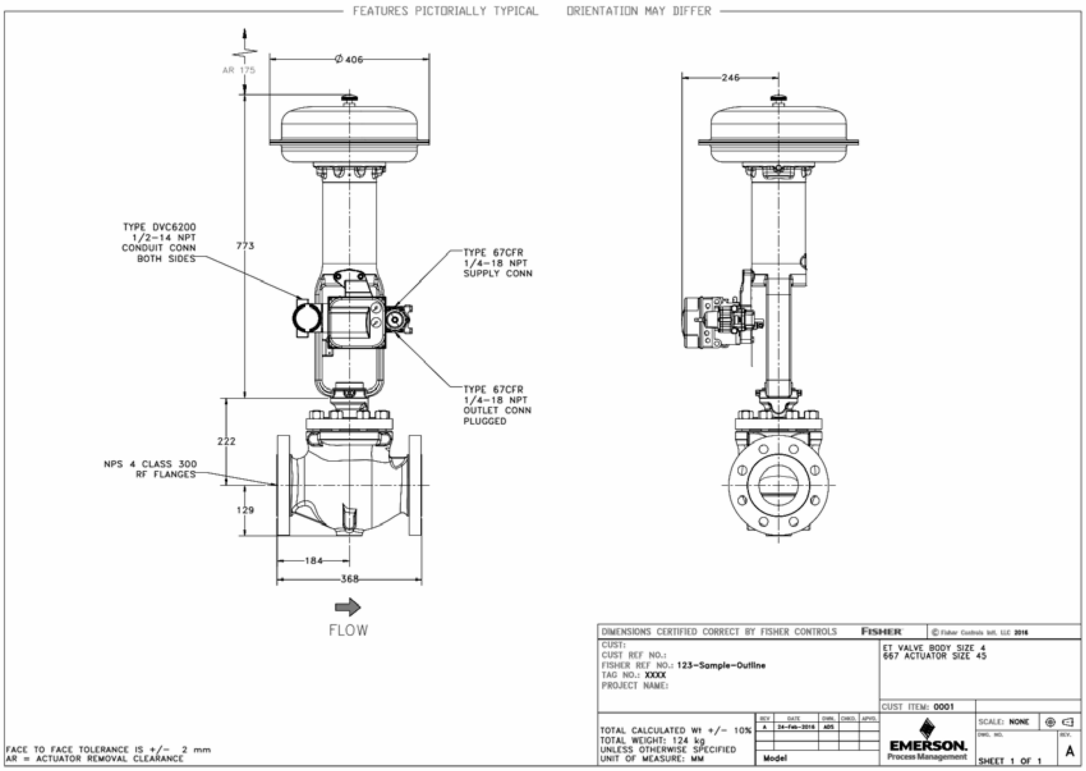


Figure 9. OUTLINE Drawing - Rotary

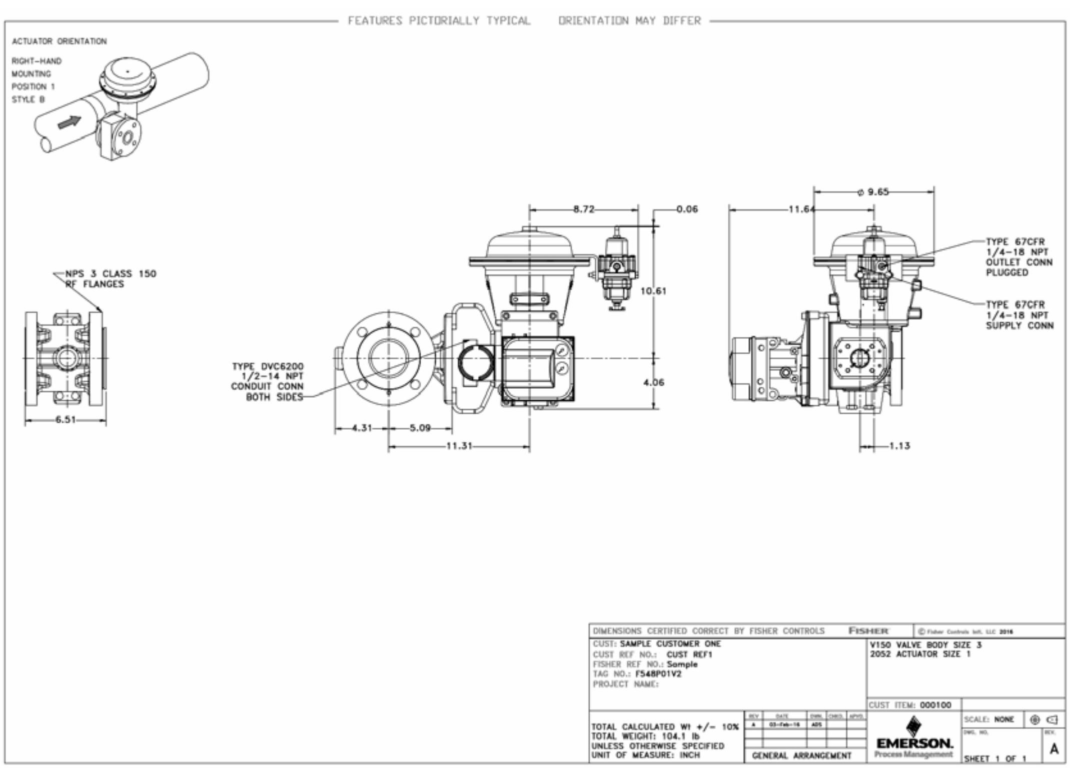
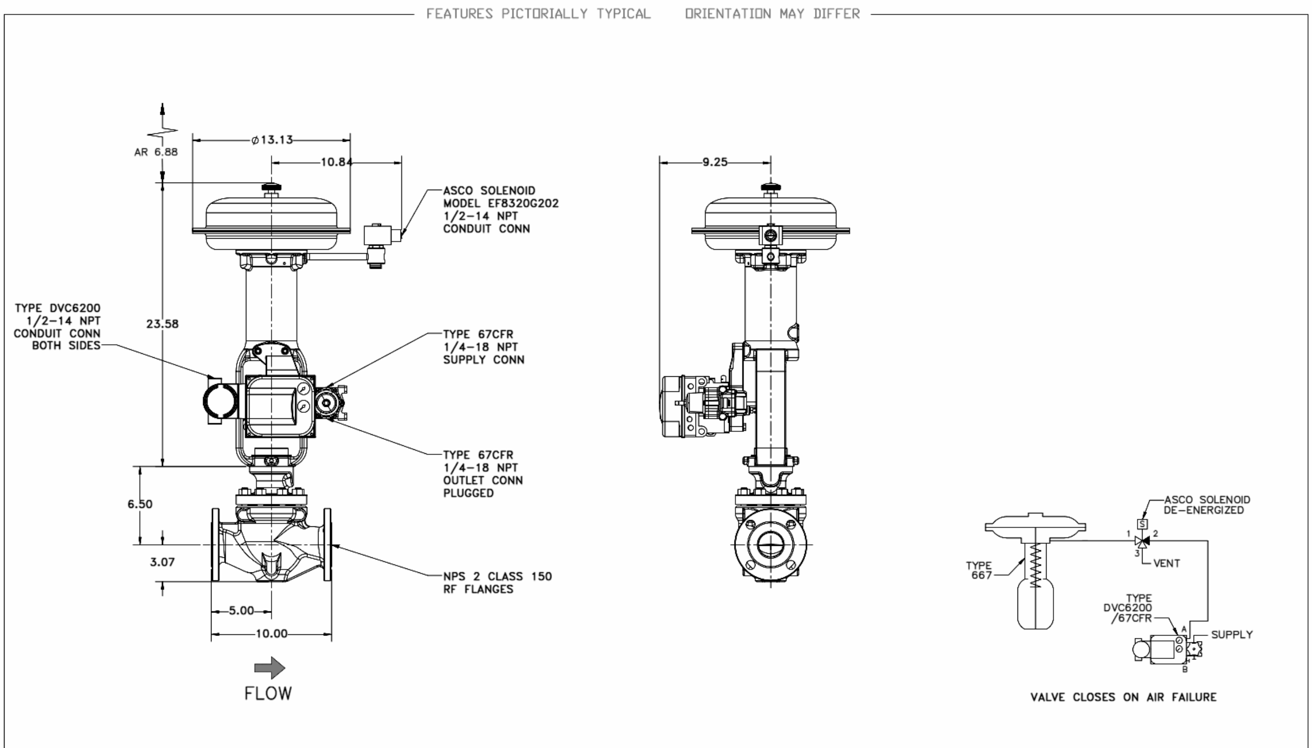


Figure 10. LEVEL 2 Drawing - Sliding-Stem (with Single-Acting Actuator)



ITEM BOM		
TYPE	MODEL/SIZE	QTY
VALVE BODY	EZ SIZE 2	1
ACTUATOR	667 SIZE 40	1
POSITIONER	DVC6200	1
ASCO SOLENOID	EF8320G202	1
REGULATOR	67CFR	1

FACE TO FACE TOLERANCE IS +/- 0.06 Inch
AR = ACTUATOR REMOVAL CLEARANCE

DIMENSIONS CERTIFIED CORRECT BY FISHER CONTROLS   FISHER   © Fisher Controls Intl. LLC 2016

CUST: CUSTOMER NAME
CUST REF NO.: CUST REF1
FISHER REF NO.: SAMPLE REF1
TAG NO.: LCV-123456
PROJECT NAME:

EZ VALVE BODY SIZE 2
667 ACTUATOR SIZE 40

CUST ITEM: 000010   S.NO.: F00103ASD4

TOTAL CALCULATED Wt +/- 10%
BODY WEIGHT: 51.7 lb
TOTAL WEIGHT: 123.3 lb
UNLESS OTHERWISE SPECIFIED
UNIT OF MEASURE: INCH

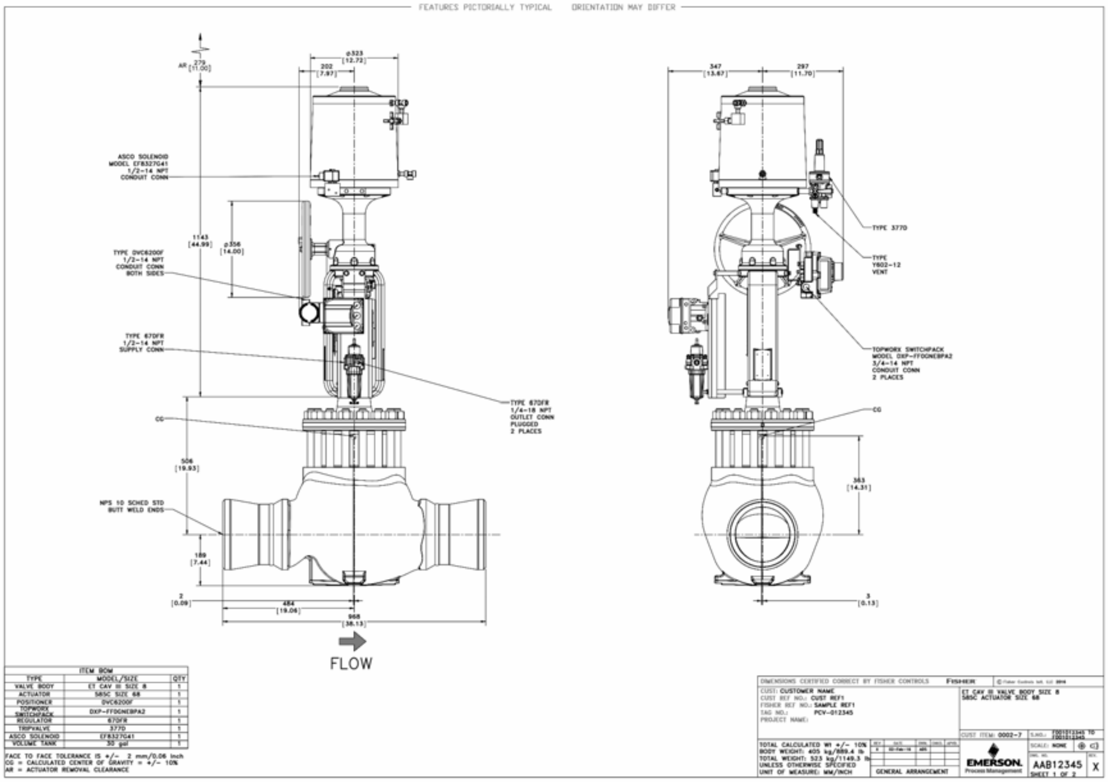
REV	DATE	DWN.	CHKD.	APVD.
X	03-Feb-16	ADS		

GENERAL ARRANGEMENT

EMERSON. Process Management

SCALE: NONE
DWG. NO. AAB12345   REV. X
SHEET 1 OF 1

Figure 11. LEVEL 2 Drawing - Sliding-Stem (with Double-Acting Actuator and Volume Tank)



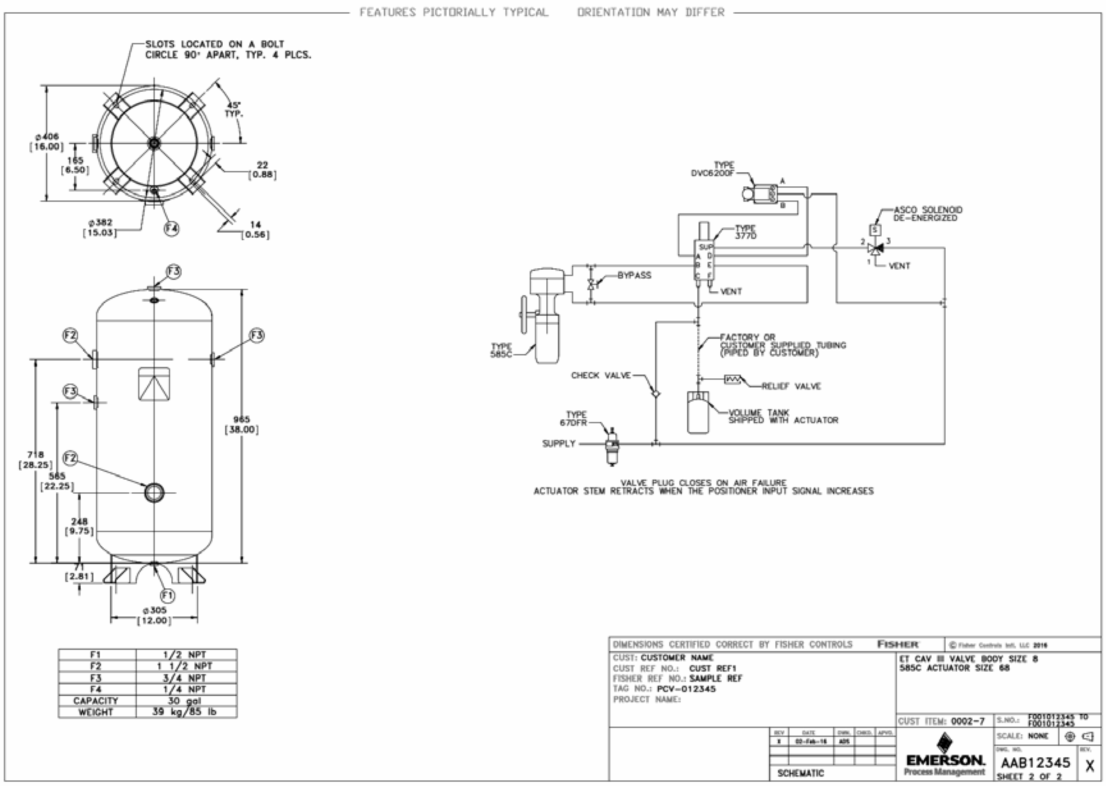


Figure 12. LEVEL 2 Drawing - Rotary (with Single-Acting Actuator)

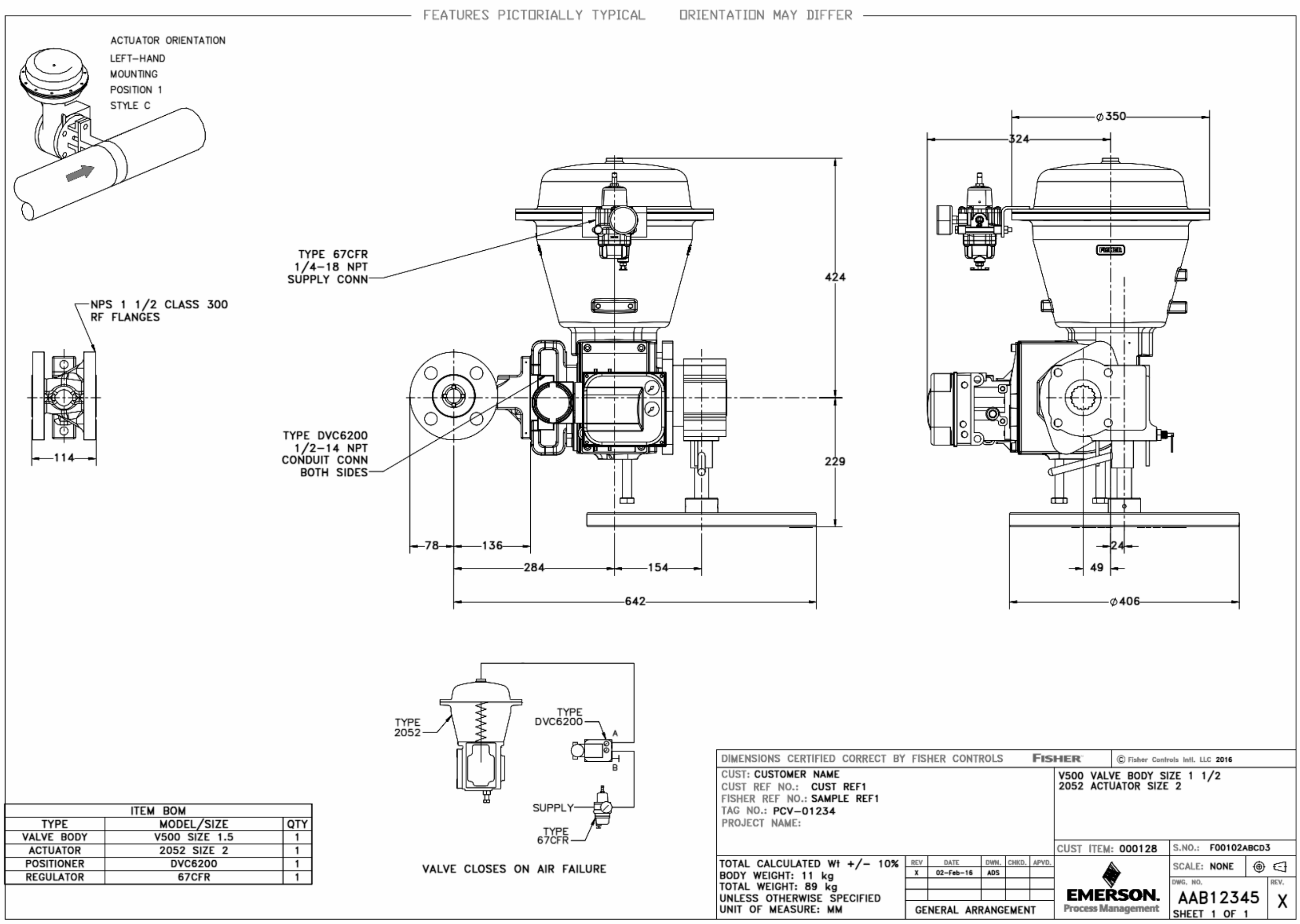
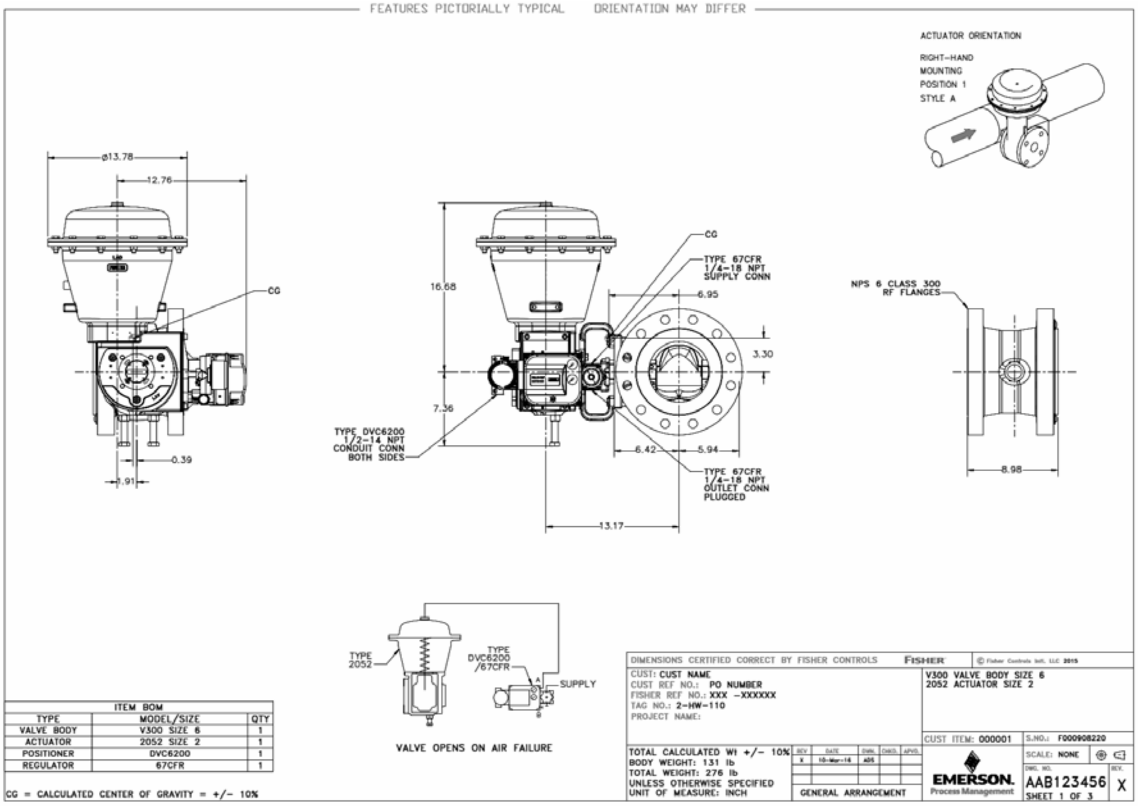


Figure 13. LEVEL 3 Drawing - Rotary (Sheets 1 and 2)



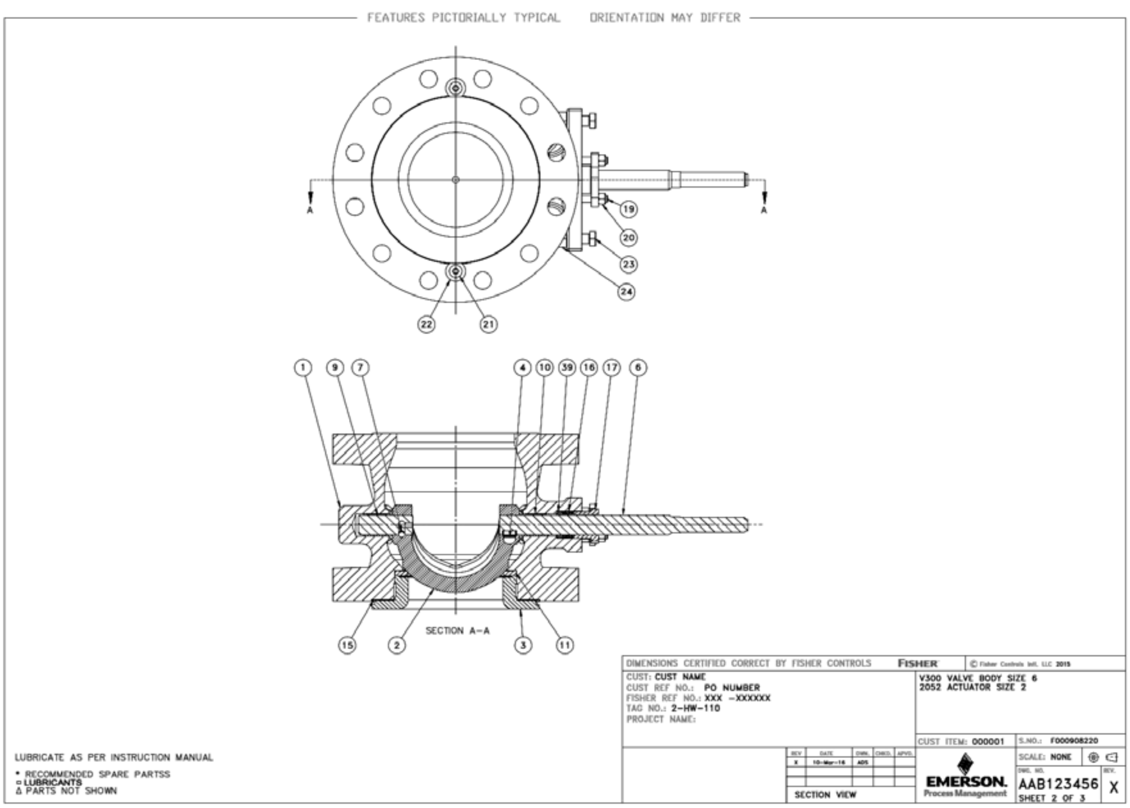


Figure 14. LEVEL 3 Drawing - Rotary (Sheet 3)

FEATURES PICTORIALLY TYPICAL ORIENTATION MAY DIFFER

RSP	FIND NO.	QTY.	PART NUMBER	PART NAME	DESCRIPTION	MATERIAL
	1	1	47B6786X862	VALVE BODY	NPS 6 CL300 RF V300B W/O TAP	CG8M FMS20B114
*	2	1	GE11073X312	VEE-BALL,CAM CONTOUR	6 RH/LH MTG V150B,V200B,V300B	CG8M/CR PLATE
	3	1	21B0678X982	SEAL PROTECTOR RING	NPS 6,CL150-600,TCM,9.00 F-F	CF3M, FMS20B114
*	4	1	12B9531X012	KEY,TAPER,W/HEAD	1.26 DEG X 1.86	R30006,FMS 31A1
*	6	1	37B2507X022	DRIVE SHAFT	6 V150,V200,V300	S20910 FMS20B21
*	7	1	18A6138X012	PIN,GROOVE,TYPE 24	5/16X2.00	S31600
*	9	1	11B0733X012	SHAFT,FOLLOWER	6	S20910 FMS20B21
*	10	2	27B7136X012	BEARING LINED,COMPOSITE	6,1 IN. SHAFT,VLINE (B SERIES)	PTFE/PEEK
*	11	1	13A2619X112	SEAL, BALL	6 V150/V200/V300	PTFE/PEEK/MOS2
*	15	1	11B0681X032	GASKET	6.28X8.34X.01	GRAFOIL,GTB
*	16	1	12A8832X022	PACKING,SET	1X1 3/8	
	17	1	26A6077X012	PACKING FOLLOWER	1 IN SHAFT	316-A FMS 20B64
	19	2	12A8835X022	STUD, CONTINUOUS THREAD	3/8-16X 1.75,LE=1.24	B8M CLASS 2
	20	2	1A375335252	NUT,HEX	3/8-16	S31600
	21	2	13B8412X012	SCREW,CAP,HEX SOCKET	3/8-16X0.62 BUTTON HEAD	SST
	22	2	1A3756X0012	WASHER,PLAIN	3/8,.44X1.00X.08	SST
	23	4	1A3616X0062	SCREW,CAP,HEX HD	1/2-13X2.00	SAEGR5/NCF3
	24	4	1A3772X0892	NUT,HEX,HEAVY	1/2-13	SA194-2H/NCF2
Δ	26	1	18B2294X012	TAG	LABEL, V300	18-8 SST
Δ	27	4	1A368228982	SCREW, DRIVE	2X3/16	18-8 SST
Δ	30	1	12B6400X0A2	NAMEPLATE	ENGLISH, FISHER	SITE MUST PICK REQD PART NO.
Δ	31	1	1D884799012	SEAL & WIRE	12 LONG	LEAD
*	39	1	16A6085X012	PACKING BOX RING	1 SHAFT X 1 3/8	316-A FMS20B64

LUBRICATE AS PER INSTRUCTION MANUAL

* RECOMMENDED SPARE PARTSS
□ LUBRICANTS
Δ PARTS NOT SHOWN

DIMENSIONS CERTIFIED CORRECT BY FISHER CONTROLS FISHER © Fisher Controls Intl. LLC 2015

CUST: CUST NAME
CUST REF NO.: PO NUMBER
FISHER REF NO.: XXX -XXXXXX
TAG NO.: 2-HW-110
PROJECT NAME:

V300 VALVE BODY SIZE 6
2052 ACTUATOR SIZE 2

CUST ITEM: 000001 S.NO.: F000908220

REV	DATE	DWN.	CHKD.	APVD.
X	10-Mar-16	ADS		

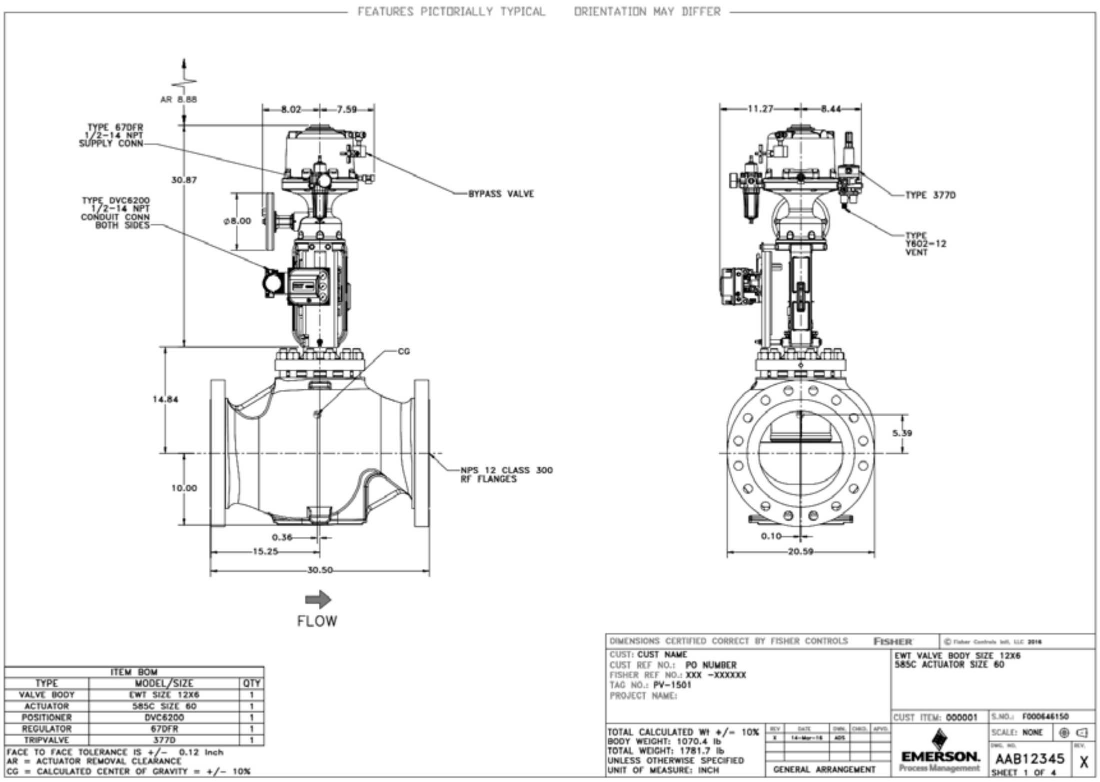
BILL OF MATERIALS

EMERSON. Process Management

SCALE: NONE

DWG. NO. AAB123456 REV. X
SHEET 3 OF 3

Figure 15. LEVEL 4 Drawing - Sliding-Stem (Sheets 1 and 2)



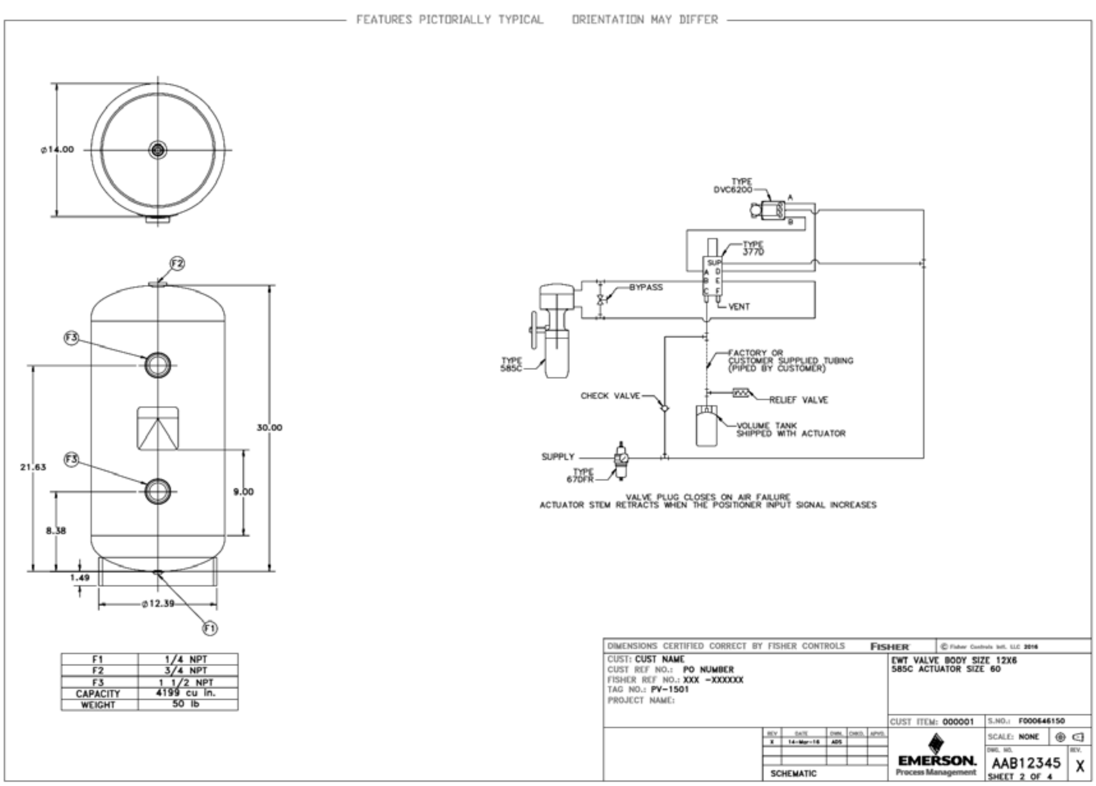
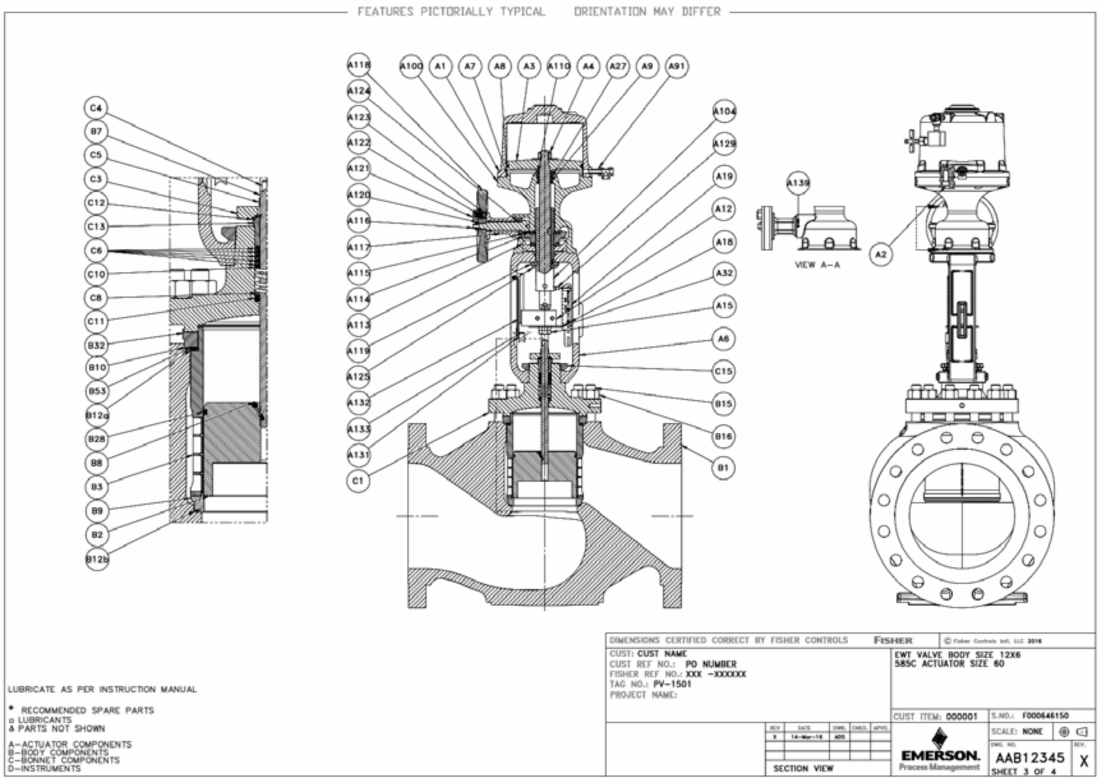


Figure 16. LEVEL 4 Drawing - Sliding-Stem (Sheets 3 and 4)



FEATURES PICTORIALLY TYPICAL   ORIENTATION MAY DIFFER

RSP	FIND NO.	QTY.	PART NUMBER	PART NAME	DESCRIPTION	MATERIAL
	A1	1	4BB4252X012	CYLINDER	SIZE 60,4 TVL,1/4 TOP,1/4 BOT	A03560/3C4/3A9
	A2	14	1A771132982	SCREW,CAP,HEX SOCKET	1/2–13X1.25	A574/12.9/NCF1
	A3	1	2H865807062	PISTON	SIZE 46,60	A03560/3C4/3A9
	A4	1	1R234924112	NUT,HEX	7/8/2009	SA194–2H/ZN PL
	A6	1	3N2178X0012	YOKE	SIZE 60–68,2 & 4 TVL,3 9/16YB	65–45–12 DI
*	A7	1	1H862306992	O–RING	8 1/4X8 1/2X1/8	NITRILE–DSS2–1
*	A8	1	1H862406992	O–RING	8X81/2X1/4	NITRILE–DSS2–4
*	A9	1	1E736906992	O–RING	1 1/4X1 1/2X1/8	NITRILE–DSS2–4
	A12	1	18A1685X012	STEM CONNECTOR ASSY	60,3/4 STEM	STL/ZN PL
	A15	2	1A3511X0062	HEX.NUT	3/4–16	SAE GR 5/NCF3
	A18	2	1E831338992	SCREW,SELF TAP	8 X 0.75 BIND HD PHILLIPS	18–8 SST
	A19	1	1U372738982	SCALE,TRAVEL IND	SIZE 70	18–8 SST
▲	A20	6	1A368228982	SCREW,DRIVE	2X3/16	18–8 SST
▲	A21	1	18A5089X0A2	NAMEPLATE,SS ACT	SITE MUST PICK REQD PART NO.	
▲	A22	1	14B6769X0A2	TAG,WARNING,ACTUATOR	SITE MUST PICK REQD PART NO.	
▲	A24	1	1M1100X0012	LUBRICANT,GREASE	LUBRIPLATE MAG–1	
*	A27	1	1D348306992	O–RING	1 1/2X1 3/4X1/8	NITRILE–DSS2–1
	A32	1	1E832838992	DISC,TRAVEL IND	657 SIZE 50–60 3 5/8 DIA	S43000
	A33	1	1E833538992	NUT,TWIN SPEED	SIZE NO. 8	SST
▲	A70	1	1M3099X0012	SEALANT,PERMATEX #2	FORM–A–GASKET,11 OZ TUBE	VENDOR
▲	A90	3	1C488238982	NIPPLE,PIPE,NPT	1/4–18 SCH 80 X 1.50	316
	A91	2	1P506938982	TEE	1/4 NPT,2000 LB	316 SST 20815
*	A92	1	1F2159X0012	VALVE,NEEDLE,ANGLE	1/4 APOLLO 425011279100010051	316 SST 20815
	A100	1	32B2663X012	CYLINDER FLANGE	SIZE 60	ASTMA126–CCI
	A104	1	34B1202X012	SLEEVE ASSY	SIZE 60,4 TVL,W/INT HDJK	STEEL/S41600
*	A110	1	1H865114042	BUSHING,SEAL	30–100	C95400
	A113	1	12B2661X012	BEARING RETAINER	SIZE30–64	ASTMA48–30ACI
	A114	1	22B2662X012	BEVEL GEAR–L.H	30–60	ASTMA126–CCI
	A115	2	12B2711X012	BALL RETAINER	SIZE30–64	CARBSTEEL–PL
	A116	1	2J464335132	BEVEL PINION	SIZE30–64	410/41620864
	A117	1	1J4634000A2	EXTENSION	SIZE 30–64	
	A118	1	1J463819042	HANDWHEEL	8 OD,5/8 SQ SHAFT	ASTM A48–30A CI
	A119	5	1A3524X0082	HEX NUT, JAM	1/2/2013	SAE GRADE 8/ZN
	A120	1	1A4878X0012	WASHER, LOCK SPRING	1/2,REGULAR	CARBSTEEL–PL
	A121	1	1D385124092	SPRING CAP	SIZE 45–50–60 MO	STL,20813/ZN PL
	A122	1	0D005916012	SPRING,COMPENSATOR		PHBRZ C51000
	A123	1	1A342732992	BALL	1/2INDIA	ALLOYSTEEL
*	A124	1	1J465599012	BEARING,COMBINATION	7/8X1 11/16X15/32	VENDOR
	A125	4	1J501428992	HEXAGON SOCKET SET SCREW	1/2–13X1.75 FLAT POINT	ALLOY STEEL
	A129	1	1J461535132	POINTER		410/41620864
	A130	1	22B3560X012	INDICATOR	40–60 4 1/8 TVL 475–7	18–8 SST
	A131	1	1J464046172	LOCKING PIN		S41600FGS288
	A132	1	1J460738992	BEAD CHAIN & COUP	SIZE 30–100	SST
	A133	2	1J494728992	ROUND HEAD DRIVE SCREW	6X3/8	CARBSTEEL–PL
	A139	1	1B856828992	SCREW,SET,HEX SOCKET	10–24X0.25 CUP PT	CARBON STEEL
▲	A145	1	14B3486X012	TAG,CAUTION	SIZE 4,LAMINATED,MANUAL OPERTR	PLASTIC
▲	A146	2	AM5775X0012	CABLE,TIES PLASTIC	8225, 5 13/16 SCOT	VENDOR

RSP	FIND NO.	QTY.	PART NUMBER	PART NAME	DESCRIPTION	MATERIAL
	B1	1	32A0559X042	VALVE BODY	12X6300LBRF	SA217GRADEWC9
*	B2	1	21B6184X012	PLUG,BAL	7 ORF,1L7500	S41600 FGS288
*	B3	1	23A7191X012	CAGE,WHISPER I	12X6,7 ORF,4 TVL	CB7CU–1,H900
*	B7	1	1U293835162	VALVE PLUG STEM	VSC1L7500,3/4X16.75,4.25THD	S31600,B , C&P
*	B8	1	1V326035072	PIN,GROOVE,FLAT END	3/16X1.06	ASMESA479S31600,22HRC(256HB)MAX
*	B9	1	GG10637X012	SEAT RING	8X6,7PORT,3&4TVL,70DEG SEAT	CA15 FGS 288
*	B10	2	1U5081X0052	GASKET	7.69X9.17X.03	GRAPH/SST,17F46
*	B12a	1	1U508599442	GASKET,SPIRAL WOUND	7.75X8.50X0.175PRO	N06600(INCONELALLOY600)/GRAPHITE,FMS17N3
*	B12b	1	1V644199442	GASKET,SPIRAL WOUND	CL900,7.56X8.06X0.175	N06600/17N3
	B15	12	1R5887X0192	STUD,CONT THD/STOP	1–8X5.25,LE=1.31DI	SA193–B7/NCF2
	B16	12	1A4409X0752	NUT,HEX,HEAVY	1–8	ASMESA194GRADE2H/NCF2FFS681
▲	B18	1	1V106038982	ARROW,FLOW DIRECTION	1 1/2–6	18–8 SST
▲	B19	6	1A368228982	SCREW,DRIVE	2X3/16	18–8 SST
*	B28	1	10A2643X022	SEAL RING/SPR,RADIAL	RND–SPR,HVY,6.72X7.09X0.18	N10276/PTFE,GLASS,MOLYBDENUMDISULFIDE
	B32	1	10A8757X342	SPACER,BONNET	12 X 6,CL600	SA217 GRADE WC9
*	B53	1	16A1942X012	GASKET SHIM	711/16X817/32X1/32	S31600ASMESA–240
▲	B54	1	18A5087X0A2	NAMEPLATE,SS BODY	SITE MUST PICK REQD PART NO.	
▲	B55	1	1D884799012	SEAL & WIRE,LEAD	12 LONG	PURCHASED PART
	C1	1	3U5092X0742	BONNET	6,3 9/16YB,PBS13A0750	SA217 GRADE WC9
	C3	1	1F380435072	FLANGE,PACKING	3/4 STEM	316–A FMS 20864
	C4	2	1E944935222	STUD BOLT,CONT THD/S	9/16–12X 3.25,LE=1.3	B8M CLASS 2
	C5	2	1E944635252	NUT,HEX	9/16 –12	S31600
*	C6	1	1R290401012	PACKING,SET	3/4X13/8	PTFE,FMS17D7
	C8	1	1F125637012	SPRING,PACKING	3/4STEM	316
	C10	1	1F125036042	WASHER,SPCL	3/4STEMX1.38	316–AFMS20864
*	C11	1	1J873335072	PACKING BOX RING	3/4STEMX13/8	TYPE316
*	C12	1	1J872806332	WIPER,UPPER	3/4STEM	FELTSAEF3
	C13	1	1E944735072	PACKING FOLLOWER	3/4STEM	TYPE316
	C15	1	1E832723062	YOKE LOCKNUT	3/4STEM,39/16YOKEBOSS	SA105/NCF

LUBRICATE AS PER INSTRUCTION MANUAL

* RECOMMENDED SPARE PARTS
□ LUBRICANTS
▲ PARTS NOT SHOWN

A–ACTUATOR COMPONENTS
B–BODY COMPONENTS
C–BONNET COMPONENTS
D–INSTRUMENTS

DIMENSIONS CERTIFIED CORRECT BY FISHER CONTROLS — FISHER — © Fisher Controls Intl. LLC 2016

CUST: CUST NAME
CUST REF NO.: PO NUMBER
FISHER REF NO.: XXX –XXXXXX
TAG NO.: PV–1501
PROJECT NAME:

EWT VALVE BODY SIZE 12X6
585C ACTUATOR SIZE 60

CUST ITEM: 000001 — S.NO.: F000646150 — SCALE: NONE

REV	DATE	DWN.	CHKD.	APVD.
X	14–Mar–16	ADS		

BILL OF MATERIAL

EMERSON. Process Management

DWG. NO. AAB12345 — REV. X — SHEET 4 OF 4

Figure 17. LEVEL 2 Drawing (2D CAD) - Rotary (with Single-Acting Actuator)

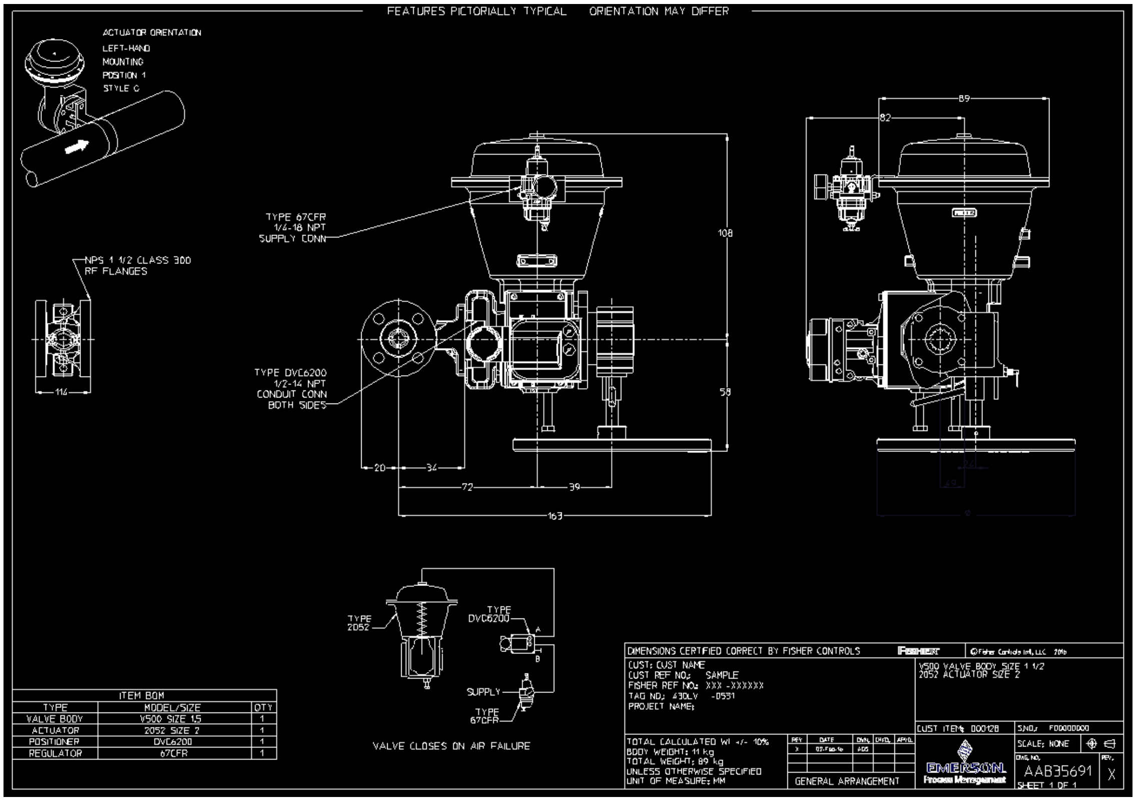
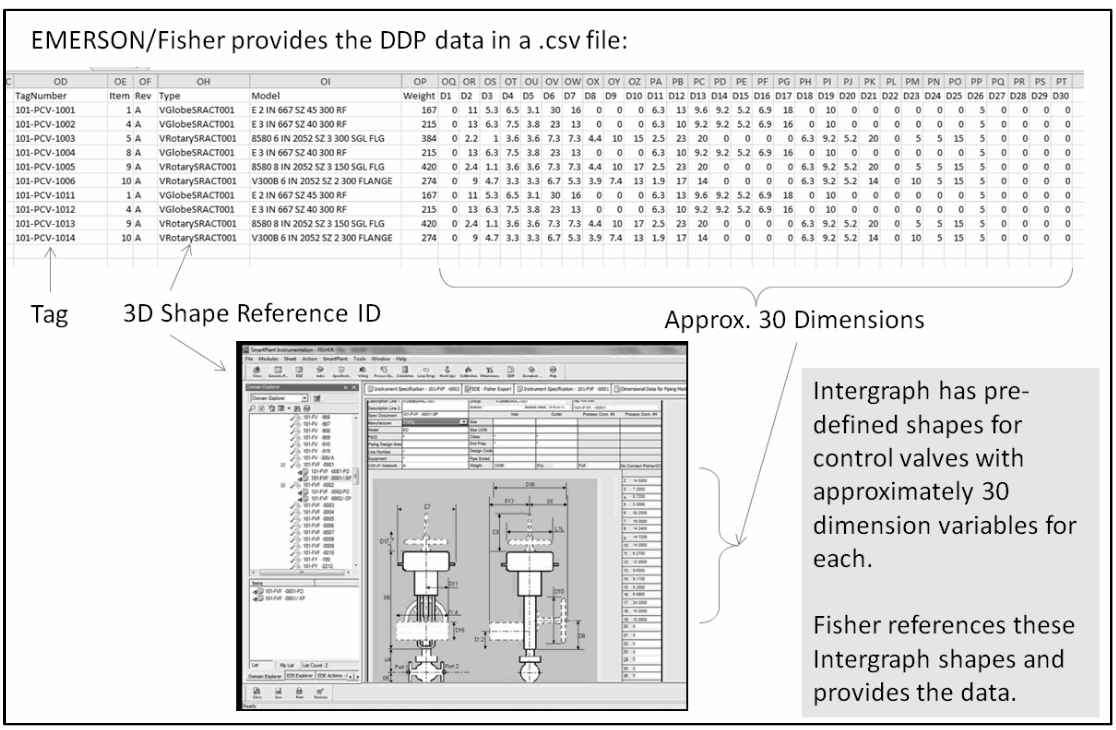


Figure 18. DDP (Dimensional Data for Piping)



OD	OE	OF	OH	OI	OP	OQ	OR	OS	OT	OU	OV	OW	OX	OY	OZ	PA	PB	PC	PD	PE	PF	PG	PH	PI	PJ	PK	PL	PM	PN	PO	PP	PQ	PR	PS	PT
TagNumber	Item	Rev	Type	Model	Weight	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	D29	D30
101-PCV-1001	1	A	VGlobeSRACT001	E 2 IN 667 SZ 45 300 RF	167	0	11	5.3	6.5	3.1	30	16	0	0	0	6.3	13	9.6	9.2	5.2	6.9	18	0	10	0	0	0	0	0	0	5	0	0	0	0
101-PCV-1002	4	A	VGlobeSRACT001	E 3 IN 667 SZ 40 300 RF	215	0	13	6.3	7.5	3.8	23	13	0	0	0	6.3	10	9.2	9.2	5.2	6.9	16	0	10	0	0	0	0	0	0	5	0	0	0	0
101-PCV-1003	5	A	VRotarySRACT001	8580 6 IN 2052 SZ 3 300 SGL FLG	384	0	2.2	1	3.6	3.6	7.3	7.3	4.4	10	15	2.5	23	20	0	0	0	0	6.3	9.2	5.2	20	0	5	5	15	5	0	0	0	0
101-PCV-1004	8	A	VGlobeSRACT001	E 3 IN 667 SZ 40 300 RF	215	0	13	6.3	7.5	3.8	23	13	0	0	0	6.3	10	9.2	9.2	5.2	6.9	16	0	10	0	0	0	0	0	0	5	0	0	0	0
101-PCV-1005	9	A	VRotarySRACT001	8580 8 IN 2052 SZ 3 150 SGL FLG	420	0	2.4	1.1	3.6	3.6	7.3	7.3	4.4	10	17	2.5	23	20	0	0	0	0	6.3	9.2	5.2	20	0	5	5	15	5	0	0	0	0
101-PCV-1006	10	A	VRotarySRACT001	V300B 6 IN 2052 SZ 2 300 FLANGE	274	0	9	4.7	3.3	3.3	6.7	5.3	3.9	7.4	13	1.9	17	14	0	0	0	0	6.3	9.2	5.2	14	0	10	5	15	5	0	0	0	0
101-PCV-1011	1	A	VGlobeSRACT001	E 2 IN 667 SZ 45 300 RF	167	0	11	5.3	6.5	3.1	30	16	0	0	0	6.3	13	9.6	9.2	5.2	6.9	18	0	10	0	0	0	0	0	0	5	0	0	0	0
101-PCV-1012	4	A	VGlobeSRACT001	E 3 IN 667 SZ 40 300 RF	215	0	13	6.3	7.5	3.8	23	13	0	0	0	6.3	10	9.2	9.2	5.2	6.9	16	0	10	0	0	0	0	0	0	5	0	0	0	0
101-PCV-1013	9	A	VRotarySRACT001	8580 8 IN 2052 SZ 3 150 SGL FLG	420	0	2.4	1.1	3.6	3.6	7.3	7.3	4.4	10	17	2.5	23	20	0	0	0	0	6.3	9.2	5.2	20	0	5	5	15	5	0	0	0	0
101-PCV-1014	10	A	VRotarySRACT001	V300B 6 IN 2052 SZ 2 300 FLANGE	274	0	9	4.7	3.3	3.3	6.7	5.3	3.9	7.4	13	1.9	17	14	0	0	0	0	6.3	9.2	5.2	14	0	10	5	15	5	0	0	0	0

Product Bulletin
39:001
August 2017

Customer Drawings
D104179X012

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ Product Material Compliance

Emerson strives for a best-in-class supply chain across its global businesses. We are committed to working with suppliers who adhere to the Emerson Supplier Code of Conduct and actively manage and demonstrate materials compliance with pertinent governmental laws and regulations, including the Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), Restriction of Hazardous Substances Directive (RoHS) and Conflict Minerals.

Hazardous Substances

European suppliers for Fisher products are required to comply with all relevant requirements of REACH and RoHS. In addition, these suppliers must meet our contractual terms and conditions covering components used in products within the scope of RoHS. Non-European suppliers are required to meet the requirements for RoHS and REACH as specified in the contractual terms and conditions. In order to comply with hazardous substances legislation globally, Fisher requires Full Material Declaration (FMD), unless otherwise agreed.

REACH

REACH, the European Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals, went into effect June 1, 2007.

REACH shifts the responsibility from public agencies to industry when it comes to assessing and managing the risks posed by chemicals and providing appropriate safety guidelines for their users. REACH impacts many sectors beyond the chemicals industry, requiring new forms of cooperation among companies and enhanced communication along the entire supply chain. It also requires the creation of tools and guidance documents to assist companies in the supply chain and public agencies in the implementation of REACH.

REACH's objectives are to ensure a high level of protection for human health and the environment — including the promotion of alternative test methods — the free circulation of substances on the internal market as well as the enhancement of competitiveness and innovation.

Fisher valves and instruments are continuously verified as to whether the products contain any substances mentioned in the REACH candidate list. We are in close contact with suppliers as part of this process.

RoHS

RoHS, the European Directive on The Restriction of Hazardous Substances, original directive was adopted January 27, 2003, and was revised June 8, 2011. Today, this revised directive is often referred to as “RoHS II.”

This directive restricts the use of certain hazardous substances in electrical and electronic equipment. The list of restricted substances includes: Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent chromium (Cr6+), Polybrominated biphenyls (PBB), Polybrominated diphenyl ether (PBDE), and added in 2015: Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP), Diisobutyl phthalate (DIBP).

RoHS II has introduced new obligations for conformity assessment, declaration and marking, and its scope has been extended to all electrical and electronic equipment (EEE). RoHS II is a CE marking directive, which means the producer has placed the CE mark on finished EEE products as a declaration the product is RoHS II compliant and meets all of the requirements established by the European Union.

We believe Fisher products are out of scope of the RoHS II directive. However, Fisher is evaluating alternatives to the restricted substances for use in their products.

Product Bulletin
39:010
July 2017

Fisher Product Material Compliance
D104298X012

Conflict Materials

The US Securities and Exchange Commission (SEC) adopted a final rule August 22, 2012 to implement the “conflict minerals” provision of Section 1502 of the Wall Street Reform and Consumer Protection Act, better known as the Dodd-Frank law.

The rule requires U.S. public companies to annually report on their efforts to determine whether or not their products contain metals mined from the Democratic Republic of Congo (DRC), or an adjoining country, and whether funds flowing to the mines supplying those conflict minerals are benefiting, directly or indirectly, armed groups in the DRC region.

The term “conflict minerals” includes: Cassiterite (Tin ore); Columbite-tantalite, aka Coltan (Tantalum ore); wolframite (Tungsten) and Gold. These are collectively known as “3TG minerals.”

The SEC's final rule on conflict minerals applies to Fisher products and consequently affects suppliers of finished products, parts and/or materials that are incorporated into Fisher products, regardless of where the supplier is located.

Emerson works aggressively with industry groups and other stakeholders to develop and implement policies and systems to reduce the risk of minerals in its supply chain coming from mines that finance or benefit armed groups in the DRC region. In 2014, Emerson joined the Conflict Free Sourcing Initiative to be more active in making informed choices in the management of the supply chain.

Summary

For quotes/orders destined for installation in the European Union, some products on this quote/order may be considered outside of the Scope of European Directive 2011/65/EC. Please refer to www.emerson.com/compliance for up to date product information.

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Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Bourdon Tube Isolators

Bourdon tube isolators are chemical seals that provide isolation between Bourdon tubes in Fisher™ pneumatic instruments and process fluids. They are designed to prevent corrosive or clogging process fluids from entering the Bourdon tube. Each isolator consists of a continuous-duty welded diaphragm seal and armored flexible tubing that is factory-welded to the control connection of a Fisher instrument.

The connecting tubing and the sealed portion of the instrument Bourdon tube are factory-filled with a suitable hydraulic liquid, which is retained by the thin, flexible diaphragm that divides the isolator (figure 1). The other side of the isolator is connected to the process fluid. Diaphragm movement transmits the true process pressure at a one-to-one ratio through the sealed liquid to the instrument.

Features

- Isolator Overpressure Protection—The machined surface in the instrument half of the isolator bowl exactly fits the shape of the diaphragm and serves as a travel stop for the isolator only. Excess process pressure can force the diaphragm against the machined surface without damage to the isolator.
- Application Flexibility—Both the diaphragm and process half of the isolator bowl are available in a wide selection of materials for compatibility with many hard-to-handle process fluids.
- Easy Cleaning—A flushing connection construction permits removal of clogging process fluids without isolator disassembly.

TYPICAL BOURDON TUBE ISOLATOR AND CONTROLLER ASSEMBLY

Specifications

Process Connection Sizes

Without Flushing Connection: ■ 1/4, ■ 3/8, ■ 1/2, ■ 3/4, ■ 1, or ■ 1-1/2 NPT
With Flushing Connection: ■ 1/4, ■ 3/8, ■ 1/2, ■ 3/4, or ■ 1 NPT

Connecting Tubing

Size and Construction: 3.2 mm (1/8-inch) outside diameter tubing protected by 7.9 mm (5/16-inch) flexible armor soldered at each end, roll-pinned to isolator, and welded to instrument process connection
Length: ■ 3 m (10 feet) (standard), ■ shorter lengths available at no extra cost, ■ greater lengths may be ordered

Temperature Ratings and Hydraulic Liquid Information

See table 1

Maximum Isolator Input Pressure

172 bar (2500 psig) standard; up to 689 bar (10 000 psig) available upon request

Output Pressure To Instrument[1]

Same as isolator input pressure

Construction Materials

Bourdon Tube Bowl: Forged steel
Typical Diaphragm and Process Bowl Material Combinations: See table below

Diaphragm	Exposed Surfaces of Process Bowl	Notes
316L SST	316 SST	Standard construction materials - For optional materials, contact your Emerson Automation Solutions sales office.

1. The pneumatic instrument Bourdon tube will yield if the isolator output pressure is greater than the Bourdon tube maximum pressure.

Table 1. Fill Fluids

Fill Fluid	Process Temperature Limits[1]		Viscosity in Centistokes
	°C	°F	
Mansfield & Green AAA Tester Oil	-1 to 150	30 to 300	16 cs at 38°C (100°F) 3.3 cs at 99°C (210°F)
Dow Corning® 200, Silicone - 20cs	-45 to 205	-49 to 401	20 cs at 25°C (77°F)
Dow Corning 200 Silicone - 10cs	-45 to 205	-49 to 401	10 cs at 25°C (77°F)

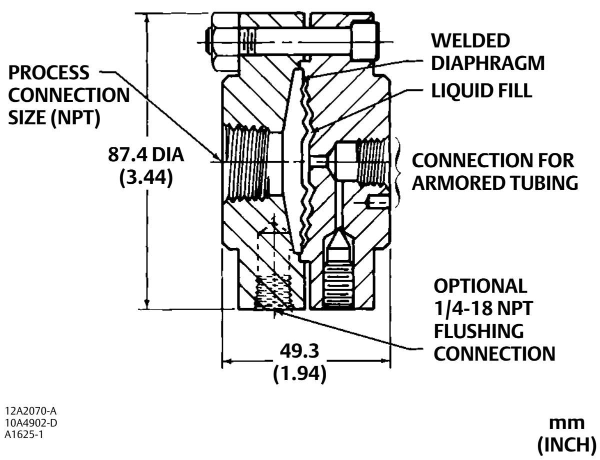
1. This temperature range is for the filled liquid in the Bourdon tube isolator. The temperature at the pneumatic instrument Bourdon tube cannot exceed the ambient temperature range of the pneumatic instrument to which the Bourdon tube isolator is connected.

Installation

The Bourdon tube isolator must not be disassembled, nor any of the connections between it and the Bourdon tube broken, as any air admitted will destroy the accuracy of the process indications. To avoid kinking the armored flexible tubing, while at the same time maintaining the integrity of the sealed system, install the process connection into the isolator bowl, rather than vice versa.

Bowl dimensions are shown in figure 1.

Figure 1. Internal Construction and Dimensions of Bowl



Ordering Information

When ordering, specify:

1. Type number and control connection size of Fisher pneumatic instrument for which isolation is desired (no bellows instruments may be specified)

2. Process connection size

3. Flushing connection, if desired

4. Operating temperature range and hydraulic liquid

5. Diaphragm and process bowl materials

6. Length of tubing, if other than 3 m (10 feet)

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Standard and Special Material Designations

Standard Materials

Materials can be referred to by many different notations which has the potential to create confusion between customers and suppliers. Throughout the past, standards organizations and trade associations made an effort to standardize alloy designations to help alleviate confusion.

To keep in step with industry standards and to maintain accuracy in specifying materials for products and replacement parts, Emerson has documented a standard designation system for all documentation and advertising literature as well as for internal references for Fisher™ valves. The designation system used by Emerson is representative of direction set by ANSI, ASME, ASTM, and EN for designation use.

The Unified Numbering System (UNS) also provides a standardized approach to material references. In the cases where the codes and standards or the UNS have not standardized on a singular designation, Emerson determines a designation in line with current trends.

The standard designations are used consistently in all Fisher valve documentation.

Special Materials

Industrial process lines are usually designed in accordance with ASME B31.1 (Power Piping) or B31.3 (Process Piping). Both of these codes include a list of acceptable standards which can be referenced and applied for piping comments. ASME B16.34 is one such standard, which, if a valve is rated and designed in accordance the valve is acceptable and can be referred to as a listed valve.

Fisher valves are routinely designed in accordance with ASME B16.34. This includes adherence to materials listed as well as other prescriptive requirements (minimum wall thicknesses, etc.). However, there are some occasions where we are forced to deviate, such as unique or arduous customer applications, requiring new materials (non-listed) or use of new manufacturing processes.

If the material to be used is not shown in ASME B16.34, the valve is considered to be an unlisted valve. However, the piping code permits manufacturers to rate this material using the same methodology used for B16.34 listed materials. In the 2016 revision of B31.3, see 307.1.2 Unlisted Valves, “unlisted valves may be used only in accordance with para 302.2.3. Unless pressure temperature ratings are established by the method set forth in AMSE B16.34 pressure design shall be qualified as a required by para 304.7.2.”

Fisher products made from non-listed materials are designed to wall thickness and other requirements of B16.34. Also, as required in B31.3, the ratings are established using the method set forth in ASME B16.34. Consequently, unlisted valves, those with manufacturer's ratings, are still permitted for use in piping code applications.

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Fisher™ Obsolete Products Including Valves, Actuators, Accessories, Instruments, and Regulators

Obsolete products may not be manufactured again in any Emerson location under any conditions. Recommended spare parts availability is guaranteed for 10 years after the last production on manufactured trim replacement parts and 5 years of best effort on die cast parts, elastomers, buyout components, and electronic components.

Should you need price and delivery for parts on any of these obsolete or inactive product lines listed, contact your Emerson sales office.

Valves, Actuators, Accessories, and Instruments

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
7 Series	Auma
7C	None
30 (obsolete 4/7/97)	None
37M	None
38	None
38F	None
38S	None
43M, MS, S	None
44M	None
49M, 49MP	None
55B	None
115 & 115C (obsolete 4/6/90 & 5/5/97)	None
125	357
126/127PJ (obsolete 6/3/91)	D2T, D3, D4
126/127PQ (obsolete 6/3/91)	D2T, D3, D4
126/127PQA (obsolete 6/3/91)	D2T, D3, D4
126/127PQC (obsolete 6/3/91)	D2T, D3, D4
126/127PQF (obsolete 6/3/91)	D2T, D3, D4
126/127PT (obsolete 6/3/91)	D2T, D3, D4
126/127PTA (obsolete 6/3/91)	D2T, D3, D4
128PQ (obsolete 6/3/91)	D2T, D3, D4
128PQA	D2T, D3, D4
128PQC (obsolete 4/1/02)	D2T, D3, D4
128PQF (obsolete 6/3/91)	D2T, D3, D4
169A & 169AS	None
171F (3/8-inch)	None
171L (3/8-inch)	None

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
183	None
184	None
186	None
220C	None
249A Series	249B
249N (obsolete 8/10/98)	249K
249PT	None
249V (obsolete 9/1/09)	249VS
249VT	None
254 (obsolete 6/1/95)	252
254E & 254F (obsolete 3/1/98)	252
260B	None
260C (obsolete 4/7/97)	None
261C	None
262C (obsolete 4/10/00)	262K
271E	None
273	249 Series
279V & 279VBU	None
299 (obsolete 4/10/00)	299H
299SO (obsolete 4/10/00)	299HS
304 (obsolete 3/1/09)	TopWorx™
310 (obsolete 2/6/95)	310A
314 (obsolete 10/1/03)	None
315 (obsolete 10/1/03)	None
320	None
321 (obsolete 11/7/05)	REXA Xpac
323 (obsolete 9/01)	None
329 (obsolete 11/7/05)	REXA Xpac

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
330SA (obsolete 9/01)	None
346	None
347-1061-V100	None
350 (obsolete 11/7/05)	REXA Xpac
350-8, 352-8	None
352 (obsolete 11/7/05)	REXA Xpac
353 (obsolete 11/7/05)	REXA Xpac
354 (obsolete 11/7/05)	REXA Xpac
357 (obsolete 12/1/03)	D3, D4
361 (obsolete 8/2/91)	None
364/365	Buyout
376	377
390	None
422 (obsolete 3/12/08)	None
424	None
430	None
450	None
451	None
470 Size 30 & 40	585C
470 sizes 60 through 130 (obsolete 12/00)	585C
471 sizes 60 through 130 (obsolete 12/00)	585C
475 sizes 60 through 130 (obsolete 12/00)	585C
477	None
478 (obsolete 9/01)	1061
490, 491, 495 (obsolete 12/00)	685
513 & 513R (obsolete 6/10/96)	Baumann™ Spring & Diaphragm Actuator
528TY	None

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
529 (obsolete 12/31/05)	GX
551 (obsolete 7/6/06)	None
571S	None
573S	None
585 (Sizes 25 & 50)(obsolete 7/1/95)	585C
585 (Sizes 100)(obsolete 10/1/03)	657,667
601	None
603 (obsolete 11/1/09)	None
607	None
608	None
610	None
611	None
612	None
613	None
616/616R (obsolete 4/7/97)	655/655R
617 & 618 (obsolete 4/99)	None
643	None
650	None
654	None
657-8 (obsolete 9/01)	1052
658	None
658-2	None
666	None
666P	None
666PH	None
666PHR	None
666PR	None
666T	None

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
666TH	None
666THR	None
666TR	None
688	None
690	None
772B	None
779K	None
787	None
864	None
1009	None
1018S (obsolete 12/31/04)	GX
1031 (obsolete 5/01)	G Series
1032 (obsolete 5/04)	HYTORK
1033 (obsolete 2/1/05)	None
1035 (obsolete 3/21/14)	FieldQ
1051	2052
1052 size 20-60	2052
1063, 1064	FieldQ
1065	Buyout
1066, 1066SR (obsolete 3/21/14)	FieldQ
1075 (obsolete 4/99)	1077
1076	1078
1082, 1083	None
1100 Series (obsolete 7/1/15)	easy-e
1250 (obsolete 10/01)	GX
2340, 2341	DLC3100
2390 (10-50 mA)(obsolete 11/2/90)	None

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
2390/2390B (obsolete 12/00)	DLC3100
2504	None
2511, 2512, 2513, 2514	2500, 2500S, 2503
2601 Series (obsolete 7/6/90)	None
2602	None
2660-266T (obsolete 4/1/95)	L2
2680-268T (obsolete 9/27/02)	L2
2800-252V	2100E
2900, 2901-244V (obsolete 6/3/91)	L2
3000 (obsolete 9/20/04)	None
3024	None
3024S (obsolete 9/1/04)	3024C
3050 (obsolete 7/98)	3611JP
3060 (obsolete 7/98)	3621JP
3201	Buyout
3511 & 3516	3610J & 3610JP
3521	Buyout
3550T, M, G	None
3551	4200, 4320
3552	4200, 4320
3554	Buyout
3555	None
3560	3582
3575 (obsolete 8/31/06)	None
3579	None
3580	3582
3583	None
3590 (obsolete 6/1/97)	DVC6200

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
4000 (obsolete 11/01)	None
4060 (obsolete 11/01)	3611JP
4070 (obsolete 11/01)	3621JP
4100Z (obsolete 9/1/03)	4195K or C1
4101Z (obsolete 8/4/97)	4195KS or C1
4102Z (obsolete 8/4/97)	4195KS or C1P
4102ZR (obsolete 8/4/97)	4195K or C1P
4103Z (obsolete 5/25/95)	4194S or C1B
4103ZR (obsolete 5/25/95)	4194SR or C1B
4104Z (obsolete 8/4/97)	4195KS or C1P
4106Z (obsolete 5/25/95)	4195K or C1B
4106ZR (obsolete 5/25/95)	4195KR or C1B
4150/4160 Series	4190 or C1
4150K, 4150KR (obsolete 1/1/09)	4195 or C1
4151K (obsolete 10/1/03)	4195K
4152K, 4154K, 4155K (obsolete 1/1/09)	4190 or C1
4153K (obsolete 10/1/03)	4195K
4156K & 4166K	4196A, B, C
4157IK, 4158K (obsolete 1/1/09)	C1
4159K (obsolete 10/1/03)	4194
4160K, 4160KR (obsolete 1/1/09)	4195K or C1
4162K, 4164K (obsolete 1/1/09)	4190 or C1
4170, 4180 Series	4190 Series
4500	None
5000 (obsolete 9/20/04)	None
5190 & 5190S (obsolete 5/5/97)	None
5453, 5458	4194, 4194H

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
6000 Silencers	Pulsco Silencers
6020 Silencers	Pulsco Silencers
7000 (obsolete 9/20/04)	None
7800 (obsolete 11/2/90)	None
8500	None
8501	None
8510 (3 thru 12-inch) (obsolete 6/10/96) (30 & 36-inch) (obsolete 6/10/96)	8580 A11
8511	8560/8580
8522 (obsolete 6/10/96)	8560/8580
8550 (obsolete 4/1/95)	8560 or 8580
8551 (obsolete 11/2/90)	None
8555, 8556	8580
8570A, 8570B	8580
9000 (obsolete 12/31/05)	GX/667 easy-e™
9710	None
9720	None
A 25 - 40 mm (Double Port (obsolete 11/2/90)	ED/EZ
A31A	8532
A41	8560
A61D (obsolete 02/02)	A31D
A81 (obsolete 10/1/15)	8580
AC (except 10-inch)	ET
AC141 (obsolete 8/4/97)	None
AF, AFB	None
AP	easy-e
AQR	None
ARS	easy-e

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
AS	easy-e
AV	easy-e
A61D (obsolete 2/02)	A31D
B (obsolete as Fisher product)	Baumann
BA	None
Baumann 10 Rotary Actuator	None
Baumann 25 Rotary Actuator	None
Baumann 54R Rotary Actuator	None
Baumann 863-1	3661
Baumann 865-1	3660
Baumann 21000 (obsolete 1/2/10)	None
Baumann 25000 Lo-T (obsolete 1/2/10)	None
Baumann 25000/25000 Lo-T 3-Way (obs 1/2/10)	None
Baumann 42000 (obsolete 1/2/10)	None
Baumann 86000	None
Baumann Belimo NV Series Electric Actuator	Baumann Belimo SV Series Electric Actuator
Baumann Resistance Plate Multi-Port (obs 1/2/10)	None
BF (obsolete 9/01)	CP
BFC	CP
BP	None
BPO (obsolete 1/1/91)	None
BV500 (obsolete 4/1/05)	Vee-Ball/eplug(V500)
B21A (obsolete 6/10/96)	A31A
C	None
Cast Bracket	1051/1052/1061
Cavitrol V for Design U	None
CC (obsolete 9/01)	EH

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
CE (1 & 2-in obsolete 7/1/95) (3 & 4-in obsolete 3/1/96) (1/2 & 3/4-inch obsolete 11/1/96)	CP
CP (obsolete 12/31/05)	GX
CVG (obsolete 1/1/01)	Globe PRV
CVP (obsolete 1/1/99)	Angle PRV
CVP-D (obsolete 1/1/93)	Y-Body
CVS-A,-C (obs 1/1/99)	TBX,PRV w/Desuperheater
CVS-E (obsolete 9/01)	CVX
CVX-A,-AA (obs 1/1/04)	TBX,PRV w/Desuperheater
CVX-AY (obs 1/1/04)	Globe PRV w/Desuperheater
CVX-CY,-CZ (obs 1/1/04)	Globe PRV w/Desuperheater
CVX-S (obs 1/1/04)	TBX-S, 6010, 6011, Whisper Disk
CVX-T (obsolete 1/1/04)	TBX-T
CZA (obsolete 8/02)	None
D2 (obsolete 7/24/15)	D2T
DED (obs 1/1/90)	DMA,DMA/AF,DMA/AF-HTC
DHY	None
DN	None
DNY	None
DPD (obsolete 1/1/87)	None
DS & DSE (obsolete 8/02)	ED, ET
DSV	8580/8532
DSW	None
DT4000 (obsolete 5/97)	None
DVC5010 (obsolete 10/1/03)	DVC6200
DVC5020 (obsolete 10/1/03)	DVC6200
DVC5030 (obsolete 10/1/03)	DVC6200
DVC5040 (obsolete 12/31/05)	DVC6200
DVG (obsolete 11/7/05)	DFA

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
DVG/AF (obsolete 1/1/13)	DFA
DVG-RSH (obs 1/1/00)	DFA,DMA,DMA/AF, DMA/AF-HTC
DY	None
EAB (obsolete 9/01)	None
EB (Spec. B, C, D F)	GX
EC-G (obsolete 9/7/90)	None
EF, 667FM	None
EHAD, EHAS, EHAT 1-8 in. CL 1500 & 1500 intermediate rated (obsolete 7/1/12)	HPAD, HPAS, HPAT
EHD,EHS,EHT 1-8 x 6 in. CL 1500 & 1500 intermediate rated (obsolete 12/31/03)	HPD,HPS,HPT
EHP (obsolete 11/7/05)	EH w/C-Seal
EJ/EWJ	ED Multi Ring
EK & EKR (obsolete 9/00)	ET, EZ
EL (obsolete 11/7/05)	EU & EW
EP (obsolete 11/7/05)	easy-e or EW w/C-Seal
ESP (obsolete 1/1/02)	None
ESR (obsolete 1/00)	easy-e, EDR, ETR
EUD, 12 to 20 inch	Large ED
EUT, 12 to 20 inch	Large ET
EWB	EWD
EWD, 16 to 24 Inch	Large EWD
EWN NPS 16x10 (obsolete 3/27/15)	Large ED/ET
EWP (obsolete 11/7/05)	easy-e or EW w/C-Seal
EWT, 16 to 24 Inch	Large EWT
F & FA	None
FBG	Large ET/ED
FloVue/System 9000 (obs 12/31/05)	GX/667 easy-e valve

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
FSV (obsolete 1/1/04)	None
FY	None
G	None
GG	None
GB	None
GBY	None
GL (obsolete 10/01)	CP/1018S
GR	None
GS (obsolete 1/1/96)	Baumann Little Scotty
Gulde 1011, 1013	easy-e or EH
Gulde 1012	EH
Gulde 1018	GX or E
Gulde 1019, 1088	EA
Gulde 1021	easy-e
Gulde 1030	easy-e
Gulde 1035	HP/EH
Gulde 1040	YD/YS/GX
Gulde 1042	None
Gulde 1045	YD/YS up to PN100
Gulde 1051	EA or HPA
Gulde 1065, 1070/1072	HPA
Gulde 1075,1076, 1078, 1080, 1081/1083, 1089	None
Gulde 1162	ET-C
Gulde 1163, 1215, 1500	None
Gulde 1210	Vee-Ball
Gulde 2016, 2101, 3026, 3027, 3030	None
GY	None
HC; HCB	None

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
HSC	EH
HSS	EH
HSQ	EH
HSY	None
HSYY	None
IC	easy-e w/Style 3 Ext.
ITT GRINNELL SAUNDERS (obsolete 1/5/03)	None
KB (obsolete 4/99)	None
LPD (obs 1/1/95)	DVI,DMA,DMA/AF,DMA/AF-HTC
M, MY, MFY, 1664	None
MPD (obs 1/1/95)	DVI,DMA,DMA/AF,DMA/AF-HTC
N850/N860 (obsolete 3/01)	None
NL Trunnion Mounted Ball Valve (obsolete 6/19)	None
P	357
PRC (obsolete 1/1/86)	None
PTA	None
PV (obsolete 9/01)	None
Q	None
SBV	V150S
SC (5/5/97)	None
SC (steam cooler) (obsolete 1/1/99)	TBX-T
SPD (obsolete 1/1/97)	DVI
SS (steam silencer) (obsolete 1/1/99)	TBX-S,6010, 6011, Whisper Disk
SS 8 (obsolete 3/12/08)	None
SS 31	None
SS 44	None
SS 78 (obsolete 3/12/08)	None
SS 112 (obsolete 3/12/08)	None

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
SS 117 (obsolete 3/12/08)	None
SS 132 (obsolete 3/12/08)	None
SS-146	ET-C, EWT-C, EZ-C
SS 147 (obsolete 3/12/08)	None
SS 154 (obsolete 3/12/08)	None
SS 157 (obsolete 3/12/08)	None
SS 201 (obsolete 3/12/08)	None

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
V25 (obsolete 3/6/92)	V250
V100 (obsolete 9/01)	V150, V200, V300
VC1000 (obsolete 9/01)	None
Vonk™ Choke Valves (obsolete 4/01/20)	N/A
VSX (obsolete 4/10/00)	VSX2
Whisper V	Diffuser
YSC (obsolete 3/12/08)	None
Z	None
ZLA	RSS

Regulators

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
SS 154 (obsolete 3/12/08)	None
30 (obsolete 4/7/02)	N/A
32 (obsolete 2/6/00)	32A
SS 154 (obsolete 3/12/08)	None
37M	N/A
38	N/A
38F	N/A
38S	N/A
61HH (obsolete 4/30/12)	61H and 61HP
63B	N/A
63FV	63EG and 1808
64 (obsolete 7/1/14)	67D
64R (obsolete 7/1/14)	67DR

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
67AFD (obsolete 9/1/11)	252
67AF/67AFR	67CF/67CFR
67AFS/67AFSR (obsolete 5/31/08)	67CFS/67CFSR
67F/67FR	67CF/67CFR
67G	N/A
67GR	N/A
67H (obsolete 7/7/02)	67CS/67CSR
67HR (obsolete 7/7/02)	67SSR
67Y	N/A
67YR	N/A
67S, 67U	67CS/67CSR
67SS/67SSR (obsolete 6/1/09)	67CS/67CSR
75A (NPS 1-1/4)	N/A

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
92B (NPS 1/2, 3/4)	92C
92B (NPS 1-1/4, 2-1/2, 6)	N/A
92BT/BTP	N/A
92CT/CTP	N/A
92P	N/A
92ST/STP	N/A
92T	N/A
94 (obsolete 8/1/11)	MR95H
95BH (obsolete 7/1/14)	N/A
95BL (obsolete 7/1/14)	N/A
95H (NPS 3/8, 1-1/4)	N/A
95HD (NPS 3/8, 1-1/4)	N/A
95L (NPS 3/8)	N/A
95LD (NPS 3/8)	N/A
98H (NPS 3/8, 1-1/4)	N/A
98HD (NPS 3/8)	N/A
98HH (NPS 3/8)	N/A
98HHD (NPS 3/8)	N/A
98L (NPS 3/8)	N/A
98LD (NPS 3/8)	N/A
111	N/A
122	119
122R	N/A
124	119
161Y (obsolete 2/29/04)	161AY
161YM (obsolete 2/29/04)	161AYM

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
164 (obsolete 7/1/14)	167D
164A (obsolete 7/1/14)	167DA
165	627M
166 (obsolete 7/01/15)	N/A
166-7	133Z
167A (obsolete 7/1/14)	167DA
167AR (obsolete 7/8/01)	6358
169A and 169AS	N/A
171F (obsolete 7/01/15)	N/A
171L (obsolete 7/01/15)	N/A
199	CP400
220C	N/A
254 (obsolete 5/31/00)	252
254E and 254F (obsolete 3/1/03)	252
260B	N/A
260C (obsolete 4/7/02)	N/A
261C	N/A
262C (obsolete 4/10/05)	262K
271E	N/A
289	289L
289B	289A
296	N/A
298C (obsolete 4/7/02)	1098H-EGR/EZR/399A
298H (obsolete 4/7/02)	1098H-EGR/EZR/399A
298T (obsolete 4/7/02)	1098/EZR/399A

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
298T-KB (obsolete 9/1/06)	N/A
299 (obsolete 4/10/05)	299H
299SO (obsolete 4/10/05)	299HS
310 (obsolete 2/6/00)	310A
330SA (obsolete 9/1/06)	N/A
361 (obsolete 8/1/96)	N/A
364/365	Buyout
399 (obsolete 8/2/97)	399A
399-161 (obsolete 3/30/08)	EZR
399A (obsolete 3/30/08)	EZR
399A-6358B (obsolete 3/30/08)	EZR
413	92W
414 (obsolete 7/01/15)	EZR, EZH, VS-FL
424	N/A
430	N/A
601	N/A
607	N/A
608	N/A
610	Buyout
611	N/A
612	N/A
613	N/A
616/616R (obsolete 4/7/02)	655/655R
617 and 618 (obsolete 3/31/04)	N/A
620	627

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
621	627
624	627R or 627 with Relief
625	627R or 627 with Relief
626 (obsolete 7/10/00)	627
627VSX (obsolete 7/01/15)	CSB454
631 (obsolete 5/31/02)	627, 627F, 299, 399A (NPS 1)
643	N/A
647/647R (obsolete 4/7/02)	63EG, 63EG-98HM, 66R, MR95HD, MR98HD, 133 Series, 1098-EGR
661 (obsolete 5/7/00)	662
666	N/A
666P	N/A
666PH	N/A
666PHR	N/A
666PR	N/A
666T	N/A
666TH	N/A
666THR	N/A
666TR	N/A
730B (obsolete 10/7/01)	Y692
730C	Y600
734A (obsolete 8/10/03)	Y692VB
734R (obsolete 6/10/01)	Y696
734V (obsolete 8/10/03)	Y696VR and Y696VRM
772B	N/A
779K	N/A

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
787	N/A
795	N/A
795-EK and 795R-EKR (obsolete 11/4/01)	N/A
796-EK and 796R-EKR (obsolete 11/4/01)	647
1266	N/A
1306	1305
1681	N/A
1805P-167AR (obsolete 7/8/01)	1805P-6358
1807 (obsolete 4/7/02)	MR98H, 63EG, 399A-6365
6300	6365
6302	N/A
6303	N/A
6305 (obsolete 7/01/15)	PRX-182
6314 (obsolete 9/7/95)	N/A
6315 (obsolete 2/6/00)	N/A
6355, 6356, 6357 (obsolete 11/2/95)	6358B/EB/EBH
6365 (except 14-inch w.c. to 2 psig), 6365C (obsolete 11/30/04)	6358B/EB/EBH
ACE850, ACE950	N/A
AQZ (obsolete 8/1/09)	JEQ
FQH (obsolete 10/1/08)	FVH
FLA (obsolete 3/1/18)	FLA1
FS (obsolete 7/1/12)	AF
GF (obsolete 7/3/12)	AH
N850/N860 (obsolete 3/1/06)	N/A
QB (obsolete 7/1/10)	RB
R522, R522H	R622, HSR

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
R722	S402 or Y600
R922	R522
RF100 and RF110 (obsolete 9/1/13)	N/A
S100 (obsolete 6/1/02)	S100K
S100C (obsolete 2/1/06)	S100K
S100K (obsolete 10/1/09)	HSR
S102 (obsolete 6/1/02)	S102K
S102C (obsolete 1/31/05)	S102K
S102F1 (obsolete 6/1/02)	S102K
S102K (obsolete 10/1/09)	N/A
S104 (obsolete 6/1/02)	N/A
S105C	N/A
S106 (obsolete 10/30/08)	N/A
S108K and S109K (obsolete 10/30/08)	N/A
S112 (obsolete 1/15/03)	S402Y, Y600A, Y600AR, Y690A
S131 (obsolete 10/7/01)	S102K, S252 or S402
S132 (obsolete 10/7/01)	S102K, S252 or S402
S201 (obsolete 11/01/16)	CS800IN
S201D (obsolete 2/1/03)	299, CP400
S201H (obsolete 11/01/16)	CS820IN
S201K (obsolete 11/01/16)	CS850IN
S201P (obsolete 11/01/16)	CS800EN
S201PK (obsolete 11/01/16)	CS850EN
S202 (obsolete 11/01/16)	CS800IR
S202H (obsolete 11/01/16)	CS820IR

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
S202P (obsolete 11/01/16)	CS800IT
S204 (obsolete 11/01/16)	N/A
S204H (obsolete 11/01/16)	N/A
S205	N/A
S206 (obsolete 11/01/16)	N/A
S206H (obsolete 11/01/16)	N/A
S207	N/A
S112	S402Y, Y600, Y600R
S211 (obsolete 1/1/02)	Y692
S250 Series (obsolete 10/1/09)	HSR
S251C (obsolete 1/23/01)	CP400
S301 (obsolete 7/01/15)	CS400IN
S301D (obsolete 7/01/15)	CP400IN
S301H (obsolete 7/01/15)	CS400IN
S301HP (obsolete 7/01/15)	CS400EN
S301P (obsolete 7/01/15)	CS400EN
S302 (obsolete 7/01/15)	CS400IR
S302H (obsolete 7/01/15)	CS400IR
S302P (obsolete 7/01/15)	CS400ET
S303 (obsolete 7/01/15)	CS403IT
S303H (obsolete 7/01/15)	CS403IT
S303P (obsolete 7/01/15)	CS403ET
S402 (obsolete 10/1/09)	HSR
S402M (obsolete 9/29/08)	N/A
SN (obsolete 8/1/09)	S
SP (obsolete 10/1/08)	SE

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
VR1 (obsolete 1/31/13)	N/A
Y191 (obsolete 2/29/04)	Y191A
Y200	912
Y291 (obsolete 2/29/04)	Y291A
Y291L (obsolete 2/29/04)	Y291AL
Y501	111
Y510 (obsolete 1/1/03)	N/A
Y600 (obsolete 2/29/04)	Y600A
Y600M (obsolete 2/29/04)	161AYW
Y600P (obsolete 2/29/04)	Y600AM
Y600R (obsolete 2/29/04)	Y600AR
Y602-3	N/A
Y602-4	N/A
Y602-16	N/A
Y605	N/A
Y606	N/A
Y607	N/A
Y609	N/A
Y610 (obsolete 2/29/04)	Y690VB
Y611 (obsolete 2/29/04)	T208
Y611P (obsolete 2/29/04)	T208
Y611RR (obsolete 2/29/04)	Y695RR
Y612 (obsolete 2/29/04)	Y695VR
Y690 (obsolete 2/29/04)	T205
Y690H (obsolete 2/29/04)	T205

OBSOLETE PRODUCT	RECOMMENDED REPLACEMENT
Y690M (obsolete 2/29/04)	T205
Y695 (obsolete 2/29/04)	T208
Y750 (obsolete 11/1/98)	T205

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ Sliding-Stem Valve Selection Guide

X1175

easy-e™

W8861-2

GX

X0165

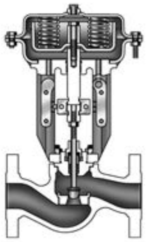
TBX Steam Conditioning Valve

Typical Fisher Sliding-Stem Control Valves

- A broad range of Fisher valves, sizes, and materials are offered—from NPS 1/2 for general service to NPS 36 and larger for demanding high-pressure steam, hydrocarbon, and noise services.
- FIELDVUE™ digital valve controllers offer digital control and remote diagnostics. The traditional proven line of Fisher transducers, positioners, controllers, transmitters, and switches are also available.
- Whisper Trim™ and Cavitrol™ anti-noise and anti-cavitation trims are available for most designs.
- ENVIRO-SEAL™ packing systems provide an improved stem seal to help prevent the loss of process and are available to assist in compliance with environmental emissions requirements.
- Fisher products deliver excellent dynamic performance to minimize process variability, providing opportunities to improve your plant's financial performance.
- Contact your Emerson sales office or Local Business Partner for details.

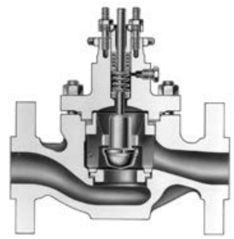
Fisher General-Service and Heavy-Duty Valves

Figure 1. General-Service and Heavy-Duty Valves



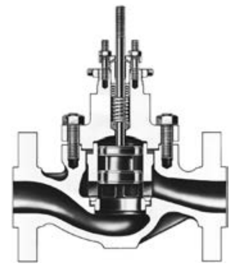
W8486-3

GX Control Valve and Actuator System



W2966B

EZ



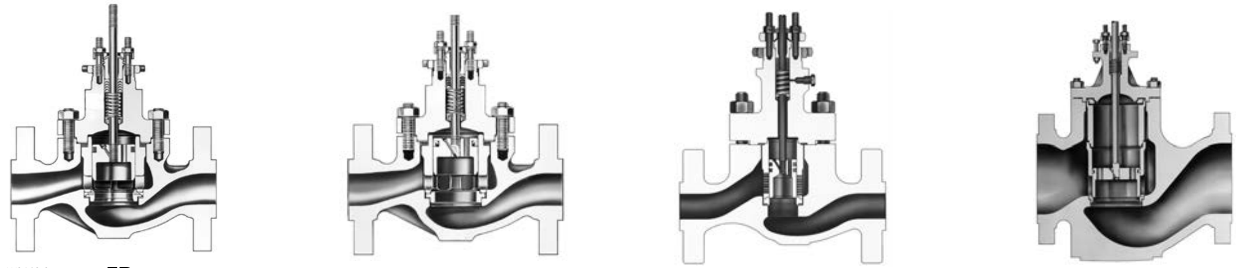
W3421-3

ES

GX	EZ	ES
Applications		
Compact, state-of-the-art control valve and actuator system designed to control a wide range of process liquids, gases, and vapors. Capable of air supply pressures to 6.0 barg (87 psig), allowing valve shutoff at high pressure drops	Heavy-duty general service for controlling liquids and gases, including viscous and other hard-to-handle fluids. UOP applications	Heavy-duty, general-service valve for clean liquids and gases. Positive shutoff at seat
Style		
Single port, flow up globe style valve Stem-guided or port-guided Balanced or unbalanced Screwed-in seat ring	Single-seated, post-guided globe or angle valve Unbalanced Seat ring retained by spacer Metal or soft seats	Cage-guided globe or angle valve Unbalanced Cage-retained seat
Sizes		
DN15 through 100 NPS 1/2 through 6	DN15 through 100 NPS 1/2 through 4	ES: DN15 through 200 (NPS 1/2 through 8) EWS: DN100 x 50 through 600 x 500 (NPS 4 x 2 through 24 x 20)
Ratings		
PN 10, 16, 25, 40, CL150, 300	PN 16, 25, 40, 63, 100, CL125, 150, 300, 600	PN 10, 16, 25, 40, 63, 100, CL150, 300, 600
End Connections		
Raised-face flanged	Screwed NPT internal, flat- or raised-face flanged, ring-type joint, socketweld, buttwelded ends	Screwed NPT internal, flat- or raised-face flanged, ring-type joint, socketweld, and buttwelded ends
Valve Body Materials		
Steel, alloy steel, stainless steel	Steel, alloy steel, stainless steel	Steel, alloy steel, stainless steel
Valve Plug and Seat Ring (Trim) Materials		
Stainless steel with optional CoCr-A hardfacing or PTFE soft seat	Stainless steel with or without CoCr-A on seat or seat and guide PTFE soft seat	Stainless steel with or without CoCr-A on seat or seat and guide PTFE soft seat
Flow Characteristics and Maximum Flow Coefficients		
Equal percentage or linear Maximum C_V from 0.0389 to 183.5	Quick opening, linear, or equal percentage Maximum C_V from 4.47 to 190	Quick opening, linear, or equal percentage Maximum C_V from 6.53 to 1110
Shutoff Class (IEC 60534-4 and ANSI/FCI 70-2)		
Class IV (standard) Class V, VI (optional)	Class IV (standard) Class V, VI (optional)	Class IV (standard) Class V, VI (optional)
Available Actuators (see section on Sliding-Stem Valve Actuators)		
GX multi-spring and diaphragm	657 or 667 spring and diaphragm, 585C piston	657 or 667 spring and diaphragm, 585C piston

Fisher Heavy-Duty and Severe-Service Valves

Figure 2. Heavy-Duty and Severe-Service Valves



ED	ET	HP and EH	EW
Applications			
easy-e heavy-duty, general and severe-service valve for clean liquids and gases with higher pressure drops but where tight shutoff is not required	easy-e heavy-duty, general and severe-service valve for tight shutoff with clean liquids and gases with higher pressure drops and temperatures	For high-pressure and severe-service applications. Available with special trim to combat noise and cavitation. Often used in power generation applications	easy-e heavy-duty, general- and severe-service valve features large internal cavities with expanded end connections for wide range of applications
Style			
Cage-guided globe or angle valve Balanced trim Cage-retained seat	Cage-guided globe or angle valve Balanced trim Cage-retained seat	Cage-guided globe or angle valve Balanced or unbalanced trim	Single-port cage-guided globe valve Balanced or unbalanced trim Cage-retained seat
Sizes			
ED: DN25 through 200 and NPS 1 through 30 EWD: DN100 x 50 through 600 x 500 and NPS 4 x 2 through 24 x 20	ET: DN25 through 200 and NPS 1 through 30 EWT: DN100 x 50 through 600 x 500 and NPS 4 x 2 through 24 x 20	DN25 through 500 NPS 1 through 20	DN 100x50 through 300x200 NPS 4x2 through 24x20
Ratings			
PN 10, 16, 25, 40, 63, 100, CL150, 300, 600	PN 10, 16, 25, 40, 63, 100, CL150, 300, 600	PN 160, 250, 420, CL900, 1500, 2500, 3200, or intermediate ASME ratings	PN 10, 16, 25, 40, 63, 100, or 160 CL150, 300, 600, or 900
End Connections			
Screwed NPT internal, flat- or raised-face flanged, ring-type joint, socketweld, buttwelded ends	Screwed NPT internal, flat- or raised-face flanged, ring-type joint, socketweld, buttwelded ends	Raised-face flanged, ring-type joint, socketweld, buttwelded ends, expanded ends	Flanged raised-face, ring-type joint, and buttweld ends
Valve Body Materials			
Steel, alloy steel, stainless steel	Steel, alloy steel, stainless steel	Steel, alloy steel, stainless steel	Steel, alloy steel, stainless steel
Valve Plug and Seat Ring (Trim) Materials			
Stainless steel with or without CoCr-A on seat or seat and guide	Stainless steel with or without CoCr-A on seat or seat and guide. PTFE soft seat	Stainless steel with or without CoCr-A on seat or seat and guide	Stainless steel with or without CoCr-A on plug and stainless steel or alloy 6 seat
Flow Characteristics and Maximum Flow Coefficients			
Quick opening, linear, or equal percentage Maximum C_v from 17.2 to 6500	Quick opening, linear, or equal percentage Maximum C_v from 17.2 to 6500	Linear, equal percentage, or characterized Maximum C_v from 0.354 to 2600	Quick opening, linear, or equal percentage Maximum Cv from 82 to 1260
Shutoff Class (IEC 60534-4 and ANSI/FCI 70-2)			
Class II (standard) Class III, IV (optional)	Class IV (standard) Class V, VI (optional)	Class II, III, IV, V	Class II, III, IV, V, or VI (depending on construction and seating)
Available Actuators (see section on Sliding-Stem Valve Actuators)			
657 or 667 spring and diaphragm, 585C piston	657 or 667 spring and diaphragm, 585C piston	657 or 667 spring and diaphragm, 585C piston	657 or 667 spring and diaphragm, 585C piston

Fisher Heavy-Duty and Severe-Service Valves

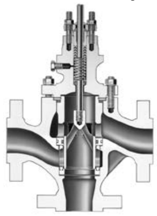
Figure 3. Heavy-Duty and Severe-Service Valves

NotchFlo DST | **CAV4** | **461**

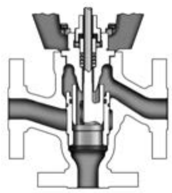
NotchFlo DST	CAV4	461
Applications		
Control of liquid services with high pressure drops and entrained particulate, dirty service anti-cavitation trim	Liquid applications, such as boiler feedwater recirculation, where pressure drops are above 207 bar (3000 psi)	Typically used in the chemical or hydrocarbon industries where control of residual oils or other liquids with coking properties is necessary. Features a venturi-type throat, which is useful in power plants or slurry services where high pressure drops and flashing might exist
Style		
Cage-guided globe, angle valve balanced, unbalanced	Angle, globe, or offset globe seal ring construction, stem-balanced construction, piston ring construction	Cylinder guided
Sizes		
NPS 1 through 8	NPS 2 through 6	NPS 2x3, 3x4, 4x6, 6x8
Ratings		
CL300, 600, 900, 1500, 2500	CL2500	CL150, 300, 600, 1500, 2500
End Connections		
Screwed, raised-face flanged, ring-type joint flanged, buttwelded ends, socketweld ends	Buttwelded ends, raised-face, ring-type joint flanged ends	Buttwelded ends, raised-face flanged, ring-type joint flanged ends
Valve Body Materials		
Steel, alloy steel, stainless steel	Steel, alloy steel, stainless steel	Steel, alloy steel, stainless steel
Valve Plug and Seat Ring (Trim) Materials		
Stainless steel with or without CoCr-A on seat or guide	Stainless steel or nickel alloy with CoCr-A on seat or guide	Stainless steel with or without CoCr-A on seat or guide or tungsten carbide trim
Flow Characteristics		
Linear	Linear	Equal percentage micro-form, modified parabolic flow characteristic
Shutoff Class (IEC 60534-4 and ANSI/FCI 70-2)		
Class V: 0.0005mL/min/psid/in of water at service pressure drop	Tight Shutoff Trim (TSO): Valves with TSO trim are factory tested to a more stringent Emerson Automation Solutions test requirement of no leakage at time of shipment using ANSI/FCI 70-2 and IEC 60534-4 Class V procedures. Piston Ring Construction: Class IV All Others: Class VI	Class IV (standard) Class V (optional)
Available Actuators (see section on Sliding-Stem Valve Actuators)		
657 or 667 spring and diaphragm, 585C piston	657 or 667 spring and diaphragm, 585C piston	657 or 667 spring and diaphragm, 585C piston

Fisher Three-Way Valves, Cryogenic, and Lined Valve

Figure 4. Three-Way, Cryogenic, and Lined Valves

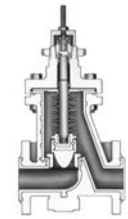


W0665-3 **YD and YS**



W9579 **GX 3-Way**

W6396 **ET-C and EZ-C**



W4521-2 **RSS**

YD and YS	GX 3-Way	ET-C and EZ-C	RSS
Applications			
Three-way valves for flow-mixing or flow-splitting service. The YS unbalanced and the YD is balanced	Three-way valves for flow-mixing or flow-splitting service	easy-e stainless steel cryogenic valves for liquefied natural gas and other special chemical and hydrocarbon applications with temperatures to -198°C (-325°F)	Lined valve for severely corrosive or toxic process fluids. An economic alternative to alloy bodies. Limited in pressure and temperature
Style			
Cage-guided three-way globe valves Balanced or unbalanced trim	Cage-guided or port-guided Balanced or unbalanced trim Screwed-in seat ring	Single-seated post-guided (EZ-C) or cage-guided (ET-C) globe valve Unbalanced (EZ-C) or balanced (ET-C) metal seats	Fully lined, single-seated, unbalanced globe valve Integral bellows stem seal
Sizes			
NPS 1/2 through 8	DN 25 through DN100 NPS 1 through 4	ET-C: DN80 through 250 x 200, and NPS 3 through 30 EZ-C: DN15 through 100, NPS 1 through 4	NPS 1 through 4 (face-to-face dimensions to DIN or ANSI/ISA specifications)
Ratings			
CL125, 150, 250, 300, 600	PN 10, 16, 25, 40 CL150 and 300	PN 10, 16, 25, 40, 63, 100 CL150, 300, 600	CL150 or 300
End Connections			
Screwed NPT internal, flat- or raised-face flanged, ring-type joint, socketweld, buttwelded ends	Flanged raised-face per EN 1092-1 and ASME B16.5, screwed (NPS 1 through 2), socket weld (NPS 1 through 2)	Raised-face flanged	Raised-face flanged
Valve Body Materials			
Cast iron, steel, alloy steel, stainless steel	Steel, stainless steel	Stainless steel	Ductile iron with PFA liner
Valve Plug and Seat Ring (Trim) Materials			
Stainless steel	Stainless steel plug with CoCr-A hard facing on seat	Stainless steel with or without CoCr-A hardfacing on seat	Valve Plug and Seat Ring: Pure modified (reinforced) PTFE Bellows: Heavy-duty PTFE (TFM1705) with 304L SST support rings [Bellows is PTFE for NPS 1/2 and 3/4 valves]
Flow Characteristics and Maximum Flow Coefficients			
Linear Maximum C_v 8.42 to 567	Linear Maximum Cv from 15.6 to 216.4	Quick opening, linear, or equal percentage Maximum C_v from 13.2 to 924	Equal percentage Maximum C_v from 0.212 to 145
Shutoff Class (IEC 60534-4 and ANSI/FCI 70-2)			
YD: Class II or IV YS: Class IV or V	Class IV (metal seat standard)	Class IV (standard) ET-C: Class V Air/Nitrogen (optional) EZ-C: Class VI (optional)	Class VI
Available Actuators (see section on Sliding-Stem Valve Actuators)			
657 or 667 spring and diaphragm, 585C piston	GX multi-spring, pneumatic diaphragm	657 or 667 spring and diaphragm, 585C piston	657 or 667 spring and diaphragm, 585C piston

Baumann™ General-Service Valves

Figure 5. 24000 Series

24000 Little Scotty | **24000C Carbon Steel** | **24000CVF/SVF Flanged** | **24000S Stainless Steel** | **240003 Little Scotty 3-Way**

24000 Little Scotty	24000C Carbon Steel	24000CVF/SVF Flanged	24000S Stainless Steel	24003 Little Scotty 3-Way
Applications				
General utility service controlling pressure, flow, and temperature. Great for steam applications along with water, air, and glycol	General utility service controlling pressure, flow, and temperature. Industrial heating and ventilation (HVAC). Humidity control in hot and chilled water, steam, glycol, and heating/cooling coils	Aerospace, Chemical, General Service, Industrial Gases, Industrial HVAC, Life Sciences, Pulp & Paper, Utilities, Waste Water Management	Light duty chemicals, solvents, dye additions, general purpose, high purity water, pH control, N2 blanketing, paint mixing, O2 injection, steam tracing, cryogenics	Ideal for control where mixing or diverting service is required. Heat exchanger bypass, cleanroom HVAC, paper machine head box pressure, glycol systems, blending systems
Style				
Globe style body	Globe style body	Globe style body	Globe style body	Globe style body, 3-way featuring bottom port
Sizes				
NPS 1/2 through 2	NPS 1/2 through 2	NPS 1/2 through 2	NPT (NPS 1/2 through 2) wafer style (NPS 3 only)	NPS 1/2 through 2
Ratings				
CL250	PN 40 CL150	PN 10, 16, 25, 40 CL150, 300	CL300 (NPS 1/2 through 2), CL150 (NPS 3)	400 psi @ 66° C (150° F) / 250 psi @ 204° C (400° F) (Bronze) 720 psi @ 66° C (150° F) / 515 psi @ 204° C (400° F) (SST)
End Connections				
NPT	ASME CL150 or EN PN 10 through 40	integral flanges, ISA/IEC face-to-face	NPT, buttwelded, wafer (NPS 3 Wafer only)	NPT
Valve Body Materials				
Bronze	Carbon steel	Carbon steel, stainless steel	Stainless steel	Stainless steel, bronze
Valve Plug and Seat Ring (Trim) Materials				
Post-guided parabolic plug, screwed-in replaceable seat ring 316 Plug and seat ring (standard), 416 plug and seat ring (optional) Metal to metal, PTFE soft seat	Post-guided parabolic plug, screwed-in replaceable seat ring 316 Plug and seat ring (standard), 416 plug and seat ring (optional) Metal to metal, PTFE soft seat	Stainless steel	Dual stem and plug guiding available in 316 stainless steel (standard) 416 stainless steel (optional)	Stainless steel trim material, metal-to-metal seating
Flow Characteristics and Maximum Flow Coefficients				
Equal percentage, linear	Equal percentage, linear	Equal percentage, linear	Equal percentage, linear	Linear
Shutoff Class (IEC 60534-4 and ANSI/FCI 70-2)				
Class IV, VI (standard)	Class IV, VI (standard)	Class IV, VI (standard)	Class IV, VI (standard)	Class III
Available Actuators (see section on Sliding-Stem Valve Actuators)				
Baumann 32, 54, 70, Belimo™ electric, Rotork™ electric	Baumann 32, 54, 70, Belimo electric, Rotork electric	Baumann 32, 54, 70, Belimo electric, Rotork electric	Baumann 32, 54, 70, Belimo electric, Rotork electric	Baumann 32, 54, 70, Belimo electric, Rotork electric

Fisher General-Service Valves

Figure 6. D Series

W9248 **D3**

W9930-5 **D4**

X1211-1 **D2T**

X1567 **DA**

D3	D4	D2T	D and DA
Applications			
Upstream production - dump valve for separators and scrubbers and high pressure production applications	Upstream production - high pressure throttling applications, ideal for separators, scrubbers, injection	Upstream production - dump valve, scrubbers and separators	Upstream production - dump valve, scrubbers and separators, injection
Style			
Globe style body	Globe style body	Configurable globe style body, angle style body	Globe style body, angle style body
Sizes			
NPS 1 and 2	NPS 1 and 2	NPS 1	NPS 1 and 2
Ratings			
CL600, 900	CL150 through 1500	CL900	CL150 through 1500
End Connections			
Raised-face flanged, NPT	Raised-face flanged, ring-type joint flanged, NPT	NPT	Raised-face flanged, ring-type joint flanged, NPT
Valve Body Materials			
Carbon steel	Carbon steel	Carbon steel	Carbon steel
Valve Plug and Seat Ring (Trim) Materials			
S17400 plug and seat ring or S17400 with tungsten carbide tip plug and S17400 with tungsten carbide insert seat ring	410/416 HT plug, 17−4 PH double H1150 pin and seat ring Optional: 17−4 PH double H1150 plug, pin and seat ring, 17−4 PH double H1150 / Tungsten carbide tip plug, 17−4 PH double H1150 pin and 17−4 PH double H1150 / Tungsten carbide insert seat ring	S17400 Double H1150, R30006	316 stainless steel trim with CoCr-A on seating surface of valve plug and seat ring
Flow Characteristics and Maximum Flow Coefficients			
Quick opening	Equal percentage	FloPro characterized	Equal percentage
Shutoff Class (IEC 60534-4 and ANSI/FCI 70-2)			
Class IV (standard)	Class IV (standard)	Class IV (standard)	Class IV, V (standard)
Available Actuators (see section on Sliding-Stem Valve Actuators)			
easy-Drive™ Electric Actuator, D3 Pneumatic Actuator	easy-Drive Electric Actuator, D4 Pneumatic Actuator	D2T Pneumatic Actuator	657 or 667 spring and diaphragm, 585C piston

Baumann Low Flow and Specialty Valves

Figure 7. Baumann Low Flow and Specialty Valves

X0603

24000F Wafer

X0527

24000SB Barstock

24000F Wafer	24000SB Barstock
Applications	
Unique wafer-style control valve designed for modulating purposes in process pressures up to 1440 psi (99 bar) and operating temperatures to 537° C (1000° F)	Low-flow high-pressure applications like desuperheater spray water, hydraulic oil, high pressure H2 injection, hydrocarbons, high pressure air separation, HCI (alloy construction)
Style	
Wafer	Barstock globe style body
Sizes	
NPS 1/2 through 1	NPS 1/2 through 1
Ratings	
CL150, 300, 600	3000 psi max working pressure
End Connections	
Mating line flanges	NPT, flanged, buttwelded
Valve Body Materials	
Stainless steel, alloys	Stainless steel, alloys
Valve Plug and Seat Ring (Trim) Materials	
Stainless steel and alloy trims based on body materials selected	Stainless steel and alloy trims based on body materials selected
Flow Characteristics and Maximum Flow Coefficients	
Equal percentage, linear	Equal percentage, linear
Shutoff Class (IEC 60534-4 and ANSI/FCI 70-2)	
Class IV, VI (standard)	Class IV, VI (standard)
Available Actuators (see section on Sliding-Stem Valve Actuators)	
Baumann 32, 54, 70, Belimo electric, Rotork electric	Baumann 32, 54, 70, Belimo electric, Rotork electric

Fisher Steam Conditioning Valves

Figure 8. Steam Conditioning Valves

TBX (Flow Up)

TBX (Flow Down)

CVX

TBX (Flow Up)	TBX (Flow Down)	CVX
Applications		
HP, HRH, IP, LP Turbine Bypass, process steam, steam let down		
Style		
Flow up design, hung trim configuration to thermally compensate rapid changes in temperature, incorporates a spraywater manifold of variable geometry AF nozzles that produce an optimized spray pattern over a wide operating range	Flow down design, hung trim configuration to thermally compensate rapid changes in temperature, incorporates a spraywater manifold of variable geometry AF nozzles that produce an optimized spray pattern over a wide operating range	Flow down design with downstream acoustical diffuser, hung trim configuration to thermally compensate rapid changes in temperature, incorporates a spraywater manifold of variable geometry AF nozzles that produce an optimized spray pattern over a wide operating range
Sizes		
Inlet Sizes: NPS 4 through 24 Outlet Sizes: NPS 8 through 36		
Orifice Type		
Welded, bolted	Bolted	Welded, bolted
End Connections		
Buttwelded, raised-face flanged		
Flow Characteristics		
Whisper Trim III: Linear or WhisperFlo™: Linear	Whisper Trim III: Linear	Standard Drill Hole: Linear
Shutoff Class (IEC 60534-4 and ANSI/FCI 70-2)		
Class V (standard) Class IV (optional)		
Valve Body and Bonnet Material and Construction		
Carbon steel, alloy steel		
Available Actuators		
See Sliding-Stem Valve Actuators Section		

Fisher Sliding-Stem Valve Actuators

Figure 9. Sliding-Stem Valve Actuators


X1178
657 and 667


X1565
585C


X1566
Baumann Pneumatic


X1520
easy-Drive

657 and 667	585C	Baumann Pneumatic	easy-Drive
Features			
Heavy-duty actuators	Heavy-duty actuators	General service design w/corrosion resistant epoxy powder paint	General service
Style			
Spring-return pneumatic diaphragm	Double-acting piston or spring-bias piston	Spring-return pneumatic, multi-spring design, field-reversible	Electric
Typical Maximum Thrust, lbf (Varies with Operating Pressure, Spring, and Construction)			
45,000	24,300	500	750
Accessories			
Pneumatic or electro-pneumatic valve positioners, FIELDVUE digital valve controller, limit switches, position transmitters, handwheels, travel stops, supply pressure filter-regulator	I/P transducers, pneumatic or electro-pneumatic valve positioners, FIELDVUE digital valve controller, limit switches, position transmitters, handwheels, travel stops, supply pressure filter-regulator	Pneumatic or electro-pneumatic valve positioners, FIELDVUE digital valve controller	easy-Drive configuration software, travel stops

Fisher Sliding-Stem Valve Actuators

Figure 10. Sliding-Stem Valve Actuators


W0446-1
655


W0590
1008


X1574
1010

655	1008	1010
Features		
Actuators for pressure regulation applications	Manual handwheel for applications that require a throttling type of control valve that can be manually operated and set	Yoke, stem, adapter, travel scale, and spacers required to accommodate ISO 5210 mounted electric actuators
Style		
Pressure-actuated, spring-and-diaphragm	Manual handwheel actuator	Mounting system for electric actuation
Typical Maximum Thrust, lbf (Varies with Operating Pressure, Spring, and Construction)		
- - -	17,000	- - -
Accessories		
Travel indicator, top-mounted handwheel/adjustable travel stop, stem seal, drain tapping for leakoff	Handwheel lock, Tejax valve stem position indicator	- - -

Other actuators available are a full range of self-operated control valves: 1B, 643, 644, and 645

Alloy Valve Guidelines

- Emerson Automation Solutions expertise has combined its knowledge of metals and foundry techniques with valve user experience in creating high alloy valves that fight corrosion successfully.
- Guidelines have been developed to help the valve user specify alloy valves correctly. Techniques have also been implemented that verify a foundry's ability to cast alloy valves properly and has established stringent specifications that guide the foundry in providing quality results
- Valve user guidelines include—Avoid the use of alloy tradenames, don't specify wrought for cast, forego non-destructive testing
- Steps used to qualify a foundry include—Weldability tests to gauge the foundry's ability to pour alloy materials, Dedicating casting patterns solely to high-alloy service
- Stringent specifications developed by Emerson Automation Solutions include—Raw Material Composition and Quality, Heat Qualification, Visual Inspection, Weld Repair, Heat Treatment, and Nondestructive Testing

Figure 11. Typical Fisher Products

FIELDVUE Digital Valve Controller Mounted on 667 Actuator and easy-e Valve

EW Valve and Actuator System

FIELDVUE Digital Valve Controller Mounted on 685 Actuator and easy-e Valve

- A complete line of actuators and accessories for Fisher sliding-stem valves are offered that meet your price/performance expectations
- FIELDVUE digital valve controllers are communicating, microprocessor-based controllers that utilize HART™ and FOUNDATION™ fieldbus protocols. Through digital communications, the controllers give easy access to actuator, valve, and instrument information that is critical to process operation
- ValveLink™ Software and AMS Suite: Intelligent Device Manager allow you to care for and maintain equipment assets—such as valves, transmitters, analyzers, motors, pumps, etc. and plant unit equipment such as pipes, vessels, tanks, columns, reactors, digesters, etc.—to improve yields and minimize downtime of industrial manufacturing processes
- Contact your Emerson sales office or Local Business Partner for details

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ Rotary Valve Selection Guide

Control-Disk™ VALVE **PIPELINE BALL VALVE** **ROTARY GLOBE VALVE** **Vee-Ball™ VALVE**

Typical Fisher Rotary Valves

Control-Disk Valve	Expanded control range, lower process variability	Fisher Control-Disk Valve
High-Performance Butterfly Valves	Outstanding performance under extreme pressure and temperature conditions, available for a variety of throttling or on/off applications	Fisher 8532, 8580, 8590, 9500, A11, and A31C
Multiport Flow Selector	Allows for automated selecting and diverting of well fluids from an individual well to a single test outlet, flow loop, or sampling device	Fisher MPFS
Pipeline Ball Valves	Full or reduced bore ball valves for throttling and severe service applications in gas transmission lines, gas distribution, or liquid pipelines	Fisher V250, V260, V270, and V280
Rotary Globe Valves	Designed for throttling control for a broad range of industrial applications	Fisher V500 and CV500
Vee-Ball Valves	High-capacity, low-friction, non-clogging	Fisher V150, V200, V300, V150S, and V300S

- ENVIRO-SEAL™ and ISO-SEAL™ live-loaded packing systems are available to assist in compliance with environmental emissions requirements
- FIELDVUE™ digital valve controllers offer digital control and remote diagnostics. The traditional proven line of Fisher positioners, controllers, transmitters, and switches also is available
- Spring-return pneumatic diaphragm and double-acting piston actuators
- Contact your Emerson sales office for details

Fisher Control-Disk Valve

W9774-2

Control-Disk VALVE

Control-Disk Valve
Applications
Expanded control, lower process variability applications
Style
Wafer and lugged
Sizes
NPS 2, 3, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24, 30, 36
Ratings
PN 10 to 40 CL150, CL300, and CL600
End Connections
Raised-face (RF)
Valve Body Materials
EN: 1.0619 steel, 1.4409 stainless steel, CW2M, or M35-1 ASME: SA216 WCC steel, SA351 CF3M or CF8M stainless steel, CW2M, or M35-1
Disk Material
SA351 CF3M or CF8M stainless steel
Seal Types (Material)
Soft (PTFE, RPTFE, ETFE, or UHMWPE) or metal (S31600)
Flow Characteristics and Maximum Flow Coefficients
Equal percentage Maximum Cv from 60.7 to 59500
Rangeability (Flow Coefficient Ratio)
100 to 1
Shutoff Class
Soft Seal: Class VI Metal Seal: Class IV
Available Actuators (refer to page 10)
Fisher 2052, 1052 Size 70, and 1061

Fisher Vee-Ball Valves


X0187-1
V150 and V300 VALVES


X0186-1
SLURRY VEE-BALL VALVE


X0188-1
V200 VALVE

V150 AND V300	V150S AND V300S	V200
Applications		
Excellent for fibrous slurries as well as liquids, gas, and steam. Shearing V-notch ball for smooth, non-clogging action	Highly wear-resistant trim materials and an unrestricted flow path make this design ideal for controlling the most abrasive of slurries	Excellent for fibrous slurries as well as liquids, gas, and steam. Shearing V-notch ball for smooth, non-clogging action
Sizes		
V150: DN 25 - 300 or NPS 1 - 24 x 20 **V300:** DN 25 - 300 or NPS 1 - 20	NPS 3, 4, 6, 8, 10, 12	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10
Ratings		
V150: PN 10/16 or CL150 **V300:** PN 25/40 or CL300	CL150 and CL300	CL150, CL300, or CL600, depending on size
End Connections		
Raised-face (RF) flanged	Raised-face (RF) flanged	Flangeless or flanged, depending on size
Valve Body Materials		
EN: 1.0619 steel, 1.4408 and 1.4409 stainless steel, M35-2, or CW2M **ASME:** SA216 WCC steel, SA351 CF3M, CG8M, CF8M stainless steel, M35-2, or CW2M	SA216 WCC steel body with high-chromium iron body liner (SA532 Class III Type A)	**EN:** 1.0619 steel, 1.4409 stainless steel, M35-2, or CW2M **ASME:** SA216 WCC steel, SA351 CF3M, CG8M stainless steel, M35-2, or CW2M
Ball Material		
SA351 CF3M, or CG8M stainless steel, CW2M	High-chromium iron (SA532 Class III Type A) or PSZ ceramic ball optional	SA351 CF3M or CG8M stainless steel, CW2M
Seal Types (Material)		
TCM Plus, metal (S31600), HD (heavy duty), or flow ring	Flow ring construction: high-chromium iron (SA532 Class III Type A) with optional PSZ ceramic insert	TCM Plus, metal (S31600), HD (heavy duty), or flow ring
Flow Characteristics and Maximum Flow Coefficients		
Modified equal percentage Maximum Cv from 3.64 to 10,300	Modified equal percentage Maximum Cv from 170 to 2850	Modified equal percentage Maximum Cv from 8.4 to 3000
Rangeability		
300 to 1		300 to 1
Shutoff Class		
Composition Seal: Class VI **Metal Seal:** Class IV **Flow Ring Construction:** 5% of wide-open capacity	Class I	**Composition Seal:** Class VI **Metal Seal:** Class IV **Flow Ring Construction:** 5% of wide-open capacity
Available Actuators (refer to page 10)		
Fisher 2052, 1052 Size 70, 1061, 1068, and Bettis RPE™		

Fisher High-Performance Butterfly Valves


W9138-2

8532 VALVE


W9498-2

8580 VALVE


X0955

8590 VALVE

8532	8580	8590
Applications		
Throttling service, high-temperature, and cryogenic applications; -196 to 816° C	Precise throttling and automated on-off service for process temperatures from -46 to 454° C	Throttling or automated on-off service in a variety of process applications
Style		
Wafer, lugged, and Double flange	Lugged (NPS 2 Wafer) and Double flange	Lugged and Double flange
Sizes		
NPS 14, 16, 18, 20, 24, 30, 36, 42, 48	NPS 2, 3, 4, 6, 8, 10, 12	NPS 3, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24
Ratings		
CL150/150, CL150, and CL300	PN 10 to 40 CL150 and CL300 NPS 2 (CL150/300/600)	CL600
End Connections		
Raised-face (RF) and ring-type joint (RTJ)	Raised-face (RF)	Raised-face (RF) and ring-type joint (RTJ)
Valve Body Materials		
SA216 WCC steel or SA351 CF8M stainless steel High-alloy materials are available	**EN:** 1.0619 steel, 1.4409 stainless steel **ASME:** SA216 WCC steel, SA351 CF3M stainless steel High-alloy materials are available	SA216 WCC steel or SA351 CF8M high-alloy materials are available
Disk Material		
SA351 CF8M stainless steel	SA351 CF3M/1.4409 stainless steel	SA351 CF8M stainless steel with chrome plated disk edge
Seal Types (Materials)		
Soft (PTFE), NOVEX, and Phoenix III	Soft (PTFE, RPTFE, or UHMWPE) or metal (S31600)	Soft (ETFE), Metal (S21800, S20910), HPS (S21800, S20910), Phoenix III (S31600/ETFE)
Flow Characteristics and Maximum Flow Coefficients		
Modified equal percentage Maximum C_v from 4550 to 21500	Approximately linear Maximum C_v from 83.7 to 5080	Approximately linear Maximum Cv from 167 to 13565
Rangeability		
100 to 1	100 to 1	100 to 1
Shutoff Class		
Soft Seal: Class VI **NOVEX Seal:** Class IV **Phoenix III Seal:** Class VI	**Soft Seal:** Class VI **Metal Seal:** Class IV	**Soft Seal:** Class VI **Metal Seal:** Class IV **HPS:** Class VI **Phoenix III Seal:** Class VI
Available Actuators (refer to page 10)		
Fisher 1052 Size 70, 1061, and 1068	Fisher 2052, 1052 Size 70, 1061, 1068, and Bettis RPE	Fisher 2052, 1052 Size 70, 1061, 1068, Bettis RPE, and G Series

Fisher High-Performance Butterfly Valves (continued)

W1628

9500 VALVE

W9570-1

A11 VALVE

9500	A11
Applications	
Fully lined butterfly valve for on/off or throttling service for tight-shutoff applications	Throttling and automated on/off service, high-pressure, high-temperature, and cryogenic applications; -254 to 816°C
Style	
Wafer	Wafer and lugged
Ratings and Sizes	
PN10, PN13, CL125B, CL150, or CL300 depending on size and material NPS 2, 3, 4, 6, 8, 10, 12	**CL150/150 and CL150:** NPS 54, 60, 66, 72 **CL600:** NPS 30, 36, 42, 48 (CL300 trim available for NPS 3 through 48) **CL900:** NPS 6, 8, 10, 12, 14, 16 ,18, 20, 24, 30, 36 (CL300 and CL600 trim available for NPS 3 through 48) **CL1500:** NPS 10, 12, 14, 16, 18, 20 (CL300 and CL600 trim available for NPS 3 through 48, CL900 trim available for NPS 6 through 36) **CL2500:** Consult your Emerson sales office
End Connections	
Cast Iron Bodies: Mate with PN 10 (NPS 2, 3, 6, 8, 10) or CL125B FF flanges **Steel and Stainless Steel Bodies:** Mate with PN16, CL150, CL300 RF flanges	Raised-face (RF), ring-type joint (RTJ), and buttwelding ends (BWE) NPS 3 through 24 comply with ASME B16.5 NPS 30 through NPS 60 comply with MSS-SP-44
Valve Body Materials	
Cast iron, carbon steel, S31600 stainless steel	SA216 WCC steel or SA351 CF8M stainless steel Other carbon steel, stainless steel, and high-alloy materials are available
Disk Material	
Aluminum bronze, S31600 stainless steel	**CL150/150, CL150, and CL300:** SA351 CF8M stainless steel or SA216 WCC steel **CL600:** SA351 CF8M stainless steel **CL900 and CL1500:** CB7Cu-1
Seal Types (Material)	
Fully lined nitrile or PTFE	**CL150 and CL300:** Soft (PTFE), NOVEX (S31600), Phoenix III (S31600/PTFE), and cryogenic (CTFE) **CL600, CL900, and CL1500:** Soft (ETFE), Metal (S20910), high-pressure (S20910), Phoenix III (S31600/ETFE), and cryogenic (CTFE)
Flow Characteristics and Maximum Flow Coefficients	
Approximately equal percentage through 90° rotation for FISHTAIL™ disk and through 60° rotation for conventional disk Maximum Cv from 91 to 7020	Modified Equal Percentage Maximum Cv from 182 to 106000
Rangeability	
100 to 1	100 to 1
Shutoff Class	
Class VI	**Soft Seal:** Class VI, **NOVEX Seal:** Class VI, **Metal Seal:** Class IV , **High-Pressure Seal:** Class VI, **Phoenix III Seal:** Class VI, **Cryogenic Seal:** Class IV
Available Actuators (refer to page 10)	
Fisher 2052, 1052 Size 70, and 1061	Fisher 2052, 1052 Size 70, 1061, Bettis RPE, and G Series

Fisher Cryogenic Butterfly Valves

W7449

TYPICAL CRYOGENIC BUTTERFLY VALVE

8532	A11	A31C
Applications		
8532 stainless steel cryogenic valves for liquified natural gas and other special chemical and hydrocarbon applications with temperatures to -254°C	A11 stainless steel cryogenic valves for liquified natural gas and other special chemical and hydrocarbon applications with temperatures to -254°C	A31C stainless steel cryogenic valves for liquified natural gas and other special chemical and hydrocarbon applications with temperatures to -254°C
Style		
Wafer, lugged, and double flanged	Wafer, lugged, and double flanged	Wafer, lugged, and double flanged
Ratings and Sizes		
CL150 and CL300: NPS 14 - 24	**CL150/150, CL150, CL300:** NPS 30 - 48 **CL600:** NPS 3 - 24 **CL900:** NPS 6 - 24 **CL1500:** NPS 10 - 20	**CL150 and CL300:** NPS 3 - 12
End Connections		
Raised-face (RF), ring-type joint (RTJ)	Raised-face (RF), ring-type joint (RTJ)	Raised-face (RF), ring-type joint (RTJ)
Valve Body Materials		
SA351 CF8M stainless steel	SA351 CF8M stainless steel	SA351 CF8M stainless steel
Disk Material		
SA351 CF8M stainless steel	SA351 CF8M stainless steel	SA351 CF8M stainless steel
Seal Types (Material)		
NOVEX and Cryogenic (CTFE and CTFE/aluminum)	**CL150 and CL300:** NOVEX and Cryogenic (CTFE) **CL600, CL900, and CL1500:** HPS and cryogenic (CTFE)	NOVEX and Cryogenic (CTFE and CTFE/aluminum)
Flow Characteristics and Maximum Flow Coefficients		
Modified Equal Percentage Maximum Cv from 4550 to 21,500	Modified Equal Percentage Maximum Cv from 182 to 106,000	Modified Equal Percentage Maximum Cv from 188 to 4940
Rangeability		
100 to 1	100 to 1	100 to 1
Shutoff Class		
NOVEX Seal: Class VI **Cryogenic (CTFE) Seal:** Class IV **Cryogenic (CTFE/Aluminum) Seal:** Class VI	**NOVEX Seal:** Class VI **Cryogenic (CTFE) Seal:** Class IV **Cryogenic (CTFE/Aluminum) Seal:** Class VI **HPS:** Class VI	**NOVEX Seal:** Class VI **Cryogenic (CTFE) Seal:** Class IV **Cryogenic (CTFE/Aluminum) Seal:** Class VI
Available Actuators (refer to page 10)		
Fisher 2052, 1052 Size 70, 1061, Bettis RPE, and G Series	Fisher 2052, 1052 Size 70, 1061, Bettis RPE, and G Series	Fisher 2052, 1052 Size 70, 1061, Bettis RPE, and G Series

Fisher Pipeline Ball Valves


W4177-3

V250 VALVE


W6569

V260 VALVE


X1454

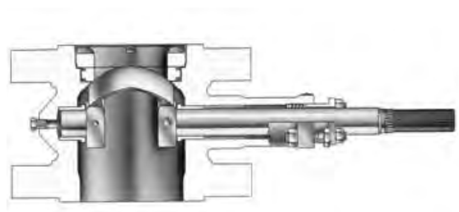
V270 VALVE


X1609

V280 VALVE

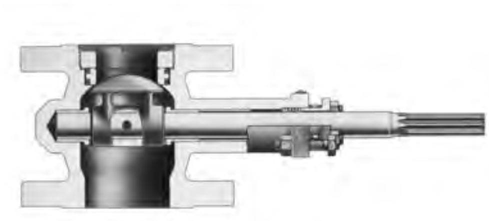
V250	V260	V270	V280
Applications			
Heavy-duty, flangeless throttling ball valves. Often used for controlled flow applications in gas transmission lines, gas distribution, and liquid pipelines. Temperatures from -40 to 204°C, depending on seal type	Large, flanged throttling ball valves. Used for demanding pipeline applications such as pump bypass and pipeline take-off. Temperatures from -29 to 93°C, depending on seal type	Full bore ball valve designed for automated control in bypass, batch, monitor, and emergency shutoff service applications. Temperatures from -40 to 82°C	A three-piece, trunnion mounted, full-bore control valve used in demanding pipeline applications to reduce noise and vibration. Temperatures from -29 to 82°C, depending on seal type
Style			
Flangeless	Flanged	Flanged	Flanged
Sizes			
NPS 4, 6, 8, 10, 12, 16, 20, 24	NPS 8, 10, 12, 16, 20, 24	NPS 6, 8, 10, 12, 14, 16, 20, 24	NPS 6, 8, 10, 12, 16
Ratings			
CL600 or CL900	CL150, CL300, or CL600	CL150, CL300, or CL600	CL900
End Connections			
Raised-face (RF) or ring-type joint (RTJ)	Raised-face (RF)	Raised-face (RF)	Raised-face (RF)
Valve Body Materials			
Carbon Steel (LCC)	Carbon Steel (LF2)	Carbon Steel (LF2)	Carbon Steel (LF2)
Ball Material			
Chrome-plated WCC steel	Chrome-plated WCC steel	LF2 Carbon Steel / ENP	LF2 Carbon Steel / ENC
Seal Types (Material)			
Single or dual seal (POM) or flow ring	Single or dual (PEEK/PTFE or POM)	Dual (POM)	POM with S31600 SST Seal Blank
Flow Characteristics and Maximum Flow Coefficients			
Modified equal percentage Maximum Cv from 499 to 18,300	Modified linear or modified equal percentage Maximum Cv from 381 to 78,000	Modified equal percentage Maximum Cv from 3190 to 78,000	Modified linear or modified equal percentage Maximum Cv from 381 to 78,000
Rangeability			
100 to 1	100 to 1	100 to 1	100 to 1
Shutoff Class			
Single and Dual Seal: Class IV **Flow Ring:** 1% of valve capacity	**Single or Dual Seal:** Class IV or VI **PEEK/PTFE Seal:** Class IV or VI **POM Seal:** Class IV or VI	Class VI	**Single or Dual Seal:** Class IV or VI
Available Actuators (refer to page 10)			
Fisher 2052, 1052 Size 70, 1061, CB, and G Series	Fisher 2052, 1052 Size 70, 1061, CB, and G Series	Fisher 1068, CB, and G Series	Fisher 2052, 1052 Size 70, 1061, CB, and G Series

Fisher Rotary Globe Valves



W5793

CV500 VALVE

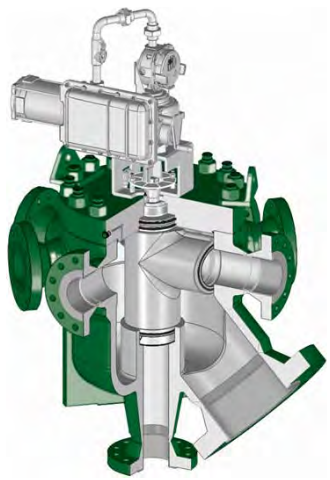


W4170

V500 VALVE

CV500	V500
Applications	
Rugged flanged or flangeless cammed-segmented V-notch ball valve offering erosion resistance and pressure control for gases, liquids, and fibrous slurries. Throttling or on/off. Temperatures from -198 to 538°C, depending on materials	Flanged or flangeless eccentric plug rotary control valve for erosive, coking, and other hard-to-handle fluids. Throttling or on/off. Temperatures from -198 to 538°C, depending on materials
Style	
Flanged	Flanged
Sizes	
DN 80 - 300 or NPS 3 - 12	DN 25 - 200 or NPS 1 - 8
Ratings	
PN 10 - 100 or CL150 - CL600	PN 10 - 100 or CL150 - CL600
End Connections	
Raised-face (RF)	Raised-face (RF) or ring-type joint (RTJ)
Valve Body Materials	
WCC, WCC/1.0619, CF8M, CF8M/1.4408, CF3M, CF3M/1.4409	WCC, WCC/1.0619, CF8M, CF8M/1.4408, CF3M, CF3M/1.4409
Plug Material	
CF3M stainless steel	Chrome-plated CF8M, solid alloy 6, or ceramic
Flow Characteristics and Maximum Flow Coefficients	
Modified equal percentage Maximum Cv from 181 to 3080	Modified linear Maximum Cv from 12.2 to 1050
Rangeability	
200 to 1	100 to 1
Shutoff Class	
Class IV	Class IV
Available Actuators (refer to page 10)	
Fisher 2052, 1052 Size 70, 1061, 1068, and Bettis RPE	Fisher 2052, 1052 Size 70, 1061, 1068, and Bettis RPE

Fisher Multiport Flow Selector

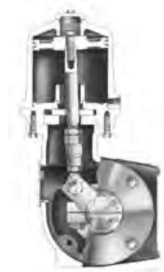


X1515

Multiport Flow Selector
Applications
Allows for automated selecting and diverting of well fluids from an individual well to a single test outlet, flow loop, or sampling device
Sizes
NPS 2x4, 3x6, 4x8, 4x10, 6x16
Ratings
CL150, CL300, CL600, CL900, CL1500, CL2500
End Connection
Raised-face (RF)
Valve Body Materials
WCB, WCC, CF3M, CF8M, CD3MN, CD3MWCuN, and WCB/WCC with N06625 Cladding
Plug Materials
CF3M, CF8M, CD3MN, CD3MWCuN, and CW6MC
Seal Types (Material)
Soft with scraper (316L Nitride and N07718)
Shutoff Class
Class IV
Available Actuator
Multiport Actuator

Fisher 1052 Size 70, 1061, and 2052 Actuators

W3813 **1052 SIZE 70 ACTUATOR**



W3827 **1061 ACTUATOR**

W9589 **2052 ACTUATOR**

1052 SIZE 70	1061	2052
Features		
Heavy-duty actuator with enclosed linkage and splined actuator-valve connection for minimized lost motion		
Style		
Spring-return pneumatic diaphragm actuator	Double-acting pneumatic piston actuator	Spring-return pneumatic diaphragm actuator
Typical Operating Torque Range (Varies with Operating Pressure and Construction)		
12,100 lbf • in PDTC	2500 to 175,000 lbf • in	226 to 5,580 lbf • in PDTO 226 to 8,230 lbf • in PDTC
Temperature Capabilities		
-40 to 82°C (-40 to 180°F) or -40 to 149°C (-40 to 300°F)	-34 to 82°C (-30 to 180°F)	Standard: -45 to 80°C (-50 to 176°F) Optional: -45 to 100°C (-50 to 212°F) or -60 to 80°C (-76 to 176°F)
Accessories		
Pneumatic or electro-pneumatic valve positioners, FIELDVUE digital valve controllers, limit switches, position transmitters, handwheels, travel stops, lock-out device to disable actuator during maintenance, supply pressure filter-regulators		

Fisher 1068 Rotary Vane Actuators

X1590

DOUBLE ACTING

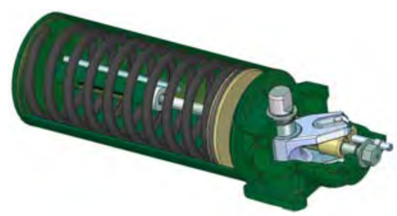
X1591

SPRING RETURN

DOUBLE ACTING	SPRING RETURN
Features	
Heavy-duty, high cycle vane actuator with or without integral air passages	
Style	
Rotary Vane Actuator	
Sizes	
7i, 8i, 9i, 10i, 12i, 14i, 15i, 16, 18, 20, and 30	5i, 7i, 8i, 9i, 10i, 12i, 14i, 15i, 16, 18, 20, and 30
Typical Operating Torque Range (Varies with Operating Pressure and Construction)	
Refer to Catalog 14	
Accessories	
DVC2000 and DVC6200	

Bettis RPE and Fisher CB and G Series Actuators

X1704
Bettis RPE ACTUATOR



X1521
Fisher CB ACTUATOR

W8305
Fisher G ACTUATOR

Bettis RPE	Fisher CB Series	Fisher G Series
Features		
Heavy duty rack-and-pinion pneumatic actuator for mounting to Fisher rotary valves	Scotch yoke type actuator for mounting to Fisher rotary valves	Scotch yoke type actuator for mounting to Fisher rotary valves
Style		
Double-acting or spring-return pneumatic piston actuator	Double-acting or spring-return pneumatic actuator	Double-acting or spring-return series single power module pneumatic actuator
Typical Operating Torque Range (Varies with Operating Pressure and Construction)		
20 to 39,498 lbf • in	38 to 2674 lbf • in	7,758 to 308,254 lbf • in
Accessories		
Bettis RPE-Series actuators can be packaged together with a range of control and feedback accessories.	Pneumatic or electro-pneumatic valve positioners, FIELDVUE digital valve, controllers, limit switches, position transmitters, handwheels, travel stops, supply pressure filter-regulator	Pneumatic or electro-pneumatic valve positioners, FIELDVUE digital valve controllers, limit switches, position transmitters, handwheels, travel stops, supply pressure filter-regulator

Alloy Valve Guidelines

- Emerson expertise has combined its knowledge of metals and foundry techniques with valve user experience to make a variety of high alloy valves available for customer selection.
- Techniques have also been implemented that verify a foundry's ability to cast alloy valves properly and has established stringent specifications that guide the foundry in providing quality results.
- Guidelines have been developed to help the valve user specify alloy valves correctly. Valve user guidelines include: Customer/end user selection of alloy valves must consider compatibility of valve materials with application and process conditions, avoid the use of alloy tradenames, do not specify wrought for cast, specify non-destructive testing only when necessary.
- Steps used to qualify a foundry include: Weldability tests to gauge the foundry's ability to pour alloy materials; Dedicating casting patterns solely to high-alloy service.
- Stringent specifications developed by Emerson include: Raw Material Composition and Quality, Heat Qualification, Visual Inspection, Weld Repair, Heat Treatment, and Nondestructive Testing.

Instruments

- Fisher pneumatic controller C1 and 4195 series provides pressure and temperature control to standalone control loops. These pneumatic controllers provides proportional, integral, and derivative actions towards maintaining the required control loop.
- Electro-pneumatic transducers providing 4-20 mA current input to pneumatic output for pneumatic positioners, controllers, volume booster or directly to actuators are available. Fisher 646, i2P-100, and 846 transducers provide the remote capability for connecting pneumatic instruments to control panel or control room.
- Fisher VBL and 2625 volume boosters used in conjunction with a positioner on a throttling control valve increase stroking speed.
- Fisher Wireless 4320 provides valve position monitoring that will improve visibility to valves without the need for wires. The 4320 can provide on/off control with pneumatic output option enabling easier automation of valves, again without wires.
- Fisher 4660 high-low pressure pilots and 377 trip valves provide pneumatic discrete control and are exida certified for use in Safety Instrument System (SIS) applications.

W8755

DVC2000

W9418-2

DVC6200 on Control-Disk VALVE

Typical Fisher Instruments

- FIELDVUE digital valve controllers are communicating, microprocessor-based controllers that convert a current or digital signal to a pressure signal to operate the actuator.
- Through the HART®, FOUNDATION Fieldbus™, or PROFIBUS communications protocol, the controller gives easy access to critical valve information.
- ValveLink™ software allows easy access to valve assembly alerts and performance characteristics. Vital information can be obtained without removing the valve from the line.
- Performance Diagnostics tests, including on-line One-Button Sweep, Friction and Deadband analysis, and Trending, can be run while the valve is in service and operating.
- Valve Signature, Dynamic Error Band, and Step Response tests are displayed in an intuitive user-friendly environment that allows easy interpretation of data.
- FIELDVUE models include the DVC6200, DVC6200f and DVC6200p. The DVC6200 SIS is used for safety applications and the DVC2000 has a local user interface.

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Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ D Series Valve Selection Guide

X1212

D2T On/Off Dump Valve

- NPS 1 CL900 NPT connections
- 0.5 inch FloPro solid R30006 or S17400 SST trim; Max $C_v = 6.0$
- Ability to meet the metallurgical requirements of NACE MR0175-2002
- Excellent live-loaded packing design

W9249

D3 Premium On/Off Dump Valve

- NPS 1 CL900 NPT connections
- NPS 1 and 2 CL900 NPT, NPS 1 and 2 CL600 RF connections
- 3/8, 3/4, or 1 inch FloPro S17400 SST or tungsten carbide trim; Max $C_v = 16.8$
- Ability to meet the metallurgical requirements of NACE MR0175/ISO 15156
- Excellent live-loaded packing design

W8531

D4 Premium High-Flow On/Off Dump Valve

- Throttling control
- NPS 1 and 2 4250 psi NPT, NPS 1 and 2 CL150 RF to 1500 RTJ connections
- 0.25 to 1.25 inch port S17400 SST or tungsten carbide trim; Max C_V = 33.2
- Ability to meet the metallurgical requirements of NACE MR0175/ISO 15156
- Excellent live-loaded packing design
- FIELDVUE™ digital valve controller and i2P-100 transducer mounting available
- Smaller envelope size than D

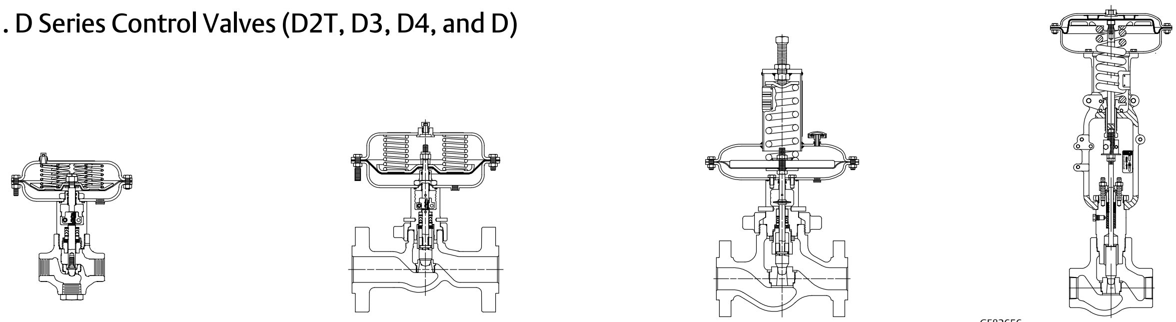
W7859-1

D High-Tier Throttling Control Valve

- NPS 1 and 2 3600 or 6000 psi NPT, NPS 1 and 2 CL150 RF to 2500 RTJ connections
- 0.25 to 1.25 inch port R30006 or tungsten carbide trim; Max C_V = 34.5
- Ability to meet the metallurgical requirements of NACE MR0175-2002
- High pressure capability; CL2500
- High flow / high pressure drop capability
- Tough standard R30006 trim offering
- Excellent tungsten carbide and VTC trim offering
- Preferred FIELDVUE digital valve controller mounting platform

D Series Control Valves (D2T, D3, D4, D)

Figure 1. D Series Control Valves (D2T, D3, D4, and D)



GE71876 **D2T** GE21316 **D3** GE02329-B **D4** GE82656 **D**

Table 1. D Series Control Valves (D2T, D3, D4, and D)

VALVE	SIZES		THROTTLING (1)	TRIM		ENVIRO-SEAL™ PACKING	FIELD REVERSIBLE	HAMMER UNION	easy-Drive™ COMPATIBLE	FIELDVUE COMPATIBLE	QUAD-O COMPLIANT
	NPS 1	NPS 2		Standard	Optional						
D2T	X		no	S17400	CoCr-A	standard	yes	no	no	no	yes
D3	X	X	yes	S17400	tungsten carbide	standard	yes	yes	yes	no	yes
D4	X	X	yes	S17400	tungsten carbide	standard	no	yes	yes	yes	yes
D	X	X	yes	S31600/ CoCr-A	VTC (ceramic) tungsten carbide	optional	no	no	no	yes	no

Note 1 for table 1. Dynamic performance and accuracy without a positioner depends on packing friction, actuator spring range, and the controller tuning. For information on your particular application, contact your Emerson sales office or Local Business Partner.

Table 2. End Connections

	D2T	D3	D4	D
NPS 1 NPT	X	X	X	X
CL150 RF			X	X
CL300 RF			X	X
CL600 RF		X	X	X
CL1500 RF			X	X
CL1500 RTJ			X	X
CL2500 RF				X
CL2500 RTJ				X
NPS 2 NPT		X	X	X
CL150 - CL300 RF			X	X
CL600 RF		X	X	X
CL1500 RF			X	X
CL1500 RTJ			X	X
CL2500 RF				X
CL2500 RTJ				X
10,000 API				X

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Fisher™ CCV-N Fuel Gas Control Valve

Fisher CCV-N fuel gas control valves are used in gas turbines which meter the fuel gas to the combustion chamber of the turbine and provide linear flow with the ability to choke very quickly at a low pressure drop. CCV-N valve provides precise control of fuel and efficient downstream static pressure recovery with reliable shutoff.

CCV-N valves are single port, angle-style, unbalanced and balanced valves with metal seat, seat ring retainer guide and push-down-to-close valve plug action.

Materials for CCV-N valve body and trim components are in compliance with NACE MR0103.

The CCV-N valves offers reliable shutoff with process temperature limited up to 316ºC (600ºF) by using PEEK (PolyEtherEtherKetone) anti-extrusion rings in combination with a spring-loaded PTFE seal. The PEEK anti-extrusion rings expand to help close off the clearance gaps on the plug outside diameter and the seat ring retainer inside diameter where the PTFE seal may extrude at high temperatures and pressures. Unbalanced and balanced bore-seal designs are also available for process temperature above 316ºC (600ºF).

FISHER NPS 3 CCV-N CHOKE CONTROL VALVE - SECTION VIEW

Features

- **Valve Plug Stability**— Rugged seat ring retainer guiding the plug provides increased valve plug stability, which reduces vibration and mechanical noise.
- **Sour Service Trims**— Standard trims are in compliance with NACE MR0103 which yields long lasting, erosion and corrosion resistant parts.
- **Stringent Valve Capacity Tolerance**— Teardrop shape seat ring retainer is used to minimize flow restriction in order to attain the required pressure recovery ratio and achieve the Cg (specified in table 3).
- **Linear Characteristics**— The pointed cone shaped plug and seat ring design helps to achieve the linear characteristic for the specified travel.
- **Reliable Shutoff**— Metal-to-metal seat and PEEK anti-extrusion seal ring construction meets bi-directional Class IV shutoff per ANSI/FCI 70-2 and IEC 60534-4 for temperatures up to 316ºC (600ºF). Metal-to-metal seat and unbalanced or bore-seal trim construction meets bi-directional Class IV shutoff per ANSI/FCI 70-2 and IEC 60534-4 for temperatures above 316ºC (600ºF).
- **Efficient Pressure Recovery**— This valve provides efficient pressure recovery and achieves critical flow conditions with low pressure drops.

Specifications

Available Configuration and Valve Sizes

Single port, angle-style valve with balanced or unbalanced valve trim and push-down-to-close valve plug action

Standard sizes are NPS ■ 2, ■ 3, and ■ 4

End Connection Style

Raised-face (RF) flanges

Maximum Inlet Pressure and Temperature

Consistent with CL300 or CL600 pressure-temperature ratings per ASME B16.34

Maximum Pressure Drop

Consistent with pressure-temperature ratings per ASME B16.34

Shutoff Classification

Bi-directional Class IV shutoff per ANSI/FCI 70-2 and IEC 60534-4

Construction Materials

CF8M valve body and stainless steel trims

Refer table 2

Material Temperature Capability

See table 2

Flow Direction

Flow down

Flow Characteristic

Linear from 10% to 100% travel

Flow Coefficient

See table 3

Port Diameter/ Plug Travel and Stem Diameter

See table 1

Bonnet/ Yoke Boss

Plain bonnet and 2 13/16 inch yoke boss

Packing

Double PTFE, Graphite Leak-off and other ENVIRO-SEAL™ and HIGH-SEAL packing options.

See Fisher Bulletin 59.1:062, Packing Selection Guidelines for Fisher Sliding-Stem Valves (D101986X012). Fisher Bulletin 59.1:061, ENVIRO-SEAL and HIGH-SEAL Packing Systems for Sliding-Stem Valves (D101633X012)

Approx. Weights

NPS 2 CL300 or CL600: 31 kg (68 lb)

NPS 3 CL300 or CL600:51 kg (112 lb)

NPS 4 CL300: 77 kg (168 lb)

NPS 4 CL600: 86 kg (190 lb)

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Table 1. Port Diameter and Valve Plug Travel

VALVE SIZE, NPS	PORT DIAMETER		TRAVEL		YOKE BOSS SIZE		STEM DIAMETER	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch
2	25.4	1.00	19.05	0.750	71.4	2.81	13	0.5
	38.1	1.60	19.05	0.750	71.4	2.81	13	0.5
3	57.1	2.25	28.58	1.125	71.4	2.81	13	0.5
4	78.7	3.10	38.10	1.500	71.4	2.81	13	0.5

Table 2. Construction Materials and Temperature Limits

PART			MATERIAL	TEMPERATURE CAPABILITES	
				°C	°F
Valve Plug, Balanced or Unbalanced			S17400 Double H1150	-29 to 427	-20 to 800
Seat Ring					
Valve Plug Stem			S20910	Not a limit factor	
Groove Pin			Stainless Steel		
Spring-loaded valve plug seal	Backup Ring Bi-Direction		S17400 Double H1150	-29 to 427	-20 to 800
	Backup Ring				
	Retaining Ring		N07750	Not a limit factor	
	Seal Ring		PTFE with R30003 Spring	-29 to 316	-20 to 600
	Anti-extrusion rings		PEEK (PolyEtherEtherKeton)		
Bore-seal valve plug seal set	Bore-seal		N07750	Not a limit factor	
	Piston Ring		Carbon Graphite		
	Plug Retainer		S17400 Double H1150	-29 to 427	-20 to 800
Cage gasket			N06600/Graphite	Not a limit factor	
Seat ring gasket			Graphite/SST		
CF8M Stainless Steel Valve Body and Bonnet	Non-exposed body-to-bonnet bolting	Studs	SA193-B7	-29 to 316	-20 to 600
		Nuts	SA194-2H		
	NACE MR0103 exposed body-to-bonnet bolting	Studs	SA479 S20910	-29 to 427	-20 to 800
		Nuts			
Seat Ring Retainer			S17400 Double H1150 Chromium Plating	-29 to 316	-20 to 600
			S17400 Double H1150 Chromium Coating	Not a limit factor	
Packing			Double PTFE	-46 to 232(1)	-50 to 450(1)
			ENVIRO-SEAL Graphite ULF for 100 PPM Service	-7 to 315(1)	20 to 600(1)
			ENVIRO-SEAL Graphite ULF for Non-Environmental Service	-198 to 371(1)	-325 to 700(1)
			Graphite Leak-off	Not a limit factor	
Packing follower, spring, or lantern ring			S31600 Stainless Steel	Not a limit factor	
Packing box ring					
Packing flange, studs, or nuts	Packing Flange		S31600 Stainless Steel		
	Studs		Steel SA193-B8M		
	Nuts		S31600 Stainless Steel		

1. Consult the Fisher Packing Selection Guidelines Bulletin (D101986X012) for additional information or contact your Emerson sales office.

Table 3. Flow Coefficient Values

DESIGN	PRESSURE RATING	VALVE SIZE NPS	PORT DIAMETER		TRAVEL		Cg - VALVE OPENING - PERCENTAGE OF TOTAL TRAVEL									
			mm	Inch	mm	Inch	10	20	30	40	50	60	70	80	90	100
Below 316°C (600°F)	CL300	2	38.1	1.60	19.05	0.750	78.7	145	256	370	489	610	730	845	973	1080
		3	57.1	2.25	28.58	1.125	146	345	568	793	1020	1260	1490	1730	1970	2210
			57.1	2.25	28.58	1.125	160	377	634	889	1160	1420	1700	1930	2220	2480
		4	78.7	3.10	38.10	1.500	251	567	1010	1470	1930	2390	2850	3300	3690	4120
Above 316°C (600°F)	CL600	2	25.4	1.00	19.05	0.750	65.5	136	197	261	324	390	459	526	597	670
			38.1	1.60	19.05	0.750	77.4	142	255	372	489	609	731	851	973	1086
		3	57.1	2.25	28.58	1.125	124	362	613	871	1131	1392	1671	1950	2226	2499
		4	78.7	3.10	38.10	1.500	240	552	988	1437	1893	2336	2789	3246	3672	4022

Figure 1. CCV-N Valve Dimensions

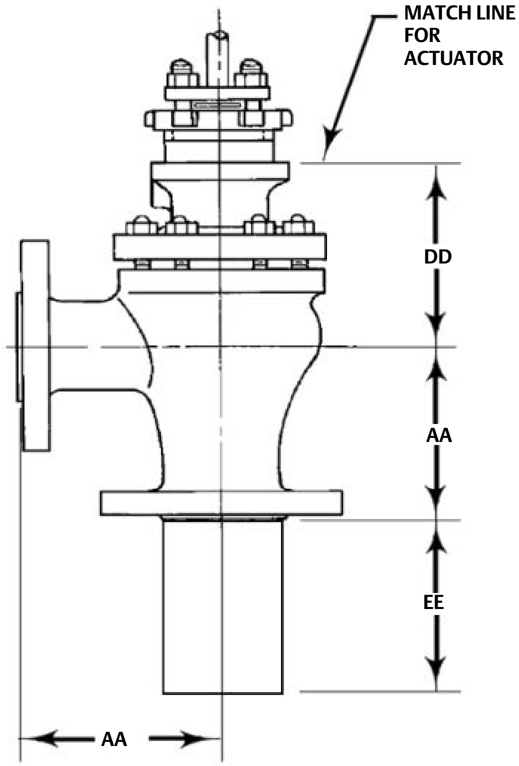

Table 4. Valve Dimensions, Plain Bonnet

PRESSURE RATING	VALVE SIZE, NPS	AA	DD	EE
		mm		
CL300	2	133.4	120.7	177.8
	3	158.8	149.4	81.3
		158.8	149.4	233.7
	4	184.2	139.7	393.7
		Inch		
	2	5.25	4.75	7.00
	3	6.25	5.88	3.20
		6.25	5.88	9.20
	4	7.25	5.50	15.50
CL600	VALVE SIZE, NPS	AA	DD	EE
		mm		
	2	142.7	150.9	241.3
		142.7	150.9	177.8
	3	168.81	149.4	233.7
	4	196.9	159.5	393.7
		Inch		
	2	5.62	5.94	9.5
		5.62	5.94	7
	3	6.62	5.88	9.2
	4	7.75	6.28	15.50

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Fisher™ easy-e™ Cryogenic Sliding-Stem Control Valves

Fisher easy-e cryogenic valves are globe-style, single-port, valves featuring stainless steel construction materials and fabricated extension bonnets. Fisher ET-C and EWT-C valves are pressure-balanced, whereas the Fisher EZ-C valve is an unbalanced design. These cryogenic valves are designed to provide throttling or on-off control of liquids and gases at cryogenic temperatures as low as -198°C (-325°F).

When required, these rugged valves can reliably provide tight shutoff for special applications within the chemical and hydrocarbon processing industries, such as certain liquefied natural gas services.

The high-capacity ET-C and EWT-C valves with pressure-balanced trim allow the use of smaller, lower-cost actuators, reducing installed costs in high-pressure and high-flow-rate applications.

TYPICAL FISHER easy-e CYROGENIC VALVE WITH EXTENSION BONNET

The easy-e Valve Family

These valves are part of the versatile easy-e family of industrial control valves. Special features include:

- **ET-C and EWT-C:** Different cage/plug styles provide particular flow characteristics for highly-specialized applications. The standard cage comes in two different flow characteristics: ■ equal percentage and ■ linear.
- **EZ-C:** Interchangeable, restricted-capacity trims and full-sized trims match a variety of process flow demands for highly-specialized applications. The standard plug is designed with three different flow characteristics: ■ equal percentage, ■ linear, and ■ quick-opening.

Features

- **Cryogenic Spring-Loaded Seal Ring**—The seal ring and associated valve parts in the ET-C and EWT-C valves are specifically designed and manufactured for excellent performance at low temperatures.

- **Stable Control**—Rugged cage guiding in the ET-C and EWT-C valves stabilizes the valve plug at all points in its travel to reduce vibration, mechanical noise, and the need for hydraulic snubbers.

- **Cost Effective Operation and Economical Maintenance**—Increased wear resistance of hardened stainless steel trim means long-lasting service. Balanced valve plug construction in the ET-C and EWT-C valves permits use of smaller, lower-cost Fisher actuators.

- **Piping Economy**—Expanded end connections of EW Series valves may reduce the need for line swages while accommodating oversized piping arrangements used to limit fluid flow velocities.

- **Cryogenic Design Features**—The stainless steel valve body and bonnet with fabricated extension are designed to meet low temperature requirements. The unique metal-to-metal seat design provides repeatable tight shutoff, reducing maintenance costs.

- **Rugged Metal Seat**—The metal-to-metal seat is designed and manufactured to provide long-lasting, reliable, tight shutoff at both ambient and cryogenic temperatures without the need for periodic lapping. This reduces the need for soft seats, even in applications with stringent shutoff requirements.

- **Fugitive Emission Protection**—The optional ENVIRO-SEAL™ packing systems provide an improved stem seal to help prevent the loss of valuable or hazardous process fluids, and keep emissions below the EPA limit of 100 ppm. Additionally, these live-loaded packing systems can provide long life and reliability at low temperatures to help reduce maintenance costs and downtime.

- **Thoroughly Tested**—Extensive cryogenic testing during the development of the valve design reduces the need for expensive cold testing for most applications, which results in quicker delivery and greater value.

- **Easy Maintenance**—Quick-change trim, with a clamped-in seat ring, reduces the disassembly/assembly time. The valve body can stay in the pipeline during removal of trim parts for inspection or maintenance.

- **Sour Service Capability**—For NACE applications, consult your Emerson sales office.

Contents

Specifications

Available Configurations

ET-C: Single-port, globe-style control valve with cage guiding, balanced valve plug, and push-down-to-close valve plug action (figure 1)
EWT-C: Single-port, globe-style control valve with cage guiding, balanced valve plug, push-down-to-close valve plug action, and with expanded end connections (figure 1)
EZ-C: Single-port, globe-style control valve with post-guiding, unbalanced valve plug, and push-down-to-close valve plug action (figure 2)

Valve Sizes

ET-C: ■ NPS 3, ■ 4, ■ 6, and ■ 8
EWT-C: ■ NPS 6X4[1], ■ 8X4, ■ 8X6, ■ 12X6, and ■ 10X8 ■ 12X8
EZ-C: ■ NPS 1, ■ 1-1/2, ■ 2, ■ 3, and ■ 4

End Connection Styles[2]

CL150, 300, or 600 raised-face flanges per ■ ASME B16.5, ■ EN 1092-1/B

Maximum Inlet Pressure[2]

Consistent with ■ CL150 and ■ CL300 pressure-temperature ratings per ASME B16.34

■ CL600 valves with B8M Class 2 bolting are consistent with CL600 pressure-temperature ratings per ASME B16.34 except as shown below:

VALVE	VALVE SIZE, NPS	MAXIMUM INLET PRESSURE at 38°C (100°F)	
		Bar	Psig
EZ-C	1	77	1110
	2	83	1200
	3	94	1370
ET-C and EWT-C	3	94	1370
	6, 8 x 6, 10 x 6, 12 x 6	75	1085
	8, 10 x 8, 12 x 8	96	1390

■ CL600 valves with optional S20910 (XM-19) bolting are consistent with CL600 pressure-temperature ratings per ASME B16.34

Maximum Pressure Drops[2]

Same as maximum inlet pressure, except where limited by spiral wound gasket for EZ-C (see tables 7 and 8)

Trim Material

See tables 1 and 2

Shutoff Classifications Per ANSI/FCI 70-2 and IEC 60534-4

ET-C and EWT-C

Metal Seat:
■ Class IV is standard
■ Class V air test is optional (Test will be 50 psid air)[6]
■ Class VI (Consult your Emerson sales office)

Composition Seat:
■ Class V air test is standard (Test will be 50 psid air)[6]
■ Class VI is optional

EZ-C

Metal Seat:
■ Class IV is standard
■ Class VI is optional

Maximum Actuator Thrust

See table 3

Conformance to Customer Specifications

ET-C with metal seats and EZ-C valves successfully passed type approval testing per SIPM (Shell) specification T-2.253.730

Flow Characteristics

ET-C, EWT-C, and EZ-C
■ Equal percentage
■ Linear

EZ-C Only
■ Quick-opening

Flow Direction[5]

ET-C and EWT-C
Normally down for linear and equal percentage trims. Flow up for Whisper Trim™. See figure 1
EZ-C
Up through the seat ring only. See figure 2

(Continued)

Specifications (Continued)

Standard Construction Materials

Valve Body and Bonnet: CF8M (316 SST)
Body-Bonnet Bolting: SA-193-B8M Class 2 studs with SA-194-8M nuts (see table 6)
Bonnet Bushing: S31600/filled PTFE
Flat Sheet Gaskets: S31600/graphite
Spiral Wound Gasket: N06600/graphite
Packing Studs and Nuts: S31600 SST
Seal Ring (ET-C and EWT-C): UHMWPE(3) with R30003 spring
Back-Up Ring (ET-C and EWT-C): S31600 (316 SST)
Retaining Ring (ET-C and EWT-C): S30200 (302 SST)
Load Ring (for ET-C, NPS 8 and for EWT-C, NPS 10 x 8 only): N07718
Packing Follower, Lantern Ring, Packing Spring(4) and Packing Box Ring: S31600 SST

Material Temperature Capabilities(2)

ET-C and EWT-C
-198 to 66°C (-325 to 150°F)
EZ-C
-198 to 149°C (-325 to 300°F)

Bonnet Extension Length

See figures 3 and 4 for standard valve dimensions

Flow Coefficients and Noise Level Prediction

See Catalog 12

Port Diameters, Plug Travel, Yoke Boss, and Stem Diameter

See tables 4 and 5
Refer to Fisher Bulletin 80.1:010 Whisper Trim III (D100191X012) for information on Whisper Trim III with ET-C and EWT-C

Packing Arrangements

Standard Material

■ Single PTFE V-ring. See figures 1 and 2

Optional Materials

■ Double PTFE V-ring and
■ Graphite ribbon/filament

ENVIRO-SEAL Packing Systems: See figure 5

Packing Material: ■ PTFE V-ring and ■ Graphite ULF

See Bulletin 59.1:061, ENVIRO-SEAL Packing Systems for Sliding-Stem Valves (D101633X012) for more information

Approximate Weights (CL600 Valves)

ET-C:

NPS 3: 51 kg (135 lb)
NPS 4: 95 kg (210 lb)
NPS 6: 211 kg (465 lb)
NPS 8: 372 kg (820 lb)

EWT-C:

NPS 6X4: 200 kg (440 lb)
NPS 8X4: 277 kg (610 lb)
NPS 8X6: 318 kg (700 lb)
NPS 10X6: 441 kg (972 lb)
NPS 10X8: 753 kg (1660 lb)
NPS 12X6: 730 kg (1610 lb)
NPS 12X8: 866 kg (1908 lb)

EZ-C:

NPS 1: 15 kg (33 lb)
NPS 1-1/2: 23 kg (48 lb)
NPS 2: 41 kg (90 lb)
NPS 3: 60 kg (130 lb)
NPS 4: 95 kg (210 lb)

Optional Safety Instrumented System Classification

SIL3 capable - certified by exida Consulting LLC

Options

ET-C and EWT-C: ■ Whisper Trim III and WhisperFlo™ trim for aerodynamic noise attenuation, and ■ Cavitrol™ III cages for liquid cavitation protection are available. Contact your Emerson sales office for information
EZ-C: ■ Micro-Flute and ■ Micro-Flow trim

1. Valve size number is end connection size by normal trim size. For example, an NPS 6X4 EWT-C valve has NPS 6 end connections with NPS 4 trim (see table 4).
2. Do not exceed the pressure or temperature limits in this bulletin, and any applicable code limitations.
3. UHMWPE stands for ultra high molecular weight polyethylene.
4. A spring is used only with PTFE V-ring packing. A lantern rings replace the spring in other packing arrangements.
5. Down is in through the cage and out the seat ring (see figure 1).
6. Class V shutoff cannot be performed with water. The residual trapped moisture from testing with water can cause valve and trim damage from the ice crystals formed at below freezing service temperatures.

Table 1. Fisher ET-C and EWT-C Typical Trim Material

Trim Designation	Valve Plug	Valve Stem	Cage	Seat Ring
429	S31600 SST with CoCr-A (Alloy 6) hard-faced seat	S20910	Chrome-plated S31600 SST	S31600 SST
430(2)	S31600 SST			S31600 SST/CTFE
431, 431W(1)	S31600 SST with CoCr-A (Alloy 6) hard-faced seat and guide			S31600 SST

1. Trim 431W for use with Whisper Trim III. Includes S31600 CRPL cage retainer and 316 SST baffle for Level D trims.
2. Soft seat construction.

Table 2. Fisher EZ-C Typical Combinations of Metal Trim Parts for Equal Percentage (Including Micro-Form), Linear, and Quick-Opening Valve Plugs

Trim Designation	Valve Plug	Valve Stem	Seat Ring	Seat Ring Retainer	Guide Bushing
327	S31600 SST with CoCr-A (Alloy 6) hard-faced Seat and Guide	S20910 (XM-19)	S31600	CF8M	R30006
328	S31600 SST with CoCr-A (Alloy 6) hard-faced Seat				

Table 3. Maximum Allowable Actuator Thrust for Standard Bonnet Extension Length

VALVE	VALVE SIZE, NPS	STEM DIAMETER		MAXIMUM ALLOWABLE STEM LOAD FOR S20910 (XM-19) STEM MATERIAL	
		mm	Inches	N	lb
ET-C and EWT-C	3	12.7	1/2	15,301	3440
		19.1	3/4	45,459	10,220
	4, 6X4, 8X4	12.7	1/2	16,458	3700
		19.1	3/4	46,971	10,560
		25.4	1	91,290	20,523
ET-C and EWT-C	6, 8X6, 10X6. 12X6	19.1	3/4	36,385	8180
		25.4	1	81,487	18,320
	8, 10X8, 12X8	19.1	3/4	41,366	9300
		25.4	1	87,003	19,560
EZ-C	1	9.5	3/8	5382	1210
		12.7	1/2	13,166	2960
	1-1/2	9.5	3/8	5338	1200
		12.7	1/2	13,166	2960
	2	12.7	1/2	14,367	3230
		19.1	3/4	44,169	9930
	3	12.7	1/2	15,301	3440
		19.1	3/4	45,459	10,220
	4	12.7	1/2	16,458	3700
		19.1	3/4	46,971	10,560

Figure 1. Fisher ET-C and EWT-C Valve Detail

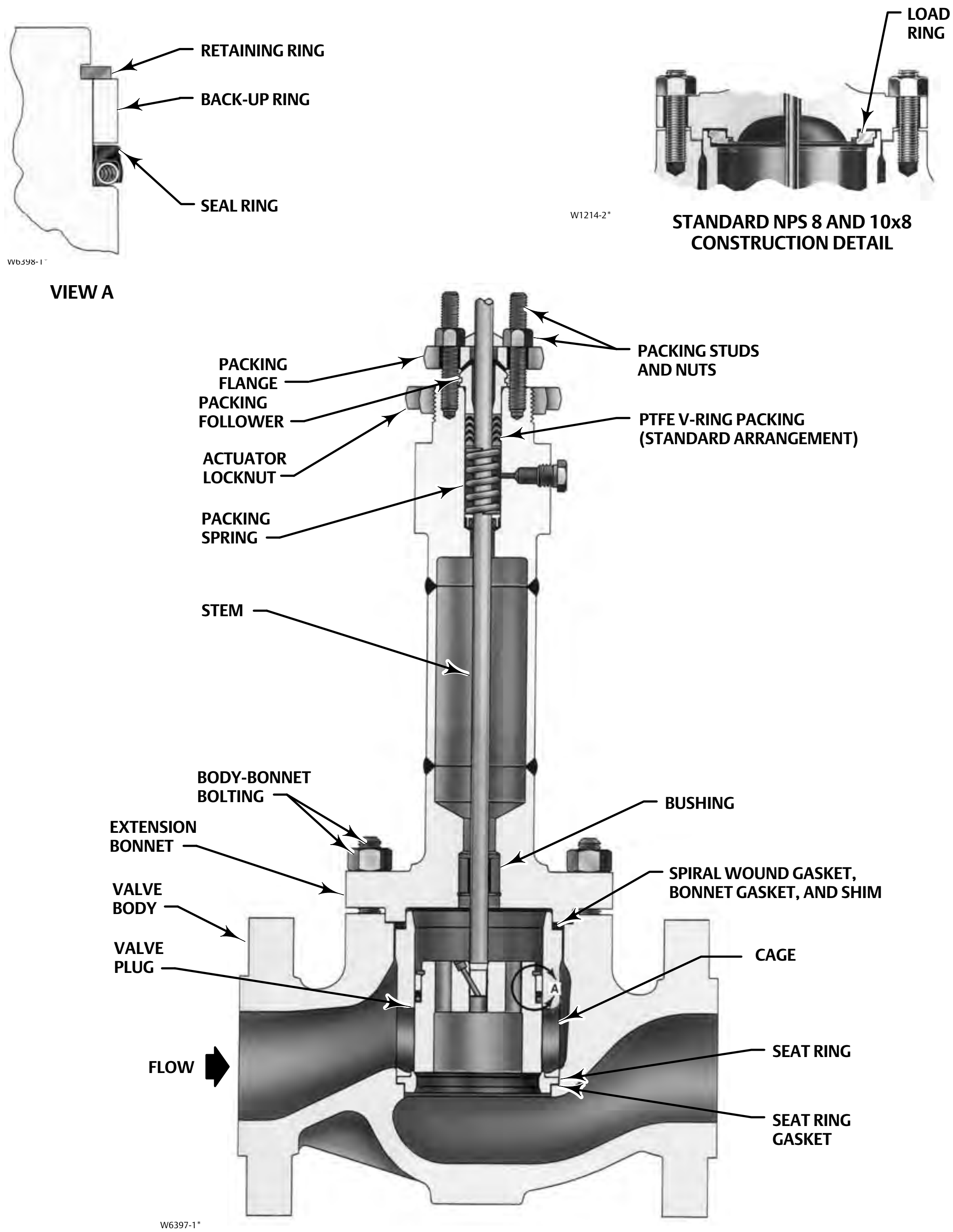


Figure 2. Fisher EZ-C Valve Assembly Detail

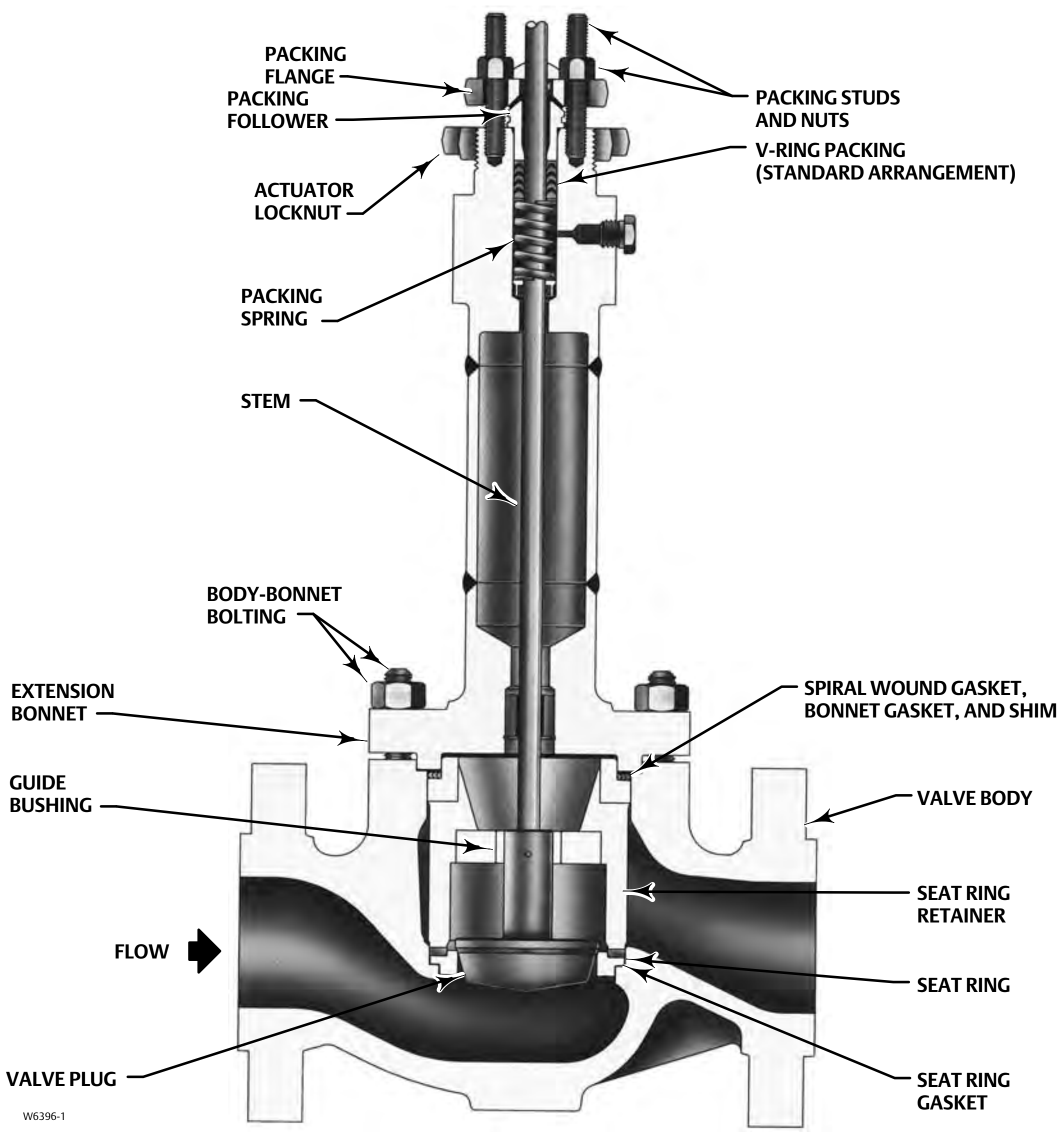


Table 4. Fisher ET-C and EWT-C Port Diameters, Valve Plug Travel, Stem and Yoke Diameters

VALVE SIZE, NPS		PORT DIAMETER	MAXIMUM VALVE PLUG TRAVEL	VALVE STEM AND YOKE BOSS DIAMETERS			
				Standard		Optional	
ET-C	EWT-C			Stem	Yoke Boss	Stem	Yoke Boss
mm							
3	- - -	87.3	38.1	12.7	71	19.1	90
4	6X4, 8X4	111.1	50.8				
6	8X6, 12X6	177.8	50.8	19.1	90	25.4	127.0
8	10X8	203.2	76.2				
Inches							
3	- - -	3.4375	1.5	1/2	2-13/16	3/4	3-9/16
4	6X4, 8X4	4.375	2				
6	8X6, 12X6	7	2	3/4	3-9/16	1	5
8	10X8	8	3				

Table 5. Fisher EZ-C Port Diameters, Valve Plug Travel, and Stem and Yoke Diameters

VALVE SIZE, NPS	PORT DIAMETER, INCHES			MAXIMUM PLUG TRAVEL	VALVE STEM AND YOKE BOSS DIAMETERS			
					Standard		Optional	
EZ-C	Equal Percentage[1]	Quick Opening	Linear		Stem	Yoke Boss	Stem	Yoke Boss
mm								
1	6.4, 9.5, 12.7, 19.1, 25.4	25.4	25.4	19	9.5	54	12.7	71
1-1/2	6.4, 9.5, 12.7, 19.1, 25.4, 38.1	38.1	38.1					
2	6.4, 9.5, 12.7, 19.1, 25.4, 50.8	50.8	50.8	29	12.7	71	19.1	90
3	50.8, 76.2	76.2	76.2	38				
4	50.8, 101.6	101.6	101.6	51				
Inches								
1	0.25, 0.375, 0.5, 0.75, 1	1	1	0.75	3/8	2-1/8	1/2	2-13/16
1-1/2	0.25, 0.375, 0.5, 0.75, 1, 1.5	1.5	1.5					
2	0.25, 0.375, 0.5, 0.75, 1, 2	2	2	1.125	1/2	2-13/16	3/4	3-9/16
3	2, 3	3	3	1.5				
4	2, 4	4	4	2				

1. 6.4 through 19.1 mm (0.25 through 0.75 inch) port diameters use Micro-Form valve plugs.

Table 6. Bolting Materials

VALVE	BODY-BONNET BOLTING	
	Studs	Nuts
ET-C, EWT-C, and EZ-C	SA-193-B8M[1] Strain Hardened	SA-194-8M[1]
	S20910 (XM-19)	SA-194-8M
		SA-194-8MA

1. Standard stud and nut combination.

Table 7. Fisher EZ-C Maximum Allowable Pressure Drop for N06600/Graphite Spiral Wound Gasket (NPS 1 and 1-1/2 Valve Size) (Flow Up Only)(1)

TEMPER-ATURE, °C(3)	BAR(2)										
	EZ-C Valve Size, NPS										
	1					1-1/2					
	Port Diameter, mm										
	6.4	9.5	12.7	19.1	25.4	6.4	9.5	12.7	19.1	25.4	38.1
-198 to 93	94.5	96.2	97.9	104.1*	114*	77.9	79.0	80.0	82.7	87.6	105*
93	89.6*	91.4*	93.1*	98.6*	108*	73.8	74.5	75.2	78.6	82.7	99.3*
149	85.5*	87.2*	88.9*	94.5*	103*	70.3	71.4	72.4	75.2	79.3*	94.5*
TEMPER-ATURE, °F(3)	PSI(2)										
	1					1-1/2					
	Port Diameter, Inches										
	0.25	0.375	0.5	0.75	1	0.25	0.375	0.5	0.75	1	1.5
-325 to 100	1370	1395	1420	1510*	1660*	1130	1145	1160	1200	1270	1520*
200	1300*	1325*	1350*	1430*	1570*	1070	1080	1090	1140	1200	1440*
300	1240*	1265*	1290*	1370*	1500*	1020	1035	1050	1090	1150*	1370*

1. EZ-C should not be used in flow down service including on-off applications.
2. Pressure drop cannot exceed maximum inlet pressure as indicated in the specification table on page 2.
3. Pressure drops at intermediate temperatures may be interpolated.
* Pressure drops are in excess of CL600 pressure ratings per ASME B16.34 for CF8M body material.

Table 8. Fisher EZ-C Maximum Allowable Pressure Drop for N06600/Graphite Spiral Wound Gasket (NPS 2 through 4 Valve Size) (Flow Up Only)(1)

TEMPER-ATURE, °C(3)	BAR(2)									
	EZ-C Valve Size, NPS									
	2						3		4	
	Port Diameter, mm									
	6.4	9.5	12.7	19.1	25.4	50.8	50.8	75.2	50.8	101.6
-198 to 93	67.6	68.2	68.7	70.3	73.1	101*	69.6	97.2	65.5	114*
93	63.4	64.1	64.8	66.9	69.6	95.8*	66.2	92.4*	62.1	108*
149	60.7	61.4	62.1	63.4	66.2	91.7*	62.7	88.3*	58.6	103*
TEMPER-ATURE, °F(3)	PSI(2)									
	2						3		4	
	Port Diameter, Inches									
	0.25	0.375	0.5	0.75	1	2	2	3	2	4
-325 to 100	980	985	990	1020	1060	1470*	1010	1410	950	1650*
200	920	930	940	970	1010	1390*	960	1340*	900	1560*
300	880	890	900	920	960	1330*	910	1280*	850	1490*

1. EZ-C should not be used in flow down service including on-off applications.
2. Pressure drop cannot exceed maximum inlet pressure as indicated in the specification table on page 2.
3. Pressure drops at intermediate temperatures may be interpolated.
* Pressure drops are in excess of CL600 pressure ratings per ASME B16.34 for CF8M body material.

Table 9. Fisher ET-C and EWT-C Valve Dimensions

VALVE SIZE, NPS	RAISED-FACE FLANGE			G	D		
	A				Stem Diameter, mm (Inches)		
	CL150	CL300	CL600		12.7 (1/2)	19.1 (3/4)	25.4 (1)
mm							
3	298	318	337	97	533	533	- - -
4	353	368	394	129	533	533	- - -
6X4	451	473	508	135	568	568	- - -
8X4	543	568	610	176	570	570	- - -
6	451	473	508	140	- - -	762	762
8X6	543	568	610	183	- - -	797	797
12X6	737	775	819	254	- - -	865	865
8	543	568	610	191	- - -	762	762
10X8	673	708	752	273	- - -	762	762
Inches							
3	11.75	12.50	13.25	3.81	21.00	21.00	- - -
4	13.88	14.50	15.50	5.06	21.00	21.00	- - -
6X4	17.75	18.62	20.00	5.31	22.38	22.38	- - -
8X4	21.38	22.38	24.00	6.94	22.44	22.44	- - -
6	17.75	18.62	20.00	5.50	- - -	30.00	30.00
8X6	21.38	22.38	24.00	7.19	- - -	31.38	31.38
12X6	29.00	30.50	32.25	10.00	- - -	34.06	34.06
8	21.38	22.38	24.00	7.50	- - -	30.00	30.00
10X8	26.50	27.88	29.62	10.75	- - -	30.00	30.00

Figure 3. Fisher ET-C and EWT-C Valve Dimensions (also see table 9)

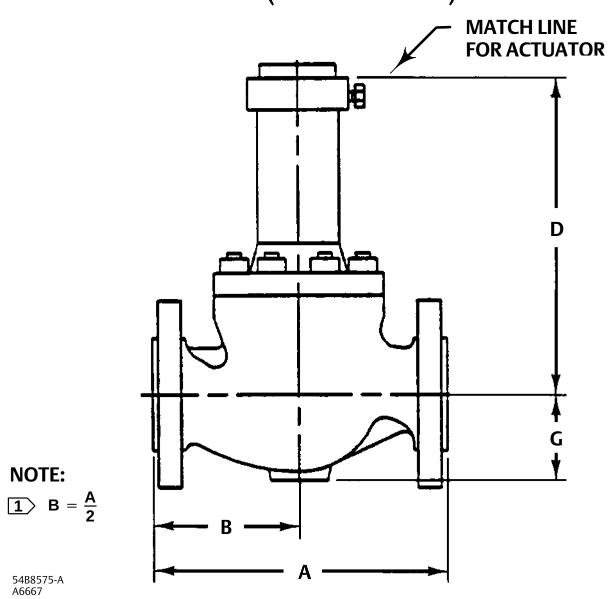


Table 10. Fisher EZ-C Valve Dimensions

VALVE SIZE, NPS	RAISED-FACE FLANGE A			G	D Stem Diameter, mm (Inches)		
	CL150	CL300	CL600		9.5 (3/8)	12.7 (1/2)	19.1 (3/4)
mm							
1	184	197	210	61	535	549	- - -
1-1/2	222	235	251	71	535	548	- - -
2	254	267	286	78	- - -	533	533
3	299	318	337	97	- - -	535	535
4	353	368	394	129	- - -	535	535
Inches							
1	7.25	7.75	8.25	2.38	21.06	21.62	- - -
1-1/2	8.75	9.25	9.88	2.81	21.06	21.56	- - -
2	10.00	10.50	11.25	3.06	- - -	21.00	21.00
3	11.75	12.50	13.25	3.81	- - -	21.06	21.06
4	13.88	14.50	15.50	5.06	- - -	21.06	21.06

Figure 4. Fisher EZ-C Valve Dimensions (also see table 10)

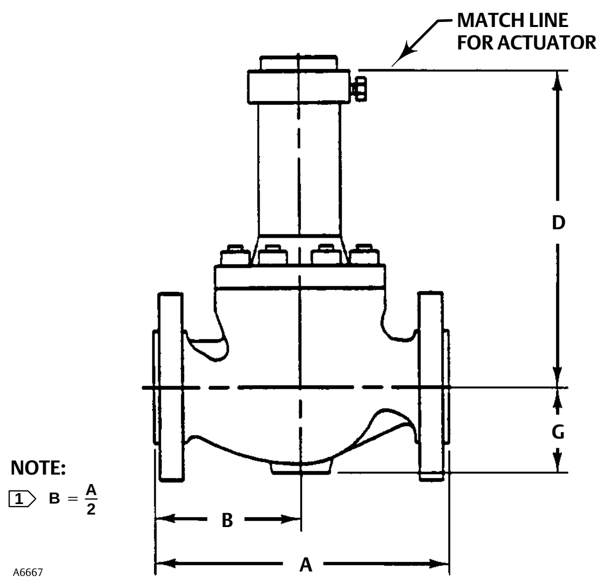
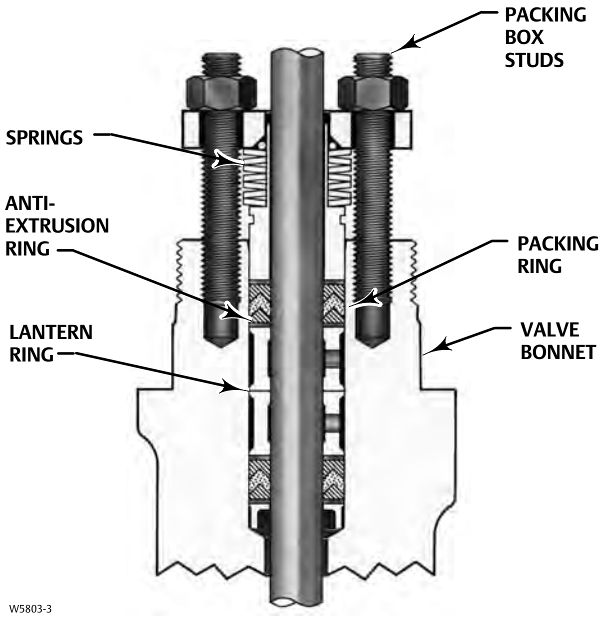
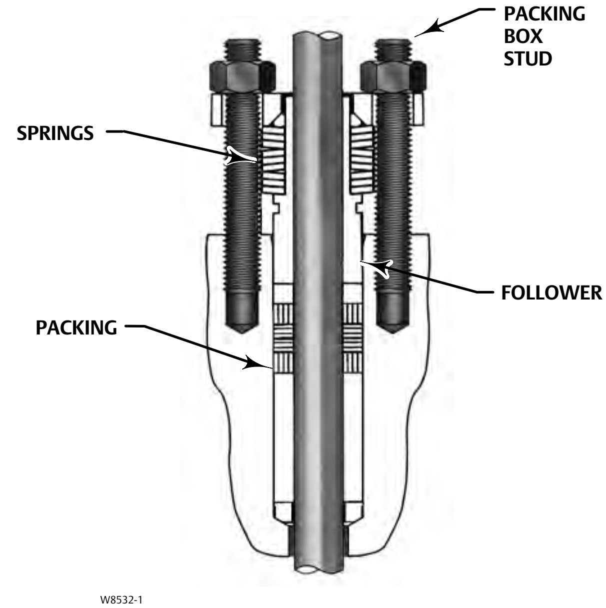


Figure 5. ENVIRO-SEAL Packing Systems



PTFE PACKING



GRAPHITE ULF PACKING

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

ED Valve
D100017X012

Product Bulletin
51.1:ED
October 2020

Fisher™ ED, EAD, and EDR Sliding-Stem Control Valves

Fisher ED, EAD, and EDR single-port control valves shown in figures 1, 2, and 3 have balanced valve plugs, cage guiding, and metal-to-metal seating for all general applications over a wide range of process pressure drops and temperatures. These general purpose, sliding-stem valves are used for either throttling or on-off control of a wide variety of liquids and gases.

The Fisher ED product line is available for a wide range of applications, including sulfide and chloride stress-cracking environments common to the oil and gas production industries. To discuss available constructions, contact your Emerson sales office and include the applicable codes and standards required for these environments.

FISHER ED CONTROL VALVE
WITH 667 ACTUATOR

The easy-e™ Valve Family

ED, EAD, and EDR valves are part of the versatile easy-e family of Fisher industrial control valves. easy-e valves share the following characteristics:

- Multiple trim material choices
- Trim temperature capability with standard metal seats to 427°C (800°F)
  - FGM gaskets
- Interchangeable, restricted-capacity trims and full-size trims match variable process flow demands
- Different cage/plug styles provide particular flow characteristics for highly-specialized applications. The standard cage comes in three different flow characteristics:
  - quick-opening
  - linear
  - equal percentage
- Noise in gaseous service may be attenuated by using Whisper Trim™ I, Whisper Trim III (figure 8), and WhisperFlo™ cages (figure 10)
- 316 stainless steel packing box parts are standard (including packing flange, studs, and nuts)

Features

- **Compliance with the Clean Air Act—**Optional ENVIRO-SEAL™ packing systems (figure 6) provide an improved stem seal to help prevent the loss of process fluid. The ENVIRO-SEAL packing systems feature PTFE, Graphite ULF, or Duplex packing with live-loading for reduced packing maintenance.

- **Valve Plug Stability—** Rugged cage guiding provides high valve plug stability, which reduces vibration and mechanical noise.

- **More Flow Capacity for Initial Investment—** Streamlined flow passages in the the ED, EAD, and EDR valves provide excellent capacities and flow.

- **Balanced Valve Plug Construction—** Balanced valve plug construction permits use of smaller, lower-cost Fisher actuators. Also, trim inventory costs are cut because dimensional standardization permits use of most standard easy-e trim parts.

- **Compliance with European Standards—** Valves are available with dimensions specified by EN/DIN standards. See figure 12.

- **High-Temperature Capability with Class IV or Class V Shutoff—**Use of multiple graphite piston rings (figure 1) permit Class IV shutoff up to 593°C (1100°F). Use of C-seal trim (see figure 5) permits Class V shutoff up to 593°C (1100°F).

- **Sour Service Capability—** Unless otherwise noted, references are to NACE MR0175-2002. Optional materials are available to meet NACE MR0103 and NACE MR0175 / ISO 15156. Material requirements under these standards vary by edition and year of issue; the specific standard must be specified.

- **Operating Economy—**Increased wear resistance provided by standard hardened stainless steel trim means long service life.

- **Maintenance Economy—**The valve body can stay in the pipeline during removal of trim parts. The EDR valve also features easy valve access without removing the actuator.

Table of Contents

Specifications

Available Configurations

ED: Single-port, globe-style control valve with cage guiding, balanced valve plug, and push-down-to-close valve plug action (figure 1)
EAD: Angle version of ED control valve, used to facilitate piping or in applications where a self-draining valve is desired (figure 2)
EDR: Same as ED control valve except with push-down-to-open valve plug action (figure 3)

Valve Sizes

See table 2

End Connection Styles(1)(2)

Cast Iron Valves
Flanged: ED, NPS 1 through 8, ■ CL125 flat-face or ■ CL250 raised-face flanges per ASME B16.1
Steel and Stainless Steel Valves
Flanged: ■ CL150, 300, or 600 raised-face (RF) or ring-type joint (RTJ) flanges per ASME B16.5, ■ Raised-face (RF) flanges per EN1092-1/B
Screwed or Socket Welding: NPS 1 through 2, consistent with ASME B16.11
Buttwelding: NPS 1 through 8
Schedules 40 or 80 consistent with ASME B16.25

Socket weld end connection style is not available for EAD
Also, see table 2 and figures 12 and 13

Maximum Inlet Pressures and Temperatures(1)(2)

As listed below, unless limited by maximum pressure drop or material temperature capabilities
Cast Iron Valves
Flanged: Consistent with CL125B or 250B per ASME B16.1
Steel and Stainless Steel Valves
Flanged: Consistent with CL150, 300, and 600(3) per ASME B16.34
Screwed or Welding: Consistent with CL600(3) per ASME B16.34

Maximum Pressure Drop(2)

Same as maximum inlet pressure for specific construction defined above, except where further limited as follows:

All Valves Except Those with Whisper Trim III and WhisperFlo Cages: See figure 9
Valves with Whisper Trim III Cages : 0.999 $\Delta P/P_1$ maximum for levels A1 through D3
Valves for NACE MR0175 / ISO 15156 and MR0103: See figure 11

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

Class II: Standard with single graphite ring and 33 through 203 mm (1.3125 through 8-inch) port size
Class III: Optional for valves with single graphite piston ring and 87 mm (3.4375 inch) or larger port diameter
Class IV: For valves with multiple graphite piston rings and 111 mm (4.375 inch) or larger port diameter
Class V High-Temperature: For valves with port diameters from 73 through 203.2 mm (2.875 through 8-inch) with optional C-seal trim. See table 1

Construction Materials

Valve Body, Bonnet, and Bonnet Spacer or Bottom Flange, if used: ■ Cast iron, ■ WCC carbon steel, ■ CF8M (cast 316 stainless steel), ■ LCC carbon steel, ■ WC9 chrome moly steel, ■ CF3M (cast 316L stainles steel) or ■ other materials upon request
Valve Plug, Cage, and Metal Seating Parts
All Valves Except Those with Whisper Trim III and WhisperFlo Cages: See table 3
Valves with Whisper Trim III and WhisperFlo Cages: See tables 4 and 5
Valves for NACE Specification: See table 10
Bellows Seal Assembly: ■ N06625/S31603 or ■ N06022/N06022
All Other Parts: See table 6

- continued -

Specifications (continued)

Material Temperature Capabilities(2)

Valve Body/Trim Combinations
All Valves Except Those with Whisper Trim III and WhisperFlo Cages: See table 7
Valves with Whisper Trim III Cages: See table 4
Valves with WhisperFlo Cages (NPS 4 and 6 ED): See table 5
All Other Parts: See table 6

Flow Characteristics

Standard Cages: ■ Quick-opening, ■ linear, or ■ equal percentage
Whisper Trim and WhisperFlo Cages: Linear

Flow Directions

ED or EAD: ■ Standard Cage--Normally down, ■ Whisper Trim and WhisperFlo Cages—Always up
EDR: ■ Standard Cage--Normally up, ■ Whisper Trim Cage—Always down

Flow Coefficients and Noise Level Prediction

See table 9 and Catalog 12

Port Diameters and Valve Plug Travels

See table 11

Yoke Boss and Stem Diameters

See table 11

Typical Bonnet Styles

■ Plain or ■ extension. See figures 12 and 13 for standard dimensions. See table 8 for selection guidelines
■ ENVIRO-SEAL bellows seal bonnet. See figure 12 for standard dimensions. See figure 7 for view of ENVIRO-SEAL bellows seal bonnet. Also, see Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets (D101641X012), for further information

Packing Arrangements

■ Single PTFE V-ring (standard), ■ double arrangements, ■ leak-off arrangements, ■ ENVIRO-SEAL packing system. See figure 6 for ENVIRO-SEAL configuration
ENVIRO-SEAL Packing Systems in vacuum service: Standard ENVIRO-SEAL packing systems can be used in vacuum service with packing rings in standard orientation. Do not reverse the ENVIRO-SEAL PTFE packing rings. See Bulletin 59.1:061, ENVIRO-SEAL Packing Systems for Sliding-Stem Valves (D101633X012), for further information

Approximate Weights

NPS 1: 14 kg (30 lb)
NPS 1-1/2: 20 kg (45 lb)
NPS 2: 39 kg (85 lb)
NPS 2-1/2: 45 kg (100 lb)
NPS 3: 57 kg (125 lb)
NPS 4: 77 kg (170 lb)
NPS 6: 159 kg (350 lb)
NPS 8: 408 kg (900 lb)

Optional Safety Instrumented System Classification

SIL3 capable — certified by exida Consulting LLC

Additional Options

■ Seal welding of EDR valve body/bonnet joint for temperatures above 232°C (450°F), ■ lubricator, ■ lubricator/isolating valve, ■ drilled and tapped connection in extension bonnet for leak-off service, ■ valve body drain plug, ■ style 3 fabricated extension bonnet made on order to a specific length for cryogenic service, ■ style NS bonnet for seismic service requirements, ■ packings suitable for nuclear service, ■ C-seal trim for Class V high-temperature shutoff

1. EN (or other) ratings and end connections can usually be supplied; consult your Emerson sales office.
2. The pressure/temperature limits in this bulletin and in any applicable standard limitations should not be exceeded.
3. Certain bonnet bolting material selections may require a CL600 easy-e valve assembly to be derated. Contact your Emerson sales office for more information.
4. Limitation based on excessive noise increases if max $\Delta P/P1$ ratio for a given cage level is exceeded.

ENVIRO-SEAL Packing System Specifications

Applicable Stem Diameters

■ 9.5 mm (3/8 inches), ■ 12.7 (1/2), ■ 19.1 (3/4), ■ 25.4 (1), and ■ 31.8 (1-1/4) diameter valve stems

Maximum Pressure/Temperature Limits[1]

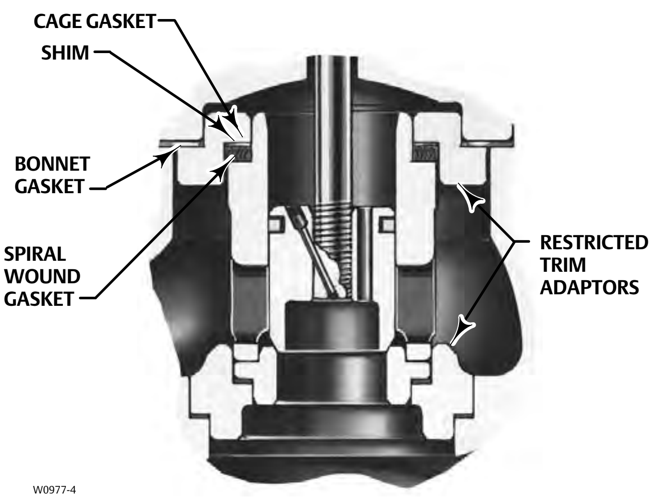
To Meet the EPA Fugitive Emission Standard of 100 PPM[2]
For ENVIRO-SEAL PTFE and ENVIRO-SEAL Duplex packing systems: full CL300 up to 232°C (450°F)
For ENVIRO-SEAL Graphite ULF packing system: 104 bar (1500 psig) at 316°C (600°F)

Construction Materials

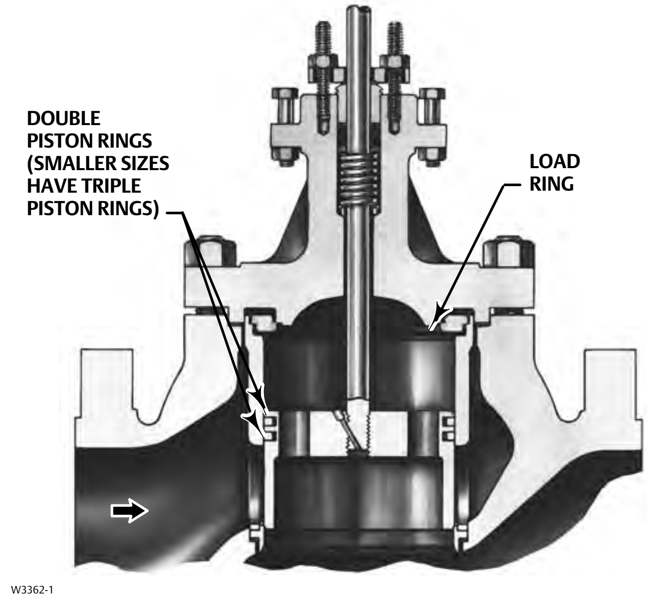
PTFE Packing Systems
Packing Ring and Lower Wiper: PTFE V-ring[3]
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Anti-Extrusion Washer: Filled PTFE
Lantern Ring: S31600 (316 stainless steel)
Spring: ■ 17-7PH stainless steel or ■ N06600
Packing Box Flange: S31600
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: Strain-hardened 316 stainless steel
Packing Box Nuts: 316 stainless steel SA194 Grade 8M
Graphite ULF Packing Systems
Packing Ring: Graphite rings
Spring: ■ 17-7PH stainless steel or ■ N06600
Packing Box Flange: S31600
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: Strain-hardened 316 stainless steel
Packing Box Nuts: 316 stainless steel SA194 Grade 8M

1. Refer to the valve specifications in this bulletin for pressure/temperature limits of valve parts. Do not exceed the pressure/temperature rating of the valve. Do not exceed any applicable code or standard limitation.
2. The Environmental Protection Agency (EPA) has set a limit of 100 parts per million (ppm) for fugitive emissions from a valve in selected VOC (Volatile Organic Compound) services.
3. In vacuum service, reversing the ENVIRO-SEAL PTFE packing rings is not necessary.

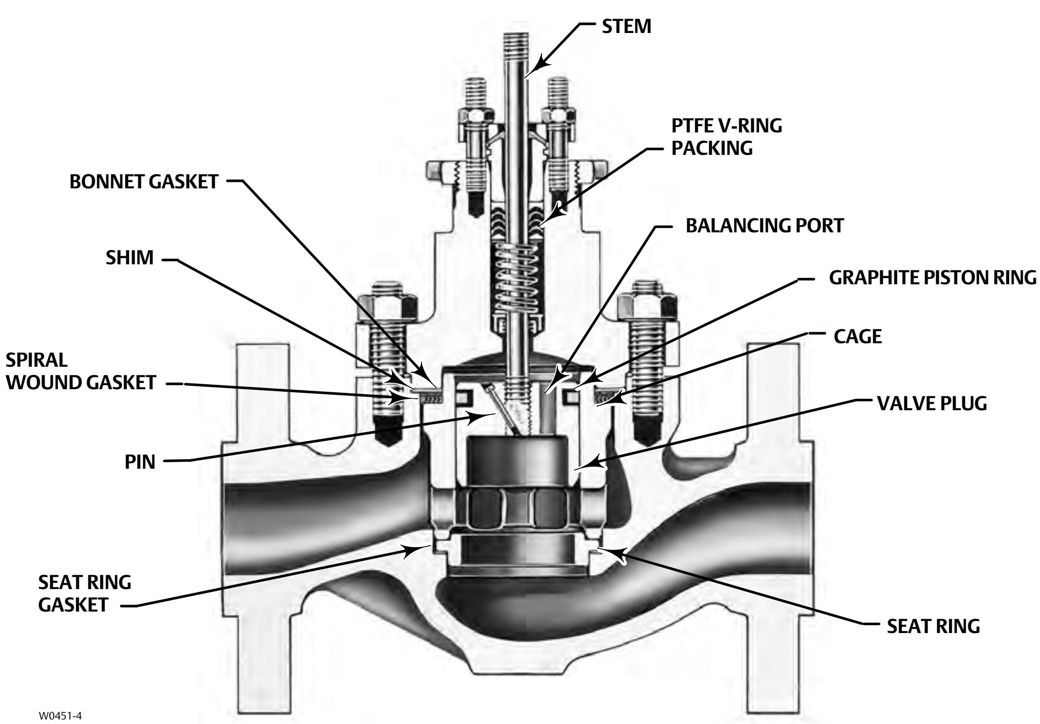
Figure 1. Fisher ED Sectional



RESTRICTED TRIM



NPS 8 VALVE WITH OPTIONAL MULTIPLE PISTON RINGS FOR CLASS IV SHUTOFF (ALSO AVAILABLE IN OTHER SIZES)



STANDARD NPS 1 THROUGH 6 CONSTRUCTION

Figure 2. Fisher EAD Sectional

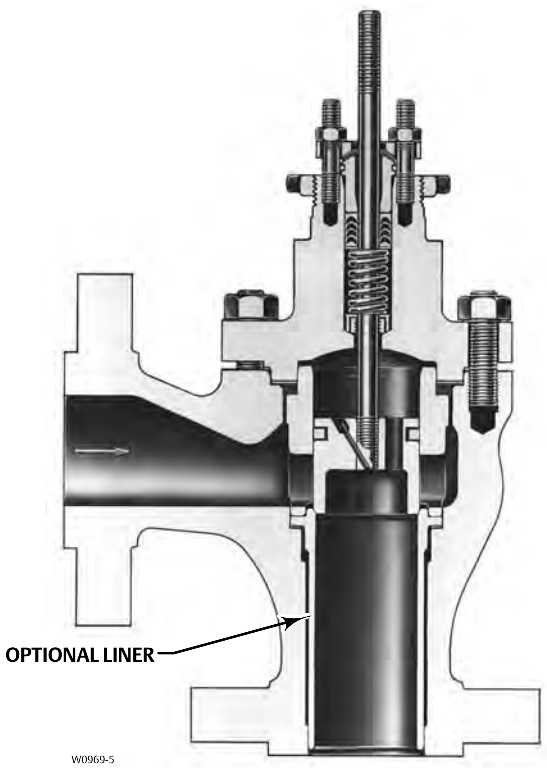


Figure 3. Fisher EDR Sectional

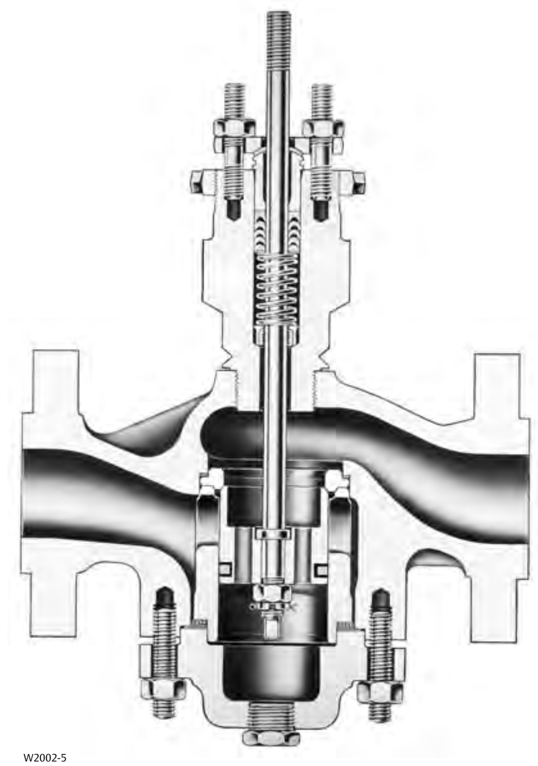


Figure 4. Typical Valve with WhisperFlo Aerodynamic Trim

WhisperFlo TRIM

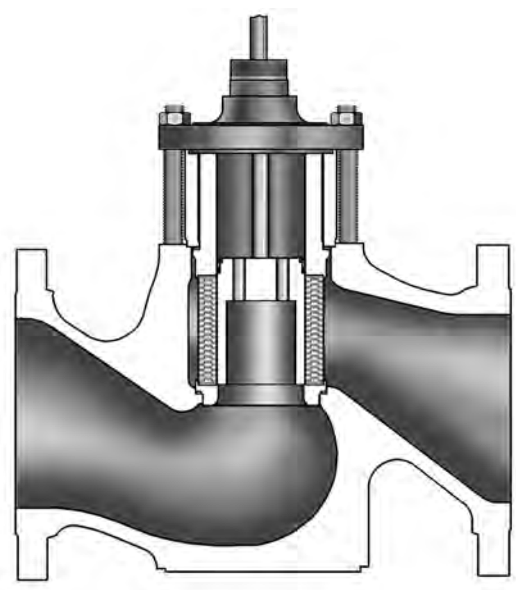
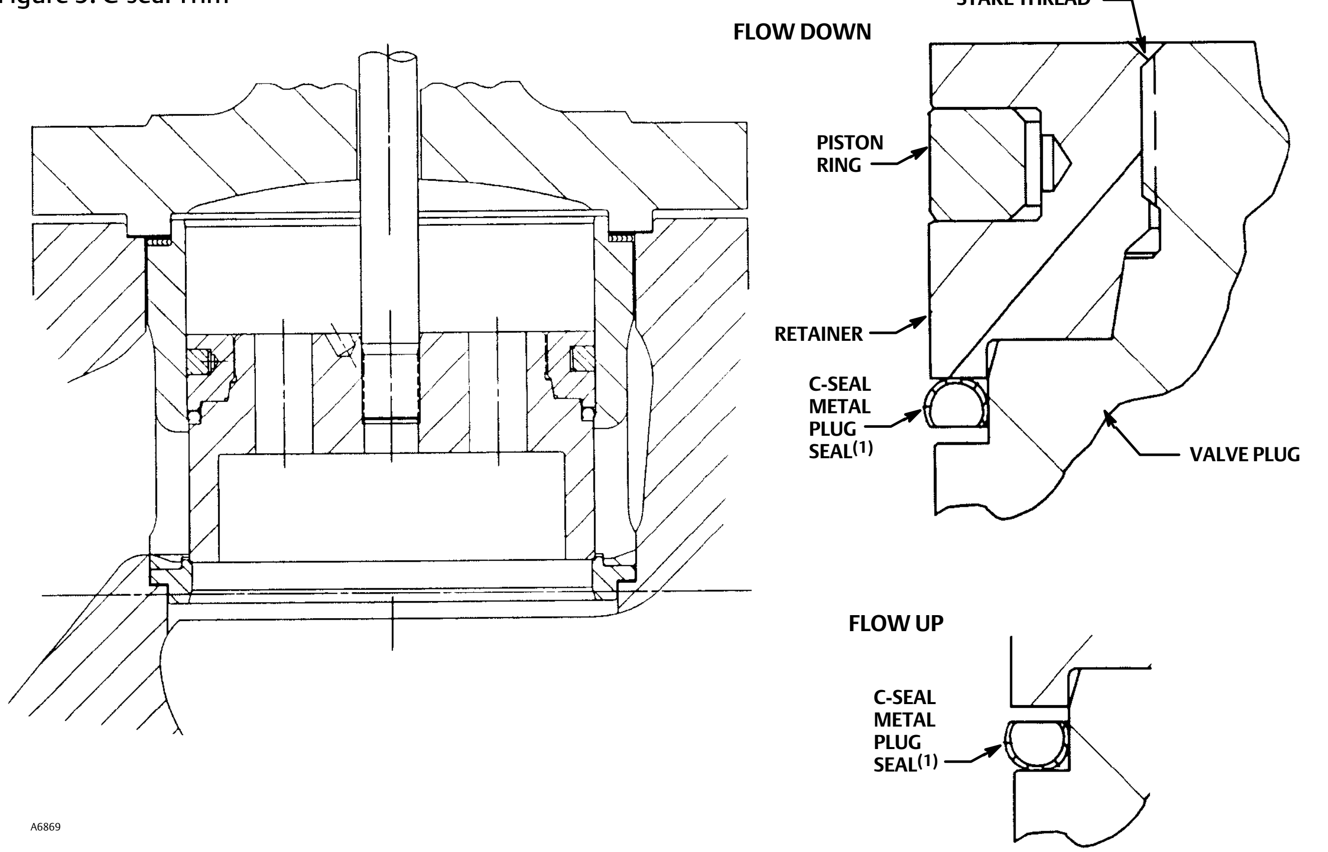


Table 1. C-seal Shutoff Classification

VALVE (PRESSURE RATING)	VALVE SIZE	PORT DIAMETER		CAGE STYLE	ANSI/FCI LEAKAGE CLASS
	NPS	mm	Inches		
ED (CL150-600)	2 1/2	73	2.875	Eq.%, Linear, Whisper I, Cav III 1 stage, Whisper III	V to 593°C (1100°F) [for port diameters from 73 through 203.2 mm (2.875 though 8-inch) with optional C-seal trim]
	3	87.3	3.4375		
		73	2.875	Cav III 2 stage	
	4	73	2.875	Eq.%, Linear, Whisper I, Cav III 1 stage, Cav III 2 stage	
		87.3	3.4375	Whisper III	
		11.1	4.375	Eq.%, Linear, Whisper I, Cav III 1 stage, Whisper III	
	6	136.5	5.375	Whisper III, Cav III 2 stage	
		177.8	7	Eq.%, Linear, Whisper I, Cav III 1 stage, Whisper III	
	8	177.8	7	Cav III 2 stage	
		203.2	8	Eq.%, Linear, Whisper I, Cav III 1 stage, Whisper III	

Figure 5. C-seal Trim



Note:
1. Reverse the orientation of the C-seal plug seal for proper shutoff when valve is used in a process with different fluid flow direction.

Table 2. Available Constructions

VALVE	VALVE SIZE, NPS	VALVE BODY MATERIAL AND END CONNECTION STYLE(1)							
		Carbon Steel, Alloy Steel, or Stainless Steel Valve Body						Cast Iron Valve Body	
		Screwed	RF or RTJ Flanged CL150	RF or RTJ Flanged CL300	RF or RTJ Flanged CL600	Butt-welding	Socket Weld	CL125 FF Flanged	CL250 RF Flanged
ED	1, 1-1/2, or 2	X	X	X	X	X	X	X	X
	2-1/2, 3, 4, 6, or 8	---	X	X	X	X	---	X	X
EAD	1 or 2	---	X	X	X	X	---	---	---
	3, 4, or 6	---	X	X	X	X	---	---	---
EDR	1, 1-1/2, or 2	X	X	X	X	X	X	X	X
	2-1/2, 3, or 4	---	X	X	X	X	---	X	X

VALVE	VALVE SIZE, DN	STEEL VALVE BODY MATERIAL AND RAISED-FACE END CONNECTION STYLE(2)				
		PN16	PN25	PN40	PN63	PN100
ED	25, 40, 50, 65, 80, 100, 150, or 200	X	X	X	X	X
EAD	25, 50, 80, 100, or 150	X	X	X	X	X
EDR	25, 40, 50, 65, 80, or 100	X	X	X	X	X

X = Available Construction.
1. End connection style abbreviations: FF - Flat Faced, RF - Raised Face, RTJ - Ring Type Joint.
2. End connection EN1092-1/B.

C-seal Trim Description

C-seal trim is available for valves with port diameters from 2.875 inches through 8 inches.

With C-seal trim, a balanced valve can achieve high-temperature, Class V shutoff. Because the C-seal plug seal is formed from metal (N07718 nickel alloy) rather than an elastomer, a valve equipped with the C-seal trim can be applied in processes with a fluid temperature of up to 593°C (1100°F).

ENVIRO-SEAL and HIGH-SEAL Packing Systems

ENVIRO-SEAL and HIGH-SEAL packing systems offer exceptional sealing capabilities. They easily install in your existing valves or can be purchased with new valves. These systems may help prevent the loss of process fluid. The long operational life and reliability of these systems also reduces your maintenance costs and downtime.

For applications requiring compliance with environmental protection regulations, the unique Fisher ENVIRO-SEAL packing system (figure 6) and a unique ENVIRO-SEAL bellows seal system (figure 7) are offered. The emission control packing system keeps emission concentrations below the EPA 100 ppm requirement.

For an excellent stem seal in applications that are not environmentally-sensitive, the Fisher HIGH-SEAL Graphite ULF packing system (figure 6) is offered. The HIGH-SEAL packing system provides excellent sealing at pressure/temperature ratings beyond ENVIRO-SEAL limits. ENVIRO-SEAL systems may also be applied for excellent stem sealing in higher pressure/temperature applications not requiring EPA compliance.

ENVIRO-SEAL packing systems, available with PTFE, Graphite ULF, or Duplex packing, and the HIGH-SEAL packing systems, Graphite ULF and graphite composite, feature live-loading and unique packing-ring arrangements for long-term, consistent sealing performance.

Table 3. Typical Combinations of Metal Trim Parts(1) for all Valves Except Those for NACE Specification, Whisper Trim III, and WhisperFlo Cages

Trim Designation	Valve Plug	Cage	Seat Ring	Liner (EAD Valve Only)
1 (standard for ED, EAD, and EDR in all valve body materials except CF8M)	S41600 HT	17-4 SST HT(8)	S41600 HT or CA15 HT(2)	S41600 HT
	17-4 SST HT(8)			
3(7) and 3H(3)	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	R30006 or R30016 (alloy 6)	R30006 (alloy 6)	- - -
4(4)	S31600	17-4 SST HT	S31600	S31600
5(6) and 5H(3)(6)	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	R31233	R30006 (alloy 6)	- - -
6(6)	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	S31603 CRPL	R30006 (alloy 6)	- - -
27	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	R30006 (alloy 6)	- - -
28(5)	S31600 with seat hard faced with CoCr-A hardfacing alloy			
29 (standard for CF8M bodies in all designs)(5)	S31600	316 SST with electroless nickel coating (ENC)	S31600	S31600
37 and 37H(3)	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	17-4 SST HT	R30006 (alloy 6)	- - -
316L	S31603	316 SST with electroless nickel coating (ENC)	S31603	- - -
316L HF	S31603 with seat and guide hard faced with CoCr-A hardfacing alloy	316L SST with electroless nickel coating (ENC)	R30006 (alloy 6)	- - -

1. Nonferrous-alloy combinations are also available. Consult your Emerson sales office for details.
2. CA15 is used for NPS 6 and 8 full-size and restricted-trim valves.
3. Trims 3H, 5H, and 37H have clearances for high-temperature service.
4. Not for use with Whisper Trim I.
5. Not use with Whisper Trim I with 136 mm (5.375 inch) and larger ports.
6. Only available for NPS 8 Whisper Trim I.
7. For trim 3, upper temperature limited to 316°C (600°F) when used for Whisper Trim I.
8. For NPS 8 Whisper Trim 1.

Table 4. Whisper Trim III Metal Trim Part Materials and Body/Trim Temperature Capabilities

TRIM DESIGN-ATION	VALVE PLUG	CAGE	CAGE RETAINER	BAFFLE (FOR LEVEL D3 CAGE ONLY)	SEAT RING FOR METAL-SEAT CONSTR-UCTION	DISK SEAT AND RETAINER FOR PTFE-SEAT CONSTR-UCTION	STEM	BODY, BONNET & BONNET SPACER	MATERIAL TEMPERATURE CAPABILITY			
									°C		°F	
									Min	Max	Min	Max
19.1 through 111.1, 177.8 and 203.2 mm (0.75 through 4.375, 7 and 8 Inch) Port Sizes												
301G	S41600	17-4 SST	--	Steel	S41600	--	S31600	WCC, WC9	-29	427	-20	800
								CF8M[8]	-29	176	-20	350
312G[1]	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	--	S31600	R30006	--	S20910	WCC, WC9	-29	343	-20	650
								CF8M	29	343	-20	650
315G[1]	S31600/ CoCr-A Seat & Guide	316 SST Chrome Plate	--	S31600	R30006	--	S20910	WCC, WC9	-29	316	-20	600
								CF8M	-198	316	-325	600
318G	F22/ CoCr-A Seat & Guide	2.25 Cr-1 Mo Nitrided	--	WC9	R30006	--	S41000/ S42200[4]	WCC	-29	427	-20	800
								WC9	-29	593	-20	1100
306	S31803/ CoCr-A Seat & Guide (< 3"Port), S31803/ Ultimet Seat & Guide (≥ 3"Port)	2205 Duplex [5] Chrome Plate	--	S31803	S31803/ CoCr-A (< 3"Port), S31803/ Ultimet (≥ 3"Port)	--	S31803	WCC, WC9, CF8M	-29	316	-20	600
307G	S31600/ CoCr-A Seat & Guide	17-4 SST	--	Steel	R30006	--	S31600	WCC, WC9	-29	210	-20	410
307GH[3]	S31600/ CoCr-A Seat & Guide	17-4 SST	--	Steel	R30006	--	S31600	WCC, WC9	210	427	410	800

-continued-

Table 4. Whisper Trim III Metal Trim Part Materials and Body/Trim Temperature Capabilities (continued)

TRIM DESIGNATION	VALVE PLUG	CAGE	CAGE RETAINER	BAFFLE (FOR LEVEL D3 CAGE ONLY)	SEAT RING FOR METAL-SEAT CONSTRUCTION	DISK SEAT AND RETAINER FOR PTFE-SEAT CONSTRUCTION	STEM	BODY, BONNET & BONNET SPACER	MATERIAL TEMPERATURE CAPABILITY			
									°C		°F	
									Min	Max	Min	Max
136.5 mm (5.375 Inch) Port												
301	S17400	416 SST	WCC/ENC	Steel	S41600	--	S31600	WCC, WC9	-29	343	-20	650
								CF8M	-29	163	-20	325
301 A	S17400	416 SST	WCC/ Nitrided	Steel	S41600	--	S31600	WCC, WC9	232	427	450	800
304	S31600/ CoCr-A Seat & Guide	416 SST	WCC/ENC	Steel	S31600/ CoCr-A Seat	--	S31600	WCC, WC9	-29	343	-20	650
								CF8M	-29	177	-20	350
312[1]	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	316/ENC Electroless Nickel Coated	S31600	R30006	--	S20910	WCC, WC9, CF8M	-29	343	-20	650
315	S31600/ CoCr-A Seat & Guide	316 SST/ Electrolyzed Chrome Coat	S31600/ Electrolyzed Chrome Coat	S31600	S31600/ CoCr-A	--	S31600/ S20910[7]	WCC, WC9	-29	260	-20	500
								CF8M	-198	537[2]	-325	1000[2]
318	S31600/ CoCr-A Seat & Guide	2.25 Cr-1 Mo Nitrided	WC9 Nitrided[6]	WC9	S31600/ CoCr-A Seat	--	S20910	WCC	-29	427	-20	800
								WC9	-29	593	-20	1100
306	S31803/ Ultimet Seat & Guide	2205 Duplex[5] Chrome Plate	--	S31803	S31803/ Ultimet	--	S31803	WCC, WC9, CF8M	-29	316	-20	600

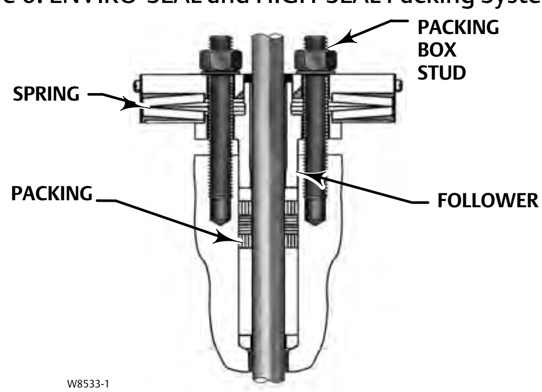
1. NACE compatible trims meets NACE MR0175 2002, MR0175/ISO15156, MR0103.
2. May be used up to 593°C (1100°F) If manufacturing process controls carbon content to 0.04% minimum or 0.08% maximum.
3. For high temperature service.
4. Trim 318G uses S41000 stem up to 538°C (1000°F) and S42200 stem above 538°C (1000°F).
5. 22 Cr-5Ni duplex stainless steel.
6. With C-seal construction use F22 alloy steel/CoCr-A/Nitrided cage material.
7. Trim 315 uses S31600 stem up to 427°C (800°F) and S20910 stem above 427°C (800°F).
8. Trim 301G can be used up to 216°C (420°F) with NPS 3 CF8M body, can be used up to 288°C (550°F) with NPS 2 CF8M body.

Table 5. WhisperFlo Metal Trim Part Materials and Valve Body/Trim Temperature Capabilities (NPS 4 and 6 Fisher ED)

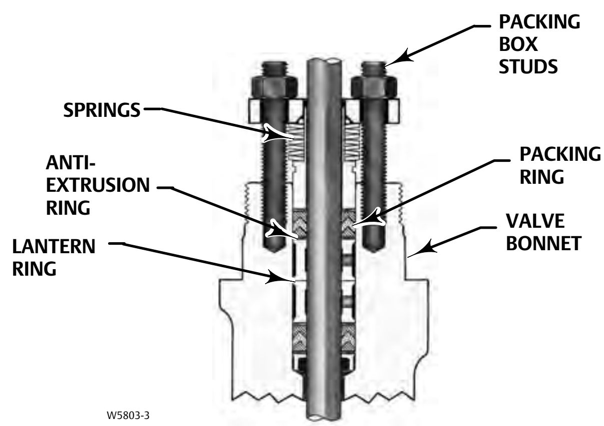
TRIM DESIGNATION	VALVE BODY	VALVE PLUG	CAGE	CAGE RETAINER	SEAT	MATERIAL TEMPERATURE CAPABILITY			
						°C		°F	
						Min	Max	Min	Max
901	WCC	S41600	410 SST	WCC ENC	S41600	-29	343	-20	650
902	WCC	S31600/CoCrA Seat and Guide	410 SST	WCC ENC	S31600/CoCrA	-29	343	-20	650
915	WCC	S31600/CoCrA Seat and Guide	410 SST	WCC/Nitride	S31600/CoCrA	343	427	650	800
916	WC9	S31600/CoCrA Seat and Guide	410 SST	WC9/Nitride	S31600/CoCrA	343	538	650	1000
926	WCC	S31600/CoCrA Seat and Guide	410 SST NACE	WCC/NACE/ENC	S31600/CoCrA	-29	343	-20	650
936	316 CF8M	S31600/CoCrA Seat and Guide	316 SST/ R31233	S31600/ENC	S31600/CoCrA	-198	343	-325	650
946	316 CF8M	S31600/CoCrA Seat and Guide	316 SST/ R31233	S31600/Nitride	S31600/CoCrA	343	538	650	1000
990	CD3MN	S31803/CoCrA Seat and Guide	2205 Duplex(1)/ R31233	S31803/ Cr Plate	S31803/CoCrA Seat	-51	316	-60	600
	LCC					-46	316	-51	600
	WCC					-29	316	-20	600

1. 22 Cr-5Ni duplex stainless steel

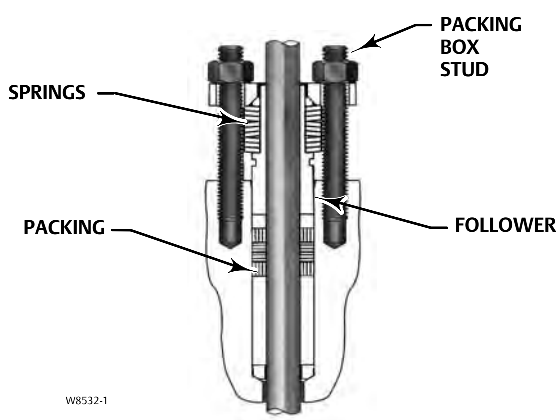
Figure 6. ENVIRO-SEAL and HIGH-SEAL Packing Systems



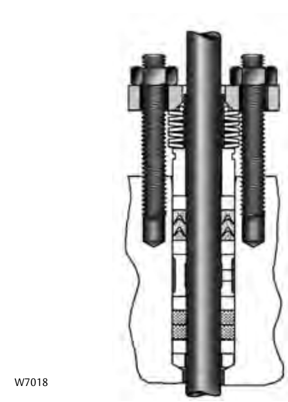
TYPICAL HIGH-SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH PTFE PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH DUPLEX PACKING

Figure 7. Cutaway of ENVIRO-SEAL Bellows Seal Bonnet and Internal Shroud, Showing Bellows

Figure 8. Whisper Trim III Cage in Fisher ED Valve

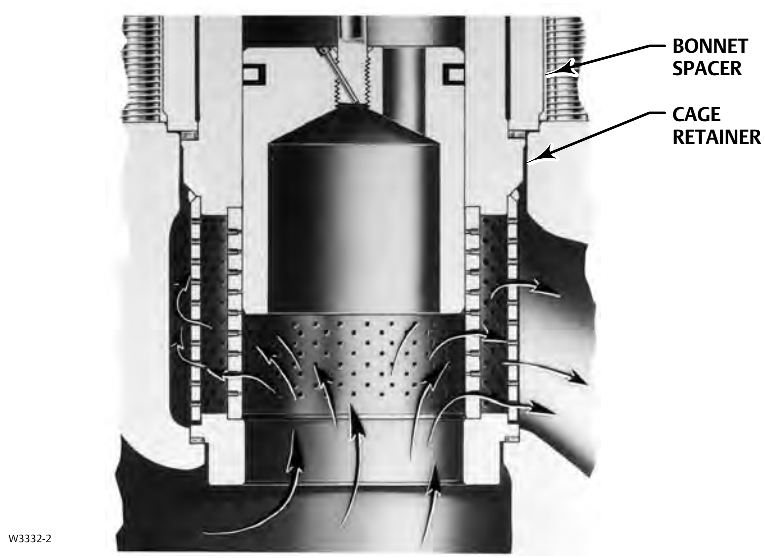
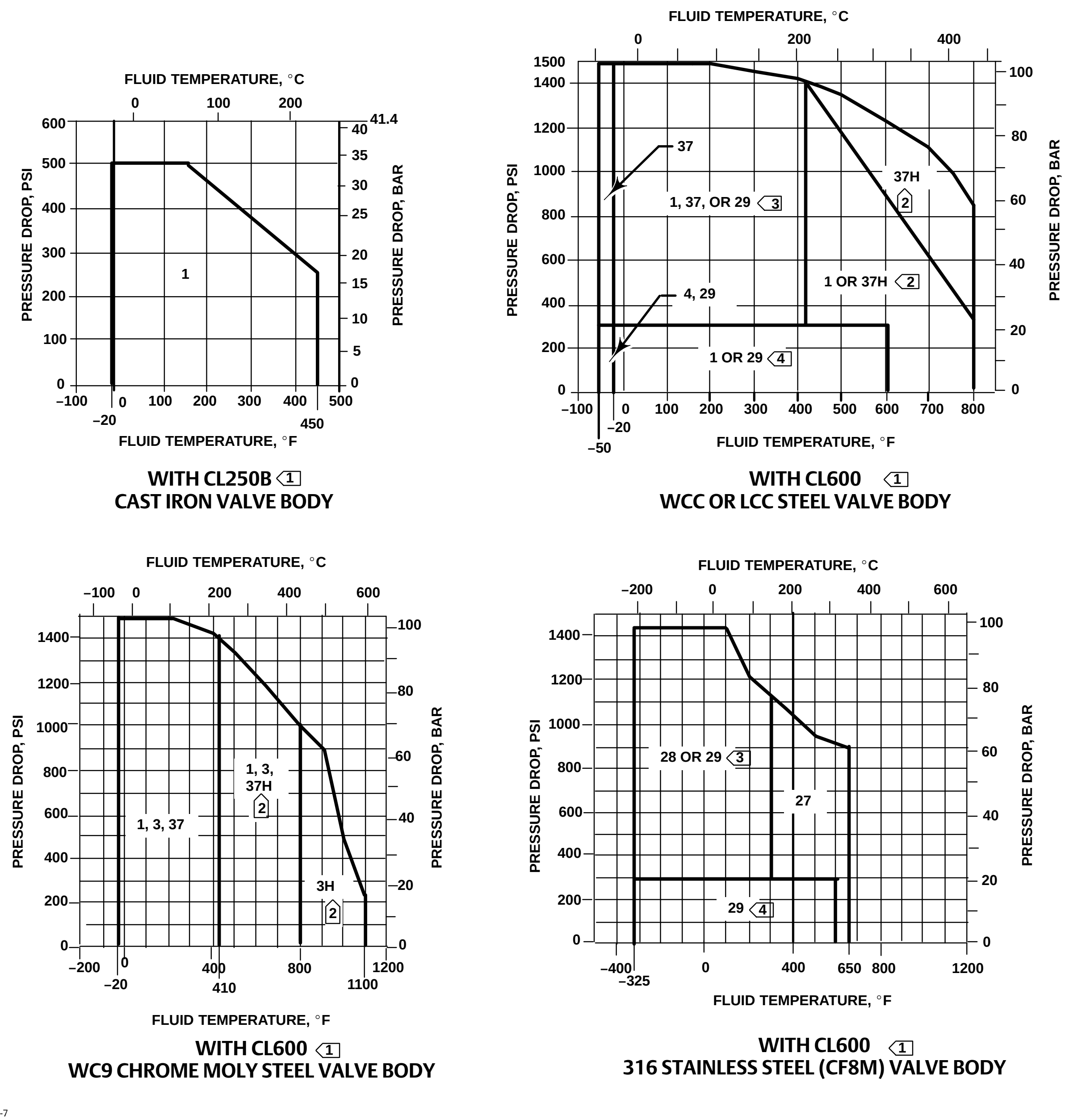


Table 6. Materials and Temperature Limits for All Other Parts

PART			MATERIAL		MATERIAL TEMPERATURE CAPABILITY °C Min	°C Max	°F Min	°F Max
Body-to-bonnet bolting. See table 13 for NACE bolting materials and temperature limits	Cast iron valve body	Cap screws	Steel SAE Grade 5		-29	232	-20	450
	WCC, or WC9 valve body	Studs	Steel SA-193-B7		-29	427(1)	-20	800(1)
		Nuts	Steel SA-194-2H					
	LCC valve body	Studs	Steel SA-193-B7		-46	343(1)	-50	650(1)
		Nuts	Steel SA-194-2H					
	WC9 valve body	Studs	Steel SA-193-B16		-29	566(1)	-20	1050(1)
		Nuts	Steel SA-194-7					
	CF3M or CF8M (316 SST) valve body	Studs	Steel SA-193-B7 (NACE [non-exposed bolting])		-48	427(1)	-55	800(1)
		Nuts	Steel SA-194-2H (NACE [non-exposed bolting])					
		Studs	304 stainless steel SA-320-B8		-198	38	-325	100
		Nuts	304 stainless steel SA-194-8					
		Studs	316 stainless steel SA-193-B8M (strain hardened)		-198(2)	427(1)	-325(2)	800(1)
		Nuts	316 stainless steel SA-194-8M					
Piston ring			Graphite (FMS 17F27)	Oxidizing service	-46(3)	427	-50(3)	800
				Non-oxidizing service	-46(3)	482	-50(3)	900
			Graphite (FMS17F39)	Oxidizing service	-46(3)	560	-50(3)	1000
				Non-oxidizing service	-46(3)	593	-50(3)	1100
Valve plug stem			S31600 (S20910, NACE Std.) or S31603		-198(2)	593	-325(2)	1100
Pin (ED or EAD valve only)			S31600 or S31603					
Castle nut and cotter pin (EDR valve only)			18-8 stainless steel					
Load ring (NPS 8 ED valve only)			S17400		-101	316	-150	600
			N06600		-254	593	-425	1100
			N05500		-204	260	-400	500
Restricted trim adaptors			Cast iron		-73	232	-100	450
			WCC steel		-29	427	-20	800
			S31600		-198(2)	593	-325(2)	1100
Seat ring, bonnet and cage gaskets			FGM (standard)		-198	593(4)	-325	1100(4)
			PTFE-coated N04400		-73	149	-100	300
Spiral wound gaskets			N06600/graphite (FGM-standard)		-198	593(4)	-325	1100(4)
			N04400/composition		-73	232	-100	450
Shim			S31600		These materials not limiting factors			
			N04400					
Packing (temperatures shown are material temperature capabilities). See table 8 for proper bonnet selection.			PTFE V-ring		-40	232	-40	450
			PTFE/composition		-73	232	-100	450
			Graphite ribbon/filament		-198	538(6)	-325	1000(6)
			Graphite ribbon for high-temperature oxidizing service		371	649	700	1200
Packing flange, studs and nuts when used with standard bonnet			S31600		-198(2)	593(1)	-325(2)	1100(1)
Packing follower, and packing spring(5) or lantern ring			S31600		-198(2)	593	-325(2)	1100
Packing box ring			S31600					
Extension bonnet bushing		Trims 1 & 37H	S41600		-29	427	-20	800
		Other trims	S31600		-198(2)	593	-325(2)	1100

1. Lubricated nuts are standard.
2. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.
3. This minimum is due to thermal expansion differential between piston ring and cage at low temperatures.
4. Except 427°C (800°F) on oxidizing service.
5. Spring is used only with single PTFE V-ring packing; lantern ring replaces spring in other packings.
6. Except 371°C (700°F) on oxidizing service.

Figure 9. Typical Trim Used for All Valves Except with Whisper Trim III Cage and WhisperFlo Cage



Notes:
1. Do not exceed the maximum pressure and temperature for the pressure rating of the valve material used, even though the trims shown may have higher capabilities.
2. Be especially careful to specify service temperature if trim 3 or 37 is selected, as different thermal expansion rates require special plug clearances. Specify trim 37H for temperatures above 210°C (410°F). Specify trim 3H for temperatures above 427°C (800°F).
3. Trim 29 may be used up to 103 bar (1500 psi) with clean, dry gas.
4. Use trim 27 instead of trim 29 for nonlubricating fluids such as superheated steam or dry gases between 149 and 316°C (300 and 600°F).

Table 7. Valve Body/Trim Temperature Capabilities[1] For All Valves Except with Whisper Trim III Cage and NPS 4 and 6 ED with WhisperFlo Cage

VALVE BODY/BONNET[2] MATERIAL	TRIM DESIGNATION	VALVE SIZE, NPS	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
			Min	Max	Min	Max
Cast Iron	1,3,27, or 29	All	-29	232	-20	450
	5[5]	8	-29	232	-20	450
	6[5]		-29	232	-20	450
	37	All	-29	210	-20	410
	37H		210	232	410	450
WCC steel	1	All	-29	427	-20	800
	4		-29	210	-20	410
	5[5]	8	-29	316	-20	600
	5H[5]		316	427	600	800
	6[5]		-29	316	-20	600
	27	All (except limited to 338 °C [640 °F] for NPS 4 and 6)	-29	343	-20	650
	29	All	-29	149[4]	-20	300[4]
	37		-29	210	-20	410
	37H		210	427	410	800
WC9 Chrome moly steel	1 or 3	All	-29	427[6]	-20	800[6]
	5[5]	8	-29	316	-20	600
	6[5]		-29	316	-20	600
	27	All (except limited to 338 °C [640 °F] for NPS 4 and 6)	-29	343	-20	650
	29	All	-29	149[4]	-20	300[4]
	37		-29	210	-20	410
	3H		427	593	800	1100
	5H[5]	8	316	593	600	1100
	37H	All	210	427	410	800
LCC steel	1	All	-29	343	-20	650
	4		-46	210	-50	410
	5[5]	8	-46	316	-50	600
	6[5]		-46	316	-50	600
	27	All (except limited to 338 °C [640 °F] for NPS 4 and 6)	-46	343	-50	650
	29	All	-46	149[4]	-50	300[4]
	37		-46	210	-50	410
	37H		210	343	410	650
CF3M (316L stainless steel)	316L	All	-198[3]	149[4]	-325[3]	300[4]
	316HF		-198[3]	343	-325[3]	650
CF8M (316 stainless steel)	5[5]	8	-198[3]	316	-325[3]	600
	6[5]		-198[3]	316	-325[3]	600
	27	All	-198[3]	343	-325[3]	650
	28		-198[3]	149[4]	-325[3]	300[4]
	29		-198[3]	149[4]	-325[3]	300[4]

1. For metal trim parts only. Restricted trim and full-sized limits are the same.
2. Same material also used for bottom flange, if required.
3. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.
4. Lubricating service allows usage to 316°C (600°F).
5. Only available for Whisper Trim I cages.
6. For Trim 3, upper temperature to 316°C (600°F) when used for Whisper Trim I cages.

Figure 10. WhisperFlo Cage in NPS 4 and 6 Fisher ED Valve

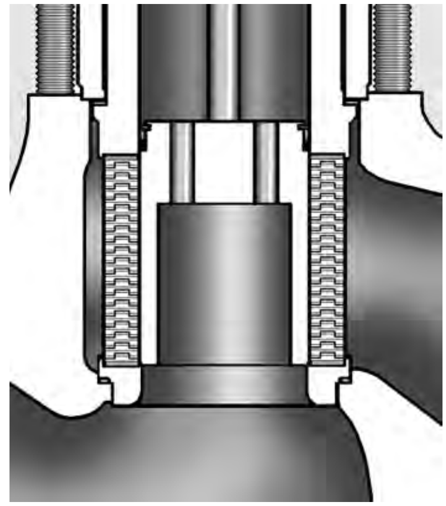


Table 8. Bonnet Selection Guidelines

BONNET STYLE	PACKING MATERIAL	IN-BODY PROCESS TEMPERATURE LIMITS[(1)]	
		°C	°F
Plain: ■ Standard for all valves through NPS 6 valve body with 2-13/16 yoke boss diameter ■ Standard for NPS 6 and 8 valves in cast iron and WCC steel bonnet material with 3-9/16 yoke boss diameter	PTFE V-ring	-18 to 232	0 to 450
	PTFE/Composition	-18 to 232	0 to 450
	Graphite ribbon/filament	-18 to maximum shown in table 6	0 to maximum shown in table 6
Style 1 Cast Extension: ■ Standard for NPS 8 valves in S31600 bonnet material with 3-9/16 yoke boss diameter	PTFE V-ring	-46 to 427	-50 to 800
	PTFE/Composition		
	Graphite ribbon/filament	-46 to to maximum shown in table 6	-50 to maximum shown in table 6
Style 2 Cast Extension: ■ Optional for NPS 2 through 4 valves with 2-13/16 inch yoke boss diameter ■ Optional for NPS 6 and 8 valves with 3-9/16 yoke boss diameter. Not available for NPS 8 valve in S31600 bonnet material	PTFE V-ring	-101 to 427	-150 to 800
	PTFE/Composition		
	Graphite ribbon/filament	-101 to maximum shown in table 6	-150 to maximum shown in table 6
ENVIRO-SEAL bellows seal bonnet	PTFE	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets, for pressure/temperature ratings.	
	Graphite ULF		

1. These in-body process temperatures assume an outside, ambient temperature of 21°C (70°F) and no insulation on the bonnet. When using any packing at low process temperatures, a cast extension bonnet may have to be used to prevent packing damage which could result from the formation of valve stem frost. Material selection for trim and other components will also be limiting factors.

Table 9. Maximum Flow Coefficients for Full-Sized Trim with Equal Percentage Cage and Normal Flow Direction

Valve		Valve Size, NPS	C_v at Max. Valve Plug Travel
ED		1	17.2
		1-1/2	35.8
		2	59.7
		2-1/2	99.4
		3	136
		4	224
		6	394
		8[(1)]	567
		8[(2)]	819
EAD	with liner	1	18.5
		2	48.1
		3	149
		4	152
		6	336
	without liner	1	19.0
		2	47.2
		3	148
		4	156
		6	328
EDR		1	17.2
		1-1/2	35.8
		2	59.7
		2-1/2	99.4
		3	136
		4	224

1. With 51 mm (2 inch) travel.
2. With 76 mm (3 inch) travel.

Table 10. Metal Trim Part Materials for Compatibility with NACE MR0175 / ISO 15156 and MR0103 (Sour Service) Specifications, Environmental Restrictions Apply, Refer to Standard. Contact your Emerson Process Management Sales Office for information on NACE MR0175 / ISO 15156 and NACE MR0103.

Trim Designation	Valve Plug	Cage	Seat Ring for Standard Metal Seat Construction	Optional Liner for Metal Seat (EAD only)	Valve Stem, Packing Follower, Lantern Ring, Packing Box Ring, and Pin	Load Ring[1]
85[2]	S31600	316 SST with electroless nickel coating (ENC)	S31600	S31600	S20910 (Valve Stem) S31600 (All Other Parts)	N05500
86[2]	S31600 with seat hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	R30006 (alloy 6)	- - -		
87	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	R30006 (alloy 6)	- - -		

1. NPS 8 valve only.
2. Not use with Whisper Trim I with 136 mm (5.375 inch) and larger ports.

Table 11. Port Diameters, Valve Plug Travel, and Stem and Yoke Boss Diameters

VALVE SIZE, NPS				PORT DIAMETER		MAX VALVE PLUG TRAVEL		STEM AND YOKE BOSS DIAMETERS							
ED or EDR		EAD						Standard				Optional			
Full-Sized Trim	Restricted-Capacity Trim	Full-Sized Trim	Restricted-Capacity Trim					Stem		Yoke Boss		Stem		Yoke Boss	
				mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
1	1-1/2	1	2	33.3	1.3125	19	0.75	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
- - -	2	- - -	- - -	33.3	1.3125	19	0.75	12.7	1/2	71	2-13/16	- - -	- - -	- - -	- - -
1-1/2	- - -	2	- - -	47.6	1.875	19	0.75	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
- - -	2-1/2	- - -	3	47.6	1.875	19	0.75	1.7	1/2	71	2-13/16	- - -	- - -	- - -	- - -
2	3	- - -	4	58.7	2.3125	29	1.125	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
2-1/2	4	3	6	73.0	2.875	38	1.5	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
3	- - -	4	- - -	87.3	3.4375	38	1.5	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
4	- - -	6	- - -	87[3]	3.4375[3]	76[3]	3[3]	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
				111.1	4.375	51	2					25.4	1	127	5
6[1]	- - -	- - -	- - -	177.8[2]	7[2]	51[2]	2[2]	19.1	3/4	90	3-9/16	25.4 or 31.8	1 or 1-1/4	127	5
				136[3]	5.375[3]	76[3]	3[3]								
8[1]	- - -	- - -	- - -	203.2	8	51	2								
						76	3								

1. Not available in EDR valve.
2. Standard-travel cages.
3. WhisperFlo cages (NPS 4 and 6 ED).

Table 12. Port Diameter, Valve Plug Travel, and Stem and Yoke Boss Diameters for Whisper III Trims[1]

VALVE SIZE, NPS		PORT DIAMETER		MAX VALVE PLUG TRAVEL		STEM AND YOKE BOSS DIAMETERS								PERFORMANCE LEVEL
						Standard				Optional				
						Stem		Yoke Boss		Stem		Yoke Boss		
ED	EAD	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
1	1	33.3	1 5/16	19	3/4	9.5	3/8	54	2 1/8	12.7	1/2	71	2 13/16	A1
1 1/2	2	47.6	1 7/8	19	3/4	9.5	3/8	54	2 1/8	12.7	1/2	71	2 13/16	A1
		33.3	1 5/16	19	3/4									A3, B1, B3
2	--	58.7	2 5/16	35	1 3/8	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		33.3	1 5/16	29	1 1/8									A3, B1, B3,C1, C3, D1, D3
2 1/2	3	73.0	2 7/8	38	1 1/2	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		47.6	1 7/8											A3, B1, B3,C1, C3, D1, D3
3	4	87.3	3 7/16	38	1 1/2	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		58.7	2 5/16											A3, B1, B3,C1, C3, D1, D3
4	6	111.1	4 3/8	51	2	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		87.3	3 7/16							25.4	1	127	5	A3, B1, B3,C1, C3, D1, D3
6	--	177.8	7	51	2	19.1	3/4	90	3 9/16	25.4 or 31.8	1 or 1 1/4	127	5	A1
		136.5	5 3/8	76	3									A3, B1, B3,C1, C3, D1, D3
8	--	203.2	8	76	3	19.1	3/4	90	3 9/16	25.4 or 31.8	1 or 1 1/4	127	5	A1
				102	4									A3, B1, B3,C1, C3

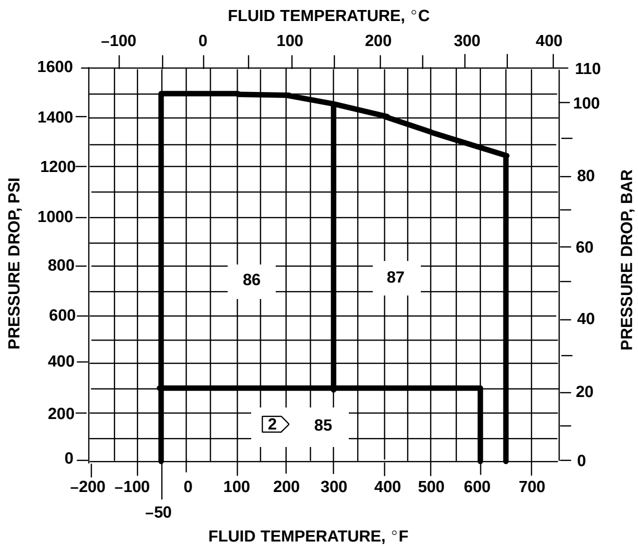
1. Refer Fisher Bulletin 80.1:010 Whisper Trim III (D100191X012) for more information.

Table 13. Bolting Materials and Temperature Limits for Compatibility with NACE MR0175-2002, NACE MR0175/ISO 15156, and NACE MR0103. Environmental restrictions may apply

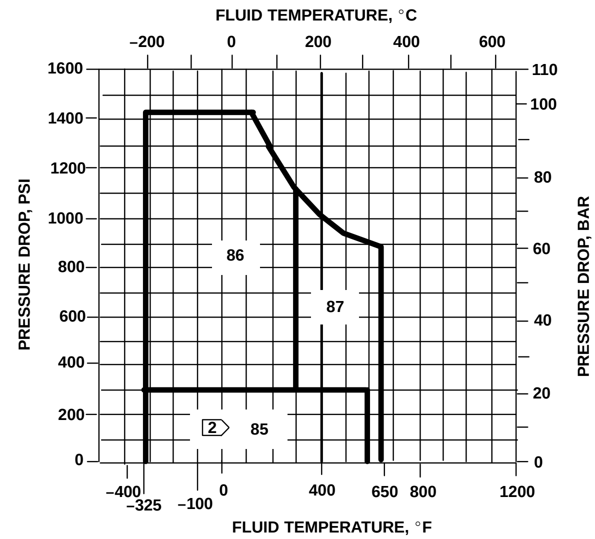
VALVE BODY MATERIAL		BOLTING MATERIAL	TEMPERATURE CAPABILITIES			
			°C		°F	
			Min	Max	Min	Max
Non-exposed bolting (Standard)						
WCC and CF8M (316 SST)	Studs	Steel SA-193-B7	-48[2]	427	-55[2]	800
	Nuts	Steel SA-194-2H				
Exposed bolting (Optional) Requires Derating of Valve[1] When These Body-to-Bonnet Bolting Materials are Used						
WCC and CF8M	Studs	Steel SA-193-B7M	-48[2]	427	-55[2]	800
	Nuts	Steel SA-194-2HM				

1. Derating is not required for CL300 valves. Derating may be required for valves rated at CL600. Contact your Emerson sales office for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used.
2. -29°C (-20°F) with WCC valve body material.

Figure 11. Typical Trim Used for NACE MR0175 / ISO 15156 and NACE MR0103. Environmental restrictions may apply



FOR STANDARD METAL SEATING WITH CL600 1 WCC OR LCC VALVE BODY



FOR STANDARD METAL SEATING WITH CL600 1 316 STAINLESS STEEL (CF8M) VALVE BODY

C0575-2

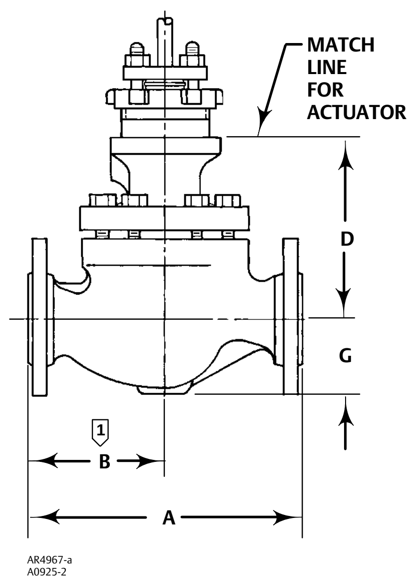
Notes:
1 Do not exceed the maximum pressure and temperature for the pressure rating of the valve material used, even though the trim shown may have higher capabilities.
2 Use trim 87 instead of trim 85 for nonlubricating fluids such as superheated steam or dry gases between 149 and 316°C (300 and 600°F).

Table 14. Fisher ED and EDR Dimensions

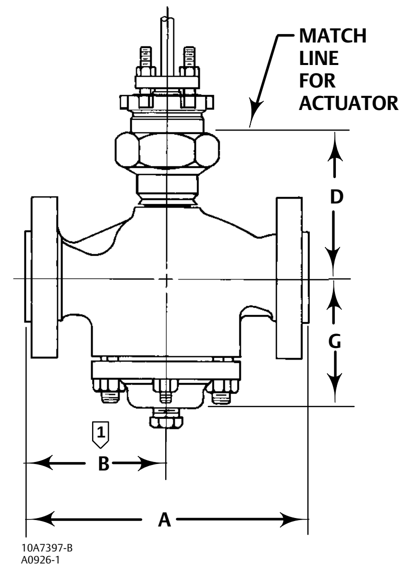
VALVE SIZE, NPS	A									G (MAX)	
	Pressure Rating, End Connection Style(1)										
	Scrd or SW	CL125 FF or 150 RF	CL150 RTJ	CL250 RF or 300 RF	CL300 RTJ	BW or CL600 RF	CL600 RTJ	PN16-40(2)	PN63-100(2)	ED	EDR
	mm										
1	210	184	197	197	210	210	210	160	230	60	119
1-1/2	251	222	235	235	248	251	251	200	260	71	116
2	286	254	267	267	282	286	289	230	300	78	133
2-1/2	---	276	292	292	308	311	314	290	340	90	159
3	---	298	311	317	333	337	340	310	380	97	168
4	---	353	365	368	384	394	397	350	430	129	192
6	---	451	464	473	489	508	511	480	550	140	---
8	---	543	556	568	584	610	613	600	650	191	---
	Inch										
1	8.25	7.25	7.75	7.75	8.25	8.25	8.25	See mm below	See mm below	2.38	4.69
1-1/2	9.88	8.75	9.25	9.25	9.75	9.88	9.88			2.81	4.56
2	11.25	10.00	10.50	10.50	11.12	11.25	11.38			3.06	5.25
2-1/2	---	10.88	11.38	11.50	12.12	12.25	12.38			3.56	6.25
3	---	11.75	12.25	12.50	13.12	13.25	13.38			3.81	6.62
4	---	13.88	14.38	14.50	15.12	15.50	15.62			5.06	7.56
6	---	17.75	18.25	18.62	19.25	20.00	20.12			5.51	---
8	---	21.38	21.88	22.38	23.00	24.00	24.12			7.50	---

1. End connection style abbreviations: BW - Buttwelding, FF - Flat Faced, Scrd - Screwed, SW - Socketweld, RF - Raised Face, RTJ - Ring Type Joint.
2. Valves which meet EN flange standards and have EN face-to-face dimensions are available only from Europe. Valves which meet EN flange standards but not EN face-to-face standards are available in the US. Consult your Emerson sales office.

Figure 12. Fisher ED and EDR Dimensions (also see tables 14, 15, and 16)



ED VALVE BODY



EDR VALVE BODY

Notes:
1 $B = \frac{A}{2}$

Table 15. Fisher ED and EDR Dimensions

VALVE SIZE, NPS	D FOR PLAIN BONNET						
	ED				EDR		
	Stem Diameter				Stem Diameter		
	mm						
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1
1	127	149	---	---	113	124	---
1-1/2	124	146	---	---	122	133	---
2	---	165	162	---	---	148	140
2-1/2	---	187	184	---	---	157	152
3	---	191	187	---	---	167	159
4	---	221	217	264	---	198	191
6(1)	---	---	251	270	---	---	---
6(2)	---	---	312	330	---	---	---
8	---	---	375(3)	---	---	---	---
	Inch						
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4
1	5.00	5.88	---	---	4.44	4.88	---
1-1/2	4.88	5.75	---	---	4.81	5.25	---
2	---	6.50	6.38	---	---	5.81	5.50
2-1/2	---	7.38	7.25	---	---	6.31	6.00
3	---	7.50	7.38	---	---	6.56	6.25
4	---	8.69	8.56	10.38	---	7.81	7.50
6(1)	---	---	9.88	10.62	---	---	---
6(2)	---	---	12.26	13.00	---	---	---
8	---	---	14.75(3)	---	---	---	---

1. For all NPS 6 valves except with Whisper III and WhisperFlo cages.
2. For NPS 6 valves with Whisper Trim III and WhisperFlo Cages.
3. Available only in cast iron or WCC steel for the stem diameter with plain bonnet.

Table 16. Fisher ED and EDR Dimensions

VALVE SIZE, NPS	D FOR EXTENSION AND ENVIRO-SEAL BELLOWS SEAL BONNETS (ED ONLY)									
	Style 1 Ext. Bonnet				Style 2 Ext. Bonnet			ENVIRO-SEAL Bellows Seal Bonnet		
	Stem Diameter				Stem Diameter			Stem Diameter		
	mm									
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1	9.5	12.7	19.1
1	213	251	---	---	303	319	---	321	---	---
1-1/2	210	248	---	---	300	316	---	317	---	---
2	---	267	---	---	---	465	---	---	384	---
2-1/2	---	289	272	---	---	492	---	---	---	---
3	---	292	297	---	---	495	487	---	518	518
4	---	322	327	370	---	526	518	---	541	---
6(1)	---	---	357	402	---	---	543	---	---	573
6(2)	---	---	418	462	---	---	604	---	---	---
8	---	---	421	450	---	---	621	---	---	---
	Inch									
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	3/8	1/2	3/4
1	8.38	9.88	---	---	11.94	12.56	---	12.62	---	---
1-1/2	8.25	9.75	---	---	11.81	12.44	---	12.50	---	---
2	---	10.50	---	---	---	18.31	---	---	15.12	---
2-1/2	---	11.38	10.69	---	---	19.38	---	---	---	---
3	---	11.50	11.69	---	---	19.50	19.19	---	20.38	20.38
4	---	12.69	12.88	14.56	---	20.69	20.38	---	21.31	---
6(1)	---	---	14.06	15.81	---	---	21.38	---	---	22.56
6(2)	---	---	16.44	18.19	---	---	23.76	---	---	---
8	---	---	16.56	17.75	---	---	24.44	---	---	---

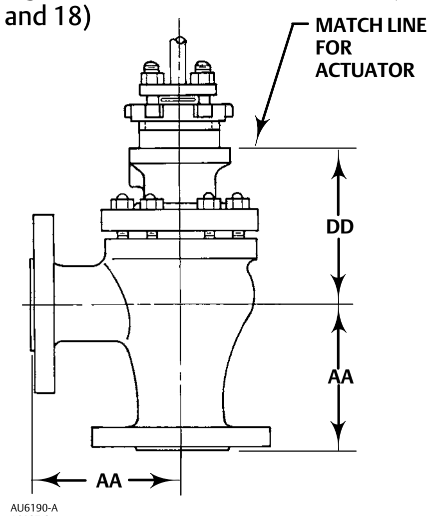
1. Standard-travel cages.
2. For NPS 6 valves with Whisper Trim III and WhisperFlo Cages.

Table 17. Fisher EAD Dimensions

VALVE SIZE, NPS	AA					
	CL150		CL300		CL600	
	End Connection Style(1)					
	RF	RTJ	RF	RTJ	BW, SW or RF	RTJ
	mm					
1	92	98	98	105	105	105
2	127	133	133	141	143	144
3	149	156	159	167	168	170
4	176	183	184	197	197	198
6	225	232	237	244	254	256
	Inch					
1	3.62	3.88	3.88	4.12	4.12	4.12
2	5.00	5.25	5.25	5.56	5.62	5.69
3	5.88	6.12	6.25	6.56	6.62	6.69
4	6.94	7.19	7.25	7.56	7.75	7.81
6	8.88	9.12	9.31	9.62	10.00	10.06

1. End connection style abbreviations: BW - Buttwelding, FF - Flat Faced, Scrd - Screwed, SW - Socketweld, RF - Raised Face, RTJ - Ring Type Joint.

Figure 13. Fisher EAD Dimensions (also see tables 17 and 18)



Note:
For dimensions of valves with EN (or other) end connections, consult your Emerson sales office.

Table 18. Fisher EAD Dimensions

VALVE SIZE, NPS	DD										
	Plain Bonnet				Style 1 Extension Bonnet			Style 2 Extension Bonnet			ENVIRO-SEAL Bellows Seal Bonnet
	Stem Diameter										
	mm										
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1	9.5	12.7	19.1	
1	111	133	---	---	197	235	---	291	305	---	Contact your Emerson sales office
2	98	121	---	---	184	223	---	278	291	---	
3	---	149	146	---	---	251	256	---	454	---	
4	---	140	137	---	---	241	246	---	445	437	
6	---	144	141	187	---	246	251	---	449	441	
	Inch										ENVIRO-SEAL Bellows Seal Bonnet
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	3/8	1/2	3/4	
1	4.38	5.25	---	---	7.75	9.25	---	11.44	12.00	---	Contact your Emerson sales office
2	3.88	4.75	---	---	7.25	8.75	---	10.94	11.44	---	
3	---	5.88	5.75	---	---	9.88	10.06	---	17.88	---	
4	---	5.50	5.38	---	---	9.50	9.69	---	17.50	17.19	
6	---	5.69	5.56	7.38	---	9.69	9.88	---	17.69	17.38	

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Fisher™ ES and EAS Sliding-Stem Control Valves

Fisher ES and EAS general-purpose control valves (figures 1 and 2) are used for throttling or on-off control of a wide variety of liquids and gases. Both valve designs have single ports, unbalanced valve plugs, and cage guiding.

In both designs, metal-to-metal seating is standard for all general applications over a wide range of pressure drops and temperatures. Metal-to-PTFE seating is optional for more stringent shutoff requirements.

The Fisher ES product line is available for a wide range of applications, including sulfide and chloride stress-cracking environments common to the oil and gas production industries. To discuss available constructions, contact your Emerson sales office and include the applicable codes and standards required for these environments.

FISHER ES CONTROL VALVE WITH 657 ACTUATOR

The easy-e™ Valve Family

ES and EAS valves are part of the versatile easy-e family of Fisher industrial control valves. easy-e valves share the following characteristics.

- Multiple trim material choices
- Trim temperature capability with standard metal seats to 427°C (800°F)
- Flexible graphite gaskets
- Interchangeable, restricted-capacity trims and full-flow trims to match variable process flow demands
- Trim part interchangeability that permits reconfiguring the valve to a different design variation
- Different cage/plug styles provide particular flow characteristics for highly-specialized applications. The standard cage comes in three different flow characteristics:
  - quick-opening
  - linear
  - equal percentage
- Whisper Trim™ I cages (figure 1) that attenuate aerodynamic noise in gaseous service are available for all sizes except the NPS 8 ES valve.
- Optional constructions provide material compatibility with NACE MR0175-2002.
- 316 stainless steel packing box parts are standard (including packing flange, studs, and nuts).

Features

- **Compliance with the Clean Air Act—** Optional ENVIRO-SEAL™ packing systems (figure 3) provide an improved stem seal to help prevent the loss of process fluid. The ENVIRO-SEAL packing systems feature PTFE, Graphite ULF, or Duplex packing with live-loading for reduced packing maintenance.

- **Valve Plug Stability—** Rugged cage guiding provides increased valve plug stability, which reduces vibration and mechanical noise.

- **Economy—** Streamlined flow passages provide higher efficiency and greater capacities per initial investment.

- **Cost-Effective Operation—** Increased wear resistance of the standard hardened stainless steel trim means long-lasting service. Also, trim inventory costs are cut because dimensional standardization permits use of most standard easy-e trim parts.

- **Easy Maintenance—** The valve can stay in the pipeline during removal of trim parts for inspection or maintenance.

- **Long-Lasting Shutoff Capability with PTFE Seating—** Controlled compression of optional seat construction protects PTFE disk between metal disk seat and disk retainer (figure 1). The flowstream contacts only the edge of the disk during normal operation.

- **Compliance with European Standards—** Valves are available with dimensions specified by EN/DIN standards. See figure 7 and the note in figure 8.

- **Sour Service Capability—** Unless otherwise noted, references are to NACE MR0175-2002. Optional materials are available to meet NACE MR0103 and NACE MR0175 / ISO15156. Material requirements under these standards vary by edition and year of issue; the specific standard must be specified.

Table of Contents

Specifications

Available Configurations

ES: Single-port, globe-style control valve with cage guiding, unbalanced valve plug, and push-down-to-close valve plug action (figure 1)
EAS: Angle version of ES control valve, used to facilitate piping or in applications where a self-draining valve is desired (figure 2)

Valve Sizes

See table 3

End Connection Styles[1][2]

Cast Iron Valves
Flanged: ES, NPS 1 through 8, including NPS 1-1/2 and 2-1/2 (except NPS 1-1/4), ■ CL125 flat-face or ■ CL250 raised-face flanges per ASME B16.1
Steel and Stainless Steel Valves
Flanged: ■ CL150, 300, or 600 raised-face (RF) or ring-type joint (RTJ) flanges per ASME B16.5, ■ Raised-face (RF) flanges per EN1092-1/B
Screwed or Socket Welding: NPS 1/2 through 2, consistent with ASME B16.11
Buttwelding: NPS 1 through 8 (except NPS 1-1/4). Schedules 40 or 80 consistent with ASME B16.25

Maximum Inlet Pressures and Temperatures[1][2]

As listed below, unless limited by maximum pressure drop or material temperature capabilities
Cast Iron Valves
Flanged: Consistent with CL125B or 250B per ASME B16.1
Steel and Stainless Steel Valves
Flanged: Consistent with CL150, 300, and 600[3] per ASME B16.34
Screwed or Welding: Consistent with flanged CL600[3] per ASME B16.34

Maximum Pressure Drop[2]

Same as maximum inlet pressure for specific construction defined above, except where further limited as shown in figures 5 and 6
Valves for NACE MR0175-2002: See figure 5

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

Metal Seating: Class IV is standard. Class V is optional
PTFE Composition Seating: Class VI

Construction Materials

Body, Bonnet, and Bonnet Spacer or Bottom Flange, if used: ■ WCC carbon steel,■ CF8M stainless steel, ■ LCC carbon steel, ■ WC9 chrome moly steel, ■ Cast iron body with steel bonnet construction, ■ CF3M stainless steel, or ■ Other material constructions upon request
Valve Plug, Cage, and Metal Seating Parts: See table 4
All Other Parts: See table 9

Material Temperature Capabilities[2]

Body/Trim Combinations: See tables 4 and 6
Those For NACE Specification: See tables 10 and 11
Whisper III Trims: See table 5
All Other Parts: See table 9

Flow Characteristics

Standard Cages: ■ Quick-opening, ■ linear, or ■ equal percentage
Whisper Trim: Linear

Flow Directions

ES
Standard Cage: Normally up
Whisper Trim Cages: Always up
EAS
Standard Cage: Without liner, flow up or down; with liner, normally down
Whisper Trim Cages: Always up

Flow Coefficients and Noise Level Prediction

See table 8 and Catalog 12

Port Diameters and Maximum Valve Plug Travels

See table 12 for trims except Whisper III
See table 13 for Whisper III trims

Yoke Boss and Stem Diameters

See table 12 and 13

Typical Bonnet Styles

■ Plain or ■ extension. See figures 7 and 8 for standard dimensions. See table 7 for selection guidelines

■ ENVIRO-SEAL bellows seal bonnet. See figure 4 for view of ENVIRO-SEAL bellows seal bonnet. Also, see Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets, (D101641X012) for further information

- continued -

Specifications (continued)

Packing Arrangements

Standard Material: Single PTFE V-ring
ENVIRO-SEAL Packing: See figure 3
ENVIRO-SEAL Packing Systems in vacuum service: Standard ENVIRO-SEAL packing systems can be used in vacuum service with packing rings in standard orientation. Do not reverse the ENVIRO-SEAL PTFE packing rings.

Also see Bulletin 59.1:061, ENVIRO-SEAL Packing Systems for Sliding-Stem Valves, (D101633X012) for more information.

Approximate Weights

NPS 1/2 and 3/4: 9 kg (20 lb)
NPS 1 and 1-1/4: 14 kg (30 lb)
NPS 1-1/2: 20 kg (45 lb)
NPS 2: 39 kg (85 lb)
NPS 2-1/2: 45 kg (100 lb)
NPS 3: 57 kg (125 lb)
NPS 4: 77 kg (170 lb)
NPS 6: 159 kg (350 lb)
NPS 8: 408 kg (900 lb)

Optional Safety Instrumented System Classification

SIL3 capable — certified by exida Consulting LLC

Additional Options

■ Lubricator, ■ lubricator/isolating valve, ■ drilled and tapped connection in extension bonnet for leakoff service, ■ body drain plug, ■ style 3 fabricated extension bonnet made on order to a specific length for cryogenic service, and ■ Whisper Trim III cage

1. EN (or other) ratings and end connections can usually be supplied; consult your Emerson sales office.
2. The pressure/temperature limits in this bulletin, and any applicable standard limitations should not be exceeded.
3. Certain bonnet bolting material selections may require a CL600 easy-e valve assembly to be derated. Contact your Emerson sales office for more information

ENVIRO-SEAL Packing System Specifications

Applicable Stem Diameters

■ 9.5 mm (3/8 inches), ■ 12.7 (1/2), ■ 19.1 (3/4), ■ 25.4 (1), and ■ 31.8 (1-1/4) diameter valve stems

Maximum Pressure/Temperature Limits(1)

To Meet the EPA Fugitive Emission Standard of 100 PPM(2)
For ENVIRO-SEAL PTFE and ENVIRO-SEAL Duplex packing systems: full CL300 up to 232°C (450°F)
For ENVIRO-SEAL Graphite packing: 104 bar (1500 psig) at 316°C (600°F)

Construction Materials

PTFE Packing Systems:
Packing Ring and Lower Wiper: PTFE V-ring(3)
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Graphite ULF Packing Systems: Graphite rings
Duplex Packing Systems:
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Guide Bushings: Carbon graphite
Packing Rings: Graphite composite
Packing Washer: PTFE
Anti-Extrusion Washer: Filled PTFE (not required for graphite or duplex packing)
Lantern Ring: S31600 (316 stainless steel) (not required for graphite packing)
Packing Box Flange: S31600
Spring: ■ 17-7PH stainless steel or ■ N06600
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: Strain-hardened 316 stainless steel
Packing Box Nuts: 316 stainless steel

1. Refer to the valve specifications in this bulletin for pressure/temperature limits of valve parts. Do not exceed the pressure/temperature rating of the valve. Do not exceed any applicable code or standard limitation.
2. The Environmental Protection Agency (EPA) has set a limit of 100 parts per million (ppm) for fugitive emissions from a valve in selected VOC (Volatile Organic Compound) services.
3. In vacuum service, it is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.

Table 1. Class VI Shutoff Availability

Valve	Port Size, Inches	Seat	Minimum Seat Load
ES	≤ 7	Metal	300 lbs/lineal inch

Table 2. Class VI Trim Materials

VALVE	CAGE/SEAT RING RETAINER	VALVE PLUG	SEAT RING	TRIM TEMPERATURE LIMIT	
				°C	°F
ES	S31600 (316 SST) / ENC	S31600/CoCr-A (alloy 6) seat	S31600	Not a limiting factor	Not a limiting factor

ENVIRO-SEAL, HIGH-SEAL Packing Systems

ENVIRO-SEAL and HIGH-SEAL packing systems offer excellent sealing capabilities. They easily install in your existing valves or can be purchased with new valves. These systems may help prevent the loss of process fluid. The long operational life and reliability of these systems also helps to reduce your maintenance costs and downtime.

For applications requiring compliance with environmental protection regulations, the unique Fisher ENVIRO-SEAL packing system (figure 3) and a unique ENVIRO-SEAL bellows seal system (figure 4) are offered. The emission control packing system helps to keep emission concentrations below the EPA 100 ppm requirement.

For an excellent stem seal in applications that are not environmentally-sensitive, the Fisher HIGH-SEAL Graphite ULF packing system is offered. The HIGH-SEAL packing system provides excellent sealing at pressure/temperature ratings beyond ENVIRO-SEAL limits.

ENVIRO-SEAL packing systems, available with PTFE, Graphite ULF, or Duplex packing, and the HIGH-SEAL packing systems, Graphite ULF and graphite composite, feature live-loading and unique packing-ring arrangements for long-term, consistent sealing performance.

Class VI Shutoff Capabilities

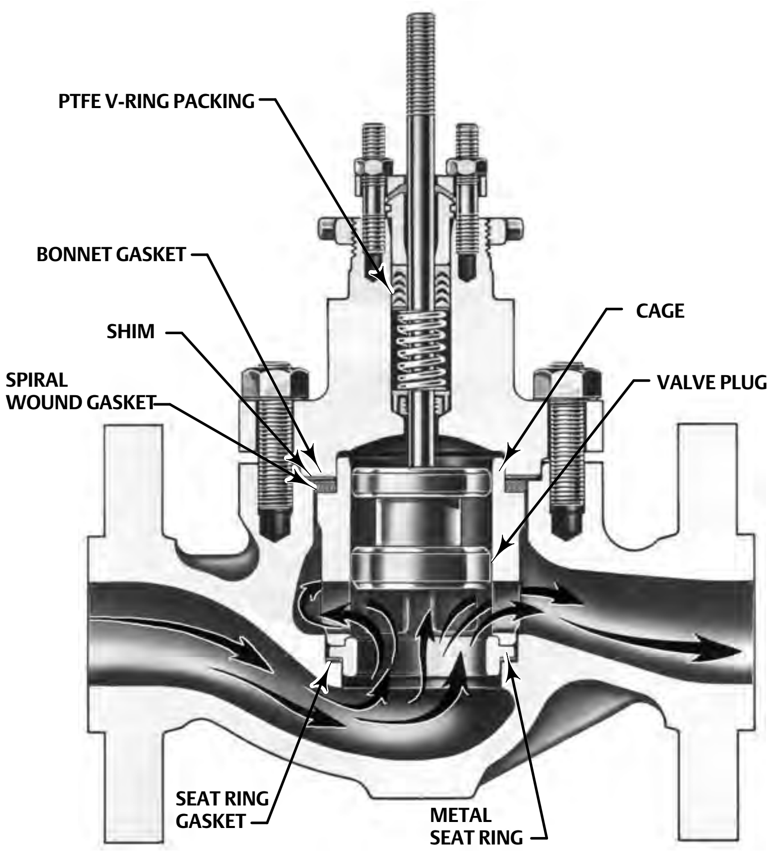
ES valves with metal seat constructions can provide ANSI/FCI Class VI shutoff capabilities. See tables 1 and 2.

Table 3. Available Valve Body Constructions

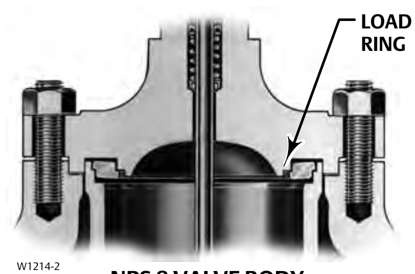
VALVE	VALVE SIZE, NPS	BODY MATERIAL AND END CONNECTION STYLE[1]							
		Carbon Steel, Alloy Steel, or Stainless Steel Valve Body						Cast Iron Valve Body	
		Screwed	RF or RTJ Flanged			Butt-welding	Socket Weld	CL125 FF Flanged	CL250 RF Flanged
			CL150	CL300	CL600				
ES	1/2 or 3/4	X	---	---	---	---	X	---	---
	1, 1-1/2, or 2	X	X	X	X	X	X	X	X
	1-1/4	X	---	---	---	---	---	---	---
	2-1/2, 3, 4, 6, or 8	---	X	X	X	X	---	X	X
EAS	1 or 2	---	X	X	X	X	---	---	---
	3, 4, or 6	---	X	X	X	X	---	---	---

X = Available Construction.
1. End connection style abbreviations: FF - Flat Faced, RF - Raised Face, RTJ - Ring Type Joint.

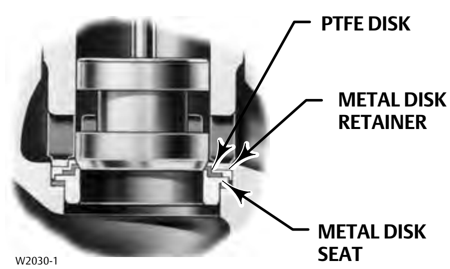
Figure 1. Fisher ES Sectional



STANDARD NPS 1 THROUGH 6 CONSTRUCTION



NPS 8 VALVE BODY



OPTIONAL PTFE SEATING

WHISPER TRIM I CAGE

Table 4. Typical Combinations of Metal Trim Parts[1] for all Valves Except Those for NACE Specification and Whisper Trim III Cages

Trim Designation	Valve Plug	Cage	Seat Ring for Standard Metal-Seat Construction	Optional Liner (Metal-Seat EAS Valve Body Only)	Disk Seat and Retainer for Optional PTFE-Seat Construction
1 (standard for metal-seat ES and EAS in all valve body materials except CF8M)	S41600 HT	17-4 SST HT[6]	S41600 HT or CA15 HT[1] (410 stainless steel)	S41600 HT	---
	17-4 SST HT[6]				
3[5] and 3H[4]	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	R30006 or R30016 (alloy 6)	R30006 (alloy 6)	---	---
4[2]	S31600	17-4 SST HT	S31600	S31600	S31600
27	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	R30006 (alloy 6)	---	---
28[3]	S31600 with seat hard faced with CoCr-A hardfacing alloy				
29[3] (standard for CF8M valve bodies in all designs regardless of seat construction)	S31600	316 SST with ENC	S31600	S31600	S31600
37 and 37H[4]	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	17-4 SST HT	R30006 (alloy 6)	---	---
57 (standard for PTFE-seat constructions in all designs and valve body materials except CF8M)	S41600 alloy HT	17-4 SST HT[6]	---	---	S31600
	17-4 SST HT[6]				
316L	S31603	316L SST with electroless nickel coating (ENC)	S31603	---	S31603
316L HF	S31603 with seat and guide hard faced with CoCr-A hardfacing alloy	316L SST with electroless nickel coating (ENC)	R30006 (alloy 6)	---	S31603 disk retainer with CoCr-A disk seat

1. CA15 is used for NPS 6 and 8 full-size and restricted-trim valves.
2. Not for use with Whisper Trim I.
3. Not for use with Whisper Trim I with 136.5 mm (5.375 inch) and larger ports.
4. Trims 3H and 37H have clearance for high-temperature service.
5. For trim 3, upper temperature limited to 316°C (600°F) when used for Whisper Trim I.
6. For NPS 8 Whisper Trim I.

Table 5. Whisper Trim III Metal Trim Part Materials and Body/Trim Temperature Capabilities

Trim Designation	Valve Plug	Cage	Cage Retainer	Baffle (For Level D3 Cage Only)	Seat Ring for Metal-Seat Construction	Disk Seat and Retainer for PTFE-Seat Construction	Stem	Body, Bonnet & Bonnet Spacer	Material Temperature Capability			
									°C		°F	
									Min	Max	Min	Max
19.1 through 111.1, 177.8 and 203.2 mm (0.75 through 4.375, 7 and 8 Inch) Port Sizes												
301G	S41600	17-4 SST	--	Steel	S41600	--	S31600	WCC, WC9	-29	427	-20	800
								CF8M(7)	-29	176	-20	350
301GC	S41600	17-4 SST	--	Steel	--	S31600	S31600	WCC, WC9	-29	204	-20	400
								CF8M	-29	176	-20	350
312G(1)	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	--	S31600	R30006	--	S20910	WCC, WC9, CF8M	-29	343	-20	650
312GC(1)	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	--	S31600	--	R30006/ S31600(8)	S20910	WCC, WC9, CF8M	-29	204	-20	400
315G(1)	S31600/ CoCr-A Seat & Guide	316 SST Chrome Plate	--	S31600	R30006	--	S20910	WCC, WC9	-29	316	-20	600
								CF8M	-198	316	-325	600
315GC(1)	S31600/ CoCr-A Seat & Guide	316 SST Chrome Plate	--	S31600	--	R30006/ S31600(8)	S20910	WCC, WC9	-29	204	-20	400
								CF8M	-29	176	-20	350
318G	F22/ CoCr-A Seat & Guide	2.25 Cr-1Mo Nitrided	--	WC9	R30006	--	S41000/ S42200(4)	WCC	-29	427	-20	800
								WC9	-29	593	-20	1100
306	S31803/ CoCr-A Seat & Guide (< 3"Port), S31803/ Ultimet Seat & Guide (≥ 3"Port)	2205 Duplex(5) Chrome Plate	--	S31803	S31803/ CoCr-A (< 3"Port), S31803/ Ultimet (≥ 3"Port)	--	S31803	WCC, WC9, CF8M	-29	316	-20	600
307G	S31600/ CoCr-A Seat & Guide	17-4 SST	--	Steel	R30006	--	S31600	WCC, WC9	-29	210	-20	410
307GH(3)	S31600/ CoCr-A Seat & Guide	17-4 SST	--	Steel	R30006	--	S31600	WCC, WC9	210	427	410	800

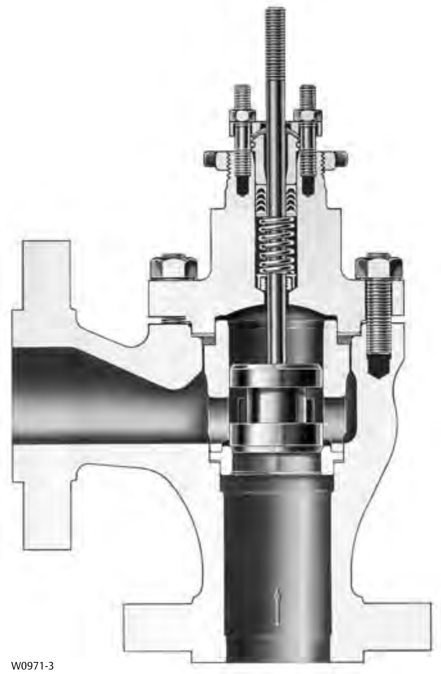
-continued-

Table 5. Whisper Trim III Metal Trim Part Materials and Body/Trim Temperature Capabilities (continued)

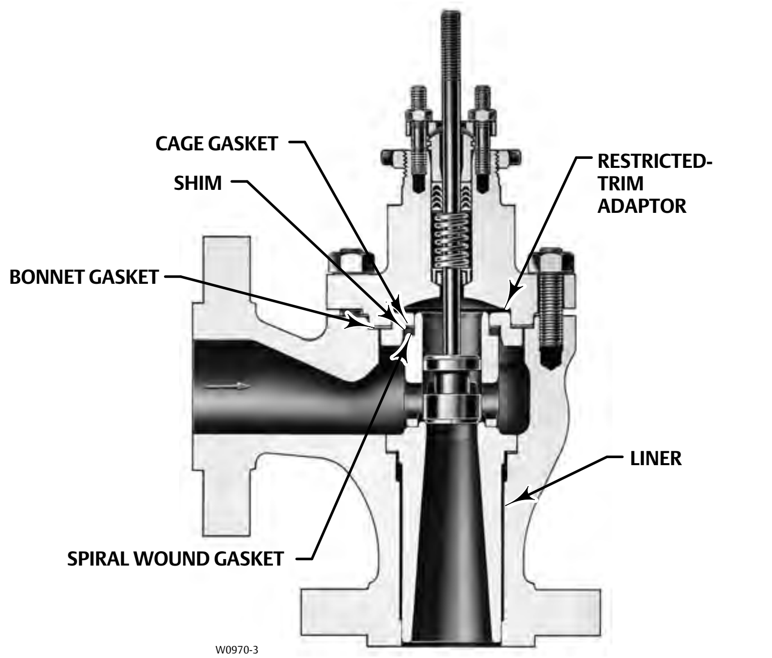
Trim Designation	Valve Plug	Cage	Cage Retainer	Baffle (For Level D3 Cage Only)	Seat Ring for Metal-Seat Construction	Disk Seat and Retainer for PTFE-Seat Construction	Stem	Body, Bonnet & Bonnet Spacer	Material Temperature Capability			
									°C		°F	
136.5 mm (5.375 Inch) Port												
301	S17400	416 SST	WCC/ENC	Steel	S41600	--	S31600	WCC, WC9	-29	343	-20	650
								CF8M	-29	163	-20	325
301 A	S17400	416 SST	WCC/Nitrided	Steel	S41600	--	S31600	WCC, WC9	-29	427	-20	800
301 C	S17400	416 SST	WCC/ENC	Steel	--	S31600	S31600	WCC, WC9	-29	204	-20	400
								CF8M	-29	163	-20	325
304	S31600/ CoCr-A Seat & Guide	416 SST	WCC/ENC	Steel	S31600/ CoCr-A Seat	--	S31600	WCC, WC9	-29	343	-20	650
								CF8M	-29	177	-20	350
312[1]	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	316/ENC Electroless Nickel Coated	S31600	R30006	--	S20910	WCC, WC9, CF8M	-29	343	-20	650
312C[1]	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	316/ENC Electroless Nickel Coated	S31600	--	R30006/ S31600	S20910	WCC, WC9	-29	204	-20	400
								CF8M	-29	204	-325	400
315	S31600/ CoCr-A Seat & Guide	316 SST/ Electrolyzed Chrome Coat	S31600/ Electrolyzed Chrome Coat	S31600	S31600/ CoCr-A	--	S31600/ S20910[6]	WCC, WC9	-29	260	-20	500
								CF8M	-198	537[2]	-325	1000[2]
318	S31600/ CoCr-A Seat & Guide	2.25 Cr-1Mo Nitrided	WC9 Nitrided	WC9	S31600/ CoCr-A Seat	--	S20910	WCC	-29	427	-20	800
								WC9	-29	593	-20	1100
306	S31803/ Ultimet Seat & Guide	2205 Duplex[5] Chrome Plate	--	S31803	S31803/ Ultimet	--	S31803	WCC, WC9, CF8M	-29	316	-20	600

1. NACE compatible trims meets NACE MR0175 2002, MR0175/ISO15156, MR0103.
2. May be used up to 593°C (1100°F). If manufacturing process controls carbon content to 0.04% minimum or 0.08% maximum.
3. For high temperature service.
4. Trim 318G uses S41000 stem up to 538°C (1000°F) and S42200 stem above 538°C (1000°F).
5. 22 Cr-S Ni duplex stainless steel.
6. Trim 315 uses S31600 stem up to 427°C (800°F) and S20910 stem above 427°C (800°F).
7. Trim 301G can be used up to 216°C (420°F) with NPS 3 CF8M body, can be used up to 288°C (550°F) with NPS 2 CF8M body.
8. For 8 inch port size, both disk seat and retainer use R30006.

Figure 2. Fisher EAS Sectional



STANDARD CONSTRUCTION WITH FULL-SIZED TRIM



RESTRICTED-CAPACITY CONSTRUCTION WITH OPTIONAL LINER

Table 6. Valve Body/Trim Temperature Capabilities for Metal Trim Parts Only

BODY/BONNET MATERIAL (ALSO FOR BOTTOM FLANGE IF USED)	TRIM DESIGNATION	VALVE SIZE AND DESIGN	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
			Min	Max	Min	Max
Cast iron body w/ steel bonnet	1, 3, 27, 29, 37, or 57	All	-29	232	-20	450
CF3M	316L	All	-198(1)	149(2)	-325(1)	300(2)
	316L HF		-198(1)	343	-325(1)	650
CF8M (316 SST)	27	All	-198(1)	343	-325(1)	650
	28		-198(1)	149	-325(1)	300
	29		-198(1)	149(2)	-325(1)	300(2)
LCC steel	1	All	-29	343	-20	650
	4		-46	210	-50	410
	29		-46	149(2)	-50	300(2)
	37		-46	343	-50	650
WCC steel	1, 37, or 57	All	-29	427	-20	800
	29		-29	149(2)	-20	300(2)
	54		-29	260	-20	500
WC9 chrome moly steel	1, 37, or 57	All	-29	427	-20	800
	3		-29	427(3)	-20	800(3)
	3H		427	566	800	1050
	27	Through NPS 3 all designs; NPS 8 ES	-29	343	-20	650
		NPS 4 or 6 ES and EAS	-29	343	-20	650
	29	All	-29	149(2)	-20	300(2)

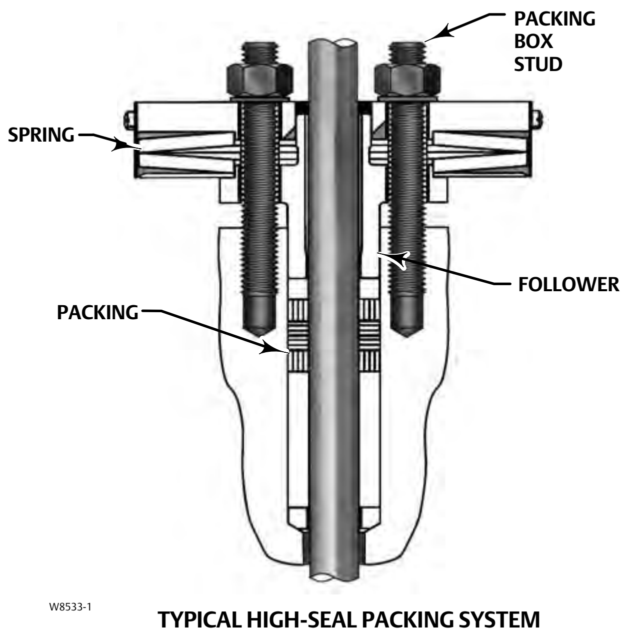
1. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.
2. Lubricating service allows usage to 316°C (600°F).
3. For Trim 3, upper temperature to 316°C (600°F) when used for Whisper Trim I cages.

Table 7. Bonnet Selection Guidelines

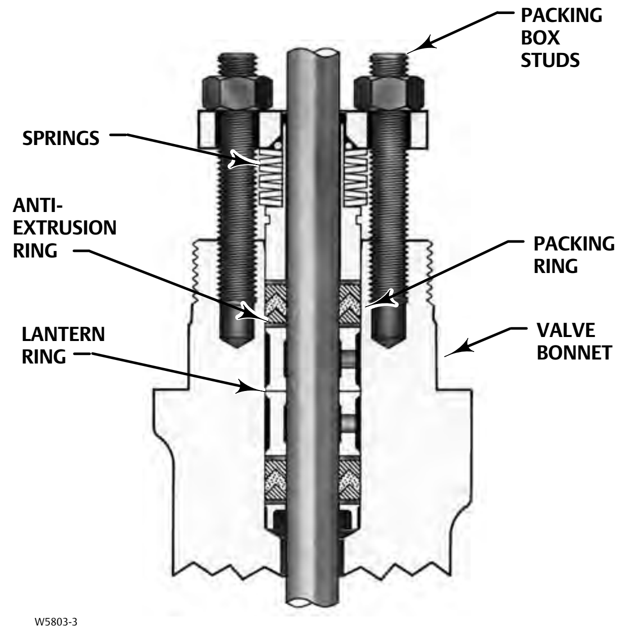
BONNET STYLE	PACKING MATERIAL	IN-BODY PROCESS TEMPERATURE LIMITS(1)	
		°C	°F
Plain: ■Standard for all valves through NPS 6 with 2-13/16 yoke boss diameter ■Standard for NPS 6 and 8 valves in cast iron and WCC steel bonnet material with 3-9/16 yoke boss diameter	PTFE V-ring	-18 to 232	0 to 450
	PTFE/Composition	-18 to 232	0 to 450
	Graphite ribbon/filament	-18 to maximum shown in table 9	0 to maximum shown in table 9
Style 1 Cast Extension: ■Standard for NPS 8 valves in S31600 bonnet material with 3-9/16 yoke boss diameter	PTFE V-ring	-46 to 427	-50 to 800
	PTFE/Composition		
	Graphite ribbon/filament	-46 to maximum shown in table 9	-50 to maximum shown in table 9
Style 2 Cast Extension: ■Optional for NPS 2 through 4 valves with 2-13/16 inch yoke boss diameter ■Optional for NPS 6 and 8 valves with 3-9/16 yoke boss diameter. Not available for NPS 8 valve in S31600 bonnet material	PTFE V-ring	-101 to 427	-150 to 800
	PTFE/Composition		
	Graphite ribbon/filament	-101 to maximum shown in table 9	-150 to maximum shown in table 9
ENVIRO-SEAL bellows seal bonnet	PTFE	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets (D101641X012), for pressure/temperature ratings.	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets (D101641X012), for pressure/temperature ratings.
	Graphite ULF		

1. These in-body process temperatures assume an outside, ambient temperature of 21°C (70°F) and no insulation on the bonnet. When using any packing at low process temperatures, a cast extension bonnet may have to be used to prevent packing damage which could result from the formation of valve stem frost. Material selection for trim and other components will also be limiting factors.

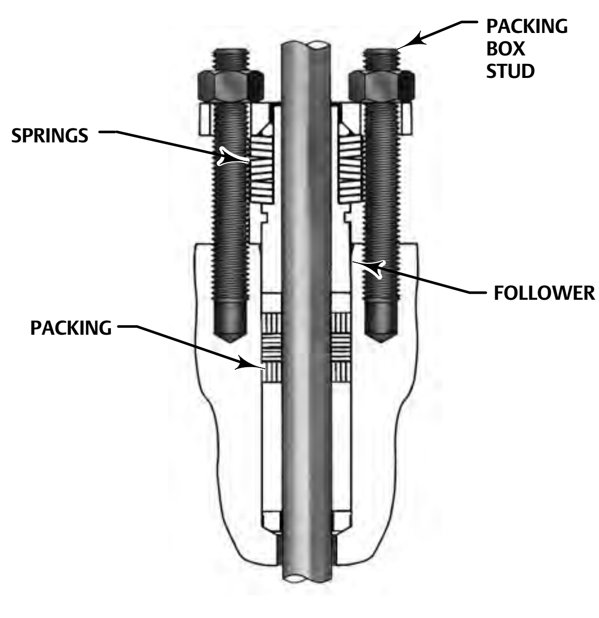
Figure 3. ENVIRO-SEAL and HIGH-SEAL Packing Systems



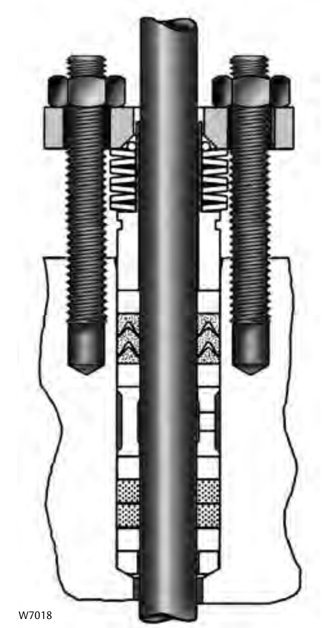
TYPICAL HIGH-SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH PTFE PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH DUPLEX PACKING

Table 8. Maximum Flow Coefficients for Full-Sized Trim with Equal Percentage Cage and Normal Flow Direction(1)

Valve	Valve Size, NPS	C_V at Max Valve Plug Travel
ES	1/2 3/4	6.53(2) 14.2(2)
	1, 1-1/4 1-1/2 2 2-1/2	17.4 33.4 56.2 82.7
	3 4 6 8	121 203 357 808
EAS (flow down)	1 2	19.0 47.2
	3 4 6	148 156 328

1. Except where indicated. Flow coefficients for linear and quick-opening cages normally are somewhat greater.
2. Quick-opening cage.

Figure 4. ENVIRO-SEAL Bellows Seal Bonnet

W5852

Table 9. Materials and Temperature Limits for All Other Parts

PART			MATERIAL	MATERIAL TEMPERATURE CAPABILITIES			
				°C		°F	
				Minimum	Maximum	Minimum	Maximum
Body-to-bonnet bolting. See table 11 for NACE bolting materials and temperatures	Cast iron body	Cap screws	Steel SAE Grade 5	-29	232	-20	450
	WCC or WC9 body	Studs	Steel SA-193-B7	-29	427(1)	-20	800(1)
		Nuts	Steel SA-194-2H				
	CF3M or CF8M body	Studs	Steel SA-193-B7 (std)	-48	427(1)	-55	800(1)
		Nuts	Steel SA-194-2H (std)				
		Studs	304 stainless steel SA-320-B8	-198	38	-325	100
		Nuts	304 stainless steel SA-194-8				
		Studs	316 stainless steel SA-193-B8M (strain-hardened)	-198(2)	427(1)	-325(2)	800(1)
		Nuts	316 stainless steel SA-194-8M				
		Studs	316 stainless steel SA-194-B8M (annealed)	-198(2)	These materials not limiting factors	-325(2)	These materials not limiting factors
		Nuts	316 stainless steel SA-194-8M				
	LCC body	Studs	Steel SA-193-B7	-46	343(1)	-50	650(1)
		Nuts	Steel SA-194-2H				
	WC9 body	Studs	Steel SA-193-B16	-29	566(1)	-20	1050(1)
		Nuts	Steel SA-194-7				
Optional disk			PTFE	-73	204	-100	400
Valve plug stem			316 stainless steel or 316L stainless steel	-198(2)	593	-325(2)	1100
Pin (ES or EAS valve only)			316 stainless steel or 316L stainless steel				
Load ring	(NPS 8 ES valve only)		17-4PH stainless steel	-101	316	-150	600
			N06600	-254	593	-425	1100
			N05500 Nickel Alloy	-240	260	-400	500
Restricted trim adaptors			Cast iron	-73	232	-100	450
			WCC steel	-29	427	-20	800
			316 stainless steel	-198(2)	593	-325(2)	1100
Seat ring, bonnet, and cage gaskets			Flexible Graphite (standard)	-198	593(3)	-325	1100(3)
			PTFE-coated N04400 Nickel Alloy	-73	149	-100	300
Spiral wound gaskets			N06600 Nickel Alloy 600/graphite (Flexible Graphite) standard	-198	593(3)	-325	1100(3)
			N04400 Nickel Alloy/composition	-73	232	-100	450
Shim			316 stainless steel	These materials not limiting factors			
			N04400 Nickel Alloy	These materials not limiting factors			
Packing	(temperatures shown are material temperature capabilities)	See table 7 for proper bonnet selection	PTFE V-ring	-40	232	-40	450
			PTFE/composition	-73	232	-100	450
			Graphite ribbon/filament	-198	538(4)	-325	1000(4)
			Graphite ribbon for high-temperature oxidizing service	371	649	700	1200
Packing flange studs, and nuts when used with standard bonnet			316 stainless steel	-198(2)	593	-325(2)	1100
Packing follower and packing spring (single PTFE V-ring packing) or lantern ring (other packing arrangements)			316 stainless steel	-198(2)	593	-325(2)	1100
Packing box ring			316 stainless steel	-198(2)	593	-325(2)	1100
Extension bonnet bushing	Trims 1 & 4		416 stainless steel	-29	427	-20	800
	Other trims		316 stainless steel	-198(2)	593	-325(2)	1100

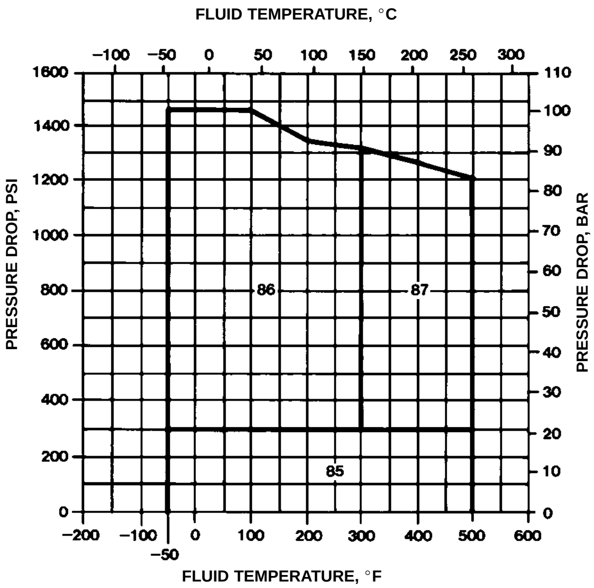
1. Lubricated nuts are standard.
2. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.
3. Except 427°C (800°F) on oxidizing service.
4. Except 371°C (700°F) on oxidizing service.

Table 10. Metal Trim Part Materials for Compatibility with NACE MR0175-2002 (Sour Service) Specifications, Environmental Restrictions Apply, Refer to Standard

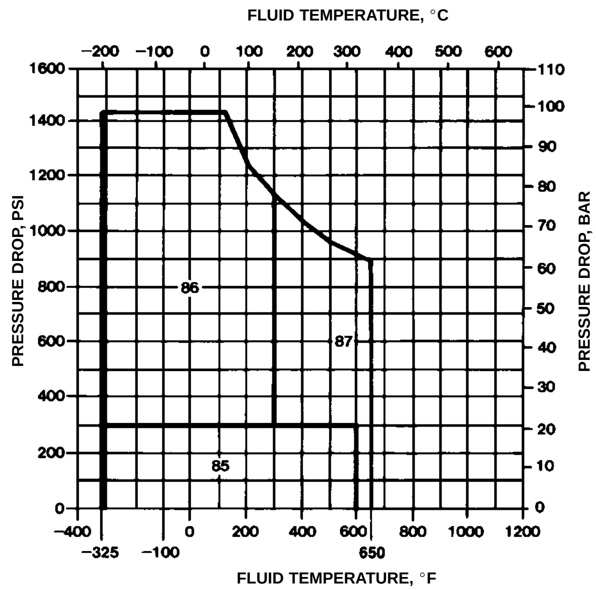
<table>
<tr><th>Trim Designation</th><th>Valve Plug</th><th>Cage</th><th>Seat Ring for Standard Metal Seat Construction</th><th>Optional Liner for Metal Seat (EAS only)</th><th>Disk Seat and Retainer for Optional PTFE-Seat Construction</th><th>Valve Stem, Packing Follower, Lantern Ring, Packing Box Ring, and Pin</th><th>Load Ring(1)</th></tr>
<tr><td>85(3)</td><td>S31600</td><td>316 SST with ENC</td><td>S31600</td><td>S31600</td><td>- - -</td><td rowspan="5">Valve stem is S20910
All other parts are S31600</td><td rowspan="5">N05500</td></tr>
<tr><td>85C(2, 3)</td><td>S31600</td><td>316 SST with ENC</td><td>- - -</td><td>- - -</td><td>S31600</td></tr>
<tr><td>86(3)</td><td>S31600 with seat hard faced with CoCr-A hard facing alloy</td><td>316 SST with ENC</td><td>R30006 (alloy 6)</td><td>- - -</td><td>- - -</td></tr>
<tr><td>87</td><td>S31600 with seat and guide hard faced with CoCr-A hard facing alloy</td><td>316 SST with ENC</td><td>R30006 (alloy 6)</td><td>- - -</td><td>- - -</td></tr>
<tr><td>87C(2)</td><td>S31600 with seat and guide hard faced with CoCr-A hard facing alloy</td><td>316 SST with ENC</td><td>- - -</td><td>- - -</td><td>S31600</td></tr>
</table>

1. NPS 8 valve only.
2. 85C and 87C are trims for PTFE-seat construction.
3. Not for use with Whisper Trim I with 136.5 mm (5.375 inch) and larger ports.

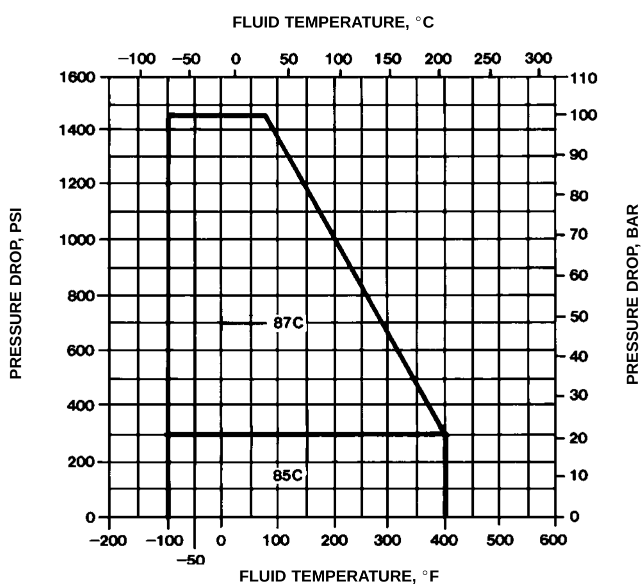
Figure 5. Typical Trim Used for NACE MR0175-2002, (Sour Service)



FOR STANDARD METAL SEATING WITH CL600 [1] WCC OR LCC BODY



FOR STANDARD METAL SEATING WITH CL600 [1] 316 STAINLESS STEEL (CF8M) BODY



C0575-3

FOR OPTIONAL PTFE SEATING WITH ALL BODY MATERIALS [1]

Note:
[1] Do not exceed the maximum pressure and temperature for the pressure rating of the valve body material used, even though the trims shown may have higher capabilities.

Table 11. Bolting Materials and Temperature Limits for Bolting Compliance with NACE MR0175-2002, NACE MR0175/ISO 15156, and NACE MR0103. Environmental restrictions may apply.

VALVE BODY MATERIAL		BOLTING MATERIAL	TEMPERATURE CAPABILITIES °C Min	°C Max	°F Min	°F Max
Non-exposed bolting (Standard)						
WCC	Studs	Steel SA-193-B7	-7	232	20	450
	Nuts	Steel SA-194-2H				
	Studs	Steel SA-193-B7	232	427	450	800
	Nuts	Steel SA-194-2H				
CF8M (316 SST)	Studs	Steel SA-193-B7 or B8M strain hardened	-48	232	-55	450
	Nuts	Steel SA-194-2H or 8M				
	Studs	Steel SA-193-B8M strain hardened or B7	232	427	450	800
	Nuts	Steel SA-194-8M lubricated or 2H				
Exposed bolting (Optional) Requires Derating of Valve(2) When These Body-to-Bonnet Bolting Materials are Used						
WCC and CF8M	Studs	Steel SA-193-B7M	-46(1)	232	-50(1)	450
	Nuts	Steel SA-194-2HM				
	Studs	Steel SA-193-B7M	232	427	450	800
	Nuts	Steel SA-194-2HM				

1. Minimum temperature is -29°C (-20°F) with WCC valve body material.
2. Derating is not required for CL300 valves. Derating may be required for valves rated at CL600. Contact your Emerson sales office for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used.

Table 12. Port Diameters, Valve Plug Travel, and Stem and Yoke Boss Diameters

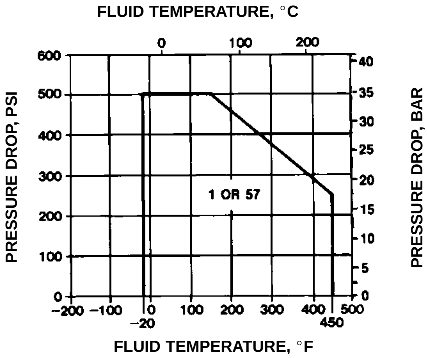
VALVE SIZE, NPS ES Full-Sized Trim	ES Restricted-Capacity Trim	EAS Full-Sized Trim	EAS Restricted-Capacity Trim	PORT DIAMETER mm	PORT DIAMETER Inch	MAX VALVE PLUG TRAVEL mm	MAX VALVE PLUG TRAVEL Inch	Standard Stem mm	Standard Stem Inch	Standard Yoke Boss mm	Standard Yoke Boss Inch	Optional Stem mm	Optional Stem Inch	Optional Yoke Boss mm	Optional Yoke Boss Inch
1 or 1-1/4	1-1/2	1	2	33.3	1.3125	19	0.75	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
---	2	---	---	33.3	1.3125	19	0.75	12.7	1/2	71	2-13/16	---	---	---	---
1-1/2	---	2	---	47.6	1.875	19	0.75	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
---	2-1/2	---	3	47.6	1.875	19	0.75	12.7	1/2	71	2-13/16	---	---	---	---
2	3	---	4	58.7	2.3125	29	1.125	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
2-1/2	4	3	6	73.0	2.875	38	1.5	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
3	---	4	---	87.3	3.4375	38	1.5	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
4	---	6	---	111.1	4.375	51	2	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
												25.4	1	127	5
6	---	---	---	177.8	7	51	2	19.1	3/4	90	3-9/16	25.4 or 31.8	1 or 1-1/4	127	5
8	---	---	---	203.2	8	51	2								
						76	3								

Table 13. Port Diameter, Valve Plug Travel, and Stem and Yoke Boss Diameters for Whisper III Trims[1]

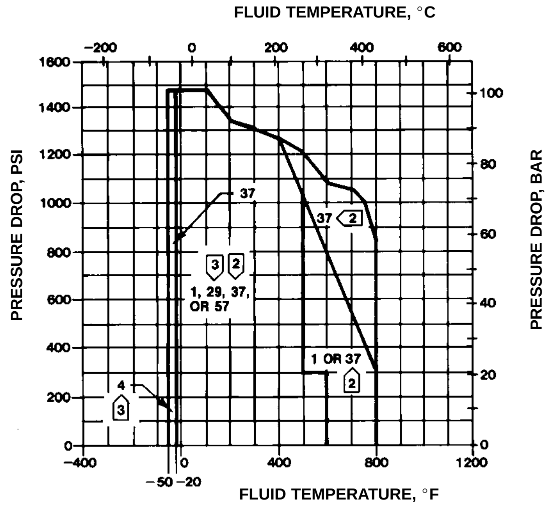
VALVE SIZE, NPS		PORT DIAMETER		MAX VALVE PLUG TRAVEL		STEM AND YOKE BOSS DIAMETERS								PERFORMANCE LEVEL
						Standard				Optional				
						Stem		Yoke Boss		Stem		Yoke Boss		
ES	EAS	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
1	1	33.3	1 5/16	19	3/4	9.5	3/8	54	2 1/8	12.7	1/2	71	2 13/16	A1
1 1/2	2	47.6	1 7/8	19	3/4	9.5	3/8	54	2 1/8	12.7	1/2	71	2 13/16	A1
		33.3	1 5/16	19	3/4									A3, B1, B3
		19.1	3/4	29	1 1/8									C1, C3, D1, D3
2	--	58.7	2 5/16	35	1 3/8	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		33.3	1 5/16	29	1 1/18									A3, B1, B3,C1, C3, D1, D3
2 1/2	3	73.0	2 7/8	38	1 1/2	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		47.6	1 7/8											A3, B1, B3,C1, C3, D1, D3
3	4	87.3	3 7/16	38	1 1/2	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		58.7	2 5/16											A3, B1, B3,C1, C3, D1, D3
4	6	111.1	4 3/8	51	2	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		87.3	3 7/16							25.4	1	127	5	A3, B1, B3,C1, C3, D1, D3
6	--	177.8	7	51	2	19.1	3/4	90	3 9/16	25.4 or 31.8	1 or 1 1/4	127	5	A1
		136.5	5 3/8	76	3									A3, B1, B3,C1, C3, D1, D3
8	--	203.2	8	76	3	19.1	3/4	90	3 9/16	25.4 or 31.8	1 or 1 1/4	127	5	A1
				102	4									A3, B1, B3,C1, C3,

1. Refer Fisher Bulletin 80.1:010 Whisper Trim III (D100191X012) for more information.

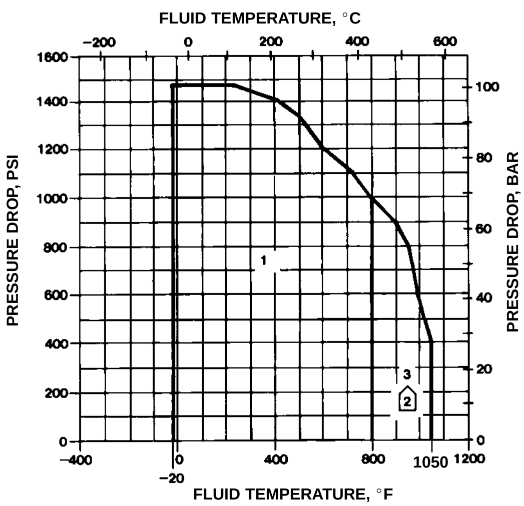
Figure 6. Typical Trim Use for All Valve Bodies Except Those for NACE Specifications



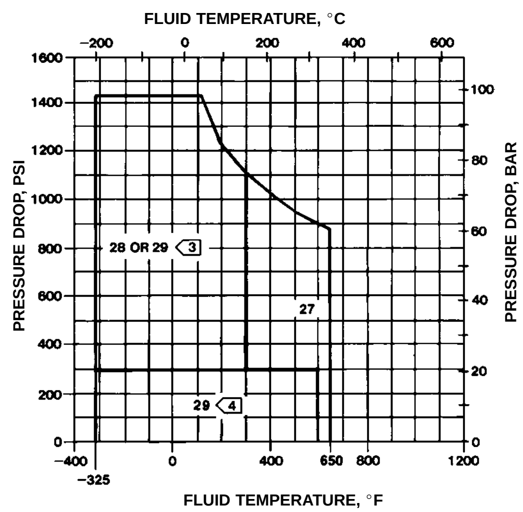
FOR STANDARD METAL SEATING WITH CL250B 1 CAST IRON BODY



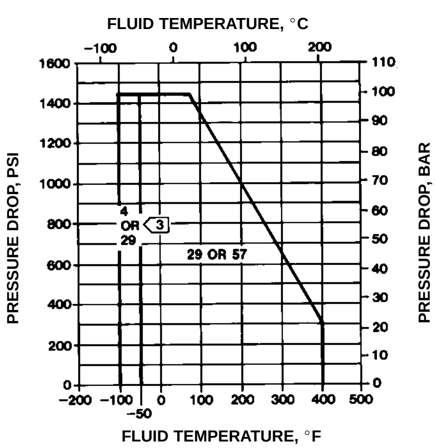
FOR STANDARD METAL SEATING WITH CL600 1 WCC OR LCC STEEL BODY



FOR STANDARD METAL SEATING WITH CL600 1 WC9 CHROME MOLY STEEL BODY



FOR STANDARD METAL SEATING WITH CL600 1 316 STAINLESS STEEL (CF8M) BODY



C0459-5

FOR OPTIONAL PTFE SEATING WITH 1 ALL BODY MATERIALS

Note:

1 Do not exceed the maximum pressure and temperature for the pressure rating of the body material used, even though the trims shown may have higher capabilities.

2 Be especially careful to specify service temperature if trims 3, 4, or 37 are selected, as different thermal expansion rates required special plug clearances, Also, use trim 37 instead of trim 4 for nonlubricating fluids such as superheated steam or dry gases between 149 and 316°C (300 and 600°F).

3 Trims 4 and 29 can be used to pressure drop shown only with clean, dry gas. For other than clean, dry gas, trims 4 and 29 can be used only up to 21 bar (300 PSI).

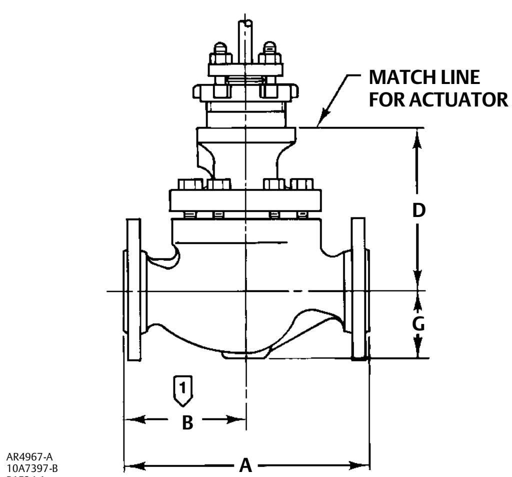
4 Use trim 27 instead of trim 29 for nonlubricating fluids such as superheated steam or dry gases between 149 and 316°C (300 and 600°F).

Table 14. Fisher ES Dimensions

VALVE SIZE, NPS	A									G(MAX)
	Scrd or SW	125 FF or 150 RF	150 RTJ	250 RF or 300 RF	300 RTJ	BW or 600 RF	600 RTJ	PN 16-40(1)	PN 63-100(1)	ES
mm										
1/2, 3/4	165	---	---	---	---	---	---	---	---	54
1	210	184	197	197	210	210	210	160	230	56
1-1/4	229	---	---	---	---	---	---	---	---	56
1-1/2	251	222	235	235	248	251	251	200	260	71
2	286	254	267	267	282	286	289	230	300	78
2-1/2	---	276	292	292	308	311	314	290	340	90
3	---	298	311	317	333	337	340	310	380	97
4	---	353	365	368	384	394	397	350	430	129
6	---	451	464	473	489	508	511	480	550	140
8	---	543	556	568	584	610	613	600	650	191
Inches										
1/2, 3/4	6.50	---	---	---	---	---	---	See mm above	See mm above	2.12
1	8.25	7.25	7.75	7.75	8.25	8.25	8.25			2.38
1-1/4	9.00	---	---	---	---	---	---			2.38
1-1/2	9.88	8.75	9.25	9.25	9.75	9.88	9.88			2.81
2	11.25	10.00	10.50	10.50	11.12	11.25	11.38			3.06
2-1/2	---	10.88	11.38	11.50	12.12	12.25	12.38			3.56
3	---	11.75	12.25	12.50	13.12	13.25	13.38			3.81
4	---	13.88	14.38	14.50	15.12	15.50	15.62			5.06
6	---	17.75	18.25	18.62	19.25	20.00	20.12			5.5
8	---	21.38	21.88	22.38	23.00	24.00	24.12			7.50

1. Valves which meet EN flange standards and have DN face-to-face dimensions are available only from Europe. Valves which meet EN flange standards but not DN face-to-face standards are available in the US. Consult your Emerson Automation Solutions sales office.

Figure 7. Fisher ES Dimensions (also see tables 14, 15, and 16)



ES VALVE

Note:

1 $B = \frac{A}{2}$

Table 15. Fisher ES Dimensions

VALVE SIZE, NPS	D FOR PLAIN BONNET			
	ES			
	Stem Diameter			
	mm			
	9.5	12.7	19.1	25.4 or 31.8
1/2, 3/4, 1, 1-1/4	127	149	---	---
1-1/2	124	146	---	---
2	---	165	162	---
2-1/2	---	187	184	---
3	---	191	187	---
4	---	221	217	264
6 (2)	---	---	251	270
6 (3)	---	---	312	330
8	---	---	375(1)	426
	Inches			
	3/8	1/2	3/4	1 or 1-1/4
1/2, 3/4, 1, 1-1/4	5.00	5.88	---	---
1-1/2	4.88	5.75	---	---
2	---	6.50	6.38	---
2-1/2	---	7.38	7.25	---
3	---	7.50	7.38	---
4	---	8.69	8.56	10.38
6 (2)	---	---	9.88	10.62
6 (3)	---	---	12.26	13.00
8	---	---	14.75(1)	16.75

1. Available only in cast iron or WCC steel for the stem diameter with plain bonnet.
2. For all NPS 6 valves except with Whisper III cages
3. For NPS 6 valves with Whisper III cages

Table 16. Fisher ES Dimensions

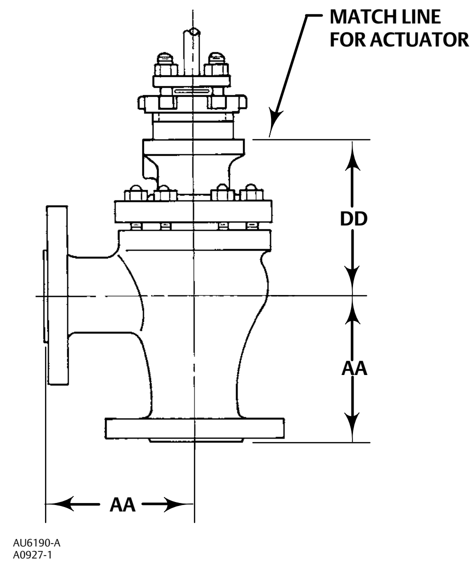
VALVE SIZE, NPS	D FOR EXTENSION AND ENVIRO-SEAL BELLOWS SEAL BONNETS (ES ONLY)									
	Style 1 Ext. Bonnet				Style 2 Ext. Bonnet			ENVIRO-SEAL Bellows Seal Bonnet		
	Stem Diameter				Stem Diameter			Stem Diameter		
	mm									
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1	9.5	12.7	19.1
1/2, 3/4, 1, 1-1/4	213	251	---	---	303	319	---	321	---	---
1-1/2	210	248	---	---	300	316	---	317	---	---
2	---	267	---	---	---	465	---	---	384	---
2-1/2	---	289	272	---	---	492	---	---	---	---
3	---	292	297	---	---	495	487	---	518	518
4	---	322	327	370	---	526	518	---	541	---
6 (1)	---	---	357	402	---	---	543	---	---	573
6 (2)	---	---	418	462	---	---	604	---	---	---
8	---	---	421	450	---	---	621	---	---	---
	Inches									
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	3/8	1/2	3/4
1/2, 3/4, 1, 1-1/4	8.38	9.88	---	---	11.94	12.56	---	12.62	---	---
1-1/2	8.25	9.75	---	---	11.81	12.44	---	12.50	---	---
2	---	10.50	---	---	---	18.31	---	---	15.12	---
2-1/2	---	11.38	10.69	---	---	19.38	---	---	---	---
3	---	11.50	11.69	---	---	19.50	19.19	---	20.38	20.38
4	---	12.69	12.88	14.56	---	20.69	20.38	---	21.31	---
6 (1)	---	---	14.06	15.81	---	---	21.38	---	---	22.56
6 (2)	---	---	16.44	18.19	---	---	23.76	--	--	--
8	---	---	16.56	17.75	---	---	24.44	---	---	---

1. For all NPS 6 valves except with Whisper III cages
2. For NPS 6 valves with Whisper III cages

Table 17. Fisher EAS Dimensions

VALVE SIZE, NPS	AA					
	CL150		CL300		CL600	
	RF	RTJ	RF	RTJ	BW, SW, or RF	RTJ
	mm					
1	92	98	98	105	105	105
2	127	133	133	141	143	144
3	149	156	159	167	168	170
4	176	183	184	197	197	198
6	225	232	237	244	254	256
	Inches					
1	3.62	3.88	3.88	4.12	4.12	4.12
2	5.00	5.25	5.25	5.56	5.62	5.69
3	5.88	6.12	6.25	6.56	6.62	6.69
4	6.94	7.19	7.25	7.56	7.75	7.81
6	8.88	9.12	9.31	9.62	10.00	10.06

Figure 8. Fisher EAS Dimensions
(also see tables 17 and 18)



Note:
For dimensions of valves with EN (or other) end connections, consult your Emerson sales office.

Table 18. Fisher EAS Dimensions

VALVE SIZE, NPS	DD												
	Plain Bonnet				Style 1 Extension Bonnet			Style 2 Extension Bonnet			ENVIRO-SEAL Bellows Seal Bonnet		
	Stem Diameter												
	mm												
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1	9.5	12.7	19.1	9.5	12.7	19.1
1	111	133	- - -	- - -	197	235	- - -	291	305	- - -	Contact your Emerson sales office		
2	98	121	- - -	- - -	184	223	- - -	278	291	- - -			
3	- - -	149	146	- - -	- - -	251	256	- - -	454	- - -			
4	- - -	140	137	- - -	- - -	241	246	- - -	445	437			
6	- - -	144	141	187	- - -	246	251	- - -	449	441			
	Inches												
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	3/8	1/2	3/4	3/8	1/2	3/4
1	4.38	5.25	- - -	- - -	7.75	9.25	- - -	11.44	12.00	- - -	Contact your Emerson sales office		
2	3.88	4.75	- - -	- - -	7.25	8.75	- - -	10.94	11.44	- - -			
3	- - -	5.88	5.75	- - -	- - -	9.88	10.06	- - -	17.88	- - -			
4	- - -	5.50	5.38	- - -	- - -	9.50	9.69	- - -	17.50	17.19			
6	- - -	5.69	5.56	7.38	- - -	9.69	9.88	- - -	17.69	17.38			

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www.Fisher.com

Fisher™ ET, EAT, and ETR Sliding-Stem Control Valves

Fisher ET, EAT, and ETR general-purpose control valves (figures 1, 2, and 3) are used for throttling or on-off control of a wide variety of liquids and gases. All three valve designs have single ports, balanced valve plugs, and cage guiding. Metal-to-PTFE seating for stringent shutoff requirements is standard in all valves except those with Cavitrol™ III cages. Metal-to-metal seating for higher temperatures is standard for valves with Cavitrol III cages and optional for all other valves.

The temperature limits of ET valves can be extended above 232°C (450°F) by using PEEK (PolyEtherEtherKetone) anti-extrusion rings in combination with a spring-loaded PTFE seal. The PEEK anti-extrusion rings expand to close off the clearance gap between the plug and the cage where the PTFE seal may extrude at high temperatures and pressures. The temperature limits are extended to 316°C (600°F) for non-oxidizing service and to 260°C (500°F) for oxidizing service.

The ET product line is available for a wide range of applications, including sulfide and chloride stress-cracking environments common to the oil and gas production industries. To discuss available constructions, contact your Emerson sales office and include the applicable codes and standards required for these environments.


W1916-4

FISHER ET CONTROL VALVE WITH 667 ACTUATOR

The easy-e™ Valve Family

ET, EAT, and ETR control valves are part of the versatile easy-e family of Fisher industrial control valves. easy-e valves share the following characteristics:

- Multiple trim material choices
- Interchangeable, restricted-capacity trims and full-sized trims to match variable process flow demands
- Different cage/plug styles that provide particular flow characteristics for highly-specialized applications. The standard cage comes in three different flow characteristics: quick-opening, linear, or equal percentage.
- Whisper Trim™ I, Whisper Trim III (figure 6), and WhisperFlo™ cages (figures 4 and 5) attenuate aerodynamic noise in gaseous service.
- To help eliminate cavitation damage in a properly-sized valve, a standard-travel, Cavitrol III, one-stage cage (figure 8) and a long-travel, Cavitrol III, two-stage cage are available in the NPS 1 through NPS 8 ET control valve.

Features

- **Compliance with the Clean Air Act**— ENVIRO-SEAL™ packing systems (figures 9 and 10) that provide an improved stem seal to help prevent the loss of process fluid are available. These packing systems feature PTFE or Graphite ULF packing with live-loading for reduced packing maintenance.

- **PTFE Seating for Long-Lasting Shutoff Capability**—Controlled compression of standard seat construction protects PTFE disk between metal disk seat and disk retainer (figure 1). Only the edge of the PTFE disk is contacted by the flowstream during normal operation. Excellent shutoff is maintained by a backup ring or spring-loading that forces the valve plug seal ring against the cage (figure 1).

- **Valve Plug Stability**— Rugged cage guiding provides high valve plug stability, which reduces vibration and mechanical noise.

- **Cost-Effective Operation and Maintenance Economy**—Increased wear resistance of hardened stainless steel trim means longer-lasting service. When inspection or maintenance is necessary, the body can stay in the pipeline during removal of trim parts. Balanced valve plug construction permits use of smaller, lower-cost Fisher actuators. The ETR valve also permits easy body interior access without having to remove the bonnet or actuator (figure 3). And, trim inventory costs are cut because dimensional standardization permits use of most standard easy-e trim parts.

- **Compliance with European Standards**— Valves are available with dimensions specified by EN/DIN standards. See figure 14.

- **Sour Service Capability**— Unless otherwise noted, references are to NACE MR0175-2002. Optional materials are available to meet NACE MR0103 and NACE MR0175 / ISO 15156. Material requirements under these standards vary by edition and year of issue; the specific standard must be specified.

Table of Contents

Specifications

Available Configurations

ET: Single-port, globe-style control valve with cage guiding, balanced valve plug, and push-down-to-close valve plug action (figure 1)
EAT: Angle version of ET control valve, used to facilitate piping or in applications where a self-draining valve is desired (figure 2)
ETR: Same as ET control valve except with push-down-to-open valve plug action (figure 3)

Valve Sizes and End Connection Styles

Flanged raised-face per EN 1092-1/B and see table 1

Maximum Inlet Pressures and Temperatures(1,2)

As listed below, unless limited by maximum pressure drop or material temperature capabilities
Valves with Cast Iron Bodies
Flanged: Consistent with CL125B or 250B per ASME B16.1
Valves with Steel and Stainless Steel Bodies
Flanged: Consistent with CL150, 300, and 600(3) per ASME B16.34
Screwed or Welding: Consistent with flanged CL600 per ASME B16.34

Maximum Pressure Drops(2)

Same as maximum inlet pressure for specific construction defined above, except where further limited as follows:
All Valves Except Those with Cavitrol III, Whisper Trim III, and WhisperFlo Cages: See figure 11.
Valves with Cavitrol III Cages: See figure 12.
Valves with Whisper Trim III Cages: 0.999 $\Delta P/P_1$ maximum for levels A1 through D3
Valves for NACE MR0175 / ISO 15156 and MR0103: See figure 13

Shutoff Classifications Per ANSI/FCI 70-2 and IEC 60534-4

Class IV, V, or VI. See tables 2, 3, or 4

Construction Materials

Body, Bonnet, and Bonnet Spacer or Bottom Flange, if used: ■ Cast iron, ■ WCC carbon steel, or ■ LCC carbon steel, ■ WC9 chrome moly steel, ■ CF8M (cast 316 stainless steel), ■ CF3M (cast 316L stainless steel) or ■ other materials upon request
Valve Plug, Cage, and Metal Seating Parts:
All Valves Except Those with Cavitrol III or Whisper Trim III Cages: See table 5
Valves with Cavitrol III Cages: See table 6
Valves with Whisper Trim III Cages: See table 8
Valves with WhisperFlo Cages: See table 7
Bellows Seal Assembly: ■ 316L stainless steel or ■ N04400
All Other Parts: See table 9

Material Temperature Capabilities(2)

Body/Trim Combinations:
All Valves Except Those with Cavitrol III or Whisper Trim III Cages: See figure 11
Valves with Cavitrol III Cages: See table 6
Valves with Whisper Trim III Cages: See table 8
Valves with WhisperFlo Cages: See table 7
Bolting For NACE MR0175 / ISO 15156 and MR0103: See table 19
Bonnets: See table 11
All Other Parts: See table 9

Flow Characteristics

Standard Cages: ■ Quick-opening, ■ linear, or ■ equal percentage
Whisper Trim, WhisperFlo, and Cavitrol Cages: Linear

Flow Directions

ET
Standard Cage: Normally down
Whisper Trim and WhisperFlo Cages: Always up
Cavitrol Cage: Always down
EAT
Standard Cage with Liner for Metal Seat: Normally down
Standard Cage without Liner: Flow up or down
Whisper Trim and WhisperFlo Cages: Always up
ETR
Standard Cage: Normally up
Whisper Trim Cage: Always down

Flow Coefficients and Noise Level Prediction

See table 12 and Catalog 12

- continued -

Specifications (continued)

Port Diameters and Maximum Valve Plug Travels

See tables 13, 15, and 16

Yoke Boss and Stem Diameters

See table 14

Typical Bonnet Styles

See table 11

Packing Arrangements

Standard Material: Single PTFE V-ring
Optional Materials: See table 9
ENVIRO-SEAL Packing Systems: See figures 9 and 10
ENVIRO-SEAL Packing Systems in vacuum service: Standard ENVIRO-SEAL packing systems can be used in vacuum service with packing rings in standard orientation. Do not reverse the ENVIRO-SEAL PTFE packing rings. Also, see Bulletin 59.1:061, ENVIRO-SEAL Packing Systems for Sliding-Stem Valves (D101633X012).

Approximate Weights

NPS 1: 14 kg (30 lb)
NPS 1-1/2: 20 kg (45 lb)
NPS 2: 39 kg (85 lb)
NPS 2-1/2: 45 kg (100 lb)
NPS 3: 57 kg (125 lb)
NPS 4: 77 kg (170 lb)
NPS 6: 159 kg (350 lb)
NPS 8: 408 kg (900 lb)

Optional Safety Instrumented System Classification

SIL3 capable — certified by exida Consulting LLC

Additional Options

■ Lubricator, ■ lubricator/isolating valve, ■ drilled and tapped connection in extension bonnet for leak-off service, ■ body drain plug, ■ style 3 fabricated extension bonnet made on order to a specific length for cryogenic service, ■ style NS bonnet for seismic service requirements, ■ packings suitable for nuclear service, ■ Class V shutoff for ET above 232°C (450°F) using PEEK anti-extrusion rings

1. EN (or other) ratings and end connections can usually be supplied; consult your Emerson sales office.
2. The pressure or temperature limits in this bulletin, and any applicable code limitations, should not be exceeded.
3. Certain bonnet bolting material selections may require a CL600 easy-e valve assembly to be derated. Contact your Emerson Automation Solutions sales office for more information.
4. Limitation based on excessive noise increase if max $\Delta P/P_1$ ratio for a given cage level is exceeded.

ENVIRO-SEAL Packing System Specifications

Applicable Stem Diameters

■ 9.5 mm (3/8 inches), ■ 12.7 mm (1/2 inches), ■ 19.1 mm (3/4 inches), ■ 25.4 mm (1 inch), and ■ 31.8 mm (1-1/4 inches) diameter valve stems

Maximum Pressure/Temperature Limits(1)

To Meet the EPA Fugitive Emission Standard of 100 PPM(2)
For ENVIRO-SEAL PTFE and ENVIRO-SEAL Duplex packing systems: full CL300 up to 232°C (450°F)
For ENVIRO-SEAL Graphite ULF packing: 104 bar (1500 psig) at 316°C (600°F)

Construction Materials

PTFE Packing Systems
Packing Ring and Lower Wiper: PTFE V-ring(3)
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Graphite ULF Packing Systems: Graphite rings
Duplex Packing Systems:
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Guide Bushings: Carbon graphite
Packing Rings: Graphite composite
Packing Washer: PTFE
Anti-Extrusion Washer: Filled PTFE (not required for Graphite ULF or duplex packing)
Lantern Ring: S31600 (316 stainless steel) (not required for Graphite ULF packing)
Packing Box Flange: S31600
Spring: ■ 17-7PH stainless steel or ■ N06600
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: Strain-hardened 316 stainless steel
Packing Box Nuts: 316 stainless steel SA194 Grade 8M

1. Refer to the valve specifications in this bulletin for pressure/temperature limits of valve parts. Do not exceed the pressure/temperature rating of the valve. Do not exceed any applicable code or standard limitation.
2. The Environmental Protection Agency (EPA) has set a limit of 100 parts per million (ppm) for fugitive emissions from a valve in selected VOC (Volatile Organic Compound) services.
3. In vacuum service, it is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.

Table 1. Available Constructions

VALVE	VALVE SIZE, NPS	VALVE BODY MATERIAL AND END CONNECTION STYLE(1)							
		Cast Iron Valve Body		Carbon Steel, Alloy Steel, or Stainless Steel Valve Body					
		CL125 FF Flanged	CL250 RF Flanged	Screwed	RF or RTJ Flanged			Butt Weld	Socket Weld
					CL150	CL300	CL600		
ET	1, 1-1/2, or 2 2-1/2, 3, 4, 6, or 8	X X	X X	X - - -	X X	X X	X X	X X	X X
EAT	1 or 2 3, 4, or 6	- - - - - -	- - - - - -	- - - - - -	X X	X X	X X	X X	X X
ETR	1, 1-1/2, or 2 2-1/2, 3, or 4	- - - - - -	- - - - - -	X - - -	X - - -	X - - -	X - - -	X - - -	X - - -
VALVE	VALVE SIZE, DN	STEEL VALVE BODY MATERIAL AND RAISED-FACE END CONNECTION STYLE(2)							
		PN16	PN25	PN40		PN63		PN100	
ET	25, 40, 50, 65, 80, 100, 150, or 200	X	X	X		X		X	
EAT	25, 50, 80, 100, or 150	X	X	X		X		X	
ETR	25, 40, 50, 65, 80, or 100	X	X	X		X		X	

X = Available Construction.
1. End connection style abbreviations: FF - Flat Faced, RF - Raised Face, RTJ - Ring Type Joint.
2. End connection EN1092-1/B.

Table 2. Shutoff Classifications Per ANSI/FCI 70-2 and IEC 60534-4

Valve Design	Seating	Shutoff Class
All except those with Cavitrol III cages	PTFE	V Air Test
		V (optional)
		VI (optional)(3)
	Metal	IV (standard)
		V (optional)(1)
		VI (optional)(3)
ET with Cavitrol III one-stage cage	Metal	IV (standard)
		V (optional)
ET with Cavitrol III two-stage cages	Metal	V
ET and EAT w/ TSO (Tight Shutoff) trim (CL125 through 600)	Replaceable, protected soft seat	TSO(2) TSO is not an ANSI/FCI leakage class. Valves with TSO trim are factory tested to a more stringent Emerson Automation Solutions test requirement of no leakage at time of shipment. Test medium is water. Specify service ΔP when ordering. Shutoff class V.
ET w/ TSO (Tight Shutoff) trim (CL125 through 600)	Std or Cavitrol III trim. Replaceable, protected soft seat.	

1. Class V shutoff requires spring-loaded seal ring, radius-seat plug, and wide-bevel seat ring (not available with 8-inch port, quick-opening cage). Not available with trims 4, 29, and 85.
2. For additional information, contact your Emerson sales office.
3. Refer to table 3.

ENVIRO-SEAL, HIGH-SEAL Packing Systems

ENVIRO-SEAL and HIGH-SEAL packing systems offer exceptional sealing capabilities. These systems easily install in existing valves or can be purchased with new valves. These systems help seal the process to conserve valuable process fluid. The long-life and reliability of these systems also reduce maintenance costs and downtime.

For applications requiring compliance with environmental protection regulations, the unique ENVIRO-SEAL packing system (figure 10) and a unique ENVIRO-SEAL bellows seal system (figure 9) are offered. The emission control packing system keeps emission concentrations below the EPA 100 ppm requirement.

For an excellent stem seal in applications that are not environmentally-sensitive, the HIGH-SEAL Graphite ULF packing system (figure 10) is offered. The HIGH-SEAL packing system provides improved sealing at pressure/temperature ratings beyond ENVIRO-SEAL limits.

ENVIRO-SEAL packing systems, available with PTFE, Graphite ULF, or duplex packing, and the HIGH-SEAL Graphite ULF packing system feature live-loading and unique packing-ring arrangements for long-term, consistent sealing performance.

ANSI/FCI Class VI Shutoff Capabilities

ET valves with soft seat and metal seat constructions can provide ANSI/FCI Class VI shut-off capabilities. See tables 3 and 4.

Table 3. Class VI Shutoff Availability[1, 2]

Valve	Port Size, Inches	Seat	Minimum Seat Load
ET	$\geq 3.4375 \leq 7$	Soft	See Catalog 14
ET	$\geq 3.4375 \leq 7$	Metal	300 lbs/lineal inch

1. Limited retrofit capability. Consult your Emerson sales office.
2. Not for use with NPS 8.

Table 4. Class VI Trim Materials

VALVE	CAGE/SEAT RING RETAINER	VALVE PLUG	SEAT RING	SEAL RING	TRIM TEMPERATURE LIMIT	
					°C	°F
ET	316 SST / ENC	S31600 w/ standard beveled seat	S31600/PTFE	UHMWPE[1] R30003	-198 to 66	-325 to 150
	316 SST / ENC	S31600/CoCr-A seat w/ radiused seat (special design)	S31600 w/ wide beveled seat (special design)	UHMWPE R30003	-198 to 66	-325 to 150
	17-4 SST (17-4PH SST)	S41600 w/ standard beveled seat	S31600/PTFE	UHMWPE R30003	-29 to 66	-20 to 150
	17-4 SST	S41600 w/ radiused seat (special design)	S31600 w/ wide beveled seat (special design)	UHMWPE R30003	-29 to 66	-20 to 150

1. UHMWPE (Ultra High Molecular Weight Polyethylene)

Figure 1. Fisher ET Sectional with Standard Cages

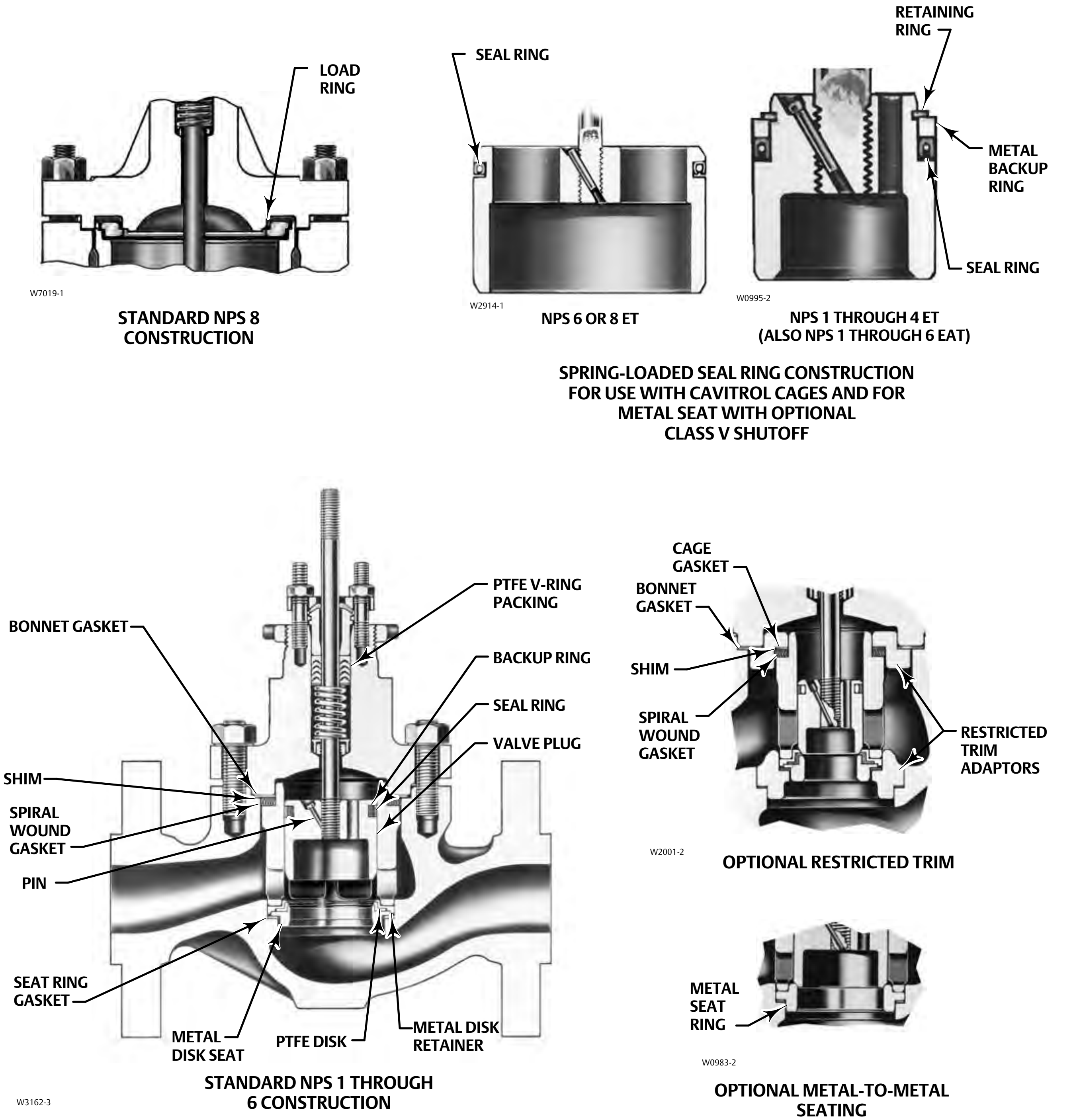

Figure 2. Fisher EAT Sectional

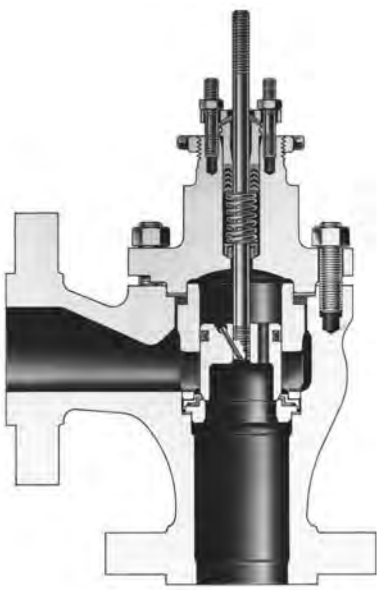
W0972-3

Figure 3. Fisher ETR Sectional

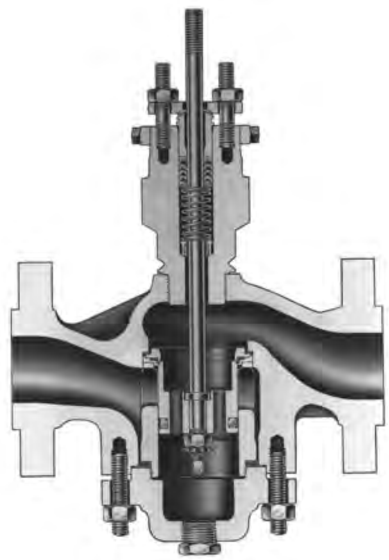
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Figure 4. Typical Valve with WhisperFlo Aerodynamic Trim


W6980

WhisperFlo TRIM

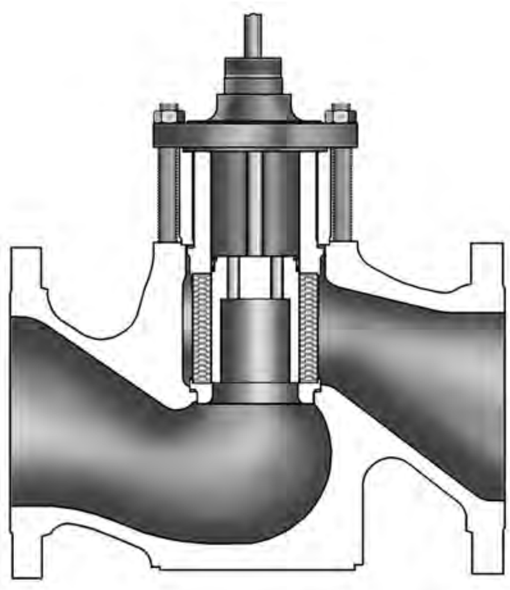
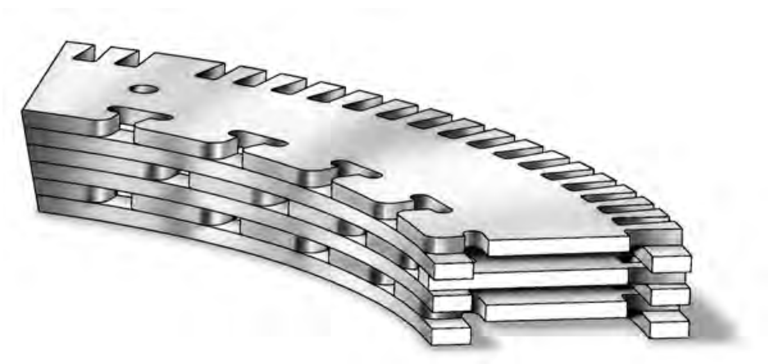

W6851-1

Figure 5. Typical WhisperFlo Cage



W7065

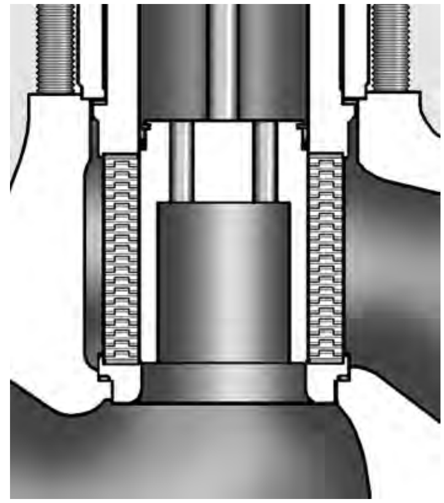


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Table 5. Typical Combinations of Metal Trim Parts for All Valves Except Those for NACE MR0175 / ISO 15156 and MR0103 Specifications[1], Cavitrol III[2], Whisper Trim III[3], and 4, 6, and 8-Inch WhisperFlo Cages[6]

Trim Designation	Valve Plug	Cage	Disk Seat and Retainer for Standard PTFE-Seat Construction	Seat Ring or Liner for Optional Metal-Seat Construction	Optional Liner (Metal Seat EAT Valve Only)
1 (typically used with optional metal-seat constructions in all designs and body materials except CF8M)	S41600 HT	17-4 SST HT	- - -	S41600 HT or CA15 HT[4]	S41600 HT
	17-4 SST HT HT[5]	17-4 SST HT[5]			
3	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	R30006 or R30016 (alloy 6)	- - -	R30006 (alloy 6)	- - -
4[7]	S31600	17-4 SST HT	S31600	S31600	S31600
5[5]	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	R31233	R30006 Disk Seat & retainer	R30006 (alloy 6)	- - -
6[5]	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	S31603 CRPL	R30006 Disk Seat & retainer	R30006 (alloy 6)	- - -
27	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	S31600 disk retainer with CoCr-A disk seat	R30006 (alloy 6)	- - -
28[8]	S31600 with seat hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	S31600 disk retainer with CoCr-A disk seat	R30006 (alloy 6)	- - -
29 (standard for CF8M bodies in all designs regardless of seat construction)[8]	S31600	316 SST with electroless nickel coating (ENC)	S31600	S31600	S31600
37 and 37H (trim 37H has clearances for high-temperature service above 210°C [410°F])	S31600 with seat and guide hard faced with CoCr-A	17-4 SST HT	S31600 disk retainer with CoCr-A disk seat	Seat Ring: R30006 (alloy 6)	- - -
57 (standard for standard PTFE-seat ET, EAT, ETR in all body materials except CF8M)	S41600 HT	17-4 SST HT[5]	S31600	- - -	- - -
	17-4 SST HT[5]				
316L	S31603	316L SST with electroless nickel coating (ENC)	S31603	S31603	- - -
316L HF	S31603 with seat and guide hard faced with CoCr-A hardfacing alloy	316L SST with electroless nickel coating (ENC)	S31603 disk retainer with CoCr-A disk seat	R30006 (alloy 6)	- - -

1. For NACE MR0175 / ISO 15156 and MR0103 specification trims, see table 18
2. For Cavitrol III trims, see table 6.
3. For Whisper Trim III trims, see table 8
4. CA15 is used for NPS 6 and 8 full-sized and restricted-trim valves.
5. For 8-inch Whisper Trim I.
6. For 4, 6, and 8-Inch WhisperFlo trims, see table 7.
7. Not for use with Whisper Trim I.
8. Not for use with Whisper Trim I with 136 mm (5.375 inch) and larger ports.

Table 6. Cavitrol III[1] Metal Trim Part Materials and Body/Trim Temperature Capabilities

TRIM DESIGNATION	VALVE PLUG	CAGE	CAGE RETAINER	SEAT RING	BODY & BONNET		MATERIAL TEMPERATURE CAPABILITY			
							°C		°F	
							Minimum	Maximum	Minimum	Maximum
76	Heat-treated S42000	17-4 SST H900 for Cavitrol III 1-stage or 17-4 SST H1075 for Cavitrol III 2-stage	S31600	S17400 with H900 heat-treat condition	WCC carbon steel, WC9 chrome moly steel, or LCC carbon steel		-29	These materials not limiting factors	-20	These materials not limiting factors
					CF8M	NPS 1, 1-1/2, or 2 valve body size	-29	These materials and sizes not limiting factors	-20	These materials and sizes not limiting factors
						NPS 2-1/2 or 3 valve body size	-29	216	-20	420
						NPS 4, 6, or 8 valve body size	-29	177	-20	350

1. Available only in NPS 1 through 8 ET valves.

Table 7. WhisperFlo Metal Trim Part Materials and Valve Body/Trim Temperature Capabilities (NPS 4, 6, and 8 Fisher ET only)

TRIM DESIGNATION	VALVE BODY	VALVE PLUG	CAGE	CAGE RETAINER	SEAT	MATERIAL TEMPERATURE CAPABILITY[1]			
						°C		°F	
						Min	Max	Min	Max
901	WCC	S41600	410 SST	WCC ENC	S41600	-29	316	-20	600
902	WCC	S31600/CoCrA Seat and Guide	410 SST	WCC ENC	S31600/CoCrA	-29	316	-20	600
926	WCC	S31600/CoCrA Seat and Guide	410 SST NACE	WCC/NACE/ENC	S31600/CoCrA	-29	316	-20	600
936	316 CF8M	S31600/CoCrA Seat and Guide	316 SST/ R31233	S31600/ENC	S31600/CoCrA	-198	316	-325	600
901C	WCC	S41000	410 SST	WCC ENC	S31600/PTFE	-29	232	-20	450
904C	WCC	S31600	410 SST	WCC ENC	S31600/PTFE	-29	149	-20	300
984C	WCC	S31600	410 SST NACE	WCC/NACE/ENC	S31600/PTFE	-29	149	-20	300
985C	CF8M	S31600	316 SST/ R31233	S31600/ENC	S31600/PTFE	-73	149	-100	300
990	CD3MN	S31803/CoCrA Seat and Guide	2205 Duplex[2]/ R31233	S31800/Cr Plate	S31803/CoCrA Seat	-51	316	-60	600
	LCC					-46	316	-51	600
	WCC					-29	316	-20	600
990C	CD3MN	S31803/CoCrA Seat and Guide	2205 Duplex[2]/ R31233	S31800/Cr Plate	S31803/PTFE	-51	232	-60	450
	LCC					-46	232	-51	450
	WCC					-29	232	-20	450

1. Temperatures above 232°C (450°F) require PEEK anti-extrusion rings and spring-loaded seal ring. This option allows ET construction to be used up to 316°C (600°F) for non-oxidizing service and 260°C (500°F) for oxidizing service.
2. 22 Cr-5Ni duplex stainless steel

Table 8. Whisper Trim III Metal Trim Part Materials and Body/Trim Temperature Capabilities

TRIM DESIGNATION	VALVE PLUG	CAGE	CAGE RETAINER	BAFFLE (FOR LEVEL D3 CAGE ONLY)	SEAT RING FOR METAL-SEAT CONSTRUCTION	DISK SEAT AND RETAINER FOR PTFE-SEAT CONSTRUCTION	STEM	BODY, BONNET & BONNET SPACER	MATERIAL TEMPERATURE CAPABILITY			
									°C		°F	
									Min	Max	Min	Max
19.1 through 111.1, 177.8 and 203.2 mm (0.75 through 4.375, 7 and 8 Inch) Port Sizes												
301G	S41600	17-4 SST	--	Steel	S41600	--	S31600	WCC, WC9	-29	316(2)	-20	600(2)
								CF8M(5)	-29	176	-20	350
301GC	S41600	17-4 SST	--	Steel	--	S31600	S31600	WCC, WC9	-29	204	-20	400
								CF8M	-29	176	-20	350
312G(1)	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	--	S31600	R30006	--	S20910	WCC, WC9	-29	316(2)	-20	600(2)
								CF8M	-198	316(2)	-325	600(2)
312GC(1)	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	--	S31600	--	R30006/ S31600(6)	S20910	WCC, WC9	-29	204	-20	400
								CF8M	-73	204	-100	400
315G(1)	S31600/ CoCr-A Seat & Guide	316 SST Chrome Plate	--	S31600	R30006	--	S20910	WCC, WC9	-29	316(2)	-20	600(2)
								CF8M	-198	316(2)	-325	600(2)
315GC(1)	S31600/ CoCr-A Seat & Guide	316 SST Chrome Plate	--	S31600	--	R30006/ S31600(6)	S20910	WCC, WC9	-29	204	-20	400
								CF8M	-73	204	-100	400
306	S31803/ CoCr-A Seat & Guide (< 3"Port), S31803/ Ultimet Seat & Guide (≥ 3"Port)	2205 Duplex(4) Chrome Plate	--	S31803	S31803/ CoCr-A (< 3"Port), S31803/ Ultimet (≥ 3"Port)	--	S31803	WCC, WC9, CF8M	-29	316(2)	-20	600(2)
307G	S31600/ CoCr-A Seat & Guide	S17400	--	Steel	R30006	--	S31600	WCC, WC9	-29	210	-20	410
307GH(3)	S31600/ CoCr-A Seat & Guide	S17400	--	Steel	R30006	--	S31600	WCC, WC9	210	316	410	600
136.5 mm (5.375 Inch) Port												
301	S17400	416 SST	WCC/ENC	Steel	S41600	--	S31600	WCC, WC9	-29	316(2)	-20	600(2)
								CF8M	-29	163	-20	325
301 C	S17400	416 SST	WCC/ENC	Steel	--	S31600	S31600	WCC, WC9	-29	204	-20	400
								CF8M	-29	163	-20	325
304	S31600/ CoCr-A Seat & Guide	416 SST	WCC/ENC	Steel	S31600/ CoCr-A Seat	--	S31600	WCC, WC9	-29	316(2)	-20	600(2)
								CF8M	-29	177	-20	350
312(1)	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	316/ENC Electroless Nickel Coated	S31600	R30006	--	S20910	WCC, WC9	-29	260	-20	500
								CF8M	-198	316(2)	-325	600(2)
312C(1)	S31600/ CoCr-A Seat & Guide	316 SST/ENC Electroless Nickel Coated	316/ENC Electroless Nickel Coated	S31600	--	R30006/ S31600	S20910	WCC, WC9	-29	204	-20	400
								CF8M	-198	204	-325	400
306	S31803/ Ultimet Seat & Guide	2205 Duplex(4) Chrome Plate	--	S31803	S31803/ Ultimet	--	S31803	WCC, WC9, CF8M or CD3MN	-29	316(2)	-20	600(2)

1.NACE compatible trims meets NACE MR0175 2002, MR0175/ISO15156, MR0103.
2. Temperatures above 202°C (450°F) require PEEK anti-extrusion rings and spring loaded. This option allows ET construction to be used up to 316°C (600°F) for non-oxidizing service and 260°C (500°F) for oxidizing service.
3. For high temperature service.
4. 22 Cr-5Ni duplex stainless steel.
5. Trim 301G can be used up to 216°C (420°F) with NPS 3 CF8M body, can be used up to 288°C (550°F) with NPS 2 CF8M body.
6. For 8 inch port size, both disk seat and retainer use R30006.

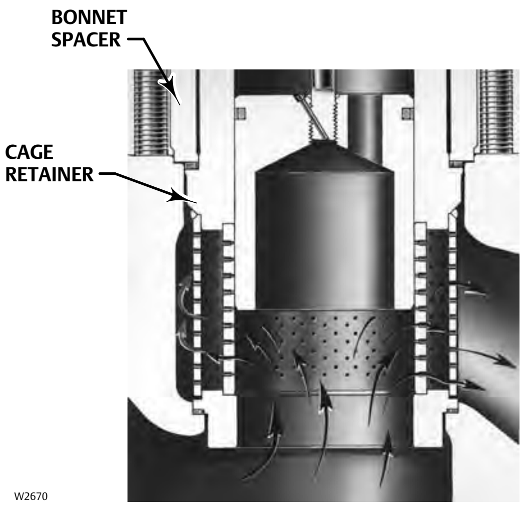


Figure 6. Metal Seat and Whisper Trim III Cage in Fisher ET Valve

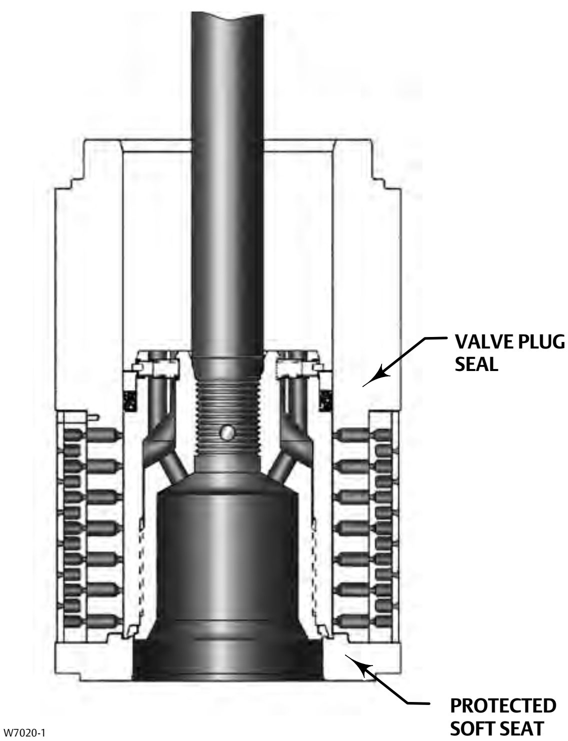


Figure 7. Typical Balanced TSO Trim

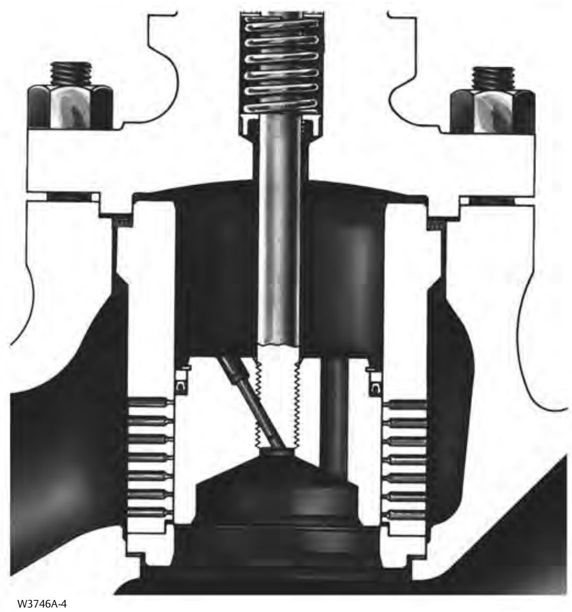


Figure 8. Cavitrol III One-Stage Cage

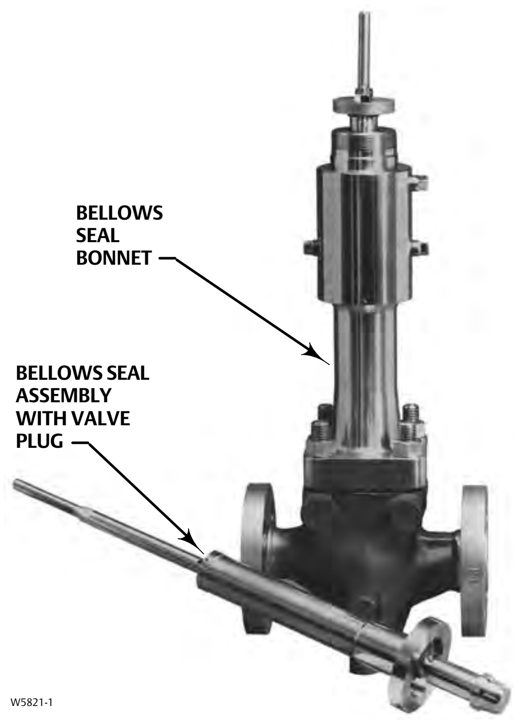
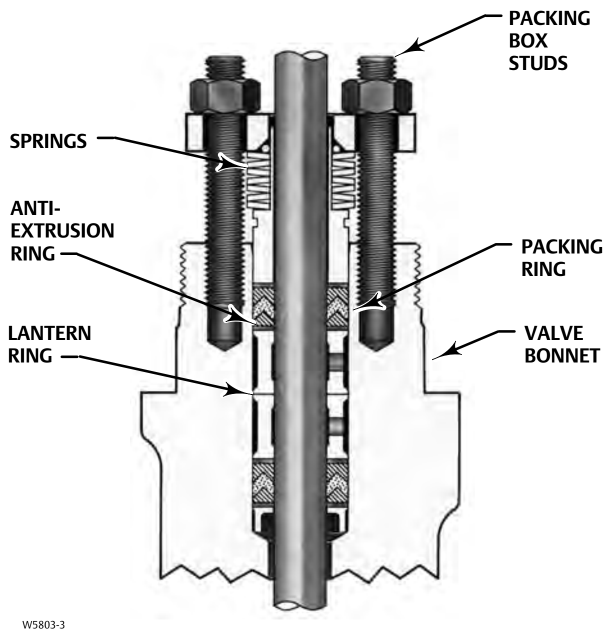
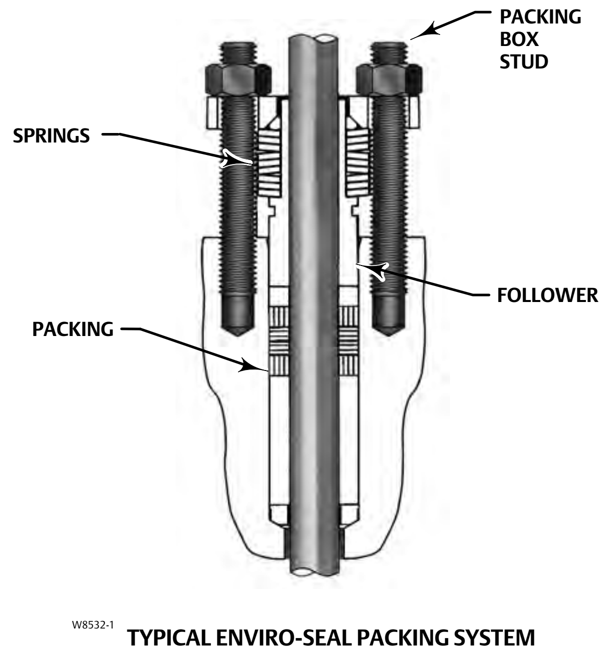


Figure 9. Typical ENVIRO-SEAL Bellows Seal Bonnet and Bellows Seal Assembly

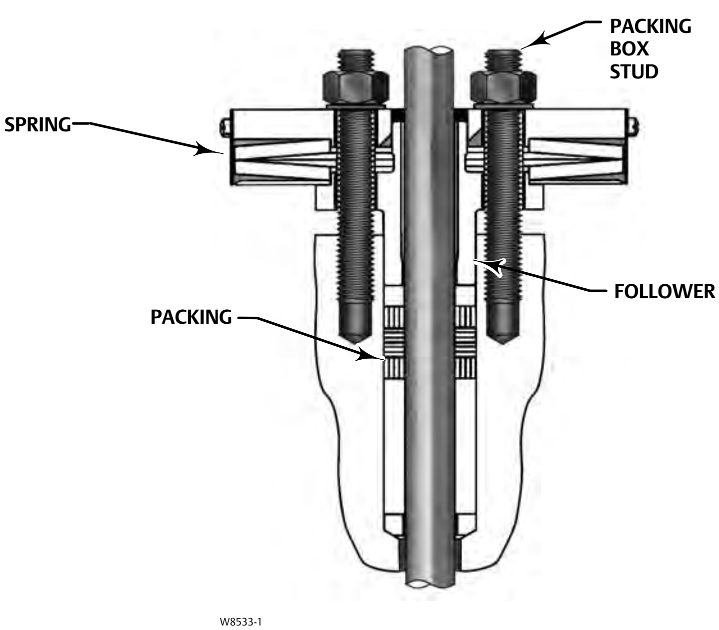
Figure 10. ENVIRO-SEAL and HIGH-SEAL Packing Systems



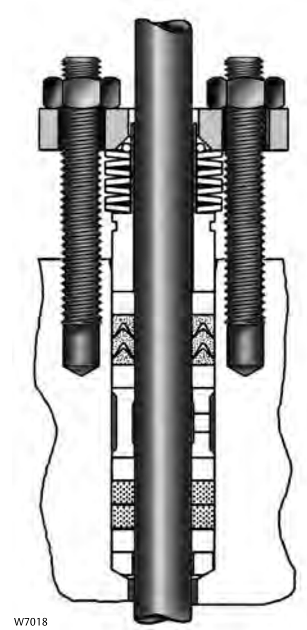
TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH PTFE PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING

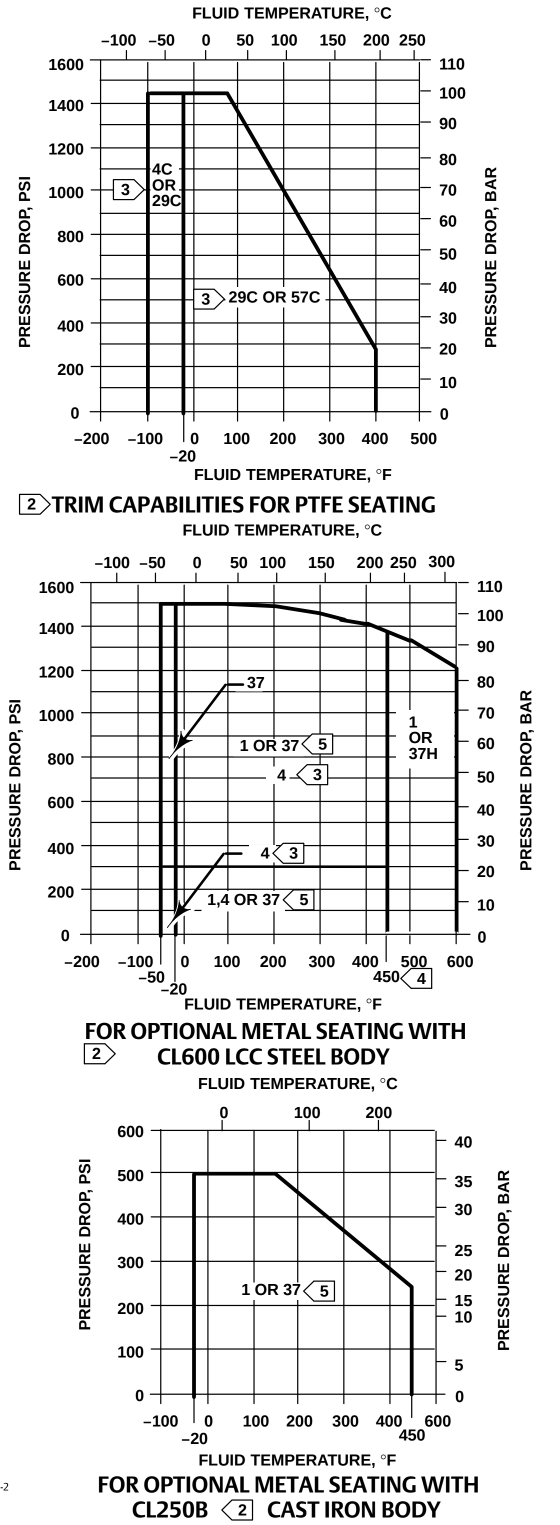


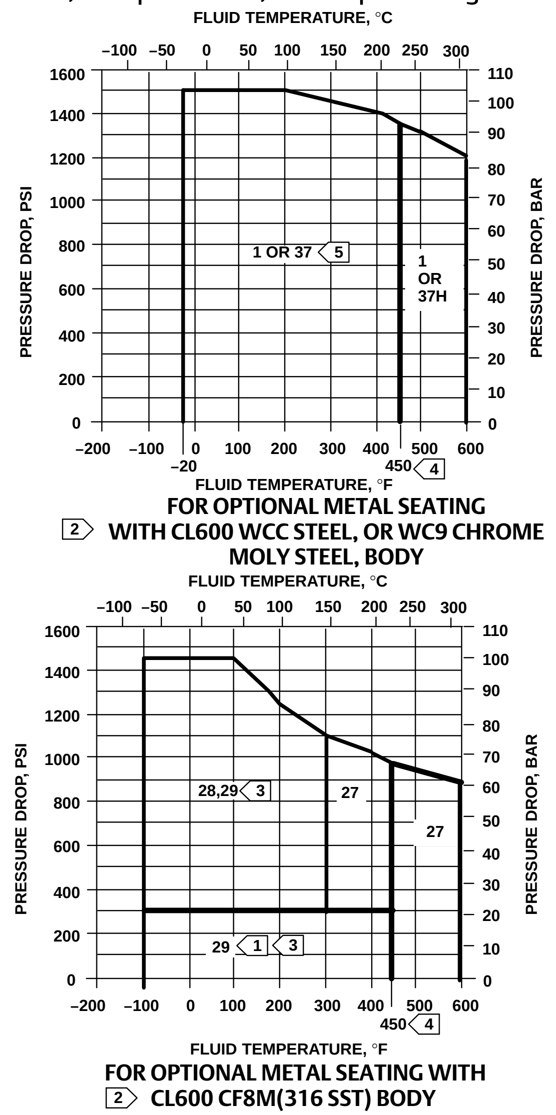
TYPICAL HIGH-SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH DUPLEX PACKING

Figure 11. Typical Trim for All Valves Except Those with Cavitrol III, Whisper Trim III, or WhisperFlo Cages



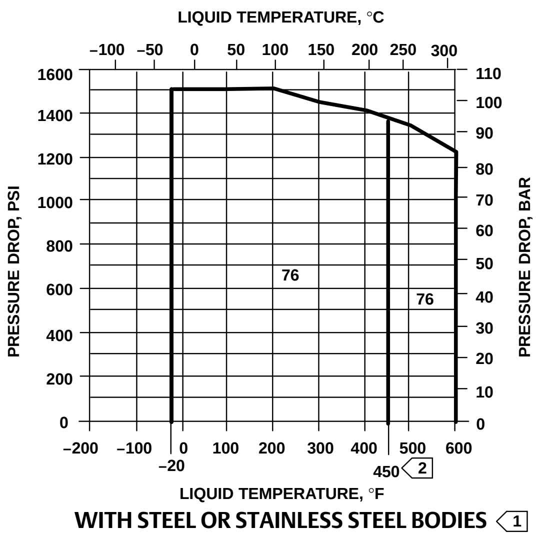


NOTES:

1. Use trim 27 instead of trim 29 for nonlubricating fluids such as superheated steam or dry gases between 149°C (300°F) and 232°C (450°F).
2. Do not exceed the maximum pressure and temperature for the pressure rating of the body material used, even though the trims shown may have higher capabilities.
3. Trims 4 and 29 may be used up to 99 bar (1440 psi) with clean dry gas. For process fluids other than clean dry gas, Use trims 4 and 29 only up to 21 bar (300 psi).
4. Trims 1, 27, and 37H temperature limits can be extended to 316°C (600°F) for non-oxidizing service or 260°C (500°F) oxidizing service if PEEK anti-extrusion rings are used with spring-loaded seal rings.
5. Use trim 37H instead of trim 37 for temperatures above 210°C (410°F). Requires anti-extrusion rings and spring-loaded seal rings for temperatures above 232°C (450°F).

A6736-2

Figure 12. Typical Trim for Cavitrol III Cage Constructions



Notes:
1. Do not exceed the maximum pressure and temperature for the pressure rating of the body material used, even though the trim shown may have higher capabilities.
2. Trim 76 temperature limits can be extended to 316°C (600°F) for non-oxidizing service or 260°C (500°F) for oxidizing service if IF PEEK anti-extrusion rings are used with spring-loaded seal rings.

A6737

Table 9. Materials and Temperature Limits for Other Parts

PART			MATERIAL	TEMPERATURE CAPABILITIES			
				°C		°F	
				Minimum	Maximum	Minimum	Maximum
Body-to-bonnet bolting. See table 19 for NACE bolting materials and temperature limits	Cast iron body	Cap screws	Steel SAE Grade 5	-29	232	-20	450
	WCC body	Studs	Steel SA-193-B7	-29	- - -(5)	-20	- - -(5)
		Nuts	Steel SA-194-2H				
	LCC body	Studs	Steel SA-193-B7	-46		-50	
		Nuts	Steel SA-194-2H				
	CF3M or CF8M (316 stainless steel) body	Studs	Steel SA-193-B7 (std) (NACE [non-exposed bolting])	-48	- - -(5)	-55	- - -(5)
		Nuts	Steel SA-194-2H (std) (NACE [non-exposed bolting])	-46	- - -(5)	-50	- - -(5)
		Studs	S30400 stainless steel SA-320-B8	- - -(5)	38	- - -(5)	100
		Nuts	S30400 stainless steel SA-194-8				
		Studs	S31600 stainless steel SA-193-B8M (strain-hardened) or S31600 stainless steel SA-193-B8M	- - -(5)	- - -(5)	- - -(5)	- - -(5)
		Nuts	S31600 stainless steel SA-194-8M				
Disk			PTFE	-73	204	-100	400
2-piece valve plug seal (standard for NPS 1 thru 6 valves except those with Cavitrol III cage)		Backup ring	Fluorocarbon(1)	-18	204	0	400
			Ethylene-propylene(2)	-40	232	-40	450
			Nitrile(3): For use with air and hydrocarbons	-40	71	-40	160
			Nitrile(3): For use with other compatible fluids	-40	82	-40	180
		Seal ring	Carbon-filled PTFE	-73	232	-100	450
Spring-loaded valve plug seal(7)		Backup ring(4)	S41600 stainless steel	-29	- - -(5)	-20	- - -(5))
			S31600 stainless steel	- - -(5)	- - -(5)	- - -(5)	- - -(5)
		Retaining ring(4)	S30200 stainless steel (N07750, NACE Std)				
		Seal ring	PTFE with N10276 spring	-73	232	-100	450
For applications using PEEK Anti-Extrusion Rings: Spring-loaded valve plug seal		Backup ring(4)	S41600 stainless steel	-29	- - -(5)	-20	- - -(5)
			S31600 stainless steel	- - -(5)	- - -(5)	- - -(5)	- - -(5)
		Retaining ring(4)	S30200 stainless steel				
		Seal ring	PTFE/graphite with R30003spring	-73	316(6)	-100	600(6)
		Anti-extrusion rings	PEEK (PolyEtherEtherKetone)	- - -(5)		- - -(5)	
Valve plug stem			S31600 (S20910, NACE Std.) or S31603	- - -(5)	- - -(5)	- - -(5)	- - -(5)
Load ring (NPS 8 ET valve only)			S17400 or optional N06600 or N05500				
Restricted trim adaptors			Cast iron	-73	232	-100	450
			WCC steel	-29	- - -(5)	-20	- - -(5)
			S31600 stainless steel	- - -(5)		- - -(5)	
Seat ring, bonnet and cage gaskets			FGM (standard)	- - -(5)		- - -(5)	
			PTFE-coated N04400	- - -(5)	149	- - -(5)	300
Spiral wound gasket			N06600/graphite (FGM-standard)	- - -(5)		- - -(5)	
			N04400/PTFE	-73	149	-100	300
Shim			S31600 stainless steel	- - -(5)	- - -(5)	- - -(5)	- - -(5)
			N04400				
Packing	(temperatures shown are material temperature capabilities)	See table 11 for proper bonnet selection	PTFE V-ring	-40	232	-40	450
			PTFE/composition	-73	232	-100	450
			Graphite ribbon/filament	- - -(5)		- - -(5)	

-continued-

Table 9. Materials and Temperature Limits for Other Parts (continued)

PART		MATERIAL	TEMPERATURE CAPABILITIES			
			°C		°F	
			Minimum	Maximum	Minimum	Maximum
Packing flange, studs, and nuts when used with standard bonnet		S31600 stainless steel	- - -(5)		- - -(5)	
Metal packing box parts		S31600 or S17400 stainless steel depending on part	- - -(5)		- - -(5)	
Extension bonnet bushing	Trims 1 & 4	S41600 stainless steel	-29	- - -(5)	-20	- - -(5)
	Other trims	S31600 stainless steel	- - -(5)		- - -(5)	

1. For high-temperature air, hydrocarbons, and certain other chemicals and solvents. Not for use with steam or ammonia. Not recommended for water above 82°C (180°F).
2. Has excellent moisture resistance to hot water and steam and may be used with most fire-resistant hydraulic oils, but cannot be used with petroleum-based fluids and other hydrocarbons.
3. Cannot be used with fire-resistant hydraulic oils.
4. These parts not used with 137 mm (7 inch) ports or larger.
5. These materials not limiting factors.
6. This material may be used in temperatures up to 260°C (500°F) for oxidizing service.
7. Standard for NPS 8 valve regardless of cage and all NPS 1 thru 6 valves with Cavitrol III cages, optional in NPS 1 thru 6 valves with other than Cavitrol III cages.

Table 10. Fisher ET Valve Body/Trim Temperature Capabilities For All Valves Except Cavitrol III, Whisper Trim III Cage, and NPS 4, 6, and 8 ET with WhisperFlo Cage

BODY/BONNET(3) MATERIALS	TRIM DESIGNATION	VALVE SIZE, NPS	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
			Min	Max	Min	Max
Cast Iron	1,3,27, 29 or 57	All	-29	232	-20	450
	5(5)	8	-29	232	-20	450
	6(5)		-29	232	-20	450
	37	All	-29	210	-20	410
	37H		210	232	410	450
CF3M (316L stainless steel)	316L	All	-198(4)	149(2)	-325(4)	300(2)
	316L HF		-198(4)	316(1)	-325(4)	600(1)
CF8M (316 stainless steel)	5(5)	8	-198(4)	316(1)	-325(4)	600(1)
	6(5)		-198(4)	316(1)	-325(4)	600(1)
	27	All	-198(4)	316(1)	-325(4)	600(1)
	28		-198(4)	149(2)	-325(4)	300(2)
	29		-198(4)	149(2)	-325(4)	300(2)
LCC steel	1	All	-29	316(1)	-20	600(1)
	4		-46	210	-50	410
	5(5)	8	-46	316(1)	-50	600(1)
	6(5)		-46	316(1)	-50	600(1)
	27	All	-46	316(1)	-50	600(1)
	29		-46	149(2)	-50	300(2)
	37		-46	210	-50	410
	37H		210	316(1)	410	600(1)
	57		-29	232	-20	450
WCC steel	1	All	-29	316(1)	-20	600(1)
	5(5)	8	-29	316(1)	-20	600(1)
	6(5)		-29	316(1)	-20	600(1)
	27	All	-29	316(1)	-20	600(1)
	29		-29	149(2)	-20	300(2)
	37		-29	210	-20	410
	37H		210	316(1)	410	600(1)
	57		-29	232	-20	450
WC9 Chrome moly steel	1 or 3	All	-29	316(1)	-20	600(1)
	5(5)	8	-29	316(1)	-20	600(1)
	6(5)		-29	316(1)	-20	600(1)
	27	All	-29	316(1)	-20	600(1)
	29		-29	149(2)	-20	300(2)
	37		-29	210	-20	410
	37H		210	316(1)	410	600(1)
	57		-29	232	-20	450

1. Temperatures above 232°C (450°F) require PEEK anti-extrusion rings and spring-loaded seal ring. This option allows ET construction to be used up to 316°C (600°F) for non-oxidizing service and 260°C (500°F) for oxidizing service.
2. Lubricating service allows usage to 232°C (450°F)
3. Same material also used for bottom flange, if required. Restricted trim and full-sized limits are the same.
4. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.
5. Only available for Whisper Trim I cages.

Table 11. Bonnet Selection Guidelines

BONNET STYLE	PACKING MATERIAL	IN-BODY PROCESS TEMPERATURE LIMITS[1]	
		°C	°F
Plain: ■Standard for all valve sizes through NPS 6 with 2-13/16 yoke boss diameter ■Standard for NPS 6 and 8 valves in cast iron and WCC steel bonnet material with 3-9/16 yoke boss diameter	PTFE V-ring	-18 to 232	0 to 450
	PTFE/Composition	-18 to 232	0 to 450
	Graphite ribbon/filament	-18 to 316[2]	0 to 600[2]
Style 1 Cast Extension: ■Standard for NPS 8 valves in S31600 bonnet material with 3-9/16 yoke boss diameter	PTFE V-ring	-46 to 316[2]	-50 to 600[2]
	PTFE/Composition		
	Graphite ribbon/filament		
Style 2 Cast Extension: ■Optional for NPS 2 through 4 valve sizes with 2-13/16 inch yoke boss diameter ■Optional for NPS 6 and 8 valves with 3-9/16 yoke boss diameter. Not available for NPS 8 valve in S31600 bonnet material	PTFE V-ring	-101 to 316[2]	-150 to 600[2]
	PTFE/Composition		
	Graphite ribbon/filament		
ENVIRO-SEAL bellows seal bonnet	PTFE	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets (D101641X012), for pressure/temperature ratings.	
	Graphite ULF	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets (D101641X012), for pressure/temperature ratings.	

1. These in-body process temperatures assume an outside, ambient temperature of 21°C (70°F) and no insulation on the bonnet. When using any packing at low process temperatures, a cast extension bonnet may have to be used to prevent packing damage which could result from the formation of valve stem frost. Material selection for trim and other components will also be limiting factors.
2. Temperatures above 232°C (450°F) require PEEK anti-extrusion rings and spring-loaded seal ring.

Table 12. Maximum Flow Coefficients for Full-Sized Trim with Equal Percentage Cage and Normal Flow Direction

Valve		Valve Size, NPS	Cv at Max. Valve Plug Travel
ET		1 1-1/2 2 2-1/2 3	17.2 35.8 59.7 99.4 136
		4 6 8[1] 8[2]	224 394 567 819
EAT	with liner	1 2 3 4 6	18.5 48.1 149 152 336
	without liner	1 2 3 4 6	19.0 47.2 148 156 328
ETR		1 1-1/2 2 2-1/2 3 4	17.2 35.8 59.7 99.4 136 224

1. With 51 mm (2 inch) travel.
2. With 76 mm (3 inch) travel.

Table 13. Port Diameters and Valve Plug Travel

VALVE SIZE, NPS				PORT DIAMETER(1)		MAXIMUM VALVE PLUG TRAVEL(1)	
ET or ETR		EAT					
Full-Sized Trim	Restricted-Capacity Trim	Full-Sized Trim	Restricted-Capacity Trim	mm	Inch	mm	Inch
1	1-1/2	1	2	33.3	1.3125	19.1	0.75
---	2	---	---	33.3	1.3125	19.1	0.75
1-1/2	---	2	---	46.7	1.875	19.1	0.75
---	2-1/2	---	---	46.7	1.875	19.1	0.75
2	3	---	4	58.7	2.3125	29	1.125
2-1/2	4	3	6	73.0	2.875	38	1.5
3	---	4	---	87.3	3.4375	38	1.5
4	---	6	---	111.1	4.375	51	2
6(2)	---	---	---	177.8(3)	7(3)	51(3)	2(3)
				---	---	---	---
8(2)	---	---	---	203.2	8	51	2
						76	3

1. For Cavitrol III trim, see table 15.
2. Not available in ETR valves.
3. Standard-travel cages.

Table 14. Stem and Yoke Boss Diameters

VALVE SIZE, NPS				STEM AND YOKE BOSS DIAMETERS							
ET or ETR		EAT		Standard				Optional			
				Stem		Yoke Boss		Stem		Yoke Boss	
Full-Sized Trim	Restricted-Capacity Trim	Full-Sized Trim	Restricted-Capacity Trim	mm	Inch	mm	Inch	mm	Inch	mm	Inch
1	1-1/2	1	2	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
---	2	---	---	12.7	1/2	71	2-13/16	---	---	---	---
1-1/2	---	2	---	9.5	3/8	54	2-1/8	12.7	1/2	71	2-13/16
---	2-1/2	---	---	12.7	1/2	71	2-13/16	---	---	---	---
2	3	---	4	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
2-1/2	4	3	6	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
3	---	4	---	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
4	---	6	---	12.7	1/2	71	2-13/16	19.1	3/4	90	3-9/16
								25.4	1	127	5
6(1)	---	---	---	19.1	3/4	90	3-9/16	25.4 or 31.8	1 or 1-1/4	127	5
8(1)	---	---	---								

1. Not available in ETR valves.

Table 15. Port Diameters and Valve Plug Travel for Cavitrol III Cage

ET VALVE SIZE, NPS	ONE-STAGE CAGE		TWO-STAGE CAGE	
	Port Diameters	Valve Plug Travel(1)	Port Diameters	Valve Plug Travel
		mm		
1	33.3	25	25.4	25
1-1/2	47.6	22	33.3	38
2	58.7	29	47.6	51
2-1/2	73.0	38	58.7	64
3	87.3	41	7.30	76
4	111.1	54	73.0	102
6	177.8	57	136.5	102
8	203.2	86	177.8	152
		Inch		
1	1.3125	1	1	1
1-1/2	1.875	0.875	1.3125	1.5
2	2.3125	1.125	1.875	2
2-1/2	2.875	1.5	2.3125	2.5
3	3.4375	1.625	2.875	3
4	4.375	2.125	2.875	4
6	7	2.25	5.375	4
8	8	3.375	7	6

1. The travel listed is the maximum travel that can be obtained for the given size. In situations where increased valve capacity is not needed, standard ET valve travels should be utilized in selecting the actuator.

Table 16. Port Diameter, Valve Plug Travel, and Stem and Yoke Boss Diameters for Whisper III Trims(1)

VALVE SIZE, NPS		PORT DIAMETER		MAX VALVE PLUG TRAVEL		STEM AND YOKE BOSS DIAMETERS								PERFORMANCE LEVEL
						Standard				Optional				
						Stem		Yoke Boss		Stem		Yoke Boss		
ET	EAT	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
1	1	33.3	1 5/16	19	3/4	9.5	3/8	54	2 1/8	12.7	1/2	71	2 13/16	A1
1 1/2	2	47.6	1 7/8	19	3/4	9.5	3/8	54	2 1/8	12.7	1/2	71	2 13/16	A1
		33.3	1 5/16	19	3/4									A3, B1, B3
2	--	58.7	2 5/16	35	1 3/8	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
2	--	33.3	1 5/16	29	1 1/8	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A3, B1, B3,C1, C3, D1, D3
2 1/2	3	73	2 7/8	38	1 1/2	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		47.6	1 7/8											A3, B1, B3,C1, C3, D1, D3
3	4	87.3	3 7/16	38	1 1/2	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		58.7	2 5/16											A3, B1, B3,C1, C3, D1, D3
4	6	111.1	4 3/8	51	2	12.7	1/2	71	2 13/16	19.1	3/4	90	3 9/16	A1
		87.3	3 7/16							25.4	1	127	5	A3, B1, B3,C1, C3, D1, D3
6	--	177.8	7	51	2	19.1	3/4	90	3.5625	25.4 or 31.8	1 or 1 1/4	127	5	A1
		136.5	5 3/8	76	3									A3, B1, B3,C1, C3, D1, D3
8	--	203.2	8	76	3	19.1	3/4	90	3.5625	25.4 or 31.8	1 or 1 1/4	127	5	A1
				102	4									A3, B1, B3,C1, C3

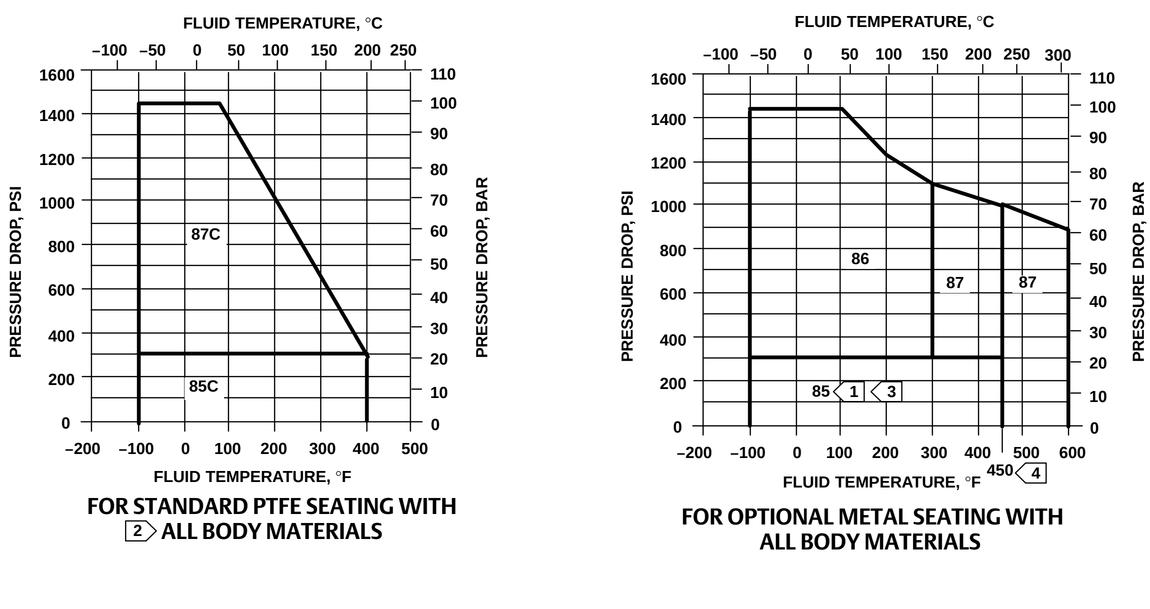
1. Refer Fisher Bulletin 80.1:010 Whisper Trim III (D100191X012) for more information.

Table 17. Port Diameters, Valve Plug Travel, Yoke Boss Diameters for TSO (Tight Shutoff) Trim

VALVE	TRIM	MAX TRAVEL		YOKE BOSS SIZE		PORT DIAMETER				C_V REDUCTION AT 100% TRAVEL(1)	UNBALANCE AREA
						Nominal		Actual TSO			
		mm	Inch	mm	Inch	mm	Inch	mm	Inch		Inch^2
ET NPS 3	CAV III 2-Stage	76.2	3	90 127	3-9/16 5	73.0	2.875	68.3	2.6875	0%	0.098
ET NPS 4	CAV III 2-Stage	102	4	90 127	3-9/16 5	73.0	2.875	68.3	2.6875	5%	0.098
EAT NPS 4	Std	38.1	1.5	71.4 90	2-13/16 3-9/16	87.3	3.4375	82.6	3.25	6% 4%	0.118
EAT NPS 6	Std	50.8	2	90	3-9/16	111	4.375	106	4.1875	4% (linear) 3% (equal percent)	0.154

1. This column lists the percent reduction of published maximum C_V of the trim listed in the TRIM column.

Figure 13. Typical Trim for NACE MR0175 / ISO 15156 and MR0103 (Sour Service)



Notes:
1 Use trim 87 instead of trim 85 for nonlubricating fluids such as super-heated steam or dry gases between 149°C (300°F) and 232°C (450°F).
2 Do not exceed the maximum pressure and temperature for the pressure rating of the body material used, even though the trims shown may have higher capabilities.
3 Trim 85 may be used up to 99 bar (1440 psi) with clean dry gas. For process fluids other than clean dry gas, use trim 85 only up to 21 bar (300 psi).
4 Trim 87 temperature limits can be extended to 316°C (600°F) for non-oxidizing service or 260°C (500°F) for oxidizing service if PEEK anti-extrusion rings are used with spring-loaded seal rings.

Table 18. Metal Trim Part Materials for Compatibility with NACE MR0175 / ISO 15156 and MR0103 (Sour Service) Specifications. Environmental Restrictions Apply, Refer to Standard.

<table>
<tr><th>Trim Designation[4]</th><th>Valve Plug</th><th>Cage</th><th>Seat Ring for Standard Metal Seat Construction</th><th>Optional Liner for Metal Seat (EAT only)</th><th>Disk Seat and Retainer for Optional PTFE-Seat Construction</th><th>Valve Stem, Packing Follower, Lantern Ring, Packing Box Ring, and Pin</th><th>Load Ring[1]</th></tr>
<tr><td>85[5]</td><td>S31600</td><td>316 SST with electroless nickel coating (ENC)</td><td>S31600</td><td>S31600</td><td>- - -</td><td rowspan="5">S20910 (Valve Stem) S31600 (All Other Parts)</td><td rowspan="5">N05500</td></tr>
<tr><td>85C[2, 5]</td><td>S31600</td><td>316 SST with electroless nickel coating (ENC)</td><td>- - -</td><td>- - -</td><td>S31600</td></tr>
<tr><td>86[5]</td><td>S31600 with seat hard faced with CoCr-A hardfacing alloy</td><td>316 SST with electroless nickel coating (ENC)</td><td>R30006 (alloy 6)</td><td>- - -</td><td>- - -</td></tr>
<tr><td>87 (Also used for 8-inch Whisper Trim I)</td><td>S31600 with seat and guide hard faced with CoCr-A hardfacing alloy</td><td>316 SST with electroless nickel coating (ENC)[3]</td><td>R30006 (alloy 6)</td><td>- - -</td><td>- - -</td></tr>
<tr><td>87C[2] (Also used for 8-inch Whisper Trim I)</td><td>S31600 with seat and guide hard faced with CoCr-A hardfacing alloy</td><td>316 SST with electroless nickel coating (ENC)[3]</td><td>- - -</td><td>- - -</td><td>S31600</td></tr>
</table>

1. NPS 8 valve body only.
2. 85C and 87C are trims for PTFE-seat construction.
3. 8-inch Whisper Trim I cage is 17-4 SST, double H1150 (NACE) / ENC.
4. N07750 retaining ring is standard for spring-loaded seal ring construction.
5. Not for use with Whisper Trim I with 136 mm (5.375 inch) and larger ports.

Table 19. Bolting Materials and Temperature Limits for Bolting Compliance with NACE MR0175-2002, NACE MR0175/ISO 15156, and NACE MR0103. Environmental restrictions may apply

VALVE BODY MATERIAL		BOLTING MATERIAL	TEMPERATURE CAPABILITIES			
			°C		°F	
			Min	Max	Min	Max
Non-exposed bolting (Standard)						
WCC and CF8M (316 SST)	Studs	Steel SA-193-B7	-48[2]	427	-55[2]	800
	Nuts	Steel SA-194-2H				
Exposed bolting (Optional) May require derating of valve[1] when these body-to-bonnet bolting materials are used						
WCC and CF8M	Studs	Steel SA-193-B7M	-48[2]	427	-55[2]	800
	Nuts	Steel SA-194-2HM				

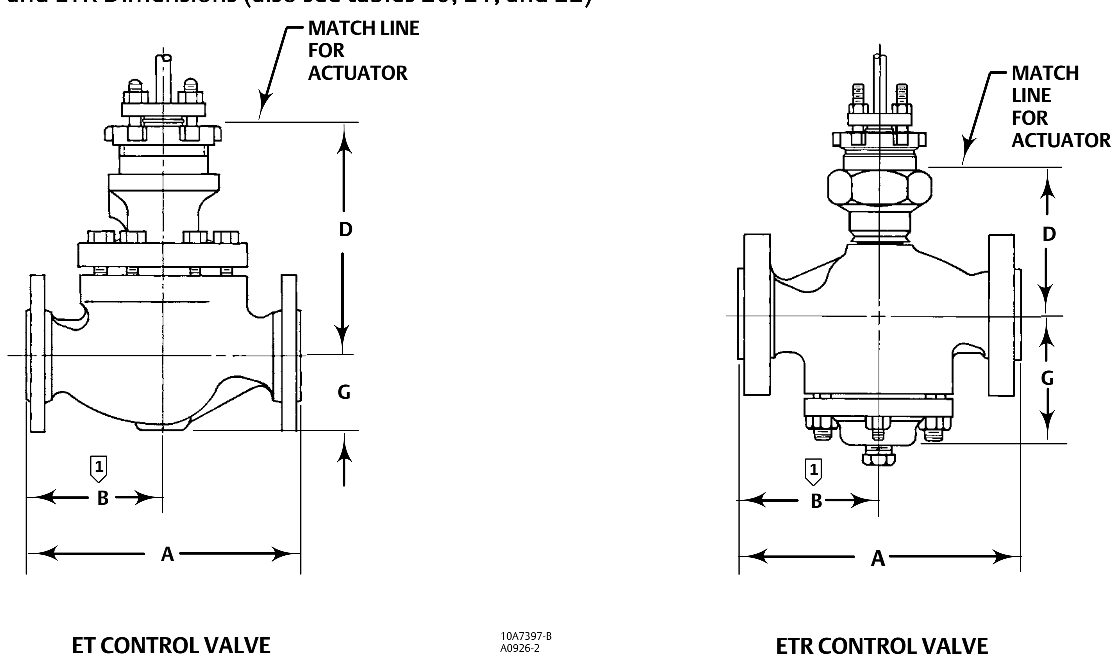
1. Derating is not required for CL150 and 300 valves. Derating may be required for valves rated at CL600. Contact your Emerson sales office for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used.
2. -29°C (-20°F) with WCC body material.

Table 20. Fisher ET and ETR Dimensions

VALVE SIZE, NPS	A									G (MAX)	
	Pressure Rating, End Connection Style (1)										
	Scrd or SW	CL125 FF or CL150 RF	CL150 RTJ	CL250 RF or CL300 RF	CL300 RTJ	BW or CL600 RF	CL600 RTJ	PN16-40 (2)	PN63-100 (2)	ET	ETR
	mm										
1	210	184	197	197	210	210	210	160	230	60	119
1-1/2	251	222	235	235	248	251	251	200	260	71	116
2	286	254	267	267	282	286	289	230	300	78	133
2-1/2	---	276	292	292	308	311	314	290	340	90	159
3	---	298	311	317	333	337	340	310	380	97	168
4	---	353	365	368	384	394	397	350	430	129	192
6	---	451	464	473	489	508	511	480	550	140	---
8	---	543	556	568	584	610	613	600	650	191	---
	Inch										
1	8.25	7.25	7.75	7.75	8.25	8.25	8.25	See mm above	See mm above	2.38	4.69
1-1/2	9.88	8.75	9.25	9.25	9.75	9.88	9.88			2.81	4.56
2	11.25	10.00	10.50	10.50	11.12	11.25	11.38			3.06	5.25
2-1/2	---	10.88	11.38	11.50	12.12	12.25	12.38			3.56	6.25
3	---	11.75	12.25	12.50	13.12	13.25	13.38			3.81	6.62
4	---	13.88	14.38	14.50	15.12	15.50	15.62			5.06	7.56
6	---	17.75	18.25	18.62	19.25	20.00	20.12			5.51	---
8	---	21.38	21.88	22.38	23.00	24.00	24.12			7.50	---

1. End connection style abbreviations: BW - Buttwelding, FF - Flat Faced, Scrd - Screwed, SW - Socketweld, RF - Raised Face, RTJ - Ring Type Joint
2. Valves which meet EN 1092 flange standards and have EN face-to-face dimensions are available only from Europe (EN 558-1). Valves which meet EN 1092 flange standards but not EN face-to-face standards are available in the US. Consult your Emerson sales office.

Figure 14. Fisher ET and ETR Dimensions (also see tables 20, 21, and 22)



Notes:
1 B = $\frac{A}{2}$
2. For dimensions of valves with other end connections, consult your Emerson sales office.

Table 21. Fisher ET and ETR Dimensions

VALVE SIZE, NPS	D FOR PLAIN BONNET										
	ET Except with Cavitrol III Two-Stage Cage				ET with Cavitrol III Two-Stage Cage				ETR		
	Stem Diameter, mm				Stem Diameter, mm				Stem Diameter, mm		
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1
1	127	149	---	---	---	184	---	---	113	124	---
1-1/2	124	146	---	---	155	177	---	---	122	133	---
2	---	165	162	---	---	201	198	---	---	148	140
2-1/2	---	187	184	---	---	229	226	---	---	157	152
3	---	191	187	---	---	260	256	---	---	167	159
4	---	221	217	264	---	311	308	354	---	198	191
6[1]	---	---	251	270	---	---	336	380	---	---	---
6[2]	---	---	312	330	---	---	---	---	---	---	---
8	---	---	375[3]	426	---	---	511	560	---	---	---
	Stem Diameter, Inch				Stem Diameter, Inch				Stem Diameter, Inch		
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4
1	5.00	5.88	---	---	---	7.25	---	---	4.44	4.88	---
1-1/2	4.88	5.75	---	---	6.09	6.97	---	---	4.81	5.25	---
2	---	6.50	6.38	---	---	7.91	7.78	---	---	5.81	5.50
2-1/2	---	7.38	7.25	---	---	9.03	8.91	---	---	6.31	6.00
3	---	7.50	7.38	---	---	10.22	10.09	---	---	6.56	6.25
4	---	8.69	8.56	10.38	---	12.25	12.12	13.94	---	7.81	7.50
6[1]	---	---	9.88	10.62	---	---	13.22	14.97	---	---	---
6[2]	---	---	12.26	13.00	---	---	---	---	---	---	---
8	---	---	14.75[3]	16.75	---	---	20.12	22.06	---	---	---

1. For all NPS 6 valves except with Whisper III and WhisperFlo cages.
2. For NPS 6 valves with Whisper III and WhisperFlo cages.
3. Available only in cast iron or WCC steel for the stem diameter with plain bonnet.

Table 22. Fisher ET and ETR Dimensions

VALVE SIZE, NPS	D FOR EXTENSION AND ENVIRO-SEAL BELLOWS SEAL BONNETS (ET ONLY, EXCEPT WITH CAVITROL III CAGE)									
	Style 1 Ext. Bonnet				Style 2 Ext. Bonnet			ENVIRO-SEAL Bellows Seal Bonnet		
	Stem Diameter				Stem Diameter			Stem diameter		
	mm									
	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1	9.5	12.7	19.1
1	213	251	---	---	303	319	---	320	---	---
1-1/2	210	248	---	---	300	316	---	317	---	---
2	---	267	272	---	---	465	---	---	384	---
2-1/2	---	289	294	---	---	492	---	---	---	---
3	---	292	297	---	---	495	487	---	517	517
4	---	322	327	370	---	526	518	---	541	---
6[1]	---	---	357	402	---	---	543	---	---	573
6[2]	---	---	418	462	---	---	604	---	---	---
8	---	---	421	450	---	---	621	---	---	703
	Inch									
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4	3/8	1/2	3/4
1	8.38	9.88	---	---	11.94	12.56	---	12.62	---	---
1-1/2	8.25	9.75	---	---	11.81	12.44	---	12.50	---	---
2	---	10.50	10.69	---	---	18.31	---	---	15.12	---
2-1/2	---	11.38	11.56	---	---	19.38	---	---	---	---
3	---	11.50	11.69	---	---	19.50	19.19	---	20.38	20.38
4	---	12.69	12.88	14.56	---	20.69	20.38	---	21.31	---
6[1]	---	---	14.06	15.81	---	---	21.38	---	---	22.56
6[2]	---	---	16.44	18.19	---	---	23.76	---	---	---
8	---	---	16.56	17.75	---	---	24.44	---	---	27.69

1. Standard-travel cages.
2. For NPS 6 valves with Whisper III and WhisperFlo cages.

Table 23. Fisher EAT Dimensions(1)

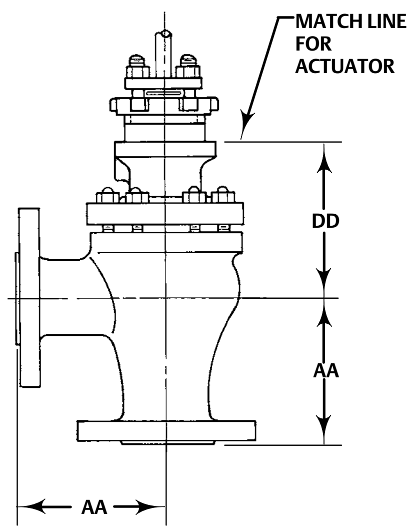
VALVE SIZE, NPS	AA					
	CL150		CL300		CL600	
	RF	RTJ	RF	RTJ	BW, SW or RF	RTJ
	mm					
1	92	98	98	105	105	105
2	127	133	133	141	143	144
3	149	156	159	167	168	170
4	176	183	184	197	197	198
6	225	232	237	244	254	256
	Inch					
1	3.62	3.88	3.88	4.12	4.12	4.12
2	5.00	5.25	5.25	5.56	5.62	5.69
3	5.88	6.12	6.25	6.56	6.62	6.69
4	6.94	7.19	7.25	7.56	7.75	7.81
6	8.88	9.12	9.31	9.62	10.00	10.06

1. End connection style abbreviations: BW - Buttwelding, FF - Flat Faced, Scrd - Screwed, SW - Socketweld, RF - Raised Face, RTJ - Ring Type Joint.

Table 24. Fisher EAT Dimensions

VALVE SIZE, NPS	DD						
	Plain Bonnet				Style 1 Extension Bonnet		
	Stem Diameter, mm				Stem Diameter, mm		
	9.5	12.7	19.1	25.4 or 38.1	9.5	12.7	19.1
1	111	133	---	---	197	253	---
2	98	121	---	---	184	223	---
3	---	149	146	---	---	251	256
4	---	140	137	---	---	241	246
6	---	144	141	187	---	246	251
	Stem Diameter, In.				Stem Diameter, In.		
	3/8	1/2	3/4	1 or 1-1/4	3/8	1/2	3/4
1	4.38	5.25	---	---	7.75	9.95	---
2	3.88	4.75	---	---	7.25	8.75	---
3	---	5.88	5.75	---	---	9.88	10.06
4	---	5.50	5.38	---	---	9.50	9.69
6	---	5.69	5.56	7.38	---	9.69	9.88

Figure 15. Fisher EAT Dimensions
(also see tables 23, 24, and 25)



Note:
For dimensions of valves with PN (or other) end connections, consult your Emerson sales office.

Table 25. Fisher EAT Dimensions

VALVE SIZE, NPS	DD					
	Style 2 Extension Bonnet			ENVIRO-SEAL Bellows Seal Bonnet		
	Stem Diameter, mm			Stem Diameter, mm		
	9.5	12.7	19.1	9.5	12.7	19.1
1	291	305	---	305	---	---
2	278	291	---	292	---	---
3	---	454	---	---	---	---
4	---	445	437	---	467	---
6	---	449	441	---	465	---
	Stem Diameter, In.			Stem Diameter, In.		
	3/8	1/2	3/4	3/8	1/2	3/4
1	11.44	12.00	---	12.00	---	---
2	10.94	11.44	---	11.50	---	---
3	---	17.88	---	---	---	---
4	---	17.50	17.19	---	18.38	---
6	---	17.69	17.38	---	18.31	---

Ordering Information

Inlet pressure and temperature must always be limited by the applicable ASME pressure/temperature rating. Pressure drop information for various trim material combinations is provided in figures 11, 12, and 13. The maximum allowable pressure drop for the application must not exceed the lowest value indicated for the combination of materials selected.

When ordering, specify:

Application Information

1. Type of application:

    a. Throttling or on-off

    b. Reducing or relief

2. Controlled fluid (include chemical analysis of fluid if possible)

3. Specific gravity of controlled fluid

4. Fluid temperature

5. Inlet pressures:

    a. Minimum

    b. Normal

    c. Maximum

6. Pressure drops:

    a. Minimum flowing drop

    b. Normal flowing drop

    c. Maximum flowing drop

    d. Maximum at shutoff

7. Flow rates:

    a. Minimum controlled flow

    b. Normal flow

    c. Maximum flow

8. Maximum permissible noise level, if critical

9. Shutoff classification required

10. Valve stem diameter and bonnet type (plain, extension, or ENVIRO-SEAL bellows seal bonnet)

11. Line size and schedule

Valve Information

To determine what valve ordering information is needed, refer to the specifications. Review the description for each specification and in the referenced tables; write down your choice whenever there is a selection to be made. Always specify the valve design letter designation.

Actuator and Accessory Information

Refer to the specific actuator and accessory bulletins for required ordering information.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ Large ED/EWD and ET/EWT Valves NPS 12 through 30

Fisher NPS 12 through 30 CL150 through CL600 ED/EWD and ET/EWT series control valves are used for either throttling or on-off control of a wide variety of liquids and gasses.

ED/EWD series valves utilize a hanging cage and a seat ring that is bolted into the valve body. These valves have two graphite piston rings between the cage and plug, which provide up to a Class IV standard shutoff. They are used for high temperature applications between 316°C (600°F) and 593°C (1100°F). Shutoff can be improved to Class V by using the Bore seal.

ET/EWT series valves utilize a hanging cage and a seat ring that is threaded into the cage. These valves have two spring loaded seal rings, one between the cage and plug and another between the seat ring and valve body, which provide up to a Class V standard shutoff. They are used for low to medium temperature applications between -46°C (-50°F) and 232°C (450°F). This temperature range can be extended to 316°C (600°F) for non-oxidizing service and to 260°C (500°F) for oxidizing service by using the High Temperature (HTS1) seal.

The temperature range of the ET/EWT series can be extended to cryogenic temperatures as low as -198°C (-325°F) with the ET-C and EWT-C specialized versions of these valves. The specialized valves feature unique trim, seals, and a longer extension bonnet to tolerate the extreme cold.

A range of severe service trims are available for noise abatement or cavitation control. Noise abatement trims help with aerodynamic noise attenuation in gas services and feature a Whisper Trim™ III or WhisperFlo™ cage. Cavitation control trims help prevent the damaging effects of liquid cavitation and include either a Cavitrol™ III cage (for services without entrained particulate) or Dirty Service Trim (DST) set (for services with entrained particulate).

W9156-1

Fisher NPS 24x20 Valve Assembly with Piston Actuator

Features

- Stable Control at High Pressure Drops— Rugged cage guiding stabilizes the valve plug at all points in its travel range. This guiding reduces vibration, mechanical noise, and the need for hydraulic snubbers.
- Economy— Streamlined flow passages provide greater capacities per initial investment than most globe valves of the same size. Balanced valve plug design can allow use of smaller actuators in high pressure drop applications.
- Cost-Effective Operation— Increased wear resistance of the standard hardened stainless steel trim means long-lasting service.
- Easy Maintenance— The valve can stay in the pipeline during removal of trim parts for inspection or maintenance.

Specifications

Valve Sizes

ED, ET, and ET-C: ■ NPS 12, ■ 14, ■ 16, ■ 18, ■ 20, and ■ 30

EWD, EWT, and EWT-C[2]: ■ NPS 16x12, ■ 20x16, ■ 24x16, and ■ 24x20

End Connection Styles

Flanged: CL150, 300, and 600 raised-face or ring-type joint flanges per ASME B16.5.
NPS 30 valve size has series A or B flanges, per ASME B16.47
Buttwelding: All ASME B16.25 schedules through schedule 120 that are compatible with the ASME B16.34 valve body rating

For other end connections, contact your Emerson sales office for details.

Maximum Inlet Pressure[1]

Flanged: Consistent with CL150, 300, and 600 pressure-temperature ratings per ASME B16.34
Buttwelding: Consistent with CL600 pressure-temperature ratings per ASME B16.34

Material Temperature and Pressure Drop Capabilities[1]

See tables 4, 6, 7, and 8

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

ET, ET-C, EWT, and EWT-C:
Standard: Class V
Optional (for all cages except Cavitrol III): Class IV
ED and EWD:
Standard: Class IV
Optional: Class V

Construction Materials

Valve Body and Bonnet: ■ WCC steel, ■ LCC steel, ■ WC9 alloy steel, ■ C12A alloy steel, ■ CF8M stainless steel, ■ CD3MN duplex stainless steel, or ■ CD3MWCuN super-duplex stainless steel
Trim and Other Parts: See tables 4, 6, 7, and 8

Flow Characteristics

Standard Cages: ■ Linear or ■ Equal percentage
Whisper Trim III and WhisperFlo Cages: Linear
Cavitrol III Cages: Linear

For other characteristics, contact your Emerson sales office for details.

Flow Direction

Standard Cages: Down
Whisper Trim III and WhisperFlo Cages: Up
Cavitrol III Cages: Down

Flow Coefficients

See Fisher Catalog 12

Port Diameters

See tables 1, 2, and 3

Valve Plug Travel

102 through 505 mm (4 to 19-7/8 inches).

See tables 1, 2, and 3

Yoke Boss and Valve Stem Diameters

■ 127 mm (5H-inch) diameter yoke boss, with 31.8 mm (1.25 inch) diameter valve stem for all valves except NPS 30
■ 179 mm (7-inch) diameter yoke boss, with 50.8 mm (2 inch) diameter valve stem for NPS 30 valve

Bonnet Style

ED, EWD, ET, and EWT: Style 1 extension
ET-C and EWT-C: Style 3 extension

Approximate Weights

See table 10

Dimensions

See figure 6, table 9

Optional Safety Instrumented System Classification

SIL3 capable - certified by exida Consulting LLC

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.
2. Size designations are "End Connection Size" x "Nominal Trim Size"

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Figure 1. Typical Fisher ED/EWD Valve

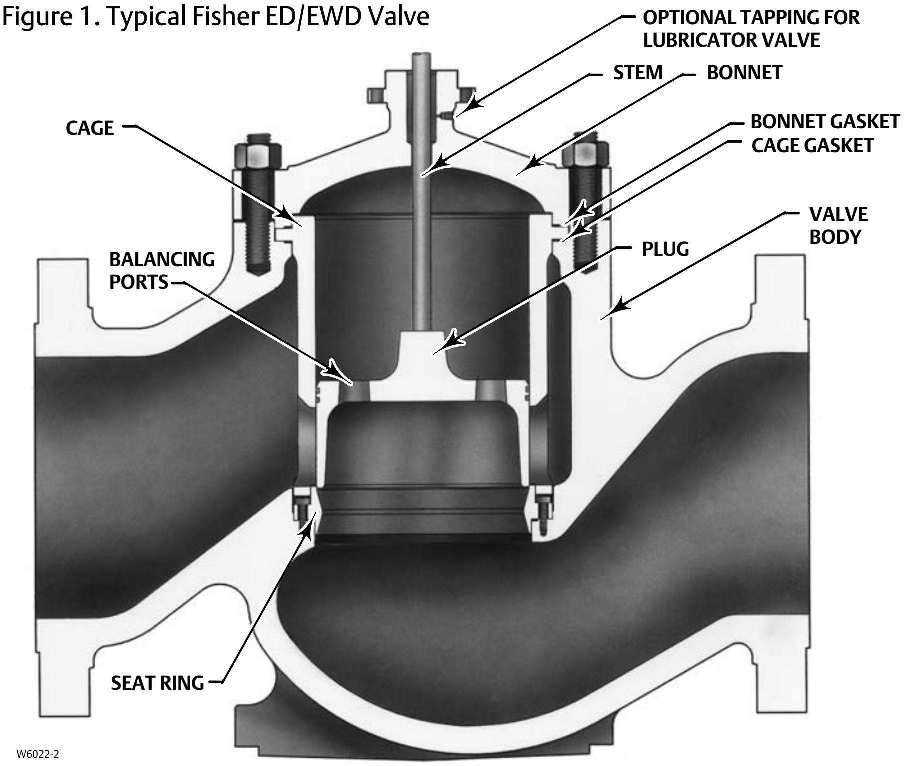


Figure 2. Typical Fisher ED/EWD Valve with Bore Seal

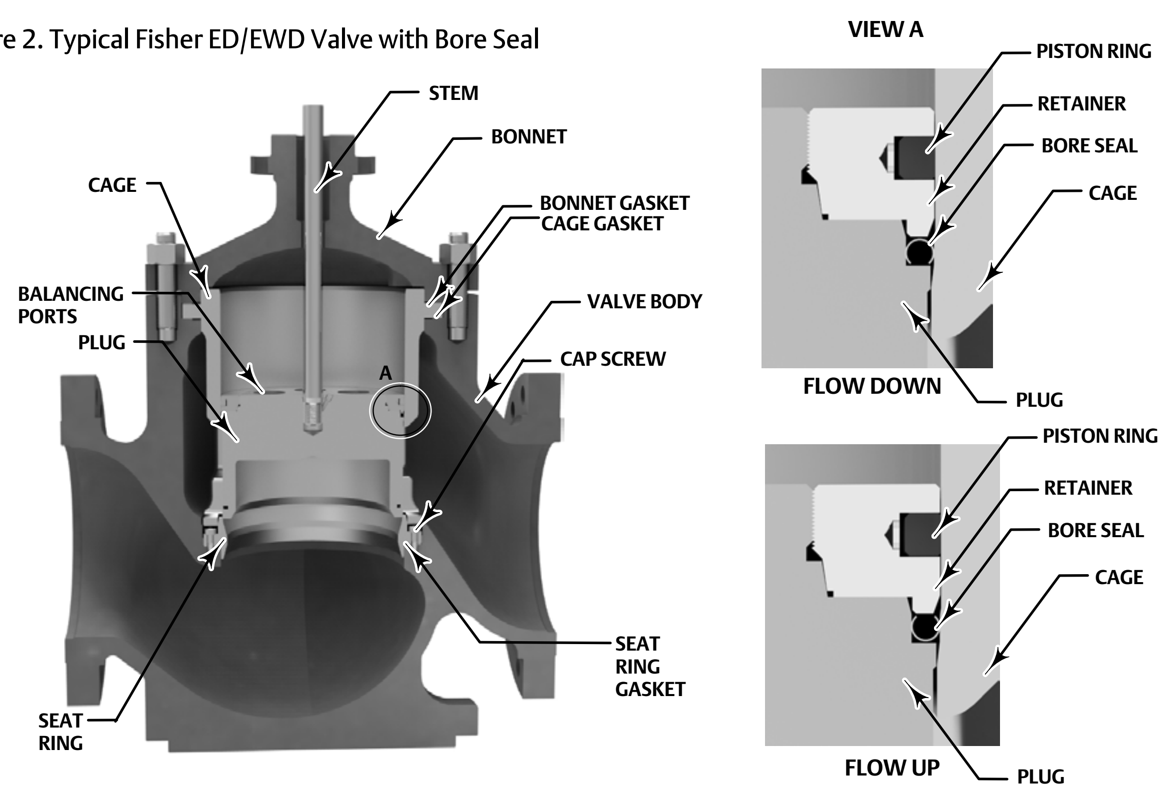
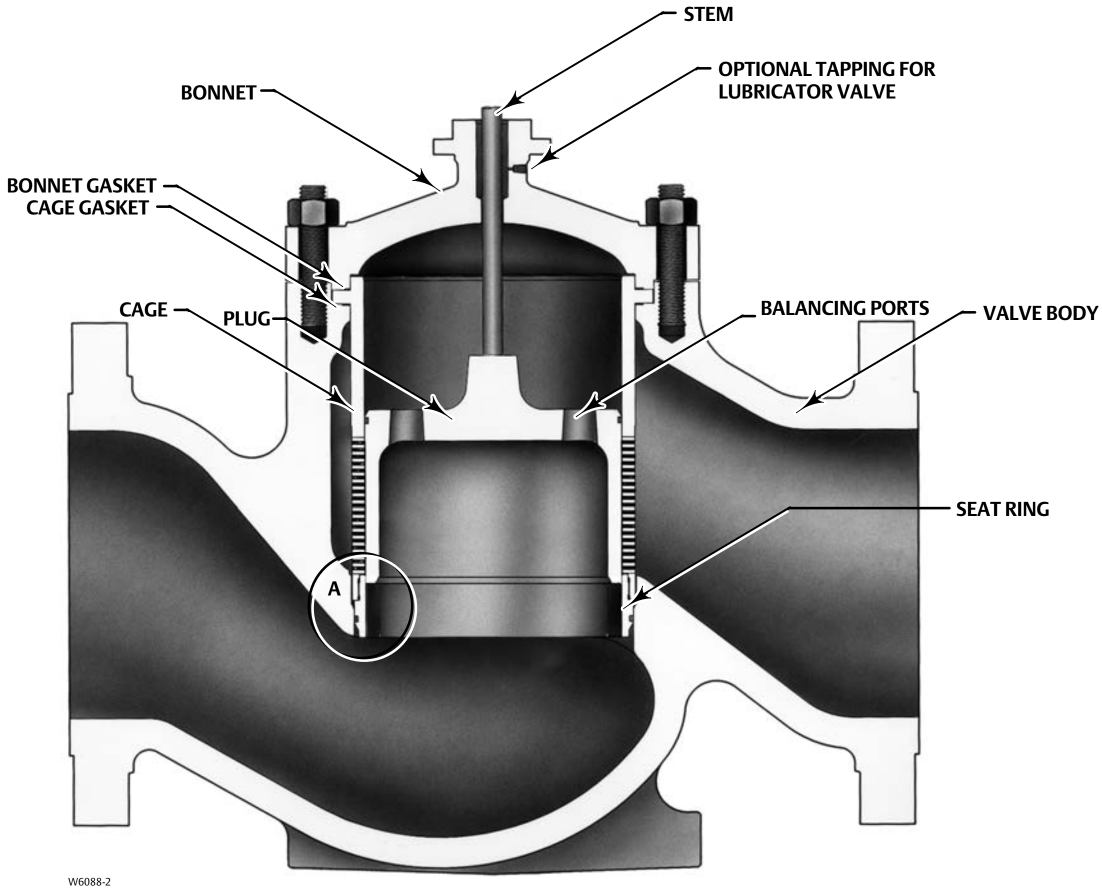
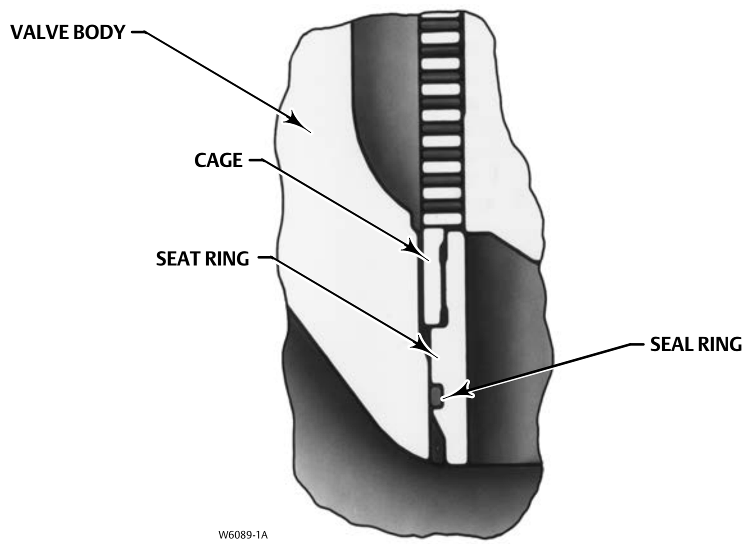


Figure 3. Typical Fisher ET/EWT Valve





SEAT RING THREADED TO CAGE
VIEW A

Figure 4. Typical Fisher ET/EWT Valve with HTS1 Seal

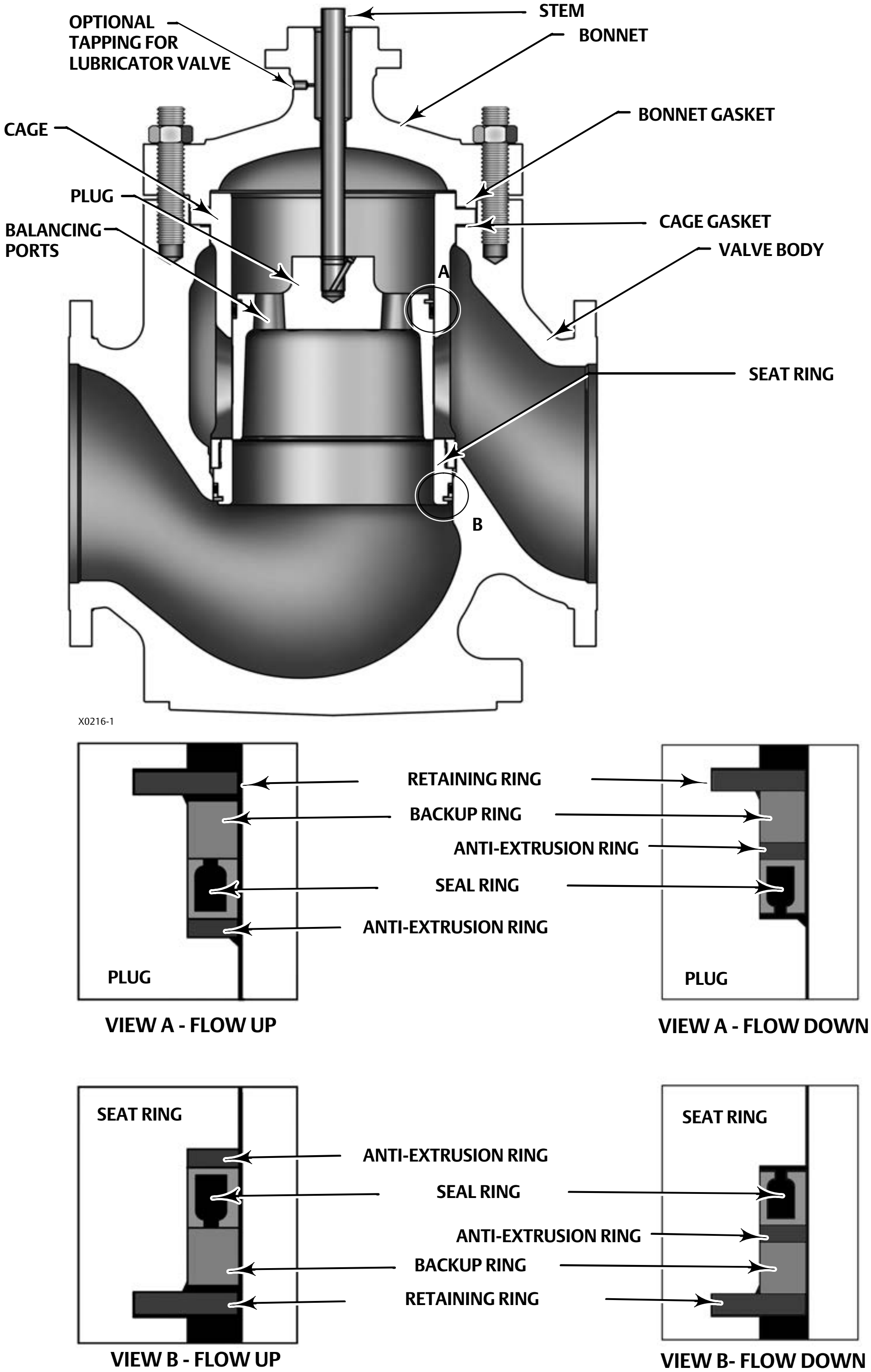


Figure 5. Typical Fisher ET-C/EWT-C Valve

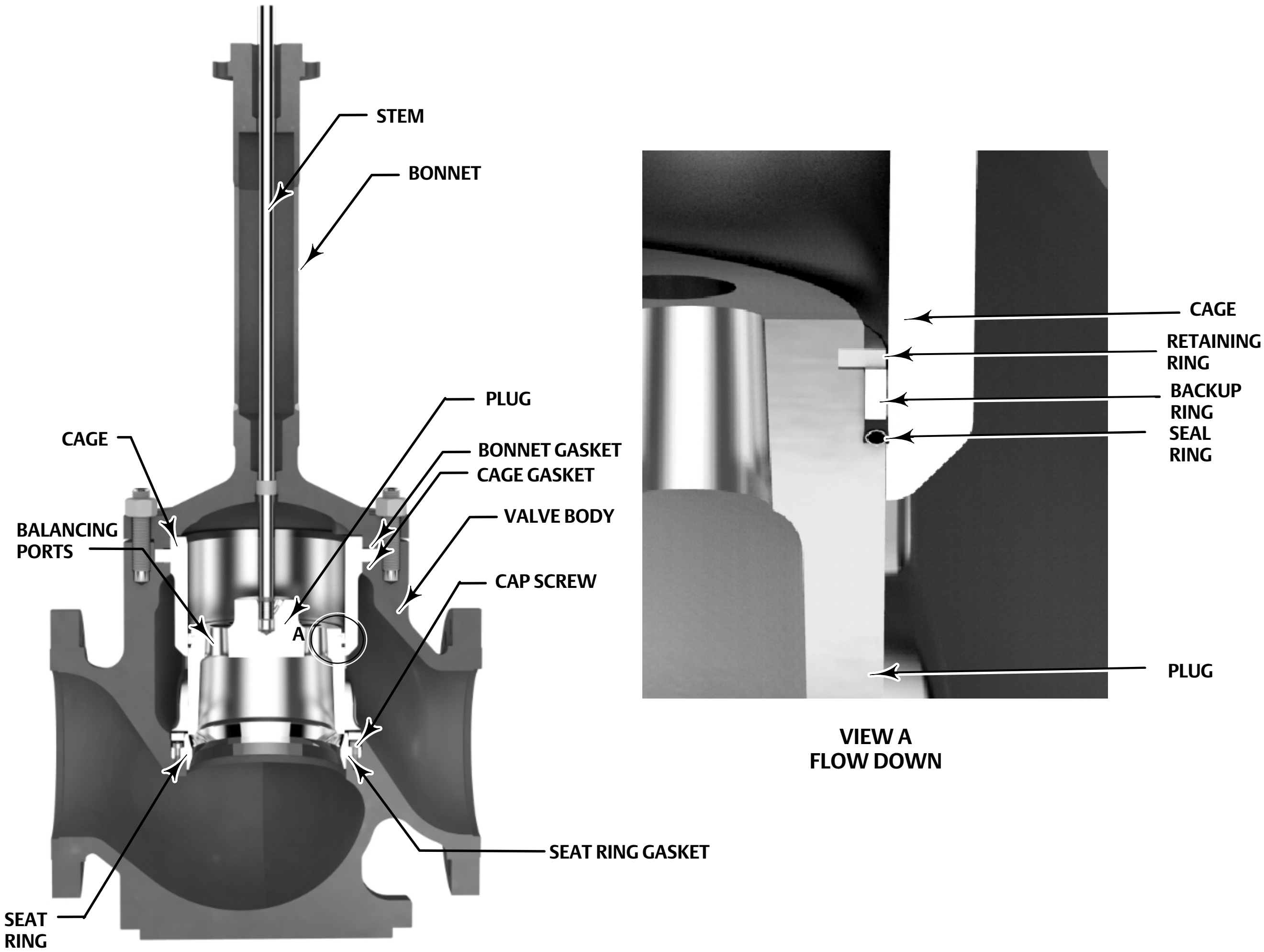


Table 1. Port Diameters and Valve Plug Travels for ED/EWD Valves

VALVE SIZE, NPS	TRIM (CAGE)	PORT DIAMETER		VALVE STYLE	MAXIMUM VALVE PLUG TRAVEL	
		mm	Inches		mm	Inches
12, 14, and 16x12	Standard	279	11.00	Short Neck	102	4.00
				Short Neck	140	5.50
	Whisper Trim III Levels A, B, and C	279	11.00	Short Neck	140	5.50
				Long Neck	203	8.00
	Whisper Trim III Level D	254	10.00	Long Neck	203	8.00
	WhisperFlo	279	11.00	Short Neck	140	5.50
				Long Neck	203	8.00
16	Standard	375	14.75	Short Neck	102	4.00
				Short Neck	140	5.50
				Long Neck(1)	203(1)	8.00(1)
	Whisper Trim III Levels A, B, and C	375	14.75	Long Neck	203	8.00
	Whisper Trim III Level D	375	14.75	Long Neck	203	8.00
	WhisperFlo	375	14.75	Long Neck	203	8.00
18, 20x16, and 24x16	Standard	375	14.75	Short Neck	102	4.00
				Short Neck	140	5.50
				Short Neck(1)	203(1)	8.00(1)
	Whisper Trim III Levels A, B, and C	375	14.75	Short Neck	203	8.00
				Long Neck	276	10.88
	Whisper Trim III Level D	375	14.75	Short Neck	203	8.00
				Long Neck	276	10.88
				Long Neck	378	14.88
	WhisperFlo	375	14.75	Short Neck	203	8.00
				Long Neck	276	10.88
				Long Neck	378	14.88
20 and 24x20	Standard	464	18.25	Short Neck	203	8.00
	Whisper Trim III Levels A, B, and C	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
	Whisper Trim III Level D	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
	WhisperFlo	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
30	Standard	610	24.00	Short Neck	302	11.88
	Whisper Trim III Levels A, B, and C	610	24.00	Short Neck	302	11.88
				Long Neck	505	19.88
	Whisper Trim III Level D	610	24.00	Short Neck	302	11.88
				Long Neck	505	19.88
	WhisperFlo	610	24.00	Short Neck	302	11.88
				Long Neck	505	19.88

1. Available with standard equal percentage trim only.

Table 2. Port Diameters and Valve Plug Travels ET/EWT Valves

VALVE SIZE, NPS	TRIM (CAGE)	PORT DIAMETER		VALVE STYLE	MAXIMUM VALVE PLUG TRAVEL	
		mm	Inches		mm	Inches
12, 14, and 16x12	Standard	279	11.00	Short Neck	102	4.00
				Short Neck	140	5.50
	Whisper Trim III Levels A, B, and C	279	11.00	Short Neck	140	5.50
				Long Neck	203	8.00
	Whisper Trim III Level D	254	10.00	Long Neck	203	8.00
	WhisperFlo	279	11.00	Short Neck	140	5.50
				Long Neck	203	8.00
	Cavitrol III	279	11.00	Long Neck	203	8.00
16	Standard	375	14.75	Short Neck	102	4.00
				Short Neck	140	5.50
				Long Neck[1]	203[1]	8.00[1]
	Whisper Trim III Levels A, B, and C	375	14.75	Long Neck	203	8.00
		413	16.25			
	Whisper Trim III Level D	375	14.75	Long Neck	203	8.00
	WhisperFlo	375	14.75	Long Neck	203	8.00
	Cavitrol III	375	14.75	Long Neck	203	8.00
18, 20x16, and 24x16	Standard	375	14.75	Short Neck	102	4.00
				Short Neck	140	5.50
				Short Neck[1]	203[1]	8.00[1]
	Whisper Trim III Levels A, B, and C	413	16.25	Short Neck	203	8.00
				Long Neck	276	10.88
				Long Neck	378	14.88
	Whisper Trim III Level D	375	14.75	Short Neck	203	8.00
				Long Neck	276	10.88
				Long Neck	378	14.88
	WhisperFlo	375	14.75	Short Neck	203	8.00
				Long Neck	276	10.88
				Long Neck	378	14.88
	Cavitrol III	375	14.75	Long Neck	276	10.88
				Long Neck	378	14.88
20 and 24x20	Standard	464	18.25	Short Neck	203	8.00
	Whisper Trim III Levels A, B, and C	502	19.75	Short Neck	276	10.88
				Long Neck	378	14.88
					429	16.88[2]
	Whisper Trim III Level D	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
	WhisperFlo	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
	Cavitrol III	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
30	Standard	610	24.00	Short Neck	302	11.88
	Whisper Trim III Levels A, B, and C	660	26.00	Short Neck	302	11.88
				Long Neck	505	19.88
	Whisper Trim III Level D	610	24.00	Short Neck	302	11.88
				Long Neck	505	19.88
	WhisperFlo	610	24.00	Short Neck	302	11.88
				Long Neck	505	19.88

1. Available with standard equal percentage trim only.
2. For NPS 20 only, the maximum travel for the Long Neck is 429 mm (14.88 inches)

Table 3. Port Diameters and Valve Plug Travels ET-C/EWT-C Valves

VALVE SIZE, NPS	TRIM (CAGE)	PORT DIAMETER		VALVE STYLE	MAXIMUM VALVE PLUG TRAVEL	
		mm	Inches		mm	Inches
12, 14, and 16x12	Standard	279	11.00	Short Neck	102	4.00
				Short Neck	140	5.50
	Whisper Trim III Levels A, B, and C	279	11.00	Short Neck	140	5.50
				Long Neck	203	8.00
	Whisper Trim III Level D	254	10.00	Long Neck	203	8.00
	WhisperFlo	279	11.00	Short Neck	140	5.50
				Long Neck	203	8.00
	Cavitrol III	279	11.00	Long Neck	203	8.00
16	Standard	375	14.75	Short Neck	102	4.00
				Short Neck	140	5.50
				Long Neck(1)	203(1)	8.00(1)
	Whisper Trim III Levels A, B, and C	375	14.75	Long Neck	203	8.00
	Whisper Trim III Level D	375	14.75	Long Neck	203	8.00
	WhisperFlo	375	14.75	Long Neck	203	8.00
	Cavitrol III	375	14.75	Long Neck	203	8.00
18, 20x16, and 24x16	Standard	375	14.75	Short Neck	102	4.00
				Short Neck	140	5.50
				Short Neck(1)	203(1)	8.00(1)
	Whisper Trim III Levels A, B, and C	375	14.75	Short Neck	203	8.00
				Long Neck	276	10.88
				Long Neck	378	14.88
	Whisper Trim III Level D	375	14.75	Short Neck	203	8.00
				Long Neck	276	10.88
				Long Neck	378	14.88
	WhisperFlo	375	14.75	Short Neck	203	8.00
				Long Neck	276	10.88
				Long Neck	378	14.88
	Cavitrol III	375	14.75	Long Neck	276	10.88
				Long Neck	378	14.88
20 and 24x20	Standard	464	18.25	Short Neck	203	8.00
	Whisper Trim III Levels A, B, and C	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
	Whisper Trim III Level D	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
	WhisperFlo	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
	Cavitrol III	464	18.25	Short Neck	276	10.88
				Long Neck	378	14.88
30	Standard	610	24.00	Short Neck	302	11.88
	Whisper Trim III Levels A, B, and C	610	24.00	Short Neck	302	11.88
				Long Neck	505	19.88
	Whisper Trim III Level D	610	24.00	Short Neck	302	11.88
				Long Neck	505	19.88
	WhisperFlo	610	24.00	Short Neck	302	11.88
				Long Neck	505	19.88

1. Available with standard equal percentage trim only.

High Temperature Seal (HTS1)

The High Temperature Seal (HTS1) is available for the ET and EWT only and is required for applications where the service temperature exceeds 232°C (450°F). This seal is available for all sizes and trims of the ET and EWT and allows the valve to be used in temperatures up to 316°C (600°F) for non-oxidizing service and up to 260°C (500°F) for oxidizing service. See tables 4 and 6 for temperature limits and figure 4.

The High Temperature Seal is used in place of the standard plug seal ring and seat ring seal ring. This seal employs a similar seal ring as the standard ET and EWT, but with the addition of an anti-extrusion ring, backup ring, and retaining ring.

Cryogenic Service ET-C and EWT-C

The ET-C and EWT-C are designed to provide throttling or on-off control of liquids and gases at cryogenic temperatures as low as -198°C (-325°F). These valves are identical to the standard ET and EWT, but with a few differences, which allow the valve to tolerate the very low temperatures. See tables 4 and 7 for temperature limits and figure 5. These differences include:

- Style 3 Extension Bonnet
- Bolted-In Seat Ring
- Cryogenic Plug Seal

The style 3 extension bonnet is different from the style 1 in that it is designed to locate the temperature sensitive packing parts further away from the valve body, preventing them from being exposed to temperature extremes. The bolted-in seat ring is similar to that used with the ED or EWD valve and accommodates the unavoidable material shrinkage that occurs at cryogenic temperatures, which would otherwise loosen the ET or EWT's standard threaded-in seat ring. The cryogenic plug seal is used in place of the standard ET or EWT plug seal ring. The maximum valve shutoff that can be attained at these cryogenic temperatures with the cryogenic seal is Class V.

Bore Seal

The Bore Seal is available for the ED and EWD only and is required for Class V shutoff applications where the service temperature exceeds 316°C (600°F). For service temperatures below 316°C (600°F) the ET or EWT should be used when Class V shutoff is required. See tables 4, 7, and 8 for temperature limits and figure 2.

The Bore Seal employs a metal C-shaped seal ring that is secured to the outside diameter of the valve plug. When the valve plug comes into contact with the seat ring, to close the valve, the Bore Seal is compressed against the cage wall thereby blocking a secondary leakage path that exists between the plug and cage wall. When the valve plug is not in contact with the seat ring (i.e. valve open) the Bore Seal is not engaged and the piston rings that are also secured to the outside diameter of the plug assume the role of blocking this secondary leakage path.

Table 4. Construction Materials (WCC, WC9, CF8M, LCC, and C12A Valves)

PART			MATERIAL		TEMPERATURE °C	TEMPERATURE °F
Valve Body and Bonnet			WCC Steel		-29 to 427	-20 to 800[3]
			LCC Steel		-46 to 343	-50 to 650
			WC9 Alloy Steel		-29 to 593	-20 to 1100[2]
			CF8M Stainless Steel		-198 to 593	-325 to 1100[1]
			C12A Alloy Steel		-29 to 593	-20 to 1100
Cage, Seat Ring, and Valve Plug			See tables 7 and 8		See tables 7 and 8	
Valve Stem			S20910		Not a Limiting Factor	
Cage Baffle (Whisper III Level D3 Cages Only)	Trim 40, 50		Steel		Not a Limiting Factor	
	Trim 41		2.25 Cr - 1 Mo Nitrided			
	Trim 42		9 Cr - 1 Mo - V			
	Trim 43, 44, 46, 48		316 SST			
	Trim 47		17-4 SST DBL H1150			
	Trim 49		2205 Duplex (22 Cr - 5 Ni)			
	Trim 50		2507 Super-Duplex (25 Cr - 7 Ni)			
Bonnet, Seat Ring, and Cage Gaskets			N06600/Graphite	Oxidizing	-198 to 427	-325 to 800
				Non-Oxidizing	Not a Limiting Factor	
Valve Body-to-Bonnet Bolting	ED/EWD	WCC Valves	B7 NCF2 Studs, 2H NCF2 Nuts		Not a Limiting Factor	
			B7M NCF2 Studs[4], 2H NCF2 Nuts[4]			
			B16 Studs, GRADE 7 Nuts			
		WC9 Valve	B7 NCF2 Studs, 2H NCF2 Nuts		-46 to 427	-50 to 800
			B16 Studs, GRADE 7 Nuts		-29 to 538	-20 to 1000
			N07718 HT Studs, N07718 HT CRCT Nuts		Not a Limiting Factor	
		CF8M Valve	See table 5			
		C12A Valve	N07718 HT Studs, N07718 HT CRCT Nuts		Not a Limiting Factor	
	ET/EWT	WCC and LCC Valves	B7 NCF2 studs, 2H NCF2 nuts		Not a Limiting Factor	
			B7M NCF2 studs[4], 2H NCF2 nuts[4]			
		CF8M Valve	See table 5			
ED and EWD Valves	Piston Ring		Graphite (Fisher Designation FMS17F39)	Oxidizing	-46 to 538	-50 to 1000
				Non-Oxidizing	Not a Limiting Factor	
	Bore Seal		N07718		Not a Limiting Factor	
	Seat Ring Cap Screws		N07718		Not a Limiting Factor	
ET and EWT Valves	Seal Ring		Glass and Moly-Filled PTFE with N10276 spring		-73 to 232	-100 to 450
			PTFE/graphite with R30003 spring		-46 to 316	-50 to 600
	Anti-extrusion Ring		PEEK (poly ether ether ketone)		Not a Limiting Factor	
	Backup Ring		S41000 S31600		Not a Limiting Factor	
	Retaining Ring		18-8 Stainless Steel N07750		Not a Limiting Factor	

-continued-

Table 4. Construction Materials (WCC, WC9, CF8M, LCC, and C12A Valves) (cont.)

PART		MATERIAL	TEMPERATURE	
			°C	°F
ET-C and EWT-C Valves	Seal Ring	UHMWPE (ultra high molecular weight polyethylene)	-198 to 66	-325 to 150
	Backup Ring	S31600	Not a Limiting Factor	
	Retaining Ring	18-8 Stainless Steel N07750		
	Seat Ring Cap Screws	N07718		
Packing		See bulletin 59.1:062, Packing Selection Guidelines for Fisher Sliding-Stem Valves (D101986X012)		
Packing Flange		S31600	Not a Limiting Factor	
Packing Flange Bolting		SA-193-B8M Studs, SA-194-8M Nuts		
Packing Follower, Spring, and Lantern Ring		S31600		
Packing Box Ring		S31600		

1. Flanged valve bodies are limited to 537°C (1000°F).
2. Flanged valve bodies are limited to 482°C (900°F).
3. Flanged valve bodies are limited to 371°C (700°F).
4. Exposed bolting compliant to NACE MR0175-2002, MR0175-2003, MR0175/ISO 15156, and MR0103.

Table 5. Construction Materials (CF8M)

Valve Body and Bonnet Material	Valve Size, NPS	Valve Pressure Class	Valve Body-to-Bonnet Bolting Material	Temperature	
				°C	°F
CF8M	12, 14, 16x12	All	SA-193-B8M Class 2 Studs, SA-194-8M Nuts	-198 to 427	-325 to 800
			SA-479 S20910 Chrome Coat Studs[1], SA-479 S20910 Nuts[1]	Not a limiting factor	
	16, 18, 20x16, 24x16	CL150 and CL300	SA-193-B8M Class 2 Studs, SA-194-8M Nuts	-198 to 121	-325 to 250
			SA-453 Gr 660A Studs, SA-453 Gr 660A Nuts	-29 to 538	-20 to 1000
			SA-479 S20910 Chrome Coat Studs[1], SA-479 S20910 Nuts[1]	Not a limiting factor	
		CL600	SA-453 Gr 660A Studs, SA-453 Gr 660A Nuts	-29 to 538	-20 to 1000
			SA-479 S20910 Chrome Coat Studs[1], SA-479 S20910 Nuts[1]	Not a limiting factor	
	20, 24x20	All	SA-453 Gr 660A Studs, SA-453 Gr 660A Nuts	-29 to 538	-20 to 1000
			SA-479 S20910 Chrome Coat Studs[1], SA-479 S20910 Nuts[1]	Not a limiting factor	
	30	CL150 and CL300	SA-193-B8M Class 2 Studs, SA-194-8M Nuts	-198 to 427	-325 to 800
			SA-479 S20910 Chrome Coat Studs[1], SA-479 S20910 Nuts[1]	Not a limiting factor	
		CL600	SA-479 S20910 Chrome Coat Studs[1], SA-479 S20910 Nuts[1]	Not a limiting factor	

1. Exposed bolting compliant to NACE MR0103.

Table 6. Construction Materials (CD3MN and CD3MWCuN Valves)

<table>
<tr><th colspan="2" rowspan="2">PART</th><th colspan="2" rowspan="2">MATERIAL</th><th colspan="2">TEMPERATURE</th></tr>
<tr><th>°C</th><th>°F</th></tr>
<tr><td colspan="2">Valve Body and Bonnet</td><td colspan="2">CD3MN Duplex Stainless Steel
CD3MWCuN Super-Duplex Stainless Steel</td><td>-46 to 316
-46 to 316</td><td>-50 to 600
-50 to 600</td></tr>
<tr><td colspan="2">Cage, Seat Ring, and Valve Plug</td><td colspan="2">See table 7</td><td colspan="2">See table 7</td></tr>
<tr><td colspan="2">Valve Stem</td><td colspan="2">S32760</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td colspan="2" rowspan="2">Bonnet, Seat Ring, and Cage Gaskets</td><td rowspan="2">N06600/Graphite</td><td>Oxidizing</td><td colspan="2" rowspan="2">Not a Limiting Factor</td></tr>
<tr><td>Non-Oxidizing</td></tr>
<tr><td colspan="2" rowspan="3">Valve Body-to-Bonnet Bolting</td><td colspan="2">SA-193-B7 Studs, SA-194-2H Nuts</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td colspan="2">S32760 Studs, S32760 Nuts[1]</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td colspan="2">SA-193-B7/Zinc HDG Studs
SA-194-2H/Zinc HDG Nuts</td><td>-46 to 199</td><td>-50 to 390</td></tr>
<tr><td colspan="2">Seal Ring</td><td colspan="2">Glass and Moly-Filled PTFE with N10276 spring
PTFE/graphite with R30003 spring</td><td>-73 to 232
-46 to 316</td><td>-100 to 450
-50 to 600</td></tr>
<tr><td colspan="2">Anti-extrusion Ring</td><td colspan="2">PEEK (poly ether ether ketone)</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td colspan="2">Backup Ring</td><td colspan="2">S41000
S31600</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td colspan="2">Retaining Ring</td><td colspan="2">18-8 Stainless Steel</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td colspan="2">Packing</td><td colspan="4">See bulletin 59.1:062, Packing Selection Guidelines for Fisher Sliding-Stem Valves (D101986X012)</td></tr>
<tr><td colspan="2">Packing Flange</td><td colspan="2">S31600</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td colspan="2">Packing Flange Bolting</td><td colspan="2">SA-193-B8M Studs, SA-194-8M Nuts</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td rowspan="2">Packing Follower, Lantern Ring, and Box Ring</td><td>CD3MN Valve</td><td colspan="2">S31803</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td>CD3MWCuN Valve</td><td colspan="2">S32760</td><td colspan="2">Not a Limiting Factor</td></tr>
<tr><td colspan="6">1. Exposed bolting compliant to NACE MR0175-2002.</td></tr>
</table>

Table 7. Standard, Whisper Trim III, and Cavitrol III[6] Trim Descriptions

VALVE	TRIM DESIGNATION	BODY MATERIAL	VALVE PLUG	SEAT RING	CAGE	TEMPERATURE LIMIT	
						°C	°F
ED/EWD	40	WCC[4]/WC9	CA6NM HT	17-4 SST H1075	17-4 SST H1075	-29 to 427	-20 to 800
	41	WCC[4]	WC9 Steel with CoCr-A	2.25 Cr - 1 Mo with CoCr-A	2.25 Cr - 1 Mo Nitrided	-29 to 427	-20 to 800
		WC9[5]				-29 to 566	-20 to 1050
	42	C12A	F91 with CoCr-A	9 Cr - 1 Mo - V with CoCr-A	9 Cr - 1 Mo - V Nitrided	-29 to 593	-20 to 1100
	43[1]	WCC/WC9	CF8M with CoCr-A	316 SST with CoCr-A	316 SST Chrome Plate	-29 to 316	-20 to 600
		CF8M				-73 to 316	-100 to 600
	44[1]	CF8M	CF8M with CoCr-A	316 SST with CoCr-A	316 SST Chrome Coated	-73 to 538	-100 to 1000
ED/EWD With Bore Seal	40	WCC/WC9	CA6NM HT	17-4 SST H1075	17-4 SST H1075	-29 to 371	-20 to 700
	41	WCC[4]	WC9 Steel with CoCr-A	2.25 Cr - 1 Mo with CoCr-A	2.25 Cr - 1 Mo Nitrided	-29 to 427	-20 to 800
		WC9[5]				-29 to 566	-20 to 1050
	42	C12A	F91 with CoCr-A	9 Cr - 1 Mo - V with CoCr-A	9 Cr - 1 Mo - V Nitrided	-29 to 593	-20 to 1100
ET/EWT	45	WCC/WC9	CA6NM HT	17-4 SST H1075	17-4 SST H1075	-29 to 316	-20 to 600
		LCC/CF8M				-46 to 316	-50 to 600
	46[1,7]	WCC/WC9	CF8M with CoCr-A	316 SST with CoCr-A	316 SST Chrome Plate	-29 to 316	-20 to 600
		LCC				-46 to 316	-50 to 600
		CF8M				-73 to 316	-100 to 600
	47[2]	WCC/WC9	CF8M with CoCr-A	316 SST with CoCr-A	17-4 SST DBL H1150	-29 to 93	-20 to 200
		LCC				-46 to 93	-50 to 200
	49[3]	CD3MN	2205 Duplex[8] with R31233	2205 Duplex[8] with CoCr-A	2205 Duplex[8] Chrome Plate	-51 to 316	-60 to 600
	50[3]	CD3MWCuN	2507 Super-Duplex[9] with R31233	2507 Super-Duplex[9] with CoCr-A	2507 Super-Duplex[9] Chrome Plate	-51 to 316	-60 to 600
ET-C/EWT-C	48[1]	CF8M	CF8M with CoCr-A	316 SST	316 SST Chrome Plate[10]	-198 to 66	-325 to 150

1. NACE MR0175-2002, MR0175-2003, MR0175/ISO 15156, and MR0103 approved trim combination. Environmental restrictions apply to MR0175/ISO15156.
2. NACE MR0175-2002 approved trim combination.
3. NACE MR0175-2003 and MR0175/ISO15156 approved trim combination. Environmental restrictions apply to MR0175/ISO15156.
4. Flanged valve bodies are limited to 371°C (700°F)
5. Flanged valve bodies are limited to 482°C (900°F)
6. Cavitrol III trim is only available with trim 45.
7. When used with the high temperature seal (HTS1), NACE MR0175/ISO 15156 compliance is not available.
8. 22 Cr - 5 Ni duplex stainless steel.
9. 25 Cr - 7 Ni super-duplex stainless steel.
10. 316 SST chrome coated cage is available. Consult your Emerson sales office.

Table 8. WhisperFlo Trim Descriptions

VALVE	TRIM DESIGNATION	BODY MATERIAL	VALVE PLUG	SEAT RING	CAGE	CAGE RETAINER	TEMPERATURE LIMIT	
							°C	°F
ED/EWD	954	WCC(2)	CA6NM HT	2.25 Cr - 1 Mo with CoCr-A	S41000/ ENC/ R31233	2.25 Cr - 1 Mo Nitrided	-29 to 427	-20 to 800
		WC9					-29 to 482	-20 to 900
	951(1)	WCC(2)	CF8M with CoCr-A	316 SST with CoCr-A	S31603/ ENC/ R31233	316 SST Chrome Coated	-29 to 427	-20 to 800
		WC9(3)					-29 to 566	-20 to 1050
		CF8M(4)					-29 to 593	-20 to 1100
	956	C12A	CA6NM HT	9 Cr - 1 Mo - V with CoCr-A	S41000/ ENC/ R31233	9 Cr - 1 Mo - V	-29 to 593	-20 to 1100
ED/EWD With Bore Seal	954	WCC(2)	CA6NM HT	2.25 Cr - 1 Mo with CoCr-A	S41000/ ENC/ R31233	2.25 Cr - 1 Mo Nitrided	-29 to 427	-20 to 800
		WC9					-29 to 482	-20 to 900
	956	C12A	CA6NM HT	9 Cr - 1 Mo - V with CoCr-A	S41000/ ENC/ R31233	9 Cr - 1 Mo - V	-29 to 593	-20 to 1100
ET/EWT	955	WCC/WC9	CA6NM HT	17-4 SST H1075	S41000/ ENC/ R31233	17-4 SST H1075	-29 to 316	-20 to 600
	953(1)	WCC/WC9/ CF8M	CF8M with CoCr-A	316 SST with CoCr-A	S31603/ ENC/ R31233	316 SST Chrome Coated	-29 to 316	-20 to 600

1. NACE MR0175-2002, MR0175-2003, and MR0103 approved trim combination.
2. Flanged valve bodies are limited to 371°C (700°F)
3. Flanged valve bodies are limited to 482°C (900°F)
4. Flanged valve bodies are limited to 537°C (1000°F)

Table 9. Dimensions

VALVE SIZE, NPS	END CONNECTION	A						G				D							
		Pressure Class										ED, EWD, ET, and EWT				ET-C and EWT-C			
		CL150		CL300		CL600		CL150/300		CL600		Short-Neck		Long-Neck		Short-Neck		Long-Neck	
	Type	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
	RF	737	29.00	775	30.50	819	32.25												
12	RTJ	749	29.50	790	31.12	822	32.38	338	13.31	338	13.31	592	23.32	745	29.32	1232	48.52	1385	54.52
	BW	Not Available				819	32.25												
	RF	889	35.00	927	36.50	972	38.25												
14	RTJ	902	35.50	943	37.12	975	38.38	379	14.92	379	14.92	561	22.07	713	28.06	1201	47.27	1353	53.26
	BW	Not Available				972	38.25												
	RF	1016	40.00	1057	41.62	1108	43.62												
16x12	RTJ	1029	40.50	1073	42.25	1111	43.75	370	14.56	389	15.31	561	22.07	713	28.06	1201	47.27	1353	53.26
	BW	Not Available				1108	43.62												
	RF	1016	40.00	1057	41.62	1108	43.62												
16	RTJ	1029	40.50	1073	42.24	1111	43.75	429	16.89	437	17.19	663	26.12	816	32.12	1353	53.26	1505	59.26
	BW	Not Available				1108	43.62												
	RF	1146	45.12	1184	46.62	1257	49.50												
18	RTJ	1159	45.62	1200	47.24	1260	49.62	487	19.19	487	19.19	765	30.13	859(2)	33.82(2)	1455	57.27	1548(2)	60.96(2)
	BW	Not Available				1257	49.50												
	RF	1267	49.88	1308	51.50	1372	54.00												
20x16	RTJ	1280	50.38	1327	52.25	1378	54.25	487	19.19	487	19.19	765	30.13	859(2)	33.82(2)	1455	57.27	1548(2)	60.96(2)
	BW	Not Available				1372	54.00												
	RF	1556	61.24	1600	63.00	1676	66.00												
24x16	RTJ	1568	61.74	1623	63.88	1686	66.38	526	20.69	526	20.69	816	32.12	1121	44.12	1505	59.26	1810	71.26
	BW	Not Available				1676	66.00												
	RF	1267	49.88	1308	51.50	1372	54.00												
20	RTJ	1280	50.38	1327	52.25	1378	54.25	514	20.25	514	20.25	917	36.12	1121	44.12	(1)	(1)	(1)	(1)
	BW	Not Available				1372	54.00												
	RF	1556	61.25	1600	63.00	1676	66.00												
24x20	RTJ	1565	61.62	1623	63.88	1686	66.38	565	22.25	565	22.25	917	36.12	1121	44.12	(1)	(1)	(1)	(1)
	BW	Not Available				1676	66.00												
	RF	2134	84.00	2134	84.00	2337	92.00												
30	RTJ	(1)	(1)	2159	85.00	(1)	(1)	699	27.50	699	27.50	1134	44.64	1444	56.84	(1)	(1)	(1)	(1)
	BW	Not Available				(1)	(1)												

1. Contact your Emerson sales office for these dimensions.
2. For 378 mm (14.88 inch) valve plug travel, add 203 mm (8 inches) to this dimension.

Figure 6. Dimensions (also see table 9)

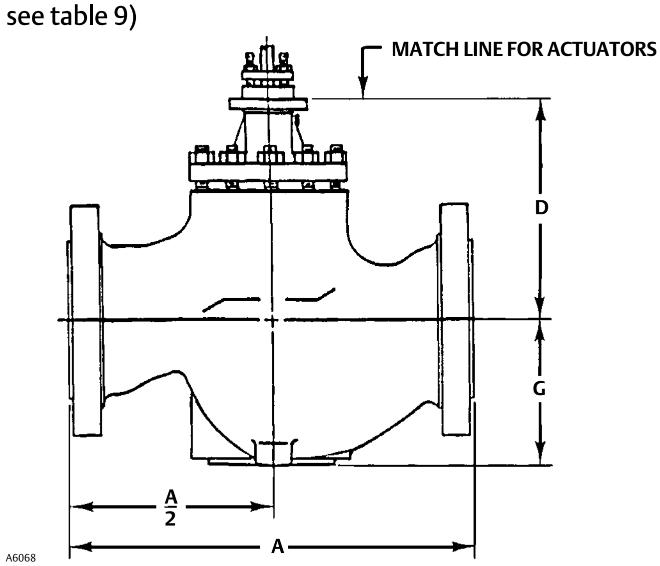


Table 10. Approximate Weights

VALVE SIZE, NPS	PRESSURE CLASS	END CONNECTION TYPE	APPROXIMATE WEIGHT							
			ED/EWD and ET/EWT				ET-C/EWT-C			
			Short Neck		Long Neck		Short Neck		Long Neck	
			Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb
12	CL150-300	Flanged	950	2100	1090	2400	982	2170	1122	2470
	CL600	Flanged	1270	2800	1410	3100	1302	2870	1442	3170
		Buttwelding	1130	2500	1270	2800	1162	2570	1302	2870
14	CL150-300	Flanged	1130	2500	1230	2700	1162	2570	1262	2770
	CL600	Flanged	1410	3100	1590	3500	1442	3170	1622	3570
		Buttwelding	1180	2600	1360	3000	1212	2670	1392	3070
16x12	CL150-300	Flanged	1320	2900	1450	3200	1352	2970	1482	3270
	CL600	Flanged	1680	3700	1810	4000	1712	3770	1842	4070
		Buttwelding	1410	3100	1540	3400	1442	3170	1572	3470
16	CL150-300	Flanged	1720	3800	2040	4500	1752	3870	2072	4570
	CL600	Flanged	2310	5100	2590	5700	2342	5170	2622	5770
		Buttwelding	2090	4600	2360	5200	2122	4670	2392	5270
18	CL150-300	Flanged	2310	5100	2500	5500	2342	5170	2532	5570
	CL600	Flanged	2900	6400	3130	6900	2932	6470	3162	6970
		Buttwelding	2540	5600	2770	6100	2572	5670	2802	6170
20x16	CL150-300	Flanged	2500	5500	2680	5900	2532	5570	2712	5970
	CL600	Flanged	3180	7000	3360	7400	3212	7070	3392	7470
		Buttwelding	2770	6100	2990	6600	2802	6170	3022	6670
24x16	CL150-300	Flanged	3360	7400	3810	8400	3392	7470	3842	8470
	CL600	Flanged	4260	9400	4810	10600	4292	9470	4842	10670
		Buttwelding	3770	8300	4220	9300	3802	8370	4252	9370
20	CL150-300	Flanged	4122	9088	4526	9978	(1)	(1)	(1)	(1)
	CL600	Flanged	4736	10442	5112	11269	(1)	(1)	(1)	(1)
		Buttwelding	4583	10104	4808	10600	(1)	(1)	(1)	(1)
24x20	CL150-300	Flanged	5507	12140	5856	12910	(1)	(1)	(1)	(1)
	CL600	Flanged	6796	14982	7172	15811	(1)	(1)	(1)	(1)
		Buttwelding	6327	13949	6549	14437	(1)	(1)	(1)	(1)
30	CL150-300	Flanged	7390	16300	8350	18400	7535	16620	18545	18720
	CL600	Flanged	9544	21040	10038	22130	(1)	(1)	(1)	(1)
		Buttwelding	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)

1. Contact your Emerson sales office for these weights.

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Fisher™ EW Series (EWD/EWS/EWT) Sliding-Stem Control Valves through NPS 12x8

Fisher EW Series easy-e™ valves (figures 1, 2, 3, and 4) feature large internal cavities with expanded end connections and a variety of unbalanced and balanced plug designs. Sizes available from NPS 4x2(1) through 12x8. These combinations provide good fluid control in economical, high-capacity valve bodies that keep valve outlet velocities within practical limits.

These valves meet a variety of service requirements, such as power plants where oversized piping is used to limit fluid flow velocity. They also perform well in noise abatement applications; for example, high-pressure gas reducing stations where sonic velocities are often encountered at the outlet of conventional valve bodies.

The Fisher EW product line is available for a wide range of applications, including sulfide and chloride stress-cracking environments common to the oil and gas production industries. To discuss available constructions, contact your Emerson sales office and include the applicable codes and standards required for these environments.

W2777-I

The easy-e Valve Family

EW Series valves are part of the versatile easy-e family of Fisher industrial control valves. easy-e valves share the following characteristics:

- Multiple trim material choices
- Trim temperature capability with metal seats standard to 427°C (800°F)
- Interchangeable, restricted-capacity trims and full-size trims to match variable process flow demands
- Different cage/plug styles that provide particular flow characteristics for highly-specialized applications. The standard cage comes in three different flow characteristics:
  - quick-opening
  - linear
  - equal percentage
- Cavitrol™ III cages are available to eliminate cavitation damage and Whisper Trim™ III cages are available to help attenuate aerodynamic noise.
- 316 stainless steel packing box parts are standard (including packing flange, studs, and nuts)

The temperature limits of EWT valves can be extended above 232°C (450°F) by using PEEK

(PolyEtherEtherKetone) anti-extrusion rings in combination with a spring-loaded PTFE seal. The PEEK anti-extrusion rings expand to close off the clearance gap between the plug and the cage where the PTFE seal may extrude at high temperatures and pressures. The temperature limits are extended to 316°C (600°F) for non-oxidizing service and to 260°C (500°F) for oxidizing service.

Note

Refer to Fisher Bulletin 51.1:EWN, EWN Series valves with Whisper Trim III cages (D100024X012) for further information.

Note

Refer to Fisher Bulletin 80.3:010, WhisperFlo™ Aerodynamic Noise Attenuation Trim (D102362X012) for further information.

Features

- **Compliance with the Clean Air Act—** ENVIRO-SEAL™ packing systems provide an improved stem seal to help prevent the loss of valuable or hazardous process fluid. The ENVIRO-SEAL packing systems feature PTFE or Graphite ULF packing with live-loading for reduced packing maintenance.

- **Noise Attenuation—**In an EW Series valve, noise produced by high flow rates and large pressure drops can be reduced by up to 18 dbA with a Whisper Trim I cage, by up to 30 dbA with a Whisper Trim III cage, and by up to 40 dbA with a WhisperFlo cage.

- **Piping Economy—**Expanded end connections of EW Series valve bodies may reduce the need for line swages while accommodating oversized piping arrangements used to limit fluid flow velocities.

- **Temperature Compensation—**On designs with the seat ring threaded into the valve body (figure 4), the hung cage feature helps reduce gasketing problems caused by thermal expansion and contraction of long parts, such as the cage assembly.

- **Standard Trim Parts across the easy-e product line—**Included are FGM gaskets, packing flange, studs, and nuts.

- **High-Temperature, Class IV or Class V Shutoff—**Optional multiple piston rings (figure 14) for EWD and EWD-1 valve bodies permit Class IV shutoff up to 593°C (1100°F).
  Use of C-seal trim for EWD (see figure 5) permits Class V shutoff up to 593°C (1100°F).

- **Increased Pressure/Temperature Ratings—**NPS 12x8 CL900 EW Series valve bodies with buttwelding end connections are capable of increased ASME ratings called Intermediate Standard Ratings. The extra strength of the valve body allows these valves to be used where pressures and temperatures exceed Standard Class ratings in ASME B16.34.

  See Bulletin 59.1:027, Increased Pressure/Temperature Ratings for EH and EW Series Steel Valves (D100076X012) for further information.

- **Sour Service Capability—** Unless otherwise noted, references are to NACE MR0175-2002. Optional materials are available to meet NACE MR0103 and NACE MR0175 / ISO 15156. Material requirements under these standards vary by edition and year of issue; the specific standard must be specified.

Table of Contents

Specifications

Valve Body Configurations

See Available Configurations section

Valve Body Sizes

See table 2

End Connection Styles

Flanged: ■ CL150, 300, 600, and 900 raised-face or ring-type joint flanges per ASME B16.5, ■ raised-face per EN 1092-1/B
Buttwelding: Styles per ASME B16.25 schedules that are consistent with ASME B16.34 are Schedule ■ 40 or ■ 80 for all CL300 and 600 valves, Schedule ■ 80 or ■ XXS for NPS 8x6 CL900 valves, or Schedule ■ 80, ■ 100, or ■ 120 for NPS 12x8 CL900 valves

Maximum Inlet Pressures and Temperatures(1)

Consistent with applicable ■ CL300, ■ 600(2), or ■ 900 pressure/temperature ratings per ASME B16.34 unless limited as follows:
Valves With All Except Cavitrol III or Whisper Trim III Cages: Where limited by individual pressure/temperature capabilities in figure 8 or 9 or temperature capabilities in table 11, 12, 13, or 20.
Valves With Cavitrol III Cages: Where limited by individual pressure/temperature capabilities in figure 12 or temperature capabilities in table 16 or 20
Valves With Whisper Trim III Cages: Where limited by individual pressure/temperature capabilities in figure 15 or 16 or temperature capabilities in table 18 or 20

Maximum Pressure Drops(1, 3)

Same as maximum inlet pressure for specific construction defined above, except where further limited as follows:
Valves With All Except Cavitrol III or Whisper Trim III Cages: See figure 8 or 9
Valves With Cavitrol III Cages: See figure 12
Valves With Whisper Trim III Cages: 0.999 $\Delta P/P_1$ maximum for levels A1 through D3

Shutoff Classifications Per ANSI/FCI 70-2 and IEC 60534-4

See tables 3 and 4

Construction Materials

Valve, Bonnet, and Bonnet Spacer If Used: ■ WCC carbon steel, ■ LCC carbon steel, ■ WC9 chrome moly steel, ■ CF8M (316 SST), ■ other materials upon request
Valve Plug, Cage, and Metal Seating Parts
Valves With All **Except** *Cavitrol III or Whisper Trim III Cages:* See table 5 or 14
Valves With Cavitrol III Cages: See table 15
Valves With Whisper Trim III Cages: See table 17, 18, or 19
All Other Parts: See table 20

Material Temperature Capabilities(1)

Valve Body/Trim Combinations
Valves With All **Except** *Cavitrol III or Whisper Trim III Cages:* See figure 8 or 9 and table 11, 12, or 13
Valves With Cavitrol III Cages: See figure 12 and table 16
Valves With Whisper Trim III Cages: See figure 15 or 16 and table 18
All Other Parts: See table 20

Flow Characteristics

Standard Cages: ■ Quick-opening, ■ linear, or ■ equal percentage
Cavitrol and Whisper Trim Cages: Linear

Flow Directions

Valves with Standard Cages
EWD, EWD-1, EWT, and EWT-1: Normally down(5)
EWS and EWS-1: Normally up(6)
Valves with Cavitrol Cages: Always down(5)
Valves with Whisper Trim III Cages: Always up(6)

Flow Coefficients and Noise Level Prediction

Refer to Fisher Catalog 12

Port Diameters and Maximum Valve Plug Travels

See table 21

- continued -

Specifications (continued)

Yoke Boss and Stem Diameters

See table 21

Typical Bonnet Styles (see table 23)

■ Plain, ■ style 1 cast extension, ■ style 2 cast extension, ■ ENVIRO-SEAL bellows seal bonnet

Packing Arrangements

■ Standard PTFE, ■ Double PTFE, ■ Graphite, ■ ENVIRO-SEAL PTFE, ■ ENVIRO-SEAL Duplex, ■ ENVIRO-SEAL Graphite ULF, ■ HIGH-SEAL

Approximate Weights

See table 22

Optional Safety Instrumented System Classification

EWD, EWD-1, EWT, and EWT-1: SIL3 capable — certified by exida Consulting LLC

Options

■ Lubricator, ■ lubricator/isolating valve, ■ drilled and tapped connection in extension bonnet for leak-off service, ■ valve body drain plug, ■ ENVIRO-SEAL bellows seal bonnet for positive stem sealing of hard-to-handle fluids at temperatures up to 566°C (1000°F), ■ style 3 fabricated extension bonnet made on order to a specific length for cryogenic service, ■ special seismic service bonnet, ■ packings suitable for nuclear service, and ■ forged bonnet for 5 in. (127 mm) yoke boss on NPS 8x6 CL900 valve, ■ Class V shutoff for EWT above 232°C (450°F) using PEEK anti-extrusion rings ■ Class V shutoff for EWD up to 593°C (1100°F) using C-seal trim

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation should not be exceeded.
2. Certain bonnet bolting material selections may require a CL600 easy-e valve assembly to be derated. Contact your Emerson sales office for more information.
3. Only NPS 12x8 CL900 valve bodies with threaded (-1) seat rings can take full CL900 pressure drops; CL900 valve bodies with clamped (no dash number) seat rings are limited to CL600 pressure drops. Also, there are two different NPS 8x6 CL900 valve bodies, one for use only with Cavitrol III cages and the other for use with all other constructions. An NPS 8x6 CL900 valve body with Cavitrol III cage can take full CL900 pressure drops. For information on other NPS 8x6 constructions that can take full CL900 pressure drops, contact your Emerson Automation Solutions sales office. All other NPS 8x6 constructions are limited to CL600 pressure drops (1440 psid flowing drop) even though installed in a CL900 valve body.
4. Restriction based on excessive noise if max $\Delta P/P1$ ratio for a given cage level is exceeded.
5. Down:in through cage and out through seat ring (direction shown in figure 1).
6. Up:in through seat ring and out through cage as shown in figure 13.

ENVIRO-SEAL Packing System Specifications

Applicable Stem Diameters

■ 19.1 (3/4), ■ 25.4 (1), and ■ 31.8 (1-1/4) diameter valve stems

Maximum Pressure/Temperature Limits[1]

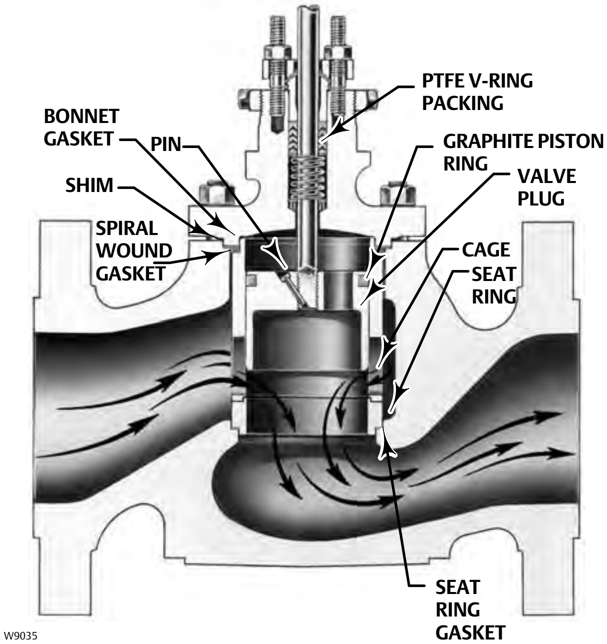
To Meet the EPA Fugitive Emission Standard of 100 PPM[2]
For ENVIRO-SEAL PTFE and ENVIRO-SEAL Duplex packing systems: full CL300 up to 232°C (450°F)
For ENVIRO-SEAL Graphite ULF packing system: 1500 psig (104 bar) at 316°C (600°F)

Construction Materials

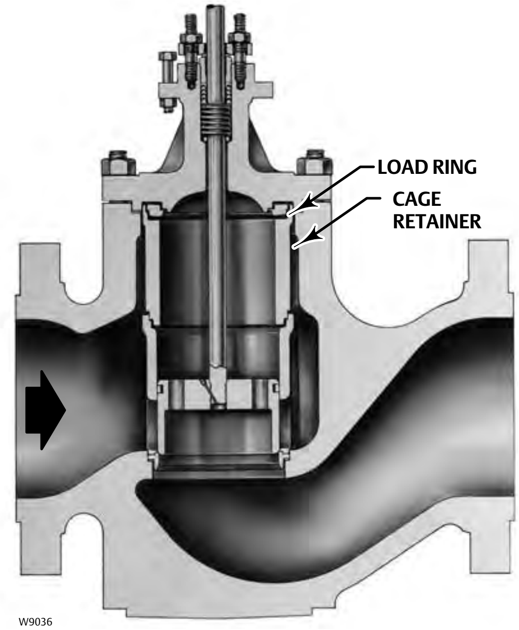
PTFE Packing Systems:
Packing Ring and Lower Wiper: PTFE V-ring[3]
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Graphite ULF Packing Systems: Graphite rings
Anti-Extrusion Washer: Filled PTFE (not required for graphite packing)
Lantern Ring: S31600 (316 stainless steel) (not required for graphite packing)
Packing Box Flange: S31600
Spring: ■ 17-7PH stainless steel, ■ N06600, or ■ S17700
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: Strain-hardened 316 stainless steel
Packing Box Nuts: 316 stainless steel SA194 Grade 8M

1. Refer to the valve specifications in this bulletin for pressure/temperature limits of valve parts. Do not exceed the pressure/temperature rating of the valve. Do not exceed any applicable code or standard limitation.
2. The Environmental Protection Agency (EPA) has set a limit of 100 parts per million (ppm) for fugitive emissions from a valve in selected VOC (Volatile Organic Compound) services.
3. In vacuum service, it is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.

Figure 1. Fisher EWD Valve with Standard Cage



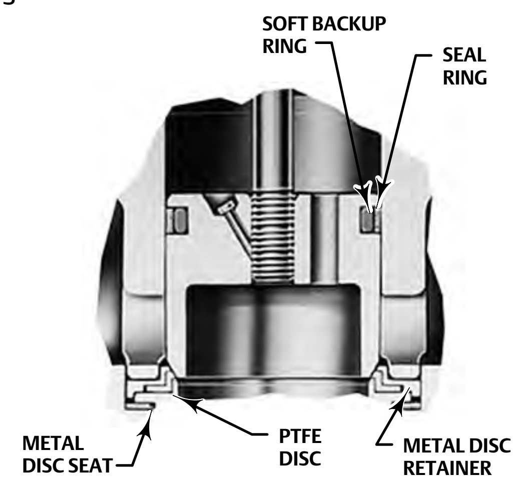
TYPICAL OF CONSTRUCTIONS THROUGH NPS 12x6



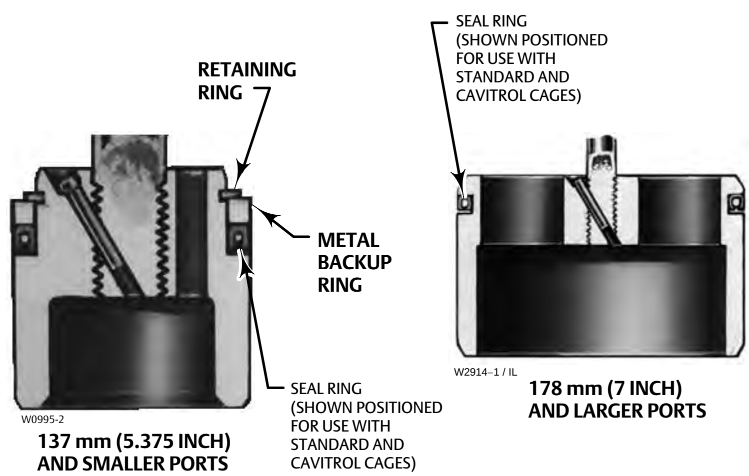
NPS 12x8 CONSTRUCTION

NOTE:
The NPS 10x8 valve is similar in appearance to sizes through NPS 12x6. However, the NPS 10x8 uses the load ring shown for the NPS 12x8. It does not use the cage retainer.

Figure 2. Fisher EWT Trim Details

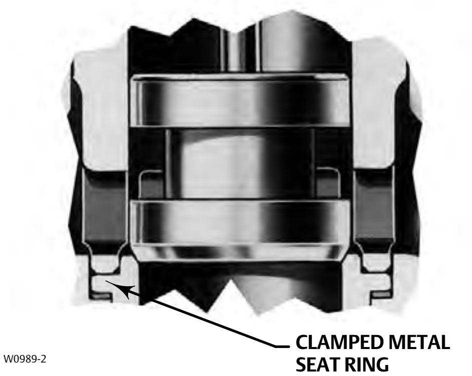


STANDARD CONSTRUCTION (SEAT PARTS ALSO TYPICAL OF OPTIONAL EWS PTFE SEATING)



VALVE PLUG WITH OPTIONAL PRESSURE-ASSISTED SEAL RING

Figure 3. Fisher EWS Trim Details Showing Standard Cage and Seating Construction



C-seal Trim Description

C-seal trim (figure 5) is available for valves with port diameters from 2.875 inches through 8 inches.

With C-seal trim, a balanced valve can achieve high-temperature, Class V shutoff. Because the C-seal plug seal is formed from metal (N07718 nickel alloy) rather than an elastomer, a valve equipped with the C-seal trim can be applied in processes with a fluid temperature of up to 593°C (1100°F).

ENVIRO-SEAL and HIGH-SEAL Packing Systems

Fisher ENVIRO-SEAL and HIGH-SEAL packing systems (figure 17) offer excellent sealing capabilities. These systems easily install in your existing valves or can be purchased with new valves. These systems help you seal your process to conserve valuable process fluid and to protect the environment against the emission of hazardous or polluting fluids. The long-life and reliability of these systems also reduce your maintenance cost and downtime.

For applications requiring compliance with environmental protection regulations, the unique ENVIRO-SEAL packing system and, for hazardous service, the ENVIRO-SEAL bellows seal bonnet (figure 18) are offered. The emission control packing system or seal bonnet keeps emission concentrations below the EPA 100 ppm requirement.

For an excellent stem seal in applications that are not environmentally-sensitive, the HIGH-SEAL Graphite ULF packing system is offered. The HIGH-SEAL packing system provides excellent sealing at pressure/temperature ratings beyond ENVIRO-SEAL limits.

ENVIRO-SEAL packing systems, available with PTFE, Graphite ULF, or Duplex packing, and the HIGH-SEAL Graphite ULF packing system feature live-loading and unique packing-ring arrangements for long-term, consistent sealing performance.

Figure 4. Fisher NPS 12x8 CL900 EWT-1 Valve

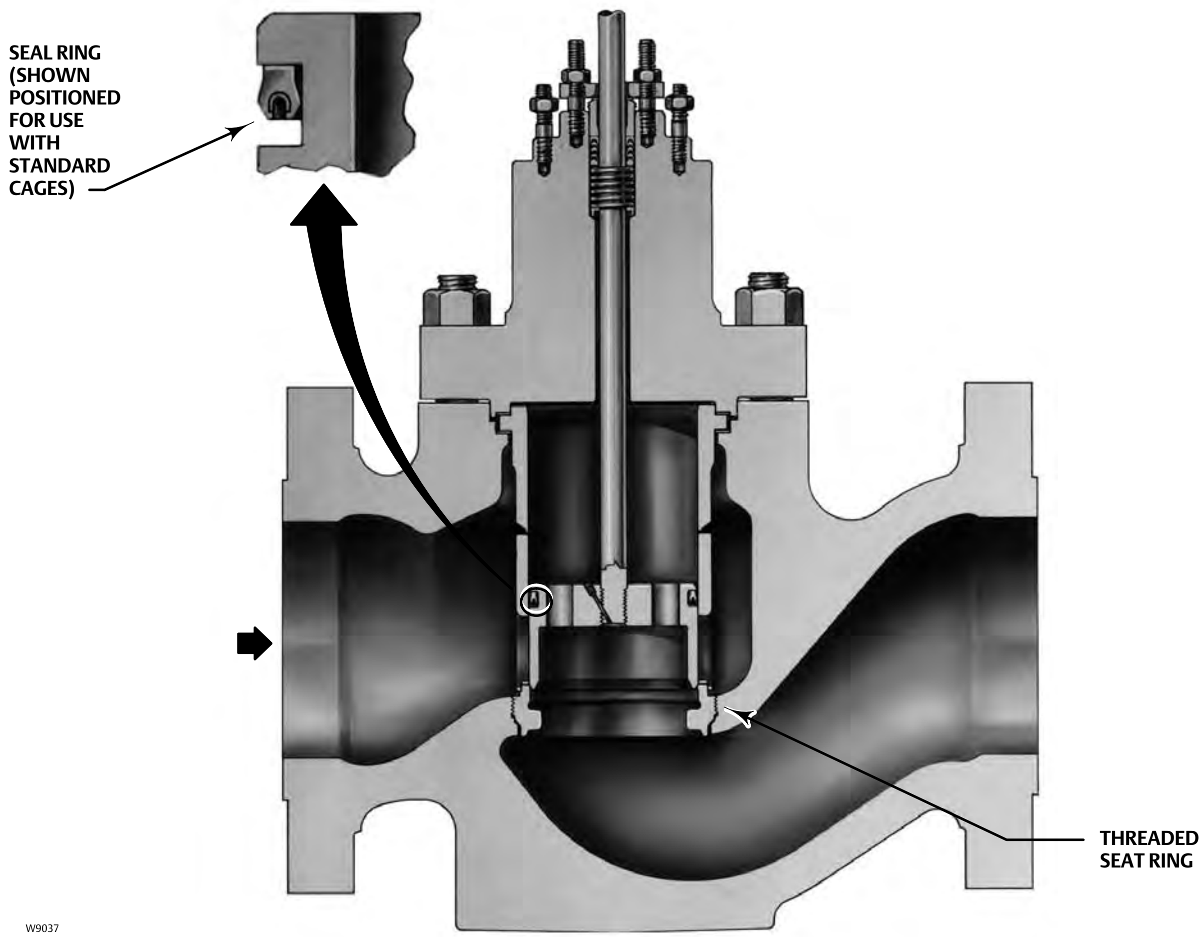
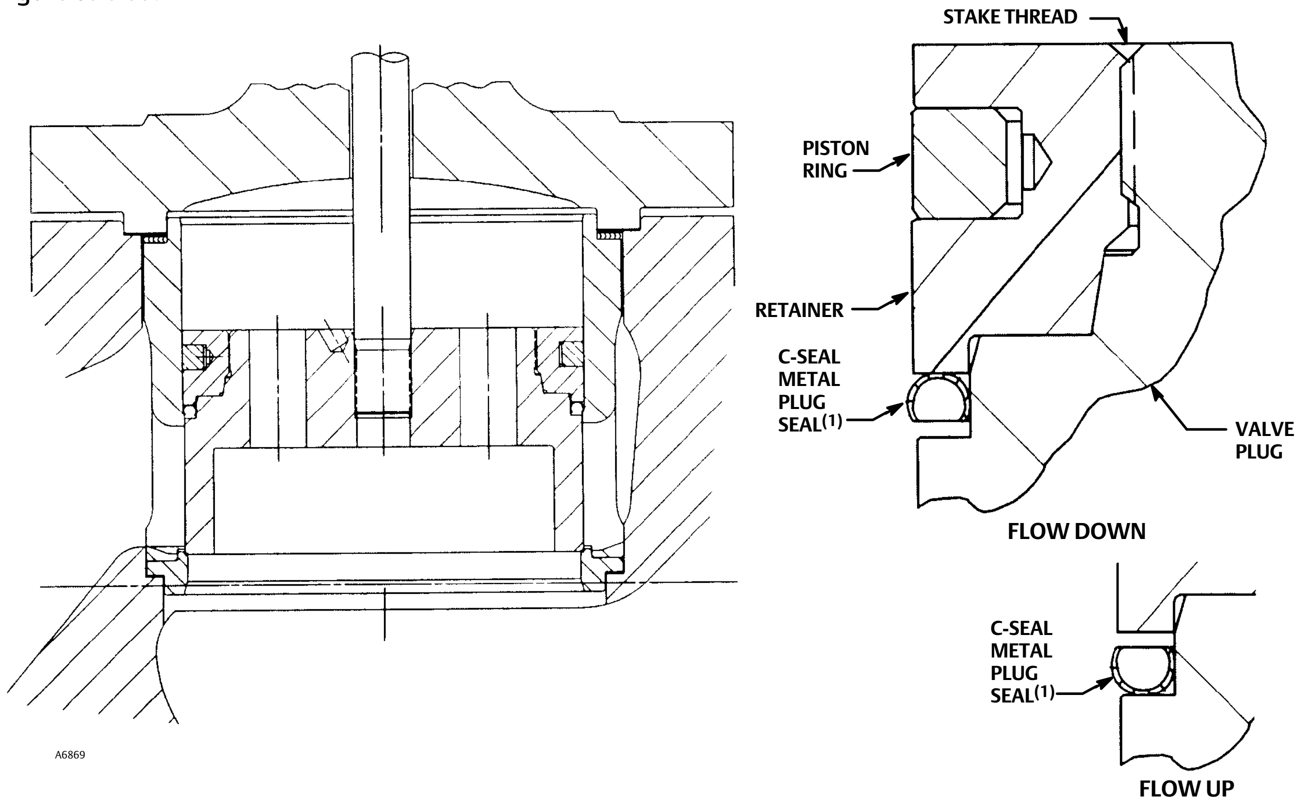


Figure 5. C-seal Trim



NOTES:
1. Reverse the orientation of the C-Seal plug seal proper shutoff when valve is used in a process with different fluid flow direction.

Figure 6. Typical Balanced TSO Trim

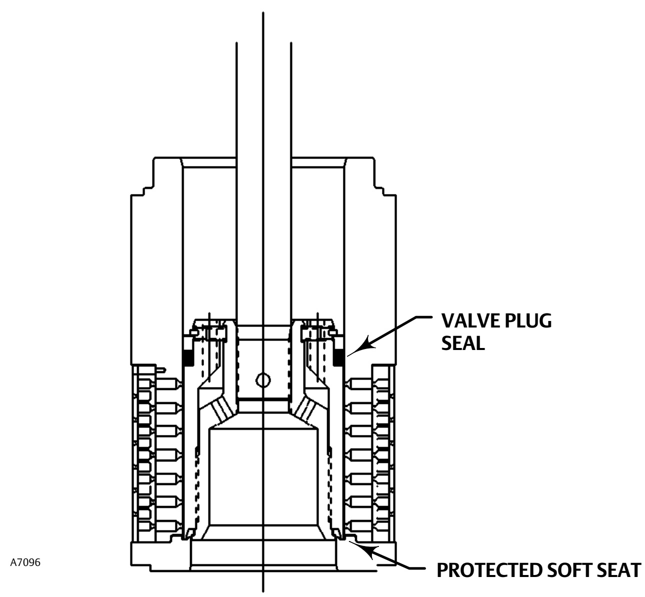
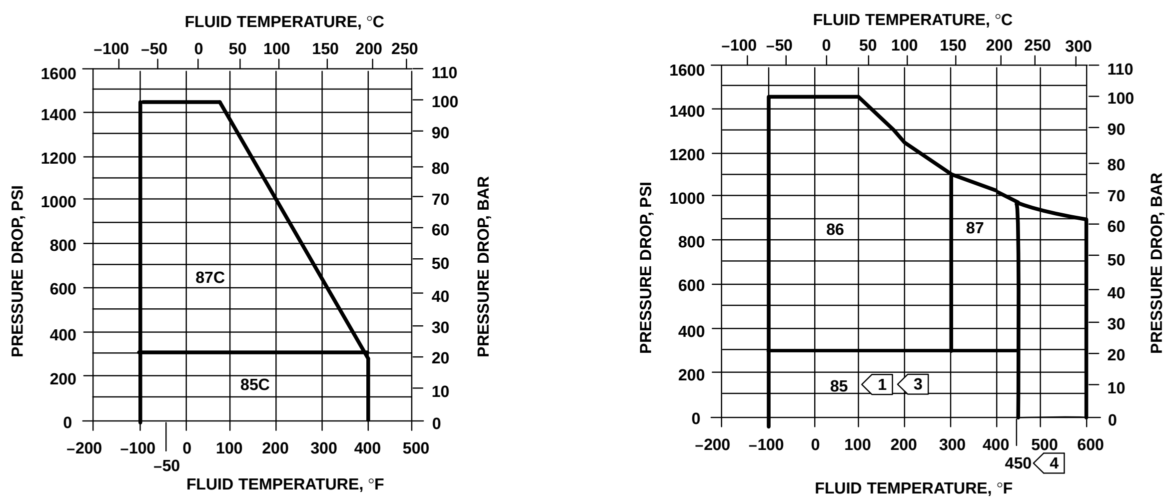


Table 1. Metal Trim Part Materials for Compatibility with NACE MR0175-2002 (Sour Service) Specifications, Environmental Restrictions Apply, Refer to Standard

Trim Designation	Valve Plug	Cage	Seat Ring for Standard Metal Seat Construction	Disk Seat and Retainer for Optional PTFE-Seat Construction	Valve Stem, Packing Follower, Lantern Ring, Packing Box Ring, and Pin	Load Ring(1)
85(3)	S31600	316 SST with electroless nickel coating (ENC)	S31600	- - -		
85C(2,3)	S31600	316 SST with electroless nickel coating (ENC)	- - -	S31600		
86(3)	S31600 with seat hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	R30006 (alloy 6)	- - -	S20910 (Valve Stem) S31600 (All Other Parts)	N05500
87	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	R30006 (alloy 6)	- - -		
87C(2)	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	- - -	S31600		

1. NPS 10x8 and 12x8 valve body only.
2. 85C and 87C are trims for PTFE-seat constructions in EWS and EWT valves.
3. Not for use with Whisper Trim I with 5-3/8 inch and larger ports.

Figure 7. Typical Trim for NACE MR0175-2002 (Sour Service) (tables 11, 12, and 13 should be used along with these graphs to determine specific limits based on valve size and trim selection)



A3115-3

FOR STANDARD PTFE SEATING WITH ALL 2 BODY MATERIALS

FOR OPTIONAL METAL SEATING WITH 2 CF8M MATERIAL

NOTES:
1 Use trim 87 instead of trim 85 for non-lubricating fluids such as superheated steam or dry gasses between 149°C (300°F) and 316°C (600°F).
2 Do not exceed the maximum pressure and temperature for the class rating of the body material used, even through the trims shown may have higher capabilities.
3 Use trim 85 up to 99 BAR (1440 PSI) with clean dry gas. For process fluids other than clean dry gas, use trim 85 only up to 21 bar (300 PSI).
4 Trim 87 temperature limit can be extended above 232°C (450°F) If PEEK anti-extrusion rings and spring-loaded seal ring are used.

Table 2. Available Valve Constructions(1)

VALVE	VALVE SIZE(2), NPS									
	CL150, 300, or 600								CL900	
	4x2	6x4	8x4	8x6	10x6(3)	12x6	10x8	12x8	8x6	12x8
EWD	x	x	x	x	x	x	x	x	x	x
EWD-1	---	---	---	---	---	---	---	---	---	x
EWS	x	x	x	x	x	x	x	x	x	x
EWS-1	---	---	---	---	---	---	---	---	---	x
EWT	x	x	x	x	x	x	x	x	x	x
EWT-1	---	---	---	---	---	---	---	---	---	x

1. X indicates available construction.
2. Two-number valve size designates end connection size x effective trim size.
3. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

Available Configurations

All configurations covered in this bulletin use a single-port, globe-style valve body with cage guiding and push-down-to-close valve plug action. This valve style is combined with different plug styles and either a clamped seat ring (no dash number suffix) or a seat ring threaded into the valve body (-1 suffix).

EWD: Balanced valve plug (figure 1) with clamped seat ring and metal-to-metal seating for all general applications over a wide range of pressure drops and temperatures.

EWD-1: NPS 12x8 CL900 EWD valve body, with threaded seat ring.

EWS: Unbalanced valve plug (figure 3) with clamped seat ring and metal-to-metal or optional metal-to-PTFE seating for all general applications requiring better shutoff capabilities than can be obtained with the EWD valve body.

EWS-1: NPS 12x8 CL900 EWS valve body, with threaded seat ring and metal-to-metal seating.

EWT: Balanced valve plug (figure 2) with metal-to-PTFE seating (for stringent shutoff requirements) standard in all EWT valves (except those with Cavitrol III cages). Metal-to-metal seating for higher temperatures is standard for all EWT valve bodies with Cavitrol III cages and optional for these valves with other cages.

EWT-1: NPS 12x8 CL900 EWT valve body, with threaded seat ring and with metal-to-metal seating (figure 4).

Material Selection Guidelines

Regardless of valve construction, select the valve body/bonnet material from the specifications table, keeping in mind that the valve service conditions cannot exceed the ASME pressure/temperature limitations for the selected valve body. Then, perform steps 1 and 2 under the appropriate valve design heading to complete the selection process.

EWD, EWS, or EWT Valve with all except Cavitrol III or Whisper Trim III Cages

1. Choose a trim combination for the service conditions according to figure 7 and 8, while making sure from tables 1 and 5 that this combination provides the desired trim materials. Then, make sure from table 11, 12, or 13 that the valve body/trim temperature limits are not exceeded.

2. Finally, check in table 20 that packing and other valve parts are available in materials that meet the desired service conditions.

EWD-1, EWS-1, or EWT-1 Valve with Standard Cage

1. Choose a trim combination for the service conditions according to figure 9, while making sure from table 7 that this combination provides the desired trim materials.

2. Finally, check in table 20 that packing and other valve parts are available in materials that meet the desired service conditions.

Table 3. Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

Valve	Seating	Shutoff Class
EWD or EWD-1	Metal	II (standard)
		III (optional for NPS 6x4 through 12x8 valves)
		IV (optional for NPS 6x4 through 12x8 valves with optional multiple graphite piston rings)
EWS or EWS-1	Metal	IV (standard)
		V (optional, consult your Emerson sales office)
EWS	PTFE	VI
EWT with all except Cavitrol III cages	PTFE	V (optional)
	Metal	IV
		V(1)
EWT with 1-stage Cavitrol III cage	Metal	IV (standard)
		V (optional)
EWT with 2-stage Cavitrol III cage or 2- or 3-stage Cavitrol III cage	Metal or PTFE	V
EWT-1	Metal	IV

1. Class V shutoff for EWT requires spring-loaded seal ring, radius-seat plug, and wide-bevel seat ring. Not available with 8-inch port, quick-opening cage. Not available with S31600 (316 SST) valve plug and seat ring (trims 4, 29, 85).

Table 4. C-seal Shutoff Classification

Valve	Valve Size, NPS	Port Diameter, mm (Inches)	Cage Style	ANSI/FCI Leakage Class
EWD (CL300, 600)	6x4x2 1/2	73 (2.875)	Eq. %, Linear, Whisper I, Cav III (2-Stage)	Class V to 593°C (1100°F) [for port diameters from 73 through 203.2 mm (2.875 though 8-inch) with optional C-seal trim]
	6x4	111.1 (4.375)	Eq. %, Linear, Whisper I, Cav III (1-Stage), Whisper III	
	8x4			
	6x4	87.3 (3.4375)	Whisper III	
	8x4			
	8x6	136.5 (5.375)	Cav III (2-Stage), Whisper III	
	12x6			
	10x6(1)	136.5 (5.375)	Whisper III	
	8x6	177.8 (7)	Eq. %, Linear, Whisper I, Cav III (1-Stage), Whisper III	
	10x6(1)			
	12x6			
	10x8	203.2 (8)	Eq. %, Linear, Whisper I, Cav III (1-Stage), Whisper III	
	12x8			
	10x8	177.8 (7)	Whisper III	
	12x8			

1. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

EWT Valve with Cavitrol III Cage

1. Choose a trim combination for the service conditions according to figure 12, while making sure from table 15 that this combination provides the desired trim materials. Then, make sure from table 16 that the valve body/trim temperature limits are not exceeded.

2. Finally, check in table 20 that packing and other valve parts are available in materials that meet the desired service conditions.

EWD, EWS, or EWT Valve with Whisper Trim III Cage

1. Choose a trim combination for the service conditions from table 17. Then, make sure from table 18 that the valve body/trim temperature limits are not exceeded.

2. Finally, check in table 20 that packing and other valve parts are available in materials that meet the desired service conditions.

Table 5. Fisher EWD, EWS, and EWT Metal Trim Part Combinations(1) Except for Valves with Cavitrol III or Whisper Trim III Cages

TRIM DESIGNATIONS	VALVE PLUG	CAGE	SEAT	
			Disk Seat, Retainer for PTFE Seat Constructions	Seat Ring for Metal Seat Constructions
1 (standard trim for all valves except EWT and those in CF8M. Trim 57 is standard for EWT. Trim 29 is standard for all valves in CF8M)	S41600 heat treated 17-4 SST HT(11)	17-4 SST HT(11)	- - -	S41600 or CA15(5) (S41000) for EWD, EWS CA6NM for EWD-1, EWS-1, EWT-1
3(10) and 3H(2)(7)	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	R30006 or R30016 (alloy 6)(3)	S31600 with seat hard faced with CoCr-A hardfacing alloy(4)	S31600 with seat hard faced with CoCr-A hardfacing alloy(4)
4(6)	S31600	17-4 SST HT	S31600	S31600
5(8) and 5H(2)(8)	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	R31233	R30006 disk seat and retainer(9)	S31600 with seat hard faced with CoCr-A hardfacing alloy(4)
6(9)	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	S31603 CRPL	R30006 disk seat and retainer(9)	R30006 (alloy 6)
27	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	S31600 with seat hard faced with CoCr-A hardfacing alloy(4)	S31600 with seat hard faced with CoCr-A hardfacing alloy(4)
28(6)	S31600 with seat hard faced with CoCr-A hardfacing alloy	316 SST with electroless nickel coating (ENC)	S31600 with seat hard faced with CoCr-A hardfacing alloy(4)	S31600 with seat hard faced with CoCr-A hardfacing alloy(4)
29(6) (standard for all valves in CF8M)	S31600	316 SST with electroless nickel coating (ENC)	S31600	S31600
37 and 37H(2)(7)	S31600 with seat and guide hard faced with CoCr-A hardfacing alloy	17-4 SST HT	S31600 with seat hard faced with CoCr-A hardfacing alloy(4)	S31600 with seat hard faced with CoCr-A hardfacing alloy(4)
57 (standard for all EWT valve bodies in all materials except CF8M)	S41600 heat treated 17-4 SST HT(11)	17-4 SST HT(11)	S31600	- - -

1. Nonferrous alloy combinations are also available. Consult your Emerson sales office for details.
2. Trims 3H, 5H, and 37H have clearances for high-temperature service.
3. Available only in linear, quick-opening, equal percentage, and Whisper Trim I cages.
4. Solid cast alloy 6 seat ring is used instead for NPS 4x2, 10x8, and 12x8 valve sizes.
5. CA15 is used for NPS 8x6 CL900 EWD and EWS.
6. Not for use with Whisper Trim I with 5-3/8 inch and larger ports.
7. With C-Seal trim, 3H, and 37H use solid cast Alloy 6 seat ring for NPS 8x4, 10x8, and 12x8 sizes.
8. Available only for NPS 8x6, 12x6, 10x8, 12x8 sizes Whisper Trim I cages.
9. Available only for NPS 10x8 and 12x8 Whisper Trim I cages.
10. For trim 3, upper temperature limited to 316°C (600°F) when used for Whisper Trim I cages.
11. For NPS 10 x 8 and 12 x 8 sizes with Whisper Trim I cages.

EWD-1, or EWT-1 Valve with Whisper Trim III Cage

1. Choose a trim combination for the service conditions according to figure 15 or 16, while making sure from table 19 that this combination provides the desired trim materials.

2. Finally, check in table 20 that packing and other valve parts are available in materials that meet the desired service conditions.

ANSI/FCI Class VI Shutoff Capabilities

EWS valves with metal seat constructions and EWT valves with soft seat and metal seat constructions can provide ANSI/FCI Class VI shutoff capabilities. See tables 6 and 7.

Table 6. Class VI Shutoff Availability

Valve	Port Size, Inches	Seat	Minimum Seat Load
EWS	≤ 7	Metal	300 lbs/lineal inch
EWT	$\geq 3.4375 \leq 7$	Soft	See Catalog 14
EWT	$\geq 3.4375 \leq 7$	Metal	300 lbs/lineal inch

Table 7. Class VI Trim Materials

VALVE	CAGE	VALVE PLUG	SEAT RING	SEAL RING	TRIM TEMPERATURE LIMIT	
					°C	°F
EWS	316 SST/ ENC	S31600/CoCr-A (alloy 6) seat	S31600	NA	Not a limiting factor	
EWT	316 SST / ENC	S31600	S31600/PTFE	UHMWPE[1] R30003	-29 to 66	-20 to 150
	316 SST / ENC	S31600/CoCr-A seat	S31600	UHMWPE R30003	-101 to 66	-150 to 150
	17-4 SST (17-4PH SST)	S41600	S31600/PTFE	UHMWPE R30003	-29 to 66	-20 to 150
	17-4 SST	S41600	S31600	UHMWPE R30003	-29 to 66	-20 to 150

1. UHMWPE (Ultra High Molecular Weight Polyethylene)

Fisher TSO (Tight Shutoff) Trim Capabilities

See figure 6 and tables 8, 9, and 10. For additional information contact your Emerson sales office.

Table 8. TSO (Tight Shutoff) Leakage Class

Leakage Class	Maximum Leakage	Test Medium	Test Pressure	Test Procedure
TSO (Tight Shutoff)	Valves with TSO trim are factory tested to a more stringent Fisher test requirement of no leakage at time of shipment.	Water	Service ΔP[1]	ANSI/FCI Class V test procedure B

1. Specify service ΔP when ordering.

Table 9. TSO Shutoff Availability

VALVE	CONSTRUCTION
EWT	Std or Cavitrol III trim. Replaceable, protected soft seat

Table 10. Port Diameters, Valve Plug Travel, Yoke Boss Diameters for TSO (Tight Shutoff) Trim

VALVE	TRIM	MAX TRAVEL		YOKE BOSS SIZE		PORT DIAMETER				C_V REDUCTION AT 100% TRAVEL[1]	UNBALANCE AREA
						Nominal		Actual TSO			
		mm	Inch	mm	Inch	mm	Inch	mm	Inch		Inch^2
EWT NPS 6x4	Std	50.8	2	90	3-9/16	111	4.375	106	4.1875	4% (linear) 3% (equal percent)	0.154
EWT NPS 8x6 and 10x6[2]	Std	50.8	2	90 127	3-9/16 5	179	7	173	6.8125	2%	0.30
		102	4	90	3-9/16					2%	

1. This column lists the percent reduction of published maximum C_V of the trim listed in the TRIM column.
2. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

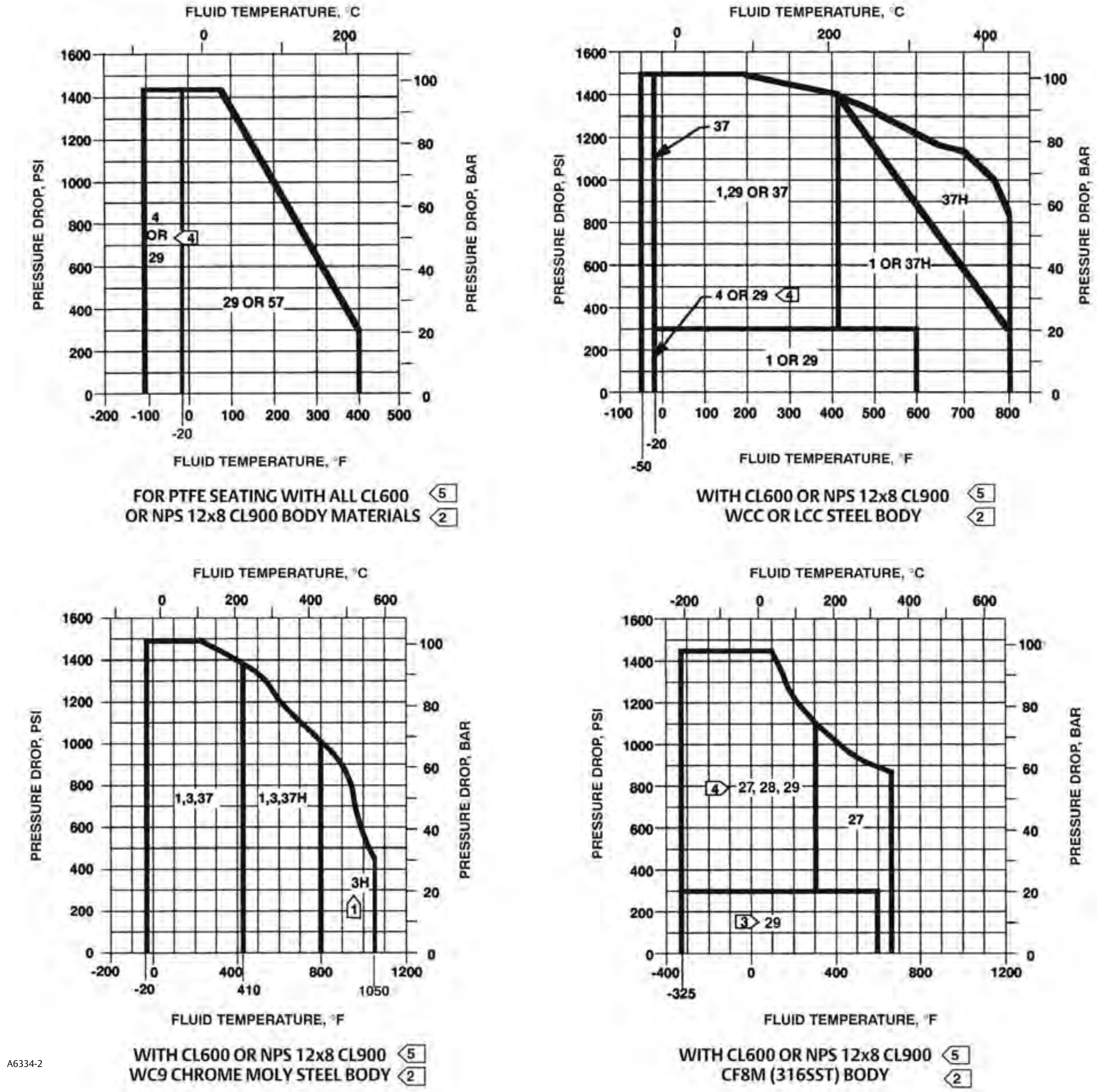
Installation

Unless limited by seismic criteria, the valve body can be installed in any position (as long as sufficient support is provided if a fabricated extension bonnet is used). However, the normal method is with the actuator vertical above the valve, because non-vertical positions may cause uneven trim wear and decreased trim life.

Flow through the valve body must be in the direction indicated by the flow direction arrow on the valve body. Consider installing an upstream strainer, especially if the valve body includes slotted or multihole Whisper Trim or Cavitrol cages.

Dimensions are shown in figure 19.

Figure 8. Typical Trim Used in Fisher EWD, EWS, or EWT Valves Except Those with Cavitrol III or Whisper Trim III Cages (tables 11, 12, and 13 should be used along with these graphs to determine specific limits based on valve size and trim selection)



NOTES:
1 Be especially careful to specify service temperature fi trim 3,4, or 37 is selected, as different thermal expansion rates require special plug clearances, also, use trim 37H instead of trim 4 for non-lubricating fluids such as superheated steam or dry gasses between 149°C (300°F) AND 316°C (600°F).
2 Do not exceed the maximum pressure and temperature for the class rating of the body material used, even through the trims shown may have higher capabilities.
3 Use trim 27 instead of trim 29 for non-lubricating fluids such as superheated steam or dry gasses between 149°C (300°F) AND 316°C (600°F).
4 Trims 4 AND 29 may be used over 300 PSI only with clean, dry gas.
5 EWD, EWS, and EWT NPS 12x8 CL900 limited to CL600 pressure drops. See figure 9 and 10 EWD-1, EWS-1, and EWT-1 for full CL900 NPS 12x8 pressure drops.

Table 11. Valve/Trim Temperature Capabilities(1) for CL300 or 600 Fisher EWD, EWS, and EWT Valves with 2-Inch (51 mm) or 3-Inch (76 mm) Travel (Except those with Cavitrol III or Whisper Trim III Cages) (figures 7 and 8 should be used along with this table to determine specific limits based on valve size and trim selection)

VALVE/BONNET MATERIAL	TRIM DESIGNATION FROM TABLE 5	VALVE SIZE, NPS	MATERIAL TEMPERATURE CAPABILITY			
			°C Min	°C Max	°F Min	°F Max
WCC steel	1	4 x 2	-29	399	-20	750
		6 x 4	-29	343	-20	650
		8 x 4	-29	329	-20	625
		8 x 6 or 10 x 6(3)	-29	316	-20	600
		12 x 6	-29	260	-20	500
		12 x 8 or 10 x 8	-29	427	-20	800
	29, 85	4 x 2	-29	316	-20	600
		6 x 4	-29	221	-20	430
		8 x 4	-29	218	-20	425
		8 x 6 or 10 x 6(3)	-29	204	-20	400
		12 x 6	-29	174	-20	345
		12 x 8 or 10 x 8	-29	316	-20	600
	5(4)	8 x 6, 12 x 6, 10 x 8, or 12 x 8	-29	316	-20	600
	5H(4)		316	427	600	800
	6(4)	10 x 8	-29	316	-20	600
	37	4 x 2 through 12 x 8	-29	210	-20	410
	37H		210	427	410	800
	57		-29	204	-20	400
LCC steel	1	4 x 2	-29	343	-20	650
		6 x 4	-29	343	-20	650
		8 x 4	-29	329	-20	625
		8 x 6 or 10 x 6(3)	-29	329	-20	625
		12 x 6	-29	260	-20	500
		10 x 8 or 12 x 8	-29	343	-20	650
	29, 85	4 x 2	-46	316	-50	600
		6 x 4	-46	218	-50	425
		8 x 4	-46	218	-50	425
		8 x 6 or 10 x 6(3)	-46	204	-50	400
		12 x 6	-46	163	-50	325
		10 x 8 or 12 x 8	-46	316	-50	600
	5(4)	8 x 6, 12 x 6, 10 x 8, or 12 x 8	-46	316	-46	600
	6(4)	10 x 8	-46	316	-50	600
	37	4 x 2 through 12 x 8	-46	210	-50	410
	37H		210	343	410	650
	57		-29	204	-20	400

-continued-

Table 11. Valve/Trim Temperature Capabilities(1) for CL300 or 600 Fisher EWD, EWS, and EWT Valves with 2-Inch (51 mm) or 3-Inch (76 mm) Travel (Except those with Cavitrol III or Whisper Trim III Cages) (figures 7 and 8 should be used along with this table to determine specific limits based on valve size and trim selection) (continued)

VALVE/BONNET MATERIAL	TRIM DESIGNATION FROM TABLE 5	VALVE SIZE, NPS	MATERIAL TEMPERATURE CAPABILITY			
			°C Min	°C Max	°F Min	°F Max
WC9 chrome moly steel	1	4 x 2	-29	399	-20	750
		6 x 4	-29	343	-20	650
		8 x 4	-29	329	-20	625
		8 x 6 or 10 x 6(3)	-29	316	-20	600
		12 x 6	-29	260	-20	500
		12 x 8 or 10 x 8	-29	427	-20	800
	3	4 x 2 through 12 x 8	-29	427(5)	-20	800(5)
	3H		427	566	800	1050
	5(4)	8 x 6, 12 x 6, 10 x 8, or 12 x 8	-29	316	-20	600
	5H(4)		316	566	600	1050
	6(4)	10 x 8	-29	316	-20	600
	27, 87	4 x 2	-29	343	-20	650
		6 x 4	-29	221	-20	430
		8 x 4	-29	218	-20	425
		8 x 6 or 10 x 6(3)	-29	204	-20	400
		12 x 6	-29	163	-20	325
		12 x 8 or 10 x 8	-29	343	-20	650
	29, 85	4 x 2	-29	316	-20	600
		6 x 4	-29	221	-20	430
		8 x 4	-29	218	-20	425
		8 x 6 or 10 x 6(3)	-29	204	-20	400
		12 x 6	-29	163	-20	325
		12 x 8 or 10 x 8	-29	316	-20	600
	37	4 x 2 through 12 x 8	-29	210	-20	410
	37H		210	427	410	800
	57		-29	204	-20	400
LCC steel CF8M (316 SST)	5(4)	8 x 6, 12 x 6, 10 x 8, or 12 x 8	-198(4)	316(1)	-325(4)	600(1)
	6(4)	10 x 8	-198(4)	316(1)	-325(4)	600(1)
	27	4 x 2 through 12 x 8	-198(2)	343	-325(2)	650
	28		-198(2)	149	-325(2)	300
	29, 85		-198(2)	316	-325(2)	600

1. For metal trim parts only.
2. May be used down to -254°C (-425°F) if manufacturing process includes Charpy Impact test.
3. NPS 10x6 has a valve outlet area identical to the NPS 8x6.
4. Available for Whisper Trim I cages.
5. For Trim 3, upper temperature to 316°C (600°F) when used for Whisper Trim I cages.

Table 12. 4-Inch (102 mm) Travel Whisper Trim I Fisher EWD and EWT Valve Body/Trim Temperature Capabilities(1) (CL150 - 600 and NPS 8 x 6, CL900) (figure 8 should be used along with this table to determine specific limits based on valve size and trim selection)

BODY/BONNET MATERIAL(2)	TRIM DESIGNATION FROM TABLE 5	VALVE SIZE, NPS	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
			Min	Max	Min	Max
WCC steel	1	8 x 6 or 10 x 6(3)	-29	329	-20	625
		12 x 6	-29	285	-20	545
	3	8 x 6 or 10 x 6(3) or 12 x 6	-29	316	-20	600
	3H		316	427	600	800
	5	8 x 6, 12 x 6, 10 x 8 or 12 X 8	-29	316	-20	600
	5H		316	427	600	800
	37	8 x 6 or 10 x 6(3) or 12 x 6	-29	204	-20	400
			-29	210	-20	410
	37H	8 x 6 or 10 x 6(3)	210	427	410	800
		12 x 6	210	363	410	685
LCC steel	1	8 x 6 or 10 x 6(3)	-29	329	-20	625
	5	8 x 6, 12 x 6, 10 x 8 or 12 x 8	-46	316	-50	600
	6	10 x 8	-46	316	-50	600
	4 and 57	8 x 6 or 10 x 6(3)	-46	204	-50	400
	37		-29	210	-20	410
	37H		210	343	410	650
WC9 Chrome moly steel	3	4 x 2 through 12 x 8	-29	316	-20	600
	3H		316	566	600	1050
	5	8 x 6, 12 x 6, 10 x 8 or 12 x 8	-29	316	-20	600
	5H		316	566	600	1050
	6	10 x 8	-29	316	-20	600

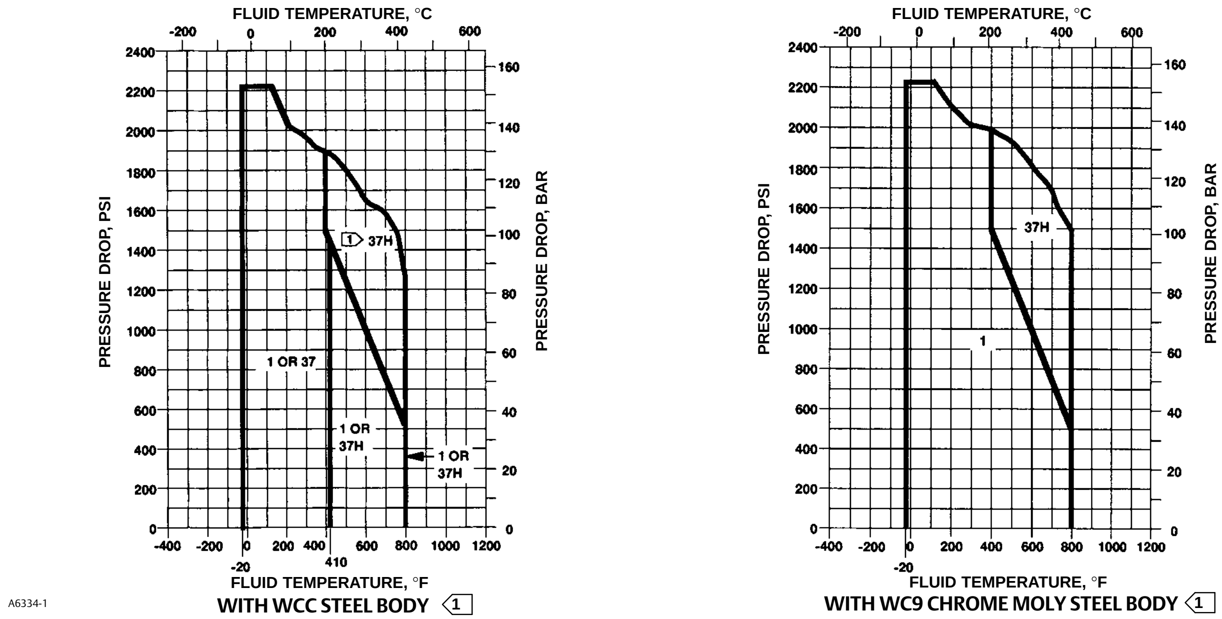
1. For metal trim parts only.
2. Same material also used for bonnet spacer.
3. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

Table 13. Fisher CL900 EWD, EWS, and EWT Valve Body/Trim Temperature Capabilities(1) (figure 8 should be used along with this table to determine specific limits based on valve size and trim selection)

BODY/BONNET MATERIAL	TRIM DESIGNATION FROM TABLE 5	VALVE SIZE, NPS	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
			Min	Max	Min	Max
WCC steel	1	8 x 6 12 x 8	-29 -29	316 427	-20 -20	600 800
	29, 85		-29 -29	204 316	-20 -20	400 600
	37	8 x 6 or 12 x 8	-29	210	-20	410
	37H		210	427	410	800
	57		-29	204	-20	400
LCC steel	1	8 x 6 only	-29	329	-20	625
	4, 37		-46	210	-50	410
	37H		210	371	410	700
	57		-29	204	-20	400
	29, 85		-46	204	-50	400
WC9 chrome moly steel	1	8 x 6 12 x 8	-29 -29	316 427	-20 -20	600 800
	3	8 x 6	-29	427	-20	800
	3H		427	566	800	1050
	3	12 x 8	-29	427	-20	800
	3H		427	566	800	1050
	27, 87	8 x 6 12 x 8	-29 -29	204 343	-20 -20	400 650
	29, 85	8 x 6 12 x 8	-29 -29	204 316	-20 -20	400 600
	37	8 x 6 or 12 x 8	-29	210	-20	410
	37H		210	427	410	800
	57		-29	204	-20	400
316 SST (CF8M)	27, 87	8 x 6 or 12 x 8	-198(2)	343	-325(2)	650
	29, 85		-198(2)	316	-325(2)	600

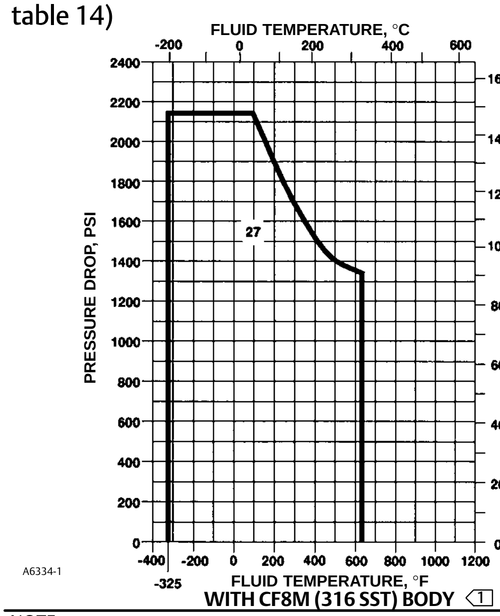
1. For metal trim parts only.
2. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.

Figure 9. Typical Trim Used in Fisher EWD, EWS, and EWT NPS 8x6 CL900 Valves with Standard Cages and EWD-1, EWS-1, and EWT-1 NPS 12x8 CL900 Valves with Standard Cages (see table 14)



NOTE:
1 Do not exceed the maximum pressure and temperature for the class rating of the body material used, even through the trims shown may have higher capabilities.

Figure 10. Typical Trim Used in NPS 8x6 CL900 Fisher EWD, EWS, EWT and NPS 12x8 CL900 EWD-1, EWS-1, and EWT-1 Valves with Standard Cages (see table 14)



NOTE:
1 Do not exceed the maximum pressure and temperature for the class rating of the body material used, even through the trims shown may have higher capabilities.

Table 14. NPS 8x6 CL900 Fisher EWD, EWS, EWT and NPS 12x8 CL900 EWD-1, EWS-1, and EWT-1 Metal Trim Part Combinations Except for Valves with Whisper Trim III Cages

Trim Designation	Valve Plug	Cage	Seat Ring
1	S41600 (416 SST) heat treated	17-4 SST H900	Heat-treated CA6NM(1)
27	316 SST with seat and guide hard-faced with CoCr-A	316 SST with electroless nickel coating (ENC)	316 SST with seat hard-faced with CoCr-A
37 and 37H(2)	S31600 with seat and guide hard-faced with CoCr-A	17-4 SST H900	S31600 with seat hard-faced with CoCr-A

1. CA6NM is similar to 410 SST.
2. Trim 37H has clearances for high-temperature service.

Figure 11. Detail of 2-Stage Cavitrol III Cage in CL300 or 600 Fisher EWT Valve

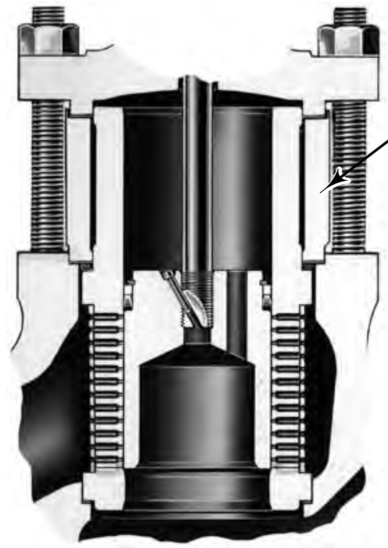
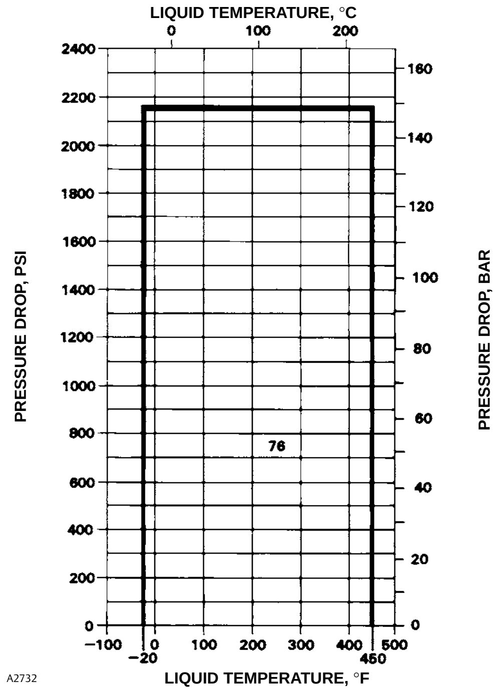


Figure 12. Typical Trim Used in Cavitrol III Cage Constructions with Steel or Stainless Steel Valves (see tables 15)



NOTE:
Do not exceed the maximum pressure and temperature for the class rating of the body material used, even through the trims shown may have higher capabilities.

Table 15. Cavitrol III(1) Metal Trim Part Combination

Trim Designation	Valve Plug	Cage	Cage Retainer(2)	Seat Ring
76	Heat-treated S42000 (420 SST)	17-4 SST H900	S31600 (316 SST)	S17400 with H900 heat-treat condition

1. Available only in EWT valve.
2. Not used in NPS 12x8 or 8x6 CL900 valves.

Table 16. Cavitrol III Valve Body/Trim Temperature Capabilities

TRIM DESIGNATION FROM TABLE 15	VALVE BODY and BONNET		MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
			Min	Max	Min	Max
76	WCC carbon steel or WC9 chrome moly steel		-29	These materials not limiting factors	-20	These materials not limiting factors
	LCC carbon steel		-46		-50	
	S31600 (316 SST)	NPS 4x2 valve	-29	204	-20	400
		NPS 6x4 valve	-29	149	-20	300
		NPS 8x4 valve	-29	135	-20	275
		NPS 8x6 or 10x6(1) valve(2)	-29	121	-20	250
		NPS 12x6 valve	-29	107	-20	225
		NPS 12x8 valve(3)	-29	177	-20	350

1. NPS 10x6 has a valve outlet area identical to the NPS 8x6.
2. This valve body/trim combination not available in CL900 valve.
3. This valve body/trim combination available in all NPS 12x8 rating classes.

Figure 13. Fisher EWT Metal-Seat Valve with Whisper Trim I Cage

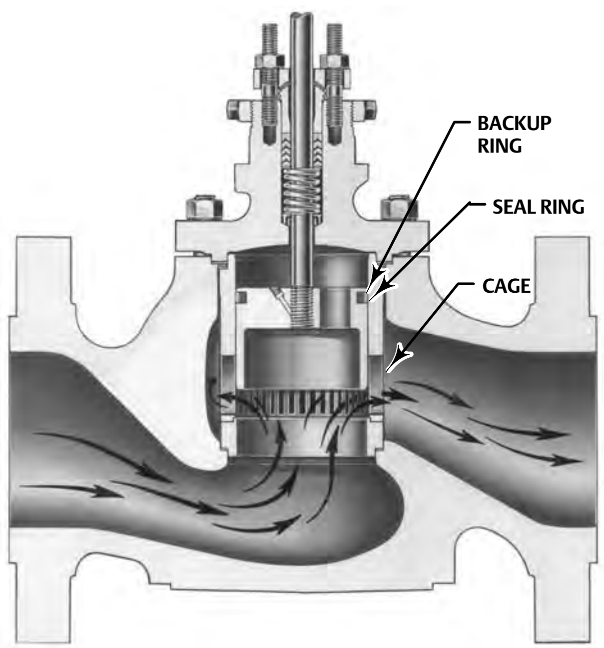


Figure 14. Fisher EWD Valve with Whisper Trim III Cage (shown with optional drain plug)

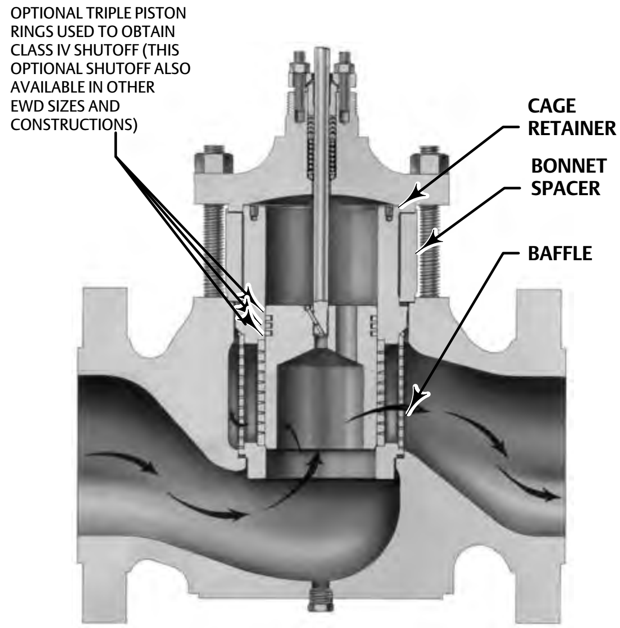


Table 17. Metal Trim Part Combinations for Fisher EWD, EWS, and EWT Valves with Whisper Trim III Cages

Trim Designation	Valve Plug	Cage	Cage Retainer	Baffle (for Level D3 Cage Only)	Seat Ring for Metal-Seat Construction	Disk Seat and Retainer for PTFE-Seat Construction	Stem
19.1 through 111.1, 177.8 and 203.2 mm (0.75 through 4.375, 7 and 8 Inch) Port Sizes							
301G	S41600	17-4 SST	--	Steel	S41600	--	S31600
301GC(3)	S41600	17-4 SST	--	Steel	--	S31600	S31600
312G(1)	S31600/CoCr-A Seat & Guide	316/ENC Electroless Nickel Coated	--	S31600	R30006	--	S20910
312GC(1)(3)	S31600/CoCr-A Seat & Guide	316/ENC Electroless Nickel Coated	--	S31600	--	R30006/ S31600(9)	S20910
315G(1)	S31600/CoCr-A Seat & Guide	316 SST Chrome	--	S31600	R30006	--	S20910
315GC(1)(3)	S31600/CoCr-A Seat & Guide	316 SST Chrome	--	S31600	--	R30006/ S31600(9)	S20910
318G(2)	F22/CoCr-A Seat & Guide	2.25 Cr-1 Mo Nitrided(7)	--	WC9	R30006	--	S41000/ S42200(4)
306	S31803/Ultimet Seat & Guide	2205 Duplex(6) Plate	--	S31803	S31803/Ultimet	--	S31803
307G	S31600/CoCr-A Seat & Guide	17-4 SST	--	Steel	R30006	--	S31600
307GH(5)	S31600/CoCr-A Seat & Guide	17-4 SST	--	Steel	R30006	--	S31600
136.5 mm (5.375 Inch) Port							
301	S17400	416 SST	WCC/ENC	Steel	S41600	--	S31600
301 A(2)	S17400	416 SST	WCC/Nitrided	Steel	S41600	--	S31600
301 C(3)	S17400	416 SST	WCC/ENC	Steel	--	S31600	S31600
304	S31600/CoCr-A Seat & Guide	416 SST	WCC/ENC	Steel	S31600/ CoCr-A Seat	--	S31600
312(1)	S31600/CoCr-A Seat & Guide	316/ENC Electroless Nickel Coated	316/ENC Electroless Nickel Coated	S31600	R30006	--	S20910
312C(1)(3)	S31600/CoCr-A Seat & Guide	316/ENC Electroless Nickel Coated	316/ENC Electroless Nickel Coated	S31600	--	R30006/ S31600	S20910
315(2)	S31600/CoCr-A Seat & Guide	316 SST/ Electrolyzed Chrome Coat	S31600/ Electrolyzed Chrome Coat	S31600	S31600/CoCr-A	--	S31600/ S20910(8)
318(2)	S31600/CoCr-A Seat & Guide	2.25 Cr-1 Mo Nitrided	WC9 Nitrided(7)	WC9	S31600/ CoCr-A Seat	--	S20910
306	S31803/Ultimet Seat & Guide	2205 Duplex(6) Chrome Plate	--	S31803	S31803/Ultimet	--	S31803

1. NACE compatible trims meets NACE MR0175 2002, MR0175/ISO15156, MR0103.
2. Not for use with EWT construction.
3. Not for use with EWD construction.
4. Trim 318G uses S41000 stem up to 538°C (1000°F) and S42200 stem above 538°C (1000°F).
5. For high temperature service.
6. 22 Cr- 5 Ni duplex stainless steel.
7. With C-seal construction use F22 alloy steel/CoCr-A/Nitrided cage material.
8. Trim 315 uses S31600 stem up to 427°C (800°F) and S20910 stem above 427°C (800°F).
9. For 8 inch port size, both disk seat and retainer use R30006.

Table 18. Valve/Trim Temperature Capabilities for Fisher EWD, EWS, and EWT Valves with Whisper Trim III Cages

VALVE/BONNET/ BONNET SPACER MATERIAL	TRIM DESIGNATION FROM TABLE 17	VALVE SIZE, NPS	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
			Min	Max	Min	Max
19.1 through 111.1, 177.8 and 203.2 mm (0.75 through 4.375, 7 and 8 Inch) Port Size						
WCC or WC9	301G	4 x 2	-29	399	-20	750
		6 x 4	-29	316	-20	625
		8 x 4	-29	316	-20	625
		8 x 6 or 10 x 6	-29	427	-20	800
		10 x 8	-29	427	-20	800
		12 x 8	-29	427	-20	800
	301GC	4 x 2	-29	204	-20	400
		6 x 4	-29	204	-20	400
		8 x 4	-29	204	-20	400
		8 x 6 or 10 x 6	-29	204	-20	400
		10 x 8	-29	204	-20	400
		12 x 8	-29	204	-20	400
	312G	4 x 2	-29	316	-20	600
		6 x 4	-29	218	-20	425
		8 x 4	-29	218	-20	425
		8 x 6 or 10 x 6	-29	316	-20	600
		10 x 8	-29	316	-20	600
		12 x 8	-29	316	-20	600
	312GC	4 x 2	-29	204	-20	400
		6 x 4	-29	204	-20	400
		8 x 4	-29	204	-20	400
		8 x 6 or 10 x 6	-29	204	-20	400
		10 x 8	-29	204	-20	400
		12 x 8	-29	204	-20	400
	315G	4 x 2	-29	316	-20	600
		6 x 4	-29	218	-20	425
		8 x 4	-29	218	-20	425
		8 x 6 or 10 x 6	-29	316	-20	600
		10 x 8	-29	316	-20	600
		12 x 8	-29	316	-20	600
	315GC	4 x 2	-29	204	-20	400
		6 x 4	-29	204	-20	400
		8 x 4	-29	204	-20	400
		8 x 6 or 10 x 6	-29	204	-20	400
		10 x 8	-29	204	-20	400
		12 x 8	-29	204	-20	400
	318G (WCC only)	4 x 2	-29	427	-20	800
		6 x 4	-29	427	-20	800
		8 x 4	-29	427	-20	800
		8 x 6 or 10 x 6	-29	427	-20	800
		10 x 8	-29	427	-20	800
		12 x 8	-29	427	-20	800
	318G (WC9 only)	4 x 2	-29	593	-20	1100
		6 x 4	-29	593	-20	1100
		8 x 4	-29	593	-20	1100
		8 x 6 or 10 x 6	-29	593	-20	1100
		10 x 8	-29	593	-20	1100
		12 x 8	-29	593	-20	1100

-continued-

Table 18. Valve/Trim Temperature Capabilities for Fisher EWD, EWS, and EWT Valves with Whisper Trim III Cages (continued)

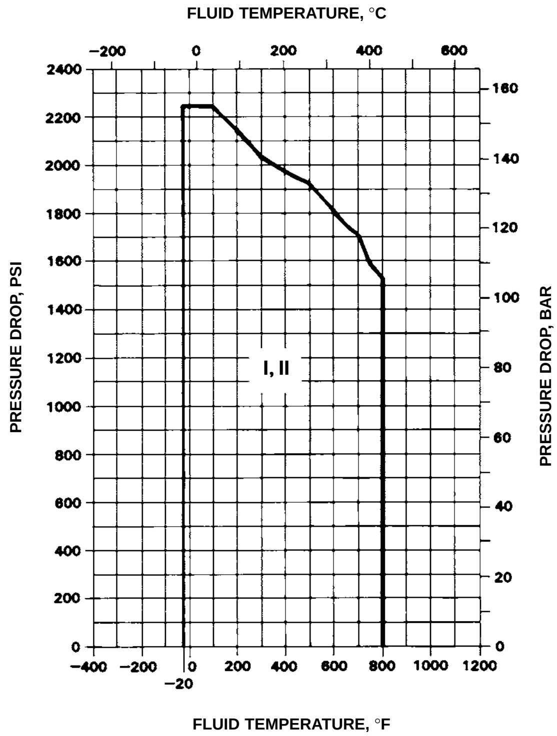
VALVE/BONNET/ BONNET SPACER MATERIAL	TRIM DESIGNATION FROM TABLE 17	VALVE SIZE, NPS	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
19.1 through 111.1, 177.8 and 203.2 mm (0.75 through 4.375, 7 and 8 Inch) Port Size						
WCC or WC9	306	4 x 2	-29	316	-20	600
		6 x 4	-29	316	-20	600
		8 x 4	-29	316	-20	600
		8 x 6 or 10 x 6	-29	316	-20	600
		10 x 8	-29	316	-20	600
		12 x 8	-29	316	-20	600
	307G	4 x 2 through 12 x 8	-29	210	-20	410
	307GH		210	427	410	800
CF8M	301G	4 x 2	-29	149	-20	300
		6 x 4	-29	149	-20	300
		8 x 4	-29	149	-20	300
		8 x 6 or 10 x 6	-29	149	-20	300
		10 x 8	-29	149	-20	300
		12 x 8	-29	149	-20	300
	301GC	4 x 2	-29	149	-20	300
		6 x 4	-29	149	-20	300
		8 x 4	-29	149	-20	300
		8 x 6 or 10 x 6	-29	149	-20	300
		10 x 8	-29	149	-20	300
		12 x 8	-29	149	-20	300
	312G	4 x 2	-198	343	-325	650
		6 x 4	-198	343	-325	650
		8 x 4	-198	343	-325	650
		8 x 6 or 10 x 6	-198	343	-325	650
		10 x 8	-198	343	-325	650
		12 x 8	-198	343	-325	650
	312GC	4 x 2	-73	204	-100	400
		6 x 4	-73	204	-100	400
		8 x 4	-73	204	-100	400
		8 x 6 or 10 x 6	-73	204	-100	400
		10 x 8	-73	204	-100	400
		12 x 8	-73	204	-100	400
	315G	4 x 2	-198	316	-325	600
		6 x 4	-198	316	-325	600
		8 x 4	-198	316	-325	600
		8 x 6 or 10 x 6	-198	316	-325	600
		10 x 8	-198	316	-325	600
		12 x 8	-198	316	-325	600
	315GC	4 x 2	-73	204	-100	400
		6 x 4	-73	204	-100	400
		8 x 4	-73	204	-100	400
		8 x 6 or 10 x 6	-73	204	-100	400
		10 x 8	-73	204	-100	400
		12 x 8	-73	204	-100	400
	306	4 x 2	-29	316	-20	600
		6 x 4	-29	316	-20	600
		8 x 4	-29	316	-20	600
		8 x 6 or 10 x 6	-29	316	-20	600
		10 x 8	-29	316	-20	600
		12 x 8	-29	316	-20	600

-continued-

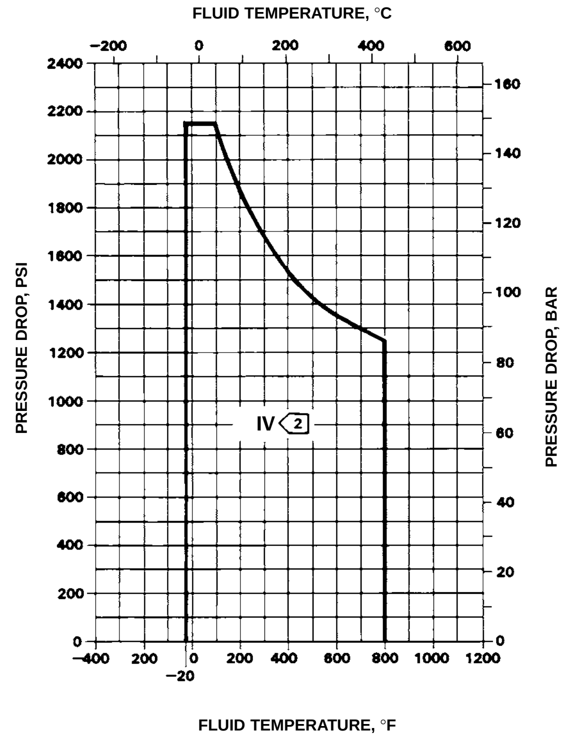
Table 18. Valve/Trim Temperature Capabilities for Fisher EWD, EWS, and EWT Valves with Whisper Trim III Cages (continued)

VALVE/BONNET/ BONNET SPACER MATERIAL	TRIM DESIGNATION FROM TABLE 17	VALVE SIZE, NPS	MATERIAL TEMPERATURE CAPABILITY			
			°C		°F	
136.5 mm (5.375 Inch) Port						
WCC or WC9	301	8 x 6 or 10 x 6	-29	338	-20	640
		12 x 6	-29	313	-20	595
	301A	8 x 6 or 10 x 6	-29	338	-20	640
		12 x 6	-29	313	-20	595
	301C	8 x 6 or 10 x 6	-29	204	-20	400
		12 x 6	-29	204	-20	400
	304	8 x 6 or 10 x 6	-29	343	-20	650
		12x6	-29	338	-20	640
	312	8 x 6 or 10 x 6	-29	204	-20	400
		12 x 6	-29	177	-20	350
	312C	8 x 6 or 10 x 6	-29	204	-20	400
		12 x 6	-29	177	-20	350
	315	8 x 6 or 10 x 6	-29	204	-20	400
		12 x 6	-29	177	-20	350
	318 (WCC only)	8 x 6 or 10 x 6	-29	427	-20	800
		12 x 6	-29	427	-20	800
	318 (WC9 only)	8 x 6 or 10 x 6	-29	593	-20	1100
		12 x 6	-29	593	-20	1100
	306	8 x 6 or 10 x 6	-29	204	-20	400
		12 x 6	-29	204	-20	400
CF8M	301	8 x 6 or 10 x 6	-29	149	-20	300
		12 x 6	-29	121	-20	250
	301C	8 x 6 or 10 x 6	-29	149	-20	300
		12 x 6	-29	121	-20	250
	304	8 x 6 or 10 x 6	-29	149	-20	300
		12 x 6	-29	121	-20	250
	312	8 x 6 or 10 x 6	-29	343	-20	650
		12 x 6	-29	343	-20	650
	312C	8 x 6 or 10 x 6	-29	204	-20	400
		12 x 6	-29	204	-20	400
	315	8 x 6 or 10 x 6	-198	427	-325	800
		12 x 6	-198	427	-325	800
	306	8 x 6 or 10 x 6	-29	316	-20	600
		12 x 6	-29	316	-20	600

Figure 15. Typical Trim Used in Fisher EWD-1 Valves with Whisper Trim III Cages (see table 19)



WITH STEEL OR CHROME MOLY STEEL VALVE 1



WITH CF8M (316 SST) VALVE 1

B1484-1

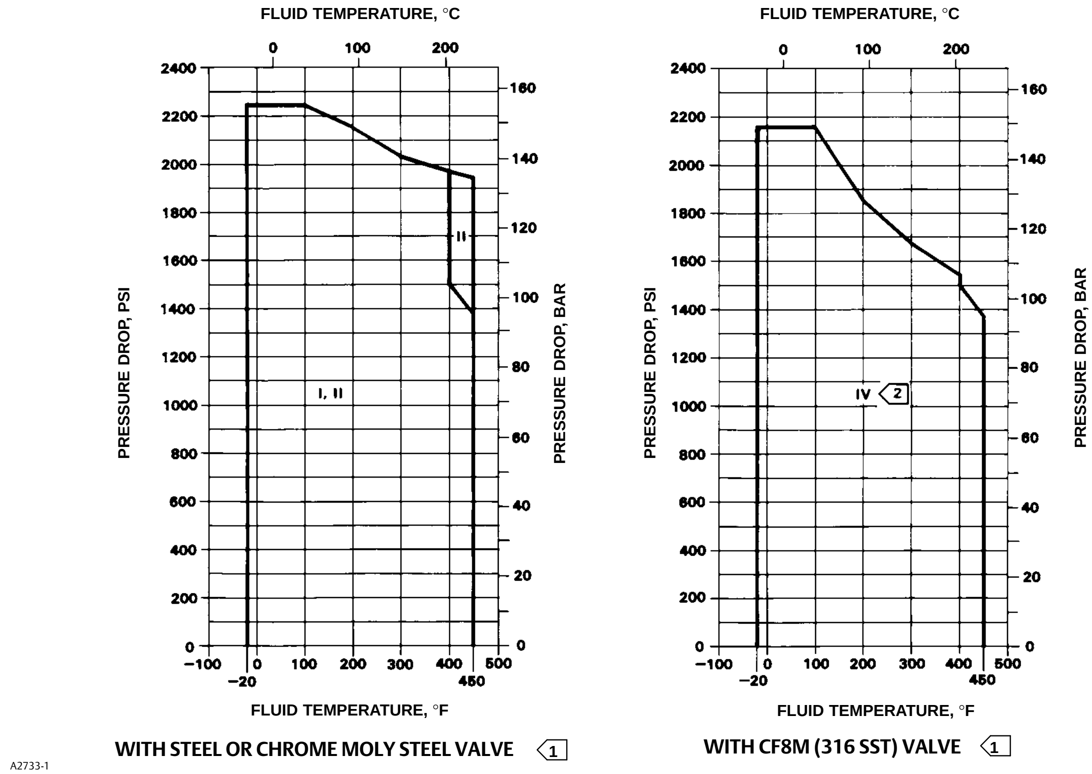
NOTE:
1 Do not exceed the maximum pressure and temperature for the class rating of the body material used, even through the trims shown may have higher capabilities..
2 May be used down to -101°C (-150°F) with level A, B, OR C cage, or with level D cage that has an 18-8 SST baffle.

Table 19. Fisher EWD-1 and EWT-1 Metal Trim Part Combinations for Valves with Whisper Trim III Cages

Trim Designation	Valve Plug	Cage	Seat Ring
I	Heat-treated CA6NM(1)	17-4 SST H1025	Heat-treated CA6NM
II	S31600 (316 SST) with seat and guide hard faced with CoCr-A		N06600 with seat hard faced with CoCr-A
IV	CF8M (316 SST) with seat and guide hard faced with CoCr-A		CF8M with seat hard faced with CoCr-A

1. CA6NM is similar to 410 SST.

Figure 16. Typical Trim Used in Fisher EWT-1 Valves with Whisper Trim III Cages (see table 19)



NOTE:
1 Do not exceed the maximum pressure and temperature for the class rating of the body material used, even through the trims shown may have higher capabilities.
2 May be used down to -101°C (-150°F) with level A, B, OR C cage, or with level D cage that has an 18-8 SST baffle.

Table 20. Materials and Temperature Limitations for Other Parts

PART			MATERIAL	MATERIAL TEMPERATURE CAPABILITY			
				°C Min	°C Max	°F Min	°F Max
Body-to-bonnet bolting (see table 24 for NACE bolting materials and temperature limits)	WCC or WC9 valve body	Studs	Steel SA-193-B7, or steel SA-193-B7M for sour service	-29	427	-20	800
		Nuts	Steel SA-194-2H, or steel SA-194-2M for sour service				
	LCC valve body	Studs	Steel SA-193-B7	-46	371	-50	700
		Nuts	Steel SA-194-2H				
	WC9 valve body	Studs	Steel SA-193-B16	-29	593	-20	1100
		Nuts	Steel SA-194-7				
	CF8M (316 SST) valve body	Studs	Steel SA-193-B7	-48	427	-55	800
		Nuts	Steel SA-194-2H				
		Studs	Steel SA-193-B7M for sour service	-46	427	-50	800
		Nuts	Steel SA-194-2HM for sour service	-46	343	-50	650
		Studs	304 SST SA-320-B8	-254	38	-425	100
		Nuts	304 SST SA-194-8				
		Studs	316 SST SA-193-B8M (strain hardened)	-198[1]	427	-325[1]	800
		Nuts	316 SST SA-194-8M				
		Studs	316 SST SA-193-B8M	-198[1]	649	-325[1]	1200
		Nuts	316 SST SA-194-8M				
Disk (all soft-seat constructions)			PTFE	-73	204	-100	400
EWD piston ring	Std. for NPS 4x2 thru 12x6		Graphite (FMS 17F27)	-46[2]	427	-50[2]	800
				-46[2]	482	-50[2]	900
	Std. for NPS 10x8 and 12x8; optional for NPS 4x2 thru 12x6		Graphite FMS 17F39 — Oxidizing service—all sizes	-46[2]	538	-50[2]	1000
			Graphite FMS 17F39 — Nonoxidizing service — NPS 12x8 CL900 and 12x8 CL600 and smaller	-46[2]	593	-50[2]	1100
Standard NPS 4x2 through 12x6 EWT valve plug seal (except valve with Cavitrol III cage)		Backup ring	Fluorocarbon[3]	-18	204	0	400
			Ethylene-propylene[4]	-40	232	-40	450
			Nitrile[5] — For use with hydrocarbons	-34	71	-30	160
			Nitrile[5] — For use with other fluids	-34	93	-30	200
		Seal ring	Carbon-filled PTFE	-73	232	-100	450
Spring-loaded EWT or EWT-1 valve plug seal [6] (standard for NPS 10x8 and 12x8 valve regardless of cage and all NPS 4x2 through 12x6 valves with Cavitrol III cage; optional in NPS 4x2 through 12x6 valves with other than Cavitrol III cages)		Backup ring	S41600 (416 SST)	-29	427	-20	800
		Retaining ring	S30200 (302 SST)	-254	593	-425	1100
		Seal ring	PTFE with N10276 Spring	-73	232[10]	-100	450[10]
		Anti-extrusion rings	PEEK (PolyEtherEtherKetone)	- - -[11]		- - -[11]	
Valve plug stem and pin			S31600 (316 SST) (S20910, NACE Std)	-198[1]	593	-325[1]	1100
Load ring (NPS 10x8 and 12x8 EWD, EWS, and EWT only)			CB7CU-1 (17-4PH SST)	-102	316	-150	600
			N07718[7]	-254	593	-425	1100
			N05500[7]	-240	260	-400	500
Seat ring, bonnet and cage gaskets			FGM (standard)	-198	593	-325	1100
			PTFE-coated N04400	-73	149	-100	300
Spiral wound gaskets			N06600[7]/laminated graphite FGM (standard)	-198	593	-325	1100
Packing (temperatures shown are material temperature capabilities)			PTFE V-ring	-40	232	-40	450
			PTFE/composition	-73	232	-100	450
			Graphite ribbon/filament	-198	538[9]	-325	1000[9]
			Graphite ribbon for high-temperature oxidizing service	371	649	700	1200
Packing flange, studs and nuts when used with standard bonnet			S31600	-198[1]	593	-325[1]	1100
Packing follower, and packing spring[8] or lantern ring			S31600	-198[1]	593	-325[1]	1100
Packing box ring when used with standard bonnet			S31600				
Extension bonnet bushing		Trims 1 and 4	S41600	-29	427	-20	800
		Other trims	S31600	-198[1]	593	-325[1]	1100

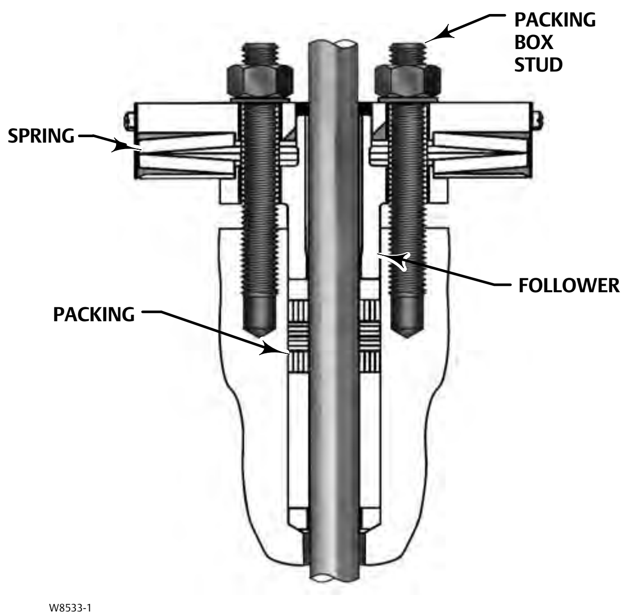
1. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.
2. This minimum is due to thermal expansion differential between piston ring and cage at low temperatures.
3. For high-temperature air, hydrocarbons, and certain other chemicals and solvents, but cannot be used with ammonia, steam, or hot water.
4. Has excellent moisture resistance to hot water and steam and may be used with most fire-resistant hydraulic oils, but cannot be used with petroleum-based fluids and other hydrocarbons.
5. Cannot be used with fire-resistant hydraulic oils.
6. May be used to increase hot water service capability to 232°C (450°F).
7. This material may be used for cyclic temperatures or those above 232°C (450°F).
8. Spring is used only with single PTFE V-ring packing; lantern ring replaces spring in other packings.
9. Except 371°C (700°F) on oxidizing service.
10. If used with PEEK anti-extrusion rings, PTFE/carbon seal ring may be used in temperatures up to 316°C (600°F) for non-oxidizing service or up to 260°C (500°F) for oxidizing service.
11. These materials not limiting factors.

Table 21. Port Diameters, Valve Plug Travel, and Stem and Yoke Boss Diameters[1,9]

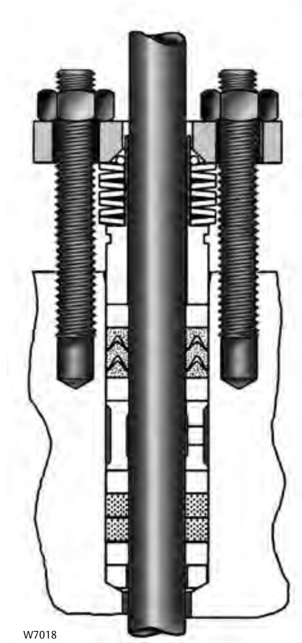
VALVE SIZE, NPS	PORT DIAMETER		MAX VALVE PLUG TRAVEL		STEM AND YOKE BOSS DIAMETERS								CAGE STYLE
					Standard				Optional				
					Stem		Yoke Boss		Stem		Yoke Boss		
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
4 x 2	33.3	1.3125	31.8	1.25	12.7	1/2	71.4	2 13/16	19.1	3/4	90.5	3 9/16	Whisper Trim III only
	58.7	2.3125	34.9	1.375									
	58.7	2.3125	28.6	1.125									Quick-opening, linear, Eq.%, Whisper Trim I, WhisperTrim III, or Cavitrol[1]
6 x 4, 8 x 4	111	4.375	50.8	2	12.7	1/2	71.4	2 13/16	19.1	3/4	90.5	3 9/16	
									25.4 or 31.8	1 or 1 1/4	127	5	
	87.3	3.438	50.8	2	12.7	1/2	71.4	2 13/16	19.1	3/4	90.5	3 9/16	Whisper Trim III only
			76.2	3	12.7	1/2	71.4	2 13/16	25.4 or 31.8	1 or 1 1/4	127	5	
8 x 6, 10 x 6[8], or 12 x 6	178	7	50.8	2	19.1	3/4	90.5	3 9/16	25.4 or 31.8	1 or 1 1/4	127	5	Quick-opening, linear, Eq.%, Whisper Trim I, or Cavitrol[1]
8 x 6, 10 x 6[8], or 12 x 6	178	7	76.2	3									Cavitrol only[1]
			102[2]	4[2]	19.1	3/4	90.5	3 9/16	- - -				Whisper Trim I
8 x 6, 10 x 6[8]	178	7	76.2	3	19.1	3/4	90.5	3 9/16	25.4 or 31.8	1 or 1 1/4	127	5	Whisper Trim III only
	178	7	102	4									
	137	5.375	127[3]	5[3]									
12 x 6	137	5.375	165[3]	6.5[3]									
10 x 8	203	8	76.2	3	19.1	3/4	90.5	3 9/16	25.4 or 31.8	1 or 1 1/4	127	5	Quick-opening, linear, or Eq. %
			152	6									Whisper Trim III only
	178	7	152	6									Whisper Trim III only
12 x 8 CL300[4] or CL600[4]	203	8	76.2	3	19.1	3/4	90.5	3 9/16	25.4 or 31.8	1 or 1 1/4	127	5	Quick-opening, linear, or Eq. %
	203	8	152	6									Whisper Trim III only
	178	7											
12 x 8 CL900	203	8	76.2	3	25.4	1	127	5	19.1	3/4	90.5	3 9/16	Quick-opening, linear, or Eq. %
									25.4	1	127H[5]	5H[5]	
					31.8	1 1/4			31.8	1 1/4			
	197[6]	7.75[6]	152	6	31.8	1 1/4	127	5	- - -				Whisper Trim III only
	171[7]	6.75[7]											

1. Except for Cavitrol III cages, which are covered in separate documentation
2. Bonnet spacer required. This travel available only in CL300 or 600 EWD or EWT
3. Bonnet spacer required for EWD or EWT valve, but not EWS valve
4. Bonnet spacer required for EWD, EWS, and EWT valve.
5. H indicates heavy actuator-to-bonnet bolting is required
6. Port diameter for level A, B, or C cage.
7. Port diameter for level D cage
8. NPS 10x6 has a valve outlet area identical to the NPS 8x6.
9. Refer Fisher Bulletin 80.1:010 Whisper Trim III (D100191X012) for more information on Whisper Trim III.

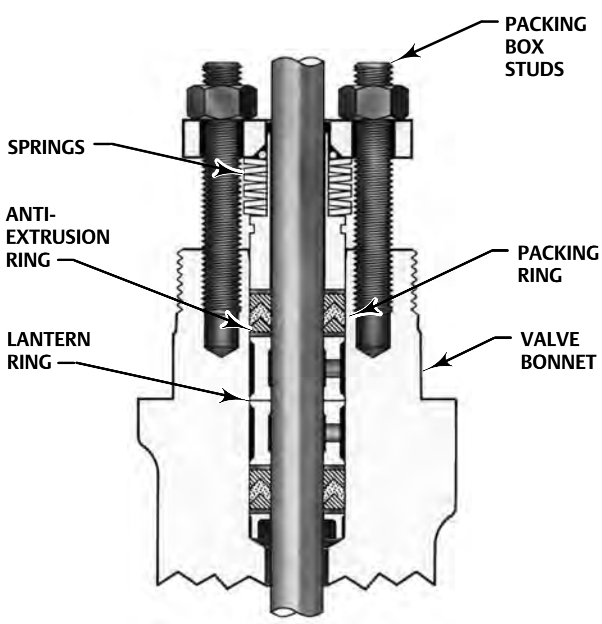
Figure 17. Typical ENVIRO-SEAL and HIGH-SEAL Packing Systems



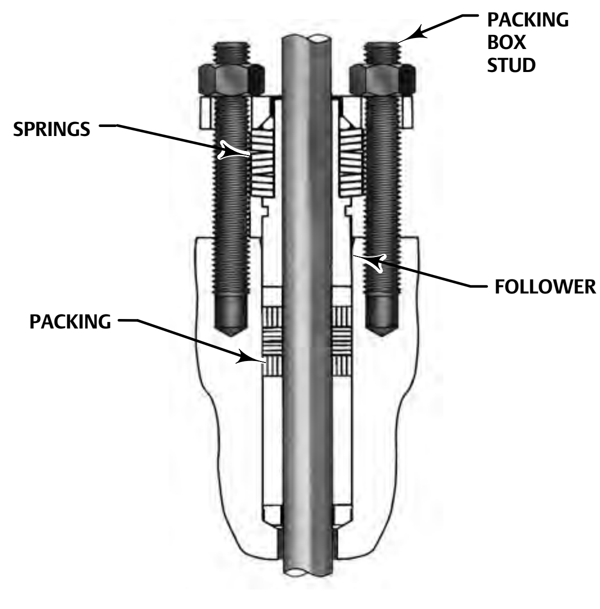
TYPICAL HIGH-SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH DUPLEX PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH PTFE PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING

Table 22. Approximate Weights

END CONNECTION		VALVE SIZE, NPS															
		4 x 2		6 x 4		8 x 4		8 x 6		10 x 6[1]		12 x 6		10 x 8		12 x 8	
		kg	Lb	kg	Lb	kg	Lb	kg	Lb	kg	Lb	kg	Lb	kg	Lb	kg	Lb
CL300		84	185	150	330	234	515	284	625	348	765	500	1102	567	1250	653	1440
CL600	Flanged	100	220	195	430	272	600	308	680	431	950	721	1590	744	1640	857	1890
	Buttwelding	61	135	122	270	177	390	272	600	380	839	526	1160	512	1130	658	1450
CL900	Flanged	- - -						612	1350	- - -						1361	3000
	Buttwelding	- - -						454	1000	- - -						1293	2850

1. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

Figure 18. ENVIRO-SEAL Bellows Seal Bonnet

Table 23. Bonnet Selection Guidelines

BONNET STYLE (CL300, 600)[1]	PACKING	IN-BODY PROCESS TEMPERATURE LIMITS[2]	
		°C	°F
Plain Bonnet ■ Standard for NPS 2, 4, and 6 nominal trim sizes ■ Standard for NPS 10x8 and 12x8 valves (in cast iron, WCC). Not available in S31600	PTFE V-ring	-18 to 232	0 to 450
	PTFE/composition	-18 to 232	0 to 450
	Graphite ribbon/filament	-18 to maximum shown in table 20	0 to maximum shown in table 20
Style 1 Cast Extension Bonnet ■ Optional for NPS 2, 4, and 6 nominal trim sizes ■ Standard for NPS 10x8 and 12x8 valves (in S31600). Optional in WCC; not available in cast iron	PTFE V-ring	-46 to 427	-50 to 800
	PTFE/composition		
	Graphite ribbon/filament	to maximum shown in table 20	to maximum shown in table 20
Style 2 Cast Extension Bonnet ■ Optional for NPS 2, 4, and 6 nominal trim sizes ■ Optional for NPS 10x8 and 12x8 valves (in WCC). Not available in cast iron or S31600	PTFE V-ring	-101 to 427	-150 to 800
	PTFE/Composition		
	Graphite ribbon/filament	to maximum shown in table 20	to maximum shown in table 20
ENVIRO-SEAL Bellows Seal Bonnet ■ Optional for NPS 2, 4, 6, and 8 nominal trim sizes. Maximum travel is 2 inches	PTFE	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets, (D101641X012) for pressure/temperature ratings.	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets, (D101641X012) for pressure/temperature ratings.
	Graphite ULF		

1. For CL900 valve bodies, only the plain bonnet is available. Consult your Emerson sales office for assistance if application conditions indicate the need for an extension bonnet for a CL900 valve body.
2. These in-body process temperatures assume an outside, ambient temperature of 21°C (70°F) and no insulation on the bonnet. When using any packing at low process temperatures, a cast extension bonnet may have to be used to prevent packing damage which could result from the formation of valve stem frost. Material selection for trim and other components will also be limiting factors.

Table 24. Bolting Materials and Temperature Limits for Bolting Compliance with NACE MR0175-2002, NACE MR0175/ISO 15156, and NACE MR0103. Environmental restrictions may apply.

VALVE BODY MATERIAL		BOLTING MATERIAL	TEMPERATURE CAPABILITIES			
			°C		°F	
			Min	Max	Min	Max
Non-exposed bolting (Standard)						
WCC	Studs	Steel SA-193-B7	-7	232	20	450
	Nuts	Steel SA-194-2H				
	Studs	Steel SA-193-B7	232	427	450	800
	Nuts	Steel SA-194-2H lubricated				
CF8M (316 SST)	Studs	Steel SA-193-B7 or B8M strain hardened	-48	232	-55	450
	Nuts	Steel SA-194-2H or 8M				
	Studs	Steel SA-193-B8M strain hardened or B7	232	427	450	800
	Nuts	Steel SA-194-8M lubricated or 2H lubricated				
Exposed bolting (Optional) Requires Derating of Valve[2] When These Body-to-Bonnet Bolting Materials are Used						
WCC and CF8M	Studs	Steel SA-193-B7M	-46[1]	232	-50[1]	450
	Nuts	Steel SA-194-2HM				
	Studs	Steel SA-193-B7M	232	427	450	800
	Nuts	Steel SA-194-2HM lubricated				

1. Minimum temperature is -29°C (-20°F) with WCC valve body material.
2. Derating is not required for CL300 valves. Derating may be required for valves rated at CL600 or 900. Emerson sales office for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used.

Table 25. Dimensions

VALVE SIZE, NPS	A								G (MAX)	
	Class, End Connection Style[1]									
	CL150	CL300		CL600		CL900			CL150, 300, and 600	CL900
	RF	RF	RTJ	RF, BW	RTJ	RF	RTJ	BW		
	mm									
4 x 2	352	368[2]	384	394[2]	397	---	---	---	108	---
6 x 4	451	473[2]	489	508[2]	511	---	---	---	135	---
8 x 4	543	568[2]	584	610[2]	613	---	---	---	176	---
8 x 6	543	568[2]	584	610[2]	613	914[3]	917	972	183	198
10 x 6[4]	603	603	619	625	629	---	---	---	183	---
12 x 6	737	775[2]	791	819[2]	822	---	---	---	254	---
10 x 8	673	708[2]	724	752[2]	756	---	---	---	275	---
12 x 8	737	775[2]	791	819[2]	822	902	905	953	356	356
	Inch									
4 x 2	13.88	14.50[2]	15.12	15.50[2]	15.62	---	---	---	4.25	---
6 x 4	17.75	18.62[2]	19.25	20.00[2]	20.12	---	---	---	5.31	---
8 x 4	21.38	22.38[2]	23.00	24.00[2]	24.12	---	---	---	6.94	---
8 x 6	21.38	22.38[2]	23.00	24.00[2]	24.12	36.00[3]	36.12	38.25	7.19	7.81
10 x 6[4]	23.75	23.75	24.38	24.62	24.75	---	---	---	7.19	---
12 x 6	29.00	30.50[2]	31.12	32.25[2]	32.38	---	---	---	10.00	---
10 x 8	26.50	27.88[2]	28.50	29.62[2]	29.75	---	---	---	10.81	---
12 x 8	29.00	30.50[2]	31.12	32.25[2]	32.38	35.50	35.62	37.50	14.00	14.00

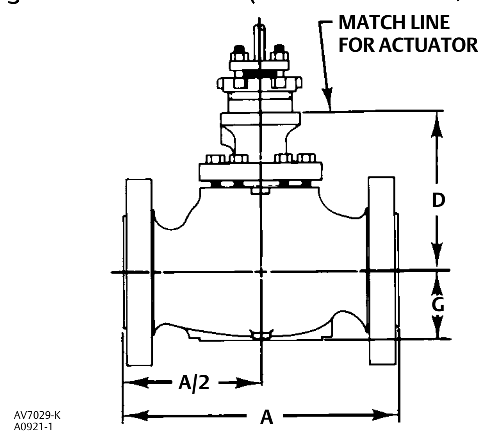
1. End connection style abbreviations: RF - Raised Face, RTJ - Ring Type Joint, BW - Buttwelding.
2. Per ISA 75.08.01.
3. Per ISA 75.08.06.
4. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

Table 26. Dimensions

VALVE SIZE, DN	A					
	PN, End Connection Style[1]					
	PN 16, RF	PN 25, RF	PN 40, RF	PN 63, RF	PN 100, RF	PN 160, RF
	mm					
100 x 50	---	---	---	430	430	---
150 x 100	480	480	480	550	550	---
200 x 100	600	600	600	650	650	---
200 x 150	---	600	600	650	650	---
300 x 150	850	850	850	900	900	---
250 x 200	---	---	---	---	---	---
300 x 200	---	850	850	900	900	900

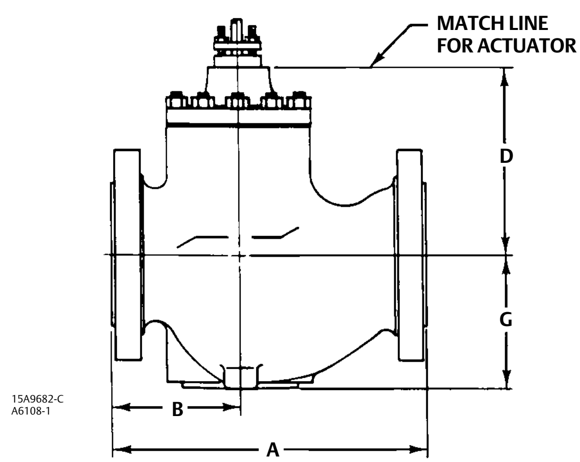
1. End connection style abbreviations: RF - Raised Face.

Figure 19. Dimensions (also see tables 25, 26, 27, and 28)



TYPICAL OF NPS 4X2 THROUGH 10X8
(INCLUDING NPS 12X6)

E0979



TYPICAL OF NPS 12X8

Table 27. Dimensions (Dimension B for 12 x 8 Valve Sizes)

VALVE SIZE, NPS	Class, End Connection Style[1]							
	CL150	CL300		CL600		CL900		
	RF	RF	RTJ	RF, BW	RTJ	RF	RTJ	BW
	mm							
12 x 8	292	311	319	333	335	397	398	422
	Inch							
12 x 8	11.50	12.25	12.56	13.12	13.18	15.63	15.69	16.63

1. End connection style abbreviations: RF - Raised Face, RTJ - Ring Type Joint, BW - Buttwelding.

Table 28. Dimensions (Dimension D for All Valve Sizes)

CAGE STYLE	BONNET	VALVE SIZE, NPS	STEM DIA									
			12.7 mm (1/2 Inch)		19.1 mm (3/4 Inch)				25.4 mm (1 Inch) or 31.8 mm (1-1/4 Inch)			
					CL900 Only		All Except CL900		CL300 and 600		CL900	
			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
All except Cavitrol III or Whisper Trim III	Plain	4 x 2	216	8.50	---	---	213	8.38	---	---	---	---
		6 x 4	257	10.12	---	---	254	10.00	300	11.81	---	---
		8 x 4	259	10.19	---	---	256	10.06	302	11.88	---	---
		8 x6, 10 x 6(3)	287	11.31	409	16.12	287	11.31	332	13.06	464	18.25
		12 x 6	356	14.00	---	---	356	14.00	400	15.75	---	---
		10 x 8	---	---	---	---	375	14.75	---	---	---	---
		12 x 8	---	---	584	23.00	411	16.19	---	---	608	23.94
	Style 1 Extension	4 x 2	318	12.50	---	---	322	12.69	---	---	---	---
		6 x 4	359	14.12	---	---	363	14.31	432	17.00	---	---
		8 x 4	360	14.19	---	---	365	14.38	433	17.06	---	---
		8 x6, 10 x 6(3)	---	---	---	---	394	15.50	464	18.25	---	---
		12 x 6	---	---	---	---	462	18.19	532	20.94	---	---
		10 x 8	---	---	---	---	421	16.56	449	17.69	---	---
		12 x 8	---	---	---	---	457	18.00	486	19.12	---	---
	Style 2 Extension	4 x 2	516	20.31	---	---	513	20.19	---	---	---	---
		6 x 4	562	22.12	---	---	554	21.81	595	23.44	---	---
		8 x 4	564	22.19	---	---	556	21.88	597	23.50	---	---
		8 x6, 10 x 6(3)	---	---	---	---	579	22.81	---	---	---	---
		10 x 8	---	---	---	---	621	24.44	---	---	---	---
		12 x 6	---	---	---	---	648	25.50	---	---	---	---
		12 x 8	---	---	---	---	---	---	---	---	---	---
	ENVIRO-SEAL bellows seal bonnet	4 x 2	435	17.12	---	---	---	---	---	---	---	---
		6 x 4	576	22.69	---	---	576	22.69	---	---	---	---
		8 x 4	578	22.75	---	---	578	22.75	---	---	---	---
		10 x 8	---	---	---	---	703	27.69	---	---	---	---
		8 x6, 10 x 6(3)	---	---	---	---	608	23.94	---	---	---	---
		12 x 6	---	---	---	---	676	26.62	---	---	---	---
		12 x 8	---	---	---	---	---	---	---	---	---	---
Cavitrol III	Plain	4 x 2	252	9.94	---	---	249	9.81	---	---	---	---
		6 x 4	346	13.62	---	---	343	13.50	389	15.31	---	---
		8 x 4	348	13.69	---	---	344	13.56	---	---	---	---
		8 x6, 10 x 6(3)	403	15.88	---	---	403	15.88	---	---	---	---
		10 x 8(1)	---	---	---	---	375	14.75	425	16.75	---	---
		10 x 8(2)	---	---	---	---	511	20.12	560	22.06	---	---
		12 x 6	480	18.88	---	---	480	18.88	---	---	---	---
		12 x 8	---	---	---	---	---	---	---	---	---	---
Whisper Trim III	Plain	4 x 2	4 x 2	216	8.50	---	---	213	8.38	---	---	---
		6 x 4	6 x 4	257	10.12	---	---	254	10.00	300	11.81	---
		8 x 4	8 x 4	259	10.19	---	---	256	10.06	302	11.88	---
		8 x6, 10 x 6(3)	287	11.31	409	16.12	399	15.69	443	17.44	464	18.25
		12 x 6	356	14.00	---	---	503	19.81	548	21.56	---	---
		10 x8	---	---	---	---	504	19.83	---	---	---	---
		12 x 8	---	---	---	---	---	---	---	---	---	---

1. One-stage trim.
2. Two-stage trim.
3. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

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Fisher™ EWN Series Control Valve

Fisher EWN Series valves are available only with Whisper Trim ™ III cages (figures 1 and 2) and are used on compressible fluid applications (including sour service) requiring maximum noise attenuation capability coupled with high capacity. As members of the versatile easy-e ™ family of industrial control valves, these valves share the following characteristics: single ports, multiple trim material choices, and the interchangeability of trim parts that permits reconfiguring the valve body to a different design variation.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

Fisher EWNT-2, NPS 12x8 Valve with Typical Actuator

Features

- Noise Attenuation—A Whisper Trim III cage used in an EWN Series valve body can reduce noise produced by high flow rates and large pressure drops up to 30 decibels below the normal valve noise level.
- Piping Economy—Expanded end connections of EWN Series valve bodies reduce the need for line swages while accommodating oversized piping arrangements used to limit fluid flow velocities.
- Temperature Compensation—The hanging cage design (figure 1 or 2) reduces gasketing problems caused by thermal expansion and contraction of long parts such as the cage assembly.
- Full Rated Inlet Pressure Capability—Design of standard body-to-bonnet bolting allows inlet pressures equal to full rating: no derating required.

Specifications

Valve Body Sizes

See table 1

End Connection Styles

Flanged Ends: Styles per ASME B16.5 are CL300, 600, or 900 ■ raised-face or ■ ring-type joint
Buttwelding Ends: Standard styles per ASME B16.25 are Schedule ■ 40 or ■ 80 for all CL300 and 600 valves or Schedule ■ 80, ■ 100, or ■ 120 for all CL900 valves; optional styles are available

Maximum Inlet Pressures and Temperatures(1)

Consistent with applicable ■ CL300, ■ 600, or ■ 900 pressure/temperature ratings per ASME B16.34, unless limited by the individual pressure/temperature capabilities in figure 3 or 4 or temperature capabilities in table 4

Maximum Pressure Drop(1)

0.999 $\Delta P/P_1$ maximum for levels A1 through D3.

Shutoff Classifications

See table 2

Construction Materials

Body and Bonnet: ■ WCC steel, ■ WC6 or ■ WC9 chrome moly steel, or ■ CF8M
Trim Parts: See table 3.
Other Parts: See table 4

Material Temperature Capabilities(1)

Valve Body-Trim Combinations: See figure 3 or 4.
Other Parts: See table 4

Whisper Trim Flow Characteristic

NPS 8x6 Valve:
Cage Level A, B, or C: Linear
Cage Level D: Equal percentage for first 38.1 mm (1.5 inches) of travel, then linear
NPS 12 x 8 Valve: Linear

Whisper Trim Flow Direction

Up through the valve body seat ring and out through the cage (figure 2)

Flow Coefficients and Noise Level Prediction

See Fisher Catalog 12

Port Diameters and Valve Plug Travels

See table 1

Yoke Boss and Stem Diameters

See table 5

Typical Bonnet Styles

Plain: Available with all valves
Style 1 Extension: Available with CL300 or 600 valves. Standard for NPS 12x8 CL900 valves

Approximate Weights

See figures 5 and 6

Options

■ Lubricator ■ lubricator/isolating valve ■ drilled and tapped connection in extension bonnet for leakoff service ■ valve body drain plug ■ style 3 fabricated extension bonnet made on order to a specific length for cryogenic service ■ packings suitable for nuclear service ■ valve body and bonnet in castable alloys other than those given in the construction materials specification, and ■ forged bonnet for 127 mm (5-inch) yoke boss on CL900 NPS 8x6 valve body

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.
2. Limitation based on excessive noise if max $\Delta P/P_1$ ratio for a given cage level is exceeded.

Available Configurations

All valve body designs covered in this bulletin have single ports, balanced push-down-to-close valve plugs, a choice of eight different Whisper Trim III cage levels (A1, A3, B1, B3, C1, C3, D1, or D3), and metal-to-metal seating. In this series, the EW designates expanded end connections, and the N designates an extended upper valve body cavity that permits full utilization of a long-travel cage without requiring a bonnet spacer. This valve body is combined with different plug styles and either a seat ring threaded into the valve body (-1 suffix) or a seat ring threaded into the cage (-2 suffix) to result in the following configurations:

EWND-1: EWN Series valve body with graphite piston ring(s) on the valve plug (see table 2) and with the seat ring threaded into the valve body (figure 1), for all general applications over a wide range of pressure drops and temperatures.

EWNT-1: EWN Series valve body with spring-loaded seal ring and seat ring threaded into the valve body, for more stringent shutoff requirements up to 232°C (450°F).

EWNT-2: EWN Series valve body with spring-loaded seal rings on both the seat ring and valve plug and with the seat ring threaded into the cage (figure 2), for more stringent shutoff requirements up to 232°C (450°F).

Material Selection Guidelines

1. Select the body/bonnet material from the specifications table and the shutoff classification from table 2, keeping in mind that the valve service conditions cannot exceed the ASME pressure/temperature limitations for the selected valve body.

2. Choose a trim combination for the service conditions according to figure 3 or 4, while making sure from table 3 that this combination provides the desired trim materials.

3. Finally, check in table 4 that packing and other valve parts also are available in materials that meet the desired service conditions.

Contents

Table 1. Valve Body Sizes, Valve Plug Travels, Port Diameters, and Unbalance Area

VALVE		PRESSURE RATING	VALVE PLUG TRAVEL		PORT DIAMETER		UNBALANCE AREA
Design	Size, NPS(1)		mm	Inch	mm	Inch	Inch^2
EWND-1/ EWNT-1	8 x 6	CL900	127(2)	5(2)	136	5.375	0.63
	12 x 8	CL300, 600, or 900	203	8	197(3)	7.75(3)	4.33
					172(4)	6.75(4)	3.79
EWNT-2	12 x 8	CL300, 600, or 900	203	8	197(3)	7.75(3)	4.33
					172(4)	6.75(4)	3.79

1. End connection x trim size
2. Restricted to 114 mm (4.5 inch) with 3 piston rings for optional Class IV shutoff.
3. Level A, B, or C cages.
4. Level D cages.

Figure 1. Fisher EWND-1, NPS 8x6 Trim Detail With Seat Ring Threaded Into the Valve Body (Also Typical of NPS 12 x 8)

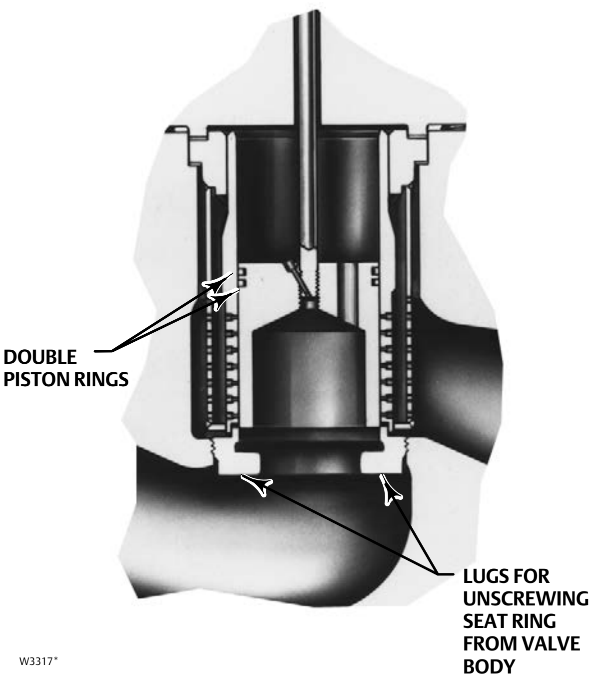


Figure 2. Fisher EWNT-2, NPS 12x8 Valve with Seat Ring Threaded Into the Cage

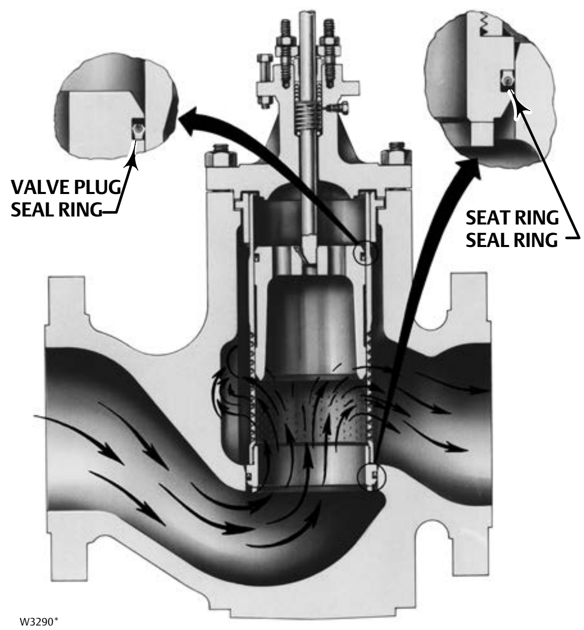


Table 2. Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

Valve Design	Shutoff Class	Max Leakage(1)	Fisher Test Fluid
EWND-1	III (standard for NPS 8x6 valve with 2 piston rings and NPS 12x8 valve)	0.1% of valve capacity at full travel	Air at service ΔP or 3.4 bar (50 psi) drop, whichever is lower, and between 10 and 52°C (50 and 125°F)
	IV (optional for NPS 8x6 valve with 3 piston rings and restricted travel(2), and for NPS 12x8 valve)	0.01% of valve capacity at full travel	
EWNT-1/EWNT-2	IV	0.01% of valve capacity at full travel	

1. Based on capacity obtained with level A cage.
2. 4.5 inch travel.

Table 3. Metal Trim Part Combinations(1)

Trim Designation	Valve Plug	Cage	Baffle (for Level D Cages Only)	Seat Ring
I	CA6NM(2)	S17400 with H1025 heat-treat condition	Steel	CA6NM
II and IV	S31600 with seat and guide hard-faced with CoCr-A (Alloy 6)	S17400 with H1025 heat-treat condition	Steel(3)	S31600 with seat hard-faced with CoCr-A
III (available only in NPS 8x6 valve)	S41600	S17400 with H1025 heat-treat condition	Steel	S31600 with seat hard-faced with CoCr-A
V(4) and VI(4)	S31600 with seat and guide hard-faced with CoCr-A	S17400 with H1150 heat-treat condition	Steel	S31600 with seat hard-faced with CoCr-A

1. Does not include seat ring seal ring or valve plug piston ring, seal ring, retaining ring, or backup ring; these parts covered in table 5.
2. CA6NM is similar to S41000.
3. 18-8 SST is optional baffle material for this trim.
4. Materials in this trim are listed in NACE MR0175-2002 as being acceptable for direct exposure to sour service when used under conditions stated in that standard.

Table 4. Materials and Temperature Limits for Other Parts

PART				MATERIAL		MATERIAL TEMPERATURE CAPABILITIES	
						Minimum	Maximum
Body-to-bonnet bolting	WCC, WC6, or WC9 body and bonnet	Sour service	Studs	SA-193-B7M steel		-29°C (-20°F)	427°C (800°F)
			Nuts	SA-194-2M steel			
		Other appli-cations	Studs	SA-193-B7 steel			
			Nuts	SA-194-2H steel			
	WC9 body and bonnet		Studs	SA-193-B16 steel		-29°C (-20°F)	This material not a limiting factor
			Nuts	SA-194-7 steel			
	CF8M body and bonnet	Sour service	Studs	SA-193-B7M steel for CL900 valves		-46°C (-50°F)	232°C (450°F)
			Nuts	SA-194-2M steel for CL900 valves			
			Studs	SA-193-B8M SST for CL300 or 600 valves		-198°C (-325°F)[1]	538°C (1000°F)
			Nuts	SA-194-8M SST for CL300 or 600 valves			
		Other appli-cations	Studs	SA-193-B7 steel		-46°C (-50°F)	232°C (450°F)
			Nuts	SA-194-2H steel			
			Studs	SA-320-B8 SST for NPS 12x8 valves		-254°C (-425°F)	38°C (100°F)
			Nuts	SA-194-8 SST for NPS 12x8 valves			
			Studs	SA-193-B8M SST		-198°C (-325°F)[1]	538°C (1000°F)
			Nuts	SA-194-8M SST			
			Studs	Strain hardened SA-193-B8M SST for NPS 8x6 or NPS 12x8 CL300 or 600 valves		-198°C (-325°F)	427°C (800°F)[2]
			Nuts	SA-194-8M SST for NPS 8x6 or NPS 12x8 CL300 or 600 valves			
			Studs	Chrome-coated SA-193-B8M SST for CL900 valves		-198°C (-325°F)	These materials not limiting factors
			Nuts	SA-194-8M SST for CL900 valves			
Design EWND-1 piston ring				Graphite	Air or oxidizing service	-254°C (-425°F)	538°C (1000°F)
					Steam or nonoxidizing service	-254°C (-425°F)	593°C (1100°F)
EWNT-1/EWNT-2 spring-loaded valve plug seal construction	Backup ring (used only with NPS 8x6 valve body)			S41600		-29°C (-20°F)	These materials not limiting factors
	Retaining ring (used only with NPS 8x6 valve body)			S30200		-254°C (-425°F)	
	Seal ring			PTFE with N10276 spring		-73°C (-100°F)	232 C (450°F)
Valve plug stem and groove pin				S31600		-198°C (-325°F)[1]	427°C (800°F)[2]
Bonnet gaskets for NPS 12x8 CL600 valve				Graphite		These materials not limiting factors	
Bonnet gasket and cage gasket for NPS 8x6 and 12x8 CL900 valve	Sour service			Tin-plated N04400		-18°C (0°F)	149°C (300°F)
	Other applications			Silver-plated N04400		-254°C (-425°F)	593°C (1100°F)
Packing (temperatures shown are material temperature capabilities)				PTFE V-ring		See note 3	See note 3
				Optional PTFE/composition		-73°C (-100°F)	232°C (450°F)
				Optional graphite ribbon/filament	Oxidizing service	-198°C (-325°F)	371°C (700°F)
					Nonoxidizing service	-198°C (-325°F)	538°C (1000°F)
				Optional graphite ribbon for high-temperature oxidizing service		271°C (700°F)	This material not a limiting factor

-continued-

Table 4. Materials and Temperature Limits for Other Parts (continued)

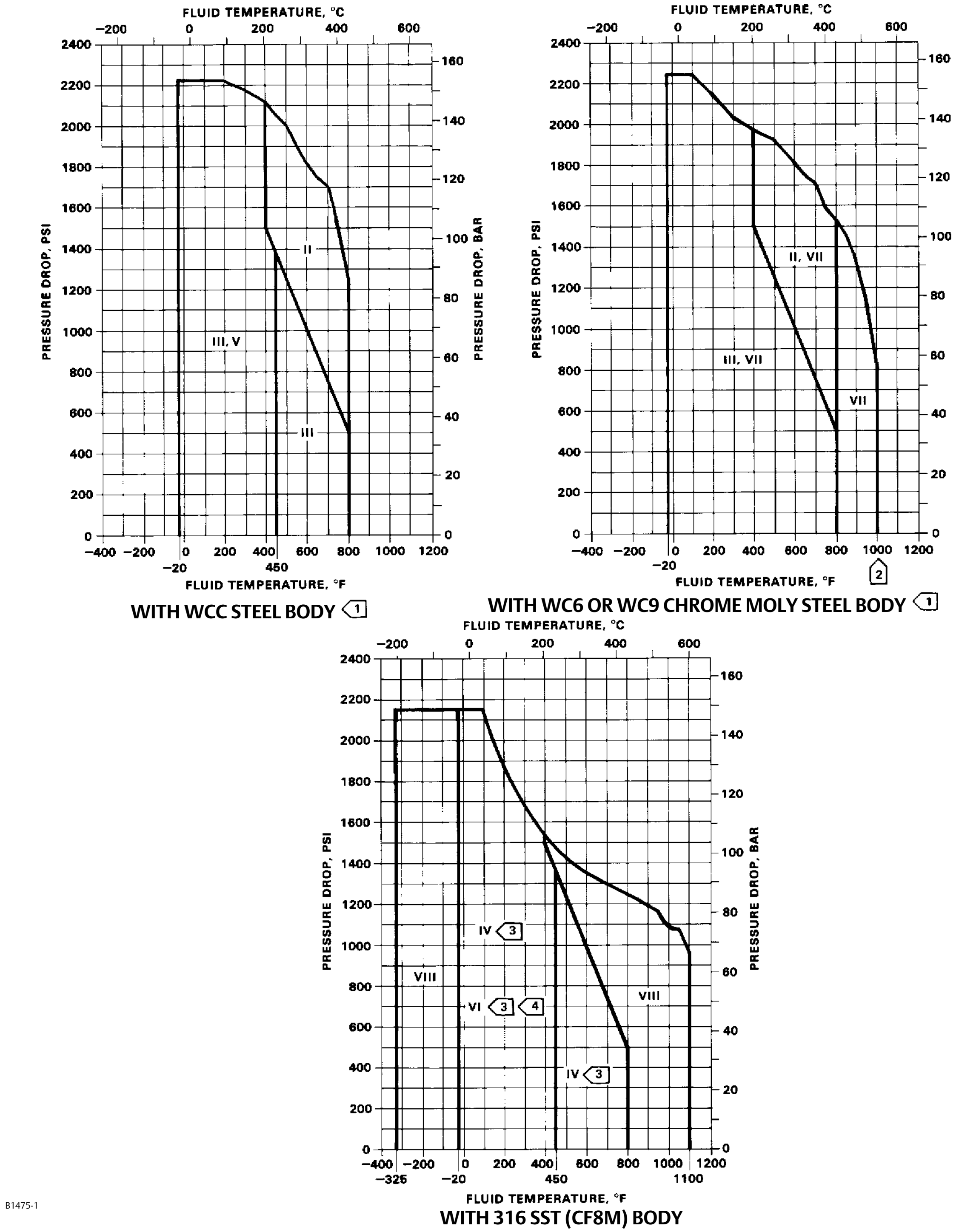
PART		MATERIAL	MATERIAL TEMPERATURE CAPABILITIES	
			Minimum	Maximum
Packing flange, studs and nuts		Steel	-29°C (-20°F)	427°C (800°F)
		Optional S31600	-198°C (-325°F)	593°C (1100°F)
Packing follower, and packing spring or lantern ring		S31600	-198°C (-325°F)	593°C (1100°F)
Packing box ring	19.1 mm (3/4 in.) stem	S31600	-198°C (-325°F)	593°C (1100°F)
	25.4 mm (1 in.) and 31.8 mm (1-1/4 in.) stems	S17400	-102°C (-150°F)	427°C (800°F)

1. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.
2. May be used up to 593°C (1100°F) if manufacturing process controls carbon content to 0.04% minimum or 0.08% maximum.
3. Consult your Emerson sales office or Local Business Partner.

Table 5. Additional Specifications

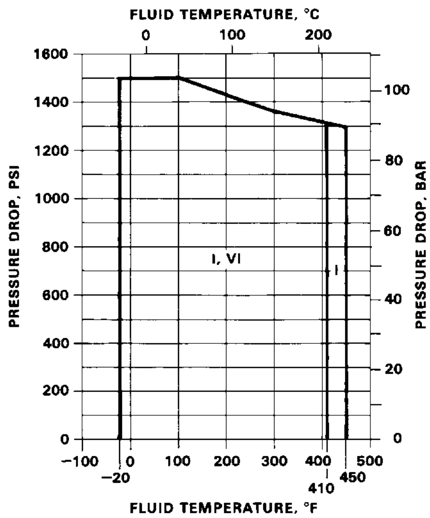
VALVE SIZE, NPS	PRESSURE RATING	YOKE BOSS AND STEM DIA							
		Standard				Optional			
		Yoke Boss		Stem		Yoke Boss		Stem	
		mm	In.	mm	In.	mm	In.	mm	In.
8 x 6	CL900	127	5	25.4	1	90	3-9/16	19.1	3/4
				31.8	1-1/4				
12 x 8	CL900	127	5	31.8	1-1/4	127	5	31.8	1-1/4
	CL300 or 600	90	3-9/16	19.1	3/4	127	5	25.4	1

Figure 3. Typical Trim Use in Fisher EWND-1 and EWNT-1 Valve Bodies

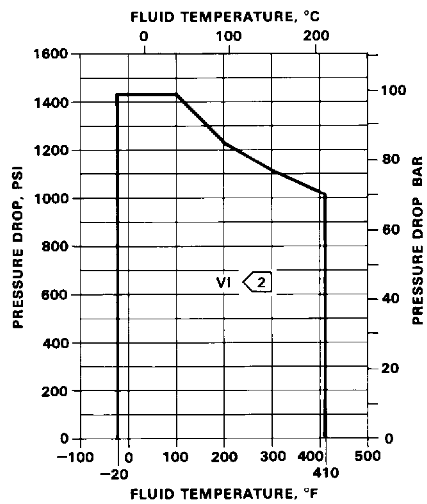


1. Do not exceed the maximum pressure and temperature for the class rating of the body material used, even though the trims shown have higher capabilities.
2. Maximum temperature for a WCC body. Maximum temperature for a WC9 body is 566°C (1060°F) with a CL900 pressure rating at this temperature of 41bar (595 psi).
3. May be used down to -101°C (-150°F) with Level A, B, or C cage, or with Level D cage that has an 18-8 SST baffle.
4. Limited to 210°C (410°F) in CL300 or CL600 body.

Figure 4. Typical Trim Use in Fisher EWNT-2 Valve Bodies



WITH STEEL OR CHROME MOLY STEEL BODY 1



WITH 316 SST (CF8M) BODY 1

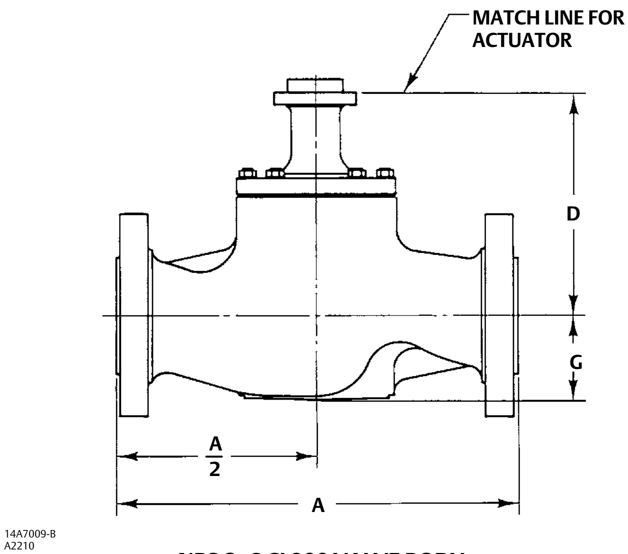
A2718

1 Do not exceed the maximum pressure and temperature for the class rating of the body material used, even though the trims shown have higher capabilities.
2 May be used down to -101°C (-150°F) with Level A, B, or C cage, or with Level D cage that has an 18-8 SST baffle.

Table 6. NPS 8x6 Dimensions and Approximate Weights

END CONN.	APPROXIMATE WEIGHT		DIMENSION							
			A		D (Plain Bonnet)				G (Max)	
					19.1 mm (3/4 In.) Stem		25.4 or 31.8 mm (1 or 1-1/4 In.) Stem			
	Kg	Lb	mm	Inch	mm	Inch	mm	Inch	mm	Inch
RF	839	1850	914	36.00	503	19.81	530	20.88	198	7.81
RTJ	839	1850	917	36.12						
BW	703	1550	972	38.25						

Figure 5. Dimensions and Approximate Weights (also see table 6)



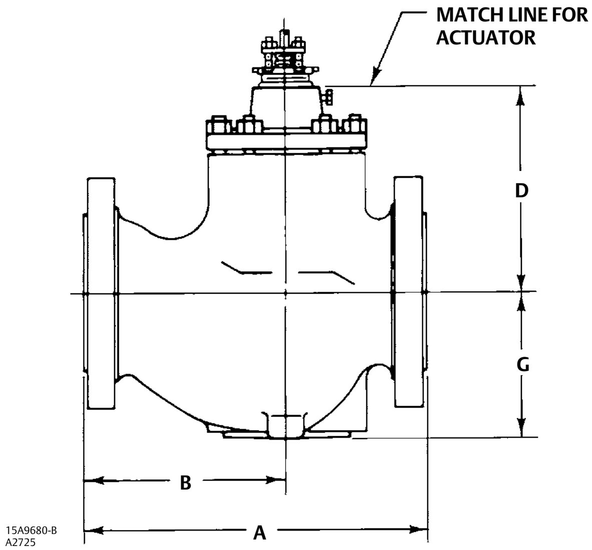
NPS 8x6 CL900 VALVE BODY

Table 7. NPS 12x8 Dimensions and Approximate Weights

VALVE BODY AND END CONNECTION		APPROXIMATE WEIGHT		DIMENSION(1)											
				A		B		D						G (Max)	
								25.4 mm (1 Inch) Stem with Style 1 Ext. Bonnet		31.8 mm (1-1/4 Inch) Stem					
										Plain Bonnet		Style 1 Ext. Bonnet			
		Kg	Lb	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
CL300	RF	721	1590	775	30.50	464	18.25	633	24.94	---	---	613	24.12	356	14.00
	RTJ	721	1590	791	31.12	471	18.56								
CL600	RF	930	2050	819	32.25	486	19.12								
	BW	726	1600												
	RTJ	930	2050	822	32.38	487	19.19								
CL900	RF	1497	3300	902	35.50	505	19.88	---	---	734(2)	28.88(2)	---	---		
	RTJ	1497	3300	905	35.62	506	19.94								
	BW	1293	2850	953	37.50	530	20.88								

1. Per ASME B16.10 and FCI 65-2 for CL300 and 600 only.
2. Add 25.4 mm (1 inch) for 585C Series and Size 100 657 or 667 Series actuators.

Figure 6. Dimensions and Approximate Weights (also see table 7)



NPS 12X8 VALVE BODY

Installation

Unless limited by seismic criteria, the control valve can be installed in any position (as long as sufficient support is provided if a fabricated extension bonnet is used). However, the normal method is with the actuator vertical above the valve body; non vertical positions may cause uneven trim wear and thus decrease trim life. Flow through the valve must be in the direction indicated by the flow direction arrow on the valve body. Consideration should be given to installing an upstream strainer since these valves use multihole Whisper Trim III cages.

Dimensions are shown in figures 5 and 6.

Ordering Information

When ordering specify:

Application information

1. Type application
   a. Throttling or on-off
   b. Reducing or relief
2. Controlled fluid (include chemical analysis of fluid if possible)
3. Specific gravity of controlled fluid
4. Fluid temperature
5. Inlet pressures
   a. Minimum
   b. Normal
   c. Maximum
6. Pressure drop
   a. Minimum flowing drop
   b. Normal flowing drop
   c. Maximum flowing drop
   d. Maximum at shutoff
7. Flow rate
   a. Minimum
   b. Normal
   c. Maximum
8. Maximum permissible noise level, if critical
9. Shutoff classification required (see table 2)
10. Line size, schedule, and end connections

Valve Body Information

To determine what valve body ordering information is needed, refer to the specifications. Carefully review the description at the right of each specification and in the referenced tables and figures. Indicate your choice whenever there is a selection to be made. Always specify the valve design being ordered, as identified in the Available Configurations section.

Actuator and Accessory Information

Refer to the specific actuator and accessory bulletins for required ordering information.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ EZ Sliding-Stem Control Valve

Fisher EZ valves (figure 1) are used for throttling or on-off control of a wide variety of liquids and gases. The single-port, globe-style body design offers quick-change trim and a post-guided, unbalanced valve plug. The EZ valve is used in chemical or hydrocarbon processing applications or wherever control of non-lubricating, viscous, or other hard-to-handle fluids is required.

Metal-to-metal seating is standard for all general applications over a wide range of pressure drops and temperatures. Metal-to-PTFE seating is optional for stringent shutoff requirements.

W2174-2

Fisher EZ Valve with 657 Actuator

The easy-e ™ Valve Family

EZ valve bodies are part of the versatile easy-e family of industrial control valves. easy-e valve bodies share the following characteristics:

- Multiple trim material choices
- Trim temperature capability with standard metal seats to 427°C (800°F)
    - FGM gaskets
- Interchangeable, restricted-capacity trims and full-sized trims to match variable process flow demands
- Different valve plug styles that provide particular flow characteristics for highly-specialized applications. Standard plugs are available with the following flow characteristics:
    - quick-opening
    - linear
    - equal percentage
- Optional constructions allow material compatibility with NACE MR0175 / ISO 15156 and MR0103. Contact your Emerson sales office or Local Business Partner for details.
- 316 stainless steel packing box parts are standard (including packing flange, studs, and nuts)

Features

- **Trim Designed for Stability--** Post guiding provides valve plug stability with less chance of a sticking valve plug due to non-lubricating or sticky process fluids or build-up of entrained solids. Post guiding stabilizes the valve plug at all points in its travel range to reduce vibration, mechanical noise, and trim wear.

- **Compliance with the Clean Air Act--** ENVIRO-SEAL packing systems (figure 3) that provide an improved stem seal to help prevent the loss of process fluid are available. These packing systems feature PTFE, Graphite ULF, or duplex packing with live-loading for reduced packing maintenance.

- **Sour Service Capability--** Unless otherwise noted, references are to NACE MR0175-2002. Optional materials are available to meet NACE MR0103 and NACE MR0175 / ISO 15156. Material requirements under these standards vary by edition and year of issue; the specific standard must be specified.

- **Compliance with European Standards--** Valves are available with dimensions specified by EN/DIN standards. See figure 6.

- **Reliability--** The process fluid flows through the trim, flushing away solid deposits above and below the guide bushing, thus reducing the possibility of a sticking valve plug.

- **Easy Maintenance--** Quick-change trim, with a clamped-in seat ring, reduces the disassembly time. The valve body can stay in the pipeline during removal of trim parts for inspection or maintenance.

- **Application Flexibility--** Low-flow requirements can be satisfied with standard restricted-capacity trim or with Micro-Form, Micro-Flute, or Micro-Flow valve plugs. If flow requirements change, the valve can be converted to full-sized trim.

- **Economy--** Streamlined flow passages provide greater capacities than most globe valves of the same line size.

Table of Contents

Specifications

Valve Sizes

NPS ■ 1/2, ■ 3/4, ■ 1, ■ 1-1/2, ■ 2, ■ 3, and ■ 4

End Connection Styles(1, 2)

Cast Iron Valves
Flanged: NPS 1 through 4, ■ CL125 flat-face or ■ CL250 raised-face flanges per ASME B16.1
Steel and Stainless Steel Valves
Flanged: ■ CL150, CL300, or CL600 raised-face (RF) or ring-type joint (RTJ) flanges per ASME B16.5, ■ Raised-face (RF) flanges per EN1092-1/B
Screwed or Socket Welding: NPS 1/2 through 2, consistent with ASME B16.11
Buttwelding (schedule 40 or 80): NPS 1 through 4, consistent with ASME B16.25

Maximum Inlet Pressure and Temperatures(1, 2)

As listed below, unless limited by maximum pressure drop or material temperature capabilities
Cast Iron Valves
Flanged: Consistent with CL125B or CL250B pressure-temperature ratings per ASME B16.1
Steel and Stainless Steel Valves
Flanged: Consistent with CL150, CL300, and CL600(3) per ASME B16.34
Screwed or Welding: Consistent with CL600(3) per ASME B16.34

Maximum Pressure Drops(2)

Same as maximum inlet pressure for specific construction defined above, except where further limited as shown in tables 8, 9, and 11. For soft seats on NACE service, see figure 4

Shutoff Classification Per ANSI/FCI 70-2 and IEC 60534-4

Metal Seating: Class IV is standard. Class V and VI is optional
PTFE Composition Seating: Class VI

Construction Materials

Body and Bonnet: ■ Cast iron, ■ WCC steel, ■ CF8M (316 stainless steel), ■ WC9 chrome moly steel, or ■ other materials upon request
Trim Materials: See tables 3, 4, 5, and 15
All Other Parts: See tables 6 and 10

Material Temperature Capabilities(2)

Body-Trim Combinations: See table 7
Bolting for NACE MR0175 / ISO 15156 and MR0103: See table 17
All Other Parts: See tables 6 and 10

Flow Characteristics

■ Equal percentage, ■ quick opening, and ■ linear. With soft seat, equal percentage is standard

Flow Direction

Up through the seat ring

Flow Coefficients and Noise Level Predictions

See table 14 and Fisher Catalog 12

Port Diameters and Valve Plug Travels

See table 15

Yoke Boss and Stem Diameters

See table 15

Typical Bonnet Styles

■ Plain or ■ extension. See figure 6 for standard dimensions
■ ENVIRO-SEAL bellows seal bonnet. See figure 2. Also, see Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets (D101641X012) for more information.

- continued -

Specifications (continued)

Packing Arrangements

Standard Material: Single PTFE V-ring
Optional Materials: See table 6.
ENVIRO-SEAL Packing Systems: See figure 3.
ENVIRO-SEAL Packing Systems in vacuum service: Standard ENVIRO-SEAL packing systems can be used in vacuum service with packing rings in standard orientation. Do not reverse the ENVIRO-SEAL PTFE packing rings. Also, see Bulletin 59.1:061, ENVIRO-SEAL Packing Systems for Sliding-Stem Valves (D101633X012) for more information.

Approximate Weights

NPS 1/2, 3/4 valves: 9 kg (20 lb)
NPS 1 valve: 11 kg (25 lb)
NPS 1-1/2 valve: 18 kg (40 lb)
NPS 2 valve: 36 kg (80 lb)
NPS 3 valve: 54 kg (120 lb)
NPS 4 valve: 75 kg (165 lb)

Valve Dimensions

See figure 6
■ ENVIRO-SEAL bellows seal bonnet dimensions, see figure 5

Optional Safety Instrumented System Classification

SIL3 capable — certified by exida Consulting LLC

Additional Options

■ Lubricator or ■ lubricator/isolating valve for packing lubrication and ■ valve body drain plug

1. EN (or other) ratings and end connections can usually be supplied; consult your Emerson Automation Solutions sales office.
2. Do not exceed the pressure/temperature limits in this bulletin. Any applicable standard or code limitations should not be exceeded.
3. Certain bonnet bolting material selections may require a CL600 easy-e valve assembly to be derated. Contact your Emerson sales office or Local Business Partner for more information.

ENVIRO-SEAL Packing System Specifications

Applicable Stem Diameters

■ 9.5 mm (3/8 inches), ■ 12.7 (1/2), ■ 19.1 (3/4) diameter valve stems

Maximum Pressure/Temperature Limits(1)

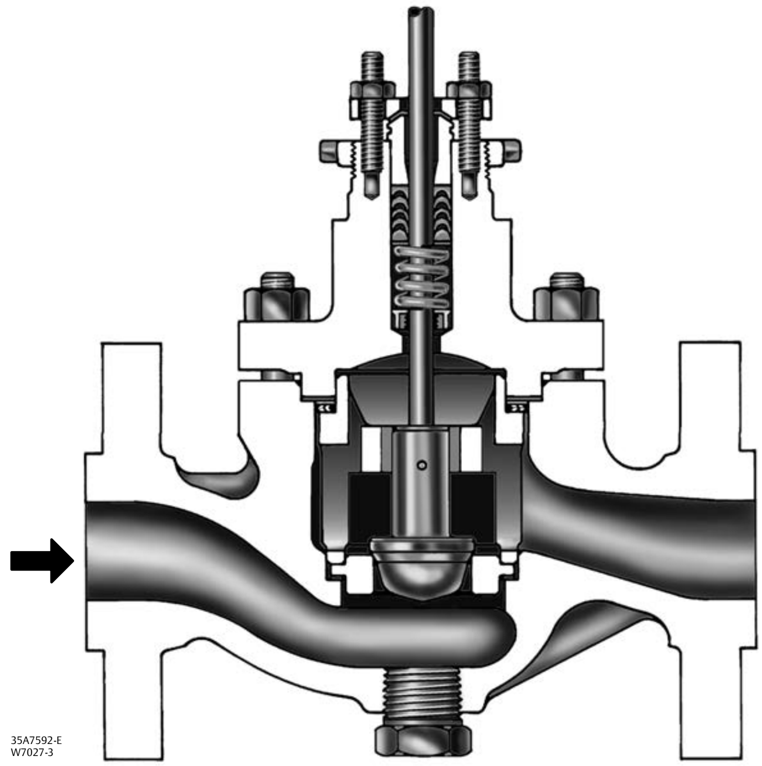
To Meet the EPA Fugitive Emission Standard of 100 PPM(2)
For ENVIRO-SEAL PTFE and ENVIRO-SEAL Duplex packing systems: full CL300 up to 232°C (450°F)
For ENVIRO-SEAL Graphite ULF packing: 104 bar (1500 psig) at 316°C (600°F)

Construction Materials

PTFE Packing Systems
Packing Ring and Lower Wiper: PTFE V-ring(3)
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Graphite ULF Packing Systems: Graphite rings
Anti-Extrusion Washer: Filled PTFE (not required for Graphite ULF packing)
Lantern Ring: S31600 (316 stainless steel) (not required for Graphite ULF packing)
Packing Box Flange: S31600
Spring: ■ 17-7PH stainless steel or ■ N07718
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: Strain-hardened 316 stainless steel
Packing Box Nuts: 316 stainless steel SA194 Grade 8M

1. Refer to the valve specifications in this bulletin for pressure/temperature limits of valve parts. Do not exceed the pressure/temperature rating of the valve. Do not exceed any applicable code or standard limitation.
2. The Environmental Protection Agency (EPA) has set a limit of 100 parts per million (ppm) for fugitive emissions from a valve in selected VOC (Volatile Organic Compound) services.
3. In vacuum service, it is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.

Figure 1. Fisher EZ Sectional with Optional Drain Plug



ENVIRO-SEAL, HIGH-SEAL Packing Systems

ENVIRO-SEAL and HIGH-SEAL packing systems offer exceptional sealing capabilities. These systems easily install in your existing valves or can be purchased with new valves. These systems offer an improved method of sealing your process to conserve valuable process fluid. The long-life and reliability of these systems also help to reduce your maintenance costs and downtime.

For applications requiring compliance with environmental protection regulations, the unique ENVIRO-SEAL packing system (figure 3) and, for hazardous service, the ENVIRO-SEAL bellows seal system (figure 2) are offered. The emission control packing system helps to keep emission concentrations below the EPA 100 ppm requirement.

For an excellent stem seal in applications that are not environmentally-sensitive, the HIGH-SEAL Graphite ULF packing system (figure 3) is offered. The HIGH-SEAL packing system provides excellent sealing at pressure/temperature ratings beyond ENVIRO-SEAL limits. ENVIRO-SEAL systems may also be applied for excellent stem sealing in higher pressure/temperature applications not requiring EPA compliance.

ENVIRO-SEAL packing systems, available with PTFE, Graphite ULF, or duplex packing, and the HIGH-SEAL Graphite ULF packing system feature live-loading and unique packing-ring arrangements for long-term, consistent sealing performance.

ENVIRO-SEAL, HIGH-SEAL Features

- **Excellent Sealing Capabilities--** The packing system provides excellent sealing, guiding, and transmission of loading force. The excellent sealing of the ENVIRO-SEAL system can control emissions to below the EPA (Environmental Protection Agency) minimum of 100 ppm (parts per million).
- **Improved Service Life--** ENVIRO-SEAL and HIGH-SEAL system design, very smooth stem surface, and live-loading combine to give you long service with very low maintenance. The external live-loading provides a constant load over the life of the packing material, which greatly reduces your need for packing box adjustment and maintenance.
- **Easy Installation in Existing Valves--** All parts needed to install the systems in existing valves are available in a convenient kit.
- **Adaptable to Many Applications--** ENVIRO-SEAL systems are available with PTFE or Graphite ULF packing for 9.5 through 31.8 mm (3/8 through 1-1/4 inch) diameter valve stems. HIGH-SEAL systems with Graphite ULF packing are available for 9.5 through 50.8 mm (3/8 through 2-inch) diameter valve stems. **Standard ENVIRO-SEAL packing systems can be used in vacuum service with packing rings in standard orientation. It is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.**

Figure 2. Fisher EZ Valve with ENVIRO-SEAL Bellows Seal Bonnet

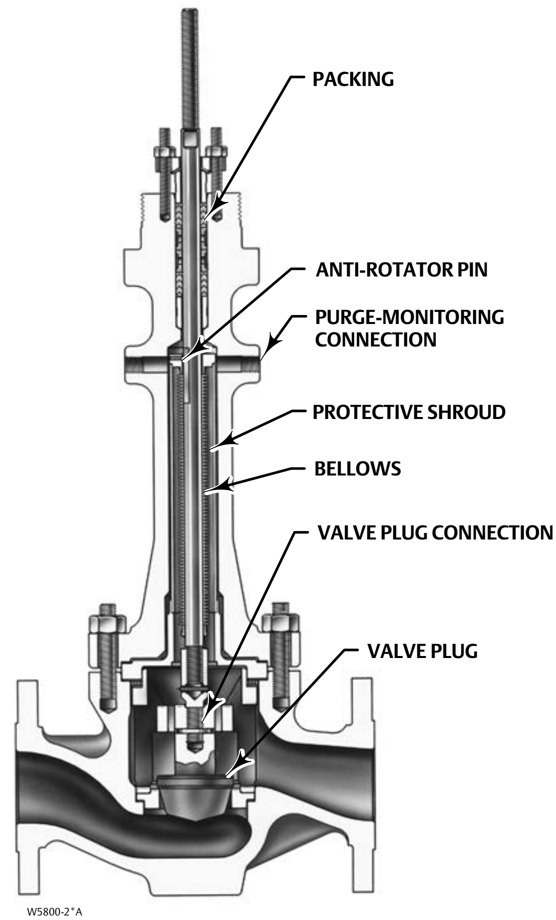
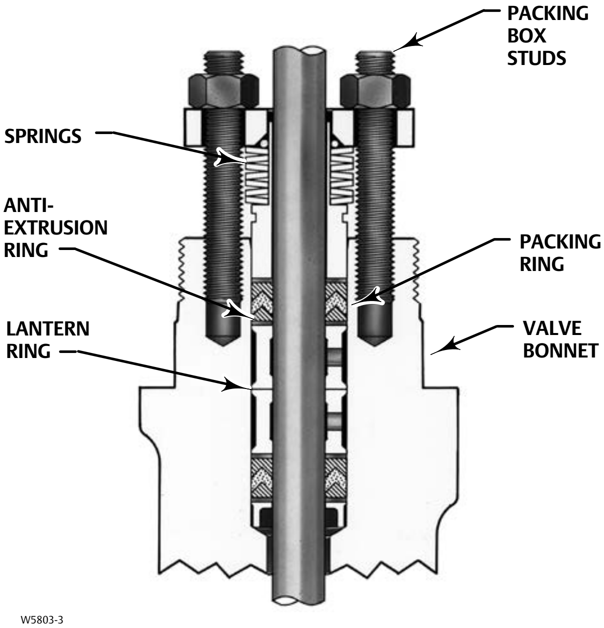
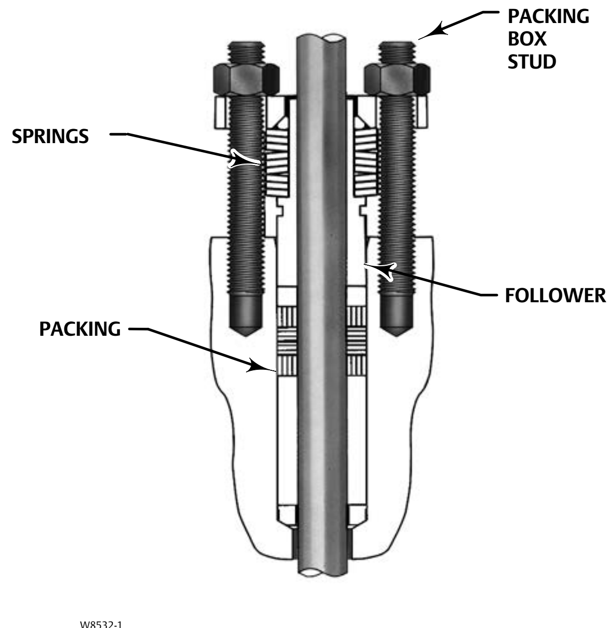


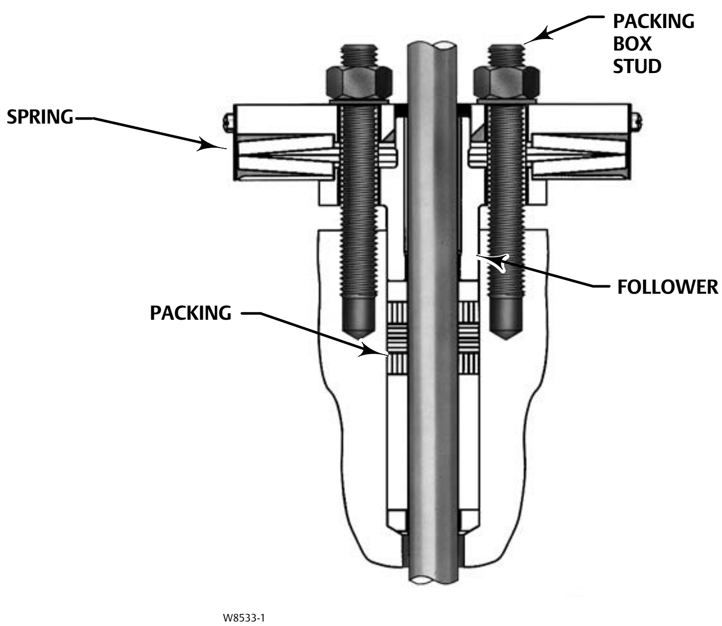
Figure 3. ENVIRO-SEAL and HIGH-SEAL Packing Systems



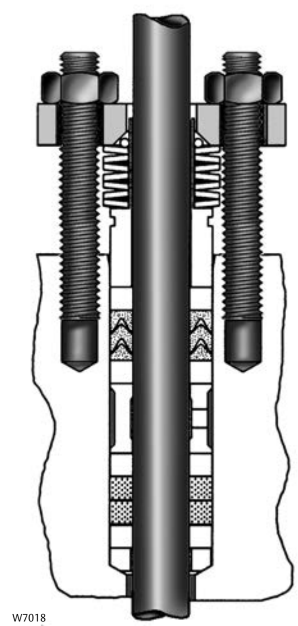
TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH PTFE PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING



TYPICAL HIGH-SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING
SYSTEM WITH DUPLEX PACKING

Class VI Shutoff Capabilities

EZ valves with metal seat and PTFE soft seat constructions can provide ANSI/FCI Class VI shutoff capabilities. See tables 1 and 2. For metal seated constructions consult your Emerson sales office or Local Business Partner.

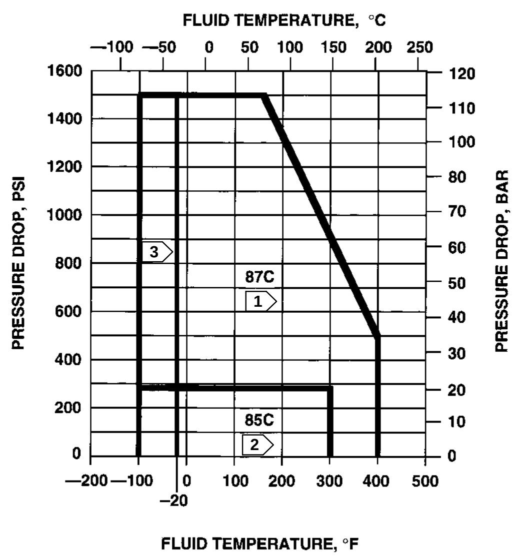
Table 1. Class VI Shutoff Availability

Valve	Port Size, Inches	Seat	Minimum Seat Load
EZ	≤4	PTFE	See Catalog 14

Table 2. Class VI Trim Materials

VALVE	CAGE/SEAT RING RETAINER	VALVE PLUG	SEAT RING	TRIM TEMPERATURE LIMIT	
				°C	°F
EZ	CF8M	S31600 w/ PTFE disk seat	S31600 w/ standard beveled seat	-73 to 149	-100 to 300
	CB7CU-1	S41600 w/ PTFE disk seat	S41600 w/ standard beveled seat	-29 to 204	-20 to 400

Figure 4. Pressure Drop / Temperature Capabilities for PTFE Seat Trim



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Notes:
1 Also applies to trims 101C, 127C, 137C, 151C, 153C, 154C, and 158C.
2 Also applies to trims 104C, 128C, 129C, 139C, 152C, 155C, 156C, and 157C.
3 Trim selections requiring Class VI shutoff are limited to -29°C (-20°F) minimum temperature. Some PTFE seat constructions can be used to -73°C (-100°F) minimum temperature if Class VI shutoff is not required. See table 7 for additional valve body/trim temperature limitations.

Micro-Flute Valve Plugs for Minimum Leakage

The EZ valve can be furnished with PTFE composition-seat Micro-Flute valve plugs for Class VI shutoff per ANSI/FCI 70-2 and IEC 60534-4.

These valve plugs are available on NPS 1/2 to 2 valves with a 9.5 mm (3/8 inch) stem diameter, 9.5 mm (3/8 inch) actuator-stem connection, and 6.4 mm (0.25 inch) seat ring port diameter. These plugs have the same flow coefficients as standard Micro-Flute plugs. Standard seat rings are used.

The valve plugs have a screwed retainer that holds the seat disk and valve plug tip to the valve stem.

Table 3. Material Cross Reference

Standard Designation	Other Designation	Standard Designation	Other Designation
CB7Cu-1	17-4 PH Stainless Steel, Cast	WC9	Chrome-Moly Steel, Cast
S17400	17-4 PH Stainless Steel	N04400	Alloy 400
CF8M	316 Stainless Steel, Cast	N05500	Alloy K500
S31600	316 Stainless Steel	M35-1	Alloy 400 Cast
CoCr-A	Alloy 6 Hardfacing	S31603	316L Stainless Steel
R30006	Alloy 6, Cast	S41600	416 Stainless Steel
Alloy 6B	Alloy 6, Wrought	WCC	WCC Steel, Cast

Table 4. Typical Combinations of Metal Trim Parts for Equal Percentage (Including Micro-Form), Linear, and Quick Opening Valve Plugs

Trim Designation	Valve Plug	Valve Stem	Seat Ring	Seat Ring Retainer	Disk Seat and Retainer for Optional PTFE-Seat Construction	Guide Bushing
101(1)	S41600 (416 stainless steel) hardened	S31600 (316 stainless steel)	S41600 hardened	CB7Cu-1 (17-4 PH stainless steel)	S41600	S17400 (17-4 PH stainless steel)
104	S31600 (316 stainless steel)	S31600	S31600	CB7Cu-1	S31600	S17400
120	N05500	N05500	N05500	M35-1	N05500	N05500
127 and 127H(3)	S31600 w/CoCr-A seat & guide	S31600	S31600 w/CoCr-A seat	CF8M (316 stainless steel)	- - -	Alloy 6B
128	S31600 w/CoCr-A seat	S31600	S31600 w/CoCr-A seat	CF8M	- - -	Alloy 6B
129(2)	S31600	S31600	S31600	CF8M	S31600	Alloy 6B
137	S31600 w/CoCr-A seat & guide	S31600	S31600 w/CoCr-A seat	CB7Cu-1	- - -	S17400
139	S31600 w/CoCr-A seat	S31600	S31600 w/CoCr-A seat	CB7Cu-1	- - -	S17400

1. Standard trim for cast iron, WCC, and WC9 valve bodies, except Micro-Flow and Micro-Flute.
2. Standard trim for CF8M valve body.
3. Utilizes special welded seat ring retainer-guide bushing assembly required for high temperature service.

Table 5. Typical Combinations of Metal Trim Parts for Micro-Flute and Micro-Flow Valve Plugs (These Constructions Do Not Use Guide Bushing)

Trim Designation	Valve Plug	Valve Stem	Seat Ring	Seat Ring Retainer	Disk Seat and Retainer for Optional PTFE-Seat Construction
151	S41600 (416 SST) hardened	S31600 (316 stainless steel)	S41600 hardened	CB7Cu-1 (17-4 PH stainless steel)	- - -
152(2)	S31600 (316 SST) w/CoCr-A seat, R30006 tip	S31600	S31600	CB7Cu-1	S31600
153	N05500	N05500	N05500	M35-1	N05500
154	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600 w/CoCr-A seat & bore	CF8M (316 stainless steel)	- - -
155	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600 w/CoCr-A seat(3)	CF8M	- - -
156(1)	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600	CF8M	S31600
157	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600 w/CoCr-A seat(3)	CB7Cu-1	- - -
158	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600 w/CoCr-A seat & bore	CB7Cu-1	- - -

1. Trim 156 can be used with a composition seal if requested.
2. Standard trim for Micro-Flow and Micro-Flute constructions in cast iron, WCC, CF8M, and WC9 valve bodies.
3. Micro-Flute and Micro-Flow valve plugs have a CoCr-A seat and R30006 tip, but are not recommended for erosive service without the additional use of CoCr-A on the seat and bore of the seat ring.

Table 6. Construction Materials and Temperature Limits

PART			MATERIAL	TEMPERATURE CAPABILITIES			
				°C		°F	
Body-to-bonnet bolting. See table 17 for NACE bolting materials and temperatures	Cast iron valve body	Cap screws	Steel SAE Grade 5	-29	232(1)	-20	450(1)
	WCC steel body	Studs	Steel SA-193-B7	-29	427	-20	800
		Nuts	Steel SA-194-2H (lubricated)				
	CF8M (316 stainless steel) body	Studs	Steel SA-193-B7 (standard)	-48	427	-55	800
		Nuts	Steel SA-194-2H (standard)				
		Studs	304 stainless steel SA-320-B8	-198	38	-325	100
		Nuts	304 stainless steel SA-194-8				
		Studs	316 stainless steel SA-193-B8M (strain hardened)	-198	427	-325	800
		Nuts	316 stainless steel SA-194-8M (lubricated)				
Seat disk (optional)			PTFE	-73	204	-100	400
Bonnet and seat ring gasket			S31600 (316 stainless steel)/graphite(2)	-198	593(4)	-325	1100(4)
			PTFE-coated N04400 (optional for trim 120)	-73	149	-100	300
Spiral wound gaskets			N04400/PTFE (optional for trims 120 & 153)	-73	149	-100	300
			N06600/graphite (FGM) standard	-198	593(4)	-325	1100(4)
Shim			S31600	These materials not limiting factors			
			N04400 (standard for trims 120 & 153)	These materials not limiting factors			
Packing flange studs and nuts when used with std bonnet			S31600	-198	593	-325	1100
Packing (temperatures shown are material temperature capabilities). See table 8 for proper bonnet selection			PTFE V-ring	-40	232	-40	450
			PTFE/composition	-73	232	-100	450
			Graphite ribbon/filament	-198	538(5)	-325	1000(5)
			Graphite ribbon for high-temperature oxidizing service	-198	649	-325	1200
Packing follower			S31600(2)	-198	593	-325	1100
			N04400 (optional for trims 120 & 153)	-198	482	-325	900
Packing spring			S31600	-198	593	-325	1100
Lantern ring (for double packing)			S31600(3)	-198	593	-325	1100
			N04400 (standard for trims 120 & 153)	-198	482	-325	900
Packing box ring			S31600(3)	-198	593	-325	1100
			N04400	-198	482	-325	900

1. Temperature limit for bodies with screwed end connections is 208°C (406°F).
2. Standard for all trim.
3. Standard for all trim except for trim 120 and 153.
4. Except 427°C (800°F) for oxidizing service.
5. Except 371°C (700°F) for oxidizing service.

Table 7. Valve Body/Trim Temperature Capabilities for Metal Trim Parts

VALVE BODY MATERIAL	VALVE BODY SIZE, NPS	TEMPERATURE CAPABILITIES									
		Trim for Equal Percentage (Including Micro-Form), Linear, and Quick Opening Valve Plugs					Trim for Micro-Flute and Micro-Flow Valve Plugs				
		Trim Designation	°C		°F		Trim Designation	°C		°F	
			Min	Max	Min	Max		Min	Max	Min	Max
Cast iron	1/2, 3/4, 1, 1-1/2, or 2	101	-29	232	-20	450	151	-29	232	-20	450
		120	-73	232	-100	450	153	-73	232	-100	450
		87, 127, 137	-73	232	-100	450	154, 158	-73	232	-100	450
		85, 86, 128, 129	-73	232(1)	-100	450(1)	- - -	- - -	- - -	- - -	- - -
		139, 104	-73	232(1)	-100	450(1)	152, 155, 156, 157	-73	149	-100	300
	3 or 4	101	-29	232	-20	450	- - -	- - -	- - -	- - -	- - -
		104, 139	-73	232(1)	-100	450(1)	- - -	- - -	- - -	- - -	- - -
		120	-73	232	-100	450	- - -	- - -	- - -	- - -	- - -
		87, 127	-73	232	-100	450	- - -	- - -	- - -	- - -	- - -
		85, 86, 128, 129	-73	232(1)	-100	450(1)	- - -	- - -	- - -	- - -	- - -
		137	-73	232	-100	450	- - -	- - -	- - -	- - -	- - -
WCC steel	1/2, 3/4, 1, 1-1/2, or 2	101	-29	427	-20	800	151	-29	316	-20	600
		104, 139	-29	427(1)	-20	800(1)	152, 157	-29	149	-20	300
		120	-29	316	-20	600	153	-29	316	-20	600
		87, 127	-29	260	-20	500	154	-29	427	-20	800
		86, 128	-29	260(1)	-20	500(1)	- - -	- - -	- - -	- - -	- - -
		85, 129	-29	260(1)	-20	500(1)	156	-29	149	-20	300
		137, 127H	-29	427	-20	800	158	-29	427	-20	800
	3	101, 127H	-29	427	-20	800	- - -	- - -	- - -	- - -	- - -
		104, 139	-29	371(1)	-20	700(1)	- - -	- - -	- - -	- - -	- - -
		120	-29	316	-20	600	- - -	- - -	- - -	- - -	- - -
		87, 127	-29	371	-20	700	- - -	- - -	- - -	- - -	- - -
		85, 86, 128, 129	-29	371(1)	-20	700(1)	- - -	- - -	- - -	- - -	- - -
		137	-29	371	-20	700	- - -	- - -	- - -	- - -	- - -
	4	101	-29	427	-20	800	- - -	- - -	- - -	- - -	- - -
		104, 139	-29	371(1)	-20	700(1)	- - -	- - -	- - -	- - -	- - -
		120	-29	316	-20	600	- - -	- - -	- - -	- - -	- - -
		87, 127, 127H	-29	338	-20	640	- - -	- - -	- - -	- - -	- - -
		85, 86, 128, 129	-29	338(1)	-20	640(1)	- - -	- - -	- - -	- - -	- - -
		137	-29	371	-20	700	- - -	- - -	- - -	- - -	- - -
CF8M (316 stainless steel)	1/2, 3/4, 1, or 1-1/2	101	-29	354	-20	670	151	-29	316	-20	600
		104	-101	371(1)	-150	700(1)	152	-101	149	-150	300
		120	-198	316	-325	600	153	-198	316	-325	600
		87, 127	-198	260	-325	500	154	-198	593	-325	1100
		127H(3)	-198	593	-325	1100	- - -	- - -	- - -	- - -	- - -
		86, 128	-198	260(1)	-325	500(1)	- - -	- - -	- - -	- - -	- - -
		85, 129	-198	260(1)	-325	500(1)	156	-198	149	-325	300
		137	-101	371	-150	700	158	-101	371	-150	700
		139	-101	371(1)	-150	700(1)	157	-101	149	-150	300
	2	101	-29	288	-20	550	151	-29	288	-20	550
		104	-101	299(1)	-150	570(1)	152	-101	149	-150	300
		120	-198	316	-325	600	153	-198	316	-325	600

-continued-

Table 7. Valve Body/Trim Temperature Capabilities for Metal Trim Parts (Continued)

VALVE BODY MATERIAL	VALVE BODY SIZE, NPS	TEMPERATURE CAPABILITIES									
		Trim for Equal Percentage (Including Micro-Form), Linear, and Quick Opening Valve Plugs					Trim for Micro-Flute and Micro-Flow Valve Plugs				
		Trim Designation	°C		°F		Trim Designation	°C		°F	
			Min	Max	Min	Max		Min	Max	Min	Max
CF8M (316 stainless steel)	2	87, 127	-198	260	-325	500	154	-198	593	-325	1100
		127H[3]	-198	593	-325	1100	---	---	---	---	---
		86, 128	-198	260[1]	-325	500[1]	---	---	---	---	---
		85, 129	-198	260[1]	-325	500[1]	156	-198	149	-325	300
		137	-101	299	-150	570	158	-101	299	-150	570
		139	-101	299[1]	-150	570[1]	157	-101	149	-150	300
	3	101	-29	216	-20	420	---	---	---	---	---
		104, 139	-101	227[1]	-150	440[1]	---	---	---	---	---
		120	-198	316	-325	600	---	---	---	---	---
		87, 127	-198	377	-325	700	---	---	---	---	---
		127H[3]	-198	593	-325	1100	---	---	---	---	---
		85, 86, 128, 129	-198	377[1]	-325	700[1]	---	---	---	---	---
		137	-101	227	-150	440	---	---	---	---	---
	4	101	-29	177	-20	350	---	---	---	---	---
		104, 139	-101	182[1]	-100	360[1]	---	---	---	---	---
		120	-198	316	-325	600	---	---	---	---	---
		87, 127	-198	371	-325	700	---	---	---	---	---
		127H[3]	-198	593	-325	1100	---	---	---	---	---
		85, 86, 128, 129	-198	371[1]	-325	700[1]	---	---	---	---	---
		137	-101	182	-150	360	---	---	---	---	---
WC9 chrome moly steel	1/2, 3/4, 1, 1-1/2, or 2	101	-29	427	-20	800	151	-29	316	-20	600
		104	-29	427[1]	-20	800[1]	152	-29	149	-20	300
		120	-29	316	-20	600	153	-29	316	-20	600
		87, 127	-29	260	-20	500	154	-29	565	-20	1050[2]
		127H	-29	565	-20	1050	---	---	---	---	---
		86, 128	-29	260[1]	-20	500[1]	---	---	---	---	---
		85, 129	-29	260[1]	-20	500[1]	156	-29	149	-20	300
		137	-29	427	-20	800	158	-29	427	-20	800[1]
		139	-29	427[1]	-20	800[1]	157	-29	149	-20	300
	3	101	-29	427	-20	800	---	---	---	---	---
		104, 139	-29	371[1]	-20	700[1]	---	---	---	---	---
		120	-29	316	-20	600	---	---	---	---	---
		87, 127	-29	343	-20	650	---	---	---	---	---
		127H	-29	510	-20	950	---	---	---	---	---
		85, 86, 128, 129	-29	343[1]	-20	650[1]	---	---	---	---	---
		137	-29	371	-20	700	---	---	---	---	---
	4	101	-29	427	-20	800	---	---	---	---	---
		104, 139	-29	371[1]	-20	700[1]	---	---	---	---	---
		120	-29	316	-20	600	---	---	---	---	---
		87, 127	-29	316	-20	450	---	---	---	---	---
		127H	-29	338	-20	640	---	---	---	---	---
		85, 86, 128, 129	-29	232[1]	-20	450[1]	---	---	---	---	---
		137	-29	371	-20	700	---	---	---	---	---

1. With non-lubricating fluids, temperature is limited to 149°C (300°F).
2. For NPS 2 valve body, maximum temperature is 466°C (870°F).
3. May be used up to 593°C (1100°F) if manufacturing process controls carbon content to 0.04% minimum or 0.08% maximum.

Table 8. Bonnet Selection Guidelines

BONNET STYLE	PACKING MATERIAL	IN-BODY PROCESS TEMPERATURE LIMITS(1)	
		°C	°F
Plain: ■ Standard for NPS 1/2, 3/4, 1, and 1-1/2 inch valves with 2-1/8 inch yoke boss diameter ■ Standard for NPS 2, 3, and 4 valves with 2-13/16 inch yoke boss diameter ■ Optional for NPS 2, 3, and 4 valves with 3-9/16 inch yoke boss diameter	PTFE V-ring	-18 to 232	0 to 450
	PTFE/Composition	-18 to 232	0 to 450
	Graphite ribbon/filament	-18 to maximum shown in table 6	0 to maximum shown in table 6
Style 1 Cast Extension: ■ Optional for all valve sizes. Check yoke boss diameter	PTFE V-ring PTFE/Composition	-46 to 427	-50 to 800
	Graphite ribbon/filament	-46 to maximum shown in table 6	-50 to maximum shown in table 6
Style 2 Cast Extension: ■ Optional for all valve sizes. Check yoke boss diameter	PTFE V-ring PTFE/Composition	-101 to 427	-150 to 800
	Graphite ribbon/filament	-101 to maximum shown in table 6	-150 to maximum shown in table 6
ENVIRO-SEAL bellows seal bonnet	PTFE	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets (D101641X012) for pressure/temperature ratings.	
	Graphite	For exceptional stem sealing capabilities. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets (D101641X012) for pressure/temperature ratings.	

1. These in-body process temperatures assume an outside, ambient temperature of 21°C (70°F) and no insulation on the bonnet. When using any packing at low process temperatures, a cast extension bonnet may have to be used to prevent packing damage which could result from the formation of valve stem frost. Material selection for trim and other components will also be limiting factors.

Table 9. Maximum Allowable Pressure Drops per Trim Designation for Equal Percentage (Including Micro-Form), Linear, and Quick Opening Valve Plugs

TRIM DESIGNATION	VALVE PLUG	VALVE STEM	SEAT RING	SEAT RING RETAINER	GUIDE BUSHING	SHUTOFF PRESSURE DROP		FLOWING PRESSURE DROP	
						Bar	Psig	Bar	Psid
101	S41600 (416 stainless steel) hardened	S31600 (316 stainless steel)	S41600 hardened	CB7Cu-1 (17-4 PH stainless steel)	S17400 (17-4 PH stainless steel)	103	1500	103	1500
104	S31600 (316 stainless steel)	S31600	S31600	CB7Cu-1	S17400	21	300(1)	103	1500
120	N05500	N05500	N05500	M35-1	N05500	55	800(1)	103	1500
87, 127, 127H	S31600 w/CoCr-A seat & guide	S31600	S31600 w/CoCr-A seat	CF8M (316 stainless steel)	Alloy 6B	103	1500	103	1500
86, 128	S31600 w/CoCr-A seat	S31600	S31600 w/CoCr-A seat	CF8M	Alloy 6B	103	1500	103	1500
85, 129	S31600	S31600	S31600	CF8M	Alloy 6B	21	300(1)	103	1500
137	S31600 w/CoCr-A seat & guide	S31600	S31600 w/CoCr-A seat	CB7Cu-1	S17400	103	1500	103	1500
139	S31600 w/CoCr-A seat	S31600	S31600 w/CoCr-A seat	CB7Cu-1	S17400	103	1500	103	1500

1. Trims 104, 120, and 129 may be used up to 103 bar (1500 psid) with clean dry gas.

Table 10. Maximum Allowable Pressure Drops per Trim Designation for Micro-Flute and Micro-Flow Valve Plugs

TRIM DESIGNATION	VALVE PLUG	VALVE STEM	SEAT RING	SEAT RING RETAINER	SHUTOFF PRESSURE DROP		FLOWING PRESSURE DROP	
					Bar	Psig	Bar	Psid
151	S41600 (416 stainless steel) hardened	S31600 (316 stainless steel)	S41600 hardened	CB7Cu-1 (17-4 PH stainless steel)	103	1500	103	1500
152	S31600 (316 stainless steel) w/CoCr-A seat, R30006 tip	S31600	S31600	CB7Cu-1	21	300(1)	103	1500
153	N05500	N05500	N05500	M35-1	55	800(1)	103	1500
87, 154	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600 w/CoCr-A seat & bore	CF8M (316 stainless steel)	103	1500	103	1500
155	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600 w/CoCr-A seat	CF8M	103	1500	103	1500
85, 156	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600	CF8M	21	300(1)	103	1500
157	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600 w/CoCr-A seat	CB7Cu-1	103	1500	103	1500
158	S31600 w/CoCr-A seat, R30006 tip	S31600	S31600 w/CoCr-A seat & bore	CB7Cu-1	103	1500	103	1500

1. Trims 152, 153, and 156 may be used up to 103 bar (1500 psid) with clean dry gas.

Table 11. Gasket Selection Guidelines(1)

Gasket Set	Seat Ring Gasket	Bonnet Gasket	Spiral Wound Gasket	Shim	Temperature Capabilities
2(2)	316 SST/graphite flat sheet	316 SST/graphite flat sheet	N06600/graphite	S31600	-198 to 593°C(3) (-325 to 1100°F)(3)
3	PTFE-coated N04400	PTFE-coated N04400	N04400/PTFE	N04400	-73 to 149°C (-100 to 300°F)

1. See Bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets (D101641X012) for bellows gasket information.
2. FGM gasket set.
3. Except 427°C (800°F) for oxidizing service.

Table 12. Maximum Allowable Pressure Drops (Flow Up Only)(1) for Gasket Materials (NPS 1/2 through 1-1/2 Valves)

TEMPER-ATURE, °C(4)(5)	BAR(2)(3)										
	Valve Body Size, NPS										
	1/2, 3/4, & 1					1-1/2					
	Port Diameter, mm										
	4.8 & 6.4	9.5	12.7	19.1	25.4	4.8 & 6.4	9.5	12.7	19.1	25.4	38.1
N04400/Composition Spiral Wound Gasket (Gasket Set 4)											
-253 to 38	67.6	68.3	69.0	72.4	76.5	58.6	59.0	59.3	61.3	63.4	72.4
93	56.5	57.2	57.9	60.0	64.1	49.0	49.3	49.6	51.0	53.1	60.0
149	47.6	48.3	49.0	51.0	53.8	41.4	41.8	42.1	43.4	44.8	51.0
204	43.4	43.8	44.1	46.2	49.0	37.9	37.9	37.9	39.3	40.7	46.2
232	42.1	42.6	43.1	44.8	47.6	36.5	36.7	36.9	38.3	39.6	44.8
N06600/Graphite Spiral Wound Gasket (Gasket Set 2) or N04400/PTFE Spiral Wound Gasket (Gasket Set 3)(5)											
-253 to 38	94.5	96.2	97.9	104.1	114	77.9	79.0	80.0	82.7	87.6	105
93	89.6	91.4	93.1	98.6	108	73.8	74.5	75.2	78.6	82.7	99.3
149	85.5	87.2	88.9	94.5	103	70.3	71.4	72.4	75.2	79.3	94.5
204	81.4	83.1	84.8	89.6	98.6	66.9	68.0	69.0	71.0	75.2	90.3
260	78.6	80.4	82.1	86.9	95.2	64.8	65.5	66.2	69.0	73.1	87.6
316	76.5	77.9	79.3	84.1	92.4	62.7	63.4	64.1	66.9	71.0	84.8
371	73.8	75.2	76.5	81.4	88.9	60.7	61.4	62.1	64.8	68.3	81.4
427	71.0	72.4	73.8	78.6	86.2	58.6	59.3	60.0	62.1	66.2	78.6

TEMPER-ATURE, °F(4)(5)	PSI(2)(3)										
	Port Diameter, Inches										
	0.1875 & 0.25	0.375	0.5	0.75	1	0.1875 & 0.25	0.375	0.5	0.75	1	1.5
N04400/Composition Spiral Wound Gasket (Gasket Set 4)											
-425 to 100	980	990	1000	1050	1110	850	855	860	890	920	1050
200	820	830	840	870	930	710	715	720	740	770	870
300	690	700	710	740	780	600	605	610	630	650	740
400	630	635	640	670	710	550	550	550	570	590	670
450	610	618	625	650	690	530	535	535	555	575	650
N06600/Graphite Spiral Wound Gasket (Gasket Set 2) or N04400/PTFE Spiral Wound Gasket (Gasket Set 3)(5)											
-425 to 100	1370	1395	1420	1510	1660	1130	1145	1160	1200	1270	1520
200	1300	1325	1350	1430	1570	1070	1080	1090	1140	1200	1440
300	1240	1265	1290	1370	1500	1020	1035	1050	1090	1150	1370
400	1180	1205	1230	1300	1430	970	985	1000	1030	1090	1310
500	1140	1165	1190	1260	1380	940	950	960	1000	1060	1270
600	1110	1130	1150	1220	1340	910	920	930	970	1030	1230
700	1070	1090	1110	1180	1290	880	890	900	940	990	1180
800	1030	1050	1070	1140	1250	850	860	870	900	960	1140

1. EZ should not be used in flow down service including on-off applications.
2. Pressure drop cannot exceed maximum inlet pressure as indicated in the Specifications section.
3. The trim may be further limited by maximum pressure drops listed in tables 9 and 10.
4. Pressure drops at intermediate temperatures may be interpolated.
5. Maximum temperature capability of PTFE-coated N04400 gaskets as used in gasket set 3 is 149°C (300°F).

Table 13. Maximum Allowable Pressure Drops (Flow Up Only)(1) for Gasket Materials (NPS 2 through 4 Valves)

TEMPER-ATURE, °C(4)(5)	BAR(2)(3)									
	Valve Body Size, NPS									
	2						3		4	
	Port Diameter, mm									
	4.8 & 6.4	9.5	12.7	19.1	25.4	50.8	50.8	76.2	50.8	101.6
N04400/Composition Spiral Wound Gasket (Gasket Set 4)										
-253 to 38	52.4	52.8	53.1	54.5	55.8	70.3	55.2	70.3	49.0	73.8
93	43.4	43.8	44.1	45.5	46.9	58.6	46.2	58.6	40.7	61.4
149	37.2	37.2	37.2	37.9	39.3	49.6	38.6	49.6	34.5	51.7
204	33.8	33.8	33.8	34.5	35.9	44.8	35.2	45.5	31.0	46.9
232	32.8	32.8	32.8	33.4	34.8	43.4	34.1	44.1	30.3	45.5
N06600/Graphite Spiral Wound Gasket (Gasket Set 2) or N04400/PTFE Spiral Wound Gasket (Gasket Set 3)(5)										
-253 to 38	67.6	68.2	68.7	70.3	73.1	101	69.6	97.2	65.5	114
93	63.4	64.1	64.8	66.9	69.6	95.8	66.2	92.4	62.1	108
149	60.7	61.4	62.1	63.4	66.2	91.7	62.7	88.3	58.6	103
204	57.9	58.3	58.6	60.7	62.7	86.9	60.0	83.4	55.8	97.9
260	55.8	56.5	57.2	58.6	61.4	84.1	57.9	81.4	54.5	94.5
316	54.5	54.9	55.2	56.5	59.3	81.4	56.5	78.6	52.4	91.7
371	52.4	52.8	53.1	55.2	57.2	78.6	54.5	75.8	51.0	88.3
427	50.3	51.0	51.7	53.1	55.2	75.8	52.4	73.1	49.0	85.5
TEMPER-ATURE, °F(4)(5)	PSI(2)(3)									
	Port Diameter, Inches									
	0.1875 & 0.25	0.375	0.5	0.75	1	2	2	3	2	4
N04400/Composition Spiral Wound Gasket (Gasket Set 4)										
-425 to 100	760	765	770	790	810	1020	800	1020	710	1070
200	630	635	640	660	680	850	670	850	590	890
300	540	540	540	550	570	720	560	720	500	750
400	490	490	490	500	520	650	510	660	450	680
450	475	475	475	485	505	630	495	640	440	660
N06600/Graphite Spiral Wound Gasket (Gasket Set 2) or N04400/PTFE Spiral Wound Gasket (Gasket Set 3)(5)										
-425 to 100	980	985	990	1020	1060	1470	1010	1410	950	1650
200	920	930	940	970	1010	1390	960	1340	900	1560
300	880	890	900	920	960	1330	910	1280	850	1490
400	840	845	850	880	910	1260	870	1210	810	1420
500	810	820	830	850	890	1220	840	1180	790	1370
600	790	795	800	820	860	1180	820	1140	760	1330
700	760	765	770	800	830	1140	790	1100	740	1280
800	730	740	750	770	800	1100	760	1060	710	1240

1. EZ should not be used in flow down service including on-off applications.
2. Pressure drop cannot exceed maximum inlet pressure as indicated in the Specifications section.
3. The trim may be further limited by maximum pressure drops listed in tables 9 and 10.
4. Pressure drops at intermediate temperatures may be interpolated.
5. Maximum temperature capability of PTFE-coated N04400 gaskets as used in gasket set 3 is 149°C (300°F).

Table 14. Maximum Flow Coefficient for Full-Sized Trim with Equal Percentage Characteristic and Normal Flow Direction[1]

Valve Body Size, NPS	C_v at Max Valve Plug Travel
1/2	4.47
3/4	9.00
1	13.2
1-1/2	28.1
2	53.8
3	114
4	190

1. Flow coefficients for linear and quick-opening valve plugs normally are somewhat greater.

Table 15. Port Diameters, Valve Plug Travel, and Stem and Yoke Boss Diameters

VALVE BODY SIZE, NPS	PORT DIAMETER, mm			MAX VALVE PLUG TRAVEL, mm	VALVE STEM AND YOKE BOSS DIAMETERS, mm			
	Equal Percentage[1]	Quick Opening	Linear		Standard		Optional	
					Stem	Yoke Boss	Stem	Yoke Boss
1/2 or 3/4	4.8[2], 6.4[3], 9.5, 12.7, 19.1, 25.4	25.4	- - -	19	9.5	54	12.7	71
1	4.8[2], 6.4[3], 9.5, 12.7, 19.1, 25.4	25.4	25.4					
1-1/2	4.8[2], 6.4[3], 9.5, 12.7, 19.1, 25.4, 38.1	38.1	38.1					
2	4.8[2], 6.4[3], 9.5, 12.7, 19.1, 25.4, 50.8	50.8	50.8	29	12.7	71	19.1	90
3	50.8, 76.2	76.2	76.2	38				
4	50.8, 101.6	101.6	101.6	51				
Inches								
1/2 or 3/4	0.1875[2], 0.25[3], 0.375, 0.5, 0.75, 1	1	- - -	0.75	3/8	2-1/8	1/2	2-13/16
1	0.1875[2], 0.25[3], 0.375, 0.5, 0.75, 1	1	1					
1-1/2	0.1875[2], 0.25[3], 0.375, 0.5, 0.75, 1, 1.5	1.5	1.5					
2	0.1875[2], 0.25[3], 0.375, 0.5, 0.75, 1, 2	2	2	1.125	1/2	2-13/16	3/4	3-9/16
3	2, 3	3	3	1.5				
4	2, 4	4	4	2				

1. 6.4 through 19.1 mm (0.25 through 0.75-inch) port diameters use Micro-Form valve plug.
2. Micro-Flow valve plug.
3. Also available in 1-flute and 3-flute Micro-Flute valve plugs.

Table 16. Typical Combinations of Metal Trim Parts for Equal Percentage (Including Micro-Form), Linear, and Quick Opening Valve Plugs for Compatibility with NACE MR0175 / ISO 15156 and MR0103 Specifications (Environmental Restrictions Apply, Refer to Standard)

Trim Designation	Valve Plug	Seat Ring Retainer	Bushing	Seat Ring	Valve Stem, Packing Follower, Lantern Ring, Packing Box Ring, Pins, and Disk Retainer
85	S31600 (316 stainless steel)	CF8M (316 stainless steel)	Alloy 6B	S31600	S20910 (Valve Stem) S31600 (All Other Parts)
85C[1]	S31600/PTFE	CF8M	Alloy 6B	S31600	
86	S31600 w/CoCr-A seat	CF8M	Alloy 6B	Alloy 6	
87	S31600 w/CoCr-A seat & guide	CF8M	Alloy 6B	Alloy 6	
87C[1]	S31600/PTFE w/CoCr-A guide	CF8M	Alloy 6B	Alloy 6	

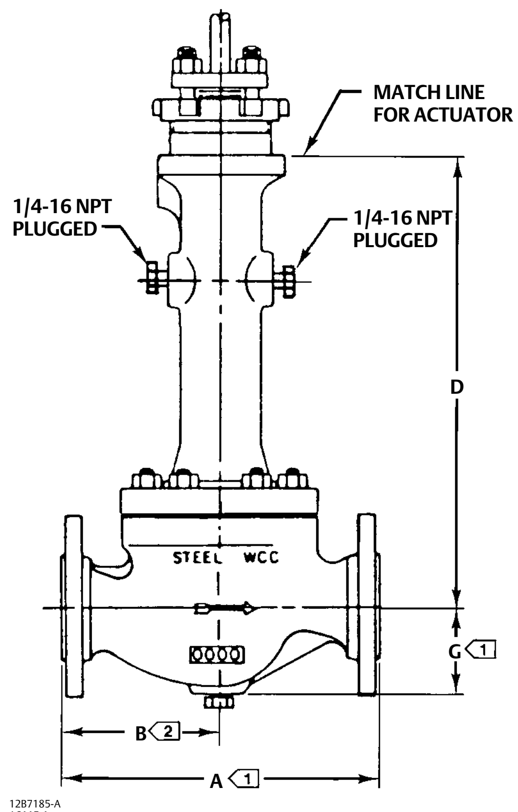
1. 85C and 87C are trims for PTFE-seat construction.

Table 17. Bolting Materials and Temperature Limits for Bolting Compliance with NACE MR0175-2002, NACE MR0175/ISO 15156, and NACE MR0103 (Environmental Restrictions May Apply)

VALVE BODY MATERIAL		BOLTING MATERIAL	TEMPERATURE CAPABILITIES °C Min	°C Max	°F Min	°F Max
Non-exposed bolting (Standard)						
WCC and CF8M (316 SST)	Studs	Steel SA-193-B7	-48(1)	427	-55(1)	800
	Nuts	Steel SA-194-2H				
Exposed bolting (Optional) Requires Derating of Valve(2) When These Body-to-Bonnet Bolting Materials are Used						
WCC and CF8M	Studs	Steel SA-193-B7M	-48(1)	427	-55(1)	800
	Nuts	Steel SA-194-2HM				

1. -29°C (-20°F) with WCC valve body material.
2. Derating is not required for CL300 valves. Derating is required for valves rated at CL600 and above. Contact your Emerson sales office or Local Business Partner for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used.

Figure 5. ENVIRO-SEAL Bellows Seal Bonnet Dimensions (also see table 18)



Notes:
1 For A and G dimensions, see figure 6.
2 B=A/2.

Table 18. ENVIRO-SEAL Bellows Seal Bonnet Dimensions

VALVE SIZE, NPS	D: ENVIRO-SEAL Bellows Seal Bonnet, Stem Diameter, mm: 9.5	12.7	19.0	Stem Diameter, Inches: 3/8	1/2	3/4
1	321	---	---	12.62	---	---
1-1/2	317	---	---	12.50	---	---
2	---	384	---	---	15.12	---
3	---	518	518	---	20.38	20.38
4	---	541	---	---	21.31	---

Ordering Information

Inlet pressure and temperature must always be limited by the applicable ASME pressure/temperature rating. Pressure drop information for various trim material combinations is provided in tables 10 and 11. Pressure drop information for gasket materials is listed in tables 12 and 13. The maximum allowable pressure drop for the application must not exceed the lowest value indicated for the combination of materials selected.

Table 19. Standard Dimensions

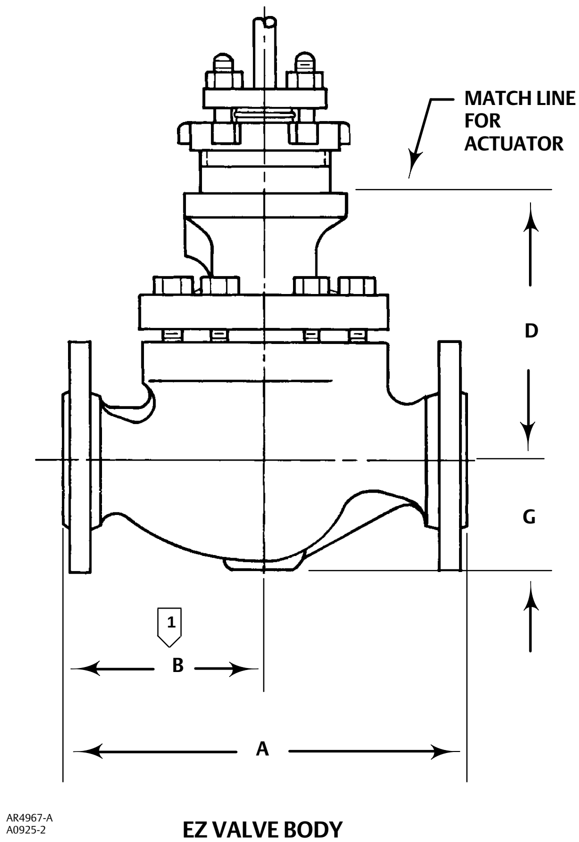
VALVE SIZE, NPS	D								
	Plain Bonnet			Extension Bonnet					
				Style 1			Style 2		
	Stem Diameter, mm								
	9.5	12.7	19.0	9.5	12.7	19.0	9.5	12.7	19.0
1/2 or 3/4	127	149	- - -	213	251	- - -	303	319	- - -
1	127	149	- - -	213	251	- - -	303	319	- - -
1-1/2	124	146	- - -	210	248	- - -	300	316	- - -
2	- - -	165	162	- - -	267	272	- - -	465	- - -
3	- - -	191	187	- - -	292	297	- - -	495	487
4	- - -	221	217	- - -	322	327	- - -	526	518
	Stem Diameter, Inches								
	3/8	1/2	3/4	3/8	1/2	3/4	3/8	1/2	3/4
1/2 or 3/4	5.00	5.88	- - -	8.38	9.88	- - -	11.94	12.56	- - -
1	5.00	5.88	- - -	8.38	9.88	- - -	11.94	12.56	- - -
1-1/2	4.88	5.75	- - -	8.25	9.75	- - -	11.81	12.44	- - -
2	- - -	6.50	6.38	- - -	10.50	10.69	- - -	18.31	- - -
3	- - -	7.50	7.38	- - -	11.50	11.69	- - -	19.50	19.19
4	- - -	8.69	8.56	- - -	12.69	12.88	- - -	20.69	21.38

Table 20. Standard Dimensions

VALVE SIZE, NPS	A									G (MAX)
	Scrd or SWE	CL125 FF or CL150 RF	CL150 RTJ	CL250 RF or CL300 RF	CL300 RTJ	BW or CL600 RF	CL600 RTJ	PN16-40(1)	PN63-100(1)	
	mm									
1/2 or 3/4	165	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	55
1	210	184	197	197	210	210	210	160	230	60
1-1/2	251	222	235	235	248	251	251	200	260	71
2	286	254	267	267	282	286	289	230	300	78
3	- - -	298	311	317	333	337	340	310	380	97
4	- - -	353	365	368	384	394	397	350	430	129
	Inches									
1/2 or 3/4	6.50	- - -	- - -	- - -	- - -	- - -	- - -	See mm	See mm	2.12
1	8.25	7.25	7.75	7.75	8.25	8.25	8.25			2.38
1-1/2	9.88	8.75	9.25	9.25	9.75	9.88	9.88			2.81
2	11.25	10.00	10.50	10.50	11.12	11.25	11.38			3.06
3	- - -	11.75	12.25	12.50	13.12	13.25	13.38			3.81
4	- - -	13.88	14.38	14.50	15.12	15.50	15.62			5.06

1. Valves which meet EN flange standards and have DN face-to-face dimensions are available only from Europe. Valves which meet EN flange standards but not DN face-to-face standards are available in the US. Consult your Emerson sales office or Local Business Partner.

Figure 6. Standard Dimensions (also see tables 19 and 20)



EZ VALVE BODY

Notes:
1. $B = \frac{A}{2}$

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
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Dubai, United Arab Emirates
Singapore 128461 Singapore

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EZ-OVT Trim
D103041X012

Product Bulletin
51.1:EZ-OVT
August 2017

Fisher™ EZ-Overtravel (EZ-OVT) Valve Trim

Fisher EZ-OVT valve trim is a dual seat valve trim, designed to maintain long term tight shutoff in on-off services that contain particulates in the flow stream such as catalyst fines. An example of this type of service is the valves used to control and purge the hydrogen and nitrogen transfer gases used on the UOP continuous catalytic regeneration (CCR) refining process.

Control valves for this application must provide bubble tight shutoff to stop the transfer gas flow and be able to maintain this performance, even in the presence of catalyst and their fines.

Trim Features

- **Dual seat design**—EZ-OVT trim features a dual seat design that includes a primary soft seat and a secondary metal seat. This dual seat design provides long term ANSI and IEC Class VI shutoff.
- **Off-the-seat deadband**—A double deadband area is built into the trim to inhibit erosive flow across the seating surfaces as the trim starts to open.
- **Flow deflector**—A special flow deflector directs the flow stream away from the seating surfaces once the valve has traveled off the seat.
- **Simple design**—Large flow passages and minimal moving parts reduce particulate buildup such as catalyst fines that could collect in these areas and cause failure.

Specifications

Valve Body Sizes

NPS ■ 1, ■ 1-1/2, and ■ 2

End Connection Styles

■ CL150 RF and RTJ
■ CL300 RF and RTJ
■ CL600 RF and RTJ

Maximum Inlet Pressures and Temperatures(1)

Consistent with CL150, CL300, and CL600 per ASME B16.34

Shutoff Classifications Per ANSI/FCI 70-2 and IEC 60534-4

Class VI

Flow Direction

Flow up

Operating Temperature Capabilities

■ **Standard:** Up to 93°C (199°F) with UHMWPE seat disk
■ **Optional**: Up to 204°C (399°F) with PTFE seat disk

Yoke Boss and Stem Diameters

See Fisher EZ bulletin 51.1:EZ (D100025X012)

Construction Materials

Valve Body: ■ A216 WCC
Plug Guide Post: ■ S31600 stainless steel with CoCr-A guiding surfaces
Plug Tip: ■ Alloy 6B
Seat Ring: ■ Alloy 6B
Seat Ring Retainer: ■ S31600 with CoCr-A bushing
Seat Disk: ■ UHMWPE or PTFE

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation should not be exceeded.

Figure 1. Fisher EZ-OVT Trim Seated

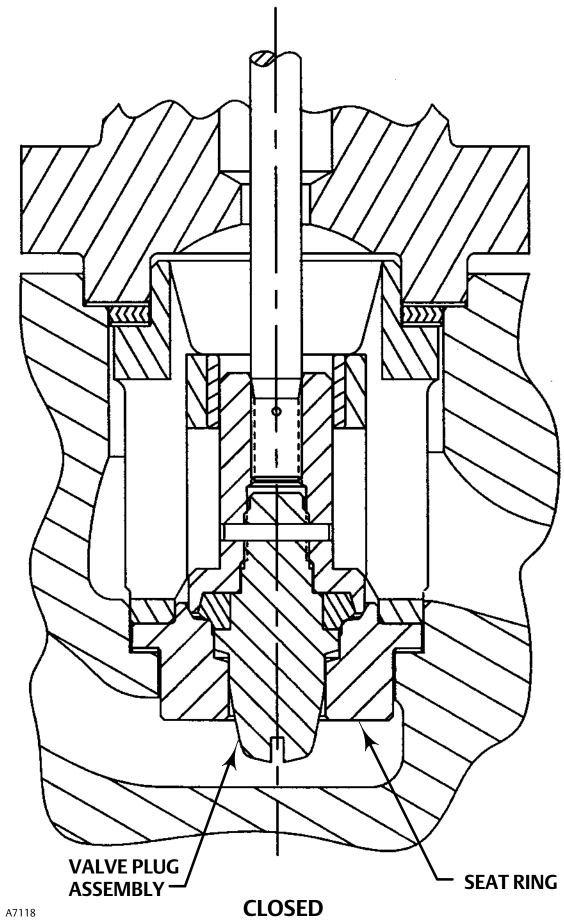
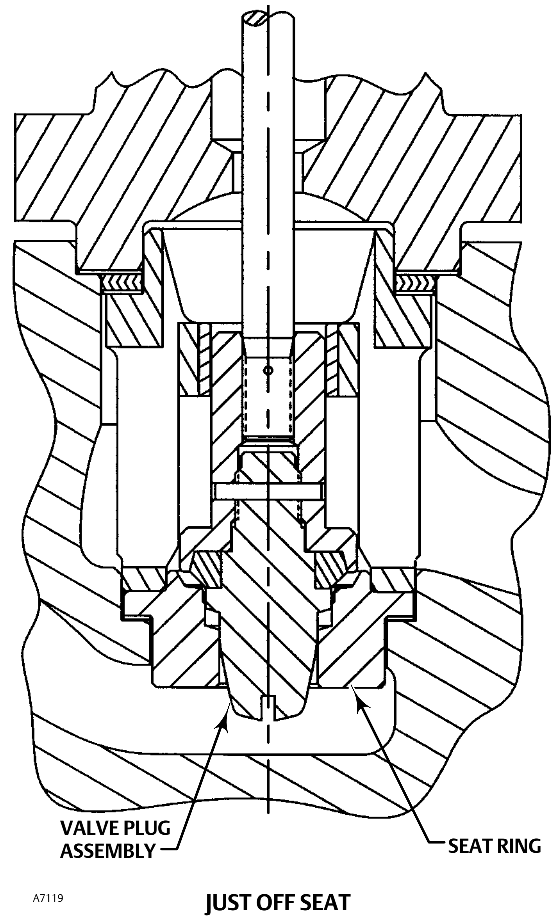


Figure 2. Fisher EZ-OVT Trim Just Off the Seat



Principle of Operation

The EZ-OVT valve trim is shown seated in figure 1. When on the seat, the primary shutoff is provided by the soft seat insert. The metal seat provides a secondary seat.

In figure 2 the trim is shown just off the seat. At this point in travel, the deadband areas are fully engaged to inhibit flow across the trim seating surfaces.

Figure 3. Fisher EZ-OVT Trim 20% Disengaged from the Seating Surface

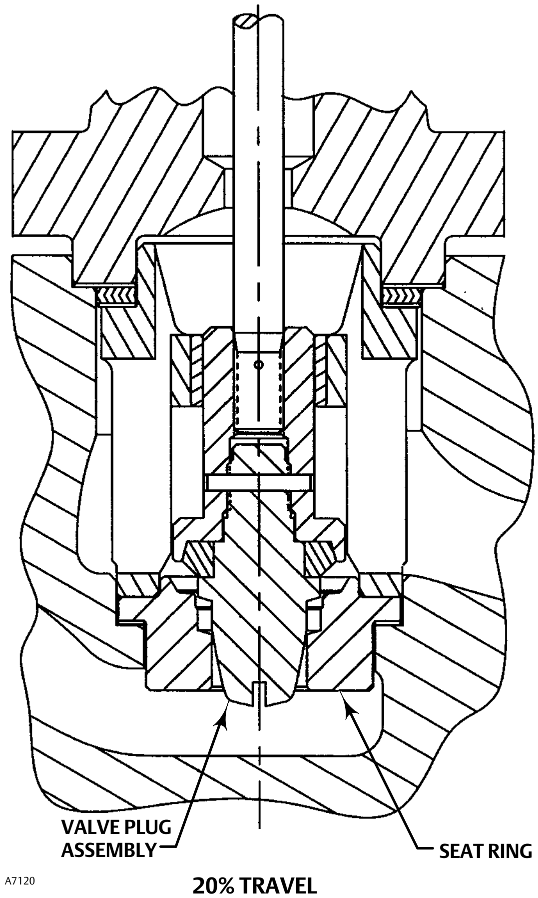
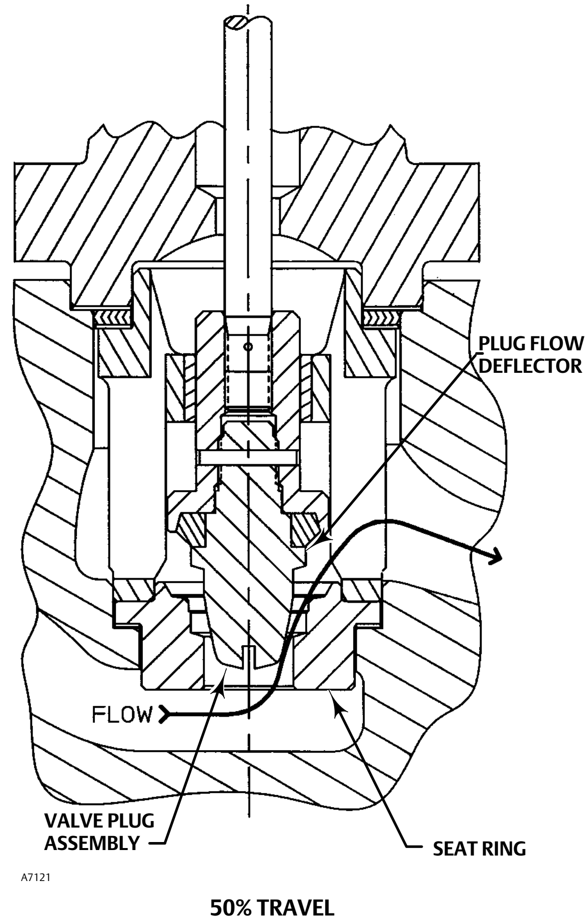


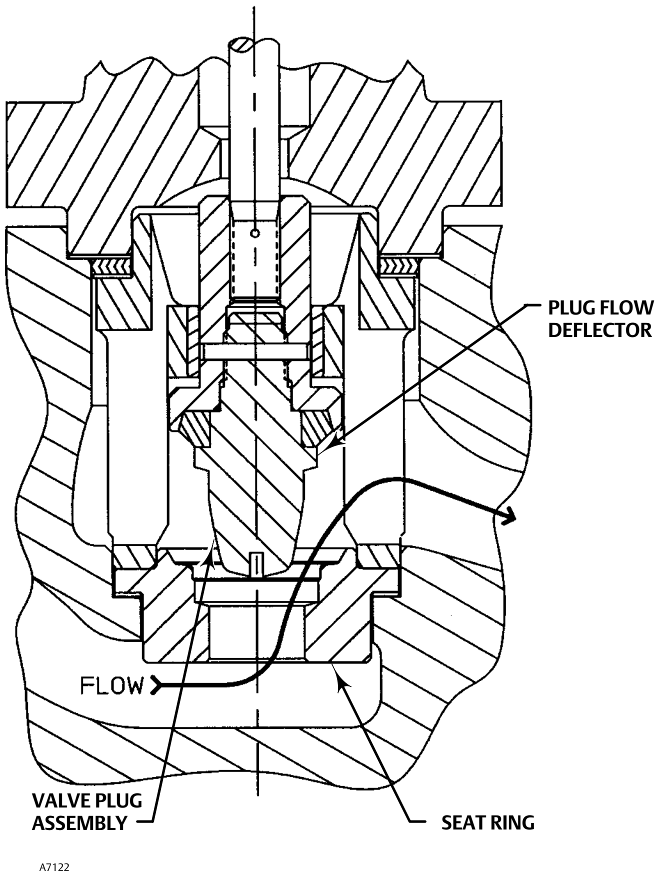
Figure 4. Fisher EZ-OVT Trim at 50% of Travel



In figure 3, the trim is shown at 20% travel. At this travel the trim is just starting to move out of the deadband areas to allow for flow.

With the seating surfaces significantly out of the flow path, the tight tolerances between the valve plug and the seat ring open enough to allow flow (see figure 4). The flow deflector directs the flow stream away from the valve plug seats.

Figure 5. Fisher EZ-OVT Trim at 100% of Travel



100% TRAVEL

The seating surface is completely removed from the flow path, enabling full flow through the trim (see figure 5). The flow deflector is continually directing the flow stream away from the valve plug seats.

Figure 6. Fisher EZ-OVT Valve Assembly

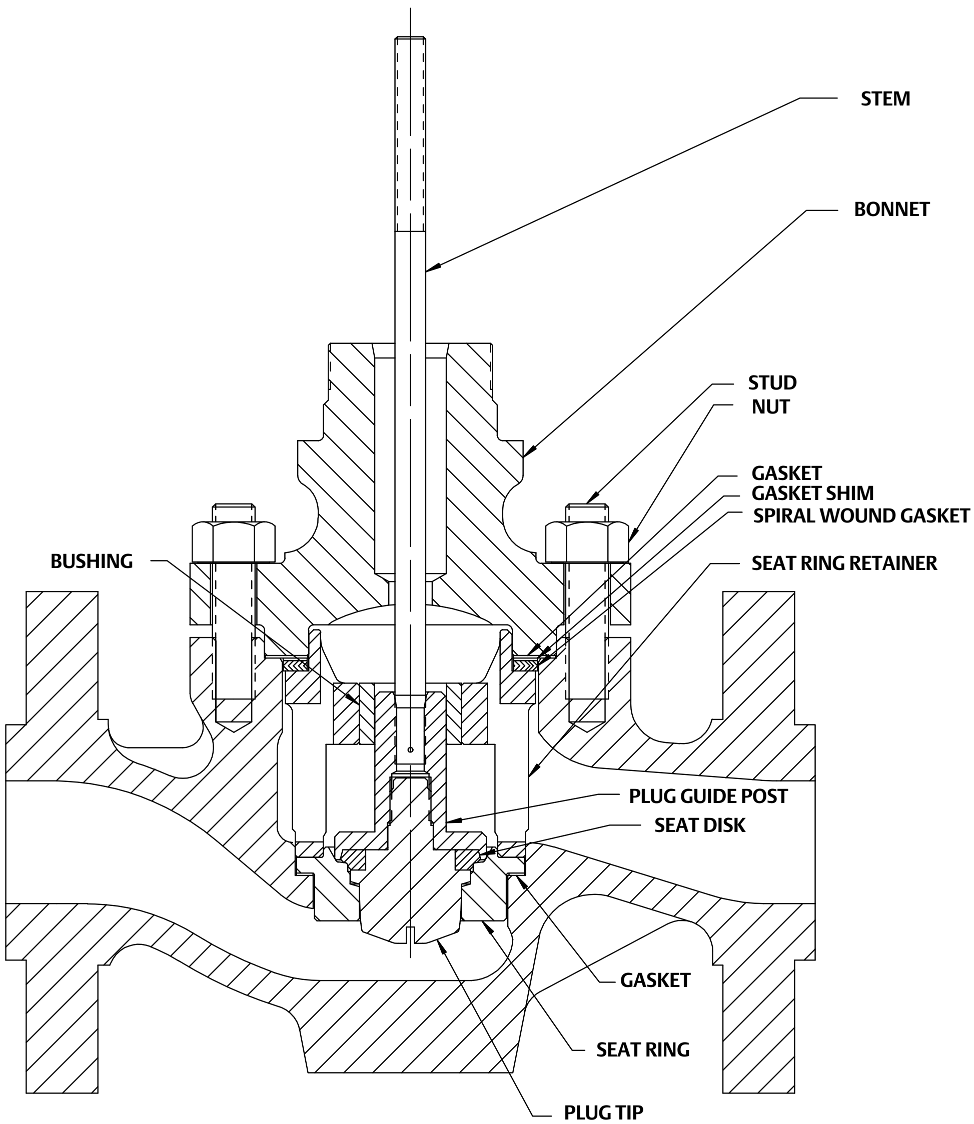


Table 1. Available Constructions

VALVE BODY SIZE		SHUTOFF PORT DIAMETER(1)		FLOWING PORT DIAMETER		TRAVEL		UNBALANCED AREA		MAX Cv
mm	NPS	mm	Inch	mm	Inch	mm	Inch	mm^2	$Inch^2$	
25	1	34.0	1.34	19.1	0.75	25.4	1	910	1.41	8.54
38.1	1-1/2	47.0	1.85	31.8	1.25	25.4	1	1736	2.69	25
50	2	53.3	2.10	38.1	1.5	25.4	1	2239	3.47	28

1. Actuator sizing should be performed using the Shutoff Port Diameter.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ FB Control Valve

Fisher FB angle valves are used with compressible fluids on special applications requiring maximum noise attenuation capability and high capacity.

Typical applications include main steam reducing valves and compressor bypass valves. FB valves are also commonly used for sour gas applications in petrochemical and gas processing plants.

Contact your Emerson sales office for more information.


W8959-3

Fisher FBT Valve with 585C Long Stroke Actuator

Features

- **Noise Attenuation —** Whisper Trim™ III or WhisperFlo™ cages used in FBD or FBT valves can reduce noise produced by high flow rates and large pressure drops.

- **Minimal Noise Regeneration —** Regeneration of valve noise is significantly reduced by reducing the outlet flow velocity with an expanded-outlet design.

- **Hung Cage Design —** The design eliminates gasketing problems caused by thermal expansion and contraction of long parts such as the cage assembly.

- **Excellent Sealing Capability —** The ENVIRO-SEAL™ or HIGH-SEAL packing system options are available. These packing systems provide excellent sealing, guiding, and loading force transmission.

- **Tight Shutoff —** A spring-loaded seal ring with PEEK anti-extrusion rings is available on FBT valves for class V shutoff up to 316°C (600°F). Bore seal is available on FBD valves for class V shutoff above 316°C (600°F).

Specifications

Available Configurations

Characteristics for FBD & FBT: Single-port, angle-style valve body with cage guiding, balanced valve plug, and push-down-to-close valve plug action
FBD: High-temperature valve with graphite piston rings, hung cage, and seat ring welded to the valve body. Used on applications with temperatures above 232°C (450°F)
FBT: Standard and low temperature design with integral cage/seat ring assembly and spring-loaded seal ring on the seat ring and valve plug. Used on applications with temperatures up to 232°C (450°F) and temperatures up to 316°C (600°F) with PEEK anti-extrusion rings

Valve Sizes

See table 1

End Connection Styles[3]

All Outlet Sizes: CL150, 300, and 600 ■ Raised-face, ■ RTJ, and ■ BWE
Outlet Sizes NPS 30 and 36: ■ Series A or B flanges available

Maximum Inlet Pressures and Temperatures[1]

Consistent with applicable ■ CL150, ■ CL300, or ■ CL600 pressure-temperature ratings per ASME B16.34

Cage Performance Levels

Whisper Trim III Cage:
0.999 $\Delta P/P_1$ maximum for levels A1 through D3

WhisperFlo Cage:
0.999$\Delta P/P_1$ maximum for levels X, Y, and Z

Maximum Pressure Drops[1]

Valve bodies and trims capable of full rated pressure drop

Temperature Capability

Piston Rings, Plug Seals, Gaskets, and Packing: See table 3
Trim: See table 4

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

FBD: ■ Standard Class II, ■ Optional--Class IV, with multiple piston rings, and ■ Optional--Class V with Bore Seal trim (contact your Emerson sales office for additional information)
FBT: ■ Standard--Class IV ■ Optional--Class V
Also see table 3

Construction Materials

Valve, Bonnet, Stem and Other Metal Parts: See table 2
Piston Rings and Plug Seals, Gaskets, and Packing: See table 3
Trim: See table 4

Flow Characteristic

Whisper Trim III Levels A, B, C and D: Linear
WhisperFlo Levels X, Y, and Z: Linear

Flow Direction

Flow up

Flow Coefficients and Valve Plug Travel

See Catalog 12

Port Diameters

See table 1

Valve Plug Stem and Yoke Boss Diameters

See table 1

Typical Actuators

Pneumatic Piston: ■ 585C, ■ 585CLS, and ■ 685
Diaphragm: ■ 657, ■ 667, and ■ 3025

Valve Dimensions and Approximate Weights

See figure 2 and tables 6, 7, 8, 9, and 10

Options

■ Special constructions with the inlet designed for higher pressure or valve class rating than the outlet are also available, ■ ENVIRO-SEAL and HIGH-SEAL packing system: See Fisher Bulletin 59.1:061 (D101633X012) for more information (retrofit kits are available for valve in service), ■ Packing box leak-off connection, ■ Packing lubricator or ■ lubricator/isolating valve, and ■ Special end connections available upon request

1. None of the pressure/temperature limits in this bulletin nor any ASME standard limitations should be exceeded.
2. Level A3 is not available in NPS 30 and 36 outlet sizes.
3. Series A and B flanges are available on sizes over NPS 24. Please specify Series A or B when ordering.

Table 1. Fisher FBD or FBT Valve Body Sizes and Trim Information

<table>
<tr><th rowspan="3">VALVE SIZE, INLET AND OUTLET, NPS</th><th colspan="3">Whisper Trim III Level A, B, and C Cages</th><th colspan="3">Whisper Trim III Level D Cage</th><th colspan="3">WhisperFlo Trim</th><th colspan="2" rowspan="2">STEM DIAMETER</th><th colspan="2" rowspan="2">YOKE BOSS DIAMETER</th></tr>
<tr><th colspan="2">Port Diameter</th><th>Unbalanced Area</th><th colspan="2">Port Diameter</th><th>Unbalanced Area</th><th colspan="2">Port Diameter</th><th>Unbalanced Area</th></tr>
<tr><th>mm</th><th>Inch</th><th>Inch^2</th><th>mm</th><th>Inch</th><th>Inch^2</th><th>mm</th><th>Inch</th><th>Inch^2</th><th>mm</th><th>Inch</th><th>mm</th><th>Inch</th></tr>
<tr><td>8 x 12
10 x 12</td><td>171</td><td>6.75</td><td>0.24</td><td>132</td><td>5.1875</td><td>0.19</td><td>178</td><td>7</td><td>0.24</td><td>25.4</td><td>1</td><td rowspan="5">127</td><td rowspan="5">5 & 5H</td></tr>
<tr><td>10 x 16
12 x 16
16 x 16</td><td>197</td><td>7.75</td><td>0.28</td><td>171</td><td>6.75</td><td>0.24</td><td>178</td><td>7</td><td>0.24</td><td rowspan="4">31.8</td><td rowspan="4">1-1/4</td></tr>
<tr><td>12 x 18
16 x 18</td><td>252</td><td>9.9375</td><td>0.35</td><td>197</td><td>7.75</td><td>0.28</td><td>178</td><td>7</td><td>0.24</td></tr>
<tr><td>10 x 20
12 x 20
16 x 20
20 x 20</td><td>275</td><td>10.8125</td><td>0.38</td><td>224</td><td>8.8125</td><td>0.31</td><td>279</td><td>11</td><td>0.38</td></tr>
<tr><td>12 x 24
16 x 24
18 x 24
20 x 24
24 x 24</td><td>352</td><td>13.875</td><td>0.49</td><td>275</td><td>10.8125</td><td>0.38</td><td>375</td><td>14.75</td><td>0.51</td></tr>
<tr><td>16 x 30
20 x 30
24 x 30
30 x 30</td><td>430</td><td>16.9375</td><td>0.59</td><td>378</td><td>14.875</td><td>0.52</td><td>464</td><td>18.25</td><td>0.63</td><td rowspan="2">50.8</td><td rowspan="2">2</td><td rowspan="2">178</td><td rowspan="2">7</td></tr>
<tr><td>20 x 36
24 x 36
30 x 36
36 x 36</td><td>506</td><td>19.9375</td><td>0.69</td><td>430</td><td>16.9375</td><td>0.59</td><td>464</td><td>18.25</td><td>0.63</td></tr>
</table>

Bore Seal Description

The Bore Seal is available for the FBD only and is required for Class V shutoff applications where the service temperature exceeds 316°C (600°F). For service temperatures below 316°C (600°F) the FBT should be used when Class V shutoff is required. This trim can only be used with trim 234, see table 3 and 4 for temperature limits.

The Bore Seal employs a metal C-shaped seal ring that is secured to the outside diameter of the valve plug.

When the valve plug comes into contact with the seat ring, to close the valve, the Bore Seal is compressed against the cage wall blocking a secondary leakage path that exists between the plug and cage wall.

When the valve plug is not in contact with the seat ring (i.e. valve open) the Bore Seal is not engaged and the piston rings that are also secured to the outside diameter of the plug assume the role of blocking this secondary leakage path.

Contents

Table 2. Valve Body and Bonnet Construction Materials (see tables 3 and 4 for other parts)
(See figure 1 for parts identification)

PART	STANDARD			OPTIONAL		
	Valve Body	Bonnet	Flanges & Head	Valve Body	Bonnet	Flanges & Head
Valve Body, Bonnet, Flanges and Head	WPC	WCC	(SA105)(1)	WP22	WC9	F22
				WPL6	LCC	LF2
				304L	CF3	304L
				316L	CF3M	316L
				316	CF8M	316
Valve Stem	25.4 and 31.8 mm (1 and 1-1/4 inch) stems--S20910 50.8 mm (2-inch) stems--S20910			- - -		
Packing Box Follower, Spring(2), Washer, and Lantern Ring(2)	316 stainless steel			- - -		
Piston and Seal Rings	See table 3			See table 3		
Gaskets and Packing	See table 3			See table 3		
Trim	See table 4			See table 4		

1. For pressure-temperature ratings, reference the pressure-temperature ratings for SA-105.
2. The spring is used with single PTFE V-ring packing only. The lantern ring replaces the spring for other packing.

Figure 1. Fisher FBT Valve Body Showing Internal Construction

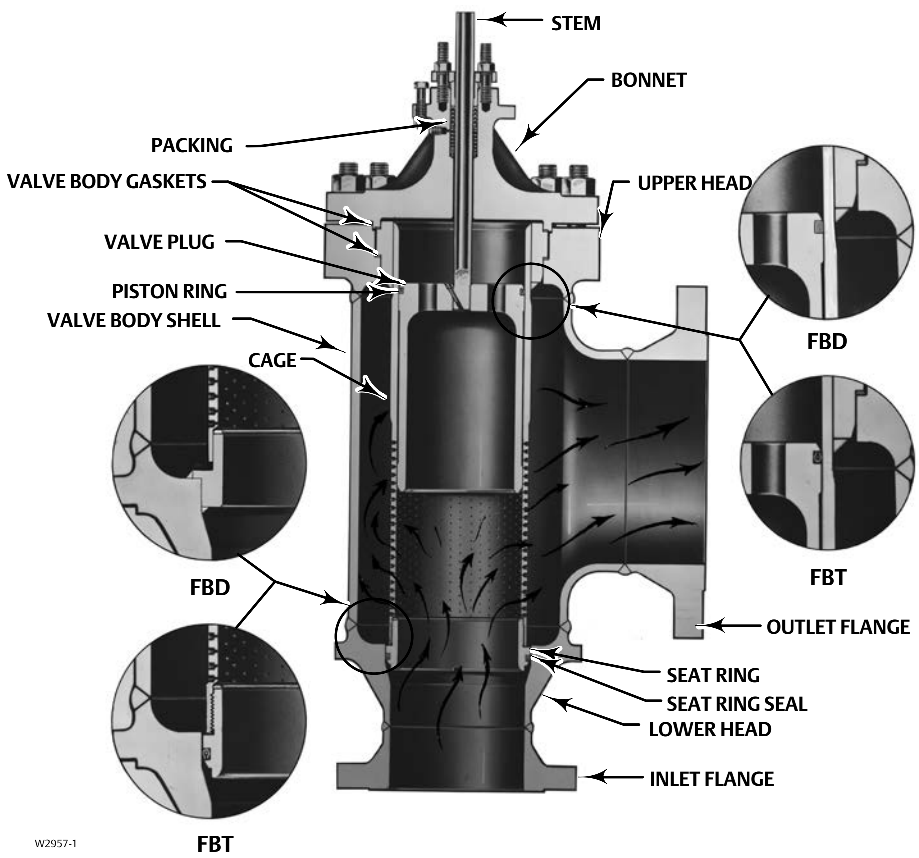


Table 3. Construction Materials for Piston Ring, Plug Seal, Packing, and Gaskets

PART		STANDARD		OPTIONAL	
		Material	Temperature	Material	Temperature
FBD Piston Ring	Material	Graphite	−46 to 593°C (−50 to 1100°F)	Bore Seal(3) N07718	316 to 593°C (600 to 1100°F)
	Shutoff Class	II is standard; IV(1) is optional	- - -	Class V	- - -
FBT Plug Seal	Material	N10276/Glass and Moly-filled PTFE	−29 to 232°C (−20 to 450°F)	Carbon-Filled PTFE w/ PEEK anti-extrusion rings	232 to 316°C (450 to 600°F)
	Shutoff Class	IV is standard; V is optional	- - -	Standard Class V	- - -
Packing		Spring-Loaded PTFE V-Ring	−40 to 232°C (−40 to 450°F)	PTFE/Composition	−73 to 232°C (−100 to 450°F)
				Graphite Ribbon/Filament	−198 to 593°C(2) (−325 to 1100°F)(2)
				ENVIRO-SEAL or HIGH-SEAL Packing System	See the separate ENVIRO-SEAL and HIGH-SEAL Product Bulletin
Gaskets		N04400, or silver-plated N04400	−254 to 593°C (−425 to 1100°F)	Tin-plated N04400 for sour gas service	−29 to 149°C (−20 to 300°F)

1. Class IV with multiple piston rings only.
2. To 371°C (700°F) with oxidizing service.
3. Available for use with trim 234 only.

Table 4. Whisper Trim III Trim Materials and Temperatures

TRIM DESIG-NATION	TRIM MATERIAL				VALVE BODY MATERIAL							
	Plug	Cage	Seat Ring	Baffle	WPC (SA234-WPC)		316L SST (SA403-WP316L) 316 SST (SA403-WP316) 304L SST (SA403-WP304L)		WPL6 (SA420-WPL6)		WP22 (SA243-WP22)	
					Trim Temperature, °C (°F)							
					Min	Max	Min	Max	Min	Max	Min	Max
230	CF8M w/ CoCr-A seat and guide	S17400 H1075 (CB-7Cu-1 H1075)	CF8M w/ CoCr-A on seat	Carbon steel	-29 (−20)	427 (800)	-62 (-80)	427 (800)	-46 (−50)	343 (650)	-29 (−20)	427 (800)
232(2)	CF8M w/ CoCr-A seat and guide	CF8M/ ENC(1)	CF8M w/ CoCr-A on seat	18-8 stainless steel	-29 (−20)	343 (650)	-198 (−325)	343 (650)	-46 (−50)	343 (650)	-29 (−20)	343 (650)
234	WC9 or F22 steel with CoCr-A seat seat and guide	WC9 steel/ nitrided	F22 with CoCr-A seat	Cr-Mo steel	-29 (−20)	427 (800)	- - -	- - -	- - -	- - -	-29 (−20)	593 (1100)

1. Electroless nickel coated.
2. Meets the metallurgical requirements of NACE MR0175-2002, NACE MR0103 and NACE MR0175/ISO 15156. Environmental restrictions apply for MR0175/ISO15156.

Table 5. WhisperFlo Metal Trim Materials and Valve Body/Trim Temperature Capabilities

TRIM DESIG-NATION	TRIM MATERIAL			VALVE BODY MATERIAL							
	Plug	Cage	Seat Ring	WPC (SA234-WPC)		316L SST (SA403-WP316L) 316 SST (SA403-WP316) 304L SST (SA403-WP304L)		WPL6 (SA420-WPL6)		WP22 (SA243-WP22)	
				Trim Temperature, °C (°F)							
				Min	Max	Min	Max	Min	Max	Min	Max
952	CA6NM HT	410 SST	CF8M with CoCr-A on seat	-29 (−20)	427 (800)	-29 (−20)	427 (800)	-29 (−20)	343 (650)	-29 (−20)	427 (800)
953(1)	CF8M with CoCr-A on Seat and Guide	316 SST / (Chrome coat)	CF8M with CoCr-A on seat	-29 (−20)	427 (800)	-198 (−325)	(2)	-46 (−50)	343 (650)	-29 (−20)	427 (800)

1. Meets the metallurgical requirements of NACE MR0175-2002, NACE MR0103 and NACE MR0175/ISO 15156. Environmental restrictions apply for MR0175/ISO15156.
2. 316L maximum temperature is 454°C (850°F), 316 maximum temperature is 538°C (1000°F), 304L maximum temperature is 427°C (800°F),

Table 6. Fisher FBT and FBD Approximate Weights

VALVE SIZE (NPS) INLET X OUTLET	VALVE AND BONNET ASSEMBLY					
	Pressure Rating(1)					
	CL150		CL300		CL600	
	Approximate Weight		Approximate Weight		Approximate Weight	
	kg	lb	kg	lb	kg	lb
8 X 12	416	925	509	1130	509	1130
10 X 12	421	935	526	1170	545	1210
10 X 16	612	1360	801	1780	1125	2500
12 X 16	619	1375	810	1800	1148	2550
16 X 16	666	1480	761	1690	1260	2800
12 X 18	810	1800	1071	2380	1496	3325
16 X 18	833	1850	1112	2470	1609	3575
10 X 20	1060	2355	1418	3150	1980	4400
12 X 20	1013	2250	1373	3050	1901	4225
16 X 20	1037	2305	1395	3100	2009	4465
20 X 20	1062	2360	1418	3150	2104	4675
12 X 24	1575	3500	2070	4600	2894	6430
16 X 24	1564	3475	2106	4680	3011	6690
18 X 24	1575	3500	2115	4700	3060	6800
20 X 24	1589	3530	2129	4730	3105	6900
24 X 24	1620	3600	2160	4800	3231	7180
16 X 30	2610	5800	3330	7400	---	---
20 X 30	2651	5890	3357	7460	---	---
24 X 30	2684	5965	3420	7600	---	---
30 X 30	2745	6100	3555	7900	---	---
20 X 36	3848	8500	4928	10950	---	---
24 X 36	3897	8660	4995	11100	---	---
30 X 36	4019	8860	5130	11400	---	---
36 X 36	4100	9110	5400	12000	---	---

1. Pressure rating for all sizes through NPS 24 outlet. NPS 30 and 36 outlets conform to MSS SP-44. Dimensions and weights and or buttwelding-end valves are available on request.

Figure 2. Fisher FBD and FBT Flanged Valve Body Dimensions (also see tables 7, 8, 9, and 10)

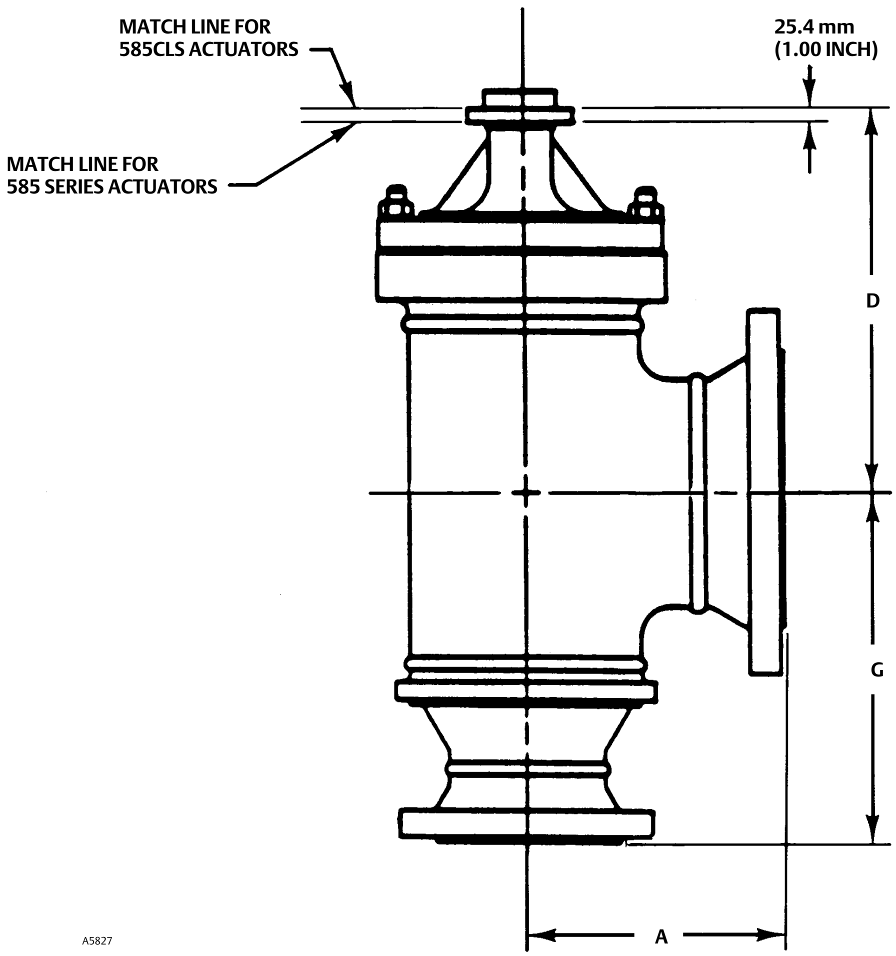


Table 7. Fisher FBT CL150 Face-to-Face Dimensions (also see figure 2)(2)

<table>
<tr><th colspan="9">CL150 FLANGED</th></tr>
<tr><th rowspan="4">Valve Size, NPS Inlet x Outlet</th><th colspan="8">Dimensions</th></tr>
<tr><th colspan="2">G</th><th colspan="2">A</th><th colspan="4">D</th></tr>
<tr><th rowspan="2">Inches</th><th rowspan="2">mm</th><th rowspan="2">Inches</th><th rowspan="2">mm</th><th colspan="2">Whisper Trim III</th><th colspan="2">WhisperFlo Trim</th></tr>
<tr><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th></tr>
<tr><td>8X12</td><td colspan="2">(1)</td><td rowspan="2">14.50</td><td rowspan="2">368</td><td colspan="4">(1)</td></tr>
<tr><td>10X12</td><td colspan="2">(1)</td><td colspan="4">(1)</td></tr>
<tr><td>10X16</td><td colspan="2">(1)</td><td rowspan="3">17.00</td><td rowspan="3">432</td><td colspan="4">(1)</td></tr>
<tr><td>12X16</td><td colspan="2">(1)</td><td colspan="4">(1)</td></tr>
<tr><td>16X16</td><td colspan="2">(1)</td><td colspan="4">(1)</td></tr>
<tr><td>12X18</td><td colspan="2">(1)</td><td rowspan="2">19.00</td><td rowspan="2">483</td><td colspan="4">(1)</td></tr>
<tr><td>16X18</td><td colspan="2">(1)</td><td colspan="4">(1)</td></tr>
<tr><td>10X20</td><td colspan="2">(1)</td><td rowspan="4">20.68</td><td rowspan="4">525</td><td rowspan="4">30.41</td><td rowspan="4">772</td><td rowspan="4">30.41</td><td rowspan="4">772</td></tr>
<tr><td>12X20</td><td>27.5</td><td>699</td></tr>
<tr><td>16X20</td><td>25.81</td><td>656</td></tr>
<tr><td>20X20</td><td colspan="2">(1)</td></tr>
<tr><td>12X24</td><td>30.5</td><td>775</td><td rowspan="5">23</td><td rowspan="5">584</td><td rowspan="5">33.46</td><td rowspan="5">850</td><td rowspan="5">32.44</td><td rowspan="5">824</td></tr>
<tr><td>16X24</td><td>30.63</td><td>778</td></tr>
<tr><td>18X24</td><td>29.76</td><td>756</td></tr>
<tr><td>20X24</td><td>28.68</td><td>728</td></tr>
<tr><td>24X24</td><td>29</td><td>737</td></tr>
<tr><td>16X30 (A)</td><td colspan="2">(1)</td><td rowspan="4">27.38</td><td rowspan="4">695</td><td rowspan="4">38.47</td><td rowspan="4">977</td><td colspan="2">(1)</td></tr>
<tr><td>20X30 (A)</td><td>38.44</td><td>976</td><td colspan="2">(1)</td></tr>
<tr><td>24X30 (A)</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>30X30 (A)</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>16X30 (B)</td><td colspan="2">(1)</td><td rowspan="4">25.94</td><td rowspan="4">659</td><td rowspan="4">38.47</td><td rowspan="4">977</td><td rowspan="4">38.47</td><td rowspan="4">977</td></tr>
<tr><td>20X30 (B)</td><td>37.44</td><td>951</td></tr>
<tr><td>24X30 (B)</td><td colspan="2">(1)</td></tr>
<tr><td>30X30 (B)</td><td colspan="2">(1)</td></tr>
<tr><td>20X36 (A)</td><td colspan="8">(1)</td></tr>
<tr><td>24X36 (A)</td><td colspan="8">(1)</td></tr>
<tr><td>30X36 (A)</td><td colspan="8">(1)</td></tr>
<tr><td>36X36 (A)</td><td colspan="8">(1)</td></tr>
<tr><td>20X36 (B)</td><td colspan="2">(1)</td><td rowspan="4">31.12</td><td rowspan="4">790</td><td rowspan="4">43.22</td><td rowspan="4">1098</td><td rowspan="4">43.22</td><td rowspan="4">1098</td></tr>
<tr><td>24X36 (B)</td><td>44</td><td>1118</td></tr>
<tr><td>30X36 (B)</td><td colspan="2">(1)</td></tr>
<tr><td>36X36 (B)</td><td colspan="2">(1)</td></tr>
</table>

1. Please contact your Emerson sales office for additional information.
2. For FBD face-to-face dimensions, please contact your Emerson sales office for additional information.
(A) DENOTES ASME B16.47 SERIES A FLANGE(S)
(B) DENOTES ASME B16.47 SERIES B FLANGE(S)

Table 8. Fisher FBT CL300 Face-to-Face Dimensions (also see figure 2)[2]

<table>
<tr><th colspan="9">CL300 FLANGED</th></tr>
<tr><th rowspan="4">Valve Size, NPS Inlet x Outlet</th><th colspan="8">Dimensions</th></tr>
<tr><th colspan="2">G</th><th colspan="2">A</th><th colspan="4">D</th></tr>
<tr><th rowspan="2">Inches</th><th rowspan="2">mm</th><th rowspan="2">Inches</th><th rowspan="2">mm</th><th colspan="2">Whisper Trim III</th><th colspan="2">WhisperFlo Trim</th></tr>
<tr><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th></tr>
<tr><td>8X12</td><td>20.76</td><td>527</td><td colspan="2">(1)</td><td rowspan="2">20.87</td><td rowspan="2">530</td><td rowspan="2">(1)</td><td rowspan="2">(1)</td></tr>
<tr><td>10X12</td><td colspan="4">(1)</td></tr>
<tr><td>10X16</td><td colspan="2">(1)</td><td rowspan="3">17.75</td><td rowspan="3">451</td><td colspan="4">(1)</td></tr>
<tr><td>12X16</td><td colspan="2">(1)</td><td colspan="4">(1)</td></tr>
<tr><td>16X16</td><td colspan="2">(1)</td><td colspan="4">(1)</td></tr>
<tr><td>12X18</td><td colspan="2">(1)</td><td rowspan="2">19.75</td><td rowspan="2">502</td><td colspan="4">(1)</td></tr>
<tr><td>16X18</td><td colspan="2">(1)</td><td colspan="4">(1)</td></tr>
<tr><td>10X20</td><td>27.62</td><td>702</td><td rowspan="4">21.38</td><td rowspan="4">543</td><td rowspan="4">30.58</td><td rowspan="4">777</td><td rowspan="4" colspan="2">(1)</td></tr>
<tr><td>12X20</td><td>28.12</td><td>714</td></tr>
<tr><td>16X20</td><td colspan="2">(1)</td></tr>
<tr><td>20X20</td><td colspan="2">(1)</td></tr>
<tr><td>12X24</td><td>31.92</td><td>811</td><td rowspan="5">23.63</td><td rowspan="5">600</td><td rowspan="5">33.46</td><td rowspan="5">850</td><td rowspan="5">32.44</td><td rowspan="5">824</td></tr>
<tr><td>16X24</td><td>31.38</td><td>797</td></tr>
<tr><td>18X24</td><td>30.5</td><td>775</td></tr>
<tr><td>20X24</td><td>29.38</td><td>746</td></tr>
<tr><td>24X24</td><td>29.63</td><td>753</td></tr>
<tr><td>16X30 (A)</td><td colspan="6">(1)</td><td rowspan="4">38.97</td><td rowspan="4">990</td></tr>
<tr><td>20X30 (A)</td><td colspan="6">(1)</td></tr>
<tr><td>24X30 (A)</td><td colspan="6">(1)</td></tr>
<tr><td>30X30 (A)</td><td colspan="6">(1)</td></tr>
<tr><td>16X30 (B)</td><td colspan="2">(1)</td><td rowspan="4">28.22</td><td rowspan="4">717</td><td rowspan="4">39.97</td><td rowspan="4">1015</td><td rowspan="4">38.97</td><td rowspan="4">990</td></tr>
<tr><td>20X30 (B)</td><td colspan="2">(1)</td></tr>
<tr><td>24X30 (B)</td><td colspan="2">(1)</td></tr>
<tr><td>30X30 (B)</td><td colspan="2">(1)</td></tr>
<tr><td>20X36 (A)</td><td colspan="2">(1)</td><td rowspan="4">36</td><td rowspan="4">914</td><td rowspan="4">43.97</td><td rowspan="4">1117</td><td rowspan="4">43.97</td><td rowspan="4">1117</td></tr>
<tr><td>24X36 (A)</td><td>44.63</td><td>1134</td></tr>
<tr><td>30X36 (A)</td><td colspan="2">(1)</td></tr>
<tr><td>36X36 (A)</td><td colspan="2">(1)</td></tr>
<tr><td>20X36 (B)</td><td colspan="2">(1)</td><td rowspan="4">33.62</td><td rowspan="4">854</td><td rowspan="4">43.97</td><td rowspan="4">1117</td><td rowspan="4">43.97</td><td rowspan="4">1117</td></tr>
<tr><td>24X36 (B)</td><td>44.75</td><td>1137</td></tr>
<tr><td>30X36 (B)</td><td colspan="2">(1)</td></tr>
<tr><td>36X36 (B)</td><td colspan="2">(1)</td></tr>
</table>

1. Please contact your Emerson sales office for additional information.
2. For FBD face-to-face dimension, please contact your Emerson Automation Solutions sales office for additional information.
(A) DENOTES ASME B16.47 SERIES A FLANGE(S)
(B) DENOTES ASME B16.47 SERIES B FLANGE(S)

Table 9. Fisher FBT CL600 with Whisper Trim III, Face-to-Face Dimensions (also see figure 2)(2)

<table>
<tr><th colspan="7">CL600 FLANGED WITH Whisper Trim III</th></tr>
<tr><th rowspan="2">Valve Size, NPS</th><th colspan="6">Dimensions</th></tr>
<tr><th colspan="2">G</th><th colspan="2">A</th><th colspan="2">D</th></tr>
<tr><th>Inlet x Outlet</th><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th></tr>
<tr><td>8X12</td><td colspan="2">(1)</td><td rowspan="2">16.37</td><td rowspan="2">416</td><td colspan="2">(1)</td></tr>
<tr><td>10X12</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>10X16</td><td>25.10</td><td>638</td><td colspan="2">(1)</td><td rowspan="3">23.5</td><td rowspan="3">597</td></tr>
<tr><td>12X16</td><td>24.37</td><td>619</td><td colspan="2">(1)</td></tr>
<tr><td>16X16</td><td colspan="4">(1)</td></tr>
<tr><td>12X18</td><td>30.99</td><td>787</td><td rowspan="2">21.00</td><td rowspan="2">533</td><td colspan="2">(1)</td></tr>
<tr><td>16X18</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>10X20</td><td colspan="2">(1)</td><td rowspan="4">22.75</td><td rowspan="4">578</td><td rowspan="4">30.17</td><td rowspan="4">766</td></tr>
<tr><td>12X20</td><td>32.56</td><td>827</td></tr>
<tr><td>16X20</td><td>28.13</td><td>715</td></tr>
<tr><td>20X20</td><td colspan="2">(1)</td></tr>
<tr><td>12X24</td><td>33.87</td><td>860</td><td rowspan="5">25.25</td><td rowspan="5">641</td><td rowspan="5">33.34</td><td rowspan="5">847</td></tr>
<tr><td>16X24</td><td>33.25</td><td>845</td></tr>
<tr><td>18X24</td><td>33.5</td><td>851</td></tr>
<tr><td>20X24</td><td>31.75</td><td>806</td></tr>
<tr><td>24X24</td><td>32.76</td><td>832</td></tr>
<tr><td>16X30 (A)</td><td colspan="2">(1)</td><td rowspan="4">32.00</td><td rowspan="4">813</td><td rowspan="4">38.53</td><td rowspan="4">979</td></tr>
<tr><td>20X30 (A)</td><td colspan="2">(1)</td></tr>
<tr><td>24X30 (A)</td><td>40.00</td><td>1016</td></tr>
<tr><td>30X30 (A)</td><td colspan="2">(1)</td></tr>
<tr><td>16X30 (B)</td><td colspan="2">(1)</td><td rowspan="4">30.31</td><td rowspan="4">770</td><td colspan="2">(1)</td></tr>
<tr><td>20X30 (B)</td><td>39.5</td><td>1003</td><td colspan="2">(1)</td></tr>
<tr><td>24X30 (B)</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>30X30 (B)</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>20X36 (A)</td><td colspan="6">(1)</td></tr>
<tr><td>24X36 (A)</td><td>46.25</td><td>1175</td><td colspan="4">(1)</td></tr>
<tr><td>30X36 (A)</td><td colspan="6">(1)</td></tr>
<tr><td>36X36 (A)</td><td colspan="6">(1)</td></tr>
<tr><td>20X36 (B)</td><td colspan="2">(1)</td><td rowspan="4">36.31</td><td rowspan="4">922</td><td colspan="2">(1)</td></tr>
<tr><td>24X36 (B)</td><td>46.25</td><td>1175</td><td colspan="2">(1)</td></tr>
<tr><td>30X36 (B)</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>36X36 (B)</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td colspan="7">1. Please contact your Emerson sales office for additional information.
2. For FBD face-to-face dimension, please contact your Emerson sales office for additional information.
(A) DENOTES ASME B16.47 SERIES A FLANGE(S)
(B) DENOTES ASME B16.47 SERIES B FLANGE(S)</td></tr>
</table>

Table 10. Fisher FBT CL600 with WhisperFlo Trim, Face-to-Face Dimensions (also see figure 2)[2]

<table>
<tr><th colspan="7">CL600 FLANGED WITH WhisperFlo TRIM</th></tr>
<tr><th rowspan="2">Valve Size, NPS</th><th colspan="6">Dimensions</th></tr>
<tr><th colspan="2">G</th><th colspan="2">A</th><th colspan="2">D</th></tr>
<tr><th>Inlet x Outlet</th><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th></tr>
<tr><td>8X12</td><td colspan="6">(1)</td></tr>
<tr><td>10X12</td><td colspan="6">(1)</td></tr>
<tr><td>10X16</td><td>25.10</td><td>638</td><td rowspan="3">19.25</td><td rowspan="3">489</td><td colspan="2">(1)</td></tr>
<tr><td>12X16</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>16X16</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>12X18</td><td>30.99</td><td>787</td><td rowspan="2">21.00</td><td rowspan="2">533</td><td colspan="2">(1)</td></tr>
<tr><td>16X18</td><td colspan="2">(1)</td><td colspan="2">(1)</td></tr>
<tr><td>10X20</td><td colspan="2">(1)</td><td rowspan="4">22.75</td><td rowspan="4">578</td><td rowspan="4">30.17</td><td rowspan="4">766</td></tr>
<tr><td>12X20</td><td>32.56</td><td>827</td></tr>
<tr><td>16X20</td><td colspan="2">(1)</td></tr>
<tr><td>20X20</td><td colspan="2">(1)</td></tr>
<tr><td>12X24</td><td>36.37</td><td>924</td><td rowspan="5">27.25</td><td rowspan="5">692</td><td rowspan="5">34.81</td><td rowspan="5">884</td></tr>
<tr><td>16X24</td><td>35.75</td><td>908</td></tr>
<tr><td>18X24</td><td>36</td><td>914</td></tr>
<tr><td>20X24</td><td>34.25</td><td>870</td></tr>
<tr><td>24X24</td><td>35.26</td><td>896</td></tr>
<tr><td>16X30 (A)</td><td colspan="2">(1)</td><td rowspan="4">32.00</td><td rowspan="4">813</td><td rowspan="4">38.53</td><td rowspan="4">979</td></tr>
<tr><td>20X30 (A)</td><td colspan="2">(1)</td></tr>
<tr><td>24X30 (A)</td><td>40.00</td><td>1016</td></tr>
<tr><td>30X30 (A)</td><td colspan="2">(1)</td></tr>
<tr><td>16X30 (B)</td><td colspan="6">(1)</td></tr>
<tr><td>20X30 (B)</td><td colspan="6">(1)</td></tr>
<tr><td>24X30 (B)</td><td colspan="6">(1)</td></tr>
<tr><td>30X30 (B)</td><td colspan="6">(1)</td></tr>
<tr><td>20X36 (A)</td><td colspan="6">(1)</td></tr>
<tr><td>24X36 (A)</td><td>46.25</td><td>1175</td><td colspan="4">(1)</td></tr>
<tr><td>30X36 (A)</td><td colspan="6">(1)</td></tr>
<tr><td>36X36 (A)</td><td colspan="6">(1)</td></tr>
<tr><td>20X36 (B)</td><td colspan="6">(1)</td></tr>
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<tr><td>30X36 (B)</td><td colspan="6">(1)</td></tr>
<tr><td>36X36 (B)</td><td colspan="6">(1)</td></tr>
</table>

1. Please contact your Emerson sales office for additional information.
2. For FBD face-to-face dimension, please contact your Emerson sales office for additional information.
(A) DENOTES ASME B16.47 SERIES A FLANGE(S)
(B) DENOTES ASME B16.47 SERIES B FLANGE(S)

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ GX Control Valve and Actuator System

The Fisher GX is a compact, state-of-the-art control valve and actuator system, designed to control a wide range of process liquids, gases, and vapors.

The GX is rugged, reliable, and easy to select. It requires no actuator sizing -- the actuator selection is automatic once the valve body construction is selected.

The optimized design results in reduced complexity and parts count. As a result, the cost of maintenance is reduced.

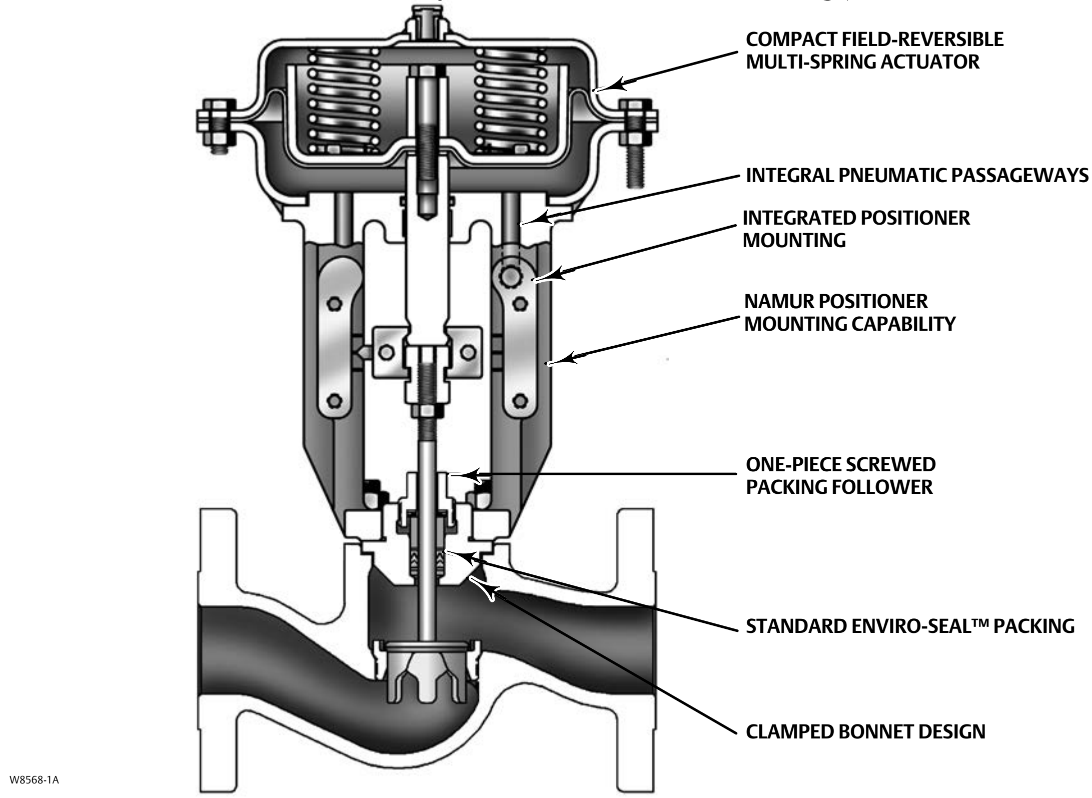
The GX meets the requirements of both EN and ASME standards. It is available with a complete accessory package, including the Fisher FIELDVUE™ DVC2000 and DVC6200 integrated digital valve controllers.

W8861-2
Fisher GX Control Valve, Actuator, and FIELDVUE DVC2000 Digital Valve Controller

Features

- Easy to size and select
- No actuator sizing required--selection is automatic
- Optimized actuator allows for a wide range of air supply
- Engineered for easy maintenance
- Maximum part commonality across sizes
- Replaceable trim
- Low lifetime costs
- Robust, low-profile design
- Compact multi-spring pneumatic actuator
- Available with integrated, easy-to-calibrate DVC2000 or DVC6200 digital valve controller
- Valve body sizes DN 15 to DN 150 (NPS 1/2 through 6)
- Pressure Classes PN 10-40, CL150 and 300
- High capacity design
- Valve body flow passage optimized for flow stability
- Full range of materials, including alloys
- Shutoff capabilities: Class IV, V, and VI
- Rangeability of 50:1 (equal percentage)
- Optional metal bellows seal
- ISO 5210 F7 mounting available for use with electric actuators

Figure 1. Fisher GX Control Valve Assembly with Port-Guided Contoured Plug (Port Sizes 36 to 136 mm)



Optimized valve and actuator system—Product simplicity and ease of selection form the foundation of the GX. Mounted with a digital or analog positioner, the GX provides high performance control across a wide range of process applications.

Compact actuator design—The GX utilizes a compact, multi-spring actuator. The GX design has been optimized to eliminate complicated actuator sizing procedures - once the valve body, port size, and air supply pressure are selected, the actuator size is fixed.

Modular design—The design architecture has been optimized to maximize the use of common parts across sizes. The actuator stem and stem connector are used across all GX sizes. The GX actuator uses a total of 5 different springs across all valve sizes. These spring sets have been optimized to allow for maximum application coverage. The plug/stem assemblies and ENVIRO-SEAL packing sets are common across several sizes, as well.

Contents

Figure 2. Fisher GX and DVC2000 Digital Valve Controller

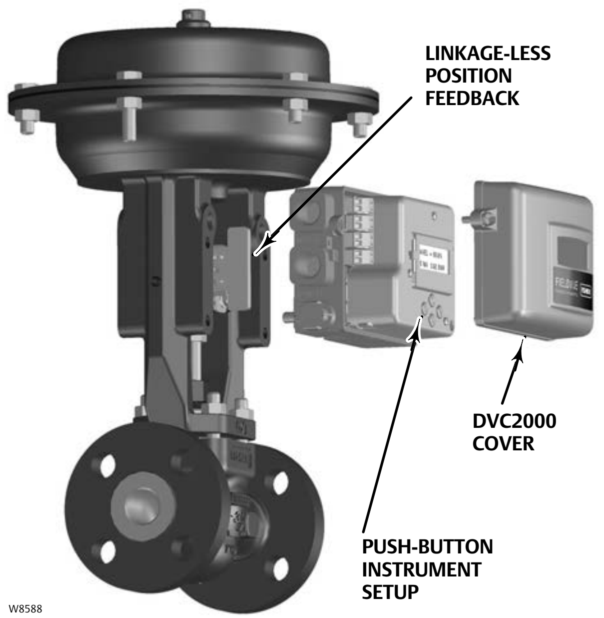


Figure 3. Fisher GX Cryogenic Valve

Low lifetime costs—Reduced product complexity, low parts count, and part commonality all contribute to reduced inventory and maintenance costs.

Stable flow control—The flow cavity of the GX valve body has been engineered to provide stable flow and reduce process variability.

Emission Requirements— ENVIRO-SEAL packing systems provide an improved stem seal to help prevent the loss of valuable or hazardous process fluid. The GX comes standard with ENVIRO-SEAL PTFE packing. For applications exceeding 232°C (450°F), ENVIRO-SEAL graphite ULF packing and extension bonnets are available.

Easy maintenance— The simple screwed seat-ring and one-piece plug and stem design provide easy maintenance. Design simplicity and parts commonality contribute to reduced spares inventory. The integrated DVC2000 and DVC6200 digital valve controllers allow easy instrument removal, without a requirement for tubing disconnection or replacement (fail-down construction).

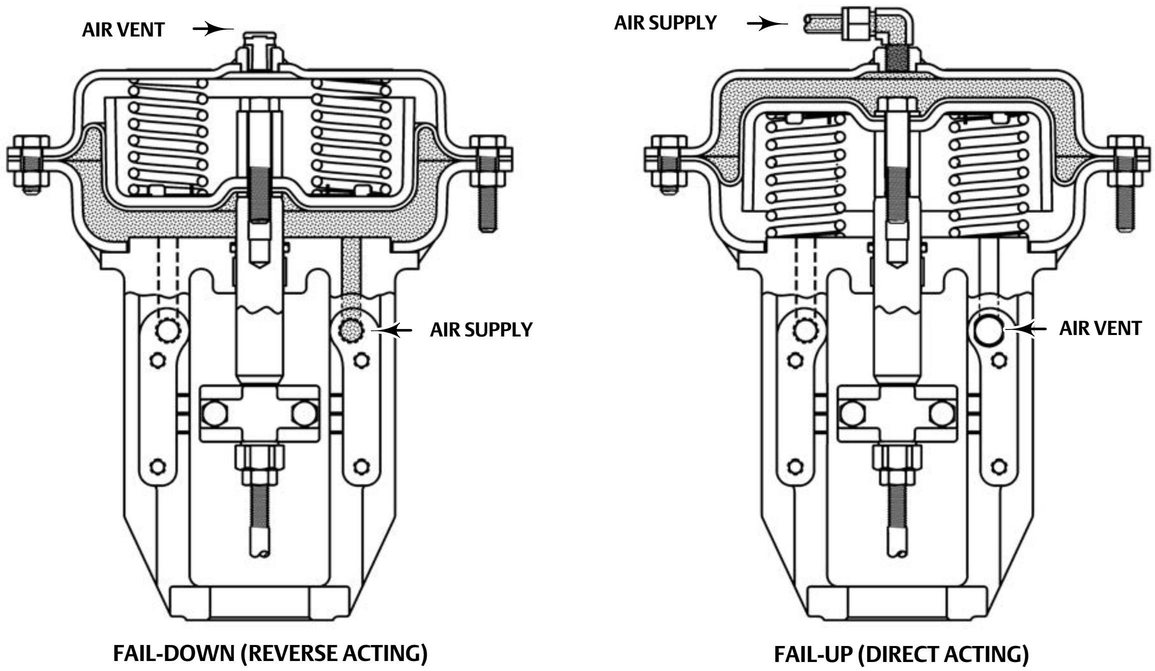
Long life—Alloy valve constructions and hardened trim materials are available in the GX to increase valve body, bonnet, and trim life.

Low ambient temperature—For service with ambient temperature down to -60°C (-76°F). This construction is suitable for cold climate regions and compliant to GOST 15150. Optional side mounted handwheel allowed, however, it is not advised to operate when ambient is below-50°C (-58°F).

Cryogenic offering—The GX is available in a low temperature construction (see figure 3). The compact design maintains high performance in low temperature applications, while minimizing overall envelope size.

Long face-to-face offering—The GX is available in ISA-S75.08.07 long face-to-face dimensions for DN25 to 50 (NPS 1 to 2). All GX control valves have integral flanges, providing replacement for separable flange and other long face-to-face valves.

Figure 4. Fisher GX Principle of Operation -- Actuator Air Supply



Digital valve controller—The GX is available with the DVC2000 digital valve controller. The DVC2000 is easy to use, compact, and designed for easy mounting. It converts a 4-20 mA input signal into a pneumatic output signal, which feeds the control valve actuator. Instrument setup is performed with a push button and LCD interface. This interface is protected from the environment within a sealed enclosure. The interface supports multiple languages, including German, French, Italian, Spanish, Chinese, Japanese, Portuguese, Russian, Polish, Czech, Arabic, and English.

Intrinsic safety and non-incendive construction is available to CSA, FM, ATEX, and IEC standards. An optional module provides integrated limit switches and a position transmitter.

Integrated mounting—The DVC2000 and DVC6200 digital valve controllers integrally mount to the GX actuator, eliminating the need for mounting brackets. The DVC2000 transmits a pneumatic signal to the actuator casing via an air passage in the yoke leg, causing the valve to stroke (see figure 4). This eliminates the need for positioner-to-actuator tubing in the fail-down configuration.

The DVC2000 and DVC6200 mounting interfaces are identical on both sides of the actuator yoke for valve body sizes DN 15 through DN 100 (NPS 1/2 through 4). This symmetrical design allows the DVC2000 to be easily moved from one side of the valve to the other without the need to rotate the actuator. The DN 150 (NPS 6) yoke is not symmetrical.

Linkage-less feedback—The DVC2000 and DVC6200 digital valve controllers offer as standard a non-contacting valve position feedback system. This is a true linkage-less design, which uses no levers and no touching parts between the valve stem and the positioner.

Additional Accessory selection—The GX is available with a variety of digital or analog positioners besides the DVC2000 or DVC6200, as well as solenoid and limit switches. The actuator is also compatible with the IEC 60534-6-1 (NAMUR) positioner mounting standard.

Principle of Operation

Integrated Air Supply—When mounted with the DVC2000 digital valve controller, the GX uses an integrated actuator air supply system. In the fail-down construction, air is supplied to the lower actuator casing via a port on the actuator yoke face -- no tubing is required. In the fail-up configuration, air is supplied to the upper casing via tubing.

Figure 5. Fisher GX Control Valve with Typical Soft Seat Trim Construction
(DN 25 to 150 and NPS 1 to 6, Port Sizes of 22 - 136mm)

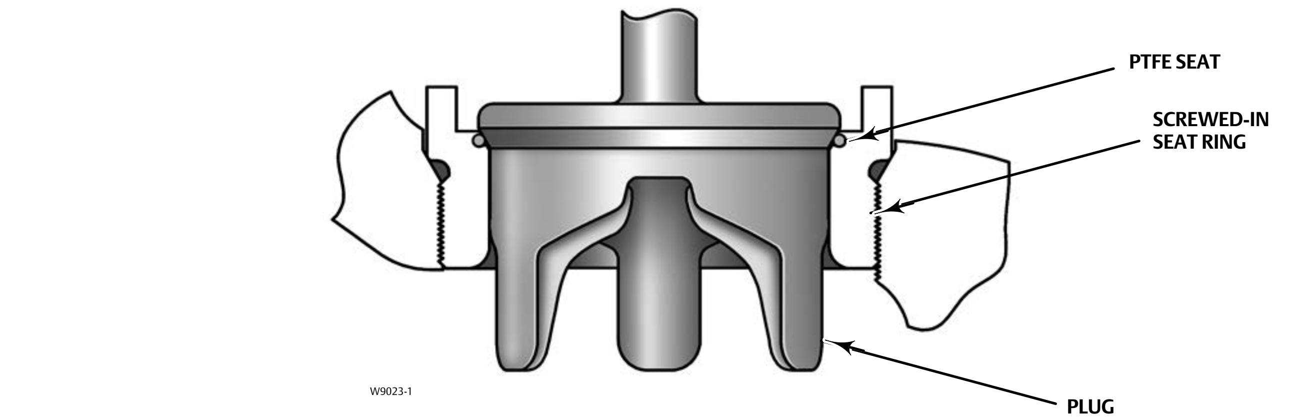


Figure 6. Fisher GX Control Valve with Port-Guided Plug
(DN 40 to 150 and NPS 1-1/2 to 6, Port Sizes of 36 - 136mm)

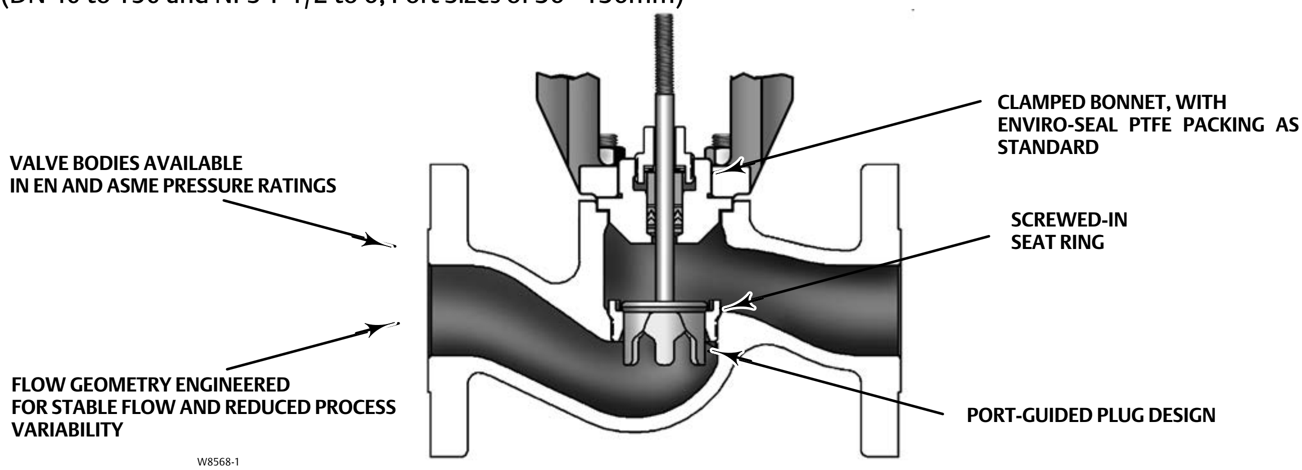


Figure 7. Fisher GX Control Valve with Balanced Trim
(DN 80 to 150 and NPS 3 to 6, Port Sizes of 70, 90, and 136 mm Only)

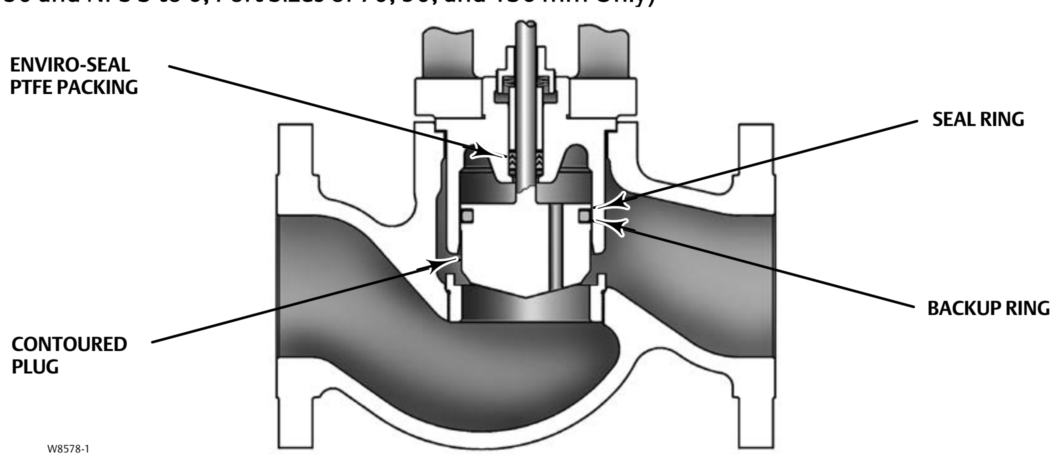
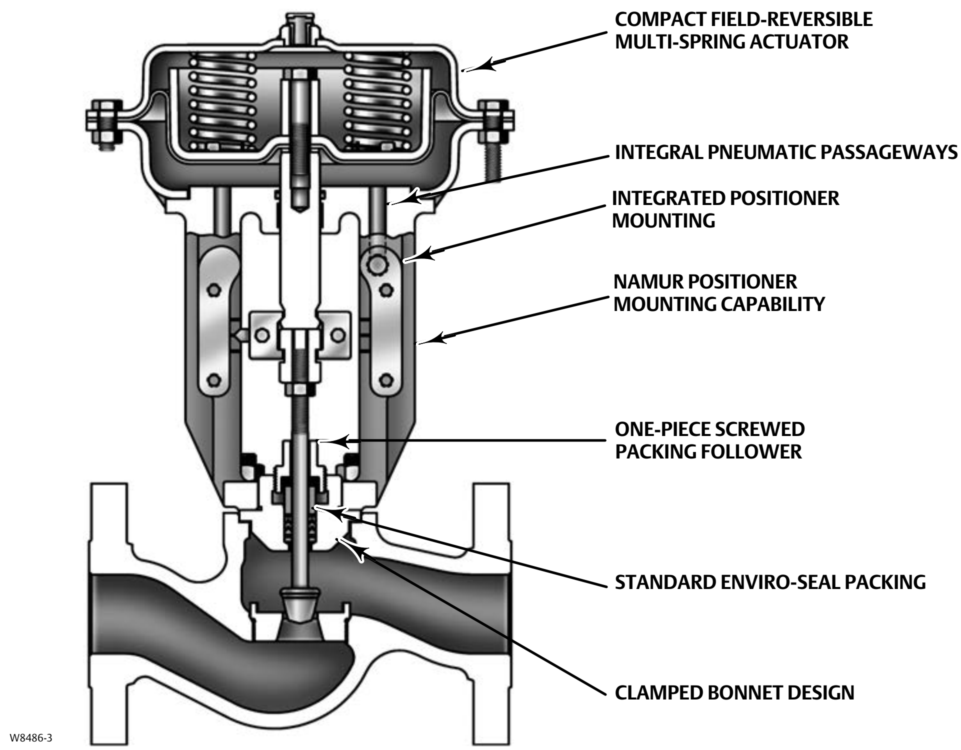


Figure 8. Fisher GX Control Valve Assembly with Stem-Guided Contoured Plug (Size DN 25 and NPS 1)



Fisher GX Control Valve

The GX is a single port, flow-up globe style valve that offers port-guided (figure 1), stem-guided (figure 8), and balanced trim with a screwed-in seat ring (see table 1 for a description of trim style availability). Each valve size offers an unbalanced plug design, which eliminates dead spaces where fluid polymerization might occur. Although the optimized GX actuator allows for wide usage of unbalanced trim, a balanced plug design is available for higher pressure drop applications in DN80, 100 and 150 (NPS 3, 4, and 6) sizes.

The GX incorporates a clamped bonnet and an easy-to-adjust screwed packing follower (see figure 1). The plug and stem are a rugged, one-piece welded assembly.

The standard construction incorporates metal-to-metal seating, with a PTFE soft seat option for Class VI shutoff (see figure 5). Class V shutoff is available with metal trim. Hardened trim with stellite overlay is available for erosive service, as well.

Both linear and equal percentage flow characteristics are available in full port and restricted trim. Micro-Flow is available for applications requiring low flow control capability.

Standard valve body materials are carbon steel and stainless steel. Alloy materials are available for valve body sizes DN 15 through DN 100 (NPS 1/2 through 4) for corrosive applications.

Fisher GX Control Valve Specifications and Materials of Construction

See tables 1 and 2.

Table 1. Fisher GX Valve Specifications

Specifications	EN	ASME
Valve Body Size	DN 15, 20, 25, 40, 50, 80, 100, 150	NPS 1/2, 3/4, 1, 1-1/2, 2, 3, 4, 6
Pressure Rating	PN 10 / 16 / 25 / 40 per EN 1092-1	CL150 / 300 per ASME B16.34
End Connections	Flanged raised face per EN 1092-1	Flanged raised face per ASME B16.5
Valve Body/Bonnet Materials	1.0619 steel	ASME SA216 WCC steel
	1.4409 stainless steel	ASME SA351 CF3M stainless steel
	CW2M (sizes DN 25 through DN 100 only)	CW2M (NPS 1 through 4 only)
	ASME SA352 LCC	ASME SA352 LCC
	ASTM A990 CN3MCu/ASME SA351 CN7M (Cast Alloy 20) (sizes DN 25 through DN 100 only)	ASTM A990 CN3MCu/ASME SA351 CN7M (Cast Alloy 20) (NPS 1 through 4 only)
	CD3MN Duplex SST (sizes DN 25 through DN 100 only)	CD3MN Duplex SST (NPS 1 through 4 only)
	CF3 304L SST (sizes DN 25 through DN 100 only)	CF3 304L SST (NPS 1 through 4 only)
	- - -	M35-2 (NPS 1 through 4 only)
	- - -	N7M Alloy B2 (NPS 1 through 4 only)
Face-to-Face Dimensions	Consistent with EN 558-1 Series 1	Consistent with ANSI/ISA 75.08.01
Long Face-to-Face Dimensions	- - -	Consistent with ANSI/ISA 75.08.07
Shutoff per IEC 60534-4 and ANSI/FCI 70-2	Metal seat - Class IV (standard)	
	Metal seat - Class V (optional)	
	PTFE seat - Class VI (optional)[1]	
Flow Direction	Flow-up (Cavitrol III trim, Flow down)	
Flow Control Characteristics	Equal Percentage and Linear	
Flow Coefficients	See Fisher Catalog 12	
Trim Style	**Port Diameters**	**Trim Style Description**
	4.8 mm	Micro-Flow trim (unbalanced)
	9.5, 14, 22 mm	Stem-Guided with Contoured Plug (unbalanced) or Port-Guided with Cavitrol III trim (unbalanced)
	36, 46 mm	Port-Guided Plug (unbalanced)
	70, 90, 136 mm	Balanced Trim with Contoured plug or Unbalanced Port-Guided Plug
Handwheel	Available as an option	
Travel Stop	Available as an option	

1. For 4.8 to 14 mm ports, Class VI shutoff is achieved without PTFE seat.

Table 2. Materials (Other Valve Components)

<table>
<tr><th>Component</th><th colspan="3">Material</th></tr>
<tr><td>Packing Follower</td><td colspan="3">S21800 SST screwed follower</td></tr>
<tr><td rowspan="2">Body/Bonnet Bolting and Nuts</td><td colspan="3">SA193-B7 studs / SA194-2H nuts with NCF2 coating for carbon steel and stainless steel constructions</td></tr>
<tr><td colspan="3">DN 15 through DN 100: S20910 (XM19) for alloy (standard) and stainless steel assemblies (optional)
DN 150: SA193-B7M studs / SA194-2HM nuts with NCF2 coating (optional)</td></tr>
<tr><td rowspan="2">Packing</td><td colspan="3">ENVIRO-SEAL Live-loaded PTFE V-ring (standard) with N07718 Belleville springs</td></tr>
<tr><td colspan="3">ENVIRO-SEAL Live-loaded Graphite ULF (optional) with N07718 Belleville springs</td></tr>
<tr><td rowspan="2">Bonnet Gasket</td><td colspan="3">DN 15 through DN 150: Graphite laminate</td></tr>
<tr><td colspan="3">DN 15 through DN 100: PTFE encapsulated N10276 (optional) Applicable from -46 to 232°C (-50 to 450°F)
(May be preferable when the standard graphite laminate gasket material is not compatible with the process fluid)</td></tr>
<tr><td rowspan="5">NACE MR0175/ISO15156(1) and NACE MR0103 Construction</td><td rowspan="4">DN 15 through DN 100</td><td colspan="2">Stainless steel, or carbon steel valve bodies and bonnets</td></tr>
<tr><td colspan="2">SA193-B7 studs / SA194-2H nuts with NCF2 coating (S20910 SST optional) body/bonnet bolting</td></tr>
<tr><td colspan="2">Standard ENVIRO-SEAL live-loaded PTFE packing</td></tr>
<tr><td colspan="2">S31603/CoCr-A plug, S20910 stem, and S31603/CoCr-A seat ring</td></tr>
<tr><td>DN 150</td><td colspan="2">SA193-B7M studs / SA194-2HM nuts with NCF2 coating</td></tr>
<tr><td rowspan="4">Balanced Trim (Sizes DN 80, 100, and 150 / NPS 3, 4, and 6)</td><td colspan="3">Carbon-Filled PTFE Seal Ring</td></tr>
<tr><td rowspan="3">Back-up Rings</td><td colspan="2">Nitrile (Standard) -46 to 82°C (-50 to 180°F)</td></tr>
<tr><td colspan="2">Ethylene Propylene [EPDM] (Optional): -46 to 232°C (-50 to 450°F) in steam and hot water;
-46 to 121°C (-50 to 250°F) in air (EPDM is not recommended for use in hydrocarbons)</td></tr>
<tr><td colspan="2">FKM (fluorocarbon) (Optional): -18 to 204°C (0 to 400°F) (Applicable in a wide variety of solvents, chemicals, and hydrocarbons. Avoid use with steam, ammonia, or hot water over 82°C [180°F])</td></tr>
<tr><td colspan="4">1. Environmental restrictions may apply.</td></tr>
</table>

Table 3. Trim Materials for Port Diameters of 4.8 mm (Micro-Flow trim) (Unbalanced Trim)

Valve Body Construction	Trim Type	Stem	Plug	Seat
Carbon steel (1.0619 / WCC and LCC)	Metal to metal	S31603 strain hardened	R31233	SA351 CF3M
	Hard-faced	S20910	R31233	SA351 CF3M / CoCr-A seat
	Metal to metal	N06022	R31233	CW2M
Stainless steel (1.4409 / CF3M)	Metal to metal	S31603 strain hardened	R31233	SA351 CF3M
	Hard-faced	S20910	R31233	SA351 CF3M / CoCr-A seat
	Metal to metal	N06022	R31233	CW2M
Carbon steel to NACE MR0175/ISO15156(2) and NACE MR0103 (1.0619 / WCC and LCC)	Hard-faced	S20910	R31233	SA351 CF3M / CoCr-A seat
Stainless steel to NACE MR0175/ISO15156(2) and NACE MR0103 (1.4409 / CF3M)	Hard-faced	S20910	R31233	SA351 CF3M / CoCr-A seat
CW2M and CN3MCu/CN7M(1)	Metal to metal	N06022	R31233	CW2M
Duplex SST (CD3MN)(1)	Metal to metal	S31803 (Duplex SST)	R31233	CD3MN (Duplex SST)
304L SST (CF3)(1)	Metal to metal	S31803 (Duplex SST)	R31233	CF3 (304L SST)

1. Not available in DN 15 and DN 20 (NPS 1/2 and 3/4) sizes.
2. Environmental restrictions may apply.

Table 4. Trim Materials for Port Diameters of 9.5 and 14 mm (Unbalanced Trim)

Valve Body Construction	Trim Type	Stem	Plug	Seat
Carbon steel (1.0619 / WCC and LCC)	Metal to metal	S31603 strain hardened	S31603	SA351 CF3M
	Hard-faced	S20910	S31603 / CoCr-A seat	SA351 CF3M / CoCr-A seat
	Metal to metal	N06022	N06022	CW2M
Stainless steel (1.4409 / CF3M)	Metal to metal	S31603 strain hardened	S31603	SA351 CF3M
	Hard-faced	S20910	S31603 / CoCr-A seat	SA351 CF3M / CoCr-A seat
	Metal to metal	N06022	N06022	CW2M
Carbon steel to NACE MR0175/ISO15156(2) and NACE MR0103 (1.0619 / WCC and LCC)	Hard-faced	S20910	S31603 / CoCr-A seat	SA351 CF3M / CoCr-A seat
Stainless steel to NACE MR0175/ISO15156(2) and NACE MR0103 (1.4409 / CF3M)	Hard-faced	S20910	S31603 / CoCr-A seat	SA351 CF3M / CoCr-A seat
CW2M and CN3MCu/CN7M(1)	Metal to metal	N06022	N06022	CW2M
Duplex SST (CD3MN)(1)	Metal to metal	S31803 (Duplex SST)	S31803 (Duplex SST)	CD3MN (Duplex SST)
304L SST (CF3)(1)	Metal to metal	S31803 (Duplex SST)	S30403 (304L SST)	CF3 (304L SST)
M35-2(1)	Metal to metal	N05500	N05500	N05500
N7M (Alloy B2)(1)	Metal to metal	N10675 (Alloy B3)	N10675 (Alloy B3)	N7M (Alloy B2)

1. Not available in DN 15 and DN 20 (NPS 1/2 and 3/4) sizes.
2. Environmental restrictions may apply.

Table 5. Trim Materials for Port Diameters of 22, 36, 46, 70, 90, and 136 mm (Unbalanced Trim)

Valve Body Construction	Trim Type	Stem	Plug	Seat
Carbon steel (1.0619 / WCC and LCC)	Metal to metal	S31603 strain hardened	S31603	SA351 CF3M(3)
	Soft seat	S31603 strain hardened	S31603	SA351 CF3M / PTFE seat(4)
	Hard-faced/ Whisper Trim III(2)	S20910	S31603 / CoCr-A seat	SA351 CF3M/CoCr-A seat (22 mm) SA351 CF3M/CoCr-A seat and guide (>22 mm)
	Cavitrol III trim	S20910	S31603/CoCr-A seat	S17400 Cage
	Metal to metal	N06022	N06022	CW2M(1)
	Soft seat	N06022	N06022	CW2M / PTFE seat(1)
Stainless steel (1.4409 / CF3M)	Metal to metal	S31603 strain hardened	S31603	SA351 CF3M(3)
	Soft seat	S31603 strain hardened	S31603	SA351 CF3M / PTFE seat(4)
	Hard-faced/ Whisper Trim III(2)	S20910	S31603 / CoCr-A seat	SA351 CF3M/CoCr-A seat (22 mm) SA351 CF3M/CoCr-A seat and guide (>22 mm)
	Cavitrol III trim	S20910	S31603/CoCr-A seat and guide	S17400 Cage
	Metal to metal	N06022	N06022	CW2M(1)
	Soft seat	N06022	N06022	CW2M / PTFE seat(1)
Carbon steel to NACE MR0175/ISO15156(5) and NACE MR0103 (1.0619 / WCC and LCC)	Hard-faced	S20910	S31603 / CoCr-A seat	SA351 CF3M/CoCr-A seat (22 mm) SA351 CF3M/CoCr-A seat and guide (>22 mm)
Stainless steel to NACE MR0175/ISO15156(5) and NACE MR0103 (1.4409 / CF3M)	Hard-faced	S20910	S31603 / CoCr-A seat	SA351 CF3M/CoCr-A seat (22 mm) SA351 CF3M/CoCr-A seat and guide (>22 mm)
CW2M and CN3MCu/CN7M(1)	Metal to metal	N06022	N06022	CW2M
	Soft seat	N06022	N06022	CW2M / PTFE seat
Duplex SST (CD3MN)(1)	Metal to metal	S31803 (Duplex SST)	S31803 (Duplex SST)	CD3MN (Duplex SST)
	Soft seat	S31803 (Duplex SST)	S31803 (Duplex SST)	CD3MN (Duplex SST)/ PTFE seat(1)
304L SST (CF3)(1)	Metal to metal	S31803 (Duplex SST)	S30403 (304L SST)	CF3 (304L SST)
	Soft seat	S31803 (Duplex SST)	S30403 (304L SST)	CF3 (304L SST)/ PTFE seat(1)
M35-2(1)	Metal to metal	N05500	N05500	N05500
N7M (Alloy B2)(1)	Metal to metal	N10675 (Alloy B3)	N10675 (Alloy B3)/ N7M (>22 mm)	N7M (Alloy B2)

1. Not available for DN 150 (NPS 6).
2. Whisper Trim III is only available in 70 and 90 mm ports.
3. DN150 (NPS 6) has CoCr-A seat and guide.
4. DN150 (NPS 6) has CoCr-A guide.
5. Environmental restrictions may apply.

Table 6. Trim Materials for Port Diameters of 70, 90, and 136 mm (Balanced Trim)(3)

Valve Body Construction	Trim Type	Stem	Plug	Seat
Carbon steel (1.0619 / WCC and LCC)(1)	Metal to metal	S31603 strain hardened	S31603	SA351 CF3M
	Hard-faced/ Whisper Trim III(4)	S20910	S31603 / CoCr-A seat and guide	SA351 CF3M / CoCr-A seat and guide
	Metal to metal	N06022	N06022	CW2M(2)
Stainless steel (1.4409 / CF3M)	Metal to metal	S31603 strain hardened	S31603	SA351 CF3M
	Hard-faced/Whisper Trim III(4)	S20910	S31603 / CoCr-A seat and guide	SA351 CF3M / CoCr-A seat and guide
	Metal to metal	N06022	N06022	CW2M(2)
Carbon steel to NACE MR0175/ISO15156(5) and NACE MR0103 (1.0619 / WCC and LCC)	Hard-faced	S20910	S31603 / CoCr-A seat	SA351 CF3M / CoCr-A seat and guide
Stainless steel to NACE MR0175/ISO15156(5) and NACE MR0103 (1.4409 / CF3M)	Hard-faced	S20910	S31603 / CoCr-A seat	SA351 CF3M / CoCr-A seat and guide
CW2M and CN3MCu/CN7M(2)	Metal to metal	N06022	N06022	CW2M
Duplex SST (CD3MN)(2)	Metal to metal	S31803 (Duplex SST)	S31803 (Duplex SST)	CD3MN (Duplex SST)
304L SST (CF3)(2)	Metal to metal	S31803 (Duplex SST)	S30403 (304L SST)	CF3 (304L SST)

1. The bonnet used in the carbon steel balanced trim construction is made of 1.4409/CF3M stainless steel.
2. Not available for DN 150 (NPS 6).
3. Balanced trim not available with M35-2 or N7M trim.
4. Balanced Whisper Trim III in DN150 (NPS 6) 136 mm port diameter only.
5. Environmental restrictions may apply.

Table 7. Fisher GX Availability

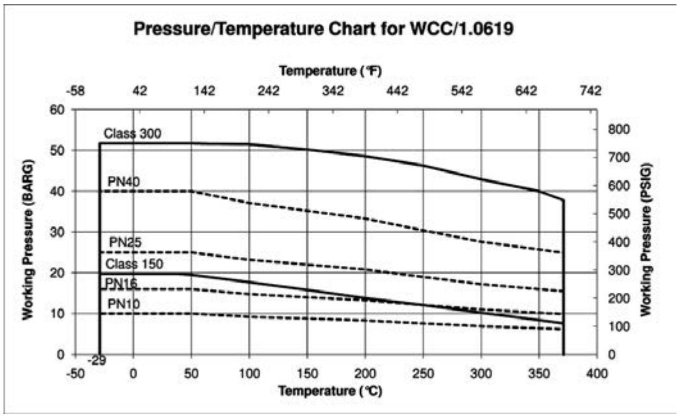
VALVE SIZE	PORT SIZE	STEM DIAMETER	TRAVEL	ACTUATOR SIZE
	mm	mm	mm	
DN15 (NPS 1/2)	9.5	10	20	Plain
DN20 (NPS 3/4)	14		20	Plain
	9.5		20	Plain
DN25 (NPS 1)	22		20	Plain
	14		20	Plain
	9.5		20	Plain
DN40 (NPS 1-1/2)	36		20	Plain
	22		20	Plain
	14		20	Plain
DN50 (NPS 2)	46		20	Plain
	36		20	Plain
	22		20	Plain
DN80 (NPS 3)	70	14	40	Plain
	46		20	Plain
	36		20	Plain
DN100 (NPS 4)	90		40	Plain
	70		40	Plain
	46		20	Plain
DN150 (NPS 6)	136	19	60	Plain
	90		40	Plain

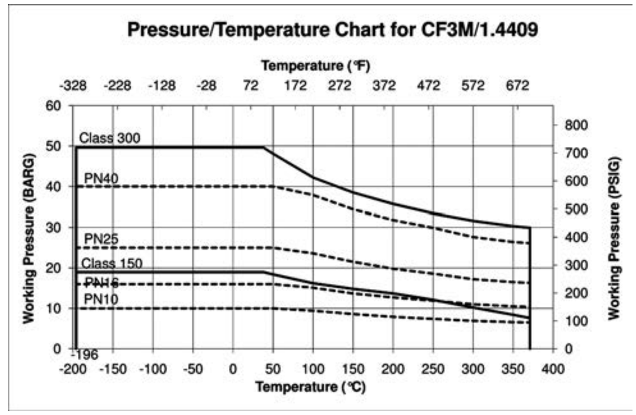
Table 8. Allowable Temperature Ranges for Valve Body, Bonnet and Trim(1)

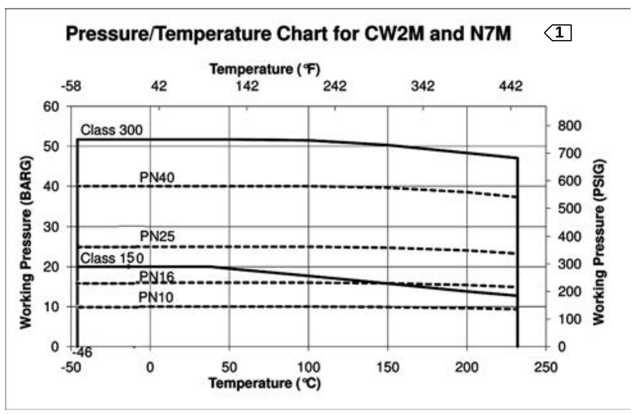
VALVE BODY / BONNET MATERIAL	BONNET STYLE	ENVIRO-SEAL PACKING	GASKET	TRIM STYLE	TEMPERATURE			
					°C		°F	
					Min	Max	Min	Max
1.0619/SA216 WCC Steel	Standard	PTFE or Graphite ULF	Graphite laminate or PTFE / N10276	Metal to metal; hard-faced; soft seat	-29	232	-20	450
	Extension		Graphite laminate	Metal to metal; hard-faced	-29	371	-20	700
	Bellows		Graphite laminate or PTFE / N10276	Metal to metal; hard-faced; soft seat	-29	232	-20	450
			Graphite laminate	Metal to metal; hard-faced	-29	371	-50	700
1.4409/SA351 CF3M SST	Standard		Graphite laminate or PTFE / N10276	Metal to metal; hard-faced; soft seat	-46	232	-50	450
	Extension		Graphite laminate	Metal to metal; hard-faced	-46	371	-50	700
	Cryogenic Extension		Graphite laminate	Metal to metal; hard-faced	(2)	371	(2)	700
	Bellows		Graphite laminate or PTFE / N10276	Metal to metal; hard-faced; soft seat	-46	232	-50	450
			Graphite laminate	Metal to metal; hard-faced	-46	371	-50	700
CW2M	Standard		Graphite laminate or PTFE / N10276	Metal to metal; soft seat	-46	232	-50	450
	Bellows		Graphite laminate or PTFE / N10276	Metal to metal; soft seat	-46	232	-50	450
LCC	Standard		Graphite laminate or PTFE / N10276	Metal to metal; hard-faced; soft seat	-46	232	-50	450
	Extension		Graphite laminate	Metal to metal; hard-faced	-46	343	-50	650
	Bellows		Graphite laminate or PTFE / N10276	Metal to metal; hard-faced; soft seat	-46	232	-50	450
			Graphite laminate	Metal to metal; hard-faced	-46	343	-50	650
CN3MCu/CN7M	Standard	PTFE	Graphite laminate or PTFE / N10276	Metal to metal; soft seat	-46	232	-50	450
304L SST (CF3)	Standard		Graphite laminate or PTFE / S30403	Metal to metal; soft seat	-46	232	-50	450
Duplex SST (CD3MN)	Standard		Graphite laminate or PTFE / N10276	Metal to metal; soft seat	-46	232	-50	450
M35-2	Standard		Graphite laminate or PTFE / N04400	Metal to metal	-46	232	-50	450
N7M (Alloy B2)	Standard		Graphite laminate or PTFE / N10276	Metal to metal	-46	232	-50	450

1. Back-up ring materials used in Sizes DN 80, 100, and 150 (NPS 3, 4, and 6) with balanced trim may be limited by temperature and application. See table 2.
2. Consult your Emerson sales office for minimum temperature limit.

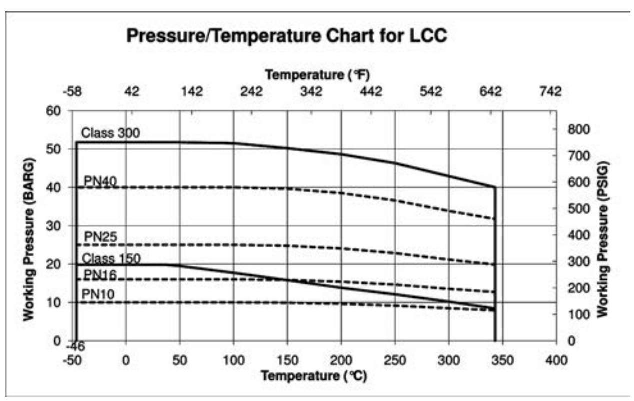
Figure 9. Material Pressure/Temperature Curves







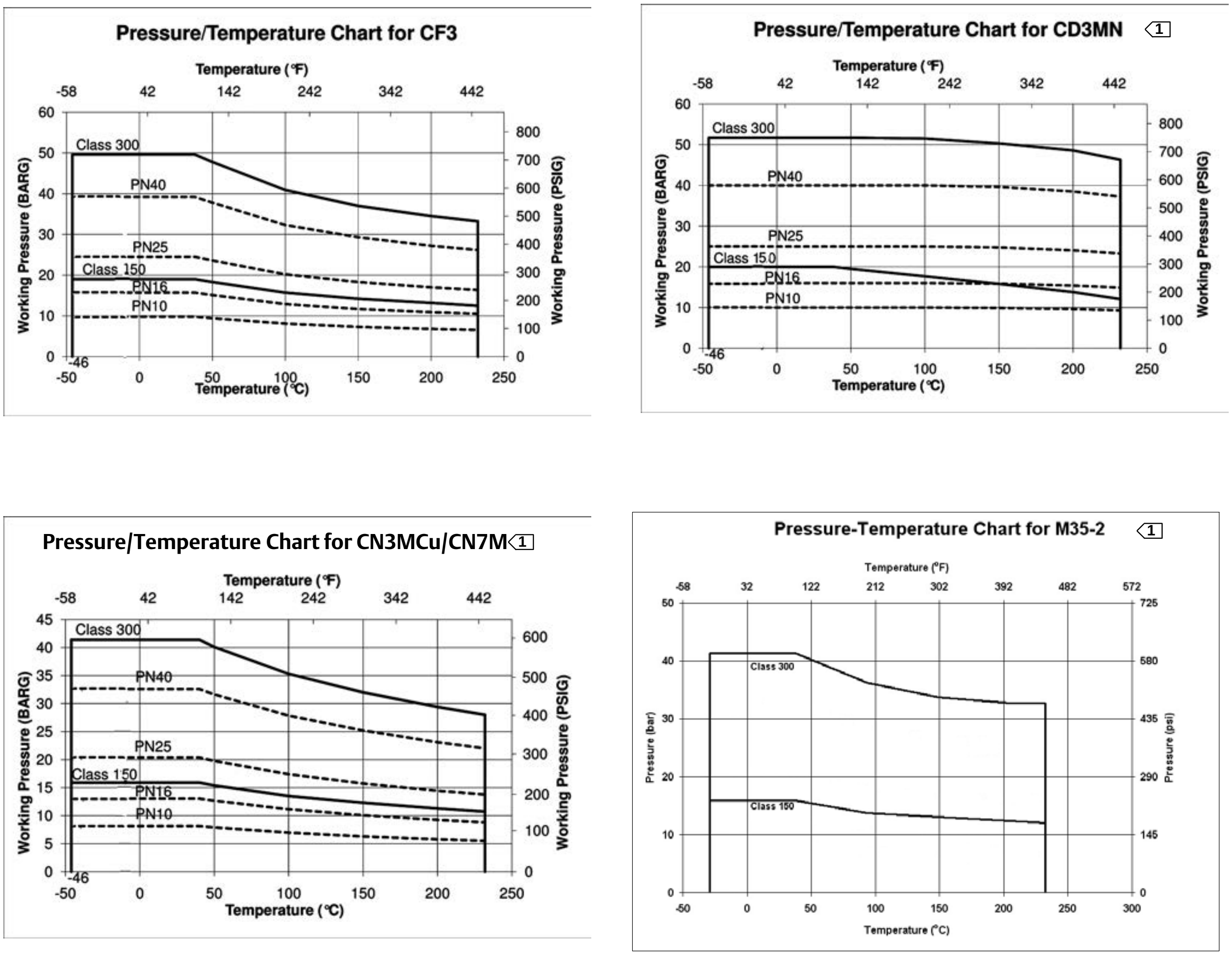
E1026



E1140

1. N7M is only offered with CL150 and CL300 (not PN10, PN16, PN25, or PN40).

Figure 10. Material Pressure/Temperature Curves



E0901

1. CD3MN, CN3MCu/CN7M, and M35-2 are not listed in EN 12516-1. The PN designations are used only to indicate relative pressure-retaining capabilities.

Figure 11. Fisher GX ENVIRO-SEAL Packing

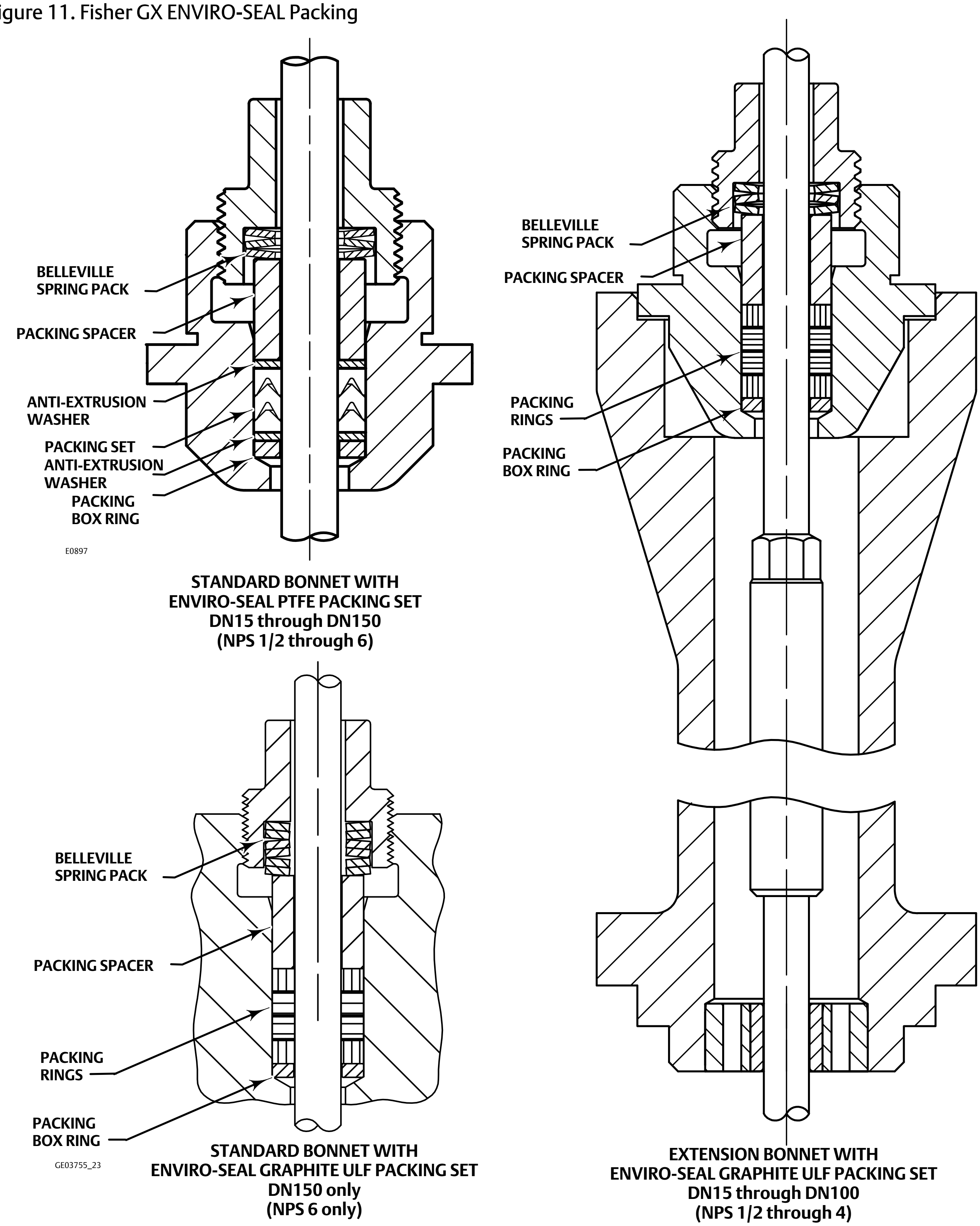


Figure 12. GX Cavitrol III Trim

GX Cavitrol III for DN25 (NPS 1) through DN50 (NPS 2)

Cavitrol III trim lowers hydrodynamic noise and reduces vibration by utilizing proprietary drilled hole shape and spacing to shift the frequency and isolate the cavitation in order to prevent damage. Cavitrol III 1-stage technology is used without altering the integral GX bonnet design.

Features

- Max delta-P of 400 psid
- Flow down
- Class V shutoff – standard

Available Sizes

- NPS 1, 225 Actuator, 20mm travel
- NPS 1-1/2, 750 Actuator, 20mm travel
- NPS 2, 750 Actuator, 20mm travel

Requirements

- Minimum 4 bar supply pressure
- Only available with standard bonnet

Table 9. Materials of Construction for Cavitrol III Trim

Part	Material
Stem	S20910
Plug	S31603 / CoCr-A Seat and Guide
Seat Ring / Cage	S17400

Figure 13. GX Whisper Trim III

GX Whisper Trim III for DN80 (NPS 3) through DN150 (NPS 6)

Whisper Trim III A1 lowers aerodynamic valve noise by utilizing multiple orifices of special shape, size, and spacing. These orifices break up turbulent compressible fluid streams and shift the acoustic energy to a higher frequency range. The result is about 20 dBA noise attenuation.

Features

- Flow up
- Class IV shutoff

Available Sizes

- NPS 3, 750 Actuator, 40mm travel
- NPS 4, 750 Actuator, 40mm travel
- NPS 6, 1200 Actuator, 60mm travel

Table 10. Materials of Construction for Whisper Trim III(1)

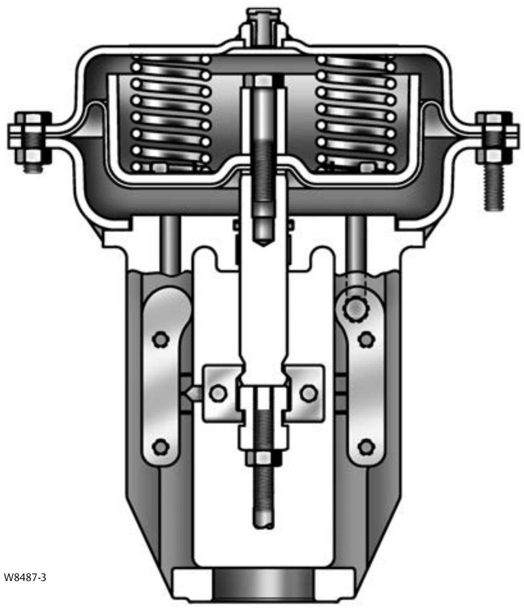
Part	Material
Stem	S20910
Plug	S31603 / CoCr-A Seat
Seat Ring	S31603 / CoCr-A Seat and Guide
Cage(1)	CF3M

1. NPS 6 uses a separate cage, not integral to the plug stem.

Allowable temperature ranges are shown in table 8.

The Fisher GX Diaphragm Actuator

Figure 14. Fisher GX Actuator



The GX uses a multi-spring, pneumatic diaphragm actuator (see figure 14). It is capable of air supply pressures to 6.0 barg (87 psig), allowing valve shutoff at high pressure drops.

The GX product selection system automatically matches the actuator to the valve, eliminating the need for complex actuator sizing procedures.

The multiple spring design provides the preload, eliminating the need for bench set adjustment. The actuator is available in spring-to-open and fail-down configurations.

The GX actuator can be used for throttling or on-off service.

The GX is available with the integrated DVC2000 digital valve controller. Other digital and analog positioners are available, as well as optional solenoids and limit switches.

Table 11. Actuator Specifications

Description	Pneumatic spring-return diaphragm actuator
Operating Principle	Air-to-open (standard) Air-to-close (optional)
Operating Pressure Ranges	2.0 to 6.0 barg (29 to 87 psig)(1)(2)
Ambient Temperature	-46 to 82°C (-50 to 180°F)
Pressure Connection (Fail-up Construction)	G 1/4 female casing connection
Finish	Powder coat polyester

1. May vary depending on construction (see Fisher bulletin 51.1:GX (S1) (D103209X012)
2. Optional ambient construction range: -60 to 82°C (-76 to 180°F)

Table 12. Materials of Construction

Part	Material
Upper and Lower Casings	AISI 1010 stamped carbon steel
Springs	Steel
Diaphragm	Nitrile and nylon
Diaphragm Plate	Size 225 and 750: AISI G10100 stamped carbon steel Size 1200: Cast carbon steel
Yoke	Carbon steel (stainless steel optional for some sizes)
Casing Fasteners	A2-70 stainless steel bolts and nuts
Actuator Rod	Stainless steel
Stem Connector	CF3M
Stem Connector Fasteners	SA193-B7 bolts with NCF2 coating
Stem Bushing	High-density polyethylene (HDPE)
Stem Seal	Nitrile

Actuator Selection

With the GX, actuator selection has never been easier. Once the valve size and port diameter have been determined, the actuator is automatically selected. No spring selection or bench set calculations are required.

The majority of GX constructions (both fail-down and fail-up) are rated to a full pressure class shutoff capability of 51.7 bar (750 psi) for a 4 to 6 bar (58 to 87 psig) actuator air supply. Refer to Fisher GX Bulletin Supplement 51.1:GX (S1) (D103209X012) for additional information.

The GX actuator has been optimized to allow for varying ranges of supply pressure. See table 13.

Table 13. Fisher GX Actuator Supply Pressure Ranges

SUPPLY PRESSURE	RANGE	
	Bar	Psig
Standard	4.0 to 6.0	58 to 87
Optional	3.0 to 4.0	44 to 58
Optional	2.0 to 3.0	29 to 44

GX ISO 5210 Electric Actuator Mounting

Electric actuator mounting is available for any manufacturing models that comply with ISO 5210, Flange type F7. The mounting offering includes a GX yoke, actuator rod adaptor, spacer, and bolting.

CAUTION

The up travel stop must be set in the electric actuator in order to prevent damage to the valve trim.

Thrust limitations apply when sizing electric actuators (see table 14).

A mounting offering can be engineered if not already available for a selected actuator. Electric actuator mounting is not available for DN150, NPS 6 GX valves. For additional information, contact your Emerson sales office.

Bellows Extension Bonnet

The GX bellows extension bonnet provides reliable and tight stem sealing for those applications where emissions escaping to the environment cannot be tolerated (see figure 15). The GX bellows is available in SST (1.4571 / 316Ti) or N10276 and covers a full range of valve sizes from DN 15 through DN 100 (NPS 1/2 through 4) (see tables 15 and 16).

The GX bellows system has been designed for 100,000 full-travel cycles at maximum allowable pressure and ambient temperature (20°C [68°F]).

The mechanically-formed metal bellows provides high operating reliability and extended cycle life (see tables 17, 18, and 19 for details).

The GX bellows design incorporates a rugged double- or triple-wall construction for added security. Each bellows is helium tested before leaving the factory.

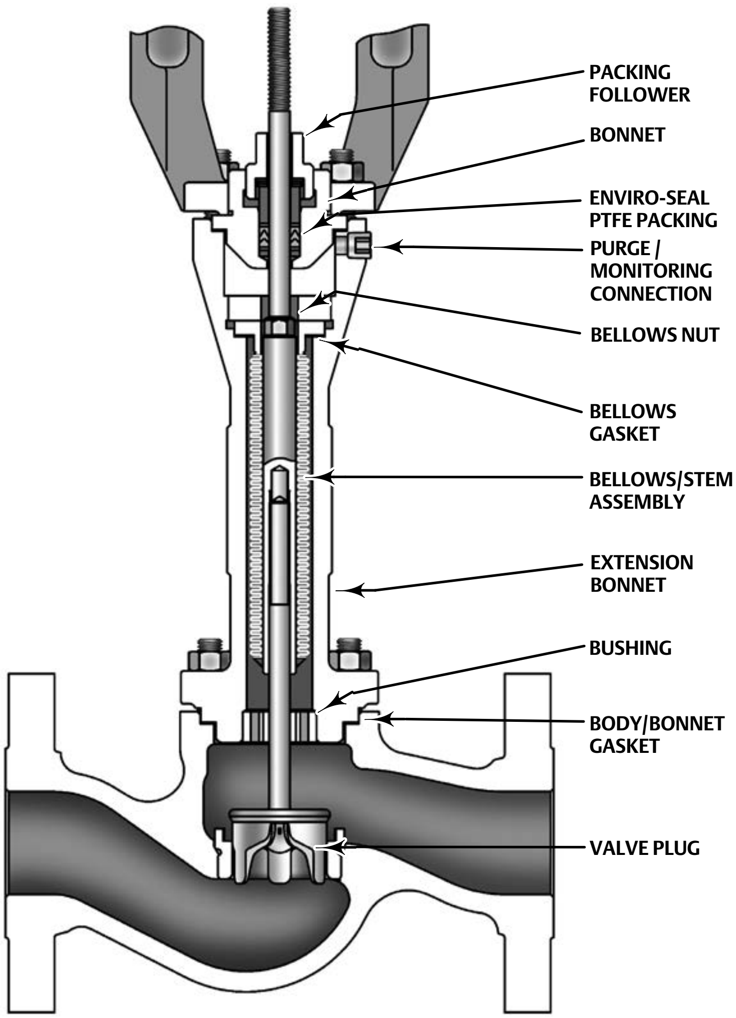
The GX bellows bonnet comes standard with an ENVIRO-SEAL live-loaded, PTFE packing system as a security backup. A connection is provided above the bellows to allow purging or monitoring the integrity of the replaceable bellows.

Table 14. Fisher GX Maximum Allowable Thrust for use with ISO 5210 Electric Actuators

VALVE SIZE	STEM DIAMETER	TRAVEL	BONNET STYLE	STEM MATERIAL STRENGTH	MAXIMUM THRUST	
	mm	mm			N	lbf
DN15-DN50 (NPS 1/2 to 2)	10	20	Plain	High(1)	17000	3820
				Low(2)	7600	1710
			Bellows/Extension	High	11400	2560
				Low	6700	1500
DN80-DN100 (NPS 3 to 4)	14	20, 40	Plain	High	20000	4500
				Low	20000	4500
			Bellows/Extension	High	20000	4500
				Low	14500	3260

1. High strength stem materials consist of S20910, N05500, S31603
2. Low strength stem materials consist of S31803, N10665, N06022

Figure 15. Fisher GX Bellows Bonnet and Selection Process



W8958-1

Bellows Selection Process

Follow this process to assist in selecting the appropriate bellows for the application:

Step 1

Size and select the GX control valve that is appropriate for the application. This will identify the:

- **Valve body size**
- **Actuator size**
- **Orifice size**
- **Trim style (balanced or unbalanced)**
- **Valve body material**

Step 2

Confirm bellows availability from table 15.

Step 3

Using table 16, select the bellows material combination that is appropriate for the application. Using the temperature limits shown in table 8, confirm the selected construction is appropriate for the application temperatures.

Step 4

Using bulletin 51.1:GX(S1), verify the application pressure drop does not exceed the actuator capability.

Step 5

Using figure 16, check to ensure the maximum process pressure and temperature do not exceed the pressure-temperature rating of the selected bellows.

Table 15. Fisher GX Constructions with Bellows Availability

VALVE BODY SIZES	PORT SIZE (mm)	ACTUATOR SIZES	PLUG TRAVEL	TRIM STYLE
DN15-50 (NPS 1/2 to 2)	4.8 to 46	225 and 750	20 mm	Unbalanced
DN80 (NPS 3)	36 to 46	750	20 mm	Unbalanced
	70	750	20 mm	Balanced
DN100 (NPS 4)	46	750	20 mm	Unbalanced
	90	750	20 mm	Balanced

Table 16. Bellows Materials of Construction

Valve Body / Bonnet	Bellows	Bellows Stem Extension	Trim Materials		Bolting	ENVIRO-SEAL Packing	Gaskets	Lower Bushing	Monitoring Connection Plug
			Plug(1)	Stem Material					
Carbon Steel (1.0619/WCC and LCC)	SST (1.4571/316Ti)	S31603	S31603 or CF3M	S31603	SA193-B7 with NCF2 coating	Live-loaded PTFE	Graphite laminate	S31600 with R31233 insert	S31600
	N10276	S31603	S31603 or CF3M	S31603	SA193-B7 with NCF2 coating	Live-loaded PTFE	Graphite laminate	S31600 with R31233 insert	S31600
	N10276	N06022	N06022 or CW2M	N06022	S20910	Live-loaded PTFE	Graphite laminate	N10276 with R31233 insert	N10276
Stainless Steel (1.4409/CF3M)	SST (1.4571/316Ti)	S31603	S31603 or CF3M	S31603	S20910	Live-loaded PTFE	Graphite laminate	S31600 with R31233 insert	S31600
	N10276	S31603	S31603 or CF3M	S31603	S20910	Live-loaded PTFE	Graphite laminate	S31600 with R31233 insert	S31600
	N10276	N06022	N06022 or CW2M	N06022	S20910	Live-loaded PTFE	Graphite laminate	N10276 with R31233 insert	N10276
CW2M	N10276	N06022	N06022 or CW2M	N06022	S20910	Live-loaded PTFE	Graphite laminate	N10276 with R31233 insert	N10276

1. Plug material for the 4.8 mm port is R31233.

For bellows height dimensions, see table 21.

Cycle Life

Bellows service life is affected by several factors, including process pressure, temperature, and plug travel. Tables 17, 18, 19, and 20 provide estimates of cycle life for several cases.

Table 17. Estimated Bellows Cycle Life at 10.3 bar (150 psig) and 20°C (68°F)

VALVE SIZE	STEM SIZE	BELLOWS MATERIAL	PLYS	BELLOWS PRESSURE	PROCESS TEMPERATURE		ESTIMATED CYCLE LIFE (50% Stroke [25-75% travel])
					°C	°F	
DN15-50 (NPS 1/2 to 2)	10mm	1.4571 (316Ti)	2	10.3 bar (150 psig)	20	68	1,040,000
		N10276	3	10.3 bar (150 psig)	20	68	910,000
DN80-100 (NPS 3 to 4)	14mm	1.4571 (316Ti)	2	10.3 bar (150 psig)	20	68	1,020,000
		N10276	2	10.3 bar (150 psig)	20	68	980,000

Table 18. Estimated Bellows Cycle Life at Bellows Maximum Allowable Pressure and 20°C (68°F)

VALVE SIZE	STEM SIZE	BELLOWS MATERIAL	PLYS	MAXIMUM ALLOWABLE BELLOWS PRESSURE(1)	PROCESS TEMPERATURE		ESTIMATED CYCLE LIFE (50% Stroke [25-75% travel])
					°C	°F	
DN15-50 (NPS 1/2 to 2)	10mm	1.4571 (316Ti)	2	40 bar (580 psig)	20	68	830,000
		N10276	3	51.7 bar (750 psig)	20	68	800,000
DN80-100 (NPS 3 to 4)	14mm	1.4571 (316Ti)	2	45 bar (650 psig)	20	68	800,000
		N10276	2	51.7 bar (750 psig)	20	68	810,000

1. Valve maximum allowable pressure drop may be limited by size and material. See Fisher bulletin 51.1:GX (S1) (D103209X012) for additional information.

Table 19. Estimated Bellows Cycle Life at Bellows Maximum Allowable Pressure and 232°C (450°F)

VALVE SIZE	STEM SIZE	BELLOWS MATERIAL	PLYS	MAXIMUM ALLOWABLE BELLOWS PRESSURE(1)	PROCESS TEMPERATURE		ESTIMATED CYCLE LIFE (50% Stroke [25-75% travel])
					°C	°F	
DN15-50 (NPS 1/2 to 2)	10mm	1.4571 (316Ti)	2	29.8 bar (430 psig)	232	450	410,000
		N10276	3	47.2 bar (685 psig)	232	450	560,000
DN80-100 (NPS 3 to 4)	14mm	1.4571 (316Ti)	2	33.5 bar (485 psig)	232	450	390,000
		N10276	2	47.2 bar (685 psig)	232	450	550,000

1. Valve maximum allowable pressure drop may be limited by size and material. See Fisher bulletin 51.1:GX (S1) (D103209X012) for additional information.

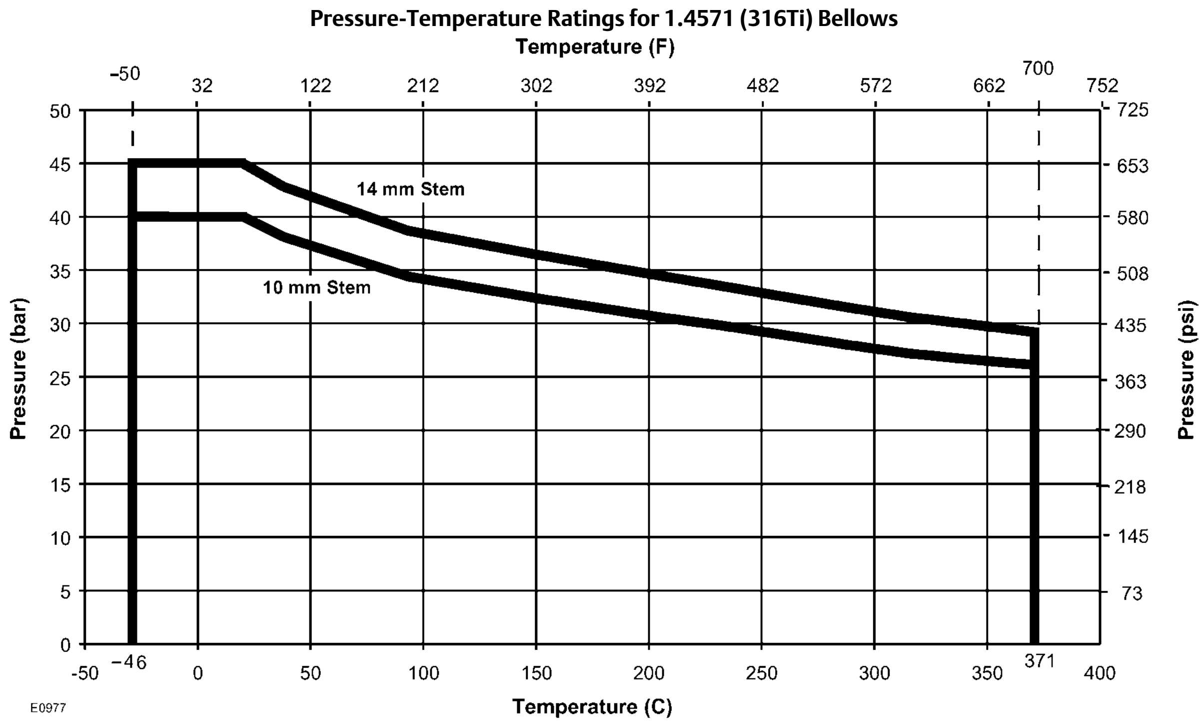
Table 20. Estimated Bellows Cycle Life at Bellows Maximum Allowable Pressure and 371°C (700°F)

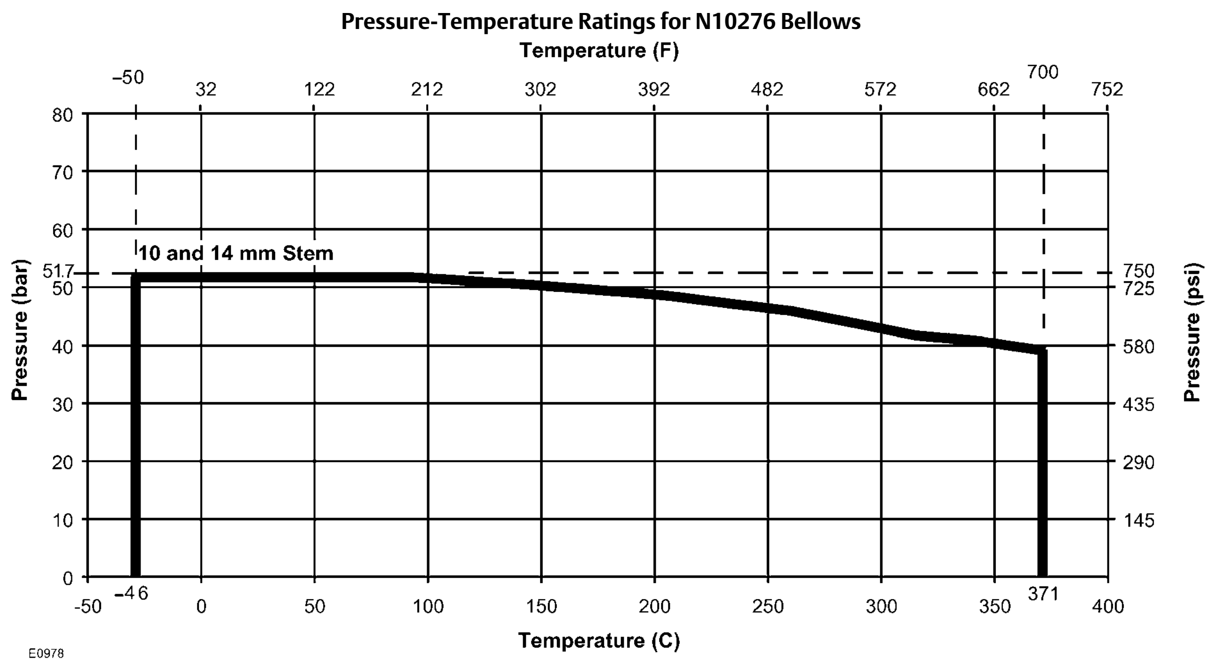
VALVE SIZE	STEM SIZE	BELLOWS MATERIAL	PLYS	MAXIMUM ALLOWABLE BELLOWS PRESSURE	PROCESS TEMPERATURE		ESTIMATED CYCLE LIFE (50% Stroke [25-75% travel])
					°C	°F	
DN15-50 (NPS 1/2 to 2)	10mm	1.4571 (316Ti)	2	26.1 bar (380 psig)	371	700	250,000
		N10276	3	39.3 bar (570 psig)	371	700	430,000
DN80-100 (NPS 3 to 4)	14mm	1.4571 (316Ti)	2	29.3 bar (425 psig)	371	700	240,000
		N10276	2	39.3 bar (570 psig)	371	700	430,000

Bellows Pressure - Temperature Ratings

See figure 16.

Figure 16. Bellows Pressure - Temperature Ratings

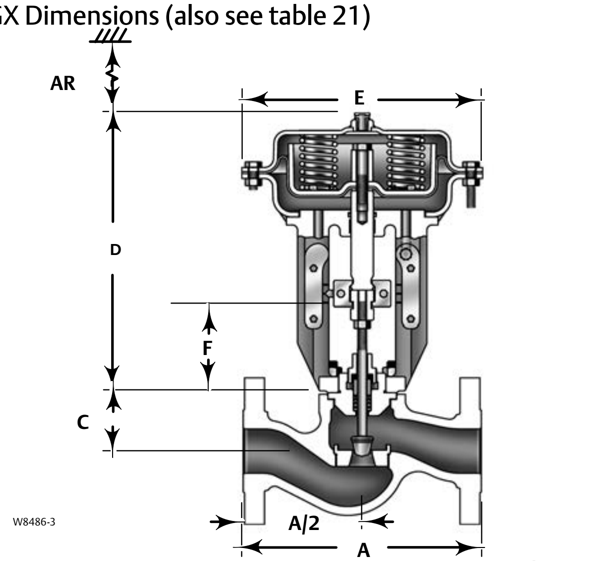




Valve-Actuator Dimensions and Weights

See figure 17 and table 21.

Figure 17. Fisher GX Dimensions (also see table 21)



GX STEM-GUIDED CONSTRUCTION (DN25 / NPS 1)

Table 21. Fisher GX Dimensions and Weights

VALVE SIZE	PORT DIA	ACTUATOR SIZE	A			C		D		E Casing Dia	F (AR) Removal Height(3)	TOTAL WEIGHT	
			PN10/ 16 & PN25/ 40	CL150	CL300	Standard Bonnet	Extended or Bellows Bonnet	Actuator Height (Standard Bonnet)	Actuator Height (Extended or Bellows Bonnet)			With Standard Bonnet	With Extended or Bellows Bonnet
	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	kg	kg
DN 15/ NPS 1/2	4.8, 9.5	225	130	184	190	66	304	313	313	270	115	21	25
DN 20/ NPS 3/4	4.8, 9.5, 14	225	150	184	194	66	304	313	313	270	115	22	26
DN 25/ NPS 1	4.8, 9.5, 14, 22	225	160	184	197	58	296	313	313	270	115	22	26
DN 40/ NPS 1-1/2	14, 22, 36	225	200	222	235	62	300	313	313	270	115	25	29
	36	750	200	222	235	62	300	342	342	430	115	52	56
DN 50/ NPS 2	22, 36, 46	225	230	254	267	68	306	313	313	270	115	29	33
	36, 46	750	230	254	267	68	306	342	342	430	115	56	60
DN 80/ NPS 3	36, 46	750	310	298	318	105	373	375	375	430	125	79	88
	70(1) 70	750 750	310 310	298 298	318 318	105 105	373(4) 373	375 395	375 395	430 430	125 125	81 83	90 92
DN 100/ NPS 4	46 70	750 750	350 350	352 352	368 368	121 121	393 393	379 399	375 395	430 430	130 130	98 101	109 111
	90(2) 90(1)	750	350	352	368	121	393(4)	379	375	430	130	105	115
	90	750	350	352	368	121	393	399	395	430	130	101	111
DN 150/ NPS 6	136 136(1) 136(5)	1200 1200 1200	480 480 480	451 451 451	473 473 473	189 200 230	--- --- ---	559 559 589	--- --- ---	566 566 566	224 210 240	235 247 247	--- --- ---

1. Balanced trim design.
2. Balanced trim with reduced-capacity plug.
3. Clearance required for removing actuator from installed valve body.
4. Bellows bonnets are available for these constructions. However, extension bonnets are not available with balanced trim due to temperature limitations of the trim seals.
5. Severe service.

Figure 18. Fisher GX Long Face-to-Face Dimensions (also see table 22)

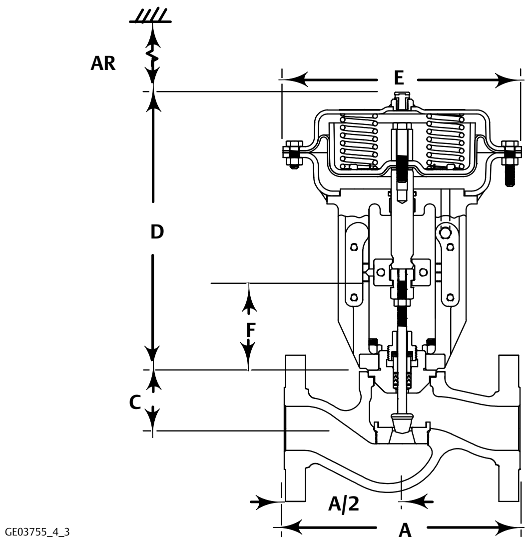
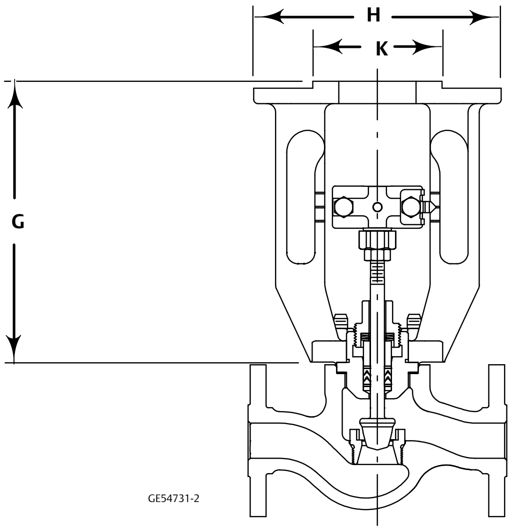


Table 22. Fisher GX Long Face-to-Face Dimensions and Weights

VALVE SIZE	PORT DIA	ACTUATOR SIZE	A		C		D		E Casing Dia	F (AR) Removal Height(1)	TOTAL WEIGHT	
			Long CL150	Long CL300	Std Bonnet	Extension or Bellows Bonnet	Actuator Height (Standard Bonnet)	Actuator Height (Extension or Bellows Bonnet)			With Standard Bonnet	With Extension or Bellows Bonnet
	mm		mm	mm	mm	mm	mm	mm	mm	mm	kg	kg
DN 25/ NPS 1	4.8	225	216	216	58	296	313	313	270	115	22	26
	9.5	225	216	216	58	296	313	313	270	115	22	26
	14	225	216	216	58	296	313	313	270	115	22	26
	22	225	216	216	58	296	313	313	270	115	22	26
DN 40/ NPS 1-1/2	14	225	241.3	241.3	62	300	313	313	270	115	25	29
	22	225	241.3	241.3	62	300	313	313	270	115	25	29
	36	750	241.3	241.3	62	300	342	342	430	115	52	56
DN 50/ NPS 2	22	225	292.1	292.1	68	306	313	313	270	115	30	34
	36	750	292.1	292.1	68	306	342	342	430	115	57	61
	46	750	292.1	292.1	68	306	342	342	430	115	57	61

1. Clearance required for removing actuator from installed valve body.

Figure 19. Fisher GX Electric Actuator Mounting Dimensions (also see table 23)



GX ELECTRIC ACTUATOR MOUNTING

Table 23. Fisher GX Electric Actuator Mounting Dimensions and Weights

VALVE SIZE	PORT DIAMETER	G	H	K	GX ELECTRIC ACTUATOR MOUNTING WEIGHT	
					With Standard Bonnet	With Extension or Bellow Bonnet
	mm	mm	mm	mm	kg	kg
DN 15/ NPS 1/2	4.8, 9.5	202	170	92	12	16
DN 20/ NPS 3/4	4.8, 9.5, 14	202	170	92	13	17
DN 25/ NPS 1	4.8, 9.5, 14, 22	202	170	92	13	17
DN 40/ NPS 1-1/2	14, 22, 36	202	170	92	16	20
	36				15	19
DN 50/ NPS 2	22, 36, 46	202	170	92	20	24
	36, 46				19	23
DN 80/ NPS 3	36, 46	222	170	92	42	51
	70(1) 70				44 43	53 52
DN 100/ NPS 4	46 70	226	170	92	61 61	72 71
	90(2) 90(1)				65	75
	90				64	74

1. Balanced trim design.
2. Balanced trim with reduced-capacity plug.
3. Severe service.

Table 24. Positioner Selection Guidelines

Type	Digital I/P(1)	I/P(2)	P/P(3)	Intrinsic Safety(4)	Flameproof / Explosionproof(4)	Non- Incendive(4)
DVC2000	X			X		X
DVC6200	X			X	X	X
3661		X		X		X
3660			X			

1. Digital I/P - microprocessor based electro-pneumatic with HART communication.
2. I/P - electro-pneumatic
3. P/P - pneumatic
4. Refer to Fisher bulletin 9.2:001 (D103222X012) for instrument hazardous area classification details.

Fisher GX Actuator Accessories

The GX is available with a variety of pneumatic (P/P), electro-pneumatic (I/P), and digital valve positioners, as well as limit switches and solenoids. Table 24 provides the basic features of the positioners offered with the GX actuator.

The Fisher FIELDVUE DVC2000 Digital Valve Controller

The DVC2000 digital valve controller (figure 20) is simple to use, compact, and designed for the GX control valve. It converts a 4-20mA input signal into a pneumatic output signal, which feeds the control valve actuator. Instrument setup is performed with a pushbutton and LCD interface. This interface is protected from the environment within an IP66 enclosure. Multiple languages are supported with the local interface including German, French, Italian, Spanish, Chinese, Japanese, Portuguese, Russian, Polish, Czech, Arabic, and English. Additionally, HART® communication is supported over the 4-20mA loop wiring.

The DVC2000 is designed to be integrally mounted to the GX actuator, avoiding the need for mounting brackets. The DVC2000 mounts directly to an interface pad on the actuator yoke leg with a secure 3-point mounting. An internal passage inside the yoke leg transmits the pneumatic signal to the actuator casing, eliminating the need for external tubing (in the air-to-open configuration).

Figure 20. Fisher FIELDVUE DVC2000 Digital Valve Controller

The high-performance linkage-less position feedback system eliminates physical contact between the valve stem and the digital valve controller or instrument. There are no wearing parts so cycle life is maximized. Additionally, the elimination of levers and linkages reduces the number of mounting parts and the mounting complexity. Digital valve controller or instrument replacement and maintenance is simplified because the feedback parts stay connected to the actuator.

The DVC2000 is available with an optional module which includes two (2) integral limit switches and a stem position transmitter. The limit switches are configurable for open and closed valve indication. The position transmitter provides a 4-20mA signal for valve position feedback verification. As an integral component to the instrument, this option module avoids the need for difficult-to-mount external switches and transmitters.

Designed to meet intrinsic safety and non-incendive requirements, this instrument delivers scalable functionality and high performance in a small package.

Optional Positioners and Instruments

Fisher FIELDVUE DVC6200 Digital Valve Controller

The DVC6200 digital valve controller is a communicating, microprocessor-based current-to-pneumatic instrument. Using HART or FOUNDATION™ fieldbus communication protocol, access to critical instrument, valve, and process conditions is provided. When used with ValveLink™ software, valve diagnostic tests can be run while the valve is in service to advise you of the performance of the entire control valve assembly. Designed to meet a broad range of hazardous area classifications, this instrument offers maximum functionality to improve your process performance. (See figure 21 and table 24.)

Fisher 3660 and 3661 Valve Positioners

The 3660 pneumatic and 3661 electro-pneumatic positioners are rugged, accurate, and feature low steady-state air consumption. Designed to meet intrinsic safety requirements, these positioners offer simple functionality in a small package. (See figure 22 and table 24.)

Figure 21. Fisher FIELDVUE DVC6200 Digital Valve Controller

W9713

Figure 22. Fisher GX Valve with 3660 or 3661 Positioner, NAMUR Mounting (IEC 60534-6-1)

W8590

Manual Handwheels

The GX is available with an optional, side-mounted manual handwheel (see figure 23). These handwheels provide a robust method of manually operating the valve in an emergency or upon loss of instrument air.

The GX handwheel will stroke the valve up to 20mm travel, and is available on the size 225 and 750 actuators. Dimensions are provided in figure 24 and table 25.

When mounted to a fail-up actuator, rotating the handwheel clockwise moves the stem downward. When mounted to a fail-down actuator, turning the handwheel in the clockwise direction causes the stem to move upward. Disengagement of the handwheel to allow automatic operation is accomplished by turning the handwheel in the counter-clockwise direction.

Figure 23. Fisher GX Control Valve and Actuator System with Manual Handwheel

Figure 24. Fisher GX with Handwheel Dimensions (also see table 25)

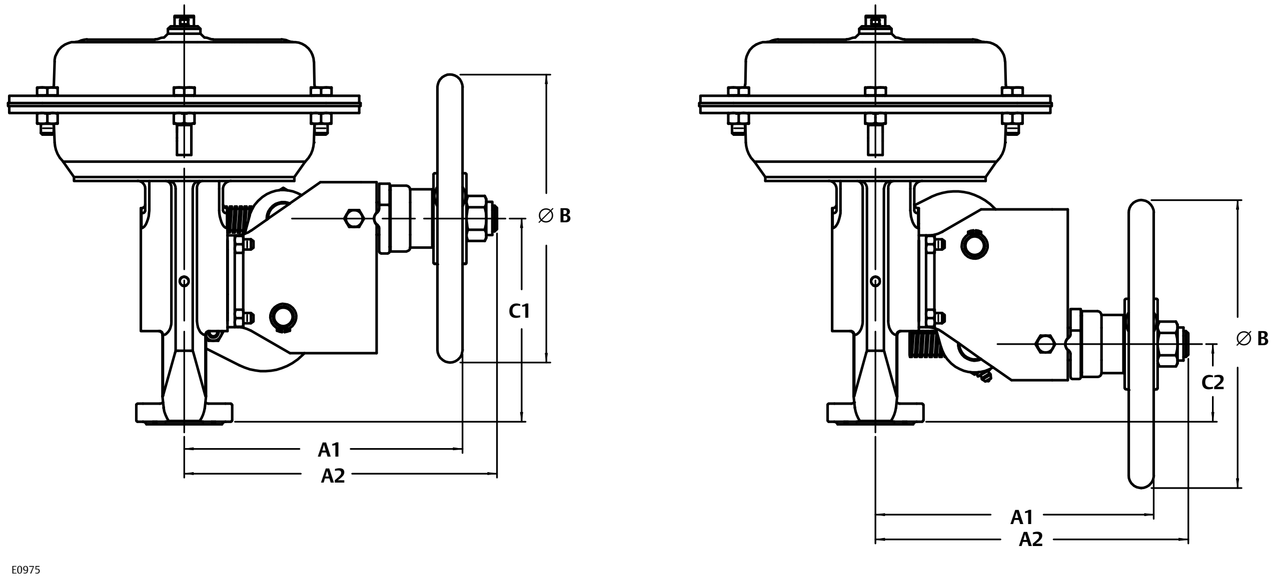


Table 25. Fisher GX with Handwheel Dimensions and Weights

VALVE SIZE		ACTUATOR SIZE	VALVE TRAVEL	HANDWHEEL WEIGHT	A1	A2	B	C1(1)	C2(2)
EN	ASME								
	NPS		mm	kg	mm	mm	mm	mm	mm
DN 15	1/2	225	20	5.6	215	242	223	159	60
DN 20	3/4	225	20	5.6	215	242	223	159	60
DN 25	1	225	20	5.6	215	242	223	159	60
DN 40	1-1/2	225 750	20 20	5.6 12.2	215 293	242 317	223 356	159 159	60 60
DN 50	2	225 750	20 20	5.6 12.2	215 293	242 317	223 356	159 159	60 60
DN 80	3	750	20	12.2	293	317	356	169	70
DN 100	4	750	20	12.2	293	317	356	173	74
DN 150	6	1200	Contact your Emerson sales office for information.						

1. C1 is fail-down.
2. C2 is fail-up.

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Singapore 128461 Singapore

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Fisher™ GX Bulletin Supplement

Use this bulletin supplement in conjunction with Bulletin 51.1:GX, Fisher GX Control Valve and Actuator System, D103171X012. This supplement provides additional information for the Fisher GX control valve and actuator.

The standard GX actuator comes with a supply pressure range of 4 to 6 bar (58 to 87 psi) for both air-to-open (ATO) and air-to-close (ATC) configurations. By selecting the appropriate option, the GX actuator will operate with a minimum supply pressure of 3 bar (44 psi) and 2 bar (29 psi) at the expense of maximum allowable shutoff pressure. **Note: These options do not apply to the size 1200 actuator which operates on a standard pressure range of 3 to 6 bar.**

The primary focus of this bulletin is to provide maximum pressure drop tables for the corresponding GX constructions.

Each of these tables includes air-to-open (standard) and air-to-close (optional) actuator configurations for varying supply pressure ranges, as well as the maximum actuator air supply pressure and associated pressure drop.

Tables are also provided for shutoff classification capability. These tables immediately follow their respective constructions. See table 1 for an index of these tables.

Table 1. Index to Trim Tables

Stem Material	Bonnet Style	Max Pressure Drop and Max Supply Pressure	Shutoff Capabilities
High Strength	Standard	Table 2	Table 3
	Extension / Bellows	Table 4	Table 5
Low Strength	Standard	Table 6	Table 7
	Bellows	Table 8	Table 9

High Strength Stem Material: S31603, S20910, N05500

Low Strength Stem Material: N06022, S31803, N10675

W8861

Fisher GX Control Valve, Actuator, and FIELDVUE™ DVC2000 Digital Valve Controller

Table 2 contains information regarding the maximum pressure drop capability of the GX with a standard bonnet and S31603 trim. Maximum pressure drop is calculated at the maximum supply pressure for each construction. The allowable leakage classes are given in table 3.

Table 2. Maximum Pressure Drops with Standard Bonnet Construction and High Strength Stem

<table>
<tr><th rowspan="4">Valve Size</th><th rowspan="3">Port Size</th><th rowspan="3">Max Travel</th><th rowspan="4">Actuator construction</th><th rowspan="4">ENVIRO-SEAL™ Packing</th><th>Air to Open</th><th colspan="9">Air to Close</th></tr>
<tr><th rowspan="2">Max ΔP</th><th colspan="7">Supply pressure</th><th colspan="2">Max Pressure Limits</th></tr>
<tr><th>2 Bar (29 psi)</th><th>2.5 Bar (36 psi)</th><th>3 Bar (44 psi)</th><th>3.44 Bar (50 psi)</th><th>4 Bar (58 psi)</th><th>5 Bar (72 psi)</th><th>6 Bar (87 psi)</th><th>ΔP</th><th>Supply</th></tr>
<tr><th>mm</th><th>mm</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th></tr>
<tr><td rowspan="12">DN15 to 25 (NPS 1/2 to 1)</td><td rowspan="6">4.8</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="6">51.7 (750)</td><td colspan="2" rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">6 (87)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">9.5</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="6">51.7 (750)</td><td colspan="2" rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">6 (87)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN20 to 40 (NPS 3/4 to 1-1/2)</td><td rowspan="6">14</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="6">51.7 (750)</td><td colspan="2" rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">6 (87)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN25 to 50 (NPS 1 to 2)</td><td rowspan="6">22[1]</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>27.3 (396)</td><td>39.2 (569)</td><td rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">6 (87)</td></tr>
<tr><td>PTFE</td><td>42.0 (609)</td><td>51.7 (750)</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td>43.4 (629)</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td><td>51.7 (750)</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td rowspan="2">51.7 (750)</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="12">DN40 to 50 (NPS 1-1/2 to 2)</td><td rowspan="12">36[1]</td><td rowspan="12">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>10.2 (148)</td><td>14.6 (212)</td><td>25.3 (367)</td><td>35.9 (521)</td><td>45.3 (657)</td><td rowspan="2">51.7 (750)</td><td colspan="2" rowspan="6">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">6 (87)</td></tr>
<tr><td>PTFE</td><td>15.7 (750)</td><td>20.1 (292)</td><td>30.8 (447)</td><td>41.4 (600)</td><td>50.8 (737)</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td>16.2 (235)</td><td colspan="2" rowspan="4">N/A</td><td>25.9 (376)</td><td>35.3 (512)</td><td>47.2 (685)</td></tr>
<tr><td>PTFE</td><td>21.7 (315)</td><td>31.4 (455)</td><td>40.8 (592)</td><td>51.7 (750)</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td>28.3 (410)</td><td colspan="2" rowspan="2">N/A</td><td>47.2 (685)</td></tr>
<tr><td>PTFE</td><td>33.7 (489)</td><td>51.7 (750)</td></tr>
<tr><td rowspan="2">750 2Bar</td><td>ULF</td><td>48.0 (696)</td><td>33.7 (489)</td><td rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">---</td><td rowspan="4">51.7 (750)</td><td rowspan="4">3.5 (51)</td></tr>
<tr><td>PTFE</td><td>51.7 (750)</td><td>39.2 (569)</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">51.7 (750)</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
</table>

-continued-

Table 2. Maximum Pressure Drops with Standard Bonnet Construction and High Strength Stem (continued)

<table>
<tr><th rowspan="4">Valve Size</th><th rowspan="3">Port Size</th><th rowspan="3">Max Travel</th><th rowspan="4">Actua-tor con-struc-tion</th><th rowspan="4">ENVIRO-SEAL Packing</th><th>Air to Open</th><th colspan="9">Air to Close</th></tr>
<tr><th rowspan="2">Max ΔP</th><th colspan="7">Supply pressure</th><th colspan="2">Max Pressure Limits</th></tr>
<tr><th>2 Bar (29 psi)</th><th>2.5 Bar (36 psi)</th><th>3 Bar (44 psi)</th><th>3.44 Bar (50 psi)</th><th>4 Bar (58 psi)</th><th>5 Bar (72 psi)</th><th>6 Bar (87 psi)</th><th>ΔP</th><th>Supply</th></tr>
<tr><th>mm</th><th>mm</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th></tr>
<tr><td rowspan="12">DN50 (NPS 2)</td><td rowspan="12">46[1]</td><td rowspan="12">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="2">---</td><td>9.0 (131)</td><td>15.5 (225)</td><td>22.0 (319)</td><td>27.8 (403)</td><td>35.1 (509)</td><td>48.1 (698)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">6 (87)</td></tr>
<tr><td>PTFE</td><td>12.3 (178)</td><td>18.8 (273)</td><td>25.4 (368)</td><td>31.1 (451)</td><td>38.4 (557)</td><td>51.5 (747)</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td>9.9 (144)</td><td colspan="2" rowspan="4">N/A</td><td>15.9 (231)</td><td>21.6 (313)</td><td>28.9 (419)</td><td>42.0 (609)</td></tr>
<tr><td>PTFE</td><td>13.3 (193)</td><td>19.2 (278)</td><td>25.0 (363)</td><td>32.3 (468)</td><td>45.3 (657)</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td>17.3 (251)</td><td colspan="2" rowspan="2">N/A</td><td>28.9 (419)</td><td>42.0 (609)</td></tr>
<tr><td>PTFE</td><td>20.7 (300)</td><td>32.3 (468)</td><td>45.3 (657)</td></tr>
<tr><td rowspan="2">750 2Bar</td><td>ULF</td><td>29.4 (426)</td><td>20.7 (300)</td><td>42.4 (615)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">---</td><td rowspan="4">51.7 (750)</td><td rowspan="4">3.5 (51)</td></tr>
<tr><td>PTFE</td><td>32.8 (476)</td><td>24.0 (348)</td><td>45.8 (664)</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td>46.5 (674)</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td><td>49.9 (724)</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td>46.5 (674)</td><td colspan="2" rowspan="2">N/A</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td><td>49.9 (724)</td></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">36</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td>46.4 (673)</td><td>32.1 (466)</td><td rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">6 (87)</td></tr>
<tr><td>PTFE</td><td>51.1 (741)</td><td>36.8 (534)</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">51.7 (750)</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">46</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td>28.4 (412)</td><td>19.7 (286)</td><td>41.5 (602)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">6 (87)</td></tr>
<tr><td>PTFE</td><td>31.3 (454)</td><td>22.6 (328)</td><td>44.3 (643)</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td>45.5 (660)</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td><td>48.4 (702)</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td>45.5 (660)</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td><td>48.4 (702)</td></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">70 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">51.7 (750)</td><td colspan="2" rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="6">6 (87)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
</table>

-continued-

Table 2. Maximum Pressure Drops with Standard Bonnet Construction and High Strength Stem (continued)

Valve Size	Port Size	Max Travel	Actua-tor con-struc-tion	ENVIRO-SEAL Packing	Air to Open	Air to Close								
					Max △P	Supply pressure							Max Pressure Limits	
						2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)	△P	Supply
	mm	mm			bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
DN80 -100 (NPS 3 to 4)	70	40	750 2Bar	ULF	11.5 (167)	17.2 (249)	26.6 (386)	35.9 (521)	44.2 (641)	51.7 (750)	51.7 (750)		51.7 (750)	6 (87)
				PTFE	12.8 (186)	18.4 (267)	27.8 (403)	37.2 (540)	45.4 (658)					
			750 3Bar	ULF	23.0 (334)	N/A	N/A	35.9 (521)	44.2 (641)					
				PTFE	24.2 (351)			37.2 (540)	45.4 (658)					
			750 4Bar	ULF	31.9 (463)			N/A	N/A	36.9 (535)				
				PTFE	33.1 (480)					38.2 (554)				
	90 Bal	20	750 2Bar	ULF	51.7 (750)	46.8 (679)	51.7 (750)	51.7 (750)		51.7 (750)			51.7 (750)	6 (87)
				PTFE		51.7 (750)								
			750 3Bar	ULF		N/A								
				PTFE										
			750 4Bar	ULF				N/A						
				PTFE										
	90	40	750 2Bar	ULF	7.0 (102)	10.4 (151)	16.1 (234)	21.7 (315)	26.7 (387)	33.1 (480)	44.4 (644)	51.7 (750)	51.7 (750)	6 (87)
				PTFE	7.7 (112)	11.2 (162)	16.8 (244)	22.5 (326)	27.5 (399)	33.8 (490)	45.2 (656)			
			750 3Bar	ULF	13.9 (202)	N/A		21.7 (315)	26.7 (387)	33.1 (480)	44.4 (644)			
				PTFE	14.7 (213)			22.5 (326)	27.5 (399)	33.8 (490)	45.2 (656)			
			750 4Bar	ULF	19.3 (280)			N/A		22.3 (323)	33.7 (489)	45.0 (653)	45.0 (653)	
				PTFE	20.0 (290)					23.1 (335)	34.4 (499)	45.7 (663)	45.7 (663)	
DN150 (NPS 6)	90	40	1200	ULF	26.4 (383)	N/A		18.9 (274)	26.9 (390)	37.2 (540)	---	---	51.7 (750)	4.9 (71)
				PTFE	27.8 (403)			20.3 (294)	28.4 (412)	38.7 (561)				
	136 Bal	60	1200	ULF	51.7 (750)			51.7 (750)		51.7 (750)				5.4 (78)
				PTFE										
	136	60	1200	ULF	8.4 (122)			4.6 (67)	8.1 (117)	12.5 (181)	20.3 (294)		23.5 (341)	
				PTFE	9.1 (132)			5.2 (75)	8.7 (126)	13.1 (190)	20.9 (303)		24.1 (350)	

1. Cavitrol™ III trim limited to 27.6 bar (400 psid) maximum pressure drop and 4 bar (58 psi) minimum supply pressure.

Table 3. Shutoff Classification Capability for Standard Bonnet Construction and High Strength Stem[1]

<table>
<tr><th rowspan="3">Valve Size</th><th rowspan="3">Port Size</th><th rowspan="3">Max Travel</th><th rowspan="4">Actua-tor con-struc-tion</th><th rowspan="4">ENVIRO-SEAL Packing</th><th>Air to Open</th><th colspan="7">Air to Close</th></tr>
<tr><th rowspan="3">Shutoff</th><th colspan="7">Supply pressure</th></tr>
<tr><th>2 Bar (29 psi)</th><th>2.5 Bar (36 psi)</th><th>3 Bar (44 psi)</th><th>3.44 Bar (50 psi)</th><th>4 Bar (58 psi)</th><th>5 Bar (72 psi)</th><th>6 Bar (87 psi)</th></tr>
<tr><th></th><th>mm</th><th>mm</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th></tr>
<tr><td rowspan="12">DN15 to 25 (NPS 1/2 to 1)</td><td rowspan="6">4.8</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>IV,V,VI[2]</td><td colspan="2" rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td><td rowspan="5">IV,V,VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">9.5</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>IV,V[2]</td><td rowspan="2">IV,V,VI[2]</td><td>IV,V,VI[2]</td><td rowspan="2">IV,V,VI</td><td rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td><td rowspan="3">IV,V,VI[2]</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td>IV,V,VI[2]</td></tr>
<tr><td>PTFE</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN20 to 40 (NPS 3/4 to 1-1/2)</td><td rowspan="6">14</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>IV</td><td rowspan="2">IV,V[2]</td><td rowspan="2">IV,V,VI[2]</td><td>IV,V,VI[2]</td><td rowspan="2">IV,V,VI</td><td colspan="3" rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td><td rowspan="2">IV,V[2]</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td colspan="2" rowspan="2">IV,V,VI[2]</td></tr>
<tr><td>PTFE</td><td rowspan="3">IV,V,VI[2]</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN25 to 50 (NPS 1 to 2</td><td rowspan="6">22</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="3">IV,VI</td><td>IV,VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td rowspan="2">IV,V[2],VI</td></tr>
<tr><td>PTFE</td><td rowspan="2">IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td><td>IV,V,VI</td></tr>
<tr><td rowspan="12">DN40 to 50 (NPS 1-1/2 to 2)</td><td rowspan="12">36</td><td rowspan="12">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="3">IV[2],VI</td><td>IV[2],VI</td><td>IV,VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="4">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td><td>IV,VI</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td>IV,VI</td><td rowspan="4">IV,V[2],VI</td></tr>
<tr><td>PTFE</td><td rowspan="2">IV,VI</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="12">DN50 (NPS 2)</td><td rowspan="12">46</td><td rowspan="12">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="2">---</td><td rowspan="2">IV[2],VI</td><td rowspan="2">IV,VI</td><td>IV,VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="6">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td rowspan="2">IV[2],VI</td><td colspan="2" rowspan="4">N/A</td><td rowspan="2">IV,VI</td><td>IV,VI</td><td>IV,V[2],VI</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td rowspan="2">IV,VI</td><td colspan="2" rowspan="2">N/A</td><td>IV,V[2],VI</td></tr>
<tr><td>PTFE</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI</td><td>IV,VI</td><td>IV,V[2],VI[2]</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
</table>

-continued-

Table 3. Shutoff Classification Capability for Standard Bonnet Construction and High Strength Stem[1] (continued)

<table>
<thead>
<tr><th rowspan="3">Valve Size</th><th rowspan="2">Port Size</th><th rowspan="2">Max Travel</th><th rowspan="3">Actua-tor con-struc-tion</th><th rowspan="3">ENVIRO-SEAL Packing</th><th>Air to Open</th><th colspan="7">Air to Close</th></tr>
<tr><th rowspan="2">Shutoff</th><th colspan="7">Supply pressure</th></tr>
<tr><th>mm</th><th>mm</th><th>2 Bar (29 psi)
Shutoff</th><th>2.5 Bar (36 psi)
Shutoff</th><th>3 Bar (44 psi)
Shutoff</th><th>3.44 Bar (50 psi)
Shutoff</th><th>4 Bar (58 psi)
Shutoff</th><th>5 Bar (72 psi)
Shutoff</th><th>6 Bar (87 psi)
Shutoff</th></tr>
</thead>
<tbody>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">36</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">46</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,VI</td><td>IV,V[2],VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">70 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV</td><td colspan="2" rowspan="2">IV</td><td colspan="2" rowspan="4">IV</td><td colspan="3" rowspan="6">IV</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">70</td><td rowspan="6">40</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,VI</td><td colspan="2" rowspan="2">IV,V[2],VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="12">DN100 (NPS 4)</td><td rowspan="6">90 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV</td><td rowspan="2">IV[2]</td><td rowspan="2">IV</td><td colspan="2" rowspan="4">IV</td><td colspan="3" rowspan="6">IV</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">90</td><td rowspan="6">40</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV[2],VI</td><td rowspan="2">IV,VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="4">IV,V[2],VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="2" rowspan="6">IV,V,VI</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V[2],VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td><td rowspan="2">IV,V[2],VI</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN150 (NPS 6)</td><td rowspan="2">90</td><td rowspan="2">40</td><td rowspan="2">1200</td><td>ULF</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="6">N/A</td><td rowspan="2">IV,V[2],VI</td><td colspan="2" rowspan="2">IV,V,VI</td><td rowspan="2">---</td><td rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">136 Bal</td><td rowspan="2">60</td><td rowspan="2">1200</td><td>ULF</td><td rowspan="2">IV</td><td rowspan="2">IV[2]</td><td colspan="3" rowspan="2">IV</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">136</td><td rowspan="2">60</td><td rowspan="2">1200</td><td>ULF</td><td rowspan="2">IV,VI</td><td>VI</td><td rowspan="2">IV,VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td></tr>
<tr><td>PTFE</td><td>IV[2],VI</td></tr>
</tbody>
</table>

1. CLVI shutoff is achieved through the use of a soft seat in ports greater than or equal to 22mm.
2. Shutoff classification not available on hard-faced trim.

Table 4 contains information regarding the maximum pressure drop capability of the GX with an extension or bellows bonnet and S31603 trim. Maximum pressure drop is calculated at the maximum supply pressure for each construction. The allowable leakage classes are given in table 5.

Table 4. Maximum Pressure Drops with Extension/Bellows Bonnet Construction with High Strength Stem

<table>
<tr><th rowspan="4">Valve Size</th><th rowspan="3">Port Size</th><th rowspan="3">Max Travel</th><th rowspan="4">Actuator construction</th><th rowspan="4">ENVIRO-SEAL Packing</th><th>Air to Open</th><th colspan="9">Air to Close</th></tr>
<tr><th rowspan="2">Max ΔP</th><th colspan="7">Supply pressure</th><th colspan="2">Max Pressure Limits</th></tr>
<tr><th>2 Bar (29 psi)</th><th>2.5 Bar (36 psi)</th><th>3 Bar (44 psi)</th><th>3.44 Bar (50 psi)</th><th>4 Bar (58 psi)</th><th>5 Bar (72 psi)</th><th>6 Bar (87 psi)</th><th>ΔP</th><th>Supply</th></tr>
<tr><th>mm</th><th>mm</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th></tr>
<tr><td rowspan="12">DN15 to 25 (NPS 1/2 to 1)</td><td rowspan="6">4.8</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="6">51.7 (750)</td><td colspan="2" rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="2" rowspan="6">51.7 (750)</td><td rowspan="2">---</td><td rowspan="6">51.7 (750)</td><td rowspan="2">5.6 (81)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td rowspan="4">51.7 (750)</td><td rowspan="4">6 (87)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">9.5</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="6">51.7 (750)</td><td colspan="2" rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="2" rowspan="6">51.7 (750)</td><td rowspan="2">---</td><td rowspan="6">51.7 (750)</td><td rowspan="2">5.6 (81)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td rowspan="4">51.7 (750)</td><td rowspan="4">6 (87)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN20 to 40 (NPS 3/4 to 1-1/2)</td><td rowspan="6">14</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="6">51.7 (750)</td><td colspan="2" rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="2" rowspan="6">51.7 (750)</td><td rowspan="2">---</td><td rowspan="6">51.7 (750)</td><td rowspan="2">5.6 (81)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td rowspan="4">51.7 (750)</td><td rowspan="4">6 (87)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN25 to 50 (NPS 1 to 2</td><td rowspan="6">22</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>27.3 (396)</td><td>39.2 (569)</td><td rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="2" rowspan="6">51.7 (750)</td><td rowspan="2">---</td><td rowspan="6">51.7 (750)</td><td rowspan="2">5.6 (81)</td></tr>
<tr><td>PTFE</td><td>42.0 (609)</td><td>51.7 (750)</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td>43.4 (629)</td><td colspan="2" rowspan="4">N/A</td><td rowspan="4">51.7 (750)</td><td rowspan="4">6 (87)</td></tr>
<tr><td>PTFE</td><td rowspan="3">51.7 (750)</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="12">DN40 to 50 (NPS 1-1/2 to 2)</td><td rowspan="12">36</td><td rowspan="12">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>10.2 (148)</td><td>14.6 (212)</td><td>25.3 (367)</td><td>35.9 (521)</td><td>45.3 (657)</td><td rowspan="2">51.7 (750)</td><td rowspan="6">51.7 (750)</td><td rowspan="2">---</td><td rowspan="6">51.7 (750)</td><td rowspan="2">5.6 (81)</td></tr>
<tr><td>PTFE</td><td>15.7 (228)</td><td>20.1 (292)</td><td>30.8 (447)</td><td>41.4 (600)</td><td>50.8 (737)</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td>16.2 (235)</td><td colspan="2" rowspan="4">N/A</td><td>25.9 (376)</td><td>35.3 (512)</td><td>47.2 (685)</td><td rowspan="4">51.7 (750)</td><td rowspan="4">6 (87)</td></tr>
<tr><td>PTFE</td><td>21.7 (315)</td><td>31.4 (455)</td><td>40.8 (592)</td><td>51.7 (750)</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td>28.3 (410)</td><td colspan="2" rowspan="2">N/A</td><td>47.2 (685)</td></tr>
<tr><td>PTFE</td><td>33.7 (489)</td><td>51.7 (750)</td></tr>
<tr><td rowspan="2">750 2Bar</td><td>ULF</td><td>48.0 (696)</td><td>33.7 (489)</td><td rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">---</td><td colspan="3" rowspan="6">---</td><td rowspan="2">51.7 (750)</td><td rowspan="2">2.8 (41)</td></tr>
<tr><td>PTFE</td><td rowspan="5">51.7 (750)</td><td>39.2 (569)</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
</table>

-continued-

Table 4. Maximum Pressure Drops with Extension/Bellows Bonnet Construction with High Strength Stem (continued)

Valve Size	Port Size	Max Travel	Actuator construction	ENVIRO-SEAL Packing	Air to Open	Air to Close								
						Supply pressure							Max Pressure Limits	
					Max ΔP	2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)	ΔP	Supply
	mm	mm			bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
DN50 (NPS 2)	46	20	225 2Bar	ULF	---	9.0 (131)	15.5 (225)	22.0 (319)	27.8 (403)	35.1 (509)	48.1 (698)	---	51.7 (750)	5.6 (81)
				PTFE		12.3 (178)	18.8 (273)	25.4 (368)	31.1 (451)	38.4 (557)	51.5 (747)			
			225 3Bar	ULF	9.9 (144)	N/A		15.9 (231)	21.6 (313)	28.9 (419)	42.0 (609)	51.7 (750)		6 (87)
				PTFE	13.3 (193)			19.2 (278)	25.0 (363)	32.3 (468)	45.3 (657)			
			225 4Bar	ULF	17.3 (251)			N/A		28.9 (419)	42.0 (609)			
				PTFE	20.7 (300)					32.3 (468)	45.3 (657)			
			750 2Bar	ULF	29.4 (426)	20.7 (300)	42.4 (615)	---		---			51.7 (750)	2.8 (41)
				PTFE	32.8 (476)	24.0 (348)	45.8 (664)							
			750 3Bar	ULF	46.5 (674)	N/A							N/A	
				PTFE	49.9 (724)									
			750 4Bar	ULF	46.5 (674)			N/A						
				PTFE	49.9 (724)									
DN80 (NPS 3)	36	20	750 2Bar	ULF	46.4 (673)	32.1 (466)	51.7 (750)	51.7 (750)		---			51.7 (750)	3.9 (57)
				PTFE	51.1 (741)	36.8 (534)								
			750 3Bar	ULF	51.7 (750)	N/A								
				PTFE										
			750 4Bar	ULF				N/A					N/A	
				PTFE										
DN80 -100 (NPS 3 to 4)	46	20	750 2Bar	ULF	28.4 (412)	19.7 (286)	41.5 (602)	51.7 (750)		---			51.7 (750)	3.9 (57)
				PTFE	31.3 (454)	22.6 (328)	44.3 (643)							
			750 3Bar	ULF	45.5 (660)	N/A								
				PTFE	48.4 (702)									
			750 4Bar	ULF	45.5 (660)			N/A					N/A	
				PTFE	48.4 (702)									
DN80 (NPS 3)	70 Bal	20	750 2Bar	ULF	51.7 (750)	51.7 (750)		51.7 (750)		---			51.7 (750)	3.9 (57)
				PTFE										
			750 3Bar	ULF		N/A								
				PTFE										
			750 4Bar	ULF				N/A					N/A	
				PTFE										

-continued-

Table 4. Maximum Pressure Drops with Extension/Bellows Bonnet Construction with High Strength Stem (continued)

Valve Size	Port Size	Max Travel	Actuator construction	ENVIRO-SEAL Packing	Air to Open	Air to Close								
					Max ΔP	Supply pressure							Max Pressure Limits	
						2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)	ΔP	Supply
	mm	mm			bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
DN80 -100 (NPS 3 to 4)	70	40	750 2Bar	ULF	11.5 (167)	17.2 (249)	26.6 (386)	35.9 (521)	44.2 (641)	---	---		45.1 (654)	3.5 (51)
				PTFE	12.8 (186)	18.4 (267)	27.8 (403)	37.2 (540)	45.4 (658)				46.4 (673)	
			750 3Bar	ULF	23.0 (334)	N/A		35.9 (521)	44.2 (641)				45.1 (654)	
				PTFE	24.2 (351)			37.2 (540)	45.4 (658)				46.4 (673)	
			750 4Bar	ULF	31.9 (463)			N/A		36.9 (535)			44.4 (644)	4.4 (64)
				PTFE	33.1 (480)					38.2 (554)			45.6 (661)	
DN100 (NPS 4)	90 Bal	20	750 2Bar	ULF	51.7 (750)	46.8 (679)	51.7 (750)	51.7 (750)		---			51.7 (750)	3.9 (57)
				PTFE		51.7 (750)								
			750 3Bar	ULF		N/A								
				PTFE										
			750 4Bar	ULF				N/A					N/A	
				PTFE										
	90	40	750 2Bar	ULF	7.0 (102)	10.4 (151)	16.1 (234)	21.7 (315)	26.7 (387)	---	---		27.3 (396)	3.5 (51)
				PTFE	7.7 (112)	11.2 (162)	16.8 (244)	22.5 (326)	27.5 (399)				28.0 (406)	
			750 3Bar	ULF	13.9 (202)	N/A		21.7 (315)	26.7 (387)				27.3 (396)	
				PTFE	14.7 (213)			22.5 (326)	27.5 (399)				28.0 (406)	
			750 4Bar	ULF	19.3 (280)			N/A		22.3 (323)			26.9 (390)	4.4 (64)
				PTFE	20.0 (290)					23.1 (335)			27.6 (400)	

Table 5. Shutoff Classification Capability for Extension / Bellows Bonnet Construction and High Strength Stem[1]

<table>
<tr><th rowspan="4">Valve Size</th><th rowspan="3">Port Size</th><th rowspan="3">Max Travel</th><th rowspan="4">Actua-tor con-struc-tion</th><th rowspan="4">ENVIRO-SEAL Packing</th><th>Air to Open</th><th colspan="7">Air to Close</th></tr>
<tr><th rowspan="3">Shutoff</th><th colspan="7">Supply pressure</th></tr>
<tr><th>2 Bar (29 psi)</th><th>2.5 Bar (36 psi)</th><th>3 Bar (44 psi)</th><th>3.44 Bar (50 psi)</th><th>4 Bar (58 psi)</th><th>5 Bar (72 psi)</th><th>6 Bar (87 psi)</th></tr>
<tr><th>mm</th><th>mm</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th></tr>
<tr><td rowspan="12">DN15 to 25 (NPS 1/2 to 1)</td><td rowspan="6">4.8</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>IV,V,VI[2]</td><td colspan="2" rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="2" rowspan="6">IV,V,VI</td><td rowspan="2">---</td></tr>
<tr><td>PTFE</td><td rowspan="5">IV,V,VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td rowspan="4">IV,V,VI</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">9.5</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>IV,V[2]</td><td rowspan="2">IV,V,VI[2]</td><td>IV,V,VI[2]</td><td rowspan="2">IV,V,VI</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="6">IV,V,VI</td><td rowspan="2">---</td></tr>
<tr><td>PTFE</td><td rowspan="3">IV,V,VI[2]</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td>IV,V,VI[2]</td><td rowspan="4">IV,V,VI</td></tr>
<tr><td>PTFE</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN20 to 40 (NPS 3/4 to 1-1/2)</td><td rowspan="6">14</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td>IV</td><td rowspan="2">IV,V[2]</td><td rowspan="2">IV,V,VI[2]</td><td>IV,V,VI[2]</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="6">IV,V,VI</td><td rowspan="2">---</td></tr>
<tr><td>PTFE</td><td rowspan="2">IV,V[2]</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td colspan="2" rowspan="2">IV,V,VI[2]</td><td rowspan="4">IV,V,VI</td></tr>
<tr><td>PTFE</td><td rowspan="3">IV,V,VI[2]</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN25 to 50 (NPS 1 to 2</td><td rowspan="6">22</td><td rowspan="6">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="3">IV,VI</td><td>IV,VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="6">IV,V,VI</td><td rowspan="2">---</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td rowspan="2">IV,V[2],VI</td><td rowspan="4">IV,V,VI</td></tr>
<tr><td>PTFE</td><td rowspan="2">IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td><td>IV,V,VI</td></tr>
<tr><td rowspan="12">DN40 to 50 (NPS 1-1/2 to 2)</td><td rowspan="12">36</td><td rowspan="12">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="3">IV[2],VI</td><td>IV[2],VI</td><td>IV,VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="4">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td rowspan="6">IV,V,VI</td><td rowspan="2">---</td></tr>
<tr><td>PTFE</td><td>IV,VI</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td><td>IV,VI</td><td rowspan="4">IV,V[2],VI</td><td rowspan="4">IV,V,VI</td></tr>
<tr><td>PTFE</td><td rowspan="2">IV,VI</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI[2]</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">---</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="12">DN50 (NPS 2)</td><td rowspan="12">46</td><td rowspan="12">20</td><td rowspan="2">225 2Bar</td><td>ULF</td><td rowspan="2">---</td><td rowspan="2">IV[2],VI</td><td rowspan="2">IV,VI</td><td>IV,VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="6">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td rowspan="2">---</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td></tr>
<tr><td rowspan="2">225 3Bar</td><td>ULF</td><td rowspan="2">IV[2],VI</td><td colspan="2" rowspan="4">N/A</td><td rowspan="2">IV,VI</td><td>IV,VI</td><td>IV,V[2],VI</td><td rowspan="4">IV,V,VI</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">225 4Bar</td><td>ULF</td><td rowspan="2">IV,VI</td><td colspan="2" rowspan="2">N/A</td><td>IV,V[2],VI</td></tr>
<tr><td>PTFE</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI</td><td>IV,VI</td><td>IV,V[2],VI</td><td colspan="2" rowspan="4">---</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td><td>IV,V[2],VI</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
</table>

-continued-

Table 5. Shutoff Classification Capability for Extension / Bellows Bonnet Construction and High Strength Stem[1] (continued)

<table>
<tr><th rowspan="4">Valve Size</th><th rowspan="3">Port Size</th><th rowspan="3">Max Travel</th><th rowspan="4">Actua-tor con-struc-tion</th><th rowspan="4">ENVIRO-SEAL Packing</th><th>Air to Open</th><th colspan="7">Air to Close</th></tr>
<tr><th rowspan="3">Shutoff</th><th colspan="7">Supply pressure</th></tr>
<tr><th>2 Bar (29 psi)</th><th>2.5 Bar (36 psi)</th><th>3 Bar (44 psi)</th><th>3.44 Bar (50 psi)</th><th>4 Bar (58 psi)</th><th>5 Bar (72 psi)</th><th>6 Bar (87 psi)</th></tr>
<tr><th>mm</th><th>mm</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">36</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">46</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI</td><td rowspan="2">IV,VI</td><td>IV,V[2],VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td><td>IV,V,VI</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">70 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV</td><td colspan="2" rowspan="2">IV</td><td colspan="2" rowspan="4">IV</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">70</td><td rowspan="6">40</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,VI</td><td colspan="2" rowspan="2">IV,V[2],VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td rowspan="4">---</td><td colspan="2" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="2">IV,V[2],VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="2">N/A</td><td rowspan="2">IV,V,VI</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="12">DN100 (NPS 4)</td><td rowspan="6">90 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV</td><td rowspan="2">IV[2]</td><td rowspan="2">IV</td><td colspan="2" rowspan="4">IV</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">90</td><td rowspan="6">40</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV[2],VI</td><td rowspan="2">IV,VI</td><td rowspan="2">IV,V[2],VI</td><td rowspan="4">IV,V[2],VI</td><td rowspan="4">IV,V,VI</td><td rowspan="4">---</td><td colspan="2" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V[2],VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td><td rowspan="2">IV,V[2],VI</td></tr>
<tr><td>PTFE</td></tr>
</table>

1. CLVI shutoff is achieved through the use of a soft seat in ports greater than or equal to 22mm.
2. Shutoff classification not available on hard-faced trim.

Table 6 contains information regarding the maximum pressure drop capability of the GX with a standard bonnet and CW2M trim. Maximum pressure drop is calculated at the maximum supply pressure for each construction. The allowable leakage classes are given in table 7.

Table 6. Maximum Pressure Drops with Standard Bonnet Construction and Low Strength Stem

Valve Size	Port Size	Max Travel	Actuator construction	ENVIRO-SEAL Packing	Air to Open	Air to Close								
						Supply pressure							Max Pressure Limits	
					Max ΔP	2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)	ΔP	Supply
	mm	mm			bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
DN15 to 25 (NPS 1/2 to 1)	4.8	20	225 2Bar	ULF	51.7 (750)	51.7 (750)		51.7 (750)		51.7 (750)	---		51.7 (750)	4.1 (59)
				PTFE										
			225 3Bar	ULF		N/A								4.6 (67)
				PTFE										
			225 4Bar	ULF				N/A						
				PTFE										
	9.5	20	225 2Bar	ULF	51.7 (750)	51.7 (750)		51.7 (750)		51.7 (750)	---		51.7 (750)	4.1 (59)
				PTFE										
			225 3Bar	ULF		N/A								4.6 (67)
				PTFE										
			225 4Bar	ULF				N/A						
				PTFE										
DN20 to 40 (NPS 3/4 to 1-1/2)	14	20	225 2Bar	ULF	51.7 (750)	51.7 (750)		51.7 (750)		51.7 (750)	---		51.7 (750)	4.1 (59)
				PTFE										
			225 3Bar	ULF		N/A								4.6 (67)
				PTFE										
			225 4Bar	ULF				N/A						
				PTFE										
DN25 to 50 (NPS 1 to 2	22	20	225 2Bar	ULF	27.3 (396)	39.2 (569)	51.7 (750)	51.7 (750)		51.7 (750)	---		51.7 (750)	4.1 (59)
				PTFE	42.0 (609)	51.7 (750)								
			225 3Bar	ULF	43.4 (629)	N/A								4.6 (67)
				PTFE	51.7 (750)									
			225 4Bar	ULF				N/A						
				PTFE										
DN40 to 50 (NPS 1-1/2 to 2)	36	20	225 2Bar	ULF	10.2 (148)	14.6 (212)	25.3 (367)	35.9 (521)	45.3 (657)	51.7 (750)	---		51.7 (750)	4.1 (59)
				PTFE	15.7 (228)	20.1 (292)	30.8 (447)	41.4 (600)	50.8 (737)					
			225 3Bar	ULF	16.2 (235)	N/A		25.9 (376)	35.3 (512)	47.2 (685)				4.6 (67)
				PTFE	21.7 (315)			31.4 (455)	40.8 (592)	51.7 (750)				
			225 4Bar	ULF	28.3 (410)			N/A		47.2 (685)				
				PTFE	33.7 (489)					51.7 (750)				

-continued-

Table 6. Maximum Pressure Drops with Standard Bonnet Construction and Low Strength Stem (continued)

Valve Size	Port Size	Max Travel	Actuator construction	ENVIRO-SEAL Packing	Air to Open	Air to Close								
						Supply pressure							Max Pressure Limits	
					Max △P	2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)	△P	Supply
	mm	mm			bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
DN40 to 50 (NPS 1-1/2 to 2)	36	20	750 2Bar	ULF	48.0 (696)	33.7 (489)	---	---		---			51.7 (750)	2.3 (33)
				PTFE	51.7 (750)	39.2 (569)								
			750 3Bar	ULF	48.0 (696)	N/A							N/A	
				PTFE	51.7 (750)									
			750 4Bar	ULF	48.0 (696)			N/A						
				PTFE	51.7 (750)									
DN50 (NPS 2)	46	20	225 2Bar	ULF	---	9.0 (131)	15.5 (225)	22.0 (319)	27.8 (403)	35.1 (509)	---		36.4 (528)	4.1 (59)
				PTFE		12.3 (178)	18.8 (273)	25.4 (368)	31.1 (451)	38.4 (557)			39.7 (576)	
			225 3Bar	ULF	9.9 (144)	N/A		15.9 (231)	21.6 (313)	28.9 (419)			36.7 (532)	4.6 (67)
				PTFE	13.3 (193)			19.2 (278)	25.0 (363)	32.3 (468)			40.1 (582)	
			225 4Bar	ULF	17.3 (251)			N/A		28.9 (419)			36.7 (532)	
				PTFE	20.7 (300)					32.3 (468)			40.1 (582)	
			750 2Bar	ULF	29.4 (426)	20.7 (300)	---	---		---			33.7 (489)	2.3 (33)
				PTFE	32.8 (476)	24.0 (348)							37.1 (538)	
			750 3Bar	ULF	29.4 (426)	N/A							N/A	
				PTFE	32.8 (476)									
			750 4Bar	ULF	29.4 (426)			N/A						
				PTFE	32.8 (476)									
DN80 (NPS 3)	36	20	750 2Bar	ULF	46.4 (673)	32.1 (466)	51.7 (750)	51.7 (750)		---			51.7 (750)	3.9 (57)
				PTFE	51.1 (741)	36.8 (534)	51.7 (750)							
			750 3Bar	ULF	46.4 (673)	N/A								
				PTFE	51.1 (741)									
			750 4Bar	ULF	46.4 (673)			N/A					N/A	
				PTFE	51.1 (741)									

-continued-

Table 6. Maximum Pressure Drops with Standard Bonnet Construction and Low Strength Stem (continued)

<table>
<tr><th rowspan="4">Valve Size</th><th rowspan="3">Port Size</th><th rowspan="3">Max Travel</th><th rowspan="4">Actua-tor con-struc-tion</th><th rowspan="4">ENVIRO-SEAL Packing</th><th>Air to Open</th><th colspan="9">Air to Close</th></tr>
<tr><th rowspan="2">Max ΔP</th><th colspan="7">Supply pressure</th><th colspan="2">Max Pressure Limits</th></tr>
<tr><th>2 Bar (29 psi)</th><th>2.5 Bar (36 psi)</th><th>3 Bar (44 psi)</th><th>3.44 Bar (50 psi)</th><th>4 Bar (58 psi)</th><th>5 Bar (72 psi)</th><th>6 Bar (87 psi)</th><th>ΔP</th><th>Supply</th></tr>
<tr><th>mm</th><th>mm</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th><th>bar (psi)</th></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">46</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td>28.4 (412)</td><td>19.7 (286)</td><td>41.5 (602)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">---</td><td rowspan="4">51.7 (750)</td><td rowspan="4">3.9 (57)</td></tr>
<tr><td>PTFE</td><td>31.3 (454)</td><td>22.6 (328)</td><td>44.3 (643)</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td>28.4 (412)</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td><td>31.3 (454)</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td>28.4 (412)</td><td colspan="2" rowspan="2">N/A</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td><td>31.3 (454)</td></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">70 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">51.7 (750)</td><td colspan="2" rowspan="2">51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">---</td><td rowspan="4">51.7 (750)</td><td rowspan="4">3.9 (57)</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">70</td><td rowspan="6">40</td><td rowspan="2">750 2Bar</td><td>ULF</td><td>11.5 (167)</td><td>17.2 (249)</td><td>26.6 (386)</td><td>35.9 (521)</td><td>44.2 (641)</td><td rowspan="4">---</td><td colspan="2" rowspan="6">---</td><td>44.2 (641)</td><td rowspan="4">3.44 (50)</td></tr>
<tr><td>PTFE</td><td>12.8 (186)</td><td>18.4 (267)</td><td>27.8 (403)</td><td>37.2 (540)</td><td>45.4 (658)</td><td>45.4 (658)</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td>23.0 (334)</td><td colspan="2" rowspan="4">N/A</td><td>35.9 (521)</td><td>44.2 (641)</td><td>44.2 (641)</td></tr>
<tr><td>PTFE</td><td>24.2 (351)</td><td>37.2 (540)</td><td>45.4 (658)</td><td>45.4 (658)</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td>23.0 (334)</td><td colspan="2" rowspan="2">N/A</td><td>36.9 (535)</td><td>42.5 (616)</td><td rowspan="2">4.3 (62)</td></tr>
<tr><td>PTFE</td><td>24.2 (351)</td><td>38.2 (554)</td><td>43.8 (635)</td></tr>
<tr><td rowspan="12">DN100 (NPS 4)</td><td rowspan="6">90 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">51.7 (750)</td><td>46.8 (679)</td><td>51.7 (750)</td><td colspan="2" rowspan="4">51.7 (750)</td><td colspan="3" rowspan="6">---</td><td rowspan="4">51.7 (750)</td><td rowspan="4">3.9 (57)</td></tr>
<tr><td>PTFE</td><td>51.7 (750)</td><td>51.7 (750)</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">90</td><td rowspan="6">40</td><td rowspan="2">750 2Bar</td><td>ULF</td><td>7.0 (102)</td><td>10.4 (151)</td><td>16.1 (234)</td><td>21.7 (315)</td><td>26.7 (387)</td><td rowspan="4">---</td><td colspan="2" rowspan="6">---</td><td>26.7 (387)</td><td rowspan="4">3.44 (50)</td></tr>
<tr><td>PTFE</td><td>7.7 (112)</td><td>11.2 (162)</td><td>16.8 (244)</td><td>22.5 (326)</td><td>27.5 (399)</td><td>27.5 (399)</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td>13.9 (202)</td><td colspan="2" rowspan="4">N/A</td><td>21.7 (315)</td><td>26.7 (387)</td><td>26.7 (387)</td></tr>
<tr><td>PTFE</td><td>14.7 (213)</td><td>22.5 (326)</td><td>27.5 (399)</td><td>27.5 (399)</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td>13.9 (202)</td><td colspan="2" rowspan="2">N/A</td><td>22.3 (323)</td><td>25.7 (373)</td><td rowspan="2">4.3 (62)</td></tr>
<tr><td>PTFE</td><td>14.7 (213)</td><td>23.1 (335)</td><td>26.5 (384)</td></tr>
</table>

Table 7. Shutoff Classification Capability for Standard Bonnet Construction and Low Strength Stem(1)

Valve Size	Port Size	Max Travel	Actuator construction	ENVIRO-SEAL Packing	Air to Open	Air to Close: Supply pressure						
					Shutoff	2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)
	mm	mm				Shutoff	Shutoff	Shutoff	Shutoff	Shutoff	Shutoff	Shutoff
DN15 to 25 (NPS 1/2 to 1)	4.8	20	225 2Bar	ULF	IV,V,VI	IV,V,VI		IV,V,VI		IV,V,VI	---	
				PTFE								
			225 3Bar	ULF		N/A						
				PTFE								
			225 4Bar	ULF				N/A				
				PTFE								
	9.5	20	225 2Bar	ULF	IV,V	IV,V,VI		IV,V,VI		IV,V,VI	---	
				PTFE	IV,V,VI							
			225 3Bar	ULF		N/A						
				PTFE								
			225 4Bar	ULF				N/A				
				PTFE								
DN20 to 40 (NPS 3/4 to 1-1/2)	14	20	225 2Bar	ULF	IV	IV,V		IV,V,VI		IV,V,VI	---	
				PTFE	IV,V							
			225 3Bar	ULF		N/A						
				PTFE	IV,V,VI							
			225 4Bar	ULF				N/A				
				PTFE								
DN25 to 50 (NPS 1 to 2	22	20	225 2Bar	ULF	IV,VI	IV,VI	IV,V,VI	IV,V,VI		IV,V,VI	---	
				PTFE		IV,V,VI						
			225 3Bar	ULF		N/A						
				PTFE	IV,V,VI							
			225 4Bar	ULF				N/A				
				PTFE								
DN40 to 50 (NPS 1-1/2 to 2)	36	20	225 2Bar	ULF	IV,VI	IV,VI	IV,VI	IV,V,VI	IV,V,VI	IV,V,VI	---	
				PTFE			IV,V,VI					
			225 3Bar	ULF		N/A		IV,VI				
				PTFE				IV,V,VI				
			225 4Bar	ULF				N/A				
				PTFE	IV,V,VI							
			750 2Bar	ULF	IV,V,VI	IV,V,VI	---	---		---		
				PTFE								
			750 3Bar	ULF		N/A						
				PTFE								
			750 4Bar	ULF				N/A				
				PTFE								
DN50 (NPS 2)	46	20	225 2Bar	ULF	---	IV,VI		IV,VI	IV,V,VI	IV,V,VI	---	
				PTFE				IV,V,VI				
			225 3Bar	ULF	IV,VI	N/A		IV,VI	IV,VI			
				PTFE					IV,V,VI			
			225 4Bar	ULF				N/A				
				PTFE								
			750 2Bar	ULF	IV,V,VI	IV,VI	---	---		---		
				PTFE		IV,V,VI						
			750 3Bar	ULF		N/A						
				PTFE								
			750 4Bar	ULF				N/A				
				PTFE								

-continued-

Table 7. Shutoff Classification Capability for Standard Bonnet Construction and Low Strength Stem(1) (continued)

<table>
<tr><th rowspan="4">Valve Size</th><th rowspan="3">Port Size</th><th rowspan="3">Max Travel</th><th rowspan="4">Actua-tor con-struc-tion</th><th rowspan="4">ENVIRO-SEAL Packing</th><th>Air to Open</th><th colspan="7">Air to Close</th></tr>
<tr><th rowspan="3">Shutoff</th><th colspan="7">Supply pressure</th></tr>
<tr><th>2 Bar (29 psi)</th><th>2.5 Bar (36 psi)</th><th>3 Bar (44 psi)</th><th>3.44 Bar (50 psi)</th><th>4 Bar (58 psi)</th><th>5 Bar (72 psi)</th><th>6 Bar (87 psi)</th></tr>
<tr><th>mm</th><th>mm</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">36</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV,V,VI</td><td colspan="2" rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">46</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV,V,VI</td><td rowspan="2">IV,VI</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">70 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV</td><td colspan="2" rowspan="2">IV</td><td colspan="2" rowspan="4">IV</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">70</td><td rowspan="6">40</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,VI</td><td colspan="2" rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td rowspan="4">---</td><td colspan="2" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td><td rowspan="2">IV,V,VI</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="12">DN100 (NPS 4)</td><td rowspan="6">90 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV</td><td colspan="2" rowspan="2">IV</td><td colspan="2" rowspan="4">IV</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">90</td><td rowspan="6">40</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="2">IV,VI</td><td rowspan="2">IV,VI</td><td rowspan="2">IV,V,VI</td><td colspan="2" rowspan="4">IV,V,VI</td><td rowspan="4">---</td><td colspan="2" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td rowspan="4">IV,V,VI</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td><td rowspan="2">IV,V,VI</td></tr>
<tr><td>PTFE</td></tr>
<tr><td colspan="13">1. CLVI shutoff is achieved through the use of a soft seat in ports greater than or equal to 22mm.</td></tr>
</table>

Table 8 contains information regarding the maximum pressure drop capability of the GX with a bellows bonnet and CW2M trim. Maximum pressure drop is calculated at the maximum supply pressure for each construction. The allowable leakage classes are given in table 9.

Table 8. Maximum Pressure Drops with Bellows Bonnet Construction and Low Strength Stem

Valve Size	Port Size	Max Travel	Actuator construction	ENVIRO-SEAL Packing	Air to Open	Air to Close								
						Supply pressure							Max Pressure Limits	
					Max ΔP	2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)	ΔP	Supply
	mm	mm			bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
DN15 to 25 (NPS 1/2 to 1)	4.8	20	225 2Bar	ULF	51.7 (750)	51.7 (750)		51.7 (750)		---	---		51.7 (750)	3.7 (54)
				PTFE										
			225 3Bar	ULF		N/A				51.7 (750)				4.1 (59)
				PTFE										
			225 4Bar	ULF				N/A						
				PTFE										
	9.5	20	225 2Bar	ULF	51.7 (750)	51.7 (750)		51.7 (750)		---	---		51.7 (750)	3.7 (54)
				PTFE										
			225 3Bar	ULF		N/A				51.7 (750)				4.1 (59)
				PTFE										
			225 4Bar	ULF				N/A						
				PTFE										
DN20 to 40 (NPS 3/4 to 1-1/2)	14	20	225 2Bar	ULF	51.7 (750)	51.7 (750)		51.7 (750)		---	---		51.7 (750)	3.7 (54)
				PTFE										
			225 3Bar	ULF		N/A				51.7 (750)				4.1 (59)
				PTFE										
			225 4Bar	ULF				N/A						
				PTFE										
DN25 to 50 (NPS 1 to 2	22	20	225 2Bar	ULF	27.3 (396)	39.2 (569)	51.7 (750)	51.7 (750)		---	---		51.7 (750)	3.7 (54)
				PTFE	42.0 (609)	51.7 (750)								
			225 3Bar	ULF	43.4 (629)	N/A				51.7 (750)				4.1 (59)
				PTFE	51.7 (750)									
			225 4Bar	ULF				N/A						
				PTFE										
DN40 to 50 (NPS 1-1/2 to 2)	36	20	225 2Bar	ULF	10.2 (148)	14.6 (212)	25.3 (367)	35.9 (521)	45.3 (657)	---	---		50.9 (738)	3.7 (54)
				PTFE	15.7 (228)	20.1 (292)	30.8 (447)	41.4 (600)	50.8 (737)				51.7 (750)	
			225 3Bar	ULF	16.2 (235)	N/A		25.9 (376)	35.3 (512)	47.2 (685)			49.3 (715)	4.1 (59)
				PTFE	21.7 (315)			31.4 (455)	40.8 (592)	51.7 (750)			51.7 (750)	
			225 4Bar	ULF	28.3 (410)			N/A		47.2 (685)			49.3 (715)	
				PTFE	33.7 (489)					51.7 (750)			51.7 (750)	

-continued-

Table 8. Maximum Pressure Drops with Bellows Bonnet Construction and Low Strength Stem (continued)

Valve Size	Port Size	Max Travel	Actua-tor con-struc-tion	ENVIRO-SEAL Packing	Air to Open	Air to Close								
						Supply pressure							Max Pressure Limits	
					Max ΔP	2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)	ΔP	Supply
	mm	mm			bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
DN40 to 50 (NPS 1-1/2 to 2)	36	20	750 2Bar	ULF	48.0 (696)	33.7 (489)	---	---		---			47.9 (695)	2.2 (32)
				PTFE	51.7 (750)	39.2 (569)							51.7 (750)	
			750 3Bar	ULF	48.0 (696)	N/A							N/A	
				PTFE	51.7 (750)									
			750 4Bar	ULF	48.0 (696)			N/A						
				PTFE	51.7 (750)									
DN50 (NPS 2)	46	20	225 2Bar	ULF	---	9.0 (131)	15.5 (225)	22.0 (319)	27.8 (403)	---	---		31.2 (453)	3.7 (54)
				PTFE		12.3 (178)	18.8 (273)	25.4 (368)	31.1 (451)				34.5 (500)	
			225 3Bar	ULF	9.9 (144)	N/A		15.9 (231)	21.6 (313)	28.9 (419)			30.2 (438)	4.1 (59)
				PTFE	13.3 (193)			19.2 (278)	25.0 (363)	32.3 (468)			33.6 (487)	
			225 4Bar	ULF	17.3 (251)			N/A		28.9 (419)			30.2 (438)	
				PTFE	20.7 (300)					32.3 (468)			33.6 (487)	
			750 2Bar	ULF	29.4 (426)	20.7 (300)	---	---		---			29.4 (426)	2.2 (32)
				PTFE	32.8 (476)	24.0 (348)							32.7 (474)	
			750 3Bar	ULF	29.4 (426)	N/A							N/A	
				PTFE	32.8 (476)									
			750 4Bar	ULF	29.4 (426)			N/A						
				PTFE	32.8 (476)									
DN80 (NPS 3)	36	20	750 2Bar	ULF	46.4 (673)	32.1 (466)	51.7 (750)	51.7 (750)	---	---			51.7 (750)	3.2 (46)
				PTFE	51.1 (741)	36.8 (534)								
			750 3Bar	ULF	46.4 (673)	N/A								
				PTFE	51.1 (741)									
			750 4Bar	ULF	46.4 (673)			N/A					N/A	
				PTFE	51.1 (741)									

-continued-

Table 8. Maximum Pressure Drops with Bellows Bonnet Construction and Low Strength Stem (continued)

Valve Size	Port Size	Max Travel	Actuator construction	ENVIRO-SEAL Packing	Air to Open	Air to Close								
						Supply pressure							Max Pressure Limits	
					Max △P	2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)	△P	Supply
	mm	mm			bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
DN80 -100 (NPS 3 to 4)	46	20	750 2Bar	ULF	28.4 (412)	19.7 (286)	41.5 (602)	51.7 (750)	---		---		51.7 (750)	3.2 (46)
				PTFE	31.3 (454)	22.6 (328)	44.3 (643)							
			750 3Bar	ULF	28.4 (412)	N/A								
				PTFE	31.3 (454)									
			750 4Bar	ULF	28.4 (412)			N/A					N/A	
				PTFE	31.3 (454)									
DN80 (NPS 3)	70 Bal	20	750 2Bar	ULF	51.7 (750)	51.7 (750)		51.7 (750)	---		---		51.7 (750)	3.2 (46)
				PTFE										
			750 3Bar	ULF		N/A								
				PTFE										
			750 4Bar	ULF				N/A					N/A	
				PTFE										
DN100 (NPS 4)	90 Bal	20	750 2Bar	ULF	51.7 (750)	46.8 (679)	51.7 (750)	51.7 (750)	---		---		51.7 (750)	3.2 (46)
				PTFE		51.7 (750)								
			750 3Bar	ULF		N/A								
				PTFE										
			750 4Bar	ULF				N/A					N/A	
				PTFE										

Table 9. Shutoff Classification Capability for Bellows Bonnet Construction and Low Strength Stem(1)

Valve Size	Port Size	Max Travel	Actua-tor con-struc-tion	ENVIRO-SEAL Packing	Air to Open	Air to Close						
					Shutoff	Supply pressure						
						2 Bar (29 psi)	2.5 Bar (36 psi)	3 Bar (44 psi)	3.44 Bar (50 psi)	4 Bar (58 psi)	5 Bar (72 psi)	6 Bar (87 psi)
	mm	mm				Shutoff	Shutoff	Shutoff	Shutoff	Shutoff	Shutoff	Shutoff
DN15 to 25 (NPS 1/2 to 1)	4.8	20	225 2Bar	ULF	IV,V,VI	IV,V,VI		IV,V,VI		---	---	
				PTFE								
			225 3Bar	ULF		N/A				IV,V,VI		
				PTFE								
			225 4Bar	ULF				N/A				
				PTFE								
	9.5	20	225 2Bar	ULF	IV,V	IV,V,VI		IV,V,VI		---	---	
				PTFE	IV,V,VI							
			225 3Bar	ULF		N/A				IV,V,VI		
				PTFE								
			225 4Bar	ULF				N/A				
				PTFE								
DN20 to 40 (NPS 3/4 to 1-1/2)	14	20	225 2Bar	ULF	IV	IV,V	IV,V,VI	IV,V,VI		---	---	
				PTFE	IV,V							
			225 3Bar	ULF		N/A				IV,V,VI		
				PTFE	IV,V,VI							
			225 4Bar	ULF				N/A				
				PTFE								
DN25 to 50 (NPS 1 to 2	22	20	225 2Bar	ULF	IV,VI	IV,VI	IV,V,VI	IV,V,VI		---	---	
				PTFE		IV,V,VI						
			225 3Bar	ULF		N/A				IV,V,VI		
				PTFE	IV,V,VI							
			225 4Bar	ULF				N/A				
				PTFE								
DN40 to 50 (NPS 1-1/2 to 2)	36	20	225 2Bar	ULF	IV,VI	IV,VI	IV,VI	IV,V,VI	IV,V,VI	---	---	
				PTFE			IV,V,VI					
			225 3Bar	ULF		N/A		IV,VI		IV,V,VI		
				PTFE				IV,V,VI				
			225 4Bar	ULF				N/A				
				PTFE	IV,V,VI							
			750 2Bar	ULF	IV,V,VI	IV,V,VI	---	---		---		
				PTFE								
			750 3Bar	ULF		N/A						
				PTFE								
			750 4Bar	ULF				N/A				
				PTFE								
DN50 (NPS 2)	46	20	225 2Bar	ULF	---	IV,VI		IV,VI	IV,V,VI	---	---	
				PTFE				IV,V,VI				
			225 3Bar	ULF	IV,VI	N/A		IV,VI	IV,VI	IV,V,VI		
				PTFE					IV,V,VI			
			225 4Bar	ULF				N/A				
				PTFE								
			750 2Bar	ULF	IV,V,VI	IV,VI	---	---		---		
				PTFE		IV,V,VI						
			750 3Bar	ULF		N/A						
				PTFE								
			750 4Bar	ULF				N/A				
				PTFE								

-continued-

Table 9. Shutoff Classification Capability for Bellows Bonnet Construction and Low Strength Stem(1) (continued)

<table>
<tr><th rowspan="4">Valve Size</th><th rowspan="3">Port Size</th><th rowspan="3">Max Travel</th><th rowspan="4">Actua-tor con-struc-tion</th><th rowspan="4">ENVIRO-SEAL Packing</th><th>Air to Open</th><th colspan="7">Air to Close</th></tr>
<tr><th rowspan="3">Shutoff</th><th colspan="7">Supply pressure</th></tr>
<tr><th>2 Bar (29 psi)</th><th>2.5 Bar (36 psi)</th><th>3 Bar (44 psi)</th><th>3.44 Bar (50 psi)</th><th>4 Bar (58 psi)</th><th>5 Bar (72 psi)</th><th>6 Bar (87 psi)</th></tr>
<tr><th>mm</th><th>mm</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th><th>Shutoff</th></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">36</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV,V,VI</td><td colspan="2" rowspan="2">IV,V,VI</td><td rowspan="4">IV,V,VI</td><td rowspan="4">---</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 -100 (NPS 3 to 4)</td><td rowspan="6">46</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV,V,VI</td><td rowspan="2">IV,VI</td><td rowspan="2">IV,V,VI</td><td rowspan="4">IV,V,VI</td><td rowspan="4">---</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN80 (NPS 3)</td><td rowspan="6">70 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV</td><td colspan="2" rowspan="2">IV</td><td rowspan="4">IV</td><td rowspan="4">---</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="6">DN100 (NPS 4)</td><td rowspan="6">90 Bal</td><td rowspan="6">20</td><td rowspan="2">750 2Bar</td><td>ULF</td><td rowspan="6">IV</td><td colspan="2" rowspan="2">IV</td><td rowspan="4">IV</td><td rowspan="4">---</td><td colspan="3" rowspan="6">---</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 3Bar</td><td>ULF</td><td colspan="2" rowspan="4">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td rowspan="2">750 4Bar</td><td>ULF</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>PTFE</td></tr>
<tr><td colspan="13">1. CLVI shutoff is achieved through the use of a soft seat in ports greater than or equal to 22mm.</td></tr>
</table>

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www.Fisher.com

Fisher™ GX 3-Way Control Valve and Actuator System

The Fisher GX 3-Way is a compact, state-of-the-art control valve and actuator system, designed to accurately control water, oils, steam, and other industrial fluids. The robust GX 3-way valve package is perfectly suited to address the space limitations of the OEM industry.

The GX 3-Way is rugged, reliable, and easy to select. The internal valve trim is designed to ensure long service life and avoiding unnecessary maintenance. The same construction may be used for both converging and diverging applications.

The GX 3-Way meets the requirements of both EN and ASME standards. It is available with a complete accessory package, including the FIELDVUE™ DVC2000 and FIELDVUE DVC6200 integrated digital valve controllers.

The GX 3-Way trim characteristics are designed for accurate temperature control in heat exchanger applications.

- Side-Port Common (SPC)--The side flange is the common pipe connection for general converging (flow-mixing) and diverging (flow-splitting) service (see figure 4). Utilizes an unbalanced plug design.
- Bottom-Port Common (BPC)--A balanced design used for high pressure drop applications. The bottom flange is the common pipe connection for both converging and diverging service (see figures 8 and 10).
- High-Temperature Side-Port Common (SPC)-- The side flange is the common pipe connection for general converging (flow-mixing) and diverging (flow-splitting) service (see figure 2). Utilizes an unbalanced plug design, a stem extension, a yoke extension, and includes ENVIRO-SEAL™ graphite ULF packing (figure 14) and a hard-faced seat ring.

W9557

Fisher GX 3-Way Control Valve, Actuator, and FIELDVUE DVC2000 Digital Valve Controller

GE49204
X0176

Fisher GX 3-Way High-Temperature Control Valve and Actuator

Figure 1. Fisher GX 3-Way Control Valve Assembly with Port-Guided Contoured Plug (Side Port Common)

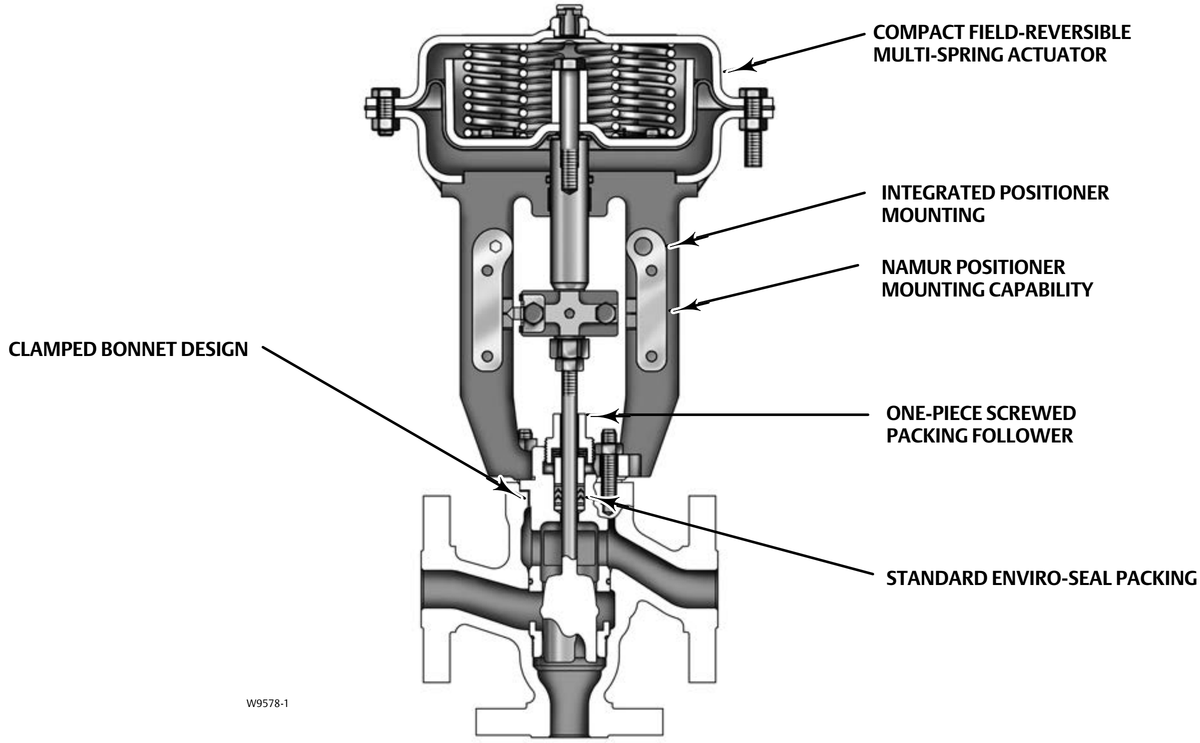
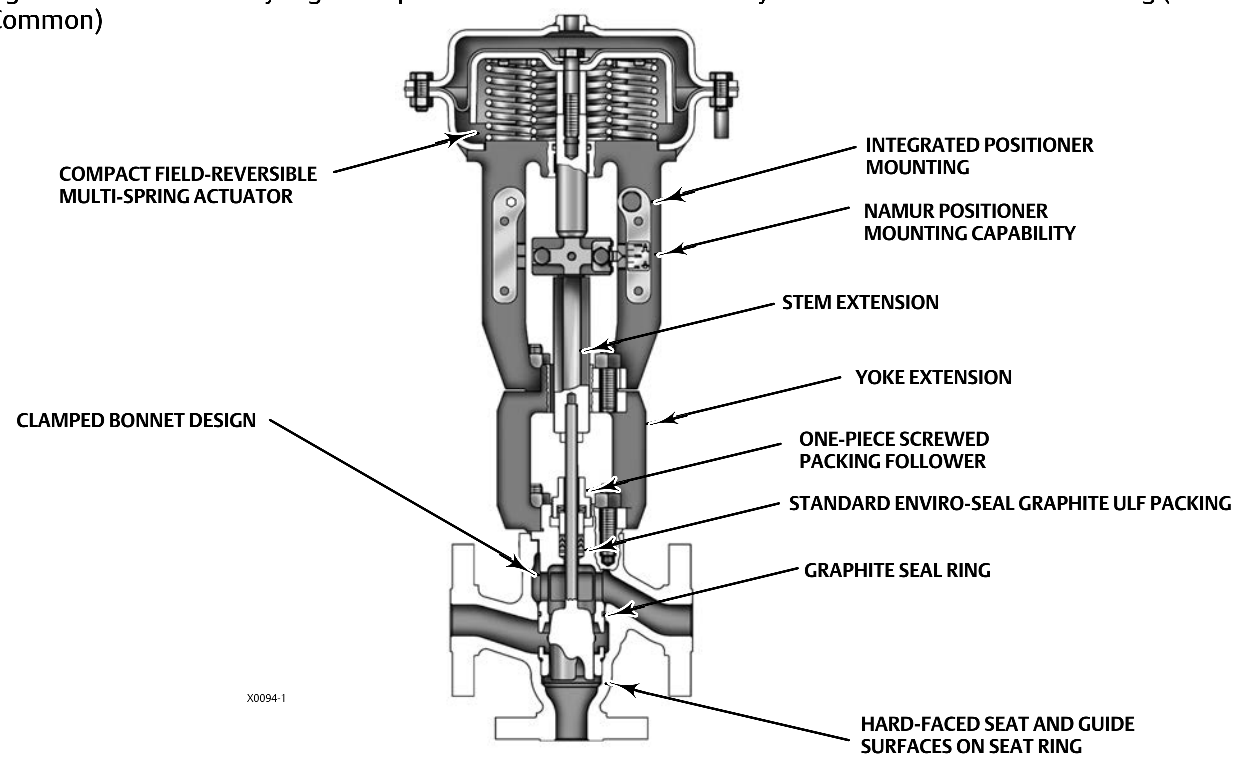


Figure 2. Fisher GX 3-Way High-Temperature Control Valve Assembly with Port-Guided Contoured Plug (Side Port Common)

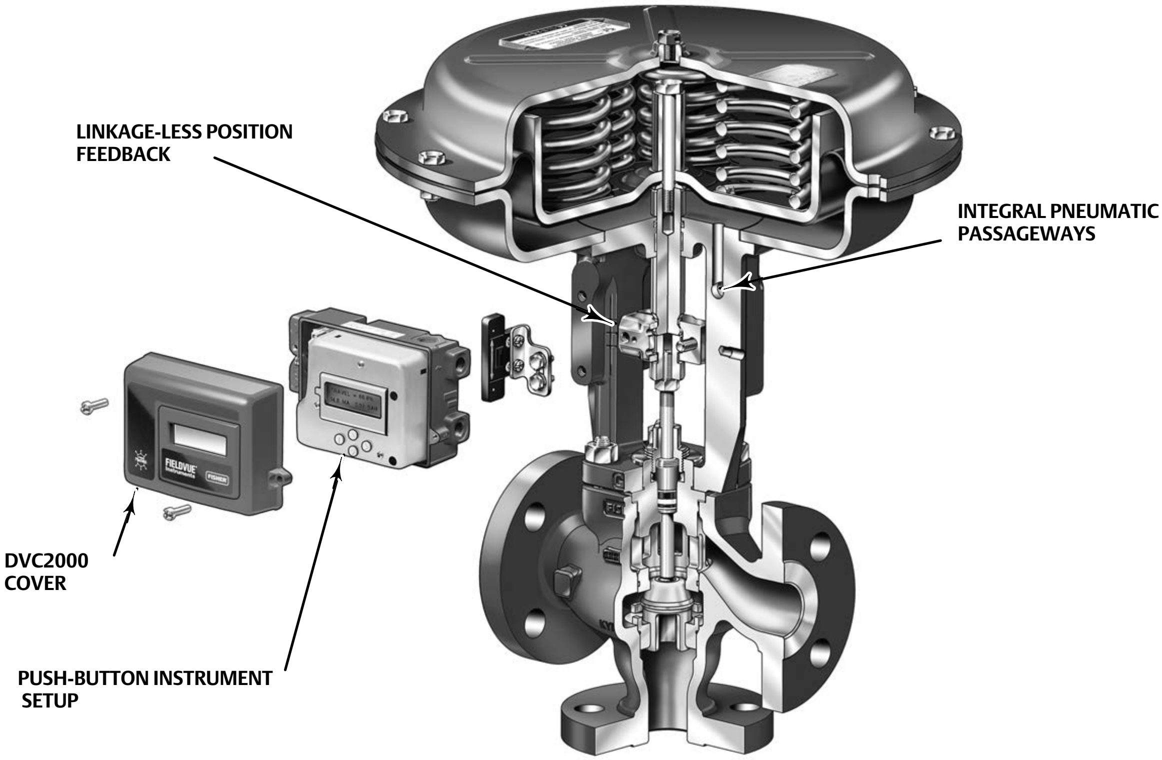


Features

- Easy to size and select
- No actuator sizing required--selection is automatic
- Engineered for easy maintenance
- Maximum part commonality across sizes
- Replaceable trim
- Low lifetime costs
- Robust, low-profile design
- Available with integrated, easy-to-calibrate DVC2000 or DVC6200 digital valve controller
- Valve body sizes DN 25 to DN 100 (NPS 1 through 4)
- Pressure Classes PN 10-40, CL150 and 300
- High capacity design
- Valve body flow passage optimized for flow stability
- Shutoff capabilities: Class IV metal to metal
- ISO 5210 F7 mounting available for use with electric actuators

Contents

Figure 3. Fisher GX 3-Way and FIELDVUE DVC2000 Digital Valve Controller



Optimized valve and actuator system. Product simplicity and ease of selection form the foundation of the GX 3-Way. Mounted with a digital or analog positioner, the GX 3-Way provides high performance control across a wide range of process applications.

Compact actuator design. The multi-spring GX 3-Way actuator is a compact robust design. The GX 3-Way design has been optimized to eliminate complicated 3-way actuator sizing procedures - once the valve body and port size are selected, the actuator size is fixed.

Reliable Actuator Performance. Special actuator diaphragm material helps reduce common problems such as air oxidation, thermal aging, low temperature embrittlement, and loss of retention (see table 6). The double-sided diaphragm within the actuator helps eliminate mechanical wear-induced failure.

Modular design. The design architecture has been optimized to maximize the use of common parts across sizes. The actuator stem and stem connector are used across all GX 3-Way sizes.

Low lifetime costs. Reduced product complexity, low parts count, and part commonality all contribute to reduced inventory and maintenance costs.

Stable flow control. The flow cavity of the GX 3-Way valve body has been engineered to provide stable flow and reduce process variability. This linear stability for both converging and diverging flow is perfectly suited for temperature and pH control applications.

Emission Requirements— ENVIRO-SEAL packing systems provide an improved stem seal to help prevent the loss of valuable or hazardous process fluid. The GX 3-Way comes standard with ENVIRO-SEAL PTFE packing. ENVIRO-SEAL graphite ULF packing is also available for all sizes and is standard on high temperature constructions.

Easy maintenance. The simple screwed seat-ring and one-piece plug and stem design provide easy maintenance. Design simplicity and parts commonality contribute to reduced spares inventory. The integrated DVC2000 and DVC6200 digital valve controllers allow easy instrument removal, without a requirement for tubing disconnection or replacement (fail-down construction).

Digital valve controller. The GX 3-Way is available with the DVC2000 digital valve controller. The DVC2000 is easy to use, compact, and designed for easy mounting. It converts a 4-20 mA input signal into a pneumatic output signal, which feeds the control valve actuator. Instrument setup is performed with a push button and LCD interface. This interface is protected from the environment within a sealed enclosure. The interface supports multiple languages, including German, French, Italian, Spanish, Chinese, Japanese, Portuguese, Russian, Polish, Czech, Arabic, and English.

Intrinsic safety and non-incendive construction is available to CSA, FM, ATEX, and IEC standards. An optional module provides integrated limit switches and a position transmitter.

Integrated mounting. The DVC2000 and DVC6200 digital valve controllers integrally mount to the GX 3-Way actuator, eliminating the need for mounting brackets. The DVC2000 transmits a pneumatic signal to the actuator casing via an air passage in the yoke leg, causing the valve to stroke (see figure 12). This eliminates the need for positioner-to-actuator tubing in the fail-down configuration.

The DVC2000 and DVC6200 mounting interfaces are identical on both sides of the actuator yoke for valve body sizes DN 25 through DN 100 (NPS 1 through 4). This symmetrical design allows the DVC2000 to be easily moved from one side of the valve to the other without the need to rotate the actuator.

Linkage-less feedback. The DVC2000 and DVC6200 digital valve controllers offer as standard a non-contacting valve position feedback system. This is a true linkage-less design, which uses no levers and no touching parts between the valve stem and the positioner.

Additional Accessory selection. The GX 3-Way is available with a variety of digital or analog positioners besides the DVC2000 or DVC6200, as well as solenoid and limit switches. The actuator is also compatible with the IEC 60534-6-1 (NAMUR) positioner mounting standard.

Flow Directions -- Side Port Common Constructions

Figure 4. Side Port Common Construction Details for Diverging Constructions

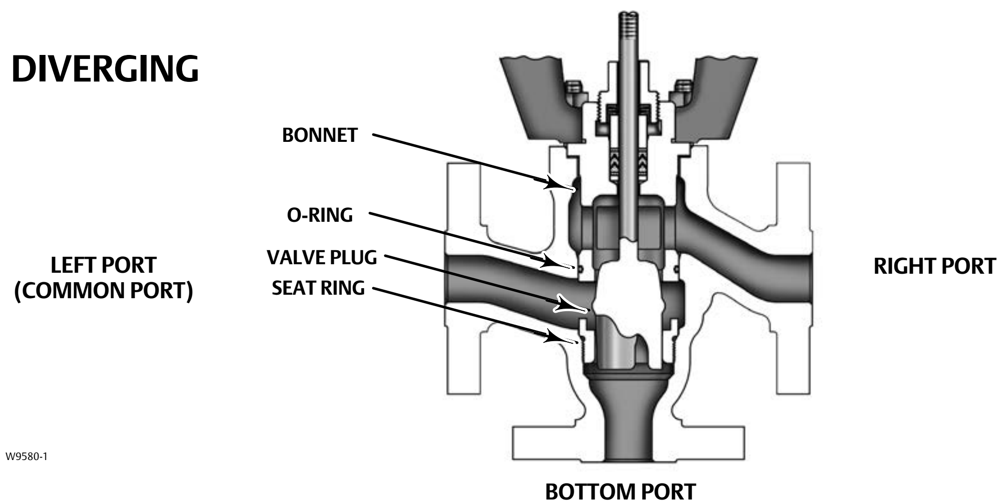


Figure 5. Fisher GX 3-Way Flow Directions for Side Port Common Diverging Constructions

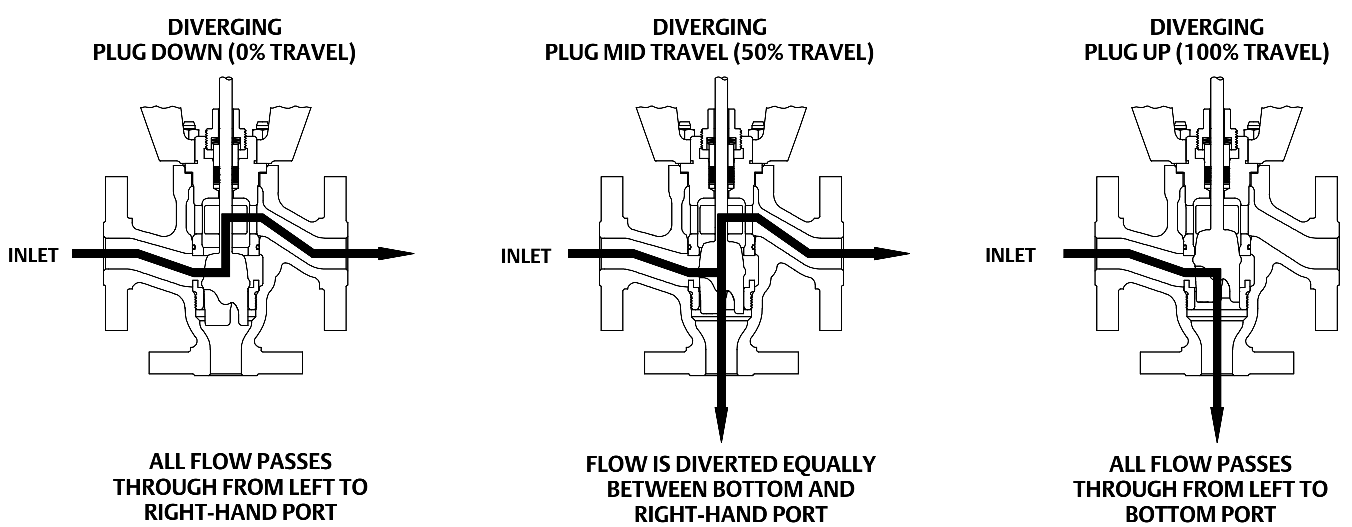


Figure 6. Side Port Common Construction Details for Converging Constructions

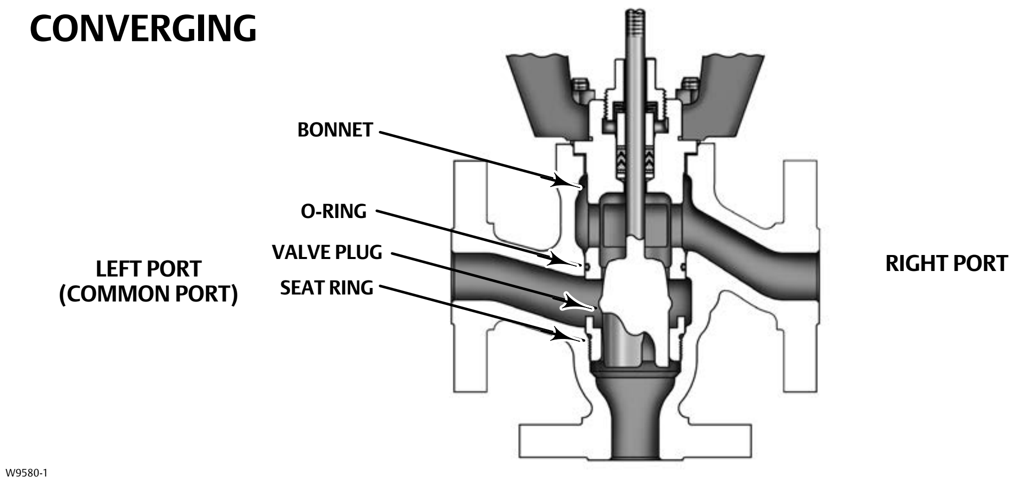
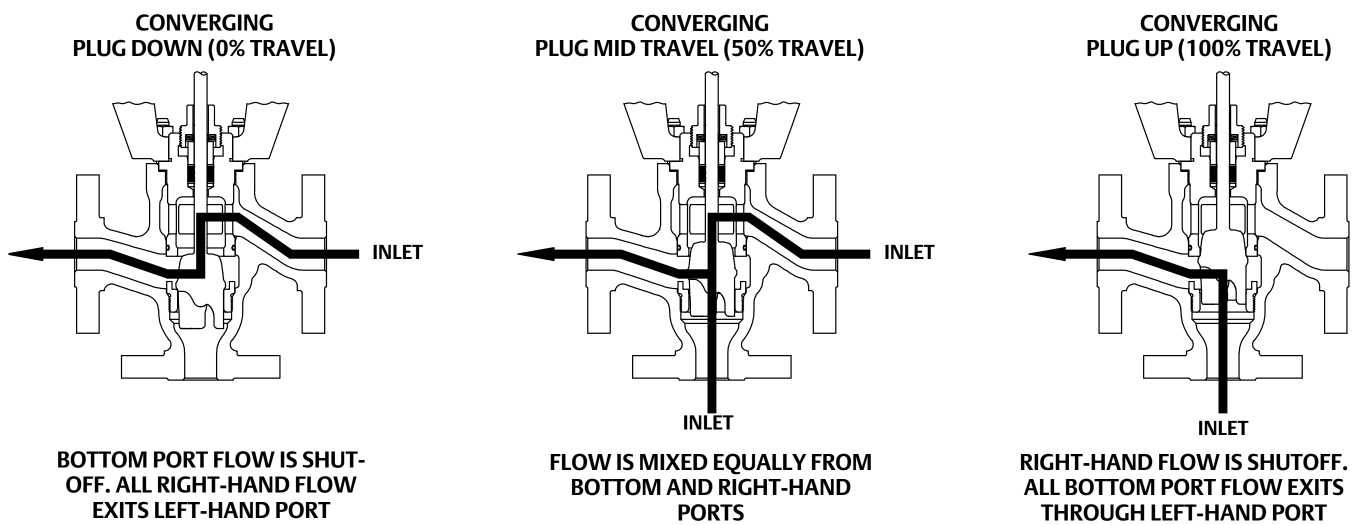


Figure 7. Fisher GX 3-Way Flow Directions for Side Port Common Converging Constructions



Flow Directions -- Bottom Port Common Constructions

Figure 8. Bottom Port Common Construction Details for Diverging Constructions

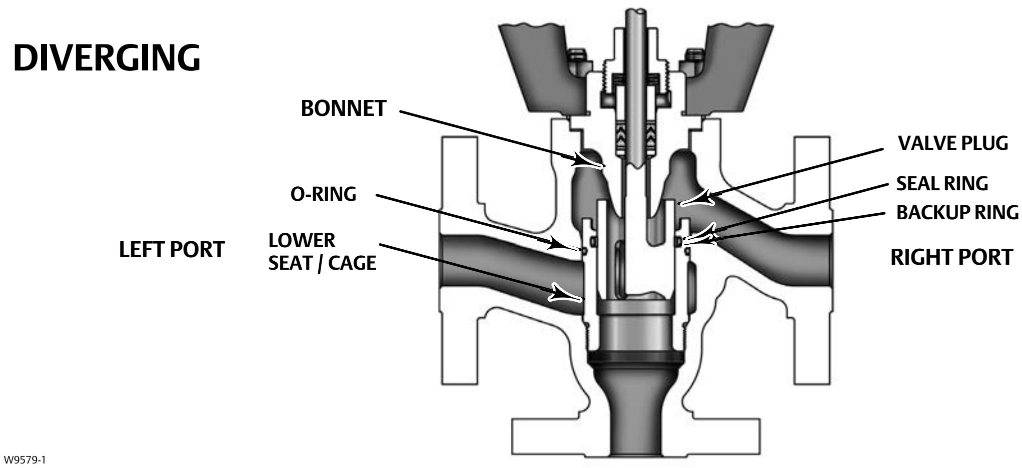


Figure 9. Fisher GX 3-Way Flow Directions for Bottom Port Common Diverging Constructions

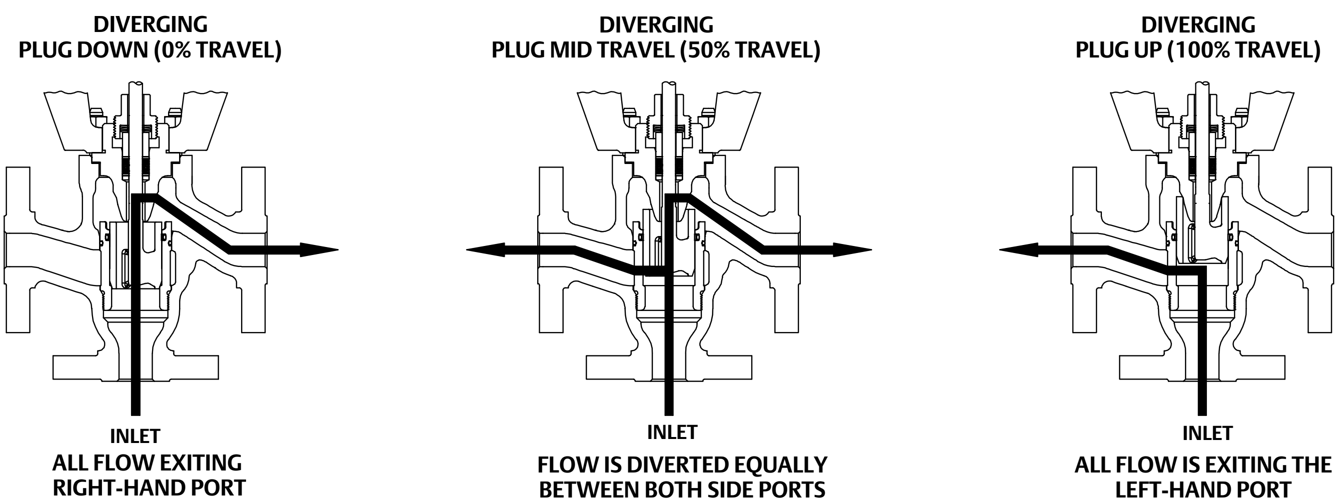


Figure 10. Bottom Port Common Construction Details for Converging Constructions

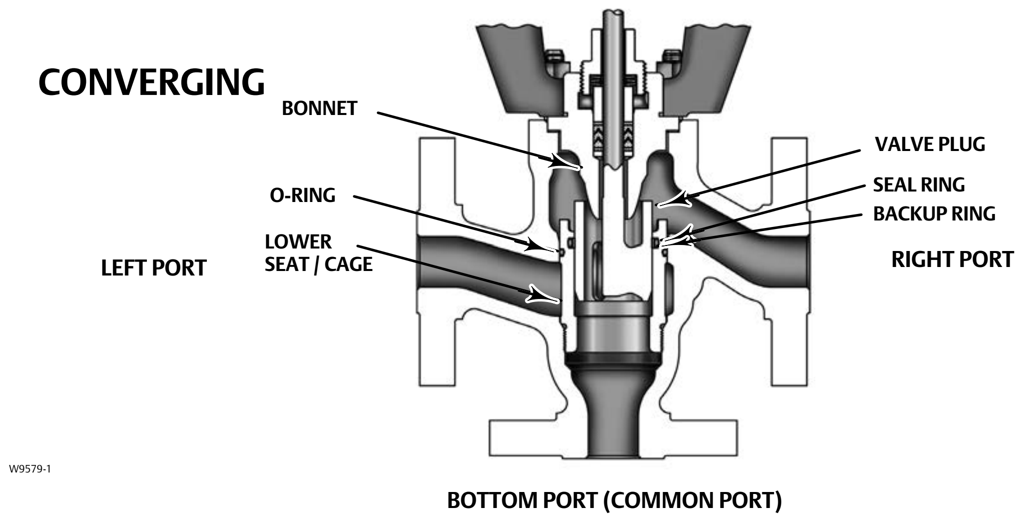
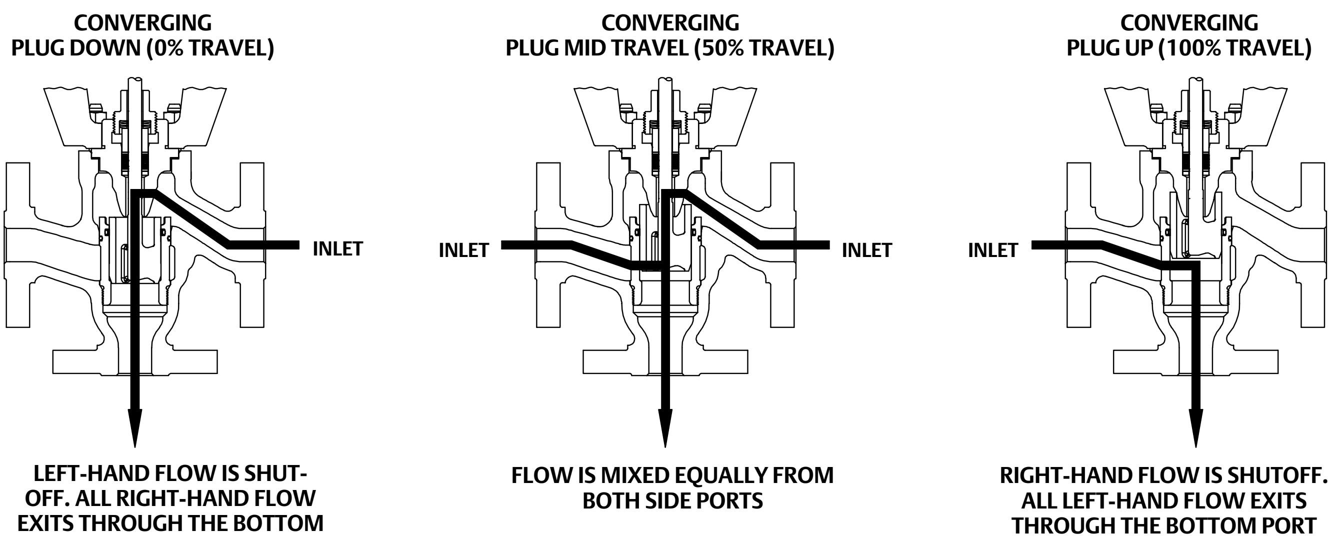
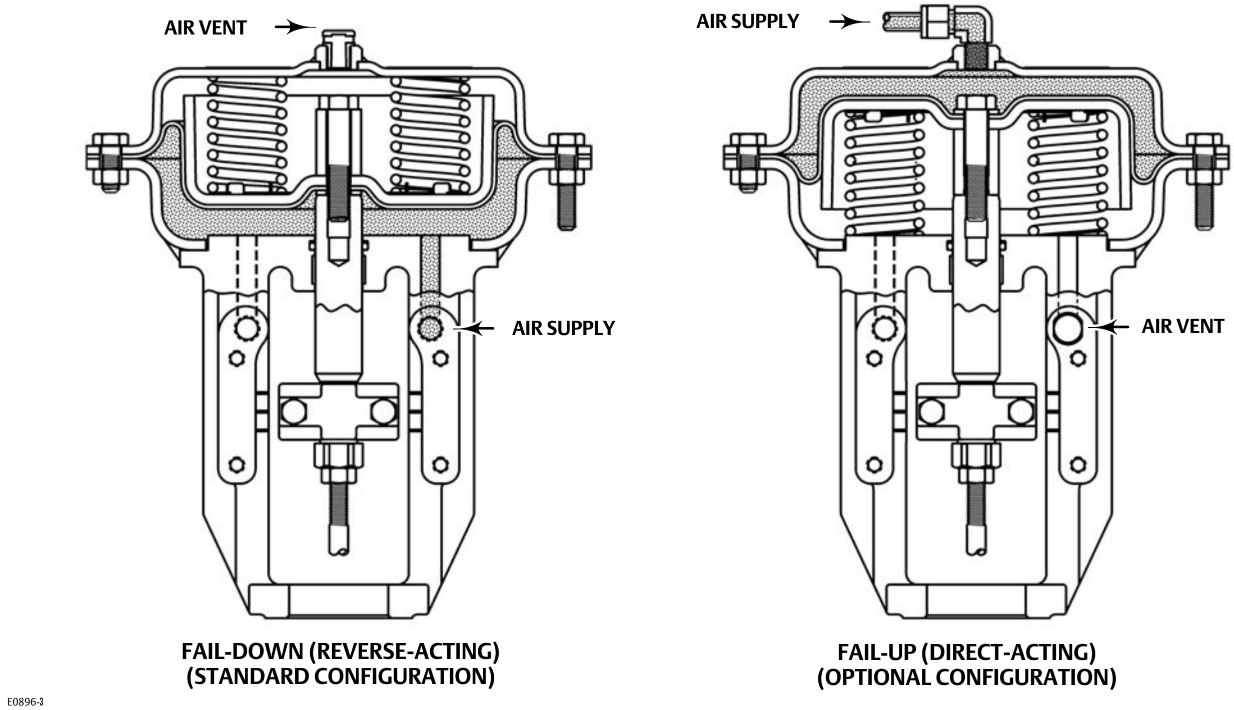


Figure 11. Fisher GX 3-Way Flow Directions for Bottom Port Common Converging Constructions



Principle of Operation - GX 3-Way Actuator

Figure 12. Fisher GX 3-Way Principle of Operation -- Actuator Fail Position



Integrated Air Supply. When mounted with the DVC2000 digital valve controller, the GX 3-Way uses an integrated actuator air supply system. In the fail-down configuration, air is supplied to the lower actuator casing via a port on the actuator yoke face -- no tubing is required. In the fail-up configuration, air is supplied to the upper casing via tubing.

GX 3-Way Control Valve Specifications and Materials of Construction

Table 1. Fisher GX 3-Way Valve Specifications(1)

Specifications	EN		ASME
Valve Body Size	DN 25, 40, 50, 80, 100		NPS 1, 1-1/2, 2, 3, 4
Pressure Rating	PN 10 / 16 / 25 / 40 per EN 1092-1		CL150 / 300 per ASME B16.34
End Connections	Flanged raised face per EN 1092-1		Flanged raised face per ASME B16.5 Screwed (NPS 1, 1-1/2, and 2)
Valve Body Materials	1.0619 steel		ASME SA216 WCC steel
	1.4409 stainless steel		ASME SA351 CF3M stainless steel
Bonnet Materials	1.4409 stainless steel / CoCr-A		SA351 CF3M SST / CoCr-A
Face-to-Face Dimensions	See table 10		
Shutoff per IEC 60534-4 and ANSI/FCI 70-2	Metal seat - Class IV (standard) SPC High Temperature construction: Metal seat - Class IV for bottom seat, Class II for upper seat		
Flow Direction	Converging and Diverging		
Flow Coefficients	See Fisher Catalog 12		
Trim Style	**Type**	**Plug Sizes**	**Description**
	Side Port Common	All sizes	Unbalanced Port-guided
	Bottom Port Common	All sizes	Balanced Cage-guided

1. Stainless steel valve body is recommended for steam service when the high temperature construction is selected.

Table 2. Materials (Other Valve Components)

Component	Material	
Packing Follower	S21800 SST screwed follower	
Body/Bonnet Bolting and Nuts	SA193-B7 studs / SA194-2H nuts with NCF2 coating for carbon steel and stainless steel constructions	
Packing	ENVIRO-SEAL Live-loaded PTFE V-ring (standard) with N07718 Belleville springs	
	ENVIRO-SEAL Live-loaded Graphite ULF (optional) with N07718 Belleville springs, (standard) on High Temperature construction.	
Bonnet Gasket	Graphite laminate	
Bottom Port Common Trim (all sizes)	Carbon-Filled PTFE Seal Ring	
	Back-up Rings	NBR (Standard) -46 to 82°C (-50 to 180°F)
		Ethylene Propylene [EPDM] (Optional): -46 to 232°C (-50 to 450°F) in steam and hot water; -46 to 121°C (-50 to 250°F) in air (EPDM is not recommended for use in hydrocarbons)
		FKM Fluorocarbon (Optional): -18 to 204°C (0 to 400°F) (Applicable in a wide variety of solvents, chemicals, and hydrocarbons. Avoid use with steam, ammonia, or hot water over 82°C [180°F])
O-ring (not used with GX 3-Way High Temperature)	NBR (Standard) -46 to 82°C (-50 to 180°F)	
	Ethylene Propylene [EPDM] (Optional): -46 to 232°C (-50 to 450°F) in steam and hot water; -46 to 121°C (-50 to 250°F) in air (EPDM is not recommended for use in hydrocarbons)	
	FKM Fluorocarbon (Optional): -18 to 204°C (0 to 400°F) (Applicable in a wide variety of solvents, chemicals, and hydrocarbons. Avoid use with steam, ammonia, or hot water over 82°C [180°F])	
Seal Ring (GX 3-Way High Temperature)	Graphite (FMS 17F27) -46 to 371°C (-50 to 700°F)	
Stem Extension (GX 3-Way High Temperature)	Stainless steel	

Table 3. Trim Materials (all sizes)

Valve Body Construction	Trim Type	Stem	Plug	Upper Seat	Lower Seat/Cage(1)
Carbon steel (1.0619 / WCC)	Bottom Port Common	S31603 strain hardened	CF3M Chrome-plated	CF3M/CoCr-A	CF3M
	Side Port Common	S31603 strain hardened	CF3M	CF3M/CoCr-A	CF3M
Stainless steel (1.4409 / CF3M)	Bottom Port Common	S31603 strain hardened	CF3M Chrome-plated	CF3M/CoCr-A	CF3M
	Side Port Common	S31603 strain hardened	CF3M	CF3M/CoCr-A	CF3M

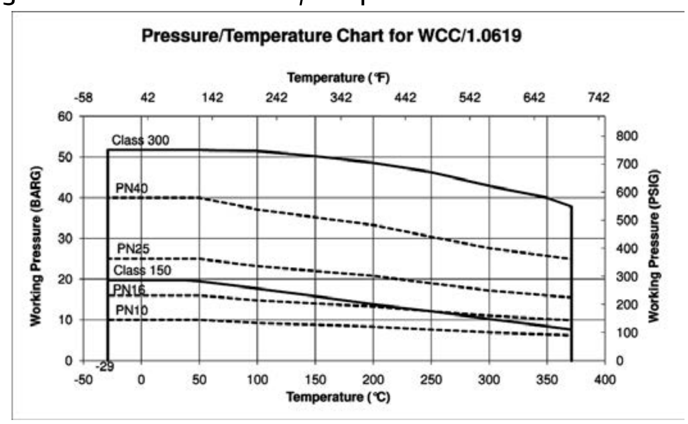
1. HT construction includes CF3M/CoCr-A lower seating. Seat and guide surfaces are hard-faced.

Table 4. Allowable Temperature Ranges for Valve Body, Bonnet and Trim(1)

VALVE BODY / BONNET MATERIAL	BONNET STYLE	ENVIRO-SEAL PACKING	GASKET	TRIM STYLE	TEMPERATURE			
					°C		°F	
					Min	Max	Min	Max
1.0619/SA216 WCC Steel	Standard	PTFE or Graphite ULF	Graphite laminate	Bottom Port Common, Side Port Common	-29	232	-20	450
1.4409/SA351 CF3M SST	Standard	PTFE or Graphite ULF	Graphite laminate	Bottom Port Common, Side Port Common	-46	232	-50	450
1.0619/SA216 WCC Steel	HT Construction	Graphite ULF	Graphite laminate	Side Port Common	-29	371	-20	700
1.4409/SA351 CF3M SST	HT Construction	Graphite ULF	Graphite laminate	Side Port Common	-46	371	-50	700

1. Bonnet O-ring and back-up ring materials used on BPC trim may be limited by temperature and application.

Figure 13. Material Pressure/Temperature Curves



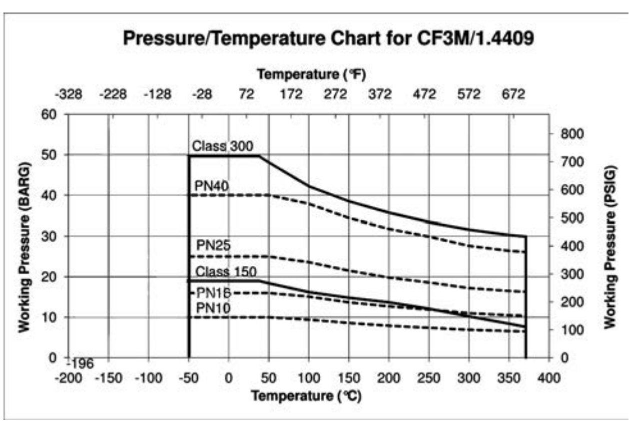
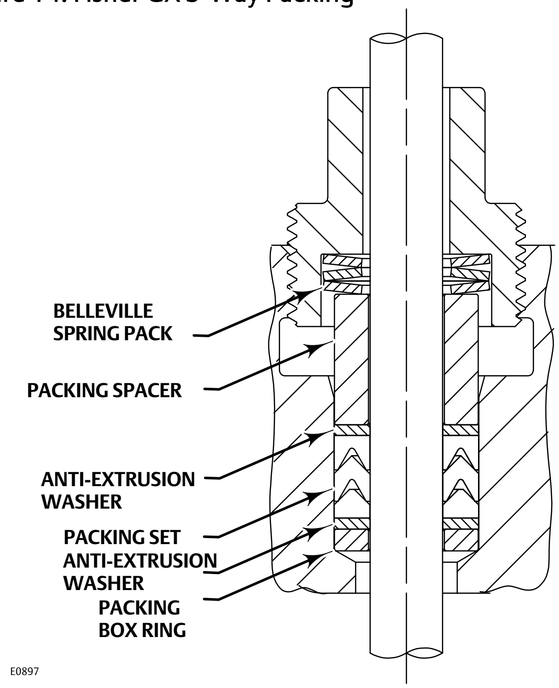
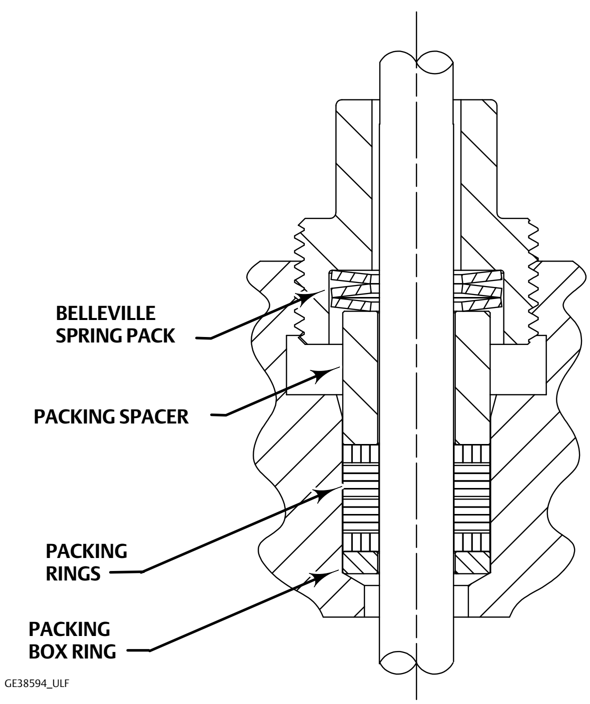


Figure 14. Fisher GX 3-Way Packing



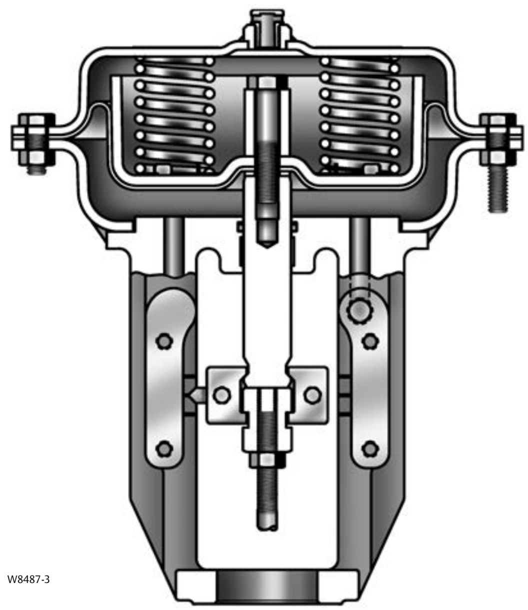
STANDARD BONNET WITH ENVIRO-SEAL LIVE-LOADED PTFE PACKING SET
DN 25 through DN 100 (NPS 1 through 4)



STANDARD BONNET WITH OPTIONAL ENVIRO-SEAL LIVE-LOADED GRAPHITE ULF
PACKING SET (STANDARD ON HIGH TEMPERATURE CONSTRUCTION)
DN 25 through DN 100 (NPS 1 through 4)

The GX 3-Way Diaphragm Actuator

Figure 15. Fisher GX 3-Way Actuator



The GX 3-Way uses a multi-spring, pneumatic diaphragm actuator (see figure 15). It is capable of air supply pressures up to 5.0 barg (72 psig), allowing valve shutoff at high pressure drops (see table 8).

The GX 3-Way product selection system automatically matches the actuator to the valve, eliminating the need for complex actuator sizing procedures.

The multiple spring design provides the preload, eliminating the need for bench set adjustment. The actuator is available in fail-down and fail-up configurations.

The GX 3-Way actuator can be used for throttling or on-off service.

The GX 3-Way is available with the integrated DVC2000 digital valve controller. Other digital and analog positioners are available, as well as optional solenoids and limit switches.

Table 5. Actuator Specifications

Description	Pneumatic spring-return diaphragm actuator
Operating Principle	Fail-down (standard configuration) Fail-up (optional configuration)
Operating Pressure Ranges	See tables 8 and 9
Ambient Temperature	-46 to 82°C (-50 to 180°F)
Pressure Connection (Fail-Up Construction)	G 1/4 internal casing connection
Finish	Powder coat polyester

Table 6. Materials of Construction

Part	Material
Upper and Lower Casings	AISI 1010 stamped carbon steel
Springs	Steel
Diaphragm	NBR and nylon
Diaphragm Plate	AISI 1010 stamped carbon steel
Yoke and Yoke Extension on High Temperature Construction	Carbon steel
Casing Fasteners	A2-70 stainless steel bolts and nuts
Actuator Rod	Stainless steel
Stem Connector	CF3M
Stem Connector Fasteners	SA193-B7 bolts with NCF2 coating
Stem Bushing	High-density polyethylene (HDPE)
Stem Seal	NBR

Actuator Selection

With the GX 3-Way, actuator selection has never been easier. Once the valve size has been determined, the actuator is automatically selected.

The following tables provide the maximum allowable pressure drops for the GX 3-Way. See table 8 for Side Port Common construction and table 9 for Bottom Port Common construction. For optimal performance, the GX 3-Way should be operated with a FIELDVUE digital valve controller.

GX ISO 5210 Electric Actuator Mounting

Electric actuator mounting is available for any manufacturing models that comply with ISO 5210, Flange type F7. The mounting offering includes a GX yoke, actuator rod adaptor, spacer, and bolting.

Thrust limitations apply when sizing electric actuators (see table 7).

Mounting offering can be engineered if not already available for a selected actuator. For additional information, contact your Emerson sales office or Local Business Partner.

Table 7. Fisher GX 3-Way Maximum Allowable Thrust for use with ISO 5210 Electric Actuators
(THRUST LIMITATIONS APPLY IN BOTH TRAVEL DIRECTIONS)

VALVE SIZE	STEM DIAMETER	TRAVEL	STEM MATERIAL	MAXIMUM THRUST	
	mm	mm		N	lbf
DN25-DN40 (NPS 1 to 1-1/2)	10	19	S31603	6900	1550
DN50 (NPS 2)	14	19	S31603	14000	3150
DN80-DN100 (NPS 3 to 4)	14	38	S31603	14000	3150

Table 8. Maximum Allowable Pressure Drop (Side Port Common)

VALVE SIZE	ACTUATOR SIZE	FLOW DIRECTION	ENVIRO-SEAL PACKING	FAIL-DOWN					FAIL-UP				
				Operating Pressure				MAX DP @ Maximum Supply Pressure	Operating Pressure				MAX DP @ Maximum Supply Pressure
				3 bar	3.44 bar	4 bar	5 bar		3 bar	3.44 bar	4 bar	5 bar	
DN25	225	Converging	PTFE	18.1	21.7	21.7	21.7	21.7 bar @ 5.0 bar	19.7	20.2	20.2	20.2	20.2 bar @ 5.0 bar
			ULF	12.2	16.2	16.2	16.2	16.2 bar @ 5.0 bar	14.2	14.3	14.3	14.3	14.3 bar @ 5.0 bar
		Diverging	PTFE	14.0	14.0	14.0	14.0	14.0 bar @ 5.0 bar	14.0	14.0	14.0	14.0	14.0 bar @ 5.0 bar
			ULF	14.0	14.0	14.0	14.0	14.0 bar @ 5.0 bar	14.0	14.0	14.0	14.0	14.0 bar @ 5.0 bar
DN40	225	Converging	PTFE	18.1	21.7	21.7	21.7	21.7 bar @ 5.0 bar	19.7	20.2	20.2	20.2	20.2 bar @ 5.0 bar
			ULF	12.2	16.2	16.2	16.2	16.2 bar @ 5.0 bar	14.2	14.3	14.3	14.3	14.3 bar @ 5.0 bar
		Diverging	PTFE	14.0	14.0	14.0	14.0	14.0 bar @ 5.0 bar	14.0	14.0	14.0	14.0	14.0 bar @ 5.0 bar
			ULF	14.0	14.0	14.0	14.0	14.0 bar @ 5.0 bar	14.0	14.0	14.0	14.0	14.0 bar @ 5.0 bar
DN50	750	Converging	PTFE	29.0	48.4	48.4	---	48.4 bar @ 4.0 bar	35.4	44.9	44.9	---	44.9 bar @ 4.0 bar
			ULF	25.8	45.5	45.5	---	45.5 bar @ 4.0 bar	32.6	41.7	41.7	---	41.7 bar @ 4.0 bar
		Diverging	PTFE	30.0	30.0	30.0	---	30.0 bar @ 4.0 bar	30.0	30.0	30.0	---	30.0 bar @ 4.0 bar
			ULF	30.0	30.0	30.0	---	30.0 bar @ 4.0 bar	30.0	30.0	30.0	---	30.0 bar @ 4.0 bar
DN80	750	Converging	PTFE	10.5	19.0	24.2	---	24.2 bar @ 4.0 bar	12.0	20.2	24.2	---	24.2 bar @ 4.0 bar
			ULF	9.2	17.7	23.0	---	23.0 bar @ 4.0 bar	10.7	19.0	22.9	---	22.9 bar @ 4.0 bar
		Diverging	PTFE	16.0	16.0	16.0	---	16.0 bar @ 4.0 bar	16.0	16.0	16.0	---	16.0 bar @ 4.0 bar
			ULF	16.0	16.0	16.0	---	16.0 bar @ 4.0 bar	16.0	16.0	16.0	---	16.0 bar @ 4.0 bar
DN100	750	Converging	PTFE	6.3	11.3	14.7	---	14.7 bar @ 4.0 bar	7.2	12.2	14.4	---	14.4 bar @ 4.0 bar
			ULF	5.5	10.5	13.9	---	13.9 bar @ 4.0 bar	6.5	11.5	13.6	---	13.6 bar @ 4.0 bar
		Diverging	PTFE	10.0	10.0	10.0	---	10.0 bar @ 4.0 bar	10.0	10.0	10.0	---	10.0 bar @ 4.0 bar
			ULF	10.0	10.0	10.0	---	10.0 bar @ 4.0 bar	10.0	10.0	10.0	---	10.0 bar @ 4.0 bar

Table 9. Maximum Allowable Pressure Drop (Bottom Port Common)

VALVE SIZE	ACTUATOR SIZE	FLOW DIRECTION	ENVIRO-SEAL PACKING	FAIL-DOWN					FAIL-UP				
				Operating Pressure				MAX DP @ Maximum Supply Pressure	Operating Pressure				MAX DP @ Maximum Supply Pressure
				3 bar	3.44 bar	4 bar	5 bar		3 bar	3.44 bar	4 bar	5 bar	
DN25	225	Converging	PTFE	32.4	50.1	51.7	51.7	51.7 bar @ 5.0 bar	36.2	36.2	36.2	36.2	36.2 bar @ 5.0 bar
			ULF	21.7	39.4	51.7	51.7	51.7 bar @ 5.0 bar	25.6	25.6	25.6	25.6	25.6 bar @ 5.0 bar
		Diverging	PTFE	28.0	28.0	28.0	28.0	28.0 bar @ 5.0 bar	28.0	28.0	28.0	28.0	28.0 bar @ 5.0 bar
			ULF	28.0	28.0	28.0	28.0	28.0 bar @ 5.0 bar	28.0	28.0	28.0	28.0	28.0 bar @ 5.0 bar
DN40	225	Converging	PTFE	25.0	38.7	51.7	51.7	51.7 bar @ 5.0 bar	27.9	27.9	27.9	27.9	27.9 bar @ 5.0 bar
			ULF	16.8	30.5	47.9	51.7	51.7 bar @ 5.0 bar	19.7	19.7	19.7	19.7	19.7 bar @ 5.0 bar
		Diverging	PTFE	22.0	22.0	22.0	22.0	22.0 bar @ 5.0 bar	22.0	22.0	22.0	22.0	22.0 bar @ 5.0 bar
			ULF	22.0	22.0	22.0	22.0	22.0 bar @ 5.0 bar	22.0	22.0	22.0	22.0	22.0 bar @ 5.0 bar
DN50	750	Converging	PTFE	35.2	51.7	51.7	---	51.7 bar @ 4.0 bar	51.7	51.7	51.7	---	51.7 bar @ 4.0 bar
			ULF	31.4	51.7	51.7	---	51.7 bar @ 4.0 bar	50.7	50.7	50.7	---	50.7 bar @ 4.0 bar
		Diverging	PTFE	30.0	30.0	30.0	---	30.0 bar @ 4.0 bar	30.0	30.0	30.0	---	30.0 bar @ 4.0 bar
			ULF	30.0	30.0	30.0	---	30.0 bar @ 4.0 bar	30.0	30.0	30.0	---	30.0 bar @ 4.0 bar
DN80	750	Converging	PTFE	19.5	35.2	51.7	---	51.7 bar @ 4.0 bar	45.0	45.0	45.0	---	45.0 bar @ 4.0 bar
			ULF	17.1	32.8	51.7	---	51.7 bar @ 4.0 bar	42.6	42.6	42.6	---	42.6 bar @ 4.0 bar
		Diverging	PTFE	25.0	25.0	25.0	---	25.0 bar @ 4.0 bar	25.0	25.0	25.0	---	25.0 bar @ 4.0 bar
			ULF	25.0	25.0	25.0	---	25.0 bar @ 4.0 bar	25.0	25.0	25.0	---	25.0 bar @ 4.0 bar
DN100	750	Converging	PTFE	19.5	35.2	51.7	---	51.7 bar @ 4.0 bar	45.0	45.0	45.0	---	45.0 bar @ 4.0 bar
			ULF	17.1	32.8	51.7	---	51.7 bar @ 4.0 bar	42.6	42.6	42.6	---	42.6 bar @ 4.0 bar
		Diverging	PTFE	25.0	25.0	25.0	---	25.0 bar @ 4.0 bar	25.0	25.0	25.0	---	25.0 bar @ 4.0 bar
			ULF	25.0	25.0	25.0	---	25.0 bar @ 4.0 bar	25.0	25.0	25.0	---	25.0 bar @ 4.0 bar

Valve-Actuator Dimensions and Weights

Table 10. Fisher GX 3-Way Dimensions and Weights (Standard and High Temperature Constructions)

VALVE SIZE	TYPE	PORT DIA		ACTUATOR SIZE	TRAVEL	A			B			C
		Upper	Lower			PN10 - PN40	CL150	CL300	PN10 - PN40	CL150	CL300	Bonnet
		mm	mm		mm	mm	mm	mm	mm	mm	mm	mm
DN 25/ NPS 1	BPC	29	36	225	19	197	184	197	98.5	92	98.5	73
	SPC	36	36									
DN 40/ NPS 1-1/2	BPC	39	46	225	19	235	222	235	117.5	111	117.5	76
	SPC	36	36									
DN 50/ NPS 2	BPC	61	70	750	19	267	254	267	133.5	127	133.5	95
	SPC	46	46									
DN 80/ NPS 3	BPC	78	90	750	38	318	298	318	159	149	159	119
	SPC	70	70									
DN 100/ NPS 4	BPC	78	90	750	38	368	352	368	184	176	184	119
	SPC	90	90									

Table 11. Fisher GX 3-Way Dimensions and Weights

VALVE SIZE	D (Actuator Height)		E	F (AR)	TOTAL WEIGHT	
	Std Construction	High Temperature Construction	Casing Dia	Removal Height(1)	Std Construction	High Temperature Construction
	mm	mm	mm	mm	kg	kg
DN 25/ NPS 1	313	418	270	115	26	30
DN 40/ NPS 1-1/2	313	422	270	115	28	32
DN 50/ NPS 2	342	485	430	120	66	74
DN 80/ NPS 3	395	585	430	145	97	112
DN 100/ NPS 4	395	585	430	145	123	138

1. Clearance required for removing actuator from installed valve body.

Figure 16. Fisher GX 3-Way Dimensions (also see tables 10 and 11)

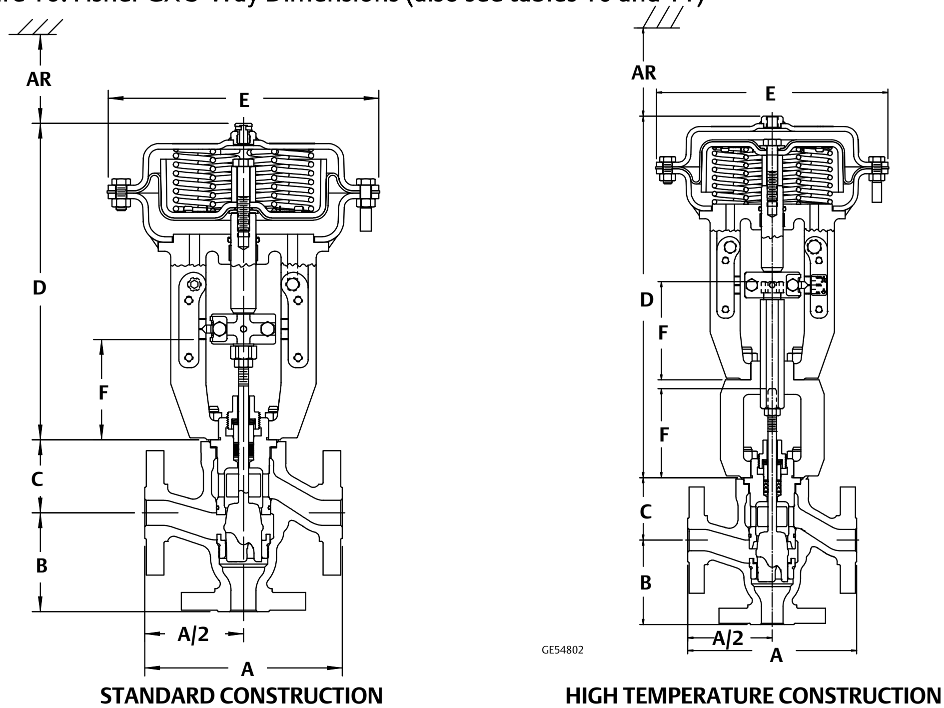


Table 12. Fisher GX 3-Way Electric Actuator Mounting Dimensions and Weights

VALVE SIZE	G	H	K	TOTAL WEIGHT, GX ELECTRIC ACTUATOR MOUNTING ASSEMBLY	
	ISO 5210 Electric Actuator Yoke Height	Yoke Diameter		Std Construction	High Temperature Construction
	mm	mm	mm	kg	kg
DN 25/ NPS 1	202	170	92	17	21
DN 40/ NPS 1-1/2	202	170	92	19	23
DN 50/ NPS 2	202	170	92	29	37
DN 80/ NPS 3	222	170	92	57	72
DN 100/ NPS 4	226	170	92	83	98

Figure 17. Fisher GX 3-Way Electric Actuator Mounting Dimensions (also see table 12)

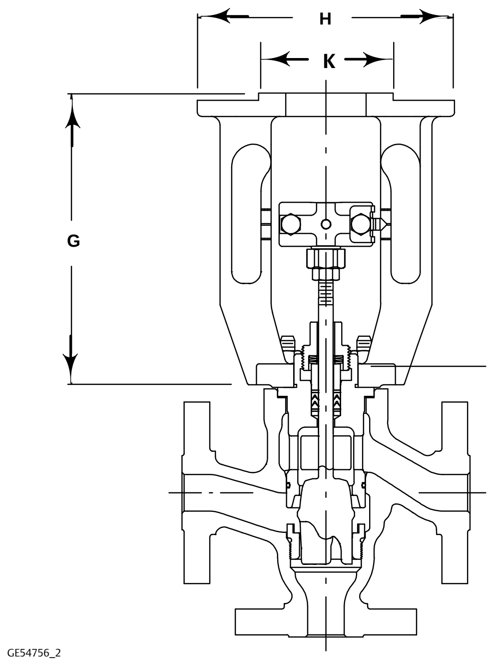


Table 13. Positioner Selection Guidelines

Type	Digital I/P(1)	I/P(2)	P/P(3)	Intrinsic Safety(4)	Flameproof / Explosion Proof(4)	Non- Incendive(4)
DVC2000	X			X		X
DVC6200	X			X	X	X
3661		X		X		X
3660			X			

1. Digital I/P - microprocessor based electro-pneumatic with HART communication.
2. I/P - electro-pneumatic
3. P/P - pneumatic
4. Refer to Fisher bulletin 9.2:001 (D103222X012) for instrument hazardous area classification details.

GX 3-Way Actuator Accessories

The GX 3-Way is available with a variety of pneumatic (P/P), electro-pneumatic (I/P), and digital valve positioners, as well as limit switches and solenoids. Table 13 provides the basic features of the positioners offered with the GX 3-Way actuator.

The FIELDVUE DVC2000 Digital Valve Controller

The DVC2000 digital valve controller (figure 18) is simple to use, compact, and designed for the GX 3-Way control valve. It converts a 4-20mA input signal into a pneumatic output signal, which feeds the control valve actuator. Instrument setup is performed with a pushbutton and LCD interface. This interface is protected from the environment within an IP66 enclosure. Multiple languages are supported with the local interface including German, French, Italian, Spanish, Chinese, Japanese, Portuguese, Russian, Polish, Czech, Arabic, and English. Additionally, HART® communication is supported over the 4-20mA loop wiring.

The DVC2000 is designed to be integrally mounted to the GX 3-Way actuator, avoiding the need for mounting brackets. The DVC2000 mounts directly to an interface pad on the actuator yoke leg with a secure 3-point mounting. An internal passage inside the yoke leg transmits the pneumatic signal to the actuator casing, eliminating the need for external tubing (in the fail-down configuration).

Figure 18. FIELDVUE DVC2000 Digital Valve Controller

The high-performance linkage-less position feedback system eliminates physical contact between the valve stem and the digital valve controller or instrument. There are no wearing parts so cycle life is maximized. Additionally, the elimination of levers and linkages reduces the number of mounting parts and the mounting complexity. Digital valve controller or instrument replacement and maintenance is simplified because the feedback parts stay connected to the actuator.

The DVC2000 is available with an optional module which includes two (2) integral limit switches and a stem position transmitter. The limit switches are configurable for open and closed valve indication. The position transmitter provides a 4-20mA signal for valve position feedback verification. As an integral component to the instrument, this option module avoids the need for difficult-to-mount external switches and transmitters.

Designed to meet intrinsic safety and non-incendive requirements, this instrument delivers scalable functionality and high performance in a small package.

Optional Positioners and Instruments

3660 and 3661 Valve Positioners

The 3660 pneumatic and 3661 electro-pneumatic positioners are rugged, accurate, and feature low steady-state air consumption. Designed to meet intrinsic safety requirements, these positioners offer simple functionality in a small package. (See table 13.)

Figure 19. FIELDVUE DVC6200 Digital Valve Controller

DVC6200 Digital Valve Controller

The DVC6200 digital valve controller is a communicating, microprocessor-based current-to-pneumatic instrument. Using HART or FOUNDATION™ fieldbus communication protocol, access to critical instrument, valve, and process conditions is provided. When used with ValveLink™ software, valve diagnostic tests can be run while the valve is in service to advise you of the performance of the entire control valve assembly. Designed to meet a broad range of hazardous area classifications, this instrument offers maximum functionality to improve your process performance. (See figure 19 and table 13.)

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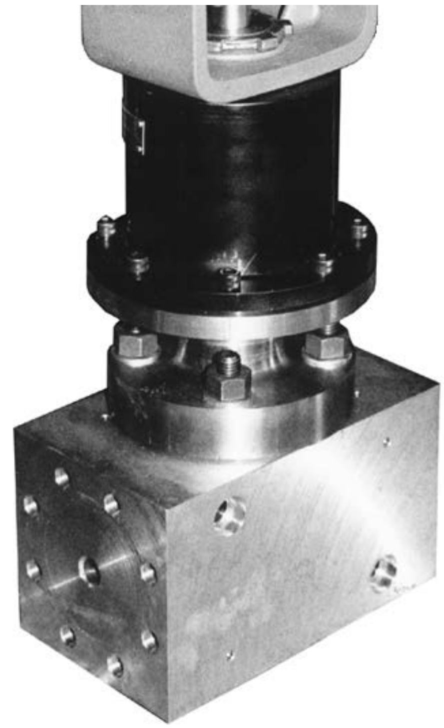
Fisher™ HVP Series Control Valves

The Fisher HVP (high viscous polymer) Series control valve is used extensively by the polymer industry. These processes generally require the valves to operate at and maintain high temperatures to assure that the polymer fluid flows freely. The HVP Series can provide integral valve body passages through which a heat-transfer fluid is pumped to keep the valve and process fluid heated.

Forged and fabricated valve body styles are engineered to meet your process and piping requirements. Standard valve body and trim designs can be adapted to exactly match specifications. Models include: HVP-TS for throttling service; HVP-DS (figure 1) for diverting service (three-way valve); and HVP-SS for stop service (on/off).



W5494-1

Fisher HVP-TS Valve

Features

- Internal passages finished to 0.1 to 0.4 micro-meters (4 to 16 micro-inches) RMS to ensure easy flow of fluid.
- Flow passage designed to prevent flow stagnation and polymer degradation.
- Bellows seal is available.
- All HVP Series control valves can be vacuum rated.
- Integral valve body jacketing for efficient heat transfer and stabilized flow.

Specifications

Valve Body Sizes

NPS 1 through 10, larger sizes on request

Flow Coefficient C_v

0.1 to 200

Inlet Pressure(1)

Consistent with CL150 through CL2500 ratings per ASME B16.34

Temperatures(1)

-18 to 427°C (0 to 800°F) as required by specific application

End Connections

■ Buttweld ends (BWE) consistent with ASME B16.25 ■ Socketweld ends (SWE) consistent with ASME B16.11 ■ Flanged ends consistent with ASME B16.5

Transfer Fluid Connections

NPS ■ 1/2, ■ 3/4, or ■ 1 with ■ Buttweld ends (BWE) consistent with ASME B16.25 ■ Socketweld ends (SWE) consistent with ASME B16.11 ■ Flanged ends consistent with ASME B16.5

Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4

To Class V as required

Travel

25 through 102 mm (1 through 4-inch)

Yoke Boss and Stem Diameter

As required to mate with specified actuator

Construction Materials

Valve Body, Bonnet, and Flanges: S30400/S31600 stainless steel
Packing: Graphite
Valve Plug and Valve Stem: S30400/S31600 stainless steel (Alloy 6 overlays applied as required)

Dimensions

Depends on actuator requirements; contact your Emerson sales office or Local Business Partner

1. The pressure/temperature limits in this bulletin, and any applicable standard or code limitation, should not be exceeded.

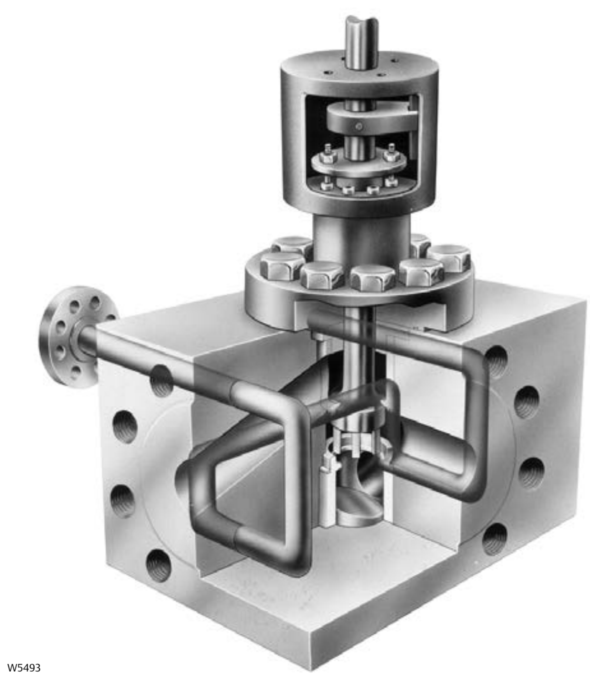
Ordering Information

When ordering, specify:

Application

1. Type of application
2. Controlled fluid
3. Fluid viscosity of controlled fluid
4. Specific gravity of controlled fluid
5. Fluid temperature requirements
6. Heat transfer medium (vapor/liquid)
7. Inlet pressures
    a. Minimum
    b. Normal
    c. Maximum
8. Pressure drops
    a. Minimum flowing drop
    b. Normal flow drop
    c. Maximum flowing drop
    d. Maximum at shutoff
9. Flow rate
    a. Minimum controlled flow
    b. Normal flow
    c. Maximum flow
10. Maximum permissible noise level, if critical
11. Shutoff classification required
12. Line/core size and schedule

Figure 1. Fisher HVP-DS Valve



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Fisher™ RSS Lined Globe Valve

The Fisher RSS lined globe-style valve is a one-piece valve body which has pure-modified (reinforced) PTFE trim parts, push-down-to-close action, and positive shutoff. The sophisticated PTFE trim has replaced the previously used glass-filled or carbon-filled standard PTFE trim without any loss of mechanical or thermal properties and has improved the universal chemical resistance. This valve is for applications involving severely corrosive and toxic flowing media and is well-suited for pure media applications, as well. Within its temperature and pressure limitations, the RSS valve body may also be applied to most media. The RSS valve body provides an economical alternative to alloy valve bodies in a wide variety of applications.

Fisher RSS Valve with 667 Actuator and FIELDVUE™ DVC6200 Digital Valve Controller

Features

- **Fluid Compatibility**—The PFA (perfluoroalkoxy resin)-lined assembly provides corrosion protection by shielding metal parts from the process media, making it ideal for controlling severely corrosive media.

- **Permeating Service**—A heavy duty PTFE bellows with stainless steel support rings is standard for all services in the NPS 1 to 4 valve sizes. Compared to a standard bellows, the heavy duty bellows design has an enhanced resistance to permeation. This is due to a wall thickness of 2.5 mm (0.1 inch) and pressure retaining rings inside the bellows. This bellows features a modified PTFE material which provides additional permeation protection over the original heavy duty PTFE bellows.

- **Economy**—Because all metal parts are shielded from the process fluid, the use of expensive alloys is not necessary.

- **Liner Integrity**—Lining thickness is a minimum of 5 millimeters at all areas where the valve is exposed to process flow. Transfer molding techniques provide for excellent consistency, density, and low permeability. Transfer molded PFA material is translucent. This allows for checking of the entire wall surface for pin holes and cracks in the material during the manufacturing process.

  Greater safety under vacuum and high temperature service is achieved by dovetail anchorings which provide a mechanical bond, minimizing the possibility of detachment of the lining from the cast valve body.

- **Easy In-Line Maintenance**—The top entry design eases in-line maintenance. This design also minimizes the transfer of pipeline stress, which minimizes leakage both at the valve body joint and seat ring.

- **Long Life Bellows Seal**—The PTFE bellows seal is leak tight and, with proper use and maintenance, can have an expected life cycle exceeding 500,000 full stroke cycles.

Specifications

Valve Sizes

NPS ■ 1, ■ 1-1/2, ■ 2, ■ 3, ■ and 4

Face-To-Face and Flange Compatibility

VALVE SIZE, NPS	DUCTILE IRON			
	Raised-Face Flange			
	CL150		CL300	
	Face-To-Face			
	ASME(1)	DIN(2)	ASME(1)	DIN(2)
1	X	X	X	---
1-1/2	X	X	X	---
2	X	X	X	---
3	X	X	---	---
4	X	X	---	---

1. For ANSI/ISA face-to-face dimensions, see figure 4.
2. For DIN face-to-face dimensions, see figure 4.

Maximum Inlet Pressures and Temperatures(1)

See table 2

Downstream/Outlet Pressure Ratings(1)

See figure 2 for positive pressure service ratings
See figure 3 for vacuum service ratings

Application Limits

Liquid Service: For cavitating applications, contact your Emerson Automation Solutions sales office
Gas Service: Velocity $\leq$ 0.33 MACH

Shutoff Classification

Class VI per ANSI/FCI 70-2 and IEC 60534-4

Bellows Seal

Heavy-duty PTFE with SST support rings

Construction Materials

See table 3

Expected Life Cycle

Full Stroke: 500,000

Temperature Capabilities

Positive Pressure Service: -29 to 180°C (-20 to 360°F) (see figure 2)
Vacuum Service: -29 to 180°C (-20 to 360°F) (see figure 3)

Standard Flow Characteristic/Valve Plug Style

Equal percentage

Flow Direction

Up through the seat ring (see figure 1)

Flow Coefficients

See table 1 or Fisher Catalog 12

Port Diameters and Maximum Valve Plug Travel

See table 1

Bonnet Style

Plain

Packing Arrangement

Braided PTFE rings

Yoke Boss and Stem Diameter

See table 1

Approximate Weight

See figure 4

Options

■ **Line-Flange gasket,** (stainless steel insert, compression gasket, and PTFE overlay) with thickness of 5.1 mm (0.20 inch) for NPS 1 through 2, and 7.1 mm (0.28 inch) for NPS 3 and 4 valves
■ **Tool** for removing and installing the seat ring

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for the valve should not be exceeded.

Table 1. Valve Size, Port Diameter(1), Maximum Flow Coefficient, Travel, and Stem and Yoke Boss Diameter

<table>
<tr><th>VALVE SIZE</th><th colspan="2">PORT DIAMETER</th><th rowspan="3">LIQUID FLOW COEFFICIENT (C_V) AT MAXIMUM TRAVEL(2)</th><th colspan="2">MAXIMUM VALVE PLUG TRAVEL</th><th colspan="2">STEM DIAMETER</th><th colspan="2">YOKE BOSS DIAMETER</th></tr>
<tr><th rowspan="2">NPS</th><th rowspan="2">mm</th><th rowspan="2">Inches</th><th colspan="2">Heavy Duty Bellows with Support Rings</th><th rowspan="2">mm</th><th rowspan="2">Inches</th><th rowspan="2">mm</th><th rowspan="2">Inches</th></tr>
<tr><th>mm</th><th>Inches</th></tr>
<tr><td>1</td><td>8
15
20
25</td><td>0.3125
0.5
0.75
1</td><td>1.91
3.57
8.41
11.5</td><td>15</td><td>0.591</td><td rowspan="3">9.5</td><td rowspan="3">3/8</td><td rowspan="3">54</td><td rowspan="3">2-1/8</td></tr>
<tr><td>1-1/2</td><td>25
40</td><td>1
1.5</td><td>13.4
28.6</td><td rowspan="2">19.1</td><td rowspan="2">0.75</td></tr>
<tr><td>2</td><td>30
50</td><td>1.1875
2</td><td>13.3
44.3</td></tr>
<tr><td>3</td><td>50
80</td><td>2
3.1875</td><td>43.3
94.1</td><td rowspan="2">28.6</td><td rowspan="2">1.125</td><td rowspan="2">12.7</td><td rowspan="2">1/2</td><td rowspan="2">71</td><td rowspan="2">2-13/16</td></tr>
<tr><td>4</td><td>65
96</td><td>2.5
4</td><td>69.3
145</td></tr>
</table>

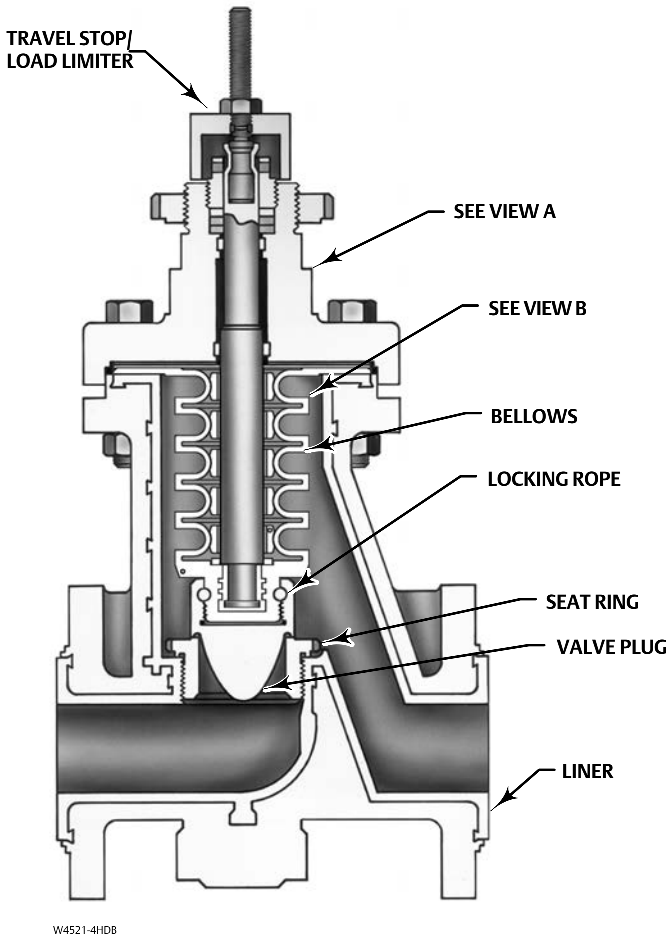
1. Inch equivalents of these metric port diameters have been rounded to common imperial decimal diameters. Actual diameter of the 15 millimeter port diameter is 0.591 inches, the 40 millimeter port diameter is 1.575 inches, and the 96 millimeter port is 3.780 inches.
2. $K_V = (0.865)(C_V)$

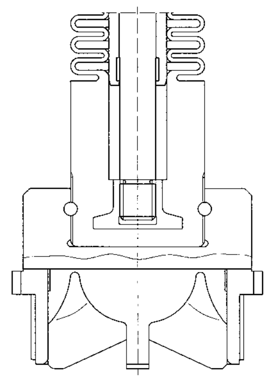
Table 2. Maximum Allowable Inlet Pressures and Temperatures for All CL150 and 300 Valves

TEMPERATURE, °C	PRESSURE, BAR	TEMPERATURE, °F	PRESSURE, PSIG
	Ductile Iron		Ductile Iron
-29 to 38	19.7	-20 to 100	285
93	17.9	200	260
149	15.9	300	230
180	14.8	360	215

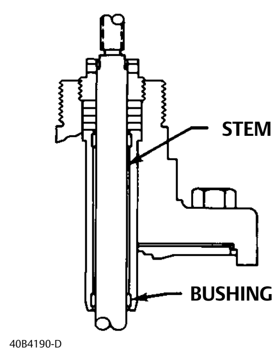
Contents

Figure 1. Fisher RSS Valve Details





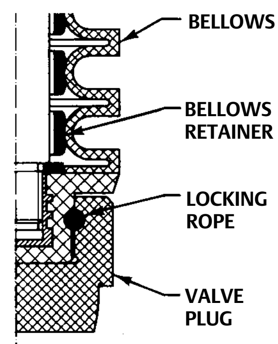
DETAIL OF NPS 3 AND 4 U-PLUG



DETAIL OF BONNET
FOR NPS 3 AND 4 VALVES

A3598-3

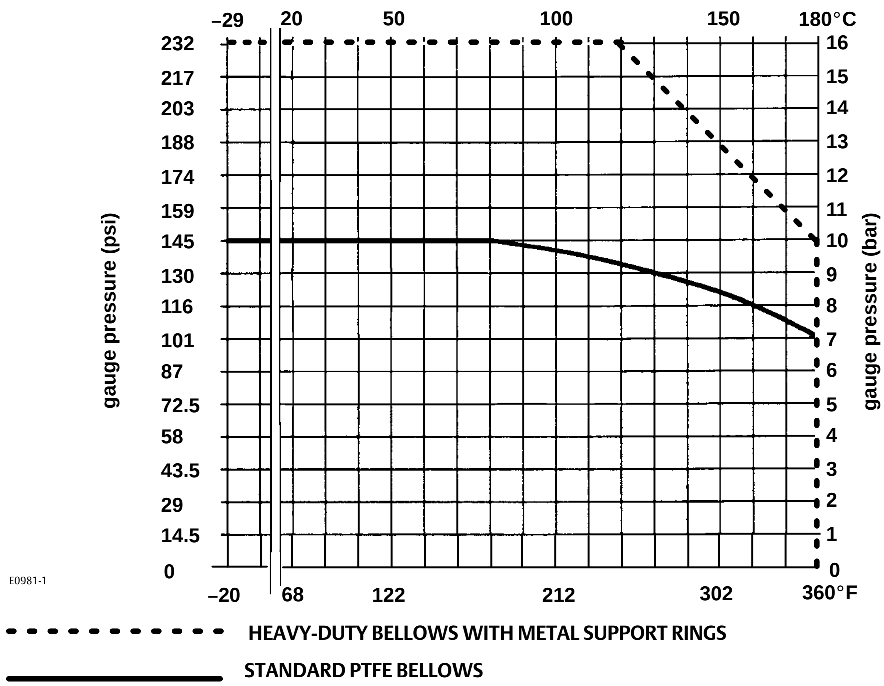
VIEW A



DETAIL OF HEAVY DUTY
PTFE BELLOWS CONSTRUCTION

VIEW B

Figure 2. Downstream/Outlet Pressure Ratings (Positive Pressure Service)



Note: The liner does not limit the downstream pressure rating in positive pressure services.

Figure 3. Downstream/Outlet Pressure Ratings (Vacuum Service)

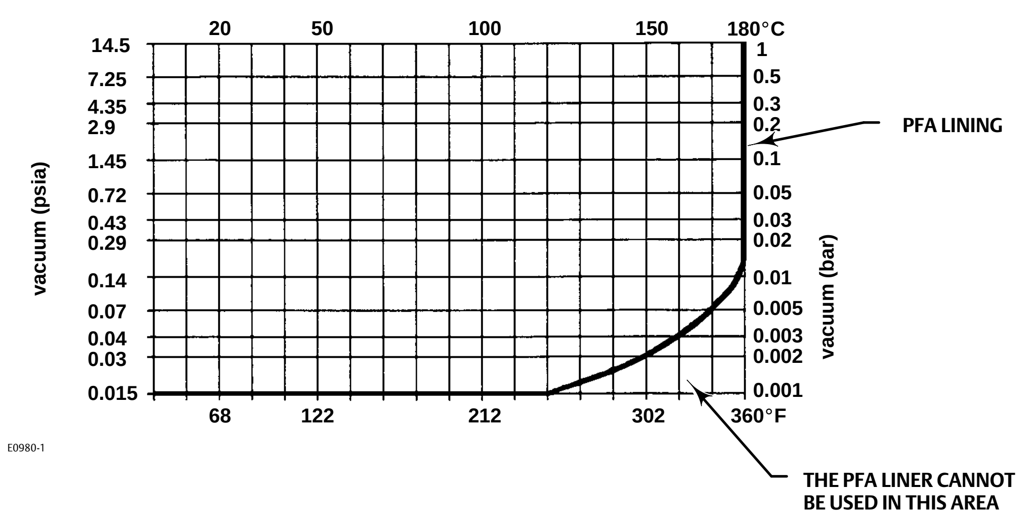


Table 3. Construction Materials

Part	Standard Material
Valve Body	Ductile iron (ASTM A 395) with PFA[1] liner
Bonnet	Ductile iron (ASTM A395)
Bellows	Heavy-duty PTFE with S30403 SST support rings
Valve plug and seat ring	Pure modified (reinforced) PTFE
Bonnet bushings	Carbon Graphite
Valve plug stem	Stainless steel
Body-to-bonnet bolting	Stainless steel
Packing	PTFE
Packing follower and packing box ring	Stainless steel
Travel stop	Stainless steel
Locking rope	PTFE
Bonnet O-ring	Fluorocarbon

1. Perfluoroalkoxy resin.

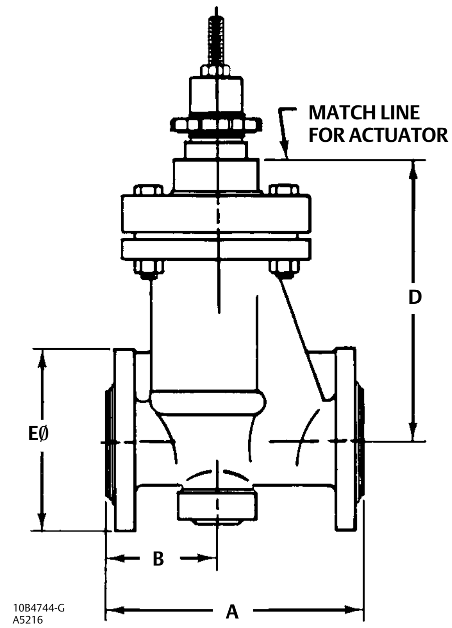
Table 4. ANSI/ISA CL150 Face-to-Face Dimensions Mating with CL150 Flanges

Valve Size, NPS	DIMENSIONS				Approximate Weight
	A	B	D	E∅	
	mm				Kg
1	184.0	83.0	185.0	108.0	10
1-1/2	222.0	97.0	225.0	127.0	17
2	254.0	107.0	230.0	152.4	20
3	298.0	121.0	340.0	190.5	39
4	350.0	176.0	350.0	220.0	42
	Inches				Pounds
1	7.25	3.27	7.28	4.25	23
1-1/2	8.75	3.82	8.86	5.00	36
2	10.00	4.21	9.06	6.00	43
3	11.75	4.76	13.39	7.50	86
4	13.78	6.94	13.78	8.66	92

Table 5. ANSI/ISA CL300 Face-to-Face Dimensions Mating with CL300 Flanges

Valve Size, NPS	DIMENSIONS				Approximate Weight
	A	B	D	E∅	
	mm				Kg
1	197.0	90.0	185.0	123.8	11
1-1/2	235.0	101.0	225.0	156.0	18
2	267.0	115.0	230.0	165.0	20
	Inches				Pounds
1	7.75	3.54	7.28	4.87	25
1-1/2	9.25	3.97	8.86	6.14	40
2	10.50	4.53	9.06	6.50	45

Figure 4. Dimensions and Weights (also see tables 4 and 5)



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EMERSON

Fisher™ YD and YS Control Valves

Fisher YD and YS three-way cage-guided valves are designed for throttling or flow-switching (on-off) service, and are available in the following constructions:

YD (Balanced)—For general converging (flow-mixing) and diverging (flow-splitting) service. Available in standard and high-temperature versions (see figure 1).

YS (Unbalanced)—For general converging service. When used in diverging service, recommended for on-off applications only (see figure 1).

The Fisher YD and YS product lines are available for a wide range of applications, including sulfide and chloride stress-cracking environments common to the oil and gas production industries. To discuss available constructions, contact your Emerson sales office and include the applicable codes and standards required for these environments.

W7593-1

Fisher YD Valve with 667 Actuator

Features

- Economy--Balanced valve plug construction in the YD permits use of smaller, lower-cost actuators. A single one-piece valve accommodates both trim designs and uses Fisher easy-e™ bonnets, gaskets, and packing, thus cutting spare part inventory costs.

- Application Flexibility--Multipurpose capability results from a valve designed specifically for three-way control. A variety of valve sizes, end connections, port diameters, and trim materials provides design versatility for your control needs.

- Long Trim Life--Hardened trim materials provide excellent wear resistance.

- Easy Maintenance--Cage-type construction simplifies inspection and removal of parts.

- Excellent Sealing Capabilities--The ENVIRO-SEAL™ packing system option is available. This packing system provides excellent sealing, guiding, and loading force transmission. The improved sealing of the ENVIRO-SEAL system can help control emissions to below the EPA (Environmental Protection Agency) limit of 100 ppm (parts per million) from valves. The ENVIRO-SEAL packing systems feature PTFE, Graphite ULF, or Duplex packing with live-loading for reduced packing maintenance.

- Parts Commonality--Packing parts, including packing flange, studs and nuts, and packing kits, are common to the YD, YS, and Fisher easy-e control valves.

- Valve Plug Stability-- Rugged cage guiding provides high valve plug stability, which reduces vibration and mechanical noise.

Specifications

Valve Sizes, Ratings, and End Connections [1,2]

Cast Iron Valves
Flanged: NPS 1 through 6 CL125 flat-face or 250 raised-face flanges per ASME B16.1
Screwed: NPS 1/2 through 2 consistent with ASME B16.4

Steel and Stainless Steel Valves
Flanged: NPS 1 through 8 CL150, 300, and 600 raised-face or ring-type joint flanges per ASME B16.5
Screwed or Socket Welding: NPS 1/2 through 2 consistent with ASME B16.11
Buttwelding: NPS 1 through 8[5]. All available ASME B16.25 schedules that are consistent with ASME B16.34

Maximum Inlet Pressures and Temperatures[1][2]

As listed below, unless limited by maximum pressure drop or material temperature capabilities.
Cast Iron Valves
Flanged: Consistent with CL125B or 250B per ASME B16.1
Screwed: Consistent with flanged CL250 per ASME B16.4
Steel and Stainless Steel Valves
Flanged: Consistent with CL150, 300, and 600[3] per ASME B16.34
Screwed or Welding: Consistent with flanged CL600[3] per ASME B16.34

Operative Pressure/Temperature Limits[1, 2]

Pressure Drop Limit Due to Gasket Loading: See table 1
Shutoff Pressure Drop Limits with Typical Actuators: See tables 6, 7, and 8
Pressures and Temperatures for Trims Only: See figure 7
Temperatures for Body-Trim Combinations: See table 5
Temperatures for All Other Parts: See table 3

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

YD
Standard Design: Class IV
High-Temperature Design: Class II
YS
Standard Class: Class IV
Optional Class: Class V (NPS 1 through 4)

Flow Characteristic

Linear

Flow Direction

See figure 6

Flow Coefficients and Noise Level Prediction

Refer to Fisher Catalog 12

- continued -

Table of Contents

Specifications (continued)

Valve Plug Styles

YD: Balanced, metal-seated
YS: Unbalanced, metal-seated

Rated Travels and Port Diameters

See table 1

Yoke Boss and Stem Diameters for Actuator Mounting

VALVE SIZE, NPS	VALVE STEM AND YOKE BOSS DIAMETERS, INCHES			
	Standard		Optional	
	Yoke Boss	Stem	Yoke Boss	Stem
mm				
1/2, 3/4, 1, 1-1/2	54	9.5	71	12.7
2, 2-1/2, 3, 4	71	12.7	90	19.1
6	90	19.1	127	25.4
8	90	19.1	- - -	- - -
Inch				
1/2, 3/4, 1, 1-1/2	2-1/8	3/8	2-13/16	1/2
2, 2-1/2, 3, 4	2-13/16	1/2	3-9/16	3/4
6	3-9/16	3/4	5	1
8	3-9/16	3/4	- - -	- - -

Actuator Sizing

Pneumatic: See tables 6, 7, and 8
Electric: See Fisher Catalog 14. Electric actuators must be capable of up and down thrust limits

Bonnet Styles

See table 11

Construction Materials

Valve Body and Bonnet: ■ Cast iron (except extension bonnet), ■ WCC steel, ■ WC9 chrome moly steel, ■ C5 chrome moly steel, or ■ CF8M (316 SST)
Trims: See table 2
All Other Parts: See table 3

Approximate Shipping Weights

VALVE SIZE, NPS	SHIPPING WEIGHT	
	kg	lb
1/2, 3/4	14	30
1	18	40
1-1/2	27	60
2	39	85
2-1/2	50	110
3	68	150
4	109	240
6	227	500
8	345	760

Options

■ Lubricator or lubricator/isolating valve for packing lubrication
■ Drilled and tapped connection in extension bonnet for leakoff
■ ENVIRO-SEAL live-loaded packing systems(4)

1. PN (or other) ratings and end connections can usually be supplied; consult your Emerson sales office.
2. The pressure or temperature limits in this bulletin and any applicable standard limitations should not be exceeded. OPERATIVE LIMITS term is defined in SAMA Standard PMC 20.1.
3. Certain bonnet bolting material selections may require a CL600 easy-e valve assembly to be derated. Contact your Emerson sales office for more information.
4. For additional information, see Bulletin 59.1:061 ENVIRO-SEAL and HIGH-SEAL Packing Systems for Sliding-Stem Valves.
5. BWE not available for NPS 8 with high temperature trim, see figure 2. Lower cage cannot be removed unless bottom flange adaptor is removed.

ENVIRO-SEAL Packing System Specifications

Applicable Stem Diameters

■ 9.5 mm (3/8 inches), ■ 12.7 (1/2), ■ 19.1 (3/4), and■ 25.4 (1) diameter valve stems

Maximum Pressure/Temperature Limits(1)

To Meet the EPA Fugitive Emission Standard of 100 PPM(2)
For ENVIRO-SEAL PTFE and ENVIRO-SEAL Duplex packing systems: full CL300 up to 232°C (450°F)
For ENVIRO-SEAL Graphite ULF packing system: 104 bar (1500 psig) at 316°C (600°F)

Construction Materials

PTFE Packing Systems
Packing Ring and Lower Wiper: PTFE V-ring(3)
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring

Anti-Extrusion Washer: Filled PTFE
Lantern Ring: S31600 (316 stainless steel)
Spring: ■ 17-7PH stainless steel or ■ N06600
Packing Box Flange: S31600
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: SA193-B8M Class 2
Packing Box Nuts: S31600
Graphite ULF Packing Systems
Packing Ring: Graphite rings
Spring: ■ 17-7PH stainless steel or ■ N06600
Packing Box Flange: S31600
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: SA193-B8M Class 2
Packing Box Nuts: S31600

1. Refer to the valve specifications in this bulletin for pressure/temperature limits of valve parts. Do not exceed the pressure/temperature rating of the valve. Do not exceed any applicable code or standard limitation.
2. The Environmental Protection Agency (EPA) has set a limit of 100 parts per million (ppm) for fugitive emissions from a valve in selected VOC (Volatile Organic Compound) services.
3. In vacuum service, reversing the ENVIRO-SEAL PTFE packing rings is not necessary.

Figure 1. Construction Details

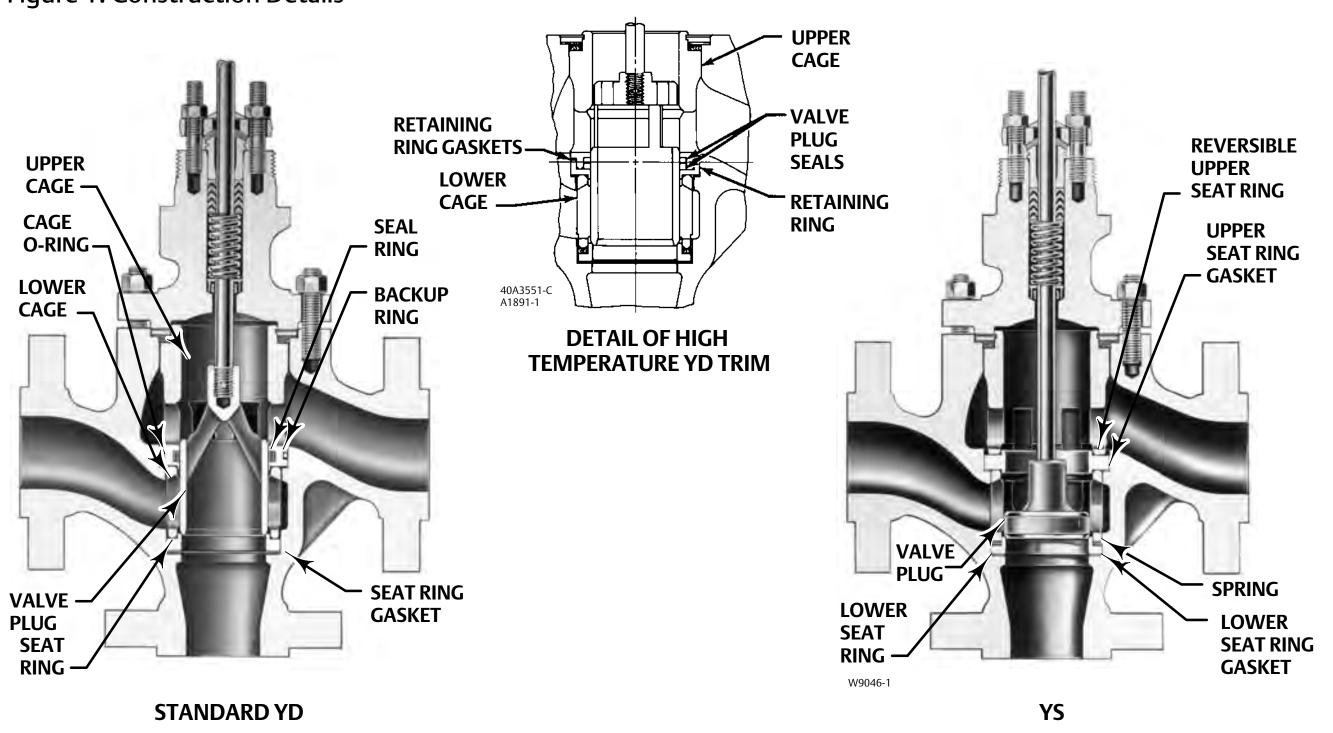


Figure 2. Construction Details - NPS 8 YD-High Temperature

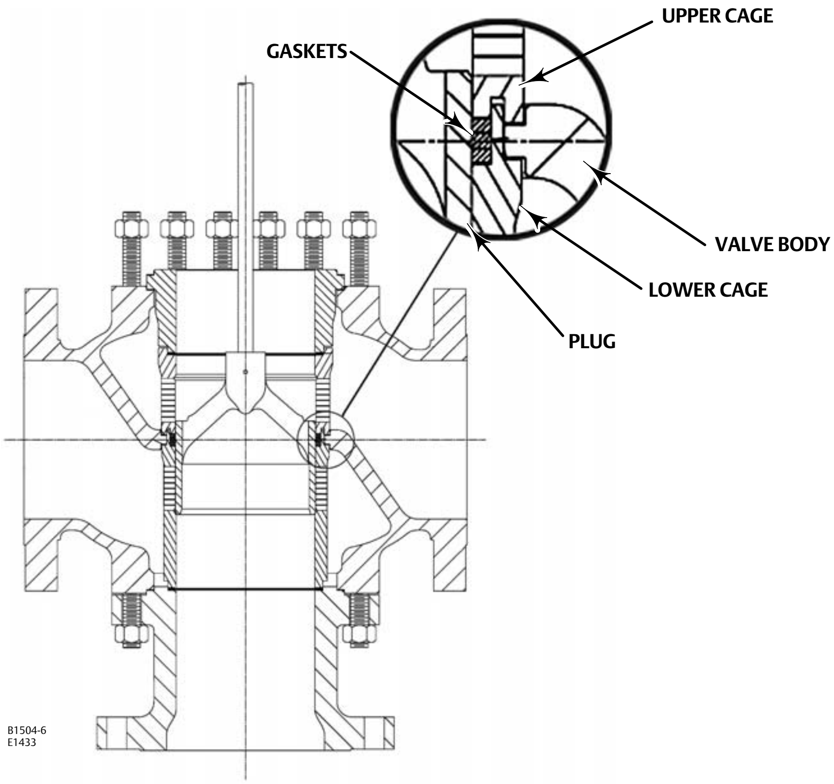
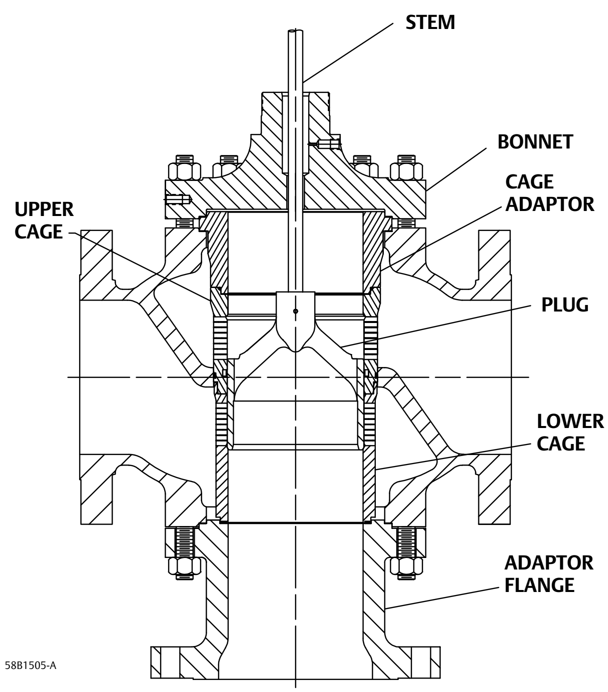


Figure 3. Construction Details - NPS 8 YD



Flow Directions

YD (Common Port on Bottom) see figure 6

- Plug Down, Left-Hand Port Closed--Flow in converging service is from right to bottom port and in diverging service is from bottom to right port.
- Plug Up, Right-Hand Port Closed--Flow in converging service is from left to bottom port and in diverging service is from bottom to left port.
- Intermediate Plug Positions--Flow in converging service is from both left and right ports to bottom port, with capacities in proportion to plug travel. Flow in diverging service is from bottom port to both left and right ports, with capacities split in proportion to plug travel.

YS (Common Port on Left) see figure 6

- Plug Down, Bottom Port Closed--Flow in converging service is from right to left port and in diverging service is from left to right port.

- **Plug Up, Right‐Hand Port Closed--**Flow in converging service is from bottom to left port and in diverging service is from left to bottom port.

- **Intermediate Plug Positions--**Flow in converging service is from both bottom and right ports to left port, with capacities in proportion to plug travel.

Figure 4. Cutaway of ENVIRO‐SEAL Bellows Seal Bonnet and Internal Shroud, Showing Bellows


W5852-1

ENVIRO‐SEAL, HIGH‐SEAL Packing Systems

ENVIRO‐SEAL and HIGH‐SEAL packing systems offer excellent sealing capabilities. These systems easily install in your existing valves or can be purchased with new valves. These systems help you seal your process to conserve valuable process fluid. The long operational life and reliability of these systems also reduce your maintenance costs and downtime.

For applications requiring compliance with environmental protection regulations, the unique ENVIRO‐SEAL packing system (figure 5) and, for hazardous service, the ENVIRO‐SEAL bellows seal system (figure 4) are offered. The emission control packing system keeps emission concentrations below the EPA 100 ppm requirement.

For an excellent stem seal in applications that are not environmentally sensitive, the HIGH‐SEAL Graphite ULF packing system (figure 5) is offered. The HIGH‐SEAL packing system provides excellent sealing at pressure/temperature ratings beyond ENVIRO‐SEAL limits. ENVIRO‐SEAL systems may also be applied for excellent stem sealing in higher pressure/temperature applications not requiring EPA compliance.

ENVIRO‐SEAL packing systems, available with PTFE, Graphite ULF, or Duplex packing, and the HIGH‐SEAL Graphite ULF packing system feature live‐loading and unique packing‐ring arrangements for long‐term, consistent sealing performance.

Installation

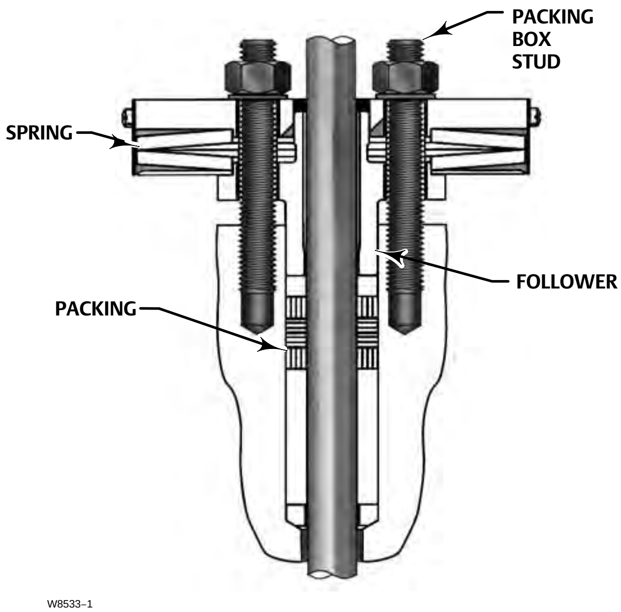
Although YD and YS valves may be mounted with the actuator in any position relative to the valve, the normal position is with the valve in a horizontal run of pipe and the actuator vertical above the valve. The actuator should be supported in any position other than vertical. Orient the valve so that valve plug positions and flow directions will conform to the flow indicator plate on the valve body.

Dimensions are shown in figure 8.

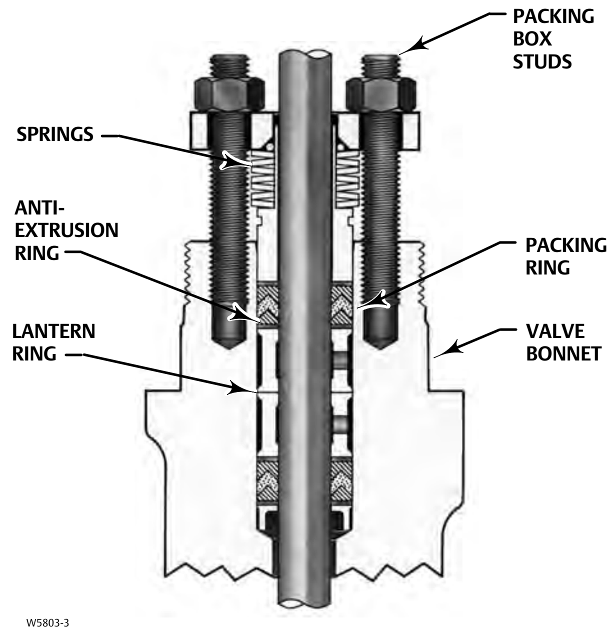
Note

For the NPS 8 high temperature construction, the bottom flange MUST be removed to access and remove the lower cage (see figure 2). BWE end connections are not available for the NPS 8 high temperature constructions for this reason.

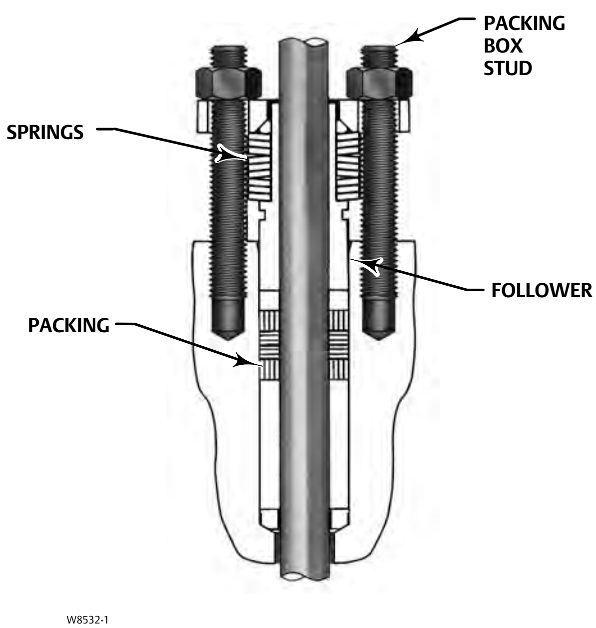
Figure 5. ENVIRO‐SEAL and HIGH‐SEAL Packing Systems



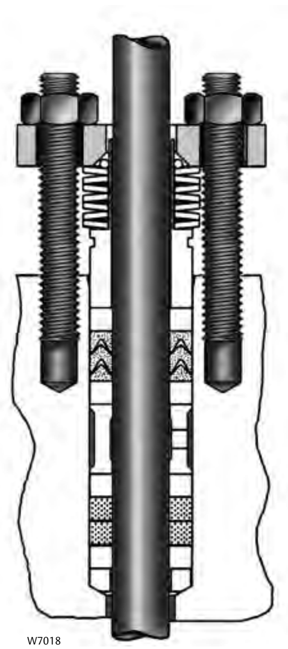
TYPICAL HIGH‐SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO‐SEAL PACKING SYSTEM
WITH PTFE PACKING



TYPICAL ENVIRO‐SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO‐SEAL PACKING SYSTEM
WITH DUPLEX PACKING

Table 1. Travel, Port, and Gasket Loading Pressure Drop Information

VALVE SIZE, NPS	MAXIMUM RATED TRAVEL		SEAT RING PORT DIAMETER		PRESSURE DROP LIMIT DUE TO GASKET LOADING			
					YS		YD(1)	
	mm	Inches	mm	Inches	bar	psig	bar	psig
1/2, 3/4, 1, 1-1/2	19	0.75	33.3	1.3125	41.4	600	103.4	1500
2, 2-1/2	29	1.125	58.7	2.3125	31.7	460		
3	38	1.5	87.3	3.4375	37.9	550		
4	51	2	111.1	4.375	38.6	560		
6	51	2	177.8	7	52.4	760		
8(2)	57.2	2.25	177.8	7	- - -	- - -		

1. For standard YD only. For high temperature YD, consult your Emerson sales office.
2. NPS 8 only available in YD construction.

Table 2. Trim Materials

PART		MATERIAL		
		Trim 1	Trim 2(1)	Trim 2A
Valve Plug	YD	CB7Cu-1 (17-4PH SST)	CF8M (316 SST)	CF8M/CoCr-A
	YS	S41600 (416 SST)	S31600 (316 SST)	CF8M/CoCr-A
Upper Cage and Lower Cage		CB7Cu-1	CF8M, ENC	CF8M, ENC
Upper Cage Retaining Ring (High-Temperature YD Only)		S41600	CF8M	CF8M
Upper Seat Ring (YS Only) and Lower Seat Ring		S41600	S31600	S31600/CoCr-A

1. Standard trim for stainless steel valves.

Figure 6. Flow Directions

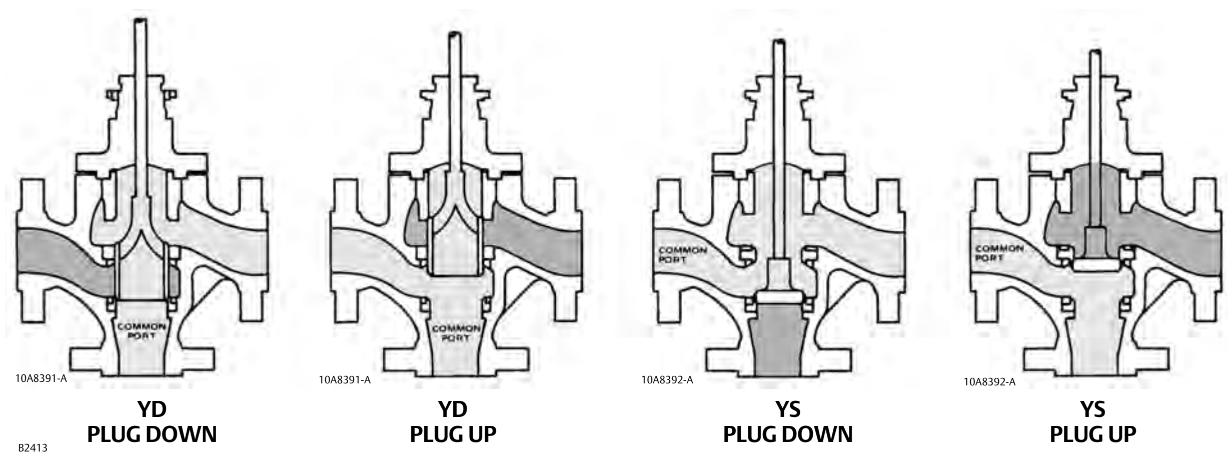


Table 3. Materials and Temperature Limits for Other Parts

PART			MATERIAL		IN-BODY PROCESS TEMPERATURE			
					°C		°F	
					Min	Max	Min	Max
Body-to-bonnet bolting. See table 4 for NACE bolting materials and temperatures	Cast iron body		Cap screws	Steel SAE Grade 5	-29	232	-20	450
	WCC body		Studs	Steel SA-193-B7	-29	427[1]	-20	800[1]
			Nuts	Steel SA-194-2H				
	316 stainless steel (CF8M)		Studs	Steel SA-193-B7 (std)	-48	427[1]	-55	800[1]
			Nuts	Steel SA-194-2H (std)				
			Studs	304 stainless steel SA-320-B8	-198	38	-325	100
			Nuts	304 stainless steel SA-194-8				
			Studs	316 stainless steel SA-193-B8M (strain-hardened)	-198[2]	427[1]	-325[2]	800[1]
			Nuts	316 stainless steel SA-194-8M				
			Studs	316 stainless steel SA-194-B8M (annealed)	-198[2]	These mat'ls not limiting factors	-325[2]	These mat'ls not limiting factors
			Nuts	316 stainless steel SA-194-8M				
	LCC body		Studs	Steel SA-193-B7	-46	343[1]	-50	650[1]
			Nuts	Steel SA-194-2H				
	WC9 and C5 body		Studs	NCF2 coated SA-193-B7	-29	427[1]	-20	800[1]
			Nuts	NCF2 coated SA-194-7				
Valve plug stem and pin			S31600 (316 SST)		-254	---[1]	-425	---[1]
Plug-cage seals (YD only)	Standard YD	Cage O-ring and backup ring	Ethylene propylene[2]		-40	232	-40	450
			Nitrile[3]	With hydrocarbons, air	-34	71	-30	160
				With other process fluids	-34	82	-30	180
			Fluorocarbon[4]		-18	204	0	400
		Seal ring	Carbon-filled PTFE		-73	232	-100	450
	High-temperature YD	Valve plug seals	Graphite		-254	---[1]	-425	---[1]
		Retaining ring gaskets	FGM Graphite/S31600		-254	---[1]	-425	---[1]
Bonnet gasket			FGM Graphite/S31600		-254	---[1]	-425	---[1]
Retaining ring gaskets (High-temperature YD only)			FGM Graphite/S31600		-254	---[1]	-425	---[1]
Spiral wound gaskets			N06600/graphite FGM-standard		-198	---[1]	-325	---[1]
Spiral wound spring		NPS 1 to 3	N06600/graphite FGM		-198	---[1]	-325	---[1]
		NPS 4 to 8	N06600		-198	---[1]	-325	---[1]
Packing (temperatures calculated for standard bonnet)		Standard	PTFE V-ring		-40	232	-40	450
		Optional	PTFE/composition		-73	232	-100	450
			Graphite ribbon/filament		-254	---[1]	-425	---[1]
Packing flange, studs, and nuts			316 SST		-254	---[1]	-425	---[1]
Packing box ring			316 SST		-254	---[1]	-425	---[1]
All other metal packing box parts			316 SST		-254	---[1]	-425	---[1]

1. Maximum temperature of this part not a limiting factor.
2. Has excellent moisture resistance with hot water and steam and may be used with most fire-resistant hydraulic oils, but cannot be used with petroleum-based fluids and other hydrocarbons.
3. General-purpose material with good resistance to petroleum-based lubricating oils, gasoline, and other hydrocarbons. Not for use with fire-resistant hydraulic oils.
4. For high-temperature air, hydrocarbons, and certain other chemicals and solvents, but cannot be used with ammonia, steam, or hot water.

Table 4. Bolting Materials and Temperature Limits for Bolting Compliance with NACE Specification MR0175-2002, MR0157/ISO 15156, and MR0103

VALVE BODY MATERIAL		BOLTING MATERIAL	TEMPERATURE CAPABILITIES			
			°C		°F	
			Min	Max	Min	Max
NACE MR0175-2002, MR0157/ISO 15156, and MR0103 (non-exposed bolting) (Standard)						
WCC and CF8M (316 SST)	Studs	Steel SA-193-B7	-48[3]	427	-55[3]	800
	Nuts	Steel SA-194-2H				
NACE MR0175-2002 (exposed bolting) (Optional) No Derating of Valve Required						
WCC and CF8M	Studs	Steel SA-564-630 (H1150 dbl[1])	-46[3]	343	-50[3]	650
	Nuts	Steel SA-194-2HM				
NACE MR0175-2002, MR0157/ISO 15156, and MR0103 (exposed bolting) (Optional) Requires Derating of Valve[2] When These Body-to-Body Bolting Materials are Used						
WCC and CF8M	Studs	Steel SA-193-B7M	-48[3]	427	-55[3]	800
	Nuts	Steel SA-194-2HM				

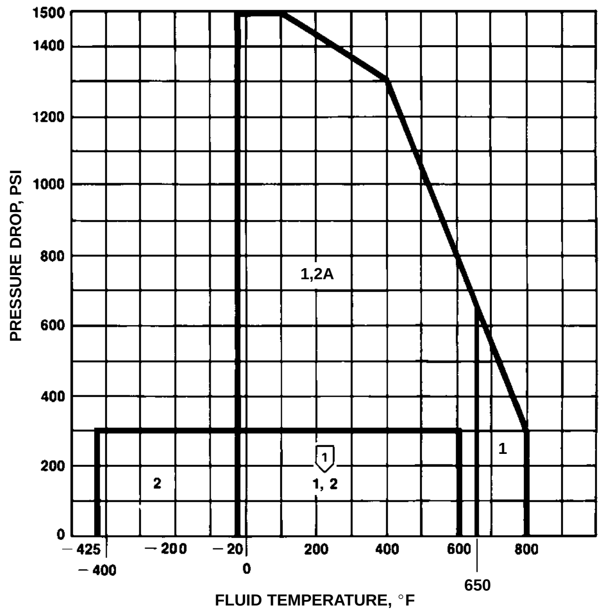
1. Special heat treating required.
2. Derating is not required for CL300 valves. Derating may be required for valves rated at CL600. Contact your Emerson sales office for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used.
3. WCC is limited to -29°C (-20°F).

Table 5. Valve Body-Trim Temperature Capabilities[1]

VALVE BODY MATERIAL	TRIM NUMBER FROM TABLE 2	TEMPERATURE[2]			
		Minimum		Maximum	
		°C	°F	Standard YD	YS and High-Temperature YD
				°C (°F)	°C (°F)
Cast Iron[3]	1	-73	-100	232 (450)	232 (450)
	2[2] and 2A	-73	-100	NPS 1-1/2 to 3: 232 (450) NPS 4 to 6: 177 (350)	232 (450)
WCC Steel and WC9 and C5 Chrome Moly Steel	1	-29	-20	NPS 1/2 to 1-1/2: 427 (800)[4] NPS 2 and 2-1/2: 371 (700)[4] NPS 3: 316 (600)[4] NPS 4 and 6: 260 (500)[4]	427 (800)
	2[2]	-29	-20	NPS 1/2 to 1-1/2: 316 (600)[4] NPS 2 and 2-1/2: 232 (450) NPS 3: 204 (400) NPS 4 and 6: 149 (300)	316 (600)
	2A	-29	-20	NPS 1/2 to 1-1/2: 343 (650)[4] NPS 2 and 2-1/2: 232 (450) NPS 3: 204 (400) NPS 4 and 6: 149 (300)	343 (650)
CF8M (316 SST)	2[2]	-254	-425	316 (600)[4]	316 (600)
	2A	-198[5]	-325[5]	343 (650)[4]	343 (650)
NPS 8 YD (WCC)	1	-29	-20	232 (450)	427 (800)[6]
NPS 8 YD (CF8M)	2[2]	-198	-325	232 (450)	316 (600)[6]
	2A	-198	-325	232 (450)	343 (650)[6]

1. Refer to table 2 for trim materials.
2. Trim 2 limited to 149°C (300°F) maximum for nonlubricating fluids.
3. Cast iron is limited to -73°C (-100°F) minimum
4. Plug cage seals limit this design to 232°C (450°F) maximum.
5. May be used down to -254°C (-425°F) if manufacturing process includes Charpy impact test.
6. Only available in YD constructions.

Figure 7. Maximum Allowable Pressure Drops and Temperatures for Table 2 Trims



10A8091-B
A1892-3

Note:
1 Trim 2 limited to 149°C (300°F) maximum for nonlubricating fluids

Table 6. Maximum Allowable Fisher YD Shutoff Pressure Drops with 657 and 667 Actuators(1)

PACKING TYPE	ACTUATOR SIZE	NOMINAL (ACTUAL) AIR TO DIAPHRAGM, PSIG(2)						
		3-15 (0-18)			6-30 (0-33)			3-40(0-43)
		△P, PSID/(Bench Set, PSIG)/Spring Drawing Number						
1.3125 Inch Port, Class IV Seat Leakage								
Standard Single or Double PTFE	30	100 (5-13) 1F1768	500 (6-12) 1F1767	925 (7-11)(3) 1J1722	500 (6-26) 1E7953	1335 (8-24) 1J2581	1500 (10-22) 1E7923	- - -
	34	1130 (5-13) 1E8053	1500 (6-12) 1E8056	- - -	1500 (6-26) 1E8051	- - -	- - -	- - -
ENVIRO-SEAL PTFE	30	290 (7-11) 1J1722	- - -	- - -	710 (8-24) 1J2581	1500 (10-22) 1E7923	- - -	- - -
	34	500 (5-13) 1E8053	1125 (6-12) 1E8056	- - -	1125 (6-26) 1E8051	1500 (8-24) 1E8055	- - -	- - -
ENVIRO-SEAL Graphite ULF	30	- - -	- - -	- - -	- - -	- - -	- - -	540 (14-28) 1F7143
	34	- - -	- - -	- - -	955 (10-22) 1E8058	1500 (12-20) 1E8053	- - -	1500 (13-29) 1E8055
1.3125 Inch Port, Class II Seat Leakage (High-Temperature Trim)								
Graphite Ribbon/ Filament (CL600)	30	- - -	- - -	- - -	320 (8-24) 1J2581	1500 (11-21) 1F1769	- - -	- - -
	34	110 (5-13) 1E8053	740 (6-12) 1E8056	1370 (7-11) 1F1771	740 (6-26) 1E8051	1500 (8-24) 1J2581	- - -	- - -
ENVIRO-SEAL Graphite ULF	30	- - -	- - -	- - -	30 (11-21) 1F1769	450 (12-20) 1F1768	- - -	1300 (14-28) 1F7143
	34	- - -	- - -	- - -	450 (8-24) 1E8055	1500 (10-22) 1E8058	- - -	- - -
2.3125 Inch Port, Class IV Seat Leakage								
Standard Single or Double PTFE	40	250 (6-12) 1F1771	- - -	- - -	250 (6-26) 1E8054	600 (7-25) 1E8058	1500 (10-22) 1E8053	- - -
	45	275 (4-14) 1E8270	820 (5-12) 1E8269	1350 (6-11) 1F1773	1350 (6-26) 1E8263	1500 (8-25) 1E8271	- - -	- - -
ENVIRO-SEAL PTFE	40	- - -	- - -	- - -	120 (7-25) 1E8058	820 (9-24) 1E8057	1170 (10-22) 1E8053	1500 (12-30) 1E8058
	45	330 (5-12) 1E8269	870 (6-11) 1F1773	- - -	865 (6-26) 1E8263	1500 (8-25) 1E8271	- - -	- - -
ENVIRO-SEAL Graphite ULF	45	- - -	- - -	- - -	430 (9-24) 1E8268	1500 (11-22) 1E8272	- - -	- - -
	46	385 (6-12) 1E8266	- - -	- - -	385 (6-26) 1E8258	1500 (8-24) 1E8264	- - -	- - -
2.3125 Inch Port, Class II Seat Leakage (High-Temperature Trim)								
Graphite Ribbon/ Filament (CL600)	40	- - -	- - -	- - -	90 (7-25) 1E8058	790 (9-24) 1E8057	1145 (10-22) 1E8053	1500 (12-30) 1E8058
	45	300 (5-12) 1E8269	840 (6-11) 1F1773	- - -	840 (6-26) 1E8263	1500 (8-25) 1E8271	- - -	- - -

-continued-

Table 6. Maximum Allowable Fisher YD Shutoff Pressure Drops with 657 and 667 Actuators[1] (continued)

PACKING TYPE	ACTUATOR SIZE	NOMINAL (ACTUAL) AIR TO DIAPHRAGM, PSIG[2]						
		3-15 (0-18)			6-30 (0-33)			3-40(0-43)
		△P, PSID/(Bench Set, PSIG)/Spring Drawing Number						
2.3125 Inch Port, Class II Seat Leakage (High-Temperature Trim) (Continued)								
ENVIRO-SEAL Graphite ULF	40	---	---	---	---	---	---	575 (12-30) 1E8058
	45	---	---	---	635 (8-25) 1E8271	1500 (11-22) 1E8272	---	---
	46	330 (5-13) 1E8272	1125 (6-12) 1E8266	---	1125 (6-12) 1E8258	1500 (8-24) 1E8264	---	---
3.4375 Inch Port, Class IV Seat Leakage								
Standard Single or Double PTFE	40	---	---	---	---	---	---	230 (8-32) 1E8058
	45	100 (5-12) 1F1773	650 (6-11)[3] 1E9215	---	650 (6-26) 1E8268	1500 (9-24) 1E8272	---	---
ENVIRO-SEAL PTFE	45	150 (6-11)[3] 1E9215	---	---	150 (6-26) 1E8268	1500 (9-24) 1E8272	---	---
	46	150 (4-14) 1E8272	1500 (6-12) 1E8269	---	1500 (6-26) 1E8267	---	---	---
ENVIRO-SEAL Graphite ULF	45	---	---	---	250 (10-22) 1E8266	800 (11-20) 1E8269	---	1500 (13-29) 1E8261
	46	---	---	---	460 (7-25) 1E8263	1500 (9-24) 1E8271	---	---
3.4375 Inch Port, Class II Seat Leakage (High-Temperature Trim)								
Graphite Ribbon/ Filament (CL600)	40	---	---	---	---	---	---	85 (8-32) 1E8058
	45	500 (6-11)[3] 1E9215	---	---	500 (6-26) 1E8268	1500 (9-24) 1E8272	---	---
ENVIRO-SEAL Graphite ULF	45	---	---	---	815 (9-24) 1E8272	1500 (11-20) 1E8269	---	---
	46	770 (6-12) 1E8269	---	---	770 (6-26) 1E8267	1500 (7-25) 1E8263	---	---
4.375 Inch Port, Class IV Seat Leakage								
Standard Single or Double PTFE	45	50 (6-12)[3] 1E9215	---	---	50 (6-26) 1E8272	570 (7-25) 1E8270	1100 (8-24) 1E8266	1500 (9-33) 1E8265
	46	800 (5-13) 1E8269	---	---	1500 (6-26) 1E8271	---	---	---
ENVIRO-SEAL PTFE	45	---	---	---	80 (7-25) 1E8270	620 (8-24) 1E8266	---	1150 (9-33) 1E8265
	46	325 (5-13) 1E8269	---	---	1125 (6-26) 1E8271	1500 (7-23) 1E8265	---	---
ENVIRO-SEAL Graphite ULF	45	---	---	---	---	---	---	200 (11-31) 1E8272
	46	---	---	---	260 (7.5-21) 1E8272	---	---	---

-continued-

Table 6. Maximum Allowable Fisher YD Shutoff Pressure Drops with 657 and 667 Actuators(1) (continued)

PACKING TYPE	ACTUATOR SIZE	NOMINAL (ACTUAL) AIR TO DIAPHRAGM, PSIG(2)						
		3-15 (0-18)			6-30 (0-33)			3-40(0-43)
		△P, PSID/(Bench Set, PSIG)/Spring Drawing Number						
4.375 Inch Port, Class II Seat Leakage (High-Temperature Trim)								
Graphite Ribbon/ Filament (CL600)	45	200 (6-12)(3) 1E9215	---	---	200 (6-26) 1E8272	720 (7-25) 1E8270	1250 (8-24) 1E8266	1500 (9-33) 1E8265
	46	950 (5-13) 1E8269	---	---	1500 (6-26) 1E8271	---	---	---
ENVIRO-SEAL Graphite ULF	45	---	---	---	250 (8.5-24.5) 1E8266	---	---	520 (9-33) 1E8265
	46	70 (5.5-11.5) 1F1773	---	---	470 (6-26) 1E8271	1260 (7-23) 1E8265	1500 (7.5-21) 1E8272	---
NPS 6, 7 Inch Port, Class IV Seat Leakage(4)								
Standard Single or Double PTFE	50	---	---	---	---	---	---	370 (11-31) 1E8272
	60	---	---	---	405 (7.5-21) 1E8272	---	---	---
	70	250 (5-13) 1N1286	---	---	750 (6-26) 1N7193	1500 (8-23) 1N1287	---	---
ENVIRO-SEAL PTFE	50	---	---	---	---	---	---	60 (11-31) 1E8272
	60	---	---	---	95 (7.5-21) 1E8272	---	---	---
	70	---	---	---	430 (6-26) 1N7193	1450 (8-23) 1N1287	1500 (10-22) 1N1284	---
ENVIRO-SEAL Graphite ULF	76 (667 only)	---	---	---	---	---	---	200 (13-29) 1N1284
	70	---	---	---	590 (10-22) 1N1284	---	---	1500 (13-28) 1N1287
NPS 6, 7 Inch Port, Class II Seat Leakage (High-Temperature Trim)								
Graphite Ribbon/ Filament (CL600)	50	---	---	---	---	---	---	125 (11-31) 1E8272
	60	---	---	---	160 (7.5-21) 1E8272	---	---	---
	70	---	---	---	500 (6-26) 1N7193	1500 (8-23) 1N1287	---	---
ENVIRO-SEAL Graphite ULF	76 (667 only)	---	---	---	490 (11-22)(3) 1N1286	---	---	1200 (13-29) 1N1284
	70	---	---	---	590 (8-23) 1N1287	1500 (10-22) 1N1284	---	---

1. Spring and bench sets selected for use with either 657 or 667. Other acceptable configurations possible from Fisher Specification Manager for a specific actuator type.
2. The bench set values shown assume an actual supply pressure to the actuator of 0 to 18 psig for a nominal 3 to 15 psig signal, an actual 0 to 33 psig supply for a nominal 6 to 30 psig signal, and an actual 0 to 43 psig supply for a nominal 3 to 40 psig signal. Any positioner or controller used with these actuators must be capable of delivering the appropriate slightly extended range.
3. Requires non-standard spring adjustor.
4. Special Class IV seat load (40 lb/lineal inch) used for YD with 7-inch diameter port.

Table 7. Maximum Allowable Fisher YS (Converging Service) Shutoff Pressure Drops with 657 and 667 Actuators(1)

PACKING TYPE	ACTUATOR SIZE	NOMINAL (ACTUAL) AIR TO DIAPHRAGM, PSIG(2)						
		3-15 (0-18)			6-30 (0-33)			3-40(0-43)
		△P, PSID/(Bench Set, PSIG)/Spring Drawing Number						
1.3125 Inch Port, Class IV Seat Leakage								
Standard Single or Double PTFE	30	40 (6-12) 1F1767	75 (7-11)(3) 1J1722	- - -	110 (8-24) 1J2581	180 (10-22) 1E7923	245 (12-20) 1F1768	315 (14-28) 1F7143
	34	95 (5-13) 1E8053	145 (6-12) 1E8056	195 (7-11) 1F1771	245 (8-24) 1E8055	350 (10-22) 1E8058	450 (12-20) 1E8053	550 (14-28) 1E8054
ENVIRO-SEAL PTFE	30	25 (7-11)(3) 1J1722	- - -	- - -	60 (8-24) 1J2581	125 (10-22) 1E7923	195 (12-20) 1F1768	265 (14-28) 1F7143
	34	40 (5-13) 1E8053	95 (6-12) 1E8056	145 (7-11) 1F1771	195 (8-24) 1E8055	300 (10-22) 1E8058	400 (12-20) 1E8053	500 (14-28) 1E8054
ENVIRO-SEAL Graphite ULF	30	- - -	- - -	- - -	- - -	- - -	- - -	45 (14-28) 1F7143
	34	- - -	- - -	- - -	80 (10-22) 1E8058	180 (12-20) 1E8053	- - -	285 (14-28) 1E8054
Graphite Ribbon/ Filament (CL300)	30	- - -	- - -	- - -	10 (8-24) 1J2581	80 (10-22) 1E7923	150 (12-20) 1F1768	215 (14-28) 1F7143
	34	45 (6-12) 1E8056	95 (7-11) 1F1771	- - -	145 (8-24) 1E8055	250 (10-22) 1E8058	350 (12-20) 1E8053	450 (14-28) 1E8054
2.3125 Inch Port, Class IV Seat Leakage								
Standard Single or Double PTFE	40	12 (6-12) 1F1771	- - -	- - -	28 (7-25) 1E8058	61 (9-24) 1E8057	78 (10-22) 1E8053	110 (12-30) 1E8058
	45	38 (5-12) 1E8269	63 (6-11) 1F1773	- - -	113 (8-25) 1E8271	188 (11-22) 1E8272	213 (12-21) 1E8266	263 (14-28) 1E8265
ENVIRO-SEAL PTFE	40	- - -	- - -	- - -	38 (9-24) 1E8057	55 (10-22) 1E8053	- - -	88 (12-30) 1E8058
	45	15 (5-12) 1E8269	40 (6-11) 1F1773	- - -	90 (8-25) 1E8271	165 (11-22) 1E8272	190 (12-21) 1E8266	240 (14-28) 1E8265
ENVIRO-SEAL Graphite ULF	45	- - -	- - -	- - -	70 (11-22) 1E8272	95 (12-21) 1E8266	- - -	145 (14-28) 1E8265
	46	18 (6-12) 1E8266	- - -	- - -	55 (7-25) 1E8257	130 (9-24) 1E8267	240 (12-21) 1E8265	(667 Only) 315 (14-28) 1E8263
Graphite Ribbon/ Filament (CL300)	40	- - -	- - -	- - -	24 (9-24) 1E8057	40 (10-22) 1E8053	- - -	73 (12-30) 1E8058
	45	26 (6-11) 1F1773	- - -	- - -	76 (8-25) 1E8271	151 (11-22) 1E8272	176 (12-21) 1E8266)	226 (14-28) 1E8265

-continued-

Table 7. Maximum Allowable Fisher YS (Converging Service) Shutoff Pressure Drops with 657 and 667 Actuators[1] (continued)

PACKING TYPE	ACTUATOR SIZE	NOMINAL (ACTUAL) AIR TO DIAPHRAGM, PSIG[2]						
		3-15 (0-18)			6-30 (0-33)			3-40(0-43)
		△P, PSID/(Bench Set, PSIG)/Spring Drawing Number						
3.4375 Inch Port, Class IV Seat Leakage								
Standard Single or Double PTFE	40	---	---	---	---	---	---	5 (8-32) 1E8058
	45	13 (6-11)[3] 1E9215	---	---	25 (7-25) 1E8265	47 (9-24) 1E8272	70 (11-20) 1E8269	104 (14-29) 1E8272
	46	30 (5-13) 1E8266	46 (6-12) 1E8269	---	80 (8-24) 1E8262	114 (10-22) 1E8265	130 (11-21) 1E8261	(667 Only) 147 (12-27) 1E8271
ENVIRO-SEAL PTFE	45	5 (6-11)[3] 1E9215	---	---	15 (7-25) 1E8265	37 (9-24) 1E8272	60 (11-20) 1E8269	94 (14-29) 1E8272
	46	19 (5-13) 1E8266	36 (6-12) 1E8269	---	70 (8-24) 1E8262	103 (10-22) 1E8265	120 (11-22) 1E8261	(667 Only) 137 (12-27) 1E8271
ENVIRO-SEAL Graphite ULF	45	---	---	---	17 (11-20) 1E8269	---	---	50 (14-29) 1E8272
	46	---	---	---	27 (8-24) 1E8262	60 (10-22) 1E8265	77 (11-21) 1E8261	(667 Only) 94 (12-27) 1E8271
Graphite Ribbon/ Filament (CL300)	45	---	---	---	8 (7-25) 1E8265	31 (9-24) 1E8272	53 (11-20) 1E8269	87 (14-29) 1E8272
	46	13 (5-13) 1E8266	30 (6-12) 1E8269	---	63 (8-24) 1E8262	97 (10-22) 1E8265	114 (11-21) 1E8261	(667 Only) 130 (12-27) 1E8271
4.375 Inch Port, Class IV Seat Leakage								
Standard Single or Double PTFE	45	---	---	---	15 (8-24) 1E8266	---	---	35 (11-31) 1E8272
	46	16 (5.5-11.5) 1F1773	---	---	21 (6-26) 1E8271	36 (7.5-21) 1E8272	---	---
	76[4] (667 Only)	---	---	---	39 (8-24) 1N1284	70 (11-22)[3] 1N1286	---	112 (15-26)[3] 1N1286
	70[4]	29 (5-13) 1N1286	---	---	44 (6-26) 1N7193	88 (9-24) 1N1287	102 (10-22) 1N1284	161 (14-29) 1N1287
ENVIRO-SEAL PTFE	45	---	---	---	8 (8-24) 1E8266	---	---	29 (11-31) 1E8272
	46	9 (5.5-11.5) 1F1773	---	---	14 (6-26) 1E8271	30 (7.5-21) 1E8272	---	---
	76[4] (667 Only)	---	---	---	30 (8-24) 1N1284	61 (11-22)[3] 1N1286	---	102 (15-26)[3] 1N1286
	70[4]	20 (5-13) 1N1286	---	---	35 (6-26) 1N7193	79 (9-24) 1N1287	93 (10-22) 1N1284	152 (14-29) 1N1287
ENVIRO-SEAL Graphite ULF	76[4] (667 Only)	---	---	---	---	---	---	85 (15-26)[3] 1N1286

-continued-

Table 7. Maximum Allowable Fisher YS (Converging Service) Shutoff Pressure Drops with 657 and 667 Actuators(1) (continued)

PACKING TYPE	ACTUATOR SIZE	NOMINAL (ACTUAL) AIR TO DIAPHRAGM, PSIG(2)						
		3-15 (0-18)			6-30 (0-33)			3-40(0-43)
		△P, PSID/(Bench Set, PSIG)/Spring Drawing Number						
4.375 Inch Port, Class IV Seat Leakage (Continued)								
ENVIRO-SEAL Graphite ULF	70(4)	---	---	---	25 (9-24) 1N1287	39 (10-22) 1N1284	---	99 (14-29) 1N1287
Graphite Ribbon/ Filament (CL300)	45	---	---	---	4 (8-24) 1E8266	---	---	25 (11-31) 1E8272
	46	5 (5.5-11.5) 1F1773	---	---	10 (6-26) 1E8271	26 (7.5-21) 1E8272	---	---
	76(4) (667 Only)	---	---	---	17 (8-24) 1N1284	48 (11-22)(3) 1N1286	---	90 (15-26)(3) 1N1286
	70(4)	7 (5-13) 1N1286	---	---	22 (6-26) 1N7193	66 (9-24) 1N1287	81 (10-22) 1N1284	139 (14-29) 1N1287
NPS 6, 7-Inch Port, Class IV Seat Leakage(5)								
Standard Single or Double PTFE	60	---	---	---	5 (7.5-21) 1E8272	---	---	---
	76 (667 Only)	---	---	---	7 (8-24) 1N1284	19 (11-22)(3) 1N1286	---	35 (15-26)(3) 1N1286
	70	3 (5-13) 1N1286	---	---	8 (6-26) 1N7193	26 (9-24) 1N1287	31 (10-22) 1N1284	54 (14-29) 1N1287
	80(4)	10 (5-13) 1H7477	---	---	25 (7-26) 1H7476	39 (8-24) 1H7473	47 (9-22) 1H7475	77 (13-29) 1H7473
ENVIRO-SEAL PTFE	76 (667 Only)	---	---	---	15 (11-22)(3) 1N1286	---	---	31 (15-26)(3) 1N1286
	70	---	---	---	5 (6-26) 1N7193	22 (9-24) 1N1287	28 (10-22) 1N1284	51 (14-29) 1N1287
	80(4)	5 (5-13) 1H7477	---	---	20 (7-26) 1H7476	34 (8-24) 1H7473	42 (9-22) 1H7475	103 (13-29) 1H7473
ENVIRO-SEAL Graphite ULF	76 (667 Only)	---	---	---	---	---	---	10 (15-26)(3) 1N1286
	70	---	---	---	7 (10-22) 1N1284	---	---	30 (14-29) 1N1287
	80(4)	---	---	---	7 (9-22) 1H7475	---	---	36 (13-29) 1H7473
Graphite Ribbon/ Filament (CL300)	76 (667 Only)	---	---	---	10 (11-22)(3) 1N1286	---	---	27 (15-26)(3) 1N1286
	70	---	---	---	17 (9-24) 1N1287	23 (10-22) 1N1284	---	46 (14-29) 1N1287
	80(4)	---	---	---	13 (7-26) 1H7476	27 (8-24) 1H7473	35 (9-22) 1H7475	65 (13-29) 1H7473

1. Spring and bench sets selected for use with either 657 or 667. Other acceptable configurations possible from Fisher Specification Manager for a specific actuator type
2. The bench set values shown assume an actual supply pressure to the actuator of 0 to 18 psig for a nominal 3 to 15 psig signal, an actual 0 to 33 psig supply for a nominal 6 to 30 psig signal, and an actual 0 to 43 psig supply for a nominal 3 to 40 psig signal. Any positioner or controller used with these actuators must be capable of delivering the appropriate slightly extended range.
3. Requires non-standard spring adjustor.
4. Oversize yoke boss required.
5. Special Class 4 seat load (40 lb/lineal inch) used for YS, 7-inch port.

Table 8. Maximum Allowable Fisher YS (Diverging Service) Shutoff Pressure Drops with 657 and 667 Actuators (ON-OFF) application only—No throttling service(1)

PACKING TYPE	ACTUATOR SIZE	NOMINAL (ACTUAL) AIR TO DIAPHRAGM, PSIG(2)		
		3-15 (0-18)	6-30 (0-33)	3-40 (0-43)
		△P(6), PSID/(Bench Set, PSIG)(7)/Spring Drawing Number		
1.3125 Inch Port, Class IV Seat Leakage				
Standard Single or Double PTFE	30	195 (5-13) 1F1768	450 (4.5-28.5) 1E7924	---
	34	315 (3-15) 1E8058	600 (4.5-28.5) 1E8052	---
ENVIRO-SEAL PTFE	30	145 (7-11)(3) 1J1722	385 (8-24) 1J2581	---
	34	265 (5-13) 1E8053	600 (6-26) 1E8051	---
ENVIRO-SEAL Graphite ULF	34	---	400 (10-22) 1E8058	---
Graphite Ribbon/ Filament (CL300)	30	---	330 (8-24) 1J2581	---
	34	210 (6-12) 1E8056	570 (6-26) 1E8051	---
2.3125 Inch Port, Class IV Seat Leakage				
Standard Single or Double PTFE	40	50 (6-12) 1F1771	210 (6-26) 1E8054	---
	45	155 (4-14) 1E8270	330 (4-28) 1E8264	---
ENVIRO-SEAL PTFE	40	---	190 (7-25) 1E8058	---
	45	120 (5-12) 1E8269	310 (6-26) 1E8263	---
ENVIRO-SEAL Graphite ULF	45	---	225 (9-24) 1E8268	---
	46	120 (6-12) 1E8266	380 (7-25) 1E8257	---
Graphite Ribbon/ Filament (CL300)	40	---	280 (9-24) 1E8057	---
	45	105 (6-11) 1F1773	295 (6-26) 1E8263	---

-continued-

Table 8. Maximum Allowable Fisher YS (Diverging Service) Shutoff Pressure Drops with 657 and 667 Actuators (ON-OFF) application only—No throttling service(1) (continued)

PACKING TYPE	ACTUATOR SIZE	NOMINAL (ACTUAL) AIR TO DIAPHRAGM, PSIG(2)		
		3-15 (0-18)	6-30 (0-33)	3-40 (0-43)
		△P(6), PSID/(Bench Set, PSIG)(7)/Spring Drawing Number		
3.4375 Inch Port, Class IV Seat Leakage				
Standard Single or Double PTFE	40	---	---	125 (8-32) 1E8058
	45	65 (5-12) 1F1773	150 (6-26) 1E8268	---
	46	110 (4-14) 1E8272	225 (6-26) 1E8267	---
ENVIRO-SEAL PTFE	45	55 (6-11)(3) 1E9215	140 (6-26) 1E8268	---
	46	100 (4-14) 1E8272	215 (4-28) 1E8257	---
ENVIRO-SEAL Graphite ULF	45	---	95 (10-22) 1E8266	---
	46	---	170 (7-25) 1E8263	---
Graphite Ribbon/ Filament (CL300)	45	---	130 (7-25) 1E8265	---
	46	90 (5-13) 1E8266	210 (6-26) 1E8267	---
4.375 Inch Port, Class IV Seat Leakage				
Standard Single or Double PTFE	45	40 (6-12)(3) 1E9215	90 (6-26) 1E8272	---
	46	65 (5-13) 1E8269	140 (6-26) 1E8271	---
ENVIRO-SEAL PTFE	45	---	85 (7-25) 1E8270	---
	46	60 (5-13) 1E8269	135 (6-26) 1E8271	---
ENVIRO-SEAL Graphite ULF	45	---	---	55 (11-31) 1E8272
	46	---	50 (7.5-21) 1E8272	---
	70(4)	---	135 (9-24) 1N1287	---
Graphite Ribbon/ Filament (CL300)	45	---	80 (8-24) 1E8266	---
	46	55 (5-13) 1E8269	130 (6-26) 1E8271	---

-continued-

Table 8. Maximum Allowable Fisher YS (Diverging Service) Shutoff Pressure Drops with 657 and 667 Actuators (ON-OFF) application only—No throttling service(1) (continued)

PACKING TYPE	ACTUATOR SIZE	NOMINAL (ACTUAL) AIR TO DIAPHRAGM, PSIG(2)		
		3-15 (0-18)	6-30 (0-33)	3-40 (0-43)
		△P(6), PSID/(Bench Set, PSIG)(7)/Spring Drawing Number		
NPS 6, 7-Inch Port, Class IV Seat Leakage(5)				
Standard Single or Double PTFE	50	- - -	- - -	50 (11-31) 1E8272
	60	- - -	45 (7.5-21) 1E8272	- - -
	70	35 (5-13) 1N1286	75 (6-26) 1N7193	- - -
ENVIRO-SEAL PTFE	50	- - -	- - -	45 (11-31) 1E8272
	60	- - -	40 (7.5-21) 1E8272	- - -
	70	30 (5-13) 1N1286	70 (6-26) 1N7193	- - -
ENVIRO-SEAL Graphite ULF	76 (667 Only)	- - -	- - -	50 (13-29) 1N1284
	70	- - -	50 (10-22) 1N1284	- - -
Graphite Ribbon/ Filament (CL300)	76 (667 Only)	- - -	45 (11-22)(3) 1N1286	- - -
	70	- - -	70 (6-26) 1N7193	- - -

1. Spring and bench sets selected for use with either 657 or 667. Other acceptable configurations possible from Fisher Specification Manager for a specific actuator type
2. The bench set values shown assume an actual supply pressure to the actuator of 0 to 18 psig for a nominal 3 to 15 psig signal, an actual 0 to 33 psig supply for a nominal 6 to 30 psig signal, and an actual 0 to 43 psig supply for a nominal 3 to 40 psig signal. Any positioner or controller used with these actuators must be capable of delivering the appropriate slightly extended range.
3. Requires non-standard spring adjustor.
4. Oversize yoke boss required.
5. Special Class 4 seat load (40 lb/lineal inch) used for YS, 7-inch port.
6. Assumes same shutoff pressure drop for top and bottom ports.
7. Bench sets selected will provide sufficient seat loading, even with no pressure drop. The selected bench sets will enable the actuator to fully stroke the valve up or down with the maximum shutoff drop listed.

Table 9. Fisher YD and YS Dimensions

VALVE MATERIAL AND SIZE, NPS	DIMENSION																	
	A							D										
	Valve Rating and End Connection Style[1]							Standard Bonnet				Extension Bonnet						
												Style 1				Style 2		
CAST IRON[2]	Screwed	CL125 FF	---	CL250 RF	---	---	---	Stem Diameter, mm (Inches)				Stem Diameter, mm (Inches)				Stem Diameter, mm (Inches)		
STEEL & SST	Screwed & SWE	CL150 RF	CL150 RTJ	CL300 RF	CL300 RTJ	CL600 RF & BWE	CL600 RTJ	9.5 (3/8)	12.7 (1/2)	19.1 (3/4)	25.4 (1)	9.5 (3/8)	12.7 (1/2)	19.1 (3/4)	25.4 (1)	9.5 (3/8)	12.7 (1/2)	19.1 (3/4)
								mm										
1/2, 3/4[2]	209.6	---	---	---	---	---	---	127.0	149.4	---	---	212.9	251.0	---	---	303.3	319.0	---
1[2]	209.6	184.2	196.9	196.9	209.6	209.6	209.6	127.0	149.4	---	---	212.9	251.0	---	---	303.3	319.0	---
1-1/2	251.0	222.3	235.0	235.0	247.7	251.0	251.0	127.0	149.4	---	---	212.9	251.0	---	---	303.3	319.0	---
2	285.8	254.0	266.7	266.7	282.4	285.8	289.1	---	171.5	168.1	---	---	273.1	277.9	---	---	471.1	468.4
2-1/2	---	276.4	289.1	292.1	307.8	311.2	314.5	---	171.5	168.1	---	---	273.1	277.9	---	---	471.1	468.4
3	---	298.5	311.1	317.5	333.2	336.6	339.9	---	195.3	192.0	---	---	296.9	301.8	---	---	500.1	505.0
4	---	352.6	365.3	368.3	384.0	393.7	396.7	---	228.6	225.6	---	---	330.2	335.0	---	---	533.4	525.5
6	---	450.9	463.6	472.9	489.0	508.0	511.0	---	---	242.8	287.3	---	---	349.3	419.1	---	---	534.9
8[3]	---	543.1	555.8	568.5	584.2	609.6	612.9	---	---	323.9	---	---	---	---	---	---	---	---
								Inches										
1/2, 3/4[2]	8.25	---	---	---	---	---	---	5.00	5.88	---	---	8.38	9.88	---	---	11.94	12.56	---
1[2]	8.25	7.25	7.75	7.75	8.25	8.25	8.25	5.00	5.88	---	---	8.38	9.88	---	---	11.94	12.56	---
1-1/2	9.88	8.75	9.25	9.25	9.75	9.88	9.88	5.00	5.88	---	---	8.38	9.88	---	---	11.94	12.56	---
2	11.25	10.00	10.50	10.50	11.12	11.25	11.38	---	6.75	6.62	---	---	10.75	10.94	---	---	18.56	18.44
2-1/2	---	10.88	11.38	11.50	12.12	12.25	12.38	---	6.75	6.62	---	---	10.75	10.94	---	---	18.56	18.44
3	---	11.75	12.25	12.50	13.12	13.25	13.38	---	7.69	7.56	---	---	11.69	11.88	---	---	19.69	19.88
4	---	13.88	14.38	14.50	15.12	15.50	15.62	---	9.00	8.88	---	---	13.00	13.19	---	---	21.00	20.69
6	---	17.75	18.25	18.62	19.25	20.00	20.12	---	---	9.56	11.31	---	---	13.75	16.50	---	---	21.06
8[3]	---	21.38	21.88	22.38	23.00	24.00	24.13	---	---	12.75	---	---	---	---	---	---	---	---

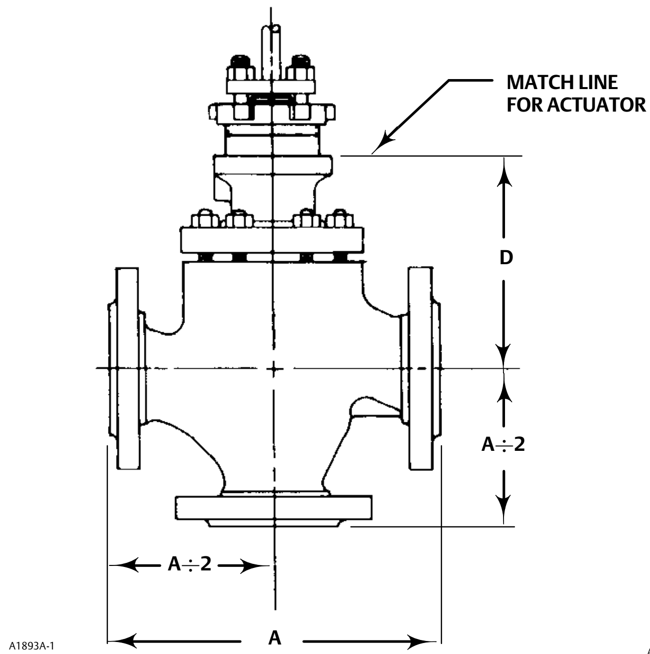
1. Abbreviations are: BWE, butt weld ends; FF, flat-face flanges; RF, raised-face flanges; RTJ, ring-type joint flanges; SWE, socket weld ends.
2. NPS 1/2, 3/4, and 1 are not available in cast iron material.
3. The NPS 8 high temperature valve is not available in a BWE construction.

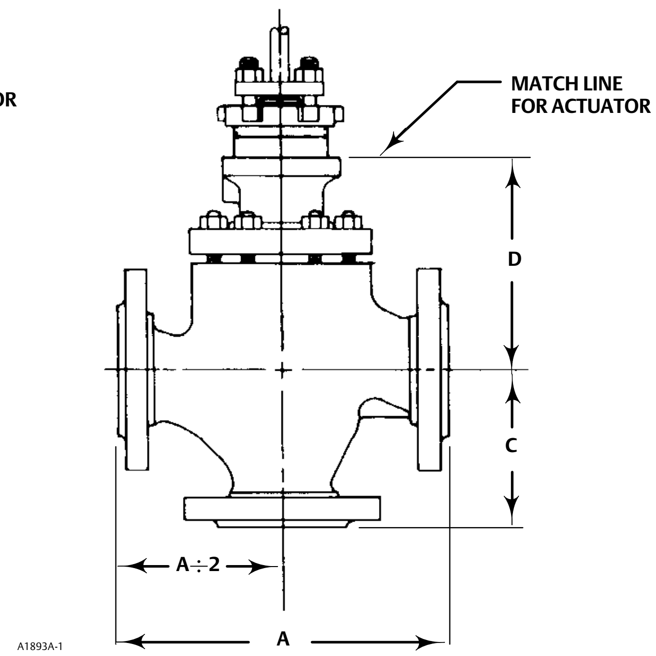
Table 10. Additional Dimensions for Fisher YD and YS High Temperature Valves

VALVE MATERIAL AND SIZE, NPS	DIMENSION						
	C						
	Valve Rating and End Connection Style[1]						
STEEL & SST	Screwed & SWE	CL150 RF	CL150 RTJ	CL300 RF	CL300 RTJ	CL600 RF & BWE	CL600 RTJ
	mm						
8[2]	---	384.6	390.9	397.0	404.9	457.2	458.7
	Inches						
8[2]	---	15.14	15.39	15.63	15.94	18.00	18.06

1. Abbreviations are: BWE, butt weld ends; FF, flat-face flanges; RF, raised-face flanges; RTJ, ring-type joint flanges; SWE, socket weld ends.
2. The NPS 8 high temperature valve is not available in a BWE construction.

Figure 8. Fisher YD and YS Dimensions (also see table 9)





NPS 8 YD and YS HIGH TEMPERATURE

Table 11. Bonnet Selection Guidelines

BONNET STYLE	PACKING MATERIAL	IN-BODY PROCESS TEMPERATURE LIMITS(1)	
		°C	°F
Plain (standard)	PTFE V-ring	-18 to 232	0 to 450
	PTFE/composition	-18 to 232	0 to 450
	Graphite ribbon/filament	-18 to max shown in table 5	0 to max shown in table 5
Style 1 cast extension	PTFE V-ring	-46 to 427	-50 to 800
	PTFE/composition		
	Graphite ribbon/filament	-46 to max shown in table 5	-50 to max shown in table 5
Style 2 cast extension	PTFE V-ring	-101 to 427	-150 to 800
	PTFE/composition		
	Graphite ribbon/filament	-101 to max shown in table 5	-150 to max shown in table 5
ENVIRO-SEAL bellows seal	PTFE	For exceptional stem sealing capabilities. See bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets, (D101641X012), for pressure/temperature ratings.	
	Graphite	For exceptional stem sealing capabilities. See bulletin 59.1:070, ENVIRO-SEAL Bellows Seal Bonnets, (D101641X012), for pressure/temperature ratings.	

1. These in-body process temperatures assume an outside, ambient temperature of 21°C (70°F) and no insulation on the bonnet. When using any packing at low process temperatures, a cast extension bonnet may have to be used to prevent the packing damage which could result from the formation of valve stem frost. Material selection for trim and other components will also be limiting factors.

Ordering Information

Application Information

When ordering, specify:

1. Type of application
    a. Converging or diverging flow
    b. Throttling or on-off (flow switching)
    c. Reducing or relief
2. Controlled fluid (include chemical analysis of fluid if possible)
3. Specific gravity of controlled fluid
4. Fluid temperature
5. Range of flowing inlet pressures
6. Pressure drops
    a. Range of flowing pressure drops
    b. Maximum at shutoff
7. Flow rates
    a. Minimum controlled flow
    b. Normal flow
    c. Maximum flow
8. Shutoff classification required (see the Specifications)
9. Line size and schedule

Valve Information

Refer to the Specifications. Review the description to the right of each specification and in the referenced figures and tables. Indicate the desired choice wherever there is a selection to be made. Always indicate the valve design being ordered.

Actuator and Accessory Information

Refer to separate bulletins covering actuators and accessories for ordering information.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 461
Increased Outlet Angle Sweep-Flo Valve

The Fisher 461 Sweep-Flo valve is a self-cleaning, increased outlet, angle valve that is typically used in the chemical and hydrocarbon industries where control of residual oils or other liquids with coking properties is necessary. The 461 features a venturi-type throat, which is useful in power plants or slurry services where high pressure drops and flashing might exist. Typical trim materials include an S44004 stainless steel plug, an S31600 stainless steel with CoCr-A hardfaced seat ring, and a hardened 410/416 stainless steel liner.

For increased protection, the 461 valve is offered with tungsten carbide trim. Use this trim only in the most severe abrasive conditions or in moderately corrosive environments.

Tungsten carbide inserts are used for the plug tip, seat ring, and the seat ring retainer. Typically, S17400 stainless steel is used as the base material.

Fisher 461 Valve with 657 Actuator

Features

- **Flashing, Outgassing, and Cavitation Control**—Increased outlet size reduces outlet fluid velocity to reduce flashing, outgassing, and cavitation damage with proper trim material selection.

- **Flow Characteristic**—Special cylinder-guided contour valve plug furnishes an equal percentage Micro-Form flow characteristic in the 12.7 to 31.8 mm (0.5 to 1.25 inch) port size and a modified parabolic flow characteristic in the 38.1 to 114.3 mm (1.5 to 4.5 inch) port size.

- **Availability**—NPS 2x3, 3x4, 4x6, and 6x8 valves are available with either flanged or welding ends in ratings from CL150 to 1500. NPS 2x3, 3x4, and 4x6 valves are available with CL2500 rating.

- **Flushing Connection**—Connection on the side of the valve is furnished for flushing oil between liner and valve plug guide to prevent buildup of coke. An optional bonnet purge connection is also available with extension bonnet. See figure 1.

- **Extended Trim Life**—Tungsten carbide trim is available for the most severe conditions and may extend the life of your trim.

- **Excellent Sealing Capability**— ENVIRO-SEAL™ packing systems (figure 4) provide an improved stem seal to help prevent the loss of process fluid. These packing systems feature PTFE or Graphite ULF packing with live-loading for reduced packing maintenance.

Specifications

Available Valve Sizes

See table 1

End Connections

■ CL150 to CL2500 raised-face (RF), ■ ring type joint (RTJ) or buttweld end (BWE)

Maximum Inlet Pressures and Temperatures(1)

Consistent with applicable pressure/temperature rating according to ASME B16.34 ratings unless limited by temperature capabilities (see table 2)

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

■ Class IV (standard), ■ Class V (optional)

Construction Materials

See table 2

Temperature Capabilities

Valve Body/Trim Combinations: See table 2
All Other Parts: See table 3

Flow Coefficients

See table 1 and Fisher Catalog 12

Flow Characteristic

■ Equal percentage (NPS 1/2 to 1-1/4 port sizes)
■ Modified parabolic flow (NPS 1-1/2 to 4-1/2 port sizes)

Flow Direction

Flow down (pressure tends to close)

Port Diameters, Valve Plug Travels, and Stem Sizes

See table 1

Typical Bonnet Styles

■ Plain (standard)
■ Extension (high temperature applications)

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.

Contents

Table 1. Maximum Trim Size and Flow Coefficients

VALVE SIZE, NPS	PORT DIAMETER		MAXIMUM PLUG TRAVEL		STEM SIZE		C_V AT MAXIMUM TRAVEL
	mm	Inches	mm	Inches	mm	Inches	
2x3	12.7	0.5	19	0.75	19	0.75	11.7
	19.1	0.75	19	0.75	19	0.75	25.4
	25.4	1	19	0.75	19	0.75	41.1
	31.8	1.25	29	1.125	19	0.75	74.9
	38.1	1.5	29	1.125	19	0.75	100
	41.3	1.625	29	1.125	19	0.75	106
3x4	25.4	1	19	0.75	19	0.75	45.2
	31.8	1.25	29	1.125	19	0.75	79.4
	38.1	1.5	29	1.125	19	0.75	104
	44.5	1.75	29	1.125	19	0.75	112
	50.8	2	29	1.125	19	0.75	122
	57.2	2.25	29	1.125	19	0.75	122
4x6	50.8	2	29	1.125	25.4	1	191
	57.2	2.25	29	1.125	25.4	1	217
	63.5	2.5	38	1.5	25.4	1	311
	69.9	2.75	38	1.5	25.4	1	331
	76.2	3	38	1.5	25.4	1	331
6x8	76.2	3	38	1.5	25.4	1	342
	88.9	3.5	51	2	25.4	1	475
	101.6	4	51	2	25.4	1	605
	114.3	4.5	51	2	25.4	1	764

Special Constructions Available

- Extension bonnet to reduce conduction of heat to packing and actuator.

- Pressure equalization piping from valve inlet to the area above the valve plug is available to flush coke out of the extension bonnet cavity and back into the flowstream as the valve plug opens.

- Valve outlet extension nozzle can be provided to further reduce cavitation and erosion damage in tank-mounted installations.

Actuator Combinations

The 461 valve can be combined with Fisher 657 direct-acting, 667 reverse-acting, or 585C piston actuators. See the appropriate actuator bulletin.

Table 2. Typical Trim Combinations(1)

TRIM DESIGNATION	VALVE BODY MATERIAL	VALVE PLUG	SEAT RING	LINER (GUIDE CYLINDER)	RETAINER	TEMPERATURE CAPABILITIES			
						°C		°F	
						Min	Max	Min	Max
401	WCC WC9 SA-217-C5	S44004 HT	S31600/ CoCr-A	410/416 HT	410/416	-29	427	-20	800
402	WCC	S31600/ CoCr-A	S31600/ CoCr-A	S31600/ CoCr-A/ Chrome Coated	316/CoCr-A	-29	427	-20	800
403	CF8M CF8C	S31600/ CoCr-A	S31600/ CoCr-A	S31600/ CoCr-A/ Chrome Coated	316/CoCr-A	-198	593	-325	1100
404	WCC	17-4 SST/CoCr-A Tungsten Carbide	17-4 SST Tungsten Carbide	410/416 HT	17-4/ Tungsten Carbide	-29	427	-20	800
405	CF8M CF8C	N07718/CoCr-A Tungsten Carbide	N07718 Tungsten Carbide	S31600/ CoCr-A/ Chrome Coated	N07718/ Tungsten Carbide	-29	482	-20	900

1. Additional materials are available. Consult your Emerson sales office or Local Business Partner for assistance.

Table 3. Construction Materials and Temperature Capabilities

PART		MATERIAL		TEMPERATURE CAPABILITIES			
				°C		°F	
				Minimum	Maximum	Minimum	Maximum
Valve plug stem		S20910 (standard)		(1)	(1)	(1)	(1)
		N07718 HT					
		S31600		(1)	417	(1)	800
		Stud Nut Material	**Body Material**				
Valve Body-to-bonnet bolting	Studs Nuts	SST GR 660 Studs Steel SA194-7 Nuts	CF8M	-29	538	-20	1000
	Studs Nuts	Steel SA193-B7 Studs Steel SA194-2H Nuts	WCC, WC9, and SA-217-C5	-29	427	-20	800
			CF8M	-48	232	-55	450
	Studs Nuts	SST SA479-XM-19 Studs Steel SA194-7 Nuts	CF8M and S31600	-46	593	-50	1100
Body to bonnet gasket		Metal jacketed gasket N04400		(1)	(1)	(1)	(1)
Packing		PTFE V-ring		-40	232	-40	450
		Graphite ribbon filament (oxidizing service to 371°C [700°F])		-73	538	-100	1000
		Graphite ULF (non-environmental service)		-198	538	-325	1000
Packing follower, spring, or lantern ring		S31600 stainless steel		-198	593	-325	1100
Packing box ring		S31600 stainless steel		-198	593	-325	1100
Packing flange, studs, or nuts		S31600 stainless steel		-198	593	-325	1100

1. These materials are not limiting factors.

Figure 1. Dimensions (also see tables 4, 5, and 6)

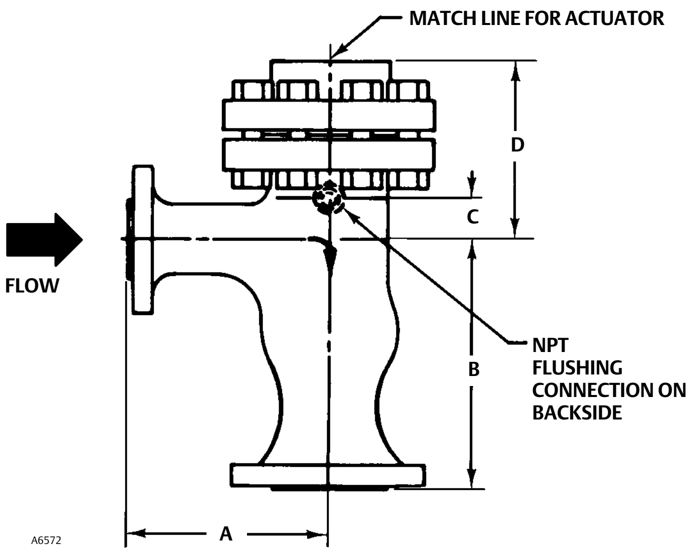


Table 4. CL300 and CL600 Dimensions

SIZE	NPT	A INLET FLANGE				B OUTLET FLANGE				D(1) STANDARD BONNET Yoke Boss Size		D(1) RADIATION FIN BONNET Yoke Boss Size		C
		300 RF	300 RTJ	600 RF	600 RTJ	300 RF	300 RTJ	600 RF	600 RTJ	3-9/16	5	3-9/16	5	
mm														
2 x 3	1/2-14	213	221	222	224	283	291	292	294	200	318	364	421	13
3 x 4	1/2-14	238	246	248	249	337	344	349	351	267	321	377	435	24
4 x 6	3/4-14	241	249	254	256	425	433	443	445	283	419	441	500	13
6 x 8	3/4-14	305	313	322	324	533	541	554	556	- - -	- - -	522	579	44
Inch														
2 x 3	1/2-14	8.38	8.69	8.75	8.81	11.13	11.44	11.50	11.56	7.88	12.50	14.32	16.56	0.50
3 x 4	1/2-14	9.38	9.69	9.75	9.81	13.25	13.56	13.75	13.81	10.51	12.63	14.83	17.13	0.94
4 x 6	3/4-14	9.50	9.81	10.00	10.06	16.75	17.06	17.44	17.50	11.13	16.49	17.38	19.69	0.50
6 x 8	3/4-14	12.00	12.31	12.69	12.75	21.00	21.31	21.81	21.88	- - -	- - -	20.56	22.81	1.75

1. This is the largest dimension that is provided.

Table 5. CL900 and CL1500 Dimensions

SIZE	NPT	A INLET FLANGE				B OUTLET FLANGE				D(1) STANDARD BONNET Yoke Boss Size		D(1) RADIATION FIN BONNET Yoke Boss Size		C
		900 RF	900 RTJ	1500 RF	1500 RTJ	900 RF	900 RTJ	1500 RF	1500 RTJ	3-9/16	5	3-9/16	5	
mm														
2 x 3	1/2-14	241	243	241	243	297	298	306	308	284	284	386	443	25
3 x 4	1/2-14	254	256	264	265	356	357	365	367	305	378	354	477	38
4 x 6	3/4-14	295	297	305	306	433	435	461	464	- - -	457	500	557	51
6 x 8	3/4-14	- - -	- - -	381	383	- - -	- - -	579	583	- - -	572	- - -	608	25
Inch														
2 x 3	1/2-14	9.50	9.56	9.50	9.56	11.69	11.75	12.06	12.13	11.19	11.18	15.19	17.44	1.00
3 x 4	1/2-14	10	10.06	10.38	10.44	14	14.06	14.38	14.44	12.00	14.88	13.94	18.76	1.50
4 x 6	3/4-14	11.63	11.69	12	12.06	17.06	17.13	18.13	18.25	- - -	18.00	19.69	21.94	2.00
6 x 8	3/4-14	- - -	- - -	15.00	15.06	- - -	- - -	22.81	22.94	- - -	22.50	- - -	23.94	1.00

1. This is the largest dimension that is provided.

Table 6. CL2500 Dimensions

SIZE	NPT	A INLET FLANGE		B OUTLET FLANGE		D(1) STANDARD BONNET Yoke Boss Size		D(1) RADIATION FIN BONNET Yoke Boss Size		C
		2500 RF	2500 RTJ	2500 RF	2500 RTJ	3-9/16	5	3-9/16	5	
mm										
2 x 3	1/2-14	260	262	327	330	276	419	443	502	32
3 x 4	1/2-14	327	330	367	372	414	437	530	584	32
4 x 6	3/4-14	375	379	461	467	- - -	468	- - -	- - -	51
Inch										
2 x 3	1/2-14	10.25	10.31	12.88	13	10.88	16.49	17.44	19.75	1.25
3 x 4	1/2-14	12.88	13	14.44	14.63	16.31	17.19	20.87	23.00	1.25
4 x 6	3/4-14	14.75	14.94	18.13	18.38	- - -	18.43	- - -	- - -	2.00

1. This is the largest dimension that is provided.

Table 7. Approximate Weights (includes valve body and bonnet)

VALVE SIZE, NPS	PRESSURE RATING	WEIGHT	
		kg	lb
2x3	CL300	100	219
	CL600	100	219
	CL900	120	265
	CL1500	136	300
	CL2500	168	370
3x4	CL300	130	286
	CL600	130	286
	CL900	152	335
	CL1500	169	371
	CL2500	286	630
4x6	CL300	218	480
	CL600	228	502
	CL900	405	890
	CL1500	448	985
	CL2500	673	1481
6x8	CL300	327	720
	CL600	382	841
	CL900	694	1526
	CL1500	776	1707

Figure 2. Fisher 461 Valve - Closed

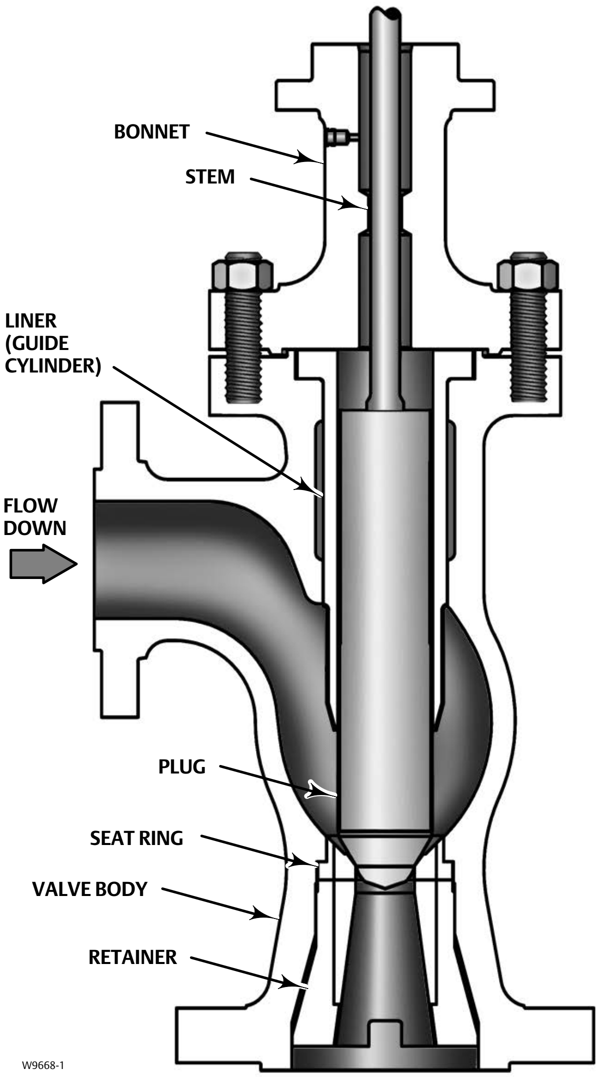


Figure 3. Fisher 461 Valve with Extended Retainer - Open

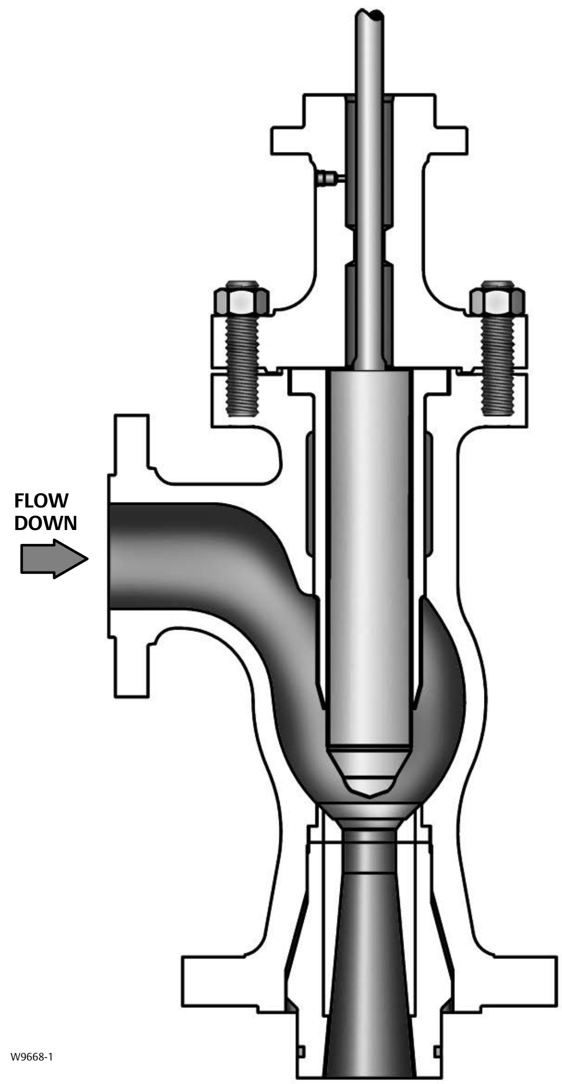
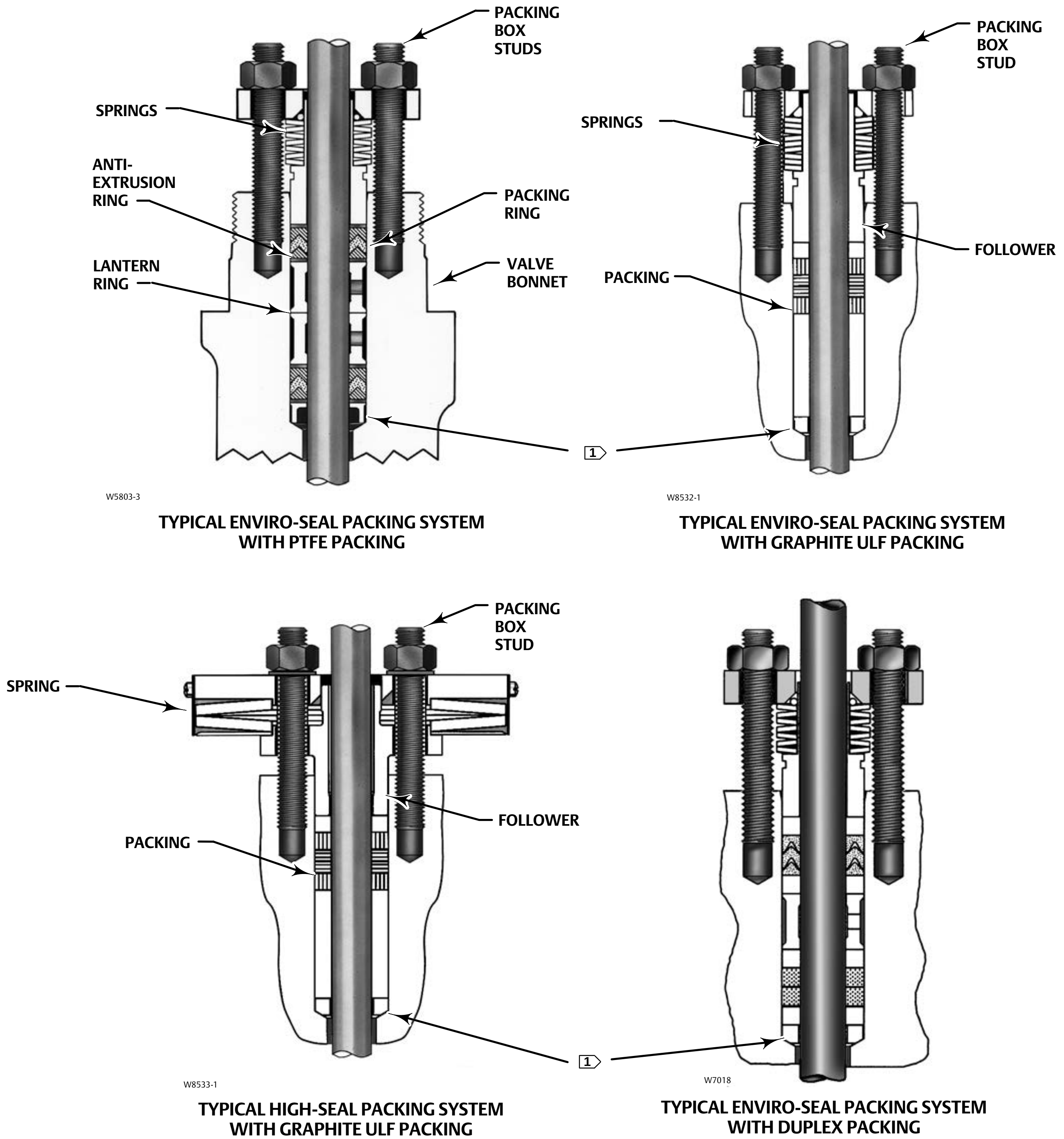
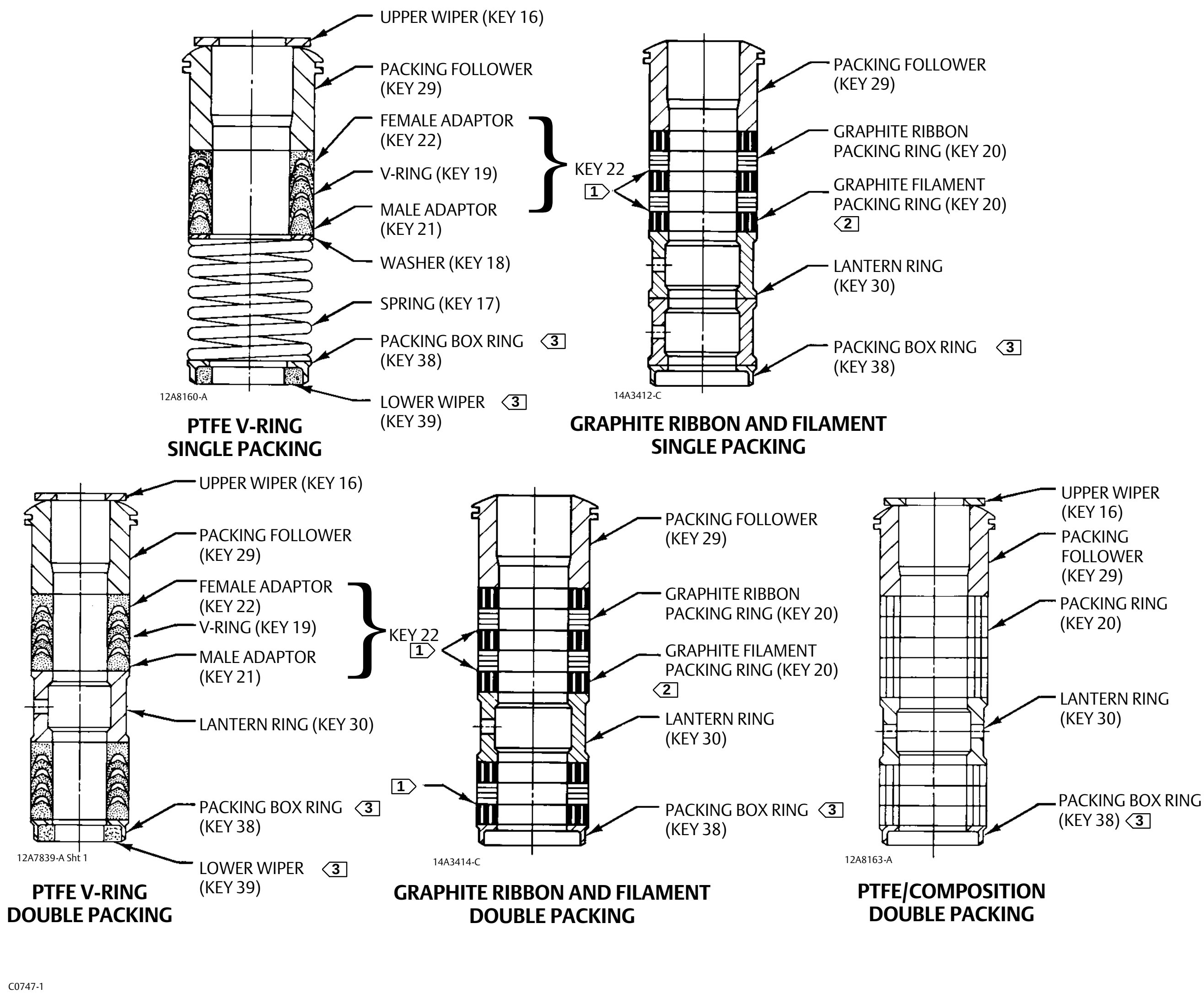


Figure 4. ENVIRO-SEAL and HIGH-SEAL Packing Systems



1 For a flat bottom packing box, the packing box ring and lower wiper are not needed.

Figure 5. Packing Arrangements



Notes:
1 0.102 mm (0.004 inch) thick sacrificial zinc washers. Use only one below each graphite ribbon ring.
2 Has the appearance of a woven or braided ring.
3 For a flat bottom packing box, these parts are not needed.

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Fisher™ CAV4 Control Valve

CAV4 (globe)

- CAV4 (NPS 2)

CAV4 (angle)

- CAV4 (NPS 2 through 6)

CAV4 Series Valves

The Fisher CAV4 control valve with Cavitrol ™ IV trim is designed specifically for liquid applications, such as boiler feedwater recirculation, where pressure drops are above 207 bar (3000 psi) and cavitation is a serious problem. The CAV4 valve is available in a broad range of valve body sizes and styles, including NPS 2 through 6 angle, globe, and offset globe.

The CAV4 valve's various valve plug constructions (figure 1) provide temperature capabilities through 417°C (800°F). The seal ring construction is used where temperatures are equal to or lower than 232°C (600°F) (see figure 5), and both the stem-balanced and the piston ring constructions are used with temperatures up to 417°C (800°F). In addition, the CAV4 valve is offered with either a separable seat ring for moderate temperature (up to 232°C [450°F]) applications or with an integral seat cage for high-temperature (up to 417°C [800°F]) applications.

Unless otherwise noted, all NACE references are to NACE MRO175 2002. Contact your Emerson sales office for information on other NACE certifications.

Features

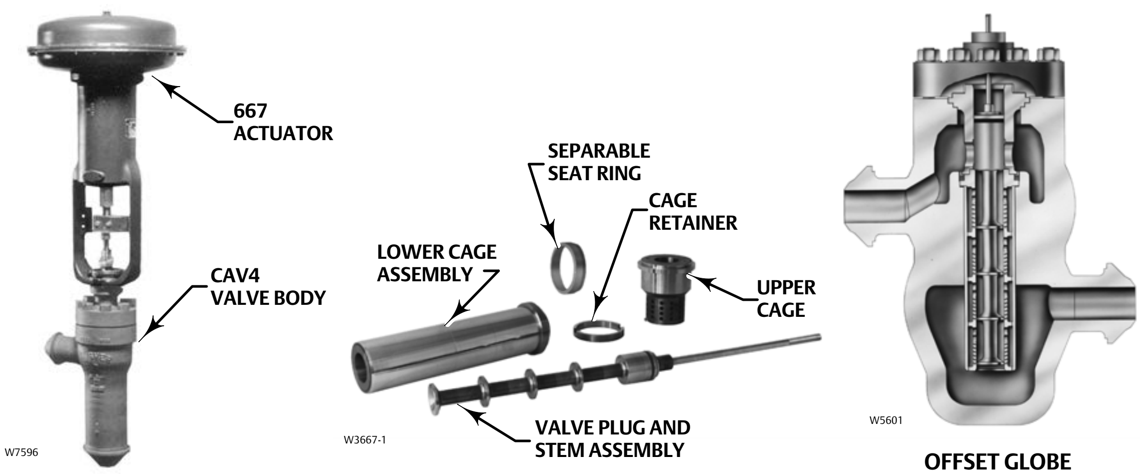
- **Cavitation Decreased**—A properly sized CAV4 valve with Cavitrol IV trim decreases cavitation and its resultant damage and noise.

- **Long Trim Life**—Pressure-staging, separation of shutoff and throttling locations, and hardened trim materials result in improved wear resistance.

- **Tight Shutoff**—Soft metal-to-metal seat provides tight shutoff without the need for periodic lapping. The enhanced valve plug seal provides improved service life. (Angle valve bodies only.)

- **TSO (Tight Shutoff) Trim**—Valves with TSO trim (figure 1) are factory tested to a more stringent Emerson Automation Solutions test requirement of no leakage at time of shipment using ANSI/FCI Class V procedures.

(continued on page 3)



Fisher 657-CAV4 Control Valve Assembly with Cavitrol IV Trim

Specifications

Available Configurations and Valve Body Sizes

Common Characteristics: CAV4 angle, globe, or offset globe valve with four-stage Cavitrol IV trim including soft metal-to-metal seat. Valve plug action is push-down-to-close
Seal Ring Construction: ■ NPS 2 angle, ■ 3, ■ 4, or ■ 6 valve body with pressure-balanced valve plug and spring-loaded PTFE seal ring. For use in low-temperature applications
Stem-Balanced Construction: ■ NPS 2 angle or ■ 4 valve body with stem-balanced valve plug (valve stem diameter—for that portion of stem that passes through bonnet—is equal to nominal port diameter). For use in high-temperature applications
Piston Ring Construction: NPS 6 valve body with pressure-balanced valve plug and five graphite piston rings. For use in high-temperature applications
Unbalanced Construction: NPS 2 globe

End Connection Style(1)

Buttwelding Ends: All buttwelding end schedules per ASME B16.25 that are compatible with ASME B16.34 valve body rating
Raised-Face or Ring-Type Joint Flanged Ends: Inlet connection is CL1500 or CL2500 flange per B16.5. Outlet connection mates with CL2500 flange and has tapped bolt holes

Maximum Inlet Pressure and Temperatures(1)(2)

Consistent with applicable CL1500 and 2500 pressure temperature ratings per ASME B16.34 unless limited by individual pressure drop limits shown in figure 5 or temperature limits shown in table 1

Maximum Pressure Drop(2)

See figure 5

Material Temperature Capabilities(2)

Seal Ring Construction: 18 to 232°C (0 to 450°F)
Stem-Balanced and Piston Ring Constructions: Up to 427°C (800°F) unless limited by selection of other parts (table 1)

Shutoff Classification

TSO (Tight Shutoff) Trim: Valves with TSO trim are factory tested to a more stringent Emerson Automation Solutions test requirement of no leakage at time of shipment using ANSI/FCI 70-2 and IEC 60534-4 Class V procedures.
Piston Ring Construction: Class IV per ANSI/FCI 70-2 and IEC 60534-4
All Other Angle Bodies: Class VI per ANSI/FCI 70-2 and IEC 60534-4
Globe Bodies: Class V per ANSI/FCI 70-2 and IEC 60534-4

Flow Direction

In through the side connection and out the bottom connection. Globe valve is flow down

Noise Levels

Because of cavitation elimination, noise is typically not a problem with Cavitrol IV trim. For virtually all applications, noise levels will be below 90 dBA. If more stringent noise specifications must be met, contact your Emerson sales office

Construction Materials

See table 1

Flow Characteristic

Linear

Maximum Flow Coefficients (C_V)

Linear: ■ NPS 2 valve, 8.25; ■ NPS 3 valve, 14.6; ■ NPS 4 valve, 21.9: ■ NPS 6 valve, 55.6
Characterized: ■ NPS 2 valve, 11.3; ■ NPS 3 valve, 24; ■ NPS 4 valve, 38.2; ■ NPS 6 valve, 89.1. Also see Fisher Catalog 12 and table 5

- continued -

Contents

Specifications (continued)

Valve Recovery and Cavitation Coefficients

Recovery Coefficient

Linear: K_m = 0.99 (F_L= 0.995) **Characterized:** K_m = 0.98 (F_L= 0.99). This value defines the maximum allowable pressure drop that is effective in producing flow as shown in the following equation:

$\Delta P_{allowable} = K_m (P_{1\ (flowing)} - r_c P_v)$

Port Diameters and Unbalance Area

See table 3

Minimum Seat Load Force

First refer to figure 6 to determine minimum seat load per inch of port circumference; then multiply that value by the port circumference from table 3

Valve Plug Travel

See table 3

Yoke Boss and Valve Stem Diameters

See table 3

Approximate Weight

See table 3

Options

■ Flushing trim, two plates used in place of Cavitrol IV trim, to protect valve body surfaces and Cavitrol IV trim from damage during pipeline flushing: ■ characterized cage; and ■ driver for installation and removal of cage retainer ■ ENVIRO-SEAL™ packing is available

1. PN (or other) ratings and end connections can usually be supplied: contact your Emerson sales office.
2. The pressure/temperature limits in this bulletin and any applicable linear limitation should not be exceeded.

Features (continued)

- **Efficient Operation—**Expanding flow area design takes advantage of the ability of the liquid to undergo a greater pressure drop in initial stages without cavitating. This results in a much lower inlet pressure to the final stage.
- **Characterization—**Special characterized cages are available to provide customer specified rangeability for specific system requirements.
- **Easy Maintenance—**Design reduces maintenance downtime by permitting quick disassembly with easy access to valve trim and valve plug seat. Separable seat ring for low temperature applications (at or below 232°C [450°F]) makes maintenance easier.

Table 1. Construction Materials and Temperature Capabilities

PART	MATERIALS		TEMPERATURE CAPABILITIES	
			°C	°F
Valve Body and Bonnet	Standard	WCC Carbon steel casting	-29 to 427	-20 to 800
	Optional	WC9 alloy steel casting	-29 to 482	-20 to 900
		C5	-29 to 427	-20 to 800
		CD3MN[3]	-29 to 316	-20 to 600
		CD3MWCuN[3]	-29 to 316	-20 to 600
Valve Plug	Angle: NPS 2, 4, 6 (High Temperature Trim)	S44004 (440C stainless steel heat-treated)	-29 to 427	-20 to 800
	Angle: NPS 2, 3, 4, 6 (Standard Trim) Globe: NPS 2	S44004 (440C stainless steel heat-treated)	-29 to 232	-20 to 450
	Angle: NPS 2, 4	N07718/CoCr-A Seat & Guide	-101 to 166	-150 to 330
	Angle: NPS 6	N07718/CoCr-A Seat & Guide	-101 to 93	-150 to 200
	Angle: NPS 2, 3 (Tight shutoff Trim)	S44004/S41600	0 to 232	32 to 450
	Angle: NPS 4 (Tight shutoff Trim)	S44004/S17400	0 to 232	32 to 450
	Globe: NPS 2	Alloy 6B	-29 to 232	-20 to 450
Valve Stem	S20910		-254 to 427	-425 to 800
	S31600		-254 to 427	-425 to 800
	S32760		-51 to 316	-60 to 600
	S31600/S17400		-101 to 427	-150 to 800
Seat Ring	S17400/S31600		-29 to 232	-20 to 450
	S44004		-29 to 427	-20 to 800
	S31600		-254 to 427	-425 to 800
	Alloy 6B		-29 to 232	-20 to 450
O-ring (separable seat ring construction)	Angle: NPS 2, 4, 6	Ethylene propylene	-18 to 232	0 to 450
	Globe: NPS 2	Ethylene propylene	-29 to 232	-20 to 450
	Globe: NPS 2	Fluorocarbon	-18 to 204	0 to 400
Upper Cage, Seat Ring Retainer, and Lower Cage Assembly	Angle	S17400/S31600 stainless steel (cages) and S17400 H1075 SST CrCt (retainer)	-29 to 427	-20 to 800
Valve Plug Seal Ring[1]	Spring-loaded PTFE Seal		-18 to 232	0 to 450
Valve Plug Backup Ring[1]	S41600		-29 to 427	-20 to 800
Seal Ring Retainer[1]	S30200		-254 to 593	-425 to 1100
Piston Ring[2]	Graphite (FMS 17F27)		-46 to 427	-50 to 800
Bonnet Gasket	Angle	Silver-plated N04400 nickel alloy	-254 to 593	-425 to 1100
	Globe	S31600/graphite	-254 to 593	-425 to 1100
Cage Gasket	S31600 stainless steel/graphite		-254 to 593	-425 to 1100
Metal Packing Box Parts	S31600		-254 to 593	-425 to 1100
Body-to-Bonnet Bolting	Standard	Studs, SA-193-B7; Nuts, SA-194-2H	-29 to 427	-20 to 800
		Studs, SA-193-B7; Nuts, SA-194-2H	-29 to 232	-20 to 450[3]
	Optional[3]	Studs, SA-193-B7M; Nuts, SA-194-2HM	-29 to 121	-20 to 250
Packing	Standard	Spring-loaded PTFE V-ring	-46 to 232	-50 to 450
	Optional	PTFE-impregnated composition	-73 to 232	-100 to 450
		Laminated graphite/filament	-18 to 427	0 to 800

1. For only seal ring construction.
2. For only 6-inch piston ring construction.
3. For only NPS 2 Globe Body.

Table 2. Trim Descriptions

TRIM DESIGNATION	VALVE SIZE, NPS	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL	OPERATING TEMPERATURE	
						°C	°F
Standard Trim							
68	2(2)	S44004	S17400 H1075	S44004	C5 WCC WC9	-29 to 232	-20 to 450
					CD3MN CD3MWCuN	-29 to 177	-20 to 350
69(4)	2(2)	Alloy 6B	S32550	Alloy 6B	C5 WCC WC9	-29 to 232	-20 to 450
					CD3MN CD3MWCuN	-29 to 177	-20 to 350
70	2(1), 4, and 6	S44004	S17400 H1075	S17400/S31600	C5 WCC WC9	-29 to 232	-20 to 450
72	2(1) and 4	N07718/CoCr-A Seat/Guide	S17400/S31600	Not Required	C5 WCC WC9	-101 to 165	-150 to 330
72	6	N07718/CoCr-A Seat/Guide	S17400/S31600	Not Required	C5 WCC WC9	-101 to 93	-150 to 200
73	3(3)	S44004	S17400 H1075	S31600	C5 WCC WC9	-29 to 232	-20 to 450
Tight Shutoff Trim							
74	2(1), 3(3), and 4	S44004/S41600	S17400 H1075	S44004	C5 WCC WC9	0 to 232	32 to 450
High Temperature Trim							
75	2(1), 4, and 6	S44004	S17400/S31600	Not Required	C5 WCC WC9	232 to 426	450 to 800

1. NPS 2 Angle Body only.
2. NPS 2 Globe Body only.
3. NPS 3 is available with a clamped-in lower cage and replaceable seat ring.
4. Trim 69 complies with NACE MR0175/ISO 15156.

Table 3. Additional Valve Body Specifications

VALVE SIZE, NPS	BODY TYPE	VALVE STEM DIAMETER		YOKE BOSS DIAMETER		TRAVEL		PORT DIAMETER		PORT CIRCUMFERENCE		UNBALANCE AREA[1]		APPROX. WEIGHT	
		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm^2	$Inch^2$	kg	lb
2	Globe	- - -	- - -	91	3-9/16	19	3/4	25.4	1	- - -	- - -	5.10	0.79	- - -	- - -
	Angle	19.0 38.1	3/4 1[2]	91 127	3-9/16 5	38	1.5	38.1	1.5	119.6	4.71	1.10	0.17	167 182	369 401
3	Angle	19.0	3/4	91	3-9/16	51	2	55.6	1.1875	174.5	6.87	1.68	0.26	301	664
4	Angle	19.0 25.4 69.8	3/4 1 2-3/4[3]	91 127 178	3-9/16 5 7	64	2.5	69.9	2.75	219.4	8.64	2.06	0.32	532 532 554	1172 1172 1222
6	Angle	31.7	1-1/4	127	5 and 5H	102	4	111.1	4.375	349.2	13.75	3.29	0.51	1512	3334

1. For seal ring and piston ring constructions. For stem-balanced construction, use port area of 11.4 cm^2 (1.77 $inch^2$) for NPS 2 valve and 38.3 cm^2 (5.94 $inch^2$) for NPS 4 valve.
2. Stem-balanced construction has 31.8 mm (1-1/4 inch) valve stem connection.
3. Stem-balanced construction has 50.8 mm (2 inch) valve stem connection.

Table 4. Additional Valve Body Specifications for TSO (Tight Shutoff) Trim — Angle Body

VALVE SIZE, NPS	MAXIMUM TRAVEL		YOKE BOSS SIZE[1]		PORT DIAMETER				PORT CIRCUMFERENCE		C_V REDUCTION AT 100% TRAVEL[2]
					Nominal		Actual TSO				
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
2	38	1.5	91 127	3-9/16 5	38.1	1.5	38.1	1.5	119.6	4.71	0%
3	50.8	2	91	3-9/16	55.6	2.1875	55.6	2.1875	174.5	6.87	0%
4	64	2.5	91 127	3-9/16 5	69.9	2.75	69.9	2.75	219.4	8.64	0%

1. Consult the factory for larger yoke boss sizes.
2. This column lists the percent reduction of published maximum C_V of the trim listed in the TRIM column.

Figure 1. Sectional View of Fisher CAV4 Angle Valve Body with Cavitrol IV Trim

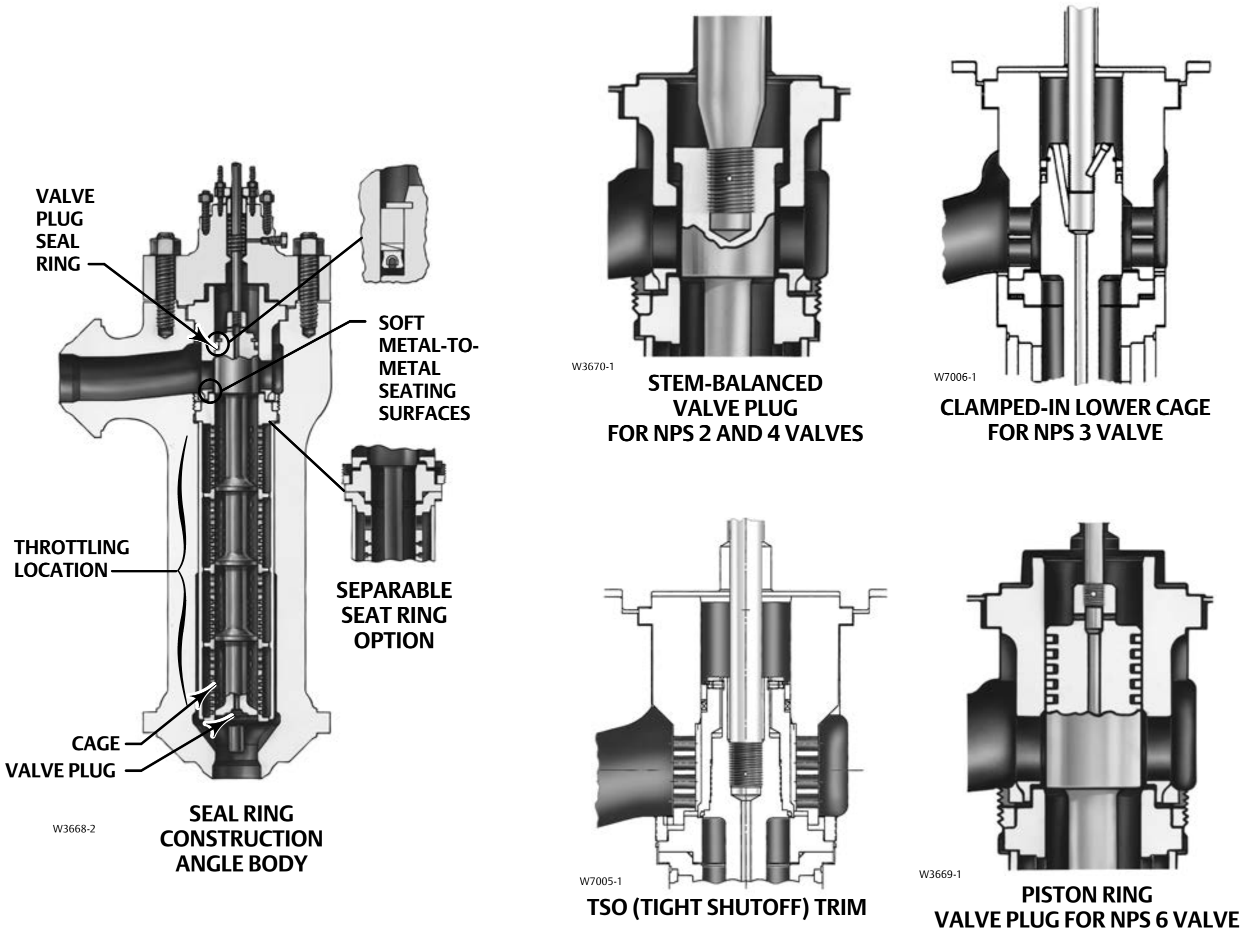


Figure 1. Sectional View of Fisher CAV4 Globe Valve Body with Cavitrol IV Trim (cont.)

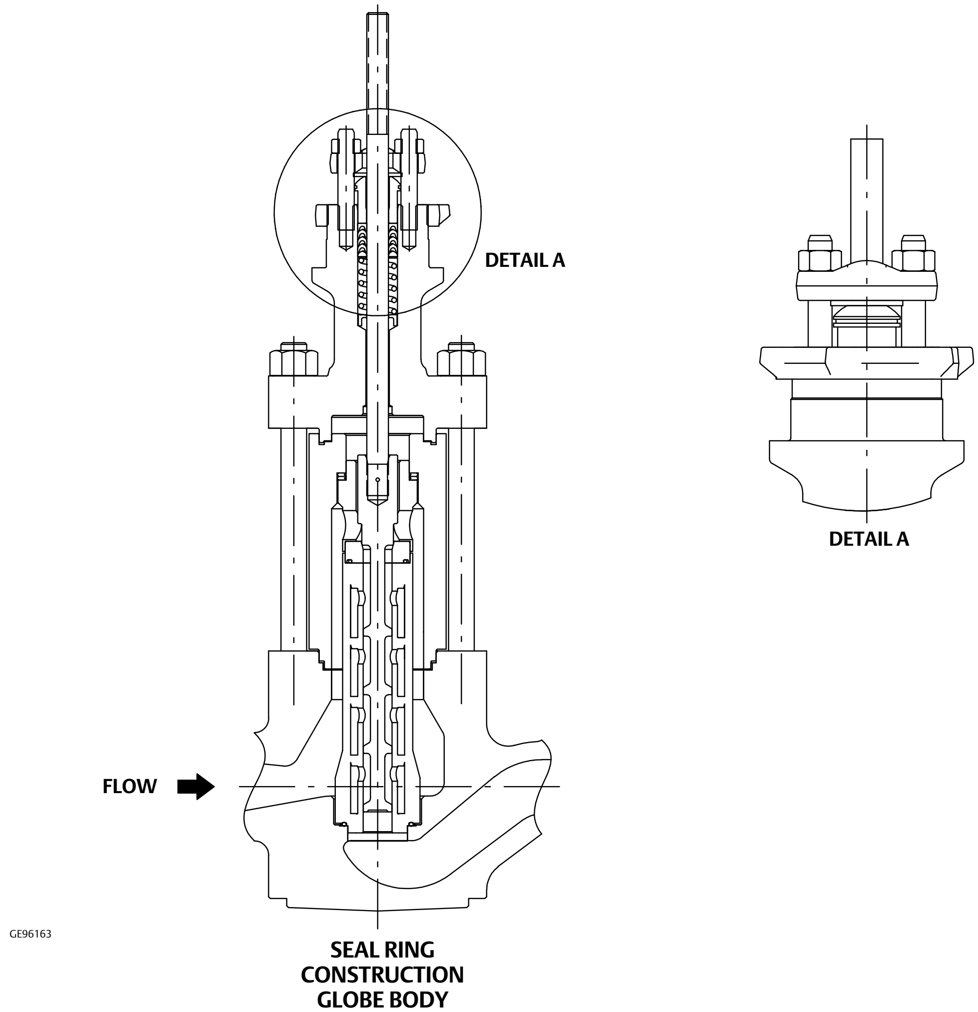


Figure 2. Standard Cage-Style Anti-cavitation Trim

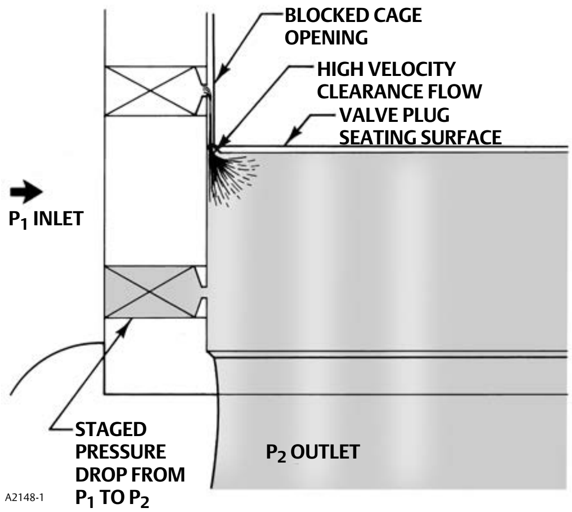
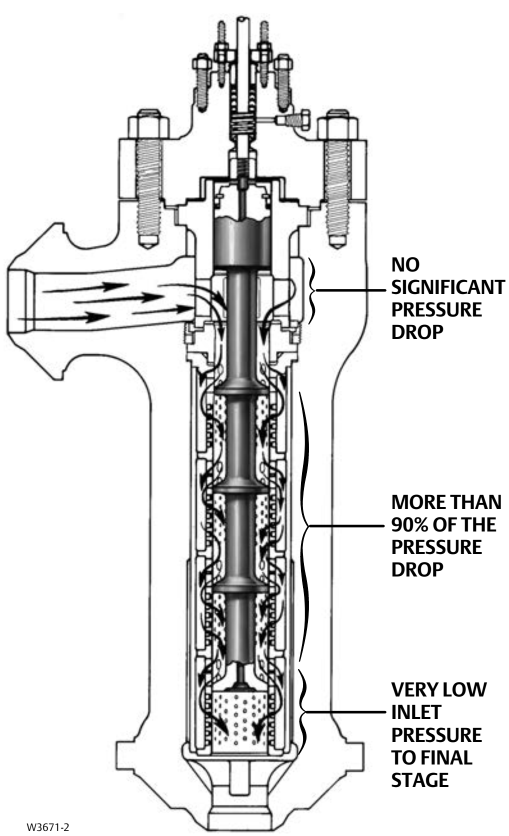


Figure 3. Cavitrol IV Trim Operation



Principle of Operation

The advantage of the CAV4 valve with Cavitrol IV trim is a result of the following three technological advancements not found in any other anti-cavitation control valve.

1. All clearance flow subjected to staged pressure drop.

2. Separation of shutoff and throttling locations.

3. An expanding flow area design.

As shown in figure 2, the linear cage openings below the valve plug seating surface are open to fluid flow and are staging the pressure drop from P_1 to P_2 as designed. However, the cage openings above the valve plug seating surface are nearly blocked by the valve plug. Even though a small clearance passage between the cage and the valve plug does exist, the fluid flow rate through this small clearance passage is so small that the cage is ineffective in staging the pressure drop. Consequently, the clearance flow pressure drop from P_1 to P_2 occurs between the valve plug surface blocking the cage opening and the seating surface of the valve plug. The resultant cavitation and erosive flow across the seat damages the valve plug seating surface. Even with valve plug/cage diametrical clearances as small as 0.20 mm (0.008 inch), this clearance flow damage still occurs and becomes worse with higher pressure drops.

The CAV4 valve with Cavitrol IV trim addresses the this clearance flow issue by not taking any significant pressure drop until the fluid is downstream of the seating surfaces (figure 3). As the flow then passes from stage to stage, even the clearance flow is subjected to a staged pressure drop. Therefore, unlike the linear cage-style anti-cavitation trims, there are no flowing conditions where pressure can go directly from P_1 to P_2.

In the Cavitrol IV trim design, trim life is lengthened by the separation of the shutoff and throttling locations. Just as all significant pressure drop is taken downstream of the shutoff seating surfaces, all significant throttling action occurs as the liquid passes through the four sets of holes downstream of the shutoff seating surfaces. As a result, the seating surfaces are normally not worn away by throttling control action (unless throttling at very nearly closed for a long time). Also, the throttling areas are not required to have the superior surface condition otherwise needed by seating surfaces for tight shutoff.

In conventional staged-trim designs, cavitation usually does not exist until the final stage. Figure 4 illustrates why this happens. As shown, the greater the pressure drop through the final stage, the lower the vena contracta pressure (P_{vc}). If P_{vc} is less than or equal to P_v, and P_2 is greater than P_v, then cavitation will result.

The CAV4 valve avoids this by means of its unique expanding flow area design. Each of the four Cavitrol IV trim stages has a successively larger flow area. The result is very efficient operation because more than 90 percent of the overall pressure drop is taken in the first three stages where there is low risk of bubble formation.

Consequently, a relatively low inlet pressure to the final stage is achieved. Figure 4 also compares the pressure drop pattern through the four stages in the expanding area Cavitrol IV design with a pattern representing a six-stage trim design with each stage taking an equal portion of the total pressure drop. As can be seen, the inlet pressure to the last stage of Cavitrol IV trim is always less than the inlet pressure to the sixth stage of an equal-drop cage. Therefore the P_{vc} of the Cavitrol IV cage remains higher than the P_{vc} of an equal-drop cage.

To determine if the CAV4 valve with Cavitrol IV trim should be used, contact your Emerson sales office.

Figure 4. Staged Pressure Drop Patterns

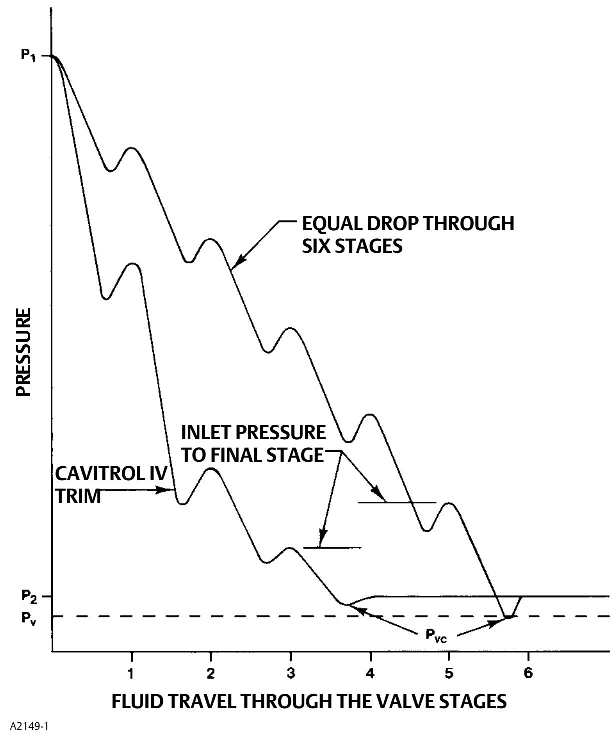
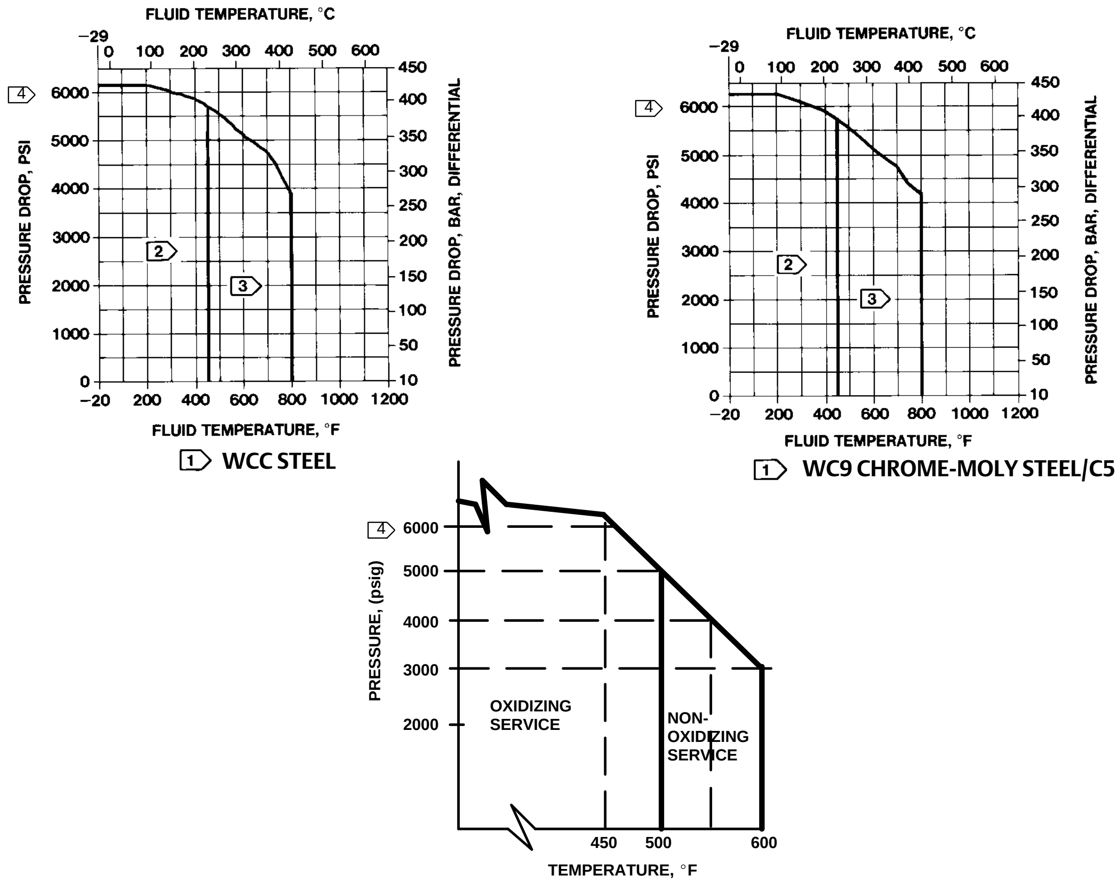


Figure 5. Pressure Drop/Temperature Capabilities



EXTENDED PRESSURE/TEMPERATURE UNITS FOR SEAL RING CONSTRUCTION WITH PEEK ANTI-EXTRUSION RINGS

B1605-1

Notes:

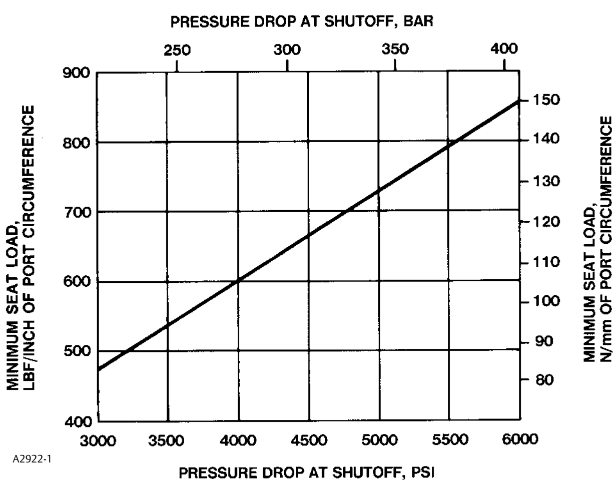
1. Do not exceed the maximum pressure and temperature for the class rating of the body material.
2. For all constructions.
3. For only stem balanced and piston ring constructions.
4. Maximum trim pressure drop is 414 bar (6000 psi) for linear trim and 310 bar (4500 psi) for approximate linear trim.

Installation

The CAV4 valve with Cavitrol IV trim must be installed with the actuator mounted vertically above the valve body. Nonvertical positions may cause uneven trim wear and decrease trim life. Flow through the valve body must be in the direction indicated by the flow arrow on the valve. For long service life and effective operation, the flowing media should be clean.

Dimensions are shown in figure 7.

Figure 6. Recommended Seat Load Force for All Constructions



Ordering Information

When ordering, specify:

Application Information

1. Process liquid—State particle size and type of entrained impurities, if any
2. Specific gravity of liquid
3. Temperature and vapor pressure of liquid
4. Critical pressure
5. Range of flowing inlet pressures
6. Maximum outlet pressure
7. Pressure drops
    a. Range of flowing pressure drops
    b. Maximum at shutoff
8. Flow rates
    a. Minimum controlled flow
    b. Normal flow
    c. Maximum flow
9. Required C_v
10. Line size and schedule
11. Angle, globe or offset globe valve body

Valve Information

To determine what information is needed for ordering the valve and trim, refer to the specifications. Review the description at the right of each specification or in the referenced tables, figures, and bulletins, and indicate the desired choice wherever there is a selection to be made.

Actuator and Accessory Information

Select the specific actuator and accessories from the appropriate bulletins. Piston or diaphragm actuators may be used. Specify any additional ordering information as required from actuator or accessory bulletins.

Table 5. Capacities for CAV4 Valve Bodies

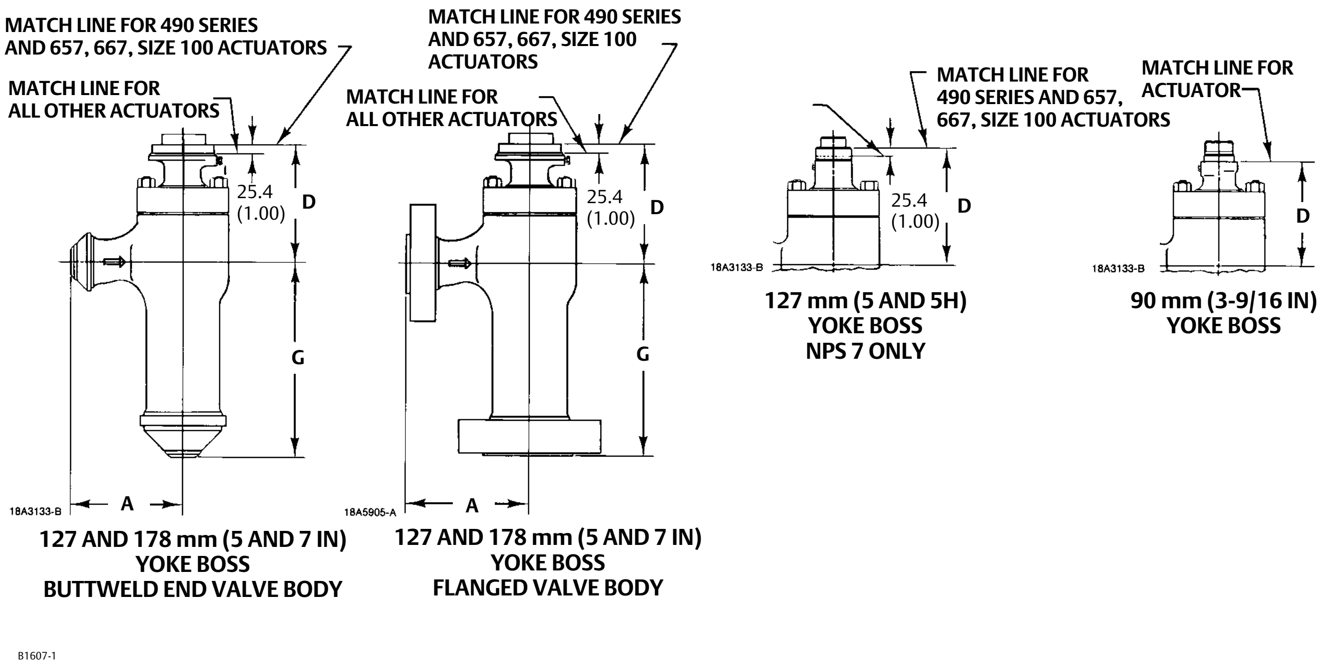
VALVE SIZE, NPS	FLOW CHARACTERISTIC	BODY TYPE	AVAILABLE CAPACITIES	
			Min Cv	Max Cv
2	Linear	Globe	0.01 0.01 0.01	1.1 1.6 2.9
	Linear Characterized	Angle	4.6 4.6	8.25 11.3
3	Linear Characterized	Angle	0.65 0.65	14.6 24.0
4	Linear Characterized	Angle	0.81 0.81	21.9 38.2
6	Linear Characterized	Angle	1.30 1.30	55.6 89.1

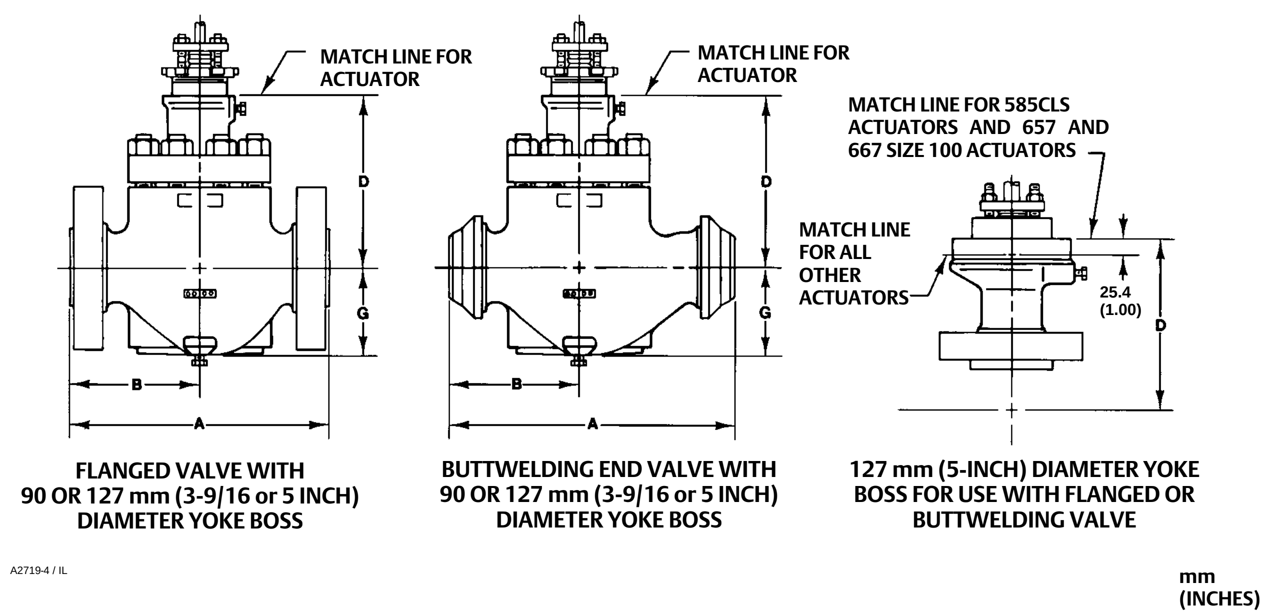
Table 6. Dimensions

VALVE SIZE, NPS	BODY TYPE	PRESSURE CLASS	END CONNECTION CL2500 RF/RTJ(1)	A		G		D YOKE BOSS DIAMETER, mm (INCH)							
								90 (3-9/16)		127 (5)		127 (5H)		178 (7)	
				mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
2	Globe	CL1500	BWE	375	14.75	109	4.31	458	18.03	521	20.53	- - -	- - -	- - -	- - -
			RF	375	14.75	109	4.31	458	18.03	521	20.53	- - -	- - -	- - -	- - -
			RTJ	378	14.88	109	4.31	458	18.03	521	20.53	- - -	- - -	- - -	- - -
	Globe	CL2500	BWE	400	15.75	108	4.25	505	19.88	538	21.19	- - -	- - -	- - -	- - -
			RF	400	15.75	108	4.25	505	19.88	538	21.19	- - -	- - -	- - -	- - -
			RTJ	403	15.88	108	4.25	505	19.88	538	21.19	- - -	- - -	- - -	- - -
	Angle	CL2500	BWE	249	9.81	406	16.00	324	12.75	360	14.19	- - -	- - -	- - -	- - -
			RF	249	9.81	406	16.00	324	12.75	360	14.19	- - -	- - -	- - -	- - -
			RTJ	251	9.87	408	16.06	324	12.75	360	14.19	- - -	- - -	- - -	- - -
3	Angle	CL2500	BWE	256	10.06	552	21.75	324	12.75	- - -	- - -	- - -	- - -	- - -	- - -
4	Angle	CL2500	BWE	344	13.56	618	24.31	430	16.94	454	17.88	- - -	- - -	454	17.88
			RF	344	13.56	618	24.31	430	16.94	454	17.88	- - -	- - -	454	17.88
			RTJ	349	13.75	622	24.50	430	16.94	454	17.88	- - -	- - -	454	17.88
6	Angle	CL2500	BWE	457	18.00	1038	40.88	- - -	- - -	432	17.00	432	17.00	- - -	- - -
			RF	457	18.00	1038	40.88	- - -	- - -	432	17.00	432	17.00	- - -	- - -
			RTJ	464	18.25	1045	41.13	- - -	- - -	432	17.00	432	17.00	- - -	- - -

1. BWE—buttweld end; RF—raised flange; RTJ—ring type joint.

Figure 7. Dimensions (See table 6)





Note:
For dimensions of valves with PN (or other) end connections, consult your Emerson sales office.

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Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ CHP Valve, NPS 8 CL2500

Description

The NPS 8 CL2500 Fisher CHP is a compact and high-performance, high-pressure globe valve designed especially for use in boiler feedwater flow control applications in power plants.

Modern power plants require higher valve capacity as the pressure drop is invariably low at all flow rate conditions because feedwater pumps use a variable pressure pump design.

Standard features offered with the CHP valve include rugged cage guiding, top entry design for easy maintenance, spiral wound gaskets, and hardened trim material to meet stringent boiler feedwater application requirements.

The CHP control valve uses a balanced plug. The trim is limited to an upper temperature of 380°C (716°F). The CHPT control valve uses a PEEK (Poly Ether Ether Ketone) anti-extrusion ring with a spring-loaded PTFE seal for service up to 316°C (600°F). The CHPD control valve uses multiple graphite piston rings and is designed for use in higher temperature service exceeding the limit of the CHPT.

Contact your Emerson sales office or Local Business Partner for more information.


X1229

FISHER CHP NPS 8 CL2500 VALVE

Table 1. Specifications

Size/ASME Class

NPS 8 / CL2500

Maximum Inlet Pressure and Temperature(1)

Consistent with CL2500 according to ASME B16.34

Maximum temperature limit is 380°C (716°F). See table 2 and figure 3

Maximum Pressure Drops(1)

Standard Cages: See figure 4

Cavitrol III 2-Stage Cages: 149 bar (2160 psi) but not to exceed maximum inlet pressure

End Connection Style

Buttweld Ends: All buttwelding end schedules per ASME B16.25

Bonnet Style

Plain Bonnet: 5H inch Yoke Boss

Construction Materials

Valve Body and Bonnet: WCC Steel, WC9 Alloy Steel
Trim and Other Parts: See tables 1 and 2

Flow Coefficient

See Fisher Catalog 12

Flow Direction

Standard Cages: Flow up or down
Cavitrol III 2-Stage Cages: Flow down

Port Diameter

136.5 mm (5-3/8 inch)

Flow Characteristics and Valve Plug Travel

See table 3

Stem Diameter

31.8 mm (1-1/4 inch)

Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4(2)

CHPT: Class IV (standard), Class V (optional)
CHPD: Class II (standard)
CHPD with Bore-Seal: Class V (standard)

Weight

810 kg (1786 lbs)

Dimensions

See figure 1

Packing Arrangements

■ Standard PTFE V-ring, ■ Double PTFE V-ring,
■ Graphite Ribbon/Filament

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valves should not be exceeded.
2. For boiler feedwater applications, proper use of a block valve during closing of the control valve is recommended to minimize control valve trim damage.

High Temperature Seal (HTS1)

The High Temperature Seal (HTS1) is available for the CHPT only and is required for applications where the service temperature exceeds 232°C (450°F). This seal is available for all sizes and trims of the CHPT and allows the valve to be used in temperatures up to 316°C (600°F) for non-oxidizing service and up to 260°C (500°F) for oxidizing service.

See table 2 for temperature limits and figure 2. The High Temperature Seal is used in place of the standard plug seal ring. This seal employs a similar seal ring as the standard CHPT, but with the addition of an anti-extrusion ring.

Bore Seal

The Bore Seal is available for the CHPD only and is required for Class V shutoff applications where the service temperature exceeds 316°C (600°F). For service temperatures below 316°C (600°F) the CHPT should be used when Class V shutoff is required. See table 2 for temperature limits.

The Bore Seal employs a metal C-shaped seal ring that is secured to the outside diameter of the valve plug. When the valve plug comes into contact with the seat ring, to close the valve, the Bore Seal is compressed against the cage wall thereby blocking a secondary leakage path that exists between the plug and cage wall.

When the valve plug is not in contact with the seat ring (i.e. valve open) the Bore Seal is not engaged and the piston rings that are also secured to the outside diameter of the plug assume the role of blocking this secondary leakage path.

Figure 1. Dimensions, mm (Inches)

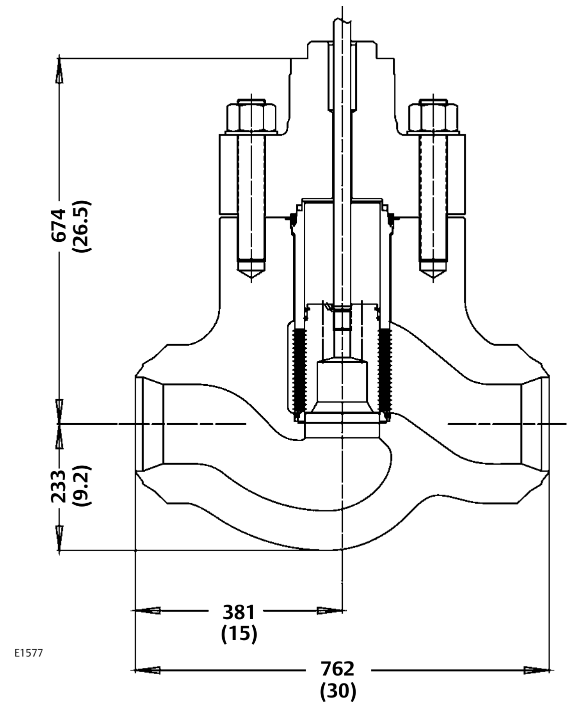


Figure 2. Typical Fisher CHPT NPS 8 CL2500 Valve

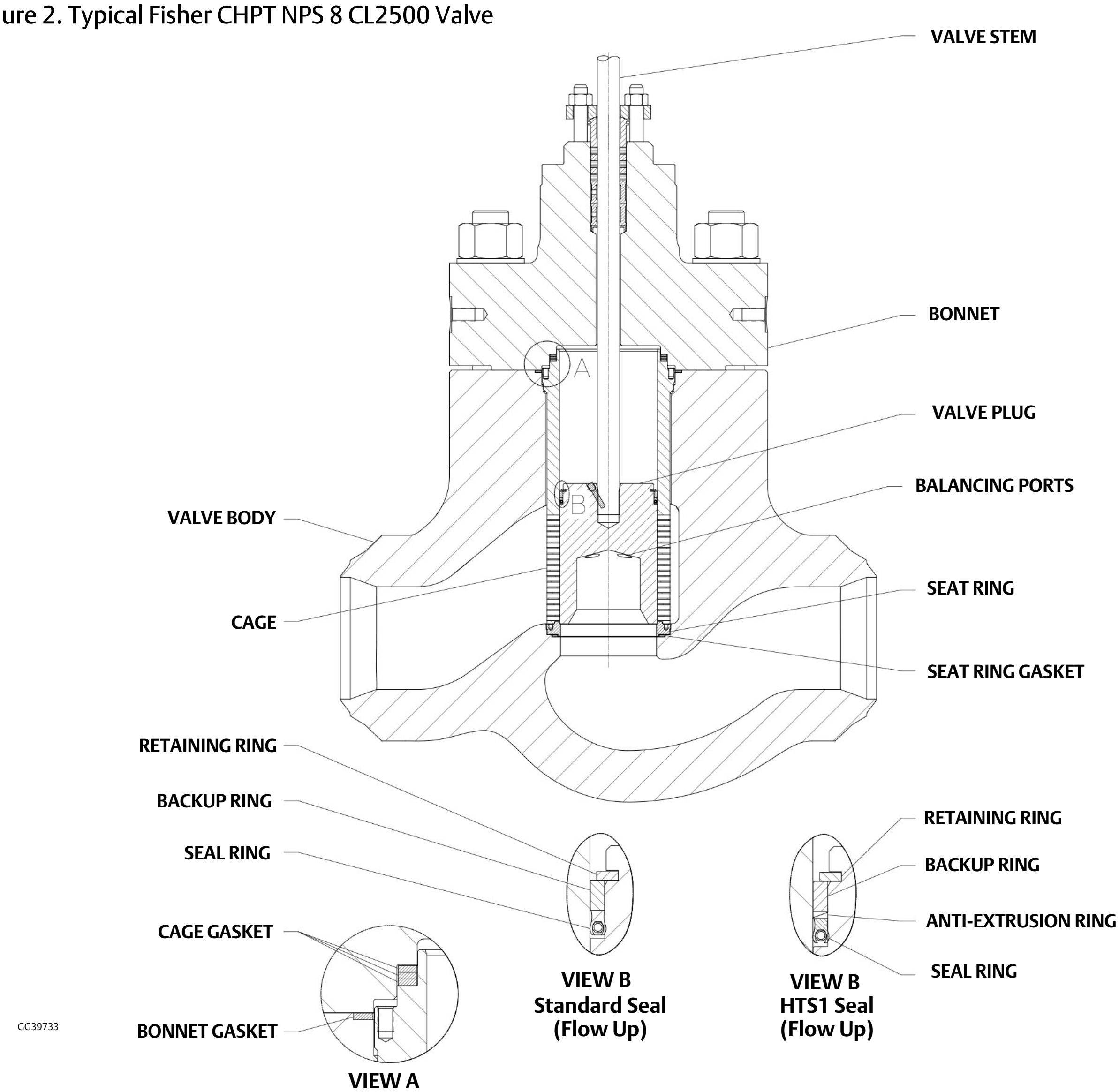


Table 1. Trim Descriptions

VALVE	TRIM (CAGE)	VALVE PLUG	SEAT RING	CAGE	TEMPERATURE LIMIT
CHPT and CHPD	Standard	416 SST	416 SST	17-4 SST PH H1075	See figure 3
	Cavitrol III 2-Stage	420 SST	420 SST	17-4 SST PH H1075	
CHPD with Bore Seal	Standard	416 SST	416 SST	17-4 SST PH H1075 with CoCr-A	
	Cavitrol III 2-Stage	420 SST	420 SST	17-4 SST PH H1075 with CoCr-A	

Table 2. Construction Materials

PART		MATERIAL	TEMPERATURE	
			C	F
Valve Body and Bonnet		WCC	-29° to 380°	-20° to 716°
		WC9		
Valve Plug, Seat Ring, and Cage		See table 1	See figure 3	
Valve Stem		S20910	Not a limiting factor	
Valve Body to Bonnet Bolting		SA-193-B7 NCF2 studs, SA-194-2H NCF2 nuts		
Bonnet, Cage and Seat Ring Gaskets		N06600/Graphite		
CHPD	Piston Ring	Graphite 17F39		
CHPD with Bore Seal	Piston Ring	Graphite 17F39		
	Bore Seal	N07718		
CHPT	Seal Ring	PTFE with N10276 spring	-46° to 232°	-50° to 450°
	Backup Ring	S41600	Not a limiting factor	
	Retaining Ring	18-8 SST		
CHPT with HTS1 Seal	Seal Ring	PTFE/graphite with R30003 spring	-46° to 232°(1)	-50° to 450°(1)
	Anti-Extrusion Ring	PEEK (Poly Ether Ether Ketone)	-73° to 316°	-100° to 600°
	Backup Ring	S41600	Not a limiting factor	
	Retaining Ring	18-8 SST		
Packing		See Bulletin 59.1:065, Packing Selection Guidelines for Fisher Sliding-Stem Valves (D101986X012)		

1. When used with a PEEK anti-extrusion ring, the PTFE/graphite with R30003 spring seal ring may be used up to 316°C (600°F) for non-oxidizing service or up to 260°C (500°F) for oxidizing service.

Figure 3. Pressure/Temperature Limit

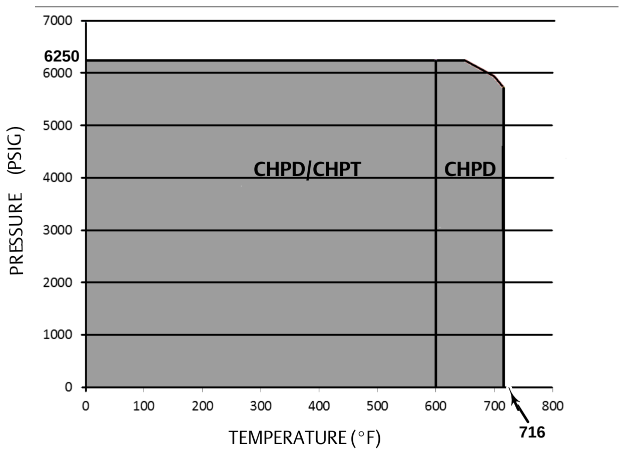
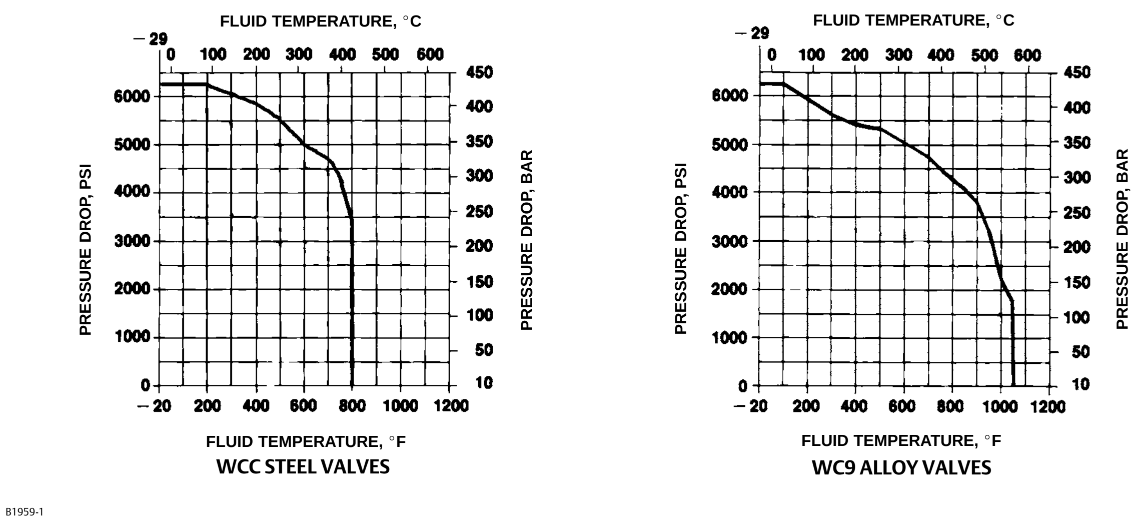


Figure 4. Pressure/Temperature Limits for Standard Cages



Note:
1. Do not exceed the maximum pressure and temperature for the pressure rating of the valve material and valve size used. Refer to table 2 and figure 3 for pressure/temperature limits of the trim used.

Table 3. Flow Characteristic and Valve Plug Travel

TRIM (CAGE)	CHARACTERISTIC	MAXIMUM VALVE PLUG TRAVEL	
		mm	Inches
Standard	Equal Percentage	102	4
	Linear	152	6
	Modified Equal Percentage	152	6
Cavitrol III 2-Stage	Linear	152	6

Emerson Automation Solutions
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Dubai, United Arab Emirates
Singapore 128461 Singapore

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Fisher™ D and DA Control Valves

Fisher D and DA single-port, high-pressure valves are widely used in oil and gas production industries. These valves are especially useful for either throttling or on/off control of liquids or gases which are gritty, sticky, or which have a tendency to build up on internal valve parts. The DA valve is also useful in angle piping or other applications where a self-draining valve is desired.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

W7859-1

Fisher D Valve with 657 Actuator

Features

- Heavy-Duty Construction—Massive guiding (figure 1) positively aligns the valve plug in the seat ring for high pressure drop applications. The screwed-in seat ring completely encloses the seat ring gasket.
- Easy Maintenance—Screwed bonnet/body joint allows repair or maintenance with a minimum of tools.
- Severe Service Capability—Valve is available with VTC (ceramic) trim for service in very erosive applications. The valve plug is also available with a tungsten carbide tip and the seat ring can be fitted with a full-bore tungsten carbide insert for erosive service.
- Meets Variety of Specifications—Valve body and end connection constructions are available for API as well as ASME standards.
- NACE Trim Standard—NACE trim and bolting materials are standard for all applications. These materials comply with the requirements of NACE MR0175-2002.

Specifications

Available Configurations

D: Globe valve with screwed-on bonnet, unbalanced post-guided valve plug, screwed-in seat ring, metal seat construction, and push-down-to-close valve plug action
DA: Same as D valve except in angle configuration (figure 1)

Valve Sizes and End Connections[1]

See table 1

Maximum Inlet Pressures and Temperatures[1][2]

See table 2

Maximum Allowable Pressure Drops[2]

Flow up: Capable of full rated pressure drops
Flow down: See table 3 for pressure drop limits for ceramic trim

Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4

Standard: Class IV leakage
Optional: Class V

Material Temperature Capabilities

-46 to 232°C (-50 to 450°F)

Construction Materials

Body, Bonnet, and Trim: See table 4
Packing:
Standard: ■ Single or ■ double PTFE V-ring packing for pressure service
Optional: Double PTFE/Composition
Standard Gaskets: S31600 (316 SST)

Flow Characteristic

Equal percentage

Flow Direction (see figure 1)

D: Flow up (through seat ring and past valve plug)
DA: ■ Flow up (through seat ring and past valve plug) or ■ flow down (past valve plug and through seat ring)

Flow Coefficients and Noise Level Prediction

See table 5 or Fisher Catalog 12

Port, Yoke Boss, Stem Diameters, and Rated Travels

See table 6

Approximate Weights

NPS 1: 34 kg (75 pounds)
NPS 2: 45 kg (100 pounds)

Options

■ Lubricator/isolating valve ■ VTC (ceramic) Trim with equal percentage characteristic (not available with Micro-Flute trim) ■ Tungsten Carbide trim (not available with Micro-Flute trim)

1. EN (or other) ratings and end connections can usually be supplied; consult your Emerson sales office or Local Business Partner.
2. The pressure/temperature limits in this bulletin and in any applicable standard limitations should not be exceeded.

Contents

Table 1. Valve Sizes, Port Diameters, and End Connections

VALVE SIZE, NPS	PORT DIAMETER (INCHES)	SCREWED VALVE BODIES				FLANGED VALVE BODIES			
						ASME			API
		3600 psi	6000 psi	9000 psi (WCC Steel DA Only)	10,000 psi (Except WCC Steel DA)	CL150 through CL600	CL900 and CL1500	CL2500	10,000 lb. Spec A and C
1	0.25, 0.375, 0.5, 0.75	X(1)	X	- - -	- - -	X	X	X	- - -
2	0.25, 0.375, 0.5, 0.75, 1, 1.25	X	X	X	X	X	X	X	X

1. \`X' indicates available construction.

Table 2. Rated Inlet Pressures and Temperatures

VALVE SIZE, NPS	TYPE	PRESSURE RATING OR COLD WORKING PRESSURE LIMIT	PRESSURE(1)		TEMPERATURE	
			bar	psi	°C	°F
1 or 2	Screwed	CL900 and 1500	259 236	3750 3425	38 232	100 450
		CL2500	431 394	6250 5710	38 232	100 450
		9000	621	9000	38	100
		10,000	689	10,000	38	100
1 or 2	Flanged	CL150	20.0 12.8	290 185	38 232	100 450
		CL300	51.7 47.2	750 685	38 232	100 450
		CL600	103.4 94.5	1500 1370	38 232	100 450
		CL900 and 1500	259 236	3750 3425	38 232	100 450
		CL2500	431 394	6250 5710	38 232	100 450
		API 10,000	689 689	Spec A 10,000 Spec C 10,000	121 121	250 250

1. LCC steel body per ASME B16.34 except C5 steel for all API bodies.

Table 3. Flow Down Pressure Drop Limits - Ceramic Trim Only

VALVE SIZE, NPS	SEAT RING DIAMETER, mm (INCHES)					
	6.4 (0.25)	9.5 (0.375)	12.7 (0.5)	19.1 (0.75)	25.4 (1)	31.8 (1.25)
	Pressure Drop, bar					
1	414	414	414	193	- - -	- - -
2	689	689	689	462	262	165
	Pressure Drop, psi					
1	6000	6000	6000	2800	- - -	- - -
2	10,000	10,000	10,000	6700	3800	2400

Table 4. Materials for Standard Trim Constructions

VALVE MATERIAL	BONNET MATERIAL	PLUG AND SEAT RING	VALVE STEM
LCC	LF2	S31600 (316 stainless steel) hard faced with CoCr-A (Alloy 6)	S20910
WCC			

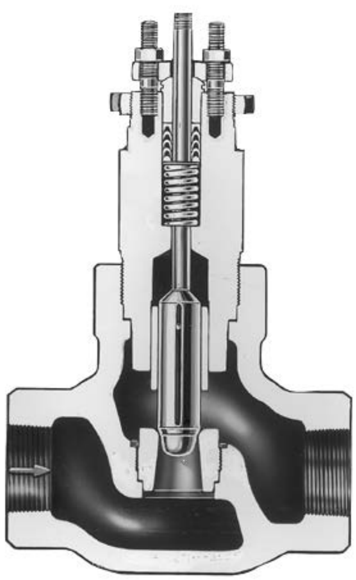
Table 5. Flow Coefficient (C_v at Maximum Valve Plug Travel)

VALVE SIZE, NPS	PORT DIAMETER, mm (INCHES)	EQUAL PERCENTAGE D	EQUAL PERCENTAGE DA
		Flow Up	Flow Down
1	6.4 (0.25) 9.5 (0.375) 12.7 (0.5) 19.1 (0.75)	1.66 4.03 6.51 12.3	3.21 7.06 11.2 16.8
2	6.4 (0.25) 9.5 (0.375) 12.7 (0.5) 19.1 (0.75) 25.4 (1) 31.8 (1.25)	1.66 4.03 6.82 14.1 23.7 34.5	3.21 7.06 12.1 21.2 31.8 44.9

Table 6. Port, Yoke Boss, Stem Diameters, and Rated Travel Specifications in mm (Inches)

VALVE SIZE, NPS	PORT DIAMETER	STANDARD			OPTIONAL		
		Yoke Boss Diameter	Stem Diameter	Rated Travel	Yoke Boss Diameter	Stem Diameter	Rated Travel
1	6.4 (0.25) 9.5 (0.375) 12.7 (0.5) 19.1 (0.75)	54 (2-1/8)	9.5 (3/8)	19.1 (0.75)	71 (2-13/16)	12.7 (1/2)	19.1 (0.75)
					90 (3-9/16)	19.1 (3/4)	19.1 (0.75)
2	6.4 (0.25) 9.5 (0.375) 12.7 (0.5) 19.1 (0.75) 25.4 (1) 31.8 (1.25)	71 (2-13/16)	12.7 (1/2)	19.1 (0.75)	90 (3-9/16)	19.1 (3/4)	19.1 (0.75)

Figure 1. Typical Constructions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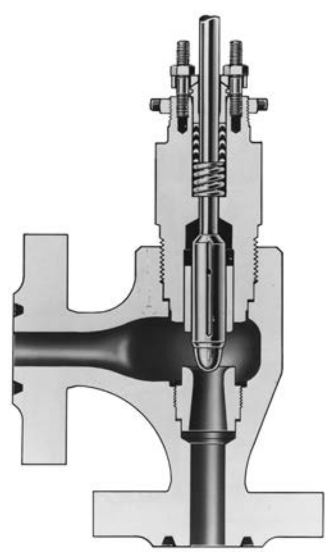
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Installation

Valve orientation of the D and DA does not affect operation, but to facilitate changing trim parts, the valve stem should be vertical with the actuator above the valve. Proper flow direction is indicated by the arrow on the valve.

Dimensions are shown in figures 2 and 3.

Ordering Information

When ordering, specify:

Application

1. Type of application
   a. Throttling or on-off
   b. Reducing or relief
2. Controlled fluid (include chemical analysis of fluid, if possible)
3. Specific gravity of controlled fluid
4. Fluid temperature
5. Range of flowing inlet pressure
6. Pressure drops
   a. Range of flowing pressure drops
   b. Maximum at shutoff
7. Flow rates
   a. Minimum controlled flow
   b. Normal flow
   c. Maximum flow
8. Maximum permissible noise level, if critical
9. Shutoff classification required
10. Line size and schedule

Valve

Refer to the specifications. Review the description for each specification. Indicate the desired choice whenever there is a selection (■) to be made. Always indicate the valve body design being ordered as identified in the available configuration specification.

Actuator and Accessories

Refer to separate bulletins covering actuators and accessories for ordering information.

Table 7. Fisher D Dimensions

FLANGED VALVE SIZE, NPS	ASME								D--All Ratings		
	CL150		CL300			CL600					
	A-Raised Face	G	A		G	A		G	Stem Size		
			Raised Face	Ring-Type Joint		Raised Face	Ring-Type Joint		9.5 (3/8)	12.7 (1/2)	19.1 (3/4)
	mm										
1	206	46	219	232	46	232	232	46	173	192	179
2	267	70	267	- - -	70	286	289	70	- - -	217	213
	Inches										
1	8.12	1.81	8.62	9.12	1.81	9.12	9.12	1.81	6.81	7.56	7.06
2	10.50	2.75	10.50	- - -	2.75	11.25	11.38	2.75	- - -	8.56	8.38

Table 8. Fisher D Dimensions

FLANGED VALVE SIZE, NPS	ASME						API			D--All Ratings		
	CL900 and 1500			CL2500			10,000 lb.					
	A		G	A		G	A		G	Stem Size		
	Raised Face	Ring-Type Joint		Raised Face	Ring-Type Joint		Spec A	Spec C		9.5 (3/8)	12.7 (1/2)	19.1 (3/4)
	mm											
1	254	254	46	308	308	54	- - -	- - -	- - -	173	192	179
2	308	311	70	391	394	83	364	360	83	- - -	217	213
	Inches											
1	10.00	10.00	1.81	12.12	12.12	2.12	- - -	- - -	- - -	6.81(1)	7.56(1)	7.06(1)
2	12.12	12.25	2.75	15.38	15.50	3.25	14.34	14.19	3.25	- - -	8.56	8.38

1. Not applicable for 10,000 lb. API.

Table 9. Fisher D Dimensions

SCREWED VALVE SIZE, NPS	3600 psi		6000 psi and 9000 psi		D--All Ratings		
					Stem Size		
	A	G	A	G	9.5 (3/8)	12.7 (1/2)	19.1 (3/4)
	mm						
1(1)	168	46	197	54	172	192	178
2	229	70	267	83	- - -	216	211
	Inches						
1(1)	6.62	1.81	7.75	2.12	6.75	7.50	7.00
2	9.00	2.75	10.50	3.25	- - -	8.50	8.31

1. For 3600 psi and 6000 psi only.

Figure 2. Fisher D Dimensions (also see tables 7, 8, and 9)

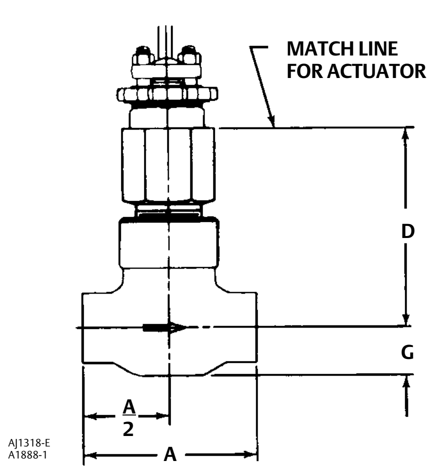


Table 10. Fisher DA Dimensions

FLANGED VALVE SIZE, NPS	A and G				D--All Ratings		
	ASME						
	CL300		CL600		Stem Size		
	Raised Face	Ring-Type Joint	Raised Face	Ring-Type Joint	9.5 (3/8)	12.7 (1/2)	19.1 (3/4)
	mm						
1	109	116	116	116	135	154	141
2	155	164	165	167	- - -	164	159
	Inches						
1	4.31	4.56	4.56	4.56	5.31	6.06	5.56
2	6.12	6.44	6.50	6.56	- - -	6.44	6.25

Table 11. Fisher DA Dimensions

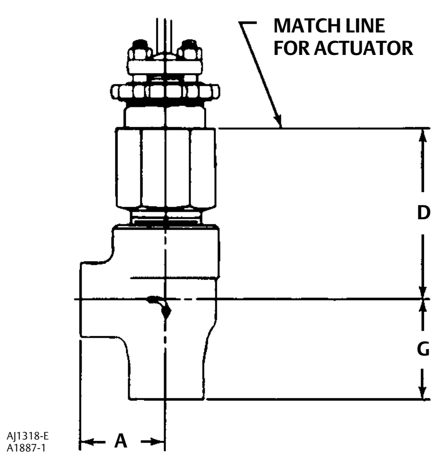
FLANGED VALVE SIZE, NPS	A and G						D--All Ratings		
	ASME				API				
	CL900 and 1500		CL2500		10,000 lb.		Stem Size		
	Raised Face	Ring-Type Joint	Raised Face	Ring-Type Joint	Spec A	Spec C	9.5 (3/8)	12.7 (1/2)	19.1 (3/4)
	mm								
1	127	127	154	154	- - -	- - -	135	154	141
2	178	179	195	197	182	180	- - -	164	159
	Inches								
1	5.00	5.00	6.06	6.06	- - -	- - -	5.31	6.06	5.56
2	7.00	7.06	7.69	7.75	7.17	7.09	- - -	6.44	6.25

Table 12. Fisher DA Dimensions

SCREWED VALVE SIZE, NPS	3600 psi		6000 psi and 9000 psi		D--All Ratings		
					Stem Size		
	A	G	A	G	9.5 (3/8)	12.7 (1/2)	19.1 (3/4)
	mm						
1[1]	76	89	89	102	133	152	140
2	102	124	114	130	- - -	162	157
	Inches						
1[1]	3.00	3.50	3.50	4.00	5.25	6.00	5.50
2	4.00	4.88	4.50	5.12	- - -	6.38	6.19

1. For 3600 psi and 6000 psi only.

Figure 3. Fisher DA Dimensions (also see tables 10, 11, and 12)



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Fisher™ D2T FloPro Control Valve

The Fisher D2T FloPro control valve is a compact, rugged valve designed for on/off service. This valve is ideal for use as a dump valve on gas separators and scrubbers. It is also well suited for other high pressure applications in natural gas production, compression, and processing. The D2T FloPro valve has threaded NPT end connections and is available in an NPS 1 globe style or angle style valve body configuration.

Fisher D2T FloPro Control Valve

Features

- **Field-Selectable Flow Rates--**The FloPro feature allows easy setting of 0.25, 0.375, and 0.5 inch port equivalent flow rates, eliminating the need for more than one port size. See figure 2.

- **Trim Options--**The valve plug and seat ring are available in S17400 double H1150, or solid R30006 (Alloy 6) for erosive service.

- **Quad-O compliant Packing System--**Features Fisher ENVIRO-SEAL™ packing technology to provide reduced packing maintenance and meet Low E fugitive emission requirements for Leak Detection and Repair (LDAR) programs in compliance with the Code of Federal Regulations (CFR) 40, Part 60, Subpart OOOO.

- **NACE MR0175/ISO 15156 Service- Ready--**Sour service trim is the standard construction for the D2T FloPro control valve. The materials of construction meet the metalurgical requirements of NACE MR0175/ISO 15156. Environmental limits may apply.

- **CL900 Service--**Valve assembly is designed and specified for ASME B16.34 CL900 service.

- **Low Temperature Materials--**Valve and actuator construction materials allow use in low temperature applications of -46° C (-50° F).

- **Field-Reversible Actuator--**The D2T FloPro actuator can be converted in the field from Air-to-Open to Air-to-Close actuator action. (Conversion to Air-to-Close actuator action requires removing four springs from the actuator casing configuration.) (Conversion to Air-to-Open actuator action requires adding four springs to the actuator casing configuration.)

- **Easy Installation--**Compact design allows installation where space is at a premium.

- **Easy Maintenance--**Screwed bonnet/body joint allows repair or maintenance with a minimum of tools and without removing the valve body from the piping system.

Specifications

Valve Assembly Pressure Class(1)

ASME B16.34 CL900

Temperature Range(1)

155 bar from -46 to 93°C, and 150 bar at 149°C. (2250 psig from −50 to 200°F, and 2185 psig at 300°F)

Maximum Allowable Pressure Drop(1)

Flow Down(2)
Maximum Inlet Pressure: 155 bar (2250 psig)
Maximum Outlet Pressure: 103 bar (1500 psig)
Flow Up
Maximum Inlet Pressure: 103 bar (1500 psig)
Maximum Outlet Pressure: 103 bar (1500 psig)

Shutoff Classification

Class IV ANSI/FCI 70-2 and IEC 60534-4

Construction Materials

Valve Body and Bonnet: ASME SA 352 LCC
Valve Plug and Seat: ■ R30006 (Alloy 6) or ■ S17400 double H1150
Valve Stem: S31600
O-Rings: HNBR (Hydrogenated Nitrile)
Packing: PTFE/Carbon PTFE
Packing Springs: N07718
Stem Bushing: PPS (polyphenylene sulfide)
Actuator Diaphragm: Nitrile/Polyester
Actuator Springs: Zinc-plated steel

Flow Characteristic

FloPro Characterized

Flow Coefficients

See figure 2

Port Diameter

13 mm (0.5 inch)

Maximum Travel

13 mm (0.5 inch)

Valve Travel Indications

See figure 2

Approximate Weight

7.7 kg (17 lb)

Dimensions

See figure 3

Material Temperature Capabilities

Valve Body Assembly: -46 to 149°C (-50 to 300°F)
Actuator Assembly: -46 to 93°C (-50 to 200°F)

Bonnet/Body Connection

Screwed with leakoff bleed

Standard Actuator Configuration

The D2T FloPro actuator is an on/off spring-and-diaphragm.
Globe Valve Body: Supplied as either Air-to-Open or Air-to-Close.

Maximum Actuator Casing Pressure

2.8 bar (40 psig)

Minimum Required Actuator Casing Pressure

2.1 to 2.4 bar (30 to 35 psig)

Actuator Diaphragm Effective Area

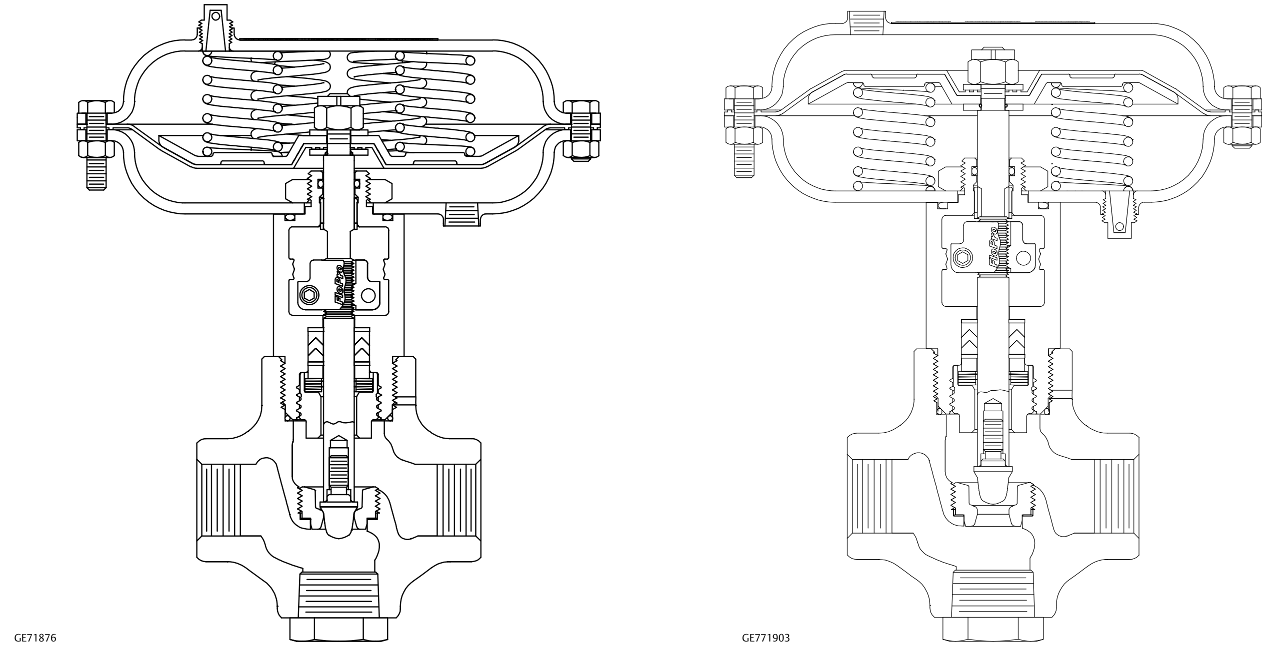
194 cm^2 (30 square inches)

Actuator Pressure Connections

1/4 NPT internal; see figure 3 for locations

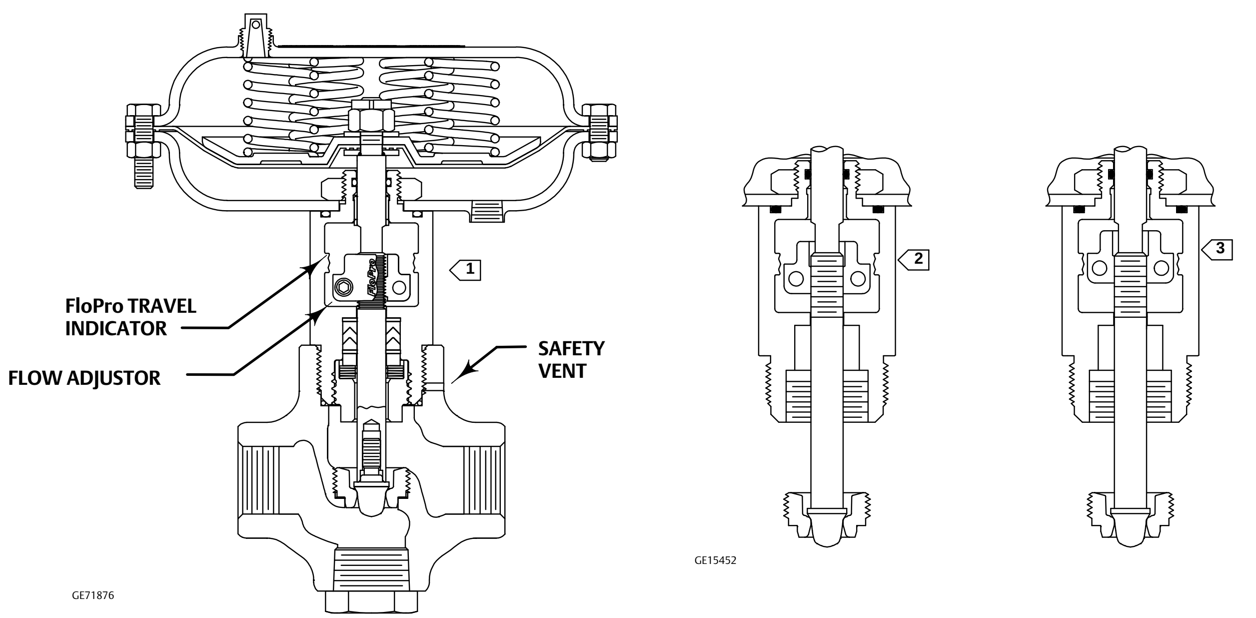
1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.
2. Standard flow direction.

Figure 1. Fisher D2T FloPro Constructions



AIR-TO-OPEN **AIR-TO-CLOSE**

Figure 2. Flow Rate Adjustments

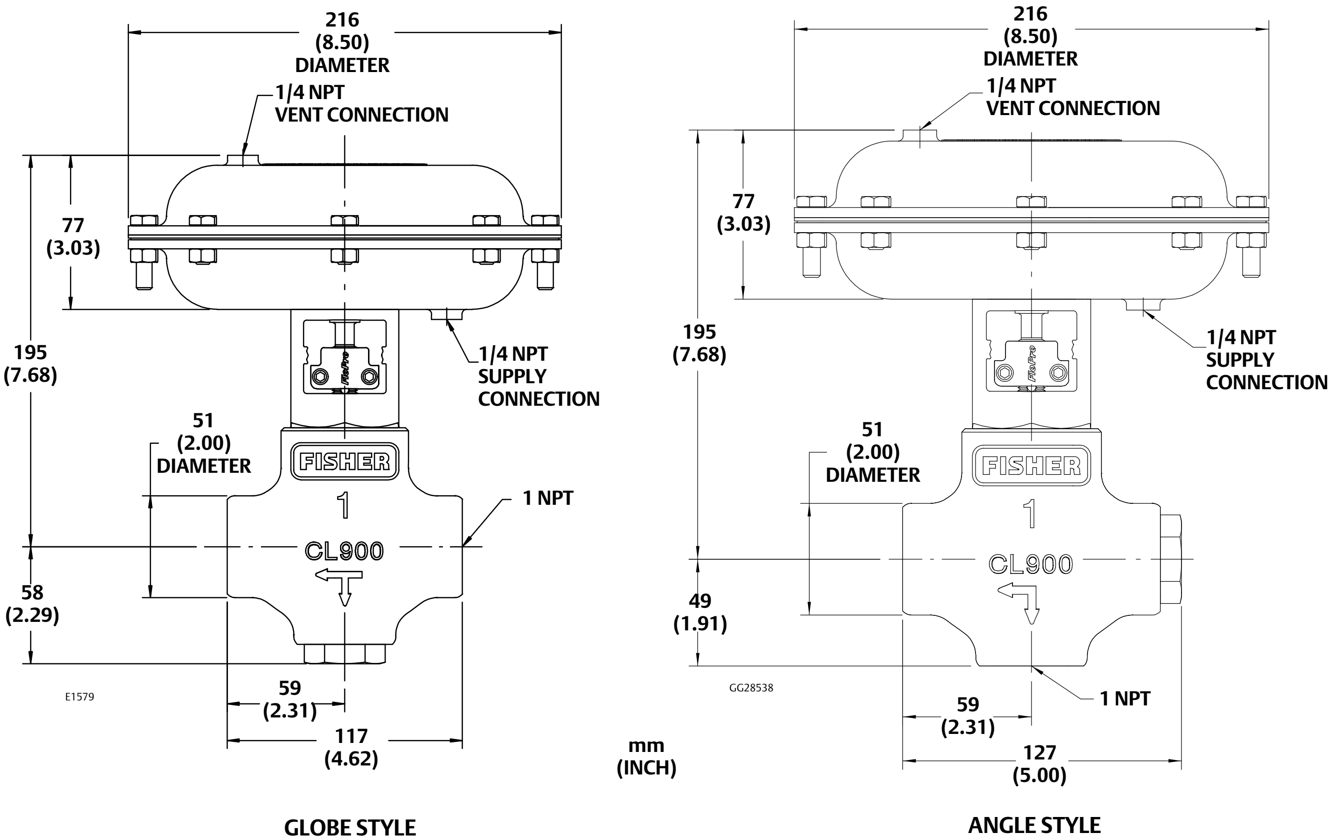


1 0.5 INCH FLOW RATE
Cv = 6
Fl = 0.77
Xt = 0.476

2 0.375 INCH FLOW RATE
Cv = 4
Fl = 0.706
Xt = 0.319

3 0.25 INCH FLOW RATE
Cv = 2
Fl = 0.65
Xt = 0.245

Figure 3. Fisher D2T Valve Dimensions (Air-to-Open Configuration Shown)



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Fisher™ D3 Control Valve

The Fisher D3 control valve is a compact, rugged valve designed for on/off or throttling control, and utilizes FloPro technology, using either pneumatic or electric control. This valve is ideal for use as a dump valve on gas separators and scrubbers. It is also well suited for other high pressure applications in natural gas production, compression, and processing. NPS 1 and 2 D3 control valves are available with CL900 NPT end connections and CL600 raised face flanged end connections.

The D3 offers easy maintenance. The trim and packing can be maintained by removing the deep-bore hammer nut and lifting the actuator/bonnet assembly off the valve without disassembling the actuator.

W9797-7

FISHER D3 CONTROL VALVE WITH easy-Drive™ ELECTRIC ACTUATOR (NPS 2 NPT END CONNECTION)

Features

Electric and Pneumatic

- **Safer Bonnet / Valve Body Connection--** The unique design provides additional protection if disassembly of bonnet/valve body connection is inadvertently started while there is still pressure in the valve body. Pins mounted in the valve bonnet help ensure the bonnet disengages from the valve body as the hammer nut is loosened, while the threads are still engaged. This allows internal pressure to be vented, while keeping the actuator retained to the valve body.

- **Field-Selectable Flow Rates--**The FloPro feature allows adjustment of the flow capacity without changing the trim. In this way, a single trim set can be used for more than one flow requirement, reducing inventory and maintenance costs. See figure 1.

W9249-1

FISHER D3 CONTROL VALVE (NPS 2 RF FLANGED END CONNECTION)

- **Two End Connection Styles--** The D3 control valve is available in both CL900 screwed-end and CL600 RF flanged construction.

Features (continued)

Electric and Pneumatic

- **Two Modes of Actuation--** Pneumatic or electric actuation is available.
- **Quad-O compliant Packing System --**Features Fisher ENVIRO-SEAL™ packing technology to provide reduced packing maintenance and meet Low E fugitive emission requirements for Leak Detection and Repair (LDAR) programs in compliance with the Code of Federal Regulations (CFR) 40, Part 60, Subpart OOOO.
- **Rugged Trim Design--**The pinned and guided plug/stem assembly is field-proven and easy to maintain.
- **Severe Service Capability with Tungsten Carbide Trim--**D3 valves are available with tungsten carbide trim for erosive service. Fisher tungsten carbide trim is designed specifically for severe service applications in the oil and gas industry. Durable tungsten carbide trim may benefit your application by wearing better and lasting longer.
- **Easy Maintenance--**The hammer nut bonnet/body joint allows repair or maintenance with a minimum of tools, without removing the valve body from the piping system. The seat ring can be removed with a standard hex socket.
- **Integral Bonnet Flange--** The bonnet has an integral flange, retained by a hammer nut, making the bonnet-to-body connection. This eliminates use of snap rings, which can be subject to possible failure in sour service or in atmospheric corrosion.
- **Application Flexibility--**A selection of end connections, trim materials, and flow capacities allows the D3 to be used in a broad range of applications, including sour service.
- **NACE MR0175/ISO 15156 Service-Ready--**The standard D3 FloPro trim, valve body, and bonnet meet the metallurgical requirements of NACE MR0175/ISO 15156.

Electric

- **Low Power Consumption--** The Fisher easy-Drive electric actuator operates from 9 to 30VDC and less than 0.1 watt hours per operation, using Modbus, 4-20 mA, or dry contact control signals.
- **Low Temperature--** The easy-Drive electric actuator design allow use in ambient temperatures as low as -20°C (-4°F) without use of a heater.
- **Easy Installation--**The compact design allows installation where space is a premium. Fisher easy-Drive calibrates by simply opening and closing the valve.
- **Remote Monitoring and Configuration--** Loss of signal position is programmable over Modbus.
- **Optional Loss of Power Positioning--** With the reserve power unit, RPU-100, loss of power position is programmable over Modbus.

Pneumatic

- **Low Temperature Materials--**Valve construction materials allow use in applications as low as -34°C (-30°F) for the pneumatic actuator.
- **Field-Reversible Actuator--**The D3 pneumatic actuator can be field-converted from spring-to-close to spring-to-open action.

Valve Specifications

Valve Body Sizes, End Connection Styles, and Port Diameters[1]

VALVE SIZE, NPS	PORT DIAMETER, (INCHES)	THREADED	RAISED FACE (RF) FLANGED
		CL900	CL600
1	0.375, 0.75, 1	X	X
2	0.375, 0.75, 1	X	X
X = Available construction.			

Maximum Inlet Pressures and Temperatures[1]

VALVE SIZE, NPS	CLASS	MAXIMUM INLET PRESSURE	TEMPERATURE RANGE
		bar (psig)	°C (°F)
1 and 2 NPT	CL900	155 (2250)	-46 to 93 (-50 to 200)
		150 (2185)	93 to 149 (200 to 300)
1 and 2 RF	CL600	103 (1500)	-46 to 93 (-50 to 200)
		100 (1455)	93 to 149 (200 to 300)

Maximum Shutoff Pressure Drops[1]

See table 3

Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4

Class IV

Flow Characteristic/Valve Plug Style

Equal percentage/Micro-Form Valve Plug

Flow Coefficients

See Fisher Catalog 12

Maximum Travel

15 mm (0.6 inch)

Material Temperature Capabilities[1]

Valve Body Assembly:
Standard Bonnet O-Ring: -40 to 135°C (-40 to 275°F)

Construction Materials

See table 1

Flow Direction

Flow Up or Flow Down

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.

Table 1. Fisher D3 Materials of Construction

Part	D3 Material with Pneumatic Actuator	D3 Material with easy-Drive Electric Actuator
Actuator Casing	Painted Steel	Painted Aluminum
Actuator Diaphragm	CR (chloroprene/polyester)	NA
Actuator Springs	Painted Steel	NA
Stem Bushing	PPS (polyphenylene sulfide)	Bronze - Oil Impregnated
Valve Body and Bonnet	ASME SA 352 LCC	
Valve Plug and Seat	Standard/Sour: S17400 (NACE MR0175/ISO 15156) Severe Service: Tungsten Carbide/S17400 (NACE MR0175/ISO 15156)	
Pin	S17400	
Valve Stem	S20910	
O-rings	HNBR (Hydrogenated Nitrile)	
Packing	PTFE/Carbon PTFE	
Packing Springs	N07718	
Packing Retainer	S17400	

Actuator Specifications

ELECTRIC ACTUATOR

Material Temperature Capabilities(1)

Electric Actuator Assembly:
-20 to 70°C (-4 to 158°F) ambient

Available Electric Actuator Configurations

Gen 2 easy-Drive Electric On/Off (snap acting)
Gen 2 easy-Drive Electric Positioning (flow or pressure control)

Maximum Current Draw

4 amps

Nominal Stroke Speed(2)

3.9 mms (0.15 inch/s) at 24VDC
2.2 mm/s (0.09 inch/s) at 12VDC(3)

Control Signals

On/Off: Dry contact, Modbus RTU
Positioning: 4-20 mA, 4-20 mA level, Modbus RTU
Auxillary Digital Input (Gen 2 only): Dry contact
Auxillary Digital Output (Gen 2 only): 10VDC, 25 mA maximum

Hazardous Area Approvals

CSA (C/US): Explosion-Proof Class I, Division 1, Groups C and D, T6, Ex d IIA T6, Class I, Zone 1, AEx d IIA T6
ATEX Flameproof - Gas:
Ⓔx II 2 G, Ex db IIA T6
IECEx Flameproof - Gas: Ex db IIA T6

Enclosure Rating

Type 4X and IP66

Electromagnetic Compatibility

Meets EN 61326-1 (2013)
Immunity: Industrial locations per table 2 of EN 61326-1 Standard. Performance is shown in table 2
Emmissions: Class A
ISM Equipment Rating: Group 1, Class A

Conduit Connections

Two 3/4 NPT connections

PNEUMATIC ACTUATOR

Material Temperature Capabilities(1)

Pneumatic Actuator Assembly:
-34 to 82°C (-30 to 180°F) ambient

Available Pneumatic Actuator Configurations

Spring-to-Open
Spring-to-Close

Maximum Actuator Casing Pressure(1)

3.4 bar (50 psig)

Actuator Diaphragm Effective Area

329 cm^2 (51 square inches)

Actuator Pressure Connections

1/4 NPT internal

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.
2. 10% variation can be expected, based on temperature and pressure of application.
3. Stroke speed when RPU is providing power.

Table 2. EMC Summary Results - Immunity

PORT	PHENOMENON	BASIC STANDARD	TEST LEVEL	PERFORMANCE CRITERIA[1]
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4kV Contact 8kV Air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m 1kHz AM at 80% 1400 to 2000 MHz @ 3V/m 1kHz AM at 80% 2000 to 2700 MHz @ 1V/m 1kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	30 A/m @ 50 and 60 Hz	A
I/O signal/ control	Burst	IEC 61000-4-4	1kV	B
	Surge	IEC 61000-4-5	1kV cable shield, and line to ground	B
	Conducted RF	IEC 61000-4-6	3V 150 kHz to 80 MHz at 3 Vrms	A

Performance criteria is +/- 5% stem position
1. A= No degradation during testing. B = Temporary degradation during testing, but is self recovering.

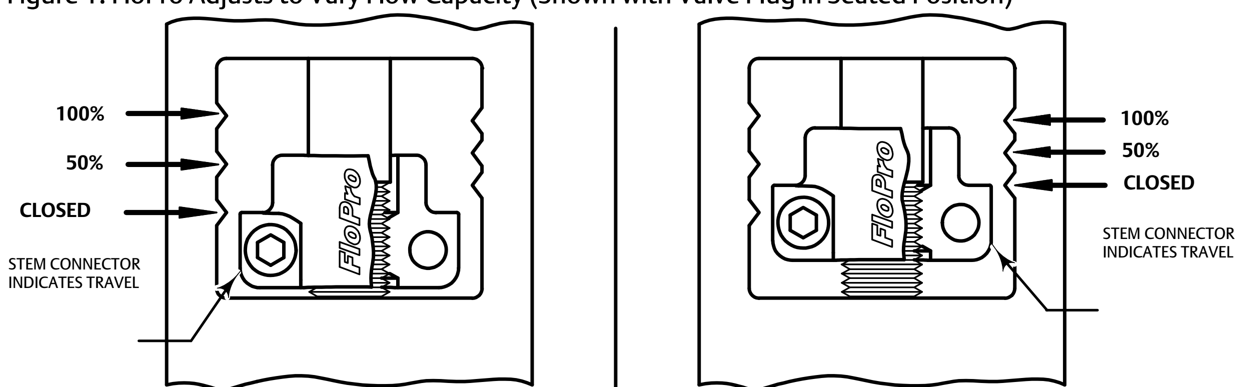
Table 3. Fisher D3 Maximum Shutoff Pressure Drops (Pneumatic)

ACTUATOR DESIGN	FLOW DIRECTION	ACTUATOR ACTION	INPUT SIGNAL	NUMBER OF SPRINGS	MAXIMUM △P (PSI) PER PORT SIZE (INCH)		
			psi		0.375	0.75	1.00
Pneumatic	Up	Spring-to-Close	0-20	3	2250	544	341
			0-35	6	2250	1504	999
		Spring-to-Open	0-20	2	2250	935	608
			0-35	2	2250	2250	2094
	Down	Spring-to-Close	0-20	2	1558	1800	950
			0-35	3	2250	2250	2250
		Spring-to-Open	0-20	2	2250	1700	939
			0-35	3	2250	2250	1575

Table 4. Fisher D3 easy-Drive Maximum Shutoff Pressure Drops (Electric)

ACTUATOR DESIGN	FLOW DIRECTION	MAXIMUM △P (PSI) PER PORT SIZE (INCH)		
		0.375	0.75	1.00
Electric	Up	2250	1714	1114
	Down	2250	2250	1948

Figure 1. FloPro Adjusts to Vary Flow Capacity (Shown with Valve Plug in Seated Position)



FULL CAPACITY SETTING (FACTORY SET)
15 mm (0.6 INCH) TRAVEL

Note: Use the widely-spaced travel indicators, as shown on the left portion of this view.

REDUCED CAPACITY SETTING
10 mm (0.4 INCH) TRAVEL

Note: Use the closely-spaced travel indicators, as shown on the right portion of this view.

Note: See Fisher Catalog 12 for flow coefficients. Full capacity coefficients are shown as 100 percent valve opening. Reduced capacity coefficients are shown as 60 percent valve opening.

easy-Drive RPU-100

Designed for use in Fisher easy-Drive actuators, the RPU-100 provides energy for positioning the actuator to the user-defined location on loss of incoming power.

Figure 2. Fisher RPU-100 with Wiring Harness

X1718

Figure 3. Fisher easy-Drive Actuator with RPU-100

X1717

Table 5. Fisher D3 Control Valve with easy-Drive Electric Actuator Dimensions (also see figure 4)

VALVE SIZE, NPS	CLASS	DIMENSION								WEIGHT[1]	
		A		B		C		D			
		mm	Inch	mm	Inch	mm	Inch	mm	Inch	kg	lb
1	CL600 (RF)	210	8.25	56	1.42	364	14.33	275	10.83	18	39
	CL900	159	6.25	51	2.00	352	13.86	275	10.83	14	31
2	CL600 (RF)	286	11.25	44	1.74	363	14.29	275	10.83	24	53
	CL900	191	7.50	46	1.80	363	14.29	275	10.83	15	34

1. Add .5 kg (1.1 lb) when RPU-100 is installed.

Figure 4. Fisher D3 Control Valve with easy-Drive Electric Actuator (also see table 5)

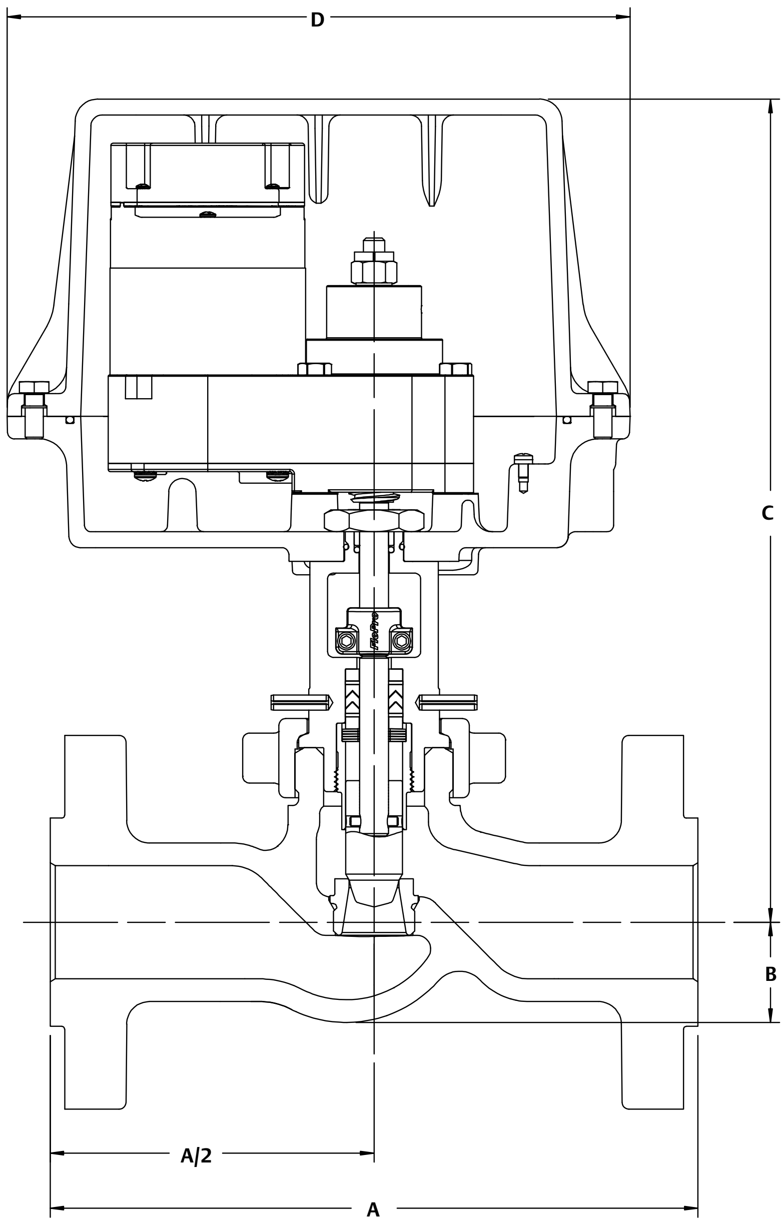


Table 6. Fisher D3 Control Valve with Pneumatic Actuator Dimensions(1) (also see figure 5)

VALVE SIZE	DIMENSION														WEIGHT	
	A		B		C		D		E		AR(2) Spring-to-Close		AR(2) Spring-to-Open			
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	kg	lb
NPS 1 NPT CL900	159	6.25	51	2.00	148	5.83	289	11.38	127	5.00	57	2.25	76	3.00	16	35
NPS 2 NPT CL900	191	7.50	46	1.80	159	6.28	289	11.38	127	5.00	57	2.25	76	3.00	17	38
NPS 1 CL600 RF	210	8.25	36	1.42	160	6.32	289	11.38	127	5.00	57	2.25	76	3.00	19	42
NPS 2 CL600 RF	286	11.25	44	1.74	159	6.28	289	11.38	127	5.00	57	2.25	76	3.00	25	56

1. All dimensions except AR are identical for both spring-to-close and spring-to-open.
2. Actuator removal clearance.

Figure 5. Fisher D3 Control Valve with Pneumatic Actuator Dimensions (also see table 6)

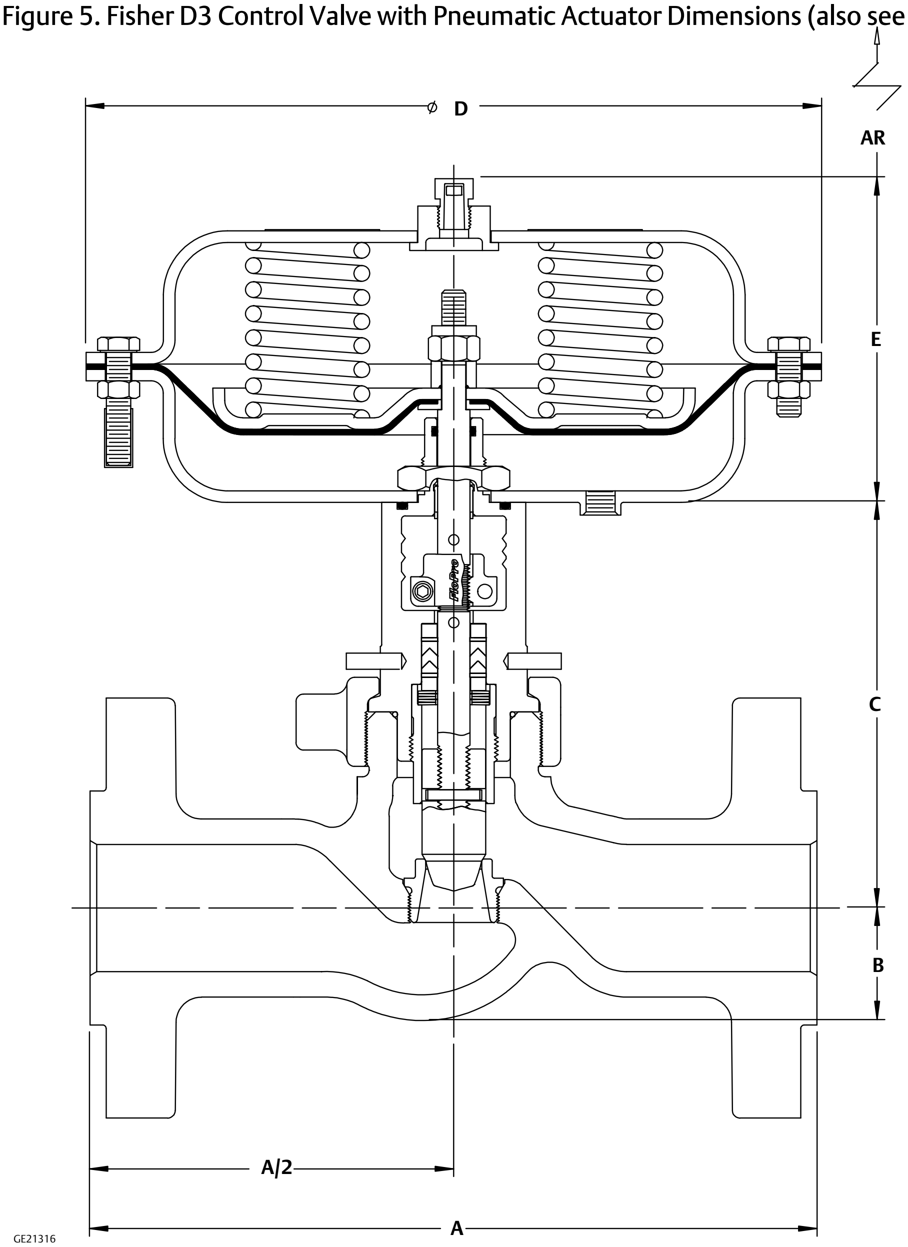
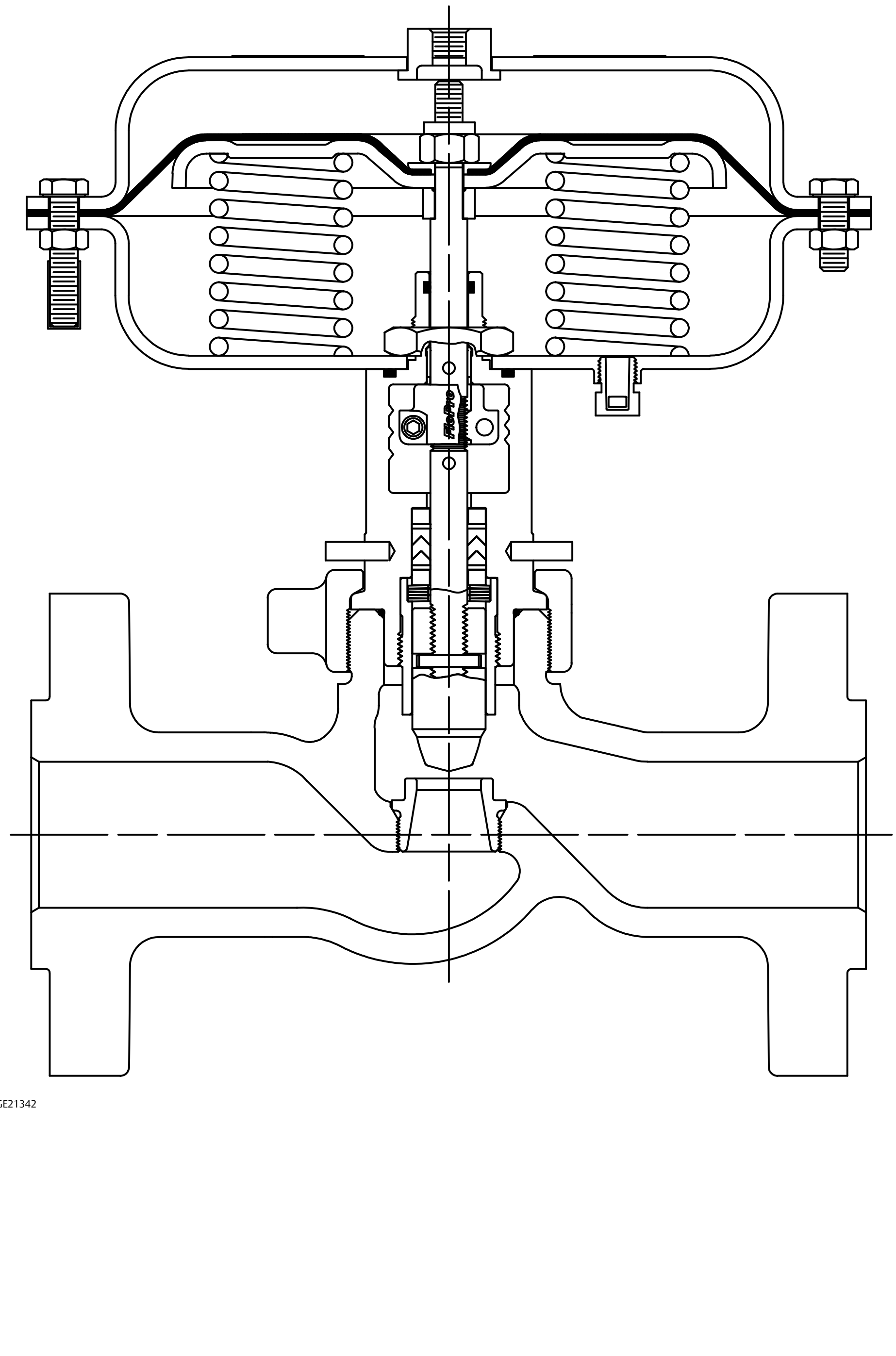


Figure 6. Fisher D3 Control Valve with Size 30 Actuator and NPS 2 Flanged Valve Body
(Spring-to-Open Configuration)



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Fisher™ D4 Control Valve Assembly

The Fisher D4 control valve is a compact, rugged globe valve designed primarily for high-pressure throttling applications using either pneumatic or electric control. This valve is ideal for use on pressure and flow control applications within the oil and gas production industry. The D4 is an excellent control valve for high-pressure separators, scrubbers, and other processing equipment. These valves are especially useful for either throttling or on/off control of liquids or gases which are gritty, sticky, or which have a tendency to build up on internal valve parts.

If the control valve requires maintenance, the trim and packing can be maintained by removing the deep-bore hammer nut and lifting the actuator/bonnet assembly off the valve without disassembling the actuator.

W9933-5

FISHER D4 CONTROL VALVE WITH Gen 2 easy-Drive™ ELECTRIC ACTUATOR (NPS 2 RF FLANGED END CONNECTION)

Features

Electric and Pneumatic

- **Safer Bonnet / Valve Body Connection—** Unique design provides additional protection if disassembly of bonnet/valve body connection is inadvertently started while there is still pressure in the valve body. Pins mounted in the valve bonnet help ensure the bonnet disengages from the valve body as the hammer nut is removed, while the threads are still engaged.

- **Heavy-Duty Guiding—**Massive guiding (figures 3 and 4) positively aligns the valve plug in the seat ring for reliable service. The screwed-in seat ring completely encloses the seat ring gasket.

- **Quad-O compliant Packing System --**Features Fisher ENVIRO-SEAL™ packing technology to provide reduced packing maintenance and meet Low E fugitive emission requirements for Leak Detection and Repair (LDAR) programs in compliance with the Code of Federal Regulations (CFR) 40, Part 60, Subpart OOOO.

W8531-2

FISHER D4 CONTROL VALVE (NPS 2 NPT END CONNECTION)

- **NACE Constructions—**NACE compatible trim is available with the D4 control valve. These constructions meet the metallurgical requirements of NACE MR0175 / ISO 15156.

Features (continued)

Electric and Pneumatic

- **Quick-Change Valve Plug**—Removable groove pin allows quick, easy valve plug replacement.

- **Severe Service Capability with Tungsten Carbide Trim**—D4 valves are available with tungsten carbide trim for erosive service. This trim is designed specifically for severe service applications in the oil and gas industry. Durable tungsten carbide trim may benefit your application by wearing better and lasting longer.

- **Easy Installation**—Compact design allows installation where space is a premium. Screwed valve bodies feature compact face-to-face dimensions while flanged valve bodies conform to ISA-75 standards for maximum versatility.

- **Easy Maintenance**—Hammer nut bonnet/body joint allows repair or maintenance with a minimum of tools, without removing the valve body from the piping system. Seat ring can be removed with a standard socket.

- **Integral Bonnet Flange**— Bonnet has an integral flange that accepts hammer nut force when making the bonnet-to-body connection. There are no snap rings subject to possible failure in sour service or in atmospheric corrosion.

- **Standard Trim for Throttling or On-Off Service**— Micro-Form trim is standard for throttling or on-off service at no extra cost.

- **Application Flexibility**—Choices of port diameters up to 31.8 mm (1.25 inches), end connections, and trim materials suit these valves to many applications, including sour service.

Electric

- **Low Power Consumption--** The Fisher easy-Drive electric actuator operates with 9 to 30VDC and less than 0.1 watt hours per operation, using Modbus, 4-20 mA, or dry contact control signals.

- **Low Temperature--** The easy-Drive electric actuator design allows use in ambient temperatures as low as -20°C (-4°F) without use of a heater.

- **Easy Installation--**The compact design allows installation where space is a premium. Fisher easy-Drive calibrates by simply opening and closing the valve.

- **Remote Monitoring and Configuration--** Loss of signal position is programmable over Modbus.

- **Optional Loss of Power Positioning--** With the reserve power unit, RPU-100, loss of power position is programmable over Modbus.

Pneumatic

- **Low Temperature Materials--**Valve construction materials allow use in applications as low as -40°C (-40°F) for the pneumatic actuator.

Installation

D4 control valves may be installed in any position, but normally the actuator is vertical and above the valve. Install the control valve so the flow direction arrow on the side of the valve body indicates the direction of the process flow.

Dimensions are shown in tables 12 and 13 and figures 3 and 4.

Valve Specifications

Available Actuation Configurations

Spring-To-Close Pneumatic
Spring-To-Open Pneumatic
Electric

Valve Sizes and End Connection Styles[1]

See table 3

Dimensions

See tables 12 and 13 and figures 3 and 4.

Face-to-face dimensions for flanged valves conform to ISA-75.03 (CL150-600) and ANSI/ISA-75.16 Short (CL900/1500)

Maximum Inlet Pressures and Temperatures[1]

Flanged connections are consistent with the ASME B16.34 pressure-temperature class, subject to Material Temperature Capabilities for the Valve Body Assembly (see following specification). For NPT end connections, the valve body rating is 4250 psig.

Maximum Pressure Drops[1]

See tables 7, 8, 9, 10, and 11

Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4

Class IV

Flow Characteristic

Equal percentage

Flow Direction

Flow up only

Flow Coefficients

See Fisher Catalog 12

Port Diameters

See table 3

Construction Materials

Valve Body and Bonnet: ASME SA 352 LCC
Valve Plug and Seat: See table 5
Valve Stem: S20910
Actuator O-Rings: (HNBR) Hydrogenated Nitrile
Bonnet O-Ring:
Standard: HNBR
Optional: Fluorocarbon
Packing:
Standard: Live-loaded single PTFE/Carbon PTFE
Optional: ENVIRO-SEAL double PTFE/Carbon[2]
Packing Springs: N07718
Packing Retainer: S17400
Actuator Diaphragm: Chloroprene
Actuator Spring: Painted steel
Seat Ring Gasket: S31600 (316 SST)
Spring Cover (Fail Up): PVC

Valve Plug Travel

19 mm (0.75 inch)

Valve Plug Style

Micro-Form valve plug

Material Temperature Capabilities

Valve Body Assembly:
Standard Bonnet O-Ring: -40 to 135°C (-40 to 275°F)
Optional Bonnet Fluorocarbon O-Ring: -23 to 204°C (-10 to 400°F)

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.
2. For erosive service.

Actuator Specifications

ELECTRIC ACTUATOR

Material Temperature Capabilities[1]

Electric Actuator Assembly:
-20 to 70°C (-4 to 158°F) ambient

Available Electric Actuator Configurations

Gen 2 easy-Drive Electric On/Off (snap acting)
Gen 2 easy-Drive Electric Positioning (flow or pressure control)

Maximum Current Draw

4 amps

Idle Current Draw

15 mA at 24VDC,
25 mA at 12VDC

30 mA at 24VDC,
50 mA at 12VDC with RPU-100

Nominal Stroke Speed[2]

3.9 mms (0.15 inch/s) at 24VDC
2.2 mm/s (0.09 inch/s) at 12VDC[3]

Control Signals

On/Off: Dry contact, Modbus RTU
Positioning: 4-20 mA, 4-20 mA level, Modbus RTU
Auxillary Digital Input (Gen 2 only): Dry contact
Auxillary Digital Output (Gen 2 only): 10VDC, 25 mA maximum

Hazardous Area Approvals

CSA (C/US): Explosion-Proof Class I, Division 1, Groups C and D, T6, Ex d IIA T6, Class I, Zone 1, AEx d IIA T6
ATEX Flameproof - Gas:
II 2 G, Ex db IIA T6
IECEx Flameproof - Gas: Ex db IIA T6

Enclosure Rating

Type 4X and IP66

Electromagnetic Compatibility

Meets EN 61326-1 (2013)
Immunity: Industrial locations per table 2 of EN 61326-1 Standard. Performance is shown in table 2
Emmissions: Class A
ISM Equipment Rating: Group 1, Class A

Conduit Connections

Two 3/4 NPT connections

PNEUMATIC ACTUATOR

Input Signal to Actuator

See tables 7, 8, 9, and 10

Material Temperature Capabilities[1]

Actuator Assembly:
Fail-Down, Spring-to-Close: -40 to 93°C (-40 to 200°F)
Fail-Up, Spring-to-Open: -40 to 93°C (-40 to 200°F)

Available Pneumatic Actuator Configurations

Spring-to-Open
Spring-to-Close

Maximum Actuator Casing Pressure[1]

3.4 bar (50 psig)

Actuator Diaphragm Effective Area

452 cm^2 (69 square inches)

Actuator Pressure Connections

1/4 NPT internal

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.
2. 10% variation can be expected, based upon temperature and pressure of application.
3. Stroke speed when RPU is providing power.

Table 1. Hazardous Area Classifications - CSA (Canada and United States)

CERTIFICATION BODY	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
CSA	Class I, Division 1, GP C, D T6	- - -	T6 (Tamb ≤ 70°C)	CSA Type 4X Enclosure

Table 2. EMC Summary Results - Immunity

PORT	PHENOMENON	BASIC STANDARD	TEST LEVEL	PERFORMANCE CRITERIA(1)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4kV Contact 8kV Air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m 1kHz AM at 80% 1400 to 2000 MHz @ 3V/m 1kHz AM at 80% 2000 to 2700 MHz @ 1V/m 1kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	30 A/m @ 50 and 60 Hz	A
I/O signal/ control	Burst	IEC 61000-4-4	1kV	B
	Surge	IEC 61000-4-5	1kV cable shield, and line to ground	B
	Conducted RF	IEC 61000-4-6	3V 150 kHz to 80 MHz at 3 Vrms	A

Performance criteria is +/- 5% stem position
1. A= No degradation during testing. B = Temporary degradation during testing, but is self recovering.

Ordering Information

When ordering, specify:

Application Information

1. Type of application
   a. Throttling or on-off
   b. Reducing or relief (back pressure)
2. Controlled fluid
   a. Type (include chemical analysis, if available)
   b. Temperature (normal and maximum anticipated)
   c. Specific gravity
3. Range of flowing inlet pressures
4. Pressure drops
   a. Range of flowing pressure drops
   b. Maximum drop at shutoff
5. Flow rates
   a. Minimum controlled flow
   b. Normal flow
   c. Maximum flow
6. Input signal range to actuator

Control Valve Assembly Information

Refer to the Specifications and review the information under each specification.

Table 3. Valve Sizes and Connection Styles

VALVE SIZE, NPS	PORT DIAMETER, (INCHES)	SCREWED	RAISED FACE (RF) FLANGED				RING TYPE JOINT (RTJ) FLANGED	
		4250 psi	CL150	CL300	CL600	CL900 and 1500	CL600	CL900 and 1500
1	0.25, 0.375, 0.5, 0.75	X	X	X	X	X	X	X
2	0.25, 0.375, 0.5, 0.75, 1, 1.25	X	X	X	X	X	X	X
X = Available construction.								

Table 4. Fisher D4 Control Valves Approximate Weights, Kg (Pounds)(1)

VALVE SIZE AND CLASS	PNEUMATIC		ELECTRIC	
	1	2	1	2
Screwed	32 (71)	39 (87)	22 (49)	29 (64)
CL150	34 (74)	39 (86)	24 (52)	29 (63)
CL300 and 600	37 (81)	48 (106)	27 (59)	33 (73)
CL900 and 1500	50 (110)	66 (146)	40 (88)	51 (113)
1. Add .5 kg (1.1 lbs) when RPU−100 is installed.				

Table 5. Typical Combinations of Metal Trim Parts

DESIGNATION	VALVE PLUG	SEAT RING
Standard	S41600 hardened to 38 HRC minimum	S17400
Sour	S17400 (NACE MR0175/ISO 15156)	S17400 (NACE MR0175/ISO 15156)
Tungsten Carbide	Tungsten carbide / S17400 (NACE MR0175/ISO 15156)	Tungsten carbide / S17400 (NACE MR0175/ISO 15156)

Table 6. Fisher D4 Environmental Limits for NACE MR0175/ISO 15156 with Sour Trim

MAXIMUM TEMPERATURE		MAXIMUM H_2S PARTIAL PRESSURE		COMPATIBLE WITH ELEMENTAL SULFUR
°C	°F	MPa	psia	
204	400	1.4	200	No
199	390	2.3	330	No
191	375	2.5	360	No
149	300	2.8	400	No
135	275	No Limit		Yes

Table 7. Maximum Shutoff Pressure Drops(1) for Fisher D4 Control Valves with Pneumatic Actuator (Spring-to-Close) When Used with Typical Control Instrumentation(2)

INPUT SIGNAL TO ACTUATOR		0 to 1.2 Bar (0 to 18 Psig)		0 to 1.4 Bar (0 to 20 Psig)		0 to 2.0 Bar (0 to 30 Psig)		0 to 2.3 Bar (0 to 33 Psig)		0 to 2.4 Bar (0 to 35 Psig)		0 to 3.4 Bar (0 to 50 Psig)	
SPRING		Light Rate				Heavy Rate							
INITIAL SPRING SETTING		0.77 Bar (11.2 Psig)		0.77 Bar (11.2 Psig)		0.85 Bar (12.4 Psig)		1.05 Bar (15.3 Psig)		1.18 Bar (17.1 Psig)		1.18 Bar (17.1 Psig)	
PORT DIAMETER		Maximum Pressure Drop											
mm	Inches	Bar	Psi	Bar	Psi	Bar	Psi	Bar	Psi	Bar	Psi	Bar	Psi
6.4	0.25	293(3)	4250(3)	293(3)	4250(3)	293	4250	293	4250	293	4250	293	4250
9.5	0.375	293(3)	4250(3)	293(3)	4250(3)	293	4250	293	4250	293	4250	293	4250
12.7	0.5	191	2765	191	2765	219	3180	288	4180	293	4250	293	4250
19.1	0.75	80	1160	80	1160	92	1340	123	1785	143	2080	143	2080
25.4	1	42	610	42	610	49	715	67	965	78	1130	78	1130
31.8	1.25	25	365	25	365	30	430	41	590	48	700	48	700

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.
2. For example, use the column marked 0-1.4 bar (0-20 psig) for a 0.21-1.0 bar (3-15 psig) pneumatic controller with 1.4 bar (20 psig) supply pressure.
3. For applications with downstream pressure in excess of 196 bar (2845 psig), use 196 bar (2845 psig) for Maximum Shutoff Pressure.

Table 8. Maximum Shutoff Pressure Drops[1] for Fisher D4 Control Valves with Pneumatic Actuator (Spring-to-Close) When Used with Instrumentation with Restricted Output Range[2]

INPUT SIGNAL TO ACTUATOR		0.4 to 2.0 Bar (6 to 30 Psig)		0.14 to 2.3 Bar (2 to 33 Psig)	
SPRING		Heavy Rate		Heavy Rate	
INITIAL SPRING SETTING		0.97 Bar (14.0 Psig)		1.17 Bar (17.0 Psig)	
PORT DIAMETER		Maximum Pressure Drop			
mm	Inches	Bar	Psi	Bar	Psi
6.4	0.25	293[3]	4250[3]	293	4250
9.5	0.375	210[3]	3045[3]	293	4250
12.7	0.5	113	1635	282	4095
19.1	0.75	45	655	120	1750
25.4	1	23	330	65	945
31.8	1.25	13	185	39	580

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.
2. For example, an Electro-Pneumatic Transducer calibrated for 0.4-2.0 bar (6-30 psig) output pressure.
3. For applications with downstream pressure in excess of 118 bar (1715 psig), use 118 bar (1715 psig) for Maximum Shutoff Pressure.

Table 9. Maximum Shutoff Pressure Drops[1] for Fisher D4 Control Valves with Pneumatic Actuator (Spring-to-Open) When Used with Typical Control Instrumentation[2]

INPUT SIGNAL TO ACTUATOR		0 to 1.2 Bar (0 to 18 Psig)		0 to 1.4 Bar (0 to 20 Psig)		0 to 2.0 Bar (0 to 30 Psig)		0 to 2.3 Bar (0 to 33 Psig)		0 to 2.4 Bar (0 to 35 Psig)		0 to 3.4 Bar (0 to 50 Psig)	
SPRING		Light Rate				Heavy Rate							
INITIAL SPRING SETTING		0.23 Bar (3.4 Psig)		0.23 Bar (3.4 Psig)		0.28 Bar (4.0 Psig)		0.28 Bar (4.0 Psig)		0.28 Bar (4.0 Psig)		0.28 Bar (4.0 Psig)	
PORT DIAMETER		Maximum Pressure Drop											
mm	Inches	Bar	Psi	Bar	Psi	Bar	Psi	Bar	Psi	Bar	Psi	Bar	Psi
6.4	0.25	293[3]	4250[3]	293[3]	4250[3]	293	4250	293	4250	293	4250	293	4250
9.5	0.375	293[3]	4250[3]	293	4250[3]	293	4250	293	4250	293	4250	293	4250
12.7	0.5	187	2715	233	3380	293	4250	293	4250	293	4250	293	4250
19.1	0.75	78	1135	99	1430	147	2130	178	2575	198	2875	293	4250
25.4	1	41	600	53	765	80	1160	97	1410	109	1575	195	2830
31.8	1.25	24	355	32	465	49	715	60	875	68	985	123	1785

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.
2. For example, use the column marked 0-1.4 bar (0-20 psig) for a 0.21-1.0 bar (3-15 psig) pneumatic controller with 1.4 bar (20 psig) supply pressure.
3. For applications with downstream pressure in excess of 190 bar (2760 psig), use 190 bar (2760 psig) for Maximum Shutoff Pressure.

Table 10. Maximum Shutoff Pressure Drops[1] for Fisher D4 Control Valves with Pneumatic Actuator (Spring-to-Open) When Used with Instrumentation with Restricted Output Range[2]

INPUT SIGNAL TO ACTUATOR		0.4 to 2.0 Bar (6 to 30 Psig)		0.14 to 2.3 Bar (2 to 33 Psig)	
SPRING		Heavy Rate		Heavy Rate	
INITIAL SPRING SETTING		0.69 Bar (10.0 Psig)		0.42 Bar (6.1 Psig)	
PORT DIAMETER		Maximum Pressure Drop			
mm	Inches	Bar	Psi	Bar	Psi
6.4	0.25	293[3]	4250[3]	293	4250
9.5	0.375	293[3]	4250[3]	293	4250
12.7	0.5	196	2845	293	4250
19.1	0.75	82	1195	156	2265
25.4	1	43	630	85	1235
31.8	1.25	26	380	52	765

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.
2. For example, an Electro-Pneumatic Transducer calibrated for 0.4-2.0 bar (6-30 psig) output pressure.
3. For applications with downstream pressure in excess of 202 bar (2925 psig), use 202 bar (2925 psig) for Maximum Shutoff Pressure.

Table 11. Fisher D4 easy-Drive Maximum Pressure Drop

PORT DIAMETER		MAXIMUM PRESSURE DROP(1)	
mm	Inch	Bar	psi
6.4	0.25	293	4250
9.5	0.375	293	4250
12.7	0.5	247	3576
19.1	0.75	105	1518
25.4	1	56	814
31.8	1.25	34	495

1. Downstream pressure, P2, is limited to 2250 psig.

easy-Drive RPU-100

Designed for use in Fisher easy-Drive actuators, the RPU-100 provides energy for positioning the actuator to the user-defined location on loss of incoming power.

Figure 1. Fisher RPU-100 with Wiring Harness

X1718

Figure 2. Fisher easy-Drive Actuator with RPU-100

X1717

Table 12. Dimensions - Pneumatic Actuator(1)

END CONNECTION STYLE	NPS 1 VALVE BODY						NPS 2 VALVE BODY					
	A		D		G		A		D		G	
	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
Screwed	155	6.12	209	8.24	54	2.01	230	9.00	215	8.47	77	2.75
CL150 RF Flg	184	7.25	209	8.24	51	2.01	254	10.00	215	8.47	71	2.75
CL300 RF Flg	197	7.75	209	8.24	51	2.01	267	10.50	215	8.47	71	2.75
CL600 RF Flg	210	8.25	209	8.24	51	2.01	286	11.25	215	8.47	71	2.75
CL600 RTJ Flg	210	8.25	209	8.24	51	2.01	289	11.38	215	8.47	71	2.75
CL900/1500 RF Flg	273	10.75	209	8.24	54	2.01	340	13.38	215	8.47	77	2.75
CL900/1500 RTJ Flg	273	10.75	209	8.24	54	2.01	343	13.50	215	8.47	77	2.75

1. Also see figures 3 and 4.

Table 13. Dimensions - Pneumatic Actuator(1)

FAIL ACTION	C		E		F	
	mm	Inches	mm	Inches	mm	Inches
Fail Down, Spring-To-Close	333	13.12	312	12.30	241	9.47
Fail Up, Spring-To-Open	333	13.12	324	12.74	---	---

1. Also see figures 3 and 4.

Table 14. Dimensions - Electric Actuator(1)

END CONNECTION STYLE	NPS 1 VALVE BODY						NPS 2 VALVE BODY						NPS 1 AND 2 VALVE BODY	
	A		B		C		A		B		C		D	
	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
Screwed	155	6.12	46	1.81	414	16.29	230	9.00	70	2.75	438	17.24	275	10.83
CL150 RF Flg	184	7.25	46	1.81	414	16.29	254	10.00	70	2.75	438	17.24	275	10.83
CL300 RF Flg	197	7.75	46	1.81	414	16.29	267	10.50	70	2.75	438	17.24	275	10.83
CL600 RF Flg	210	8.25	46	1.81	414	16.29	286	11.25	70	2.75	438	17.24	275	10.83
CL600 RTJ Flg	210	8.25	46	1.81	414	16.29	289	11.38	70	2.75	438	17.24	275	10.83
CL900/1500 RF Flg	273	10.75	46	1.81	414	16.29	340	13.38	70	2.75	438	17.24	275	10.83
CL900/1500 RTJ Flg	273	10.75	46	1.81	414	16.29	343	13.50	70	2.75	438	17.24	275	10.83

1. Also see figure 5.

Figure 3. Fisher D4 Valve Dimensions, Spring-To-Close (also see tables 12 and 13)

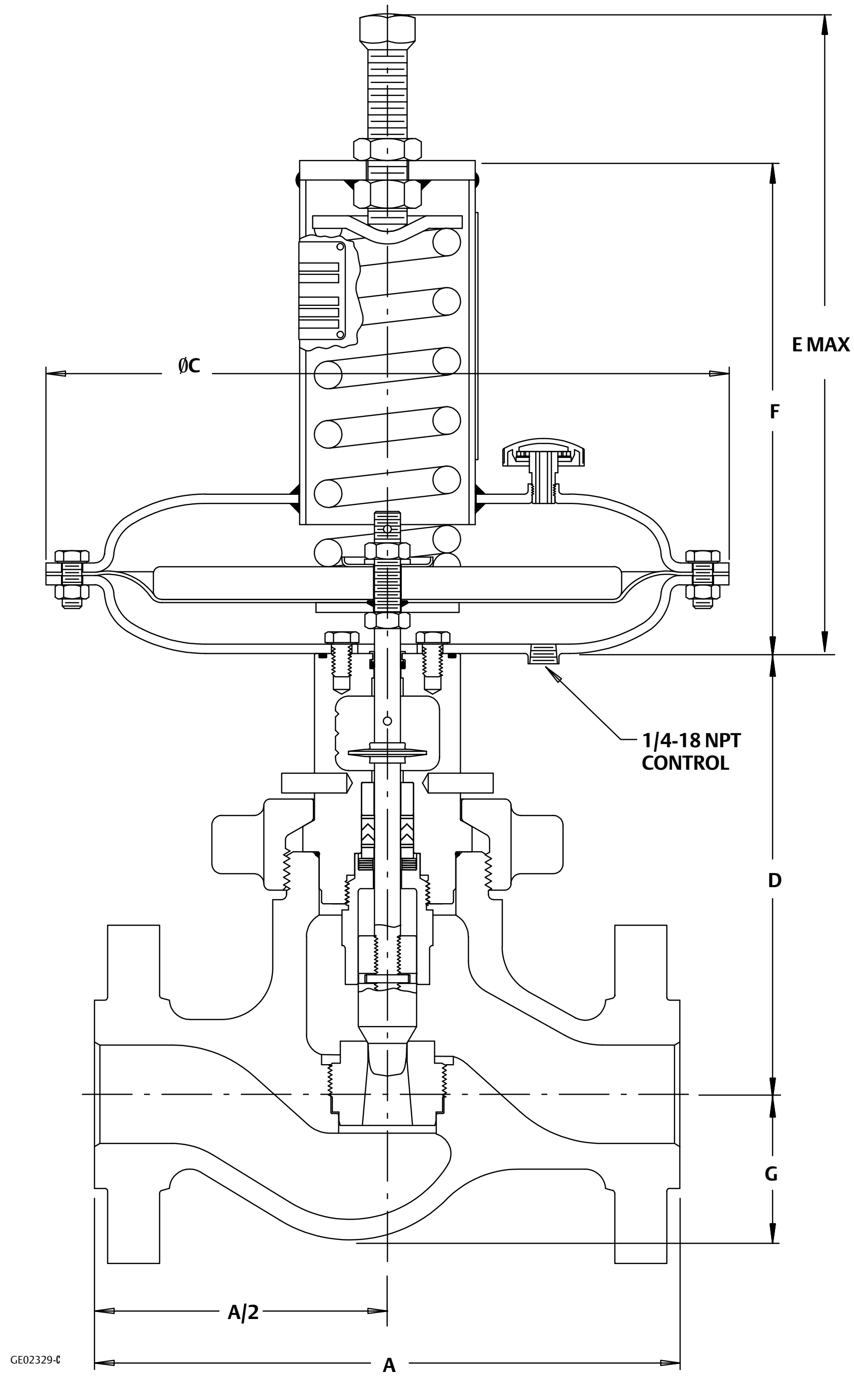


Figure 4. Fisher D4 Valve Dimensions, Spring-To-Open (also see tables 12 and 13)

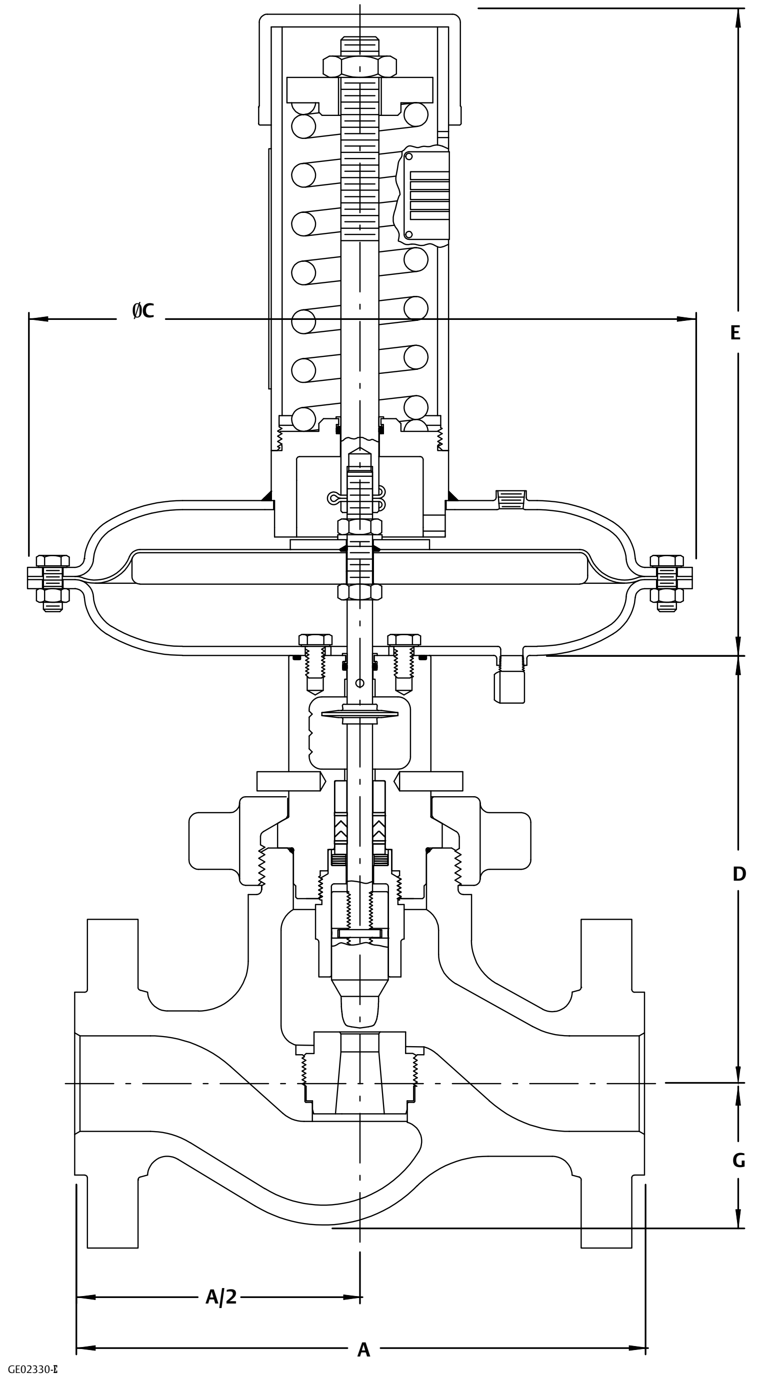
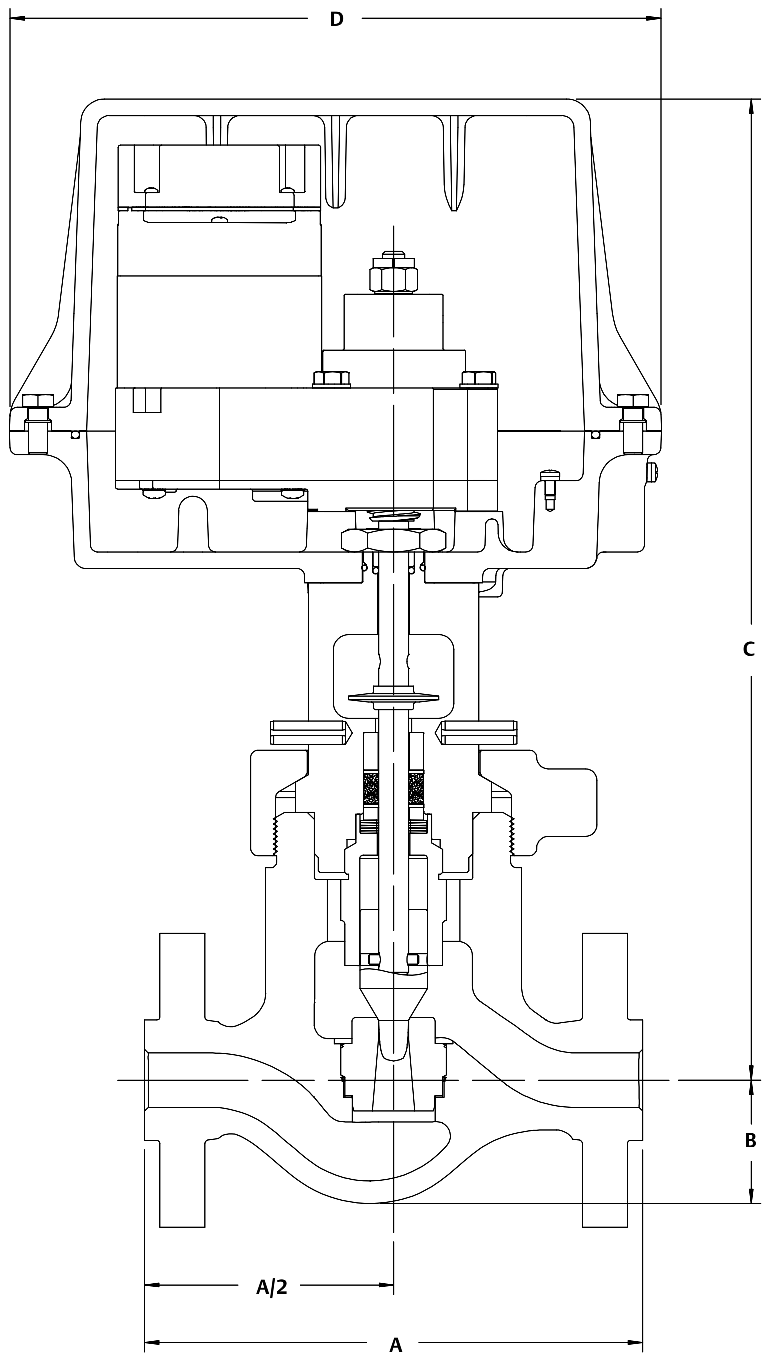


Figure 5. Fisher D4 Control Valve with easy-Drive Electric Actuator and NPS 2 Flanged Valve Body



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Fisher™ EH and EHA Control Valves

EH (globe)

■ EHS (NPS 1-1/2x1 through 8x6), ■ EHD (NPS 2 through 20), and ■ EHT (NPS 2 through 16x12)

EHA (angle)

■ EHAS (NPS 3 through 6), ■ EHAD (NPS 3 through 8), and ■ EHAT (NPS 3 through 8)

EH Series Valves

These valves are specially designed for high-pressure applications. Fisher EH valve configurations incorporate proven techniques in flow-stream contouring for higher capacities and in valve trim design for reliability in severe applications.

The temperature limits of EHT valves can be extended above 232°C (450°F) by using PEEK (PolyEtherEtherKetone) anti-extrusion rings in combination with a spring-loaded PTFE seal. The PEEK anti-extrusion rings expand to close off the clearance gap between the plug and the cage where the PTFE seal may extrude at high temperatures and pressures. The temperature limits are extended to 316°C (600°F) for non-oxidizing service and to 260°C (500°F) for oxidizing service.

Unless otherwise noted, all NACE references are to NACE MR0175-2002. Contact your Emerson sales office for information on NACE MR0175/ISO 15156 or NACE MR0103.

X1083-1

Fisher ET Valve with 685 Piston Actuator

W9768-3

Fisher EHT Valve with 585C Actuator

Features

- **Improved Cage Design**—Drilled-hole cages, offering excellent strength and additional resistance to destructive vibration, are standard. Special materials of construction are readily available.
- **Piping Economy**—The availability of expanded end connections on EH valves may eliminate the need for line swages while accommodating oversized piping arrangements.

- **O-ring Seat Ring Gasket Construction**—Use of O-ring construction provides excellent shut-off with minimal seat ring installation torques for temperatures up to 232°C (450°F). O-ring construction is standard on EHT valves. The flat sheet seat ring gasket construction is available for elevated design temperatures and/or NACE constructions where a suitable O-ring material is not available.

- **Increased Pressure/Temperature Ratings**—Steel EH and EHA valves with buttwelding end connections have Intermediate Standard Ratings. With nondestructive testing, these valves can conform to ASME Intermediate Special Ratings, which allow even higher pressure/temperature applications. See table 7 for specific ratings.

- **Long Trim Life**—Hardened materials of construction for the cage, valve plug, cage guiding, and other trim parts are standard for all applications, providing excellent wear resistance. In all applications, rugged cage guiding provides increased valve plug stability. Increased stability results in reduced vibration and other mechanical stresses, which contributes to long trim life.

- **Control of Low Flow Rates/Tight Shut-off**—Micro-Form or Micro-Flute valve plugs (figure 5 or 6) provide superb rangeability in high-pressure, low-flow applications. A choice of several restricted port diameters helps match valve capacity to required flow, helps provide necessary control with full travel, and helps prevent throttling near the seat.

1. For EHA valves only, and in low-flow applications where cavitation damage may occur, the Micro-Flat style valve plug can be used. For low-flow applications where cavitation damage may occur and the minimum required C_V is equal to or greater than 0.05, Cavitrol III with Micro-Flat trim can be used in both EH and EHA valves. Please contact your Emerson sales office for more information.

2. For soot-blower applications, a special trim design is available to address noise, vibration, tight shutoff, and thermal cycling which is seen in this application. Please contact your Emerson Automation Solutions sales office for more information.

- **High-Temperature, Class V Shutoff**—Use of the metal C-seal (see figure 17) permits Class V shutoff up to 593°C (1100°F) for up to 4-3/8 inch port in CL2500 rated valves and 5-3/8 inch port in CL1500 rated valves. The metal Bore Seal will permit Class V shutoff up 593°C (1100°F) for 5-3/8 inch ports and larger.

- **Excellent Stem Sealing**—HIGH-SEAL packing systems provide excellent sealing to conserve valuable or hazardous process fluid and to protect against the emission of hazardous or polluting fluids to atmosphere. This system (figure 1) features graphite packing material and heavy-duty live loading.

- **High Capacity**—Careful consideration of aerodynamic and hydrodynamic principles in the design of the flow stream passages results in 30 to 40 percent higher capacity than conventional valves with comparable port sizes and travels.

(continued on page 6)

Table of Contents

Specifications

Available Configurations

See table 1

Common Characteristics: EH valves are single-port, high-pressure, globe-style valves with metal seats, cage guiding, and push- down- to- close valve plug action. EHA valves are angle versions of EH valves
EHD/EHAD: Uses a balanced valve plug(1) with graphite valve plug piston rings; also, see tables 4 and 5
EHS/EHAS: Uses an unbalanced valve plug. For low-flow applications, smaller valve sizes are available with specialized valve plug designs. See tables 4(1) and 5
EHT/EHAT: Uses a balanced valve plug(1) with a pressure-assisted PTFE valve plug seal ring; also, see tables 4 and 5

NPS 20 Valve Rating

■ Intermediate Standard Class 2185 (per ASME B16.34) or ■ other ratings available per customer specifications

Valve Sizes

■ **Globe Valves:** Tables 4 and 6
■ **Angle Valves:** Table 5

End Connection Styles(2)

Buttwelding Ends (BWE): See table 6 for all available ASME B16.25 schedules that are compatible with ASME B16.34 pressure/temperature ratings
Flanged Ends: ■ CL900, ■ CL1500, or ■ CL2500 ■ ring-type joint (RTJ) or ■ raised-face (RF) flanges according to ASME B16.5. Flanged ends for EHA valves are available in CL900 and 1500 only
Socketweld Ends (SWE): See table 6 for those valve sizes available with socketweld end connections according to ASME B16.11 that are compatible with ASME B16.34

Maximum Inlet Pressures and Temperatures(2,3)

Consistent with applicable CL900, 1500, or 2500 pressure/temperature ratings (for EH valves) according to ASME B16.34 unless limited by individual temperature limits shown in the Material Temperature Capabilities specification(7) or in figure 20.

In addition, both steel EH and EHA valves with BWE connections have increased pressure/ temperature ratings as shown in table 7

Maximum Pressure Drops(3)

Valve With Standard Cage: See figures 20, 21, and 22
Valve With Cavitrol™ III Cage: 149 bar (2160 psi) for two-stage cage and 207 bar (3000 psi) for three-stage cage. Consult Fisher Bulletin 80.2:030, Fisher Cavitrol III One-, Two-, and Three-Stage Trims (D100196X012) for more information
Valve With DST Trim:
■ 103 bar (1500 psi) for three-stage trim,
■ 207 bar (3000 psi) for four-stage trim, and
■ 289 bar (4200 psi) for six-stage trim
Consult Fisher bulletin 80.2:021, Fisher Dirty Service Anti-Cavitation Trim (DST) (D102310X012) for more information
Valve With Whisper Trim™ III Cage:
0.999 $\Delta P/P_1$ maximum for levels A1 through D3
Valve with WhisperFlo™ Trim:
Levels X, Y, and Z: 0.999 $\Delta P/P_1$ maximum

Construction Materials

All Except NPS 20 Valve
Body and Bonnet: ■ WCC steel, ■ LCC steel, ■ WC9 chrome-moly steel, ■ C12A chrome-moly alloy, or ■ CF8M (316 SST or 316H SST for service above 538°C [1000°F])
Trim: Trim materials are listed in table 10 and 11. Special materials for trim and valve body are available. Please consult your Emerson sales office
Other Parts: See tables 12 and 13
Yoke Temperature Limit (NPS 8 to 20 Valves): Standard bonnet with cast iron yoke is limited to 537°C (1000°F)

NPS 20 Valve
Valve Body and Bonnet: SA 217 Grade WC9 steel
Cage: Cast M152 SST
Valve Plug: CF8M (316 stainless steel) with alloy 6 seat and guide
Seat Ring: CF8M with CoCr-A (alloy 6) seat or N06600 with CoCr-A seat
Seat Ring Bolting: N07718
Valve Stem: ■ SA 286 Grade 660 Condition 2 stainless steel or ■ other materials upon request
Piston Rings: Graphite
Cage & Seat Ring Gaskets: Silver-plated N04400
Body/Bonnet Bolting: ■ B7/2H, ■ B16/Gr-7
Packing Rings: Carbon/graphite composition, graphite, and zinc
Packing Box Bushing: Graphite
Packing Box Flange, Studs, and Nuts: S31600 (316 stainless steel) (other materials are available on request)
Packing Springs: ■ G61500 (6150 steel), ■ S17700 (17-7 stainless steel), or ■ N07718

Shutoff Classifications

See table 9

For NPS 20 valves, one-half of Class IV leakage (0.005% of valve capacity at full travel) per ANSI/FCI 70-2 and IEC 60534-4

- continued -

Specifications (continued)

Material Temperature Capabilities(3)

EHD/EHAD and EHS/EHAS: Up to 593°C (1100°F) unless limited by selection of standard trim materials (table 10 and 11 and figures 20, 21, and 22), Cavitrol III and Whisper Trim III trim materials (table 10), or other parts (table 12)
EHT/EHAT: Up to 316°C (600°F) unless limited by selection of standard trim materials (tables 10 and 11 and figures 20, 21, and 22), Cavitrol III and Whisper Trim III trim materials (table 10), or other parts (tables 12 and 13)

Flow Characteristic

Standard Cage: ■ Equal percentage, ■ modified equal percentage(4), or ■ linear
Micro-Form Valve Plug (for EHS and EHAS only):
■ Equal percentage or ■ modified equal percentage(4).
Micro-Flute Valve Plug (for EHS and EHAS only):
■ Equal percentage or ■ modified equal percentage(4)
Micro-Flat Valve Plug (EHAS only): ■ Linear
Cavitrol III, Whisper Trim III, or WhisperFlo: ■ Linear
Special cages: Special characterized flow characteristic cages are available. Please consult your local Emerson sales office

Flow Direction

Standard Cage
■ *EHD:* Normal flow down(8)
■ *EHS:* Normal flow up(5)
■ *EHT:* Normal flow down(8)
■ *EHAD:* Normal flow down
■ *EHAS:* Normal flow up
■ *EHAT:* Normal flow down

Cavitrol III Cage: Flow down

Whisper Trim III cage: Flow up

WhisperFlo Trim: Flow up

For NPS 20 Valves: ■ Flow up through seat ring and out through cage openings (for standard and Whisper cages)

Flow Coefficients

See Fisher Catalog 12 section 1

Noise Levels

See Fisher Catalog 12, section 3 for noise predictions methods

NPS 20 Valve Maximum Flow Coefficient

Approximately 92,000 C_g or 2600 C_v for modified equal percentage characteristics

Port Diameters

See tables 17 and 18 for NPS 1 through 6 for NPS 1 through 6

NPS 8 and 10x8 Valves
CL1500: 178 mm (7 inch) port diameter
CL2500: 137 mm (5.375 inch) port diameter
NPS 12, 14, and 14x12 Valves
CL1500: 254 mm (10 inch) port diameter
CL2500: 178 mm (7 inch) port diameter
NPS 16x12 Valves
CL1500: 254 mm (10 inch) port diameter
CL2500: 254 mm (10 inch) port diameter
NPS 20 Valves: 355.6 mm (14 inches)

Valve Plug Travel and Stem Diameters(9)

See tables 14, 17, and 18

5 Inch H(10) Boss Diameter: 31.8 mm (1.25 inches) stem diameter
7 Inch Boss Diameter: 50.8 mm (2 inches) stem diameter
NPS 20 Valves: *Valve Plug Travel:* 85.7 mm (9.125 inches)
Valve Stem Diameter: 50.4 mm (2 inches)

Bonnet Style

■ Standard bonnet (figures 3 and 4) for all valve sizes, standard bonnet with cast iron yoke is limited to 537°C (1000°F)
■ Optional Style 1 extension bonnet for NPS 1 and 2 globe valves, see figure 24

Packing Arrangements

■ Single, ■ double, and ■ leakoff standard packing arrangements, or optional ■ HIGH-SEAL packing systems; see Fisher Bulletin 59.1:061, ENVIRO-SEAL™ and HIGH-SEAL Packing Systems for Sliding-Stem Valves (D101633X012)

- continued -

Specifications (continued)

Yoke Boss Diameters for Actuator Mounting

See table 19

NPS 8 and 10 CL2500 Valves: 127 mm (5 inch H[10]) yoke boss diameter
All Other Sizes and Ratings: ■ 127 mm (5 inch H[10]) or ■ 178 mm (7 inch) yoke boss diameter
NPS 20 Valve: 178 mm (7 inches)

Approximate Weight

See tables 20 and 21

Optional Safety Instrumented System Classification

■ **EHD, EHS, and EHT:** SIL3 capable for NPS 1-1/2 through 20 - certified by exida Consulting LLC
■ **EHAD, EHAS, and EHAT:** SIL3 capable for NPS 3 through 8 - certified by exida Consulting LLC

Options

■ Flat sheet seat ring gasket constructions[6], ■ driver for removing and installing of seat ring retainer, ■ Class V shutoff for EHT above 232°C (450°F) to 316°C (600°F) by using PEEK anti-extrusion rings, ■ Class V shutoff for EHD up to 593°C (1100°F) using C-seal trim or Bore Seal (refer to table 9, ■ lubricator/isolating valve for packing lubrication, and ■ liner with integral seat ring (EHA Series valves only)

Options for NPS 20 Valve

Tool Kit: Includes tools useful during maintenance [3 sets of lifting eyes, 2 hoist rings, flushing plate with either ■ two O-rings for use when flushing fluid is 149°C (300°F) or less or ■ two silver-plated N04400 gaskets for use when flushing fluid is over 149°C (300°F), valve stem lifting nut, lapping fixture and handle, and tamping tools]
Special Cage Characterization: Standard, Cavitrol, or Whisper Trim cage openings as necessary to provide the required installed flow characteristic

1. In flow up applications only, NPS 6-14 EHD and EHT and NPS 8 EHAD and EHAT valves are available with a diverter cone valve plug construction to provide increased stability for higher pressure drops. See figures 7 and 12. Diverter cone valve plug construction is also used for NPS 6 EHD and EHT and NPS 8 EHAD and EHAT requiring Whisper Trim III Level A, B, or C cages.
2. EN (or other) ratings and end connections can usually be supplied; please consult your Emerson sales office.
3. The pressure or temperature limits in this bulletin and any applicable standard limitations should not be exceeded.
4. Modified equal percentage characteristic is equal-percentage for the first 90% of travel, then quick-opening for additional capacity.
5. EHS may be used for flow down in special cases. Please consult your sales office. NPS 1 and 2 valves with Micro-Form plugs can only be used for flow up applications
6. O-ring seat ring gasket construction is preferred where temperature allows and is standard for EHT valves. See table 12.
7. For temperatures above 204°C (400°F), the following CF8M (316 SST) valves must be derated: NPS 8 and 10 ASME Special CL1500 or 2500 valves; NPS 12 and 14 ASME Standard or Special CL2500 valves. For more information, contact your sales office.
8. NPS 8 to 14 flow up for boiler feedwater service with pressure drop greater than 69 bar (1000 psi) when a diverter plug is used.
9. Valves using an equal percentage cage may be traveled an additional 13 mm (0.5 inch) if desired to obtain additional capacity; flow characteristic becomes modified equal percentage.
10. H indicates heavy actuator-to-body bolting.

Features (continued)

- Long Thermal-Cycle Life—The seat ring design minimizes operational stresses, thereby reducing chances of distortion and resultant leakage caused by temperature cycling. The hung cage design allows thermal expansion of the cage without affecting the seat ring gasket loading.
- Operational Economy—Balanced trim constructions reduce forces acting on the valve plug, reducing actuator thrust requirements and permitting the use of smaller actuators. This makes the NPS 8 -14 EH Series valves economical for high-pressure, high-flow service. Actuator selection for NPS 20 valves can be made from electromechanical or electrohydraulic styles that use readily available power sources.
- Reliability—All aspects of the control valve (material selection, trim components, packing, and control accuracy) are designed, built, and tested to assure performance and reliability. Extensive metallurgical evaluation results in state-of-the-art cage, valve plug, and stem materials that help ensure trim life and dependable performance.
- Control Accuracy—The NPS 20 cage and valve plug deliver accurate control of high pressure and high capacity flow. Each cage has milled openings and is flow tested for the required flow characteristic. With precise cage openings, accurate installed characteristics result; valves in parallel have the same flow at the same plug position. The cone-shaped plug reduces fluid turbulence, ensure plug stability, and aids positioning accuracy.
- Easy Maintenance—The bonnet lifts off to allow trim access. The separate seat ring and cage allow parts removal and maintenance. The globe configuration reduces the uneven trim wear and resultant maintenance downtime normally associated with slant configurations. Installation with the stem vertical above the bonnet also makes trim removal and installation easy.
- Control Flexibility—Special cage characterization (standard, Whisper Trim, or Cavitrol trim) can be supplied to satisfy almost any combination of flow and noise or cavitation abatement. Cage characterization and efficient flow passages provide close control for low flow, high pressure drop and high flow, low pressure drop conditions. A choice of actuator styles allows wide selection of power and control capabilities.

Figure 1. Typical HIGH-SEAL Packing System

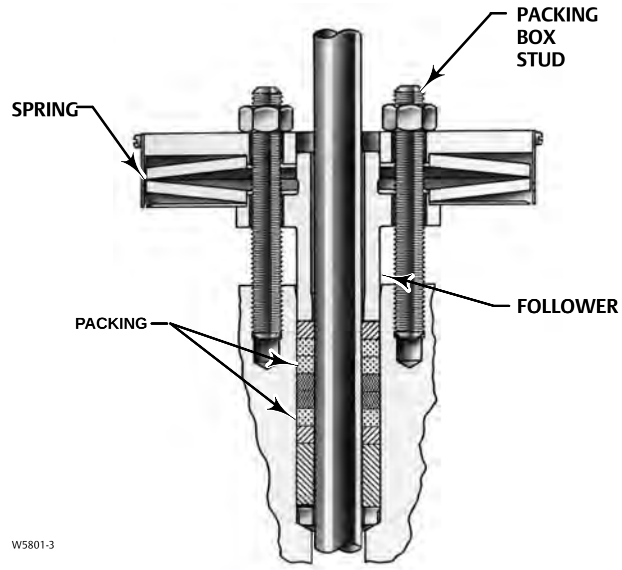
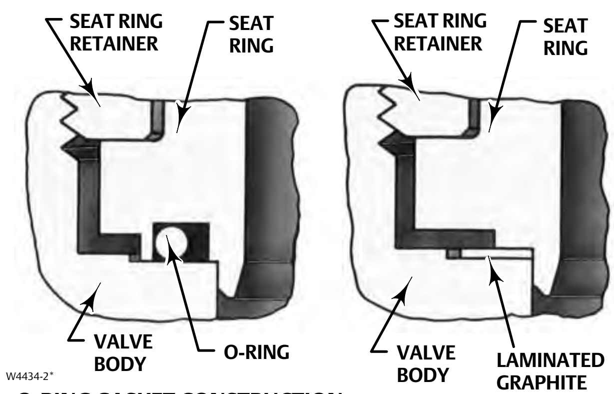


Figure 2. Seat Ring Gasket Constructions



O-RING GASKET CONSTRUCTION, STANDARD CONSTRUCTION FOR EHT, CAVITROL TRIMS, AND SOUR SERVICE 1

LAMINATED GRAPHITE GASKET CONSTRUCTION

NOTES:
1 Preferred for all other body constructions where temperature allows.

Table 1. Availability Chart

Valve Size, NPS[1]	CL1500	CL1500 Intermediate	CL2500	CL2500 Intermediate
1-1/2 x 1	- - -	- - -	EHS	EHS
2 x 1	- - -	- - -	EHS	- - -
2	- - -	- - -	- - -	EHD, EHS, EHT
3 x 2	- - -	- - -	EHD, EHS, EHT	EHD, EHS, EHT
3	- - -	EHAD, EHAS, EHAT	EHD, EHS, EHT EHAD, EHAS, EHAT	EHD, EHS, EHT EHAD, EHAS, EHAT
4 x 3	- - -	- - -	EHD, EHS, EHT	- - -
4	- - -	EHAD, EHAS, EHAT	EHD, EHS, EHT EHAD, EHAS, EHAT	EHD, EHS, EHT EHAD, EHAS, EHAT
6 x 4	- - -	- - -	EHD, EHS, EHT	- - -
6	- - -	EHAD, EHAS, EHAT	EHD, EHS, EHT EHAD, EHAS, EHAT	EHD, EHS, EHT EHAD, EHAS, EHAT
8 x 6	- - -	- - -	EHD, EHS, EHT	- - -
8	EHD, EHT	EHD, EHT EHAD, EHAT	EHD, EHT EHAD, EHAT	EHD, EHT
10 x 8	EHD, EHT	EHD, EHT	EHD, EHT	EHD, EHT
12	EHD, EHT	EHD, EHT	EHD, EHT	EHD, EHT
14	- - -	- - -	EHD, EHT	- - -
14 x 12	EHD, EHT	EHD, EHT	EHD, EHT	EHD, EHT
16 x 12	- - -	- - -	EHD, EHT	- - -
20	EHD	- - -	EHD[2]	- - -

1. Two numbers indicate end connection by nominal valve size. For example, 3 x 2 indicates 3 inch end connection with NPS 2 valve size.
2. CL2185

Table 2. Liquid Flow Coefficients, C_v, at Maximum Travel with Equal Percentage Cage (Modified Equal Percentage Characteristic) (NPS 8 through 14 Valves)[1]

VALVE DESIGN	PRESSURE RATING	VALVE SIZE, NPS	
		8 and 10x8	12 and 14x12
EHD, EHT	CL1500	912	1830
	CL2500	584	1010

1. See Fisher Catalog 12 for additional sizing data.

Figure 3. NPS 3 Fisher EH Valve with 657 Actuator

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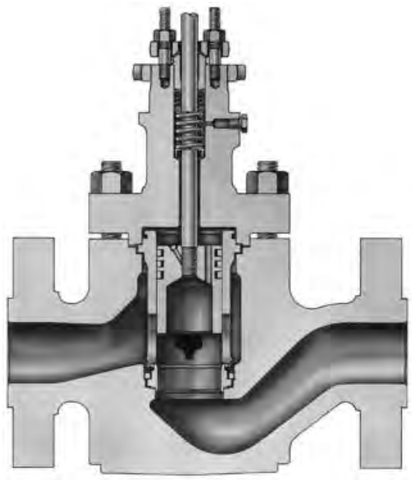
Figure 4. Fisher EHD Valve Body Assembly



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NPS 1-1/2 x 1 through 6 Globe Valves NPS 3 through 8 Angle Valves

EH Series valves (figure 3) offer higher capacities, rugged cage guiding, hardened trim materials, and are available with special trims for noise attenuation and cavitation abatement. An EH valve package can be created for specific service conditions from a variety of special features, including oversized ends, intermediate ratings, special trim materials, and special trim configurations.

Because of flow capacity and severe service capabilities, both EH and EHA valves are used for many high-pressure applications in process industries such as power generation, hydrocarbon production, chemical processing, and refining.

The EHD (figure 4) uses a balanced valve plug and is well suited for general applications where extremely tight shutoff is not required.

The EHS (figures 5 and 6) has an unbalanced valve plug and provides up to Class V shutoff.

The EHT has a balanced valve plug and offers up to Class V shutoff with process temperatures below 232°C (450°F).

EHA valves — EHAD, EHAT, and EHAS — are angle versions of the EH valve.

EH valves are available in CL2500 ratings. EHA valves are available in CL2500. Because these valves feature a thicker body wall, both EH and EHA valves are available with intermediate ratings. See the Features section in this bulletin.

EHA valves provide many of the same features available with EH valves. One important feature is the availability of special trims for aerodynamic noise attenuation, for cavitating liquid service, and for sour service.

Trims (NPS 1-1/2 x 1 through 6 Globe Valves)

Figure 5. Fisher EHS Trim with Micro-Form Valve Plug

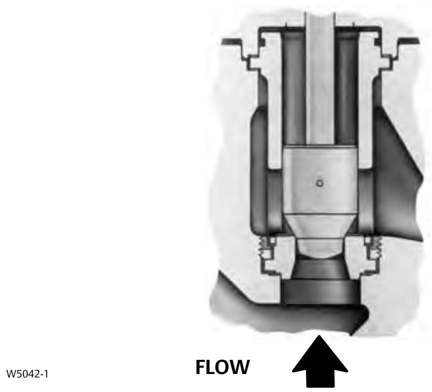


Figure 6. Fisher EHS Trim with Micro-Flute Valve Plug

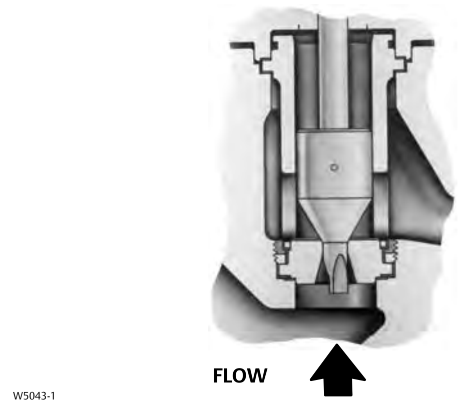
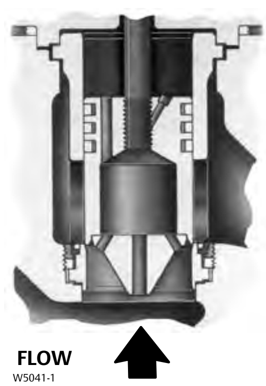


Figure 7. Diverter Cone Plug Used in NPS 6 Fisher EHD and EHT Valves (Flow Up Only)



NOTE: Diverter cone valve plug used for flowing ΔP> 207 bar (3000 psi) or for Whisper Trim III Level A, B, or C cages.

Figure 8. Fisher EHD Valve Assembly (NPS 8 through 14 Globe Valves)

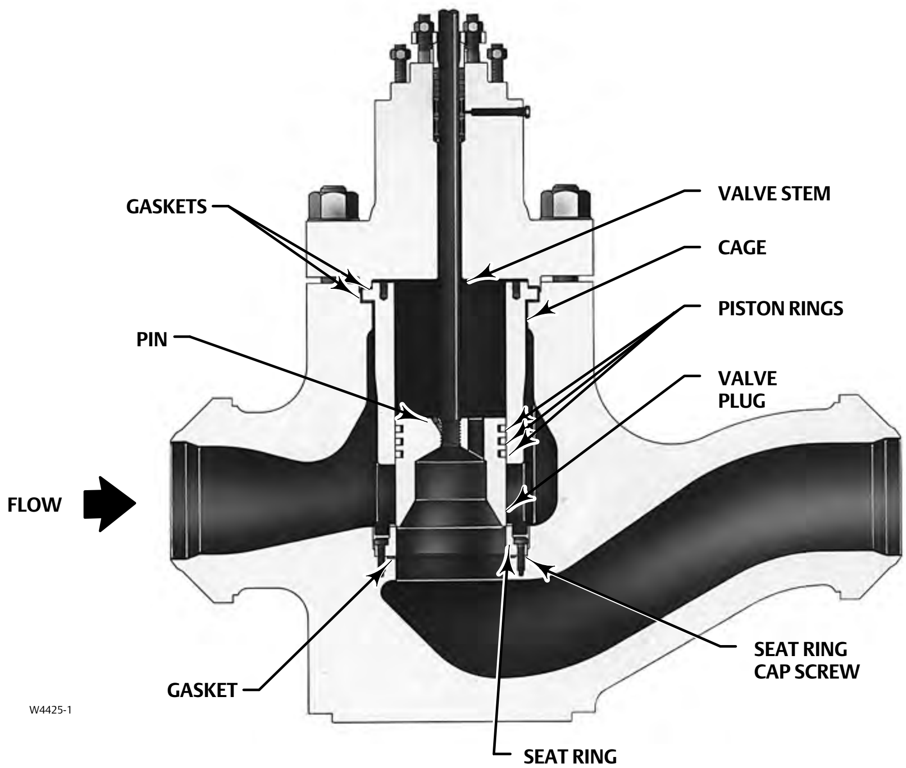


Figure 9. NPS 8 Fisher EH Valve with Welded Pipe Expanders and 585C Actuator

NPS 8 through 14 Globe Valves

EH Series control valves (figure 9) are large, high-pressure globe valves that incorporate proven techniques in flow-stream contouring and in seat ring and valve plug design. These features, along with rugged cage guiding and hardened trim materials, make the EH Series valves reliable high-capacity valves.

These valves are used for many high-pressure applications in the power, process, oil production, chemical, refining, and other industries. The EHD valve (figure 8) is well-suited to general applications where extremely tight shutoff is not required, and the EHT valve (figure 10) offers up to Class V shutoff for applications with relatively low process temperatures.

Principle of Operation (NPS 8 through 14 Globe Valves)

EHD and EHT valves, shown in figures 8 and 10, are balanced valve designs. When the valves are opening or closing, pressure registers on top of the valve plug through the balancing holes in the plug. The force of the pressure on top of the plug balances the force of the pressure on the bottom of the plug to reduce the actuator force required.

Figure 10. Fisher EHT Trim (NPS 8 through 14 Globe Valves)

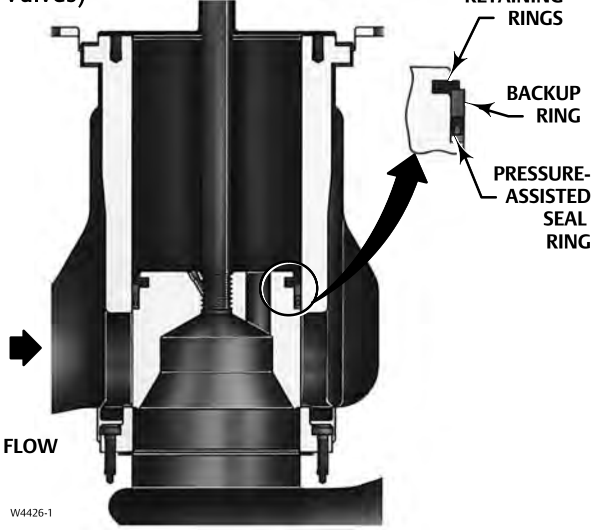
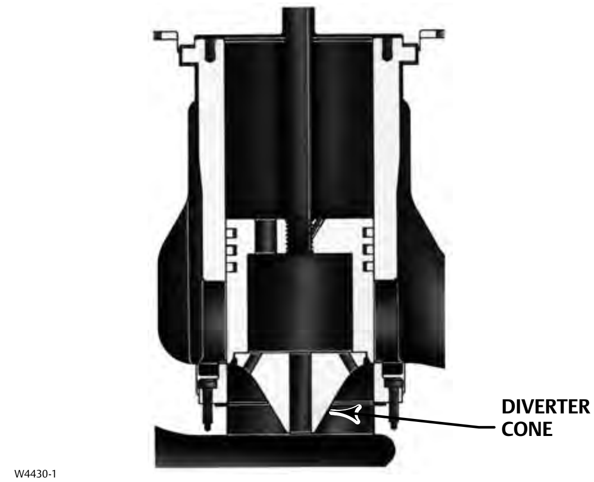


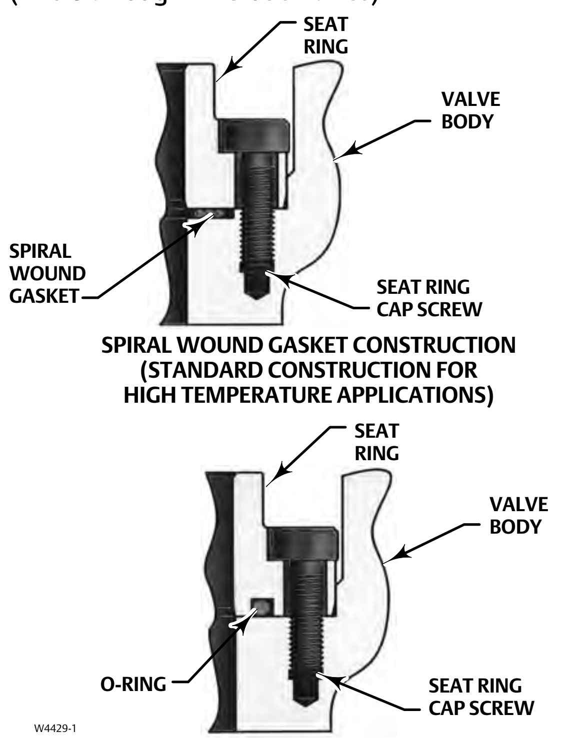
Figure 11. Fisher EHD Trim with Whisper Trim III Level D Cage (NPS 8 through 14 Globe Valves)

Figure 12. Diverter Cone Valve Plug Used in Fisher EHD and EHT Valves (NPS 8 through 14 Globe Valves, Flow Up Only)



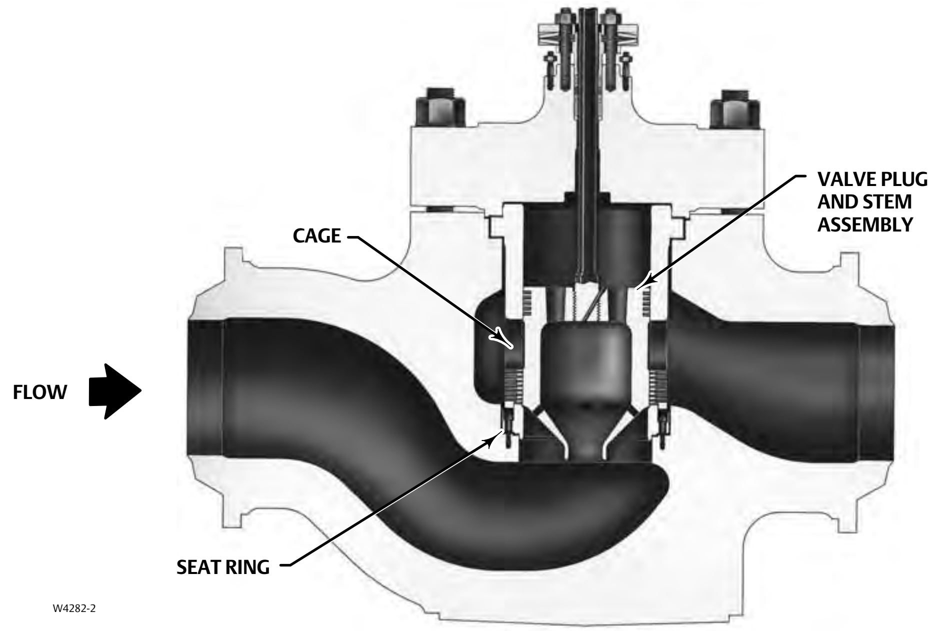
DIVERTER CONE VALVE PLUG USED IN BOILER FEEDWATER SERVICE FOR FLOWING ΔP> 1000 PSI (69 BAR) AND IN OTHER APPLICATIONS FOR FLOWING ΔP> 138 BAR (2000 PSI) OR FOR WHISPER TRIM III LEVEL A, B, OR C CAGES

Figure 13. Seat Ring Gasket Constructions (NPS 8 through 14 Globe Valves)



O-RING GASKET CONSTRUCTION (STANDARD CONSTRUCTION FOR SOUR SERVICE AND OPTIONAL FOR OTHER VALVE CONSTRUCTIONS)

Figure 14. Sectional of NPS 20 Fisher EHD Control Valve Assembly



NPS 20 Globe Valves

The NPS 20 EHD control valve (figure 15) is a large, high-pressure, single-port, globe valve designed to closely and dependably control high-pressure, high-temperature media in the power and hydrocarbon industries. For example, NPS 20 EHD control valves are used in sliding pressure systems to control high-pressure steam in fossil-fueled power plants.

Advanced, yet successfully field-proven, the NPS 20 EHD control valve usually incorporates special design features to satisfy specific customer requirements. For example, figure 14 illustrates a specially characterized cage. Both Whisper Trim cage holes and large cage windows provide the customer-required flow characteristic. Additionally, the drilled Whisper Trim holes in the cage provide noise abatement.

Standard construction details such as the cone-shaped valve plug and stem assembly, separate seat ring, and HIGH-SEAL packing arrangement are also shown in figure 14.

Figure 15. NPS 20 Fisher EHD Valve with Electromechanical Actuator

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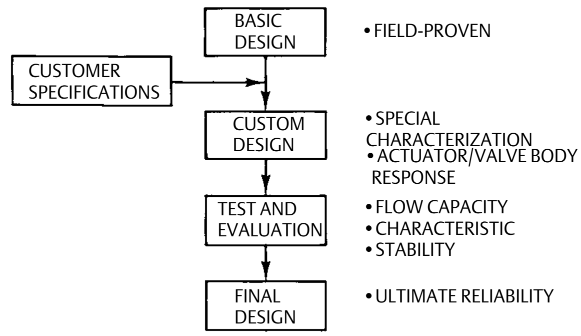
Figure 16. Custom Design Sequence (NPS 20 Globe Valves)



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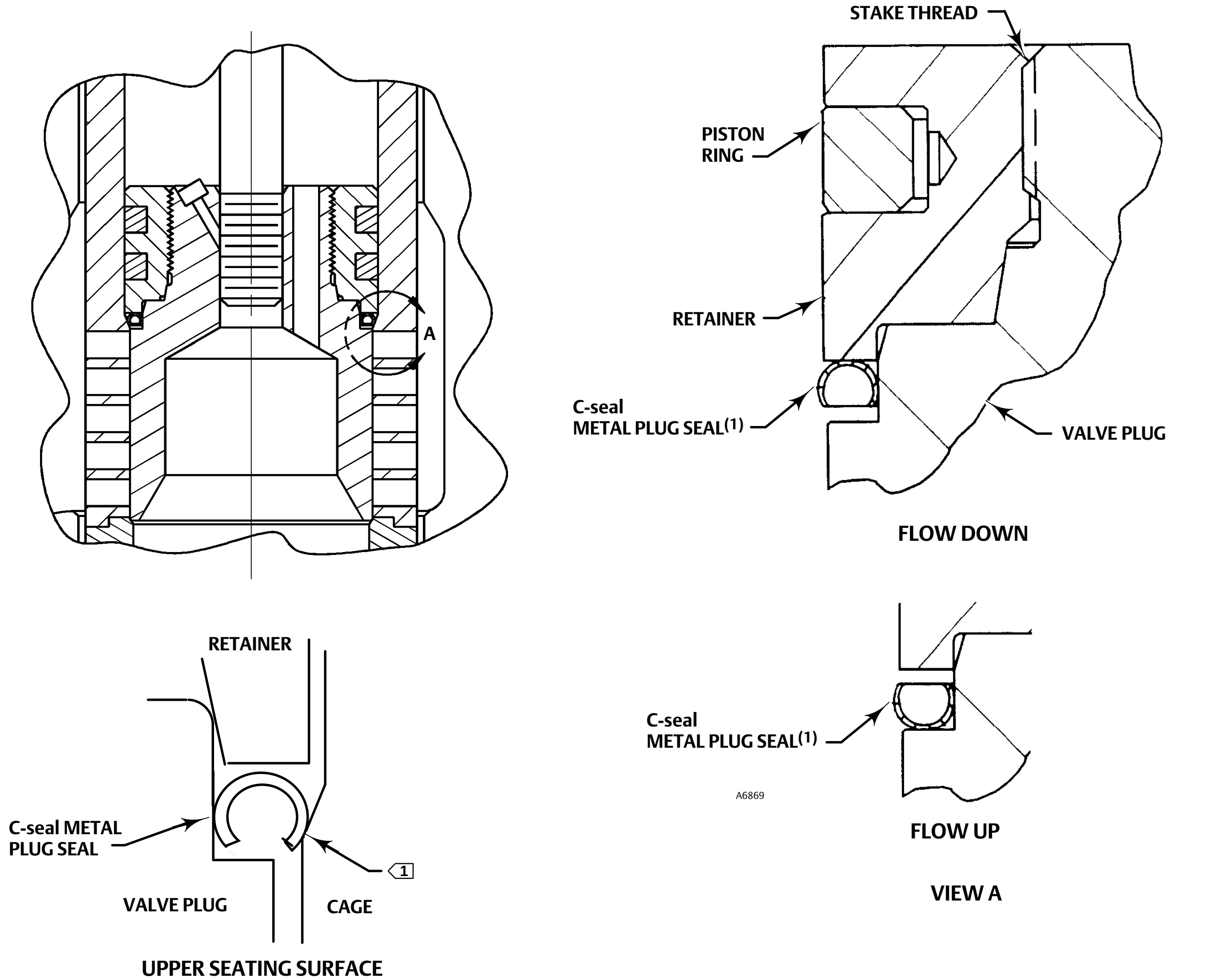
Custom Design Capability (NPS 20 Globe Valves)

Sliding pressure systems, as well as other control systems, have specific performance characteristics that require special control valve constructions. These special constructions must perform dependably and provide accurate system operation and plant reliability.

As shown in figure 16, the basic NPS 20 EHD valve configuration can be designed to meet customer specifications. Special cage characterization and actuator/valve response characteristics can be designed and then confirmed through exhaustive testing and evaluation. Flow testing of these large valves takes place at the Emerson Innovation Center, Fisher Technology, the largest facility of its kind in the world.

The final control valve assembly provides reliable, dependable performance. This performance delivers controllability for not only the control valve but also the plant control system, sliding pressure or otherwise.

Figure 17. C-seal Trim

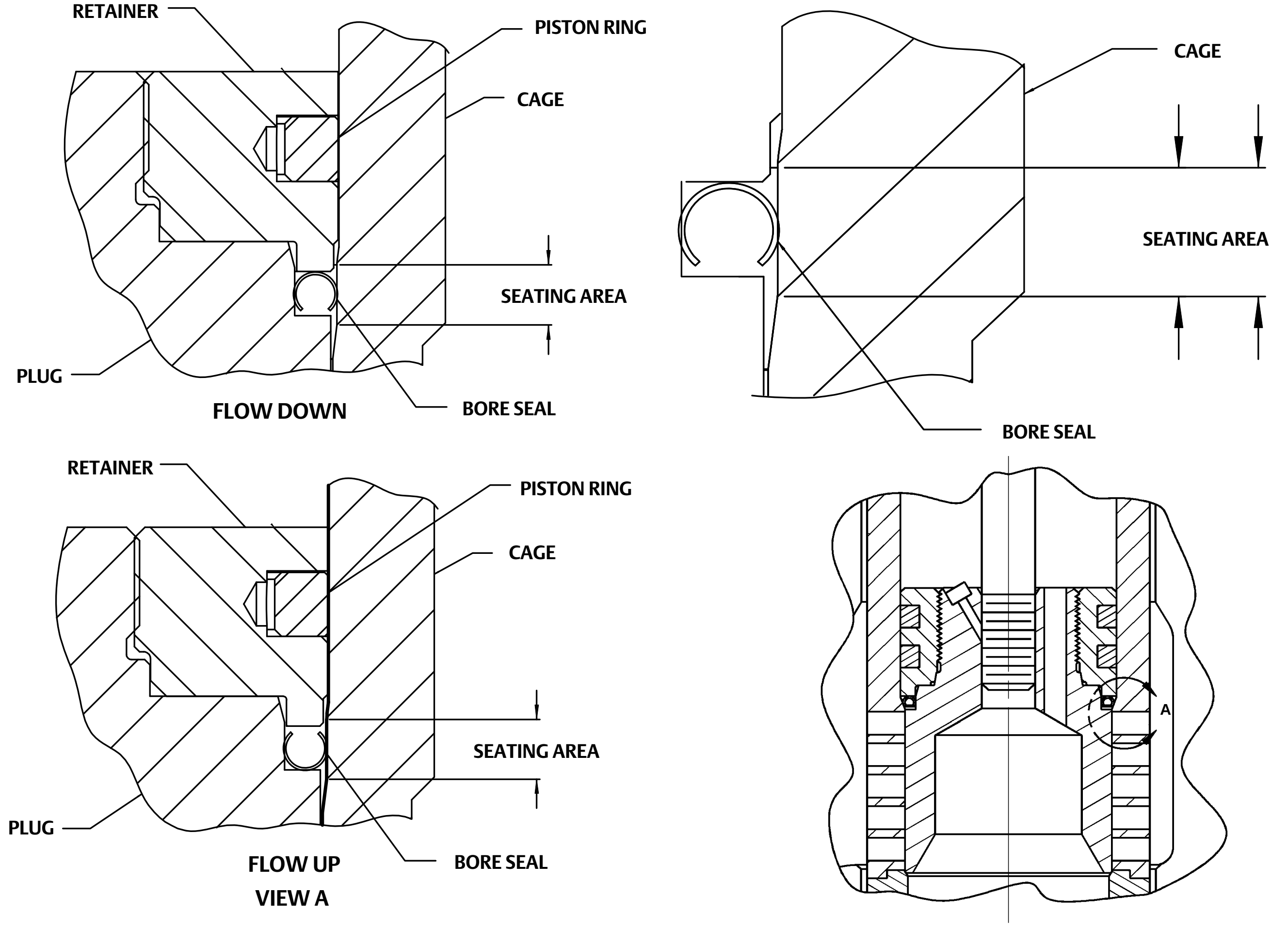


NOTES:
1 Reverse the orientation of the C-seal plug seal for proper shutoff when valve is used in a process with different fluid flow direction.

C-seal Trim Description

With C-seal trim, a balanced valve can achieve high-temperature, Class V shutoff. Because the C-seal plug seal is formed from metal (N07718 nickel alloy) rather than an elastomer, a valve equipped with the C-seal trim can be applied in processes with a fluid temperature of up to 593°C (1100°F).

Figure 18. Bore Seal



Bore Seal Description

The Bore Seal (figure 18) is available for the EHD only and employs a variation of the proven C-seal trim with enhancements for use with the larger port EH hung cage. The Bore Seal is required for Class V shutoff applications where the service temperature exceeds 316°C (600°F). See table 3 for availability and temperature limits.

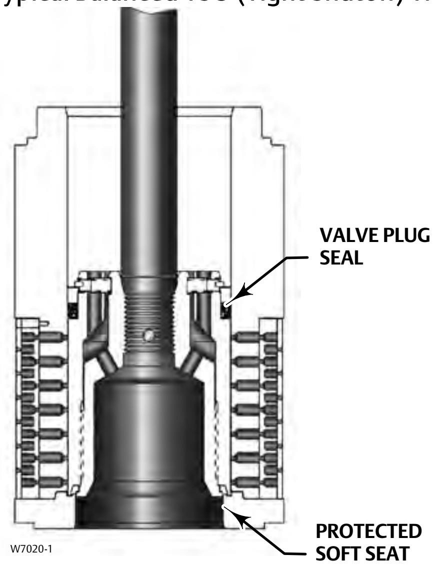
The Bore Seal employs a metal C-shaped seal ring that is secured to the outside diameter of the valve plug. When the valve plug comes into contact with the seat ring to close the valve, the Bore Seal is compressed against the cage wall, thereby blocking a secondary leakage path that exists between the plug and cage wall. When the valve plug is not in contact with the seat ring (i.e. valve open), the Bore Seal is not engaged and the piston rings that are also secured to the outside diameter of the plug assume the role of blocking this secondary leakage path.

Table 3. Bore Seal Availability and Temperature Limits (EHD only)

VALVE (PRESSURE CLASS)	VALVE SIZE, NPS	TRIM DESIGNATION(1)	VALVE BODY MATERIAL	TEMPERATURE LIMIT		ANSI/FCI/IEC SHUTOFF CLASS
				°C	°F	
EHD (CL1500 - CL2500)	8, 10, 12, and 14	75	WCC/WC9	-29 to 427	-20 to 800	V
		95	WCC	315 to 427	600 to 800	
			WC9	315 to 593	600 to 1100	
		96	WCC/WC9	-29 to 427	-20 to 800	

1. See tables 11 and 13 for materials.

Figure 19. Typical Balanced TSO (Tight Shutoff) Trim



Fisher TSO (Tight Shutoff) Trim Capabilities

TSO trim consists of a protected soft seat plus PEEK anti-extrusion rings with a spring-loaded PTFE plug seal. Used only in flow down applications, TSO trim offers unparalleled shutoff integrity, resulting in long plug and seat life.

See figure 19 and tables 8 and 9. For additional information contact your Emerson sales office.

Table 4. Available Globe Valve Configurations and Valve Sizes[1] (NPS 1-1/2 x 1 through 6 Globe Valves)

AVAILABLE CONFIGURATIONS			VALVE SIZES (NPS) AND PRESSURE RATING					
Valve Design	Valve Plug Style	Cage Style	1-1/2 x 1, 2 x 1	2	3 x 2	3, 4 x 3	4, 6 x 4	6, 8 x 6
			CL2500	CL3273	CL2500	CL2500	CL2500	CL2500
EHS	Micro-Form	Quick-Opening[2]	X	X	X	---	---	---
	Standard	Standard[3]	---	X	X	X	X	X
		Whisper Trim III	---	X	X	X	X	X
		Cavitrol III: 2-stage 3-stage	 X ---	 --- X	 --- X	 --- ---	 --- ---	 --- ---
EHT	Standard	Standard[3]	---	---	X	X	X	X
		Whisper Trim III	---	---	X	X	X	X
		Cavitrol III: 2-stage 3-stage	 --- ---	 --- ---	 X ---	 X X	 X X	 X X
EHD	Standard	Standard[3]	---	---	X	X	X	X
		Whisper Trim III	---	---	X	X	X	X

X—Indicates available construction.
1. Two numbers indicate end connection by nominal valve size. For example, 3 x 2 indicates 3 inch end connection with NPS 2 valve size.
2. Linear cage used on NPS 2 and 3 x 2 valves.
3. Standard cages are equal percentage, modified equal percentage, and linear cages.

Table 5. Available Angle Valve Configurations and Valve Sizes (NPS 1 through 6 Angle Valves)

AVAILABLE CONFIGURATIONS			VALVE SIZES (NPS) AND PRESSURE RATING	
Valve Design	Valve Plug Style	Cage Style	1 - 4	6(4)
			CL2500	CL3230
EHAS	Micro-Form	Quick-Opening(1)	X(3)	- - -
	Micro-Flute	Quick-Opening	- - -	- - -
	Standard	Standard(2)	X	X
		Whisper Trim III	X	X
		Cavitrol III: 2-stage 3-stage	- - - - - -	- - - - - -
EHAT	Standard	Standard(2)	X	X
		Whisper Trim III	X	X
		Cavitrol III: 2-stage 3-stage	X X	X X
EHAD	Standard	Standard(2)	X	X
		Whisper Trim III	X	X

X—Indicates available construction.
1. Linear cage used on NPS 2 and 3 valves.
2. Standard cages are equal percentage, modified equal percentage, and linear cages.
3. Not available in NPS 4 and larger.
4. Intermediate CL3230. Contact your Emerson sales office.

Table 6. Globe Valve Sizes and End Connection Styles(1) (NPS 1-1/2 x 1 through 6 Globe Valves)

VALVE SIZE, NPS	CL2500(2)					
	BWE			SWE	RTJ	RF
	SCH 80	SCH 160	SCH XXS			
1-1/2 x 1	X	- - -	X	X	X	X
2 x 1	X	- - -	X	X	X	X
2(3)	- - -	- - -	X	- - -	- - -	- - -
3 x 2	X	- - -	X	- - -	X	X
3	X	- - -	X	- - -	X	X
4 x 3	X	- - -	X	- - -	X	X
4	X	- - -	X	- - -	X	X
6 x 4	X	- - -	X	- - -	X	X
6	X	- - -	X	- - -	X	X
8 x 6	X	X	- - -	- - -	X	X

X—Indicates available construction.
1. EN (or other) ratings and end connections can usually be supplied; consult your Emerson sales office.
2. For valve ratings of EH Series valves with BWE connections, refer to separate bulletin. Increased Pressure/Temperature Ratings for EH Series and EW Series Steel Valves (D100075X012 or D100076X012).
3. Intermediate CL3273 only.

Table 7. Increased Pressure/Temperature Ratings for Steel Fisher EH Series Globe Valves with Buttwelding End Connections(1)

VALVE SIZE, NPS	CL1500	CL2500
	Intermediate Rating (ASME B16.34)	Intermediate Rating (ASME B16.34)
1	- - -	3862(2)
1-1/2 x 1	- - -	3021
2	- - -	3273
3	- - -	2932
4	- - -	3294
6	- - -	2987
8	1866	2943
10x8	1568	2522
12	1650	2940
14 x 12	1650	2754

1. See Fisher bulletin 59.1:026 (D100075X012) for additional information.
2. Intermediate rating of 4080 is available with special bolting materials in most valve body materials. Contact your Emerson sales office.

Table 8. Port Diameters, Valve Plug Travel, Yoke Boss Diameters for TSO (Tight Shutoff) Trim

VALVE DESIGN	TRIM	MAX TRAVEL		YOKE BOSS SIZE		PORT DIAMETER				C_V REDUCTION AT 100% TRAVEL[1]
						Nominal		Actual TSO		
		mm	Inch	mm	Inch	mm	Inch	mm	Inch	
EHT NPS 6	CAV III 3-Stage CL2500	95.3	3.75	90 127	3-9/16 5	111	4.375	106	4.1875	0%
EHT NPS 6	Std CL2500	76.2	3	90 127	3-9/16 5	111	4.375	106	4.1875	5% (linear) 5% (equal %)

1. This column lists the percent reduction of published maximum C_V of the trim listed in the TRIM column.

Table 9. Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

Valve Design		Port Diameter, mm (inch)		ANSI/FCI Leakage Class
EHD/EHAD		47.6 mm (1.875 in) and smaller		II
		58.7 mm (2.3125 inch) to 92.1 mm (3.625 in)		II—Standard III—Optional
		111.1 mm (4.375 in) and larger		III—Standard IV—Optional
EHD		C-Seal - 73.0 (2.875 in) to 111.1 mm (4.375 in) ports		V—Standard
		Bore Seal - 136.5 (5.375 in) to177.8 mm (7 in) ports		IV—Optional
	Valve Size, NPS	**Port Diameter, mm (inch)**	**Cage Style**	**ANSI/FCI Leakage Class**
EHD (CL1500)	8 10x8	177.8 (7)	Eq. %, Mod. Eq. % Linear (std. cage) Linear (Whisper III, A1, B3, C3)	V - Standard to 593°C (1100°F) (for port diameters from 177.8 (7 inch) through 254 mm (10 inch) with optional Bore Seal); IV - Optional
	12 14 x 12	254 (10)		
EHD (CL2500)	4 6 x 4	73 (2.875)	Eq. %, Mod. Eq. %, Linear (std. cage), Linear (Whisper III, A1, B3, C3)	V - Standard to 593°C (1100°F) (for port diameters from 73 through 111.1 mm [2.875 through 4.375 inches] with optional C-seal trim); IV - Optional
			Linear (Cav III, 2-stage)	
	6 8 x 6	111.1 (4.375)	Eq. %, Mod. Eq. %, Linear (std. cage), Linear (Whisper III, A1, B3, C3, D3)	
			Linear (Cav III, 2- and 3-stage)	
	8 10x8	136.5 (5.375)	Eq. %, Mod. Eq. %, Linear (std. cage), Linear (Whisper III, A1, B3, C3, D3)	V - Standard to 593°C (1100°F) (for port diameters from 136.5 through 177.8 mm [5.375 through 7-inches] with optional Bore seal); IV - Optional
	12 14x12	177.8 (7)		
EHS, EHAS, EHT, EHAT		All	Cavitrol III	V
EHS, EHAS, EHT, EHAT		All	Std or w/ Micro-Form or w/ Micro-Flute	IV—Standard, V—Optional
EHT w/ TSO (Tight Shutoff)		See table 8	See table 8	TSO - Optional TSO is not an ASME leakage class. Valves with TSO trim are factory tested to a more stringent Fisher test requirement of no leakage at time of shipment. Test medium is water. Specify service ΔP when ordering. Test procedure is ANSI/FCI Class V test procedure B.
EHT w/ PEEK[1] Anti-Extrusion Rings		15.9 (5/8) to 254 (10)	All	IV to 316°C (600°F) or V to 316°C (600°F)

1. PEEK (PolyEtherEtherKetone)

Trim Selection Guidelines for NPS 1-1/2 x 1 through 6 Globe Valves

Please refer to the following descriptions as a guideline for the selection of appropriate trims:

- **Trim 49--**Trim 49 is the standard trim for C12A valve body materials and should only be used with C12A valve body materials. C12A should only be used when the pressure and temperature capabilities for WC9 valve body materials are not acceptable.

- **Trim 50--**Trim 50 is the standard trim for carbon steel and alloy steel body materials and is recommended for general and severe service applications up to 427°C (800°F). Typical applications for Trim 50 include services in water, boiler feedwater, non-sour hydrocarbons, and steam. The S41600 (416 stainless steel) heat-treated plug and seat ring have a hardness similar to CoCr-A (Alloy 6).

- **Trim 53--**Trim 53 should be used in all high temperature applications between 427°C (800°F) and 566°C (1050°F) unless chlorides are present. The presence of chlorides could lead to stress corrosion cracking of the CA28MWV (422 stainless steel) cage.

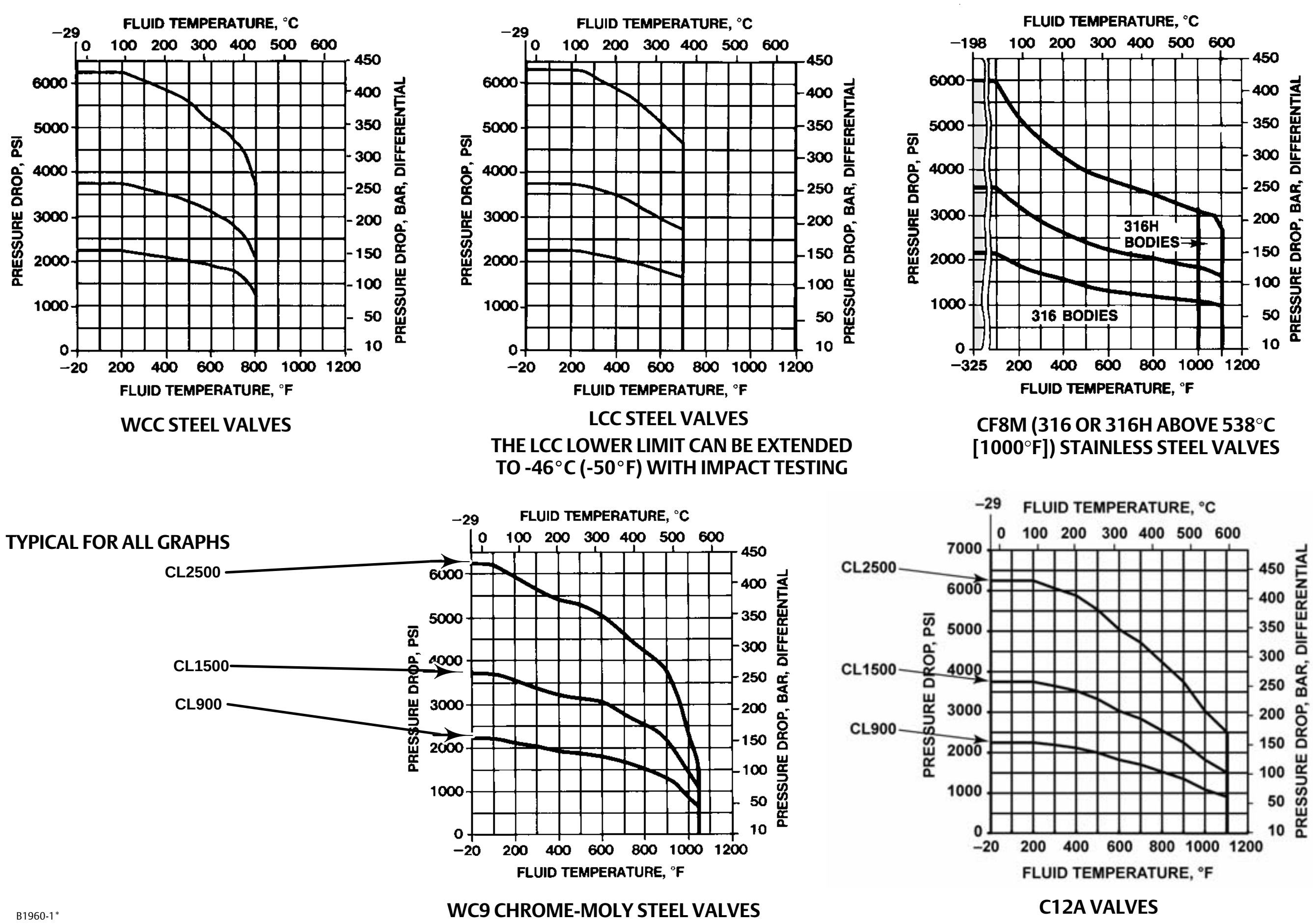
- **Trim 54--**Trim 54 is the standard trim for stainless steel body materials. It should be used where hard-faced trim is specified.

- **Trim 56--**Trim 56 should be used for sour service.

- **Trim 57--**Trim 57 shall be used for boiler feedwater service when limits exceed those specified for Trim 50.

Care should be taken when specifying this trim in small sizes for applications where chlorides are present due to stress corrosion cracking problems with S44004 (440C stainless steel).

Figure 20. Pressure/Temperature Limits for CL2500 Valves (NPS 1-1/2 x 1 through 6 Globe)



WCC STEEL VALVES

LCC STEEL VALVES
THE LCC LOWER LIMIT CAN BE EXTENDED TO -46°C (-50°F) WITH IMPACT TESTING

CF8M (316 OR 316H ABOVE 538°C [1000°F]) STAINLESS STEEL VALVES

WC9 CHROME-MOLY STEEL VALVES

C12A VALVES

NOTE:
Do not exceed the maximum pressure and temperature for the pressure rating of the body material and valve size used. Refer to tables 4 and 5 for pressure/temperature limits of the trim used. Intermediate pressure/temperature ratings are found in separate bulletin, Increased pressure/temperature ratings for EH AND EW series steel valves.

Material Selection Guidelines

Please use these numbered steps as a guideline for the selection of materials:

3. Determine the pressure/temperature rating of the valve size and material required. Inlet pressure and temperature must always be limited by the applicable ASME pressure/temperature rating.

4. Select the desired valve style from the Available Configurations specification and from the shutoff classifications listed in table 9.

5. Select desired materials from tables 10, 11, 12, and 13 and figures 20, 21, and 22. The temperature capabilities determined from figures 20, 21, and 22 may be further limited by the temperature capabilities of materials selected from tables 10, 11, 12, and 13. Refer to figures 20, 21, and 22 to determine pressure drop limits of the body-trim combinations selected.

Inlet pressure and temperature must always be limited by the applicable ASME pressure/ temperature rating. Contact your Emerson sales office for special materials for temperatures exceeding the following maximum limits: EHD valve [593°C (1100°F)] and the EHT valve [232°C (450°F)].

Table 10. Trim Material Combinations (NPS 1-1/2 x 1 through 6 Globe Valves)

DESIGNATION	VALVE PLUG	CAGE	SEAT RING	SEAT RING RETAINER	VALVE BODY MATERIAL[6]	OPERATING TEMPERATURE RANGE		SOUR SERVICE (NACE)
						Degrees Celsius	Degrees Fahrenheit	
WITH STANDARD CAGE								
50	S41600 (416 SST) heat-treated[1]	S17400 (17-4PH SST) H1075 heat-treated	S41600 heat-treated	S17400 H1150D heat-treated chrome coat	WCC, WC9	-29 to 427	-20 to 800	No
	S44004 (440C SST) heat-treated for Micro-Flute valve plugs							
53[2, 4]	S31600 (316 SST) with CoCr-A (Alloy 6) seat and guide	S42200 (422 SST) nitrided	Alloy 6	N07718 heat-treated chrome coat	WC9	427 to 566	800 to 1050	No
54	S31600 with CoCr-A seat and guide	CF8M (316 SST) chrome coat	Alloy 6	N07718 heat-treated chrome coat	WCC, WC9	-29 to 427	-20 to 800	Yes
					CF8M	-73 to 593	-100 to 1100	
56[3]	S31600 with CoCr-A seat and guide	CF8M ENC	Alloy 6	S17400 H1150D heat-treated chrome coat	WCC, WC9	-29 to 149	-20 to 300	Yes
					CF8M	-40 to 149	-40 to 300	
57[3]	S44004 heat-treated	S17400 H1075 heat-treated	S44004 heat-treated	S17400 H1150D heat-treated chrome coat	WCC, WC9	0 to 232	32 to 450	No
49[4, 5]	F22 with CoCr-A seat and guide	F22 nitrided	Alloy 6	N07718 heat-treated chrome coat	C12A	-29 to 593	-20 to 1100	No
WITH CAVITROL III TRIM CAGE								
58[3]	S44004 heat-treated	CB7CU-1 H1075 heat-treated	S44004	S17400 H1150D heat-treated chrome coat	WCC, WC9	0 to 232	32 to 450	No
59[3]	S31600 with CoCr-A seat and guide	CB7CU-1 H1150D heat-treated	Alloy 6	S17400 H1150D heat-treated chrome coat	WCC, WC9	-29 to 232	-20 to 450	Yes
WITH WHISPER TRIM III CAGE								
60	S41600 heat-treated	CB7CU-1 H1075 heat-treated	S41600 heat-treated	S17400 H1150D heat-treated chrome coat	WCC, WC9	-29 to 427	-20 to 800	No
	S17400 H900 SST heat-treated for NPS 6 EH only							
61[4]	S31600 with CoCr-A seat and guide	S42200 nitrided	Alloy 6	N07718 heat-treated chrome coat	WCC	-29 to 427	-20 to 800	No
		F22 nitrided for NPS 6 EH only			WC9	-29 to 566	-20 to 1050	
62[3]	S31600 with CoCr-A seat and guide	CB7CU-1 H1150D heat-treated	Alloy 6	S17400 H1150D heat-treated chrome coat	CF8M	-46 to 399	-50 to 750	Yes
					WCC, WC9	-29 to 232	-20 to 450	
63[4, 5]	F91 with CoCr-A seat and guide	S42200 nitrided	Alloy 6	N07718 heat-treated chrome coat	C12A	-29 to 593	-20 to 1100	No
	F22 with CoCr-A seat and guide for NPS 6 EH only	F22 nitrided for NPS 6 EH only						

1. S17400 H900 stainless steel heat-treated is used when a diverter cone valve plug is specified for port diameters equal to and larger than 4.375 inches.
2. This trim designation not available with the O-ring seat ring gasket construction due to temperature limitations.
3. This trim designation uses the O-ring seat ring gasket construction. See table 12 for O-ring temperature limits. For temperatures greater than 232°C (450°F), flat sheet seat ring gasket with HTS1 seal ring option (up to 316°C (600°F) is available. Consult your Emerson sales office.
4. This trim is for use in EHD and EHS constructions only.
5. Trims 49 and 63 use S41000 stem instead of the standard S31600 material. S41000 is limited to 538°C (1000°F). For temperatures greater than 538°C (1000°F), S42200 stem is used. S20910 stem material should not be used with this trim.
6. If using valve body/trim combinations other than those listed, consult your sales office.

Table 11. Trim Material Combinations (NPS 8 through 14 Fisher EHD and EHT)

<table>
<tr><th rowspan="2">TRIM DESIGNATION</th><th rowspan="2">VALVE PLUG</th><th rowspan="2">VALVE PLUG STEM</th><th rowspan="2">CAGE</th><th rowspan="2">SEAT RING</th><th rowspan="2">SEAT RING CAP SCREWS</th><th rowspan="2">VALVE BODY MATERIAL(5)</th><th colspan="2">OPERATING TEMPERATURE RANGE</th></tr>
<tr><th>°C</th><th>°F</th></tr>
<tr><td colspan="9">**EHD and EHT Valve with Standard Cage**</td></tr>
<tr><td>75</td><td>S42000
(420 SST)</td><td>S20910</td><td>CA6NM</td><td>S17400
H1075 heat-treated</td><td>S17400</td><td>WCC, WC9</td><td>-29 to 427</td><td>-20 to 800</td></tr>
<tr><td rowspan="2">77</td><td rowspan="2">S31600
with CoCr-A (alloy 6)
seat and guide</td><td rowspan="2">S20910</td><td rowspan="2">S31600
chrome coat</td><td rowspan="2">S31600
with CoCr-A seat</td><td rowspan="2">S66286
(660 SST)</td><td>CF8M</td><td>-198 to 593</td><td>-325 to 1100</td></tr>
<tr><td>WCC, WC9</td><td>-29 to 204</td><td>-20 to 400</td></tr>
<tr><td rowspan="2">79</td><td rowspan="2">S31600 with CoCr-A
seat and guide</td><td rowspan="2">S20910</td><td rowspan="2">CA6NM
chrome coat</td><td rowspan="2">N06600
with CoCr-A seat</td><td rowspan="2">N07718</td><td>WCC</td><td>-29 to 427</td><td>-20 to 800</td></tr>
<tr><td>WC9</td><td>-29 to 566</td><td>-20 to 1050</td></tr>
<tr><td colspan="9">**EHD and EHT Valve with Standard Cage for Sour Service**</td></tr>
<tr><td rowspan="2">82(1)</td><td rowspan="2">S31600 with CoCr-A
seat and guide</td><td rowspan="2">S20910</td><td rowspan="2">S31600
ENC</td><td rowspan="2">N06600
with CoCr-A seat</td><td rowspan="2">N07718</td><td>WCC, WC9</td><td>-29 to 204</td><td>-20 to 400</td></tr>
<tr><td>CF8M</td><td>-198 to 343</td><td>-325 to 650</td></tr>
<tr><td colspan="9">**All Valves with Whisper Trim III Cages**</td></tr>
<tr><td rowspan="2">95(3)</td><td rowspan="2">F22 with CoCr-A
seat and guide</td><td rowspan="2">S41000
heat treated(2)</td><td rowspan="2">WC9/
nitrided</td><td rowspan="2">F22
with CoCr-A seat</td><td rowspan="2">N07718</td><td>WCC</td><td>315 to 427</td><td>600 to 800</td></tr>
<tr><td>WC9</td><td>315 to 593</td><td>600 to 1100</td></tr>
<tr><td>96</td><td>S17400 with CoCr-A
seat and guide</td><td>S17400
H1150D</td><td>CB7CU-1
H1075</td><td>S17400
with CoCr-A seat</td><td>S17400</td><td>WCC, WC9</td><td>-29 to 427</td><td>-20 to 800</td></tr>
<tr><td colspan="9">**All Valves with Whisper Trim III Cages for Sour Service(4)**</td></tr>
<tr><td>97</td><td>S17400 with CoCr-A
seat and guide</td><td>S17400
H1150D dbl</td><td>S17400
H1150D ENC</td><td>S17400
with CoCr-A seat</td><td>S17400</td><td>WCC, WC9</td><td>-29 to 343</td><td>-20 to 650</td></tr>
</table>

1. Limit to 149°C (300°F) when using N04400 gasket material.
2. S41000 is limited to 538°C (1000°F). For temperatures greater than 538°C (1000°F), an S42200 stem is used.
3. This trim is for use in EHD constructions only.
4. Trim 97 complies with NACE MR0175/2002 and is not NACE MR0175/ISO15156 or NACE MR0103 compliant.
5. If using valve body/trim combinations other than those listed, consult your Emerson sales office.

Table 12. Construction Materials and Temperature Capabilities for Parts Other than Body and Trim (NPS 1-1/2 x 1 through 6 Globe Valves)

PART		MATERIAL	TEMPERATURE CAPABILITIES	
			Degrees Celsius	Degrees Fahrenheit
Valve plug stem		S31600 (316 stainless steel)	-198 to 427	-325 to 800
		S31600/chromium coating	427 to 593	800 to 1100
		S20910 (1)	-198 to 593	-325 to 1100
		S20910/chromium coating	427 to 593	800 to 1100
		S41000	-29 to 538	-20 to 1000
		S42200	-29 to 593	-20 to 1100
EHD/EHAD piston ring		Graphite (FMS 17F27)	-46 to 427 (to 482 for nonoxidizing service)	-50 to 800 (to 900 for nonoxidizing service)
		Graphite (FMS 17F39)	-46 to 537 (to 593 for nonoxidizing service)	-50 to 1000 (to 1100 for nonoxidizing service)
EHT/EHAT seal ring		N10276 with glass and moly-filled PTFE	-73 to 232	-100 to 450
EHT/EHAT seal ring backup ring		Same as base material of valve plug	See table 10	See table 10
Spring-loaded EHT valve plug seal	Backup ring	S41600 (416 SST)	-29 to 427	-20 to 800
	Retaining ring	S30200 (302 SST) N07750(1)	-254 to 593	-425 to 1100
	Seal ring	R30003 (with glass and moly-filled PTFE)	-73 to 232(7)	-100 to 450(7)
	Anti-extrusion ring	PEEK (PolyEtherEtherKetone)	-73 to 316	-100 to 600
Cage gasket		S31600/Graphite(1)	-254 to 427 (to 593 for nonoxidizing service)	-425 to 800 (to 1100 for nonoxidizing service)
Seat ring gasket	O-ring seat ring gasket(1)	Nitrile(5)	-29 to 107(8)	-20 to 225(8)
		Ethylene-propylene(6)	-40 to 232	-40 to 450
		Fluorocarbon (not for water or steam service)(5)	-23 to 204	-10 to 400
	Flat sheet seat ring gasket	S31600/Graphite(1)	-254 to 427 (to 593 for nonoxidizing service)	-425 to 800 (to 1100 for nonoxidizing service)
Body-to-bonnet bolting(2)	Studs Nuts	Steel SA193-B7 NCF2 (all body materials) Steel SA194-2H NCF2 (all body materials)	-29 to 427 (WCC, WC9) -46 to 343 (LCC) -48 to 232 (CF8M [316 and 316H])	-20 to 800 (WCC, WC9) -50 to 650 (LCC) -55 to 450 (CF8M [316 and 316H])
	Studs Nuts	Steel SA193-B7 NCF2 (WC9 body mat'l) Steel SA194-7 NCF2(WC9 body mat'l)	-29 to 454	-20 to 850
	Studs Nuts	Steel SA193-B16 (WC9 and C12A body mat'ls) Steel SA194-7 (WC9 and C12A body mat'ls)	-29 to 510	-20 to 950
	Studs Nuts	304 stainless steel SA320-B8 (CF8M [316, 316H body mat'ls]) 304 stainless steel SA194-8 (CF8M [316, 316H body mat'ls])	-198 to 66	-325 to 150
	Studs Nuts	316 SST SA193-B8M(3) (CF8M [316, 316H body mat'l]) 316 SST SA194-8M (CF8M [316, 316H body mat'l])	-198 to 66	-325 to 150
	Studs Nuts	316 SST SA193-B8M chrome coat(4) (CF8M [316, 316H body mat'ls]) 316 SST SA194-8M (CF8M [316, 316H body mat'ls])	-198 to 66	-325 to 150
	Studs Nuts	SST SA453 GR660 with Belleville washers (CF8M[316, 316H, body mat'ls] Steel SA194-7 NCF2 (CF8M [316, 316H body mat'ls]	-29 to 427	-20 to 800
	Studs Nuts	SST SA453 GR660 rupture tested with Belleville washers (CF8M[316, 316H, body mat'ls] Steel SA194-7 NCF2 (CF8M [316, 316H body mat'ls]	427 to 537	801 to 1000
	Studs Nuts	SST SA453 GR660 for sour service(1) with Belleville washers (CF8M[316, 316H, body mat'ls] Steel SA194-7M NCF2(1) (CF8M [316, 316H body mat'ls]	-29 to 427	-20 to 800
	Studs Nuts	SST SA453 GR660 rupture tested for sour service(1) with Belleville washers (CF8M[316, 316H, body mat'ls] Steel SA194-7M NCF2(1) (CF8M [316, 316H body mat'ls]	427 to 537	801 to 1000
	Studs Nuts	N07718 SST (SB037) Steel SA194-7	-29 to 566 (WC9) -29 to 593 (C12A)	-20 to 1050 (WC9) -20 to 1100 (C12A)
	Studs Nuts	Steel SA193-B7M NCF2 for sour service(1) (CF8M [316 body mat'l]) Steel SA194-2HM NCF2 for sour service(1) (CF8M [316 body mat'l])	-46 to 232	-50 to 450
Packing		PTFE V-ring	-40 to 232	-40 to 450
		Graphite ribbon/filament (oxidizing service to 700°F)	-254 to 537	-425 to 1000
		Graphite ribbon (high-temperature oxidizing service)	371 to 593	700 to 1100
		HIGH-SEAL packing system (see Fisher Bulletin 59.1:061, ENVIRO-SEAL and HIGH-SEAL Packing Systems for Sliding-Stem Valves (D101633X012))	See bulletin 59.1:061	See bulletin 59.1:061

-continued-

Table 12. Construction Materials and Temperature Capabilities for Parts Other than Body and Trim (NPS 1-1/2 x 1 through 6 Globe Valves) (continued)

PART	MATERIAL	TEMPERATURE CAPABILITIES	
		Degrees Celsius	Degrees Fahrenheit
Packing follower, spring, or lantern ring	S31600	-254 to 593	-425 to 1100
Packing box ring	S31600	-254 to 593	-425 to 1100
Packing flange, studs, or nuts	Steel	-29 to 427	-20 to 800
	S31600	-29 to 593	-20 to 1100

1. Complies with NACE MR0175-2002, NACE MR0175-2003, NACE MR0103, and NACE MR0175/ISO 15156.
2. Valve body materials with which these bolting materials may be used are shown in parentheses.
3. Class 1 (annealed).
4. Class 2 (strain hardened).
5. For use with all O-ring seat ring constructions without Cavitrol III trim.
6. For use with all O-ring seat ring constructions with Cavitrol III trim.
7. If used with PEEK anti-extrusion rings, PTFE/carbon seal ring may be used up to 316°C (600°F) for non-oxidizing service or up to 260°C (500°F) for oxidizing service.
8. Temperature range per DS52 Group 2.

Table 13. Construction Materials and Temperature Capabilities for Parts Other than Body and Trim (NPS 8 through 14 Fisher EHD and EHT)

PART		MATERIAL	TEMPERATURE CAPABILITIES	
			°C	°F
Standard gasket construction	Cage gasket	Silver-plated N04400	-254 to 593	-425 to 1100
		S31600/Graphite(1)	-254 to 427 (to 593 for nonoxidizing service)	-425 to 800 (to 1100 for nonoxidizing service)
	Metal seat ring gasket	Graphite filled spiral wound N06600	-254 to 593	-425 to 1100
	O-ring seat ring gasket	Nitrile	-29 to 107	-20 to 225
		Ethylene-propylene	-40 to 232	-40 to 450
		Fluorocarbon	-23 to 204	-10 to 400
Sour service gasket construction	Cage gasket	Tin-plated N04400	-29 to 149	-20 to 300
		S31600/Graphite(1)	-254 to 427 (to 593 for nonoxidizing service)	-425 to 800 (to 1100 for nonoxidizing service)
	O-ring seat ring gasket	Nitrile	-29 to 107	-20 to 225
		Fluorocarbon	-23 to 149	-10 to 300
EHD piston ring		Graphite (FMS 17F27)	-46 to 427 (to 482 for nonoxidizing service	-50 to 800 (to 900 for nonoxidizing service)
		Graphite (FMS 17F39)	-46 to 537 (to 593 for nonoxidizing service)	-50 to 1000 (to 1100 for nonoxidizing service)
EHD Bore Seal		N07718	-198 to 593	-325 to 1100
EHT seal ring		PTFE with N10276 Spring	-73 to 232	-100 to 450
EHT seal ring retaining ring		S30200 (302 stainless steel)	-254 to 593	-425 to 1100
Spring-loaded EHT valve plug seal	Backup ring	S41600 (416 SST)	-29 to 427	-20 to 800
	Retaining ring	S30200 (302 SST)	-254 to 593	-425 to 1100
	Seal ring	R30003 (with glass and moly-filled PTFE)	-73 to 232(3)	-100 to 450(3)
	Anti-extrusion rings	PEEK (PolyEtherEtherKetone)	-73 to 316	-100 to 600
Packing		PTFE V-ring	-46 to 232	-50 to 450
		PTFE/composition	-73 to 232	-100 to 450
		Graphite ribbon filament	-18 to 371 (to 537 for nonoxidizing service)	0 to 700 (to 1000 for nonoxidizing service)
		Graphite Ribbon (high temperature oxidizing service)	371 to 649	700 to 1200
		HIGH-SEAL (see Bulletin 59.1:061, HIGH-SEAL Packing Systems for Sliding-Stem Valves (D101633X012) for information)		
Packing follower, spring, or lantern ring		S31600 (316 stainless steel)	-254 to 593	-425 to 1100
Packing box ring		S17400	-101 to 427	-150 to 800
		S31600	-254 to 593	-425 to 1100

-continued-

Table 13. Construction Materials and Temperature Capabilities for Parts Other than Body and Trim (NPS 8 through 14 Fisher EHD and EHT) (continued)

PART		MATERIAL		TEMPERATURE CAPABILITIES °C	TEMPERATURE CAPABILITIES °F
Body-to-bonnet bolting(1)	Studs	Steel SA 193-B7 NCF2	All body materials	-29 to 427 (steel bodies)	-20 to 800 (steel bodies)
	Nuts	Steel SA 194-2H NCF2		-48 to 232 (SST bodies)	-55 to 450 (SST bodies)
	Studs	Steel SA 193-B7 NCF2	WC9 and C5 body materials	-29 to 482	-20 to 900
	Nuts	Steel SA 194-7 NCF2			
	Studs	Steel SA 193-B16	WC9 and C5 body materials	-29 to 593	-20 to 1100
	Nuts	Steel SA 194-7			
	Studs	304 Stainless steel SA320-B8	CF8M (316 SST) body materials	-198 to 66	-325 to 150
	Nuts	316 stainless steel SA194-8			
	Studs	316 stainless steel SA193-B8M(2)	CF8M and CF8M (316H) body materials	-198 to 66	-325 to 150
	Nuts	316 stainless steel SA194-8M			
	Studs	316 stainless steel SA194-B8M	CF8M body materials	-198 to 66	-325 to 150
	Nuts	316 stainless steel SA194-B8			
	Studs	Steel SA 193-B7M NCF2	For sour service(4) CF8M body material	-48 to 232	-55 to 450
	Nuts	Steel SA 194-2HM NCF2			
	Studs	SST SA453 GR660 with Belleville washers	CF8M and CF8M (316H) body materials	-29 to 427	-20 to 800
	Nuts	Steel SA194-7 NCF2			
	Studs	SST SA453 GR660 rupture tested with Belleville washers	CF8M and CF8M (316H) body materials	427 to 537	801 to 1000
	Nuts	Steel SA194-7 NCF2			
	Studs	SST SA453 GR660 with Belleville washers	For sour service(4) CF8M and CF8M (316H) body materials	-29 to 427	-20 to 800
	Nuts	Steel SA194-7M NCF2			
	Studs	SST SA453 GR660 rupture tested with Belleville washers	For sour service(4) CF8M and CF8M (316H) body materials	427 to 537	801 to 1000
	Nuts	Steel SA194-7M NCF2			

1. Valve body materials with which these bolting materials may be used are shown in parentheses.
2. Class 1 (annealed).
3. If used with PEEK anti-extrusion rings, PTFE/carbon seal ring may be used up to 316°C (600°F) for non-oxidizing service or up to 260°C (500°F) for oxidizing service.
4. Complies with NACE MR0175-2002, NACE MR0175-2003, NACE MR0103, and NACE MR0175/ISO 15156.

Table 14. Valve Plug Travel(1) (NPS 8 through 14 Valves)

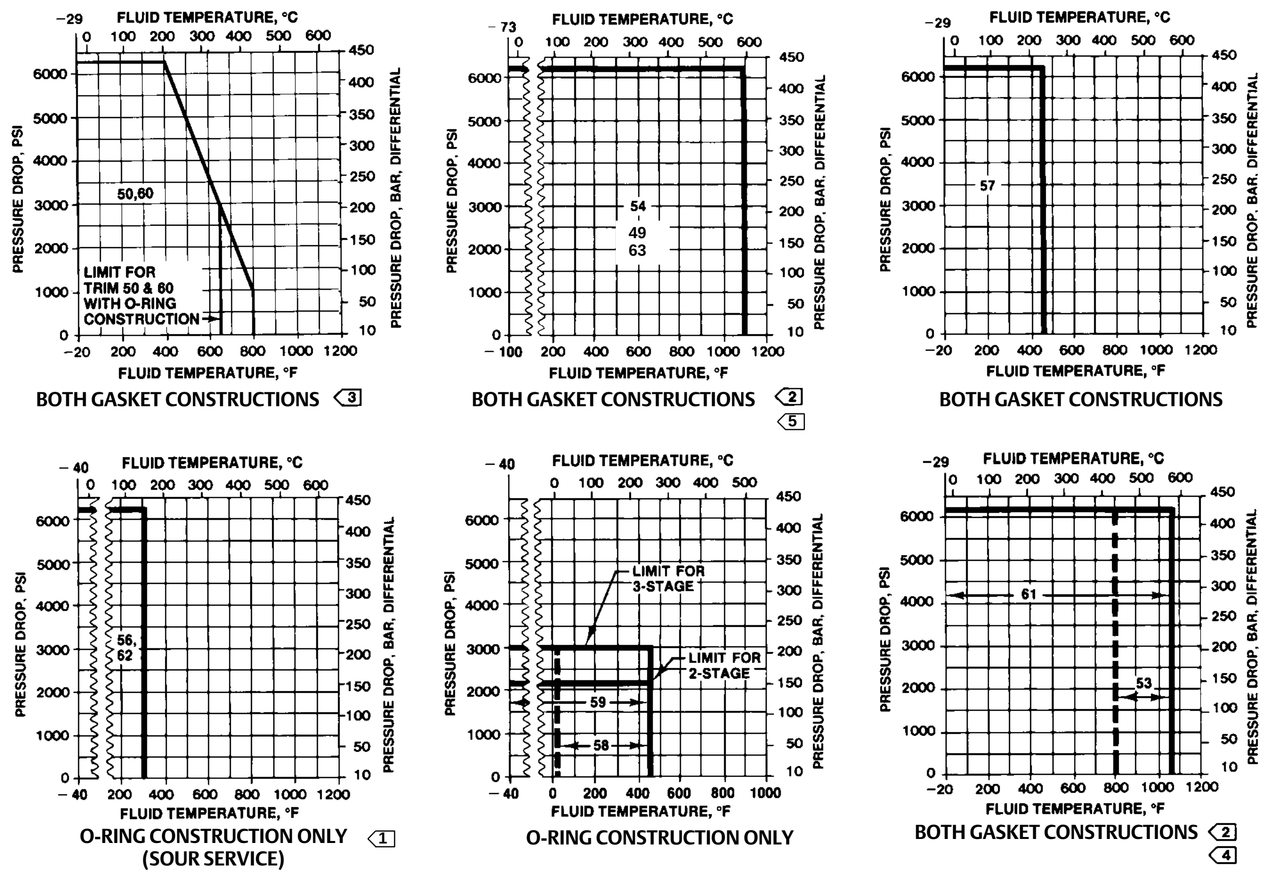
CAGE STYLE	PRESSURE RATING	EHD, EHT Valve Size, NPS 8, 10 mm	8, 10 Inches	12, 14 mm	12, 14 Inches
Linear	CL1500	76	3	102	4
	CL2500	64	2.5	76	3
Equal Percentage(1)	CL1500	76	3	102	4
	CL2500	64	2.5	76	3
Modified Equal Percentage(1)	CL1500	89	3.5	114	4.5
	CL2500	76	3	89	3.5
Whisper Trim III Cage	CL1500	178	7	184	7.25
	CL2500	146	5.75	178	7

1. Valves using an equal percentage cage may be travelled an additional 13 mm (0.05 inch) if desired to obtain additional capacity; flow characteristic becomes modified equal percentage.

Table 15. Flowing Pressure Drop Limits for NPS 6 CL2500 Fisher EHD/EHT and NPS 8 CL2500 EHAD/EHAT Valves (Without Cavitrol III or Whisper Trim III)

VALVE PRESSURE RATING	FLOW MEDIA	STEM SIZE, mm (INCHES)	MAXIMUM FLOWING PRESSURE DROP			
			Bar		PSI	
			Flowing Down	Flowing up with Diverter Cone	Flowing Down	Flowing up with Diverter Cone
CL2500	All except boiler feedwater	19.1 mm (3/4 inch)	69	- - -	1000	- - -
		50.8 mm (1-inch)	69	- - -	1000	- - -
		31.7 mm (1-1/4 inch)	138	431	2000	6250
	Boiler feedwater	31.7 mm (1-1/4 inch)	69	431	1000	6250

Figure 21. Pressure/Temperature Limits for Trim Material Combinations (NPS 1-1/2 x 1 through 6 Globe Valves) (also see table 15)

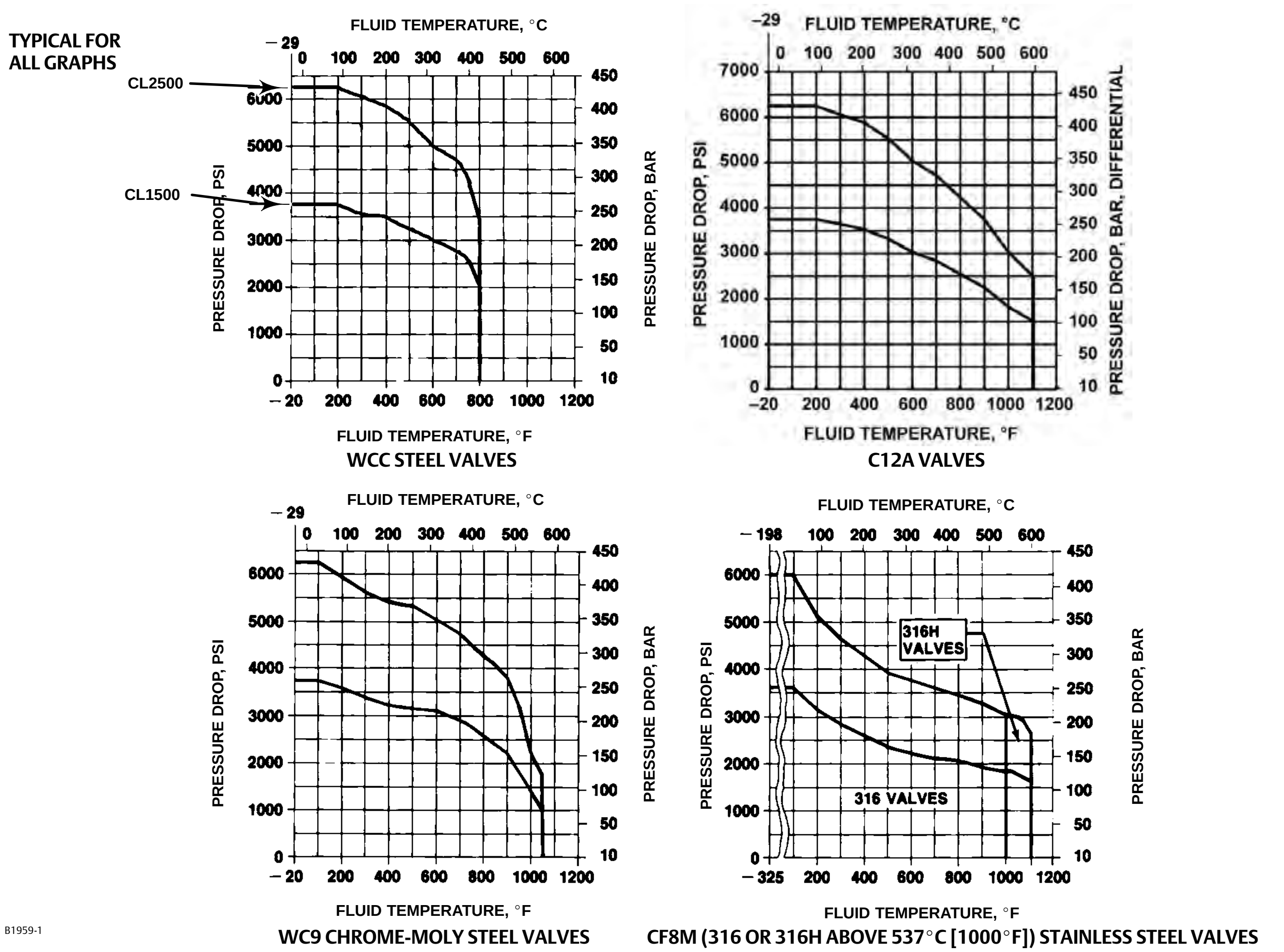


NOTES:
1. For recommended service applications, See table 15.
2. O-ring construction limited to 232°C (450°F), laminated graphite construction limited to 427°C (800°F) for oxidizing service and 593°C (1100°F) for non-oxidizing service.
3. CF8M (316 SST) valve bodies are available for use with trim 60 up to 232°C (450°F).
4. CF8M valve bodies are available for use with trim 61 up to 232°C (450°F).
5. Trim 49 and 63 are only good down to -29°C (-20°F).

Table 16. Flowing Pressure Drops Limits for Fisher EHD and EHT Valves (Without Cavitrol III or Whisper Trim III) (NPS 8 to 14 Valves)

FLOW MEDIA	VALVE STEM CONNECTOR SIZE	MAXIMUM FLOWING PRESSURE DROP BAR (PSID)	
	mm (inch)	Flowing Down	Flowing Up with Diverter Cone
All except boiler feedwater	50.8 mm (2-inch)	138 (2000)	259 (3750)
Boiler feedwater	50.8 mm (2-Inch)	69 (1000)	259 (3750)

Figure 22. Pressure/Temperature Limits for CL1500 and 2500 Valves (NPS 8 through 14 Valves)



NOTES:
1. Do not exceed the maximum pressure and temperature for the pressure rating of the valve material and valve size used. Refer to figure 10 for pressure/temperature limits of the trim used. Intermediate class pressure/temperature ratings are found in separate bulletin, Increased pressure/temperature ratings for EH series and EW series steel valve bodies (D100075X012 or D100076X012).

Table 17. Additional Globe Valve Specifications (NPS 1-1/2 x 1 through 6 Globe Valves)

VALVE SIZE, NPS	PRESS-URE RATING	FLOW CHARACTERISTIC	VALVE DESIGN AND PLUG STYLE	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
				mm	Inches	mm	Inches	mm	Inches
1-1/2 x 1, 2 x 1	CL2500	Equal percentage	EHS w/Micro-Flute	6.4 9.5 12.7	0.25 0.375 0.5	19 19 19	0.75 0.75 0.75	12.7 12.7 12.7	1/2 1/2 1/2
			EHS w/Micro-Form	6.4 12.7 19.1	0.25 0.5 0.75	19 19 19	0.75 0.75 0.75	12.7 12.7, 19.1 12.7, 19.1	1/2 1/2, 3/4 1/2, 3/4
		Modified equal percentage	EHS w/Micro-Form	12.7 19.1	0.5 0.75	22 22	0.875 0.875	12.7, 19.1 12.7, 19.1	1/2, 3/4 1/2, 3/4
			EHS w/Micro-Flute	9.5 12.7	0.375 0.5	22 22	0.75 0.75	12.7 12.7	1/2 1/2
		Linear (Cavitrol III, 2-stage)	EHS	15.9	0.625	32	1.25	12.7, 19.1	1/2, 3/4
2[2] 3 x 2	CL2500	Equal percentage	EHS w/Micro-Form	25.4	1	22	0.875	12.7, 19.1, 25.4	1/2, 3/4, 1
			EHS, EHD, EHT	38.1	1.5	22	0.875	12.7, 19.1[1], 25.4[1]	1/2, 3/4[1], 1[1]
		Linear (cage style: Whisper Trim III, level A1)	EHS, EHD, EHT	38.1	1.5	38	1.5	12.7, 19.1[1], 25.4[1]	1/2, 3/4[1], 1[1]
		Linear	EHS, EHD, EHT	38.1	1.5	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
		Modified equal percentage	EHS w/Micro-Form	25.4	1	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
			EHS, EHD, EHT	38.1	1.5	29	1.125	12.7, 19.1[1], 25.4[1]	1/2, 3/4[1], 1[1]
		Linear (Cavitrol III, 2-stage)	EHT	31.8	1.25	51	2	12.7, 19.1	1/2, 3/4
		Linear (Cavitrol III, 3-stage)	EHS	15.9	0.625	51	2	12.7, 19.1	1/2, 3/4
3, 4 x 3	CL2500	Equal percentage	EHS, EHD, EHT	58.7	2.3125	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
		Modified equal percentage Linear (cage style: Whisper Trim III, level A1, B1)	EHS, EHD, EHT	58.7	2.3125	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cavitrol III, 3-stage)	EHT	33.3	1.3125	64	2.5	12.7, 19.1 25.4	1/2, 3/4, 1
		Linear (Cavitrol III, 2-stage)	EHT	47.6	1.875	64	2.5	12.7, 19.1 25.4	1/2, 3/4, 1
4, 6 x 4	CL2500	Equal percentage	EHS, EHD, EHT	73	2.875	38	1.5	19.1, 25.4	3/4, 1
		Modified equal percentage Linear (cage style: Whisper Trim III, level A1, B1, B3)	EHS, EHD, EHT	73	2.875	51	2	19.1, 25.4	3/4, 1
		Linear (Cavitrol III, 3-stage)	EHT	58.7	2.3125	70	2.75	19.1, 25.4	3/4, 1
		Linear (Cavitrol III, 2-stage)	EHT	73	2.875	70	2.75	19.1, 25.4	3/4, 1
6, 8 x 6	CL2500	Equal percentage	EHS, EHD, EHT	111.1	4.375	51	2	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Modified equal percentage	EHS, EHD, EHT	111.1	4.375	76	3	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Linear (cage style: Whisper Trim III, level B3, C3, D3)	EHS, EHD, EHT	111.1	4.375	76	3	25.4, 31.8	1, 1-1/4
		Linear (cage style: Cavitrol III, 2- and 3-stage)	EHT	111.1	4.375	95	3.75	19.1, 25.4, 31.8	3/4, 1, 1-1/4

1. Available only with EHS valve body.
2. EHS Intermediate CL3273 only.

Table 18. Additional Angle Valve Specifications (NPS 1 through 6 Angle Valves)

VALVE SIZE, NPS	PRESS-URE RATING	FLOW CHARACTERISTIC	VALVE DESIGN AND PLUG STYLE	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
				mm	Inches	mm	Inches	mm	Inches
1 & 2	CL2500	Equal Percent	EHAS w/Micro-Flute	6.4	0.25	19	0.75	12.7	1/2
				9.5	0.375	19	0.75	12.7	1/2
				12.7	0.5	19	0.75	12.7	1/2
			EHAS w/Micro-Form	6.4	0.25	19	0.75	12.7	1/2
				12.7	0.5	19	0.75	12.7, 19.1	1/2, 3/4
				19.1	0.75	19	0.75	12.7, 19.1	1/2, 3/4
		Modified Equal Percent	EHAS w/Micro-Flute	9.5	0.375	22	0.75	12.7	1/2
				12.7	0.5	22	0.75	12.7	1/2
			EHAS w/Micro-Form	12.7	0.5	22	0.875	12.7, 19.1	1/2, 3/4
				19.1	0.75	22	0.875	12.7, 19.1	1/2, 3/4
		Linear(Cavitrol III, 2-stage)	EHAS	15.9	0.625	32	1.25	12.7, 19.1, 25.4	1/2, 3/4, 1
3	CL2500	Equal Percent	EHAS w/Micro-Form	25.4	1	22	0.875	12.7, 19.1, 25.4	1/2, 3/4, 1
			EHAS, EHAD, EHAT	38.1	1.5	22	0.875	12.7, 19.1, 25.4	1/2, 3/4, 1
		Modified Equal Percent	EHAS w/Micro-Form	25.4	1	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
			EHAS, EHAD, EHAT	38.1	1.5	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear	EHAS, EHAD, EHAT	38.1	1.5	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear(Cavitrol III, 2-stage)	EHAT	31.8	1.25	51	2	12.7, 19.1	1/2, 3/4
		Linear(Cavitrol III, 3-stage)	EHAS	15.9	0.625	51	2	12.7, 19.1	1/2, 3/4
		Linear(cage style: Whisper Trim III Level A1)	EHAS, EHAD, EHAT	38.1	1.5	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
4	CL2500	Equal Percent	EHAS, EHAD, EHAT	58.7	2.3125	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
		Modified Equal Percent	EHAS, EHAD, EHAT	58.7	2.3125	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear(Cavitrol III, 2-stage)	EHAT	33.3	1.3125	64	2.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear(Cavitrol III, 3-stage)	EHAT	47.6	1.875	64	2.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear(cage style: Whisper Trim III Level A1)	EHAS, EHAD, EHAT	58.7	2.3125	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
6	CL2500	Modified Equal Percent	EHAD	92.1	3.625	51	2	31.8	1-1/4
		Linear(Cavitrol III, 3-stage)	EHAD	73	2.875	102	4	31.8	1-1/4

1. Available only with EHAS valve body.

Table 19. Globe Valve Yoke Boss and Valve Stem Diameter Combinations(1) (NPS 1-1/2 x 1 through 6 Globe Valves)

VALVE SIZE, NPS	STANDARD DIAMETERS				OPTIONAL DIAMETERS			
	mm		Inches		mm		Inches	
	Stem	Yoke Boss	Stem	Yoke Boss	Stem	Yoke Boss	Stem	Yoke Boss
1-1/2 x 1, 2 x 1	12.7	71	1/2	2-13/16	19.1	90	3/4	3-9/16
2, 3 x 2	12.7 19.1	71 90	1/2 3/4	2-13/16 3-9/16	25.4	127	1	5
3, 4 x 3	19.1	90	3/4	3-9/16	12.7 25.4	71 127	1/2 1	2-13/16 5
4, 6 x 4	19.1	90	3/4	3-9/16	25.4	127	1	5
6, 8 x 6	25.4 31.8	127 127	1 1-1/4	5 5H	19.1	90	3/4	3-9/16

1. See table 17 for valve stem diameters available for specific construction.

Table 20. Approximate Weights (Valve and Bonnet Assemblies)
(NPS 1-1/2 x 1 through 6 Globe and NPS 1 through 6 Angle Valves)

VALVE SIZE, NPS	GLOBE VALVES				ANGLE VALVES			
	CL2500				CL2500			
	Kilograms		Pounds		Kilograms		Pounds	
	Flg	SWE and BWE	Flg	SWE and BWE	Flg	SWE and BWE	Flg	SWE and BWE
1	- - -	- - -	- - -	- - -	73.1	53.5	161	118
1-1/2 x 1	- - -	46	- - -	101	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	98	66.2	216	146
2 x 1	78	47	173	104	- - -	- - -	- - -	- - -
3 x 2	161	94	355	207	- - -	- - -	- - -	- - -
3	223	163	492	359	181	99.3	399	219
4 x 3	265	162	585	357	- - -	- - -	- - -	- - -
4	338	243	745	536	- - -	203.2	- - -	448
6 x 4	526	257	1160	567	- - -	- - -	- - -	- - -
6	785	544	1731	1199	- - -	496.2	- - -	1094
8 x 6	955	558	2106	1231	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

Table 21. Approximate Weights (Valve Assembly and Bonnet) (NPS 8 through 14 Valves)

VALVE SIZE, NPS	WEIGHTS							
	CL1500				CL2500			
	BWE		FLG		BWE		FLG	
	Kilograms	Pounds	Kilograms	Pounds	Kilograms	Pounds	Kilograms	Pounds
8	1400	3100	1700	3700	1900	4100	2200	4700
10	1500	3300	1900	4100	2000	4400	- - -	- - -
12	3400	7300	3900	8600	3400	7600	- - -	- - -
14	3400	7300	- - -	- - -	3400	7600	- - -	- - -

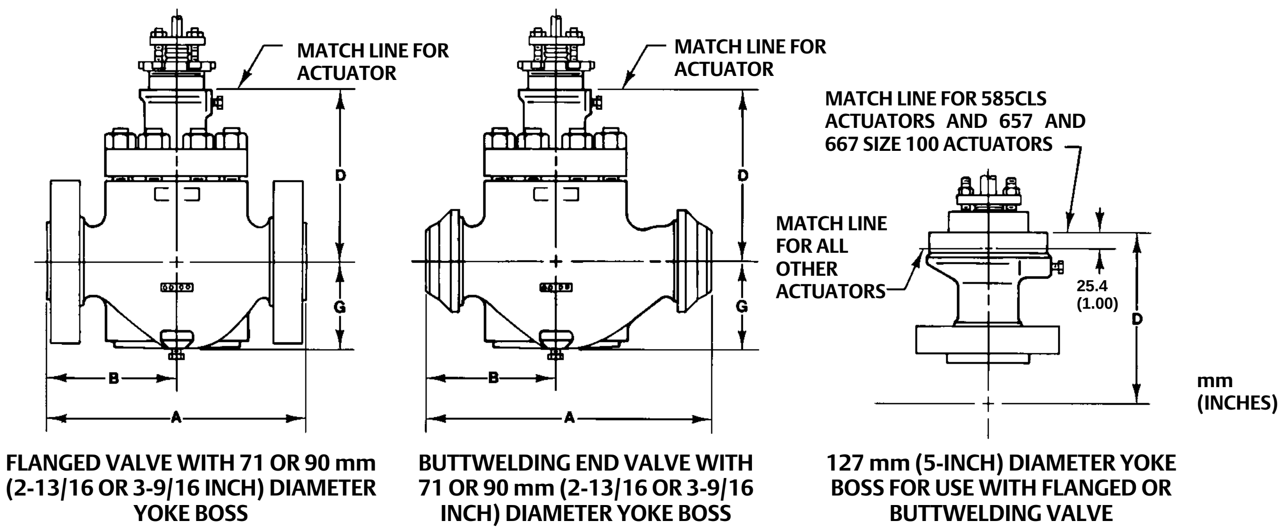
Installation

The valve must be installed so flow through the valve matches the flow direction arrow on the valve body. Consideration should be given to installing an upstream strainer, especially if the valve uses a multi-orifice Whisper Trim III or Cavitrol III cage.

For NPS 8 and larger valves, the recommended installation position is with the valve in a horizontal pipeline and the actuator vertical above the valve. Other orientations may result in shortened trim life and difficulty with field maintenance.

Overall dimensions are shown in figures 23, 24, 25, 26, and 27. Face-to-face dimensions are in compliance with ANSI/ISA-S75 for valves smaller than NPS 8. For NPS 8 and larger valves, face-to-face dimensions are longer than industry standards for valves of this size and rating. Actual end connection dimensions conform to ASME B16.25 for buttwelding ends and to ASME B16.5 for flanged ends.

Figure 23. NPS 1-1/2 x 1 through 6 Globe Valve Dimensions with Standard Bonnet (also see tables 22, 23, and 24)



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NOTE:
For dimensions of valves with DIN (or other) end connections, consult your Emerson sales office.

Table 22. NPS 1-1/2 x 1 through 6 Globe Valve Dimensions with Standard Bonnet

VALVE SIZE NPS	A(1)			
	CL2500			
	BWE	SWE	RF	RTJ
mm				
1-1/2 x 1	318	318	337	340
2 x 1	318	318	349	353
2(2)	400	- - -	- - -	- - -
3 x 2	400	- - -	435	442
3	498	- - -	498	505
4 x 3	498	- - -	518	527
4	575	- - -	575	584
6 x 4	575	- - -	660	673
6	819	- - -	819	832
8 x 6	819	- - -	857	873
Inches				
1-1/2 x 1	12.50	12.50	13.25	13.38
2 x 1	12.50	12.50	13.75	13.88
2(2)	15.75	- - -	- - -	- - -
3 x 2	15.75	- - -	17.12	17.38
3	19.62	- - -	19.62	19.88
4 x 3	19.62	- - -	20.38	20.75
4	22.62	- - -	22.62	23.00
6 x 4	22.62	- - -	26.00	26.50
6	32.25	- - -	32.25	32.75
8 x 6	32.25	- - -	33.75	34.38

1. RF—raised-face flanges; RTJ—ring-type joint flanges; BWE—buttwelding ends; SWE—socketweld ends.
2. Intermediate CL3273 only.

Table 23. NPS 1-1/2 x 1 through 6 Globe Valve Dimensions with Standard Bonnet

VALVE SIZE NPS	B(1)			
	CL2500			
	BWE	SWE	RF	RTJ
mm				
1-1/2 x 1	159	159	168	170
2 x 1	159	159	175	176
2(2)	200	---	---	---
3 x 2	200	---	217	221
3	249	---	249	253
4 x 3	249	---	259	264
4	273	---	273	278
6 x 4	273	---	325	331
6	397	---	397	403
8 x 6	397	---	416	424
Inches				
1-1/2 x 1	6.25	6.25	6.62	6.69
2 x 1	6.25	6.25	6.88	6.94
2(2)	7.88	---	---	---
3 x 2	7.88	---	8.56	8.69
3	9.81	---	9.81	9.94
4 x 3	9.81	---	10.19	10.38
4	10.75	---	10.75	10.94
6 x 4	10.75	---	12.81	13.06
6	15.62	---	15.62	15.88
8 x 6	15.62	---	16.38	16.69

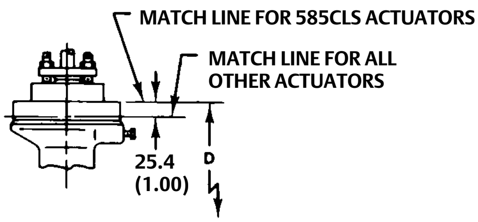
1. RF—raised-face flanges; RTJ—ring-type joint flanges; BWE—buttwelding ends; SWE—socketweld ends.
2. Intermediate CL3273 only.

Table 24. NPS 1-1/2 x 1 through 6 Globe Valve Dimensions with Standard Bonnet

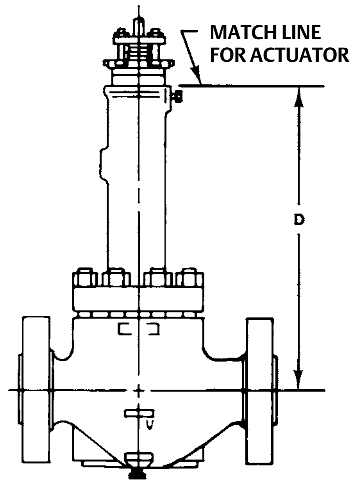
VALVE SIZE NPS	G	D		
	CL2500	CL2500		
		Yoke Boss Diameters, mm (Inches)		
		71 (2-13/16)	90 (3-9/16)	127 (5)
mm				
1-1/2 x 1	78	249	256	---
2 x 1	78	249	256	---
2(1)	108	303	310	343
3 x 2	108	303	310	343
3	145	335	335	371
4 x 3	145	335	335	371
4	168	---	348	406
6 x 4	168	---	348	406
6	229	---	408	445
8 x 6	229	---	408	445
Inches				
1-1/2 x 1	3.06	9.81	10.06	---
2 x 1	3.06	9.81	10.06	---
2(1)	4.35	11.94	12.19	13.50
3 x 2	4.35	11.94	12.19	13.50
3	5.69	13.19	13.19	14.62
4 x 3	5.69	13.19	13.19	14.62
4	6.62	---	13.69	16.00
6 x 4	6.62	---	13.69	16.00
6	9.00	---	16.06	17.50
8 x 6	9.00	---	16.06	17.50

1. Intermediate CL3273 only.

Figure 24. Dimension D for Style 1 Extension Bonnet
(A, B, and G Dimensions Listed in Figure 23 Do Not Change When Extension Bonnet is Used)
(also see table 25)



127 mm (5-INCH) DIAMETER YOKE BOSS FOR STYLE 1 EXTENSION BONNET



FLANGED VALVE WITH STYLE 1 EXTENSION BONNET HAVING 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

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Table 25. Dimension D for Style 1 Extension Bonnet
(A, B, and G Dimensions Listed in Figure 23 Do Not Change When Extension Bonnet is Used)

GLOBE VALVE SIZE, NPS	PRESSURE RATING	D		
		Yoke Boss Diameter, mm (Inches)		
		71 (2-13/16)	90 (3-9/16)	127 (5)
mm				
1-1/2 x 1 and 2 x 1	CL2500	391	406	- - -
2	CL3273	427	443	502
3 x 2	CL2500	427	443	502
Inches				
1-1/2 x 1 and 2 x 1	CL2500	15.38	16.00	- - -
2	CL3273	16.81	17.44	19.75
3 x 2	CL2500	16.81	17.44	19.75

Figure 25. NPS 1 through 6 Angle Valve CL2500 Dimensions with Standard Bonnet and Style 1 Extension Bonnet (also see table 26)

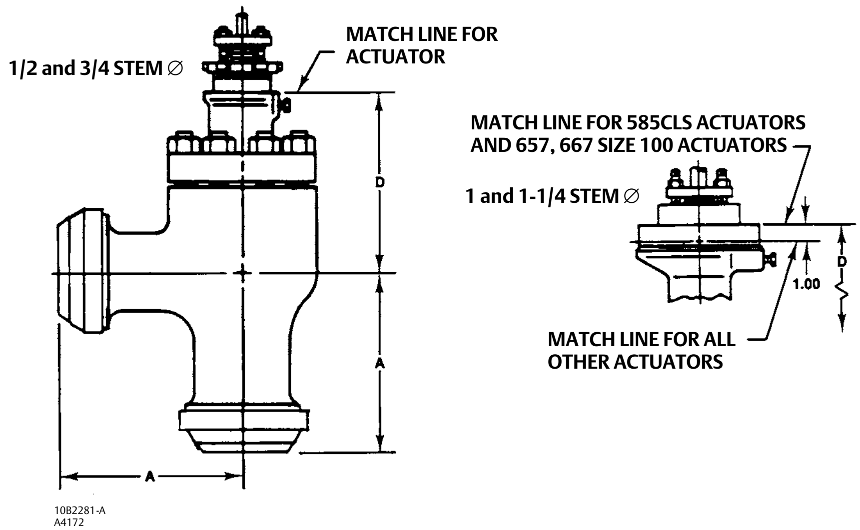
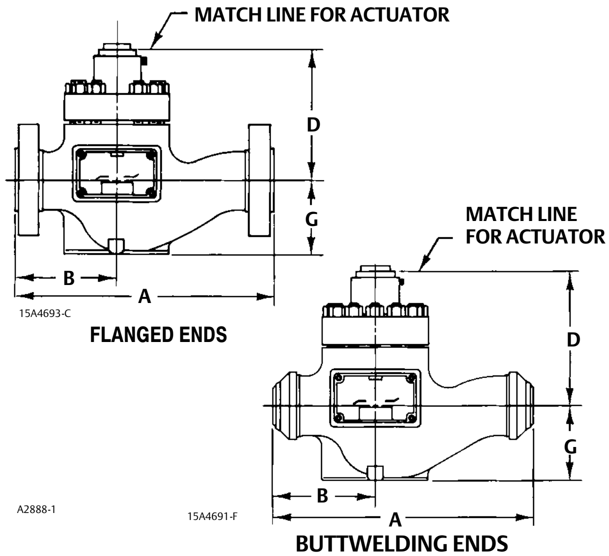


Table 26. NPS 1 through 6 Angle Valve CL2500 Dimensions with Standard Bonnet

VALVE SIZE, NPS	PRESSURE RATING	A, mm				D			
						Std. Bonnet			
		BWE	SWE	RF	RTJ	BWE	SWE	RF	RTJ
1	CL2500	153.9	153.9	153.9	153.9	256.5	392.2	408.1	408.1
2	CL2500	225.6	225.6	225.6	227.1	408.1	408.1	250.0	256.5
3	CL2500	289.1	---	---	292.1	308.9	---	---	308.9
4	CL2500	336.6	---	---	---	334.8	---	---	---
6	CL3230(1)	374.7	---	---	---	451.7	---	---	---
Inches									
1	CL2500	6.06	6.06	6.06	6.06	10.097	15.440	16.065	16.065
2	CL2500	8.88	8.88	8.88	8.94	16.065	16.065	9.844	10.097
3	CL2500	11.38	---	---	11.5	12.162	---	---	12.162
4	CL2500	13.25	---	---	---	13.182	---	---	---
6	CL3230(1)	14.75	---	---	---	17.782	---	---	---

1. NPS 6 is an intermediate CL3230.

Figure 26. Dimensions (NPS 8 through 14 Fisher EHD and EHT Valves) (also see tables 27, 28, and 29)



NOTE:
For dimensions of valves with EN (or other) end connections, consult your Emerson sales office.

Table 27. Dimensions (NPS 8 through 14 Fisher EHD and EHT Valves)

VALVE SIZE, NPS	D		G	
	CL900 and 1500	CL2500	CL900 and 1500	CL2500
mm				
8, 10	684	665	363	370
12, 14	702	724	452	437
Inches				
8, 10	26.94	26.19	14.31	14.56
12, 14	27.62	28.50	17.81	17.19

Table 28. Dimensions (NPS 8 through 14 Fisher EHD and EHT Valves)

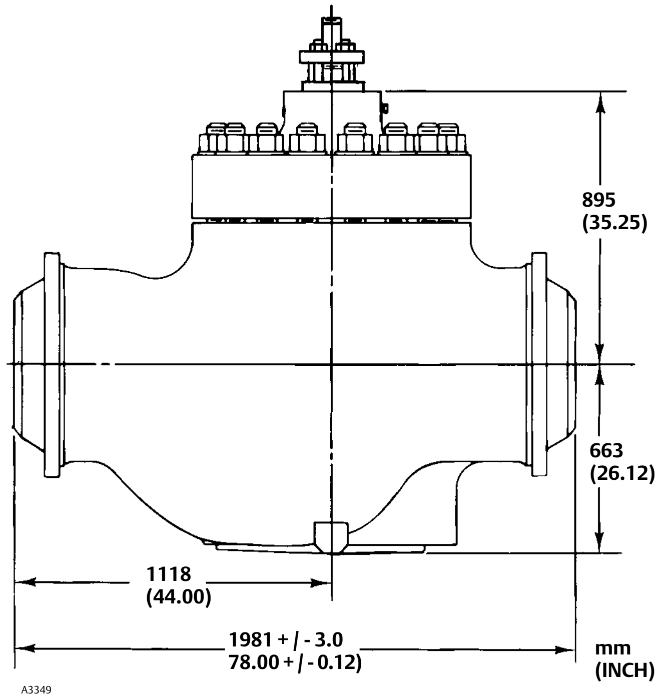
VALVE SIZE, NPS	A(1,2)							
	CL900		CL1500			CL2500		
	RF	RTJ	BWE	RF	RTJ	BWE	RF	RTJ
mm								
8	1137	1140	1194	1194	1203	1295	1295	1311
10	1168	1172	1245	1245	1254	1346	---	---
12	1715	1718	1803	1803	1819	1778	---	---
14	1727	1739	1829	---	---	1803	---	---
Inches								
8	44.75	44.88	47.00	47.00	47.38	51.00	51.00	51.62
10	46.00	46.13	49.00	49.00	49.38	53.00	---	---
12	67.50	67.62	71.00	71.00	71.62	70.00	---	---
14	68.00	68.38	72.00	---	---	71.00	---	---

Table 29. Dimensions (NPS 8 through 14 Fisher EHD and EHT Valves)

VALVE SIZE, NPS	B(1,2)							
	CL900		CL1500			CL2500		
			BWE	RF	RTJ	BWE	RF	RTJ
mm								
8	429	430	457	457	462	508	508	516
10	445	446	483	483	487	533	---	---
12	794	795	838	838	846	838	---	---
14	800	805	851	---	---	851	---	---
Inches								
8	16.88	16.94	18.00	18.00	18.19	20.00	20.00	20.31
10	17.50	17.56	19.00	19.00	19.19	21.00	---	---
12	31.25	31.31	33.00	33.00	33.31	33.00	---	---
14	31.50	31.69	33.50	---	---	33.50	---	---

1. Face-to-face dimensions for these valves are not standard dimensions due to the lack of industry standards for valves of this size and rating.
2. BWE—buttwelding ends; RF—raised-face flanges; RTJ—ring-type joint flanges.

Figure 27. Dimensions (NPS 20 Fisher EHD Valve)



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Fisher™ HP Series Control Valves

HP (Globe Valve)
HPA (Angle Valve)

- Balanced High-Temperature Trim
- Balanced Tight Shutoff Trim
- Unbalanced Trim

Fisher HP Series control valves are single-port, high-pressure, globe- or angle-style valves with metal seats, cage guides, and push-down-to-close valve plug action.

These valves are designed for high-pressure applications in process control industries such as power generation, hydrocarbon production, chemical processing, and refining.

HP Series valves have NACE compliant materials available. In certain sizes extra valve body wall thickness provides a safety margin of protection against erosion, as well as extra protection against corrosion due to chemical attack. Because these valves feature a thicker valve body wall, they are available in higher intermediate ratings with weld-end fittings.

Unless otherwise noted, all NACE references are to NACE MR0175-2002 and MR0103.

X0183-2

FISHER HP VALVE WITH 667 ACTUATOR AND FIELDVUE™ DVC6200 DIGITAL VALVE CONTROLLER

Balanced High-Temperature Trim

HPD and HPAD

These valves use a balanced valve plug with graphite piston rings and are well suited for general applications with process temperatures in excess of 232°C (450°F), where extremely tight shutoff is not required.

Balanced Tight Shutoff Trim

HPT and HPAT

These valves use a balanced valve plug and offer excellent shutoff with process temperatures below 232°C (450°F). The temperature limits of HPT can be extended above 232°C (450°F) to 316°C (600°F) by using PEEK (PolyEtherEtherKetone) anti-extrusion rings in combination with a spring-loaded PTFE seal. The PEEK anti-extrusion rings expand to help close off the clearance gaps on the plug outside diameter and the cage inside diameter where the PTFE seal may extrude at high temperatures and pressures.

Specifications

Available Configurations[1] and Valve Sizes

See table 1

Common Characteristics: Designed according to: ■ ASME B16.34 Valve-Flanges, Threaded and Welded End and ■ ANSI/ISA-75.08.05 (long or short) or ANSI/ISA-75.08.06 (long or short) ■ Socket Welding consistent with ASME B16.11 ■ ASME B16.10 Face-to-Face and End-to-End dimensions of valves

End Connections Styles[1]

See table 1

Maximum Inlet Pressure and Temperature[1,2]

Flanged, Socketweld, or Buttweld: Consistent with CL900, 1500, 2500, and 3200 according to ASME B16.34, unless limited by maximum pressure drop or material temperature capabilities

In addition, both steel HP and HPA valves with BWE and SWE connections have increased pressure/temperature ratings as shown in table 3

Maximum Pressure Drop[1]

Valve with Standard Cage: See figure 17

Valve with Cavitrol™ III Cage: Typically 149 bar (2160 psi) for two-stage and 207 bar (3000 psi) for three-stage cage. Consult Fisher Bulletin 80.2:030, Cavitrol III One-, Two-, and Three-Stage trims (D100196X012) for more information

Valve with Whisper Trim™ III Cage:
0.999 $\Delta P/P_1$ maximum for levels A1 through D3
Valve with WhisperFlo™ Trim:
Levels X, Y, and Z: 0.999 $\Delta P/P_1$ maximum

Shutoff Classifications

See table 4

Construction Materials

Valve Body and Bonnet:
■ WCC steel[3], ■ WC9 Cr-Mo steel[3][9], ■ C12A chrome-moly alloy, ■ CF8M, CF8C, CD3MN, and CD3MWCuN stainless steel, and ■ LCC for low temperature service
Valve Plug, Cage, and Seat Ring: See table 13
Other Parts: See table 7

Consult your Emerson sales office for special trim and valve body material availability.

Material Temperature Capabilities[1]

HPD, HPAD, HPS, and HPAS: Up to 593°C (1100°F) unless limited (see tables 7 and 13 and figure 17)
HPT and HPAT: Up to 316°C (600°F) unless limited (see tables 7 and 13 and figure 17)

Flow Characteristics[4]

Standard Cages: ■ Linear, ■ equal percentage, ■ modified equal percentage[5]
Cavitrol III, Whisper Trim III, and WhisperFlo Cages: Linear
Micro-Flute: Equal percentage
Micro-Flat: Linear
Micro-Form: ■ Equal percentage, ■ modified equal percentage

Flow Direction

Standard Cage
■ *HPD, HPAD:* Normally flow down
■ *HPS, HPAS:* Normally flow up[6]
■ *HPAS Micro-Flat:* Flow down
■ *HPS, HPAS Micro-Form:* Flow up only
■ *HPT, HPAT:* Normally flow down
Cavitrol III Cage: Flow down
Whisper Trim III and WhisperFlo Cage: Flow up

Flow Coefficients

See table 2 and also Fisher Catalog 12

Noise Levels

See Fisher Catalog 12, Section 3 for noise prediction methods

Port Diameters, Valve Plug Travel, and Stem Diameters

See tables 5, 9, 10, and 12

- continued -

Specifications (continued)

Bonnet Style and Mounting[1]

■ **Standard Bonnet:** See figure 1
Yoke Temperature Limit (NPS 2 through 6): Standard bonnet with cast iron yoke is limited to 538°C (1000°F)
■ **Optional Style 1—Extension Bonnet:** Used for NPS 1 and 2 valves for CL900 or 1500, and NPS 1 valves for CL2500 (see figures 22 and 23)

Packing Arrangements

■ Single, ■ Double, and ■ Leakoff standard packing, or optional ■ ENVIRO-SEAL™ and ■ HIGH-SEAL packing systems. See figure 7. Also see Fisher bulletin 59.1:061, ENVIRO-SEAL and HIGH-SEAL Packing System for Sliding-Stem Valves (D101633X012)

Yoke Boss Diameter for Actuator Mounting

See tables 5 and 11, and figures 21, 22, and 23

Approximate Weight

See table 6

Optional Safety Instrumented System Classification

HPD, HPS, HPAS, and HPT: SIL3 capable for NPS 1 through 14 - certified by exida Consulting LLC
HPAD and HPAT: SIL3 capable for NPS 1, 2, 6, 8, and 12 - certified by exida Consulting LLC

Options[1]

■ Valves with weld-end fittings have increased pressure/temperature ratings, called intermediate ratings[7], ■ Class V[6] shutoff for HPT and HPAT to 316°C (600°F) using PEEK anti-extrusion rings[8], ■ Class V shutoff for HPD and HPAD to 593°C (1100°F) using C-seal trim, ■ expanded ends[7] for NPS 4 and 6 valves (NPS 4 valves are available with NPS 6 ends, and NPS 6 valves are available with NPS 8 ends), ■ lubricator or lubricator/isolating valve[7]

1. The pressure/temperature limits in this bulletin and any applicable standard limitations should not be exceeded.
2. EN (or other valve body material) ratings and end connections can usually be supplied; consult your Emerson sales office.
3. SA-105 and SA-182-F22 are used for CL2500 HPA valves instead of WCC and WC9.
4. Special characterized cages are available. Contact your Emerson sales office.
5. Modified equal percentage characteristic is equal percentage for the first 75% of travel, then opens quickly for additional capacity.
6. HPS valves may be used flow down for on-off service only. HPAS valves may be used for flow down in erosive service.
7. For more information contact your Emerson sales office.
8. Required for all boiler feedwater applications.
9. For NPS 8, 10, and 12 above 510°C (950°F) when using WC9 body must use C12A bonnet. Below 510°C (950°F) when using WC9 body can use WC9 bonnet.

Table of Contents

Figure 1. Fisher HPD Valve Assembly, NPS 2 to 6

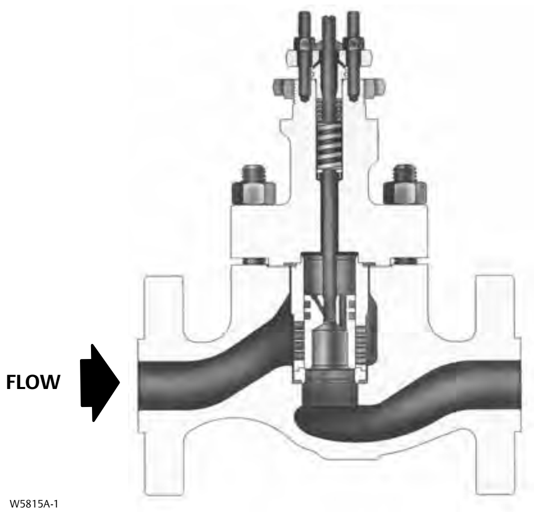


Figure 2. Fisher HPD Valve Assembly, NPS 8 to 14

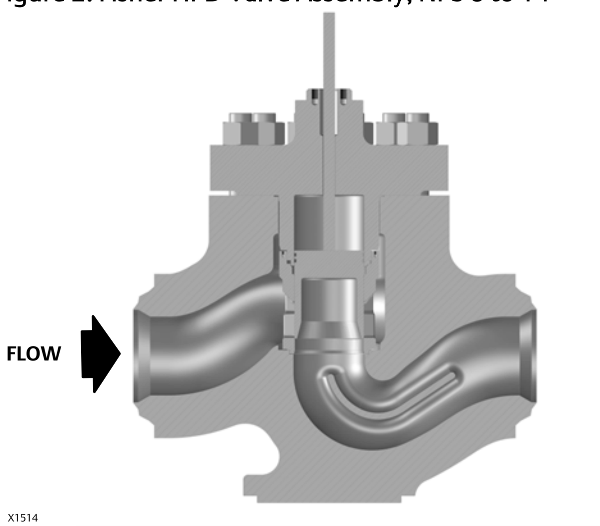
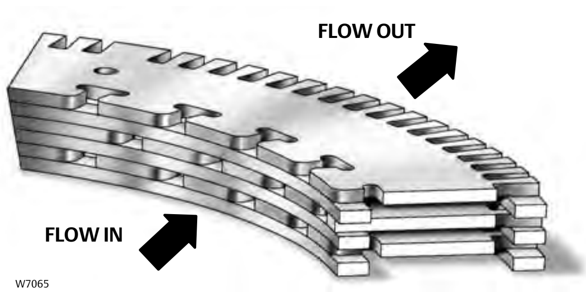


Figure 3. Typical WhisperFlo Trim Cut Section View for Fisher HP Valve



Unbalanced Trim

HPS and HPAS

These valves have an unbalanced plug and provide excellent shutoff.

Expanded Ends

Expanded ends are available on the NPS 4 and 6 CL900 and 1500 HP (ISA 75.08.05 (long) or ISA 75.08.06 (long)) valves. The NPS 4 HP valve body is offered with NPS 6 ends. The NPS 6 valve body is offered with NPS 8 ends. Both flanged and buttweld end valve bodies are offered with expanded ends.

Cavitrol III, Whisper Trim III, and WhisperFlo Cages

To eliminate cavitation damage in a properly-sized valve, a Cavitrol III cage is available with HPS, HPAS, HPT, HPAT, and HPD control valves.

To help attenuate aerodynamic noise in gaseous service, Whisper Trim III and WhisperFlo (figure 3) cages are available with HPS, HPAS, HPT, HPAT, along with NPS 8 through 14 HPD and HPT control valves. Contact your Emerson sales office for more information.

Features

- Valve Plug Stability— Rugged cage guiding provides increased valve plug stability, which reduces vibration and mechanical noise.

- Full Pressure Drop Capability—Rugged construction allows full pressure drop capability in HP series valves.

- Spiral-Wound Gaskets for Excellent Sealing Under All Service Conditions—Premium materials are used in the construction of spiral-wound gaskets for HP Series valves. These premium materials, which make up the standard spiral-wound gaskets, are N06600 (alloy 600)/graphite or N07750 (alloy X750)/graphite.

Figure 4. Fisher HPT Valve Assembly, NPS 3 to 6

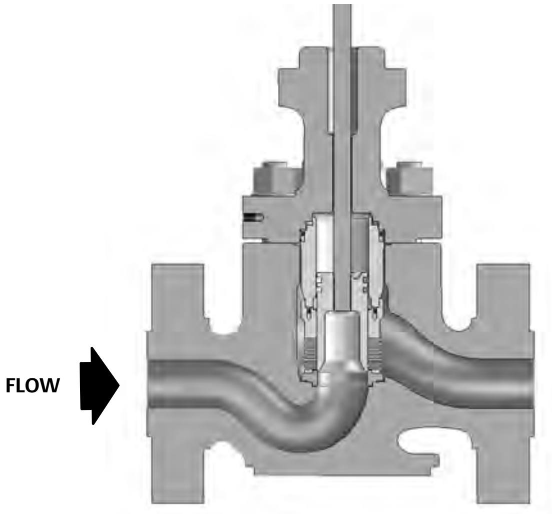
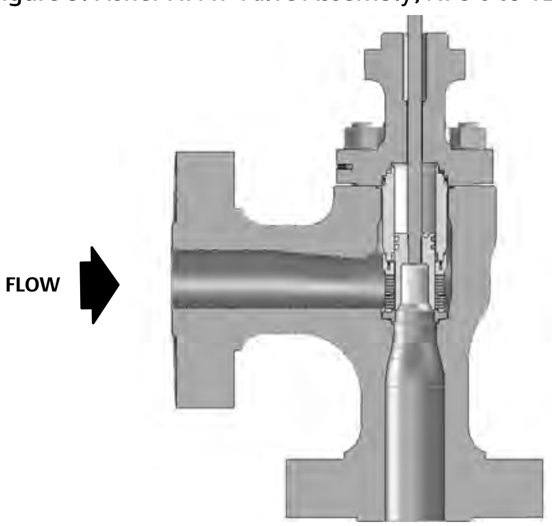


Figure 5. Fisher HPAT Valve Assembly, NPS 6 to 12



Features (cont.)

- **Compliance with the Clean Air Act**—Optional ENVIRO-SEAL packing systems (figure 7) provide an improved stem seal to help prevent the loss of valuable process fluid or emission of hazardous process fluid. The ENVIRO-SEAL packing systems feature PTFE or graphite ULF.

- **Piping Economy**—The availability of expanded end connections on NPS 4 and 6 HP (ISA 75.08.05 (long) or ISA 75.08.06 (long)) valves may eliminate the need for line swages while accommodating oversized piping arrangements.

- **Quick Change Trim**—Maintenance is simple and can easily be performed using common tools. Trim components can be quickly removed and changed with no need for special tools.

- **Integrated Cage-Seat Ring Design**—Find this option on globe NPS 8, 10, 12, 14 and angle NPS 12 valves offering easier maintenance and better shutoff.

- **Standard Hard Trim Materials**—The cage, valve plug, and other trim parts are manufactured from hardened materials. This standard feature provides excellent wear resistance.

- **Increased Pressure/Temperature Ratings**— HP Series valves with weld-end fittings have increased pressure/temperature ratings, called intermediate ratings, as defined in ASME B16.34. The extra strength of these valves allows ratings higher than the standard CL900 or 1500 ratings specified in B16.34. The globe NPS 8 to 12 HP is available as a standard Intermediate ANSI Class 3200 to achieve higher pressure/temperature ratings. Not available on angle NPS 8. Contact your Emerson sales office for further information on intermediate ratings.

- **Trim Interchangeability**—Cavitrol III, Whisper Trim III, and WhisperFlo trims (figures 12, 13, and 15) are interchangeable with standard trims.

- **Control of Low Flow Rates/Tight Shutoff**—Micro-Flute and Micro-Form valve plugs (figures 10 and 11, respectively) provide superb rangeability in high-pressure, low-flow applications, while maintaining tight shutoff (table 4). A choice of several restricted port diameters helps to match valve body capacity to required flow, to provide necessary control with full travel, and to prevent throttling near the seat.

  In low-flow applications where cavitation damage may occur, the Micro-Flat valve plug can be used with a special Cavitrol III cage. Contact your Emerson sales office for more information.

- **Smooth Control at High Pressure Drops**—Available on NPS 2 through 14 valves, balanced trim provides smooth control at high pressure drops.

Features (cont.)

- **High-Temperature Capability with Class V Shutoff**—Use of C-seal trim (see figure 8) permits Class V shutoff up to 593°C (1100°F) for NPS 2 through 6 HPD (ISA 75.08.05 (long) or ISA 75.08.06 (long)) valves. Use of Bore-seal trim (see figure 6) permits Class V shutoff up to 593°C (1100°F) for NPS 8 through 12 HPD valves.

- **Sour Service Trims Available**—Long-lasting, erosion- and corrosion-resistant trims are available for control of sour service. These trims are offered with either a standard cage, a Cavitrol III cage, a Whisper Trim III cage, or WhisperFlo trim. Spiral-wound gasket construction is standard.

Table 1. Available Constructions

<table>
<tr><th rowspan="3">DESIGN</th><th rowspan="3">VALVE SIZE, NPS</th><th rowspan="3">PRESSURE RATING</th><th colspan="2">VALVE BODY MATERIAL AND END CONNECTION STYLE(1, 2)</th></tr>
<tr><th>WCC, WC9, LCC, C12A, CF8M, CF8C, CD3MN, and CD3MWCuN Stainless Steel Cast Valves</th><th>SA-105, SA-182-F22, SA-182-F316, S31803 F51, and S32760 F55 forged SST (for forged steel HPA CL2500 angle valves)</th></tr>
<tr><th>RF or RTJ Flanged, Buttweld, and Socketweld(3)</th><th>Socketweld</th></tr>
<tr><td rowspan="2">HPAD</td><td>2 to 8</td><td>CL900 and 1500</td><td>X</td><td>- - -</td></tr>
<tr><td>2, 6, 8, 12</td><td>CL2500</td><td>X</td><td>X</td></tr>
<tr><td rowspan="2">HPAS</td><td rowspan="2">1 to 2</td><td>CL900 and 1500</td><td>X</td><td>- - -</td></tr>
<tr><td>CL2500</td><td>- - -</td><td>X</td></tr>
<tr><td rowspan="2">HPAT</td><td>2 to 8</td><td>CL900 and 1500</td><td>X</td><td>- - -</td></tr>
<tr><td>2, 6, 8, 12</td><td>CL2500</td><td>X</td><td>X</td></tr>
<tr><td rowspan="5">HPD</td><td>2 to 6</td><td>CL900 and 1500</td><td>X</td><td>- - -</td></tr>
<tr><td>2, 3, 4, 6</td><td>CL2500</td><td>X</td><td>- - -</td></tr>
<tr><td rowspan="2">8 to 12</td><td>CL900,1500, and 2500</td><td>X</td><td>- - -</td></tr>
<tr><td>CL3200</td><td>X(4)</td><td>- - -</td></tr>
<tr><td>14</td><td>CL2500</td><td>X(4)</td><td>- - -</td></tr>
<tr><td rowspan="2">HPS</td><td>1 to 3</td><td>CL900 and 1500</td><td>X</td><td>- - -</td></tr>
<tr><td>1 to 4</td><td>CL2500</td><td>X</td><td>- - -</td></tr>
<tr><td rowspan="5">HPT</td><td>2 to 6</td><td>CL900 and 1500</td><td>X</td><td>- - -</td></tr>
<tr><td>2, 3, 4, 6</td><td>CL2500</td><td>X</td><td>- - -</td></tr>
<tr><td rowspan="2">8 to 12</td><td>CL900,1500, and 2500</td><td>X</td><td>- - -</td></tr>
<tr><td>CL3200</td><td>X(4)</td><td>- - -</td></tr>
<tr><td>14</td><td>CL2500</td><td>X(4)</td><td>- - -</td></tr>
</table>

X = Available Construction.
1. End connection style abbreviations: RF - Raised Face, RTJ - Ring Type Joint.
2. EN (or other valve body material) ratings and end connections can usually be supplied; consult your Emerson sales office.
3. Socketweld available on NPS 1, 1-1/2, and 2 only.
4. Only buttweld end available.

Table 2. Typical Flow Coefficients(1)

DESIGN AND CLASS	VALVE SIZE, NPS	CHARACTERISTIC	MAXIMUM Cv
HP CL1500	1	M-Form Modified Equal Percentage (HPS)	17.1
	2	Linear (HPS)	54.6
	3	Linear (HPS)	127
HP CL900 and CL1500	4	Linear	212
		Modified Equal Percentage	
	6	Linear	469
		Modified Equal Percentage	412
	8	Equal Percentage	449
		Linear	767
	10	Equal Percentage	723
		Linear	973
	12	Equal Percentage	949
		Linear	1337
HP CL2500	1	M-Form Modified Equal Percentage (HPS)	13.8
	2	Linear (HPS)	40.9
	3	Linear	87
		Modified Equal Percentage	84
	4	Linear	153
		Modified Equal Percentage	130
	6	Linear	324
		Modified Equal Percentage	313
HP CL2500 and CL3200	8	Equal Percentage	582
		Linear	560
	10	Equal Percentage	651
		Linear	682
	12	Equal Percentage	1083
		Linear	1232
HP CL2500	14	Equal Percentage	1238
		Linear	1525
HPA CL1500	1	M-Form Modified Equal Percentage (HPAS)	19.5
	2	Linear (HPAS)	73.6
	3	Linear	64.3
	4	Linear	121
	6	Modified Equal Percentage	203
	8	Linear	425
HPA CL2500	1	M-Form Modified Equal Percentage (HPAS)	14.3
	2	Linear (HPAS)	56.2
	6	Linear	217
		Modified Equal Percentage	203
	8	Linear	446
		Modified Equal Percentage	453
	12	Linear	1023
		Modified Equal Percentage	1013

1. See Catalog 12 for a complete listing of flow coefficients.

Table 3. Increased Pressure/Temperature Ratings for Steel Valves with BWE and SWE Connections[1]

Valve Type	Valve Size, NPS	Pressure Rating	Intermediate Rating (ASME B16.34)
Globe Valves	1	CL900 CL1500	1675
		CL2500	2800
	2	CL900 CL1500	1694
	3	CL1500	1578
	4 (long)[2]	CL1500	2017
	6 (long)[2]	CL1500	1876
	8	CL3200	3200
	10	CL3200	3200
	12	CL3200	3200

1. Contact your Emerson sales office for further information on intermediate ratings.
2. (Long) indicates industry standard long face-to-face.

Table 4. Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

Valve Design			Port Diameter, mm (Inches)		ANSI/FCI and IEC Leakage Class
HPD, HPAD			57.15 (2.25) and smaller		II
			58.7 (2.3125) to 105.9 (4.17)		II - Standard
					III - Optional
			111.1 (4.375) and larger		III - Standard
					IV - Optional
	Valve Size, NPS		**Port Diameter, mm (Inches)**	**Cage Style**	**ANSI/FCI and IEC Leakage Class**
	HPD	**HPAD**			
HPD, HPAD w/ C-seal trim	3	4	73 (2.875)	Eq. %, Mod. Eq. %, Linear (std. cage), Linear (Whisper III, A1, B1)	V - Standard to 593°C (1100°F) (for port diameters from 73 mm [2.875 inch] through 136.5 mm [5.375 inch] with optional C-seal trim) IV - Optional (for port diameters 73 mm [2.875 inch] through 136.5 mm [5.375 inch]
	4	6	73 (2.875)	Linear (Whisper III, D3)	
			92.1 (3.625)	Eq. %, Mod. Eq. %, Linear (std. cage), Linear (Whisper III, A1, B3, C3)	
	6	8	111.1 (4.375)	Linear (Whisper III, D3)	
			136.5 (5.375)	Eq. %, Mod. Eq. %, Linear (std. cage), Linear (Whisper III, A1, B3, C3)	
	Valve Size, NPS		**Port Diameter, mm (Inches)**	**Cage Style**	**ANSI/FCI and IEC Leakage Class**
	HPD	**HPAD**			
HPD(2), HPAD(2) w/ Bore-seal trim	8	- - -	139.7 (5.5)	Eq. %, Linear (std. cage), Whisper III, Cavitrol III	V - Standard to 593°C (1100°F) (for port diameters from 139.7 mm [5.5 inch] through 215.9 mm [8.5 inch] with optional Bore-seal trim)
			152.4 (6)		
	10	- - -	165.1 (6.5)		
			177.8 (7)		
	12	12	165.1 (6.5)		
			190.5 (7.5)		
			203.2 (8)		
	14	- - -	215.9 (8.5)		
HPS, HPAS, HPT, HPAT			All	Cavitrol III and Micro-Flat	V - Standard
				Micro-Form, Micro-Flute, Eq. %, Mod Eq. %, Linear, Whisper III	IV - Standard V - Optional
HPS and HPT w/ TSO (Tight Shutoff trim)			See table 5	See table 5	TSO - Optional TSO is not an ANSI/FCI or IEC leakage class. Valves with TSO trim are factory tested to a more stringent Fisher test requirement of no leakage at time of shipment. Test medium is water. Specify service ΔP when ordering. Test procedure is ANSI/FCI Class V test procedure B
HPT and HPAT w/ PEEK(1) Anti-Extrusion Rings			47.6 (1.875) to 215.9 (8.5)	All	V - Standard (to 316°C [600°F]) IV - Optional (47.6 mm [1.875 inch] through 203.2 mm [8 inch] ports)

1. PEEK (PolyEtherEtherKetone), required for all boiler feedwater applications.
2. Trims 263, 2635, 264, 2645, 265, and 2655 are not available in bore-seal.

Material Selection Guidelines

Use the following steps as a guideline for the selection of materials:

1. Determine the pressure/temperature rating of the valve body size and material required. Inlet pressure and temperature must always be limited by the applicable ASME pressure/temperature rating.

2. Select the desired trim style from the Available Configurations specification and from table 4, Shutoff Classifications.

3. Select desired materials from tables 7, 9, 12, and 13 and figure 17. The temperature capabilities determined from figure 17 may be further limited by the temperature capabilities of materials selected from tables 7 and 13. Refer to figure 17 to determine pressure drop limits of the valve body-trim combinations selected.

Installation

The valve must be installed so flow through the valve is as indicated by the flow direction arrow on the valve body. Consideration should be given to installing an upstream strainer, especially if the valve uses a Cavitrol III cage, Whisper Trim III, or WhisperFlo trim.

Overall dimensions are shown in figures 21, 22, and 23. Face-to-face dimensions are in compliance with ANSI/ISA-75.08.05 (long or short), ANSI/ISA-75.08.06 (long or short), or ASME B16.10. Actual end connection dimensions conform to ASME B16.25 for buttweld ends, to B16.11 for socket welding, and to ASME B16.5 for flanged ends.

Table 5. Port Diameters, Valve Plug Travel, Yoke Boss Diameters for TSO (Tight Shutoff) Trim

VALVE TYPE	TRIM	MAX TRAVEL		YOKE BOSS SIZE		PORT DIAMETER				C_V REDUCTION AT 100% TRAVEL(1)	UNBALANCE AREA
						Nominal		Actual TSO			
		mm	Inch	mm	Inch	mm	Inch	mm	Inch		Inch^2
Balanced Plugs—Flow Down Only											
HPT NPS 3(2)	CAV III 3-Stage	63.5	2.5	90	3-9/16	47.6	1.875	42.9	1.6875	5%	0.031
HPT NPS 4 (long)(3)	CAV III 3-Stage	76.2	3	90 127	3-9/16 5	73.0	2.875	68.3	2.6875	2%	0.047
HPT NPS 6 (long)(3)	CAV III 3-Stage	102	4	90 127	3-9/16 5	116	4.5625	111	4.375	0%	0.080
	Standard	76.2	3	90 127	3-9/16 5	137	5.375	132	5.1875	4%	0.206
Unbalanced Plugs—Flow Down Only											
HPS NPS 2	CAV III 3-Stage	50.8	2	90	3-9/16	25.4	1	26.2	0.8125	0%	0.785

1. This column lists the percent reduction of published maximum C_V of the trim listed in the TRIM column.
2. Not available with 5-inch yoke boss.
3. (Long) indicates industry standard long face-to-face.

Figure 6. Typical Balanced TSO Trim

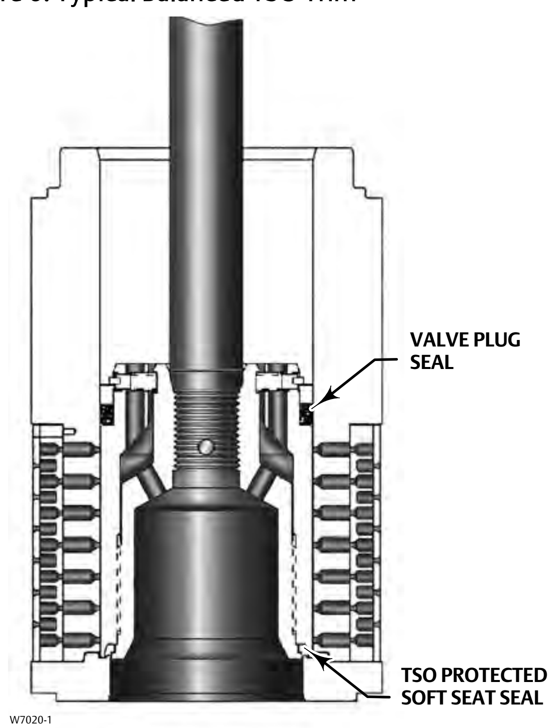
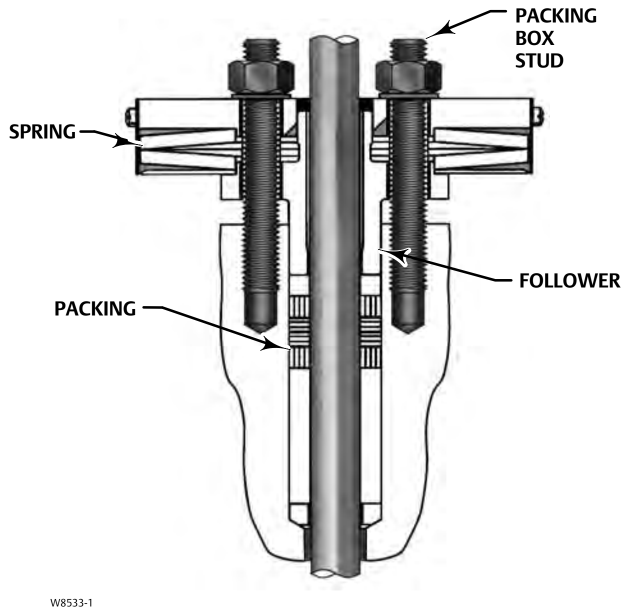
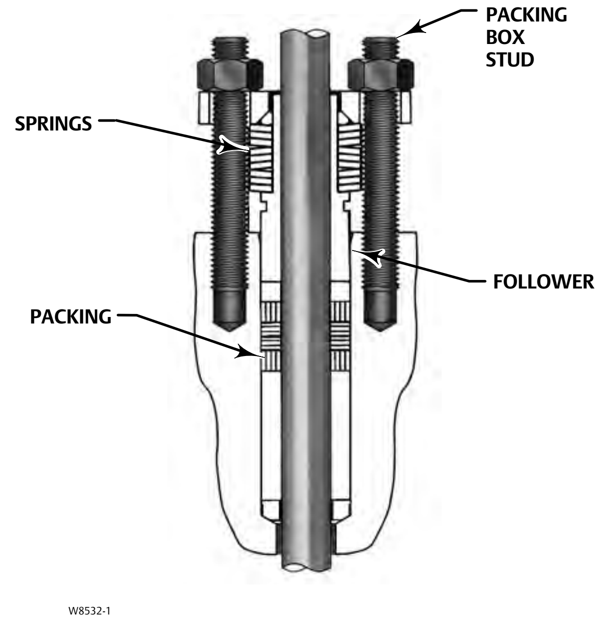


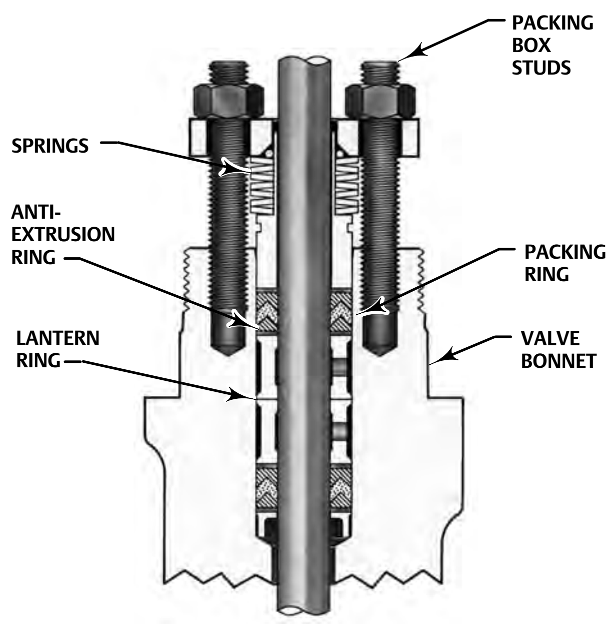
Figure 7. ENVIRO-SEAL and HIGH-SEAL Packing Systems



TYPICAL HIGH-SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING



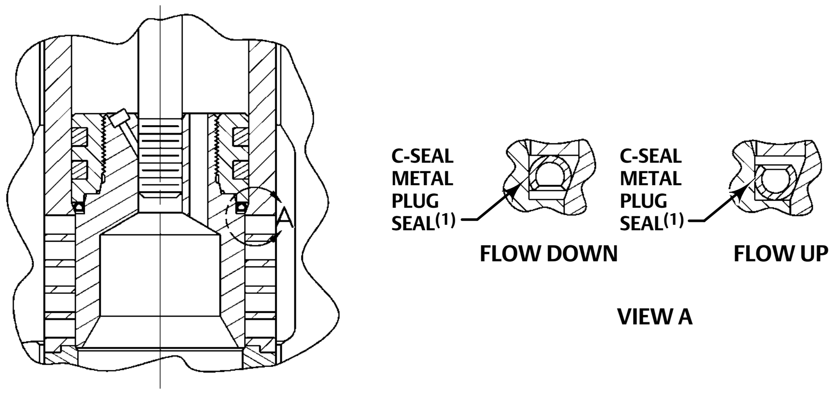
TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH PTFE PACKING

Table 6. Approximate Weights (Valve and Bonnet Assemblies)

VALVE TYPE	VALVE SIZE, NPS	PRESSURE RATING	KILOGRAMS		POUNDS	
			Flg	SWE, BWE	Flg	SWE, BWE
Globe Valves	1	CL900 and 1500	42	38	93	85
		CL2500	45	34	100	76
	1-1/2 x 2	CL2500	- - -	34	- - -	76
	2	CL900 and 1500	72	52	158	115
		CL2500	104	74	229	164
	3	CL900	125	- - -	276	- - -
		CL1500	129	97	284	213
		CL2500	228	163	502	358
	4 (long)(2)	CL900	230	- - -	507	- - -
		CL1500	249	201	548	444
	4 (short)(2)	CL900	167	136	368	- - -
		CL1500	194	162	428	444
		CL2500	321	206	708	444
	6 (long)(2)	CL900	511	- - -	1127	- - -
		CL1500	557	455	1228	1003
	6 (short)(2)	CL900	317	227	699	500
		CL1500	575	269	1268	593
		CL2500	757	481	1669	1060
	8	CL900	720	510	1587	1124
		CL1500	930	640	2050	1411
		CL2500	1630	1050	3594	2315
		CL3200	- - -	1460	- - -	3219
	10	CL900	1030	750	2271	1653
		CL1500	1490	1010	3285	2227
		CL2500	2560	1550	5644	3417
		CL3200	- - -	2200	- - -	4850
	12	CL900	1340	940	2954	2072
		CL1500	1950	1250	4299	2756
		CL2500	3380	2000	7452	4409
		CL3200	- - -	2950	- - -	6504
	14	CL2500	- - -	2297	- - -	5064
Angle Valves	1	CL900 and 1500	40	36	88	80
		CL2500	- - -	72(1)	- - -	160(1)
	2	CL900 and 1500	69	50	153	110
		CL2500	- - -	109(1)	- - -	240(1)
	3	CL1500	123	78	272	173
	4	CL1500	181	117	399	258
	6	CL1500	357	202	788	445
		CL2500	658	325	1451	716
	8	CL1500	648	405	1428	893
		CL2500	971	663	2141	1462
	12	CL2500	2471	1660	5448	3660

1. Only SWE is available for CL2500.
2. (Long) indicates industry standard long face-to-face. (Short) indicates industry standard short face-to-face.

Figure 8. C-seal Trim



NOTE:
1. Reverse the orientation of the C-seal plug seal for proper shutoff when valve is used in a process with different fluid flow direction.

Figure 9. Bore Seal Trim

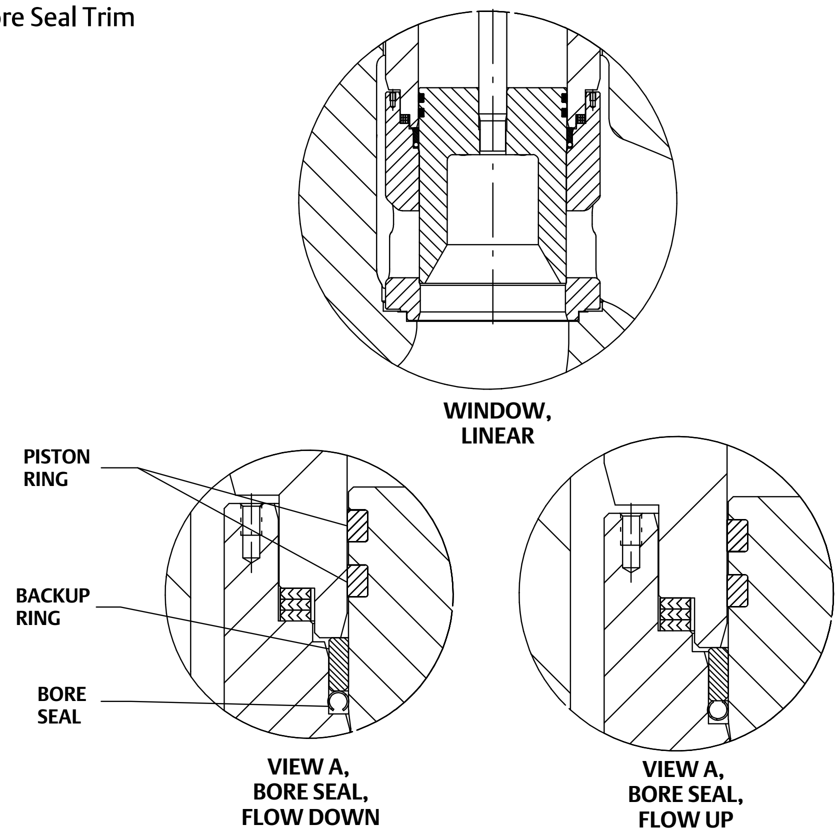


Table 7. Construction Materials and Temperature Capabilities for Parts Other than Valve Body

PART		MATERIAL	TEMPERATURE CAPABILITIES °C	TEMPERATURE CAPABILITIES °F
Valve plug, cage, and seat ring		See table 13	See table 13	
Valve plug stem		S20910	-198 to 593	-325 to 1100
		S42200	-29 to 649	-20 to 1200
		S32760	-51 to 316	-60 to 600
HPD piston ring		Graphite (FMS 17F27)	-46 to 427 (to 482 for nonoxidizing service)	-50 to 800 (to 900 for nonoxidizing service)
		Graphite (FMS 17F39)(2)	-46 to 538 (to 593 for nonoxidizing service)	-50 to 1000 (to 1100 for nonoxidizing service)
Spring-loaded HPT or HPAT valve plug seal	Backup ring	S41600 (416 SST)	-29 to 427	-20 to 800
		S31600 (316 SST)	-198 to 593	-325 to 1100
	Retaining ring	S30200 (302 SST) N07750 (NACE)	-254 to 593	-425 to 1100
	Seal ring	PTFE with N10276 Spring	-73 to 232(1)	-100 to 450(1)
		PTFE with R30003 Spring(3)	-73 to 316	-100 to 600
	Anti-extrusion rings	PEEK (PolyEtherEtherKetone)	-73 to 316	-100 to 600
Cage gasket		N06600/Graphite	-240 to 593	-400 to 1100
TSO protected soft seat seal		Carbon-filled PTFE	-73 to 232	-100 to 450
Seat ring gasket		N06600/Graphite	-240 to 593	-400 to 1100
		S31600/Graphite	-240 to 593	-400 to 1100
Packing		PTFE V-ring	-46 to 232	-50 to 450
		Graphite ribbon filament (oxidizing service to 371°C [700°F])	-254 to 538	-425 to 1000
		Graphite ribbon (high-temperature oxidizing service)	371 to 593	700 to 1100
Packing follower, spring, or lantern ring		S31600 stainless steel	-254 to 593	-425 to 1100
Packing box ring		S31600 stainless steel	-254 to 593	-425 to 1100
Packing flange, studs, or nuts		Steel	-29 to 427	-20 to 800
		S31600 stainless steel	-198 to 593	-325 to 1100

1.If used with PEEK anti-extrusion rings, PTFE/carbon seal ring may be used in temperatures up to 316°C (600°F) for non-oxidizing service or up to 260°C (500°F) for oxidizing service.
2. NPS 8, 10, 12 HPD and HPT come standard with Graphite (FMS 17F39) piston ring.
3. Only offered in NPS 8, 10 and 12 HPT.

Table 8. Construction Materials and Temperature Capabilities for Valve Body-to-Bonnet Bolting (Face-to-Face Structure)

VALVE TYPE	STUDS / NUTS	LONG				SHORT			
		VALVE BODY MATERIAL	VALVE SIZE, NPS	TEMPERATURE CAPABILITIES		VALVE BODY MATERIAL	VALVE SIZE, NPS	TEMPERATURE CAPABILITIES	
				°C	°F			°C	°F
Globe	Steel SA193-B7 NCF2 (all valve body materials) Steel SA194-2H NCF2 (all valve body materials)	WCC and WC9	1 to 6	-29 to 427	-20 to 800	WCC and WC9	3 to 14	-29 to 427	-20 to 800
		LCC	1 to 6	-46 to 343	-50 to 650	LCC	3 to14	-46 to 343	-50 to 650
		CF8M	1 to 6	-48 to 427[2]	-55 to 800[2]	CF8M and CF8C	3 to14	-29 to 316	-20 to 600
	Steel SA193-B7M NCF2 for sour service[3] Steel SA194-2HM NCF2 for sour service	WCC	1 to 6	-29 to 427	-20 to 800	WCC and WC9	3 to 14	-29 to 427	-20 to 800
		LCC	1 to 6	-46 to 343	-50 to 650	LCC	3 to14	-46 to 343	-50 to 650
		CF8M	1 to 6	-29 to 427	-20 to 800	CF8M and CF8C	3 to 14	-29 to 260	-20 to 500
	Steel SA193-B16 Steel SA194-7	WC9	1 to 6	-29 to 538	-20 to 1000	WC9	3 to 14	-29 to 510	-20 to 950
		C12A	1 to 6	-29 to 510	-20 to 950				
		WCC	1 to 6	-29 to 427	-20 to 800	WCC	3 to 14	-29 to 427	-20 to 800
		LCC	1 to 6	-46 to 343	-50 to 650	LCC	3 to14	-46 to 343	-50 to 650
	N07718 SST (SB637)[1] Steel SA194-7	WC9	1 to 6	-29 to 566	-20 to 1050	WC9	3 to 14	-29 to 566	-20 to 1050
		C12A	1 to 6	-29 to 593	-20 to 1100	C12A	3 to 14	-29 to 593	-20 to 1100
	S31600 stainless steel SA193-B8M Class 2 S31600 stainless steel SA194-8M	CF8M	1 to 3	-198 to 427	-325 to 800	- - -	- - -	- - -	- - -
	S31600 Stainless steel SA193-B8M2 Class 2B[3] S31600 Stainless Steel SA194-8M	- - -	- - -	- - -	- - -	CF8M and CF8C	3 to 14	-198 to 566	-325 to 1050
	S20910 SST (SA479-XM-19)[1] Steel SA194-7	CF8M	1 to 6	-198 to 538	-325 to 1000	CF8M and CF8C	3 to14	-198 to 566	-325 to 1050
Angle	Steel SA193-B7 NCF2 (all valve body materials) Steel SA194-2H NCF2 (all valve body materials)	WCC and WC9	1 to 8	-29 to 427	-20 to 800	WCC and WC9	6, 8, 12	-29 to 427	-20 to 800
		LCC	1 to 8	-46 to 343	-50 to 650	LCC	6, 8, 12	-46 to 343	-50 to 650
		CF8M	1 to 8	-48 to 427	-55 to 800	CF8M and CF8C	6, 8, 12	-29 to 316	-20 to 600
	Steel SA193-B7M NCF2 for sour service[3] Steel SA194-2HM NCF2 for sour service	WCC	1 to 8	-29 to 427	-20 to 800	WCC and WC9	6, 8, 12	-29 to 427	-20 to 800
		LCC	1 to 8	-46 to 343	-50 to 650	LCC	6, 8, 12	-46 to 343	-50 to 650
		CF8M	1 to 8	-48 to 427	-55 to 800	CF8M and CF8C	6, 8, 12	-46 to 260	-20 to 500
	Steel SA193-B16 Steel SA194-7	WCC	1 to 8	-29 to 427	-20 to 800	WCC	6, 8, 12	-29 to 427	-20 to 800
		WC9	1 to 8	-29 to 538	-20 to 1000	WC9	6, 8, 12	-29 to 510	-20 to 950
		C12A	1 to 6	-29 to 510	-20 to 950				
		LCC	3 and 4	-46 to 343	-50 to 650	LCC	6, 8, 12	-46 to 343	-50 to 650
	N07718 SST (SB637)[1] Steel SA194-7	WC9	1 to 8	-29 to 566	-20 to 1050	WC9	6, 8, 12	-29 to 566	-20 to 1050
		C12A	1 to 8	-29 to 593	-20 to 1100	C12A	6, 8, 12	-29 to 593	-20 to 1100
	S31600 stainless steel SA193-B8M Class 2 S31600 stainless steel SA194-8M	CF8M	1 to 4	-29 to 427	-20 to 800	- - -	- - -	- - -	- - -
	S31600 Stainless Steel SA193-B8M2 Class 2B[3] S31600 Stainless Steel SA194-8M	- - -	- - -	- - -	- - -	CF8M and CF8C	6, 8, 12	-198 to 566	-325 to 1050
	S20910 SST (SA479-XM-19)[1] Steel SA194-7	CF8M	1 to 4	-198 to 538	-325 to 1000	CF8M and CF8C	6, 8, 12	-198 to 566	-325 to 1050

1. These stud materials are not listed in ASME B16.34.
2. Steel studs and nuts with NCF (non-corroding finish) coating are used with NPS 4 and 6 CF8M valve bodies.
3. Short HP constructions are derated with this bolt material. Consult your Emerson sales office for information.

Table 9. Additional Globe Valve Specifications CL900 through CL1500

<table>
<tr><th rowspan="2">VALVE SIZE, NPS</th><th rowspan="2">VALVE BODY DESIGN AND PLUG STYLE</th><th rowspan="2">FLOW CHARACTERISTIC</th><th colspan="2">PORT DIAMETER</th><th colspan="2">VALVE PLUG TRAVEL</th><th colspan="2">VALVE STEM DIAMETER</th></tr>
<tr><th>mm</th><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th><th>Inches</th></tr>
<tr><td rowspan="14">1</td><td rowspan="3">HPS Micro-Flute</td><td rowspan="3">Equal percentage</td><td>6.4</td><td>0.25</td><td>19</td><td>0.75</td><td>12.7</td><td>1/2</td></tr>
<tr><td>9.53</td><td>0.375</td><td>19</td><td>0.75</td><td>12.7</td><td>1/2</td></tr>
<tr><td>12.7</td><td>0.50</td><td>19</td><td>0.75</td><td>12.7</td><td>1/2</td></tr>
<tr><td rowspan="7">HPS Micro-Form</td><td rowspan="4">Equal percentage</td><td>6.4</td><td>0.25</td><td>19</td><td>0.75</td><td>12.7</td><td>1/2</td></tr>
<tr><td>12.7</td><td>0.50</td><td>19</td><td>0.75</td><td>12.7</td><td>1/2</td></tr>
<tr><td>19.1</td><td>0.75</td><td>19</td><td>0.75</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>25.4</td><td>1</td><td>19</td><td>0.75</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td rowspan="3">Modified equal percentage</td><td>12.7</td><td>0.50</td><td>29</td><td>1.125</td><td>12.7</td><td>1/2</td></tr>
<tr><td>19.1</td><td>0.75</td><td>29</td><td>1.125</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>25.4</td><td>1</td><td>29</td><td>1.125</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td rowspan="3">HPS Micro-Flat</td><td rowspan="4">Linear (Cage Style: Cavitrol III, 2-stage)</td><td>22.2</td><td>0.875</td><td>19</td><td>0.75</td><td>12.7</td><td>1/2</td></tr>
<tr><td>25.4</td><td>1</td><td>29</td><td>1.125</td><td>12.7</td><td>1/2</td></tr>
<tr><td>25.4</td><td>1</td><td>38</td><td>1.5</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>HPS Standard</td><td>22.2</td><td>0.875</td><td>38</td><td>1.5</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td rowspan="27">2</td><td rowspan="8">HPS Micro-Form</td><td rowspan="3">Equal percentage</td><td>6.4</td><td>0.25</td><td>19</td><td>0.75</td><td>12.7</td><td>1/2</td></tr>
<tr><td>12.7</td><td>0.50</td><td>19</td><td>0.75</td><td>12.7</td><td>1/2</td></tr>
<tr><td>19.1</td><td>0.75</td><td>19</td><td>0.75</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td rowspan="5">Modified equal percentage</td><td>12.7</td><td>0.50</td><td>29</td><td>1.125</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>19.1</td><td>0.75</td><td>29</td><td>1.125</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>25.4</td><td>1</td><td>29</td><td>1.125</td><td>12.7, 19.1, 25.4</td><td>1/2, 3/4, 1</td></tr>
<tr><td>31.8</td><td>1.25</td><td>29</td><td>1.125</td><td>12.7, 19.1, 25.4</td><td>1/2, 3/4, 1</td></tr>
<tr><td>38.1</td><td>1.5</td><td>38</td><td>1.5</td><td>19.1, 25.4</td><td>3/4, 1</td></tr>
<tr><td rowspan="4">HPS Micro-Flat</td><td>Linear (Cage Style: Cavitrol III, 2-stage)</td><td>25.4</td><td>1</td><td>38</td><td>1.5</td><td>19.1</td><td>3/4</td></tr>
<tr><td rowspan="3">Linear (Cage Style: Cavitrol III, 3-stage)</td><td>15.88</td><td>0.625</td><td>31.7</td><td>1.3</td><td>19.1</td><td>3/4</td></tr>
<tr><td>25.4</td><td>1</td><td>38</td><td>1.5</td><td>19.1</td><td>3/4</td></tr>
<tr><td>25.4</td><td>1</td><td>63.5</td><td>2.5</td><td>19.1</td><td>3/4</td></tr>
<tr><td rowspan="5">HPS Standard</td><td>Equal percentage</td><td>47.6</td><td>1.875</td><td>29</td><td>1.125</td><td>12.7, 19.1, 25.4</td><td>1/2, 3/4, 1</td></tr>
<tr><td>Modified equal percentage</td><td>47.6</td><td>1.875</td><td>38</td><td>1.5</td><td>12.7, 19.1, 25.4</td><td>1/2, 3/4, 1</td></tr>
<tr><td>Linear (Cage Style: Standard)</td><td>47.6</td><td>1.875</td><td>38</td><td>1.5</td><td>12.7, 19.1, 25.4</td><td>1/2, 3/4, 1</td></tr>
<tr><td>Linear
(Cage Style: Whisper Trim III, Level A1)</td><td>47.6</td><td>1.875</td><td>38</td><td>1.5</td><td>12.7, 19.1, 25.4</td><td>1/2, 3/4, 1</td></tr>
<tr><td>Linear (Cage Style: Cavitrol III, 3-stage)</td><td>25.4</td><td>1</td><td>51</td><td>2</td><td>19.1</td><td>3/4</td></tr>
<tr><td rowspan="4">HPD</td><td>Equal percentage</td><td>47.6</td><td>1.875</td><td>29</td><td>1.125</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>Modified equal percentage</td><td>47.6</td><td>1.875</td><td>38</td><td>1.5</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>Linear (Cage Style: Standard)</td><td>47.6</td><td>1.875</td><td>38</td><td>1.5</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>Linear
(Cage Style: Whisper Trim III, Level A1)</td><td>47.6</td><td>1.875</td><td>38</td><td>1.5</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td rowspan="5">HPT</td><td>Equal percentage</td><td>47.6</td><td>1.875</td><td>29</td><td>1.125</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>Linear (Cage Style: Standard)</td><td>47.6</td><td>1.875</td><td>38</td><td>1.5</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>Linear
(Cage Style: Whisper Trim III, Level A1)</td><td>47.6</td><td>1.875</td><td>38</td><td>1.5</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>Modified equal percentage</td><td>47.6</td><td>1.875</td><td>38</td><td>1.5</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
<tr><td>Linear (Cage Style: Cavitrol III, 2-stage)</td><td>44.5</td><td>1.750</td><td>51</td><td>2</td><td>12.7, 19.1</td><td>1/2, 3/4</td></tr>
</table>

-continued-

Table 9. Additional Globe Valve Specifications CL900 through CL1500 (continued)

VALVE SIZE, NPS	VALVE BODY DESIGN AND PLUG STYLE	FLOW CHARACTERISTIC	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches
3	HPS	Linear	73	2.875	51	2.0	19.1, 25.4	3/4, 1
		Modified equal percentage	73	2.875	51	2.0	19.1, 25.4	3/4, 1
		Whisper III, Level A1, B1	73	2.875	50	2.0	19.1, 25.4	3/4, 1
	HPD	Equal percentage	73	2.875	38	1.5	12.7, 19.1, 25.4	1/2,3/4,1
		Modified equal percentage	73	2.875	51	2	12.7, 19.1, 25.4	1/2,3/4,1
		Linear (Cage Style: Standard)	73	2.875	51	2	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style: Whisper Trim III, Level A1, B1)	73	2.875	51	2	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style: Whisper Trim III, Level D3)	47.6	1.875	51	2	12.7, 19.1, 25.4	1/2, 3/4, 1
	HPT	Equal percentage	73	2.875	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Modified equal percentage	73	2.875	51	2	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style: Standard)	73	2.875	51	2	12.7,19.1,25.4	1/2,3/4,1
		Linear (Cage Style: Whisper Trim III, Level A1, B1)	73	2.875	51	2	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style: Whisper Trim III, Level D3)	47.6	1.875	51	2	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style: Cavitrol III, 2-stage)	63.5	2.50	64	2.50	19.1, 25.4	3/4, 1
		Linear (Cage Style: Cavitrol III, 3-stage)	47.6	1.875	64	2.50	19.1, 25.4	3/4, 1
			42.86	1.688	64	2.50	19.1	3/4
			47.6	1.875	88.9	3.50	19.1	3/4
4	HPD	Equal percentage	92.1	3.625	38	1.5	19.1, 25.4	3/4, 1
		Modified equal percentage	91.4	3.60	51	2	19.1, 25.4	3/4, 1
			92.1	3.625	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Standard)	91.4	3.60	51	2	19.1, 25.4	3/4, 1
			92.1	3.625	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level A1, A3, B1, B3, C1, C3)	92.4	3.60	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level A1, B3, C3)	92.1	3.625	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level D3)	73	2.875	51	2	19.1, 25.4	3/4, 1
	HPT	Equal percentage	92.1	3.625	38	1.5	19.1, 25.4	3/4, 1
		Modified equal percentage	91.4	3.60	51	2	19.1, 25.4	3/4, 1
			92.1	3.625	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Standard)	91.4	3.60	51	2	19.1, 25.4	3/4, 1
			92.1	3.625	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level A1, A3, B1, B3, C1, C3)	92.4	3.60	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level A1, B3, C3)	92.1	3.625	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level D3)	73	2.875	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Cavitrol III, 2-stage)	91.4	3.60	51	2	19.1, 25.4	3/4, 1
			72.39	2.85	76	3	25.4	1
			87.3	3.4375	76	3	19.1, 25.4	3/4, 1
		Linear (Cage Style: Cavitrol III, 3-stage)	68.262	2.6875	76	3	19.1, 25.4	3/4, 1
			73	2.875	76	3	19.1, 25.4	3/4, 1

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Table 9. Additional Globe Valve Specifications CL900 through CL1500 (continued)

<table>
<tr><th rowspan="2">VALVE SIZE, NPS</th><th rowspan="2">VALVE BODY DESIGN AND PLUG STYLE</th><th rowspan="2">FLOW CHARACTERISTIC</th><th colspan="2">PORT DIAMETER</th><th colspan="2">VALVE PLUG TRAVEL</th><th colspan="2">VALVE STEM DIAMETER</th></tr>
<tr><th>mm</th><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th><th>Inches</th></tr>
<tr><td rowspan="15">6</td><td rowspan="15">HPD, HPT</td><td>Equal percentage</td><td>136.5</td><td>5.375</td><td>64</td><td>2.50</td><td>19.1, 25.4, 31.8</td><td>3/4, 1, 1-1/4</td></tr>
<tr><td rowspan="2">Modified equal percentage(1)</td><td>136.5</td><td>5.375</td><td>76</td><td>3</td><td>19.1, 25.4, 31.8</td><td>3/4, 1, 1-1/4</td></tr>
<tr><td>137.2</td><td>5.400</td><td>76</td><td>3</td><td>19.1, 25.4, 31.8</td><td>3/4, 1, 1-1/4</td></tr>
<tr><td rowspan="2">Linear (Cage Style: Standard)</td><td>136.5</td><td>5.375</td><td>76</td><td>3</td><td>19.1, 25.4, 31.8</td><td>3/4, 1, 1-1/4</td></tr>
<tr><td>137.2</td><td>5.400</td><td>76</td><td>3</td><td>19.1, 25.4, 31.8</td><td>3/4, 1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Whisper Trim III, Level A1, B3, C3)</td><td>136.6</td><td>5.375</td><td>76</td><td>3</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Whisper Trim III, Level A1, A3, B1, B3, C1, C3)</td><td>137.2</td><td>5.40</td><td>76</td><td>3</td><td>19.1, 25.4, 31.8</td><td>3/4, 1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Whisper Trim III, Level D3)</td><td>111.1</td><td>4.375</td><td>76</td><td>3</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td rowspan="3">Linear (Cage Style: Cavitrol III, 2-stage) (HPT only)</td><td>118.36</td><td>4.66</td><td>102</td><td>4</td><td>31.8</td><td>1-1/4</td></tr>
<tr><td>133.35</td><td>5.25</td><td>102</td><td>4</td><td>19.1, 25.4, 31.8</td><td>3/4, 1, 1-1/4</td></tr>
<tr><td>137.2</td><td>5.40</td><td>76</td><td>3</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td rowspan="2">Linear (Cage Style: Cavitrol III, 3-stage) (HPT only)</td><td>100.83</td><td>3.97</td><td>102</td><td>4</td><td>31.8</td><td>1-1/4</td></tr>
<tr><td>115.9</td><td>4.5625</td><td>102</td><td>4</td><td>19.1, 25.4, 31.8</td><td>3/4, 1, 1-1/4</td></tr>
<tr><td rowspan="6">8</td><td rowspan="6">HPD, HPT</td><td>Equal percentage</td><td>152.4</td><td>6.00</td><td>76.2</td><td>3</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Standard)</td><td>152.4</td><td>6.00</td><td>76.2</td><td>3</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Whisper Trim III, Level A1, A3)</td><td>152.4</td><td>6.00</td><td>101.6</td><td>4</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Whisper Trim III, Level B1, B3, C1, C3, D3)</td><td>152.4</td><td>6.00</td><td>127</td><td>5</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Cavitrol III, 2-stage)</td><td>152.4</td><td>6.00</td><td>127</td><td>5</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Cavitrol III, 3-stage)</td><td>152.4</td><td>6.00</td><td>127</td><td>5</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td rowspan="6">10</td><td rowspan="6">HPD, HPT</td><td>Equal percentage</td><td>177.8</td><td>7.00</td><td>101.6</td><td>4</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Standard)</td><td>177.8</td><td>7.00</td><td>101.6</td><td>4</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Whisper Trim III, Level A1, A3)</td><td>177.8</td><td>7.00</td><td>101.6</td><td>4</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Whisper Trim III, Level B1, B3, C1, C3, D3)</td><td>177.8</td><td>7.00</td><td>127</td><td>5</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Cavitrol III, 2-stage)</td><td>177.8</td><td>7.00</td><td>127</td><td>5</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
<tr><td>Linear (Cage Style: Cavitrol III, 3-stage)</td><td>177.8</td><td>7.00</td><td>127</td><td>5</td><td>25.4, 31.8</td><td>1, 1-1/4</td></tr>
</table>

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Table 9. Additional Globe Valve Specifications CL900 through CL1500 (continued)

VALVE SIZE, NPS	VALVE BODY DESIGN AND PLUG STYLE	FLOW CHARACTERISTIC	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches
12	HPD, HPT	Equal percentage	203.2	8.00	101.6	4	CL900 25.4, 31.8 CL1500 25.4, 31.8, 50.8	CL900 1, 1-1/4 CL1500 1, 1-1/4, 2
		Linear (Cage Style: Standard)	203.2	8.00	101.6	4	CL900 25.4, 31.8 CL1500 25.4, 31.8, 50.8	CL900 1, 1-1/4 CL1500 1, 1-1/4, 2
		Linear (Cage Style: Whisper Trim III, Level A1, A3)	203.2	8.00	127	5	CL900 25.4,31.8 CL1500 25.4, 31.8, 50.8	CL900 1, 1-1/4 CL1500 1, 1-1/4, 2
		Linear (Cage Style: Whisper Trim III, Level B1, B3, C1, C3, D3)	203.2	8.00	152.4	6	CL900 25.4, 31.8 CL1500 25.4, 31.8, 50.8	CL900 1, 1-1/4 CL1500 1, 1-1/4, 2
		Linear (Cage Style: Cavitrol III, 2-stage)	203.2	8.00	152.4	6	CL900 25.4, 31.8 CL1500 25.4, 31.8, 50.8	CL900 1, 1-1/4 CL1500 1, 1-1/4, 2
		Linear (Cage Style: Cavitrol III, 3-stage)	203.2	8.00	152.4	6	CL900 25.4, 31.8 CL1500 25.4, 31.8, 50.8	CL900 1, 1-1/4 CL1500 1, 1-1/4, 2

1. The first 75% is equal percentage.

Table 10. Globe Valve Specifications for CL2500 through CL3200

VALVE SIZE, NPS	VALVE BODY DESIGN AND PLUG STYLE	FLOW CHARACTERISTIC	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches
1	HPS Micro-Flute	Equal percentage	6.4	0.25	19	0.75	12.7	1/2
			9.525	0.375	19	0.75	12.7	1/2
			12.7	0.50	19	0.75	12.7	1/2
	HPS Micro-Form	Equal percentage	6.4	0.25	19	0.75	12.7	1/2
			12.7	0.50	19	0.75	12.7	1/2
			19.1	0.75	19	0.75	12.7, 19.1	1/2, 3/4
		Modified equal percentage	19.1	0.75	29	1.125	12.7, 19.1	1/2, 3/4
			25.4	1	29	1.125	12.7, 19.1	1/2, 3/4
	HPS Micro-Flat	Linear (Cage Style: Cavitrol III, 2-stage)	22.2	0.875	38	1.5	12.7, 19.1	1/2, 3/4
2	HPS Micro-Flute	Linear (Cage Style: Cavitrol III, 2-stage)	25.4	1	38	1.5	12.7, 19.1	1/2, 3/4
		Linear (Cage Style: Cavitrol III, 3-stage)	15.875	0.625	31.8	1.25	19.1	3/4
			25.4	1	38.64	1.5, 2.5	19.1	3/4
	HPS Micro-Form	Equal percentage	6.4	0.25	19	0.75	12.7	1/2
			12.7	0.5	19	0.75		
			19.1	0.75	19	0.75	12.7, 19.1	1/2, 3/4
		Modified equal percentage	25.4	1	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
			31.8	1.25	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
			38.1	1.5	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
	HPS Standard	Equal percentage	47.6	1.875	25.4	1	12.7, 19.1, 25.4	1/2, 3/4, 1
		Modified equal percentage	47.6	1.875	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style: Standard)	47.6	1.875	25.4	1	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style: Whisper Trim III, Level A1)	47.6	1.875	38	1.50	12.7, 19.1	1/2, 3/4
		Linear (Cage Style: Cavitrol III, 3-stage)	25.4	1	51	2	19.1	3/4
	HPD	Equal percentage	47.6	1.875	25.4	1	12.7, 19.1	1/2, 3/4
		Modified equal percentage	47.6	1.875	29	1.125	12.7, 19.1	1/2, 3/4
		Linear (Cage Style: Standard)	47.6	1.875	25.4	1	12.7, 19.1	1/2, 3/4
		Linear (Cage Style: Whisper Trim III, Level A1)	47.6	1.875	38	1.5	12.7, 19.1	1/2, 3/4
	HPT	Equal percentage	47.6	1.875	25.4	1	12.7, 19.1	1/2, 3/4
		Modified equal percentage	47.6	1.875	29	1.125	12.7, 19.1	1/2, 3/4
		Linear (Cage Style: Standard)	47.6	1.875	25.4	1	12.7, 19.1	1/2, 3/4
		Linear (Cage Style: Whisper Trim III, Level A1)	47.6	1.875	38	1.5	12.7, 19.1	1/2, 3/4
		Linear (Cage Style: Cavitrol III, 2-stage)	44.5	1.75	51	2	12.7, 19.1	1/2, 3/4

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Table 10. Globe Valve Specifications for CL2500 through CL3200 (continued)

VALVE SIZE, NPS	VALVE BODY DESIGN AND PLUG STYLE	FLOW CHARACTERISTIC	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches
3	HPS	Linear (Cage Style: Standard)	57.15	2.25	38	1.5	19.1, 25.4	3/4, 1
		Modified equal percentage	57.15	2.25	38	1.5	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level A1, A3, B1, B3, C1, C3)	57.15	2.25	38	1.5	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level D3)	35	1.375	51	2	19.1, 25.4	3/4, 1
	HPD, HPT	Modified equal percentage	57.15	2.25	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style: Standard)	57.15	2.25	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style:Whisper Trim III, Level A1, A3, B1, B3, C1, C3)	57.15	2.25	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (Cage Style: Whisper Trim III, Level D3)	35	1.375	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Cavitrol III, 2-stage)	57.15	2.25	64	2.5	19.1, 25.4	3/4, 1
		Linear (Cage Style: Cavitrol III, 3-stage)	35	1.375	64	2.5	19.1, 25.4	3/4, 1
4	HPS	Linear (Cage Style: Whisper Trim III, Level D3)	57.15	2.250	51	2.0	19.1, 25.4	3/4, 1
	HPD, HPT	Modified equal percentage	73.7	2.90	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Standard)	73.7	2.90	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level A1, A3, B1, B3, C1, C3)	73.7	2.90	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Whisper Trim III, Level D3)	57.15	2.25	51	2	19.1, 25.4	3/4, 1
		Linear (Cage Style: Cavitrol III, 2-stage)	73.7	2.90	69.9	2.75	25.4	1
		Linear (Cage Style: Cavitrol III, 3-stage)	57.15	2.25	69.9	2.75	19.1, 25.4	3/4, 1
6	HPD, HPT	Modified equal percentage	105.9	4.17	76	3	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Linear (Cage Style: Standard)	105.9	4.17	76	3	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Linear (Cage Style: Whisper Trim III, Level A1, A3, B1, B3, C1, C3)	105.9	4.17	76	3	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Linear (Cage Style: Whisper Trim III, Level D3)	105.9	4.17	76	3	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Linear (Cage Style: Cavitrol III, 2-stage)	105.9	4.17	95.3	3.75	25.4, 31.8	1, 1-1/4
		Linear (Cage Style: Cavitrol III, 3-stage)	105.9	4.17	95.3	3.75	25.4, 31.8	1, 1-1/4
8(1)	HPD, HPT	Equal percentage	139.7	5.50	76.2	3	31.8	1-1/4
		Linear (Cage Style: Standard)	139.7	5.50	76.2	3	31.8	1-1/4
		Linear (Cage Style: Whisper Trim III, Level A1, A3)	139.7	5.50	101.6	4	31.8	1-1/4
		Linear (Cage Style: Whisper Trim III, Level B1, B3, C1, C3, D3)	139.7	5.50	127	5	31.8	1-1/4
		Linear (Cage Style: Cavitrol III, 2-stage)	139.7	5.50	127	5	31.8	1-1/4
		Linear (Cage Style: Cavitrol III, 3-stage)	139.7	5.50	127	5	31.8	1-1/4

-continued-

Table 10. Globe Valve Specifications for CL2500 through CL3200 (continued)

VALVE SIZE, NPS	VALVE BODY DESIGN AND PLUG STYLE	FLOW CHARACTERISTIC	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches
10(1)	HPD, HPT	Equal percentage	165.1	6.50	101.6	4	31.8	1-1/4
		Linear (Cage Style: Standard)	165.1	6.50	76.2	3	31.8	1-1/4
		Linear (Cage Style: Whisper Trim III, Level A1, A3)	165.1	6.50	101.6	4	31.8	1-1/4
		Linear (Cage Style: Whisper Trim III, Level B1, B3, C1, C3, D3)	165.1	6.50	127	5	31.8	1-1/4
		Linear (Cage Style: Cavitrol III, 2-stage)	165.1	6.50	127	5	31.8	1-1/4
		Linear (Cage Style: Cavitrol III, 3-stage)	165.1	6.50	127	5	31.8	1-1/4
12(1)	HPD, HPT	Equal percentage	190.5	7.50	127	5	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Standard)	190.5	7.50	127	5	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Whisper Trim III, Level A1, A3)	190.5	7.50	127	5	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Whisper Trim III, Level B1, B3, C1, C3, D3)	190.5	7.50	152.4	6	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Cavitrol III, 2-stage)	190.5	7.50	152.4	6	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Cavitrol III, 3-stage)	190.5	7.50	152.4	6	32.75, 50.8	1-1/4, 2
14	HPD, HPT	Equal percentage	215.9	8.50	127	5	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Standard)	215.9	8.50	127	5	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Whisper Trim III, Level A1, A3)	215.9	8.50	127	5	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Whisper Trim III, Level B1, B3, C1, C3, D3)	215.9	8.50	152.4	6	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Cavitrol III, 2-stage)	215.9	8.50	152.4	6	32.75, 50.8	1-1/4, 2
		Linear (Cage Style: Cavitrol III, 3-stage)	215.9	8.50	152.4	6	32.75, 50.8	1-1/4, 2

1. Includes CL3200 intermediate rating.

Table 11. Globe and Angle Valve Yoke Boss and Valve Stem Diameter Combinations(1)

VALVE SIZE, NPS	STANDARD DIAMETERS				OPTIONAL DIAMETERS			
	mm		Inches		mm		Inches	
	Stem	Yoke Boss	Stem	Yoke Boss	Stem	Yoke Boss	Stem	Yoke Boss
1	12.7	71	0.5	2-13/16	19.1	90	0.75	3-9/16
2	12.7 19.1	71 90	0.5 0.75	2-13/16 3-9/16	25.4	127	1	5
3	19.1	90	0.75	3-9/16	12.7	71	0.5	2-13/16
					25.4	127	1	5
4	19.1	90	0.75	3-9/16	25.4	127	1	5
6	25.4 31.8	127 127	1 1.25	5 5	19.1	71	0.75	3-9/16
6(2)	19.1	90	0.75	3-9/16	25.4	127	1	5
8(2)	25.4 31.75	127 127	1 1.25	5 5H	19.1	71	0.75	3-9/16
8	31.75	127	1.25	5H	25.4	127	1	5
					50.8	177.8	2	7
10	31.75	127	1.25	5H	25.4	127	1	5
					50.8	177.8	2	7
12	31.75	127	1.25	5H	25.4	127	1	5
					50.8	177.8	2	7
12(2)	31.75	127	1.25	5H	- - -	- - -	- - -	- - -
14	31.75	127	1.25	5H	50.8	177.8	2	7

1. See tables 9, 10, and 12 for valve stem diameters available for specific constructions.
2. Angle valve construction only (HPAD, HPAT).

Table 12. Additional Angle Valve Specifications

VALVE SIZE, NPS	VALVE BODY DESIGN AND PLUG STYLE	FLOW CHARACTERISTIC	FLOW DIRECTION	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
				mm	Inches	mm	Inches	mm	Inches
1	HPAS w/Micro-Flute	Equal percentage	Up(2)	6.4 9.5 12.7	0.25 0.375 0.5	19 19 19	0.75 0.75 0.75	12.7 12.7 12.7	1/2 1/2 1/2
	HPAS w/Micro-Form		Up	6.4 12.7 19.1 25.4	0.25 0.5 0.75 1	19 19 19 19	0.75 0.75 0.75 0.75	12.7 12.7 12.7, 19.1 12.7, 19.1	1/2 1/2 1/2, 3/4 1/2, 3/4
	HPAS, equal percentage characterized cage		Down	19.1	0.75	19	0.75	12.7, 19.1	1/2, 3/4
	HPAS w/Micro-Form	Modified equal percentage	Up	12.7 19.1 25.4	0.5 0.75 1	29 29 29	1.125 1.125 1.125	12.7, 19.1 12.7, 19.1 12.7, 19.1	1/2, 3/4 1/2, 3/4 1/2, 3/4
	HPAS		Down	19.1	0.75	29	1.125	12.7, 19.1	1/2, 3/4
	HPAS w/ Micro-Flat	Linear (cage style: Std)	Down	9.5 12.7 19.1	0.375 0.5 0.75	19 19 19	0.75 0.75 0.75	12.7 12.7 19.1	1/2 1/2 3/4
	HPAS	Linear (cage style: Cavitrol III, 2-stage)	Down	22.2	0.875	38	1.5	12.7, 19.1	1/2, 3/4
2	HPAS w/Micro-Flute	Equal percentage	Up(2)	6.4 9.5 12.7	0.25 0.375 0.5	19 19 19	0.75 0.75 0.75	12.7 12.7 12.7	1/2 1/2 1/2
	HPAS w/Micro-Form		Up	6.4 12.7 19.1 25.4 31.8 38.1	0.25 0.5 0.75 1 1.25 1.5	19 19 19 19 19 29	0.75 0.75 0.75 0.75 0.75 1.125	12.7 12.7 12.7, 19.1 12.7, 19.1, 25.4 12.7, 19.1, 25.4 12.7, 19.1, 25.4	1/2 1/2 1/2, 3/4 1/2, 3/4, 1 1/2, 3/4, 1 1/2, 3/4, 1
	HPAS, equal percentage characterized cage		Down	19.1 25.4 31.8 38.1	0.75 1 1.25 1.5	19 19 19 29	0.75 0.75 0.75 1.125	12.7, 19.1, 25.4 12.7, 19.1, 25.4 19.1, 25.4 19.1, 25.4	1/2, 3/4, 1 1/2, 3/4, 1 3/4, 1 3/4, 1
	HPAS		Up	47.6	1.875	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
	HPAT, HPAD		Down	47.6	1.875	29	1.125	12.7, 19.1	1/2, 3/4
	HPAS w/Micro-Form	Modified equal percentage	Up	12.7 19.1 25.4 31.8 38.1	0.5 0.75 1 1.25 1.5	29 29 29 29 38	1.125 1.125 1.125 1.125 1.5	12.7 12.7, 19.1 12.7, 19.1, 25.4 12.7, 19.1, 25.4 12.7, 19.1, 25.4	1/2 3/4 1/2, 3/4, 1 1/2, 3/4, 1 1/2, 3/4, 1
	HPAS, equal percentage characterized cage		Down	19.1 25.4 31.8 38.1	0.75 1 1.25 1.5	29 29 29 38	1.125 1.125 1.125 1.5	12.7, 19.1, 25.4 12.7, 19.1, 25.4 19.1, 25.4 19.1, 25.4	1/2, 3/4, 1 1/2, 3/4, 1 3/4, 1 3/4, 1
	HPAS		Up	47.6	1.875	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
	HPAT, HPAD		Down	47.6	1.875	38	1.5	12.7, 19.1	1/2, 3/4
	HPAS w/Micro-Flat	Linear (cage style: std)	Down	25.4	1	29	1.125	19.1	3/4
	HPAS	Linear (cage style: std)	Up	47.6	1.875	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
	HPAT, HPAD		Down	47.6	1.875	38	1.5	12.7, 19.1	1/2, 3/4
	HPAS, HPAT, HPAD	Linear (cage style: Whisper III, level A1)	Up	47.6	1.875	38	1.5	12.7, 19.1, 25.4(1)	1/2, 3/4, 1(1)
	HPAT	Linear (cage style: Cavitrol III, 2-stage)	Down	44.5	1.75	51	2	12.7, 19.1	1/2, 3/4
	HPAS	Linear (cage style: Cavitrol III, 3-stage)	Down	25.4	1	51	2	19.1	3/4

-continued-

Table 12. Additional Angle Valve Specifications (continued)

VALVE SIZE, NPS	VALVE BODY DESIGN AND PLUG STYLE	FLOW CHARACTERISTIC	FLOW DIRECTION	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
				mm	Inches	mm	Inches	mm	Inches
3	HPAT, HPAD	Equal percentage	Down	47.6	1.875	29	1.125	12.7, 19.1	1/2, 3/4
		Modified equal percentage	Down	47.6	1.875	38	1.5	12.7, 19.1	1/2, 3/4
		Linear (cage style: Std)	Down	47.6	1.875	38	1.5	12.7, 19.1	1/2, 3/4
		Linear (cage style: Whisper III, level A1)	Up						
	HPAT	Linear (cage style: Cavitrol III, 2-stage)	Down	44.5	1.75	51	2	12.7, 19.1	1/2, 3/4
4	HPAT, HPAD	Equal percentage	Down	73	2.875	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Modified equal percentage	Down	73	2.875	51	2	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (cage style: Std)	Down						
		Linear (cage style: Whisper III, level A1, B1)	Up						
	HPAT	Linear (cage style: Cavitrol III, 2-stage)	Down	64	2.5	64	2.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		Linear (cage style: Cavitrol III, 3-stage)	Down	47.6	1.875	64	2.5	12.7, 19.1, 25.4	1/2, 3/4, 1
6 (long)(3)	HPAT, HPAD	Equal percentage	Down	92.1	3.625	38	1.5	19.1, 25.4	3/4, 1
		Modified equal percentage	Down	92.1	3.625	51	2	19.1, 25.4	3/4, 1
		Linear (cage style: Std)	Down						
		Linear (cage style: Whisper III, level A1, A3, B3, C3)	Up						
		Linear (cage style: Whisper III, level D3)	Up	73	2.875	51	2	19.1, 25.4	3/4, 1
	HPAT	Linear (cage style: Cavitrol III, 2-stage)	Down	87.3	3.4375	76	3	19.1, 25.4	3/4, 1
		Linear (cage style: Cavitrol III, 3-stage)	Down	73	2.875	76	3	19.1, 25.4	3/4, 1
6 (short)(3)	HPAD, HPAT	Linear	Down	73.7	2.9	69.9	2.75	19.1, 25.4	3/4, 1
		Modified Equal Percent	Down						
		Linear (cage style: Whisper III, level A1, A3, B1, B3, C1, C3)	Up						
		Linear (cage style: Whisper III, level D3)	Up	57.2	2.25	50.8	2	19.1, 25.4	3/4, 1
		Linear (cage style: Cavitrol III, 2-stage)	Down	73.7	2.9	69.9	2.75	25.4	1
		Linear (cage style: Cavitrol III, 3-stage)	Down	57.2	2.25	69.9	2.75	25.4	1

-continued-

Table 12. Additional Angle Valve Specifications (continued)

VALVE SIZE, NPS	VALVE BODY DESIGN AND PLUG STYLE	FLOW CHARACTERISTIC	FLOW DIRECTION	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
				mm	Inches	mm	Inches	mm	Inches
8	HPAT, HPAD	Equal percentage	Down	136.5	5.375	64	2.5	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Modified equal percentage	Down	136.5	5.375	76	3	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Linear (cage style: Std)	Down						
		Linear (cage style: Whisper III, level A1, A3, B3, C3)	Up	136.5	5.375	76	3	25.4, 31.8	1, 1-1/4
		Linear (cage style: Whisper III, level D3)	Up	111.1	4.375	76	3	25.4, 31.8	1, 1-1/4
	HPAT	Linear (cage style: Cavitrol III, 2-stage)	Down	133.4	5.25	102	4	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Linear (cage style: Cavitrol III, 3-stage)	Down	115.9	4.5625	102	4	19.1, 25.4, 31.8	3/4, 1, 1-1/4
8 (short)(3)	HPAD, HPAT	Linear	Down	105.9	4.17	95.3	3.75	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Modified Equal Percent	Down						
		Linear (cage style: Whisper III, level A1, A3, B1, B3, C1, C3)	Up						
		Linear (cage style: Whisper III, level D3)	Up	105.9	4.17	76.2	3	19.1, 25.4, 31.8	3/4, 1, 1-1/4
		Linear (cage style: Cavitrol III, 2-stage)	Down	105.9	4.17	95.3	3.75	25.4, 31.8	1, 1-1/4
		Linear (cage style: Cavitrol III, 3-stage)	Down	105.9	4.17	95.3	3.75	19.1, 25.4, 31.8	1, 1-1/4
12	HPAD, HPAT	Linear	Down	165.1	6.5	101.6	4	31.8	1, 1-1/4
		Modified Equal Percent	Down	165.1	6.5	127	5	31.8	1, 1-1/4
		Linear (cage style: Whisper III, level A1, A3, B1, B3, C1, C3, D3)	Up						
		Linear (cage style: Cavitrol III, 2-stage)	Down						
		Linear (cage style: Cavitrol III, 3-stage)	Down						

1. Available only with HPAS valves.
2. Micro-Flutes (1 flute and 0.5 inch port 2 flute) may be used flow down in flashing and erosive service.
3. (Long) indicates industry standard long face-to-face. (Short) indicates industry standard short face-to-face.

Figure 10. Fisher HPS Trim with Micro-Flute Valve Plug

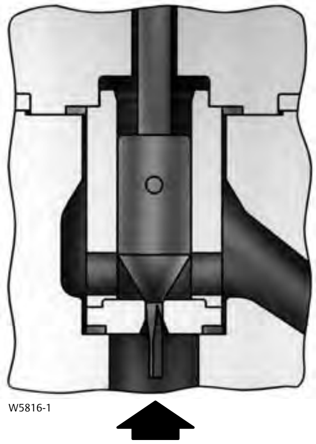
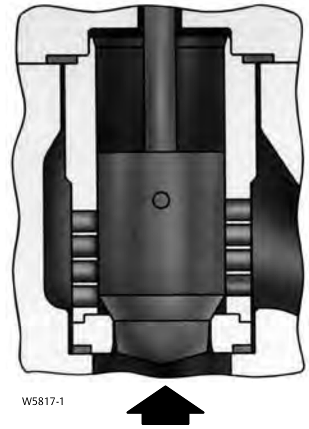


Figure 11. Fisher HPS Trim with Micro-Form Valve Plug



Trim Selection Guidelines

NPS 1 through 6 HP Globe Valve, NPS 8 Angle Body Valve

Refer to the following descriptions as a guideline for the selection of appropriate trims.

- Trim 201A— Trim 201A is the standard trim for carbon steel and alloy steel valve body materials. This trim is recommended for general or severe service applications up to 343°C (650°F) or 427°C (800°F) depending on valve construction. Typical applications for this trim include services in boiler feedwater, water, non-sour hydrocarbons, and steam.

- Trims 202 and 202H— Trims 202 and 202H are designed for use in high temperature applications up to 566°C (1050°F). Trim 202H includes special tolerances required for larger sized HPD and HPAD constructions, as indicated in table 13, at operating temperatures above 343°C (650°F).

- Trim 203— Trim 203 is the standard trim for stainless steel valve body materials and should only be used with stainless steel valve body materials. This trim meets the metallurgical requirements of NACE MR0175-2002 and can be used in applications up to 593°C (1100°F)

- Trim 204— Trim 204 is used in sour or moderately corrosive services. This trim meets the metallurgical requirements of NACE MR0175-2002 and can be used with carbon steel and alloy steel valve body materials.

- Trim 210— Provides a S31600 CoCr-A hardfaced valve plug, which can be easily weld repaired. The S17400 H1075 cage in this trim also allows it to be used in an HPT or HPAT construction.

- Trim 211— Trim 211 is the standard trim for C12A valve body materials and should only be used with C12A valve body materials. C12A should only be used when the pressure and temperature capabilities for WC9 valve body materials are not acceptable.

Figure 12. NPS 2 Fisher HPS Trim with Cavitrol III 3-Stage Cage

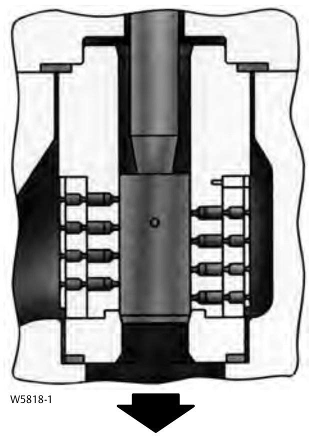


Figure 14. Fisher HPAS Trim with Micro-Flat Valve Plug

Figure 13. Fisher HPD Trim with Whisper Trim III Level D Cage (also available in HPT and HPS)

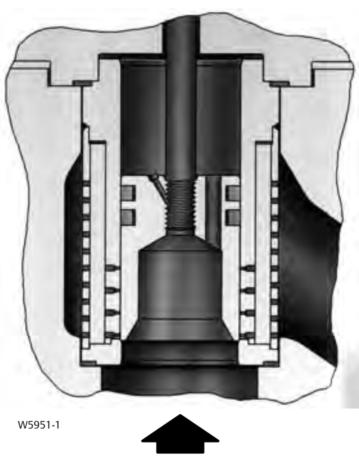
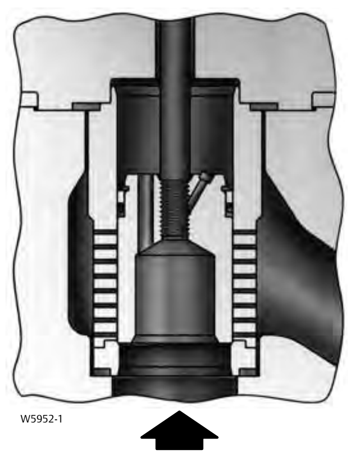


Figure 15. Fisher HPT Trim with Whisper Trim III Level A1 Cage (also available in HPD NPS 2-6 and HPS NPS 2 and 3)



C-seal Trim Description

C-seal trim is available for HPD and HPAD valves with port diameters from 2.875 inches through 5.375 inches.

With C-seal trim, a balanced valve can achieve high-temperature, Class V shutoff. Because the C-seal plug seal is formed from metal (N07718 nickel alloy) rather than an elastomer, a valve equipped with the C-seal trim can be applied in processes with a fluid temperature of up to 593°C (1100°F).

Bore-seal Trim Description

Bore-seal trim is available for HPD valves with port diameters from 5.5 inches through 8.5 inches.

With Bore-seal trim, a balanced valve can achieve high-temperature, Class V shutoff. Because the Bore-seal plug seal is formed from metal (N07718 nickel alloy) rather than an elastomer, a valve equipped with the Bore-seal trim can be applied in processes with a fluid temperature of up to 593°C (1100°F).

Fisher TSO (Tight Shutoff) Trim Capabilities

TSO trim is available for HPS and HPT valves with port diameters as defined in table 5. Also see figure 6 and table 4.

TSO trim consists of a protected soft seat plus PEEK anti-extrusion rings with a spring-loaded PTFE plug seal. Used only in flow down applications, TSO trim offers unparalleled shutoff integrity, resulting in longer plug and seat life. For additional information contact your Emerson sales office.

Table 13. Trim Descriptions

TRIM DESIGNATION	VALVE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL(1)	OPERATING TEMPERATURE RANGE(2)	
						°C	°F
With Standard Cage							
201A	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900 &1500 & NPS 1-2 CL2500)	S41600 heat-treated for HP, HPA, Micro-Form (HPA), and flow down HPAS) or S44004 (440C SST) heat-treated for Micro-Flute and Micro-Flat (HPA only) valve plugs	S17400 (17-4 SST) H1075 heat-treated	S41600 heat-treated or HPA (S44004 heat-treated seat ring for Micro-Flat S44004 heat-treated seat and liner)	WCC	-29 to 343(8)	-20 to 650(8)
					LCC	-29 to 343	-20 to 650
					WC9	-29 to 343(8)	-20 to 650(8)
202	HPD & HPS only (NPS 1-6 CL900 & 1500 & NPS 1 to 2 CL2500) HPAD & HPAS only (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S31600 (316 stainless steel) with CoCr-A seat and guide	F22 (Cr-Mo alloy steel) nitrided	S31600/CoCr-A or R30006 (Alloy 6) for Micro-Flat valve plugs R30006 seat, liner(3)	WCC	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 566	-20 to 1050
202H(4)	HPD NPS 6 CL900 & 1500, HPAD NPS 8 CL900 & 1500 only	S31600 (316 stainless steel) with CoCr-A seat and guide	F22 (Cr-Mo alloy steel) nitrided	S31600/CoCr-A	WCC	260 to 427	500 to 800
					LCC	260 to 343	500 to 650
					WC9	260 to 566	500 to 1050
203 (NACE)(12)	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S31600 with CoCr-A seat and guide	S31600/hard Cr coat	S31600/CoCr-A or R30006 (Alloy 6) for Micro-Flat valve plugs R30006 seat, liner(3)	CF8M	-198 to 593(2)	-325 to 1100(2)
203A (NACE)(12)	HP (NPS 1-6 1500)	S31600 with CoCr-A seat and guide	S31600/Cr plate	S31600/CoCr-A	CF8M	-198 to 316	-325 to 600
204 (NACE)(12)	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S31600 with CoCr-A seat and guide	S17400 Double H1150 heat-treated	S31600/CoCr-A or R30006 (Alloy 6) for Micro-Flat valve plugs R30006 seat, liner(3)	WCC	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 427	-20 to 800

-continued-

Table 13. Trim Descriptions (continued)

TRIM DESIGNATION	VALVE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL[1]	OPERATING TEMPERATURE RANGE[2]	
						°C	°F
With Standard Cage							
210	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S31600 with CoCr-A seat and guide	S17400 H1075	S31600/CoCr-A	WCC	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 427	-20 to 800
211[9]	HPD & HPS only (NPS 1-6 CL900 & 1500 & NPS 1 to 2 CL2500) HPAD & HPAS only (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	F91 with CoCr-A seat and guide	F91 ion nitrided	F91 with CoCr-A	C12A	-29 to 593	-20 to 1100
260	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS12)	410/416 SST heat treated	S17400 H1075 heat treated	S17400 H1075 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
260S[13]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12)	410/416 SST heat treated	S17400 H1075 heat treated	S41600 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
360S[13]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	410/416 SST heat treated	S17400 H1075 heat treated	S41600 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
262	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12)	2.25 Cr - 1 Mo with CoCr-A	2.25 Cr - 1 Mo Nitrided	2.25 Cr - 1 Mo with CoCr-A	WC9, C12A	-29 to 566	-20 to 1050
262S[13]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12)	2.25 Cr - 1 Mo with CoCr-A	2.25 Cr - 1 Mo Nitrided	2.25 Cr - 1 Mo with CoCr-A	WC9, C12A	-29 to 566	-20 to 1050
362S[13]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	2.25 Cr - 1 Mo with CoCr-A	2.25 Cr - 1 Mo Nitrided	2.25 Cr - 1 Mo with CoCr-A	WC9	-29 to 566	-20 to 1050
					C12A	-29 to 593	-20 to 1100
263 (NACE)[11][12]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12)	S31600 with CoCr-A	S31600 with Cr plating	S31600 with CoCr-A	CF8M, CF8C	-198 to 316	-325 to 600
					WCC, WC9	-29 to 316	-20 to 600
					LCC	-46 to 316	-50 to 600
263S[13] (NACE)[11][12]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12)	S31600 with CoCr-A	S31600 with Cr plating	S31600 with CoCr-A	CF8M, CF8C	-198 to 316	-325 to 600
					WCC, WC9	-29 to 316	-20 to 600
					LCC	-46 to 316	-50 to 600
363S[13] (NACE)[11][12]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	S31600 with CoCr-A	S31600 with Cr plating	S31600 with CoCr-A	CF8M, CF8C	-198 to 316	-325 to 600
					WCC, WC9	-29 to 316	-20 to 600
					LCC	-46 to 316	-50 to 600
264 (NACE)[11][12]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12)	S31600 with CoCr-A	S31600 with Cr coating	S31600 with CoCr-A	CF8M, CF8C	-198 to 593	-325 to 1100[14]
					WCC	-29 to 399	-20 to 750[15]
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 427	-20 to 800[15]
264S[13] (NACE)[11][12]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12)	S31600 with CoCr-A	S31600 with Cr coating	S31600 with CoCr-A	CF8M, CF8C	-198 to 593	-325 to 1100[14]
					WCC	-29 to 399	-20 to 750[15]
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 427	-20 to 800[15]
364S[13] (NACE)[11][12]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	S31600 with CoCr-A	S31600 with Cr coating	S31600 with CoCr-A	CF8M, CF8C	-198 to 593	-325 to 1100[16]
					WCC	-29 to 427	-20 to 800[17]
					LCC	-46 to 343	-50 to 650[18]
					WC9	-29 to 454	-20 to 850[17]
265 (NACE)[11][12]	HP (NPS 14 CL2500) HPA (NPS 12)	S34700 with CoCr-A	S34700 with Cr Coating	S34700 with CoCr-A	CF8C	-198 to 593	-325 to 1100[14]

-continued-

Table 13. Trim Descriptions (continued)

TRIM DESIGNATION	VALVE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL[1]	OPERATING TEMPERATURE RANGE[2]	
						°C	°F
With Standard Cage							
265S[13] (NACE)[11][12]	HP (NPS 14 CL2500) HPA (NPS 12)	S34700 with CoCr-A	S34700 with Cr Coating	S34700 with CoCr-A	CF8C	-198 to 593	-325 to 1100[14]
365S[13] (NACE)[11][12]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	S34700 with CoCr-A	S34700 with Cr Coating	S34700 with CoCr-A	CF8C	-198 to 593	-325 to 1100[16]
TC1	HP (NPS 1-6 CL900, 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900, 1500 & NPS 1-2 CL2500)	S17400/tungsten carbide insert for seat & contour [10]	R30006	S17400/Tungsten carbide insert for seat & bore	WCC, WC9	-29 to 232	-20 to 450
TC2	HP (NPS 1-6 CL900, 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900, 1500 & NPS 1-2 CL2500)	S32550/tungsten carbide insert for seat & contour [10]	R30006	S32550/tungsten carbide insert for seat & bore	CF8M, CD3MN, CD3MWCuN	-29 to 93	-20 to 200
TC3	HP (NPS 1-6 CL900, 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900, 1500 & NPS 1-2 CL2500)	N07718/tungsten carbide insert for seat & contour [10]	R30006	N07718/tungsten carbide insert for seat & bore	CW6MC	-29 to 232	-20 to 450
751	HP (NPS 1-6 CL900 & 1500)	**≤ 1/4 inch Port:** R30006 or R30016 **> 1/4 inch, < 3 inch Port:** S31803 with CoCr-A seat and guide **≥ 3 inch Port:** S31803/Ultimet	S31803/Cr Pl	S31803/CoCr A	CD3MN	-51 to 316	-60 to 600
752	HP (NPS 1-6 CL900 & 1500)	**≤ 1/4 inch Port:** R30006 or R30016 **> 1/4 inch, < 3 inch Port:** S32760 with CoCr-A seat and guide **≥ 3 inch Port:** S32760/Ultimet	S32760/Cr Pl	S32760/CoCr A	CD3MWCuN	-51 to 316	-60 to 600
With Cavitrol III Cage							
215A	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S44004 heat-treated	S17400 H1075 heat-treated	S42000 or S44004 heat-treated for CAV III Micro-Flat only	WCC	-29 to 343[8]	-20 to 650[8]
					LCC		
					WC9		
215B[6]	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S44004 heat-treated	S17400 H1075 heat-treated	S42000 or S44004 heat-treated for CAV III Micro-Flat only	WCC	-29 to 343[8]	-20 to 650[8]
					LCC		
					WC9		
206 (NACE)[5]	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S31600 with CoCr-A seat and guide	S17400 Double H1150 heat-treated	S31600/CoCr-A	WCC	-29 to 343	-20 to 650
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 343	-20 to 650
306S[13] (NACE)[5]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	S31600 with CoCr-A seat and guide	S17400 Double H1150 heat-treated	S31600/CoCr-A	WCC, WC9	-29 to 316	-20 to 600
					LCC	-46 to 316	-50 to 600
					CF8M, CF8C	-29 to 316	-20 to 600[20]

-continued-

Table 13. Trim Descriptions (continued)

TRIM DESIGNATION	VALVE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL[1]	OPERATING TEMPERATURE RANGE[2]	
						°C	°F
With Cavitrol III Cage							
275	HP (NPS 8-14 CL900, 1500, 2500, & 3200)HPA (NPS 12 CL2500)	S42000 heat treated	S17400 H1075 heat treated	S17400 H1075 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					CF8M, CF8C	-29 to 232	-20 to 450
275S[13]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	S42000 heat treated	S17400 H1075 heat treated	S42000 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					CF8M, CF8C	-29 to 232	-20 to 450
375S[13]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	S42000 heat treated	S17400 H1075 heat treated	S42000 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					CF8M, CF8C	-29 to 343	-20 to 650[19]
276	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	S44004 heat treated	S17400 H1075 heat treated	S17400 H1075 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					CF8M, CF8C	-29 to 232	-20 to 450
276S[13]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	S44004 heat treated	S17400 H1075 heat treated	S42000 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					CF8M, CF8C	-29 to 232	-20 to 450
275	HP (NPS 8-12 CL900, 1500, 2500, & 3200)	S42000 heat treated	S17400 H1075 heat treated	S17400 H1075 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					CF8M	-29 to 232	-20 to 450
276	HP (NPS 8-12 CL900, 1500, 2500, & 3200)	S44004 heat treated	S17400 H1075 heat treated	S17400 H1075 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					CF8M	-29 to 232	-20 to 450
753	HP (NPS 1-6 CL900 & 1500)	**≤ 1/4 inch Port:** R30006 or R30016 **> 1/4 inch, < 3 inch Port:** S31803 with CoCr-A seat and guide **≥ 3 inch Port:** S31803/Ultimet	S32760	S31803/CoCr A	CD3MN	-51 to 316[7]	-60 to 600[7]
754	HP (NPS 1-6 CL900 & 1500)	**≤ 1/4 inch Port:** R30006 or R30016 **> 1/4 inch, < 3 inch Port:** S32760 with CoCr-A seat and guide **≥ 3 inch Port:** S32760/Ultimet	S32760	S32760/CoCr A	CD3MWCuN	-51 to 316[7]	-60 to 600[7]
With Whisper Trim III Cage							
207A	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S41600 heat-treated	S17400 H1075 heat-treated	S41600 heat-treated	WCC	-29 to 343[8]	-20 to 650[8]
					LCC		
					WC9		
307S[13]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	S41600 heat-treated	S17400 H1075 heat-treated	S41600 heat-treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650

-continued-

Table 13. Trim Descriptions (continued)

TRIM DESIGNATION	VALVE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL[1]	OPERATING TEMPERATURE RANGE[2]	
						°C	°F
With Whisper Trim III Cage							
207B	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500	S41600 heat-treated	S17400 H1075 heat-treated	S31600/CoCr-A	WCC	-29 to 427	-20 to 800
					LCC	-29 to 343	-20 to 650
					WC9	-29 to 427	-20 to 800
208	HPD & HPS only (NPS 1-6 CL900 & 1500 & NPS 1 to 2 CL2500) HPAD & HPAS (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S31600 with CoCr-A seat and guide	F22 (Cr-Mo alloy steel) nitrided	S31600/CoCr-A	WCC	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 566	-20 to 1050
208H[4]	HPD (NPS 6 CL900 & 1500) HPAD (NPS 8 CL900 & 1500 only)	S31600 with CoCr-A seat and guide	F22 (Cr-Mo alloy steel) nitrided	S31600/CoCr-A	WCC	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 566	-20 to 1050
209 (NACE)[5]	HP (NPS 1-6 CL900 & 1500 & NPS 1-2 CL2500) HPA (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	S31600 with CoCr-A seat and guide	S17400 Double H1150 heat-treated	S31600/CoCr-A	WCC	-29 to 343	-20 to 650
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 343	-20 to 650
212[9]	HPD & HPS only (NPS 1-6 CL900 & 1500 & NPS 1 to 2 CL2500) HPAD & HPAS only (NPS 1-8 CL900 & 1500 & NPS 1-2 CL2500)	F91 with CoCr-A seat and guide	F91 ion nitrided	F91 with CoCr-A	C12A	-29 to 593	-20 to 1100
286A	HP (NPS 8-14 CL900, 1500, 2500, & 3200)	410/416 SST heat treated	S17400 H1075 heat treated	S17400 H1075 heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
286S[13]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	410/416 SST heat treated	S17400 H1075 heat treated	S41600 SST heat treated	WCC, WC9	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
287	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	2.25 Cr - 1 Mo with CoCr-A	2.25 Cr - 1 Mo Nitrided	2.25 Cr - 1 Mo with CoCr-A	WC9	-29 to 566	-20 to 1050
					LCC	-46 to 343	-50 to 650
287S[13]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	2.25 Cr - 1 Mo with CoCr-A	2.25 Cr - 1 Mo Nitrided	2.25 Cr - 1 Mo with CoCr-A	WC9	-29 to 566	-20 to 1050
387S[13]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	2.25 Cr - 1 Mo with CoCr-A	2.25 Cr - 1 Mo Nitrided	2.25 Cr - 1 Mo with CoCr-A	WC9	-29 to 566	-20 to 1050
With Whisper Trim III Cage							
288	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	9 Cr - 1 Mo - V	9 Cr - 1 Mo - V Nitrided	9 Cr - 1 Mo - V	C12A	-29 to 566	-20 to 1100
		with CoCr-A		with CoCr-A	LCC	-46 to 343	-50 to 650
288S[13]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	9 Cr - 1 Mo - V with CoCr-A	9 Cr - 1 Mo - V Nitrided	9 Cr - 1 Mo - V with CoCr-A	C12A	-29 to 566	-20 to 1100

-continued-

Table 13. Trim Descriptions (continued)

TRIM DESIGNATION	VALVE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL[1]	OPERATING TEMPERATURE RANGE[2]	
						°C	°F
With Whisper Trim III Cage							
388S[13]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	9 Cr - 1 Mo - V with CoCr-A	9 Cr - 1 Mo - V Nitrided	9 Cr - 1 Mo - V with CoCr-A	C12A	-29 to 566	-20 to 1100
289 (NACE)[5]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	S31600 with CoCr-A	S17400 Double H1150 heat treated	S17400 Double H1150 heat treated with CoCr-A	WCC, WC9, CF8M, CF8C	-29 to 260	-20 to 500
					LCC	-46 to 260	-50 to 500
289S[13] (NACE)[5]	HP (NPS 8-14 CL900, 1500, 2500, & 3200) HPA (NPS 12 CL2500)	S31600 with CoCr-A	S17400 Double H1150 heat treated	S31600 with CoCr-A	WCC, WC9, CF8M, CF8C	-29 to 260	-20 to 500
					LCC	-46 to 260	-50 to 500
389S[13] (NACE)[5]	HP (NPS 3, 4, 6 CL900, 1500, & 2500) HPA (NPS 6 & 8 CL2500)	S31600 with CoCr-A	S17400 Double H1150 heat treated	S31600 with CoCr-A	WCC, WC9	-29 to 316	-20 to 600
					LCC	-46 to 316	-50 to 600
					CF8M, CF8C	-29 to 316	-20 to 600[21]
751	HP (NPS 1-6 CL900 & 1500)	**≤ 1/4 inch Port:** R30006 or R30016 **> 1/4 inch, < 3 inch Port:** S31803 with CoCr-A seat and guide **≥ 3 inch Port:** S31803/Ultimet	S31803/Cr Pl	S31803/CoCr A	CD3MN	-51 to 316	-60 to 600
752	HP (NPS 1-6 CL900 & 1500)	**≤ 1/4 inch Port:** R30006 or R30016 **> 1/4 inch, < 3 inch Port:** S32760 with CoCr-A seat and guide **≥ 3 inch Port:** S32760/Ultimet	S32760/Cr Pl	S32760/CoCr A	CD3MWCuN	-51 to 316	-60 to 600

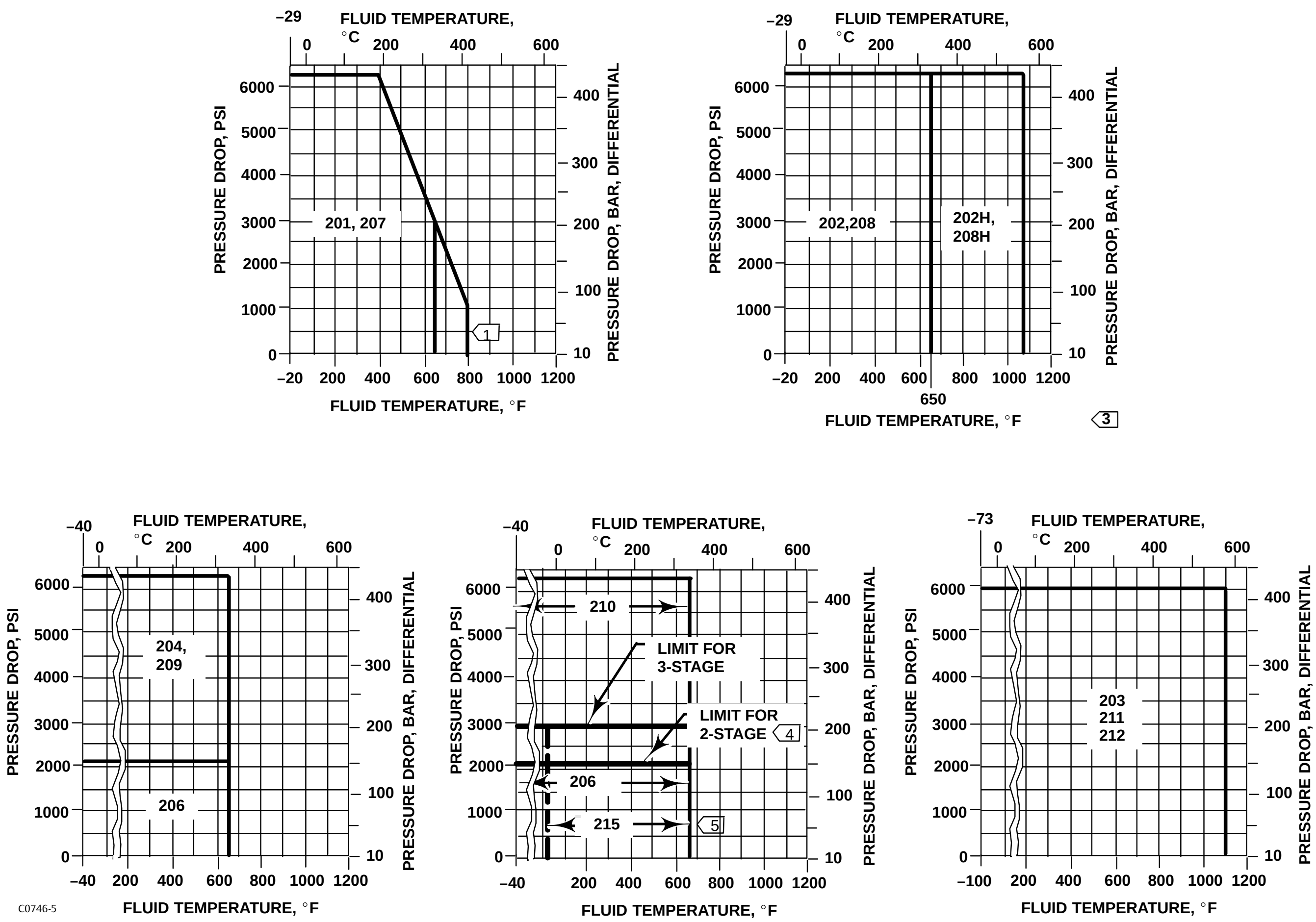
1. If using valve body/trim combinations other than those listed, consult your Emerson sales office.
2. Temperatures above 538°C (1000°F) require a non-standard CF8M body material (CF8M to FMS 20B16).
3. For HPA valves.
4. Trims 202H and 208H have valve plug tolerances for high temperature service and are used in place of trims 202 and 208 for the constructions listed when operating temperatures exceed 343°C (650°F).
5. NACE MR0175-2002.
6. Trim 215B has a S31600 valve stem instead of the standard S20910 material.
7. NPS 1 2 stage and NPS 2 3 stage HPS can be used at temperatures up to 343°C (650°F).
8. NPS 1 and 2 can be used at temperatures up to 427°C (800°F).
9. Trims 211 and 212 use S41000 stem instead of the standard S20910 material. S41000 is limited to 538°C (1000°F). For temperatures greater than 538°C (1000°F), S42200 stem is used.
10. Use with Micro-Form trim in HPS, Micro-Form and Micro-Flat in HPAS valves.
11. Not available with bore seal.
12. NACE MRO175-2002, 2003, and NACE MRO103.
13. Separate seat and cage design trim.
14. NPS 12 angle limited to -198 to 510°C (-325 to 950°F).
15. NPS 12 angle limited to -29 to 371°C (-20 to 700°F).
16. NPS 6 CL2500 globe and NPS 6 angle limited to -198 to 482°C (-325 to 900°F). NPS 8 angle limited to -198 to 371°C (-325 to 700°F).
17. NPS 6 CL2500 globe limited to -29 to 343°C (-20 to 650°F). NPS 8 angle limited to 29 to 315°C (-20 to 600°F).
18. NPS 8 angle limited to -45 to 173°C (-50 to 600°F).
19. NPS 6 globe CL1500 and CL2500 limited to -29 to 232°C (-20 to 450°F). NPS 6 angle limited to -29 to 260°C (-20 to 500°F). NPS 8 angle limited to -29 to 176°C (-20 to 350°F).
20. NPS 6 globe CL1500 and CL2500 limited to -29 to 260°C (-20 to 500°F). NPS 6 angle limited to -29 to 287°C (-20 to 550°F). NPS 8 angle limited to -29 to 176°C (-20 to 350°F).
21. NPS 6 globe and angle CL1500 and CL2500 limited to -29 to 287°C (-20 to 550°F). NPS 8 angle limited to -45 to 287°C (-50 to 350°F).

Table 14. Flowing Pressure Drop Limits for NPS 6 (Long)(1) HPD and HPT Valves (Without Cavitrol III or Whisper Trim III Cage)

FLOW MEDIA	STEM DIAMETER, mm (INCHES)	MAXIMUM FLOWING PRESSURE DROP			
		Bar		PSI	
		Flow Down	Flow Up	Flow Down	Flow Up
All except boiler feedwater	19 (3/4)	103	- - -	1500	- - -
	25.4 (1)	172	- - -	2500	- - -
	31.8 (1-1/4)	259	- - -	3750	- - -
	51.8 x 31.8(2) (2 x 1-1/4)	259	259	3750	3750
Boiler feedwater	31.8 (1-1/4)	69	- - -	1000	- - -
	51.8 x 31.8(2) (2 x 1-1/4)	138	259	2000	3750

1. (Long) indicates industry standard long face-to-face.
2. Requires 31.8 mm (1-1/4 inch) S20910 stem with 52.8 mm (2-inch) plug-to-stem connection.

Figure 16. Pressure-Temperature Limits for Trim Material Combinations (also refer to table 7)



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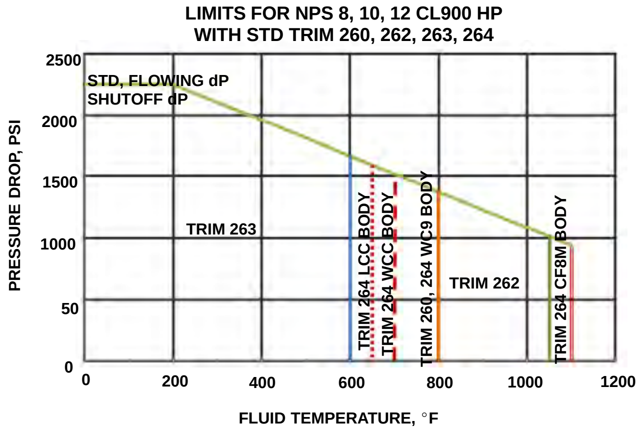
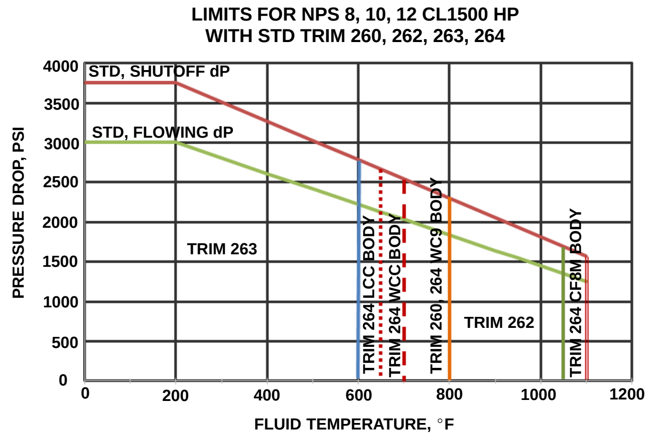
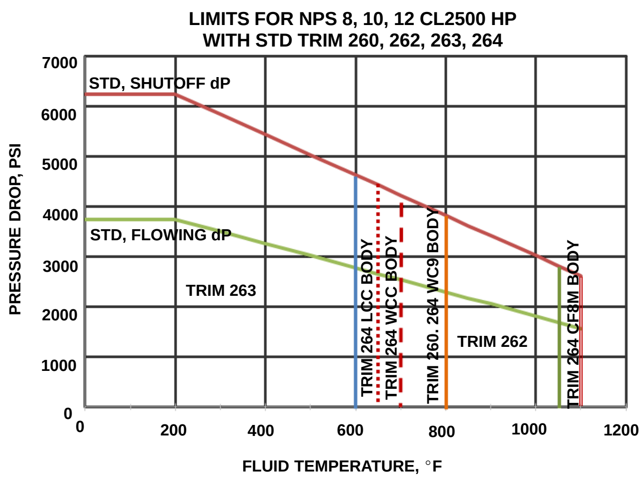
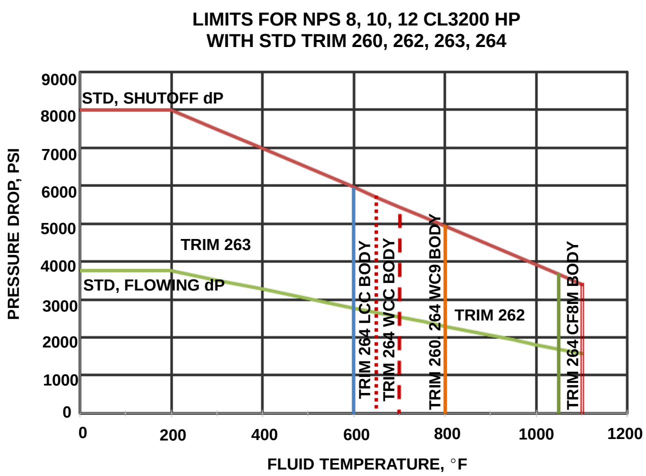
Notes:
1 Use trim 207B in NPS 3, 4, 6 HP and NPS 4, 6, 8 HPA above 343°C (650°F).
2 NACE MR0175-2002.
3 Be especially careful to specify service temperature if trim 202 or 208 is selected, as different thermal expansion rates require special plug clearances.
4 The limit for 2-stage NPS 1 and 2 valves is 2160 psig. For NPS 3 to 6 valves the limit is 1800 psig.
5 Use trim 215 up to 427°C (800° F) for NPS 1 and 2.

Figure 17. Pressure-Temperature Limits for Standard Window Cage (also refer to table 7)









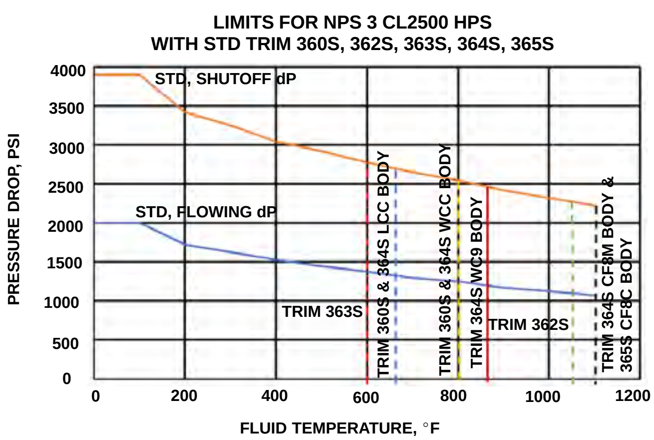
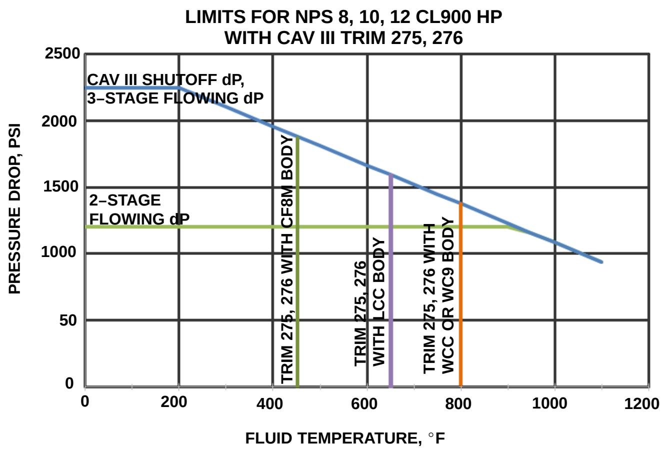
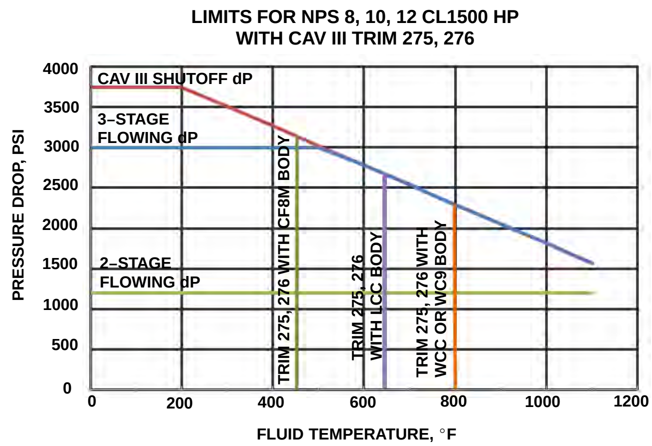
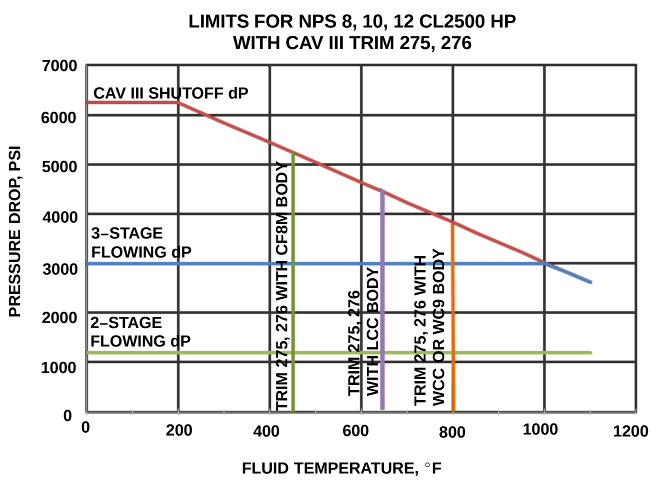


Figure 18. Pressure-Temperature Limits for Cavitrol III Cage (also refer to table 7)







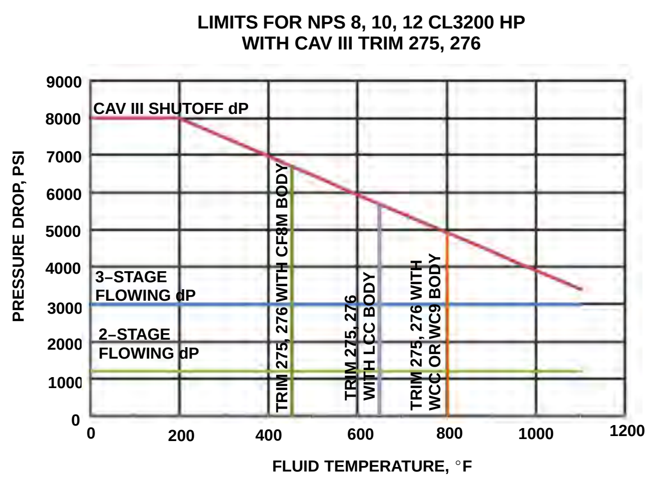
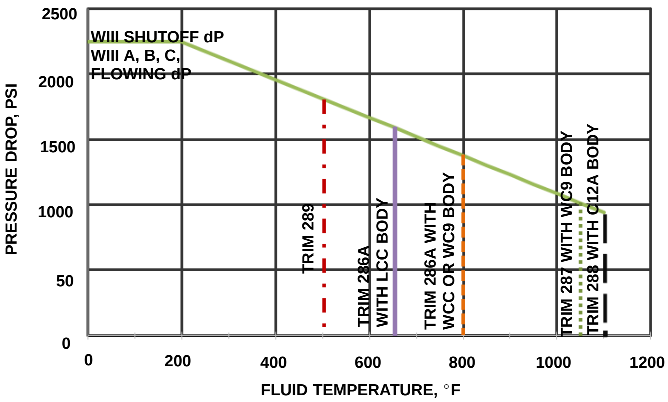
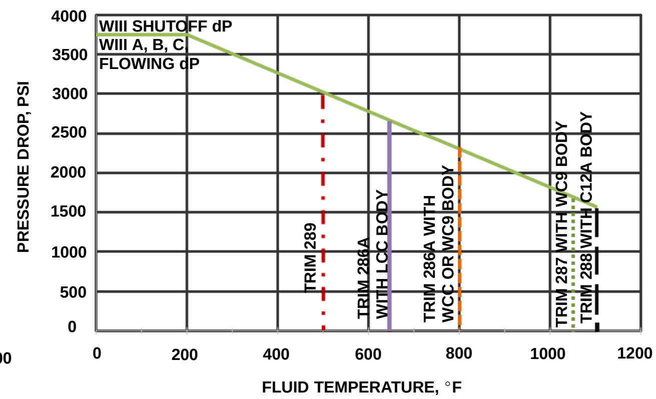


Figure 19. Pressure-Temperature Limits for Whisper III A, B, C Cage (also refer to table 7)

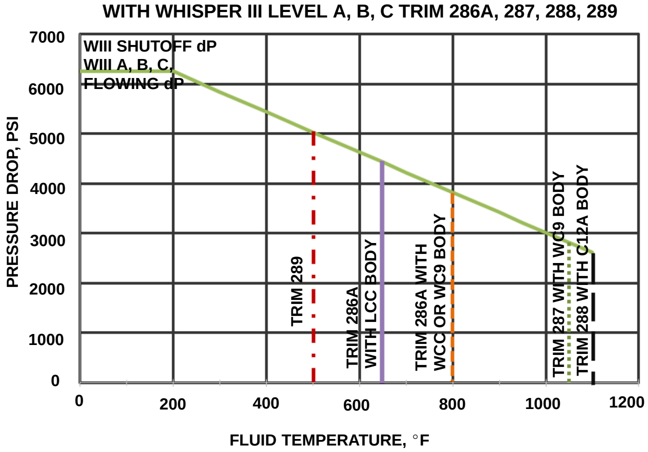
LIMITS FOR NPS 8, 10, 12 CL900 HP
WITH WHISPER III LEVEL A, B, C TRIM 286A, 287, 288, 289



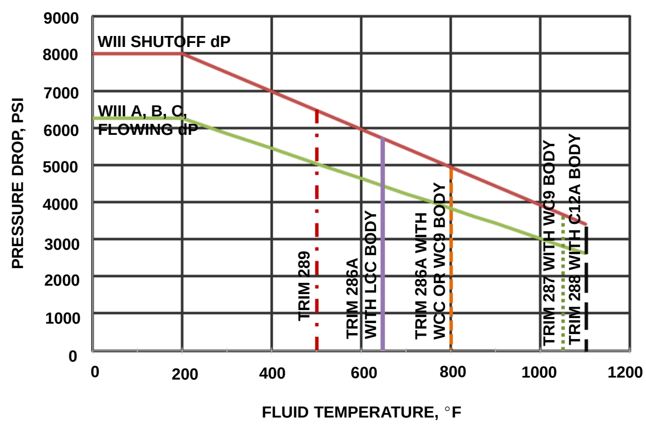
LIMITS FOR NPS 8, 10, 12 CL1500 HP
WITH WHISPER III LEVEL A, B, C TRIM 286A, 287, 288, 289



LIMITS FOR NPS 8, 10, 12 CL2500 HP
WITH WHISPER III LEVEL A, B, C TRIM 286A, 287, 288, 289



LIMITS FOR NPS 8, 10, 12 CL3200 HP
WITH WHISPER III LEVEL A, B, C TRIM 286A, 287, 288, 289



LIMITS FOR NPS 3 CL2500 HPS
WITH WHISPER III LEVEL A, B, C TRIM 307S, 387S, 388S, 389S

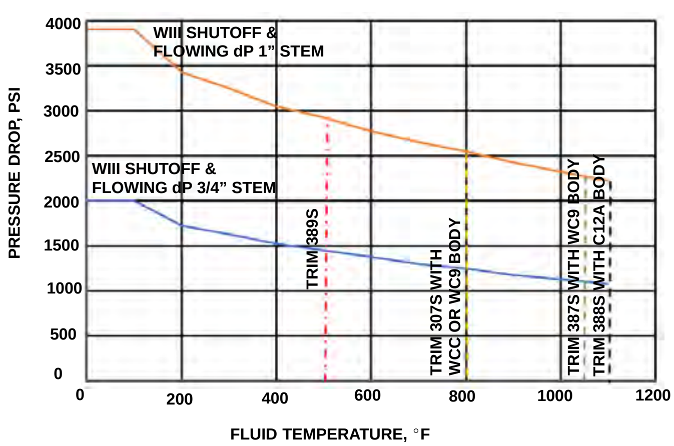


Figure 20. Pressure-Temperature Limits for Whisper III D Cage (also refer to table 7)

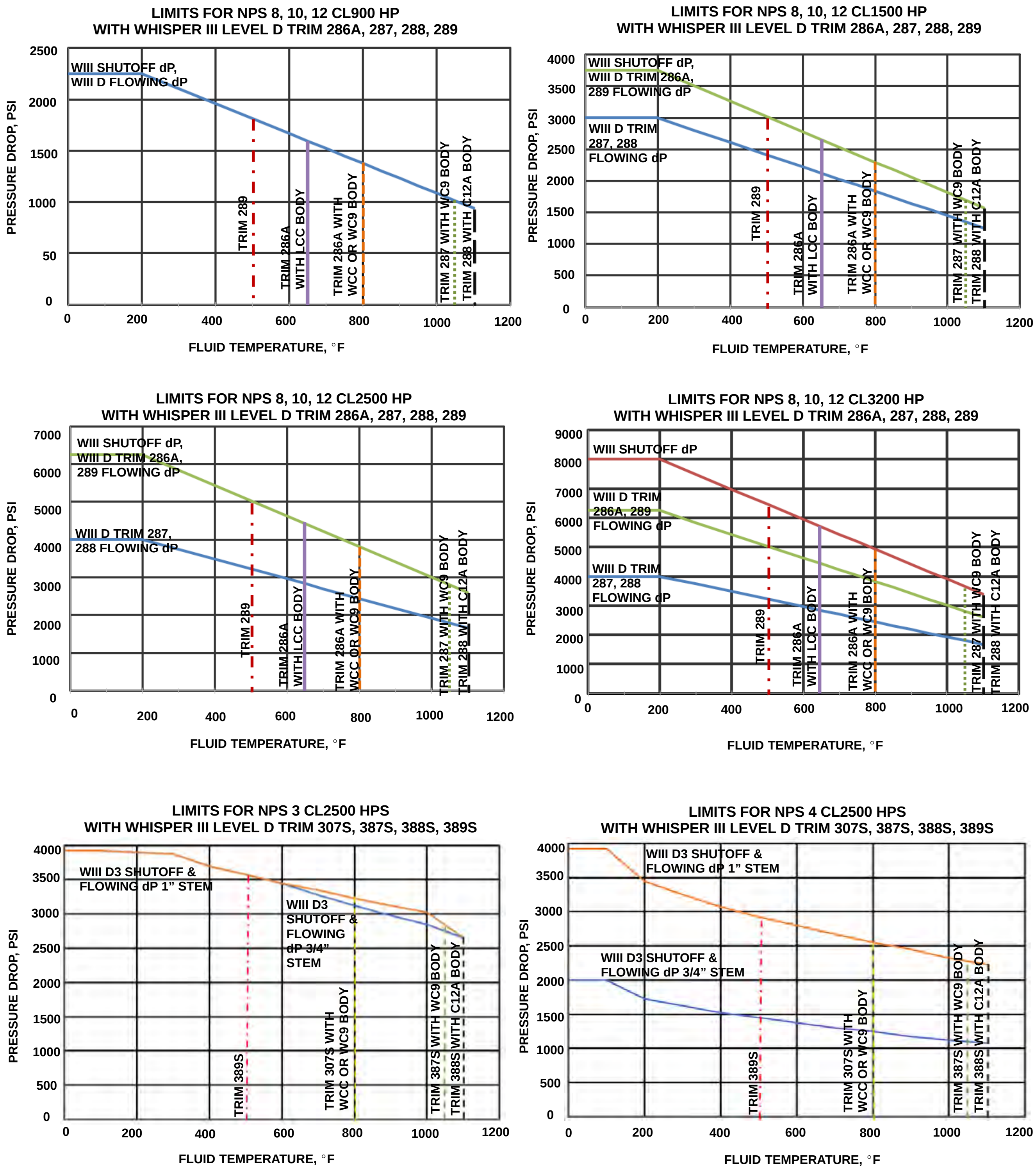


Table 15. Globe Valve Dimensions with Standard/Style 1 Extension Bonnet

VALVE SIZE, NPS	A(1)							
	ASME						EN	
	CL900		CL1500				PN160	PN250
	RF	RTJ	BWE	SWE	RF	RTJ		
	mm							
1	292	292	292	292	292	292	269	277
2	375	378	375	375	375	378	344	360
3	442	445	460	- - -	460	464	442	460
4x3	460	463	460	- - -	479	482	- - -	- - -
4	511	514	530	- - -	530	533	511	530
6x4	544	547	530	- - -	598	604	- - -	- - -
6	714	718	768	- - -	768	775	714	768
8x6	730	733	768	- - -	787	797	- - -	- - -
	CL2500							
1	- - -	- - -	318	318	318	318	- - -	- - -
2	- - -	- - -	400	400	413	416	- - -	- - -
	CL900		CL1500				PN160	PN250
	Inches							
1	11.50	11.50	11.50	11.50	11.50	11.50	10.58	10.90
2	14.75	14.88	14.75	14.75	14.75	14.88	13.56	14.18
3	17.38	17.50	18.12	- - -	18.12	18.25	17.38	18.12
4x3	18.12	18.25	18.12	- - -	18.88	19.00	- - -	- - -
4	20.12	20.25	20.88	- - -	20.88	21.00	20.12	20.88
6x4	21.44	21.56	20.88	- - -	23.56	23.81	- - -	- - -
6	28.12	28.25	30.25	- - -	30.25	30.50	28.12	30.25
8x6	28.75	28.88	30.25	- - -	31.00	31.38	- - -	- - -
	CL2500							
1	- - -	- - -	12.50	12.50	12.50	12.50	- - -	- - -
2	- - -	- - -	15.75	15.75	16.25	16.38	- - -	- - -

1. RF-raised-face flanges; RTJ-ring-type joint flanges; BWE-buttweld ends; SWE-socketweld ends.

Table 16. Globe Valve Dimensions with Standard/Style 1 Extension Bonnet

VALVE SIZE, NPS	B(1)							
	ASME						EN	
	CL900		CL1500				PN160	PN250
	RF	RTJ	BWE	SWE	RF	RTJ		
	mm							
1	146	146	146	146	146	146	134	138
2	187	189	187	187	187	189	172	180
3	221	222	230	- - -	230	232	192	202
4x3	212	214	209	- - -	222	223	- - -	- - -
4	229	230	238	- - -	238	240	218	232
6x4	249	250	238	- - -	276	279	- - -	- - -
6	310	311	337	- - -	337	340	298	316
8x6	317	319	336	- - -	345	350	- - -	- - -
	CL2500							
1	- - -	- - -	159	159	159	159	- - -	- - -
2	- - -	- - -	200	200	206	208	- - -	- - -
	CL900		CL1500				PN160	PN250
	Inches							
1	5.75	5.75	5.75	5.75	5.75	5.75	5.29	5.45
2	7.38	7.44	7.38	7.38	7.38	7.44	6.78	7.09
3	8.69	8.75	9.06	- - -	9.06	9.12	7.54	7.94
4x3	8.38	8.44	8.25	- - -	8.75	8.81	- - -	- - -
4	9.00	9.06	9.38	- - -	9.38	9.44	10.75	9.13
6x4	9.81	9.88	9.38	- - -	10.88	11.00	- - -	- - -
6	12.19	12.25	13.25	- - -	13.25	13.38	11.72	12.43
8x6	12.5	12.56	13.25	- - -	13.62	13.81	- - -	- - -
	CL2500							
1	- - -	- - -	6.25	6.25	6.25	6.25	- - -	- - -
2	- - -	- - -	7.88	7.88	8.12	8.19	- - -	- - -

1. RF-raised-face flanges; RTJ-ring-type joint flanges; BWE-buttweld ends; SWE-socketweld ends.

Table 17. Globe Valve Dimensions with Standard Bonnet

STANDARD BONNETS				
VALVE SIZE, NPS	G	D		
		Yoke Boss Diameters, mm (Inches)		
		71 (2-13/16)	90 (3-9/16)	127 (5)
mm				
CL900 and 1500				
1	52	260	267	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	77	261	267	331
2, Cavitrol III 2-Stage	77	279	286	344
4x3, 3	121	322	311	370
6x4, 4 (long)(1)	175	- - -	300	368
8x6, 6 (long)(1)	248	- - -	365	402
CL2500				
1	63	35	35	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	84	303	303	352
2, Cavitrol III 2-Stage	84	320	320	40
Inches				
CL900 and 1500				
1	2.06	10.25	10.50	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	3.06	10.31	10.56	13.06
2, Cavitrol III 2-Stage	3.06	11.00	11.25	13.56
4x3, 3	4.75	12.69	12.25	14.56
6x4, 4 (long)(1)	6.88	- - -	11.81	14.50
8x6, 6 (long)(1)	9.75	- - -	14.38	15.81
CL2500				
1	2.47	10.07	10.07	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	3.31	11.91	11.91	13.85
2, Cavitrol III 2-Stage	3.31	12.59	12.59	14.53

1. (Long) indicates industry standard long face-to-face.

Table 18. Globe Valve Dimensions with Extension Bonnet

EXTENSION BONNETS (CL900 AND 1500)				
VALVE SIZE, NPS	G	D		
		Yoke Boss Diameters, mm (Inches)		
		71 (2-13/16)	90 (3-9/16)	127 (5)
mm				
1	52	384	400	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	77	430	446	505
2, Cavitrol III 2-Stage	77	448	464	518
Inches				
1	2.06	15.12	15.75	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	3.06	16.94	17.56	19.88
2, Cavitrol III 2-Stage	3.06	17.62	18.25	20.38

Table 19. Globe Valve Dimensions A and B with Standard Bonnet

VALVE SIZE, NPS	A					
	CL900			CL1500		
	RF	RTJ	BWE	RF	RTJ	BWE
mm						
4 (short)(1)	464	467	406	483	486	406
6 (short)(1)	600	603	559	692	698	559
8	781	784	653	838	848	685
10	864	867	762	991	1001	822
12	1016	1019	914	1130	1146	989
Inches						
4 (short)(1)	18.27	18.39	15.98	19.02	19.13	15.98
6 (short)(1)	23.62	23.74	22.01	27.24	27.48	22.01
8	30.75	30.87	25.71	32.99	33.39	26.97
10	34.02	34.13	30.00	39.02	39.41	32.36
12	40.00	40.12	35.98	44.49	45.12	38.94
VALVE SIZE, NPS	B					
	CL900			CL1500		
	RF	RTJ	BWE	RF	RTJ	BWE
mm						
4 (short)(1)	232	233.5	203	241.5	243	203
6 (short)(1)	300	301.5	282	340	343	282
8	402.0	403.5	349.0	431.0	436.0	370.0
10	457.5	459.0	406.5	521.0	526.0	436.5
12	559.0	560.5	503.0	616.0	624.0	536.0
Inches						
4 (short)(1)	9.13	9.2	8	9.51	9.6	8
6 (short)(1)	11.81	11.9	11.1	13.39	13.5	11.1
8	15.83	15.89	13.74	16.97	17.17	14.57
10	18.01	18.07	16.00	20.51	20.71	17.19
12	22.01	22.07	19.80	24.25	24.57	21.10

1. (Short) indicates industry standard short face-to-face.

VALVE SIZE, NPS	A					
	CL2500			CL3200		
	RF	RTJ	BWE	RF	RTJ	BWE
mm						
3	498	504	381	---	---	---
4	575	585	457	---	---	---
6	819	832	610	---	---	---
8	1022	1038	762	---	---	840
10	1270	1292	1016	---	---	1016
12	1321	1343	1118	---	---	1118
14	---	---	1300	---	---	---
Inches						
3	19.61	19.84	15.00	---	---	---
4	22.64	23.03	17.99	---	---	---
6	32.24	32.76	24.02	---	---	---
8	40.24	40.87	30.00	---	---	33.07
10	50.00	50.87	40.00	---	---	40.00
12	52.01	52.87	44.02	---	---	44.02
14	---	---	51.18	---	---	---
VALVE SIZE, NPS	B					
	CL2500			CL3200		
	RF	RTJ	BWE	RF	RTJ	BWE
mm						
3	249	252	190.5	---	---	---
4	290	295	228.5	---	---	---
6	422	428.5	317.7	---	---	---
8	530.0	538.0	393.0	---	---	435.0
10	685.8	696.8	559.0	---	---	526.0
12	694.8	705.8	575.0	---	---	575.0
14	---	---	680	---	---	---
Inches						
3	9.8	9.92	7.5	---	---	---
4	11.42	11.61	9	---	---	---
6	16.61	16.87	12.5	---	---	---
8	20.87	21.18	15.47	---	---	17.13
10	27.00	27.43	22.01	---	---	20.71
12	27.35	27.79	22.64	---	---	22.64
14	---	---	26.77	---	---	---

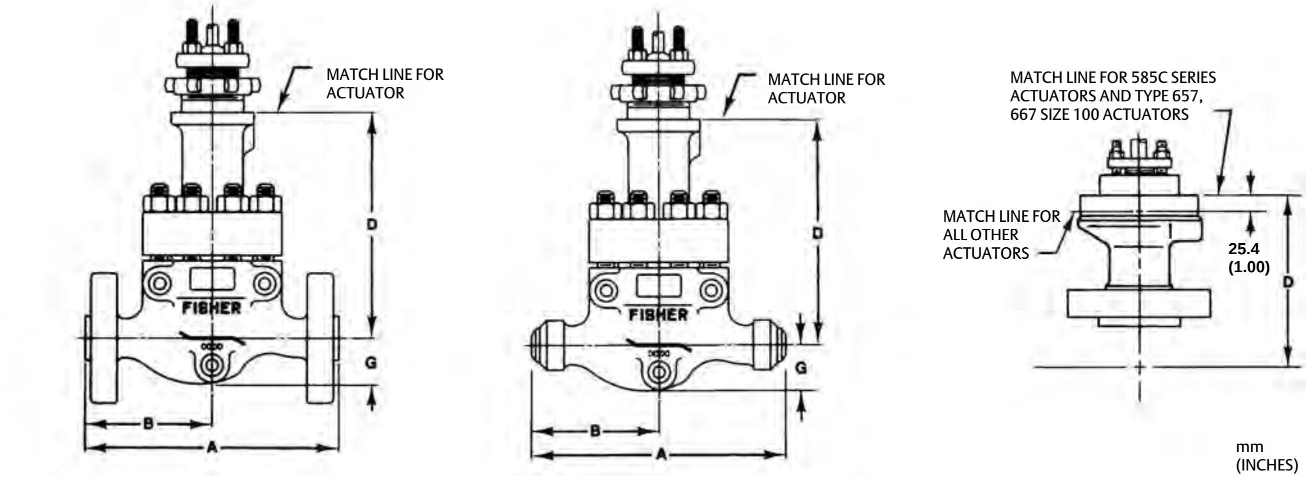
Table 20. Globe Valve Dimensions G and D with Standard Bonnet

VALVE SIZE, NPS	G				D					
					Yoke Boss Diameters, mm (inch)					
					90 (3 9/16)			127 (5)		
	CL900	CL1500	CL2500	CL3200	CL900	CL1500	CL2500	CL900	CL1500	CL2500
mm										
3	---	---	120.4	---	---	---	401	---	---	439
4 (short)[1]	102.8	102.8	136.8	---	379	405	430	417	443	468
6 (short)[1]	130.9	141.1	204.7	---	392	411	475	479	524	475
8	259.6	281.0	314.2	311.2	---	---	---	547.1	547.1	---
10	312.5	332.0	370	390	---	---	---	556.2	565	---
12	355	377.1	418.0	408	---	---	---	618.3	653.1	---
14	---	---	397	---	---	---	---	---	---	---
Inches										
3	---	---	4.74	---	---	---	15.77	---	---	17.27
4 (short)[1]	4.05	4.05	5.39	---	14.92	15.95	16.93	16.42	17.45	18.42
6 (short)[1]	5.15	5.56	8.06	---	15.42	16.17	18.7	18.87	20.63	18.7
8	10.22	11.06	12.37	12.25	---	---	---	21.54	21.54	---
10	12.30	13.07	14.57	15.35	---	---	---	21.9	22.24	---
12	13.98	14.85	16.46	16.06	---	---	---	24.34	25.71	---
14	---	---	15.63	---	---	---	---	---	---	---

VALVE SIZE, NPS	D							
	Yoke Boss Diameters, mm (inch)							
	127 (5H)				178 (7)			
	CL900	CL1500	CL2500	CL3200	CL900	CL1500	CL2500	CL3200
mm								
3	---	---	---	---	---	---	---	---
4 (short)[1]	---	---	---	---	---	---	---	---
6 (short)[1]	479	524	475	---	---	---	---	---
8	547.1	547.1	620	---	---	---	620	647.3
10	556.2	565	647.4	---	---	---	647.4	734.3
12	618.3	653.1	662.7	745.8	---	653.1	662.7	745.8
14	---	---	747	---	---	---	747	---
Inches								
3	---	---	---	---	---	---	12.17	---
4 (short)[1]	---	---	---	---	---	---	19.33	---
6 (short)[1]	18.87	20.63	18.7	---	---	---	18.58	---
8	21.54	21.54	24.41	---	---	---	24.41	25.48
10	21.9	22.24	25.49	---	---	---	25.49	28.91
12	24.34	25.71	26.09	29.36	---	25.71	26.09	29.36
14	---	---	29.41	---	---	---	29.45	---

1. (Short) indicates industry standard short face-to-face.

Figure 21. Globe Valve Dimensions with Standard Bonnet (also see tables 15, 16, 17, and 18)



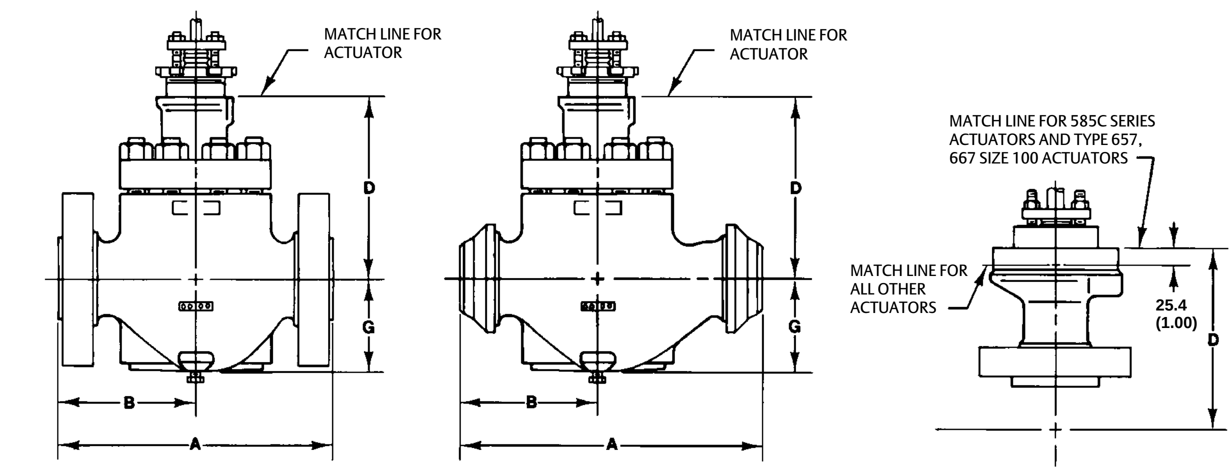
FLANGED VALVE WITH 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

BUTTWELD END VALVE WITH 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

127mm (5-INCH) DIAMETER YOKE BOSS FOR USE WITH ALL VALVES

A5700A-3

TYPICAL NPS 1, 2, AND 3



FLANGED VALVE WITH 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

BUTTWELD END VALVE WITH 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

127mm (5-INCH) DIAMETER YOKE BOSS FOR USE WITH FLANGED OR BUTTWELD VALVE

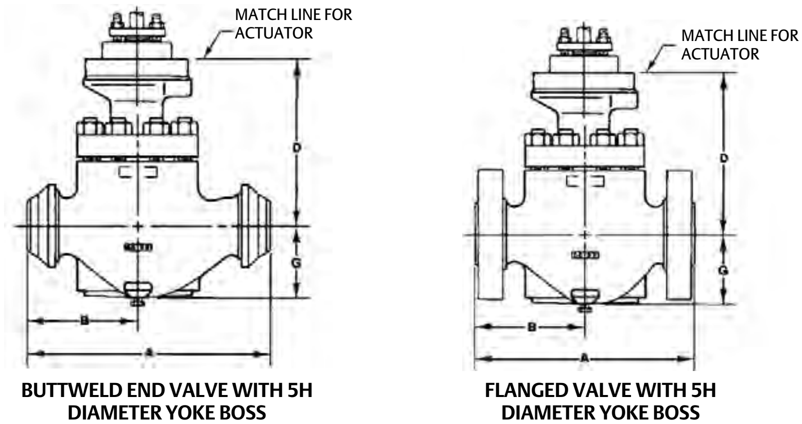
mm
(INCHES)

A2719A-4

TYPICAL NPS 4, AND 6

NOTE:
For dimensions of valves with other end connections, consult your Emerson sales office.

Figure 21. Globe Valve Dimensions with Standard Bonnet (also see tables 15, 16, 17, and 18) (continued)



TYPICAL NPS 8, 10, AND 12

NOTE:
For dimensions of valves with other end connections, consult your Emerson sales office.

Figure 22. Dimensions D for Style 1 Extension Bonnet
(A, B, and G Dimensions Listed in Figure 21 Do Not Change When Extension Bonnet is Used) (also see table 19)

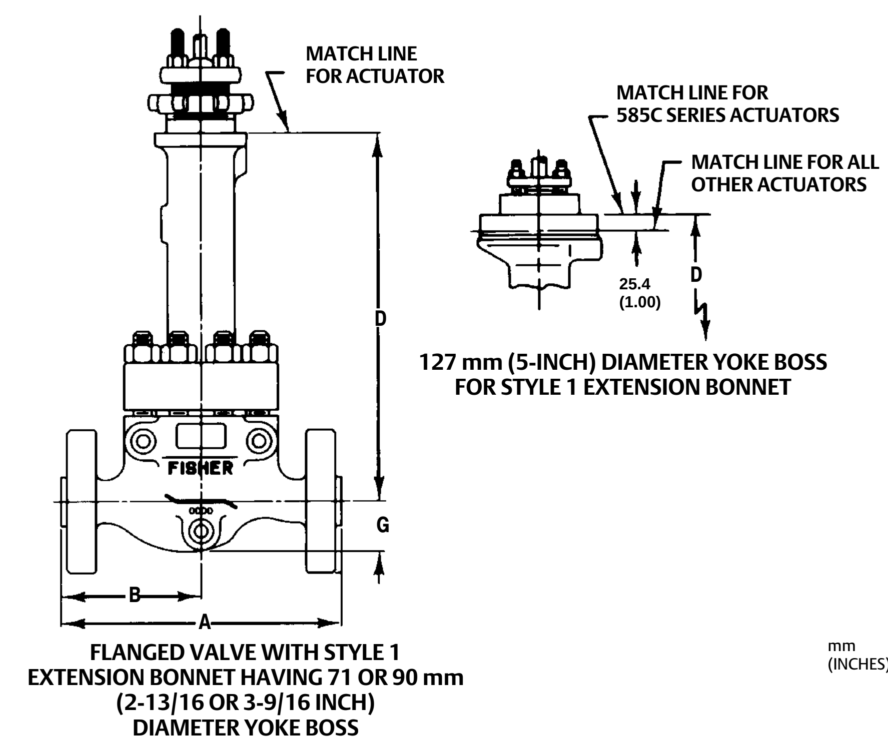


Table 21. Angle Valve Dimensions with Standard/Style 1 Extension Bonnet

STANDARD BONNETS								
VALVE SIZE, NPS	D							
	Yoke Boss Diameters, mm (Inches)							
	71 (2-13/16)		90 (3-9/16)		127 (5)		127 (5H)	
	CL900 and 1500	CL2500	CL900 and 1500	CL2500	CL900 and 1500	CL2500	CL900 and 1500	CL2500
mm								
1	230	204	238	210	---	---	---	---
2 Std, Whisper III, Cavitrol III 3-Stage	227	240	233	229	297	288	---	---
2 Cavitrol III 2-Stage	244	257	251	246	314	305	---	---
3	259	---	265	---	329	---	---	---
4	289	---	278	---	337	---	---	---
6	---	---	300	396	368	434	---	---
8	---	---	364	414	401	414	---	414
12	---	---	---	---	---	---	---	516
Inches								
1	9.06	8.04	9.38	8.28	---	---	---	---
2 Std, Whisper III, Cavitrol III 3-Stage	8.94	9.45	9.19	9.00	11.69	11.32	---	---
2 Cavitrol III 2-Stage	9.62	10.13	9.88	9.69	12.38	12.01	---	---
3	10.19	---	10.44	---	12.94	---	---	---
4	11.38	---	10.94	---	13.25	---	---	---
6	---	---	11.81	15.59	14.50	17.09	---	---
8	---	---	14.34	16.31	15.77	16.31	---	16.31
12	---	---	---	---	---	---	---	20.32

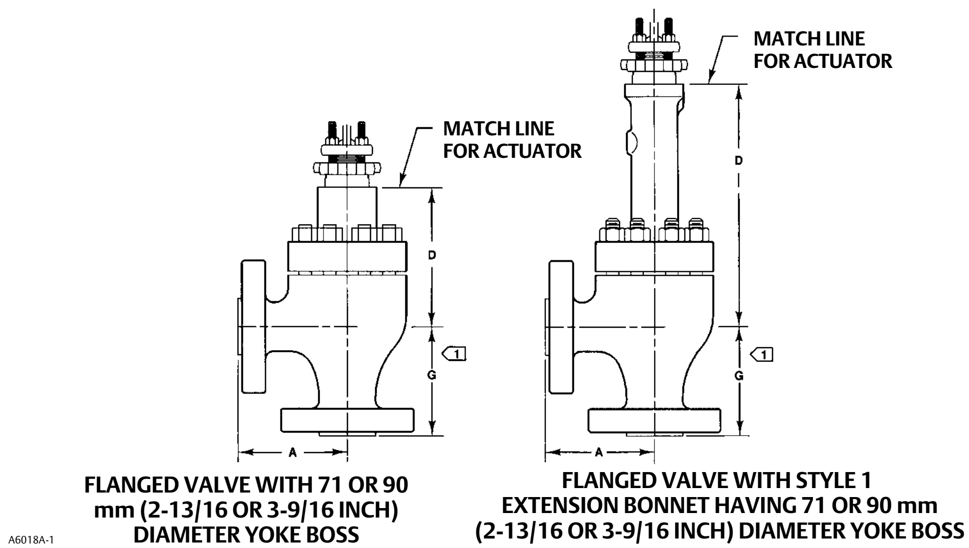
EXTENSION BONNETS						
VALVE SIZE, NPS	D					
	Yoke Boss Diameters, mm (Inches)					
	71 (2-13/16)		90 (3-9/16)		127 (5)	
	CL900 and 1500	CL2500	CL900 and 1500	CL2500	CL900 and 1500	CL2500
mm						
1	354	373	371	388	---	---
2 Std, Whisper III, Cavitrol III 3-Stage	395	---	411	---	470	---
2 Cavitrol III 2-Stage	413	---	429	---	487	---
Inches						
1	13.94	14.67	14.62	15.28	---	---
2 Std, Whisper III, Cavitrol III 3-Stage	15.56	---	16.19	---	18.50	---
2 Cavitrol III 2-Stage	16.25	---	16.88	---	19.19	---

Table 22. Angle Valve Dimensions with Standard/Style 1 Extension Bonnet

VALVE SIZE, NPS	G	A	A & G(1)							
	ASME								EN	
	CL2500		CL900		CL1500				PN160	PN250
	SWE	SWE	RF	RTJ	BWE	SWE	RF	RTJ		
mm										
1	141	102	141	141	141	141	141	141	130	134
2	184	124	178	179	178	178	178	179	163	170
3	- - -	- - -	226	227	235	- - -	235	237	- - -	- - -
4	- - -	- - -	273	275	273	- - -	273	275	- - -	- - -
6	- - -	- - -	325	327	353	- - -	353	356	- - -	- - -
8	- - -	- - -	387	389	416	- - -	416	421	- - -	- - -
Inches										
1	5.56	4.00	5.56	5.56	5.56	5.56	5.56	5.56	5.10	5.26
2	7.25	4.88	7.00	7.06	7.00	7.00	7.00	7.06	6.40	6.71
3	- - -	- - -	8.88	8.94	9.25	- - -	9.25	9.31	- - -	- - -
4	- - -	- - -	10.75	10.81	10.75	- - -	10.75	10.81	- - -	- - -
6	- - -	- - -	12.81	12.88	13.88	- - -	13.88	14.00	- - -	- - -
8	- - -	- - -	15.25	15.31	16.38	- - -	16.38	16.56	- - -	- - -

1. RF—raised-face flanges; RTJ—ring-type-joint flanges; BWE—buttweld ends; SWE—socketweld ends.

Figure 23. Angle Valve Dimensions with Standard/Style 1 Extension Bonnet (also see tables 21 and 22)



1 For CL900 and 1500 valves, G = A. For CL2500 valves, see table 22 for the G dimension.
Note: For dimensions of valves with other end connections, consult your Emerson sales office.

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Fisher™ HP Cryogenic Sliding-Stem Control Valves

Fisher HP cryogenic valves are high-pressure, single-port, globe-style valves featuring stainless steel construction materials and fabricated extension bonnets. The HPT-C valve is a balanced design, whereas the HPS-C valve is an unbalanced design. These cryogenic valves are designed to provide throttling or on/off control of liquids and gases at cryogenic temperatures as low as -198°C (-325°F).

When required, these rugged valves can reliably provide tight shutoff for special applications within the chemical and hydrocarbon processing industries, such as certain liquefied natural gas services.

The HPT-C valve with pressure-balanced trim allows smooth control at high pressure drops in a cryogenic environment.

FISHER HP-C VALVE WITH 657 ACTUATOR

HP Cryogenic Valves

- HPT-C: These valves use a balanced valve plug with ultra high molecular weight polyethylene (UHMWPE) seal ring for excellent shutoff at low temperature. Different cage/plug styles provide particular flow characteristics for highly-specialized applications. Available flow characteristics are ■ equal percentage, ■ linear, and ■ modified equal percentage.

- HPS-C: These valves use an unbalanced valve plug and provide excellent shutoff. Interchangeable, restricted-capacity trims and full-sized trims match a variety of process flow demands for highly-specialized applications. Available flow characteristics include ■ equal percentage, ■ linear, and ■ modified equal percentage.

Features

- Cryogenic Spring-Loaded Seal Ring--The seal ring and associated valve parts in the HPT-C valve is specifically designed and manufactured for excellent performance at low temperatures.

- Stable Control--Rugged cage guiding in the HPT-C and HPS-C valves stabilizes the valve plug at all points in its travel to reduce vibration, mechanical noise, and the need for hydraulic snubbers.

- Cost Effective Operation and Economical Maintenance--Increased wear resistance of hardened stainless steel trim means long-lasting service. Balanced valve plug construction in the HPT-C valve permits use of spring and diaphragm Fisher actuators.

(continued on page 3)

Specifications

Available Configurations[1] and Valve Sizes

HPT-C: Single-port, globe-style control valve with cage-guiding, balanced valve plug, and push-down-to-close valve plug action (figure 1 and 2)
HPS-C: Single-port, globe-style control valve with cage-guiding, unbalanced valve plug, and push-down-to-close valve plug action (figure 3)

Valve Sizes

HPS-C: ■ NPS 1 to 3 (CL900 and CL1500) ■ NPS 1 to 2 (CL2500)
HPT-C: ■ NPS 4 through 12 (CL900 and CL1500)

End Connections Styles[1]

CL900, 1500, and 2500 raised-face and ring-type-joint flanges per ASME B16.5.
Buttweld end connection per ASME B16.25.
PN160 and PN250 flanges per EN1092-1.

Maximum Inlet Pressure[1]

Consistent with CL900, 1500, and 2500 pressure/temperature ratings per ASME B16.34

Maximum Pressure Drop[1]

Consistent with CL900, 1500, and 2500 pressure/temperature ratings per ASME B16.34

Trim Material

See table 1

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

HPT-C and HPS-C
Metal Seat: ■ Class IV is standard ■ Class V Air Test is optional (Test will be at 50 psid air)[2]
Cryogenic Leak Test: Class C (optional)

Maximum Actuator Thrust

See table 4

Flow Characteristics

HPT-C and HPS-C
■ Equal percentage, ■ linear, ■ modified equal percentage

Flow Direction

HPT-C: Normally flow down for linear and equal percentage trims. Flow up for Whisper Trim™
HPS-C: Normally flow up

Construction Materials

Valve Body and Bonnet: CF8M
Body-bonnet Bolting: See table 2
Bonnet Bushing: S31600/filled PTFE
Spiral Wound Gasket: N06600/graphite
Packing Studs and Nuts: ■ S31600 SST, ■ B7, ■ B8M Class 2, and ■ B7M
Seal Ring (HPT-C): ■ UHMWPE with R30003 spring, ■ Modified PTFE with R30003 spring
Back-Up Ring (HPT-C): S31600 (316 SST)
Retaining Ring (HPT-C): ■ S30200 (302 SST), ■ 18-8 SST
Packing Follower, Lantern Ring, Packing Spring[3] and Packing Box Ring: S31600 SST

Material Temperature Capabilities[1]

HPT-C: -198 to 66°C (-325 to 150°F)
HPS-C: -198 to 316°C (-325 to 600°F)

Bonnet Extension Length

See figure 5 and tables 8 and 9 for standard valve dimensions

Flow Coefficients and Noise Level Prediction

See Fisher Catalog 12

Port Diameters, Valve Plug Travel, Yoke Boss, and Stem Diameters

See tables 5, 6, and 7

Packing Arrangements

Standard Material
■ Single PTFE V-ring. See figures 1 and 3
Optional Material
■ Double PTFE V-ring and
■ Graphite ribbon/filament
ENVIRO-SEAL™ Packing Systems
Packing Material: ■ PTFE V-ring and ■ Graphite ULF. See figure 4. Also see Fisher bulletin 59.1:061, ENVIRO-SEAL and HIGH-SEAL Packing System for Sliding-Stem Valves (D101633X012)

Options

HPT-C: ■ Whisper Trim III and WhisperFlo™ trim for aerodynamic noise attenuation, and ■ Cavitrol™ III cages for liquid cavitation protection are available. Contact your Emerson sales office for information
HPS-C: ■ Micro-Flute and ■ Micro-Flow trim

1. Do not exceed the pressure/temperature limits in this bulletin and any applicable code limits
2. Class V shutoff cannot be performed with water. The residual trapped moisture from testing with water can cause valve and trim damages from the ice crystals formed at below freezing service temperatures.
3. A spring is used only with PTFE V-ring packing. Lantern rings replace the spring in other packing arrangements.

Features (continued)

- **Piping Economy--**Expanded end connections on NPS 4 and 6 HP valves may reduce the need for line swages. while accommodating oversized piping arrangements used to limit fluid flow velocities.

- **Cryogenic Design Features--**The stainless steel valve body and bonnet with fabricated extension are designed to meet low temperature requirements. The unique metal-to-metal seat design provides repeatable tight shutoff, reducing maintenance costs.

- **Rugged Metal Seat--**The metal-to-metal seat is designed and manufactured to provide long-lasting, reliable, tight shutoff at both ambient and cryogenic temperatures without the need for periodic lapping. This reduces the need for soft seats, even in applications with stringent shutoff requirements.

- **Thoroughly Tested--**Extensive cryogenic testing during the development of the valve design reduces the need for expensive cold testing for most applications, which results in quicker delivery and greater value.

- **Fugitive Emission Protection--**The optional ENVIRO-SEAL packing systems provide an improved stem seal to help prevent the loss of valuable or hazardous process fluids, and keep emissions below the EPA limit of 100 ppm. Additionally, these live-loaded packing systems can provide long life and reliability at low temperatures to help reduce maintenance costs and downtime.

- **Easy Maintenance--**Quick-change trim, with a clamped-in seat ring, reduces the disassembly/ assembly time. The valve body can stay in the pipeline during removal of trim parts for inspection or maintenance.

- **Sour Service Capability--**For NACE applications, consult your Emerson sales office.

- **Smooth Control at High Pressure Drops--**HPT-C available on NPS 4 through 12, balanced trim provides smooth control at high pressure drops.

- **Extension Bonnet--**Standard Style III extension bonnet to meet the low temperature requirements. Optional drip plate and special designs for cold box are available for different applications.

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Table 1. Fisher HPT-C and HPS-C Typical Trim Material

Valve Design	Trim Construction	Valve Plug	Valve Stem	Backup Ring	Cage Retainer	Cage	Seat Ring
HPT-C	219	S31600 with CoCr-A seat and guide	S20910	316 SST	- - -	S31600/ Chrome Plate	S31600
	220						S31600 with CoCr-A seat
	223[1]				S31600/ Chrome Plate	S31600	- - -
HPS-C	221			- - -	- - -	S31600/ Chrome Coat	S31600
	222						S31600 with CoCr-A seat

1. Trim construction only available for NPS 8 through 12.

Table 2. Bolting Material

VALVE	VALVE SIZE, NPS	RATING	BODY-BONNET BOLTING	
			Studs	Nuts
HPS-C	1 to 3	CL900 and 1500	SA-193-B8M Strain Hardened	SA-194-8M
			S20910/Chrome Coat	S20910
	1 and 2	CL2500	SA-193-B8M Strain Hardened	SA-194-8M
			S20910/Chrome Coat	S20910
HPT-C	4 and 6	CL900	SA-193-B8M Strain Hardened	SA-194-8M
		CL1500	S20910/Chrome Coat	S20910
	8 to 12	CL900 and 1500	S20910/Chrome Coat	S20910
			SA-193-B8M2[1]	SA-194-8M[1]

1. Short HP constructions are derated with this bolt material. Consult your Emerson sales office for information.

Table 3. Approximate Weights (Valve and Bonnet Assemblies)

VALVE	VALVE SIZE, NPS	RATING	END CONNECTION			
			Flange		SWE, BWE	
			kg	lb	kg	lb
HPS-C	1	CL900 and 1500	51	113	48	105
		CL2500	55	120	44	96
	2	CL900 and 1500	81	178	61	135
		CL2500	113	249	84	184
	3	CL900	135	296	- - -	- - -
		CL1500	138	304	106	233
HPT-C	4 (long)[1]	CL900	240	527	- - -	- - -
		CL1500	258	568	211	464
	6 (long)[1]	CL900	521	1147	- - -	- - -
		CL1500	567	1248	465	1023
	8	CL900	809	1779	644	1417
		CL1500	999	2198	781	1718
	10	CL900	1087	2392	887	1951
		CL1500	1560	3432	1193	2625
	12	CL900	1349	2967	1044	2297
		CL1500	1953	4296	1425	3134

1. (Long) indicates industry standard long face-to-face.

Figure 1. Fisher HPT-C Valve Assembly Detail NPS 4 and 6

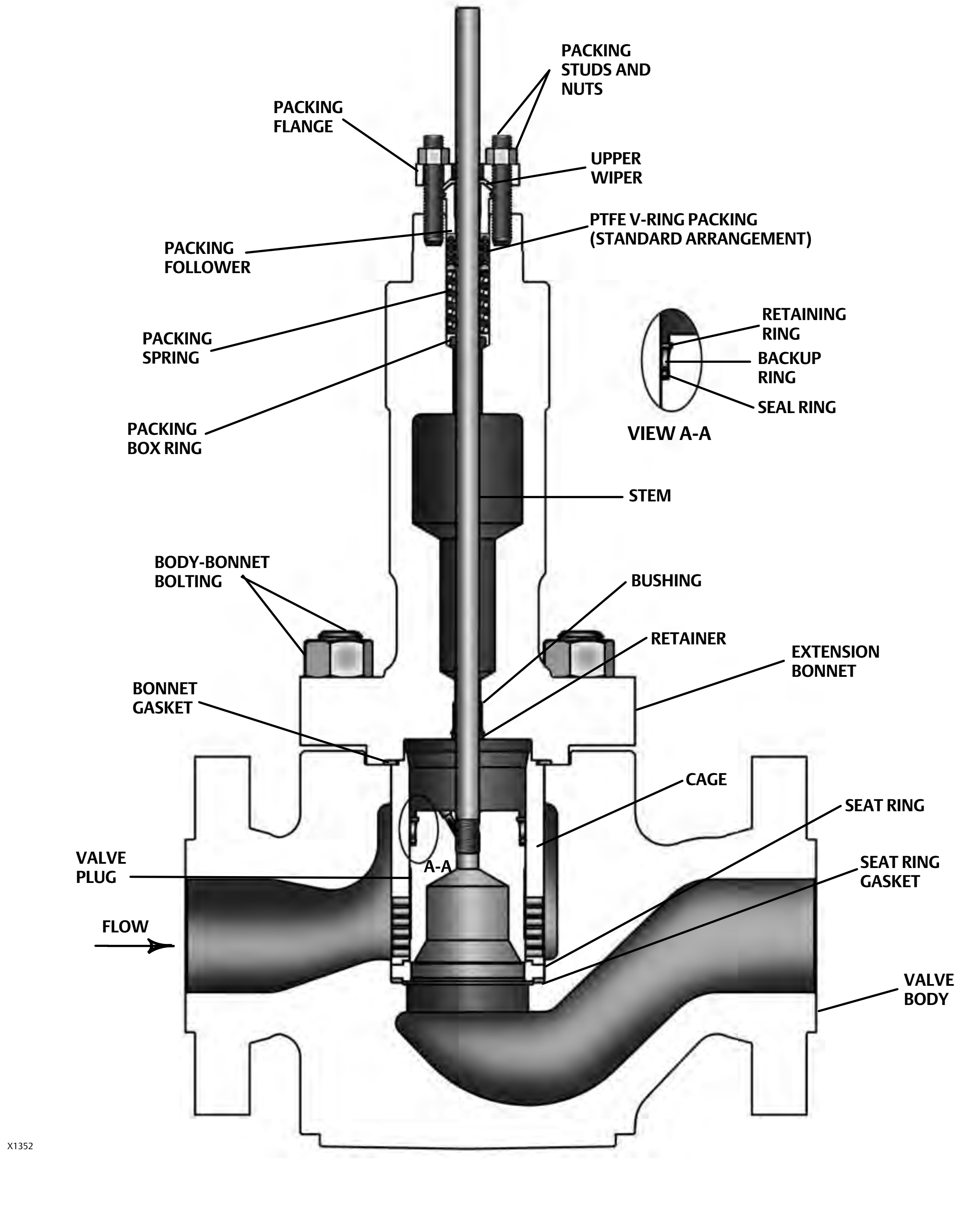

Figure 2. Fisher HPT-C Valve Assembly Detail NPS 8 through 12

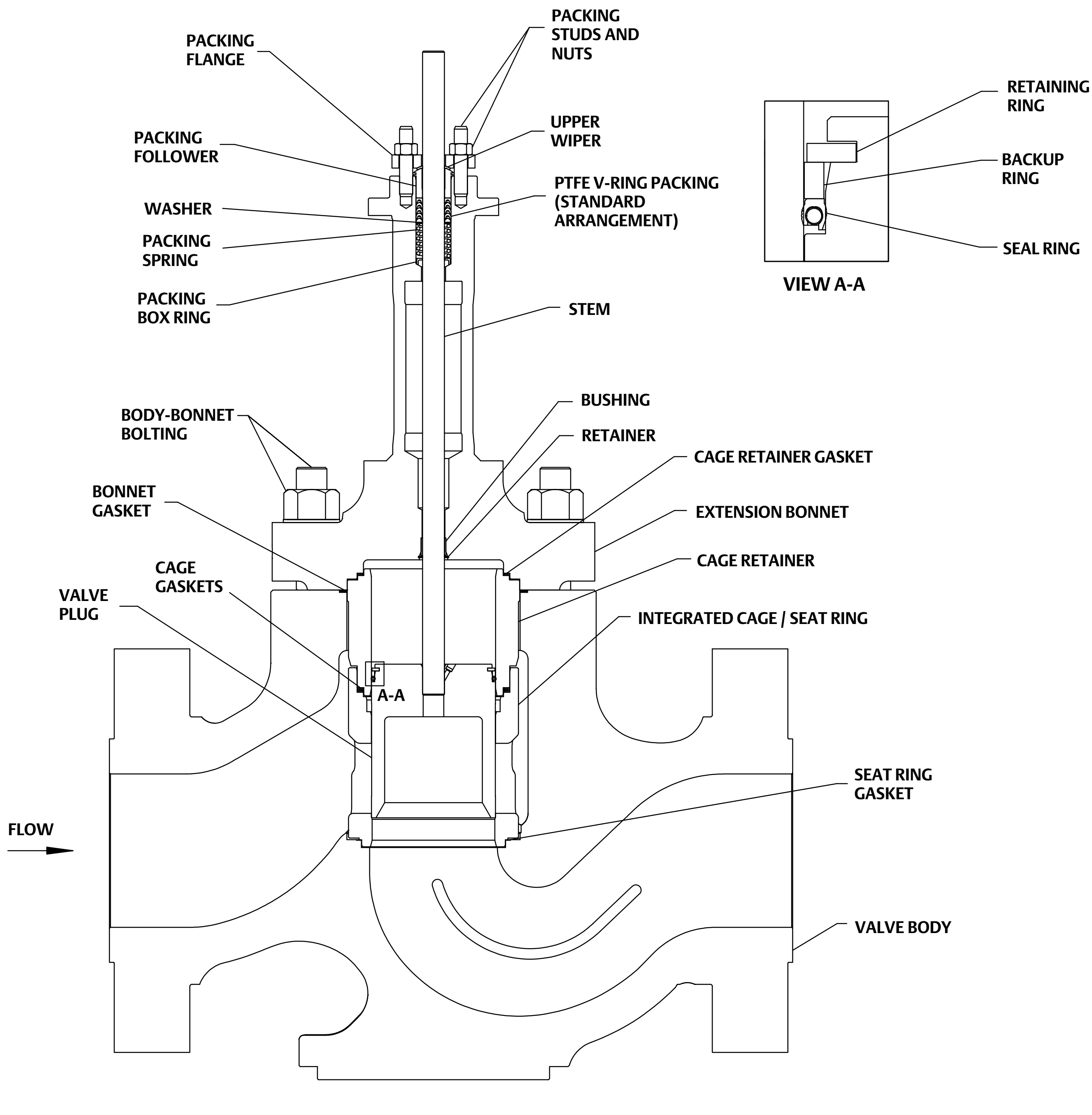

Figure 3. Fisher HPS-C Valve Assembly Detail NPS 1 through 3

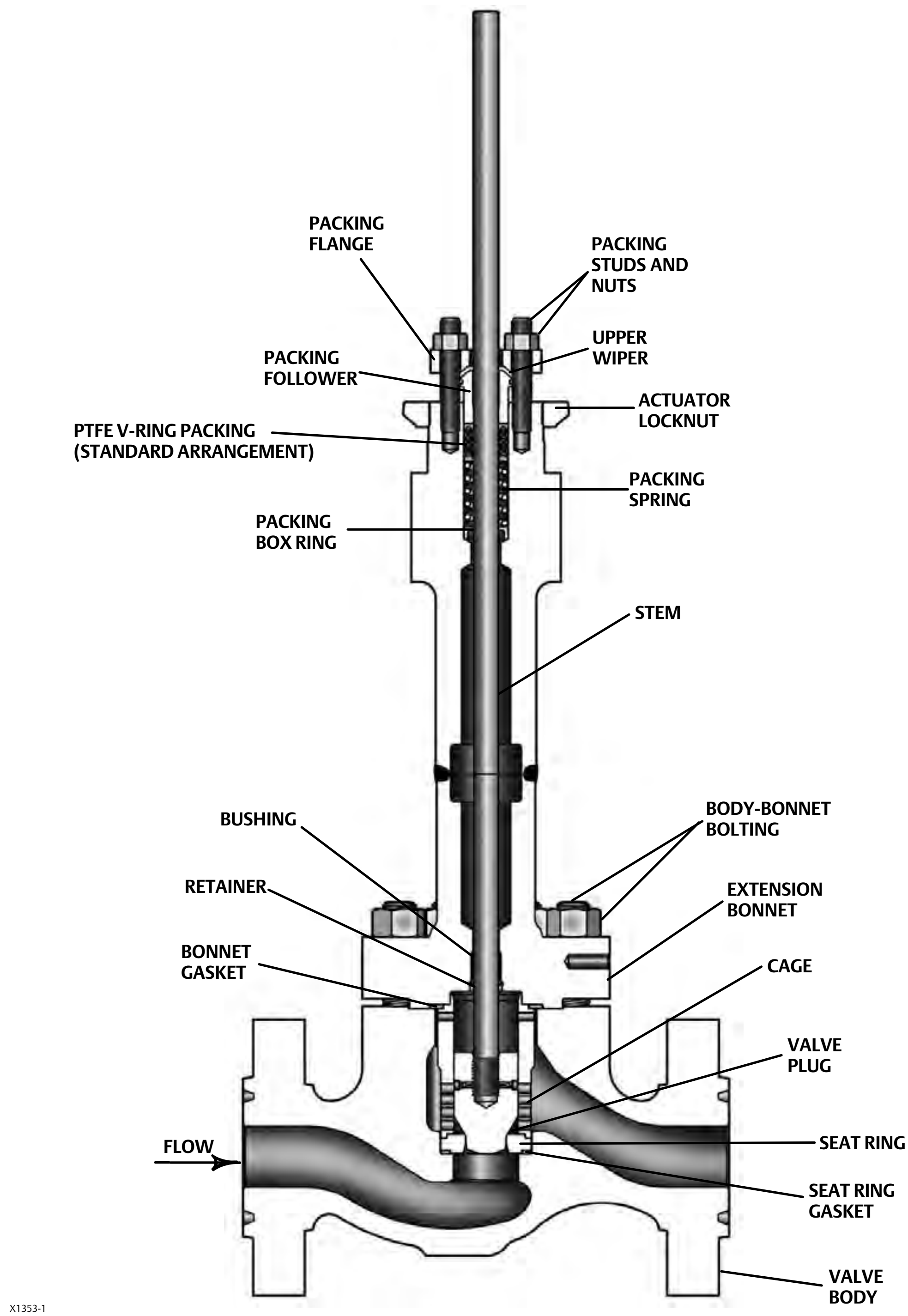

Table 4. Maximum Allowable Thrust for Style III Bonnet Extension Length

VALVE	VALVE SIZE	STEM DIAMETER		MAXIMUM ALLOWABLE STEM LOAD FOR S20910 STEM MATERIAL	
		mm	Inch	N	lb
HPS-C	1	12.7	1/2	15413	3465
		19.1	3/4	45176	10156
	2	12.7	1/2	16458	3700
		19.1	3/4	46738	10507
		25.4	1	95130	21386
	3	19.1	3/4	48873	10987
		25.4	1	89956	20223
HPT-C	4	19.1	3/4	48055	10803
		25.4	1	89956	20223
	6	25.4	1	83382	18745
		31.8	1 1/4	139185	31290
	8	25.4	1	83840	18848
		31.8	1 1/4	139741	31415
	10	25.4	1	77662	17459
		31.8	1 1/4	133393	29988
	12	25.4	1	80446	18085
		31.8	1 1/4	136280	30637
		50.8	2	378326	85051

Table 5. Fisher HPS-C CL900 and 1500 Port Diameters, Valve Plug Travel, Stem and Yoke Diameters

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	PORT DIAMETER		VALVE PLUG TRAVEL		YOKE BOSS DIAMETER		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches	mm	Inches
1	Equal percentage	HPS w/Micro-Form	6.4	0.25	19	0.75	71	2-13/16	12.7	1/2
			12.7	0.5	19	0.75	71	2-13/16	12.7	1/2
			19.1	0.75	19	0.75	71, 90	2-13/16, 3-9/16	12.7, 19.1	1/2, 3/4
	Modified Equal percentage	HPS w/Micro-Form	19.1	0.75	29	1.125	71, 90	2-13/16, 3-9/16	12.7, 19.1	1/2, 3/4
			25.4	1	29	1.125	71, 90	2-13/16, 3-9/16	12.7, 19.1	1/2, 3/4
2	Equal percentage	HPS w/Micro-Form	6.4	0.25	19	0.75	71	2-13/16	12.7	1/2
			12.7	0.5	19	0.75	71	2-13/16	12.7	1/2
			19.1	0.75	19	0.75	71, 90	2-13/16, 3-9/16	12.7, 19.1	1/2, 3/4
		HPS	47.6	1.875	29	1.125	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
	Linear	HPS	47.6	1.875	38	1.5	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
	Modified Equal percentage	HPS w/Micro-Form	25.4	1	29	1.125	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
			31.8	1.25	29	1.125	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
			38.1	1.5	38	1.5	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
		HPS	47.6	1.875	38	1.5	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
3	Equal percentage	HPS	73	2.875	38	1.5	90, 127	3-9/16, 5	19.1, 25.4	3/4, 1
	Linear				51	2	90, 127	3-9/16, 5	19.1, 25.4	3/4, 1
	Modified Equal percentage						90, 127	3-9/16, 5	19.1, 25.4	3/4, 1

Table 6. Fisher HPS-C CL2500 Port Diameters, Valve Plug Travel, Stem and Yoke Diameters

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	PORT DIAMETER		VALVE PLUG TRAVEL		YOKE BOSS DIAMETER		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches	mm	Inches
1	Equal percentage	HPS w/Micro-Form	6.4	0.25	19	0.75	71	2-13/16	12.7	1/2
			12.7	0.5	19	0.75	71	2-13/16	12.7	1/2
			19.1	0.75	19	0.75	71, 90	2-13/16, 3-9/16	12.7, 19.1	1/2, 3/4
	Modified Equal percentage	HPS w/Micro-Form	19.1	0.75	29	1.125	71, 90	2-13/16, 3-9/16	12.7, 19.1	1/2, 3/4
			25.4	1	29	1.125	71, 90	2-13/16, 3-9/16	12.7, 19.1	1/2, 3/4
2	Equal percentage	HPS w/Micro-Form	6.4	0.25	19	0.75	71	2-13/16	12.7	1/2
			12.7	0.5	19	0.75	71	2-13/16	12.7	1/2
			19.1	0.75	19	0.75	71, 90	2-13/16, 3-9/16	12.7, 19.1	1/2, 3/4
		HPS	47.6	1.875	25.4	1	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
	Linear	HPS	47.6	1.875	25.4	1	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
	Modified Equal percentage	HPS w/Micro-Form	25.4	1	29	1.125	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
			31.8	1.25	29	1.125	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
			38.1	1.5	38	1.5	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1
		HPS	47.6	1.875	29	1.125	71, 90, 127	2-13/16, 3-9/16, 5	12.7, 19.1, 25.4	1/2, 3/4, 1

Table 7. Fisher HPT-C Port Diameters, Valve Plug Travel, Stem and Yoke Diameters

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	PORT DIAMETER		VALVE PLUG TRAVEL		YOKE BOSS DIAMETER		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches	mm	Inches
4	Equal percentage	HPT	92.1	3.625	38	1.5	90, 127	3-9/16, 5	19.1, 25.4	3/4, 1
	Linear				51	2				
	Modified Equal percentage									
6	Equal percentage		136.5	5.375	64	2.5	127.0	5.0	25.4, 31.8	1, 1-1/4
	Linear				76	3				
	Modified Equal percentage									
8	Linear		152.4	6	76	3	127, 127	5, 5H	25.4, 31.8	1, 1-1/4
	Equal Percentage									
10	Linear		177.8	7	102	4	127, 127	5, 5H	25.4, 31.8	1, 1-1/4
	Equal Percentage									
12	Linear		203.2	8	102	4	127, 127, 178	5, 5H, 7	25.4, 31.8, 50.8	1, 1-1/4, 2
	Equal Percentage									

Figure 4. ENVIRO-SEAL Packing Systems

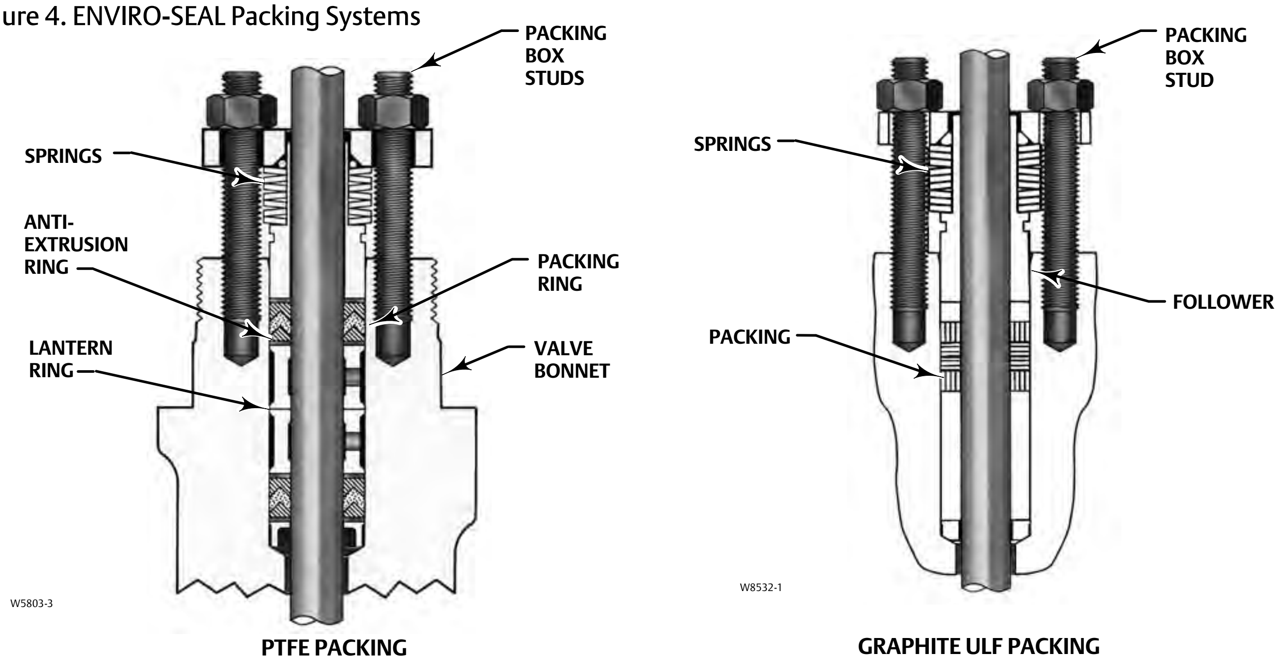

Figure 5. Valve Dimensions

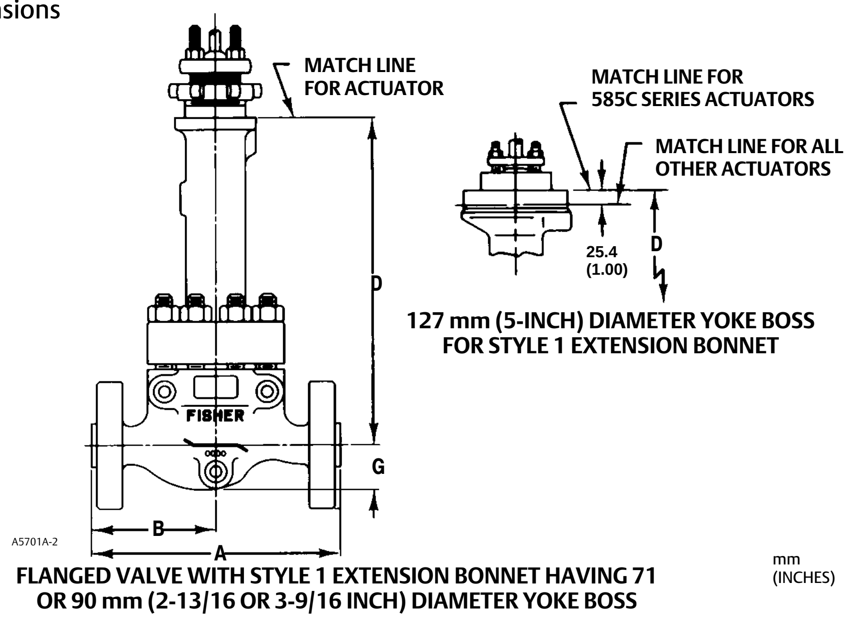

Table 8. Fisher HPS-C CL2500 Valve Dimensions

VALVE SIZE, NPS	A		B		G	D		
	CL2500		CL2500		CL2500	Yoke Boss Diameter, mm (inches)		
	RF	RTJ	RF	RTJ		71 (2-13/16)	90 (3-9/16)	127 (5)
mm								
1	318	318	159	159	63	533	533	- - -
2	413	416	206	208	84	470	470	445
Inches								
1	12.5	12.5	6.25	6.25	2.47	21	21	- - -
2	16.25	16.38	8.12	8.19	3.31	18.53	18.53	17.5

Table 9. Fisher HPT-C and HPS-C CL900 and 1500 Valve Dimensions NPS 1 though 6[1]

VALVE SIZE, NPS	A						B						G	D		
	ASME				EN		ASME				EN			Yoke Boss Diameter, mm (inches)		
	CL900		CL1500		PN160	PN250	CL900		CL1500		PN160	PN250	CL900 and CL1500	71 (2-13/16)	90 (3-9/16)	127 (5)
	RF	RTJ	RF	RTJ			RF	RTJ	RF	RTJ						
mm																
1	292	292	292	292	269	277	146	146	146	146	134	138	52	553	553	- - -
2	375	378	375	378	344	360	187	189	187	189	172	180	77	553	553	445
3	442	445	460	464	442	460	221	222	230	232	192	202	121	- - -	553	CF
4	511	514	530	533	511	530	229	230	238	240	218	232	175	- - -	553	CF
6	714	718	768	775	714	768	310	311	337	340	298	316	248	- - -	- - -	402
Inches																
1	11.5	11.5	11.5	11.5	10.58	10.9	5.75	5.75	5.75	5.75	5.29	5.45	2.06	21	21	- - -
2	14.75	14.88	14.75	14.88	13.56	14.18	7.38	7.44	7.38	7.44	6.78	7.09	3.06	21	21	17.5
3	17.38	17.5	18.12	18.25	17.38	18.12	8.69	8.75	9.06	9.12	7.54	7.94	4.75	- - -	21	CF
4	20.12	20.25	20.88	21	20.12	20.88	9	9.06	9.38	9.44	10.75	9.13	6.88	- - -	21	CF
6	28.12	28.25	30.25	30.5	28.12	30.25	12.19	12.3	13.3	13.38	11.72	12.43	9.75	- - -	- - -	30

1. NPS 1 to 3 for HPS–C and NPS 4 to 6 for HPT–C.

Table 10. Fisher HPT-C CL900 and 1500 Valve Dimensions NPS 8 though 12

VALVE SIZE, NPS	A						B						G		D	
	ASME														Yoke Boss Diameter, mm (inches)	
	CL900			CL1500			CL900			CL1500			CL900	CL1500	127 (5, 5H)	178 (7)
	RF	RTJ	BWE	RF	RTJ	BWE	RF	RTJ	BWE	RF	RTJ	BWE				
mm																
8	781	784	653	838	848	685	402	404	349	431	436	370	260	281	846	- - -
10	864	867	762	991	1001	822	458	459	407	521	526	437	313	332	946	- - -
12	1016	1019	914	1130	1146	989	559	561	503	616	624	536	355	377	946	946
Inches																
8	30.75	30.87	25.71	32.99	33.39	26.97	15.83	15.89	13.74	16.97	17.17	14.57	10.22	11.06	33.31	- - -
10	34.02	34.13	30.00	39.02	39.41	32.36	18.01	18.07	16.00	20.51	20.71	17.19	12.30	13.07	37.24	- - -
12	40.00	40.12	35.98	44.49	45.12	38.94	22.01	22.07	19.80	24.25	24.57	21.10	13.98	14.85	37.24	37.24

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Fisher™ Control-Disk™ Rotary Valve

The Fisher Control-Disk rotary valve offers excellent throttling performance. An equal percentage flow characteristic provides an improved throttling range comparable to that of a segmented ball valve. This improved capability allows you to control closer to the target set point, regardless of process disturbances, which results in a reduction in process variability.

The valve body meets PN 10 through PN 40, CL150, and CL300 ratings. Face-to-face dimensions meet EN 558, API 609, and MSS-SP68 standards. Line centering clips provide for versatility to mount and align the same wafer style valve body in different piping configurations (ASME and EN ratings).

The Control-Disk rotary valve features an eccentrically-mounted disk with either soft or metal seal, providing capability for enhanced shutoff. The interchangeable sealing technology allows for the same valve body to accept both soft and metal seals.

W9418-2

LUGGED STYLE
(NPS 3 through NPS 12)

X1426

DOUBLE FLANGED STYLE
(NPS 3 through NPS 12)

Control-Disk Valve Features

- **Equal percentage flow characteristic—** An equal percentage flow characteristic provides an improved throttling range comparable to that of a segmented ball valve. This improved capability allows you to control closer to the target set point, regardless of process disturbances, which results in a reduction in process variability.
- **Global Standards—** The valve meets API, ASME, and EN standards, making it suitable for use in all world areas.
- **PEEK/PTFE bearing as standard—** The PTFE-lined PEEK bearing is a low friction, low wear bearing. It allows the valve to operate under high pressure drops for a high cycle life while maintaining low torque. The “drop-in” bearing design enables fast, easy maintenance.
- **Lower Operating Torques—** The equal percentage disk reduces operating torque at peak angles of disk opening.
- **Spline-ended Shaft—** The splined shaft with clamped lever and single-pivot linkage reduces lost motion between the actuator and the valve shaft.

- **Improved shaft-disk pinning—** The improved expansion pin system ensures there is a positive, durable connection between disk and shaft. This connection reduces backlash and wear in the drive system, optimizing long-term performance. It also makes disassembly for maintenance quick and simple with no need for special tools.

- **New Spring-Loaded Shaft—** The spring in the outboard shaft provides support to the drive train and disk, enabling the shaft to be installed in both horizontal and vertical orientations with no detriment to performance or cycle life. This complements the ability to mount the actuator on the left- or right-hand side, enabling access for any installation.

- **Excellent Emissions Capabilities—** The optional ENVIRO-SEAL™ packing systems, are designed with very smooth shaft surfaces and live-loading to provide improved sealing, guiding, and loading force transmission. The seal of the ENVIRO-SEAL system can control emissions to below 100 ppm (parts per million).

- **Sour Service Capability—** Trim and bolting materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0103, and MR0175 / ISO 15156.

- **Field-Reversible Valve Action—** The actuator/valve assembly action can be converted from push-down-to-open to push-down-to-close, or vice versa, without additional parts.

- **Easy Installation—** Line-centering clips engage the line flange bolts to simplify installation and provide for centering of wafer-style valves in the pipeline. End connections are compatible with EN and ASME standards.

- **Excellent Shutoff—** Both the metal and soft seal rings have pressure-assisting sealing action that ensures tight shutoff regardless of pressure drop.

- **Long Seal Life—** The opening and closing path of the eccentric disk minimizes disk contact with the seal ring, thereby reducing seal wear, undue friction, and seating torque requirements. See figure 2.

- **Reliable Flange Gasketing Surface—** The seal retainer screws and retention clips are outside the gasket surface of the seal retainer. Spiral-wound or flat-sheet gaskets can be installed between the uninterrupted seal retainer face and the pipeline flange.

- **Integral Shaft-to-Valve Body Bonding—** Standard valve construction includes conductive packing to provide electrical bonding for hazardous area applications.

- **Powder paint as standard—** The Emerson powder paint finish offers an excellent corrosion-resistant finish to all steel parts.

- **High Temperature Capability—** The valve will operate at elevated temperatures, with the appropriate trim components.

- **Shaft Retention—** Redundant shaft retention provides added protection. The packing follower, anti-blowout ring, and shaft groove interact to hold the shaft securely in the valve body (see figure 1).

- **Travel Indication—** Additional travel indication can be achieved by using the indication line on the shaft, along with the disk position markings on the packing follower (see figure 4).

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Control-Disk Valve Specifications and Materials of Construction

Table 1. Fisher Control-Disk Valve Specifications

Specifications		EN	ASME
Valve Body Size		DN 50, 80, 100, 150, 200, 250, and 300	NPS 2, 3, 4, 6, 8, 10, and 12
Pressure Rating		PN 10 to 40 per EN 12516-1	CL150 / 300 per ASME B16.34 (CL150-600 for NPS 2)
Valve Body Materials		EN 1.0619 steel	WCC steel
		EN 1.4409 stainless steel	CF3M (316L) stainless steel
		LCC	LCC
		CW2M(1)	CW2M(1)
		M35-2(2)	M35-2
Disk Materials	PTFE or RPTFE(4) Seal	EN 1.4409 stainless steel	CF3M stainless steel
		CW2M	CW2M
		M35-2	M35-2
	Metal or UHMWPE(3) Seal	Chrome-plated EN 1.4409 Stainless Steel	Chrome-plated CF3M Stainless Steel
End Connections		Mates with raised-face flanges per EN 1092-1	Mates with raised-face flanges per ASME B16.5
Valve Body Style		Lugged with tapped or through holes, Double-Flange with through holes, and Wafer (for select sizes)	
Face-to-Face Dimensions		Meets MSS SP68, API 609, and EN 558 standards	
Shutoff		PTFE, RPTFE, or UHMWPE seal ring - Class VI per ANSI/FCI 70-2 and IEC 60534-4	
		S31600 (316 SST) seal ring - Class IV per ANSI/FCI 70-2 and IEC 60534-4	
Flow Coefficients		See Fisher Catalog 12	
Flow Direction		Standard (forward flow) is with the seal retainer facing upstream; reverse flow is permissible for soft seals only	
Flow Characteristic		Equal percentage	
Disk Rotation		Counterclockwise to open (when viewed from actuator side of valve body) through 90 degrees of disk rotation	
Shaft Diameters and Approximate Weights		See table 7	

1. This material is not listed in EN 12516-1 or ASME B16.34. See figure 6 for pressure/temperature ratings.
2. This material is not listed in EN 12516-1. See figure 6 for pressure/temperature ratings.
3. UHMWPE stands for ultra high molecular weight polyethylene.
4. RPTFE is a reinforced PTFE seal.

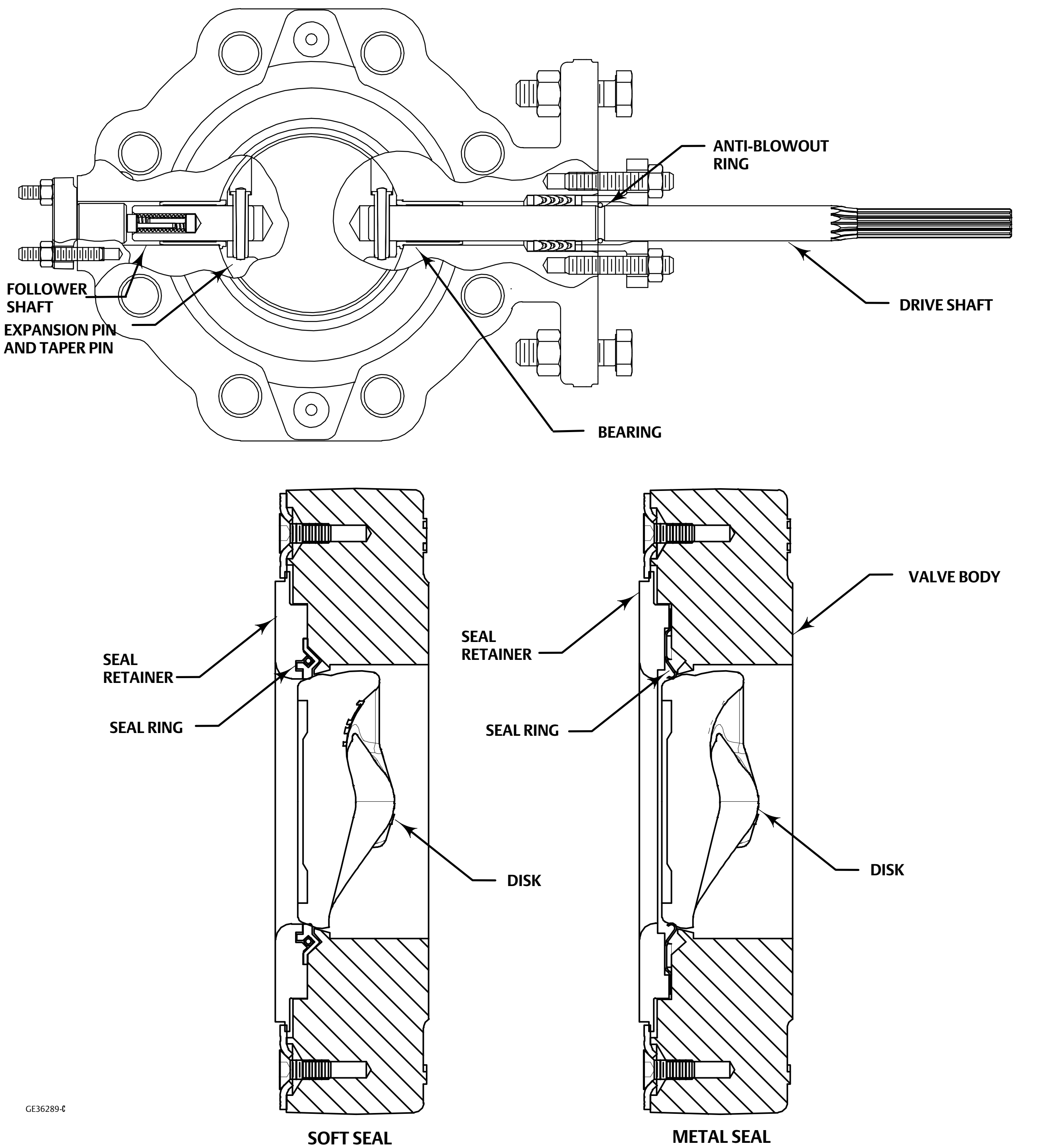
Table 2. Materials (Other Valve Components)

Component	Material
Shafts and Pins	S17400 (17-4PH) stainless steel, S20910 (XM-19) stainless steel, N10276, N05500
Anti-blowout Ring	N07718
Seal	PTFE, RPTFE, or UHMWPE with S31600 (316 stainless steel) or R30003 spring. Metal seal is 316 stainless steel with graphite gaskets
Bearings	PEEK/PTFE, R30006 (Alloy 6), S31600 Nitride
Packing	PTFE/carbon-filled PTFE (standard), graphite die-molded ribbon, ENVIRO-SEAL PTFE packing, ENVIRO-SEAL graphite packing
Follower Spring	N07718 with carbon-filled PEEK or S31600 spring seats
Bolting	B8M Class 2, B7M, N05500, N07718
Nuts	8M, 2HM, N04400, N10276

Table 3. Trim Combinations with Standard Construction Materials

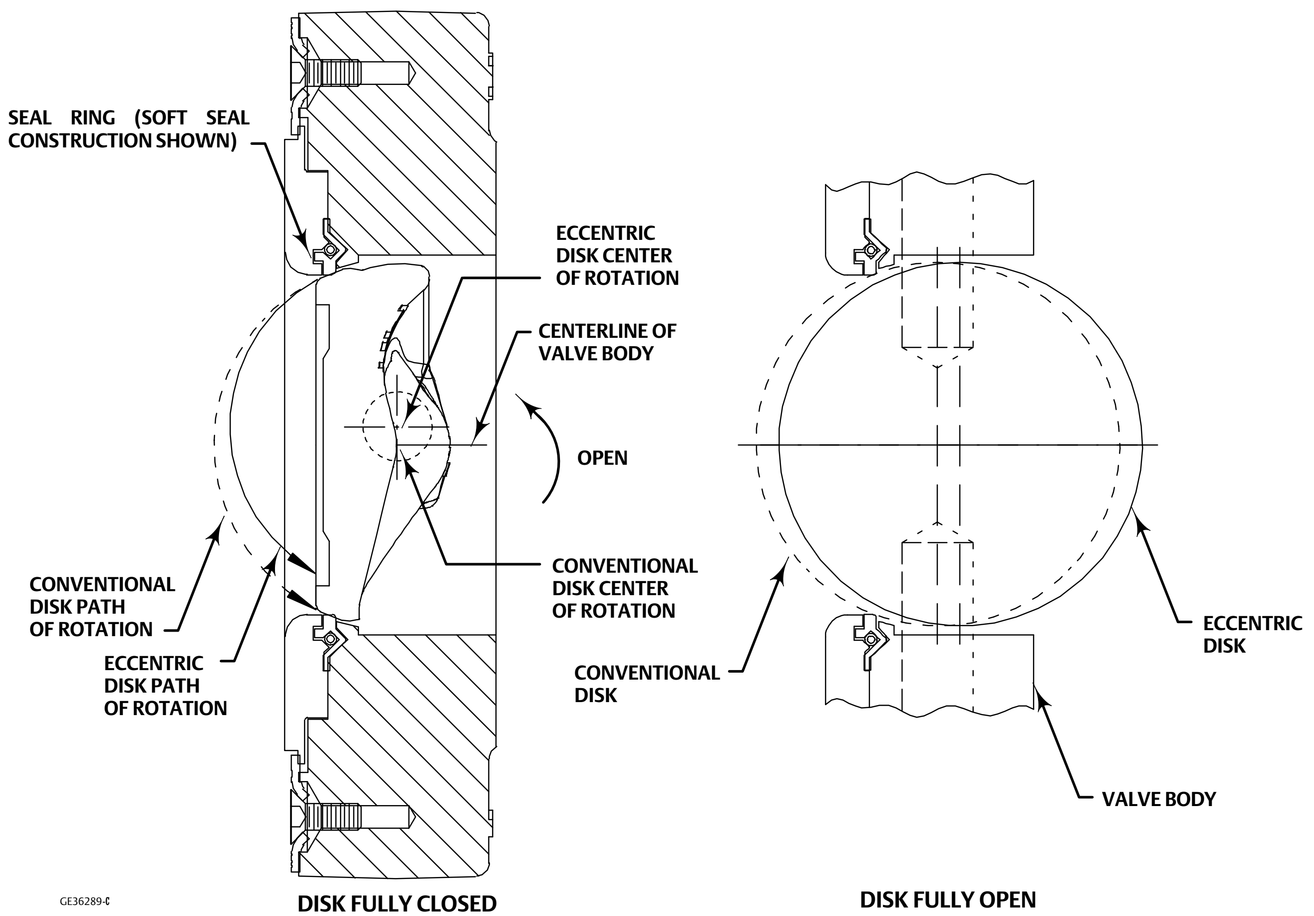
Valve Body Material	Shaft Material	Disk Material	Bearings	Seal Material
1.0619 & WCC	S17400 H1075	1.4409 & CF3M	PEEK/PTFE	PTFE or RPTFE
		1.4409 & CF3M Chrome-Plated	PEEK/PTFE	UHMWPE or Metal
			Alloy 6 or S31600 Nitride	Metal
LCC	S17400 H1075	1.4409 & CF3M	PEEK/PTFE	PTFE
1.4409 & CF3M	S20910	1.4409 & CF3M	PEEK/PTFE	PTFE or RPTFE
		1.4409 & CF3M Chrome-Plated	PEEK/PTFE	UHMWPE or Metal
			Alloy 6 or S31600 Nitride	Metal
CW2M	N10276	CW2M	PEEK/PTFE	PTFE or RPTFE
M35-2	N05500	M35-2	PEEK/PTFE	PTFE or RPTFE

Figure 1. Typical Fisher Control-Disk Valve Construction Detail



Note: Split shaft construction shown.

Figure 2. Comparison of Disk Action



Note: Split shaft construction shown.

Figure 3. Available Seal Configuration

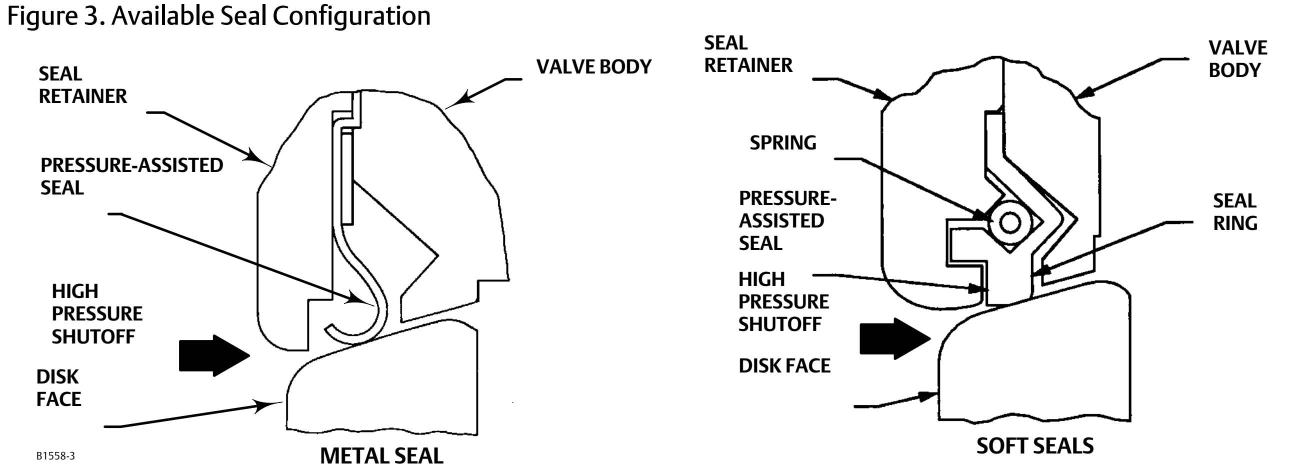


Figure 4. Travel Indication

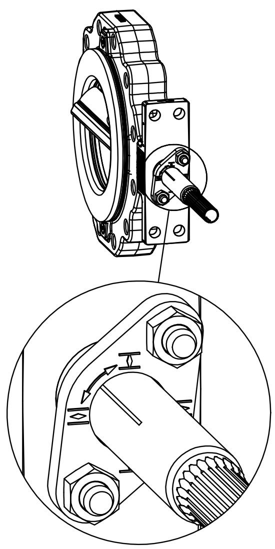


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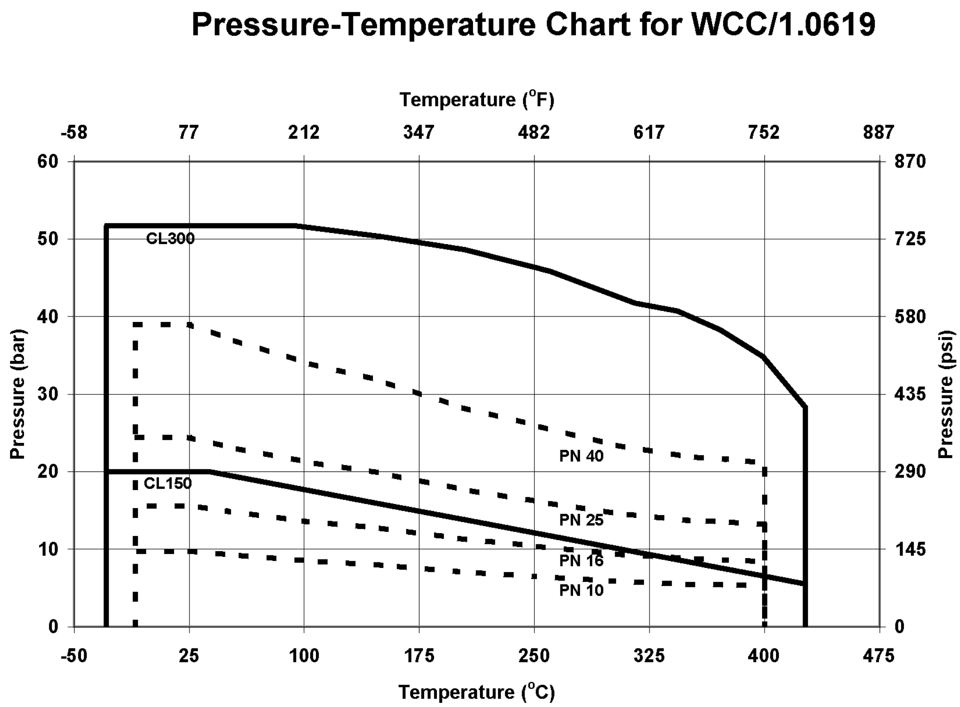
Table 4. Material Temperature Capabilities

MATERIAL					TEMPERATURE LIMITS	
PN FLANGES						
Valve Body	**Shaft**	**Bearing Lining and Jacket**	**Seal**	**Packing**	**°C**	**°F**
1.0619 Steel	S17400 or S20910	PEEK / PTFE	PTFE or RPTFE	PTFE or Graphite	−10 to 232	14 to 450
			UHMWPE	PTFE or Graphite	−10 to 93	14 to 200
			Metal or Flow Ring	PTFE	−10 to 232	14 to 450
				Graphite	−10 to 260	14 to 500
		R30006 (Alloy 6) or S31600 Nitride	Metal or Flow Ring	Graphite	−10 to 400	14 to 752
LCC	S17400 or S20910	PEEK / PTFE	PTFE	PTFE	−46 to 232	−50 to 450
1.4409 Stainless Steel	S20910	PEEK / PTFE	PTFE or RPTFE	PTFE or Graphite	−46 to 232	-50 to 450
			UHMWPE	PTFE or Graphite	−18 to 93	0 to 200
			Metal or Flow Ring	PTFE	−46 to 232	-50 to 450
				Graphite	−46 to 260	-50 to 500
		R30006 (Alloy 6) or S31600 Nitride	Metal or Flow Ring	Graphite	−46 to 500[1]	-50 to 932[1]
CW2M	N10276	PEEK / PTFE	PTFE or RPTFE	PTFE	−10 to 232	14 to 450
M35-2	N05500	PEEK / PTFE	PTFE or RPTFE	PTFE	−10 to 232	14 to 450
ASME FLANGES						
Valve Body	**Shaft**	**Bearing Lining and Jacket**	**Seal**	**Packing**	**°C**	**°F**
WCC steel	S17400 or S20910	PEEK / PTFE	PTFE or RPTFE	PTFE or Graphite	−29 to 232	-20 to 450
			UHMWPE	PTFE or Graphite	−18 to 93	0 to 200
			Metal or Flow Ring	PTFE	−29 to 232	-20 to 450
				Graphite	−29 to 260	-20 to 500
		R30006 (Alloy 6) or S31600 Nitride	Metal or Flow Ring	Graphite	−29 to 427	-20 to 800
LCC	S17400 or S20910	PEEK / PTFE	PTFE	PTFE	−46 to 232	−50 to 450
CF3M Stainless Steel	S20910	PEEK / PTFE	PTFE or RPTFE	PTFE or Graphite	−46 to 232	−50 to 450
			UHMWPE	PTFE or Graphite	−18 to 93	0 to 200
			Metal or Flow Ring	PTFE	−46 to 232	−50 to 450
				Graphite	−46 to 260	−50 to 500
		R30006 (Alloy 6) or S31600 Nitride	Metal or Flow Ring	Graphite	−46 to 454[1]	−50 to 850[1]
CW2M	N10276	PEEK / PTFE	PTFE or RPTFE	PTFE	−46 to 232	−50 to 450
M35-2	N05500	PEEK / PTFE	PTFE or RPTFE	PTFE	−46 to 232	−50 to 450

1. For applications exceeding 427°C (800°F), consult your Emerson sales office or Local Business Partner for appropriate high temperature disk edge coating.

Figure 5. Material Pressure/Temperature Curves



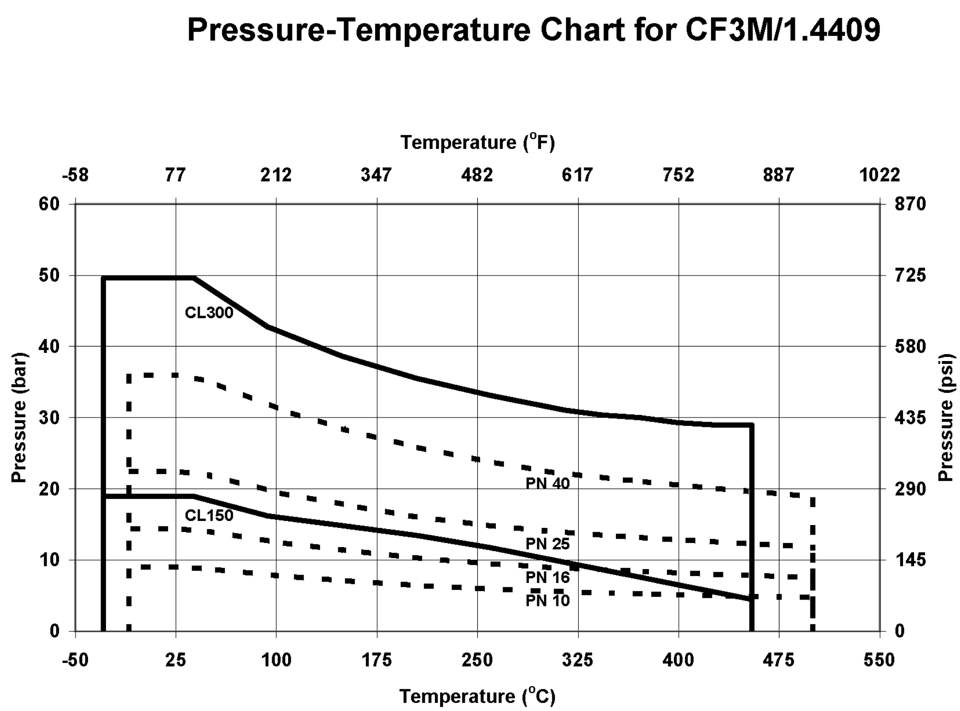
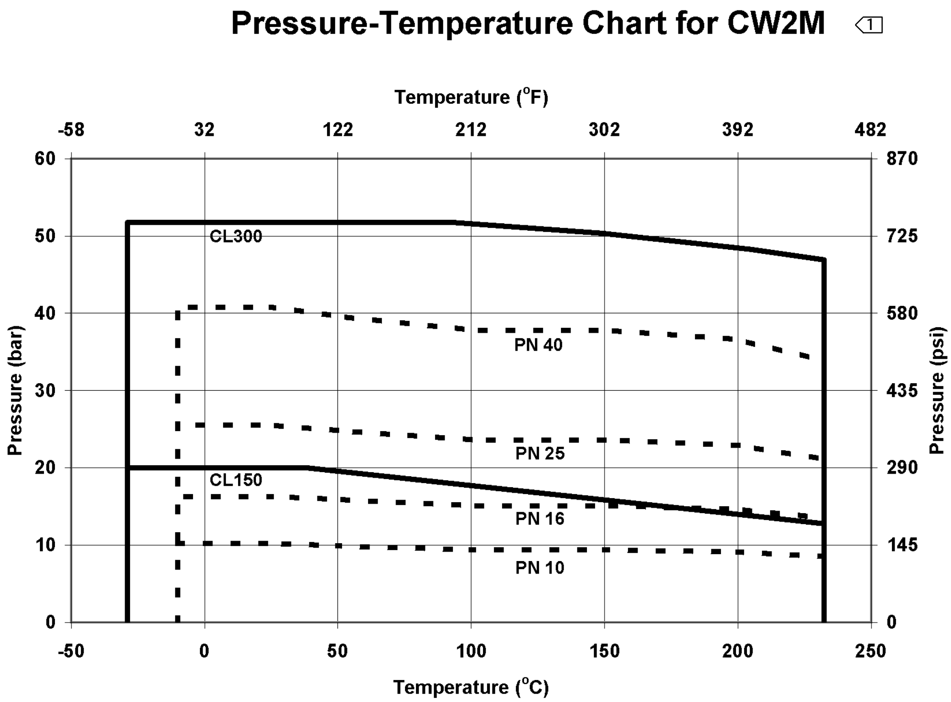
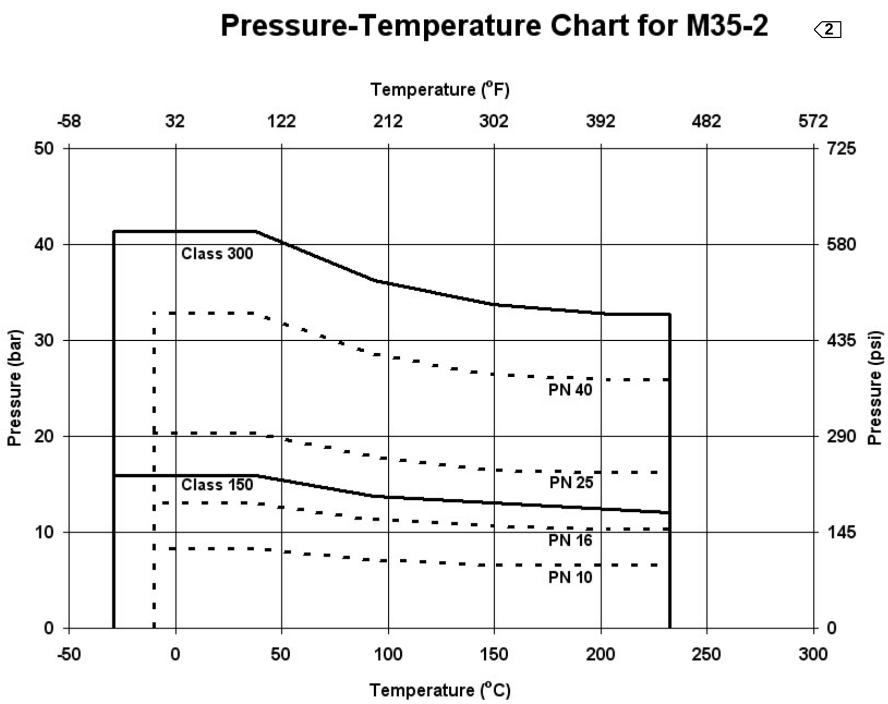


Figure 6. Material Pressure/Temperature Curves





Note:
1 CW2M is not listed in EN 12516-1 or ASME B16.34. The PN and CL designations are used only to indicate relative pressure-retaining capabilities.
2 M35-2 is not listed in EN 12516-1. The PN designations are used only to indicate relative pressure-retaining capabilities.

Figure 7. Material Pressure/Temperature Curves

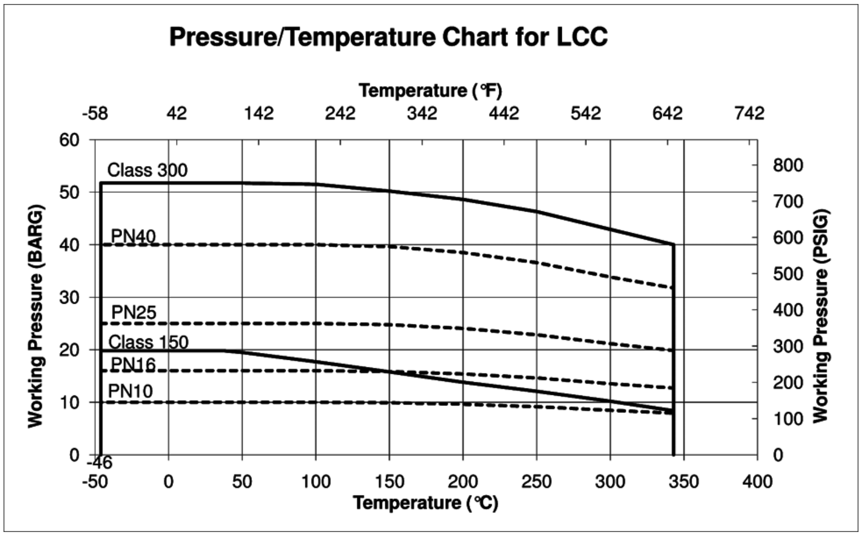


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Table 5. Maximum Allowable Shutoff Pressure Drops based on Trim (Seal, Shaft, and Bearings), Bar

Note: Do not exceed the EN or ASME pressure/temperature rating of the valve or mating flanges.

TRIM	TEMPERATURE, °C	DN 50	DN 80	DN 100	DN 150	DN 200	DN 250	DN 300
		Bar						
PTFE or RPTFE Seal PEEK/PTFE Bearings	-46 to 65	51.7	51.7	51.7	51.7	51.7	51.7	51.7
	93	48.5	48.5	48.5	48.5	48.5	45.6	46.8
	121	38.6	38.6	38.6	38.6	38.6	38.6	38.6
	149	28.7	28.7	28.7	28.7	28.7	28.7	28.7
	191	13.8	13.8	13.8	13.8	13.8	13.8	13.8
	204	10.3	10.3	10.3	10.3	10.3	10.3	10.3
	232	3.4	3.4	3.4	3.4	3.4	3.4	3.4
UHMWPE Seal PEEK/PTFE Bearings	-17 to 37	51.7	51.7	51.7	51.7	51.7	51.7	51.7
	66	38.6	38.6	38.6	38.6	38.6	38.6	38.6
	93	25.9	25.9	25.9	25.9	25.9	25.9	25.9
Metal Seal(1) Alloy 6 Bearings	-46 to 37	18.5	16.5	13.9	12.8	11.0	6.8	7.0
	93	17.0	15.1	12.8	11.7	10.1	6.3	6.5
	149	16.0	14.2	12.0	11.0	9.4	5.9	6.1
	204	15.1	13.4	11.4	10.4	9.0	5.6	5.7
	260	14.3	12.8	10.8	9.9	8.5	5.3	5.4
	316	13.8	12.3	10.3	9.5	8.2	5.1	5.2
	371	13.2	11.9	10.0	9.2	7.9	5.0	5.0
	427	12.5	11.6	9.8	9.0	7.7	4.8	5.0
	454	12.1	11.5	9.7	8.9	7.7	4.8	4.9
Metal Seal(1) S31600/Nitride Bearings	-46 to 37	19.5	28.2	26.1	20.8	31.0	15.5	8.0
	93	19.3	28.0	26.0	20.6	31.0	15.4	7.9
	149	17.0	25.4	23.7	18.7	28.8	14.0	7.1
	204	15.9	24.3	22.7	17.8	26.3	13.3	6.8
	260	14.5	22.9	21.4	16.8	24.6	12.5	6.3
	316	13.8	22.1	20.8	16.2	23.2	12.1	6.1
	371	13.2	21.5	20.2	15.7	22.4	11.8	5.9
	427	12.5	20.7	19.5	15.2	21.8	11.4	5.6
	454	12.1	20.3	19.2	14.9	21.6	11.2	5.4
Metal Seal(1) PEEK/PTFE Bearings	-46 to 37	51.7	51.7	51.7	51.7	31.0	17.2	17.2
	93	51.7	51.7	51.7	51.7	31.0	17.2	17.2
	149	50.3	50.3	50.3	50.3	31.0	17.2	17.2
	204	48.6	48.6	48.6	48.2	31.0	17.2	17.2
	232	47.2	47.2	46.3	42.6	31.0	17.2	17.2
	260	24.7	21.9	18.5	17.0	14.6	9.1	9.4
Flow Ring PEEK/PTFE Bearings	-46 to 37	51.7	51.7	51.7	51.7	51.7	45.5	46.8
	93	51.7	51.7	51.7	51.7	51.7	37.7	38.8
	149	50.3	50.3	50.3	50.3	50.3	31.7	32.6
	204	48.6	48.6	48.6	48.1	41.3	25.7	26.4
	232	47.2	47.2	46.3	42.6	36.6	22.8	23.4
	260	24.6	21.9	18.5	17	14.6	9.1	9.3
Flow Ring S31600/Nitride Bearings	-46 to 37	32	34.4	34.8	28.6	31.6	20.2	13
	93	31.8	34.4	34.6	28.5	31.6	19.7	12.9
	149	29.5	34.4	32.4	26.6	28.7	17.9	12.1
	204	28.5	34.4	31.3	25.7	26.3	16.4	11.7
	260	27.3	37.5	30.1	24.8	24.6	15.3	11.3
	316	26.6	35.5	29.5	24.2	23.2	14.4	11.1
	371	26.1	34.1	28.7	23.7	22.4	13.9	10.8
	427	25.4	28.9	27.9	23.2	21.7	13.5	10.6
	454	25	28.9	27.6	22.9	21.5	13.3	10.5

1. Pressure drops shown for metal seals are for forward flow only.

Table 6. Maximum Allowable Shutoff Pressure Drops based on Trim (Seal, Shaft, and Bearings), Psi

Note: Do not exceed the EN or ASME pressure/temperature rating of the valve or mating flanges.

TRIM	TEMPERATURE, °F	NPS						
		2	3	4	6	8	10	12
		Psi						
PTFE or RPTFE Seal PEEK/PTFE Bearings	-50 to 150	750	750	750	750	750	750	750
	200	704	704	704	704	704	662	679
	250	560	560	560	560	560	560	560
	300	416	416	416	416	416	416	416
	375	200	200	200	200	200	200	200
	400	150	150	150	150	150	150	150
	450	50	50	50	50	50	50	50
UHMWPE Seal PEEK/PTFE Bearings	0 to 100	750	750	750	750	750	750	750
	150	560	560	560	560	560	560	560
	200	375	375	375	375	375	375	375
Metal Seal(1) Alloy 6 Bearings	-50 to 100	268	239	202	185	159	99	102
	200	246	219	185	170	146	91	94
	300	232	206	174	160	137	86	88
	400	219	195	165	151	130	81	83
	500	208	186	157	144	124	77	79
	600	200	178	150	138	119	74	76
	700	192	172	145	134	115	72	73
	800	181	168	142	130	112	70	72
	850	176	167	141	129	111	69	71
Metal Seal(1) S31600/Nitride Bearings	-50 to 100	283	409	379	301	450	225	116
	200	280	406	377	299	450	223	115
	300	246	369	344	271	417	203	103
	400	230	352	329	258	382	193	98
	500	211	332	311	243	357	182	91
	600	200	321	301	235	337	176	88
	700	192	312	293	228	325	171	85
	800	181	300	283	220	316	165	81
	850	176	295	278	216	313	162	79
Metal Seal(1) PEEK/PTFE Bearings	-50 to 100	750	750	750	750	450	250	250
	200	750	750	750	750	450	250	250
	300	730	730	730	730	450	250	250
	400	705	705	705	699	450	250	250
	450	685	685	672	618	450	250	250
	500	358	318	269	247	212	132	136
Flow Ring PEEK/PTFE Bearings	-50 to 150	750	750	750	750	750	661	679
	200	750	750	750	750	750	548	563
	300	730	730	730	730	730	461	474
	400	705	705	705	699	600	374	384
	450	685	685	672	618	531	331	340
	500	358	318	269	247	212	132	136
Flow Ring S31600/Nitride Bearings	-50 to 150	465	499	505	416	459	293	189
	200	462	499	502	414	459	287	188
	300	429	499	470	387	417	260	176
	400	414	499	455	374	382	238	171
	500	397	545	438	360	357	222	165
	600	387	515	428	351	337	210	161
	700	379	496	417	345	325	202	158
	800	369	420	405	337	316	196	155
	850	364	420	401	333	313	194	153

1. Pressure drops shown for metal seals are for forward flow only.

Table 7. Dimensions and Weights

VALVE SIZE, PRESSURE RATING		A	E	F		G		K	R[4]	S[1]	T	U	W	APPROXIMATE WEIGHT[2]	
				Wafer	Lugged	Wafer	Lugged							Wafer	Lugged
		mm												kg	
DN50/ NPS 2	PN10-40/ CL150-300	43	187.5	150	---	109	---	125	102	12.7	117	---	14	4.7	6.7
DN80/ NPS 3	PN10-40/ CL150-300	47/48 [3]	187.5	---	196	---	133	130	144	15.9	117	---	14	---	11.2
DN100/ NPS 4	PN10-40/ CL150-300	53	214.4	---	226	---	147	172	162	19.1	152	32	14	---	17.6
DN150/ NPS 6	PN10-40/ CL150-300	57	214.4	270	300	147	182	205	218	25.4	152	32	14	15.7	26.5
DN200/ NPS 8	PN10-16/ CL150	61	208	---	342	---	225	258	278	31.8	235	46	18	---	40.9
	PN25-40	61	208	358	364	225	225	258	291	31.8	235	46	18	34.6	46.7
	CL300	73													
DN250/ NPS 10	PN10-16/ CL150	69	208	---	395	---	250	270	331	31.8	235	46	18	---	50.7
	PN25-40	69	208	400	450	265	265	270	352	31.8	235	46	18	52.0	79.4
	CL300	83													
DN300/ NPS 12	PN10-16/ CL150	78	208	---	467	---	309	304	381	38.1	235	46	18	---	98.6
	PN25-40	78	208	---	512	---	309	304	410	38.1	235	46	18	---	104.9
	CL300	92													
		Inches												lbs	
DN50/ NPS 2	PN10-40/ CL150-300	1.69	7.38	5.91	---	4.29	---	4.92	4.02	0.50	4.62	---	0.55	10	15
DN80/ NPS 3	PN10-40/ CL150-300	1.85/ 1.89 [3]	7.38	---	7.72	---	5.24	5.12	5.67	0.63	4.62	---	0.55	---	25
DN100/ NPS 4	PN10-40/ CL150-300	2.09	8.44	---	8.90	---	5.79	6.77	6.38	0.75	6.00	1.25	0.55	---	39
DN150/ NPS 6	PN10-40/ CL150-300	2.24	8.44	10.63	11.81	5.79	7.17	8.07	8.58	1.00	6.00	1.25	0.55	35	58
DN200/ NPS 8	PN10-16/ CL150	2.40	8.19	---	13.46	---	8.86	10.16	10.96	1.25	9.25	1.81	0.71	---	90
	PN25-40	2.40	8.19	14.09	14.33	8.86	8.86	10.16	11.46	1.25	9.25	1.81	0.71	76	103
	CL300	2.87													
DN250/ NPS 10	PN10-16/ CL150	2.72	8.19	---	15.55	---	9.84	10.63	13.03	1.25	9.25	1.81	0.71	---	112
	PN25-40	2.72	8.19	15.75	17.72	10.43	10.43	10.63	13.86	1.25	9.25	1.81	0.71	115	175
	CL300	3.27													
DN300/ NPS 12	PN10-16/ CL150	3.07	8.19	---	18.39	---	12.17	11.97	15.00	1.50	9.25	1.81	0.71	---	217
	PN25-40	3.07	8.19	---	20.16	---	12.17	11.97	16.14	1.50	9.25	1.81	0.71	---	231
	CL300	3.62													

1. This nominal valve shaft diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.
2. Valve assembly only.
3. 48 mm for CL150 and CL300 lugged only.
4. Dimension shown is seal retainer OD. Diameter for serrated gasket surface may be smaller.

Table 8. Line Bolting Dimensions

VALVE SIZE	Y					
	Pressure Rating					
	CL150	CL300	PN10	PN16	PN25	PN40
DN80 / NPS 3	4X 5/8-11	8X 3/4-10	8X M16X2			
DN100 / NPS 4	8X 5/8-11	8X 3/4-10	8X M16X2		8X M20X2.5	
DN150 / NPS 6	8X 3/4-10	12X 3/4-10	8X M20X2.5		8X M24X3(1)	
DN200 / NPS 8	8X 3/4-10	12X 7/8-9	8X M20X2.5	12X M20X2.5	12X M24X3	12X M27X3(1)
DN250 / NPS 10	12X 7/8-9	16X 1-8	12X M20X2.5	12X M24X3	12X M27X3	12X M30X3.5(1)
DN300 / NPS 12	12X 7/8-9	16X 1-1/8-8	12X M20X2.5	12X M24X3	16X M27X3	16X M30X3.5

1. Not available in single flange with threaded holes.

Figure 8. Dimensions for Fisher Control-Disk Valve, Single Flange

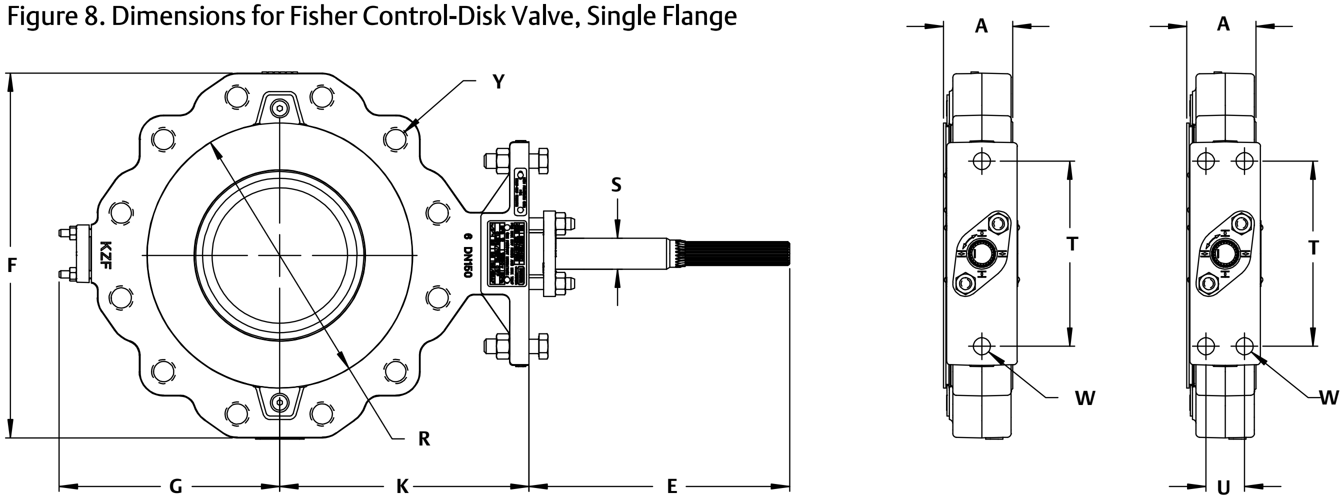


Figure 9. Dimensions for Fisher Control-Disk Valve, Wafer Style (limited sizes)

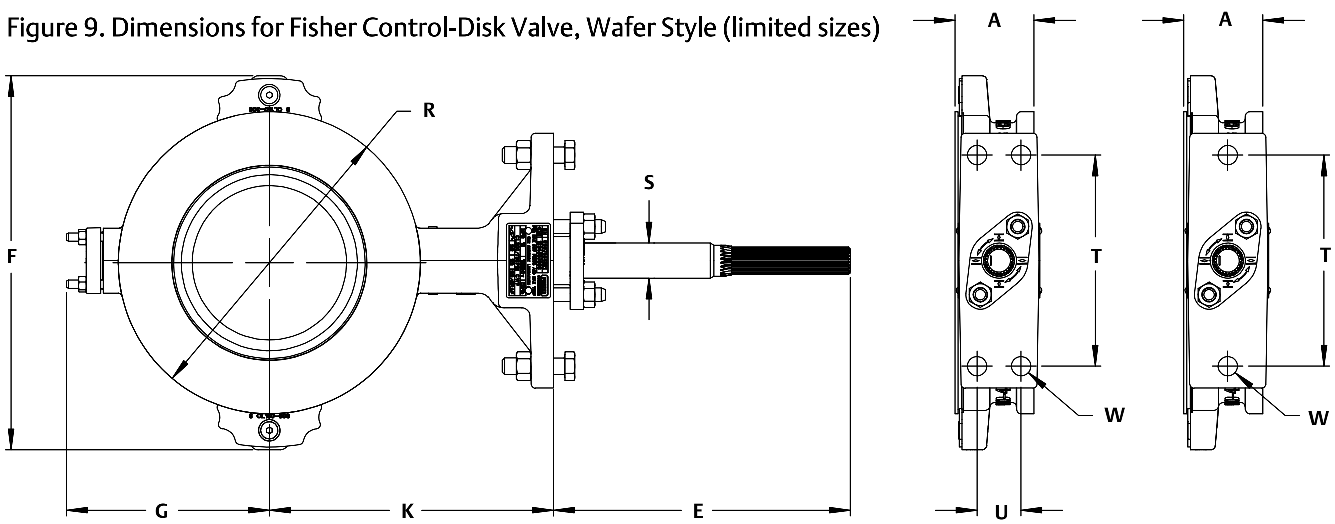
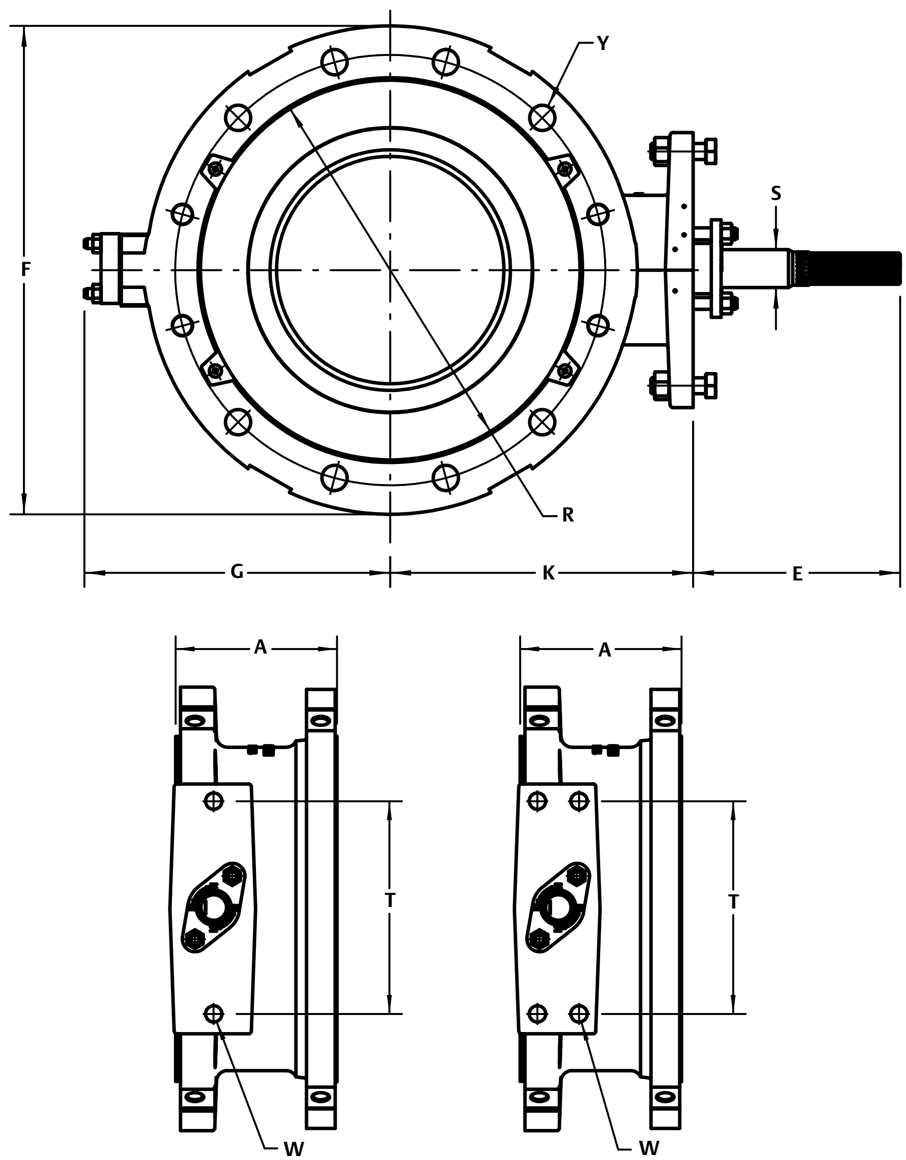


Table 9. Dimensions and Weights, Double Flange Valve Body (See Figure 10)

VALVE SIZE, PRESSURE RATING		A	B	E		F	G	K	R	S	T	U	W	APPROX-IMATE WEIGHT
				Splined	Square									
		mm												kg
DN80/ NPS 3	PN10-16 /CL150	114	25.3	187.5	76	190	133	130	144	15.9	117	- - -	14	17.6
	PN25-40 /CL300	180	25.3	187.5	76	210	133	130	144	15.9	117	- - -	14	29
DN100/ NPS 4	PN10-16 /CL150	127	28.5	214.4	103	230	147	172	162	19.1	152	32	14	28.9
	PN25-40 /CL300	190	28.5	214.4	103	254	147	172	162	19.1	152	32	14	47.8
DN150/ NPS 6	PN10-16 /CL150	140	31.7	214.4	108	280	182	205	218	25.4	152	32	14	40.2
	PN25-40 /CL300	210	31.7	214.4	108	322	182	205	218	25.4	152	32	14	76.4
NPS200/ NPS 8	PN10-16 /CL150	152	32.8	208	107	345	225	258	278	31.8	235	46	18	71.3
	PN25-40 /CL300	230	32.8	208	107	380	225	258	291	31.8	235	46	18	124
DN250/ NPS 10	PN10-16 /CL150	165	35.6	208	109	405	250	270	331	31.8	235	46	18	80
	PN25-40 /CL300	250	35.6	208	109	445	265	270	352	31.8	235	46	18	203
DN300/ NPS 12	PN10-16 /CL150	178	41.7	208	114	485	309	304	381	38.1	235	46	18	144
	PN25-40 /CL300	270	41.7	208	114	520	309	304	410	38.1	235	46	18	275
		Inches												lbs
DN80/ NPS 3	PN10-16 /CL150	4.5	1	7.38	2.99	7.48	5.24	5.12	5.67	0.63	4.62	- - -	0.55	39
	PN25-40 /CL300	7.1	1	7.38	2.99	8.26	5.24	5.12	5.67	0.63	4.62	- - -	0.55	64
DN100/ NPS 4	PN10-16 / CL150	5	1.12	8.44	4.06	9.05	5.79	6.77	6.38	0.75	6	1.25	0.55	64
	PN25-40 /CL300	7.5	1.12	8.44	4.06	10	5.79	6.77	6.38	0.75	6	1.25	0.55	105
DN150/ NPS 6	PN10-16 /CL150	5.5	1.25	8.44	4.25	11.02	7.17	8.07	8.58	1	6	1.25	0.55	89
	PN25-40 /CL300	8.3	1.25	8.44	4.25	12.66	7.17	8.07	8.58	1	6	1.25	0.55	168
NPS200/ NPS 8	PN10-16 /CL150	6	1.29	8.19	4.21	13.58	8.86	10.16	10.96	1.25	9.25	1.81	0.71	157
	PN25-40 /CL300	9.1	1.29	8.19	4.21	14.96	8.86	10.16	11.46	1.25	9.25	1.81	0.71	273
DN250/ NPS 10	PN10-16 /CL150	6.5	1.4	8.19	4.29	15.94	9.84	10.63	13.03	1.25	9.25	1.81	0.71	176
	PN25-40 /CL300	9.8	1.4	8.19	4.29	17.52	10.43	10.63	13.86	1.25	9.25	1.81	0.71	448
DN300/ NPS 12	PN10-16 /CL150	7	1.64	8.19	4.49	19.09	12.17	11.97	15	1.5	9.25	1.81	0.71	317
	PN25-40 /CL300	10.6	1.64	8.19	4.49	20.47	12.17	11.97	16.14	1.5	9.25	1.81	0.71	606

Figure 10. Dimensions for Fisher Control-Disk Valve Double Flange



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Fisher™ CL600 Control-Disk™ Valve

The Fisher CL600 Control-Disk valve provides outstanding performance in a wide range of pressure and temperature conditions.

The CL600 Control-Disk valve is available in a lugged or double flanged body design. A splined drive shaft can combine with a variety of spring-and-diaphragm or pneumatic piston actuators to make the Control-Disk valve a reliable control valve for a variety of throttling applications in the process industries.

The CL600 Control-Disk valve can be supplied with one of several dynamic seals (figure 1) that can be used in a variety of demanding applications. With the appropriate seal selection and materials of construction, the pressure-assisted seal helps provide excellent shutoff against the full ASME class pressure range for the CL600 Control-Disk valve.

X0955-2

Lugged Style Fisher Control-Disk Valve

X1610

Double Flanged Style Fisher Control-Disk Valve

Features

- **Equal percentage flow characteristic--** An equal percentage flow characteristic provides an improved throttling range comparable to that of a segmented ball valve. This improved capability allows you to control closer to the target set point, regardless of process disturbances, which results in a reduction in process variability.

- **Fire Safe Construction--** The CL600 Control-Disk valve has been fire tested per API 607, 6th edition with the Phoenix III seal. Standard construction requires 316 stainless steel chrome plated disk, graphite packing, metal bearings and S17400 H1025 SST or S20910 SST shaft. For information on fire tested valves, consult Fire-Tested Rotary Valves Bulletin 59.3:025 (D103907X012).

- **Excellent Shutoff Integrity--** The pressure-assisted seal design provides tight shutoff and permits the use of smaller, less expensive actuators in applications requiring full ASME B16.34 shutoff capabilities.

- **Excellent Emissions Capabilities--** The optional ENVIRO-SEAL™ packing systems are designed with very smooth shaft surfaces and live-loading to provide improved sealing, guiding, and loading force transmission. The seal of the ENVIRO-SEAL system can control emissions to below 100 ppm (parts per million).

Features (continued on 2)

- **Sour Service Capability--** Trim and bolting materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0175-2003, MR0103, and MR0175 / ISO 15156.

- **Reliable Flange Gasketing Surface--** Seal retainer screws are located so there is no interference with the sealing function of either flat sheet or spiral wound line flange gaskets.

- **True Bidirectional Shutoff Performance--** A feature of the valve design is that the torque necessary to open and close the valve is the same regardless of the direction in which the differential pressure is applied.

- **Easy Installation--** The valve body self-centers on the line flange bolts as a fast, accurate means of centering the valve in the pipeline.

- **Powder Paint as Standard--** The Emerson Automation Solutions powder paint finish offers an excellent corrosion-resistant finish to all steel parts.

- **Shaft Retention--** Redundant shaft retention provides added protection. The packing follower, anti-blowout ring, and shaft groove interact to hold the shaft securely in the valve body in NPS 3 through 10 (see figure 4). The NPS 12 through 24 utilize a stepped packing follower and stepped shaft to hold the shaft securely in the valve body.

Table of Contents

CL600 Control-Disk Valve Specifications and Materials

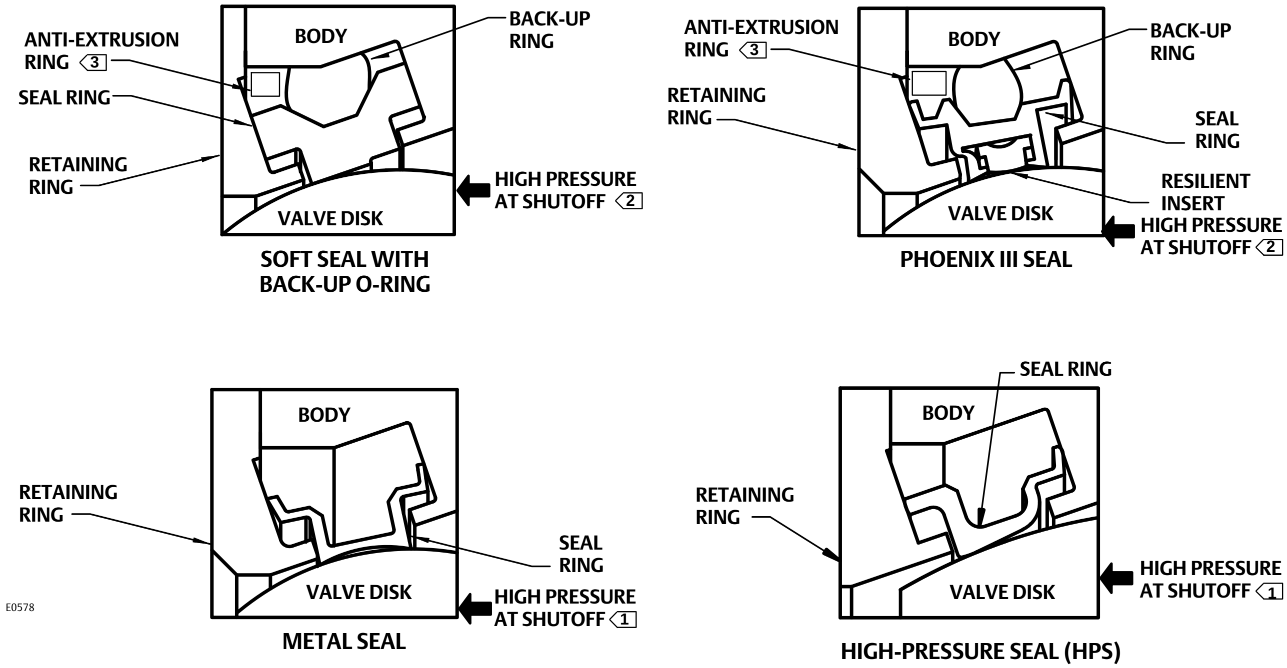
Table 1. Fisher CL600 Control-Disk Valve Specifications

Specifications	ASME
Valve Body Size	NPS 3, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24
Pressure Rating	CL600 per ASME B16.34
Valve Body Materials	WCC or CF8M (std)
	LCC, CD3MN, M35-2, and CW2M
Disk Materials	CF8M (std), CD3MN, M35-2, and CW2M
Disk Edge Coating	Chrome Plate (std) Chrome Coat Chromium Carbide Coating
End Connections	Mates with RF Flanges per ASME B16.5 Optional construction mates with RTJ Flanges per ASME B16.5
Valve Body Style	Lugged (Single Flange), Lugged with drilled through flange holes, or Double Flange
Shaft Connection Style	NPS 3-24: Splined (std) NPS 3-12: Square NPS 14-24: Keyed
Face-to-Face Dimensions	Meets MSS SP68, API 609, ASME B16.10, and EN 558 standards; Double-Flange available upon request
Shutoff	Soft Seal: Class VI
	Metal Seal: Class IV, reverse direction only
	Phoenix III Seal: Class VI; reverse direction preferred, forward direction optional
	High Pressure Seal: Class VI, reverse direction only
Flow Direction	Standard (reverse flow) is with the flow into the shaft side of the disk
Flow Characteristic	Equal Percentage
Disk Rotation	Clockwise (CW) to close

Table 2. Materials (Other Valve Components)

Component	Material
Shafts and Pins	S17400 H1025
	S20910
	N07718
Anti-Blowout Ring (NPS 3-8 only)	N07718
Seal Ring	Soft: ETFE
	Metal: S21800
	Phoenix III: S20910/ETFE
	HPS: S21800 Nitrided
Bearings	PEEK, S31600 Nitrided, R30006 (Alloy 6)
Packing	PTFE/carbon-filled PTFE (standard), graphite die-molded ribbon, ENVIRO-SEAL PTFE packing, ENVIRO-SEAL graphite packing

Figure 1. Available Seal Configurations



Notes:
1 This unidirectional seal must be installed so that the retaining ring is downstream from the high pressure side of the valve at shutoff, as shown.
2 For this bidirectional seal, the "preferred" valve orientation places the retaining ring downstream from the high pressure side of the valve at shutoff.
3 NPS 3 only.

Standard Seal Configurations

- **Standard Soft Seal--** A resilient dynamic seal with an elastomeric back-up ring for low to moderate temperature applications.

- **Metal Seal--** This stainless steel seal is available for severe service and high-temperature applications to 538°C (1000°F).

- **Phoenix III Seal--** This three-component, metal-and-polymeric seal is available for severe service with low to moderate temperature applications.

- **High-Pressure Seal--** This robust, stainless steel seal is available for severe service, cryogenic, and high-temperature applications to 538°C (1000°F).

Installation

Preferred valve orientation for the CL600 Control-Disk valve is reverse flow direction. Reverse flow direction is into the side of the valve body opposite the retaining ring or into the shaft side of the disk.

For erosive and many severe service applications, valves with bidirectional seals can and should be installed with the shaft horizontal and in the forward flow direction to prevent direct impingement of the process media on the seal, and to minimize the exposure of the shaft bearings to the process media.

The standard soft seal and the Phoenix III seal both offer bidirectional shutoff. Valves using either metal or HPS are unidirectional and must be installed in the reverse flow orientation.

For assistance in selecting the appropriate combination of actuator action and open valve position, consult your Emerson sales office. Dimensions and weights are shown in figure 5 and table 6.

Figure 2. CL600 Control-Disk Valve, NPS 3 to 6, Valve Body Assembly

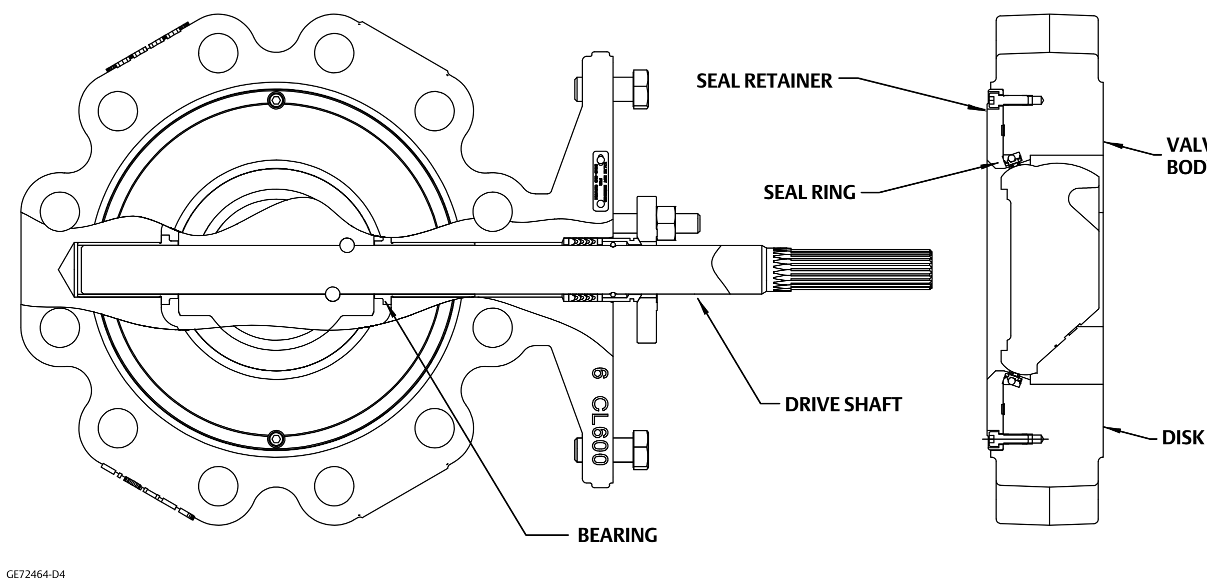
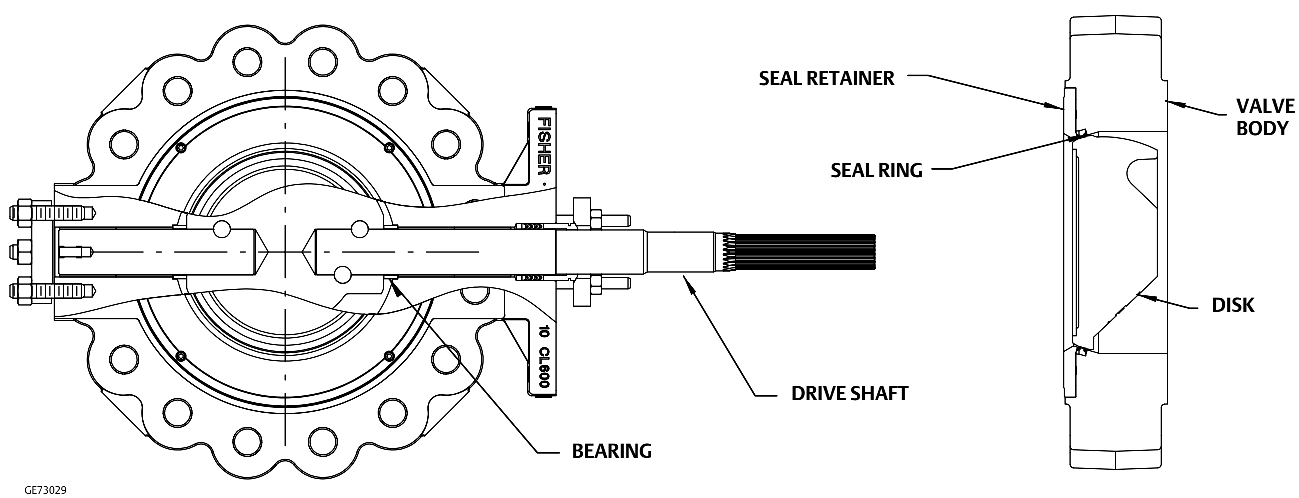


Figure 3. CL600 Control-Disk Valve, NPS 8 to 24, Valve Body Assembly 1



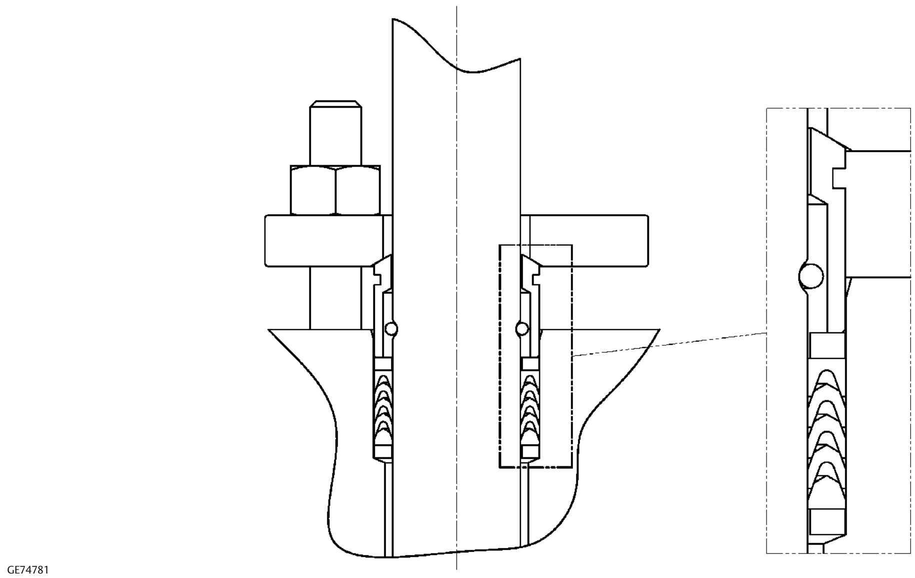
Note:
1 NPS 8 valve utilizes a one piece shaft

Table 3. Material Temperature Ranges

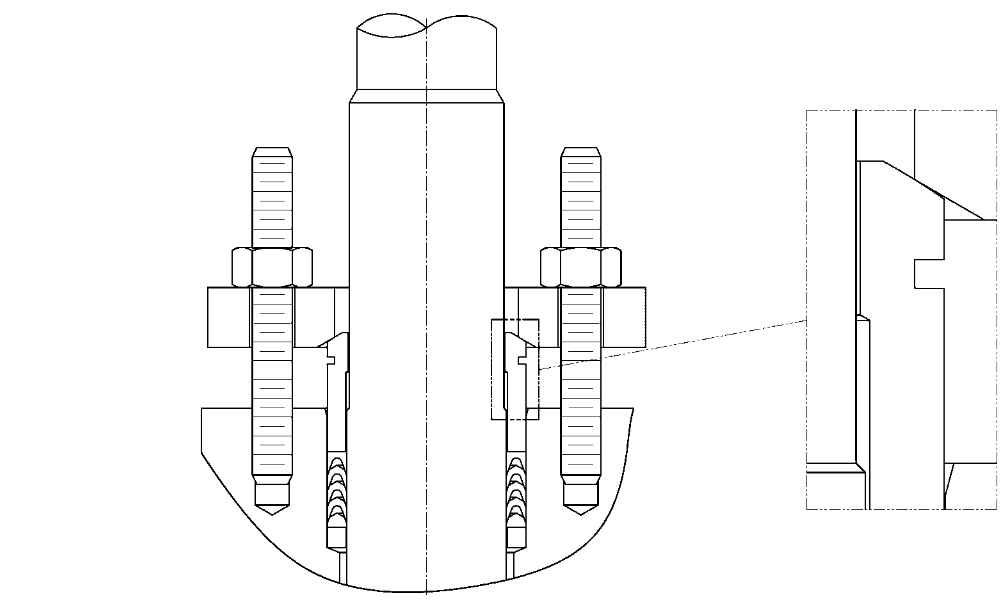
PART NAME	MATERIAL	TEMP °C	TEMP °F
Valve Body	WCC Steel	-29 to 427	-20 to 800
	CF8M(1)	-254 to 538	-425 to 1000
	LCC	-45 to 343	-50 to 650
	CD3MN	-51 to 316	-60 to 600
	M35-2	-198 to 482	-325 to 900
	CW2M(1)	-198 to 538	-325 to 1000
Disk	CF8M with Chrome Plated Disk Edge	-254 to 427	-425 to 800
	CF8M with Chrome Coated Disk Edge(1)	-254 to 538	-425 to 1000
	CF8M with Chromium Carbide Disk Edge(1)	-254 to 538	-425 to 1000
	CD3MN (no plating)(2)	-51 to 316	-60 to 600
	M35-2 (no plating)(2)	-198 to 482	-325 to 900
	CW2M (no plating)(1)(2)	-198 to 538	-325 to 1000
Shaft	S17400 (H1025)	-46 to 427	-50 to 800
	S20910(1)	-198 to 538	-325 to 1000
	S31803	-51 to 316	-60 to 600
	N05500	-198 to 482	-325 to 900
	N10276	-198 to 538	-325 to 1000
	N07718(1)	-254 to 538	-425 to 1000
Bearings	PEEK(1)	-73 to 149	-100 to 300
	S31600 Nitrided(1)	-254 to 538	-425 to 1000
	R30006 (Alloy 6)(1)	-198 to 538	-325 to 1000
Seal	**ETFE Soft Seal Ring**		
	ETFE Soft Seal Ring with FKM Backup Ring	-29 to 149	-20 to 300
	ETFE Soft Seal Ring with EPR Backup Ring	-54 to 149	-65 to 300
	S20910/ETFE Phoenix III Seal Ring		
	S20910/ETFE Phoenix III Seal Ring with FKM Backup Ring	-40 to 149	-40 to 300
	S20910/ETFE Phoenix III Seal Ring with EPR Backup Ring	-62 to 149	-80 to 300
	Metal Seal		
	S21800(1)	-198 to 538	-325 to 1000
	S20910(1)	-198 to 538	-325 to 1000
	High Pressure Seal		
	S21800 Nitrided(1)	-198 to 538	-325 to 1000
	S20910 Nitrided(1)	-198 to 538	-325 to 1000
Packing	PTFE /Carbon-filled PTFE (standard)	-45 to 232	-50 to 450
	ENVIRO-SEAL PTFE	-45 to 232	-50 to 450
	Graphite Die-molded Ribbon	-198 to 538	-325 to 1000
	ENVIRO-SEAL Graphite	-198 to 371	-325 to 700

1. The maximum temperature for a standard CL600 Control-Disk valve is 538°C (1000°F). Contact your Emerson sales office for use in higher temperature applications.
2. For use with soft seal only.

Figure 4. Anti-Blowout Protection



NPS 3 THROUGH 8 WITH ANTI-BLOWOUT RING



NPS 10 THROUGH 24 WITH STEPPED SHAFT

Pressure Drops

Pressure drop limits of any given valve are based on valve body, and trim material limits. To find the appropriate pressure drop limitation, choose the desired valve size and temperature range. Then search table 4 for body limitations and table 5 for trim limitations. Information on limits for CW2M, M35-2, and other alloy constructions can be obtained by contacting your Emerson sales office. The lowest number from the tables is the appropriate limit. **The tables for both trim and body limits must be consulted.**

Table 4. Maximum Allowable Shutoff Pressure Drops (Valve Ratings) Based on Carbon Steel and Stainless Steel Valve Types(1) (The tables for both trim and body limits must be consulted)

TEMPERATURE RANGE	PRESSURE RANGE			
	CL600			
	WCC(2)	CF8M(2)	LCC(2)	CD3MN
°C	Bar			
-254 to -29	- - -	99.3	- - -	103.4
-29 to 38	103.4	99.3	103.4	103.4
93	103.4	85.5	103.4	102.7
149	100.3	77.2	100.3	92
204	96.9	70.7	96.9	84.8
260	91.7	65.8	91.7	80
316	83.4	62.1	83.4	76.9
343	81.0	61.0	81.0	- - -
371	76.5	60.0	- - -	- - -
399	70.0	59.0	- - -	- - -
427	56.9	58.3	- - -	- - -
454	- - -	57.6	- - -	- - -
482	- - -	57.2	- - -	- - -
510	- - -	53.4	- - -	- - -
538	- - -	50.0	- - -	- - -
°F	Psi			
-425 to -20	- - -	1440	- - -	1500
-20 to 100	1500	1440	1500	1500
200	1500	1240	1500	1490
300	1455	1120	1455	1335
400	1405	1025	1405	1230
500	1330	955	1330	1160
600	1210	900	1210	1115
650	1175	885	1175	- - -
700	1110	870	- - -	- - -
750	1015	855	- - -	- - -
800	825	845	- - -	- - -
850	- - -	835	- - -	- - -
900	- - -	830	- - -	- - -
950	- - -	775	- - -	- - -
1000	- - -	725	- - -	- - -

1. For pressure/temperature rating of other materials, contact your Emerson sales office.
2. WCC, LCC, and CF8M valve bodies use S31600 seal retainers and blind flanges.

Table 5. Maximum Allowable Shutoff Pressure Drops based on Trim(1)

Note: Do not exceed the ASME pressure/temperature ratings of the valve or mating flanges.

Trim	Temperature, °C	NPS 3	4	6	8	10	12	14	16	18	20	24
		Bar										
ETFE Seal, PEEK Bearings	-46 to 37	103	94	103	103	103	102	103	103	103	103	100
	93	76	76	76	76	76	76	76	76	76	76	76
	121	41	41	41	41	41	41	41	41	41	41	41
	149	7	7	7	7	7	7	7	7	7	7	7
Phoenix III Seal, PEEK Bearings	-46 to 37	103	92	103	103	103	81	103	102	103	103	80
	93	103	86	103	101	103	73	103	92	103	103	72
	121	61	61	61	61	61	61	61	61	61	61	61
	149	21	21	21	21	21	21	21	21	21	21	21
Phoenix III Seal, Metal Bearings	-46 to 37	103	90	103	103	103	63	103	78	103	103	61
	93	98	84	103	99	96	56	103	71	103	101	56
	121	61	61	61	61	61	54	61	61	61	61	54
	149	21	21	21	21	21	21	21	21	21	21	21
Metal Seal, PEEK Bearings	-46 to 37	103	92	103	103	103	86	103	103	103	103	91
	149	100	83	100	97	100	73	100	95	100	100	79
Metal Seal, Metal Bearings	-46 to 37	103	90	103	103	103	66	103	84	103	103	69
	316	83	75	83	78	81	49	83	65	83	83	54
	427(2)	70	70	70	70	70	47	70	62	70	70	51
HPS Seal, Metal Bearings	-46 to 37	33	44	89	80	89	57	103	77	103	103	67
	316	18	28	67	59	68	43	83	60	83	83	52
	427(2)	16	26	63	56	64	41	70	57	70	70	50
Trim	**Temperature, °F**	**PSI**										
ETFE Seal, PEEK Bearings	-50 to 100	1500	1370	1500	1500	1500	1483	1500	1500	1500	1500	1456
	200	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
	250	600	600	600	600	600	600	600	600	600	600	600
	300	100	100	100	100	100	100	100	100	100	100	100
Phoenix III Seal, PEEK Bearings	-50 to 100	1500	1332	1500	1500	1500	1175	1500	1476	1500	1500	1155
	200	1500	1251	1500	1464	1500	1058	1500	1340	1500	1500	1051
	250	890	890	890	890	890	890	890	890	890	890	890
	300	300	300	300	300	300	300	300	300	300	300	300
Phoenix III Seal, Metal Bearings	-50 to 100	1500	1303	1500	1500	1500	907	1500	1134	1500	1500	887
	200	1428	1222	1500	1435	1394	817	1496	1030	1500	1463	807
	250	890	890	890	890	890	788	890	890	890	890	781
	300	300	300	300	300	300	300	300	300	300	300	300
Metal Seal, PEEK Bearings	-50 to 100	1500	1336	1500	1500	1500	1245	1500	1500	1500	1500	1327
	300	1455	1207	1455	1407	1455	1053	1455	1381	1455	1455	1147
Metal Seal, Metal Bearings	-50 to 100	1500	1309	1500	1500	1500	954	1500	1221	1500	1500	998
	600	1210	1093	1210	1127	1176	714	1210	939	1210	1210	777
	800(2)	1015	1015	1015	1015	1015	675	1015	894	1015	1015	741
HPS Seal, Metal Bearings	-50 to 100	484	640	1284	1154	1289	831	1500	1124	1500	1500	978
	600	264	408	968	862	981	624	1210	865	1210	1210	760
	800(2)	228	370	916	815	932	590	1015	823	1015	1015	725

1. Trim ratings based on S17400 H1025 shaft. For other shaft materials, please contact factory.
2. The temperature limit of S17400 H1025 shaft material is 427°C (800°F). For higher temperatures another shaft material option must be selected.

Table 6. Single Flange Dimensions and Weights

Valve Size, NPS	A	E	F	G	K	R	S(1)	T	U	Y(2)	W(2)	Approximate Weight
	mm											kg
3	52	187	198	98	123	127	15.9	117	--	3/4-10	1/2-13	10.8
4	62	214	259	128	150	157	19.1	152	32	7/8-9	1/2-13	21.6
6	76	208	333	166	220	216	31.8	235	46	1-8	5/8-11	45.9
8	102	208	407	241	234	270	38.1	235	46	1-1/8-8	5/8-11	81.5
10	116	356	506	312	302	324	44.5	273	51	1-1/4-8	3/4-10	160
12	140	356	553	339	332	381	50.8	273	51	1-3/8-8	3/4-10	217
14	157	356	597	370	348	413	63.5	337	76	1-1/2-8	7/8-9	287
16	178	356	678	408	386	470	63.5	337	76	1-5/8-8	7/8-9	405
18	198	508	735	451	427	533	76.2	533	127	1-5/8-8	1-1/4-8	577
20	216	508	807	478	446	584	76.2	533	127	1-5/8-8	1-1/4-8	739
24	230	508	933	544	513	692	76.2	533	127	1-7/8-8	1-1/4-8	1036
	Inches											lbs
3	2.04	7.38	7.80	3.85	4.84	5.00	0.63	4.62	--	3/4-10	1/2-13	24
4	2.44	8.44	10.20	5.04	5.89	6.19	0.75	6.00	1.25	7/8-9	1/2-13	48
6	2.98	8.19	13.11	6.54	8.65	8.50	1.25	9.25	1.81	1-8	5/8-11	102
8	4.00	8.19	16.02	9.49	9.20	10.62	1.50	9.25	1.81	1-1/8-8	5/8-11	181
10	4.56	14.00	19.92	12.28	11.90	12.75	1.75	10.75	2.00	1-1/4-8	3/4-10	355
12	5.51	14.00	21.77	13.35	13.07	15.00	2.00	10.75	2.00	1-3/8-8	3/4-10	482
14	6.18	14.00	23.50	14.57	13.70	16.25	2.50	13.25	3.00	1-1/2-8	7/8-9	637
16	7.00	14.00	26.69	16.06	15.20	18.50	2.50	13.25	3.00	1-5/8-8	7/8-9	900
18	7.81	20.00	28.94	17.76	16.81	21.00	3.00	21.00	5.00	1-5/8-8	1-1/4-8	1280
20	8.50	20.00	31.77	18.82	17.57	23.00	3.00	21.00	5.00	1-5/8-8	1-1/4-8	1640
24	9.06	20.00	36.73	21.42	20.20	27.25	3.00	21.00	5.00	1-7/8-8	1-1/4-8	2300

1. This is the nominal valve shaft diameter to be used when selecting Fisher actuators.
2. Threaded hole per ASME B1.1.

Figure 5. Single Flange Dimensions (also see table 6)

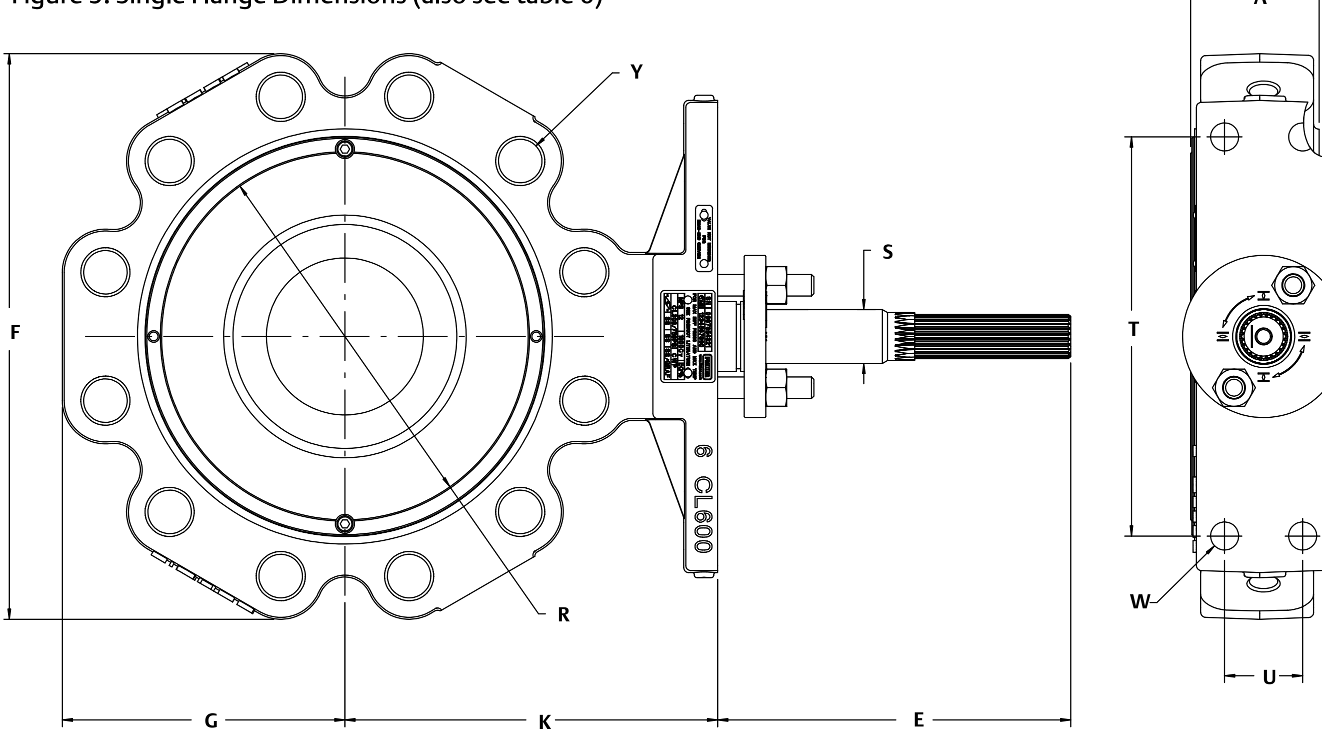


Table 7. Double Flange Dimensions and Weights

Valve Size, NPS	A	E	F	G	H	K	R	S(1)	T	U	Y(2)	W(2)	Approximate Weight
	mm												kg
3	180	187	211	106	21.5	123	127	15.9	117	- - -	3/4-10	1/2-13	25.9
4	190	214	277	138	25.6	150	157	19.1	152	32	7/8-9	1/2-13	48.1
6	210	208	357	178	28.4	220	216	31.8	235	46	1-8	5/8-11	97.1
8	230	208	423	243	31.9	234	270	38.1	235	46	1-1/8-8	5/8-11	145.6
10	250	356	515	316	35.1	302	324	44.5	273	51	1-1/4-8	3/4-10	247.7
12	270	356	563	343	35.1	332	381	50.8	273	51	1-1/4-8	3/4-10	316.6
14	290	356	610	374	38.3	348	413	63.5	337	76	1-3/8-8	7/8-9	410
16	310	356	691	412	41.5	386	470	63.5	337	76	1-1/2-8	7/8-9	571.5
18	330	508	751	455	43.7	428	533	76.2	533	127	1-5/8-8	1-1/4-8	817.4
20	350	508	831	483	44.6	446	584	76.2	533	76	1-5/8-8	1-1/4-8	989.3
24	390	508	946	549	50.8	543	692	76.2	533	127	1-7/8-8	1-1/4-8	1422
	Inches												lbs
3	7.09	7.38	.32	4.16	0.85	4.84	5.00	0.63	4.62	- - -	3/4-10	1/2-13	57
4	7.48	8.44	.89	5.45	1.01	5.89	6.19	0.75	6.00	1.25	7/8-9	1/2-13	106
6	8.27	8.19	.04	7.02	1.12	8.65	8.50	1.25	9.25	1.81	1-8	5/8-11	214
8	9.06	8.19	.65	9.56	1.26	9.20	10.62	1.50	9.25	1.81	1-1/8-8	5/8-11	321
10	9.84	14.00	.28	12.42	1.38	11.90	12.75	1.75	10.75	2.00	1-1/4-8	3/4-10	546
12	10.63	14.00	.15	13.50	1.38	13.07	15.00	2.00	10.75	2.00	1-1/4-8	3/4-10	698
14	11.42	14.00	.00	14.71	1.51	13.70	16.25	2.50	13.25	3.00	1-3/8-8	7/8-9	904
16	12.2	14.00	.19	16.21	1.63	15.20	18.50	2.50	13.25	3.00	1-1/2-8	7/8-9	1260
18	12.99	20.00	.55	17.93	1.72	16.81	21.00	3.00	21.00	5.00	1-5/8-8	1-1/4-8	1802
20	13.78	20.00	.70	19.00	1.76	17.57	23.00	3.00	21.00	3.00	1-5/8-8	1-1/4-8	2181
24	15.35	20.00	.24	21.62	2.00	20.20	27.25	3.00	21.00	5.00	1-7/8-8	1-1/4-8	3135

Figure 6. Double Flange Dimensions (also see table 7)

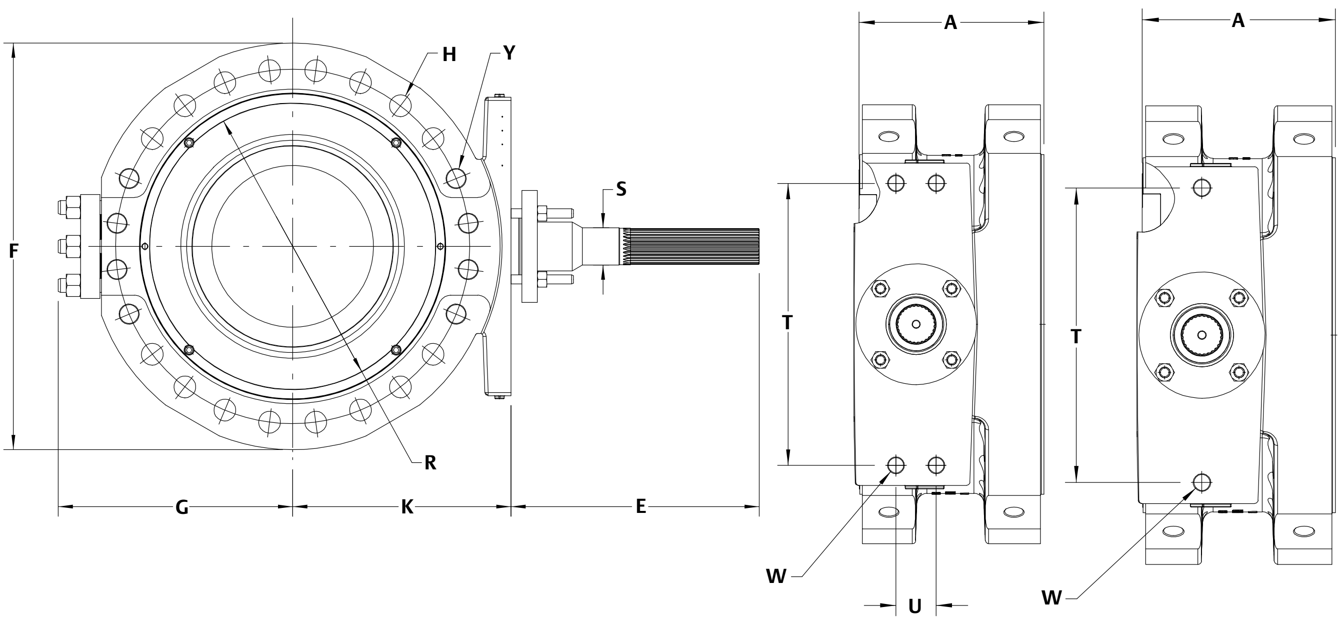


Table 8. Dimensions, Optional Square Shaft and Mounting Bracket (ISO 5211)

Valve Size, NPS	C	E	L	M	S	T	U	W	ISO 5211
	mm								
3	11	76	64	12	15.9	49.5	49.5	10	F07
						72.1	72.1	12	F10
4	14	103	87	16	19.1	49.5	49.5	10	F07
						72.1	72.1	12	F10
						88.4	88.4	14	F12
6	22	108	85	23	31.8	72.1	72.1	12	F10
						88.4	88.4	14	F12
						99	99	18	F14
						116.7	116.7	22	F16
8	27	114	85	29	38.1	72.1	72.1	12	F10
						88.4	88.4	14	F12
						99	99	18	F14
						116.7	116.7	22	F16
10	36	190	152	38	44.5	99	99	18	F14
						116.7	116.7	22	F16
12	36	190	152	38	50.8	99	99	18	F14
						116.7	116.7	22	F16
	Inches								
3	0.43	3.00	2.52	0.48	0.63	1.95	1.95	0.39	F07
						2.84	2.84	0.47	F10
4	0.55	4.06	3.43	0.63	0.75	1.95	1.95	0.39	F07
						2.84	2.84	0.47	F10
						3.48	3.48	0.55	F12
6	0.87	4.25	3.35	0.90	1.25	2.84	2.84	0.47	F10
						3.48	3.48	0.55	F12
						3.90	3.90	0.71	F14
						4.59	4.59	0.87	F16
8	1.06	4.49	3.35	1.14	1.50	2.84	2.84	0.47	F10
						3.48	3.48	0.55	F12
						3.90	3.90	0.71	F14
						4.59	4.59	0.87	F16
10	1.42	7.48	6	1.50	1.75	3.90	3.90	0.71	F14
						4.59	4.59	0.87	F16
12	1.42	7.48	6	1.50	2.00	3.90	3.90	0.71	F14
						4.59	4.59	0.87	F16

Figure 7. CL600 Control-Disk Valve Assembly with Square Shaft and Mounting Bracket (also see table 8)

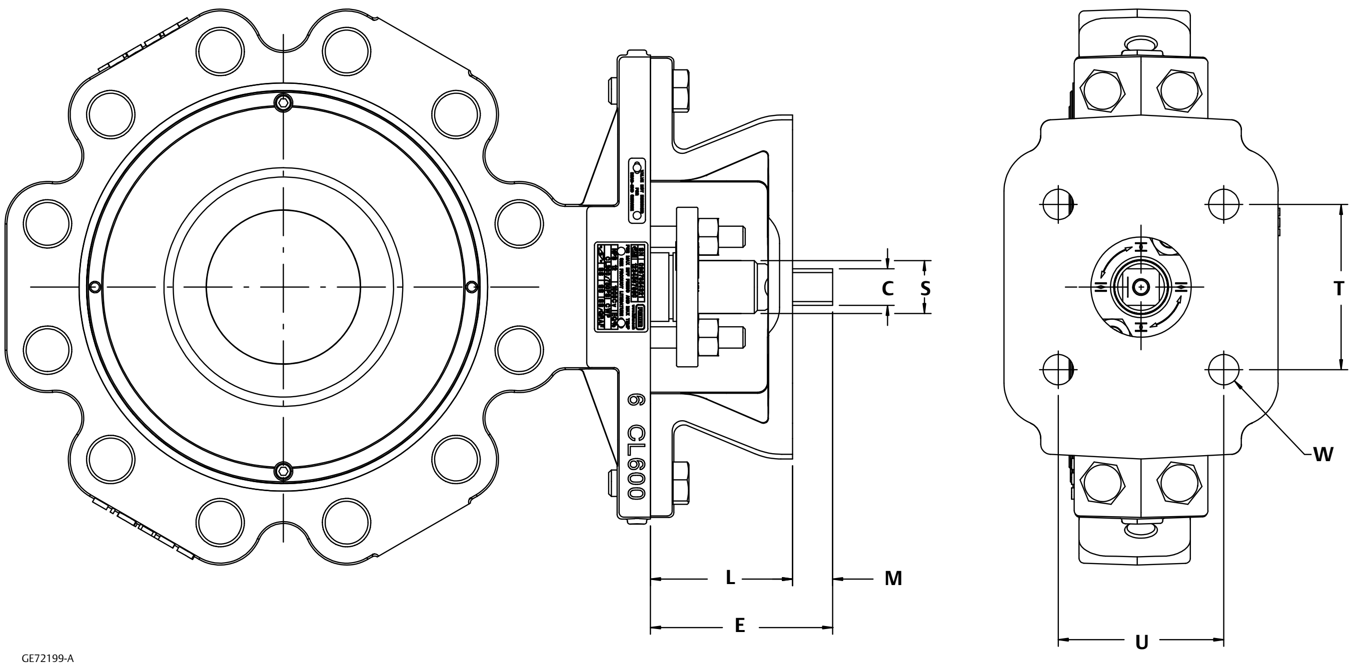
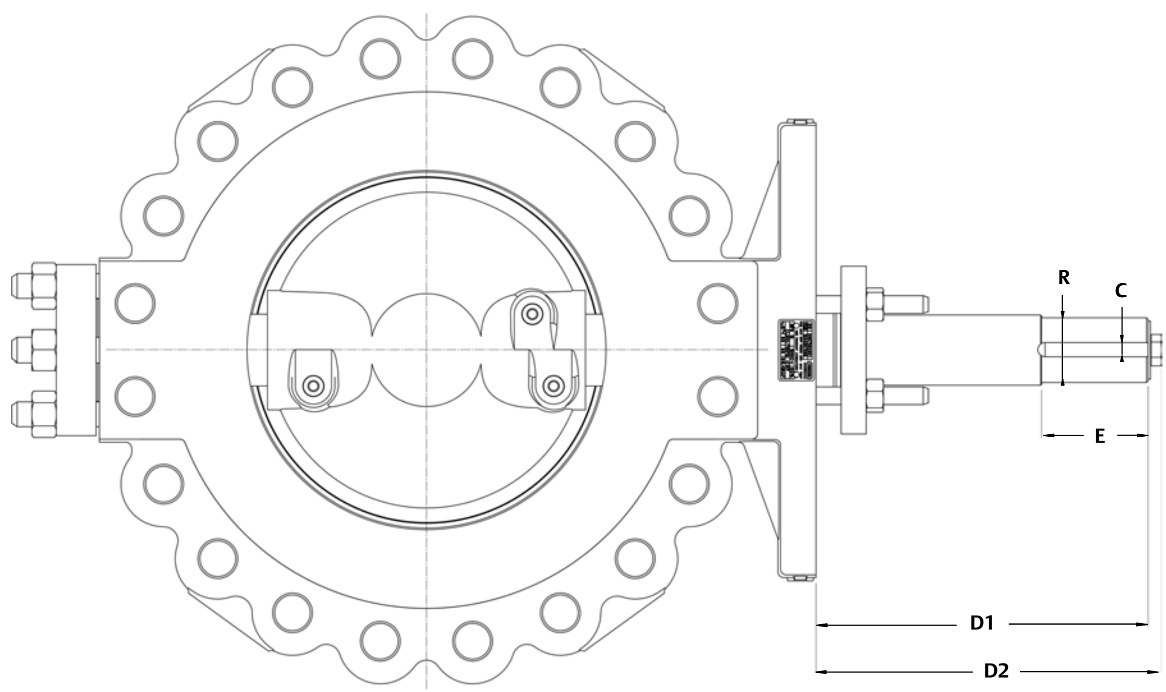


Table 9. Dimensions, Optional Keyed Shaft

Valve Size, NPS	C	D1	D2	E	R
	mm				
14	12.7	297	309	95.3	57.2
16	16.0	316	330	114.3	69.9
18	16.0	394	408	114.3	69.9
20	16.0	394	408	114.3	69.9
24	16.0	394	408	114.3	69.9
	Inches				
14	0.50	11.68	12.2	3.75	2.25
16	0.63	12.44	13.0	4.5	2.75
18	0.63	15.51	16.1	4.5	2.75
20	0.63	15.51	16.1	4.5	2.75
24	0.63	15.51	16.1	4.5	2.75

Figure 8. Dimensions for Fisher **CL600 Control-Disk** NPS 14 to 24 Valve with Keyed Shaft



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Fisher™ Control-Disk™ Valve NPS 14-24

The Fisher Control-Disk valve provides outstanding performance under extreme pressure and temperature conditions. The Control-Disk valve maintains tight shutoff, is available in a fire-tested version, and can be specified for cryogenic applications.

The Control-Disk valve is available as a flangeless (wafer), lugged, or double flange design. A splined drive shaft combines with a variety of spring-and-diaphragm or pneumatic piston actuators to make the Control-Disk a reliable control valve for a variety of throttling applications in the various process industries.

The Control-Disk valve can be supplied with one of several dynamic seals (figure 1) that can be used in a variety of demanding applications. With the appropriate seal selection and materials of construction, the pressure-assisted seal provides excellent shutoff against the full CL150 or 300 pressure ratings.

X0686-3

Fisher Control-Disk Valve

Features

- **Equal percentage flow characteristic—** An equal percentage flow characteristic provides an improved throttling range comparable to that of a segmented ball valve. This improved capability allows you to control closer to the target set point, regardless of process disturbances, which results in a reduction in process variability.

- **Economical Tight Shutoff—** The pressure-assisted seal design provides tight shutoff against the full pressure rating of the specified valve.

- **Shaft Retention—** Shaft blowout protection is designed into the Control-Disk valve (figure 2). The anti-blowout gland fits securely over the valve shaft which has been turned down to form a circumferential shoulder that contacts the anti-blowout gland.

- **Excellent Flow Control—**With an equal percentage flow characteristic, the Control-Disk can be used for throttling applications through 90 degrees of disk rotation. Rangeability is 100 to 1.

- **High-Temperature / Cryogenic Capabilities—** Optional valve constructions allow this valve to meet both high-temperature and cryogenic applications.

- **Sour Service Capability—** Trim and bolting materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0103, and MR0175 / ISO 15156.

- **Spline-ended Shaft—** The splined shaft with clamped lever and single-pivot linkage reduces lost motion between the actuator and the valve shaft.

- **Application Versatility—**Standard construction materials and seal assemblies provide long life and outstanding performance in a broad range of liquid and gas applications.

- **Easy Installation—**The valve body self-centers on the line flange bolts as a fast, accurate means of centering the valve in the pipeline.

- **Reliable Flange Gasketing Surface—**Seal retainer screws are located so there is no interference with the sealing function of either flat sheet or spiral wound line flange gaskets.

- **Powder paint as standard—** The Emerson Automation Solutions™ powder paint finish offers an excellent corrosion-resistant finish to all steel parts.

- **Excellent Emissions Capabilities—** The optional ENVIRO-SEAL™ packing systems, are designed with very smooth shaft surfaces and live-loading to provide improved sealing, guiding, and loading force transmission. The seal of the ENVIRO-SEAL system can control emissions to below 100 ppm (parts per million).

Control-Disk NPS 14-24 Valve Specifications and Materials of Construction

Table 1. Fisher Control-Disk NPS 14-24 Valve Specifications

SPECIFICATION	ASME
Valve Body Size	NPS 14, 16, 18, 20, and 24
Pressure Rating	Consistent with CL150 and 300 per ASME B16.34[(1)]
Valve Body Materials	WCC Steel
	CF8M Stainless Steel
Disk Materials	CF8M Stainless Steel
End Connections	Mates with RF flanges per ASME B16.5
Valve Body Style	Wafer, Lugged, or Double Flange
Shaft Connection	Spline
Face-to-Face Dimensions	Wafer and Lugged: MSS SP68 and API 609
	Double Flange Class 150: ISO 5752 Butterfly Valve Short Series
	Double Flange Class 300: ISO 5752 Butterfly Valve Long Series
Shutoff	Soft Seal: **Bidirectional** ANSI/FCI 70-2 Class VI
	NOVEX Seal: **Unidirectional** ANSI/FCI 70-2 1% of Class IV
	Phoenix III Seal: ANSI/FCI 70-2 Class VI
Flow Direction	Reverse (flow direction is into the shaft side of the disk)
Flow Characteristic	Equal Percentage
Disk Rotation	Clockwise (CW) to close

1. See tables 4 and 5 for additional information. The pressure/temperature limits in this bulletin and any applicable standard limitation should not be exceeded.

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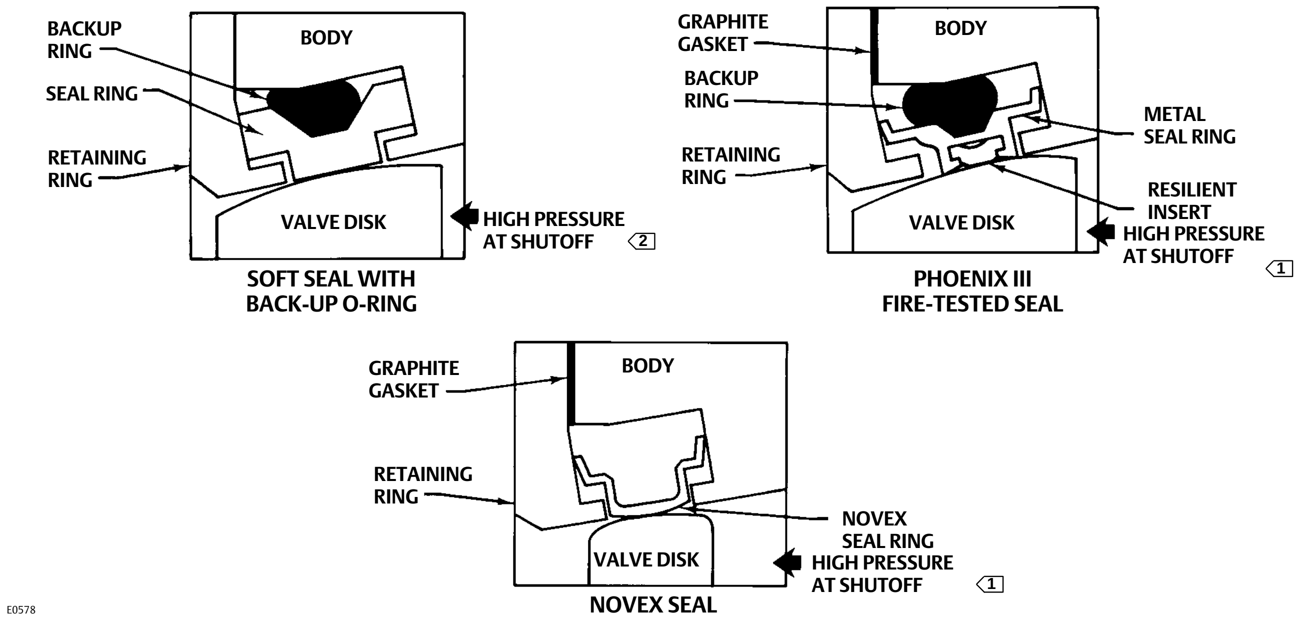
Figure 1. Available Seal Configurations



Notes:
1 This unidirectional seal must be installed so that the retaining ring is downstream from the high pressure side of the valve at shutoff, as shown.
2 For this bidirectional seal, The “preferred” valve orientation places the retaining ring downstream from the high pressure side of the valve at shutoff.

Installation

Recommended or “preferred” installation for Control-Disk NPS 14-24 valves is with the flow into the shaft side of the disk (retaining ring downstream from the high pressure side of the valve).

The standard soft seal offers ANSI/FCI 70-2 Class VI, bidirectional shutoff. The Phoenix III seal should be installed in the preferred direction to obtain optimal shutoff performance, and it must be installed in the preferred direction for fire-tested applications. The NOVEX seal is uni-directional and should be installed in the preferred direction.

For assistance in selecting the appropriate combination of actuator action and open valve position, contact your Emerson sales office.

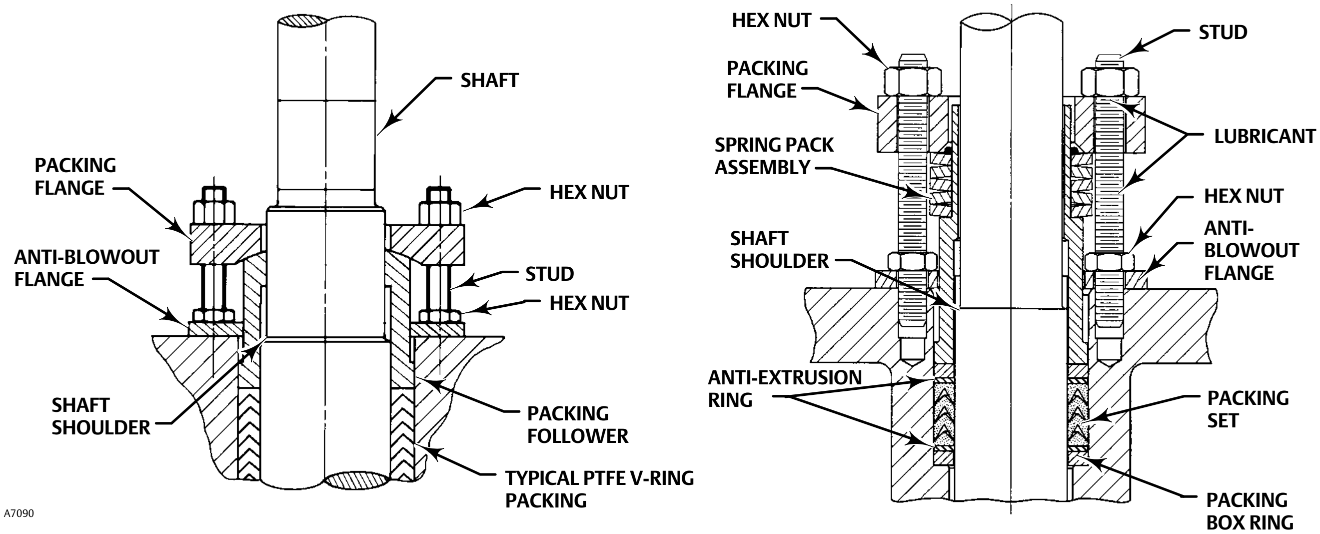
Standard Seal Configurations

- **Standard Soft Seal (PTFE)--** A resilient dynamic seal with an elastomeric back-up ring for low to moderate temperature applications.

- **NOVEX Seal--** The NOVEX stainless steel seal is available for severe service, Cryogenic, and high-temperature applications.

- **Phoenix III Seal--** This three-component, metal-and-polymeric seal is available for severe service with low to moderate temperature applications.

Figure 2. Blowout Protection



STANDARD PACKING ARRANGEMENT

ENVIRO-SEAL ARRANGEMENT (PTFE SHOWN)

Figure 3. Typical Valve Assembly

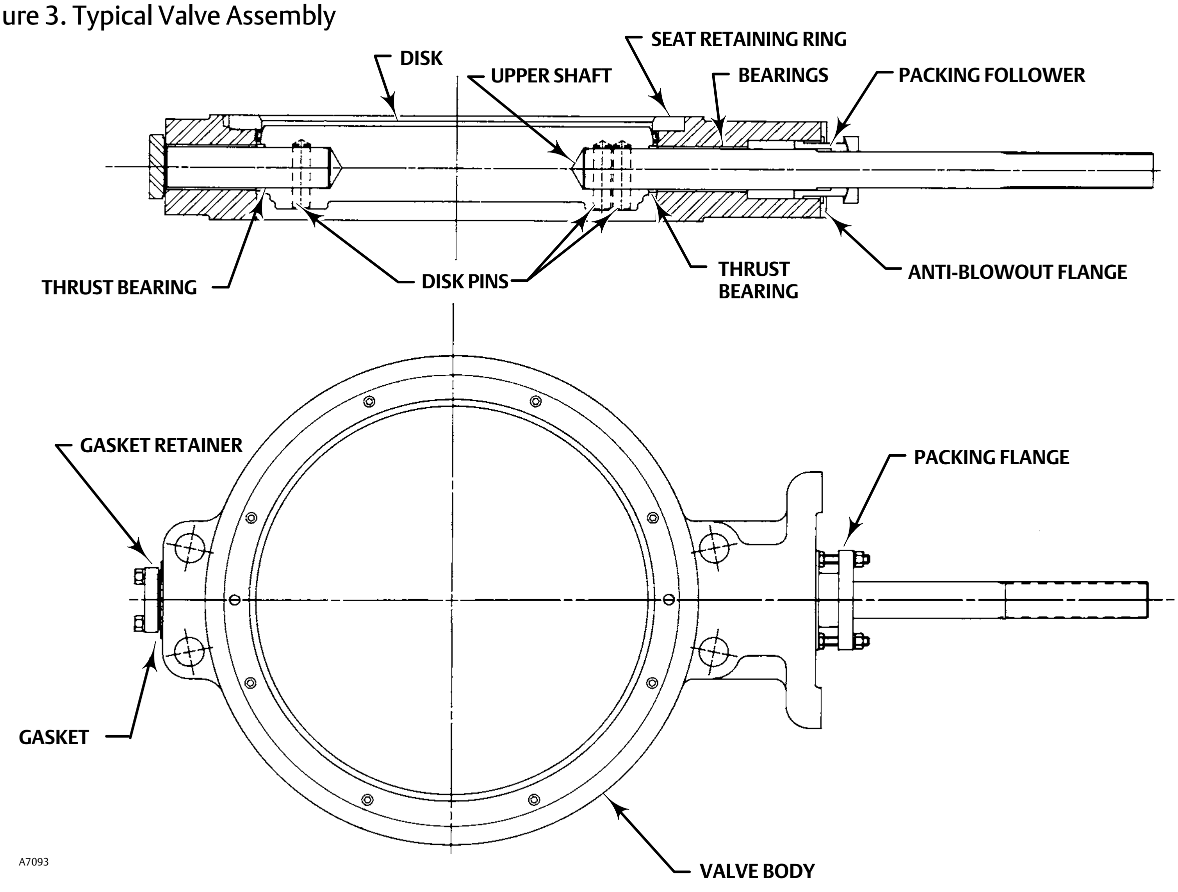


Table 2. Materials of Construction and Temperature Ratings

COMPONENTS AND MATERIALS OF CONSTRUCTION		TEMPERATURE RANGE °C	TEMPERATURE RANGE °F
Valve Body			
WCC		–29 to 427	–20 to 800
CF8M (316 SST)		–198 to 538	–325 to 1000
Disk			
CF8M (316 SST)		–198 to 538	–325 to 1000
Disk Edge Coating			
Chrome Plating (Standard with NOVEX or Phoenix III Seals)		–254 to 316	–425 to 600
Chrome Coating		-254 to 593	-425 to 1100
Chrome Carbide Coating		-254 to 816	-425 to 1500
Shaft			
S20910		–198 to 538	–325 to 1000
S17400 (H1025)		–73 to 427	–100 to 800
N00550		-254 to 482	-425 to 900
N07718		-254 to 704	-425 to 1300
Bearings(3)			
PEEK (standard)		–73 to 149	–100 to 300
S31600 Nitrided(1)		–198 to 816	–325 to 1500
R30006 (Alloy 6)		–198 to 816	–325 to 1500
Packing			
PTFE Packing and PTFE ENVIRO-SEAL Packing		–198 to 232	–325 to 450
Graphite packing		–198 to 916	–325 to 1500
Graphite packing with oxidizing media		–198 to 538	–325 to 1000
Graphite ENVIRO-SEAL Packing		-198 to 315	-325 to 600
Seal Ring	**PTFE** Seal Ring		
	Nitrile Backup O-Ring	–29 to 93	–20 to 200
	Chloroprene Backup O-Ring	–43 to 149	–45 to 300
	EPR Backup O-Ring	–54 to 182	–65 to 360
	Fluorocarbon Backup O-Ring	–29 to 204	–20 to 400
	UHMWPE(2) Seal Ring (CL150 Only)		
	Nitrile Backup O-Ring	–29 to 93	–20 to 200
	Chloroprene Backup O-Ring	–43 to 93	–45 to 200
	EPR Backup O-Ring	–54 to 93	–65 to 200
	Fluorocarbon Backup O-Ring	–29 to 93	-20 to 200
	Phoenix III and/or Fire Tested Construction		
	S31600 and PTFE Seal Ring with Nitrile Backup O-Ring	–40 to 149	–40 to 300
	Chloroprene Backup O-Ring	–54 to 149	–65 to 300
	EPR Backup O-Ring	–62 to 204	–80 to 400
	Fluorocarbon Backup O-Ring	–40 to 232	–40 to 450
	NOVEX S31600 Seal(1) Ring	–29 to 816	–20 to 1500
	NOVEX S21800 Seal(1) Ring (CL300 only)	-29 to 816	–20 to 1500

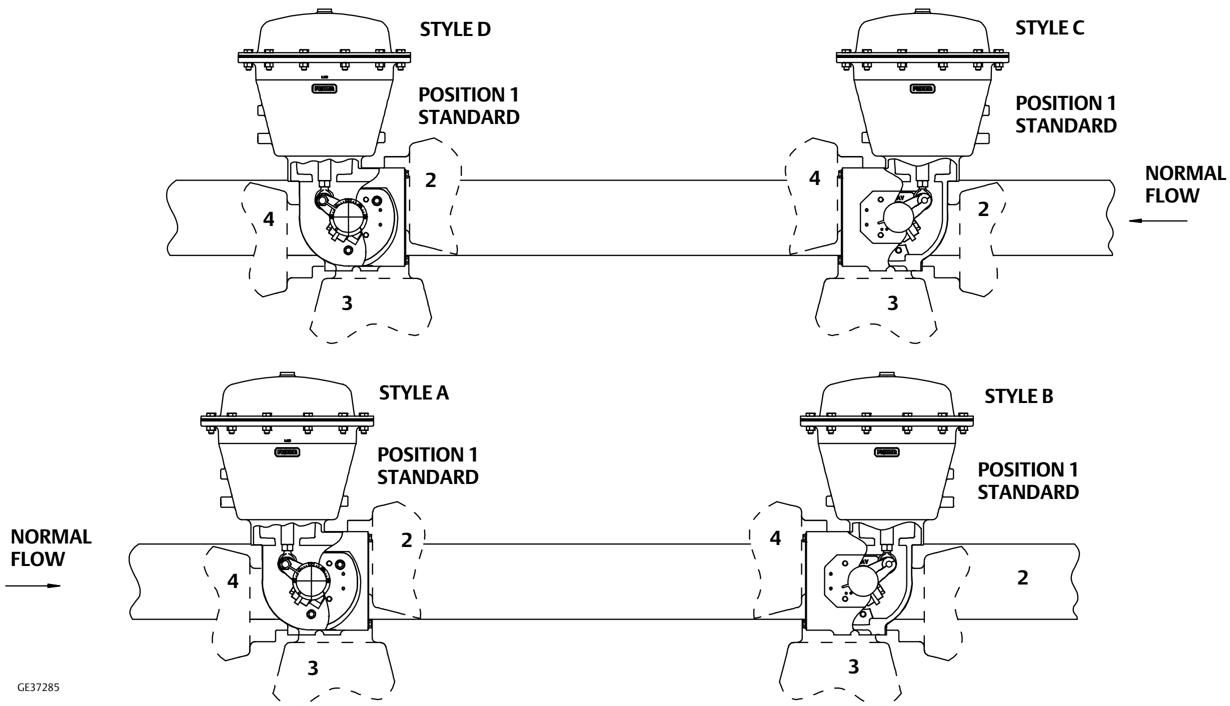
1. For a complete material description, contact your Emerson sales office.
2. UHMWPE stands for ultra high molecular weight polyethylene.
3. Special thrust bearings are required for high temp. applications over 343°C (650°F) (with 6 and 12-inch shaft extensions). Constructions with carbon steel valves and SST disks may require special thrust bearings at temps. less than 343°C (650°F).

Table 3. Valve/Actuator Combinations

TEMPERATURE RANGE	SELECTION GUIDELINES
	1052, 1061 or 2052
From -46 to 343°C (-50 to 650°F)	Valve (select appropriate trim) and standard actuator
From 343 to 426°C (650 to 800°F)	Mounting positions 1 and 3
	Valve (select appropriate trim) and standard actuator
From 426 to 538°C (800 to 1000°F)(1)	Mounting positions 1 and 3
	Valve (select appropriate trim) and standard actuator

1. Consult your Emerson Automation Solutions sales office.

Figure 4. Mounting Styles and Positions



Pressure Drops

Pressure drop limits of any given valve are based on valve body, and trim material limits. To find the appropriate pressure drop limitation, choose the desired valve size and temperature range. Then search table 4 for body limitations and table 5 for trim limitations. Information on limits for S31254, CW2M, M35-1 and other alloy constructions can be obtained by contacting your Emerson sales office. The lowest number from the tables is the appropriate limit. **The tables for both trim and body limits must be consulted.**

Table 4. Maximum Allowable Shutoff Pressure Drops (Valve Ratings) Based on Carbon Steel and Stainless Steel Valve Types (The tables for both trim and body limits must be consulted.)

TEMPERATURE RANGE	PRESSURE RANGE			
	CL150		CL300	
	WCC	CF8M	WCC	CF8M
°C	Bar			
-254 to -29	---	19.0	---	49.6
-29 to 38	20	19.0	51.7	49.6
93	17.9	16.2	51.7	42.7
149	15.9	14.8	50.3	38.6
204	13.8	13.4	48.6	35.5
260	11.7	11.7	45.9	33.1
316	9.7	9.7	41.7	31.0
343	8.6	8.6	40.7	30.3
371	7.6	7.6	38.3	30.0
399	6.6	6.6	34.8	29.3
427	5.5	5.5	28.3	29.0
454	---	4.5	---	29.0
482	---	3.4	---	28.6
510	---	2.4	---	26.5
538	---	1.4	---	25.2
°F	Psi			
-450 to -20	---	275	---	720
-20 to 100	290	275	750	720
200	260	235	750	620
300	230	215	730	560
400	200	195	705	515
500	170	170	665	480
600	140	140	605	450
650	125	125	590	440
700	110	110	555	435
750	95	95	505	425
800	80	80	410	420
850	---	65	---	420
900	---	50	---	415
950	---	35	---	385
1000	---	20	---	365

Table 5. Maximum Allowable Shutoff Pressure Drops[1] Metric
Based on Trim (Seal and Bearing) and with S17400 (H1025) Shaft Except Where Noted

TRIM	TEMPERATURE RANGE	CL150, VALVE BODY SIZE, NPS					CL300, VALVE BODY SIZE, NPS				
		14	16	18	20	24	14	16	18	20	24
	°C	Pressure Range, Bar									
Soft Seal and PEEK Bearing	-46 to 38	20.0	20.0	20.0	20.0	20.0	51.7	51.7	51.7	51.7	51.7
	38 to 93	20.0	20.0	20.0	20.0	20.0	43.6	43.6	43.6	43.6	43.6
	93 to 149	20.0	20.0	20.0	20.0	20.0	27.6	27.6	27.6	27.6	27.6
NOVEX (S31600) Seal and PEEK Bearing	-46 to 38	20.0	20.0	20.0	20.0	20.0	22.1	22.1	22.1	22.1	22.1
	38 to 93	17.9	17.9	17.9	17.9	17.9	22.1	22.1	22.1	22.1	22.1
	93 to 149	15.9	15.9	15.9	15.9	15.9	22.1	22.1	22.1	22.1	22.1
NOVEX (S21800)[2] Seal and PEEK Bearing	-46 to 38						51.7	44.7	51.7	51.7	51.7
	38 to 93						49.0	40.6	51.7	51.7	51.7
	93 to 149						46.1	38.1	50.3	50.3	50.3
Phoenix III Seal and PEEK Bearing	-46 to 38	20.0	20.0	20.0	19.2	20.0	51.7	47.6	51.7	51.7	51.7
	38 to 93	20.0	20.0	20.0	16.9	20.0	51.7	43.2	51.7	51.7	51.7
	93 to 149	20.0	18.5	19.2	15.6	20.0	39.3	39.3	39.3	39.3	39.3
Phoenix III Seal and S31600 Nitrided Bearing	-46 to 38	20.0	17.1	18.8	15.3	20.0	48.6	36.3	51.7	51.7	51.7
	38 to 93	18.1	14.8	16.6	13.5	20.0	44.2	32.6	51.7	51.5	51.7
	93 to 149	16.5	13.5	15.4	12.5	20.0	39.3	30.5	39.3	39.3	39.3
	149 to 204	15.4	12.6	14.5	11.7	20.0	26.9	26.9	26.9	26.9	26.9
	204 to 232	15.0	12.2	14.1	11.4	20.0	20.7	20.7	20.7	20.7	20.7
NOVEX (S31600) Seal and S31600 Nitrided Bearing	-46 to 38	20.0	20.0	20.0	20.0	20.0	22.1	22.1	22.1	22.1	22.1
	38 to 93	17.9	17.9	17.9	17.9	17.9	22.1	22.1	22.1	22.1	22.1
	93 to 149	15.9	15.9	15.9	15.9	15.9	22.1	22.1	22.1	22.1	22.1
	149 to 232	12.8	12.8	12.8	12.8	12.8	17.5	17.5	17.5	17.5	17.5
	232 to 343	8.6	8.6	8.6	8.6	8.6	13.7	13.7	13.7	13.7	13.7
	343 to 427	5.5	5.5	5.5	5.5	5.5	12.8	12.8	12.8	12.8	12.8
	427 to 482[3]	3.4	3.4	3.4	3.4	3.4	12.5	12.5	12.5	12.5	12.5
	482 to 538[3]	1.4	1.4	1.4	1.4	1.4	12.3	12.3	12.3	12.3	12.3
NOVEX (S21800)[2] Seal and S31600 Nitrided Bearing	-46 to 38						43.3	34.5	51.7	51.7	51.7
	38 to 93						39.3	31.1	51.7	51.7	51.7
	93 to 149						36.9	29.0	50.3	50.3	50.3
	149 to 232						34.5	27.0	47.2	47.2	47.2
	232 to 343						32.4	25.1	40.0	40.0	40.0
	343 to 427						31.2	24.0	29.0	29.0	29.0
	427 to 482[3]						28.6	28.6	28.6	28.6	28.6
	482 to 538[3]						25.2	25.2	25.2	25.2	25.2

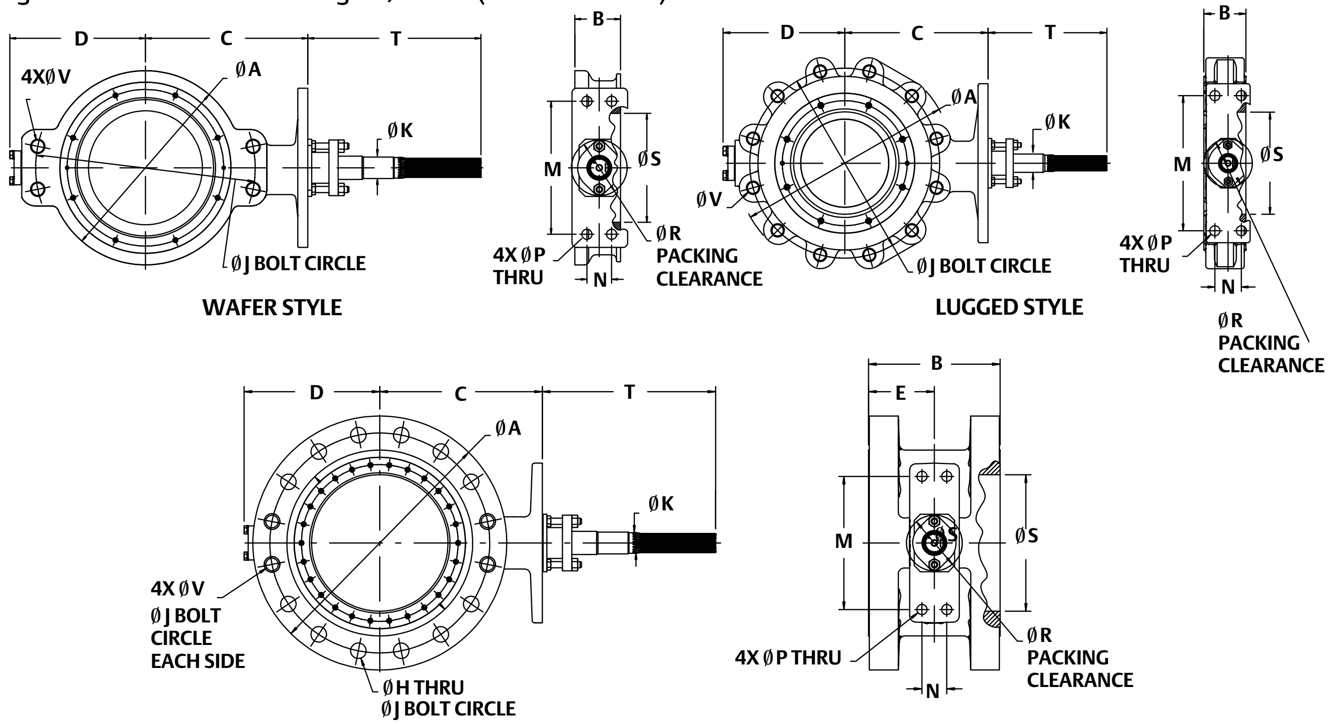
1. Consult your Emerson sales office if higher pressure drops are required.
2. NOVEX S21800 seal is available for CL300 only.
3. N07718 shaft must be specified above 427°C.

Table 6. Maximum Allowable Shutoff Pressure Drops[1] U.S. Traditional Units
Based on Trim (Seal and Bearing) and with S17400 (H1025) Shaft Except Where Noted

TRIM	TEMPERATURE RANGE	CL150, VALVE BODY SIZE, NPS					CL300, VALVE BODY SIZE, NPS				
		14	16	18	20	24	14	16	18	20	24
	°F	Pressure Range, Psi									
Soft Seal and PEEK Bearing	-50 to 100	290	290	290	290	290	750	750	750	750	750
	100 to 200	290	290	290	290	290	633	633	633	633	633
	200 to 300	290	290	290	290	290	400	400	400	400	400
NOVEX (S31600) Seal and PEEK Bearing	-50 to 100	290	290	290	290	290	320	320	320	320	320
	100 to 200	260	260	260	260	260	320	320	320	320	320
	200 to 300	230	230	230	230	230	320	320	320	320	320
NOVEX (S21800)[2] Seal and PEEK Bearing	-50 to 100						750	649	750	750	750
	100 to 200						711	589	750	750	750
	200 to 300						668	553	730	730	730
Phoenix III Seal and PEEK Bearing	-50 to 100	290	290	290	278	290	750	691	750	750	750
	100 to 200	290	290	290	245	290	750	627	750	750	750
	200 to 300	290	269	278	226	290	570	570	570	570	570
Phoenix III Seal and S31600 Nitrided Bearing	-50 to 100	290	248	272	222	290	705	526	750	750	750
	100 to 200	262	215	241	196	290	641	473	750	747	750
	200 to 300	240	196	223	181	290	570	442	570	570	570
	300 to 400	224	183	210	170	290	390	390	390	390	390
	400 to 450	217	177	204	166	290	300	300	300	300	300
NOVEX (S31600) Seal and S31600 Nitrided Bearing	-50 to 100	290	288	290	290	290	320	320	320	320	320
	100 to 200	260	258	260	260	260	320	320	320	320	320
	200 to 300	230	230	230	230	230	320	320	320	320	320
	300 to 450	185	185	185	185	185	254	254	254	254	254
	450 to 650	125	125	125	125	125	198	198	198	198	198
	650 to 800	80	80	80	80	80	186	186	186	186	186
	800 to 900[3]	50	50	50	50	50	182	182	182	182	182
	900 to 1000[3]	20	20	20	20	20	179	179	179	179	179
NOVEX (S21800)[2] Seal and S31600 Nitrided Bearing	-50 to 100						628	501	750	750	750
	100 to 200						570	451	750	750	750
	200 to 300						535	421	730	730	730
	300 to 450						501	391	685	685	685
	450 to 650						470	364	580	580	580
	650 to 800						452	348	420	420	420
	800 to 900[3]						415	415	415	415	415
	900 to 1000[3]						365	365	365	365	365

1. Consult your Emerson sales office if higher pressure drops are required.
2. NOVEX S21800 seal is available for CL300 only.
3. N07718 shaft must be specified above 800°F.

Figure 5. Dimensions and Weights, CL150 (also see table 7)



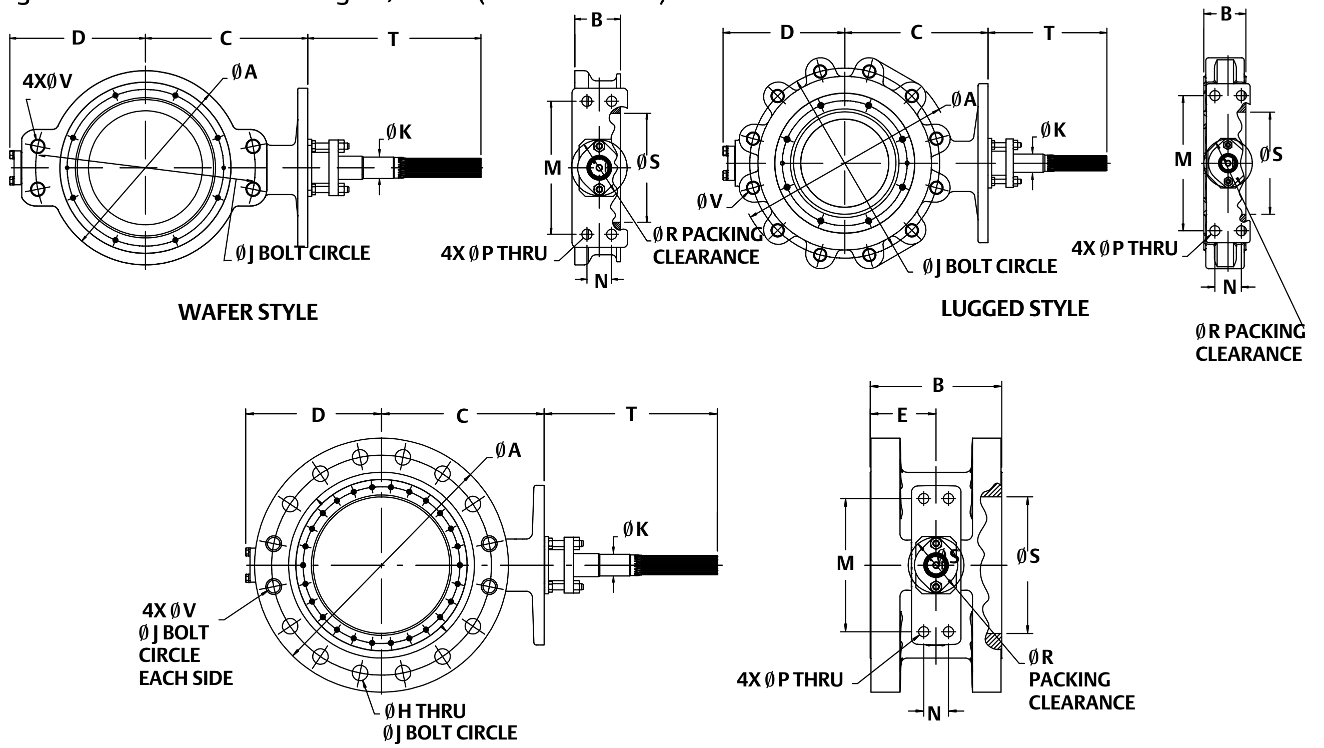
DOUBLE FLANGE STYLE

Table 7. Dimensions, CL150

VALVE SIZE, NPS	CL150 DIMENSION																
	A			B		C	D	E	H	J	K	M	N	P	R	S	T	V(4)
	(1)	(2)	(3)	(1, 2)	(3)			(3)	(3)									
	mm																	
14	422	530	533	91.9	191	327	295	95.3	1-1/8 8 holes	476	31.8	235	46.0	17.5	117	338	208	1-8 12 holes
16	465	607	597	102	216	371	318	108	1-1/8 12 holes	540	31.8	235	46.0	17.5	117	384	208	1-8 16 holes
18	529	645	635	114	222	400	349	111	1-1/4 12 holes	578	39.7	273	50.8	20.6	133	432	356	1 1/8-8 16 holes
20	584	695	699	127	229	432	381	114	1-1/4 16 holes	635	44.5	273	50.8	20.6	133	480	356	1 1/8-8 20 holes
24	692	822	813	154	267	492	438	133	1-3/8 16 holes	749	57.2	337	76.2	23.9	155	594	356	1 1/4-8 20 holes
	inches																	
14	16.62	20.88	21.00	3.62	7.50	12.88	11.62	3.75	1-1/8 8 holes	18.75	1-1/4	9.25	1.81	0.69	4.62	13.31	8.19	1-8 12 holes
16	18.31	23.88	23.50	4.00	8.50	14.62	12.50	4.25	1-1/8 12 holes	21.25	1-1/4	9.25	1.81	0.69	4.62	15.12	8.19	1-8 16 holes
18	20.81	25.38	25.00	4.50	8.75	15.75	13.75	4.38	1-1/4 12 holes	22.75	1-9/16	10.75	2.00	0.81	5.25	17.00	14.00	1 1/8-8 16 holes
20	23.00	27.38	27.50	5.00	9.00	17.00	15.00	4.50	1-1/4 16 holes	25.00	1-3/4	10.75	2.00	0.81	5.25	18.88	14.00	1 1/8-8 20 holes
24	27.25	32.38	32.00	6.06	10.50	19.38	17.25	5.25	1-3/8 16 holes	29.50	2-1/4	13.25	3.00	0.94	6.12	23.38	14.00	1 1/4-8 20 holes

1. Wafer Style Valve.
2. Lugged Style Valve.
3. Double Flange Style Valve.
4. Wafer and Double Flange styles have 4 holes. NPS 14 CL150 wafer has no holes.

Figure 6. Dimensions and Weights, CL300 (also see table 8)



DOUBLE FLANGE STYLE

Table 8. Dimensions, CL300

VALVE SIZE, NPS	CL300 DIMENSION																		
	A			B		C	D	E	H	J	K	M	N	P	R	S	T	V(4)
	(1)	(2)	(3)	(1, 2)	(3)			(3)	(3)									
	mm																	
14	436	594	584	117	290	363	319	145	1-1/4 16 holes	514	44.5	273	50.8	20.6	124	339	356	1 1/8-8 16 holes
16	498	657	648	133	310	397	353	155	1-3/8 16 holes	572	44.5	273	50.8	20.6	130	383	356	1 1/4-8 20 holes
18	556	721	711	149	330	419	384	165	1-3/8 20 holes	629	57.2	337	76.2	23.9	143	430	356	1 1/4-8 24 holes
20	605	784	767	159	350	483	416	175	1-3/8 20 holes	686	76.2	337	76.2	23.9	187	478	265	1 1/4-8 24 holes
24	716	924	914	181	390	546	483	195	1-5/8 20 holes	813	76.2	337	76.2	23.9	202	575	265	1 1/2-8 24 holes
	inches																	
14	17.19	23.38	23.00	4.62	11.41	14.31	12.56	5.70	1-1/4 16 holes	20.25	1-3/4	10.75	2.00	0.81	4.88	12.65	14.00	1 1/8-8 16 holes
16	19.62	25.88	25.50	5.25	12.20	15.63	13.88	6.10	1-3/8 16 holes	22.50	1-3/4	10.75	2.00	0.81	5.12	15.07	14.00	1 1/4-8 20 holes
18	21.88	28.38	28.00	5.88	13.00	16.50	15.12	6.50	1-3/8 20 holes	24.75	2-1/4	13.25	3.00	0.94	5.62	16.91	14.00	1 1/4-8 24 holes
20	23.81	30.88	30.20	6.25	13.78	19.00	16.38	6.89	1-3/8 20 holes	27.00	3	13.25	3.00	0.94	7.38	18.80	10.44	1 1/4-8 24 holes
24	28.19	36.38	36.00	7.12	15.35	21.50	19.00	7.67	1-5/8 20 holes	32.00	3	13.25	3.00	0.94	7.94	21.69	10.44	1 1/2-8 24 holes

1. Wafer Style Valve
2. Lugged Style Valve
3. Double Flange Style Valve
4. Wafer and Double Flange styles have 4 holes

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Dubai, United Arab Emirates
Singapore 128461 Singapore

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Fisher™ CV500 Rotary Globe Control Valve

The Fisher CV500 Cam Vee-Ball™ control valve combines the rangeability of the cammed-segmented V-notched ball, with the inherent ruggedness found in the V500 heavy duty bearings, seals and body. This combination provides a balance of erosion resistance and pressure control for gas and liquids. The unrestricted, straight-through flow design provides high capacity for gas, steam, liquids, or fibrous slurries. The flanged valve features streamlined flow passages, rugged metal trim components, and a self-centering seat ring (figures 1 and 2).

With these components, the CV500 valve, designed for throttling or on-off applications, combines globe valve ruggedness with the efficiency of a rotary valve. Matched with a Fisher power or manual actuator, the CV500 valve dependably controls fluids in many process industries.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

X0189

Fisher CV500 VALVE WITH 2052 ACTUATOR AND FIELDVUE™ DVC6200 DIGITAL VALVE CONTROLLER

Features

- Excellent Flow Characteristic—Precise contouring of V-notch ball provides a modified equal percentage flow characteristic.
- High Capacity—Unrestricted, straight-through, flow design provides greater capacity than many conventional globe and rotary eccentric plug valves.
- Long Seat Life—The V-notch ball cams into and out of the seat minimizing contact with the seat ring for reduced wear and friction (figure 3). The V-notch ball does not contact the seat during throttling operation. S31600 (316 stainless steel) or R30006 (Alloy 6) seat ring has two shutoff surfaces and can be easily reversed, reducing downtime.
- One-Piece Body—Valve body is cast in one piece. There are no body gaskets to leak as a result of pipeline stresses.
- Operational Versatility—Self-centering seat ring and rugged V-notch ball allow forward or reverse flow with tight shutoff in either flow direction.
- Easy Installation—Integral valve flanges mate with many different classes of pipeline flanges, satisfying a variety of piping requirements. Flanges eliminate exposed line flange bolting, shorten alignment and installation time, and promote secure valve installations and piping integrity.

(continued on page 3)

Specifications

Available Configuration

Flanged valve body assembly with reversible[1] metal seat ring and splined shaft. See tables 2 and 3.

Valve Sizes

NPS ■ 3, ■ 4, ■ 6, ■ 8, ■ 10, and ■ 12.
DN 80, 100, 150, 200, 250 and 300 are also available.

End Connection Style and Rating

■ Raised-face flanges or ■ ring-type joint flanges (ASME B16.5). Valve bodies with EN PN10 through PN100 flanges also available. See tables 2 and 3 for ASME and EN availability.

Maximum Inlet Pressure[2]

Consistent with applicable ASME or EN flange ratings

Maximum Pressure Drops[2]

See table 4 for both forward and reverse flow pressure drops

Shutoff Classification

Class IV per ANSI/FCI 70-2 and IEC 60534-4, (0.01% of valve capacity at full travel) for either flow direction

Construction Materials

See table 5

Material Temperature Capability[2]

See table 5

Flow Characteristic

Modified equal percentage

Flow Direction

■ Forward (normal) flow is into the convex side of the V-notch ball
■ Bidirectional flow is into either side of the V-notch ball

Flow Coefficients

See Fisher Catalog 12

Flow Coefficient Ratio[3]

200 to 1

Actuator Mounting

■ Right-hand or ■ left-hand as viewed from the upstream side of the valve.

Mounting position depends on the desired open valve position and flow direction required by operating conditions. For more information, see the Installation section.

Valve V-Notch Ball Rotation

Counterclockwise to close (when viewed from the actuator side of the valve body) through 90 degrees of V-notch ball rotation

Valve Body/Actuator Action

With diaphragm or piston rotary actuator, field-reversible between
■ push-down-to-close (extending actuator rod closes valve body) and
■ push-down-to-open (extending actuator rod opens valve body)

Packing Constructions

PTFE V-Ring: With one carbon-filled PTFE conductive packing ring in ■ single, ■ double, or ■ leak-off arrangements
Braided PTFE Composition and Graphite Ribbon: With one graphited composition conductive packing ring in ■ single, ■ double, or ■ leak-off arrangements
Graphite Ribbon Packing Rings: In ■ single, ■ double, or ■ leak-off arrangements
ENVIRO-SEAL™: ■ PTFE or ■ Graphite in single arrangements

Approximate Weights

See table 1

Dimensions

See figure 4; face-to-face dimensions conform to ISA S75.04. IEC 60534-3-2 face-to-face dimensions are equivalent to S75.04 face-to-face dimensions.

Options

■ Sealed bearing constructions, ■ purged bearings

1. The reversible seat is not available in every trim material. Consult your Emerson sales office.
2. The pressure or temperature limits in the referenced tables or figures, and in any applicable code limitation, should not be exceeded.
3. Ratio of maximum flow coefficient to minimum usable flow coefficient. May also be called rangeability.

Table 1. Approximate Weights

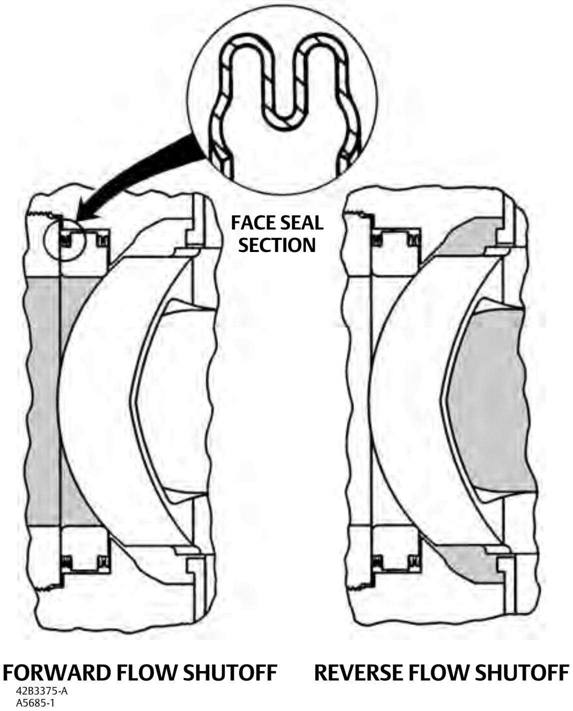
VALVE SIZE, NPS	FLANGED		
	CL150	CL300	CL600
DN	kg		
80	19	24	26
100	36	42	50
150	54	69	93
200	79	98	135
250	- - -	208	312
300	- - -	253	367
NPS	Pounds		
3	42	52	57
4	79	93	111
6	120	152	204
8	175	217	298
10	- - -	458	687
12	- - -	558	810

Table 2. Valve Size, ASME Ratings, and Flange Compatibility

VALVE SIZE, NPS	ASME		
	FLANGED		
	CL150	CL300	CL600
3	X	X	X
4	X	X	X
6	X	X	X
8	X	X	X
10	- - -	X	X
12	- - -	X	X

X indicates availability.

Figure 1. Detail of Seat Ring Design



Features (continued)

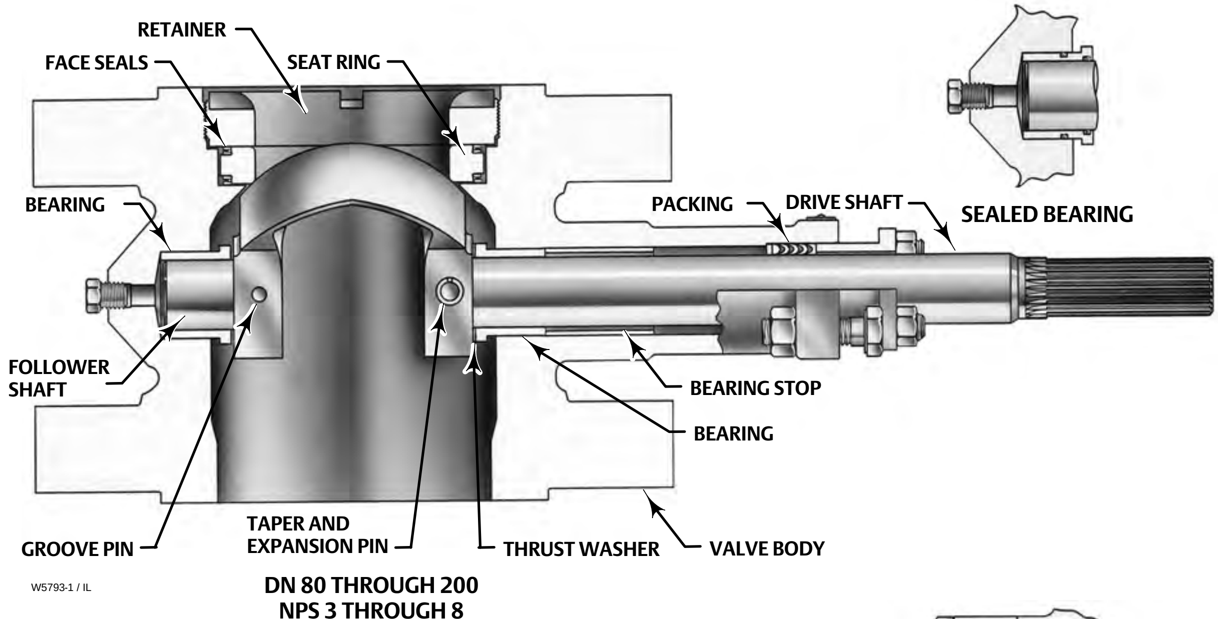
- **Simple Assembly and Maintenance—**No special orientation, precision clamping or repetitive centering of V-notch ball and seat ring is required when tightening the retainer, promoting accurate alignment and easy assembly.

- **Sour Service Capability—**Trim and bolting materials are available for applications handling sour fluids and gases. These constructions comply with the requirements of NACE MR0175-2002.

- **Rugged Construction—**Durable, solid metal seat ring and ball shut off tightly. Oversized shaft diameters and rugged trim parts allow high pressure drops.

- **Reliable Performance—**The seat ring design (figure 1) self-centers, self-laps, and dynamically aligns with V-notch ball, giving superior cycle life. Optional sealed metal bearings help prevent particle buildup and valve shaft seizure in severe applications.

Figure 2. Sectionals of Fisher CV500 Rotary Control Valves



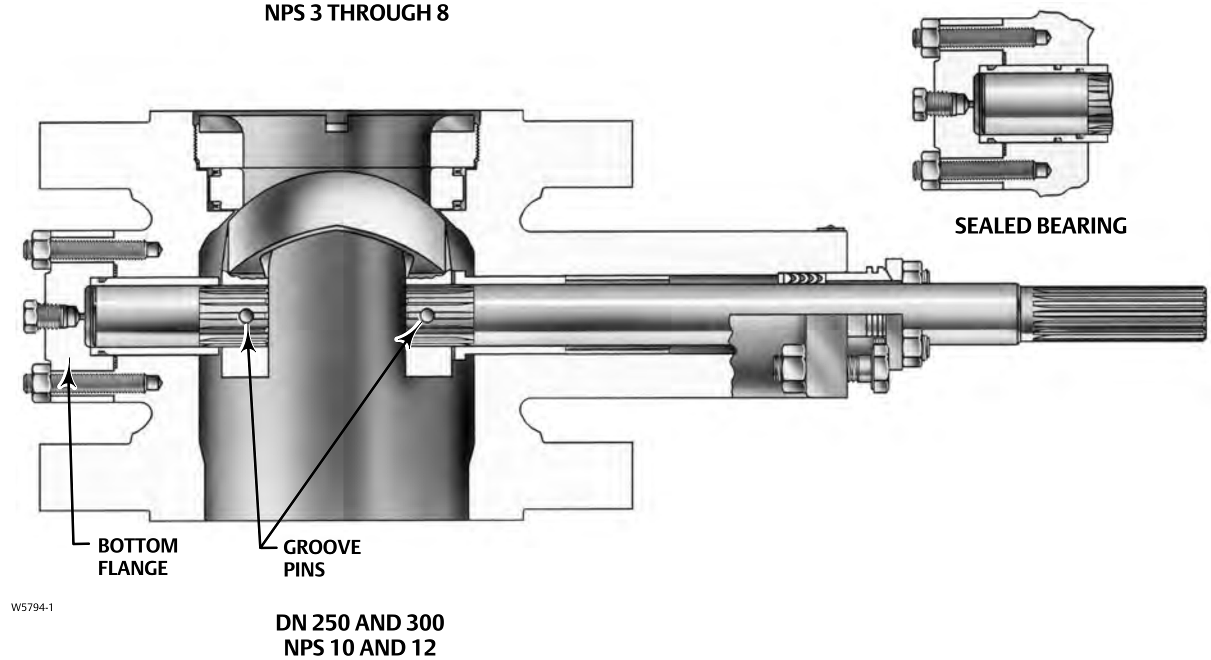


Table 3. Valve Size, DN Ratings, and Flange Compatibility

VALVE SIZE, DN	EN					
	Flanged					
	PN 10	PN 16	PN 25	PN 40	PN 63	PN 100
80	X	X	X	X	X	X
100	X	X	X	X	X	X
150	X	X	X	X	X	X
200	X	X	X	X	X	X
250	- - -	- - -	X	X	- - -	- - -
300	- - -	- - -	X	X	- - -	- - -

X indicates availability.

Table 4. Maximum Allowable Shutoff Pressure Drops(2)

VALVE BODY MATERIAL	BEARING MATERIAL	TEMPERATURE,	VALVE SIZE, DN					
			80	100	150	200	250	300
		°C	Bar					
WCC steel	S44004 (440C SST)	-29 to 149	41.4	41.4	41.4	24.1	24.1	27.6
		149 to 204	41.4	41.4	41.4	23.8	24.1	27.6
		204 to 316	41.4	41.4	41.4	23.1	24.1	27.6
WCC Steel, 1.0619 steel, CF8M (316 SST), 1.4581 SST, or CF3M(3) (316L SST)	R30006 (Alloy 6)	-46(1) to 204	41.4	41.4	20.7	15.2	24.1	27.6
		204 to 260	41.4	41.4	20.7	15.2	24.1	27.6
		260 to 316	41.4	41.4	20.7	15.2	24.1	27.6
	PTFE/composition-lined S31603(3) (S316L SST)	-46(1) to 93	41.4	41.4	41.4	24.1	31	34.5
		93 to 149	41.4	41.4	41.4	24.1(4) 23.1(5)	31	34.5
		149 to 204	41.4	41.4	41.4	23.8(4) 22.1(5)	31	34.5
		204 to 232	41.4	41.4	41.4	23.4(4) 21.7(5)	31	34.5
VALVE BODY MATERIAL	BEARING MATERIAL	TEMPERATURE,	VALVE SIZE, NPS					
			3	4	6	8	10	12
		°F	Psi					
WCC steel	S44004 (440C SST)	-20 to 300	600	600	600	350	350	400
		300 to 400	600	600	600	345	350	400
		400 to 600	600	600	600	335	350	400
WCC Steel, 1.0619 steel, CF8M (316 SST), 1.4581 SST, or CF3M(3) (316L SST)	R30006 (Alloy 6)	-50(1) to 400	600	600	300	220	350	400
		400 to 500	600	600	300	220	350	400
		500 to 600	600	600	300	220	350	400
	PTFE/composition-lined S31603(3) (S316L SST)	-50(1) to 200	600	600	600	350	450	500
		200 to 300	600	600	600	350(4) 335(5)	450	500
		300 to 400	600	600	600	345(4) 320(5)	450	500
		400 to 450	600	600	600	340(4) 315(5)	450	500

1. -29°C (-20°F) for WCC steel valve body material.
2. The pressure or temperature limits in this table or in any applicable code limitation, should not be exceeded.
3. Fisher standard material offerings in Europe only.
4. S17400 (17-4PH SST) shaft only.
5. ASME SA-479 Grade S20910 stainless steel shaft only. Pressure drops appropriate for both shaft materials.

Table 5. Materials of Construction and Temperature Capabilities

PART NAME	MATERIAL		MINIMUM TO MAXIMUM TEMPERATURE °C	MINIMUM TO MAXIMUM TEMPERATURE °F
Valve body and retainer	WCC steel bodies	CB7Cu-1 (17-4PH) retainer	-29 to 427	-20 to 800
		R30006 (Alloy 6) retainer	-29 to 427	-20 to 800
		CF8M (316 SST) retainer	-29 to 260	-20 to 500
	1.0619 steel bodies	CB7Cu-1 (17-4PH) retainer	-26 to 427	-14 to 800
		R30006 (Alloy 6) retainer	-26 to 427	-14 to 800
		CF3M (316L SST) retainer	-26 to 260	-14 to 500
	CF8M (316 SST) bodies	CF8M retainer	-198 to 427	-325 to 800
		R30006 (Alloy 6) retainer	-46 to 316	-50 to 600
		CF8M with CoCr-A (Alloy 6) bore	-198 to 427	-325 to 800
	1.4581 SST bodies	CF3M retainer	-195 to 427	-319 to 800
		R30006 (Alloy 6) retainer	-46 to 316	-50 to 600
		CF3M with CoCr-A bore	-198 to 427	-319 to 800
	CF3M(1) (316L SST) bodies	CF3M retainer	-198 to 427	-325 to 800
		R30006 (Alloy 6) retainer	-46 to 316	-50 to 600
		CF3M with CoCr-A bore	-198 to 427	-325 to 800
Seat ring	CF8M		-198 to 538	-325 to 1000
	R30006 (Alloy 6)		-198 to 538	-325 to 1000
	CF8M with CoCr-A seat		-198 to 538	-325 to 1000
	CF3M(1)		-198 to 454	-325 to 850
	CF3M(1) with CoCr-A seat		-198 to 454	-325 to 850
Ball	Chrome plated CF3M		-198 to 316	-325 to 600
	Chrome plated CF3M with CoCr-A V-notch		-198 to 316	-325 to 600
Drive shaft and follower shaft	S17400 (17-4PH SST)		-62 to 427	-80 to 800
	ASME SA479 grade S20910		-198 to 538	-325 to 1000
Taper and expansion pins (NPS 3 through 8)	ASME SA479 grade S20910		-198 to 538	-325 to 1000
Groove pin	S31600		-198 to 538	-325 to 1000
Bearings	S44004 (440C SST)		-29 to 427	-20 to 800
	R30006 (Alloy 6)		-198 to 538	-325 to 1000
	PTFE/composition lined S31603		-46 to 232	-50 to 450
O-rings(2) (for S44004 or R30006 sealed bearings)	Fluorocarbon		-18 to 204	0 to 400
	Nitrile		-29 to 93	-20 to 200
Bearing stop	S31600		-198 to 538	-325 to 1000
	S31603(1)		-198 to 454	-325 to 850
Thrust washer	S17700 for S17400 drive shaft		-198 to 427	-325 to 800
	Alloy 6B for S20910 drive shaft		-198 to 538	-325 to 1000
Face seals	N07718		-198 to 538	-325 to 1000
Retainer gasket	S31600		-198 to 538	-325 to 1000
	S31603(1)		-198 to 454	-325 to 850
Packing	PTFE V-ring with one carbon-filled PTFE ring(3)		-46 to 260	-50 to 500
	Braided PTFE composition with one graphite filament ring(4)		-73 to 260	-100 to 500
	Graphite ribbon		-198 to 538	-325 to 1000
Packing follower	S31600		-198 to 538	-325 to 1000
Studs and nuts	SA-193-B7 studs and SA-194-2H nuts		-46 to 427	-50 to 800
	SA-193-B7M studs and SA-194-2HM nuts		-29 to 427	-20 to 800
	SA-193-B8M studs and SA-194-8M nuts		-198 to 538	-325 to 1000
Packing box ring	S31600		-198 to 538	-325 to 1000
	S31603(1)		-198 to 454	-325 to 850

1. Fisher standard material offerings in Europe only.
2. For sealed bearing constructions.
3. Carbon-filled PTFE ring used for grounding purposes.
4. Graphite filament ring used for grounding purposes.

Installation

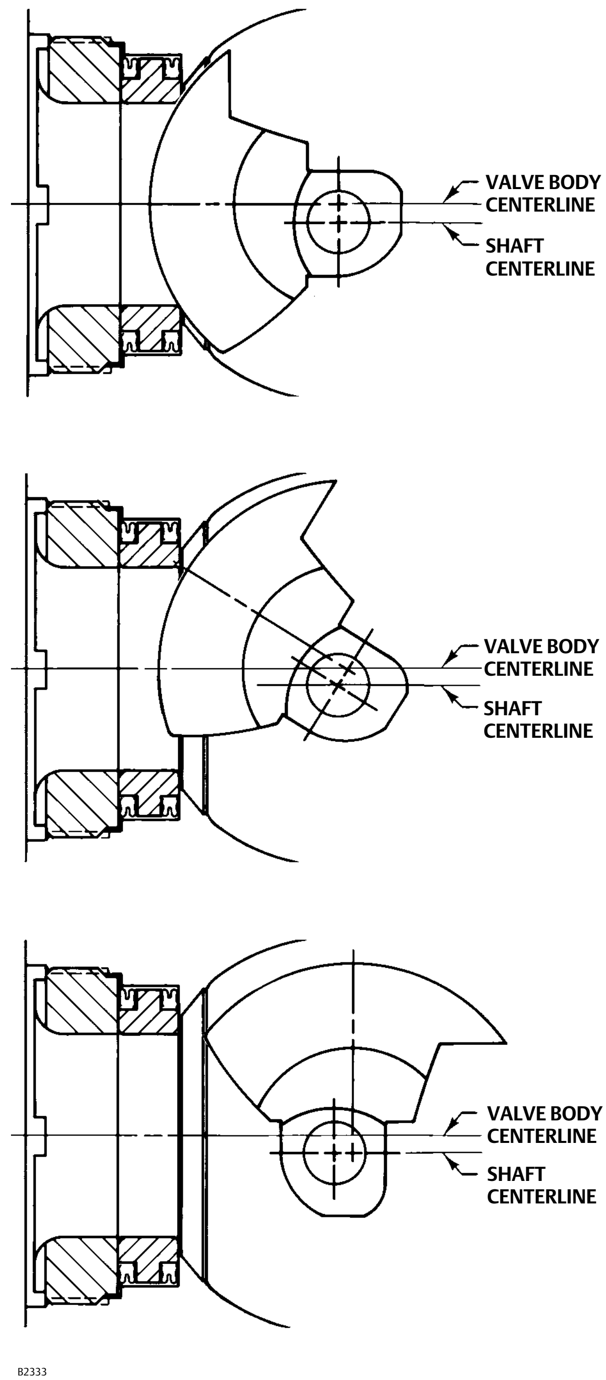
The CV500 control valve may be installed in any position. However, for best shutoff performance, a position with the shaft horizontal is recommended.

The control valve may be installed in forward or reverse flow direction. Forward flow (through the seat ring and past the V-notch ball) tends to open the valve; reverse flow (past the V-notch ball and through the seat ring) tends to close the valve. The forward flow direction is recommended. Refer to the Fisher CV500 Rotary Control Valve instruction manual, D101640X012, to determine the proper installation orientation of the V-notch ball and actuator, and to determine the flow direction of the process fluid through the valve.

Refer to the appropriate actuator bulletin for possible assembly and installation options. For assistance in selecting the appropriate combination of actuator action and open valve position, consult your Emerson sales office.

Dimensions are shown in figure 4.

Figure 3. Eccentric V-Notch Ball Rotation



Ordering Information

Valve Information

To determine what valve ordering information is needed, refer to the specifications table. Review the information under each specification and in the referenced tables; specify your choice whenever there is a selection to be made.

Actuator and Accessory Information

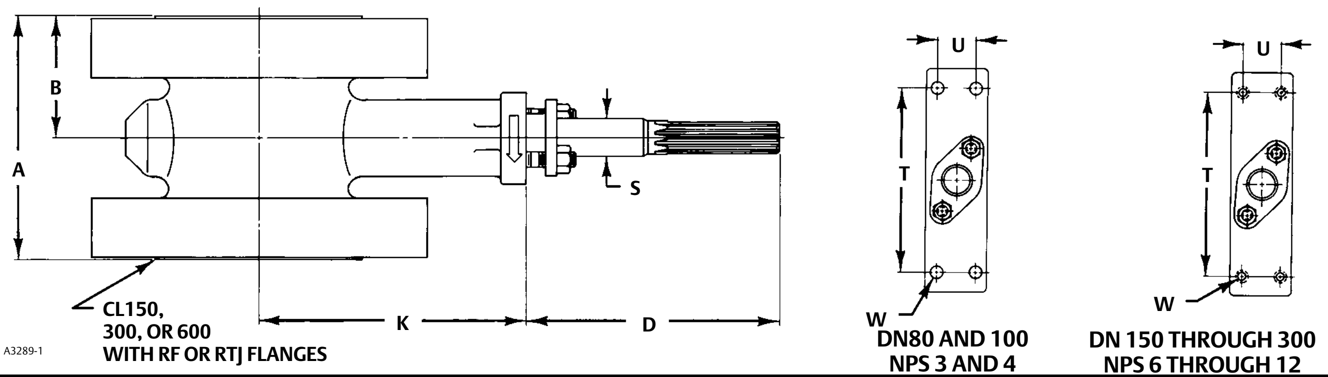
Refer to the specific actuator and accessory bulletins for required ordering information.

Table 6. Fisher CV500 Valve Body Dimensions

VALVE SIZE	DIMENSIONS									
	A		B		D	K	S (Shaft Dia)(1)	T	U	W
	RF	RTJ	RF	RTJ						
DN	mm									
80	165	165	83	83	213	200	25.4 25.4 x 19.1	152	32	14
100	194	194	97	97	208	216	31.8	235	46	18
150	229	229	114	114	208	270	38.1 38.1 x 31.8	235	46	5/8-inch 11 UNC
200	243	243	121	121	208	318	38.1	235	46	5/8-inch 11 UNC
250	297	312	148	156	356	353	44.5	273	51	3/4-inch 10 UNC
300	338	354	169	177	356	408	53.8 53.8 x 50.8	273	51	3/4-inch 10 UNC
NPS	Inches									
3	6.50	6.50	3.25	3.25	8.44	7.88	1.00 1.00 x 0.75	6.00	1.25	0.56
4	7.62	7.62	3.81	3.81	8.19	8.50	1.25	9.25	1.81	0.69
6	9.00	9.00	4.50	4.50	8.19	10.62	1.50 1.50 x 1.25	9.25	1.81	5/8-inch 11 UNC
8	9.56	9.56	4.78	4.78	8.19	12.50	1.50	9.25	1.81	5/8-inch 11 UNC
10	11.68	12.30	5.84	6.15	14.00	13.91	1.75	10.75	2.00	3/4-inch 10 UNC
12	13.31	13.93	6.66	6.97	14.00	16.07	2.12 2.12 x 2.00	10.75	2.00	3/4-inch 10 UNC

1. Shaft diameter versus spline diameter.

Figure 4. Fisher CV500 Valve Body Dimensions (also see table 6)



Note:
For dimensions of valves with DN (or other) end connections, contact your Emerson sales office.

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Dubai, United Arab Emirates
Singapore 128461 Singapore

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Fisher™ SS-138B Continuous Catalytic Regeneration Valve

This bulletin covers the Fisher SS-138B, an NPS 1 through NPS 8 segmented ball valve with metal flow ring construction. The segmented ball is used to control the flow of catalyst from reactor to regeneration towers in a continuous catalyst regeneration (CCR) unit.

The Fisher SS-138B is specifically designed to meet process licensor requirements. The demanding nature of the application requires a specific design which reduces crushing of the catalyst and pressure build up downstream of the valve by controlling gravity feed of the catalyst through the valve. This is achieved by shimming the Vee-Ball™ to the center of the valve body cavity to hold the flow ring a process-licensor specified distance away from the ball.

X0714

SS-138B NPS 4 WITH FISHER 2052 SIZE 2 ACTUATOR

Features

- Flow Passages— Specially designed flow passages eliminate solids accumulation that can hinder valve operation. This extends the life of the catalyst spheres, reduces maintenance cost, and improves regeneration efficiency.

- Easy Installation— Optional flanged body design of the SS-138B eliminates exposed line flange bolting, reduces alignment and installation time, and promotes secure valve installations and piping integrity.

- Smooth Valve Operation—Precision machined parts and pressure balanced seal designs allow smooth, precise movement of the ball.

- Precision Engineered— Specific clearance between the flow ring and hardened Vee-Ball trim parts prevent crushing of the catalyst spheres.

- Quick and Easy Maintenance—Ball seal inspection and replacement is done at the valve body inlet without removing the actuator or disassembling the valve. Valve maintenance requires no special tools.

- Structural Integrity—One-piece valve body improves structural integrity of the pressure boundary by eliminating leak paths that could be caused by the gaskets in two-piece, bolted valve designs.

- Exceptional Environmental Capabilities—The optional ENVIRO-SEAL™ packing systems are designed with very smooth shaft surfaces and live loading to provide exceptional sealing. The seal of the ENVIRO-SEAL system can restrict emissions to less than the EPA (Environmental Protection Agency) limit of 100 ppm (parts per million).

Specifications

Valve Sizes and End Connection Styles

SS-138B: NPS ■ 1, ■ 1-1/2, ■ 2, ■ 3, ■ 4, ■ 6, and ■ 8

Maximum Inlet Pressures[1]

CG8M and CF3M Valves: Consistent with CL300 for flanged SS-138B, pressure-temperature ratings per ASME B16.34, but do not exceed the material temperature capabilities shown below or the pressure drop limitations.

Flangeless SS-138B CG8M and CF3M Valves: Consistent with applicable pressure-temperature ratings in table 1 per ASME B16.34, but do not exceed the material temperature capabilities shown below and the pressure drop limitations.

Shutoff Classification[1,3]

Class I per ANSI/FCI 70-2 and per IEC 60534-4, (Class II and better not available). A defined initial maximum leak rate can be provided subject to review of service conditions.

Construction Materials

See table 3

Temperature Capabilities[1,2]

Flow Ring: -198 to 538°C (-325 to 1000°F)
R30006 Bearings: -198 to538°C (-325 to 1000°F)

Packing Constructions

PTFE V-ring: -46 to 232°C (-50 to 450°F)
Graphite: -198 to 538°C (-325 to 1000°F)
ENVIRO-SEAL Single PTFE V-ring: -46 to 232°C (-50 to 450°F)
ENVIRO-SEAL Graphite: -7 to 316°C (20 to 600°F) for 100ppm service requirements. This packing arrangement can be used to 371°C (700°F) for non-environmental service.

Flow Characteristic

Modified equal percentage

Dimensions

See figures 3 and 4 for dimensions

Standard Flow Direction

Forward (into the convex face of the V-notch ball)

Flow Coefficients

See Fisher Catalog 12

Flow Coefficient Ratio

See Fisher Catalog 12

Maximum Ball Rotation

90 degrees

Actuator Mounting

Standard valve construction is for right-hand mounting, as viewed from upstream end of valve. Left-hand (optional) mounting is available upon request.

Valve/Actuator Action

With diaphragm or piston rotary actuator, the valve is field-reversible between PDTC or PDTO:
■ push-down-to-close (extending actuator rod closes valve) and ■ push-down-to-open (extending actuator rod opens valve)

Approximate Weight

See table 2

Options

■ Pipe plug at end of follower shaft for all sizes, ■ Line flange bolting, ■ ENVIRO-SEAL packing system: See figure 2 and Bulletin 59.3:041, ENVIRO-SEAL Packing Systems for Fisher Rotary Valves (D101638X012) for more information, ■ S31254/CK3MCuN trim material

1. The pressure/temperature limits in this bulletin, and any applicable code or standard limitation, should not be exceeded.
2. Additional limits are shown in tables 4 and 5.
3. Shutoff classification Class I as required by process licensor.

Figure 1. Fisher SS-138B Construction Features (Flanged SS-138B Shown)

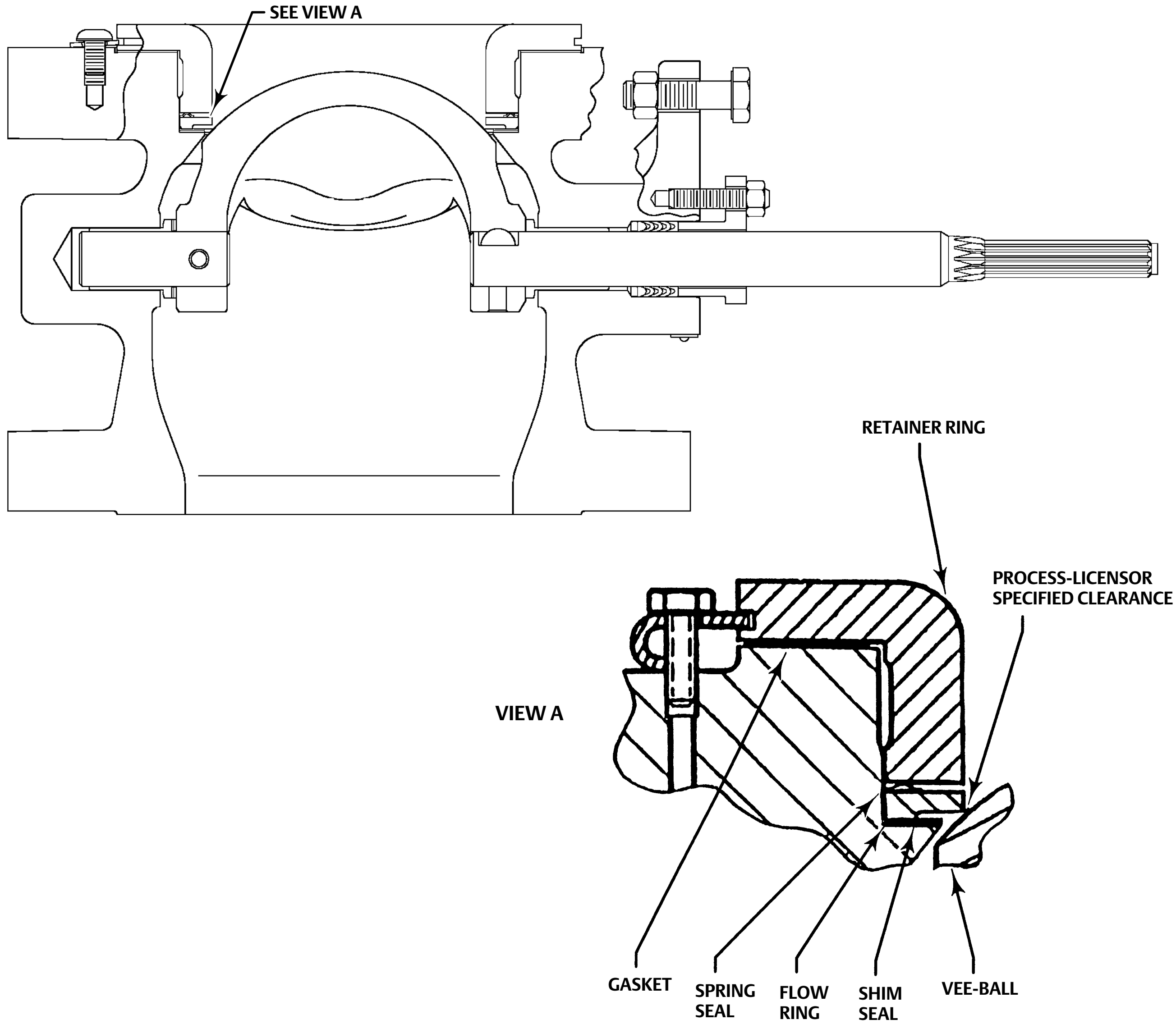


Table 1. Valve Body Materials, Ratings, and End Connections

VALVE BODY MATERIAL	VALVE DESIGN	VALVE SIZE, NPS	RATINGS	END CONNECTION
CG8M or CF3M(1)	Flangeless SS-138B	1, 1-1/2, 2	CL150/CL300/CL600	Mates with RF flanges per ASME B16.5
		3, 4	CL300/CL600	
		6, 8	CL150/CL300	
	Flanged SS-138B	1, 1-1/2, 2, 3, 4, 6, 8	CL300	

1. CF3M is the standard offering in Europe and Asia Pacific.

Table 2. Valve Weights, Approximate

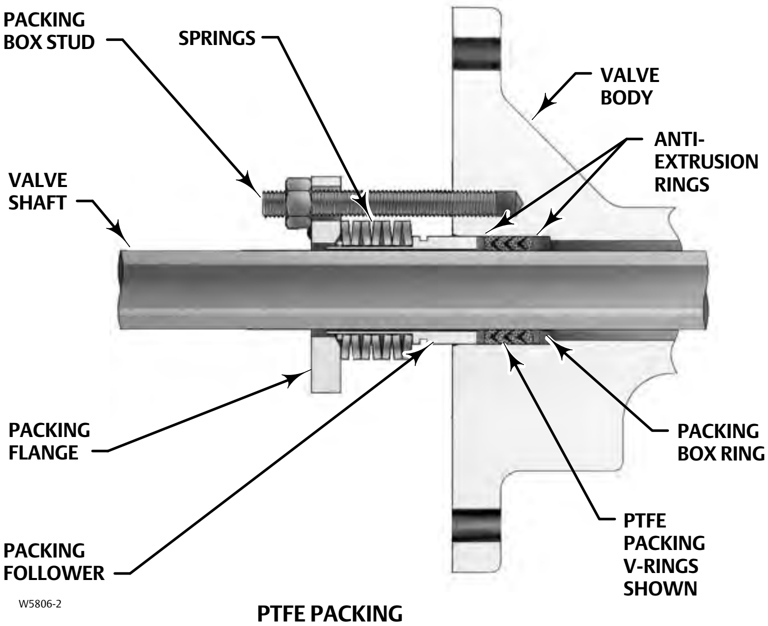
VALVE SIZE, NPS	FLANGELESS SS-138B		FLANGED SS-138B	
	kg	lbs	kg	lbs
1	4.5	10	8	17
1-1/2	6.4	14	12	27
2	10	23	17	38
3	15	34	28	61
4	22	48	37	81
6	36	80	60	133
8	62	136	103	226

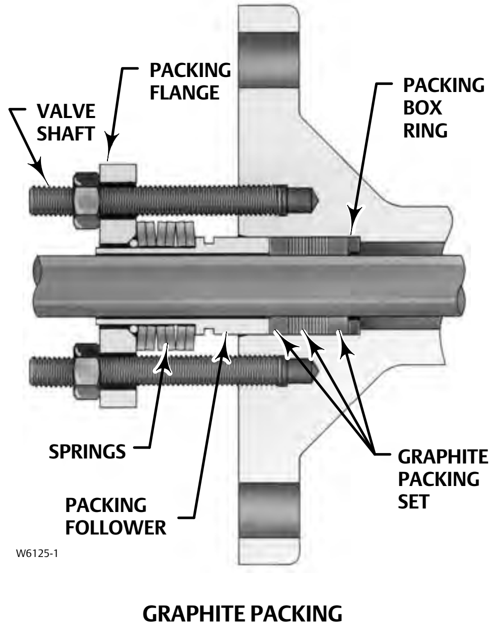
Table 3. Standard Construction Materials for NPS 1 through 8 Valves

PART	MATERIAL
Seal Protector Ring	CG8M and CF3M(3)
V-Notch Ball	CG8M chrome plate with CoCr-A V-notch, CG8M chrome coat with CoCr-A V-notch, CF3M chrome plate with CoCr-A V-notch, CF3M chrome coat with CoCr-A V-notch(3)
Seal	Flow ring- S31600 with CoCr-A hardfacing alloy
Bearings	R30006 (Alloy 6)
Seal Retainer Gasket	Graphite
Packing	Enviroseal PTFE or graphite, PTFE V-ring with one carbon-filled PTFE ring(1), PTFE V-ring, or graphite ribbon. Packing is available with or without live loading.
Shafts	S17400 /chrome plate or N07750 / CoCr-A hardfacing alloy / chrome coat
Groove Pin	S31600 or N10276
Taper Key	R30006(2), S20910, or N10276
Taper Pin (NPS 1, 1-1/2, and 2 only)	S20910 or N10276
Seal Retainer Screws and Washers	Stainless steel
Packing Follower and Packing Box Ring	CF8M (316 stainless steel), N10276, S31254, or N10276 with separate S31600 packing box flange
Actuator Mounting Bolts and Nuts	Grade 5 steel or strain-hardened B8M stainless steel
Spacer and Bushing	S31700, N10276, or S31603
Packing Follower Bolting and Optional Line Bolting	SA-193-B7, SA-193-B7M, or strain-hardened SA-193-B8M

1. The carbon-filled PTFE ring is used for grounding.
2. Standard material offered in North America.
3. CF3M is the standard offering in Europe and Asia Pacific.

Figure 2. Typical ENVIRO-SEAL Packing Arrangements





Pressure Drops

Pressure drop limits of any given valve are based on valve body, and trim material limits. To find the appropriate pressure drop limitation, choose the desired valve size and temperature range. Then search table 4 for body limitations and table 5 for trim limitations. The lowest number from the tables is the appropriate limit. **The tables for both trim and body limits must be consulted.**

Table 4. Maximum Allowable Shutoff Pressure Drops (Body Ratings) based on Stainless Steel Valve Body Types (The tables for both trim and body limits must be consulted)

TEMPERATURE RANGE	PRESSURE CLASS	
	CG8M or CF3M CL300	CG8M or CF3M CL600
°C	Bar	
-46 to -29	49.6	99.3
-29 to 38	49.6	99.3
93	42.7	85.5
149	38.6	77.2
204	35.5	70.6
232	34.5	68.6
260	33.1	65.8
316	32.1	64.1
343	31.0	62.4
371	30.7	60.0
399	29.3	58.9
427	29.0	58.3
454	28.8	57.6
482	28.6	57.1
510	27.1	54.2
538	25.2	50.0
°F	Psi	
-50 to -20	720	1440
-20 to 100	720	1440
200	620	1240
300	560	1120
400	515	1025
450	500	995
500	480	955
550	465	930
600	450	905
650	445	890
700	430	870
750	425	855
800	420	845
850	418	835
900	415	830
950	385	775
1000	365	725

Table 5. Maximum Allowable Shutoff Pressure Drops based on Trim (Bearing and Seal)
(Note: Do not exceed the ASME pressure/temperature rating of the valve or mating flanges)

BEARING MATERIAL	BALL SEAL	BALL MATERIAL	SHAFT	TEMPERATURE RANGE, °C	VALVE SIZE, NPS						
					1	1-1/2	2	3	4	6	8
					Bar						
R30006	Flow Ring	CG8M or CF3M chrome plate with CoCr-A V-notch	S17400 / chrome plate	316	74.5	49.6	26.8	18.8	10.9	11.2	11.1
		CG8M or CF3M chrome coat with CoCr-A V-notch	N07750 / CoCr-A / chrome coat	538	74.5	49.6	26.8	18.8	10.9	11.2	11.1
BEARING MATERIAL	**BALL SEAL**	**BALL MATERIAL**	**SHAFT**	**TEMPERATURE RANGE, °F**	**Psi**						
R30006	Flow Ring	CG8M or CF3M chrome plate with CoCr-A V-notch	S17400 / chrome plate	600	1080	720	388	273	158	163	161
		CG8M or CF3M chrome coat with CoCr-A V-notch	N07750 / CoCr-A / chrome coat	1000	1080	720	388	273	158	163	161

Table 6. Fisher Flangeless SS-138B Dimensions

VALVE SIZE, NPS	FLANGELESS SS-138B DIMENSIONS (ISA S75.04)													ASME B16.5 RF FLANGES
	A	B	D	G	K	M		R	R1	S	T	U	W	
						CL300	CL600							
mm														
1	102	56		81	95	202	202	51	102	12.7				
1-1/2	114	62	188	89	121	224	224	73	119	15.7 and 15.7 x 12.7	117	---	14.2	
2	124	67		106	127	236	236	92	137	15.7 and 15.7 x 12.7				CL300 and 600
3	165	79	214	117	130	279	286	127	167	19.1	152	32	14.2	
4	194	101	214	133	141	305	343	157	197	19.1	152	32	14.2	
6	229	109	214	159	164(1)	362	413	216	260	25.4	152	32	14.2	
8	243	124	208	195	232	387	426	270	314	31.8	235	46	17.5	
Inch														
1	4.00	2.21		3.19	3.75	7.94	7.94	2	4.00	1/2				
1-1/2	4.50	2.46	7.38	3.50	4.75	8.81	8.81	2.88	4.68	5/8 and 5/8 x 1/2	4.62	---	0.56	
2	4.88	2.63		4.19	5.00	9.31	9.31	3.63	5.38	5/8 and 5/8 x 1/2				
3	6.50	3.10	8.44	4.62	5.12	11.00	11.25	5.00	6.56	3/4	6.00	1.25	0.56	CL300
4	7.62	3.99	8.44	5.25	5.56	12.00	13.50	6.19	7.76	3/4	6.00	1.25	0.56	
6	9.00	4.29	8.44	6.25	6.44(1)	14.25	16.25	8.50	10.24	1	6.00	1.25	0.56	
8	9.56	4.88	8.19	7.69	9.12	15.25	16.75	10.63	12.38	1-1/4	9.25	1.81	0.69	

1. 179 mm (7.06 inches) for NPS 6, CL600 valves only.

Figure 3. Fisher Flangeless SS-138B Dimensions (also see table 6)

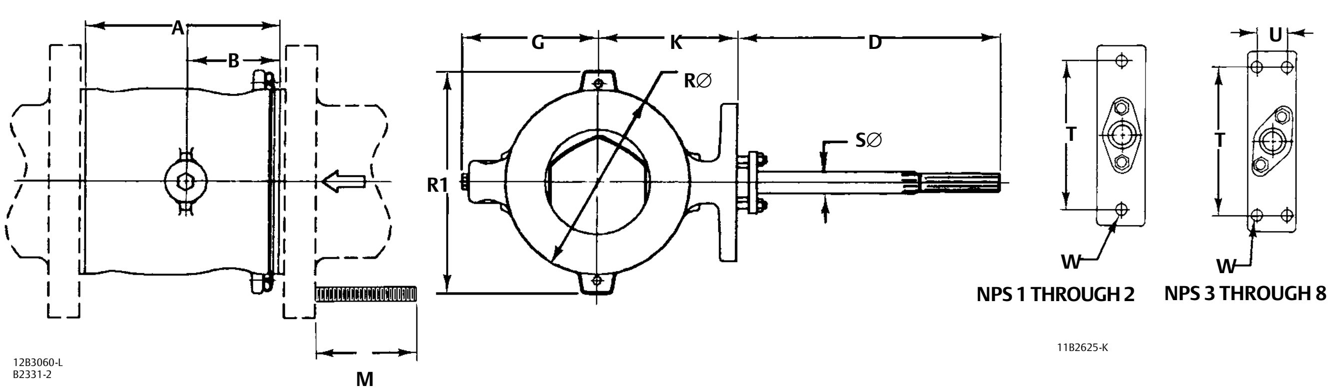
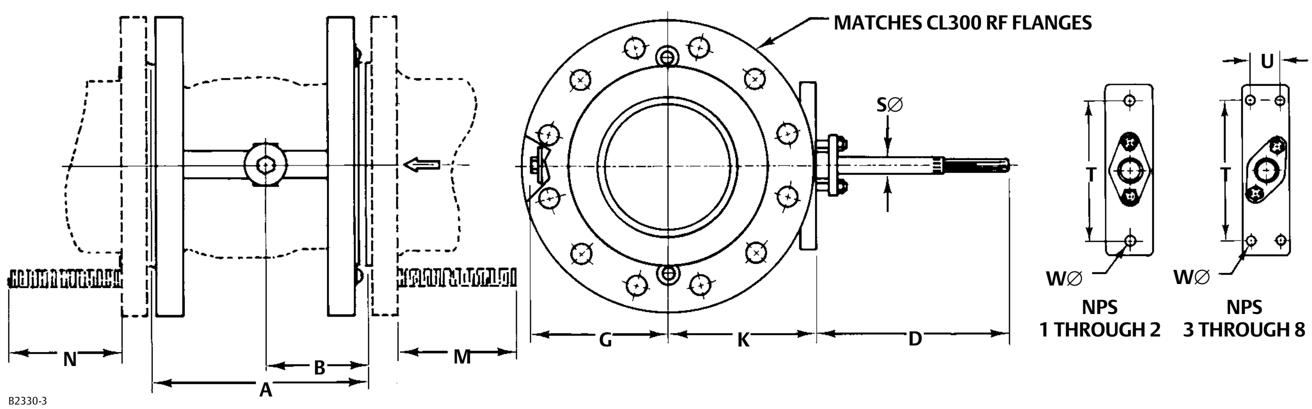


Table 7. Fisher Flanged SS-138B Dimensions

VALVE SIZE, NPS	FLANGED SS-138B DIMENSIONS (ISA S75.04)										
	A	B	D	G	K	M(1)	N(1)	S Diameter	T	U	W
mm											
1	102	56		81	95	100	94	12.7			
1-1/2	114	62	188	89	121	114	108	15.7 and 15.7 X 12.7	117	---	14.2
2	124	67		106	127	106	100	15.7 and 15.7 X 12.7			
3	165	79	214	117	130	133	121	19.1	152	32	14.2
4	194	101	214	133	141	140	127	19.1	152	32	14.2
6	229	109	214	159	164(2)	152	140	25.4	152	32	14.2
8	243	124	208	195	232	165	152	31.8	235	46	17.5
Inch											
1	4.00	2.21		3.19	3.75	3.94	3.69	1/2			
1-1/2	4.50	2.46	7.38	3.50	4.75	4.50	4.25	5/8 and 5/8 X 1/2	4.62	---	0.56
2	4.88	2.63		4.19	5.00	4.19	3.94	5/8 and 5/8 X 1/2			
3	6.50	3.10	8.44	4.62	5.12	5.25	4.75	3/4	6.00	1.25	0.56
4	7.62	3.99	8.44	5.25	5.56	5.50	5.00	3/4	6.00	1.25	0.56
6	9.00	4.29	8.44	6.25	6.44(2)	6.00	5.50	1	6.00	1.25	0.56
8	9.56	4.88	8.19	7.69	9.12	6.50	6.00	1-1/4	9.25	1.81	0.69

1. Clearance necessary to remove flange bolts.
2. 179 mm (7.06 inches) for NPS 6, CL600 valves only.

Figure 4. Fisher Flanged SS-138B Dimensions (also see table 7)



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Fisher™ SS-252B Continuous Catalytic Regeneration Valve

This bulletin covers the Fisher SS-252B, an NPS 1 through NPS 8 segmented ball valve with an R30006 metal seal. The segmented ball is used to control the flow of catalyst from reactor to regeneration towers in a continuous catalyst regeneration (CCR) unit.

The Fisher SS-252B is specifically designed to meet process licensor requirements. The demanding nature of the application requires a specific design which reduces crushing of the catalyst and pressure build up downstream of the valve by controlling gravity feed of the catalyst through the valve. This is achieved by shimming the Vee-Ball™ to the center of the valve body cavity to maintain zero ball seal deflection.

X0714

SS-252B NPS 4 with Fisher 2052 Size 2

Features

- **Flow Passages**— Specially designed flow passages eliminate solids accumulation that can hinder valve operation. This extends the life of the catalyst spheres, reduces maintenance cost, and improves regeneration efficiency.

- **Easy Installation**— Optional flanged body design of the SS-252B eliminates exposed line flange bolting, reduces alignment and installation time, and promotes secure valve installations and piping integrity.

- **Precision Engineered**— Specific clearance between the ball seal and hardened Vee-Ball trim parts prevent crushing of the catalyst spheres.

- **Quick and Easy Maintenance**—Ball seal inspection and replacement is done at the valve body inlet without removing the actuator or disassembling the valve. Valve maintenance requires no special tools.

- **Structural Integrity**—One-piece valve body improves structural integrity of the pressure boundary by eliminating leak paths that could be caused by the gaskets in two-piece, bolted valve designs.

- **Exceptional Environmental Capabilities**—The optional ENVIRO-SEAL™ packing systems are designed with very smooth shaft surfaces and live loading to provide exceptional sealing. The seal of the ENVIRO-SEAL system can restrict emissions to less than the EPA (Environmental Protection Agency) limit of 100 ppm (parts per million).

Specifications

Valve Sizes and End Connection Styles

NPS ■ 1, ■ 1-1/2, ■ 2, ■ 3, ■ 4, ■ 6, and ■ 8

Maximum Inlet Pressures(1)

CG8M (317 Stainless Steel) Valves: Consistent with CL300 for flanged SS-252B, pressure-temperature ratings per ASME B16.34, but do not exceed the material temperature capabilities shown below or the pressure drop limitations.

Flangeless SS-252B CG8M (317 Stainless Steel) Valves: Consistent with applicable pressure-temperature ratings in table 1 per ASME B16.34, but do not exceed the material temperature capabilities shown below and the pressure drop limitations.

Shutoff Classification(1, 3)

The maximum allowable leakage rates (scfh) for this valve are 200 for NPS 1, 300 for NPS 1-1/2, 400 for NPS 2, 500 for NPS 3, 800 for NPS 4, and 1100 for NPS 6. The leak test is conducted with 100 psig air.

Construction Materials

See table 3

Temperature Capabilities(1,2)

Ball Seal: -198 to 538°C (-325 to 1000°F)
PEEK/PTFE Bearings: -198 to 260°C (-325 to 500°F)

Packing Constructions

PTFE V-ring: -46 to 232°C (-50 to 450°F)
Graphite: -198 to 538°C (-325 to 1000°F)
ENVIRO-SEAL Single PTFE V-ring: -46 to 232°C (-50 to 450°F)
ENVIRO-SEAL Graphite: -7 to 316°C (20 to 600°F)

Flow Characteristic

Modified equal percentage

Dimensions

See figure 4 for dimensions

Standard Flow Direction

Forward (into the convex face of the V-notch ball)

Flow Coefficients

See V300 information in Fisher Catalog 12

Flow Coefficient Ratio

See V300 information in Fisher Catalog 12

Maximum Ball Rotation

90 degrees

Actuator Mounting

Standard valve construction is for right-hand mounting, as viewed from upstream end of valve. Left-hand (optional) mounting is available upon request.

Valve/Actuator Action

With diaphragm or piston rotary actuator, the valve is field-reversible between PDTC or PDTO: ■ push-down-to-close (extending actuator rod closes valve) and ■ push-down-to-open (extending actuator rod opens valve)

Approximate Weight

See table 2

Options

■ Pipe plug at end of follower shaft for all sizes, ■ Line flange bolting, ■ ENVIRO-SEAL packing system: See figure 2 and Bulletin 59.3:041, ENVIRO-SEAL Packing Systems for Fisher Rotary Valves (D101638X012) for more information, ■ S31254/CK3MCuN trim material

1. The pressure/temperature limits in this bulletin, and any applicable code or standard limitation, should not be exceeded.
2. Additional limits are shown in tables 4 and 5.
3. Shutoff classification Class I as required by process licensor.

Figure 1. Fisher SS-252B Construction Features

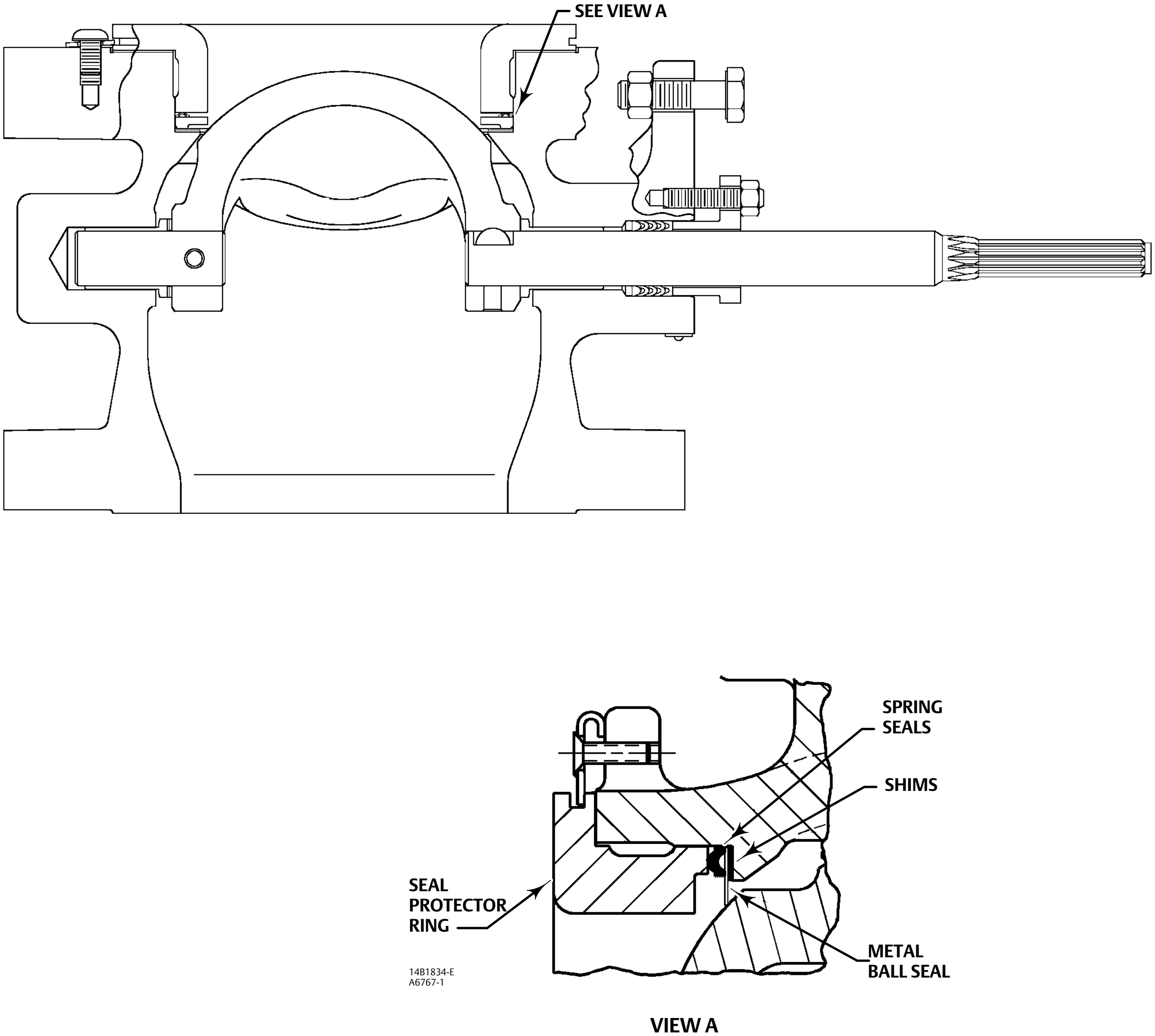


Table 1. Valve Body Materials, End Connections, and Ratings

VALVE DESIGN	VALVE BODY MATERIAL	SIZE	RATINGS
		NPS	
Flangeless SS-252B[1]	CG8M	1, 1-1/2, 2, 3, 4	CL300/600 raised-face
		6, 8	CL300 or CL600 raised-face
Flanged SS-252B	CG8M	1, 1-1/2, 2, 3, 4, 6, 8	CL300

1. Flangeless SS-252B is a dual-rated valve body in sizes NPS 1 to 4.

Table 2. Valve Weights, Approximate

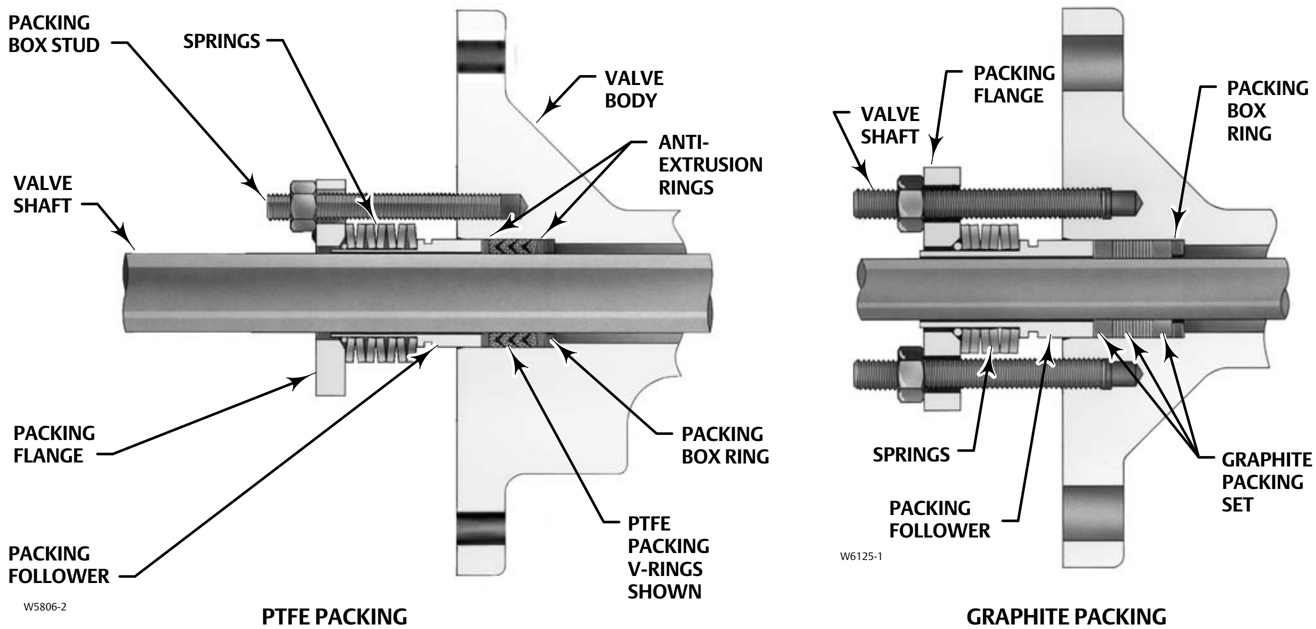
VALVE SIZE, NPS	FLANGELESS SS-252B		FLANGED SS-252B	
	kg	lbs	kg	lbs
1	4.5	10	8	17
1-1/2	6.4	14	12	27
2	10	23	17	38
3	15	34	28	61
4	22	48	37	81
6	36	80	60	133
8	62	136	103	226

Table 3. Standard Construction Materials for NPS 1 through 8 Valves

PART	MATERIAL
Seal Protector Ring	CG8M (317 SST)
V-Notch Ball	CG8M chromium carbide with CoCr-A V-notch
Seal	R30006 (Alloy 6)
Bearings	R30006 (Alloy 6)
Seal Retainer Gasket	Graphite
Packing	PTFE V-ring with one carbon-filled PTFE ring[1], PTFE V-ring, or graphite ribbon. Packing is available with or without live loading.
Shafts	S17400 H900/chrome plated, N07750 chrome coated
Groove Pin	S31600 or N10276
Taper Key	R30006[2], S20910, or N10276
Taper Pin (NPS 1, 1-1/2, and 2 only)	S20910 or N10276
Seal Retainer Screws and Washers	Stainless steel
Packing Follower and Packing Box Ring	CF8M (316 stainless steel), N10276, S31254, or N10276 with separate S31600 packing box flange
Actuator Mounting Bolts and Nuts	Grade 5 steel or strain-hardened B8M stainless steel
Spacer and Bushing	S31700, N10276, or S31603
Packing Follower Bolting and Optional Line Bolting	SA-193-B7, SA-193-B7M, or strain-hardened SA-193-B8M

1. The carbon-filled PTFE ring is used for grounding.
2. Standard material offered in North America.

Figure 2. Typical ENVIRO-SEAL Packing Arrangements



Pressure Drops

Pressure drop limits of any given valve are based on valve body, and trim material limits. To find the appropriate pressure drop limitation, choose the desired valve size and temperature range. Then search table 4 for body limitations and table 5 for trim limitations. The lowest number from the tables is the appropriate limit. **The tables for both trim and body limits must be consulted.**

Table 4. Maximum Allowable Shutoff Pressure Drops (Body Ratings) based on Stainless Steel Valve Body Types. (The tables for both trim and body limits must be consulted.)

TEMPERATURE RANGE	PRESSURE CLASS
	317 SST CL300
°C	Bar
-46 to -29	49.6
-29 to 38	49.6
93	42.7
149	38.6
204	35.5
232	34.5
260	33.1
316	32.1
343	31.0
371	30.7
399	29.3
427	29.0
454	58.8
482	58.6
510	27.1
538	25.2
°F	Psi
-50 to -20	720
-20 to 100	720
200	620
300	560
400	515
450	500
500	480
550	465
600	450
650	445
700	430
750	425
800	420
850	420
900	415
950	385
1000	365

Table 5. Maximum Allowable Shutoff Pressure Drops based on Trim (Bearing and Seal).
(Note: Do not exceed the ASME pressure/temperature rating of the valve or mating flanges.)

BEARING MATERIAL	BALL SEAL	BALL MATERIAL	SHAFT	TEMPERATURE RANGE, °C	VALVE SIZE, NPS						
					1	1-1/2	2	3	4	6	8
					Bar						
R30006	R30006	CG8M CRCB CoCr-A V-notch	S17400 H900 CRPL	316	74.5	49.6	26.8	18.8	10.9	11.2	11.1
		CG8M CRCB CoCr-A V-notch	N07750/CoCr-A CRCT	538	74.5	49.6	26.8	18.8	10.9	11.2	11.1
BEARING MATERIAL	**BALL SEAL**	**BALL MATERIAL**	**SHAFT**	**TEMPERATURE RANGE, °F**	**Psi**						
R30006	R30006	CG8M CRCB CoCr-A V-notch	S17400 H900 CRPL	600	1080	720	388	273	158	163	161
		CG8M CRCB CoCr-A V-notch	N07750/CoCr-A CRCT	1000	1080	720	388	273	158	163	161

Table 6. Fisher Flangeless SS-252B Dimensions

VALVE SIZE, NPS	FLANGELESS SS-252B DIMENSIONS (ISA S75.04)													ASME B16.5 RF FLANGES
	A	B	D	G	K	M		R	R1	S	T	U	W	
						CL300	CL600							
mm														
1	102	56		81	95	202	202	51	102	12.7				
1-1/2	114	62	188	89	121	224	224	73	119	15.7 and 15.7 x 12.7	117	- - -	14.2	
2	124	67		106	127	236	236	92	137	15.7 and 15.7 x 12.7				CL300 and 600
3	165	79	214	117	130	279	286	127	167	19.1	152	32	14.2	
4	194	101	214	133	141	305	343	157	197	19.1	152	32	14.2	
6	229	109	214	159	164(1)	362	413	216	260	25.4	152	32	14.2	
8	243	124	208	195	232	387	426	270	314	31.8	235	46	17.5	
Inch														
1	4.00	2.21		3.19	3.75	7.94	7.94	2	4.00	1/2				
1-1/2	4.50	2.46	7.38	3.50	4.75	8.81	8.81	2.88	4.68	5/8 and 5/8 x 1/2	4.62	- - -	0.56	
2	4.88	2.63		4.19	5.00	9.31	9.31	3.63	5.38	5/8 and 5/8 x 1/2				CL300
3	6.50	3.10	8.44	4.62	5.12	11.00	11.25	5.00	6.56	3/4	6.00	1.25	0.56	
4	7.62	3.99	8.44	5.25	5.56	12.00	13.50	6.19	7.76	3/4	6.00	1.25	0.56	
6	9.00	4.29	8.44	6.25	6.44(1)	14.25	16.25	8.50	10.24	1	6.00	1.25	0.56	
8	9.56	4.88	8.19	7.69	9.12	15.25	16.75	10.63	12.38	1-1/4	9.25	1.81	0.69	

1. 179 mm (7.06 inches) for NPS 6, CL600 valves only.

Figure 3. Fisher Flangeless SS-252B Dimensions (also see table 6)

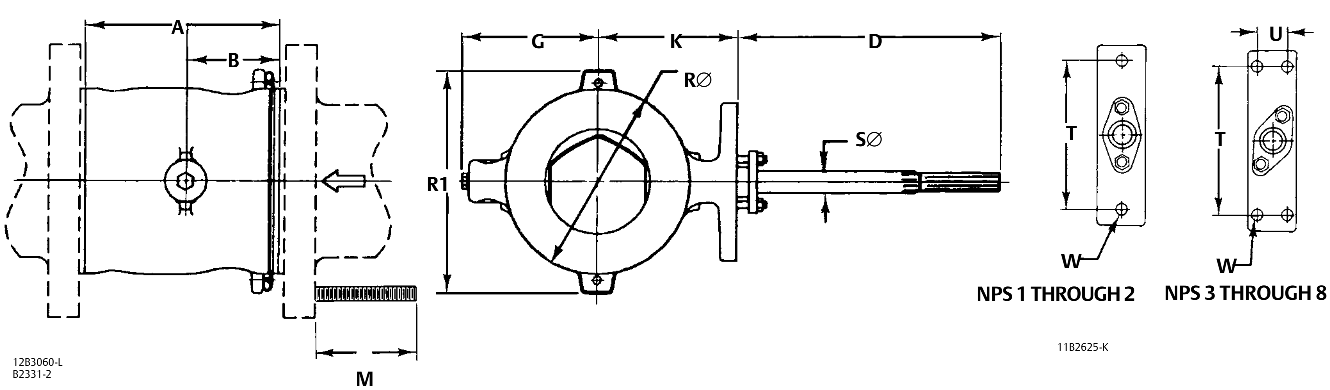
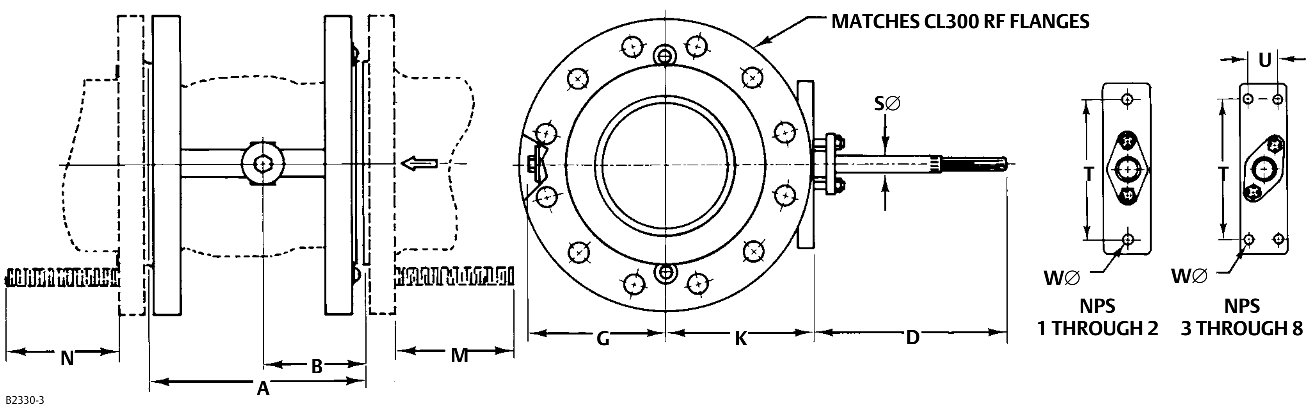


Table 7. Fisher Flanged SS-252B Dimensions

VALVE SIZE, NPS	DIMENSIONS (ISA S75.04)										
	A	B	D	G	K	M(1)	N(1)	S Diameter	T	U	W
mm											
1	102	56		81	95	100	94	12.7			
1-1/2	114	62	188	89	121	114	108	15.7 and 15.7 X 12.7	117	---	14.2
2	124	67		106	127	106	100	15.7 and 15.7 X 12.7			
3	165	79	214	117	130	133	121	19.1	152	32	14.2
4	194	101	214	133	141	140	127	19.1	152	32	14.2
6	229	109	214	159	164	152	140	25.4	152	32	14.2
8	243	124	208	195	232	165	152	31.8	235	46	17.5
Inch											
1	4.00	2.21		3.19	3.75	3.94	3.69	1/2			
1-1/2	4.50	2.46	7.38	3.50	4.75	4.50	4.25	5/8 and 5/8 X 1/2	4.62	---	0.56
2	4.88	2.63		4.19	5.00	4.19	3.94	5/8 and 5/8 X 1/2			
3	6.50	3.10	8.44	4.62	5.12	5.25	4.75	3/4	6.00	1.25	0.56
4	7.62	3.99	8.44	5.25	5.56	5.50	5.00	3/4	6.00	1.25	0.56
6	9.00	4.29	8.44	6.25	6.44	6.00	5.50	1	6.00	1.25	0.56
8	9.56	4.88	8.19	7.69	9.12	6.50	6.00	1-1/4	9.25	1.81	0.69

1. Clearance necessary to remove flange bolts.

Figure 4. Fisher Flanged SS-252B Dimensions (also see table 7)



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Fisher™ Vee-Ball™ V150, V200, and V300 Rotary Control Valves

This bulletin covers the DN 25 through 600 (NPS 1 through 24) V150, V200 and V300 Vee-Ball control valves. The Vee-Ball valve combines globe valve ruggedness with the efficiency of a rotary valve. The Vee-Ball valve is a segmented ball valve which features a contoured segmented V-Notch ball. A shearing action between the V-notch ball and the ball seal (figure 1) promotes smooth, nonclogging operation. The unrestricted straight-through flow design provides high capacity for gas, steam, liquids, and fibrous slurries.

V150, V200, and V300 valves mate with a variety of ASME raised face flanges, as well as with EN flanges (see Specifications).

To meet specific application requirements, a variety of metal and soft ball seal materials are available. A splined drive shaft combines with a variety of power operated and manual actuators to provide reliable, high-performance throttling or on-off operation for many different applications in the process industries.

X0187-1

NPS 3 V150 with Fisher 2052 Actuator and FIELDVUE™ DVC6200 Digital Valve Controller

X1800

NPS 16 V150 with Optional Cavitrol™ Hex Anti-Cavitation Trim and Fisher 1061 Actuator with DVC6200

X0337-1

NPS 3 V200 with Fisher 2052 Actuator and DVC6200

Features

- **Trim Versatility**—Trim components are interchangeable between V150, V200, and V300 valves. This feature allows you to reduce your spare parts inventory and maintenance procedures. The seal assembly can be changed without removing the actuator or without removing the ball from the valve body.

- **Easy Installation**—Flanged body design of the V150 and V300 eliminates exposed line flange bolting, reduces alignment and installation time, and promotes secure valve installations and piping integrity. The V200 is available with flanges in NPS 2 through 8.

Specifications

Valve Sizes

See table 1

Valve End Connection Styles

V150: Flanged valves that mate with CL150 raised-face flanges and EN 1092-1 Type B raised-face and Type F Recess

V200: Flangeless (all sizes) and flanged valves that mate with CL600 raised-face flanges (NPS 2-8)

V300: Flanged valves that mate with CL300 raised-face flanges and EN 1092-1 Type B raised-face and Type F Recess

Maximum Inlet Pressures[1]

Consistent with pressure-temperature ratings per ASME B16.34 and EN12516-1 for the body materials shown in table 1.

Specific to CW2M body material, refer to the pressure-temperature ratings shown in table 7.

Do not exceed the material temperature capabilities shown below or the allowable pressure drop as shown in tables 8 and 9.

Maximum Shutoff Pressure/Temperature Ratings[1]

Composition (Fisher TCM Plus or TCM Ultra), Flat Metal (NPS 3 through 12 valves only), HD and High Temperature HD Metal Ball Seals and Flow Ring: See table 9.

Shutoff Classification[1]

Fisher TCM Plus or Ultra Ball Seal (Forward Flow): Class VI per ANSI/FCI 70-2 and per IEC 60534-4,
Flat Metal Ball Seal for NPS 3 through 12 only (Forward Flow): Class IV per ANSI/FCI 70-2 and per IEC 60534-4,
HD (Heavy Duty) Ball Seal (Bidirectional Flow): 0.01% of valve capacity; Class IV per ANSI/FCI 70-2 and IEC 60534-4; Maximum allowable pressure drop in reverse flow is 6.9 bar (100 psi);
High Temperature HD (Heavy Duty) Ball Seal (Bidirectional Flow): Class III per ANSI/FCI 70-2 and IEC 60534-4
Flow Ring Construction (Bidirectional Flow): 5% of valve capacity at full travel
Micro-Notch Ball with HD Seal: 4 SCFH (Leakage rate equivalent to Class IV for standard ball. This is based on the capacity of a standard ball.)

Construction Materials

See tables 5 and 6

Temperature Capabilities[1,2]

Composition Seals
Fisher TCM Plus: -46 to 232°C (-50 to 450°F)
Fisher TCM Ultra: -46 to 260°C (-50 to 500°F)
HD Metal Seals: -46 to 288°C (-50 to 550°F)
PEEK HD Seal: -46 to 232°C (-50 to 450°F)
High Temperature HD Metal Seal: 288 to 427°C (550 to 800°F). Contact your Emerson sales office if higher temperatures are required.
Ceramic Micro-Notch Ball: -46 to 93°C (-50 to 200°F)[4]
Flow Ring or Flat Metal Seal : -198 to 425°C (-325 to 800°F)
PEEK/PTFE Bearings: -198 to 260°C (-325 to 500°F)

Packing Constructions

PTFE V-ring: -46 to 232°C (-50 to 450°F)
Graphite: -198 to 538°C (-325 to 1000°F)
ENVIRO-SEAL™ Single PTFE V-ring: -46 to 232°C (-50 to 450°F) (for 100 ppm service requirements)
ENVIRO-SEAL Graphite: -7 to 316°C (20 to 600°F) (for 100 ppm service requirements). This packing arrangement can be used to 371°C (700°F) for non-environmental service.

Flow Characteristic

Modified equal percentage

Dimensions

See figures 10, 11, and 13 for dimensions

Face-to-Face Dimensions

■ Standard Face-to-Face dimensions comply with ISA S75.08.02
■ ASME B16.10 short face-to-face dimensions are available as an option for NPS 1 through 12 valves. Note that ASME B16.10 short dimensions are longer than ISA S75.08.02. See figure 14 for dimensions.

(continued)

Specifications (continued)

Standard Flow Direction

Forward (into the convex face of the V-notch ball)

Flow Coefficients, Flow Coefficient Ratio[3], and Noise Levels

See Fisher Catalog 12

Maximum Ball Rotation

90 degrees

Actuator Mounting

Standard actuator mounting is on the right-hand side, as viewed from the valve inlet. The standard ball design and actuator action is counter-clockwise to close (CCW) so the ball will rotate to the top of the valve body when open for a horizontal pipe run with the valve shaft positioned horizontal.

Left-hand actuator mounting with CCW action is an option. Left-hand (optional) actuator mounting with a special clockwise to close (CW) ball design and actuator action is also available to allow the ball to rotate to the top of the valve body.[5]

Valve/Actuator Action

With diaphragm or piston rotary actuator, the valve is field-reversible between PDTC or PDTO:
■ push-down-to-close (extending actuator rod closes valve) and ■ push-down-to-open (extending actuator rod opens valve)

Approximate Weight

See table 2

Options

■ Pipe plug at end of follower shaft for all sizes, ■ Line flange bolting, ■ Materials that are compatible with sour service, ■ Alloy construction materials, ■ ENVIRO-SEAL packing system: See figure 9 and Bulletin 59.3:041, ENVIRO-SEAL Packing Systems for Rotary Valves (D101638X012) for more information, ■ Micro-Notch construction for NPS 1 valves (see Micro-Notch Construction section), ■ Alloy trim material , ■ Chrome Carbide coated internals (NPS 2 through 12), ■ Rotary attenuator to reduce aerodynamic noise and cavitation effects, ■ Double D, Square, and Keyed shaft options, ■ Cavitrol Hex anti-cavitation trim

1. The pressure/temperature limits in this bulletin, and any applicable code or standard limitation, should not be exceeded.
2. Additional limits are shown in tables 7, 8 and 9.
3. Ratio of maximum flow coefficients to minimum usable flow coefficient can also be called rangeability.
4. For the CG8M and alloy 6 Micro-Notch constructions, pressure and temperature capabilities are the same as for standard constructions.
5. The special clockwise to close (CW) action ball design is not available for the Micro-Notch, Macro-Notch, and Micro-Scratch constructions.

Table of Contents

Features (continued)

- **Application Versatility**—The valves are available with ISA S75.08.02 and IEC 534-3-2 face-to-face dimensions as a standard construction, and optional ASME B16.10 short face-to-face dimensions. IEC 534.3.2 face-to-face dimensions are equivalent to S75.08.02 face-to-face dimensions.

- **Long Service Life**—The solid HD ball seal (figures 1 and 2) construction provides long service life in demanding applications. The constant wiping action of the seal across the ball's sealing surface prevents scale and sludge buildup, and provides excellent service on steam, gases, slurries, and various liquid applications.

- **Excellent Flow Control**—Precise contouring of the Vee-Ball provides a modified equal percentage flow characteristic. For very precise control of low flow rates, the Micro-Notch option is available on the NPS 1 valve. See the Micro-Notch Construction section of this bulletin for more information.

- **Sour Service Capability**—Materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0175-2003, MR0103, and MR0175/ISO 15156.

- **Smooth Valve Operation**—Precision machined parts and pressure balanced seal designs allow smooth, precise movement of the ball.

- **Quick and Easy Maintenance**—Ball seal inspection and replacement is done at the valve body inlet without removing the actuator or disassembling the valve. Valve maintenance requires no special tools.

- **Structural Integrity**—One-piece valve body improves structural integrity of the pressure boundary by eliminating leak paths that could be caused by the gaskets in two-piece, bolted valve designs.

- **Exceptional Environmental Capabilities**—The optional ENVIRO-SEAL packing systems are designed with very smooth shaft surfaces and live loading to provide exceptional sealing. The seal of the ENVIRO-SEAL system can restrict emissions to less than the EPA (Environmental Protection Agency) limit of 100 ppm (parts per million).

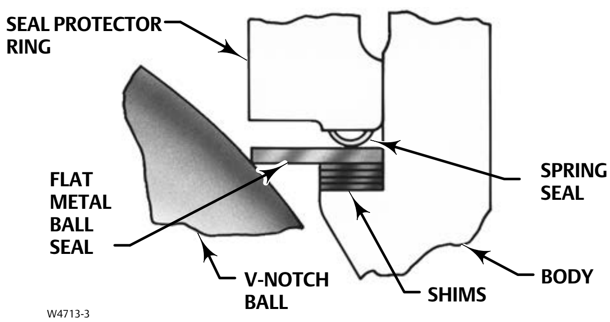
- **Severe Service Trim Options**—Fisher Vee-Ball Series valves with the severe service attenuator or Cavitrol Hex anti-cavitation trim installed combine the efficiency of a rotary valve with the energy absorbing capability of a special trim to provide improved performance for demanding applications. The Fisher attenuator and Cavitrol Hex trim options were designed for gas and liquid service to reduce noise and cavitation effects that cause pipeline vibration.

Table 1. Valve Body Materials, End Connections, and Ratings

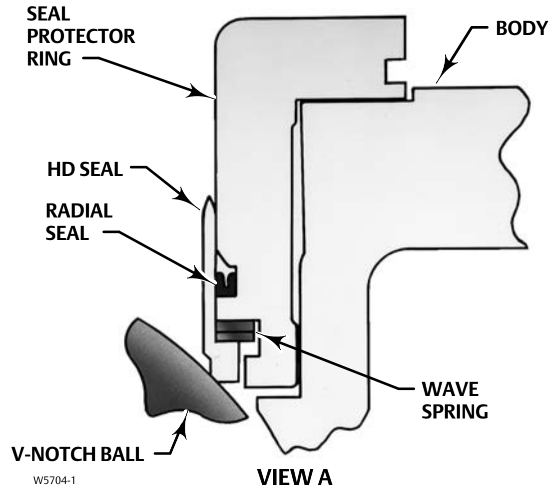
VALVE DESIGN	VALVE BODY MATERIAL	SIZE NPS / DN	RATINGS ASME / PN
V150	WCC	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12, 14, 16, 20, 24x20[5]	CL150
	WCC / 1.0619[1]	DN 80, 100, 150	PN 10-16
		DN 200, 250, 300	PN 10 or PN 16
	LCC	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	CL150
		DN 80, 100, 150	PN 10-16
		DN 200, 250, 300	PN 10 or PN 16
	CF3M,[2] CF8M/1.4408[2]	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	CL150
	CF3M/1.4409[1] CF8M/1.4408[1]	DN 80, 100, 150	PN 10-16
		DN 200, 250, 300	PN 10 or PN 16
	R50550	NPS 1, 1-1/2, 2, 3, 4, 6	CL150
	CG8M	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12, 14, 16, 20, 24x20[5]	
	CW2M	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	
	M35-2	NPS 1, 1-1/2, 2, 3, 4, 6, 8	
	CD3MN[3]	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	
	CD3MWCuN[3]	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	
	CK3MCuN	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	
V200[4]	WCC, LCC, CG8M, or CF3M[2]	NPS 1, 1-1/2, 2	CL150/300/600 flangeless
		NPS 3, 4	CL150 and CL300/600 flangeless
		NPS 6, 8	CL150/300 and CL600 flangeless
		NPS 10	CL150 flangeless
	WCC, LCC, or CG8M	NPS 2, 3, 4, 6, 8	CL600
	WCC/1.0609[1]	NPS 2, 3, 4, 6, 8	CL600
	CF8M/1.4408[2]	DN 50, 80, 100, 150, 200	PN 63-100
	CW2M, M35-2, or CK3MCuN	NPS 1, 1-1/2, 2, 3, 4, 6, 8	CL150/300/600 flangeless
	CK3MCuN	NPS 10	CL150 flangeless
V300	WCC	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12, 14, 16, 20	CL300
	WCC / 1.0619[1]	DN 25, 40, 50	PN 10-40
		DN 80, 100, 150	PN 25-40
		DN 200, 250, 300	PN 25 or PN 40
	LCC	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	CL300
		DN 25, 40, 50	PN 10-40
		DN 80, 100, 150	PN 25-40
		DN 200, 250, 300	PN 25 or PN 40
	CF3M[2] CF8M/1.4408[2]	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	CL300
	CF3M/1.4409[1] CF8M/1.4408[1]	DN 25, 40, 50	PN 10-40
		DN 80, 100, 150	PN 25-40
	R50550	NPS 1, 1-1/2, 2, 3, 4	CL300
	CF3M/1.4409[1] CF8M/1.4408[1]	DN 200, 250, 300	PN 25 or PN 40
	CG8M	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12, 14, 16, 20	CL300
	CW2M	NPS 1, 1-1/2, 2, 3, 4, 6, 8	
	M35-2	NPS 1, 1-1/2, 2, 3, 4, 6, 8	
	CD3MN[3]	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	
	CD3MWCuN[3]	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	
	CK3MCuN	NPS 1, 1-1/2, 2, 3, 4, 6, 8, 10, 12	

1. WCC and EN Stl 1.0619 are dual certified. CF3M and EN SST 1.4409 are dual certified. CF8M and EN SST 1.4408 are dual certified.
2. CF3M is offered in Europe and Asia Pacific. CF8M / 1.4408 is only offered in Europe.
3. NORSOK compliant materials available upon request.
4. Flangeless V200 assemblies mate with raised-face flanges.
5. Valve body mates with NPS 24 ASME CL150 flanges. Internal based on NPS 20 valve design.

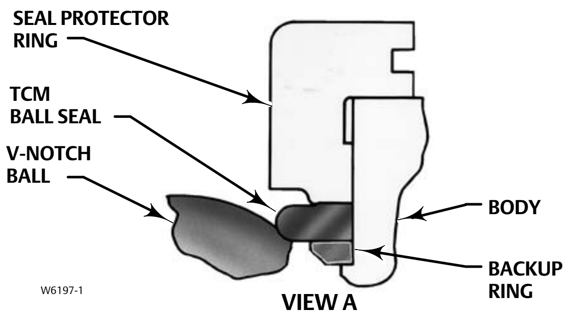
Figure 1. Vee-Ball Construction Features, Seals (Fisher V150 Shown)



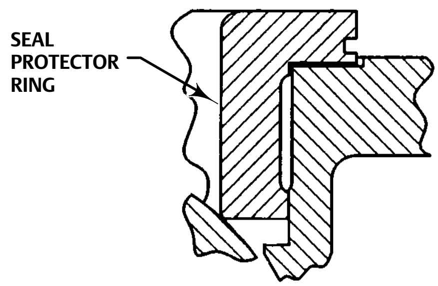
VIEW A
FLAT METAL BALL SEAL DETAIL
FOR DN 80 THROUGH 300
(NPS 3 THROUGH 12)



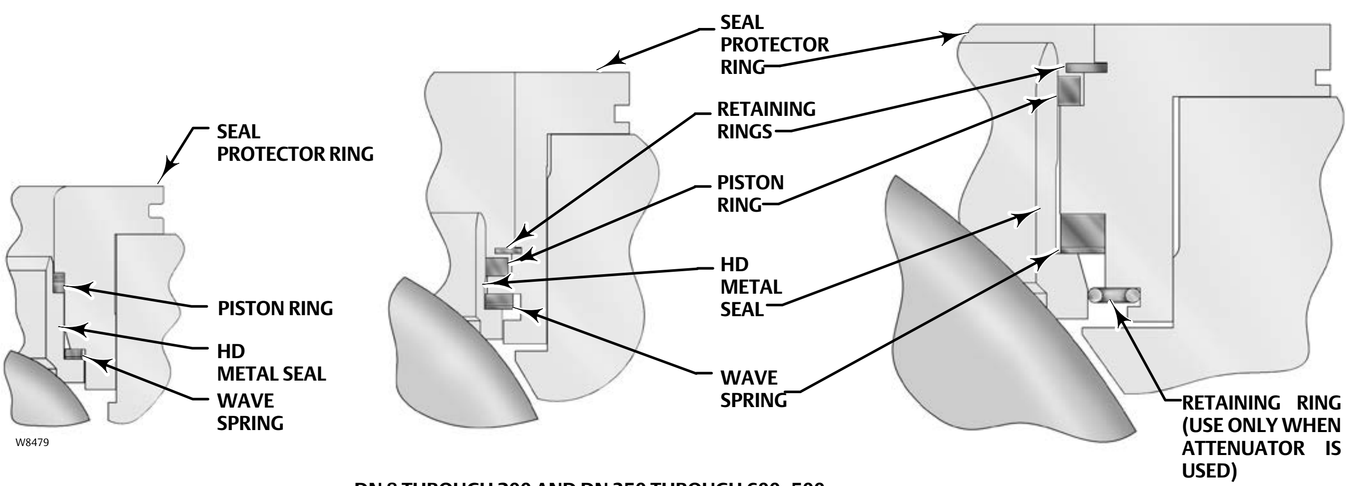
VIEW A
HD BALL SEAL DETAIL



VIEW A
FISHER TCM PLUS BALL SEAL
DN 25, 40, AND 50
(NPS 1, 1-1/2, AND 2) VALVES



VIEW A
FLOW RING DETAIL



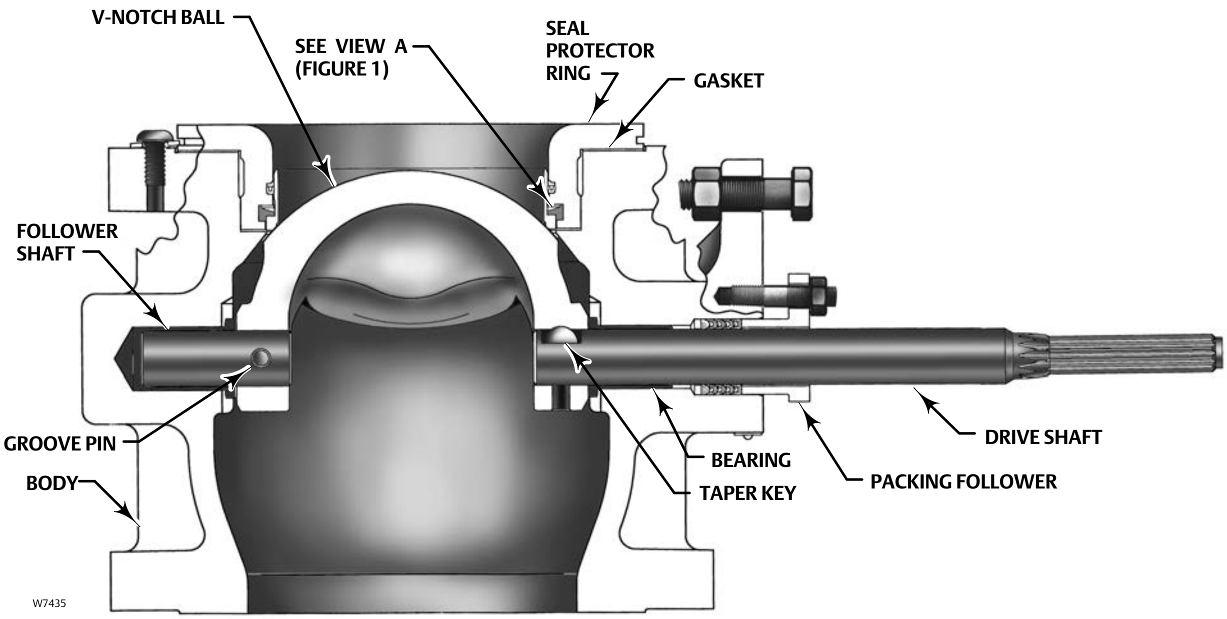
DN 25, 40, AND 50
(NPS 1, 1-1/2 AND 2)
HD BALL SEAL

DN 8 THROUGH 200 AND DN 350 THROUGH 600x500
(NPS 3 THROUGH 8 AND NPS 14 THROUGH 24x20)
HD BALL SEAL

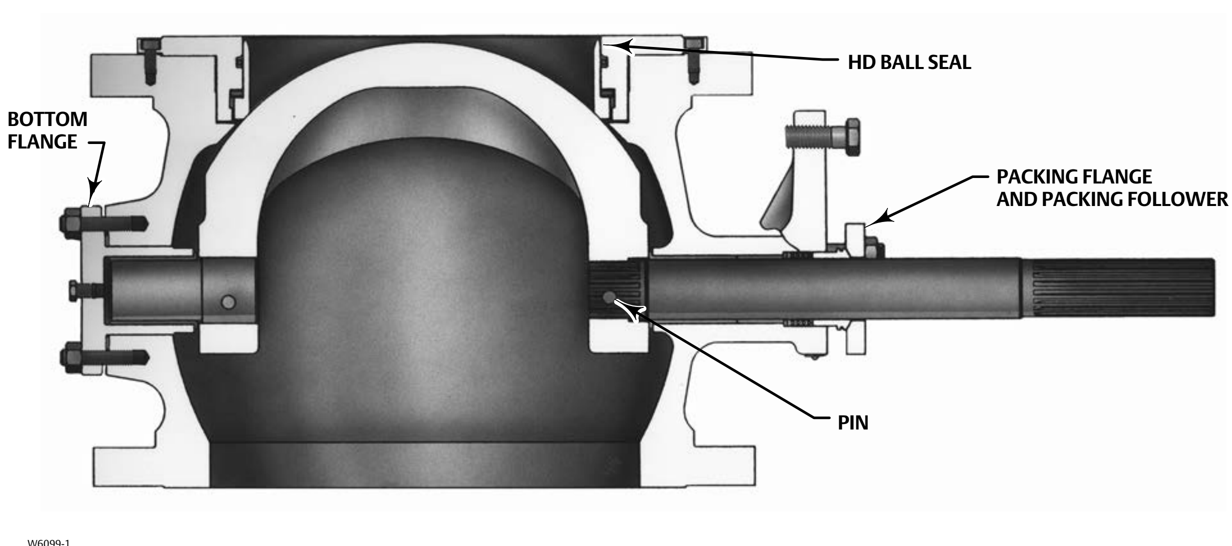
DN 250 AND 300
(NPS 10 AND 12)
HD BALL SEAL

VIEW A
HIGH-TEMPERATURE HD BALL SEAL

Figure 2. Vee-Ball Construction Features (Fisher V150 Shown)



DN 80 THROUGH 300
(NPS 3 THROUGH 12) VALVES
(HD BALL SEAL SHOWN)



DN 350, 400, 500 and 600x500
(NPS 14, 16, 20, and 24x20) VALVES
(HD BALL SEAL)

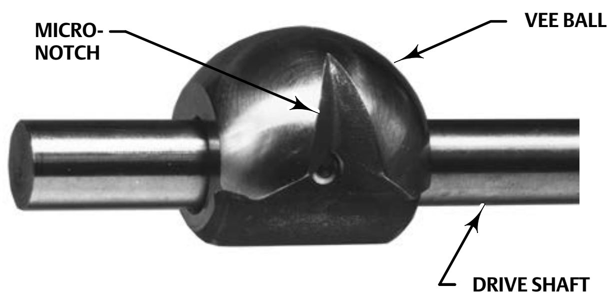
Table 2. Valve Weights, Approximate

VALVE SIZE		V150		V200		V300	
DN	NPS	kg	lbs	kg	lbs	kg	lbs
25	1	5.6	13	4.5	10	8	17
40	1-1/2	8.2	19	6.4	14	12	27
50	2	9.1	21	10	23	17	38
80	3	13	43	15	34	28	61
100	4	26	57	22	48	37	81
150	6	42	93	36	80	60	133
200	8	72	158	62	136	103	226
250	10	107	235	114	252	200	440
300	12	157	347	- - -	- - -	293	645
350	14	247	545	- - -	- - -	374	825
400	16	333	735	- - -	- - -	510	1125
500	20	524	1155	- - -	- - -	755	1661
600x500	24x20	757	1666	- - -	- - -	- - -	- - -

Series B

NPS 3 through 12 have been changed to reduce parts and to improve control performance. The V-notch Ball now resembles the NPS 14 through 24x20 V-notch Ball. The pressed-in bushings have been eliminated, as well as the thrust washer.

Figure 3. Typical Micro-Notch Ball and Shaft



Micro-Notch Construction

For very precise control of low flow rates, the Micro-Notch construction (see figure 3) is available on DN 25 (NPS 1) valves. Three Micro-Notch ball materials are available: chrome-plated CG8M (317 stainless steel), solid alloy 6, and solid VTC ceramic. A VTC ceramic HD seal is standard with the VTC ceramic ball. For the CG8M and alloy 6 constructions, pressure and temperature capabilities are the same as for standard constructions. For the ceramic construction, maximum temperature is 93°C (200°F).

For further information, please refer to the Fisher Vee-Ball V150, V200 and V300 Rotary Control Valves NPS 1 through 12 Instruction Manual (D101554X012).

In addition to the standard Micro-Notch offering, options are available in both low (Micro-Scratch) and high (Macro-Notch) flow construction. Contact your Emerson sales office for more information.

Severe Service Attenuator

Fisher Vee-Ball series valves (V150, V200 flanged and flangeless, and V300), with the severe service attenuator, combine the efficiency of a rotary valve with the energy absorbing capability of a special trim to provide improved performance for demanding applications. The Fisher attenuator design can be utilized in both liquid and gas service to reduce cavitation and noise effects that cause pipeline vibration. See table 3 for a competitive comparison.

The attenuator will not change the NACE compliance of the Vee-Ball valve. When a rotary noise attenuator is installed in a Vee-Ball valve, the V-Notch is no longer a point of high-velocity erosion. As a result, the CoCr-A V-Notch option is not required when a rotary attenuator is used. The rotary attenuator and CoCr-A V-Notch options are not available together.

Features

- **Trim Versatility** — Trim components are interchangeable for Fisher V150, V200, and V300 valves. This feature allows you to reduce your spare parts inventory and maintenance procedures.

- **Attenuator-Ball Fabrication** — The ball-attenuator construction provides structural integrity because of its rugged fabrication weld.

- **Attenuator Performance** — Up to -10 dBA acoustical attenuation, and a K_c = 1.0 for hydrodynamics are achievable depending on service conditions.

- **Valve Sizes and End Connection Styles** — NPS 4 through 20 applicable Vee-Ball valves that mate with ASME CL150, CL300, and CL600 raised-face flanges. In addition, DN100 through DN300 valve sizes that mate with PN10, 16, 25, or 40 raised-face flanges.

Attenuator Ball Material

Standard attenuator ball material is CG8M, M35-1, CW2M, or CK3McuN.

Standard Flow Direction

Forward flow direction is into the convex face of the V-notch ball. The valve with the attenuator must be placed in the forward flow direction for the attenuator to be effective.

Actuator Mounting

Right-hand or left-hand as viewed from the upstream end of the valve. Counter-clockwise to close and clockwise to close ball designs are available.

Figure 4. Fisher Vee-Ball Series Noise Attenuator Ball

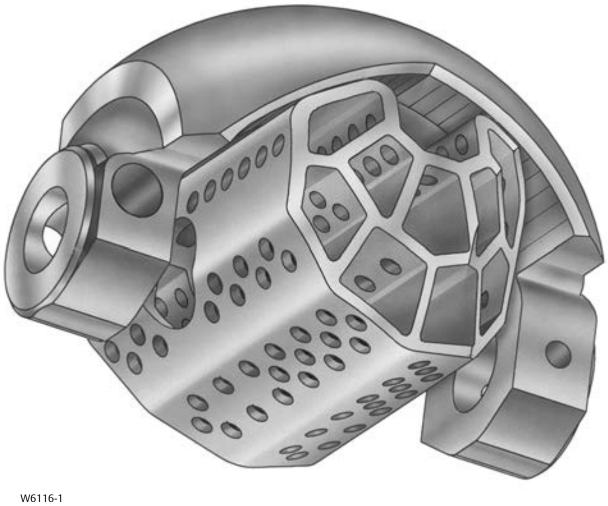


Figure 5. Fisher Vee-Ball Series Rotary Attenuator Construction

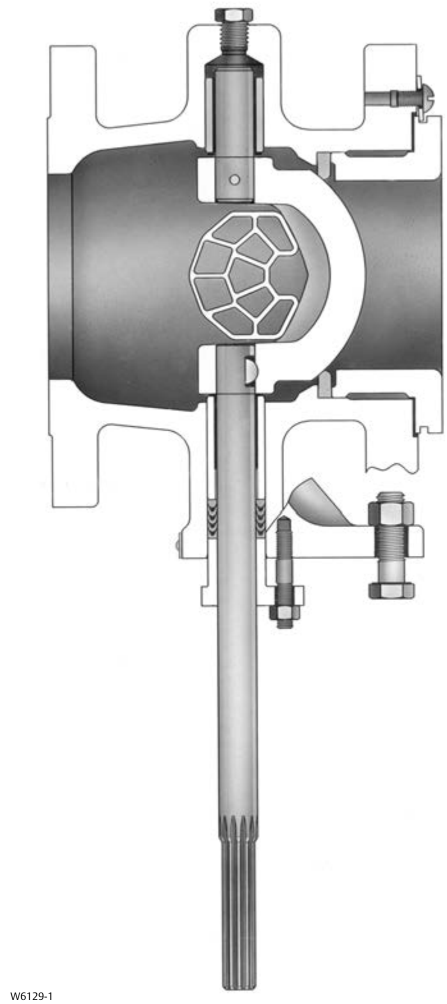


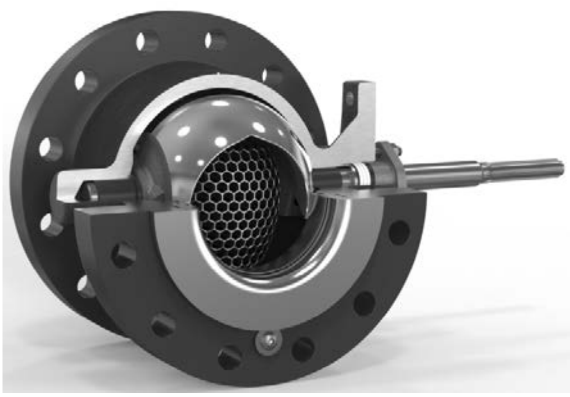
Table 3. Segmented Ball Benefits Analysis Comparison

Benefits	Typical Competitive Device	Fisher Vee-Ball Attenuator
Predictable Performance	No	Yes
-10 dBA Aerodynamic Noise Attenuation	No	Yes
Superior Attenuation Effect at Critical Opening Position	No	Yes
Maximum Pressure Drop Capability	No	Yes
Heavy Duty, Integrally Welded Attenuator/Ball Assembly	No	Yes
Valve Splined Shaft Connects to Clamped Actuator Lever to Minimize Lost Motion	No	Yes
Superior Soft Seats for Tight Shutoff	No	Yes
Moderate Kc Improvement vs Unattenuated Device	Yes	Yes
Trunnion Mounted Ball for Superior Wear Resistance	Yes	Yes
Heavy Duty Metal Seats for Demanding Applications	Yes	Yes

Cavitrol Hex Anti-Cavitation Trim

Designed for the V150, V300, and V200 flanged CL600 valve designs, the Fisher Cavitrol Hex trim option provides improved performance for severe service applications and maintains the efficiency of a rotary valve. The Cavitrol Hex reduces cavitation and noise effects that cause pipeline vibration

Figure 6. Fisher NPS 6 V300 Cutaway Image with Optional Cavitrol Hex Anti-Cavitation Trim



X1561

Features

- Retrofitability — Convert previously installed Fisher Vee-Ball Series valves with the Cavitrol Hex anti-cavitation trim after minimal modification to the valve body outlet flange.
- Materials — Standard Cavitrol Hex trim material is S31603. R31233 material is also available when a harder, more erosion-resistant trim option is required.
- Performance — A Kc=1.0 for hydrodynamics is achievable at extreme service conditions.
- Standard Flow Direction — Forward flow is into the convex face of the V-notch ball. The valve with the Cavitrol Hex trim should be installed in the forward flow direction for the anti-cavitation trim to be most effective.
- Actuator Mounting — Right hand or left hand as viewed from the upstream end of the valve. Counter-clockwise to close and clockwise to close ball action is available.
- Valve Sizes and End Connection Styles — NPS 4 through 20, applicable Vee-Ball valves that mate with CL150, 300 or 600 raised face flanges.

Figure 7. Fisher NPS 8 V300 Cavitrol Hex Cross Sectional View

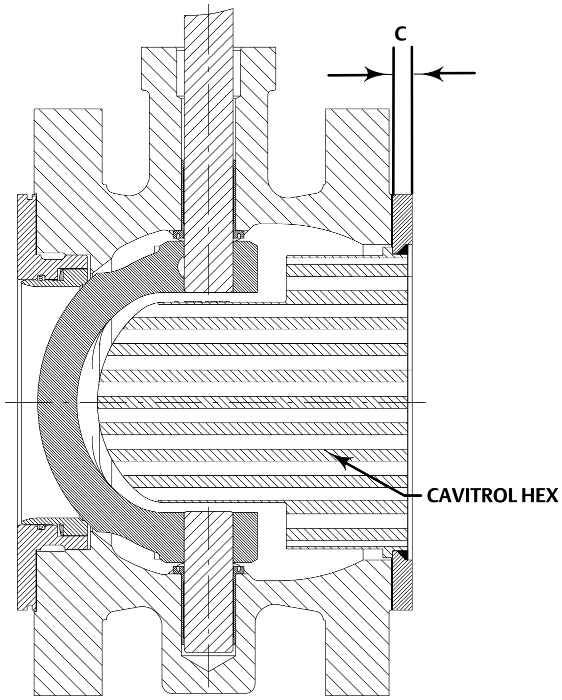


Table 4. Fisher Cavitrol Hex Dimensions and Weight

VALVE SIZE	FLANGE THICKNESS C (ADD TO OVERALL FACE-TO-FACE DIMENSION)		WEIGHT	
NPS	mm	Inch	kg	lbs
4	12.7	0.5	3.3	7.3
6	12.7	0.5	7.8	17.3
8	12.7	0.5	12.8	28.3
10	12.7	0.5	24.0	53.1
12	12.7	0.5	35.7	78.8
14	12.7	0.5	44.1	97.3
16	12.7	0.5	63.5	139.9
20	12.7	0.5	111.2	245.1

Figure 8. Fisher NPS 10 Fisher Cavitrol Hex Trim

Table 5. Materials of Construction for DN 25 through 300 (NPS 1 through 12) Valves

PART		MATERIAL
Valve Body and Seal Protector Ring or Flow Ring		WCC steel (EN 1.0619), CG8M (317 SST), R50550[10], CF3M[1] (316L SST EN 1.4409 or optional, or CF8M (316 SST EN 1.4408) EN 1.4581), CD3MN, CD3MWCuN, CW2M (CW2M valve available with Fisher TCM Plus seal only), M35-2 or CK3MCuN
Backup Ring [DN 25, 40, and 50 (NPS 1, 1-1/2, and 2) only]		CG8M, CF3M[1], R50550, or CW2M
Segmented V-Notch Ball		CG8M, R50550, CF3M, CW2M, chromium-plated CF3M, chromium-plated CG8M, chromium-plated CG8M with alloy 6 notch, chromium-plated CF3M with alloy 6 notch, chromium-plated CD3MN, chromium-plated CD3MWCuN, M35-1, or CK3MCuN
Seal	Fisher TCM	Fisher TCM Plus and Fisher TCM Ultra
	Flat Metal Seal, Shims, and Spring Seal[7]	Spring Tempered S31600 (316 SST) or Spring Tempered S30200 (302 SST) for NPS 12 valves only
	HD (Heavy-Duty) Ball Seal	CF10SMnN[2] , CD7MCuN[3] (alloy 255 duplex stainless steel) or R30006 (Alloy 6)
	High Temperature HD Seal	R30006 (Alloy 6)
Wave Spring (use with HD seal)		N07750
HD Seal Radial Seal		Graphite reinforced PTFE
High Temp HD Seal Piston Ring		Graphite FMS 17F39
Bearings		PEEK[4]/Carbon-filled PTFE liner, S31603 Nitride, R30006 (alloy 6), silver-plated R30006, N10276 with carbon-filled PTFE liner, or N10276 with glass-filled PTFE liner R50400 PTFE/carbon liner (through NPS 6), R50400 PTFE/glass liner (through NPS 6)
Seal Retainer Gasket		Laminated graphite
Packing		PTFE V-ring with one carbon-filled PTFE ring[5], PTFE V-ring, graphite ribbon, ENVIRO-SEAL PTFE, or ENVIRO-SEAL graphite
Shafts		S20910, S17400 (17-4PH SST), N10276, N05500, S31254[8], R50550, or S32760[8]
Groove Pin		R50550, S31600 or N10276
Taper Key		R50550, R30006[6], S20910, or N10276
Taper Pin [DN 25, 40, and 50 (NPS 1, 1-1/2, and 2) only]		R50550, S20910, or N10276
Pipe Plug (Optional)		S31600 N10276, or S31603 (316L SST)
Seal Retainer Screws and Washers		Stainless steel
Packing Follower and Packing Box Ring		R50550, CF8M (316 SST), N10276, S312254, or N10276 with separate S31600 packing box flange
Actuator Mounting Bolts and Nuts		Grade 5 steel or strain-hardened B8M stainless steel
Spacer and Bushing		S31700, N10276, or S31603
Packing Follower Bolting and Optional Line Bolting		SA-193-B7, SA-193-B7M, or strain-hardened SA-193-B8M
Attenuator[9]		CG8M, M35-1, CW2M, or CK3MCuN
Cavitrol Hex		S31603 or R31233

1. CF3M and CF8M are available in all areas as a special order and are offered as standard material in Europe.
2. Recommended for lubricated and non-lubricated service and where corrosion properties similar to 304 stainless steel are acceptable.
3. Recommended for lubricated service and where corrosion properties equal to or better than 317 stainless steel are required.
4. PEEK is poly-ether-ether-ketone.
5. The carbon-filled PTFE ring is used for grounding.
6. Standard material offered in North America.
7. Offered for lubricated service only.
8. S31254 and S32760 shafts may cause the valve to be derated. Contact your Emerson sales office.
9. Attenuator material will match segmented V-Notch ball material.
10. R50550 is available with TCM seat. For other seal availability contact your Emerson sales office.

Table 6. Materials of Construction for DN 350, 400, 500, and 600x500 (NPS 14, 16 20, and 24x20) Valves

PART		MATERIAL
Valve Body, Seal Protector Ring, and Flow Ring		WCC steel or CG8M (317 stainless steel)
Segmented V-Notch Ball		Chromium-plated CG8M, CG8M, Chromium-plated CG8M with alloy 6 notch
Ball Seal	Fisher TCM	Fisher TCM Plus and Fisher TCM Ultra
	HD (Heavy-Duty Metal)	CF10SMnN(1) , CD7MCuM(2) (alloy 225 duplex stainless steel) or CG8M/CoCr-A
Wave Spring (use with HD seal)		N07750
Radial Seal (use with HD seal)		PTFE with N10276 spring
Bearings		PEEK/PTFE(3), S44004 (440C stainless steel--use with S17400 [17-4PH stainless steel] shafts, alloy 6B, and silver plated alloy 6B
Thrust Washer (use with metal bearings)		Alloy 6B
Seal Retainer Gasket		Laminated Graphite
Packing		PTFE V-ring with one conductive V-ring(4), PTFE V-ring, graphite ribbon, ENVIRO-SEAL PTFE, or ENVIRO-SEAL graphite
Shafts		S17400 (17-4 stainless steel) or S20910
Pins		S20910
Pipe Plug		S31700 (317 stainless steel)
Packing Follower Bolting		B7M steel or strain-hardened B8M stainless steel
Retainer Screw		B8M stainless steel
Packing Follower and Packing Box ring		S31600 (316 stainless steel)
Packing Flange		Steel or S31600
Actuator Mounting Bolts and Nuts		Grade 5 steel or strain-hardened B8M stainless steel
Gasket (used with bottom flange)		S31603 (316L stainless steel) spiral wound
Stud and Hex Nut (used with bottom flange)		B7 steel or strain-hardened B8M stainless steel
Attenuator		CG8M

1. Recommended where corrosion properties similar to 304 stainless steel are acceptable.
2. Recommended for lubricated service and where corrosion properties equal to or better than S31700 stainless steel.
3. PEEK (Poly-ether-ether-ketone) w/PTFE liner.
4. A carbon-filled PTFE ring is used for grounding.

Figure 9. Typical ENVIRO-SEAL Packing Arrangements

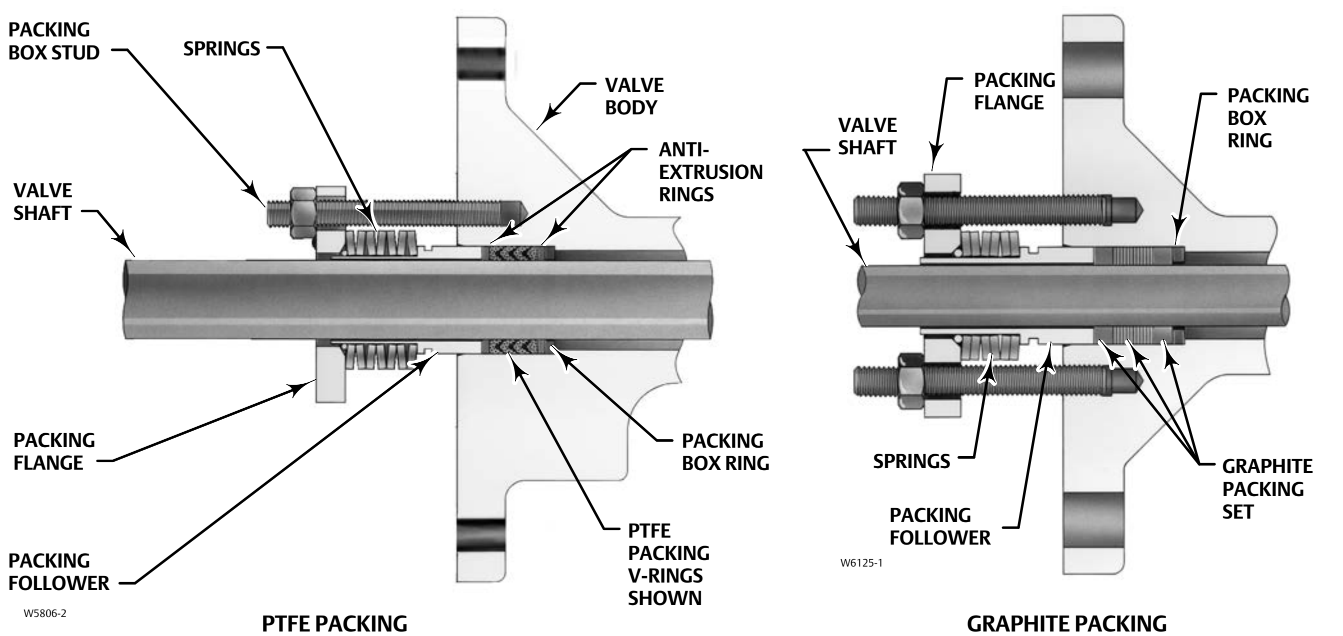


Table 7. Maximum Allowable Inlet Pressure for CW2M Valves

TEMPERATURE	CW2M[1]					
	150[2]	300[2]	PN 10[2]	PN 16[2]	PN 25[2]	PN 40[2]
°C	Bar					
−46 to 38	20.0	51.7	10.0	16.0	25.0	40.0
50	19.5	51.7	9.9	15.9	24.8	39.6
100	17.7	51.5	9.4	15.1	23.6	37.8
150	15.8	50.3	9.4	15.1	23.6	37.8
200	13.8	48.3	9.1	14.6	22.9	36.6
232	12.7	47.0	9.1	14.6	22.9	36.6
°F	Psi					
−50 to 100	290	750	145	232	362	580
200	260	750	144	230	359	575
300	230	730	137	219	342	548
400	200	700	133	212	331	530
450	185	680	133	212	331	530

1. This material is not listed in EN 12516-1 or ASME B16.34. Also see the Installation section.
2. The designations PN or 150 and 300 are used only to indicate relative pressure-retaining capabilities and are not EN or ASME pressure-temperature rating class designations.

Pressure Drops

Pressure drop limits of any given valve are based on valve body, and trim material limits. To find the appropriate pressure drop limitation, choose the desired valve size and temperature range. Then search table 8 for body limitations and table 9 for trim limitations. Information on limits for S31254, CW2M, M35-2, CD3MN, CD3MWCuN, and other alloy constructions can be obtained by contacting your Emerson sales office. The lowest number from the tables is the appropriate limit. The tables for both trim and body limits must be consulted.

Table 8. Maximum Allowable Shutoff Pressure Drops (Body Ratings)
(Tables for both trim and body limits must be consulted)

TEMPERATURE RANGE	PRESSURE CLASS													
	WCC CL150	CF3M CF8M CL150	CG8M CL150	LCC CL150	R50550 CL150	WCC CL300	CF3M CF8M CL300	CG8M CL300	LCC CL300	R50550 CL300	WCC CL600	CF3M CF8M CL600	CG8M CL600	LCC CL600
°C	Bar													
-46 to -29	- - -(1)	19.0	19.0	20	18.3	- - -(1)	49.6	49.6	51.7	47.2	- - -(1)	99.3	99.3	103
-29 to 38	20.0	19.0	19.0	20	18.3	51.7	49.6	49.6	51.7	47.2	103	99.3	99.3	103
93	17.9	16.2	16.2	17.9	15.5	51.7	42.7	42.7	51.7	40.7	103	85.5	85.5	103
149	15.9	14.8	14.8	15.9	12.8	50.3	38.6	38.6	50.3	33.0	100	77.2	77.2	100
177	- - -(2)	- - -(2)	- - -(2)	- - -(2)	11.7	- - -(2)	- - -(2)	- - -(2)	- - -(2)	30.0	- - -(2)	- - -(2)	- - -(2)	- - -(2)
204	13.8	13.4	13.4	13.8	10.3	48.6	35.5	35.5	48.6	26.9	97.2	70.6	70.6	97.2
232	12.8	12.8	12.8	12.8	9.3	47.2	34.5	34.5	47.2	24.5	94.5	68.6	68.6	94.5
260	11.7	11.7	11.7	11.7	8.3	45.9	33.1	33.1	45.9	22.1	91.7	65.8	65.8	91.7
316	10.7	10.7	10.7	10.7	7.9	43.8	32.1	32.1	43.8	20.7	87.6	64.1	64.1	87.6
343	9.65	8.62	8.62	9.65	7.2	41.7	31.0	31.0	41.7	19.0	83.4	62.4	62.4	83.4
371	8.62	7.58	7.58	- - -	- - -	40.7	30.7	30.7	- - -	- - -	81.0	60.0	60.0	- - -
399	6.55	6.55	6.55	- - -	- - -	34.8	29.3	29.3	- - -	- - -	69.6	58.9	58.9	- - -
427	5.52	5.52	5.52	- - -	- - -	28.3	29.0	29.0	- - -	- - -	56.9	58.3	58.3	- - -
°F	Psi													
-50 to -20	- - -(1)	275	275	290	265	- - -(1)	720	720	750	695	- - -(1)	1440	1440	1500
-20 to 100	290	275	275	290	265	750	720	720	750	695	1500	1440	1440	1500
200	260	235	235	260	225	750	620	620	750	590	1500	1240	1240	1500
300	230	215	215	230	185	730	560	560	730	480	1455	1120	1120	1455
350	- - -(2)	- - -(2)	- - -(2)	- - -(2)	170	- - -(2)	- - -(2)	- - -(2)	- - -(2)	435	- - -(2)	- - -(2)	- - -(2)	- - -(2)
400	200	195	195	200	150	705	515	515	705	390	1410	1025	1025	1410
450	185	185	185	185	135	685	500	500	685	355	1370	995	995	1370
500	170	170	170	170	120	665	480	480	665	320	1330	955	955	1330
550	155	155	155	155	115	635	465	465	635	300	1270	930	930	1270
600	140	140	140	140	105	605	450	450	605	275	1210	905	905	1210
650	125	125	125	125	- - -	590	445	445	590	- - -	1175	890	890	1175
700	110	110	110	- - -	- - -	570	430	430	- - -	- - -	1135	870	870	- - -
750	95	95	95	- - -	- - -	505	425	425	- - -	- - -	1010	855	855	- - -
800	80	80	80	- - -	- - -	410	420	420	- - -	- - -	825	845	845	- - -

1. Low temperature for these materials limited to -29°C (-20°F).
2. Refer to ASME B16.34.

Table 9. Maximum Allowable Shutoff Pressure Drops based on Trim (Bearing and Seal)
(Note: Do not exceed the PN or ASME pressure/temperature rating of the valve or mating flanges)

BEARING MATERIAL	BALL SEAL	TEMPERA-TURE RANGE, °C	VALVE SIZE, DN												
			25	40	50	80	100	150	200	250	300	350	400		500[4]
			Bar												
			Shaft Size, Inches												
			1/2	5/8	5/8	3/4	3/4	1	1-1/4	1-1/4	1-1/2	1-3/4	2-1/8x2	2-1/8	2-1/2
PEEK/PTFE	Fisher TCM Plus or Ultra	-46 to 38	51.7	51.7	51.7	51.7	51.7	51.7	51.7	40.2	37.6	31.0	23.8	31.0	31.0
		93	37.9	37.9	37.9	37.9	37.9	37.9	37.9	37.9	37.6	31.0	23.8	31.0	31.0
		149	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	23.8	24.1	24.1
		204	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
		232	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.44	3.45
	HD Seal[1]	-46 to 260	51.7	51.7	51.7	51.7	51.7	51.7	51.7	40.9	38.1	31.0	26.5	31.0	31.0
	Flat Metal[2]	-73 to 260	- - -	- - -	- - -	20.7	20.7	20.7	20.7	10.3	10.3	- - -	- - -	- - -	- - -
	Flow Ring	260	103.4	103.4	103.4	103.4	72.4	75.2	73.8	40.5	37.7	40.5	35.0	48.8	44.7
R30006	HD Seal[1]	-46 to 288	51.7	50.0	25.7	17.5	11.0	10.9	11.2	6.14	5.72	6.14	7.52	7.51	6.83
	High Temp HD Seal[1]	228 to 427	38.3[3]	37.5[3]	19.3[3]	13.2[3]	8.3[3]	8.2[3]	8.4[3]	4.6[3]	4.3[3]	4.62	5.65	5.65	5.10
	Flat Metal[2]	-73 to 427	- - -	- - -	- - -	17.0	10.1	10.7	10.6	5.86	5.52	- - -	- - -	- - -	- - -
	Flow Ring	427	74.5	49.6	26.8	18.8	10.9	11.2	11.1	6.07	5.65	6.07	7.31	7.30	6.69
R30006 Silver Plated	HD Seal[1]	-46 to 288	51.7	51.7	51.7	35.0	22.1	21.8	22.5	12.3	11.4	12.3	13.2	15.0	13.7
	High Temp HD Seal[1]	228 to 427	38.3[3]	38.3[3]	38.3[3]	26.3[3]	16.5[3]	16.3[3]	16.9[3]	9.2[3]	8.6[3]	9.16	11.2	11.2	10.2
	Flat Metal[2]	-73 to 427	- - -	- - -	- - -	20.7	20.1	20.7	20.7	10.3	10.3	- - -	- - -	- - -	- - -
	Flow Ring	427	103.4	103.4	53.5	37.6	21.8	22.5	22.2	12.1	11.3	12.1	14.6	14.6	13.4
S31603L Nitride	HD Seal[1]	-46 to 288	51.0	51.0	51.0	51.7	36.7	36.3	37.4	20.5	19.1	20.5	25.0	25.0	14.0
	High Temp HD Seal[1]	228 to 427	- - -	- - -	- - -	38.3[3]	27.6[3]	27.2[3]	28.1[3]	15.4[3]	14.3[3]	15.3	18.7	18.7	17.0
	Flat Metal[2]	-73 to 427	- - -	- - -	- - -	20.7	20.7	20.7	20.7	10.3	10.3	- - -	- - -	- - -	- - -
	Flow Ring	427	99.3	99.3	88.9	62.7	36.3	37.4	37.0	20.2	18.8	20.2	24.3	24.3	22.3
R50400 PTFE or N10276 PTFE	Fisher TCM Plus or Ultra	-46 to 38	51.7	51.7	51.7	51.7	36.75	36.3	37.4	20.5	19.1	20.5	25	25	22.75
		93	37.9	37.9	37.9	37.9	36.75	36.3	37.4	20.5	19.1	20.5	25	25	22.75
		149	24.1	24.1	24.1	24.1	24.1	24.1	24.1	20.5	19.1	20.5	25	25	22.75
		204	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
		232	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45
	Flow Ring	260	103.4	103.4	103.4	103.4	72.4	75.2	73.8	40.5	37.7	40.5	35.0	48.8	44.7

-continued-

Table 9. Maximum Allowable Shutoff Pressure Drops based on Trim (Bearing and Seal)
(Note: Do not exceed the PN or ASME pressure/temperature rating of the valve or mating flanges) (cont.)

BEARING MATERIAL	BALL SEAL	TEMPERATURE RANGE, °F	VALVE SIZE, NPS												
			1	1-1/2	2	3	4	6	8	10	12	14	16		20[4]
			Psi												
			Shaft Size, Inches												
			1/2	5/8	5/8	3/4	3/4	1	1-1/4	1-1/4	1-1/2	1-3/4	2-1/8x2	2-1/8	2-1/2
PEEK/PTFE	Fisher TCM Plus or Ultra	-50 to 100	750	750	750	750	750	750	750	583	545	450	345	450	450
		200	550	550	550	550	550	550	550	550	545	450	345	450	450
		300	350	350	350	350	350	350	350	350	350	350	345	350	350
		400	150	150	150	150	150	150	150	150	150	150	150	150	150
		450	50	50	50	50	50	50	50	50	50	50	50	50	50
	HD Seal[1]	-50 to 500	750	750	750	750	750	750	750	593	553	450	384	450	450
	Flat Metal[2]	-100 to 500	- - -	- - -	- - -	300	300	300	300	150	150	- - -	- - -	- - -	- - -
	Flow Ring	500	1500	1500	1500	1500	1050	1090	1070	587	547	587	508	708	648
R30006	HD Seal[1]	-50 to 550	750	725	373	254	160	158	163	89	83	89	109	109	99
	High Temp HD Seal[1]	550 to 800	555[3]	544[3]	280[3]	191[3]	120[3]	119[3]	122[3]	67[3]	62[3]	67	82	82	74
	Flat Metal[2]	-100 to 800	- - -	- - -	- - -	246	146	155	154	85	80	- - -	- - -	- - -	- - -
	Flow Ring	800	1080	720	388	273	158	163	161	88	82	88	106	106	97
R30006 Silver Plated	HD Seal[1]	-50 to 550	750	750	750	508	320	316	326	178	166	178	192	218	198
	High Temp HD Seal[1]	550 to 800	555[3]	555[3]	555[3]	381[3]	240[3]	237[3]	245[3]	134[3]	125[3]	133	163	163	148
	Flat Metal[2]	-100 to 800	- - -	- - -	- - -	300	292	300	300	150	150	- - -	- - -	- - -	- - -
	Flow Ring	800	1500	1500	776	546	316	326	322	176	164	176	212	212	194
S31603L Nitride	HD Seal[1]	-50 to 550	740	740	740	750	533	527	543	297	277	297	363	363	203
	High Temp HD Seal[1]	550 to 800	- - -	- - -	- - -	555[3]	400[3]	395[3]	407[3]	223[3]	208[3]	222	272	272	247
	Flat Metal[2]	-100 to 800	- - -	- - -	- - -	300	300	300	300	150	150	- - -	- - -	- - -	- - -
	Flow Ring	800	1440	1440	1290	910	527	543	537	293	273	293	353	353	323
R50400 PTFE or N10276 PTFE	Fisher TCM Plus or Ultra	-50 to 100	750	750	750	750	533	527	543	297	277	297	363	363	330
		200	550	550	550	550	533	527	543	297	277	297	363	363	330
		300	350	350	350	350	350	350	350	297	277	297	363	363	330
		400	150	150	150	150	150	150	150	150	150	150	150	150	150
		450	50	50	50	50	50	50	50	50	50	50	50	50	50
	Flow Ring	500	1500	1500	1500	1500	1050	1090	1070	587	547	587	508	708	648

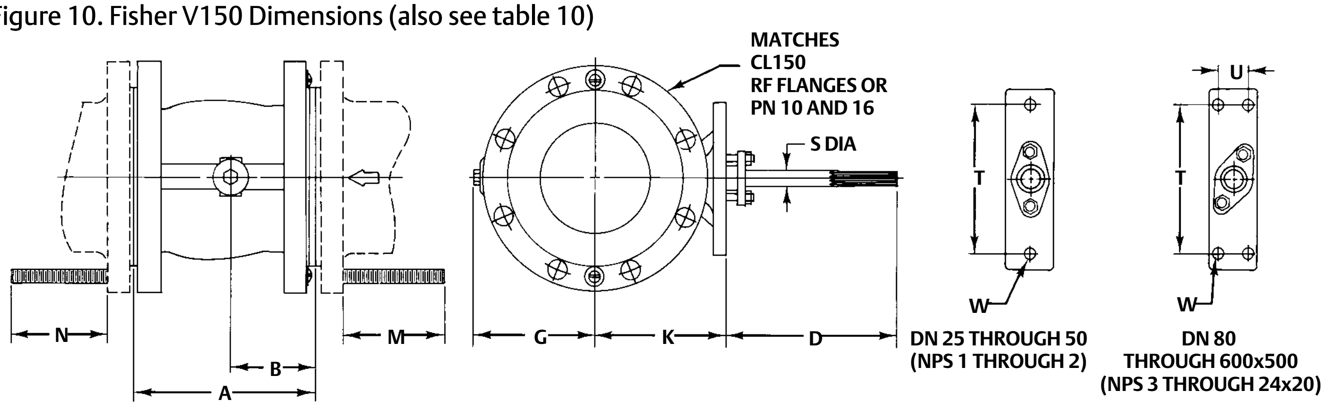
1. Pressure drops shown for HD seals are for forward flow only. For reverse flow with HD seal, limit pressure drop to 6.9 bar (100 psig).
2. Lubricated service only.
3. Consult your Emerson sales office if higher pressure drops are required.
4. This column is also appropriate for the DN 600x500 (NPS 24x20).

Table 10. Fisher V150 Dimensions

VALVE SIZE	V150 DIMENSIONS (ISA S75.08.02)(1)											APPROXIMATE WEIGHT
	A(5)	B	D	G	K	M(3)	N(3,4)	S Diameter	T	U	W	
DN	mm											kg
25	102	56		83	95	79	73	13				5.9
40	114	62	188	90	121	92	80	15.9 and 15.9 x 12.7	117	- - -	14.2	8.6
50	124	67		87	127	100	87	15.9 and 15.9 x 12.7				9.5
80	165	79		100	130	106	100	19.1			14.2	19.5
100	194	101	214	133	141	119	100	19.1	152	31.8	14.2	26
150	229	109		151	164	127	114	25.4			14.2	42
200	243	124		184	232	133	127	31.8				72
250	297	147	208	222	260	146	133	31.8	235	46.0	17.5	107
300	338	174		268	303	152	133	38.1				158
350(2)	381	206		295	343	152	133	44.5	273	50.8	19.1	248
400(2)	406	229	356	330	365	152	133	54.0	273	50.8	19.1	333
500	508	235		406	457	178	159	63.5	337	76.2	22.4	525
600x500	608	373		406	457	192	171	63.5	337	76.2	22.4	757
NPS	Inch											lbs
1	4.00	2.21		3.19	3.75	3.12	2.88	1/2				13
1-1/2	4.50	2.46	7.38	3.38	4.75	3.62	3.12	5/8 and 5/8 x 1/2	4.62	- - -	0.56	19
2	4.88	2.63		4.19	5.00	3.94	3.44	5/8 and 5/8 x 1/2				21
3	6.50	3.10		4.62	5.12	4.19	3.94	3/4			0.56	43
4	7.62	3.99	8.44	5.25	5.56	4.69	3.94	3/4	6.00	1.25	0.56	57
6	9.00	4.29		5.94	6.44	5.00	4.50	1			0.56	93
8	9.56	4.88		7.69	9.12	5.25	5.00	1-1/4				158
10	11.69	5.77	8.19	8.75	10.25	5.75	5.25	1-1/4	9.25	1.81	0.69	235
12	13.31	6.87		10.56	11.94	6.00	5.25	1-1/2				347
14(2)	15.00	8.12		11.62	13.50	6.00	5.25	1-3/4	10.75	2.00	0.75	545
16(2)	16.00	9.00	14.00	13.00	14.38	6.00	5.25	2-1/8	10.75	2.00	0.75	735
20	20.00	9.25		16.00	18.00	7.00	6.25	2-1/2	13.25	3.00	0.88	1155
24x20	23.94	14.69		16.00	18.00	7.56	6.75	2-1/2	13.25	3.00	0.88	1666

1. Inlet flange stud bolt length is longer than the standard length specified in ASME B16.5. See dimension M below.
2. DN350 and 400 (NPS 14 and 16) valves are available in ASME B16.10 short, only. See dimension A for ASME B16.10 short shown in figure 14.
3. Clearance necessary to remove flange bolts.
4. For valve assemblies with the Cavitrol Hex anti-cavitation trim installed, the required outlet flange bolt length and the clearance necessary to remove the bolt will be 12.7 mm (1/2 inch) longer than dimension N specified. In this case, use dimension M to determine the outlet flange bolt length.
5. For valve assemblies with Cavitrol Hex anti-cavitation trim installed, dimension A will be 12.7 mm (1/2 inch) larger than specified.

Figure 10. Fisher V150 Dimensions (also see table 10)



11B2625-K
B2153-5

Table 11. Fisher V200 Flangeless Dimensions(1)

VALVE SIZE, NPS	V200 DIMENSIONS (ISA S75.08.02)														ASME B16.5 RF FLANGES	APPROX WEIGHT
	A	B	D	G	K	M CL150	M CL300	M CL600	R	R1	S	T	U	W		
	mm															kg
1	102	56		81	95	176	202	202	51	102	12.7					4.3
1-1/2	114	62	188	89	121	189	224	224	73	119	15.7 and 15.7 x 12.7	117	- - -	14.2		6.4
2	124	67		106	127	211	236	236	92	137	15.7 and 15.7 x 12.7				CL150, 300, and 600	10
3	165	79		117	130	254	279	286	127	167	19.1					15
4	194	101	214	133	141	286	305	343	157	197	19.1	152	32	14.2		22
6	229	109		159	164(1)	343	362	413	216	260	25.4					27
8	243	124	208	195	232	343	387	426	270	314	31.8	235	46	17.5		62
10	297	147		222	260	419	- - -	- - -	324	368					CL150	114
	Inch															lbs
1	4.00	2.21		3.19	3.75	6.94	7.94	7.94	2	4.00	1/2					10
1-1/2	4.50	2.46	7.38	3.50	4.75	7.44	8.81	8.81	2.88	4.68	5/8 and 5/8 x 1/2	4.62	- - -	0.56		14
2	4.88	2.63		4.19	5.00	8.31	9.31	9.31	3.63	5.38	5/8 and 5/8 x 1/2				CL150, 300, and 600	23
3	6.50	3.10		4.62	5.12	10.00	11.00	11.25	5.00	6.56	3/4					34
4	7.62	3.99	8.44	5.25	5.56	11.25	12.00	13.50	6.19	7.76	3/4	6.00	1.25	0.56		48
6	9.00	4.29		6.25	6.44(2)	13.50	14.25	16.25	8.50	10.24	1					60
8	9.56	4.88	8.19	7.69	9.12	13.50	15.25	16.75	10.63	12.38	1-1/4	9.25	1.81	0.69		136
10	11.69	5.77		8.75	10.25	16.50	- - -	- - -	12.75	14.50					CL150	252

1. Multi-class valves are not interchangeable because of line bolting requirements. Please select the appropriate valve based on the pressure class of your piping.
2. 179 mm (7.06 inches) for NPS 6, CL600 valves only.

Figure 11. Fisher V200 Dimensions (also see table 11)

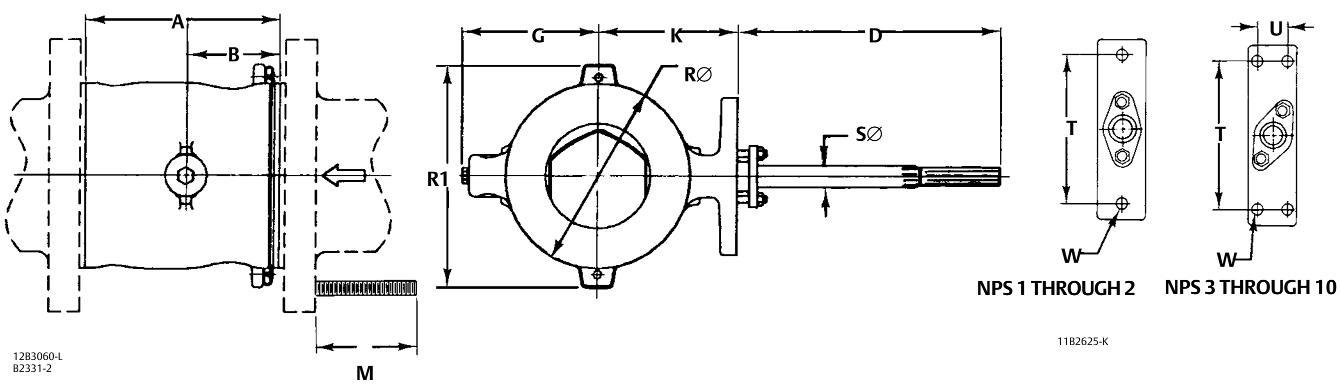


Table 12. Fisher V200 Flanged CL600 Dimensions

VALVE SIZE	DIMENSIONS (ANSI/ISA 75.08.02)												APPROXIMATE WEIGHT
	A(2)	B	D	G	K	M (Qty)(1)	Bolt Size	Threaded Holes Per Flange	S Diameter	T	U	W	
DN	mm												kg
50	124	67	188	106	127	121 (16)	5/8-11 UNC	4	16	117	- - -	14.2	17
80	165	79	214	117	130	140 (16)	3/4-10 UNC	4	19	152	32		28
100	194	101	214	133	141	165 (16)	7/8-9 UNC	- - -	19	152	32	14.2	48
150	229	109	214	159	164	197 (24)	1-8 UNC	2	25	152	32	14.2	93
200	243	124	208	195	232	216 (24)	1-1/8-8 UNC	4	32	235	46	17.5	160
NPS	Inch												lbs
2	4.88	2.63	7.38	4.19	5.00	4.75 (16)	5/8-11 UNC	4	5/8	4.62	- - -	0.56	38
3	6.50	3.10	8.44	4.62	5.12	5.50 (16)	3/4-10 UNC	4	3/4	6.00	1.25		61
4	7.62	3.99	8.44	5.25	5.56	6.50 (16)	7/8-9 UNC	- - -	3/4	6.00	1.25	0.56	105
6	9.00	4.29	8.44	6.25	6.44	7.75 (24)	1-8 UNC	2	1	6.00	1.25	0.56	205
8	9.56	4.88	8.19	7.69	9.12	8.50 (24)	1-1/8-8 UNC	4	1-1/4	9.25	1.81	0.69	353

1. For valve assemblies with the Cavitrol Hex anti-cavitation trim installed, the required outlet flange bolt length and the clearance necessary to remove the bolt will be 12.7 mm (1/2 inch) longer than dimension M specified.
2. For valve assemblies with Cavitrol Hex anti-cavitation trim installed, dimension A will be 12.7 mm (1/2 inch) larger than specified.

Figure 12. Fisher V200 CL600 Flanged Dimensions (also see table 12)

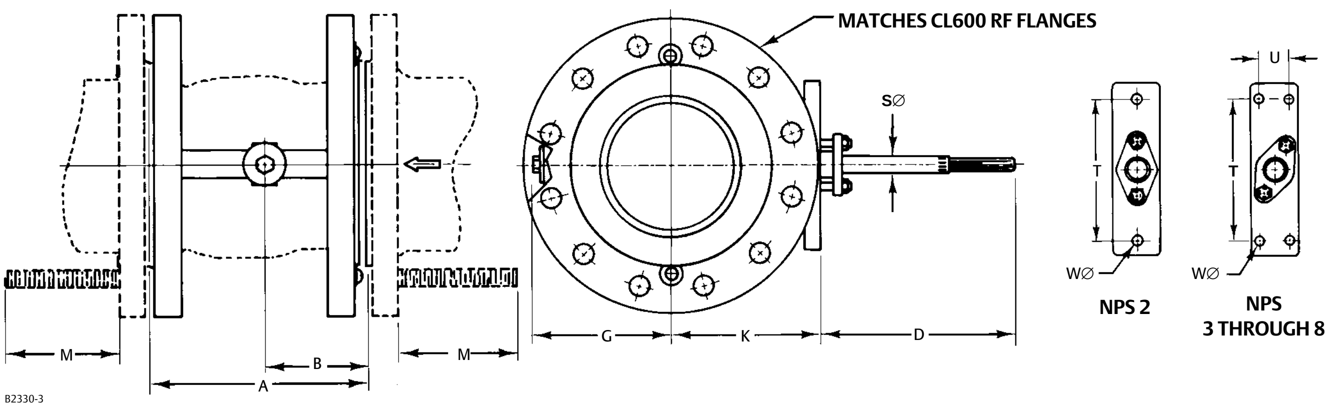


Table 13. Fisher V300 Dimensions

VALVE SIZE,	V300 DIMENSIONS (ISA S75.08.02)											APPROXIMATE WEIGHT
	A(5)	B	D	G	K	M(3)	N(3,4)	S Diameter	T	U	W	
DN(1)	mm											kg
25	102	56		81	95	100	94	13				8
40	114	62	188	89	121	114	108	16 and 16 X 13	117	- - -		12
50	124	67		106	127	106	100	16 and 16 X 13			14.2	17
80	165	79		117	130	133	121	19				28
100	194	101	214	133	141	140	127	19	152	32		37
150	229	109		159	164	152	140	25				60
200	243	124		195	232	165	152	32				103
250	297	147	208	222	260	186	173	32	235	46	17.5	200
300	338	174		268	303	198	186	38				293
350(2)	381	206		295	343	152	133	44.5	273	50.8	19.1	375
400(2)	406	229	356	330	365	152	133	54.0	273	50.8	19.1	511
500	508	235		406	457	224	203	63.5	337	76.2	22.4	755
NPS	Inch											lbs
1	4.00	2.21		3.19	3.75	3.94	3.69	1/2				17
1-1/2	4.50	2.46	7.38	3.50	4.75	4.50	4.25	5/8 and 5/8 X 1/2	4.62	- - -		27
2	4.88	2.63		4.19	5.00	4.19	3.94	5/8 and 5/8 X 1/2			0.56	38
3	6.50	3.10		4.62	5.12	5.25	4.75	3/4				61
4	7.62	3.99	8.44	5.25	5.56	5.50	5.00	3/4	6.00	1.25		81
6	9.00	4.29		6.25	6.44	6.00	5.50	1				133
8	9.56	4.88		7.69	9.12	6.50	6.00	1-1/4				226
10	11.69	5.77	8.19	8.75	10.25	7.31	6.81	1-1/4	9.25	1.81	0.69	440
12	13.31	6.87		10.56	11.94	7.81	7.31	1-1/2				645
14(2)	15.00	8.12	14.00	11.62	13.50	7.75	7.00	1-3/4	10.75	2.00	0.75	825
16(2)	16.00	9.00	14.00	13.31	14.38	8.25	7.50	2-1/8	10.75	2.00	0.75	1125
20	20.00	9.25	14.00	16.00	18.00	8.81	8.00	2-1/2	13.25	3.00	0.88	1661

1. DN25, 40, 50, 80, and 100 are the only sizes offered in V300 for Europe.
2. DN350 and 400 (NPS 14 and 16) valves are available in ASME B16.10 short, only. See dimension A for ASME B16.10 short shown in figure 14.
3. Clearance necessary to remove flange bolts.
4. For valve assemblies with the Cavitrol Hex anti-cavitation trim installed, the required outlet flange bolt length and the clearance necessary to remove the bolt will be 12.7mm (1/2 inch) longer than dimension N specified. In this case, use dimension M to determine the outlet flange bolt length.
5. For valve assemblies with Cavitrol Hex anti-cavitation trim installed, dimension A will be 12.7 mm (1/2 inch) larger than specified.

Figure 13. Fisher V300 Dimensions (also see table 13)

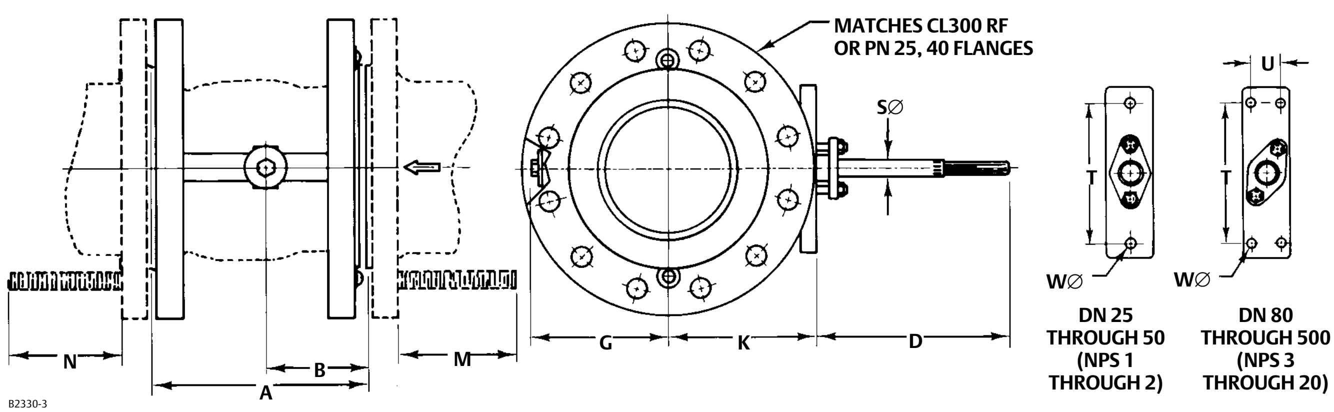


Table 14. Fisher V150 Optional Dimensions

V150 OPTIONAL DIMENSIONS FOR NPS 1 THROUGH 12 (ASME B16.10 SHORT)							
VALVE SIZE		A(3)		M(1)		N(1,2)	
DN	NPS	mm	Inches	mm	Inches	mm	Inches
25	1	127	5.00	103	4.06	71	2.81
40	1-1/2	165	6.50	135	5.31	78	3.06
50	2	178	7.00	155	6.11	92	3.61
80	3	203	8.00	142	5.61	98	3.86
100	4	229	9.00	155	6.11	98	3.86
150	6	267	10.50	163	6.40	112	4.40
200	8	292	11.50	182	7.15	124	4.90
250	10	330	13.00	176	6.94	132	5.19
300	12	356	14.00	170	6.69	132	5.19

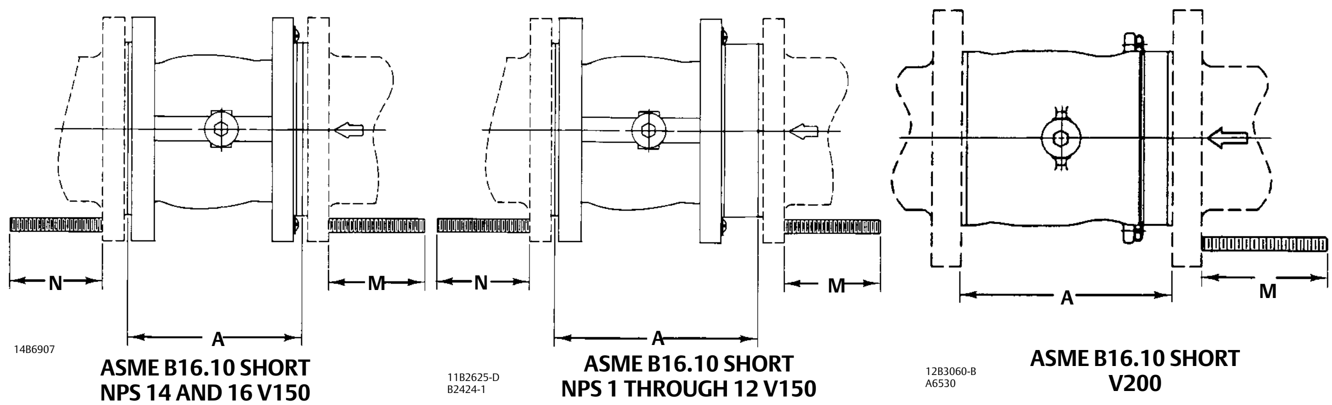
1. Clearance necessary to remove flange bolts.
2. For valve assemblies with the Cavitrol Hex anti-cavitation trim installed, the required outlet flange bolt length and the clearance necessary to remove the bolt will be 12.7 mm (1/2 inch) longer than dimension N specified.
3. For valve assemblies with Cavitrol Hex anti-cavitation trim installed, dimension A will be 12.7 mm (1/2 inch) larger than specified.

Table 15. Fisher V200 Optional Dimensions

V200 OPTIONAL DIMENSIONS (ASME B16.10 SHORT)(1,2)		
VALVE SIZE, NPS	A	M
mm		
1	127	202
1-1/2	165	240
2	178	268
3	203	286
4	229	321
6	267	381
8	292	394
10	330	451
Inch		
1	5.00	7.94
1-1/2	6.50	9.44
2	7.00	10.56
3	8.00	11.25
4	9.00	12.62
6	10.50	15.00
8	11.50	15.50
10	13.00	17.75

1. Available for CL150 valves only.
2. ASME B16.10 short dimensions are actually longer than ISA S75.08.02 dimensions.

Figure 14. Fisher V150 and V200 Optional Dimensions (also see tables 14 and 15)



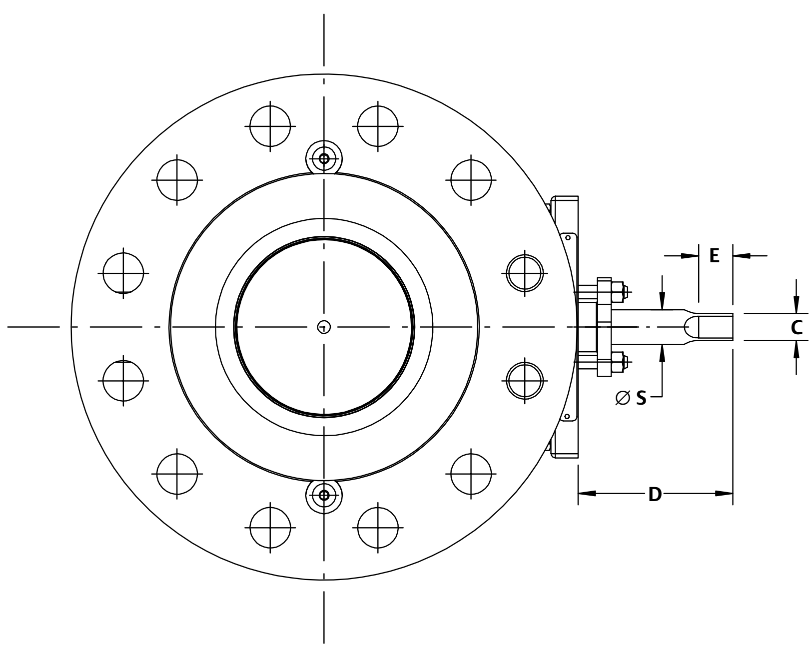
Notes:
- NPS 1 through 12 valves are available with either ISA S75.08.02 face-to-face dimensions or ASME B16.10 short face-to-face dimensions. NPS 1 through 12 valves will be supplied in ISA S75.08.02 unless you specify otherwise. Note that ASME B16.10 short dimensions are actually longer than ISA S75.08.02.
- NPS 14 and 16 valves are available only with ASME B16.10 short face-to-face dimensions.
- NPS 20 valves are available only with a 508 mm (20-inch) face-to-face dimension.
- M and N dimensions shown for V150 are clearance necessary to remove flange bolts.

Table 16. Fisher Vee-Ball Square Shaft Dimensions

VALVE SIZE/ PRESSURE RATING		C		D		E		S(1)	
DN	NPS	mm	Inches	mm	Inches	mm	Inches	mm	Inches
DN25/ PN10-40	NPS 1/ CL150-300	9.0	0.4	74.0	2.91	15.0	0.59	13.0	1/2
DN40/ PN10-40	NPS 1.5/ CL150-600	11.0	0.4	76.0	2.99	15.0	0.59	15.9	5/8
DN50/ PN10-40	NPS 2/ CL150-600	11.0	0.4	76.0	2.99	15.0	0.59	15.9	5/8
DN80/ PN10-40	NPS 3/ CL150-600	14.0	0.6	103.0	4.06	19.0	0.75	19.1	3/4
DN100/ PN10-40	NPS 4/ CL150-600	14.0	0.6	103.0	4.06	19.0	0.75	19.1	3/4
DN150/ PN10-40	NPS 6/ CL150-600	19.0	0.8	108.0	4.25	25.0	0.94	25.4	1
DN200/ PN10-40	NPS 8/ CL150-600	22.0	0.9	109.0	4.29	30.0	1.18	31.8	1 1/4
DN250/ PN10-40	NPS 10/ CL150-600	22.0	0.9	109.0	4.29	30.0	1.18	31.8	1 1/4
DN300/ PN10-25	NPS 12/ CL150-600	27.0	1.1	114.0	4.49	35.0	1.38	38.1	1 1/2
- - -	NPS 14/ CL150-300	- - -	1.4	- - -	6.25	- - -	1.77	- - -	1 3/4

1. This nominal Valve Shaft Diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.

Figure 15. Fisher Vee-Ball Square Shaft Dimensions (also see table16)



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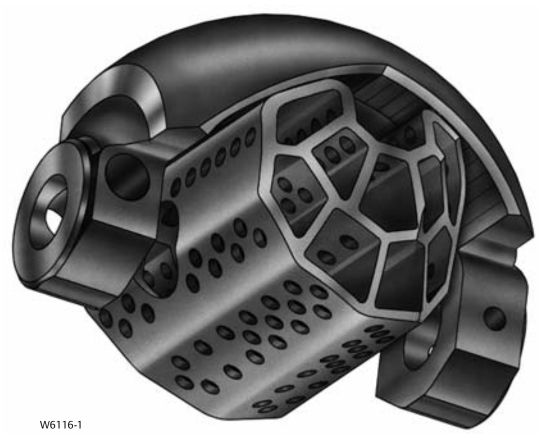
Fisher™ Vee-Ball™ V150, V200, and V300 Noise Attenuator

Fisher Vee-Ball Series valves (V150, V200, and V300) with the severe service Attenuator combine the efficiency of a rotary valve with the energy absorbing capability of a special trim to provide improved performance for demanding applications. The Fisher attenuator design can be utilized in both liquid and gas service to reduce cavitation and noise effects that cause pipeline vibration. See table 1 for a competitive comparison.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.



Fisher Vee-Ball Series Noise Attenuator Ball

Features

- Trim Versatility—Trim components are interchangeable for Fisher V150, V200, and V300 valves. This feature allows you to reduce your spare parts inventory and maintenance procedures.
- Attenuator-Ball Fabrication—The ball-attenuator construction provides structural integrity because of its rugged fabrication weld.
- Attenuator Performance—Up to -10 dBA acoustical attenuation, and a K_C=1.0 for hydrodynamics are achievable depending on service conditions.
- Application Versatility—The Vee-Ball valves are available as standard with ISA S75.04 face-to-face dimensions as well as ASME B16.10-short face-to-face dimensions for CL150 valves. IEC 60534-3-2 face-to-face dimensions are also available (60534-3-2 face-to-face dimensions are equivalent to S75.04 face-to-face dimensions).
- Long Service Life—Solid HD metal seal construction (figure 1) provides long service life in demanding applications. The constant wiping action of the seal across the ball's sealing surface prevents scale and sludge buildup, and provides excellent service on steam, gases, slurries, and various liquid applications.
- Excellent Flow Characteristic—Precise contouring of the V-notch ball provides an approximately equal percentage flow characteristic.
- Sour Service Capability—Optional materials are available that comply with NACE MR0175-2002.
- Improved Environmental Capabilities—The optional ENVIRO-SEAL packing system is designed with very smooth stem surfaces and live-loading provides improved sealing, guiding, and loading force transmission. The seal of the ENVIRO-SEAL system can control emissions to below the EPA (Environmental Protection Agency) limit of 100 ppm (parts per million) for valves.
- Quick and Easy Maintenance—The Vee-Ball valve ball seals can be inspected simply by removing two screws on the valve body inlet. There is no need to remove the actuator or disassemble the valve. No special tools are required for valve maintenance procedures, such as removing the packing, ball seal, and shafts.

Specifications for Vee-Ball Valves and Noise Attenuator

Valve Sizes and End Connection Styles

NPS ■ 4, ■ 6, ■ 8, ■ 10, ■ 12, ■ 14, ■ 16, or ■ 20 valves that mate with CL150 or 300 raised-face flanges. Valves sizes also mate with DN 50 through DN 300 and DIN PN10 or PN16 flanges

Maximum Inlet Pressures(1)

Consistent with applicable pressure-temperature ratings, but do not exceed the material temperature capabilities and pressure drop limitations listed in Bulletin 51.3:Vee-Ball

Maximum Shutoff Pressure/Temperature Ratings(1)

Composition (TCM Plus or TCM Ultra) Seals, Flat Metal, HD (Heavy-Duty) and High Temperature HD Metal Ball Seals: See Bulletin 51.3:Vee-Ball
Flow Ring Constructions: Contact your Emerson Automation Solutions sales office for more information

Shutoff Classification

See Bulletin 51.3:Vee-Ball

Attenuator Ball Material

■ Standard attenuator ball material is CG8M.
■ Other attenuator ball materials are available upon request. For other valve parts, refer to the appropriate valve bulletin

Temperature Capabilities(1)

Fisher TCM Plus or Ultra Seals: -46 to 232°C (-50 to 450°F)
HD Metal Seals: -46 to 288°C (-50 to 550°F)
High Temperature HD Metal Seal: 288 to 427°C (550 to 800°F). Contact your Emerson Automation Solutions sales office if higher temperatures are required.
Flow Ring or Flat Metal Seal : -198 to 425°C (-325 to 800°F)
PEEK/PTFE Bearings: -198 to 260°C (-325 to 500°F)

Packing Constructions

PTFE V-ring: -198 to 232°C (-325 to 450°F)
Graphite: -198 to 538°C (-325 to 1000°F)
ENVIRO-SEAL™ Single PTFE V-ring: -46 to 232°C (-50 to 450°F)
ENVIRO-SEAL Graphite: -7 to 316°C (20 to 600°F)

Flow Coefficients

See Fisher Catalog 12

Flow Characteristic

Modified equal percentage (see figure 3)

Face-to-Face Dimensions

Consistent with ■ ISA S75.04 and IEC 60534-3-2 face-to-face dimensions

Option for CL150 ■ ASME B16.10-short

Standard Flow Direction

Forward flow direction is into the convex face of the V-notch ball. The valve with the attenuator must be placed in the forward flow direction for the attenuator to be effective.

Actuator Mounting

■ Right-hand or ■ left-hand as viewed from upstream end of valve. Counter-clockwise to close for both mounting styles.

Maximum Ball Rotation

90 degrees

Valve/Actuator Action

With diaphragm or piston rotary actuator, field-reversible between
■ push-down-to-close (extending actuator rod closes valve) and
■ push-down-to-open (extending actuator rod opens valve)

ENVIRO-SEAL Packing

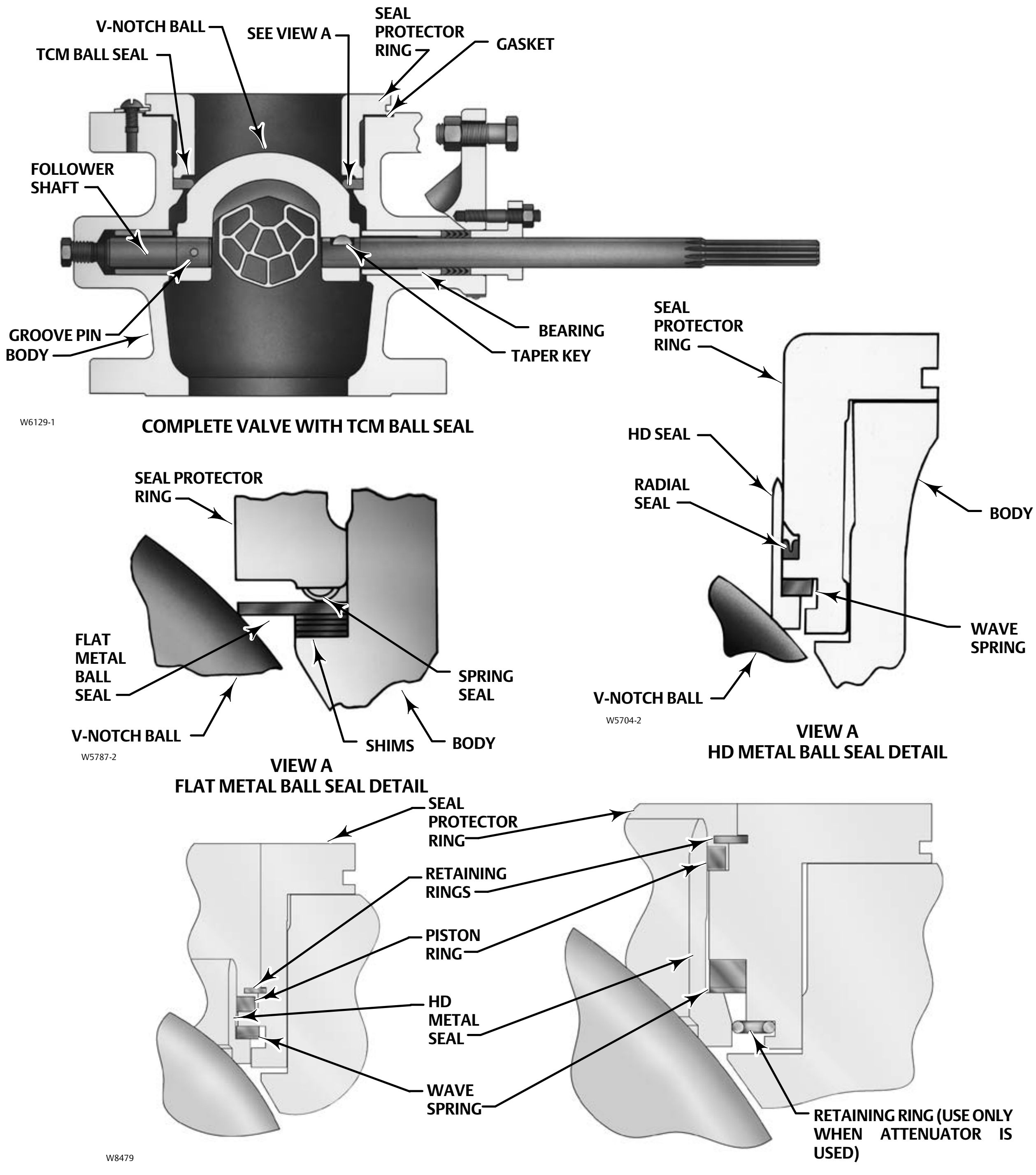
This optional packing system provides improved sealing, guiding, and transmission of loading force to control liquid and gas emissions.

Options

■ Alloy construction materials, and other common valve parts are available upon request, ■ Materials that comply with NACE MR0175-2002 for sour service. Refer to Bulletin 51.3:Vee-Ball, or contact your Emerson sales office or Local Business Partner.

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.

Figure 1. Fisher Vee-Ball Series Rotary Attenuator Construction



NPS 4 THROUGH 8 & NPS 14 THROUGH 20
HD METAL BALL SEAL

NPS 10 AND 12
HD METAL BALL SEAL

VIEW A
HIGH-TEMPERATURE HD METAL BALL SEAL

Other Considerations

When a rotary noise attenuator is installed in a Vee-Ball valve, the V-notch is no longer a point of high-velocity erosion. As a result, the CoCr-A V-notch option is not required when a rotary noise attenuator is used. The rotary attenuator and CoCr-A V-notch options are not available together.

Table 1. Segmented Ball Benefits Analysis Comparison

Benefits	Typical Competitive Device	Fisher Vee-Ball Attenuator(1)
Predictable Performance	No	Yes
-10 dBA Aerodynamic Noise Attenuation	No	Yes
Superior Attenuation Effect at Critical Opening Position	No	Yes
Maximum Pressure Drop Capability	No	Yes
Heavy Duty, Integrally Welded Attenuator/Ball Assembly	No	Yes
Valve Splined Shaft Connects to Clamped Actuator Lever to Minimize Lost Motion	No	Yes
Superior Soft Seats for Tight Shutoff	No	Yes
Moderate Kc Improvement vs Unattenuated Device	Yes	Yes
Trunnion Mounted Ball for Superior Wear Resistance	Yes	Yes
Heavy Duty Metal Seats for Demanding Applications	Yes	Yes

1. See figure 3 for valve characteristics.

Figure 2. Typical Fisher ENVIRO-SEAL PTFE and Graphite Packing Arrangements

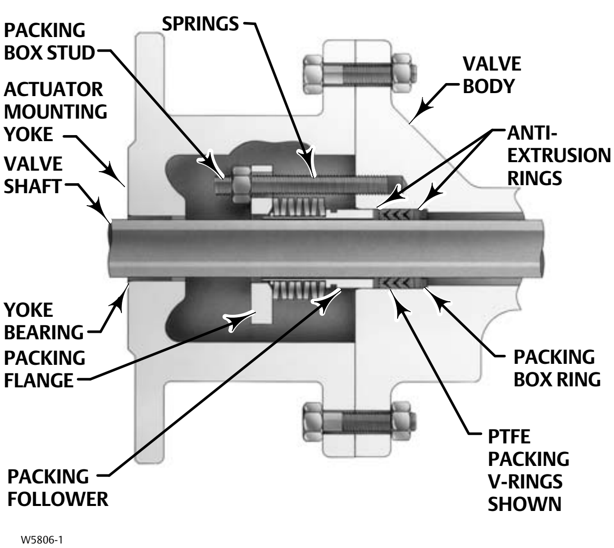
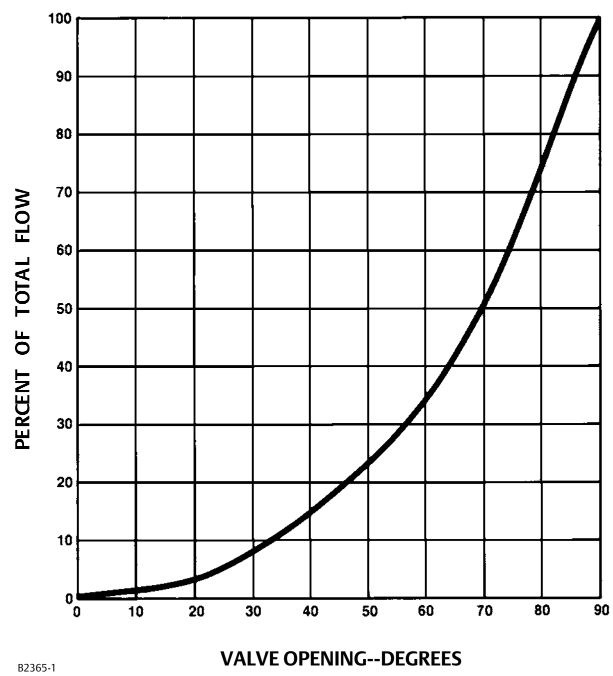


Figure 3. Valve Characteristics



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Product Bulletin
51.3:V150E
August 2017

V150E Valve
D103429X012

Fisher™ V150E Expanded Outlet Vee-Ball™ Control Valve

The Fisher V150E Vee-Ball control valve (figure 3) features a flanged expanded outlet design. The outlet flange is one standard line size diameter larger than the inlet. The expanded outlet geometry streamlines the flow through the valve as the flow area increases from inlet to outlet. This valve body design accommodates requirements when expanded downstream piping is specified.

This bulletin provides details for the V150E Vee-Ball control valves (shown in figure 3). The V150E valve retains many of the favorable traits of the traditional Vee-Ball valve design with the added feature of an expanded outlet. The inherent characteristic and shearing action between the V-notch ball and the ball seal (figure 2) promotes smooth operation over a wide range of flow conditions.

The Fisher V150E control valve assembly features CG8M (S31700) valve body and ball, and R30006 seal materials as standard. The low friction, zero lost motion drive train assembly features a clamped splined shaft, compact spring and diaphragm actuator, and non-contact digital valve controller. This construction will provide reliable, high-performance throttling operation.

W9915

Fisher V150E Expanded Outlet Vee-Ball Valve with 2052 Actuator and FIELDVUE™ DVC6200 Digital Valve Controller

Features

- **Trim Versatility --** Trim components are interchangeable with existing V150, V200, and V300 Series B valves.
- **Easy Installation --** Flanged valve body design eliminates exposed line flange bolting, reduces alignment and installation time, and promotes secure valve installations and piping integrity.
- **Long Service Life --** The heavy-duty, metal seal construction provides long service life in demanding applications. The constant wiping action of the seal across the ball's sealing surface provides excellent service on high consistency fibrous slurry applications. Also, low-friction, rigid bearing designs are tested and proven in high-load and high-cycle applications.
- **Smooth Valve Operation --** Precision machined parts, pressure-balanced seal, and low friction bearing designs allow smooth, precise movement of the ball.
- **Excellent Flow Control --** Precise contouring of the Vee-Ball provides a modified equal percentage flow characteristic.
- **Expanded Outlet --** Satisfies installation requirements where expanded down stream piping is specified.
- **Face-to-Face --** Unique dimensions typical of expanded outlet ball valve designs.
- **Structural Integrity --** One-piece valve body improves structural integrity of the pressure boundary by eliminating leak paths that could be caused by the gaskets in two-piece, bolted valve designs.

Specifications

Valve Sizes and End Connection Styles

DN ■ 80x100, ■ 100x150, ■ 150x200, ■ 200x250, ■ 250x300 and NPS ■ 3x4, ■ 4x6, ■ 6x8, ■ 8x10, ■ 10x12 flanged valves that mate with PN 10/16 or CL150 raised-face flanges (see table 1)

Maximum Inlet Pressures(1)

CG8M (317 Stainless Steel) Valves: Consistent with ASME CL150 pressure-temperature ratings per ASME B16.34 or with PN pressure- temperature ratings shown in table 1, but do not exceed the material temperature capabilities shown below or the pressure drop limitations shown in table 4

Maximum Shutoff Pressure/Temperature Ratings(1)

HD (Heavy Duty) Metal Ball Seals and PEEK/PTFE Bearings: See table 4

Shutoff Classification(1)

HD (Heavy Duty) Metal Ball Seal (Bidirectional Flow): 0.01% of valve capacity; Class IV per ANSI/FCI 70-2 and IEC 60534-4; Maximum allowable pressure drop in reverse flow is 6.9 bar (100 psi)

Construction Materials

See table 3

Temperature Capabilities(1)

HD Metal Seals: -46 to 288°C (-50 to 500°F)

PEEK/PTFE Bearings: -198 to 260°C (-325 to 500°F)

Packing Constructions

PTFE V-ring: –198 to 232°C (-325 to 450°F)

ENVIRO-SEAL™ Single PTFE V-ring: -46 to 232°C (-50 to 450°F)

Flow Characteristic

Modified equal percentage

Dimensions

See table 6 for dimensions

Standard Flow Direction

Forward (into the convex face of the V-notch ball)

Flow Coefficients

See Fisher Catalog 12

Actuator Sizing

See Catalog 14, section D for torque sizing factors. Use the inlet NPS of the V150E to determine appropriate factors from the Vee-Ball tables

Noise Levels

See Catalog 12

Maximum Ball Rotation

90 degrees

Actuator Mounting

Standard valve construction is for right-hand mounting, as viewed from upstream end of valve with the shaft horizontal. Actuator can be mounted in any of four quadrants. Left-hand actuator mounting is available upon request

Valve/Actuator Action

With compact 2052 spring and diaphragm or 1061 piston rotary actuator, the valve is field-reversible between PDTC or PDTO: push-down-to-close (extending actuator rod closes valve) and push-down-to-open (extending actuator rod opens valve)

Approximate Weight

See table 2

Options

■ Flushing connection, ■ ENVIRO-SEAL packing system, ■ JIS 10K flanges

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.

Table 1. Valve Body Material, End Connections, and Ratings

VALVE DESIGN	VALVE BODY MATERIAL	VALVE SIZE	FLANGE END CONNECTIONS
V150E	CG8M	DN 80x100, 100x150, 150x200, 200x250, 250x300	Compatible with PN 10/16 raised-face flanges
		NPS 3x4, 4x6, 6x8, 8x10, 10x12	Compatible with CL150 raised-face flanges

Table 2. Fisher V150E Valve Weights, Approximate

VALVE SIZE		V150E	
DN	NPS	kg	lbs
80x100	3x4	26	58
100x150	4x6	28	61
150x200	6x8	46	100
200x250	8x10	87	192
250x300	10x12	123	271

Table 3. Fisher V150E Standard Construction Materials

Part	Material
Valve body	CG8M (317 SST)
V-Notch Ball	Chromium-plated CG8M
Seal – Heavy Duty Metal	R30006 (Alloy 6)
Wave Spring	N07750
Radial Seal	Graphite reinforced PTFE
Bearings	PEEK/Carbon-filled PTFE liner
Packing	PTFE V-ring with one carbon-filled PTFE ring
Shaft	S20910
Groove Pin	S31600
Taper Key	R30006
Packing Follower and Packing Box Ring	CF8M (316 SST)
Actuator Mounting Bolts and Nuts	Grade 5 steel or strain hardened B8M stainless steel
Spacer and Bushing	S31700
Packing Follower Bolting	Strain hardened SA-193-B8M
Pipe Plug (optional flushing connection)	S31600

Contents

Figure 1. Fisher V150E Construction Features

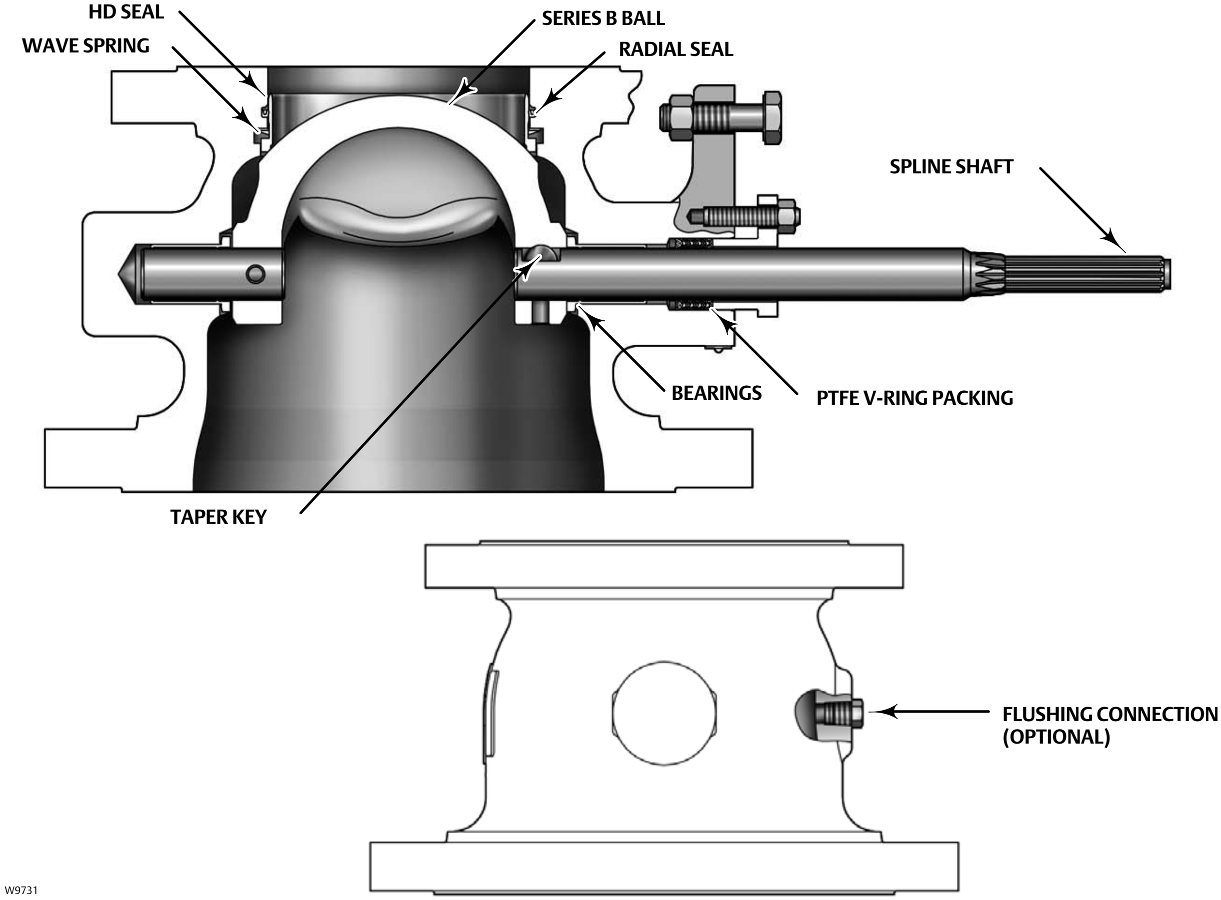


Table 4. Fisher V150E Maximum Allowable Shutoff Pressure Drop
(based on trim [bearing and seal] and ASME pressure temperature rating of the valve material [CG8M])

BEARING MATERIAL	BALL SEAL	TEMPERATURE RANGE, °C	VALVE SIZE, DN				
			80x100	100x150	150x200	200x250	250x300
			Bar				
PEEK/PTFE	HD Metal (R30006)(1)	-46 to -29	19	19	19	19	19
		-29 to 38	19	19	19	19	19
		93	16.2	16.2	16.2	16.2	16.2
		149	14.8	14.8	14.8	14.8	14.8
		204	13.4	13.4	13.4	13.4	13.4
		232	12.8	12.8	12.8	12.8	12.8
		260	11.7	11.7	11.7	11.7	11.7
BEARING MATERIAL	BALL SEAL	TEMPERATURE RANGE, °F	VALVE SIZE, NPS				
			3X4	4X6	6X8	8X10	10X12
			Psi				
PEEK/PTFE	HD Metal (R30006)(1)	-50 to -20	275	275	275	275	275
		-20 to 100	275	275	275	275	275
		200	235	235	235	235	235
		300	215	215	215	215	215
		400	195	195	195	195	195
		450	185	185	185	185	185
		500	170	170	170	170	170

1. Pressure drops for HD seals are for forward flow only. For reverse flow with HD metal seal limit pressure drop to 6.9 bar (100 psi).

Figure 2. Fisher V150E Dimensions

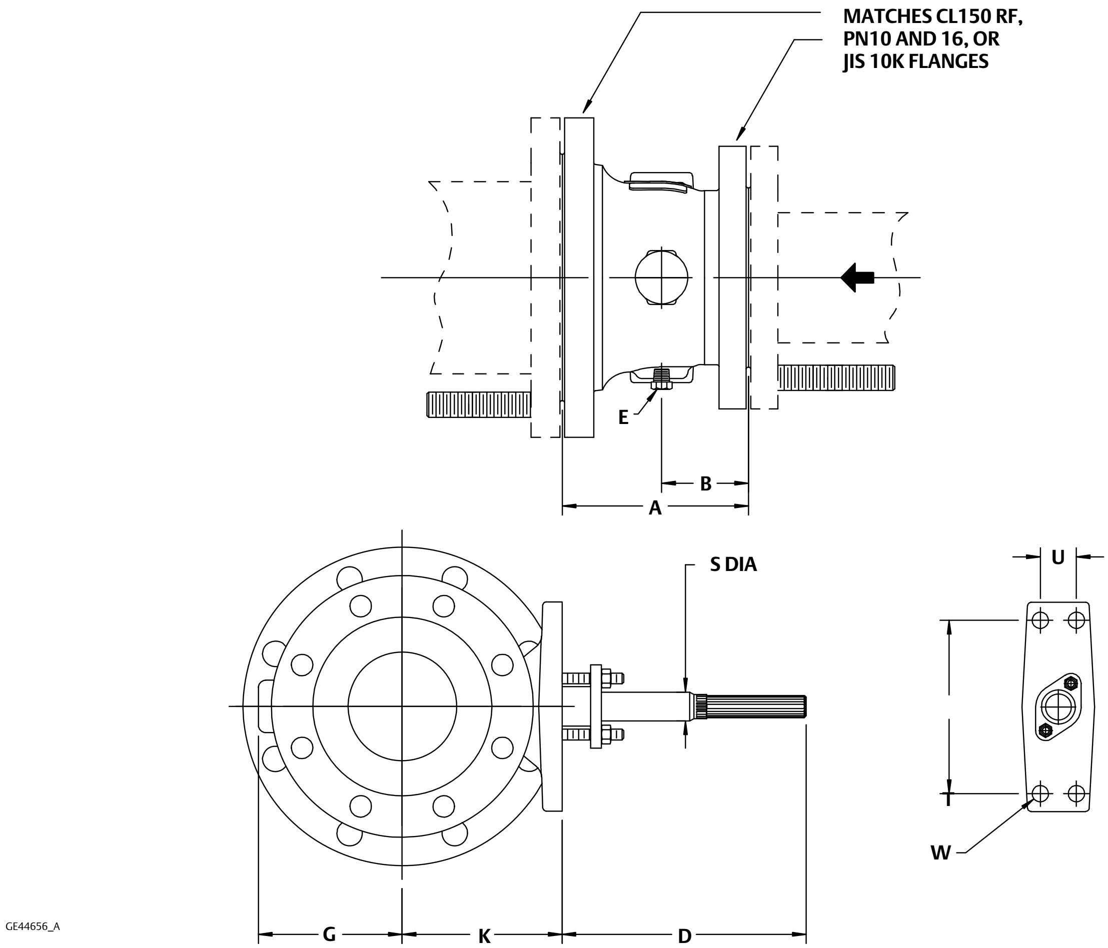
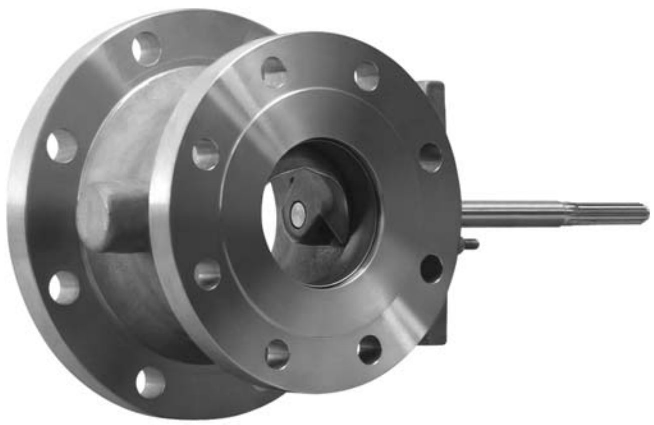


Table 5. Fisher V150E Dimensions (see figure 2)

DN(1)	mm										APPROXIMATE WEIGHT
	A	B	D	G	K	SØ	T	U	W	E (optional)	kg
80x100	165	82	214	111	130	19.1	152	31.8	14.2	12.7	26
100x150	163	76	214	127	141	19.1	152	31.8	14.2	12.7	28
150x200	207	101	214	154	164	25.4	152	31.8	17.5	12.7	46
200x250	248	123.5	208	189	232	31.8	235	46	17.5	19.1	87
250x300	297	147	208	216	260	31.8	235	46	17.5	19.1	123
NPS(1)	Inch										APPROXIMATE WEIGHT
	A	B	D	G	K	SØ	T	U	W	E (optional)	lbs
3x4	6.50	3.23	8.43	4.37	5.12	0.75	5.98	1.25	0.56	1/2 NPT	58
4x6	6.42	2.99	8.43	5.00	5.55	0.75	5.98	1.25	0.56	1/2 NPT	61
6x8	8.15	3.98	8.43	6.06	6.46	1.00	5.98	1.25	0.69	1/2 NPT	100
8x10	9.76	4.86	8.19	7.44	9.13	1.25	9.25	1.81	0.69	3/4 NPT	192
10x12	11.69	5.79	8.19	8.50	10.24	1.25	9.25	1.81	0.69	3/4 NPT	271

1. Valve Inlet size x Outlet size

Figure 3. Fisher V150E Expanded Outlet Vee-Ball Valve



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Fisher™ Slurry Vee-Ball™ V150S and V300S Rotary Control Valves

The Fisher V150S and V300S Slurry Vee-Ball valve mates with CL150 and CL300 raised-face flanges. Rugged construction, highly wear-resistant trim materials, and an unrestricted straight through flow path make the design ideal for controlling the most abrasive of slurries.

A shaft with a choice of drive connections will allow a variety of power operated actuators and valve positioners or controllers to be used.

The design is particularly effective in minimizing erosive damage to the adjoining pipework, thereby providing greater operational safety and service life when compared with other valve types.

Fisher Slurry Vee-Ball Control Valve

Features

- **Fully protective trim**—The valve body, shaft, and bearings are fully protected by hard wear-resistant trim materials.

- **Pipeline and flange protection**—The throttled flow stream is guided through a specially shaped flow ring to minimize turbulence and impingement on the pipe wall. The valve can be matched to the bore size of the inlet and outlet piping in order to prevent turbulence being generated by the step resulting in scouring erosion of the flange faces, unexpected leakage, and expensive rework. In addition, both the inlet and outlet valve flange faces are protected by a portion of the hard trim.

- **Long Service Life**—The Vee-Ball design, when used in reverse flow mode, keeps the high velocity down stream of the vena contracta within the flow ring bore at the outlet of the valve. Compared with other styles of valves, the exit flow is essentially parallel with the flow ring wall and a minimum of flow impingement occurs. Combined with a choice of hard wear-resistant materials, a significantly long life is obtained.

  Easily replaceable trim parts allow the valve to be overhauled at predetermined intervals and the valve body used again during repeated operational cycles.

- **Ease of installation**—Full flanging on the valve body allows the valve body to be easily aligned centrally with the pipe flanges, an essential requirement in avoiding erosion across the flange faces.

- **Excellent Flow Control**—Precise contouring of the V-notch ball provides a modified equal percentage flow characteristic. When combined with a valve actuator/controller system having minimal lost motion, improved process control can be obtained.

(continued on page 2)

Features (continued)

- **Quick and Easy Maintenance—**All trim parts are retained without the use of press fits or screw threads exposed to the process fluid. See figure 1.

- **Structural Integrity—**The valve body, complete with flanges, is made from a one-piece casting. No welding is employed. No O-ring seals are used. Use of a flanged valve body does not require the use of extra long studs.

  The shaft seal is made from well-proven PTFE chevron ring packing with the means for external adjustment.

Options

- A PSZ (partially stabilized zirconia) ceramic flow ring insert is available with HCI (high chrome iron) or PSZ ceramic ball for particularly aggressive slurry services with extended lifetime requirements. The ceramic insert offers substantial increase in flow ring lifetimes.

- Trim materials are available to meet the requirements of corrosive/erosive slurries. See table 2.

- The “Flow Over the Top” V-Notch Ball offers an alternative to the standard V-Notch Ball in scaling applications.

- The drive shaft is available with either a double D or splined actuator connection to accommodate a choice of actuation between a spring-opposed diaphragm or a rack and pinion.

Specifications

Valve Sizes

■ NPS 3, ■ 4, ■ 6, ■ 8, ■ 10, and ■ 12

End Connection

V150S: CL150 Raised-face flange

V300S: CL300 Raised-face flange

Face to Face Dimension

See figure 2

Maximum Inlet Pressure

Consistent with pressure-temperature ratings per ASME B16.34 but do not exceed the material temperature capabilities shown below or the pressure drop limitations

Maximum Shut Off Pressure

See tables 3 and 4

Shutoff Classification

Class I per ANSI/FCI 70-2 and IEC 60534-4 (Class II and better not available). A defined initial maximum leak rate can be provided subject to review of service conditions.

Construction Materials

Standard Construction: See table 1

Temperature Capability

For Trim 1: 427°C (801°F) maximum
For Trims 2 and 3: 230°C (446°F) maximum
For materials: See table 1

Flow Characteristic

Modified equal percentage

Dimensions

See figures 2 and 3

Flow Direction

Reverse flow recommended (into concave face of ball, out through the flow ring)

Flow Coefficients

See Fisher Catalog 12

Maximum Ball Rotation

90 degrees

Valve Installation

Shaft axis to be horizontal

Actuator Mounting

Standard ball rotation is clockwise (CW) to close with right hand mount actuator. Left hand mount actuator with counter clockwise (CCW) to close ball action is optional. For horizontal pipe run and horizontal shaft orientation, it is recommended the ball rotate to the top of the valve body upon opening.

Valve/Actuator Action

With diaphragm or piston rotary actuator and splined shaft, the valve is field-reversible between PDTC or PDTO: ■ push-down-to-close (extending actuator rod closes valve) and ■ push-down-to-open (extending actuator rod opens valve)

Actuator Size Selection

Contact your Emerson sales office for information.

Approximate Weight

Valve Size, NPS	V150S		V300S	
	kg	lb	kg	lb
3	15	33	30	66
4	28	62	39	86
6	45	99	65	142
8	82	180	120	265
10	120	265	213	470
12	178	390	314	692

Table 1. Standard Construction Materials

Part	Material	MATERIAL TEMPERATURE CAPABILITY			
		°C		°F	
		Minimum	Maximum	Minimum	Maximum
Valve Body	Carbon Steel ASME SA216 WCC	-29	427	-20	800
Body Liner	High Chrome Iron (HCI) ASTM A532 Class III Type A	-29	427	-20	800
V-Notch Ball	High Chrome Iron ASTM A532 Class III Type A	-29	427	-20	800
	Ceramic (optional)	-29	427	-20	800
Flow Ring	High Chrome Iron ASTM A532 Class III Type A	-29	427	-20	800
	HCI with Ceramic Insert (optional)	-29	230	-20	450
Flow Ring Retainer	Carbon Steel ASME SA105	-29	427	-20	800
Bearing Shroud	High Chrome Iron ASTM A532 Class III Type A	-29	427	-20	800
Bearing	S44004	-29	427	-20	800
Drive Shaft	S17400	-29	427	-20	800
Follower Shaft	S17400	-29	427	-20	800
Shaft Pins	S42000	-29	427	-20	800
Gaskets	Graphite SST Laminate	-198	538	-325	1000
Packing Set	PTFE V-ring	-46	230	-50	450
	Graphite	-198	538	-325	1000
Packing Box Ring and Follower	S31600	-198	538	-325	1000
Studs	B8M Class 2	-45	538	-50	1000
Nuts	S31600	-45	538	-50	1000
Retainer Screws and Clips	S31600	-45	538	-50	1000
Spring	S30400	-29	427	-20	800
Plug	S31600	-45	538	-50	1000

Table 2. Trim Levels

Trim Level	Ball	Flow Ring	Valve Body Liner	Bearing Shrouds
1 (standard)	HCI (High Chrome Iron)	HCI	HCI	HCI
2	HCI	HCI with ceramic insert	HCI	HCI
3	Ceramic Ball	HCI with ceramic insert	HCI	HCI

Table 3. V150S and V300S Maximum Allowable Shutoff Pressure Drops (Body Ratings)
(Tables for both trim and body limits must be consulted)

TEMPERATURE RANGE	PRESSURE RATING	
	WCC CL150	WCC CL300
°C	Bar	
-46 to -29	- - -	- - -
-29 to 38	20.0	51.7
93	17.9	51.7
149	15.9	50.3
204	13.8	48.6
232	12.8	47.2
260	11.7	45.9
316	10.7	43.8
343	9.65	41.7
371	8.62	38.3
399	6.55	34.8
427	5.52	28.3
°F	Psi	
-50 to -20	- - -	- - -
-20 to 100	290	750
200	260	750
300	230	730
400	200	705
450	185	685
500	170	665
550	155	635
600	140	605
650	125	590
700	110	555
750	95	505
800	80	410

Table 4. V150S and V300S Maximum Allowable Shutoff Pressure Drops based on Standard Trim. Note: Do not exceed the pressure/temperature rating of the valve or mating flanges

TEMPERATURE RANGE	VALVE SIZE, NPS					
	3	4	6	8	10	12
°C	Bar					
-29 to 427	47.0	27.5	28.3	27.5	15.2	13.8
°F	Psi					
-20 to 800	680	400	410	400	220	200

1. Refer to table 3.

Figure 1. Slurry Vee-Ball Cutaway View

W9177-2

Table 5. Fisher V150S Dimensions

VALVE SIZE	V150S DIMENSIONS(1)										
	A	B	D	G	K	M(2)	N(2)	S Diameter	T	U	W
NPS	mm										
3	165	80.0	235	140	130	104	98.0	19.1	152	31.8	14.2
4	194	102	214	152	140	117	98.0	19.1	152	31.8	14.2
6	230	111	214	175	164	124	112	25.4	152	31.8	14.2
8	304	184	208	220	231	195	124	31.8	235	46.0	17.5
10	385	235	208	250	261	235	132	31.8	235	46.0	17.5
12	455	291	208	300	304	270	132	38.1	235	46.0	17.5
	Inch										
3	6.49	3.15	9.26	5.51	5.12	4.11	3.86	0.75	6.00	1.25	0.56
4	7.62	4.02	8.44	5.98	5.53	4.61	3.86	0.75	6.00	1.25	0.56
6	9.06	4.38	8.44	6.89	6.45	4.90	4.40	1.00	6.00	1.25	0.56
8	11.96	7.25	8.19	8.66	9.11	7.68	4.90	1.25	9.25	1.81	0.69
10	15.16	9.26	8.18	9.84	10.26	9.25	5.19	1.25	9.25	1.81	0.69
12	17.91	11.47	8.18	11.81	11.97	10.63	5.19	1.50	9.25	1.81	0.69

1. Stud length associated with clearance dimension "M" is longer than standard length specified in ASME B16.5.
2. Clearance necessary to remove flange bolts.

Figure 2. Slurry Vee-Ball Dimensions (see tables 5 and 6)

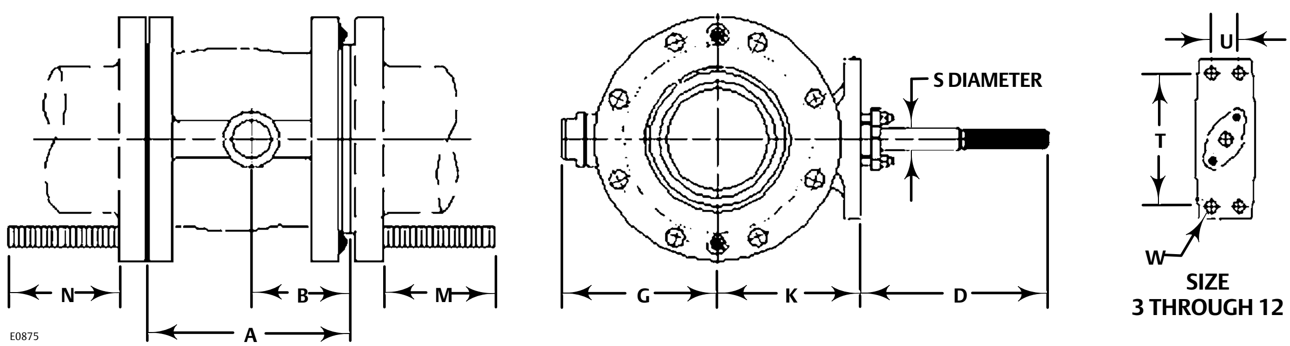


Table 6. Fisher V300S Dimensions

VALVE SIZE	V300S DIMENSIONS										
	A	B	D	G	K	M(1)	N(1)	S Diameter	T	U	W
NPS	mm										
3	165	80.0	235	140	130	127	121	19.1	152	31.8	14.2
4	194	102	214	152	140	146	127	19.1	152	31.8	14.2
6	230	111	214	175	164	152	140	25.4	152	31.8	14.2
8	304	184	208	220	231	223	152	31.8	235	46.0	17.5
10	385	235	208	250	261	276	137	31.8	235	46.0	17.5
12	455	291	208	300	304	324	186	38.1	235	46.0	17.5
	Inch										
3	6.49	3.15	9.26	5.51	5.12	5	4.75	0.75	6.00	1.25	0.56
4	7.62	4.02	8.44	5.98	5.53	5.75	5	0.75	6.00	1.25	0.56
6	9.06	4.38	8.44	6.89	6.45	6	5.5	1.00	6.00	1.25	0.56
8	11.96	7.25	8.19	8.66	9.11	8.78	6	1.25	9.25	1.81	0.69
10	15.16	9.26	8.18	9.84	10.26	10.87	6.81	1.25	9.25	1.81	0.69
12	17.91	11.47	8.18	11.81	11.97	12.75	7.31	1.50	9.25	1.81	0.69

1. Clearance necessary to remove flange bolts.

Table 7. Fisher Slurry Vee-Ball Dimensions for Double D Shaft Drive

VALVE SIZE	E	S(1)	FLAT LENGTH	FLAT SIZE	T	U	W
NPS	mm						
3	83	19.0	25.4	14.2	95	25	see below
4	83	19.0	25.4	14.2	95	25	
6	83	25.4	25.4	17.5	95	25	
8	83	31.8	25.4	20.6	133	38	
10	89	31.8	25.4	20.6	133	38	
12	89	38.1	38.1	25.4	133	38	
	Inch						
3	3.25	0.75	1.0	0.56	3.75	1.0	1/2-13
4	3.25	0.75	1.0	0.56	3.75	1.0	1/2-13
6	3.25	1	1.0	0.69	3.75	1.0	1/2-13
8	3.25	1.25	1.0	0.81	5.25	1.5	5/8-11
10	3.5	1.25	1.0	0.81	5.25	1.5	5/8-11
12	3.5	1.5	1.5	1.0	5.25	1.5	5/8-11

1. This nominal valve shaft diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.

Figure 3. Fisher Slurry Vee-Ball Dimensions for Double D Shaft Drive (see table 7)

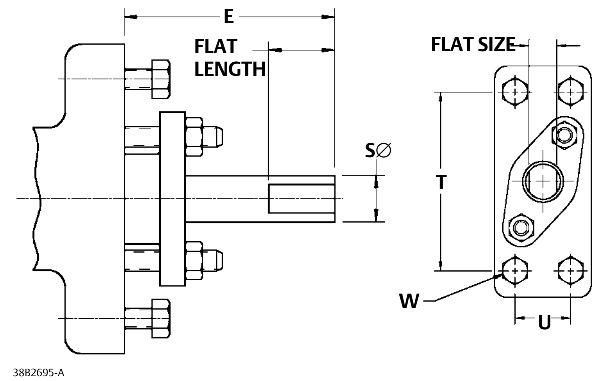
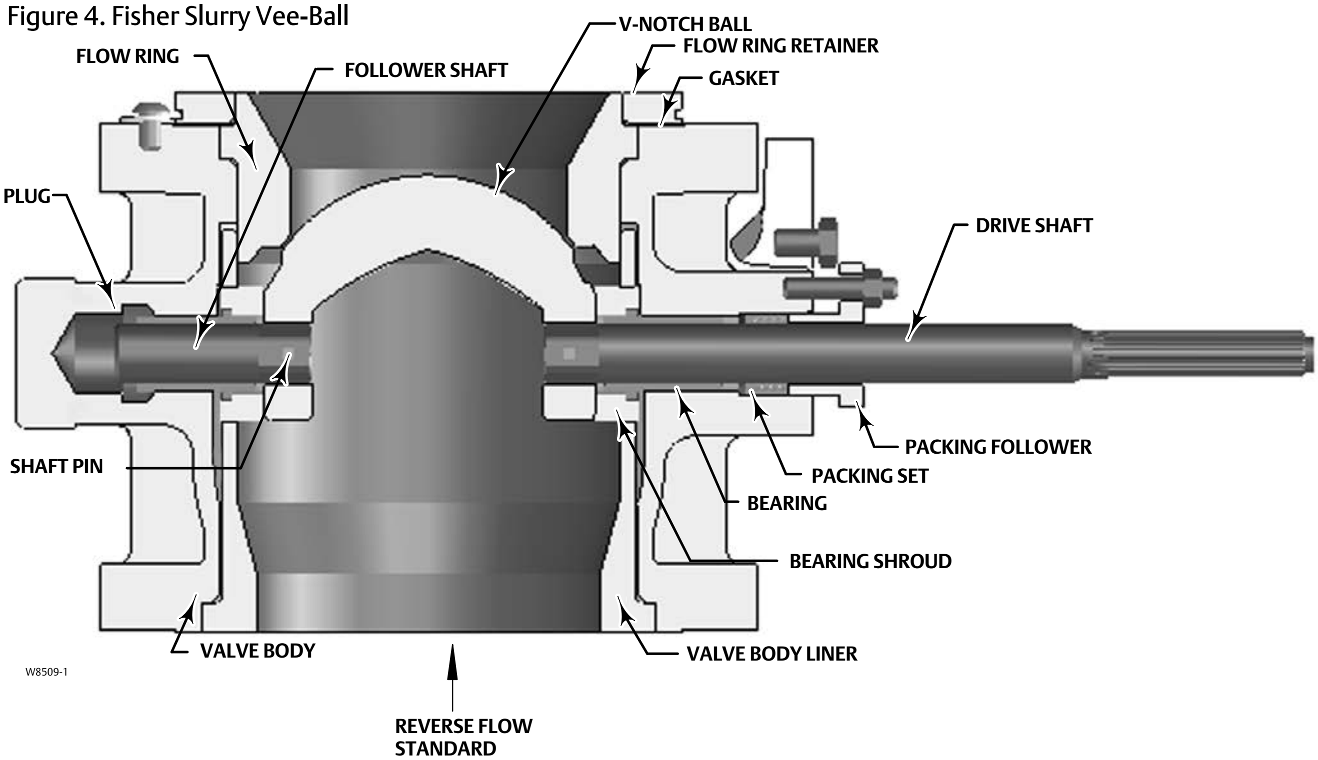


Figure 4. Fisher Slurry Vee-Ball



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Fisher™ Vee-Ball™ V200U Rotary Control Valve

This bulletin provides details on the DN 80 through DN 250 (NPS 3 through NPS 10) Fisher Vee-Ball V200U rotary control valves. The V200U is a flangeless design that offers many of the favorable traits of the proven V150, V200, and V300 Series B Vee-Ball valves with the added feature of a reduced, compact face-to-face dimension design. The contoured segmented V-Notch ball promotes smooth, nonclogging operation and provides a shearing action between ball and the durable HD metal seal. The unrestricted straight-through flow design provides efficient, high capacity for gas, steam, liquids, and fibrous slurries.

The flangeless V200U is capable of interfacing with EN 1092-1 Type B or ASME B16.5 raised face flanges.

The splined or square drive shaft options connect to a variety of rotary-shaft actuator designs to provide reliable, high-performance throttling or on-off operation for many different applications in the process industries.

X1712

Fisher DN200 (NPS 8) V200U Vee-Ball Valve with 2052 Actuator and FIELDVUE ™ DVC6200 Digital Valve Controller

Features

- **Excellent Flow Control**—Precise contouring of the Vee-Ball provides a modified equal percentage flow characteristic.
- **Smooth Valve Operation**—Precision machined parts, pressure-balanced seal, and low friction bearing designs allow smooth, precise movement of the ball.
- **Long Service Life**—The durable HD metal seal construction provides long service life in demanding applications. The constant wiping action of the seal across the ball's sealing surface provides excellent service on high consistency fibrous slurry applications.
- **Line Centering Geometry**—Cast or machined features on the body outside diameter align and center the valve within the mating pipeline flange bolting to ensure optimum performance.

X1710

Fisher DN80 (NPS 3) V200U Vee-Ball Valve with Bettis ™ RPE Actuator and FIELDVUE DVC2000 Digital Valve Controller

- **Trim Versatility**—The V200U drive train components are interchangeable with existing V150, V200, and V300 Series B valves. This feature allows you to reduce your spare parts inventory and maintenance procedures.

Specifications

Valve Sizes

DN ■ 80 ■ 100 ■ 150 ■ 200 ■ 250

NPS ■ 3 ■ 4 ■ 6 ■ 8 ■ 10

Mates with EN1092-1 PN10-40 Type B raised-face flanges and ASME B16.5 CL150/CL300 raised-face flanges (see table 1)

Maximum Inlet Pressures(1)

Consistent with pressure-temperature ratings per EN12516-1 and ASME B16.34 as shown in table 1, but do not exceed the material temperature capabilities shown below or the pressure drop limitations shown in table 4

Maximum Shutoff Pressure/Temperature Ratings(1)

HD (Heavy Duty) Metal Ball Seals and PEEK/PTFE Bearings: See table 4

Shutoff Classification(1)

HD (Heavy Duty) Metal Ball Seal (Bidirectional Flow): 0.01% of valve capacity; Class IV per ANSI/FCI 70-2 and IEC 60534-4; Maximum allowable pressure drop in reverse flow is 6.9 bar (100 psi)

Construction Materials

See table 3

Temperature Capabilities(1)

HD Metal Seals: -46 to 288°C (-50 to 550°F)
PEEK/PTFE Bearings: -198 to 260°C (-325 to 500°F)

Packing Constructions

PTFE V-ring: -46 to 232°C (-50 to 450°F)
ENVIRO-SEAL™ Single PTFE V-ring: -46 to 232°C (-50 to 450°F)

Flow Characteristic

Modified equal percentage

Dimensions

See table 6 and 7 for dimensions

Standard Flow Direction

Forward (into the convex face of the V-notch ball)

Maximum Ball Rotation

90 degrees

Flow Coefficients

See Fisher Catalog 12

Actuator Sizing

See Catalog 14, section D for torque sizing factors. Use the inlet NPS of the V200U to determine appropriate factors from the Vee-Ball tables

Actuator Mounting

Standard actuator mounting is on the right-hand side, as viewed from the valve inlet, with the shaft horizontal. Actuator can be mounted in any of four quadrants. Left-hand actuator mounting is available upon request

Valve/Actuator Action

For right-hand mount actuator, the standard ball design and actuator action is counter-clockwise to close (CCW). The ball will rotate to the top of the valve body when open for a horizontal pipe run with the valve shaft positioned horizontal. ■ Left-hand actuator mounting with CCW action is an option.

Left-hand actuator mounting with a special clockwise to close (CW) ball design and actuator action is also available to allow the ball to rotate to the top of the valve body for a horizontal pipe run with the valve shaft positioned horizontal.

With diaphragm or piston rotary actuator, field-reversible between:■ push-down-to-close (PDTC) (extending actuator rod closes valve) and ■ push-down-to-open (PDTO) (extending actuator rod opens valve.)

Approximate Weight

See table 2

Options

ENVIRO-SEAL packing system

1. The pressure/temperature limits in this bulletin, and any applicable code or standard limitation, should not be exceeded.

Features (continued)

- **Structural Integrity—**One-piece valve body ensures structural integrity of the pressure boundary by eliminating leak paths that could be caused by the gaskets in two-piece, bolted valve designs.

- **Sour Service Capability—**Materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0175-2003, MR0103, and MR0175/ISO 15156.

- **Exceptional Environmental Capabilities—**The optional ENVIRO-SEAL packing systems are designed with very smooth shaft surfaces and live loading to provide exceptional sealing. The seal of the ENVIRO-SEAL system can restrict emissions to less than the Environmental Protection Agency (EPA) limit of 100 parts per million (ppm).

- **Compact Face-to-Face Dimension Design—**Refer to table 5.

Table 1. Valve Body Materials, End Connections, and Ratings

VALVE BODY MATERIAL	VALVE SIZE, DN	VALVE SIZE, NPS	FLANGELESS VALVE END CONNECTION COMPATIBILITY					
			ASME B16.5		EN1092-1			
			Raised Face Flange		Type B Raised Face Flange			
			CL150	CL300	PN10	PN16	PN25	PN40
EN 1.4408/CF8M	80	3	X	X	X	X	X	X
	100	4	X	X	X	X	X	X
	150	6	X	X	X	X	X	X
	200	8	X	X	X	X	X	X
	250	10	X	X	X	X	X	X

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Table 2. V200U Approximate Weights

VALVE SIZE			WEIGHT	
DN	NPS	Rating EN PN (ASME)	kg	lbs
80	3	CL150	8	18
		CL300	10	22
		PN10-40	9	19
100	4	CL150/300	13	28
		PN10/16	12	26
		PN25/40	13	28
150	6	CL150/300	27	58
		PN10-40		
200	8	CL150/300	49	109
		PN10/16		
		PN25/40		
250	10	CL150	64	140
		CL300	102	225
		PN10/16	64	140
		PN25/40	71	156

Table 3. V200U Standard Construction Materials

PART	MATERIAL
Valve Body	CF8M / EN 1.4408 Dual Certified
V-Notch Ball	CF3M / Chrome Plate
Seal — Heavy Duty Metal	CF8M with CoCr-A Hard Facing Alloy
Seal Protector Ring(1)	CF8M / EN 1.4408 Dual Certified
Wave Spring	N07750
Radial Seal	Graphite reinforced PTFE
Bearings	PEEK/Carbon-filled PTFE liner(2)
Packing	PTFE V-ring with one carbon-filled PTFE ring(3)
Shaft	S20910
Groove Pin	S31600
Taper Key	S20910
Seal Protector Ring Gasket(1)	Laminated Graphite
Packing Follower and Packing Box Ring	CF8M
Packing Follower Bolting	Strain hardened B8M stainless steel
Actuator Mounting Bolting	Strain hardened B8M stainless steel

1. For DN80 and DN100 (NPS 3 and NPS 4) constructions only.
2. PEEK is poly-ether-ketone.
3. The carbon-filled PTFE ring is used for grounding.

Figure 1. Fisher V200U Construction Features, DN80 through DN100 (NPS 3 and 4)

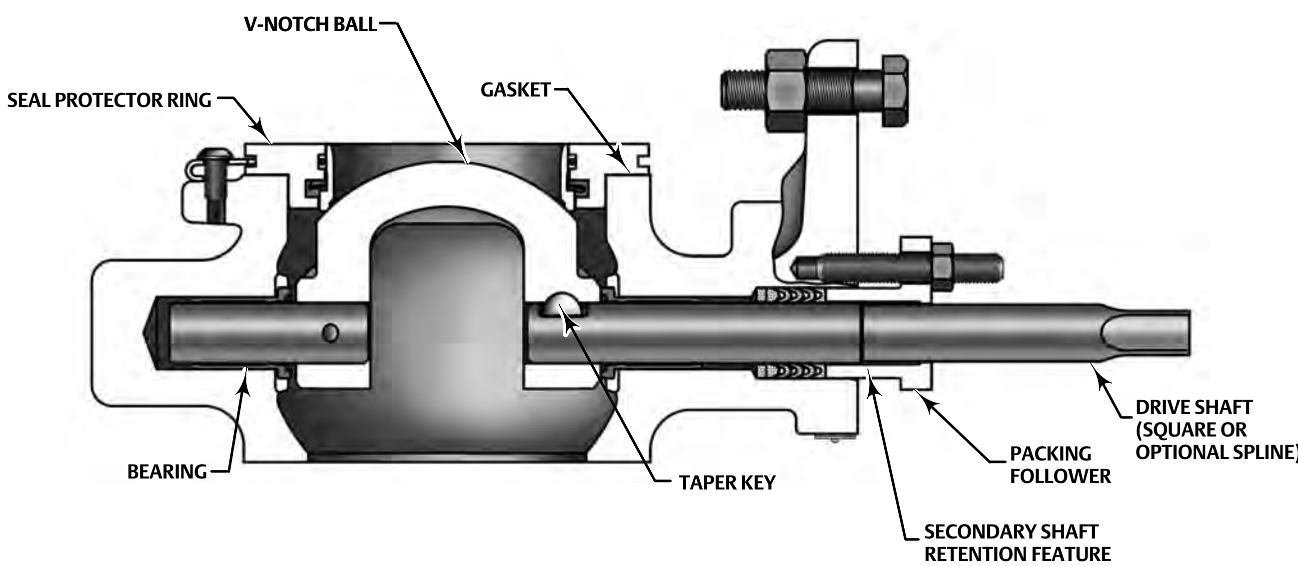


Figure 2. Fisher V200U Construction Features, DN150 through DN250 (NPS 6 through 10)

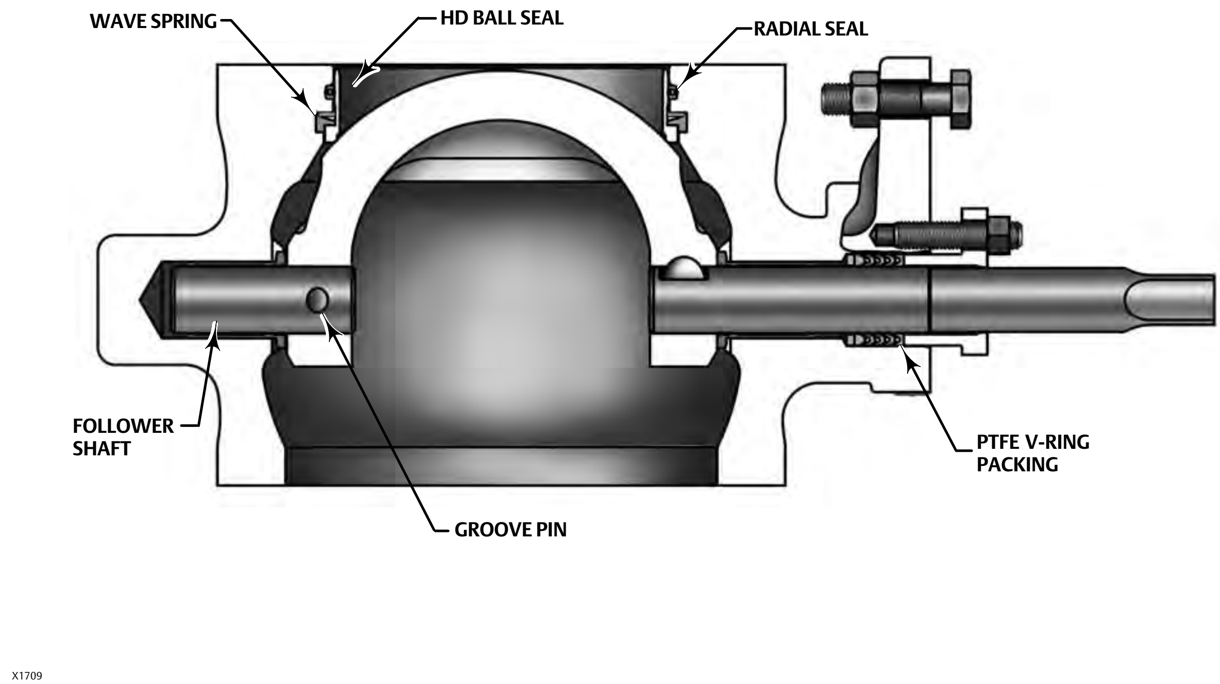


Figure 3. Optional ENVIRO-SEAL Packing Arrangements

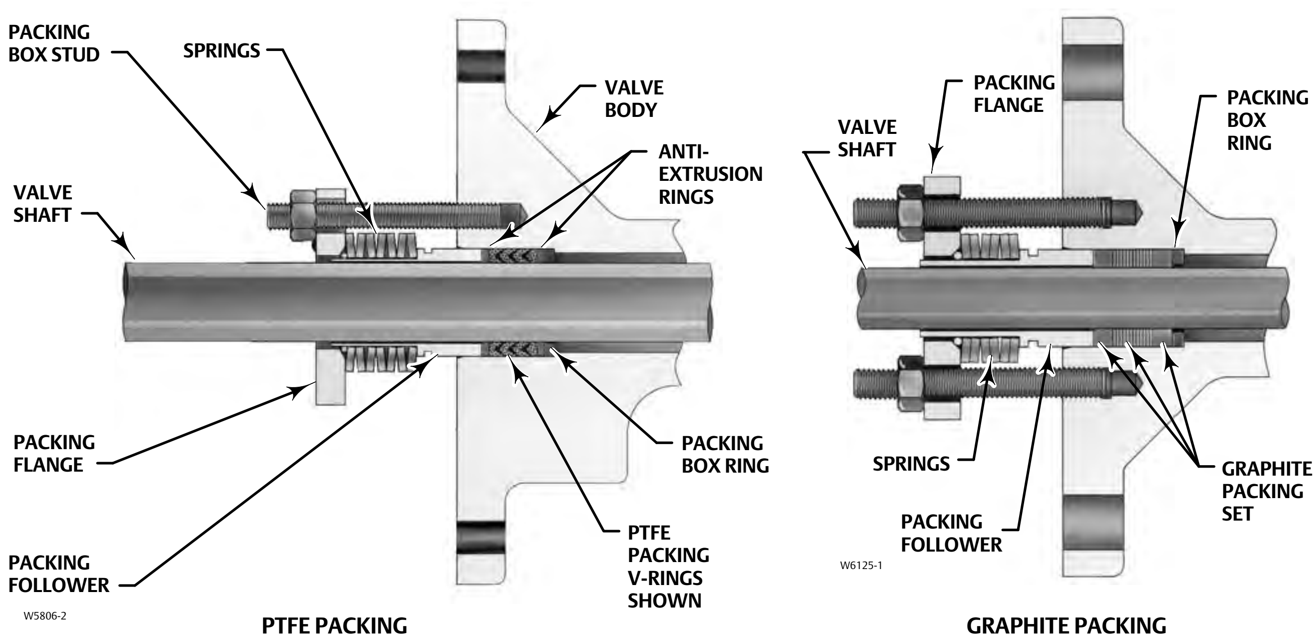


Table 4. Maximum Allowable Shutoff Pressure Drops based on Trim (PEEK Bearing and HD Seal) and EN Pressure Temperature Rating of the Valve Material CF8M/1.4408

BEARING MATERIAL	BALL SEAL	TEMPERATURE RANGE, °C	VALVE SIZE, DN							
			80	100		150	200		250	
			PN 10-40	PN 10/16	PN 25/40	PN 10-40	PN 10/16	PN 25/40	PN 10/16	PN 25/40
			Bar							
PEEK/PTFE	HD Metal (CF8M with CoCr-A hard Facing Alloy)[1]	-10 to 50	40.0	16.0	40.0	40.0	16.0	40.0	16.0	40.0
		100	38.1	15.2	38.1	38.1	15.2	38.1	15.2	38.1
		150	34.2	13.7	34.2	34.2	13.7	34.2	13.7	34.2
		200	30.2	12.1	30.2	30.2	12.1	30.2	12.1	30.2
		250	28.0	11.2	28.0	28.0	11.2	28.0	11.2	28.0
BEARING MATERIAL	**BALL SEAL**	**TEMPERATURE RANGE, °F**	**VALVE SIZE, DN**							
			80	**100**		**150**	**200**		**250**	
			PN 10-40	**PN 10/16**	**PN 25/40**	**PN 10-40**	**PN 10/16**	**PN 25/40**	**PN 10/16**	**PN 25/40**
			Psi							
PEEK/PTFE	HD Metal (CF8M with CoCr-A hard Facing Alloy)[1]	14 to 122	580	232	580	580	232	580	232	580
		212	552	220	552	552	220	552	220	552
		302	496	199	496	496	199	496	199	496
		392	438	175	438	438	175	438	175	438
		482	406	162	406	406	162	406	162	406

1. Pressure drops for HD seals are for forward flow only. For reverse flow with HD metal seal limit pressure drop to 6.9 bar (100 psi).

Table 5. Maximum Allowable Shutoff Pressure Drops based on Trim (PEEK Bearing and HD Seal) and ASME Pressure Temperature Rating of the Valve Material CF8M/1.4408

BEARING MATERIAL	BALL SEAL	TEMPERATURE RANGE, °C	VALVE SIZE, NPS						
			3		4	6	8	10	
			CL150	CL300	CL150/300			CL150	CL300
			Bar						
PEEK/PTFE	HD Metal (CF8M with CoCr-A hard Facing Alloy)[1]	-46 to 38	19.0	49.6	49.6	49.6	49.6	19.0	40.9 [2]
		93	16.2	42.7	42.7	42.7	42.7	16.2	40.9 [2]
		149	14.8	38.6	38.6	38.6	38.6	14.8	38.6
		204	13.4	35.5	35.5	35.5	35.5	13.4	35.5
		232	12.8	34.5	34.5	34.5	34.5	12.8	34.5
		260	11.7	33.1	33.1	33.1	33.1	11.7	33.1
BEARING MATERIAL	**BALL SEAL**	**TEMPERATURE RANGE, °F**	**VALVE SIZE, NPS**						
			3		**4**	**6**	**8**	**10**	
			CL150	**CL300**	**CL150/300**			**CL150**	**CL300**
			Bar						
PEEK/PTFE	HD Metal (CF8M with CoCr-A hard Facing Alloy)[1]	-50 to 100	275	720	720	720	720	275	593 [2]
		200	235	620	620	620	620	235	593 [2]
		300	215	560	560	560	560	215	560
		400	195	515	515	515	515	195	515
		450	185	500	500	500	500	185	500
		500	170	480	480	480	480	170	480

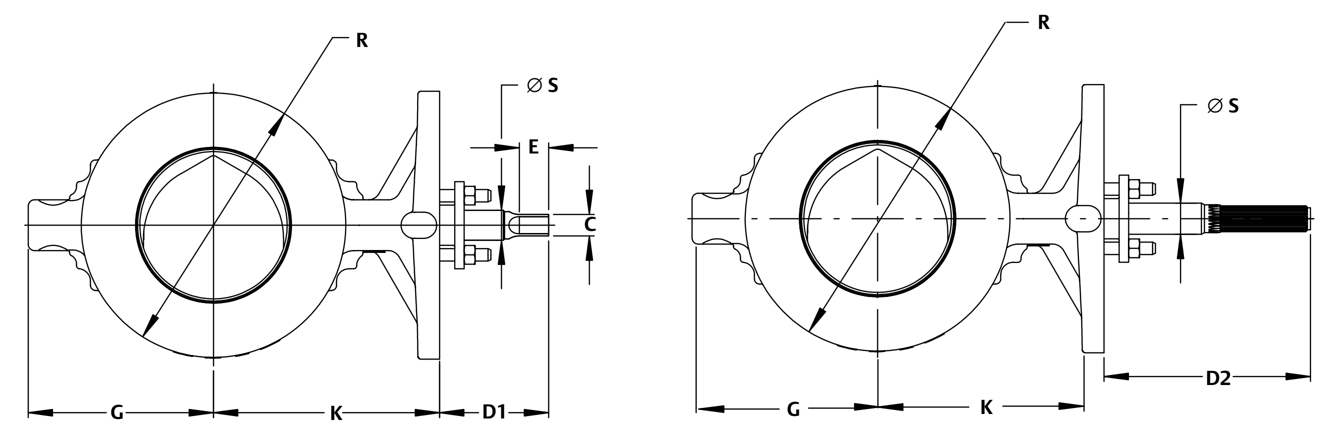
1. Pressure drops for HD seals are for forward flow only. For reverse flow with HD metal seal limit pressure drop to 6.9 bar (100 psi).
2. Maximum allowable shutoff pressure drop limited by trim.

Table 6. Fisher V200U Dimensions(1)

VALVE SIZE, DN	A	B	G	K	M(4)		P(2)		R	T	U	W
					PN 10/16	PN 25/40	PN 10/16	PN 25/40				
	mm											
80	100	59	112	130	225	240	- - -	- - -	127			14.2
100	116	68	127	141	250	270	103	104	158	152	32	14.2
150	160	89	154	164	310	340	- - -	- - -	216			17.5
200	200	124	189	232	355	405	188	190	270	235	46	17.5
250	240	147	216(3)	261	410	470	253	253	324			
VALVE SIZE, NPS	**A**	**B**	**G**	**K**	**M(4)**		**P(2)**		**R**	**T**	**U**	**W**
					CL150	CL300(5)	CL150	CL300				
	Inch											
3	3.94	2.34	4.40	5.12	8.00	8.50	- - -	- - -	5.00			0.56
4	4.58	2.67	5.00	5.55	8.75	9.50	3.90	3.90	6.19	5.98	1.25	0.56
6	6.30	3.52	6.06	6.46	10.75	11.75	- - -	- - -	8.50			0.69
8	7.87	4.89	7.44	9.11	12.75	14.00	7.40	7.40	10.63	9.25	1.81	0.69
10	9.45	5.78	8.50(3)	10.26	14.75	16.25	9.53	9.33	12.76			

1. Select the appropriate valve based on the pressure class of your pipe flanges as some multi-class valves are not interchangeable because of line bolting requirements.
2. Minimum internal diameter of the mating pipe or flange required for Vee-Ball clearance.
3. 221 mm (8.69 inches) for NPS 10, CL300 valves.
4. Clearance necessary to remove the bolt.
5. The NPS 10 CL300 construction requires 4 bolts per side (8 total) to be installed in blind, tapped holes on the valve body. The M value for these 1-8 UNC fasteners is 140 mm (5.5 inch).

Figure 4. Fisher V200U Dimensions with Square and Spline Shaft (also see tables 6 and 7)



SQUARE

SPLINE

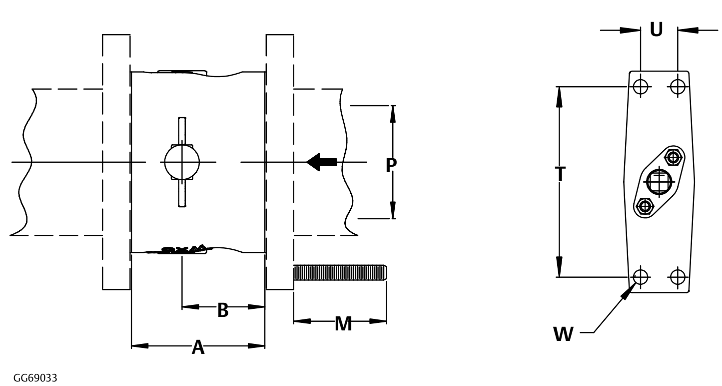


Table 7. Fisher V200U Shaft Dimensions

VALVE SIZE/ PRESSURE RATING		S(1)		SQUARE						SPLINE	
				C		D1		E		D2	
DN	NPS	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
DN80/ PN10-40	NPS 3/ CL150-300	19.1	0.75	14.0	0.6	103.0	4.06	19.0	0.75	214	8.44
DN100/ PN10-40	NPS 4/ CL150-300	19.1	0.75	14.0	0.6	103.0	4.06	19.0	0.75	214	8.44
DN150/ PN10-40	NPS 6/ CL150-300	25.4	1.00	19.0	0.8	108.0	4.25	25.0	0.94	214	8.44
DN200/ PN10-40	NPS 8/ CL150-300	31.8	1.25	22.0	0.9	109.0	4.29	30.0	1.18	208	8.19
DN250/ PN10-40	NPS 10/ CL150-300	31.8	1.25	22.0	0.9	109.0	4.29	30.0	1.18	208	8.19

1. This nominal Valve Shaft Diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.

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Fisher™ V250 Rotary Control Valve

The V250 Hi-Ball rotary control valve is designed for heavy-duty throttling and on-off applications. Depending on size, this valve installs between two CL600 or CL900 pipeline flanges. The V250 valve is available with a single ball seal, flow ring, or dual-seal construction.

Single-seal constructions are used in tight shutoff applications; the flow ring construction can satisfy higher temperature requirements. The dual-seal construction, with a seal in the inlet and outlet openings, is used in bidirectional flow-shutoff applications.

The V250 Hi-Ball valve is typically used for throttling and controlled flow applications in gas transmission lines, gas distribution, or liquid pipelines.

W4177-3

Features

- **High Pressure Drop Capabilities**—Depending on the construction, a V250 valve is capable of a maximum static pressure differential of 103 bar (1500 psi) at 82°C (180°F) for CL600, and 155 bar (2250 psi) for CL900 constructions at 38°C (100°F) for LCC steel and CF8M (316 stainless steel).

- **Efficient Operation**—Tapered-polygon ball-to-shaft connection (see figure 4) and clamped splined actuator connection (see figure 5) remove lost motion or deadband from the drive train for throttling control applications.

- **Excellent Flow Control**—Reduced ball port design provides a modified equal percentage flow characteristic and an excellent response characteristic.

- **Tight Shutoff**—Shutoff with the V250 ball seal is 0.0001 percent of maximum capacity.

- **Greater Capacities**—V250 ball valve construction offers greater capacities than conventional globe valves for both compressible and incompressible fluids.

- **Sour Service Capability**—Materials are available for applications handling sour service. These materials comply with the requirements of NACE MR0175-2002.

- **Long Service Life**—Pressure-balanced drive shaft design with PTFE-lined bearings and pressure-assisted shaft sealing arrangement provides for a long life of reliable service.

- **Minimum Maintenance**—Two-piece ball and shaft assembly allows for complete trim overhaul; parts replacement is kept to a minimum.

- **Excellent Environmental Capabilities**—The optional live loaded packing system is designed with very smooth shaft surfaces and live loading to provide excellent sealing.

Specifications

Available Configuration

Flangeless ball valve assembly with ■ single ball seal, ■ flow ring, or ■ dual ball seal

Valve Body Sizes and End Connection Styles

NPS 4 through 12 flangeless valves retained by line flange bolts and designed to fit between CL600 or CL900 ■ raised-face or ■ ring-type joint flanges (ASME B16.5)

NPS 16 through 24 flangeless valves retained by line flange bolts and designed to fit between CL600 ■ raised-face or ■ ring-type joint flanges (ASME B16.5)

Maximum Inlet Pressure(1)

NPS 4 through 12 consistent with CL600 or CL900 (ASME B16.34)
NPS 16 through 24 consistent with CL600 (ASME B16.34)

Maximum Allowable Shutoff Pressure Drop(1,2)

Single-Seal and Dual-Seal Construction: See figure 2.
Flow Ring Construction: Limited by the pressure-temperature rating of the valve body

Shutoff Classification

Single-Seal and Dual-Seal Constructions: 0.0001% of maximum valve capacity (less than 1% of Class IV, ANSI/FCI 70-2 and IEC 60534-4)
Flow Ring Construction: 1% of maximum valve capacity

Construction Materials

See table 1

Seal Material Temperature Capability(1)

Single-Seal and Dual-Seal Construction:
■ -46 to 82°C (-50 to 180°F) for LCC steel and CF8M [316 stainless steel (SST)] valve bodies
Flow Ring with Nitrile O-Rings: ■ -46 to 93°C (-50 to 200°F) for LCC steel and CF8M valve bodies
Flow Ring with Fluorocarbon O-Rings: ■ -46 to 204°C (-50 to 400°F) for LCC steel and CF8M valve bodies

Flow Characteristic

Modified equal percentage

Flow Direction

Single Seal Construction: Forward-flow only (see figure 3)

Flow Ring Construction: Forward- or reverse-flow (see figure 3)

Dual Seal Construction: Required to provide shutoff for bi-directional flow

Flow Coefficients

See Catalog 12

Noise Levels

See Catalog 12 for sound pressure level prediction

Maximum Ball Rotation

90 degrees

Actuator Mounting

■ Right-hand or ■ left-hand mounted as viewed from the valve inlet for forward-flow

Shaft and Bore Diameters

See figure 7

- continued -

Specifications (continued)

Approximate Weights
See table 2

Options
■ Line flange bolts, ■ Sour service trim(3), ■ Buried service actuator adaptation, and ■ Dual seal configuration for bi-directional shutoff (this configuration incorporates a tapped and plugged connection which can be used in a double block and bleed system to test seal integrity), ■ Live Loaded PTFE Packing

1. The pressure or temperature limits in this bulletin and any applicable standard or code limitations should not be exceeded.
2. The maximum allowable shutoff pressure drops are further limited for the following constructions. The NPS 12 with S20910 drive shaft is limited to 128 bar (1862 psi) from -46 to 59°C (-50 to 139°F) and to 103 bar (1490 psi) at 93°C (200°F). The NPS 16 with 17-4PH steel, with 2-1/2 inch splined driveshaft is limited to 1000 psi (69 bar), and with the S20910, 2-1/2 inch splined drive shaft is limited to 55 bar (795 psi) at all service temperatures. The NPS 24 with S20910 drive shaft is limited to 92 bar (1336 psi) at all service temperatures.
3. See table 1 for sour service trim materials.

Figure 1. Sectional View of Fisher V250 Valve

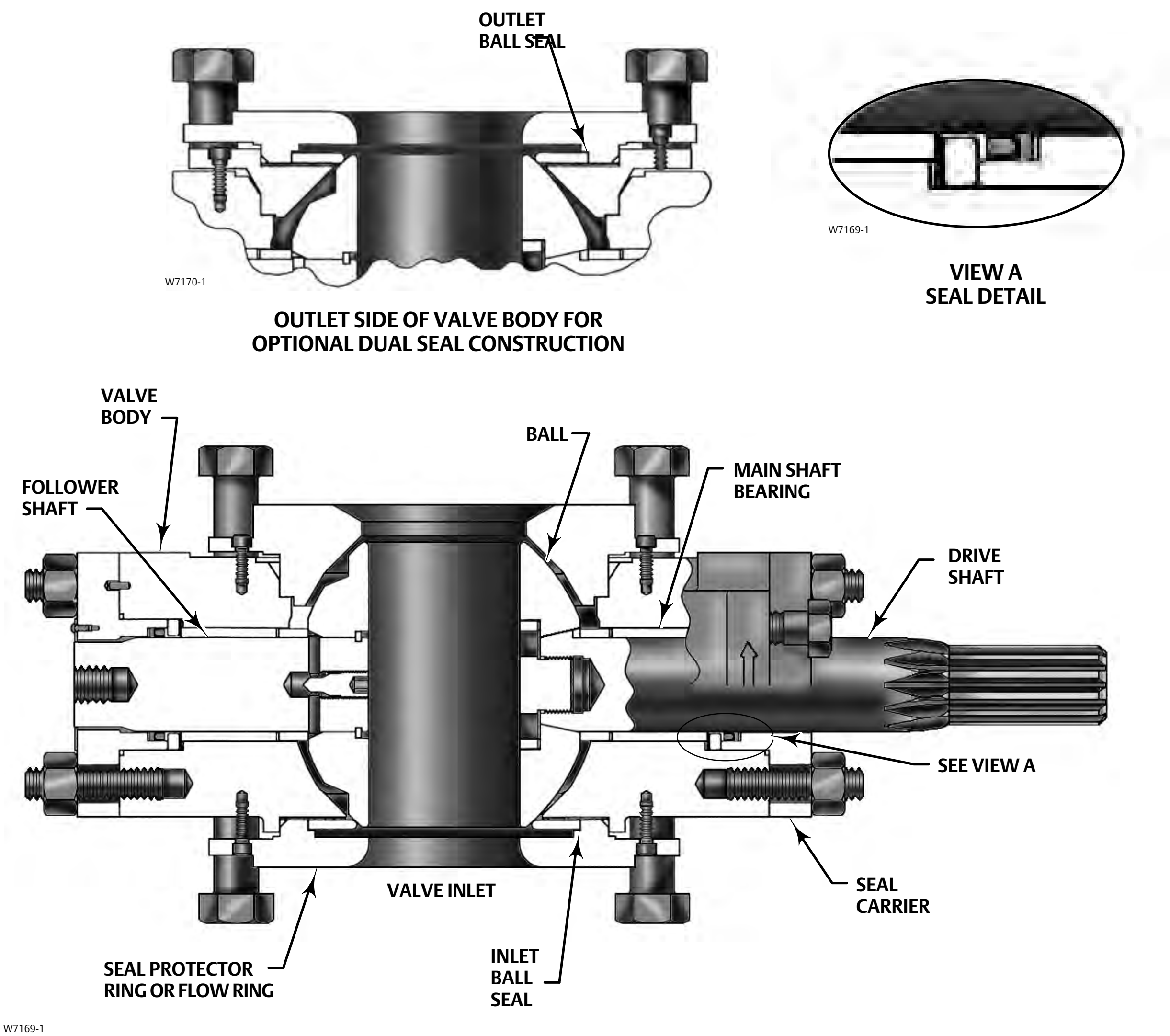


Table 1. Construction Materials

Part		Construction Material
Valve Body, Body Outlet, and Seal Protector Ring or Flow Ring	Standard	LCC carbon steel
	Sour Service Trim(1)	LCC steel, heat-treated
	Optional	WCC carbon steel or S31600 [316 stainless steel (SST)]
Drive Shaft, Follower Shaft, and Shaft Retainer	Standard	S17400 (17-4PH SST)
	Sour Service Trim(1)	S17400 (17-4PH SST) H1150 DBL
	Optional	S20910 stainless steel
Ball	Standard	Chrome-plated WCC steel
	Sour Service Trim(1)	Chrome-plated WCC steel, heat-treated
	Optional	Chrome-plated S31600
Ball Seal	All Trims	POM (polyoxymethylene)
Bearings	All Trims	PTFE/Composition-lined S31600
O-Rings	Standard	Nitrile
	Sour Service Trim(1)	Fluorocarbon
	Optional	Fluorocarbon
Shaft Seal	Std. with Backup Ring	PTFE R30003 / PEEK
	Live Loaded Packing	PTFE / SST
Seal Carrier	All Trims	S31600 SST
Seal Carrier Stud Bolts	Standard	Grade B7 steel
	Sour Service Trim(1)	Grade B7M steel
	Optional	Grade B8M stainless steel
Seal Carrier Hex Nuts	Standard	Grade 2H steel
	Sour Service Trim(1)	Grade 2HM steel
	Optional	Grade 8M stainless steel
Line Bolts(2)	Standard	Grade B7 steel
	Sour Service Trim(1)	Grade B7M steel
Line Nuts(2)	Standard	Grade 2H steel
	Sour Service Trim(1)	Grade 2HM

1. As detailed in NACE MR0175-2002.
2. Line bolts and nuts are not included as part of the standard package. Specify line bolts and nuts as an option.

Table 2. Approximate Weights

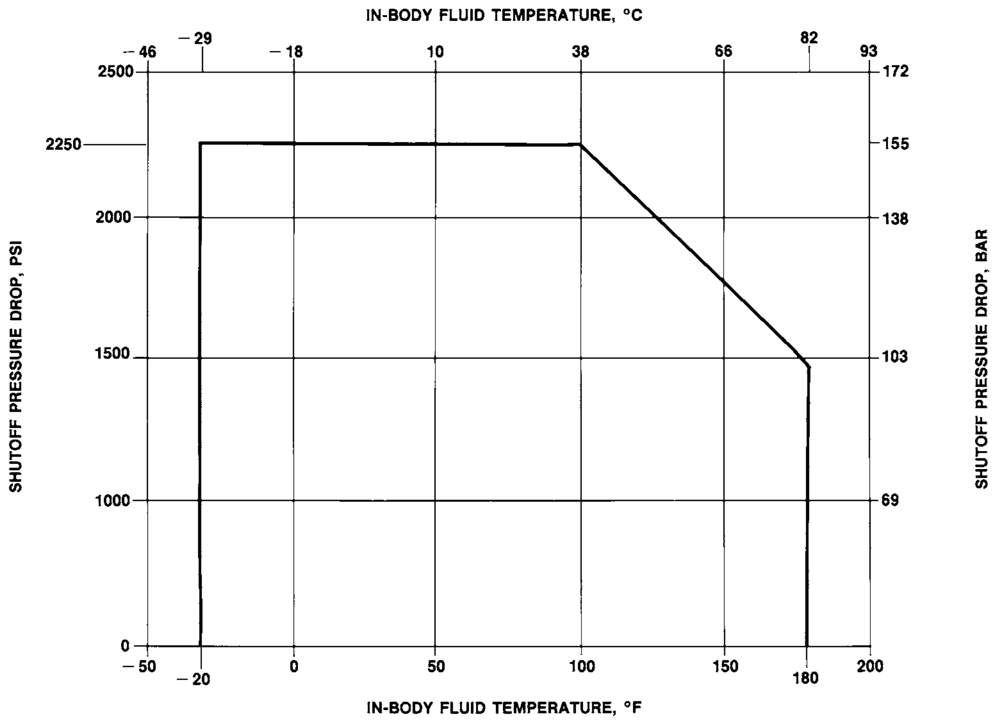
VALVE SIZE, NPS	WEIGHT	
	kg	lbs
4	73	160
6	132	290
8	222	490
10	345	760
12	431	950
16	771	1700
20	1814	4000
24	2404	5300

Installation

Install the V250 valve in any position, but the recommended orientation is in a horizontal pipeline with the shaft positioned horizontally and the ball closing in the downward direction. The actuator can be either right- or left-hand mounted as viewed from the valve inlet for forward-flow. For bidirectional flow, install the valve so that the highest pressure condition will flow as shown by the flow direction arrow on the valve body.

Dimensions are shown in figure 7.

Figure 2. Maximum Allowable Shutoff Pressure Drop for Single and Dual POM Seal Construction



Note:
Do not exceed the limits in this curve or the body rating, whichever is lower.

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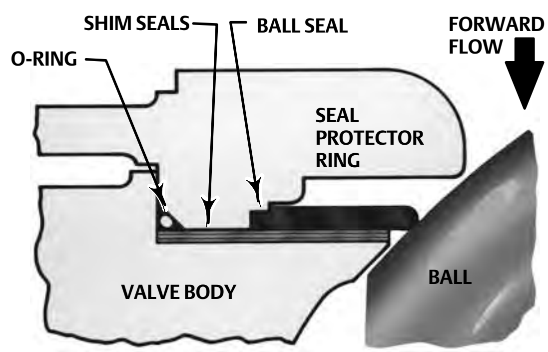
Figure 3. Ball Seal and Flow Ring Constructions



BALL SEAL

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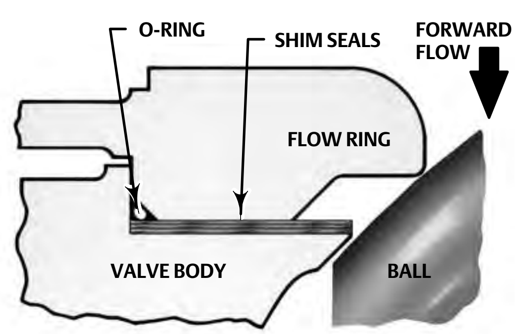

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FLOW RING

Figure 4. Drive Shaft for Fisher V250 Valve

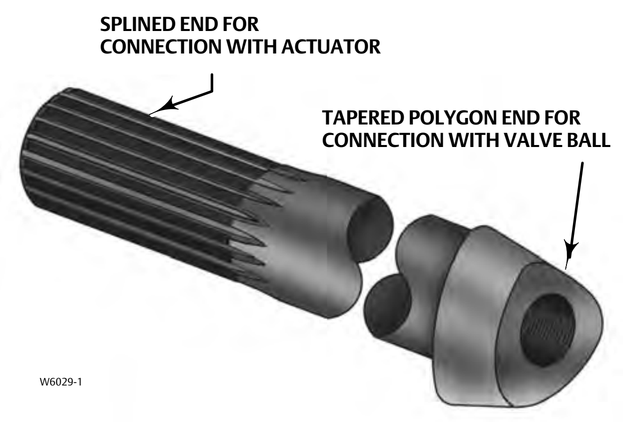


Figure 5. Clamped Splined Actuator Connection on Fisher 1061 Actuator

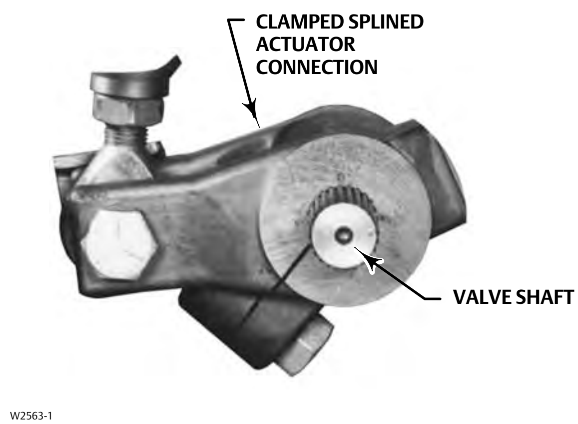


Figure 6. Live Loaded PTFE Packing

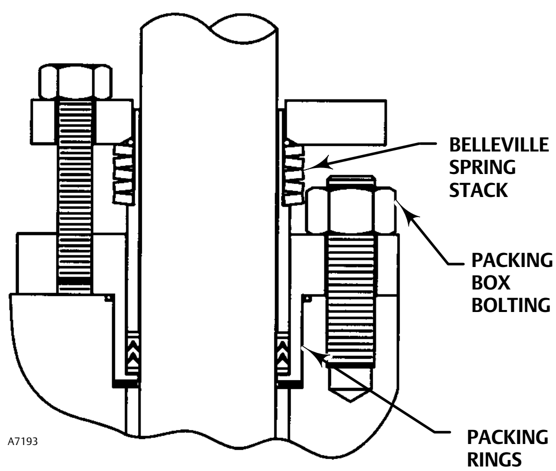
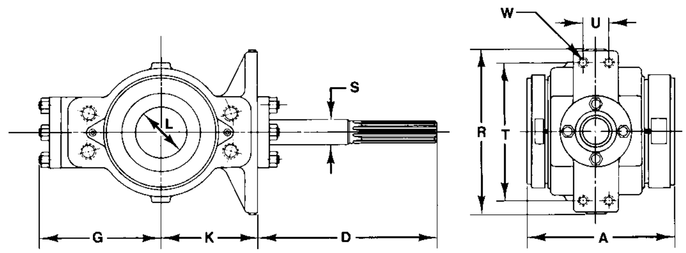
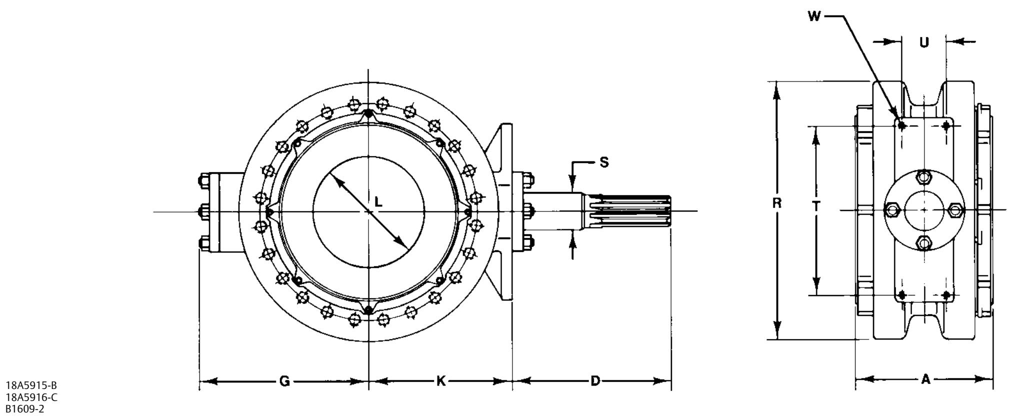


Figure 7. Dimensions (also see table 3)



NPS 4 THROUGH 16



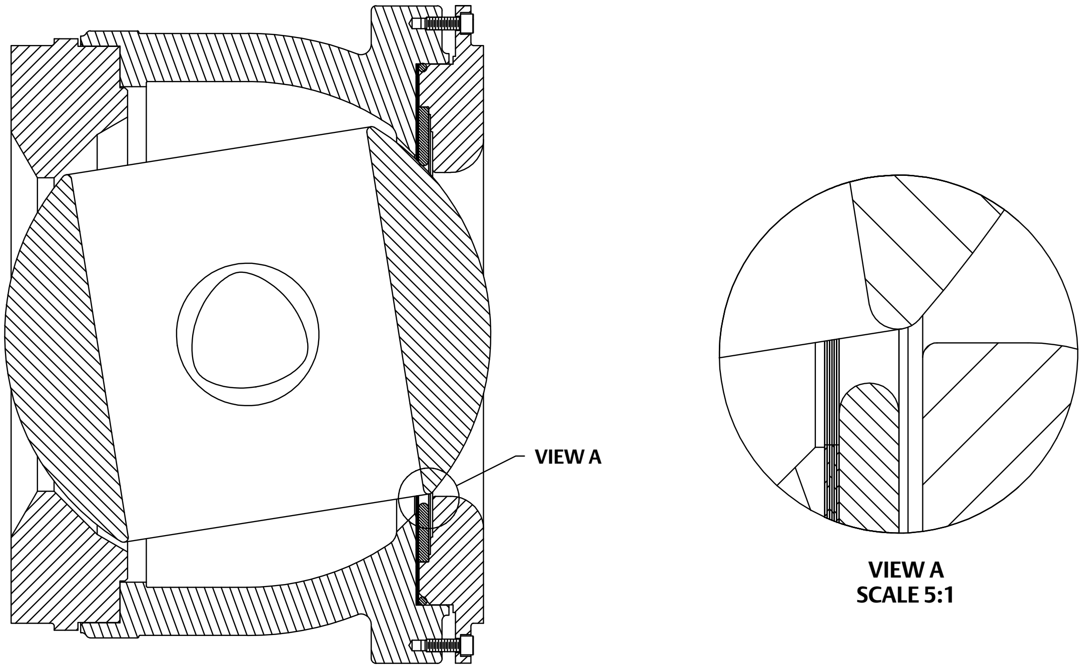
NPS 20 AND 24

Table 3. Dimensions

VALVE SIZE, NPS	A	D	G	K	L (BORE DIAMETER)	R	S		T	U	W
							Shaft Diameter	Spline Diameter[1]			
mm											
4	194	208	197	162	76.2	279	31.8	31.8	235	46	5/8-UNC
6	229	356	238	194	101.6	327	50.8	50.8	273	51	3/4-UNC
8	243	356	327	270	152.4	413	63.5	63.5	337	76	7/8-UNC
10	297	356	343	287	187.5	445	69.9	63.5	337	76	7/8-UNC
12	338	356	381	324	228.6	483	76.2	63.5	337	76	7/8-UNC
16	400	470	460	392	292.1	613	101.6	63.5	533	127	1-1/4—8UN
		508						88.9			
20	533	508	546	480	371.3	864	127.0	88.9	533	127	1-1/4—8UN
24	679	508	629	546	438.2	991	152.4	88.9	533	127	1-1/4—8UN
Inches											
4	7.62	8.19	7.75	6.38	3.00	11.00	1.25	1.25	9.25	1.81	5/8-UNC
6	9.00	14.00	9.38	7.62	4.00	12.88	2.00	2.00	10.75	2.00	3/4-UNC
8	9.56	14.00	12.88	10.62	6.00	16.25	2.50	2.50	13.25	3.00	7/8-UNC
10	11.69	14.00	13.50	11.31	7.38	17.50	2.75	2.50	13.25	3.00	7/8-UNC
12	13.31	14.00	15.00	12.75	9.00	19.00	3.00	2.50	13.25	3.00	7/8-UNC
16	15.75	18.50	18.12	15.44	11.50	24.12	4.00	2.50	21.00	5.00	1-1/4—8UN
		20.00						3.50			
20	21.00	20.00	21.50	18.88	14.62	34.00	5.00	3.50	21.00	5.00	1-1/4—8UN
24	26.75	20.00	24.75	21.50	17.25	39.00	6.00	3.50	21.00	5.00	1-1/4—8UN

1. Use this dimension to select compatible Fisher rotary actuators.

Figure 8. Dead Angle (also see table 4)



GH11897

Table 4. Dead Angle Degrees

VALVE SIZE, NPS	DEAD ANGLE, DEGREES
4	17
6	12
8	11
10	8
12	8
16	10
20	10
24	8

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

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EMERSON

Fisher™ V260 Ball Control Valve

The Fisher V260 is a full-bore control valve designed from the ground up with features for optimized pressure, flow and process control. An integral drilled attenuator controls noise and vibration from high pressure drop liquids and gases. The splined shaft connection to the actuator reduces lost motion.

The V260A with Aerodome attenuator, V260B with Hydrodome attenuator, and V260C Ball Control Valves (figures 1 and 3) combine the efficiency of a rotary valve with the energy-dissipating capability of a special trim to provide improved performance for demanding applications. The valve is available with single, dual, or dual block-and-bleed seal options (see the Specifications table).

The trim design of the V260A is used in gas service to reduce noise effects that cause pipeline vibration. The V260B provides improved performance for demanding applications such as pump bypass and pipeline take-off. The trim is designed for liquid service to help eliminate or reduce cavitation and associated pipeline noise and vibration. The V260C full-bore ball valve is designed for automated control in bypass, batch, monitor, and emergency shutoff service applications, and it presents little or no restriction to flow.

The V260 full-bore ball valve is available with composition seals, and process type stem packing for improved service life.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

Fisher V260 Valve

Features

- **Excellent Flow Control--** The splined ball to shaft connection, splined shaft to actuator connection, double power-end bushing assemblies, and trunnion guiding, all provide improved dynamic control.
- **Aerodynamic Performance--** Up to -20 dBA acoustical attenuation can be achieved for the V260A within a single stage construction. Dual-stage construction can provide up to -25 dBA attenuation.
- **Improved Service Life--** The attenuator is not part of the seal assembly. The seal wipes to ball surface, not the attenuator, promoting increased service life.
- **Trim Versatility--** Key valve components, such as valve body, ball, shaft and bearings, are interchangeable between the V260A, V260B and V260C. This feature allows you to reduce your spare parts inventory and maintenance time.

(continued on page 3)

Specifications

Valve Body Sizes and End Connection Styles

NPS ■ 6 ■ 8, ■ 10, ■ 12, ■ 16, ■ 20, and ■ 24 flanged valves with CL150, CL300, or CL600 raised-face flanges compatible with ASME B16.5. Consult your Emerson sales office for other end style connections.

Maximum Inlet Pressures and Temperatures(1)

Consistent with CL150, CL300, or CL600 pressure-temperature ratings per ASME B16.34

Maximum Allowable Shutoff Pressure Drop(1).

For Single-Seal and Dual-Seal Construction (Except where further limited by the pressure-temperature rating of the valve body):

■ CL150: 20 bar (285 psi) at 38°C (100°F)
■ CL300: 51 bar (740 psi) at 38°C (100°F)
■ CL600: 103 bar (1480 psi) at 38°C (100°F)

Flow Characteristic

■ Modified linear with single high density attenuator, ■ Modified equal percentage with single characterized attenuator (see figure 2), or ■ Modified equal percentage without attenuator

Flow and Shutoff Direction

Unidirectional flow for V260 is forward flow. Seal is upstream.

■ **Single Seal Constructions:** Should be used for unidirectional flow and unidirectional shutoff only.

■ **Double Seal Constructions:** V260A and V260C may be used for unidirectional and bidirectional flow. V260B should be used for unidirectional flow only for effective anti-cavitation protection. Bidirectional shutoff requires the dual seal construction.

Flow Coefficients

See Fisher Catalog 12

Shutoff Classification (per ANSI/FCI 70-2 and IEC 60534-4)

Single-Seal Composition Constructions: Class IV, optional Class VI
Dual-Seal Composition Constructions: Class IV, optional Class VI

Seal Material and Temperature Capability(1)

Standard: ■ POM (polyoxymethylene) -29 to 82°C (-20 to 180°F)

Optional: ■ PTFE/PEEK(2)(3) -37 to 100°C (-35 to 212°F)

Maximum Ball Rotation

90 degrees

Actuator Mounting

Right-hand or left-hand mounted as viewed from the valve inlet for forward flow

Packing Arrangements

PTFE Packing: Standard construction (see figure 4)

ENVIRO-SEAL™ Packing: This optional packing system provides improved sealing, guiding, and transmission of loading force to control liquid and gas emissions. Contact your Emerson sales office for availability of ENVIRO-SEAL packing (see figure 4)

Dimensions

See figure 5

Options

■ Double block-and-bleed applications (Dual-seal construction is required), ■ Two Stage V260A Attenuator, ■ Two or Three Stage V260B Attenuator, ■ CL900 flanges, ■ Ring type joint flanges

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for this valve should not be exceeded.
2. PTFE stands for Polytetrafluoroethylene, and PEEK stands for PolyEtherEtherKetone.
3. Temperature limit of PTFE/PEEK is limited due to standard Nitrile O-Ring. Contact your Emerson sales office for higher temperature options, up to 232°C (450°F).

Features (continued)

- **Sour Service and Sour Crude Oil Capability--** Optional materials are available that comply with NACE Standard MR0175-2002.

- **Tight Shutoff--** Self-adjusting seal(s) that are pressure assisted provide tight shutoff for long reliable service. The design incorporates a heavy duty S31600 stainless steel carrier that retains the composition seal for full-rated pressure drop service. Class IV and VI shutoff available.

- **Heavy Duty Trunnion--** The ball trunnions are designed for demanding applications requiring long service life, with a reduction in maintenance time and costs.

- **Broad Hydrodynamic Applications--** Single, dual, and three-stage attenuators for the V260B may be provided for a varying range of applications. A K_c value of 1.0 is achievable depending on service conditions.

- **Flexible Applications--** The attenuator is active throughout the ball rotation for very demanding services or a characterized attenuator is used to match the service conditions (see figure 2).

Table 1. Aerodome and Hydrodome Trim Benefits Comparison

Benefits	Typical Competitive Device	V260A with Aerodome Attenuator	V260B with Hydrodome Attenuator
Up to -20 dBA aerodynamic noise attenuation	No	Yes	N/A
Excellent attenuation effect at critical opening position	No	Yes	Yes
High Density (Full) or characterized attenuation	No	Yes	Yes
2 or 3 stage options	No	Yes	Yes
Effective bidirectional attenuation option	No	Yes	Yes
Integrated ball, shaft, and attenuator design for best throttling dynamics	No	Yes	Yes
Dual seal option	No	Yes	Yes
Ball seal exchange without actuator removal	No	Yes	Yes
K_c improved versus unattenuated device	Yes	N/A	Yes
Double block-and-bleed option	No	Yes	Yes
Overall ease of maintenance	No	Yes	Yes
Trunnion-mounted ball for excellent wear resistance	Yes	Yes	Yes
Low profile for ease of piping	Yes	Yes	Yes

Table 2. Standard Materials of Construction

Part	Material
Valve Body	LF2 Carbon Steel
Ball	WCC Carbon Steel or Low Temperature Carbon Steel
Seal	POM with S31600 SST Seal Blank or PTFE/PEEK with S31600 SST Seal Blank
Dome Attenuator	S17400 SST
Shaft	S17400 SST H1075 or S17400 SST H1150 DBL
Wave Spring	S17700 SST or N07750
Tailpiece	Low Temperature Carbon Steel
Tailpiece Mounting Bolting	B7 Steel or B7M Steel
Bearing Plate	Carbon Steel
Bearings	S30400 SST with Aramid liner
Thrust Washer	Carbon filled PTFE
Packing Box Housing	Low Temperature Carbon Steel
Packing	PTFE/Carbon filled PTFE
Packing Bolting	B7 Steel, B7M Steel, or B8M Class 2 SST
Packing Follower, Packing Box Ring	Annealed S31600 SST
Groove Pins	B8M SST
O-Rings	Nitrile
Actuator Mounting Bolting	Steel Grade 5

Figure 1. Sectional View of Valve (Single Seal)

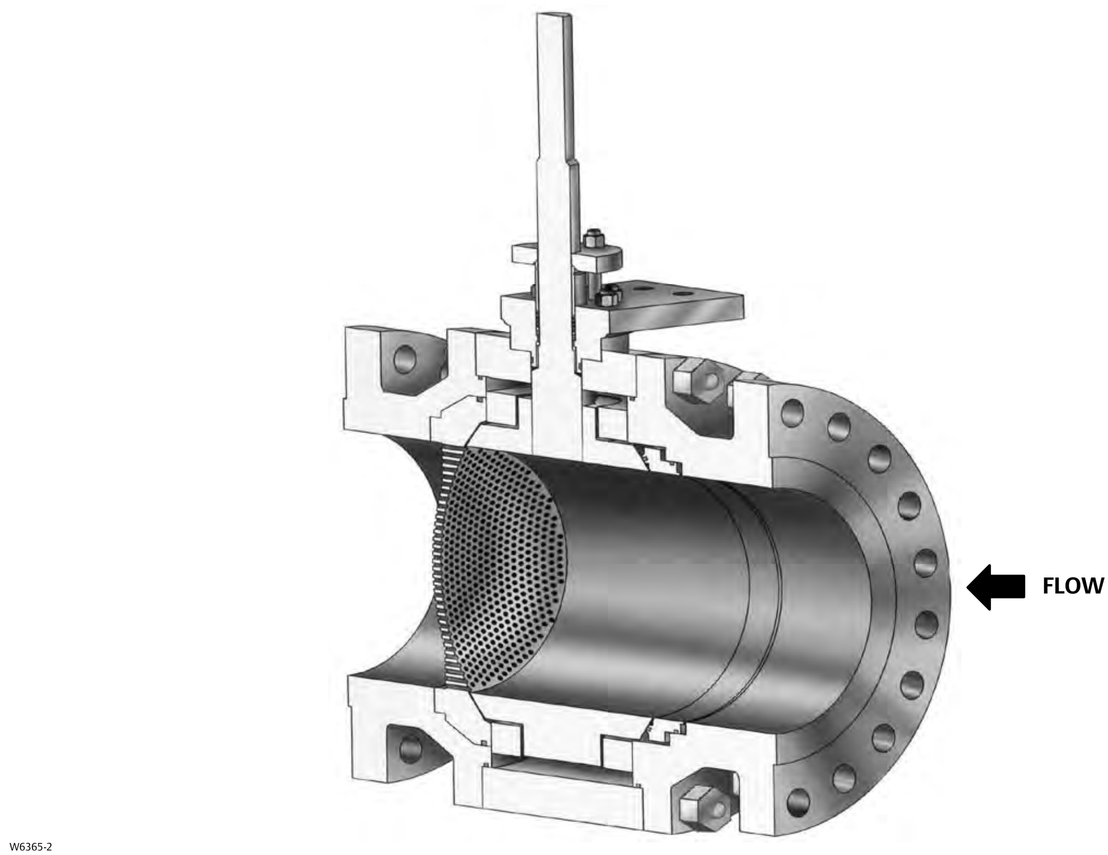


Figure 2. Aerodome and Hydrodome Attenuator Details

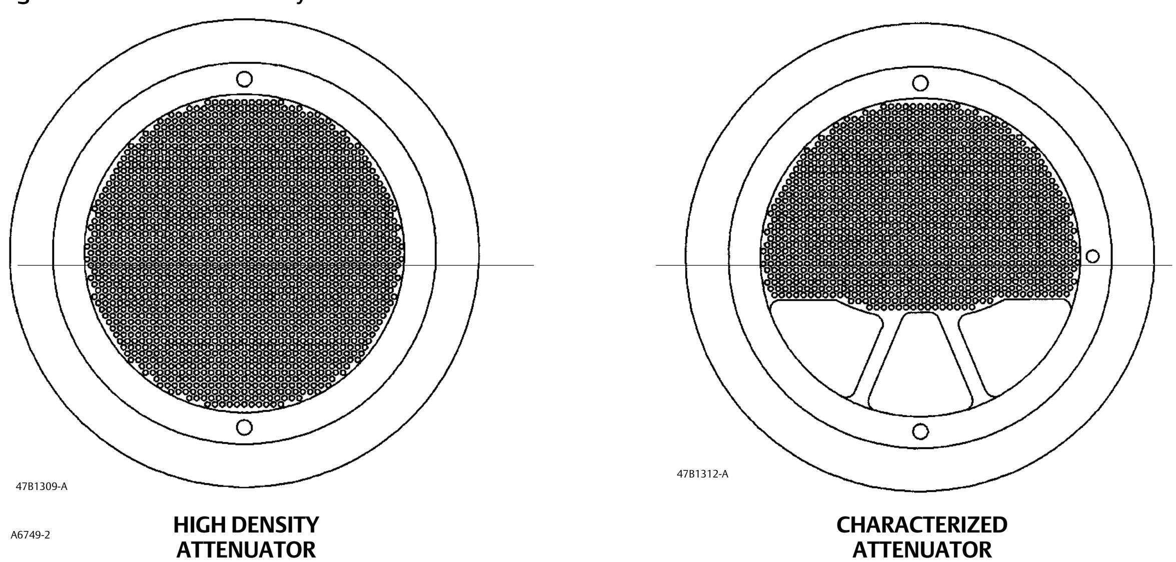
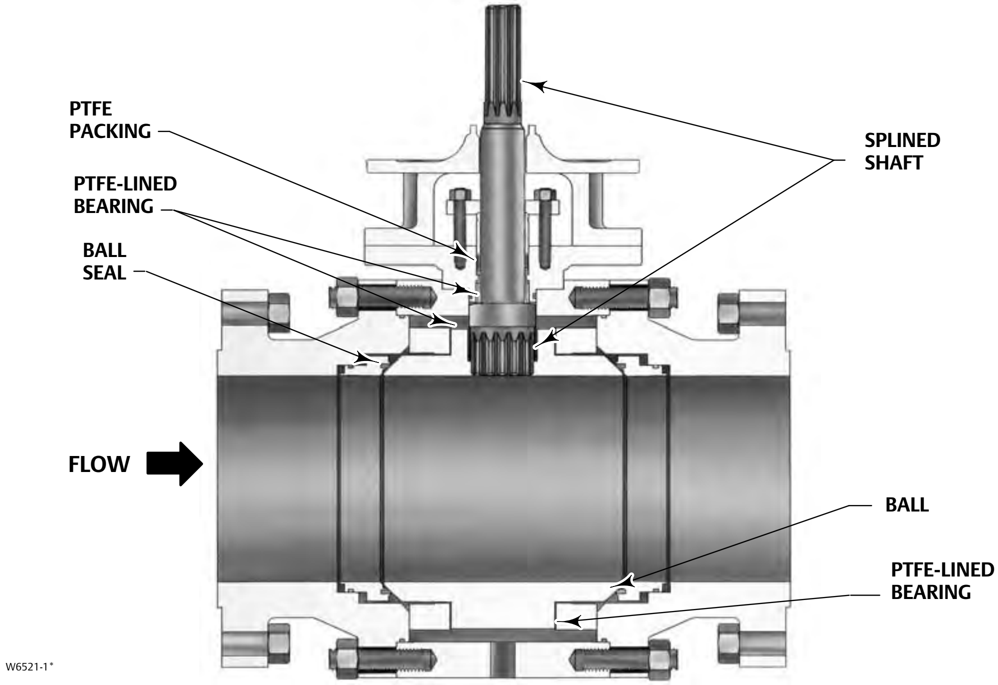
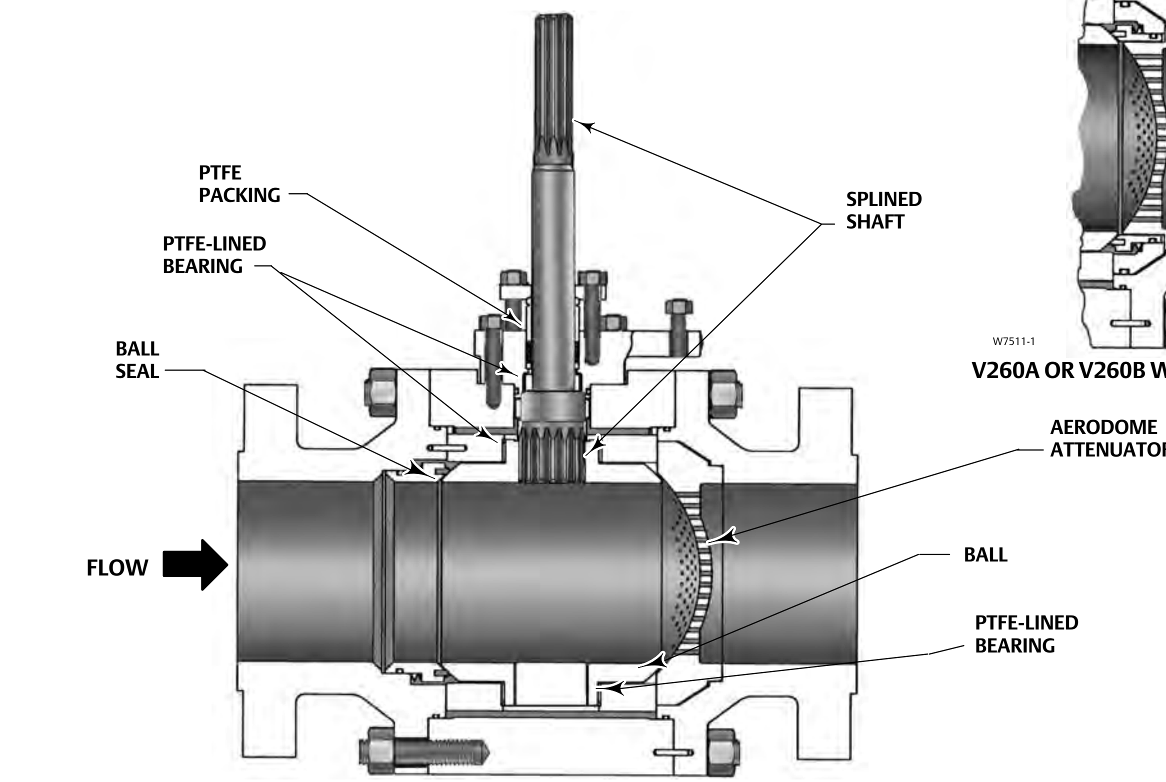


Figure 3. Typical Fisher V260 Valve Assembly



V260C WITH DUAL SEAL

V260A OR V260B WITH DUAL SEAL



V260A OR V260B WITH SINGLE SEAL

Figure 4. Packing Arrangement Details

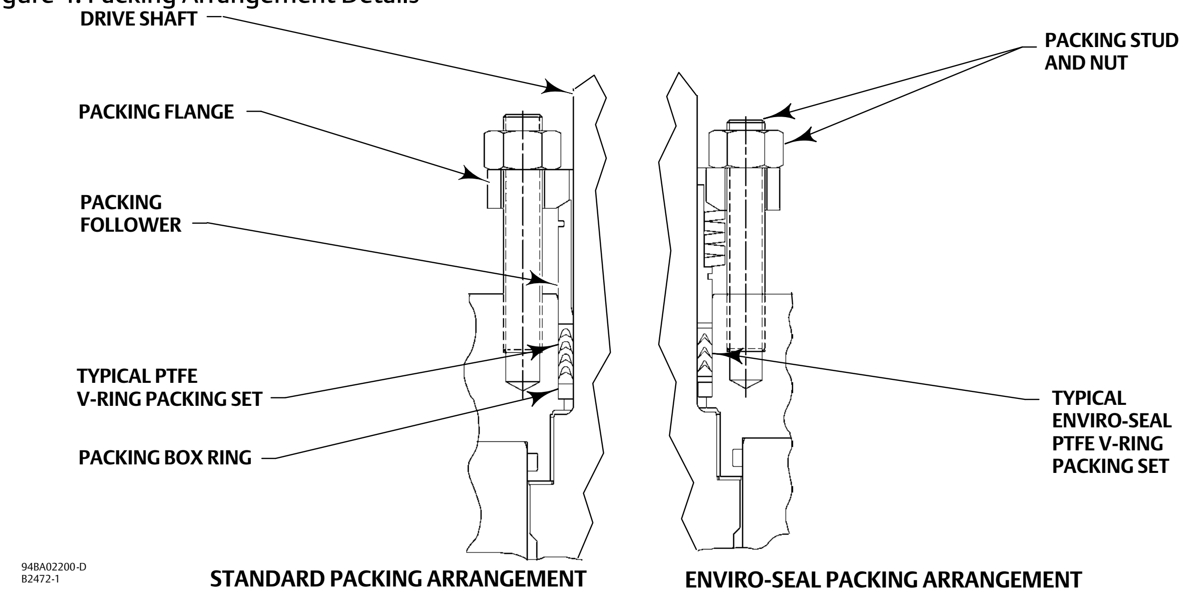
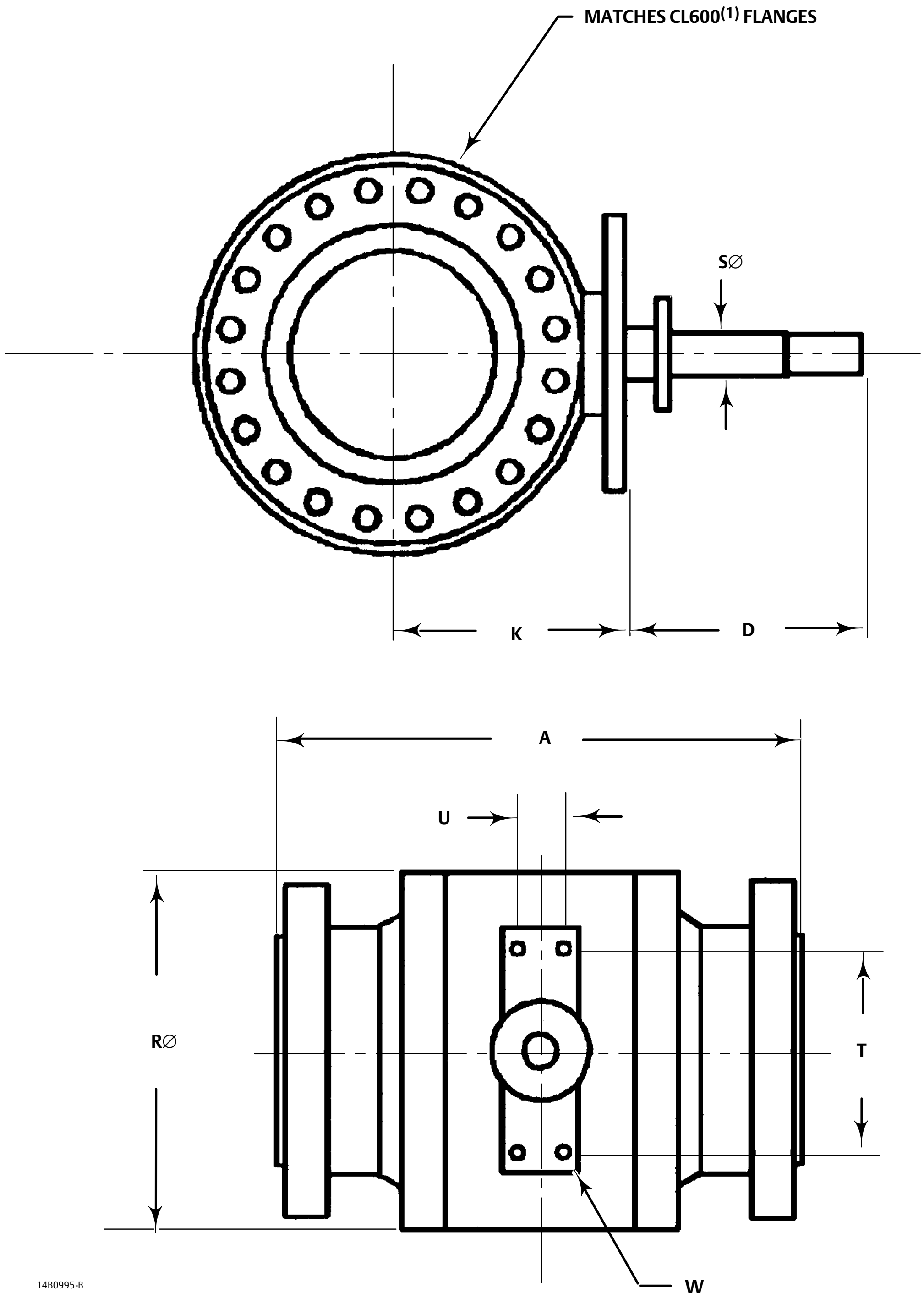


Table 3. Dimensions

VALVE SIZE, NPS	A	D	K	R∅	S∅ Shaft Dia.	S∅ Spline Dia.	T	U	W (THREADED)	APPROXIMATE WEIGHT
mm										kg
6	559	356	228	381	44.4	44.4	273	51	See thread info below	311
8	661		273	457						442
10	788		324	553	63.5	63.5	337	76		703
12	840		369	639						919
16	991	508	508	848	76.2	76.2[1]	533	127		2472
		471			76.2	63.5[2]				
20	1194	508	602	1040	88.9	88.9[1]				4309
		471			88.9	63.5[2]				
24 CL150	1397	314	671	1158	88.9	88.9 (keyed shaft)	533	127		5352
24 CL300	1397	508	708	1158	88.9	88.9	533	127		5761
24 CL600	1397	364	708	1241	102	102 (keyed shaft)	610	457 (U1)[3] 254 (U2)[3]		7076
Inches										Pounds
6	22	14.00	8.99	15.00	1-3/4	1-3/4	10.75	2.00	3/4-10	686
8	26.04		10.75	18.00						975
10	31.04		12.75	21.77	2-1/2	2-1/2	13.25	3.00	7/8-9	1550
12	33.07		14.53	25.15						2025
16	39.00	20.00	19.99	33.38	3	3[1]	21.00	5.00	1-1/4-8	5450
		18.56			3	2-1/2[2]				
20	47.00	20.00	23.70	40.96	3-1/2	3-1/2[1]				9500
		18.56			3-1/2	2-1/2[2]				
24 CL150	55.00	12.38	26.40	45.60	3-1/2	3-1/2 (keyed shaft)	21.00	5.00	1-1/4-8	11800
24 CL300	55.00	20.00	27.87	45.60	3-1/2	3-1/2	21.00	5.00	1-1/4-8	12700
24 CL600	55.00	14.32	27.87	48.86	4	4 (keyed shaft)	24.00	18 (U1)[3] 10 (U2)[3]	1-1/4-8	15600

1. For 1069 size 100 actuator.
2. For 1061 size 100 actuator.
3. See table 6 for NPS 24 U1 and U2 information.

Figure 5. Dimensions (also see table 3)



Note:
1. For CL150 and 300 valves, face-to-face dimensions are the same as CL600 valves.
2. Valve shown meets CL600 flanges. Flange and bolt dimensions vary for CL150 and 300 valves.

Figure 6. NPS 24 Additional Dimensions (also see table 3)

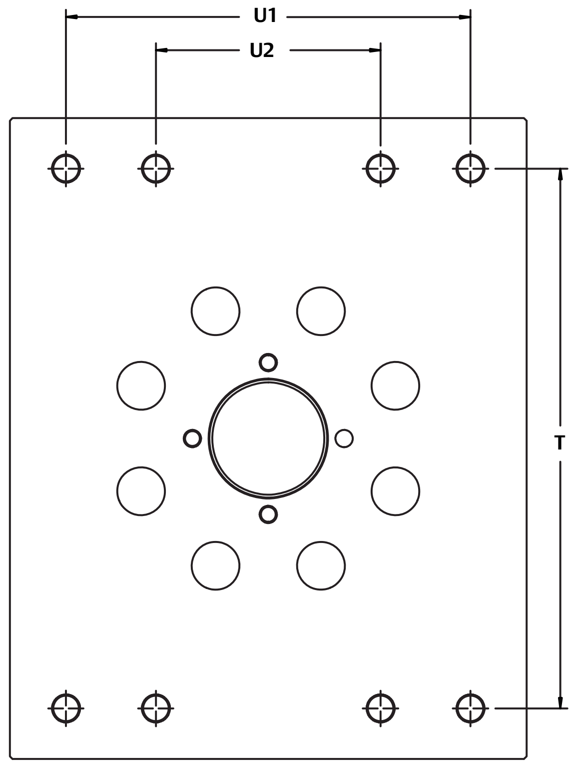


Figure 7. Dead Angle (also see table 4)

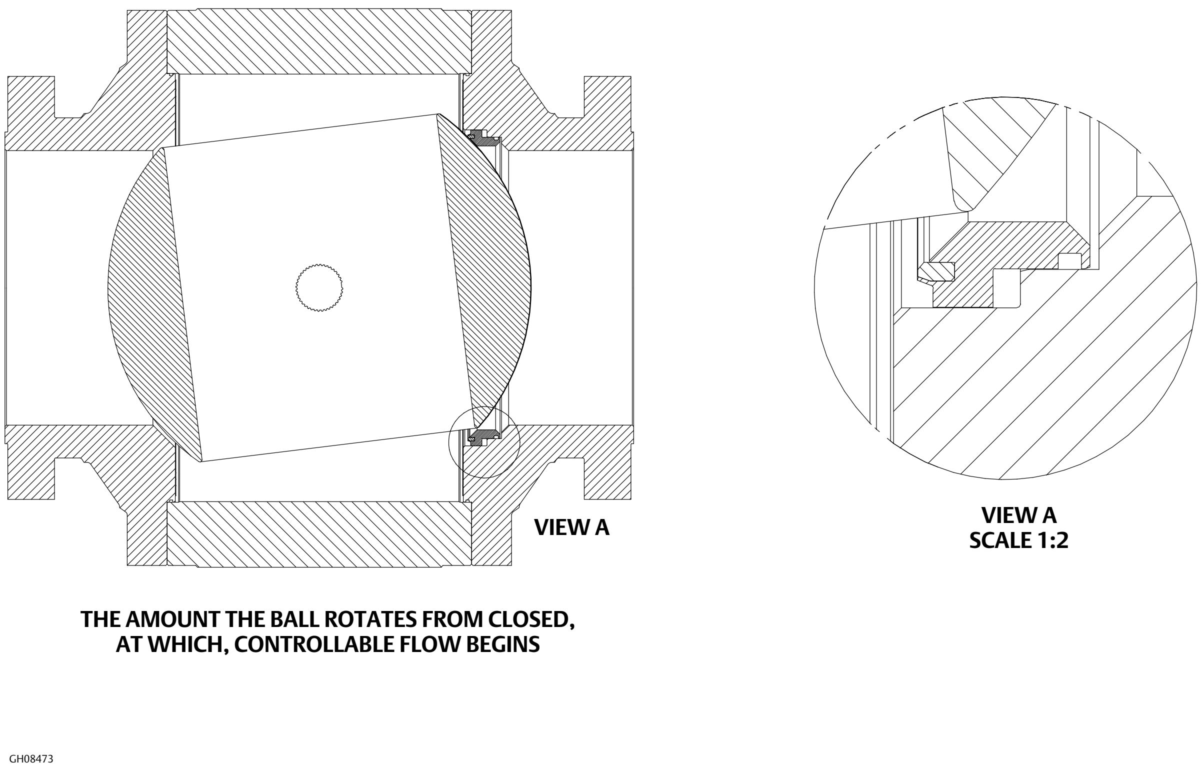


Table 4. Dead Angle Degrees

VALVE SIZE, NPS	DEAD ANGLE, DEGREES
6	10
8	11
10	10
12	9
16	11
20	9
24	9

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ V270 Full-Bore Ball Control Valve

The Fisher V270 is a three piece, trunnion mounted, full-bore control valve designed from the ground up with features for optimized pressure, flow and process control.

The V270 full-bore ball valve is designed for automated control in bypass, batch, monitor, and emergency shutoff service applications, and it presents little or no restriction to flow.

The V270 full-bore ball valve is available with composition seals, and process type live-loaded shaft packing for improved service life and lower emissions.

Unless otherwise noted, all NACE references are to NACE MR0175/ ISO 15156.

X1454

FISHER V270 VALVE

Features

- **Excellent Flow Control**—Shaft and trunnion guiding provides improved dynamic control.
- **Sour Service and Sour Crude Oil Capability**—Standard construction materials comply with NACE Standard MR0175 / ISO 15156.
- **Tight Shutoff**—Self-adjusting seals that are pressure assisted provide Class VI shutoff for long reliable service. The design incorporates a heavy duty S31600 stainless steel carrier that retains the composition seal.
- **Free Standing Design**—Comes standard with a base bracket allowing the valve to sit upright.
- **Heavy Duty Trunnions**—The ball trunnions are designed for demanding applications requiring long service life, with a reduction in maintenance time and costs.
- **Double Block and Bleed**—Design comes standard with a dual seal arrangement.
- **Optional Fire-Tested Construction**—Certified for API 607 and 6FA.

Specifications

Valve Body Sizes and End Connection Styles

NPS ■ 6, ■ 8, ■ 10, ■ 12, ■ 14, ■ 16, ■ 20, and ■ 24 flanged valves with CL150, CL300, or CL600 raised-face flanges compatible with ASME B16.5-2013

Designed in accordance with API 6D

Maximum Inlet Pressures and Temperatures(1)

Consistent with CL150, CL300, or CL600 pressure-temperature ratings per ASME B16.34-2013

Allowable Temperature Range: -40 to 82°C (-40 to 180°F)

Flow Characteristic

Modified equal percentage

Flow and Shutoff Direction

Dual Seal Construction: The V270 may be used for unidirectional or bidirectional flow

Flow Coefficients

See Fisher Catalog 12

Shutoff Classification

ANSI/FCI 70-2 Class VI

Seal Material

Standard: POM (Polyoxymethylene)

Maximum Ball Rotation

90°

Packing Arrangements

Standard: Live-Loaded Packing

This packing system provides improved sealing, guiding, and transmission of loading force to control liquid and gas emissions

Dimensions

See figure 2 through 7

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for this valve should not be exceeded.

Table 1. Standard Materials of Construction

Part	Material
Valve Body	LF2 Carbon Steel
Ball	LF2 Carbon Steel / ENP
Seal	POM with S31600 SST Seal Carrier
Drive Shaft	S17400 H1150D
Spring	N07750
Tailpiece	LF2 Carbon Steel
Tailpiece Mounting and Packing Box Bolting	L7M Steel
Bearing Plate	LF2 Carbon Steel
Trunnion Bushings	Carbon Steel, Bronze, PTFE
Thrust Washer	Glass filled PTFE
Shaft Bushing	N04400 / Comp
Packing Box Housing	Carbon Steel
Packing	Live-Loaded PTFE
Packing Bolting	B7M Steel
Packing Follower, Packing Box Ring	S31600 SST
Straight Pins	S17400 H1150D
O-Rings, Backup Rings	Nitrile
Actuator Mounting Bolting	Steel Grade 5

Figure 1. Sectional View of V270 Valve

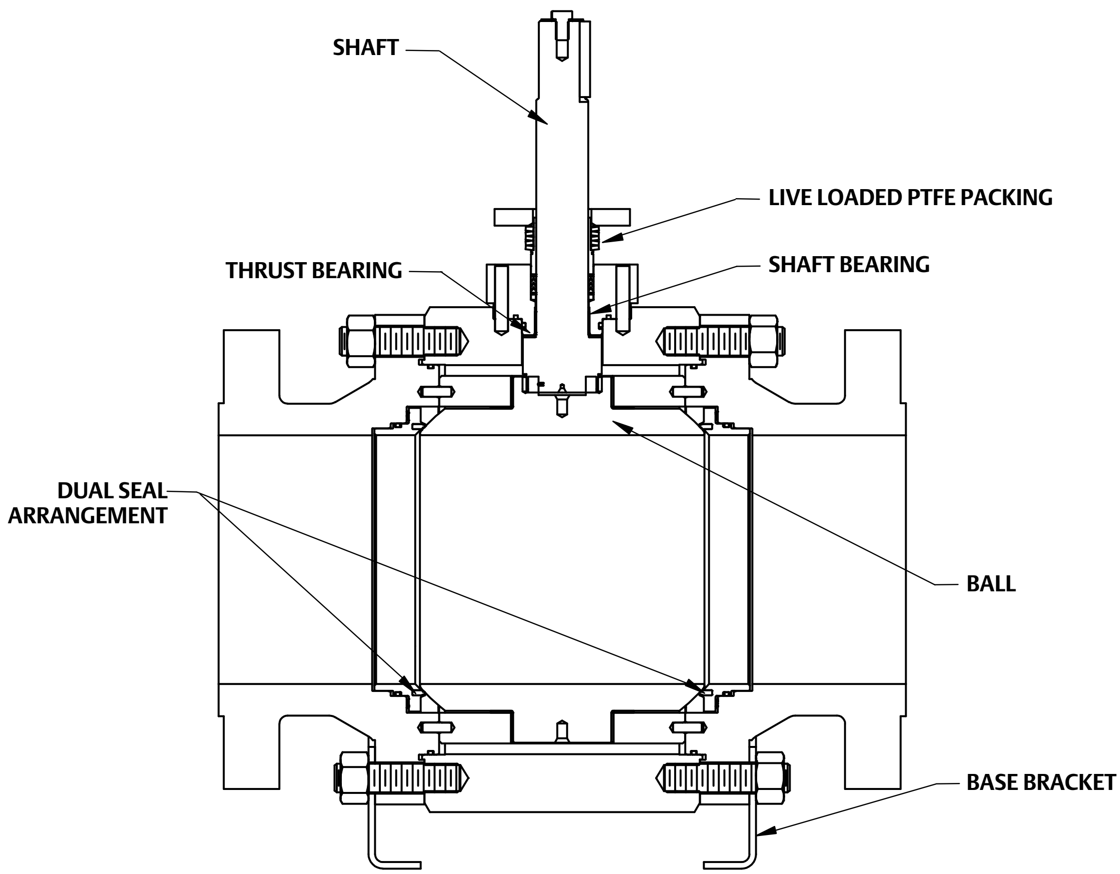


Figure 2. Envelope Dimensions (see table 2)

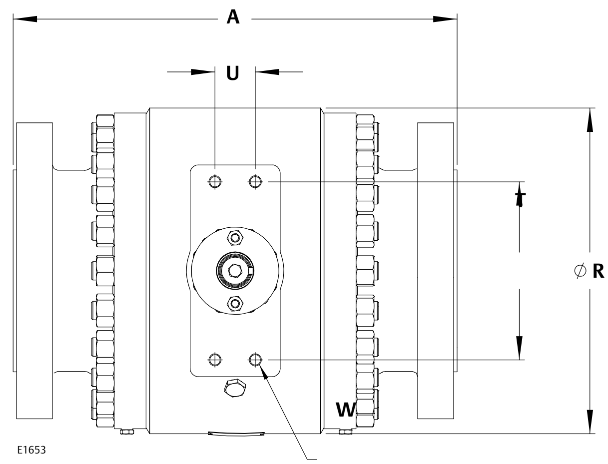


Figure 4. NPS 24 CL600 Packing Box Housing Mounting Pad Dimensions (see table 2)

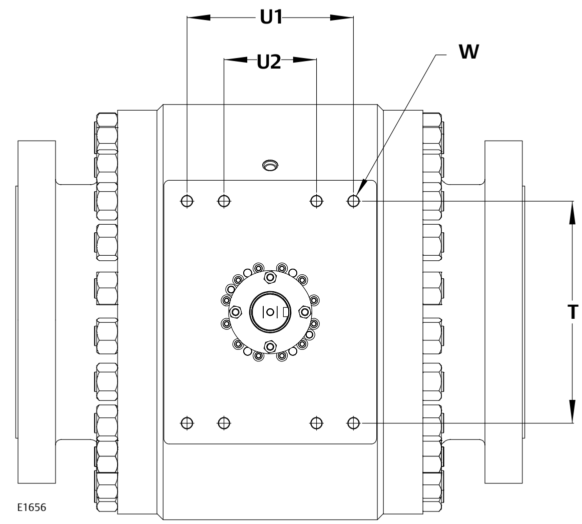


Figure 3. Envelope Dimensions (see table 2 and 3)

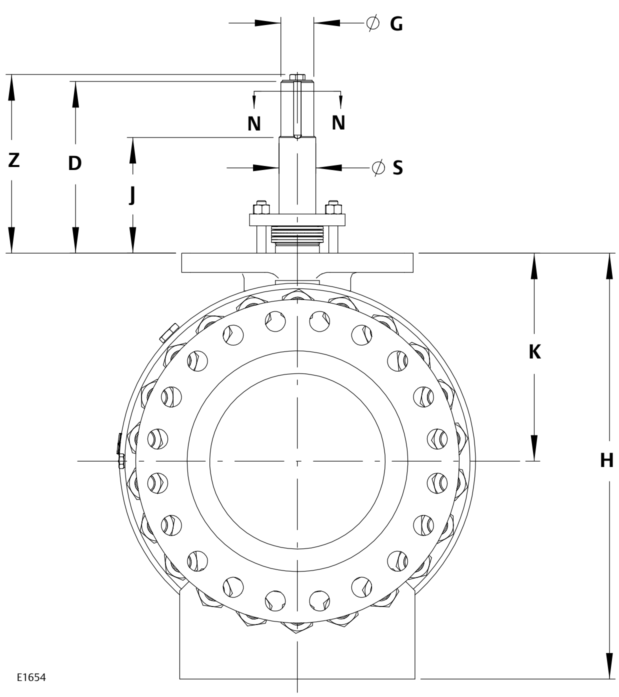
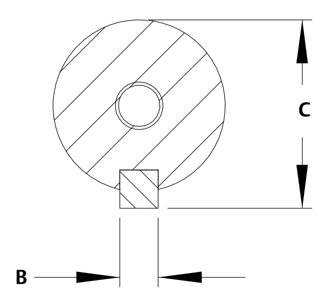


Figure 5. Shaft Detail (see table 3)



SECTION N-N

Figure 6. NPS 6 CL600 thru NPS 14 CL300 Base Bracket Dimensions (see table 3)

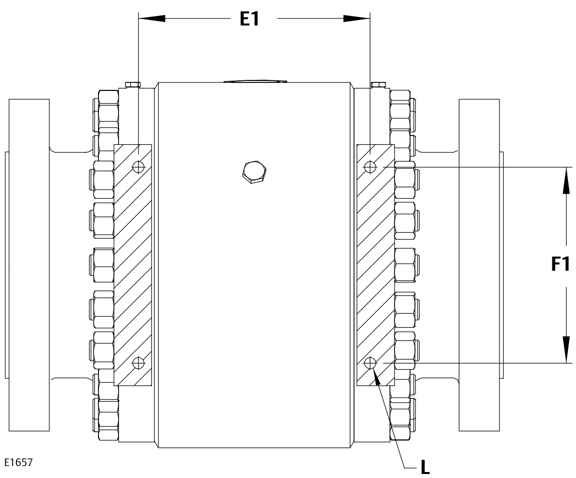


Figure 7. NPS 14 CL600 thru NPS 24 CL600 Base Bracket Dimensions (see table 3)

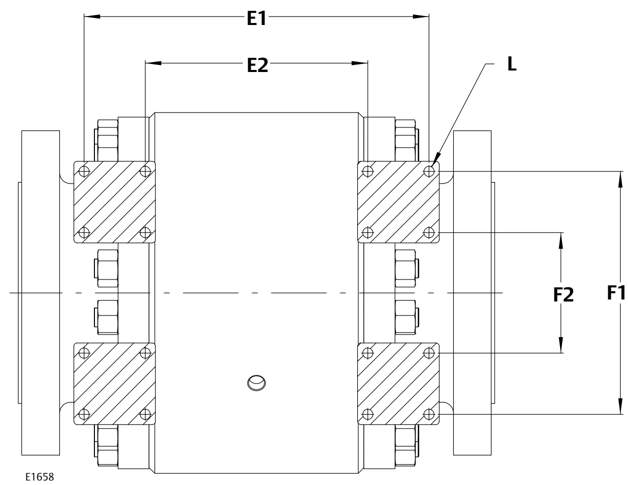


Figure 8. Live-Loaded Packing Arrangement Details

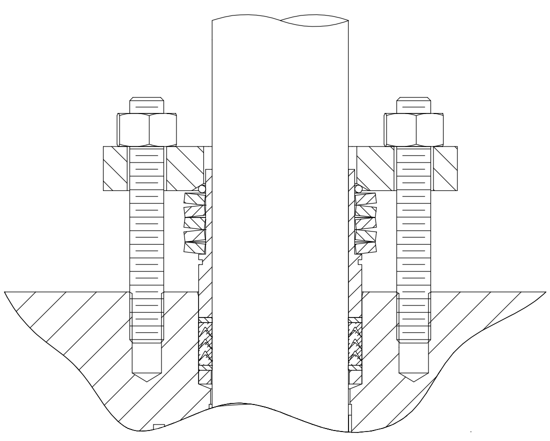


Table 2. Envelope Dimensions

<table>
<tr><th rowspan="2">VALVE SIZE, NPS</th><th rowspan="2">PRESSURE CLASS</th><th rowspan="2">A</th><th rowspan="2">K</th><th rowspan="2">H</th><th rowspan="2">R∅</th><th>S∅</th><th>G∅</th><th rowspan="2">T</th><th rowspan="2">U</th><th rowspan="2">W (THREADED)</th><th rowspan="2">APPROXIMATE WEIGHT</th></tr>
<tr><th>Shaft Dia.</th><th>Keyway Dia.</th></tr>
<tr><td colspan="11">mm</td><td>kg</td></tr>
<tr><td rowspan="3">6</td><td>150</td><td>394</td><td>210.2</td><td>388.2</td><td>330</td><td rowspan="6">44.4</td><td rowspan="6">41.3</td><td rowspan="6">237.1</td><td rowspan="6">50.8</td><td rowspan="24">See Below</td><td>170</td></tr>
<tr><td>300</td><td>403</td><td>216.4</td><td>387.9</td><td>343</td><td>190</td></tr>
<tr><td>600</td><td>559</td><td>220.4</td><td>470.5</td><td>351</td><td>280</td></tr>
<tr><td rowspan="3">8</td><td>150</td><td>457</td><td>259.4</td><td>521.1</td><td>424</td><td>305</td></tr>
<tr><td>300</td><td>502</td><td>259.4</td><td>526.1</td><td>426</td><td>350</td></tr>
<tr><td>600</td><td>660</td><td>265.7</td><td>565.6</td><td>440</td><td>465</td></tr>
<tr><td rowspan="3">10</td><td>150</td><td>533</td><td>295.3</td><td>616.3</td><td>482</td><td rowspan="6">63.5</td><td rowspan="6">57.1</td><td rowspan="6">336.6</td><td rowspan="6">76.2</td><td>430</td></tr>
<tr><td>300</td><td>568</td><td>301.3</td><td>622.3</td><td>492</td><td>495</td></tr>
<tr><td>600</td><td>787</td><td>313.8</td><td>645.4</td><td>525</td><td>745</td></tr>
<tr><td rowspan="3">12</td><td>150</td><td>610</td><td>338.8</td><td>704.5</td><td>569</td><td>645</td></tr>
<tr><td>300</td><td>648</td><td>345.8</td><td>716.6</td><td>587</td><td>770</td></tr>
<tr><td>600</td><td>838</td><td>359.5</td><td>736.0</td><td>615</td><td>1050</td></tr>
<tr><td rowspan="3">14</td><td>150</td><td>686</td><td>369.0</td><td>821.0</td><td>628</td><td rowspan="6">76.2</td><td rowspan="7">69.8</td><td rowspan="11">533.4</td><td rowspan="11">127.0</td><td>1045</td></tr>
<tr><td>300</td><td>762</td><td>401.8</td><td>827.2</td><td>630</td><td>1065</td></tr>
<tr><td>600</td><td>889</td><td>419.0</td><td>866.8</td><td>673</td><td>1365</td></tr>
<tr><td rowspan="3">16</td><td>150</td><td>762</td><td>435.2</td><td>936.9</td><td>701</td><td>1275</td></tr>
<tr><td>300</td><td>838</td><td>440.7</td><td>878.9</td><td>713</td><td>1455</td></tr>
<tr><td>600</td><td>991</td><td>464.5</td><td>923.1</td><td>762</td><td>1925</td></tr>
<tr><td rowspan="3">20</td><td>150</td><td>914</td><td>522.9</td><td>1074.9</td><td>875</td><td rowspan="3">88.9</td><td>2245</td></tr>
<tr><td>300</td><td>991</td><td>530.0</td><td>1110.2</td><td>895</td><td rowspan="2">82.5</td><td>2580</td></tr>
<tr><td>600</td><td>1194</td><td>555.5</td><td>1129.2</td><td>947</td><td>3450</td></tr>
<tr><td rowspan="3">24</td><td>150</td><td>1067</td><td>600.0</td><td>1287.9</td><td>1029</td><td rowspan="3">101.6</td><td>69.8</td><td>3380</td></tr>
<tr><td>300</td><td>1143</td><td>615.0</td><td>1312.2</td><td>1066</td><td>88.8</td><td>4280</td></tr>
<tr><td>600</td><td>1397</td><td>649.0</td><td>1280.4</td><td>1140</td><td>101.6</td><td>609.6</td><td>475.2 (U1)
254.0 (U2)</td><td>5775</td></tr>
<tr><td colspan="11">Inches</td><td>Pounds</td></tr>
<tr><td rowspan="3">6</td><td>150</td><td>15.50</td><td>8.27</td><td>15.28</td><td>12.99</td><td rowspan="6">1 3/4</td><td rowspan="6">1 5/8</td><td rowspan="6">10.75</td><td rowspan="6">2.00</td><td rowspan="6">3/4-10</td><td>370</td></tr>
<tr><td>300</td><td>15.88</td><td>8.52</td><td>15.27</td><td>13.50</td><td>415</td></tr>
<tr><td>600</td><td>22.00</td><td>8.68</td><td>18.52</td><td>13.82</td><td>620</td></tr>
<tr><td rowspan="3">8</td><td>150</td><td>18.00</td><td>10.21</td><td>20.52</td><td>16.70</td><td>670</td></tr>
<tr><td>300</td><td>19.75</td><td>10.21</td><td>20.71</td><td>16.77</td><td>775</td></tr>
<tr><td>600</td><td>26.00</td><td>10.46</td><td>22.27</td><td>17.32</td><td>1020</td></tr>
<tr><td rowspan="3">10</td><td>150</td><td>21.00</td><td>11.62</td><td>24.26</td><td>18.98</td><td rowspan="6">2 1/2</td><td rowspan="6">2 1/4</td><td rowspan="6">13.25</td><td rowspan="6">3.00</td><td rowspan="6">7/8-9</td><td>950</td></tr>
<tr><td>300</td><td>22.38</td><td>11.86</td><td>24.50</td><td>19.37</td><td>1095</td></tr>
<tr><td>600</td><td>31.00</td><td>12.35</td><td>25.41</td><td>20.67</td><td>1640</td></tr>
<tr><td rowspan="3">12</td><td>150</td><td>24.00</td><td>13.34</td><td>27.74</td><td>22.40</td><td>1425</td></tr>
<tr><td>300</td><td>25.50</td><td>13.61</td><td>28.21</td><td>23.11</td><td>1695</td></tr>
<tr><td>600</td><td>33.00</td><td>14.15</td><td>28.97</td><td>24.21</td><td>2320</td></tr>
<tr><td rowspan="3">14</td><td>150</td><td>27.00</td><td>15.59</td><td>32.32</td><td>24.70</td><td rowspan="6">3</td><td rowspan="7">2 3/4</td><td rowspan="11">21.00</td><td rowspan="11">5.00</td><td rowspan="12">1-1/4-8</td><td>2305</td></tr>
<tr><td>300</td><td>30.00</td><td>15.82</td><td>32.57</td><td>24.80</td><td>2350</td></tr>
<tr><td>600</td><td>35.00</td><td>16.50</td><td>34.13</td><td>26.50</td><td>3015</td></tr>
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<tr><td>300</td><td>33.00</td><td>17.35</td><td>34.60</td><td>28.05</td><td>3210</td></tr>
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<tr><td>300</td><td>45.00</td><td>24.21</td><td>51.66</td><td>41.97</td><td>3 1/2</td><td>9435</td></tr>
<tr><td>600</td><td>55.00</td><td>25.55</td><td>50.41</td><td>44.88</td><td>4</td><td>24.00</td><td>18.00 (U1)
10.00 (U2)</td><td>12740</td></tr>
</table>

Table 3. Additional Envelope Dimensions

<table>
<tr><th rowspan="2">VALVE SIZE, NPS</th><th rowspan="2">PRESSURE CLASS</th><th rowspan="2">D</th><th rowspan="2">Z</th><th rowspan="2">J</th><th>C</th><th>B</th><th rowspan="2">E1</th><th rowspan="2">E2</th><th rowspan="2">F1</th><th rowspan="2">F2</th><th rowspan="2">L</th></tr>
<tr><th>Shaft & Key Height</th><th>Key Width</th></tr>
<tr><td colspan="12">mm</td></tr>
<tr><td rowspan="3">6</td><td>150</td><td rowspan="6">228.6</td><td rowspan="6">239.8</td><td rowspan="6">149.1</td><td rowspan="6">45.3</td><td rowspan="6">9.5</td><td rowspan="2">N/A</td><td rowspan="14">N/A</td><td rowspan="2">N/A</td><td rowspan="14">N/A</td><td rowspan="2">N/A</td></tr>
<tr><td>300</td></tr>
<tr><td>600</td><td>242.4</td><td>200.1</td><td rowspan="4">15.9</td></tr>
<tr><td rowspan="3">8</td><td>150</td><td>250.4</td><td>273.1</td></tr>
<tr><td>300</td><td>269.4</td><td>231.4</td></tr>
<tr><td>600</td><td>302.4</td><td>292.1</td></tr>
<tr><td rowspan="3">10</td><td>150</td><td rowspan="6">297.0</td><td rowspan="6">309.4</td><td rowspan="6">201.7</td><td rowspan="6">62.6</td><td rowspan="6">12.7</td><td>278.1</td><td>297.0</td><td rowspan="18">19.1</td></tr>
<tr><td>300</td><td>282.4</td><td>251.8</td></tr>
<tr><td>600</td><td>328.9</td><td>307.6</td></tr>
<tr><td rowspan="3">12</td><td>150</td><td>318.0</td><td>279.9</td></tr>
<tr><td>300</td><td>328.2</td><td>330.2</td></tr>
<tr><td>600</td><td>389.4</td><td>330.2</td></tr>
<tr><td rowspan="3">14</td><td>150</td><td rowspan="7">394.0</td><td rowspan="7">408.3</td><td rowspan="7">279.7</td><td rowspan="7">76.7</td><td rowspan="7">15.9</td><td>422.5</td><td>482.5</td></tr>
<tr><td>300</td><td>428.5</td><td>396.8</td></tr>
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<tr><td rowspan="3">16</td><td>150</td><td>706.1</td><td>439.4</td><td>489.3</td><td>222.6</td></tr>
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<tr><td>600</td><td>677.1</td><td>486.6</td><td>568.2</td><td>352.3</td></tr>
<tr><td rowspan="3">20</td><td>150</td><td>823.2</td><td>556.5</td><td>598.7</td><td>338.3</td></tr>
<tr><td>300</td><td rowspan="2">381.0</td><td rowspan="2">409.0</td><td rowspan="2">260.6</td><td rowspan="2">90.7</td><td rowspan="2">19.1</td><td>813.5</td><td>559.5</td><td>618.9</td><td>364.9</td></tr>
<tr><td>600</td><td>871.2</td><td>604.5</td><td>708.4</td><td>441.7</td></tr>
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<tr><td>600</td><td>363.0</td><td>379.0</td><td>N/A</td><td>112.5</td><td>25.4</td><td>1009.5</td><td>704.7</td><td>853.4</td><td>548.6</td></tr>
<tr><td colspan="12">Inches</td></tr>
<tr><td rowspan="3">6</td><td>150</td><td rowspan="6">9.00</td><td rowspan="6">9.44</td><td rowspan="6">5.87</td><td rowspan="6">1.78</td><td rowspan="6">0.38</td><td rowspan="2">N/A</td><td rowspan="14">N/A</td><td rowspan="2">N/A</td><td rowspan="14">N/A</td><td rowspan="2">N/A</td></tr>
<tr><td>300</td></tr>
<tr><td>600</td><td>9.54</td><td>7.88</td><td rowspan="4">0.63</td></tr>
<tr><td rowspan="3">8</td><td>150</td><td>9.86</td><td>10.75</td></tr>
<tr><td>300</td><td>10.61</td><td>9.11</td></tr>
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<tr><td rowspan="3">10</td><td>150</td><td rowspan="6">11.69</td><td rowspan="6">12.18</td><td rowspan="6">7.94</td><td rowspan="6">2.46</td><td rowspan="6">0.50</td><td>10.95</td><td>11.69</td><td rowspan="18">0.75</td></tr>
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<tr><td>300</td><td>26.69</td><td>19.19</td><td>19.78</td><td>12.28</td></tr>
<tr><td>600</td><td>26.66</td><td>19.16</td><td>22.37</td><td>13.87</td></tr>
<tr><td rowspan="3">20</td><td>150</td><td>32.41</td><td>21.91</td><td>23.57</td><td>13.32</td></tr>
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<tr><td>600</td><td>34.30</td><td>23.80</td><td>27.89</td><td>17.39</td></tr>
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<tr><td>600</td><td>14.29</td><td>14.92</td><td>N/A</td><td>4.43</td><td>1.00</td><td>39.74</td><td>27.74</td><td>33.60</td><td>21.60</td></tr>
</table>

Figure 9. Dead Angle (also see table 4)

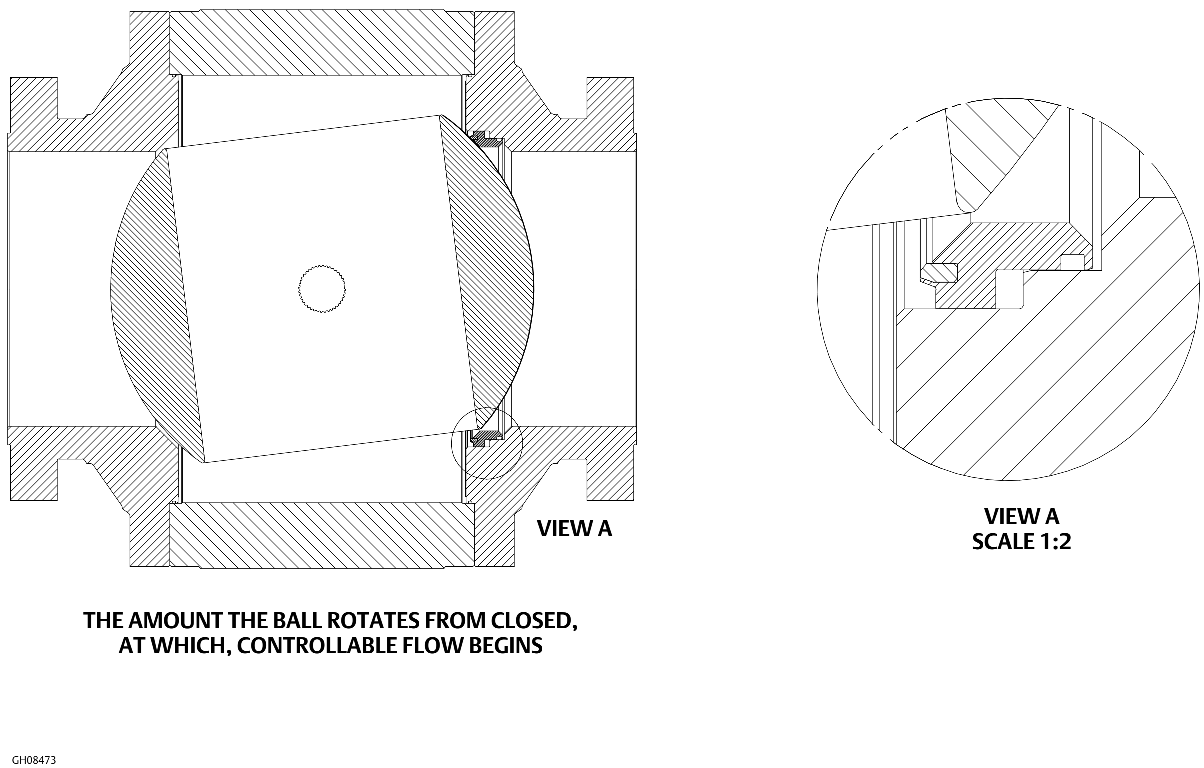


Table 4. Dead Angle Degrees

VALVE SIZE, NPS	DEAD ANGLE, DEGREES
6	12
8	11
10	8
12	9
14	8
16	7
20	7
24	7

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

EMERSON

Fisher™ V280 Full-Bore Ball Control Valve

The Fisher V280 is a three-piece, trunnion mounted, full-bore control valve capable of handling full ASME CL900 pressure drops. It is designed with features for optimized pressure, flow, and process control. An optional drilled attenuator controls noise and vibration from high pressure drop liquids and gases. The splined shaft connection to the actuator reduces lost motion.

The V280 with an Aerodome attenuator is used in gas service to reduce noise in demanding applications such as anti-surge, station recycle and worker/monitor applications.

The V280 with a Hydrodome attenuator provides improved performance for demanding applications such as pump bypass or pipeline take-off. The trim is designed for liquid service to help eliminate or reduce cavitation associated with pipeline noise and vibration.

The V280 without attenuation is designed for automated control in bypass, batch, monitor, and emergency shutoff service applications. It presents little or no restriction to flow.

Unless otherwise noted, all NACE references are to NACE MR0175/ISO 15156.

X1609

Fisher V280 Valve

Features

- **Thoroughly Tested**—Valve construction cycle tested and flow tested in laboratory subject to full ASME CL900 pressure drops to maximize service life.

- **Excellent Flow Control**—Robust drive train designed to guide the shaft and properly absorb energy during dynamic operation.

- **Aerodynamic Performance**—Up to -20 dBA acoustical attenuation can be achieved for the V280 with Aerodome within a single stage construction. Dual-stage construction can provide up to -25 dBA attenuation.

- **Sour Service and Sour Crude Oil Capability**—Standard construction materials comply with NACE MR0175/ISO 15156.

- **Heavy Duty Trunnion**—The ball trunnions are designed for demanding applications requiring long service life, with a reduction in maintenance time and costs.

- **Broad Hydrodynamic Applications**—Single and dual stage attenuators for the V280 with Hydrodome may be provided for a varying range of applications. A KC value of 1.0 is achievable depending on service conditions.

- **Flexible Applications**—The attenuator is active throughout the ball rotation for very demanding services. The characterized attenuator can be utilized when more flow capacity is necessary.

Features (continued on 3)

Specifications

Valve Sizes and End Connection Styles

NPS ■ 6, ■ 8, ■ 10, ■ 12, and ■ 16 flanged valve size with CL900 raised-face flanges compatible with ASME B16.5. Consult your Emerson sales office for other end connection styles

Maximum Inlet Pressure and Temperatures(1)

Consistent with CL900 pressure-temperature ratings per ASME B16.34

Maximum Allowable Shutoff Pressure Drop(1)

For Single-Seal and Dual-Seal Construction (except where further limited by pressure-temperature rating of the valve body):

CL900: 153.2 bar (2220 psig) at 38°C (100°F)
TCM Ultra Seal: 120 bar (1750 psig) at 38°C (100°F)

Shutoff Classifications

Single or Dual-Seal Construction

Class IV standard: ANSI/FCI 70-2 and IEC 65034-4
Class VI optional: ANSI/FCI 70-2 and IEC 65034-4

Flow Characteristic

■ Modified linear with single high-density attenuator

■ Modified equal percentage with single characterized attenuator

■ Modified equal percentage without attenuator

Flow and Shutoff Direction

Unidirectional flow is forward flow. Seal is upstream

Single Seal Construction: Should be used for unidirectional flow and unidirectional shutoff only

Dual Seal Construction: V280 with Aerodome and unattenuated V280 may be used for unidirectional and bidirectional flow

V280 with Hydrodome should be used for unidirectional flow only for effective anti-cavitation protection. Bidirectional shutoff requires dual seal construction

Flow Coefficients

See Fisher Catalog 12

Seal Material and Temperature Capabilities(1)

Standard: POM (polyoxymethylene) -29 to 82°C (-20 to 180°F)
Optional: POM (polyoxymethylene) with Nitrile MoS_2 Impregnated O-rings -46 to 82°C (-50 to 180°F) or PTFE/PEEK(2) with flurorocarbon O-rings -23 to 204°C (-10 to 400°F)

Maximum Ball Rotation

90°

Actuator Mounting

Right-hand or left-hand mounted as viewed from the valve inlet from forward flow

Packing Arrangements

PTFE Packing: Standard construction
ENVIRO-SEAL™ Packing: This optional packing system provides improved sealing, guiding, and transmission of leading force to control liquid and gas emissions

Dimensions

See figure 3

Options

■ Double block-and-bleed applications (Dual seal construction is required)
■ Two or three-stage Aerodome attenuator, two-stage or three-stage Hydrodome attenuator
■ Ring type joint flanges
■ Inconel drive shaft
■ Keyed shaft
■ Nitrile MoS_2 Impregnated O-rings
■ S31600 SST ENC ball
■ PTFE/PEEK seal insert
■ Contact your Emerson sales office for other options

1. The pressure or temperature limits in this bulletin and any applicable standard or code limitation for this valve should not be exceeded.
2. PTFE stands for Polytetrafluoroethylene and PEEK stands for PolyEtherEtherKetone.

Features (continued)

- **Construction Versatility—**Seal and dome attenuators are interchangeable. The valve construction can be altered by adding/removing a dome attenuator and/or seal without requiring a different body flange. This allows for flexibility to meet changing demands. See figure 2.

- **Base Bracket—**Standard easy-removal base bracket simplifies maintenance and storage prior to installation. The base bracket is designed to remain secured to the valve body during removal of the body flanges for maintenance.

- **Integral Valve Lifting Provision—**Valve body includes standard tapped holes for easy attachment of swivel hoist rings or other appropriate rigging equipment.

- **Tight Shutoff—**Self-adjusting seal(s) that are pressure assisted provide tight shutoff for long reliable service. The design incorporates a heavy duty S31600 stainless steel carrier that retains the composition seal for full-rated pressure drop service.

- **Improved Service Life—**The attenuator is not part of the seal assembly. The seal wipes the ball surface, not the attenuator, promoting increased service life.

Table 1. Fisher V280 Standard Materials of Construction

PART	MATERIAL
Valve Body	LF2 Carbon Steel
Ball	Carbon Steel ENC
Seal	POM with S31600 SST Seal Blank
Drive Shaft	S17400 SST H1150D
Dome Attenuator	S17400 SST
Wave Spring	N07750
Retaining Ring	N07750
Tailpiece	LF2 Carbon Steel
Tailpiece Mounting Bolting	B7M Steel
Bearing Plate	Carbon Steel
Bearings	N04400 with PTFE
Thrust Washer	Carbon filled PTFE
Packing Box Housing	Carbon Steel
Packing	PTFE/Carbon filled PTFE
Packing Bolting	B7M Steel
Packing Follower, Packing Box Ring	Annealed S31600 SST
Groove Pins	S31600
O-Rings	Nitrile
Actuator Mounting Bolting	Steel Grade 5

Figure 1. V280 with Dual Seal and Single Dome Attenuator

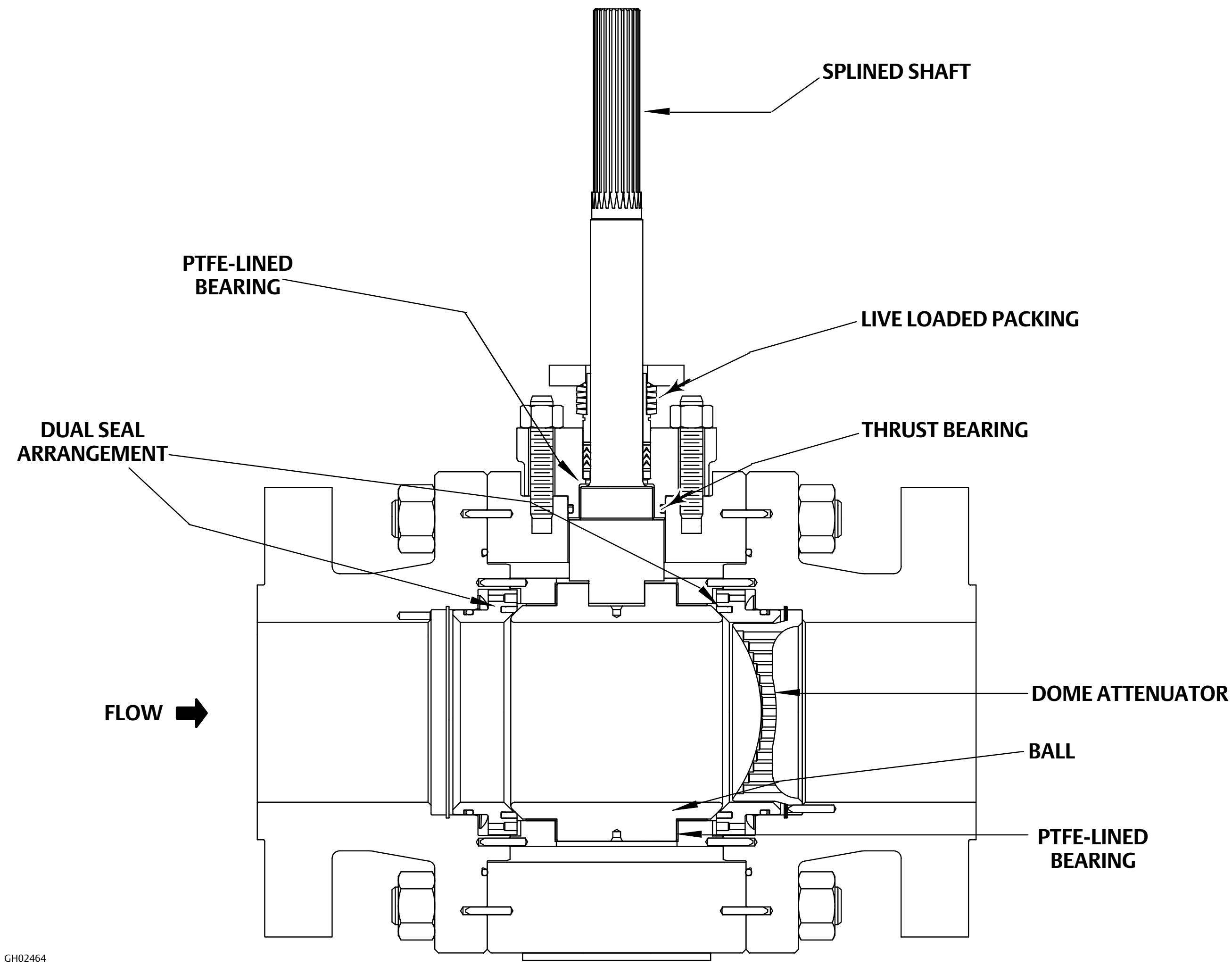


Figure 2. Construction Versatility Seal/Dome Assembly Details

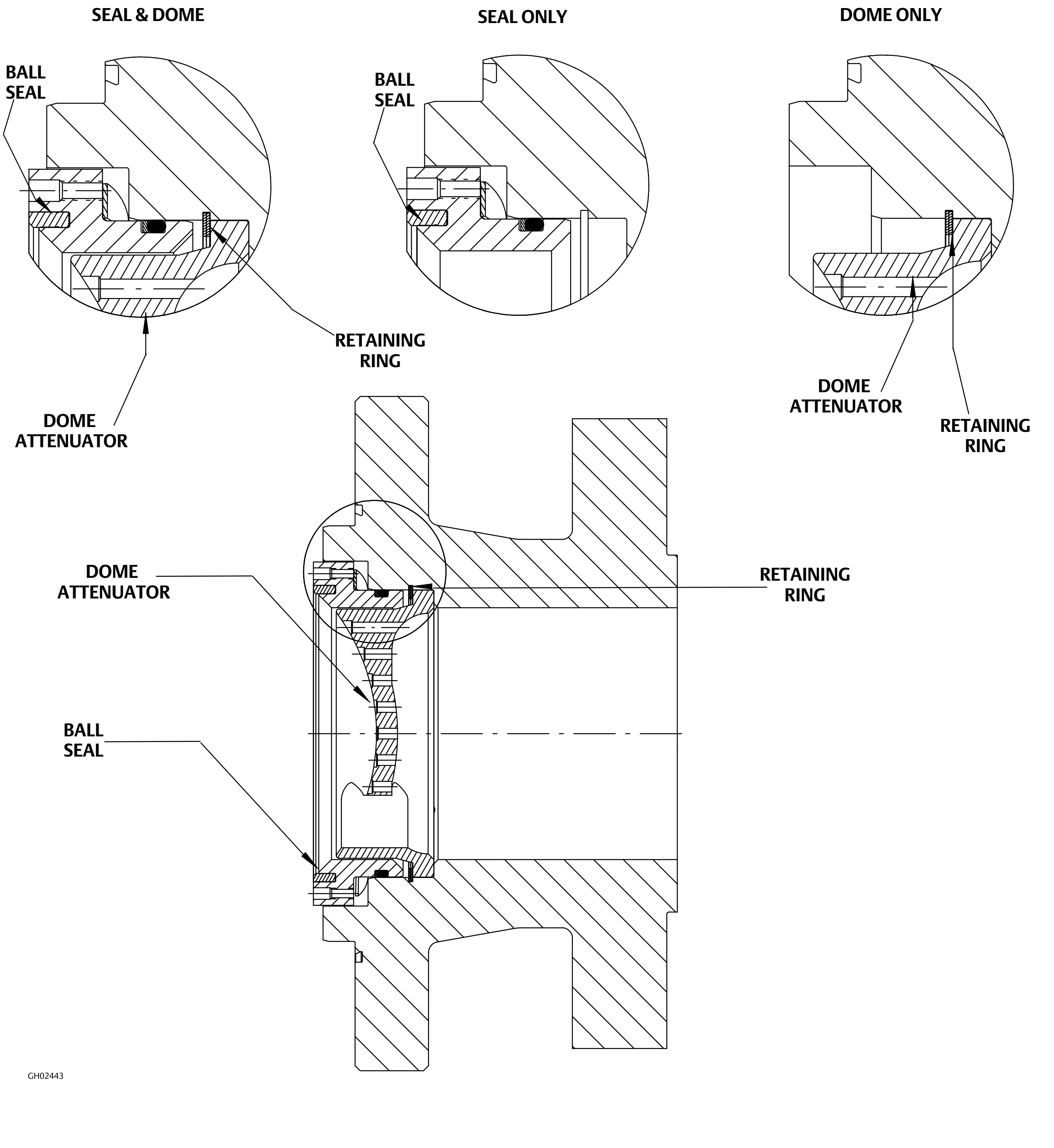
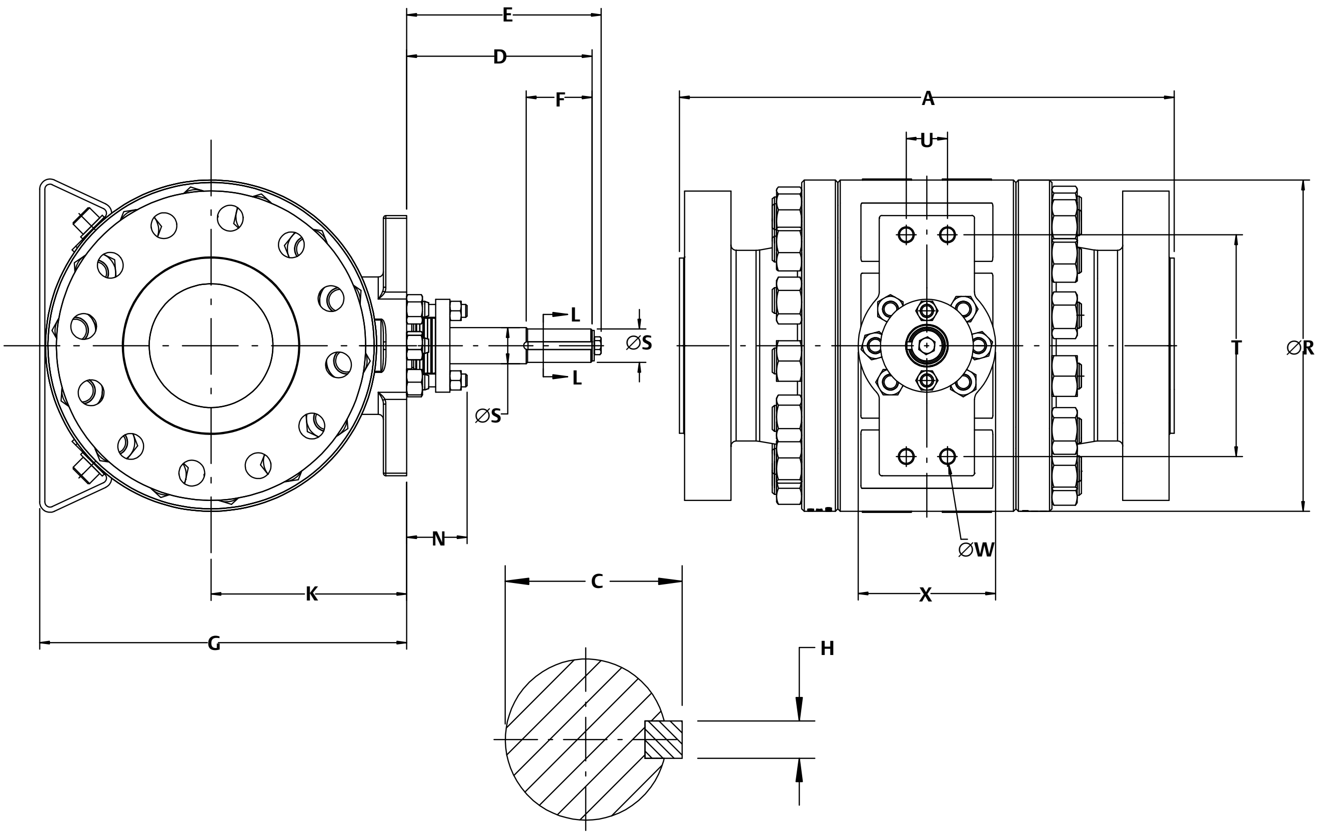


Figure 3. V280 Envelope Dimensions



SECTION L-L
SCALE 1:1

Table 2. V280 Envelope Dimensions (see figure 3)

Valve Size, NPS	Pressure Class	ØBore	A	K	G	ØR	ØS			V	U	ØW (Threaded)	Approximate Weight
							Shaft Dia.	Spline Dia.	Keyway Dia.				
			mm										kg
6	900	152	610	241	452	409	44.4	38.1	41.2	273	51	See Below	415
8		203	737	300	561	508	63.5	50.8	57.1	337	76		753
10		254	838	343	648	597							1143
12		305	965	434	798	705	76.2	71.1	69.8	533	127		1823
16		374	1130	503	937	851							2885
		Inches											lbs
6	900	6.00	24.00	9.50	17.80	16.10	1.75	1.50	1.625	10.75	2.00	3/4-10	915
8		8.00	29.00	11.80	22.10	20.00	2.50	2.00	2.25	13.25	3.00	7/8-9	1660
10		10.00	33.00	13.50	25.50	23.50							2520
12		12.00	38.00	17.10	31.40	27.75	3.00	2.80	2.75	21.00	5.00	1-1/4-8	4020
16		14.71	44.50	19.80	36.90	33.50							6360

Table 3. V280 Envelope Dimensions (see figure 3) (cont.)

<table>
<tr><th rowspan="3">Valve Size, NPS</th><th rowspan="3">Pressure Class</th><th colspan="2">D</th><th>E</th><th colspan="2">F</th><th>C</th><th>H</th><th>N</th><th>X</th></tr>
<tr><th>Splined Shaft</th><th>Keyed Shaft</th><th>Keyed Shaft</th><th>Splined Shaft</th><th>Keyed Shaft</th><th>Shaft & Key Height</th><th>Key Width</th><th>Packing Nut Removal Clearance</th><th>Flange Width</th></tr>
<tr><th colspan="9">mm</th></tr>
<tr><td>6</td><td rowspan="5">900</td><td rowspan="3">356</td><td>229</td><td>243</td><td rowspan="3">155</td><td>80</td><td>45.2</td><td>9.52</td><td>96</td><td>169</td></tr>
<tr><td>8</td><td rowspan="2">297</td><td rowspan="2">312</td><td rowspan="2">95</td><td rowspan="2">62.4</td><td rowspan="2">12.70</td><td rowspan="2">109</td><td rowspan="2">191</td></tr>
<tr><td>10</td></tr>
<tr><td>12</td><td rowspan="2">508</td><td rowspan="2">394</td><td rowspan="2">408</td><td rowspan="2">264</td><td rowspan="2">111</td><td rowspan="2">76.7</td><td rowspan="2">15.87</td><td rowspan="2">134</td><td rowspan="2">244</td></tr>
<tr><td>16</td></tr>
<tr><th></th><th></th><th colspan="9">Inches</th></tr>
<tr><td>6</td><td rowspan="5">900</td><td rowspan="3">14.00</td><td>9.00</td><td>9.60</td><td rowspan="3">6.12</td><td>3.13</td><td>1.78</td><td>0.375</td><td>3.81</td><td>6.66</td></tr>
<tr><td>8</td><td rowspan="2">11.70</td><td rowspan="2">12.30</td><td rowspan="2">3.75</td><td rowspan="2">2.46</td><td rowspan="2">0.500</td><td rowspan="2">4.31</td><td rowspan="2">7.50</td></tr>
<tr><td>10</td></tr>
<tr><td>12</td><td rowspan="2">20.00</td><td rowspan="2">15.50</td><td rowspan="2">16.10</td><td rowspan="2">10.38</td><td rowspan="2">4.38</td><td rowspan="2">3.02</td><td rowspan="2">0.625</td><td rowspan="2">5.31</td><td rowspan="2">9.62</td></tr>
<tr><td>16</td></tr>
</table>

Figure 4. Dead Angle (also see table 4)

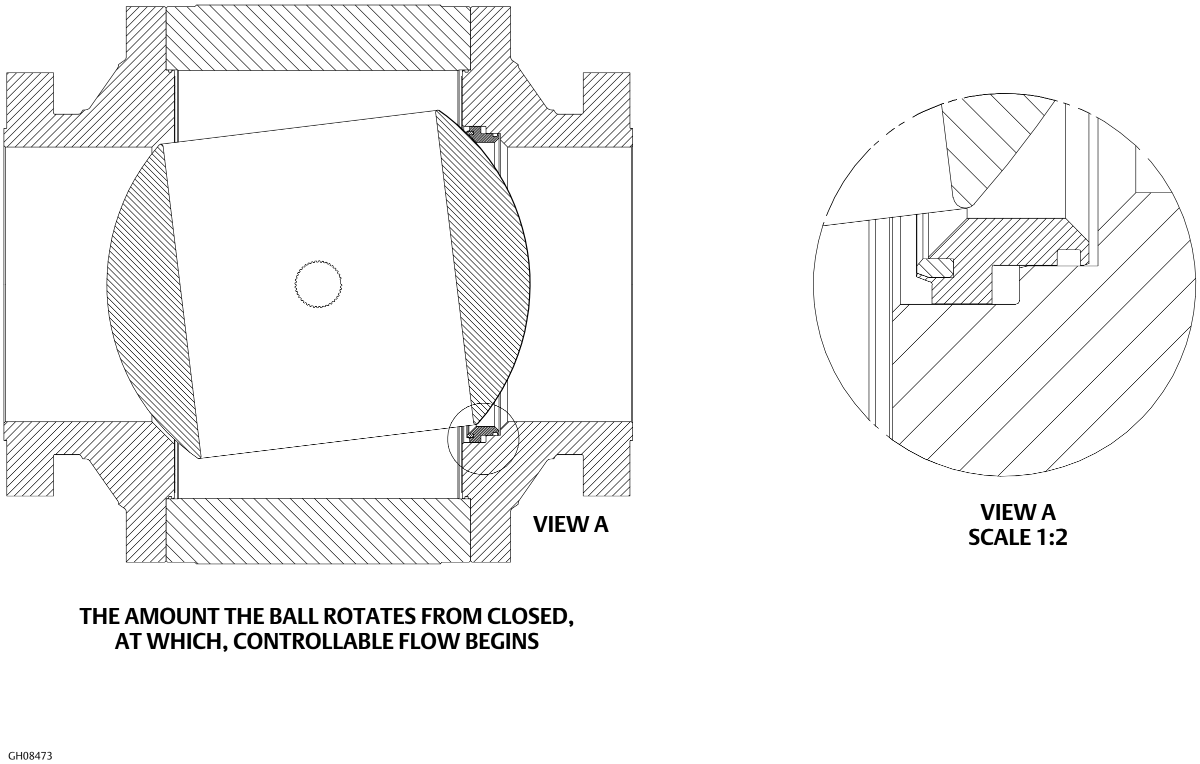


Table 4. Dead Angle Degrees

VALVE SIZE, NPS	DEAD ANGLE, DEGREES
6	10
8	9
10	9
12	9
16	10

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

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Fisher™ V500 Rotary Globe Control Valve

The Fisher V500 eccentric plug rotary control valve controls erosive, coking, and other hard-to-handle fluids, providing either throttling or on/off operation. The flanged valve features streamlined flow passages, rugged metal trim components, and a self-centering seat ring (figures 1 and 2). With these components, the V500 rotary control valve combines globe valve ruggedness with the efficiency of a rotary valve. Matched with a Fisher power or manual actuator, the V500 rotary control valve dependably controls fluids in many process industries.

Fisher V500 Flanged Rotary Control Valve with 2052 Actuator and FIELDVUE™ DVC6200 Digital Valve Controller

Features

- Easy Installation -- Integral valve body flanges mate with many different classes of pipeline flanges, satisfying a variety of piping requirements. Flanges help to eliminate exposed line flange bolting, shorten alignment and installation time, and promote secure valve installations and piping integrity.

- Operational Versatility -- Self-centering seat ring and rugged plug allow forward or reverse flow with tight shutoff in either flow direction. Reverse flow direction helps move downstream turbulence away from shutoff surfaces. Full 90-degree rotation removes valve plug from flowstream, helping to reduce plug wear. Seat ring and retainer are available in full and restricted port constructions, and can easily be changed if capacity requirements change.

- Furnace Feed Design -- Specially selected trim materials and body coatings help to withstand oil sands, furnace feed, and other highly erosive applications.

- Resists Damage from Erosive Flow -- Valve assembly is specifically designed to combat the process of erosion. Streamlined flow passages, rugged components, and a wide choice of erosion-resistant trim materials all promote long, dependable service life in erosive applications.

- Long Seat Life -- Path of eccentric plug (figure 4) minimizes contact with seat ring when opening, reducing seat wear and friction. When the valve plug rotates into the seat ring, a self-lapping action occurs, improving the fit between shutoff surfaces. Full-port, S31600, R30006, or VTC seat ring has two shutoff surfaces and can be easily reversed, reducing downtime.

(continued on page 3)

Specifications

Available Configuration

Flanged valve assembly (NPS 3 through 8 only) with reversible(1) metal or VTC (ceramic) seat ring and splined valve shaft

Valve Sizes

■ NPS 1, ■ 1-1/2, ■ 2, ■ 3, ■ 4, ■ 6, and ■ 8
DN sizes are also available (see tables 1 and 2).

End Connection Style and Rating

■ Raised-face flanges or ■ ring-type joint flanges (ASME B16.5). Valves with EN PN10 through PN100 flanges also available. (See tables 1 and 2 for ASME and EN availability by valve size.)

Maximum Inlet Pressure(2)

Consistent with applicable ASME or EN flange ratings

Maximum Pressure Drops(2)

See tables 5, 6, 7, 8 and 9

Shutoff Classification

Class IV per ANSI/FCI 70-2 and IEC 60534-4, (0.01% of valve capacity at full travel) for either flow direction. Leak rates for full and restricted port valves are based on full port valve capacities. Reduced port valves seat at the full port diameter.

Construction Materials

See table 4 for individual parts and table 3 for trim combinations

Material Temperature Capability(2)

See table 4

Flow Characteristic

Modified linear

Flow Direction

Reverse flow (standard): Past valve plug and through seat ring; tends to close the valve; recommended for erosive service
Forward flow: Through seat ring and past valve plug; tends to open the valve

Flow Coefficients

See Fisher Catalog 12

Flow Coefficient Ratio(3)

See Fisher Catalog 12

Noise Levels

See Fisher Catalog 12

Actuator Mounting

■ Right-hand or ■ left-hand as viewed from the upstream side of the valve.

Mounting position depends on the desired open valve plug position and flow direction required by operating conditions. For more information, see the Installation section.

Valve Plug Rotation

Counterclockwise to close (when viewed from actuator side of valve) through 90 degrees of plug rotation

Valve/Actuator Action

With diaphragm or piston rotary actuator, field-reversible between
■ push-down-to-close (extending actuator rod closes valve) and
■ push-down-to-open (extending actuator rod opens valve

Packing Constructions

■ **PTFE V-Ring:** With one carbon-filled PTFE conductive packing ring in single, double, or leak-off arrangements, -46 to 232°C (-50 to 450°F)
■ **PTFE/Bound-Composition:** With one graphited composition conductive packing ring in single, double, or leak-off arrangements, -46 to 232°C (-50 to 450°F)
■ **Graphite Ribbon Packing Rings:** In single, double, or leak-off arrangements, -198 to 538°C (-325 to 1000°F)
■ **ENVIRO-SEAL™ PTFE:** -46 to 232°C (-50 to 450°F) (for 100 ppm service requirements)
■ **ENVIRO-SEAL Graphite:** -7 to 316°C (20 to 600°F) (for 100 ppm service requirements). This packing arrangement can be used to 371°C (700°F) for non-environmental service.

(continued)

Specifications (continued)

Shaft Diameters

See figure 5

Dimensions and Approximate Weights

See figure 5; face-to-face dimensions conform to ISA S75.04 and IEC 60534-3-2

Options

■ Restricted trim (retainer and seat ring) for low-flow applications, ■ sealed bearing constructions, ■ purged bearings, ■ tungsten carbide trim option, ■ flushing connections, ■ chrome carbide valve body coating, ■ ENVIRO-SEAL packing system; see figure 3 and bulletin 59.3:041, ENVIRO-SEAL Packing Systems for Rotary Valves (D101638X012) for more information

1. The reversible seat is not available in every trim material. Consult your Emerson sales office.
2. The pressure or temperature limits in the referenced tables or figures, and in any applicable code limitation, should not be exceeded.
3. Ratio of maximum flow coefficient to minimum usable flow coefficient. May also be called rangeability.

Features (continued)

- **Simple Assembly and Maintenance --** No special orientation, precision clamping or repetitive centering of valve plug and seat ring is required when tightening the retainer, promoting accurate alignment and easy assembly.

- **Improved Environmental Capabilities --** The optional ENVIRO-SEAL packing systems are designed with very smooth shaft surfaces and live loading to provide improved sealing. The seal of the ENVIRO-SEAL system can restrict emissions to less than the EPA (Environmental Protection Agency) limit of 100 ppm (parts per million).

- **Sour Service Capability --** Materials are available for applications involving sour liquids and gases. Depending on the construction, the product will comply with NACE MR0175-2002, MR0175-2003, MR0103 and/or MR0175/ISO15156. Contact your Emerson sales office for additional information.

- **Rugged Construction --** Durable, solid metal or VTC seat ring and valve plug shutoff tightly without deforming plug arms or employing thin ball seals. Oversized shaft diameters and rugged trim parts allow high pressure drops. Tungsten carbide is also available for erosive service.

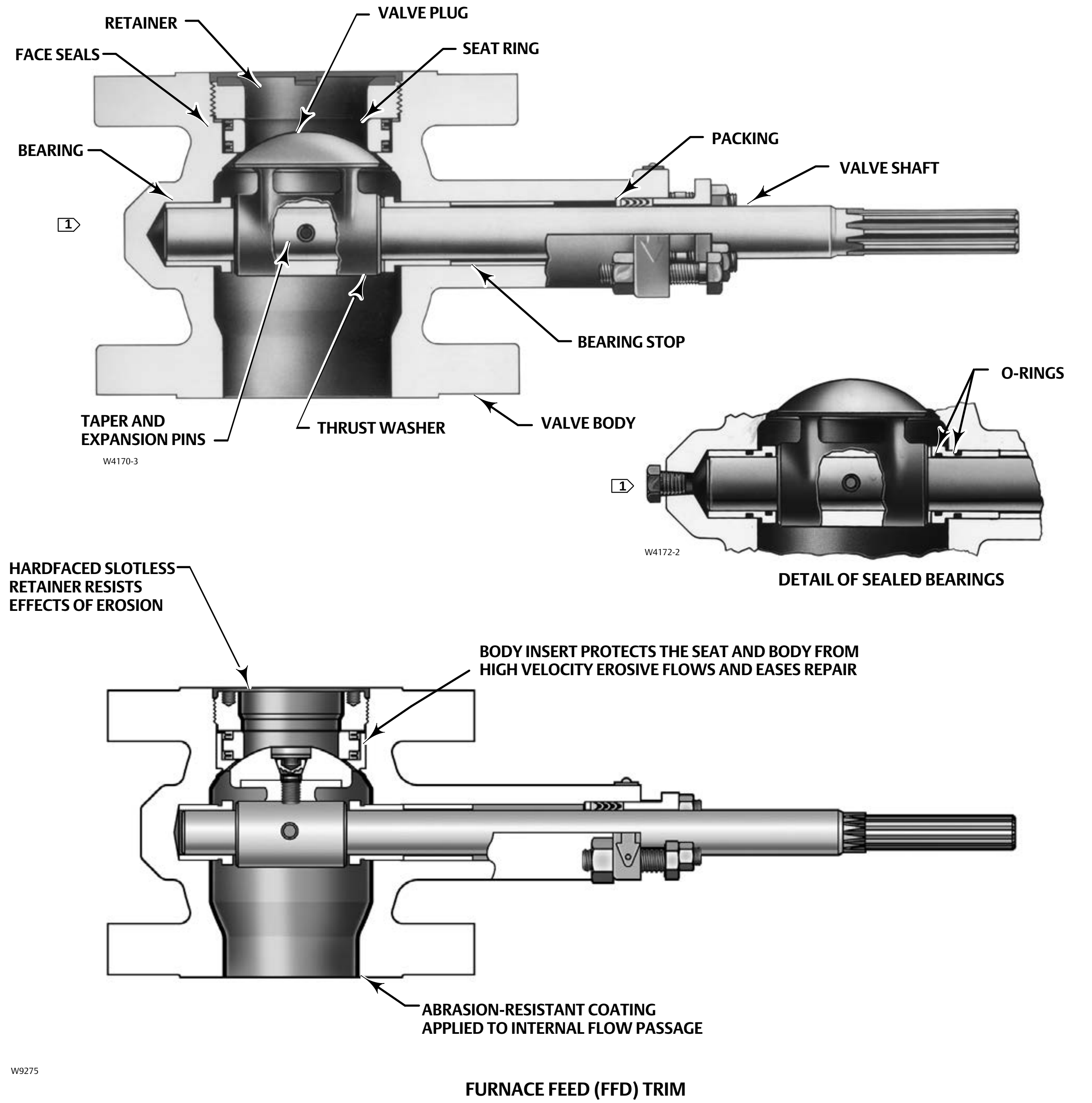
- **Reliable Performance --** Seat ring design (figure 2) self-centers, self-laps, and dynamically aligns with plug, giving excellent cycle life. Sealed metal bearings (see figure 1) help prevent particle buildup and valve shaft seizure in erosive applications.

- **Choice of Construction Materials --** Plug, seat ring, and retainer are available in four levels of hardness for selection of erosion resistance.

- **Optional Alloy 6 Seat Ledge Insert Available --** Protects seat and valve body from high-velocity erosive flows and eases repair. Available for NPS 2-8.

Contents

Figure 1. Sectional of Fisher V500 Control Valve



1 End-tapped valve body and pipe plug optional (limited to less than 232°C [450°F])

Figure 2. Detail of Seat Ring Design

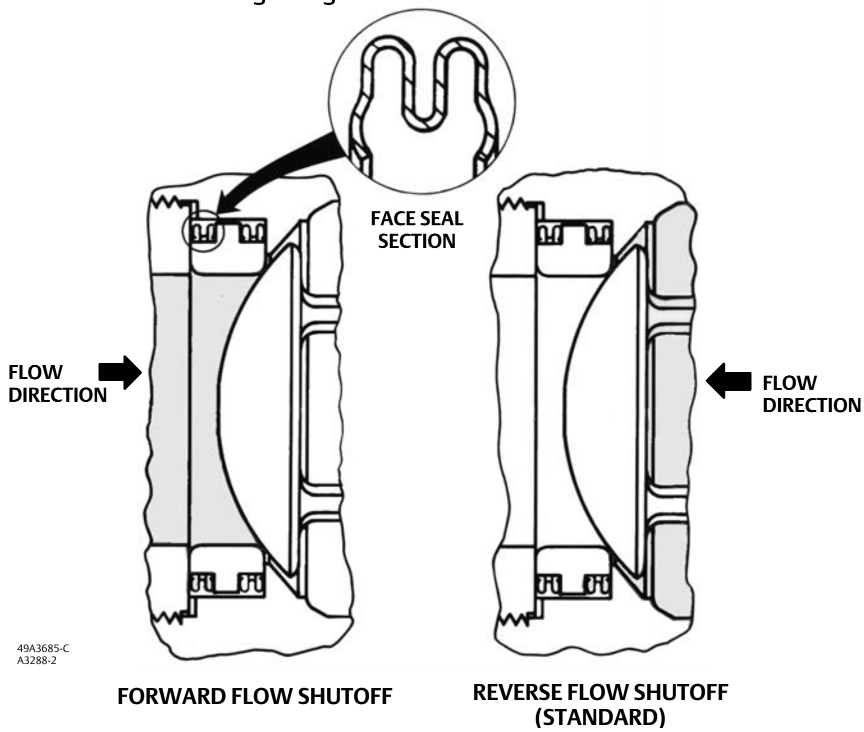


Figure 3. Typical ENVIRO-SEAL Packing Arrangements for Rotary Valves

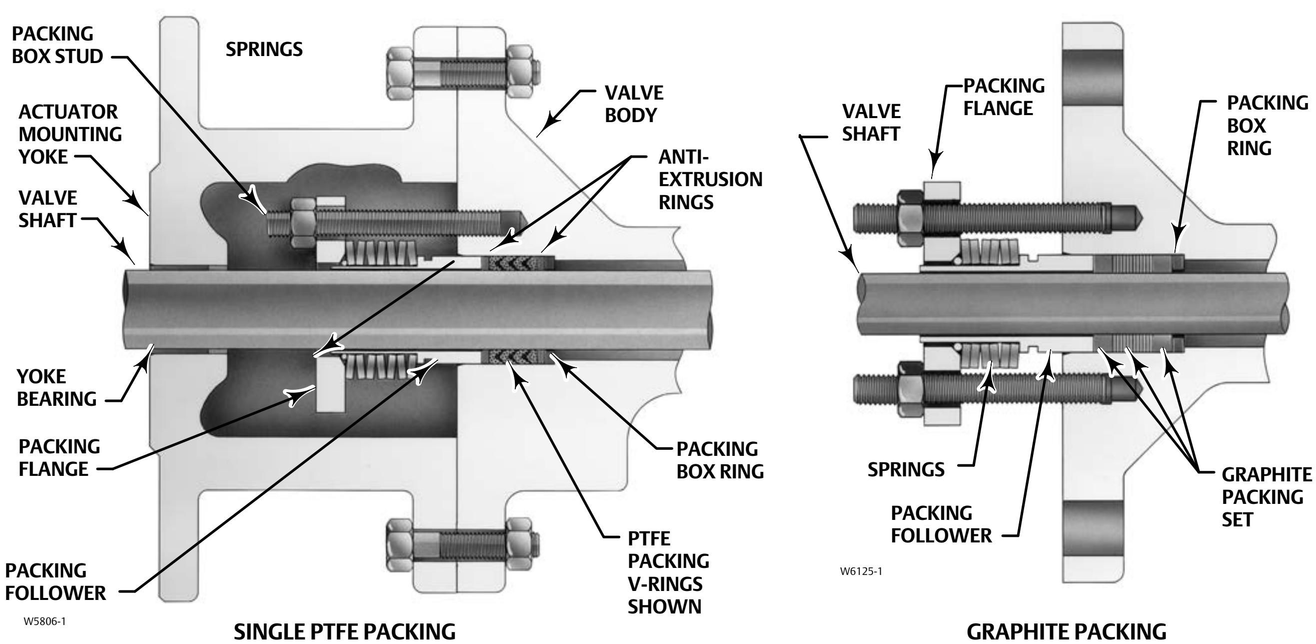


Table 1. Valve Size, ASME Pressure Ratings, and Flange Compatibility (X indicates availability)

VALVE SIZE, NPS	FLANGED		
	CL150	CL300	CL600
1	X	X	X
1-1/2	X	X	X
2	X	X	X
3	X	X	X
4	X	X	X
6	X	X	X
8	X	X	X

Table 2. Valve Size, EN Pressure Ratings, and Flange Capability (X indicates availability)

VALVE SIZE, DN	Flanged					
	PN 10	PN 16	PN 25	PN 40	PN 63	PN 100
25	X	X	X	X	X	X
40	X	X	X	X	X	X
50	X	X	X	X	X	X
80	X	X	X	X	X	X
100	X	X	X	X	X	X
150	X	X	X	X	X	X
200	X	X	X	X	X	X

Table 3. Material Combinations

Trim Level	Body Material	Valve Size, NPS	Valve Plug	Seat Ring	Retainer
1	WCC	1 & 1-1/2	CF8M/Chrome Plate	CF8M	CF8M
		2 through 8	CF8M/Chrome Plate	CF8M	CB7Cu-1
	CF8M	1 through 8	CF8M/Chrome Plate	CF8M	CF8M
	CF3M(2)	1 through 8	CF3M/Chrome Plate	CF3M	CF3M
2	WCC	1 & 1-1/2	R30006	R30006	CF8M
		2 through 8	R30006	R30006	CB7Cu-1
	CF8M	1 through 8	R30006	R30006	CF8M
	CF3M(2)	1 through 8	R30006	R30006	CF3M
3	WCC/CF8M/CF3M(1,3)	1 & 1-1/2	R30006	R30006	CF8M/R30006 bore or CF3M/R30006 bore(3)
		2 through 8	R30006	R30006	R30006
3H (over 600°F)	CF8M/CF3M(3)	2 through 8	R30006	R30006	CF8M/R30006 bore or CF3M/R30006 bore(3)
4(5,6)	WCC/CF8M/CF3M(3)	1 & 1-1/2(4)	Solid VTC	Solid VTC	CF8M/VTC bore or CF3M/VTC bore(3)
		2(4)	Solid VTC	Solid VTC	R30006/VTC bore
		3 through 8	R30006 hub, Titanium Gr 5 cap screw, and VTC surface cap	Solid VTC	R30006/VTC bore
4S(5,6)	WCC/CF8M/CF3M(3)	3 through 8	R30006 hub, S17400SST treated insert, N07718 cap screw, and VTC surface cap	Solid VTC	R30006/VTC bore
FFD(6)	CF8M with Tungsten Carbide Coating and R30006 Drop-in Seat Ledge	2 through 8	R30006/Tungsten Carbide Seating Surface	Solid VTC	CF8M/R30006 Bore

1. Trim 3 for NPS 2 through 8 stainless steel bodies is limited to 600°F.
2. European Sourcing Only.
3. European sources supply CF3M in lieu of CF8M.
4. Includes an S20910 SST shaft for NPS 1, 1-1/2, and 2.
5. Use trim 4S when sour service construction is required for compliance to NACE MR0175-2002.
6. VTC trim is not compatible with water and steam above 180°C (360°F).

Table 4. Material Temperature Capabilities(1, 4)

PART NAME	MATERIAL		MINIMUM TO MAXIMUM TEMPERATURE	
			°C	°F
Valve body and retainer NPS 1 and 1-1/2	Steel body	CF8M retainer CF8M retainer with R30006 bore CF8M retainer with VTC bore	-29 to 427	-20 to 800
	CF8M body	CF8M retainer CF8M retainer with R30006 bore S31600 retainer with VTC bore	-198 to 538	-325 to 1000
Valve body and retainer NPS 2 through 8	WCC steel body	CB7Cu-1 retainer	-29 to 427	-20 to 800
		Solid R30006 retainer	-29 to 427	-20 to 800
		CF8M retainer	-29 to 260	-20 to 500
		R30006 retainer with VTC bore	-29 to 427	-20 to 800
	CF8M body	CF8M retainer	-198 to 427	-325 to 800
		Solid R30006 retainer	-46 to 324	-50 to 600
		CF8M with R30006 bore	-198 to 427	-325 to 800
		R30006 retainer with VTC bore	-46 to 427	-50 to 800
Seat Ledge Insert	R30006		-46 to 538	-50 to 1000
Seat ring	CF8M		-198 to 538	-325 to 1000
	Solid R30006		-46 to 538	-50 to 1000
	CF8M with R30006 seat		-198 to 538	-325 to 1000
	Solid VTC		-46 to 427	-50 to 800
Valve plug	Chrome-plated CF8M		-198 to 316	-325 to 600
	Solid R30006		-46 to 427	-50 to 800
	Solid VTC (NPS 1 through 2 valves only)		-46 to 427	-50 to 800
	VTC surface bolted to an R30006 hub (NPS 3 through 8 valves only)		-46 to 427	-50 to 800
	R30006 Hub, Tungsten Carbide Seat		-40 to 538	-40 to 1000
Valve shaft	S17400		-62 to 427	-80 to 800
	S20910		-198 to 538	-325 to 1000
Taper and expansion pins	1 through 2-inch solid VTC valve plug	N10276	-46 to 427	-50 to 800
	Other valve plugs	S20910	-198 to 538	-325 to 1000
Bearings	PTFE/composition-lined S31600		-46 to 260	-50 to 500
	R30006(2)		-198 to 538	-325 to 1000
	S44004(2)		-29 to 427	-20 to 800
O-rings(3) (for Alloy 6 or 440C SST sealed bearings)	FKM		-18 to 204	0 to 400
	NBR		-29 to 93	-20 to 200
Bearing stop	S31600		-198 to 538	-325 to 1000
Thrust washer	S17700 for S17400 shaft		-198 to 427	-325 to 800
	R30016 for S20910 SST shaft		-198 to 538	-325 to 1000
Face seals	N07718 (NACE MR0175-2002 or PTFE/N10276		-198 to 538	-325 to 1000
Retainer gasket	Graphite laminate for NPS 1 and 1-1/2 valves or S31600 for NPS 2 through 8 valves		-198 to 538	-325 to 1000
Packing rings	PTFE		-46 to 260	-50 to 500
	PTFE/bound composition		-73 to 260	-100 to 500
	Graphite ribbon		-198 to 538	-325 to 1000
Packing follower	S31600		-198 to 538	-325 to 1000
Studs and nuts	SA-193-B7 studs and SA-194-2H nuts		-46 to 427	-50 to 800
	SA-193-B7M studs and SA-194-2HM nuts		-29 to 427	-20 to 800
	B8M studs and 8M nuts		-198 to 538	-325 to 1000
Packing box ring	S31600		-198 to 538	-325 to 1000

1. VTC trim is incompatible with water and steam above 180°C (360°F).
2. Recommended for erosive applications.
3. For sealed bearing constructions
4. Component ratings (not indicative of assembly rating)

Table 5. Maximum Allowable Shutoff Pressure Drops for Level 1 Trim, Bar

VALVE BODY MATERIAL	BEARING MATERIAL	TEMPERATURE, °C	VALVE BODY SIZE, NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-29 to 149	68.9	55.2	41.4	41.4	41.4	41.4	24.1
		149 to 204	68.9	55.2	41.4	41.4	41.4	41.4	23.8
		204 to 316	68.9	55.2	41.4	41.4	41.4	41.4	23.1
	R30006	-29 to 204	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		204 to 260	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		260 to 316	68.9	55.2	41.4	41.4	41.4	20.7	15.2
	PTFE/ composition-lined S31600	-29 to 93	68.9	55.2	41.4	41.4	41.4	41.4	24.1
		93 to 149	68.9	55.2	41.4	41.4	41.4	41.4	24.1[1]
									23.1[2]
		149 to 204	68.9	55.2	41.4	41.4	41.4	41.4	23.8[1]
									22.1[2]
		204 to 260	68.9	55.2	41.4	41.4	41.4	41.4	23.4[1]
									21.7[2]
CF8M SST	R30006	-46 to 20	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		204 to 260	65.8	55.2	41.4	41.4	41.4	20.7	15.2
		260 to 316	62.4	55.2	41.4	41.4	41.4	20.7	15.2
	PTFE/ composition-lined S31600	-46 to 93	68.9	55.2	41.4	41.4	41.4	41.4	24.1
		93 to 149	68.9	55.2	41.4	41.4	41.4	41.4	24.1[1]
									23.1[2]
		149 to 204	68.9	55.2	41.4	41.4	41.4	41.4	23.8[1]
									22.1[2]
		204 to 260	65.8	55.2	41.4	41.4	41.4	41.4	23.4[1]
									21.7[2]

1. S17400 shaft only
2. ASME SA-479 Grade S20910 SST shaft only. Pressure drops appropriate for both shaft materials.

Table 6. Maximum Allowable Shutoff Pressure Drops for Level 1 Trim, Psi

VALVE BODY MATERIAL	BEARING MATERIAL	°F	VALVE BODY SIZE, NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-20 to 300	1000	800	600	600	600	600	350
		300 to 400	1000	800	600	600	600	600	345
		400 to 600	1000	800	600	600	600	600	335
	R30006	-20 to 400	1000	800	600	600	600	300	220
		400 to 500	1000	800	600	600	600	300	220
		500 to 600	1000	800	600	600	600	300	220
	PTFE/ composition- lined S31600	-20 to 200	1000	800	600	600	600	600	350
		200 to 300	1000	800	600	600	600	600	350[1] 335[2]
		300 to 400	1000	800	600	600	600	600	345[1] 320[2]
		400 to 500	1000	800	600	600	600	600	340[1] 315[2]
CF8M SST	R30006	-50 to 400	1000	800	600	600	600	300	220
		400 to 500	955	800	600	600	600	300	220
		500 to 600	905	800	600	600	600	300	220
	PTFE/ composition- lined S31600	-50 to 200	1000	800	600	600	600	600	350
		200 to 300	1000	800	600	600	600	600	350[1] 335[2]
		300 to 400	1000	800	600	600	600	600	345[1] 320[2]
		400 to 500	955	800	600	600	600	600	340[1] 315[2]

1. S17400 shaft only
2. ASME SA-479 Grade S20910 SST shaft only. Pressure drops appropriate for both shaft materials.

Table 7. Maximum Allowable Shutoff Pressure Drops for Level 2 and 3 Trims, Bar

VALVE BODY MATERIAL	BEARING MATERIAL	TEMPERATURE, °C	VALVE BODY SIZE, NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-29 to 93	103.4	103.4	103.4	103.4	82.7	51.7	24.1
		93 to 149	100.3	100.3	99.0	100.3	82.7	51.7	24.1
		149 to 204	97.2	97.2	93.8	97.2	82.7	51.0	23.8
		204 to 260	91.7	91.7	91.4	91.7	82.7	50.0	23.1
		260 to 316	83.4	83.4	83.4	83.4	82.7	49.3	23.1
		316 to 343	81.0	81.0	81.0	81.0	81.0	48.3	22.4
		343 to 371	78.3	78.3	78.3	78.3	78.3	48.3	22.4
		371 to 399	69.6	69.6	69.6	69.6	69.6	46.9	21.7
		399 to 427	56.9	56.9	56.9	56.9	56.9	46.9	21.7
	R30006	-29 to 204	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		204 to 260	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		260 to 316	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		316 to 343	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		343 to 371	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		371 to 399	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		399 to 427	56.9	55.2	41.4	41.4	41.4	20.7	15.2
	PTFE/ composition-lined S31600	-29 to 38	103.4	103.4	103.4	103.4	89.6	55.2	24.1
		38 to 93	103.4	103.4	103.4	103.4	89.6	55.2	24.1
		93 to 149	100.3	100.3	100.3	100.3	89.6	55.2	24.1[1]
									23.1[2]
		149 to 204	97.2	97.2	97.2	97.2	89.6	54.8[1]	23.8[1]
								51.0[2]	22.1[2]
		204 to 232	91.7	91.7	91.7	91.7	89.6	53.8[1]	23.4[1]
								50.0[2]	21.7[2]
CF8M SST[3]	R30006	-46 to 204	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		204 to 260	65.8	55.2	41.4	41.4	41.4	20.7	15.2
		260 to 316	62.4	55.2	41.4	41.4	41.4	20.7	15.2
		316 to 343	61.4	55.2	41.4	41.4	41.4	20.7	15.2
		343 to 371	59.6	55.2	41.4	41.4	41.4	20.7	15.2
		371 to 399	58.3	55.2	41.4	41.4	41.4	20.7	15.2
		399 to 427	57.2	55.2	41.4	41.4	41.4	20.7	15.2
	PTFE/ composition-lined S31600	-46 to 38	99.3	99.3	99.3	99.3	89.6	55.2	24.1
		38 to 93	85.5	85.5	85.5	85.5	85.5	55.2	24.1
		93 to 149	77.3	77.3	77.3	77.3	77.2	53.1	24.1[1]
									23.1[2]
		149 to 204	71.0	71.0	71.0	71.0	71.0	54.8[1]	23.8[1]
								51.0[2]	22.1[2]
		204 to 232	65.8	65.8	65.8	65.8	65.8	53.8[1]	23.4[1]
								50.0[2]	21.7[2]

1. S17400 shaft only
2. ASME SA-479 Grade S20910 SST shaft only. Pressure drops appropriate for both shaft materials.
3. Level 3 trim is limited to a maximum temperature of 316°C. For temperatures above 316°C, use trim 3H.

Table 8. Maximum Allowable Shutoff Pressure Drops for Level 2 and 3 Trims, Psi

VALVE BODY MATERIAL	BEARING MATERIAL	TEMPERATURE, °F	VALVE BODY SIZE, NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-20 to 200	1500	1500	1500	1500	1200	750	350
		200 to 300	1455	1455	1435	1455	1200	750	350
		300 to 400	1410	1410	1360	1410	1200	740	345
		400 to 500	1330	1330	1325	1330	1200	725	335
		500 to 600	1210	1210	1210	1210	1200	715	335
		600 to 650	1175	1175	1175	1175	1175	700	325
		650 to 700	1135	1135	1135	1135	1135	700	325
		700 to 750	1010	1010	1010	1010	1010	680	315
		750 to 800	825	825	825	825	825	680	315
	R30006	-20 to 400	1000	800	600	600	600	300	220
		400 to 500	1000	800	600	600	600	300	220
		500 to 600	1000	800	600	600	600	300	220
		600 to 650	1000	800	600	600	600	300	220
		650 to 700	1000	800	600	600	600	300	220
		700 to 750	1000	800	600	600	600	300	220
		750 to 800	825	800	600	600	600	300	220
	PTFE/ composition-lined S31600	-20 to 100	1500	1500	1500	1500	1300	800	350
		100 to 200	1500	1500	1500	1500	1300	800	350
		200 to 300	1455	1455	1455	1455	1300	800	350[1] 335[2]
		300 to 400	1410	1410	1410	1410	1300	795[1] 740[2]	345[1] 320[2]
		400 to 450	1330	1330	1330	1330	1300	780[1] 725[2]	340[1] 315[2]
CF8M SST[3]	R30006	-50 to 400	1000	800	600	600	600	300	220
		400 to 500	955	800	600	600	600	300	220
		500 to 600	905	800	600	600	600	300	220
		600 to 650	890	800	600	600	600	300	220
		650 to 700	865	800	600	600	600	300	220
		700 to 750	845	800	600	600	600	300	220
		750 to 800	830	800	600	600	600	300	220
	PTFE/ composition-lined S31600	-50 to 100	1440	1440	1440	1440	1300	800	350
		100 to 200	1240	1240	1240	1240	1240	800	350
		200 to 300	1120	1120	1120	1120	1120	770	350[1] 335[2]
		300 to 400	1030	1030	1030	1030	1030	795[1] 740[2]	345[1] 320[2]
		400 to 450	955	955	955	955	955	780[1] 725[2]	340[1] 315[2]

1. S17400 shaft only
2. ASME SA-479 Grade S20910 SST shaft only. Pressure drops appropriate for both shaft materials.
3. Level 3 trim is limited to a maximum temperature of 600°F. For temperatures above 600°F, use trim 3H.

Table 9. Maximum Allowable Shutoff Pressure Drops for Level 4 Trim(1)

VALVE BODY MATERIAL	BEARING MATERIAL	TEMPERATURE, °C	BAR						
			VALVE SIZE, NPS						
			1	1-1/2	2	3	4	6	8
WCC steel	S44004	-29 to 93	103.4	103.4	70.3	103.4	78.6	52.4	24.1
		93 to 149	100.3	100.3	70.3	100.3	78.6	52.4	24.1
		149 to 204	97.2	97.2	70.3	97.2	78.6	51.0	23.8
		204 to 260	91.7	91.7	70.3	91.7	78.6	50.0	23.1
		260 to 316	83.4	83.4	70.3	83.4	78.6	49.3	23.1
		316 to 371	78.3	78.3	70.3	78.3	78.3	48.3	22.4
		371 to 427	56.9	56.9	56.9	56.9	56.9	46.9	21.7
	R30006	-29 to 204	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		204 to 260	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		260 to 316	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		316 to 371	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		371 to 427	56.9	55.2	41.4	41.4	41.4	20.7	15.2
CF8M SST	R30006	-46 to 204	68.9	55.2	41.4	41.4	41.4	20.7	15.2
		204 to 260	65.8	55.2	41.4	41.4	41.4	20.7	15.2
		260 to 316	62.4	55.2	41.4	41.4	41.4	20.7	15.2
		316 to 371	59.6	55.2	41.4	41.4	41.4	20.7	15.2
		371 to 427	57.2	55.2	41.4	41.4	41.4	20.7	15.2
VALVE BODY MATERIAL	**BEARING MATERIAL**	**TEMPERATURE, °F**	**PSI**						
			1	**1-1/2**	**2**	**3**	**4**	**6**	**8**
WCC steel	S44004	-20 to 200	1500	1500	1020	1500	1140	750	350
		200 to 300	1455	1455	1020	1455	1140	760	350
		300 to 400	1410	1410	1020	1410	1140	740	345
		400 to 500	1330	1330	1020	1330	1140	725	335
		500 to 600	1210	1210	1020	1210	1140	715	335
		600 to 700	1135	1135	1020	1135	1135	700	325
		700 to 800	825	825	825	825	825	680	315
	R30006	-20 to 400	1000	800	600	600	600	300	220
		400 to 500	1000	800	600	600	600	300	220
		500 to 600	1000	800	600	600	600	300	220
		600 to 700	1000	800	600	600	600	300	220
		700 to 800	825	800	600	600	600	300	220
CF8M SST	R30006	-50 to 400	1000	800	600	600	600	300	220
		400 to 500	955	800	600	600	600	300	220
		500 to 600	905	800	600	600	600	300	220
		600 to 700	855	800	600	600	600	300	220
		700 to 800	830	800	600	600	600	300	220

1. VTC trim is incompatible with water and steam above 180°C (360°F).

Table 10. Maximum Allowable Shutoff Pressure Drops for FFD Trim(1)

VALVE BODY MATERIAL	BEARING MATERIAL	TEMPERATURE, °C	BAR		
			VALVE SIZE, NPS		
			3	4	6
CF8M SST	R30006	-46 to 204	41.4	41.4	20.7
		204 to 260	41.4	41.4	20.7
		260 to 316	41.4	41.4	20.7
		316 to 371	41.4	41.4	20.7
		371 to 427	41.4	41.4	20.7
VALVE BODY MATERIAL	**BEARING MATERIAL**	**TEMPERATURE, °F**	**PSI**		
			3	**4**	**6**
CF8M SST	R30006	-50 to 400	600	600	300
		400 to 500	600	600	300
		500 to 600	600	600	300
		600 to 700	600	600	300
		700 to 800	600	600	300

1. VTC trim is incompatible with water and steam above 180°C (360°F).

Table 11. Actuator Mounting Selections, with Action and Open Plug Position Options

MOUNTING	ACTION(1)	OPEN PLUG POSITION	
		Forward Flow	Reverse Flow
Left-hand	PDTC	Below shaft(2)	Above shaft
	PDTO	Below shaft(2)	Above shaft
Right-hand	PDTC	Above shaft	Below shaft(2)
	PDTO	Above shaft	Below shaft(2)

1. PDTC—Push-down-to-close (extending actuator rod closes valve)
PDTO—Push-down-to open (extending actuator rod opens valve).
2. Consult your Emerson sales office for compatibility with process fluid. Particulate can cause the valve to stick if the plug is rotated below the shaft.

Installation

The V500 control valve may be installed in any position. However, for best shutoff performance, a position with the shaft horizontal is recommended.

The control valve may be installed in forward or reverse flow direction. Forward flow (through the seat ring and past the plug) tends to open the valve; reverse flow (past the plug and through the seat ring) tends to close the valve. The reverse flow direction is recommended for erosive applications.

Specific operating conditions may require a specific combination of push-down-to-close or -open actuator motion and open valve plug position above or below the shaft. To satisfy specific operating requirements, the complete control valve package (valve and actuator) can be assembled and installed in different ways, providing eight options for actuator motion and open plug position.

Table 11 and the appropriate actuator bulletin describe possible assembly and installation options. For assistance in selecting the appropriate combination of actuator action and open valve position, consult your Emerson sales office.

Dimensions are shown in figure 5.

Valve Information

To determine the required valve ordering information, refer to the Specifications table. Review the information under each specification and in the referenced tables.

Actuator and Accessory Information

Refer to the specific actuator and accessory bulletins for required ordering information.

Figure 4. Eccentric Rotation

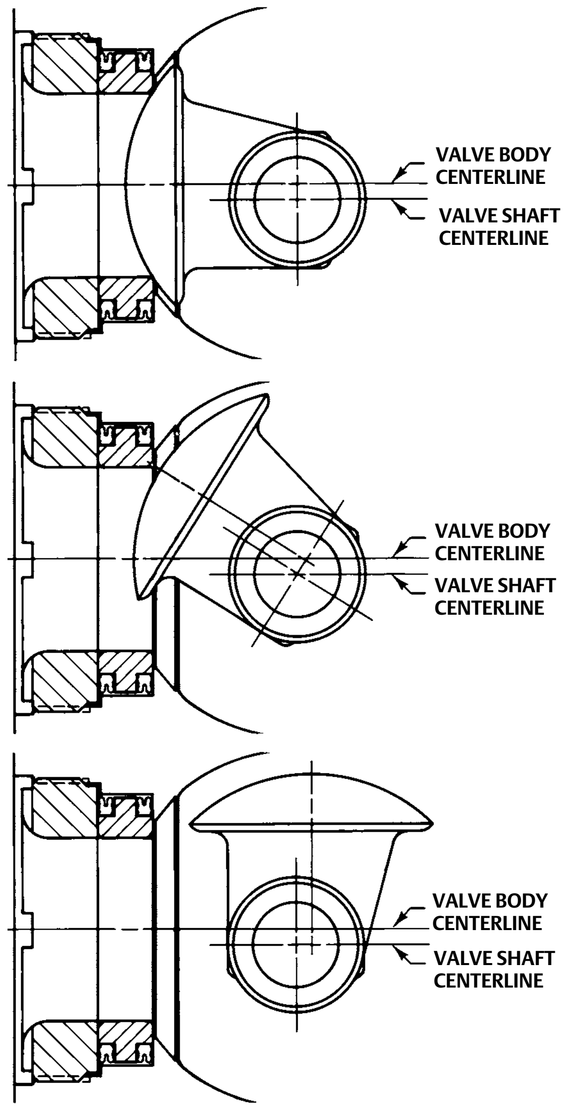
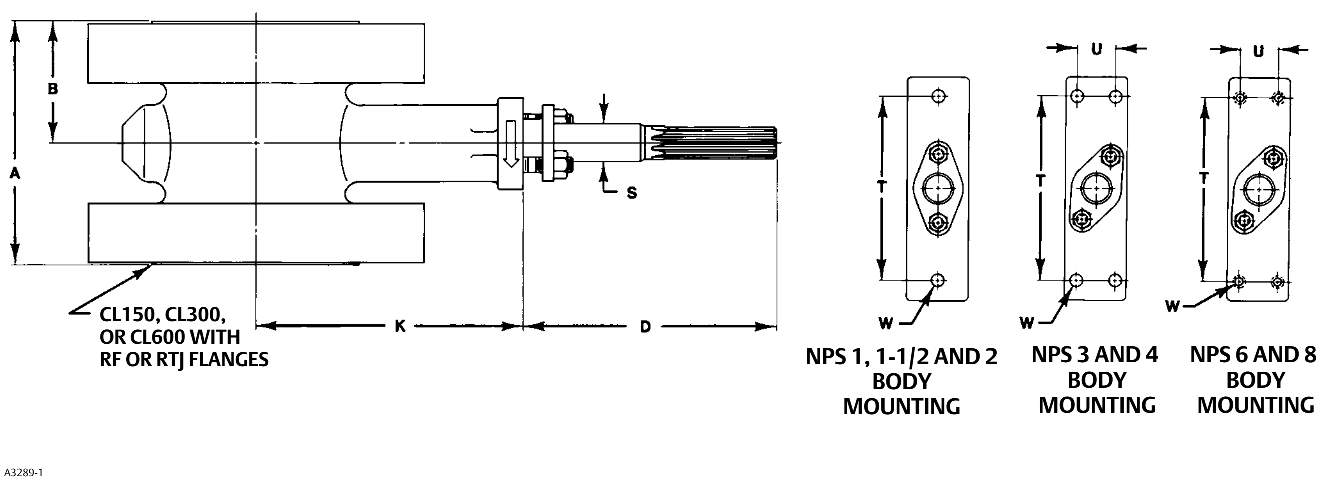


Table 12. Fisher V500 Rotary Control Flanged Valve Dimensions

VALVE SIZE, NPS	DIMENSIONS										APPROXIMATE WEIGHT		
	A		B		D	K	S (SHAFT DIA)(1)	T	U	W	Flanged		
											Pressure Class		
	RF	RTJ	RF	RTJ							CL150	CL300	CL600
	mm										kg		
1	102	108	51	57	187	126	12.7	118	- - -	11	5.4	5.9	5.9
1-1/2	114	122	57	63	187	135	15.9	118	- - -	14	8.6	9.5	10
2	124	124	62	62	187	151	15.9	118	- - -	14	9.5	11	13
3	165	165	83	83	213	200	25.4 25.4 x 19.1	152	32	14	19	24	26
4	194	194	97	97	208	216	31.8	235	46	18	36	42	50
6	229	229	114	114	208	270	38.1 38.1 x 31.8	235	46	5/8-Inch 11 UNC	54	69	93
8	243	243	121	121	208	318	38.1	235	46	5/8-Inch 11 UNC	79	98	135
VALVE SIZE, NPS	Inches										Pounds		
1	4.00	4.25	2.00	2.25	7.38	4.97	1/2	4.62	- - -	0.45	12	13	13
1-1/2	4.50	4.75	2.25	2.50	7.38	5.31	5/8	4.62	- - -	0.56	19	21	23
2	4.88	4.88	2.44	2.44	7.38	5.94	5/8	4.62	- - -	0.56	21	25	28
3	6.50	6.50	3.25	3.25	8.44	7.88	1 1 x 3/4	6.00	1.25	0.56	42	52	57
4	7.62	7.62	3.81	3.81	8.19	8.50	1-1/4	9.25	1.81	0.69	79	93	111
6	9.00	9.00	4.50	4.50	8.19	10.6	1-1/2 1-1/2 x 1-1/4	9.25	1.81	5/8-Inch 11 UNC	120	152	204
8	9.56	9.56	4.78	4.78	8.19	12.5	1-1/2	9.25	1.81	5/8-Inch 11 UNC	175	217	298

1. Shaft diameter versus spline diameter.

Figure 5. Fisher V500 Rotary Control Flanged Valve Dimensions (refer to table 12)



Note:
For dimensions of valves with DN (or other) end connections, consult your Emerson sales office.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

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Fisher™ Z500 Severe Service Ball Valves

This bulletin covers Fisher NPS 1/2 - 36 Z500 Severe Service Ball Valves. The Z500 severe service ball valve line is a simplistic two-piece floating ball design with integral metal seat meant to provide tight shutoff in high temperature, high pressure, and erosive applications across all industries. The mate lapped ball and seat constructions help ensure sealing and the High-Velocity Oxyfuel coatings (HVOF) provide excellent corrosion resistance and help eliminate the problems associated with severe service conditions.

Z500 valves are available with a variety of end connections from ASME CL150 through CL4500.

All Z500 valves are designed and manufactured to be used in severe service applications. They are highly engineered to help enhance safety in potentially dangerous operating parameters and reduce valve maintenance costs.

Fisher Z500 Valve

X1243

Features

- **Machined Stops --** Integral 90 degree lockplate design prevents over-rotation and maintains critical alignment on lever-operated valves.

- **Side Mounted Bracket --** Helps prevent shaft and packing box side load and bolt shear by attaching to the side of the valve body. Allows easy access to packing gland nuts for needed adjustments.

- **Live-Loaded Packing --** Packing design utilizes live-loaded spring washers for easy adjustment. Compact stuffing box and live-loaded Belleville springs ensure packing is continuously energized and protects against shaft side loading and temperature fluctuations.

- **Shaft Adapter --** Lever-operated valves have a contact-proof shaft adapter designed to prevent the shaft from being knocked into the ball, causing misalignment and possible leakage.

- **Blow-Out Proof Shaft --** Rugged, one-piece, machined, surface-hardened and polished shaft is designed to be blow-out proof. There are no pins to rely on, which helps increase safety and reliability.

- **Integral Metal Seat --** Preferred sealing seat is machined into the end adapter, coated, and mate lapped with the ball. Design eliminates a potential leak path and helps the valve withstand high pressures, temperatures and severe service conditions.

- **Metal Body Gasket --** Specially engineered, self-energizing gasket helps ensure that there is no leakage during thermal transients.

- **High-Velocity Oxyfuel Coatings (HVOF) --** Forms a very hard and dense coating on the base metal of the ball forming a strong mechanical bond. Typically these coatings are chrome or tungsten carbide. These coatings provide exceptional wear, corrosion, and erosion resistance.

(continued on page 2)

Specifications

Valve Sizes

Z500: NPS ■ 1/2, ■ 3/4, ■ 1, ■ 1-1/2, ■ 2, ■ 3, ■ 4, ■ 6, ■ 8, ■ 10, ■ 12, ■ 14, ■ 16, ■ 18, ■ 20, ■ 24, ■ 26, ■ 28, ■ 30 and, ■ 36

Maximum Working Pressures(1)

Consistent with applicable pressure-temperature ratings in table 1 per ASME B16.34, but do not exceed the material temperature capabilities shown below

Shutoff Classification(1)

Z500: Valves are tested to API 598 in the preferred flow direction.

Class V type B per FCI 70-2 in reverse flow in bi-directional design (Must be specified). For other shutoff requirements, please contact your Emerson sales office

Construction Materials

See table 2

Temperature Capabilities(1)

Welded and Threaded Ends: *Carbon Steel:* 427°C (800°F); *F22:* 593°C (1100°F); *F91:* 649°C (1200°F); *F316:* 538°C (1000°F); *F316H:* 760°C (1400°F)

Flanged End Connections: *Carbon Steel:* 316°C (600°F); *F22:* 427°C (800°F); *F91:* 538°C (1000°F); *F316:* 538°C (1000°F)

Lower Limits: *Carbon steel:* -29°C (-20°F), *Stainless steel:* -40°C (-40°F)

Packing Constructions

Carbon Steel Valve Bodies: Wire reinforced graphite packing, AISI 4130 nitrided packing gland
Stainless Steel: N06600 wire-reinforced graphite packing, S31600 nitrided packing gland

Dimensions

See figures 4 and 7 and tables 10 through 19 or contact your Emerson sales office

Standard Flow Direction

Preferred Flow Direction: Preferred flow for optimal sealing is forward into the integral seat

Flow Coefficients

Contact your Emerson sales office

Maximum Ball Rotation

90 degrees

Actuator Mounting

The preferred mounting orientation is vertical. Other orientations are acceptable

Approximate Weight

Contact your Emerson sales office

Options

■ Reduced port, ■ Expanded outlet, ■ Scraper seats, ■ HVOF coating options, ■ Bi-directional sealing, ■ High cycle constructions, ■ Lockouts, ■ Spray and fused coatings

1. The pressure/temperature limits in this bulletin, and any applicable code or standard limitation, should not be exceeded.

Features (continued)

- **Bi-Directional Sealing --** Optional bi-directional sealing is available for all configurations but must be specified when ordering. Selecting this option designates reverse flow sealing to ANSI/FCI 70-2 Class V Type B shutoff classification.
- **Sour Service Capability --** Materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0103.
- **Back Pressure Protection --** Welded and threaded end connection valves with 0.65, 1.15, 1.5, and 2 inch bores come standard with a seat holder designed to protect the Belleville spring from being deformed in case of process back pressure.

Table 1. Valve Body Materials, End Connections, and Ratings

Ratings	Bore (inches)	Size, NPS	End Connection	Valve Body Materials[1]
CL150 through 1500	0.65	1/2	Buttweld, Socketweld, FNPT, RF, RTJ	Carbon Steel, F22, F91, F316, and F316H
		3/4		
		1		
		1-1/2		
	1.15	1		
		1-1/2		
		2		
		2-1/2		
	1.5	1-1/2		
		2		
		2-1/2		
		3	Buttweld, RF, RTJ	
	2	2	Buttweld, Socketweld, FNPT, RF, RTJ	
		2-1/2		
		3	Buttweld, RF, RTJ	
		4		
	3	3		
		4		
		6		
	4	4		
		6		
	6	6		
		8		
	8	8	RF, RTJ	
		10		
	10	10		
	12	12		
	14	14		
	16	16		
	18	18		
	20	20		
	24	24		
	26	26		
	28	28		
	30	30		
	36	36		

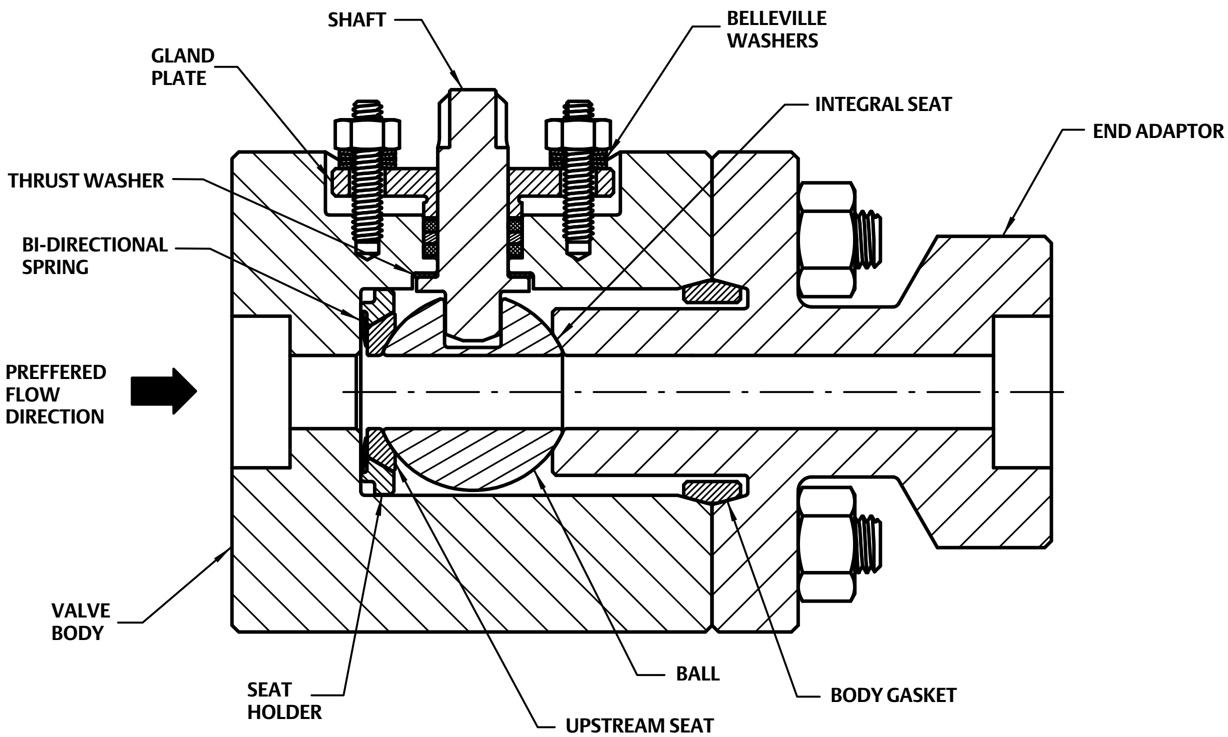
-continued-

Table 1. Valve Body Materials, End Connections, and Ratings (continued)

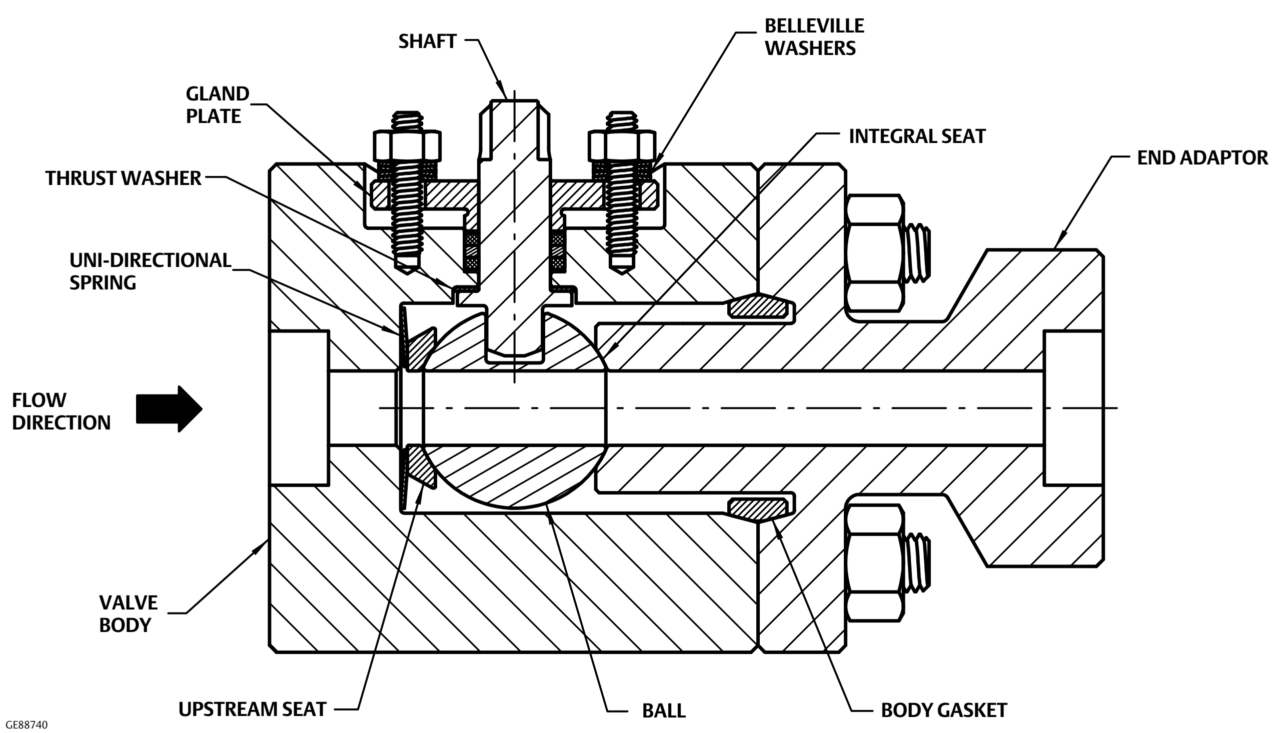
Ratings	Bore (inches)	Size, NPS	End Connection	Valve Body Materials[1]
CL2500	0.65	1/2	Buttweld, Socketweld, FNPT, RF, RTJ	Carbon Steel, F22, F91, F316, and F316H
		3/4		
		1		
		1-1/2		
	1.15	1		
		1-1/2		
		2		
		2-1/2		
	1.5	1-1/2		
		2		
		2-1/2		
		3	Buttweld, RF, RTJ	
	2	2	Buttweld, Socketweld, FNPT, RF, RTJ	
		2-1/2		
		3	Buttweld, RF, RTJ	
		4		
	3	3		
		4		
		6		
	4	4		
		6		
	6	6		
		8		
	8	8	RF, RTJ	
		10		
CL3200	0.65	1/2	Buttweld, Socketweld	Carbon Steel, F22, F91, F316, and F316H
		3/4		
		1		
	1.15	1		
		1-1/2		
		2		
	1.5	1-1/2		
		2		
		2-1/2		
CL4500	0.65	1/2	Buttweld, Socketweld	Carbon Steel, F22, F91, F316, and F316H
		3/4		
		1		
	1.15	1		
		1-1/2		
		2		
	1.5	1-1/2		
		2		
		2-1/2		

1. Valve bodies are machined from forgings or forged bar.

Figure 1. Z500 Cross Section Construction Features

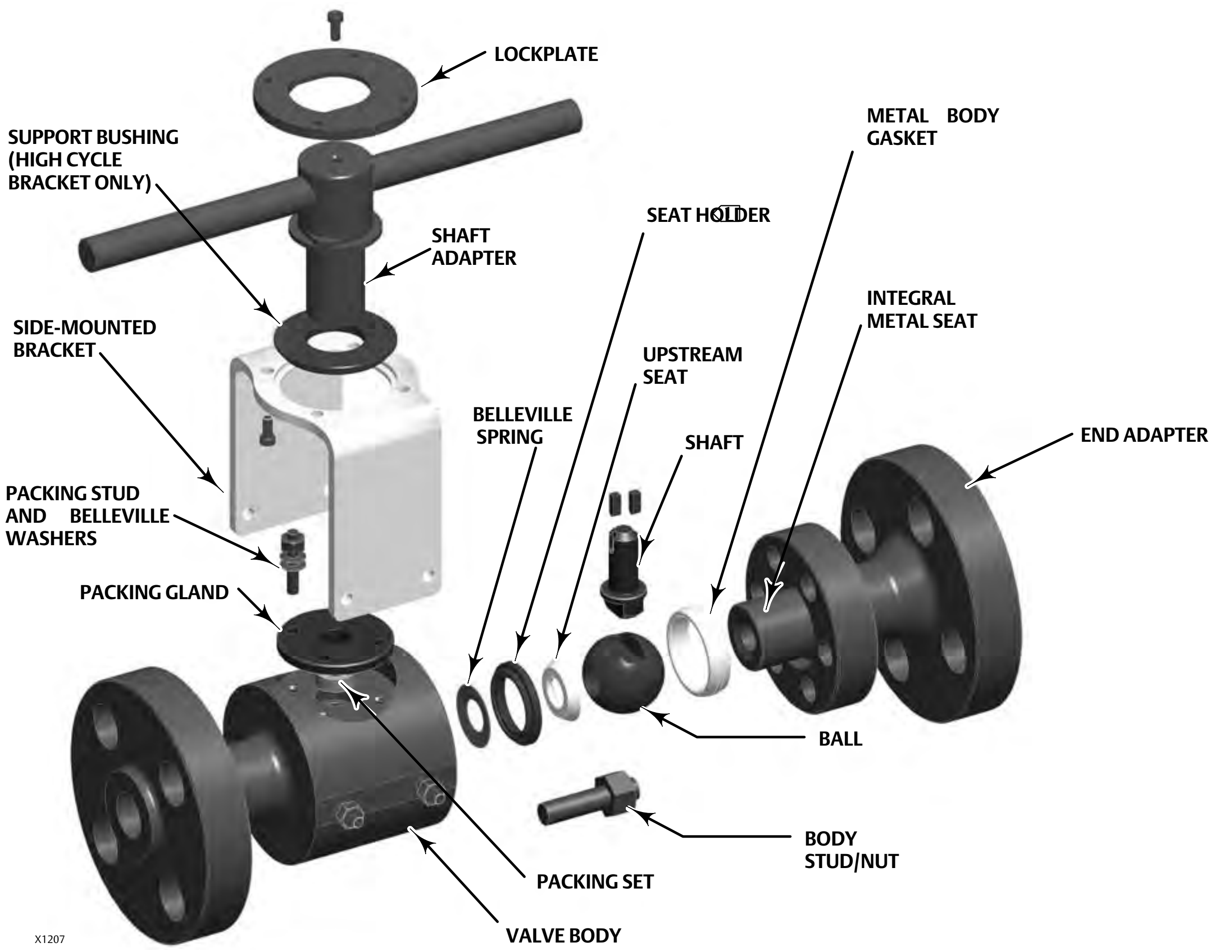


BI-DIRECTIONAL DESIGN



UNI-DIRECTIONAL DESIGN

Figure 2. Z500 Construction Features



Note:
1 Seat holder is standard on welded and threaded end connections in 0.65, 1.15, 1.5, and 2 inch bores only. Bidirectional option must be specified for all other constructions.

Table 2. Standard Construction Materials for NPS 1/2 through 36 Valves

PART	VALVE BODY AND END ADAPTER MATERIAL			
	Carbon Steel	F22	F91	F316, F316H
Ball(1)	S41000	S41000	S41000	S31600
Upstream seat(1)	S41000	S41000	S41000	S31600
Seat Holder(2)	S41000	S41000	S41000	S31600
Body gasket	S17400	N07718	N07718	S66286
Spring	N07718 or S17400(3)	N07718	N07718	S66286
Packing	Flexible graphite with wire-reinforced braided graphite and stainless steel washers			
Shaft	S17400 Nitrided	N07718 Nitrided	N07718 Nitrided	S66286 Nitrided
Shaft adapter	AISI 4130 Nitrided, 4140 Nitrided			
Coatings	HVOF Chrome Carbide (standard), HVOF Tungsten Carbide, Spray and Fused Nickel-Boron			

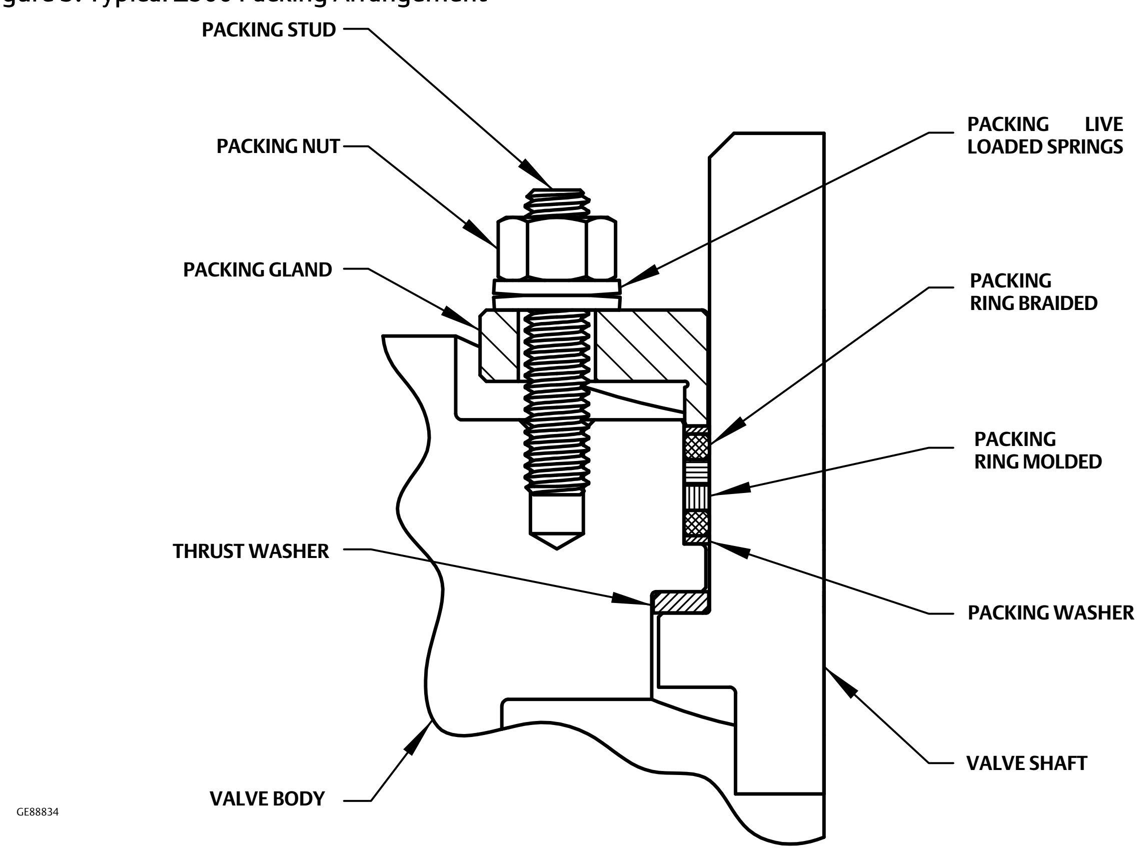
1. Part is coated (HVOF chrome carbide standard)
2. Seat holder is standard on welded and threaded end connections in 0.65, 1.15, 1.5, and 2 inch bores only. Bidirectional option must be specified for all other constructions.
3. N07718 spring for 2 inch bore and below. S17400 spring for 3 inch bore and below.

Table 3. Spray and Fused Coating Standard Construction Materials(1)

PART	VALVE BODY AND END ADAPTER MATERIAL			
	Carbon Steel	F22	F91	F316, F316H
Ball and Upstream Seat(2)	F22			S31600

1. Seat holder is standard on welded and threaded end connections in 0.65, 1.15, 1.5, and 2 inch bores only. Bidirectional option must be specified for all other constructions.
2. Part is coated.

Figure 3. Typical Z500 Packing Arrangement



Pressure Drops

Pressure drop limits of any given valve are based on valve body and material limits. Z500 valves meet full B16.34 pressure drop capabilities up to specified material maximum temperature limit. Information on limits for other material constructions can be obtained by contacting your Emerson sales office.

Table 4. Maximum Allowable Shutoff Pressure Drops (Body Ratings)

TEMPERATURE RANGE	PRESSURE CLASS						
	Carbon Steel CL150	Carbon Steel CL300	Carbon Steel CL600	Carbon Steel CL900	Carbon Steel CL1500	Carbon Steel CL2500	Carbon Steel CL4500
°C	Bar						
-29 to 38	19.7	51.0	102.0	153.1	255.5	425.4	766.0
93	17.9	46.9	93.8	140.3	234.1	389.9	702.2
149	15.9	45.2	90.3	135.5	225.5	375.8	676.7
204	13.8	43.8	87.2	131.0	218.6	364.0	655.3
260	11.7	41.7	83.1	124.8	207.9	346.5	623.3
316	9.7	39.3	78.3	117.6	195.8	326.1	587.1
343(1)	8.6	37.9	75.8	113.8	189.3	315.4	568.1
371(1)	7.6	36.5	71.0	109.6	183.7	305.1	548.8
399(1)	6.6	34.8	70.0	104.8	174.8	291.6	524.7
427(1)	5.5	28.3	56.9	85.2	141.7	236.5	425.4
°F	Psi						
-20 to 100	285	740	1480	2220	3705	6170	11110
200	260	680	1360	2035	3395	5655	10185
300	230	655	1310	1965	3270	5450	9815
400	200	635	1265	1900	3170	5280	9505
500	170	605	1205	1810	3015	5025	9040
600	140	570	1135	1705	2840	4730	8515
650(1)	125	550	1100	1650	2745	4575	8240
700(1)	110	530	1030	1590	2665	4425	7960
750(1)	95	505	1015	1520	2535	4230	7610
800(1)	80	410	825	1235	2055	3430	6170

1. Due to material limitations, consult your Emerson sales office for flanged end connection use over 316°C (600°F).

Table 5. Maximum Allowable Shutoff Pressure Drops (Body Ratings)

TEMPERATURE RANGE	PRESSURE CLASS						
	F22 Class 3 CL150	F22 Class 3 CL300	F22 Class 3 CL600	F22 Class 3 CL900	F22 Class 3 CL1500	F22 Class 3 CL2500	F22 Class 3 CL4500
°C	Bar						
-29 to 38	20.0	51.7	103.4	155.1	258.6	430.9	775.7
93	17.9	51.7	103.4	155.1	258.6	430.9	775.7
149	15.9	50.3	100.3	150.7	251.0	418.5	753.3
204	13.8	48.6	97.2	145.8	243.4	405.4	729.8
260	11.7	45.9	91.7	137.6	229.3	382.0	687.1
316	9.7	41.7	83.4	125.1	208.6	347.5	625.4
343	8.6	40.7	81.0	121.7	202.7	338.2	608.5
371	7.6	39.3	78.3	117.6	195.8	326.1	587.1
399	6.6	36.5	73.4	110.0	183.4	305.4	549.5
427	5.5	35.2	70.0	105.1	175.1	291.6	524.7
454(1)	4.5	33.4	67.2	100.7	167.9	279.9	503.7
482(1)	3.4	31.0	62.1	93.1	154.8	258.2	464.7
510(1)	2.4	26.5	52.1	80.0	133.1	222.0	399.6
538(1)	1.4	18.3	36.9	55.2	92.0	153.8	276.5
566(1)	1.4	12.1	24.1	36.2	60.3	100.3	181.0
593(1)	1.4	7.6	15.2	22.8	37.9	63.1	113.4
°F	Psi						
-20 to 100	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925
400	200	705	1410	2115	3530	5880	10585
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1065	1595	2660	4430	7970
800	80	510	1015	1525	2540	4230	7610
850(1)	65	485	975	1460	2435	4060	7305
900(1)	50	450	900	1350	2245	3745	6740
950(1)	35	385	755	1160	1930	3220	5795
1000(1)	20	265	535	800	1335	2230	4010
1050(1)	20	175	350	525	875	1455	2625
1100(1)	20	110	220	330	550	915	1645

1. Due to material limitations, consult your Emerson sales office for flanged end connection use over 427°C (800°F).

Table 6. Maximum Allowable Shutoff Pressure Drops (Body Ratings)

TEMPERATURE RANGE	PRESSURE CLASS						
	F316, F316H[2] CL150	F316, F316H[2] CL300	F316, F316H[2] CL600	F316, F316H[2] CL900	F316, F316H[2] CL1500	F316, F316H[2] CL2500	F316, F316H[2] CL4500
°C	Bar						
-29 to 38	19.0	49.6	99.3	148.9	248.2	413.7	744.6
93	16.2	42.7	85.5	128.2	213.4	355.8	640.5
149	14.8	38.6	77.2	115.8	192.7	321.3	578.5
204	13.4	35.5	70.7	106.2	177.2	295.1	531.2
260	11.7	33.1	65.8	98.9	164.8	274.4	494.0
316	9.7	31.0	62.1	93.4	155.5	259.2	466.8
343	8.6	30.3	61.0	91.4	152.4	253.7	456.8
371	7.6	30.0	60.0	90.0	149.6	249.6	456.1
399	6.6	29.3	59.0	88.3	147.2	245.5	442.0
427	5.5	29.0	58.3	87.2	145.5	242.7	436.8
454	4.5	29.0	57.6	86.5	144.1	239.9	432.0
482	3.4	28.6	57.2	85.8	143.1	238.6	429.5
510	2.4	26.5	53.4	80.0	133.1	222.0	399.6
538	1.4	25.2	50.0	75.2	125.5	208.9	375.8
566[1]	1.4	11.0	49.6	74.5	124.1	206.8	372.3
593[1]	1.4	21.0	42.1	63.1	105.1	175.5	315.4
621[1]	1.4	16.2	32.8	49.0	81.7	135.8	244.8
649[1]	1.4	12.8	25.5	38.3	63.8	106.5	191.3
677[1]	1.4	10	20.3	30.3	50.7	84.8	145.5
704[1]	1.4	7.9	16.2	24.1	40.3	66.9	120.6
732[1]	1.4	6.6	13.1	20	33.1	55.2	99.3
760[1]	1.4	5.2	10.3	15.5	26.2	43.4	77.9
°F	Psi						
-20 to 100	275	720	1440	2160	3600	6000	10800
200	235	620	1240	1860	3095	5160	9290
300	215	560	1120	1680	2795	4660	8390
400	195	515	1025	1540	2570	4280	7705
500	170	480	955	1435	2390	3980	7165
600	140	450	900	1355	2255	3760	6770
650	125	440	885	1325	2210	3680	6625
700	110	435	870	1305	2170	3620	6615
750	95	425	855	1280	2135	3560	6410
800	80	420	845	1265	2110	3520	6335
850	65	420	835	1255	2090	3480	6265
900	50	415	830	1245	2075	3460	6230
950	35	385	775	1160	1930	3220	5795
1000	20	365	725	1090	1820	3030	5450
1050[1]	20	160	720	1080	1800	3000	5400
1100[1]	20	305	610	915	1525	2545	4575
1150[1]	20	235	475	710	1185	1970	3550
1200[1]	20	185	370	555	925	1545	2775
1250[1]	20	145	295	440	735	1230	2110
1300[1]	20	115	235	350	585	970	1750
1350[1]	20	95	190	290	480	800	1440
1400[1]	20	75	150	225	380	630	1130

1. Due to material limitations, consult your Emerson sales office for flanged end connection use over 538°C (1000°F).
2. Use F316H above 538°C (1000°F).

Table 7. Maximum Allowable Shutoff Pressure Drops (Body Ratings)

TEMPERATURE RANGE	PRESSURE CLASS						
	F91 CL150	F91 CL300	F91 CL600	F91 CL900	F91 CL1500	F91 CL2500	F91 CL4500
°C	Bar						
-29 to 38	20.0	51.7	103.4	155.1	258.6	430.9	775.7
93	17.9	51.7	103.4	155.1	258.6	430.9	775.7
149	15.9	50.3	100.3	150.7	251.0	418.5	753.3
204	13.8	48.6	97.2	145.8	243.4	405.4	729.8
260	11.7	45.9	91.7	137.6	229.3	382.0	687.1
316	9.7	41.7	83.4	125.1	208.6	347.5	625.4
343	8.6	40.7	81.0	121.7	133.8	338.2	608.5
371	7.6	39.3	78.3	117.6	126.9	326.1	587.1
399	6.6	36.5	73.4	110.0	114.5	305.4	549.5
427	5.5	35.2	70.0	105.1	106.2	291.6	524.7
454	4.5	33.4	67.2	100.7	98.9	279.9	503.7
482	3.4	31.0	62.1	93.1	154.8	258.2	464.7
510	2.4	26.5	53.4	80.0	133.1	222.0	399.6
538	1.4	25.2	50.0	75.2	125.5	208.9	375.8
566(1)	1.4	24.8	49.6	74.5	124.1	206.8	448.2
593(1)	1.4	20.7	41.7	62.6	104.1	173.4	312.0
621(1)	1.4	15.5	30.7	46.2	76.9	127.9	230.6
649(1)	1.4	10.0	20.0	29.6	49.6	82.7	148.9
°F	Psi						
-20 to 100	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925
400	200	705	1410	2115	3530	5880	10585
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	1940	4905	8825
700	110	570	1135	1705	1840	4730	8515
750	95	530	1065	1595	1660	4430	7970
800	80	510	1015	1525	1540	4230	7610
850	65	485	975	1460	1435	4060	7305
900	50	450	900	1350	2245	3745	6740
950	35	385	775	1160	1930	3220	5795
1000	20	365	725	1090	1820	3030	5450
1050(1)	20	360	720	1080	1800	3000	6500
1100(1)	20	300	605	908	1510	2515	4525
1150(1)	20	225	445	670	1115	1855	3345
1200(1)	20	145	290	430	720	1200	2160

1. Due to material limitations, consult your Emerson sales office for flanged end connection use over 538°C (1000°F).

Table 8. Maximum Allowable Shutoff Pressure Drops - Limited Class (Valve Body Ratings)

Temperature Range	CL 1500				CL 2500				CL 3200				CL 4500			
	Carbon Steel	F22 CL3	F91	F316, F316H	Carbon Steel	F22 CL3	F91	F316, F316H	Carbon Steel	F22 CL3	F91	F316, F316H	Carbon Steel	F22 CL3	F91	F316, F316H
°C	Bar															
-29 to 38	259	259	259	259	431	431	431	431	552	552	552	552	776	776	776	776
93	259	259	259	231	431	431	431	385	552	552	552	492	776	776	776	693
149	255	255	259	207	425	425	431	345	544	544	552	441	766	765	776	621
204	253	251	259	191	421	418	431	319	539	535	552	408	758	753	776	573
260	253	250	259	179	421	416	431	299	539	533	552	382	758	749	776	537
316	253	249	259	170	421	414	431	283	539	530	552	362	758	746	776	510
343	246	247	259	166	411	411	431	277	526	526	552	355	740	740	776	498
371	238	244	253	162	397	406	421	271	508	520	539	347	715	731	758	487
399	219	244	251	159	364	406	419	265	466	520	536	339	656	731	754	476
427	177	244	248	156	295	406	414	260	378	520	530	333	532	731	745	468
454	-	233	233	152	-	389	389	254	-	498	498	325	-	701	701	457
482	-	207	207	150	-	345	345	249	-	441	441	319	-	621	621	449
510	-	166	166	147	-	281	281	245	-	365	365	313	-	521	521	441
538	-	123	155	143	-	215	271	239	-	290	365	305	-	428	539	430
566	-	81	155	140	-	141	271	234	-	189	365	300	-	280	539	421
893	-	51	139	113	-	88	243	192	-	119	327	249	-	176	483	355
621	-	-	103	95	-	-	179	166	-	-	241	223	-	-	357	329
649	-	-	66	76	-	-	116	132	-	-	156	178	-	-	231	264
677	-	-	-	62	-	-	-	108	-	-	-	145	-	-	-	214
704	-	-	-	52	-	-	-	91	-	-	-	123	-	-	-	181
732	-	-	-	43	-	-	-	75	-	-	-	100	-	-	-	148
760	-	-	-	35	-	-	-	61	-	-	-	82	-	-	-	121

Table 9. Maximum Allowable Shutoff Pressure Drops - Limited Class (Valve Body Ratings)

Temper-ature Range	CL 1500				CL 2500				CL 3200				CL 4500			
	Carbon Steel	F22 CL3	F91	F316, F316H	Carbon Steel	F22 CL3	F91	F316, F316H	Carbon Steel	F22 CL3	F91	F316, F316H	Carbon Steel	F22 CL3	F91	F316, F316H
°F	Psi															
-20 to 100	3750	3750	3750	3750	6250	6250	6250	6250	8000	8000	8000	8000	11250	11250	11250	11250
200	3750	3750	3750	3350	6250	6250	6250	5580	8000	8000	8000	7143	11250	11250	11250	10045
300	3700	3695	3750	3000	6170	6160	6250	5000	7897	7886	8000	6400	11105	11090	11250	9000
400	3665	3640	3750	2770	6105	6065	6250	4620	7817	7763	8000	5913	10995	10915	11250	8315
500	3665	3620	3750	2600	6105	6035	6250	4330	7817	7726	8000	5543	10995	10865	11250	7795
600	3665	3605	3750	2465	6105	6010	6250	4105	7817	7692	8000	5257	10995	10815	11250	7395
650	3575	3580	3750	2410	5960	5965	6250	4020	7630	7635	8000	5144	10730	10735	11250	7230
700	3455	3535	3665	2355	5760	5895	6110	3930	7372	7544	7820	5029	10365	10605	10995	7070
750	3170	3535	3645	2305	5285	5895	6070	3840	6766	7544	7771	4915	9515	10605	10930	6910
800	2570	3535	3600	2265	4285	5895	6000	3770	5486	7544	7680	4827	7715	10605	10800	6790
850	-	3385	3385	2210	-	5645	5645	3685	-	7225	7225	4716	-	10160	10160	6630
900	-	3000	3000	2170	-	5000	5000	3615	-	6400	6400	4628	-	9000	9000	6510
950	-	2412	2412	2130	-	4076	4076	3550	-	5294	5294	4544	-	7556	7556	6390
1000	-	1785	2250	2075	-	3119	3926	3460	-	4202	5288	4430	-	6213	7818	6230
1050	-	1170	2250	2035	-	2038	3926	3395	-	2747	5288	4344	-	4064	7818	6105
1100	-	732	2015	1640	-	1282	3522	2779	-	1725	4742	3609	-	2546	7006	5151
1150	-	-	1491	1373	-	-	2598	2402	-	-	3502	3233	-	-	5179	4776
1200	-	-	962	1101	-	-	1680	1921	-	-	2263	2586	-	-	3345	3822
1250	-	-	-	892	-	-	-	1562	-	-	-	2102	-	-	-	3104
1300	-	-	-	753	-	-	-	1322	-	-	-	1778	-	-	-	2627
1350	-	-	-	620	-	-	-	1081	-	-	-	1455	-	-	-	2150
1400	-	-	-	502	-	-	-	879	-	-	-	1185	-	-	-	1753

Figure 4. Fisher Z500 Mounting Types (see tables 10 through 17)

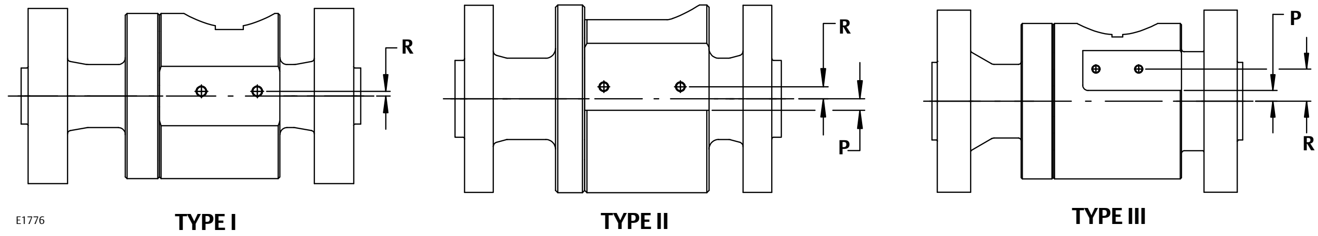


Figure 5. Fisher Z500 Packing Box Dimensions (see tables 10 through 17)

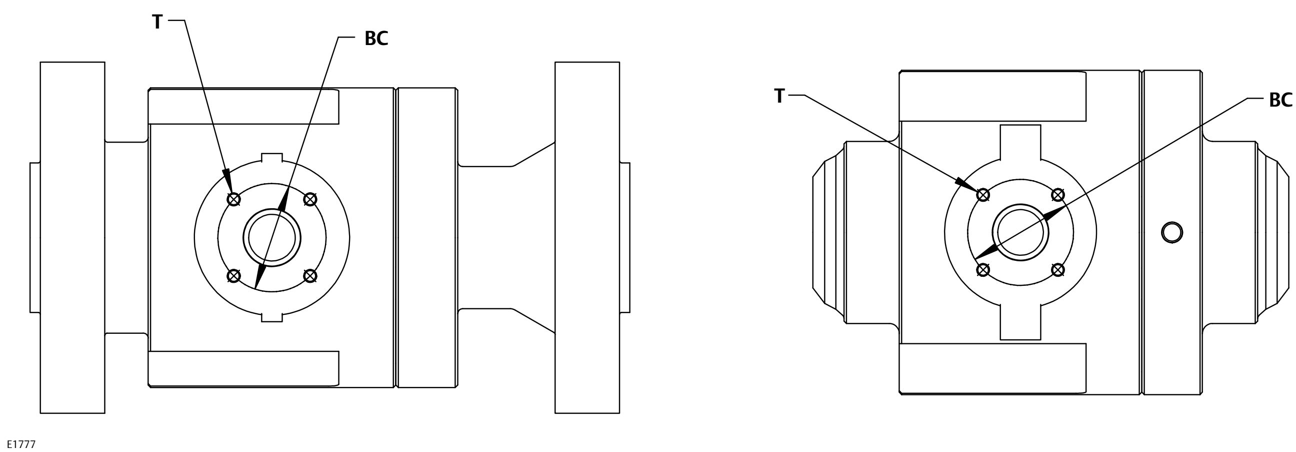


Figure 6. Fisher Z500 Socket Weld End Connections Dimensions (see tables 10 and 11)

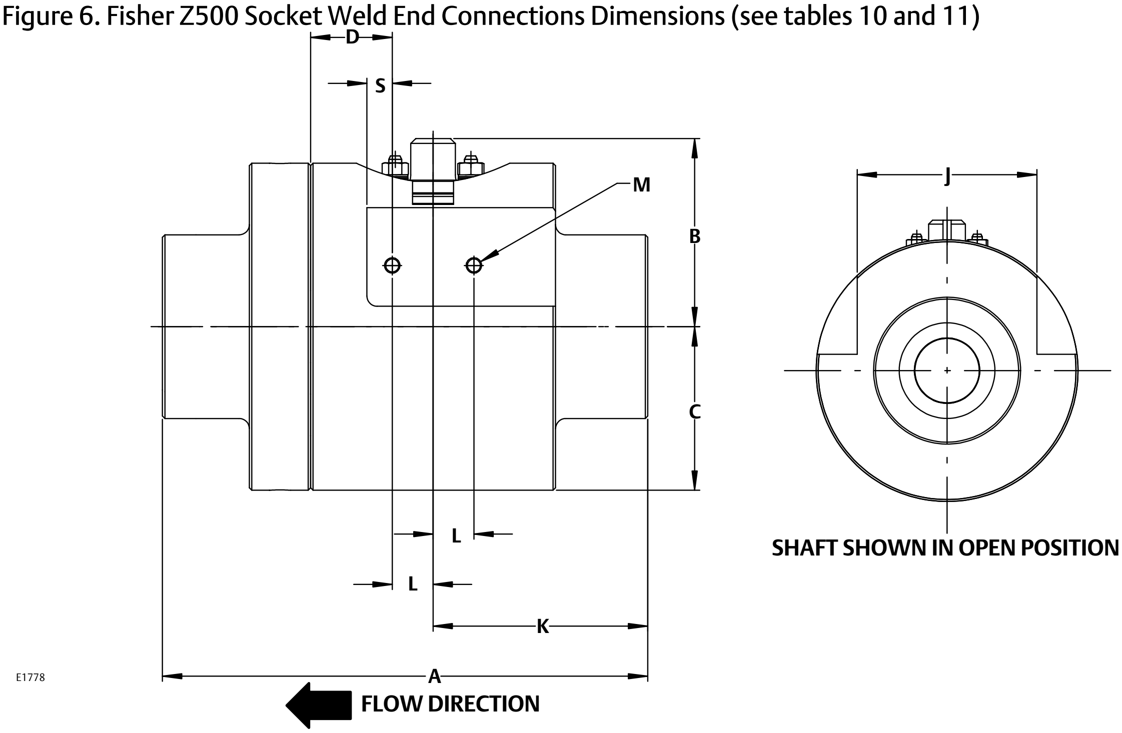


Table 10. Fisher Z500 Severe Service Ball Socket Weld End Dimensions (in, lb)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)[1]	SOCKET WELD END CONNECTION (in, lb)												Packing	
			A	B	C	J	K	L	M	P	R	S	Weight	Type	BC	T
150-1500	0.65	.5-1.5	9.0	2.4	2.13	4.0	3.14	1.00	1/4 20 UNC	N/A	0.00	1.13	30	I	2.13	1/4 20 UNC
	1.15	1-2.5	9.0	3.1	2.63	4.0	3.02	1.00	3/8 16 UNC	0.50	1.00	1.25	45	III	2.25	1/4 20 UNC
	1.5	1.5-2.5	10.4	3.9	3.26	5.2	2.89	1.00	3/8 16 UNC	0.50	1.00	1.50	75	III	2.50	1/4 20 UNC
	2	2-2.5	9.5	4.6	3.63	5.5	4.00	1.00	3/8 16 UNC	0.50	1.50	0.63	85	III	2.62	5/16 18 UNC
2500	0.65	.5-1.5	9.5	2.4	2.51	4.0	2.64	1.00	1/4 20 UNC	N/A	0.00	0.86	45	I	3.13	1/4 20 UNC
	1.15	1-2.5	11.3	3.1	3.13	5.5	3.02	1.00	3/8 16 UNC	N/A	0.00	2.25	75	I	3.50	1/4 20 UNC
	1.5	1.5-2.5	13.5	3.9	4.01	7.8	4.52	1.50	3/8 16 UNC	N/A	0.00	2.00	160	I	3.88	1/4 20 UNC
	2	2-2.5	10.9	5.3	4.50	7.6	3.88	1.00	1/2 13 UNC	0.00	0.70	1.12	180	II	3.25	3/8 16 UNC
3200	0.65	.5-1	9.6	2.5	2.81	5.0	3.76	1.00	1/4 20 UNC	N/A	0.00	2.00	55	I	3.14	3/8 16 UNC
	1.15	1-2	12.4	3.1	3.21	5.5	3.81	1.00	3/8 16 UNC	N/A	0.03	3.94	80	I	3.50	1/4 20 UNC
	1.5	1.5-2.5	13.5	3.9	4.38	7.8	5.75	1.50	3/8 16 UNC	N/A	0.06	2.63	185	I	4.25	3/8 16 UNC
4500	0.65	.5-1	11.3	2.6	3.25	6.3	4.39	1.00	3/8 16 UNC	N/A	0.00	2.50	80	I	3.50	3/8 16 UNC
	1.15	1-2	12.2	3.7	4.51	8.0	4.66	1.00	3/8 16 UNC	N/A	0.00	2.63	175	I	4.00	3/8 16 UNC
	1.5	1.5-2.5	16.0	4.3	5.50	10.3	6.14	1.50	3/8 16 UNC	N/A	0.00	3.38	330	I	5.50	3/8 16 UNC

1. Other sizes available, contact your Emerson sales office.

Table 11. Fisher Z500 Severe Service Ball Socket Weld End Dimensions (mm, kg)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)(1)	SOCKET WELD END CONNECTION (mm, kg)												Packing	
			A	B	C	J	K	L	M	P	R	S	Weight	Type	BC	T
150-1500	0.65	.5-1.5	229.4	62.0	54.2	100.3	79.8	25.4	1/4 20 UNC	N/A	0.0	28.6	14	I	54.0	1/4 20 UNC
	1.15	1-2.5	229.4	77.8	66.9	101.6	76.6	25.4	3/8 16 UNC	12.7	25.4	31.8	20	III	57.2	1/4 20 UNC
	1.5	1.5-2.5	264.3	98.9	82.7	132.1	73.4	25.4	3/8 16 UNC	12.7	25.4	38.1	34	III	63.5	1/4 20 UNC
	2	2-2.5	241.3	117.1	92.1	139.7	101.6	25.4	3/8 16 UNC	12.7	38.1	15.9	39	III	66.5	5/16 18 UNC
2500	0.65	.5-1.5	242.1	62.0	63.7	100.3	67.1	25.4	1/4 20 UNC	N/A	0.0	21.8	20	I	79.4	1/4 20 UNC
	1.15	1-2.5	286.5	78.2	79.6	139.7	76.6	25.4	3/8 16 UNC	N/A	0.0	57.2	34	I	88.9	1/4 20 UNC
	1.5	1.5-2.5	343.7	98.6	101.8	196.9	114.7	38.1	3/8 16 UNC	N/A	0.0	50.8	73	I	98.4	1/4 20 UNC
	2	2-2.5	276.9	135.8	114.3	193.7	98.6	25.4	1/2 13 UNC	0.0	17.8	28.4	82	II	82.6	3/8 16 UNC
3200	0.65	.5-1	244.6	63.4	71.2	127.0	95.4	25.4	1/4 20 UNC	N/A	0.0	50.8	25	I	79.8	3/8 16 UNC
	1.15	1-2	313.7	78.8	81.5	139.7	96.8	25.4	3/8 16 UNC	N/A	0.8	99.9	36	I	88.9	1/4 20 UNC
	1.5	1.5-2.5	342.6	99.8	111.1	196.9	145.9	38.1	3/8 16 UNC	N/A	1.5	66.7	84	I	108.0	3/8 16 UNC
4500	0.65	.5-1	286.1	66.3	82.6	158.8	111.5	25.4	3/8 16 UNC	N/A	0.0	63.5	36	I	88.9	3/8 16 UNC
	1.15	1-2	309.2	92.8	114.5	203.2	118.4	25.4	3/8 16 UNC	N/A	0.0	66.7	79	I	101.6	3/8 16 UNC
	1.5	1.5-2.5	406.5	108.3	139.7	260.4	155.8	38.1	3/8 16 UNC	N/A	0.0	85.7	150	I	139.7	3/8 16 UNC

1. Other sizes available, contact your Emerson sales office.

Figure 7. Fisher Z500 Buttweld End Connections Dimensions (see tables 12 and 13)

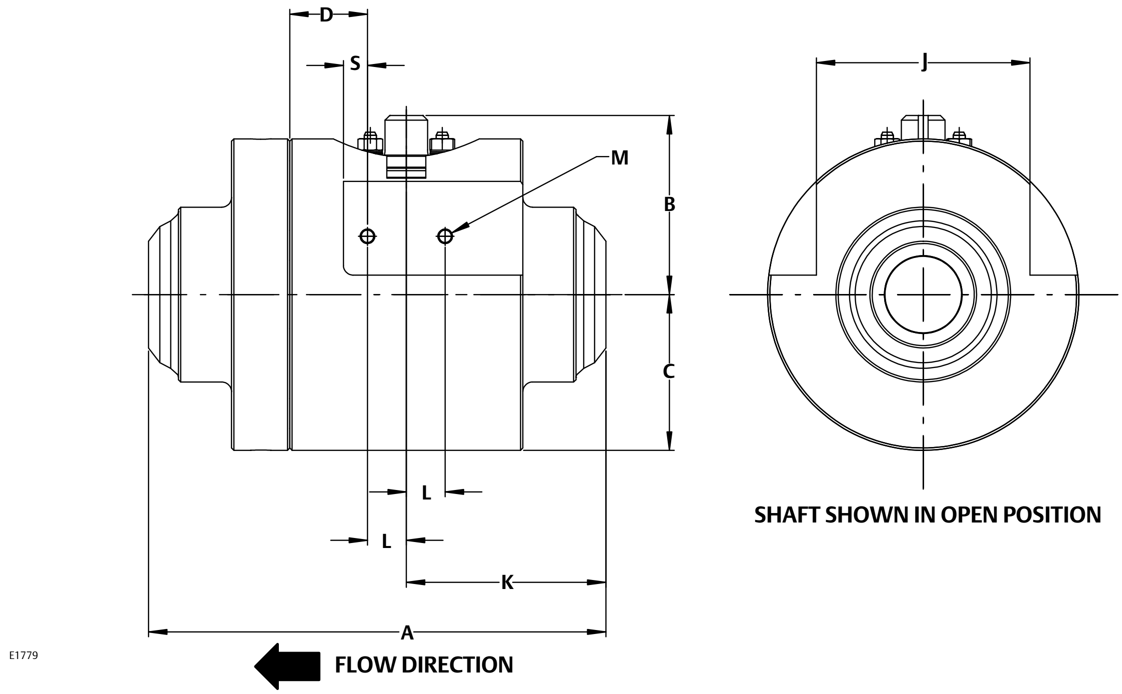


Table 12. Fisher Z500 Severe Service Ball Butt Weld End Dimensions (in, lb)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)(1)	BUTT WELD END CONNECTION (in, lb)												Packing	
			A	B	C	J	K	L	M	P	R	S	Weight	Type	BC	T
150-1500	0.65	.5-1.5	10.0	2.4	2.13	4.0	4.02	1.00	1/4 20 UNC	N/A	0.00	1.13	35	I	2.13	1/4 20 UNC
	1.15	1-2.5	10.5	3.1	2.63	4.0	4.25	1.00	3/8 16 UNC	0.50	1.00	1.25	40	III	2.25	1/4 20 UNC
	1.5	1.5-2.5	12.8	3.9	3.25	5.2	4.25	1.00	3/8 16 UNC	0.49	1.00	1.50	65	III	2.50	1/4 20 UNC
	2	2	11.8	4.6	3.63	5.5	4.88	1.00	3/8 16 UNC	0.50	1.50	0.63	75	III	2.62	5/16 18 UNC
2500	0.65	.5-1.5	10.8	2.4	2.51	4.0	3.88	1.00	1/4 20 UNC	N/A	0.00	0.86	40	I	3.13	1/4 20 UNC
	1.15	1-2.5	12.8	3.1	3.13	5.5	4.52	1.00	3/8 16 UNC	N/A	0.00	2.25	70	I	3.50	1/4 20 UNC
	1.5	1.5-3	18.0	3.9	4.01	7.8	7.25	1.50	3/8 16 UNC	N/A	0.00	2.00	195	I	3.88	1/4 20 UNC
	2	2-4	13.0	5.3	4.70	7.6	5.25	1.00	1/2 13 UNC	0.00	0.70	1.12	160	II	3.25	3/8 16 UNC
3200	0.65	.5-1	9.6	2.5	2.81	5.0	3.76	1.00	1/4 20 UNC	N/A	0.00	2.00	45	I	3.14	3/8 16 UNC
	1.15	1-2	12.4	3.1	3.21	5.5	3.81	1.00	3/8 16 UNC	N/A	0.03	3.94	70	I	3.50	1/4 20 UNC
	1.5	1.5-2.5	13.5	3.9	4.38	7.8	5.62	1.50	3/8 16 UNC	N/A	0.06	2.63	165	I	4.25	3/8 16 UNC
	2	3	13.9	5.5	4.81	9.0	5.37	1.50	1/2 13 UNC	N/A	0.00	3.00	190	I	4.25	3/8 16 UNC
4500	0.65	.5-1	11.3	2.6	3.25	6.3	4.39	1.00	3/8 16 UNC	N/A	0.00	2.50	75	I	3.50	3/8 16 UNC
	1.15	1-2	12.2	3.7	4.51	8.0	4.66	1.00	3/8 16 UNC	N/A	0.00	2.63	160	I	4.00	3/8 16 UNC
	1.5	1.5-2.5	16.0	4.3	5.50	10.3	6.14	1.50	3/8 16 UNC	N/A	0.00	3.38	300	I	5.50	3/8 16 UNC

1. Other sizes available, contact your Emerson sales office.

Table 13. Fisher Z500 Severe Service Ball Butt Weld End Dimensions (mm, kg)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)[1]	BUTT WELD END CONNECTION (mm, kg)												Packing	
			A	B	C	J	K	L	M	P	R	S	Weight	Type	BC	T
150-1500	0.65	.5-1.5	254.8	62.0	54.2	100.3	102.0	25.4	1/4 20 UNC	N/A	0.0	28.6	16	I	54.0	1/4 20 UNC
	1.15	1-2.5	267.5	77.8	66.9	101.6	108.0	25.4	3/8 16 UNC	12.7	25.4	31.8	18	III	57.2	1/4 20 UNC
	1.5	1.5-2.5	324.6	98.9	82.6	132.1	108.0	25.4	3/8 16 UNC	12.3	25.4	38.1	29	III	63.5	1/4 20 UNC
	2	2	298.8	117.1	92.1	139.7	124.0	25.4	3/8 16 UNC	12.7	38.1	15.9	34	III	66.5	5/16 18 UNC
2500	0.65	.5-1.5	273.8	62.0	63.7	100.3	98.4	25.4	1/4 20 UNC	N/A	0.0	21.8	18	I	79.4	1/4 20 UNC
	1.15	1-2.5	324.6	78.2	79.6	139.7	114.7	25.4	3/8 16 UNC	N/A	0.0	57.2	32	I	88.9	1/4 20 UNC
	1.5	1.5-3	458.0	98.9	101.8	196.9	184.2	38.1	3/8 16 UNC	N/A	0.0	50.8	88	I	98.4	1/4 20 UNC
	2	2-4	329.2	135.8	119.3	193.7	133.4	25.4	1/2 13 UNC	0.0	17.8	28.4	73	II	82.6	3/8 16 UNC
3200	0.65	.5-1	244.6	63.4	71.2	127.0	95.4	25.4	1/4 20 UNC	N/A	0.0	50.8	20	I	79.8	3/8 16 UNC
	1.15	1-2	313.7	78.8	81.5	139.7	96.8	25.4	3/8 16 UNC	N/A	0.8	99.9	32	I	88.9	1/4 20 UNC
	1.5	1.5-2.5	342.6	99.8	111.1	196.9	142.7	38.1	3/8 16 UNC	N/A	1.5	66.7	75	I	108.0	3/8 16 UNC
	2	3	352.3	140.1	122.1	228.6	136.4	38.1	1/2 13 UNC	N/A	0.0	76.2	86	I	108.0	3/8 16 UNC
4500	0.65	.5-1	286.1	66.3	82.6	158.8	111.5	25.4	3/8 16 UNC	N/A	0.0	63.5	34	I	88.9	3/8 16 UNC
	1.15	1-2	309.2	92.8	114.5	203.2	118.4	25.4	3/8 16 UNC	N/A	0.0	66.7	73	I	101.6	3/8 16 UNC
	1.5	1.5-2.5	406.5	108.3	139.7	260.4	155.8	38.1	3/8 16 UNC	N/A	0.0	85.7	136	I	139.7	3/8 16 UNC

1. Other sizes available, contact your Emerson sales office.

Figure 8. Fisher Z500 Flanged Raised-Face End Connections Dimensions (see tables 14, 15, and 16)

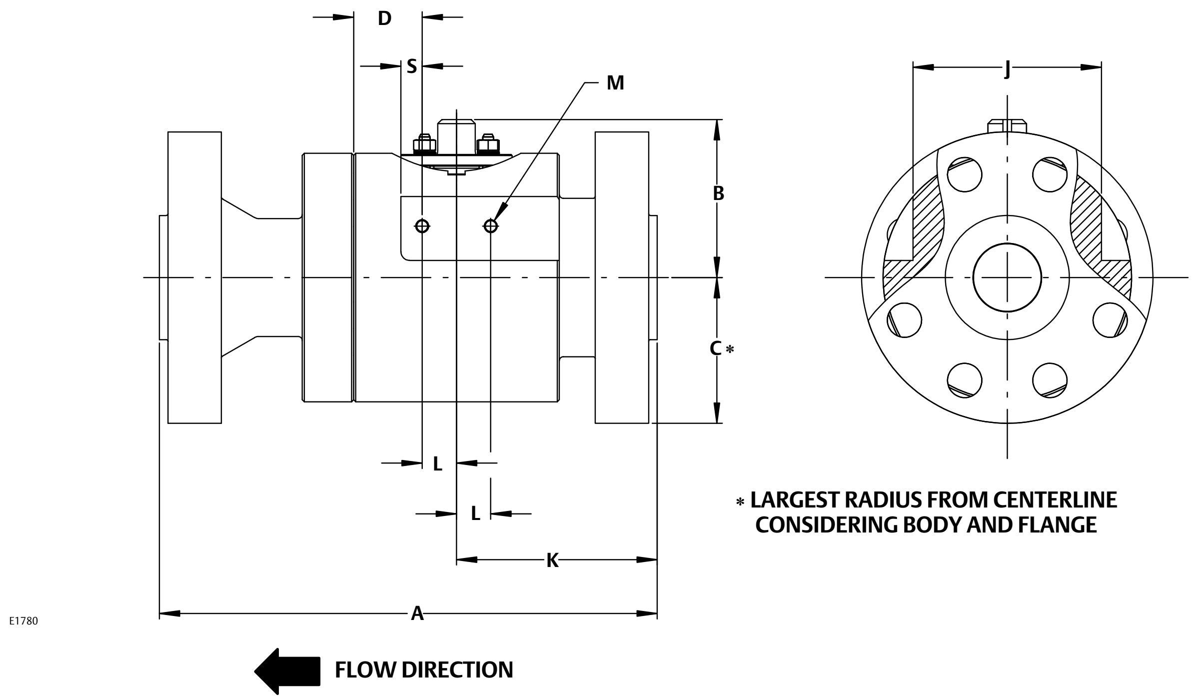


Table 14. Fisher Z500 Severe Service Ball Valve Raised-Face Flange Dimensions (in, lb)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)	RAISED FACE FLANGED END CONNECTION (in, lb)												Packing	
			A	B	C[1]	J	K	L	M	P	R	S	Weight	Type	BC	T
150	0.65	0.75[4]	4.7	2.5	2.26	3.95	2.10	1.00	1/4 20 UNC	N/A	0	0.38	18	I	1.88	1/4 20 UNC
	1.15	1[4]	5.0	3.2	2.45	3.95	2.22	0.75	1/4 20 UNC	0.3	0.315	0.75	25	II	2.25	1/4 20 UNC
		1.5	6.5	3.2	2.50	4.0	2.90	0.75	1/4 20 UNC	0.30	0.32	0.32	25	II	2.25	1/4 20 UNC
		2	7.0	3.2	3.00	4.0	3.18	0.75	1/4 20 UNC	0.30	0.32	0.32	30	II	2.25	1/4 20 UNC
	1.5	1.5[3]	6.5	3.9	3.26	5.2	2.49	1.00	3/8 16 UNC	.50	1.00	0.38	45	III	2.50	5/16 18 UNC
		2	7.0	3.9	3.01	5.2	3.37	1.00	3/8 16 UNC	0.50	1.00	0.38	45	III	2.50	5/16 18 UNC
	2	2	7.0	4.6	3.25	5.2	3.52	0.75	3/8 16 UNC	0.50	1.50	0.42	55	III	2.62	5/16 18 UNC
	4	4[1][3]	9.0	8.4	5.01	9.6	4.46	1.50	1/2 13 UNC	N/A	1	0.50	180	I	3.50	7/16 14 UNC
	6	6	15.5	11.1	6.96	13.6	7.52	2.00	3/4 10 UNC	N/A	0.00	1.00	405	I	3.38	1/2 13 UNC
	10	10	21.2	16.3	10.01	19.9	10.54	3.50	1/2 13 UNC	N/A	0.00	1.53	1070	I	6.00	1/2 13 UNC
	24	24[2]	42.1	42.0	22.11	16.0	21.78	5.00	1 1/4 8 UNC	N/A	2.63	6.00	13550	I	10.38	3/4 10 UNC
300	0.65	0.5[3]	7.5	2.5	2.26	3.95	3.91	1.00	1/4 20 UNC	N/A	0	0.38	25	I	1.88	1/4 20 UNC
		0.75	6.0	2.5	2.31	4.0	2.55	1.00	1/4 20 UNC	N/A	0.00	0.38	25	I	1.88	1/4 20 UNC
		1	6.5	2.5	2.44	4.0	2.88	1.00	1/4 20 UNC	N/A	0.00	0.38	25	I	1.88	1/4 20 UNC
		1.5	7.5	2.5	3.06	4.0	3.20	1.00	1/4 20 UNC	N/A	0.00	0.38	30	I	1.88	1/4 20 UNC
	1.15	1	6.5	3.2	2.45	4.0	2.90	0.75	1/4 20 UNC	0.30	0.32	0.32	25	II	2.25	1/4 20 UNC
		1.5	7.5	3.2	3.06	4.0	3.45	0.75	1/4 20 UNC	0.30	0.32	0.32	35	II	2.25	1/4 20 UNC
	1.5	1.5	7.5	3.9	3.06	5.2	3.52	1.00	3/8 16 UNC	0.50	1.00	0.38	50	III	2.50	5/16 18 UNC
		2	8.5	3.9	3.25	5.2	3.52	1.00	3/8 16 UNC	0.50	1.00	0.75	55	III	2.50	5/16 18 UNC
		3	11.2	3.9	4.13	5.2	4.33	1.00	3/8 16 UNC	0.50	1.00	0.75	80	III	2.50	5/16 18 UNC
	2	2	8.5	4.6	3.25	5.5	4.18	0.75	3/8 16 UNC	0.50	1.50	0.50	65	III	2.62	5/16 18 UNC
	3	3	11.2	6.6	4.26	7.8	5.04	1.25	5/8 11 UNC	0.62	1.38	0.60	135	III	2.75	3/8 16 UNC
		4	12.0	6.6	5.00	7.8	5.42	1.25	5/8 11 UNC	0.62	1.38	0.60	160	III	2.75	3/8 16 UNC
	4	4	12.0	8.4	5.01	9.6	5.65	1.50	5/8 11 UNC	N/A	1.00	0.75	195	I	3.50	7/16 14 UNC
	6	6	15.9	11.1	6.96	13.6	7.90	2.00	3/4 10 UNC	N/A	0.00	N/A	455	I	4.50	1/2 13 UNC
	8	8	19.8	14.1	8.81	17.1	9.26	3.00	1 8 UNC	N/A	0.00	1.50	870	I	5.00	7/16 14 UNC

-continued-

Table 14. Fisher Z500 Severe Service Ball Valve Raised-Face Flange Dimensions (in, lb) (cont.)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)	RAISED FACE FLANGED END CONNECTION (in, lb)												Packing	
			A	B	C(1)	J	K	L	M	P	R	S	Weight	Type	BC	T
300	10	10	21.0	16.3	10.65	19.9	10.54	3.50	7/8 9 UNC	N/A	0.00	1.38	1095	I	6.00	1/2 13 UNC
	12	12	25.6	22.4	12.76	25.4	12.97	3.00	1 1/2 8 UNC	N/A	0.00	2.51	2285	I	6.50	3/8 16 UNC
	24	24(2)	45.1	42.0	22.26	43.8	23.35	5.00	1 5/8 8 UNC	N/A	2.63	6.00	11860	I	10.38	3/4 10 UNC
600	0.65	0.5	6.5	2.5	1.88	4.0	2.77	1.00	1/4 20 UNC	N/A	0.00	N/A	20	I	1.88	1/4 20 UNC
		0.75	7.5	2.5	2.31	4.0	3.32	1.00	1/4 20 UNC	N/A	0.00	N/A	25	I	1.88	1/4 20 UNC
		1	8.5	2.5	2.44	4.0	3.82	1.00	1/4 20 UNC	N/A	0.00	N/A	25	I	1.88	1/4 20 UNC
	1.15	1	8.5	3.2	2.45	4.0	3.64	1.00	1/4 20 UNC	0.30	0.32	0.50	30	II	2.25	1/4 20 UNC
		1.5	9.5	3.2	3.06	4.0	4.14	1.00	1/4 20 UNC	0.30	0.32	0.50	45	II	2.25	1/4 20 UNC
		2	11.5	3.2	3.25	4.0	4.52	1.00	1/4 20 UNC	0.30	0.32	0.50	50	II	2.25	1/4 20 UNC
	1.5	1.5	9.5	3.9	3.06	5.2	3.99	1.00	3/8 16 UNC	0.50	1.00	0.75	55	III	2.50	5/16 18 UNC
		2	11.5	3.9	3.25	5.2	4.52	1.00	3/8 16 UNC	0.50	1.00	0.75	65	III	2.50	5/16 18 UNC
		3	14.0	3.9	4.13	5.2	5.77	1.00	3/8 16 UNC	0.50	1.00	0.75	90	III	2.5	5/16 18 UNC
	2	2	11.5	4.6	3.38	5.5	4.52	1.00	3/8 16 UNC	0.50	1.50	1.00	105	III	2.62	5/16 18 UNC
		3	14.0	4.6	4.13	5.5	5.77	1.00	3/8 16 UNC	0.50	1.50	1.00	115	III	2.62	5/16 18 UNC
	3	3	14.0	6.6	4.50	7.8	6.17	1.25	5/8 11 UNC	0.62	1.38	0.85	165	III	2.75	3/8 16 UNC
		4	17.0	6.6	5.38	7.8	7.92	1.25	5/8 11 UNC	0.62	1.38	0.85	225	III	2.75	3/8 16 UNC
	4	4	17.0	7.3	5.38	10.1	7.27	1.50	5/8 11 UNC	N/A	0.00	1.75	280	I	3.50	7/16 14 UNC
	6	6	22.0	10.3	7.26	14.4	10.25	2.00	7/8 9 UNC	N/A	0.00	2.50	675	I	4.50	1/2 13 UNC
	8	8	26.0	14.1	9.57	19.0	12.02	3.00	1 8 UNC	N/A	0.00	1.88	1280	I	5.00	7/16 14 UNC
	10	10	31.0	16.3	11.50	22.7	14.52	3.50	1 3/8 8 UNC	N/A	0.00	2.50	2295	I	6.00	1/2 13 UNC
	12	12	33.1	22.4	13.26	26.2	16.22	3.00	1 1/2 8 UN	N/A	0.00	N/A	3615	I	6.88	3/8 16 UNC
	14	14(2)	35.1	22.0	15.38	30.0	17.53	6.50	1 1/2 8 UNC	N/A	2.00	3.75	4630	I	8.00	3/8 16 UNC

-continued-

Table 14. Fisher Z500 Severe Service Ball Valve Raised-Face Flange Dimensions (in, lb) (cont.)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)	RAISED FACE FLANGED END CONNECTION (in, lb)												Packing	
			A	B	C(1)	J	K	L	M	P	R	S	Weight	Type	BC	T
900	0.65	0.75	9.0	2.5	2.56	4.0	3.67	1.00	1/4 20 UNC	N/A	0.00	0.45	35	I	1.88	1/4 20 UNC
		1	10.3	2.5	2.96	4.0	4.17	1.00	1/4 20 UNC	N/A	0.00	0.45	40	I	1.875	1/4 20 UNC
	1.15	1	10.0	3.2	2.94	5.2	4.14	1.00	3/8 16 UNC	0.00	0.37	0.38	50	II	2.25	1/4 20 UNC
		2	14.5	3.2	4.27	4.0	5.69	1.00	3/8 16 UNC	0.50	1.00	1.25	100	III	2.25	1/4 20 UNC
	1.5	1.5	12.0	3.9	3.50	5.2	5.02	1.00	3/8 16 UNC	0.50	1.00	0.75	85	III	2.50	5/16 18 UNC
		2	14.5	3.9	4.25	5.2	6.27	1.00	3/8 16 UNC	0.50	1.00	0.75	105	III	2.50	5/16 18 UNC
		3	15.0	3.9	4.75	5.2	6.97	1.00	3/8 16 UNC	0.50	1.00	0.75	135	III	2.50	5/16 18 UNC
	2	2	14.5	4.6	4.25	5.5	5.86	1.00	3/8 16 UNC	0.50	1.50	0.62	140	III	2.62	5/16 18 UNC
	3	3	15.0	6.6	4.88	9.3	5.97	1.25	5/8 11 UNC	N/A	0.00	1.50	215	I	2.75	3/8 16 UNC
	4	4	18.0	8.4	5.75	11.6	7.45	2.50	3/4 10 UNC	N/A	0.00	1.75	415	I	4.75	3/8 16 UNC
	6	6	24.0	13.9	8.75	17.3	10.27	4.00	1 1/8 8 UNC	N/A	0.00	1.75	1140	I	6.50	1/2 13 UNC
		8	29.0	13.9	9.25	17.3	11.27	4.00	1 1/8 8 UNC	N/A	0.00	1.75	1410	I	6.50	1/2 13 UNC
1500	0.65	0.75	9.0	2.5	2.56	4.0	3.67	1.00	1/4 20 UNC	N/A	0.00	0.45	35	I	1.875	1/4 20 UNC
		1	10.3	2.5	2.96	4.0	4.17	1.00	1/4 20 UNC	N/A	0.00	0.45	40	I	1.875	1/4 20 UNC
	1.15	1	10.0	3.2	2.94	5.2	4.14	1.00	3/8 16 UNC	0.00	0.37	0.38	50	II	2.25	1/4 20 UNC
		2	14.5	3.2	4.27	4.0	5.69	1.00	3/8 16 UNC	0.50	1.00	1.25	100	III	2.25	1/4 20 UNC
	1.5	1.5	12.0	3.9	3.50	5.2	5.02	1.00	3/8 16 UNC	0.50	1.00	0.75	85	III	2.5	5/16 18 UNC
		2	14.5	3.9	4.25	5.2	6.27	1.00	3/8 16 UNC	0.50	1.00	0.75	105	III	2.5	5/16 18 UNC
	2	2	14.5	4.6	4.25	5.5	5.86	1.00	3/8 16 UNC	0.50	1.50	0.62	140	III	2.62	5/16 18 UNC
		2.5	16.5	4.6	4.81	5.5	6.50	1.00	3/8 16 UNC	0.50	1.50	0.62	160	III	2.62	5/16 18 UNC
		3	18.5	4.6	5.25	5.8	7.61	1.00	3/8 16 UNC	0.50	1.50	0.62	215	III	2.62	5/16 18 UNC
		4	21.5	4.6	6.13	5.8	10.15	1.00	3/8 16 UNC	0.50	1.50	0.62	270	III	2.62	5/16 18 UNC
	3	3	18.5	7.8	5.70	10.3	7.77	1.75	3/4 10 UNC	N/A	0.00	1.50	350	I	4.75	7/16 14 UNC
	4	4	21.5	8.4	6.63	13.1	8.39	2.50	1 8 UNC	N/A	0.00	2.38	590	I	4.75	3/8 16 UNC
	8	8	32.8	16.2	11.01	21.7	13.46	4.13	1 1/4 8 UNC	N/A	0.00	2.88	2395	I	7.12	1/2 13 UNC

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Table 14. Fisher Z500 Severe Service Ball Valve Raised-Face Flange Dimensions (in, lb) (cont.)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)	RAISED FACE FLANGED END CONNECTION (in, lb)												Packing	
			A	B	C(1)	J	K	L	M	P	R	S	Weight	Type	BC	T
2500	1.15	1	12.2	3.5	3.13	5.5	4.70	1.00	3/8 16 UNC	N/A	0.17	1.50	70	I	2.375	5/16 18 UNC
	1.5	2	17.8	3.9	4.63	7.8	7.39	1.50	3/8 16 UNC	N/A	0.00	2.00	210	I	4	3/8 16 UNC
	2	4	26.5	5.3	7.00	7.6	12.27	1.00	1/2 13 UNC	0.00	0.70	1.12	520	II	3.25	3/8 16 UNC
	4	4	26.5	8.8	7.00	15.0	9.52	2.50	1 8 UNC	N/A	0.00	3.50	1005	I	6.125	5/8 11 UNC

Other sizes available, contact your Emerson sales office.
1. Uses the largest value of the body diameter or the flange diameter.
2. Four bolt mounting bracket pattern instead of the standard two bolt pattern.
3. Valve body and end adapter have blind threaded bolt hole connections.
4. Valve body has blind threaded bolt hole connections.

Table 15. Fisher Z500 Severe Service Ball Valve Raised-Face Flange Dimensions (mm, kg)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)	RAISED FACE FLANGED END CONNECTION (mm, kg)												Packing	
			A	B	C(1)	J	K	L	M	P	R	S	Weight	Type	BC	T
150	0.65	0.75(4)	118.1	64.0	57.3	100.3	53.3	25.4	1/4 20 UNC	N/A	0.0	9.5	8	I	47.6	1/4 20 UNC
	1.15	1(4)	127.8	80.9	62.2	100.3	56.3	19.1	1/4 20 UNC	7.6	8.0	19.1	11	II	57.2	1/4 20 UNC
		1.5	165.9	80.9	63.5	100.3	73.5	19.1	1/4 20 UNC	7.6	8.0	8.1	11	II	57.2	1/4 20 UNC
		2	178.6	80.9	76.2	100.3	80.7	19.1	1/4 20 UNC	7.6	8.0	8.1	14	II	57.2	1/4 20 UNC
	1.5	1.5(3)	165.1	98.9	82.7	132.1	63.2	25.4	3/8 16 UNC	12.7	25.4	9.5	20	III	63.5	5/16 18 UNC
		2	178.6	98.9	76.4	132.1	85.7	25.4	3/8 16 UNC	12.7	25.4	9.5	20	III	63.5	5/16 18 UNC
	2	2	178.6	117.1	82.6	132.1	89.4	19.1	3/8 16 UNC	12.7	38.1	10.7	25	III	66.5	5/16 18 UNC
	4	4(1)(4)	229.4	213.0	127.2	243.8	113.2	38.1	1/2 13 UNC	N/A	25.4	12.7	82	I	88.9	7/16 14 UNC
	6	6	394.5	282.0	176.9	345.9	190.9	50.8	3/4 10 UNC	N/A	0.0	25.4	184	I	85.9	1/2 13 UNC
	10	10	538.0	412.8	254.2	505.5	267.7	88.9	1/2 13 UNC	N/A	0.0	38.8	485	I	152.4	1/2 13 UNC
	24	24(2)	1068.3	1066.0	561.6	406.4	553.2	127.0	1 1/4 8 UNC	N/A	66.7	152.4	6146	I	263.5	3/4 10 UNC
300	0.65	0.5(3)	191.3	64.0	57.4	100.3	99.2	25.4	1/4 20 UNC	N/A	0.0	9.5	11	I	47.6	1/4 20 UNC
		0.75	153.2	64.0	58.7	100.3	64.8	25.4	1/4 20 UNC	N/A	0.0	9.5	11	I	47.6	1/4 20 UNC
		1	165.9	64.0	62.0	100.3	73.0	25.4	1/4 20 UNC	N/A	0.0	9.5	11	I	47.6	1/4 20 UNC
		1.5	191.3	64.0	77.7	100.3	81.3	25.4	1/4 20 UNC	N/A	0.0	9.5	14	I	47.6	1/4 20 UNC
	1.15	1	165.9	80.9	62.2	100.3	73.5	19.1	1/4 20 UNC	7.6	8.0	8.1	11	II	57.2	1/4 20 UNC
		1.5	191.3	80.9	77.7	100.3	87.5	19.1	1/4 20 UNC	7.6	8.0	8.1	16	II	57.2	1/4 20 UNC
	1.5	1.5	191.3	98.9	77.7	132.1	89.4	25.4	3/8 16 UNC	12.7	25.4	9.5	23	III	63.5	5/16 18 UNC
		2	216.7	98.9	82.6	132.1	89.3	25.4	3/8 16 UNC	12.7	25.4	19.1	25	III	63.5	5/16 18 UNC
		3	283.2	99.3	104.8	132.1	109.9	25.4	3/8 16 UNC	12.7	25.4	19.1	36	III	63.5	5/16 18 UNC
	2	2	216.7	117.1	82.6	139.7	106.1	19.1	3/8 16 UNC	12.7	38.1	12.7	29	III	66.5	5/16 18 UNC
	3	3	283.2	167.9	108.2	196.9	127.9	31.8	5/8 11 UNC	15.7	34.9	15.2	61	III	69.9	3/8 16 UNC
		4	305.6	167.9	127.0	196.9	137.5	31.8	5/8 11 UNC	15.7	34.9	15.2	73	III	69.9	3/8 16 UNC
	4	4	305.6	213.0	127.2	243.8	143.4	38.1	5/8 11 UNC	N/A	25.4	19.1	88	I	88.9	7/16 14 UNC
	6	6	404.1	282.0	176.9	345.9	200.5	50.8	3/4 10 UNC	N/A	0.0	N/A	206	I	114.3	1/2 13 UNC
	8	8	502.4	358.1	223.8	434.8	235.3	76.2	1 8 UNC	N/A	0.0	38.2	395	I	127.0	7/16 14 UNC

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Table 15. Fisher Z500 Severe Service Ball Valve Raised-Face Flange Dimensions (mm, kg) (cont.)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)	RAISED FACE FLANGED END CONNECTION (mm, kg)												Packing	
			A	B	C(1)	J	K	L	M	P	R	S	Weight	Type	BC	T
300	10	10	534.2	412.8	270.5	505.5	267.7	88.9	7/8 9 UNC	N/A	0.0	35.0	497	I	152.4	1/2 13 UNC
	12	12	649.2	567.7	324.1	645.2	329.3	76.2	1 1/2 8 UNC	N/A	0.0	63.6	1036	I	165.1	3/8 16 UNC
	24	24(2)	1144.5	1066.0	565.4	1112.5	593.1	127.0	1 5/8 8 UNC	N/A	66.7	152.4	5380	I	263.5	3/4 10 UNC
600	0.65	0.5	165.9	64.0	47.6	100.3	70.2	25.4	1/4 20 UNC	N/A	0.0	N/A	9	I	47.6	1/4 20 UNC
		0.75	191.3	64.0	58.7	100.3	84.3	25.4	1/4 20 UNC	N/A	0.0	N/A	11	I	47.6	1/4 20 UNC
		1	216.7	64.0	62.0	100.3	97.0	25.4	1/4 20 UNC	N/A	0.0	N/A	11	I	47.6	1/4 20 UNC
	1.15	1	216.7	80.9	62.2	100.3	92.5	25.4	1/4 20 UNC	7.6	8.0	12.7	14	II	57.2	1/4 20 UNC
		1.5	242.1	80.9	77.7	100.3	105.2	25.4	1/4 20 UNC	7.6	8.0	12.7	20	II	57.2	1/4 20 UNC
		2	292.9	80.9	82.6	100.3	114.7	25.4	1/4 20 UNC	7.6	8.0	12.7	23	II	57.2	1/4 20 UNC
	1.5	1.5	242.1	98.9	77.7	132.1	101.3	25.4	3/8 16 UNC	12.7	25.4	19.1	25	III	63.5	5/16 18 UNC
		2	292.9	98.9	82.6	132.1	114.7	25.4	3/8 16 UNC	12.7	25.4	19.1	29	III	63.5	5/16 18 UNC
		3	356.4	98.9	104.8	132.1	146.4	25.4	3/8 16 UNC	12.7	25.4	19.1	41	III	63.5	5/16 18 UNC
	2	2	292.9	117.1	85.7	139.7	114.7	25.4	3/8 16 UNC	12.7	38.1	25.4	48	III	66.5	5/16 18 UNC
		3	356.4	117.1	104.8	139.7	146.4	25.4	3/8 16 UNC	12.7	38.1	25.4	52	III	66.5	5/16 18 UNC
	3	3	356.4	167.9	114.3	196.9	156.6	31.8	5/8 11 UNC	15.7	34.9	21.6	75	III	69.9	3/8 16 UNC
		4	432.6	167.9	136.5	196.9	201.0	31.8	5/8 11 UNC	15.7	34.9	21.6	102	III	69.9	3/8 16 UNC
	4	4	432.6	184.5	136.5	257.0	184.5	38.1	5/8 11 UNC	N/A	0.0	44.5	127	I	88.9	7/16 14 UNC
	6	6	559.6	260.4	184.4	365.8	260.4	50.8	7/8 9 UNC	N/A	0.0	63.5	306	I	114.3	1/2 13 UNC
	8	8	661.2	358.4	243.0	482.6	305.2	76.2	1 8 UNC	N/A	0.0	47.6	581	I	127.0	7/16 14 UNC
	10	10	788.2	412.8	292.1	576.6	368.7	88.9	1 3/8 8 UNC	N/A	0.0	63.5	1041	I	152.4	1/2 13 UNC
	12	12	839.7	567.7	336.8	665.5	411.9	76.2	1 1/2 8 UN	N/A	0.0	N/A	1640	I	174.8	3/8 16 UNC
	14	14(2)	890.5	558.4	390.7	762.0	445.3	165.1	1 1/2 8 UNC	N/A	50.8	95.3	2100	I	203.2	3/8 16 UNC
900	0.65	0.75	229.4	64.0	65.0	100.3	93.1	25.4	1/4 20 UNC	N/A	0.0	11.4	16	I	47.6	1/4 20 UNC
		1	261.1	64.0	75.1	100.3	105.8	25.4	1/4 20 UNC	N/A	0.0	11.4	18	I	47.6	1/4 20 UNC
	1.15	1	254.8	80.9	74.7	101.6	105.2	25.4	3/8 16 UNC	0.0	9.3	9.5	23	II	57.2	1/4 20 UNC
		2	369.1	80.9	108.3	101.6	144.6	25.4	3/8 16 UNC	12.7	25.4	31.8	45	III	57.2	1/4 20 UNC

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Table 15. Fisher Z500 Severe Service Ball Valve Raised-Face Flange Dimensions (mm, kg) (cont.)

PRESSURE CLASS	VALVE BORE SIZE	VALVE SIZE (NPS)	RAISED FACE FLANGED END CONNECTION (mm, kg)												Packing	
			A	B	C(1)	J	K	L	M	P	R	S	Weight	Type	BC	T
900	1.5	1.5	305.6	98.9	88.9	132.1	127.4	25.4	3/8 16 UNC	12.7	25.4	19.1	39	III	63.5	5/16 18 UNC
		2	369.1	98.9	108.0	132.1	159.1	25.4	3/8 16 UNC	12.7	25.4	19.1	48	III	63.5	5/16 18 UNC
		3	381.8	99.3	120.7	132.1	176.9	25.4	3/8 16 UNC	12.7	25.4	19.1	61	III	63.5	5/16 18 UNC
	2	2	369.1	117.1	108.0	139.7	148.8	25.4	3/8 16 UNC	12.7	38.1	15.7	64	III	66.5	5/16 18 UNC
	3	3	381.8	167.9	123.8	235.0	151.5	31.8	5/8 11 UNC	N/A	0.0	38.1	98	I	69.9	3/8 16 UNC
	4	4	458.0	213.8	146.1	295.1	189.3	63.5	3/4 10 UNC	N/A	0.0	44.5	188	I	120.7	3/8 16 UNC
	6	6	610.4	352.5	222.3	438.2	260.7	101.6	1 1/8 8 UNC	N/A	0.0	44.5	517	I	165.1	1/2 13 UNC
		8	737.4	352.5	235.0	438.2	286.1	101.6	1 1/8 8 UNC	N/A	0.0	44.5	640	I	165.1	1/2 13 UNC
1500	0.65	0.75	229.4	64.0	65.0	100.3	93.1	25.4	1/4 20 UNC	N/A	0.0	11.4	16	I	47.6	1/4 20 UNC
		1	261.1	64.0	75.1	100.3	105.8	25.4	1/4 20 UNC	N/A	0.0	11.4	18	I	47.6	1/4 20 UNC
	1.15	1	254.8	80.9	74.7	132.1	105.2	25.4	3/8 16 UNC	0.0	9.3	9.5	23	II	57.2	1/4 20 UNC
		2	369.1	80.9	108.3	101.6	144.6	25.4	3/8 16 UNC	12.7	25.4	31.8	45	III	57.2	1/4 20 UNC
	1.5	1.5	305.6	98.9	88.9	132.1	127.4	25.4	3/8 16 UNC	12.7	25.4	19.1	39	III	63.5	5/16 18 UNC
		2	369.1	98.9	108.0	132.1	159.1	25.4	3/8 16 UNC	12.7	25.4	19.1	48	III	63.5	5/16 18 UNC
	2	2	369.1	117.1	108.0	139.7	148.8	25.4	3/8 16 UNC	12.7	38.1	15.7	64	III	66.5	5/16 18 UNC
		2.5	419.9	117.1	122.2	139.7	165.1	25.4	3/8 16 UNC	12.7	38.1	15.7	73	III	66.5	5/16 18 UNC
		3	470.7	117.1	133.4	146.1	193.3	25.4	3/8 16 UNC	12.7	38.1	15.7	98	III	66.5	5/16 18 UNC
		4	546.9	117.1	155.6	146.1	257.8	25.4	3/8 16 UNC	12.7	38.1	15.7	122	III	66.5	5/16 18 UNC
	3	3	470.7	197.2	144.7	260.4	197.2	44.5	3/4 10 UNC	N/A	0.0	38.1	159	I	120.7	7/16 14 UNC
	4	4	546.9	213.8	168.5	332.7	213.1	63.5	1 8 UNC	N/A	0.0	60.3	268	I	120.7	3/8 16 UNC
	8	8	832.6	410.5	279.6	551.2	341.8	104.8	1 1/4 8 UNC	N/A	0.0	73.0	1086	I	180.8	1/2 13 UNC
2500	1.15	1	308.6	88.8	79.4	139.7	119.4	25.4	3/8 16 UNC	N/A	4.3	38.1	32	I	60.3	5/16 18 UNC
	1.5	2	451.6	99.8	117.5	196.9	187.6	38.1	3/8 16 UNC	N/A	0.0	50.8	95	I	101.6	3/8 16 UNC
	2	4	673.9	135.8	177.8	193.7	311.5	25.4	1/2 13 UNC	0.0	17.8	28.4	236	II	82.6	3/8 16 UNC
	4	4	673.9	224.6	177.8	381.0	241.7	63.5	1 8 UNC	N/A	0.0	88.9	456	I	155.6	5/8 11 UNC

Other sizes available, contact your Emerson sales office.
1. Uses the largest value of the body diameter or the flange diameter.
2. Four bolt mounting bracket pattern instead of the standard two bolt pattern.
3. Valve body and end adapter have blind threaded bolt hole connections
4. Valve body has blind threaded bolt hole connections.

Table 16. Fisher Z500 Severe Service Ball Valve Ring-Type Joint End Connection, Face-to-Face Dimensions (ASME B16.10)

Valve Size, NPS	CL150		CL300		CL600		CL900		CL1500		CL2500	
	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
0.5	---	---	150.9	5.94	163.6	6.44	---	---	---	---	---	---
0.75	---	---	165.1	6.5	190.5	7.5	---	---	---	---	---	---
1	139.7	5.5	177.8	7	215.9	8.5	254	10	---	---	---	---
1.5	177.8	7	203.2	8	241.3	9.5	305	12	---	---	---	---
2	190.5	7.5	231.6	9.12	295.1	11.6	371	14.6	371	14.62	454	17.87
2.5	203.2	8	257	10.12	333.2	13.1	422	16.6	422	16.62	514	20.25
3	215.9	8.5	298.2	11.74	358.6	14.1	384	15.1	473	18.62	584	23
4	241.3	9.5	320.5	12.62	434.8	17.1	460	18.1	549	21.62	683	26.88
6	279.4	11	419.1	16.5	561.8	22.1	613	24.1	711	28	927	36.5
8	304.8	12	517.4	20.37	663.4	26.1	740	29.1	842	33.13	1038	40.87
10	342.9	13.5	584.2	23	790.4	31.1	841	33.1	1000.3	39.38	1292	50.88
12	368.3	14.5	663.4	26.12	841.2	33.1	968	38.1	1146.0	45.12	1445	56.88

Figure 9. Fisher Z500 Shaft Dimensions (see tables 17 and 18)

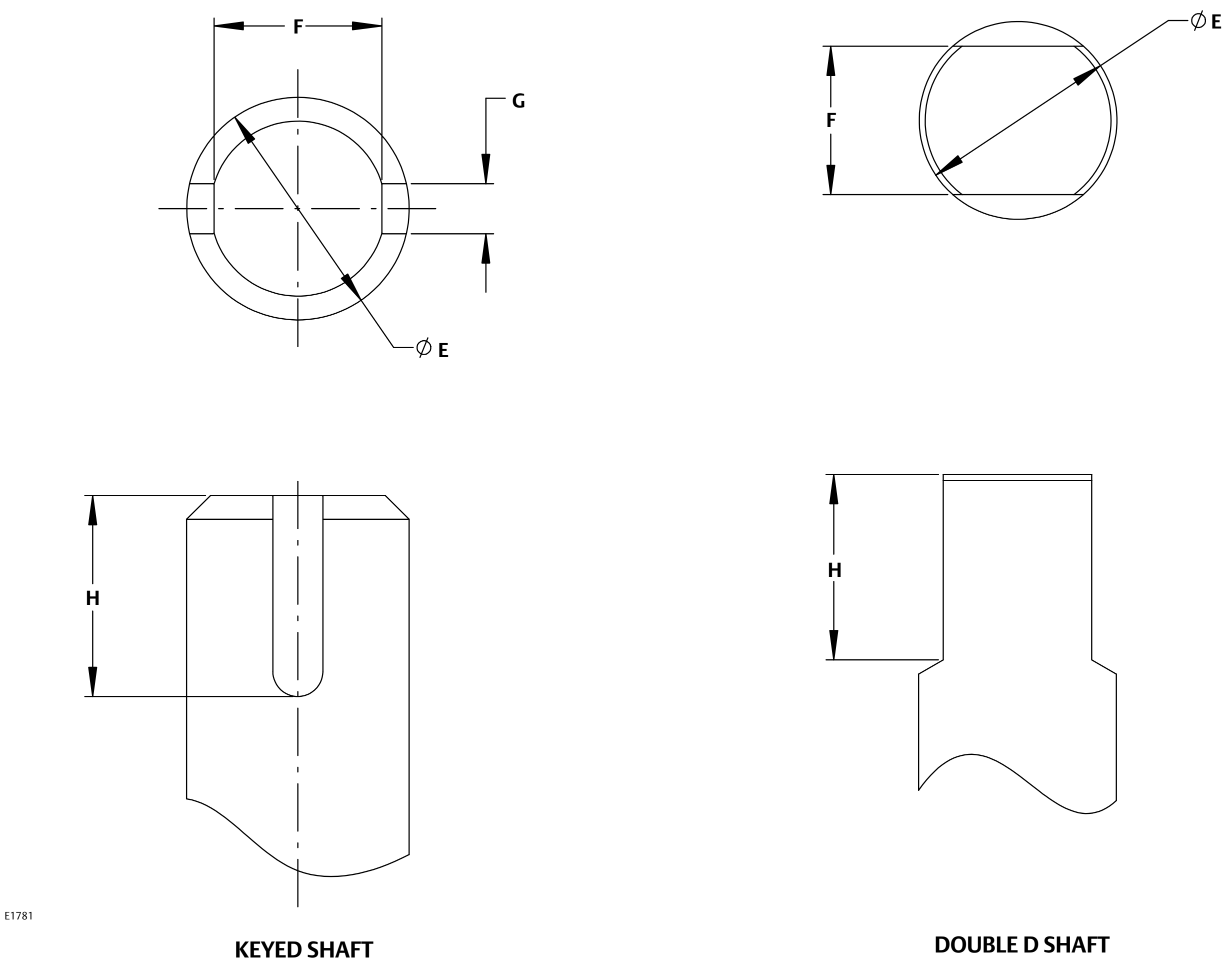

Table 17. Fisher Z500 Severe Service Ball Valve Shaft Dimensions (in)

PRESSURE CLASS	VALVE BORE SIZE	Double D	Key		H	E
		F		G		
CL150	0.65	0.450	0.410	0.191	0.515	0.625
	1.15	0.550	0.539	0.191	0.642	0.750
	1.5	0.600	0.719	0.253	1.015	1.000
	2	0.840	0.848	0.253	1.015	1.125
	3	1.125	1.079	0.378	1.515	1.500
	4	- - -	1.437	0.503	2.015	2.000
	6	- - -	1.786	0.627	2.515	2.491
	8	- - -	2.155	0.751	4.145	3.000
	10	- - -	2.873	1.003	4.015	4.000
	14	- - -	3.587	1.252	5.641	5.000
	24	- - -	5.746	2.001	8.515	8.000
CL300	0.65	0.450	0.410	0.191	0.515	0.625
	1.15	0.550	0.539	0.191	0.642	0.750
	1.5	0.600	0.719	0.253	1.015	1.000
	2	0.840	0.848	0.253	1.015	1.125
	3	1.125	1.079	0.378	1.515	1.500
	4	- - -	1.437	0.503	2.015	2.000
	6	- - -	1.786	0.627	2.515	2.491
	8	- - -	2.155	0.751	4.145	3.000
	10	- - -	2.873	1.003	4.015	4.000
	14	- - -	3.587	1.252	5.641	5.000
	24	- - -	5.746	2.001	8.515	8.000
CL600	0.65	0.450	0.410	0.191	0.515	0.625
	1.15	0.550	0.539	0.191	0.642	0.750
	1.5	0.600	0.719	0.253	1.015	1.000
	2	0.840	0.848	0.253	1.015	1.125
	3	1.125	1.079	0.378	1.515	1.500
	4	- - -	1.437	0.503	2.015	2.000
	6	- - -	1.786	0.627	2.515	2.491
	8	- - -	2.155	0.751	4.145	3.000
	10	- - -	2.873	1.003	4.015	4.000
	14	- - -	3.587	1.252	5.641	5.000
CL900	0.65	0.450	0.410	0.191	0.515	0.625
	1.15	0.550	0.539	0.191	0.642	0.750
	1.5	0.600	0.719	0.253	1.015	1.000
	2	0.840	0.848	0.253	1.015	1.125
	3	1.125	1.079	0.378	1.515	1.500
	4	- - -	1.797	0.628	2.265	2.500
	6	- - -	2.413	0.753	3.515	3.250
CL1500	0.65	0.450	0.410	0.191	0.515	0.625
	1.15	0.550	0.539	0.191	0.642	0.750
	1.5	0.600	0.719	0.253	1.015	1.000
	2	0.840	0.848	0.253	1.015	1.125
	3	1.500	1.437	0.503	.765	2.000
	4	- - -	1.797	0.628	2.265	2.500
	6	- - -	2.413	0.753	3.515	3.250
	8	- - -	2.744	1.003	6.025	3.875

-continued-

Table 17. Fisher Z500 Severe Service Ball Valve Shaft Dimensions (in) (cont.)

PRESSURE CLASS	VALVE BORE SIZE	Double D	Key		H	E
		F		G		
CL2500	0.65	0.450	0.410	0.191	0.515	0.625
	1.15	0.550	0.539	0.191	0.642	0.750
	1.5	0.750	0.719	0.253	0.936	1.000
	2	0.866	0.975	0.253	1.016	1.250
	3	- - -	1.437	0.503	1.765	2.000
	4	- - -	1.796	0.628	2.265	2.500
	6	- - -	2.413	0.753	3.515	3.250
CL3200	0.65	0.450	0.410	0.191	0.515	0.625
	1.15	0.580	- - -	- - -	0.640	0.750
	1.5	0.750	0.719	0.253	0.936	1.000
	2	0.866	0.975	0.253	1.235	1.250
CL4500	0.65	0.550	0.539	0.191	0.471	0.750
	1.15	0.650	0.668	0.191	0.642	0.875
	1.5	0.840	0.848	0.253	0.877	1.125

Table 18. Fisher Z500 Severe Service Ball Valve Shaft Dimensions (mm)

PRESSURE CLASS	VALVE BORE SIZE	Double D	Key		H	E
		F		G		
CL150	0.65	11.4	10.4	4.9	13.1	15.9
	1.15	14.0	13.7	4.9	16.3	19.1
	1.5	15.2	18.3	6.4	25.8	25.4
	2	21.3	21.5	6.4	25.8	28.6
	3	28.6	27.4	9.6	38.5	38.1
	4	- - -	36.5	12.8	51.2	50.8
	6	- - -	45.4	15.9	63.9	63.3
	8	- - -	54.7	19.1	105.3	76.2
	10	- - -	73.0	25.5	102.0	101.6
	14	- - -	91.1	31.8	143.3	127.0
	24	- - -	145.9	50.8	216.3	203.2
CL300	0.65	11.4	10.4	4.9	13.1	15.9
	1.15	14.0	13.7	4.9	16.3	19.1
	1.5	15.2	18.3	6.4	25.8	25.4
	2	21.3	21.5	6.4	25.8	28.6
	3	28.6	27.4	9.6	38.5	38.1
	4	- - -	36.5	12.8	51.2	50.8
	6	- - -	45.4	15.9	63.9	63.3
	8	- - -	54.7	19.1	105.3	76.2
	10	- - -	73.0	25.5	102.0	101.6
	14	- - -	91.1	31.8	143.3	127.0
	24	- - -	145.9	50.8	216.3	203.2
CL600	0.65	11.4	10.4	4.9	13.1	15.9
	1.15	14.0	13.7	4.9	16.3	19.1
	1.5	15.2	18.3	6.4	25.8	25.4
	2	21.3	21.5	6.4	25.8	28.6
	3	28.6	27.4	9.6	38.5	38.1
	4	- - -	36.5	12.8	51.2	50.8
	6	- - -	45.4	15.9	63.9	63.3
	8	- - -	54.7	19.1	105.3	76.2
	10	- - -	73.0	25.5	102.0	101.6
	14	- - -	91.1	31.8	143.3	127.0
CL900	0.65	11.4	10.4	4.9	13.1	15.9
	1.15	14.0	13.7	4.9	16.3	19.1
	1.5	15.2	18.3	6.4	25.8	25.4
	2	21.3	21.5	6.4	25.8	28.6
	3	28.6	27.4	9.6	38.5	38.1
	4	- - -	45.6	16.0	57.5	63.5
	6	- - -	61.3	19.1	89.3	82.6
CL1500	0.65	11.4	10.4	4.9	13.1	15.9
	1.15	14.0	13.7	4.9	16.3	19.1
	1.5	15.2	18.3	6.4	25.8	25.4
	2	21.3	21.5	6.4	25.8	28.6
	3	38.1	36.5	12.8	44.8	50.8
	4	- - -	45.6	16.0	57.5	63.5
	6	- - -	61.3	19.1	89.3	82.6
	8	- - -	69.7	25.5	153.0	98.4

-continued-

Table 18. Fisher Z500 Severe Service Ball Valve Shaft Dimensions (mm) (cont.)

PRESSURE CLASS	VALVE BORE SIZE	Double D	Key		H	E
		F		G		
CL2500	0.65	11.4	10.4	4.9	13.1	15.9
	1.15	14.0	13.7	4.9	16.3	19.1
	1.5	19.1	18.3	6.4	23.8	25.4
	2	22.0	24.8	6.4	25.8	31.8
	3	- - -	36.5	12.8	44.8	50.8
	4	- - -	45.6	16.0	57.5	63.5
	6	- - -	61.3	19.1	89.3	82.6
CL3200	0.65	11.4	10.4	4.9	13.1	15.9
	1.15	14.7	- - -	- - -	16.3	19.1
	1.5	19.1	18.3	6.4	23.8	25.4
	2	22.0	24.8	6.4	31.4	31.8
CL4500	0.65	14.0	13.7	4.9	12.0	19.1
	1.15	16.5	17.0	4.9	16.3	22.2
	1.5	21.3	21.5	6.4	22.3	28.6

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

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Fisher™ 9500 Butterfly Control Valve

The Fisher 9500 butterfly valve is a fully lined valve for use with corrosive fluids and where tight shutoff is required. The nitrile or PTFE liner totally isolates the valve body and shaft from the process fluid and maintains excellent shutoff at pressure drops to 15.2 bar (220 psi), and temperatures to 121°C (250°F).

The 9500 valve is available in NPS 2 through 12 and is compatible with ASME B16.1 CL125B, with ASME B16.34 CL150 and CL300, or with DIN flanges. These valves are furnished with splined shafts for use with power actuators, with a Fisher 1077 manual actuator, or with a 1078 declutchable manual actuator (see figure 1).

W9224-3

Fisher 9500 Valve with 1052 Actuator and FIELDVUE™ DVC6200 Digital Valve Controller

W4082-1

Fisher 9500 Valve with 1066SR Actuator

Specifications

Valve Sizes

NPS ■ 2, ■ 3, ■ 4, ■ 6, ■ 8, ■ 10, or ■ 12

Valve Style

Flangeless (wafer-type) valve to be installed between two pipe flanges

End Connection Styles

Flangeless (wafer-style) valve mates with CL125 flat-face flanges per ASME B16.1, CL150 and CL300 raised-face flanges per ASME B16.34, or DIN flanges as shown in table 2

Maximum Allowable Inlet Pressure(1)

Maximum material temperature capabilities are limited as shown in table 3. The material maximum allowable shutoff or flowing pressure drop limits are shown in tables 1 and 4. Valve bodies are consistent with applicable pressure/temperature ratings for ■ CL125B per ASME B16.1, or ■ CL150 and CL300 per ASME B16.34.

Vacuum Service

Valves suitable are for vacuum service to approximately 10^{-7} mm Hg absolute (3.4×10^{-12} mbar, absolute)

Maximum Allowable Pressure Drop(1)

Maximum Allowable Shutoff: See table 1
Maximum Flowing Pressure Drops: See table 4

Construction Materials

Valve body: ■ Cast iron, ■ carbon steel, or ■ S31600 [316 stainless steel (SST)]
Disk and Liner: See table 3
Shaft and Taper Pins: S17400 (17-4PH SST) standard or S20910
Thrust Bearing: All cast iron or steel valves use a PTFE/bronze in a carbon steel shell; NPS 2 through 6 SST valves use a PTFE-liner in a S31600 shell; NPS 8 through 12 SST valves use a PTFE-liner in a fiberglass shell
Thrust Bearing Sleeves: Stainless steel
Shaft-Seal Thrust Plate: ■ Plated carbon steel (standard) or ■ S31600 SST
Thrust-Plate Cap Screws: Steel

Material Temperature Capabilities(1)

See table 3

Flow Characteristic

Conventional Disk: Approximately equal percentage through 60 degrees of disk rotation
FISHTAIL™ Disk: Approximately equal percentage through 90 degrees of disk rotation

Flow Direction

Conventional Disk: Bidirectional
FISHTAIL Disk: Forward flow -The tail of the disk opens into the downstream end of the valve

Flow Coefficients

See Fisher Catalog 12

Flow Coefficient Ratio(2)

Conventional Disk: approximately 33 to 1 for a 0 to 60 degree disk rotation
FISHTAIL Disk: 100 to 1 or greater for a 0 to 90 degree disk rotation

Disk Rotation

Conventional Disk:

On/Off Service: ■ 0 to 60 or ■ 0 to 90 degrees
Throttling Service: 0 to 60 degrees

FISHTAIL Disk: 0 to 60 or 0 to 90 degrees for on/off or throttling

Noise Levels

Refer to Catalog 12 for sound pressure level prediction

Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4

Nitrile or PTFE Liner: Class VI

Actuator/Valve Action

Field-reversible between ■ push-down-to-open (extending actuator stem opens disk) or ■ push-down-to-close (extending actuator stem closes disk)

(continued)

Specifications (continued)

Actuator Mounting

Mounting configurations are as follows: Actuator can be ■ perpendicular to (standard) or ■ parallel with pipeline with actuator to ■ right (standard) or ■ left of valve body (when viewed from valve inlet). With perpendicular mounting in horizontal pipeline, actuator can extend ■ above (standard) or ■ below pipeline. With parallel mounting, actuator can extend ■ upstream or ■ downstream of valve

Mating Flange Capabilities

All sizes compatible with weld-neck flanges; also see the Installation section for slip-on flanges

Face-to-Face Dimensions

Dimensions meet MSS SP-67 specifications for face-to-face dimensions of flangeless valves

Valve Shaft Diameters

See figure 4 and table 5

Approximate Weights

See figure 4 and table 5

Options

Three-Way Valve: For converging or diverging service. Consists of two 9500 valves and a single actuator mounted on a pipe tee. Actuator operates both valves through tandem linkage. Contact your Emerson sales office for sizing information
Flange Adapters: Provide additional liner support for use with ■ slip-on flanges and valve bodies NPS 6 and larger, ■ flexible flanges, ■ flanges having inside diameters less than or greater than standard weld-neck flanges, or for ■ dead-end service (valve installed at end of pipe run)
Valve body for mating between CL300 flanges.
Manual Actuator: Fisher 1077 manual handwheel rotary actuator, or the 1078 declutchable manual actuator, see figure 1

1. The pressure/temperature limits in this bulletin and any other applicable standard or code limitation should not be exceeded.
2. Ratio of maximum flow coefficient to minimum usable flow coefficient.

Figure 1. Fisher 1077 and 1078 Manual Rotary Actuators


W4579

1077 MANUAL ACTUATOR


W4867

1078 DECLUTCHABLE MANUAL ACTUATOR

Table 1. Maximum Allowable Shutoff Pressure Drops(1)

VALVE SIZE, NPS	MAXIMUM ALLOWABLE SHUTOFF PRESSURE DROPS							
	Liquid Service				Gaseous Service			
	PTFE Liner		Nitrile Liner		PTFE Liner		Nitrile Liner	
	Cast Iron Valve Material	Steel or Stainless Steel Valve Material	Cast Iron Valve Material	Steel or Stainless Steel Valve Material	Cast Iron Valve Material	Steel or Stainless Steel Valve Material	Cast Iron Valve Material	Steel or Stainless Steel Valve Material
Bar								
2, 3, and 4	12.1	15.2	12.1	15.2	12.1	15.2	12.1	15.2
6, 8, 10, and 12	12.1	15.2	10.4	10.4	12.1	15.2	10.4	10.4
Psi								
2, 3, and 4	175	220	175	220	175	220	175	220
6, 8, 10, and 12	175	220	150	150	175	220	150	150

1. The values in this table were determined using S17400 (17-4PH SST) shaft and taper pins. If other materials are used, you **must** refer to Catalog 14 Pages (section D) for adjustment percentages.

Features

- **Versatile**—Conventional disks are available for bidirectional, on/off or throttling control. Valves are available with S31600 [316 stainless steel (SST)] FISHTAIL disk for on/off or throttling control (see figure 2). The disks can be obtained in a variety of alloy materials for additional corrosion resistance.

- **Economical**—Valve body and shafts are isolated from process fluid, allowing use of cast iron valve bodies for corrosive applications.

- **Adjustable Shaft Seal**—Liner is directed against a flat disk hub by a thrust bearing, creating a seal between the liner and the disk as shown in figure 3. Seals are adjusted as necessary to provide leak control.

- **Flange Gasket Not Required**—Partial O-ring (figure 3) is molded as part of the liner. It seals against mating flanges which eliminate the need for flange gaskets.

- **Excellent Flow Control**—The conventional disk is approximately equal percentage flow characteristic through 60 degrees of its rotation. The FISHTAIL disk has an approximate equal percentage flow characteristic through a full 90 degrees of disk rotation.

- **Operational Economy**—The FISHTAIL disk reduces dynamic torque, which allows the use of a smaller actuator size for a given application.

- **Minimum Maintenance**—No lubrication is required, and no packing or flange gaskets to replace. Shaft seal is easy to adjust. Removing valve components and changing the valve action is accomplished without complete disassembly. Field-replaceable slip-in liner minimizes downtime and reduces maintenance costs.

Table 2. Mating Flange Compatibility

VALVE SIZE, NPS	CAST IRON		STEEL AND STAINLESS STEEL	
	ASME	DIN	ASME	DIN
2, 3	CL125B	PN10	CL150	PN16
4	CL125B	---	CL150	PN16
6, 8, 10	CL125B	PN10	CL150	PN16
12	CL125B	---	CL150	PN16

Table 3. Disk and Liner Materials

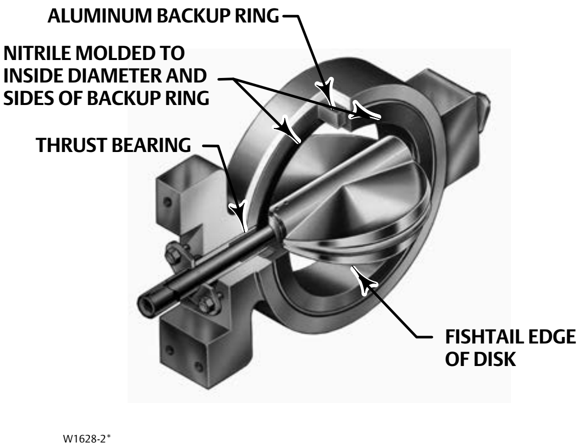
DISK STYLE	DISK MATERIAL	LINER MATERIAL	TEMPERATURE RANGE	
			°C	°F
Conventional	Aluminum bronze	PTFE-lined elastomer molded to aluminum backup ring	-18 to 121	0 to 250
		Nitrile molded to hard rubber backup ring	-7 to 93	20 to 200
FISHTAIL	S31600 stainless steel	PTFE-lined elastomer molded to aluminum backup ring	-18 to 121	0 to 250

Table 4. Maximum Allowable Flowing Pressure Drops Due to Strength Capabilities of Valve Body Components

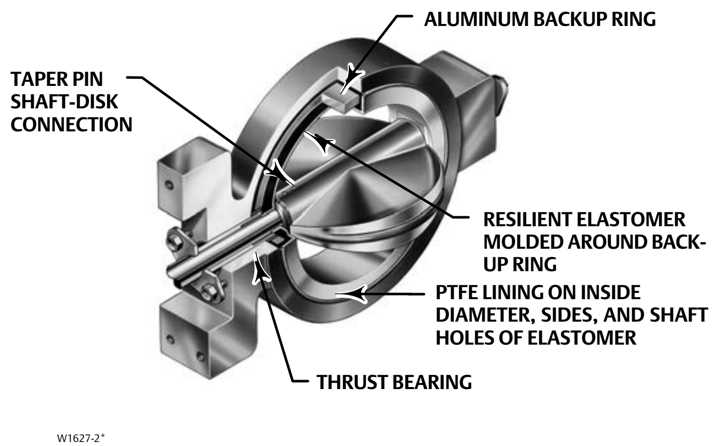
VALVE SIZE, NPS	MAXIMUM ALLOWABLE FLOWING PRESSURE DROPS			
	Conventional Disk		FISHTAIL Disk	
	At 60 Degrees Rotation	At 90 Degrees Rotation	At 60 Degrees Rotation	At 90 Degrees Rotation
Bar				
2	12.1(1) 15.2(2)	8.5	12.1(1) 15.2(2)	12.1(1) 15.2(2)
3	12.1(1) 15.2(2)	5.0	12.1(1) 15.2(2)	12.1(1) 15.2(2)
4	6.6	2.1	11.9	6.8
6	3.4	1.1	5.9	2.9
8	3.4	1.1	5.9	2.9
10	1.7	0.6	2.8	1.2
12	2.0	0.6	3.2	1.3
Psi				
2	175(1) 220(2)	124	175(1) 220(2)	175(1) 220(2)
3	175(1) 220(2)	73	175(1) 220(2)	175(1) 220(2)
4	96	31	173	99
6	50	16	85	42
8	50	16	85	42
10	25	8	41	17
12	29	9	47	19

1. For cast iron valve bodies.
2. For steel or stainless steel valve bodies.

Figure 2. Sectional Views of Fisher 9500 Valves

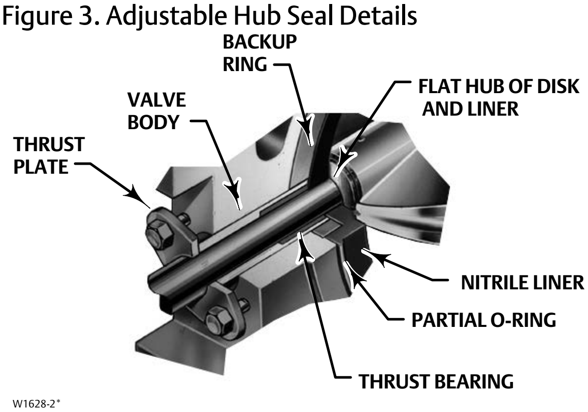


NITRILE LINER



PTFE LINER

Figure 3. Adjustable Hub Seal Details



Installation

Please refer to the Fisher 9500 instruction manual, (D100380X012) for additional / complete installation and maintenance instructions.

These valves may be installed in any position. For conventional disks, flow may be in either direction. For FISHTAIL disks, the FISHTAIL edge of the disks must be located in to the downstream end of the valve (see figure 2).

The liner overlaps the valve face producing the partial O-ring shown in figure 3. It acts as the flange gasket. Improper use of additional gasketing materials may damage the valve liner.

The simplicity of the 9500 valve design is achieved by relying on mating pipe flanges to retain the slip-in liner in the valve body. Care must be taken during installation to assure that the pipe flanges are properly supported to avoid liner damage, flange joint leakage, and problems with valve operation. Flexible, plastic flanges; fiberglass, slip-on flanges; or weld-neck flanges with other than standard inside diameters may not provide adequate support for the liner. The use of flange adapters can overcome flange support problems during installation. Whenever a flange adapter is used, a standard flange gasket must be installed between the line flange and flange adapter. Do not use a flange gasket between the valve and flange adapter. The partial O-ring on the liner acts as the flange gasket and any additional gasket here will damage the liner.

Excessive line bolt load on flexible mating flanges can warp the liner. Also, failing to support the liner at the inside diameter can warp the liner. The use of flange adapters can overcome bolt load problems during installation.

Slip-on pipe flanges may be used with NPS 2, 3, or 4 9500 valves. Valves NPS 6 and larger will require flange adapters for complete liner support.

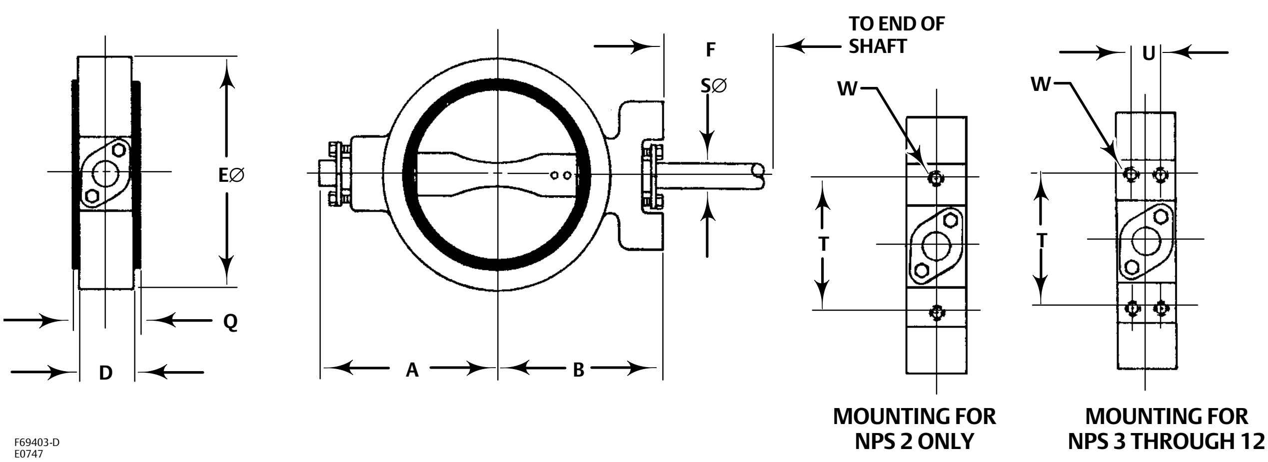
The maximum and minimum allowable inside diameter of mating flanges or adjacent pipes are given in figure 4 and table 5. Flanges or pipes with inside diameters smaller than the minimum shown may interfere with the opening of the disk. Flanges or pipes with an inside diameter larger than the maximum shown may not be in full contact with the liner. Flange adapters are needed in either case, to provide disk clearance or to fully contact the liner.

Table 5. Dimensions

VALVE SIZE NPS	A		B		D	E	F	Q	S (Shaft Diameter)	T	U	W	ALLOWABLE MATING FLANGE / PIPEBORE		APPROX-IMATE WEIGHT
	CL125 / 150	CL300	CL125 / 150	CL300			Splined Valve Shaft						Min	Max	
							mm								kg
2	105	111	108	114	42.00	103	187	44	12.7	117	---	3/8-16	31	63	9.4
3	119	129	127	137	45.00	133	211	48	15.9	146	32	3/8-16	64	92	11
4	116	151	146	159	51.00	171	211	54	15.9	146	32	3/8-16	89	117	14
6	167	186	171	191	54.00	220	214	57	19.1	146	32	3/8-16	145	171[1]	20
8	198	217	203	222	61.00	276	214	64	25.4	146	32	3/8-16	196	222[1]	27
10	230	249	235	254	69.00	335	214	71	25.4	146	32	3/8-16	246	273[1]	32
12	268	287	273	292	78.00	405	208	81	31.8	210	51	5/8-11	297	330[1]	54
							Inches								Pounds
2	4.13	4.38	4.25	4.50	1.64	4.06	7.38	1.75	0.50	4.62	---	3/8-16	1.20	2.50	20
3	4.69	50.6	5.00	5.38	1.76	5.25	8.31	1.88	0.62	5.75	1.25	3/8-16	2.50	3.62	25
4	5.44	5.94	5.75	6.25	2.02	6.75	8.31	2.12	0.62	5.75	1.25	3/8-16	3.50	4.62	30
6	6.56	7.31	6.75	7.50	2.14	8.68	8.44	2.25	0.75	5.75	1.25	3/8-16	5.70	6.75[1]	46
8	7.81	8.56	8.00	8.75	2.39	10.88	8.44	2.50	1.00	5.75	1.25	3/8-16	7.70	8.75[1]	60
10	9.06	9.81	9.25	10.00	2.70	13.19	8.44	2.81	1.00	5.75	1.25	3/8-16	9.70	10.75[1]	70
12	10.56	11.31	10.75	11.50	3.08	15.94	8.19	3.19	1.25	8.25	2.00	5/8-11	11.70	13.00[1]	119

1. These size valves when installed between slip-on flanges require flange adapters for complete support.

Figure 4. Dimensions (also see table 5)



NOTE:
FOR NON-CODE MATERIAL THE ASME CLASS REPRESENTS DIMENSIONS NOT PRESSURE TEMPERATURE RATING.
DISK CHORDAL SWING DIA. AT VALVE FACE IS “M”. PLEASE VERIFY CLEARANCE WITH PIPING.

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Fisher™ 8532 High-Performance Butterfly Valve

The Fisher 8532 high-performance butterfly valve provides outstanding performance under extreme pressure and temperature conditions. The 8532 valve maintains tight shutoff, is available in a fire-tested version, and can be specified for cryogenic applications.

The 8532 valve is available as either a flangeless, wafer-style design or as a single-flange (lugged) design. A splined drive shaft combines with a variety of spring-and-diaphragm or pneumatic piston actuators to make the 8532 a reliable, high-performance butterfly valve for a variety of throttling and on-off applications in the various process industries.

The 8532 valve can be supplied with one of several dynamic seals (figure 4) that can be used in a variety of demanding applications. With the appropriate seal selection and materials of construction, the pressure-assisted seal provides excellent shutoff against the full CL150 or CL300 pressure ratings.


W9138-2

Features

- Economical Tight Shutoff-- The pressure-assisted seal design provides tight shutoff against the full pressure rating of the specified valve.

- Safety-- Shaft blowout protection is designed into the 8532 valve (figure 6). The anti-blowout gland fits securely over the valve shaft which has been turned down to form a circumferential shoulder that contacts the anti-blowout gland.

- Excellent Flow Control-- With a modified equal percentage flow characteristic, the 8532 can be used for throttling applications through 90 degrees of disk rotation. Rangeability is 100 to 1.

- Economically Designed for Minimal Deadband-- A splined end connection on the drive shaft allows lever clamping by most Fisher rotary actuators.

- Application Versatility-- Optional keyed shaft is ideal for on/off applications and allows actuator selection flexibility. Standard construction materials and seal assemblies provide long life and outstanding performance in a broad range of liquid and gas applications.

- Ease of Maintenance-- Interchangeability of all parts including shafts and disks simplifies service and reduces maintenance costs.

- Improved Environmental Capabilities-- The optional ENVIRO-SEAL™ packing system is designed with very smooth stem surfaces and live-loading provides improved sealing, guiding, and loading force transmission. The ENVIRO-SEAL packing system can control emissions below the EPA (Environmental Protection Agency) limit of 100 ppm (parts per million).

- Easy Installation-- The valve body self-centers on the line flange bolts as a fast, accurate means of centering the valve in the pipeline.

- Reliable Flange Gasketing Surface-- Seal retainer screws are located so there is no interference with the sealing function of either flat sheet or spiral wound line flange gaskets.

Specifications

Available Valve Configurations

■ Wafer (Flangeless), ■ Lugged (Single Flange), or ■ Double Flanged valve bodies

Valve Body Sizes

NPS ■ 14, ■ 16, ■ 18, ■ 20, ■ 24, ■ 30, ■ 36, ■ 42, and ■ 48

End Connection Style

Valve body is designed to fit between raised-face mating flanges per ASME B16.5 CL150 or CL300

Maximum Inlet Pressure/Temperature(1)

Consistent with ■ CL150 and ■ CL300 pressure/temperature ratings per ASME B16.34. Also, see figures 2 and 3 for additional information
NPS 30 through 48: ■ CL150/150 construction has CL150 rated pressure retaining parts and 150 psid rated trim

Available Seal Configurations

Standard Constructions
See figure 4 and table 2

Standard Construction Materials

Valve Body and Disk: ASTM grades of ■ carbon steel or ■ stainless steel

Disk Coating:

Hardfacing options are available. Chrome plate is standard with NOVEX, Phoenix III, or Cryogenic seals

Shaft: ASTM grade of ■ S17400 (17-4PH H1025 SST), or ■ S20910

Shaft Extension Lengths:
High Temperature ■ Extensions are available but not required for temperatures less than 343°C (650°F), ■ Optional 6 inches for temperatures from 343 to 538°C (650 to 1000°F), or ■ 12 inches for temperatures above 538°C (1000°F)
Cryogenic ■ 914mm (36 in) from valve center line

Seal Ring: ■ PTFE, ■ S31600 (316 SST), ■ S21800, ■ S31600/PTFE, ■ UHMWPE(4), or ■ CTFE(5).

Backup ring: ■ Nitrile, ■ Chloroprene, ■ PTFE, ■ Fluorocarbon--for a broad range of hydrocarbon and chemical process applications(1) or ■ EPR--for process applications including steam and water(1). A backup ring is not used with the NOVEX seal

Packing: ■ PTFE V-ring (standard packing), ■ Graphite (optional), or ■ ENVIRO-SEAL packing (optional)

Bearings: ■ PEEK(2) (standard material), and ■ S31600, ■ PTFE Composition, or ■ CoCr-A (Alloy 6) (optional)

Valve Body Classification

Wafer and Lugged face-to-face dimensions are in compliance with MSS SP68 and API 609 standards through NPS 24. Double Flange valve bodies comply with API 609 short face-to-face dimensions. Valve bodies are designed for installation between ASME B16.5 CL150 or CL300 raised-face flanges

Shutoff Classification. Per ANSI/FCI 70-2 and IEC 60534-4

Standard Soft Seal: Bidirectional shutoff Class VI (bubble-tight)
NOVEX Seal: Unidirectional shutoff Class IV (preferred flow direction only(3)), Class VI optional (excluding NPS 42 and 48)
Phoenix III Seal: Bidirectional shutoff Class VI (bubble-tight)
Phoenix III Seal for Fire-Tested Applications: Unidirectional shutoff Class VI (reverse flow direction only) (bubble-tight). Fire Tested per API 607 Rev. 4. Contact your Emerson sales office for more information

Flow Characteristic

Modified equal percentage

Flow Coefficients

See table 1 and Fisher Catalog 12

Noise Levels

See Catalog 12 for sound pressure level prediction

-continued-

Specifications (cont.)

Disk Rotation

Clockwise to close

Valve Dimensions and Approximate Weights

See figures 7, 8, 9, and 10

ENVIRO-SEAL Packing

This optional ■ PTFE or ■ graphite packing system provides improved sealing, guiding, and transmission of loading force to control liquid and gas emissions. See Bulletin 59.3:041 ENVIRO-SEAL Packing Systems for Rotary Valves (D101638X012) for more information.

1. The pressure/temperature limits in this bulletin (figures 2 and 3), and any application code or standard limitation, should not be exceeded.
2. PEEK stands for poly-ether-ether-ketone.
3. For optimum seal performance, the preferred valve orientation at shutoff is with the retaining ring downstream from the high pressure side of the valve.
4. UHMWPE stands for ultra high molecular weight polyethylene.
5. CTFE not recommended for fast cycling, less than 2 seconds. Contact your Emerson sales office for other seals available for fast cycling or tighter shutoff.

Figure 1. Flow Direction

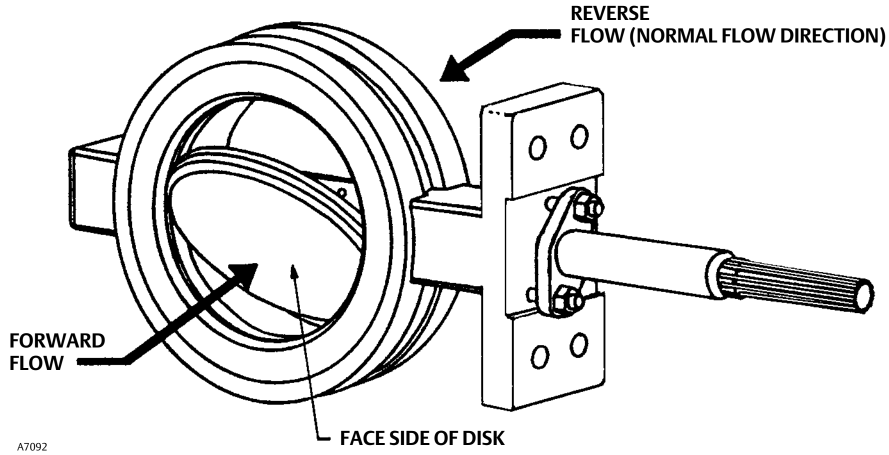


Table 1. Flow Coefficients(1)(3)

VALVE SIZE, NPS	MAX C_V (2), VALVE 90° OPEN		
	CL150/150	CL150	CL300
14	---	6320	4550
16	---	8600	5630
18	---	11,050	8230
20	---	13,850	9530
24	---	21,500	12,510
30	40,500	33,900	23,800
36	60,600	50,500	36,800
42	79,800	72,700	57,100
48	106,000	92,600	62,200

1. To obtain the flow coefficient K_V in terms of cubic meters per hour at one kilogram force per square centimeter differential pressure across the valve, using the following multiplier: $K_V = 0.856\ C_V$.
2. Measured in gallons per minutes at 1 psi differential pressure across the valve.
3. See Catalog 12 for a complete listing of flow coefficients.

Installation

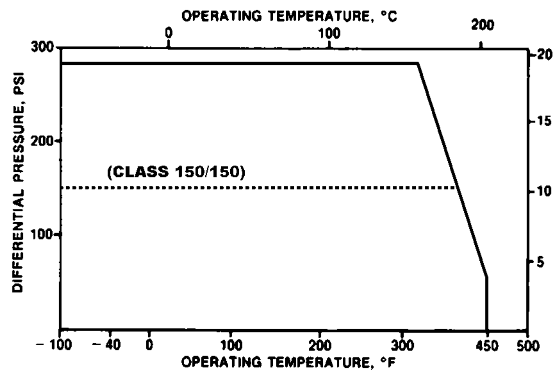
Recommended installation for the 8532 valve is with the shaft horizontal in a normal-flow direction. Horizontal installation will enhance valve performance because process fluid flow will sweep entrained solids from valve surfaces. This sweeping action prevents particle buildup on seal surfaces. However, the valve may be installed in either the forward or reverse flow direction.

The standard soft seal offers bubble-tight, bidirectional shutoff. To meet the performance requirements of many of today's fire-tested requirements, a Phoenix III valve must be installed in the preferred valve orientation. Both the NOVEX and cryogenic seals are uni-directional and should be installed with the shaft upstream of the seal.

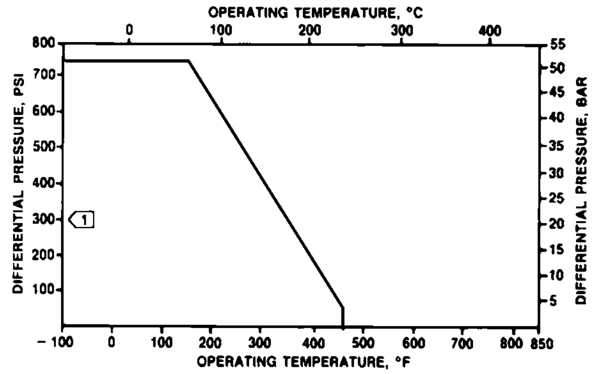
Unique operating conditions may require a specific combination of actuator motion. To satisfy unique operating requirements, the valve and actuator can be assembled in eight ways, providing for actuator motion and open disk position. For assistance in selecting the appropriate combination of actuator action and open valve position, consult your [Emerson sales office](#).

Dimensions and weights are shown in figures 7, 8, 9, and 10.

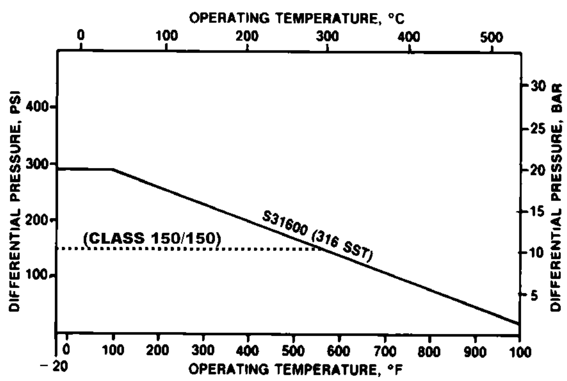
Figure 2. Maximum Pressure/Temperature Ratings for Soft Seal, NOVEX Seal and Phoenix III Seal, CL150 and CL300



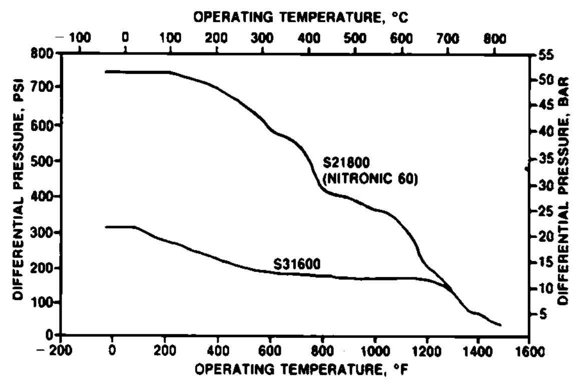
CL150 SOFT SEAL



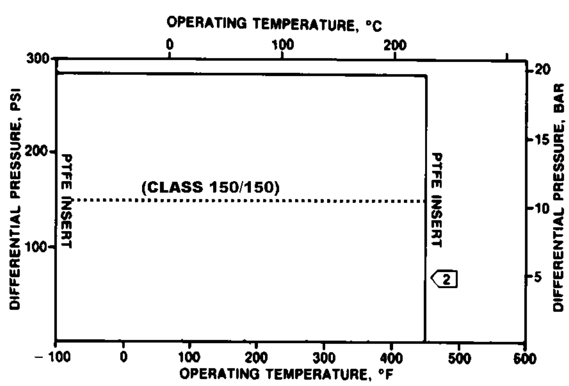
CL300 SOFT SEAL



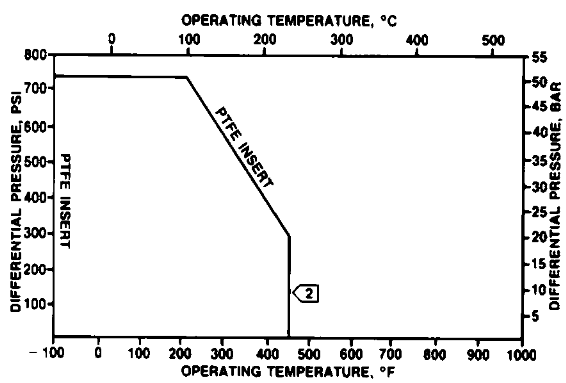
CL150 NOVEX SEAL



CL300 NOVEX SEAL



CL150 PHOENIX III SEAL



CL300 PHOENIX III SEAL

C0759-1/IL

Note
1 Because of potential erosive effects and premature seal failure that can occur, throttling PTFE seals at differential pressures greater than 300 psid at disk angles less than 20° open is not recommended.
2 Temperature limitations do not account for the additional limitations imposed by the backup O-ring used with this seal. To determine the effective temperature limitation of the appropriate seal, backup O-ring combination, refer to table 1.

Figure 3. Maximum Pressure/Temperature Ratings for Cryogenic Seal, CL150 and CL300

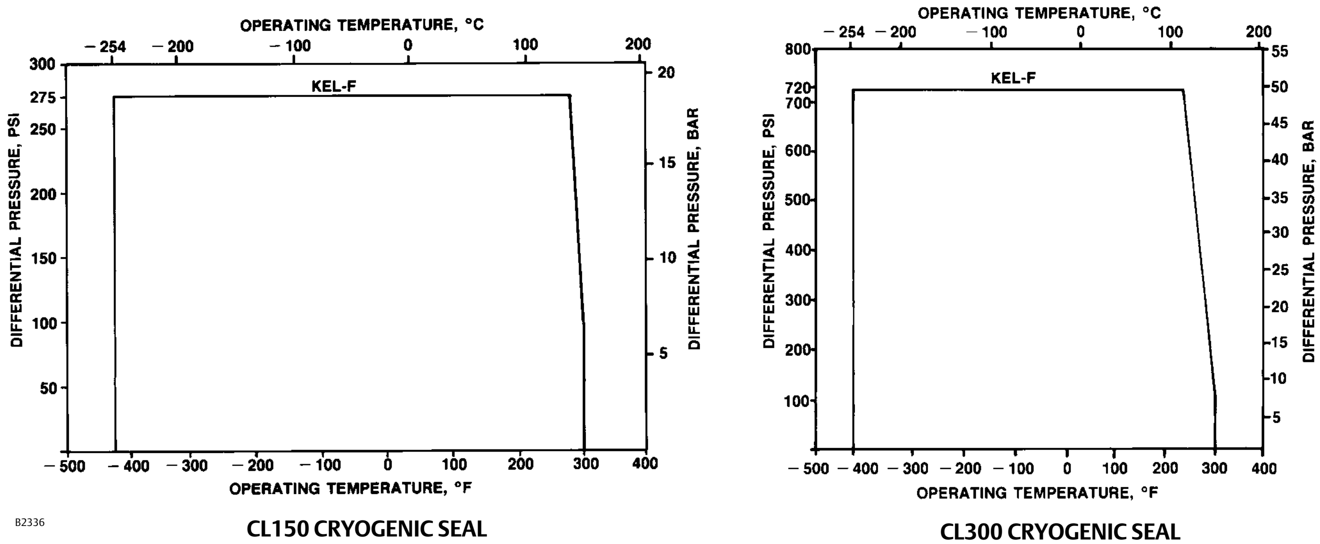


Figure 4. Available Seal Configurations

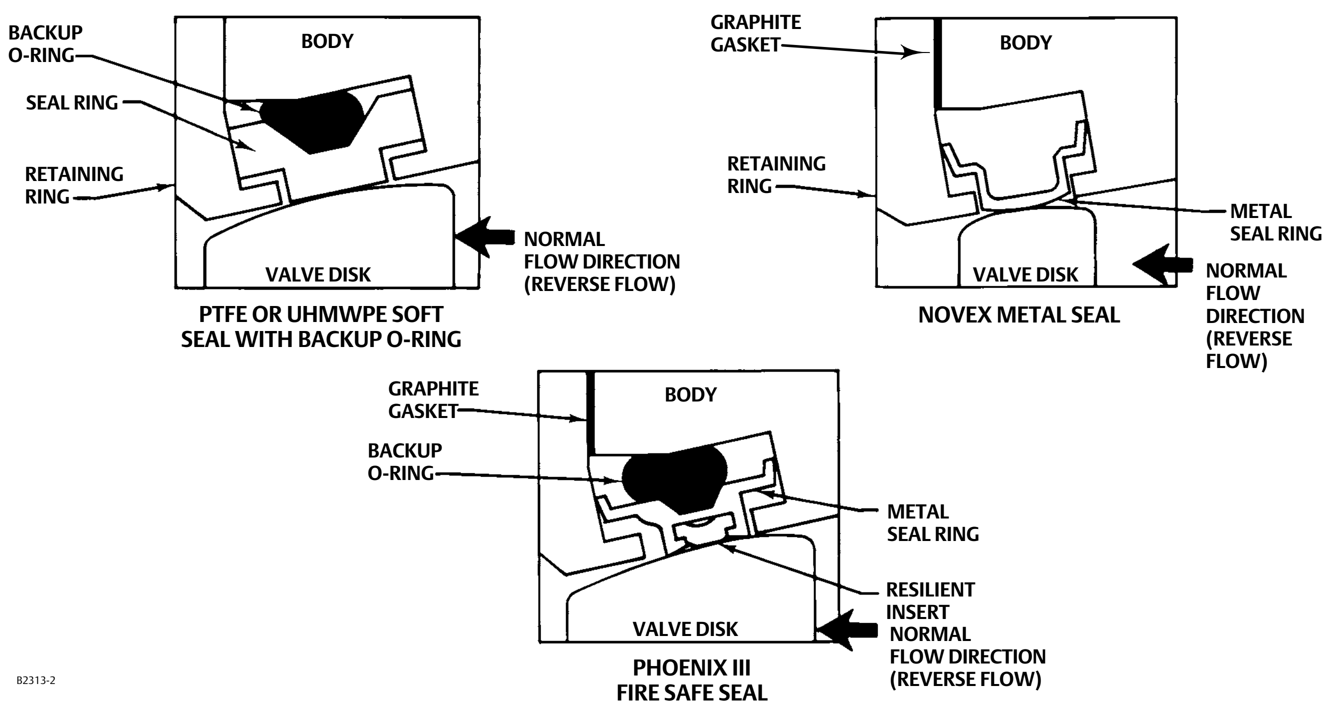


Figure 5. Typical Valve Assembly

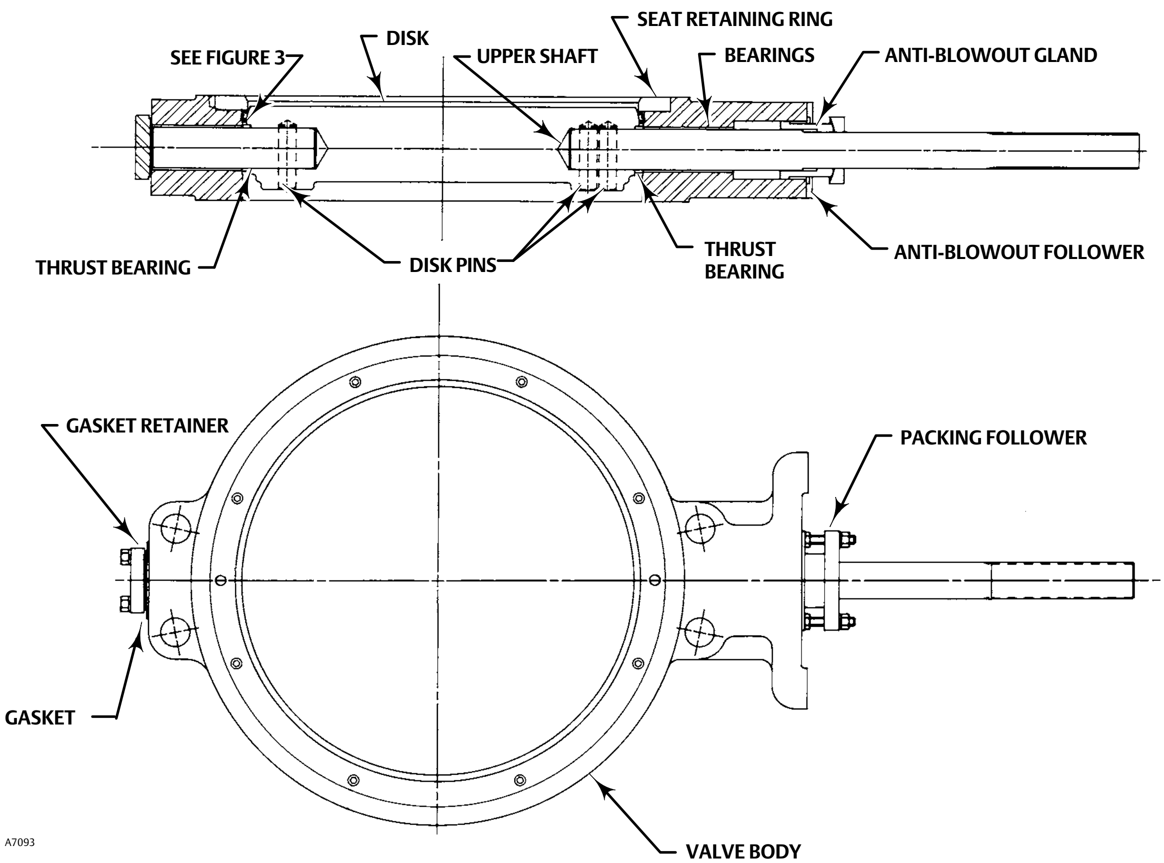


Figure 6. Blowout Protection

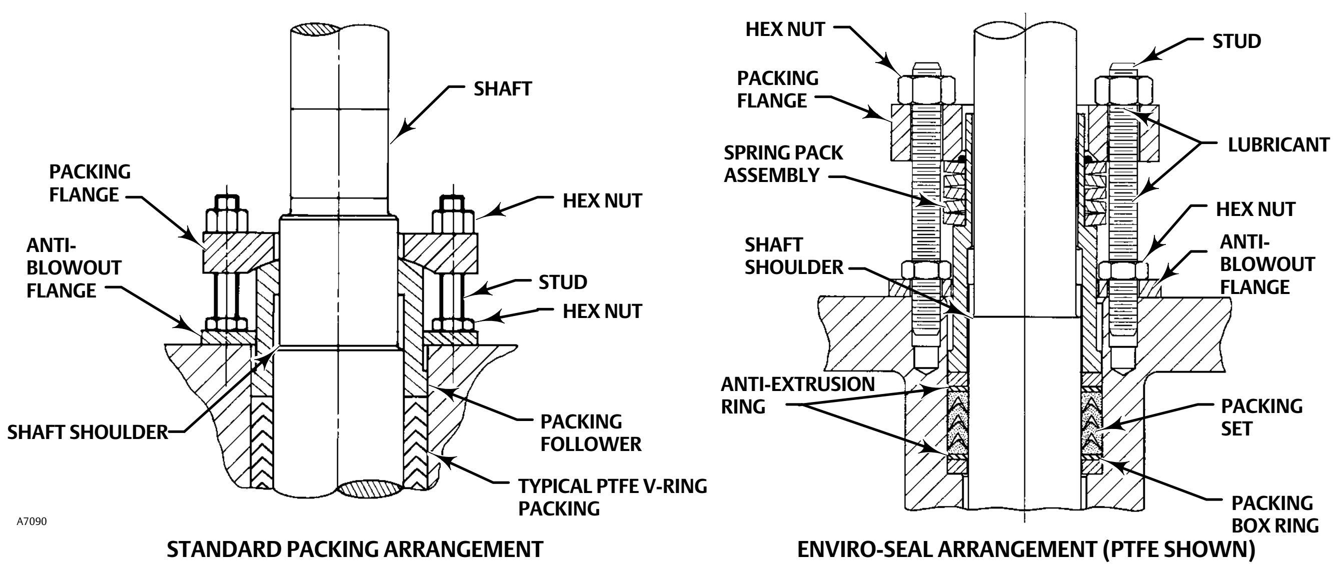


Table 2. Material Temperature Ratings

COMPONENT AND MATERIAL OF CONSTRUCTION[1]		TEMPERATURE RANGE °C	TEMPERATURE RANGE °F
Valve Body[2]			
Carbon Steel (WCC or SA 516-70)[7]		-29 to 427	-20 to 800
CF8M (316 SST)		-198 to 538	-325 to 1000
CF8M/CF10M (316/316H)[3] Dual-Certified		over 538 to 816	over 1000 to 1500
Disk			
CF8M (316 SST)		-198 to 538	-325 to 1000
CF8M/CF10M (316/316H)[3] Dual-Certified		over 538 to 816	over 1000 to 1500
Disk Coating			
Chromium Carbide		-198 to 816	-325 to 1500
Chrome Plating		-254 to 427	-425 to 800
Chromium Coating		-254 to 593	-425 to 1100
Shaft			
S20910		-198 to 538	-325 to 1000
S17400 (17-4 pH 1025)		-73 to 427	-100 to 800
N07718		-254 to 704	-425 to 1300
N07750		over 593 to 816	over 1100 to 1500
N05500		-198 to 482	-325 to 900
Bearings[6]			
PEEK (standard)		-73 to 260	-100 to 500
S31600[4]		-198 to 816	-325 to 1500
R30006 (Alloy 6)		-198 to 816	-325 to 1500
Bronze		-254 to 302	-425 to 575
Packing			
PTFE Packing and PTFE ENVIRO-SEAL Packing		-148 to 232	-325 to 450
Graphite packing		-198 to 816	-325 to 1500
Graphite packing with oxidizing media		-198 to 538	-325 to 1000
Graphite ENVIRO-SEAL Packing		-148 to 315	-325 to 600
Seal Ring and Backup Ring	**PTFE Seal Ring**		
	Nitrile Backup O-Ring	-29 to 93	-20 to 200
	Chloroprene Backup O-Ring	-43 to 149	-45 to 300
	EPR Backup O-Ring	-54 to 149	-65 to 300
	Fluorocarbon Backup O-Ring	-29 to 204	-20 to 400
	PTFE Backup O-Ring	-73 to 204	-100 to 400
	UHMWPE[5] Seal Ring (CL150 Only)		
	EPR Backup O-Ring	-54 to 93	-65 to 200
	Fluorocarbon Backup O-Ring	-29 to 93	-20 to 200
	Phoenix III and/or Fire Tested Construction		
	S31600 and PTFE Seal Ring with Nitrile Backup O-Ring	-40 to 149	-40 to 300
	Chloroprene Backup O-Ring	-54 to 149	-65 to 300
	EPR Backup O-Ring	-62 to 204	-80 to 400
	Fluorocarbon Backup O-Ring	-40 to 232	-100 to 200
Seal Ring	NOVEX S31600 Seal[4] Ring (CL150)	-29 to 538	-20 to 1000
	NOVEX S31600 Seal[4] Ring (CL300)	-29 to 816	-20 to 1500
	NOVEX S21800 Seal[4] Ring (CL300)	-29 to 816	-40 to 1500
	Cryogenic Seal Ring	Contact your Emerson sales office	

1. NACE trim constructions are available; consult your Emerson sales office.
2. Special gasket retainer bolts are required for over 427°C (800°F)
3. Special retaining ring screws for single flange valves over 538°C (1000°F)
4. For a complete material description, contact your Emerson sales office.
5. UHMWPE stands for ultra high molecular weight polyethylene.
6. Special thrust bearings are required for high temp. applications over 343°C (650°F) (with 6- and 12-inch shaft extensions). Constructions with carbon steel valves and SST disks may require special thrust bearings at temperatures less than 343°C (650°F).
7. Cast or wrought /plate grades used interchangeably, depending upon availability - unless requested by customer.

Table 3. Dimensions and Weights, Wafer Style Valves

Valve Size, NPS(5)	Rating	A(1)	D	G	K	M(2)	R	S(3)	T	U	W	Y	Approx. Weight
		mm											kg
14	CL150	91.9	208	295	327	331	422	31.8	235	46.0	17.5	---(4)	72
	CL300	117	356	319	364	304	437	44.5	273	50.8	20.6	1-1/8 - 8 UNC	121
16	CL150	102	208	318	371	375	465	31.8	235	46.0	17.5	1 - 8 UNC	94
	CL300	133	356	353	397	346	498	44.5	273	50.8	20.6	1-1/4 - 8 UNC	183
18	CL150	114	356	349	400	419	529	39.6	273	50.8	20.1	1-1/8 - 8 UNC	139
	CL300	149	356	384	419	389	556	57.2	337	76.2	23.9	1-1/4 - 8 UNC	227
20	CL150	127	356	381	432	464	584	44.5	273	50.8	20.1	1-1/8 - 8 UNC	167
	CL300	159	265	416	483	442	605	76.0	337	76.2	23.9	1-1/4 - 8 UNC	364
24	CL150	154	356	438	292	581	692	57.2	337	76.2	23.9	1-1/4 - 8 UNC	255
	CL300	181	546	483	546	523	716	76.0	337	76.2	23.9	1-1/2 - 8 UNC	469
30	CL150/150	121	---	516	559	744	864	---	337	76	7/8-9	1 1/4-8	365
	CL150	159	---	521	591	736	867	---	337	76	7/8-9	1 1/4-8	528
	CL300	241	---	576	648	681	865	---	508	203	1 1/4-7	1 3/4-8	953
36	CL150/150	149	---	613	683	888	1029	---	337	76	7/8-9	1 1/2-8	626
	CL150	178	---	619	657	888	1032	---	305	152	1 1/4-7	1 1/2-8	806
	CL300	273	---	675	740	838	1035	---	432	203	1 1/4-7	2 -8	1315
42	CL150/150	210	---	695	762	1032	1207	---	337	76	7/8-9	1 1/2-8	1100
	CL150	229	---	730	838	1028	1207	---	305	152	1 1/4-7	1 1/2-8	1302
	CL300	298	---	768	867	943	1162	---	432	203	1 1/4-7	1 5/8-8	2263
48	CL150/150	229	---	826	889	1180	1364	---	305	152	1 1/4-7	1 1/2-8	1604
	CL150	260	---	797	902	1171	1372	---	508	203	1 1/4-7	1 1/2-8	1904
Size	Rating	Inch											lb
14	CL150	3.62	8.19	11.62	12.88	13.04	16.62	1-1/4	9.25	1.81	0.69	---(4)	158
	CL300	4.62	14.00	12.56	14.31	12.00	17.19	1-3/4	10.75	2.00	0.81	1-1/8 - 8 UNC	266
16	CL150	4.00	8.19	12.50	14.62	14.77	18.31	1-1/4	9.25	1.81	0.69	1 - 8 UNC	207
	CL300	5.25	14.00	13.88	15.62	13.60	19.62	1-3/4	10.75	2.00	0.81	1-1/4 - 8 UNC	403
18	CL150	4.50	14.00	13.75	15.75	16.49	20.81	1-9/16	10.75	2.00	0.81	1-1/8 - 8 UNC	307
	CL300	5.88	14.00	15.12	16.50	15.30	21.88	2-1/4	13.25	3.00	0.94	1-1/4 - 8 UNC	500
20	CL150	5.00	14.00	15.00	17.00	18.27	23.00	1-3/4	10.75	2.00	0.81	1-1/8 - 8 UNC	368
	CL300	6.25	10.44	16.38	19.00	17.40	23.81	3	13.25	3.00	0.94	1-1/4 - 8 UNC	802
24	CL150	6.06	14.00	17.25	19.38	22.87	27.25	2-1/4	13.25	3.00	0.94	1-1/4 - 8 UNC	563
	CL300	7.12	21.50	19.00	21.50	20.60	28.19	3	13.25	3.00	0.94	1-1/2 - 8 UNC	1035
30	CL150/150	4.75	---	20.31	22.00	29.30	34.00	---	13.25	3.00	7/8-9	1 1/4-8	805
	CL150	6.25	---	20.50	23.25	28.97	34.12	---	13.25	3.00	7/8-9	1 1/4-8	1164
	CL300	9.50	---	22.69	25.50	26.80	34.06	---	20.00	8.00	1 1/4-7	1 3/4-8	2100
36	CL150/150	5.88	---	24.12	26.88	34.96	40.50	---	13.25	3.00	7/8-9	1 1/2-8	1380
	CL150	7.00	---	24.38	25.88	34.95	40.62	---	12.00	6.00	1 1/4-7	1 1/2-8	1778
	CL300	10.75	---	26.56	29.12	33.00	40.75	---	17.00	8.00	1 1/4-7	2 -8	2900
42	CL150/150	8.25	---	27.38	30.00	40.64	47.50	---	13.25	3.00	7/8-9	1 1/2-8	2425
	CL150	9.00	---	28.75	33.00	40.48	47.50	---	12.00	6.00	1 1/4-7	1 1/2-8	2871
	CL300	11.75	---	30.25	34.12	37.13	45.75	---	17.00	8.00	1 1/4-7	1 5/8-8	4989
48	CL150/150	9.00	---	32.50	35.00	46.47	53.69	---	12.00	6.00	1 1/4-7	1 1/2-8	3537
	CL150	10.25	---	31.38	35.50	46.09	54.00	---	20.00	8.00	1 1/4-7	1 1/2-8	4198

1. For NPS 14 through 24, face-to-face dimensions are in compliance with MSS SP68 and API 609.
2. Minimum internal diameter of the mating pipe or flange required for full disk clearance.
3. For valves with spline shafts. Use this nominal shaft diameter for selecting Fisher actuators.
4. This size and class wafer body has no tapped holes for mating pipe flange.
5. NPS 30 through 48 use keyed shaft as standard.

Figure 7. Dimensions and Weights, Wafer Style Valves (also see table 3)

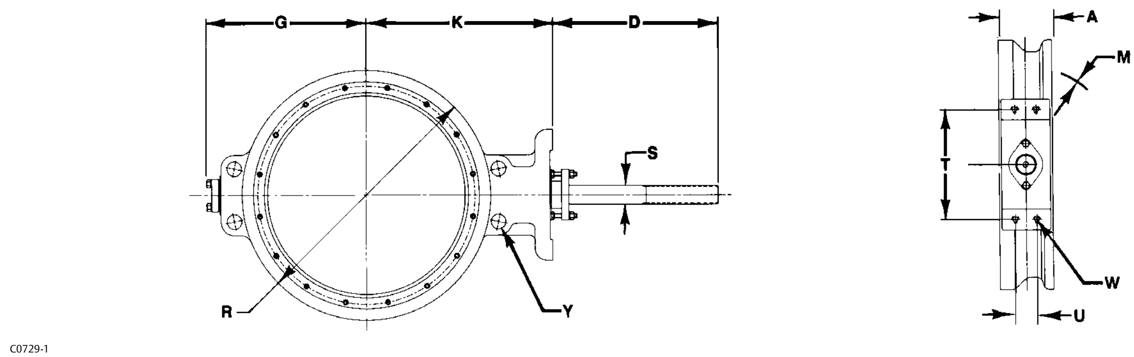


Table 4. Dimensions and Weights, Lugged Valves

Valve Size, NPS(5)	Rating	A(1)	D	G	K	M(2)	R	S(3)	T	U	W	Y(4)	Approx-Weight
		mm											kg
14	CL150	91.9	208	295	327	331	531	31.8	235	46.0	17.5	1 - 8 UNC	95
	CL300	117	356	319	364	304	594	44.5	273	50.8	20.6	1-1/8 - 8 UNC	227
16	CL150	102	208	318	371	375	607	31.8	235	46.0	17.5	1 - 8 UNC	138
	CL300	133	356	353	397	346	657	44.5	273	50.8	20.6	1-1/4 - 8 UNC	294
18	CL150	114	356	349	400	419	645	39.6	273	50.8	20.1	1-1/8 - 8 UNC	178
	CL300	149	356	384	419	389	721	57.2	337	76.2	23.9	1-1/4 - 8 UNC	402
20	CL150	127	356	381	432	464	696	44.5	273	50.8	20.1	1-1/8 - 8 UNC	224
	CL300	159	265	416	483	442	784	76.0	337	76.2	23.9	1-1/4 - 8 UNC	544
24	CL150	154	356	438	292	581	822	57.2	337	76.2	23.9	1-1/4 - 8 UNC	315
	CL300	181	546	483	546	523	924	76.0	337	76.2	23.9	1-1/2 - 8 UNC	821
30	CL150/150	121	---	516	559	744	864	---	337	76	7/8-9	1 1/4-8	525
	CL150	159	---	521	591	736	867	---	337	76	7/8-9	1 1/4-8	736
	CL300	241	---	576	648	681	865	---	508	203	1 1/4-7	1 3/4-8	1406
36	CL150/150	149	---	613	683	888	1029	---	337	76	7/8-9	1 1/2-8	897
	CL150	178	---	619	657	888	1032	---	305	152	1 1/4-7	1 1/2-8	1120
	CL300	273	---	675	740	838	1035	---	432	203	1 1/4-7	2 -8	1989
42	CL150/150	210	---	695	762	1032	1207	---	337	76	7/8-9	1 1/2-8	1328
	CL150	229	---	730	838	1028	1207	---	305	152	1 1/4-7	1 1/2-8	1550
	CL300	298	---	768	867	943	1162	---	432	203	1 1/4-7	1 5/8-8	2726
48	CL150/150	229	---	826	889	1180	1364	---	305	152	1 1/4-7	1 1/2-8	1907
	CL150	260	---	797	902	1171	1372	---	508	203	1 1/4-7	1 1/2-8	2248
Size	**Rating**	**Inch**											**lb**
14	CL150	3.62	8.19	11.62	12.88	13.04	20.88	1-1/4	9.25	1.81	0.69	1 - 8 UNC	209
	CL300	4.62	14.00	12.56	14.31	12.00	23.38	1-3/4	10.75	2.00	0.81	1-1/8 - 8 UNC	500
16	CL150	4.00	8.19	12.50	14.62	14.77	23.88	1-1/4	9.25	1.81	0.69	1 - 8 UNC	304
	CL300	5.25	14.00	13.88	15.62	13.60	25.88	1-3/4	10.75	2.00	0.81	1-1/4 - 8 UNC	649
18	CL150	4.50	14.00	13.75	15.75	16.49	25.38	1-9/16	10.75	2.00	0.81	1-1/8 - 8 UNC	393
	CL300	5.88	14.00	15.12	16.50	15.30	28.38	2-1/4	13.25	3.00	0.94	1-1/4 - 8 UNC	886
20	CL150	5.00	14.00	15.00	17.00	18.27	27.38	1-3/4	10.75	2.00	0.81	1-1/8 - 8 UNC	493
	CL300	6.25	10.44	16.38	19.00	17.40	30.88	3	13.25	3.00	0.94	1-1/4 - 8 UNC	1200
24	CL150	6.06	14.00	17.25	19.38	22.87	32.38	2-1/4	13.25	3.00	0.94	1-1/4 - 8 UNC	773
	CL300	7.12	21.50	19.00	21.50	20.60	36.38	3	13.25	3.00	0.94	1-1/2 - 8 UNC	1810
30	CL150/150	4.75	---	20.31	22.00	29.30	34.00	---	13.25	3.00	7/8-9	1 1/4-8	1157
	CL150	6.25	---	20.50	23.25	28.97	34.12	---	13.25	3.00	7/8-9	1 1/4-8	1623
	CL300	9.50	---	22.69	25.50	26.80	34.06	---	20.00	8.00	1 1/4-7	1 3/4-8	3100
36	CL150/150	5.88	---	24.12	26.88	34.96	40.50	---	13.25	3.00	7/8-9	1 1/2-8	1978
	CL150	7.00	---	24.38	25.88	34.95	40.62	---	12.00	6.00	1 1/4-7	1 1/2-8	2470
	CL300	10.75	---	26.56	29.12	33.00	40.75	---	17.00	8.00	1 1/4-7	2 -8	4385
42	CL150/150	8.25	---	27.38	30.00	40.64	47.50	---	13.25	3.00	7/8-9	1 1/2-8	2928
	CL150	9.00	---	28.75	33.00	40.48	47.50	---	12.00	6.00	1 1/4-7	1 1/2-8	3418
	CL300	11.75	---	30.25	34.12	37.13	45.75	---	17.00	8.00	1 1/4-7	1 5/8-8	6009
48	CL150/150	9.00	---	32.50	35.00	46.47	53.69	---	12.00	6.00	1 1/4-7	1 1/2-8	4204
	CL150	10.25	---	31.38	35.50	46.09	54.00	---	20.00	8.00	1 1/4-7	1 1/2-8	4955

1. For NPS 14 through 24, face-to-face dimensions are in compliance with MSS SP68 and API 609.
2. Minimum internal diameter of the mating pipe or flange required for full disk clearance.
3. For valves with spline shafts. Use this nominal shaft diameter for selecting Fisher actuators.
4. Bolt hole quantity and bolt circle diameter to mate with B16.5 flanges for CL150 and CL300. Valve bodies also available with drilled-thru, clearance holes.
5. NPS 30 through 48 use keyed shaft as standard.

Figure 8. Dimensions and Weights, Lugged Valves (also see table 4)

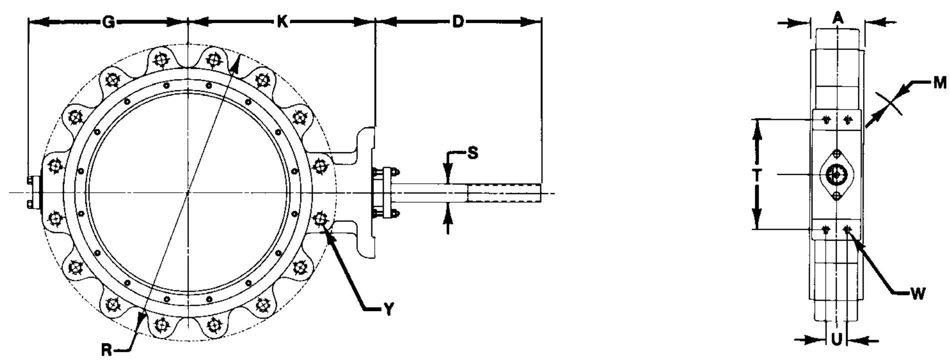


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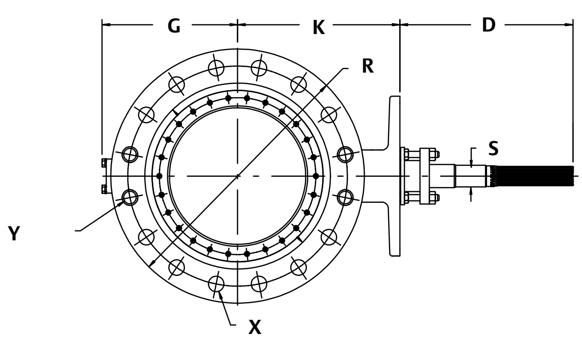
Table 5. Dimensions and Weights, Double Flange Valves

Valve Size, NPS	Rating	A(1)	B	D	G	K	R	S(2)	T	U	W	X	Y	Approx-Weight
		mm												kg
14	CL150	191	95.3	208	295	327	533	31.8	235	46.0	17.5	28.4	---(3)	152
	CL300	290	145	356	319	364	584	44.5	273	50.8	20.6	31.8	1-1/8 - 8 UNC	345
16	CL150	216	108	208	318	371	597	31.8	235	46.0	17.5	28.4	1 - 8 UNC	201
	CL300	310	155	356	353	397	648	44.5	273	50.8	20.6	34.8	1-1/4 - 8 UNC	563
18	CL150	222	111	356	349	400	635	39.6	273	50.8	20.1	31.8	1-1/8 - 8 UNC	243
	CL300	330	165	356	384	419	711	57.2	337	76.2	23.9	34.8	1-1/4 - 8 UNC	591
20	CL150	229	114	356	381	432	699	44.5	273	50.8	20.1	31.8	1-1/8 - 8 UNC	277
	CL300	350	175	265	416	483	767	76.0	337	76.2	23.9	34.8	1-1/4 - 8 UNC	706
24	CL150	267	133	356	438	292	813	57.2	337	76.2	23.9	35.0	1-1/4 - 8 UNC	434
	CL300	390	195	546	483	546	914	76.0	337	76.2	23.9	41.1	1-1/2 - 8 UNC	1307
Size	**Rating**	**Inch**												
14	CL150	7.50	3.75	8.19	11.62	12.88	21.00	1-1/4	9.25	1.81	0.69	1.13	---(3)	335
	CL300	11.41	5.70	14.00	12.56	14.31	23.00	1-3/4	10.75	2.00	0.81	1.25	1-1/8 - 8 UNC	760
16	CL150	8.50	4.25	8.19	12.50	14.62	23.50	1-1/4	9.25	1.81	0.69	1.13	1 - 8 UNC	443
	CL300	12.20	6.10	14.00	13.88	15.62	25.50	1-3/4	10.75	2.00	0.81	1.38	1-1/4 - 8 UNC	1240
18	CL150	8.75	4.38	14.00	13.75	15.75	25.00	1-9/16	10.75	2.00	0.81	1.25	1-1/8 - 8 UNC	535
	CL300	13.00	6.50	14.00	15.12	16.50	28.00	2-1/4	13.25	3.00	0.94	1.38	1-1/4 - 8 UNC	1303
20	CL150	9.00	4.50	14.00	15.00	17.00	27.50	1-3/4	10.75	2.00	0.81	1.25	1-1/8 - 8 UNC	611
	CL300	13.78	6.89	10.44	16.38	19.00	30.20	3	13.25	3.00	0.94	1.38	1-1/4 - 8 UNC	1556
24	CL150	10.50	5.25	14.00	17.25	19.38	32.00	2-1/4	13.25	3.00	0.94	1.38	1-1/4 - 8 UNC	956
	CL300	15.35	7.67	21.50	19.00	21.50	36.00	3	13.25	3.00	0.94	1.62	1-1/2 - 8 UNC	2881

1. Face-to-face dimensions are in compliance with API 609 short series and ISO 5752. Contact your Emerson sales office for other face-to-face lengths.
2. For valves with spline shafts. Use this nominal shaft diameter for selecting Fisher actuators.
3. This size and class double-flange valve body has no tapped holes for mating pipe flange.

Figure 9. Dimensions and Weights, Double Flange Valves (also see table 5)



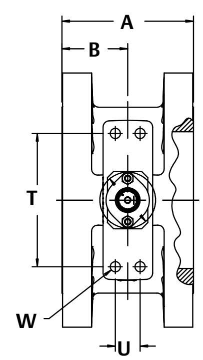
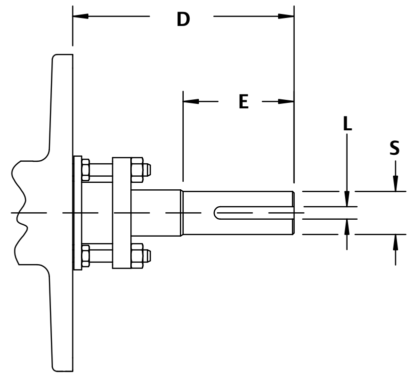


Table 6. Dimensions, Optional Keyed Shaft Valves

Valve Size, NPS[3]	Rating	D	E	L[1]	S[2]
		mm			
14	CL150	146	63.5	6.4	30.2
	CL300	229	79.5	9.5	44.5
16	CL150	146	63.5	6.4	31.8
	CL300	229	79.5	9.5	44.5
18	CL150	229	79.5	9.5	38.1
	CL300	254	105	12.7	57.2
20	CL150	229	79.5	9.5	44.5
	CL300	273	124	15.9	69.9
24	CL150	254	105	12.7	57.2
	CL300	273	124	15.9	69.9
30	CL150/150	295	95	12.7	57
	CL150	314	114	15.9	70
	CL300	314	114	15.9	70
36	CL150/150	295	95	12.7	57
	CL150	314	114	15.9	70
	CL300	353	152	22.2	95
42	CL150/150	314	114	15.9	70
	CL150	314	114	15.9	70
	CL300	363	164	25.4	102
48	CL150/150	314	114	15.9	70
	CL150	314	114	15.9	70
Size	**Rating**	**Inch**			
14	CL150	5.75	2.50	0.25	1.19
	CL300	9.00	3.13	0.38	1.75
16	CL150	5.75	2.50	0.25	1.25
	CL300	9.00	3.13	0.38	1.75
18	CL150	9.00	3.13	0.38	1.50
	CL300	10.00	4.13	0.50	2.25
20	CL150	9.00	3.13	0.38	1.75
	CL300	10.75	4.88	0.63	2.75
24	CL150	10.00	4.13	0.50	2.25
	CL300	10.75	4.88	0.63	2.75
30	CL150/150	11.62	3.75	0.500	2.25
	CL150	12.38	4.50	0.625	2.75
	CL300	12.38	4.50	0.625	2.75
36	CL150/150	11.62	3.75	0.500	2.25
	CL150	12.38	4.50	0.625	2.75
	CL300	13.88	6.00	0.875	3.75
42	CL150/150	12.38	4.50	0.625	2.75
	CL150	12.38	4.50	0.625	2.75
	CL300	14.31	6.44	1.000	4.00
48	CL150/150	12.38	4.50	0.625	2.75
	CL150	12.38	4.50	0.625	2.75

1. Nominal square key size.
2. Nominal shaft diameter at the keyway.
3. NPS 30 through 48 use keyed shaft as standard.

Figure 10. Dimensions, Optional Keyed Shaft Valves (also see table 6)



OPTIONAL KEYED DRIVE SHAFT

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 8560 High-Performance Butterfly Control Valve

Fisher 8560 high-performance butterfly valves feature a stainless steel disk with a stainless steel seal ring. The pressure-assisted metal seal ring provides excellent shutoff against pressure applied in the recommended flow direction for both liquid and gas applications.

The NOVEX and Phoenix III metal seals are available for demanding applications requiring excellent shutoff capabilities. The splined-shaft valve combines with a variety of power actuators to form a reliable, high-performance control valve suitable for throttling applications requiring extremely low leakage rates.

An optional double D shaft combines with a variety of power and manual actuators for use in quarter-turn or on/off applications.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

Fisher 8560 Lugged Valve

Features

- **Excellent Flow Control**—The eccentrically- mounted disk design provides an approximate linear flow characteristic and can be used for throttling or on/off control applications through 90 degrees of disk rotation.

- **Sour Service Capability**—Trim and bolting materials are available for applications involving sour service. These constructions comply with the recommendations of NACE MR0175-2002.

- **Improved Environmental Capabilities**—The optional ENVIRO-SEAL™ packing system is designed with improved sealing, guiding, and loading force transmission. The ENVIRO-SEAL packing system can control emissions to below the EPA (Environmental Protection Agency) limit of 100 ppm (parts per million) for valves.

- **Integral Shaft-to-Body Bonding**—Standard valve construction includes conductive packing to provide electrical bonding for hazardous area applications.

- **Low Cost Maintenance**—Individual disk/shaft components can be replaced after disassembly due to sleeve and taper pin connections (see figure 1).

Specifications

Valve Sizes and End Connection Styles

NPS ■ 3, ■ 4, ■ 6, ■ 8, ■ 10, and ■ 12 valve size available in lugged style

Maximum Inlet Pressure(1)

Carbon Steel and Stainless Steel Valve Bodies: Consistent with CL150 and 300 pressure-temperature ratings per ASME B16.34 unless limited by material temperature capabilities

Maximum Pressure Drops(1)

Consistent with CL150 and 300 pressure-temperature ratings per ASME B16.34 except for Phoenix III seals which are derated at some higher pressure-temperature values. Refer to figure 6

Shutoff Classifications

■ **NOVEX Seal:** For NPS 3 through 12. Unidirectional shutoff is Class IV. See figure 2
■ **Phoenix III Seal:** For NPS 3 through 12. Bidirectional shutoff to Class VI per ANSI/FCI 70-2 and IEC 60534-4. See figure 2. For the optional Phoenix III Fire-Tested seal(2), consult your Emerson sales office.

Construction Materials

Refer to table 2 for standard material selections and component temperature ranges

Material Temperature Capabilities(1)

NOVEX Seal: -46 to 538°C (-50 to 1000°F)
Phoenix III: -46 to 232°C (-50 to 450°F)

Flow Characteristic

Approximately linear

Flow Direction

Refer to figure 7

Flow Coefficients

See table 1 and Fisher Catalog 12

Flow Coefficient Ratio(3)

100 to 1

Noise Levels

See Catalog 12 for sound pressure level prediction

Disk Rotation

Clockwise to close (when viewing from the drive shaft end) through 90 degrees of disk rotation

Actuator/ Valve Action

With a diaphragm or piston rotary actuator, the valve action is field-reversible. Refer to information provided in the Installation section and figure 7

Valve Classification

Face-to-face dimensions of NPS 3 through 12 valves in CL150 or 300, meets API 609 or MSS-SP68 standards for face-to-face dimensions of lugged valves (see figure 4)

Mating Flange Capabilities

All sizes compatible with CL150 and 300 flanges (schedule 80 or lighter, see figure 4, Dimension M)

Shaft Diameters

See figure 4

ENVIRO-SEAL Packing

This optional ■ PTFE or ■ graphite packing system provides improved sealing, guiding, and transmission of loading force to control liquid and gas emissions (see figure 3). See Bulletin 59.3:041 ENVIRO-SEAL Packing Systems for Rotary Valves (D101638X012)for more information.

1. The pressure-temperature limits in this bulletin and any applicable standard or code limitation should not be exceeded.
2. For component selection and applicable fire-tested standards and codes, consult your Emerson sales office (see table 2).
3. Ratio of maximum flow coefficient to minimum usable flow coefficient.

Installation

It is recommended that the valve drive shaft be mounted in a horizontal position as shown in the figures on page 1. Operating conditions may require specific valve/actuator fail action, styles, positions and flow direction. Valves with NOVEX seal rings require mounting in the reverse flow direction. Refer to figure 7. Large valve/actuator assemblies may require additional support because of their combined weight.

Fail Action: For actuators with spring returns, spring fail action is available for push-down-to-open or push-down-to-close valve action. The valve action is field reversible.

For assistance in selecting the valve/actuator mounting suited to your application, consult your Emerson sales office.

Dimensions for lugged valves are shown in figure 4.

Table 1. Flow Coefficients(1)

VALVE SIZE, NPS	C_v FORWARD FLOW WITH DISK WIDE OPEN (90 DEGREES ROTATION)	
	CL150	CL300
3	237	237
4	499	488
6	1250	1110
8	2180	2070
10	3600	3480
12	5400	5130

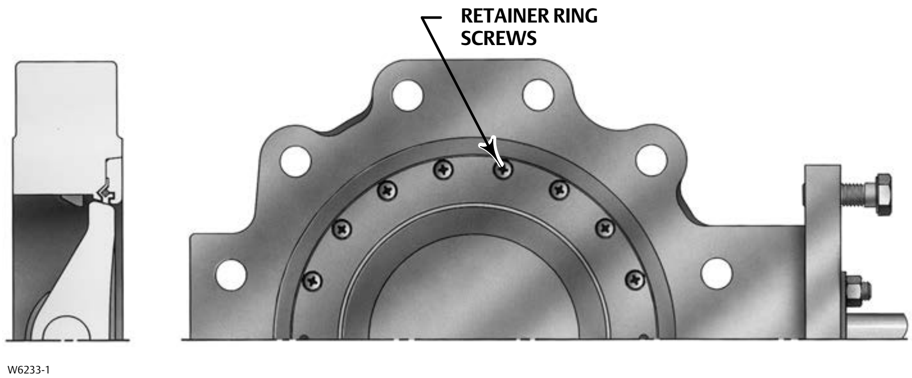
1. See Fisher Catalog 12 for a complete listing of flow coefficients.

Table 2. Construction Material Temperature Limits

COMPONENTS AND MATERIALS OF CONSTRUCTION	TEMPERATURE LIMITS	
	°C	°F
Valve Body Material		
Carbon Steel	-29 to 427	-20 to 800
CF8M	-198 to 538	-325 to 1000
Disk Material		
CF8M	-198 to 538	-325 to 1000
Shaft Material		
S20910	-198 to 538	-325 to 1000
S17400	-62 to 427	-80 to 800
Bearing Material		
PEEK / PTFE lined	-73 to 260	-100 to 500
Metal	-198 to 538	-325 to 1000
Packing Material		
PTFE V-Rings	-46 to 232	-50 to 450
Graphite rings	-198 to 538	-325 to 1000
Seal Ring		
NOVEX Metal Seal Ring	-46 to 538	-50 to 1000
Phoenix III Metal Seal Ring Fluorocarbon backup ring	-40 to 232	-40 to 450
Phoenix III Fire-Tested(1) Metal Seal Ring Fluorocarbon backup ring (Specify metal bearings and graphite packing)	-40 to 232	-40 to 450

1. For component selection and applicable fire-tested standards and codes, consult your Emerson sales office.

Figure 1. Typical Valve Construction



LUGGED STYLE

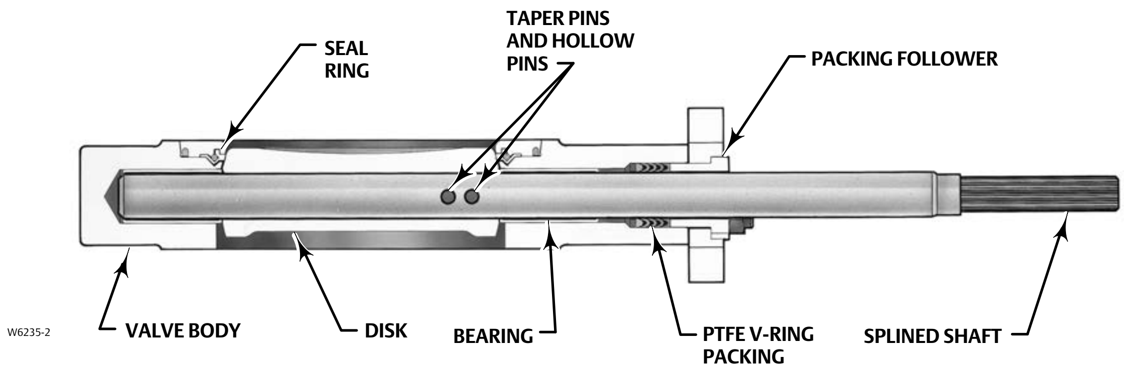


Figure 2. Available Seal Configuration

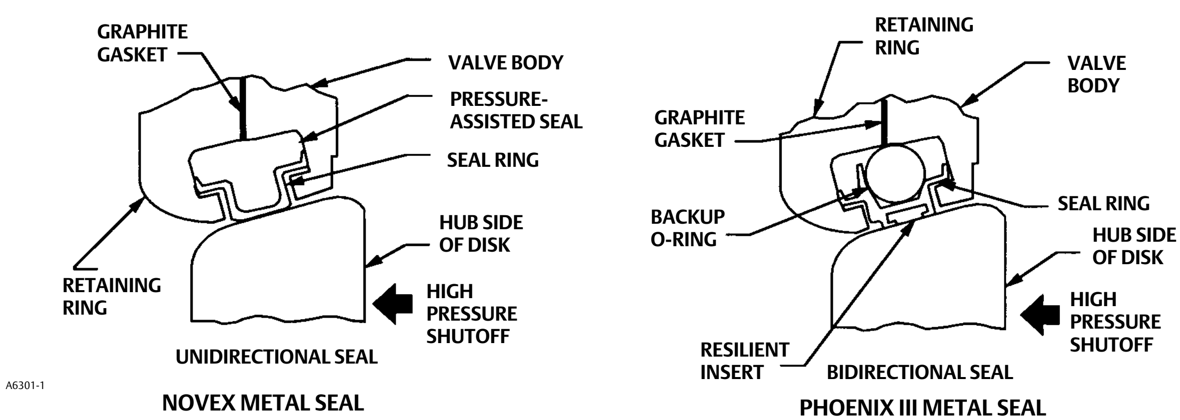
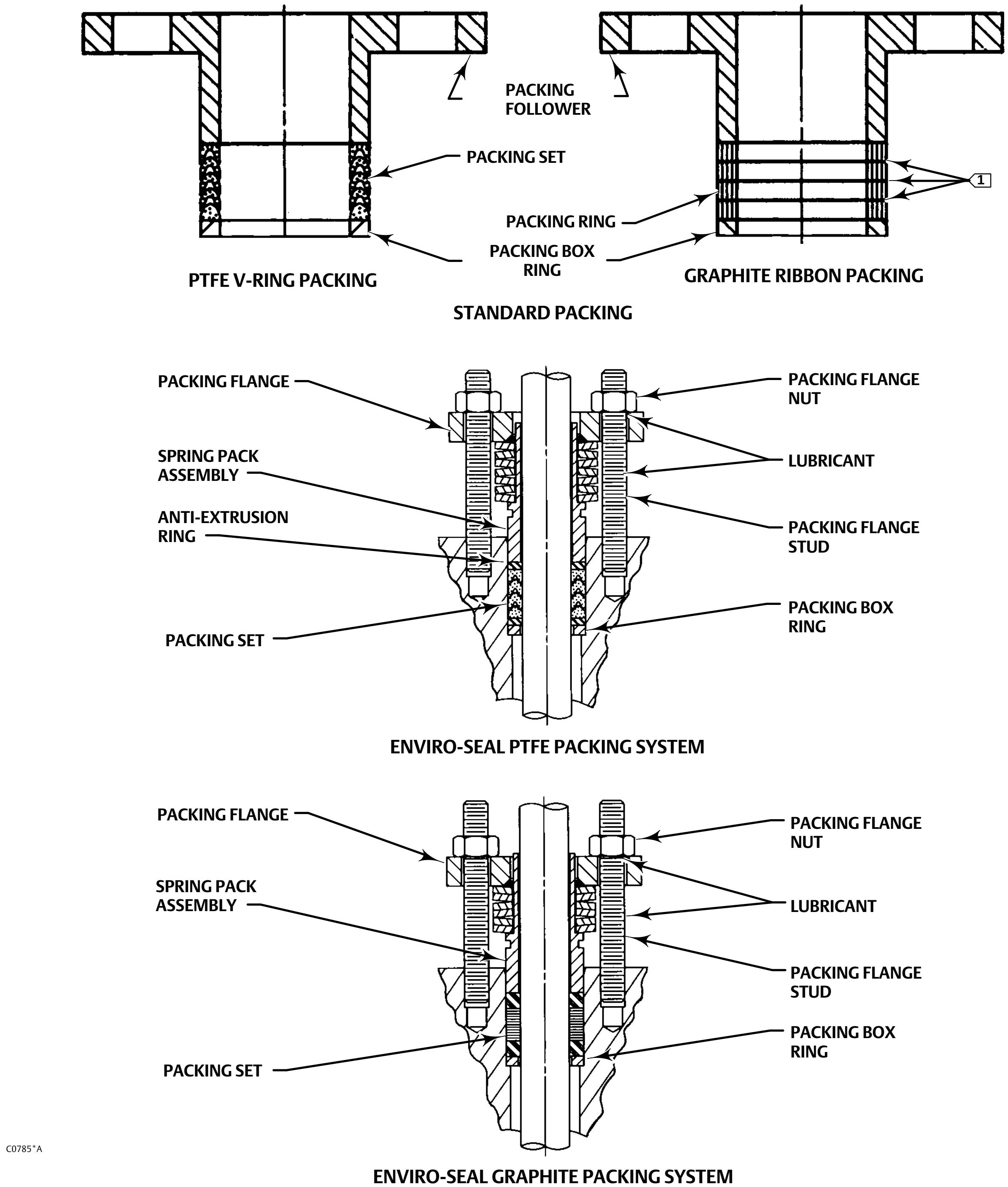


Figure 3. Typical Packing Arrangement



Note:
1 Includes zinc washers for graphite ribbon packing only.

Table 3. CL150 Valve Dimensions

Valve Size, NPS	A	E	G	K	M(2)	R	S(1)	T	U	W	Y
mm											
3	48	188	79	121	73	189	12.7	117	- - -	See thread information below	See thread information below
4	54	188	102	143	97	219	15.9	117	- - -		
6	57	214	129	172	146	273	19.1	152	32		
8	64	214	157	200	191	333	25.4	152	32		
10	71	208	198	254	238	406	31.8	235	46		
12	81	208	230	279	284	476	38.1	235	46		
Inches											
3	1.88	7.38	3.12	4.00	2.88	7.44	1/2	4.62	- - -	1/2-13	5/8-11 4-holes
4	2.12	7.38	4.00	5.62	3.81	8.62	5/8	4.62	- - -	1/2-13	5/8-11 8-holes
6	2.25	8.44	5.06	6.75	5.75	10.75	3/4	6.00	1.25	1/2-13	3/4-10 8-holes
8	2.50	8.44	6.19	7.88	7.50	13.12	1	6.00	1.25	1/2-13	3/4-10 8-holes
10	2.81	8.19	7.81	10.00	9.38	16.00	1-1/4	9.25	1.81	5/8-11	7/8-9 12-holes
12	3.19	8.19	9.06	11.00	11.19	18.75	1-1/2	9.25	1.81	5/8-11	7/8-9 12-holes

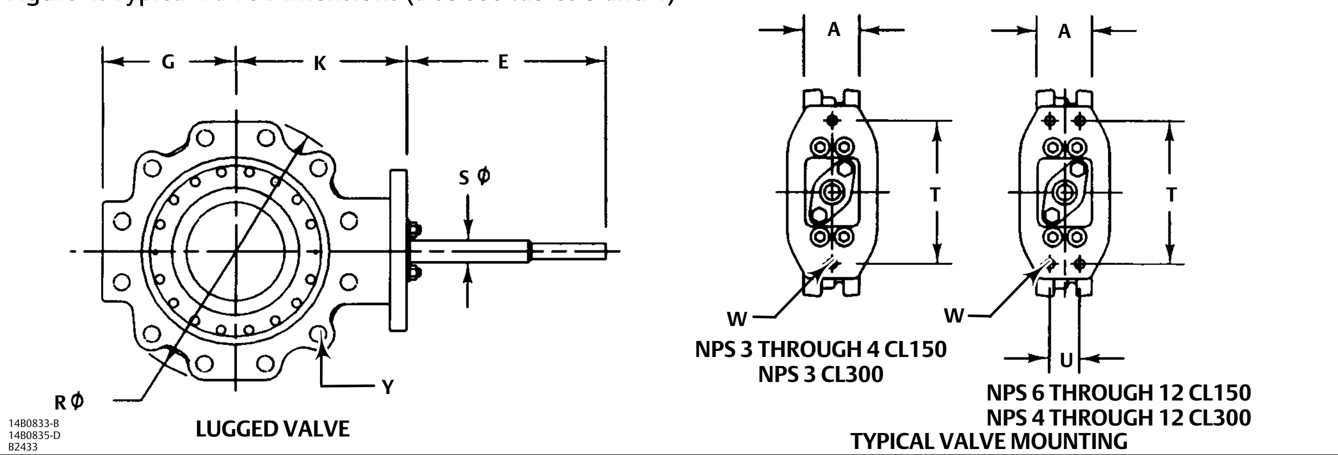
1. This nominal valve shaft diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.
2. Disk chordal swing diameter at valve face. Please verify with piping.

Table 4. CL300 Valve Dimensions

Valve Size, NPS	A	E	G	K	M(2)	R	S(1)	T	U	W	Y
mm											
3	48	188	95	137	73	206	15.9	117	- - -	See thread information below	See thread information below
4	54	214	121	165	97	238	19.1	152	32		
6	59	214	152	197	146	308	25.4	152	32		
8	73	208	183	235	188	375	31.8	235	46		
10	83	208	229	268	233	438	38.1	235	46		
12	92	365	308	308	278	508	44.5	273	51	21	
Inches											
3	1.88	7.38	3.75	5.38	2.88	8.12	5/8	4.62	- - -	1/2-13	3/4-10 8-holes
4	2.12	8.44	4.75	6.50	3.81	9.38	3/4	6.00	1.25	1/2-13	3/4-10 8-holes
6	2.31	8.44	6.00	7.75	5.69	12.12	1	6.00	1.25	1/2-13	3/4-10 12-holes
8	2.88	8.19	7.19	9.25	7.38	14.75	1-1/4	9.25	1.81	5/8-11	7/8-9 12-holes
10	3.25	8.19	9.00	10.56	9.19	17.25	1-1/2	9.25	1.81	5/8-11	1-8 16-holes
12	3.61	14.00	12.12	12.12	10.94	20.00	1-3/4	10.75	2.00	0.82	1-1/8-8 16-holes

1. This nominal valve shaft diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.
2. Disk chordal swing diameter at valve face. Please verify with piping.

Figure 4. Typical Valve Dimensions (also see tables 3 and 4)



Note:
Disk chordal swing diameter at valve face is M. Please verify clearance with piping.

Table 5. CL150 Valve Dimensions

Valve Size, NPS	A	E	G	K	M(2)	R	S(1)	Flat Size	Flat Length	T	U	W	Y
mm													
3	48	83	79	121	73	189	12.7	9.50	25.4	83	19	See thread information below	See thread information below
4	54	83	102	124	97	219	15.9	11.07	25.4	83	19		
6	57	83	129	152	146	273	19.1	14.25	25.4	95	25		
8	64	83	157	181	191	333	25.4	17.45	25.4	95	25		
10	71	89	198	229	238	406	31.8	20.60	25.4	133	38		
12	81	89	230	254	284	476	38.1	25.37	38.1	133	38		
Inches													
3	1.88	3.25	3.12	4.00	2.88	7.44	1/2	0.374	1	3.25	0.75	3/8-16	5/8-11 4-holes
4	2.12	3.25	4.00	4.88	3.81	8.62	5/8	0.436	1	3.25	0.75	3/8-16	5/8-11 8-holes
6	2.25	3.25	5.06	6.00	5.75	10.75	3/4	0.561	1	3.75	1.00	1/2-13	3/4-10 8-holes
8	2.50	3.25	6.19	7.12	7.50	13.12	1	0.687	1	3.75	1.00	1/2-13	3/4-10 8-holes
10	2.81	3.50	7.81	9.00	9.38	16.00	1-1/4	0.811	1	5.25	1.50	5/8-11	7/8-9 12-holes
12	3.19	3.50	9.06	10.00	11.19	18.75	1-1/2	0.999	1.5	5.25	1.50	5/8-11	7/8-9 12-holes

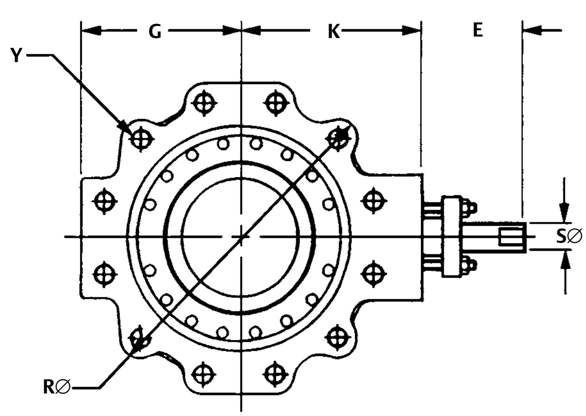
1. This nominal valve shaft diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.
2. Disk chordal swing diameter at valve face. Please verify clearance with piping.

Table 6. CL300 Valve Dimensions

Valve Size, NPS	A	E	G	K	M(2)	R	S(1)	Flat Size	Flat Length	T	U	W	Y
mm													
3	48	83	95	119	73	206	15.7	11.07	25.4	83	19	See thread information below	See thread information below
4	54	83	121	146	97	238	19.0	14.25	25.4	95	25		
6	59	83	152	178	145	308	25.4	17.45	25.4	95	25		
8	73	89	183	210	188	375	31.8	20.60	25.4	133	38		
10	83	89	229	243	233	438	38.1	25.37	38.1	133	38		
12	92	89	308	279	278	508	44.4	28.55	38.1	146	38		
Inches													
3	1.88	3.25	3.75	4.69	2.88	8.12	5/8	0.436	1	3.25	0.75	3/8-16	3/4-10 8-holes
4	2.12	3.25	4.75	5.75	3.81	9.38	3/4	0.561	1	3.75	1.00	1/2-13	3/4-10 8-holes
6	2.31	3.25	6.00	7.00	5.69	12.12	1	0.687	1	3.75	1.00	1/2-13	3/4-10 12-holes
8	2.88	3.50	7.19	8.25	7.38	14.75	1-1/4	0.811	1	5.25	1.50	5/8-11	7/8-9 12-holes
10	3.25	3.50	9.00	9.56	9.19	17.25	1-1/2	0.999	1.5	5.25	1.50	5/8-11	1-8 16-holes
12	3.62	3.50	12.12	11.00	10.94	20.00	1-3/4	1.124	1.5	5.75	1.50	3/4-10	1 1/8-8 16-holes

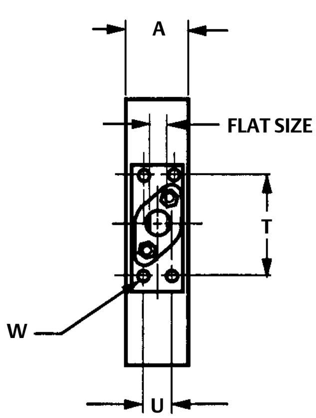
1. This nominal valve shaft diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.
2. Disk chordal swing diameter at valve face. Please verify clearance with piping.

Figure 5. Typical Valve Dimensions with Double D Shaft (also see tables 5 and 6)



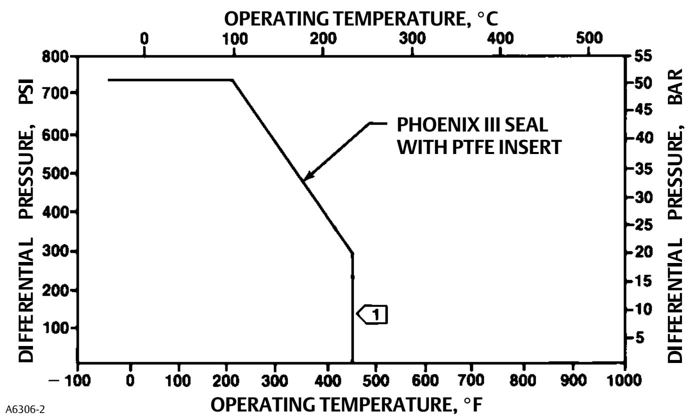
14B0818-D
14B0829-D
14B0830-D
B2437-2

LUGGED VALVE



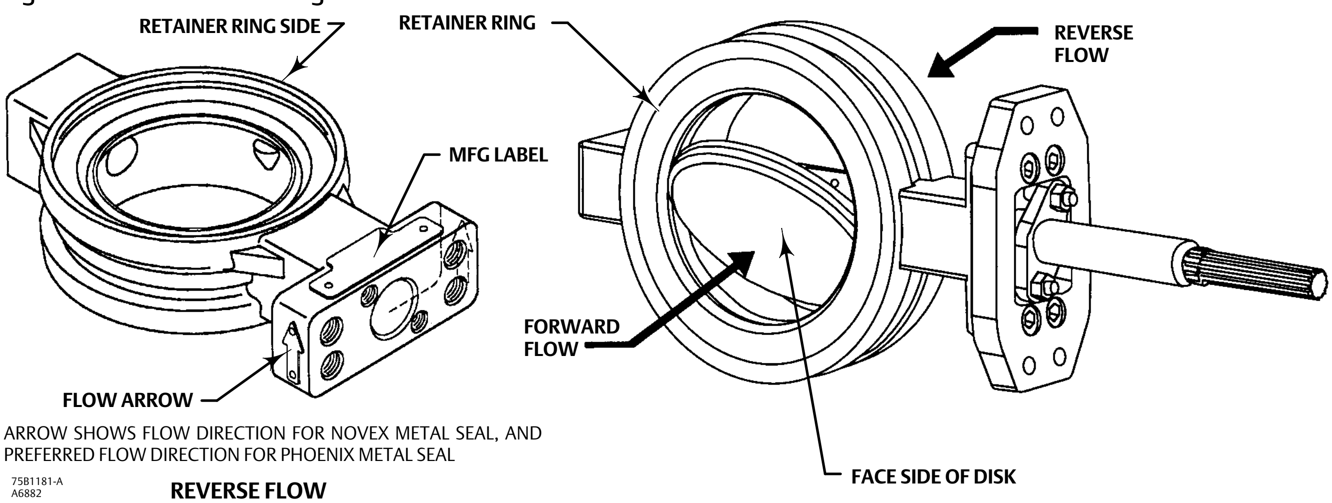
TYPICAL VALVE MOUNTING

Figure 6. Maximum Pressure-Temperature Ratings



Note:
1 Temperature limitations do not account for the additional limitations imposed by the backup ring used with this seal. To determine the effective temperature limitation of the appropriate seal/backup ring combination, refer to table 2.

Figure 7. Actuator Mounting



ARROW SHOWS FLOW DIRECTION FOR NOVEX METAL SEAL, AND PREFERRED FLOW DIRECTION FOR PHOENIX METAL SEAL

75B1181-A
A6882

REVERSE FLOW

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

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EMERSON

Fisher™ 8580 Rotary Valve

The Fisher 8580 rotary valve offers excellent throttling and automated on-off, quarter-turn performance. An approximately linear flow characteristic provides precise throttling control. The 8580 valve offers high cycle life and rugged reliability.

The valve body meets PN 10 through PN 40, CL150, and CL300 ratings. Face-to-face dimensions meet EN 558, API 609, and MSS-SP68 standards. Line centering clips provide for versatility to mount and align the same wafer style valve body in different piping configurations (ASME and EN ratings).

The 8580 rotary valve features an eccentrically-mounted disk with either soft or metal seal, providing capability for enhanced shutoff. The interchangeable sealing technology allows for the same valve body to accept both soft and metal seals.

W9498-3

LUGGED STYLE
(NPS 3 through NPS 12)

X1426

DOUBLE FLANGED STYLE
(NPS 3 through NPS 12)

8580 Features

- Approximately linear flow characteristic -- An approximately linear flow characteristic provides precise throttling control.
- Global Standards -- The valve is based on API, ASME, and EN standards, making it suitable for use in all world areas. An optional mounting bracket provides ISO 5211 actuator mounting capability.
- PEEK/PTFE bearing as standard -- The PTFE-lined PEEK bearing is a low friction, low wear bearing. It allows the valve to operate under high pressure drops for a high cycle life while maintaining low torque. The “drop-in” bearing design enables fast, easy maintenance.
- Spline-ended Shaft -- The splined shaft with clamped lever and single-pivot linkage reduces lost motion between the actuator and the valve shaft.
- Application Versatility -- Optional square shaft is ideal for on/off applications and allows actuator selection flexibility. Standard construction materials and seal assemblies provide long life and superior performance in a broad range of liquid and gas applications.

- **Excellent Shutoff --** Both the metal and soft seal rings have pressure-assisting sealing action that ensures tight shutoff regardless of pressure drop.

- **Improved shaft-disk pinning --** The improved expansion pin system ensures there is a positive, durable connection between disk and shaft. This connection reduces backlash and wear in the drive system, optimizing long-term performance. It also makes disassembly for maintenance quick and simple with no need for special tools.

- **New Spring-Loaded Shaft --** The spring in the outboard shaft provides support to the drive train and disk, enabling the shaft to be installed in both horizontal and vertical orientations with no detriment to performance or cycle life. This complements the ability to mount the actuator on the left- or right-hand side, enabling access for any installation.

- **Excellent Emissions Capabilities --** The optional ENVIRO-SEAL™ packing systems, are designed with very smooth shaft surfaces and live-loading to provide improved sealing, guiding, and loading force transmission. The seal of the ENVIRO-SEAL system can control emissions to below 100 ppm (parts per million).

- **Sour Service Capability --** Trim and bolting materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0103, and MR0175 / ISO 15156.

- **Field-Reversible Valve Action --** The actuator/valve assembly action can be converted from push-down-to-open to push-down-to-close, or vice versa, without additional parts.

- **Easy Installation --** Line-centering clips engage the line flange bolts to simplify installation and provide for centering of wafer-style valves in the pipeline. End connections are compatible with EN and ASME standards.

- **Long Seal Life --** The opening and closing path of the eccentric disk minimizes disk contact with the seal ring, thereby reducing seal wear, undue friction, and seating torque requirements. See figure 2.

- **Reliable Flange Gasketing Surface --** The seal retainer screws and retention clips are outside the gasket surface of the seal retainer. Spiral-wound or flat-sheet gaskets can be installed between the uninterrupted seal retainer face and the pipeline flange.

- **Integral Shaft-to-Valve Body Bonding --** Standard valve construction includes conductive packing to provide electrical bonding for hazardous area applications.

- **Powder paint as standard --** The Emerson powder paint finish offers an excellent corrosion-resistant finish to all steel parts.

- **High Temperature Capability --** The valve will operate at elevated temperatures, with the appropriate trim components.

- **Shaft Retention --** Redundant shaft retention provides added protection. The packing follower, anti-blowout ring, and shaft groove interact to hold the shaft securely in the valve body (see figure 1).

- **Travel Indication --** Additional travel indication can be achieved by using the indication line on the shaft, along with the disk position markings on the packing follower (see figure 4).

Table of Contents

8580 Valve Specifications and Materials of Construction

Table 1. Fisher 8580 Valve Specifications

Specifications		EN	ASME
Valve Body Size		DN 50, 80, 100, 150, 200, 250, and 300	NPS 2, 3, 4, 6, 8, 10, and 12
Pressure Rating		PN 10 to 40	CL150 / 300, CL150-600 for NPS 2
Valve Body Materials		EN 1.0619 steel	WCC steel
		EN 1.4409 stainless steel	CF3M (316L) stainless steel
		LCC	LCC
		CW2M(1)	CW2M(1)
		M35-2(2)	M35-2
Disk Materials	PTFE or RPTFE(4) Seal	EN 1.4409 stainless steel	CF3M stainless steel
		CW2M	CW2M
		M35-2	M35-2
	Metal or UHMWPE(3) Seal	Chrome-plated EN 1.4409 Stainless Steel	Chrome-plated CF3M Stainless Steel
		Chrome-carbide EN 1.4409 Stainless Steel	Chrome-carbide CF3M Stainless Steel
End Connections(5)		Mates with raised-face flanges per EN 1092-1	Mates with raised-face flanges per ASME B16.5
Valve Body Style		Lugged with tapped or through holes, Double-Flange with through holes, and Wafer (for select sizes)	
Face-to-Face Dimensions		Meets MSS SP68, API 609, and EN 558 standards	
Shutoff		PTFE, RPTFE, or UHMWPE seal ring - Class VI per ANSI/FCI 70-2 and IEC 60534-4	
		S31600 (316 SST) seal ring - Class IV per ANSI/FCI 70-2 and IEC 60534-4	
Flow Coefficients		See Fisher Catalog 12	
Flow Direction		Standard (forward flow) is with the seal retainer facing upstream; reverse flow is permissible for soft seals only	
Flow Characteristic		Approximately linear	
Disk Rotation		Counterclockwise to open (when viewed from actuator side of valve body) through 90 degrees of disk rotation	
Shaft Diameters and Approximate Weights		See table 7	

1. This material is not listed in EN 12516-1 or ASME B16.34. See figure 6 for pressure/temperature ratings.
2. This material is not listed in EN 12516-1. See figure 6 for pressure/temperature ratings.
3. UHMWPE stands for ultra high molecular weight polyethylene.
4. RPTFE is a reinforced PTFE seal.
5. Valve is designed to be installed between two pipe flanges. Valve has not been designed for dead-end service.

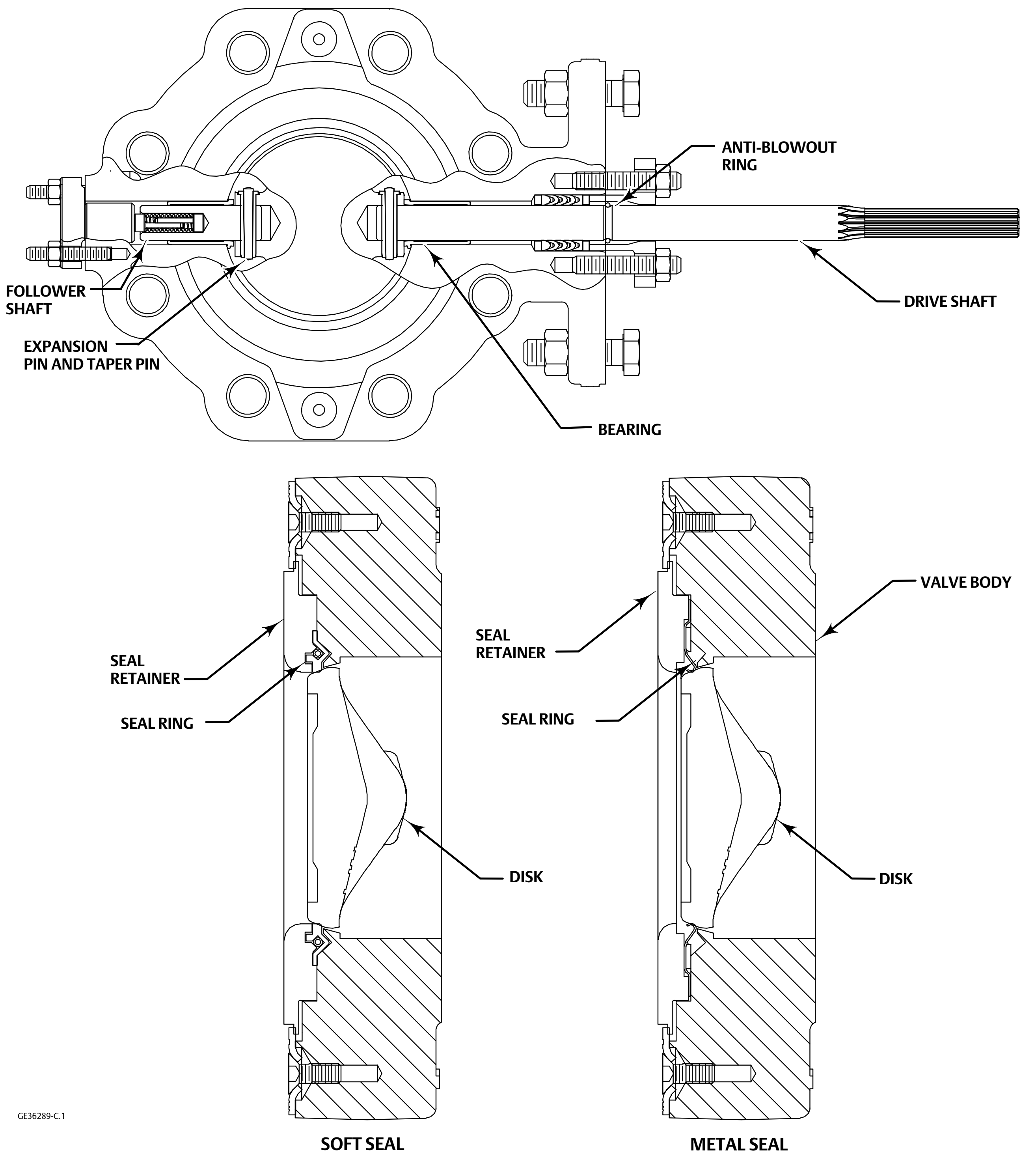
Table 2. Materials (Other Valve Components)

Component	Material
Shafts and Pins	S17400 (17-4PH) stainless steel, S20910 (XM-19) stainless steel, N10276, N05500
Anti-blowout Ring	N07718
Seal	PTFE, RPTFE, or UHMWPE with S31600 (316 stainless steel) or R30003 spring. Metal seal is 316 stainless steel with graphite gaskets
Bearings	PEEK/PTFE, R30006 (Alloy 6), S31600 Nitride
Packing	PTFE/carbon-filled PTFE (standard), graphite die-molded ribbon, ENVIRO-SEAL PTFE packing, ENVIRO-SEAL graphite packing
Follower Spring	N07718 with carbon-filled PEEK or S31600 spring seats
Bolting	B8M Class 2, B7M, N05500, N07718
Nuts	8M, 2HM, N04400, N10276

Table 3. Trim Combinations with Standard Construction Materials

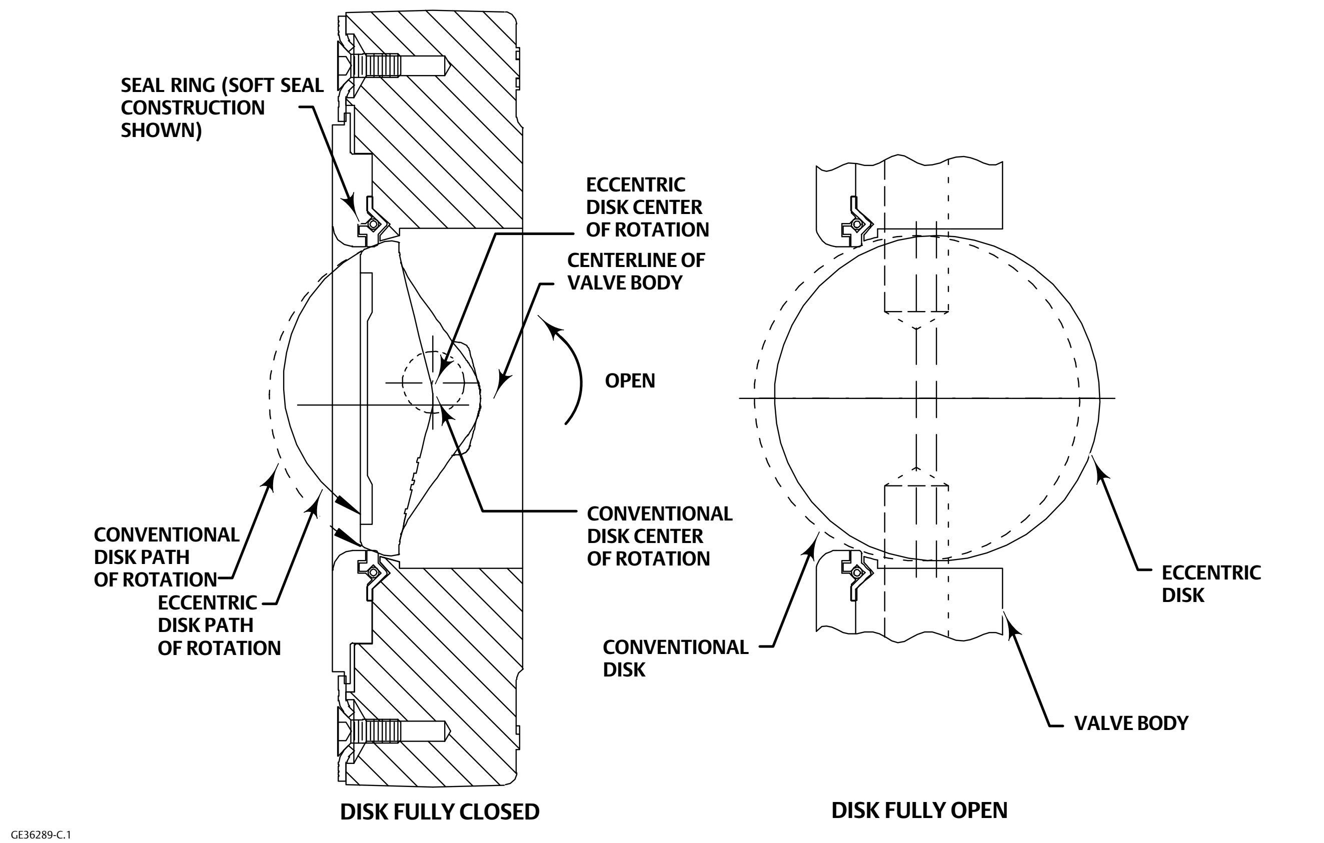
Valve Body Material	Shaft Material	Disk Material	Bearings	Seal Material
1.0619 & WCC	S17400 H1075	1.4409 & CF3M	PEEK/PTFE	PTFE or RPTFE
		1.4409 & CF3M Chrome-Plated	PEEK/PTFE	UHMWPE or Metal
			Alloy 6 or S31600 Nitride	Metal
LCC	S17400 H1075	1.4409 & CF3M	PEEK/PTFE	PTFE
1.4409 & CF3M	S20910	1.4409 & CF3M	PEEK/PTFE	PTFE or RPTFE
		1.4409 & CF3M Chrome-Plated, 1.4409 & CF3M Chrome-Carbide	PEEK/PTFE	UHMWPE or Metal
			Alloy 6 or S31600 Nitride	Metal
CW2M	N10276	CW2M	PEEK/PTFE	PTFE or RPTFE
M35-2	N05500	M35-2	PEEK/PTFE	PTFE or RPTFE

Figure 1. Typical Fisher 8580 Valve Construction Detail



Note: Split shaft construction shown. Size NPS 8 through NPS 12 are thru-shaft.

Figure 2. Comparison of Disk Action



Note: Split shaft construction shown.

Figure 3. Available Seal Configuration

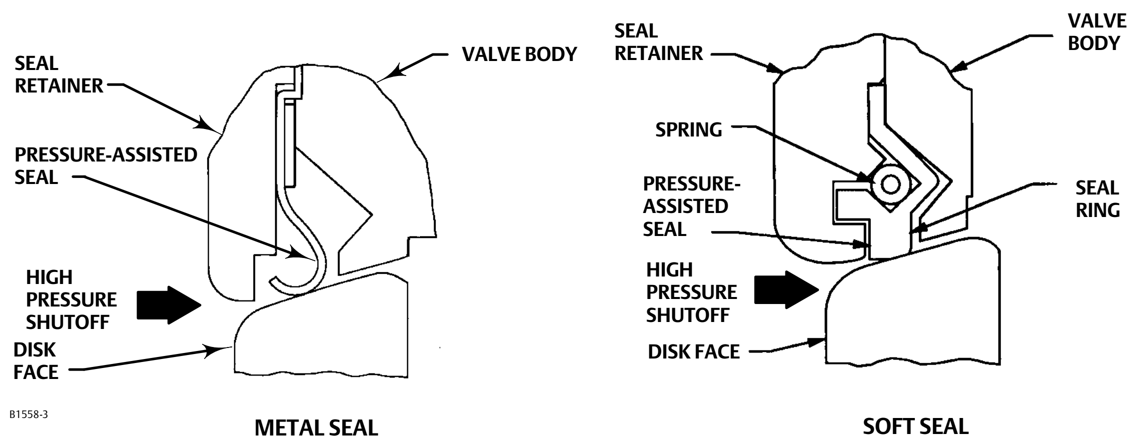


Figure 4. Travel Indication

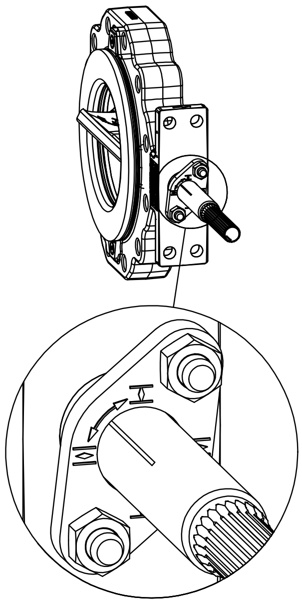
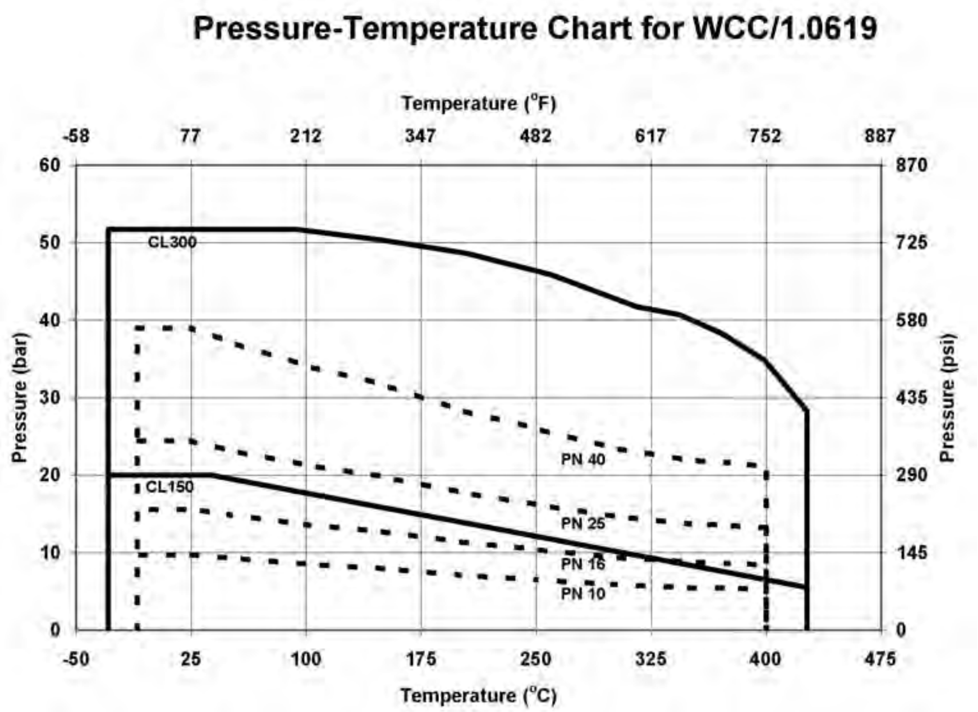


Table 4. Material Temperature Capabilities

MATERIAL					TEMPERATURE LIMITS	
PN FLANGES						
Valve Body	**Shaft**	**Bearing Lining and Jacket**	**Seal**	**Packing**	**°C**	**°F**
1.0619 Steel	S17400 or S20910	PEEK / PTFE	PTFE or RPTFE	PTFE or Graphite	−10 to 232	14 to 450
			UHMWPE	PTFE or Graphite	−10 to 93	14 to 200
			Metal or Flow Ring	PTFE	−10 to 232	14 to 450
				Graphite	−10 to 260	14 to 500
		R30006 (Alloy 6) or S31600 Nitride	Metal or Flow Ring	Graphite	−10 to 400	14 to 752
LCC	S17400 or S20910	PEEK / PTFE	PTFE	PTFE	−46 to 232	−50 to 450
1.4409 Stainless Steel	S20910	PEEK / PTFE	PTFE or RPTFE	PTFE or Graphite	−46 to 232	−50 to 450
			UHMWPE	PTFE or Graphite	−18 to 93	0 to 200
			Metal or Flow Ring	PTFE	−46 to 232	−50 to 450
				Graphite	−46 to 260	−50 to 500
		R30006 (Alloy 6) or S31600 Nitride	Metal or Flow Ring	Graphite	−10 to 500(1)	14 to 932(1)
CW2M	N10276	PEEK / PTFE	PTFE or RPTFE	PTFE	−10 to 232	14 to 450
M35-2	N05500	PEEK / PTFE	PTFE or RPTFE	PTFE	−10 to 232	14 to 450
ASME FLANGES						
Valve Body	**Shaft**	**Bearing Lining and Jacket**	**Seal**	**Packing**	**°C**	**°F**
WCC steel	S17400 or S20910	PEEK / PTFE	PTFE or RPTFE	PTFE or Graphite	−29 to 232	-20 to 450
			UHMWPE	PTFE or Graphite	−18 to 93	0 to 200
			Metal or Flow Ring	PTFE	−29 to 232	-20 to 450
				Graphite	−29 to 260	-20 to 500
		R30006 (Alloy 6) or S31600 Nitride	Metal or Flow Ring	Graphite	−29 to 427	-20 to 800
LCC	S17400 or S20910	PEEK / PTFE	PTFE	PTFE	−46 to 232	−50 to 450
CF3M Stainless Steel	S20910	PEEK / PTFE	PTFE or RPTFE	PTFE or Graphite	−46 to 232	−50 to 450
			UHMWPE	PTFE or Graphite	−18 to 93	0 to 200
			Metal or Flow Ring	PTFE	−46 to 232	−50 to 450
				Graphite	−46 to 260	−50 to 500
		R30006 (Alloy 6) or S31600 Nitride	Metal or Flow Ring	Graphite	−46 to 454(1)	−50 to 850(1)
CW2M	N10276	PEEK / PTFE	PTFE or RPTFE	PTFE	−46 to 232	−50 to 450
M35-2	N05500	PEEK / PTFE	PTFE or RPTFE	PTFE	−46 to 232	−50 to 450

1. For applications exceeding 427°C (800°F), consult your Emerson sales office for appropriate disk edge coating material selection.

Figure 5. Material Pressure/Temperature Curves



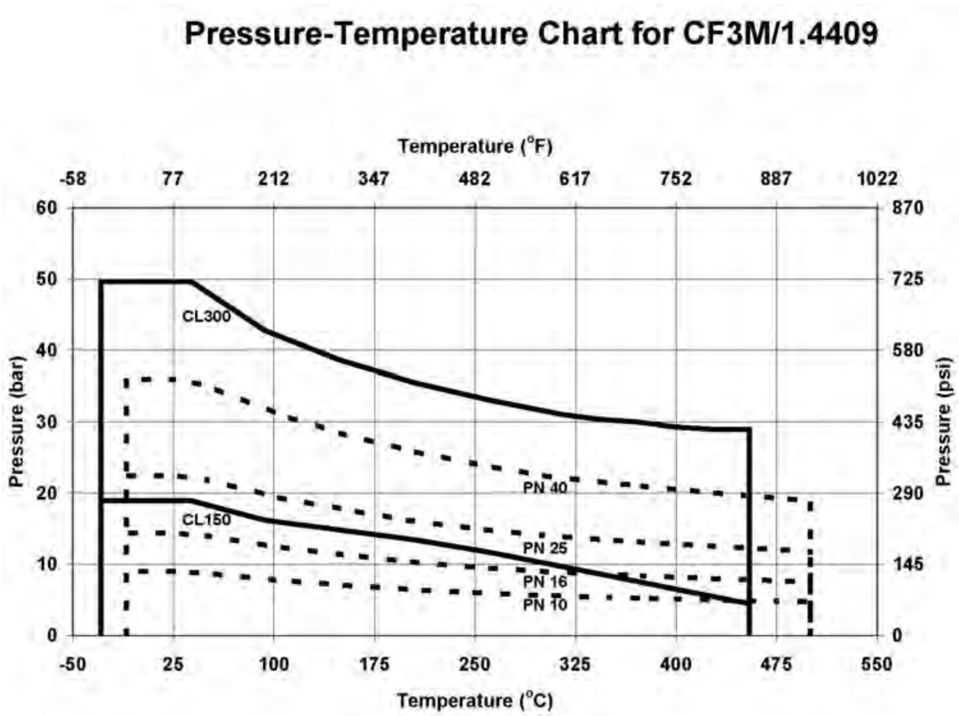
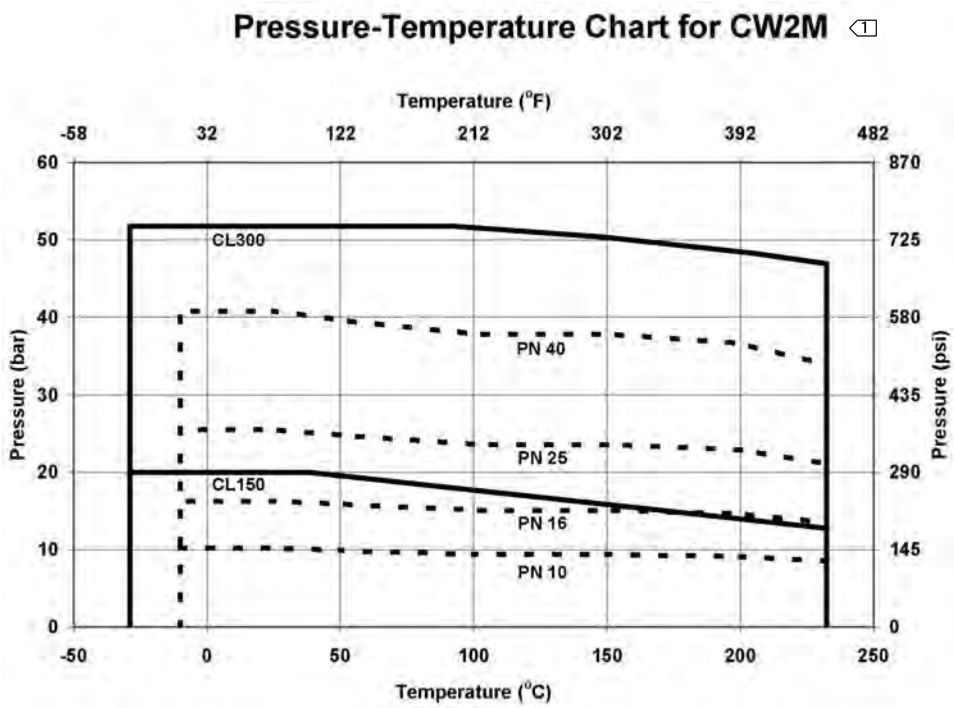
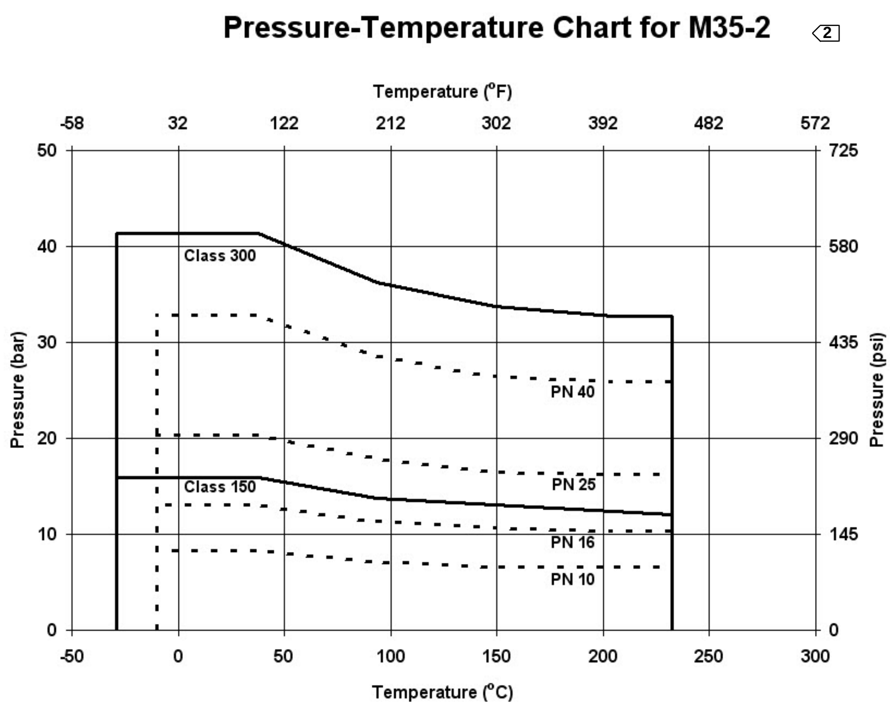


Figure 6. Material Pressure/Temperature Curves





1. CW2M is not listed in EN 12516-1 or ASME B16.34. The PN and CL designations are used only to indicate relative pressure-retaining capabilities.
2. M35-2 is not listed in EN 12516-1. The PN designations are used only to indicate relative pressure-retaining capabilities.

Figure 7. Material Pressure/Temperature Curves

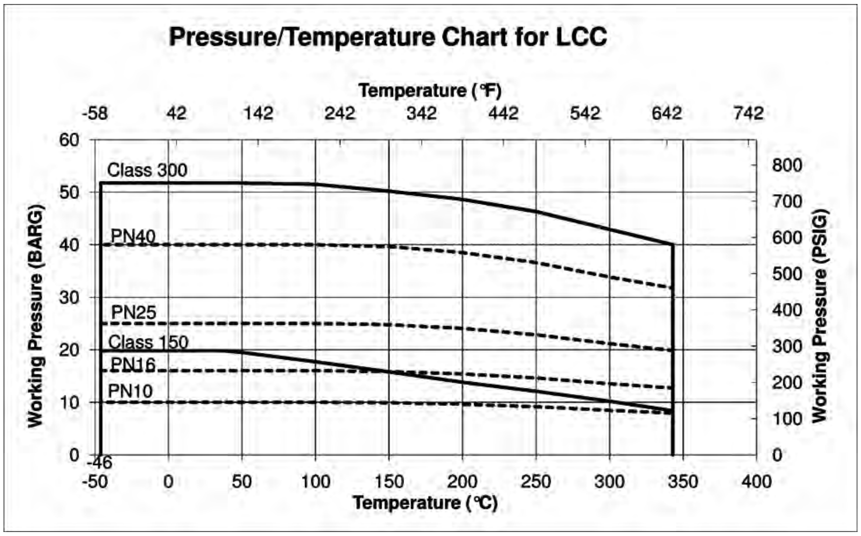


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Table 5. Maximum Allowable Shutoff Pressure Drops based on Trim (Seal, Shaft, and Bearings), Bar

Note: Do not exceed the EN12516-1 or ASME B16.34 pressure/temperature rating of the valve or mating flanges.

TRIM	TEMPERATURE, °C	DN 50	DN 80	DN 100	DN 150	DN 200	DN 250	DN 300
		Bar						
PTFE or RPTFE Seal PEEK/PTFE Bearings	-46 to 65	51.7	51.7	51.7	51.7	51.7	51.7	51.7
	93	48.5	48.5	48.5	48.5	48.5	45.6	46.8
	121	38.6	38.6	38.6	38.6	38.6	38.6	38.6
	149	28.7	28.7	28.7	28.7	28.7	28.7	28.7
	191	13.8	13.8	13.8	13.8	13.8	13.8	13.8
	204	10.3	10.3	10.3	10.3	10.3	10.3	10.3
	232	3.4	3.4	3.4	3.4	3.4	3.4	3.4
UHMWPE Seal PEEK/PTFE Bearings	-17 to 37	51.7	51.7	51.7	51.7	51.7	51.7	51.7
	66	38.6	38.6	38.6	38.6	38.6	38.6	38.6
	93	25.9	25.9	25.9	25.9	25.9	25.9	25.9
Metal Seal(1) Alloy 6 Bearings	-46 to 37	18.5	16.5	13.9	12.8	11.0	6.8	7.0
	93	17.0	15.1	12.8	11.7	10.1	6.3	6.5
	149	16.0	14.2	12.0	11.0	9.4	5.9	6.1
	204	15.1	13.4	11.4	10.4	9.0	5.6	5.7
	260	14.3	12.8	10.8	9.9	8.5	5.3	5.4
	316	13.8	12.3	10.3	9.5	8.2	5.1	5.2
	371	13.2	11.9	10.0	9.2	7.9	5.0	5.0
	427	12.5	11.6	9.8	9.0	7.7	4.8	5.0
	454	12.1	11.5	9.7	8.9	7.7	4.8	4.9
Metal Seal(1) S31600/Nitride Bearings, Spline Shaft	-46 to 37	19.5	28.2	26.1	20.8	31.0	15.5	8.0
	93	19.3	28.0	26.0	20.6	31.0	15.4	7.9
	149	17.0	25.4	23.7	18.7	28.8	14.0	7.1
	204	15.9	24.3	22.7	17.8	26.3	13.3	6.8
	260	14.5	22.9	21.4	16.8	24.6	12.5	6.3
	316	13.8	22.1	20.8	16.2	23.2	12.1	6.1
	371	13.2	21.5	20.2	15.7	22.4	11.8	5.9
	427	12.5	20.7	19.5	15.2	21.8	11.4	5.6
	454	12.1	20.3	19.2	14.9	21.6	11.2	5.4
Metal Seal(1) S31600/Nitride Bearings, Square Shaft	-46 to 37	19.5	22.4	26.1	20.8	27.6	12.8	8.0
	93	19.3	22.4	26.0	20.6	27.6	12.8	7.9
	149	17.0	22.4	23.7	18.7	27.6	12.8	7.1
	204	15.9	22.4	22.7	17.8	26.3	12.8	6.8
	260	14.5	22.4	21.4	16.8	24.6	12.5	6.3
	316	13.8	22.1	20.8	16.2	23.2	12.1	6.1
	371	13.2	21.5	20.2	15.7	22.4	11.8	5.9
	427	12.5	20.7	19.5	15.2	21.8	11.4	5.6
	454	12.1	20.3	19.2	14.9	21.6	11.2	5.4
Metal Seal(1) PEEK/PTFE Bearings	-46 to 37	51.7	51.7	51.7	51.7	31.0	17.2	17.2
	93	51.7	51.7	51.7	51.7	31.0	17.2	17.2
	149	50.3	50.3	50.3	50.3	31.0	17.2	17.2
	204	48.6	48.6	48.6	48.2	31.0	17.2	17.2
	232	47.2	47.2	46.3	42.6	31.0	17.2	17.2
	260	24.7	21.9	18.5	17.0	14.6	9.1	9.4
Flow Ring PEEK/PTFE Bearings	-46 to 37	51.7	51.7	51.7	51.7	51.7	45.5	46.8
	93	51.7	51.7	51.7	51.7	51.7	37.7	38.8
	149	50.3	50.3	50.3	50.3	50.3	31.7	32.6
	204	48.6	48.6	48.6	48.1	41.3	25.7	26.4
	232	47.2	47.2	46.3	42.6	36.6	22.8	23.4
	260	24.6	21.9	18.5	17	14.6	9.1	9.3
Flow Ring S31600/Nitride Bearings	-46 to 37	32	34.4	34.8	28.6	31.6	20.2	13
	93	31.8	34.4	34.6	28.5	31.6	19.7	12.9
	149	29.5	34.4	32.4	26.6	28.7	17.9	12.1
	204	28.5	34.4	31.3	25.7	26.3	16.4	11.7
	260	27.3	37.5	30.1	24.8	24.6	15.3	11.3
	316	26.6	35.5	29.5	24.2	23.2	14.4	11.1
	371	26.1	34.1	28.7	23.7	22.4	13.9	10.8
	427	25.4	28.9	27.9	23.2	21.7	13.5	10.6
	454	25	28.9	27.6	22.9	21.5	13.3	10.5

1. Pressure drops shown for metal seals are for forward flow only.

Table 6. Maximum Allowable Shutoff Pressure Drops based on Trim (Seal, Shaft, and Bearings), Psi

Note: Do not exceed the EN12516-1 or ASME B16.34 pressure/temperature rating of the valve or mating flanges.

TRIM	TEMPERATURE, °F	NPS						
		2	3	4	6	8	10	12
		Psi						
PTFE or RPTFE Seal PEEK/PTFE Bearings	-50 to 150	750	750	750	750	750	750	750
	200	704	704	704	704	704	662	679
	250	560	560	560	560	560	560	560
	300	416	416	416	416	416	416	416
	375	200	200	200	200	200	200	200
	400	150	150	150	150	150	150	150
	450	50	50	50	50	50	50	50
UHMWPE Seal PEEK/PTFE Bearings	0 to 100	750	750	750	750	750	750	750
	150	560	560	560	560	560	560	560
	200	375	375	375	375	375	375	375
Metal Seal(1) Alloy 6 Bearings	-50 to 100	268	239	202	185	159	99	102
	200	246	219	185	170	146	91	94
	300	232	206	174	160	137	86	88
	400	219	195	165	151	130	81	83
	500	208	186	157	144	124	77	79
	600	200	178	150	138	119	74	76
	700	192	172	145	134	115	72	73
	800	181	168	142	130	112	70	72
	850	176	167	141	129	111	69	71
Metal Seal(1) S31600/Nitride Bearings, Spline Shaft	-50 to 100	283	409	379	301	450	225	116
	200	280	406	377	299	450	223	115
	300	246	369	344	271	417	203	103
	400	230	352	329	258	382	193	98
	500	211	332	311	243	357	182	91
	600	200	321	301	235	337	176	88
	700	192	312	293	228	325	171	85
	800	181	300	283	220	316	165	81
	850	176	295	278	216	313	162	79
Metal Seal(1) S31600/Nitride Bearings, Square Shaft	-50 to 100	283	325	379	301	400	185	116
	200	280	325	377	299	400	185	115
	300	246	325	344	271	400	185	103
	400	230	325	329	258	382	185	98
	500	211	325	311	243	357	182	91
	600	200	321	301	235	337	176	88
	700	192	312	293	228	325	171	85
	800	181	300	283	220	316	165	81
	850	176	295	278	216	313	162	79
Metal Seal(1) PEEK/PTFE Bearings	-50 to 100	750	750	750	750	450	250	250
	200	750	750	750	750	450	250	250
	300	730	730	730	730	450	250	250
	400	705	705	705	699	450	250	250
	450	685	685	672	618	450	250	250
	500	358	318	269	247	212	132	136
Flow Ring PEEK/PTFE Bearings	-50 to 150	750	750	750	750	750	661	679
	200	750	750	750	750	750	548	563
	300	730	730	730	730	730	461	474
	400	705	705	705	699	600	374	384
	450	685	685	672	618	531	331	340
	500	358	318	269	247	212	132	136
Flow Ring S31600/Nitride Bearings	-50 to 150	465	499	505	416	459	293	189
	200	462	499	502	414	459	287	188
	300	429	499	470	387	417	260	176
	400	414	499	455	374	382	238	171
	500	397	545	438	360	357	222	165
	600	387	515	428	351	337	210	161
	700	379	496	417	345	325	202	158
	800	369	420	405	337	316	196	155
	850	364	420	401	333	313	194	153

1. Pressure drops shown for metal seals are for forward flow only.

Table 7. Dimensions and Weights

VALVE SIZE, PRESSURE RATING		A	E		F		G		K	R[4]	S[1]	T	U	W	APPROXIMATE WEIGHT[2]	
			Splined	Square Shaft	Wafer	Lugged	Wafer	Lugged							Wafer	Lugged
		mm													kg	
DN50/ NPS 2	PN10-40/ CL150-300	43	187.5	74	150	- - -	109	- - -	125	102	12.7	117	- - -	14	4.7	6.7
DN80/ NPS 3	PN10-40/ CL150-300	47/48 (3)	187.5	76	- - -	196	- - -	133	130	144	15.9	117	- - -	14	- - -	11.2
DN100/ NPS 4	PN10-40/ CL150-300	53	214.4	103	- - -	226	- - -	147	172	162	19.1	152	32	14	- - -	17.6
DN150/ NPS 6	PN10-40/ CL150-300	57	214.4	108	270[5]	300	147[5]	182	205	218	25.4	152	32	14	15.7[5]	26.5
DN200/ NPS 8	PN10-16/ CL150	61	208	107	- - -	342	- - -	225	258	278	31.8	235	46	18	- - -	40.9
	PN25-40	61	208	107	358[5]	364	225[5]	225	258	291	31.8	235	46	18	34.6[5]	46.7
	CL300	73														
DN250/ NPS 10	PN10-16/ CL150	69	208	109	- - -	395	- - -	250	270	331	31.8	235	46	18	- - -	50.7
	PN25-40	69	208	109	400[5]	450	265[5]	265	270	352	31.8	235	46	18	52.0[5]	79.4
	CL300	83														
DN300/ NPS 12	PN10-16/ CL150	78	208	114	- - -	467	- - -	309	304	381	38.1	235	46	18	- - -	98.6
	PN25-40	78	208	114	- - -	512	- - -	309	304	410	38.1	235	46	18	- - -	104.9
	CL300	92														
		Inches													lbs	
DN50/ NPS 2	PN10-40/ CL150-300	1.69	7.38	2.91	5.91	- - -	4.29	- - -	4.92	4.02	0.50	4.62	- - -	0.55	10	15
DN80/ NPS 3	PN10-40/ CL150-300	1.85/ 1.89 (3)	7.38	2.99	- - -	7.72	- - -	5.24	5.12	5.67	0.63	4.62	- - -	0.55	- - -	25
DN100/ NPS 4	PN10-40/ CL150-300	2.09	8.44	4.06	- - -	8.90	- - -	5.79	6.77	6.38	0.75	6.00	1.25	0.55	- - -	39
DN150/ NPS 6	PN10-40/ CL150-300	2.24	8.44	4.25	10.63[5]	11.81	5.79[5]	7.17	8.07	8.58	1.00	6.00	1.25	0.55	35[5]	58
DN200/ NPS 8	PN10-16/ CL150	2.40	8.19	4.21	- - -	13.46	- - -	8.86	10.16	10.96	1.25	9.25	1.81	0.71	- - -	90
	PN25-40	2.40	8.19	4.21	14.09[5]	14.33	8.86[5]	8.86	10.16	11.46	1.25	9.25	1.81	0.71	76[5]	103
	CL300	2.87														
DN250/ NPS 10	PN10-16/ CL150	2.72	8.19	4.29	- - -	15.55	- - -	9.84	10.63	13.03	1.25	9.25	1.81	0.71	- - -	112
	PN25-40	2.72	8.19	4.29	15.75[5]	17.72	10.43[5]	10.43	10.63	13.86	1.25	9.25	1.81	0.71	115[5]	175
	CL300	3.27														
DN300/ NPS 12	PN10-16/ CL150	3.07	8.19	4.49	- - -	18.39	- - -	12.17	11.97	15.00	1.50	9.25	1.81	0.71	- - -	217
	PN25-40	3.07	8.19	4.49	- - -	20.16	- - -	12.17	11.97	16.14	1.50	9.25	1.81	0.71	- - -	231
	CL300	3.62														

1. This nominal valve shaft diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.
2. Valve assembly only.
3. 48 mm for CL150 and CL300 lugged only.
4. Dimension shown is seal retainer OD. Diameter for serrated gasket surface may be smaller.
5. Values shown are for PN10-PN-40 or PN25-PN40 bodies only. Wafer bodies in this valve size are not available for CL150 and CL300 flanges.

Table 8. Line Bolting Dimensions

VALVE SIZE	Y					
	Pressure Rating					
	CL150	CL300	PN10	PN16	PN25	PN40
DN80 / NPS 3	4X 5/8-11	8X 3/4-10	8X M16X2			
DN100 / NPS 4	8X 5/8-11	8X 3/4-10	8X M16X2		8X M20X2.5	
DN150 / NPS 6	8X 3/4-10	12X 3/4-10	8X M20X2.5		8X M24X3(1)	
DN200 / NPS 8	8X 3/4-10	12X 7/8-9	8X M20X2.5	12X M20X2.5	12X M24X3	12X M27X3(1)
DN250 / NPS 10	12X 7/8-9	16X 1-8	12X M20X2.5	12X M24X3	12X M27X3	12X M30X3.5(1)
DN300 / NPS 12	12X 7/8-9	16X 1-1/8-8	12X M20X2.5	12X M24X3	16X M27X3	16X M30X3.5

1. Not available in lugged with threaded holes.

Figure 8. Dimensions for Fisher 8580, Lugged Valve

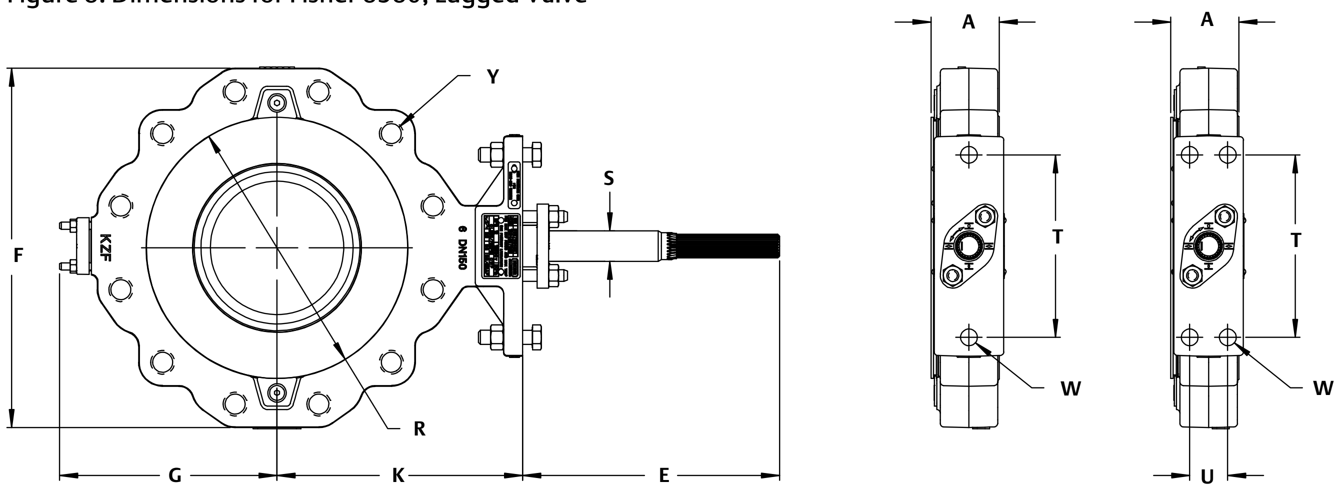


Figure 9. Dimensions for Fisher 8580, Wafer Style Valve (limited sizes)

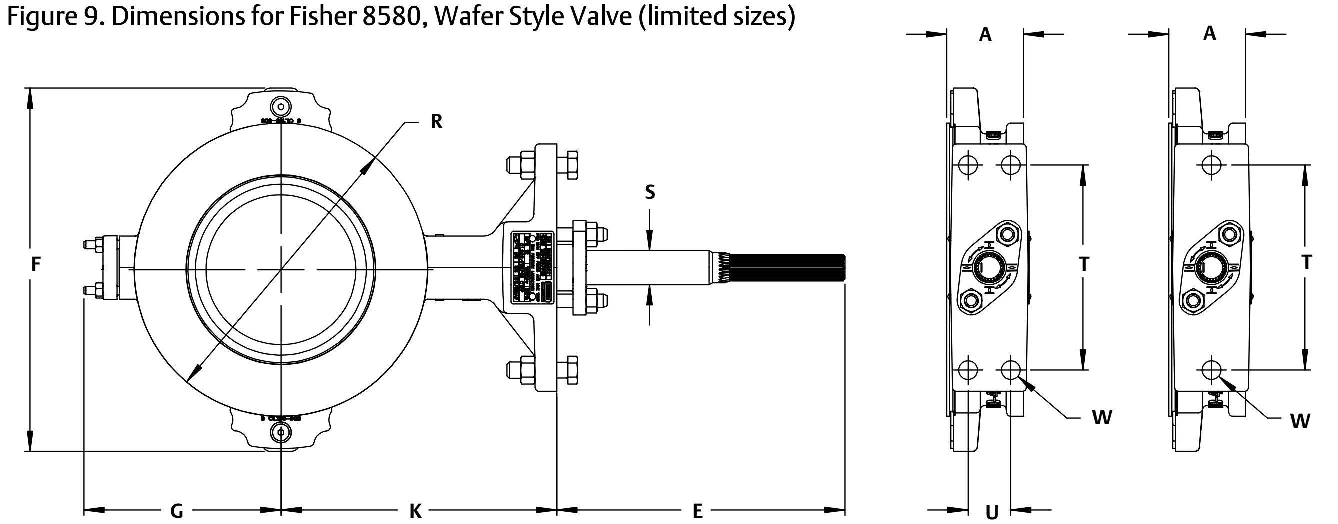
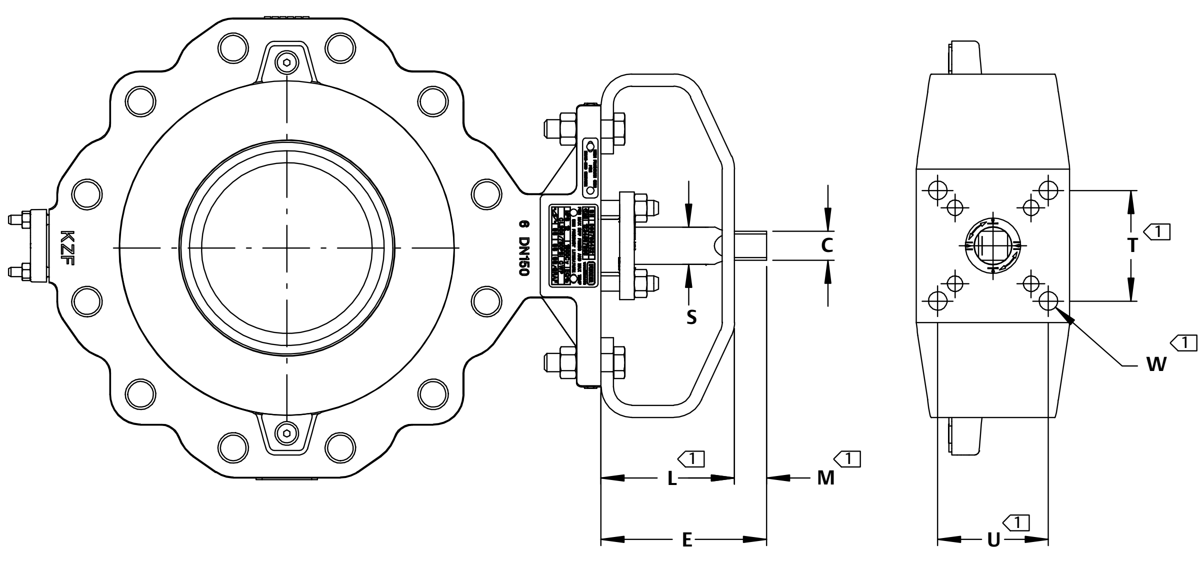


Table 9. Dimensions and Weights, Optional Square Shaft Mounting Bracket

VALVE SIZE	PRESSURE RATING	S(1) mm	S(1) inch	C mm	C inch	E mm	E inch	L mm	L inch	M mm	M inch	T mm	T inch	U mm	U inch	W mm	W inch	ISO 5211
DN50/ NPS 2	PN10-40/ CL150-300	12.7	0.50	9	0.35	74	2.91	64	2.52	10	0.39	49.50	1.95	49.50	1.95	10	0.39	F07
												72.12	2.84	72.12	2.84	12	0.47	F10
DN80/ NPS 3	PN10-40/ CL150-300	15.9	0.63	11	0.43	76	2.99	64	2.52	12	0.47	49.50	1.95	49.50	1.95	10	0.39	F07
												72.12	2.84	72.12	2.84	12	0.47	F10
DN100/ NPS 4	PN10-40/ CL150-300	19.1	0.75	14	0.55	103	4.06	87	3.43	16	0.63	49.50	1.95	49.50	1.95	10	0.39	F07
												72.12	2.84	72.12	2.84	12	0.47	F10
												88.39	3.48	88..39	3.48	14	0.55	F12
DN150/ NPS 6	PN10-40/ CL150-300	25.4	1.00	19	0.75	108	4.25	87	3.43	21	0.82	49.50	1.95	49.50	1.95	10	0.39	F07
												72.12	2.84	72.12	2.84	12	0.47	F10
												88.39	3.48	88.39	3.48	14	0.55	F12
												99.00	3.90	99.00	3.90	18	0.71	F14
												116.67	4.59	116.67	4.59	22	0.87	F16
DN200/ NPS 8	PN10-16/ CL150	31.8	1.25	22	0.87	107	4.21	85	3.35	22	0.87	72.12	2.84	72.12	2.84	12	0.47	F10
												88.39	3.48	88.39	3.48	14	0.55	F12
	PN25-40/ CL300	31.8	1.25	22	0.87	107	4.21	85	3.35	22	0.87	99.00	3.90	99.00	3.90	18	0.71	F14
												116.67	4.59	116.67	4.59	22	0.87	F16
DN250/ NPS 10	PN10-16/ CL150	31.8	1.25	22	0.87	109	4.29	85	3.35	24	0.94	72.12	2.84	72.12	2.84	12	0.47	F10
												88.39	3.48	88.39	3.48	14	0.55	F12
	PN25-40/ CL300	31.8	1.25	22	0.87	109	4.29	85	3.35	24	0.94	99.00	3.90	99.00	3.90	18	0.71	F14
												116.67	4.59	116.67	4.59	22	0.87	F16
DN300/ NPS 12	PN10-16/ CL150	38.1	1.50	27	1.06	114	4.49	85	3.35	29	1.14	72.12	2.84	72.12	2.84	12	0.47	F10
												88.39	3.48	88.39	3.48	14	0.55	F12
	PN25-40/ CL300	38.1	1.50	27	1.06	114	4.49	85	3.35	29	1.14	99.00	3.90	99.00	3.90	18	0.71	F14
												116.67	4.59	116.67	4.59	22	0.87	F16

1. This nominal valve shaft diameter is the shaft diameter through the packing box. Use this diameter when selecting Fisher actuators.

Figure 10. Dimensions for Fisher 8580 with Optional Square Shaft Mounting Bracket

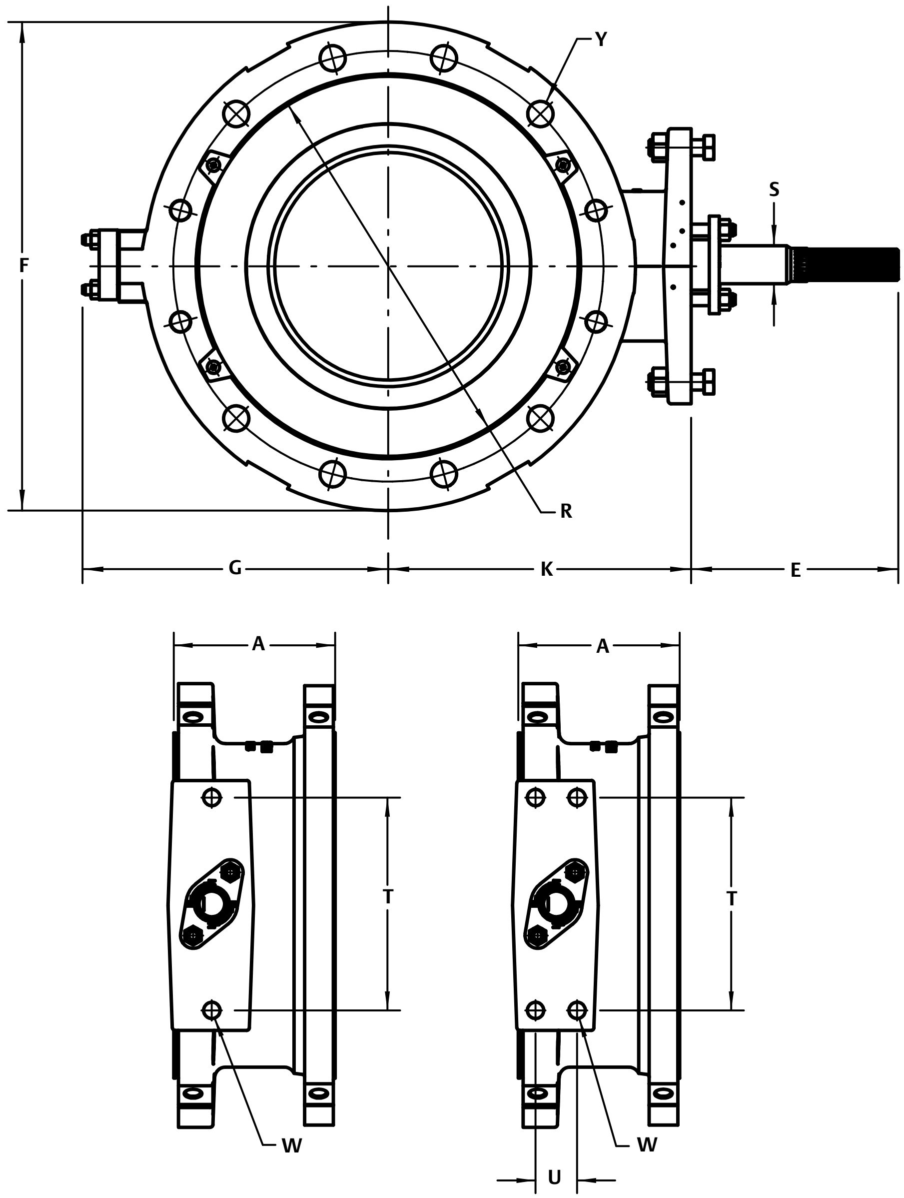


1 Mounting bracket optional.

Table 10. Dimensions and Weights, Double Flange Valve Body (See Figure 11)

VALVE SIZE, PRESSURE RATING		A	B	E Splined	E Square	F	G	K	R	S	T	U	W	APPROX-IMATE WEIGHT
		mm												kg
DN80/ NPS 3	PN10-16 /CL150	114	25.3	187.5	76	190	133	130	144	15.9	117	- - -	14	17.6
	PN25-40 /CL300	180	25.3	187.5	76	210	133	130	144	15.9	117	- - -	14	29
DN100/ NPS 4	PN10-16 /CL150	127	28.5	214.4	103	230	147	172	162	19.1	152	32	14	28.9
	PN25-40 /CL300	190	28.5	214.4	103	254	147	172	162	19.1	152	32	14	47.8
DN150/ NPS 6	PN10-16 /CL150	140	31.7	214.4	108	280	182	205	218	25.4	152	32	14	40.2
	PN25-40 /CL300	210	31.7	214.4	108	322	182	205	218	25.4	152	32	14	76.4
NPS200/ NPS 8	PN10-16 /CL150	152	32.8	208	107	345	225	258	278	31.8	235	46	18	71.3
	PN25-40 /CL300	230	32.8	208	107	380	225	258	291	31.8	235	46	18	124
DN250/ NPS 10	PN10-16 /CL150	165	35.6	208	109	405	250	270	331	31.8	235	46	18	80
	PN25-40 /CL300	250	35.6	208	109	445	265	270	352	31.8	235	46	18	203
DN300/ NPS 12	PN10-16 /CL150	178	41.7	208	114	485	309	304	381	38.1	235	46	18	144
	PN25-40 /CL300	270	41.7	208	114	520	309	304	410	38.1	235	46	18	275
		Inches												lbs
DN80/ NPS 3	PN10-16 /CL150	4.5	1	7.38	2.99	7.48	5.24	5.12	5.67	0.63	4.62	- - -	0.55	39
	PN25-40 /CL300	7.1	1	7.38	2.99	8.26	5.24	5.12	5.67	0.63	4.62	- - -	0.55	64
DN100/ NPS 4	PN10-16 /CL150	5	1.12	8.44	4.06	9.05	5.79	6.77	6.38	0.75	6	1.25	0.55	64
	PN25-40 /CL300	7.5	1.12	8.44	4.06	10	5.79	6.77	6.38	0.75	6	1.25	0.55	105
DN150/ NPS 6	P10-16/ CL150	5.5	1.25	8.44	4.25	11.02	7.17	8.07	8.58	1	6	1.25	0.55	89
	PN25-40 /CL300	8.3	1.25	8.44	4.25	12.66	7.17	8.07	8.58	1	6	1.25	0.55	168
NPS200/ NPS 8	PN10-16 /CL150	6	1.29	8.19	4.21	13.58	8.86	10.16	10.96	1.25	9.25	1.81	0.71	157
	PN25-40 /CL300	9.1	1.29	8.19	4.21	14.96	8.86	10.16	11.46	1.25	9.25	1.81	0.71	273
DN250/ NPS 10	PN10-16 /CL150	6.5	1.4	8.19	4.29	15.94	9.84	10.63	13.03	1.25	9.25	1.81	0.71	176
	PN25-40 /CL300	9.8	1.4	8.19	4.29	17.52	10.43	10.63	13.86	1.25	9.25	1.81	0.71	448
DN300/ NPS 12	PN10-16 /CL150	7	1.64	8.19	4.49	19.09	12.17	11.97	15	1.5	9.25	1.81	0.71	317
	PN25-40 /CL300	10.6	1.64	8.19	4.49	20.47	12.17	11.97	16.14	1.5	9.25	1.81	0.71	606

Figure 11. Dimensions for Fisher 8580 Double-Flange



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Fisher™ 8590 High-Performance Butterfly Valve

The Fisher 8590 High-Performance Butterfly Valve maintains tight shutoff, and can be specified for a wide range of pressure and temperature conditions.

The 8590 valve is available in a lugged or double flanged body design. A splined shaft can combine with a variety of spring-and- diaphragm or pneumatic piston actuators. A square or keyed shaft can combine with a variety of handlevers, handwheels, or pneumatic piston diaphragm actuators. These combinations help make the 8590 valve a reliable, high-performance butterfly valve for both throttling and on-off applications in the process industries.

The 8590 valve can be supplied with one of several dynamic seals (figure 1) that can be used in a variety of demanding applications. With the appropriate seal selection and materials of construction, the pressure-assisted seal helps provide excellent shutoff against the full ASME class pressure range for the 8590 valve.

X0955-3 **Lugged Style Fisher 8590 Valve**

X1610 **Double Flanged Style Fisher 8590 Valve**

Features

- Shaft Versatility— This valve will meet your actuator needs with a choice of splined, square, or keyed shaft connections.
- Excellent Shutoff Integrity—The pressure-assisted seal design provides tight shutoff and permits the use of smaller, less expensive actuators in applications requiring full ASME B16.34 shutoff capabilities.
- Excellent Emissions Capabilities— The optional ENVIRO-SEAL™ packing systems are designed with very smooth shaft surfaces and live-loading to provide improved sealing, guiding, and loading force transmission. The seal of the ENVIRO-SEAL system can control emissions to below 100 ppm (parts per million).
- Sour Service Capability— Trim and bolting materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0175-2003, MR0103, and MR0175 / ISO 15156.

- **Fire Safe Construction —** The 8590 valve has been fire tested per API 607, 6th edition with the Phoenix III seal. Standard construction requires 316 stainless steel chrome plated disk, graphite packing, metal bearings and S17400 H1025 SST or S20910 SST shaft. For information on fire tested valves, consult Fire-Tested Status of Fisher Rotary Valves Bulletin 59.3:025 (D103907X012).

- **Reliable Flange Gasketing Surface—**Seal retainer screws are located so there is no interference with the sealing function of either flat sheet or spiral wound line flange gaskets.

- **Powder Paint as Standard—**The Emerson Automation Solutions powder paint finish offers an excellent corrosion-resistant finish to all steel parts.

- **True Bidirectional Shutoff Performance—**A feature of the valve design is that the torque necessary to open and close the valve is the same regardless of the direction in which the differential pressure is applied.

- **Easy Installation—**The valve body self-centers on the line flange bolts as a fast, accurate means of centering the valve in the pipeline.

- **Shaft Retention—**Redundant shaft retention provides added protection. The packing follower, anti-blowout ring, and shaft groove interact to hold the shaft securely in the valve body in NPS 3 through 10 (see figure 4). The NPS 12 through 24 utilize a stepped packing follower and stepped shaft to hold the shaft securely in the valve body.

8590 Valve Specifications and Materials of Construction

Table 1. Fisher 8590 Valve Specifications

SPECIFICATIONS	ASME
Valve Body Size	NPS 3, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24
Pressure Rating	CL600 per ASME B16.34
Valve Body Materials	WCC or CF8M (std)
	LCC, CD3MN, M35-2, and CW2M
Disk Materials	CF8M (std), CD3MN, M35-2, and CW2M
Disk Edge Coating	Chrome Plate (std) Chrome Coat Chromium Carbide Coating
End Connections	Mates with RF Flanges per ASME B16.5 Optional construction mates with RTJ Flanges per ASME B16.5
Valve Body Style	Lugged (single flange), lugged with drilled through flange holes, or double flange with drilled through holes
Shaft Connection Style	NPS 3-24: Splined (std) NPS 3-12: Square NPS 14-24: Keyed
Face-to-Face Dimensions	Meets MSS SP68, API 609, ASME B16.10, and EN 558 standards, double flange
Shutoff	Soft Seal: Class VI
	Metal Seal: Class IV, reverse direction only
	Phoenix III Seal: Class VI; reverse direction preferred, forward direction optional
	High Pressure Seal: Class VI, reverse direction only
Flow Direction	Standard (reverse flow) is with the flow into the shaft side of the disk
Flow Characteristic	Linear
Disk Rotation	Clockwise (CW) to close

Table 2. Materials (Other Valve Components)

COMPONENT	MATERIAL
Shafts and Pins	S17400 H1025
	S20910
	N07718
Anti-Blowout Ring (NPS 3-8 only)	N07718
Seal Ring	Soft: ETFE
	Metal: S21800
	Phoenix III: S20910/ETFE
	HPS: S21800 nitrided
Bearings	PEEK, S31600 Nitrided, R30006 (Alloy 6)
Packing	PTFE/carbon-filled PTFE (standard), graphite die-molded ribbon, ENVIRO-SEAL PTFE packing, ENVIRO-SEAL graphite packing

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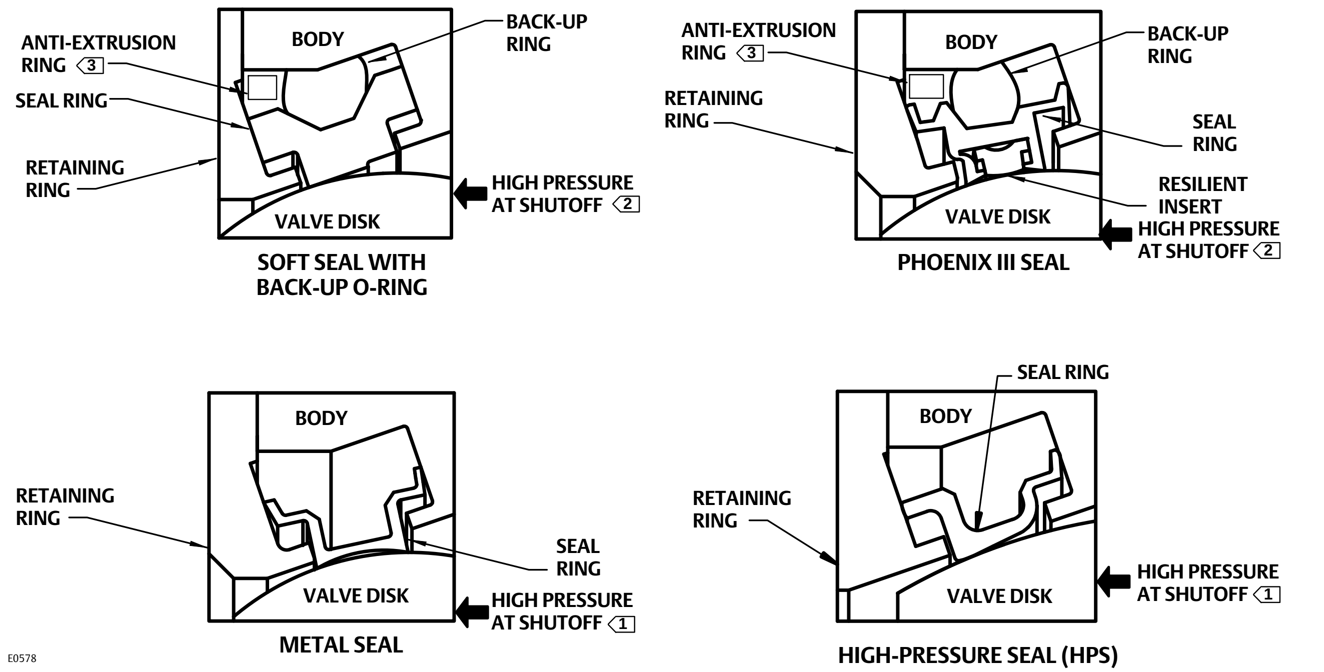
Figure 1. Available Seal Configurations



Notes:
1 This unidirectional seal must be installed so that the retaining ring is downstream from the high pressure side of the valve at shutoff, as shown.
2 For this bidirectional seal, the “preferred” valve orientation places the retaining ring downstream from the high pressure side of the valve at shutoff.
3 NPS 3 only.

Standard Seal Configurations

- Standard Soft Seal—A resilient dynamic seal with an elastomeric back-up ring for low to moderate temperature applications.

- Metal Seal—This stainless steel seal is available for severe service and high-temperature applications to 538°C (1000°F).

- Phoenix III Seal—This three-component, metal-and-polymeric seal is available for severe service with low to moderate temperature applications.

- High-Pressure Seal—This robust, stainless steel seal is available for severe service, cryogenic, and high-temperature applications to 538°C (1000°F).

Installation

Preferred valve orientation for the 8590 valve is reverse flow direction. Reverse flow direction is into the side of the valve body opposite the retaining ring or into the shaft side of the disk.

For erosive and many severe service applications, valves with bidirectional seals can and should be installed with the shaft horizontal and in the forward flow direction to prevent direct impingement of the process media on the seal, and to minimize the exposure of the shaft bearings to the process media.

The standard soft seal and the Phoenix III seal both offer bidirectional shutoff. Valves using either metal or HPS are unidirectional and must be installed in the reverse flow orientation.

For assistance in selecting the appropriate combination of actuator action and open valve position, consult your Emerson sales office.

Dimensions and weights are shown in figures 5, 6, and 7.

Figure 2. 8590, NPS 3 to 8, Valve Body Assembly

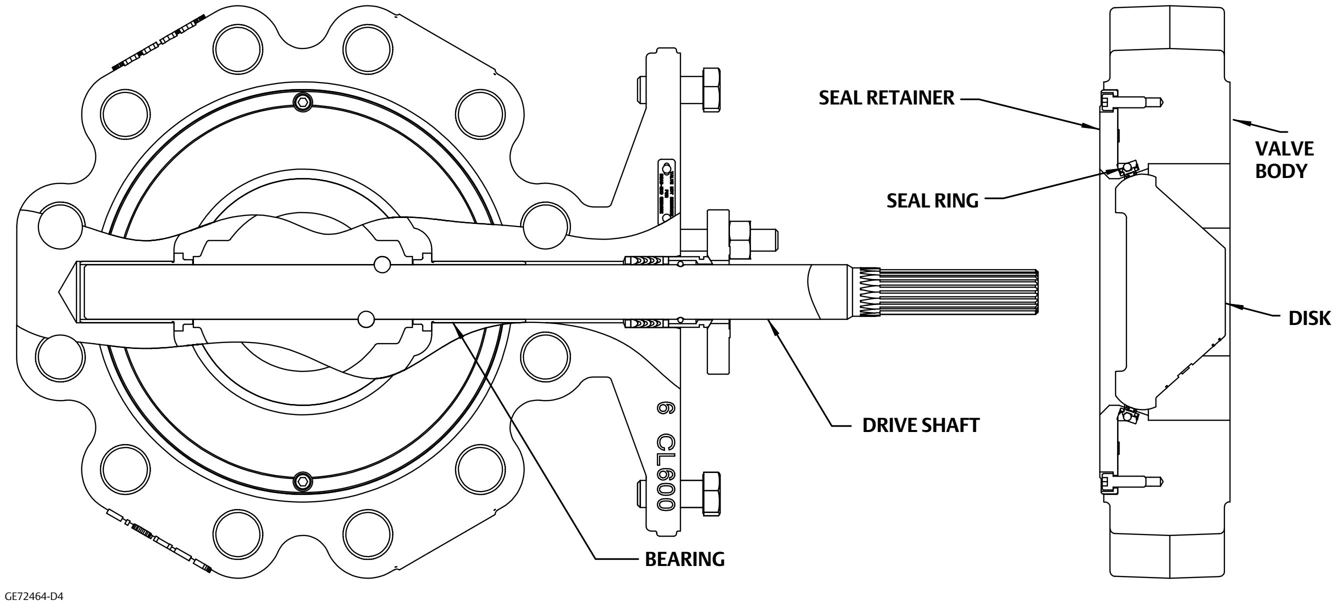


Figure 3. 8590, NPS 10 to 24, Valve Body Assembly

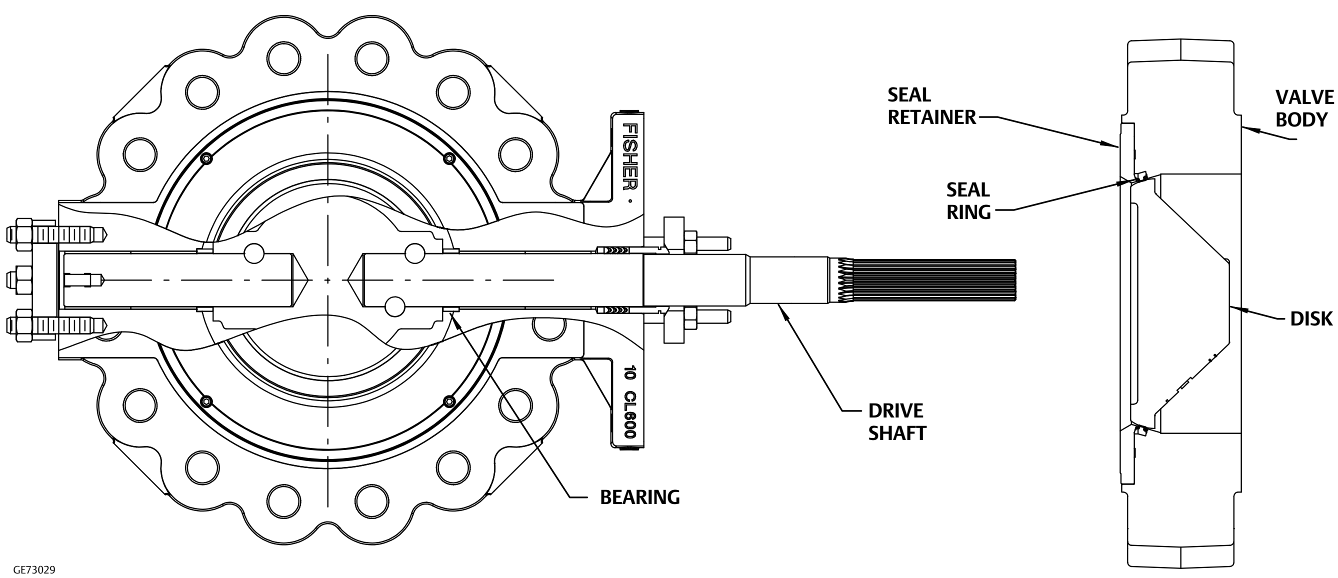
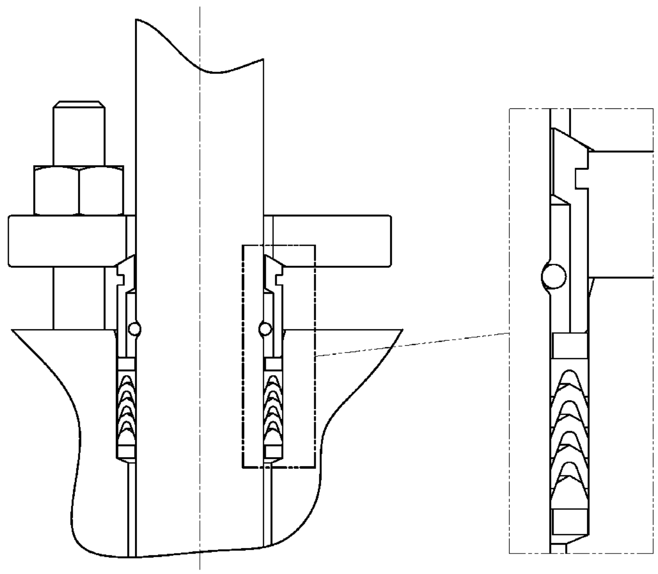


Table 3. Material Temperature Ranges

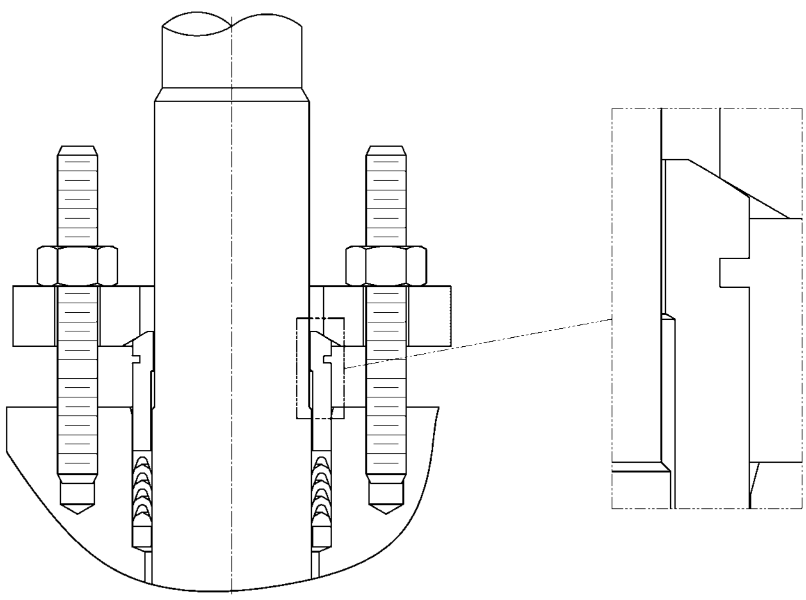
PART NAME	MATERIAL	TEMP °C	TEMP °F
Valve Body	WCC Steel	-29 to 427	-20 to 800
	CF8M(1)	-254 to 538	-425 to 1000
	LCC	-46 to 345	-50 to 650
	CD3MN	-51 to 316	-60 to 600
	M35-2	-198 to 482	-325 to 900
	CW2M(1)	-198 to 538	-325 to 1000
Disk	CF8M with Chrome Plated Disk Edge	-254 to 427	-425 to 800
	CF8M with Chrome Coated Disk Edge(1)	-254 to 538	-425 to 1000
	CF8M with Chromium Carbide Disk Edge(1)	-254 to 538	-425 to 1000
	CD3MN (no plating)(2)	-51 to 316	-60 to 600
	M35-2 (no plating)(2)	-198 to 482	-325 to 900
	CW2M (no plating)(1)(2)	-198 to 538	-325 to 1000
Shaft	S17400 (H1025)	-46 to 427	-50 to 800
	S20910(1)	-198 to 538	-325 to 1000
	S31803	-51 to 316	-60 to 600
	N05500	-198 to 482	-325 to 900
	N10276	-198 to 538	-325 to 1000
	N07718(1)	-254 to 538	-425 to 1000
Bearings	PEEK(1)	-73 to 149	-100 to 300
	S31600 Nitrided(1)	-254 to 538	-425 to 1000
	R30006 (Alloy 6)(1)	-198 to 538	-325 to 1000
Seal	**ETFE Soft Seal Ring**		
	ETFE Soft Seal Ring with FKM Backup Ring	-29 to 149	-20 to 300
	ETFE Soft Seal Ring with EPR Backup Ring	-54 to 149	-65 to 300
	S20910/ETFE Phoenix III Seal Ring		
	S20910/ETFE Phoenix III Seal Ring with FKM Backup Ring	-40 to 149	-40 to 300
	S20910/ETFE Phoenix III Seal Ring with EPR Backup Ring	-62 to 149	-80 to 300
	Metal Seal		
	S21800(1)	-198 to 538	-325 to 1000
	S20910(1)	-198 to 538	-325 to 1000
	High Pressure Seal		
	S21800 Nitrided(1)	-198 to 538	-325 to 1000
	S20910 Nitrided(1)	-198 to 538	-325 to 1000
Packing	PTFE /Carbon-filled PTFE (standard)	-45 to 232	-50 to 450
	ENVIRO-SEAL PTFE	-45 to 232	-50 to 450
	Graphite Die-molded Ribbon	-198 to 538	-325 to 1000
	ENVIRO-SEAL Graphite	-198 to 371	-325 to 700

1. The maximum temperature for a standard design of the 8590 valve is 538°C (1000°F). Contact your Emerson sales office for use in higher temperature applications.
2. For use with soft seal only.

Figure 4. Anti-Blowout Protection



NPS 3 THROUGH 8 WITH ANTI-BLOWOUT RING



NPS 10 THROUGH 24 WITH STEPPED SHAFT

Pressure Drops

Pressure drop limits of any given valve are based on valve body, and trim material limits. To find the appropriate pressure drop limitation, choose the desired valve size and temperature range. Then search table 4 for body limitations and table 5 for trim limitations. Information on limits for CW2M, M35-2, and other alloy constructions can be obtained by contacting your Emerson sales office. The lowest number from the tables is the appropriate limit. **The tables for both trim and body limits must be consulted.**

Table 4. Maximum Allowable Shutoff Pressure Drops (Valve Ratings) Based on Carbon Steel and Stainless Steel Valve Types(1) (The tables for both trim and body limits must be consulted)

TEMPERATURE RANGE	PRESSURE RANGE			
	CL600			
	WCC(2)	CF8M(2)	LCC(2)	CD3MN
°C	Bar			
-254 to -29	---	99.3	---	103.4
-29 to 38	103.4	99.3	103.4	103.4
93	103.4	85.5	103.4	102.7
149	100.3	77.2	100.3	92
204	96.9	70.7	96.9	84.8
260	91.7	65.8	91.7	80
316	83.4	62.1	83.4	76.9
343	81.0	61.0	81.0	---
371	76.5	60.0	---	---
399	70.0	59.0	---	---
427	56.9	58.3	---	---
454	---	57.6	---	---
482	---	57.2	---	---
510	---	53.4	---	---
538	---	50.0	---	---
°F	PSI			
-425 to -20	---	1440	---	1500
-20 to 100	1500	1440	1500	1500
200	1500	1240	1500	1490
300	1455	1120	1455	1335
400	1405	1025	1405	1230
500	1330	955	1330	1160
600	1210	900	1210	1115
650	1175	885	1175	---
700	1110	870	---	---
750	1015	855	---	---
800	825	845	---	---
850	---	835	---	---
900	---	830	---	---
950	---	775	---	---
1000	---	725	---	---

1. For pressure/temperature rating of other materials, contact your Emerson sales office.
2. WCC, LCC, and CF8M valve bodies use S31600 seal retainers and blind flanges.

Table 5. Maximum Allowable Shutoff Pressure Drops based on Trim[1]

Note: Do not exceed the ASME pressure/temperature ratings of the valve or mating flanges.

Trim	Temperature, °C	NPS										
		3	4	6	8	10	12	14	16	18	20	24
		Bar										
ETFE Seal, PEEK Bearings	-46 to 37	103	94	103	103	103	102	103	103	103	103	100
	93	76	76	76	76	76	76	76	76	76	76	76
	121	41	41	41	41	41	41	41	41	41	41	41
	149	7	7	7	7	7	7	7	7	7	7	7
Phoenix III Seal, PEEK Bearings	-46 to 37	103	92	103	103	103	81	103	102	103	103	80
	93	103	86	103	101	103	73	103	92	103	103	72
	121	61	61	61	61	61	61	61	61	61	61	61
	149	21	21	21	21	21	21	21	21	21	21	21
Phoenix III Seal, Metal Bearings	-46 to 37	103	90	103	103	103	63	103	78	103	103	61
	93	98	84	103	99	96	56	103	71	103	101	56
	121	61	61	61	61	61	54	61	61	61	61	54
	149	21	21	21	21	21	21	21	21	21	21	21
Metal Seal, PEEK Bearings	-46 to 37	103	92	103	103	103	86	103	103	103	103	91
	149	100	83	100	97	100	73	100	95	100	100	79
Metal Seal, Metal Bearings	-46 to 37	103	90	103	103	103	66	103	84	103	103	69
	316	83	75	83	78	81	49	83	65	83	83	54
	427[2]	70	70	70	70	70	47	70	62	70	70	51
HPS Seal, Metal Bearings	-46 to 37	33	44	89	80	89	57	103	77	103	103	67
	316	18	28	67	59	68	43	83	60	83	83	52
	427[2]	16	26	63	56	64	41	70	57	70	70	50
Trim	**Temperature, °F**	**PSI**										
ETFE Seal, PEEK Bearings	-50 to 100	1500	1370	1500	1500	1500	1483	1500	1500	1500	1500	1456
	200	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
	250	600	600	600	600	600	600	600	600	600	600	600
	300	100	100	100	100	100	100	100	100	100	100	100
Phoenix III Seal, PEEK Bearings	-50 to 100	1500	1332	1500	1500	1500	1175	1500	1476	1500	1500	1155
	200	1500	1251	1500	1464	1500	1058	1500	1340	1500	1500	1051
	250	890	890	890	890	890	890	890	890	890	890	890
	300	300	300	300	300	300	300	300	300	300	300	300
Phoenix III Seal, Metal Bearings	-50 to 100	1500	1303	1500	1500	1500	907	1500	1134	1500	1500	887
	200	1428	1222	1500	1435	1394	817	1496	1030	1500	1463	807
	250	890	890	890	890	890	788	890	890	890	890	781
	300	300	300	300	300	300	300	300	300	300	300	300
Metal Seal, PEEK Bearings	-50 to 100	1500	1336	1500	1500	1500	1245	1500	1500	1500	1500	1327
	300	1455	1207	1455	1407	1455	1053	1455	1381	1455	1455	1147
Metal Seal, Metal Bearings	-50 to 100	1500	1309	1500	1500	1500	954	1500	1221	1500	1500	998
	600	1210	1093	1210	1127	1176	714	1210	939	1210	1210	777
	800[2]	1015	1015	1015	1015	1015	675	1015	894	1015	1015	741
HPS Seal, Metal Bearings	-50 to 100	484	640	1284	1154	1289	831	1500	1124	1500	1500	978
	600	264	408	968	862	981	624	1210	865	1210	1210	760
	800[2]	228	370	916	815	932	590	1015	823	1015	1015	725

1. Trim ratings based on S17400 H1025 shaft. For other shaft materials, please contact factory.
2. The temperature limit of S17400 H1025 shaft material is 427°C (800°F). For higher temperatures another shaft material option must be selected.

Table 6. Single Flange Dimensions and Weights

Valve Size, NPS	A	E	F	G	K	R	S(1)	T	U	Y(2)	W(2)	Approximate Weight
	mm											kg
3	52	187	198	98	123	127	15.9	117	- - -	3/4-10	1/2-13	10.8
4	62	214	259	128	150	157	19.1	152	32	7/8-9	1/2-13	21.6
6	76	208	333	166	220	216	31.8	235	46	1-8	5/8-11	45.5
8	102	208	407	241	234	270	38.1	235	46	1-1/8-8	5/8-11	80.2
10	116	356	506	312	302	324	44.5	273	51	1-1/4-8	3/4-10	157
12	140	356	553	339	332	381	50.8	273	51	1-1/4-8	3/4-10	213
14	157	356	597	370	348	413	63.5	337	76	1-3/8-8	7/8-9	281
16	178	356	678	408	386	470	63.5	337	76	1-1/2-8	7/8-9	395
18	198	508	735	451	427	533	76.2	533	127	1-5/8-8	1-1/4-8	563
20	216	508	807	478	446	584	76.2	533	127	1-5/8-8	1-1/4-8	721
24	230	508	933	544	513	692	76.2	533	127	1-7/8-8	1-1/4-8	1000
	Inches											lbs
3	2.04	7.38	7.80	3.85	4.84	5.00	0.63	4.62	- - -	3/4-10	1/2-13	24
4	2.44	8.44	10.20	5.04	5.89	6.19	0.75	6.00	1.25	7/8-9	1/2-13	48
6	2.98	8.19	13.11	6.54	8.65	8.50	1.25	9.25	1.81	1-8	5/8-11	101
8	4.00	8.19	16.02	9.49	9.20	10.62	1.50	9.25	1.81	1-1/8-8	5/8-11	178
10	4.56	14.00	19.92	12.28	11.90	12.75	1.75	10.75	2.00	1-1/4-8	3/4-10	348
12	5.51	14.00	21.77	13.35	13.07	15.00	2.00	10.75	2.00	1-1/4-8	3/4-10	473
14	6.18	14.00	23.50	14.57	13.70	16.25	2.50	13.25	3.00	1-3/8-8	7/8-9	624
16	7.00	14.00	26.69	16.06	15.20	18.50	2.50	13.25	3.00	1-1/2-8	7/8-9	876
18	7.81	20.00	28.94	17.76	16.81	21.00	3.00	21.00	5.00	1-5/8-8	1-1/4-8	1250
20	8.50	20.00	31.77	18.82	17.57	23.00	3.00	21.00	5.00	1-5/8-8	1-1/4-8	1600
24	9.06	20.00	36.73	21.42	20.20	27.25	3.00	21.00	5.00	1-7/8-8	1-1/4-8	2220

1. This is the nominal valve shaft diameter to be used when selecting Fisher actuators.
2. Threaded hole per ASME B1.1.

Figure 5. Single Flange Dimensions (also see table 6)

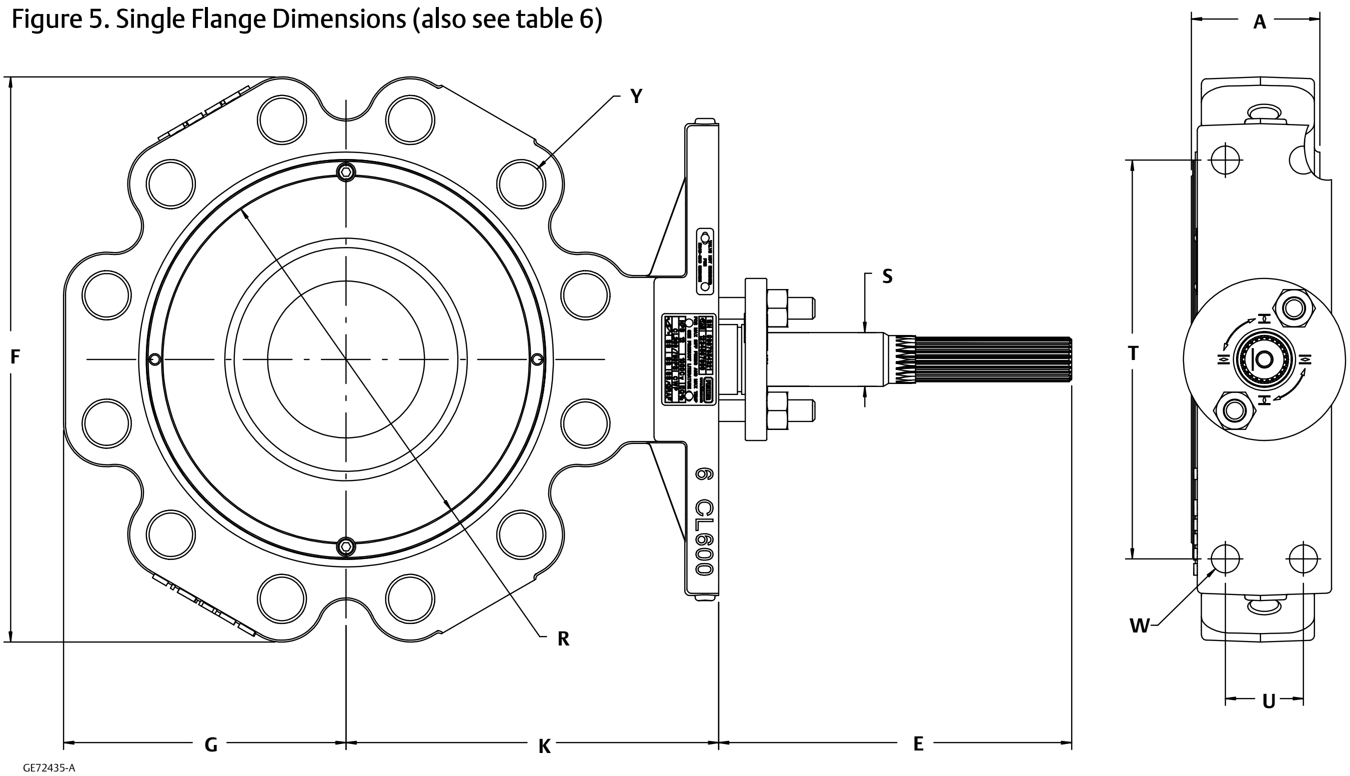


Table 7. Double Flange Dimensions and Weights

Valve Size, NPS	A	E	F	G	H	K	R	S(1)	T	U	Y(2)	W(2)	Approximate Weight
	mm												kg
3	180	187	211	106	21.5	123	127	15.9	117	- - -	3/4-10	1/2-13	25.9
4	190	214	277	138	25.6	150	157	19.1	152	32	7/8-9	1/2-13	48.1
6	210	208	357	178	28.4	220	216	31.8	235	46	1-8	5/8-11	97.1
8	230	208	423	243	31.9	234	270	38.1	235	46	1-1/8-8	5/8-11	145.6
10	250	356	515	316	35.1	302	324	44.5	273	51	1-1/4-8	3/4-10	247.7
12	270	356	563	343	35.1	332	381	50.8	273	51	1-1/4-8	3/4-10	316.6
14	290	356	610	374	38.3	348	413	63.5	337	76	1-3/8-8	7/8-9	410
16	310	356	691	412	41.5	386	470	63.5	337	76	1-1/2-8	7/8-9	571.5
18	330	508	751	455	43.7	428	533	76.2	533	127	1-5/8-8	1-1/4-8	817.4
20	350	508	831	483	44.6	446	584	76.2	533	76	1-5/8-8	1-1/4-8	989.3
24	390	508	946	549	50.8	543	692	76.2	533	127	1-7/8-8	1-1/4-8	1422
	Inches												lbs
3	7.09	7.38	.32	4.16	0.85	4.84	5.00	0.63	4.62	- - -	3/4-10	1/2-13	57
4	7.48	8.44	.89	5.45	1.01	5.89	6.19	0.75	6.00	1.25	7/8-9	1/2-13	106
6	8.27	8.19	.04	7.02	1.12	8.65	8.50	1.25	9.25	1.81	1-8	5/8-11	214
8	9.06	8.19	.65	9.56	1.26	9.20	10.62	1.50	9.25	1.81	1-1/8-8	5/8-11	321
10	9.84	14.00	.28	12.42	1.38	11.90	12.75	1.75	10.75	2.00	1-1/4-8	3/4-10	546
12	10.63	14.00	.15	13.50	1.38	13.07	15.00	2.00	10.75	2.00	1-1/4-8	3/4-10	698
14	11.42	14.00	.00	14.71	1.51	13.70	16.25	2.50	13.25	3.00	1-3/8-8	7/8-9	904
16	12.2	14.00	.19	16.21	1.63	15.20	18.50	2.50	13.25	3.00	1-1/2-8	7/8-9	1260
18	12.99	20.00	.55	17.93	1.72	16.81	21.00	3.00	21.00	5.00	1-5/8-8	1-1/4-8	1802
20	13.78	20.00	.70	19.00	1.76	17.57	23.00	3.00	21.00	3.00	1-5/8-8	1-1/4-8	2181
24	15.35	20.00	.24	21.62	2.00	20.20	27.25	3.00	21.00	5.00	1-7/8-8	1-1/4-8	3135

Figure 6. Double Flange Dimensions (also see table 7)

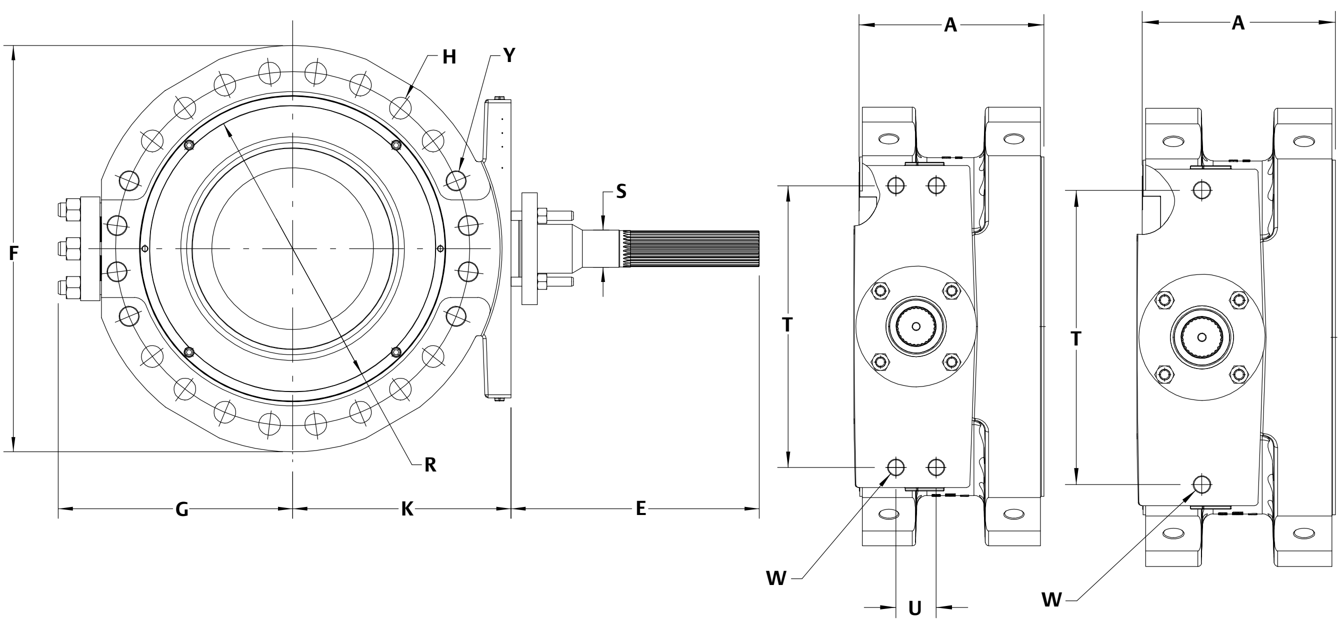


Table 8. Dimensions, Optional Square Shaft and Mounting Bracket (ISO 5211)

Valve Size, NPS	C	E	L	M	S	T	U	W	ISO 5211
	mm								
3	11	76	64	12	15.9	49.5	49.5	10	F07
						72.1	72.1	12	F10
4	14	103	87	16	19.1	49.5	49.5	10	F07
						72.1	72.1	12	F10
						88.4	88.4	14	F12
6	22	108	85	23	31.8	72.1	72.1	12	F10
						88.4	88.4	14	F12
						99	99	18	F14
						116.7	116.7	22	F16
8	27	114	85	29	38.1	72.1	72.1	12	F10
						88.4	88.4	14	F12
						99	99	18	F14
						116.7	116.7	22	F16
10	36	190	152	38	44.5	99	99	18	F14
						116.7	116.7	22	F16
12	36	190	152	38	50.8	99	99	18	F14
						116.7	116.7	22	F16
	Inches								
3	0.43	3.00	2.52	0.48	0.63	1.95	1.95	0.39	F07
						2.84	2.84	0.47	F10
4	0.55	4.06	3.43	0.63	0.75	1.95	1.95	0.39	F07
						2.84	2.84	0.47	F10
						3.48	3.48	0.55	F12
6	0.87	4.25	3.35	0.90	1.25	2.84	2.84	0.47	F10
						3.48	3.48	0.55	F12
						3.90	3.90	0.71	F14
						4.59	4.59	0.87	F16
8	1.06	4.49	3.35	1.14	1.50	2.84	2.84	0.47	F10
						3.48	3.48	0.55	F12
						3.90	3.90	0.71	F14
						4.59	4.59	0.87	F16
10	1.42	7.48	6	1.50	1.75	3.90	3.90	0.71	F14
						4.59	4.59	0.87	F16
12	1.42	7.48	6	1.50	2.00	3.90	3.90	0.71	F14
						4.59	4.59	0.87	F16

Figure 7. 8590 Valve Assembly with Square Shaft and Mounting Bracket (also see table 8)

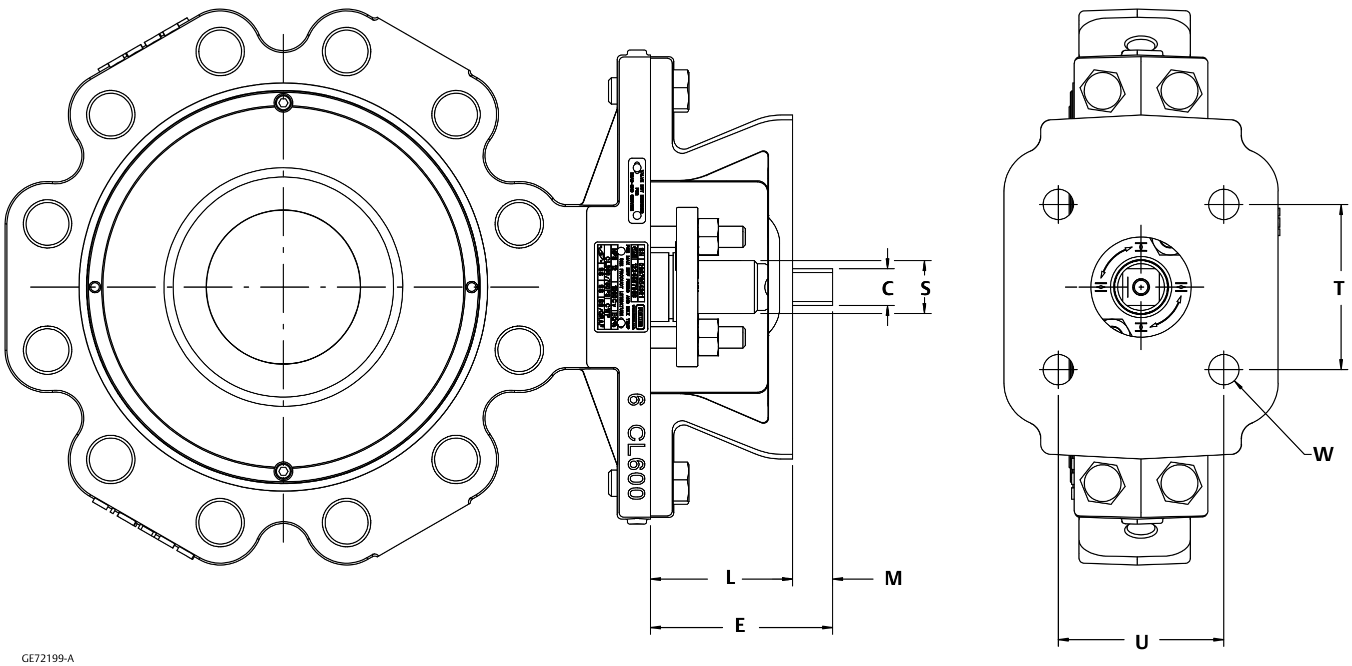
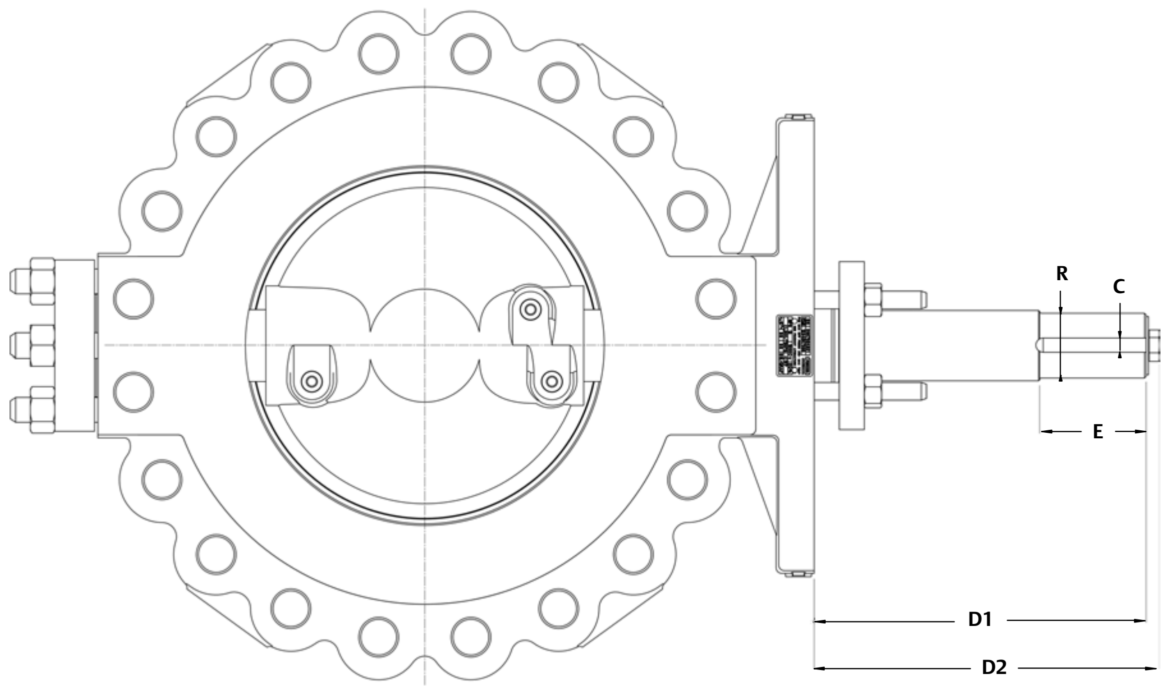


Table 9. Dimensions, Optional Keyed Shaft

Valve Size, NPS	C	D1	D2	E	R
	mm				
14	12.7	297	309	95.3	57.2
16	16.0	316	330	114.3	69.9
18	16.0	394	408	114.3	69.9
20	16.0	394	408	114.3	69.9
24	16.0	394	408	114.3	69.9
	Inches				
14	0.50	11.68	12.2	3.75	2.25
16	0.63	12.44	13.0	4.5	2.75
18	0.63	15.51	16.1	4.5	2.75
20	0.63	15.51	16.1	4.5	2.75
24	0.63	15.51	16.1	4.5	2.75

Figure 9. Dimensions for Fisher 8590 NPS 14 to 24 Valve with Keyed Shaft (also see table 9)



GE72443-A

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Fisher™ A11 High-Performance Butterfly Valve, NPS 30-72

The Fisher A11 High-Performance Butterfly Valve maintains tight shutoff, and can be specified for a wide range of pressure and temperature conditions, including cryogenic applications.

The A11 valve is available in either a wafer or a lugged design. A keyed shaft can combine with a variety of handlevers, handwheels, or pneumatic piston diaphragm actuators. These combinations help make the A11 valve a reliable, high-performance butterfly valve for both throttling and on-off applications in the process industries.

The A11 valve can be supplied with one of several dynamic seals (figure 1) that can be used in a variety of demanding applications. With the appropriate seal selection and materials of construction, the pressure-assisted seal helps provide excellent shutoff against the full ASME class pressure range for the A11 valve.

W9134

Features

- **Excellent Shutoff Integrity**—The pressure-assisted seal design provides tight shutoff and permits the use of smaller, less expensive actuators in applications requiring full ASME B16.34 shutoff capabilities.

- **Excellent Emissions Capabilities**— The optional live-loaded packing systems are designed with very smooth shaft surfaces and live-loading to provide improved sealing, guiding, and loading force transmission.

- **Sour Service Capability**— Trim and bolting materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0103, and MR0175 / ISO 15156.

- **High-Temperature/Cryogenic Capabilities**— Optional valve constructions allow this valve to meet both high-temperature and cryogenic applications.

- **Easy Installation**—The valve body self-centers on the line flange bolts as a fast, accurate means of centering the valve in the pipeline.

- **Reliable Flange Gasketing Surface**—Seal retainer screws are located so there is no interference with the sealing function of either flat sheet or spiral wound line flange gaskets.

- **True Bidirectional Shutoff Performance**—A feature of the valve design is that the torque necessary to open and close the valve is the same regardless of the direction in which the differential pressure is applied.

Standard Seal Configurations

- **Standard Soft Seal —** A resilient dynamic seal with an elastomeric back-up ring for low to moderate temperature applications.

- **Metal Seal—**This stainless steel seal is available for severe service and high-temperature applications to 704°C (1300°F) for NACE applications and 816°C (1500°F) for other applications.

- **NOVEX Seal—**The NOVEX stainless steel seal is available for severe service, Cryogenic, and high-temperature applications to 816°C (1500°F). Available for CL150/150, 150, and 300, up to NPS 36 only.

- **Phoenix III Seal—**This three-component, metal-and-polymeric seal is available for severe service with low to moderate temperature applications.

- **Cryo-Tight Cryogenic Seal—**This resilient dynamic seal is available with or without an aluminum back-up ring for low temperature applications.

Table of Contents

Specifications

Available Configurations and Sizes

■ Wafer (flangeless) or ■ Lugged (single-flange)

Available Sizes
CL150/150[1]*:* NPS 30 through 72
CL150: NPS 30 through 72
CL300: NPS 30 through 72

End Connection Style

Wafer or lugged style bodies designed to fit between raised-face mating flanges of appropriate class pressure rating
ASME B16.47 Class A and MSS-SP-44
NPS 30 through 48: CL150 and 300
Consult your Emerson sales office or Local Business Partner for valves compatible with API 605 and ASME B16.47 Class B flanges

Maximum Inlet Pressure[1]

Valve Body: Consistent with CL150 and 300 pressure/temperature ratings per ASME B16.34, see table 8

Seal: see figure 1

Materials of Construction

See table 1
Disk Hard Surfacing: Metal, NOVEX, Phoenix III and cryogenic seals require the disk to be coated, regardless of the valve class

Maximum Temperature Capabilities[1]

See table 1

High-Temperature and Cryogenic Applications: Contact your Emerson sales office or Local Business Partner for information

Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4

Standard Soft Seal: Class VI
Metal Seal: Class IV (reverse direction only)
NOVEX Seal: Class IV (Class VI optional, reverse direction only)
Phoenix III Seal: Class VI (reverse direction only)
Cryogenic Seal (Reverse direction only):
CTFE: Class IV
CTFE with Aluminum Backup Ring: Class VI

Flow Characteristic

Modified equal percentage

Flow Coefficients

See Fisher Catalog 12

Noise Levels

See Fisher Catalog 12 for sound pressure level prediction

Available Actuators

■ Spring-return pneumatic actuators,
■ double-acting pneumatic actuators,
■ electric actuators, and
■ handwheel

Disk Rotation

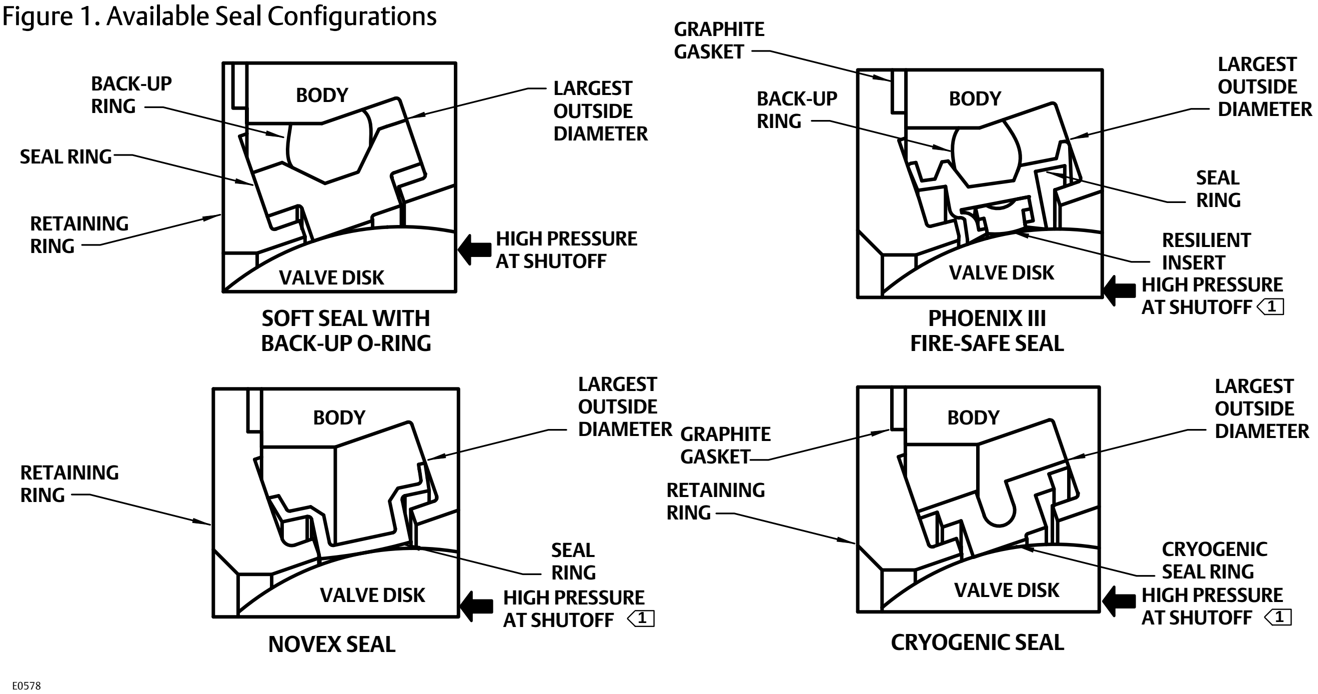
Clockwise (CW) to close

Valve Dimensions and Approximate Weights

See figures 2, 3, and 4
For general packing guidelines, see Bulletin 59.3:042 Packing Selection Guidelines for Rotary Valves (D102093X012)

1. The pressure/temperature limits in this bulletin, and any applicable code or standard limitation, should not be exceeded.

Figure 1. Available Seal Configurations



Notes:
1 This unidirectional seal must be installed so that the retaining ring is downstream from the high pressure side of the valve at shutoff, as shown.

Installation

Preferred valve orientation for the A11 valve is reverse flow direction. Reverse flow direction is into the side of the valve body opposite the retaining ring or into the shaft side of the disk.

For erosive and many severe service applications, valves with bidirectional seals can and should be installed with the shaft horizontal and in the forward flow direction to prevent direct impingement of the process media on the seal, and to minimize the exposure of the shaft bearings to the process media.

The standard soft seal and the Phoenix III seal both offer bidirectional shutoff. Valves using either metal, NOVEX, or cryogenic seals are unidirectional and must be installed in the reverse flow orientation.

For assistance in selecting the appropriate combination of actuator action and open valve position, consult your Emerson sales office or Local Business Partner.

Dimensions and weights for wafer-style and lugged valves are shown in figures 2, 3, and 4.

Table 1. Material Temperature Ranges

PART NAME	MATERIAL	TEMP °C	TEMP °F
Valve Body(1)	WCC Steel, SA-516-70 or SA-105	-29 to 427	-20 to 800
	CF8M	-254 to 538	-425 to 1000
	CF8M/CF10M (316/316H) dual-certified	over 538 to 816	over 1000 to 1500
	LCC	-45 to 343	-50 to 650
Disk(4)	WCC Steel	-29 to 427	-20 to 800
	CF8M	-254 to 538	-425 to 1000
	CF8M/CF10M (316/316H) dual-certified	over 538 to 816	over 1000 to 1500
Disk Seating Surface Coating	Chrome Plating	-254 to 427	-425 to 800
	Chromium Coat	-254 to 593	-425 to 1100
	Chromium Carbide Coating	-254 to 816	-425 to 1500
Shaft	S17400 (H1025)	-73 to 427	-100 to 800
	S17400 (H1150M)	-196 to 427	-320 to 800
	N05500	-254 to 482	-425 to 900
	N07718	-254 to 704	-425 to 1300
	S20910	-196 to 593	-320 to 1100
	N07750	over 593 to 816	over 1100 to 1500
Bearings(3)	PEEK	-73 to 260	-100 to 500
	PTFE Composition	-254 to 163	-425 to 325
	S31600 (316 SST Nitrided)	-254 to 816	-425 to 1500
	R30006 (Alloy 6)		
Seal Ring	Soft - PTFE	-62 to 232	-80 to 450
	Metal - All	See table 2	
Backup Ring	Used with Soft Seal		
	Fluorocarbon	-29 to 204	-20 to 400
	EPR	-54 to 182	-65 to 360
	Nitrile	-29 to 93	-20 to 200
	Chloroprene	-43 to 149	-45 to 300
	Used with Phoenix III Seal		
	Fluorocarbon	-40 to 232	-40 to 450
	EPR	-62 to 204	-80 to 400
	Nitrile	-40 to 149	-40 to 300
	Chloroprene	-54 to 149	-65 to 300
	Used with Cryogenic Seal		
	Aluminum	-254 to 149	-425 to 300
Packing	PTFE V-Ring	-254 to 232	-425 to 450
	PTFE Live-Loaded	-254 to 232	-425 to 450
	Square Ring Graphite for Oxidizing Service	-254 to 538	-425 to 1000
	Square Ring Graphite for Non-oxidizing Service	-254 to 816	-425 to 1500
	Graphite Live-Loaded	-198 to 315	-325 to 600

1. Special gasket retainer bolts are required for over 538°C (1000° F).
2. Special retaining ring screws for single flange valves over 538°C (1000°F).
3. Special thrust bearings are required for high temperature applications over 343°C (650°F) (with 6 and 12 inch extensions). Constructions with carbon steel valves and SST disks may require special thrust bearings at temperatures greater than 343°C (650°F).
4. At temperatures over 254°C (450°F), the disk material should be the same as the valve body material.

Table 2. Temperature Limits for Metal Seal

SEAL TYPE	PRESSURE RATING	SEAL MATERIAL	MAXIMUM TEMPERATURE LIMITS		BACKUP RING
			°C	°F	
Metal	CL150/150, and 150(2)	S31600 w/ CF8M disk S31600 w/ WCC disk(2)	538 232	1000 450	No
	300	S31600 w/ CF8M disk S31600 w/ WCC disk(2)	816 232	1500 450	No

1. When used with CF8M disks, S20910 is the preferred seal material. When used with WCC disks, S17400 H1150M is the preferred material.
2. For valves with WCC disks at temperatures over 254°C (450°F), contact your Emerson sales office or Local Business Partner for seal material selection.

Table 3. Trim Descriptions - CL150/150, CL150, and CL300

Trim Type	Trim Number	Temperature Range	Disk Material	Disk Edge Coating	Seal Type	Seal Material	Shaft	Bearings	Packing
Standard	550(1)	-29 to 204°C -20 to 400°F	CF8M or WCC	None	Soft	PTFE	S17400 H1025	PEEK	PTFE
	552	-46 to 232°C -50 to 450°F	CF8M or WCC	Chrome Plated	NOVEX(5)	S31600	S17400 H1025	PEEK	PTFE
	554	-40 to 232°C -40 to 450°F	CF8M or WCC	Chrome Plated	Phoenix III	S31600/PTFE	S17400 H1025	PEEK	PTFE
	555	-46 to 316°C -50 to 600°F	CF8M or WCC	Chrome Plated	NOVEX(5)	S31600	S17400 H1025	316 SST Nitrided	Graphite
	556	-46 to 427°C -50 to 800°F	CF8M or WCC	Chromium Coat	NOVEX(5)	S31600	S17400 H1025	316 SST Nitrided	Graphite
High-Temperature	564H(2)	-46 to 427°C -50 to 800°F	CF8M or WCC	Chromium Coat	NOVEX(5)	S31600	S17400 H1025	316 SST Nitrided	Graphite
	566H(3)	–46 to 538°C –50 to 1000°F	CF8M	Chromium Coat	NOVEX(5)	S31600	N07718	316 SST Nitrided	Graphite
Cryogenic	567C(4)	-196 to 163°C -320 to 325°F	CF8M	Chrome Plated	NOVEX(5)	S31600	S17400 H1150M	PTFE Composition	PTFE

1. Trim 550 is furnished as standard trim in all CL150/150, 150, and 300 A11 valves.
2. Trim includes 6-inch shaft extension.
3. Trim includes 12-inch shaft extension.
4. Trim includes Cryogenic shaft extension, see table 4 for extension length.
5. NPS 42 and 48 will have an S31600 metal seal ring in place of the S31600 NOVEX seal ring.

Table 4. Cryogenic Shaft Extension Lengths(1)

CRYOGENIC EXTENSION LENGTH, INCH FOR VALVE BODY SIZE, NPS			
30	36	42	48
36	36	36	36

1. Extension length measured from center of valve body to bottom of packing flange.

Table 5. Dimensions and Weights Wafer and Lugged Style CL150/150

VALVE SIZE, NPS	A		B	C	D	E	F	H	J	K	L	M(1)	R	KEY SQ SIZE	APPROX WEIGHT
	Wafer	Lugged													
	mm														kg
30	864	994	121	559	516	295	95.25	337	See Thread Info Below	76.2	See Thread Info Below	744	57.2	12.7	528
36	1029	1178	149	683	613	295	95.25	337		76.2		888	57.2	12.7	806
42	1207	1356	210	762	695	314	114.3	337		76.2		1032	69.9	15.9	1302
48	1364	1524	229	889	826	314	114.3	305		152		1180	69.9	15.9	1904
	Inches														lbs
30	34.00	39.12	4.75	22.00	20.31	11.62	3.75	13.25	1-1/4-8	3.00	7/8-9	29.30	2.25	1/2	1164
36	40.50	46.38	5.88	26.88	24.12	11.62	3.75	13.25	1-1/2-8	3.00	7/8-9	34.96	2.25	1/2	1778
42	47.50	53.38	8.25	30.00	27.38	12.38	4.5	13.25	1-1/2-8	3.00	7/8-9	40.64	2.75	5/8	2871
48	53.69	60.00	9.00	35.00	32.50	12.38	4.5	12.00	1-1/2-8	6.00	1-1/4-7	46.47	2.75	5/8	4198

1. M dimension is disk chordal swing diameter.

Figure 2. Dimensions Wafer and Lugged Style CL150/150 (also see table 5)

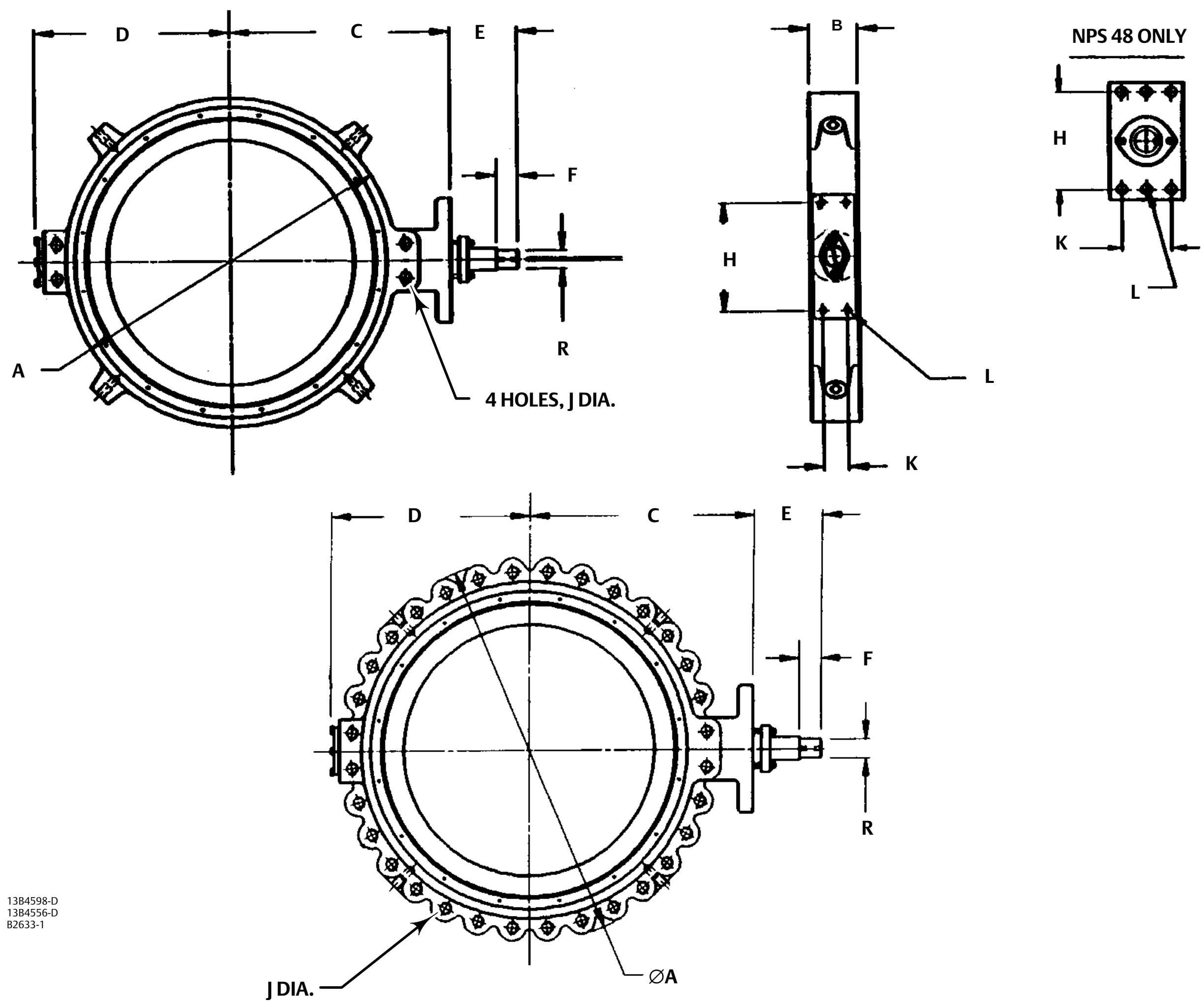


Table 6. Dimensions and Weights Wafer and Lugged Style CL150

VALVE SIZE, NPS	A		B	C	D	E	F	H	J	K	L	M(1)	R	KEY SQ SIZE	APPROX WEIGHT
	Wafer	Single Flange													
	mm														kg
30	866.6	991	158.8	590.6	520.7	314.5	114.3	336.6	See Thread Info Below	76.2	See Thread Info Below	735.8	69.9	15.9	528
36	1031.7	1175	177.8	657.4	619.3	314.5	114.3	304.8		152.4		887.7	69.9	15.9	806
42	1050	1360	228.6	838.2	730.3	314.5	114.3	304.8		152.4		1028.2	69.9	15.9	1302
48	1371.6	1524	260.4	901.7	797.1	314.5	114.3	508.0		203.2		1110.9	69.9	15.9	1904
	Inches														lbs
30	34.12	39.00	6.25	23.25	20.50	12.38	4.5	13.25	1-1/4-8	3.00	7/8-9	28.97	2-3/4	5/8	1164
36	40.62	46.25	7.00	25.88	24.38	12.38	4.5	12.00	1-1/2-8	6.00	1-1/4-7	34.95	2-3/4	5/8	1778
42	47.50	53.56	9.00	33.00	28.75	12.38	4.5	12.00	1-1/2-8	6.00	1-1/4-7	40.48	2-3/4	5/8	2871
48	54.00	60.00	10.25	35.50	31.38	12.38	4.5	20.00	1-1/2-8	8.00	1-1/4-7	46.09	2-3/4	5/8	4198

1. M dimension is disk chordal swing diameter.

Figure 3. Dimensions Wafer and Lugged Style CL150 (also see table 6)

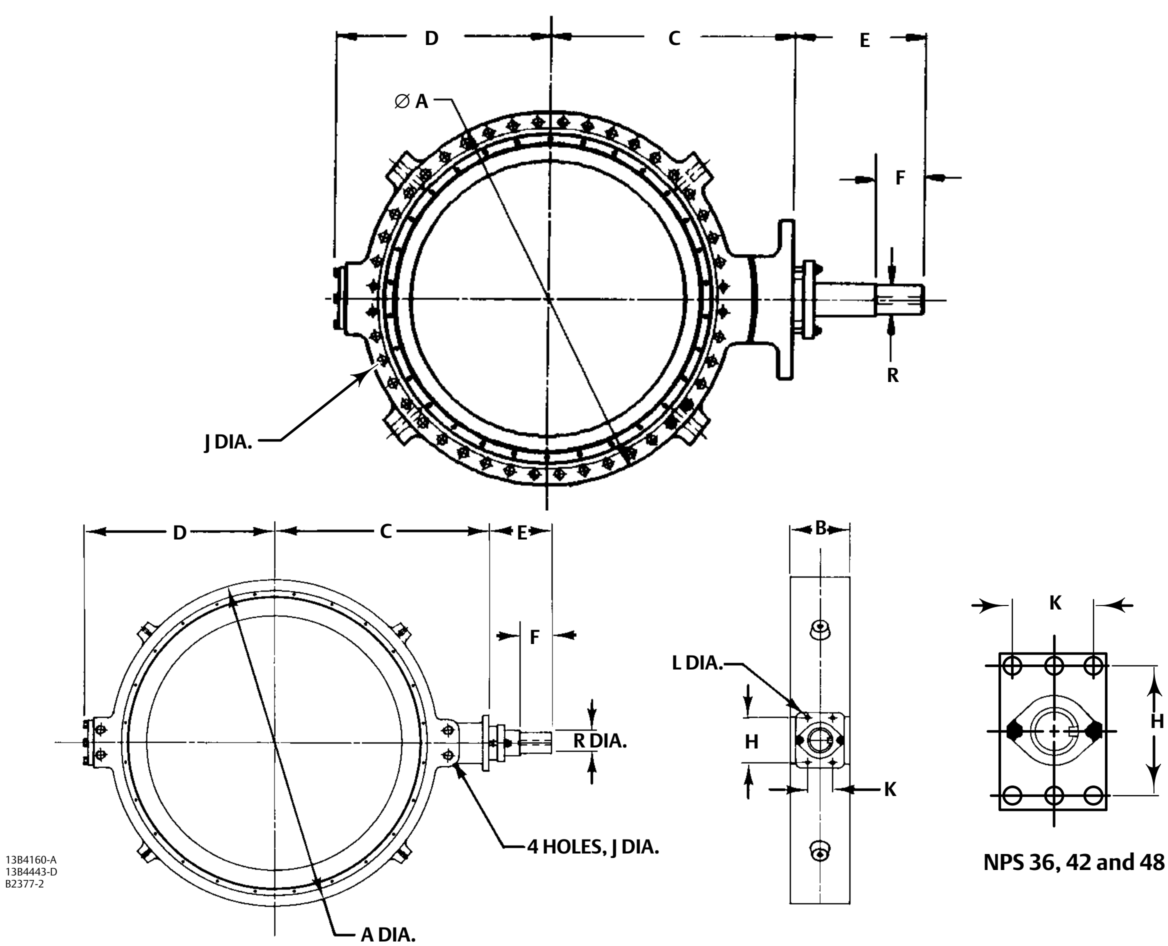
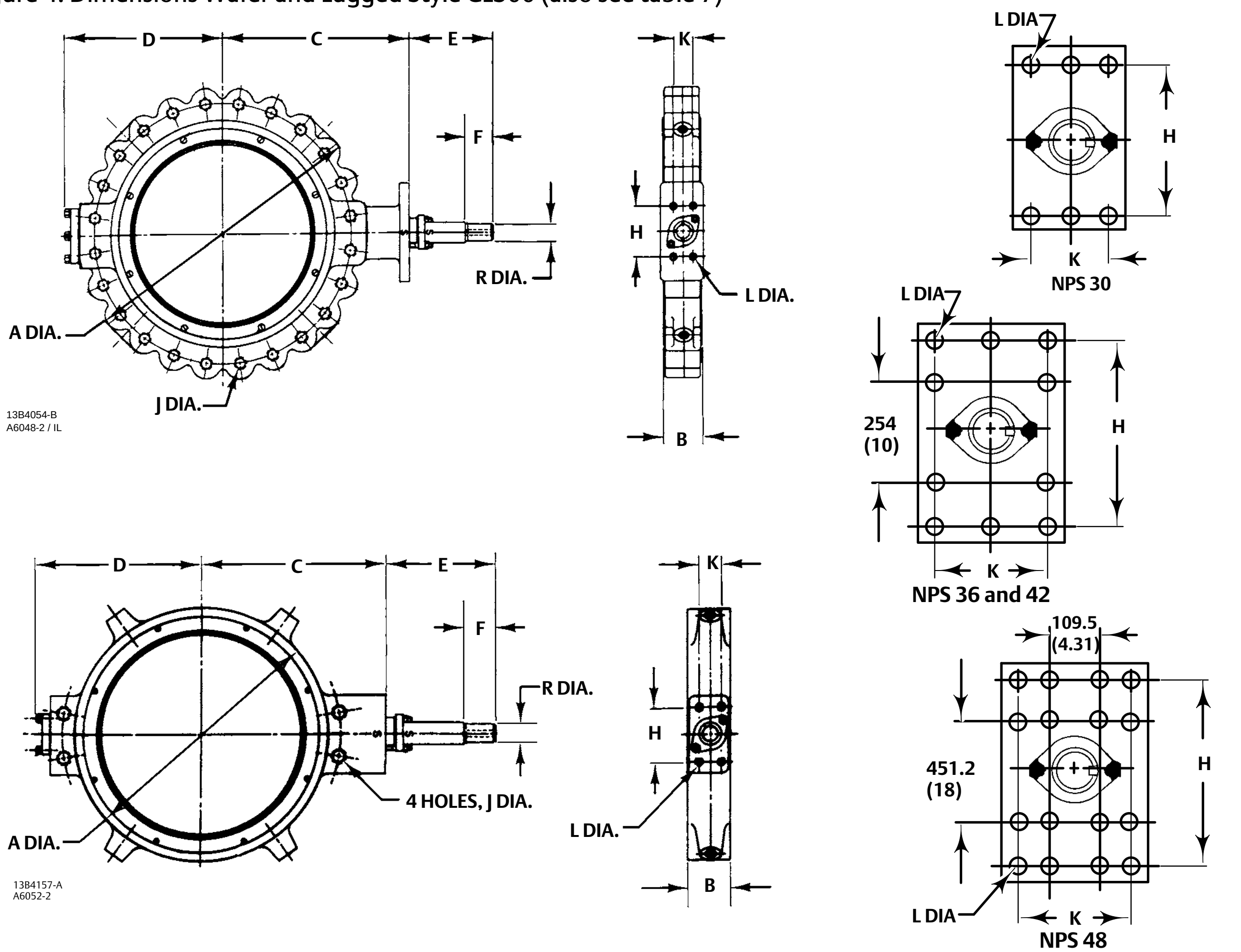


Table 7. Dimensions and Weights Wafer and Lugged Style CL300

VALVE SIZE NPS	A Wafer	A Single Flange	B	C	D	E	F	H	J	K	L	M(1)	R	KEY SQ SIZE	APPROX WEIGHT
	mm														kg
30	865	1105	241	648	576	314	114.3	508	See Thread Info Below	203	See Thread Info Below	681	70	15.9	952
36	1035	1286	273	740	675	353	152.4	432		203		838	95	22.2	1315
42	1162	1346	299	867	768	363	163.6	432		203		943	102	25.4	2263
48	1315	1484	422	934	888	497	114.3	660		330		1125	146	38.1	3056
	Inches														lbs
30	34.06	43.50	9.50	25.50	22.69	12.38	4.5	20.00	1-3/4-8	8.00	1-1/4-7	26.80	2-3/4	5/8	2100
36	40.75	50.62	10.75	29.12	26.56	13.88	6	17.00	2-8	8.00	1-1/4-7	32.99	3-3/4	7/8	2900
42	45.75	53.00	11.75	34.12	30.25	14.31	6.44	17.00	1-5/8-8	8.00	1-1/4-7	37.13	4	1	4989
48	51.75	58.44	16.62	36.75	34.94	19.56	4.5	26.00	1-7/8-8	13.00	1-1/4-7	44.29	5-3/4	1-1/2	6738

1. M dimension is disk chordal swing diameter.

Figure 4. Dimensions Wafer and Lugged Style CL300 (also see table 7)



Pressure Drops

Pressure drop limits of any given valve are based on valve body, and trim material limits. To find the appropriate pressure drop limitation, choose the desired valve size and temperature range. Then search table 8 for body limitations and table 9 for trim limitations. Information on limits for S31254, CW2M, M35-1 and other alloy constructions can be obtained by contacting your Emerson sales office or Local Business Partner. The lowest number from the tables is the appropriate limit. **The tables for both trim and body limits must be consulted.**

Table 8. Maximum Allowable Shutoff Pressure Drops (Valve Ratings) Based on Carbon Steel and Stainless Steel Valve Types[(1)] (The tables for both trim and body limits must be consulted)

TEMPERATURE RANGE	PRESSURE RANGE					
	CL150/150		CL150		CL300	
	WCC	CF8M	WCC	CF8M	WCC	CF8M
°C	Bar					
-254 to -29	- - -	10.3	- - -	19.0	- - -	49.6
-29 to 38	10.3	10.3	20	19.0	51.7	49.6
93	9.3	9.0	17.9	16.2	51.7	42.7
149	8.3	7.9	15.9	14.8	50.3	38.6
204	7.2	7.2	13.8	13.4	48.6	35.5
260	6.2	6.2	11.7	11.7	45.9	33.1
316	5.2	5.2	9.7	9.7	41.7	31.0
343	4.5	4.5	8.6	8.6	40.7	30.3
371	4.1	4.1	7.6	7.6	38.3	30.0
399	3.4	3.4	6.6	6.6	34.8	29.3
427	2.8	2.8	5.5	5.5	28.3	29.0
454	- - -	2.4	- - -	4.5	- - -	29.0
482	- - -	1.7	- - -	3.4	- - -	28.6
510	- - -	1.4	- - -	2.4	- - -	26.5
538	- - -	0.7	- - -	1.4	- - -	25.2
°F	Psi					
-450 to -20	- - -	150	- - -	275	- - -	720
-20 to 100	150	150	290	275	750	720
200	135	130	260	235	750	620
300	120	115	230	215	730	560
400	105	105	200	195	705	515
500	90	90	170	170	665	480
600	75	75	140	140	605	450
650	65	65	125	125	590	440
700	60	60	110	110	555	435
750	50	50	95	95	505	425
800	40	40	80	80	410	420
850	- - -	35	- - -	65	- - -	420
900	- - -	25	- - -	50	- - -	415
950	- - -	20	- - -	35	- - -	385
1000	- - -	10	- - -	20	- - -	365

1. For pressure/temperature rating of other materials, contact your Emerson sales office or Local Business Partner.

Table 9. Maximum Allowable Shutoff Pressure Drops(1)

TRIM NUMBER	TEMPERATURE RANGE	PRESSURE RANGE											
		CL150/150				CL150				CL300			
		Valve Body Size, NPS				Valve Body Size, NPS				Valve Body Size, NPS			
		30	36	42	48	30	36	42	48	30	36	42	48
	°C	Bar											
550	-46 to 38	10.34	10.34	10.34	10.34	32.06	27.85	18.55	12.34	38.47	51.02	46.06	51.02
	38 to 149	10.34	10.34	10.34	10.34	27.58	27.58	18.55	12.34	27.58	27.58	27.58	27.58
	149 to 232	3.447	3.447	3.447	3.447	3.447	3.447	3.447	3.447	3.447	3.447	3.447	3.447
552	-46 to 38	10.34	10.34	10.34	10.34	29.72	23.72	16.27	11.17	32.82	45.44	41.23	61.64
	38 to 149	10.34	10.34	10.34	10.34	25.72	23.72	16.27	11.17	32.82	45.44	41.23	61.64
	149 to 232	10.34	10.34	10.34	10.34	24.2	23.72	16.27	11.17	32.82	45.44	41.23	61.09
554	-46 to 38	10.34	8.136	10.34	4.964	21.24	16	9.584	5.792	26.48	35.78	31.37	48.06
	38 to 149	10.34	8.136	10.34	4.964	17.93	16	9.584	5.792	26.48	35.78	31.37	39.64
	149 to 232	10.34	8.136	10.34	4.964	16.75	16	9.584	5.792	20.68	20.68	20.68	20.68
555, 556	-46 to 38	10.34	10.34	10.34	7.722	22.75	16.62	11.45	7.653	22.75	32.47	29.51	44.33
	38 to 149	10.34	10.34	10.34	7.722	19.65	16.62	11.45	7.653	22.75	32.47	29.51	44.33
	149 to 232	10.34	10.34	10.34	7.722	18.48	16.62	11.45	7.653	22.75	32.47	29.51	44.33
	232 to 316	10.34	10.34	10.34	7.722	17.65	16.96	11.45	7.653	22.75	32.47	29.51	44.33
556	316 to 427	10.34	10.34	10.34	7.446	16.89	16.62	11.17	7.446	22.75	32.47	29.51	44.33
564H, 566H	343 to 427	10.34	10.34	10.34	7.722	16.89	16.96	11.45	7.653	22.75	32.54	29.51	44.33
564H(2), 566H	427 to 538	10.34	10.34	10.34	7.722	24.55	16.96	11.45	7.653	22.75	32.54	29.51	44.33
567C	-196 to -46	10.34	10.34	10.34	10.34	26.34	28.89	20.82	14.34	41.78	55.23	46.61	56.95
	-46 to 149	10.34	10.34	10.34	10.34	17.24	22.89	16.89	14.34	41.78	43.99	36.89	45.23
TRIM NUMBER	°F	Psi											
550	-50 to 100	150	150	150	150	465	404	269	179	558	740	668	740
	100 to 300	150	150	150	150	400	400	269	179	400	400	400	400
	300 to 450	50	50	50	50	50	50	50	50	50	50	50	50
552	-50 to 100	150	150	150	150	431	344	236	162	476	659	598	894
	100 to 300	150	150	150	150	373	344	236	162	476	659	598	894
	300 to 450	150	150	150	150	351	344	236	162	476	659	598	886
554	-50 to 100	150	118	150	72	308	232	139	84	384	519	455	697
	100 to 300	150	118	150	72	260	232	139	84	384	519	455	575
	300 to 450	150	118	150	72	243	232	139	84	300	300	300	300
555, 556	-50 to 100	150	150	150	112	330	241	166	111	330	471	428	643
	100 to 300	150	150	150	112	285	241	166	111	330	471	428	643
	300 to 450	150	150	150	112	268	241	166	111	330	471	428	643
	450 to 600	150	150	150	112	256	246	166	111	330	471	428	643
556	600 to 800	150	150	150	108	245	241	162	108	330	471	428	643
564H, 566H	650 to 800	150	150	150	112	245	246	166	111	330	472	428	643
564H(2), 566H	800 to 1000	150	150	150	112	356	246	166	111	330	472	428	643
567C	-320 to -50	150	150	150	150	382	419	302	208	606	801	676	826
	-50 to 300	150	150	150	150	250	332	245	208	606	638	535	656

1. Consult your Emerson sales office or Local Business Partner if higher pressure drops are required.
2. Trim 564H with optional N07718 shaft for temperatures up to 482°C. (1000°F).

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Product Name
D104222X012

Product Bulletin
51.6:A11 CL900-2500
August 2017

Fisher™ A11 High-Performance Butterfly Valve CL900-2500

The Fisher A11 High-Performance Butterfly Valve maintains tight shutoff, and can be specified for a wide range of pressure and temperature conditions, including cryogenic applications.

The A11 valve is available in a lugged design. A square or keyed shaft can combine with a variety of handlevers, handwheels, or pneumatic piston diaphragm actuators. A splined shaft can combine with a variety of spring-and-diaphragm or pneumatic piston actuators. These combinations help make the A11 valve a reliable, high-performance butterfly valve for both throttling and on-off applications in the process industries.

The A11 valve can be supplied with one of several dynamic seals (figure 1) that can be used in a variety of demanding applications. With the appropriate seal selection and materials of construction, the pressure-assisted seal helps provide excellent shutoff against the full ASME class pressure range for the A11 valve.

W9570-1

Features

- Shaft Versatility— This valve will meet your actuator needs with a choice of square, keyed, or splined shaft connections.
- Excellent Shutoff Integrity— The pressure-assisted seal design provides tight shutoff and permits the use of smaller, less expensive actuators in applications requiring full ASME B16.34 shutoff capabilities.
- Excellent Emissions Capabilities— The optional ENVIRO-SEAL™ packing systems are designed with very smooth shaft surfaces and live-loading to provide improved sealing, guiding, and loading force transmission. The seal of the ENVIRO-SEAL system can control emissions to below 100 ppm (parts per million).
- Sour Service Capability— Trim and bolting materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0103, and MR0175 / ISO 15156.
- High-Temperature/Cryogenic Capabilities— Optional valve constructions allow this valve to meet both high-temperature and cryogenic applications (see table 4 for cryogenic and high-temperature actuator configurations).
- Easy Installation— The valve body self-centers on the line flange bolts as a fast, accurate means of centering the valve in the pipeline.

Features (continued)

- **Reliable Flange Gasketing Surface—** Seal retainer screws are located so there is no interference with the sealing function of either flat sheet or spiral wound line flange gaskets.
- **True Bidirectional Shutoff Performance—** A feature of the valve design is that the torque necessary to open and close the valve is the same regardless of the direction in which the differential pressure is applied.
- **Ease of Maintenance—** Interchangeability of all parts, including shafts and disks, simplifies service and reduces maintenance costs.

Standard Seal Configurations

- **Standard Soft Seal (ETFE CL900, and 1500)—** A resilient dynamic seal with an elastomeric back-up ring for low to moderate temperature applications.
- **High-Pressure Seal (CL900, and 1500)—** This robust, stainless steel seal is available for severe service, cryogenic, and high-temperature applications to 704°C (1300°F), for NACE, and for other applications to 816°C (1500°F).
- **Cryo-Tight Cryogenic Seal—** This resilient dynamic seal is available with or without an aluminum back-up ring for low temperature applications.

Table of Contents

Specifications

Available Configurations and Sizes

Lugged

Available Sizes and Shaft Styles

PRESSURE RATING	VALVE SIZE, NPS		
	Keyed	Square	Splined
CL900	12 to 24 (standard), 3(2) to 10 (optional)	Consult your Emerson sales office	Consult your Emerson sales office
CL1500	3(3) to 20 (standard)		
CL2500	Consult your Emerson sales office		

1. Refers to a valve construction consisting of a CL150 body and trim suitable for a shutoff pressure drop of 150 psid.
2. Sizes NPS 3 and 4 are CL900 bodies with CL600 internals.
3. Sizes NPS 3 and 4 are CL1500 bodies with CL600 internals. Sizes NPS 6 and 8 are CL1500 bodies with CL900 internals.

End Connection Style

Lugged style designed to fit between raised-face mating flanges of appropriate class pressure rating ASME B16.5
NPS 6 through 24: CL900
NPS 10 through 20: CL1500

Maximum Inlet Pressure(1)

Valve Body: Consistent with CL900 and 1500 pressure/temperature ratings per ASME B16.34, see table 9

Seal: See figure 1

Materials of Construction

See table 1
Disk Hard Surfacing: All CL900 and 1500 disk edges must be coated, regardless of the seal type. Metal, Phoenix III and cryogenic seals require the disk to be coated, regardless of the valve class.

Maximum Temperature Capabilities(1)

See table 1

High-Temperature and Cryogenic Applications: See table 4 for available valve and actuator combinations

Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4

Class VI Soft Seal: Bubble-tight shutoff (exceeds Class VI)
High Pressure Seal: Standard Class V
Cryogenic Seal (Reverse direction only)
CTFE: 10% of Class IV
CTFE with Aluminum Backup Ring: Class VI
Consult Emerson sales office for other shutoff classifications

Flow Characteristic

Modified equal percentage

Flow Coefficients

See Fisher Catalog 12

Noise Levels

See Fisher Catalog 12 for sound pressure level prediction

Available Actuators

Handlever; handwheel; or pneumatic piston, spring return, double-acting, spring and diaphragm

Disk Rotation

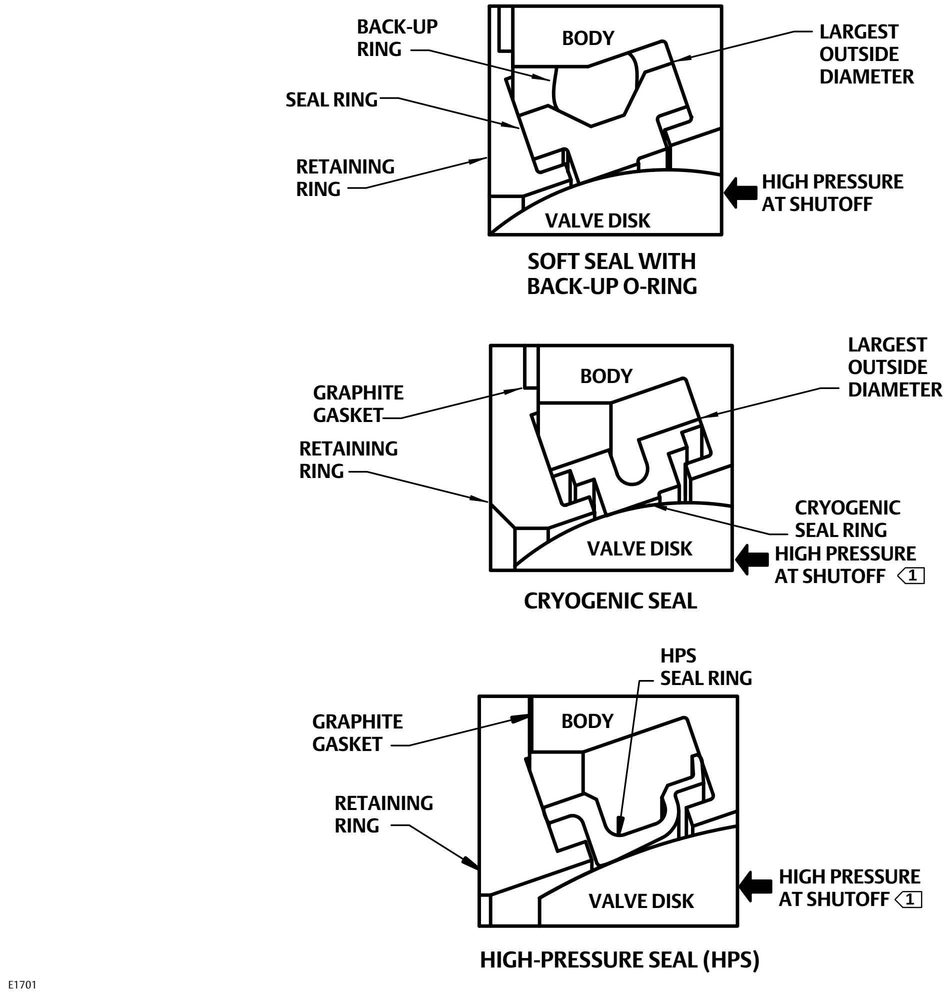
Clockwise (CW) to close

Valve Dimensions and Approximate Weights

See figure 3
For general packing guidelines, see Bulletin 59.3:042 Packing Selection Guidelines for Rotary Valves, (D102093X012)
For information on ENVIRO-SEAL packing system see Bulletin 59.3:041 ENVIRO-SEAL Packing Systems for Rotary Valves, (D101638X012)

1. The pressure/temperature limits in this bulletin, and any applicable code or standard limitation, should not be exceeded.

Figure 1. Available Seal Configurations



Notes:
1 This unidirectional seal must be installed so that the retaining ring is downstream from the high pressure side of the valve at shutoff, as shown.

Installation

Preferred valve orientation for the A11 valve is reverse flow direction. Reverse flow direction is into the side of the valve body opposite the retaining ring or into the shaft side of the disk.

For erosive and many severe service applications, valves with bidirectional seals can and should be installed with the shaft horizontal and in the forward flow direction to prevent direct impingement of the process media on the seal, and to minimize the exposure of the shaft bearings to the process media.

The standard soft seal and the Phoenix III seal both offer bidirectional shutoff. Valves using either metal or cryogenic seals are unidirectional and must be installed in the reverse flow orientation.

For assistance in selecting the appropriate combination of actuator action and open valve position, consult your Emerson sales office or Local Business Partner.

Dimensions and weights for lugged valves are shown in figure 3.

Table 1. Material Temperature Ranges

PART NAME	MATERIAL	TEMP °C	TEMP °F
Valve Body	WCC Steel, SA-516-70 or SA-105	-29 to 427	-20 to 800
	CF8M, CF8, CF3M, CF3	-254 to 538	-425 to 1000
	CF8M, CF8C, CF8[1] FMS 20B16 a Fisher material standard (0.04% min carbon)	over 538 to 816	over 1000 to 1500
	LCC	-45 to 343	-50 to 650
	C12A	-29 to 649	-20 to 1200
	WC9	-29 to 593	-20 to 1100
	CG8M, CG3M, CF8C	-198 to 538	-325 to 1000
Disk	CF8M	-254 to 538	-425 to 1000
	CB7Cu-1	-29 to 427	-20 to 800
Disk Seating Surface Coating	Chrome Plating	-254 to 427	-425 to 800
	Chromium Coat per FFS 2E1	-254 to 593	-425 to 1100
	Chromium Carbide Coating	-254 to 816	-425 to 1500
	CoCr-A (Alloy 6)[3]		
Shaft	S17400 (H1025)	-73 to 427	-100 to 800
	S17400 (H1150M)	-196 to 427	-320 to 800
	N05500[3]	-254 to 482	-425 to 900
	N07718	-254 to 704	-425 to 1300
	S20910[3]	-196 to 593	-320 to 1100
	N07750[3]	over 593 to 816	over 1100 to 1500
Bearings[2]	PEEK	-73 to 260	-100 to 500
	PTFE Composition	-254 to 163	-425 to 325
	S31600 (316 SST Nitrided)	-254 to 816	-425 to 1500
	R30006 (Alloy 6)[3]		
Seal Ring	Soft - ETFE	-54 to 149	-65 to 300
	HPS - S20910[3]	-254 to 649	-425 to 1200
Backup Ring	**Used with Soft Seal**		
	Fluorocarbon	-29 to 204	-20 to 400
	EPR	-54 to 182	-65 to 360
	Nitrile[3]	-29 to 93	-20 to 200
	Chloroprene[3]	-43 to 149	-45 to 300
	Used with Cryogenic Seal		
	Aluminum[3]	-254 to 149	-425 to 300
Packing	PTFE V-Ring	-254 to 232	-425 to 450
	PTFE ENVIRO-SEAL	-254 to 232	-425 to 450
	Square Ring Graphite for Oxidizing Service	-254 to 538	-425 to 1000
	Square Ring Graphite for Non-oxidizing Service	-254 to 816	-425 to 1500
	Graphite ENVIRO-SEAL	-198 to 315	-325 to 600

1.Special retaining ring screws for lugged valves over 538°C (1000°F).
2. Special thrust bearings are required for high temperature applications over 343°C (650°F) (with 6 and 12 inch extensions). Constructions with carbon steel valves and SST disks may require special thrust bearings at temperatures greater than 343°C (650°F).
3. Special option; contact your Emerson sales office.

Table 2. Trim Descriptions - CL900 and CL1500

Trim Type	Trim Number	Temperature Range	Disk Material	Disk Edge Coating	Seal Type	Seal Material	Shaft	Bearings	Packing(5)
Standard	500(1)	-29 to 149°C -20 to 300°F	CB7Cu-1	Chrome Plated	Soft	ETFE	S17400 H1025	PEEK	PTFE
	502	-46 to 232°C -50 to 450°F	CB7Cu-1	Chrome Plated	HPS	S20910 Nitrided	S17400 H1025	PEEK	PTFE
	504	-40 to 149°C -40 to 300°F	CB7Cu-1	Chrome Plated	Phoenix III	S31600/ETFE	S17400 H1025	PEEK	PTFE
	506(2)	-46 to 427°C -50 to 800°F	CB7Cu-1	Chromium Coat per FFS 2E1	HPS	S20910 Nitrided	S17400 H1025	316 SST Nitrided	Graphite
High-Temperature	514H(3)	-46 to 427°C -50 to 800°F	CB7Cu-1	Chromium Coat per FFS 2E1	HPS	S20910 Nitrided	S17400 H1025	316 SST Nitrided	Graphite
	516H(4)	-46 to 538°C -50 to 1000°F	CF8M	Chromium Coat per FFS 2E1	HPS	S21800 Nitrided	N07718	316 SST Nitrided	Graphite

1. Trim 500 is furnished as standard trim in all CL1500 A11 valves.
2. If operating temperature is above 343°C (650°F), see table 4 for available actuator configurations.
3. Trim includes 6-inch shaft extension.
4. Trim includes 12-inch shaft extension.
5. Consult Bulletin 59.3:042 Packing Selection Guidelines for Rotary Valves, D102093X012, for packing selection guidelines regarding pressure/temperature limits.

Table 3. Cryogenic Shaft Extension Lengths(1)

STANDARD CRYOGENIC EXTENSION LENGTH, INCH FOR VALVE BODY SIZE, NPS										
3	4	6	8	10	12	14	16	18	20	24
14-3/4	17-3/4	19-1/4	26-3/4	28-1/2	33-1/2	36	36	36	36	36

1. Extension length measured from center of valve body to bottom of packing flange.

Table 4. Valve/Actuator Combinations

TEMPERATURE RANGE	SELECTION GUIDELINES	
	1052, 1061, or 2052(1)	G Series(2), FieldQ ™ (4)
-254 to -196°C (-425 to -320°F)	Valve with cryogenic extension and special trim materials(3) and standard actuator	
-196 to -46°C (-320 to -50°F)	Valve with cryogenic extension and trim and standard actuator	
-46 to 343°C (-50 to 650°F)	Valve (select appropriate trim) and standard actuator	
343 to 426°C (650 to 800°F)	**Mounting positions 1 and 3:** Valve (select appropriate trim) and standard actuator **Mounting positions 2 and 4:** Valve with 6-inch extension (select trim 514H or 564H) and standard actuator - ambient temperature may dictate the need for a high-temperature diaphragm	Valve (select appropriate trim) and actuator with high-temperature O-rings option or Valve with 6-inch extension (select trim 514H) and standard actuator
426 to 538°C (800 to 1000°F)	**Mounting positions 1 and 3:** Valve (select appropriate trim) and standard actuator **Mounting positions 2 and 4:** Valve with 6-inch extension (select trim 564H or 514H with N07718 shaft) and standard actuator - ambient temperature may dictate the need for a high-temperature diaphragm	Valve (select appropriate trim) and actuator with high-temperature O-rings option or Valve with 6-inch extension (select trim 564H or 514H with N07718 shaft) and standard actuator
538 to 816°C (1000 to 1500°F)	Valve with 12-inch extension and special trim materials(3) and standard actuator	Valve with 12-inch extension and special trim materials(3) and standard actuator

1. See figure 2 for actuator mounting positions.
2. Select keyed shaft option when using G series actuator.
3. Consult your Emerson sales office.
4. Select square shaft option when using FieldQ actuators.

Figure 2. Mounting Styles and Positions

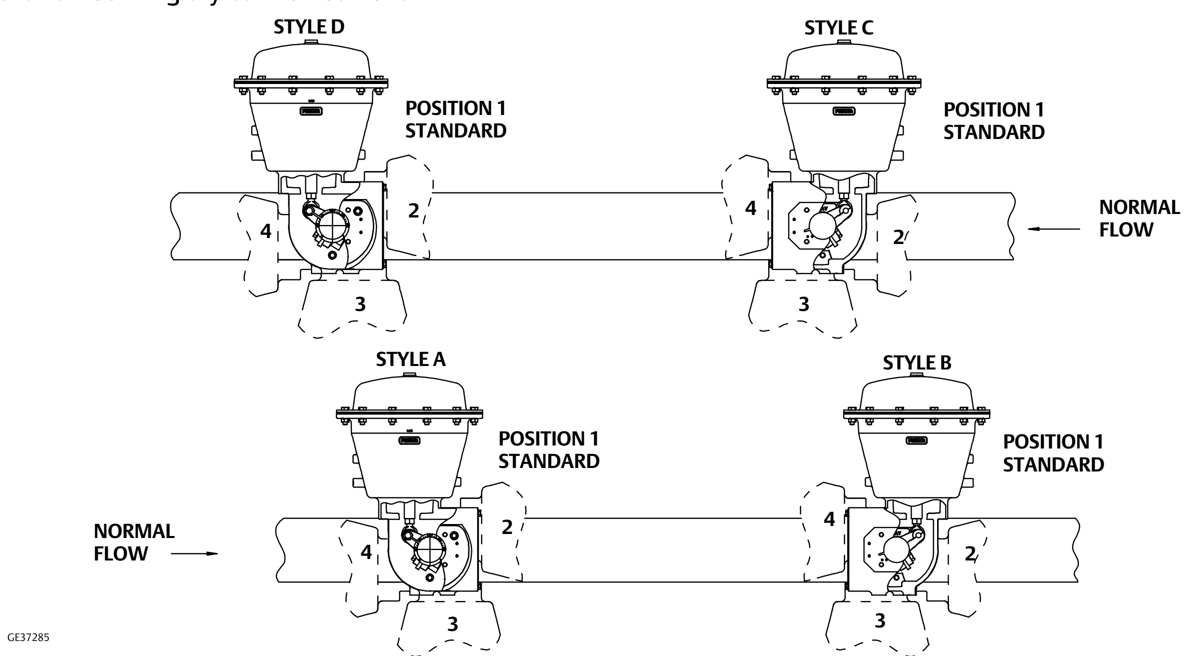


Table 5. Dimensions and Weights Lugged Style CL900

VALVE SIZE, NPS	A	B	C	D	E		F	G	H	K	M(1)	R∅	KEY SQ SIZE	APPROX WEIGHT
					Keyed Shaft	Sq Shaft		Square				Keyed		
	mm													kg
6	381	76	233	233	210	90	67	22	235	46	126	25	6	59.0
8	470	109	305	305	210	90	67	35	273	51	164	38	10	120
10	546	146	353	353	210	95	67	35	273	51	182	44	10	210
12	610	229	445	445	295	- - -	95	- - -	337	76	165	57	13	450
14	635	216	451	451	295	- - -	95	- - -	337	76	208	57	13	444
16	705	241	438	438	314	- - -	117	- - -	337	76	217	70	16	513
18	781	273	524	524	314	- - -	114	- - -	337	76	(2)	70	16	703
20	857	292	695	695	314	- - -	114	- - -	305	165	284	70	16	991
24	1041	333	657	657	314	- - -	117	- - -	572	203	366	95	22	1628
	Inches													lbs
6	15.00	3.00	9.19	9.19	8.25	3.56	2.62	0.87	9.25	1.812	4.98	1.00	1/4	130
8	18.50	4.31	12.00	12.00	8.25	3.75	2.62	1.37	10.75	2.00	6.46	1.50	3/8	264
10	21.50	5.75	13.88	13.88	8.25	3.75	2.62	1.37	10.75	2.00	7.17	1.75	3/8	463
12	24.00	9.00	17.50	17.50	11.62	- - -	3.75	- - -	13.25	3.00	6.48	2.25	1/2	993
14	25.00	8.50	17.75	17.75	11.62	- - -	3.75	- - -	13.25	3.00	8.17	2.25	1/2	978
16	27.75	9.50	17.25	17.25	12.38	- - -	4.62	- - -	13.25	3.00	8.55	2.75	5/8	1132
18	30.76	10.75	20.63	20.63	12.38	- - -	4.50	- - -	13.25	3.00	(2)	2.75	5/8	1550
20	33.75	11.50	27.38	27.38	12.38	- - -	4.50	- - -	12.00	6.50	11.19	2.75	5/8	2185
24	41.00	13.12	25.88	25.88	12.38	- - -	4.62	- - -	22.50	8.00	14.40	3.75	7/8	3590

1. M dimension is the disk chordal swing diameter.
2. Contact your Emerson sales office.

Table 6. Dimensions Lugged Style CL900

VALVE SIZE, NPS	L	J
	mm	
6	See Thread Info Below	See Thread Info Below
8		
10		
12		
14		
16		
18		
20		
24		
VALVE SIZE, NPS	Inches	
6	5/8-11 4 Holes	1-1/8-8 12 Holes
8	3/4-10 4 Holes	1-3/8-8 12 Holes
10	3/4-10 4 Holes	1-3/8-8 16 Holes
12	7/8-9 4 Holes	1-3/8-8 20 Holes
14	7/8-9 4 Holes	1-1/2-8 20 Holes
16	7/8-9 4 Holes	1-5/8-8 20 Holes
18	1-1/4-7 6 Holes	1-7/8-8 20 Holes
20	1-1/4-7 6 Holes	2-8 20 Holes
24	1-1/4-7 6 Holes	2-1/2-8 20 Holes

Table 7. Dimensions and Weights Lugged Style CL1500

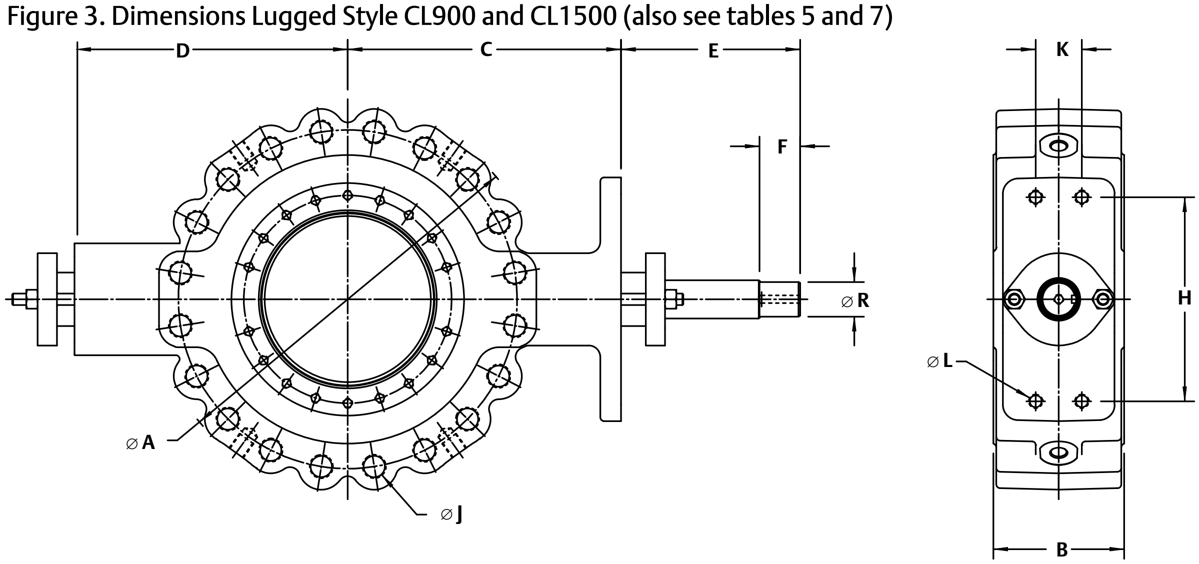
VALVE SIZE, NPS	A	B	C	D	E Keyed Shaft	F	H	K	M(1)	R∅ Keyed	KEY SQ SIZE	APPROX WEIGHT
	mm											kg
10	584	178	399	399	295	95	337	76	118	57	13	311
12	673	267	445	445	305	105	337	76	(2)	64	16	663
14	754	283	483	483	210	114	337	76	(2)	70	16	810
16	826	321	559	559	314	152	305	152	(2)	70	22	1152
18	914	349	629	629	379	164	508	203	(2)	102	25	1613
20	991	410	682	682	404	171	508	203	(2)	108	25	2250
	Inches											lbs
10	23.00	7.00	15.69	15.69	11.62	3.75	13.25	3.00	4.63	2.25	1/2	685
12	26.50	10.50	17.50	17.50	12.00	4.13	13.25	3.00	(2)	2.50	5/8	1462
14	29.69	11.13	19.00	19.00	8.25	4.50	13.25	3.00	(2)	2.75	5/8	1785
16	32.52	12.63	22.00	22.00	12.38	6.00	12.00	6.00	(2)	2.75	7/8	2540
18	36.00	13.75	24.75	24.75	14.94	6.44	20.00	8.00	(2)	4.00	1	3555
20	39.00	16.13	26.84	26.84	15.89	6.75	20.00	8.00	(2)	4.25	1	4960

1. M dimension is the disk chordal swing diameter.
2. The disk size is less than the face-to-face dimension of this valve. Therefore, the disk chordal swing is not applicable when sizing this valve.

Table 8. Dimensions Lugged Style CL1500

VALVE SIZE, NPS	L	J
	mm	
10	See Thread Info Below	See Thread Info Below
12		
14		
16		
18		
20		
VALVE SIZE, NPS	Inches	
10	7/8-9 4 Holes	1-7/8-8 12 Holes
12	7/8-9 4 Holes	2-8 16 Holes
14	7/8-9 4 Holes	2-1/4-8 16 Holes
16	1-1/4-7 6 Holes	2-1/2-8 16 Holes
18	1-1/4-7 6 Holes	2-3/4-8 16 Holes
20	1-1/4-7 6 Holes	3-8 16 Holes

Figure 3. Dimensions Lugged Style CL900 and CL1500 (also see tables 5 and 7)



Pressure Drops

Pressure drop limits of any given valve are based on valve body, and trim material limits. To find the appropriate pressure drop limitation, choose the desired valve size and temperature range. Then search table 9 for body limitations and tables 10 and 11 for trim limitations. Information on limits for S31254, CW2M, M35-1 and other alloy constructions can be obtained by contacting your Emerson sales office or Local Business Partner. The lowest number from the tables is the appropriate limit. **The tables for both trim and body limits must be consulted.**

Table 9. Maximum Allowable Shutoff Pressure Drops (Valve Ratings) Based on Carbon Steel and Stainless Steel Valve Types[1] (The tables for both trim and body limits must be consulted)

TEMPERATURE RANGE	PRESSURE RANGE			
	CL900		CL1500	
	WCC	CF8M	WCC	CF8M
°C	Bar			
-254 to -29	- - -	148.9	- - -	248.2
-29 to 38	155.1	148.9	258.6	248.2
93	155.1	128.2	258.6	213.4
149	150.7	115.8	251.0	192.7
204	145.5	106.2	242.7	177.2
260	137.6	98.9	229.3	164.8
316	125.1	93.4	208.6	155.5
343	121.7	91.4	202.7	152.4
371	114.8	90.0	191.3	149.6
399	104.8	88.3	174.8	147.2
427	85.2	87.2	141.7	145.5
454	- - -	86.5	- - -	144.1
482	- - -	85.8	- - -	143.1
510	- - -	80.0	- - -	133.1
538	- - -	75.2	- - -	125.5
°F	Psi			
-450 to -20	- - -	2160	- - -	3600
-20 to 100	2250	2160	3750	3600
200	2250	1860	3750	3095
300	2185	1680	3640	2795
400	2110	1540	3520	2570
500	1995	1435	3325	2390
600	1815	1355	3025	2255
650	1765	1325	2940	2210
700	1665	1305	2775	2170
750	1520	1280	2535	2135
800	1235	1265	2055	2110
850	- - -	1255	- - -	2090
900	- - -	1245	- - -	2075
950	- - -	1160	- - -	1930
1000	- - -	1090	- - -	1820

1. For pressure/temperature rating of other materials, contact your Emerson sales office.

Table 10. Maximum Allowable Shutoff Pressure Drops, CL900[1, 2]

TRIM NUMBER	TEMP RANGE	NPS 6	NPS 8	NPS 10	NPS 12	NPS 14	NPS 16	NPS 18	NPS 20	NPS 24
	°C	Bar								
500	-46 to 38	103.4	103.4	103.4	103.4	103.4	103.4	103.4	103.4	103.4
	38 to 93	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8
	93 to 121	41.4	41.4	41.4	41.4	41.4	41.4	41.4	41.4	41.4
	121 to 149	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
502	-46 to 38	100.0	155.1	110.7	155.1	146.6	154.2	151.9	120.0	128.7
	38 to 149	84.6	146.2	110.7	150.7	146.5	139.3	139.1	120.0	128.6
	149 to 232	78.8	140.4	110.7	141.7	141.7	131.5	134.1	120.0	128.7
504	-46 to 38	103.4	103.4	103.4	103.4	103.4	103.4	103.4	91.0	92.8
	38 to 93	96.5	96.5	96.5	96.5	96.5	96.5	96.5	91.0	92.8
	93 to 121	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
	121 to 149	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7
506	-46 to 38	81.1	122.2	78.5	131.3	104.1	119.8	118.7	82.5	89.9
	38 to 149	67.6	122.2	78.5	131.3	104.1	103.4	118.7	82.5	89.9
	149 to 232	62.6	122.2	78.5	131.3	104.1	97.4	118.7	82.5	89.9
	232 to 343	58.1	121.3	78.5	121.3	104.1	91.8	118.7	82.5	89.9
	343 to 427	55.5	105.1	78.5	105.1	104.1	88.7	105.1	82.5	89.9
514H, 516H	343 to 427	55.5	105.1	78.5	105.1	104.1	88.7	105.1	82.5	89.9
514H[3], 516H	427 to 538	70.4	62.5	58.7	88.0	48.9	39.1	37.2	52.8	43.0
TRIM NUMBER	°F	Psi								
500	-50 to 100	1500	1500	1500	1500	1500	1500	1500	1500	1500
	100 to 200	1100	1100	1100	1100	1100	1100	1100	1100	1100
	200 to 250	600	600	600	600	600	600	600	600	600
	250 to 300	100	100	100	100	100	100	100	100	100
502	-50 to 100	1451	2250	1606	2250	2126	2237	2203	1741	1866
	100 to 300	1227	2120	1606	2185	2125	2020	2017	1741	1865
	300 to 450	1143	2036	1606	2055	2055	1907	1945	1741	1866
504	-50 to 100	1500	1500	1500	1500	1500	1500	1500	1320	1346
	100 to 200	1400	1400	1400	1400	1400	1400	1400	1320	1346
	200 to 250	900	900	900	900	900	900	900	900	900
	250 to 300	300	300	300	300	300	300	300	300	300
506	-50 to 100	1176	1773	1138	1905	1510	1737	1721	1197	1304
	100 to 300	980	1773	1138	1905	1510	1500	1721	1197	1304
	300 to 450	908	1773	1138	1905	1510	1412	1721	1197	1304
	450 to 650	842	1760	1138	1760	1510	1332	1721	1197	1304
	650 to 800	805	1525	1138	1525	1510	1286	1525	1197	1304
514H, 516H	650 to 800	805	1525	1138	1525	1510	1286	1525	1197	1304
514H[3], 516H	800 to 1000	1021	907	851	1276	709	567	539	766	624

1. Consult your Emerson sales office if higher pressure drops are required.
2. Consult Bulletin 59.3:042 Packing Selection Guidelines for Rotary Valves, D102093X012, for packing selection guidelines regarding pressure/temperature limits.
3. Trim 514H with optional N07718 shaft.

Table 11. Maximum Allowable Shutoff Pressure Drops, CL1500(1, 2)

TRIM NUMBER	TEMP RANGE	NPS 10	NPS 12	NPS 14	NPS 16	NPS 18	NPS 20
	°C	Bar					
500	-46 to 38	103.4	103.4	103.4	103.4	103.4	103.4
	38 to 93	75.8	75.8	75.8	75.8	75.8	75.8
	93 to 121	41.4	41.4	41.4	41.4	41.4	41.4
	121 to 149	6.9	6.9	6.9	6.9	6.9	6.9
502	-46 to 38	155.1	155.1	155.1	155.1	155.1	155.1
	38 to 149	155.0	155.1	155.1	155.1	155.1	155.1
	149 to 232	146.1	155.1	155.1	155.1	155.1	155.1
504	-46 to 38	103.4	103.4	103.4	103.4	103.4	103.4
	38 to 93	96.5	96.5	96.5	96.5	96.5	96.5
	93 to 121	62.1	62.1	62.1	62.1	62.1	62.1
	121 to 149	20.7	20.7	20.7	20.7	20.7	20.7
506	-46 to 38	133.5	155.1	116.5	139.5	155.1	155.1
	38 to 149	114.2	155.1	116.5	139.5	155.1	155.1
	149 to 232	107.1	155.1	116.5	139.5	155.1	155.1
	232 to 343	100.6	155.1	116.5	139.5	155.1	155.1
	343 to 427	96.9	155.1	116.5	139.5	155.1	155.1
514H, 516H	343 to 427	96.9	155.1	116.5	139.5	155.1	155.1
514H(3), 516H	427 to 538	78.2	70.4	86.0	78.2	66.5	74.3
TRIM NUMBER	°F	Psi					
500	-50 to 100	1500	1500	1500	1500	1500	1500
	100 to 200	1100	1100	1100	1100	1100	1100
	200 to 250	600	600	600	600	600	600
	250 to 300	100	100	100	100	100	100
502	-50 to 100	2250	2250	2250	2250	2250	2250
	100 to 300	2248	2250	2250	2250	2250	2250
	300 to 450	2119	2250	2250	2250	2250	2250
504	-50 to 100	1500	1500	1500	1500	1500	1500
	100 to 200	1400	1400	1400	1400	1400	1400
	200 to 250	900	900	900	900	900	900
	250 to 300	300	300	300	300	300	300
506	-50 to 100	1936	2250	1689	2024	2250	2250
	100 to 300	1657	2250	1689	2024	2250	2250
	300 to 450	1553	2250	1689	2024	2250	2250
	450 to 650	1459	2250	1689	2024	2250	2250
	650 to 800	1405	2250	1689	2024	2250	2250
514H, 516H	650 to 800	1406	2250	1689	2024	2250	2250
514H(3), 516H	800 to 1000	1134	1021	1248	1134	964	1077

1. Consult your Emerson sales office if higher pressure drops are required.
2. Consult Bulletin 59.3:042 Packing Selection Guidelines for Rotary Valves, D102093X012, for packing selection guidelines regarding pressure/temperature limits.
3. Trim 514H with optional N07718 shaft.

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Product Bulletin
51.6:A31A Cryogenic
February 2019

Fisher™ A31A Cryogenic High Performance Butterfly Valve

The Fisher A31A Cryogenic High Performance Butterfly Valve (HPBV) is designed for extreme temperature cryogenic services and features a valve body extension which positions the packing system and the actuator away from the extreme temperatures. The NPS 3 through 12 valves feature a unique one-piece investment cast extension housing. The NPS 14 through 24 valves employ a two-piece fabricated extension housing. The valve also features a metal NOVEX seal as standard providing tight shutoff, low operating torques and the rugged durability needed for cryogenic service.

The A31A Cryogenic HPBV has been developed as a valve/actuator package with a Double D drive shaft (standard for NPS 3 through 12) to allow easy, direct mounting to the Fisher 1035 Rack and Pinion actuator, eliminating the need for external coupling systems. Also available are keyed shaft (standard for NPS 14 through 24) and splined drive shafts to allow easy mounting to other Fisher actuators.

The A31A Cryogenic HPBV is available in either flangeless (wafer) or single flange styles, and S31600 is the standard valve body and disk material. This valve is offered in full rated CL150 and CL300 pressure classes.

W7451-1

FISHER A31A CRYOGENIC VALVE WITH 1035 ACTUATOR

Specifications

Valve Body Sizes and Ratings

NPS ■ 3, ■ 4, ■ 6, ■ 8, ■ 10, and ■ 12
CL150 and 300
■ NPS 14 through 24 valves are also available in CL150 and 300

End Connection Style

■ Flangeless, wafer-style or ■ single flange valve body designed to fit between raised-face mating flanges per ASME B16.5 CL150 or 300

Maximum Inlet Pressure/Temperature(1)

Consistent with CL150 and CL300 pressure/temperature ratings per ASME B16.34, except that 38°C (100°F) rating is applicable to -254°C (-425°F). NOVEX seal maximum pressure/temperature rating is the same as the valve body. See figure 3 for rating of CTFE seal.

Temperature Range(1)

-234 to 260°C (-425 to 500°F)

Available Seal Configurations

See figure 2 and table 2

Standard Construction Materials

Valve Body and Disk: ASTM grades of S31600 stainless steel
Disk Coating:Hardcoating Standard (Chrome or Nickel)
Shaft: ■ ASTM grade of S17400 H1150M SST,
■ N05500 (Optional), ■ N07718 (Optional)
Seal Ring: ■ S31600 NOVEX Std for CL 150,
■ S21800 NOVEX Std for CL300, ■ CTFE(2) optional, or ■ CTFE(2) with Aluminum Back-up ring optional
Packing: ■ PTFE V-ring, or ■ graphite (optional)
Bearings: ■ PTFE Composition, or ■ bronze (optional)

Valve Body Classification

Face-to-face dimensions are in compliance with MSS SP68 and API 609 standards; valve bodies are designed for installation between ASME B16.5 CL150 or 300 raised-face flanges

Shutoff Classification

Unidirectional Reverse flow. Per ANSI/FCI 70-2 and IEC 60534-4 at ambient temperature

NOVEX Seal: Class VI

CTFE Seal with Aluminum back-up ring: Class VI

Flow Characteristic

Modified equal percentage

Flow Coefficients

See Fisher Catalog 12

Noise Levels

See Catalog 12 for sound pressure level prediction

Available Actuators

■ Rack and Pinion 1035 for NPS 3 through 12,
■ Bettis G Series for keyed shaft NPS 14 through 24 or
■ Rotary Diaphragm 1051 and 1052 for splined shafts

Disk Rotation

Clockwise to close

Valve Dimensions and Approximate Weights

See figures 5, 6, 7, 8, 9, 10, 11, and 12 and tables 1, 3, 4, 5, 6, 7, 8, 9, and 10.

1. The pressure/temperature limits in this bulletin, and any application code or standard limitation, should not be exceeded.
2. CTFE not recommended for fast cycling, less than 2 seconds.

Figure 1. Fisher A31A Cryogenic Valve, Single Flange Style

W7449

Table 1. Approximate Weights

VALVE SIZE, NPS	WAFER CL150		SINGLE FLANGE CL150		WAFER CL300		SINGLE FLANGE CL300	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs
3	12	27	16	36	12	27	16	35
4	21	46	22	48	21	46	24	52
6	24	53	28	61	24	53	28	61
8	34	75	40	89	47	104	52	115
10	57	125	67	148	80	176	100	220
12	74	164	93	206	103	227	135	298
14	87	191	120	265	142	314	249	548
16	133	294	182	401	213	470	325	716
18	170	374	231	510	259	570	434	956
20	210	463	302	665	401	884	582	1282
24	326	719	455	1004	512	1128	863	1903

Features

- Cryogenic Seal Improvement— The NOVEX pressure-assisted metal seal design provides tight shutoff (ANSI Class VI, ambient) and permits the use of smaller, less expensive actuators in applications requiring full ASME B16.34 shutoff capabilities. The NOVEX seal is standard on all A31A Cryogenic valves.

- Direct Actuation—The A31A Cryogenic NPS 3 through 8 Double D shaft allows direct mounting with the 1035 actuator, eliminating the need for a coupler.

- Excellent Shutoff Integrity—Concentric rotation enables the valve disk to remain in the closed position in spite of line pressure surges or actuator failure.

- Safety—Redundant shaft retention provides added protection. The packing follower and shaft step interact to hold the shaft securely in the valve body. The NPS 3 through 12 valves use a one-piece packing follower, and the NPS 14 through 24 valves use a two-piece follower (see figure 4).

- Strength— The cast S31600 one-piece extensions are welded directly onto the NPS 3 through 8 valves for greater strength under service conditions.

- Easy Installation—The valve body self-centers on the line flange bolts as a fast, accurate means of centering the valve in the pipeline.

- Reliable Flange Gasketing Surface—Seal retainer screws are located so there is no interference with the sealing function of either flat sheet or spiral wound line flange gaskets.

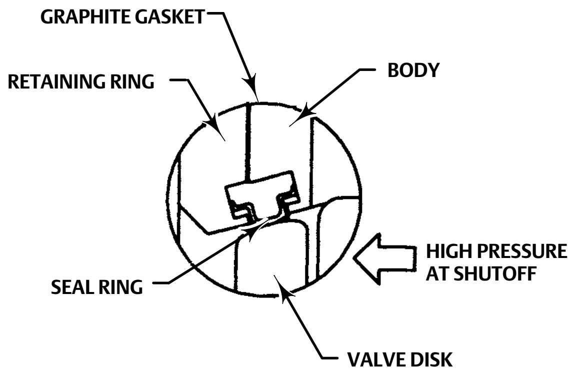
Installation

Recommended installation for the A31A Cryogenic valve is with the shaft upstream of the seal (reverse flow).

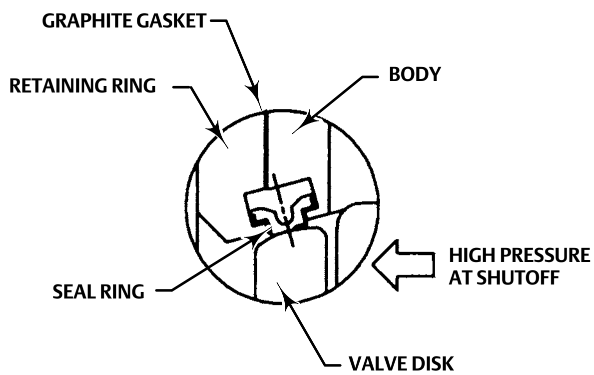
Dimensions for wafer-style and single-flange valves are shown in figures 5, 6, 7, 8, 9, 10, 11, and 12 and tables 3, 4, 5, 6, 7, 8, 9 and 10.

For assistance in selecting the appropriate combination of actuator action and open valve position, consult your Emerson sales office.

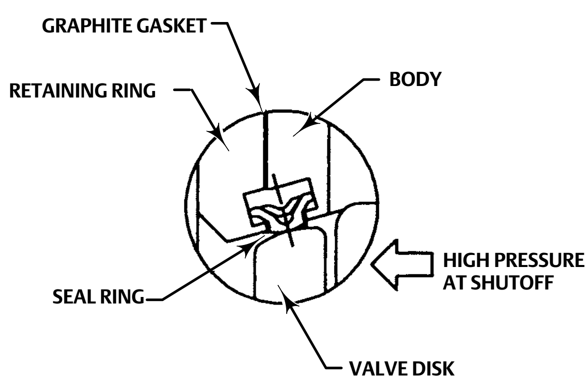
Figure 2. Available Seal Configurations



NOVEX SEAL



CTFE SEAL



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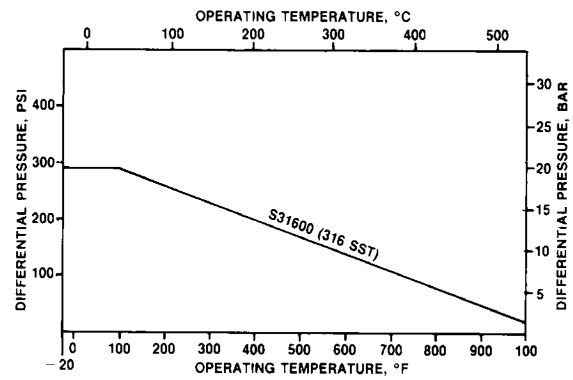
CTFE / ALUM SEAL

Figure 3. Maximum Pressure/Temperature Ratings



CL150, NOVEX SEAL

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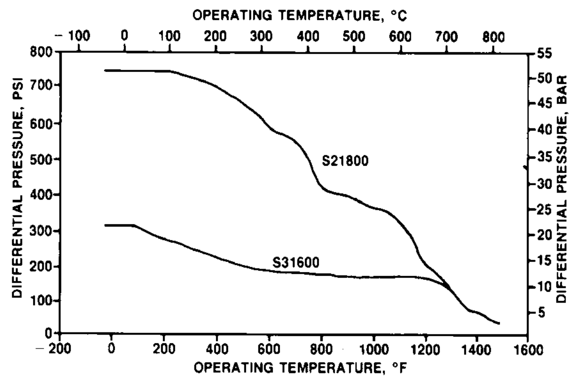
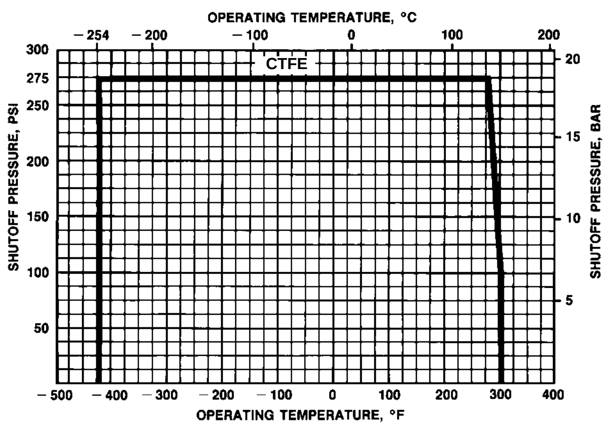


CL300, NOVEX SEAL



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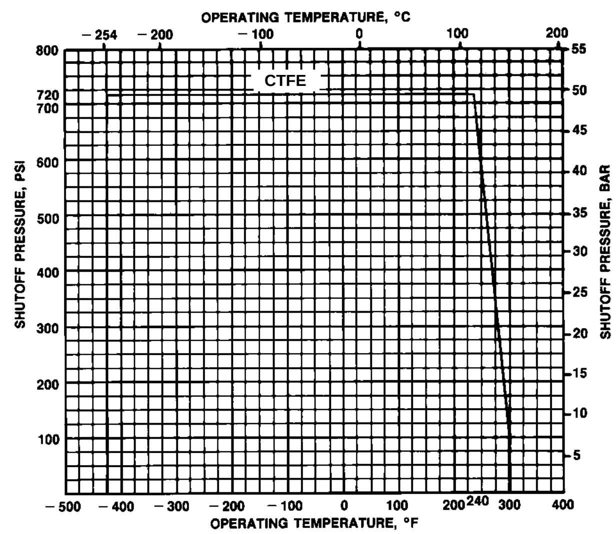
CL150, CTFE SEAL



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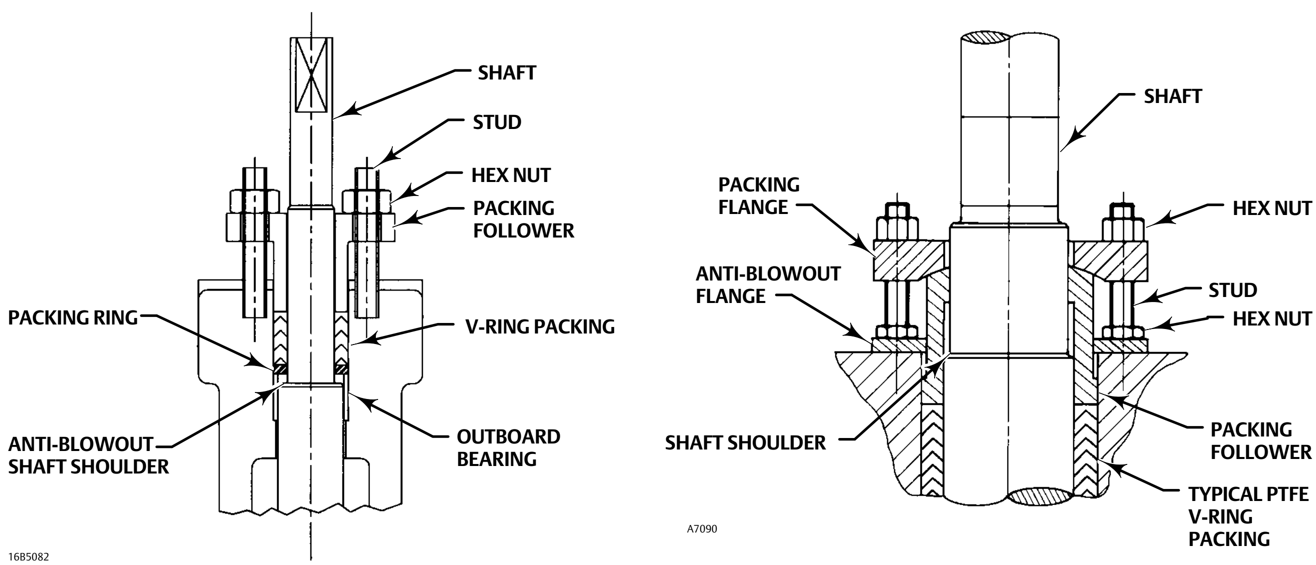
CL300, CTFE SEAL

Table 2. Material Temperature Ratings

COMPONENT AND MATERIAL OF CONSTRUCTION	TEMPERATURE RANGE	
	°C	°F
Valve Body		
CF8M (316 SST) CL150 and 300	-254 to 260	–425 to 500
Disk		
CF8M (316 SST)	-254 to 260	–425 to 500
Disk Coating		
Hard Coating(1)	-254 to 260	–425 to 500
Shaft		
S17400 H1150M (standard) N05500 N07718	-196 to 260 -198 to 260 -254 to 260	–320 to 500 -325 to 500 -425 to 500
Bearings		
PTFE Composition Rexnord (standard) Bronze	-254 to 163 -254 to 260	–425 to 325 –425 to 500
Packing		
PTFE Packing (standard) Graphite	-254 to 232 -254 to 260	–425 to 450 -425 to 500
Seal Ring		
NOVEX S31600 Seal Ring (CL150) (standard) NOVEX S21800 Seal Ring (CL300) (standard)	-254 to 260 -254 to 260	-425 to 500 -425 to 500
CTFE Cryogenic Seal Ring	-254 to 149	-425 to 300

1. The material for hard coating on the disk is either hard chrome plating or Electroless Nickel Coating (ENC) depending upon availability.

Figure 4. Anti-Blowout Protection



NPS 3 THROUGH 12

NPS 14 THROUGH 24

Table 3. Dimensions, Wafer Style Valves, CL150, NPS 3 through 8

VALVE SIZE, NPS	A	D	E	F	F1	G	J	K	M(2)	R(1)	S	T	U	V	FLAT LENGTH	FLAT SIZE
	mm															
3	48	87	83	10	19	79	146	375	71	133	16	152	32	117	25	11
4	54	113	83	22	25	95	178	451	94	171	19	152	32	117	25	14
6	57	165	83	41	51	127	248	489	148	219	25	152	32	117	25	17
8	64	210	83	65	68	152	- - -	679	197	273	25	152	32	117	25	17
	Inches															
3	1.88	3.44	3.25	0.38	0.75	3.13	5.75	14.75	2.82	5.25	0.625	6.0	1.25	4.63	1.0	0.436
4	2.13	4.44	3.25	0.88	1.0	3.75	7.0	17.75	3.69	6.75	0.75	6.0	1.25	4.63	1.0	0.561
6	2.25	6.50	3.25	1.63	2.0	5.0	9.75	19.25	5.82	8.63	1	6.0	1.25	4.63	1.0	0.687
8	2.50	8.25	3.25	2.57	2.69	6.0	- - -	26.75	7.75	10.75	1	6.0	1.25	4.63	1.0	0.687

1. Face-to-face dimensions are in compliance with MSS SP68 and API 609 specifications.
2. Minimum I.D. is the minimum pipe or flange I.D. required for disk swing clearance.

Figure 5. Dimensions, Wafer Style Valves, CL150, NPS 3 through 8 (also see table 3)

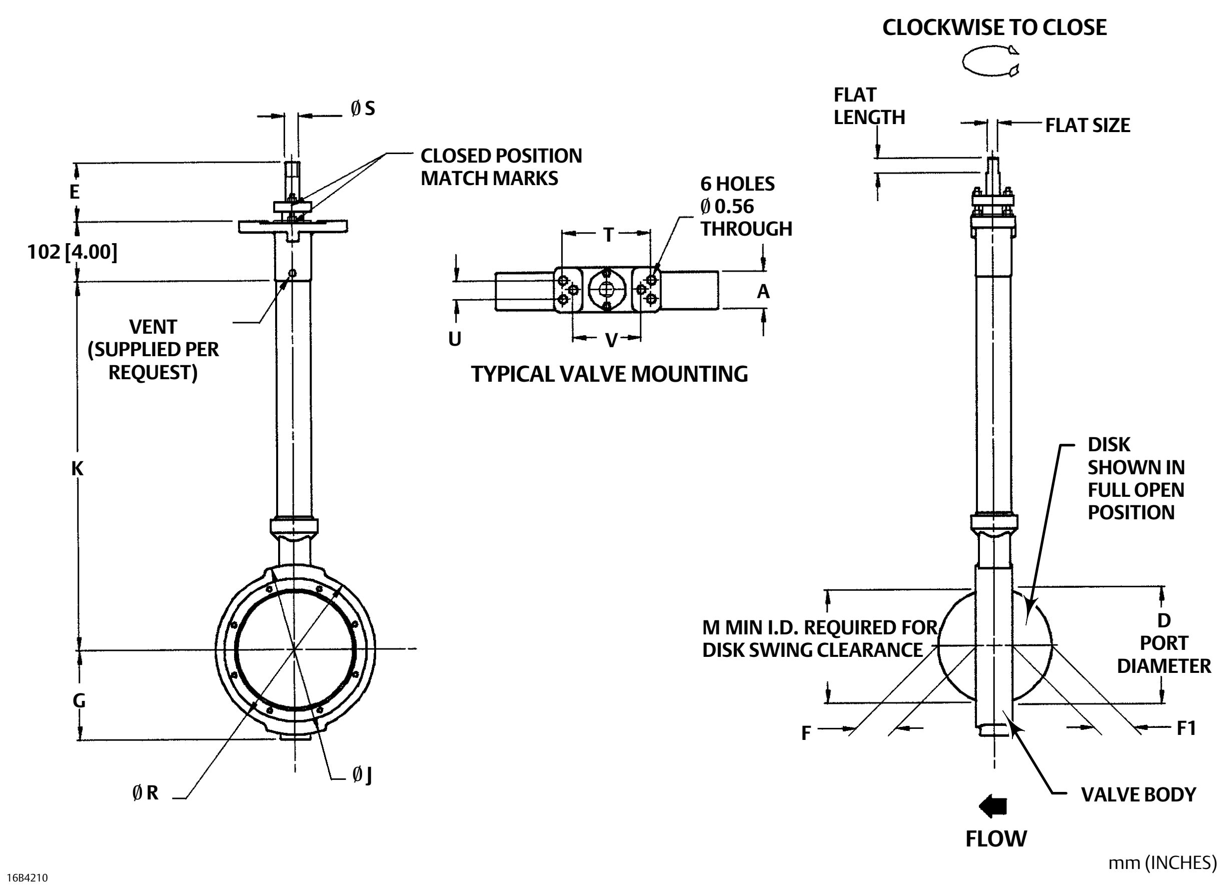


Table 4. Dimensions, Single Flange Style Valves, CL150, NPS 3 through 8

VALVE SIZE, NPS	A	D	E	F	F1	J	K	M(2)	R(1)	S	T	U	V	W	FLAT LENGTH	FLAT SIZE
	mm															
3	48	87	83	10	19	152	375	71	207	16	152	32	117	See thread information below	25	11
4	54	113	83	22	25	191	451	94	238	19	152	32	117		25	14
6	57	165	83	41	51	241	489	148	308	25	152	32	117		25	17
8	64	210	83	65	68	298	679	197	336	25	152	32	117		25	17
	Inches															
3	1.88	3.44	3.25	0.375	0.75	6.0	14.75	2.82	8.25	0.625	6.0	1.25	4.63	0.625-11 4 holes	1.0	0.436
4	2.13	4.44	3.25	0.875	1.0	7.5	17.75	3.69	9.38	0.75	6.0	1.25	4.63	0.625-11 8 holes	1.0	0.561
6	2.25	6.50	3.25	1.63	2.0	9.5	19.25	5.82	12.13	1	6.0	1.25	4.63	0.75-10 8 holes	1.0	0.687
8	2.50	8.25	3.25	2.57	2.69	11.75	26.75	7.75	13.25	1	6.0	1.25	4.63	0.75-10 8 holes	1.0	0.687

1. Face-to-face dimensions are in compliance with MSS SP68 and API 609 specifications.
2. Minimum I.D. is the minimum pipe or flange I.D. required for disk swing clearance.

Figure 6. Dimensions, Single Flange Style Valves, CL150, NPS 3 through 8 (also see table 4)

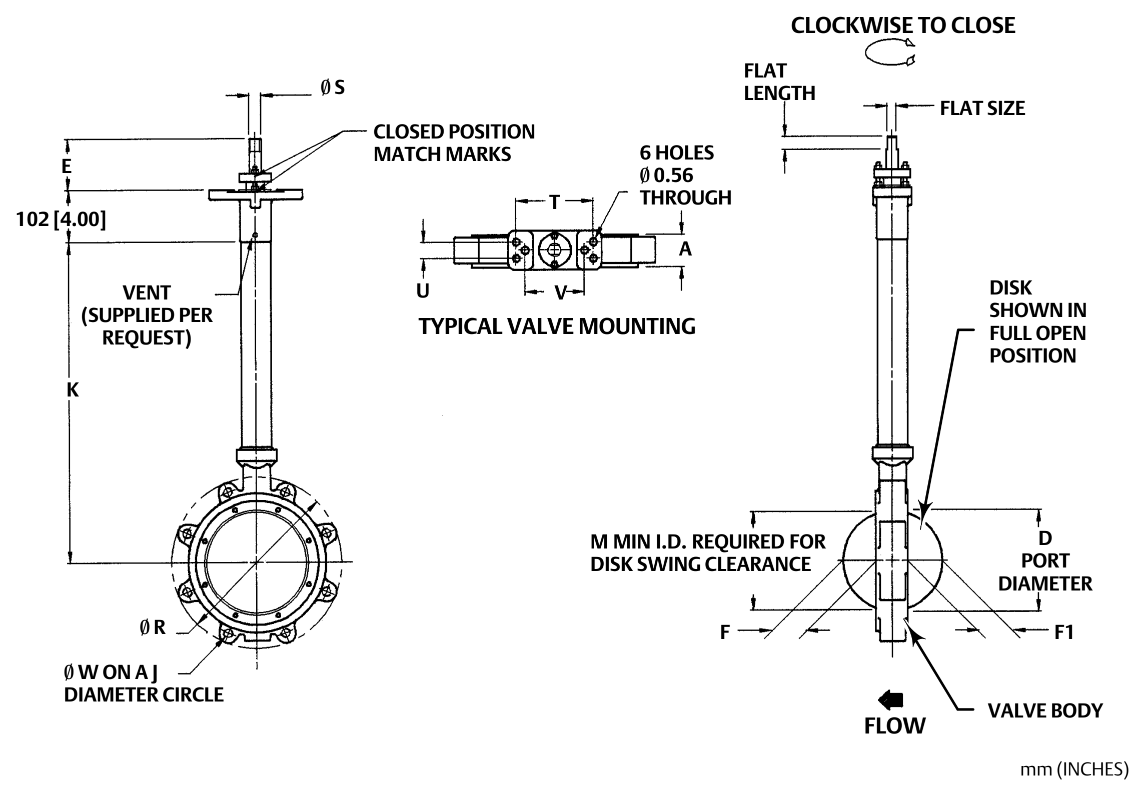


Table 5. Dimensions, Wafer Style valves, CL300, NPS 3 through 6

VALVE SIZE, NPS	A	D	E	F	F1	G	J	K	M(2)	R(1)	S	T	U	V	FLAT LENGTH	FLAT SIZE
	mm															
3	48	87	83	10	19	79	146	375	71	133	16	152	32	117	25	11
4	54	113	83	22	25	95	178	451	94	171	19	152	32	117	25	14
6	57	164	83	41	48	127	248	489	146	219	25	152	32	117	25	17
	Inches															
3	1.88	3.44	3.25	0.375	0.75	3.13	5.75	14.75	2.81	5.25	0.625	6.0	1.25	4.63	1.0	0.436
4	2.13	4.44	3.25	0.875	1.0	3.75	7.0	17.75	3.69	6.75	0.75	6.0	1.25	4.63	1.0	0.561
6	2.25	6.44	3.25	1.63	1.88	5.0	9.75	19.25	5.75	8.63	1	6.0	1.25	4.63	1.0	0.687

1. Face-to-face dimensions are in compliance with MSS SP68 and API 609 specifications.
2. Minimum I.D. is the minimum pipe or flange I.D. required for disk swing clearance.

Figure 7. Dimensions, Wafer Style valves, CL300, NPS 3 through 6 (also see table 5)

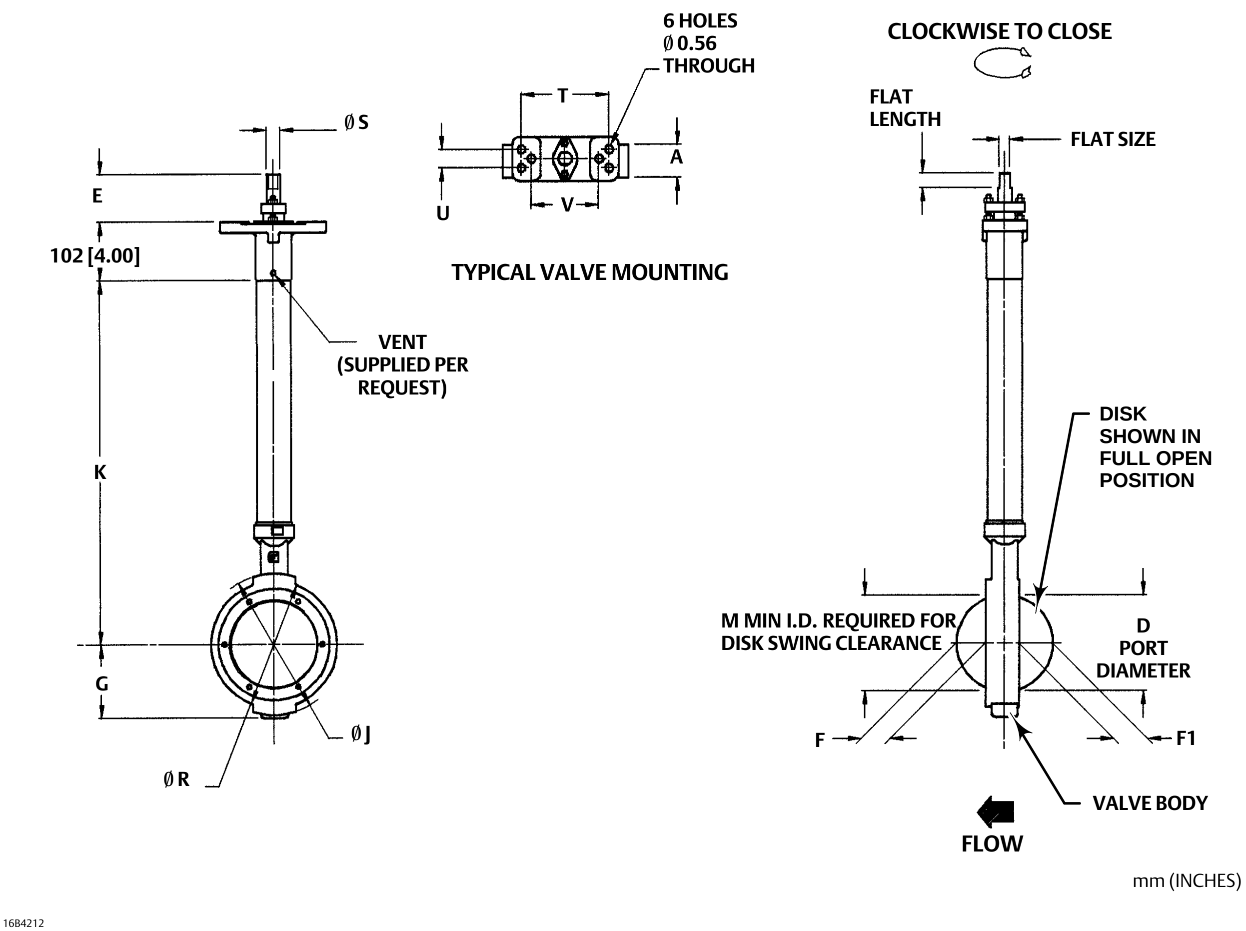


Table 6. Dimensions, Single Flange Style Valves, CL300, NPS 3 through 6

VALVE SIZE, NPS	A	D	E	F	F1	J	K	M(2)	R(1)	S	T	U	V	W	FLAT LENGTH	FLAT SIZE
	mm															
3	48	87	83	10	19	168	375	71	207	16	152	32	117	See thread information below	25	11
4	54	113	83	22	25	200	451	94	238	19	152	32	117		25	14
6	57	164	83	41	48	270	489	146	308	25	152	32	117		25	17
	Inches															
3	1.88	3.44	3.25	0.375	0.75	6.63	14.75	2.81	8.13	0.625	6.0	1.25	4.63	0.75-10 8 holes	1.0	0.436
4	2.13	4.44	3.25	0.875	1.0	7.88	17.75	3.69	9.75	0.75	6.0	1.25	4.63	0.75-10 8 holes	1.0	0.561
6	2.25	6.44	3.25	1.63	1.88	10.63	19.25	5.75	12.63	1	6.0	1.25	4.63	0.75-10 12 holes	1.0	0.687

1. Face-to-face dimensions are in compliance with MSS SP68 and API 609 specifications.
2. Minimum I.D. is the minimum pipe or flange I.D. required for disk swing clearance.

Figure 8. Dimensions, Single Flange Style Valves, CL300, NPS 3 through 6 (also see table 6)

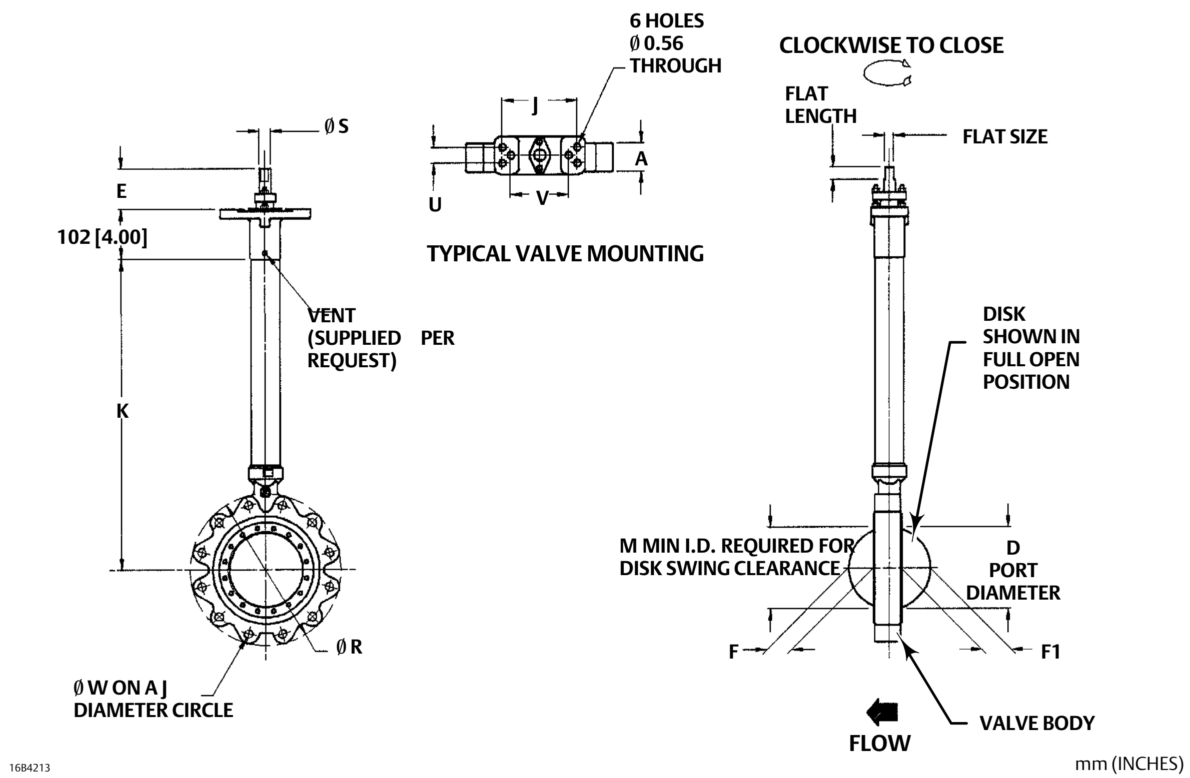


Table 7. Dimensions, Wafer Style Valve, CL150, NPS 10 through 24

VALVE SIZE, NPS	A(1)	D	E	F	F1	G	J	K	M(2)	R	S(3)	T	U	W
	mm													
10	71	265	89	83	98	187	---	724	254	337	32	235	46.0	---
12	81	316	89	105	113	224	406	851	298	381	38	235	46.0	---
14	92	338	102	122	117	240	476	914	330	448	30.2	235	46.0	29
16	102	384	102	143	133	276	540	914	378	511	31.8	235	46.0	29
18	114	432	102	162	149	341	578	914	429	533	38.1	273	50.8	32
20	127	479	102	182	162	375	635	914	470	584	44.5	273	50.8	32
24	154	594	102	227	203	432	749	914	575	692	57.2	337	76.2	35
	Inches													
10	2.82	10.44	3.5	3.25	3.81	7.38	---	28.5	10	13.25	1.25	9.25	1.81	---
12	3.19	12.44	3.5	4.13	4.44	8.82	16.0	33.5	11.75	15.0	1.5	9.25	1.81	---
14	3.6	13.3	4	4.80	4.61	9.45	18.75	36	13	17.64	1.1875	9.25	1.81	1.125
16	4	15.1	4	5.63	5.25	10.87	21.25	36	14.88	20.11	1.25	9.25	1.81	1.125
18	4.5	17	4	6.38	5.87	13.43	22.75	36	16.89	21	1.5	10.75	2.00	1.25
20	5	18.86	4	7.17	6.38	14.75	25	36	18.5	23	1.75	10.75	2.00	1.25
24	6.06	23.38	4	8.94	8	17	29.5	36	22.64	27.25	2.25	13.25	3.00	1.375

1. Face-to-face dimensions are in compliance with MSS SP68 and API 609 specifications.
2. Minimum I.D. is the minimum pipe or flange I.D. required for disk swing clearance.
3. Shaft diameter at key.

Figure 9. Dimensions, Wafer Style Valve, CL150, NPS 10 through 24 (see also table 7)

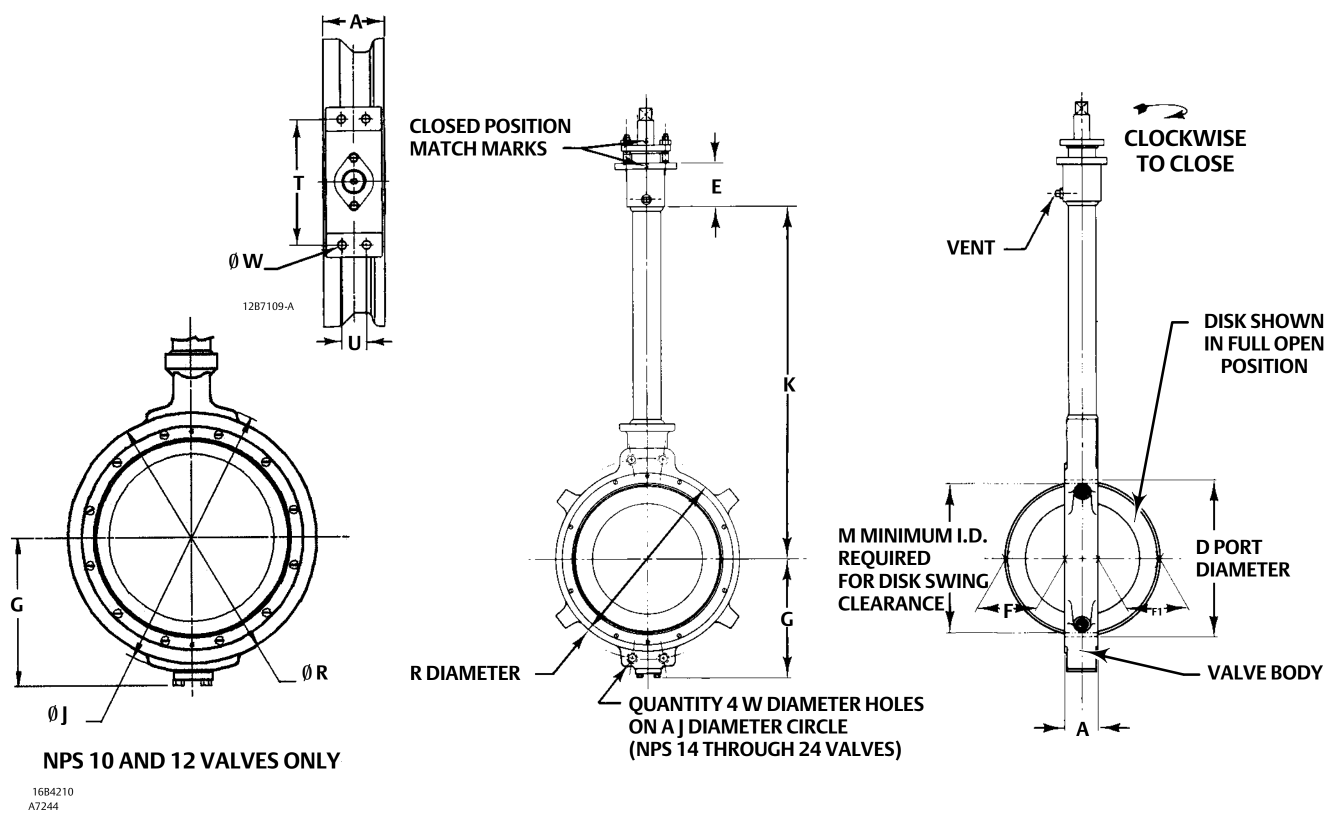


Table 8. Dimensions, Single Flange Style Valve, CL150, NPS 10 through 24

VALVE SIZE, NPS	A(1)	D	E	F	F1	G	J	K	M(2)	R	S(3)	T	U	W
	mm													
10	71	265	89	83	98	---	362	724	254	406	32	235	46.0	See thread information below
12	81	316	89	105	113	---	432	851	298	476	32	235	46.0	
14	92	338	102	122	117	240	476	914	330	533	30.2	235	46.0	
16	102	384	102	143	133	316	540	914	378	597	31.8	235	46.0	
18	114	432	102	162	149	341	578	914	429	635	38.1	273	50.8	
20	127	479	102	182	162	375	635	914	470	705	44.5	273	50.8	
24	154	594	102	227	203	432	749	914	575	813	57.2	337	76.2	
	Inches													
10	2.82	10.44	3.5	3.25	3.82	---	14.25	28.5	10.0	16.0	1.25	9.25	1.81	0.875-9 12 holes
12	3.19	12.44	3.5	4.13	4.38	---	17.0	33.5	11.75	18.75	1.25	9.25	1.81	0.875-9 12 holes
14	3.62	13.30	4	4.8	4.60	9.45	18.75	36	13	21	1.1875	9.25	1.81	1-8 12 holes
16	4	15.12	4	5.63	5.25	12.44	21.25	36	14.88	23.5	1.25	9.25	1.81	1-8 16 holes
18	4.5	17	4	6.38	5.86	13.43	22.75	36	16.89	25	1.5	10.75	2.00	1.125-8 16 holes
20	5	18.85	4	7.17	6.38	14.75	25	36	18.50	27.75	1.75	10.75	2.00	1.125-8 20 holes
24	6.06	23.38	4	8.94	8	17	29.50	36	22.64	32	2.25	13.25	3.00	1.25-8 20 holes

1. Face-to-face dimensions are in compliance with MSS SP68 and API 609 specifications.
2. Minimum I.D. is the minimum pipe or flange I.D. required for disk swing clearance.
3. Shaft diameter at key.

Figure 10. Dimensions, Single Flange Style Valve, CL150, NPS 10 through 24 (see also table 8)

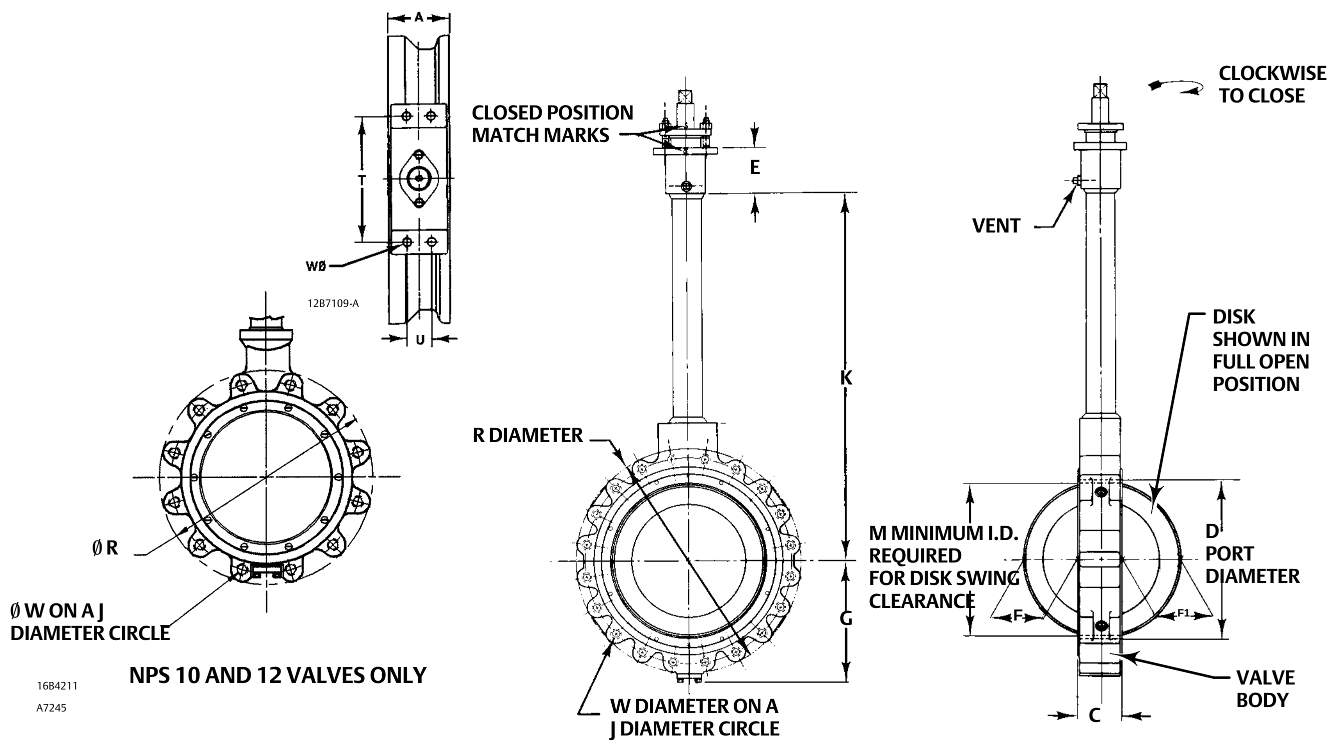


Table 9. Dimensions, Wafer Style Valve, CL300, NPS 8 through 24

VALVE SIZE, NPS	A(1)	D	E	F	F1	G	J	K	M(2)	R	S(3)	T	U	W
	mm													
8	73	195	89	51	62	173	305	679	186	279	32	235	46.0	See thread information below
10	85	246	89	75	75	265	387	724	230	349	38	235	46.0	
12	94	292	89	93	99	281	451	851	282	394	44	273	50.8	
14	117	321	102	100	97	314	514	914	305	432	44.5	273	50.8	
16	133	367	102	117	105	348	572	914	349	489	44.5	273	50.8	
18	149	413	152	129	125	379	629	914	391	546	57.2	337	76.2	
20	159	468	152	149	146	410	686	914	442	600	69.9	337	76.2	
24	181	551	152	176	173	476	813	914	523	711	69.9	337	76.2	
	Inches													
8	2.88	7.69	3.5	2.0	2.44	6.81	12.0	26.75	7.31	11.0	1.25	9.25	1.81	- - -
10	3.36	9.69	3.5	2.94	2.94	10.44	15.25	28.5	9.06	13.75	1.5	9.25	1.81	1-8
12	3.70	11.5	3.5	3.88	3.88	11.06	17.75	33.5	11.09	15.5	1.75	10.75	2.00	1.125-8
14	4.60	12.64	4	3.93	3.82	12.36	20.25	36	12	17	1.75	10.75	2.00	1.125-8
16	5.25	14.45	4	4.60	4.13	13.7	22.50	36	13.75	19.25	1.75	10.75	2.00	1.25-8
18	5.86	16.25	6	5.08	4.92	14.92	24.75	36	15.40	21.5	2.25	13.25	3.00	1.25-8
20	6.25	18.43	6	5.86	5.75	16.14	37	36	17.40	23.62	2.75	13.25	3.00	1.25-8
24	7.13	21.69	6	6.93	16.81	18.75	32	36	20.59	28	2.75	13.25	3.00	1.5-8

1. Face-to-face dimensions are in compliance with MSS SP68 and API 609 specifications.
2. Minimum I.D. is the minimum pipe or flange I.D. required for disk swing clearance.
3. Shaft diameter at key.

Figure 11. Dimensions, Wafer Style Valve, CL300, NPS 8 through 24 (also see table 9)

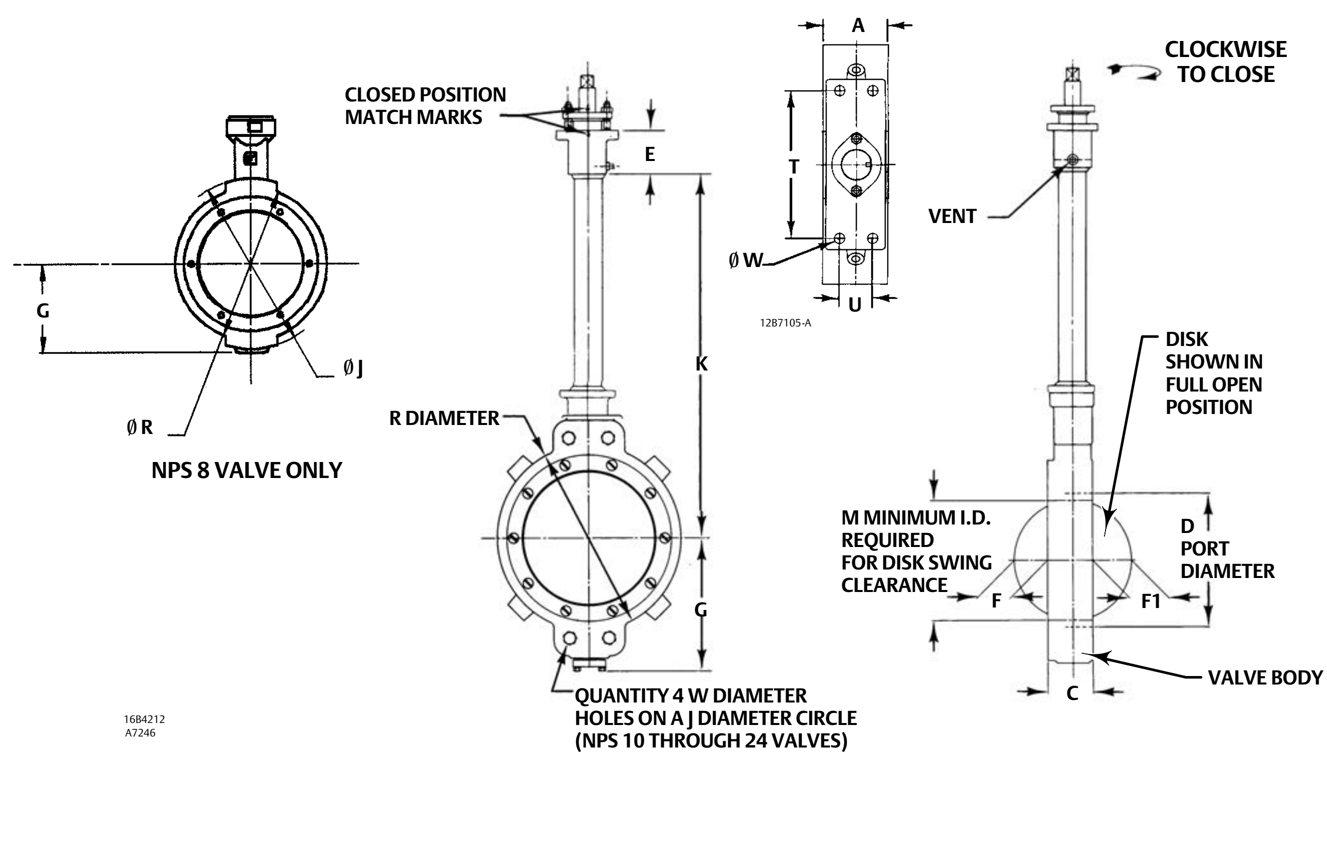
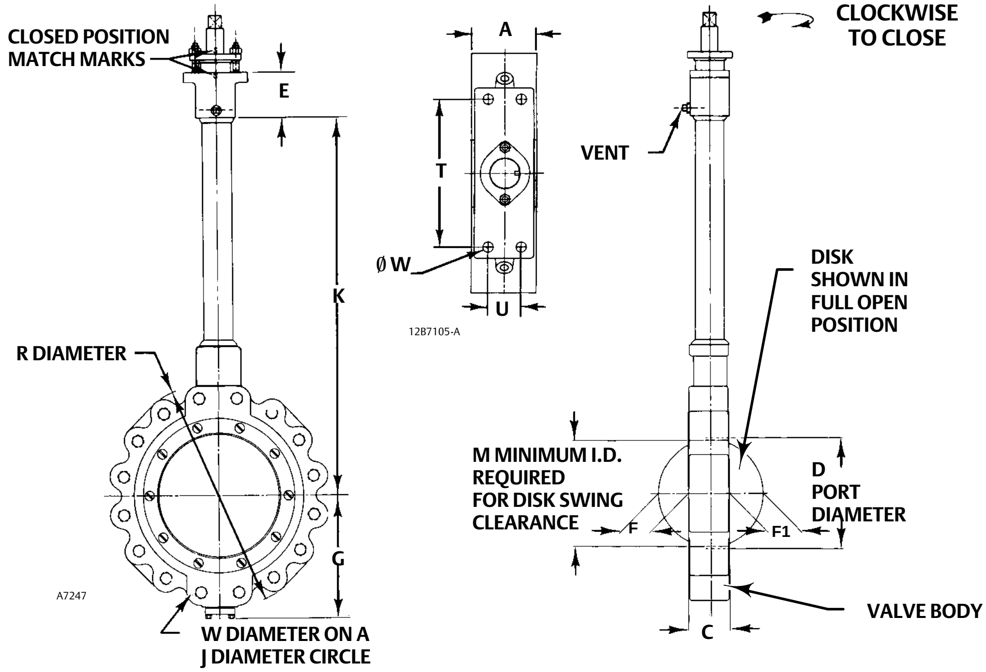


Table 10. Dimensions, Single Flange Style Valve, CL300, NPS 8 through 24

VALVE SIZE, NPS	A(1)	D	E	F	F1	G	J	K	M(2)	R	S(3)	T	U	W
	mm													
8	73	195	89	51	62	214	330	679	186	375	32	235	46.0	See thread information below
10	85	246	89	75	75	265	387	724	230	438	38	235	46.0	
12	94	292	89	93	99	281	451	851	282	514	47.6	273	50.8	
14	117	321	102	100	97	314	514	914	305	584	44.5	273	50.8	
16	133	367	102	117	105	348	572	914	349	648	44.5	273	50.8	
18	149	413	152	129	125	379	629	914	391	711	57.2	337	76.2	
20	159	468	152	149	146	410	686	914	442	775	69.9	337	76.2	
24	181	551	152	176	173	476	813	914	523	914	69.9	337	76.2	
	Inches													
8	2.88	7.69	3.5	2.0	2.44	8.44	13.0	26.75	7.32	14.75	1.25	9.25	1.81	0.875-9 12 holes
10	33.6	9.69	3.5	2.94	2.94	10.44	15.25	28.5	9.06	17.25	1.5	9.25	1.81	1-8 16 holes
12	3.70	11.5	3.5	3.69	3.88	11.06	17.75	33.5	11.09	20.25	1.875	10.75	2.00	1.125-8 16 holes
14	4.60	12.63	4	3.94	3.82	12.36	20.25	36	12	23	1.75	10.75	2.00	1.125-8 20 holes
16	5.25	14.45	4	4.60	4.13	13.70	22.50	36	13.75	25.5	1.75	10.75	2.00	1.25-8 20 holes
18	5	16.25	6	5.08	4.92	14.92	24.75	36	15.39	28	2.25	13.25	3.00	1.25-8 24 holes
20	6.25	18.43	6	5.87	5.75	16.14	37	36	17.40	30.5	2.75	13.25	3.00	1.25-8 24 holes
24	7.13	2121.69	6	6.93	6.81	18.75	32	36	20.59	36	2.75	13.25	3.00	1.5-8 24 holes

1. Face-to-face dimensions are in compliance with MSS SP68 and API 609 specifications.
2. Minimum I.D. is the minimum pipe or flange I.D. required for disk swing clearance.
3. Shaft diameter at key.

Figure 12. Dimensions, Single Flange Style Valve, CL300, NPS 8 through 24 (also see table 10)



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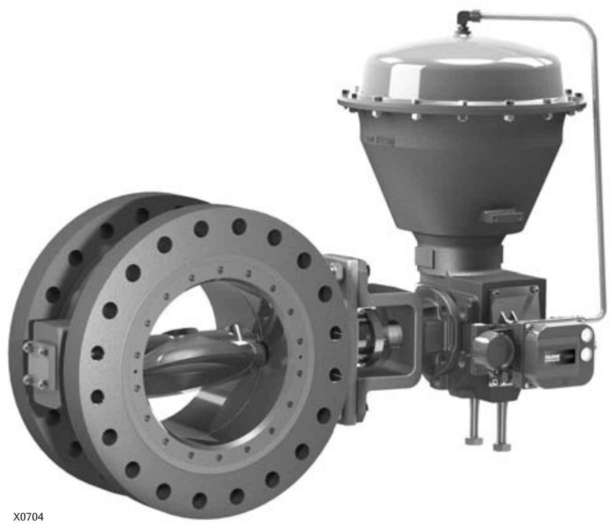
Fisher™ A31D Double-Flange High-Performance Butterfly Valve

The Fisher A31D double-flange high-performance butterfly valve provides outstanding performance under extreme pressure and temperature conditions.

The A31D valve is available with face-to-face dimensions conforming to ISO 5752 Butterfly Valve Short (CL150) or Long (CL300) Series (for other face-to-face dimension requirements, consult your Emerson sales office or Local Business Partner). A splined shaft combines with a variety of Fisher spring-and-diaphragm or pneumatic piston actuators. A keyed drive shaft combines with a variety of handlevers, handwheels, or pneumatic double-acting or spring-return piston actuators. These combinations make the A31D valve a reliable, high-performance butterfly valve for both throttling and on-off applications in the process industries.

The A31D valve can be supplied with one of several dynamic seals (figure 1) that can be used in a variety of demanding applications. With the appropriate seal selection and materials of construction, the pressure-assisted seal provides excellent shutoff against the full ASME class pressure range.


X0704

Fisher A31D Valve with 2052 Actuator

Features

- Excellent Shutoff Integrity-- The pressure-assisted seal design provides tight shutoff and permits the use of smaller actuators in applications requiring full ASME B16.34 shutoff capabilities.

- True Bi-directional Shutoff Performance-- A31D valve design helps to ensure that the torque necessary to open and close the valve is the same regardless of the direction in which the differential pressure is applied.

- Safety-- Shaft-blowout protection is designed into the A31D valve (figure 2). For NPS 3 through 12 valves, the packing follower and an anti-blowout follower hold an anti-blowout gland securely around the valve shaft. Under the anti-blowout gland, a formed wire ring around the shaft completes the protection design. For NPS 14 through 24 valves, the anti-blowout gland fits securely over the valve shaft which has been turned down to form a circumferential shoulder that contacts the anti-blowout gland.

- Excellent Emissions Capabilities-- The optional ENVIRO-SEAL™ packing system is designed with improved sealing, guiding, and loading force transmission. The ENVIRO-SEAL packing system can control emissions to below the EPA (Environmental Protection Agency) limit of 100 ppm (parts per million) for valves.

- **Shaft Versatility--** This valve will meet your actuator needs with a choice of splined or keyed shaft connections.
- **Sour Service Capability--** Trim and bolting materials are available for applications involving sour liquids and gases. These constructions comply with NACE MR0175-2002, MR0103, and MR0175/ISO 15156.
- **Reliable Flange Gasketing Surface--** Seal retainer screws are located so there is no interference with the sealing function of either flat sheet or spiral wound line flange gaskets.
- **Easy Installation--** The valve body self-centers on the line flange bolts as a fast, accurate means of centering the valve in the pipeline.

A31D Valve Specifications and Materials of Construction

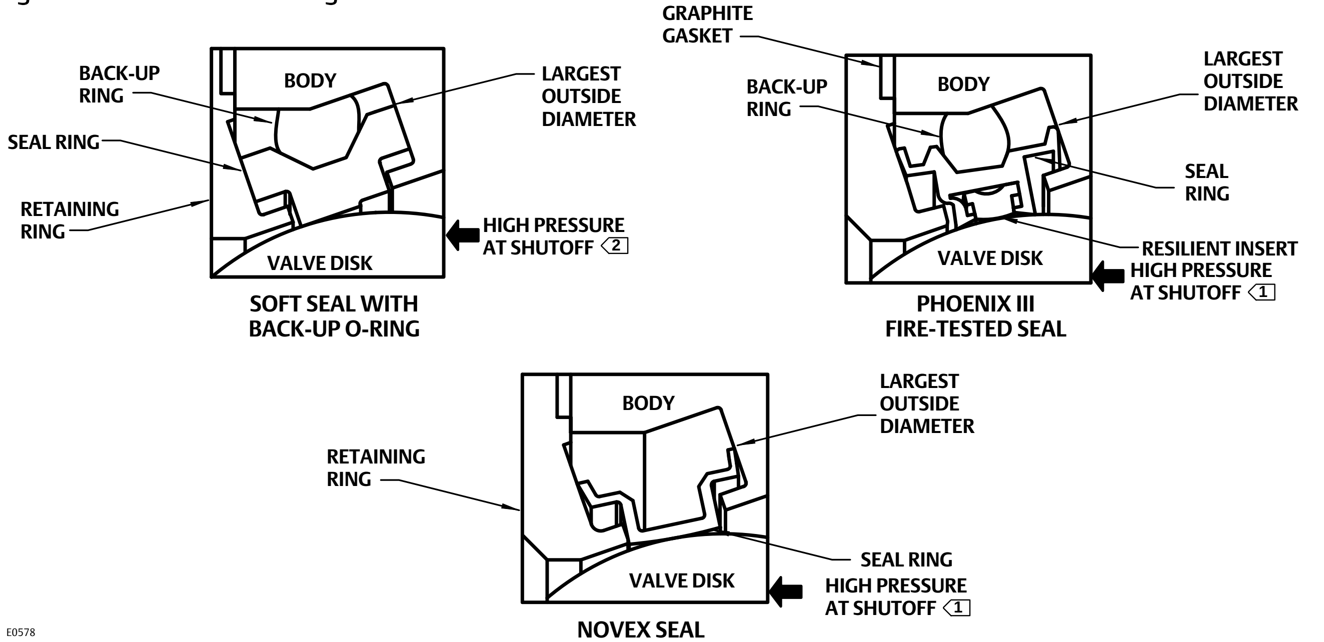
Table 1. Fisher A31D Valve Specifications

	SPECIFICATION
Valve Body Size	NPS 3, 4, 6, 8, 10, 12
Pressure Rating	Consistent with CL150 and 300 per ASME B16.34(1)
Valve Body Materials	WCC Steel
	CF8M Stainless Steel
Disk Materials	CF8M Stainless Steel
End Connections	Mates with RF flanges per ASME B16.5
Valve Body Style	Double Flange
Shaft Connection	Spline (standard)
	Keyed (optional)
Face-to-Face Dimensions	CL150: ISO 5752 Butterfly Valve Short Series
	CL300: ISO 5752 Butterfly Valve Long Series
Shutoff	Soft Seal: Bidirectional ANSI/FCI 70-2 Class VI
	NOVEX Seal: Unidirectional MSS SP-61(2)
	Phoenix III Seal: ANSI/FCI 70-2 Class VI
Flow Direction	Reverse (flow direction is into the shaft side of the disk)
Flow Characteristic	Approximately Linear
Disk Rotation	Clockwise (CW) to close

1, See table 4 and figure 4 for additional information. The pressure/temperature limits in this bulletin and any applicable codes or standard limitation should not be exceeded.
2. 0.1 scfh per unit of NPS at 80 psi.

Table of Contents

Figure 1. Available Seal Configurations



Notes:
1 This unidirectional seal must be installed so that the retaining ring is downstream from the high pressure side of the valve at shutoff, as shown.
2 For this bidirectional seal, The "preferred" valve orientation places the retaining ring downstream from the high pressure side of the valve at shutoff.

Installation

Recommended or "preferred" installation for the A31D valve is with the flow into the shaft side of the disk (retaining ring downstream from the high pressure side of the valve).

The standard soft seal offers ANSI/FCI 70-2 Class VI, bidirectional shutoff. The Phoenix III seal should be installed in the preferred direction to obtain optimal shutoff performance, and it must be installed in the preferred direction for fire-tested applications. The NOVEX seal is uni-directional and should be installed in the preferred direction.

For assistance in selecting the appropriate combination of actuator action and open valve position, contact your Emerson sales office or Local Business Partner.

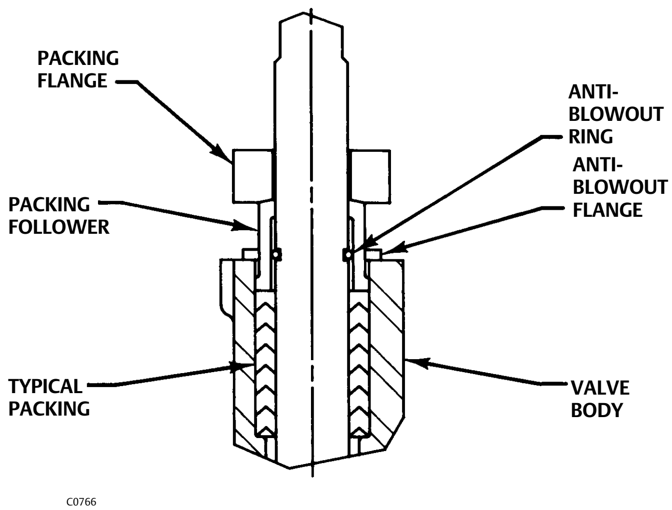
Standard Seal Configurations

- Standard Soft Seal (PTFE)-- A resilient dynamic seal with an elastomeric back-up ring for low to moderate temperature applications.

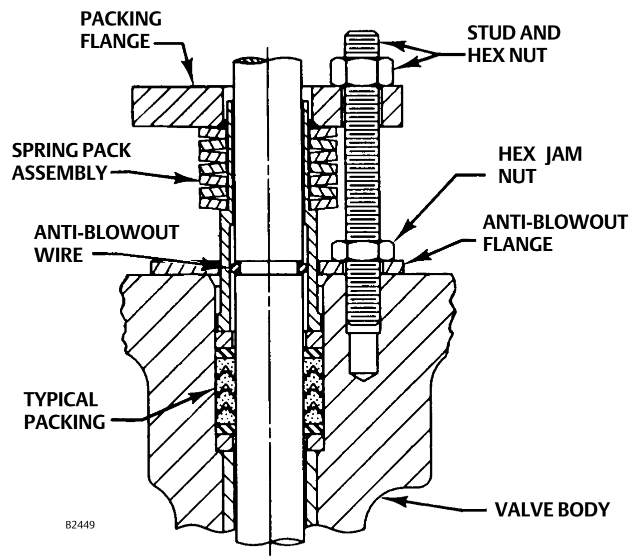
- NOVEX Seal-- The NOVEX stainless steel seal is available for severe service, Cryogenic, and high-temperature applications.

- Phoenix III Seal-- This three-component, metal-and-polymeric seal is available for severe service with low to moderate temperature applications.

Figure 2. Blowout Protection (NPS 3 through 12)



STANDARD PACKING ARRANGEMENT
CUTAWAY, NPS 3 THROUGH 12



ENVIRO-SEAL ARRANGEMENT (PTFE SHOWN)
NPS 3 THROUGH 12

Table 2. Materials of Construction and Temperature Ratings

COMPONENT AND MATERIAL OF CONSTRUCTION		TEMPERATURE RANGE °C	TEMPERATURE RANGE °F
Valve Body			
Carbon steel (SA216 WCC)		−29 to 427	−20 to 800
CF8M (316 SST)		−198 to 538	−325 to 1000
Disk			
CF8M (316 SST)		−198 to 538	−325 to 1000
Disk Edge Coating			
Chrome Plating (Standard with NOVEX or Phoenix III Seals)		−254 to 316	−425 to 600
Chrome Coating		-254 to 593	-425 to 1100
Shaft			
S20910		−198 to 538	−325 to 1000
S17400 (H1025)		−73 to 427	−100 to 800
S17400 (H1150M)		-196 to 427	−320 to 800
N07718		-254 to 704	-425 to 1300
Bearings			
PEEK (standard)		−73 to 260	−100 to 500
S31600(1)		−198 to 816	−325 to 1500
R30006 (Alloy 6)		−198 to 816	−325 to 1500
Packing			
PTFE Packing and PTFE ENVIRO-SEAL Packing		−148 to 232	−325 to 450
Graphite packing		−198 to 816	−325 to 1500
Graphite packing with oxidizing media		−198 to 538	−325 to 1000
Graphite ENVIRO-SEAL Packing		-148 to 315	-325 to 600
Seal Ring and Backup Ring	PTFE Seal Ring		
	Nitrile Backup O-Ring	−29 to 93	−20 to 200
	Chloroprene Backup O-Ring	−43 to 149	−45 to 300
	EPR Backup O-Ring	−54 to 182	−65 to 360
	Fluorocarbon Backup O-Ring (std)	−29 to 204	−20 to 400
	UHMWPE(2) Seal Ring (CL150 Only)		
	Nitrile Backup O-Ring	−29 to 93	−20 to 200
	Chloroprene Backup O-Ring	−43 to 93	−45 to 200
	EPR Backup O-Ring	−54 to 93	−65 to 200
	Fluorocarbon Backup O-Ring (std)	−29 to 93	-20 to 200
	Phoenix III and/or Fire Tested Construction		
	S31600 and PTFE Seal Ring with Nitrile Backup O-Ring	−40 to 149	−40 to 300
	Chloroprene Backup O-Ring	−54 to 149	−65 to 300
	EPR Backup O-Ring	−62 to 204	−80 to 400
	Fluorocarbon Backup O-Ring (std)	−40 to 232	−40 to 450
Seal Ring	NOVEX S31600 Seal(1) Ring (CL150)	−254 to 816	−425 to 1500
	NOVEX S31600 Seal(1) Ring (CL300)	−254 to 816	−425 to 1500
	NOVEX S21800 Seal(1) Ring (CL300)	-254 to 816	−425 to 1500

1. For a complete material description, contact your Emerson sales office or Local Business Partner.
2. UHMWPE stands for ultra high molecular weight polyethylene.

Table 3. Valve/Actuator Combinations

TEMPERATURE RANGE	SELECTION GUIDELINES	
	1052, 1061, or 2052(2)	**Bettis™ (1)**
-46 to 343°C (-50 to 650°F)	Valve (select appropriate trim) and standard actuator	Valve (select appropriate trim) and standard actuator
343 to 426°C (650 to 800°F)	**Mounting positions 1 and 3:** Valve (select appropriate trim) and standard actuator	Valve (select appropriate trim) and actuator with high-temperature O-rings option
426 to 538°C (800 to 1000°F)	**Mounting positions 1 and 3:** Valve (select appropriate trim) and standard actuator	Valve (select appropriate trim) and actuator with high-temperature O-rings option

1. Select keyed shaft option.
2. See figure 3 for actuator mounting positions.
3. Consult your Emerson sales office or Local Business Partner.

Figure 3. Mounting Styles and Positions

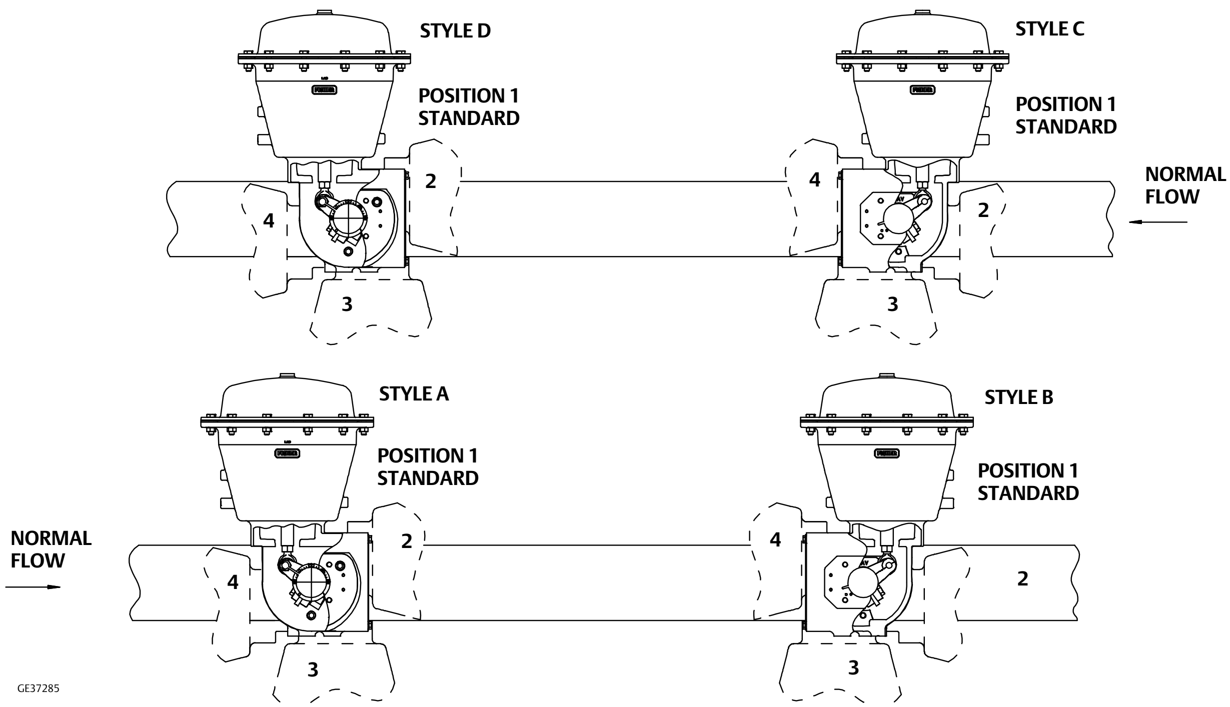
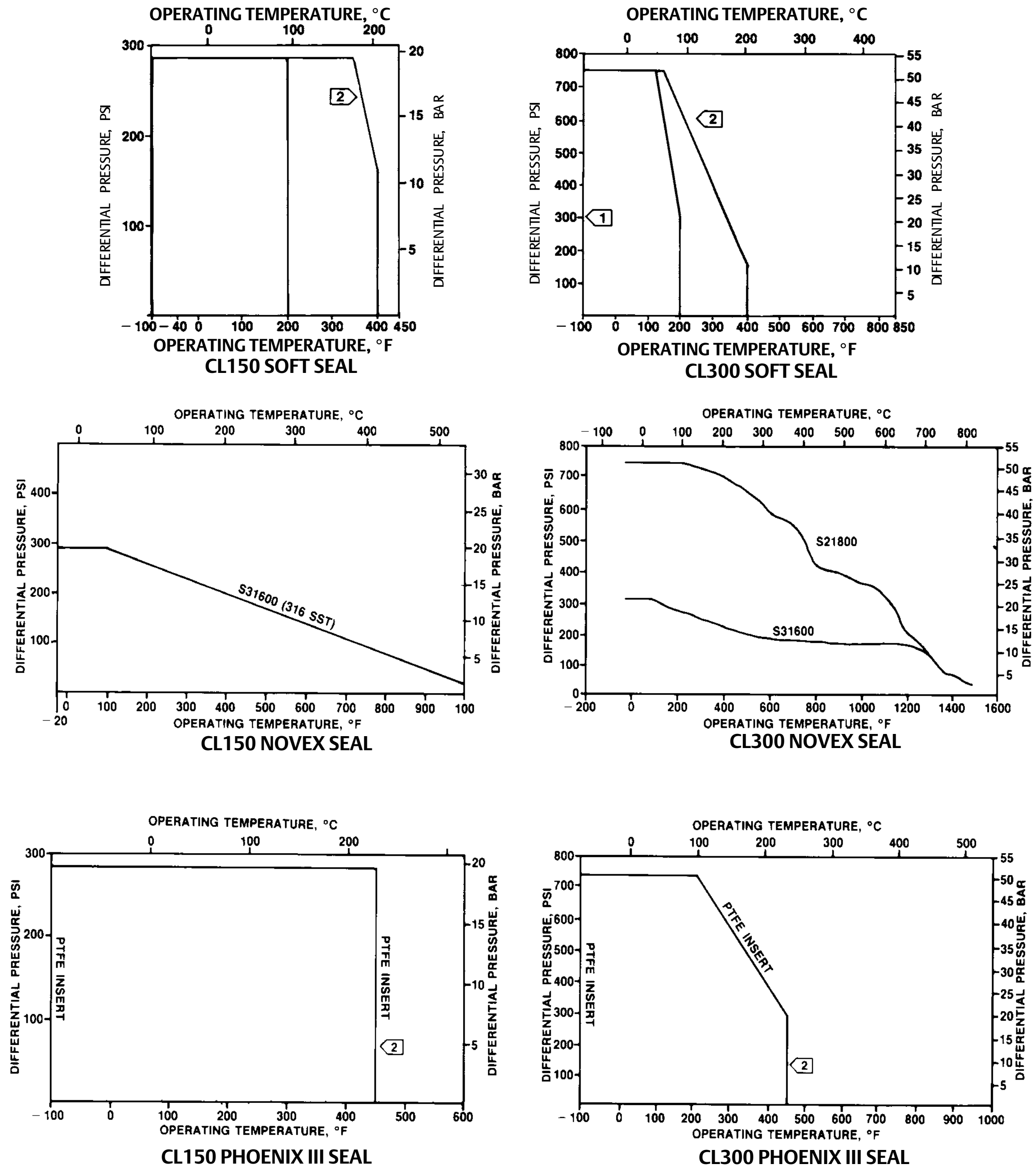


Table 4. Valve Body Material Pressure/Temperature Ratings[1]

TEMPERATURE RANGE	PRESSURE RANGE			
	WCC	CF8M	WCC	CF8M
	CL150		CL300	
°C	Bar			
-254 to -29	---	19.0	---	49.6
-29 to 38	20	19.0	51.7	49.6
93	17.9	16.2	51.7	42.7
149	15.9	14.8	50.3	38.6
204	13.8	13.4	48.6	35.5
260	11.7	11.7	45.9	33.1
316	9.7	9.7	41.7	31.0
343	8.6	8.6	40.7	30.3
371	7.6	7.6	38.3	30.0
399	6.6	6.6	34.8	29.3
427	5.5	5.5	28.3	29.0
454	---	4.5	---	29.0
482	---	3.4	---	28.6
510	---	2.4	---	26.5
538	---	1.4	---	25.2
°F	Psi			
-450 to -20	---	275	---	720
-20 to 100	290	275	750	720
200	260	235	750	620
300	230	215	730	560
400	200	195	705	515
500	170	170	665	480
600	140	140	605	450
650	125	125	590	440
700	110	110	555	435
750	95	95	505	425
800	80	80	410	420
850	---	65	---	420
900	---	50	---	415
950	---	35	---	385
1000	---	20	---	365

1. For pressure/temperature ratings of other materials, contact your Emerson sales office or Local Business Partner.

Figure 4. Maximum Pressure/Temperature Ratings for Soft Seal, NOVEX Seal and Phoenix III Seal, CL150 and CL300



C0759-1

Note
1 Because of potential erosive and premature seal failure that can occur, throttling PTFE seals at differential pressures greater than 300 psid at disk angles less than 20 degrees open is not recommended.
2 Temperature limitations do not account for the additional limitations imposed by the backup O-ring used with this seal. To determine the effective temperature limitation of the appropriate seal backup O-ring combination, refer to table 2.

Figure 5. Dimensions and Weights, CL150 Double-Flange Valves (also see tables 5 and 7)

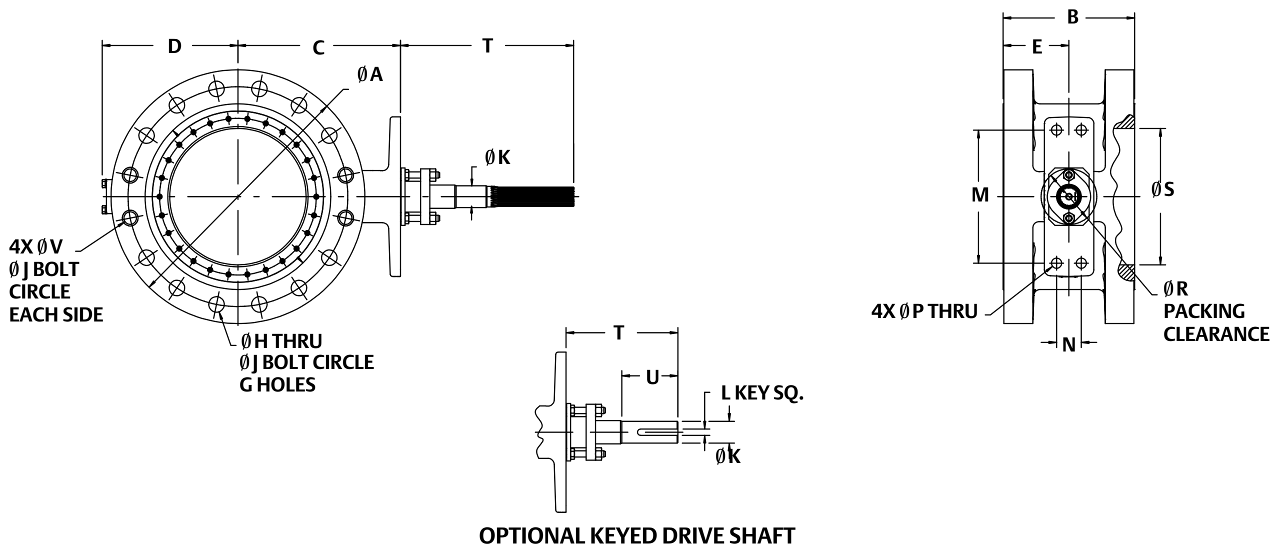


Table 5. CL150, Double-Flange Dimensions

VALVE SIZE, NPS	CL150 DIMENSION A, C, D, E, & H THROUGH U																			
	A	B(3)	C	D	E(3)	G(3)	H	J	K (1)	K (2)	L	M	N	P	R	S	T (1)	T (2)	U (2)	V
	mm																			
3	191	114	143	132	57.2	4	19.1	152	14.3	14.3	3.18	117	---	14.2	65.0	85.9	187	102	47.8	---
4	229	127	159	154	63.5	4	19.1	191	15.9	17.5	4.76	117	---	14.2	69.9	111	187	102	47.8	5/8--11
6	279	140	206	186	69.9	4	22.2	241	22.2	23.8	6.35	152	31.8	14.2	79.2	160	214	102	47.8	3/4--10
8	343	152	222	198	76.2	4	22.2	298	22.2	23.8	6.35	152	31.8	14.2	79.2	202	214	102	47.8	3/4--10
10	406	165	279	203	82.6	8	25.4	362	28.4	28.6	6.35	235	46.0	17.5	88.9	265	208	102	47.8	7/8--9
12	483	178	305	236	88.9	8	25.4	432	31.8	31.8	6.35	235	46.0	17.5	88.9	316	208	102	47.8	7/8--9
	Inches																			
3	7.50	4.50	5.62	5.18	2.25	4	3/4	6.00	9/16	9/16	1/8	4.62	---	0.56	2.56	3.38	7.38	4.00	1.88	---
4	9.00	5.00	6.25	6.06	2.50	4	3/4	7.50	5/8	11/16	3/16	4.62	---	0.56	2.75	4.38	7.38	4.00	1.88	5/8--11
6	11.00	5.50	8.12	7.31	2.75	4	7/8	9.50	7/8	15/16	1/4	6.00	1.25	0.56	3.12	6.28	8.44	4.00	1.88	3/4--10
8	13.50	6.00	8.75	7.81	3.00	4	7/8	11.75	7/8	15/16	1/4	6.00	1.25	0.56	3.12	7.97	8.44	4.00	1.88	3/4--10
10	16.00	6.50	11.00	8.00	3.25	8	1	14.25	1-1/8	1-1/8	1/4	9.25	1.81	0.69	3.50	10.44	8.19	4.00	1.88	7/8--9
12	19.00	7.00	12.00	9.31	3.50	8	1	17.00	1-1/4	1-1/4	1/4	9.25	1.81	0.69	3.50	12.44	8.19	4.00	1.88	7/8--9

1. Splined shaft connection.
2. Optional keyed shaft connection.
3. ISO 5752 Butterfly Valve Short Series

Figure 6. Dimensions and Weights, CL300 Double-Flange Valves (also see tables 6 and 7)

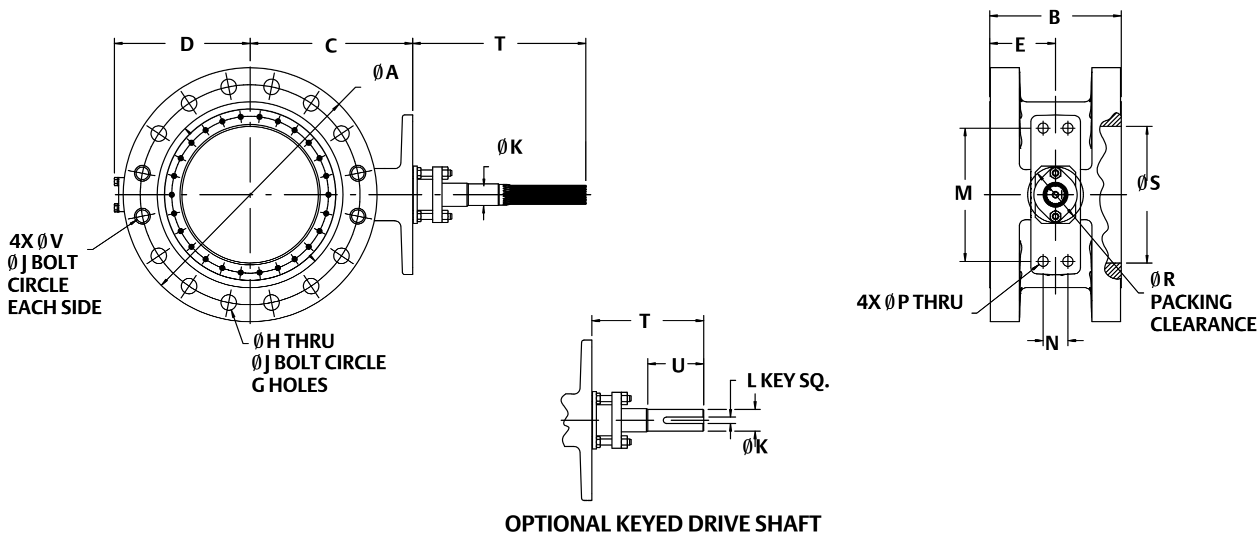


Table 6. CL300, Double-Flange Dimensions

VALVE SIZE, NPS	CL300 DIMENSION A, C, D, E, & H THROUGH U																			
	A	B(3)	C	D	E(3)	G(3)	H	J	K (1)	K (2)	L	M	N	P	R	S	T (1)	T (2)	U (2)	V
	mm																			
3	210	180	143	121	90.2	8	22.2	168	14.3	14.3	3.05	117	- - -	14.2	65.0	85.9	187	102	47.8	- - -
4	254	191	159	145	95.0	8	22.2	200	15.9	17.5	4.83	117	- - -	14.2	69.9	112	187	102	47.8	- - -
6	318	210	207	181	105	12	22.2	270	22.2	23.8	6.35	152	31.8	14.2	79.2	163	214	102	47.8	- - -
8	387	230	249	215	115	12	25.4	330	31.8	31.8	6.35	235	46.0	17.5	105	195	208	102	47.8	- - -
10	448	250	324	263	125	16	31.8	387	38.1	41.3	9.65	235	46.0	17.5	105	246	208	152	66.5	- - -
12	521	270	334	279	135	12	31.8	451	44.5	47.6	12.7	273	50.8	20.6	118	291	356	229	76.2	1-1/8--8
	Inches																			
3	8.25	7.09	5.63	4.78	3.55	8	0.875	6.62	9/16	9/16	0.12	4.62	- - -	0.56	2.56	3.38	7.38	4.00	1.88	- - -
4	10.00	7.50	6.25	5.72	3.74	8	0.875	7.87	5/8	11/16	0.19	4.62	- - -	0.56	2.75	4.39	7.38	4.00	1.88	- - -
6	12.50	8.27	8.13	7.12	4.14	12	0.875	10.62	7/8	15/16	0.25	6.00	1.25	0.56	3.12	6.40	8.44	4.00	1.88	- - -
8	15.25	9.06	9.81	8.47	4.53	12	1.00	13.00	1-1/4	1-1/4	0.25	9.25	1.81	0.69	4.12	7.68	8.19	4.00	1.88	- - -
10	17.62	9.84	12.75	10.36	4.92	16	1.25	15.25	1-1/2	1-5/8	0.38	9.25	1.81	0.69	4.12	9.68	8.19	6.00	2.62	- - -
12	20.50	10.63	13.13	11.00	5.32	12	1.25	17.75	1-3/4	1-7/8	0.50	10.75	2.00	0.81	4.63	11.46	14	9.00	3.00	1-1/8--8

1. Splined shaft connection.
2. Optional keyed shaft connection.
3. ISO 5752 Butterfly Valve Long Series

Table 7. Valve Weights

SIZE	CL150		CL300	
NPS	kg	lb	kg	lb
3	15	33	28	63
4	25	56	35	77
6	34	76	65	143
8	54	118	156	343
10	81	178	176	388
12	110	243	294	649

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Fisher™ Multiport Flow Selector Valve

The Fisher Multiport Flow Selector Valve connects up to eight input lines, allowing for the diversion and testing of fluid from any individual line through a rotating plug, while the remaining seven lines continue to flow to a common group outlet. This product provides compact selection and diversion of fluids from individual wells for testing without disrupting the production from all other wells.

The Multiport Flow Selector consists of four main components: the body, bonnet, plug, and actuator. The body consists of inlet and outlet ports to connect all the seven well inlets, one test outlet and common group outlet. The bonnet will hold the plug vertically and balanced to rotate within the body and provides tight sealing to the valve body. The plug is used to select which well media or well port is sent through the test outlet port.

X1398

FISHER MULTIPORT FLOW SELECTOR VALVE

Features

- **Reliable Bearing Life**—A tapered roller thrust bearing and wiper are fitted at the top of the plug and a carbon filled PTFE bushing is located at the bottom of the plug. Tapered roller bearings can take large axial forces as well as being able to sustain large radial forces.
- **Sour Service Capability**—Standard material configurations are compliant to NACE MR0175/ISO 15156.
- **Fire Safe Construction**—The Fisher Multiport product has been Fire-Tested in accordance with API 6FA by third party laboratories and has met the external leakage requirements.
- **Manual Travel Indicator**—Integral travel indication allows for quick visible confirmation of plug alignment to each inlet port within the manifold.
- **Scraper Seat**—The leading edge of the rotating seal contains a scraper seat providing a wiping action on the sealing surface inside the manifold. This removes process debris allowing for the seat to reliably seal around each inlet port.
- **High Differential Seal**—Features a high differential seal assembly, allowing for tight shut off. This dynamic seal prevents leakage and contamination to the test port from the bulk production.

(continued on page 3)

Specifications

Body Design Standards

ASME B16.34

Valve Sizes

NPS ■ 2x4, ■ 3x6, ■ 4x8, ■ 4x10, and ■ 6x16

Reference table 1

Available Configuration

Flanged or FNPT body assembly with optional alternative end connections.

End Connection Styles

■ Raised-face flanges (ASME B16.5) or ■ Threaded connections for NPS 2x4 constructions only

Flow Direction

Typically flow down, flow up optional

Maximum Group Outlet Flow (C_v)

See tables 4 and 5

Maximum Inlet Pressure(1)

Flanged: Consistent with ASME CL150, 300, 600, 900, 1500, and 2500 per ASME B16.34

See tables 4 and 5

Maximum Pressure Drops

See tables 4 and 5

Shutoff Classification

Class IV per ANSI/FCI70-2 and IEC 60534-4

Material Temperature Capability

See table 3

Dimensions

See tables 6 and 7

Actuator

Automated with a Bettis™ Multiport Electric Actuator

Approximate Weights

See table 2

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitations should not be exceeded.

Features (continued)

- **Serviceable Seal**—Field adjustable seal/seat with various materials for adverse service conditions. In this manner, seal adjustments can be made in the field without removing the actuator. Replacement soft seal kits are available for maintenance.
- **Plug Alignment**—One-piece angle plug is centered in the body from bonnet to test outlet and provides smooth operation through the full 360 degrees of travel. The bonnet will hold the plug vertically and balanced to rotate within the body and provides tight sealing to the valve body.
- **Precise Positioning**—Inlet port calibration with the Bettis MPA electric actuator provides precision alignment with each inlet throughout the actuators 360 degrees of travel. The Bettis exclusive solid state motor starter and control software provides precise positioning of flow selector within +/- 1 degree of the selected port.

Multiport Functionality

The maximum number of wells that can be connected to a single MPFS is eight. However, for best operation, it is recommended to connect maximum seven number of wells.

The well lines can be easily diverted to production and test separator from MPFS. The seven inlets of the Multiport flow selector are connected to wells along with the isolation valve. The remaining one port is kept free which is the home port.

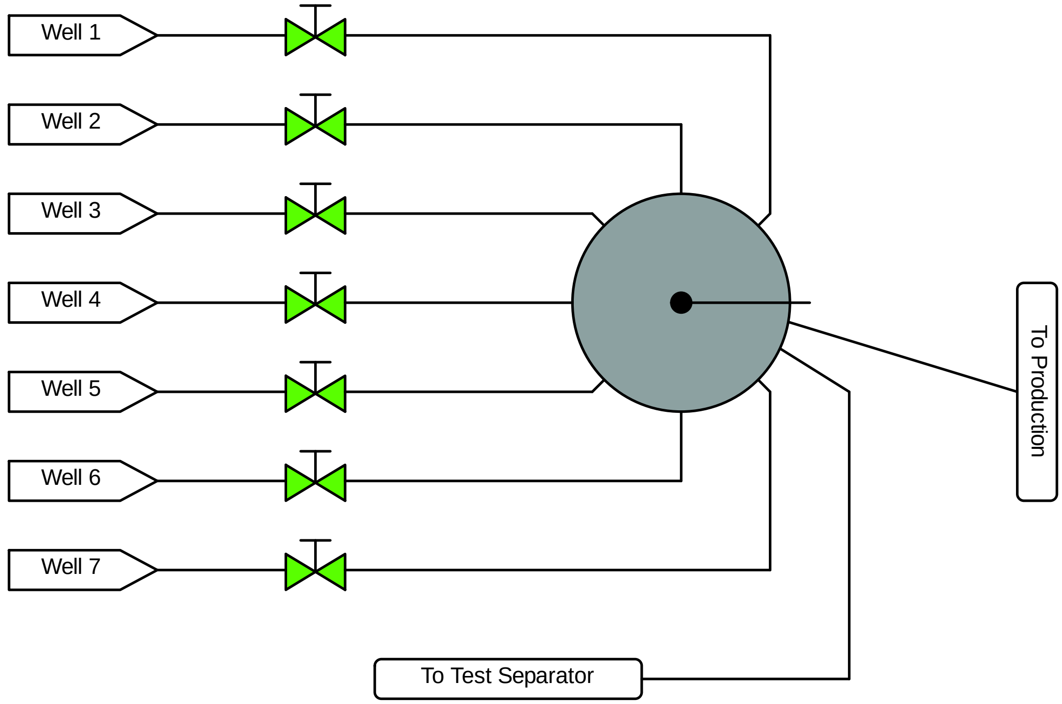
Table 1. Valve Size, ANSI Ratings, and Flange Compatibility

VALVE SIZE, NPS	ANSI CLASS RATING					
	CL150	CL300	CL600	CL900	CL1500	CL2500
2x4	– – –	X	X	X	X	– – –
3x6	X	X	X	X	X	X
4x8	– – –	X	X	X	X	– – –
4x10	– – –	– – –	– – –	– – –	– – –	X
6x16	– – –	X	X	X	X	X
X indicates availability						

Table 2. Approximate Weights

VALVE SIZE, NPS	FLANGED, KG (LB)					
	CL150	CL300	CL600	CL900	CL1500	CL2500
2x4	- - -	- - -	90.7 (200)	362.9 (800)	- - -	- - -
3x6	551.1 (1215)	629.1 (1387)	655.9 (1446)	678.6 (1496)	968.9 (2136)	- - -
4x8	- - -	959.3 (2115)	976.1 (2152)	1134.8 (2502)	- - -	- - -
4x10	- - -	- - -	- - -	- - -	1740 (3836)	- - -
6x16	- - -	1809 (3988)	2017.5 (4448)	3589.7 (7914)	5343.3 (11780)	8703 (19187)

Figure 1. Detail Multiport Selector in Production



Arrangement and Working of Multiport Selector in Production Manifold

A Multiport Flow Selector typically has eight inlet and two outlet connections.

- Inlets—Out of eight inlets it is recommended to connect seven to the wells, and the eighth connection is generally used as a parking location and/or observation port for the selector plug. This allows for an observation port for temporary maintenance, flushing and allows production of all seven wells if the test system is offline. The internal plug diverts one wells fluid stream to the test port at a time. The plug is rotated to align with the well inlet to be tested.

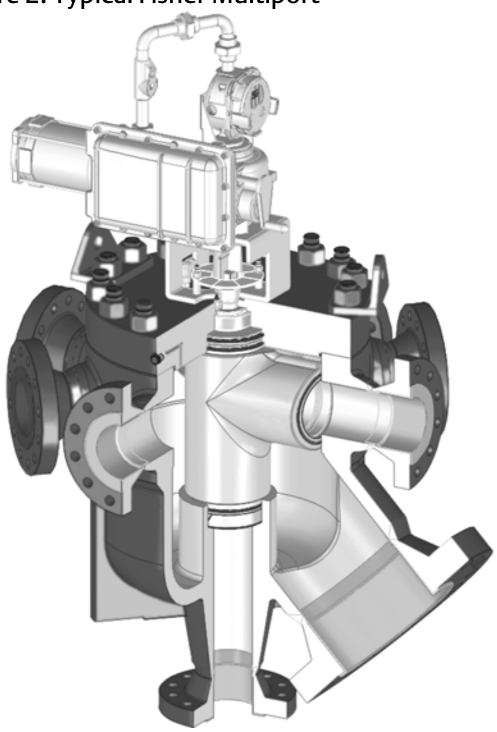
- Outlets—The test outlet connects to the test system and the group outlet carries the flow of all other wells together to the production header.

Table 3. Materials of Construction and Temperature Capabilities

<table>
<tr><th rowspan="2">BONNET & BODY MATERIAL</th><th rowspan="2">FLANGE MATERIAL</th><th rowspan="2">PLUG MATERIAL</th><th rowspan="2">SEAL ASSEMBLY MATERIAL</th><th rowspan="2">STUD MATERIAL</th><th rowspan="2">NUT MATERIAL</th><th rowspan="2">O-RING MATERIAL</th><th colspan="2">OPERATING TEMPERATURE RANGE</th></tr>
<tr><th>°C</th><th>°F</th></tr>
<tr><td>WCB/WCC</td><td>WCC or A105N</td><td>CF3M/CF8M</td><td rowspan="2">S31600/S31603 with 25% carbon graphite filled insert or S31600/S31603 with PTFE-PFA insert</td><td rowspan="4">A193 Gr. B7M</td><td rowspan="4">A194 Gr. 2HM</td><td rowspan="4">AFLAS</td><td rowspan="4">-9 to 232</td><td rowspan="4">16 to 450</td></tr>
<tr><td>CF3M/CF8M</td><td>CF3M or A182 F316L</td><td>CF8M</td></tr>
<tr><td>CD3MN</td><td>CD3MN or A182 F51</td><td>CD3MN</td><td rowspan="2">Inconel 718 with PTFE/25% carbon graphite filled insert or Inconel 718 with PTFE-PFA insert</td></tr>
<tr><td>CD3MWCuN</td><td>CD3MWCuN or A182 F55</td><td>CD3MWCuN</td></tr>
</table>

Typical Fisher Multiport Construction Detail

Figure 2. Typical Fisher Multiport



X1515

Figure 3. Fisher Multiport Plug Cross Section

X1517

Table 4. Multiport Specifications 2x4 and 3x6

	MULTIPORT SIZES						
	2x4		3x6				
ANSI RATING	600 Max (threaded)	900 Max (flanged)	150	300	600	900	1500
MAXIMUM WORKING PRESSURE PSIG (BARG)(2)	1480 (102)	2220 (153.1)	285 (19.7)	740 (51)	1480 (1480)	2220 (153.1)	3705 (255.5)
TEMP RANGE °C (°F)	-29 to 300 (-20 to 572)						
TEST OUTLET C_V	67		151				100
GROUP OUTLET C_V	262		594				429
INLET PORTS	8 @ 2 FNPT	8 @ 2 flange	8 @ NPS 3 flange				
TEST OUTLET PORT	1 @ 2 FNPT	1 @ 2 flange	1 @ NPS 3 flange				
GROUP OUTLET PORT	1 @ 4 FNPT	1 @ 4 flange	1 @ NPS 6 flange				
WEIGHT, KG (LB)	90.7 (200)	362.8 (800)	551.1 (1215)	629.1 (1387)	655.9 (1446)	678.6 (1496)	968.4 (2135)
MAXIMUM DYNAMIC DIFFERENTIAL PRESSURE TEST TO GROUP PSID (BARG)(2)	600 (41.4)		500 (34.5)				
MAXIMUM DYNAMIC DIFFERENTIAL PRESSURE GROUP TO TEST PSID (BARG)(2)	550 (37.9)						
STATIC STATIONARY DIFFERENTIAL TEST TO GROUP PSID (BARG)(1,2)	1200 (82.7)		1000 (68.9)				
STATIC STATIONARY DIFFERENTIAL GROUP TO TEST PSID (BARG)(1,2)	1000 (68.9)						

1. In emergency situations only, the Multiport Flow Selector seal can maintain STATIC STATIONARY DIFFERENTIAL pressure rating per specifications above. However, do not operate the electric actuator at greater than the MAXIMUM DYNAMIC DIFFERENTIAL pressure rating because damage may occur to the electric actuator.
2. Pressure at ambient temperature.

Table 5. Multiport Specifications 4x8, 4x10, and 6x16

	MULTIPORT SIZES							
	4x8			4x10	6x16			
ANSI RATING	300	600	900	1500	300	600	900	1500
MAXIMUM WORKING PRESSURE PSIG (BARG)(2)	740 (51)	1480 (102)	2220 (153.1)	3705 (153.1)	740 (51)	1480 (102)	2220 (153.1)	3705 (255.5)
TEMP RANGE °C (°F)	-29 to 300 (-20 to 572)							
TEST OUTLET C_V	270		217	217	951			
GROUP OUTLET C_V	1040		1292	1292	5121			
SHELL HYDROSTATIC TEST PRESSURE PSIG (Kpa)	1110 (7650)	2220 (15300)	3330 (22950)	5560 (38310)	1110 (7650)	2220 (15300)	3330 (22950)	5560 (38310)
INLET PORTS	8 @ NPS 4 flange				8 @ NPS 6 flange			
TEST OUTLET PORT	1 @ NPS 4 flange				1 @ NPS 6 flange			
GROUP OUTLET PORT	1 @ NPS 8 flange			1 @ NPS 10 flange	1 @ NPS 16 flange			
WEIGHT, KG (LB)	959 (2115)	976 (2152)	1135 (2502)	1740 (3836)	1809 (3988)	2017 (4448)	3589 (7914)	5343 (11780)
MAXIMUM DYNAMIC DIFFERENTIAL PRESSURE TEST TO GROUP PSID (BARG)(2)	500 (34.5)							
MAXIMUM DYNAMIC DIFFERENTIAL PRESSURE GROUP TO TEST PSID (BARG)(2)								
STATIC STATIONARY DIFFERENTIAL TEST TO GROUP PSID (BARG)(1,2)	1000 (68.9)							
STATIC STATIONARY DIFFERENTIAL GROUP TO TEST PSID (BARG)(1,2)								

1. In emergency situations only, the Multiport Flow Selector seal can maintain STATIC STATIONARY DIFFERENTIAL pressure rating per specifications above. However, do not operate the electric actuator at greater than the MAXIMUM DYNAMIC DIFFERENTIAL pressure rating because damage may occur to the electric actuator.
2. Pressure at ambient temperature.

Figure 4. Dimensions for Multiport (see table 6)

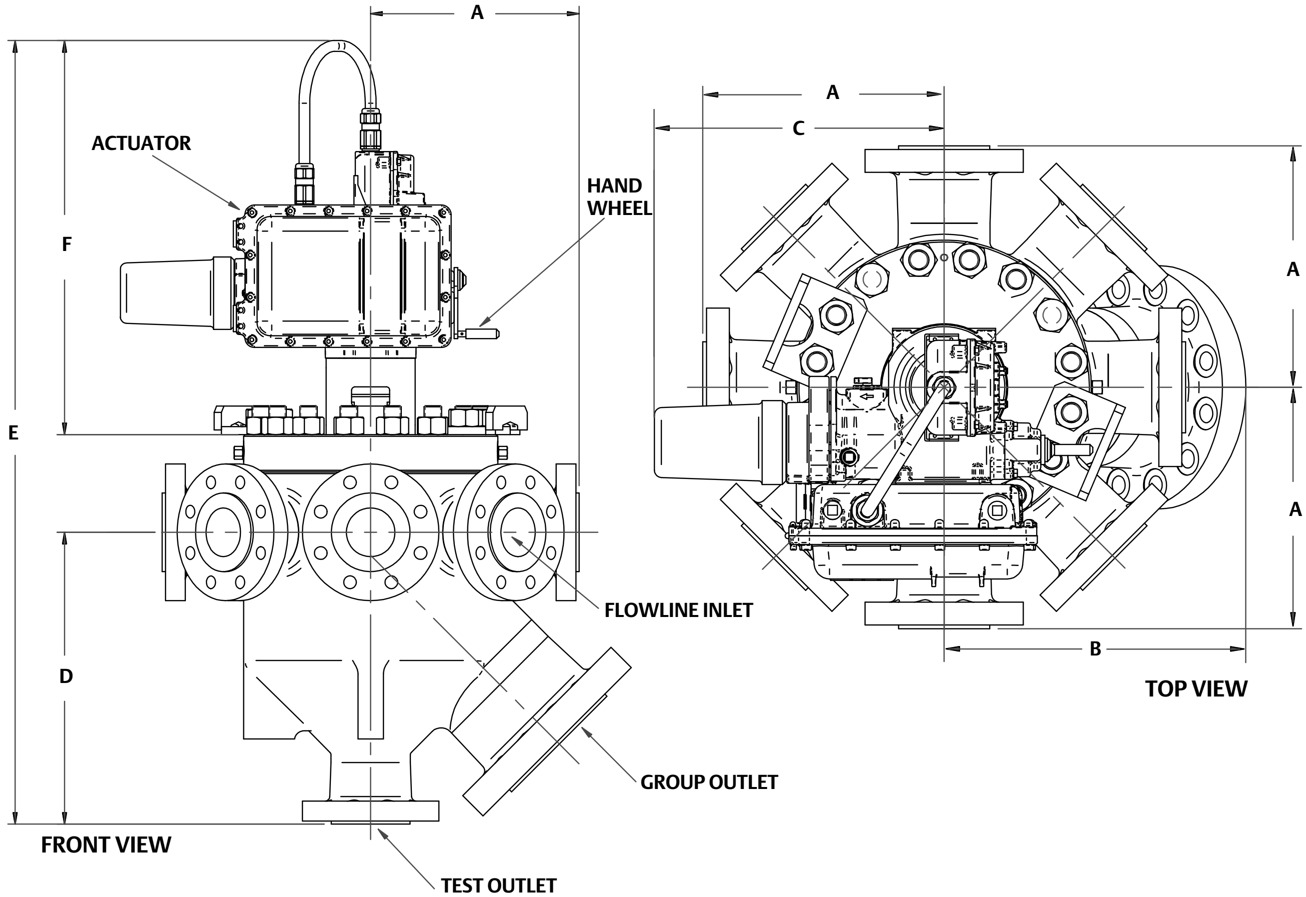


Table 6. Fisher Multiport Valve Body Dimensions (Raised-face Only)

VALVE SIZE, NPS	ASME CLASS	DIMENSIONS, MM (INCH)					
		A	B	C	D	E	F(1)
2x4	CL150	- - -	- - -	- - -	- - -	- - -	- - -
	CL300	353 (13.9)	345 (13.6)	500 (19.7)	417 (16.4)	1161 (45.7)	787 (31)
	CL600	353 (13.9)	358 (14.1)	500 (19.7)	417 (16.4)	1161 (45.7)	787 (31)
	CL900	353 (13.9)	386 (15.2)	500 (19.7)	417 (16.4)	1161 (45.7)	787 (31)
3x6	CL150	340 (13.4)	391 (15.4)	500 (19.7)	437 (17.2)	1382 (54.4)	787 (31)
	CL300	351 (13.8)	411 (16.2)	500 (19.7)	446 (17.6)	1390 (54.7)	787 (31)
	CL600	360 (14.2)	427 (16.8)	500 (19.7)	456 (17.9)	1399 (55.1)	787 (31)
	CL900	379 (14.9)	451 (17.8)	500 (19.7)	475 (18.7)	1399 (55.1)	787 (31)
	CL1500	432 (17.0)	498 (19.6)	500 (19.7)	533 (21.0)	1537 (60.5)	787 (31)
4x8	CL150	- - -	- - -	- - -	- - -	- - -	- - -
	CL300	395 (15.6)	491 (19.3)	500 (19.7)	560 (22.1)	1544 (60.8)	787 (31)
	CL600	417 (16.4)	520 (20.5)	500 (19.7)	583 (22.9)	1565 (61.6)	787 (31)
	CL900	430 (16.9)	558 (22.0)	500 (19.7)	595 (23.4)	1577 (62.1)	787 (31)
4x10	CL1500	478 (18.8)	712 (28.0)	500 (19.7)	661 (26.0)	1793 (70.6)	787 (31)
6x16	CL150	- - -	- - -	- - -	- - -	- - -	- - -
	CL300	527 (20.8)	684 (26.9)	500 (19.7)	361 (33.9)	1908 (75.1)	787 (31)
	CL600	551 (21.7)	721 (28.4)	500 (19.7)	884 (34.8)	1932 (76.1)	787 (31)
	CL900	667 (26.2)	790 (31.1)	500 (19.7)	957 (37.7)	2054 (80.9)	787 (31)
	CL1500	657 (25.9)	919 (36.2)	500 (19.7)	1038 (40.9)	2250 (88.6)	843 (33)
	CL2500	829 (32.6)	950 (37.4)	500 (19.7)	1105 (43.5)	2383 (93.8)	800 (31.5)

1. 28 inches of space is required to remove the actuator assembly from the valve.

Figure 5. Dimensions for Mounting (see table 7)

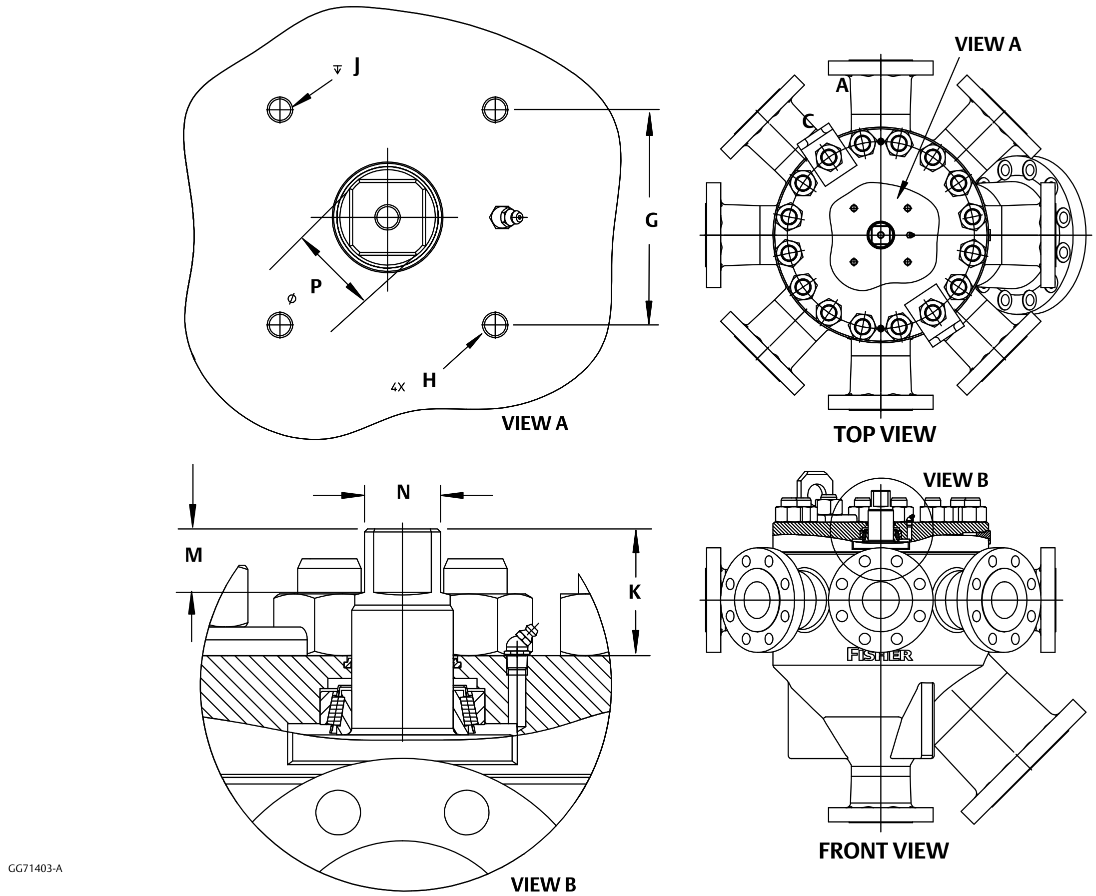


Table 7. Fisher Multiport Mounting Dimensions

VALVE SIZE, NPS	ASME CLASS	DIMENSIONS, MM (INCH)						
		G	H	J	K	M	N	P
2x4	CL150	- - -	- - -	- - -	- - -	- - -	- - -	- - -
	CL300-900	108 (4.24)	1/2-13UNC(1)	19 (0.75)	62 (2.44)	25 (1.00)	25 (1.00)	36 (1.42)
3x6	CL150-900	108 (4.24)	1/2-13UNC	19 (0.75)	63 (2.49)	32 (1.25)	38 (1.50)	48 (1.88)
	CL1500	108 (4.24)	1/2-13UNC	19 (0.75)	65 (2.56)	32 (1.25)	38 (1.50)	48 (1.88)
4x8	CL150	- - -	- - -	- - -	- - -	- - -	- - -	- - -
	CL300-900	108 (4.24)	1/2-13UNC	19 (0.75)	65 (2.55)	32 (1.25)	38 (1.50)	48 (1.88)
4x10	CL1500	108 (4.24)	3/4-10UNC	25 (1.00)	69 (2.72)	41 (1.63)	38 (1.50)	51 (2.00)
6x16	CL150	- - -	- - -	- - -	- - -	- - -	- - -	- - -
	CL300-600	117 (4.60)	3/4-10UNC	25 (1.00)	69 (2.70)	41 (1.63)	38 (1.50)	51 (2.00)
	CL900	117 (4.60)	3/4-10UNC	25 (1.00)	75 (2.97)	41 (1.63)	57 (2.25)	76 (3.00)
	CL1500-2500	117 (4.60)	3/4-10UNC	38 (1.50)	75 (2.97)	41 (1.63)	57 (2.25)	76 (3.00)

1. UNC is defined as unified coarse.

Installation

The Multiport Flow Selector is installed vertically with the test port down. Flow is normally from the seven inlets to the group outlet or test outlet. The eighth inlet is normally used as the home port for when testing of an individual inlet is not desired.

The Multiport Flow Selector plug seal/port alignment is factory adjusted when supplied with actuator and should not require further adjustment.

Note

When hydrotesting external piping, position the plug between any two inlet ports in order to equalize test pressure between the multiport body and external piping to prevent possible seal damage from happening.

Ordering Information

Valve Information

To determine what valve ordering information is needed, refer to the specifications table. Review the information under each specification and in the referenced tables; specify your choice whenever there is a selection to be made.

Actuator and Accessory Information

Refer to the specific actuator and accessory bulletins for required ordering information.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Baumann™ 24000C Carbon Steel Little Scotty™ Control Valve

Baumann Little Scotty industrial control valves are intended for general utility service in pressure, flow, and temperature control applications. This compact carbon steel control valve is positioned to take advantage of the trend toward industrial grade requirements spanning general utility and special applications. These control valves exhibit low hysteresis and deadband, good control characteristics, tight shutoff, rugged construction, high performance packing, and easy maintainability. These attributes translate into reduced maintenance costs, reduced process variability, and increased process availability, resulting in lower long-term operating costs.

W9743

24000C Control Valve with Baumann 32 Actuator

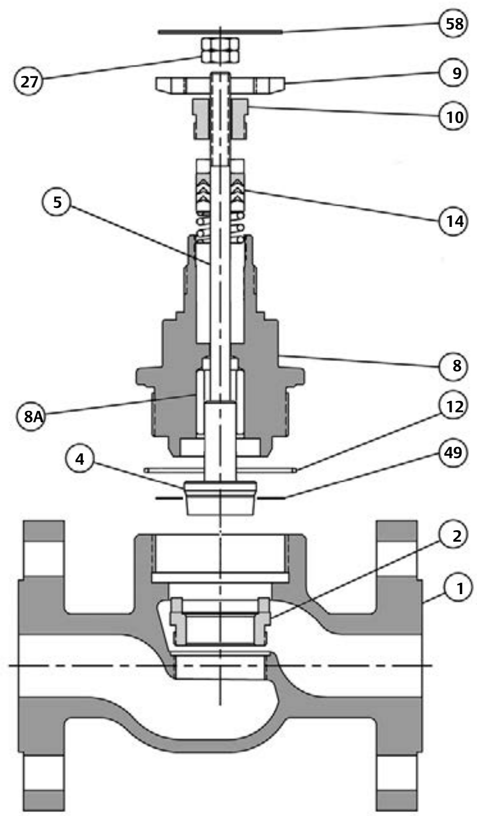
W9744

24000C Control Valve with Baumann 32 Actuator and Fisher 3661 I/P Positioner

Features

- Compact and light weight design reduces installed piping costs
- ASME and EN end connections are available to meet your piping standards
- High quality type 316 austenitic stainless steel trim materials
- 416 stainless steel trim available
- Dual plug and stem guiding provides increased stability during plug travel
- Multiple trim capacity reductions available to meet changing process requirements
- Fisher™ FIELDVUE™ digital valve controller available for remote calibration and diagnostics in facilities using the PlantWeb™ architecture

Figure 1. Baumann 24000C Valve Body Assembly with Standard PTFE Spring-Loaded Packing

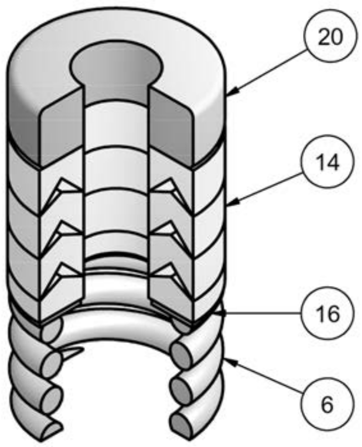


E1239-1

Table 1. Materials of Construction

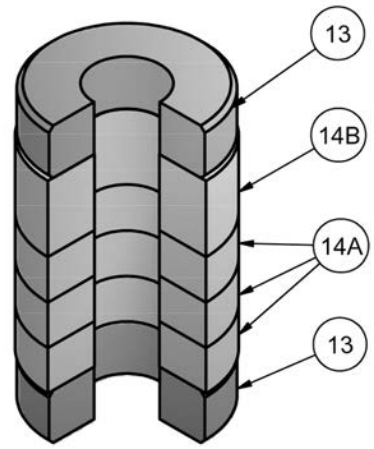
Key No.	Description		Material
1	Valve Body		Carbon Steel
2	Seat Ring	Standard	ASTM A276 S31600 / S31603 Dual Certified
		Optional	ASTM A582 S41600 Condition T
4	Plug (Metal Seat) Cv < 2.5	Standard	ASME SA479 S21800 Annealed
		Optional	ASTM A582 S41600 Condition T
	Plug (Metal Seat) Cv > 4.0	Standard	ASTM A276 S31600 / S31603 Dual Certified
		Optional	ASTM A582 S41600 Condition T
	Plug (Soft Seat)		ASTM A276 S31600 / S31603 with PTFE (Polytetrafluoroethylene) Insert
5	Stem		ASTM A276 S31600 Condition A
8	Bonnet		Carbon Steel
8A	Bonnet Bushing		ASTM A276 S44004, HT 56-60 HRC or ASTM A311 Class B Stressproof 62-65 HRC
9	Drive Nut (Yoke)		S30400
10	Packing Follower		ASTM A276 S31600 / S31603 Dual Certified
12	O-Ring		FKM (Fluorocarbon)
14	Packing	Standard	Refer to figure 2, table 2, shown below
		Optional	Refer to figure 3, table 3, shown below
27	Locknuts		Stainless Steel
49	Body Gasket	Standard	Annealed Soft Copper
		Optional	Graphite Grade GHR with stainless steel Insert
58	Travel Indicator		ASME SA240 S30400

Figure 2. Standard Spring Loaded PTFE V-Ring Packing Kit



E1240

Figure 3. Molded Graphite (Flexible Graphite) Packing Kit (Optional)



E1241

Table 2. Standard Spring Loaded PTFE V-Ring Packing Kit

Key No.	Description	Material
6	Spring	ASTM A313 S30200
14	Packing Set	PTFE (Polytetrafluoroethylene)/ 25% carbon filled PTFE
16	Washer	ASME SA240 S31600
20	Spacer	J-2000 (filled Polytetrafluoroethylene)

Table 3. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

Key No.	Description	Material
13	Bushings	Carbon-Graphite
14A	Packing Rings	Graphite
14B	Packing Ring	Graphite

Table 1. Cv Values at 100% Plug Opening (Kv = 0.86 x Cv)(1)

VALVE SIZE	ORIFICE DIAMETER	PLUG TRAVEL	PLUG SERIES				
			102	577	548 / 588	677	648 / 688
NPS	inch	inch	Cv	Cv	Cv	Cv	Cv
1/2	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	0.20, 0.50, 1.0	---	0.50, 1.0
	0.375	0.50	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.50, 1.0, 2.5	1.5, 2.5
	0.8125	0.50	---	4, 6	4, 7.7	5	4, 6
3/4	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	0.20, 0.50, 1.0	---	0.5, 1.0
	0.375	0.50	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.50, 1.0, 2.5	1.5, 2.5
	0.8125	0.5	---	4, 7.5	4, 10.1	5	4, 8
1	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	0.20, 0.50, 1.0	---	0.5, 1.0
	0.375	0.50	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.5, 1.0, 2.5	1.5, 2.5
	0.8125	0.5	---	4, 8.5	4, 10.1	5	4, 9
	1.0625	0.5	---	13	13.6	---	13
1-1/2	1.25	0.75	---	20	10, 20	20	10, 20
	1.5	0.75	---	10, 17, 28	10, 17, 32.9	10, 17	10, 17, 28
2	1.5	0.75	---	10, 17, 28	10, 17, 32.9	10, 17	10, 17, 28
	2.0	0.75	---	30	30, 52.9	30, 50	30, 50

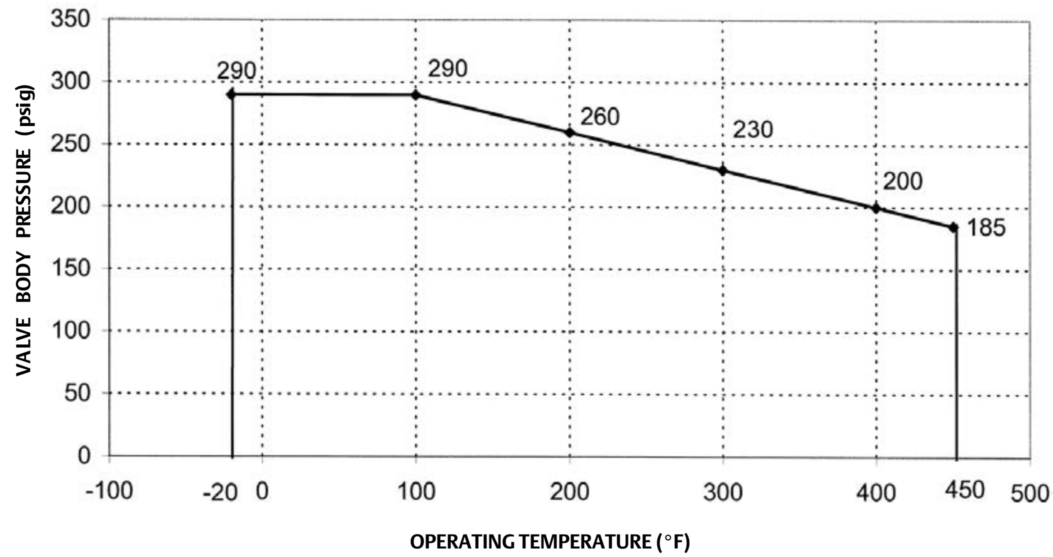
1. See Fisher Catalog 12 for a full range of flow and sizing information.

Table 4. Technical Specifications

VALVE TYPE	EN	ASME
NOMINAL SIZE	DN 15, 20, 25, 40, and 50	NPS 1/2, 3/4, 1, 1-1/2, and 2
END CONNECTIONS	Mates with PN 10-40 Flanges per EN 1092-1	Mates with ASME CL150 RF Flanges per ASME B16.5
PRESSURE RATING	PN 40 per EN 1092-2	ASME CL150 per ASME B16.34
SEAT PLUG SEALING	Metal-to-Metal or PTFE Soft Seat	Metal-to-Metal or PTFE Soft Seat
FLANGE FINISH	EN 500 to 300 Ra circular lay	ASME 250 to 125 Ra circular lay
FACE-TO-FACE DIMENSIONS	Consistent with EN 558-1	Consistent with EN 588-2 (same as ISA S75.03)
CHARACTERISTIC	Equal Percentage or Linear	Equal Percentage or Linear
TEMPERATURE LIMITS	-29°C to 232°C (-20°F to 450°F)	-29°C to 232°C (-20°F to 450°F)
ACTUATOR	See Baumann 16, 32, 54, and 70 Pneumatic Actuators Bulletin (D104175X012)	

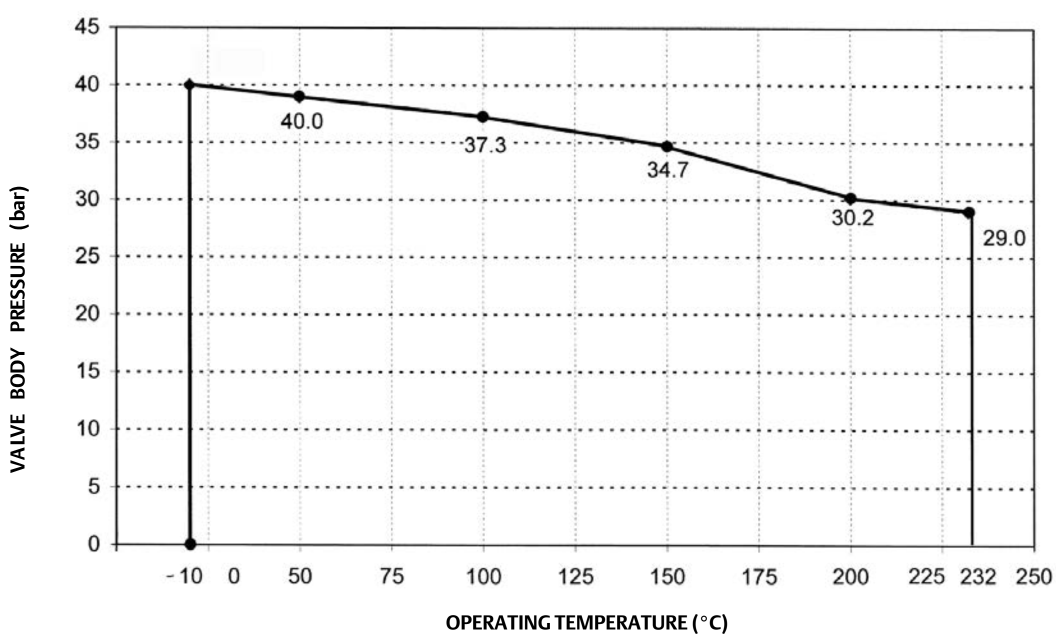
Figure 4. Baumann Pressure-Temperature Ratings

PRESSURE-TEMPERATURE RATINGS
ASME CL150 FLANGED VALVES
(SOURCE: ASME B16.34)



E1242

PRESSURE-TEMPERATURE RATINGS
EN PN10-40 FLANGED VALVES
(SOURCE: EN 1092, MATERIAL GROUP 3E0, GP240GH -EN 10213-2 1.0619)



E1243

Table 5. Valve Dimensions

VALVE SIZE		A FACE-TO-FACE				B BONNET	
EN	ASME	EN 10-40		CL150			
DN	NPS	mm	in	mm	in	in	mm
15	1/2	130	5.1	184	7.25	3.2	80
20	3/4	150	5.9	184	7.25	3.2	80
25	1	160	6.3	184	7.25	3.3	83
40	1-1/2	200	7.9	222	8.75	3.9	99
50	2	230	9.1	254	10.00	4.2	107

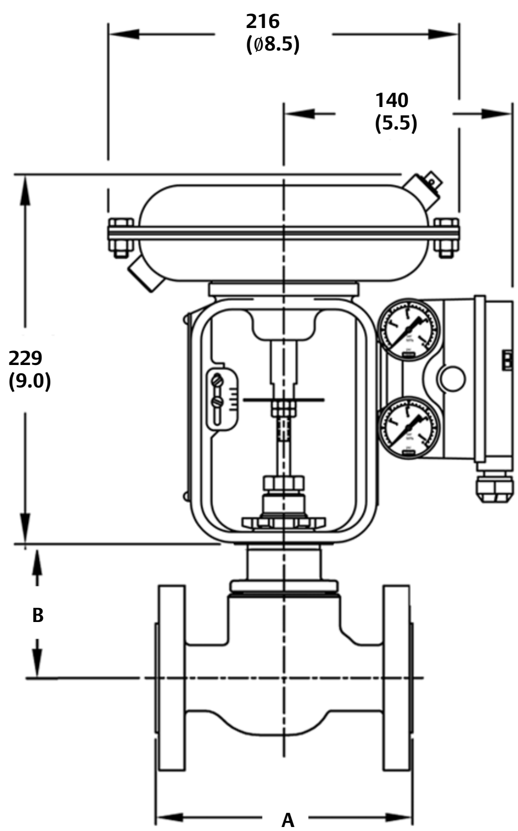
Table 6. Valve Assembly Weights

VALVE SIZE		WEIGHTS	
EN	ASME		
DN	NPS	kg	lb
15	1/2	3.9	9
20	3/4	4.8	11
25	1	6.4	14
40	1-1/2	10	22
50	2	15	33

Table 7. Actuator Weights

ACTUATOR TYPE	WEIGHTS	
	kg	lb
MV1020	10	22
VA1020	13.6	30
SVX24-MFT	Reference Baumann bulletin 52.1:SVACT (D104169X012)	
SVK24-MFT		

Figure 5. Dimensional Drawing



24000C WITH BAUMANN 32 ACTUATOR AND FISHER 3660/3661 POSITIONER

Note: Actuator removal requires 115 mm (4.5 inches) vertical clearance.

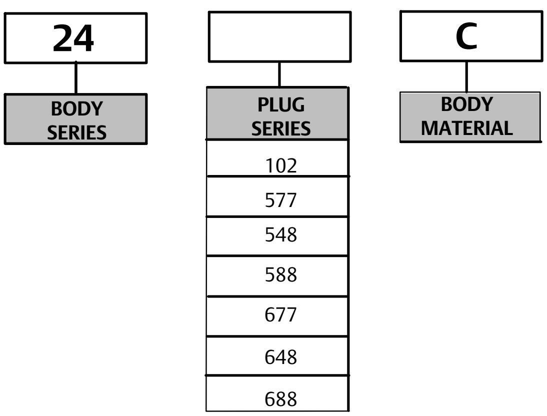
Table 8. Electric Actuators

Actuator Type
CML-250
CML-750
SVX24-MFT
SVK24-MFT

Table 9. 24000C Valve Model Numbering System

Model	Plug Series	Characteristic	Seat Leakage	Valve Body Material	
24	102	Linear / Metal Seat	IV	C	Carbon Steel
	577	Equal % / PTFE Seat	VI		
	548	Equal % / Metal Seat (S41600)	IV		
	588	Equal % / Metal Seat (S31600)	IV		
	677	Linear / PTFE Seat	VI		
	648	Linear / Metal Seat (S41600)	IV		
	688	Linear / Metal Seat (S41600)	IV		

Figure 6. 24000C Valve Model Nameplate Example



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Baumann™ 24000CVF Carbon & 24000SVF Stainless Steel Flanged Control Valves

The Baumann 24000CVF and 24000SVF line of control valves can be utilized for the control of pressure, temperature, level, and flow. These valves are available with ASME CL150 RF, CL300 RF, or PN 10-40 flanged end connections. The high performance 24000CVF and SVF designs feature low deadband and hysteresis, high flow capacity, superb control characteristics, tight shutoff and advanced packing systems to meet demanding service conditions. Compact and light weight make them ideal for installation in high density piping systems where space is a premium.

W9745-1

Baumann 24000CVF Control Valve with FIELDVUE DVC6200 Digital Valve Controller

W9746

Baumann 24000SVF Control Valve with FIELDVUE DVC2000 Digital Valve Controller

Features

- Compact and light weight design reduces installed piping costs
- ASME and EN end connection options to meet your piping standards
- Full lift post-guided contoured plug allows flushing of debris through valve body
- S31600 austenitic stainless steel trim material is standard; S41600 stainless steel trim is available
- Multiple trim options are available to meet changing process requirements
- Fisher™ FIELDVUE™ digital valve controller available for remote calibration and diagnostics in facilities utilizing the PlantWeb™ architecture
- ENVIRO-SEAL™ packing available for increased packing life and integrity
- NOLEEK bellows bonnet suitable for a wide range of operating temperatures
- Extension bonnets in multiple lengths available for elevated temperature and cryogenic application service

Figure 1. Baumann 24000CVF / SVF Control Valve Subassembly

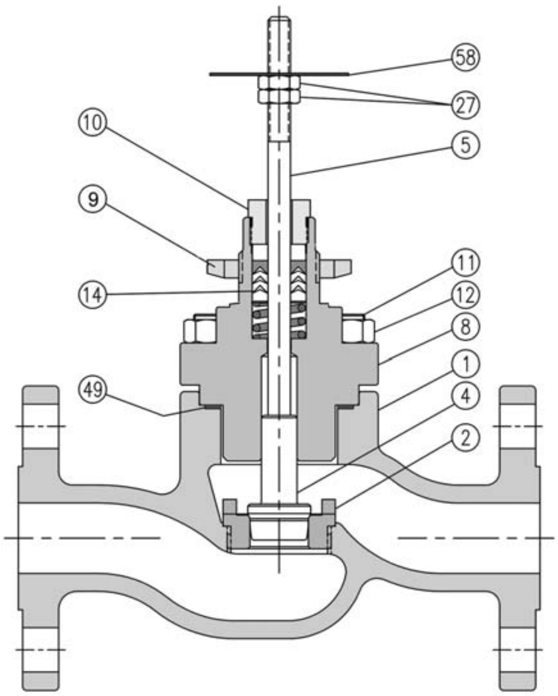


Table 1. Materials of Construction

Key No.	Description	Material
1	Valve Body, Carbon Steel	Cast Carbon Steel (ASME SA216 WCC and EN10213 1.0619 Dual Certified)
	Valve Body, Stainless Steel	ASME SA351 CF3M
2	Seat Ring (For Low Flow Trim, Refer to tables 2 & 3)	Standard ASTM A276 S31600/ S31603 Dual Certified / Optional ASTM A582 S41600 Condition T
4	Plug (Metal Seat) Cv < 3.3	ASME SA479 S21800 (standard) / ASTM A582 S41600 Condition T (optional)
	Plug (Metal Seat) Cv > 3.7	ASTM A276 S31600/ S31603(standard) / ASTM A582 S41600 Condition T (optional)
	Plug (Soft Seat)	ASTM A276 S31600/ S31603 with PTFE (Polytetrafluoroethylene) insert
5	Stem	ASTM A276 S31600
8	Bonnet, Carbon Steel (Std)	Cast Carbon Steel (ASME SA216 WCC and EN10213 1.0619 Dual Certified)
	Bonnet, Stainless Steel (Std)	ASME SA351 CF3M
	Bonnet (extended)(1)	ASME SA351 CF3M
	Bonnet (NOLEEK)(1)	ASME SA351 CF3M & ASTM A479 S31600/S31603, Annealed
8a	Bonnet Bushing(2)	ASTM A276 S44004, HT 56-60 HRC
9	Drive Nut (Yoke)	S30400
10	Packing Follower	ASTM A276 S31600/S31603 Dual Certified
11	Stud	ASME SA193 Grade B8, Class 1
12	Nut	ASME SA194 Grade 8
14	V-Ring Packing (standard)	Refer to figure 4, table 4
	Packing (optional)	Refer to figures 5 & 6, tables 5 & 6
27	Locknuts	Stainless Steel (18-8 SST)
49	Body Gasket	Graphite Grade GHR with S31600 Insert
58	Travel Indicator	ASME SA240 S30400

1. Extension bonnets and NOLEEK bellows bonnets are available with 24000SVF stainless steel valves only.
2. Guide bushing is applicable to 24000CVF carbon steel valve assembly only.

Figure 2. Optional 151 Low Flow Trim Assembly

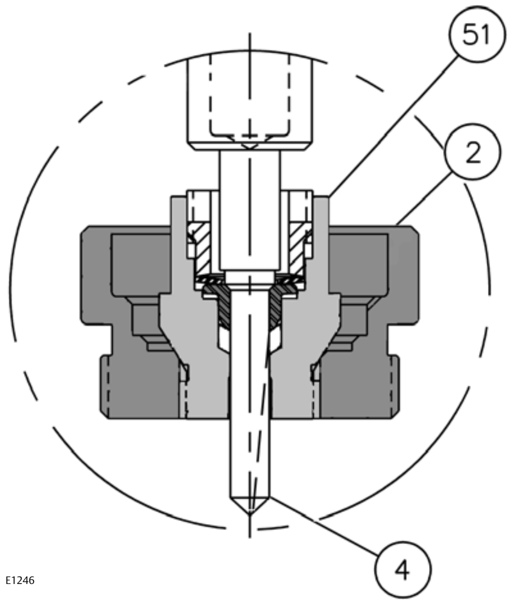
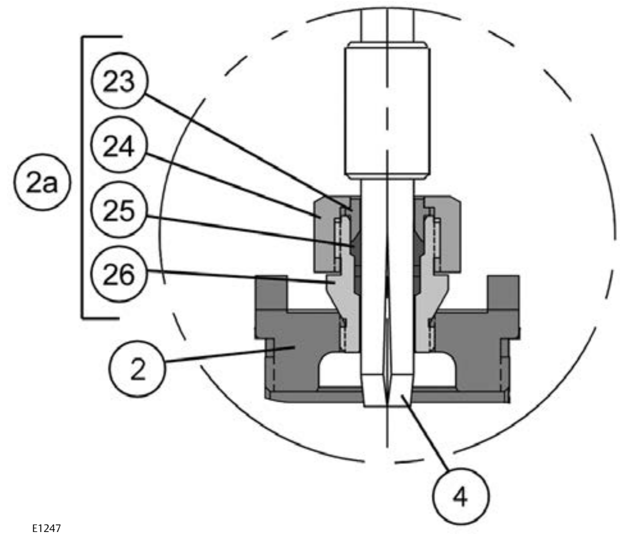


Figure 3. Optional 177 Low Flow Trim Assembly



151 Low Flow Trim Assembly

The PTFE seat surrounds the valve plug (key 4) to eliminate clearance flow typical of lapped-in metal-to-metal close clearance micro trims. Flow is directed over the valve plug and forced through a single V-notch path as the plug moves above the PTFE seat providing precise and predictable control over its entire travel range. When the V-notch moves below the PTFE seat, CLVI primary shutoff is achieved.

A live-loaded metal collar fully retains the PTFE seat. The valve plug (key 4) seats against the metal collar providing CL IV secondary shutoff. In addition, the fluid process pressure combines with the actuator seating force to form a hydraulic seal within the fully retained PTFE seat. Therefore, the higher the process pressure the tighter the shutoff.

Table 2. 151 Low Flow Trim

Key No.	Description	Material
2(1)	Seat Ring	ASTM A276 S31600/ S31603
4(1)	Plug	ASME SA479 S21800
Seat Subassembly		
51(1)	Cage	ASTM A276 S31600/ S31603
	Seat	PTFE
	Collar	ASTM A276 S31600/ S31603
	Washer	ASTM A276 S31600 Cond B
	Insert	ASTM A276 S31600/ S31603

1. For optional trim materials, consult your Emerson sales office or Local Business Partner for price and delivery.

Table 3. 177 Low Flow Trim

Key No.		Description	Material
2(1)		Seat Ring	ASTM A276 S31600/ S31603
Seat Subassembly			
2a(1)	23	Gland	ASTM A276 S31600/ S31603
	24	Retainer Nut	ASTM A276 S31600/ S31603
	25	Insert	Reinforced PTFE
	26	Housing	ASTM A276 S31600/ S31603
4(1)		Plug	ASME SA479 S21800

1. For optional trim materials, consult your Emerson sales office or Local Business Partner for price and delivery. Baumann 32 actuator requires duel-stops with 177 trim series.

Figure 4. Standard Spring-Loaded PTFE V-Ring Packing Kit

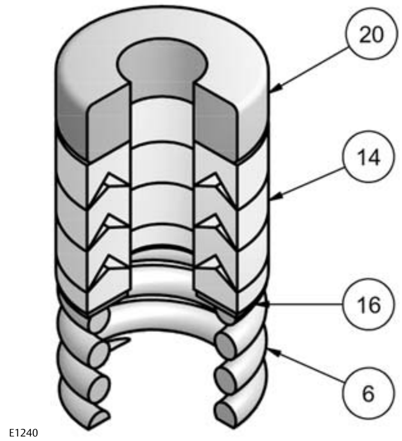


Table 4. Standard Spring-Loaded PTFE V-Ring Packing Kit

Key No.	Description	Material
6	Spring	ASTM A313 S30200
14	Packing Set	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
16	Washer	ASME SA240 S31600
20	Spacer	J-2000 (filled-Polytetrafluoroethylene)

Figure 5. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

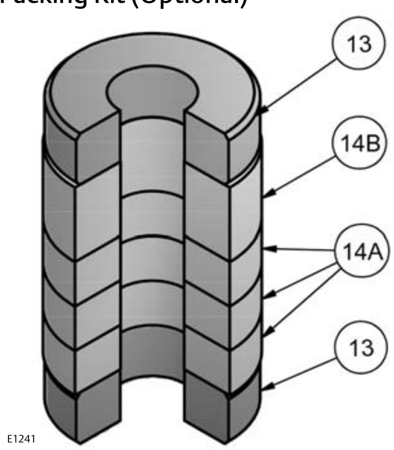


Table 5. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

Key No.	Description	Material
13	Bushings	Carbon - Graphite
14A	Packing Rings	Graphite
14B	Packing Ring	Graphite

Figure 6. ENVIRO-SEAL Packing Kit (Optional)

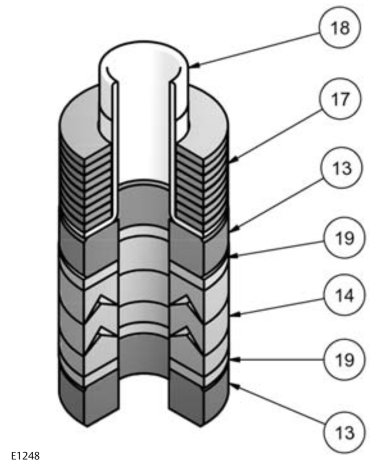


Table 6. ENVIRO-SEAL Packing Kit (Optional)

Key No.	Description	Material
13	Bushings	Carbon Graphite
14	Packing Set	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
17	Belleville Spring	ASTM B637 N07718, 40 HRC max
18	Bushing	PEEK (Polyetheretherketone)
19	Washer	Modified PTFE

Special ENVIRO-SEAL Packing Note

The ENVIRO-SEAL PTFE packing system is suitable for 100 ppm environmental applications on services up to 51.7 barg (750 psig) and process temperatures ranging from -46 to 232°C (-50 to 450°F).

For non-environmental applications, this packing system offers excellent performance at the same temperature range up to the maximum valve working pressure.

Temperature limits apply to packing arrangements only. Complete valve assembly temperature limits may differ. Refer to appropriate pressure/ temperature ratings.

Reference Fisher Packing Selection Guidelines for Sliding-Stem Valves, bulletin 59.1:062 (D101986X012).

⚠ WARNING

The Baumann NOLEEK valve bonnet assembly is not intended for use in lethal service applications.

The NOLEEK Bellows Bonnet Assembly is reliable and user-friendly. Typical service life is in excess of 250,000 full cycles under 100 psi pressure. The bonnet adds only approximately 5 inches to the height of a standard valve. Operating temperature range is -195 to 399°C (-320 to 750°F).

ONLY AVAILABLE WITH 24000SVF STAINLESS STEEL VALVES.

Figure 7. Baumann NOLEEK Bellow Bonnet Assembly

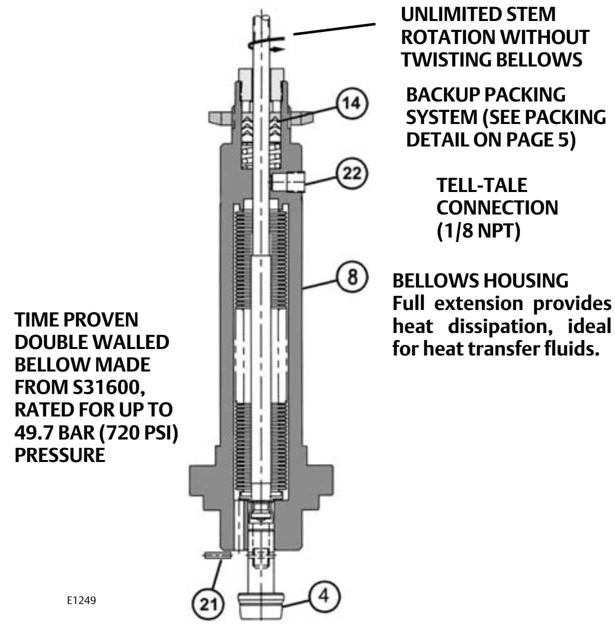


Table 7. Baumann NOLEEK Bellow Bonnet Assembly

Key Number	Description		Material
4	Plug		Refer to table 1
8	Bellows Bonnet Sub-Assembly	Housing	S31600/S31603
		Bellows	S31603/1.4571 SST
		Bonnet	CF3M
21	Plug Retaining Pin		S30300
22	Hex Socket Pipe Plug, 1/8 NPT		S30400

Figure 8. Bellows Pressure / Temperature Curve

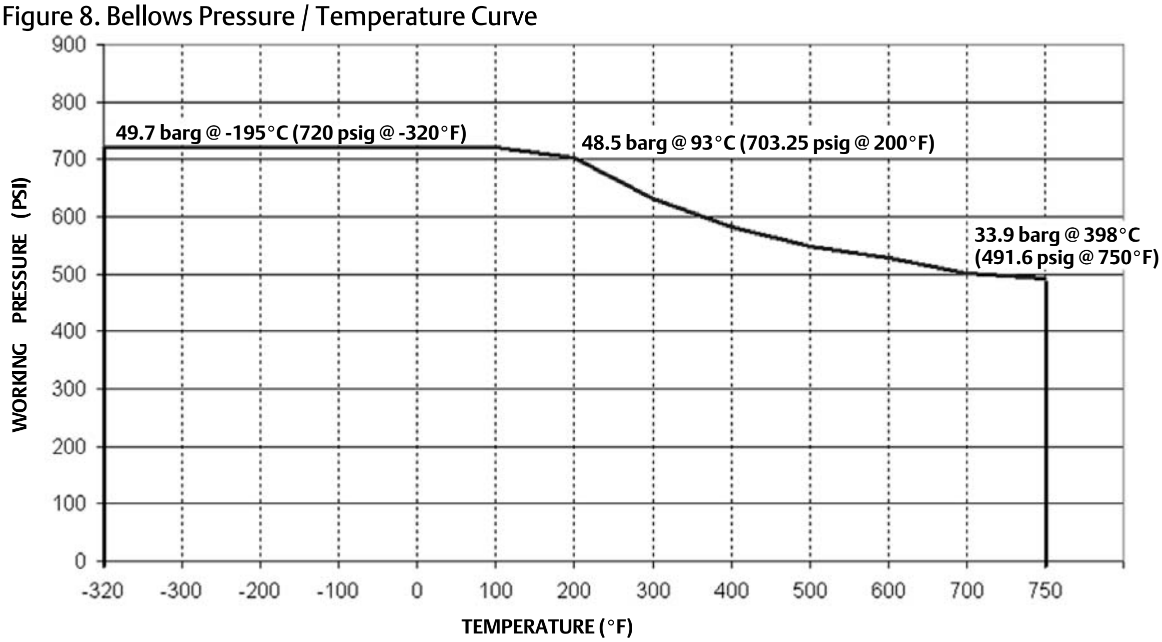


Table 8. Cv Values at 100% Plug Opening (Kv = 0.86 x Cv)(1)

VALVE SIZE	ORIFICE DIAMETER	PLUG TRAVEL	PLUG SERIES						
			102	151	177	577	548 / 588	677	648 / 688
NPS	inch	inch	Cv	Cv	Cv	Cv	Cv	Cv	Cv
1/2	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.22, 0.61, 1.0	---	0.5, 1.0
	0.3125	0.50	---	---	0.0005, 0.001, 0.002, 0.005, 0.01, 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.6, 2.7	1.6, 2.9	0.10, 0.20, 0.50, 1.0, 2.8	1.6, 2.9
	0.8125	0.50	---	---	---	3.9, 6.1	3.9, 6.1	3.4	3.7, 6.1
3/4	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.22, 0.61, 1.0	---	0.5, 1.0
	0.3125	0.50	---	---	0.0005, 0.001, 0.002, 0.005, 0.01, 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.6, 2.7	1.6, 2.9	0.10, 0.20, 0.50, 1.0, 2.8	1.6, 2.9
	0.8125	0.50	---	---	---	3.9, 9.5	3.9, 9.8	3.4	3.7, 9.8
1	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.22, 0.61, 1.0	---	0.5, 1.4
	0.3125	0.50	---	---	0.0005, 0.001, 0.002, 0.005, 0.01, 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.1, 1.6, 3.2	1.7, 3.3	0.10, 0.20, 0.50, 1.0, 3.3	1.7, 3.3
	0.8125	0.50	---	---	---	5, 11	4.4, 11	5.1	4.6, 11
	1.0625	0.50	---	---	---	13	15.5	---	13
1-1/2	1.25	0.75	---	---	---	26	10, 27	26	11, 26
	1.5	0.75	---	---	---	13, 20, 33	11, 19, 31	14, 23	12, 22, 31
2	1.5	0.75	---	---	---	13, 20, 38	11, 18, 35	14, 23	12, 22, 35
	2.0	0.75	---	---	---	33	55	37, 56	33, 55

1. See Fisher Catalog 12 for a full range of flow and sizing information.

Figure 9. Baumann 24000CVF / SVF Trims

102 Linear
Low Flow Trim

W9747

151 Modified Equal %
Low Flow Trim

W9751

177 Modified Equal %
Low Flow Trim

W9748

548 / 577 / 588
Equal % Trim

W9749

648 / 677 / 688
Linear Trim

W9750

Table 9. Technical Specifications

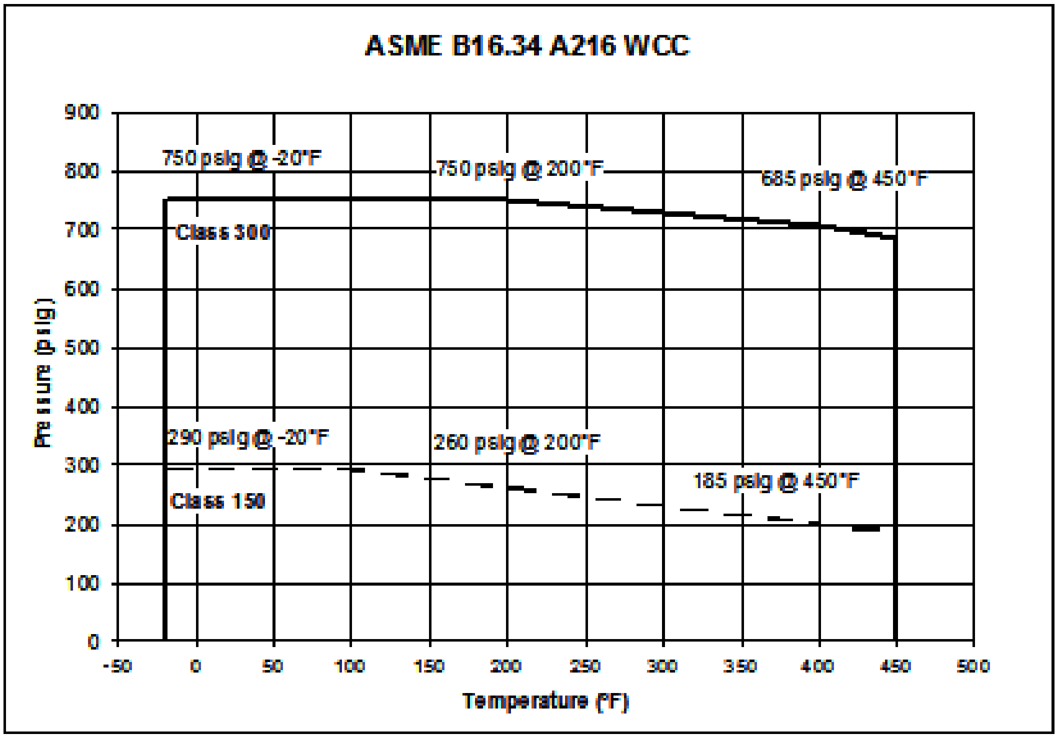
VALVE TYPE	EN	ASME
NOMINAL PIPE SIZE	DN 15, 20, 25, 40, & 50	NPS 1/2, 3/4, 1, 1-1/2, & 2
END CONNECTIONS	PN 10-40 Flanges per EN 1092-1	CL150 RF or CL300 RF Flanges per ASME B16.5
PRESSURE RATING	PN 40 per EN 1092-1	CL150 or CL300 per ASME B16.34
FACE-TO-FACE DIMENSIONS	Consistent with EN 558-1	Consistent with EN 588-2 (ISA S75.03)

Table 10. Temperature Ratings for Packing and Seat Material(1)

SEATING MATERIAL	PTFE Soft Seat	151 Trim	-29 to 177°C (-20 to 350°F)
		577 and 677 Trim	-73 to 232°C (-100 to 450°F)
	Reinforced PTFE	177 Trim	-73 to 232°C (-100 to 450°F)
	Metal Seat	102, 588, and 688 Trim	-195 to 537°C (-320 to 1000°F)
		548 and 648 Trim	-29 to 537°C (-20 to 1000°F)
PACKING AND BONNET COMBINATIONS	BONNET STYLE	PACKING	TEMPERATURE LIMIT
	Standard Bonnet	Spring Loaded PTFE	-73 to 232°C (-100 to 450°F)
		ENVIRO-SEAL	-46 to 232°C (-50 to 450°F)
		Graphite	-73 to 232°C (-100 to 450°F)
	Extension Bonnet(2, 3)	Spring Loaded PTFE	-195 to 232°C (-320 to 450°F)
		ENVIRO-SEAL	-46 to 232°C (-50 to 450°F)
		Graphite	-195 to 537°C (-320 to 1000°F)
	Bellows(2)	NOLEEK Bellows	-195 to 399°C (-320 to 750°F)
CHARACTERISTIC	Equal Percentage or Linear		

1. Temperature limits apply to seating or packing arrangements only. Complete valve assembly temperature limits may differ, refer to appropriate pressure/temperature ratings. For more information on packing selection, reference Fisher Packing Selection Guidelines for Sliding-Stem Valves Bulletin 59.1:062 (D101986X012).
2. Extension bonnets and NOLEEK bellows bonnets are applicable for the 24000SVF stainless steel body assembly ONLY.
3. PTFE packing can be used in cryogenic service but becomes stiff.

Figure 10. Baumann 24000CVF Carbon Steel Flanges, Pressure-Temperature Ratings



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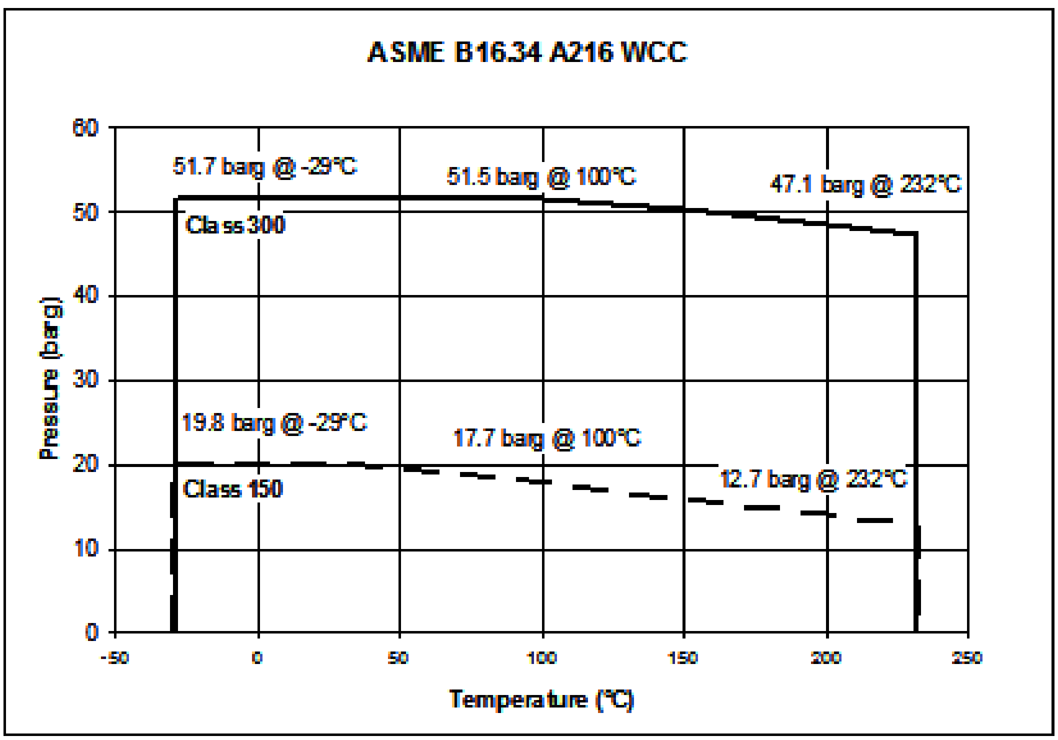
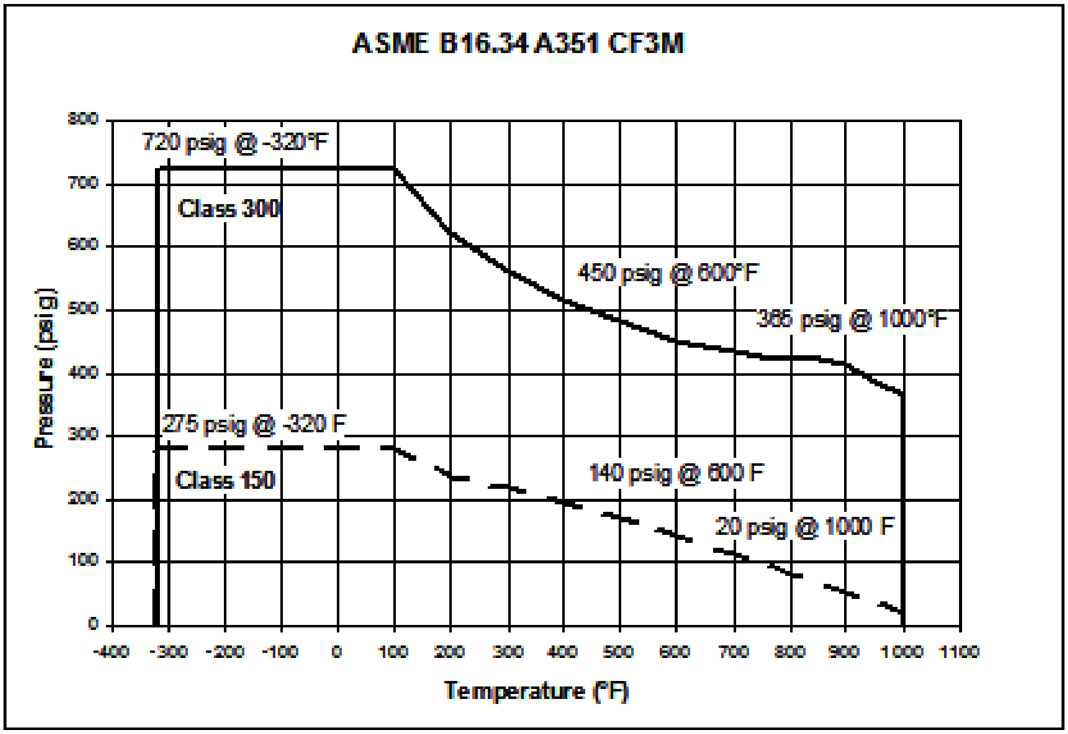


E1252-1

Figure 11. Baumann 24000SVF Stainless Steel Flanges, Pressure-Temperature Ratings



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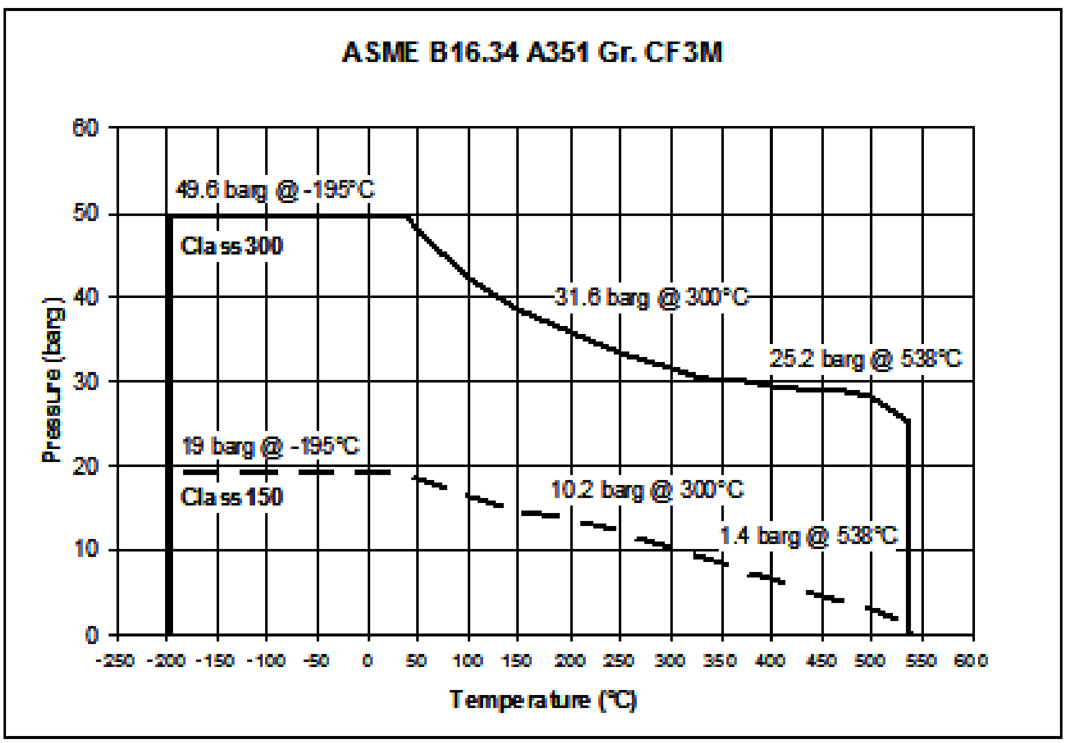
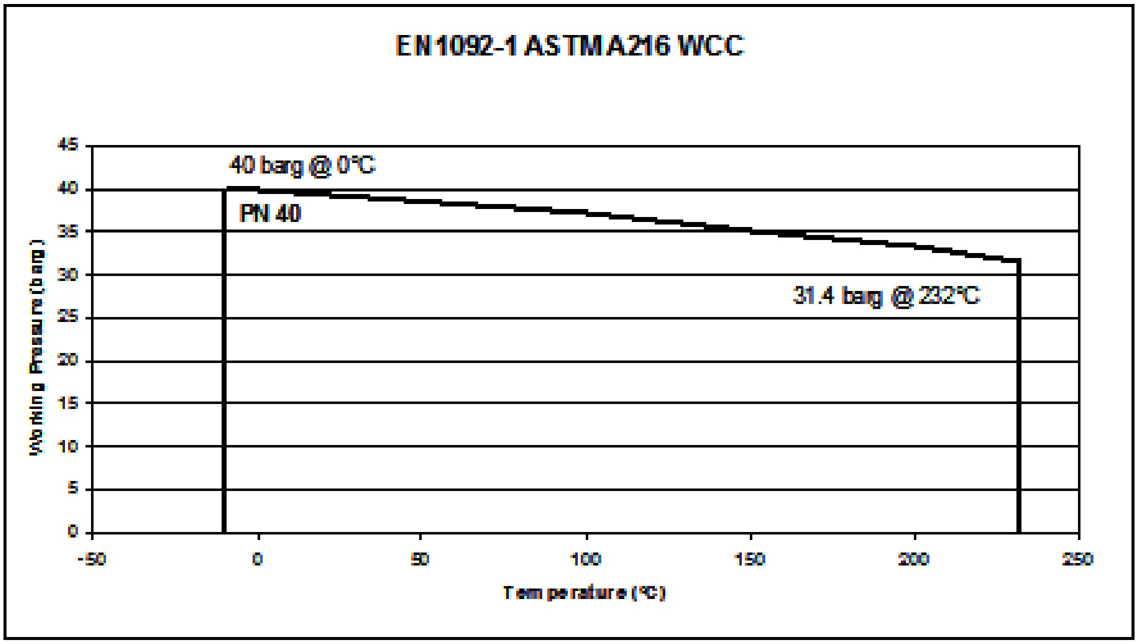


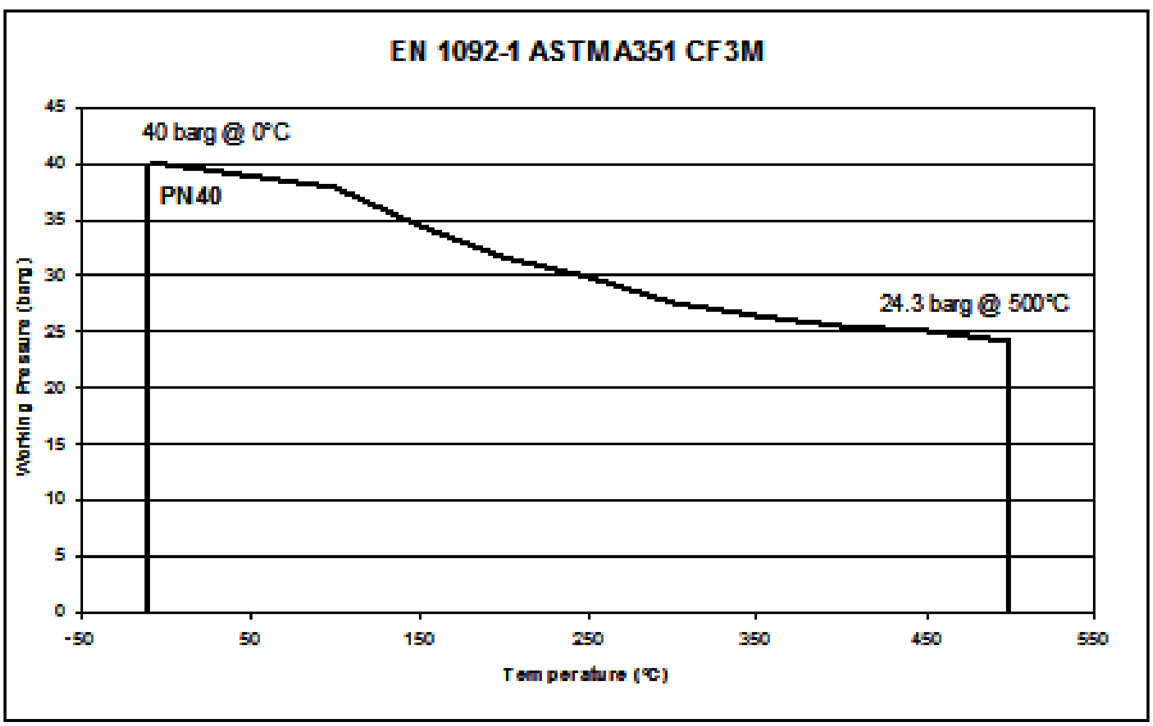
E1255-1

Figure 12. Baumann 24000CVF and 24000SVF Pressure-Temperature Ratings for EN 1092-1



24000CVF

E1253-1



E1256-1

24000SVF

Figure 13. Baumann 24000SVF Stainless Steel Control Valves with Extension Bonnets Dimensional Drawing

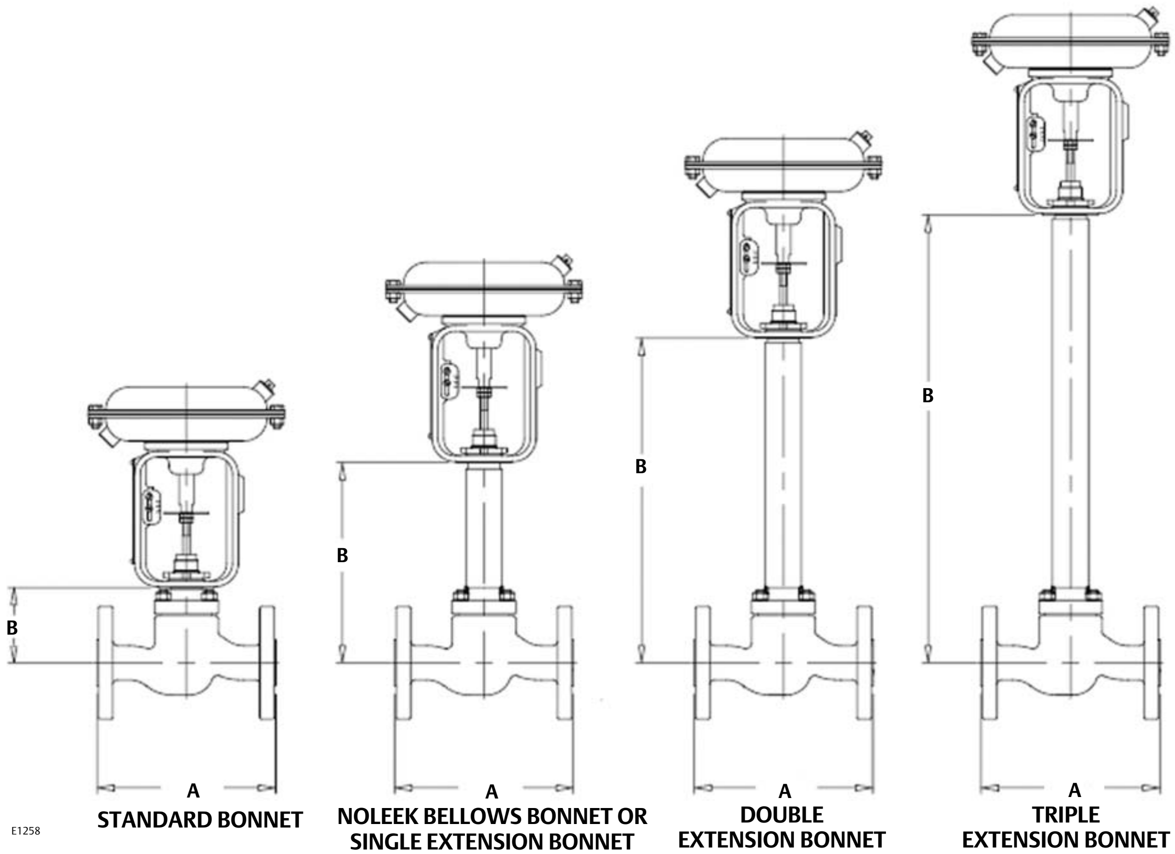


Table 11. Dimensions(1, 2)

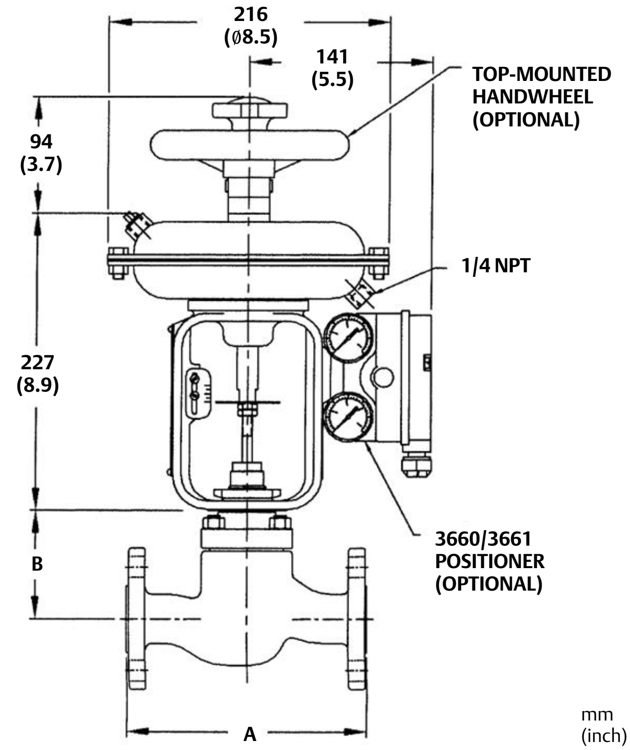
VALVE SIZE		A - FACE-TO-FACE						B - BONNET											
EN	ASME	CL150		CL300		EN 10-40		Standard		Extension(3)						NOLEEK Bellows(3)	
										Single		Double		Triple			
DN	NPS	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
15	1/2	184	7.25	190	7.5	130	5.11	79	3.1	216	8.5	352	13.9	488	19.2	226	8.9
20	3/4	184	7.25	194	7.62	150	5.90	79	3.1	216	8.5	352	13.9	488	19.2	226	8.9
25	1	184	7.25	197	7.75	160	6.30	84	3.3	221	8.7	356	14.0	493	19.4	229	9.0
40	1-1/2	222	8.75	235	9.25	200	7.87	96	3.8	234	9.2	370	14.6	505	19.9	229	9.0
50	2	254	10.0	267	10.5	230	9.06	107	4.2	244	9.6	381	15.0	516	20.3	234	9.2

1. Actuator requires 115 mm (4.5 inches) vertical clearance.
2. Face-to-face dimension per EN 558-1 and ISA S75.03.
3. Extension and NOLEEK bellows bonnets are available with 24000SVF stainless steel body ONLY.

Table 12. Valve Assembly Weights

VALVE SIZE		24000CVF WEIGHTS						24000SVF WEIGHTS					
EN	ASME	CL150		CL300		EN 10-40		CL150		CL300		EN 10-40	
DN	NPS	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb
15	1/2	3.1	6.8	3.3	8.3	3.8	7.7	3.7	7.2	3.5	8.2	3.5	7.8
20	3/4	3.3	7.3	3.4	10	4.5	9.2	4.7	7.4	4.2	10.3	4.3	9.4
25	1	4.8	10.6	5.1	13.8	6.3	12.6	6.4	11.2	5.7	14	5.9	13
40	1-1/2	8.3	18.2	8.3	24.8	11.3	21.2	11.4	18.3	9.6	25.2	9.8	21.7
50	2	14.1	31	13.8	35.3	16	33.4	16.1	30.4	15.2	35.4	15.2	33.4

Figure 14. Dimensional Drawings



mm
(inch)

E1257

24000CVF/SVF FLANGED WITH BAUMANN 32 ATO ACTUATOR WITH HANDWHEEL

Note: Actuator removal requires 115 mm (4.5 inches) vertical clearance.

Table 13. Model Numbering System

	24							
Actuator Type	**Valve Body**	**Plug Series**	**Characteristic**	**Seat Leakage**	**Valve Body Material**		**Bonnet Style**	
MV1020(1)		548	Equal % / Metal Seat (S41600)	IV				
VA1020(1)		577	Equal % / PTFE Seat	VI				
		588	Equal % / Metal Seat (S31600)	IV				
		648	Linear / Metal Seat (S41600)	IV				
		677	Linear / PTFE Seat	VI				
		688	Linear / Metal Seat (S31600)	IV				

1. Refer to Bulletin 52.1:ECV, Baumann Electronic Modulating Actuators (D103347X012) for details on these electronic actuators.

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Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Baumann™ 24000 Little Scotty™ Bronze Control Valve

Baumann Little Scotty industrial control valves are intended for general utility service in pressure, flow, and temperature control applications. This control valve is positioned to take advantage of the trend toward industrial grade requirements spanning general utility to special applications. Little Scotty valves exhibit low hysteresis and deadband, good control characteristics, tight shutoff, rugged construction, high performance packing, and easy maintainability. These attributes translate into reduced maintenance costs, reduced process variability, and increased process availability, resulting in lower long-term operating costs.

W9752

24000 Little Scotty Control Valve with Baumann 32 Actuator

W9753

24000 Little Scotty Control Valve with Baumann 32 Actuator and FIELDVUE DVC2000 Digital Valve Controller

Features

- Compact and light weight design reduces installed piping costs
- High quality S31600 austenitic stainless steel trim materials
- S41600 stainless steel trim available
- Dual plug and stem guiding provides increased stability during plug travel
- Multiple trim capacity reductions available to meet changing process requirements
- Fisher™ FIELDVUE™ digital valve controller available for remote calibration and diagnostics in facilities utilizing the PlantWeb™ architecture

Figure 1. Baumann Little Scotty Valve Body Subassembly with Standard PTFE Spring-Loaded Packing

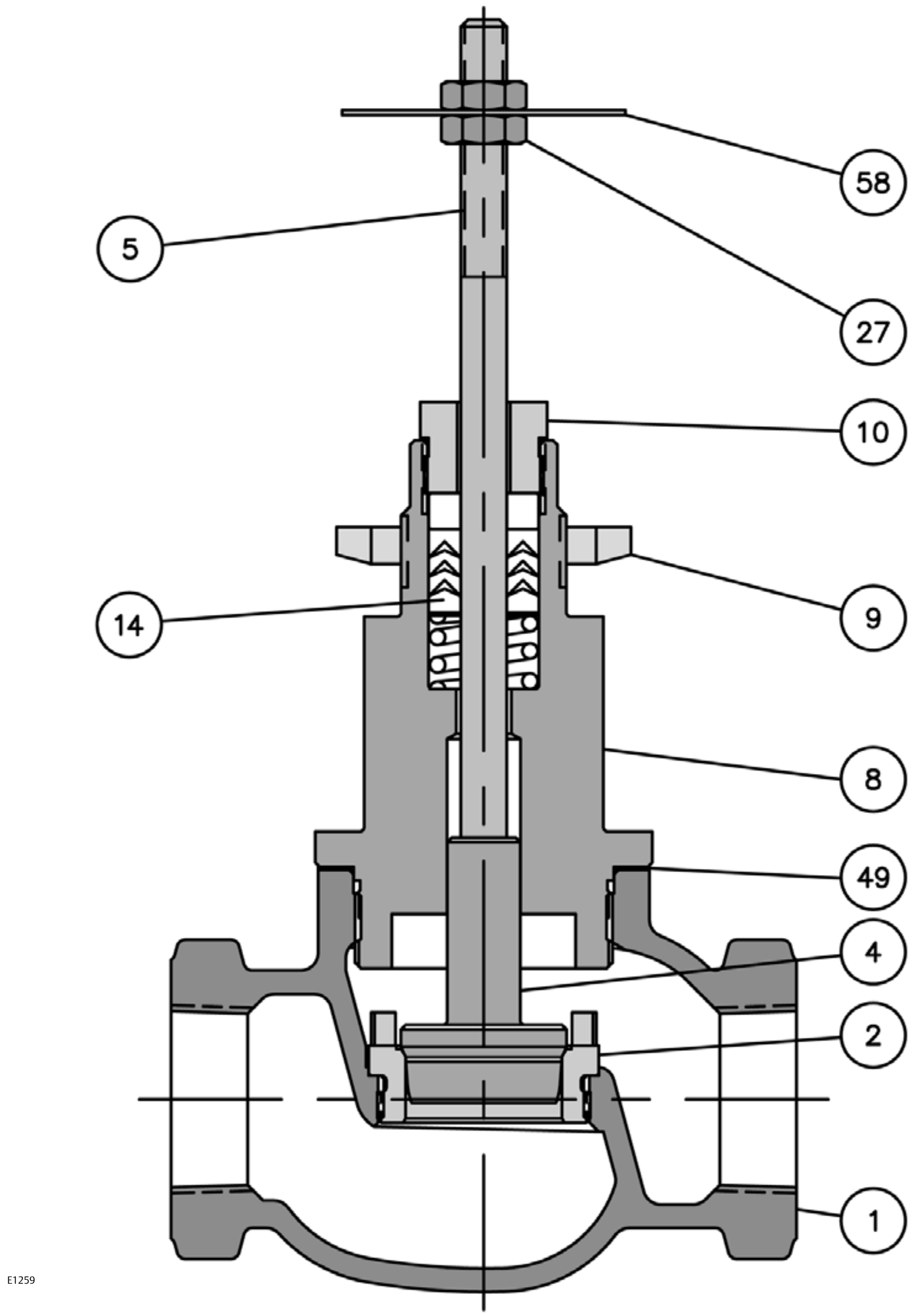


Table 1. Materials of Construction

Key No.	Description		Material
1	Valve Body		ASTM B62 Grade C83600
2	Seat Ring	Standard	ASTM A276 S31600/ S31603 Dual Certified
		Optional	ASTM A582 S41600 Condition T
4	Plug (Metal Seat) Cv < 2.5	Standard	ASME SA479 S21800
		Optional	ASTM A582 S41600 Condition T
	Plug (Metal Seat) Cv > 4.0	Standard	ASTM A276 S31600/ S31603
		Optional	ASTM A582 S41600 Condition T
	Plug (Soft Seat)		ASTM A276 S31600/ S31603 with PTFE (Polytetrafluoroethylene) insert
5	Stem		ASTM A276 S31600
8	Bonnet		ASTM B148 Alloy C95500
9	Drive Nut (Yoke)		S30400
10	Packing Follower		ASTM A276 S31600/ S31603 Dual Certified
14	Packing	Standard	V-Ring, see figure 2
		Optional	Molded Graphite, see figure 3
27	Locknuts		Stainless Steel (18-8 SST)
49	Body Gasket	Standard	Annealed Soft Copper
		Optional	Graphite Grade GHR with S31600 Insert
58	Travel Indicator		ASME SA240 S30400

Table 2. Cv Values at 100% Plug Opening (Kv = 0.86 x Cv)(1)

VALVE SIZE	ORIFICE DIAMETER	PLUG TRAVEL	PLUG SERIES				
			102	577	548 / 588	677	648 / 688
NPS	inch	inch	Cv	Cv	Cv	Cv	Cv
1/2	0.25	0.50	0.20, 0.05, 0.10, 0.20	---	0.2, 0.5 1.0	---	0.5, 1.0
	0.375	0.50	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.50 1.0, 2.5	1.5, 2.5
	0.8125	0.50	---	4, 6	4, 6	5	4, 6
3/4	0.25	0.50	0.20, 0.05, 0.10, 0.20	---	0.2, 0.5 1.0	---	0.5, 1.0
	0.375	0.50	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.50 1.0, 2.5	1.5, 2.5
	0.8125	0.50	---	4, 7.5	4, 8	5	4, 8
1	0.25	0.50	0.20, 0.05, 0.10, 0.20	---	0.2, 0.5 1.0	---	0.5, 1.0
	0.375	0.50	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.50 1.0, 2.5	1.5, 2.5
	0.8125	0.50	---	4, 8.5	4, 9	5	4, 9
	1.0625	0.50	---	13	13	---	13
1-1/2	1.25	0.75	---	20	10, 20	20	10, 20
	1.5	0.75	---	10, 17, 28	10, 17, 28	10, 17	10, 17, 28
2	1.5	0.75	---	10, 17, 28	10, 17, 28	10, 17	10, 17, 28
	2.0	0.75	---	30	30, 50	30, 50	30, 50

1. See Fisher Catalog 12 for a full range of flow and sizing information.

Table 3. Technical Specifications

VALVE TYPE	EN	ASME
NOMINAL SIZE	DN 15, 20, 25, 40, & 50	NPS 1/2, 3/4, 1, 1-1/2, & 2
END CONNECTIONS	Screwed NPT	
PRESSURE RATING	400 psi @ 150°F / 250 psi @ 400°F (ASME B16.15 CL250)	
SEAT PLUG SEALING	Metal to metal or PTFE soft seat	
CHARACTERISTIC	Equal Percentage or Linear	
TEMPERATURE LIMITS	-29 to 204°C	-20 to 400°F
ACTUATOR	See Baumann 16, 32, 54, and 70 Pneumatic Actuators bulletin D104175X012	

Figure 2. Spring-Loaded PTFE V-Ring Packing Kit

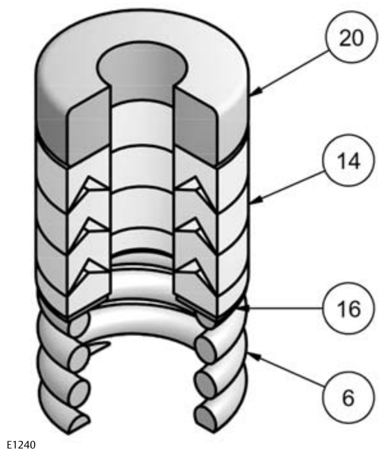


Table 4. Standard Spring-Loaded PTFE V-Ring Packing Kit

Key No.	Description	Material
6	Spring	ASTM A313 S30200
14	Packing Set	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
16	Washer	ASME SA240 S31600
20	Spacer	J-2000 (filled-Polytetrafluoroethylene)

Figure 3. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

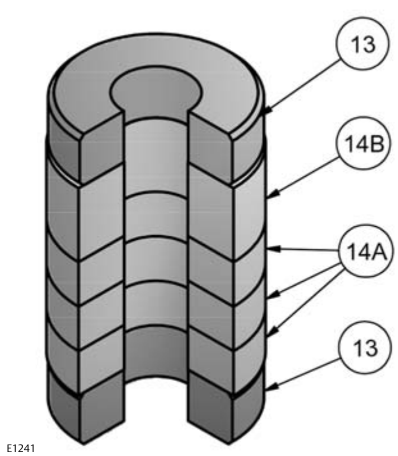
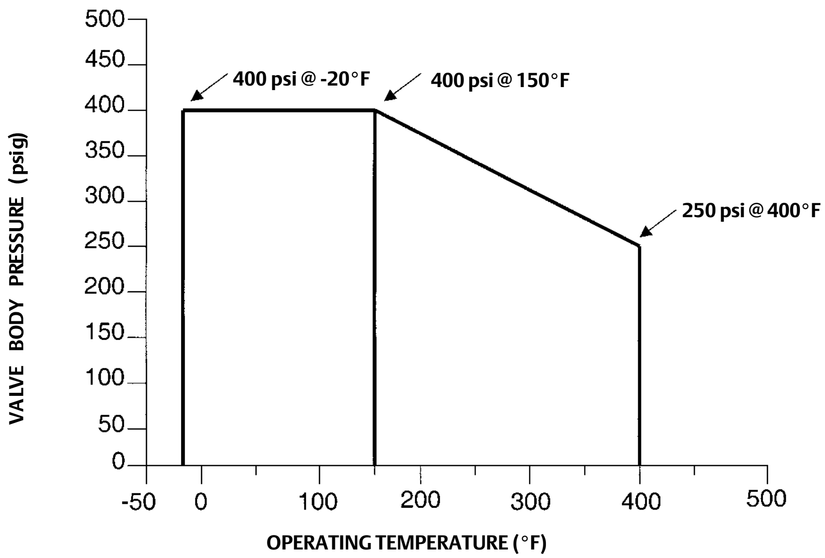


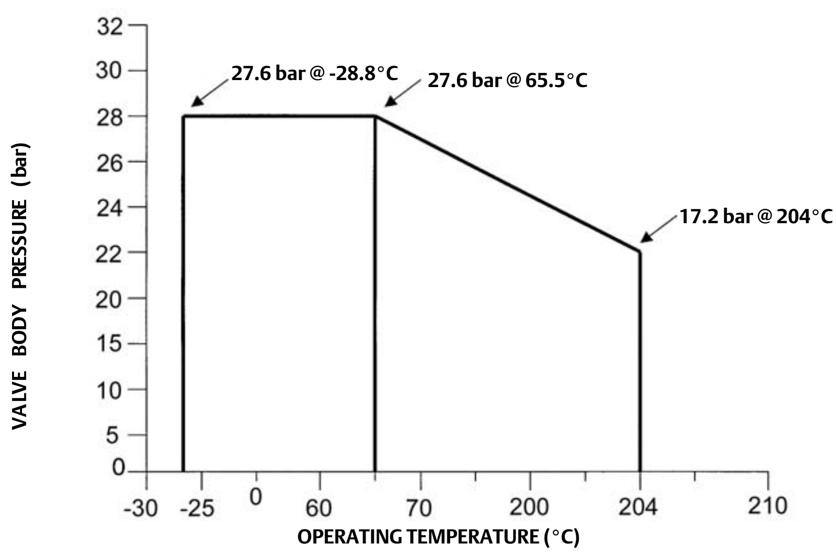
Table 5. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

Key No.	Description	Material
13	Bushings	Carbon - Graphite
14A	Packing Rings	Graphite
14B	Packing Ring	Graphite

Figure 4. Baumann 24000 Pressure-Temperature Ratings

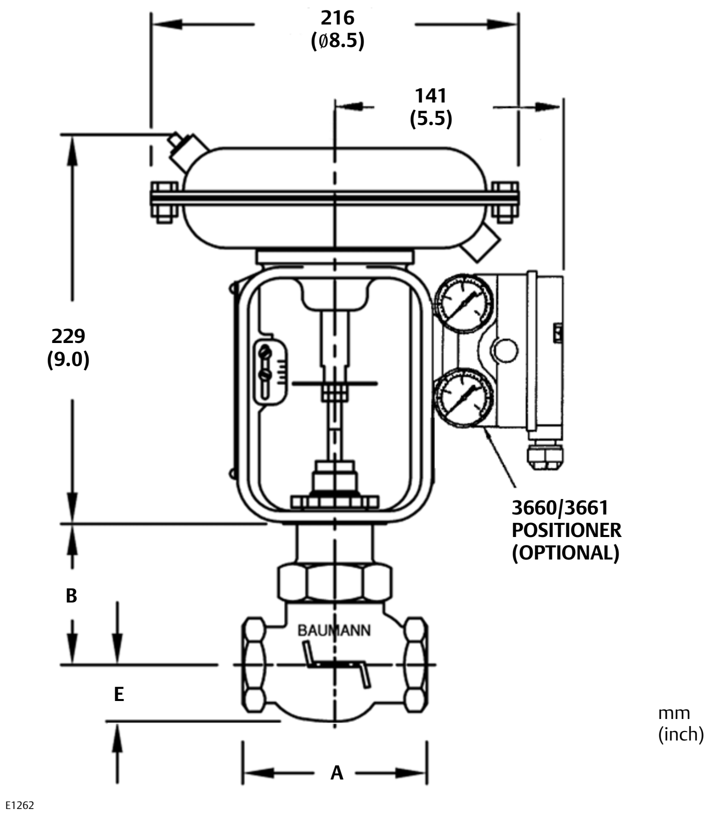


E1260



E1261

Figure 5. Dimensional Drawing



24000 WITH BAUMANN 32 ACTUATOR AND FISHER 3660/3661 POSITIONER

Note: Actuator removal requires 115 mm (4.5 inches) vertical clearance.

Table 6. Dimensions

VALVE SIZE		A VALVE BODY		B BONNET		E	
DN	NPS	mm	inch	mm	inch	mm	inch
15	1/2	89	3.5	78	3.1	27	1.06
20	3/4	89	3.5	78	3.1	27	1.06
25	1	109	4.3	83	3.3	33	1.3
40	1-1/2	137	5.4	99	3.9	46	1.8
50	2	168	6.6	104	4.1	58	2.3

Table 7. Valve Assembly Weights

VALVE SIZE		WEIGHT	
DN	NPS	kg	lb
15	1/2	1.6	3.5
20	3/4	1.6	3.5
25	1	2.3	5.0
40	1-1/2	4.9	10.9
50	2	8.9	19.7

Table 8. Actuator Weights

ACTUATOR TYPE	WEIGHTS	
	kg	lb
MV1020	10	22
VA1020	14	30
SVX24-MFT	Reference Baumann bulletin 52.1:SVACT (D104169X012)	
SVK24-MFT		

Table 9. Electric Actuators

Actuator Type
MV1020
VA1020
SVX24-MFT
SVK24-MFT

Table 10. Model Numbering System

24			
Valve Body Series	Plug Series	Characteristic	Seat Leakage
	102	Linear / Metal Seat	IV
	548	Equal % / Metal Seat (S41600)	IV
	577	Equal % / PTFE Seat	VI
	588	Equal % / Metal Seat (S31600)	IV
	677	Linear / PTFE Seat	VI
	648	Linear / Metal Seat (S41600)	IV
	688	Linear / Metal Seat	IV

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EMERSON

24000SB Valve
D103334X012

Product Bulletin
52.1:24SB
March 2020

Baumann™ 24000SB Barstock Control Valve

This rugged Baumann control valve is recommended for low-flow, high-pressure, industrial control applications. S31600 / S31603 stainless steel barstock valve body and bonnet is suitable for process pressures up to 413 barg (6000 psig).

The 24000SB is the ideal solution for applications that exceed the operating range of our other 24000 series valves. Various end connections ranging from threaded (standard), buttweld, and flanged add versatility to this high-pressure product line. Special high nickel alloy constructions are available and round out the basic S31600/S31603 stainless steel offering.

W9756-1

24000SB Control Valve with Baumann 32 Actuator and FIELDVUE DVC2000 Digital Valve Controller

Features

- Compact and light-weight design reduces installed piping costs.
- Dual plug and stem guiding provides increased stability during plug travel.
- Multiple trim capacity reductions available to meet changing process requirements with C_V ratings as low as 0.00013.
- Optional extended bonnet for applications ranging from -195 to 537°C (-320 to 1000°F).
- Optional ENVIRO-SEAL™ packing system to meet critical emission control requirements.

W9757-1

W9758-1

Baumann 24000SB Control Valve with Flanges and Extension Bonnet

- Fisher™ FIELDVUE™ digital valve controller are available for remote calibration and diagnostics.

Figure 1. Valve Body Subassembly with Standard PTFE Spring-Loaded V-Ring Packing

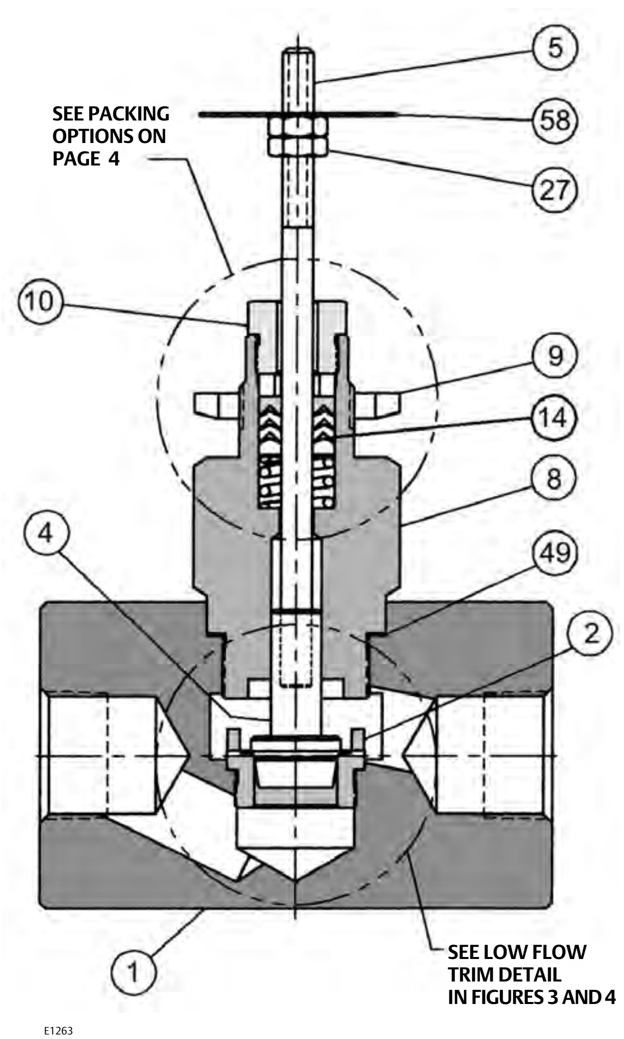


Figure 2. Valve Body with Extension Bonnet

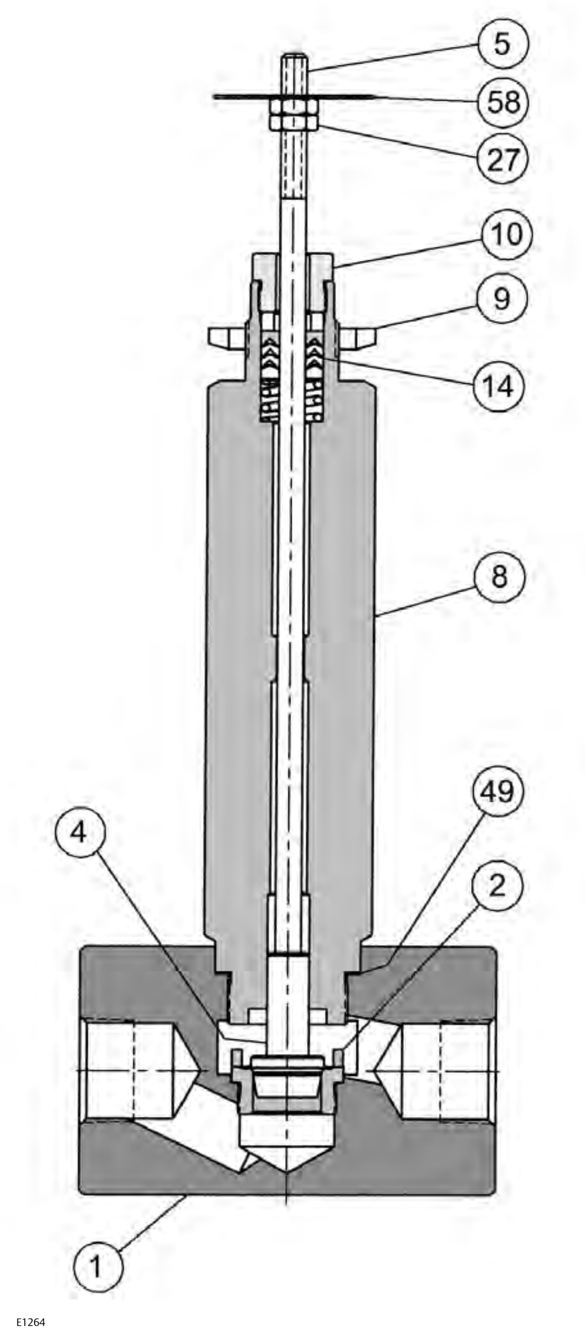


Table 1. Materials of Construction

Key No.	Description	Material			
		S31603 Stainless Steel	**N10276 Nickel Alloy[1]**	**N08020 Nickel Alloy[1]**	**N04400 Nickel Alloy[1]**
1[1]	Valve Body	ASME SA479 S31600/ S31603 Dual Certified	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
2[1]	Seat Ring (standard) (For low flow trim, refer to tables 2 & 3)	ASTM A276 S31600/ S31603 Dual Certified	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
4[1]	Plug (Metal Seat) Cv ≤ 2.5	ASME SA479 S21800 (standard) / ASTM A582 S41600 Condition T (optional)	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
	Plug (Metal Seat) Cv ≥ 4.0	ASTM A276 S31600/ S31603(standard) / ASTM A582 S41600 Condition T (optional)			
	Plug (Soft Seat)	ASTM A276 S31600/ S31603 with PTFE (Polytetrafluoroethylene) insert	ASME SB574 N10276/PTFE	ASTM B473 N08020/PTFE	ASME SB164 N04400/ PTFE
5[1]	Stem	ASTM A276 S31600	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
8[1]	Bonnet	ASME SA479 S31600/ S31603 Dual Certified	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
9	Drive Nut (Yoke)	S30400			
10[1]	Packing Follower	ASTM A276 S31600/ S31603 Dual Certified	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
14[1]	V-Ring Packing (standard)	Refer to page 4			
	Packing (optional)	Refer to page 4			
27	Lock Nut	Stainless Steel (18-8 Stainless Steel)			
49	Body Gasket	Graphite Grade GHR with S31600 Insert			
58	Travel Indicator	ASME SA240 S30400			

1. For optional valve and trim materials, consult your Emerson sales office for price and delivery. N08020 and N04400 nickel alloy materials have pressure-temperature ratings less than 206 barg (3000 psig) or 413 barg (6000 psig) respectively.

Figure 3. Optional 151 Low Flow Trim Assembly

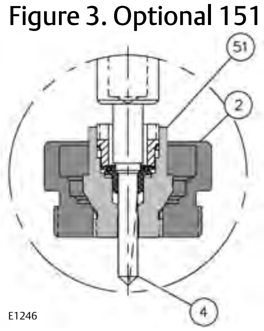


Table 2. 151 Low Flow Trim

Key Number	Description	Material
2[1]	Seat Ring	ASTM A276 S31600/ S31603
4[1]	Plug	ASME SA479 S21800
51[1]	Seat Sub-Assembly	
	Cage	ASTM A276 S31600/ S31603
	Seat	PTFE
	Collar	ASTM A276 S31600/ S31603
	Washer	ASTM A276 S31600 Cond B
	Insert	ASTM A276 S31600/ S31603

1. For optional trim materials, consult your Emerson sales office for price and delivery.

Figure 4. Optional 177 Low Flow Trim Assembly

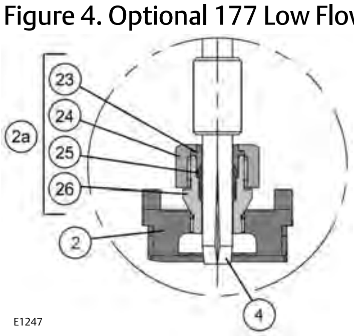
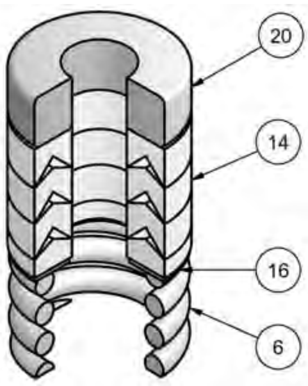


Table 3. 177 Low Flow Trim

Key Number		Description	Material
2[1]		Seat Ring	ASTM A276 S31600/ S31603
2a[1]		Seat Sub-Assembly	
	23	Gland	ASTM A276 S31600/ S31603
	24	Retainer Nut	ASTM A276 S31600/ S31603
	25	Insert	Reinforced PTFE
	26	Housing	ASTM A276 S31600/ S31603
4[1]		Plug	ASME SA479 S21800

1. For optional trim materials, consult your Emerson sales office for price and delivery.

Figure 5. Standard Spring-Loaded PTFE V-Ring Packing Kit

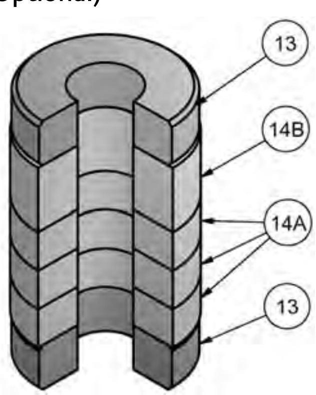


E1240

Table 4. Standard Spring-Loaded PTFE V-Ring Packing Kit

Key Number	Description	Material
6(1)	Spring	ASTM A313 S30200
14	Packing Set	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
16	Washer	ASME SA240 S31600
20	Spacer	J-2000 (filled-Polytetrafluoroethylene)
1. N10276 nickel alloy valve body construction is furnished with N10276 nickel alloy spring.		

Figure 6. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

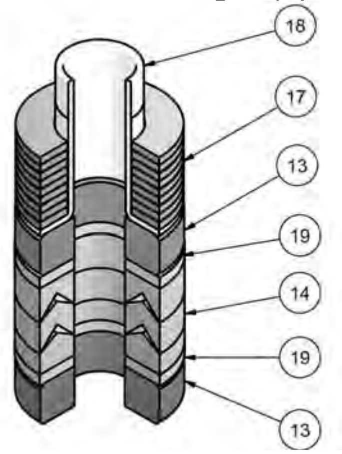


E1241

Table 5. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

Key Number	Description	Material
13	Bushings	Carbon-Graphite
14A	Packing Rings	Graphite
14B	Packing Ring	Graphite

Figure 7. ENVIRO-SEAL Packing Kit (Optional)



E1248

Table 6. ENVIRO-SEAL Packing Kit (Optional)

Key Number	Description	Material
13	Bushings	Carbon-Graphite
14	Packing Rings	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
17	Belleville Spring	N06600 Nickel Alloy (ASTM B637 N07718, 40 HRC max)
18	Bushing	PEEK (polyetheretherketone)
19	Washers	Modified PTFE

Special ENVIRO-SEAL Packing Note

The ENVIRO-SEAL PTFE packing system is suitable for 100 ppm environmental applications on services up to 51.7 barg (750 psig) and process temperatures ranging from -46 to 232°C (-50 to 450°F).

For non-environmental applications, this packing system offers excellent performance at the same temperature range up to the maximum valve working pressure.

Temperature limits apply to packing arrangements only. Complete valve assembly temperature limits may differ, refer to appropriate pressure/temperature ratings.

Reference Fisher Packing Selection Guidelines for Sliding-Stem Valves Bulletin 59.1:062 (D101986X012).

Table 7. Technical Specifications

NOMINAL PIPE SIZE		DN 15, 20, and 25 (NPS 1/2, 3/4, and 1)
END CONNECTIONS	**Standard**	Threaded (NPT)
	Available(1)	Buttweld, Flanged (CL150 to CL2500)
PRESSURE RATING		See Pressure-Temperature Ratings, tables 10, 11, 12, 13, 14, and 15
CHARACTERISTIC		Equal Percentage or Linear

1. Consult your Emerson sales office for other available connections.

Table 8. Temperature Ratings for Packing and Seat Material(1)

SEATING MATERIAL	**PTFE Soft Seat**	151 Trim	-29 to 177°C (-20 to 350°F)
		577 & 677 Trim	-73 to 232°C (-100 to 450°F)
	Reinforced PTFE	177 Trim	-73 to 232°C (-100 to 450°F)
	Metal Seat	102, 588, and 688 Trim	-195 to 537°C (-320 to 1000°F)
		548 and 648 Trim	-29 to 537°C (-20 to 1000°F)
PACKING AND BONNET COMBINATIONS	**BONNET STYLE**	**PACKING**	**TEMPERATURE LIMIT**
	Standard Bonnet(2)	Spring Loaded PTFE Packing	-73 to 232°C (-100 to 450°F)
		ENVIRO-SEAL	-45 to 232°C (-50 to 450°F)
		Graphite	-73 to 232°C (-100 to 450°F)
	Extension Bonnet	Spring Loaded PTFE Packing	-195 to 232°C (-320 to 450°F)
		ENVIRO-SEAL	-45 to 232°C (-50 to 450°F)
		Graphite	-195 to 537°C (-320 to 1000°F)

1. Temperature limits apply to seating or packing arrangements only. Complete valve assembly temperature limits may differ, refer to appropriate pressure/temperature ratings. For more information on packing selection, reference Fisher Packing Selection Guidelines for Sliding-Stem Valves Bulletin 59.1:062 (D101986X012).
2. PTFE packing may be used in cryogenic service but becomes stiff.

Figure 8. Baumann 24000SB Trims

102 Linear Low Flow Trim | **151 Modified Equal % Low Flow Trim** | **177 Modified Equal % Low Flow Trim** | **548 / 577 / 588 Equal % Trim** | **648 / 677 / 688 Linear Trim**

Table 9. Cv Values at 100% Plug Opening (Kv = 0.86 x Cv)(4)

VALVE SIZE	ORIFICE DIAMETER	PLUG TRAVEL	PLUG SERIES						
			102	151	177	577	548 / 588	677	648 / 688
NPS	inch	inch	Cv	Cv	Cv	Cv	Cv	Cv	Cv
1/2	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.20, 0.50, 1.0	---	0.50, 1.0
	0.3125	0.50	---	---	0.0005, 0.001, 0.002, 0.005, 0.01, 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.5, 2.0	1.5, 2.0	0.10, 0.20, 0.50, 1.0, 2.0	1.5, 2.0
3/4	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.20, 0.50, 1.0	---	0.50, 1.0
	0.3125	0.50	---	---	0.0005, 0.001, 0.002, 0.005, 0.01, 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.50, 1.0, 2.5	1.5, 2.5
	0.8125	0.50	---	---	---	3.8	3.8	3.8	3.8
1	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.20, 0.50, 1.0	---	0.50, 1.0
	0.3125	0.50	---	---	0.0005, 0.001, 0.002, 0.005, 0.01, 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.50, 1.0, 2.5	1.5, 2.5
	0.8125	0.50	---	---	---	4.0, 6.8	4.0, 6.8	4.0	4.0, 6.8

1. For DN 15 (NPS 1/2
2. For DN 20 (NPS 3/4)
3. For DN 25 (NPS 1)
4. See Fisher Catalog 12 for a full range of flow and sizing information.

⚠ WARNING

Refer to pressure - temperature rating tables 10, 11, 12, 13, 14, and 15 and consult your Emerson sales office for potential cavitation and noise concerns.

Table 10. Pressure-Temperature Ratings for S31600/S31603 Dual Certified Stainless Steel Valve Body - 3000 psig (Standard)(1)

Temperature (°C)(2)	Working Pressure (barg)	Temperature (°F)(2)	Working Pressure (psig)
-195 to 37	206	-320 to 100	3000
93	177	200	2580
148	160	300	2330
204	147	400	2141
232	142	450	2066
260	137	500	1992
287	133	550	1936
315	129	600	1880
343	127	650	1849
371	124	700	1810
398	122	750	1779
426	121	800	1758
454	120	850	1742
482	119	900	1729
510	110	950	1609
537	100	1000	1458

1. Caution: When the valve is furnished with CL150 through CL900 flanges, the pressure-temperature ratings are limited to the values published in ASME B16.34. Valve assemblies with CL1500 flanges are limited to 206 barg (3000 psig) maximum Cold Working Pressure (CWP).
2. Do not exceed seating and packing material ratings.

Table 11. Pressure-Temperature Ratings for S31600/S31603 Dual Certified Stainless Steel Valve Body - 6000 psig (Optional)(1)

Temperature (°C)(2)	Working Pressure (barg)	Temperature (°F)(2)	Working Pressure (psig)
-195 to 37	413.7	-320 to 100	6000
93	355.8	200	5160
149	321.3	300	4660
204	295.1	400	4280
232	284.8	450	4130
260	274.4	500	3980
288	266.8	550	3870
316	259.2	600	3760
343	253.7	650	3680
371	249.6	700	3620
399	245.5	750	3560
427	242.7	800	3520
454	239.9	850	3480
482	238.6	900	3460
510	222.0	950	3220
538	208.9	1000	3030

1. Caution: When the valve is furnished with CL150 through CL1500 flanges, the pressure-temperature ratings are limited to the values published in ASME B16.34.
2. Do not exceed seating and packing material ratings.

Table 12. Pressure-Temperature Ratings for N10276 Nickel Alloy Valve Body - 3000 psig (Optional)[1]

Temperature (°C)[2]	Working Pressure (barg)	Temperature (°F)[2]	Working Pressure (psig)
-195 to 37	215	-320 to 100	3125
93	215	200	3125
148	209	300	3033
204	202	400	2941
232	196	450	2856
260	190	500	2770
287	182	550	2645
315	173	600	2520
343	168	650	2450
371	163	700	2366
398	152	750	2216
426	145	800	2116
454	139	850	2029
482	128	900	1870
510	110	950	1608
537	104	1000	1516

1. Caution: When the valve is furnished with CL150 through CL900 flanges, the pressure-temperature ratings are limited to the values published in ASME B16.34. Valve assemblies with CL1500 flanges are limited to 206 barg (3000 psig) maximum Cold Working Pressure (CWP).
2. Do not exceed seating and packing material ratings.

Table 13. Pressure-Temperature Ratings for N10276 Nickel Alloy Valve Body - 6000 psig (Optional)[1]

Temperature (°C)[2]	Working Pressure (barg)	Temperature (°F)[2]	Working Pressure (psig)
-195 to 37	430.9	-320 to 100	6250
93	430.9	200	6250
149	418.5	300	6070
204	401.3	400	5820
232	391.6	450	5680
260	382.0	500	5540
288	364.7	550	5290
316	347.5	600	5040
343	338.2	650	4905
371	326.1	700	4730
399	305.4	750	4430
427	291.6	800	4230
454	279.9	850	4060
482	258.2	900	3745
510	222.0	950	3220
538	208.9	1000	3030

1. Caution: When the valve is furnished with CL150 through CL1500 flanges, the pressure-temperature ratings are limited to the values published in ASME B16.34.
2. Do not exceed seating and packing material ratings.

Table 14. Pressure-Temperature Ratings for N08020 Nickel Alloy Valve Body (Optional)(1)

Temperature (°C)(2)	Working Pressure (barg)	Temperature (°F)(2)	Working Pressure (psig)
-195 to 37	172	-320 to 100	2500
93	150	200	2175
148	140	300	2041
204	140	400	2041
232	140	450	2041
260	140	500	2041
287	140	550	2041
315	140	600	2041
343	140	650	2041
371	140	700	2041
398	140	750	2041
426	140	800	2041

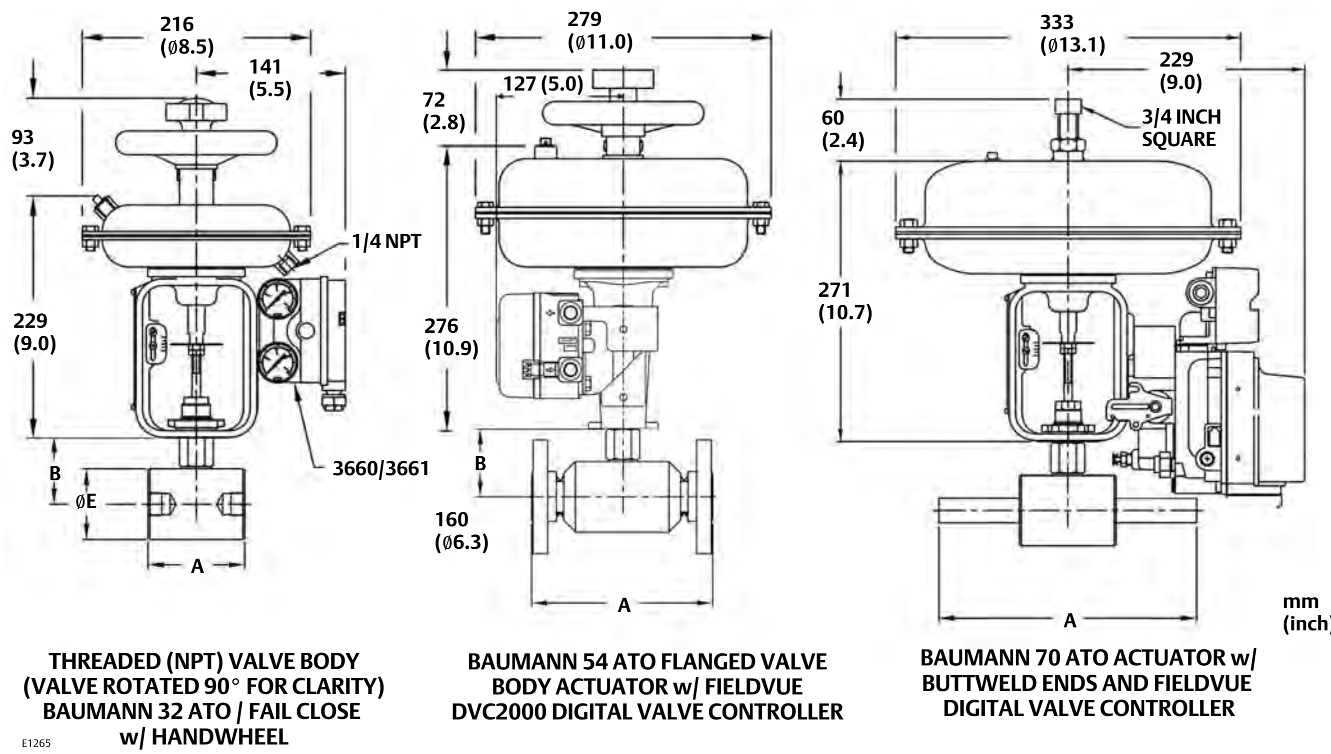
1. Caution: When the valve is furnished with CL150 through CL900 flanges, the pressure-temperature ratings are limited to the values published in ASME B16.34. Valve assemblies with CL1500 flanges are limited to 206 barg (3000 psig) maximum Cold Working Pressure (CWP).
2. Do not exceed seating and packing material ratings.

Table 15. Pressure-Temperature Ratings for N08020 Nickel Alloy Valve Body (Optional)(1)

Temperature (°C)(2)	Working Pressure (barg)	Temperature (°F)(2)	Working Pressure (psig)
(-)195 to 37	430.9	(-) 320 to 100	6250
93	426.1	200	6180
149	408.2	300	5920
204	391.6	400	5680
232	384.0	450	5570
260	376.5	500	5460
288	362.0	550	5250
316	347.5	600	5040
343	338.2	650	4905
371	326.1	700	4730
399	305.4	750	4430
427	291.6	800	4230

1. Caution: When the valve is furnished with CL150 through CL1500 flanges, the pressure-temperature ratings are limited to the values published in ASME B16.34.
2. Do not exceed seating and packing material ratings.

Figure 9. Dimensional Drawings



Note: Actuator removal requires 115 mm (4.5 inches) vertical clearance.

Table 16. Valve Dimensions

VALVE SIZE		A VALVE BODY															
		NPT		Flanged										Buttweld	
				CL150		CL300		CL600		CL900/1500		CL2500			
DN	NPS	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
15	1/2	102	4.00	184	7.25	191	7.50	203	8.00	273	10.25	264	10.38	387	15.25
20	3/4	105	4.13	184	7.25	194	7.62	206	8.12	273	10.75	273	10.75	387	15.25
25	1	127	5.00	184	7.25	197	7.75	210	8.25	273	10.75	308	12.12	406	16.00

Table 17. Valve Dimensions

VALVE SIZE		B BONNET				E DIAMETER	
		Standard		Extension			
DN	NPS	mm	inch	mm	inch	mm	inch
15	1/2	71	2.8	208	8.2	64	2.50
20	3/4	74	2.9	211	8.3	76	3.00
25(1)	1(1)	74	2.9	211	8.3	76	3.00
25(2)	1(2)	74	2.9	211	8.3	83	3.25

1. For 206 barg (3000 psig) valve body.
2. For 413 barg (6000 psig) valve body.

Table 18. Valve Assembly Weights

VALVE SIZE		WEIGHT	
DN	NPS	kg	lb
15	1/2	3.0	6.6
20	3/4	3.1	6.9
25(1)	1(1)	5.1	11.3
25(2)	1(2)	5.8	12.8

1. For 206 barg (3000 psig) valve body.
2. For 413 barg (6000 psig) valve body.

Table 19. Model Numbering System

24 Valve Body Series	Plug Series	Characteristic	Seat Leakage	S Valve Body Material	B Barstock Body	Bonnet Style	
---	548	Equal % / Metal Seat (S41600)	IV	S	---	---	Standard
	577	Equal % / PTFE Seat	VI			E	Extension
	588	Equal % / Metal Seat (S21800 Cv ≤ 2.5 or S31600 Cv ≥ 4.0)	IV				
	648	Linear / Metal Seat (S41600)	IV				
	677	Linear / PTFE Seat	VI				
	688	Linear / Metal Seat	IV				

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Baumann™ 24000S Stainless Steel Control Valve

The Baumann 24000S versatile, pneumatic, control valve may be used for the control of pressure, temperature, level, and flow. NPS 1/2 through 2 valves are available with NPT end connections. NPS 3 is available as wafer style only. The CF8M stainless steel valve body will withstand mildly corrosive fluids, yet is economical enough to use in applications where carbon steel is normally specified.


W9759-1

Baumann 24000S NPT Control Valve

Features

- Compact and light weight design reduces installed piping costs.
- End connection options are available to meet your piping standards.
- Dual stem and plug guiding provides increased stability during plug travel.
- High-quality S31600 stainless steel trim materials; S41600 stainless steel trim available.
- Multiple trim capacity reductions available to meet changing process requirements.
- Fisher™ FIELDVUE™ digital valve controller are available for remote calibration and diagnostics.
- The FIELDVUE DVC2000 digital valve controller has a local user interface that includes a liquid crystal display and four push buttons for menu navigation.
- NOLEEK bellows bonnet and single through triple extension bonnets are available.

Figure 1. Baumann 24000S Valve Body Assembly

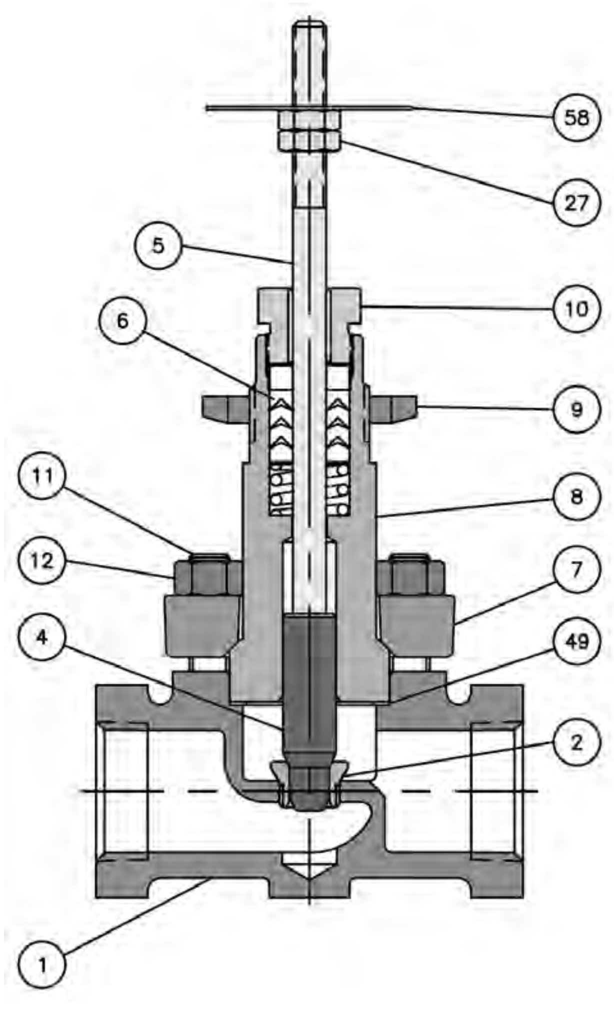


Figure 2. Baumann 24000S Valve with Extension Bonnet, available in Single and Double Extension Lengths

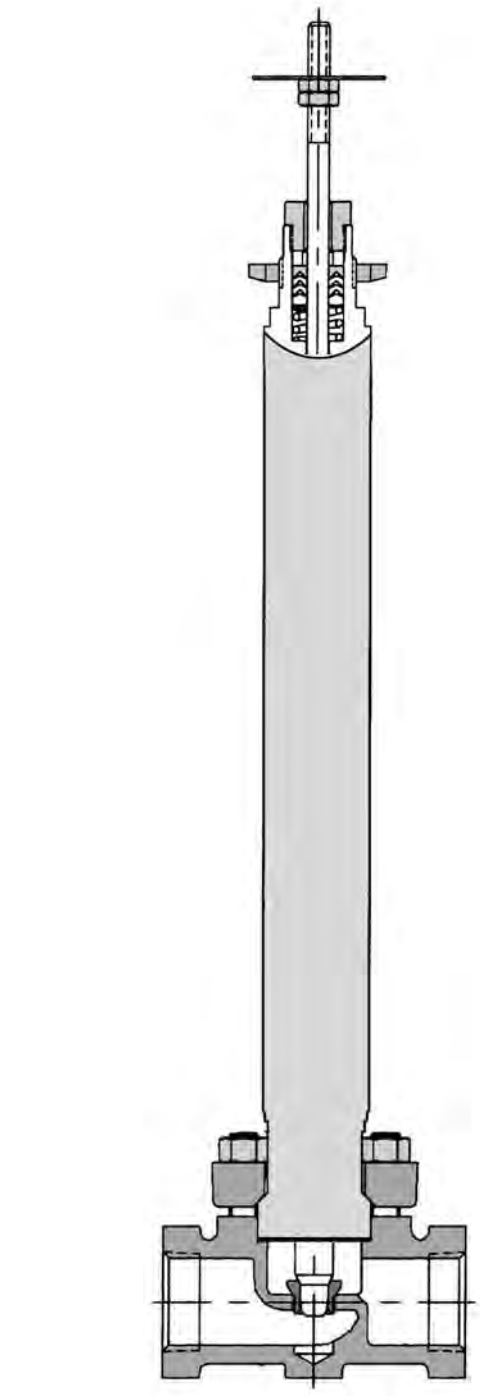


Table 1. Materials of Construction

Key No.	Description		Material
1	Valve Body		ASME SA351 CF8M
2	Seat Ring		ASTM A276 S31600 / S31603 Dual Certified (used for 6.3 mm and 9.5 mm [1/4 inch and 3/8 inch] orifice diameters only)
4	Plug (Metal Seat) Cv < 2.5	Standard	ASME SA479 S21800 Annealed
		Optional	ASTM A582 S41600 Condition T
	Plug (Metal Seat) Cv > 4.0	Standard	ASTM A276 S31600 / S31603 Dual Certified
		Optional	ASTM A582 S41600 Condition T
	Plug (Soft Seat)		ASTM A276 S31600 / S31603 Dual Certified with PTFE (Polytetrafluoroethylene) Insert
5	Stem		ASTM A276 S31600 Condition A
6	Packing Set		(Refer to page 5)
7	Bonnet Flange	1/2 to 2 inch	ASME SA351 CF8M
		3 inch	ASME SA240 S31600 / S31603 Dual Certified
8	Bonnet	Standard	ASME SA479 S31600 / S31603 Dual Certified
		Extension	ASME SA479 S31600 / S31603 Dual Certified
		NOLEEK	ASME SA479 S31600 / S31603 Dual Certified
9	Drive Nut (Yoke)	S30400	
10	Packing Follower	ASTM A276 S31600 / S31603 Dual Certified	
11	Bonnet Studs (Bolt)	ASME SA193 Grade B8 Class 1	
12	Bonnet Nuts	ASME SA194 Grade B8	
27	Locknuts	Stainless Steel (18-8 Stainless Steel)	
49	Body Gasket	Graphite Grade GHR with S31600 Insert	
58	Travel Indicator	ASME SA240 S30400	

Figure 3. Screwed Seat

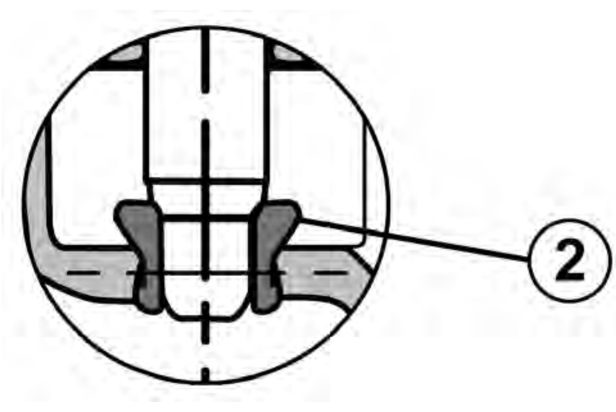


Figure 4. Integral Seat

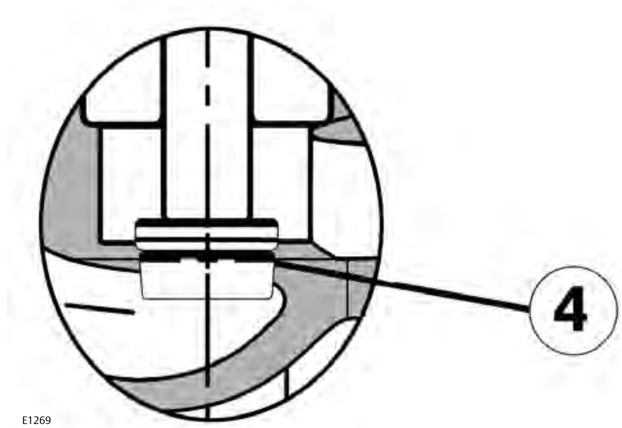


Figure 5. 24151S Low Flow Trim

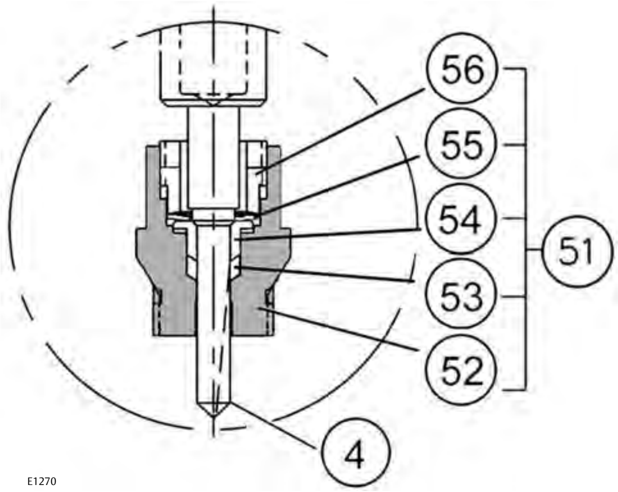


Figure 6. 24177S Low Flow Trim

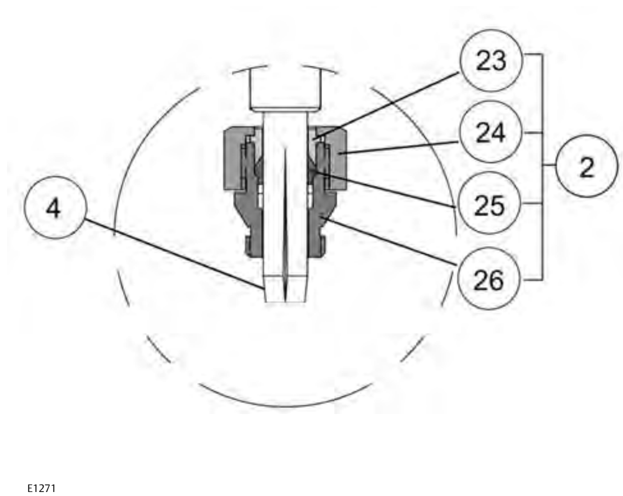


Table 2. 24151S Low Flow Trim

Key Number	Description		Material
4	Plug		ASME SA479 S21800
51	Seat Sub-Assembly		
	52	Cage	ASTM A276 S31600 / S31603
	53	Seat	PTFE
	54	Collar	ASTM A276 S31600/ S31603
	55	Washer	ASTM A276 S31600 Cond B
	56	Insert	ASTM A276 S31600/ S31603

Table 3. 24177S Low Flow Trim(1)

Key Number		Description	Material
2	Seat Sub-Assembly		
	23	Gland	ASTM A276 S31600/ S31603
	24	Retainer Nut	ASTM A276 S31600/ S31603
	25	Insert	Reinforced PTFE
	26	Housing	ASTM A276 S31600/ S31603
4		Plug	ASME SA479 S21800

1. For optional trim materials, consult your Emerson sales office for price and delivery.
Baumann 32 actuator requires dual-stops with 177 trim series.

Figure 7. Standard Spring-Loaded PTFE V-Ring Packing Kit

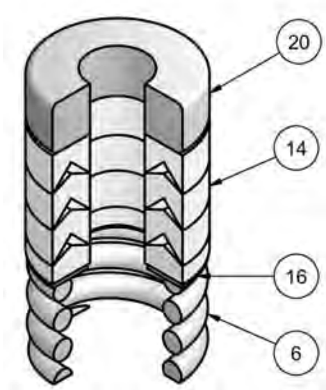


Table 4. Standard Spring-Loaded PTFE V-Ring Packing Kit

Key Number	Description	Material
6	Spring	ASTM A313 S30200
14	Packing Set	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
16	Washer	ASME SA240 S31600
20	Spacer	J-2000 (filled-Polytetrafluoroethylene)

Figure 8. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

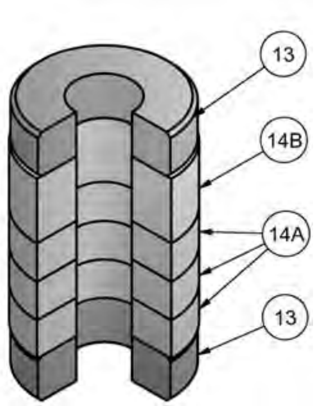


Table 5. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

Key Number	Description	Material
13	Bushings	Carbon-Graphite
14A	Packing Rings	Graphite
14B	Packing Ring	Graphite

Figure 9. ENVIRO-SEAL™ Packing Kit (Optional)

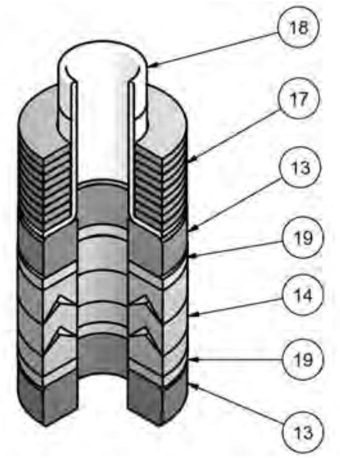


Table 6. ENVIRO-SEAL Packing Kit (Optional)

Key Number	Description	Material
13	Bushings	Carbon-Graphite
14	Packing Rings	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
17	Belleville Spring	N06600 Nickel Alloy (ASTM B637 N07718, 40 HRC max)
18	Bushing	PEEK (polyetheretherketone)
19	Washers	Modified PTFE

Special ENVIRO-SEAL Packing Note

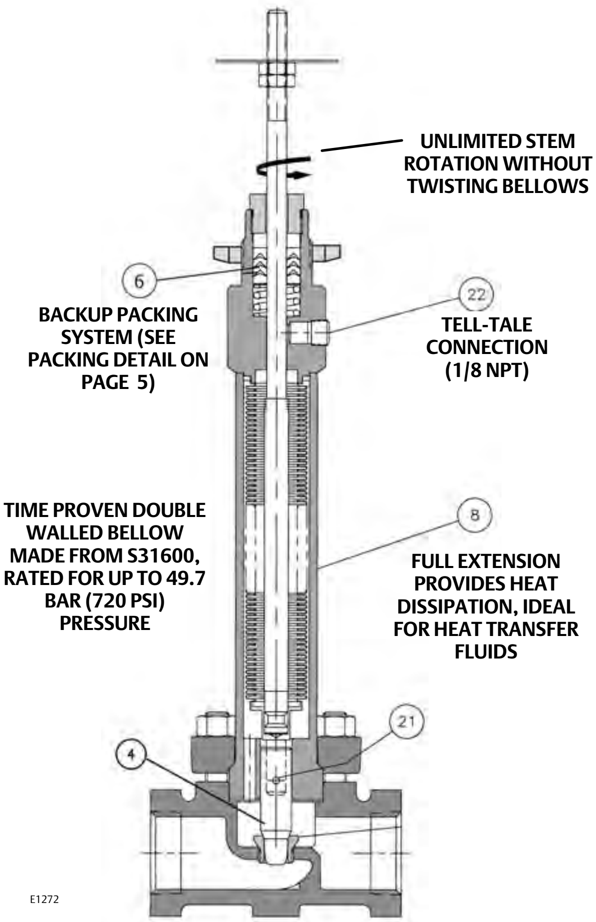
The ENVIRO-SEAL PTFE packing system is suitable for 100 ppm environmental applications on services up to 51.7 barg (750 psig) and process temperatures ranging from -46 to 232°C (-50 to 450°F).

For non-environmental applications, this packing system offers excellent performance at the same temperature range up to the maximum valve working pressure.

Temperature limits apply to packing arrangements only. Complete valve assembly temperature limits may differ, refer to appropriate pressure/temperature ratings.

Reference Packing Selection Guidelines for Fisher Sliding-Stem Valves, Bulletin 59.1:062 (D101986X012).

Figure 10. NOLEEK Bellows Bonnet Assembly



⚠ WARNING

The Baumann NOLEEK valve bonnet assembly is not intended for use in lethal service applications.

The NOLEEK Bellows Bonnet Assembly is reliable and user-friendly. Typical service life is in excess of 250,000 full cycles under 100 psi pressure. The bonnet adds only approximately 5 inches to the height of a standard valve. Operating temperature range is -195 to 399°C (-320 to 750°F).

Table 7. Baumann NOLEEK Bellow Bonnet Assembly

Key No.	Description	Material
4	Plug	See table 1
6	V-Ring Packing Kit (Standard)	See table 4
	ENVIRO-SEAL Packing Kit (Optional)	See table 6
8	Housing	S31600/S31603
	Bellows	S31603/1.4571 SST
	Bonnet	CF8M
21	Plug Retaining Pin	S30300
22	Hex Socket Pipe Plug, 1/8 NPT	S30400

Figure 11. Bellows Pressure Temperature Curve

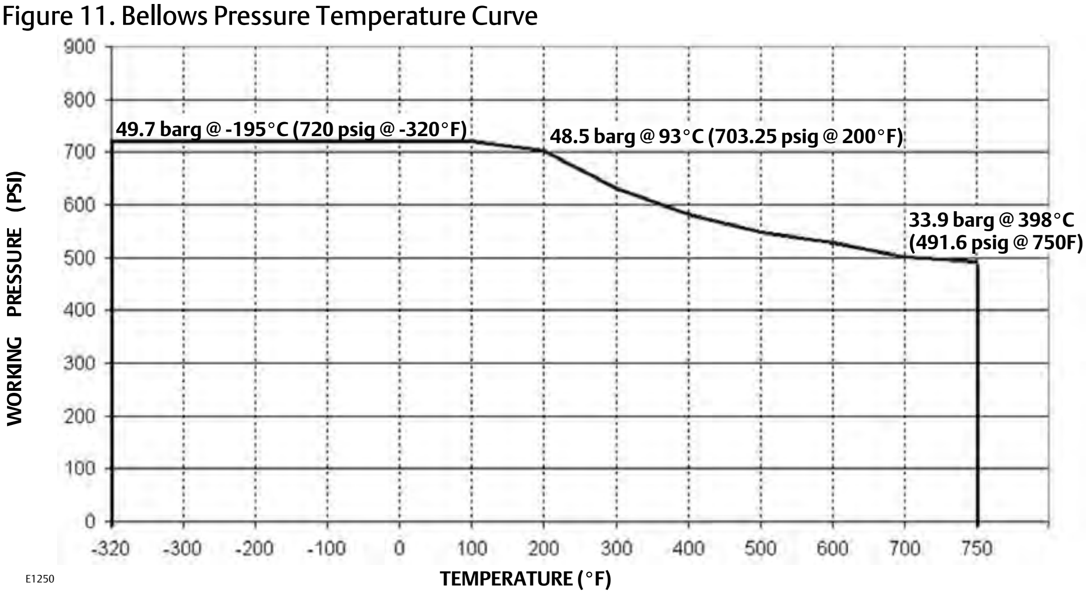


Table 2. Cv Values at 100% Plug Opening (Kv = 0.86 x Cv)(1)

VALVE SIZE	ORIFICE DIAMETER	PLUG TRAVEL	PLUG SERIES						
			102	151	177	577	548 / 588	677	648 / 688
NPS	inch	inch	Cv	Cv	Cv	Cv	Cv	Cv	Cv
1/2	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.22, 0.61, 1.0	---	0.50, 1.0
	0.3125	0.50	---	---	0.0005, 0.001, 0.002 0.005, 0.01 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.5 2.0	1.5, 2.5	0.10, 0.20, 0.50 1.0, 2.5	1.5, 2.5
1	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.22, 0.61, 1.0	---	0.50, 1.0
	0.3125	0.50	---	---	0.0005, 0.001, 0.002 0.005, 0.01 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.5 2.0	1.5, 2.5	0.10, 0.20, 0.50 1.0	1.5, 2.5
	0.8125	0.50	---	---	---	4, 8.5	4.7, 9.5	4.0	4.0, 9.5
1-1/2	1.25	0.75	---	---	---	17.5	9, 17.5	17.5	17.5
2	1.5	0.75	---	---	---	10, 18, 30.5	10, 17.5, 30.5	10, 17.5	10, 17.5, 30.5
3	2.0	0.75	---	---	---	35	35, 61	35, 61	35, 61

1. See Fisher Catalog 12 for a full range of flow and sizing information.

Figure 12. Baumann 24000S Trims

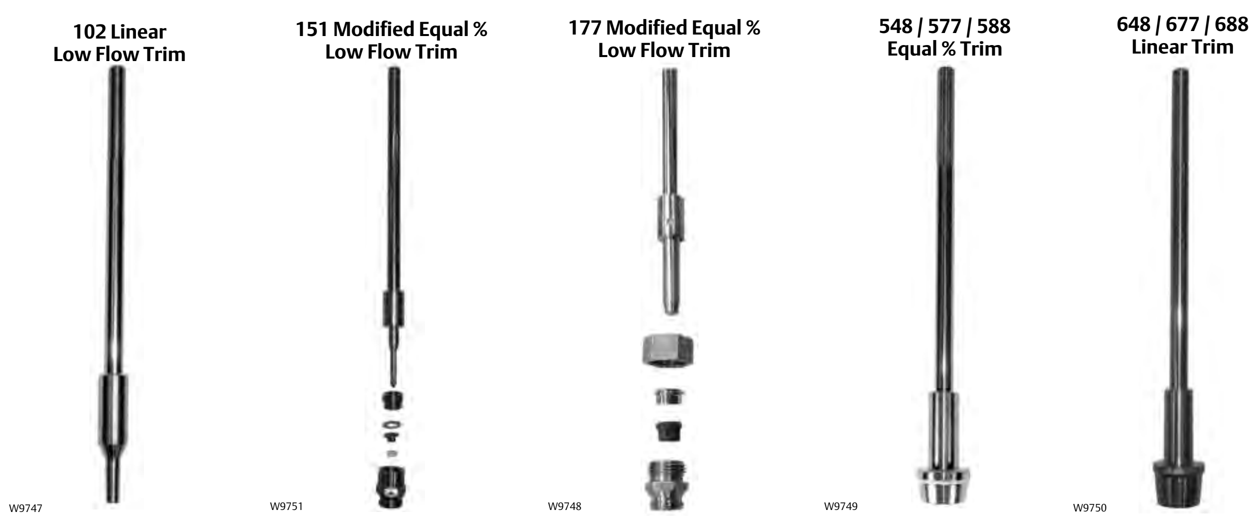


Table 8. Technical Specifications

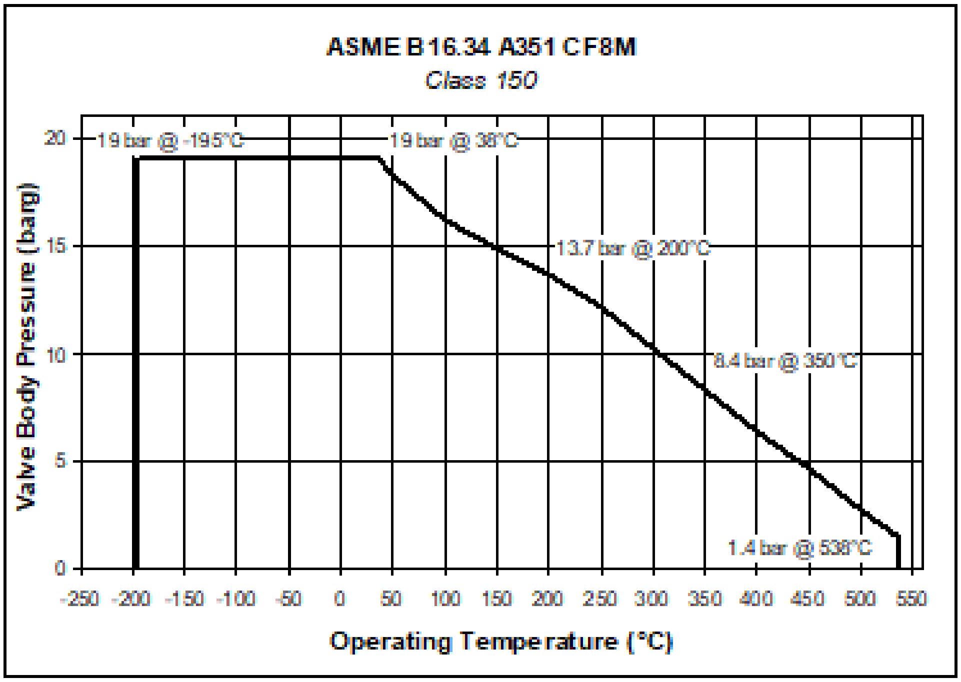
NOMINAL PIPE SIZE	DN 15, 25, 40, 50, and 80	NPS 1/2, 1, 1-1/2, 2, and 3
END CONNECTIONS	Screwed NPT (except for NPS 3, wafer style only) Wafer / Buttweld	
PRESSURE RATING	CL300 (CL150 for NPS 3 per ASME B16.34)	
VALVE BODY MATERIAL	CF8M ASTM A351	
CHARACTERISTIC	Equal Percentage or Linear	

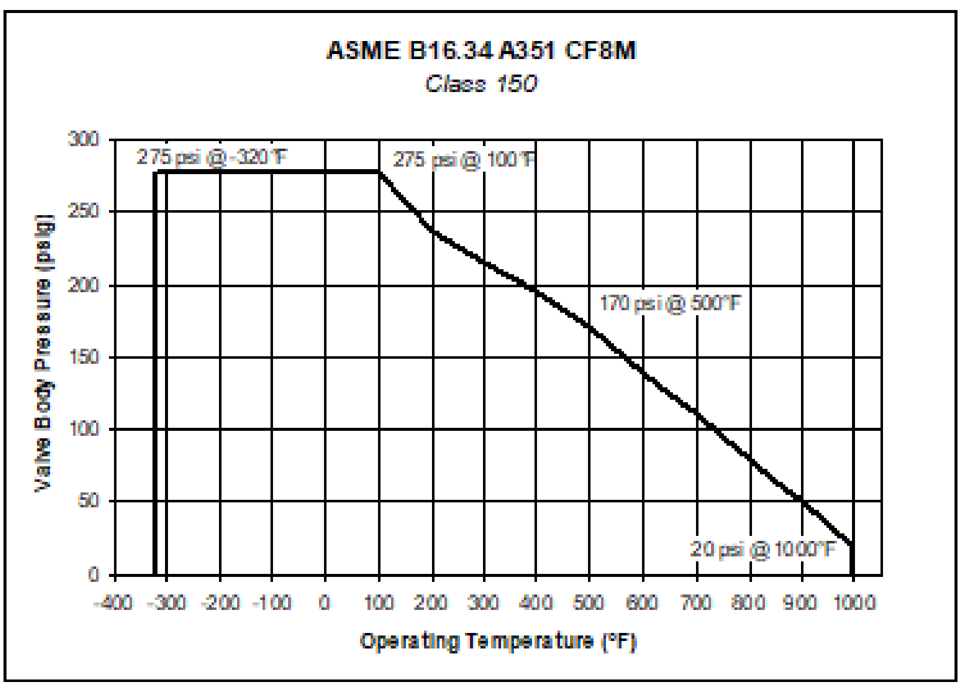
Table 9. Temperature Ratings for Packing and Seat Material[1]

SEATING MATERIAL	**PTFE Soft Seat**	151 Trim	-29 to 177°C (-20 to 350°F)
		577 & 677 Trim	-73 to 232°C (-100 to 450°F)
	Reinforced PTFE	177 Trim	-73 to 232°C (-100 to 450°F)
	Metal Seat	102, 588, and 688 Trim	-195 to 537°C (-320 to 1000°F)
		548 and 648 Trim	-29 to 537°C (-20 to 1000°F)
PACKING AND BONNET COMBINATIONS	**BONNET STYLE**	**PACKING**	**TEMPERATURE LIMIT**
	Standard Bonnet	Spring Loaded PTFE	-73 to 232°C (-100 to 450°F)
		ENVIRO-SEAL	-45 to 232°C (-50 to 450°F)
		Graphite	-73 to 232°C (-100 to 450°F)
	Extension Bonnet	Spring Loaded PTFE	-195 to 232°C (-320 to 450°F)
		ENVIRO-SEAL	-45 to 232°C (-50 to 450°F)
		Graphite	-195 to 537°C (-320 to 1000°F)
	Bellows	NOLEEK Bellows	-195 to 399°C (-320 to 750°F)

1. Temperature limits apply to seating or packing arrangements only. Complete valve assembly temperature limits may differ, refer to appropriate pressure/temperature ratings. For more information on packing selection, reference Packing Selection Guidelines for Fisher Sliding-Stem Valves, Bulletin 59.1:062 (D101986X012).

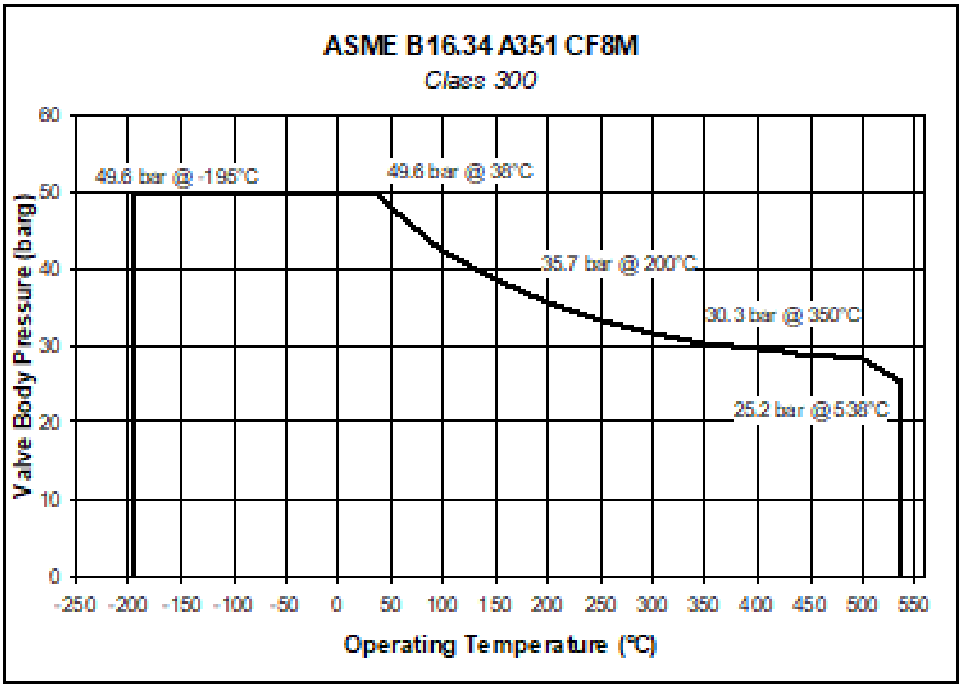
Figure 13. Valve Body Pressure / Temperature Ratings ASME CL150 Valves (Source: ASME B16.34)

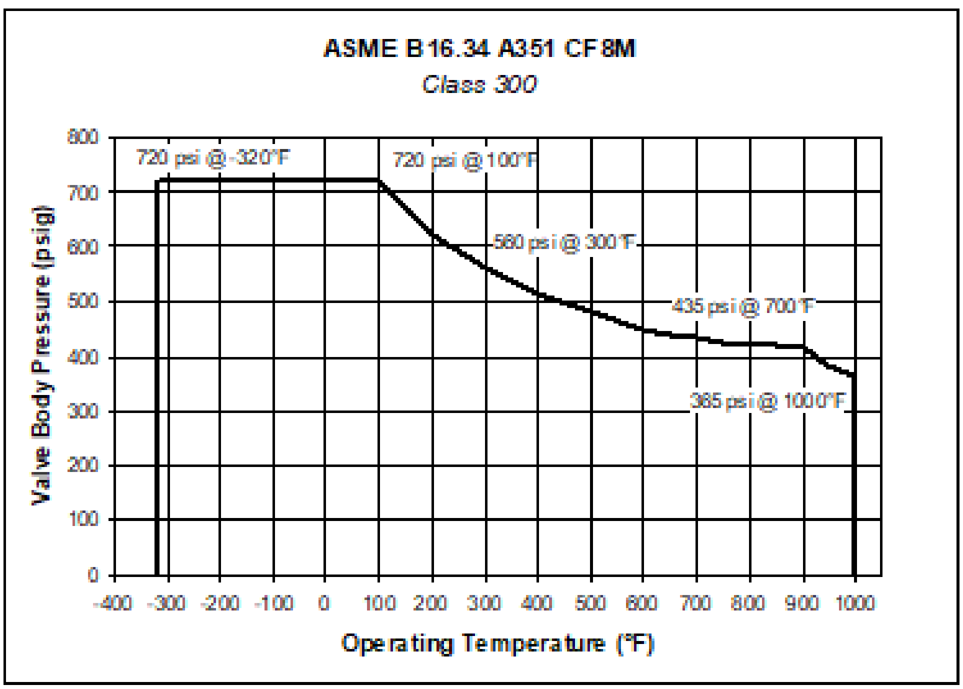




E1426

Figure 14. Valve Body Pressure / Temperature Ratings ASME CL300 Valves (Source: ASME B16.34)
(Does not apply to 24000S NPS 3 valves)





E1427

Table 10. Valve Dimensions

VALVE SIZE		ASME CLASS	A				B							
			NPT		Wafer		Standard		Extension Bonnet				NOLEEK Bellows	
									Single		Double			
DN	NPS		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
15	1/2	300	7.9	3.1	N/A	N/A	78.7	3.1	213.4	8.4	351	13.8	227.8	8.97
25	1	300	102	4.0	102	4.0	78.7	3.1	215.9	8.5	351	13.8	227.8	8.97
40	1-1/2	300	114	4.5	114	4.5	88.9	3.5	226	8.9	363	14.3	235.7	9.28
50	2	300	124	4.9	124	4.9	83.8	3.3	221	8.7	356	14	234.4	9.23
80	3	150	N/A	N/A	165	6.5	96.5	3.8	234	9.2	371	14.6	235.7	9.28

Table 11. Valve Assembly Weights

VALVE SIZE		WEIGHT	
DN	NPS	kg	lb
15	1/2	2.3	5
25	1	2.7	6
40	1-1/2	4.1	9
50	2	5.0	11
80	3	9.1	20

Table 12. Actuator Weights

ACTUATOR TYPE	WEIGHTS	
	kg	lb
MV1020	10	22
VA1020	14	30
SVX24-MFT	Reference Baumann bulletin 52.1:SVACT (D104169X012)	
SVK24-MFT		

Table 13. Baumann 24000S Wafer Style(1)

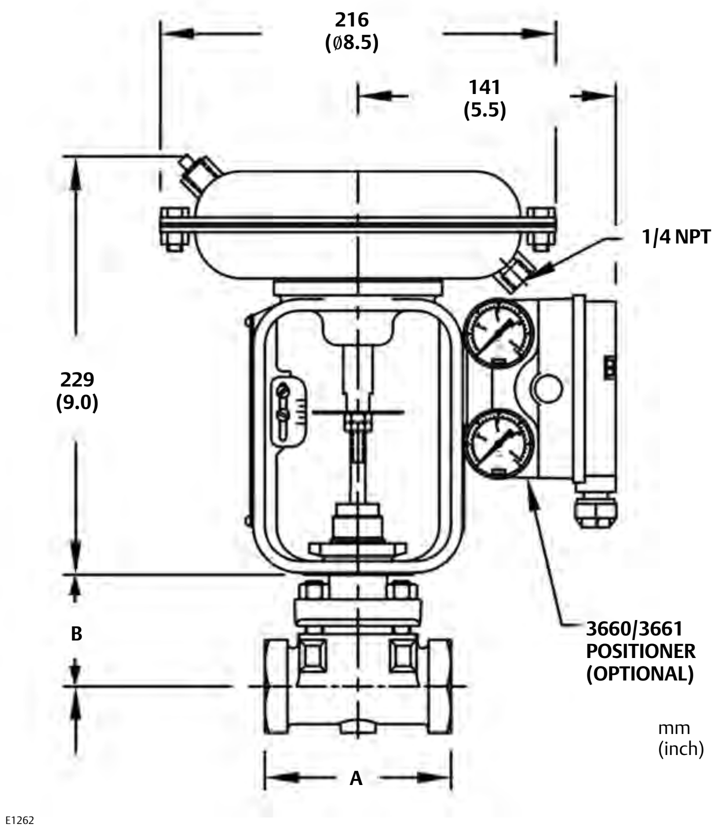
Valve Size	DN 15 / NPS 1/2	DN 25 / NPS 1	DN 40 / NPS 1-1/2	DN 50 / NPS 2	DN 80 / NPS 3
ASME Flange	None	CL150	CL150	CL150	CL150
DN Flange	None	PN 16	PN 16	PN 16	PN 16
NPT	Yes	Yes	Yes	Yes	None

1. The Baumann 24000S valve is available as NPT and wafer style (fits between RF line flanges). Not all sizes are available as wafer. This table outlines available constructions.

Table 14. Model Numbering System

24	Plug Series	Characteristic	Seat Leakage	S		Bonnet Style	
Valve Body Series				Valve Body Material			
	102	Linear / Metal Seat	IV	S	NPT	Omit	Standard
	151	Modified Equal % / PTFE Seat	VI			E	Extension
	177	Modified Equal % / Reinforced PTFE	VI			EB	NOLEEK
	577	Equal % / PTFE Seat	VI				
	548	Equal % / Metal Seat (S41600)	IV				
	588	Equal % / Metal Seat (S31600)	IV				
	648	Linear / Metal Seat (S41600)	IV				
	677	Linear / PTFE Seat	VI				
	688	Linear / Metal Seat	IV				

Figure 15. Dimensional Drawing



24000S WITH BAUMANN 32 ATO ACTUATOR

Note: Actuator removal requires 115 mm (4.5 inches) vertical clearance.

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24000F Valve
D103330X012

Product Bulletin
52.1:24WF
March 2020

Baumann™ 24000F Wafer Body Control Valve

The Baumann unique 24000F wafer style control valve mates with ASME and EN line flange connections and is designed to control a wide range of process liquids, gases and vapors. This very compact package provides the connection integrity of flanged body globe valves while being significantly lighter and easier to install. Special alloy constructions are available and round out the standard S31603 stainless steel offering. The 24000F serves as a general purpose, modulating valve suitable for process line pressures up to 99 barg (1440 psig) and operating temperatures to 537°C (1000°F).

W9762-1

24000F Control Valve with Baumann 32 Dual-Stop Actuator

Features

- Compact and light-weight design reduces installed piping costs.
- Universal valve body construction mates with both ASME and EN flanges (see table 9).
- Multiple trim capacity reductions available to meet changing process requirements with Cv ratings as low as 0.00013.
- Optional extended bonnet for applications ranging from -195 to 537°C (-320 to 1000°F).
- Optional ENVIRO-SEAL™ packing system to meet critical emission control requirements

W9763-1

24000F Control Valve with Baumann 32 Actuator and FIELDVUE DVC2000 Digital Valve Controller

- Fisher™ FIELDVUE™ digital valve controller are available for remote calibration and diagnostics.

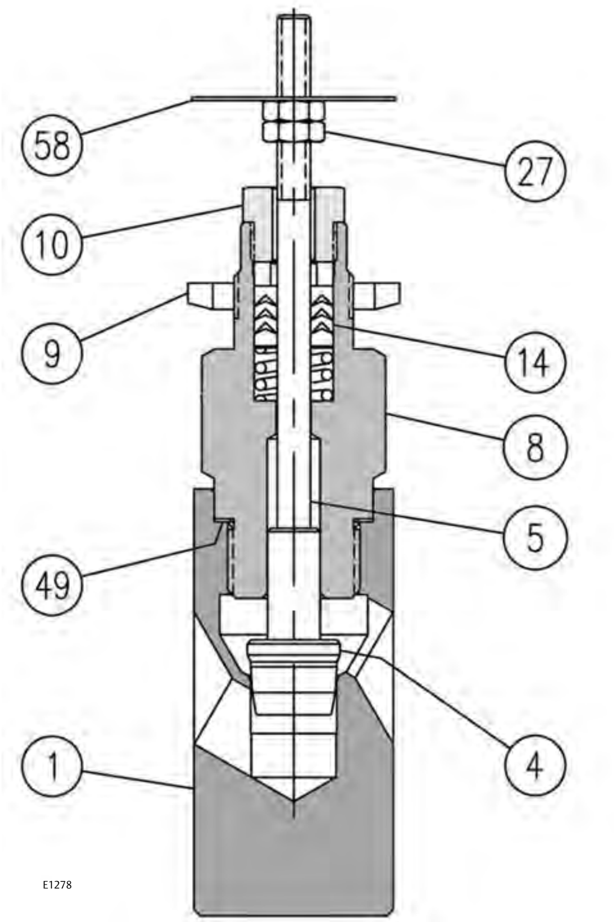


Figure 1. Baumann 24000F Valve Body with Standard Bonnet and NPS 1 Integral Seat

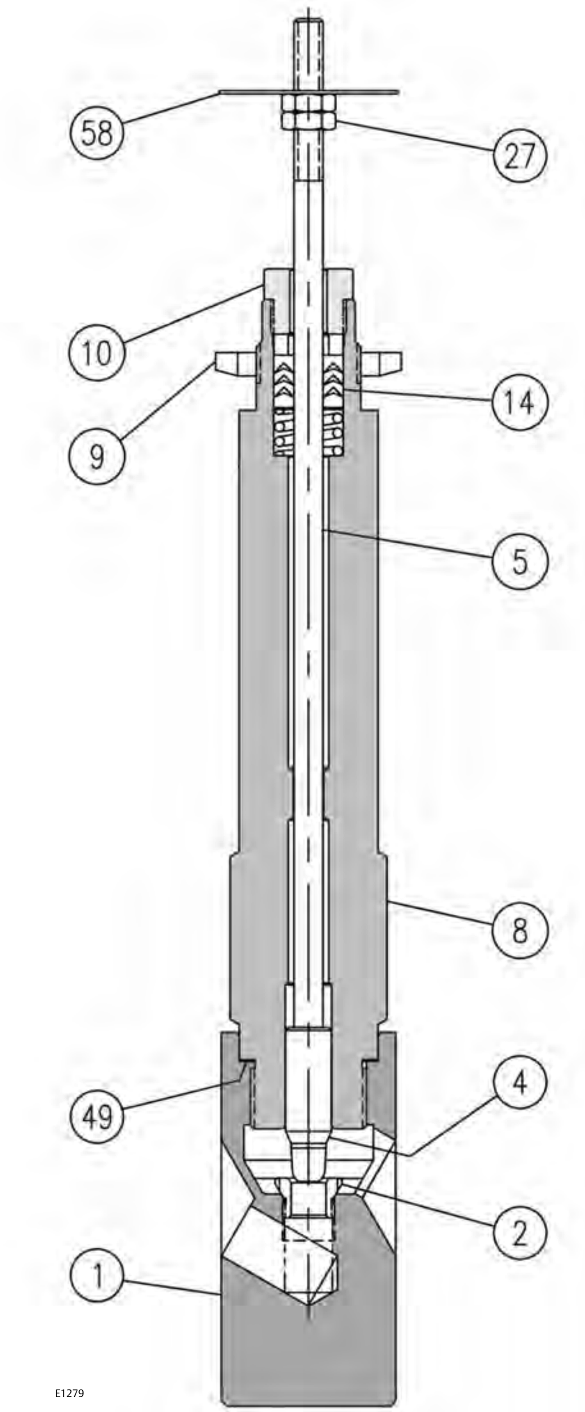


Figure 2. Baumann 24000F Valve Body with Extension Bonnet and Screwed-In Seat Ring

Table 1. Materials of Construction

Key No.	Description	Material			
		S31603 Stainless Steel	**N10276 Nickel Alloy(1)**	**N08020 Nickel Alloy(1)**	**N04400 Nickel Alloy(1)**
1	Valve Body	ASME SA479 S31600/ S31603 Dual Certified	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
2	Seat Ring (standard) (For Low Flow Trim, see tables 2 and 3)	ASTM A276 S31600/ S31603 Dual Certified	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
4	Plug (Metal Seat) Cv ≤ 2.5	ASME SA479 S21800 (standard) / ASTM A582 S41600 Condition T (optional)	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
	Plug (Metal Seat) Cv ≥ 4.0	ASTM A276 S31600/ S31603(standard) / ASTM A582 S41600 Condition T (optional)			
	Plug (Soft Seat)	ASTM A276 S31600/ S31603 with PTFE (Polytetrafluoroethylene) insert	ASME SB574 N10276/PTFE	ASTM B473 N08020/PTFE	ASME SB164 N04400/ PTFE
5	Stem	ASTM A276 S31600	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
8	Bonnet	ASME SA479 S31600/ S31603 Dual Certified	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
9	Drive Nut (Yoke)	S30400			
10	Packing Follower	ASTM A276 S31600/ S31603 Dual Certified	ASME SB574 N10276	ASTM B473 N08020	ASME SB164 N04400
14	V- Ring Packing (standard)	(Refer to page 4)			
	Packing (optional)	(Refer to page 4)			
27	Lock Nut	Stainless Steel (18-8 Stainless Steel)			
49	Body Gasket	Graphite Grade GHR with S31600 Insert			
58	Travel Indicator	ASME SA240 S30400			

1. For optional valve and trim materials, consult your Emerson sales office for price and delivery. N08020 and N04400 nickel alloy materials have pressure-temperature ratings less than 206 barg (3000 psig) or 413 barg (6000 psig) respectively.

Figure 3. Optional 151 Low Flow Trim Assembly

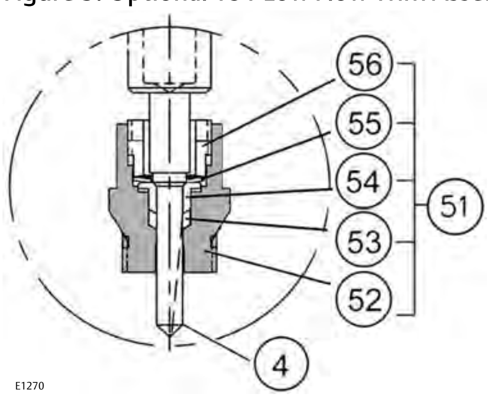


Figure 4. Optional 177 Low Flow Trim Assembly

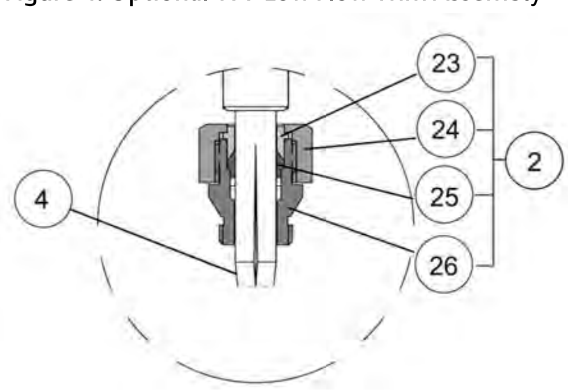


Table 2. 151 Low Flow Trim

Key Number		Description	Material
4		Plug	ASME SA479 S21800
51	Seat Sub-Assembly		
	52	Cage	ASTM A276 S31600/ S31603
	53	Seat	PTFE
	54	Collar	ASTM A276 S31600/ S31603
	55	Washer	ASTM A276 S31600 Cond B
	56	Insert	ASTM A276 S31600/ S31603

Table 3. 177 Low Flow Trim

Key Number		Description	Material
2(1)	Seat Sub-Assembly		
	23	Gland	ASTM A276 S31600/ S31603
	24	Retainer Nut	ASTM A276 S31600/ S31603
	25	Insert	Reinforced PTFE
	26	Housing	ASTM A276 S31600/ S31603
4(1)		Plug	ASME SA479 S21800

1. For optional trim materials, consult your Emerson sales office for price and delivery. Baumann 32 actuator requires dual-stops with 177 trim series.

Figure 5. Standard Spring-Loaded PTFE V-Ring Packing Kit

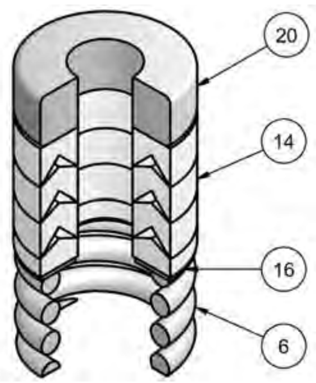


Table 4. Standard Spring-Loaded PTFE V-Ring Packing Kit

Key Number	Description	Material
6(1)	Spring	ASTM A313 S30200
14	Packing Set	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
16	Washer	ASME SA240 S31600
20	Spacer	J-2000 (filled-Polytetrafluoroethylene)

1. N10276 nickel alloy valve body construction is furnished with N10276 nickel alloy spring.

Figure 6. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

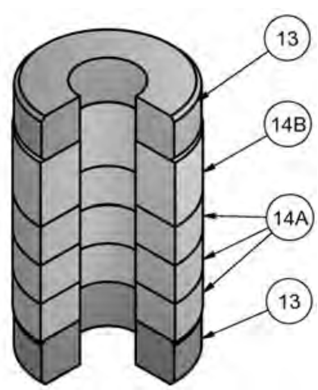


Table 5. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

Key Number	Description	Material
13	Bushings	Carbon-Graphite
14A	Packing Rings	Graphite
14B	Packing Ring	Graphite

Figure 7. ENVIRO-SEAL Packing Kit (Optional)

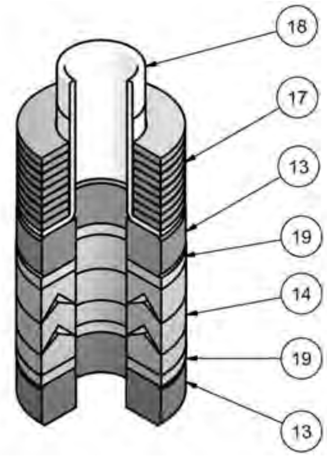


Table 6. ENVIRO-SEAL Packing Kit (Optional)

Key Number	Description	Material
13	Bushings	Carbon-Graphite
14	Packing Rings	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
17	Belleville Spring	N06600 Nickel Alloy (ASTM B637 N07718, 40 HRC max)
18	Bushing	PEEK (polyetheretherketone)
19	Washers	Modified PTFE

Special ENVIRO-SEAL Packing Note

The ENVIRO-SEAL PTFE packing system is suitable for 100 ppm environmental applications on services up to 51.7 barg (750 psig) and process temperatures ranging from -46 to 232°C (-50 to 450°F).

For non-environmental applications, this packing system offers excellent performance at the same temperature range up to the maximum valve working pressure.

Temperature limits apply to packing arrangements only. Complete valve assembly temperature limits may differ, refer to appropriate pressure/temperature ratings.

(Reference Fisher Packing Selection Guidelines for Sliding-Stem Valves, Bulletin 59.1:062, D101986X012).

Table 7. Technical Specifications

NOMINAL PIPE SIZE	DN 15, 20, and 25	NPS 1/2, 3/4, and 1
END CONNECTIONS	Refer to table 9	
PRESSURE RATING	Refer to tables 11, 12, 13, and 14	
CHARACTERISTIC	Equal Percentage or Linear	

Table 8. Temperature Ratings for Packing and Seat Material(1)

SEATING MATERIAL	**PTFE Soft Seat**	151 Trim	-29 to 177°C (-20 to 350°F)
		577 & 677 Trim	-73 to 232°C (-100 to 450°F)
	Reinforced PTFE	177 Trim	-73 to 232°C (-100 to 450°F)
	Metal Seat	102, 588, and 688 Trim	-195 to 537°C (-320 to 1000°F)
		548 and 648 Trim	-29 to 537°C (-20 to 1000°F)
PACKING AND BONNET COMBINATIONS	**BONNET STYLE**	**PACKING**	**TEMPERATURE LIMIT**
	Standard Bonnet	Spring Loaded PTFE	-73 to 232°C (-100 to 450°F)
		ENVIRO-SEAL	-45 to 232°C (-50 to 450°F)
		Graphite	-73 to 232°C (-100 to 450°F)
	Extension Bonnet	Spring Loaded PTFE	-195 to 232°C (-320 to 450°F)
		ENVIRO-SEAL	-45 to 232°C (-50 to 450°F)
		Graphite	-195 to 537°C (-320 to 1000°F)

1. Temperature limits apply to seating or packing arrangements only. Complete valve assembly temperature limits may differ, refer to appropriate pressure/temperature ratings. For more information on packing selection, reference Fisher Packing Selection Guidelines for Sliding-Stem Valves, Bulletin 59.1:062, D101986X012.

Table 9. Connections Available

CONNECTIONS	**VALVE SIZE**		**MATING LINE FLANGES**			
	DN	**NPS**	**CL150**	**CL300**	**CL600**	**PN10-40**
	15	1/2	NO	Yes	Yes	Yes
	20	3/4	Yes	Yes	Yes	Yes
	25	1	Yes	Yes	Yes	Yes

Figure 8. Baumann 24000F Trims

102 Linear Low Flow Trim | **151 Modified Equal % Low Flow Trim** | **177 Modified Equal % Low Flow Trim** | **548 / 577 / 588 Equal % Trim** | **648 / 677 / 688 Linear Trim**

Table 10. Cv Values at 100% Plug Opening (Kv = 0.86 x Cv)(1)

VALVE SIZE	ORIFICE DIAMETER	PLUG TRAVEL	PLUG SERIES						
			102	151	177	577	548 / 588	677	648 / 688
NPS	inch	inch	Cv	Cv	Cv	Cv	Cv	Cv	Cv
1/2	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.20, 0.50, 1.0	---	0.50, 1.0
	0.3125	0.50	---	---	0.0005 0.001, 0.002 0.005, 0.01 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.5, 2.0	1.5, 2.0	0.10, 0.20, 0.50, 1.0, 2.0	1.5 2.0
3/4	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.20, 0.50, 1.0	---	0.50, 1.0
	0.3125	0.50	---	---	0.0005 0.001, 0.002 0.005, 0.01 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.5, 2.0	1.5, 2.0	0.10, 0.20, 0.50, 1.0, 2.0	1.5, 2.0
1	0.156	0.50	---	0.00013, 0.00025, 0.0005, 0.001, 0.002, 0.004, 0.008, 0.015, 0.03, 0.06, 0.10, 0.20, 0.45	---	---	---	---	---
	0.25	0.50	0.02, 0.05, 0.10, 0.20	---	---	---	0.20, 0.50, 1.0	---	0.50, 1.0
	0.3125	0.50	---	---	0.0005 0.001, 0.002 0.005, 0.01 0.02, 0.05	---	---	---	---
	0.375	0.50	---	---	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.50, 1.0, 2.5	1.5, 2.5
	0.375	0.50	---	---	---	1.0, 1.5, 2.5	1.5, 2.5	0.10, 0.20, 0.50, 1.0, 2.5	1.5, 2.5
	0.8125	0.50	---	---	---	4.0, 6.5	4.0, 6.5	4.0	4.0, 6.5

1. See Fisher Catalog 12 for a full range of flow and sizing information.
2. 24000F NPS 1, Cv 4.0 and 6.5 are integral seat.

Table 11. Pressure-Temperature Ratings for S31603 Stainless Steel Valve Body (Standard)

Temperature (°C)[1]	Working Pressure (barg)	Temperature (°F)[1]	Working Pressure (psig)
-195 to 37	99	-320 to 100	1440
93	85	200	1240
149	77	300	1120
204	70	400	1025
232	68	450	990
260	65	500	955
288	63	550	927
315	62	600	900
343	61	650	890
371	60	700	870
398	58	750	855
426	58	800	845
454	57	850	835
482	57	900	830
510	53	950	775
537	48	1000	700

1. Do not exceed seating and packing material ratings.

Table 12. Pressure-Temperature Ratings for N10276 Nickel Alloy Valve Body (Optional)

Temperature (°C)[1]	Working Pressure (barg)	Temperature (°F)[1]	Working Pressure (psig)
-195 to 37	103	-320 to 100	1500
93	103	200	1500
149	100	300	1455
204	97	400	1410
232	94	450	1370
260	91	500	1330
288	87	550	1270
315	83	600	1210
343	81	650	1175
371	78	700	1135
398	73	750	1065
426	69	800	1015
454	67	850	975
482	62	900	900
510	53	950	775
537	49	1000	725

1. Do not exceed seating and packing material ratings.

Table 13. Pressure-Temperature Ratings for N04400 Nickel Alloy Valve Body (Optional)

Temperature (°C)(1)	Working Pressure (barg)	Temperature (°F)(1)	Working Pressure (psig)
-195 to 37	82	-320 to 100	1200
93	72	200	1055
149	68	300	990
204	65	400	955
232	65	450	952
260	65	500	950
288	65	550	950
315	65	600	950
343	65	650	950
371	65	700	950
398	64	750	935
426	63	800	915
454	46	850	680
482	34	900	495

1. Do not exceed seating and packing material ratings.

Table 14. Pressure-Temperature Ratings for N08020 Nickel Alloy Valve Body (Optional)

Temperature (°C)(1)	Working Pressure (barg)	Temperature (°F)(1)	Working Pressure (psig)
-195 to 37	82	-320 to 100	1200
93	72	200	1045
149	67	300	980
204	67	400	980
232	67	450	980
260	67	500	980
288	67	550	980
315	67	600	980
343	67	650	980
371	67	700	980
398	67	750	980
426	67	800	980

1. Do not exceed seating and packing material ratings.

Table 15. Valve Assembly Weights

VALVE SIZE		WEIGHT	
DN	NPS	kg	lb
15	1/2	1.7	3.8
20	3/4	2.4	5.3
25	1	3.3	7.3

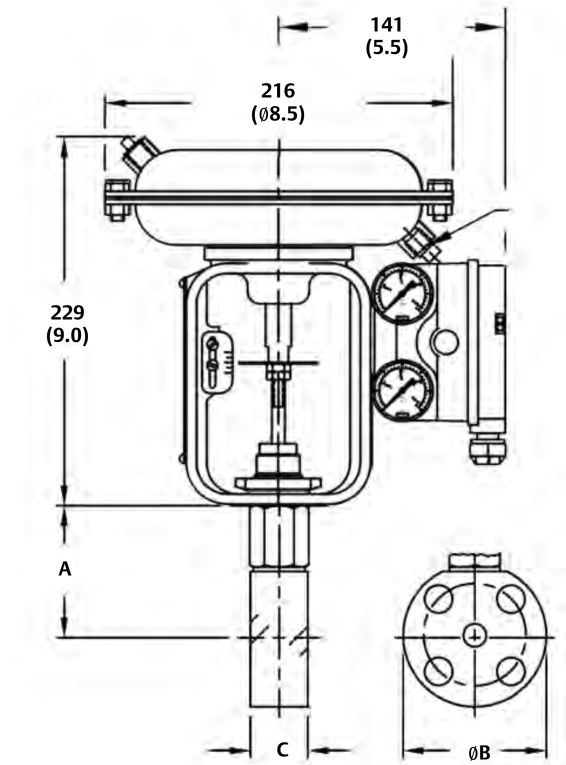
Table 16. Actuator Weights

ACTUATOR TYPE	WEIGHT	
	kg	lb
MV	10	22
VA	14	30

Table 17. Model Numbering System

24 Valve Body Series	Plug Series	Characteristic	Seat Leakage	F Wafer Valve Body	Bonnet Style	
	548	Equal % / Metal Seat (S41600)	IV		---	Standard
	577	Equal % / PTFE Seat	VI		E	Extension
	588	Equal % / Metal Seat (S31600)	IV			
	648	Linear / Metal Seat	IV			
	677	Linear / PTFE Seat	VI			
	688	Linear / Metal Seat	IV			

Figure 9. Dimensional Drawing



BAUMANN 32 ACTUATOR WITH FISHER 3660/3661 POSITIONER

Note: Actuator removal requires 115 mm (4.5 inches) vertical clearance.

Table 18. Valve Dimensions

VALVE SIZE		A BONNET				B DIAMETER		C	
		Standard		Extension					
DN	NPS	mm	Inch	mm	Inch	mm	Inch	mm	Inch
15	1/2	83.8	3.3	218.4	8.6	88.9	3.5	38.1	1.5
20	3/4	83.8	3.3	218.4	8.6	107.95	4.25	38.1	1.5
25	1	78.7	3.1	215.9	8.5	114.3	4.5	50.8	2.0

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24003 Valve
D103329X012

Product Bulletin
52.1:243WY
February 2021

Baumann™ 24003 3-Way Bronze or Stainless Steel Control Valve

The Baumann 24003 3-way control valve is ideally suited for control of flow and temperature where mixing or diverting service is required. This 3-way valve uses a rugged cast bronze or CF8M stainless steel body with S31600 austenitic stainless steel trim for extended service life.

W9764-1

Stainless Steel 3-Way Valve with Baumann 32 Actuator

W9765-1

Bronze 3-Way Valve with Baumann 54 Actuator and FIELDVUE DVC2000 Digital Valve Controller

Features

- Compact and light weight design reduces installed piping costs.
- Optional ENVIRO-SEAL ™ packing system to meet critical emission control requirements; suitable for use in light duty chemical service (not for use in corrosive service). This option is available in the stainless steel version only.
- High quality S31600 austenitic stainless steel trim materials.
- Dual plug and stem guiding provides increased stability during plug travel.
- Multiple trim capacity reductions available to meet changing process requirements.
- Fisher™ FIELDVUE™ digital valve controllers available for remote calibration and diagnostics.

Table 1. Flow Direction(1)

Service	Inlet	Outlet
Diverting	C	U and L
Mixing	U and L	C
1. C = Common port, U = Upper port, L = Lower port		

Figure 1. Baumann 24003 Valve Body with Standard Bonnet and NPS 1 Integral Seat

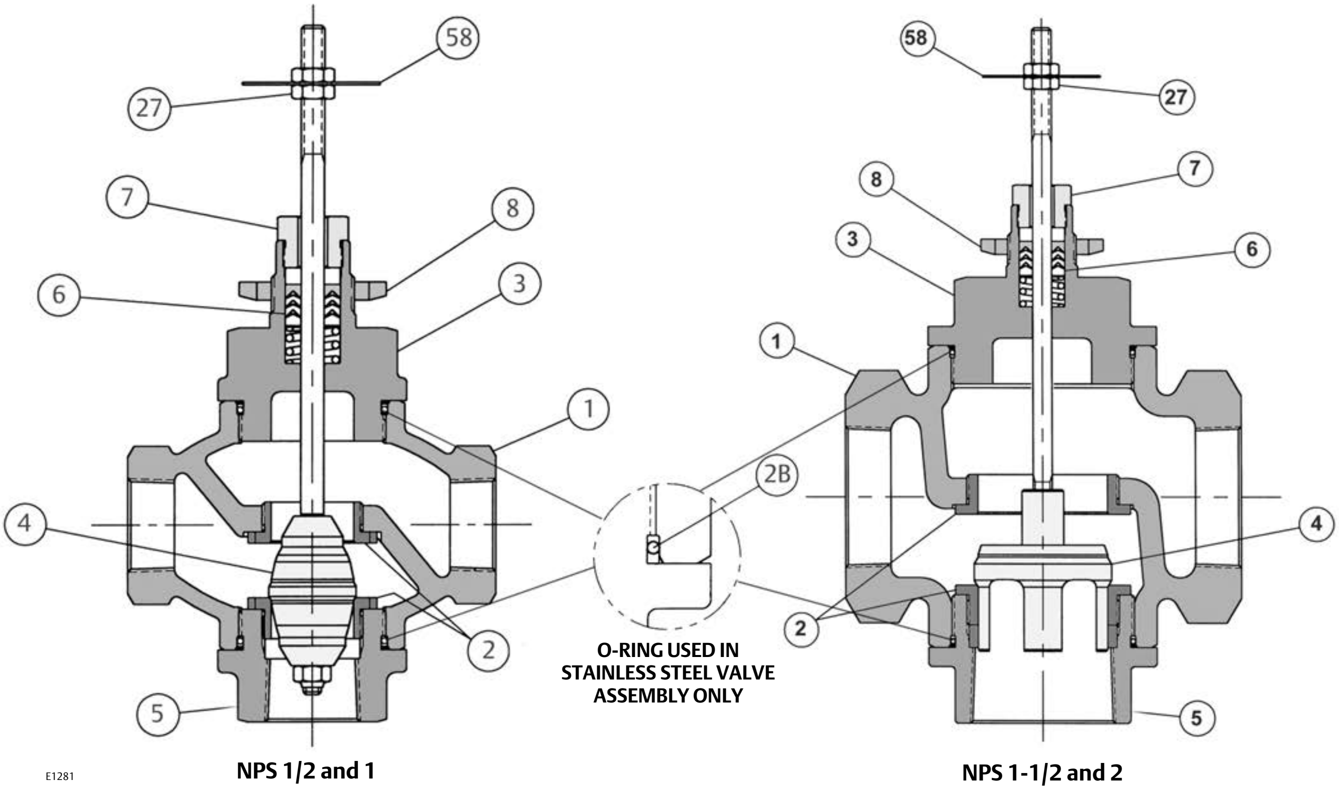


Table 2. Materials of Construction

KEY NO.	DESCRIPTION		MATERIAL	
			Bronze	Stainless Steel
1	Valve Body		Bronze ASTM B62	ASTM A351 CF8M
2	Seat Rings		ASTM A276 S31600 Condition A	ASTM A276 S31600 Condition A
2B	O-Ring		N/A	TFE/P (tetrafluoroethylene/propylene)
3	Bonnet		Bronze ASTM B62	ASTM A351 CF8M
4	Plug & Stem Assembly		ASTM A276 S31600 Condition A	ASTM A276 S31600 Condition A
5	Bottom Port		Bronze ASTM B62	ASTM A351 CF8M
6	Packing	Standard	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled	
		Optional	Molded Graphite Ribbon (Flexible Graphite)	
			ENVIRO-SEAL (Stainless Steel ONLY)	
7	Packing Follower		ASTM A276 S31600 Condition A Stainless Steel	
8	Drive Nut (Yoke)		ASTM A194 S30400 Gr. 8	
27	Locknuts		Stainless Steel (18-8 SST)	
58	Travel Indicator		ASTM A240 S30400	

Figure 2. Standard Spring-Loaded PTFE V-Ring Packing Kit

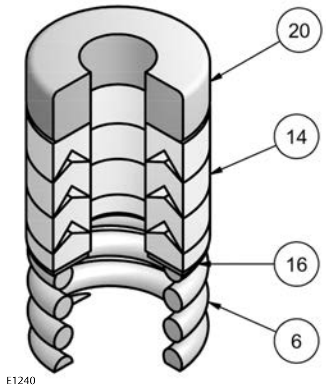


Table 3. Standard Spring-Loaded PTFE V-Ring Packing Kit

Key Number	Description	Material
6	Spring	ASTM A313 S30200
14	Packing Set	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
16	Washer	ASTM A240 S31600
20	Spacer	J-2000 (filled-Polytetrafluoroethylene)

Figure 3. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

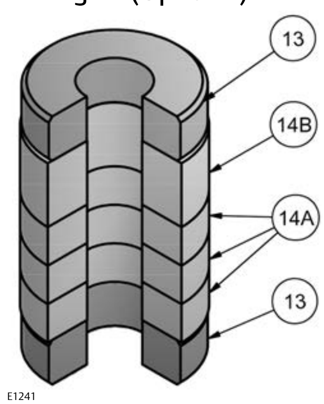


Table 4. Molded Graphite (Flexible Graphite) Packing Kit (Optional)

Key Number	Description	Material
13	Bushings	Carbon-Graphite
14A	Packing Rings	Graphite
14B	Packing Ring	Graphite

Figure 4. ENVIRO-SEAL Packing Kit (Optional for Stainless Steel Only)

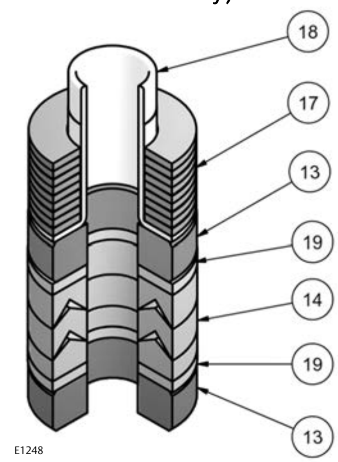


Table 5. ENVIRO-SEAL Packing Kit (Optional for Stainless Steel Only)

Key Number	Description	Material
13	Bushing	Carbon-Graphite
14	Packing Set	PTFE (Polytetrafluoroethylene) / PTFE, 25% carbon filled
17	Belleville Spring	N06600 Nickel Alloy (ASTM B637 N07718, 40 HRC max)
18	Bushing	PEEK (polyetheretherketone)
19	Washer	Modified PTFE

Special ENVIRO-SEAL Packing Note

The ENVIRO-SEAL PTFE packing system is suitable for 100 ppm environmental applications on services up to 51.7 barg (750 psig) and process temperatures ranging from -28 to 204°C (-20 to 400°F).

For non-environmental applications, this packing system offers excellent performance at the same temperature range up to the maximum valve working pressure.

Temperature limits apply to packing arrangements only. Complete valve assembly temperature limits may differ, refer to appropriate pressure/temperature ratings.

(Reference Fisher Packing Selection Guidelines for Sliding-Stem Valves, Bulletin 59.1:062, D101986X012).

Table 6. Technical Specifications

NOMINAL PIPE SIZE	NPS 1/2, 1, 1-1/2, and 2	
END CONNECTIONS	Screwed NPT	
SEAT PLUG SEALING	Metal-to-Metal	
CHARACTERISTIC	Linear	
SEAT LEAKAGE	Class III	
VALVE BODY MATERIAL	Bronze	Stainless Steel
PRESSURE RATING	400 psi @ 150°F / 250 psi @ 400°F	720 psi @ 150°F / 515 psi @ 400°F
TEMPERATURE LIMITS	-20 to 400°F	-20 to 400°F

Figure 5. Valve Body and Temperature Limits

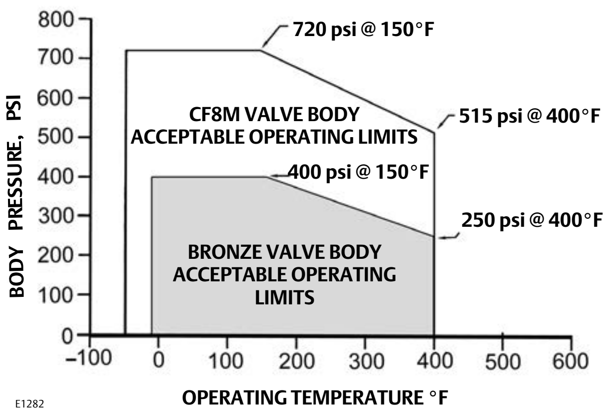


Table 7. Max Cv Values at 100% Plug Opening (1)
(Kv = 0.86 x Cv)

VALVE SIZE	ORIFICE DIAMETER	PLUG TRAVEL	RATED VALUES
NPS	inches	inches	C_V
1/2	0.626	0.56	1, 2
	0.876	0.56	4
1	0.876	0.56	4
	1.126	0.56	10
1-1/2	1.676	0.75	20
2	2.126	0.75	40

1. See Fisher Catalog 12 for a full range of flow and sizing information.

Figure 6. Mixing Service Flow Characteristics

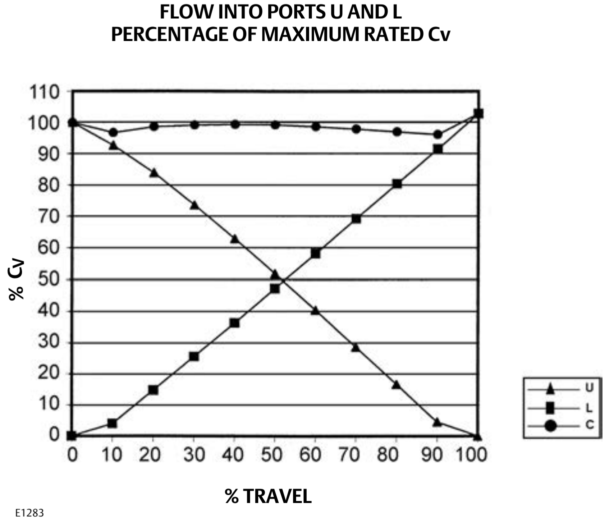


Figure 7. Diverting Service Flow Characteristics

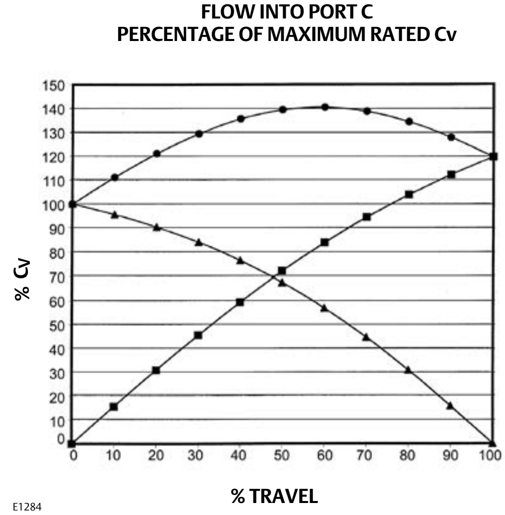
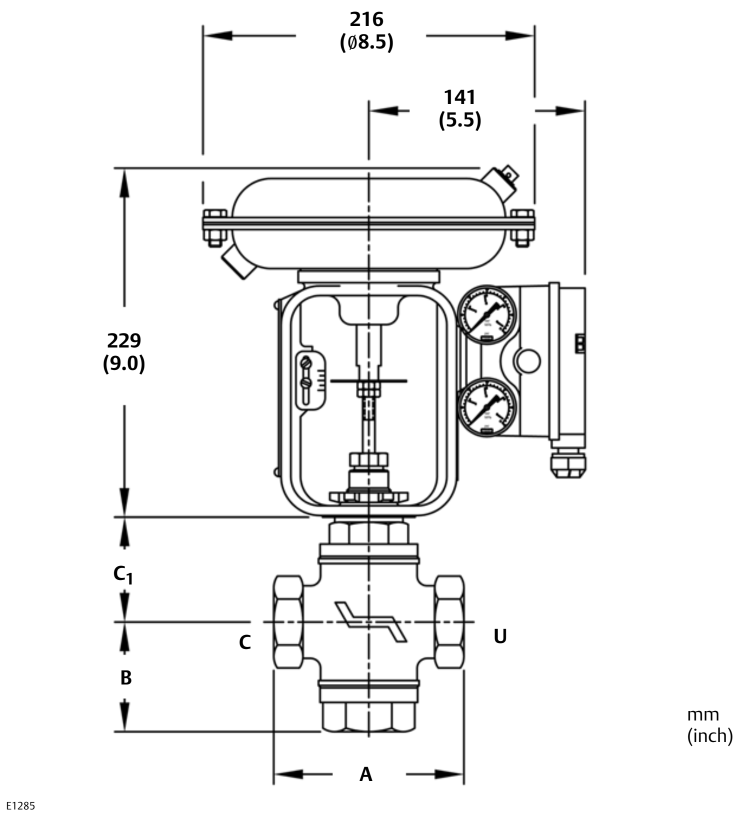


Table 8. Valve Body Dimensions and Weights: NPT Valve Bodies Only

VALVE SIZE	VALVE BODY MATERIAL						TRAVEL	WEIGHT
	BRONZE, NPT			STAINLESS STEEL, NPT (A)				
NPS	A	B	C1	A	B	C1	Inches	lbs
1/2	4.88	2.75	2.75	5.0	2.75	2.75	0.56	8
1	4.88	2.75	2.75	5.0	2.75	2.75	0.56	8
1-1/2	5.75	3.81	3.31	6.1	3.38	3.31	0.75	15
2	6.50	4.0	3.6	6.50	3.75	3.6	0.75	20

Figure 8. Dimensional Drawing



24000 3-WAY ATC/FAIL OPEN ACTUATOR WITH HANDWHEEL

Note: Actuator removal requires 115 mm (4.5 inches) vertical clearance.

Table 9. Application Port(1)

Service	Inlet	Outlet
Diverting	C	U and L
Mixing	U and L	C

1. C = Common port, U = Upper port, L = Lower port

Figure 9. Mixing and Diverting Applications

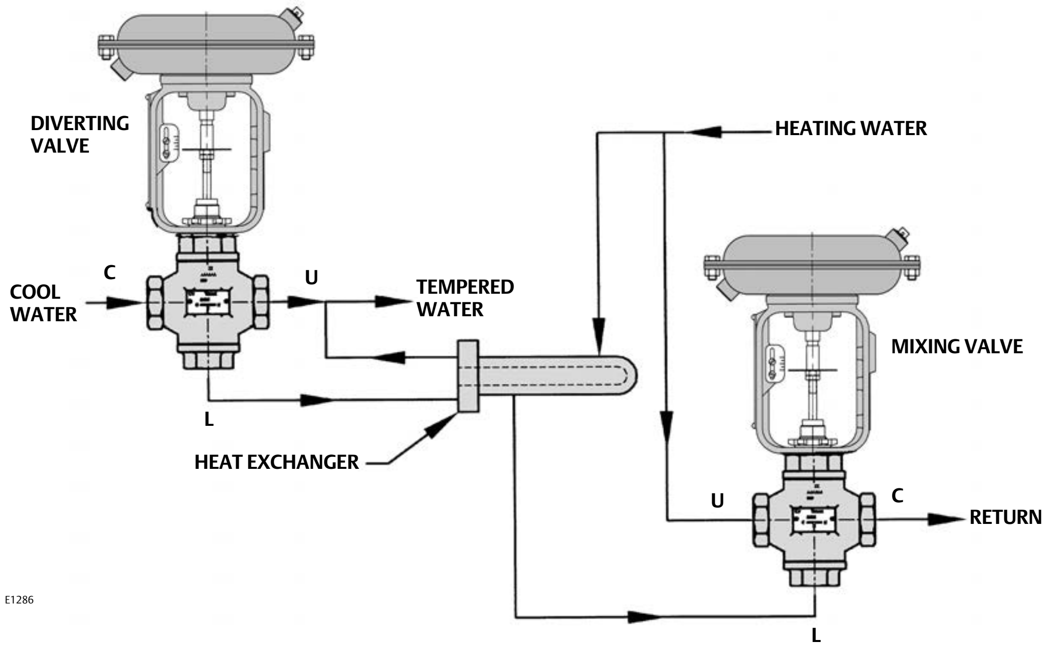


Table 10. Model Numbering System

24					3		
Valve Body Series	**Service**		**Port "L" Fails**		**3-Way Valve Body**	**Material**	
24	D	Diverting	1	Closed	3	---	Bronze
	M	Mixing	2	Open		S	Stainless Steel

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26000 Valve
D103337X012

Product Bulletin
52.1:26CR
September 2017

Baumann™ 26000 Corrosion Resistant Control Valve

The Baumann 26000 is a unique corrosion resistant control valve featuring a flangeless wafer valve body and powerful multi-spring diaphragm actuator. This valve is available with a Fisher™ FIELDVUE™ digital valve controller to allow for highly accurate, low flow control of nearly all corrosive media. **(Note: For optimal, non-compromised valve life, fluid must be clear and service non-cavitating.)** A solid corrosion resistant R05200 Tantalum or N10276 Nickel Alloy valve plug and pressure-assisted PTFE seat combine for an extremely wide control range making the 26000 series ideal for pH control applications.

An S31600/S31603 stainless steel flangeless valve body, thru-hole wafer design, allows for installation between plastic pipe line flanges without risk of gasket leakage. Top entry trim provides ease of servicing and a long operating life.

W9766

26000 Control Valve with Baumann 32 Actuator and Dual Travel Stops

Features

- Wide control range with high rangeability.
- Solid R05200 Tantalum or N10276 Nickel Alloy valve plug (Other materials on request).
- S31600/S31603 stainless steel valve housing with PTFE body interior.
- Pressure assisted seating, up to Class VI shutoff.
- The combination of primary and secondary valve stem packing ensures process retention.
- Flangeless body construction, unique thru-hole wafer design for installation between CL150 and 300 and PN 10 through 25 RF or FF line flanges.
- PTFE encapsulated line flange gaskets (included) permit valve installation between plastic lined slip-on mating flanges.

X0663-1

26000 Valve with Baumann 32 Actuator, Dual Travel Stops, and FIELDVUE DVC6200 Digital Valve Controller

- FIELDVUE digital valve controller available for remote calibration and diagnostics in facilities utilizing the PlantWeb™ architecture.

Figure 1. Valve Body for Cv Ratings of 0.001 to 1.0 (Class VI Seat Leakage)

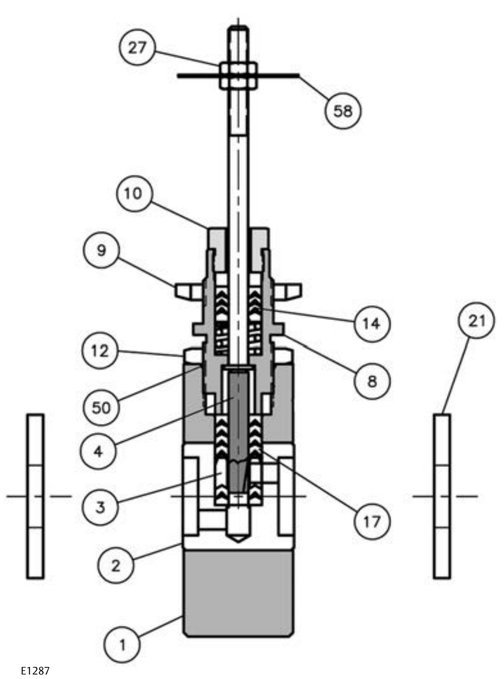


Figure 2. Valve Body for Cv Rating of 2.5 (Class IV Seat Leakage)

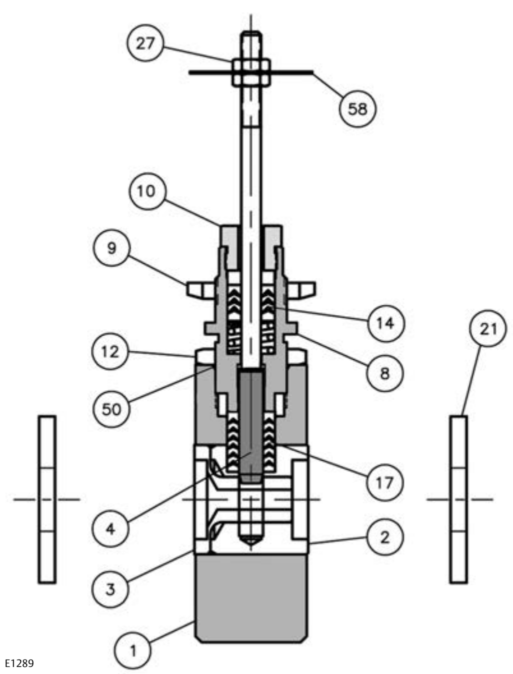


Figure 3. Valve Body for Cv Rating of 4.2 (Class IV Seat Leakage)

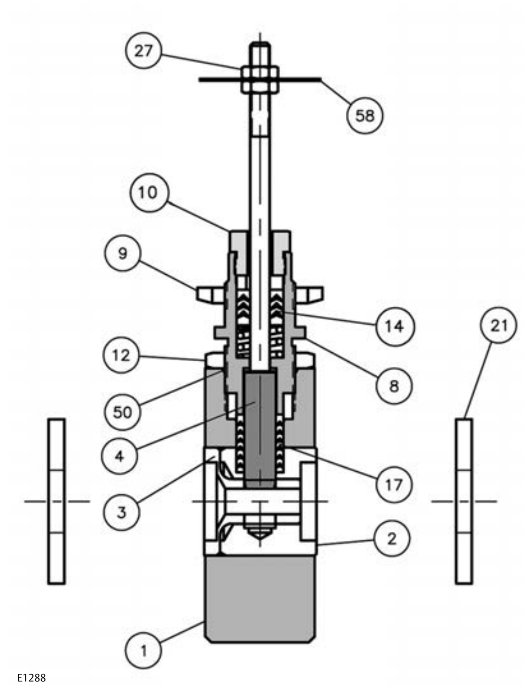


Figure 4. Secondary Packing: Spring-Loaded PTFE V-Ring Packing Kit

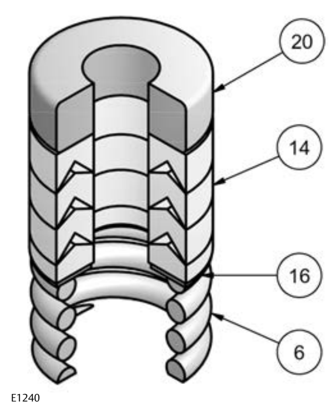


Table 1. Secondary Packing: Standard Spring-Loaded PTFE V-Ring Packing Kit

Key Number	Description	Material
6	Spring	ASTM A313 S30200
14	Packing Set	PTFE/carbon-filled PTFE
16	Washer	ASTM A240 S31600
20	Spacer	J-2000 (filled-Polytetrafluoroethylene)

Table 2. Materials of Construction

Key No.	Description	Material
1	Valve Body	ASTM A479 S31600/S31603, Annealed
2	Liner	PTFE (Polytetrafluoroethylene)
3	Spacer (Cv = 0.001 - 1.0 ONLY)	PTFE (Polytetrafluoroethylene)
	Insert (Cv = 2.5 and 4.2 ONLY)	PTFE (Polytetrafluoroethylene)
4	Valve Plug	ASTM B365 R05200 cold worked or ASTM B574 N10276, 35 HRC Max
	Stop Washer	ASTM B574 N06022, 35 HRC Max
	Stem	ASTM B574 N10276, 35 HRC Max
8	Bonnet	ASTM A479 S31600/S31603, Annealed
9	Yoke Drive Nut	S30400 Stainless Steel
10	Packing Follower	ASTM A276 S31600 Condition A
12	Hex Clamp Nut	ASTM A582 S30300 Condition A
14	Secondary Packing Kit, Spring Loaded PTFE V-Ring Packing Kit	Refer to figure 4 and table 1
17	Primary Packing, V-Ring	PTFE (Polytetrafluoroethylene)
21	Line Flange Adapter Gaskets(1)	PTFE (Polytetrafluoroethylene), Steel Core
27	Locknut	18-8 Stainless Steel
50	Bonnet Seal	PTFE (Polytetrafluoroethylene)
58	Travel Indicator	ASTM A240 S30400

1. It is highly recommended that the included PTFE encapsulated line flange adaptor gaskets be utilized.

Table 3. Technical Specifications

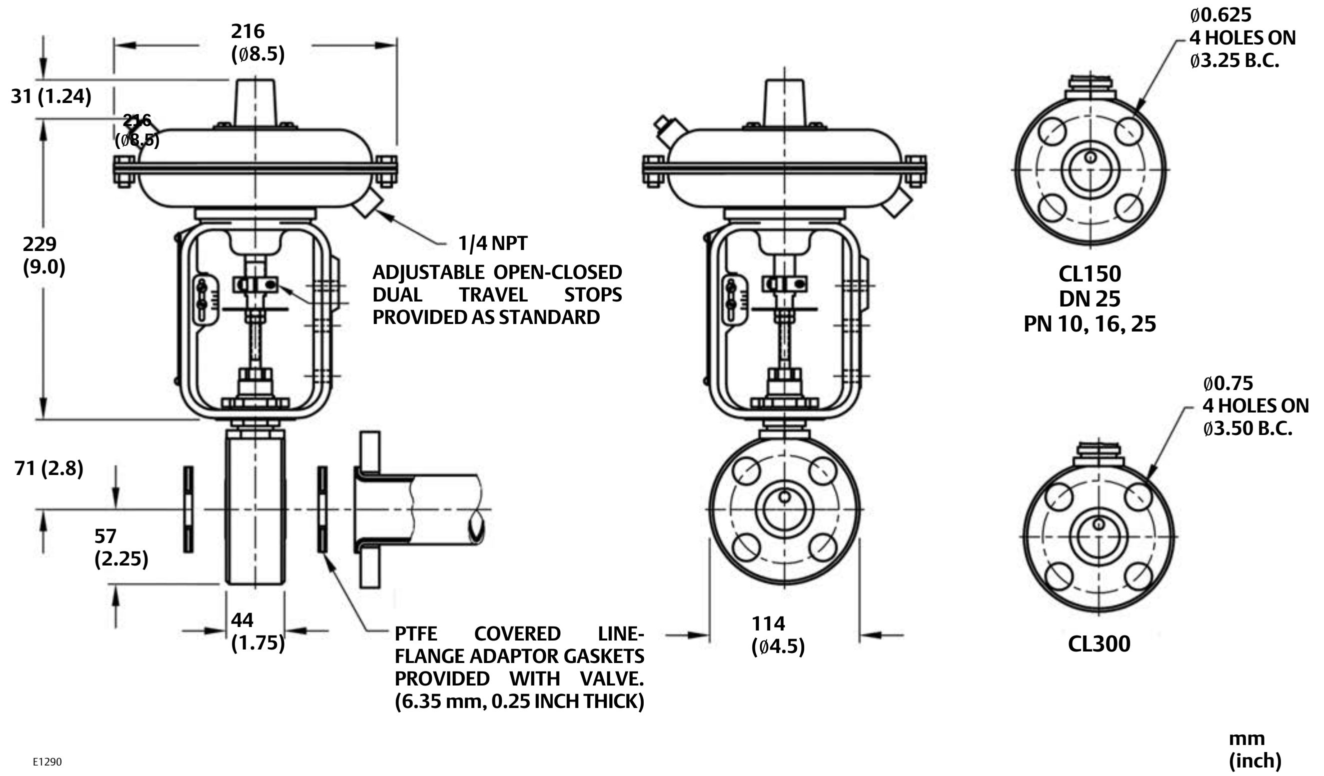
VALVE BODY RATNG		10.3 bar CWP (150 psi CWP)
CONNECTIONS		Wafer (Flangeless) design for installation between NPS 1 CL150, CL300 or Metric DN 25 PN10, PN16 or PN25 RF or FF line Flanges
SEAT PLUG SEALING		PTFE Soft Seat -28.9 to 177°C (-20 to 350°F)
BONNET		-28.9 to 177°C (-20 to 350°F)
PACKING(1)	Spring Loaded PTFE V-Ring	-28.9 to 177°C (-20 to 350°F)
SEAT LEAKAGE		Class VI (Rated Cv = 0.001 - 1.0), Class IV (Rated Cv = 2.5 and 4.2)
CHARACTERISTIC		Modified Equal Percentage
MAXIMUM SHUTOFF PRESSURE		10.3 bar (150 psi)
WEIGHT		3.3 kg (7.3 lbs)

1. Temperature limits apply to packing materials only and not to the valve body assembly.

Table 4. Coefficients

Valve Size	Port Dia.	Plug Tvl	CV AT VALVE OPENING - Percent of Plug Travel
NPS	in.	in.	100
1	0.312	0.5	0.001
			0.005
			0.01
			0.02
			0.05
			0.1
			0.2
			0.4
			0.8
			1
	0.375	0.5	2.5
	0.5	0.5	4.2

Figure 5. Dimensions NPS 1 26000 Valve with Baumann 32 Actuator and Dual Travel Stops



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Baumann™ 51000 High-Pressure, Low-Flow Control Valve

The Baumann 51000 control valve is optimally designed for demanding low-flow, high-pressure control applications often found in laboratories and pilot plants. NPS 1/4 or 1/2 valve assemblies are standard as either 316 stainless steel or N10276 nickel alloy. Constructions with other high nickel alloys are available.

With a small footprint, less than 10 inches tall, and multiple trim capacity reductions available to meet changing process requirements, the 51000 is a perfect fit where space is at a premium and flexibility is a must. The valve is suited for demanding control of gases, chemical/dye injection and acid/caustic solutions in paper production, textiles, specialty chemicals, and many other industries.

W9733-1

Baumann 51000 NPS 1/2 Control Valve with TA6000 Electropneumatic Transducer (I/P)

W9734-2

51000 NPS 1/4 Control Valve with Baumann 16 Actuator, and Fisher™ 3660 Pneumatic Positioner

W9066-1

51000 NPS 1/2 Control Valve with Baumann 16 Actuator, and FIELDVUE™ DVC2000 Digital Valve Controller

Features

- Compact size.
- Suitable for sticky fluids and corrosive atmospheres.
- Quick trim change out—Matched trims not required.
- 316 stainless steel body in NPS 1/4 and 1/2, or N10276 Nickel Alloy. Other alloys available, consult your Emerson sales office.
- Class VI shutoff with soft seat available. Up to 207 barg (3000 psig) at 37°C (100°F).
- Rugged bolted bonnet design.
- Wide flow capacity range—Maximum rated Cv ranges from 0.00013 to 2.5 (0.00011 to 2.16 Kv).
- Available without positioner—For fail-open or fail-close applications.

Figure 1. NPS 1/4 and 1/2 (6.35 and 12.7 mm) Soft Seat Cage Design for Cv = 0.00013 to 0.45 Class VI Shutoff (N10276 Nickel Alloy Construction Available)

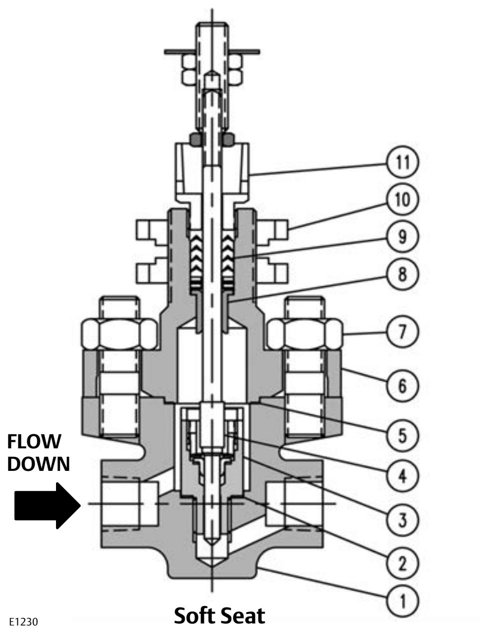


Figure 3. NPS 1/2 (12.7 mm) Integral (Metal) Seating for Cv = 1.0, 1.5, and 2.5 Class IV Shutoff

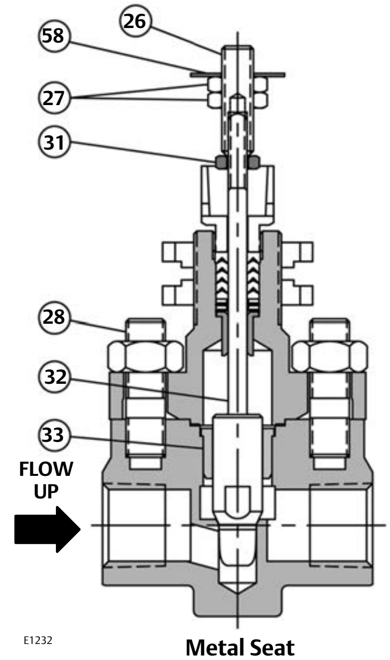
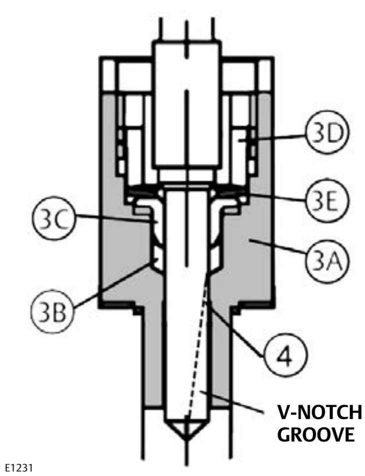


Figure 2. Soft Seat Cage Assembly



The PTFE ring (key 3B) surrounds the valve plug (key 4) to help eliminate clearance flow typical of lapped-in metal-to-metal close clearance micro trims. Flow is directed over the valve plug and forced through a single V-notch path as the plug moves above the PTFE ring, providing precise and predictable control over its entire travel range. When the V-notch moves below the PTFE ring, Class VI primary shutoff is achieved.

A live-loaded metal seat collar (key 3C) fully retains the PTFE ring (key 3B). The valve plug (key 4) seats against the metal collar providing Class IV secondary shutoff. In addition, the fluid process pressure combines with the actuator seating force to form a hydraulic seal within the fully retained PTFE ring (key 3B). Therefore, the higher the process pressure the tighter the shutoff.

Table 1. Baumann 51000 Soft Seat Cage Assembly

Key Number	Parts	Material
3A	Cage	ASTM A276 S31600 Condition A or ASTM B574 N10276, 35 HRC Max
3B	Ring	PTFE (Polytetrafluoroethylene)
3C	Collar	ASTM A276 S31600 Condition A or ASTM B574 N10276, 35 HRC Max
3D	Retainer	
3E	Spring	

Figure 4. V-Ring Packing Kit

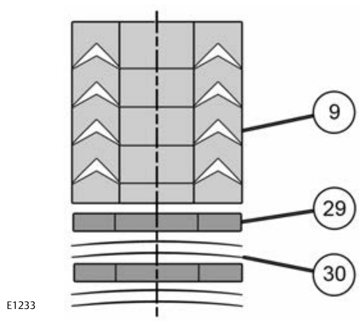


Table 2. Baumann 51000 V-Ring Packing Kit 51607

Key Number	Quantity	Description
9	1	Packing Set
29	2	Flat Washer
3	4	Disc Spring

Table 3. Materials of Construction

Key Number	Parts	Material
1	Valve Body, NPS 1/4 and NPS 1/2	316 SST or N10276, 35 HRC Max
2	Seat Cage Gasket	Reinforced Graphite
3	Figure 1 ONLY! Soft Seat Cage Assy, (Cv's 0.00013 to 0.45), (Kv's 0.00011 to 0.39)	See figure 2, table 1
	Seat, Body (Integral Seat) (Cv's 1.0, 1.5, 2.5); (Kv's 0.86, 1.29, 2.16)	316 SST or N10276, 35 HRC Max
4	Plug/Stem (Cv's 0.00013 - 0.45); (Kv's 0.00011 to 0.39)	ASTM A479 S21800 Annealed or ASTM B574 N10276, 35 HRC Max
5	Bonnet Gasket	Flexible Graphite and Polymer Composite
6	Bonnet	ASTM A351 CF8M or ASTM B574 N10276, 35 HRC Max
7	Hex Nuts	18-8 Stainless Steel
8	Stem Guide	ASTM A582 S30300 Condition A or Carbon Fiber-Filled Thermoplastic Fluoropolymer
9	V-Ring Packing Kit	PTFE (Polytetrafluoroethylene) & S30400 & S30100
10	Clamp Nut	ASTM A240 S30400
11	Packing Follower Nut	ASTM A582 S30300 Condition A or ASTM B574 N10276, 35 HRC Max
26	Stem Adapter, Baumann 16 Actuator	18-8 Stainless Steel
27	Hex Jam Nut, Baumann 16 Actuator	18-8 Stainless Steel
28	Body Studs	S30400 ASTM A193, B8 Class 1
31	Stem Adapter Nut	18-8 Stainless Steel
32	Plug and Stem S/A (for metal seated plugs) Integral Seat, Cv's 1.0, 1.5, & 2.5; (Kv's 0.86, 1.29, 2.16)	ASTM A276 S31600 Condition A or ASTM B574 N10276, 35 HRC Max
33	Plug Guide	ASTM A479 S21800 Annealed or Carbon Fiber-Filled Thermoplastic Fluoropolymer
34	Flange, Bonnet	ASTM A743 CF8
35	Travel Indicator Disc, Baumann 16 Actuator	18-8 Stainless Steel

Table 4. Valve Body S/A Pressure-Temperature Ratings

WORKING PRESSURE (barg)			WORKING PRESSURE (psig)		
Temperature (°C)	Stainless Steel	N10276, 35 HRC Max	Temperature (°F)	Stainless Steel	N10276, 35 HRC Max
-195 to 37.8	207	207	-320 to 100	3000	3000
93.3	178	207	200	2580	3000
149	161	200	300	2330	2910
176	154	196	350	2235	2850

Table 5. Dimensions and Weights, Valve Body Subassembly

VALVE SIZE		A		MATERIAL	APPROXIMATE WEIGHTS	
mm	NPS	mm	inch		kgs	lbs
6.35	1/4	55.9	2.20	Stainless Steel	0.64	1.4
				N10276 Nickel Alloy	1.0	2.2
12.7	1/2	68.6	2.70	Stainless Steel	0.82	1.8
				N10276 Nickel Alloy	1.18	2.6

Table 6. Rated Cv Comparison Chart

VALVE SIZE		ORIFICE DIAMETER		PLUG TRAVEL		TRIM NUMBER	CV AT VALVE OPENING-PERCENT OF PLUG TRAVEL
mm	NPS	mm	inch	mm	inch		100
6.35 12.7	1/4 1/2	3.97	0.156	12.7	0.5	16	0.00013
						15	0.00025
						14	0.0005
						13	0.001
						12	0.002
						11	0.004
						10	0.008
						09	0.015
						08	0.03
						07	0.06
						06	0.10
						05	0.20
						04	0.45
12.7	1/2	9.53	0.375	12.7	0.5	03	1.0
						02	1.5
						01	2.5

Table 7. Model Numbering System

51													
51000	Valve Size			Trim No.	Cv	Kv	Instrument		Valve Body Material		Fail Option	
		mm	NPS									
51000	1	6.35	1/4	01	2.5(1)	2.16(1)	0(2)	None	S	Stainless Steel	O	Open
	2	12.7	1/2	02	1.5(1)	1.29(1)	1(3)	Pneumatic (3-15 psi)	C	N10276	C	Closed
				03	1.0(1)	0.86(1)	2(4)	I/P Positioner (4-20 mA)				
				04	0.45	0.39	3(5)	I/X Transducer (4-20 mA)				
				05	0.20	0.17						
				06	0.10	0.09						
				07	0.060	0.05						
				08	0.030	0.026						
				09	0.015	0.013						
				10	0.008	0.0069						
				11	0.004	0.0035						
				12	0.002	0.0018						
				13	0.001	0.0009						
				14	0.0005	0.00043						
				15	0.00025	0.00022						
				16	0.00013	0.00011						

1. Available in NPS 1/2 valve only.
2. Baumann 16 actuator.
3. 16 with 3660.
4. 16 with 3661.
5. 16 with TA6000.

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Baumann™ 81000 Mikroseal Control Valve

The Baumann 81000 Mikroseal control valve is excellent for throttling of liquid or gaseous media, particularly where wide flow variations are encountered. Its packless design allows for applications where leakage prone stem packings are not tolerated.

A nearly frictionless mechanical force-amplifying mechanism is employed to reduce the travel of the pneumatic or electric actuators. This allows the closure diaphragm to move precisely against the valve orifice to throttle or stop the passing fluid. The same nearly frictionless mechanism, composed of stainless steel and PTFE lined ball bearings and guide bushings, assures very precise positioning with negligible deadband. This permits direct operation from remote mounted I/P (current to pneumatic) signal converters.

Easy removal of the bonnet allows for inspection and cleaning of the valve seat and closure diaphragm while the actuator stays attached to the bonnet and the valve body remains in the line. During this process the actuator stays in calibration. A backup O-ring prevents leakage should the primary seal (diaphragm to valve body) fail. A tell-tale connection in the bonnet yoke can be utilized to show if the sealing diaphragm is damaged.

W9846

81000 NPS 1/4 Angle Valve with Baumann 16 Actuator

W9847

81000 NPS 1/2 Inline Valve with Baumann 16 Actuator, and FIELDVUE DVC2000 Digital Valve Controller

Features

- Compact and light-weight design reduces installed piping costs
- Packless construction
- Fisher™ FIELDVUE™ digital valve controller available for remote calibration and diagnostics in facilities utilizing PlantWeb™ architecture

Figure 1. Baumann 81000 NPS 1/4 Angle Valve Body

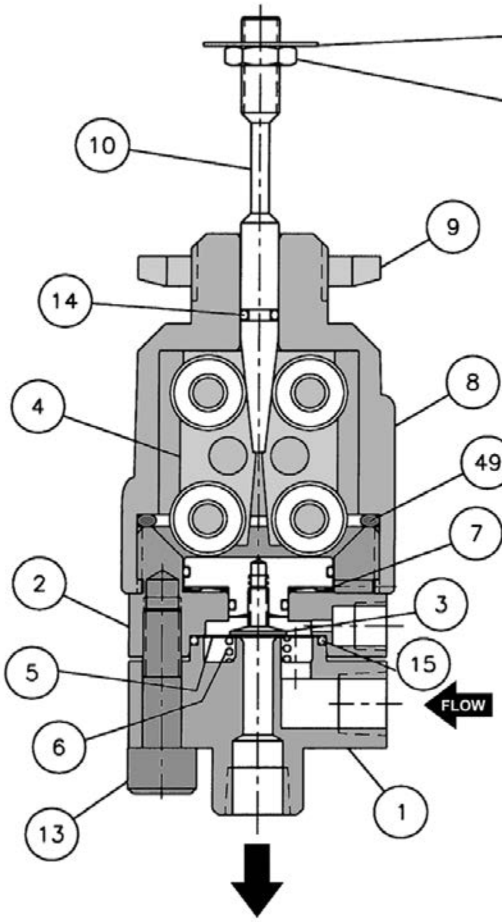
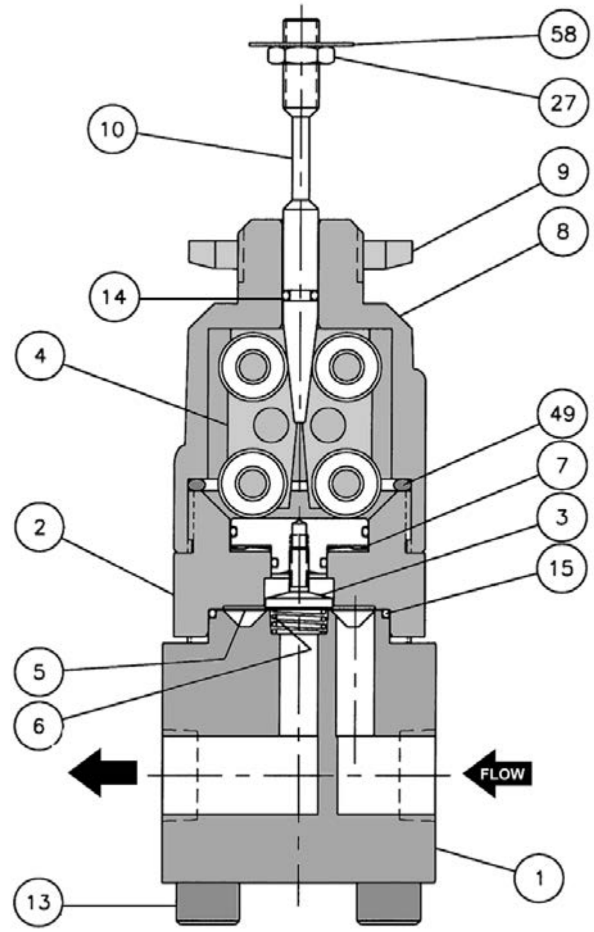


Figure 2. Baumann 81000 NPS 1/2 Inline Valve Body



Specifications

See table 3 for technical specifications.

Table 1. Flow Coefficients (ASME/ISA/IEC) and ISA Sizing Factors

ORIFICE DIAMETER	DIAPHRAGM TRAVEL	Cv AT VALVE OPENING - PERCENT OF VALVE STEM TRAVEL
mm (Inch)	mm (Inch)	100
0.635 (0.025)	0.177 (0.007)	0.01
1.60 (0.063)		0.03
7.92 (0.312)		0.10
7.92 (0.312)	0.381 (0.015)	0.30
13.2 (0.520)	0.304 (0.012)	0.50
13.2 (0.520)	0.381 (0.015)	0.70

Table 2. Materials of Construction

Key Number	Description	Material
1	Valve Body	S31600 SST, standard / ASTM B575 N06022, optional
2	Bonnet Yoke	S31600 SST
3	Piston Subassembly	S30300 SST and FKM (Fluorocarbon)
4	Bearing Cartridge Subassembly	Stainless Steel and PTFE (Polytetrafluoroethylene)
5	Closure Diaphragm	S31600 SST, standard / N10276 Nickel Alloy, optional
6	Seat Spring	ASTM B575 N06022
7	Wave Spring	S17700 SST
8	Bonnet	ASTM A743 CF8
9	Drive Nut, Yoke	S30400 SST
10	Plunger	ASTM A276 S31600 Condition A
13	Allen head Bolts	Stainless Steel (18-8 SST)
14	O-Ring, Plunger	FKM (Fluorocarbon)
15	O-Ring	PTFE, FDA 21 CFR 177 (Polytetrafluoroethylene)
27	Jam Nut	Stainless Steel (18-8 SST)
49	O-Ring	FKM (Fluorocarbon)
58	Travel Indicator Disk	ASTM A240 S30400

Table 3. Technical Specifications

VALVE BODY RATING		18.9 bar CWP (275 psi CWP)
NOMINAL SIZE		6.35 mm or 12.7 mm (NPS 1/4 or 1/2)
CONNECTIONS		NPT (Flanged or Welded Ends Optional)
SEAT LEAKAGE		ASME/FCI 70-2, Class IV
BONNET		Bolted
CHARACTERISTIC		Modified Equal Percentage
MAXIMUM OPERATING TEMPERATURE		177°C (350°F)
WEIGHTS	**6.35 mm (1/4 inch)**	1.35 kg (3 lbs)
	12.7 mm (1/2 inch)	1.82 kg (4 lbs)

Table 4. Model Numbering System

81						2					
81000	Maximum Cv			End Connections		Bonnet Construction		Valve Body Material		Valve Body Style	
		Cv	Kv								
	3	0.01	0.009	0	Screwed (NPT) / Flangeless	2	Bolted	S	316 SST	A	Angle
	4	0.03	0.026	3	Special			H	N06022 Nickel Alloy	I	Inline
	6	0.10	0.086								
	7	0.30	0.259								
	8	0.50	0.43								
	9	0.70	0.60								

Figure 3. 81000 Angle Valve with Baumann 16 Actuator and FIELDVUE Digital Valve Controller

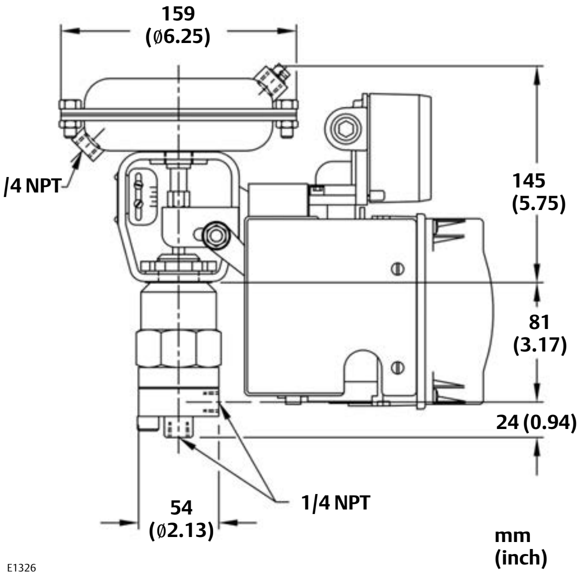
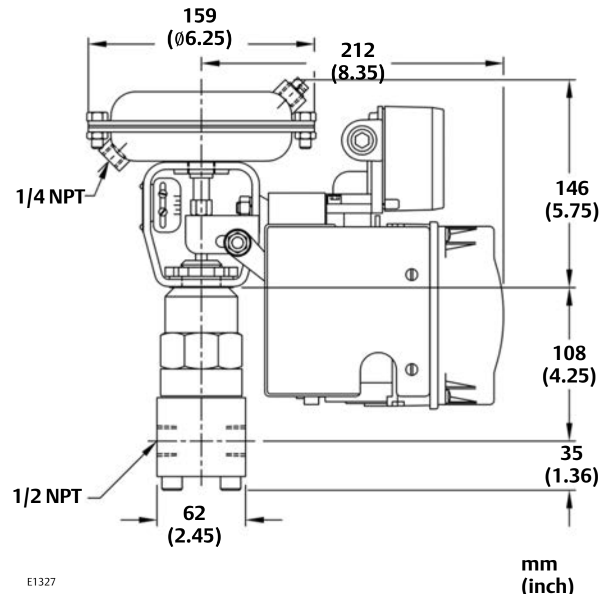


Figure 4. 81000 Inline Valve with Baumann 16 Actuator and FIELDVUE Digital Valve Controller



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Product Bulletin
52.1:83SA
September 2017

Baumann™ 83000 Sanitary Angle Control Valve

The Baumann 83000 sanitary control valve is excellent for the control of high purity fluids or gaseous media. A low-friction-force amplification mechanism, comprised of a roller bearing linkage, produces high-positioning resolution suitable for direct operation from remote I/P signal converters.

The 83000 features a packless design and is intended for laboratory flow rates as low as 0.001 liters per minute (l/m) with a Cv range of 0.00001 to 1.02. This innovative design also allows for clean-in-place (CIP) and sanitize-in-place (SIP) procedures and is self-draining.

W9848

83000 Sanitary Angle Valve with Baumann 16 Actuator

W9849

83000 Sanitary Angle Valve with FIELDVUE DVC2000 Digital Valve Controller

Features

- Compact and light-weight design reduces installed piping costs.
- NPS 1/2 tri-clamp end connections standard with optional welded connections.
- Electropolished wetted interior finished to $\leq$ 30 Ra microinch ($\leq$ 20 Ra microinch optional).
- Self-draining designed for Clean-in-Place (CIP) and Sanitize-in-Place (SIP).
- Closure diaphragm is polished 316 stainless steel; Quick-Disconnect bonnet aids closure diaphragm replacement.
- Fisher™ FIELDVUE™ digital valve controller available for remote calibration and diagnostics in facilities utilizing the PlantWeb™ architecture.
- Elastomer seals meet FDA and USP CLVI requirements.

Specifications

See table 3 for technical specifications.

Figure 1. 83000 for Baumann 16 Actuator

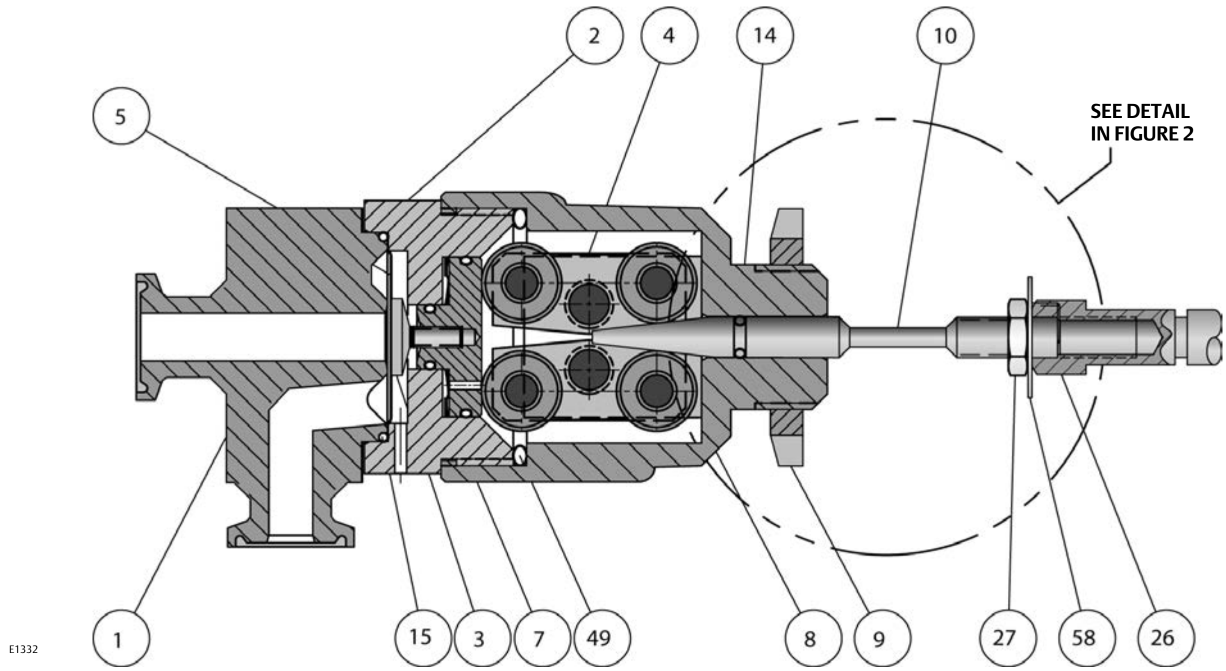


Figure 2. 83000 with Stem Adaptor for Baumann 32 Actuator

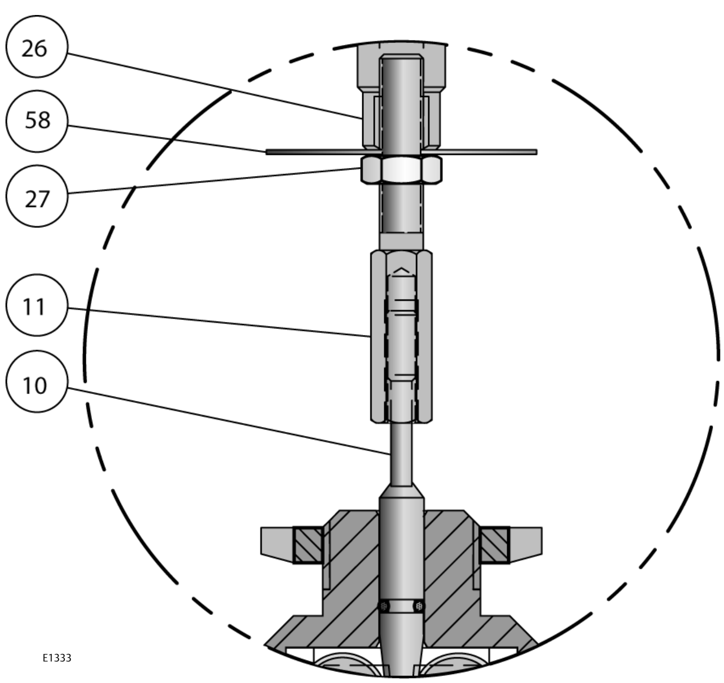


Figure 3. Baumann 83000 - Rotated View to Show Locking Bolts

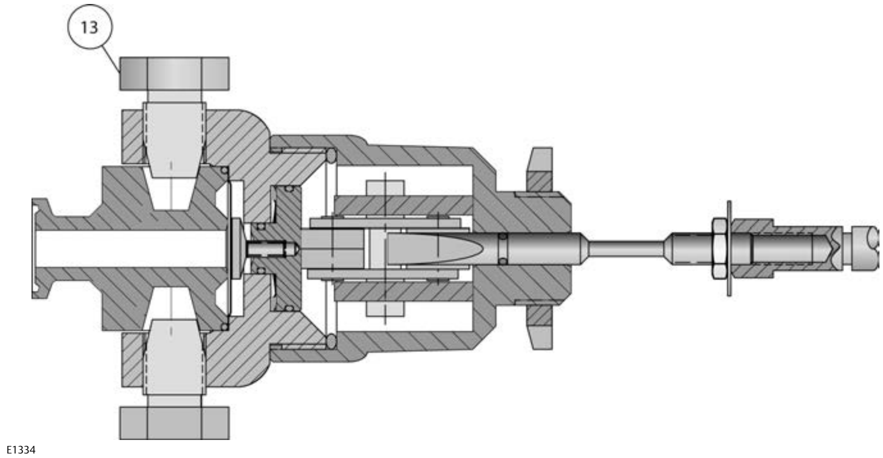


Table 1. Materials of Construction

Key Number	Description	Material
1	Valve Body	ASME A479 S31600/S31603
2	Bonnet Yoke	S30400 SST
3	Piston Subassembly	S30300 SST and FKM (Fluorocarbon)
4	Bearing Cartridge Subassembly	Stainless Steel and PTFE (Polytetrafluoroethylene)
5	Closure Diaphragm	S31600 SST, standard / N10276 Nickel Alloy, optional
7	Wave Spring	S17700 SST
8	Bonnet	ASTM A743 CF8
9	Drive Nut, Yoke	S30400 SST
10	Plunger	ASTM A276 S31600 Condition A
11	Actuator Stem Adapter for Baumann 32	A582 S30300 Stainless Steel
13	Locking Bolt (Refer to Figure 3)	S21800 SST
14	O-Ring, Plunger	FKM (Fluorocarbon)
15	O-Ring, Body	EPDM
27	Jam Nut, Baumann 16 Actuator	Stainless Steel (18-8 SST)
	Jam Nut, Baumann 32 Actuator	S30400 SST
49	O-Ring	FKM (Fluorocarbon)
58	Travel Indicator Disk	ASTM A240 S30400

Table 2. Flow Coefficients (Cv Values)(1)

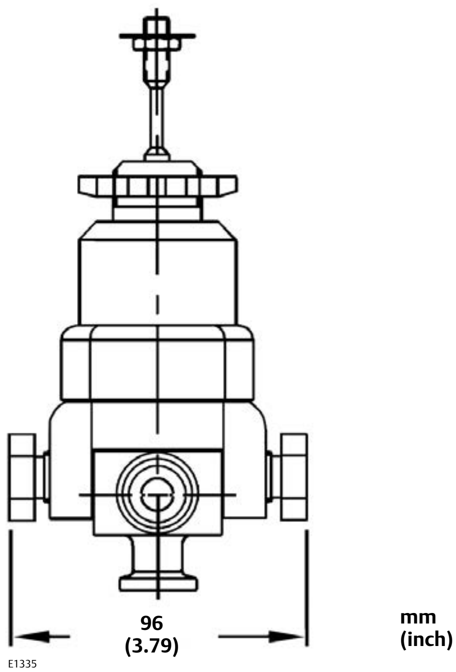
ORIFICE DIAMETER	DIAPHRAGM TRAVEL	Cv AT VALVE OPENING - PERCENT OF VALVE STEM TRAVEL
mm (Inch)	mm (Inch)	100
0.686 (0.027)	0.177 (0.007)	0.014
1.60 (0.063)		0.053
3.81 (0.150)		0.182
3.81 (0.150)	0.381 (0.015)	0.427
9.40 (0.370)	0.304 (0.012)	0.631
9.40 (0.370)	0.381 (0.015)	1.02

1. See Fisher Catalog 12 for a full range of flow and sizing information.

Table 3. Technical Specifications

VALVE BODY RATING	18.9 bar CWP (275 psi CWP)
NOMINAL SIZE	12.7 mm (NPS 1/2)
CONNECTIONS	Tri-Clamp, Standard / Welded Ends, Optional
SEAT LEAKAGE	ASME/FCI 70-2, Class IV
BONNET	Quick Disconnect
CHARACTERISTIC	Modified Equal Percentage
INTERNAL VALVE BODY FINISH	≤ 30 Ra microinch, Standard / ≤ 20 Ra microinch Optional
MAXIMUM OPERATING TEMPERATURE	177°C (350°F)
WEIGHT	1.82 kg (4 lbs)

Figure 4. Valve Body Subassembly



Note

The Baumann 16 actuator requires 77 mm (3 inches) vertical clearance. The Baumann 32 actuator requires 115 mm (4.5 inches) vertical clearance.

WARNING

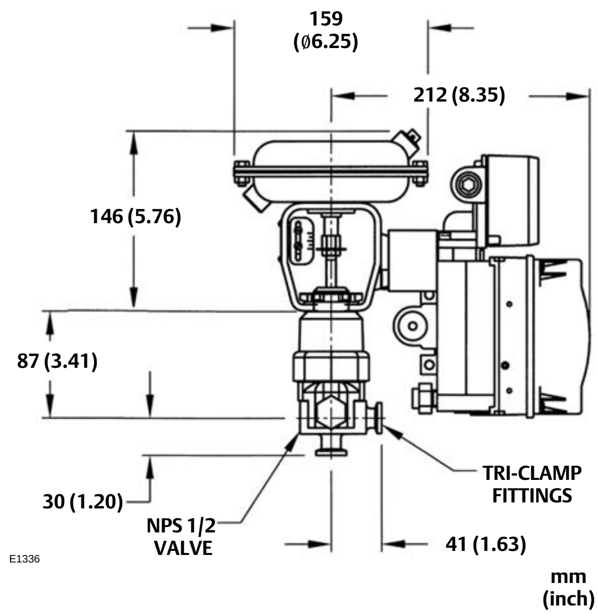
To prevent property damage or personal injury, you must use an actuator support when purchasing an actuator with a FIELDVUE digital valve controller and mounting sideways.

Table 4. Model Numbering System

83						SA	
83000	Maximum Cv			End Connections		Valve Body Style	
		Cv	Kv				
	3	0.014	0.012	11	Tri-Clamp	SA	Angle
	4	0.053	0.046	12	Welded Ends		
	6	0.182	0.157				
	7	0.427	0.369				
	8	0.631	0.546				
	9	1.02	0.882				

1. Contact your Emerson sales office or Local Business Partner.

Figure 5. 83000 with Baumann 16 Actuator and FIELDVUE Digital Valve Controller



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Baumann™ 84000 Sanitary Control Valves

The Baumann 84000 sanitary control valves are designed to satisfy the stringent demands of the pharmaceutical and biotechnology industries. These valves are in compliance with 3A Sanitary Standards Inc. requirements. Incorporating reliable class III diaphragm technology, the 84000 valves can handle temperatures up to 160°C (320°F). The uniquely shaped diaphragm, unlike plug style sanitary valves, results in low shear forces in the flow stream, minimizing possible damage to delicate bio-media or altering the consistency of end product.

W9838

84000 Inline Sanitary Valve with Baumann 32 Actuator

W9839

84000 Angle Sanitary Valve with Baumann 32 Actuator and FIELDVUE DVC2000 Digital Valve Controller

W9840

84000 Angle Sanitary Valve with Baumann 54 Actuator and FIELDVUE Digital Valve Controller

Features

- Electropolished internal surfaces
- USP 24 Class VI PTFE, EPDM backed diaphragms are marked in accordance with ASME BPE for material identification and traceability.
- Designed for Clean-in-Place (CIP) and Sanitize-in-Place (SIP) service
- Self-draining in preferred mounting mode
- Compact size, see figure 9 and tables 5 to 6
- Stainless steel spring case and yoke available
- Fisher™ FIELDVUE™ digital valve controller available for remote calibration and diagnostics

Figure 1. Baumann 84000 NPS 1 Angle Valve Body Sub-Assembly

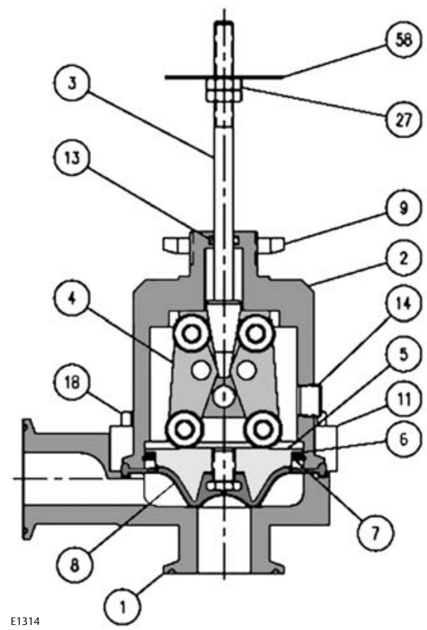


Figure 2. Baumann 84000 NPS 1 Inline Valve Body Sub-Assembly

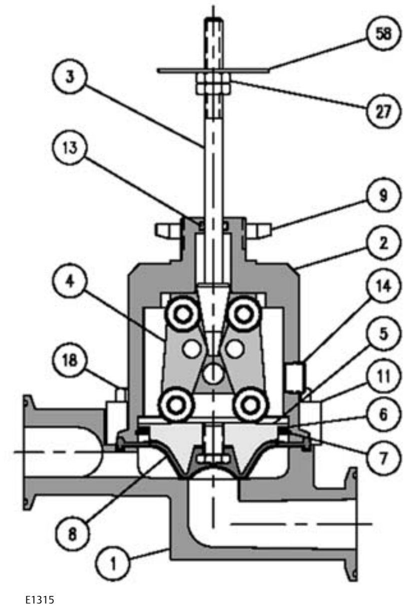


Table 1. Materials of Construction for NPS 1 Angle and Inline Valves

Key Number	Description	Material
1	Valve Body	ASME SA-479 S31603 stainless steel, annealed
2	Bonnet	ASME SA-479 S30400 Annealed
3	Piston Stem Sub-assembly	Stainless Steel
4	Drive Mechanism Sub-assembly	Multiple (predominantly stainless steel)
5	Compressor	S30300 or S30400 stainless steel
6	Wave Spring	S17700 stainless steel
7	Retaining Ring	S30200 stainless steel
8	Diaphragm, Closure Member	PTFE (FDA 21 CFR 177.1550 & USP CL VI compliant) face with Aramid fabric reinforced EPDM (FDA 21 CFR 177.2600 & USP CL VI compliant) backing and S30400 stainless steel insert
9	Drive Nut, Actuator Yoke	S30400 stainless steel
11	Bonnet Flange	ASTM A240 S30400 stainless steel
13	O-Ring, Stem	FKM fluorocarbon
14	Tell Tale Port	S31600 stainless steel
18	Hex Head Cap Screw	Grade B8, Class 1
27	Locknuts	S30400 stainless steel
58	Travel Indicator	S30400 stainless steel

Figure 3. Baumann 84000 NPS 1-1/2 and 2 Angle Valve Body Sub-Assembly

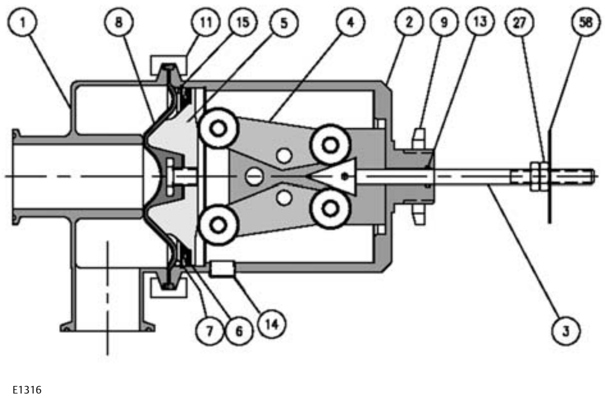


Figure 4. Baumann 84000 Linkage Mechanism

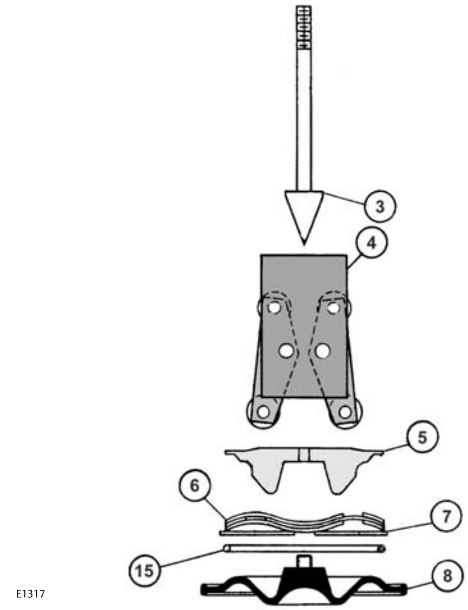


Table 2. Materials of Construction for NPS 1-1/2 and 2 Angle Valves

Key Number	Description	Material
1	Valve Body	ASME SA-479 S31603 stainless steel, annealed
2	Bonnet	ASME SA-479 S30400 Annealed
3	Piston Stem Sub-assembly	Stainless Steel
4	Drive Mechanism Sub-assembly	Multiple (predominantly stainless steel)
5	Compressor	S30300 or S30400 stainless steel
6	Wave Spring	S17700 stainless steel
7	Retaining Ring	S30200 stainless steel
8	Diaphragm, Closure Member	PTFE face with Aramid fabric reinforced EPDM backing and S30400 stainless steel insert. Diaphragm assembly conforms to FDA 21CFR 177.1550 and USP24 Class VI standards.
9	Drive Nut, Actuator Yoke	S30400 stainless steel
11	Clamp	S30400 stainless steel
13	O-Ring, Stem	FKM fluorocarbon
14	Tell Tale Port	S31600 stainless steel
15	O-Ring	EPDM, conforming to FDA 21CFR 177.1550
27	Locknuts	S30400 stainless steel
58	Travel Indicator	S30400 stainless steel

Table 3. Cv Values at Percent Plug Opening(1)

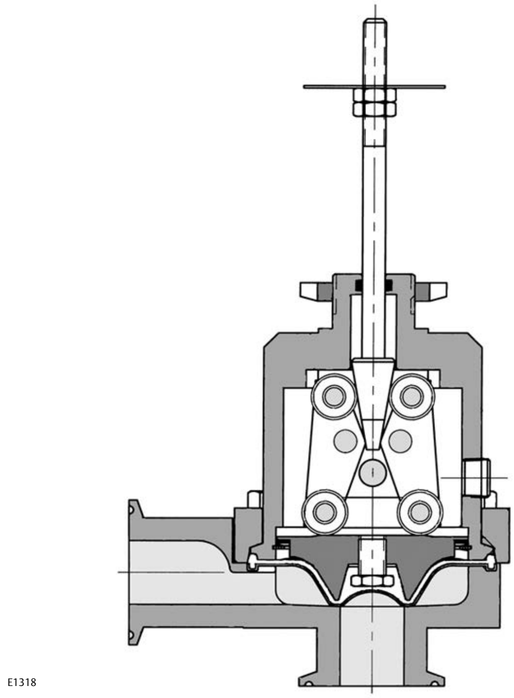
VALVE SIZE	FLOW DIRECTION(2)	ACTUATOR TRAVEL	Cv VERSUS PERCENT OF ACTUATOR TRAVEL OPEN
NPS		Inches	100
1 Angle & Inline	A to B or B to A	0.50	2.00
		0.50	4.00
		0.75	8.00
1-1/2 Angle	A to B	0.50	21.7
		0.75	29.6
	B to A	0.50	17.1
		0.75	24.2
2 Angle	A to B	0.50	29.4
		0.75	42.6
	B to A	0.50	23.5
		0.75	32.5

1. See Fisher Catalog 12 for a full range of flow and sizing information.
2. Flow A to B is recommended for low discharge pressure. Low discharge pressure being defined as near or below atmospheric pressure.

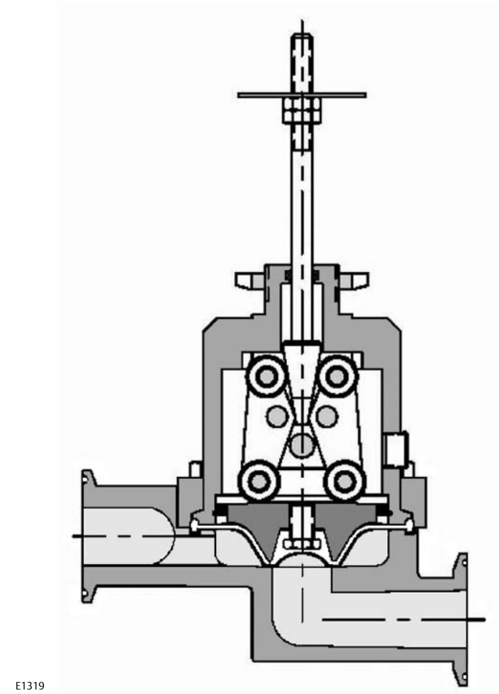
Table 4. Technical Specifications

VALVE SIZE			NPS 1 Angle & Inline			NPS 1-1/2 Angle		NPS 2 Angle	
RATED	Installed with flow from Port A to B	Cv	2	4	8	22	30	29	43
		Kv	1.72	3.44	6.88	18.92	25.8	24.94	36.98
	Installed with flow from Port B to A	Cv	2	4	8	17	24	24	32
		Kv	1.72	3.44	6.88	14.62	20.64	20.64	27.52
TRAVEL		mm	12.7	12.7	19.05	12.7	19.05	12.7	19.05
		inches	0.50	0.50	0.75	0.50	0.75	0.50	0.75
BONNET			Bolted			Clamped			
ACTUATOR TYPE			32 or 54			54			
RANGEABILITY			100:1						
CHARACTERISTIC			Modified Equal Percentage						
SEAT LEAKAGE			ASME/FCI 70-2, Class VI						
MAXIMUM OPERATING PRESSURE			10.34 bar (150 Psi)						
MAXIMUM OPERATING TEMPERATURE			160°C (320°F)						
INTERNAL BODY FINISH (WETTED INTERIOR)			< 30 Ra Microinch / 0.76 Ra Micron (standard) < 20 Ra Microinch / 0.51 Ra Micron (optional - or as required)						
END CONNECTIONS			Sanitary (optional welded ends)						

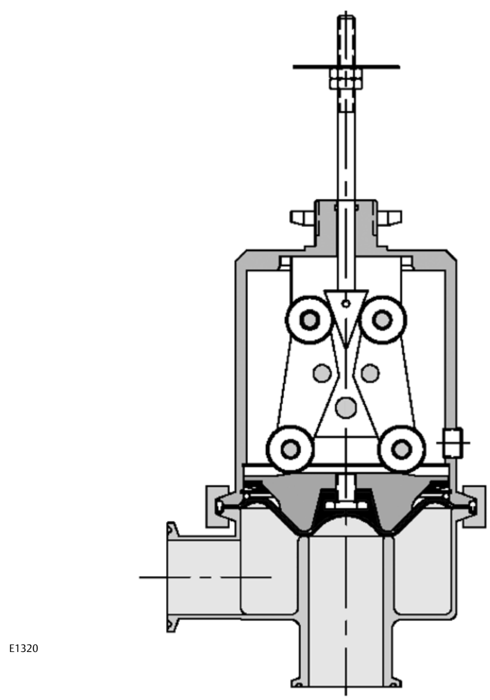
Figure 5. Preferred Flow Directions for Self-Draining



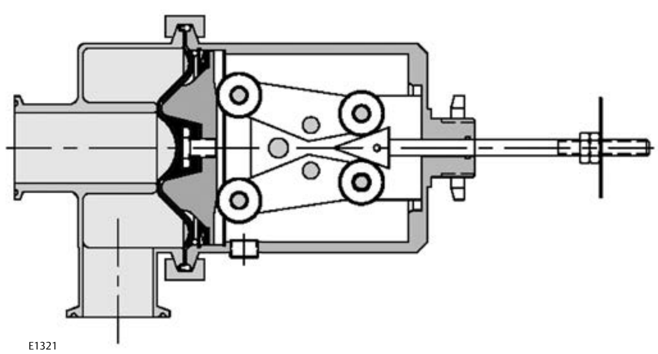
NPS 1 ANGLE VALVE BODY POSITIONED FOR FORWARD FLOW SELF DRAINING FROM PORT A TO B



NPS 1 INLINE VALVE BODY POSITIONED FOR FORWARD FLOW SELF DRAINING FROM PORT A TO B

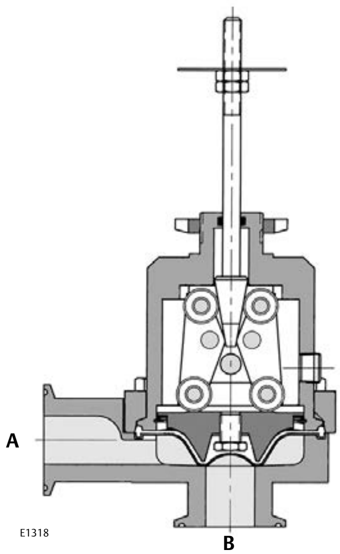


NPS 1-1/2 AND 2 ANGLE VALVE BODY (RECOMMENDED FOR PROCESSES WHERE ATMOSPHERIC OR SLIGHT VACUUM IS PRESENT DOWNSTREAM OF PORT B) [PORTS A AND B MUST BE DRAINED SEPARATELY]

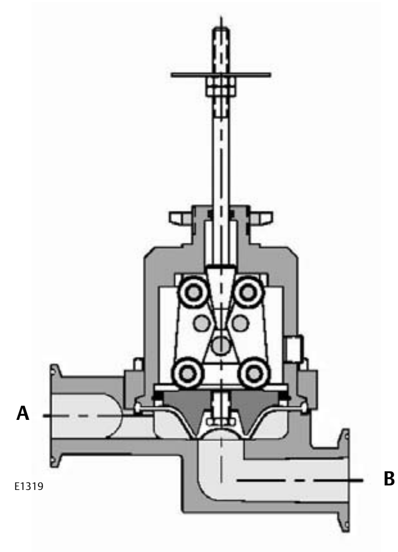


NPS 1-1/2 AND 2 ANGLE VALVE BODY POSITIONED FOR SELF DRAINING FROM PORT B TO A

Figure 6. NPS 1 Angle and Inline Valve Body Orientations

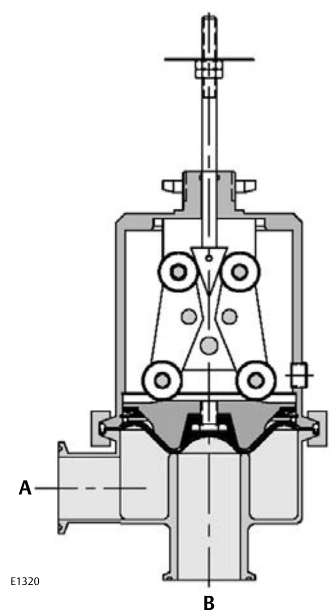


NPS 1 ANGLE VALVE BODY POSITIONED FOR FORWARD FLOW SELF DRAINING FROM PORT A TO B



NPS 1 INLINE VALVE BODY POSITIONED FOR FORWARD FLOW SELF DRAINING FROM PORT A TO B

Figure 7. NPS 1-1/2 and 2 Angle Valve Body



RECOMMENDED FOR PROCESSES WHERE ATMOSPHERIC OR SLIGHT VACUUM IS PRESENT DOWNSTREAM OF PORT B. (PORTS A AND B MUST BE DRAINED SEPARATELY)

Figure 8. NPS 1-1/2 and 2 Angle Valve Body Positioned for Self Draining from Port B to A

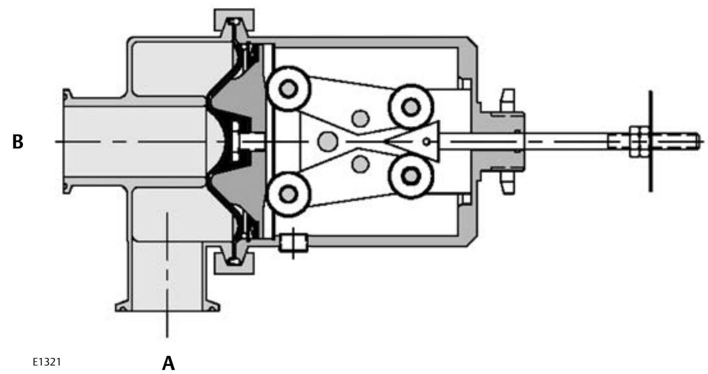
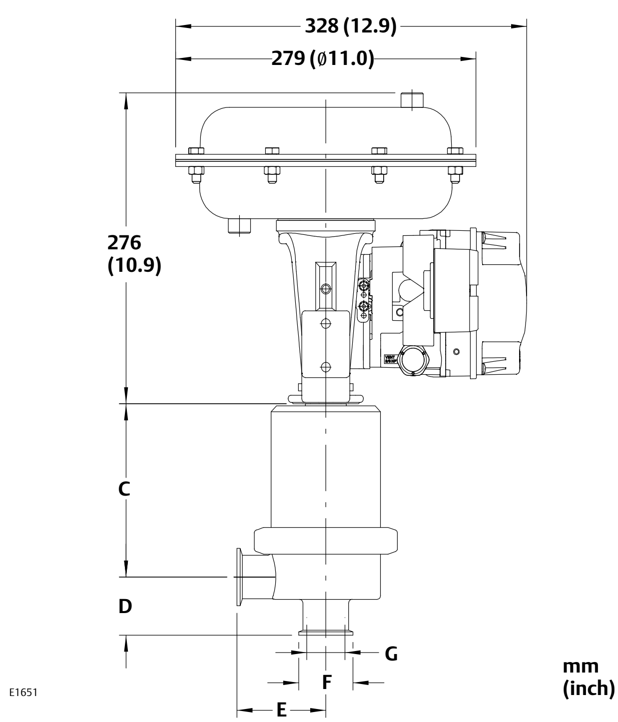


Table 5. Valve Assembly

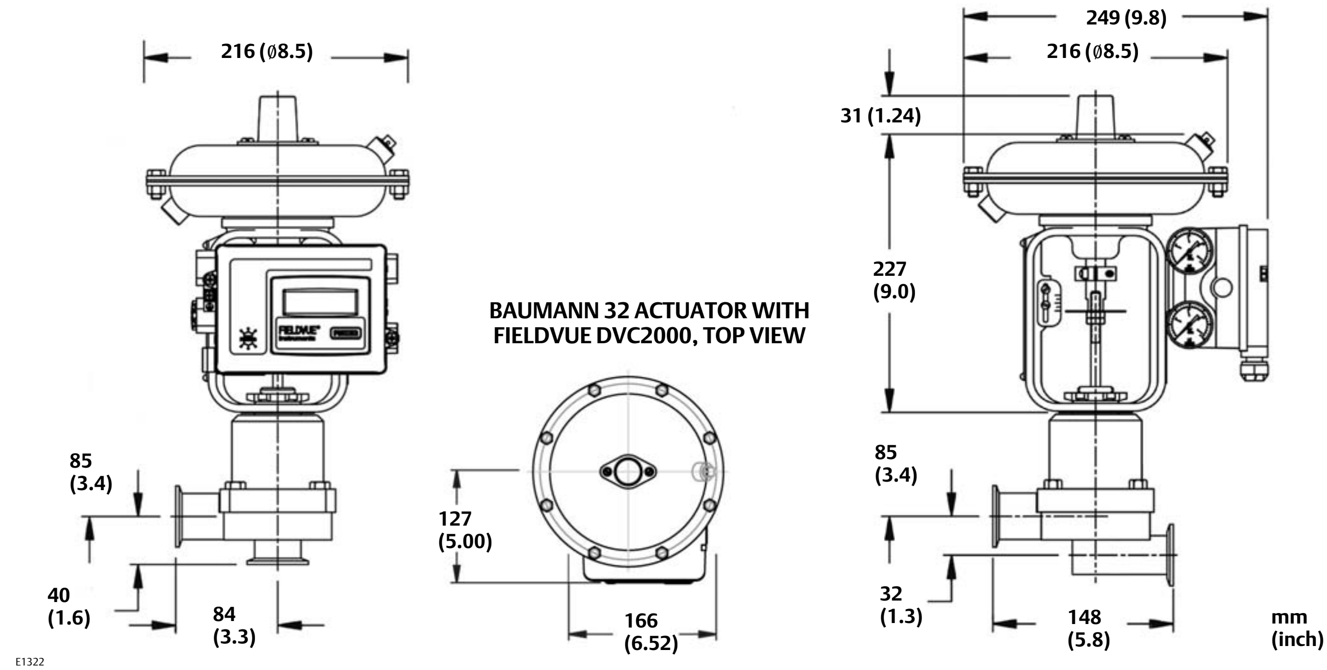
VALVE SIZE		84000 ANGLE ASSEMBLY		84000 IN-LINE ASSEMBLY	
DN	NPS	kgs	lbs	kgs	lbs
25	1	4.06	9.0	4.31	9.5
40	1-1/2	5.22	11.5	N/A	
50	2	5.22	11.5	N/A	

Figure 9. Dimensional Drawing for Baumann 84000 NPS 1-1/2 and 2 Angle Valve with FIELDVUE Digital Valve Controller



Note: Actuator removal requires 115mm (4.5 inches) vertical clearance.

Figure 10. Dimensional Drawings for Baumann 84000 NPS 1 Angle and Inline Valves



84000 ANGLE VALVE BODY WITH BAUMANN 32 ACTUATOR ATC/FO ACTION, DUAL STOP AND FIELDVUE DVC2000 DIGITAL VALVE CONTROLLER

84000 INLINE VALVE BODY WITH BAUMANN 32 ACTUATOR ATC/FC ACTION, DUAL STOP AND 3660/3661 POSITIONER

Table 6. Valve Assembly and Actuator Weights

VALVE SIZE		C		D		E		F		G	
DN	NPS	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
40	1-1/2	152.4	6.0	50.8	2.00	82.55	3.25	50.39	1.984	34.44	1.356
50	2	160	6.3	50.8	2.00	88.9	3.50	63.9	2.516	47.63	1.875

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EMERSON

85000 Valve
D103535X012

Product Bulletin
52.1:85000
September 2017

Baumann™ 85000 Sanitary Pinch Valve

Baumann 85000 sanitary pinch valves are intended for use with 3/4 inch O.D. pharmaceutical grade tubing. They are designed to couple FIELDVUE™ intelligence with a linear actuator and tube shell.

The 85000 is designed for use in both biotechnology and pharmaceutical industries, where cleanliness and sterility are required. The primary use is for disposable skid-based processes, replacing traditional manually operated valves. Automated valves offer consistent quality, better record keeping, and improved batch control.

Lab testing resulted in a max capacity of 6.5 C_V achieved with standard pharmaceutical grade tubing.

Baumann 85000 Sanitary Pinch Valve with Fisher FIELDVUE DVC2000 Digital Valve Controller

Features

- Characterization of the Fisher™ FIELDVUE digital valve controller provides an installed equal percent flow characteristic for precision control (see figure 2)
- The 85000 has no physical contact with the process fluid, due to the use of disposable tubing
- Tube shell design of the 85000 allows for easy changeout of disposable tubing while providing stability during service
- Fail-close configuration
- Compact and light weight design
- Epoxy powder-coated actuator with SST fasteners for maximum corrosion resistance

Figure 1. Baumann 85000 Sanitary Pinch Valve Body Sub-Assembly (also see table 1)

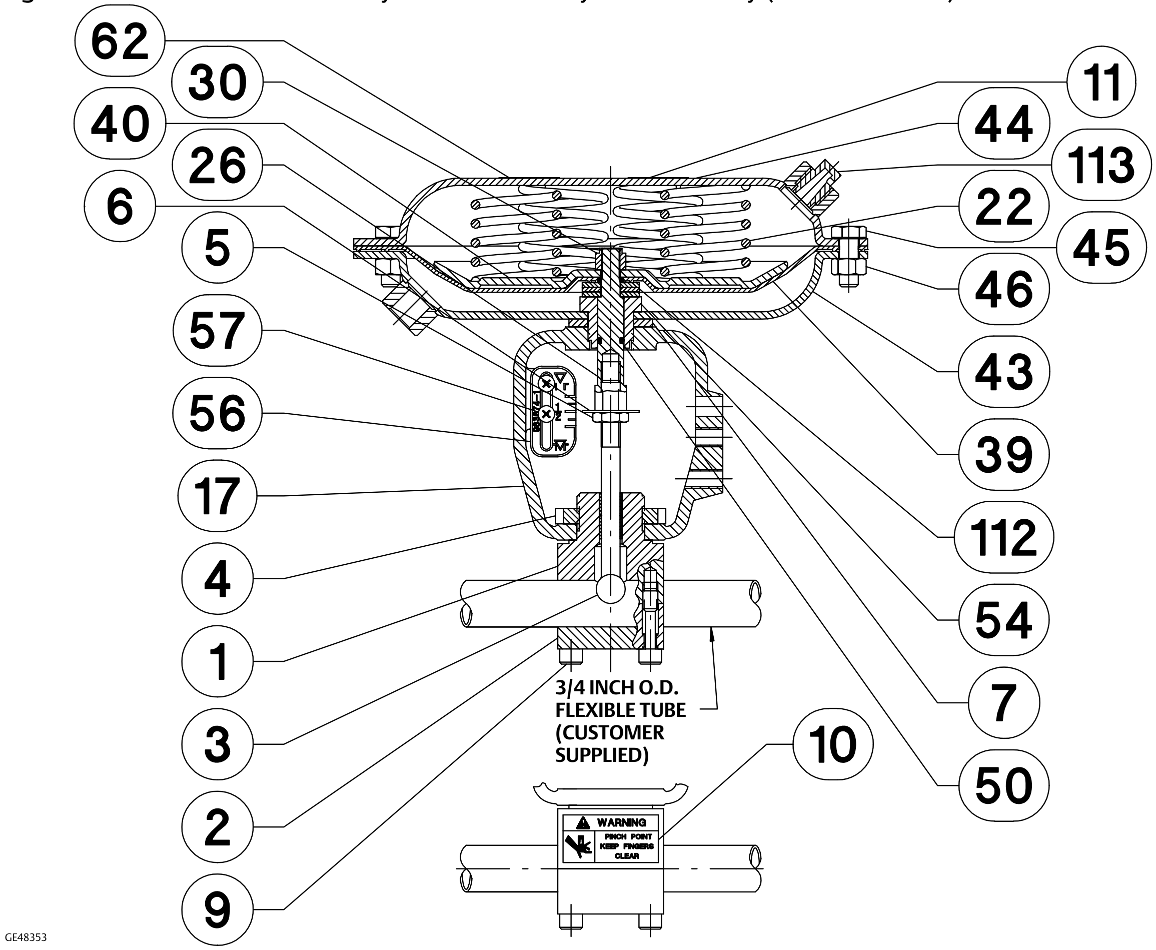

Figure 2. Baumann 85000 Sanitary Pinch Valve Flow Characteristic

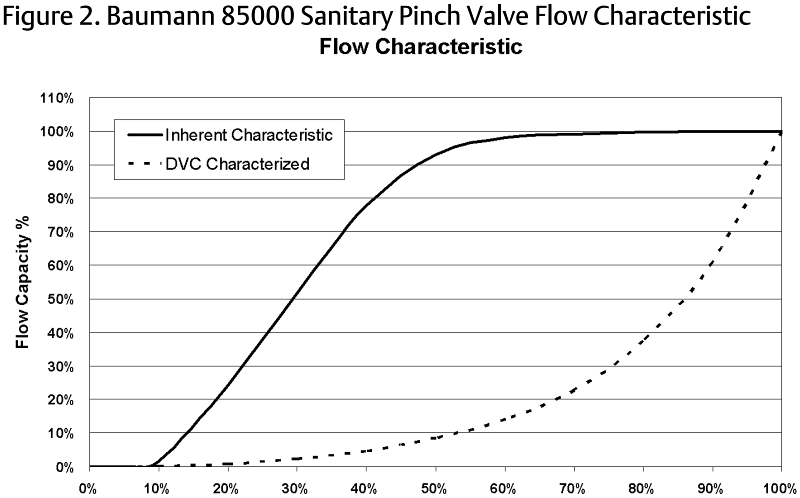

Table 1. Materials of Construction for Baumann 85000 Sanitary Pinch Valve (see figure 1)

Key Number	Description	Material
1	Bonnet Assembly	S31600
2	Valve Body Cradle	S31600
3	Plunger	S31600
4	Yoke Drive Nut	S30400
5	Jam Nut, M8 x 1.25	18-8 SST
6	Travel Indicator Disk	18-8 SST
7	Washer Stop	S30400
9	Cap Screw, Reduced Shank, 1/4-20x1.00	18-8 SST
10	Warning Label - Pinch	Polyester Film
11	Label - Maximum Pressure	Polyester Film
17	Yoke Size 16	CF8M
22	Actuator Spring	High Carbon Spring Wire
26	Actuator Stem	S30300
30	Self Locking Jam Nut, 5/16x24	Cadmium Plated Steel
39	Diaphragm, Size 32 Mini	Nitrile/Polyester
40	Diaphragm Plate, Size 32 Mini	AISI 1010 Stamped Carbon Steel
43	Lower Actuator Case, Size 32 Mini	AISI 1010 Stamped Carbon Steel
44	Upper Actuator Case, Size 32 Mini	AISI 1010 Stamped Carbon Steel
45	Hex Head Cap Screw, 5/16-18x1.00	18-8 SST
46	Hex Nut, 5/16-18	18-8 SST
50	O-Ring	FKM Fluorocarbon
54	Actuator Coupling, Size 16	660 Bronze
56	Travel Scale, 1/2 inch Stroke	1100 Aluminum
57	Pan Head Screw, M3.5x6	18-8 SST
62	Nameplate	18-8 SST
112	Washer	18-8 SST
113	Vent Plug	High Density Polyethelene

Table 2. Technical Specifications

VALVE SIZE		3/4 Inch O.D. Tubing
RATED	Cv	6.5(1)
	Kv	5.6(1)
TRAVEL	inches	0.50
	mm	12.7
BONNET		Lock Nut
ACTUATOR TYPE		32 Mini
CHARACTERISTIC		Quick Opening, Modified Equal Percentage(2)
SEAT LEAKAGE		ASME/FCI 70-2, Class VI(1)
MAXIMUM OPERATING PRESSURE		6.9 bar (100 Psi)(3)
MAXIMUM OPERATING TEMPERATURE		40°C (104°F)(3)

1. May be impacted by grade of tubing. Values presented here are based on pharmaceutical grade tubing, 3/4 inch O.D., 1/2 inch I.D., 72 durometer material with reinforcing braid.
2. Inherent characteristic is quick opening. FIELDVUE digital valve controller may be programmed to provide linear or modified equal percentage characteristic.
3. Selected tubing may require lower pressure/temperature requirements.

Table 3. Actuator Specifications

TYPE	32 Mini Multi-Spring Diaphragm (Single-Acting)
NOMINAL SIZE	32 in^2
AIR FAILURE	Closed
TRAVEL	12.7 mm (0.50 inches)
AMBIENT TEMPERATURE RANGE	-29 to 82°C (-20 to 180°F)
MAXIMUM AIR PRESSURE	2.4 bar (35 psig)

Figure 3. Dimensional Drawing for Baumann 85000 NPS 3/4 Pinch Valve

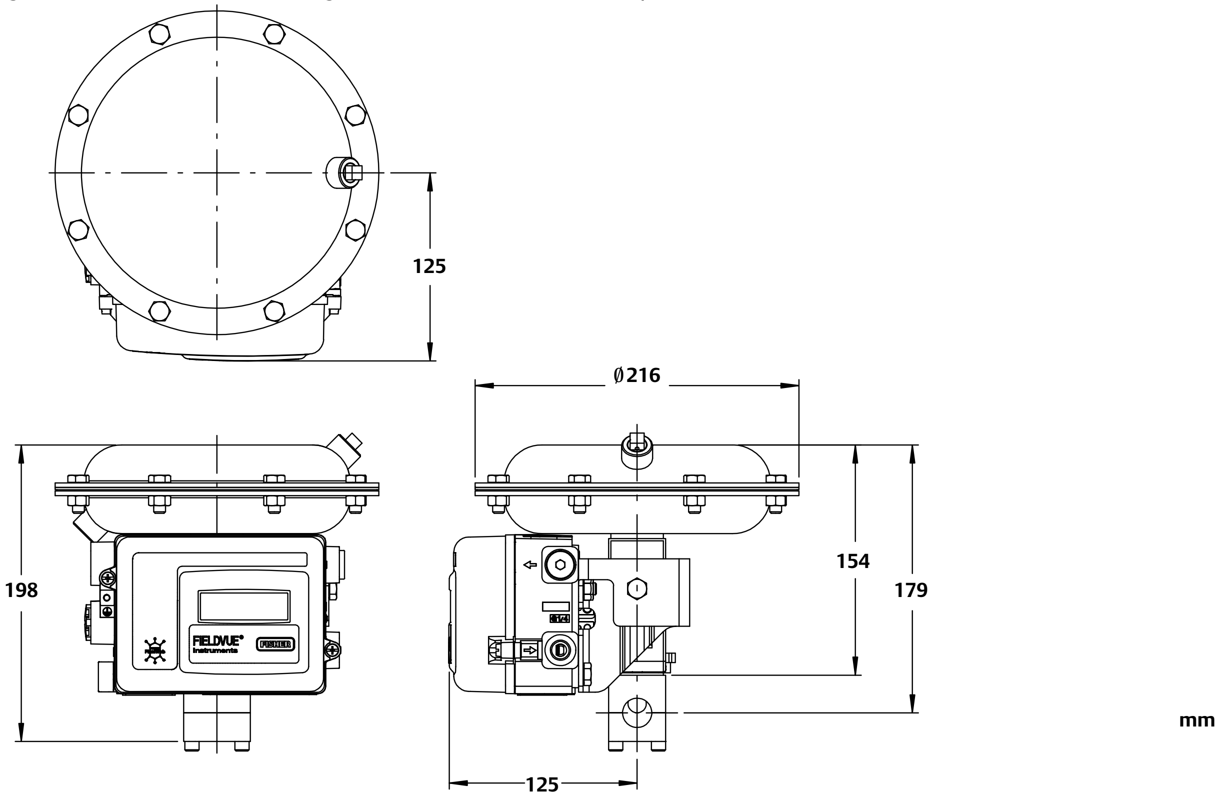

Table 4. Baumann 85000 Valve Assembly and Actuator Weights

VALVE SIZE		85000 VALVE AND ACTUATOR WEIGHT		
DN	NPS	TYPE	kgs	lbs
20	3/4	32 Mini	4.3	9.5

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EMERSON

87000 Valve
D103345X012

Product Bulletin
52.1:87FS
September 2017

Baumann™ 87000 Flexsleev Sanitary Control Valve

The Baumann 87000 control valve is excellent for throttling high purity liquid or gaseous media commonly found in the food and beverage, pharmaceutical, film, and biotechnology industries.

The valve is suitable for repeated steam sterilization cycles with 2.4 bar (35 psi) maximum steam pressures.

Assembly of valve body sections using only two bolts allows for ease of cleaning and inspection. A lower telltale port is provided. The valve will drain either horizontally or vertically with the actuator in the horizontal position. In contrast to diaphragm valves, the operation is not affected by vacuum.

W9823

Baumann 87000 Valve Shown in Recommended Mounting Position for Self-Draining

Features

- Unique flow pattern allows for self-draining in both vertical and horizontal pipelines
- Streamlined low shear flow contours make it ideal for sensitive biomedia
- Electropolished, wetted interior finishes to $\leq$ 30 R_a microinch ($\leq$ 20 R_a microinch optional)
- Flow area between tubing O.D. and valve body seating is suitable for fine particulate media
- Full and reduced port orifices available to optimize sizing
- Foolproof bolting method assists with ease of valve body disassembly and reassembly
- Fisher™ FIELDVUE™ digital valve controller available for remote calibration and diagnostics in facilities utilizing the PlantWeb™ architecture

W9824

Baumann 87000 Valve with FIELDVUE DVC2000 Digital Valve Controller

Figure 1. Baumann 87000 Flexsleev Valve Assembly

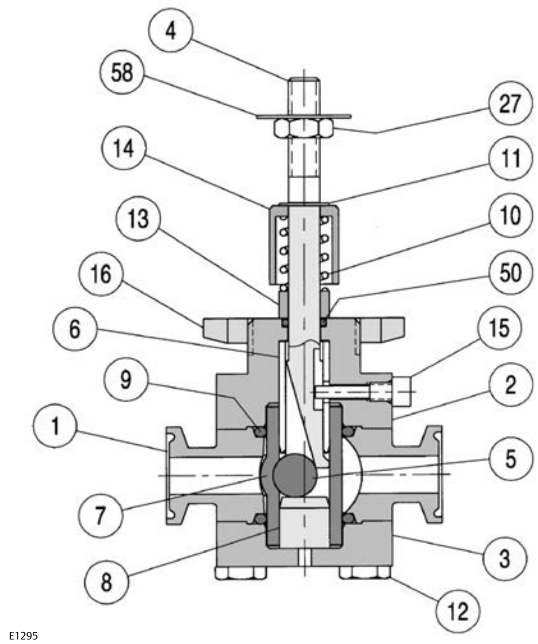


Table 1. Materials of Construction

Key Number	Description	Material
1	Valve Body	ASTM SA479 (S31600/S31603)
2	Bonnet, Upper	ASTM SA479 (S31600/S31603)
3	Bonnet, Lower	ASTM SA479 (S31600/S31603)
4	Shaft	S21800 SST
5	Ceramic Ball	Grade 25 Ceramic
6	Sleeve Bushing	S30300 Stainless Steel
7	Sleeve	Silicone, fluorocarbon (FKM), EPDM, Perfluoroelastomer (FFKM)
8	Anvil	S21800
9	O-Ring	Silicone, fluorocarbon (FKM), EPDM, Perfluoroelastomer (FFKM)
10	Spring Stem	Passivated Stainless Steel
11	Retaining Ring	S15700
12	Hex Head Cap Screw	18-8 Stainless Steel
13	Spring Seat	PA Nylon 6/6
14	Protecting Cap	S30300 Stainless Steel
15	Alignment Pin	18-8 Stainless Steel
16	Drive Nut, (Yoke)	S31600 SST (ASTM A194 Grade 8M)
27	Jam Nut (locknut)	B8 Stainless Steel
50	O-Ring	Fluorocarbon (FKM)
58	Travel Indicator	ASTM A240 S30400

Mode of Operation

As shown in figure 2, a flexible sleeve is inserted through the length of the valve and sealed between the valve body and bonnet by O-rings. The actuator-motivated valve stem has a tapered groove that pushes a ceramic ball against the inside of the sleeve and, thereby, the sleeve against a valve seat.

Figure 2. Mode of Operation

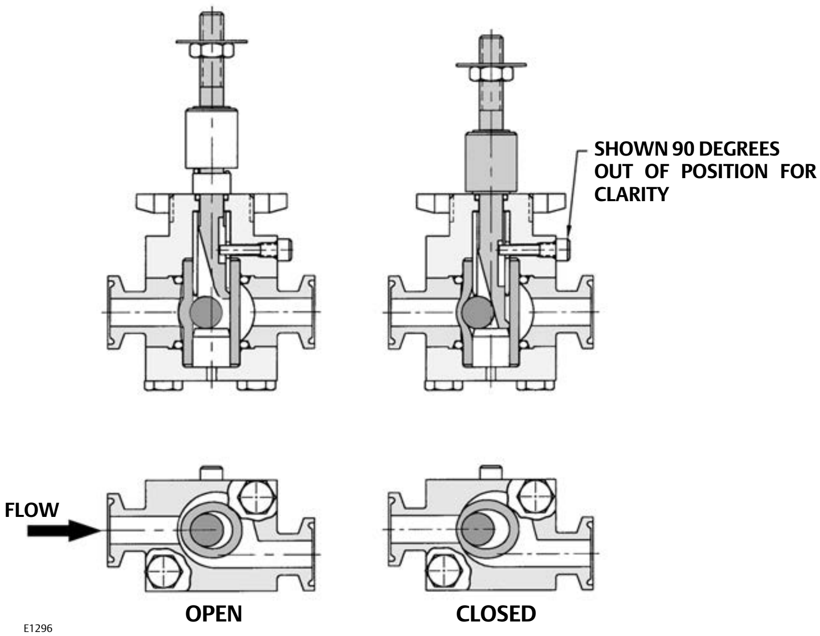


Table 2. Technical Specifications

Valve Body Rating	18.9 bar CWP (275 psi CWP)
Nominal Size	17.7 mm (NPS 1/2)
Connections	17.7 mm (0.5 inch), Tri-Clover / Tri-Clamp (Welded Ends Optional)
Seat Leakage	Class VI
Bonnet	Bolted
Characteristic	Modified Linear
Internal Valve Body Finish (Wetted Interior)	< 30 Ra Microinch / 0.76 Ra Micron (standard) < 20 Ra Microinch / 0.51 Ra Micron (optional - or as required)
Maximum Operating Temperature	Refer to table 3
Available Certificates(1)	USP CL VI, 21CFR 177(1)

1. Consult your Emerson sales office or Local Business Partner for applicable materials.

Table 3. Sleeve Material Temperature Chart

SLEEVE MATERIAL(1)	TEMPERATURE RANGE(3)	SEAT LEAKAGE	FLOW DIRECTION	MAXIMUM SHUTOFF PRESSURE	
				psi	bar
Silicone	-62 to 232°C (-80 to 450°F)	VI	To Open	150	10.35
Silicone (steam)	-17 to 135°C (0 to 275°F)				
Fluorocarbon (general service)	-17 to 204°C (-0 to 400°F)				
Fluorocarbon (water or steam service)	-17 to 37°C (-0 to 100°F)				
EPDM	-40 to 148°C (-40 to 300°F)				
Perfluoroelastomer(2)	-17 to 248°C (-0 to 480°F)				

1. Medical grade in compliance with FDA 21CFR 177.
2. Please consult your Emerson sales office or Local Business Partner before ordering perfluoroelastomer.
3. Sleeve material temperature limitations may reduce allowable shutoff pressures.

Table 4. Flow Coefficients (ASME/ISA/IEC) and ISA Sizing Factors(1)

PLUG TRAVEL mm (INCH)	ORIFICE DIAMETER mm (INCH)	C_V AT VALVE OPENING - PERCENT OF PLUG TRAVEL
		100
7.9 (0.3125)	3.18 (0.125)	0.25
	9.40 (0.370)	1.25

1. See Fisher Catalog 12 for a full range of flow and sizing information.

Table 5. Model Numbering System

87							
87000	MAX C_V			END CONNECTIONS		SLEEVE MATERIAL	
		C_V	K_V				
	00	0.25	0.22	1	Tri-Clamp	S	Silicone
	01	1.25	1.08	3	Special	E	EPDM
						V	Fluorocarbon
						K	Perfluoroelastomer(1)

1. Consult your Emerson sales office or Local Business Partner.

Figure 3. 87000 Dimensions

87000 WITH BAUMANN 16 ACTUATOR AND FIELDVUE DVC2000 SHOWN IN RECOMMENDED MOUNTING POSITION FOR SELF-DRAINING (TOP VIEW SHOWN AT RIGHT)

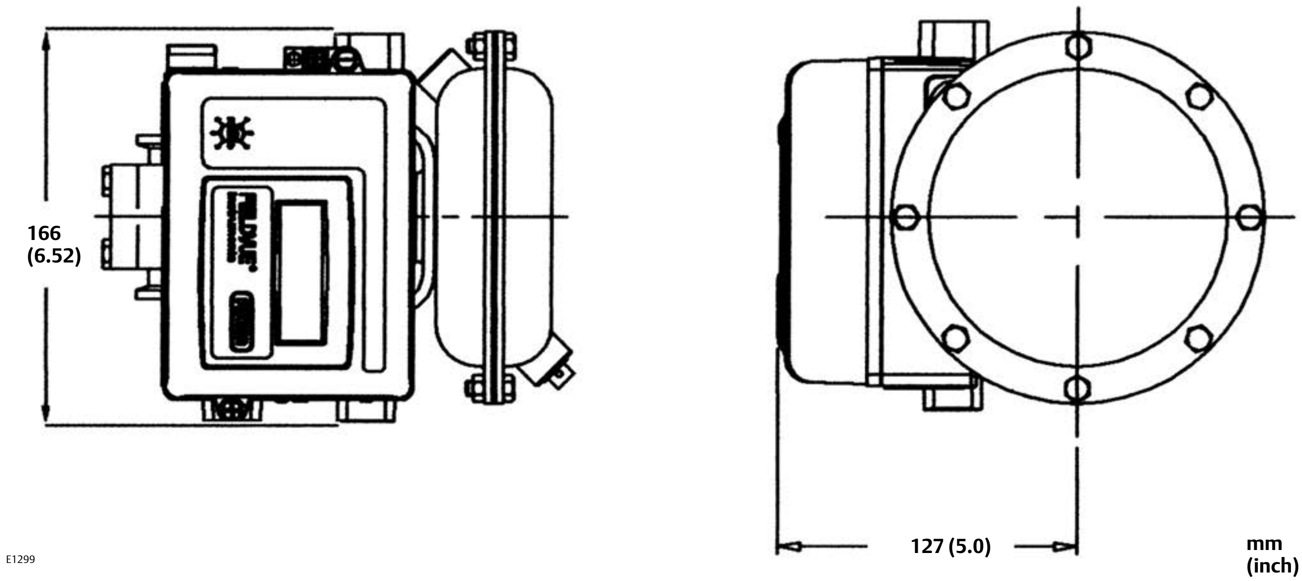
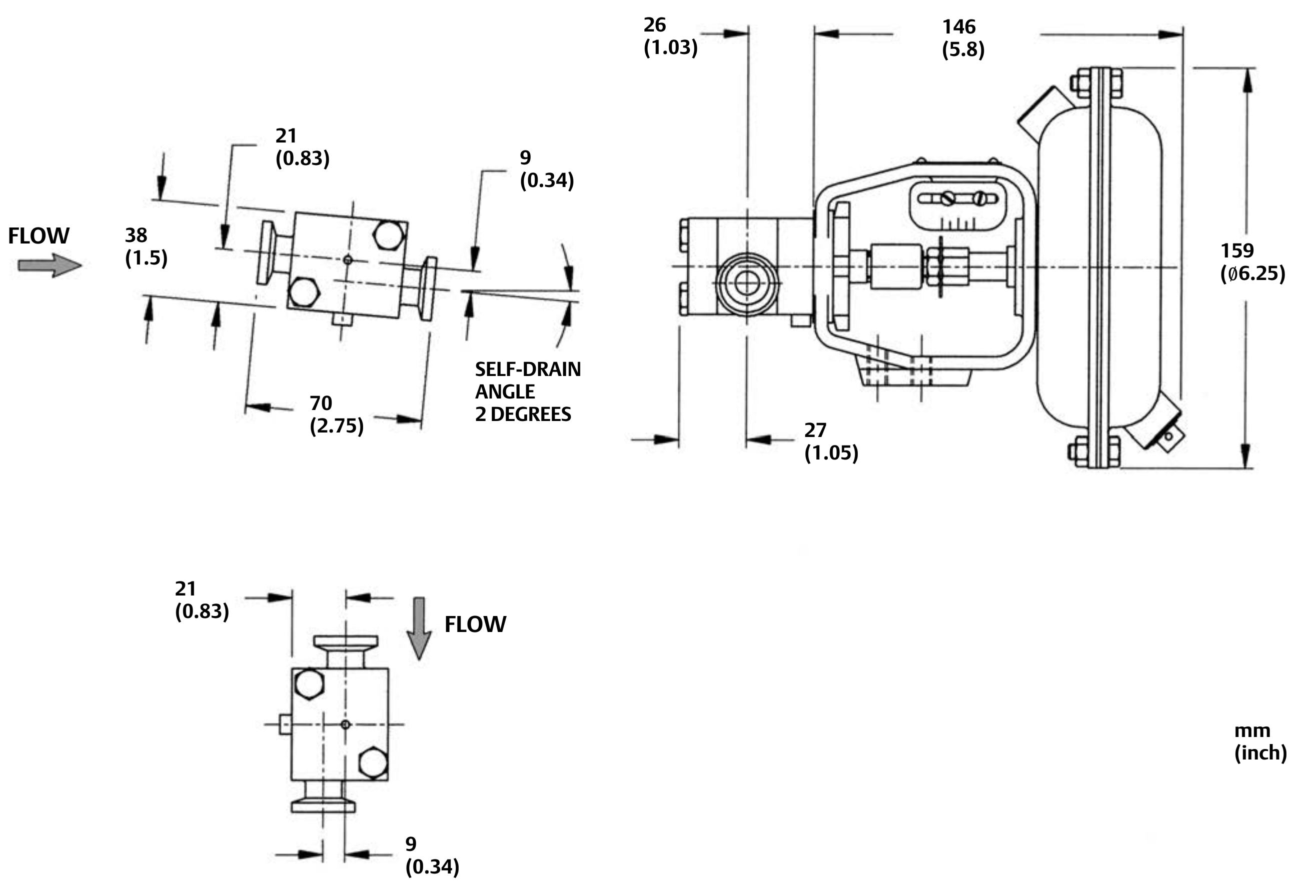


Figure 4. 87000 Dimensions

87000 WITH BAUMANN 16 ACTUATOR SHOWN IN RECOMMENDED MOUNTING POSITION FOR SELF-DRAINING



RECOMMENDED MOUNTING FOR SELF-DRAINING (ACTUATOR SHOULD BE MOUNTED HORIZONTALLY)

E1297

NOTE: ACTUATOR REQUIRES 115mm (4.5 INCHES) VERTICAL CLEARANCE.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
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Dubai, United Arab Emirates
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Baumann™ 89000 Sanitary Control Valve

Baumann 89000 sanitary control valves provide control solutions for various sanitary process systems. These valves meet FDA and USP CLVI standards. All metal parts in contact with the media are made of S31603 stainless steel and each valve comes standard with a stainless steel actuator to resist corrosion from caustic wash down.

The 89000 control valve is designed for use in a wide range of applications in many industries, including biotechnology, pharmaceutical, food & beverage, cosmetics, and others where cleanliness and sterility are required. The valves have a modular design allowing for quick assembly and easy maintenance and calibration.

W9850

Baumann 89000 NPS 1/2 Sanitary Control Valve Shown with FIELDVUE DVC2000 Digital Valve Controller

Features

- Sizes ranging from NPS 1/2 to 6
- Elastomers meet FDA and USP CLVI standards
- Internal surface finish of 20 Ra (0.5 μm) available
- Stainless steel diaphragm actuators with an electropolish finish come standard
- Actuators are optimally matched to each valve size to suit many processes
- A robust stainless steel yoke construction connects the valve with its actuator and allows the Fisher™ FIELDVUE™ digital valve controller to be attached
- The entire valve assembly can be easily disassembled for inspection and maintenance

W9851-2

Baumann 89000 NPS 3 Sanitary Control Valve Shown with FIELDVUE DVC6200 Digital Valve Controller

Specifications

See table 2 for technical specifications and table 3 for actuator specifications.

Figure 1. Baumann 89000A Angle Valve Assembly

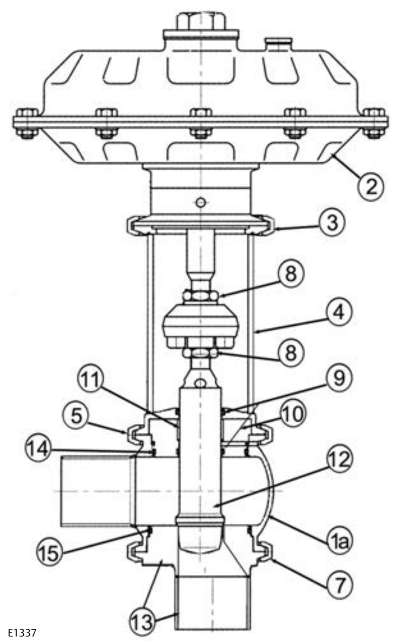


Figure 2. Baumann 89000I Inline Valve Assembly

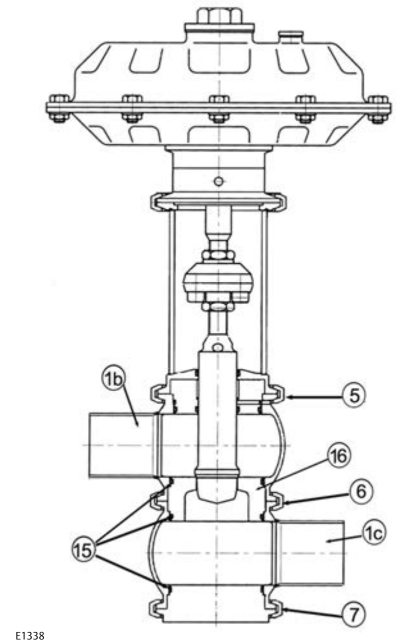
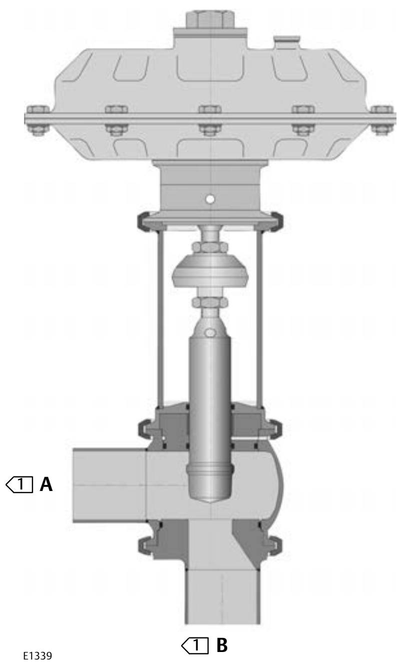


Table 1. Materials of Construction

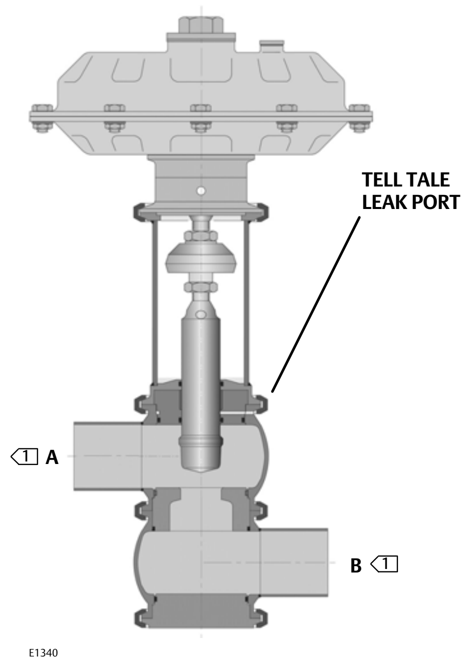
Key Number	Description	Material
1a	Angle Valve Body	S31603 Stainless Steel
1b	Upper Inline Valve Body	
1c	Lower Inline Valve Body	
2	Diaphragm Actuator	S30400 Stainless Steel
3	Actuator Clamp	
4	Yoke	
5	Upper Body Clamp	
6	Middle Body Clamp	
7	Lower Body Clamp	
8	Stem Locknut	
9	O-Ring	EPDM
10	Bonnet	S31603 Stainless Steel
11	Bearing	PTFE/Bronze
12	Valve Plug with Seat	S31603 Stainless Steel
13	Angle Valve Seat/Lower Pipe Connection (1pc)	
14	O-Ring	EPDM
15	O-Ring	
16	Inline Valve Seat	S31603 Stainless Steel

Figure 3. Baumann 89000A Angle Valve Body



1 Installed with flow from Port B to Port A. Flow from Port A to Port B is not recommended

Figure 4. Baumann 89000I Inline Valve Body



1 Installed with flow from Port B to Port A. Flow from Port A to Port B is not recommended

Table 2. Technical Specifications

Nominal Size	NPS 1/2 through 6
Valve Body Material	S31603 Stainless Steel
Internal Valve Body Finish	</=20Ra Microinch / 0.50Ra Micron
Connections	Tri-Clamp Standard (Weld Ends, ISO Clamps and others available)
Rangeability	50:1
Bonnet	Clamped
Characteristics	Modified Equal Percentage
Seat Leakage	ANSI / FCI 70-2, CLIV (Metal Seat)
Maximum Operating Pressure	17 bar (250 Psi)
Maximum Operating Temperature, Fluids, and Gases (Non-Steam)	135°C (275°F)
Maximum Operating Temperature, Steam	160°C (320°F)

Table 3. Actuator Specifications

Type	20	50	50H	112
Travel, mm (Inches)	20 (0.8)		30 (1.2)	60 (2.4)
Air Failure	Open or Closed			
Ambient Temperature Range	-20 to 80°C (0 to 175°F)			
Maximum Air Pressure	80 Psi			
Spring Cases	S30400 Stainless Steel			
Yoke	S30400 Stainless Steel			

Table 4. Allowable Pressure Drops

AIR-TO-OPEN				ACTUATOR SIZE	20	50	50H	112
				Bench Range (bar)	0.8 - 4.0	1.5 - 3.0	1.5 - 3.0	1.4 - 3.0
				Bench Range (psi)	12 - 58	22 - 44	22 - 44	45 - 75
				Valve Stroke, mm (Inches)	20 (0.8)		30 (1.2)	60 (2.4)
VALVE SIZE		**Cv**	**Kv**	**Port Diameter mm (Inches)**	**ALLOWABLE SHUTOFF PRESSURES**			
DN	**NPS**				**bar (psi)**			
15	1/2	0.29	0.25	7 (0.28)	16 (230)			
		1.2	1.0	7 (0.28)	16 (230)			
20	3/4	1.9	1.6	8.5 (0.33)	16 (230)			
		4.7	4.0	16 (0.63)	16 (230)			
25	1.0	10	9.0	24 (0.94)		16 (230)		
40	1-1/2	21	18	32 (1.26)		16 (230)		
50	2	21	18	32 (1.26)		16 (230)		
		33	28	48 (1.89)		16 (230)		
--	3	79	68	62 (2.44)			11 (155)	16 (230)
80	--	99	85	73 (2.87)			7.7 (110)	16 (230)
100	4	209	180	90 (3.54)			5 (70)	16 (230)
150	6 (A)	442	380	135 (5.31)				8 (115)
AIR-TO-CLOSE			**ACTUATOR SIZE**		**20**	**50**	**50H**	**112**
			Bench Range, bar		0.8 - 4.0	1.5 - 3.0	1.5 - 3.0	1.4 - 3.0
			Bench Range, psi		12 - 58	22 - 44	22 - 44	45 - 75
			Valve Stroke, mm (Inches)		20 (0.8)		30 (1.2)	60 (2.4)
			VALVE SIZE		**Allowable Shutoff Pressure**			
			DN	**NPS**	**bar (psi)**			
			25 - 100	1 - 4	160 (230)			
			150	6[1]	10 (145)			

1. Consult your Emerson sales office or Local Business Partner for NPS6 availability.

Figure 5. Dimensions for Baumann 89000A Angle Valve with FIELDVUE DVC6200 Digital Valve Controller

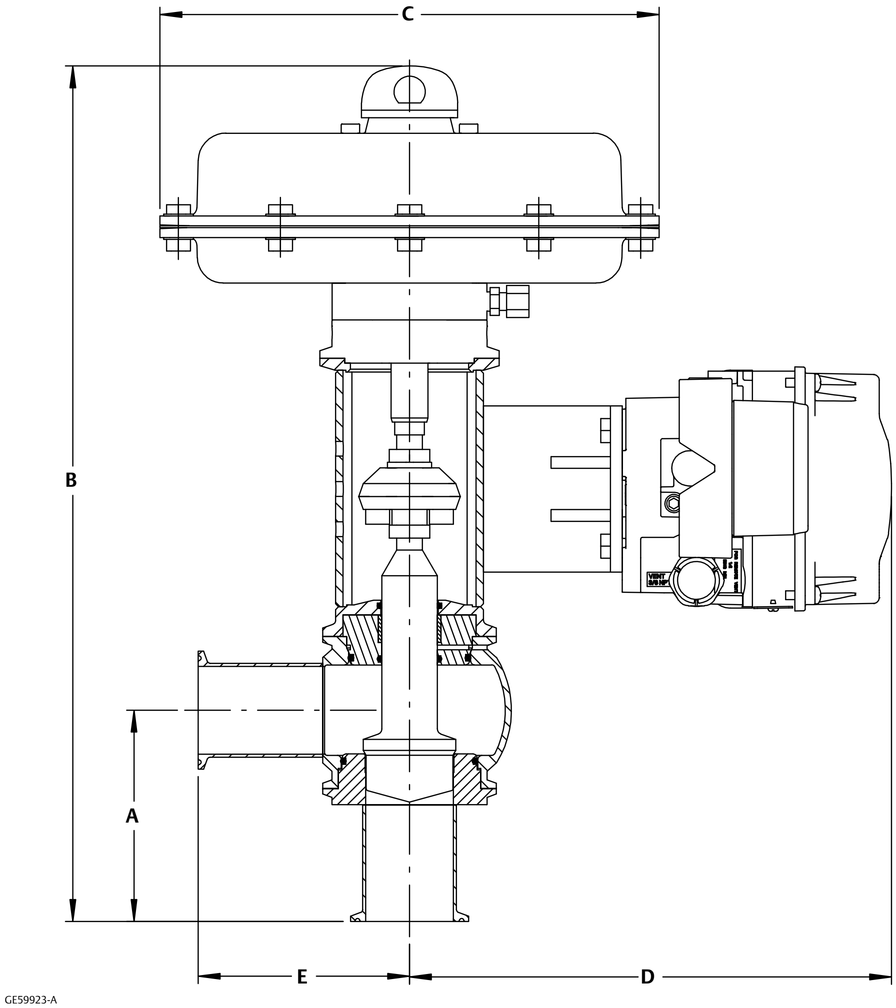


Table 5. Baumann 89000A Angle Valve Dimensions

VALVE SIZE			DIMENSIONS															
			Tri-Clamp A		Weld End A		Tri-Clamp B		Weld End B		C		D		Tr-Clamp E		Weld End E	
DN	NPS	Capacity	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
15	1/2	0.29	62.7	2.5	50	1.97	344	13.5	331	13	165	6.5	261	10.3	65.40	2.57	52.70	2.07
15	1/2	1.2	62.7	2.5	50	1.97	344	13.5	331	13	165	6.5	261	10.3	63.90	2.52	51.20	2.01
20	3/4	1.9	62.7	2.5	50	1.97	344	13.5	331	13	165	6.5	261	10.3	66.35	2.61	53.65	2.11
20	3/4	4.7	62.7	2.5	50	1.97	344	13.5	331	13	165	6.5	261	10.3	62.70	2.47	50.00	1.97
25	1	10	62.7	2.5	50	1.97	344	13.5	331	13	270	10.6	261	10.3	61.75	2.43	49.05	1.93
40	1-1/2	21	102.7	4	90	3.54	445	17.5	432	17	270	10.6	261	10.3	104.10	4.1	91.40	3.60
50	2	33	112.7	4.4	100	3.94	459	18.1	446	17.6	270	10.6	261	10.3	112.70	4.44	100.00	3.94
---	3	79	142.7	5.6	130	5.12	531	20.9	519	20.4	270	10.6	261	10.3	148.15	5.83	135.45	5.33
80	---	99	142.7	5.6	130	5.12	531	20.9	519	20.4	270	10.6	261	10.3	142.70	5.62	130.00	5.12
100	4	209	155.9	6.1	140	5.50	552	21.7	536	21.1	270	10.6	261	10.3	155.90	6.14	150.00	5.91
150	6	442	Contact your Emerson sales office or Local Business Partner for NPS 6 availability.															

Figure 6. Dimensions for Baumann 89000I Inline Valve with FIELDVUE DVC2000 Digital Valve Controller

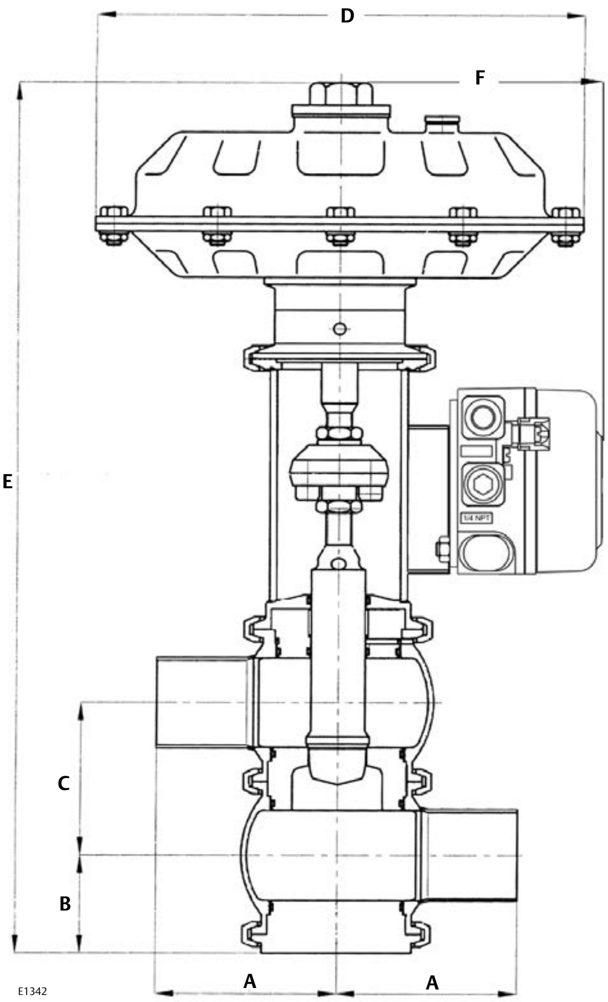


Table 6. Baumann 89000I Inline Valve Dimensions

VALVE SIZE		DIMENSIONS													
		Tri-Clamp A		Weld End A		B		C		D		E		F	
DN	NPS	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
15	1/2	62.7	2.5	50	1.97	34.5	1.36	50	1.97	165	6.5	366	14.4	127	5
20	3/4	62.7	2.5	50	1.97	34.5	1.36	50	1.97	165	6.5	366	14.4	127	5
25	1	102.7	4	90	3.54	48	1.89	74	2.91	165	6.5	464	18.3	153	6
40	1-1/2	102.7	4	90	3.54	48	1.89	74	2.91	270	10.6	464	18.3	153	6
50	2	112.7	4.4	100	3.94	56	2.20	85	3.35	270	10.6	488	19.2	153	6
80	3	147.7	5.6	130	5.12	78	3.07	116	4.57	270	10.6	581	22.9	153	6
100	4	1553.9	6.1	140	5.50	86	3.39	136	5.35	270	10.6	617	24.3	153	6
150	6	Contact your Emerson sales office or Local Business Partner for NPS 6 availability.													

Table 7. Model Numbering System

	89	588				
ACTUATOR TYPE	VALVE BODY	PLUG SERIES	CHARACTERISTIC	SEAT LEAKAGE	VALVE BODY STYLE	
20		588	Equal % / Metal Seat (S31603)	IV	A	Angle
50					I	Inline
50H						
112						

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Baumann™ 16, 32, 54, and 70 Pneumatic Actuators

Baumann actuators are single acting, pneumatic actuators with spring-return action. They are compact, multi-spring actuators with low operating friction. The 16, 32, and 54 can be reversed in the field (air-to-open or air-to-close) without special tools or additional parts. The size 70 is not field-reversible.

Baumann 24000SB Valve with Baumann 32 Actuator

Features

- Multi-spring, field-reversible actuator with reduced deadband, permits direct operation from remote signal devices.
- Epoxy powder-coated actuator with stainless steel fasteners for corrosion resistance.
- Actuator and yoke can be removed from the valve assembly while maintaining packing integrity.
- Stainless steel construction available for corrosive and sanitary environments.
- Optional handwheel and adjustable travel stop constructions are available.

Specifications

Table 1. Actuator Construction

TYPE	16	32	54	70
DIAPHRAGM PLATE	S30400 SST	Steel - AISI G10100		
STEM	ASTM A582 S30300 Condition A		ASTM A276 S30400 Condition A	
DIAPHRAGM MATERIAL(1)	CR (Chloroprene), TPES (Polyester Thermoplastic)	NBR (Nitrile), TPES (Polyester Thermoplastic)(1)		
SPRINGS	Stainless Steel	Steel		
SPRING CASES	Carbon Steel (AISI G10100)(2)			
YOKE	CF8M Stainless Steel	Ductile Iron, Powder-Epoxy-Coated(3)		

1. Optional reinforced VMQ (Silicone) diaphragm with FKM (Fluorocarbon) O-ring actuator stem seal for high temperature conditions (-29°C to 121°C / -20°F to 250°F) is available on select sizes.
2. ASTM S240 S30400 SST is available as an optional casing material on select sizes.
3. ASTM A351 CF8M SST is available as an optional yoke material on select sizes.

Table 2. Actuator Specifications

TYPE(1)	16	32	54	70
DIAPHRAGM AREA	103 cm^2 (16 in^2)	210 cm^2 (32 in^2)	350 cm^2 (54 in^2)	450 cm^2 (70 in^2)
AIR FAILURE	Fail Open or Closed (Field Reversible)			Fail Closed ONLY
TRAVEL(2)	12.7 mm (0.50 inches)	12.7 or 19.1 mm (0.50 or 0.75 inches)		
AMBIENT TEMPERATURE RANGE	-29°C to 71°C / -20°F to 160°F(3)			
MAXIMUM AIR PRESSURE	2.41 barg / 35 psig			
PRESSURE CONNECTION	1/4 NPT			
SPRING CASES	Steel, Powder Epoxy-Coated with Stainless Steel Fasteners			
YOKE	CF8M Stainless Steel	Ductile Iron, Powder Epoxy-Coated		

1. Electric actuators available. Refer to bulletins 52.1:ECV (D103347X012) and 52.1:SVACT (D104169X012).
2. Dual travel stops are available on Baumann 32 and 54 actuators. These are not field reversible.
3. Optional reinforced VMQ (Silicone) diaphragm with FKM (Fluorocarbon) O-ring actuator stem seal for high temperature conditions (-29°C to 121°C / -20°F to 250°F) is available with Baumann 32 and 54 actuators ONLY.

Table of Contents

Table 3. Actuator Weight

ACTUATOR TYPE	WEIGHT	
	kg	lb
16	2.1	4.6
32	4.5	10
54	11.3	25
70	15.4	34

Considerations

- Contact your Emerson sales office for Bellows sizing and actuator selection
- Size 54 or 70 actuator should be used with Graphite packing selection

24000 Series

Table 4. Maximum Allowable Pressure Drops (bar)
24000LS, 24000C, 24000CVF/SVF, 24000S, 24000F and 24000SB(1)(2)(3), CL IV Shutoff

Air to Diaphragm, bar		AIR-TO-OPEN									AIR-TO-CLOSE			
		0.2 to 1.0 (Signal to Actuator)				0 to 1.38 (with Positioner)					0.2 to 1.0 (Signal to Actuator)		0 to 1.38 (with Positioner)	
Port Dia (mm)	Actuator Size	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar	ΔP, bar
CL IV SHUTOFF - 0.50 INCH TRAVEL														
Bench Set, bar		**0.3 to 1.0**	**0.5 to 1.0**	**0.6 to 1.0**	**0.7 to 1.0**	**0.3 to 1.0**	**0.5 to 1.0**	**0.6 to 1.0**	**0.7 to 1.0**	**0.8 to 1.1**	**0.2 to 0.9**	**0.2 to 0.7**	**0.2 to 0.9**	**0.2 to 0.7**
6.3	32	61.0	122.4	---	---	122.4	183.4	---	---	---	61.0	152.7	214.1	305.8
	54	92.7	185.1	277.9	---	185.1	277.9	370.2	---	---	92.7	232.0	324.4	463.0
9.5	32	31.0	62.4	---	---	62.4	93.4	---	---	---	31.0	77.9	109.3	155.8
	54	47.2	94.5	141.7	---	94.5	141.7	188.9	---	---	47.2	118.2	165.5	236.1
20.6	32	7.9	15.5	---	---	15.5	23.4	---	---	---	7.9	19.7	27.2	39.0
	54	11.7	23.8	35.5	---	23.8	35.5	47.2	---	---	11.7	29.6	41.4	59.0
	70	---	---	---	56.2	---	---	---	72.4	88.3	---	---	---	---
27.0	32	3.4	8.3	---	---	8.3	13.1	---	---	---	3.4	10.7	15.2	22.4
	54	5.5	12.4	19.7	---	12.4	19.7	26.9	---	---	5.5	16.2	23.1	33.8
	70	---	---	---	31.7	---	---	---	41.4	51.0	---	---	---	---
CL IV SHUTOFF - 0.75 INCH TRAVEL														
Bench Set, bar		**0.3 to 1.0**	**0.5 to 0.9**	**0.7 to 1.0**	**0.7 to 1.0**	**0.3 to 1.0**	**0.5 to 0.9**	**0.7 to 1.0**	**0.7 to 1.0**	**0.8 to 1.2**	**0.2 to 0.9**	**0.2 to 0.7**	**0.2 to 0.9**	**0.2 to 0.7**
31.8	32	2.2	2.8	---	---	6.2	---	---	---	---	2.8	7.9	11.4	16.5
	54	3.8	9.3	17.2	---	9.3	14.5	22.4	---	---	3.8	11.7	17.2	24.8
	70	---	---	---	23.1	---	---	---	30.3	37.6	---	---	---	---
38.1	32	1.7	---	---	---	4.1	---	---	---	---	1.7	5.5	7.9	11.7
	54	2.8	6.6	12.1	---	6.6	10.3	15.9	---	---	2.8	8.3	12.1	17.6
	70	---	---	---	16.2	---	---	---	21.4	26.5	---	---	---	---
50.8	32	1.0	---	---	---	2.4	---	---	---	---	1.0	3.1	4.5	6.6
	54	1.7	3.8	6.9	---	3.8	5.9	9.0	---	---	1.7	4.8	6.9	10.0
	70	---	---	---	9.3	---	---	---	12.4	15.2	---	---	---	---

1. Do not exceed valve body temperature/pressure ratings.
2. Maximum shutoff pressure when using ENVIRO-SEAL™ packing: Table Value - (1120 / (Port Dia) ^ 2). Environmental applications, maximum shutoff pressure limited to 51.7 bar.
3. Maximum shutoff pressure when using Graphite packing: Table Value - (6150 / (Port Dia) ^ 2).

Table 5. Maximum Allowable Pressure Drops (psi)
24000LS, 24000C, 24000CVF/SVF, 24000S, 24000F and 24000SB(1)(2)(3), CL IV Shutoff

Air to Diaphragm, psig		AIR-TO-OPEN									AIR-TO-CLOSE			
		3 to 15 (Signal to Actuator)				0 to 20 (with Positioner)					3 to 15 (Signal to Actuator)		0 to 20 (with Positioner)	
Port Dia (in)	Actuator Size	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi
CL IV SHUTOFF - 0.50 INCH TRAVEL														
Bench Set, psig		**5 to 15**	**7 to 15**	**9 to 15**	**10 to 15**	**5 to 15**	**7 to 15**	**9 to 15**	**10 to 15**	**12 to 16**	**3 to 13**	**3 to 10**	**3 to 13**	**3 to 10**
0.25	32	885	1775	---	---	1775	2660	---	---	---	885	2215	3105	4435
	54	1345	2685	4030	---	2685	4030	5370	---	---	1345	3365	4705	6715
0.375	32	450	905	---	---	905	1355	---	---	---	450	1130	1585	2260
	54	685	1370	2055	---	1370	2055	2740	---	---	685	1715	2400	3425
0.8125	32	115	225	---	---	225	340	---	---	---	115	285	395	565
	54	170	345	515	---	345	515	685	---	---	170	430	600	855
	70	---	---	---	815	---	---	---	1050	1280	---	---	---	---
1.0625	32	50	120	---	---	120	190	---	---	---	50	155	220	325
	54	80	180	285	---	180	285	390	---	---	80	235	335	490
	70	---	---	---	460	---	---	---	600	740	---	---	---	---
CL IV SHUTOFF - 0.75 INCH TRAVEL														
Bench Set, psig		**5 to 15**	**7 to 13**	**10 to 14**	**10 to 15**	**5 to 15**	**7 to 13**	**10 to 14**	**10 to 15**	**12 to 18**	**3 to 13**	**3 to 10**	**3 to 13**	**3 to 10**
1.25	32	40	---	---	---	90	---	---	---	---	40	115	165	240
	54	55	135	250	---	135	210	325	---	---	55	170	250	360
	70	---	---	---	335	---	---	---	440	545	---	---	---	---
1.5	32	25	---	---	---	60	---	---	---	---	25	80	115	170
	54	40	95	175	---	95	150	230	---	---	40	120	175	255
	70	---	---	---	235	---	---	---	310	385	---	---	---	---
2.0	32	15	---	---	---	35	---	---	---	---	15	45	65	95
	54	25	55	100	---	55	85	130	---	---	25	70	100	145
	70	---	---	---	135	---	---	---	180	220	---	---	---	---

1. Do not exceed valve body temperature/pressure ratings.
2. Maximum shutoff pressure when using ENVIRO-SEAL packing: Table Value - (25 / (Port Dia) ^ 2). Environmental applications, maximum shutoff pressure limited to 750 psi.
3. Maximum shutoff pressure when using Graphite packing: Table Value - (140 / (Port Dia) ^ 2).

Table 6. Maximum Allowable Pressure Drops (bar)
24000LS, 24000C, 24000CVF/SVF, 24000S, 24000F and 24000SB[(1)(2)(3)], CL VI Shutoff

Air to Diaphragm, bar		AIR-TO-OPEN									AIR-TO-CLOSE			
		0.2 to 1.0 (Signal to Actuator)				0 to 1.38 (with Positioner)					0.2 to 1.0 (Signal to Actuator)		0 to 1.38 (with Positioner)	
Port Dia (mm)	**Actuator Size**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**	**∆P, bar**
CL VI SHUTOFF - 0.50 INCH TRAVEL														
Bench Set, bar		**0.3 to 1.0**	**0.5 to 1.0**	**0.6 to 1.0**	**0.7 to 1.0**	**0.3 to 1.0**	**0.5 to 1.0**	**0.6 to 1.0**	**0.7 to 1.0**	**0.8 to 1.1**	**0.2 to 0.9**	**0.2 to 0.7**	**0.2 to 0.9**	**0.2 to 0.7**
3.9 Trim 151	32	82.7	82.7	---	---	82.7	82.7	---	---	---	82.7	82.7	82.7	82.7
	54	82.7	82.7	82.7	---	82.7	82.7	82.7	---	---	82.7	82.7	82.7	82.7
7.9[(4)] Trim 177	32	29.0	71.4	---	---	71.4	82.7	---	---	---	29.0	82.7	82.7	82.7
	54	50.7	82.7	82.7	---	82.7	82.7	82.7	---	---	50.7	82.7	82.7	82.7
9.5	32	19.3	50.3	---	---	50.3	81.4	---	---	---	19.3	65.8	97.2	143.8
	54	35.2	94.5	129.6	---	82.4	129.6	176.9	---	---	35.2	106.2	153.4	224.1
20.6	32	1.4	9.0	---	---	9.0	16.9	---	---	---	1.4	13.1	20.7	32.4
	54	5.2	17.2	29.0	---	17.2	29.0	40.7	---	---	5.2	23.1	34.8	52.4
	70	---	---	---	49.6	---	---	---	65.8	81.7	---	---	---	---
27.0	32	---	3.1	---	---	3.1	7.9	---	---	---	---	5.5	10.3	17.2
	54	---	7.2	14.5	---	7.2	14.5	21.7	---	---	---	11.0	17.9	28.6
	70	---	---	---	26.5	---	---	---	36.2	45.9	---	---	---	---
CL VI SHUTOFF - 0.75 INCH TRAVEL														
Bench Set, bar		**0.3 to 1.0**	**0.5 to 0.9**	**0.7 to 1.0**	**0.7 to 1.0**	**0.3 to 1.0**	**0.5 to 0.9**	**0.7 to 1.0**	**0.7 to 1.0**	**0.8 to 1.2**	**0.2 to 0.9**	**0.2 to 0.7**	**0.2 to 0.9**	**0.2 to 0.7**
31.8	32	---	---	---	---	1.7	---	---	---	---	---	3.4	6.9	12.1
	54	---	4.8	12.8	---	4.8	10.0	17.9	---	---	---	7.2	12.8	20.3
	70	---	---	---	18.6	---	---	---	25.9	33.1	---	---	---	---
38.1	32	---	---	---	---	---	---	---	---	---	---	1.7	4.1	7.9
	54	---	2.8	8.3	---	2.8	6.6	12.1	---	---	---	4.5	8.3	13.8
	70	---	---	---	12.8	---	---	---	17.6	22.8	---	---	---	---
50.8	32	---	---	---	---	---	---	---	---	---	---	---	1.7	3.8
	54	---	0.7	4.1	---	0.7	3.1	6.2	---	---	---	2.1	4.1	7.2
	70	---	---	---	6.6	---	---	---	9.3	12.4	---	---	---	---

1. Do not exceed valve body temperature/pressure ratings.
2. Maximum shutoff pressure when using ENVIRO-SEAL packing: Table Value - (1120 / (Port Dia) ^ 2). Environmental applications, maximum shutoff pressure limited to 51.7 bar.
3. Maximum shutoff pressure when using Graphite packing: Table Value - (6150 / (Port Dia)^2).
4. Actuator requires dual travel stops.

Table 7. Maximum Allowable Pressure Drops (psi)
24000LS, 24000C, 24000CVF/SVF, 24000S, 24000F and 24000SB[(1)(2)(3)], CL VI Shutoff

Air to Diaphragm, psig		AIR-TO-OPEN									AIR-TO-CLOSE			
		3 to 15 (Signal to Actuator)				0 to 20 (with Positioner)					3 to 15 (Signal to Actuator)		0 to 20 (with Positioner)	
Port Dia (in)	Actuator Size	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi	ΔP, Psi
CL VI SHUTOFF - 0.50 INCH TRAVEL														
Bench Set, psig		**5 to 15**	**7 to 15**	**9 to 15**	**10 to 15**	**5 to 15**	**7 to 15**	**9 to 15**	**10 to 15**	**12 to 16**	**3 to 13**	**3 to 10**	**3 to 13**	**3 to 10**
0.156 Trim 151	32	1200	1200	---	---	1200	1200	---	---	---	1200	1200	1200	1200
	54	1200	1200	1200	---	1200	1200	1200	---	---	1200	1200	1200	1200
0.3125[(4)] Trim 177	32	420	1035	---	---	1035	1200	---	---	---	420	1200	1200	1200
	54	735	1200	1200	---	1200	1200	1200	---	---	735	1200	1200	1200
0.375	32	280	730	---	---	730	1180	---	---	---	280	955	1410	2085
	54	510	1370	1880	---	1195	1880	2565	---	---	510	1540	2225	3250
0.8125	32	20	130	---	---	130	245	---	---	---	20	190	300	470
	54	75	250	420	---	250	420	590	---	---	75	335	505	760
	70	---	---	---	720	---	---	---	955	1185	---	---	---	---
1.0625	32	---	45	---	---	45	115	---	---	---	---	80	150	250
	54	---	105	210	---	105	210	315	---	---	---	160	260	415
	70	---	---	---	385	---	---	---	525	665	---	---	---	---
CL VI SHUTOFF - 0.75 INCH TRAVEL														
Bench Set, psig		**5 to 15**	**7 to 13**	**10 to 14**	**10 to 15**	**5 to 15**	**7 to 13**	**10 to 14**	**10 to 15**	**12 to 18**	**3 to 13**	**3 to 10**	**3 to 13**	**3 to 10**
1.25	32	---	---	---	---	25	---	---	---	---	---	50	100	175
	54	---	70	185	---	70	145	260	---	---	---	105	185	295
	70	---	---	---	270	---	---	---	375	480	---	---	---	---
1.5	32	---	---	---	---	---	---	---	---	---	---	25	60	115
	54	---	40	120	---	40	95	175	---	---	---	65	120	200
	70	---	---	---	185	---	---	---	255	330	---	---	---	---
2.0	32	---	---	---	---	---	---	---	---	---	---	---	25	55
	54	---	10	60	---	10	45	90	---	---	---	30	60	105
	70	---	---	---	95	---	---	---	135	180	---	---	---	---

1. Do not exceed valve body temperature/pressure ratings.
2. Maximum shutoff pressure when using ENVIRO-SEAL packing: Table Value - (25 / (Port Dia) ^ 2). Environmental applications, maximum shutoff pressure limited to 750 psi.
3. Maximum shutoff pressure when using Graphite packing: Table Value - (140 / (Port Dia) ^ 2).
4. Actuator requires dual travel stops.

Table 8. Allowable Pressure Drops (psi) - Mixing (Combining) Service for 24003

ORIFIC DIAMETER (inch)	NOMINAL PLUG TRAVEL (inch)(1)	ACTUATOR TYPE	BENCH RANGE (psi)	AIR-TO-OPEN: ALLOWABLE PRESSURE DROP PORT L FAILS CLOSED (PSI)		AIR-TO-CLOSE: BENCH RANGE (psi)	AIR-TO-CLOSE: ALLOWABLE PRESSURE DROP PORT L FAILS OPEN (PSI)	
				3-15 psi Signal to Actuator	With Positioner 20 psig Air Supply		3-15 psi Signal to Actuator	With Positioner 20 psig Air Supply
0.626	0.56	32	5-13	112	225	3-11	281	563
			7-15	225	337	5-13	112	394
		54	7-14	375	563	3-10	469	720
			9-15	563	720	3-13	187	656
0.876	0.56	32	5-13	60	121	3-11	151	303
			7-15	121	259	5-13	60	212
		54	7-14	202	303	3-10	252	505
			9-16	303	404	3-13	101	353
1.126	0.56	32	5-13	37	75	3-11	94	189
			7-15	75	113	5-13	37	132
		54	7-14	126	189	3-10	157	315
			9-16	189	252	3-13	63	220
		70	8-15	220	309	---	---	---
1.676	0.75	54	5-15	29	58	3-10	73	147
			7-13	58	88	3-13	29	102
		70	7-15	82	123	---	---	---
2.126	0.75	54	3-10	---	---	3-10	46	93
			7-13	37	55	3-13	18	65
		70	7-15	52	78	---	---	---
			10-15	91	117	---	---	---

1. Use Baumann 54 or larger actuator with molded graphite ribbon or ENVIRO-SEAL packing systems.

Table 9. Allowable Pressure Drops (psi) - Diverting (Diverging) Service for 24003

ORIFIC DIAMETER (inch)	NOMINAL PLUG TRAVEL (inch)(1)	ACTUATOR TYPE	BENCH RANGE (psi)	AIR-TO-OPEN: ALLOWABLE PRESSURE DROP PORT L FAILS CLOSED (PSI)		AIR-TO-CLOSE: BENCH RANGE (psi)	AIR-TO-CLOSE: ALLOWABLE PRESSURE DROP PORT L FAILS OPEN (PSI)	
				3-15 psi Signal to Actuator	With Positioner 20 psig Air Supply		3-15 psi Signal to Actuator	With Positioner 20 psig Air Supply
0.626	0.56	32	5-13	80	160	3-11	201	402
			7-15	160	241	5-13	80	281
		54	7-14	268	402	3-10	335	670
			9-15	402	670	3-13	134	469
0.876	0.56	32	5-13	43	86	3-11	108	216
			7-15	86	185	5-13	43	151
		54	7-14	144	216	3-10	180	360
			9-16	216	288	3-13	72	252
1.126	0.56	32	5-13	27	54	3-11	67	135
			7-15	54	81	5-13	27	94
		54	7-14	90	135	3-10	112	225
			9-16	135	180	3-13	45	157
		70	8-15	157	220	---	---	---
1.676	0.75	54	5-15	21	42	3-10	52	105
			7-13	42	63	3-13	21	73
		70	7-15	59	88	---	---	---
2.126	0.75	54	3-10	---	---	3-10	33	66
			7-13	26	39	3-13	13	46
		70	7-15	37	55	---	---	---
			10-15	65	83	---	---	---

1. Use Baumann 54 or larger actuator with molded graphite ribbon or ENVIRO-SEAL packing systems.

Low Flow and Specialty

Table 10. 26000 Allowable Pressure Drops (bar)

PORT DIA. (mm)	PLUG TRAVEL (mm)	ACT TYPE	AIR-TO-OPEN ACTION					AIR-TO-CLOSE ACTION				
			BENCH RANGE (barg)	0.2-1.0 barg SIGNAL TO ACTUATOR		WITH POSITIONER 1.38 barg AIR SUPPLY		BENCH RANGE (barg)	0.2-1.0 barg SIGNAL TO ACTUATOR		WITH POSITIONER 1.38 barg AIR SUPPLY	
				Max CL IV Shutoff Pressure	Max CL VI Shutoff Pressure	Max CL IV Shutoff Pressure	Max CL VI Shutoff Pressure		Max CL IV Shutoff Pressure	Max CL VI Shutoff Pressure	Max CL IV Shutoff Pressure	Max CL VI Shutoff Pressure
7.9	12.7	32	0.3-1.0	---	10	---	10	0.2-0.9	---	10	---	10
9.5	12.7	32	0.3-1.0	10	---	10	---	0.2-0.9	10	---	10	---
12.7	12.7	32	0.3-1.0	10	---	10	---	0.2-0.9	10	---	10	---

Table 11. 26000 Allowable Pressure Drops (psi)

PORT DIA. (in)	PLUG TRAVEL (in)	ACT TYPE	AIR-TO-OPEN ACTION					AIR-TO-CLOSE ACTION				
			BENCH RANGE (psig)	3-15 psig SIGNAL TO ACTUATOR		WITH POSITIONER 20 psig AIR SUPPLY		BENCH RANGE (psig)	3-15 psig SIGNAL TO ACTUATOR		WITH POSITIONER 20 psig AIR SUPPLY	
				Max CL IV Shutoff Pressure	Max CL VI Shutoff Pressure	Max CL IV Shutoff Pressure	Max CL VI Shutoff Pressure		Max CL IV Shutoff Pressure	Max CL VI Shutoff Pressure	Max CL IV Shutoff Pressure	Max CL VI Shutoff Pressure
0.312	0.50	32	5-15	---	150	---	150	3-13	---	150	---	150
0.375	0.50	32	5-15	150	---	150	---	3-13	150	---	150	---
0.500	0.50	32	5-15	150	---	150	---	3-13	150	---	150	---

Table 12. 51000 Series Valve with Baumann 16 Actuator and Positioner (Metric)

PERFORMANCE SPECIFICATIONS				ALLOWABLE PRESSURE DROPS			
Valve Size, mm	K_V Range	Process Temperature Range	Seat Leakage (per ASME/ FCI 70-2)	Bench Spring Range	Air-to-Open(1)	Bench Spring Range	Air-to-Close(1)
6.35 & 12.7	0.00011 - 0.39	-28.9 to 177°C	Class VI	0.3 - 0.9 bar	207 bar	0.2 - 0.8 bar	207 bar
12.7	0.86, 1.29, 2.16	-28.9 to 232°C	Class IV	0.3 - 0.9 bar	28 bar	0.2 - 0.8 bar	55 bar

1. Based on 1.4 barg air supply to positioner.

Table 13. 51000 Series Valve with Baumann 16 Actuator and Positioner

PERFORMANCE SPECIFICATIONS				ALLOWABLE PRESSURE DROPS			
Valve Size, NPS	C_V Range	Process Temperature Range	Seat Leakage (per ASME/ FCI 70-2)	Bench Spring Range	Air-to-Open(1)	Bench Spring Range	Air-to-Close(1)
1/4 & 1/2	0.00013 - 0.45	-20 to 350°F	Class VI	4-13 psi	3000 psi	3-12 psi	3000 psi
1/2	1.0, 1.5, 2.5	-20 to 450°F	Class IV	4-13 psi	400 psi	3-12 psi	800 psi

1. Based on 20 psig air supply to positioner.

Table 14. 51000 Series Valve with Baumann 16 Actuator without Positioner or with Transducer (Metric)

PERFORMANCE SPECIFICATIONS				ALLOWABLE PRESSURE DROPS			
Valve Size, mm	K_V Range	Process Temperature Range	Seat Leakage (per ASME/ FCI 70-2)	Bench Spring Range	Air-to-Open(1)	Bench Spring Range	Air-to-Close(1)
6.35 & 12.7	0.00011 - 0.39	-28.9 to 177°C	Class VI	0.3 - 0.9 bar	69 bar	0.2 - 0.8 bar	207 bar
12.7	0.86, 1.29, 2.16	-28.9 to 232°C	Class IV	0.3 - 0.9 bar	6.8 bar	0.2 - 0.8 bar	20.6 bar

1. Based on 0.2 to 1.0 bar air output signal to actuator.

Table 15. 51000 Series Valve with Baumann 16 Actuator without Positioner or with Transducer

PERFORMANCE SPECIFICATIONS				ALLOWABLE PRESSURE DROPS			
Valve Size, NPS	C_V Range	Process Temperature Range	Seat Leakage (per ASME/ FCI 70-2)	Bench Spring Range	Air-to-Open(1)	Bench Spring Range	Air-to-Close(1)
1/4 & 1/2	0.00013 - 0.45	-20 to 350°F	Class VI	4-13 psi	1000 psi	3-12 psi	3000 psi
1/2	1.0, 1.5, 2.5	-20 to 450°F	Class IV	4-13 psi	100 psi	3-12 psi	300 psi

1. Based on 3 to 15 psi air output signal to actuator.

Table 16. 81000 Allowable Pressure Drops with Baumann 16 Actuator

<table>
<tr><th rowspan="2">VALVE SIZE</th><th rowspan="2" colspan="2">PLUG</th><th rowspan="2">PLUG TRAVEL</th><th colspan="6">AIR-TO-OPEN ACTION</th><th colspan="6">AIR-TO-CLOSE ACTION</th></tr>
<tr><th colspan="2">Bench Range</th><th colspan="2">3-15 psig (0.2-1.0 bar) Signal to Actuator</th><th colspan="2">With Positioner</th><th colspan="2">Bench Range</th><th colspan="2">3-15 psig (0.2-1.0 bar) Signal to Actuator</th><th colspan="2">With Positioner</th></tr>
<tr><th>NPS (mm)</th><th>Cv</th><th>Kv</th><th>mm (inch)</th><th>bar</th><th>psig</th><th>bar</th><th>psig</th><th>bar</th><th>psig</th><th>bar</th><th>psig</th><th>bar</th><th>psig</th><th>bar</th><th>psig</th></tr>
<tr><td>1/4
(6.35)</td><td>0.01
0.03
0.10
0.30</td><td>0.0009
0.026
0.086
0.259</td><td>12.7
(0.50)</td><td rowspan="2">0.2-1.0</td><td rowspan="2">3-15</td><td rowspan="2">10</td><td rowspan="2">150</td><td rowspan="2">19</td><td rowspan="2">275</td><td rowspan="2">0.2- 0.9</td><td rowspan="2">3-13</td><td rowspan="2">10</td><td rowspan="2">150</td><td rowspan="2">19</td><td rowspan="2">275</td></tr>
<tr><td>1/2
(12.7)</td><td>0.01
0.03
0.10
0.30
0.50
0.70</td><td>0.0009
0.026
0.086
0.259
0.43
0.60</td><td>12.7
(0.50)</td></tr>
</table>

Sanitary/Aseptic

Table 17. 83000 Allowable Pressure Drops with Baumann 16 Actuator

ORIFICE		PLUG TRAVEL	AIR-TO-OPEN ACTION						AIR-TO-CLOSE ACTION					
			Bench Range		3-15 psig (0.2-1.0 bar) Signal to Actuator		With Positioner(1)		Bench Range		3-15 psig (0.2-1.0 bar) Signal to Actuator		With Positioner(1)	
Cv	Kv	mm (inch)	bar	psig	bar	psig	bar	psig	bar	psig	bar	psig	bar	psig
0.014 0.053 0.182 0.427 0.631 1.02	0.012 0.046 0.157 0.369 0.546 0.882	12.7 (0.50)	0.2-1.0	3-15	10	150	19	275	0.2- 0.9	3-13	10	150	19	275

1. Based on 1.38 bar (20 psig) supply.

Table 18. 84000 Allowable Pressure Drops (bar): NPS 1 Angle and NPS 1 Inline Valves

VALVE SIZE	FLOW DIREC-TION	RATED Kv	TRAVEL	ACTUATOR TYPE	AIR-TO-OPEN ACTION				AIR-TO-CLOSE ACTION			
					Bench Spring Range	Signal to Actuator		With Positioner (2)	Bench Spring Range	Signal to Actuator		With Positioner (2)
DN			mm		bar	0.2-1.0 bar	0.07-1.2 bar(1)	bar	bar	0.2-1.0 bar	0.07-1.2 bar(1)	bar
25	A to B	1.72	12.7	32	0.3-1.0	7.58	8.62	8.62	0.2-0.9	6.9	8.62	8.62
		3.44	12.7	32	0.3-1.0	6.9	10.34	10.34	0.2-0.9	6.9	8.62	8.62
			12.7	54	0.3-1.0	10.34	10.34	10.34	0.2-0.9	10.34	10.34	10.34
		6.88	19.05	32	0.3-1.0	3.45	8.62	8.62	0.2-0.9	3.45	8.62	8.62
			19.05	54	0.5-0.9	6.9	10.34	10.34	0.2-0.7	6.9	10.34	10.34

1. I/P transducer with 0.07 - 1.2 bar (1 - 17 psig) output signal per FCI 87.2.
2. Shutoff with positioner based on 1.4 bar (20 psi) air supply pressure.

Table 19. 84000 Allowable Pressure Drops (psi): NPS 1 Angle and NPS 1 Inline Valves

VALVE SIZE	FLOW DIREC-TION	RATED Cv	TRAVEL	ACTUATOR TYPE	AIR-TO-OPEN ACTION				AIR-TO-CLOSE ACTION			
					Bench Spring Range	Signal to Actuator		With Positioner (2)	Bench Spring Range	Signal to Actuator		With Positioner (2)
NPS			Inches		psig	3-15 psig	1-2 psig(1)	psig	psig	3-15 psig	1-2 psig(1)	psig
1	A to B	2.00	0.50	32	5-15	110	125	125	3-13	100	125	125
		4.00	0.50	32	5-15	100	150	150	3-13	100	125	125
			0.50	54	5-15	150	150	150	3-13	150	150	150
		8.00	0.75	32	5-15	50	125	125	3-13	50	125	125
			0.75	54	7-13	100	150	150	3-10	100	150	150

1. I/P transducer with 0.07 - 1.2 bar (1 - 17 psig) output signal per FCI 87.2.
2. Shutoff with positioner based on 1.4 bar (20 psi) air supply pressure.

Table 20. 84000 Allowable Pressure Drops (bar): Flow Direction A to B: NPS 1-1/2 and 2 Angle Valves

VALVE SIZE	FLOW DIREC-TION	RATED Kv	TRAVEL	ACTUATOR TYPE	AIR-TO-OPEN ACTION				AIR-TO-CLOSE ACTION			
					Bench Spring Range	Signal to Actuator		With Positioner (2)	Bench Spring Range	Signal to Actuator		With Positioner (2)
DN			mm		bar	0.2-1.0 bar	0.07-1.2 bar(1)	bar	bar	0.2-1.0 bar	0.07-1.2 bar(1)	bar
40	A to B	18.92	12.7	54	0.3-1.0	1.99	3.99	3.99	0.2-0.9	1.99	3.99	6.96
		18.92	12.7	54	0.6-1.0	4.96	6.96	6.96	0.2-0.7	4.96	6.96	9.99
		25.8	19.05	54	0.3-1.0	1.99	3.99	3.99	0.2-0.9	1.99	3.99	6.96
		25.8	19.05	54	0.5-0.9	3.99	5.99	5.99	0.2-0.7	4.92	6.96	9.99
50	A to B	24.94	12.7	54	0.3-1.0	2.34	4.68	4.68	0.2-0.9	2.34	4.68	8.20
		24.94	12.7	54	0.6-1.0	5.86	8.20	8.20	0.2-0.7	5.79	8.20	11.72
		36.98	19.05	54	0.3-1.0	2.34	4.68	4.68	0.2-0.9	2.34	4.68	8.20
		36.98	19.05	54	0.5-0.9	4.68	7.03	7.03	0.2-0.7	5.86	8.20	11.72

1. I/P transducer with 0.07 - 1.2 bar (1 - 17 psig) output signal per FCI 87.2.
2. Shutoff with positioner based on 1.4 bar (20 psi) air supply pressure.

Table 21. 84000 Allowable Pressure Drops (psi): Flow Direction A to B: NPS 1-1/2 and 2 Angle Valves

VALVE SIZE	FLOW DIREC-TION	RATED Cv	TRAVEL	ACTUATOR TYPE	AIR-TO-OPEN ACTION				AIR-TO-CLOSE ACTION			
					Bench Spring Range	Signal to Actuator		With Positioner (2)	Bench Spring Range	Signal to Actuator		With Positioner (2)
NPS			Inches		psig	3-15 psig	1-2 psig(1)	psig	psig	3-15 psig	1-2 psig(1)	psig
1-1/2	A to B	22	0.50	54	5-15	29	58	58	3-13	29	58	101
		22	0.50	54	8-15	72	101	101	3-10	72	101	145
		30	0.75	54	5-15	29	58	58	3-13	29	58	101
		30	0.75	54	7-13	58	87	87	3-10	72	101	145
2	A to B	29	0.50	54	5-15	34	68	68	3-13	34	68	119
		29	0.50	54	8-15	85	119	119	3-10	84	119	170
		43	0.75	54	5-15	34	68	68	3-13	34	68	119
		43	0.75	54	7-13	68	102	102	3-10	85	119	170

1. I/P transducer with 0.07 - 1.2 bar (1 - 17 psig) output signal per FCI 87.2.
2. Shutoff with positioner based on 1.4 bar (20 psi) air supply pressure.

Table 22. 84000 Allowable Pressure Drops (bar): Flow Direction B to A: NPS 1-1/2 and 2 Angle Valves

VALVE SIZE	FLOW DIREC-TION	RATED Kv	TRAVEL	ACTUATOR TYPE	AIR-TO-OPEN ACTION				AIR-TO-CLOSE ACTION			
					Bench Spring Range	Signal to Actuator		With Positioner (2)	Bench Spring Range	Signal to Actuator		With Positioner (2)
DN			mm		bar	0.2-1.0 bar	0.07-1.2 bar(1)	bar	bar	0.2-1.0 bar	0.07-1.2 bar(1)	bar
40	B to A	14.62	12.7	54	0.3-1.0	5.10	10.20	10.20	0.2-0.9	5.10	10.20	17.86
		14.62	12.7	54	0.6-1.0	12.76	17.86	17.86	0.2-0.7	12.76	17.86	25.58
		20.64	19.05	54	0.3-1.0	5.10	10.20	10.20	0.2-0.9	5.10	10.20	17.86
		20.64	19.05	54	0.5-0.9	10.20	15.31	15.31	0.2-0.7	12.76	17.86	25.58
50	B to A	20.64	12.7	54	0.3-1.0	2.90	5.79	5.79	0.2-0.9	2.90	5.79	10.14
		20.64	12.7	54	0.6-1.0	7.24	10.14	10.14	0.2-0.7	7.24	10.14	14.48
		27.52	19.05	54	0.3-1.0	2.90	5.79	5.79	0.2-0.9	2.90	5.79	10.14
		27.52	19.05	54	0.5-0.9	5.79	8.69	8.69	0.2-0.7	7.24	10.14	14.48

1. I/P transducer with 0.07 - 1.2 bar (1 - 17 psig) output signal per FCI 87.2.
2. Shutoff with positioner based on 1.4 bar (20 psi) air supply pressure.

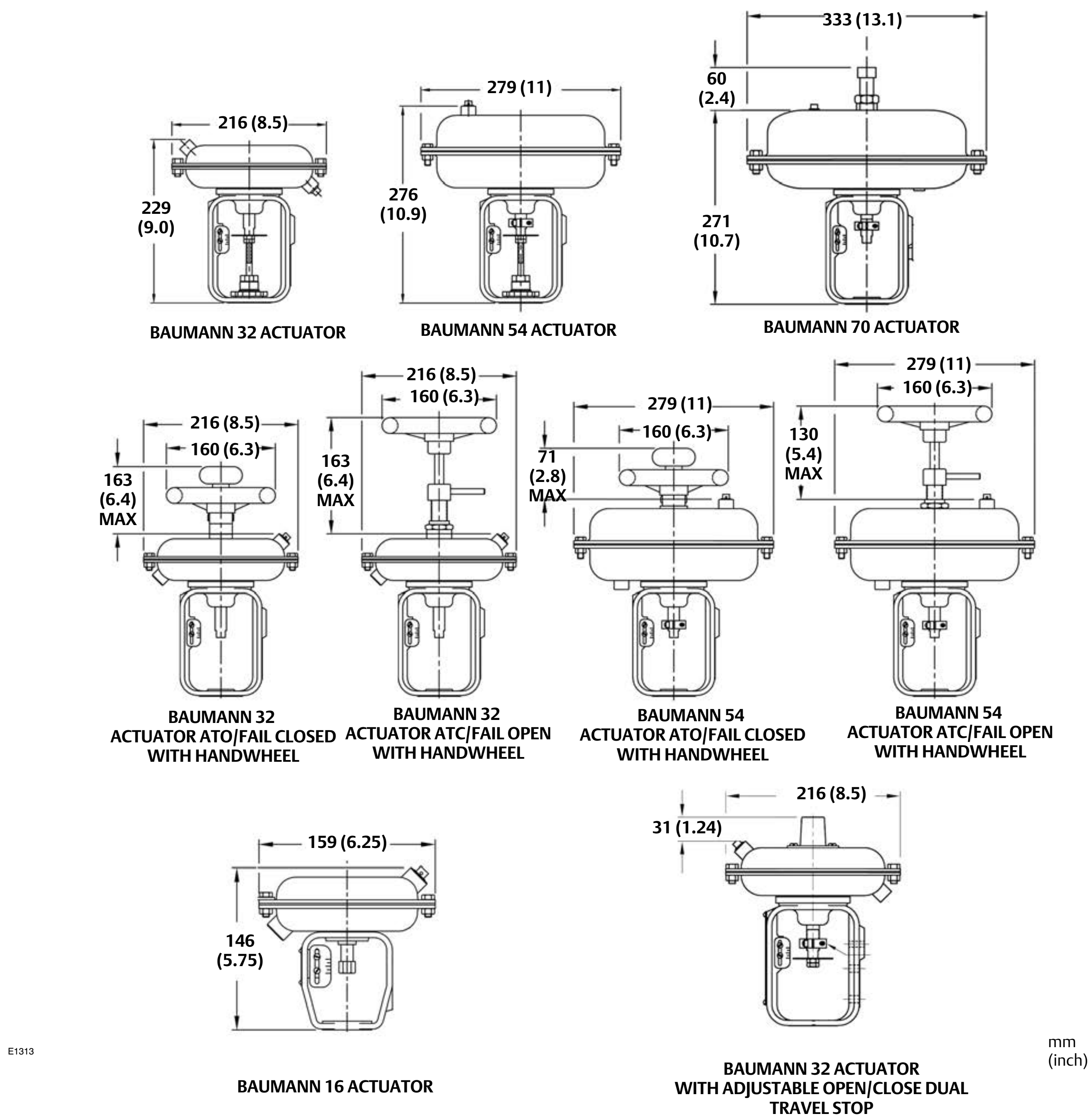
Table 23. 84000 Allowable Pressure Drops (psi): Flow Direction B to A: NPS 1-1/2 and 2 Angle Valves

VALVE SIZE	FLOW DIREC-TION	RATED Cv	TRAVEL	ACTUATOR TYPE	AIR-TO-OPEN ACTION				AIR-TO-CLOSE ACTION			
					Bench Spring Range	Signal to Actuator		With Positioner (2)	Bench Spring Range	Signal to Actuator		With Positioner (2)
NPS			Inches		psig	3-15 psig	1-2 psig(1)	psig	psig	3-15 psig	1-2 psig(1)	psig
1-1/2	B to A	17	0.50	54	5-15	74	148	148	3-13	74	148	259
		17	0.50	54	8-15	185	259	259	3-10	185	259	371
		24	0.75	54	5-15	74	148	148	3-13	74	148	259
		24	0.75	54	7-13	148	222	222	3-10	185	259	371
2	B to A	24	0.50	54	5-15	42	84	84	3-13	42	84	147
		24	0.50	54	8-15	105	147	147	3-10	105	147	210
		32	0.75	54	5-15	42	84	84	3-13	42	84	147
		32	0.75	54	7-13	84	126	126	3-10	105	147	210

1. I/P transducer with 0.07 - 1.2 bar (1 - 17 psig) output signal per FCI 87.2.
2. Shutoff with positioner based on 1.4 bar (20 psi) air supply pressure.

See the appropriate Baumann valve bulletin for maximum pressure drops for 85000 and 87000 valves.

Figure 1. Baumann Pneumatic Actuator Dimensions, mm (Inch)



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CML Electric Actuator for Baumann™ 24000 Series

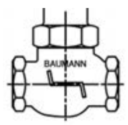
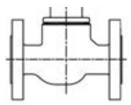
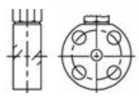
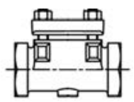
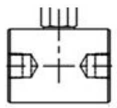
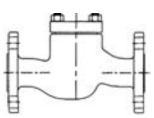
CML-250 and CML-750 electronic modulating valve actuators feature state-of-the-art brushless DC motor technology to provide unrestricted, continuous modulation and exacting position control. Performance of these actuators rivals the power of our pneumatic diaphragm sliding-stem designs.

Baumann 24000 CVF Valve with CML-250 Electric Actuator

Features

- **Integral Servo Amplifier/Positioner; AC or DC pulse (optional):** Accepts 4-20 mA input signal as standard; dry contact closure
- **Wide Ambient Temperature Operating Range:** -30 to 70°C (-22 to 158°F)
- **Motor Enclosure:** Standard: CSA explosion-proof for Class I, Div 1, Groups C & D; Dust-ignition-proof for Class II, Div 1, Groups E, F, G. Also rated NEMA 4, and 6 (IP67) indoor/outdoor
- **Excellent Positioning Accuracy:** Adjustable deadband 0-10% of analogue signal
- **Brushless DC Motor Technology:** Unrestricted continuous modulating duty
- **Fits Baumann 24000 Series Sliding-Stem Valve Designs:** Baumann 24000 series family of bronze, carbon steel, stainless steel, and special alloy designs, see table 1
- **Top-Mounted Manual Override:** Permits manual operation with loss of power
- **Built-in Loop-Powered Position Transmitter:** 4-20 mA signal
- **Easy Push Button Calibration**

Table 1. Valve Body Selections for Electronic Actuators

VALVE BODY STYLE	VALVE SERIES	VALVE BODY MATERIAL	AVAILABLE SIZES NPS	VALVE BODY RATING	AVAILABLE CONNECTIONS	APPLICATION TEMPERATURE RANGE	Cv RATING
	24000	Bronze	1/2 3/4 1 1-1/2 2	ASME CL250	NPT	-20 to 400°F	0.2 - 50.0
	24000C	Carbon Steel WCC	1/2 3/4 1 1-1/2 2	ASME CL150 / PN40 per EN 1092-2	ASME CL150RF or PN10-PN40 RF	-320 to 450°F	0.2 - 52.9
	24000F	316L CF3M	1/2 3/4 1	ASME CL600	Wafer Design CL150/300/600	-320 to 1000°F	0.0005 - 6.5
	24000S	316SS CF8M	1/2 1 1-1/2 2 3	ASME CL300	NPT, Flangeless, or Buttweld	-320 to 1000°F	0.0005 - 61
	24000SB	316L CF3M	1/2 3/4 1	3000 psig	NPT, Socket/Buttweld CL150 - 1500RF	-320 to 1000°F	0.0005 - 6.8
	24000SVF 24000CVF	316L SS CF3M WCC	1/2 3/4 1 1-1/2 2	ASME CL150 or CL300, PN10-40 per EN 1092	ASME CL150 or 300RF, PN10-40 RF	-320 to 850°F	0.0005 - 53.7

Related Documents

- CMA Installation and Maintenance Manual (PUB094-009)
- CMA Range Quick Start Guide (PUB094-007)

Table 2. CML-250 Valve Pressure Drop Limitations (Based on 200 lbf thrust @ 0.13 in/sec)

ORIFICE DIAMETER(1)		SEAT AREA (in^2)	STEM TRAVEL		MAXIMUM SHUTOFF PRESSURE(2)			
					Class IV		Class VI	
mm	inch		mm	inch	bar	psi	bar	psi
6.35	0.25	0.08	12.7	0.50	172	2500	157	2280
7.94	0.3125	0.11	12.7	0.50	---	---	111	1615
9.53	0.375	0.15	12.7	0.50	91	1330	79	1155
20.64	0.8125	0.60	12.7	0.50	22.9	330	16.4	235
27.0	1.0625	0.89	12.7	0.50	13.8	200	8.5	125
31.80	1.25	1.35	19.1	0.75	10.2	145	5.7	80
38.10	1.50	1.92	19.1	0.75	7.1	100	3.4	45
50.80	2.00	3.34	19.1	0.75	4.0	55	1.2	15

1. See respective valve bulletins for port diameters.
2. Do not exceed valve body pressure-temperature rating.

Table 3. CML-750 Valve Pressure Drop Limitations (Based on 750 lbf thrust @ 0.018 in/sec)

ORIFICE DIAMETER(1)		SEAT AREA (in^2)	STEM TRAVEL		MAXIMUM SHUTOFF PRESSURE(2)			
					Class IV		Class VI	
mm	inch		mm	inch	bar	psi	bar	psi
6.35	0.25	0.08	12.7	0.50	206	3000	206	3000
7.94	0.3125	0.11	12.7	0.50	---	---	206	3000
9.53	0.375	0.15	12.7	0.50	206	3000	206	3000
20.64	0.8125	0.60	12.7	0.50	85.8	1245	80.6	1170
27.0	1.0625	0.89	12.7	0.50	51.8	750	47.9	695
31.80	1.25	1.35	19.1	0.75	38.0	550	34.6	500
38.10	1.50	1.92	19.1	0.75	26.9	390	23.9	345
50.80	2.00	3.34	19.1	0.75	15.3	220	13.1	190

1. See respective valve bulletins for port diameters.
2. Do not exceed valve body pressure-temperature rating.

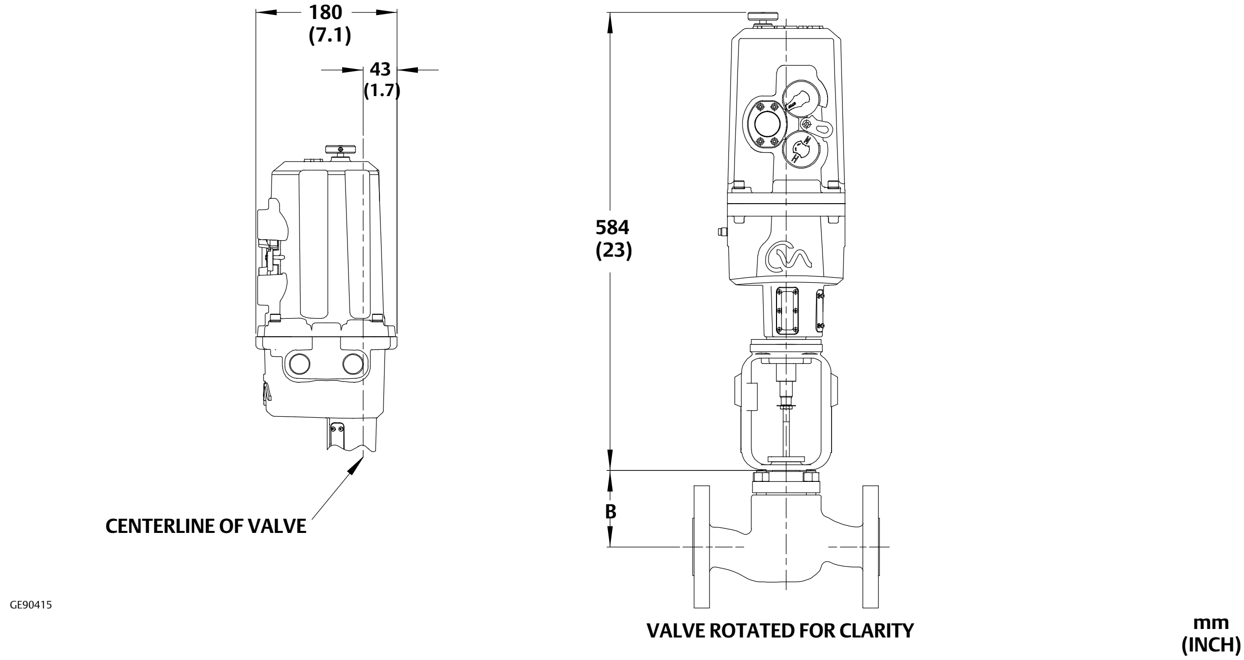
Specifications

See table 4 for actuator specifications.

Table 4. Actuator Specifications

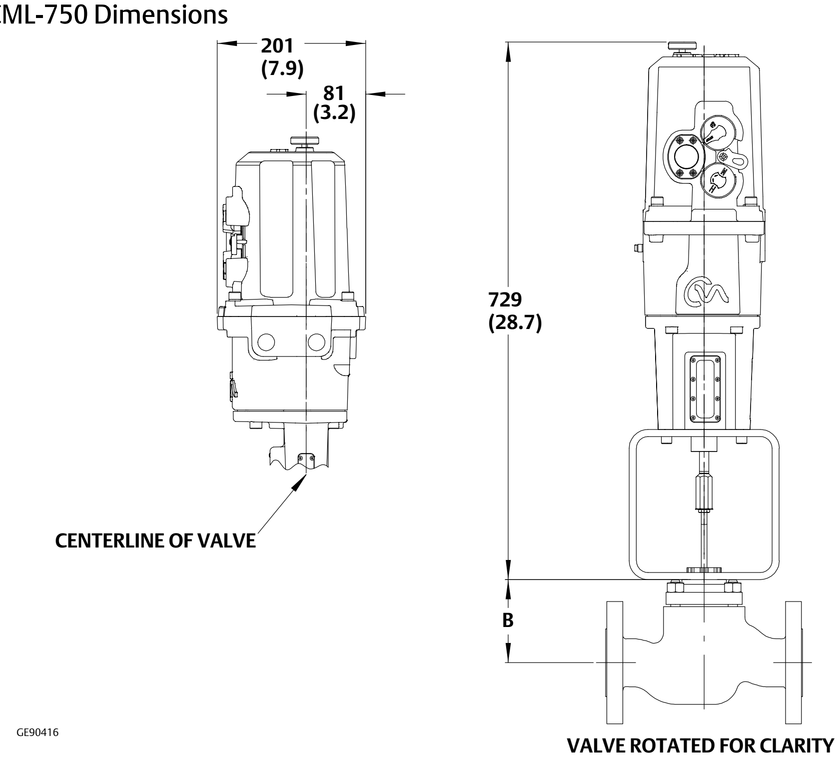
ACTUATOR	CML-250	CML-750
ACTUATOR HOUSING	Cast Aluminum	
ENVIRONMENTAL RATINGS	FM, CSA, ATEX, IEC	
OPTIONAL RATINGS	FM, CSA, ATEX, IEC	
STANDARD ENCLOSURE	FM NEMA 4 and 6 / IP67 Class 1 Div 1 Gr C, D Class II Div I E, F, G	
STANDARD TEMPERATURE RATING	-30°C to 70°C (-22°F to 158°F)	
HAZARDOUS AREA TEMPERATURE RANGE	-20°C to 65°C (-4°F to 150°F)	
CONDUIT CONNECTION	3/4" - 14 NPT (M25 x 1.50p optional)	
MOTOR TYPE	Brushless DC	
OPTIONAL VOLTAGES	120VAC, 240VAC, 24VDC (24VAC not available)	
STANDARD POWER	120VAC/240VAC	
THRUST RATING	250 lbs Mod/Run (1112.1 N) 375 lbs Seating (1668.1 N)	750 lbs Mod/Run (3336.2 N) 1125 lbs Seating (5004.2 N)
THRUST ADJUSTABILITY	60-150% Rated Thrust	
MAX SPEED	0.13 in/sec (adjustable from 50-100%)	
MAX STROKE	38.1 mm (1.5 inch)	50.8 mm (2 inch)
STANDARD CONTROL	Full range 4-20mA / Split Range 4/12 or 12-20mA **optional: 0-5Vdc and 0-10Vdc	
STANDARD FEEDBACK	4-20mA loop powered feedback (Includes 2 adjustable relay outputs)	
CONTROL OPTIONS (SPECIAL)	Discrete On/Off RIRO (24Vdc or 120VAC control), HART, Foundation Fieldbus, DeviceNet, Profibus, Modbus, Pakscan	
HMI/GUI SETUP	LCD - TEXT	
MODULATING DUTY CYCLE	Unrestricted and Continuous	
RESOLUTION	0.2% (adjustable deadband 0-10% of analogue signal)	
SENSITIVITY	0.2%	
RESPONSE TIME	20 milliseconds	
STANDARD FAILURE ACTION	Close valve/Open Valve/Hold-in-Place/Fail to Position on loss of input signal (selectable), Holds in place on power failure (standard)	
CUSTOMER SETTINGS SAVED	Yes (standard)	
POWER BACKUP OPTION	Available: Super Capacitors, Fail to Position on Loss of Power, Adjustable to Fail Closed/Fail Open/Fail to Position/Fail in Place	
LOCAL CONTROL OPTION	Available: Separate option, Local Controls come standard with Super Capacitor Power Back-up	
WEIGHT (ACTUATOR ONLY)	8.3 kg (18.4 lbs)	11.5 kg (25.4 lbs)

Figure 1. CML-250 Dimensions



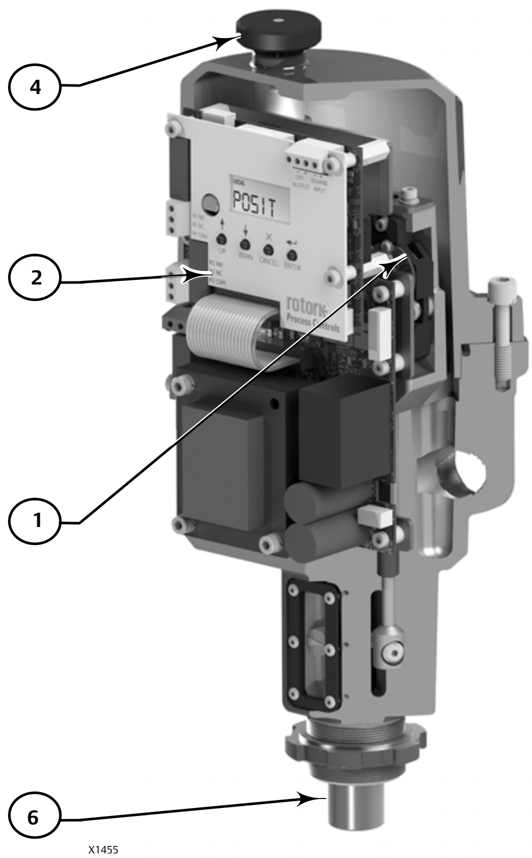
Note: B dimension varies upon valve selection; reference appropriate valve bulletin.

Figure 2. CML-750 Dimensions



Note: B dimension varies upon valve selection; reference appropriate valve bulletin.

Figure 3. CML Linear Actuator Key Actuation Components



Key Action Components

1. Encoder Technology

The CML utilizes absolute encoder technology where a unique digital code corresponds to the stroke length of the actuator.

To achieve high resolution, the position sensor location eliminates any backlash effect in the gearing. The sensor is 12-bit for the CML, fitted at the output gear stages, removing any internal backlash effect that may exist in the drive train.

2. User Interface

Two programmable relays energize upon reaching a desired position or any other available condition among the programmable options.

Field selectable adjustments for:

- Deadband
- Zero and span
- Command signal type
- Standard or reverse acting
- Manual-auto operation
- Fail to position on loss of signal capability

3. DC Brushless Motor

The CML uses a high efficiency, continuous rated, brushless DC motor allowing for maintenance-free operation with continuous modulation duty.

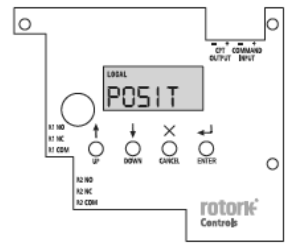
4. Hand Drive

A hand drive mechanism is provided as standard for all CML actuators to allow manual operation of the valve. Pressing down on the hand-knob shaft engages a gear in the upper section of the drive train and releasing the knob causes the spring to disengage the gear.

5. Gear train

The simple yet durable high efficiency spur gear drive is lubricated for life with proven high reliability.

Figure 4. Programmable User Interface



E1660

**CML-250 AND CML-750
MAJOR COMPONENT IDENTIFICATION**

6. Output Drive

The CML may be adapted to suit individual valves.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

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Baumann™ SV Electric Actuator with 24000 Control Valves

The Baumann SV electric control valve series is specifically designed for Baumann sliding-stem control valves. It is used for temperature and humidity control for HVAC (hot and chilled water, steam, glycol, etc.), semiconductor manufacturing (clean rooms, make-up air handlers, recirculation air handlers, humidification, chillers, jackets, and glycol systems), and for many industrial environments such as textiles, food and beverage, and tire manufacturing.

Baumann 24000CVF Valve with SV Electric Actuator

Features

Actuator

- Multi-Function Technology™ (MFT) provides standard auto calibration and signal select ability at the factory or in the field
- Valve failure modes available: close, open, and last position
- Choice of power supply: 24VAC or 24VDC
- Stem position feedback transmitter available

Valve

- High quality S21800 SST and S31600 SST internal valve trim parts are standard; S41600 trim and PTFE seating options are available
- Dual stem and plug guiding provides increased stability during plug travel
- Available equal percentage and linear characterized trims to match process loop dynamics

Specifications

Actuator specifications are shown in table 1.

Manual Override

The valve stem position can be adjusted by inserting a 4 mm hex head screwdriver into the housing cover.

Table 1. Actuator Specifications

ACTUATOR TYPE		SVX24-MFT	SVK24-MFT
POWER FAILURE		Lock in last position	Fail Open / Fail Closed
ACTION		Direct or Reverse	
POWER CONSUMPTION		4 W	8.5 W
TRANSFORMER SIZE		6 VA (class 2 power source)	21 VA (class 2 power source)
TRAVEL		12.7 and 19.1 mm (0.50 and 0.75 inches)	
MATERIAL	Housing	Aluminum die cast and plastic casing	
	YOKE Legs	Aluminum	
ENCLOSURE RATING		NEMA 2, / IP 54 UL Enclosure Type 2	
INPUT SIGNAL		2 - 10 VDC or 4 - 20 mA input signal	
POWER SUPPLY		24 VAC or 24 VDC	
ELECTRICAL CONNECTION		3 ft, 18GA appliance cable, 0.5 inch conduit fitting	
AMBIENT TEMPERATURE		-30 to 50°C (-22 to 122°F)	
RELATIVE HUMIDITY RANGE		5 to 95% RH, non-condensing	
OUTPUT THRUST		1500 N (337 lbf)	
VALVE STEM POSITION FEEDBACK OUTPUT		2-10 VDC (0.5 mA maximum)	
SHUTOFF CLASS		Class IV or VI per ANSI/FCI 70-2 (Refer to Valve Technical Bulletin)	
TRAVEL TIME		35 seconds	
NOISE LEVEL		< 45 dB(A)	
MANUAL OVERRIDE		4 mm Hex Head	
POSITION INDICATION		Travel Indicator on Yoke	
SPLIT RANGE CAPABILITY		Yes	
AGENCY APPROVALS		CE (A), UL 60730-1A/-2 -14, CSA E60730-1:02 (CE approval for actuator only)	
QUALITY STANDARD		ISO 9001	
WEIGHT		1.3 kg (2.9 lbs)	1.6 kg (3.6 lbs)

Baumann 24000 Bronze Control Valve

Table 2. Maximum Allowable Pressure Drops

VALVE SIZE		ORIFICE DIAMETER		PLUG TRAVEL		SHUTOFF Metal Seat CL IV		SHUTOFF Soft Seat CL VI	
DN	NPS	mm	in	mm	in	bar	psi	bar	psi
15, 20, 25	1/2, 3/4, 1	6.3	0.25	12.7	0.5	17	250	17	250
		9.5	0.375	12.7	0.5	17	250	17	250
15	1/2	20.6	0.8125	12.7	0.5	17	250	17	250
20	3/4	20.6	0.8125	12.7	0.5	17	250	17	250
25	1	20.6	0.8125	12.7	0.5	17	250	17	250
		26.9	1.0625	12.7	0.5	17	250	17	250
40	1-1/2	31.8	1.25	19.1	0.75	17	249	13	184
		38.1	1.5	19.1	0.75	12	176	8	121
50	2	38.1	1.5	19.1	0.75	12	176	8	121
		50.8	2	19.1	0.75	7	101	4	59

Baumann 24000C Carbon Steel Control Valve

Table 3. Maximum Allowable Pressure Drops

VALVE SIZE		ORIFICE DIAMETER		PLUG TRAVEL		SHUTOFF Metal Seat CL IV		SHUTOFF Soft Seat CL VI	
DN	NPS	mm	in	mm	in	bar	psi	bar	psi
15, 20, 25	1/2, 3/4, 1	6.3	0.25	12.7	0.5	20	290	20	290
		9.5	0.375	12.7	0.5	20	290	20	290
15	1/2	20.6	0.8125	12.7	0.5	20	290	20	290
20	3/4	20.6	0.8125	12.7	0.5	20	290	20	290
25	1	20.6	0.8125	12.7	0.5	20	290	20	290
		27.0	1.0625	12.7	0.5	20	290	18	264
40	1-1/2	31.8	1.25	19.1	0.75	17	249	13	184
		38.1	1.5	19.1	0.75	12	176	8	121
50	2	38.1	1.5	19.1	0.75	12	176	8	121
		50.8	2	19.1	0.75	7	101	4	59

Baumann 24000S Stainless Steel Control Valves

Table 4. Maximum Allowable Pressure Drops

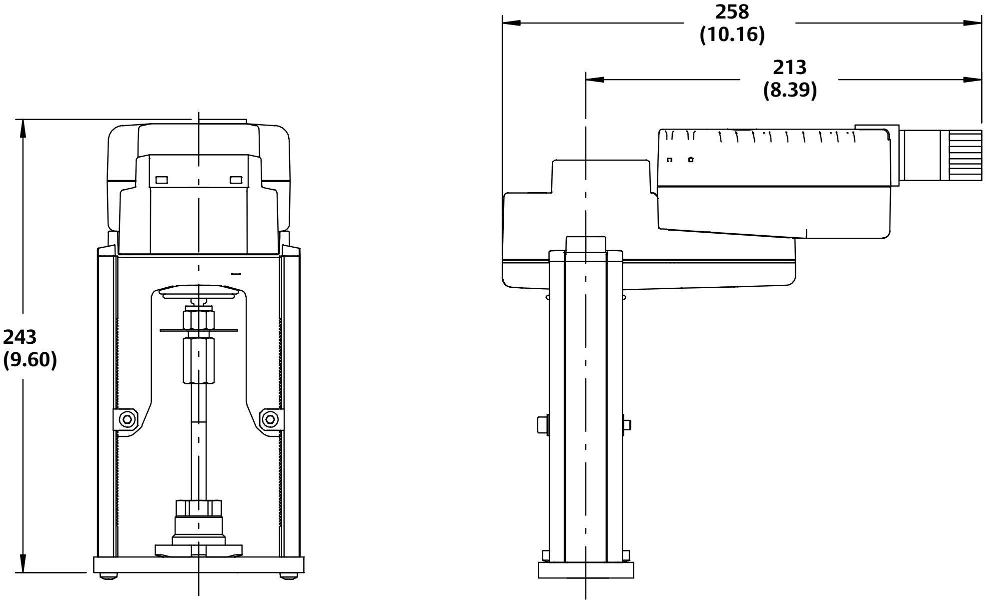
VALVE SIZE		ORIFICE DIAMETER		PLUG TRAVEL		SHUTOFF Metal Seat CL IV		SHUTOFF Soft Seat CL VI	
DN	NPS	mm	in	mm	in	bar	psi	bar	psi
15, 25	1/2, 1	4.0	0.156	12.7	0.5	50	720	50	720
		6.4	0.25	12.7	0.5	50	720	50	720
25	1	7.9	0.3125	12.7	0.5	50	720	50	720
		9.5	0.375	12.7	0.5	50	720	50	720
		20.6	0.8125	12.7	0.5	39	560	32	466
40	1-1/2	31.8	1.25	19.1	0.75	17	249	13	184
50	2	38.1	1.5	19.1	0.75	12	176	8	121
80	3	50.8	2	19.1	0.75	7	101	4	59

Baumann 24000CVF/SVF Carbon Steel and Stainless Steel Flanged Control Valve

Table 5. Maximum Allowable Pressure Drops

VALVE SIZE		ORIFICE DIAMETER		PLUG TRAVEL		SHUTOFF Metal Seat CL IV		SHUTOFF Soft Seat CL VI	
DN	NPS	mm	in	mm	in	bar	psi	bar	psi
15	1/2	4.0	0.156	12.7	0.5	50	720	50	720
		6.4	0.25	12.7	0.5	50	720	50	720
20	3/4	7.9	0.3125	12.7	0.5	50	720	50	720
25	1	9.5	0.375	12.7	0.5	50	720	50	720
15	1/2	20.6	0.8125	12.7	0.5	39	560	32	466
20	3/4	20.6	0.8125	19.1	0.75	39	560	32	466
25	1	20.6	0.8125	19.1	0.75	39	560	32	466
		27.0	1.0625	12.7	0.5	23	339	18	264
40	1-1/2	31.8	1.25	19.1	0.75	17	249	13	184
		38.1	1.5	19.1	0.75	12	176	8	121
50	2	38.1	1.5	19.1	0.75	12	176	8	121
		50.8	2	19.1	0.75	7	101	4	59

Figure 1. Baumann SV Electric Actuator Dimensions



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FlowScanner™ Linear Travel Transducer

FlowScanner Linear Travel Transducers are used to accurately measure linear valve travel, which is essential for diagnostic testing. Extending or retracting the cable rotates a shaft connected to a digital encoder producing a digital output signal. These unique linear-to-rotational, industrial-grade string encoder modules allow for versatility in valve position measurement both in the field and shop environments.

FlowScanner Linear Travel Transducers are cable actuated position sensors that are typically mounted temporarily to a control valve assembly for diagnostic testing. Valve diagnostic tools, such as the FlowScanner 6000 and QUIKLOOK 3-FS, have digital input channels to allow the Linear Travel Transducer to be utilized. Valve travel is a vital characteristic to all control valves and significantly important to accurately measure during diagnostic testing.

X1355

Figure 1. Mounted Linear Transducer

X1344

Features

- **High Resolution**—The 2-1/2 inch diameter encoder allows for a resolution of 0.0001 inch for both the 25- and 50-inch models. This provides critical detail when examining seating profiles.

- **Digital Quadrature Output**—The digital incremental quadrature output is a square waveform free of noise and drift. This output is viewed as pulses or counts, which are electronically counted to produce accurate readings.

- **Compensated Stroke Range**—Both models have cables longer than the specified measurement range to avoid damage from inadvertent over-extension and for improved accuracy to the end of the measurement range.

- **TEDS 'Plug-and-Play'**—Embedded memory chips can be used by valve diagnostic tools to recognize and automatically set the transducer's range, sensitivity, and calibration information. (Not used in FlowScanner 6000).

- **Compact design**—The cable and rotary encoder combination allow for easier placement than prior art. Legacy linear probe-type encoders are large, bulky, and could typically only measure 4 inches of change.

Table 1. Specifications

Available Configurations

25 Inch Linear Travel Transducer: P/N 19B2908X022

50 Inch Linear Travel Transducer: P/N 19B2908X062

Electrical Specifications

Input: Supply Voltage 5 to 28 VDC

Output: Incremental Encoder

Connection: Industrial 10-pin Circular Connector

Performance Specifications

Standard Sensitivity: 2500 PPI (±10 pulses)

Resolution:
0.0001 inch (using standard 4x quadrature)

Calibrated Accuracy:
±0.0065 inch over measurement range (25 inch)
±0.0130 inch over measurement range (50 inch)

Environmental Specifications

Storage Temperature: -25 to 90°C (-13 to 194°F)

Operating Temperature: 0 to 70°C (32 to 158°F)

Operating Humidity: 0 - 98% RH without condensation

Mechanical Specifications

Construction: Powder Painted Aluminum

Weight: Less than 1.1 kg (2.5 lb)

Dimensions: see figure 2

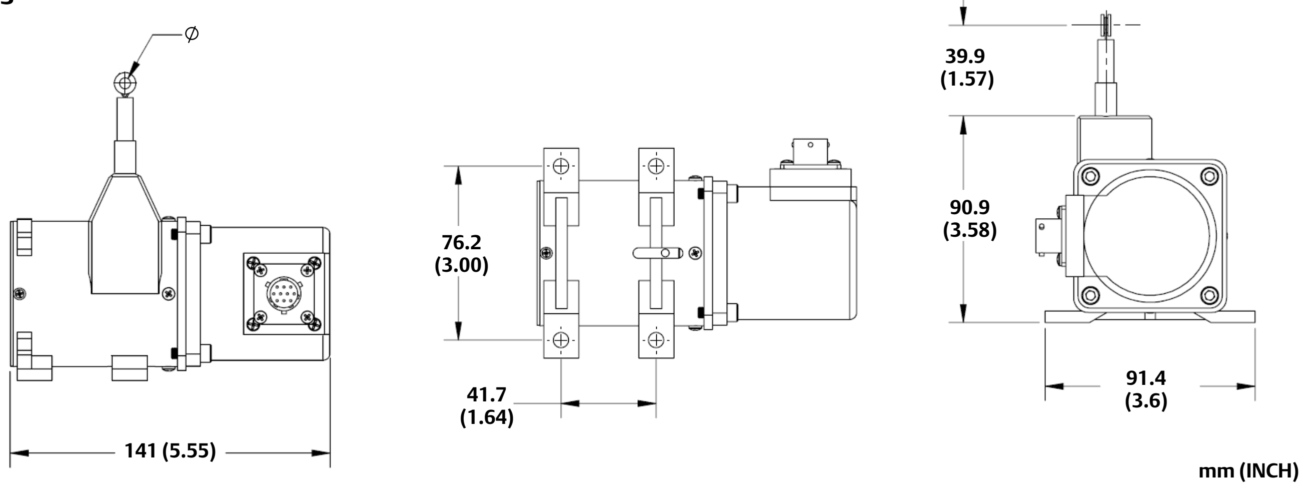
Cable (String): 0.034 inch coated stainless steel rope

Cable Length:
40 inches (25 inch model)
60 inches (50 inch model)

Cable Eyelet: 0.191 inch inside diameter, stainless steel

Cable Tension: 17 ±8.5oz. 5g max acceleration (higher tension special order)

Figure 2. Dimensions



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FlowScanner™ Rotary Travel Transducer

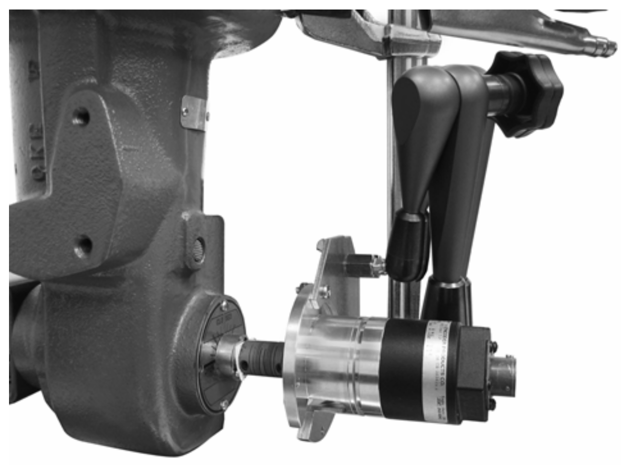
FlowScanner Rotary Travel Transducers are used to accurately measure rotary valve travel, which is essential for diagnostic testing. Rotating the shaft of the transducer produces a digital output signal.

FlowScanner Rotary Travel Transducers are end shaft operated position sensors that are typically mounted temporarily to a control valve assembly for diagnostic testing. Valve diagnostic tools, such as the FlowScanner 6000 and QUIKLOOK 3-FS, have digital input channels to allow the Rotary Travel Transducer to be utilized. Valve travel is a vital characteristic to all control valves and significantly important to accurately measure during diagnostic testing.

Features

- **High Resolution**—The 2 inch diameter encoder allows for a resolution of 0.0075 degree.
- **Compact, Rugged, Lightweight**—This industrial packaged transducer is designed to be used in a field environment. While being compact to fit into tight places and very lightweight to affix to any location.
- **Digital Quadrature Output**—The digital incremental quadrature output is a square waveform free of noise and drift. The output is viewed as pulses or counts, which are electronically counted to produce the accurate readings.
- **TEDS 'Plug-and-Play'**—Embedded memory chips can be used to recognize and automatically set the transducer's range, sensitivity, and calibration information. (Not used in FlowScanner 6000).
- **Compact design**—The rotary transducer allows for easier placement than prior art. Legacy encoders are large, bulky, and could not fit into tight spaces.

Figure 1. Mounted Rotary Trandsducer



X1343

Table 1. Specifications

Available Configuration

Rotary Travel Transducer: P/N GE07458X022

Electrical Specifications

Input: Supply Voltage 4.75 to 28 VDC

Output: Incremental Encoder

Connection: Industrial 10-pin Circular Connector

Performance Specifications

Standard Sensitivity: 12,000 pulses per revolution

Resolution: 0.0075 degree (using standard 4x quadrature)

Calibrated Accuracy: ±0.0225 degree per revolution (360 degrees)

Environmental Specifications

Storage Temperature: -25 to 85°C (-13 to 185°F)

Operating Temperature: 0 to 70°C (32 to 158°F)

Operating Humidity: 0 - 98% RH without condensation

Sealing: IP50

Mechanical Specifications

Construction: Powder Painted Aluminum

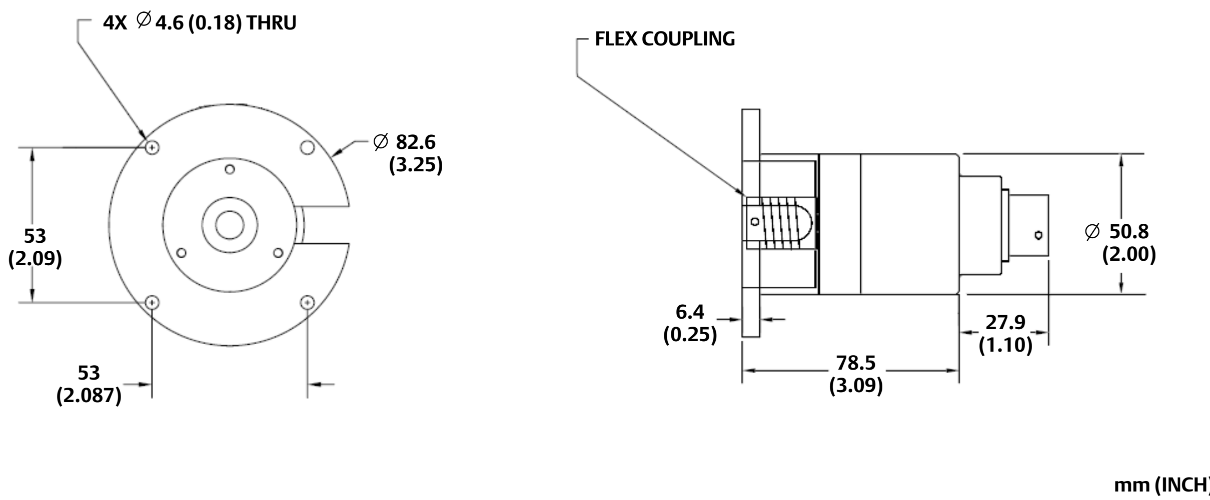
Weight: Less than 1 lb

Dimensions: see figure 2

Max Shaft Speed: 8,000 RPM

Starting Torque: 1.0 oz-in typical

Figure 2. Dimensions



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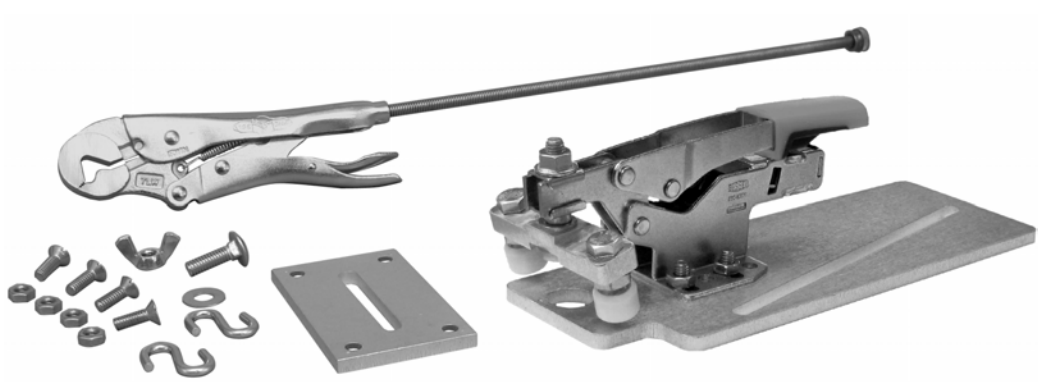
FlowScanner™ Travel Transducer Mounting Kit for Common Sliding-Stem

The FlowScanner Travel Transducer Mounting Kit for Common Sliding-Stem (CSS) valve assemblies is used to securely attach the travel transducer in order to accurately measure valve travel for a diagnostic test. This quick-connection apparatus connects to the actuator's diaphragm casing lip temporarily and provides an adjustable means to affix the FlowScanner Linear Travel Transducer.

The FlowScanner Travel Transducer CSS Mounting Kit is designed to reduce diagnostic testing hook-up time by incorporating quick action concepts within the bracketry. The single clamping motion used to connect a travel transducer mounting location reduces time required to setup a control valve assembly for diagnostic testing. Valve travel is a vital characteristic to all control valves and accurate measurement of valve travel is significantly important during diagnostic testing. The CSS Mounting Kit will improve the measurement of travel and the resulting diagnostic testing.

Features

- Ease of use—A single motion, one hand use, is needed to clamp this bracket on to the actuator allowing the user a means to become repetitive in testing hook-ups. The same applies to connecting the modified locking wrench to the valve stem or feedback arm.
- Fast —Reduces diagnostic test hook-up time of travel transducer, greatly lowering the overall diagnostic testing time.
- Auto-Adjusting Clamp—The clamping width is auto adjusting to different heights, corresponding to different actuator casing lip thicknesses. No individual adjustment is required.
- Compatibility—Fits all Fisher™ and most other spring and diaphragm actuators with stamped steel casings.
- Versatility—Slotted bracket allows travel transducer to be infinitely placed, yet placed in the proper position regardless of the actuator model and size, allowing the cable to be parallel to the valve's travel.
- Sturdy Mounting—The combination of high clamping force, a wide clamping surface, and a thick, flat aluminum bracket creates a solid mounting location for the travel transducer.



X1337

Available Configurations

CSS Mounting Kit: P/N GE80360X012

Mechanical Specifications

Construction: Steel, Aluminum

Clamping Force: 500 lbs typical

Clamp Opening Width: 0.375 inch to 0.800 inch

Clamping Bracket Length: 10 inches

Modified Locking Wrench Length: 19 inches

Compatible Actuators

Fisher 657, sizes 30 to 70

Fisher 667, sizes 30 to 70

Fisher GX, all sizes

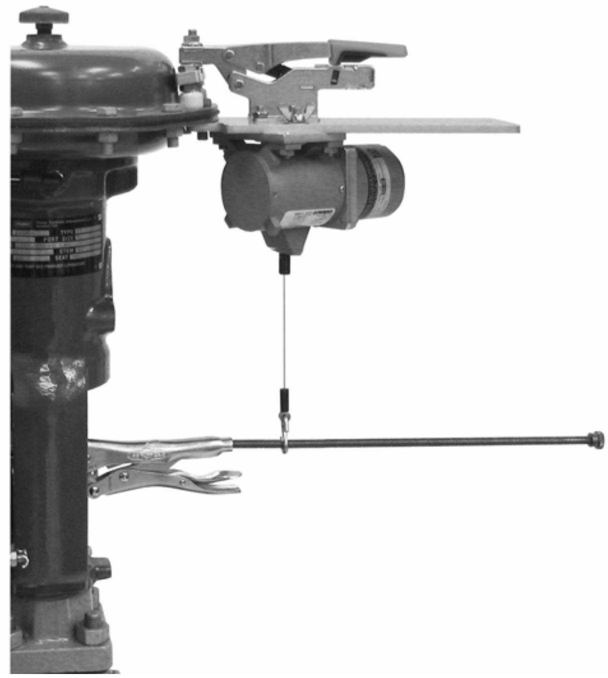
Masoneilan 37/38

Masoneilan 87/88

Copes/Vulcan 700 Series

Many other spring and diaphragm actuators with stamped steel casings

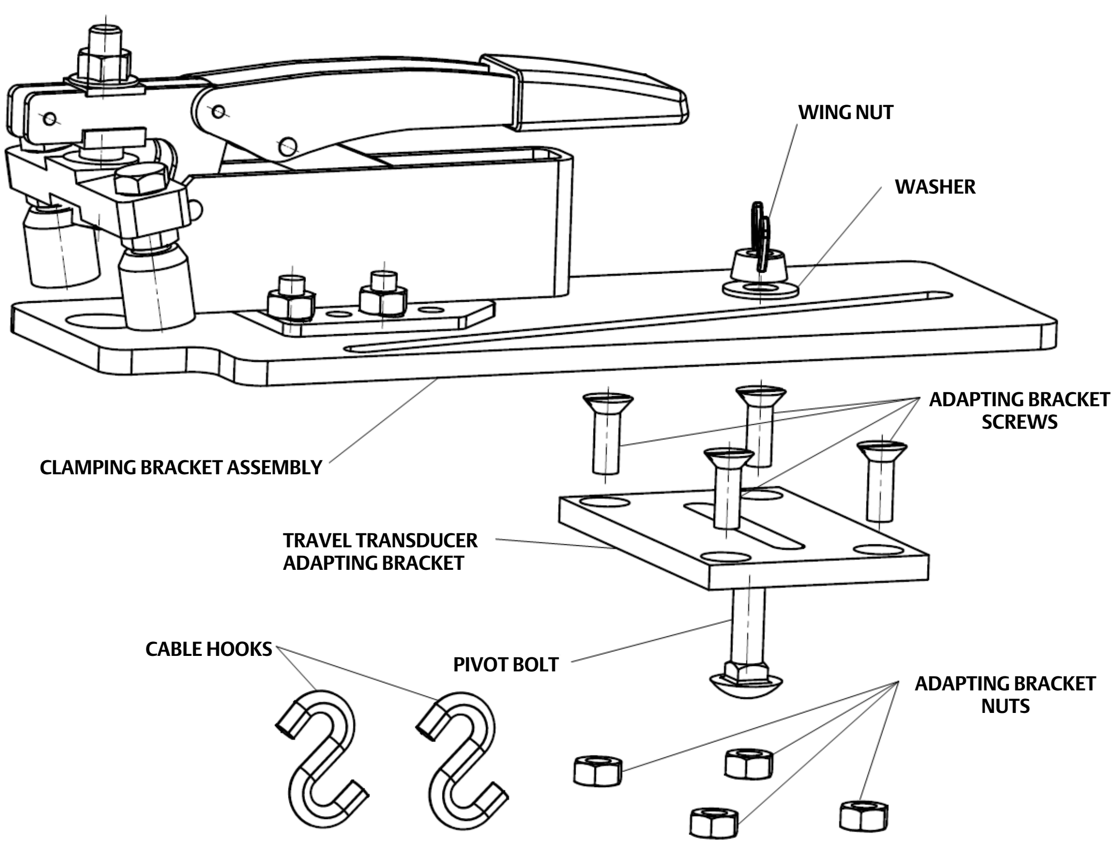
Figure 1. CSS Mounting Kit



Parts Included

Qty	Description
1	Clamping Bracket Assembly
1	Modified Locking Wrench
1	Travel Transducer Adapting Bracket
4	Adapting Bracket Screws
4	Adapting Bracket Nuts
1	Pivot Bolt
1	Washer
1	Wing Nut
2	Cable Hooks

Figure 2. CAD Drawing



Not Shown:
Modified Locking Wrench

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FlowScanner™ Travel Transducer Mounting Kit for Piston and Universal

The FlowScanner Travel Transducer Mounting Kit for Piston and Universal (PIST) valve assemblies is used to securely place the travel transducer in order to accurately measure valve travel for a diagnostic test. This connection apparatus connects to the actuator's cylinder or yoke temporarily and provides an adjustable means to affix the FlowScanner Linear Travel Transducer.

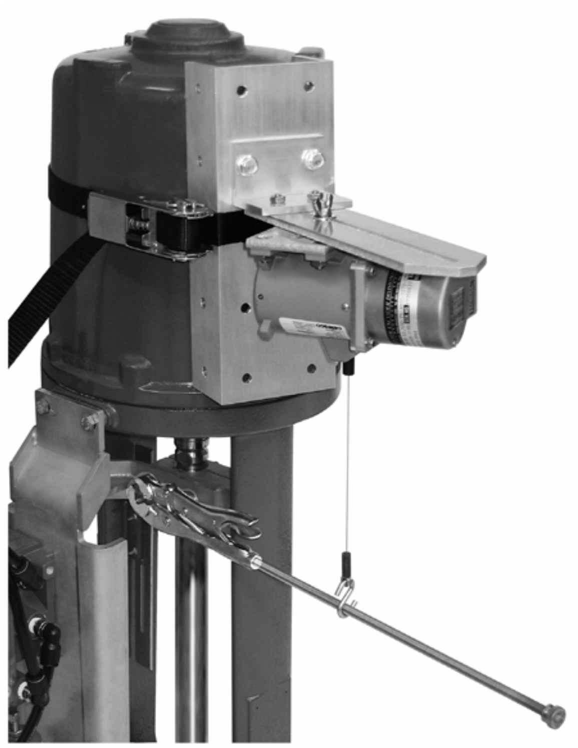
The FlowScanner Travel Transducer PIST Mounting Kit is designed to reduce diagnostic testing hook-up time on actuators that don't have a typical design. By utilizing a fabric strap, this mounting kit is secured to round, cylindrical objects that otherwise have no connecting options. Valve travel is a vital characteristic to all control valves and accurate measurement of valve travel is significantly important during diagnostic testing. The PIST Mounting Kit will improve the measurement of travel and the resulting diagnostic testing.

Features

- Ease of use—Simple bracketry used with a ratcheting fabric strap to hold bracket in place. Same applies to connecting the modified locking wrench to the valve stem or feedback arm.
- Versatility—Universal design focused at mounting to cylindrical objects allows for use in many different and difficult applications. The U bracket and the connecting bracket assembly can be mounted in both horizontal or vertical positions, independent of each other.
- Adjustability—Multiple holes drilled to allow multiple configurations of the mounting location based on the actuator's design. The ratcheting fabric strap can be used on a wide range of objects with differing sizes or diameters.
- Sturdy Mounting—The combination of the ratcheting fabric strap and the thick aluminum U bracket creates a solid foundation and mounting location for the travel transducer.


X1338

Figure 1. PIST Mounting Kit



X1340

Available Configurations

PIST Mounting Kit: P/N GE81019X012

Mechanical Specifications

Construction: Aluminum, Stainless Steel, Polyester

Strap Load Limit: 500 lbs

Strap Length: 15 feet

Clamping Diameter Range: 5 inches to 4 feet

Connecting Bracket Length: 10 inches

Modified Locking Wrench Length: 19 inches

Hole Pattern: 2.25 inches apart

Compatible Actuators

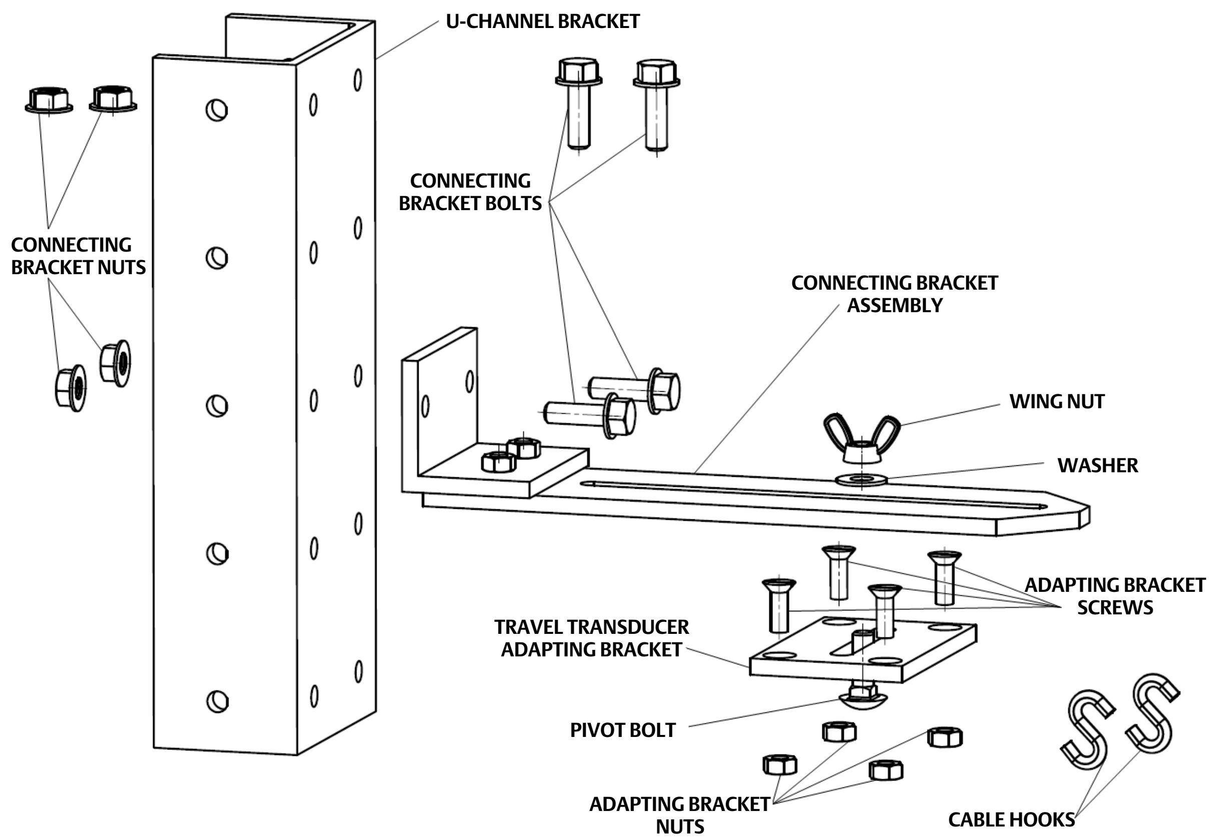
Fisher™ 585C, sizes 50 to 130
Fisher 470, sizes 68 to 130
Fisher 657, sizes 80 and 100
Fisher 667, sizes 80 and 100
Fisher 685, sizes 10 to 28
Many other piston actuators.

Parts Included

Qty	Description
1	U-Channel Bracket
1	Connecting Bracket Assembly
1	Ratcheting Strap
4	Connecting Bracket Bolts
4	Connecting Bracket Nuts
1	Modified Locking Wrench

Qty	Description
1	Travel Transducer Adapting Bracket
4	Adapting Bracket Screws
4	Adapting Bracket Nuts
1	Pivot Bolt
1	Washer
1	Wing Nut
2	Cable Hook

Figure 2. CAD Drawing



Not Shown:
Ratcheting Strap
Modified Locking Wrench

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FlowScanner™ Travel Transducer Mounting Kit for Common Rotary

The FlowScanner Travel Transducer Mounting Kit for Common Rotary (RTY) valve assemblies is used to securely place the travel transducer in order to accurately measure valve travel for a diagnostic test. This quick-connection apparatus temporarily connects to the actuator's yoke or casing and provides an adjustable means to affix the FlowScanner Rotary Travel Transducer.

This quick-connection apparatus temporarily connects to the actuator's yoke or casing and provides an adjustable means to affix the FlowScanner Rotary Travel Transducer with access to the end of a rotating shaft. Alternatively, the FlowScanner Linear Travel Transducer can also be affixed with perpendicular, clear access to the valve shaft.

The FlowScanner Travel Transducer RTY Mounting Kit is designed to reduce diagnostic testing hook-up time by incorporating quick action concepts within the bracketry. The single clamping motion used to connect a travel transducer mounting location reduces time required to setup a control valve assembly for diagnostic testing. Valve travel is a vital characteristic to all control valves and accurate measurement of valve travel is significantly important during diagnostic testing. The RTY Mounting Kit will improve the measurement of travel and the resulting diagnostic testing.

Features

- Ease of use—A single clamping motion followed by proper adjustment of the positioning arm aligns the travel transducer to the valve shaft allowing the user a means to become consistent in diagnostics testing.
- Adjustability—The clamping width is adjustable and the positioning arm has infinite configurations to position the travel transducer in the correct alignment.
- Versatility—Jointed positioning arm can be manipulated into infinite locations, yet placed in the proper position regardless of the actuator model and size. Either the FlowScanner Rotary Travel Transducer or the FlowScanner Linear Travel Transducer can be attached for measurement providing options for all rotary control valve assemblies.
- Sturdy Mounting—The clamp's profiled rail is thick and acts as a steady base for the positioning arm.
- Fast—Reduces diagnostic test hook-up time of travel transducer, greatly lowering the overall diagnostic testing time.

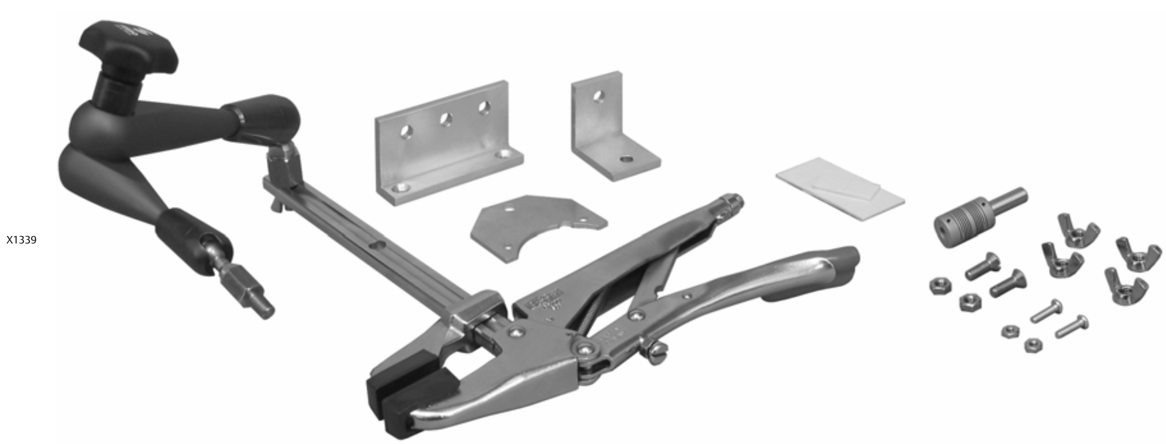
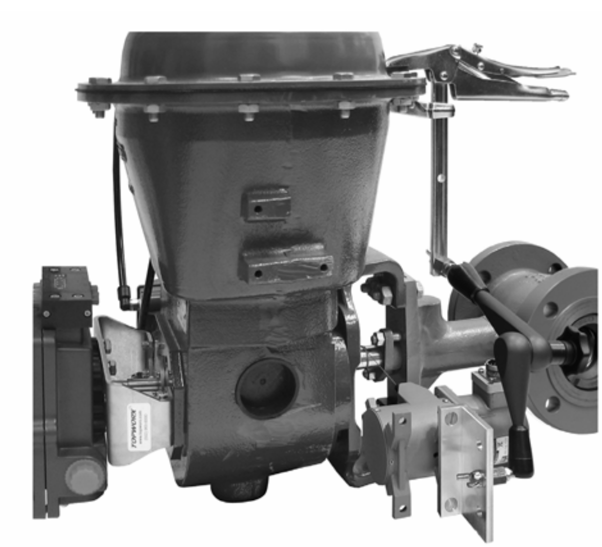


Figure 1. RTY Mounting Kit

X1341

Figure 2. Alternate Configuration



X1342

Available Configurations

RTY Mounting Kit: P/N GE80354X012

Mechanical Specifications

Construction: Steel, Aluminum

Clamping Force: 450 lbs typical

Clamp Opening Width: 7 inches

Positioning Arm Length: 12 inches

Compatible Actuators

Fisher™ 1051/1052, sizes 20 to 70

Fisher 2052, sizes 1 to 3

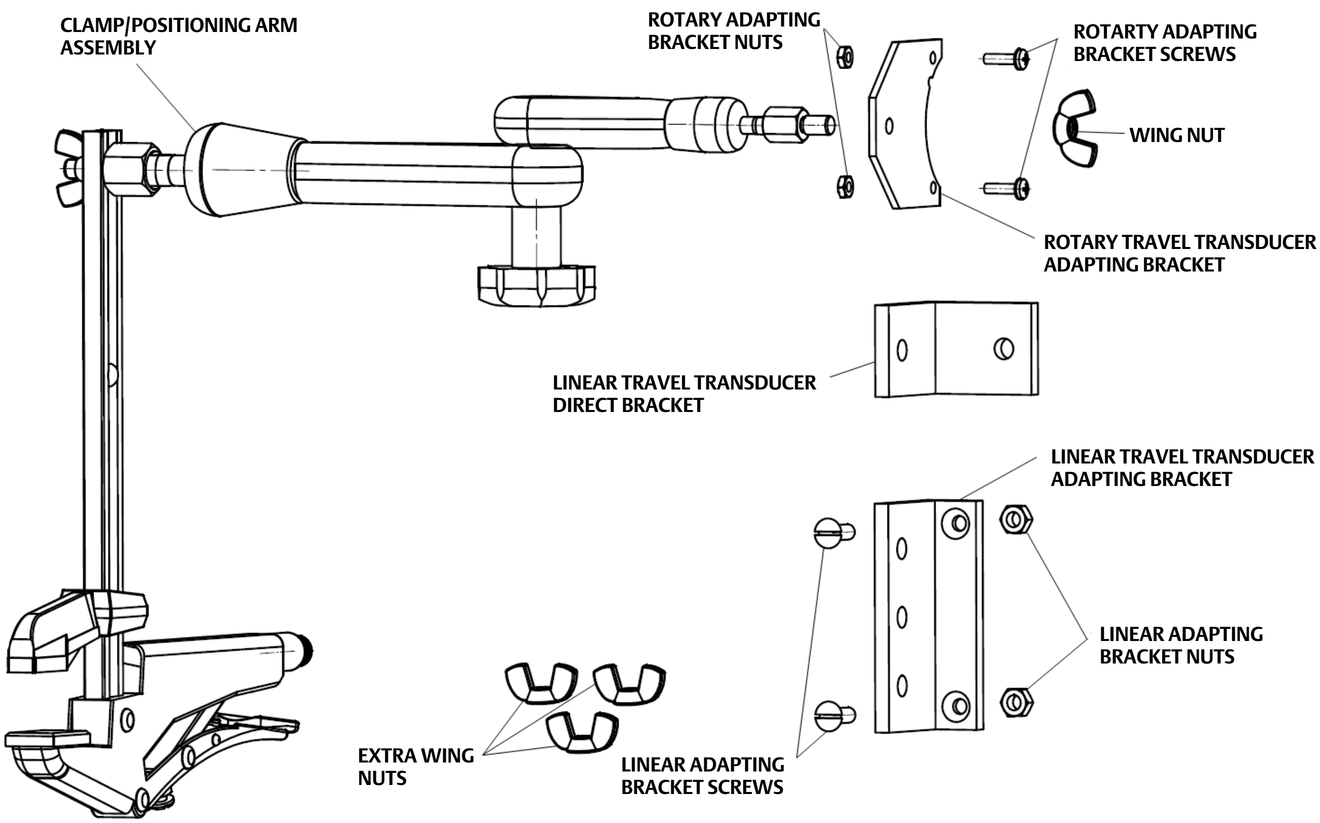
Many other rotary actuators with end shaft access

Many other rotatry actuators with clear valve shaft access

Parts Included

Qty	Description
1	Clamp/Positioning Arm Assembly
1	Flexible Coupling
1	Coupling Shaft
1	Rotary Travel Transducer Adapting Bracket
1	Linear Travel Transducer Adapting Bracket
1	Linear Travel Transducer Direct Bracket
4	Adapting Bracket Screws (2-Linear, 2-Rotary)
4	Adapting Bracket Nuts (2-Linear, 2-Rotary)
4	Wing Nuts
20	Mounting Tape

Figure 3. CAD Drawing



Not Shown:
Flexible Coupling
Coupling Shaft
Mounting Tape

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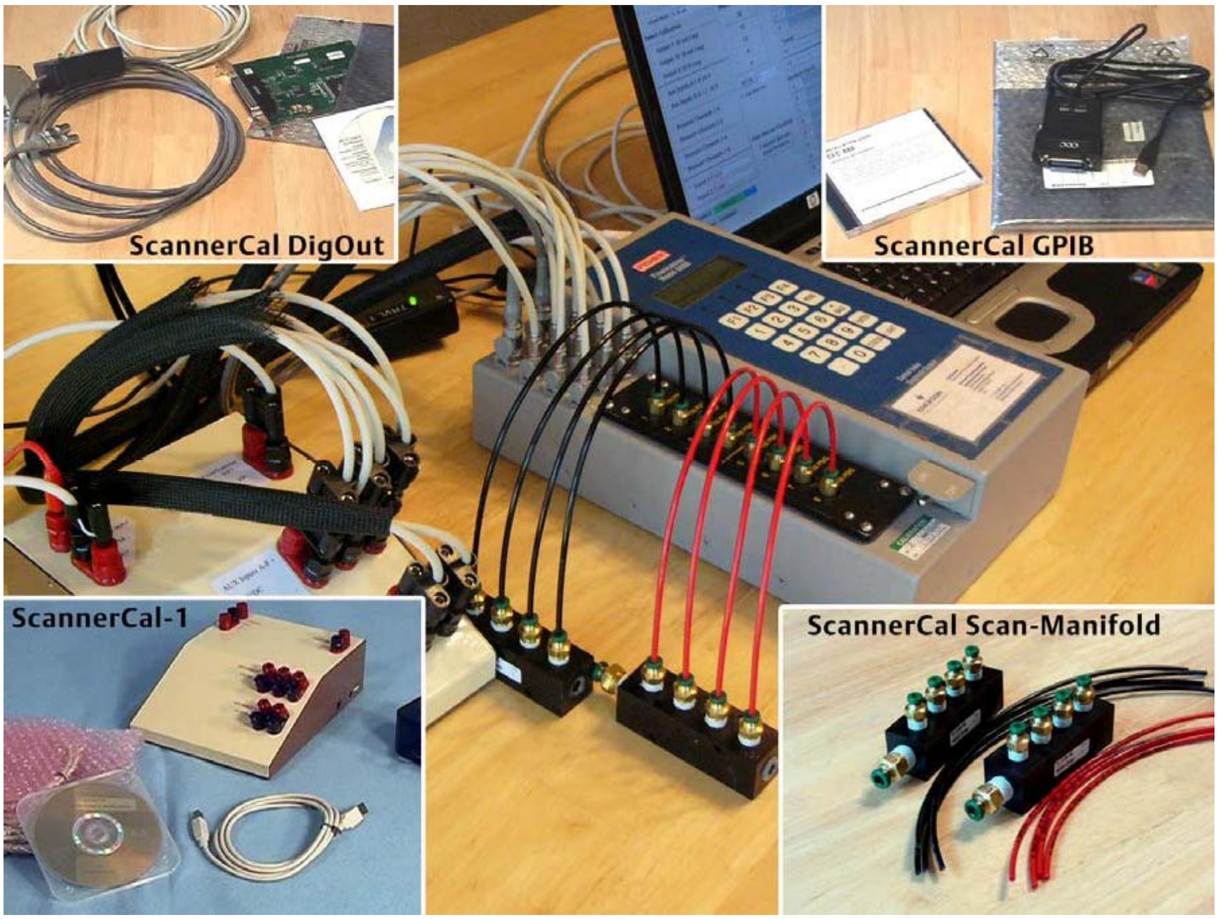
ScannerCal
D103179X012

Product Bulletin
56.3:ScannerCal
September 2017

ScannerCal Accuracy Verification System for the FlowScanner



ScannerCal Accuracy Verification System

Verify the calibration and accuracy of the FlowScanner™ 6000 with the ScannerCal Accuracy Verification System. ScannerCal uses electrical test signals and compares the FlowScanner 6000 readings with laboratory test instruments. Test results can be automatically copied from the FlowScanner and test instruments to an Excel spreadsheet for complete and accurate record keeping.

ScannerCal does not include the master instruments needed for comparison to FlowScanner readings, as most calibration labs already have similar instruments. Our shops use the Agilent 3458A Multi-meter and Druck DPI 515 pressure calibrator.

ScannerCal provides the needed interconnections between the instruments and FlowScanner, and the software to record readings.

ScannerCal does not perform any adjustment of the calibration. It only documents the accuracy. If the accuracy changes the FlowScanner requires repair, not recalibration.

The ScannerCal Accuracy Verification System consists of the following components:

- Interface Box for testing the electrical analog inputs and output of the FlowScanner.
- Aux Input Cables to connect the interface box to the FlowScanner auxiliary inputs.
- An optional GPIB/USB instrument bus converter to connect laboratory test instruments to the computer.
- Two optional Scan-Manifolds with 1/4” tubing inlets and four 1/8” tubing outlets for connecting the FlowScanner pressure channels to a single pressure line.
- Optional DigOut digital output card and travel simulator cables for testing the two travel inputs on the FlowScanner. The DigOut is available as both a PCI card for desktop computers and a PCMCIA card for laptop computers.

ScannerCal was originally developed for Emerson Instrument & Valve Services internal use for production testing of FlowScanner systems. You get the same hardware and software we use to certify the accurate operation of the FlowScanner.

Computer Requirements

ScannerCal software will run on a computer running Microsoft Windows XP or later. The computer will need a CD-ROM reader for installing the software. The computer will also need an Ethernet interface for connecting the FlowScanner, and an available USB port for connecting the interface box and the optional Agilent multimeter and Druck calibration units. ScannerCal does not need to use the same computer that the FlowScanner uses for field work

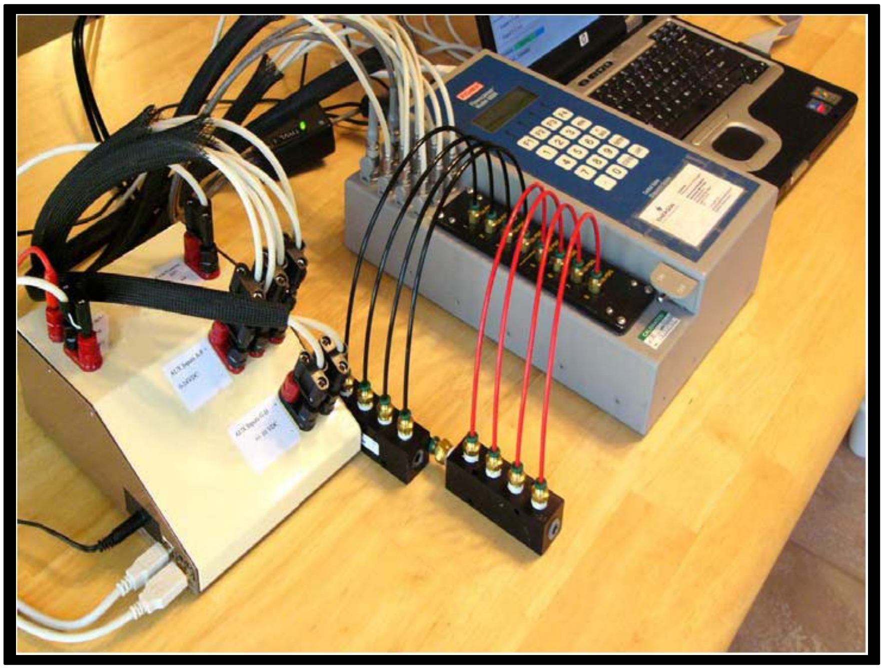
If the DigOut option is used to test the travel inputs, an expansion slot (either PCI or PCMCIA) is also needed.

Because ScannerCal is provided only for licensed users of the FlowScanner 6.X software, it is governed by the terms of the license provided with that software.

ScannerCal Equipment Installation and Setup

Figure 1 shows the complete ScannerCal Calibration System connected to a computer and a FlowScanner™ 6000.

Figure 1. ScannerCal Calibration System connected to a FlowScanner™ 6000



The software drivers should be installed before connecting the ScannerCal hardware. These programs can be loaded either from the hardware drivers folder on the ScannerCal 6.3 CD, or from the Measurement Computing CD which is included with the ScannerCal system. (The Measurement Computing CD should have the most recent version of the software.) Then the interface box should be connected to the computer and the InstaCal configuration program should be run.

The procedure is as follows:

1. Insert the CD in the PC's CD-ROM drive.

2. Run the "MCCSETUP" program to install the software drivers. When the installation is complete, a dialog box appears advising you that you need to restart the computer. Select "Yes."

3. Connect the power supply to the ScannerCal-1 Interface Box, and plug the power supply into an AC outlet. The interface box will power up as soon as the power supply is connected.

4. Connect a USB cable from the computer to the ScannerCal-1 Interface Box. Windows should find the hardware and run a Wizard to install and configure it. Follow the instructions until Windows reports that the new hardware is ready to use.

5. Select Start/Programs/Management Computing, and run the InstaCal software to configure the interface. This program identifies the USB ScannerCal-1 Interface Box as "USB-ERB08." InstaCal records this configuration information in a file so the ScannerCal software can find it.

   Note: You will need to run the InstaCal program again if you install a DigOut card.

Optional Scan-Manifold Installation

Two manifolds are provided for connecting pressure master sources (0-100 and 0- 150 psig) to the FlowScanner pressure inputs. Each manifold has a ¼-inch input and four 1/8-inch outputs. Two different colored 1/8-inch tubing are provided; black for the 100 psig channels, and red for the 150 psig channels. Using a Dual-Output Druck DPI 515 as the pressure master source, one manifold can be connected to each output, and the software will switch outputs as needed.

1. Connect the ¼-inch tube to the input of each manifold and to a pressure master source (Druck DPI 515 recommended).
2. Connect the four black 1/8-inch tubes to the 0-100 psig manifold, and the other ends to the four 100 psig inputs on the FlowScanner.
3. Connect the four red 1/8-inch tubes to the 0-150 psig manifold and the 150 psig inputs on the FlowScanner.

Optional GPIB Converter Installation

By installing a GPIB-to-USB converter on the Agilent multi-meter and the Druck DPI 515 pressure master, the ScannerCal software can automatically control theses devices and input there readings.

1. Install the software driver that comes with the interface. Follow the manufacture's directions.
2. Connect the converter to the Agilent multi-meter and/or the Druck DPI 515 test instrument.
3. Connect the USB cable to either the USB port on the ScannerCal-1 Interface Box or to another USB port on the PC.
4. Follow the usual prompts until Windows reports the hardware is ready to use.

   Note: ScannerCal will probably work with most GPIB converters; however it has only been tested with the ICS and CEC USB-to-GPIB interfaces.

Optional DigOut Installation and Configuration

Before installing the DigOut interface card, the software drivers may need to be installed and the InstaCal configuration program should be run. If the drivers were installed for the ScannerCal-1 system, they do not need to be reinstalled for the DigOut card. If they do need to be installed, they can be loaded either from the hardware driver's folder on the ScannerCal 6.3 CD, or from the Measurement Computing CD. (The Measurement Computing CD should have the most recent version of the software.)

1. Insert the CD in the PC's CD-ROM drive.
2. (Skip this step if drivers were installed as part of the ScannerCal-1 installation process.)

   Run the "MCCSETUP" program to install the software drivers. When the installation is complete, a dialog box appears advising you that you need to restart the computer. Select "Yes." Leave the CD in place for a future step.
3. If the PCI version is being installed for a desktop computer, shut the computer off, and follow the manufacturer's instructions to open the case and install the card into an available PCI slot. Then restart the computer.
4. If the PCMCIA version is being installed in a laptop computer, it is not necessary to shut the computer off. Simply connect the Travel Simulator cables to the card and insert the card into an available PCMCIA (PC-CARD) slot.
5. Windows will recognize the new card and run the wizard to install it. Follow the prompts until Windows reports the hardware is ready to use.

6. Ensure that power is applied to the ScannerCal Interface Box and that the box is connected to the PC via a USB cable.

7. Select Start/Programs/Management Computing, and run the InstaCal software to configure the interface. This program identifies both the DigOut card and the ScannerCal-1 Interface Box. InstaCal records this configuration information in a file so the ScannerCal software can find it. If the interface card is changed or moved, run InstaCal again to change the configuration information.

ScannerCal 6.3 Software Installation

The ScannerCal installation program installs the ScannerCal program and two Excel templates that are used to generate reports.

1. Insert the ScannerCal 6.3 CD.

2. Run the “setup” program in the ScannerCal Setup folder.

   The setup program will install ScannerCal in directory “C:\Program Files\Emerson Automation Solutions\ScannerCal 6.3.” The Excel templates will be just below this directory in a templates folder. These templates are for the standard FlowScanner Inspection and Test Report (FITR). Templates for both the standard 4&4 pressure and special 6&2 pressure channel configurations are provided. These Templates can be copied or moved to another location if desired.

Ethernet Connection to FlowScanner™ 6000

The test PC communicates with the FlowScanner via an Ethernet cable. The simplest way to establish this connection is to connect the PC directly to the FlowScanner using an Ethernet crossover cable. If the PC must remain on a LAN, you have two options: 1.) you can change the FlowScanner’s IP address to one that will work on the LAN, or 2.) you can insert a router between the PC and the LAN, and connect the FlowScanner to the router. Whichever method you choose, the IP address of the PC must be in the same subnet range as the FlowScanner’s IP address.

If the computer will connect directly to the FlowScanner with a crossover Ethernet cable, set the address on the PC Ethernet port to work with the FlowScanner. For example: the FlowScanner 6000™ normally has a default IP address of 10.6.0.10, subnet mask 255.255.255.0. The PC could then be set to 10.6.0.101, subnet 255.255.255.0.

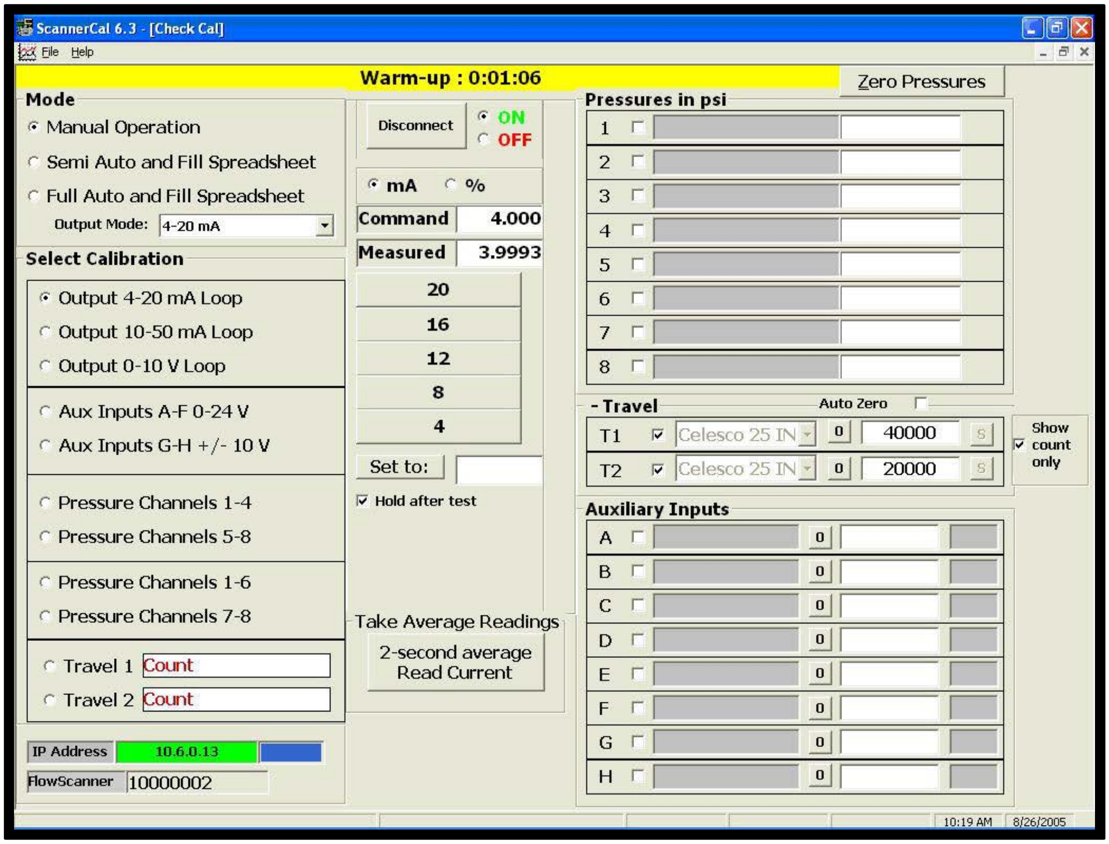
If the PC must remain on a LAN, then one option is to change the IP address of the FlowScanner to a static IP address that will work on the LAN. The PC can then access both the LAN and FlowScanner.

Another option that allows the FlowScanner address to remain at the default setting is to use an inexpensive router to isolate the PC and FlowScanner from the LAN. Routers are available for cable/DSL that includes a DHCP function to automatically assign an IP address to the computer. Set the local DHCP of the router to assign addresses of 10.6.0.100 and higher. This won’t duplicate the FlowScanner address but it will still assign an address that is within its subnet range.

ScannerCal Software Operation

ScannerCal certifies the accuracy of the FlowScanner by running it through a series of nine tests. If the DigOut option is detected it will run two additional tests on the two travel channels. During each test, the FlowScanner readings are inputted into ScannerCal through the Ethernet connection, and, if a digital multi-meter is connected, the multi-meter readings are also read. Both of these readings are entered into a report spreadsheet.

Figure 2. ScannerCal main display - The nine tests are listed on the left along with the two travel channel test



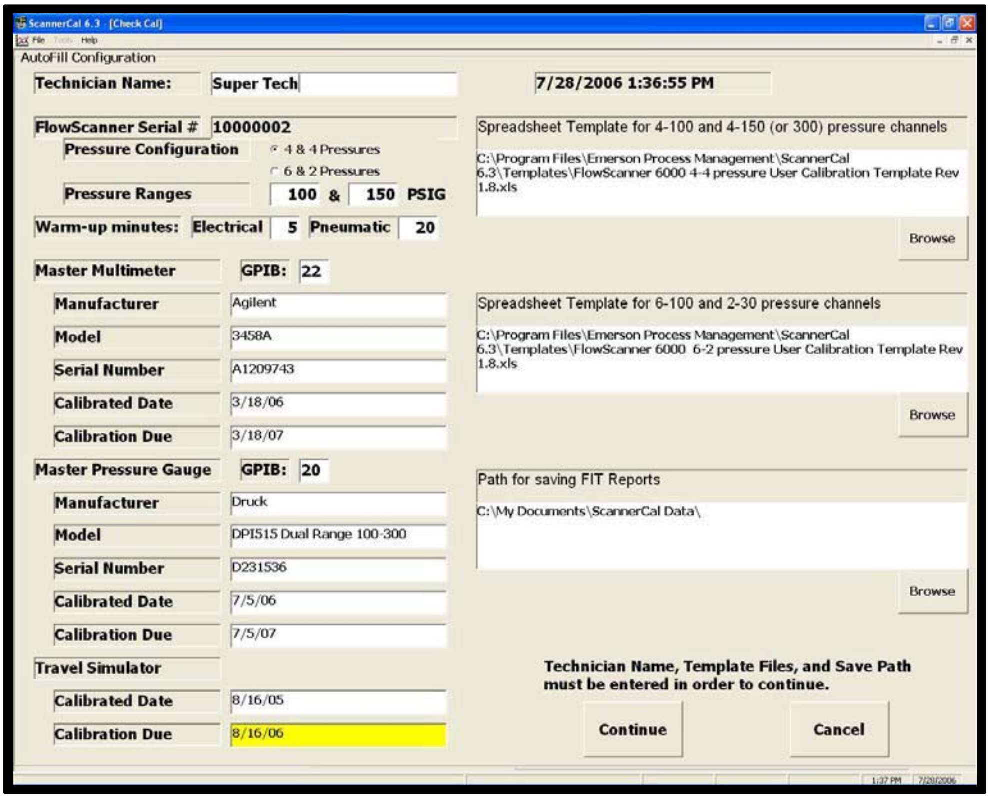
Configure the Instrument Details and File locations

The first time you run the ScannerCal software, you must input details about the test instruments, indicate where to find the spreadsheet templates, and indicate where to save the report files.

1. Ensure the ScannerCal Interface Box is connected and powered on, and any GPIB connected instruments are powered on. Then start ScannerCal 6.3.

2. Open the Tools/Configure/File Options menu.

Figure 3. ScannerCal File Options display showing the test instrument details and the paths to the spreadsheet directories



3. Enter the information for the master multi-meter. If the instrument it connected to the computer by a GPIB bus for automatic reading, enter the GPIB address. Then enter the manufacturer, model, serial number, and calibration dates as indicated. The software will compare the calibration due date to the current date, and warn when the due date is approaching or past by changing the field background color.

4. Enter the master pressure instrument information the same way.

5. If a DigOut Travel Simulator is used, record the calibration date and the due date.

6. Select the Browse button and select the spreadsheet template. (Normally in the Templates folder).

7. Select the Browse button to select the folder for the final report. You can select any drive/folder location to store the reports. If any unit fails the tolerance evaluation, ScannerCal will create a “FlowScanner Failed Calibration” folder within this specified folder and put the report there.

8. When all information is correct, click the Save button and a configuration file will be created. These details can be edited later if desired.

9. End the ScannerCal software.

Connecting a FlowScanner™ 6000 to the ScannerCal System

Connect the FlowScanner 6000 to be tested to the ScannerCal system before starting the ScannerCal software. The procedure is as follows:

1. Connect the FlowScanner power supply and Ethernet cable.

2. Connect the single 3-foot cable to the I/P connector on the interface box. A small tab on the banana plug indicates the negative terminal. Plug this negative terminal into the black post. Connect the other end to the I/P connector on the FlowScanner.

3. Connect the six 3-foot cables to the three posts for channels A through F on the interface box. Two banana plugs should be installed on each post. Connect the other ends of these six cables to AUX Inputs A through F on the FlowScanner

Figure 4. The tab on banana plug indicates the negative side

4. Connect the two 3-foot cables to the posts for channels G and H.

5. Connect the 4-foot dual-banana cable, and the single banana lead to the DVM posts. Connect the other end to the Agilent multi-meter. The single lead is used for the current input.

6. Connect the eight 1/8-inch tubes from the pressure manifolds to the FlowScanner.

7. If the DigOut option is used, connect the two Travel Simulator cables to travel inputs 1 and 2 on the FlowScanner.

8. Power on the FlowScanner and all test instruments.

9. Start the ScannerCal software.

ScannerCal Connect Operation

Unlike the FlowScanner program, ScannerCal will not attempt to find the FlowScanner until the “Connect” button is clicked. The IP address bar starts by showing the IP address that is entered in the Tools/Configuration menu and the red background shows it has not found the unit.

If the FlowScanner LCD shows that it has a different IP address than that shown by ScannerCal, open the ScannerCal Tools/Configuration menu and change the IP address that ScannerCal will use to look for the FlowScanner. Then close and restart ScannerCal to use the new address.

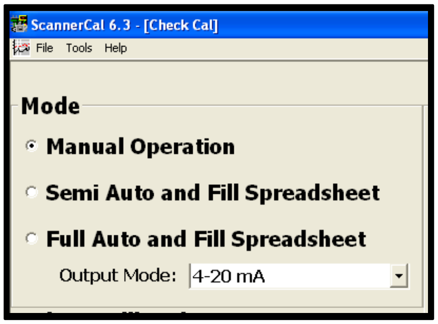
1. Click the Connect button. If the IP address is found, the background of the bar turns green, and the serial number of the FlowScanner is shown under the IP address bar. This serial number is read automatically from the unit and will be entered into the calibration reports. This is the same serial number that is recorded in the test data files when valves are tested. In this way you can verify that the tests were performed with a certified FlowScanner.

2. Select the ON radio button to turn on the FlowScanner data acquisition. This activates the electronics in the FlowScanner. The ScannerCal screen will now track the Warm-Up time in the status bar at the top of the screen. If a test is selected before the recommended warm-up time for that function, the status bar will turn yellow. If an automatic test sequence is selected, tests will not run until the warm-up time is correct. These warm-up times can be specified when configuring an automated sequence.

Three Modes of Operation

ScannerCal can run certification tests in manual, semi-automatic, or full-automatic sequences. The manual sequence allows the technician to select each test from the list on the left of the screen. If the ScannerCal Interface box is detected, the software will switch the circuits to connect the required inputs and outputs. If it is not detected it will prompt the technician to switch the manual switches on the older ScannerCal Interface box.

Figure 5. ScannerCal's three modes of operation



ScannerCal also checks to see if the DigOut card for testing the travel inputs is detected, and checks to see if it is connected to the Agilent digital multi- meter and Druck pressure calibrator. It will offer appropriate semi-automatic and full-automatic sequences for the instruments detected. If the multi-meter is detected, but not the Druck, it will allow automatic sequence of the electrical I/O tests, and then semi-automatic sequence for the pressure calibration.

Manual Mode

You should use the manual mode if you will be using your own report format and not one of the spreadsheet templates. Manual mode does not fill in the spreadsheet with the data readings, but it provides buttons that allow the user to easily copy- and-paste readings into any other PC program. You can manually select any plateau/test to run.

Note: If the spreadsheet templates are used for reports, Semi-Automatic or Full- Automatic modes are recommended.

Semi-Automatic Mode

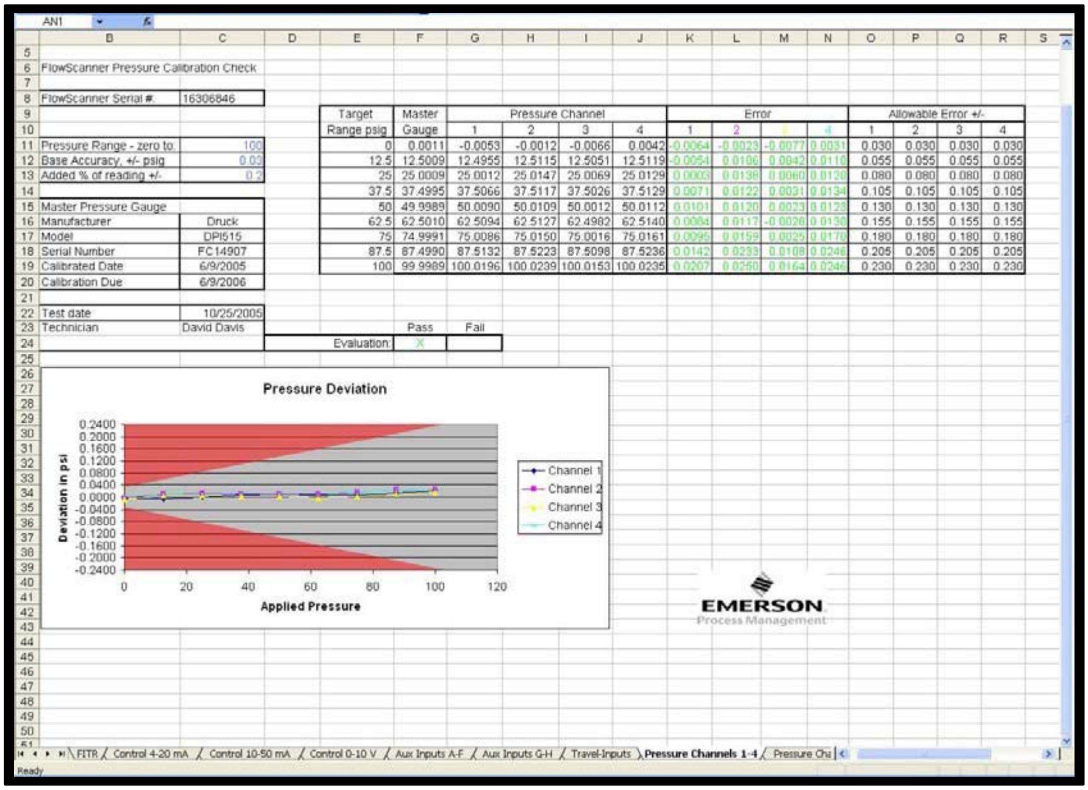
The Semi-Automatic mode runs the standard sequence of tests in the normal order and enters the data on one of the spreadsheet templates. It sequences through the pre-set plateaus for each input and output, and automatically sets the voltage or current required. Readings are taken on the FlowScanner™ 6000 channels when the average reading button is clicked. If the GPIB converter is used with an Agilent DMM or Druck controller, the master readings are also read. If a GPIB converter is not used, the master instrument readings can be manually entered when the software prompts.

The user can control when to advance to the next plateau and when to advance to the next test. The user can also re-read both the FlowScanner™ 6000 channels and master instrument as desired. The user can review each plateau results on the spreadsheet before continuing to the next test.

Full-Automatic Mode

This mode is only offered if both the ScannerCal-1 Interface Box and a compatible GPIB multi-meter are detected by the software. If a Druck pressure controller is found, the pressure test will run automatically; otherwise the pressure sequence will revert to semi-automatic mode after running the electrical tests. The specified warm-up times are automatically applied to both the analog electrical tests and the pressure tests.

Figure 6. Spreadsheet created by ScannerCal to hold test results



All data is automatically entered in a spreadsheet file that is appropriately named with the FlowScanner serial number and a suffix to avoid over-writing tests. At the conclusion of the test sequence the spreadsheet can be evaluated to see if all tests passed. Units that do not pass, whether from bad readings or incomplete tests, are stored in a “Failed FlowScanner Calibration” folder in the specified file location.

Starting Automatic Sequences

Clicking the option button for either of the automatic sequences opens the configuration form to verify the settings and identify the test technician. The test sequence can not continue until the Technician fills in his name. The default locations for the template and report folder may be used, or new locations may be specified at this time.

The test instrument details are also recorded and saved, and are transferred to the spreadsheet reports during the test sequence. Each time ScannerCal opens this screen it checks the calibration due dates for the instruments and begins alerting the user 30 days before the dates come due by changing the background field for the date entry.

For each FlowScanner check, the user should verify the pressure channel configuration of the FlowScanner. Either the normal 4 & 4 pressure or alternate 6 & 2 pressure (for early retrofitted units) configuration is used. The pressure ranges are transferred to the spreadsheets and are used for determining the plateau levels and for controlling a Druck pressure calibrator.

After all of the information is entered the Continue button is clicked. ScannerCal then finds and loads the spreadsheet template into Microsoft Excel, and saves it in a “Temp” folder during the test process with a filename based on the FlowScanner serial number. At the end of the sequence it will be transferred to the specified report file directory.

⚠ WARNING

Do not close the Excel spreadsheet until ScannerCal finishes with all tests and ends the ScannerCal program. Doing so will crash ScannerCal.

ScannerCal then prompts the user to be sure all cables and tubing are connected to the FlowScanner unit, and then proceeds with the sequence.

If the DigOut Travel Simulator card is detected, ScannerCal first tests the travel inputs. It sends sequences of 20,000 counts (approximately 2 inches of simulated travel) to each of the FlowScanner travel inputs, reads the response from the FlowScanner and displays the count total as well as the total counts commanded by ScannerCal. It repeat this up to 80,000 counts on both channels, then counts down in steps of 20,000 back to zero. The results of each step are transferred to the open spreadsheet as the test is run.

The automatic sequences then proceeds through the remaining tests:

- 4-20 mA output
- 10-50 mA output
- 0-10 V output
- 0-24V AUX inputs A-F
- +/- 10V AUX inputs G-H
- Pressure channels 1-4
- Pressure channels 5-8

When running in full-automatic mode, ScannerCal will wait until all warm up times are met. It will take about 28 minutes for ScannerCal to run all tests in full-automatic mode.

After the test sequence ScannerCal exits, but leaves the spreadsheet reports open for review and for adding any additional information about the lab and work order. Each section of the FlowScanner is reported on a separate page of the workbook, so the Excel “Print Entire Workbook” command can be used to print all the worksheets.

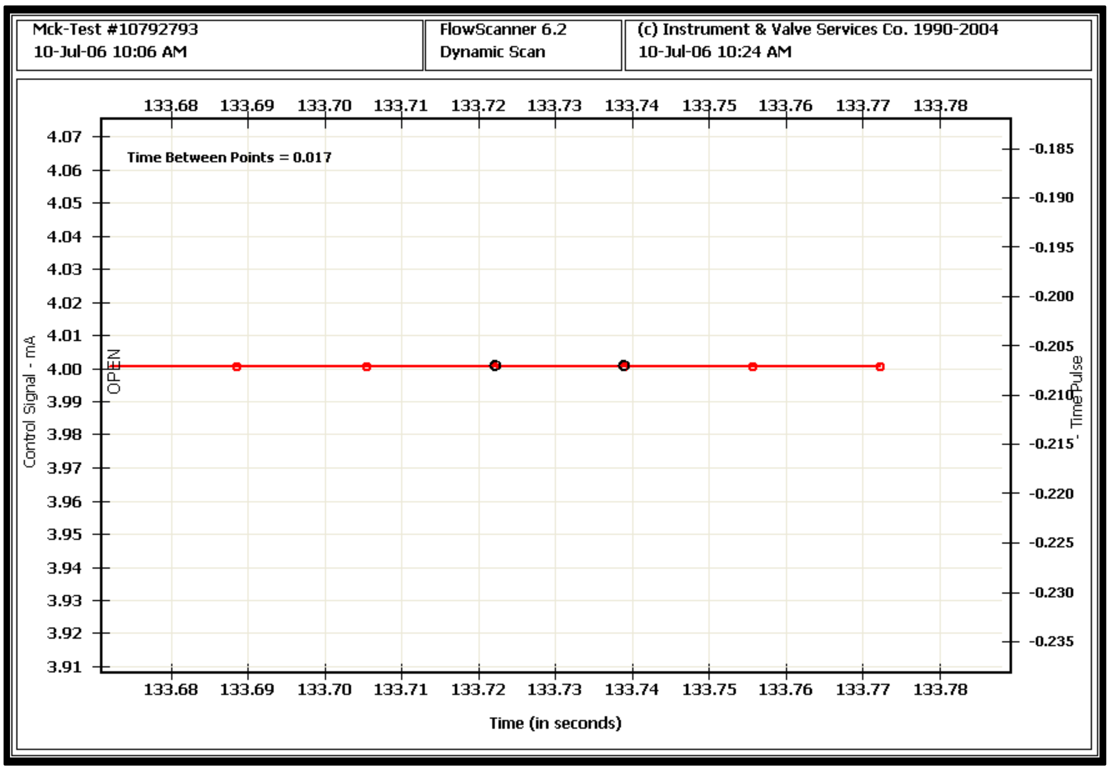
Checking FlowScanner Timing Accuracy Using ScannerCal – DigOut and Timing Checker Software

Overview

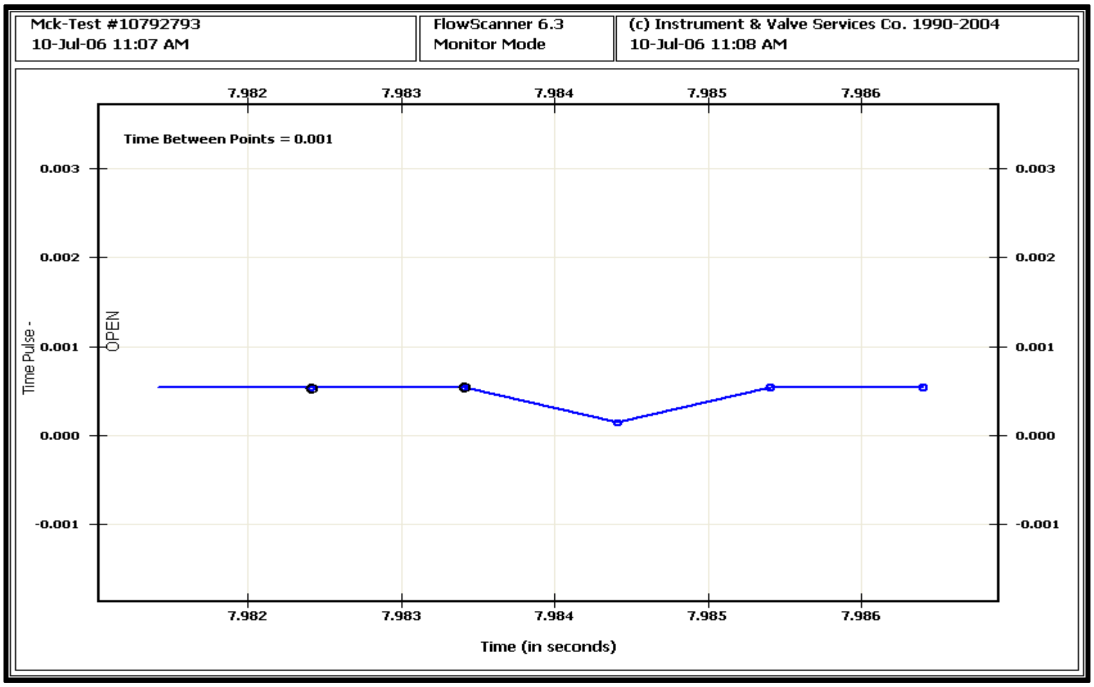
The FlowScanner is sometimes used to check the timing of valve events, such as the closing time of a valve with a specified requirement. Sometimes these requirements can be for a very short period, 250 ms or less. Some users have requested a means to test the timing accuracy of the FlowScanner system when running these tests. The ScannerCal DigOut option (also used for testing the travel inputs on the FlowScanner) provides a signal cable to connect to one of the AUX voltage inputs on the FlowScanner, and the Timing Checker application (installed with the ScannerCal software) can control this voltage signal to provide a square-wave timing pulse that can be recorded during a FlowScanner test, and then graphed to determine the overall timing accuracy of the FlowScanner system, as configured to run a specific test.

Effect of Test Duration on Timing Accuracy

The length of a FlowScanner test determines the sample rate at which readings are recorded, and the sample rate affects the timing accuracy. For example, a “50- Second Dynamic Scan” test allows about 50 seconds to ramp the signal followed by about 16.7 seconds to allow the valve to complete its motion before another 50 second ramp down, and another 16.7 second “dwell” recording for a total of about 133.7 seconds. The FlowScanner records 8,000 readings during this test, so it records a reading about every 0.0167 seconds. Thus when looking at the data you can’t tell if an event occurred exactly when it appears on the graph, or sometime in the 0.0167 interval before the change shows on the graph. A timed event has both a beginning and an end, so the uncertainty due to this sampling rate is twice this interval (once for the start and once for the end events) or 0.0334 seconds, even if the timing accuracy of the hardware is perfect. The FlowScanner timing routines round to the nearest millisecond, so the sample interval on the 50 second Dynamic Scan test looks like this when zoomed in:



On the other hand, an 8-second Monitor Mode test completes 8,000 readings in 8 seconds, for a reading every 0.001 seconds. If the hardware accuracy is perfect, this test would give accuracy for start-finish test of 0.002 seconds. This shows the sample interval on the 8-second monitor mode test:

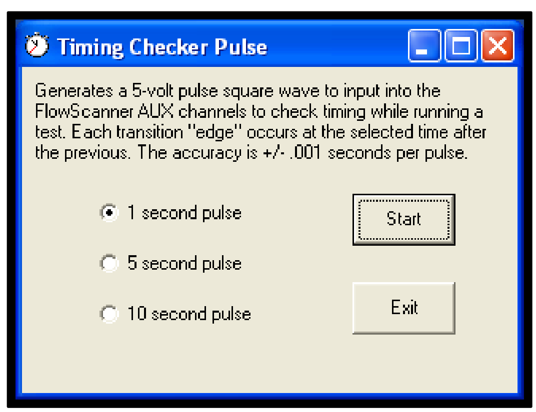


Effect of number of channels recorded and test duration.

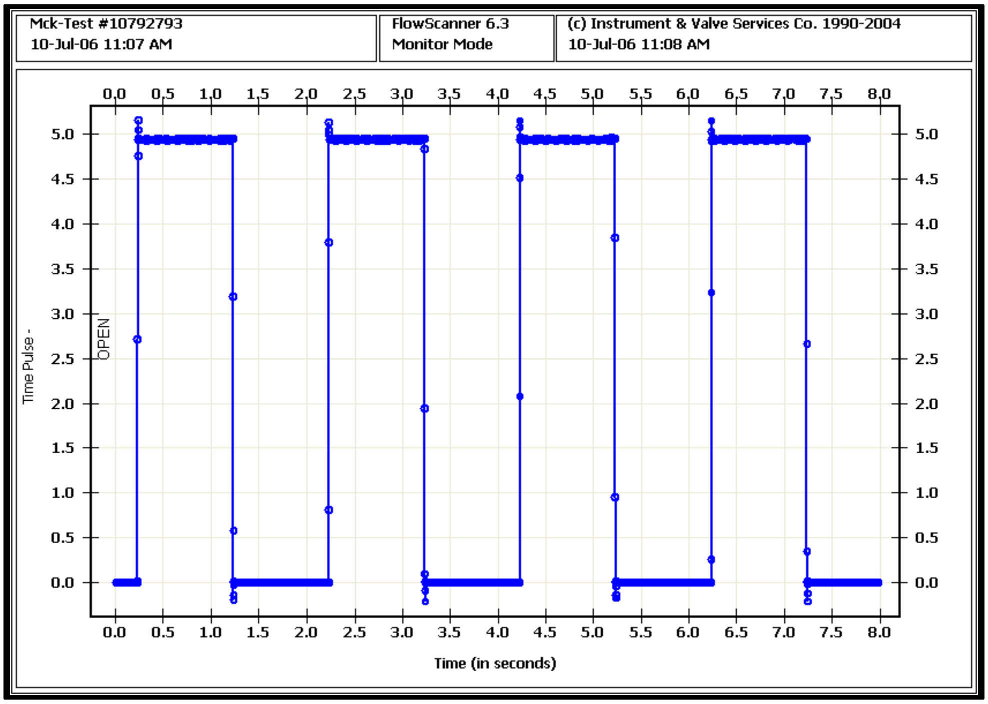
Although the FlowScanner™ 6000 hardware is capable of recording data at 1000 samples/second on all channels, FlowScanner software revisions 6.2 and earlier impose a communication burden that prevents the system from reaching this rate if too many channels are being measured. If a too-short time is selected for the number of channels being recorded, the test will slow down and run in a longer time, but this will not be shown on the graph, which will present the data as if the test ran in the specified time. Thus events will appear to run faster than they actually occurred. Software versions after FlowScanner 6.2 correct this condition, and it can be avoided on earlier versions by limiting the number of channels used on short critical timing tests. Tests on the version after 6.2 show it can collect data accurately at 1000 samples/second on all channels.

ScannerCal Timing Checker Application

The ScannerCal Timing Checker application uses the Windows system internal clock to switch a 5 Volt signal on and off at specified time intervals of 1, 5, or 10 seconds. According to Microsoft the system clock is accurate to 0.001 seconds.



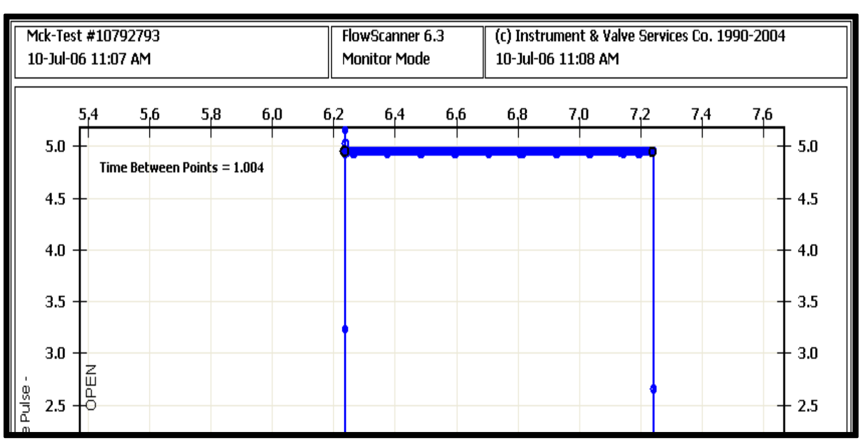
A one-second pulse recorded during an 8-second Monitor test would look like this:



Each switching point has an accuracy of 0.001 seconds, so the time interval represented by a single pulse (one on-off period) would be accurate to 0.002 seconds. A one-second pulse would be accurate to 0.002 seconds, while 10 one-second pulses would be accurate to 0.020 seconds. However, a 10-second single pulse still has a timing accuracy of 0.002 seconds. This allows the user to select a timing pulse interval appropriate to the event in order to verify accuracy to 0.002 seconds.

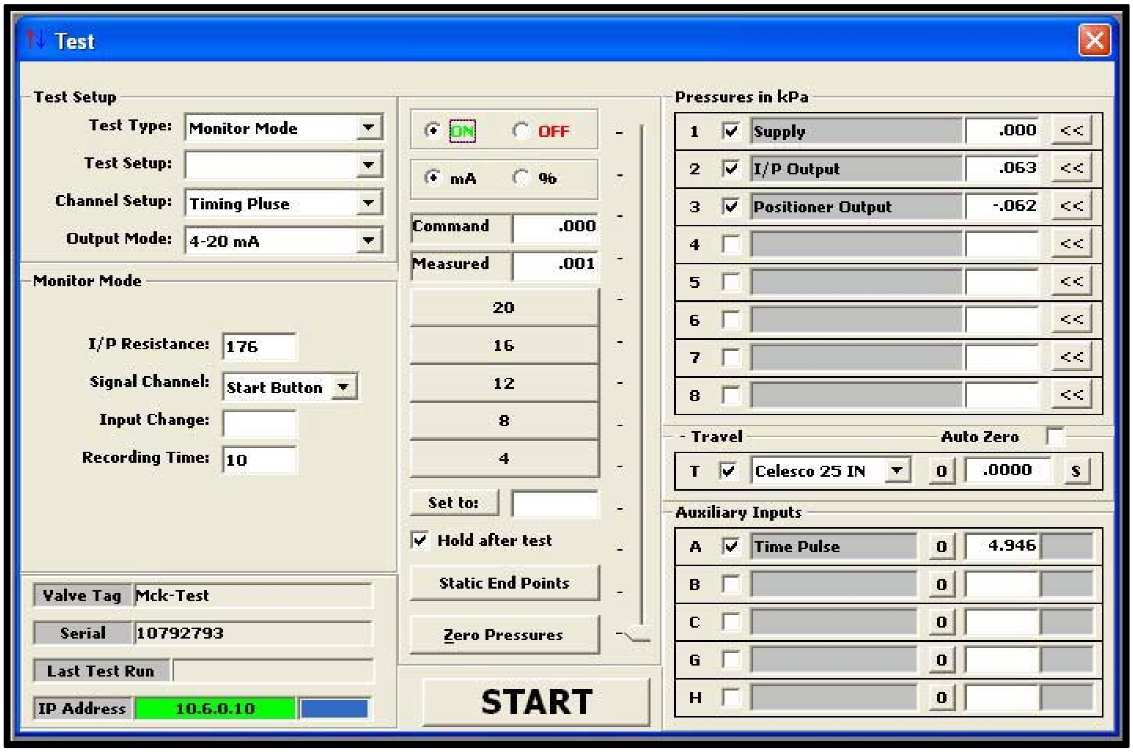
Combined Accuracy

With the accuracy of a single pulse generated by the Timing Checker program of 0.002 seconds, and the accuracy due to FlowScanner sampling time (8 second test) of 0.002 seconds, the interval reported by the graph timing analysis for a single pulse could be up to 0.004 seconds from the nominal 1-second pulse. Here's the width of a 1-second pulse as recorded and graphed:



Verifying Timing Accuracy for a specific test setup

First determine the expected duration of the event to be timed, such as the closing time for a valve. Then determine the appropriate test type and length to capture the event, and set up to record data using this setup. Determine the appropriate timing pulse length (1, 5 or 10 seconds) and run the Timing Checker program in the ScannerCal program group selecting that time. Input the DigOut signal cable into an AUX channel, and select that channel to record data in the FlowScanner software. (Both applications can be run on the same or on different computers without affecting the results.) You should be able to see the selected AUX channel switch between 0 and about 5volts on the Test window:



Run a trial test, and select the “vs. Time Plots” graph selection, and graph the AUX channel that records the timing pulse from the timing checker. Zoom in on a single pulse, and use the mouse “right-click” menu to select the start and end points of the pulse. The FlowScanner graph will show the analyzed elapsed time between the two selected points, in the same way the actual event will be recorded and analyzed.

By comparing the analyzed pulse duration with the pulse time selected in Timing Checker you can determine if the FlowScanner accuracy as set up for that test is accurate enough for the event to be tested.

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Safety Instrumented Systems

Safety Layers and Protections

Safety is provided by layers of protection (see figure 1). These layers of protection start with effective process control, extend to manual and automatic safety prevention layers, and continue with layers to mitigate the consequences of an event.

The first layer is the basic process control system (BPCS). The process control system itself provides significant safety through proper design of process control.

The next layer of protection is also provided by the control system and the control system operators.

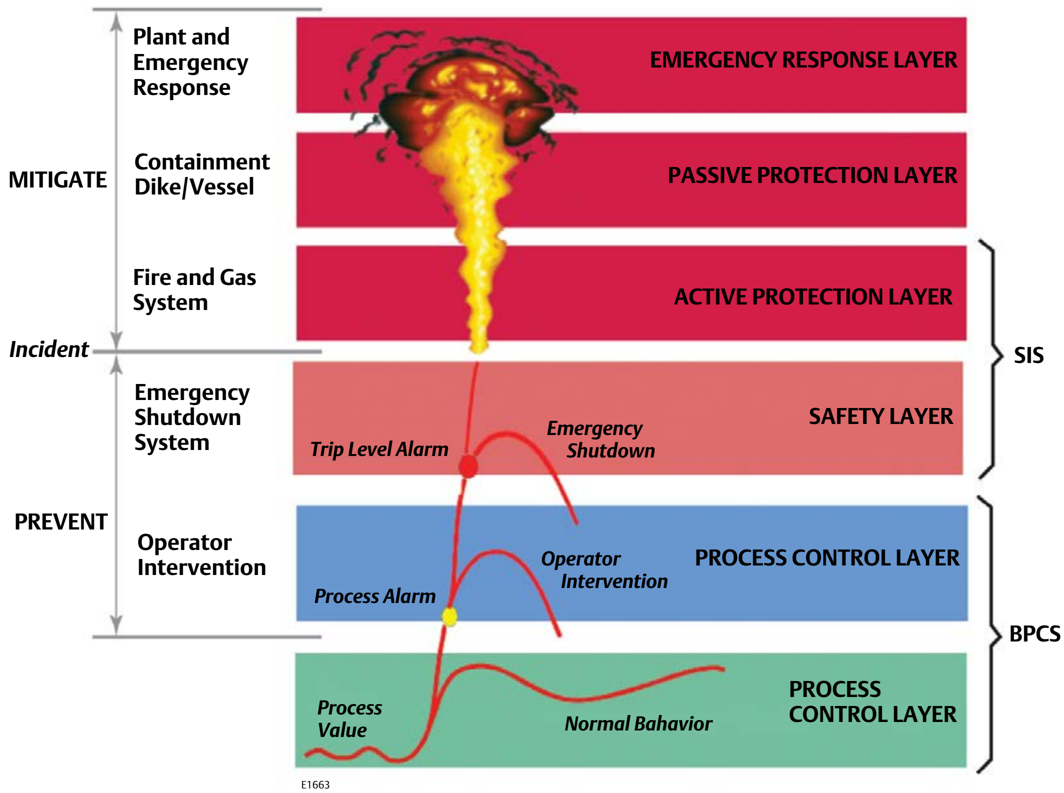
Automated shutdown routines in the process control system combined with operator intervention to shut down the process are the next layer of safety.

Next is the safety instrumented system.

It is a safety system independent of the process control system. It has separate sensors, valves, and a logic solver. Its only role is safety. No process control is performed in this system.

Operator intervention and the safety instrumented system layers are designed to prevent a safety-related event. If a safety-related event occurs, there are additional layers designed to mitigate the impact of the event.

Figure 1. Layers of Protection



The next layer is an active protection layer. This layer may have valves or rupture disks designed to provide a relief point that prevents an uncontrolled release that can cause an explosion or fire.

The next layer is a passive protection layer. It may consist of a dike or other passive barrier that serves to contain a fire or channel the energy of an explosion in a direction that minimizes the spread of damage.

The final layer is plant and emergency response. If a large safety event occurs this layer responds in a way that minimizes ongoing damage, injury, or loss of life. It may include evacuation plans, firefighting, etc.

Overall safety is determined by how these layers work together.

Safety Instrumented Systems (SIS)

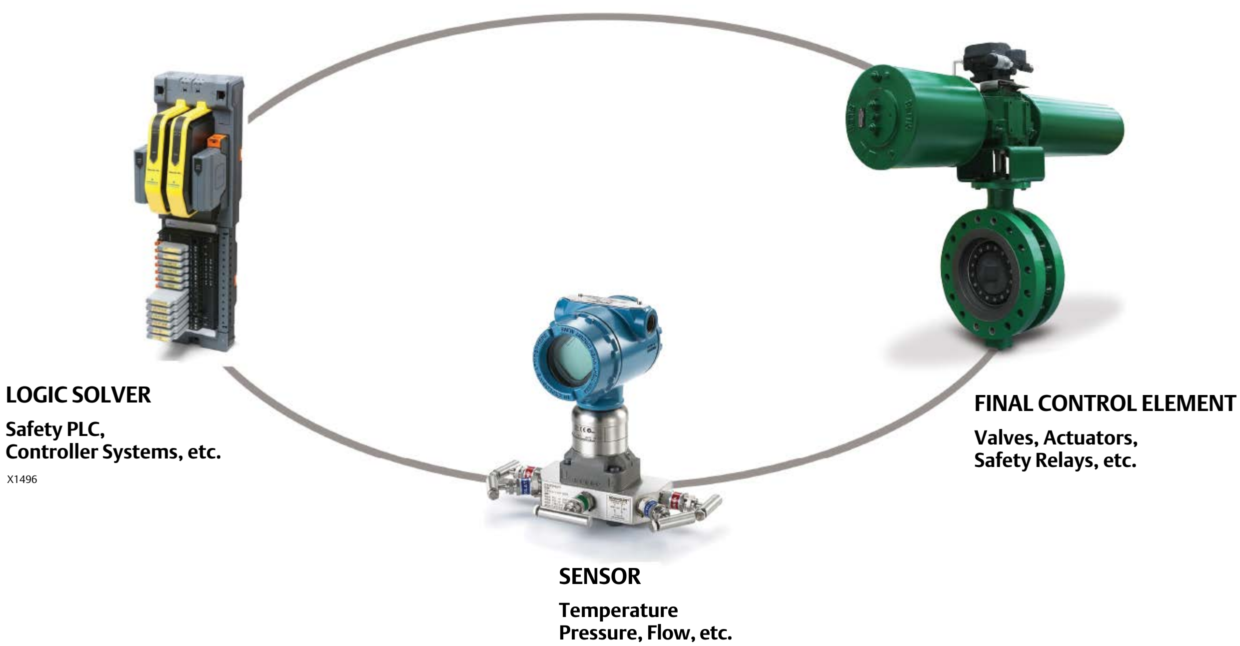
A safety instrumented system (SIS) is considered separate than the basic process control system (BPCS) in that the SIS is dedicated to taking the process to a "safe state" should a critical situation occur.

The SIS consists of several safety instrumented functions (SIF). Each safety instrumented function has a specified safety integrity level (SIL), which is necessary to achieve functional safety. Each SIF is a separate or interlinked loop comprised of sensors, logic solver (LS), and final control element (FE) as shown in figure 2.

Sensors: Field sensors are used to collect information necessary to determine if an emergency situation exists. The purpose of these sensors is to measure process parameters (i.e. temperature, pressure, flow, density etc.) to determine if the equipment or process is in a safe state. Sensor types range from simple pneumatic or electrical switches to smart transmitters with on-board diagnostics. These sensors are dedicated to SIS service and have process taps, which are separate and distinct from the process taps used by normal process information sensors.

Logic Solver: The purpose of this component of SIS is to determine what action is to be taken based on the information gathered. Highly reliable logic solvers are used which provide both fail-safe and fault-tolerant operation. It is typically a controller that reads signals from the sensors and executes pre-programmed actions to prevent a hazard by providing output to final control element(s). Logic solvers are very often programmable or non- programmable devices, but can also be mechanical in form of switched set to trip the safety function.

Figure 2. Components of a Safety Instrumented System



Final Control Element: Final control elements implement the action determined by the logic solver. This final control element is typically an automated on/off valve, with a valve fail- closed or fail-open function.

It is imperative that all three elements of the SIS function as designed in order to safely isolate the process plant in the event of an emergency.

Safety Standards

In a process plant, there is no such thing as risk-free operation or 100% reliability. Therefore, one of the first tasks of the SIS designer is to perform a risk- tolerance analysis to determine what level of safety is needed. IEC Standard 61508 (Functional Safety of Electric, Electronic and Programmable Electronic Systems) is a general standard that covers functional safety related to all kinds of processing and manufacturing plans. IEC Standard 61511 and ISA S84.01 (Replaced by ISA 84.00.01-2004) are standards specific to the process industries. All three standards use a performance-based lifecycle model and specify precise levels of safety, best practices, and quantifiable proof of compliance.

Safety Integrity Level (SIL)

Safety integrity levels (SIL) are quantifiable measurement of risk. Since they were first introduced, safety integrity levels have been used as a quantifiable way to establish safety performance targets for SIS systems. IEC standards specify four possible Safety Integrity Levels (SIL 1, SIL 2, SIL 3, SIL 4) as shown in table 1; however, ISA S84.01 only recognizes up to SIL 3.

A determination of the target Safety Integrity Level requires:

- An identification of the hazards involved.
- Assessment of the risk of each of the identified hazards.
- An assessment of other Independent Protection Layers (IPLs) that may be in place.

Hazards can be identified using a number of different techniques; one common technique is a HAZard and OPerability study (HAZOP).

A risk factor must then be determined for each of the defined hazards, where risk is defined as a function of the probability (likelihood or frequency) and consequences (severity) of each hazardous event.

The HAZOP study is used to identify the risk to personnel or the environment and is carried out by a multi-disciplinary team (HAZOP team).

Once the risk is identified, the HAZOP/ process hazard study (PHA) will set the requirement for risk reduction, thus define the required SIL Level.

Table 1. Safety Integrity Levels and Associated PFD_{avg} and RRF Figures

RRF (Risk Reduction Factor)	PFD_{avg} (Probability of Failure on Demand = 1/RRF)	SIL (Safety Integrity Level)
100000 to 10000	$>=10^{-5}$ to $<10^{-4}$	4
10000 to 1000	$>=10^{-4}$ to $<10^{-3}$	3
1000 to 100	$>=10^{-3}$ to $<10^{-2}$	2
100 to 10	$>=10^{-2}$ to $<10^{-1}$	1

Additional criteria need to be verified to ensure the SIF meets the required SIL, and they are often divided into the following points:

- Systematic integrity: All elements of the SIF need to be capable being used for the defined SIL level.
- Architectural constraints: Hardware Fault Tolerance (HFT) and redundancy of the architecture need to comply with current functional safety standards.
- Random integrity (PFDavg): The failure rates of the individual devices will be used to calculate the average probability of failure on demand.

Probability of Failure Upon Demand

By understanding how the components of the SIS system can fail, it is possible to calculate a probability of failure on demand (PFD). There are two basic ways for the SIS to fail. The first way is commonly called a nuisance or spurious trip, which usually results in an unplanned but relatively safe process shutdown. While there is minimal danger associated with this type of SIS failure, the operational costs can be enormous. The second type of failure does not cause a process shutdown or nuisance trip. Instead, the failure remains undetected, permitting continued process operation in an unsafe and dangerous manner. If an emergency demand occurred, the SIS system would be unable to respond properly. These failures are known as covert or hidden failures and contribute to the probability (PFD) of the system failing in a dangerous manner on demand.

The PFD for the SIS system is the sum of PFDs for each element of the system:

$$PFD_{total} =$$
$$PFD_{sensor} + PFD_{logic\ solver} + PFD_{final}$$

In order to determine the PFD of each element, the analyst needs documented failure rate data for each element. This failure rate (dangerous) is used in conjunction with the test interval (TI) term to calculate the PFD. It is this test interval that accounts for the length of time before a covert fault is discovered through testing. Increasing the test interval directly impacts the PFD value in a linear manner; i.e., if you double the interval between tests, you will double the probability for failure on demand, and make it twice as difficult to meet the target SIL.

The governing standards for safety instrumented systems state that plant operators must determine and document that equipment is designed, maintained, inspected, tested, and operated in a safe manner. Thus, it is imperative that these components of safety instrumented system be tested frequently enough to reduce the PFD and meet the target SIL.

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Product Bulletin
57.1:003
August 2020

Fisher™ Digital Isolation™ Solutions Selection Guide

Fisher Digital Isolation solutions are fully engineered, intelligent solutions with comprehensive product support and lifecycle services for critical safety and ESD valve assets leveraging Emerson's automation expertise with time-tested products.

Fisher Triple Offset Valve (TOV) SIS Solution

Figure 1. Fisher TOV SIS Solution, including Triple Offset Valve, Scotch-Yoke Actuator, and FIELDVUE™ DVC6200 SIS Digital Valve Controller with 775 THUM Adapter


X1550

This bulletin covers the 3rd party verified SIL 3 capable Final Element SIS solution from Emerson. The Fisher Digital Isolation solution is intended for use in process functional safety applications and can be configured to meet a wide range of SIS requirements using industry proven Emerson valves assemblies.

Features

- Third Party Verified—The Fisher Digital Isolation solution has been 3rd party verified which ensures all aspects of providing a SIS final element solution have been properly vetted. This includes design, engineering, assembly practices, and procedures as well as full documentation support.

- Single SIL Certificate—The Fisher Digital Isolation solution is supplied with a single SIL certification for the final element assembly rather than SIL certificates for each component. This reduces documentation complexity and systematic errors as well as time needed for SIL verification for the safety instrumented function.

- Lower Failure Rates—Third party verification via the Single SIL certification process allows for lower failure rates for the Digital Isolation solution than one would get by calculating the failure rates for the individual components. A lower assembly failure rate allows one to extend the proof test time intervals, resulting in increased productivity and cost savings.

- Engineered Solution—The Fisher Digital Isolation solution has been engineered to work seamlessly. Valve to actuator bracketry has been rigorously designed and stress-validated to ensure precise alignment with minimal angular twist. Valve torques have been tested and verified allowing for optimized actuator sizing.

- Factory Acceptance Testing—Each Digital Isolation solution goes through Factory Acceptance Testing (FAT) to ensure the final element correctly performs the safety function. Testing includes stroking time verification, partial stroke testing and solenoid health monitoring with full documentation.

- One Company—With the Fisher Digital Isolation solution you are dealing with just one company for the complete final element throughout the entire safety lifecycle.

The following products make up the core of the Digital Isolation offering. The purpose of this bulletin is to provide the necessary technical information to assist in solution selection.

Fisher Digital Isolation TOV SIS Solution – Valve Details

TOV Features
Torque assisted elastic metal seal provides zero leakage performance, ensures continuous optional bi-directional, zero leakage performance
Stellite® hardfaced standard integral seat results in broader applications, longer valve life and less maintenance
Single-piece cast body, with F-F dimensions in accordance to ISO 5752, ANSI B16.10 and API 609
All metal construction and sealing and zero leakage performance translate into an inherently firesafe valve
Long-length hardened bearings, incorporating a standard reinforced, die-formed, flexible graphite bearing protector ensure additional reliability
Internally and externally retained, three times blowout proof stem is safer to operate and provides complete compliance with API 609
Integral position indicators on the stem and the top mounting flange ensure positive disk position indication
Applications
Oil and Gas Processing, Offshore Platforms, Refineries
Hydrocarbon Storage and Transportation. Liquid Natural Gas (LNG) Storage and Transportation
Steam (Saturated and Superheated), Hydrocarbons, Hydrogen, Oxygen
Cryogenic Fluids, Hot Gases, Sulfur, Chlorinated solvents, Flare Gas
Specifications
Body Style: Double Flanged (ISO 5752), Lugged (API 609)
Pressure Class/Size
Basic Configuration: CL150: 3”-36”, CL300: 3”–24”, CL600: 6”-24” Cryogenic Configuration: CL150: 3”-24”, CL300: 3”–24”
Basic Configuration: EN PN10-16-40: (80 mm - 600 mm), EN PN 63-100 (150 mm – 600 mm) Cryogenic Configuration: EN PN10-16-40: (80 mm - 600 mm)
Referenced Standards
Design standards: ANSI B16.34, API 609, EN 12516-1
Flange Drilling: ANSI B16.5, DIN PN16-25-40
Face-to-Face: Double Flanged - ISO 5752, Lugged - API 609
Fire Safety Test: API 607, ISO 10497
Pressure, Temperature and Shutoff Capability
Maximum Inlet Pressures: Full class rating per ASME B16.34/EN 1092-1
Temperature Range Basic Configuration: CF8M/1.4408: -46°C to 427°C (-50°F to 800°F) WCC/1.0619: -28°C to 427°C (-20°F to 800°F) Cryogenic Configuration: CF8M/1.4408: -254°C to +250°C (-425°F to 482°F)
Shutoff Class: Leakage in accordance with ISO 5208/EN 12516-1 (leakage rate A) and API 598 (resilient seated valves)

- continued -

Fisher Digital Isolation TOV SIS Solution – Valve Details (continued)

Standard Materials of Construction

Size Range	NPS3-24 (30 and 36)(1)			DN80-600		NPS 6-24			DN150-600	
Pressure Class	CL150, CL300			PN16, PN25, PN40		CL600			PN63 - PN100	
Body	WCC	LCC	CF8M/CF3M	EN 10213-2	EN 10213-4	WCC	LCC	CF8M/CF3M	EN 10213-2	EN 10213-4
Disk	WCC	LCC	CF8M	EN 10213-2	EN 10213-4	WCC	LCC	CF85	EN 10213-2	EN 10213-4
Shaft	S41000	S41000	S20910	S41000	S20910	S41000	S41000	S20910	S41000	S20910
Packing	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded	Graphite or Live Loaded
Seal Ring	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S20910 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S20910 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S20910 Hard Faced	S31803 + Graphite or S17400 Hard Faced	S31803 + Graphite or S20910 Hard Faced
Bearings	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced	S31600 hard faced

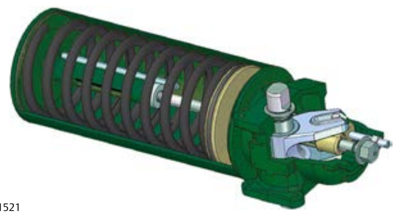
1. 30” and 36”: CL150 in WCC and LCC only.

Cryogenic Materials of Construction

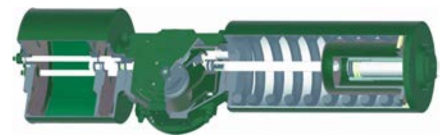
Size Range	NPS3-24
Pressure Class	CL150, CL300
Body	CF8M/CF3M
Disk	CF8M
Shaft	S20910
Packing	Graphite or Live Loaded
Seal Ring	S20910 hard faced
Bearings	S31600 hard faced

Actuation

Figure 2. Fisher Scotch Yoke Type Actuator for Mounting to Fisher Rotary Valves



X1521



W8305

Fisher CBB	Fisher CBA-300	Fisher G/GC
Style		
Double-acting or spring-return pneumatic piston	Double-acting or spring-return pneumatic piston	Double-acting or spring-return series single power
Size Range		
315-725	730 to 1030	G01 to G8
Torque Range		
Double Acting: 673 in • lb to 12,992 in • lb	Double Acting: 7,388 in • lb to 20,377 in • lb	Double Acting: 7,765 in • lb to 2,273,134 in • lb
Spring Return: 194 in • lb to 4,972 in • lb (spring end)	Spring Return: 2,532 in • lb to 10,457 in • b (spring end)	Spring Return: 9,626 in • lb to 1,219,134 in • lb (spring end)
Temperature Range		
Standard: -29°C to +93°C (-20°F to +200°F)	Standard: -29°C to +93°C (-20°F to +200°F)	Standard: -29°C to +93°C (-20°F to +200°F)
Optional High Temp: -18°C to +177°C (0°F to +350°F)	Optional High Temp: -18°C to +177°C (0°F to +350°F)	Optional High Temp: -18°C to +177°C (0°F to +350°F)
Optional Low Temp: -40°C to +66°C (-40°F to +150°F)	Optional Low Temp: -40°C to +66°C (-40°F to +150°F)	Optional Low Temp: -40°C to +66°C (40°F to +150°F)
Manual Override Options		
M3 Jack Screw	M3 Jack Screw, M11 Hydraulic Override	M3 Jack Screw, M11 Hydraulic Override
Safety Integrity Level		
SIL 3 Capable	SIL 3 Capable	SIL 3 Capable

Digital Valve Controllers

Figure 3. FIELDVUE Digital Valve Controllers

W9699_fb

X0076

DVC6200f PST	DVC6200 SIS
Construction	
Aluminum or Stainless Steel	
Temperature Limits	
-52 to 85°C (-62 to 185°F)	
Communication	
Foundation Fieldbus Communication	4 - 20 mA with HART 5 or 7 Communications
Feedback	
Linkageless, Non-Contact	
Enclosure Rating	
See Bulletin 62.1:DVC6200f PST D104160X012	See Bulletin 62.1:DVC6200 SIS D103555X012
Diagnostics	
PST, FST	PST, FST, Spurious Trip Protection, Solenoid Health monitoring
Safety Integrity Level	
NA	SIL3 Capable

Boosters, Regulators and Filters

Figure 4. Volume Boosters

X0648

W4727

X0206

VBL		2625		SS-263	
Material of Construction					
Aluminum		Aluminum or 316 SST		Aluminum or 316 SST	
Cv					
Supply: 2.5	**Exhaust Port:** 1.1 to 1.8	**Supply:** 3.74 to 4.98	**Exhaust:** 0.23 to 3.40	**Supply:** 9.5	**Exhaust:** 9.5
Temperature Limits					
-40 to 93°C (-40 to 200°F)		**Standard:** -40 to 71°C (-40 to 160°F) **High Temperature:** 0 to 121°C (32 to 250°F)		-40 to 71°C (40 to 160°F)	
Maximum Input Signal Pressure					
VBL-1 and VBL-3: 5.5 bar (80 psig) **VBL-2 and VBL-4:** 10.3 bar (150 psig)		10.3 bar (150 psig)		10.3 bar (150 psig)	
Connections					
Input: 1/4 NPT **Supply and Output:** 1/2 NPT		**Input Signal:** 1/4 NPT **Supply and Output:** 3/4 NPT		**Input Signal:** 1/4 NPT **Supply:** 1 NPT **Output:** 1 NPT or 1-1/4 NPT	
Safety Integrity Level					
SIL 3 Capable		SIL 3 Capable		SIL 3 Capable	
Additional Information					
Bulletin 62.3:VBL D103393X012		Bulletin 62.3:2625 D200071X012		Bulletin 62.3:SS-263 D103592X012	

Boosters, Regulators and Filters (continued)

Figure 5. Regulators

67CFR	67DFR	MR95H
Material of Construction		
Aluminum, Stainless Steel	Aluminum, Stainless Steel	Cast Iron, Steel, Stainless Steel
Cv		
0.36	1.33	0.8 to 12.5
Maximum Inlet Pressure		
17.2 bar (250 psig)	17.2 bar (250 psig)	17.2 bar (250 psig)
Outlet Pressure range		
15 to 150 psig	20 to 150 psig	5 to 150 psig
Temperature Limits*		
-29 to 82°C (-20 to 180°F)	-29 to 82°C (-20 to 180°F)	-29 to 82°C (-20 to 180°F)
Connections		
1/4 NPT	1/2 NPT	1/4 NPT to 2 NPT
Filter		
5 micron	5 micron	None
Additional Information		
Bulletin 71.1:67C D102656X012	Bulletin 71.1:67D D103152X012	Bulletin 71.1 D103742X012
* Nitrile Diaphragm		

Boosters, Regulators and Filters (continued)

Figure 6. Filters

X0648

262K	Headline 365A, 25-64-70C	Headline 383, 38-152-70C
Material of Construction		
Cast Iron, Stainless Steel	Aluminum	Aluminum
Cv/Flow Rate		
3.96	58 SCFM @ 150 psig	167 SCFM @ 150 psig
Maximum Inlet Pressure		
28 bar at 65°C (400 psig at 150°F)	150 psig	150 psig
Temperature Limits		
-28 to 208°C (-20 to 406°F)	49°C (120°F)	49°C (120°F)
Connections		
3/4 NPT	3/4 NPT	1 NPT
Filter		
40 microns	0.1 microns	0.1 microns
Additional Information		
Bulletin 90.1:262K D100205X012	- - -	- - -

Trip and Switching Valves

Figure 7. Trip Valves

377 Trip Valve	167D 2 Way Switching Valve	167DA 3 Way Switching Valve
Material of Construction		
Aluminum or Stainless Steel	Aluminum or Stainless Steel	
Uses		
With Piston actuators: Fail Up, Fail Down or Lock-in-Last on loss of supply pressure	Initiate safety function upon loss of supply pressure	
Cv		
0.5 to 0.6	0.96 to 1.81	
Supply Pressure		
3.8 bar (55 psig) to 10.3 bar (150 psig)	27.6 bar (400 psig)	8.6 bar (125 psig)
Outlet Pressure		
Normal Operation: Pressure from control device **Fail-Up or Fail-Down Mode:** Maximum volume tank pressure **Lock-In-Last-Position:** Respective cylinder pressure	0.21 to 10.3 bar (3 to 150 psig)	0.97 to 8.6 bar (14 to 125 psig)
Trip Point		
Minimum of 2.8 bar (40 psig) to a maximum of 72 percent of supply pressure	14 psig to 90 psig	
Temperature Limits*		
-40 to 82°C (-40 to 180°F)*	-29 to 82°C (-20 to 180°F)	
Connection		
1/4 NPT	1/4 NPT or 1/2 NPT	
Safety Integrity Level		
SIL 3 Capable	NA	
Additional Information		
Bulletin 62.3:377 D200318X012	Bulletin 71.7:167D D103235X012	
* Nitrile Diaphragm		

Solenoid

Figure 8. ASCO™ Solenoids

8327	8316	8362
Certification		
ATEX / IEC Ex, UL/CSA Approved	ATEX / IEC Ex, UL/CSA Approved	ATEX / IEC Ex, UL/CSA Approved
Port Size		
1/4 NPT	1/4, 3/8, 1/2 NPT	1/4, 3/8, 1/2, 3/4, 1 NPT
Style (ports/positions)		
3/2	3/2*	3/2*
Valve type		
Poppet	Poppet	Spool
Cv range		
0.49/0.56	1.5, 1.8, 4	2, 4, 4.8, 5, 5.6, 13, 15.5
Body Material		
Brass or 316 SST	Brass or 316 SST	Brass or 316 SST
Mounting		
Hard Piped	Hard Piped	Hard Piped
Operation		
Universal	Normally closed	Normally Closed
No. Coils		
Single	Single	Single
Voltage		
120/60 VAC or 24 VDC	120/60 VAC or 24 VDC	120/60 VAC or 24 VDC
Power		
12.0W / 11.6W	1.4W / 10.1W / 11.6W	1.4W / 10.1W
Temperature range		
-40°C to 55°C (-40°F to 131°F)	-40°C to 60°C (-40°F to 140°F)	-40°C to 60°C (-40°F to 140°F)
Direct/Pilot		
Direct Acting	Pilot Operated	Internal Pilot Operated
Safety Integrity Level		
SIL 3 Capable	SIL 3 Capable	SIL 3 Capable

*Others available upon request
**T180°C : Temperature Class 180°C-120/60-110/50 or 230/50-240/50 Applications
**T6 : Temperature Class 85°C-12/DC, 24/DC, 48/DC or 120/DC Applications
***Additional ASCO Models available upon request

DXP

Figure 9. TopWorx™ Discrete Valve Controller

D-ESD	DXP-Controller	DXP-L2 Switchbox
Enclosure		
Tropicalized Aluminum, SST or Resin	Tropicalized Aluminum	Tropicalized Aluminum
Enclosure Rating		
Explosion Proof, Cl I Div 1, Grps C-D; Cl I Div 2, Grps A-D;	Explosion Proof, Class 1 Div 1 Groups C,D	Explosion Proof, Class 1 Div 1 Groups C,D
Type 4X; T4 -50°C ≤ Ta ≤ 60°C	Class 1 Div 2 Groups A,B,C,D	Class 1 Div 2 Groups A,B,C,D
Ex d IIB + H_2 T6/T5/T4/T3 Gb; -50°C ≤ Ta ≤ 60°C/75°C/110°C/175°C	ATEX/IECx Zone 1 II2G,II2GD T6/T4/T3	ATEX/IECx Zone 1 II2G,II2GD T6/T4/T3
IP66	Ex d IIB + H2, Ex tb IIIC IP66/67	Ex d IIB + H2, Ex tb IIIC IP66/67
Communication		
Discrete	FOUNDATION Fieldbus, DeviceNet, AS-Interface, Profibus, HART protocols	HART optional with transmitter
Switches (Number and Type)		
(2) SPDT Reed Switches for ESD Module (1) SPDT GO Switch for PST	(2) GO Switches, SPDT hermetic seal (2) "L" GO Switches, SPDT hermetic seal* *Standard for DeviceNet,Profibus and AS-I; optional for HART and Foundation Fieldbus	(2) GO Switches, SPDT hermetic seal or (2) GO Switches, DPDT hermetic seal (2) "L" GO switches option
Analog Output		
NA	NA	optional 4-20mA transmitter (HART option)
Visual Display		
90 degree , Green/Open, Red/Close	90 degree , Green/Open, Red/Close	90 degree , Green/Open, Red/Close
Conduit Connection		
(2) 3/4 NPT	(2) 3/4 NPT	(2) 3/4 NPT
Temperature Range		
-40 to +80°C	-60 to 105°C (-75 to 221°F)	-60 to 105°C (-75 to 221°) -40 to 80°C (-40 to 176°F) w/transmitter
Pilot		
(1) 24VDC pilot, Fail Open/Closed (1) 110VAC pilot, Fail Open/Closed	(1) 24 VDC pilot, fail open/closed 0.5 W (non- I.S.)	NA
Spool Valve		
Aluminum Hard coat anodized (IP65) or SST	Aluminum Hard coat anodized (IP65)	NA
Spool Valve Cv		
1.2 Cv (1/4 NPT Ports) or 3.0 Cv (1/2 NPT Ports)	0.86 Cv (1/4 NPT Ports) or 3.7 Cv (1/2 NPT Ports)	NA
Safety Integrity Level		
SIL 3 Capable	SIL 2 Capable	SIL 2 Capable

Factory Acceptance Testing

Factory Acceptance Testing (FAT) is available in three classes to allow for customer selection to meet needs for a variety of applications for safety applications. Every Fisher Digital Isolation Solution assembly is subjected to product and performance testing in the factory prior to shipment.

Class A — Assemblies will meet all functional performance and tests offered. This level should be selected only when superior performance is required in both valve stroking directions, or if an additional test is required

Class B — Offers the optimum level of functional performance testing and documentation for a SIS or ESD application. This includes the basic functional requirement testing as well as proper setup of partial stroke testing (PST) with signature series documentation.

Class C — Provides the most basic level of functional requirement testing, as listed in the table below. This includes valve stroke time under trip and supply droop. Hydrostatic and seat leak certificates for the valve will be provided.

Factory Acceptance Testing Requirements

Requirement	Requirement Description	Class A	Class B	Class C
1	Stroking Time Open Under Command Signal	x		
2	Stroking Time Closed Under Command Signal	x		
3	Valve Stroke Time Under Trip	x	x	x
4	Supply Droop	x	x	x
5	Partial Stroke Test	x	x	
6	Solenoid Valve Health Monitoring/Test	x		
7	Witness Factory Hydrostatic Test	x		
8	Witness Factory Seat Leak Test	x		
9	Double Block and Bleed Seat Leak Test(1)	x		
10	Factory Hydrostatic Test	x	x	x
11	Factory Seat Leak Test	x	x	x
12	Signature Series Documentation	x	x	

(1) Not applicable with 3000 TOV

Testing Definitions

Stroking Time Under Command Signal: Time for full stroke under instrument signal

Valve Stroke Time Under Trip: Time to reach desired position under a simulated trip condition

Supply Droop: Test to verify proper air supply flow rates

Partial Stroke Test: Diagnostic test to ensure valve operation and track wear

Solenoid Valve Health Monitoring/Test: Diagnostic test to ensure solenoid valve operation

Hydrostatic Test: Test to ensure valve shell integrity

Seat Leak Test: Test to measure leakage in the closed position

Double Block and Bleed Seat Leak Test: Test to ensure sealing capability against pressure for valves with multiple internal seats

Signature Series Documentation: Factory birth certificate of assembly performance to allow comparison with future valve signatures

Hookups

Hookup drawings for pneumatic and electrical accessories are available for the following standard configurations. Others are available upon request.

Option	Accessories Included*
1	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller
2	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller + ASCO Solenoid Valve
3	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller + Fisher Volume Booster
4	Fisher Regulator/Filter + ASCO Solenoid Valve
5	Fisher Regulator/Filter + TopWorx
6	Fisher Regulator/Filter + ASCO Solenoid Valve + TopWorx Switchbox
7	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller + ASCO Solenoid Valve + *Fisher Volume Booster (Optional)*
8	Fisher Regulator/Filter + FIELDVUE Digital Valve Controller + 1oo2 ASCO Solenoid Valve + *Fisher Volume Booster (Optional)*

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Duplex, Super Duplex, and Super Austenitic Stainless Steels for Fisher™ Valves

High Alloy Stainless Steels

For many years, the 300 series stainless steels (SST) have been the workhorse alloys for corrosive applications. For severe applications, the nickel-base alloys were the next step up in corrosion resistance. The cost differential, however, was great (four to ten times, or more). In recent years, duplex and superaustenitic SSTs have started to fill this void as cost-effective alternatives.

High alloy SSTs are similar to the 300 series SSTs whereas they are iron base with significant additions of chromium, nickel, and molybdenum. To produce a duplex SST, the alloy chemistry is adjusted by increasing the chromium and molybdenum and reducing the amount of nickel, see the following figure. These changes result in both ferrite and austenite phases present in approximately equal amounts. By contrast, the 300 series SSTs are generally fully austenitic. Superaustenitic SST's have the same structure as the common 300 series alloys, but have higher levels of elements such as chromium, nickel, molybdenum, copper and nitrogen.

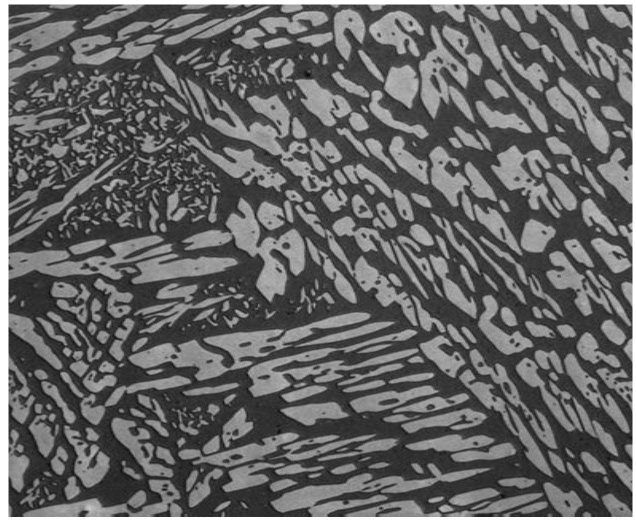
High alloy SST's are often used where chlorides or sour gas are encountered. Industries include pulp and paper, chemical, oil and gas, power, desalination, and marine.

Advantages of high alloy stainless steels are:

- Superior stress corrosion cracking resistance and corrosion resistance in chloride environments compared to the standard austenitic materials such as S31600.

- Yield strengths significantly higher or even double that of annealed 300 series SST.

- Duplex SST's have inherently better resistance to stress corrosion cracking than 300 series single-phase alloys, because at least one of the phases is often resistant to cracking in a given environment.



W8154

Photomicrograph of a Typical Cast Duplex Stainless Steel

High alloy SST's are commonly ranked by an empirical formula to calculate their pitting resistance equivalency number [PREN = %Cr + 3.3%Mo 0.5%W + 30%N]. Higher PREN's correlate to improved resistance to pitting corrosion. See table 1. The standard duplex SST grades have a PREN of 30-40. Superduplex SST grades have a PREN of greater than 40.

Another measure of corrosion resistance is the critical pitting temperature (CPT). Tests are conducted to the requirements of ASTM G48 practice A; 6% ferric chloride. A series of tests are run at increasing temperatures. The CPT is the minimum temperature at which pitting corrosion occurs. See table 1.

A third measure of corrosion resistance is the threshold temperature for chloride stress corrosion cracking (SCC) in 4% sodium chloride. Again a series of tests are run at increasing temperatures until SCC occurs. See table 1.

Because the nickel content of a duplex SST is lower than S31600, one would expect the prices to be slightly lower. However, the opposite is true for two reasons:

- Duplex SSTs are produced in much lower volumes than the 300 series SSTs.
- The higher strength of the duplex and special processing requirements increase cost.

Table 1. Measures of Resistance to Pitting and Stress Corrosion Cracking. These are typical values, not for specification purposes.

MATERIAL	PREN(4)	CPT(1)		SCC(1)	
		°C	°F	°C	°F
S31600 CF8M	26 28	15(3)	60(3)	55(3)	130(3)
S31803 Duplex CD3MN Duplex	35 35	30(3)	85(3)	150(3)	300(3)
S32760 Super Duplex CD3MWCuN Super Duplex	44 44	70(3)	160(3)	250+(3)	480+(3)
S31254 Super Austenitic CK3MCuN Super Austenitic	43 45	70(3)	160(3)	250+(2,3)	480+(2,3)

1. NACE Corrosion 94 Conference Paper by R. Francis, The Performance of Duplex Stainless Steels in Chemical Environments, NACE Corrosion 94.
2. Estimated by Emerson Automation Solutions.
3. Due to elemental segregation and other factors, the cast grades may have lower threshold values than the wrought grades.
4. These are typical mid-range values; not for specification purposes.

Table 2. High Alloy SST Grades

Grade	Typical Composition	Cast Equivalent	Forged Equivalent	Plate Equivalent
S31803 Duplex CD3MN Duplex (commonly called 2205)	22% chromium, 5% nickel, 3% molybdenum	ASME SA995 Grade CD3MN or 4A	ASME SA182 Grade F51	ASME SA240 S31803
S32760 Super Duplex CD3MWCuN Super Duplex (UNS J93380)	25% chromium, 7% nickel, 3.5% molybdenum, and traces of tungsten and copper	ASME SA351 Grade CD3MWCuN or 6A	ASME SA182 Grade 55	ASME SA240 S32760
S31254 Super Austenitic CK3MCuN Super Austenitic (commonly called 254SMO	20% chromium, 18% nickel, 6% molybdenum, 1% copper	ASME SA351 Grade CK3MCuN	ASME SA182 Grade F44	ASME SA240 S31254

Table 3. Compliance of High Alloy SST Grades with NACE Specifications

Grade	NACE MR0175-2002	NACE MR0175/ISO 15156	NACE MR0103
S31803 Duplex CD3MN Duplex	Wrought form only acceptable to 28 HRC hardness	Wrought and cast acceptable with some environmental restrictions	Offered only as block-forged bodies. Welding is prohibited(1)
S32760 Super Duplex CD3MWCuN Super Duplex	Both wrought and cast acceptable with some restrictions	Wrought and cast acceptable with some environmental restrictions	Offered only as block-forged bodies. Welding is prohibited(1)
S31254 Super Austenitic CK3MCuN Super Austenitic	Wrought and cast acceptable with some restrictions	Wrought acceptable with environmental restrictions. Cast acceptable to 100 HRB without environmental restrictions.	Wrought and cast acceptable without restrictions to 35 HRC hardness

1. The duplex SST welding restrictions in NACE MR0103 are very restrictive and cost prohibitive. Forged valves are offered with no welding permitted. Cast valves are not offered by Emerson Automation Solutions at this time.

Preferred Grades for Fisher Valves

A summary of the varieties of high alloy SST's is shown in table 2. In an effort to increase volumes and control cost, we have standardized our offerings. To provide the optimum properties and the best value to our customers, we have standardized on:

- S31803 and CD3MN Duplex
  (best cost)
- S32760 and CD3MWCuN Super Duplex
  ("middle" cost)
- S31254 and CK3MCuN Super Austenitic
  (higher cost)

Our preferred grades are superior materials. By concentrating on specific grades, we can keep your costs lower and provide you materials in a more efficient manner.

S31803, CD3MN Duplex

S31803 contains approximately 22% chromium, 5% nickel, and 3% molybdenum. S31803 is commonly called 2205 and is the most widely used duplex stainless steel. It is produced by most stainless steel producers because it is not protected by any patents. It combines high strength, ductility, and hardness with resistance to corrosion, stress corrosion cracking, and erosion. Because it has a slightly lower alloy content, its corrosion resistance is not as good as the superduplex SST.

ASME SA995 grade CD3MN or 4A is the cast equivalent of S31803. Grade F51 per ASME SA182 is the forged equivalent. ASME SA240 S31803 is the plate equivalent.

Only the wrought form of S31803 is approved for use in sour environments per NACE MR0175-2002 to 28 HRC maximum. Both the wrought and cast forms are acceptable per NACE MR0175/ISO 15156 with certain environmental restrictions. This duplex SST is only being offered to the requirements of NACE MR0103 as block-forged bodies with welding prohibited. Castings are not offered due to welding restrictions contained in the specification.

S31803 is limited to 316°C or 600°F by the ASME Boiler and Pressure Vessel Code. S31803 and CD4MCu suffer embrittlement when exposed to temperatures above the limit.

S31803 is listed in ASME B16.34. CD3MN is not listed in ASME B16.34; it is Fisher-rated.

S32760, CD3MWCuN Super Duplex

This material is a superduplex stainless steel. Its corrosion resistance is superior to other duplex stainless steels because its alloy content is higher. It has a high PREN (pitting resistance equivalency number) for superior resistance to chloride pitting and stress corrosion cracking.

S32760 contains approximately 25% chromium, 7% nickel, 3.5% molybdenum, and traces of tungsten and copper.

ASME SA351 and SA995 grade CD3MWCuN or 6A is the cast equivalent of S32760. The UNS number is J93380. Grade F55 to ASME SA182 is the forged equivalent. ASME SA240 S32760 is the plate equivalent.

Both the wrought and cast forms are acceptable per NACE MR0175-2002 and NACE MR0175/ISO 15156 with certain environmental restrictions. Superduplex is only being offered to the requirements of NACE MR0103 as block-forged bodies with welding prohibited. Castings are not offered due to welding restrictions contained in that specification.

S32760 is limited to 316°C or 600°F by the ASME Boiler and Pressure Vessel Code. These alloys suffer embrittlement when exposed to temperatures above the limit.

S32760 and CD3MWCuN are listed in ASME B16.34.

S31254, CK3MCuN Super Austenitic

This material is a superaustenitic stainless steel. Its corrosion resistance is higher than the duplex grades because its alloy content is higher. It has a high PREN (pitting resistance equivalency number) for superior resistance to chloride pitting and stress corrosion cracking.

S31254 contains approximately 20% chromium, 18% nickel, 6% molybdenum, and 1% copper.

ASME SA351 grade CK3MCuN is the cast equivalent of S31254. The UNS number is J93254. Grade F44 to ASME SA182 is the forged equivalent. ASME SA240 S31254 is the plate equivalent.

Both the wrought and cast forms are acceptable per NACE MR0175-2002 and NACE MR0175/ISO 15156 with certain environmental restrictions. It is acceptable to NACE MR0103 to 35 HRC without environmental restrictions.

S31254 is limited to 398°C or 750°F by the ASME Boiler and Pressure Vessel Code. These alloys suffer embrittlement when exposed to temperatures above the limit.

S31254 and CK3MCuN are listed in ASME B16.34.

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Material Guidelines for Gaseous Oxygen Service

All organic and inorganic materials will react with gaseous or liquid oxygen at certain pressures and temperatures. The reaction that occurs can cause a fire or an explosion. Because of these inherent dangers, process system design and control valve material selection are extremely important.

Oxygen service has many inherent hazards and requires careful and knowledgeable design of the process system. The information and guidelines presented here are intended to help the user; however, other factors such as service conditions and process system design must be considered to properly select materials that will handle this gas in a safe manner.

Many of the materials commonly used in control valves have ignition temperatures above the normal flowing temperature of gaseous oxygen. Ignition of these materials by normal flowing temperatures is generally not the danger. The danger is in the ignition of these materials by abnormal, localized high temperatures. Listed below are some of the common causes of localized high temperature. This list has been compiled from the best information available, but does not necessarily contain all the hazardous conditions that might be encountered in oxygen service applications.

Common Sources of Localized High Temperature

Flow Velocity

All valve materials should be suitable for oxygen service, and material selection should meet the velocity criteria, such as set by the Compressed Gas Association Pamphlet G-4.4 (copies can be obtained from Compressed Gas Association, Inc., 500 Fifth Avenue, New York, NY 10036). In general, if the velocity through the port of the valve can exceed 61 meters per second (200 feet per second), only copper-base alloy material should be used for valve body and trim parts in contact with the flow stream.

Foreign Particle Impingement

A foreign particle, such as weld spatter, that is being carried in the flow stream and that strikes the valve trim or the valve body wall might have its kinetic energy transformed into sufficient heat to raise the impinging particle or the material it strikes to its respective ignition temperature.

Ignition by Already-Burning Material

An organic valve disk, for example, that has already been ignited by foreign particle impingement will release sufficient heat to ignite surrounding metallic materials, thus initiating a serious fire.

Vibration

A part that is caused to vibrate, usually by the flowing velocity, might generate enough heat from internal friction to raise its temperature to its ignition point.

Adiabatic or Rapid Compression of Gas

Opening a valve to pressure the downstream system will result in the compression of the gas in the downstream system. If this is done rapidly, it can result in abnormally high gas temperatures, which might ignite material in the valve and piping system.

Static Electricity Discharge

The flow of gas across the trim of a ball, butterfly, or eccentric disk valve might generate a static charge on the trim. Because these valves inherently do not have a good grounding path from the trim to the valve body or from the valve body to the pipeline, use proper provisions and care for their grounding. Failure to do this might allow a discharge spark between the trim and valve body or between the valve body and adjacent piping, igniting the surrounding material.

Conclusion

This list shows that many of the hazards arise from the velocity of the flowing gas. For this reason, it is imperative that the system be designed such that flowing velocities will be low.

Organic Materials

Organic materials have ignition temperatures below those of metals. Use of organic materials in contact with oxygen should be avoided, particularly when the material is directly in the flow stream. When an organic material must be used for parts such as valve seats, diaphragms, or packing, it is preferable to select a material with the highest ignition temperature, the lowest specific heat, and the necessary mechanical properties.

Lubricants and sealing compounds should be used only if they are suitable for oxygen service and then used sparingly. Ordinary petroleum lubricants are not satisfactory and are particularly hazardous because of their high heat of combustion and high rate of reaction.

The approximate ignition temperatures in 138 bar (2000 psig) oxygen for a few organic materials are shown in table 1.

Table 1. Typical Ignition Temperatures

MATERIAL	TYPICAL IGNITION TEMPERATURE IN 138 BAR (2000 PSIG) OXYGEN	
	°C	°F
PTFE and PCTFE	468	875
70% Bronze-filled PTFE	468	875
Fluoroelastomer	316	600
Nylon	210	410
Polyethylene	182	360
Chloroprene and Nitrile	149	300

Metals

The selection of metals should be based on their resistance to ignition and rate of reaction. Following is a comparison of these two properties for some commonly used valve materials.

Resistance to Ignition in Oxygen

Materials are listed in order from hardest to ignite to easiest to ignite.

- Copper, copper alloys, and nickel-copper alloys -- most resistant
- Stainless steel (300 series)
- Carbon steel
- Aluminum -- least resistant

Rate of Reaction

Materials are listed in order from slowest rate of combustion to most rapid rate of combustion.

- Copper, copper alloys, and nickel-copper alloys -- do not normally propagate combustion
- Carbon steel
- Stainless steel (300 series)
- Aluminum -- burns very rapidly

Note that stainless steel, once ignited, burns more rapidly than carbon steel. Nevertheless, the austenitic grades (300 series) of stainless steel are considered to be much better than carbon steel because of their high resistance to ignition.

Suggested Guidelines

Consider the following guidelines when selecting process equipment for gaseous oxygen service. These guidelines are for customer use in selecting appropriate equipment for oxygen service, and neither Emerson, Emerson Automation Solutions, nor any of their affiliated entities assumes responsibility for material selection.

1. All regulators and control valves should be degreased and processed for oxygen service in accordance with current Emerson or customer specifications. Suitable lubricants, anti-seizing compounds, gaskets, and packing are included in Fisher™ Specification FGS 8A11, Cleaning, Processing, and Handling Equipment for Oxygen Service.

2. All metals in contact with oxygen in the main flow stream should be of appropriate materials suitable for the given oxygen service.

   In general, diaphragm casings, diaphragm plates, springs, and other parts not in the main flow stream may be of ordinary materials such as carbon steel, stainless steel, or cast iron. It is suggested, however, that all valve body and trim parts in contact with the flow stream be made of copper, copper alloy, or nickel-copper alloys.

3. All diaphragms in contact with oxygen gas should be made of fluoroelastomer.

4. All O-rings in contact with oxygen gas should be made of fluoroelastomer or a similar fluorocarbon elastomer.

5. Organic materials should be avoided for use in valve seats or other parts exposed to the flow stream.

6. Filters should be placed upstream of all valves and regulators. Only non-ferrous, inorganic filter elements should be used. Filters must have regular maintenance and cleaning.

7. To minimize the number of parts in contact with oxygen, oxygen should not be used as supply pressure to a pneumatic instrument or an actuator.

8. Plated parts should not be used in the main flow stream because of their potential contributions to foreign particle impingement.

Note

Some users of oxygen valves and regulators have established their own standards and specifications for construction materials. The customer's instructions in those instances will be followed. Emerson disclaims responsibility or liability if materials other than copper-based alloys or nickel-copper alloys are in contact with the flow stream.

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Corrosion Protection for Fisher™ Green Valves

Control valves operate in some of the most severely corrosive conditions imaginable. Valves used near or on the sea are constantly subjected to corrosive salt-laden atmospheres.

In chemical, pulp, and other processing plants, any variety of chemicals can be expected to be in contact with the exterior surfaces and fasteners.

In addition, in-valve and ambient temperatures can cycle considerably. These are ideal conditions for corrosion of valve components and fasteners.

To protect your investment from attack and deterioration, Emerson Automation Solutions protects exposed metal valve parts with excellent protective coatings for components and fasteners.

Powder Coating and NCF (Non-Corroding Finish) Coating Provide Attractive, Long-Lasting, and Cost-Effective Protection for Your Fisher Valve

Standard and Optional Coatings for Fisher Valves

Table 1. Coatings

COATING	STANDARD			PREMIUM OPTION
	Powder Coating	NCF (Non-Corroding Finish)	Heavy Zinc Plating	Offshore Coating System
Typical uses	Cast Iron and steel valve bodies; actuator yokes, casings, and cylinders	Steel bolts, studs, and nuts; yoke locknuts	Instrument feedback arms, valve-actuator stem connectors	Complete control valve assemblies with the exception of stem connectors, yoke locknuts, instruments, and instrument mounting hardware, (Instrument mounting plates and brackets are typically coated).

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Table 2. Fisher Paint System (FPS) and System Descriptions

FPS-1A	**Wet Spray Coating**
General Description	Wet spray solvent or water borne primer and top coat are applied
Surface Condition	Parts must be clean and free of previously applied coatings. Iron phosphates may be applied
Number of Coats	2
Total Thickness	Total dry film thickness: 60 to 76.2 microns (2.5 to 3.0 mils) minimum
Temperature Limits	121°C (250°F) constant, 149°C (300°F) in intervals
ISO 12944 Expected Durability	Not Applicable
ISO 12944 Equivalent Paint System	None
FPS-2A	**Powder Coating**
General Description	Electrostatically applied heat cured powder coating
Surface Condition	Clean, iron phosphate, and final seal coat
Number of Coats	1
Total Thickness	Total dry film thickness: 50 microns (2 mils) minimum
Temperature Limits	121°C (250°F) constant, 149°C (300°F) in intervals
ISO 12944 Expected Durability	Not Applicable
ISO 12944 Equivalent Paint System	None
FPS-3	**Epoxy Primer and Top Coat**
General Description	Polyamide epoxy coating
Surface Condition	SSPC-SP6 (commercial blast clean)
Number of Coats	2
Total Thickness	Total dry film thickness: 200 to 400 microns (8 to 16 mils)
Temperature Limits	121°C (250°F) dry, 65°C (150°F) immersion
ISO 12944 Expected Durability	C3 (medium)
ISO 12944 Equivalent Paint System	A1.16
Notes	Not recommended for steel parts in highly corrosive service. Can be used with insulation.
FPS-3B	**Two-Coat Phenolic (Novalac) Epoxy**
General Description	Phenolic (novalac) epoxy coating
Surface Condition	SSPC-SP6 or SSPC−SP10
Number of Coats	2
Total Thickness	Total dry film thickness: 200 to 300 microns (8 to 12 mils)
Temperature Limits	218°C (425°F) continuous, 232°C (450°F) intermittent
ISO 12944 Expected Durability	C4 (high)
ISO 12944 Equivalent Paint System	A1.21
Notes	Can be used with insulation.
FPS-4	**Zinc Primer**
General Description	Inorganic zinc-rich coating
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	1
Total Thickness	Total dry film thickness: 50 to 150 microns (2 to 6 mils)
Temperature Limits	398°C (750°F) constant, 426°C (800°F) in intervals
ISO 12944 Expected Durability	Not Applicable
ISO 12944 Equivalent Paint System	None
Notes	Not for use with stainless steel. Uninsulated only.
FPS-7A	**High Temperature and Corrosive Applications**
General Description	Zinc-rich primer with silicone modified top coats
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Typical total dry film thickness: 100 to 275 microns (4 to 11 mils)
Temperature Limits	537°C (1000°F) constant, 648°C (1200°F) in intervals
ISO 12944 Expected Durability	C3 (high) and C4 (low)
ISO 12944 Equivalent Paint System	A1.08
Notes	Can be used with insulation.

-continued-

Table 2. Fisher Paint System (FPS) and System Descriptions (continued)

FPS-7B	High Temperature and Corrosive Applications (Stainless)
General Description	Siloxane
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	2
Total Thickness	Total dry thickness: 200 to 400 microns (8 to 16 mils)
Temperature Limits	599°C (1110°F) maximum constant
ISO 12944 Expected Durability	C3 (medium)
ISO 12944 Equivalent Paint System	A1.02
Notes	Coverage over stainless steel material only. Used against chloride attack and corrosive applications. Uninsulated only.
FPS-7C	**Modified Acrylic Topcoats with Color Option**
General Description	Inorganic zinc-rich primer and silicone acrylic topcoats
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Typical total dry film thickness: 125 to 200 microns (5 to 8 mils)
Temperature Limits	Dependent on color
ISO 12944 Expected Durability	C4 (high)
ISO 12944 Equivalent Paint System	A1.13
Notes	Not for use with stainless steel. Semi-high temperature and corrosive. Can be used with insulation.
FPS-8A	**Three-Coat Offshore Applications**
General Description	Inorganic zinc-rich primer, polyamide epoxy mid-coat and aliphatic polyurethane top coat
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Total dry film thickness: 187.5 to 337 microns (7.5 to 13.5 mils)
Temperature Limits	93°C (200°F) constant, 121°C (250°F) in intervals
ISO 12944 Expected Durability	C5-I and C5-M (medium)
ISO 12944 Equivalent Paint System	A1.20
Notes	Not for use with stainless steel. Can be used with insulation.
FPS-8B	**Four-Coat Offshore Applications**
General Description	Inorganic zinc-rich primer, two polyamide epoxy mid-coats and aliphatic polyurethane top coat
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	4
Total Thickness	Total dry film thickness: 300 to 550 microns (12 to 22 mils)
Temperature Limits	93°C (200°F) constant, 121°C (250°F) in intervals
ISO 12944 Expected Durability	C5-M (high)
ISO 12944 Equivalent Paint System	A1.23
Notes	Not for use with stainless steel. Can be used with insulation.
FPS-8C	**Stainless Steel Body Applications in Corrosive Service**
General Description	Polyamide-cured epoxy primer and intermediate coat with aliphatic polyurethane top coat
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Total dry film thickness: 237.5 to 362.5 microns (9.5 to 14.5 mils)
Temperature Limits	93°C (200°F) constant, 121°C (250°F) in intervals
ISO 12944 Expected Durability	Not Applicable
ISO 12944 Equivalent Paint System	None
Notes	Used with stainless steel. Can be used with insulation.
FPS-8D	**Optional Three-Coat Offshore Paint System**
General Description	Epoxy/zinc primer, polyamide epoxy mid-coat, and aliphatic polyurethane top coat
Surface Condition	SSPC-SP10 minimum (near white metal grit blast)
Number of Coats	3
Total Thickness	Total dry film thickness: 212 to 312 microns (8.5 to 12.5 mils)
Temperature Limits	93°C (200°F) constant, 121°C (250°F) intermittent
ISO 12944 Expected Durability	C5-I and C5-M (medium)
ISO 12944 Equivalent Paint System	A1.20
Notes	Not for use with stainless steel. Can be used with insulation.

Powder Coating - Fisher Green

Powder coating is an electrostatically applied and baked-on finish consisting of a mixture of finely ground resin, pigments, and binders, very similar to wet-spray coatings. Unlike wet-spray coatings, however, powder coating is nearly 100% VOC free, thereby reducing some of the environmental concerns associated with wet-spray coatings.

Powder coating is the standard finish for actuator casings, yokes, and cylinders, as well as for cast iron and carbon steel valve body assemblies. During the powder coating process, the part is cleaned, and a conversion coating is formed on the substrate. A seal coat is then applied over the conversion coating. These steps prepare the part surface for the application of the powder coating and improve the adhesion of cured powder to the part. This pretreatment process is the foundation for the powder coating and is critical in assuring the durability of this coating in corrosive environments.

Powder coating has many of the attributes of catalyzed epoxy and urethane finishes, but Emerson powder coating does not have the disadvantage of chalking or discoloring when subjected to ultraviolet light such as sunlight.

Emerson has conducted extensive laboratory testing of powder coating, and this finish has been proven on valves in the field. Refer to table 4 for the comparative results of several coating systems.

Table 3. Powder Coating Specifications

TECHNICAL SPECIFICATIONS — POWDER COATING	
Surface Preparation	Clean, apply conversion coating, and seal coat
Coating Thickness	50 to 150 microns (2 to 6 mils)
Standard Acceptance Test	500 hours of ASTM B117 salt-spray conducted on products. For comparison test on test panels, refer to the “TEST” column in table 4
Standard Color Specifications	**Fisher Green**: Munsell #2.5G3/8 **Gray**: Munsell #10BG 4.90/0.60, ANSI/ASA #49 **Regal Gray**: Munsell #8.4B 3.47/0.60

Figure 1. Powder Coating is Nearly 100% Free of VOCs

W7163

Figure 2. Any Color of Powder Coating Can Be Specified;
A Sampling of Available Colors are Shown on Actuator Casings

X1203

Powder Coating Test Results

Standardized flat-panel tests allow a good comparison between different types of coatings. However, these tests do not reflect performance on actual products. Refer to Technical Specifications (table 3) for the standard acceptance test for products. For more information about test conditions, procedures, and results, contact your Emerson sales office.

Table 4. Powder Coating Test Results

POWDER COATING TEST										
Surface Preparation: This coating was applied to Bonderite 1000 test panels.										
ASTM B117 Salt Spray	ASTM D522 Mandrel Bend	ASTM D3359 Cross-Hatch Adhesion	ASTM D2794 Direct Impact	Gasoline	15% Xylene and 85% Mineral Spirits	10% Nitric Acid	10% Hydrochloric Acid	3% Sulfuric Acid	10% Sodium Hydroxide	10% Ammonium Hydroxide
PASSED Up to 1000 hours: Rusting at scribe line. No loss of adhesion. No rust or blisters away from scribe.	PASSED No visible cracking or loss of adhesion.	PASSED No loss of adhesion. Rated 5B.	PASSED Up to 140 in/lb	PASSED Slight color change and slight softening, but recovered.	PASSED No effect	PASSED No effect	PASSED No effect	PASSED No effect	PASSED No effect	PASSED No effect

Powder Coating Compared to Other Coatings

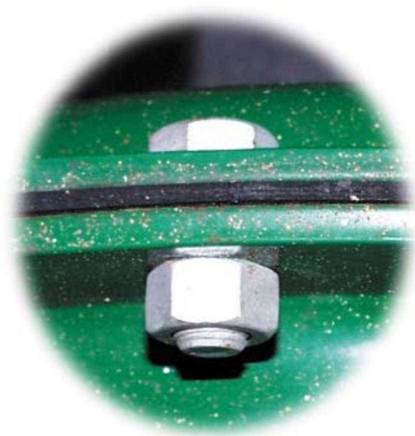
Table 5. Coating Comparisons

<table>
<tr><th>COATING</th><th>COMMON APPLICATION</th><th>COMMENTS</th></tr>
<tr><td>Powder Coating</td><td>Used anywhere a durable, long-lasting, cost-effective coating is required.</td><td>Will withstand a continuous temperature exposure of 121°C or 250°F without detrimental effects
Passes all listed tests</td></tr>
<tr><td>Two-Component Epoxy—Primer and Top Coat</td><td>Not recommended. Does not exceed the powder coating results in any of these tests and is inferior in many aspects.</td><td>Will withstand a continuous temperature of 121°C or 250°F without detrimental effect.
Chalks and discolors when exposed to sunlight
Will not pass salt-spray testing
Will not pass mandrel-bend testing
Will not pass impact testing
Added cost</td></tr>
<tr><td>High-Temperature Modified Silicone Coating</td><td>Used where corrosive atmosphere is not a factor but where the body is subjected to temperatures up to 399°C or 750°F continuously.</td><td rowspan="2">Will not pass salt-spray testing
Will not pass mandrel-bend testing
Will not pass cross-hatch adhesion testing
Will not pass impact testing
Added cost</td></tr>
<tr><td>Inorganic Zinc-Rich Primer and High-Temperature Modified Silicone Top coat</td><td>Used where the application is corrosive and the body is subjected to temperatures up to 399°C or 750°F continuously.</td></tr>
<tr><td>Offshore Three-Coat System—Inorganic Zinc-Rich Primer, Epoxy Tie Coat, Polyurethane Top Coat</td><td>Used for applications that are highly corrosive but where temperatures will not exceed 121°C or 250°F on a continuous basis.</td><td>Will withstand a continous temperature exposure of 121°C or 250°F without detrimental effects
Will not pass mandrel-bend testing
Will not pass cross-hatch adhesion testing
Will not pass impact testing
Added cost</td></tr>
</table>

Figure 3. Powder Coating Results

W7696

Powder-Coated Actuator Casings with NCF Coated Cap Screws after 500 Hours in an Accelerated Salt Spray Laboratory Test



W7697

Powder-Coated Actuator Casings with NCF Coated Cap Screws after One Year of Service on an Off-Shore Platform (Light-Colored Spots are Paint Drift from Customer Paint Spraying of Nearby Equipment)

Standard Instrument Paint

Standard paints applied to instruments are formulated to withstand extreme exposures to corrosive atmospheres and are tested to confirm this benefit. Due to the excellent surface preparation and superior coatings applied to the prepared substrate, other more expensive coating systems are not necessary. The coatings used for instruments are baked-on finishes that will withstand the toughest environments and will keep on performing for years to come.

Comparisons of paints other than standard have shown no advantages in using other paints. Because of the potential impact on instrument performance, we are unable to apply coatings or paints other than our standard.

Figure 4. Fisher Instrument with Standard Finish

Table 6. Standard Instrument Paint Specifications

Technical Specifications—Standard Instrument Paint	
Surface Preparation	Clean, desmut, apply chromate conversion coating
Coating Thickness	31 to 37 microns (1.25 to 1.5 mils)
Standard Acceptance Test	Refer to the standardized test chart for details
Standard Color Specifications	**Regal Gray**—Munsell #8.4 B 3.47/0.60 **Rosemount Blue**—Federal Standard 595A- #25177

Standard Instrument Paint Test - Panel Results

Standardized flat-panel tests show the effect of common chemical exposures and physical attributes. Tests were performed on chromate conversion coated aluminum alloy panels. For more information about test conditions, procedures, and results, contact your Emerson sales office.

Table 7. Standard Instrument Paint Panel Results

TEST	RESULT	TEST	RESULT	TEST	RESULT
Hot and Cold Cycle	No effect	10% NH_4OH	No effect	Mandrel Bend ASTM D522	PASSED
10% HNO_3	Slight loss of gloss to no effect	15% Xylene; 85% Mineral Spirits	Slightly lighter to no effect	Impact ASTM D2794	PASSED
10% HCL	No effect	Unleaded Gasoline	No effect	Thread-locking Sealant Resin	PASSED
3% H_2SO_4	No effect	Cross-Hatch Adhesion ASTM D3359	PASSED	Humidity, Ultraviolet, and Gravel Tests	PASSED
10% NaOH	Slight loss of gloss to no effect	Pencil Hardness ASTM D3363	PASSED	Salt Cabinet ASTM B117	PASSED

DVC6200 Stainless Steel Alternative

As an alternative to painted instruments, the FIELDVUE™ DVC6200 digital valve controller can be furnished with a stainless steel module base, housing and an all-stainless mounting kit. The sealed terminal box isolates field wiring connections from other areas of the instrument and keeps water and harsh atmosphere away from electronic components. The DVC6200 stainless steel version eliminates all diecast aluminum parts, which greatly increases its resistance to the tough, corrosive environments found on offshore platforms, within chemical plants, and inside refinery processing units.

Figure 5. Fisher DVC6200 Digital Valve Controller Stainless Steel Version

X0350

Proprietary NCF (Non-Corroding Finish) Coating for Steel Fasteners

Standard steel fasteners such as bonnet bolting, actuator casing bolting, and steel fasteners for Fisher instruments have NCF (non-corroding finish) coating.

NCF coating was developed by Emerson Automation Solutions to greatly improve resistance to corrosion from acids, bases, salts, and many other chemicals and to follow the parameters listed in ASTM F1136 (Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners). NCF coating is a polymer-based coating consisting of multiple coats applied to all surfaces of bolts, studs, and nuts. (NCF coating is not used on steel bolting for temperatures over 427°C or 800°F). NCF coating is silver or gray in color and the finish is dull when compared with zinc plating.

The effectiveness of this proprietary coating designed specifically for the control valve market has been proven by actual testing on offshore platforms and accelerated salt-spray tests in the laboratory. NCF coated fasteners remain easily maintainable after offshore exposure. Original replacement NCF bolting is only available from Emerson Automation Solutions.

Figure 6. NCF-Coated Fasteners Exhibit Superior Performance in Accelerated Laboratory Tests

W7698

STANDARD ZINC PLATED **NCF COATED**

Table 8. NCF Coating Specifications

Technical Specifications—NCF Coating	
Surface Preparation	**Pressure-retaining parts:** Light blast **Non pressure-retaining parts:** Light blast or zinc plating
Coating Thickness	Approximately 0.025 mm (0.001 inches)
Standard Acceptance Test	No red rust after 500 hours of ASTM B117 salt-spray test conducted on products after assembly with a pneumatic impact wrench
Color	Light silver-gray

Heavy Zinc Plating for Hardware Items

Figure 7. Heavy Zinc Plating Specifications

W7659

For hardware items such as instrument feedback arms and stem connectors, heavy zinc plating is standard. Heavy zinc plating is used for non-threaded parts that require protection from corrosion.

Table 9. Heavy Zinc Plating Specifications

Technical Specifications—Heavy Zinc Plating and Chromate	
Coating Thickness	0.0155 mm +/- 0.0025 mm (0.0006 inches +/- 0.000098 inches)
Standard Acceptance Test	300 hours in ASTM B117 salt-spray test

Offshore Three-Coat System (Optional)

This optional coating is often specified for valves used on offshore platforms. It is a wet-spray process consisting of three coats: a zinc-rich primer, polyamide epoxy, and polyurethane top coat.

This coating is applied to the complete control valve assembly with the exception of instruments, instrument mounting hardware, stem connectors, and yoke locknuts. The offshore three-coat system is not available on stainless steel parts.

Table 10. Offshore Three-Coat Specifications

Technical Specifications—Offshore Three-Coat System	
Surface Preparation	White metal grit blast per SSPC SP5.
Typical Coating Thickness	**Primer:** 25 to 75 microns (1 to 3 mils) **Tie Coat:** 75 microns (3 mils) **Top Coat:** 50 to 75 microns (2 to 3 mils)
Standard Acceptance Test	More than 2000 hours of ASTM B117 salt spray
Color	As specified

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Fisher™ Packaging and Shipment Methods

Standard Packaging

Standard shipping methods vary from cardboard box containers to packaging on wood pallets covered with a cardboard box, to all wood crate packaging for shipments without special requirements. These methods are intended to allow the most product protection for the time periods specified.

Domestic Shipment—Immediate Use

For domestic shipments a cardboard box may be used to contain the unit or components to be shipped, or for larger units, cardboard may be used to cover a wood pallet that has been utilized to secure the unit. All-wood crates are used to ship very large items.

Domestic shipments for immediate use are intended for product that will be installed or used within a relatively short amount of time. The package will protect the item for up to one year if the package is stored in an enclosed, heated warehouse; protection will last up to one month if the item is stored in an open shed (a roof and three walls) or outside, if covered with a secure, waterproof tarp. This packaging method will not protect units that will be stored outside, uncovered.

Export Shipment—Immediate Use

Standard packaging for exports may also include the use of cardboard to protect the unit or component as described for domestic shipments, and depending on size, may be packaged in an all-wood crate or box.

The export package will protect the item for the same time periods as for the domestic packaging method — up to one year if the package is stored in an enclosed heated warehouse; protection will last up to one month if the item is stored in an open shed or outside, if covered with a secure, waterproof tarp. This packaging method will not protect units that will be stored outside, uncovered.

Long Term or Extended Storage Shipment Methods

Automobile manufacturers, the military, and petroleum companies have used vapor corrosion inhibiting (VpCI) materials to mothball equipment or ship items that will be exposed to corrosive atmospheres for long periods. These products allow chemistry that is formulated into the packaging materials to volatilize and cover the packaged product with a micro layer of rust inhibiting compounds.

Emerson uses a series of rust preventive products, provided by Cortec® Corporation, for shipping products requiring long term storage that are more effective for product protection. Cortec's vast network of representatives provide worldwide distribution. Because the chemistry incorporated in the multiple material packaging process volatilizes to completely coat the product in a protective layer, it is much more effective than trying to keep the entire package airtight. A small amount of air exchange will not deplete the effectiveness of these products.

The long term or extended storage package will protect the item for up to one year with outdoor, covered storage, up to two years when stored in an unheated warehouse, or up to five years in a heated warehouse. This packaging method will not protect units that will be stored outside, uncovered.

Cortec packaging materials help to assure a rust-free condition of products that require long-term storage protection shipped both domestically and overseas. If you have any other questions concerning this packaging method, please contact your Emerson sales office or Local Business Partner.

With Cortec packaging material desiccant is not required and not used by Emerson. Typical desiccant material is only good until it absorbs all the moisture it can hold, and then offers no other protection. This saturation of the desiccant can happen very quickly in a poorly sealed or damaged container.

Desiccant can also cause corrosion to form when in the saturated condition if the packaged item is placed into a warm environment. The saturated desiccant material will begin to "give up" the moisture it has absorbed, and will create a humidity chamber inside the package enclosure, causing rust to form on unpainted surfaces.

Cortec Specifications

Cortec products utilize the newest generation of VpCI technology, which will protect vulnerable metal surfaces from corrosion for up to 5 years when packaged and stored according to Emerson long term storage specifications. These specifications will include VpCI 369D on all unpainted surfaces, VpCI 132 pads inside of the enclosed space and VpCI 126 film totally enclosing the parts.

Packaging standards that utilize Cortec film will provide a higher level of protection in the harsh climates and vulnerable elements than the typical tarpaper/desiccant/vapor barrier bag solution that had previously been used.

Cortec packaging products use only safe chemicals with low toxicity levels. All of the Cortec products are recyclable and environmentally compatible packaging. Contact your Emerson sales office or Local Business Partner for more information.

Vapor Permeability Test per MIL-B-121

Permeability testing was conducted on the Cortec VpCI-126 4 mil polyethylene sheeting as compared to typical tarpaper. Testing concluded that neither material was permeable when tested per MIL-B-121, paragraph 4.5.5.

The panel in figures 1 and 2 was packaged in typical tarpaper with a plain polyethylene sheet covering, and then glued tarpaper was installed over the entire crate.

The panel in figures 3 and 4 was protected with Cortec VpCI-126 low-density poly sheeting only.

Both panels were grit blasted to a "white metal" condition prior to this testing, and no rust inhibitor was applied to either of the panel surfaces. Mini-skids were constructed to mirror what is normally done for completed valve assemblies. The loaded skids were then placed into a salt exposure cabinet that was prepared per ASTM B-117.

Results of testing showed the panel in figures 3 and 4 was better protected by the VpCI-126 poly than the panel in the typical tarpaper-covered and glued container in figures 1 and 2.

Figure 1. Typical Tarpaper Packaging

X1386

Figure 1 packaging method utilized tarpaper under the panel and the container uprights covered with tarpaper with seams glued. The panel was covered with VpCI paper and plain plastic sheeting (not VpCI plastic). Heavy rust is visible on the upper right side of the panel.

Figure 2. Typical Tarpaper Packaging (Reverse side)

X1387

In figure 2, square headed nails were removed from the panels and the panels were turned over. With the old tarpaper method, the same side that was heavily rusted in figure 1 now exhibits heavy rusting on the under side (left side) of the panel. Rusting has begun on the opposite side as well.

Figure 3. Cortec VpCI-126 Packaging

X1384

Figure 3 packaging method utilized Cortec VpCI-126 polyethylene under and over the test panel. The panel was sandwiched between the two VpCI impregnated polyethylene layers. Frame lumber was nailed to hold the sheeting in place. The container was built with uprights, but no barrier material was used over the skid framework sides, ends, or top. The panel is virtually rust-free.

Figure 4. Cortec VpCI-126 Packaging (Reverse side)

X1385

In figure 4, some minor rust is visible on the underside of the panel protected with Cortec VpCI-126 poly, but the largest area of this rust appears to be from a thumbprint or fingerprint.

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Pressure/Temperature Ratings for Fisher™ Cast Iron Valve Bodies

The pressure/temperature ratings for flanged cast iron valves given in the following figure are in accordance with ASME B16.1. Fisher valves with Class B ratings are listed in table 1. Cast iron valves with screwed connections have CL250 ratings in accordance with ASME B16.4.

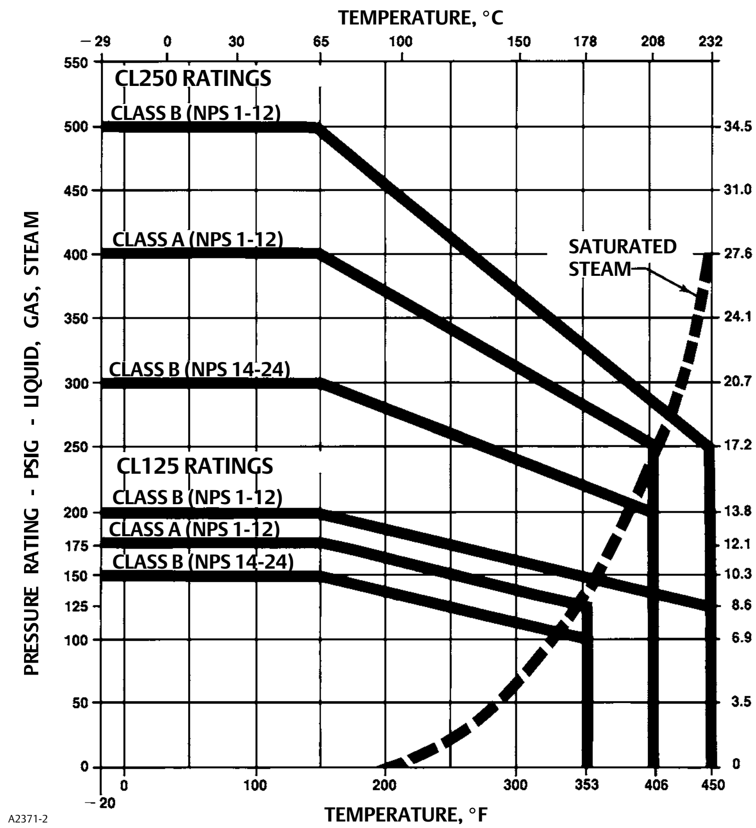
Information in the following figure has been extracted from Cast Iron Pipe Flanges and Flanged Fittings (ASME B16.1) with the permission of the publisher.

The American Society of Mechanical Engineers, United Engineering Center, Three Park Avenue, New York, New York 10016.

Table 1. Class B Ratings

Valve Body Design	Valve Size, NPS	CL125B	CL250B
E[1]	1, 1-1/2, 2, 2-1/2, 3, 4, 6, 8	X	X
YD, YS	1, 1-1/2, 2, 2-1/2, 3, 4, 6	X	X

1. Refers to all valve designs beginning with "E" that are available in cast iron, for example: ED, EDR, etc.



Pressure/Temperature Ratings

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Pressure/Temperature Ratings for Fisher™ Valves (ASME B16.34-2017) - U.S. Traditional Units

Material Reference Guide Table

U.S. Traditional Units

Fisher valves conforming to ASME B16.34-2017 standard have specific pressure-temperature limits depending on construction materials. Use the material references in table 1 when determining pressure-temperature ratings of valves used in accordance with the ASME standard.

Table 1. Valve Body Materials

CATEGORY	ASME			
	Specification	Grade	Material Group	Nominal Designation
Carbon Steel	SA-216	WCC(1)	1.2	S-Mn-Si
	SA-352	LCC(2)	1.2	S-Mn-Si
	SA-350	LF2	1.1	C-Mn-Si
Alloy Steels	SA-217	WC6	1.9	1-1/4Cr-1/2 Mo
		WC9	1.10	2-1/4Cr-1 Mo
		C12A	1.15	9Cr-1 Mo-V
Stainless Steel	SA-351	CF8M	2.2	16Cr-12 Ni-2Mo
		CF8	2.1	18Cr-8 Ni
		CF8C	2.11	18Cr-10 Ni-Cb
		CF3M	2.2	16Cr-12 Ni-2Mo
		CG8M	2.2	19Cr-10 Ni-3Mo
		CK3MCuN	2.8	20Cr-18 Ni-6Mo
	SA-995	CD3MN(3) (Grade 4A)	2.8	22Cr-5 Ni-3Mo-N
		CD3MWCuN (Grade 6A)	2.8	25Cr-7 Ni-3.5Mo-Cb

1. WCC is a standard substitute for WCB material.
2. LCC is a standard substitute for LCB material.
3. Listed as A351-CD3MN in B16.34-2013.

Standard Pressure-Temperature Ratings for CL150 and CL300 Valves

Fisher valve materials that conform to ASME B16.34-2017 Standard Class pressure-temperature ratings are listed in tables 2 and 3. These ratings apply to all Fisher cast, forged, and fabricated steel valves.

Table 2. For ASME Standard CL150 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6 (2)	WC9 (2)	C12A (2)	CF8 (2,3) or 304 (2,3)	CF8M (2,3) or 316(2,3)	CF3M	316L	CG8M	317 (2,3)	CF8C (2,3)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	290	285	290	290	290	290	275	275	275	230	275	275	275	275	290
200	260	260	260	260	260	260	230	235	235	195	235	235	255	255	260
300	230	230	230	230	230	230	205	215	215	175	215	215	230	230	230
400	200	200	200	200	200	200	190	195	195	160	195	195	200	200	200
500	170	170	170	170	170	170	170	170	170	150	170	170	170	170	170
600	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
650	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
700	- - -	110	110	110	110	110	110	110	110	110	110	110	110	110	110
750	- - -	95	95	95	95	95	95	95	95	110	95	95	95	95	95
800	- - -	80	80	80	80	80	80	80	80	80	80	80	80	80	- - -
850	- - -	- - -	- - -	65	65	65	65	65	65	65	65	65	65	65	- - -
900	- - -	- - -	- - -	50	50	50	50	50	- - -	- - -	50	50	50	50	- - -
950	- - -	- - -	- - -	35	35	35	35	35	- - -	- - -	35	35	35	35	- - -
1000	- - -	- - -	- - -	20	20	20	20	20	- - -	- - -	20	20	20	20	- - -
1050	- - -	- - -	- - -	20	20	20	20	20	- - -	- - -	- - -	20	20	- - -	- - -
1100	- - -	- - -	- - -	20	20	20	20	20	- - -	- - -	- - -	20	20	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	20	20	20	- - -	- - -	- - -	20	20	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	20	20	20	- - -	- - -	- - -	20	20	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	20	20	- - -	- - -	- - -	20	20	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	20	20	- - -	- - -	- - -	20	20	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	20	20	- - -	- - -	- - -	20	20	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	20	20	- - -	- - -	- - -	20	15	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	20	20	- - -	- - -	- - -	20	10	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	15	15	- - -	- - -	- - -	15	10	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. Flanged end ratings terminate at 1000°F.
3. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Table 3. For ASME Standard CL300 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	750	740	750	750	750	750	720	720	720	600	720	720	720	720	750
200	750	680	750	750	750	750	600	620	620	510	620	620	660	660	745
300	730	655	730	720	730	730	540	560	560	455	560	560	615	615	665
400	705	635	705	695	705	705	495	515	515	420	515	515	575	575	615
500	665	605	665	665	665	665	465	480	480	395	480	480	540	540	580
600	605	570	605	605	605	605	440	450	450	370	450	450	515	515	555
650	590	550	590	590	590	590	430	440	440	365	440	440	505	505	545
700	- - -	530	555	570	570	570	420	435	435	360	435	435	495	495	540
750	- - -	505	505	530	530	530	415	425	425	355	425	425	490	490	530
800	- - -	410	410	510	510	510	405	420	420	345	420	420	485	485	- - -
850	- - -	- - -	- - -	485	485	485	395	420	420	340	420	420	485	485	- - -
900	- - -	- - -	- - -	450	450	450	390	415	- - -	- - -	415	415	450	450	- - -
950	- - -	- - -	- - -	320	385	385	380	385	- - -	- - -	385	385	385	385	- - -
1000	- - -	- - -	- - -	215	265	365	355	365	- - -	- - -	365	365	365	365	- - -
1050	- - -	- - -	- - -	145	175	360	325	360	- - -	- - -	- - -	360	360	- - -	- - -
1100	- - -	- - -	- - -	95	110	300	255	305	- - -	- - -	- - -	305	310	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	225	205	235	- - -	- - -	- - -	235	210	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	145	165	185	- - -	- - -	- - -	185	150	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	135	145	- - -	- - -	- - -	145	115	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	115	115	- - -	- - -	- - -	115	75	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -		95	95	- - -	- - -	- - -	95	50	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -		75	75	- - -	- - -	- - -	75	40	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -		60	60	- - -	- - -	- - -	60	30	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -		40	40	- - -	- - -	- - -	40	25	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Special Pressure-Temperature Ratings for CL150 and CL300 Threaded or Welding End Valves

Fisher valve materials that conform to ASME B16.34-2017 Special Class pressure-temperature ratings are listed in tables 4 and 5. These ratings apply to all Fisher cast, forged, and fabricated steel valves. Nondestructive examination applies (Fisher Process Level 6).

Table 4. For ASME Special CL150 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A(2)	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	290	290	290	290	290	290	290	290	290	255	290	290	290	290	290
200	290	290	290	290	290	290	255	265	265	220	265	265	275	285	290
300	290	285	290	290	285	290	230	240	240	195	240	240	255	265	285
400	290	280	290	290	280	290	215	220	220	180	220	220	240	245	265
500	290	280	290	290	280	290	200	205	205	170	205	205	230	230	250
600	290	280	290	290	275	290	190	195	195	160	195	195	220	220	240
650	290	275	290	290	275	290	185	190	190	155	190	190	215	215	235
700	- - -	265	280	280	270	280	180	185	185	155	185	185	215	215	230
750	- - -	245	280	280	270	280	175	185	185	150	185	185	210	210	230
800	- - -	195	255	275	270	275	175	180	180	150	180	180	210	210	- - -
850	- - -	- - -	- - -	260	260	260	170	180	180	145	180	180	205	205	- - -
900	- - -	- - -	- - -	225	230	230	165	180	- - -	- - -	180	180	205	205	- - -
950	- - -	- - -	- - -	155	180	180	165	175	- - -	- - -	175	175	180	180	- - -
1000	- - -	- - -	- - -	105	130	160	160	160	- - -	- - -	160	160	160	160	- - -
1050	- - -	- - -	- - -	70	85	160	155	160	- - -	- - -	- - -	160	160	- - -	- - -
1100	- - -	- - -	- - -	45	55	145	125	145	- - -	- - -	- - -	145	150	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	105	100	115	- - -	- - -	- - -	115	100	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	70	80	90	- - -	- - -	- - -	90	70	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	65	70	- - -	- - -	- - -	70	55	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	55	55	- - -	- - -	- - -	55	35	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	45	45	- - -	- - -	- - -	45	25	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	35	35	- - -	- - -	- - -	35	20	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	30	30	- - -	- - -	- - -	30	15	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	20	20	- - -	- - -	- - -	20	15	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Table 5. For ASME Special CL300 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A(2)	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	750	750	750	750	750	750	750	750	750	670	750	750	750	750	750
200	750	750	750	750	750	750	670	690	690	570	690	690	715	740	750
300	750	740	750	750	740	750	600	625	625	510	625	625	660	690	745
400	750	735	750	750	730	750	555	575	575	470	575	575	620	645	685
500	750	735	750	750	725	750	520	535	535	440	535	535	600	605	650
600	750	735	750	750	720	750	495	505	505	415	505	505	575	575	620
650	750	715	750	750	715	750	480	495	495	405	495	495	565	565	610
700	- - -	690	715	735	705	735	470	485	485	400	485	485	555	555	605
750	- - -	635	635	730	705	730	460	475	475	395	475	475	550	550	600
800	- - -	515	515	720	705	720	455	470	470	385	470	470	545	545	- - -
850	- - -	- - -	- - -	680	680	680	440	465	465	380	465	465	540	540	- - -
900	- - -	- - -	- - -	585	600	600	435	465	- - -	- - -	465	465	540	540	- - -
950	- - -	- - -	- - -	400	470	470	425	460	- - -	- - -	460	460	470	470	- - -
1000	- - -	- - -	- - -	270	335	420	415	420	- - -	- - -	420	420	420	420	- - -
1050	- - -	- - -	- - -	180	220	420	405	420	- - -	- - -	- - -	420	420	- - -	- - -
1100	- - -	- - -	- - -	120	135	375	320	380	- - -	- - -	- - -	380	390	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	280	255	295	- - -	- - -	- - -	295	260	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	180	205	230	- - -	- - -	- - -	230	190	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	165	185	- - -	- - -	- - -	185	140	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	140	145	- - -	- - -	- - -	145	95	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	115	120	- - -	- - -	- - -	120	65	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	95	95	- - -	- - -	- - -	95	50	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	75	75	- - -	- - -	- - -	75	40	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	50	50	- - -	- - -	- - -	50	35	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Standard Pressure-Temperature Ratings for CL600 and CL900 Valves

Fisher valve materials that conform to ASME B16.34-2017 Standard Class pressure-temperature ratings are listed in tables 6 and 7. These ratings apply to all Fisher cast, forged, and fabricated steel valves.

Table 6. For ASME Standard CL600 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	1500	1480	1500	1500	1500	1500	1440	1440	1440	1200	1440	1440	1440	1440	1500
200	1500	1360	1500	1500	1500	1500	1200	1240	1240	1020	1240	1240	1325	1325	1490
300	1455	1310	1455	1445	1455	1455	1075	1120	1120	910	1120	1120	1235	1235	1335
400	1405	1265	1405	1385	1410	1410	995	1025	1025	840	1025	1025	1150	1150	1230
500	1330	1205	1330	1330	1330	1330	930	955	955	785	955	955	1085	1085	1160
600	1210	1135	1210	1210	1210	1210	885	900	900	745	900	900	1030	1030	1115
650	1175	1100	1175	1175	1175	1175	865	885	885	730	885	885	1015	1015	1095
700	- - -	1060	1110	1135	1135	1135	845	870	870	720	870	870	995	995	1085
750	- - -	1015	1015	1065	1065	1065	825	855	855	705	855	855	985	985	1065
800	- - -	825	825	1015	1015	1015	810	845	845	690	845	845	975	975	- - -
850	- - -	- - -	- - -	975	975	975	790	835	835	675	835	835	970	970	- - -
900	- - -	- - -	- - -	900	900	900	780	830	- - -	- - -	830	830	900	900	- - -
950	- - -	- - -	- - -	640	755	775	765	775	- - -	- - -	775	775	775	775	- - -
1000	- - -	- - -	- - -	430	535	725	710	725	- - -	- - -	725	725	725	725	- - -
1050	- - -	- - -	- - -	290	350	720	650	720	- - -	- - -	- - -	720	720	- - -	- - -
1100	- - -	- - -	- - -	190	220	605	515	610	- - -	- - -	- - -	610	625	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	445	410	475	- - -	- - -	- - -	475	420	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	290	330	370	- - -	- - -	- - -	370	300	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	265	295	- - -	- - -	- - -	295	225	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	225	235	- - -	- - -	- - -	235	150	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	185	190	- - -	- - -	- - -	190	105	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	150	150	- - -	- - -	- - -	150	80	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	115	115	- - -	- - -	- - -	115	60	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	85	85	- - -	- - -	- - -	85	55	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Table 7. For ASME Standard CL900 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	2250	2220	2250	2250	2250	2250	2160	2160	2160	1800	2160	2160	2160	2160	2250
200	2250	2035	2250	2250	2250	2250	1800	1860	1860	1535	1860	1860	1985	1985	2230
300	2185	1965	2185	2165	2185	2185	1615	1680	1680	1370	1680	1680	1850	1850	2000
400	2110	1900	2110	2080	2115	2115	1490	1540	1540	1260	1540	1540	1730	1730	1845
500	1995	1810	1995	1995	1995	1995	1395	1435	1435	1180	1435	1435	1625	1625	1740
600	1815	1705	1815	1815	1815	1815	1325	1355	1355	1115	1355	1355	1550	1550	1670
650	1765	1650	1765	1765	1765	1765	1295	1325	1325	1095	1325	1325	1520	1520	1640
700	- - -	1590	1665	1705	1705	1705	1265	1305	1305	1080	1305	1305	1490	1490	1625
750	- - -	1520	1520	1595	1595	1595	1240	1280	1280	1060	1280	1280	1475	1475	1595
800	- - -	1235	1235	1525	1525	1525	1215	1265	1265	1035	1265	1265	1460	1460	- - -
850	- - -	- - -	- - -	1460	1460	1460	1190	1255	1255	1015	1255	1255	1455	1455	- - -
900	- - -	- - -	- - -	1350	1350	1350	1165	1245	- - -	- - -	1245	1245	1350	1350	- - -
950	- - -	- - -	- - -	955	1160	1160	1145	1160	- - -	- - -	1160	1160	1160	1160	- - -
1000	- - -	- - -	- - -	650	800	1090	1065	1090	- - -	- - -	1090	1090	1090	1090	- - -
1050	- - -	- - -	- - -	430	525	1080	975	1080	- - -	- - -	- - -	1080	1080	- - -	- - -
1100	- - -	- - -	- - -	290	330	905	770	915	- - -	- - -	- - -	915	935	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	670	615	710	- - -	- - -	- - -	710	625	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	430	495	555	- - -	- - -	- - -	555	455	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	400	440	- - -	- - -	- - -	440	340	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	340	350	- - -	- - -	- - -	350	225	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	280	290	- - -	- - -	- - -	290	155	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	225	225	- - -	- - -	- - -	225	125	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	175	175	- - -	- - -	- - -	175	95	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	125	125	- - -	- - -	- - -	125	80	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Special Pressure-Temperature Ratings for CL600 and CL900 Threaded or Welding End Valves

Fisher valve materials that conform to ASME B16.34-2017 Special Class pressure-temperature ratings are listed in tables 8 and 9. These ratings apply to all Fisher cast, forged, and fabricated steel valves. Nondestructive examination applies (Fisher Process Level 6).

Table 8. For ASME Special CL600 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A(2)	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	1500	1500	1500	1500	1500	1500	1500	1500	1500	1340	1500	1500	1500	1500	1500
200	1500	1500	1500	1500	1500	1500	1340	1380	1380	1140	1380	1380	1435	1480	1500
300	1500	1480	1500	1500	1480	1500	1200	1250	1250	1020	1250	1250	1320	1375	1490
400	1500	1465	1500	1500	1455	1500	1110	1145	1145	940	1145	1145	1245	1285	1370
500	1500	1465	1500	1500	1450	1500	1040	1065	1065	880	1065	1065	1200	1210	1295
600	1500	1465	1500	1500	1440	1500	985	1005	1005	830	1005	1005	1150	1150	1245
650	1500	1430	1500	1500	1430	1500	965	985	985	815	985	985	1130	1130	1220
700	---	1380	1425	1465	1415	1465	945	970	970	805	970	970	1110	1110	1210
750	---	1270	1270	1460	1415	1460	920	955	955	790	955	955	1100	1100	1200
800	---	1030	1030	1440	1415	1440	905	945	945	770	945	945	1090	1090	---
850	---	---	---	1355	1355	1355	885	930	930	755	930	930	1080	1080	---
900	---	---	---	1175	1200	1200	870	925	---	---	925	925	1080	1080	---
950	---	---	---	795	945	945	850	915	---	---	915	915	945	945	---
1000	---	---	---	540	670	840	830	840	---	---	840	840	840	840	---
1050	---	---	---	360	435	840	815	840	---	---	---	840	840	---	---
1100	---	---	---	240	275	755	645	765	---	---	---	765	780	---	---
1150	---	---	---	---	---	555	515	590	---	---	---	590	525	---	---
1200	---	---	---	---	---	360	410	465	---	---	---	465	375	---	---
1250	---	---	---	---	---	---	335	370	---	---	---	370	285	---	---
1300	---	---	---	---	---	---	285	290	---	---	---	290	190	---	---
1350	---	---	---	---	---	---	230	240	---	---	---	240	130	---	---
1400	---	---	---	---	---	---	190	190	---	---	---	190	105	---	---
1450	---	---	---	---	---	---	145	145	---	---	---	145	75	---	---
1500	---	---	---	---	---	---	105	105	---	---	---	105	70	---	---

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Table 9. For ASME Special CL900 Valves[1]

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A[2]	CF8[2] or 304[2]	CF8M[2] or 316[2]	CF3M	316L	CG8M	317[2]	CF8C[2]	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	2250	2250	2250	2250	2250	2250	2250	2250	2250	2010	2250	2250	2250	2250	2250
200	2250	2250	2250	2250	2250	2250	2010	2075	2075	1710	2075	2075	2150	2220	2250
300	2250	2220	2250	2250	2220	2250	1800	1870	1870	1525	1870	1870	1975	2065	2235
400	2250	2200	2250	2250	2185	2250	1665	1720	1720	1405	1720	1720	1865	1930	2055
500	2250	2200	2250	2250	2175	2250	1560	1600	1600	1320	1600	1600	1800	1815	1945
600	2250	2200	2250	2250	2165	2250	1480	1510	1510	1245	1510	1510	1730	1730	1865
650	2250	2145	2250	2250	2145	2250	1445	1480	1480	1220	1480	1480	1695	1695	1830
700	- - -	2075	2140	2200	2120	2200	1415	1455	1455	1205	1455	1455	1665	1665	1815
750	- - -	1905	1905	2185	2120	2185	1380	1430	1430	1180	1430	1430	1645	1645	1800
800	- - -	1545	1545	2160	2120	2160	1360	1415	1415	1155	1415	1415	1630	1630	- - -
850	- - -	- - -	- - -	2030	2030	2030	1325	1400	1400	1135	1400	1400	1625	1625	- - -
900	- - -	- - -	- - -	1760	1800	1800	1300	1390	- - -	- - -	1390	1390	1625	1625	- - -
950	- - -	- - -	- - -	1195	1415	1415	1280	1375	- - -	- - -	1375	1375	1415	1415	- - -
1000	- - -	- - -	- - -	810	1005	1260	1245	1260	- - -	- - -	1260	1260	1260	1260	- - -
1050	- - -	- - -	- - -	540	655	1260	1220	1260	- - -	- - -	- - -	1260	1260	- - -	- - -
1100	- - -	- - -	- - -	360	410	1130	965	1145	- - -	- - -	- - -	1145	1170	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	835	770	885	- - -	- - -	- - -	885	785	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	540	615	695	- - -	- - -	- - -	695	565	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	500	555	- - -	- - -	- - -	555	425	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	425	435	- - -	- - -	- - -	435	285	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	345	360	- - -	- - -	- - -	360	195	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	285	285	- - -	- - -	- - -	285	155	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	220	220	- - -	- - -	- - -	220	115	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	155	155	- - -	- - -	- - -	155	105	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Standard Pressure-Temperature Ratings for CL1500 and CL2500 Valves

Fisher valve materials that conform to ASME B16.34-2017 Standard Class pressure-temperature ratings are listed in tables 10 and 11. These ratings apply to all Fisher cast, forged, and fabricated steel valves.

Table 10. For ASME Standard CL1500 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	3750	3705	3750	3750	3750	3750	3600	3600	3600	3000	3600	3600	3600	3600	3750
200	3750	3395	3750	3750	3750	3750	3000	3095	3095	2555	3095	3095	3310	3310	3720
300	3640	3270	3640	3610	3640	3640	2690	2795	2795	2280	2795	2795	3085	3085	3335
400	3520	3170	3520	3465	3530	3530	2485	2570	2570	2100	2570	2570	2880	2880	3070
500	3325	3015	3325	3325	3325	3325	2330	2390	2390	1970	2390	2390	2710	2710	2905
600	3025	2840	3025	3025	3025	3025	2210	2255	2255	1860	2255	2255	2580	2580	2785
650	2940	2745	2940	2940	2940	2940	2160	2210	2210	1825	2210	2210	2530	2530	2735
700	- - -	2665	2775	2840	2840	2840	2110	2170	2170	1800	2170	2170	2485	2485	2710
750	- - -	2535	2535	2660	2660	2660	2065	2135	2135	1765	2135	2135	2460	2460	2660
800	- - -	2055	2055	2540	2540	2540	2030	2110	2110	1730	2110	2110	2435	2435	- - -
850	- - -	- - -	- - -	2435	2435	2435	1980	2090	2090	1690	2090	2090	2425	2425	- - -
900	- - -	- - -	- - -	2245	2245	2245	1945	2075	- - -	- - -	2075	2075	2245	2245	- - -
950	- - -	- - -	- - -	1595	1930	19360	1910	1930	- - -	- - -	1930	1930	1930	1930	- - -
1000	- - -	- - -	- - -	1080	1335	1820	1770	1820	- - -	- - -	1820	1820	1820	1820	- - -
1050	- - -	- - -	- - -	720	875	1800	1630	1800	- - -	- - -	- - -	1800	1800	- - -	- - -
1100	- - -	- - -	- - -	480	550	1510	1285	1525	- - -	- - -	- - -	1525	1560	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	1115	1030	1185	- - -	- - -	- - -	1185	1045	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	720	825	925	- - -	- - -	- - -	925	755	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	670	735	- - -	- - -	- - -	735	565	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	565	585	- - -	- - -	- - -	585	375	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	465	480	- - -	- - -	- - -	480	255	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	380	380	- - -	- - -	- - -	380	205	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	290	290	- - -	- - -	- - -	290	155	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	205	205	- - -	- - -	- - -	205	135	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Table 11. For ASME Standard CL2500 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	6250	6170	6250	6250	6250	6250	6000	6000	6000	5000	6000	6000	6000	6000	6250
200	6250	5655	6250	6250	6250	6250	5000	5160	5160	4260	5160	5160	5520	5520	6200
300	6070	5450	6070	6015	6070	6070	4480	4660	4660	3800	4660	4660	5140	5140	5560
400	5865	5280	5865	5775	5880	5880	4140	4280	4280	3500	4280	4280	4800	4800	5120
500	5540	5025	5540	5540	5540	5540	3880	3980	3980	3280	3980	3980	4520	4520	4840
600	5040	4730	5040	5040	5040	5040	3680	3760	3760	3100	3760	3760	4300	4300	4640
650	4905	4575	4905	4905	4905	4905	3600	3680	3680	3040	3680	3680	4220	4220	4560
700	- - -	4425	4630	4730	4730	4730	3520	3620	3620	3000	3620	3620	4140	4140	4520
750	- - -	4230	4230	4430	4430	4430	3440	3560	3560	2940	3560	3560	4100	4100	4430
800	- - -	3430	3430	4230	4230	4230	3380	3520	3520	2880	3520	3520	4060	4060	- - -
850	- - -	- - -	- - -	4060	4060	4060	3300	3480	3480	2820	3480	3480	4040	4040	- - -
900	- - -	- - -	- - -	3745	3745	3745	3240	3460	- - -	- - -	3460	3460	3745	3745	- - -
950	- - -	- - -	- - -	2655	3220	3220	3180	3220	- - -	- - -	3220	3220	3220	3220	- - -
1000	- - -	- - -	- - -	1800	2230	3030	2950	3030	- - -	- - -	3030	3030	3030	3030	- - -
1050	- - -	- - -	- - -	1200	1455	3000	2715	3000	- - -	- - -	- - -	3000	3000	- - -	- - -
1100	- - -	- - -	- - -	800	915	2515	2145	2545	- - -	- - -	- - -	2545	2600	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	1855	1715	1970	- - -	- - -	- - -	1970	1745	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	1200	1370	1545	- - -	- - -	- - -	1545	1255	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	1115	1230	- - -	- - -	- - -	1230	945	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	945	970	- - -	- - -	- - -	970	630	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	770	800	- - -	- - -	- - -	800	430	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	630	630	- - -	- - -	- - -	630	345	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	485	485	- - -	- - -	- - -	485	255	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	345	345	- - -	- - -	- - -	345	230	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Special Pressure-Temperature Ratings for CL1500 and CL2500 Threaded or Welding End Valves

Fisher valve materials that conform to ASME B16.34-2017 Special Class pressure-temperature ratings are listed in tables 12 and 13. These ratings apply to all Fisher cast, forged, and fabricated steel valves. Nondestructive examination applies (Fisher Process Level 6).

Table 12. For ASME Special CL1500 Valves[1]

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A[2]	CF8[2] or 304[2]	CF8M[2] or 316[2]	CF3M	316L	CG8M	317[2]	CF8C[2]	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	3750	3750	3750	3750	3750	3750	3750	3750	3750	3350	3750	3750	3750	3750	3750
200	3750	3750	3750	3750	3750	3750	3350	3455	3455	2855	3455	3455	3585	3695	3750
300	3750	3700	3750	3750	3695	3750	3000	3120	3120	2545	3120	3120	3295	3440	3725
400	3750	3665	3750	3750	3640	3750	2770	2865	2865	2345	2865	2865	3105	3215	3430
500	3750	3665	3750	3750	3620	3750	2600	2665	2665	2195	2665	2665	3000	3025	3240
600	3750	3665	3750	3750	3605	3750	2465	2520	2520	2075	2520	2520	2880	2880	3105
650	3750	3575	3750	3750	3580	3750	2410	2465	2465	2035	2465	2465	2825	2825	3055
700	- - -	3455	3565	3665	3535	3665	2355	2425	2425	2010	2425	2425	2770	2770	3025
750	- - -	3170	3170	3645	3535	3645	2305	2385	2385	1970	2385	2385	2745	2745	3000
800	- - -	2570	2570	3600	3535	3600	2265	2355	2355	1930	2355	2355	2720	2720	- - -
850	- - -	- - -	- - -	3385	3385	3385	2210	2330	2330	1890	2330	2330	2705	2705	- - -
900	- - -	- - -	- - -	2935	3000	3000	2170	2315	- - -	- - -	2315	2315	2705	2705	- - -
950	- - -	- - -	- - -	1995	2360	2360	2130	2290	- - -	- - -	2290	2290	2360	2360	- - -
1000	- - -	- - -	- - -	1350	1670	2105	2075	2105	- - -	- - -	2105	2105	2105	2105	- - -
1050	- - -	- - -	- - -	900	1095	2105	2035	2105	- - -	- - -	- - -	2105	2105	- - -	- - -
1100	- - -	- - -	- - -	600	685	1885	1605	1905	- - -	- - -	- - -	1905	1950	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	1395	1285	1480	- - -	- - -	- - -	1480	1305	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	900	1030	1155	- - -	- - -	- - -	1155	945	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	835	920	- - -	- - -	- - -	920	705	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	705	730	- - -	- - -	- - -	730	470	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	580	600	- - -	- - -	- - -	600	320	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	470	470	- - -	- - -	- - -	470	255	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	365	365	- - -	- - -	- - -	365	195	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	260	260	- - -	- - -	- - -	260	170	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Table 13. For ASME Special CL2500 Valves[1]

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A[2]	CF8[2] or 304[2]	CF8M[2] or 316[2]	CF3M	316L	CG8M	317[2]	CF8C[2]	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	6250	6250	6250	6250	6250	6250	6250	6250	6250	5580	6250	6250	6250	6250	6250
200	6250	6250	6250	6250	6250	6250	5580	5760	5760	4755	5760	5760	5975	6160	6250
300	6250	6170	6250	6250	6160	6250	5000	5200	5200	4240	5200	5200	5490	5735	6205
400	6250	6105	6250	6250	6065	6250	4620	4775	4775	3905	4775	4775	5180	5355	5715
500	6250	6105	6250	6250	6035	6250	4330	4440	4440	3660	4440	4440	5000	5045	5400
600	6250	6105	6250	6250	6010	6250	4105	4195	4195	3460	4195	4195	4800	4800	5180
650	6250	5960	6250	6250	5965	6250	4020	4105	4105	3395	4105	4105	4710	4710	5090
700	- - -	5760	5940	6110	5895	6110	3930	4040	4040	3350	4040	4040	4620	4620	5045
750	- - -	5285	5285	6070	5895	6070	3840	3975	3975	3280	3975	3975	4575	4575	5000
800	- - -	4285	4285	6000	5895	6000	3770	3930	3930	3215	3930	3930	4530	4530	- - -
850	- - -	- - -	- - -	5645	5645	5645	3685	3885	3885	3145	3885	3885	4510	4510	- - -
900	- - -	- - -	- - -	4895	5000	5000	3615	3860	- - -	- - -	3860	3860	4510	4510	- - -
950	- - -	- - -	- - -	3320	3930	3930	3550	3815	- - -	- - -	3815	3815	3930	3930	- - -
1000	- - -	- - -	- - -	2250	2785	3505	3460	3505	- - -	- - -	3505	3505	3505	3505	- - -
1050	- - -	- - -	- - -	1500	1820	3505	3395	3505	- - -	- - -	- - -	3505	3505	- - -	- - -
1100	- - -	- - -	- - -	1000	1145	3145	2680	3180	- - -	- - -	- - -	3180	3250	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	2320	2145	2465	- - -	- - -	- - -	2465	2180	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	1500	1715	1930	- - -	- - -	- - -	1930	1570	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	1395	1535	- - -	- - -	- - -	1535	1180	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	1180	1215	- - -	- - -	- - -	1215	785	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	965	1000	- - -	- - -	- - -	1000	535	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	785	785	- - -	- - -	- - -	785	430	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	610	605	- - -	- - -	- - -	605	320	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	430	430	- - -	- - -	- - -	430	285	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Standard Pressure-Temperature Ratings for CL3200 Valves

Fisher valve materials that conform to ASME B16.34-2017 Standard Class pressure-temperature ratings are listed in table 14. These ratings apply to all Fisher cast, forged, and fabricated steel valves.

Table 14. For ASME Standard CL3200 Valves[1]

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)						
	LCC	WCC	WC9	C12A	CF8M[2]	CF8C[2]	CD3MN CD3MWCuN
-20 to 100	8000	8000	8000	8000	7680	7680	8000
200	8000	8000	8000	8000	6605	7065	7935
300	7765	7765	7765	7765	5965	6575	7115
400	7505	7505	7525	7525	5475	6140	6550
500	7085	7085	7085	7085	5090	5785	6190
600	6450	6450	6450	6450	4810	5500	5935
650	6275	6275	6275	6275	4710	5400	- - -
700	- - -	5925	6050	6050	4630	5295	- - -
750	- - -	5410	5665	5665	4555	5245	- - -
800	- - -	4385	5410	5410	4505	5195	- - -
850	- - -	- - -	5195	5195	4450	5170	- - -
900	- - -	- - -	4790	4790	4425	4790	- - -
950	- - -	- - -	4120	4120	4120	4120	- - -
1000	- - -	- - -	2850	3875	3875	3875	- - -
1050	- - -	- - -	1860	3840	3840	3840	- - -
1100	- - -	- - -	- - -	3215	3255	3325	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Standard and Special Pressure-Temperature Ratings for CL4500 Valves

Fisher valve materials that conform to ASME B16.34-2013 Standard and Special Class pressure-temperature ratings are listed in tables 15 and 16. These ratings apply to all Fisher cast, forged, and fabricated steel valves. For Special Class pressure-temperature ratings, nondestructive examination applies (Fisher Process Level 6).

Table 15. For ASME Standard CL4500 Valves(1)

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	11250	11110	11250	11250	11250	11250	10800	10800	10800	9000	10800	10800	10800	10800	11250
200	11250	10185	11250	11250	11250	11250	9000	9290	9290	7670	9290	9290	9935	9935	11160
300	10925	9815	10925	10830	10925	10925	8065	8390	8390	6840	8390	8390	9250	9250	10010
400	10555	9505	10555	10400	10585	10585	7450	7705	7705	6300	7705	7705	8640	8640	9215
500	9965	9040	9965	9965	9965	9965	6985	7165	7165	5905	7165	7165	8135	8135	8710
600	9070	8515	9070	9070	9070	9070	6625	6770	6770	5580	6770	6770	7740	7740	8350
650	8825	8240	8825	8825	8825	8825	6480	6625	6625	5470	6625	6625	7595	7595	8210
700	- - -	7960	8330	8515	8515	8515	6335	6515	6515	5400	6515	6515	7450	7450	8135
750	- - -	7610	7610	7970	7970	7970	6190	6410	6410	5290	6410	6410	7380	7380	7970
800	- - -	6170	6170	7610	7610	7610	6085	6335	6335	5185	6335	6335	7310	7310	- - -
850	- - -	- - -	- - -	7305	7305	7305	5940	6265	6265	5075	6265	6265	7270	7270	- - -
900	- - -	- - -	- - -	6740	6740	6740	5830	6230	- - -	- - -	6230	6230	6740	6740	- - -
950	- - -	- - -	- - -	4785	5795	5795	5725	5795	- - -	- - -	5795	5795	5795	5795	- - -
1000	- - -	- - -	- - -	3240	4010	5450	5315	5450	- - -	- - -	5450	5450	5450	5450	- - -
1050	- - -	- - -	- - -	2160	2625	5400	4885	5400	- - -	- - -	- - -	5400	5400	- - -	- - -
1100	- - -	- - -	- - -	1440	1645	4525	3855	4575	- - -	- - -	- - -	4575	4680	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	3345	3085	3550	- - -	- - -	- - -	3550	3135	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	2160	2470	2775	- - -	- - -	- - -	2775	2265	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	2005	2210	- - -	- - -	- - -	2210	1695	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	1695	1750	- - -	- - -	- - -	1750	1130	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	1390	1440	- - -	- - -	- - -	1440	770	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	1130	1130	- - -	- - -	- - -	1130	615	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	875	875	- - -	- - -	- - -	875	465	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	620	620	- - -	- - -	- - -	620	410	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017..
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

Table 16. For ASME Special CL4500 Valves[1]

SERVICE TEMP (°F)	WORKING PRESSURE (PSIG)														
	LCC	LF2	WCC	WC6	WC9	C12A[2]	CF8[2] or 304[2]	CF8M[2] or 316[2]	CF3M	316L	CG8M	317[2]	CF8C[2]	347	CK3MCuN CD3MN CD3MWCuN
-20 to 100	11250	11250	11250	11250	11250	11250	11250	11250	11250	10045	11250	11250	11250	11250	11250
200	11250	11250	11250	11250	11250	11250	10045	10365	10365	8560	10365	10365	10750	11090	11250
300	11250	11105	11250	11250	11090	11250	9000	9360	9360	7635	9360	9360	9885	10325	11170
400	11250	10995	11250	11250	10915	11250	8315	8600	8600	7030	8600	8600	9320	9645	10285
500	11250	10995	11250	11250	10865	11250	7795	7995	7995	6590	7995	7995	9000	9080	9725
600	11250	10995	11250	11250	10815	11250	7395	7555	7555	6230	7555	7555	8640	8640	9320
650	11250	10730	11250	11250	10735	11250	7230	7395	7395	6105	7395	7395	8480	8480	9160
700	- - -	10365	10690	10995	10605	10995	7070	7270	7270	6025	7270	7270	8315	8315	9080
750	- - -	9515	9515	10930	10605	10930	6910	7150	7150	5905	7150	7150	8235	8235	9000
800	- - -	7715	7715	10800	10605	10800	6790	7070	7070	5785	7070	7070	8155	8155	- - -
850	- - -	- - -	- - -	10160	10160	10160	6630	6990	6990	5665	6990	6990	8115	8115	- - -
900	- - -	- - -	- - -	8805	9000	9000	6510	6950	- - -	- - -	6950	6950	8115	8115	- - -
950	- - -	- - -	- - -	5980	7070	7070	6390	6870	- - -	- - -	6870	6870	7070	7070	- - -
1000	- - -	- - -	- - -	4050	5015	6310	6230	6310	- - -	- - -	6310	6310	6310	6310	- - -
1050	- - -	- - -	- - -	2700	3280	6310	6105	6310	- - -	- - -	- - -	6310	6310	- - -	- - -
1100	- - -	- - -	- - -	1800	2055	5655	4820	5720	- - -	- - -	- - -	5720	5850	- - -	- - -
1150	- - -	- - -	- - -	- - -	- - -	4180	3855	4435	- - -	- - -	- - -	4435	3920	- - -	- - -
1200	- - -	- - -	- - -	- - -	- - -	2700	3085	3470	- - -	- - -	- - -	3470	2830	- - -	- - -
1250	- - -	- - -	- - -	- - -	- - -	- - -	2505	2765	- - -	- - -	- - -	2765	2120	- - -	- - -
1300	- - -	- - -	- - -	- - -	- - -	- - -	2120	2185	- - -	- - -	- - -	2185	1415	- - -	- - -
1350	- - -	- - -	- - -	- - -	- - -	- - -	1735	1800	- - -	- - -	- - -	1800	965	- - -	- - -
1400	- - -	- - -	- - -	- - -	- - -	- - -	1415	1415	- - -	- - -	- - -	1415	770	- - -	- - -
1450	- - -	- - -	- - -	- - -	- - -	- - -	1095	1095	- - -	- - -	- - -	1095	580	- - -	- - -
1500	- - -	- - -	- - -	- - -	- - -	- - -	770	770	- - -	- - -	- - -	770	515	- - -	- - -

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 1000°F, use material only when carbon content is 0.04% or higher.

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Pressure/Temperature Ratings for Fisher™ Valves (ASME B16.34-2017) - Metric Units

Material Reference Guide Table

Metric Units

Fisher valves conforming to ASME B16.34-2017 standard have specific pressure-temperature limits depending on construction materials. Use the material references in table 1 when determining pressure-temperature ratings of valves used in accordance with the ASME standard.

Table 1. Valve Body Materials

CATEGORY	ASME			
	Specification	Grade	Material Group	Nominal Designation
Carbon Steel	SA-216	WCC(1)	1.2	S-Mn-Si
	SA-352	LCC(2)	1.2	S-Mn-Si
	SA-350	LF2	1.1	C-Mn-Si
Alloy Steels	SA-217	WC6	1.9	1-1/4Cr-1/2 Mo
		WC9	1.10	2-1/4Cr-1 Mo
		C12A	1.15	9Cr-1 Mo-V
Stainless Steel	SA-351	CF8M	2.2	16Cr-12 Ni-2Mo
		CF8	2.1	18Cr-8 Ni
		CF8C	2.11	18Cr-10 Ni-Cb
		CF3M	2.2	16Cr-12 Ni-2Mo
		CG8M	2.2	19Cr-10 Ni-3Mo
		CK3MCuN	2.8	20Cr-18 Ni-6Mo
	SA-995	CD3MN(3) (Grade 4A)	2.8	22Cr-5 Ni-3Mo-N
		CD3MWCuN (Grade 6A)	2.8	25Cr-7 Ni-3.5Mo-Cb

1. WCC is a standard substitute for WCB material.
2. LCC is a standard substitute for LCB material.
3. Listed as A351-CD3MN in B16.34-2013.

Standard Pressure-Temperature Ratings for CL150 and CL300 Valves

Fisher valve materials that conform to ASME B16.34-2017 Standard Class pressure-temperature ratings are listed in tables 2 and 3. These ratings apply to all Fisher cast, forged, and fabricated steel valves.

Table 2. For ASME Standard CL150 Valves[1]

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6[2]	WC9[2]	C12A[2]	CF8[2,3] or 304[2,3]	CF8M[2,3] or 316[2,3]	CF3M	316L	CG8M	317 [2,3]	CF8C [2,3]	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	19.8	19.6	19.8	19.8	19.8	20.0	19.0	19.0	19.0	15.9	19.0	19.0	19.0	19.0	20.0
50	19.5	19.2	19.5	19.5	19.5	19.5	18.3	18.4	18.4	15.3	18.4	18.4	18.7	18.7	19.5
100	17.7	17.7	17.7	17.7	17.7	17.7	15.7	16.2	16.2	13.3	16.2	16.2	17.4	17.4	17.7
150	15.8	15.8	15.8	15.8	15.8	15.8	14.2	14.8	14.8	12.0	14.8	14.8	15.8	15.8	15.8
200	13.8	13.8	13.8	13.8	13.8	13.8	13.2	13.7	13.7	11.2	13.7	13.7	13.8	13.8	13.8
250	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	10.5	12.1	12.1	12.1	12.1	12.1
300	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.0	10.2	10.2	10.2	10.2	10.2
325	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3
350		8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
375		7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
400		6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
425		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
450				4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	
475				3.7	3.7	3.7	3.7	3.7			3.7	3.7	3.7	3.7	
500				2.8	2.8	2.8	2.8	2.8			2.8	2.8	2.8	2.8	
538				1.4	1.4	1.4	1.4	1.4			1.4	1.4	1.4	1.4	
550				1.4	1.4	1.4	1.4	1.4				1.4	1.4		
575				1.4	1.4	1.4	1.4	1.4				1.4	1.4		
600						1.4	1.4	1.4				1.4	1.4		
625						1.4	1.4	1.4				1.4	1.4		
650						1.4	1.4	1.4				1.4	1.4		
675							1.4	1.4				1.4	1.4		
700							1.4	1.4				1.4	1.4		
725							1.4	1.4				1.4	1.4		
750							1.4	1.4				1.4	1.2		
775							1.4	1.4				1.4	0.9		
800							1.2	1.2				1.2	0.8		
816							1.0	1.0				1.0	0.7		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. Flange end valve ratings terminate at 538°C.
3. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Table 3. For ASME Standard CL300 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)													
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	51.7	51.1	51.7	51.7	51.7	51.7	49.6	49.6	49.6	41.4	49.6	49.6	49.6	49.6	51.7
50	51.7	50.1	51.7	51.7	51.7	51.7	47.8	48.1	48.1	40.0	48.1	48.1	48.8	48.8	51.7
100	51.5	46.6	51.5	51.5	51.5	51.5	40.9	42.2	42.2	34.8	42.2	42.2	45.3	45.3	50.7
150	50.2	45.1	50.2	49.7	50.3	50.3	37.0	38.5	38.5	31.4	38.5	38.5	42.5	42.5	45.9
200	48.6	43.8	48.6	48.0	48.6	48.6	34.5	35.7	35.7	29.2	35.7	35.7	39.9	39.9	42.7
250	46.3	41.9	46.3	46.3	46.3	46.3	32.5	33.4	33.4	27.5	33.4	33.4	37.8	37.8	40.5
300	42.9	39.8	42.9	42.9	42.9	42.9	30.9	31.6	31.6	26.1	31.6	31.6	36.1	36.1	38.9
325	41.4	38.7	41.4	41.4	41.4	41.4	30.2	30.9	30.9	25.5	30.9	30.9	35.4	35.4	38.2
350		37.6	40.0	40.3	40.3	40.3	29.6	30.3	30.3	25.1	30.3	30.3	34.8	34.8	37.6
375		36.4	37.8	38.9	38.9	38.9	29.0	29.9	29.9	24.8	29.9	29.9	34.2	34.2	37.4
400		34.7	34.7	36.5	36.5	36.5	28.4	29.4	29.4	24.3	29.4	29.4	33.9	33.9	36.5
425		28.8	28.8	35.2	35.2	35.2	28.0	29.1	29.1	23.9	29.1	29.1	33.6	33.6	
450				33.7	33.7	33.7	27.4	28.8	28.8	23.4	28.8	28.8	33.5	33.5	
475				31.7	31.7	31.7	26.9	28.7			28.7	28.7	31.7	31.7	
500				25.7	28.2	28.2	26.5	28.2			28.2	28.2	28.2	28.2	
538				14.9	18.4	25.2	24.4	25.2			25.2	25.2	25.2	25.2	
550				12.7	15.6	25.0	23.6	25.0				25.0	25.0		
575				8.8	10.5	24.0	20.8	24.0				24.0	24.0		
600						19.5	16.9	19.9				19.9	19.8		
625						14.6	13.8	15.8				15.8	13.9		
650						9.9	11.3	12.7				12.7	10.3		
675							9.3	10.3				10.3	8.0		
700							8.0	8.4				8.4	5.6		
725							6.8	7.0				7.0	4.0		
750							5.8	5.9				5.9	3.1		
775							4.6	4.6				4.6	2.5		
800							3.5	3.5				3.5	2.0		
816							2.8	2.8				2.8	1.9		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Special Pressure-Temperature Ratings for CL150 and CL300 Threaded or Welding End Valves

Fisher valve materials that conform to ASME B16.34-2017 Special Class pressure-temperature ratings are listed in tables 4 and 5. These ratings apply to all Fisher cast, forged, and fabricated steel valves. Nondestructive examination applies (Fisher Process Level 6).

Table 4. For ASME Special CL150 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6	WC9	C12A(2)	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	20.0	19.8	20.0	19.8	19.8	20.0	19.8	19.8	19.8	17.7	19.8	19.8	19.8	20.0	20.0
50	20.0	19.8	20.0	19.8	19.8	20.0	19.4	19.5	19.5	17.1	19.5	19.5	19.6	20.0	20.0
100	20.0	19.8	20.0	19.8	19.8	20.0	17.5	18.1	18.1	14.9	18.1	18.1	18.8	19.4	20.0
150	20.0	19.6	20.0	19.8	19.5	20.0	15.8	16.5	16.5	13.4	16.5	16.5	17.4	18.2	19.6
200	20.0	19.4	20.0	19.8	19.3	20.0	14.8	15.3	15.3	12.5	15.3	15.3	16.5	17.1	18.2
250	20.0	19.4	20.0	19.8	19.2	20.0	13.9	14.3	14.3	11.8	14.3	14.3	16.0	16.2	17.3
300	20.0	19.4	20.0	19.8	19.1	20.0	13.2	13.5	13.5	11.2	13.5	13.5	15.4	15.4	16.6
325	20.0	19.2	20.0	19.8	19.0	20.0	12.9	13.2	13.2	10.9	13.2	13.2	15.1	15.1	16.3
350		18.7	19.8	19.8	18.9	19.8	12.7	13.0	13.0	10.7	13.0	13.0	14.9	14.9	16.1
375		18.1	19.3	19.3	18.7	19.3	12.4	12.8	12.8	10.6	12.8	12.8	14.6	14.6	16.0
400		16.6	19.3	19.3	18.7	19.3	12.2	12.6	12.6	10.4	12.6	12.6	14.5	14.5	15.2
425		13.8	18.0	19.0	18.7	19.0	12.0	12.5	12.5	10.2	12.5	12.5	14.4	14.4	
450				18.1	18.1	18.1	11.7	12.3	12.3	10.0	12.3	12.3	14.3	14.3	
475				16.4	16.4	16.4	11.5	12.3			12.3	12.3	14.3	14.3	
500				12.3	13.7	13.7	11.3	12.2			12.2	12.2	13.7	13.7	
538				7.1	8.8	11.0	11.0	11.0			11.0	11.0	11.0	11.0	
550				6.1	7.5	11.0	10.9	11.0				11.0	11.0		
575				4.2	5.0	10.9	10.0	10.9				10.9	10.9		
600						9.3	8.1	9.5				9.5	9.5		
625						7.0	6.6	7.6				7.6	6.6		
650						4.8	5.4	6.1				6.1	4.9		
675							4.5	4.9				4.9	3.8		
700							4.1	4.4				4.4	3.1		
725							3.5	3.7				3.7	2.3		
750							2.8	2.8				2.8	1.6		
775							2.2	2.2				2.2	1.2		
800							1.8	1.8				1.8	1.0		
816							1.4	1.4				1.4	0.9		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Table 5. For ASME Special CL300 Valves[1]

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6	WC9	C12A[2]	CF8[2] or 304[2]	CF8M[2] or 316[2]	CF3M	316L	CG8M	317[2]	CF8C[2]	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	46.2	51.7	51.7	51.7	51.7	51.7
50	51.7	51.7	51.7	51.7	51.7	51.7	50.5	50.8	50.8	44.7	50.8	50.8	51.2	51.7	51.7
100	51.7	51.6	51.7	51.7	51.6	51.7	45.6	47.1	47.1	38.8	47.1	47.1	48.9	50.6	51.7
150	51.7	51.0	51.7	51.7	51.0	51.7	41.3	43.0	43.0	35.0	43.0	43.0	45.4	47.4	51.3
200	51.7	50.6	51.7	51.7	50.2	51.7	38.5	39.8	39.8	32.5	39.8	39.8	43.1	44.6	47.6
250	51.7	50.5	51.7	51.7	50.0	51.7	36.3	37.3	37.3	30.7	37.3	37.3	41.6	42.2	45.2
300	51.7	50.5	51.7	51.7	49.8	51.7	34.5	35.3	35.3	29.1	35.3	35.3	40.2	40.3	43.4
325	51.7	50.1	51.7	51.7	49.6	51.7	33.7	34.5	34.5	28.4	34.5	34.5	39.5	39.5	42.6
350		48.9	51.1	51.5	49.2	51.5	33.1	33.8	33.8	28.0	33.8	33.8	38.8	38.8	42.0
375		47.1	48.4	50.6	48.8	50.6	32.4	33.3	33.3	27.6	33.3	33.3	38.2	38.2	41.7
400		43.4	43.4	50.3	48.8	50.3	31.7	32.9	32.9	27.1	32.9	32.9	37.8	37.8	39.7
425		36.0	36.0	49.6	48.8	49.6	31.2	32.5	32.5	26.6	32.5	32.5	37.5	37.5	
450				47.3	47.3	47.3	30.6	32.2	32.2	26.1	32.2	32.2	37.3	37.3	
475				42.8	42.8	42.8	30.1	32.0			32.0	32.0	37.3	37.3	
500				32.2	35.6	35.6	29.6	31.7			31.7	31.7	35.6	35.6	
538				18.6	23.0	29.0	28.6	29.0			29.0	29.0	29.0	29.0	
550				15.9	19.5	29.0	28.4	29.0				29.0	29.0		
575				11.0	13.2	28.6	26.1	28.6				28.6	28.6		
600						24.4	21.1	24.9				24.9	24.8		
625						18.3	17.2	19.8				19.8	17.3		
650						12.4	14.1	15.8				15.8	12.9		
675							11.7	12.9				12.9	9.9		
700							10.7	11.4				11.4	8.2		
725							9.2	9.5				9.5	5.9		
750							7.4	7.4				7.4	4.1		
775							5.8	5.8				5.8	3.1		
800							4.4	4.4				4.4	2.7		
816							3.4	3.4				3.4	2.4		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Standard Pressure-Temperature Ratings for CL600 and CL900 Valves

Fisher valve materials that conform to ASME B16.34-2017 Standard Class pressure-temperature ratings are listed in tables 6 and 7. These ratings apply to all Fisher cast, forged, and fabricated steel valves.

Table 6. For ASME Standard CL600 Valves[1]

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8[2] or 304[2]	CF8M[2] or 316[2]	CF3M	316L	CG8M	317[2]	CF8C[2]	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	103.4	102.1	103.4	103.4	103.4	103.4	99.3	99.3	99.3	82.7	99.3	99.3	99.3	99.3	103.4
50	103.4	100.2	103.4	103.4	103.4	103.4	95.6	96.2	96.2	80.0	96.2	96.2	97.5	97.5	103.4
100	103.0	93.2	103.0	103.0	103.0	103.0	81.7	84.4	84.4	69.6	84.4	84.4	90.6	90.6	101.3
150	100.3	90.2	100.3	99.5	100.3	100.3	74.0	77.0	77.0	62.8	77.0	77.0	84.9	84.9	91.9
200	97.2	87.6	97.2	95.9	97.2	97.2	69.0	71.3	71.3	58.3	71.3	71.3	79.9	79.9	85.3
250	92.7	83.9	92.7	92.7	92.7	92.7	65.0	66.8	66.8	54.9	66.8	66.8	75.6	75.6	80.9
300	85.7	79.6	85.7	85.7	85.7	85.7	61.8	63.2	63.2	52.1	63.2	63.2	72.2	72.2	77.7
325	82.6	77.4	82.6	82.6	82.6	82.6	60.4	61.8	61.8	51.0	61.8	61.8	70.7	70.7	76.3
350		75.1	80.0	80.4	80.4	80.4	59.3	60.7	60.7	50.1	60.7	60.7	69.5	69.5	75.3
375		72.7	75.7	77.6	77.6	77.6	58.1	59.8	59.8	49.5	59.8	59.8	68.4	68.4	74.7
400		69.4	69.4	73.3	73.3	73.3	56.9	58.9	58.9	48.6	58.9	58.9	67.8	67.8	73.3
425		57.5	57.5	70.0	70.0	70.0	56.0	58.3	58.3	47.7	58.3	58.3	67.2	67.2	
450				67.7	67.7	67.7	54.8	57.7	57.7	46.8	57.7	57.7	66.9	66.9	
475				63.4	63.4	63.4	53.9	57.3			57.3	57.3	63.4	63.4	
500				51.5	56.5	56.6	53.0	56.5			56.5	56.5	56.5	56.5	
538				29.8	36.9	50.0	48.9	50.0			50.0	50.0	50.0	50.0	
550				25.4	31.3	49.8	47.1	49.8				49.8	49.8		
575				17.6	21.1	47.9	41.7	47.9				47.9	47.9		
600						39.0	33.8	39.8				39.8	39.6		
625						29.2	27.6	31.6				31.6	27.7		
650						19.9	22.5	25.3				25.3	20.6		
675							18.7	20.6				20.6	15.9		
700							16.1	16.8				16.8	11.2		
725							13.5	14.0				14.0	8.0		
750							11.6	11.7				11.7	6.2		
775							9.0	9.0				9.0	4.9		
800							7.0	7.0				7.0	4.0		
816							5.9	5.9				5.9	3.8		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Table 7. For ASME Standard CL900 Valves[1]

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)													
	LCC	LF2	WCC	WC6	WC9	C12A	CF8[2] or 304[2]	CF8M[2] or 316[2]	CF3M	316L	CG8M	317[2]	CF8C[2]	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	155.1	153.2	155.1	155.1	155.1	155.1	148.9	148.9	148.9	124.1	148.9	148.9	148.9	148.9	155.1
50	155.1	150.4	155.1	155.1	155.1	155.1	143.5	144.3	144.3	120.1	144.3	144.3	146.3	146.3	155.1
100	154.6	139.8	154.6	154.4	154.6	154.6	122.6	126.6	126.6	104.4	126.6	126.6	135.9	135.9	152.0
150	150.5	135.2	150.5	149.2	150.6	150.6	111.0	115.5	115.5	94.2	115.5	115.5	127.4	127.4	137.8
200	145.8	131.4	145.8	143.9	145.8	145.8	103.4	107.0	107.0	87.5	107.0	107.0	119.8	119.8	128.0
250	139.0	125.8	139.0	139.0	139.0	139.0	97.5	100.1	100.1	82.4	100.1	100.1	113.4	113.4	121.4
300	128.6	119.5	128.6	128.6	128.6	128.6	92.7	94.9	94.9	78.2	94.9	94.9	108.3	108.3	116.6
325	124.0	116.1	124.0	124.0	124.0	124.0	90.7	92.7	92.7	76.4	92.7	92.7	106.1	106.1	114.5
350		112.7	120.1	120.7	120.7	120.7	88.9	91.0	91.0	75.2	91.0	91.0	104.3	104.3	112.9
375		109.1	113.5	116.5	116.5	116.5	87.1	89.6	89.6	74.3	89.6	89.6	102.6	102.6	112.1
400		104.2	104.2	109.8	109.8	109.8	85.3	88.3	88.3	72.9	88.3	88.3	101.7	101.7	109.8
425		86.3	86.3	105.1	105.1	105.1	84.0	87.4	87.4	71.6	87.4	87.4	100.8	100.8	
450				101.4	101.4	101.4	82.2	86.5	86.5	70.2	86.5	86.5	100.4	100.4	
475				95.1	95.1	95.1	80.8	86.0			86.0	86.0	95.1	95.1	
500				77.2	84.7	84.7	79.5	84.7			84.7	84.7	84.7	84.7	
538				44.7	55.3	75.2	73.3	75.2			75.2	75.2	75.2	75.2	
550				38.1	46.9	74.8	70.7	74.8				74.8	74.8		
575				26.4	31.6	71.8	62.5	71.8				71.8	71.8		
600						58.5	50.6	59.7				59.7	59.4		
625						43.8	41.4	47.4				47.4	41.6		
650						29.8	33.8	38.0				38.0	30.9		
675							28.0	31.0				31.0	23.9		
700							24.1	25.1				25.1	16.8		
725							20.3	21.0				21.0	11.9		
750							17.3	17.6				17.6	9.3		
775							13.7	13.7				13.7	7.4		
800							10.5	10.5				10.5	6.1		
816							8.6	8.6				8.6	5.7		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Special Pressure-Temperature Ratings for CL600 and CL900 Threaded or Welding End Valves

Fisher valve materials that conform to ASME B16.34-2017 Special Class pressure-temperature ratings are listed in tables 8 and 9. These ratings apply to all Fisher cast, forged, and fabricated steel valves. Nondestructive examination applies (Fisher Process Level 6).

Table 8. For ASME Special CL600 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6	WC9	C12A(2)	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	103.4	103.4	103.4	103.4	103.4	103.4	103.4	103.4	103.4	92.3	103.4	103.4	103.4	103.4	103.4
50	103.4	103.4	103.4	103.4	103.4	103.4	101.0	101.6	101.6	89.3	101.6	101.6	102.4	103.4	103.4
100	103.4	103.3	103.4	103.4	103.2	103.4	91.2	94.2	94.2	77.7	94.2	94.2	97.9	101.1	103.4
150	103.4	102.1	103.4	103.4	101.9	103.4	82.6	85.9	85.9	70.1	85.9	85.9	90.8	94.8	102.5
200	103.4	101.1	103.4	103.4	100.4	103.4	77.0	79.6	79.6	65.1	79.6	79.6	86.1	89.1	95.2
250	103.4	101.1	103.4	103.4	100.0	103.4	72.5	74.5	74.5	61.3	74.5	74.5	83.3	84.4	90.3
300	103.4	101.1	103.4	103.4	99.6	103.4	69.0	70.6	70.6	58.2	70.6	70.6	80.3	80.6	86.7
325	103.4	100.2	103.4	103.4	99.2	103.4	67.5	68.9	68.9	56.9	68.9	68.9	78.9	78.9	85.2
350		97.8	102.2	102.8	98.4	102.8	66.1	67.7	67.7	56.0	67.7	67.7	77.6	77.6	84.0
375		94.2	96.7	101.0	97.5	101.0	64.8	66.7	66.7	55.2	66.7	66.7	76.4	76.4	83.4
400		86.8	86.8	100.6	97.5	100.6	63.5	65.7	65.7	54.3	65.7	65.7	75.7	75.7	79.4
425		71.9	71.9	99.3	97.5	99.3	62.5	65.1	65.1	53.3	65.1	65.1	75.0	75.0	
450				94.4	94.4	94.4	61.2	64.4	64.4	52.3	64.4	64.4	74.7	74.7	
475				85.5	85.5	85.5	60.1	64.0			64.0	64.0	74.6	74.6	
500				64.3	71.5	71.5	59.1	63.4			63.4	63.4	71.5	71.5	
538				37.2	46.1	57.9	57.3	57.9			57.9	57.9	57.9	57.9	
550				31.8	39.1	57.9	56.8	57.9				57.9	57.9		
575				22.0	26.3	57.1	52.1	57.1				57.1	57.1		
600						48.7	42.2	49.8				49.8	49.5		
625						36.5	34.5	39.5				39.5	34.6		
650						24.8	28.2	31.7				31.7	25.7		
675							23.4	25.8				25.8	19.9		
700							21.3	22.8				22.8	16.4		
725							18.5	19.1				19.1	11.8		
750							14.8	14.8				14.8	8.2		
775							11.4	11.4				11.4	6.2		
800							8.8	8.8				8.8	5.3		
816							7.2	7.2				7.2	4.7		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Table 9. For ASME Special CL900 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)													
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	155.1	155.1	155.1	155.1	155.1	155.1	155.1	155.1	155.1	138.5	155.1	155.1	155.1	155.1	155.1
50	155.1	155.1	155.1	155.1	155.1	155.1	151.5	152.5	152.5	134.0	152.5	152.5	153.6	155.1	155.1
100	155.1	154.9	155.1	155.1	154.9	155.1	136.8	141.3	141.3	116.5	141.3	141.3	146.8	151.7	155.1
150	155.1	153.1	155.1	155.1	152.9	155.1	123.9	128.9	128.9	105.1	128.9	128.9	136.1	142.2	153.8
200	155.1	151.7	155.1	155.1	150.7	155.1	115.4	119.4	119.4	97.6	119.4	119.4	129.2	133.7	142.8
250	155.1	151.6	155.1	155.1	149.9	155.1	108.8	111.8	111.8	92.0	111.8	111.8	124.9	126.6	135.5
300	155.1	151.6	155.1	155.1	149.3	155.1	103.5	105.9	105.9	87.3	105.9	105.9	120.5	120.8	130.1
325	155.1	150.3	155.1	155.1	148.8	155.1	101.2	103.4	103.4	85.3	103.4	103.4	118.4	118.4	127.8
350		146.7	153.3	154.3	147.6	154.3	99.2	101.5	101.5	83.9	101.5	101.5	116.4	116.4	126.1
375		141.3	145.1	151.5	146.3	151.5	97.2	100.0	100.0	82.9	100.0	100.0	114.5	114.5	125.1
400		130.2	130.2	150.6	146.3	150.6	95.2	98.6	98.6	81.4	98.6	98.6	113.5	113.5	119.1
425		107.9	107.9	148.9	146.3	148.9	93.7	97.6	97.6	79.9	97.6	97.6	112.5	112.5	
450				141.4	141.4	141.4	91.8	96.6	96.6	78.4	96.6	96.6	112.0	112.0	
475				128.2	128.2	128.2	90.2	96.0			96.0	96.0	111.9	111.9	
500				96.5	107.1	107.1	88.7	95.1			95.1	95.1	107.1	107.1	
538				55.8	69.1	86.9	85.9	86.9			86.9	86.9	86.9	86.9	
550				47.7	58.6	86.9	85.1	86.9				86.9	86.9		
575				33.0	39.5	85.7	78.2	85.7				85.7	85.7		
600						73.1	63.3	74.6				74.6	74.3		
625						54.8	51.7	59.3				59.3	52.0		
650						37.2	42.2	47.5				47.5	38.6		
675							35.1	38.7				38.7	29.8		
700							32.0	34.3				34.3	24.5		
725							27.7	28.6				28.6	17.7		
750							22.1	22.1				22.1	12.2		
775							17.2	17.2				17.2	9.3		
800							13.2	13.2				13.2	8.0		
816							10.7	10.7				10.7	7.1		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Standard Pressure-Temperature Ratings for CL1500 and CL2500 Valves

Fisher valve materials that conform to ASME B16.34-2017 Standard Class pressure-temperature ratings are listed in tables 10 and 11. These ratings apply to all Fisher cast, forged, and fabricated steel valves.

Table 10. For ASME Standard CL1500 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	258.6	255.3	258.6	258.6	258.6	258.6	248.2	248.2	248.2	206.8	248.2	248.2	248.2	248.2	258.6
50	258.6	250.6	258.6	258.6	258.6	258.6	239.1	240.6	240.6	200.1	240.6	240.6	243.8	243.8	258.6
100	257.6	233.0	257.6	257.4	257.6	257.6	204.3	211.0	211.0	173.9	211.0	211.0	226.5	226.5	253.3
150	250.8	225.4	250.8	248.7	250.8	250.8	185.0	192.5	192.5	157.0	192.5	192.5	212.4	212.4	229.6
200	243.2	219.0	243.2	239.8	243.4	243.4	172.4	178.3	178.3	145.8	178.3	178.3	199.7	199.7	213.3
250	231.8	209.7	231.8	231.8	231.8	231.8	162.4	166.9	166.9	137.3	166.9	166.9	189.1	189.1	202.3
300	214.4	199.1	214.4	214.4	214.4	214.4	154.6	158.1	158.1	130.3	158.1	158.1	180.4	180.4	194.3
325	206.6	193.6	206.6	206.6	206.6	206.6	151.1	154.4	154.4	127.4	154.4	154.4	176.8	176.8	190.8
350		187.8	200.1	201.1	201.1	201.1	148.1	151.6	151.6	125.4	151.6	151.6	173.8	173.8	188.2
375		181.8	189.2	194.1	194.1	194.1	145.2	149.4	149.4	123.8	149.4	149.4	171.0	171.0	186.8
400		173.6	173.6	183.1	183.1	183.1	142.2	147.2	147.2	121.5	147.2	147.2	169.5	169.5	183.1
425		143.8	143.8	175.1	175.1	175.1	140.0	145.7	145.7	119.3	145.7	145.7	168.1	168.1	
450				169.0	169.0	169.0	137.0	144.2	144.2	117.1	144.2	144.2	167.3	167.3	
475				158.2	158.2	158.2	134.7	143.4			143.4	143.4	158.2	158.2	
500				128.6	140.9	140.9	132.4	140.9			140.9	140.9	140.9	140.9	
538				74.5	92.2	125.5	122.1	125.5			125.5	125.5	125.5	125.5	
550				63.5	78.2	124.9	117.8	124.9				124.9	124.9		
575				44.0	52.6	119.7	104.2	119.7				119.7	119.7		
600						97.5	84.4	99.5				99.5	99.0		
625						73.0	68.9	79.1				79.1	69.3		
650						49.6	56.3	63.3				63.3	51.5		
675							46.7	51.6				51.6	39.8		
700							40.1	41.9				41.9	28.1		
725							33.8	34.9				34.9	19.9		
750							28.9	29.3				29.3	15.5		
775							22.8	22.8				22.8	12.3		
800							17.4	17.4				17.4	10.1		
816							14.1	14.1				14.1	9.5		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Table 11. For ASME Standard CL2500 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	430.9	425.5	430.9	430.9	430.9	430.9	413.7	413.7	413.7	344.7	413.7	413.7	413.7	413.7	430.9
50	430.9	417.7	430.9	430.9	430.9	430.9	398.5	400.9	400.9	333.5	400.9	400.9	406.4	406.4	430.9
100	429.4	388.3	429.4	429.0	429.4	429.4	340.4	351.6	351.6	289.9	351.6	351.6	377.4	377.4	422.2
150	418.1	375.6	418.1	414.5	418.2	418.2	308.4	320.8	320.8	261.6	320.8	320.8	353.9	353.9	382.7
200	405.4	365.0	405.4	399.6	405.4	405.4	287.3	297.2	297.2	243.0	297.2	297.2	332.8	332.8	355.4
250	386.2	349.5	386.2	386.2	386.2	386.2	270.7	278.1	278.1	228.9	278.1	278.1	315.1	315.1	337.2
300	357.1	331.8	357.1	357.1	357.1	357.1	257.6	263.5	263.5	217.2	263.5	263.5	300.7	300.7	323.8
325	344.3	322.6	344.3	344.3	344.3	344.3	251.9	257.4	257.4	212.3	257.4	257.4	294.6	294.6	318.0
350		313.0	333.5	335.3	335.3	335.3	246.9	252.7	252.7	208.9	252.7	252.7	289.6	289.6	313.7
375		303.1	315.3	323.2	323.2	323.2	241.9	249.0	249.0	206.3	249.0	249.0	285.1	285.1	311.3
400		289.3	289.3	304.9	304.9	304.9	237.0	245.3	245.3	202.5	245.3	245.3	282.6	282.6	304.9
425		239.7	239.7	291.6	291.6	291.6	233.3	242.9	242.9	198.8	242.9	242.9	280.1	280.1	
450				281.8	281.8	281.8	228.4	240.4	240.4	195.1	240.4	240.4	278.8	278.8	
475				263.9	263.9	263.9	224.5	238.9			238.9	238.9	263.9	263.9	
500				214.4	235.0	235.0	220.7	235.0			235.0	235.0	235.0	235.0	
538				124.1	153.7	208.9	203.6	208.9			208.9	208.9	208.9	208.9	
550				105.9	130.3	208.0	196.3	208.0				208.0	208.0		
575				73.4	87.7	199.5	173.7	199.5				199.5	199.5		
600						162.5	140.7	165.9				165.9	165.1		
625						121.7	114.9	131.8				131.8	115.5		
650						82.7	93.8	105.5				105.5	85.8		
675							77.9	86.0				86.0	66.3		
700							66.9	69.8				69.8	46.8		
725							56.3	58.2				58.2	33.1		
750							48.1	48.9				48.9	25.8		
775							38.0	38.0				38.0	20.4		
800							29.2	29.2				29.2	16.9		
816							23.8	23.8				23.8	15.8		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Special Pressure-Temperature Ratings for CL1500 and CL2500 Threaded or Welding End Valves

Fisher valve materials that conform to ASME B16.34-2017 Special Class pressure-temperature ratings are listed in tables 12 and 13. These ratings apply to all Fisher cast, forged, and fabricated steel valves. Nondestructive examination applies (Fisher Process Level 6).

Table 12. For ASME Special CL1500 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6	WC9	C12A(2)	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	258.6	258.6	258.6	258.6	258.6	258.6	258.6	258.6	258.6	230.9	258.6	258.6	258.6	258.6	258.6
50	258.6	258.6	258.6	258.6	258.6	258.6	252.5	254.1	254.1	223.3	254.1	254.1	256.0	258.6	258.6
100	258.6	258.2	258.6	258.6	258.1	258.6	228.0	235.5	235.5	194.1	235.5	235.5	244.7	252.8	258.6
150	258.6	255.2	258.6	258.6	254.8	258.6	206.5	214.8	214.8	175.2	214.8	214.8	226.9	237.0	256.3
200	258.6	252.9	258.6	258.6	251.1	258.6	192.4	199.0	199.0	162.7	199.0	199.0	215.3	222.9	238.0
250	258.6	252.6	258.6	258.6	249.9	258.6	181.3	186.3	186.3	153.3	186.3	186.3	208.2	211.0	225.8
300	258.6	252.6	258.6	258.6	248.9	258.6	172.5	176.4	176.4	145.5	176.4	176.4	200.9	201.4	216.8
325	258.6	250.6	258.6	258.6	248.0	258.6	168.7	172.3	172.3	142.2	172.3	172.3	197.3	197.3	213.0
350		244.6	255.5	257.1	246.0	257.1	165.3	169.2	169.2	139.9	169.2	169.2	194.0	194.0	210.1
375		235.5	241.9	252.5	243.8	252.5	162.0	166.7	166.7	138.1	166.7	166.7	190.9	190.9	208.4
400		217.0	217.0	251.2	243.8	251.2	158.7	164.3	164.3	135.6	164.3	164.3	189.2	189.2	198.6
425		179.8	179.8	248.2	243.8	248.2	156.2	162.6	162.6	133.1	162.6	162.6	187.6	187.6	
450				235.8	235.8	235.8	153.0	161.0	161.0	130.6	161.0	161.0	186.7	186.7	
475				213.7	213.7	213.7	150.3	160.0			160.0	160.0	186.5	186.5	
500				160.8	178.6	178.6	147.8	158.6			158.6	158.6	178.6	178.6	
538				93.1	115.2	145.1	143.1	145.1			145.1	145.1	145.1	145.1	
550				79.4	97.7	145.1	141.9	145.1				145.1	145.1		
575				55.0	65.8	143.0	130.3	143.0				143.0	143.0		
600						121.9	105.5	124.4				124.4	123.8		
625						91.3	86.2	98.8				98.8	86.6		
650						62.1	70.4	79.1				79.1	64.4		
675							58.4	64.5				64.5	49.7		
700							53.3	57.1				57.1	40.9		
725							46.2	47.7				47.7	29.5		
750							36.7	36.7				36.7	20.4		
775							28.5	28.5				28.5	15.5		
800							22.0	22.0				22.0	13.3		
816							17.9	17.9				17.9	11.8		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Table 13. For ASME Special CL2500 Valves[1]

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)													
	LCC	LF2	WCC	WC6	WC9	C12A[2]	CF8[2] or 304[2]	CF8M[2] or 316[2]	CF3M	316L	CG8M	317[2]	CF8C[2]	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	430.9	430.9	430.9	430.9	430.9	430.9	430.9	430.9	430.9	384.8	430.9	430.9	430.9	430.9	430.9
50	430.9	430.9	430.9	430.9	430.9	430.9	420.8	423.5	423.5	372.2	423.5	423.5	426.7	430.9	430.9
100	430.9	430.3	430.9	430.9	430.2	430.9	380.0	392.4	392.4	323.6	392.4	392.4	407.8	421.3	430.9
150	430.9	425.3	430.9	430.9	424.6	430.9	344.2	358.0	358.0	291.9	358.0	358.0	378.2	395.0	427.2
200	430.9	421.4	430.9	430.9	418.5	430.9	320.7	331.7	331.7	271.2	331.7	331.7	358.8	371.5	396.7
250	430.9	421.1	430.9	430.9	416.5	430.9	302.2	310.4	310.4	255.4	310.4	310.4	347.0	351.7	376.3
300	430.9	421.1	430.9	430.9	414.8	430.9	287.5	294.1	294.1	242.4	294.1	294.1	334.8	335.6	361.4
325	430.9	417.6	430.9	430.9	413.3	430.9	281.1	287.2	287.2	237.0	287.2	287.2	328.8	328.8	355.0
350		407.6	425.8	428.6	410.0	428.6	275.5	282.1	282.1	233.2	282.1	282.1	323.3	323.3	350.2
375		392.5	403.1	420.9	406.3	420.9	270.0	277.9	277.9	230.2	277.9	277.9	318.1	318.1	347.4
400		361.7	361.7	418.3	406.3	418.3	264.5	273.8	273.8	226.0	273.8	273.8	315.4	315.4	330.9
425		299.6	299.6	413.7	406.3	413.7	260.4	271.1	271.1	221.9	271.1	271.1	312.6	312.6	
450				393.1	393.1	393.1	254.9	268.3	268.3	217.7	268.3	268.3	311.1	311.1	
475				356.3	356.3	356.3	250.5	266.6			266.6	266.6	310.9	310.9	
500				268.0	297.5	297.5	246.4	264.3			264.3	264.3	297.5	297.5	
538				155.1	192.1	241.7	238.5	241.7			241.7	241.7	241.7	241.7	
550				132.4	162.8	241.7	236.5	241.7				241.7	241.7		
575				91.7	109.7	238.3	217.2	238.3				238.3	238.3		
600						203.1	175.8	207.3				207.3	206.4		
625						152.1	143.6	164.7				164.7	144.3		
650						103.4	117.3	131.9				131.9	107.3		
675							97.4	107.5				107.5	82.9		
700							88.9	95.2				95.2	68.2		
725							77.0	79.5				79.5	49.2		
750							61.2	61.2				61.2	34.0		
775							47.6	47.6				47.6	25.8		
800							36.6	36.6				36.6	22.2		
816							29.6	29.6				29.6	19.7		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Standard Pressure-Temperature Ratings for CL3200 Valves

Fisher valve materials that conform to ASME B16.34-2017 Standard Class pressure-temperature ratings are listed in table 14. These ratings apply to all Fisher cast, forged, and fabricated steel valves.

Table 14. For ASME Standard CL3200 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)						
	LCC	WCC	WC9	C12A	CF8M(2)	CF8C(2)	CD3MN CD3MWCuN
-29 to 38	551.6	551.6	551.6	551.6	529.5	529.5	551.6
50	551.6	551.6	551.6	551.6	513.2	520.2	551.6
100	549.7	549.7	549.7	549.7	450.1	483.1	540.4
150	535.2	535.2	535.3	535.3	410.6	453.0	489.9
200	518.9	518.9	518.9	518.9	380.4	426.0	454.9
250	494.2	494.2	494.2	494.2	356.0	403.3	431.6
300	457.0	457.0	457.0	457.0	337.3	384.9	414.5
325	440.7	440.7	440.7	440.7	329.5	377.1	407.1
350	---	426.9	429.1	429.1	323.5	370.7	---
375	---	403.6	413.7	413.7	318.7	364.9	---
400	---	370.3	390.2	390.2	314.0	361.7	---
425	---	306.8	373.2	373.2	310.9	358.5	---
450	---	---	360.6	360.6	307.7	356.9	---
475	---	---	337.7	337.7	305.8	337.7	---
500	---	---	300.8	300.8	300.8	300.8	---
538	---	---	196.7	267.3	267.3	267.3	---
550	---	---	166.8	266.2	266.2	266.2	---
575	---	---	112.3	255.4	255.4	255.4	---
600	---	---	---	208.0	212.3	211.3	---

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures over 538°C, use material only when carbon content is 0.04% or higher.

Standard and Special Pressure-Temperature Ratings for CL4500 Valves

Fisher valve materials that conform to ASME B16.34-2017 Standard and Special Class pressure-temperature ratings are listed in tables 15 and 16. These ratings apply to all Fisher cast, forged, and fabricated steel valves. For Special Class pressure-temperature ratings, nondestructive examination applies (Fisher Process Level 6).

Table 15. For ASME Standard CL4500 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6	WC9	C12A	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	775.7	765.9	775.7	775.7	775.7	775.7	744.6	744.6	744.6	620.5	744.6	744.6	744.6	744.6	775.7
50	775.7	751.9	775.7	775.7	775.7	775.7	717.3	721.7	721.7	600.3	721.7	721.7	731.5	731.5	775.7
100	773.0	699.0	773.0	772.2	773.0	773.0	612.8	632.9	632.9	521.8	632.9	632.9	679.4	679.4	759.9
150	752.6	676.1	752.6	746.2	752.8	752.8	555.1	577.4	577.4	470.9	577.4	577.4	637.1	637.1	688.9
200	729.7	657.0	729.7	719.4	729.8	729.8	517.2	534.9	534.9	437.3	534.9	534.9	599.1	599.1	639.8
250	694.8	629.1	694.8	694.8	694.8	694.8	487.3	500.6	500.6	412.0	500.6	500.6	567.2	567.2	606.9
300	642.6	597.3	642.6	642.6	642.6	642.6	463.7	474.3	474.3	391.0	474.3	474.3	541.3	541.3	582.8
325	619.6	580.7	619.6	619.6	619.6	619.6	453.3	463.3	463.3	382.2	463.3	463.3	530.3	530.3	572.5
350		563.5	600.3	603.3	603.3	603.3	444.4	454.9	454.9	376.1	454.9	454.9	521.3	521.3	564.7
375		545.5	567.5	581.8	581.8	581.8	435.5	448.2	448.2	371.3	448.2	448.2	513.1	513.1	560.3
400		520.8	520.8	548.5	548.5	548.5	426.6	441.6	441.6	364.6	441.6	441.6	508.6	508.6	548.5
425		431.5	431.5	524.7	524.7	524.7	419.9	437.1	437.1	357.9	437.1	437.1	504.2	504.2	
450				507.0	507.0	507.0	411.1	432.7	432.7	351.2	432.7	432.7	501.8	501.8	
475				474.8	474.8	474.8	404.0	430.1			430.1	430.1	474.8	474.8	
500				385.9	423.0	423.0	397.3	423.0			423.0	423.0	423.0	423.0	
538				223.4	276.6	375.8	366.4	375.8			375.8	375.8	375.8	375.8	
550				190.6	234.5	374.2	353.4	374.2				374.2	374.2		
575				132.0	157.9	359.1	312.7	359.1				359.1	359.1		
600						292.5	253.2	298.6				298.6	297.1		
625						219.1	206.8	237.2				237.2	207.9		
650						148.9	168.9	189.9				189.9	154.5		
675							140.2	154.8				154.8	119.4		
700							120.4	125.7				125.7	84.2		
725							101.3	104.8				104.8	59.6		
750							86.7	87.9				87.9	46.4		
775							68.4	68.4				68.4	36.8		
800							52.6	52.6				52.6	30.4		
816							42.7	42.7				42.7	28.4		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The user is advised that a valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, ASME Code for Pressure Piping, or governmental regulations is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material or rule governing the use of a material at a low temperature." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

Table 16. For ASME Special CL4500 Valves(1)

SERVICE TEMP (°C)	WORKING PRESSURE (Bar)														
	LCC	LF2	WCC	WC6	WC9	C12A(2)	CF8(2) or 304(2)	CF8M(2) or 316(2)	CF3M	316L	CG8M	317(2)	CF8C(2)	347	CK3MCuN CD3MN CD3MWCuN
-29 to 38	775.7	775.7	775.7	775.7	775.7	775.7	775.7	775.7	775.7	692.6	775.7	775.7	775.7	775.7	775.7
50	775.7	775.7	775.7	775.7	775.7	775.7	757.4	762.3	762.3	670.0	762.3	762.3	768.1	775.7	775.7
100	775.7	774.5	775.7	775.7	774.3	775.7	683.9	706.4	706.4	582.4	706.4	706.4	734.1	758.3	775.7
150	775.7	765.5	775.7	775.7	764.3	775.7	619.6	644.4	644.4	525.5	644.4	644.4	680.7	711.0	768.9
200	775.7	758.6	775.7	775.7	753.4	775.7	577.2	597.0	597.0	488.1	597.0	597.0	645.8	668.6	714.1
250	775.7	757.9	775.7	775.7	749.7	775.7	543.9	558.8	558.8	459.8	558.8	558.8	624.5	633.0	677.4
300	775.7	757.9	775.7	775.7	746.7	775.7	517.5	529.3	529.3	436.4	529.3	529.3	602.6	604.1	650.4
325	775.7	751.7	775.7	775.7	743.9	775.7	506.0	517.0	517.0	426.6	517.0	517.0	591.8	591.8	638.9
350		733.7	766.4	771.4	738.1	771.4	496.0	507.7	507.7	419.7	507.7	507.7	581.9	581.9	630.3
375		706.5	725.6	757.4	731.3	757.4	486.0	500.2	500.2	414.4	500.2	500.2	572.7	572.7	625.3
400		651.0	651.0	753.2	731.3	753.2	476.1	492.9	492.9	406.9	492.9	492.9	567.7	567.7	595.7
425		539.3	539.3	744.6	731.3	744.6	468.7	487.9	487.9	399.4	487.9	487.9	562.7	562.7	
450				707.6	707.6	707.6	458.9	482.9	482.9	391.9	482.9	482.9	560.0	560.0	
475				641.3	641.3	641.3	450.9	480.0			480.0	480.0	559.6	559.6	
500				482.4	535.4	535.4	443.5	475.7			475.7	475.7	535.4	535.4	
538				279.2	345.7	435.1	429.4	435.1			435.1	435.1	435.1	435.1	
550				238.3	293.1	435.1	425.7	435.1				435.1	435.1		
575				165.1	197.4	428.8	390.9	428.8				428.8	428.8		
600						365.6	316.5	373.2				373.2	371.4		
625						273.8	258.5	296.5				296.5	259.8		
650						186.2	211.2	237.4				237.4	193.1		
675							175.3	193.5				193.5	149.2		
700							160.0	171.3				171.3	122.7		
725							138.6	143.0				143.0	88.5		
750							110.3	110.3				110.3	61.2		
775							85.6	85.6				85.6	46.4		
800							65.6	65.6				65.6	40.0		
816							53.1	53.1				53.1	35.5		

1. Table information is extracted from the Valve—Flanged, Threaded, and Welding End, ASME Standard B16.34-2013. These tables must be used in accordance with the ASME standard. The ASME standard states in paragraph "**2.1.3 Special Class Valves.** Threaded or welding end valves that conform to all the requirements of para. 2.1.2 and in addition have successfully passed the examinations required by Section 8, may be designated Special Class valves." The standard also stipulates that, "Special Class ratings shall not be used for flanged end valves." Information copied with permission of the publisher; The American Society of Mechanical Engineers, 345 East 47th Street, New York, New York, 10017.
2. At temperatures above 538°C, use only when carbon content is 0.04% or higher.

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EH and EW Steel Ratings (US)
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Increased Pressure/Temperature Ratings for Fisher™ EH and EW Series Steel Valves

U.S. Traditional Units

EH Series and EW Series valves with buttwelded ends have increased/temperature ratings, called Intermediate ratings as defined in ASME B16.34-2013.

The extra strength of these valves allows ratings higher than the normal CL900, CL1500, or CL2500 ratings that are specified in ASME B16.34-2013. Two types of the higher (Intermediate) ratings are available: Intermediate Standard and Intermediate Special. All EH and EW Series valves with buttwelded ends listed in the following tables have Intermediate Standard ratings. Intermediate Special ratings allow pressures higher than Intermediate Standard ratings, which can only be obtained by a valve body assembly successfully undergoing certain nondestructive examinations as described in the ASME B16.34-2013 standard.

Intermediate ratings apply only to valve body assemblies with the material listed in tables 1 and 2. EH Series valves with line-size buttwelding ends have Intermediate ratings as listed in tables 3 through 21.

The NPS 12 x 8 CL900 EW Series valve body has Intermediate ratings as shown in table 22. Note that the NPS 1 and 2 socketweld EH Series valve bodies also provide the ratings shown for NPS 1 and 2 buttwelded valve bodies. Also, the NPS 1-1/2 x 1 EH Series valve body is the only valve body with expanded ends that provides Intermediate ratings; the NPS 2 x 1, 3 x 2, 4 x 3, 6 x 4, and 8 x 6 valve bodies do not allow these higher ratings.

The ratings in tables 3 through 22 were calculated using the maximum stem load listed in each table. These stem loads are for the largest diameter 316 strain-hardened stainless steel stem available for each valve body size. When using the tables, compare the maximum available stem load to the table stem load. If the maximum available stem load is greater than the printed value, consult your Emerson sales office or Local Business Partner, since the higher stem load may require additional pressure derating due to bolting limitations. If the maximum available stem load is less than or equal to the printed value, a lower load may allow pressures higher than those shown in the tables if the rating is limited by bolting limitations.

Table 1. Body and Bolting Material Descriptions for NPS 1 through 6 EH Series Valves

VALVE BODY MATERIAL		BOLTING MATERIAL				TEMPERATURE, °F
		Bolts		Nuts		
Specification	Grade	Specification	Grade	Specification	Grade	
SA-352	LCC	SA-193	B7	SA-194	2H	to 700
SA-216	WCC	SA-193	B7	SA-194	2H	to 800
SA-217	WC9	SA-193	B7	SA-194	2H	to 800
		SA-193	B7	SA-194	7	over 800
		SA-193	B16	SA-194	7	See table values
SA-351	CF8M or 316(1)	SA-193	B7	SA-193	2H	to 450
		SA-453	660 Class A or B with Belleville washers	SA-194	7	to 800
		SA-453	660 Class A or B rupture tested with Belleville washers	SA-194	7	to 1000
		SA-453	660 Class A or B with Belleville washers	SA-194	7M	to 800
		SA-453	660 Class A or B rupture tested with Belleville washers	SA-194	7M	to 1000

1. 316H must be specified for service temperatures above 1000°F.

Table 2. Body and Bolting Material Descriptions for NPS 8 through 14 EH Series Valves and NPS 12 x 8 EW Series Valves

VALVE BODY MATERIAL		BOLTING MATERIAL				TEMPERATURE, °F
Specification	Grade	Bolts		Nuts		
		Specification	Grade	Specification	Grade	
SA-352	LCC	SA-193	B7	SA-194	2H	to 450
SA-216	WCC	SA-193	B7	SA-194	2H	to 800
SA-217	WC9	SA-193	B7	SA-194	2H	to 800
		SA-193	B7	SA-194	7	over 800
		SA-193	B16	SA-194	7	See table values
SA-351	CF8M or 316(1)	SA-193	B7	SA-193	2H	to 450
		SA-453	660 Class A or B with Belleville washers	SA-194	7	to 800
		SA-453	660 Class A or B rupture tested with Belleville washers	SA-194	7	to 1000
		SA-453	660 Class A or B with Belleville washers	SA-194	7M	to 800
		SA-453	660 Class A or B rupture tested with Belleville washers	SA-194	7M	to 1000

1. 316H must be specified for service temperatures above 1000°F.

Table 3. NPS 1 CL1500 EH Series Valves with Intermediate 2282 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	5705	5705	5705	5705	5705	5705	5475	5705	11110
200	5705	5705	5705	5705	5705	5705	4710	5250	9920
300	5540	5705	5540	5705	5540	5640	4255	4745	9020
400	5370	5705	5370	5705	5370	5510	3905	4335	8120
450	5205	5705	5205	5705	5205	5490	3720	4085	7860
500	5055	5705	5055	5705	5055	5475	(4)	(4)	7660
600	4600	5705	4600	5705	4600	5475	(4)	(4)	7320
650	4475	5705	4475	5705	4475	5445	(4)	(4)	7140
700	4315	5413	4315	5413	4320	5410	(4)	(4)	6970
750	3835	4792	- - -	- - -	4045	5250	(4)	(4)	6910
800	3130	3911	- - -	- - -	3860	5115	(4)	(4)	6850
850	- - -	- - -	- - -	- - -	3705	4890(3)	(4)	(4)	2950
900	- - -	- - -	- - -	- - -	3420	4565(3)	(4)	(4)	2930
950	- - -	- - -	- - -	- - -	2870(3)	3585(3)	(4)	(4)	2900
1000	- - -	- - -	- - -	- - -	1980(3)	2480(3)	(4)	(4)	2870
1050	- - -	- - -	- - -	- - -	1330(3)	1545(3,5)	(4)	(4)	2870
1100	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	2870

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 4. NPS 1 CL2500 EH Series Valves with Intermediate 3862 Rating[1]

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,[3] POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M[2]		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	9655	9655	9655	9655	9655	9655	9270	9655	11110
200	9655	9655	9655	9655	9655	9655	7975	8885	9920
300	9375	9655	9375	9655	9375	9545	7200	8035	9020
400	9085	9655	9085	9655	9085	9325	6610	7340	8120
450	8805	9655	8805	9655	8805	9295	5500	6915	7860
500	8550	9655	8550	9655	8555	9270	[5]	[5]	7660
600	7785	9655	7785	9655	7785	9270	[5]	[5]	7320
650	7575	9655	7575	9655	7575	9215	[5]	[5]	7140
700	7310	9160	7310	9160	7310	9160	[5]	[5]	6970
750	6490	8110	- - -	- - -	6840	8885	[5]	[5]	6910
800	5295	6620	- - -	- - -	6530	8665[4]	[5]	[5]	6850
850	- - -	- - -	- - -	- - -	6270	8275[4]	[5]	[5]	2950
900	- - -	- - -	- - -	- - -	5785[4]	7725[4]	[5]	[5]	2930
950	- - -	- - -	- - -	- - -	4860[4]	6070[4]	[5]	[5]	2900
1000	- - -	- - -	- - -	- - -	3355[4]	4195[4]	[5]	[5]	2870
1050	- - -	- - -	- - -	- - -	2250[4]	2425[4,6]	[5]	[5]	2870
1100	- - -	- - -	- - -	- - -	- - -[5]	- - -[5]	[5]	[5]	2870

1. Intermediate 4080 rating is available with special bolting materials in most valve body materials. Consult your Emerson sales office.
2. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
3. For largest available 316 strain-hardened stainless steel stem.
4. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
5. Consult your Emerson sales office.
6. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 5. NPS 1-1/2 x 1 CL1500 EH Series Valves with Intermediate 1789 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,[2] POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M[1]		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	4475	4475	4475	4475	4475	4475	4295	4475	11110
200	4475	4475	4475	4475	4475	4475	3690	4115	9920
300	4345	4475	4345	4475	4340	4420	3335	3720	9020
400	4212	4475	4212	4475	4210	4320	3065	3400	8120
450	4080	4475	4080	4475	4080	4305	2905	3205	7860
500	3967	4475	3967	4475	3965	4295	[4]	[4]	7660
600	3609	4475	3609	4475	3605	4295	[4]	[4]	7320
650	3510	4475	3510	4475	3510	4270	[4]	[4]	7140
700	3388	4247	3388	4247	3385	4240	[4]	[4]	6970
750	3007	3759	- - -	- - -	3170	4115	[4]	[4]	6910
800	2457	3067	- - -	- - -	3030	4010	[4]	[4]	6850
850	- - -	- - -	- - -	- - -	2905	3835	[4]	[4]	2950
900	- - -	- - -	- - -	- - -	2680	3580[3]	[4]	[4]	2930
950	- - -	- - -	- - -	- - -	2250[3]	2810[3]	[4]	[4]	2900
1000	- - -	- - -	- - -	- - -	1555[3]	1945[3]	[4]	[4]	2870
1050	- - -	- - -	- - -	- - -	1045[3]	1305[3]	[4]	[4]	2870
1100	- - -	- - -	- - -	- - -	- - -[4]	- - -[4]	[4]	[4]	2870

1. Ratings based on SA-193-B7 bolts up to 450°F and SA-193-B8M annealed bolts above 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 6. NPS 1-1/2 x 1 CL2500 EH Series Valves with Intermediate 3021 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	7555	7555	7555	7555	7555	7555	7250	7555	11110
200	7555	7555	7555	7555	7555	7555	6235	6950	9920
300	7335	7555	7335	7555	7335	7465	5630	6285	9020
400	7105	7555	7105	7555	7105	7295	5170	5740	8120
450	6890	7555	6890	7555	6890	7270	4800	5410	7860
500	6693	7555	6693	7555	6695	7250	(4)	(4)	7660
600	6090	7555	6090	7555	6090	7250	(4)	(4)	7320
650	5925	7555	5925	7555	5925	7210	(4)	(4)	7140
700	5715	7165	5715	7165	5715	7165	(4)	(4)	6970
750	5075	6345	---	---	5350	6950	(4)	(4)	6910
800	4145	5180	---	---	5110	6775	(4)	(4)	6850
850	---	---	---	---	4905	6475	(4)	(4)	2950
900	---	---	---	---	4525	6040(3)	(4)	(4)	2930
950	---	---	---	---	3800(3)	4750(3)	(4)	(4)	2900
1000	---	---	---	---	2625(3)	3280(3)	(4)	(4)	2870
1050	---	---	---	---	1760(3)	2200(3)	(4)	(4)	2870
1100	---	---	---	---	---(4)	---(4)	(4)	(4)	2870

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 7. NPS 2 CL1500 EH Series Valves with Intermediate 1758 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	4395	4395	4395	4395	4395	4395	4220	4395	15920
200	4395	4395	4395	4395	4395	4395	3630	4045	14200
300	4265	4395	4265	4395	4265	4345	3275	3655	12910
400	4135	4395	4135	4395	4135	4245	3010	3340	11610
450	4005	4395	4005	4395	4005	4230	2760	3150	11240
500	3895	4395	3895	4395	3895	4220	(4)	(4)	10960
600	3545	4395	3545	4395	3545	4220	(4)	(4)	10460
650	3445	4395	3445	4395	3445	4195	(4)	(4)	10220
700	3325	4170	3325	4170	3330	4170	(4)	(4)	9970
750	2955	3690	---	---	3115	4045	(4)	(4)	9890
800	2415	3010	---	---	2975	3945	(4)	(4)	9800
850	---	---	---	---	2855	3765	(4)	(4)	5250
900	---	---	---	---	2630	3515(3)	(4)	(4)	5200
950	---	---	---	---	2210(3)	2760(3)	(4)	(4)	5160
1000	---	---	---	---	1530(3)	1910(3)	(4)	(4)	5110
1050	---	---	---	---	1025(3)	1280(3)	(4)	(4)	5110
1100	---	---	---	---	---(4)	---(4)	(4)	(4)	5110

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 8. NPS 2 CL2500 EH Series Valves with Intermediate 3273 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	8185	8185	8185	8185	8185	8185	7855	8185	15920
200	8185	8185	8185	8185	8185	8185	6755	7530	14200
300	7950	8185	7950	8185	7945	8090	6100	6810	12910
400	7700	8185	7700	8185	7700	7900	5605	6220	11610
450	7465	8185	7465	8185	7465	7875	5095	5860	11240
500	7250	8185	7250	8185	7250	7855	(4)	(4)	10960
600	6600	8185	6600	8185	6600	7855	(4)	(4)	10460
650	6420	8185	6420	8185	6420	7810	(4)	(4)	10220
700	6195	7765	6195	7765	6195	7760	(4)	(4)	9970
750	5500	6875	- - -	- - -	5800	7530	(4)	(4)	9890
800	4490	5610	- - -	- - -	5535	7340(3)	(4)	(4)	9800
850	- - -	- - -	- - -	- - -	5315	7015(3)	(4)	(4)	5250
900	- - -	- - -	- - -	- - -	4905(3)	6545(3)	(4)	(4)	5200
950	- - -	- - -	- - -	- - -	4120(3)	5145(3)	(4)	(4)	5160
1000	- - -	- - -	- - -	- - -	2845(3)	3555(3)	(4)	(4)	5110
1050	- - -	- - -	- - -	- - -	1905(3)	2110(3,5)	(4)	(4)	5110
1100	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	5110

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 9. NPS 3 CL1500 EH Series Valves with Intermediate 1756 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	4390	4390	4390	4390	4390	4390	4215	4390	15920
200	4390	4390	4390	4390	4390	4390	3625	4040	14200
300	4260	4390	4260	4390	4260	4340	3270	3650	12910
400	4130	4390	4130	4390	4130	4240	3010	3335	11610
450	4000	4390	4000	4390	4000	4225	2860	3215	11240
500	3890	4390	3890	4390	3890	4215	(4)	(4)	10960
600	3540	4390	3540	4390	3540	4215	(4)	(4)	10460
650	3445	4390	3445	4390	3445	4190	(4)	(4)	10220
700	3325	4165	3325	4165	3325	4165	(4)	(4)	9970
750	2950	3690	- - -	- - -	3115	4040	(4)	(4)	9890
800	2410	3010	- - -	- - -	2975	3940	(4)	(4)	9800
850	- - -	- - -	- - -	- - -	2850	3765	(4)	(4)	5250
900	- - -	- - -	- - -	- - -	2630	3510	(4)	(4)	5200
950	- - -	- - -	- - -	- - -	2210	2760(3)	(4)	(4)	5160
1000	- - -	- - -	- - -	- - -	1525(3)	1910(3)	(4)	(4)	5110
1050	- - -	- - -	- - -	- - -	1025(3)	1280(3)	(4)	(4)	5110
1100	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	5110

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 10. NPS 3 CL2500 EH Series Valves with Intermediate 2932 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,[2] POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M[1]		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	7330	7330	7330	7330	7330	7330	7035	7330	15920
200	7330	7330	7330	7330	7330	7330	6050	6745	14200
300	7120	7330	7120	7330	7120	7245	5465	6100	12910
400	6895	7330	6895	7330	6895	7080	5020	5570	11610
450	6685	7330	6685	7330	6685	7055	4655	5250	11240
500	6495	7330	6495	7330	6495	7035	[4]	[4]	10960
600	5910	7330	5910	7330	5910	7035	[4]	[4]	10460
650	5750	7330	5750	7330	5750	6995	[4]	[4]	10220
700	5550	6955	5550	6955	5550	6955	[4]	[4]	9970
750	4925	6155	---	---	5195	6745	[4]	[4]	9890
800	4020	5025	---	---	4960	6575	[4]	[4]	9800
850	---	---	---	---	4760	6280[3]	[4]	[4]	5250
900	---	---	---	---	4390	5865[3]	[4]	[4]	5200
950	---	---	---	---	3690[3]	4610[3]	[4]	[4]	5160
1000	---	---	---	---	2545[3]	3185[3]	[4]	[4]	5110
1050	---	---	---	---	1710[3]	2135[3]	[4]	[4]	5110
1100	---	---	---	---	---[4]	---[4]	[4]	[4]	5110

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 11. NPS 4 CL1500 EH Series Valves with Intermediate 2083 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD[2] POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M[1]		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	5210	5210	5210	5210	5210	5210	5000	5210	15920
200	5210	5210	5210	5210	5210	5210	4300	4790	14200
300	5055	5210	5055	5210	5055	5150	3880	4335	12910
400	4900	5210	4900	5210	4900	5030	3565	3960	11610
450	4750	5210	4750	5210	4750	5015	3240	3730	11240
500	4615	5210	4615	5210	4615	5000	[4]	[4]	10960
600	4200	5210	4200	5210	4200	5000	[4]	[4]	10460
650	4085	5210	4085	5210	4085	4970	[4]	[4]	10220
700	3940	4940	3940	4940	3940	4940	[4]	[4]	9970
750	3500	4375	---	---	3690	4790	[4]	[4]	9890
800	2860	3570	---	---	3525	4670	[4]	[4]	9800
850	---	---	---	---	3380	4465[3]	[4]	[4]	5250
900	---	---	---	---	3120	4165[3]	[4]	[4]	5200
950	---	---	---	---	2620[3]	3275[3]	[4]	[4]	5160
1000	---	---	---	---	1810[3]	2265[3]	[4]	[4]	5110
1050	---	---	---	---	1215[3]	1485[3,5]	[4]	[4]	5110
1100	---	---	---	---	---[4]	---[4]	[4]	[4]	5110

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 12. NPS 4 CL2500 EH Series Valves with Intermediate 3294 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	8235	8235	8235	8235	8235	8235	7905	8235	15920
200	8235	8235	8235	8235	8235	8235	6800	7575	14200
300	7995	8235	7995	8235	7995	8140	6140	6850	12910
400	7750	8235	7750	8235	7750	7955	5640	6260	11610
450	7510	8235	7510	8235	7510	7930	5130	5900	11240
500	7295	8235	7295	8235	7295	7905	(4)	(4)	10960
600	6640	8235	6640	8235	6640	7905	(4)	(4)	10460
650	6460	8235	6460	8235	6460	7860	(4)	(4)	10220
700	6235	7810	6235	7810	6235	7810	(4)	(4)	9970
750	5535	6915	- - -	- - -	5835	7575(3)	(4)	(4)	9890
800	4520	5645	- - -	- - -	5570	7390(3)	(4)	(4)	9800
850	- - -	- - -	- - -	- - -	5350	7060(3)	(4)	(4)	5250
900	- - -	- - -	- - -	- - -	4935(3)	6590(3)	(4)	(4)	5200
950	- - -	- - -	- - -	- - -	4145(3)	5175(3)	(4)	(4)	5160
1000	- - -	- - -	- - -	- - -	2860(3)	3575(3)	(4)	(4)	5110
1050	- - -	- - -	- - -	- - -	1920(3)	2035(3,5)	(4)	(4)	5110
1100	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	5110

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 13. NPS 6 CL1500 EH Series Valves with Intermediate 1876 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	4690	4690	4690	4690	4690	4690	4500	4690	20340
200	4690	4690	4690	4690	4690	4690	3870	4315	18130
300	4555	4690	4555	4690	4555	4635	3495	3900	16470
400	4415	4690	4415	4690	4415	4530	3215	3565	14810
450	4280	4690	4280	4690	4280	4515	2920	3355	14330
500	4160	4690	4160	4690	4160	4500	(4)	(4)	13970
600	3785	4690	3785	4690	3785	4500	(4)	(4)	13360
650	3680	4690	3680	4690	3680	4475	(4)	(4)	13030
700	3550	4450	3550	4450	3550	4450	(4)	(4)	12710
750	3150	3940	- - -	- - -	3325	4315	(4)	(4)	12610
800	2575	3215	- - -	- - -	3175	4205	(4)	(4)	12510
850	- - -	- - -	- - -	- - -	3045	4020(3)	(4)	(4)	8200
900	- - -	- - -	- - -	- - -	2810(3)	3750(3)	(4)	(4)	8130
950	- - -	- - -	- - -	- - -	2360(3)	2945(3)	(4)	(4)	8060
1000	- - -	- - -	- - -	- - -	1630(3)	2040(3)	(4)	(4)	7990
1050	- - -	- - -	- - -	- - -	1095(3)	1280(3,5)	(4)	(4)	7990
1100	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	7990

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 14. NPS 6 CL2500 EH Series Valves with Intermediate 2987 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	7470	7470	7470	7470	7470	7470	7170	7470	20340
200	7470	7470	7470	7470	7470	7470	6165	6870	18130
300	7255	7470	7255	7470	7250	7385	5570	6215	16470
400	7025	7470	7025	7470	7025	7210	5115	5675	14810
450	6810	7470	6810	7470	6810	7190	4650	5345	14330
500	6620	7470	6620	7470	6615	7170	(4)	(4)	13970
600	6020	7470	6020	7470	6020	7170	(4)	(4)	13360
650	5860	7470	5860	7470	5860	7125	(4)	(4)	13030
700	5650	7085	5650	7085	5650	7085	(4)	(4)	12710
750	5020	6275	---	---	5290	6870	(4)	(4)	12610
800	4095	5120	---	---	5055	6700(3)	(4)	(4)	12510
850	---	---	---	---	4850	6400(3)	(4)	(4)	8200
900	---	---	---	---	4475(3)	5975(3)	(4)	(4)	8130
950	---	---	---	---	3760(3)	4695(3)	(4)	(4)	8060
1000	---	---	---	---	2595(3)	3245(3)	(4)	(4)	7990
1050	---	---	---	---	1740(3)	2065(3,5)	(4)	(4)	7990
1100	---	---	---	---	---(4)	---(4)	(4)	(4)	7990

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 15. NPS 8 CL1500 EH Series Valves with Intermediate 1866 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	4665	4665	4665	4665	4665	4665	4480	4665	34810
200	4665	4665	4665	4665	4665	4665	3850	4290	30980
300	4529	4665	4529	4665	4530	4610	3480	3880	28000
400	4378	4665	4378	4665	4390	4505	3195	3545	25730
450	4257	4665	4257	4665	4255	4490	2905	3340	24700
500	4136	4665	4136	4665	4135	4480	(4)	(4)	24060
600	3762	4665	3762	4665	3760	4480	(4)	(4)	22740
650	3659	4665	3659	4665	3660	4455	(4)	(4)	22260
700	3454	4434	---	---	3530	4425	(4)	(4)	21780
750	3155	3944	---	---	3310	4290	(4)	(4)	21480
800	2558	3198	---	---	3160	4185	(4)	(4)	21180
850	---	---	---	---	3030	4000(3)	(4)	(4)	20990
900	---	---	---	---	2795(3)	3730(3)	(4)	(4)	20810
950	---	---	---	---	2345(3)	2930(3)	(4)	(4)	20630
1000	---	---	---	---	1620(3)	2025(3)	(4)	(4)	20450
1050	---	---	---	---	1085(3)	1180(3,5)	(4)	(4)	20450
1100	---	---	---	---	---(4)	---(4)	(4)	(4)	20450

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales officer for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 16. NPS 8 CL2500 EH Series Valves with Intermediate 2943 Rating

TEMP, °F	PRESSURE RATINGS, PSIG — Valve Body Material and Intermediate Class Designation								MAXIMUM STEM LOAD,(2) POUNDS
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	7358	7358	7358	7358	7360	7360	7065	7360	19670
200	7358	7358	7358	7358	7360	7360	6075	6770	17610
300	7145	7358	7145	7358	7145	7275	5485	6120	16030
400	6904	7358	6904	7358	6920	7105	5040	5590	14450
450	6712	7358	6712	7358	6710	7085	4580	5265	13990
500	6520	7358	6520	7358	6520	7065	(4)	(4)	13640
600	5933	7358	5933	7358	5935	7065	(4)	(4)	13050
650	5773	7358	5773	7358	5775	7020	(4)	(4)	12740
700	5450	6988	- - -	- - -	5570	6980	(4)	(4)	12430
750	4979	6222	- - -	- - -	5215	6770	(4)	(4)	12330
800	4037	5045	- - -	- - -	4980	6600	(4)	(4)	12230
850	- - -	- - -	- - -	- - -	4780	6305	(4)	(4)	6680
900	- - -	- - -	- - -	- - -	4410	5885(3)	(4)	(4)	6620
950	- - -	- - -	- - -	- - -	3705(3)	4625(3)	(4)	(4)	6530
1000	- - -	- - -	- - -	- - -	2555(3)	3195(3)	(4)	(4)	6510
1050	- - -	- - -	- - -	- - -	1715(3)	2145(3)	(4)	(4)	6510
1100	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	6510

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 17. NPS 10 CL1500 EH Series Valves with Intermediate 1568 Rating

TEMP, °F	PRESSURE RATINGS, PSIG — Valve Body Material and Intermediate Class Designation								MAXIMUM STEM LOAD,(2) POUNDS
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	3920	3920	3920	3920	3920	3920	3765	3920	34810
200	3920	3920	3920	3920	3920	3920	3235	3605	30980
300	3805	3920	3805	3920	3805	3875	2920	3260	28000
400	3679	3920	3679	3920	3690	3785	2685	2980	25730
450	3578	3920	3578	3920	3575	3775	2550	2805	24700
500	3476	3920	3476	3920	3475	3765	(4)	(4)	24060
600	3162	3920	3162	3920	3160	3765	(4)	(4)	22740
650	3074	3920	3074	3920	3075	3740	(4)	(4)	22260
700	2901	3727	- - -	- - -	2970	3715	(4)	(4)	21780
750	2650	3314	- - -	- - -	2780	3605	(4)	(4)	21480
800	2149	2687	- - -	- - -	2655	3515	(4)	(4)	21180
850	- - -	- - -	- - -	- - -	2545	3360	(4)	(4)	20990
900	- - -	- - -	- - -	- - -	2345	3135(3)	(4)	(4)	20810
950	- - -	- - -	- - -	- - -	1970(3)	2460(3)	(4)	(4)	20630
1000	- - -	- - -	- - -	- - -	1365(3)	1705(3)	(4)	(4)	20450
1050	- - -	- - -	- - -	- - -	915(3)	1145(3)	(4)	(4)	20450
1100	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	20450

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 18. NPS 10 CL2500 EH Series Valves with Intermediate 2522 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	6305	6305	6305	6305	6305	6305	6055	6305	19670
200	6305	6305	6305	6305	6305	6305	5205	5800	17610
300	6123	6305	6123	6305	6125	6235	4700	5245	16030
400	5917	6305	5917	6305	5930	6090	4320	4790	14450
450	5753	6305	5753	6305	5750	6070	4110	4515	13990
500	5589	6305	5589	6305	5590	6055	(4)	(4)	13640
600	5084	6305	5084	6305	5085	6055	(4)	(4)	13050
650	4948	6305	4948	6305	4950	6015	(4)	(4)	12740
700	4671	5992	---	---	4770	5980	(4)	(4)	12430
750	4267	5332	---	---	4470	5800	(4)	(4)	12330
800	3460	4323	---	---	4265	5655	(4)	(4)	12230
850	---	---	---	---	4095	5400	(4)	(4)	6680
900	---	---	---	---	3780	5045	(4)	(4)	6620
950	---	---	---	---	3175	3965(3)	(4)	(4)	6530
1000	---	---	---	---	2190(3)	2740(3)	(4)	(4)	6510
1050	---	---	---	---	1470(3)	1835(3)	(4)	(4)	6510
1100	---	---	---	---	---(4)	---(4)	(4)	(4)	6510

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 19. NPS 12 and 14 CL1500 EH Series Valves with Intermediate 1650 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	4125	4125	4125	4125	4125	4125	3960	4125	34810
200	4125	4125	4125	4125	4125	4125	3405	3795	30980
300	4005	4125	4005	4125	4005	4075	3075	3430	28000
400	3872	4125	3872	4125	3885	3980	2825	3135	25730
450	3765	4125	3765	4125	3760	3970	2690	2950	24700
500	3657	4125	3657	4125	3655	3960	(4)	(4)	24060
600	3327	4125	3327	4125	3325	3960	(4)	(4)	22740
650	3235	4125	3235	4125	3235	3940	(4)	(4)	22260
700	3053	3921	---	---	3125	3910	(4)	(4)	21780
750	2789	3487	---	---	2925	3795	(4)	(4)	21480
800	2261	2827	---	---	2795	3700	(4)	(4)	21180
850	---	---	---	---	2680	3535	(4)	(4)	20990
900	---	---	---	---	2470	3300(3)	(4)	(4)	20810
950	---	---	---	---	2075(3)	2590(3)	(4)	(4)	20630
1000	---	---	---	---	1475(3)	1795(3)	(4)	(4)	20450
1050	---	---	---	---	960(3)	1205(3)	(4)	(4)	20450
1100	---	---	---	---	---(4)	---(4)	(4)	(4)	20450

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 20. NPS 12 CL2500 EH Series Valves with Intermediate 2940 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	7350	7350	7350	7350	7350	7350	7055	7350	34810
200	7350	7350	7350	7350	7350	7350	6070	6760	30980
300	7138	7350	7138	7350	7140	7265	5480	6115	28000
400	6897	7350	6897	7350	6915	7100	5035	5585	25730
450	6705	7350	6705	7350	6705	7075	4580	5260	24700
500	6514	7350	6514	7350	6515	7055	(4)	(4)	24060
600	5927	7350	5927	7350	5925	7055	(4)	(4)	22740
650	5767	7350	5767	7350	5765	7015	(4)	(4)	22260
700	5444	6981	---	---	5565	6975	(4)	(4)	21780
750	4974	6216	---	---	5210	6760	(4)	(4)	21480
800	4033	5040	---	---	4975	6595	(4)	(4)	21180
850	---	---	---	---	4775	6300(3)	(4)	(4)	20990
900	---	---	---	---	4405(3)	5880(3)	(4)	(4)	20810
950	---	---	---	---	3700(3)	4620(3)	(4)	(4)	20630
1000	---	---	---	---	2555(3)	3190(3)	(4)	(4)	20450
1050	---	---	---	---	1710(3)	1892(3,5)	(4)	(4)	20450
1100	---	---	---	---	---(4)	---(4)	(4)	(4)	20450

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 21. NPS 14 CL2500 EH Series Valves with Intermediate 2754 Rating

TEMP, °F	PRESSURE RATINGS, PSIG								MAXIMUM STEM LOAD,(2) POUNDS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
100	6885	6885	6885	6885	6885	6885	6610	6885	34810
200	6885	6885	6885	6885	6885	6885	5685	6335	30980
300	6687	6885	6687	6885	6685	6805	5135	5730	28000
400	6461	6885	6461	6885	6480	6650	4715	5235	25730
450	6281	6885	6281	6885	6290	6630	4285	4935	24700
500	6102	6885	6102	6885	6100	6610	(4)	(4)	24060
600	5552	6885	5552	6885	5550	6610	(4)	(4)	22740
650	5403	6885	5403	6885	5405	6570	(4)	(4)	22260
700	5100	6541	---	---	5210	6530	(4)	(4)	21780
750	4659	5822	---	---	4880	6335	(4)	(4)	21480
800	3778	4721	---	---	4660	6175	(4)	(4)	21180
850	---	---	---	---	4470	5900	(4)	(4)	20990
900	---	---	---	---	4125	5510(3)	(4)	(4)	20810
950	---	---	---	---	3465(3)	4330(3)	(4)	(4)	20630
1000	---	---	---	---	2390(3)	2990(3)	(4)	(4)	20450
1050	---	---	---	---	1600(3)	1890(3,5)	(4)	(4)	20450
1100	---	---	---	---	---(4)	---(4)	(4)	(4)	20450

1. Ratings based on SA-193-B7 bolts up to 450°F, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 22. NPS 12 x 8 CL900 EW Series Valve with Intermediate 1150 Rating

TEMPERATURE, °F	PRESSURE RATINGS, PSIG				MAXIMUM STEM LOAD, POUNDS
	Valve Body Material and Intermediate Class Designation				
	WCC		WC9		
	Standard Class	Special Class	Standard Class	Special Class	
100	2875	2875	2870	2870	17000
200	2875	2875	2745	2870	16740
300	2791	2875	2590	2870	16420
400	2698	2875	2485	2870	16100
500	2549	2875	2450	2820	15830
600	2319	2875	2315	2820	15540
650	2255	2875	2255	2820	15420
700	2128	2734	2175	2810	15280
750	1943	2432	2035	2790	15180
800	1577	1972	1945	2760	15060
850	- - -	- - -	1865	2590	14820
900	- - -	- - -	1725	2300	14590
950	- - -	- - -	1440	1805	13630
1000	- - -	- - -	1025	1285	12680

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Metric Units

EH Series and EW Series valves with buttwelded ends have increased/temperature ratings, called Intermediate ratings as defined in ASME B16.34-2013.

The extra strength of these valves allows ratings higher than the normal CL900, CL1500, or CL2500 ratings that are specified in ASME B16.34-2013. Two types of the higher (Intermediate) ratings are available: Intermediate Standard and Intermediate Special. All EH and EW Series valves with buttwelded ends listed in the following tables have Intermediate Standard ratings. Intermediate Special ratings allow pressures higher than Intermediate Standard ratings, which can only be obtained by a valve body assembly successfully undergoing certain nondestructive examinations as described in the ASME B16.34-2013 standard.

Intermediate ratings apply only to valve body assemblies with the material listed in tables 1 and 2. EH Series valves with line-size buttwelding ends have Intermediate ratings as listed in tables 3 through 21.

The NPS 12 x 8 CL900 EW Series valve body has Intermediate ratings as shown in table 22. Note that the NPS 1 and 2 socketweld EH Series valve bodies also provide the ratings shown for NPS 1 and 2 buttwelded valve bodies. Also, the NPS 1-1/2 x 1 EH Series valve body is the only valve body with expanded ends that provides Intermediate ratings; the NPS 2 x 1, 3 x 2, 4 x 3, 6 x 4, and 8 x 6 valve bodies do not allow these higher ratings.

The ratings in tables 3 through 22 were calculated using the maximum stem load listed in each table. These stem loads are for the largest diameter 316 strain-hardened stainless steel stem available for each valve body size. When using the tables, compare the maximum available stem load to the table stem load. If the maximum available stem load is greater than the printed value, consult your Emerson sales office or Local Business Partner since the higher stem load may require additional pressure derating due to bolting limitations. If the maximum available stem load is less than or equal to the printed value, a lower load may allow pressures higher than those shown in the tables if the rating is limited by bolting limitations.

Table 1. Body and Bolting Material Descriptions for NPS 1 through 6 EH Series Valves

<table>
<tr><th colspan="2">VALVE BODY MATERIAL</th><th colspan="4">BOLTING MATERIAL</th><th rowspan="3">TEMPERATURE, °C</th></tr>
<tr><th rowspan="2">Specification</th><th rowspan="2">Grade</th><th colspan="2">Bolts</th><th colspan="2">Nuts</th></tr>
<tr><th>Specification</th><th>Grade</th><th>Specification</th><th>Grade</th></tr>
<tr><td>SA-352</td><td>LCC</td><td>SA-193</td><td>B7</td><td>SA-194</td><td>2H</td><td>to 371</td></tr>
<tr><td>SA-216</td><td>WCC</td><td>SA-193</td><td>B7</td><td>SA-194</td><td>2H</td><td>to 427</td></tr>
<tr><td rowspan="3">SA-217</td><td rowspan="3">WC9</td><td>SA-193</td><td>B7</td><td>SA-194</td><td>2H</td><td>to 427</td></tr>
<tr><td>SA-193</td><td>B7</td><td>SA-194</td><td>7</td><td>over 427</td></tr>
<tr><td>SA-193</td><td>B16</td><td>SA-194</td><td>7</td><td>See table values</td></tr>
<tr><td rowspan="5">SA-351</td><td rowspan="5">CF8M or 316(1)</td><td>SA-193</td><td>B7</td><td>SA-193</td><td>2H</td><td>to 232</td></tr>
<tr><td>SA-453</td><td>660 Class A or B with Belleville washers</td><td>SA-194</td><td>7</td><td>to 427</td></tr>
<tr><td>SA-453</td><td>660 Class A or B rupture tested with Belleville washers</td><td>SA-194</td><td>7</td><td>to 538</td></tr>
<tr><td>SA-453</td><td>660 Class A or B with Belleville washers</td><td>SA-194</td><td>7M</td><td>to 427</td></tr>
<tr><td>SA-453</td><td>660 Class A or B rupture tested with Belleville washers</td><td>SA-194</td><td>7M</td><td>to 538</td></tr>
<tr><td colspan="7">1. 316H must be specified for service temperatures above 538°C.</td></tr>
</table>

Table 2. Body and Bolting Material Descriptions for NPS 8 through 14 EH Series Valves and NPS 12 x 8 EW Series Valves

VALVE BODY MATERIAL		BOLTING MATERIAL				TEMPERATURE, °C
		Bolts		Nuts		
Specification	Grade	Specification	Grade	Specification	Grade	
SA-352	LCC	SA-193	B7	SA-194	2H	to 343
SA-216	WCC	SA-193	B7	SA-194	2H	to 427
SA-217	WC9	SA-193	B7	SA-194	2H	to 427
		SA-193	B7	SA-194	7	over 427
		SA-193	B16	SA-194	7	See table values
SA-351	CF8M or 316(1)	SA-193	B7	SA-193	2H	to 232
		SA-453	660 Class A or B with Belleville washers	SA-194	7	to 427
		SA-453	660 Class A or B rupture tested with Belleville washers	SA-194	7	to 538
		SA-453	660 Class A or B with Belleville washers	SA-194	7M	to 427
		SA-453	660 Class A or B rupture tested with Belleville washers	SA-194	7M	to 538

1. 316H must be specified for service temperatures above 538°C.

Table 3. NPS 1 CL1500 EH Series Valves with Intermediate 2282 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	393	393	393	393	393	393	378	393	49400
93	393	393	393	393	393	393	325	362	44110
149	382	393	382	393	382	389	293	327	40120
204	370	393	370	393	370	380	269	299	36100
232	359	393	359	393	359	379	228	281	34960
260	349	393	349	393	349	378	(4)	(4)	34080
316	317	393	317	393	317	378	(4)	(4)	32550
343	309	393	309	393	309	376	(4)	(4)	31780
371	298	373	298	373	298	373	(4)	(4)	31010
399	264	330	- - -	- - -	279	362	(4)	(4)	30750
427	216	270	- - -	- - -	266	353	(4)	(4)	30490
454	- - -	- - -	- - -	- - -	255	337(3)	(4)	(4)	13130
482	- - -	- - -	- - -	- - -	236	315(3)	(4)	(4)	13010
510	- - -	- - -	- - -	- - -	198(3)	247(3)	(4)	(4)	12900
538	- - -	- - -	- - -	- - -	137(3)	172(3)	(4)	(4)	12790
566	- - -	- - -	- - -	- - -	92(3)	107(3)	(4)	(4)	12790
593	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	12790

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 4. NPS 1 CL2500 EH Series Valves with Intermediate 3862 Rating(1)

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(3) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(2)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	666	666	666	666	666	666	639	666	49400
93	666	666	666	666	666	666	550	613	44110
149	646	666	646	666	647	658	496	554	40120
204	626	666	626	666	627	643	456	506	36100
232	607	666	607	666	607	641	414	476	34960
260	590	666	590	666	590	639	(5)	(5)	34080
316	537	666	537	666	537	639	(5)	(5)	32550
343	522	666	522	666	522	636	(5)	(5)	31780
371	504	632	504	632	504	632	(5)	(5)	31010
399	447	559	- - -	- - -	472	613	(5)	(5)	30750
427	365	456	- - -	- - -	450	598(4)	(5)	(5)	30490
454	- - -	- - -	- - -	- - -	432	571(4)	(5)	(5)	13130
482	- - -	- - -	- - -	- - -	399(4)	533(4)	(5)	(5)	13010
510	- - -	- - -	- - -	- - -	335(4)	419(4)	(5)	(5)	12900
538	- - -	- - -	- - -	- - -	231(4)	289(4)	(5)	(5)	12790
566	- - -	- - -	- - -	- - -	155(4)	167(4)(6)	(5)	(5)	12790
593	- - -	- - -	- - -	- - -	- - -(5)	- - -(5)	(5)	(5)	12790

1. Intermediate 4080 rating is available with special bolting materials in most valve body materials. Consult your Emerson sales office.
2. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
3. For largest available 316 strain-hardened stainless steel stem.
4. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
5. Consult your Emerson sales office.
6. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 5. NPS 1-1/2 x 1 CL1500 EH Series Valves with Intermediate 1789 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	309	309	309	309	309	309	296	309	49400
93	309	309	309	309	309	309	254	284	44110
149	299	309	299	309	299	305	230	257	40120
204	290	309	290	309	290	298	211	234	36100
232	281	309	281	309	281	297	199	213	34960
260	273	309	273	309	273	296	(4)	(4)	34080
316	249	309	249	309	249	296	(4)	(4)	32550
343	242	309	242	309	242	294	(4)	(4)	31780
371	234	293	234	293	233	292	(4)	(4)	31010
399	207	259	- - -	- - -	219	284	(4)	(4)	30750
427	169	211	- - -	- - -	209	277	(4)	(4)	30490
454	- - -	- - -	- - -	- - -	200	264	(4)	(4)	13130
482	- - -	- - -	- - -	- - -	185	247(3)	(4)	(4)	13010
510	- - -	- - -	- - -	- - -	155(3)	194(3)	(4)	(4)	12900
538	- - -	- - -	- - -	- - -	107(3)	134(3)	(4)	(4)	12790
566	- - -	- - -	- - -	- - -	72(3)	90(3)	(4)	(4)	12790
593	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	12790

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 6. NPS 1-1/2 x 1 CL2500 EH Series Valves with Intermediate 3021 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	521	521	521	521	521	521	500	521	49400
93	521	521	521	521	521	521	430	479	44110
149	506	521	506	521	506	515	388	433	40120
204	490	521	490	521	490	503	356	396	36100
232	474	521	474	521	475	501	330	372	34960
260	461	521	461	521	462	500	(4)	(4)	34080
316	420	521	420	521	420	500	(4)	(4)	32550
343	409	521	409	521	409	497	(4)	(4)	31780
371	394	494	394	494	394	494	(4)	(4)	31010
399	350	437	---	---	369	479	(4)	(4)	30750
427	286	357	---	---	352	467	(4)	(4)	30490
454	---	---	---	---	338	447	(4)	(4)	13130
482	---	---	---	---	312	416(3)	(4)	(4)	13010
510	---	---	---	---	262(3)	328(3)	(4)	(4)	12900
538	---	---	---	---	181(3)	226(3)	(4)	(4)	12790
566	---	---	---	---	121(3)	151(3)	(4)	(4)	12790
593	---	---	---	---	---(4)	---(4)	(4)	(4)	12790

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 7. NPS 2 CL1500 EH Series Valves with Intermediate 1758 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	303	303	303	303	303	303	291	303	70830
93	303	303	303	303	303	303	250	279	63180
149	294	303	294	303	294	300	226	252	57430
204	285	303	285	303	285	293	208	230	51650
232	276	303	276	303	276	292	190	208	50010
260	269	303	269	303	269	291	(4)	(4)	48740
316	244	303	244	303	244	291	(4)	(4)	46550
343	238	303	238	303	238	289	(4)	(4)	45450
371	229	288	229	288	230	288	(4)	(4)	44350
399	204	254	---	---	215	279	(4)	(4)	43980
427	167	208	---	---	205	272	(4)	(4)	43600
454	---	---	---	---	197	260	(4)	(4)	23340
482	---	---	---	---	181	242(3)	(4)	(4)	23140
510	---	---	---	---	152(3)	190(3)	(4)	(4)	22940
538	---	---	---	---	106(3)	132(3)	(4)	(4)	22740
566	---	---	---	---	71(3)	88(3)	(4)	(4)	22740
593	---	---	---	---	---(4)	---(4)	(4)	(4)	22740

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 8. NPS 2 CL2500 EH Series Valves with Intermediate 3273 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	564	564	564	564	564	564	542	564	70830
93	564	564	564	564	564	564	466	519	63180
149	548	564	548	564	548	558	421	470	57430
204	531	564	531	564	531	545	386	429	51650
232	514	564	514	564	514	543	350	404	50010
260	500	564	500	564	500	542	(4)	(4)	48740
316	455	564	455	564	455	542	(4)	(4)	46550
343	443	564	443	564	443	539	(4)	(4)	45450
371	427	535	427	535	427	535	(4)	(4)	44350
399	379	475	---	---	400	519	(4)	(4)	43980
427	310	387	---	---	382	506(3)	(4)	(4)	43600
454	---	---	---	---	366	484(3)	(4)	(4)	23340
482	---	---	---	---	338(3)	451(3)	(4)	(4)	23140
510	---	---	---	---	284(3)	355(3)	(4)	(4)	22940
538	---	---	---	---	196(3)	245(3)	(4)	(4)	22740
566	---	---	---	---	131(3)	145(3,5)	(4)	(4)	22740
593	---	---	---	---	---(4)	---(4)	(4)	(4)	22740

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 9. NPS 3 CL1500 EH Series Valves with Intermediate 1756 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	303	303	303	303	303	303	291	303	70830
93	303	303	303	303	303	303	250	279	63180
149	294	303	294	303	294	299	225	252	57430
204	285	303	285	303	285	292	208	230	51650
232	276	303	276	303	276	291	197	221	50010
260	268	303	268	303	268	291	(4)	(4)	48740
316	244	303	244	303	244	291	(4)	(4)	46550
343	238	303	238	303	238	289	(4)	(4)	45450
371	229	287	229	287	229	287	(4)	(4)	44350
399	203	254	---	---	215	279	(4)	(4)	43980
427	166	208	---	---	205	272	(4)	(4)	43600
454	---	---	---	---	197	260	(4)	(4)	23340
482	---	---	---	---	181	242	(4)	(4)	23140
510	---	---	---	---	152	190(3)	(4)	(4)	22940
538	---	---	---	---	105(3)	132(3)	(4)	(4)	22740
566	---	---	---	---	71(3)	88(3)	(4)	(4)	22740
593	---	---	---	---	---(4)	---(4)	(4)	(4)	22740

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 10. NPS 3 CL2500 EH Series Valves with Intermediate 2932 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	505	505	505	505	505	505	485	505	70830
93	505	505	505	505	506	505	417	465	63180
149	491	505	491	505	491	500	377	421	57430
204	475	505	475	505	476	488	346	384	51650
232	461	505	461	505	461	486	321	362	50010
260	448	505	448	505	448	485	(4)	(4)	48740
316	407	505	407	505	407	485	(4)	(4)	46550
343	396	505	396	505	396	482	(4)	(4)	45450
371	383	480	383	480	383	480	(4)	(4)	44350
399	340	424	---	---	358	465	(4)	(4)	43980
427	277	346	---	---	342	453	(4)	(4)	43600
454	---	---	---	---	328	433(3)	(4)	(4)	23340
482	---	---	---	---	303	404(3)	(4)	(4)	23140
510	---	---	---	---	254(3)	318(3)	(4)	(4)	22940
538	---	---	---	---	176(3)	220(3)	(4)	(4)	22740
566	---	---	---	---	118(3)	147(3)	(4)	(4)	22740
593	---	---	---	---	---(4)	---(4)	(4)	(4)	22740

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 11. NPS 4 CL1500 EH Series Valves with Intermediate 2083 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	359	359	359	359	359	359	345	359	70830
93	359	359	359	359	359	359	296	330	63180
149	349	359	349	359	349	355	268	299	57430
204	338	359	338	359	338	347	246	273	51650
232	327	359	327	359	327	346	220	257	50010
260	318	359	318	359	318	345	(4)	(4)	48740
316	290	359	290	359	290	345	(4)	(4)	46550
343	282	359	282	359	282	343	(4)	(4)	45450
371	272	341	272	341	272	341	(4)	(4)	44350
399	241	302	---	---	254	330	(4)	(4)	43980
427	197	246	---	---	243	322	(4)	(4)	43600
454	---	---	---	---	233	308(3)	(4)	(4)	23340
482	---	---	---	---	215	287(3)	(4)	(4)	23140
510	---	---	---	---	181(3)	226(3)	(4)	(4)	22940
538	---	---	---	---	125(3)	156(3)	(4)	(4)	22740
566	---	---	---	---	84(3)	102(3,5)	(4)	(4)	22740
593	---	---	---	---	---(4)	---(4)	(4)	(4)	22740

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 12. NPS 4 CL2500 EH Series Valves with Intermediate 3294 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	568	568	568	568	568	568	545	568	70830
93	568	568	568	568	568	568	469	522	63180
149	551	568	551	568	551	561	423	472	57430
204	534	568	534	568	534	549	389	432	51650
232	517	568	517	568	517	547	353	406	50010
260	503	568	503	568	503	545	(4)	(4)	48740
316	458	568	458	568	458	545	(4)	(4)	46550
343	445	568	445	568	445	542	(4)	(4)	45450
371	430	538	430	538	430	539	(4)	(4)	44350
399	382	477	- - -	- - -	402	522(3)	(4)	(4)	43980
427	312	389	- - -	- - -	384	510(3)	(4)	(4)	43600
454	- - -	- - -	- - -	- - -	369	487(3)	(4)	(4)	23340
482	- - -	- - -	- - -	- - -	340(3)	454(3)	(4)	(4)	23140
510	- - -	- - -	- - -	- - -	286(3)	357(3)	(4)	(4)	22940
538	- - -	- - -	- - -	- - -	197(3)	247(3)	(4)	(4)	22740
566	- - -	- - -	- - -	- - -	132(3)	140(3,5)	(4)	(4)	22740
593	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	22740

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 13. NPS 6 CL1500 EH Series Valves with Intermediate 1876 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	323	323	323	323	323	323	310	323	90470
93	323	323	323	323	323	323	267	298	80640
149	314	323	314	323	314	320	241	269	73270
204	304	323	304	323	304	312	222	246	65870
232	295	323	295	323	295	311	197	231	63770
260	287	323	287	323	287	310	(4)	(4)	62150
316	261	323	261	323	261	310	(4)	(4)	59420
343	254	323	254	323	254	309	(4)	(4)	57980
371	245	307	245	307	245	307	(4)	(4)	56540
399	217	272	- - -	- - -	229	298	(4)	(4)	56100
427	178	222	- - -	- - -	219	290	(4)	(4)	55660
454	- - -	- - -	- - -	- - -	210	277(3)	(4)	(4)	36480
482	- - -	- - -	- - -	- - -	194(3)	259(3)	(4)	(4)	36160
510	- - -	- - -	- - -	- - -	163(3)	203(3)	(4)	(4)	35850
538	- - -	- - -	- - -	- - -	112(3)	141(3)	(4)	(4)	35530
566	- - -	- - -	- - -	- - -	76(3)	88(3,5)	(4)	(4)	35530
593	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	35530

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 14. NPS 6 CL2500 EH Series Valves with Intermediate 2987 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD[2] NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M[1]		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	515	515	515	515	515	515	494	515	90470
93	515	515	515	515	515	515	425	474	80640
149	500	515	500	515	500	509	384	429	73270
204	484	515	484	515	484	497	353	391	65870
232	469	515	469	515	469	495	314	368	63770
260	456	515	456	515	456	494	[4]	[4]	62150
316	415	515	415	515	415	494	[4]	[4]	59420
343	404	515	404	515	404	491	[4]	[4]	57980
371	390	489	390	489	390	489	[4]	[4]	56540
399	346	433	- - -	- - -	365	474	[4]	[4]	56100
427	282	353	- - -	- - -	349	462[3]	[4]	[4]	55660
454	- - -	- - -	- - -	- - -	334	441[3]	[4]	[4]	36480
482	- - -	- - -	- - -	- - -	309[3]	412[3]	[4]	[4]	36160
510	- - -	- - -	- - -	- - -	259[3]	324[3]	[4]	[4]	35850
538	- - -	- - -	- - -	- - -	179[3]	224[3]	[4]	[4]	35530
566	- - -	- - -	- - -	- - -	120[3]	142[3,5]	[4]	[4]	35530
593	- - -	- - -	- - -	- - -	- - -[4]	- - -[4]	[4]	[4]	35530

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 15. NPS 8 CL1500 EH Series Valves with Intermediate 1866 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD[2] NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M[1]		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	322	322	322	322	322	322	309	322	154830
93	321	322	321	322	322	322	265	296	137790
149	312	322	312	322	312	318	240	268	124530
204	301	322	301	322	303	311	220	244	114450
232	293	322	293	322	294	310	200	230	109880
260	284	322	284	322	285	309	[4]	[4]	107000
316	260	322	260	322	259	309	[4]	[4]	101140
343	251	322	72	90	252	307	[4]	[4]	99010
371	237	318	- - -	- - -	243	305	[4]	[4]	96870
399	217	301	- - -	- - -	228	296	[4]	[4]	95530
427	180	270	- - -	- - -	218	289	[4]	[4]	94190
454	- - -	- - -	- - -	- - -	209	276[3]	[4]	[4]	93390
482	- - -	- - -	- - -	- - -	193[3]	257[3]	[4]	[4]	92580
510	- - -	- - -	- - -	- - -	162[3]	202[3]	[4]	[4]	91770
538	- - -	- - -	- - -	- - -	112[3]	140[3]	[4]	[4]	90970
566	- - -	- - -	- - -	- - -	75[3]	81[3,5]	[4]	[4]	90970
593	- - -	- - -	- - -	- - -	- - -[4]	- - -[4]	[4]	[4]	90970

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 16. NPS 8 CL2500 EH Series Valves with Intermediate 2943 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	507	507	507	507	507	507	487	507	87500
93	506	507	506	507	507	507	419	467	78310
149	492	507	492	507	493	502	378	422	71320
204	475	507	475	507	477	490	348	385	64260
232	463	507	463	507	465	488	320	342	62270
260	448	507	448	507	450	487	(4)	(4)	60690
316	411	507	411	507	409	487	(4)	(4)	58050
343	396	507	113	142	398	484	(4)	(4)	56660
371	375	501	- - -	- - -	384	481	(4)	(4)	55270
399	342	475	- - -	- - -	360	467	(4)	(4)	54830
427	284	426	- - -	- - -	343	455	(4)	(4)	54390
454	- - -	- - -	- - -	- - -	330	435(3)	(4)	(4)	29730
482	- - -	- - -	- - -	- - -	304	406(3)	(4)	(4)	29470
510	- - -	- - -	- - -	- - -	256(3)	319(3)	(4)	(4)	29030
538	- - -	- - -	- - -	- - -	176(3)	220(3)	(4)	(4)	28950
566	- - -	- - -	- - -	- - -	118(3)	148(3)	(4)	(4)	28950
593	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	28950

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 17. NPS 10 CL1500 EH Series Valves with Intermediate 1568 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	270	270	270	270	270	270	260	270	154830
93	269	270	269	270	270	270	223	249	137790
149	262	270	262	270	262	267	201	225	124530
204	253	270	253	270	254	261	185	205	114450
232	247	270	247	270	247	260	176	188	109880
260	239	270	239	270	240	260	(4)	(4)	107000
316	219	270	219	270	218	260	(4)	(4)	101140
343	211	270	60	76	212	258	(4)	(4)	99010
371	200	267	- - -	- - -	205	256	(4)	(4)	96870
399	182	253	- - -	- - -	192	249	(4)	(4)	95530
427	151	227	- - -	- - -	183	242	(4)	(4)	94190
454	- - -	- - -	- - -	- - -	175	232	(4)	(4)	93390
482	- - -	- - -	- - -	- - -	162	216(3)	(4)	(4)	92580
510	- - -	- - -	- - -	- - -	136(3)	170(3)	(4)	(4)	91770
538	- - -	- - -	- - -	- - -	94(3)	118(3)	(4)	(4)	90970
566	- - -	- - -	- - -	- - -	63(3)	79(3)	(4)	(4)	90970
593	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	90970

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 18. NPS 10 CL2500 EH Series Valves with Intermediate 2522 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	435	435	435	435	435	435	417	435	87500
93	433	435	433	435	435	435	359	400	78310
149	422	435	422	435	422	430	324	362	71320
204	407	435	407	435	409	420	298	330	64260
232	397	435	397	435	398	419	283	314	62270
260	384	435	384	435	386	418	(4)	(4)	60690
316	352	435	352	435	351	418	(4)	(4)	58050
343	339	435	97	122	341	415	(4)	(4)	56660
371	321	430	- - -	- - -	329	412	(4)	(4)	55270
399	293	407	- - -	- - -	308	400	(4)	(4)	54830
427	243	365	- - -	- - -	294	390	(4)	(4)	54390
454	- - -	- - -	- - -	- - -	282	372	(4)	(4)	29730
482	- - -	- - -	- - -	- - -	261	348	(4)	(4)	29470
510	- - -	- - -	- - -	- - -	219	273(3)	(4)	(4)	29030
538	- - -	- - -	- - -	- - -	151(3)	189(3)	(4)	(4)	28950
566	- - -	- - -	- - -	- - -	101(3)	127(3)	(4)	(4)	28950
593	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	28950

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 19. NPS 12 and 14 CL1500 EH Series Valves with Intermediate 1650 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD(2) NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M(1)		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	284	284	284	284	284	284	273	284	154830
93	283	284	283	284	284	284	235	262	137790
149	276	284	276	284	276	281	212	237	124530
204	266	284	266	284	268	274	195	216	114450
232	259	284	259	284	260	273	185	202	109880
260	251	284	251	284	252	273	(4)	(4)	107000
316	230	284	230	284	229	273	(4)	(4)	101140
343	222	284	64	80	223	272	(4)	(4)	99010
371	210	281	- - -	- - -	215	270	(4)	(4)	96870
399	192	266	- - -	- - -	202	262	(4)	(4)	95530
427	159	239	- - -	- - -	193	255	(4)	(4)	94190
454	- - -	- - -	- - -	- - -	185	244	(4)	(4)	93390
482	- - -	- - -	- - -	- - -	170	228(3)	(4)	(4)	92580
510	- - -	- - -	- - -	- - -	143(3)	179(3)	(4)	(4)	91770
538	- - -	- - -	- - -	- - -	102(3)	124(3)	(4)	(4)	90970
566	- - -	- - -	- - -	- - -	66(3)	83(3)	(4)	(4)	90970
593	- - -	- - -	- - -	- - -	- - -(4)	- - -(4)	(4)	(4)	90970

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.

Table 20. NPS 12 CL2500 EH Series Valves with Intermediate 2940 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD[2] NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M[1]		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	507	507	507	507	507	507	486	507	154830
93	505	507	505	507	507	507	419	466	137790
149	492	507	492	507	492	501	378	422	124530
204	475	507	475	507	477	490	347	385	114450
232	462	507	462	507	464	488	315	362	109880
260	447	507	447	507	449	487	[4]	[4]	107000
316	410	507	410	507	409	487	[4]	[4]	101140
343	396	507	113	142	397	484	[4]	[4]	99010
371	374	501	- - -	- - -	384	481	[4]	[4]	96870
399	341	474	- - -	- - -	359	466	[4]	[4]	95530
427	283	425	- - -	- - -	343	455	[4]	[4]	94190
454	- - -	- - -	- - -	- - -	329	434[3]	[4]	[4]	93390
482	- - -	- - -	- - -	- - -	304[3]	405[3]	[4]	[4]	92580
410	- - -	- - -	- - -	- - -	255[3]	319[3]	[4]	[4]	91770
538	- - -	- - -	- - -	- - -	176[3]	220[3]	[4]	[4]	90970
566	- - -	- - -	- - -	- - -	118[3]	130[3,5]	[4]	[4]	90970
593	- - -	- - -	- - -	- - -	- - -[4]	- - -[4]	[4]	[4]	90970

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 21. NPS 14 CL2500 EH Series Valves with Intermediate 2754 Rating

TEMP, °C	PRESSURE RATINGS, BAR								MAXIMUM STEM LOAD[2] NEWTONS
	Valve Body Material and Intermediate Class Designation								
	WCC		LCC		WC9		CF8M[1]		
	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	Standard Class	Special Class	
38	475	475	475	475	475	475	456	475	154830
93	473	475	473	475	475	475	392	437	137790
149	461	475	461	475	461	469	354	395	124530
204	445	475	445	475	447	459	325	361	114450
232	433	475	433	475	435	457	292	340	109880
260	419	475	419	475	421	456	[4]	[4]	107000
316	384	475	384	475	383	456	[4]	[4]	101140
343	371	475	106	133	373	453	[4]	[4]	99010
371	351	469	- - -	- - -	359	450	[4]	[4]	96870
399	320	444	- - -	- - -	336	437	[4]	[4]	95530
427	265	398	- - -	- - -	321	426	[4]	[4]	94190
454	- - -	- - -	- - -	- - -	308	407	[4]	[4]	93390
482	- - -	- - -	- - -	- - -	284	380[3]	[4]	[4]	92580
510	- - -	- - -	- - -	- - -	239[3]	299[3]	[4]	[4]	91770
538	- - -	- - -	- - -	- - -	165[3]	206[3]	[4]	[4]	90970
566	- - -	- - -	- - -	- - -	111[3]	130[3,5]	[4]	[4]	90970
593	- - -	- - -	- - -	- - -	- - -[4]	- - -[4]	[4]	[4]	90970

1. Ratings based on SA-193-B7 bolts up to 232°C, consult your Emerson sales office for ratings with other bolt material.
2. For largest available 316 strain-hardened stainless steel stem.
3. SA-193-B16 bolts and SA-194-7 nuts must be used to obtain maximum rating shown.
4. Consult your Emerson sales office.
5. Derating due to bolting limitations, higher ratings may be possible with alternate bolt materials. Consult your Emerson sales office for ratings with other bolt materials.

Table 22. NPS 12 x 8 CL900 EW Series Valve with Intermediate 1150 Rating

TEMPERATURE, °C	PRESSURE RATINGS, BAR				MAXIMUM STEM LOAD, NEWTONS
	Valve Body Material and Intermediate Class Designation				
	WCC		WC9		
	Standard Class	Special Class	Standard Class	Special Class	
38	198	198	198	198	75,620
93	198	198	189	198	74,480
149	192	198	179	198	73,040
204	186	198	171	198	71,610
260	176	198	169	194	70,400
316	160	198	160	194	69,110
343	155	198	155	194	68,580
371	147	189	150	194	67,980
399	134	168	140	192	67,520
427	109	136	134	192	66,700
454	- - -	- - -	129	179	65,940
482	- - -	- - -	119	159	64,880
510	- - -	- - -	99	124	60,640
538	- - -	- - -	71	87	56,410

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Flange Standards on all Bronze Flanged Valve Bodies

Description

Pressure/temperature ratings for CL150 and CL300 flanged bronze valves, given in table 1, are in accordance with ASME B16.24-2001. Pressure/temperature ratings for ASME SB-148 C95400 aluminum bronze, shown in table 2, are in accordance with ASME Case Code N-133. Aluminum bronze is not an ASME B16.34 approved material and should not be used in systems requiring conformance to that standard. Flange facings and dimensions of ASME SB-148 C95400 aluminum bronze valve bodies are in accordance with ASME B16.24-2001. Consult your Emerson sales office or Local Business Partner for additional information.

Information in table 1 has been extracted from ASME B16.24-2001 (Cast Copper Alloy Pipe Flanges and Flange Fittings), and information in table 2 has been extracted from ASME Case Code N-133. The ratings in both tables are presented with the permission of the publisher, The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017.

Additional information on flange facings, dimensions, gaskets, and bolting is also provided.

Flange Facings

Faces of bronze and aluminum bronze flanges will be machined to a smooth finish over their entire face. Raised, male-and-female and/or tongue and groove facings will not be used as they cannot be successfully employed in joints between bronze or aluminum bronze flanges conforming to standards. Where bronze or aluminum bronze flanges are bolted to cast iron or steel flanges, which normally have a raised face, the raised face of the cast iron or steel flanges should be removed.

Dimensions

The center-to-face and face-to-face dimensions of all bronze and aluminum bronze valve bodies will differ from those of cast iron valve bodies. The difference is due to different flange thicknesses recommended by ASME B16.24.

Gaskets

Gasket dimensions will be the same as the flange diameters. Metallic gaskets should not be used.

Bolting

Bolts recommended for companion flanges will be of steel. Bolts smaller than 19 mm (3/4-inch) will have ANSI standard square heads or standard heavy hex heads and will be used with standard heavy nuts. Bolts 19 mm (3/4-inch) and larger will have ANSI standard square heads or standard hex heads and will be used with standard hex nuts, heavy hex nuts, or standard square nuts.

Bolting for bonnet or bottom flanges will be carbon steel cap screws unless otherwise specified. Bronze bolts for bonnet and blind flanges will be furnished only when specifically requested on an order.

Table 1. Pressure/Temperature Ratings for ASTM B62 and B61 Bronze

SERVICE TEMPERATURE		WORKING PRESSURE							
		CL150				CL300			
°C	°F	ASTM B62		ASTM B61		ASTM B62		ASTM B61	
		Bar	Psig	Bar	Psig	Bar	Psig	Bar	Psig
-18 to 66	0 to 150	15.5	225	15.5	225	34.5	500	34.5	500
79	175	15.2	220	15.2	220	33.1	480	33.8	490
93	200	14.5	210	14.8	215	32.1	465	32.8	475
107	225	14.1	205	14.5	210	30.7	445	32.1	465
121	250	13.4	195	14.1	205	29.3	425	31.0	450
135	275	13.1	190	13.8	200	28.3	410	30.3	440
149	300	12.4	180	13.4	195	26.9	390	29.3	425
177	350	11.4	165	12.4	180	24.1	350	27.6	400
204	400	- - -	- - -	11.7	170	- - -	- - -	25.9	375
208	406	10.3	150	- - -	- - -	- - -	- - -	- - -	- - -
232	450	9.3(1)	135(1)	11.0	160	19.3(1)	280(1)	24.1	350
260	500	- - -	- - -	10.3	150	- - -	- - -	22.4	325
288	550	- - -	- - -	9.7	140	- - -	- - -	20.7	300

1. Some codes (e.g. ASME B31.1) limit the rating temperature of the indicated material to 208°C (406°F).

Table 2. Pressure/Temperature Ratings for ASME SB-148 C95400 Aluminum Bronze

SERVICE TEMPERATURE		WORKING PRESSURE			
		CL150		CL300	
°C	°F	Bar	Psig	Bar	Psig
38	100	15.9	230	41.4	600
93	200	15.2	220	39.7	575
149	300	14.8	215	39.0	565
204	400	13.8	200	38.6	560

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Nipples and Reducers for Fisher™ Welding-End Valve Bodies

Description

Certain alloy steel valve bodies (WC9, WC6, etc.) require post-weld heat treatment. These alloy steels are usually selected for temperatures above 427°C (800°F) but are occasionally specified for temperatures below 427°C (800°F) because of superior material characteristics (such as better erosion resistance). In the latter case, the inconvenience of post-weld heat treatment when welding the alloy steel valve body into a carbon steel line can be avoided if carbon steel nipples (figure 1) are welded to the alloy steel valve body and post-weld heat treated at the factory.

Nipples or reducers offer no advantage where the line has to be post-weld heat treated (such as alloy steel lines) or where carbon steel valve bodies or stainless steel valve bodies have to be welded into lines of the same material (these are not usually post-weld heat treated).

Valves with nipples or reducers will be hydrostatically tested as an assembly whenever possible. If the schedule or material of the attachments will not allow this single test, or if the valve has been component tested, the valve body will be hydrostatically tested by itself and then the completed assembly air tested at 5.5 bar (80 psig) to check the weld. Optionally, a double hydrostatic test can be scheduled at additional cost.

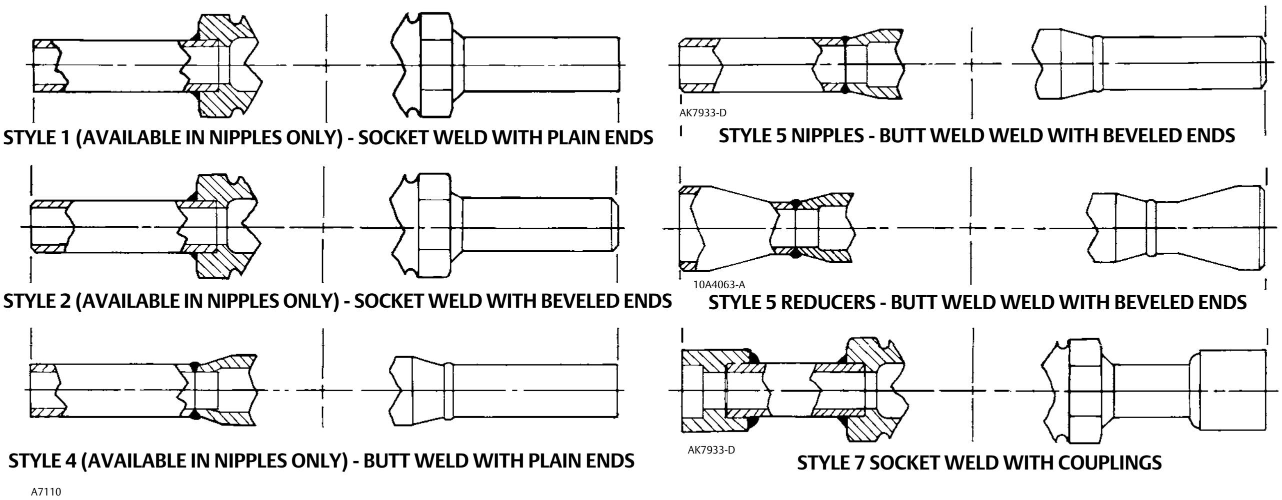
Pressure Capability

Unless specified, the attached piping components are not considered part of the valve and are not within the scope of ASME B16.34.

If the customer has specified the specific pipe schedule for nipples and reducers, the pressure capability of the piping component is not checked.

If the customer specifies that the welded-on piping components, other than ASME Flanges, are to be considered as part of the valve, then the valve is treated as a fabricated valve in accordance with ASME B16.34. Then, the minimum wall thickness of the welded-on components must meet the minimum wall thickness requirements of ASME B16.34.

Figure 1. Nipple and Reducer Styles



Ordering Information

When ordering nipples or reducers, specify:

1. Valve body size
2. Pipe size, schedule, and material
3. Desired nipple or reducer material
4. Desired nipple or reducer length
5. Style (figure 1)
6. Maximum design pressure and temperature

When nipples are specified and no length is given, they will be furnished in six-inch lengths. Styles 4 and 5 (figure 1) are recommended for valve bodies larger than NPS 2, and the other styles are recommended for NPS 2 and smaller valve bodies.

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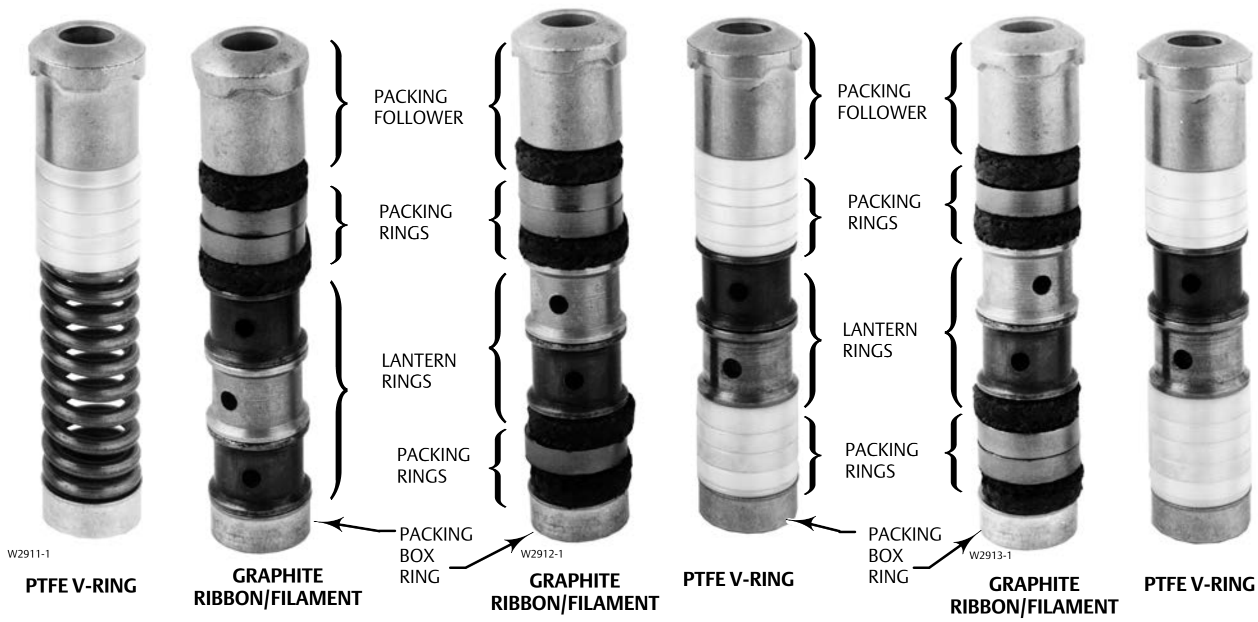
Packing for Fisher™ Sliding-Stem Valves (Non-Live-Loaded)



Typical Packing Arrangements. For Packing Arrangement Cutaway Drawings, see figures 1, 2, 3, 4, 5, 6, 7, and 8.

This bulletin will guide you in selecting standard Fisher valve stem packing materials and packing box arrangements. Packing materials and arrangements discussed here are those most commonly specified for Fisher sliding-stem style valves. Special packing can be provided for special applications. For more information about special packing, contact your Emerson sales office.

Using Tabulated Information

Most of the information contained in this bulletin is in tabular form. Table 1 is designed to aid in the selection of packing materials on the basis of the temperature and chemical make-up of the controlled medium.

Tables 2, 3, and 4 aid in the selection of packing on the basis of dimensional characteristics of the valve. Characteristics that must be considered include stem diameter, yoke boss diameter, and valve body design. Table 5 lists the valve body designs that are available with bonnets having a 1/2-inch socket-weld leak-off connection.

Table 1. Packing Material Selection

Temperature Range	Common Uses	Packing Material	Description	Adjustment	Relative Stem Friction	Special Considerations
-73 to 232°C (-100 to 450°F)	Non-Radioactive Nuclear	PTFE Impregnated Composition	Split rings of braided composition impregnated with PTFE	Jam Type	Low	- - -
-40 to 232°C (-40 to 450°F)	All Chemicals (Except Molten Alkali), Non-Radioactive Nuclear	Single PTFE V-Ring	Solid rings of molded PTFE	Self-Adjusting with Spring; Jam Type with lantern ring (see figure 1)	Low	Requires 2 to 4 micro-inch RMS valve plug stem finish
	Vacuum, Pressure/ Vacuum	Double PTFE V-Ring	Solid rings of molded PTFE	Jam Type	Low	Requires 2 to 4 micro-inch RMS valve plug stem finish
-84 to 260°C (-120 to 500°F)	Vacuum, All Chemicals (Except Molten Alkali)	Chesterton 324	Split rings of braided, preshrunk PTFE yarn impregnated with PTFE; can be supplied with copper rings at top and bottom of packing box to meet UOP specification 6-14-0 for acid service	Jam Type	Low	Not stocked; requires special order
-18 to 538°C (0 to 1000°F)	Water, Steam, Petroleum Products, Oxidizing Service to 371°C (700°F), Radioactive and Non-Radioactive Nuclear	Graphite Ribbon/ Filament	Ribbon-style graphite rings and rings of braided graphite fibers with sacrificial zinc washers	Jam Type	High	Low chloride content (less than 100 ppm), Chrome-plated stem not necessary for high-temperature service
371 to 649°C (700 to 1200°F)	High-Temperature Oxidizing Service	Graphite Composite	Solid rings of ribbon-style graphite with sacrificial zinc washers	Jam Type	Very High	See section on high-temperature oxidizing service

As used in tables 2, 3, and 4, square packing refers to PTFE-impregnated composition packing and Chesterton® 324 packing. Chesterton 324 packing is available either as a square packing (figure 4) or in a packing arrangement that meets UOP Specification 6-14-0 for acid service and includes copper rings at the top and bottom of the packing box.

Packing Arrangements

Fisher standard packing arrangements are available for use on all sliding-stem style valves. The packing comes in a variety of materials for specific applications (see table 1). In addition, packing materials can be ordered in three arrangements: single, double, and leak-off. A brief description of each is given below.

Single Packing Arrangements

Single packing arrangements offer an economical seal in the majority of applications. Single packing consists of a stack of packing at the top of the packing box supported by either a spring or lantern rings. Spring-type packing can be recognized as having the packing follower drawn against the bonnet to compress the spring. This type of packing is non-adjustable. Springs are not available in all alloy materials. If a special alloy is required, it may be necessary to consider packing with lantern rings.

Jam-type packing (with lantern rings) will have a gap between the packing follower shoulder and bonnet. Single packing arrangements are available in PTFE V-ring, graphite ribbon/filament, and graphite composite packings. Typically, the packing flange nuts will be tightened upon shipment. Final adjustments will normally be required to limit stem leakage as a valve is being put into service. Refer to the appropriate valve body instruction manual for recommended procedures. Single packing arrangements are listed in tables 2 and 3 and illustrated in figures 1 and 6.

Double Packing Arrangements

Double packing arrangements are available in all materials shown in table 1. Double packing arrangements provide a more rugged seal than single packing arrangements and generally have more packing above than below the lubricating connection (in some cases there is an equal amount above and below the lubricating connection). Double packing arrangements are listed in tables 2 and 3 and illustrated in figures 2, 4, and 7.

Leak-Off Packing Arrangements

Leak-off packing arrangements are specifically designed for applications that require a means of purging packing leakage without allowing the process fluid to leak through the top of the packing box. For this purpose, leak-off packing arrangements have packing below and above a bonnet leakoff connection. At least one full set of packing is below the leak-off connection (on the valve side of the connection). The packing stack above the leak-off connection is shorter than the stack below the leak-off connection. The smaller amount of packing above the leak-off connection ensures that the adjustment force applied to the packing follower is more completely transmitted to the lower set of packing without creating overcompression and excessive stem friction in the upper set. Leak-off packing arrangements are listed in table 4 and illustrated in figures 3, 5, and 8.

Some standard packing arrangements (such as double PTFE V-ring) that have packing above and below the lubricator connection are also used for leak-off applications. However, standard packing arrangements are not specifically designed for leak-off applications and do not have a suitable ratio of packing heights above and below the lubricator connection.

Body/Bonnet Availability

Single and double packing arrangements can be used on all valves that will accept the plain bonnet, the style 1 cast extension bonnet, the style 2 cast extension bonnet, the style 3 fabricated extension bonnet, or the bellows seal bonnet.

Leak-off packing arrangements require a deeper packing box than single or double arrangements. Normally, bonnets having a 1/2-inch socket-weld leak-off connection are used with leak-off packing arrangements. Valve bodies that have bonnets with this 1/2-inch socket-weld leak-off connection are shown in table 5.

Process Fluid Compatibility and Temperature Ranges

Table 1 lists packing types often used with various process fluids. Some process fluids might not be compatible with the packing throughout the entire temperature range shown.

A lower temperature of -18°C (0°F) listed in table 1, indicates that the temperature capabilities below -18°C (0°F) are unknown. When using any packing at low temperatures, frost must not be allowed to form on the valve stem. Valve stem frost can damage packing as the stem travels through the packing.

For packing box temperatures above 427°C (800°F), an extension bonnet or steel actuator yoke should be used along with high-temperature packing. When using graphite or graphite ribbon/filament packing at high temperatures, it is not necessary to have a chrome-coating on the valve stem because these packings are non-abrasive.

When using graphite packing, pitting can occur on ordinary stainless steel stems and packing box bores. To avoid this stem pitting and the packing damage that can result, it is suggested that alloy stems of N07718 or N06625 be used if either of the process conditions exists.

Lubrication

Lubrication is recommended for PTFE impregnated composition packing. Either a lubricator or lubricator/isolating valve can be used for packing lubrication (see figure 9). A good-quality silicon-base lubricant is recommended. Packing used for oxygen service or for process temperatures over 260°C (500°F) should not be lubricated.

Table 2. Standard Packing Arrangements for Fisher E(1), EH, FB, HP, YD, and YS Valves

STEM DIAMETER		YOKE BOSS DIAMETER		VALVE BODY DESIGNS	PACKING MATERIAL	PACKING ARRANGEMENT NUMBER
mm	Inch	mm	Inch			
9.5	3/8	54	2-1/8	All shown in title that are available with this stem/yoke boss combination	Single PTFE V-Ring Double PTFE V-Ring Square(2) Chesterton 324(2) Single Graphite Ribbon/Filament Double Graphite Ribbon/Filament Graphite Composite	12A8185 12A8187 12A8188 12A8189 14A3411 14A2153 12B5792
12.7	1/2	71	2-13/16	All shown in title that are available with this stem/yoke boss combination	Single PTFE V-Ring Double PTFE V-Ring Square(2) Chesterton 324(2) Single Graphite Ribbon/Filament Double Graphite Ribbon/Filament Graphite Composite	12A7811 12A7814 12A7815 12A7816 13A9775 14A1849 12B5793
19.1	3/4	90	3-9/16	All shown in title that are available with this stem/yoke boss combination	Single PTFE V-Ring Double PTFE V-Ring Square(2) Chesterton 324(2) Single Graphite Ribbon/Filament Double Graphite Ribbon/Filament Graphite Composite	12A8170 12A8172 12A8173 12A8175 13A9776 14A1780 12B5794
25.4	1	127	5	All shown in title that are available with this stem/yoke boss combination	Single PTFE V-Ring Double PTFE V-Ring Square(2) Chesterton 324(2) Single Graphite Ribbon/Filament Double Graphite Ribbon/Filament Graphite Composite	12A7837 12A7839 12A8150 12A7847 14A2340 14A3413 12B5795
31.8	1-1/4	127	5	All shown in title that are available with this stem/yoke boss combination	Single PTFE V-Ring Double PTFE V-Ring Square(2) Chesterton 324(2) Single Graphite Ribbon/Filament Double Graphite Ribbon/Filament Graphite Composite	12A8160 12A8162 12A8163 12A8164 14A3412 14A3414 12B5796
50.8	2	178	7	EH, FB	Single PTFE V-Ring Double PTFE V-Ring Single Graphite Ribbon/Filament Double Graphite Ribbon/Filament Graphite Composite	14A2185 14A4221 14A3419 14A3418 12B5797

1. Refers to all valve designations that begin with the letter "E" (i.e, EDR, EWD, etc.).
2. Square packing refers to PTFE-impregnated composition and Chesterton 324. When Chesterton 324 packing is listed separately it meets UOP Specification 6-14-0 for acid service.

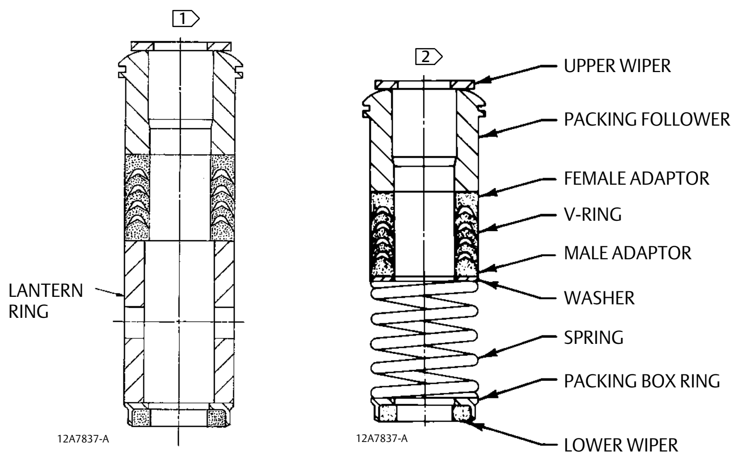
Oxygen Service

Due to the highly combustible nature of most lubricants or foreign material in the presence of liquid or gaseous oxygen, special precautions must be taken in the cleaning and handling of oxygen service equipment. Emerson Automation Solutions offers this special cleaning service for equipment ordered. Be sure to specify oxygen service when ordering packing or other equipment for this purpose.

High-Temperature Oxidizing Service

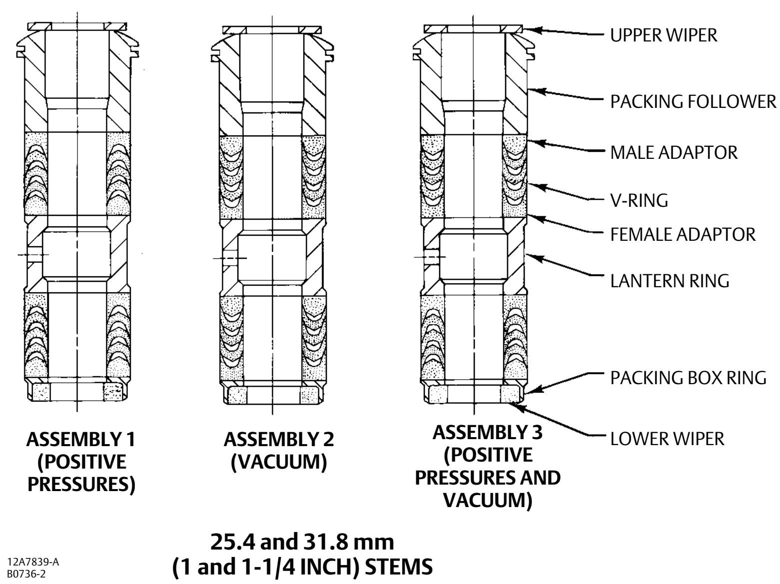
High-temperature oxidizing service, 371° to 649°C (700° to 1200°F), presents special problems in the area of stem packing because the filament rings oxidize at temperatures above 371°C (700°F). Graphite composite packing (see table 1) is used for these applications.

Figure 1. Typical Single Packing Arrangement for PTFE V-Ring Packing



NOTES:
1 USED WITH ALLOY TRIM
2 USED WITH SST TRIM

Figure 2. Typical Double Packing Arrangements for PTFE V-Ring Packing



Radiation Resistance

Graphite ribbon/filament packing is essentially impervious to radiation and is suitable for nuclear service. It will withstand gamma radiation dosages to 1.7 x 10^8 Rads and can be certified to contain no more than 100 ppm of leachable chloride.

Figure 3. Typical Leak-Off Packing Arrangements for PTFE V-Ring Packing

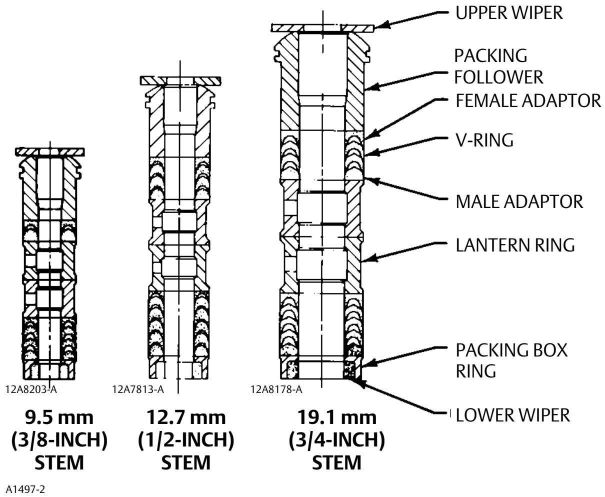


Figure 4. Typical Double Packing Arrangements for Square Packing

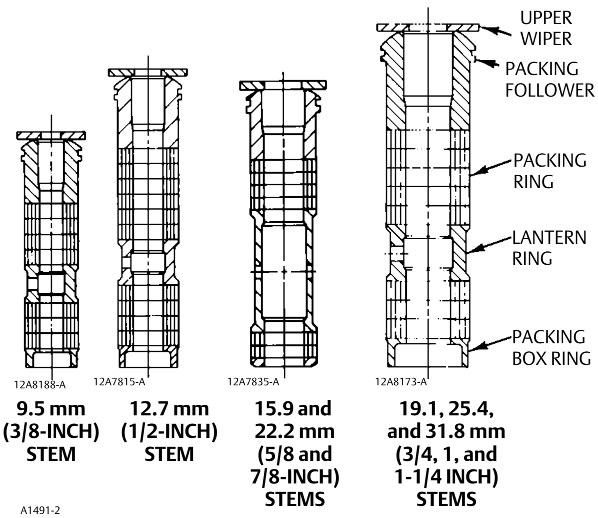


Table 3. Standard Packing Arrangements for Fisher CP, D, DA and 461 Valves

STEM DIAMETER		YOKE BOSS DIAMETER		VALVE BODY DESIGNS	EXCEPTIONS	PACKING MATERIAL	PACKING ARRANGEMENT NUMBER
mm	Inch	mm	Inch				
9.5	3/8	54	2-1/8	D, DA	- - -	Single PTFE V-Ring Double PTFE V-Ring Square(2) Double Graphite Ribbon/Filament	12A8212 12A5530 12A8214 14A2154
12.7	1/2(1)	54	2-1/8	CP	- - -	Double PTFE V-Ring (1-inch valve) Double PTFE V-Ring (1-1/2 inch valve) Single Graphite/Filament (1-inch valve) Single Graphite/Filament (1-1/2 inch valve)	14B7941 14B7942 14B7939 14B7940
		71	2-13/16	D, DA	- - -	Single PTFE V-Ring Double PTFE V-Ring Square(2)	12A7795 13A2890 12A7798
15.9	5/8	54	2-1/8	CP	- - -	Double PTFE V-Ring Single Graphite/Filament	17B7055 17B7054
19.1	3/4	90	3-9/16	D, DA, 461	- - -	Single PTFE V-Ring Square(2) Single Graphite Ribbon/Filament Double Graphite Ribbon/Filament	12A8183 12A8179 13A9776 14A3313
25.4	1(1)	90	3-9/16	CP	- - -	Double PTFE V-Ring Single Graphite/Filament	27B5506 27B5507
		127	5	D, DA	- - -	Single PTFE V-Ring Square(2)	12A7837 12A8150
				461	All Radiation Bonnets	Single PTFE V-Ring(3)	12A8157
					NPS 3 x 4 CL1500 Valve Body with Standard Bonnet	Single PTFE V-Ring	12A7837
					All Other Standard Bonnets	Single PTFE V-Ring(3) Single PTFE V-Ring(4)	12A8157 13A0119
31.8	1-1/4(1)	90	3-9/16	CP	- - -	Double PTFE V-Ring Single Graphite/Filament	27B5510 27B5511

1. Guide Post diameter for CP valves.
2. Square packing refers to PTFE-impregnated composition.
3. Spring loaded PTFE V-ring packing only.
4. PTFE V-ring packing using spacer in place of spring.

Figure 5. Typical Leak-Off Packing Arrangements for Square Packing

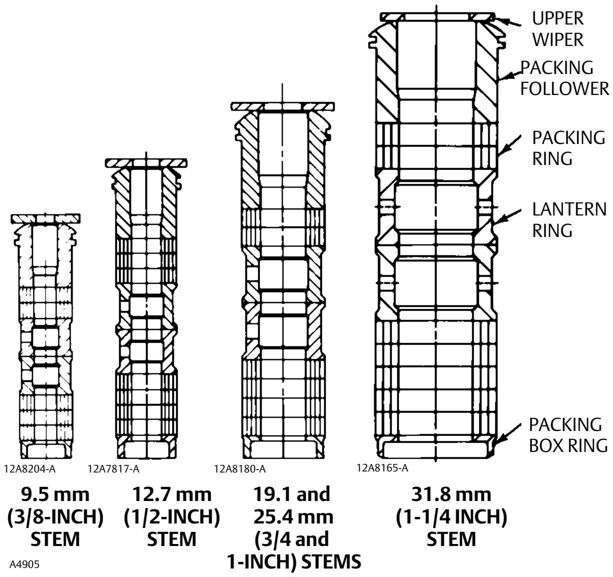
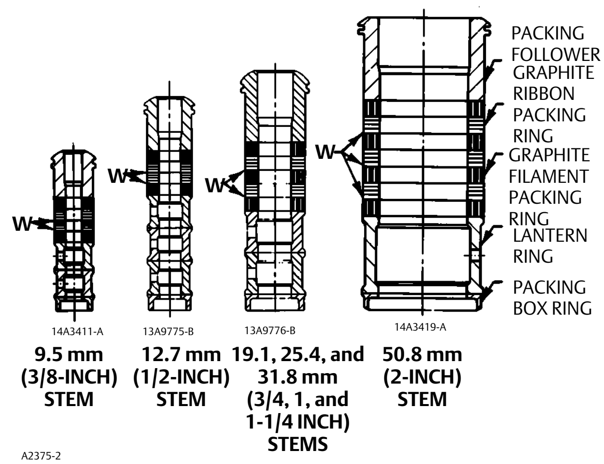


Figure 6. Typical Single Packing Arrangements for Graphite Ribbon/Filament Packing



NOTE: INSTALL SACRIFICIAL WASHERS AT PLACES MARKED "W"

Figure 7. Typical Packing Arrangements for Graphite Composite Packing

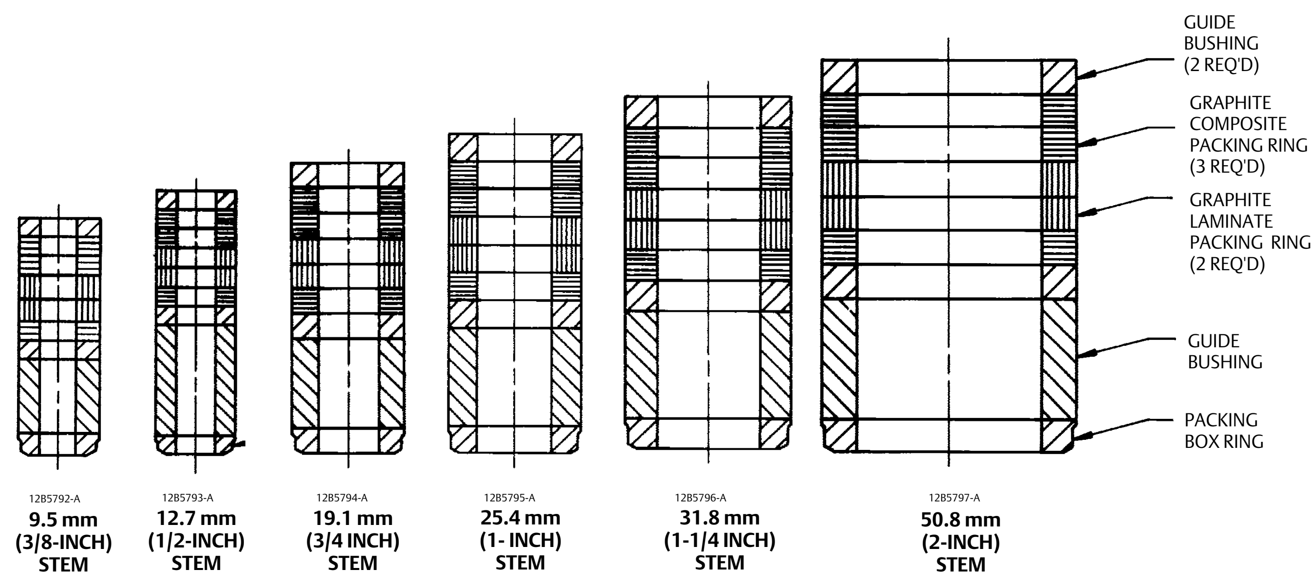
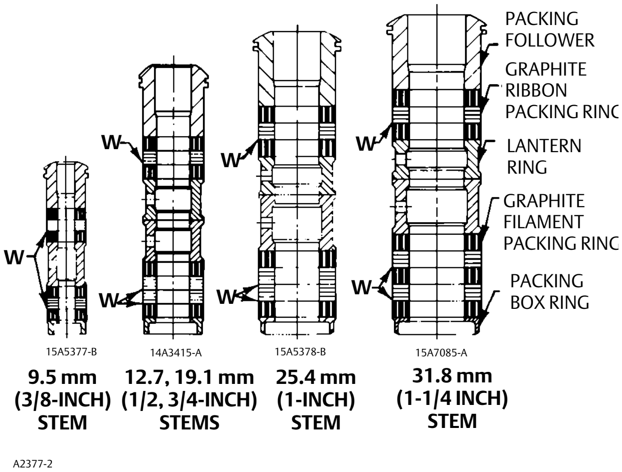


Figure 8. Typical Leak-Off Packing Arrangements for Graphite Ribbon/Filament Packing



NOTE: INSTALL SACRIFICIAL WASHERS AT PLACES MARKED “W”

Figure 9. Packing Lubricator and Lubricator/Isolating Valve

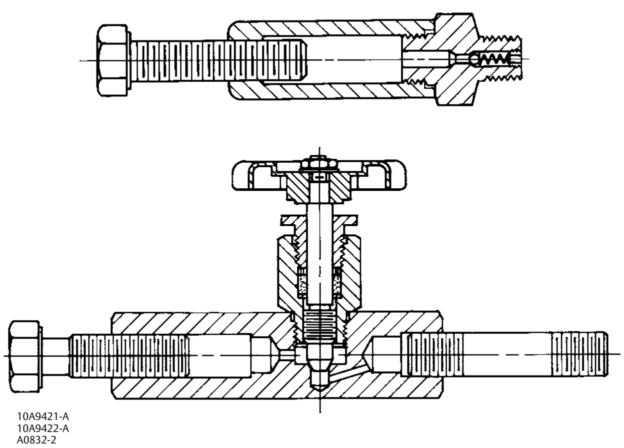


Table 4. Leak-Off Packing Arrangements

STEM DIAMETER mm	STEM DIAMETER Inch	YOKE BOSS DIAMETER mm	YOKE BOSS DIAMETER Inch	PACKING TYPE	PACKING ARRANGEMENT NUMBER
9.5	3/8	54	2-1/8	PTFE V-Ring Square(1) Graphite Ribbon/Filament	12A8203 12A8204 15A5377
12.7	1/2	71	2-13/16	PTFE V-Ring Square(1) Graphite Ribbon/Filament	12A7813 12A7817 14A2485
19.1	3/4	90	3-9/16	PTFE V-Ring Square(1) Graphite Ribbon/Filament	12A8178 12A8180 14A3415
25.4	1	127	5	PTFE V-Ring Square(1) Graphite Ribbon/Filament	15A4982 12A8154 15A5378
31.8	1-1/4	127	5	Square(1) Graphite Ribbon/Filament	12A8165 15A7085

1. PTFE-impregnated composition.

Table 5. Leak-Off Bonnets for Table 4 Arrangements

1/2-INCH SOCKET-WELD LEAK-OFF CONNECTION		
Valve Design	**Pressure Rating**	**Bonnet**
NPS 1/2 through 6 E(1) & NPS 4 x 2 through 12 x 6 EW(2)	CL150, CL300, & CL600	Style 1 Extension
NPS 8 ED, ES, & ET	CL150, CL300, & CL600	Standard or Style 1 Extension
YD & YS	CL150, CL300, & CL600	Style 1 Extension

1. EAD, EAS, EAT, ED, ES, and ET
2. EWD, EWS, and EWT.

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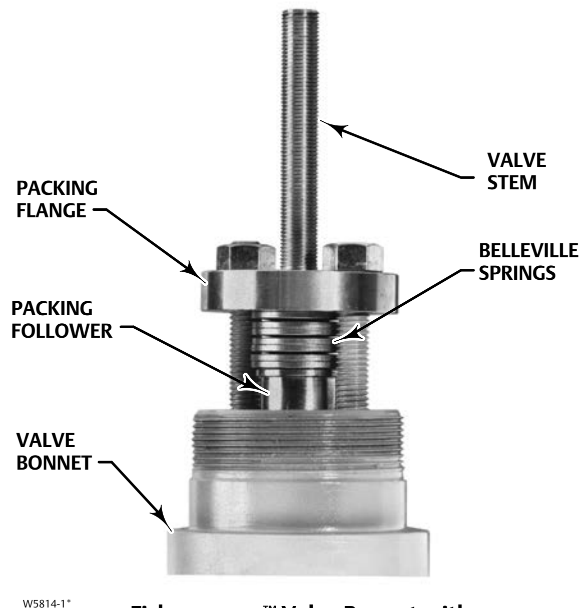
Fisher™ ENVIRO-SEAL™ and HIGH-SEAL Packing Systems for Sliding-Stem Valves (Live-Loaded)

Fisher ENVIRO-SEAL and HIGH-SEAL live-loaded packing systems offer exceptional stem sealing capabilities. These systems easily install in your existing valves or can be purchased with new valves. ENVIRO-SEAL and HIGH-SEAL packing systems help seal your process to conserve valuable process fluid and protect the environment against the emission of hazardous or polluting fluids. The long life and reliability of these systems also reduce your maintenance costs and downtime.

For process control applications requiring compliance with mandated environmental protection regulations, the unique ENVIRO-SEAL packing system and, for hazardous service, the ENVIRO-SEAL bellows seal system are offered. These packing systems keep fugitive emission concentrations below the 100 ppm (parts per million) requirement set by the federal Environmental Protection Agency (EPA).

The HIGH-SEAL packing system (figure 1) provides excellent sealing at pressure/temperature ratings beyond ENVIRO-SEAL limits.

Both ENVIRO-SEAL and HIGH-SEAL packing systems feature live-loading and unique packing-ring arrangements for consistent, long-term sealing performance. The ENVIRO-SEAL packing system is available in double PTFE, graphite ULF, and duplex configurations. The HIGH-SEAL packing system is offered without PTFE washers (graphite composite), for nuclear applications where PTFE is prohibited, and with PTFE washers (graphite ULF) for all other applications.



Fisher easy-e™ Valve Bonnet with ENVIRO-SEAL Packing Installed

Features

- Compliance with the Clean Air Act-- The excellent stem sealing of the ENVIRO-SEAL packing system (figure 1) controls emissions to below the EPA minimum of 100 ppm (parts per million). ENVIRO-SEAL packing systems provide an excellent stem seal to help prevent the loss of process fluid.
- Improved Service Life-- ENVIRO-SEAL and HIGH-SEAL packing systems, coupled with a very smooth stem surface and live-loading, give you long service life with very low maintenance. The live-loading provides a constant load over the life of the packing material. This greatly reduces or, in

many applications, helps to eliminate your need for packing box adjustment and maintenance. The installed packing system provides excellent sealing, guiding, and transmission of loading force.

- Easy Installation in Existing Valves-- All parts needed to install the systems in existing valves are available in a convenient kit.

- Adaptable to Many Applications-- ENVIRO-SEAL systems are available with PTFE, Graphite ULF, or Duplex packing for 9.5 through 31.8 mm (3/8 through 1-1/4 inch) diameter valve stems on CL125 through CL600 valves. HIGH-SEAL systems with Graphite ULF packing are available for 9.5 through 50.8 mm (3/8 through 2 inch) diameter valve stems on CL600 through CL2500 valves. Standard ENVIRO-SEAL PTFE packing systems can be used in vacuum service with packing rings in the standard orientation. It is not necessary to reverse the PTFE packing rings.

Lubrication Recommendations for ENVIRO-SEAL Packing Systems

Do not lubricate ENVIRO-SEAL packing components or the bonnet bore prior to assembly. Lubrication is often used as part of standard valve assembly techniques. However, lubrication is not required for the ENVIRO-SEAL packing systems.

Lubrication **is required** for the packing studs and nuts. While it is important to properly lubricate the stud threads and internal nut threads, it is also important to properly lubricate the contacting face of the nut.

ENVIRO-SEAL Duplex and H2 Duplex Packing Systems

ENVIRO-SEAL Duplex

ENVIRO-SEAL Duplex packing systems (figure 1) are available for Fisher sliding-stem valves with valve stem diameters ranging from 9.5 to 31.8 mm (3/8 to 1-1/4 inches). See table 2 for a list of applicable product types and stem diameters.

ENVIRO-SEAL Duplex packing systems were developed, utilizing the benefits of both PTFE and graphite components. These special packing systems provide the capability of graphite packing along with low friction advantages of PTFE packing. Thus, ENVIRO-SEAL Duplex packing systems provide a low friction, low emission, fire-tested solution for applications with process temperatures below 232°C (450°F). ENVIRO-SEAL Duplex packing systems were tested in accordance with API Standard 589, “Fire Test Evaluation of Valve Stem Packing”, first edition.

ENVIRO-SEAL H2 Duplex

ENVIRO-SEAL H2 Duplex packing systems (figure 1) were developed for high pressure applications requiring low emission performance at pressures up to 138 bar (2000 psig) and temperatures up to 149°C (300°F). ENVIRO-SEAL H2 Duplex packing systems are available for Fisher sliding-stem valves with valve stem diameters ranging from 12.7 to 31.8 mm (1/2 to 1-1/4 inches). See table 3 for a list of applicable product types and stem diameters.

ENVIRO-SEAL Packing System Specifications

Applicable Sliding-Stem Valve Designs and Stem Diameters

See tables 1, 2, and 3

Pressures and Temperatures(1)

See bulletin 59.1:062, Packing Selection Guidelines for Sliding-Stem Valves, D101986X012.

Construction Materials

PTFE Packing Systems:
Packing Ring and Lower Wiper: PTFE V-ring(2)
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Optional Male and Female Adaptor Rings: Glass-filled PTFE V-ring

Graphite ULF Packing Systems:
Packing Rings: Graphite
Anti-Extrusion Washer: Filled PTFE (not required for graphite packing)
Lantern Ring: S31600 (316 stainless steel) (not required for graphite packing)
Packing Box Flange: S31600
Spring: N07718
Packing Follower: S31600 lined with carbon-filled PTFE
Packing Box Studs: Strain-hardened 316 stainless steel
Packing Box Nuts: 316 stainless steel SA194 Grade 8M

1 The pressure/temperature limits in this bulletin, in the valve bulletin, and any applicable code or standard limitation, should not be exceeded.
2. In vacuum service, it is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.

HIGH-SEAL Packing System Specifications

Applicable Sliding-Stem Valve Designs

CL600: ■ easy-e(1), ■ YD, and ■ YS
CL1500: ■ CAV4, ■ HPD, ■ HPS, and ■ HPT
CL2500: ■ EHD, ■ EHS, ■ EHT, ■ HPD, ■ HPS, and ■ HPT

Applicable Stem Diameters

Millimeters: ■ 9.5, ■ 12.7, ■ 19.1, ■ 25.4, ■ 31.8, and ■ 50.8

Inches: ■ 3/8, ■ 1/2, ■ 3/4, ■ 1, ■ 1-1/4, and ■ 2

Maximum Pressures and Temperatures(2)

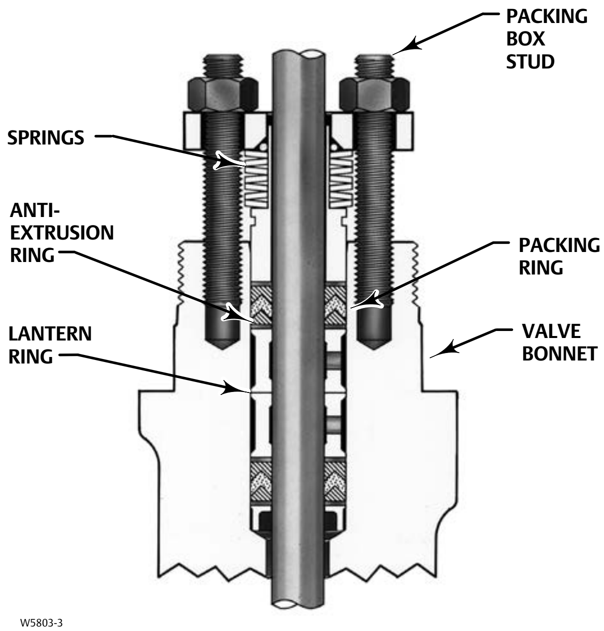
See bulletin 59.1:062, Packing Selection Guidelines for Sliding-Stem Valves, D101986X012.

Construction Materials

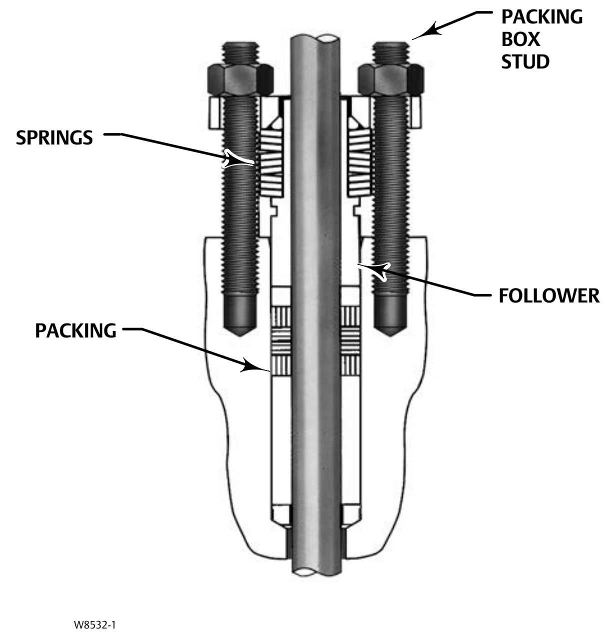
Packing Rings: Carbon/graphite composition, graphite, and zinc
Packing Box Bushing: Graphite
Packing Box Flange, Studs, and Nuts: S31600 (316 stainless steel) (other materials are available on request)
Springs: ■ S17700 (17-7 stainless steel) or ■ N07718

1. easy-e includes ED, ES, ET, EW, and EZ valves.
2. The pressure/temperature limits in this bulletin, in the valve bulletin, and any applicable code or standard limitation, should not be exceeded.

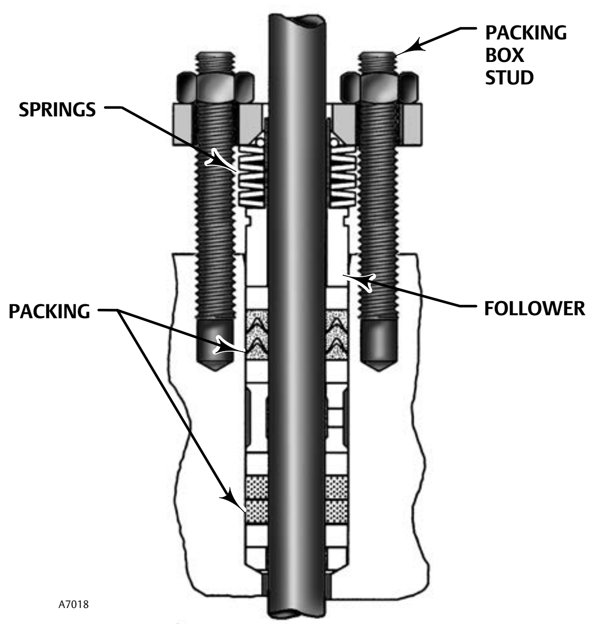
Figure 1. Fisher ENVIRO-SEAL and HIGH-SEAL Packing Systems



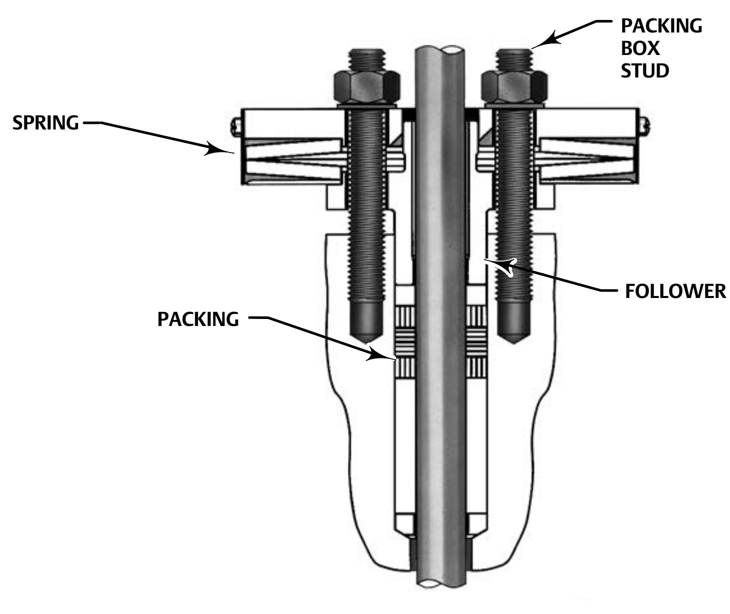
TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH PTFE PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM
WITH DUPLEX PACKING



TYPICAL HIGH-SEAL PACKING SYSTEM
WITH GRAPHITE ULF PACKING

Table 1. Sliding-Stem Product Availability for Fisher ENVIRO-SEAL PTFE and Graphite ULF Packing Systems

VALVE TYPE	STEM DIAMETER, mm (INCHES)					STEM DIAMETER, mm		
	9.5 (3/8)	12.7 (1/2)	19.1 (3/4)	25.4 (1)	31.8 (1-1/4)	10 mm	14 mm	19 mm
A	X	X	X	X	X	---	---	---
CAV4	---	---	X	X	X	---	---	---
D	---	X	---	---	---	---	---	---
DA	---	X	---	---	---	---	---	---
DBQ	---	X	X	X	X	---	---	---
DBQ-NS	---	X	---	---	---	---	---	---
easy-e (ED, ES, ET, EZ, EW)	X	X	X	X	X	---	---	---
E-NS	---	X	---	---	---	---	---	---
EH	---	X	X	X	X	---	---	---
ENA	---	---	---	---	X	---	---	---
ET-C	---	X	X	X	---	---	---	---
EWT-C	---	X	X	X	---	---	---	---
EZ-C	X	X	X	---	---	---	---	---
FB	---	---	---	X	X	---	---	---
GX	---	---	---	---	---	X	X	X
GX 3-Way	---	---	---	---	---	X	X	---
HP	---	X	X	X	X	---	---	---
HS	---	X	X	X	---	---	---	---
SS-79	---	---	X	---	---	---	---	---
SS-83	---	---	X	X	X	---	---	---
SS-85	---	X	---	---	---	---	---	---
SS-95	---	X	---	---	---	---	---	---
SS-98	---	---	---	X	---	---	---	---
YD	X	X	X	X	X	---	---	---
YS	X	X	X	X	X	---	---	---

Table 2. Sliding-Stem Product Availability for Fisher ENVIRO-SEAL Duplex Packing

VALVE TYPE	STEM DIAMETER, mm (INCHES)				
	9.5 (3/8)	12.7 (1/2)	19.1 (3/4)	25.4 (1)	31.8 (1-1/4)
A	X	X	X	X	X
DBQ	---	X	X	X	X
easy-e (ED, ES, ET, EZ, EW)	X	X	X	X	X
EH	---	X	X	X	X
FB	---	---	---	X	X
HP	---	X	X	X	X
HS	---	X	X	X	---
SS-83	---	---	X	X	X
YD	X	X	X	X	X
YS	X	X	X	X	X

Figure 2. Fisher ENVIRO-SEAL H2 Duplex Packing System

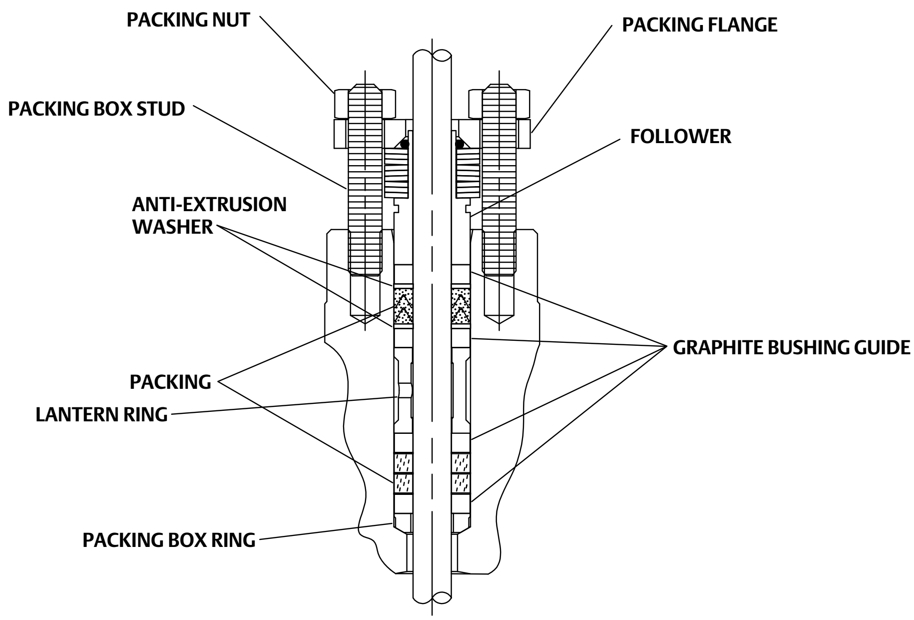


Table 3. Sliding-Stem Product Availability for Fisher ENVIRO-SEAL H2 Duplex Packing

VALVE TYPE	STEM DIAMETER, mm (INCHES)			
	12.7 (1/2)	19.1 (3/4)	25.4 (1)	31.8 (1-1/4)
A	X	X	X	X
DBQ	X	X	X	X
easy-e (ED, ES, ET, EZ, EW)	X	X	X	X
EH	X	X	X	X
FB	- - -	- - -	X	X
HP	X	X	X	X
HS	X	X	X	- - -
SS-83	- - -	X	X	X
YD	X	X	X	X
YS	X	X	X	X

Figure 3. Applications Guidelines Chart for 100 PPM Service

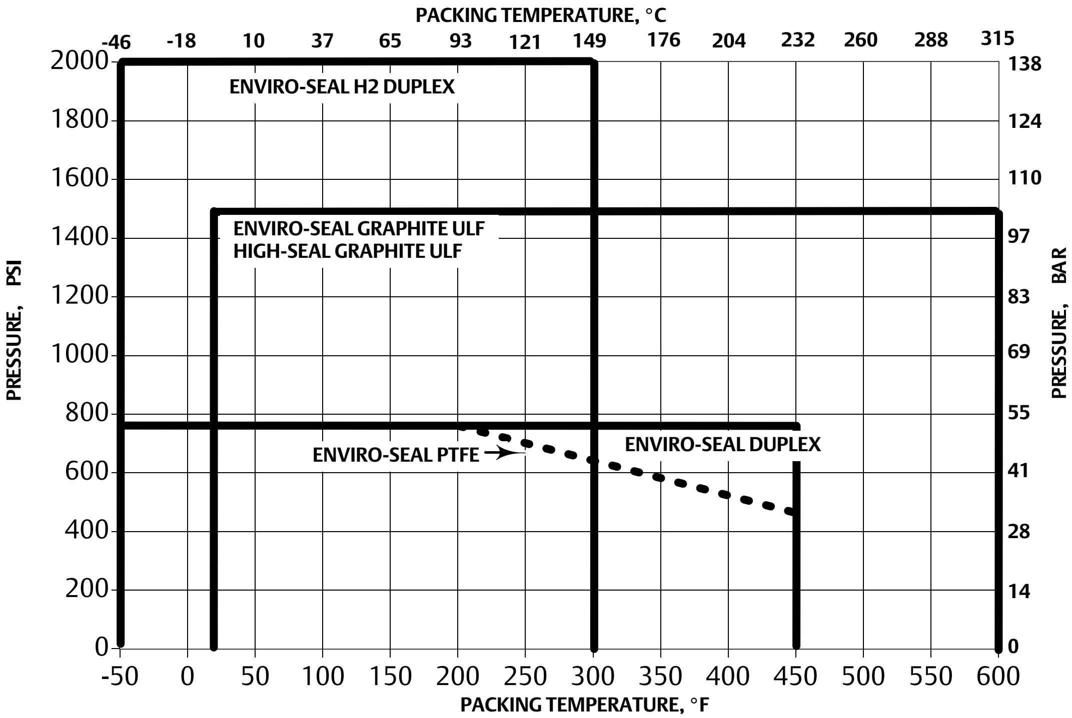
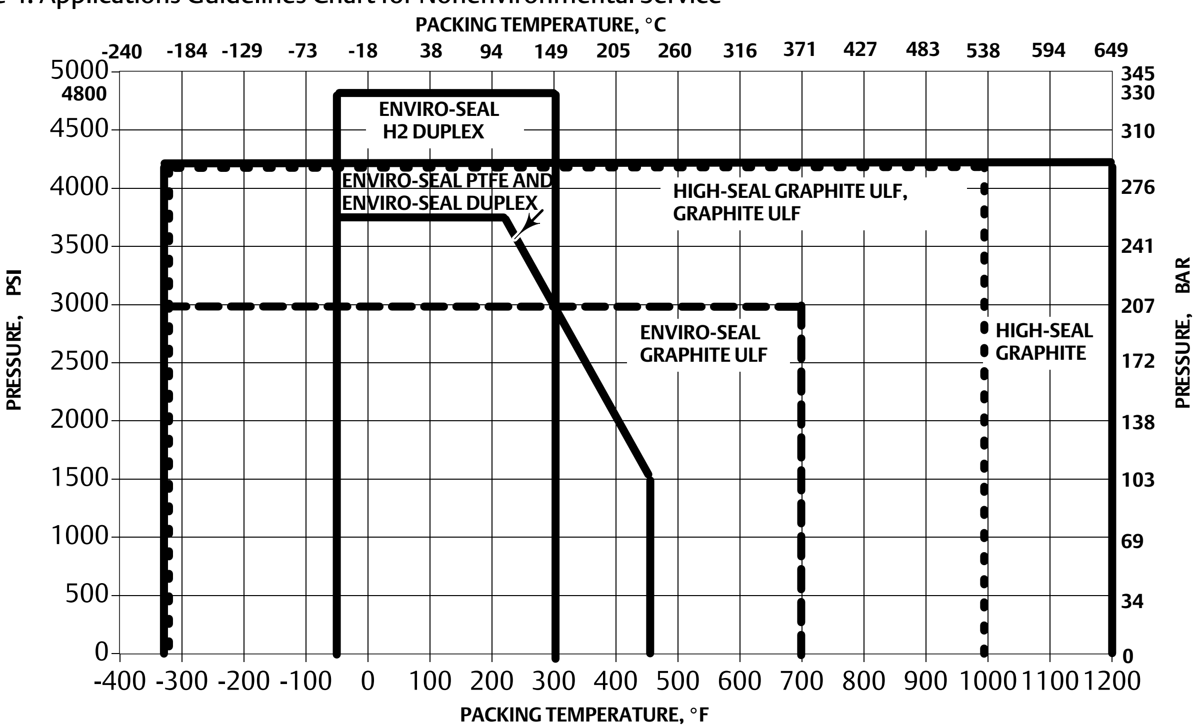


Figure 4. Applications Guidelines Chart for Nonenvironmental Service



Ordering Information

When ordering, specify:

For Existing Valves

1. Process fluid

2. Process fluid temperature

3. Maximum valve inlet pressures

4. Maximum valve pressure drops

5. Valve design (ED, YD, etc.), size, and pressure rating

6. Valve stem diameter and bonnet type (plain, extension, or bellows)

7. Refer to the specifications. Review the information under each specification. Write down your choice whenever a selection is to be made.

For New Valves

1. Refer to the valve bulletin for ordering information.

2. Also refer to the specifications. Review the information under each specification and in the referenced tables; write down your choice whenever there is a selection to be made.

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Packing Selection Guidelines for Fisher™ Sliding-Stem Valves

This bulletin provides information and insight to help you select Fisher packing systems properly. The following application guidelines have been developed to aid in the packing selection process. It is important to note that these guidelines were developed based on the results of numerous tests on various packing systems conducted in the Emerson ™ laboratory. Exceeding these guidelines might result in reduced service life.

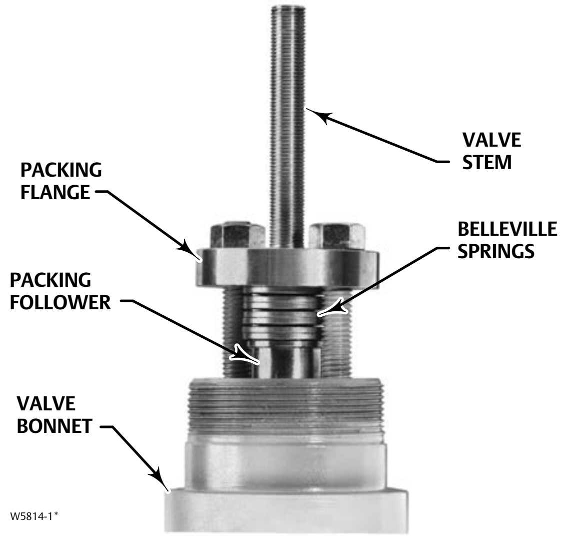
The traditional valve selection process includes selecting a valve design based on pressure and temperature capabilities, flow characteristics, material compatibility, and other factors. One such major factor is packing selection, which has gained significant attention over the years due to stringent environmental and safety concerns.

Proper packing selection is being driven by USA Clean Air Act Amendments and subsequent EPA (Environmental Protection Agency) regulations, as well as our customers' increasing concern for improved packing performance (less maintenance and longer life). Seal performance continues to be a focus item.

In the past, packing selection was primarily based on process temperature; that is, PTFE was selected for temperatures below 232°C (450°F) and graphite was selected for temperatures above 232°C (450°F). Considerations now include the effect of packing friction on process control, hysteresis, seal quality, and cycle life. Given the variety of process applications and installation conditions, these variables are difficult to quantify. A relative packing performance comparison can be made that provides an engineered approach to the packing selection process.

Clarification of trade names is required for proper understanding of the tables shown in this bulletin. From an Emerson engineering perspective, ENVIRO-SEAL packing (figure 1) is defined as an advanced packing system using a "compact", live-load spring design. From a user perspective, ENVIRO-SEAL packing is most typically thought of as an emission-reducing packing system. The HIGH-SEAL packing system is used in those applications having extreme pressures and temperatures. HIGH-SEAL packing uses two "large" live-load springs.

Figure 1. Fisher easy-e™ Valve Bonnet with ENVIRO-SEAL™ Packing



This bulletin will help extend your thinking of ENVIRO-SEAL packing as being suitable not only for those applications where the control of fugitive emissions is a requirement, but also for nonenvironmental applications involving higher temperatures and pressures. The use of ENVIRO-SEAL packing in nonenvironmental applications offers the benefit of lower ongoing maintenance costs.

Table 1. Fisher Packing Selection Guidelines for Sliding-Stem Valves

Packing System	Maximum Pressure and Temperature Limits for 100 PPM Service(1)		Application Guideline for Nonenvironmental Service(1)		Seal Performance Index	Service Life Index	Packing Friction (2)
	Metric	Imperial	Metric	Imperial			
Single PTFE V-Ring	20.7 bar -18 to 93°C	300 psi 0 to 200°F	See figure 3 -46 to 232°C	See figure 3 -50 to 450°F	Better	Long	Very low
Double PTFE V-Ring	- - -	- - -	See figure 3 -46 to 232°C	See figure 3 -50 to 450°F	Better	Long	Low
ENVIRO-SEAL PTFE	See figure 2 -46 to 232°C	See figure 2 -50 to 450°F	See figure 3 -46 to 232°C	See figure 3 -50 to 450°F	Best	Very long	Low
ENVIRO-SEAL Duplex	51.7 bar -46 to 232°C	750 psi -50 to 450°F	See figure 3 -46 to 232°C	See figure 3 -50 to 450°F	Best	Very long	Low
ENVIRO-SEAL H2 Duplex	138 bar -46 to 149°C	2000 psi -50 to 300°F	330 bar -46 to 149°C	4800 psi -50 to 300°F	Best	Very long	Medium
KALREZ® with Vespel® CR-6100 (KVSP 500)(3)	24.1 bar 4 to 260°C	350 psig 40 to 500°F	See figure 3 -40 to 260°C	See figure 3 -40 to 500°F	Best	Long	Low
ENVIRO-SEAL Graphite ULF	103 bar -7 to 315°C	1500 psi 20 to 600°F	207 bar -198 to 371°C	3000 psi -325 to 700°F	Best	Very long	Medium
HIGH-SEAL Graphite ULF	103 bar -7 to 315°C	1500 psi 20 to 600°F	290 bar(4) -198 to 538°C	4200 psi(4) -325 to 1000°F	Best	Very long	Medium
Graphite Composite / HIGH-SEAL Graphite	- - -	- - -	290 bar(4) -198 to 649°C	4200 psi(4) -325 to 1200°F	Better	Very long	Very high
Braided Graphite Filament	- - -	- - -	290 bar -198 to 538°C(5)	4200 psi -325 to 1000°F(5)	Good	Moderate	High
Graphite ULF	- - -	- - -	290 bar -198 to 538°C	4200 psi -325 to 1000°F	Better	Very long	Medium

1. The values shown are only guidelines. These guidelines can be exceeded, but shortened packing life or increased leakage might result. The temperature ratings apply to the actual packing temperature, not to the process temperature.
2. See Fisher Catalog 14 for actual friction values.
3. The KALREZ pressure/temperature limits referenced in this bulletin are for Fisher valve applications only. DuPont may claim higher limits.
4. Except for the 9.5 mm (3/8 inch) stem, 110 bar (1600 psi).
5. Except for oxidizing service, -198 to 371°C (-325 to 700°F).

Figure 2. Applications Guidelines Chart for 100 PPM Service

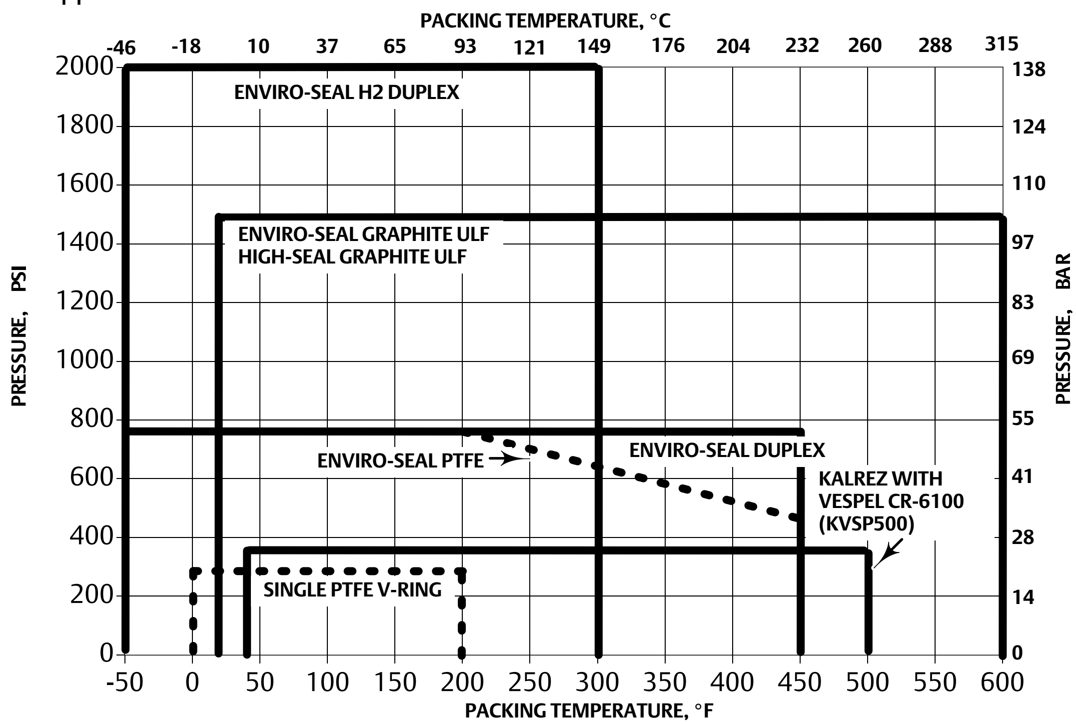
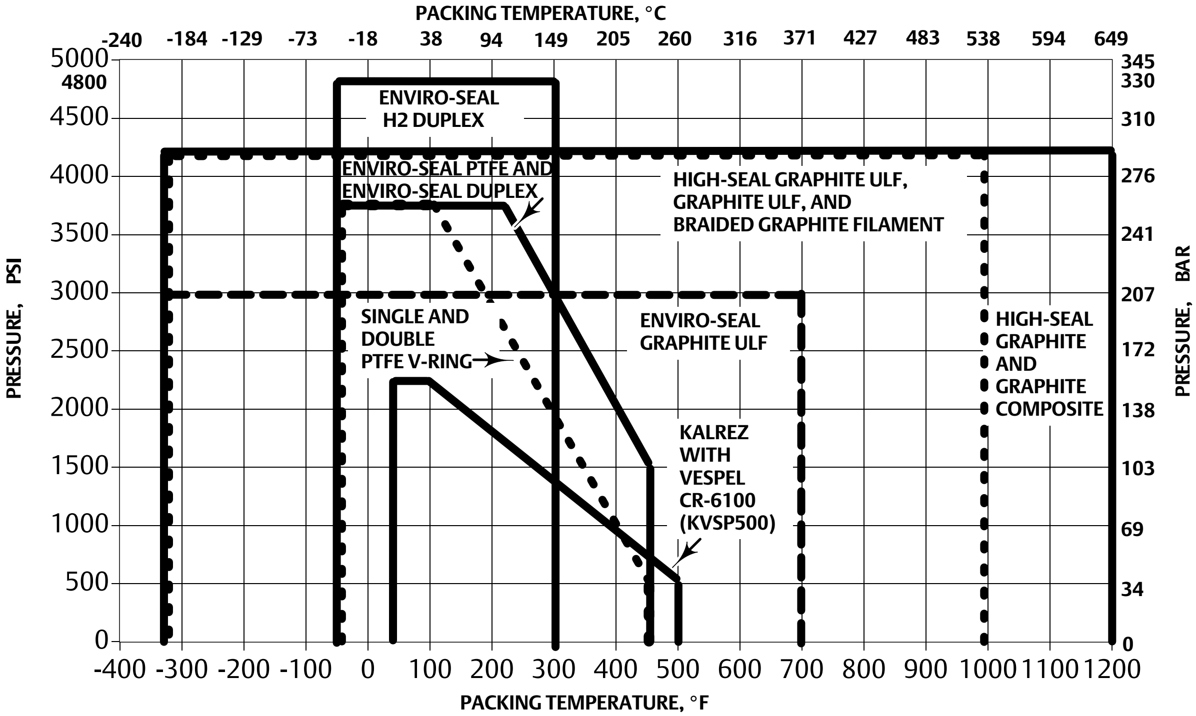


Figure 3. Applications Guidelines Chart for Nonenvironmental Service



The packing selection guidelines in table 1 present two categories of service conditions. The first category defines packing systems designed for environmental or fugitive emission applications where 100 ppmv (parts per million volume) seal performance is required, using EPA Method 21 per ANSI/FCI 91-1 as the measurement technique (see figure 2). The second category defines application guidelines for nonenvironmental services (see figure 3). Depending on category requirements, different pressure/temperature guidelines have been established for the packing systems. In addition, a given packing design has certain characteristics concerning seal performance, service life, and friction. The pressure and temperature guidelines and the relative comparison of these characteristics are defined in table 1, figure 2, and figure 3.

Extension bonnets can be used to extend temperature capability. Reference applicable product bulletin for bonnet selection options/guidelines.

Packing selections are offered for environmental service: Single PTFE V-ring (easy-e valves such as ED and EWT), ENVIRO-SEAL PTFE, ENVIRO-SEAL Duplex, ENVIRO-SEAL H2 Duplex, KALREZ with Vespel CR-6100, ENVIRO-SEAL graphite ULF, and HIGH-SEAL graphite ULF. Each of these options has different pressure/temperature service ranges.

Single PTFE V-Ring Packing

The single PTFE V-ring arrangement uses a coil spring, as in the easy-e valves, and meets the 100 ppmv criteria, assuming that the pressure does not exceed 20.7 bar (300 psi) and the temperature is between -18°C and 93°C (0°F and 200°F). This packing arrangement offers very good seal performance with the lowest packing friction.

ENVIRO-SEAL PTFE Packing

The ENVIRO-SEAL PTFE arrangement is suitable for environmental applications on services up to 51.7 bar and 232°C (750 psi and 450°F). The sealing capability is excellent. The ENVIRO-SEAL PTFE packing system is designed to operate at high stress. This gives the ENVIRO-SEAL PTFE packing system the ability to compensate for stem or packing bore imperfections. The high packing stress design approach also results in an increase in stem friction. Typically, this slight increase in stem friction does not cause problems, such as hysteresis, for actuator sizing or process control. It is good practice, however, to always verify actuator sizing whenever you select a different packing material. Carbon-filled PTFE or glass-filled PTFE adaptor rings can be selected for process compatibility.

ENVIRO-SEAL Duplex Packing

ENVIRO-SEAL Duplex packing systems were developed, utilizing the benefits of both PTFE and graphite components. These special packing systems provide the capability of graphite packing along with low friction advantages of PTFE packing. Thus, ENVIRO-SEAL Duplex packing systems provide a low friction, low emission, fire-tested solution for applications with process temperatures below 232°C (450°F). ENVIRO-SEAL Duplex packing systems were successfully tested in accordance with API Standard 589, Fire Test Evaluation of Valve Stem Packing, first edition.

ENVIRO-SEAL H2 Duplex Packing

ENVIRO-SEAL H2 Duplex packing is designed for high pressure applications that require low emissions performance. This packing set uses a PTFE packing set with carbon-reinforced packing adaptors enveloped between both anti-extrusion washers and close-fit graphite bushing guides to provide three modes of anti-extrusion protection. It is suitable for environmental service up to 138 bar (2000 psig) and 149°C (300°F).

KALREZ with Vespel CR-6100 Packing

The KALREZ pressure/temperature limits referenced in this bulletin are for Fisher valve applications only. DuPont may claim higher limits.

KALREZ packing is available in KVSP-500 (260°C [500°F] service). The KVSP-500 series uses DuPont material called Vespel CR-6100, which is a carbon fiber-reinforced PTFE.

KALREZ is currently available for Fisher sliding-stem valves with 9.5, 12.7, 19.1, 25.4, and 31.8 mm (3/8, 1/2, 3/4, 1-, and 1-1/4 inch) diameter stems. The system can be used with many sliding-stem valves, as shown in the KALREZ System--Sliding-Stem Valves instruction manual, D102136X012. KALREZ packing arrangements are also available for various Fisher rotary valves (see Fisher bulletin 59.3:042, Packing Selection Guidelines for Rotary Valves, D102093X012).

Note that KALREZ packing arrangements require that a controlled low stress be applied to the packing in order to seal properly and also have a long life. This is achieved by using the same spring pack as ENVIRO-SEAL, but with a lower initial loading.

In contrast, the ENVIRO-SEAL PTFE packing system is designed to operate at high stress (approximately 5 times the KALREZ stress). This gives the ENVIRO-SEAL PTFE packing system the ability to tolerate less-than-perfect conditions and continue to seal reliably. For example, in changing installed valves to ENVIRO-SEAL PTFE packing, minor imperfections in the stem finish or packing bore can be tolerated because of the high stress design of the packing system.

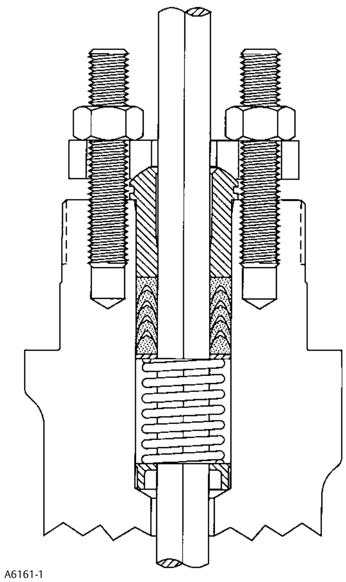
ENVIRO-SEAL Graphite ULF

ENVIRO-SEAL graphite ULF packing is designed primarily for environmental applications at elevated temperatures in excess of 232°C (450°F). It has a full temperature rating of -7°C to 316°C (20°F to 600°F) and still maintains the 100 ppmv leakage criteria. For best performance the service temperature should be a least 149°C (300°F). At temperatures below 149°C (300°F), packing wear may be accelerated compared to higher temperatures.

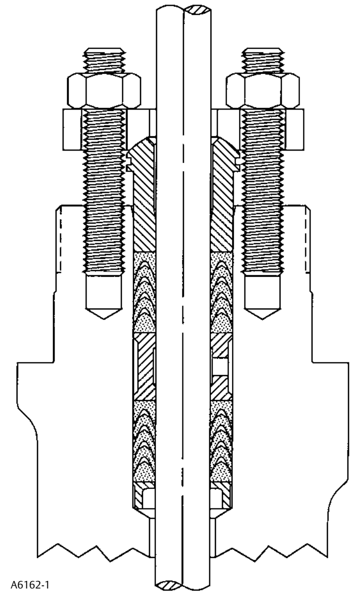
Compared to PTFE packing systems, graphite packing systems operate at higher stress levels and have higher friction values for a given level of sealing. To combat this, most graphite systems incorporate a small amount of PTFE which acts primarily as a lubricant.

The ULF packing system, however, incorporates very thin PTFE layers inside the packing rings as well as thin PTFE washers placed on each side of the packing rings. This strategic placement of PTFE material minimizes control problems (such as slip-stick action), reduces friction, promotes sealing, and extends the cycle life of the packing set. (With slip-stick action, packing friction prevents the valve stem from moving until stem force increases enough to make the stem move suddenly.) While the PTFE components of the ULF packing set are critical to the overall performance of the packing set, they make up a very small volumetric percentage of the ULF packing set and therefore do not require additional follower travel. The ULF packing system has remarkably low stem friction at elevated temperatures, compared to other graphite packing systems. ENVIRO-SEAL Graphite ULF packing systems were successfully tested in accordance with API Standard 589, Fire Test Evaluation of Valve Stem Packing, second edition.

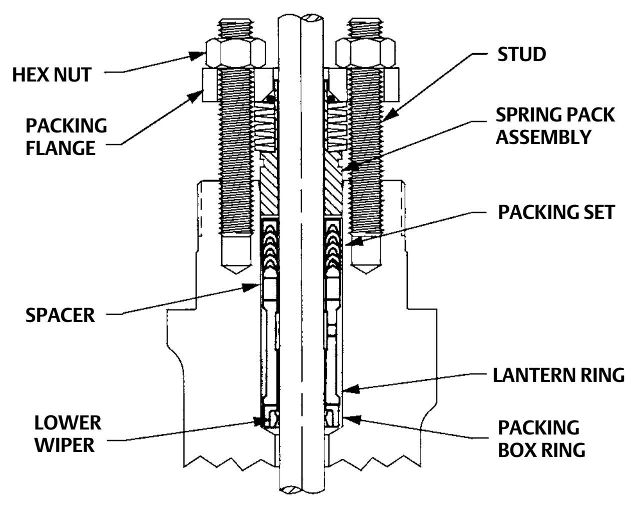
Figure 4. Typical Fisher Packing Examples



SINGLE PTFE V-RING



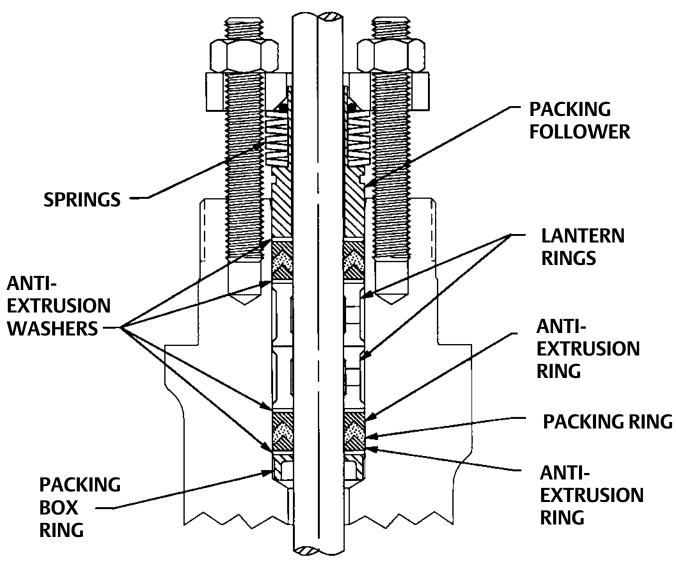
DOUBLE PTFE V-RING



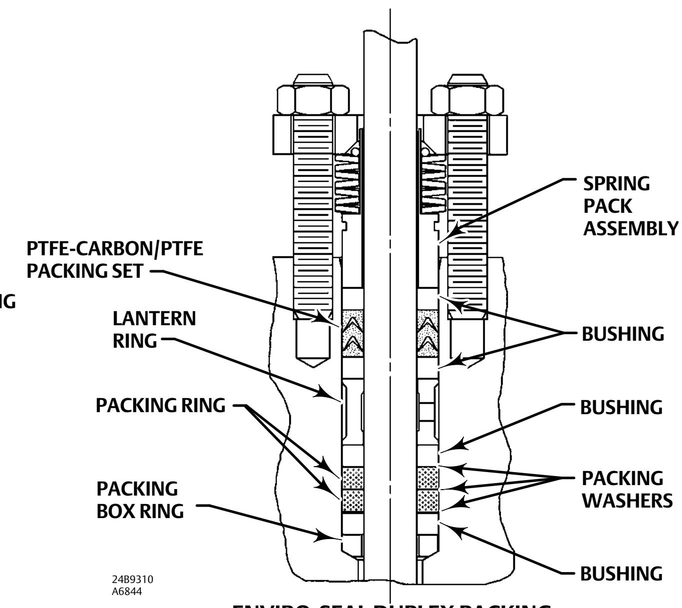
KALREZ PACKING ASSEMBLY

Note: Leak-off tapping and pipe plug are optional.

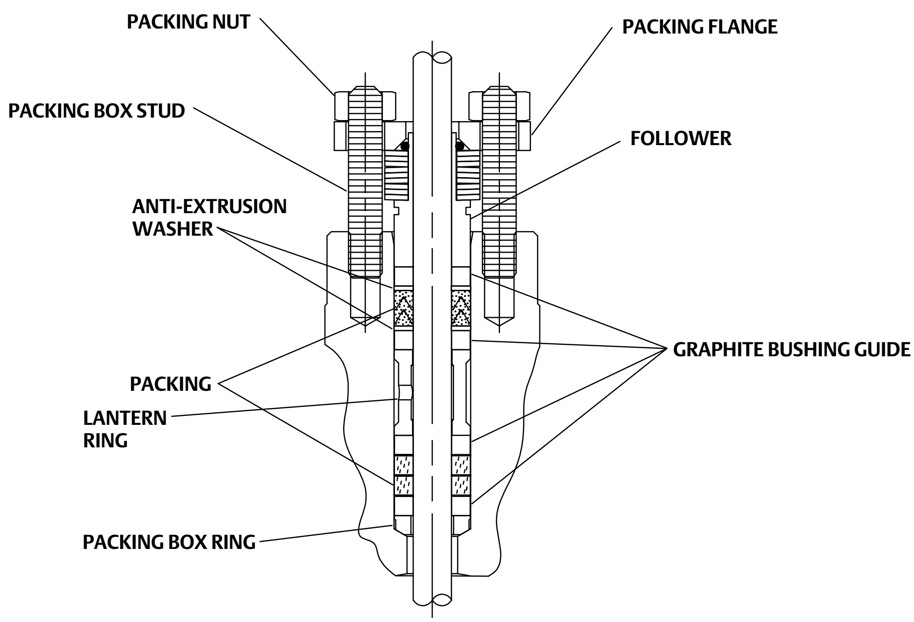
Figure 4. Typical Fisher Packing Examples (continued)



ENVIRO-SEAL PTFE



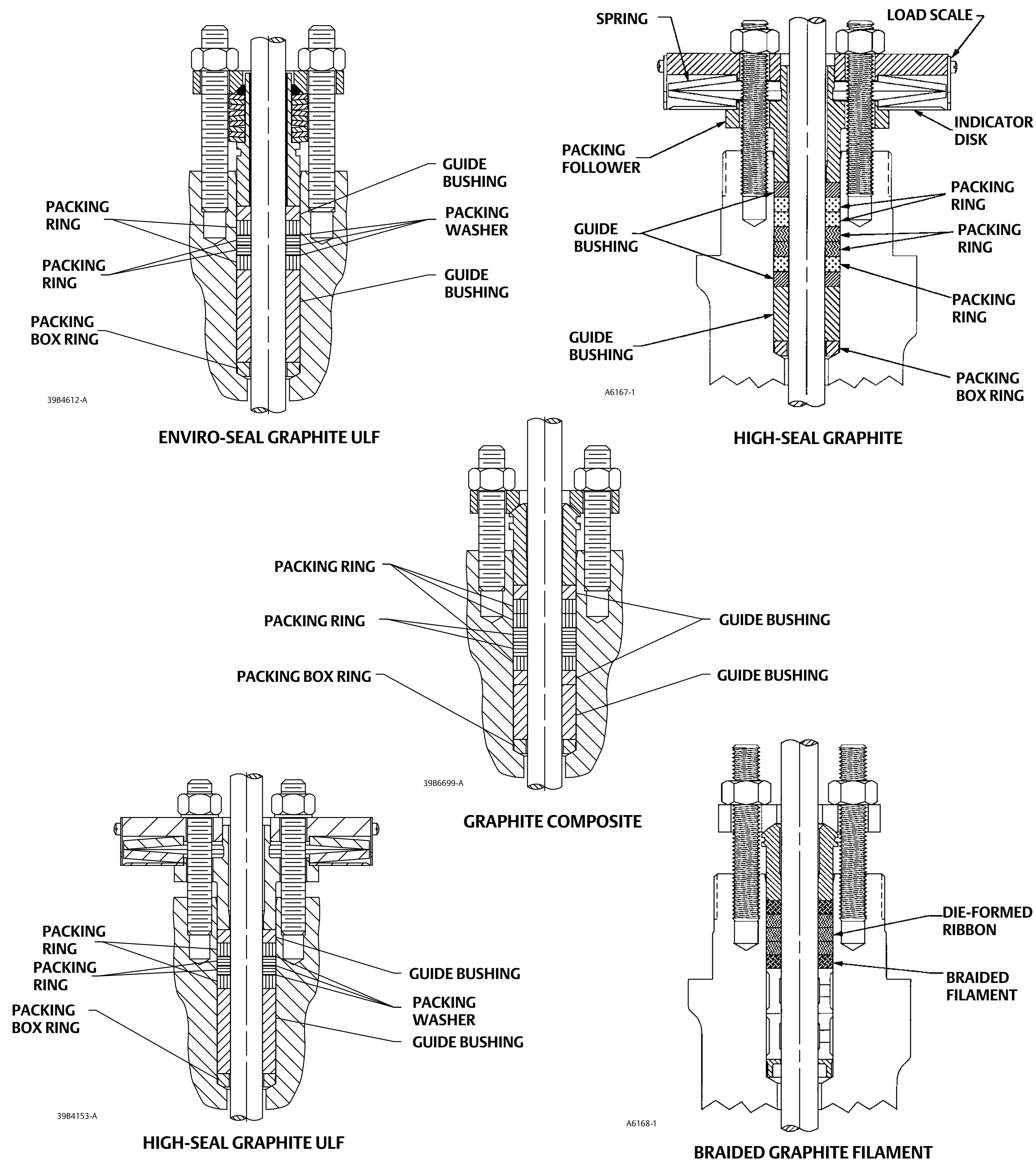
ENVIRO-SEAL DUPLEX PACKING



ENVIRO-SEAL H2 DUPLEX PACKING

Note: Leak-off tapping and pipe plug are optional.

Figure 5. Typical Fisher Packing Examples



Note: Leak-off tapping and pipe plug are optional.

HIGH-SEAL Graphite ULF

The HIGH-SEAL graphite ULF packing system is identical to the ENVIRO-SEAL graphite ULF packing system below the packing follower. The primary advantage of the HIGH-SEAL packing system is the use of large diameter Belleville springs. These heavy duty springs offer additional follower travel and can be calibrated with a load scale. The load scale provides a visual indication of packing load as well as packing wear, making it easier for you to determine when additional torquing might be required.

For ENVIRO-SEAL or HIGH-SEAL graphite ULF packing, the service life is very long, compared to other graphite packing arrangements. Both offer excellent seal performance. The ULF packing system has remarkably low stem friction at elevated temperatures, compared to other graphite packing systems.

Non-environmental Services

For the non-environmental pressure/temperature guidelines, service life can be extended by using ENVIRO-SEAL and HIGH-SEAL packing systems. As service pressures and temperatures increase, the ENVIRO-SEAL packing systems provide a significant step change in performance, compared to the traditional single PTFE V-ring or braided graphite filament arrangements. For example, a CL1500 (HP valve) application at 138 bar and 93°C (2000 psi and 200°F) frequently required packing maintenance. The HIGH-SEAL packing system with PTFE washers was installed, significantly reducing maintenance requirements. This system is rated to 290 bar and 371°C (4200 psi and 700°F). The ENVIRO-SEAL packing system or compact Belleville spring arrangement is rated to 207 bar and 371°C (3000 psi and 700°F).

HIGH-SEAL packing systems have a disadvantage, from an installation perspective. The disadvantage is that the actuator cannot be removed from the valve without removing the Belleville springs. You must release process pressure from the valve before removing the Belleville springs.

Table 1 shows that the braided graphite filament arrangement is limited to 103 bar (1500 psi). Due to its construction, braided graphite filament cannot sustain high packing stress levels. Over time, the braided graphite filament will break down and compress, and sealing force will be lost. Due to these characteristics, braided graphite filament will not provide the required seal performance for environmental services. The braided graphite filament arrangement is also susceptible to stick-slip action, which might cause process control deviations.

Conclusion

It is important to recognize that many parameters affect seal performance and service life. Even if the optimum design is selected, other factors such as stem finish, packing bore finish, and job site installation practices will have an effect on performance.

Emerson knowledge gained, as a result of the ENVIRO-SEAL and HIGH-SEAL packing development program, has provided an opportunity to help you "engineer" the packing selection. Proper selection has a bottom line result; that is, increased service life and reduced maintenance.

If you need a more detailed engineering discussion of the design principles affecting packing seal design, contact your Emerson sales office. They can provide you a copy of Technical Monograph TM-38, Control Valve Packing Systems.

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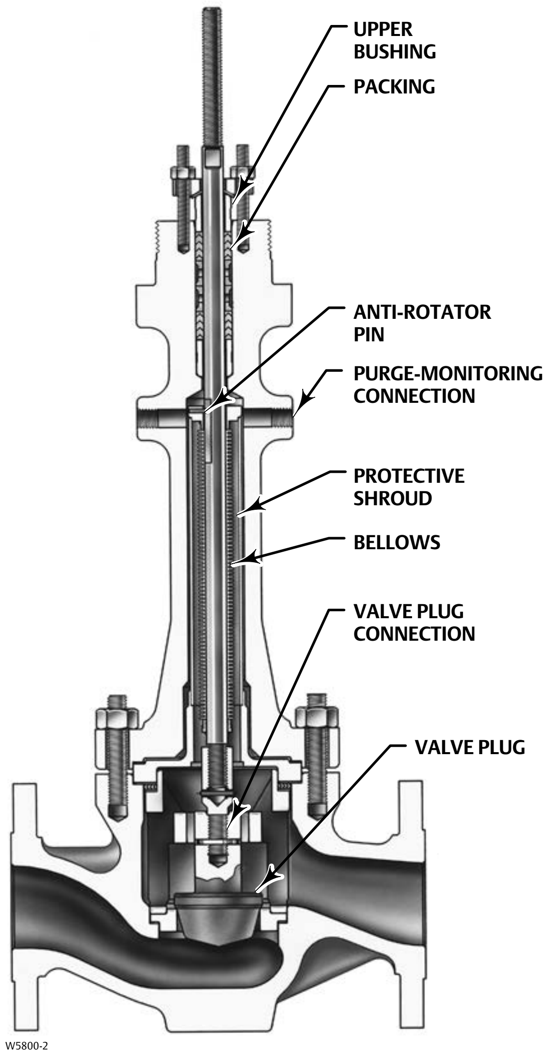
Fisher™ ENVIRO-SEAL™ Bellows Seal Bonnets

ENVIRO-SEAL bellows seal bonnets improve sealing capabilities of Fisher valves and provide long life for applications where emissions escaping from a valve stem seal to the atmosphere cannot be tolerated. This excellent stem sealing system is available for Fisher easy-e ™ valves (see the specifications table for information on valve designs and sizes).

Corrosion resistance is excellent--the bellows is available in either N06625 or N06022, and the bellows is protected against direct impingement by the flow stream. The mechanically formed bellows provides high operating reliability and extended cycle life, and the large annular area around the bellows optimizes warming by the process fluid.



ENVIRO-SEAL Bellows Detail (Mounted on easy-e VALVE)

Features

- Excellent Sealing Capabilities are Factory Tested—Every bellows seal is tested before leaving the factory. Each bellows is mass spectrometer tested to 1 X 10^{-6} cubic centimeters per second of helium.
- Long Cycle Life—Cycle lives in excess of those shown in tables 1, 2, 3, and 4 can be achieved with proper use and maintenance.
- Easy Installation in Existing Valves—All parts needed to install the system in existing valves are available in a convenient kit.
- Rugged Construction—An anti-rotator pin helps prevent accidental twisting and subsequent damage and helps prevent stem blow out. A full-length shroud protects the bellows against damage during handling, inspection, or maintenance. See the following figure.
- Purging/Monitoring Connections are Standard—Two connections above the bellows allow for purging or monitoring of bellows integrity.

Specifications

Applicable Valve Designs

NPS 1/2 through 4 Fisher CL125 through 600 ■easy-e valves (for example, EAT, EZ, ETR, etc.),■YD, and ■YS valves

Cycle Life

See tables 1, 2, 3, and 4 and the Cycle Life section. The bellows is available in ■one-ply or ■two-ply construction for higher pressures and longer cycle life

Pressures and Temperatures(1)

See tables 5 and 6. Do not exceed the pressure-temperature rating of the valve or the maximum temperature of the packing and gaskets

Factory Testing Specification

Every bellows is tested to 1 X 10^{-6} cubic centimeters per second of helium

Bellows Seal Travel (Also See Cycle Life Section)

See table 7

Construction Materials

See table 10

Material Temperature Capabilities(1)

Standard Packing:

Material	In-Body Process Temperature Limits(2)	Temperature Limits of the Packing Material
PTFE and PTFE/ Composition	-46 to 427°C (-50 to 800°F)	-40 to 232°C (-40 to 450°F)
Graphite Ribbon/ Filament	-46 to 593°C (-50 to 1100°F)	-18 to 538°C(3) (0 to 1000°F(3))

ENVIRO-SEAL Packing: See Bulletin 59.1:061 ENVIRO-SEAL Packing Systems for Sliding-Stem Valves
Bellows Gasket: Graphite Laminate
-254 to 593°C (-425 to 1100°F)
Valve Components: See the valve bulletin

Applicable Stem and Yoke Boss Diameters

See table 11

Maximum Flow Coefficients

See table 7

Bellows Spring Rate

Negligible for actuator sizing and selection purposes

Bellows Effective Area

When sizing an actuator, use the bellows effective area instead of the valve stem area
NPS 1/2 through 2 Valves: 2.28 cm^2 (0.353 square inches)
NPS 3 and 4 Valves: 8.65 cm^2 (1.340 square inches)

Dimensions

See figure 2

Options

■Retrofit kits for installation in existing valves.
■ENVIRO-SEAL packing systems (figure 1) with PTFE, Graphite ULF, or Duplex packing materials; see Bulletin 59.1:061

1. The pressure-temperature limits in this bulletin, in the valve bulletin, and any applicable code or standard limitation, should not be exceeded.
2. These in-body process temperatures assume an outside, ambient temperature of 21°C (70°F).
3. Limit to 371°C (700°F) on oxidizing service.

Cycle Life

Bellows seal service life is affected by several factors, including pressure, temperature, and travel. The cycle life values listed in tables 1, 2, 3, and 4 are determined from experimental data and reflect a 99% confidence factor. These cycle life estimates do not include effects from vibration in the piping system.

ENVIRO-SEAL bellows are normally sold with the travel limited for optimum cycle life performance. Bellows may be operated at full valve travel at reduced cycle life.

Table 1. Estimated Cycle Life for N06625 Bellows(1) at 10.3 Bar (150 Psig) and 38°C (100°F)

VALVE SIZE, NPS		BELLOWS SEAL TRAVEL											
1/2, 3/4, 1, & 1-1/2		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		3.6	**0.14**	**4.6**	**0.19**	**6.4**	**0.28**	**9.7**	**0.38**	**14.2**	**0.56**	**19.1**	**0.75**
	1 Ply	8,000,000		4,000,000		1,400,000		550,000		150,000		50,000	
	2 Ply	10,000,000		10,000,000		2,300,000		800,000		160,000		50,000	
2		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		5.3	**0.21**	**7.1**	**0.28**	**10.7**	**0.42**	**14.2**	**0.56**	**22.2**	**0.88**	**28.6**	**1.12**
	1 Ply	8,000,000		4,000,000		1,400,000		550,000		150,000		50,000	
	2 Ply	10,000,000		10,000,000		2,300,000		800,000		160,000		50,000	
3		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		6.4	**0.28**	**9.5**	**0.38**	**26.0**	**0.56**	**19.1**	**0.75**	**28.6**	**1.12**	**38.1**	**1.50**
	1 Ply	1,000,000		1,000,000		700,000		450,000		300,000		100,000	
	2 Ply	10,000,000		10,000,000		5,000,000		2,500,000		1,000,000		350,000	
4		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		9.5	**0.38**	**12.7**	**0.5**	**19.1**	**0.75**	**28.6**	**1.12**	**38.1**	**1.50**	**50.8**	**2.00**
	1 Ply	1,000,000		700,000		450,000		300,000		100,000		50,000	
	2 Ply	10,000,000		5,000,000		2,500,000		1,000,000		350,000		150,000	

1. See the Cycle Life section in this bulletin for more information on bellows travel.

Table 2. Estimated Cycle Life for N06625 Bellows(1) at Maximum Pressure and 316°C (600°F)

VALVE SIZE, NPS		BELLOWS SEAL TRAVEL											
1/2, 3/4, 1, & 1-1/2		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		3.6	**0.14**	**4.6**	**0.19**	**6.4**	**0.28**	**9.7**	**0.38**	**14.2**	**0.56**	**19.1**	**0.75**
	1 Ply	100,000		80,000		50,000		30,000		12,000		7,000	
	2 Ply	100,000		90,000		50,000		30,000		12,000		7,000	
2		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		5.3	**0.21**	**7.1**	**0.28**	**10.7**	**0.42**	**14.2**	**0.56**	**22.2**	**0.88**	**28.6**	**1.12**
	1 Ply	100,000		80,000		50,000		30,000		12,000		7,000	
	2 Ply	100,000		90,000		50,000		30,000		12,000		7,000	
3		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		6.4	**0.28**	**9.5**	**0.38**	**26.0**	**0.56**	**19.1**	**0.75**	**28.6**	**1.12**	**38.1**	**1.50**
	1 Ply	45,000		45,000		34,000		24,000		18,000		12,000	
	2 Ply	50,000		50,000		41,000		34,000		24,000		12,000	
4		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		9.5	**0.38**	**12.7**	**0.5**	**19.1**	**0.75**	**28.6**	**1.12**	**38.1**	**1.50**	**50.8**	**2.00**
	1 Ply	45,000		34,000		24,000		18,000		12,000		7,000	
	2 Ply	50,000		41,000		34,000		24,000		12,000		7,000	

1. See the Cycle Life section in this bulletin for more information on bellows travel.

Table 3. Estimated Cycle Life for N06022 Bellows[1] at 10.3 Bar (150 Psig) and 38°C (100°F)

VALVE SIZE, NPS		BELLOWS SEAL TRAVEL											
1/2, 3/4, 1, & 1-1/2		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		3.6	**0.14**	**4.6**	**0.19**	**6.4**	**0.28**	**9.7**	**0.38**	**14.2**	**0.56**	**19.1**	**0.75**
	1 Ply	8,000,000		4,000,000		1,200,000		500,000		110,000		40,000	
	2 Ply	10,000,000		10,000,000		2,000,000		650,000		140,000		40,000	
2		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		5.3	**0.21**	**7.1**	**0.28**	**10.7**	**0.42**	**14.2**	**0.56**	**22.2**	**0.88**	**28.6**	**1.12**
	1 Ply	8,000,000		4,000,000		1,200,000		500,000		110,000		40,000	
	2 Ply	10,000,000		10,000,000		2,000,000		650,000		140,000		40,000	
3		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		6.4	**0.28**	**9.5**	**0.38**	**26.0**	**0.56**	**19.1**	**0.75**	**28.6**	**1.12**	**38.1**	**1.50**
	1 Ply	1,000,000		1,000,000		700,000		450,000		300,000		100,000	
	2 Ply	10,000,000		10,000,000		5,000,000		2,000,000		900,000		300,000	
4		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		9.5	**0.38**	**12.7**	**0.5**	**19.1**	**0.75**	**28.6**	**1.12**	**38.1**	**1.50**	**50.8**	**2.00**
	1 Ply	1,000,000		700,000		450,000		300,000		100,000		50,000	
	2 Ply	10,000,000		5,000,000		2,000,000		900,000		300,000		130,000	

1. See the Cycle Life section in this bulletin for more information on bellows travel.

Table 4. Estimated Cycle Life for N06022 Bellows[1] at Maximum Pressure and 316°C (600°F)

VALVE SIZE, NPS		BELLOWS SEAL TRAVEL											
1/2, 3/4, 1, & 1-1/2		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		3.6	**0.14**	**4.6**	**0.19**	**6.4**	**0.28**	**9.7**	**0.38**	**14.2**	**0.56**	**19.1**	**0.75**
	1 Ply	90,000		80,000		50,000		30,000		12,000		6,000	
	2 Ply	100,000		90,000		50,000		30,000		12,000		6,000	
2		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		5.3	**0.21**	**7.1**	**0.28**	**10.7**	**0.42**	**14.2**	**0.56**	**22.2**	**0.88**	**28.6**	**1.12**
	1 Ply	90,000		80,000		50,000		30,000		12,000		6,000	
	2 Ply	100,000		90,000		50,000		30,000		12,000		6,000	
3		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		6.4	**0.28**	**9.5**	**0.38**	**26.0**	**0.56**	**19.1**	**0.75**	**28.6**	**1.12**	**38.1**	**1.50**
	1 Ply	40,000		40,000		34,000		24,000		18,000		12,000	
	2 Ply	50,000		50,000		40,000		31,000		23,000		12,000	
4		**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
		9.5	**0.38**	**12.7**	**0.5**	**19.1**	**0.75**	**28.6**	**1.12**	**38.1**	**1.50**	**50.8**	**2.00**
	1 Ply	40,000		34,000		24,000		18,000		12,000		7,000	
	2 Ply	50,000		40,000		31,000		23,000		12,000		7,000	

1. See the Cycle Life section in this bulletin for more information on bellows travel.

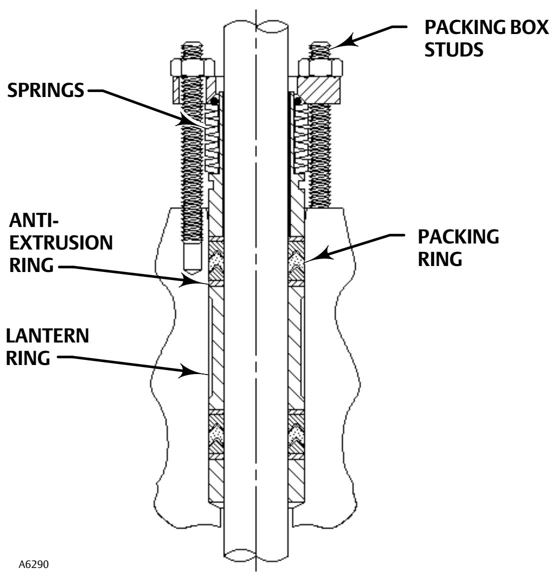
Table 5. Pressure-Temperature Rating for N06625 Bellows

VALVE SIZE, NPS	PRESSURE, BAR								
	Temp., °C	38	93	149	204	260	316	371	427
1/2, 3/4, 1, 1-1/2, and 2	1 Ply 2 Ply	37.9 68.9	34.9 63.4	33.0 60.0	31.1 56.5	29.6 53.8	28.5 51.7	27.7 50.3	27.3 49.6
3 & 4	1 Ply 2 Ply	23.9 43.1	21.6 39.6	20.4 37.5	19.2 35.3	18.3 33.6	17.6 32.3	17.1 31.4	16.9 31.0
VALVE SIZE, NPS	PRESSURE, PSIG								
	Temp., °F	100	200	300	400	500	600	700	800
1/2, 3/4, 1, 1-1/2, and 2	1 Ply 2 Ply	550 1000	506 920	479 870	451 820	429 780	413 750	402 730	396 720
3 & 4	1 Ply 2 Ply	346 625	313 575	296 544	279 512	265 488	255 469	248 456	245 450

Table 6. Pressure-Temperature Rating for N06022 Bellows

VALVE SIZE, NPS	PRESSURE, BAR								
	Temp., °C	38	93	149	204	260	316	371	427
1/2, 3/4, 1, 1-1/2, and 2	1 Ply 2 Ply	37.9 68.9	36.8 66.8	36.0 65.5	34.9 63.4	33.4 60.6	32.6 59.3	31.5 57.2	30.3 55.1
3 & 4	1 Ply 2 Ply	23.9 43.1	22.7 41.8	22.3 40.9	21.6 39.6	20.6 37.9	20.1 37.0	19.4 35.8	18.7 34.5
VALVE SIZE, NPS	PRESSURE, PSIG								
	Temp., °F	100	200	300	400	500	600	700	800
1/2, 3/4, 1, 1-1/2, and 2	1 Ply 2 Ply	550 1000	534 970	523 950	506 920	484 880	473 860	457 830	440 800
3 & 4	1 Ply 2 Ply	340 625	330 606	323 594	313 575	299 550	292 537	282 519	272 500

Figure 1. Typical ENVIRO-SEAL Packing Systems



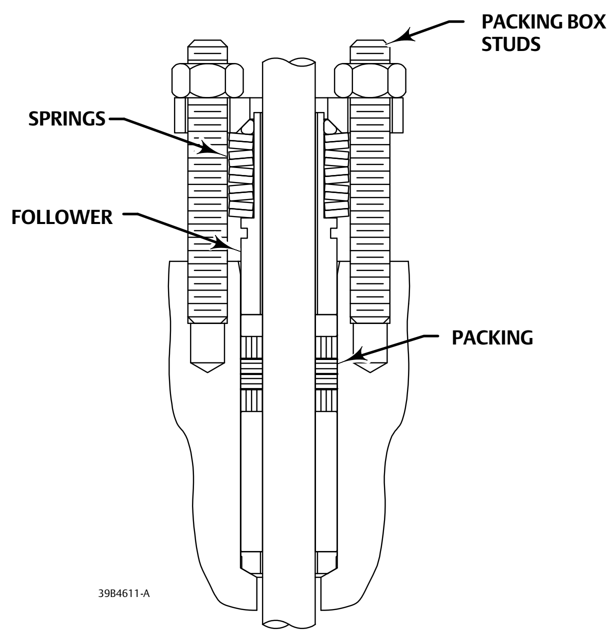


Table 7. Flow Coefficients with ENVIRO-SEAL Bellows Seal and easy-e Valves

VALVE DESIGN	VALVE SIZE, NPS	BELLOWS SEAL TRAVEL		FULL-SIZE TRIM			RESTRICTED TRIM		
		mm	Inch	Quick Opening	Linear	Equal Percentage	Quick Opening	Linear	Equal Percentage
ED, EDR, ET, and ETR (Flow Down)				C_v					
	1	14.2	0.56	21.5	17.8	9.37	---	---	---
	1-1/2	14.2	0.56	40.4	32.5	21.0	26.8	22.5	11.1
	2	22.2[1]	0.88[1]	74.7	65.1	31.4	31.2	33.3	24.3
	3	28.6	1.125	152	126	81.5	91.9	102	70.7
	4	38.1[2]	1.50[2]	243	192	148	130	113	112
				C_g					
	1	14.2	0.56	641	559	325	---	---	---
	1-1/2	14.2	0.56	1300	1090	695	990	760	357
	2	22.2[1]	0.88[1]	2390	2130	1070	1120	1110	783
	3	28.6	1.125	4740	4130	2690	3170	3490	2370
	4	38.1[2]	1.50[2]	7990	6680	5000	4750	4220	4040
ES (Flow Up)				C_v					
	1/2	14.2	0.56	6.53	---	---	---	---	---
	3/4	14.2	0.56	14.2	---	---	---	---	---
	1	14.2	0.56	21.2	16.8	11.3	---	---	---
	1-1/2	14.2	0.56	38.0	28.4	20.4	30.0	19.5	10.0
	2	22.2[1]	0.88[1]	67.2	60.6	30.9	39.4	30.9	20.8
	3	28.6	1.125	140	117	73.1	115	88.8	67.5
	4	38.1[2]	1.50[2]	228	174	125	183	139	121
				C_g					
	1/2	14.2	0.56	206	---	---	---	---	---
	3/4	14.2	0.56	415	---	---	---	---	---
	1	14.2	0.56	688	565	367	---	---	---
	1.5	14.2	0.56	1325	967	679	992	659	334
	2	22.2[1]	0.88[1]	2410	2100	1090	1350	1050	710
	3	28.6	1.125	4780	4100	2540	3990	3060	2320
	4	38.1[2]	1.50[2]	8000	6170	4250	6280	4910	4230
EZ (Flow Up)				C_v					
	1/2	14.2	0.56	4.44	---	---	---	---	---
	3/4	14.2	0.56	9.72	---	---	---	---	---
	1	14.2	0.56	16.8	11.6	9.15	---	---	---
	1.5	14.2	0.56	33.6	27.5	13.1	19.0	12.0	10.0
	2	22.2[1]	0.88[1]	58.5	46.2	38.8	17.9	15.7	15.9
	3	28.6	1.125	127	93.4	73.4	88.4	80.4	71.5
	4	38.1[2]	1.50[2]	221	168	118	86.7	86.8	72.7
				C_g					
	1/2	14.2	0.56	168	---	---	---	---	---
	3/4	14.2	0.56	341	---	---	---	---	---
	1	14.2	0.56	475	375	299	---	---	---
	1-1/2	14.2	0.56	1250	921	417	727	380	302
	2	22.2[1]	0.88[1]	2140	1630	1330	687	599	605
	3	28.6	1.125	4490	3460	2400	3120	2783	2450
	4	38.1[2]	1.50[2]	7940	5860	3770	2910	2979	2570

Note: Bellows seal travel is 75% of maximum rated valve travel.
1. 19.1 mm (0.75 inch) travel for restricted trim.
2. 28.6 mm (1.125 inch) travel for restricted trim.

Table 8. Dimensions for easy-e Valves

VALVE SIZE, NPS	easy-e VALVES			
	Stem Diameter		D	
	mm	Inch	mm	Inch
1/2, 3/4, & 1	9.5	3/8	320	12.59
1-1/2	9.5	3/8	317	12.47
2	12.7	1/2	383	15.09
3	12.7	1/2	517	20.34
4	12.7	1/2	541	21.28

Table 9. Dimensions for easy-e Valves

VALVE STEM DIAMETER		ACTUATOR TYPE	ACTUATOR SIZE	E	
mm	Inch			mm	Inch
9.5	3/8	657	30 34	440 498	17.31 19.62
		667	30 34	478 573	18.81 22.56
12.7	1/2	657	40 45 46	548 659 656	21.56 25.94 25.81
		667	40 45 46	594 768 748	23.38 30.25 29.44

Ordering Information

When ordering, specify:

For Existing Valves

1. Process fluid

2. Process fluid temperature

3. Maximum valve inlet pressures

4. Maximum valve pressure drops

5. Valve design (ED, YD, etc.), size, and class

6. Valve stem diameter

7. Refer to the specifications. Review the information under each specification and in the referenced tables; write down your choice whenever there is a selection to be made.

With New Valves

1. Refer to the valve bulletin for ordering information.

2. Also refer to the specifications. Review the information under each specification and in the referenced tables; write down your choice whenever there is a selection to be made.

Figure 2. Dimensions for easy-e Valves (also see tables 8 and 9)

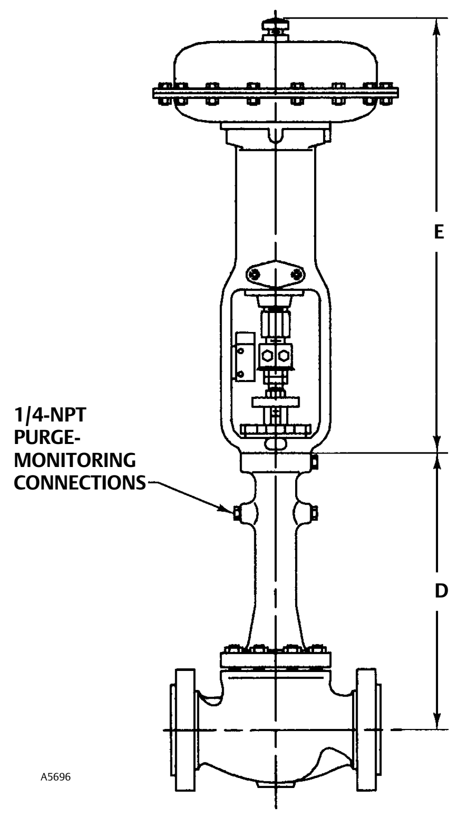


Table 10. Construction Materials

PART	easy-e VALVES
Bonnet	WCC steel or CF3M (316L stainless steel)
Bellows Seal Assembly (Bellows / Other Wetted Parts)	N06625 / S31603 (316L stainless steel) or N06022 / N06022
Upper Bushing	S31600 (316 stainless steel), R30006, Chrome-coated S31600, PTFE-lined S31600, or N10276/PTFE-glass
Bonnet Gaskets	Graphite laminate/stainless steel
Packing	PTFE V-ring, PTFE/composition, graphite ribbon/filament, or PTFE or ENVIRO-SEAL Graphite ULF packing system
Packing Box Ring and Lantern Ring	S31600 (316 stainless steel) or N10276
Packing Flange, Studs, and Nuts	Steel, 316 stainless steel, or N10276
Valve Components	See valve bulletin

Table 11. Applicable Yoke Boss and Stem Diameters

VALVE SIZE, NPS	easy-e VALVES					
	Yoke Boss Diameter		Stem Thread Diameter(1)		Valve Stem Diameter(2)	
	mm	Inch	mm	Inch	mm	Inch
1/2, 3/4, 1, & 1-1/2	54	2-1/8	9.5	3/8	12.7	1/2
2	71	2-13/16	12.7	1/2	12.7	1/2
3 & 4	71	2-13/16	12.7	1/2	25.4	1

1. This is the diameter at the actuator stem connector.
2. This is the diameter where the stem passes through the packing.

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Understanding Choked Flow in Fisher™ Valves

Choked flow is often a subject of concern among our customers due to misunderstandings and association with potentially damaging conditions. The following guidelines are to help in the understanding of choked flow and how it affects control valves. It will also dispel any misconceptions associated with it.

What is Choked Flow?

Choked flow is defined as the point at which increasing the pressure drop (ΔP), while maintaining a constant inlet pressure (P_1), yields no further increase in flow rate.

Note: It is important to note that this definition assumes a fixed flow area. It is also important to note that increasing P_1 will also increase the flow rate.

Common Questions and Misconceptions

Q: The valve is choked in a liquid application. Does this mean damage will occur?

A: Choked flow by itself is not a cause for damage. While it is true that choked flow in a liquid application indicates the presence of cavitation or flashing, it does not necessarily mean damage will occur. There are many different characteristics of the operating conditions and valve construction that must be considered when trying to determine if damage will occur due to the cavitation present in any given application. For more information on these factors, contact your Emerson sales office or Local Business Partner.

Q: The valve is choked, does this mean there will be excessive noise produced?

A: Choked flow by itself is not an indicator of elevated noise. In liquid applications, noise is associated with cavitation; the more severe the cavitation, the higher the noise levels. The same thing can be said about choked flow in gas applications. In gas applications, choked flow occurs when the velocity at the vena contracta reaches sonic velocity (a.k.a critical flow condition). At this point, any increase in ΔP does not increase flow, but instead additional energy takes the form of increased noise levels. Common solutions to noise in gas applications are noise attenuating trim technology and/or enlarging the valve outlet area.

Q: If the valve is choked, will it pass the required flow rate?

A: The IEC liquid sizing equation includes the recovery coefficient (F_L), which is used to calculate the choke point of the valve. It is important to confirm you are using the correct F_L value, as it directly impacts the calculated C_V. If these values are properly accounted for, the sizing will be accurate for the considered flow rate.

In gas sizing, due to the compressible nature of the fluid, it is important to pay close attention to the pressure drop ratio factor (X_T). This value is used to calculate the choke point (similar to F_L in liquid sizing). Simply put, the higher the X_T value, the lower the required C_V to pass a given flow rate through a given orifice (the converse is true as well).

Q: The valve is choked in a liquid application, does this mean it will be flashing?

A: Choked flow does not cause flashing, but may indicate a flashing situation. Flashing is a system dependent phenomena, where the downstream pressure (P_2) is below the liquid's vapor pressure (Pv). For more information on solutions for flashing applications, please contact your Emerson sales office or Local Business Partner.

Q: Is it true that liquids don't choke, because they can't reach sonic velocity?

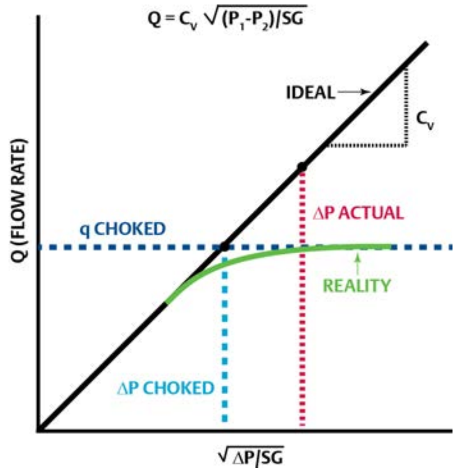
A: No, liquids can also choke. Choked flow in liquids occurs as the velocity at the vena contracta increases, causing the local pressure to drop below the liquid's vapor pressure. At this point, the liquid will start to form vapor which takes up additional space, leading to the choked condition. This point is determined experimentally, and denoted by the value, F_L. High recovery devices will have numerically lower F_L values with more energy being released as cavitation or flashing. Conversely, low recovery devices have numerically higher F_L values with less energy available in these conditions. When sizing for liquids, pay close attention to the F_L values, and make sure the values used match the trim and valve selected.

The Physics of Choked Flow

In an ideal world, there is a linear relationship between the differential pressure (ΔP) and flow Rate (Q) as depicted by the "ideal" linear line in the graph below. In this case, as the ΔP increases (as a function of decreasing P_2), so does the flow rate.

In reality, this in only true to an extent. After a certain point, the line begins to level off as the flow becomes choked. This point is determined experimentally, by modeling the actual flow through a specific device, and is depicted by the bold curved line in the graph in figure 1.

Figure 1.



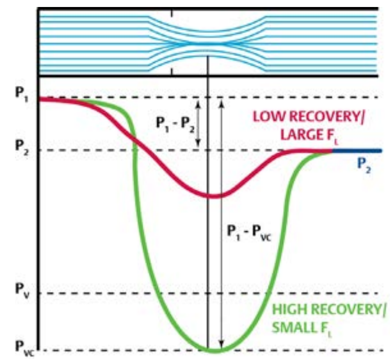
The point at which the flow becomes choked is determined by the F_L value for liquid sizing, and the X_T value for gas sizing. In liquid flows, this is due to the formation of vapor. In gas flows, it is due to the gas reaching sonic velocity at the vena contracta. The equations below show how these values are obtained, and how they relate to the sizing.

$\Delta P_{choked} = F_L^2 [P_1\text{-}(F_F)(P_v)]$
F_L = pressure recovery factor
F_F = liquid critical pressure ratio factor
$F_F = 0.96\text{-}0.28(P_V/P_C)^{½}$
P_v = vapor pressure of fluid
(Per IEC 60534-2-1)

In gas sizing, make sure to use the correct X_T value as it will have an impact on the required C_V for a given condition. Whisper trims generally have a different X_T value than a standard trim design.

Additionally, if a valve is choked, it does not necessarily mean unfavorable performance will occur. For example, in liquid sizing, a globe valve may choke, but it might not experience damaging cavitation. However, with a rotary product, the valve may experience damaging cavitation before it chokes. This is because of the F_L values and the flow geometry of the valve. Globe valves generally have a numerically high F_L, which results in a lower recovery factor. Rotary products generally have a smaller F_L, which results in higher recovery. The following diagram in figure 2 shows the difference between the two. The point here is that choked flow is not always a cause for concern. Contact your Emerson Sales office or Local Business Partner for additional information.

Figure 2.



Choked flow, when considered by itself, is not a cause for concern. The confusion stems from the potential association with many negative phenomena that affect control valves. This leads to misunderstandings amongst our users who correlate negative thoughts about choked flow by its association with these undesirable situations. It is our mission to fully understand and help educate our customers on important valve sizing and selection considerations that must be made when dealing with conditions of choked flow. If you encounter conditions of choked flow and have concerns/questions on how to proceed with valve selection, please contact your local Emerson sales office for additional technical support.

If you have any further questions, please contact your Emerson sales office or Local Business Partner.

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Fire-Tested Status of Fisher™ Rotary Valves

This bulletin will help you find the correct High Performance Butterfly Valve (HPBV) product when you require a Fire-Tested Butterfly Valve Construction. The following table provides current constructions that have met the requirements of API 607, Fire-Test for Soft Seated Quarter-Turn Valves. Should this bulletin conflict with information in the product bulletin, the information in this shall take priority. For proof of Fire-Tested status, please contact your Emerson sales office.

Table 1. Fire-Tested Construction Availability(3)

Valve Type, Pressure Class	8560(2) CL 150/300	8532(2) CL 150/300	A31D(2) CL 150/300	8590(1) CL 600	Control-Disk™ Valve
Size Range (NPS)	3 -12	14 -48	3 - 12	3 – 24	See 8532 for CL 150/300 NPS 14-24 and 8590 for CL 600
Phoenix III Seal Material	NPS 3 -NPS 6 S31600/virgin or filled PTFE NPS 8 - NPS 12 S20910/virgin or filled PTFE	S31600/virgin or filled PTFE	S31600/virgin or filled PTFE	S20910 / ETFE	
Body Style	Lugged	Double Flanged and Lugged	Double Flanged	Lugged	

1. 8590 and Class 600 Control-Disk tested to API 607 6th Edition.
2. Tested to API 607 4th Edition.
3. See table 2 for fire-tested construction availability by valve type.

For Fire-Tested HPBV's you must use Phoenix III seals in the reverse (pressure at back side of disk). The materials of construction must be:
Body: Any Table 1 ASME B16.34 material
Packing: Graphite - standard, ENVIRO-SEAL™, or ISO-Seal
Bearings: Metal

Seat Leakage

Max allowable leakage rates when using fire-tested Phoenix III seal differ before, during, and after exposure to high temperatures or a fire. The concept behind a fire-tested seal is the valve can utilize a resilient seat during normal operating conditions but when exposed to elevated temperatures, or a fire, the resilient materials will deform or melt and a metal backup seal will provide shutoff. See figures 1 and 2 for images depicting the seal before and after a fire or high temperature exposure. The factory acceptance test is ANSI FCI 70-2 Class VI.

To pass API 607 valve configurations must meet the following leakage and operational requirements as specified by API 607. Reference Table 1 in API 607 standard, 5th edition (June 2005) for test procedures and conditions(1):

1. Allowable seat leak rate during fire (low pressure test) = 100 mL/min per inch of NPS
2. Allowable seat leak rate during fire (high pressure test) = 400 mL/min per inch of NPS
3. Allowable seat leak rate after cool down (low pressure test) = 25 mL/min per inch of NPS
4. Allowable external leakage during fire (low pressure test) = 25 mL/min per inch of NPS
5. Allowable external leakage during fire (high pressure test) = 100 mL/min per inch of NPS

6. Operational test after fire: The valve shall be capable of being unseated against test pressure and moved to full open position one time

7. Allowable external leakage after operational test (high pressure) = 25 mL/min per inch of NPS

1. External Leakage Following Operational Test, Table 1 -Maximum Leak Rates, source: API 607 5th Edition, June 2005.

Figure 1. Phoenix III Seal with Resilient Components

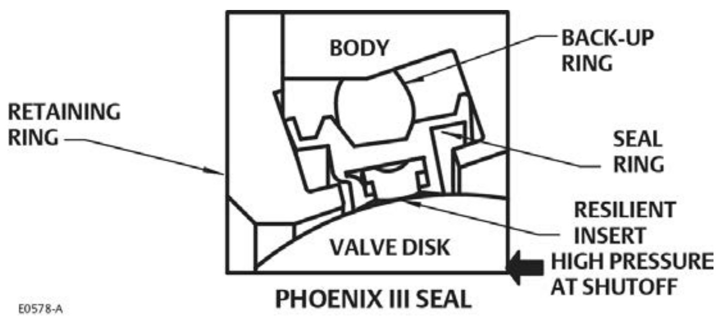
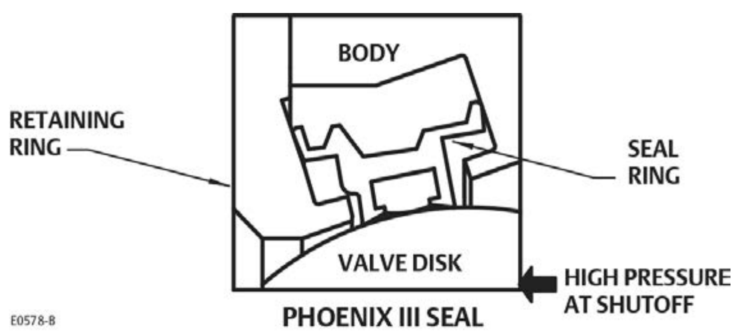


Figure 2. Phoenix III Seal without Resilient Components



Phoenix III Seal NACE Compatibility

The Phoenix III seal design has been used in applications requiring fire-safe performance since its release more than 30 years ago. While it does not technically conform to NACE MR0103 specifications, the non-conformance is caused by the method used to capture the resilient insert in the valve body by bending over the area circled in figure 3. The bending motion cold works the 316 SST, which is not allowed by current NACE standards.

Emerson has no record of the seal design failing due to stress corrosion cracking of the 316 stainless steel version. An Inconel 625 material option is available that would allow for NACE compliance, however that material was not qualified during Emerson's third party API 607 testing. Contact your Emerson sales office to discuss whether either of these solutions would be suitable for your selection and use in your process.

Figure 3. Phoenix III Seal with Resilient Components

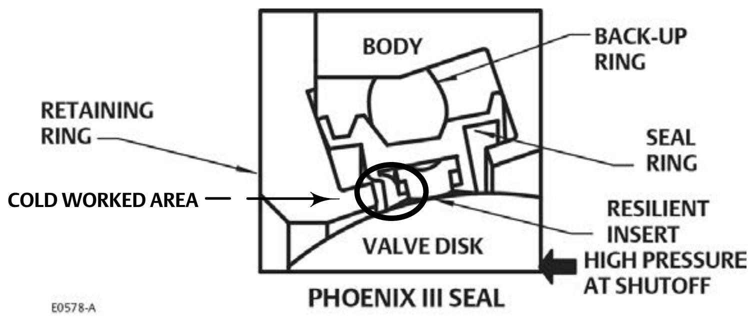


Table 2. Fire-Tested Construction Availability by Valve Type

<table>
<tr><th rowspan="2">PRESSURE CLASS</th><th rowspan="2">BODY STYLE</th><th colspan="12">NPS</th></tr>
<tr><th>3</th><th>4</th><th>6</th><th>8</th><th>10</th><th>12</th><th>14</th><th>16</th><th>18</th><th>20</th><th>24</th><th>30-48</th></tr>
<tr><td rowspan="2">CL 150/300</td><td>Lugged</td><td colspan="6">8560</td><td colspan="5" rowspan="2">8532/Control-Disk Valve</td><td>A11</td></tr>
<tr><td>Double Flange</td><td colspan="6">A31D</td><td rowspan="3">N/A</td></tr>
<tr><td rowspan="2">CL 600</td><td>Lugged</td><td colspan="11">8590/Control-Disk Valve</td></tr>
<tr><td>Double Flange</td><td colspan="11">8590 Special Construction</td></tr>
</table>

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ENVIRO-SEAL Packing Systems - Rotary
D101638X012

Product Bulletin
59.3:041
September 2017

ENVIRO-SEAL™ Packing Systems for Fisher™ Rotary Valves

Fisher ENVIRO-SEAL packing systems offer exceptional shaft sealing capabilities. These packing systems, available with PTFE or graphite packing material, feature live-loading and unique packing ring arrangements for long-term, consistent sealing performance.

ENVIRO-SEAL packing systems easily install in your existing valves or can be purchased with new valves. ENVIRO-SEAL packing systems help seal your process to conserve valuable process fluid. The long life and reliability of these systems also reduce your maintenance cost and downtime.

For process control applications requiring compliance with specific environmental protection regulations, the Fisher solution is the unique ENVIRO-SEAL packing system. ENVIRO-SEAL packing systems keep emission concentrations below the 100 ppm (parts per million) requirement set by the Federal Environmental Protection Agency (EPA).

For an excellent shaft seal in applications that are not environmentally-sensitive, ENVIRO-SEAL packing systems may be applied at higher pressure/temperature ratings [103 bar (1500 psig)/-46 to 232°C (-50 to 450°F) for PTFE design or 207 bar (3000 psig)/-198 to 371°C (-325 to 700°F) for graphite design]. Such applications offer excellent shaft sealing, extended packing life, and reduced maintenance costs when you compare ENVIRO-SEAL packing systems to standard packing arrangements. Contact your Emerson sales office or Local Business Partner for applications assistance.

Features

- **Compliance with the Clean Air Act**—The excellent shaft sealing of the ENVIRO-SEAL packing system (figure 1) can control emissions to below the EPA maximum of 100 ppm. ENVIRO-SEAL packing systems provide an excellent shaft seal to prevent the loss of process fluid.

- **Improved Service Life**—ENVIRO-SEAL packing system design, the anti-extrusion rings that contain the packing, and live loading combine to give you long service with very low maintenance. External live-loading provides a constant load over the life of the packing material which reduces your need for constant packing box adjustment and high levels of packing maintenance.

  Installed ENVIRO-SEAL packing systems provide excellent shaft sealing, guiding, and transmission of loading force.

- **Easy Installation in Existing Valves**—All parts needed to install the systems in existing valves are available in a convenient kit. Some larger valves may require the packing box to be sleeved to accommodate a smaller cross section of packing.

- **Adaptable to Many Applications**— ENVIRO-SEAL packing systems are available with PTFE or graphite packing rings. ENVIRO-SEAL packing systems fit a wide range of Fisher rotary valves. See the valve product bulletin for specific availability information. **Note: ENVIRO-SEAL PTFE and graphite packing systems can be used in vacuum service applications with packing rings in the standard orientation. It is not necessary to reverse the PTFE packing rings.**

ENVIRO-SEAL Packing System Specifications

Rotary Valve Designs, Packing Availability

See table 1

Maximum Temperature/Pressure Limits[1]

Maximum Application Temperature/Pressure Limits To Meet the EPA Fugitive Emission Standard of 100 PPM[2]:
For ENVIRO-SEAL single PTFE packing material: 232°C (450°F). Not restricted by pressure for class rating of valves listed in this bulletin, see table 1
For ENVIRO-SEAL graphite packing material: 316°C (600°F). Not restricted by pressure for class rating of valves listed in this bulletin, see table 1

Material Temperature Range:
For ENVIRO-SEAL PTFE Packing Material: -46 to 232°C (-50 to 450°F)
For ENVIRO-SEAL Graphite Packing Material: Up to 371°C (700°F)

Construction Materials

PTFE Packing Systems:
Packing Rings: PTFE V-ring[3]
Male and Female Adaptor Rings: Carbon-filled PTFE V-ring
Anti-Extrusion Rings: High strength polymer
Packing Box Rings: S31600 (316 SST)

Graphite Packing System:
Packing Rings: Graphite
Anti-Extrusion Rings: Carbon
Packing Box Rings: S31600 (316 SST)

Packing Flange: S31600 (316 SST, other materials available upon request)

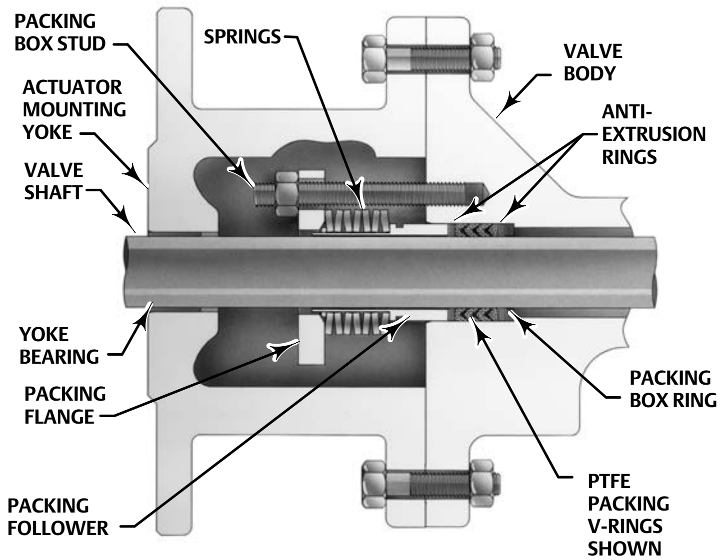
Packing Box Studs:
Steel, SA-193-B7, is standard for all Fisher Vee-Ball™ and eccentric disk rotary valves, except 8532, A31A, and A31D high-performance butterfly valves. Strain-hardened S31600, SA-193-B8M, strain hardened, is standard for Fisher 8532, A31A, and A31D rotary valves

Packing Box Nuts:
Steel, SA-194-2H, is standard for all Fisher Vee-Ball and eccentric disk rotary valves, except 8532, A31A and A31D. Steel SA194 Grade 8M is standard for Fisher 8532, A31A, and A31D rotary valves

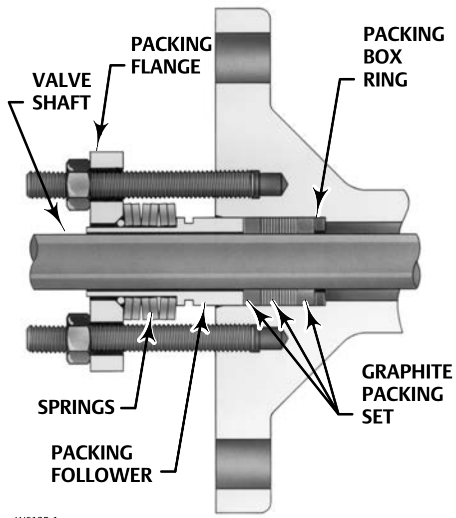
Spring Pack Components:
O-ring: Nitrile. The O-ring serves as an assembly convenience to hold the springs in position on the packing follower
Packing Follower: S31600 with carbon-filled PTFE liner
Springs: ■ N07718 or ■ S17400 (17-4 PH) for larger sizes

1. The pressure/temperature limits in this bulletin, in the valve body bulletin, and any applicable code or standard limitation, should not be exceeded.
2. The Environmental Protection Agency (EPA) has set a limit of 100 ppm (parts per million) for fugitive emissions from a valve in selected VOC (Volatile Organic Compound) services.
3. In vacuum service, it is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.

Figure 1. Typical ENVIRO-SEAL Packing Arrangements for Fisher Rotary Valves



SINGLE PTFE PACKING



GRAPHITE PACKING

Table 1. Packing Availability(1) in PTFE and Graphite

Rotary Valve Design	Valve Size, NPS
Fisher Control-Disk ™ Valve	2 through 24
Fisher 8580 Valves	2 through 12
Fisher 8532, A31A, and A31D valves	3 through 24
Fisher 8560 valves	2 through 12
Fisher 8590 valves	3 through 24
Fisher V150 Vee-Ball	2 through 12
Fisher V200 Vee-Ball	1 through 10
Fisher V300 Vee-Ball	2 through 12
Fisher V500	1 through 8
Fisher CV500	3 through 12

1. Larger valve sizes and ratings are available upon request. Consult your Emerson sales office or Local Business Partner.

Installation

The following lubrication recommendations for ENVIRO-SEAL packing systems are provided to assist with proper installation of the packing.

ENVIRO-SEAL internal packing parts, valve drive shaft and packing box do not require lubrication as do some other types of packing. Lubrication on packing component parts may cause “slip-stick” operation. Also, the lubricant may not be compatible with the process.

Lubrication **is required** for the packing studs and nuts. It is important to lubricate the contact surface of the nuts on the flange surface. Friction between the unlubricated surface may cause incorrect torque indication.

Ordering Information

When ordering ENVIRO-SEAL packing systems, specify:

For Existing Valves

1. Process fluid

2. Process fluid temperature

3. Maximum valve inlet pressures

4. Maximum valve pressure drops

5. Valve type (8590, V200, etc.), size, and class

6. Actuator type

For New Valves

1. Refer to the valve bulletin for ordering information.

2. Refer to the specifications on page 2. Review the information under each specification. Write down your choice whenever a selection is to be made.

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Packing Selection Guidelines for Fisher™ Rotary Valves

This bulletin provides information and insight to help you select packing systems properly. The following application guidelines for each packing selection have been developed to aid in the packing selection process. It is important to note that these guidelines were developed based on the results of numerous tests on various packing systems conducted in the Emerson laboratory. Exceeding these guidelines might result in reduced service life. The ratings for these systems do not affect the pressure/temperature class rating of the valve.

The traditional valve selection process entailed selecting a valve design based on pressure and temperature capabilities, flow characteristics, and material compatibility. An additional factor--packing selection--is now involved in the valve selection process.

Proper packing selection is being driven by USA Clean Air Act Amendments, subsequent EPA (Environmental Protection Agency) regulations, and our customers' increasing concern for improved packing performance (less maintenance and longer life).

In the past, packing selection was primarily based on process temperature; that is, PTFE was selected for temperatures below 232°C (450°F) and graphite was selected for temperatures above 232°C (450°F). Considerations now include the effect of packing friction on process control, hysteresis, seal quality, and cycle life.

Given the variety of process applications and installation conditions, these variables are difficult to quantify. A relative packing performance comparison can be made that provides an engineered approach to the packing selection process.

W5882-1

Typical ENVIRO-SEAL Rotary Packing System

Clarification of trade names is required for proper understanding of the tables shown in this bulletin. From an Emerson engineering perspective, ENVIRO-SEAL™ packing systems are defined as advanced packing systems using a compact, live-load spring design. From a user perspective, ENVIRO-SEAL packing systems are most typically thought of as emission-reducing packing systems.

This bulletin will help extend your thinking of ENVIRO-SEAL packing systems as being suitable not only for certain applications where the control of fugitive emissions is a requirement, but also for nonenvironmental applications involving higher temperatures and pressures. The use of ENVIRO-SEAL packing systems in applications involving non-environmental service offers the benefit of lower ongoing maintenance costs.

Table 1. Packing Selection Guidelines for Rotary Valves

PACKING SYSTEM	MAXIMUM PRESSURE AND TEMPERATURE LIMITS FOR 100 PPM SERVICE(1)		APPLICATION GUIDELINE FOR NONENVIRONMENTAL SERVICE(1)		SEAL PERFORMANCE INDEX	SERVICE LIFE INDEX	PACKING FRICTION
	Metric	Customary U.S.	Metric	Customary U.S.			
Single PTFE V-Ring	- - - - - -	- - - - - -	103 bar -46 to 232°C	1500 psig -50 to 450°F	Better	Long	Very low
ENVIRO-SEAL PTFE	103 bar -46 to 232°C	1500 psig -50 to 450°F	207 bar -46 to 232°C	3000 psig -50 to 450°F	Excellent	Very long	Low
Live-Loaded PTFE for V250 Valves	69 bar -29 to 93°C	1000 psig -20 to 200°F	155 bar -46 to 232°C	2250 psig -50 to 450°F	Excellent	Very long	Low
KALREZ® with Vespel® CR-6100 (KVSP 500)(3)	24.1 bar 4 to 260°C	350 psig 40 to 500°F	51 bar -40 to 260°C	750 psig -40 to 500°F	Excellent	Long	Very low
ENVIRO-SEAL Graphite	103 bar -7 to 315°C	1500 psig 20 to 600°F	207 bar -198 to 371°C	3000 psig -325 to 700°F	Excellent	Very long	Moderate
Graphite Ribbon	- - - - - -	- - - - - -	103 bar -198 to 538°C(2)	1500 psig -325 to 1000°F(2)	Acceptable	Acceptable	High

1. The values shown are only guidelines. These guidelines can be exceeded, but shortened packing life or increased leakage might result. The temperature ratings apply to the actual packing temperature, not to the process temperature.
2. Except for oxidizing service, -198 to 371°C (-325 to 700°F).
3. The KALREZ pressure/temperature limits referenced in this bulletin are for Fisher valve applications only. DuPont may claim higher limits.

The packing selection guidelines in table 1 present two categories of service conditions. The first category defines packing systems designed for environmental or fugitive emission applications where 100 ppmv (parts per million volume) seal performance is required. The second category defines application guidelines for non-environmental services.

Depending on category requirements, different pressure/temperature guidelines have been established for the packing systems. In addition, a given packing design has certain characteristics concerning seal performance, service life, and friction. The pressure and temperature guidelines and the relative comparison of these characteristics are defined in table 1. See figure 1 for illustrations of typical packing examples.

Today, Emerson Automation Solutions offers three selections for environmental service. These selections include ENVIRO-SEAL PTFE (single arrangement), KALREZ with Vespel CR-6100 (single arrangement), and ENVIRO-SEAL graphite (single arrangement). Each of these options has different pressure/temperature service ranges.

Single PTFE V-Ring Packing

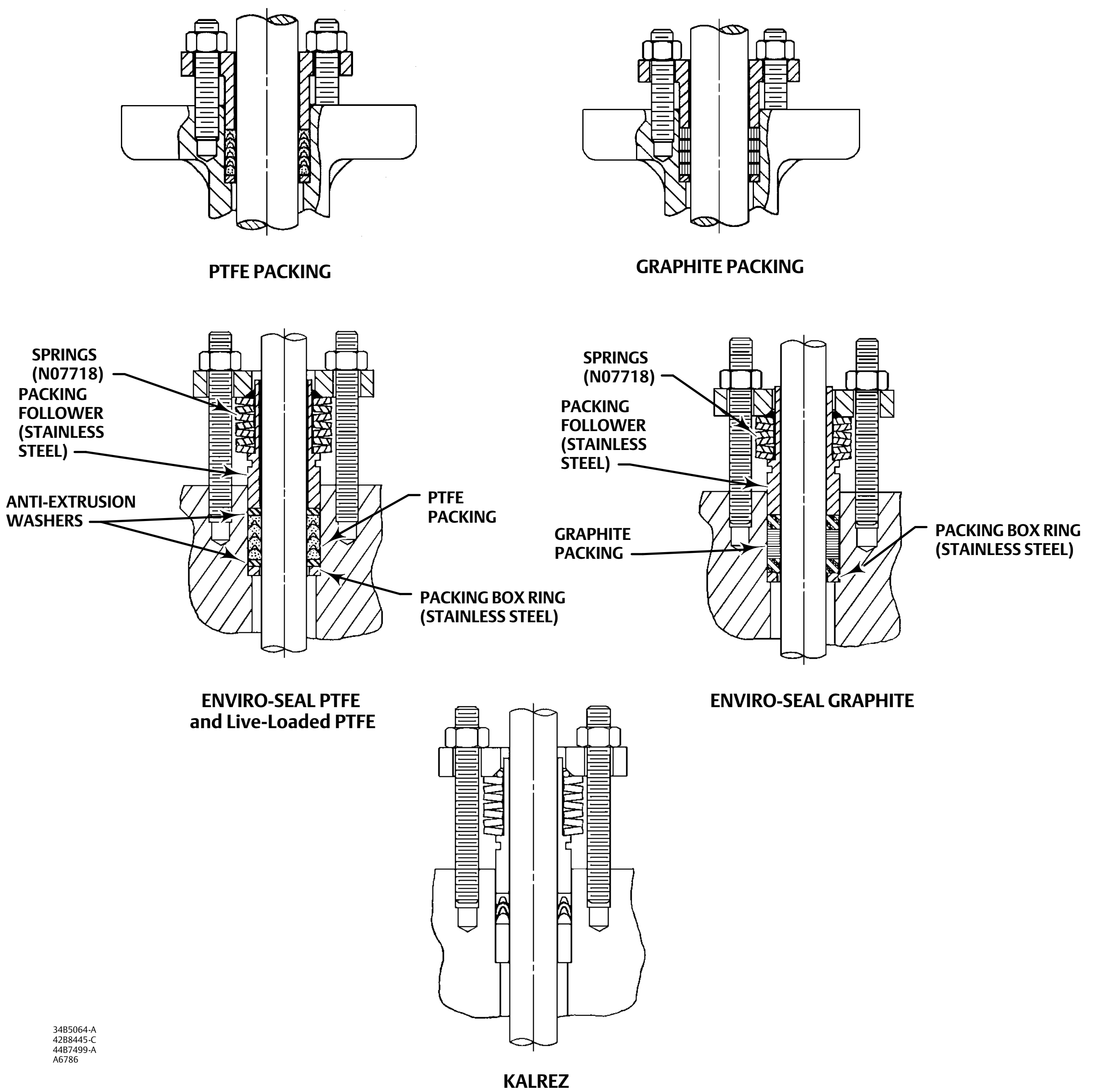
This packing arrangement offers very good seal performance with the lowest packing friction.

ENVIRO-SEAL PTFE Packing

The ENVIRO-SEAL PTFE packing arrangement is suitable for environmental applications on services up to 103 bar and 232°C (1500 psig and 450°F). The sealing capability is excellent. The ENVIRO-SEAL PTFE packing system is designed to operate at high stress. This gives the ENVIRO-SEAL PTFE packing system the ability to compensate for shaft or packing bore imperfections. The high packing stress design approach also results in an increase in shaft friction. The slight increase in shaft friction does not cause problems with actuator sizing or process control, such as hysteresis.

ENVIRO-SEAL PTFE packing systems can be used in vacuum service applications with packing rings in the standard orientation. It is not necessary to reverse the PTFE packing rings.

Figure 1. Typical Packing Examples



KALREZ Packing

KALREZ packing is available in KVSP-500 (260°C [500°F] service). The KVSP-500 series packing uses a DuPont V-ring material called Vespel CR-6100, which is a carbon fiber-reinforced PTFE. KALREZ packing is only available for Vee-Ball™ and eccentric disc valves.

Note that KALREZ packing arrangements require that a controlled low stress be applied to the packing in order to seal properly and also have a longer life.

This is achieved by using similar springs to those used in ENVIRO-SEAL packing systems, but with a lower initial defection, thus a lower force.

In contrast to KALREZ packing, the ENVIRO-SEAL PTFE packing system is designed to operate at high stress (approximately 10 times the KALREZ packing stress). This gives the ENVIRO-SEAL PTFE packing system the ability to tolerate less-than-perfect conditions and continue to seal reliably. For example, in changing installed valves to ENVIRO-SEAL PTFE packing, minor imperfections in the shaft finish or packing bore can be tolerated because of the high stress design of the packing system.

ENVIRO-SEAL Graphite Packing

ENVIRO-SEAL graphite packing is designed for environmental applications from -6 to 316°C (20°F to 600°F), or for those applications where fire safety is a concern and graphite packing is desired. The ENVIRO-SEAL graphite arrangement can also be used with higher pressures up to 103 bar (1500 psi) and still maintain the 100 ppmv EPA leakage criteria.

Graphite Ribbon Packing

Graphite ribbon packing is designed for nonenvironmental applications that span a wide temperature range from -198 to 538°C (-325 to 1000°F).

Non-environmental Services

For the non-environmental pressure/temperature guidelines, service life can be extended by using ENVIRO-SEAL packing systems. As service pressures and temperatures increase, the ENVIRO-SEAL packing systems provide a significant step change in performance, compared to the traditional single PTFE V-ring or graphite ribbon arrangements.

Conclusion

It is important to recognize that many parameters affect seal performance and service life. Even if the optimum design is selected, other factors such as shaft finish, packing bore finish, and job site installation practices will have an effect on performance.

The knowledge gained by Emerson as a result of the ENVIRO-SEAL packing development program has provided an opportunity to help you engineer the packing selection. Proper selection has a bottom line result; that is, increased service life and reduced maintenance.

If you need a more detailed engineering discussion of the design principles affecting packing seal design, contact your Emerson sales office or Local Business Partner. The sales representative can provide you with a copy of Emerson Automation Solutions TM-38, Control Valve Packing Systems.

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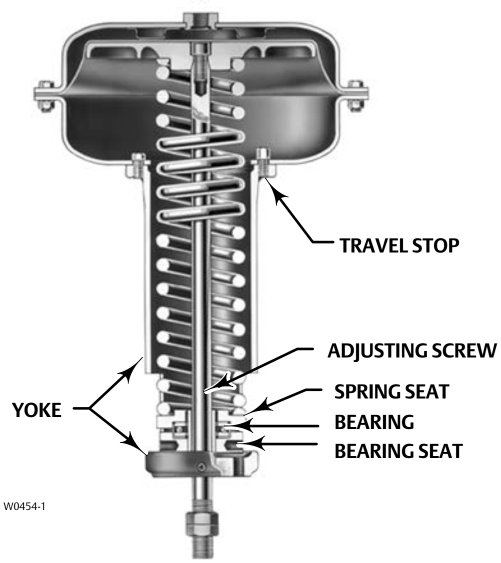
Fisher™ 656 Diaphragm Actuator

The Fisher 656 actuator is a bracket-mounted, direct-acting, diaphragm actuator for either throttling or on-off service. Principal applications include operation of butterfly valves and built-in turbine valves, louvers, dampers, and other similar equipment.



TYPICAL CONSTRUCTION

Fisher 656 Actuator

Features

- **Mounting Versatility**—Four tapped holes in the actuator base permit either bracket or plate mounting.
- **Long Actuator Travel**—Deep casings provide up to 105 mm (4.125 inches) of maximum travel with a size 60 actuator.
- **Application Versatility**—Wide spring selection is available for nearly any control application. Spring selection procedures are quick and accurate.
- **Severe Service Capability**—Rugged yoke and casings provide stability and corrosion resistant protection.

Installation

The actuator may be installed in any position. Dimensions are shown in figure 1.

Specifications

Maximum Recommended Casing Operating Pressure(1)

2.4 bar (35 psig)

Maximum Allowable Casing Pressure(2)(4)

Actuator Size	Maximum Casing Pressure for Actuator Sizing(2a), Bar (Psig)	Maximum Excess Diaphragm Pressure(1a), Bar (Psig)	Maximum Diaphragm Casing Pressure(2a,3a), Bar (Psig)
30	8.6 (125)	1.0 (15)	9.7 (140)
40	4.5 (65)	0.69 (10)	5.2 (75)
60	2.8 (40)	0.69 (10)	3.4 (50)

1a. Additional pressure may be added when the actuator is at full travel. If the Maximum Excess Diaphragm Pressure is exceeded, damage to the diaphragm or diaphragm casing might result. See the Maximum Pressure Limitation section.
2a. Maximum diaphragm casing pressure must not be exceeded and must not produce a force on the actuator stem greater than the maximum allowable actuator output thrust or the maximum allowable stem load. See the Maximum Pressure Limitation section.
3a. This maximum casing pressure is not to be used for normal operating pressure. Its purpose is to allow for typical regulator supply settings and/or relief valve tolerances.

Net Stem Force Output

See table 1

Springs Commonly Used with Rotary Valves

See table 2

Maximum Travel

ACTUATOR SIZE	MAXIMUM RATED STEM TRAVEL mm (INCHES)	
	Standard Travel Stop	Optional Travel Stop
30	54 (2.125)	Not available
40	89 (3.5)	76 (3)
60	105 (4.125)	97 (3.8125)

Operating Temperature Range(4)

- -40 to 82°C (-40 to 180°F) with Nitrile Elastomer
- -40 to 149°C (-40 to 300°F) with Silicone Diaphragm

Construction Materials

Part Description	Construction Material
Diaphragm	Nitrile(3) (standard)
Diaphragm plate and yoke	Cast iron
Diaphragm casings, spring, spring seats, travel stop, stem, bearings, bearing seat, and bearing race	Steel
Adjustment screw	Brass

Casing Pressure Connection

1/4 NPT internal

Mounting and Stem Thread Information

See figure 1

Actuator Weight

Actuator Size	Approximate Shipping Weight, kg (Pounds)
30	23 (50)
40	32 (70)
60	73 (160)

Options

Top-mounted handwheel/adjustable travel stop

1. Control and stability may be impaired if this pressure is exceeded.
2. Exceeding this pressure can cause damage to the diaphragm, diaphragm casing, or other parts.
3. For fluid and temperature capabilities of optional materials, consult your Emerson sales office or Local Business Partner.
4. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded

Ordering Information

When ordering, specify:

1. Actuator type and size
2. Spring range (see table 2)
3. Handwheel or optional travel stop
4. Loading pressure range and volume requirement

Table 1. Stem Force Output and Other Actuator Data

ACTUATOR SIZE	TYPICAL SPRINGS[1]			NET STEM FORCE[2]			EFFECTIVE DIAPHRAGM AREA	
	Maximum Range	Part Number	Color Code	Stem Fully Retracted[3]	Stem Fully Extended[4], with Diaphragm Loading as Shown		Stem Fully Retracted[3]	Stem Fully Extended[4]
	Metric Units							
	Bar	---	---	Newtons	Newtons	Bar	cm^2	
30	0.17 to 0.66 0.21 to 0.86 0.29 to 1.2 0.26 to 1.3	1F361627032 1K509827032 1N751527032 1F177027092	Aluminum and orange Aluminum and dark green Aluminum and red Tan	734 939 1321 1143	2322 1735 698 525	1.4	425	310
	0.27 to 1.6 0.21 to 1.8	1F177127092 1F177227092	Brown Pink	1232 939	1699 1108	2.1		
40	0.21 to 0.88 0.41 to 1.9 0.30 to 2.2	1L217427042 1L217327042 1N844027082	White Dark green None[5]	1468 2802 2002	2424 1201 1632	1.4 2.1 2.4	645	445
60	0.26 to 0.90 0.24 to 1.1	1K162727082 1N937327082	None[5] None[5]	3541 3350	5360 3336	1.4	1387	1032
	0.49 to 1.9 0.48 to 2.3	1K162827082 1P270227042	None[5] None[5]	6503 6410	3034 2224	2.1 2.4		
	US Units							
	Psig	---	---	Pounds	Pounds	Psig	Square Inches	
30	2.5 to 9.6 3.0 to 12.5 4.3 to 17.6 3.7 to 18.4	1F361627032 1K509827032 1N751527032 1F177027092	Aluminum and orange Aluminum and dark green Aluminum and red Tan	165 211 297 257	522 390 157 118	20 psig	66	48
	3.9 to 23.9 3.1 to 26.1	1F177127092 1F177227092	Brown Pink	277 211	382 249	30 psig		
40	3.1 to 12.7 6.0 to 27.4 4.3 to 31.2	1L217427042 1L217327042 1N844027082	White Dark green None[5]	330 630 450	545 270 367	20 psig 30 psig 35 psig	100	69
60	3.7 to 13.1 3.5 to 16.1	1K162727082 1N937327082	None[5] None[5]	796 753	1205 750	20 psig	215	160
	7.1 to 27.0 6.9 to 33.5	1K162827082 1P270227042	None[5] None[5]	1462 1441	682 500	30 psig 35 psig		

1. Others available; consult with your Emerson sales office or Local Business Partner for spring characteristics.
2. For maximum rated stem travel with standard travel stop and zero handwheel limitation.
3. Stem force equals initial spring compression with zero loading pressure.
4. Stem force equals: (loading pressure X diaphragm area with stem fully extended) minus force of springs at maximum compression. Higher pressures can be used, but they must not exceed maximum allowable casing pressure or create stem force greater than safe load limit of any control device component.
5. Part number stamped on spring.

Table 2. Springs Commonly Used with Rotary Valves

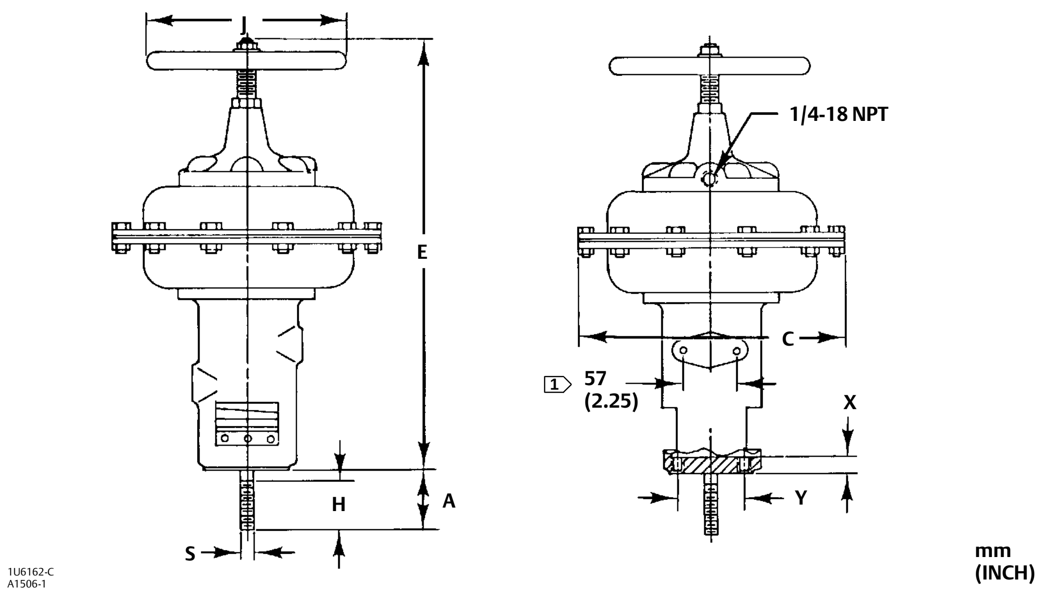
INPUT SIGNAL		1.4 BAR (20 PSIG)			2.4 BAR (35 PSIG)		
INPUT SIGNAL	WITH POSITIONER	1.4 BAR (20 PSIG)			2.4 BAR (35 PSIG)		
	WITHOUT POSITIONER	0.2 to 1.0 BAR (3 to 15 PSIG)			0.4 to 2.1 BAR (6 to 30 PSIG)		
ACTUATOR SIZE		30	40	60	30	40	60
MAXIMUM RATED TRAVEL[1], mm (INCHES)		54 (2.125)	89 (3.5)	105 (4.125)	54 (2.125)	89 (3.5)	105 (4.125)
SPRING PART NUMBER[2]		1K509827032	1K217427042	1K162727082	1F177220792	1L217327042	1K162827082

1. With standard travel stop and zero handwheel limitation.
2. For torque outputs using common springs, contact your Emerson sales office or Local Business Partner.

Table 3. Dimensions

ACTUATOR SIZE	DIMENSION									
	A	C	E		H	J	S (Stem Thread)	X	Y (4 Holes)	
			Without Handwheel	With Handwheel					Bolt Circle Diameter	Thread
mm										
30	67	289	314	490	54	171	1/2-20	19	73	3/8-16 UNC
40	79	333	454	723	64	222	3/4-16	19	73	3/8-16 UNC
60	79	473	692	1014	64	222	3/4-16	32	99	1/2-13 UNC
Inches										
30	2.62	11.38	12.38	19.32	2.12	6.75	See above	0.75	2.88	See above
40	3.12	13.12	17.88	28.38	2.50	8.75		0.75	2.88	
60	3.12	18.62	27.25	39.94	2.50	8.75		1.25	3.88	

Figure 1. Dimensions (also see table 3)



Note:
1 Duplicated on opposite side: each hole 5/16-18 UNC-2B tapped 13 (0.50) deep.

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Fisher™ 657 and 667 Diaphragm Actuators

Fisher 657 and 667 spring-opposed diaphragm actuators position the valve plug in the valve in response to varying controller or valve positioner pneumatic output signals applied to the actuator diaphragm. Zero setting of the actuator is determined by the compression of the actuator spring. Span is set by both the actuator spring rate and the number of springs available. The 657 actuator is direct-acting; the 667 is reverse-acting. These actuators are designed to provide dependable on-off or throttling operation of automatic control valves.

W2174-2
657 ACTUATOR

W1916-3
667 ACTUATOR

Fisher 657 and 667 Actuators Mounted on easy-e™ Valves

Features

- **Application Versatility**—Five actuator types in eleven sizes are available for an extensive variety of applications. Spring rates, travel stops, and manual operators are available for nearly any control valve application.

- **Excellent Linearity Between Loading Pressure and Travel**—A molded diaphragm travels in a deep diaphragm casing, minimizing area change throughout the travel.

- **High Degree of Dynamic Stability and Frequency Response**—A shallow casing on the pressure side means reduced volume on that side, thereby minimizing response time.

- **High Thrust Capability**—The molded diaphragm allows maximum thrust for given diaphragm size.

- **Long Service Life**—Rugged thick-walled cast iron and steel construction provides increased stability, corrosion protection, and protection from deformation should over-pressurization occur.

- **Cold Service Applications**—Enhanced product specifications for all sizes of 657 and 667 diaphragm actuators allow performance to -50°C (-58°F). Use of a positioner is recommended to ensure responsiveness in applications operating below -40°C (-40°F).

- **Positive Connections**—A split block stem connection provides a solid transfer of motion while allowing easy mounting. The absence of linkages helps to avoid lost motion and inaccurate valve positioning.

Specifications

Standard Operating Pressure Range(1)

657 and 667: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)
657-4 and 667-4: 0.2 to 1.9 bar (3 to 27 psig)
667 Size 76: ■ 0.4 to 2.0 bar (6 to 30 psig) or ■ 0 to 3.1 bar (0 to 45 psig)

Maximum Travel

See table 1

Output Indication

Stainless steel disk or pointer and graduated scale

Stroking Speed

Dependent on actuator size, travel, spring rate, initial spring compression, and supply pressure. If stroking speed is critical, consult your Emerson sales office or Local Business Partner.

Maximum Allowable Thrust(2)

See table 1

Operating Temperature Range(1)

Standard Construction (Nitrile Elastomers): -40 to 82°C (-40 to 180°F)
Optional Construction (Silicone Diaphragm): -40 to 149°C (-40 to 300°F)
Maximum Valve Packing Box Temperature: 427°C (800°F) with cast iron yoke

Volumetric Displacement

See table 2

Signal Connections

Sizes 30 - 60 and 667 Size 76: 1/4 NPT internal
Sizes 70 and 87: 1/2 NPT internal with 1/4 NPT internal bushing
Size 80
657: 3/4 NPT internal with 1/4 NPT internal bushing
667: 1/2 NPT internal with 1/4 NPT internal bushing
Size 100: 1 NPT internal with 1/4 NPT internal bushing

Effective Diaphragm Area

See table 1

Construction Materials (refer to figure 1)

Diaphragm Casing
Sizes 30 -87: Steel
Size 80: ■ Cast iron or ■ steel
Size 100: ■ Cast aluminum
Diaphragm
Sizes 30 -87: ■ Nitrile on nylon, ■ Silicone on polyester
Size 100: Nitrile on polyester
Diaphragm Plate
657 Sizes 30-60, 100: ■ Cast aluminum
657 Sizes 70 -87: ■ Cast iron or ■ steel
667 Sizes 30 -60, 100: ■ Cast aluminum or ■ steel
667 Sizes 70 -87: ■ Cast iron or ■ steel
Actuator Spring: Steel
Spring Adjustor: Steel
Spring Seat: ■ Steel or ■ cast iron
Actuator Stem: Steel
Travel Indicator: Stainless steel
O-Rings: Nitrile
Seal Bushing: Brass
Stem Connector: Zinc-plated steel
Yoke
Sizes 30 -80: ■ Cast iron or ■ steel
Size 100: Steel

-continued-

Contents

Specifications (continued)

Construction Materials for Cold Service [to -50°C (-58°F)] 657 and 667--all sizes

Yoke: Steel (Grade LCC)
Diaphragm: Silicone
O-Rings:[3] Ethylene Propylene
Bolting: Stainless Steel B8M Cl 2
Stem Connector: Stainless Steel
Lubricant: Silicone

Stem and Yoke Boss Diameters

See table 1

Approximate Weight

See table 3

Optional Safety Instrumented System Classification

SIL3 capable - certified by exida Consulting LLC

Options

■ Oversize signal connections, ■ Plastic yoke covers

1. The pressure and temperature limits in this bulletin and in any applicable standard or code limitation should not be exceeded.
2. Do not exceed the thrust limits in this bulletin.
3. Includes diaphragm casing seals, casing-mounted handwheel on 657, seal bushing on 667.

Available Configurations

Direct Action

All 657 actuators are direct acting. Applying air pressure to the upper diaphragm casing forces the actuator stem downward. When this pressure is reduced, the opposing spring force moves the actuator stem upward. Should the loading pressure fail, the spring forces the stem to the extreme upward position. This provides fail-open action for push-down-to-close valves and fail-closed action for push-down-to-open valves.

657—A direct-acting actuator used on sliding-stem valves. Available in sizes 30 through 100. See figures 1, 2, 5, and 6.

657-4—A 657 actuator in sizes 70 and 87, designed with 102 mm (4-inch) travel.

Reverse Action

All 667 actuators are reverse acting. Applying air pressure to the lower diaphragm casing forces the actuator stem upward against the opposing spring force. When this loading pressure is reduced, the spring moves the actuator stem downward. Should the loading pressure fail, the spring forces the stem to the extreme downward position. The actuators provide fail-closed action for push-down-to-close valves and fail-open action for push-down-to-open valves.

667—A reverse-acting actuator used on sliding-stem valves. Available in sizes 30 through 100 and 76. See figures 1, 2, and 7.

667-4—A 667 actuator in sizes 70 and 87, designed with 102 mm (4-inch) travel.

Accessories

Handwheels

Handwheels for diaphragm actuators are often used as adjustable travel stops. They also provide a ready means of positioning the control valve in an emergency. The specifications in tables 5 and 6 apply to handwheels on both 657 and 667 Series actuators. For repeated or daily manual operation, the unit should be equipped with a side-mounted handwheel actuator.

Top-Mounted Handwheels—Typical 657 and 667 actuators with handwheels mounted on the diaphragm case are shown in figure 2 (not available on a 667 actuator, size 80). On the 657 actuator, the handwheel can be set to limit the travel in the upward direction; on the 667 actuator, travel in the downward direction can be restricted. A P-2 travel stop (figure 4) is available for a 667 actuator, sizes 45-60 to limit travel in either the upward or downward directions. An actuator with a P-2 travel stop is limited to a maximum travel of 19 mm (0.75 inch). The handwheel on the size 100 is similar in function to those on the smaller sizes, but it uses a gear drive similar to the drive employed on the integral side-mounted handwheels (see figure 2).

Clockwise rotation of the handwheel on the 657 actuator moves the actuator stem downward, compressing the spring. Spring action returns the stem as the handwheel is turned counterclockwise. With the 667 actuator, counterclockwise rotation moves the stem upward, and spring action returns the stem on clockwise rotation.

Side-Mounted Handwheels—Figure 3 shows the side-mounted handwheels (designated by the letters MO) applicable to sizes 34 through 87, 657 and 667 actuators. Size 30 actuators do not have a side-mounted handwheel available.

All side-mounted handwheels can be used to stroke the valve in either direction at any point in the actuator stem travel. Unlike the top-mounted handwheel, the side-mounted handwheel can be positioned to limit travel in either direction, but not both at the same time. With the handwheel in the neutral position, automatic operation is possible throughout full valve travel. In any other position, valve travel will be restricted. The handwheel is furnished with a spring-loaded ball detent which prevents vibration from changing the setting.

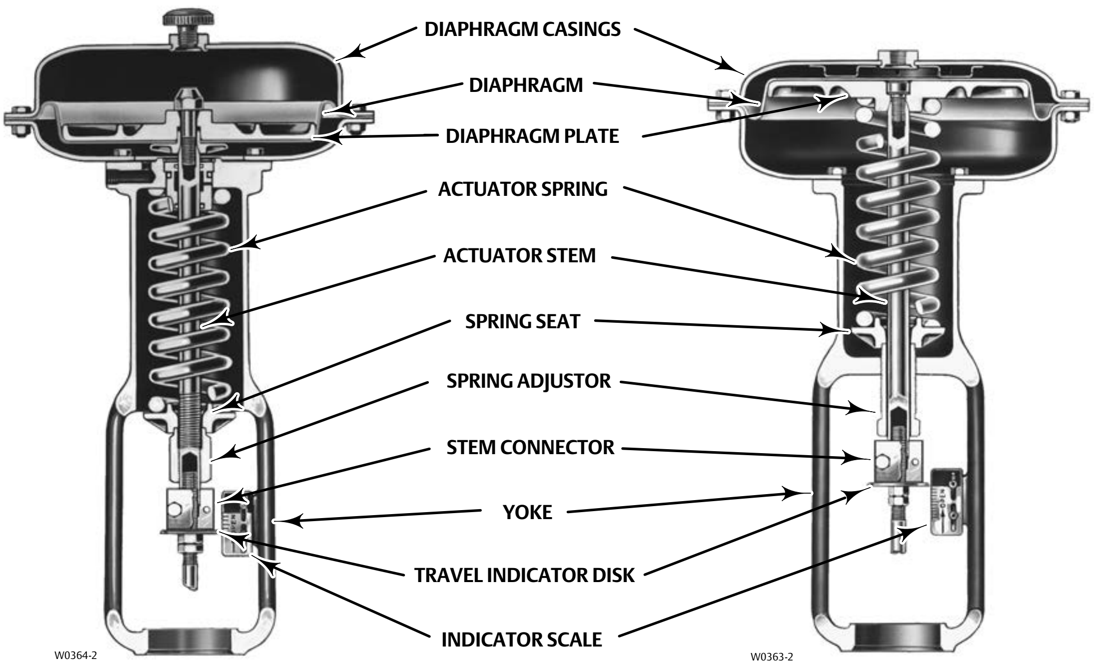
Adjustable Travel Stops

Top-mounted adjustable travel stops are available for 657 and 667 Series actuators. They are used to limit travel in the up, down, or up and down directions. Figure 4 illustrates the different constructions. Table 7 locates the different style constructions with actuator type and use.

Other

Accessories such as transducers, positioners, position transmitters, air relays, volume boosters, switching valves, lockup valves, limit switches, and solenoid valves are also available for actuator mounting. They are described in separate publications. Contact your Emerson sales office or Local Business Partner for details.

Figure 1. Typical Actuators



667 SIZES 30-87

657 SIZES 30-87

657 SIZE 100

Table 1. Additional Specifications for Fisher 657 and 667 Series Actuators

ACTUATOR SIZE	EFFECTIVE DIAPHRAGM AREA	YOKE BOSS DIAMETER	STEM DIA	MAXIMUM TRAVEL	MAXIMUM ALLOWABLE THRUST(1)
	cm^2	mm			N
30	297	54	9.5	19	10,231
34	445	54	9.5	29	10,231
40	445	71	12.7	38	12,010
45	677	71	12.7	51	25,132
46	1006	71	12.7	51	33,584
50	677	90	19.1	51	25,131
60	1006	90	19.1	51	30,246
70(2)	1419	90	19.1	76 102(3)	39,142
76(667)	1006	90	19.1	51	30,246
80	1761	127	25.4 31.8	76	63,392 88,075(4)
87(2)	1419	127	25.4	76 102(3)	39,142
100	2902	127H(5) 178	31.8 50.8	102	200,160
	$Inch^2$	Inch			Lb
30	46	2-1/8	3/8	0.75	2300
34	69	2-1/8	3/8	1.125	2300
40	69	2-13/16	1/2	1.5	2700
45	105	2-13/16	1/2	2	5650
46	156	2-13/16	1/2	2	7550
50	105	3-9/16	3/4	2	5650
60	156	3-9/16	3/4	2	6800
70(2)	220	3-9/16	3/4	3 4(3)	8800
76(667)	156	3-9/16	3/4	2	6800
80	273	5	1 1-1/4	3	14,150 19,800(4)
87(2)	220	5	1	3 4(3)	8800
100	450	5H(5) 7	1-1/4 2	4	45,000

1. These values are based on material limitations such as yoke, stem connection, diaphragm plate, and travel stop strengths.
2. Values also apply to 657-4 and 667-4 actuators.
3. For 657-4 and 667-4 actuator constructions.
4. Steel construction.
5. H=Heavy actuator-to-valve bolting.

Table 2. Volumetric Casing Displacement for Fisher 657 and 667 Series Actuators

ACTUATOR SIZE		CLEARANCE VOLUME(1)	TRAVEL, mm							
			11	16	19	29	38	51	76	102
		cm^3	Casing Volume(2), cm^3							
30		540	918	1080	1180	---	---	---	---	---
34 and 40		934	1470	1700	1850	2330	2790	---	---	---
45 and 50		1560	---	2790	3000	3720	4420	5410	---	---
46, 60, and 76		2180	---	3880	4210	5280	6340	7740	---	---
70 and 87		3490	5240	5950	6420	7830	9240	11,110	14,880	18,570
80		4820	---	---	---	10,490	12,450	14,860	19,340	---
100	657	10,880	---	---	16,400	19,170	21,940	25,630	33,000	40,380
	667	12,780	---	---	18,320	21,070	23,840	27,530	34,900	42,280
		Inch^3	TRAVEL, INCH							
			0.4375	0.625	0.75	1.125	1.5	2	3	4
			Casing Volume(2), Inch^3							
30		33	56	66	72	---	---	---	---	---
34 and 40		57	90	104	113	142	170	---	---	---
45 and 50		95	---	170	183	227	270	330	---	---
46, 60, and 76		133	---	237	257	322	387	472	---	---
70 and 87		213	320	363	392	478	564	678	980	1133
80		294	---	---	---	640	760	907	1180	---
100	657	664	---	---	1002	1170	1339	1564	2014	2464
	667	780	---	---	1118	1286	1455	1680	2130	2580

1. Clearance volume indicates casing volume at zero travel.
2. Includes clearance volume.

Table 3. Approximate Actuator Weights (without handwheel)

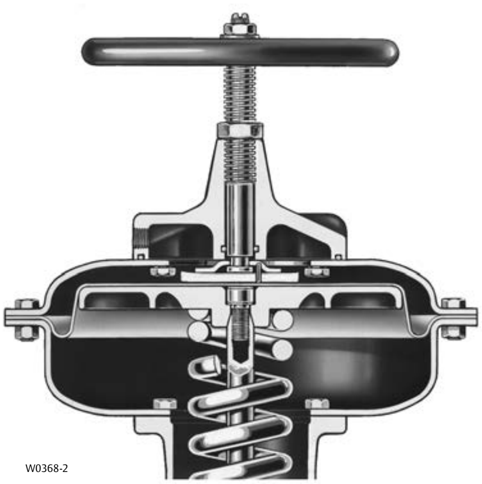
ACTUATOR SIZE	ACTUATOR			
	657	667	657	667
	Kg		Lb	
30	16	15	36	34
34	22	22	48	48
40	23	23	51	50
45	37	41	82	90
46	49	55	107	121
50	42	43	92	94
60	53	55	116	122
70	107	115	235	254
76	---	86	---	190
80	234	284	515	626
87	116	118	255	260
100	346	544	762	1200

Table 4. Thrust Capabilities(1) by Input Signal Range

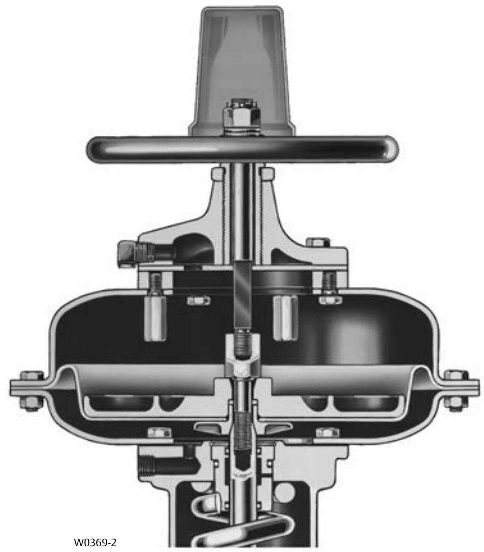
TRAVEL	ACTUATOR SIZE	PRESSURE RANGE TO ACTUATOR DIAPHRAGM(2)	THRUST CAPABILITIES	
			657	667
mm		Bar	N	
19	30	0.2-1	2250	1840
		0.4-2	3890	3270
	34	0.2-1	3380	3380
		0.4-2	5830	5530
29	40	0.2-1	3380	2760
		0.4-2	5530	3680
	45	0.2-1	4670	4670
		0.4-2	8410	8870
	46	0.2-1	6940	6250
		0.4-2	13,190	11,800
38	50	0.2-1	5140	3740
		0.4-2	8410	7010
	60	0.2-1	6940	4860
		0.4-2	13,190	8330
51	70	0.2-1	7830	7830
		0.4-2	18,590	13,700
	80	0.2-1	10,110	11,250
		0.4-2	18,950	19,680
	87	0.2-1	6850	7830
		0.4-2	18,590	13,700
76	100	0.2-1	16,010	8010
		0.4-2	32,030	36,030
102		0.2-1	12,010	- - -
		0.4-2	22,019	28,024
Inch		Psig	Lb	
0.75	30	3-15	506	414
		6-30	874	736
	34	3-15	759	759
		6-30	1311	1242
1.125	40	3-15	759	621
		6-30	1242	828
	45	3-15	1050	1050
		6-30	1890	1995
	46	3-15	1560	1404
		6-30	2964	2652
1.5	50	3-15	1155	840
		6-30	1890	1575
	60	3-15	1560	1092
		6-30	2964	1872
2	70	3-15	1760	1760
		6-30	4180	3080
	80	3-15	2272	2528
		6-30	4260	4424
	87	3-15	1540	1760
		6-30	4180	3080
3	100	3-15	3600	1800
		6-30	7200	8100
4		3-15	2700	- - -
		6-30	4950	6300

1. For Size 76 667 actuators, contact your Emerson sales office or Local Business Partner.
2. Consult Fisher 657 and 667 instruction manuals (D100306X012, D100307X012, D100310X012, and D100311X012) for additional information on maximum pressure limitations.

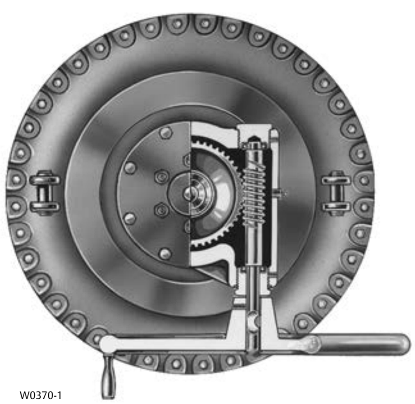
Figure 2. Typical Top-Mounted Handwheels



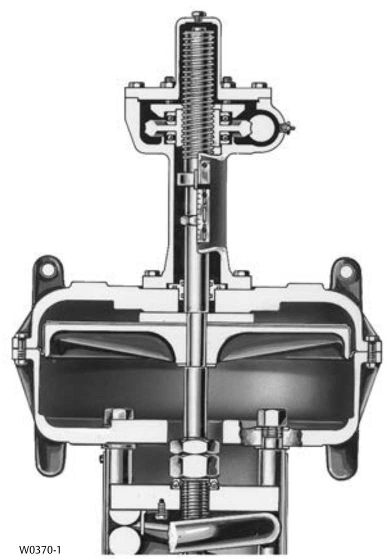
657 ACTUATOR
(EXCEPT SIZE 100)



667 ACTUATOR
(EXCEPT SIZES 80 AND 100)



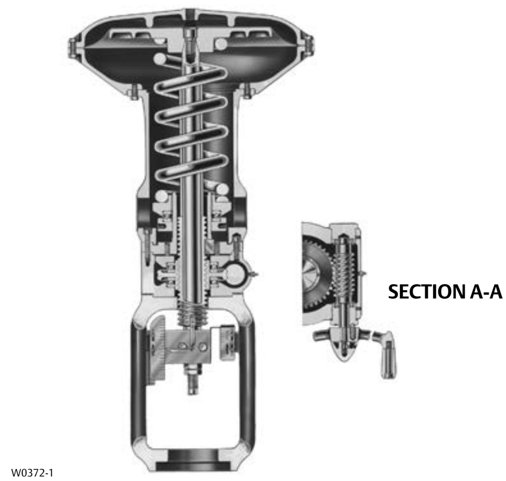
TOP VIEW



657 ACTUATOR SIZE 100
(GEAR DRIVEN)

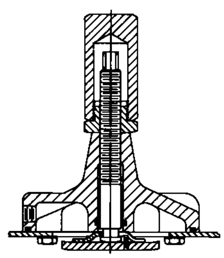
Figure 3. Typical Side-Mounted Handwheels for Fisher 657 and 667 Series Actuators

SIZES 34 THROUGH 60

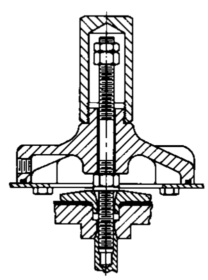


SIZES 70, 76, 80, AND 87

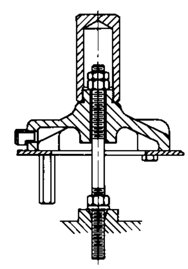
Figure 4. Adjustable Travel Stops



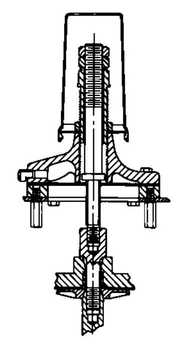
STYLE 1
657 AND 657-4
UP STOP



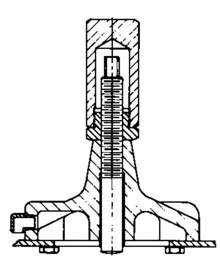
STYLE 2
657 AND 657-4
DOWN STOP



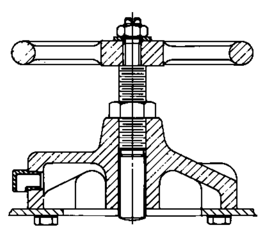
STYLE 10
667 DOWN STOP



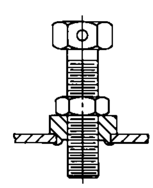
STYLE 11
667 UP
AND DOWN STOP



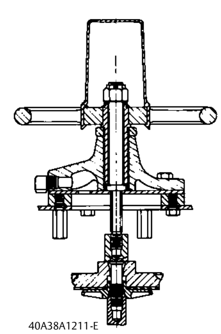
STYLE 12
667 UP STOP



STYLE 13
667 UP STOP



STYLE 14
667 UP STOP



STYLE P2
667 UP AND
DOWN STOP

Table 5. Fisher 657 Handwheel Specifications

657 ACTUATOR SIZE	TOP-MOUNTED HANDWHEEL				SIDE-MOUNTED HANDWHEEL			
	Handwheel Diameter	Turns Per mm Travel	Rim Force(1)	Maximum Handwheel Output Force(3)	Handwheel Diameter	Turns Per mm Travel	Rim Force(1)	Maximum Handwheel Output Force(3)
	mm		N	N	mm		N	N
30	171	0.3	190	6670	- - -	- - -	- - -	- - -
34 and 40	222	0.3	210	10,010	304	0.2	230	10,010
45 and 50	222	0.3	420	15,080	355	0.3	360	15,080
46 and 60	222	0.3	490	22,690	355	0.3	540	22,690
70 and 87	355	0.3	590	29,360	432	0.8	160	29,360
80	355	0.3	770	37,770	432	0.4	240	37,770
100(2)	406	6	270	160,000	- - -	- - -	- - -	- - -
	Inch	Turns Per Inch Travel	Lb	Lb	Inch	Turns Per Inch Travel	Lb	Lb
30	6.75	8	42	1500	- - -	- - -	- - -	- - -
34 and 40	8.75	8	48	2250	12	5.14	52	2250
45 and 50	8.75	8	95	3390	14	6.65	81	3390
46 and 60	8.75	8	110	5100	14	6.65	122	5100
70 and 87	14	8	132	6600	17	20	36	6600
80	14	8	173	8490	17	10	53	8490
100(2)	16	144	60	36,000	- - -	- - -	- - -	- - -

1. Tangential handwheel force required to produce the handwheel output force shown. (Proportional to handwheel output force).
2. Top-mounted with gear drive.
3. Maximum force available to compress the actuator spring and close the valve.

Table 6. Fisher 667 Handwheel Specifications

667 ACTUATOR SIZE	TOP-MOUNTED HANDWHEEL				SIDE-MOUNTED HANDWHEEL				
	Handwheel Diameter	Turns Per mm Travel	Rim Force(1)	Maximum Handwheel Output Force(3)	667 ACTUATOR SIZE	Handwheel Diameter	Turns Per mm Travel	Rim Force(1)	Maximum Handwheel Output Force(3)
	mm		N	N		mm		N	N
30	171	0.3	200	6670	30	- - -	- - -	- - -	- - -
34 and 40	222	0.3	230	10,010	34 and 40	304	0.2	230	10,010
45 and 50	222	0.2	460	17,790	45 and 50	355	0.3	360	15,080
	355	0.2	430	26,690					
46, 60, and 76	222	0.2	460	17,790	46 and 60	355	0.3	540	22,690
	355	0.2	430	26,690					
70 and 87	355	0.2	520	26,690	70, 76, and 87	432	0.8	160	29,360
	762 mm Bar	0.2	410	44,480					
100(2)	406	6	270	160,000	80	432	0.4	240	37,770
667 ACTUATOR SIZE	Inch	Turns Per Inch Travel	Lb	Lb	667 ACTUATOR SIZE	Inch	Turns Per Inch Travel	Lb	Lb
30	6.75	8	45	1500	30	- - -	- - -	- - -	- - -
34 and 40	8.75	8	51	2250	34 and 40	12	5.14	52	2250
45 and 50	8.75	6	103	4000	45 and 50	14	6.65	81	3390
	14	6	97	6000					
46, 60, and 76	8.75	6	103	4000	46 and 60	14	6.65	122	5100
	14	6	97	6000					
70 and 87	14	6	118	6000	70, 76, and 87	17	20	36	6600
	30 Inch Bar	6	92	10000					
100(2)	16	144	60	36,000	80	17	10	53	8490

1. Tangential handwheel force required to produce the handwheel output force shown. (Proportional to handwheel output force).
2. Top-mounted with gear drive.
3. Maximum force available to compress actuator spring.

Table 7. Adjustable Travel Stop Styles (1)

Actuator Size	30	34	40	45	46	50	60 and 667 Size 76	70	87	80	100
657 Up Stop	1	1	1	1	1	1	1	1	1	NOTE 2	NOTE 2
657 Down Stop	2	2	2	2	2	2	2	2	2	- - -	- - -
667 Up Stop	12, 13(3), 14	12, 13(3), 14	12, 13(3), 14	12, 13(3), 14	12, 13(3), 14	12, 13(3), 14	12, 13(3), 14	12	12	13(3)	- - -
667 Down Stop	10	10	10	10	10	10	10	10	10	- - -	NOTE 2
667 Up and Down Stop	- - -	11	11	11(4), P2(5)	11(4), P2(5)	11(4), P2(5)	11(4), P2(5)	- - -	- - -	- - -	- - -

1. See figure 4.
2. Top-mounted handwheel, see figure 2.
3. Adjustable handwheel up stop.
4. 38 mm (1.5 inch) maximum travel.
5. Adjustable handwheel up and down stop, 19 mm (0.75 inch) maximum travel.

Figure 5. Fisher 646 Electro-Pneumatic Transducer on 657 Actuator

W4917-1

Figure 6. Fisher 3582i Valve Positioner on 657 Actuator

W4930

Figure 7. Fisher 4200 Position Transmitter on 667 Actuator

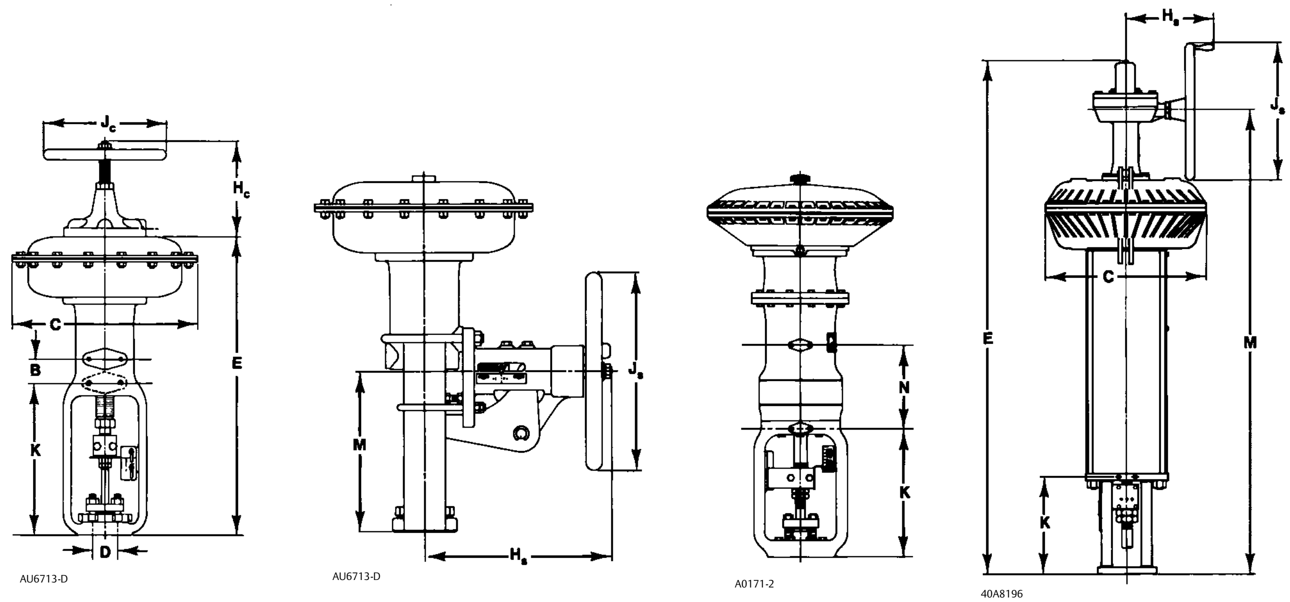
W4273-1

Table 8. Dimensions

DIMENSION REFERENCE		ACTUATOR SIZE												
		30	34	40	45	46	47	50	60	70	76	80	87	100
		mm												
B	657, -4	0	25	25	38	38	38	38	38	38	- - -	- - -	38	- - -
B	667, -4	38	38	38	38	38	38	38	38	38	38	- - -	38	- - -
C		289	333	333	406	473	536	406	473	536	473	635	536	729
D		54	54	71	71	71	71	90	90	90	90	127	127	127(2)
E	657	440	498	548	659	656	- - -	722	722	840	- - -	1075	938	NOTE 3
E	657-4	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	994	- - -	- - -	1089	- - -
E	657MO(1)	440	498	548	659	656	- - -	722	722	976	- - -	1183	1057	NOTE 4
E	657-4 MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1124	- - -	- - -	1204	- - -
E	667	478	573	594	768	748	- - -	784	784	933	881	1257	1003	1857
E	667-4	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1070	- - -	- - -	1143	- - -
E	667MO	478	573	594	768	748	- - -	784	784	1164	1112	1392	1245	2346
E	657-4 MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1314	- - -	- - -	1394	- - -
H_c	657	121	164	164	202	202	- - -	202	202	313	- - -	227	313	- - -
H_c	667	119	121	137	159	159	- - -	159	159	286	159	- - -	286	- - -
H_s		- - -	284	286	375	375	- - -	378	378	292	222	303	292	401
J_c		171	222	222	222	222	356	222	222	356	356	356	356	- - -
J_s		- - -	305	305	356	356	- - -	356	356	432	432	432	432	406
K	657, -4	213	222	272	291	291	395	354	354	406	- - -	435	780	451
K	667, -4	194	224	244	310	310	- - -	325	325	375	375	432	419	451
M	657, -4	- - -	226	248	306	306	- - -	370	370	446	- - -	503	527	NOTE 5
M	667, -4	- - -	214	248	362	362	- - -	378	378	446	446	503	527	2105
N	657	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	254	- - -	- - -
N	657MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	219	- - -	384	219	- - -
N	657-4MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	219	- - -	- - -	219	- - -
N	667	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	254	- - -	- - -
N	667MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	219	219	384	219	- - -
N	667-4MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	219	- - -	- - -	219	- - -
		Inches												
B	657, -4	0.00	1.00	1.00	1.50	1.50	1.50	1.50	1.50	1.50	- - -	- - -	1.50	- - -
B	667, -4	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	- - -	1.50	- - -
C		11.38	13.12	13.12	16.00	18.62	21.12	16.00	18.62	21.12	18.62	25.00	21.12	28.69
D		2.125	2.125	2.8125	2.8125	2.8125	2.8125	3.5625	3.5625	3.5625	3.5625	5	5	5(2)
E	657	17.31	19.62	21.56	25.94	25.81	- - -	28.44	28.44	33.06	- - -	42.31	36.94	NOTE 3
E	657-4	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	39.12	- - -	- - -	42.88	- - -
E	657MO	17.31	19.62	21.56	25.94	25.81	- - -	28.44	28.44	38.44	- - -	46.56	41.62	NOTE 4
E	657-4 MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	44.25	- - -	- - -	47.38	- - -
E	667	18.81	22.56	23.38	30.25	29.44	- - -	30.88	30.88	36.75	34.70	49.50	39.50	73.12
E	667-4	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	42.12	- - -	- - -	45.00	- - -
E	667MO	18.81	22.56	23.38	30.25	29.44	- - -	30.88	30.88	45.81	43.76	54.81	49.00	92.38
E	657-4 MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	51.75	- - -	- - -	54.88	- - -
H_c	657	4.75	6.44	6.44	7.94	7.94	- - -	7.94	7.94	12.31	- - -	8.94	12.31	- - -
H_c	667	4.69	4.75	5.38	6.25	6.25	- - -	6.25	6.25	11.25	6.25	- - -	11.25	- - -
H_s		- - -	11.19	11.25	14.75	14.75	- - -	14.88	14.88	11.50	11.50	11.94	11.50	15.78
J_c		6.75	8.75	8.75	8.75	8.75	14.00	8.75	8.75	14.00	8.75	14.00	14.00	- - -
J_s		- - -	12.00	12.00	14.00	14.00	- - -	14.00	14.00	17.00	17.00	17.00	17.00	16.00
K	657, -4	8.38	8.75	10.69	11.44	11.44	15.56	13.94	13.94	16.00	- - -	17.12	18.88	17.75
K	667, -4	7.62	8.83	9.62	12.19	12.19	- - -	12.81	12.81	14.75	14.75	17.00	16.50	17.75
M	657, -4	- - -	8.88	9.75	12.06	12.06	- - -	14.56	14.56	17.56	- - -	19.81	20.75	NOTE 5
M	667, -4	- - -	8.44	9.75	14.25	14.25	- - -	14.88	14.88	17.56	17.56	19.81	20.75	82.88
N	657	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	10.00	- - -	- - -
N	657MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	8.62	- - -	15.12	8.62	- - -
N	657-4MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	8.62	- - -	- - -	8.62	- - -
N	667	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	10.00	- - -	- - -
N	667MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	8.62	8.62	15.12	8.62	- - -
N	667-4MO	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	8.62	- - -	- - -	8.62	- - -

1. MO = Manual operator.
2. Also available with 7 inch boss.
3. With group 1 springs, E=1959 mm (77.12 inch). With group 2 springs, E=1497 mm (58.94 inch).
4. With group 1 springs, E=2345 mm (92.31 inch). With group 2 springs, E=1883 mm (74.12 inch).
5. With group 1 springs, M=2103 mm (82.81 inch). With group 2 springs, M=1654 mm (65.12 inch).

Figure 8. Dimensions (also see table 8)



657, 667, 657-4, AND 667-4 SIZES 30 THROUGH 87

657, 667, 657-4, AND 667-4 SIZES 30 THROUGH 87

ALL TYPES SIZES 70, 80, 87, AND 667 SIZE 76

657 AND 667 SIZE 100

Ordering Information

When ordering, specify:

Application

1. On-off or throttling service
2. Input signal range
3. Maximum supply pressure
4. Valve body type and size with which the actuator will be used
5. Valve plug travel
6. Actuator thrust required with actuator stem both fully retracted and fully extended
7. Stroking time requirements, if critical
8. Seismic requirements, if critical
9. Ambient temperature range

Actuator and Positioner

Be sure to specify: actuator type number; whether a positioner is required; whether a top-mounted handwheel is required; and whether an adjustable up or down travel stop is required. Refer to the Specifications section. Review the information under each specification and in the referenced tables and figures. Specify the desired choice wherever there is a selection to be made.

Valve Body and Accessories

Refer to the separate valve body bulletin and bulletins covering accessories for ordering information.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 657 and 667 Size 30i - 76i Diaphragm Actuators

Fisher 657 and 667, size 30i to 76i, spring-opposed diaphragm actuators position the valve plug in the valve in response to varying controller or valve positioner pneumatic output signals applied to the actuator diaphragm. Zero setting of the actuator is determined by the compression of the actuator spring, and span is set by the actuator spring rate. The 657 actuator is direct-acting; the 667 is reverse-acting. These actuators are designed to provide dependable on-off or throttling operation of control valves.


X1175-1 X1182-2

Fisher 657 and 667 Size 30i - 76i Actuators Mounted on easy-e™ Valves

Features

- **Improved Ease of Use--** Integral mounting pad for Fisher FIELDVUE™ DVC2000 and DVC6200 digital valve controllers eliminates the traditional mounting bracket and reduces the number of parts required to mount.
- **Integral Air Passage--** Fisher 667 size 30i through 76i actuators incorporate an integral air passage that eliminates the need for external tubing and fittings when paired with a DVC2000 or DVC6200.
- **Backwards Compatible--** Both 657 and 667 are compatible with instruments that utilize traditional bracket-based mounting kits. The 667 can be externally tubed for instruments or accessories when required.
- **Application Versatility--** Spring rates, travel stops, and manual operators are available for nearly any control valve application.
- **Excellent Linearity Between Loading Pressure and Travel--** A molded diaphragm travels in a deep diaphragm casing, minimizing area change throughout the travel.
- **High Degree of Dynamic Stability and Frequency Response--** A shallow casing on the pressure side means reduced volume on that side, thereby minimizing response time.
- **High Thrust Capability--** The molded diaphragm allows maximum thrust for given diaphragm size.
- **Long Service Life--** Rugged thick-walled cast iron and steel construction provides increased stability and corrosion protection.

Specifications

Standard Operating Pressure Range(1)

657 and 667: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)
657-4 and 667-4: 0.2 to 1.9 bar (3 to 27 psig)
667 Size 76i: ■ 0.4 to 2.0 bar (6 to 30 psig) or ■ 0 to 3.1 bar (0 to 45 psig)

Maximum Travel

See table 2

Output Indication

Stainless steel disk or pointer and graduated scale

Stroking Speed

Dependent on actuator size, travel, spring rate, initial spring compression, and supply pressure. If stroking speed is critical, consult your Emerson sales office.

Maximum Allowable Thrust(2)

See table 2

Operating Temperature Range(1)

Standard Construction (Nitrile Elastomers): -40 to 82°C (-40 to 180°F)
Optional Construction (Silicone Diaphragm) and Ethylene Propylene (EPDM) or Fluorocarbon (FKM) O-rings): -40 to 149°C (-40 to 300°F)
Optional Low Ambient Temperature Construction: -60 to 82°C (-72 to 180°F). Optional side mounted handwheel allowed.
This construction is suitable for cold climate regions and compliant to GOST 15150, however, when ambient temperature is below -50°C (-58°F), it is not advised to operate the handwheel. Note that current SIL certification is only relevant for standard temperature construction. Contact your Emerson sales office for details.
Maximum Valve Packing Box Temperature: 427°C (800°F) with cast iron yoke

Volumetric Displacement

See table 1

Signal Connections

Sizes 30i - 60i and 667 Size 76i: 1/4 NPT internal
Size 70i: 1/2 NPT internal.
Oversize signal connections available

Effective Diaphragm Area

See table 2

Construction Materials (refer to figure 1)

Diaphragm Casing
Sizes 30i - 76i: Steel
Diaphragm
Sizes 30i - 76i: ■ Nitrile on nylon, ■ Silicone on polyester, ■ EPDM on aramid, ■ FKM on aramid
Diaphragm Plate
657 Sizes 30i- 60i: ■ Cast aluminum
657 Size 70i: ■ Cast iron or ■ steel
667 Sizes 30i- 60i and 76i: ■ Cast aluminum
667 Size 70i: ■ Cast iron or ■ steel
Actuator Spring: Steel
Spring Adjustor: Steel
Spring Seat: ■ Cast iron or ■ steel
Actuator Stem: Steel
Travel Indicator: Stainless steel
O-Rings: , ■ Nitrile, ■ EPDM, or ■ FKM
Seal Bushing
667 Sizes 30i- 60i: ■ Brass
667 Sizes 70i - 76i: ■ Glass-filled PTFE or ■ Brass
Stem Connector: Zinc-plated steel
Yoke
Sizes 30i - 76i: Cast iron only

Stem and Yoke Boss Diameters

See table 2

Approximate Weight

See table 3

1. The pressure and temperature limits in this bulletin and in any applicable standard or code limitation should not be exceeded.
2. Do not exceed the thrust limits in this bulletin.

Contents

Tables

Available Configurations

Direct Action

All 657 actuators are direct acting. Applying air pressure to the upper diaphragm casing forces the actuator stem downward. When this pressure is reduced, the opposing spring force moves the actuator stem upward. Should the loading pressure fail, the spring forces the stem to the extreme upward position. This provides fail-open action for push-down-to-close valves and fail-closed action for push-down-to-open valves.

657—A direct-acting actuator used on sliding-stem valves. Available in sizes 30i through 70i. See figure 1.

657-4—A 657 actuator in size 70i, designed with 102 mm (4-inch) travel.

Reverse Action

All 667 actuators are reverse acting. Applying air pressure to the lower diaphragm casing forces the actuator stem upward against the opposing spring force. When this loading pressure is reduced, the spring moves the actuator stem downward. Should the loading pressure fail, the spring forces the stem to the extreme downward position. These actuators provide fail-closed action for push-down-to-close valves and fail-open action for push-down-to-open valves.

667—A reverse-acting actuator used on sliding-stem valves. Available in sizes 30i through 76i. See figure 1.

667-4—A 667 actuator in size 70i, designed with 102 mm (4-inch) travel.

Integral Instrument Mount

Fisher 657 and 667 size 30i through 76i actuators feature an integral mounting pad for the DVC2000 and DVC6200 (see figure 1). Only a few parts are required to mount these FIELDVUE instruments to the size i, resulting in a fast and simple mounting procedure.

Fisher 667 size 30i through 76i actuators feature an integral air passage that eliminates the need for tubing and fittings when paired with a DVC2000 or DVC6200. The 667 retains an external air connection for applications and instruments or accessories that require external tubing.

Accessories

Handwheels

Handwheels for diaphragm actuators are often used as adjustable travel stops. They also provide a ready means of positioning the control valve in an emergency. The specifications in tables 6 and 7 apply to handwheels on both 657 and 667 actuators. For repeated or daily manual operation, the unit should be equipped with a side-mounted handwheel.

Top-Mounted Handwheels—Typical 657 and 667 actuators with handwheels mounted on the diaphragm casing are shown in figure 5. On the 657 actuator, the handwheel can be set to limit the travel in the upward direction; on the 667 actuator, travel in the downward direction can be restricted. A P-2 travel stop (figure 5) is available for a 667 actuator, sizes 45i-60i to limit travel in either the upward or downward directions. An actuator with a P-2 travel stop is limited to a maximum travel of 19mm (0.75 inch).

Clockwise rotation of the handwheel on the 657 actuator moves the actuator stem downward, compressing the spring. Spring action returns the stem as the handwheel is turned counterclockwise. With the 667 actuator, counterclockwise rotation moves the stem upward, and spring action returns the stem on clockwise rotation.

Side-Mounted Handwheels—Figure 3 shows the side-mounted handwheels (designated by the letters MO) available in sizes 34i through 60i on 657 and 667 actuators. Size 30i actuators do not have a side-mounted handwheel available.

All side-mounted handwheels can be used to stroke the valve in either direction at any point in the actuator stem travel. Unlike the top-mounted handwheel, the side-mounted handwheel can be positioned to limit travel in either direction, but not both at the same time. With the handwheel in the neutral position, automatic operation is possible throughout full valve travel. In any other position, valve travel will be restricted. The handwheel is furnished with a spring-loaded ball detent which prevents vibration from changing the setting.

Adjustable Travel Stops

Top-mounted adjustable travel stops are available for 657 and 667 actuators. They are used to limit travel in the up, down, or up and down directions. Figure 7 illustrates the different constructions. Table 5 defines availability of the different style constructions with actuator type and use.

Other

Accessories such as transducers, positioners, position transmitters, air relays, volume boosters, switching valves, lockup valves, limit switches, and solenoid valves are also available for actuator mounting. They are described in separate publications. Contact your Emerson sales office for details.

Figure 1. Typical 657 and 667 Actuators

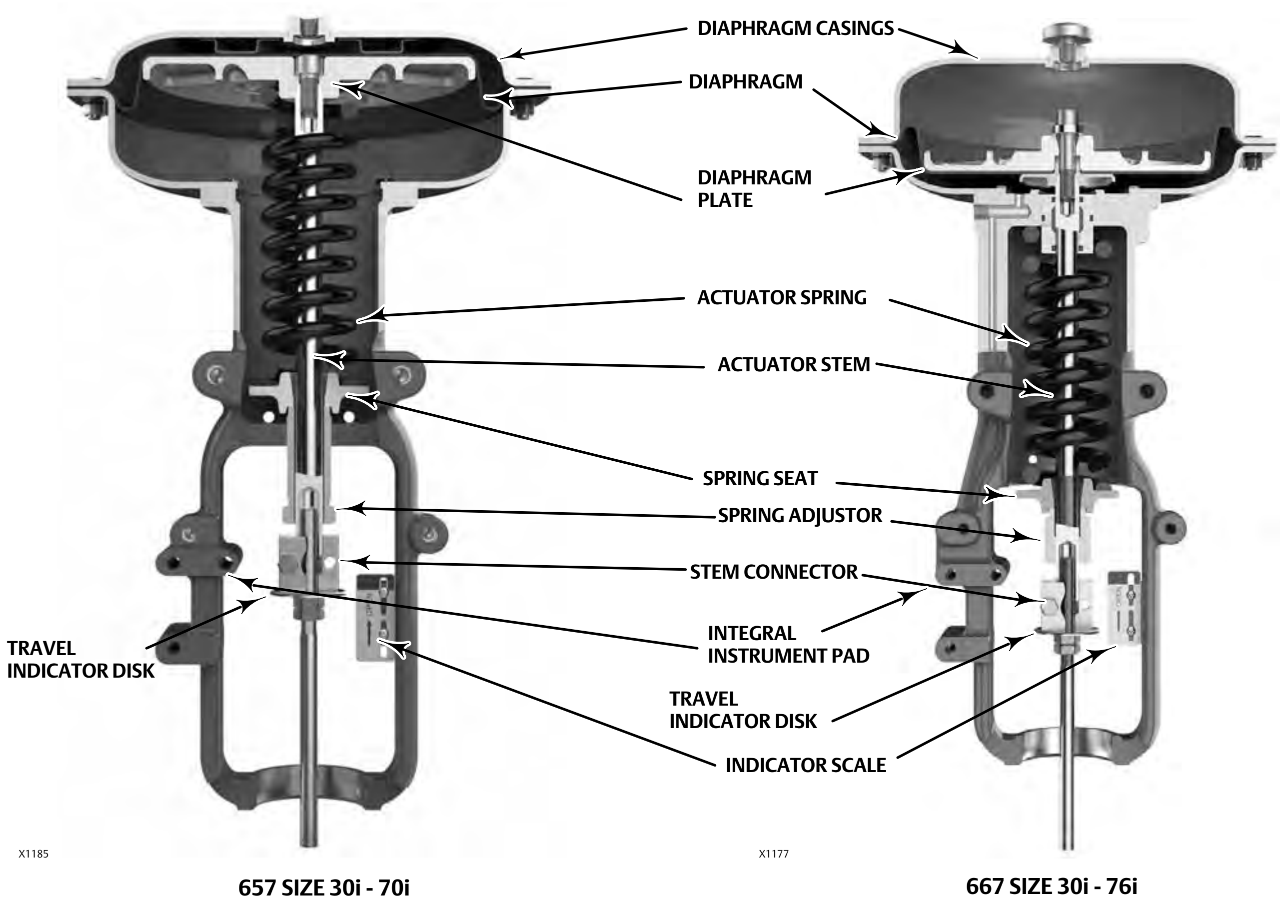


Figure 2. Fisher 657 with Integral-Mounted DVC6200

X1178

X1214

Table 1. Volumetric Casing Displacement for Fisher 657 and 667 Actuators

ACTUATOR SIZE	CLEARANCE VOLUME(1)	TRAVEL, mm							
		11	16	19	29	38	51	76	102
	cm^3	Casing Volume(2), cm^3							
30i	540	918	1080	1180	- - -	- - -	- - -	- - -	- - -
34i and 40i	934	1470	1700	1850	2330	2790	- - -	- - -	- - -
45i and 50i	1560	- - -	2790	3000	3720	4420	5410	- - -	- - -
46i, 60i, and 76i(3)	2180	- - -	3880	4210	5280	6340	7740	- - -	- - -
70i	3490	5240	5950	6420	7830	9240	11110	14880	18570
		TRAVEL, INCH							
	$Inch^3$	0.4375	0.625	0.75	1.125	1.5	2	3	4
		Casing Volume(2), $Inch^3$							
30i	33	56	66	72	- - -	- - -	- - -	- - -	- - -
34i and 40i	57	90	104	113	142	170	- - -	- - -	- - -
45i and 50i	95	- - -	170	183	227	270	330	- - -	- - -
46i, 60i, and 76i(3)	133	- - -	237	257	322	387	472	- - -	- - -
70i	213	320	363	392	478	564	678	980	1133

1. Clearance volume indicates casing volume at zero travel.
2. Includes clearance volume.
3. For 667i only.

Table 2. Additional Specifications for Fisher 657 and 667 Actuators

ACTUATOR SIZE	EFFECTIVE DIAPHRAGM AREA	YOKE BOSS DIAMETER	STEM DIAMETER	MAXIMUM TRAVEL	MAXIMUM ALLOWABLE THRUST(1)
	cm^2	mm			N
30i	297	54	9.5	19	10231
34i	445	54	9.5	29	10231
40i	445	71	12.7	38	12010
45i	677	71	12.7	51	25132
46i	1006	71	12.7	51	33584
50i	677	90	19.1	51	25131
60i	1006	90	19.1	51	30246
70i	1419	90	19.1	76 102(2)	39142
76i (667)	1006	90	19.1	51	30246
	$Inch^2$	Inch			Lb
30i	46	2-1/8	3/8	0.75	2300
34i	69	2-1/8	3/8	1.125	2300
40i	69	2-13/16	1/2	1.5	2700
45i	105	2-13/16	1/2	2	5650
46i	156	2-13/16	1/2	2	7550
50i	105	3-9/16	3/4	2	5650
60i	156	3-9/16	3/4	2	6800
70i	220	3-9/16	3/4	3 4(2)	8800
76i (667)	156	3-9/16	3/4	2	6800

1. These values are based on material limitations such as yoke, stem connection, diaphragm plate, and travel stop strengths.
2. For 657-4 and 667-4 actuator constructions.

Table 3. Approximate Actuator Weights (without handwheel)

ACTUATOR SIZE	ACTUATOR			
	657	667	657	667
	Kg		Lb	
30i	17	17	38	37
34i	25	26	54	58
40i	25	26	56	56
45i	40	44	89	98
46i	52	59	114	129
50i	45	48	99	105
60i	56	60	123	133
70i	109	118	240	260
76i	- - -	89	- - -	196

Table 4. Thrust Capabilities(1) by Input Signal Range

TRAVEL	ACTUATOR SIZE	PRESSURE RANGE TO ACTUATOR DIAPHRAGM(2)	THRUST CAPABILITIES 657	THRUST CAPABILITIES 667
mm		Bar	N	
19	30i	0.2-1	2250	1840
		0.4-2	3890	3270
	34i	0.2-1	3380	3380
		0.4-2	5830	5530
29	40i	0.2-1	3380	2760
		0.4-2	5530	3680
	45i	0.2-1	4670	4670
		0.4-2	8410	8870
	46i	0.2-1	6940	6250
		0.4-2	13190	11800
38	50i	0.2-1	5140	3740
		0.4-2	8410	7010
	60i	0.2-1	6940	4860
		0.4-2	13190	8330
51	70i	0.2-1	7830	7830
		0.4-2	18590	13700
Inch		Psig	Lb	
0.75	30i	3-15	506	414
		6-30	874	736
	34i	3-15	759	759
		6-30	1311	1242
1.125	40i	3-15	759	621
		6-30	1242	828
	45i	3-15	1050	1050
		6-30	1890	1995
	46i	3-15	1560	1404
		6-30	2964	2652
1.5	50i	3-15	1155	840
		6-30	1890	1575
	60i	3-15	1560	1092
		6-30	2964	1872
2	70i	3-15	1760	1760
		6-30	4180	3080

1. For size 76i 667 actuators, contact your Emerson sales office.
2. Consult Fisher 657 and 667 instruction manuals (D100306X012, D100307X012, D100310X012, and D100311X012) for additional information on maximum pressure limitations.

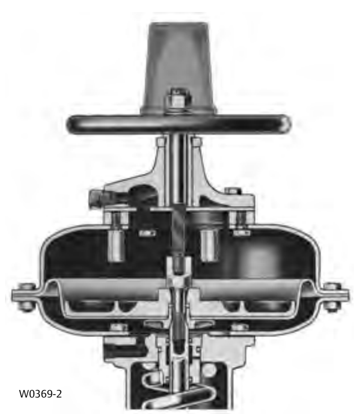
Figure 3. Typical Side-Mounted Handwheel

Figure 4. Typical Side-Mounted Handwheel for Fisher 657 and 667 Actuators

667 SIZES 34i THROUGH 60i

Figure 5. Typical Top-Mounted Handwheels

657 ACTUATOR

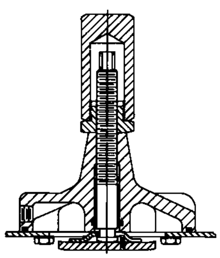


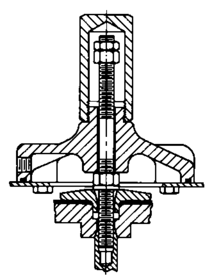
667 ACTUATOR

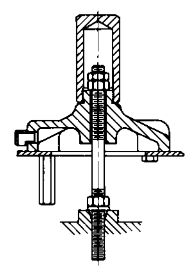
Figure 6. Fisher 667 Size 40i with Integral-Mounted DVC6200

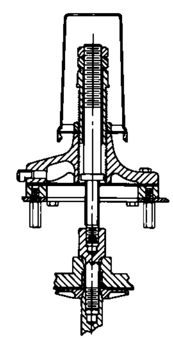
667 SIZE 40i

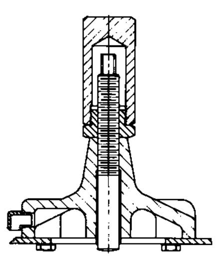
Figure 7. Adjustable Travel Stops


STYLE 1
657 AND 657-4
UP STOP

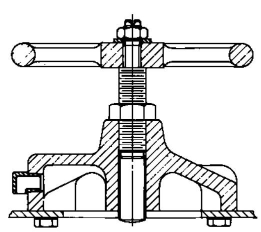

STYLE 2
657 AND 657-4
DOWN STOP

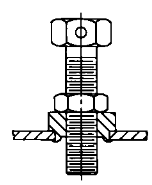

STYLE 10
667 DOWN STOP

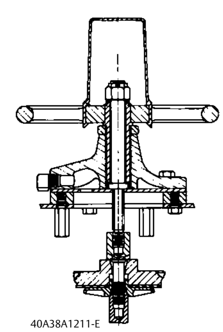

STYLE 11
667 UP
AND DOWN STOP



STYLE 12
667 UP STOP


STYLE 13
667 UP STOP


STYLE 14
667 UP STOP



STYLE P2
667 UP AND
DOWN STOP

Table 5. Adjustable Travel Stop Styles [1]

Actuator Size	30i	34i	40i	45i	46i	50i	60i	70i	667 Size 76i
657 Up Stop	1	1	1	1	1	1	1	1	1
657 Down Stop	2	2	2	2	2	2	2	2	2
667 Up Stop	12, 13[3], 14	12, 13[3], 14	12, 13[3], 14	12, 13[3], 14	12, 13[3], 14	12, 13[3], 14	12, 13[3], 14	12	12, 13[3], 14
667 Down Stop	10	10	10	10	10	10	10	10	10
667 Up and Down Stop	- - -	11	11	11[4], P2[5]	11[4], P2[5]	11[4], P2[5]	11[4], P2[5]	- - -	11[4], P2[5]

1. See figure 7.
2. Top-mounted handwheel, see figure 5.
3. Adjustable handwheel up stop.
4. 38 mm (1.5 inch) maximum travel.
5. Adjustable handwheel up and down stop, 19 mm (0.75 inch) maximum travel.

Table 6. Fisher 657 Handwheel Specifications

657 ACTUATOR SIZE	TOP-MOUNTED HANDWHEEL				SIDE-MOUNTED HANDWHEEL			
	Handwheel Diameter	Turns Per mm Travel	Rim Force[1]	Max Handwheel Output Force	Handwheel Diameter	Turns Per mm Travel	Rim Force[1]	Max Handwheel Output Force[2]
	mm		N	N	mm		N	N
30i	171	0.3	190	6670	- - -	- - -	- - -	- - -
34i and 40i	222	0.3	210	10010	304	0.2	230	10010
45i and 50i	222	0.3	420	15080	355	0.3	360	15080
46i and 60i	222	0.3	490	22690	355	0.3	540	22690
70i[3]	355	0.3	590	29360	- - -			
	Inch	Turns Per Inch Travel	Lb	Lb	Inch	Turns Per Inch Travel	Lb	Lb
30i	6.75	8	42	1500	- - -	- - -	- - -	- - -
34i and 40i	8.75	8	48	2250	12	5.14	52	2250
45i and 50i	8.75	8	95	3390	14	6.65	81	3390
46i and 60i	8.75	8	110	5100	14	6.65	122	5100
70i[3]	14	8	132	6600	- - -			

1. Tangential handwheel force required to produce the handwheel output force shown. (Proportional to handwheel output force).
2. Maximum force available to compress the actuator spring and close the valve.
3. 657 size 70i is not available with a side-mounted handwheel. Utilize 657 size 70 for side-mounted handwheel.

Table 7. Fisher 667 Handwheel Specifications

667 ACTUATOR SIZE	TOP-MOUNTED HANDWHEEL				SIDE-MOUNTED HANDWHEEL			
	Handwheel Diameter	Turns Per mm Travel	Rim Force[1]	Maximum Handwheel Output Force[2]	Handwheel Diameter	Turns Per mm Travel	Rim Force[1]	Maximum Handwheel Output Force[2]
	mm		N	N	mm		N	N
30i	171	0.3	200	6670	- - -	- - -	- - -	- - -
34i and 40i	222	0.3	230	10010	304	0.2	230	10010
45i and 50i	222	0.2	460	17790	355	0.3	360	15080
	355	0.2	430	26690				
46i, 60i, and 76i[3]	222	0.2	460	17790	355	0.3	540	22690
	355	0.2	430	26690				
70i[3]	355	0.2	520	26690	- - -			
	762 mm Bar	0.2	410	44480				
667 ACTUATOR SIZE	Inch	Turns Per Inch Travel	Lb	Lb	Inch	Turns Per Inch Travel	Lb	Lb
30i	6.75	8	45	1500	- - -	- - -	- - -	- - -
34i and 40i	8.75	8	51	2250	12	5.14	52	2250
45i and 50i	8.75	6	103	4000	14	6.65	81	3390
	14	6	97	6000				
46i, 60i, and 76i[3]	8.75	6	103	4000	14	6.65	122	5100
	14	6	97	6000				
70i[3]	14	6	118	6000	- - -			
	30 Inch Bar	6	92	10000				

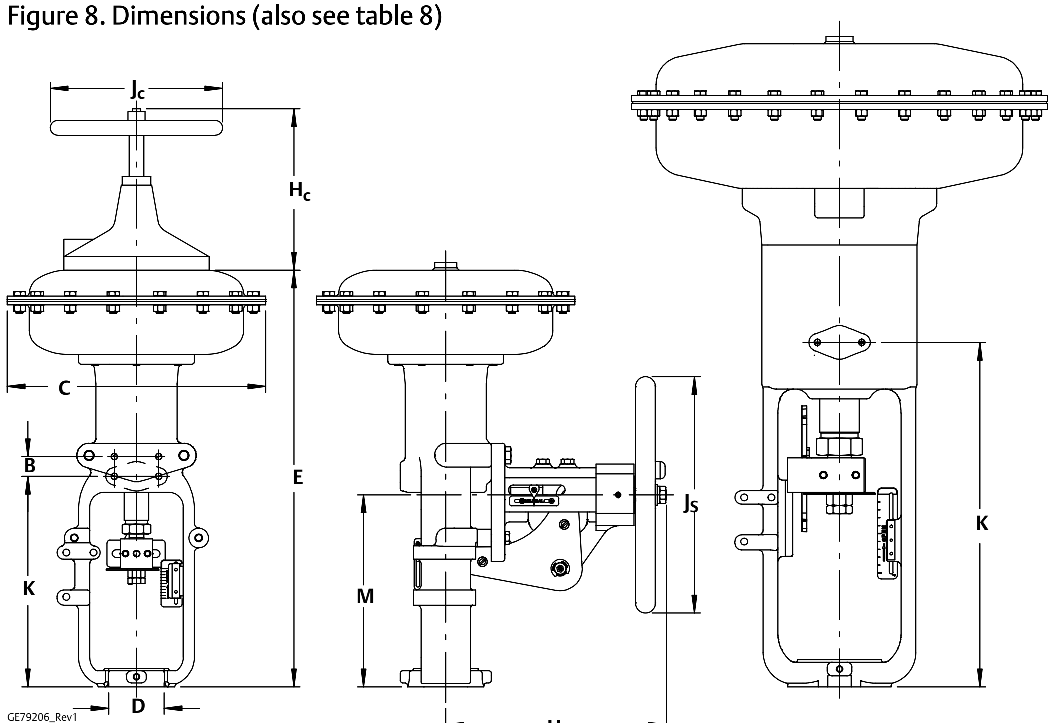
1. Tangential handwheel force required to produce the handwheel output force shown. (Proportional to handwheel output force).
2. Maximum force available to compress actuator spring.
3. 667 size 70i and 76i are not available with a side-mounted handwheel. Utilize 667 size 70 and 76 for side-mounted handwheel.

Table 8. Dimensions

DIMENSION REFERENCE		ACTUATOR SIZE								
		30i	34i	40i	45i	46i	50i	60i	70i	76i
		mm								
B	657, -4	0	25	25	38	38	38	38	38	- - -
	667, -4	38	38	38	38	38	38	38	38	38
C		289	333	333	406	473	406	473	536	473
D		54	54	71	71	71	90	90	90	90
E	657	440	498	548	659	656	722	722	840	- - -
	657-4	- - -	- - -	- - -	- - -	- - -	- - -	- - -	994	- - -
	657MO(1)	440	498	548	659	656	722	722	- - -	- - -
	667	478	573	594	768	748	784	784	933	881
	667-4	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1070	- - -
	667MO(1)	478	573	594	768	748	784	784	- - -	- - -
H_c	657	121	164	164	202	202	202	202	313	- - -
	667	119	121	137	159	159	159	159	286	159
H_s		- - -	284	286	375	375	378	378	292	222
J_c		171	222	222	222	222	222	222	356	356
J_s		- - -	305	305	356	356	356	356	432	432
K	657, -4	213	222	272	291	291	354	354	406	- - -
	667, -4	194	224	244	310	310	325	325	375	375
M	657, -4	- - -	226	248	306	306	370	370	446	- - -
	667, -4	- - -	214	248	362	362	378	378	446	446
		Inches								
B	657, -4	0.00	1.00	1.00	1.50	1.50	1.50	1.50	1.50	- - -
	667, -4	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
C		11.38	13.12	13.12	16.00	18.62	16.00	18.62	21.12	18.62
D		2.125	2.125	2.8125	2.8125	2.8125	3.5625	3.5625	3.5625	3.5625
E	657	17.31	19.62	21.56	25.94	25.81	28.44	28.44	33.06	- - -
	657-4	- - -	- - -	- - -	- - -	- - -	- - -	- - -	39.12	- - -
	657MO	17.31	19.62	21.56	25.94	25.81	28.44	28.44	- - -	- - -
	667	18.81	22.56	23.38	30.25	29.44	30.88	30.88	36.75	34.70
	667-4	- - -	- - -	- - -	- - -	- - -	- - -	- - -	42.12	- - -
	667MO	18.81	22.56	23.38	30.25	29.44	30.88	30.88	- - -	- - -
H_c	657	4.75	6.44	6.44	7.94	7.94	7.94	7.94	12.31	- - -
	667	4.69	4.75	5.38	6.25	6.25	6.25	6.25	11.25	6.25
H_s		- - -	11.19	11.25	14.75	14.75	14.88	14.88	11.50	11.50
J_c		6.75	8.75	8.75	8.75	8.75	8.75	8.75	14.00	8.75
J_s		- - -	12.00	12.00	14.00	14.00	14.00	14.00	17.00	17.00
K	657, -4	8.38	8.75	10.69	11.44	11.44	13.94	13.94	16.00	- - -
	667, -4	7.62	8.83	9.62	12.19	12.19	12.81	12.81	14.75	14.75
M	657, -4	- - -	8.88	9.75	12.06	12.06	14.56	14.56	17.56	- - -
	667, -4	- - -	8.44	9.75	14.25	14.25	14.88	14.88	17.56	17.56

1. MO = Manual operator.

Figure 8. Dimensions (also see table 8)



657, 667, 657-4, AND 667-4
SIZES 30i THROUGH 76i (667)

657 AND 667,
SIZES 34i THROUGH 60i

657, 667, 657-4, AND 667-4
SIZES 70i AND 76i (667)

Ordering Information

When ordering, specify:

Application

1. On-off or throttling service
2. Input signal range
3. Maximum supply pressure
4. Valve body type and size with which the actuator will be used
5. Valve plug travel
6. Actuator thrust required with actuator stem both fully retracted and fully extended
7. Stroking time requirements, if critical
8. Ambient temperature range

Actuator

Be sure to specify: actuator type number; whether a top-mounted handwheel is required; and whether an adjustable up or down travel stop is required. Refer to the Specifications section. Review the information under each specification and in the referenced tables and figures. Specify the desired choice wherever there is a selection to be made.

Valve Body, Instruments, and Accessories

Refer to the separate valve body bulletin, instrument bulletins, and bulletins covering accessories for ordering information.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

EMERSON

Fisher™ 657C Size 40i, 46i, and 60i Diaphragm Actuators

The Fisher 657C is a direct-acting, spring-opposed, long-travel diaphragm actuator for the Yarway™ desuperheater line of products (AT-38/48, AT-37/47, AT-18/28, and 4300 Templow™). Zero setting of the actuator is determined by the compression of the actuator spring, and span is set by the actuator spring rate. The actuator is designed to provide dependable on-off or throttling operation of desuperheaters.

The 657C diaphragm actuator is available in size 40i, 46i, and 60i to cover the wide range of thrust to operate all Yarway desuperheater valves (AT-38/48, AT-37/47, AT-18/28, and 4300 Templow). Contact your Emerson sales office for more information.

Fisher 657C Actuator

Features

- **Long Actuator Travel**—Deep casings provide up to 105 mm (4.125 inches) of maximum travel with a size 60i actuator.

- **Backwards Compatible**—The 657C is compatible with the Yarway installed base, includes non-Fisher yoke boss sizes.

- **Long Service Life**—Rugged thick-walled cast iron construction provides increased stability and corrosion protection.

- **Application Versatility**—Spring rates and travel stops are available to cover the wide range of AT-38/48, AT-37/47, AT-18/28, and 4300 Templow desuperheaters.

- **Excellent Linearity Between Loading Pressure and Travel**—A molded diaphragm travels in a deep diaphragm casing, minimizing area change throughout the travel.

- **High Thrust Capability**—The molded diaphragm allows maximum thrust for given diaphragm size.

- **Improved Ease of Use**—Integral mounting pad for Fisher FIELDVUE™ DVC6200 digital valve controllers eliminates the traditional mounting bracket and reduces the number of parts required to mount.

- **Positive Connections**—A split block stem connection provides a solid transfer of motion while allowing easy mounting. The absence of linkages helps to avoid lost motion and inaccurate valve positioning.

Specifications

Standard Operating Pressure Range(1)

■ 0.2 to 1.0 bar (3 to 15 psig) or
■ 0.4 to 2.0 bar (6 to 30 psig)

Maximum Travel

See table 1

Operating Temperature Range(1)

Standard Construction (Nitrile Elastomers):
-40 to 82°C (-40 to 180°F)
Optional Construction (Silicone Diaphragm):
-40 to 149°C (-40 to 300°F)

Maximum Allowable Thrust(2)

See table 1

Volumetric Displacement

See table 2

Signal Connections

Standard: 1/4 NPT internal
Optional: 1/2 NPT internal

Stroking Speed

Dependent on actuator size, travel, spring rate, initial spring compression, and supply pressure. If stroking speed is critical, consult your Emerson sales office.

Effective Diaphragm Area

See table 1

Construction Materials

See figure 1:
Diaphragm Casing: ■ Steel
Diaphragm: ■ Nitrile on nylon, ■ Silicone on polyester
Diaphragm Plate: ■ Cast Aluminum
Actuator Spring: ■ Steel
Spring Adjustor: ■ Steel
Spring Seat: ■ Steel
Actuator Stem: ■ Steel
Travel Indicator: ■ Stainless Steel
Stem Connector: ■ Zinc-plated steel
Yoke: ■ Cast Iron

Stem and Yoke Boss Dimensions

See table 1

Approximate Weights (without handwheel)

Actuator Size	kg	lb
40i	34	75
46i	66	146
60i	72	160

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.
2. Do not exceed the thrust limits in this bulletin.

Principle of Operation

Direct Action - Push Down to Open

The 657C is a direct acting actuator used on Yarway AT-38/48, AT-37/47, AT-18/28, and 4300 Templow desuperheaters. Available in sizes 40i, 46i, and 60i. Applying air pressure to the upper diaphragm casing forces the actuator stem downward. When this pressure is reduced, the opposing spring force moves the actuator stem upward. Should the loading pressure fail, the spring forces the stem to the extreme upward position. This provides fail-closed action for Yarway desuperheaters.

Adjustable Travel Stop

Top-mounted adjustable travel stop is available for 657C series actuators. See figure 3. The adjustable travel stop is used to limit travel in the down directions.

Accessories

Handwheel for diaphragm actuators are often used as adjustable travel stops. It can be operated easily and allows for means of positioning the control valve in an emergency.

Clockwise rotation of the handwheel on the 657C actuator moves the actuator stem downward, compressing the spring. Spring action returns the stem as the handwheel is turned counterclockwise

Top-mounted handwheel—Typical 657C actuator with handwheel mounted on the diaphragm case are shown in figure 2. On the 657C actuator, the handwheel can be set to limit the travel in the upward direction.

Other

Accessories such as transducers, positioners, position transmitters, air relays, volume boosters, switching valves, lockup valves, limit switches, and solenoid valves are also available for actuator mounting. They are described in separate publications. Contact your Emerson sales office for more information.

Figure 1. Actuator Components for Size 40i, 46i, and 60i Actuators

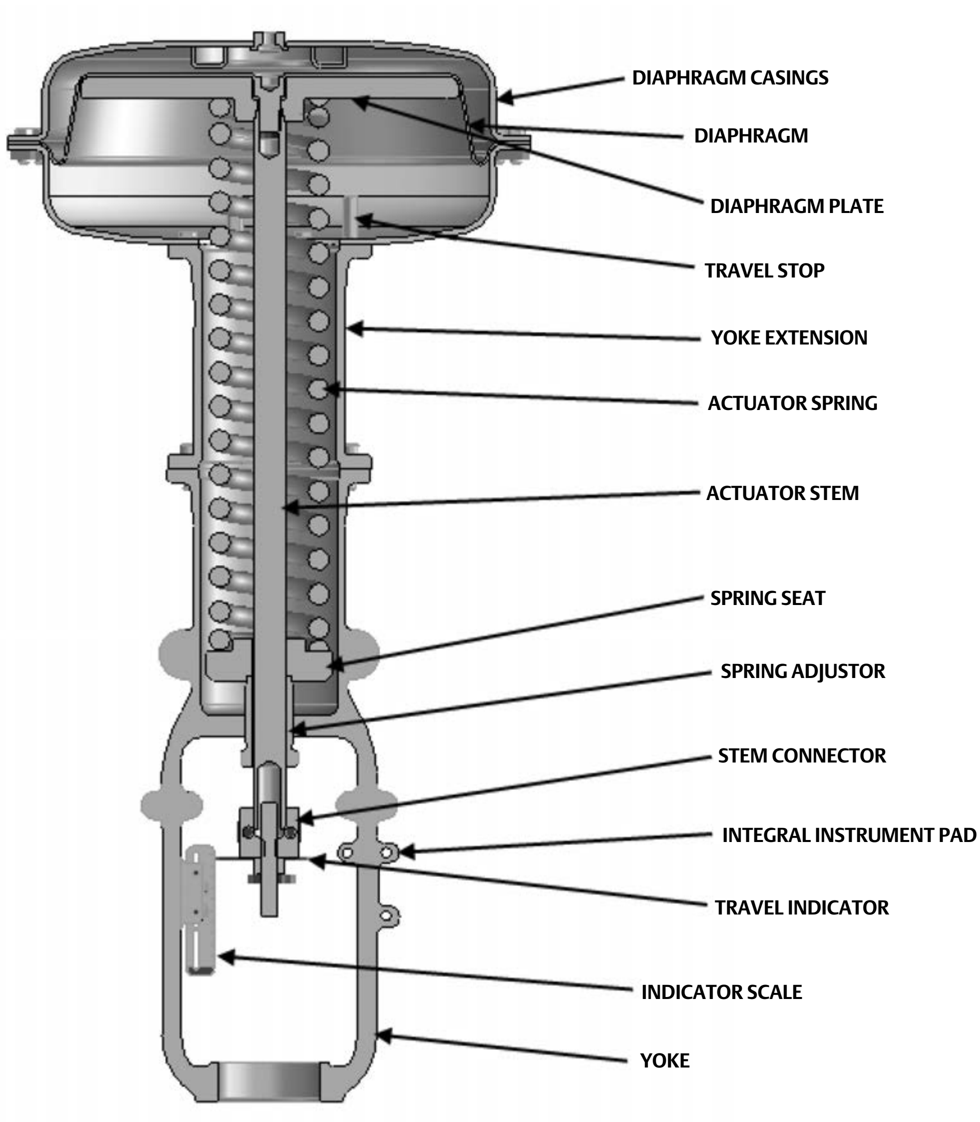


Figure 2. Fisher 657C Top-Mounted Handwheel

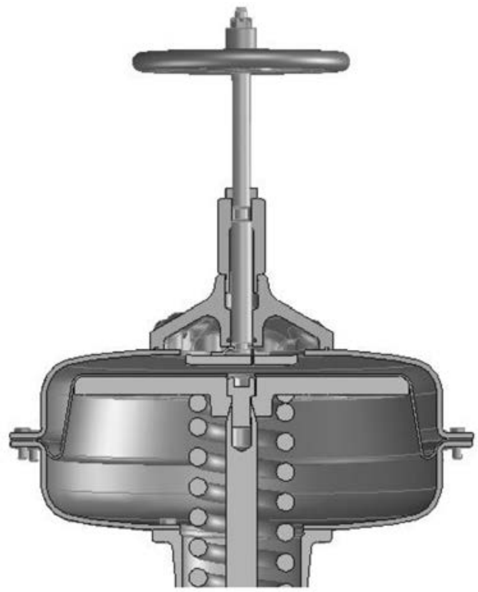


Figure 3. Fisher 657C Adjustable Travel Stop

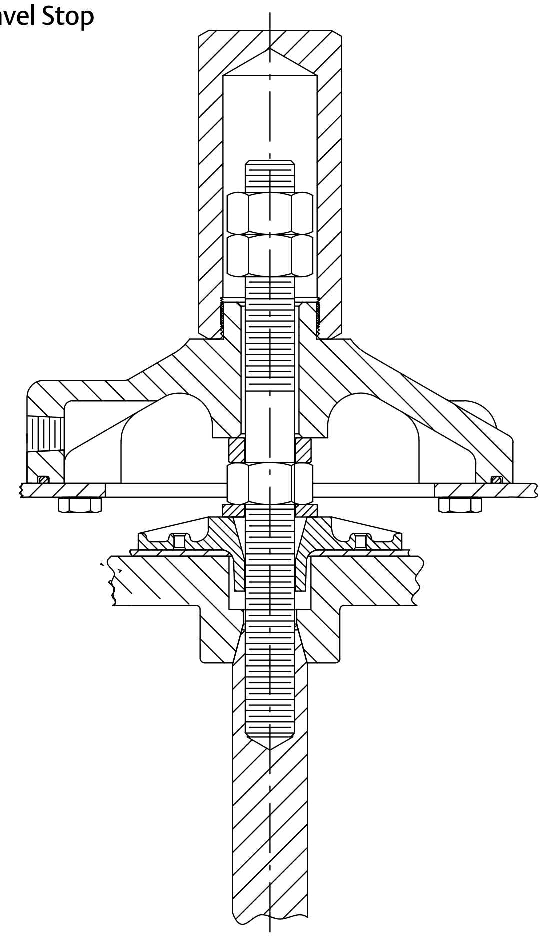


Table 1. Additional Specifications for Fisher 657C Series Actuators

ACTUATOR SIZE	EFFECTIVE DIAPHRAGM AREA	YOKE BOSS DIAMETER(3)	MAXIMUM TRAVEL	MAXIMUM ALLOWABLE THRUST(1)	STEM DIAMETER
	cm2	mm		N	
40i	445	71	89	12,010	12 mm or 1/2 inch(2)
46i	1006	71	105	30,246	
60i	1006	91	105	30,246	16 mm
	Inch2	Inch		lb	
40i	69	2-13/16	3-1/2	2700	12 mm or 1/2 inch(2)
46i	156	2-13/16	4-1/8	6800	
60i	156	3-9/16	4-1/8	6800	16 mm

1. These values are based on material limitations such as yoke, stem connection, diaphragm plate, and travel stop strengths.
2. 1/2 inch stem is only available for 4300 Templow.
3. The metric dimensions are for Yarway 71 mm and 91 mm yoke bosses. This is not a simple inch dimension conversion.

Table 2. Volumetric Casing Displacement for Fisher 657C Series Actuators

ACTUATOR SIZE	CLEARANCE VOLUME(1)	TRAVEL, mm										
		45	50	55	60	65	70	75	80	85	90	95
	cm^3	Casing Volume(2), cm^3										
40i	1229	3228	3457	3703	3949	4260	4555	4834	5096	5374	- - -	- - -
46i	3998	8652	9225	9733	10192	10684	11372	11880	12618	13109	13601	14256
60i		- - -	- - -	9733	- - -	- - -	- - -	- - -	- - -	- - -	13601	- - -
	$Inch^3$	TRAVEL, INCH										
		1.78	1.97	2.17	2.37	2.56	2.76	2.96	3.15	3.35	3.54	3.75
		Casing Volume(2), $Inch^3$										
40i	75	197	211	226	241	260	278	295	311	328	- - -	- - -
46i	244	528	563	594	622	652	694	725	770	800	830	870
60i		- - -	- - -	594	- - -	- - -	- - -	- - -	- - -	- - -	830	- - -

1. Clearance volume indicates casing volume at zero travel.
2. Includes clearance volume.

Table 3. Thrust Capabilities(1) by Input Signal Range

TRAVEL, mm	ACTUATOR SIZE	PRESSURE RANGE TO ACTUATOR DIAPHRAGM(1)	THRUST CAPABILITIES
		Bar	N
45	40i	0.2-1	1842
		0.4-2	5525
	46i	0.2-1	5551
50	40i	0.2-1	2762
		0.4-2	5218
	46i	0.2-1	4857
		0.4-2	13185
55	40i	0.2-1	2762
		0.4-2	4911
	46i and 60i	0.2-1	6245
		0.4-2	12491
60	40i	0.2-1	2455
		0.4-2	4297
	46i	0.2-1	6245
		0.4-2	11797
65	40i	0.2-1	2148
		0.4-2	4297
	46i	0.2-1	5551
		0.4-2	11103
70	40i	0.2-1	2148
		0.4-2	3990
	46i	0.2-1	5551
		0.4-2	10409
75	40i	0.2-1	1842
		0.4-2	3376
	46i	0.2-1	4857
		0.4-2	9715
80	40i	0.2-1	1842
		0.4-2	3376
	46i	0.2-1	4857
		0.4-2	9715
85	40i	0.2-1	1535
		0.4-2	3069
	46i	0.2-1	4857
		0.4-2	9021
90	46i and 60i	0.2-1	4857
		0.4-2	8327
95	46i	0.2-1	4164
		0.4-2	7633
Inch		**Psig**	**lb**
1.78	40i	3-15	414
		6-30	1242
	46i	3-15	1248
1.97	40i	3-15	621
		6-30	1173
	46i	3-15	1092
		6-30	2964

-continued-

Table 3. Thrust Capabilities(1) by Input Signal Range (cont.)

TRAVEL, Inch	ACTUATOR SIZE	PRESSURE RANGE TO ACTUATOR DIAPHRAGM(1)	THRUST CAPABILITIES
		Psig	lb
2.17	40i	3-15	621
		6-30	1104
	46i and 60i	3-15	1404
		6-30	2808
2.37	40i	3-15	552
		6-30	966
	46i	3-15	1404
		6-30	2652
2.56	40i	3-15	483
		6-30	966
	46i	3-15	1248
		6-30	2496
2.76	40i	3-15	483
		6-30	897
	46i	3-15	1248
		6-30	2340
2.96	40i	3-15	414
		6-30	759
	46i	3-15	1092
		6-30	2184
3.15	40i	3-15	414
		6-30	759
	46i	3-15	1092
		6-30	2184
3.35	40i	3-15	345
		6-30	690
	46i	3-15	1092
		6-30	2028
3.54	46i and 60i	3-15	1092
		6-30	1872
3.75	46i	3-15	936
		6-30	1716

1. Consult Fisher 657C instruction manual (D104496X012) for additional information on maximum pressure limitations.

Table 4. Fisher 657C Handwheel Specifications

ACTUATOR SIZE	TOP-MOUNTED HANDWHEEL			
	Handwheel Diameter	Turns Per mm Travel	Rim Force(1)	Maximum Handwheel Output Force(2)
	mm		N	N
40i	222	0.3	360	10010
46i and 60i			540	22690
	Inch	Turns Per Inch Travel	Lb	Lb
40i	8.75	8	48	2250
46i and 60i			110	5100

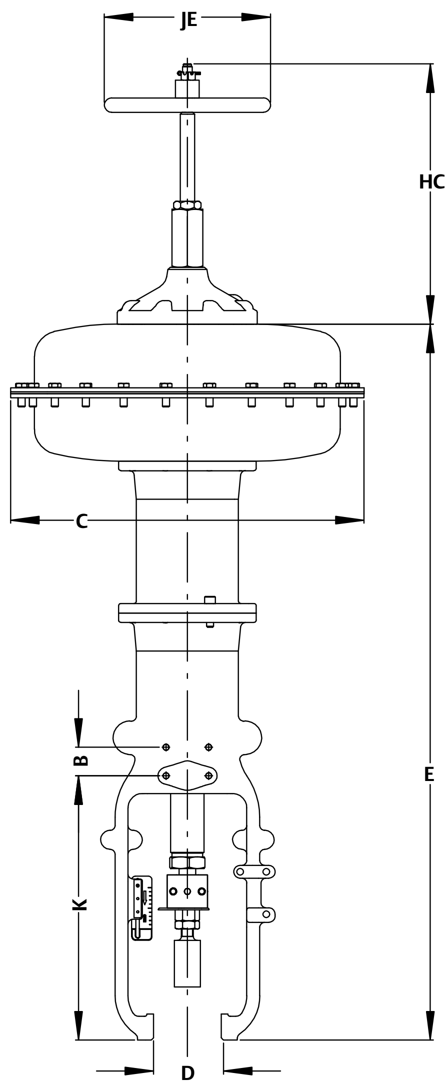
1. Tangential handwheel force required to produce the handwheel output force shown. (Proportional to handwheel output force).
2. Maximum force available to compress the actuator spring.

Table 5. Dimensions

ACTUATOR SIZE	DIMENSION (mm)						
	B	C	D(1)	E	HC	JE	K
40i	25	333	71	678	306	222	272
46i	38	473	71	895	349	222	290
60i	38	473	91	985	349	222	354
	(Inch)						
40i	1.00	13.12	2.81	26.71	12.04	8.75	10.69
46i	1.50	16.00	2.81	35.22	13.72	8.75	11.43
60i	1.50	16.00	3.56	37.72	13.72	8.75	13.93

1. The metric D dimensions are for Yarway 71 mm and 91 mm yoke bosses. There is not a simple inch dimension conversion.

Figure 4. Dimensions (see table 5)



Ordering Information

When ordering, specify:

Application Information

1. On-off or throttling service.

2. Input signal range.

3. Maximum supply pressure.

4. Valve body type and size with which the actuator will be used.

5. Valve plug travel.

6. Actuator thrust required with actuator stem both fully retracted and fully extended.

7. Stroking time requirements, if critical.

8. Ambient temperature range.

Actuator

Be sure to specify: Actuator type number, whether a positioner is required, whether a top-mounted handwheel is required, or whether an adjustable down travel stop is required. Refer to the Specifications section. Review the information under each specification and in the referenced tables and figures. Specify the desired choice wherever there is a selection to be made.

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www.Fisher.com

Fisher™ 1052 Size 70 Diaphragm Rotary Actuator

Fisher 1052 size 70 spring-return diaphragm rotary actuators operate splined shaft rotary valves, such as 8580, 8532, 8590, CV500, V500, and Vee-Ball™ (V150, V200 and V300) valves. 1052 actuators are suitable for on-off service or for throttling service.

This actuator is designed for easy installation of a broad range of options: limit switches, position indicating switches, positioners, and manual over-rides. Option applicability varies with actuator size. Refer to the specifications table and table 4 for information concerning option applicability and specifications.


W8508-3

Typical Fisher 1052 Actuator with Vee-Ball Valve and FIELDVUE™ DVC6200 Digital Valve Controller

Features

- Application Flexibility-- 1052 rotary actuators are available with fail-open or fail-close construction and can be mounted in any of four actuator-valve mounting positions. See figure 5 for mounting positions. These actuators can be mounted on a broad range of Fisher valves or used with other equipment.
- Minimal Dead Band-- Single joint linkage with splined and clamped lever minimizes lost motion and improves control accuracy.
- Long Service Life-- Rugged construction provides stability, corrosion resistance, and protection from deformation should over-pressurization occur.
- Safety-- The 1052 actuator has an externally accessible spring adjuster to relieve spring compression (see figure 1). Actuator-valve linkage is completely enclosed, yet the valve packing adjustment remains accessible without removing any parts (see figure 2).

Specifications

Available Configurations

For on-off service without a positioner or for throttling services with or without a positioner
Direct Acting: Increasing loading pressure extends the diaphragm rod out of the spring barrel

Actuator Sizes

70

Standard Diaphragm Pressure Ranges

■ 0 to 2.3 bar (0 to 33 psig), ■ 0 to 2.8 bar (0 to 40 psig), and ■ 0 to 3.8 bar (0 to 55 psig)

Maximum Diaphragm Sizing Pressure(1)

3.8 bar (55 psig)

Maximum Diaphragm Casing Pressure(5)

4.5 bar (65 psig)

Nominal Valve Shaft Rotation

■ 90 degrees (standard), ■ 60 degrees (optional), or ■ 75 degrees (optional)

Valve Shaft Diameters, mm (Inches)

■ 31.8 (1-1/4), ■ 38.1 (1-1/2), ■ 44.5 (1-3/4), or ■ 50.8 (2)

Maximum Breakout Torque(2)

Up to 1370 N•m (12,100 lbf•in)

Stroking Time

Dependent on rotation, spring rate, initial spring compression, supply pressure, and size of supply piping. If stroking time is critical, consult your Emerson sales office or Local Business Partner

Diaphragm Casing Displacement

See table 1

Construction Materials

See table 3

Material Temperature Capabilities(1)

Nitrile Diaphragm or O-Rings(3): -40 to 82°C (-40 to 180°F)

Silicone Diaphragm: -40 to 149°C (-40 to 300°F)

Travel Indication

Graduated scale and pointer combination located on actuator end of valve drive shaft

Pipe or Tubing Connection Sizes

Standard: 1/4 NPT internal

Optional: ■ 1/2 or ■ 3/4 NPT internal, and ■ 3/4 NPT Pipe-Away vent opening

Mounting Positions

See figure 5

Approximate Weights

See table 2

Options

Option applicability varies with actuator size. Refer to table 4 and the Options section.

1. Use this value to determine the maximum torque output. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for the actuator should not be exceeded.
2. Actual actuator torque available depends on specific construction and casing pressure. For information on torque requirements of the valve being considered, contact your Emerson sales office or Local Business Partner
3. Nitrile O-rings are used in the optional top-mounted handwheel and in the optional up and down travel stop assemblies.
4. For higher temperature ratings, contact your Emerson sales office or Local Business Partner.
5. This maximum casing pressure is not to be used for normal operating pressure. Its purpose is to allow for typical regulator supply settings and/or relief valve tolerances.

Options

Top-Mounted Handwheel: For infrequent use as a manual actuator or for use as an adjustable up travel stop (see figure 4). For repeated or daily manual operation, the unit should be equipped with a declutchable handwheel actuator.

Declutchable Handwheel Actuator: A side-mounted manual actuator can be used to provide on-site control and to provide override capabilities. See bulletin 61.8:1078 (D101339X012) for handwheel actuator specifications.

Limit Switches: Micro-Switch or NAMCO switches for one or two single-pole, double-throw contacts. See separate bulletins for limit switch information.

Position Indicating Switch: TopWorx™ DXP M21GNEB switch for one through six single pole, double throw switch contacts are available. See separate bulletin for position indicating switch information.

Positioner: For precise positioning of the valve disk or ball, the actuator should be equipped with a positioner. Under some service conditions, the 1052 actuator may be used successfully in these applications without a positioner. For additional information, contact your Emerson sales office or Local Business Partner with complete service conditions.

Adjustable Down-Travel Stop: Used to limit the actuator stroke in the downward direction (see figure 3).

Adjustable Up-Travel Stop: Used to limit the actuator stroke in the upward direction (see figure 3).

Actuator Locking Mechanism: An actuator locking mechanism is available. It can be used to keep the actuator in a locked position (the same as the spring-fail position) during maintenance. The padlock is customer supplied, and the mechanism requires a modified actuator housing.

Pipe Away Vent: Some applications use natural gas or other hazardous gases as a supply pressure to the actuator. These applications sometimes require the actuator housing to be vented, reducing the accumulation of gases. For new constructions and retrofit kit information, contact your Emerson sales office or Local Business Partner with complete service conditions.

Table 1. Diaphragm Casing Displacement

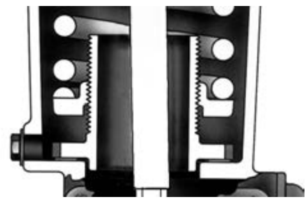
CASING SIZE	CLEARANCE VOLUME(1)		CASING VOLUME(2)			
			60 Degree Rotation		90 Degree Rotation	
	cm^3	Inches^3	cm^3	Inches^3	cm^3	Inches^3
70	3490	213	13,929	850	19,025	1161

1. Volume when the diaphragm is in the up position.
2. Includes clearance volume.

Table 2. Approximate Actuator Weights

SIZE	1052 ACTUATOR		TOP-MOUNTED HANDWHEEL	
	Kg	Pounds	Kg	Pounds
70	123	272	21.3	47

Figure 1. Sectional Views of Spring Seat Construction Details



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TYPICAL OF THE 1052 ACTUATOR WITH ADJUSTABLE SPRING SEAT

Table 3. Construction Materials

PART	MATERIAL
Actuator	
Actuator Housing and Spring Barrel	Cast iron
Diaphragm	Nitrile on nylon or silicone on polyester
Diaphragm Head	Cast Iron
Diaphragm Casing(1)	Pressed steel
Diaphragm Rod	Steel
Housing Cover	Cast iron or aluminum
Lever	Ductile iron
Optional Top-Mounted Handwheel Assembly	
Handwheel and Handwheel Body	Cast iron
Handwheel Stem	Bronze
O-Rings	Nitrile
Pusher Plate	Cast iron or steel
Optional Down Travel Stop Assembly	
Closing Cap	Brass
O-ring	Nitrile
Stem	Stainless steel
Travel Stop Body	Cast iron
Optional Up Travel Stop Assembly	
Closing Cap	Brass
O-Ring	Nitrile
Stem	Bronze
Travel Stop Body	Cast iron

Figure 2. Sectional Views Typical of 1052 Actuator

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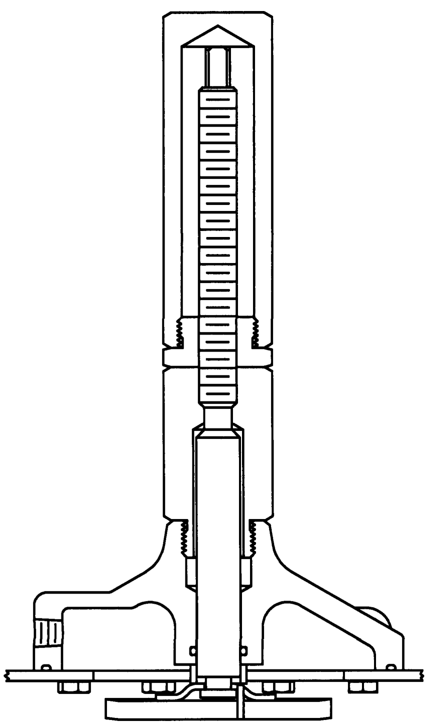
Figure 3. Optional Adjustable Travel Stops



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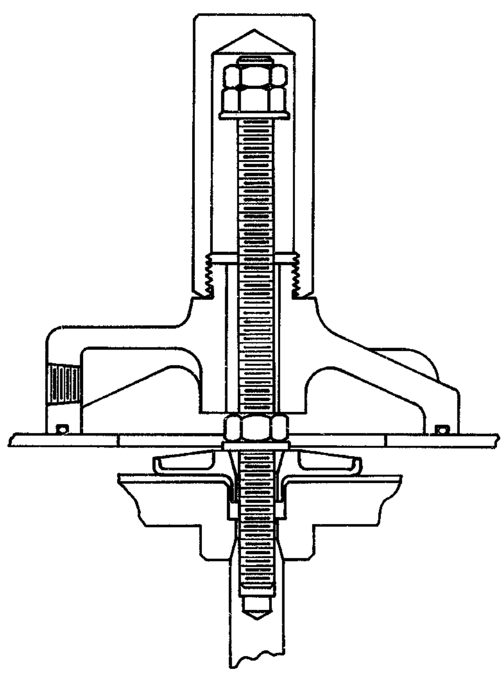
TYPICAL ADJUSTABLE UP TRAVEL STOP



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TYPICAL ADJUSTABLE DOWN TRAVEL STOP

Table 4. Construction Features and Option Applicability

ACTUATOR SIZE	ACTUATOR TYPE	STANDARD TRAVEL STOP	OPTIONAL TRAVEL STOP		OPTIONAL MANUAL OVERRIDE	ACCESSORY SWITCH MOUNTING
		Style	Style	Range of Adjustability		Mechanically Operated Switches
70	1052	Fixed	Top-mounted up-travel stop or down-travel stop	90 degrees	Top-mounted handwheel for infrequent operation or side-mounted manual actuator for routine operation	Externally mounted, lever operated

Figure 4. Top-Mounted Handwheel

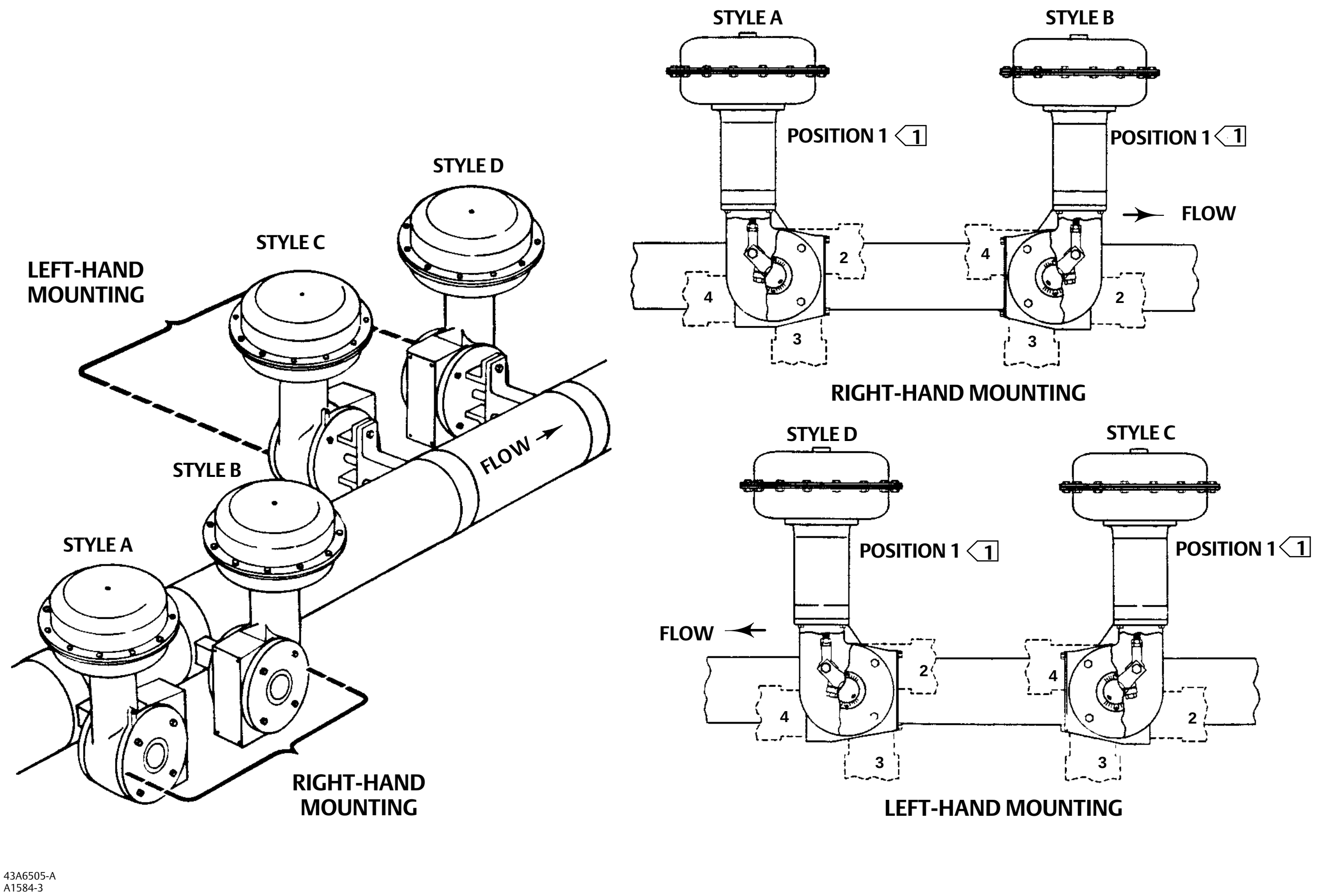
W3145

Table 5. Mounting Styles and Positions

MOUNTING	ACTION(1)	VALVE SERIES OR DESIGN				VALVE SERIES OR DESIGN		
		BALL/PLUG ROTATION TO CLOSE	V250	V150, V200 and V300	CV500 and V500	DISK/BALL ROTATION TO CLOSE	V250	8532, 8560, 8580, and 8590
Right-Hand	PDTC PDTO	CCW(3) CCW	A B	A B	A B	CW CW	NA NA	B A
Left-Hand	PDTC PDTO	CCW CCW	NA NA	D C	D C	CW CW	C D	C D
Left-Hand (Optional)(2)	PDTC PDTO	CW(4) CW	NA NA	C D	NA NA	NA NA	NA NA	NA NA

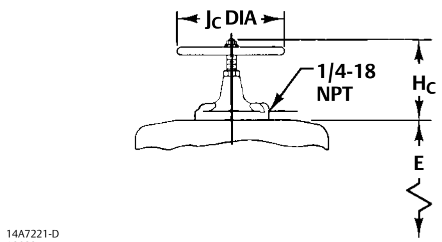
1. PDTC—Push-down-to-close, and PDTO—Push-down-to-open.
2. A left hand ball will be required for NPS 3 through 12 V150, V200 and V300, Series B and NPS 14 through 20, with or without an attenuator.
3. CCW = counterclockwise
4. CW = clockwise

Figure 5. Mounting Styles and Positions (also see table 5)

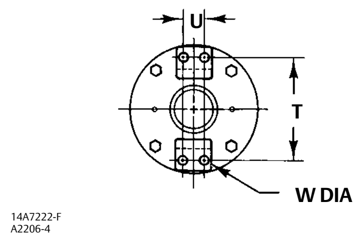


Notes:
1 Position 1 is standard; Positions 2 through 4 (shown in dotted lines) are alternatives.

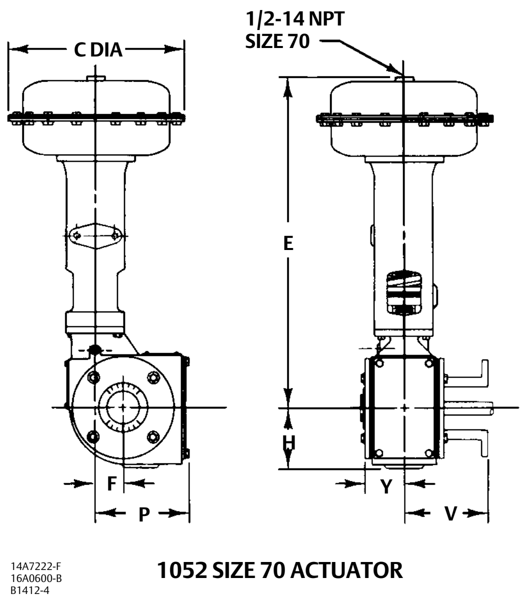
Figure 6. Dimensions (also see tables 6, 7 and 8)



TOP-MOUNTED
HANDWHEEL



ACTUATOR/VALVE BODY
MOUNTING DIMENSIONS



1052 SIZE 70 ACTUATOR

Installation

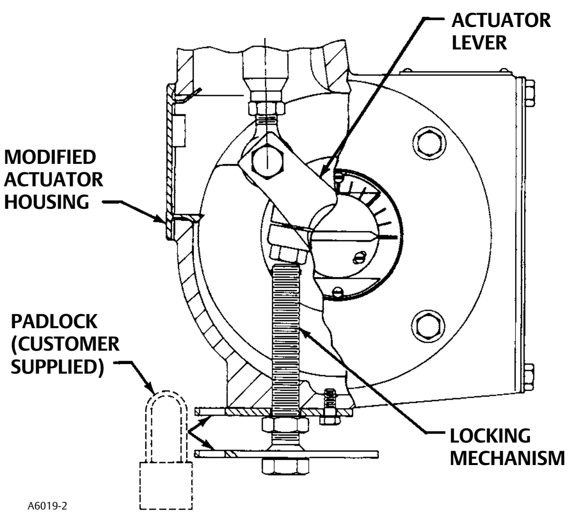
The actuator is normally positioned vertically in a horizontal pipeline. Four mounting styles and four positions for each style are possible (see figure 5). Due to its weight, the 1052 size 70 actuator must be externally supported if mounted in the horizontal position.

When looking in the direction of flow in the pipeline, an actuator is right-hand mounted when it is on the right side of the pipeline, and an actuator is left-hand mounted when it is mounted on the left side of the pipeline.

By Emerson Automation Solutions definition, forward flow is into the face side of the disk or ball, and reverse flow is into the hub side of the disk or ball.

Dimensions for both actuator types are shown in figure 6. These dimensions should be used in conjunction with the mounting positions shown in figure 5. Make clearance considerations before mounting the actuator to determine the most suitable mounting position.

Figure 7. Actuator Locking Mechanism



Adjustable Travel Stops

Adjustable travel stops (in addition to those shown in figure 3) are available as discussed below.

As used here, down or downward means in a direction toward the valve shaft and away from the piston and diaphragm.

An adjustable down travel stop is installed in a special actuator housing. The assembly consists of a special housing, cap screw, locknut, lever, and rod end bearing. The cap screw can be positioned to limit downward travel of the actuator lever to any rotation between 0 and 90 degrees.

The locking mechanism shown in figure 7 is not to be used as a travel stop. Please specify an adjustable travel stop assembly instead.

Table 6. Dimensions

ACTUATOR SIZE	C		E		F		H		P		Y	
	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
70	536	21.12	849	33.44	64	2.50	121	4.75	186	7.31	76	3.00

Table 7. Actuator / Valve Body Mounting Dimensions

VALVE SHAFT DIAMETER		T		U		V		W	
mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
31.8 - 38.1	1-1/4 - 1-1/2	235	9.25	46	1.81	148	5.81	17.5	0.69
44.5 - 50.8	1-3/4 - 2	273	10.75	51	2.00	286	11.25	20.6	0.81

Table 8. Dimensions for Top-Mounted Handwheel

ACTUATOR SIZE	H_C		J_C	
	mm	Inches	mm	Inches
70	378	14.88	356	14.00

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Fisher™ 2052 Diaphragm Rotary Actuator

Fisher 2052 spring-and-diaphragm rotary actuators are used on rotary-shaft valve bodies for throttling or on-off applications. The 2052 may be used for throttling service with a positioner, or it may be used for on-off service without a positioner. The 2052 has an ISO 5211 mating interface that allows installation to non-Fisher valves. Refer to separate bulletins for valve and positioner information.

Fisher Control-Disk ™ Valve with 2052 Actuator and FIELDVUE™ DVC6200 Digital Valve Controller

Features

- **Compact design, smaller actuators--** Ensures reduced valve/actuator envelope dimensions leading to greater mounting versatility for both skids and process plants, where space is at a premium.

- **Compatible with DVC2000, DVC6200, and DVC6000 digital valve controllers; and 3610J and 3620J positioners--** The new actuator allows linkage-less feedback, via a contact-less magnetic array, from the lever to the end-mounted DVC2000. Integral window mounting of the DVC6200, DVC6000, 3610J, and 3620J is also available.

- **Clamped lever to reduce lost motion--** The clamping of the lever onto a splined valve shaft, coupled with the single pivot linkage, reduces lost motion between the actuator and the valve. The typical cumulative deadband for a Fisher rotary control valve assembly results in 0.5% or less variability.

- **No bench set required--** The new nested spring design requires no bench set. This also simplifies the actuator selection process, see table 3.

- **ISO 5211 mounting with optional insert--** The actuator can now be mounted directly onto non-spline shafts, such as Square and Double D. This allows the actuator, with its enhanced control, to mount on a wider range of valves conforming to ISO 5211.

- **Adjustable travel stops standard--** Provides the ability to adjust or change the travel range by 30 degrees in either direction without removing the actuator or the addition of extra parts.

- **Fail-safe mechanism contains no aluminum--** All parts in the fail-safe mechanism (made of steel, cast iron, and ductile iron) ensure the actuator will maintain safety integrity in the event of a fire.

- **Powder paint as standard--** The Emerson powder paint finish offers an excellent corrosion-resistant finish to all external steel and cast iron parts.

- **NAMUR VDE/VDI 3845 bolt pattern for accessory mounting--** Meeting the global standard ensures compatibility for most accessories, enabling quick and easy mounting.

- **Field reversible, right- or left-hand mounting--** The actuator/valve assembly action can be converted from push-down-to-open to push-down-to-close, or vice-versa, without additional parts.

- **Declutchable and top-mounted handwheels--** Available for all sizes.

2052 Actuator Specifications and Materials of Construction

Table 1. Fisher 2052 Actuator Specifications

Specifications	
Actuator Mounting Connections	Splined shaft connection, ISO 5211 actuator-to-bracket connection **Size 1:** F07, **Size 2:** F10, **Size 3:** F14
Actuator Sizes	See table 3
Operating Pressure(1)	See table 5
Maximum Diaphragm Casing Pressure	Size 1, 2, and 3 Actuators: 5 barg (73 psig)
Pressure Connection	See table 4
Torque Output	See table 5
Actuator Temperature Capabilities(1)	Standard: -45 to 80°C (-50 to 176°F) Optional: -45 to 100°C (-50 to 212°F)(3) or -60 to 80°C (-76 to 176°F)(4)
Operation	Field reversible between PDTC and PDTO; right- and left-hand mounting, any angle of orientation
Approximate Weight	Size 1: 22.2 kg (49 lb) Size 2: 54.4 kg (120 lb) Size 3: 113 kg (250 lb)
Controller/Positioners Available	DVC2000, DVC6020, DVC6030, DVC6200, 3610J, 3620J, 4190, C1
Adjustable Travel Stops	Standard adjustable up and down stops capable of 30 degrees of adjustment per stop.
Accessories Available	846, 646, 2625, and 67C Series, switches, i2P-100, VBL, DXP, GO Switch™
Handwheel	Top-mounted handwheel: Optional on Size 1, 2, and 3 actuators Declutchable handwheel(2): Optional on Size 1, 2, and 3 actuators
Operational Lockout(2)	Available for customer-supplied padlock to lock the actuator in the spring-fail position

1. The pressure/temperature limits in this bulletin should not be exceeded. The current SIL certification for the 2052 actuator is only relevant for the standard temperature ratings shown.
2. Lockout and declutchable handwheel cannot be used together on size 2 and size 3 actuators.
3. Temperature range only applies when using silicone diaphragm material. Silicone diaphragm is not available with the top-mounted handwheel option.
4. Temperature range requires use of stainless steel bolting for yoke and travel stops. Not available with top-mounted handwheel.

Table 2. Materials of Construction

Component	**Material**
Top Casing	Steel
Housing	Cast Iron
Diaphragm	Nitrile and nylon standard, Silicone on polyester
Lever	Ductile iron, Steel
Diaphragm Plate	Cast iron
OPTIONAL TOP-MOUNTED HANDWHEEL ASSEMBLY	
Component	**Material**
Handwheel	Cast iron
Handwheel Stem	Aluminum-Bronze
Top Casing Assembly	Steel
O-ring	Nitrile
Pusher Plate	Steel

Contents

Options

Top-Mounted Handwheel: For infrequent use as a manual actuator (see figure 2). For repeated or daily manual operation, the unit should be equipped with a declutchable handwheel actuator.

Declutchable Handwheel Actuator: An end-mounted manual actuator can be used to provide on-site control and to provide override capabilities. See Fisher 1078 Declutchable Manual Actuator bulletin (D101339X012) for handwheel actuator specifications. The declutchable handwheel is not compatible with the lockout option on the size 2 and size 3 actuators.

Limit Switches: ■ Micro-Switch or NAMCO switches for one or two single-pole, double-throw contacts, or ■ GO Switch™ proximity switches for one or two single-pole, double-throw contacts are available. See separate bulletins for limit switch information.

Position Indicating Switch: TopWorx™ DXP M21GNEB switch for one through six single pole, double throw switch contacts are available. See separate bulletin for position indicating switch information.

Positioner: For precise positioning of the valve control element, the actuator should be equipped with a positioner. For additional information, contact your Emerson sales office with complete service conditions.

Optional Lockout Option: An actuator locking mechanism is available, which can be used to keep the actuator in a locked position (the same as the spring-fail position) during maintenance. The padlock is customer supplied. The lockout option on the size 2 and size 3 actuators is not compatible with the declutchable handwheel.

Low Ambient Temperature: For services with ambient temperatures down to -60°C (-76°F). This construction is suitable for cold climate regions per GOST 15150. Contact your Emerson sales office for details. Note the current SIL certification for the 2052 actuator is only relevant for the standard temperature ratings shown in table 1. Not available with the top-mounted handwheel option.

Tandem Linkage: Fisher three-way valve assemblies for converging and diverging throttling or on/off service. Valves are operated by a single actuator through a tandem linkage, typically arranged so that one of the valves is opening while the other is closing. Consult your Emerson sales office for additional details on sizing, selection, and installation.

Figure 1. Fisher 2052 Assembly

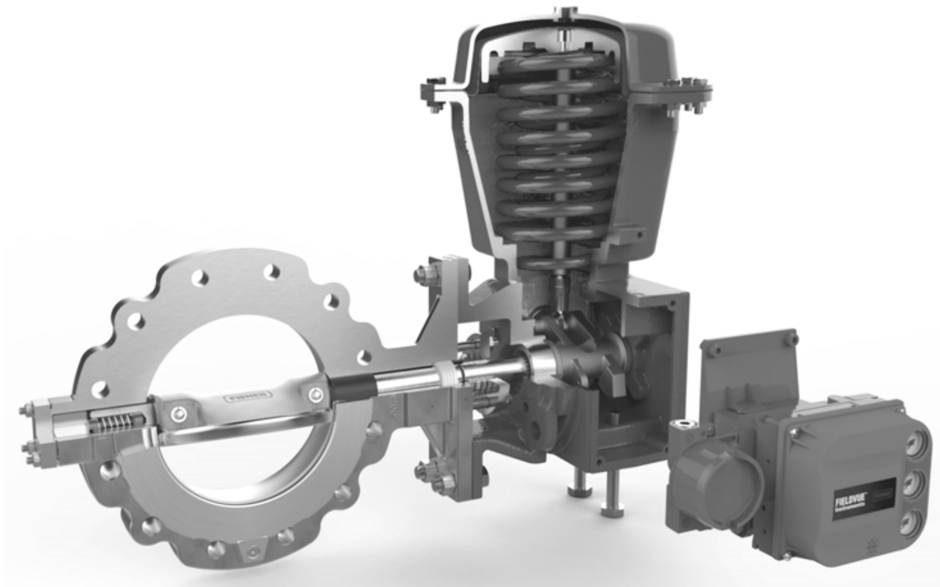


Figure 2. Top-Mounted Handwheel

W9484

Table 3. Actuator and Shaft Size Availability

SHAFT SIZE		ACTUATOR SIZE		
mm	**Inches**	**1**	**2**	**3**
12.7	1/2	X	- - -	- - -
14.3 x 15.9	9/16 x 5/8	X	X	- - -
15.9	5/8	X	X	- - -
19.1	3/4	X	X	X
22.2	7/8	- - -	X	X
25.4	1	- - -	X	X
28.6 x 31.8	1-1/8 x 1-1/4	- - -	X	X
31.8	1-1/4	- - -	X	X
31.8 x 38.1	1-1/4 x 1-1/2	- - -	- - -	X
38.1	1-1/2	- - -	- - -	X
39.7 x 44.5	1-9/16 x 1-3/4	- - -	- - -	X
44.5	1-3/4	- - -	- - -	X
50.8	2	- - -	- - -	X

Table 4. Pressure Connections

ACTUATOR SIZE	PRESSURE CONNECTION			
	1/4 NPT	**1/2 NPT**	**3/4 NPT**	**G 1/4**
1	Standard	Optional	Not Available	Optional
2	Standard	Optional	Not Available	Optional
3	Not Available	Standard	Optional	Not Available

Table 5. Torque versus Actuator Size

ACTUATOR SIZE AND ACTION	OPERATING PRESSURE							
	2 barg (29 psig)(1)		3 barg (44 psig)(1)		4 barg (58 psig)(1)		4.7 barg (68 psig)(1)	
	Torque							
	N•m	**lbf•in**	**N•m**	**lbf•in**	**N•m**	**lbf•in**	**N•m**	**lbf•in**
1 (PDTO) 1 (PDTC)	25.5 25.5	226 226	25.5 36.2	226 320	51.2 51.2	453 453	51.2 72.4	453 641
2 (PDTO) 2 (PDTC)	105 105	930 930	105 175	930 1550	210 210	1860 1860	210 320	1860 2840
3 (PDTO)	327	2890	327	2890	631	5580	631	5580
3 (PDTC)	280	2480	557	4930	584	5170	930	8230

1. Do not interpolate between operating pressures. Consult your Emerson sales office for assistance.

Table 6. Dimensions

ACTUATOR SIZE	C		E		F		H		P		Y	
	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
1	245	9.65	267	10.51	29	1.14	103	4.06	107	4.21	71	2.80
2	350	13.78	424	16.69	49	1.93	187	7.36	170	6.69	84.5	3.33
3	496	19.53	592	23.31	64	2.52	254	10.0	185	7.28	92	3.62

Table 7. Actuator / Valve Body Mounting Dimensions

VALVE SHAFT DIAMETER		FIGURE 6 REFERENCE	T		U		W	
mm	Inches		mm	Inches	mm	Inches	mm	Inches
Style F Mounting: Control-Disk, Vee-Ball™, 8532, 8510B, 8560, and 8580 Eccentric Disk Valves								
12.7 - 15.9	1/2 - 5/8	A	117	4.62	- - -	- - -	14.2	0.56
19.1 - 25.4	3/4 - 1	B	152	6.00	32	1.25	14.2	0.56
31.8 - 38.1	1-1/4 - 1-1/2	B	235	9.25	46	1.81	17.5	0.69
44.5 - 50.8	1-3/4 - 2	B	273	10.75	51	2.00	20.6	0.81
Style G Mounting: 9500 Series Valves								
12.7	1/2	A	117	4.62	- - -	- - -	11.0	0.44
15.9 - 25.4	5/8 - 1	B	146	5.75	32	1.25	11.0	0.44
31.8 - 38.1	1-1/4 - 1-1/2	B	210	8.25	51	2.00	17.5	0.69

Table 8. Actuator / Valve Body Mounting Dimensions

VALVE SHAFT DIAMETER		V					
		Size 1		Size 2		Size 3	
mm	Inches	mm	Inches	mm	Inches	mm	Inches
12.7	1/2	135	5.3	- - -	- - -	- - -	- - -
15.9	5/8	135	5.3	148.5	5.8	- - -	- - -
19.1	3/4	158	6.2	171.5	6.8	179	7.0
25.4	1	- - -	- - -	171.5	6.8	179	7.0
31.8	1-1/4	- - -	- - -	169.5	6.7	177	7.0
38.1	1-1/2	- - -	- - -	- - -	- - -	177	7.0
44.5	1-3/4	- - -	- - -	- - -	- - -	316	12.4
50.8	2	- - -	- - -	- - -	- - -	316	12.4

Table 9. Actuator / Valve Body Mounting Dimensions

ACTUATOR SIZE	Hc		Jc		R
	mm	Inches	mm	Inches	NPT Connection Used
1	207	8.1	171	6.7	1/4 NPT
2	289	11.4	305	12.0	1/4 NPT
3	398	15.67	356	14.0	1/2 NPT

Table 10. NAMUR Instrument Mounting Dimensions

ACTUATOR SIZE	J	K	L	N
	mm	mm	mm	mm
1	80	30	30.4	35
2	130	30	48.34	55
3	130	30	65	75

Table 11. ISO 5211 Mounting Information

ACTUATOR SIZE	F SIZE	A	B	AA	BB
		mm	mm	mm	mm
1	F07	70	M8	16.5	See table 12
2	F10	102	M10	29.0	
3	F14	140	M16	49.0	

Table 12. ISO 5211 Square Insert Sizes Available

SQUARE SIZE	ACTUATOR SIZE		
mm	1	2	3
9	X	- - -	- - -
11	X	X	- - -
14	X	X	X
19	- - -	X	X
22	- - -	X	X
27	- - -	- - -	X
36	- - -	- - -	X

Figure 3. Dimensions (also see tables 6, 7, and 8)

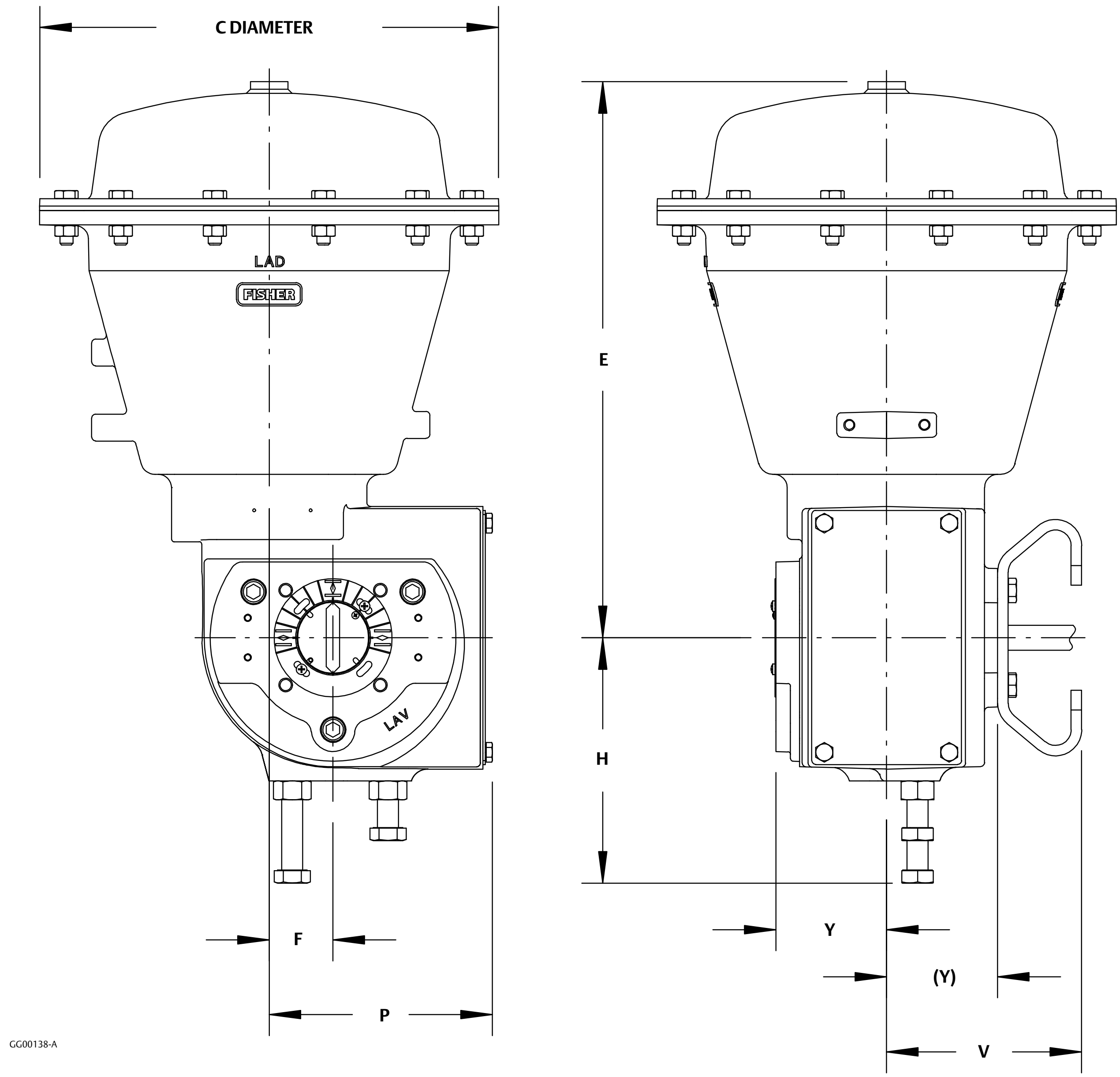


Figure 4. Handwheel Dimensions (also see tables 6 and 9)

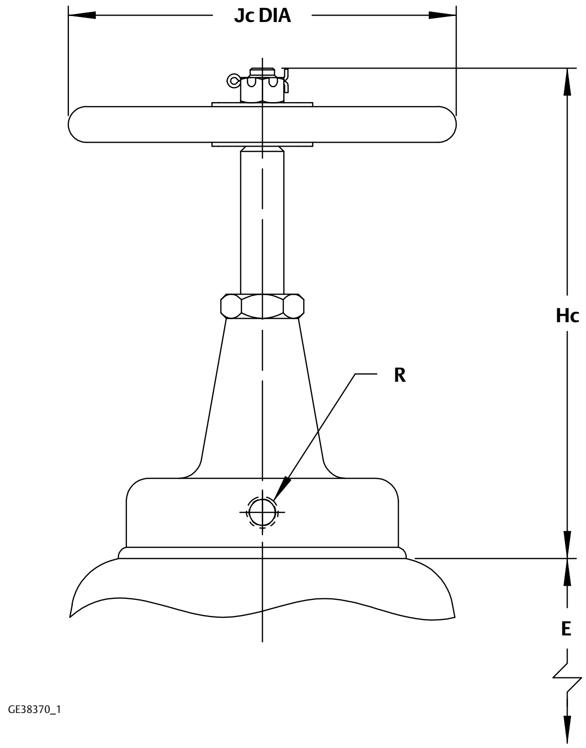


Figure 5. Mounting Yokes Dimensions (also see table 7)

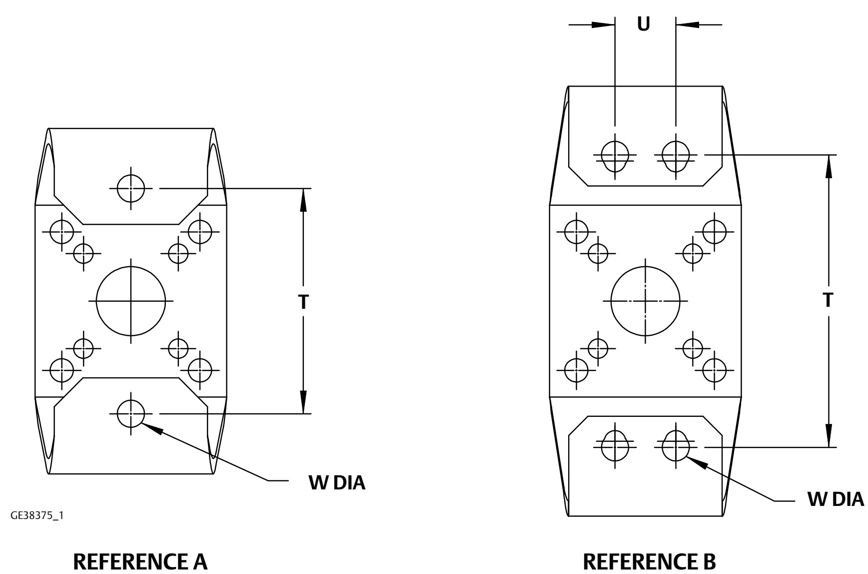
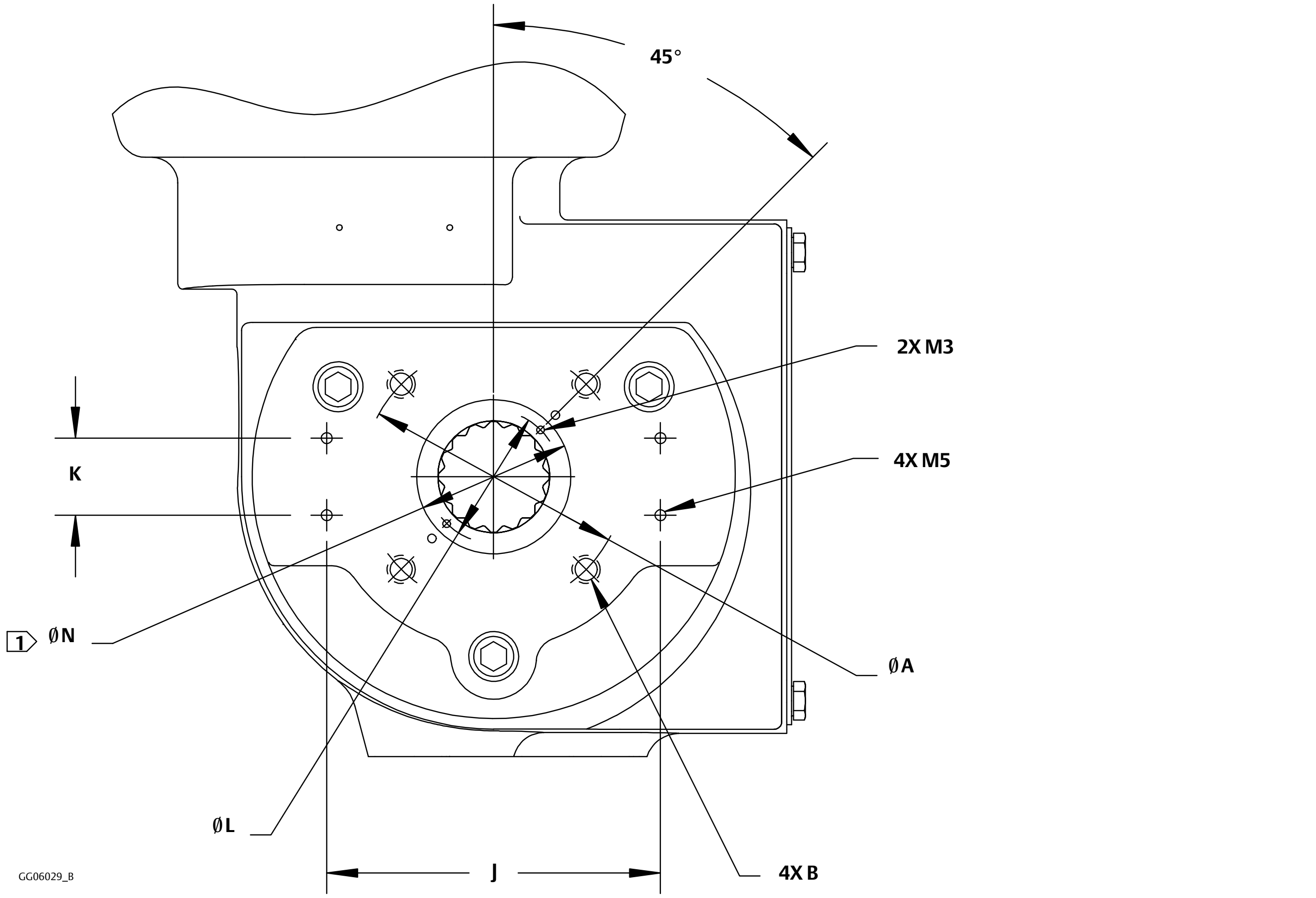
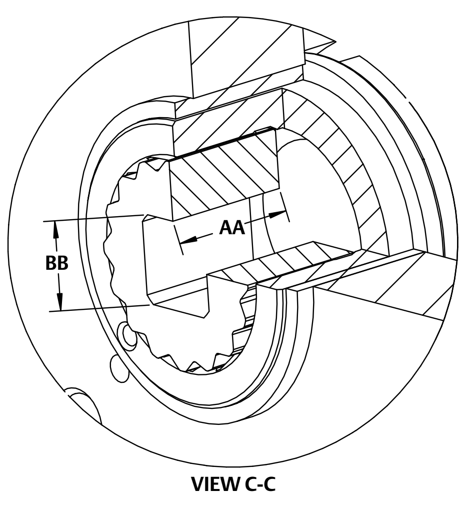


Figure 6. NAMUR Instrument Mounting Dimensions (also see tables 10 and 11)



1 N is the outside diameter of the lever hub.

Figure 7. ISO 5211 Square Lever Insert Dimensions (also see table 11)



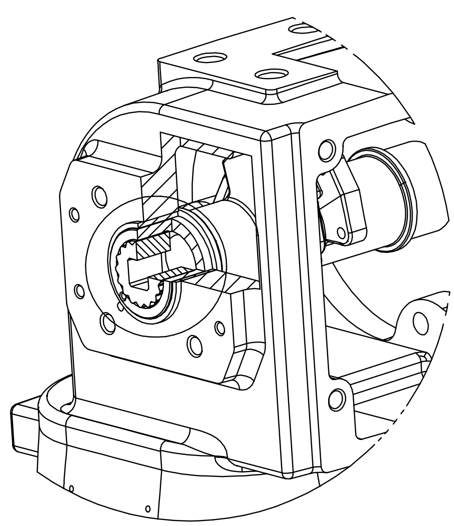


Figure 8. Fisher 2052 Actuator Mounting Styles (also see table 13)

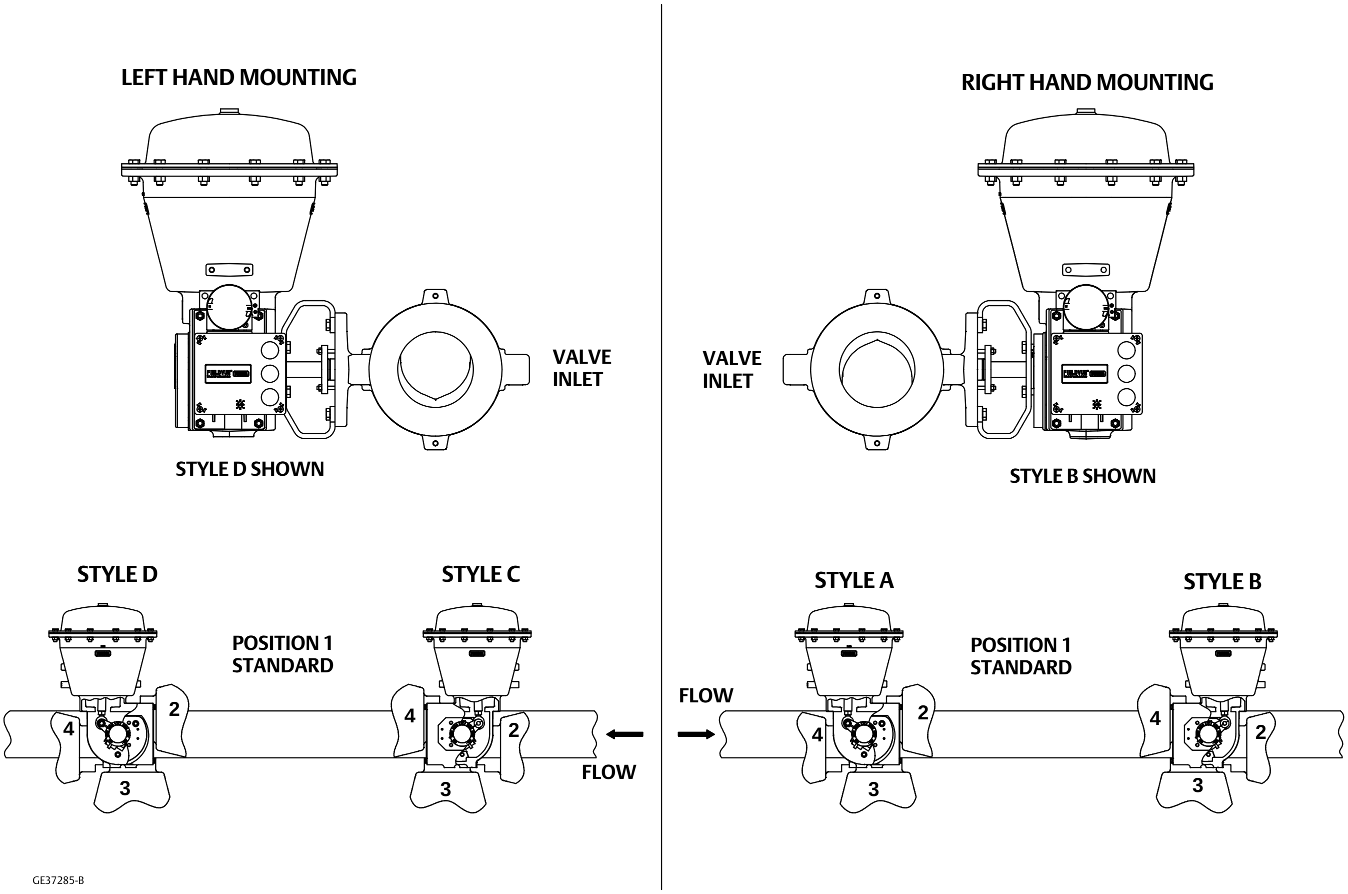


Table 13. Fisher 2052 Actuator Mounting Styles

MOUNTING (SEE FIGURE 8)	ACTION(1)	VALVE						
		Ball/Plug Rotation to Close	V150, V200, V300 Series	CV500 and V500	V250	Ball/Plug Rotation to Close	V250	8510, 8510B, 8532, 8560, 8580, 9500, Control-Disk
RIGHT-HAND	PDTC	CCW	A	A	A	CW	NA	B
	PDTO	CCW	B	B	B	CW	NA	A
LEFT-HAND	PDTC	CCW	D	D	NA	CW	C	C
	PDTO	CCW	C	C	NA	CW	D	D
LEFT-HAND (Optional)	PDTC	CW	C	NA	NA	NA	NA	NA
	PDTO	CW	D	NA	NA	NA	NA	NA

1. PDTC = Push Down To Close. PDTO = Push Down To Open.

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3024C Actuator
D103051X012

Product Bulletin
61.1:3024C
September 2017

Fisher™ 3024C Diaphragm Actuator

The 3024C actuator is a compact spring opposed pneumatic diaphragm actuator incorporating a cast yoke mounting and is suitable for general purpose actuation of globe valves. It will position the valve plug in response to varying controller or valve positioner pneumatic output signals applied to the actuator diaphragm. The 3024C actuator can be assembled as either direct-acting or reverse-acting and provides dependable and on-off or throttling operation of automatic control valves.

W8488 **3024C Actuator Mounted on Fisher Valve**

Features

- Application Versatility—With eight different configurations available, there is an actuator size to meet your needs. Multi-spring combinations allow for accurate selection of actuator thrust and valve travel.

- Reversible Action—The simple design allows the change of action from direct to reverse acting without the requirement for extra parts. Change of action can be easily made in the field.

- High Thrust Capability—The moulded diaphragm and high strength casings allow for a maximum casing pressure of 6 bar, enabling a high stem thrust for a given size diaphragm.

- Positive Connections—Split block stem connection provides a solid transfer of motion while allowing easy mounting and no linkages that create lost motion or inaccurate valve positioning.

- Rugged Construction—The cast steel yoke and heavy duty steel casings provide stability, protection against corrosion, longevity, and resistance against misuse.

- Severe Temperature Applications—Through careful selection of construction materials, this actuator can be used for a wide range of ambient temperature conditions from a minimum of -40°C to a maximum of +82°C.

- Compact Design—The compact size minimizes weight and space needed.

Available Configurations

Refer to figure 1.

Direct Action

With the direct action mode on the 3024C actuator, applying air pressure to the upper side of the diaphragm forces the actuator stem downward while, at the same time, compressing the springs on the underside of the diaphragm. Refer to figure 1. When this pressure is reduced, the opposing spring force moves the actuator stem upwards. Should the loading pressure fail, the springs force the stem to the extreme upward position, thereby providing fail-open action for a push-down-to-close valve.

Reverse Action

With the reverse action mode, air is applied on the underside of the diaphragm while opposing spring force is on the top side. Increasing air pressure will force the stem upwards. When the loading pressure is reduced, the stem moves downwards. Should loading pressure fail, the springs force the stem to the extreme downward position, thereby providing fail-closed action for a push-down-to-close valve.

Valve Compatibility

With the availability of both metric and imperial threaded stem connectors, the 3024C can be used with a range of valve body assemblies such as the Fisher metric 1018S construction or imperial easy-e™ and RSS valve body constructions, along with others.

Table 1. Handwheel Specifications

ACTUATOR SIZE	HANDWHEEL DIAMETER		TURNS PER mm/INCH TRAVEL		RIM FORCE (1, 2)		HANDWHEEL OUTPUT FORCE	
	mm	Inch	mm	Inch	N	lbs	N	lbs
30 and 30E	200	7.87	0.24	6.1	179	40	5000	1125
34, 34E, 40, and 40E	250	9.84	0.21	5.4	286	64	10000	2250
45 and 45E	250	9.84	0.21	5.5	400	90	14000	3150

1. Tangential handwheel force required to produce the handwheel output force shown.
2. Brass operating nut and stainless steel screw.

Accessories

Handwheels

An optional side-mounted handwheel can be fitted to all sizes of actuator with travel up to 32 mm (1.25 inch) and where the maximum actuator thrust is less than 14,000 N (3150 lbf). These handwheels provide a robust method of manually operating the valve in an emergency or when there is a loss of instrument air. Refer to figures 2 and 3 and table 1 for details.

Note, a side-mounted handwheel cannot be fitted on the sizes 45 and 45E actuator if an adjustable travel stop is fitted as well.

When mounted on a direct action actuator, turning the handwheel clockwise always moves the stem downwards. When mounted on a reverse action actuator, turning the handwheel clockwise moves the stem upwards. Disengagement of the handwheel to enable automatic operation is simply accomplished by rewinding the handwheel.

Adjustable Travel Stops

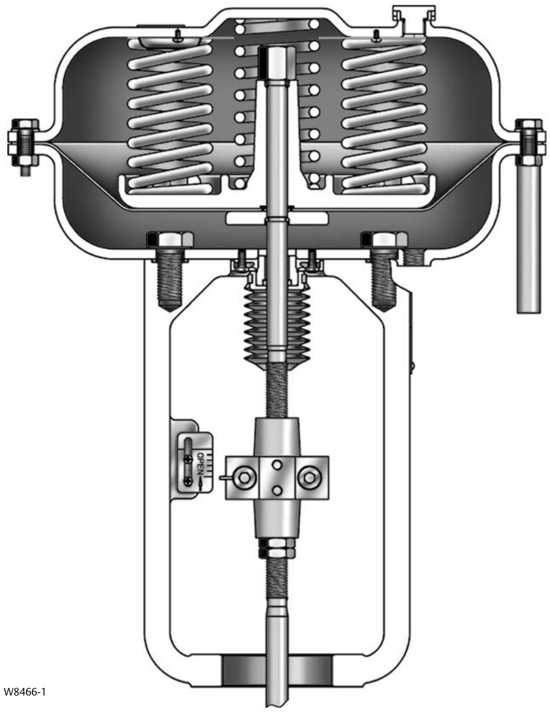
Top mounted adjustable up travel stops are available for all actuators from size 30 to 40E. For the larger sizes 45 and 45E, an adjustable stop can be fitted to the actuator stem below the diaphragm casings. Both constructions give total variable adjustment of the travel of the actuator by limiting movement in the upward direction. Refer to figures 4 and 5.

Others

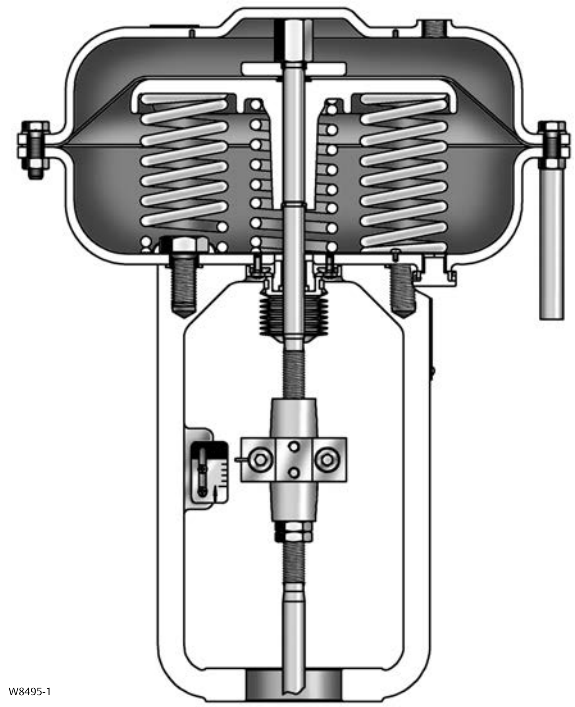
Accessories such as transducers, positioners, position transmitters, air relays, volume boosters, switching valves, lockup valves, limit switches, and solenoid valves are also available for actuator mounting. They are described in separate publications. Contact your Emerson sales office or Local Business Partner for details.

Contents

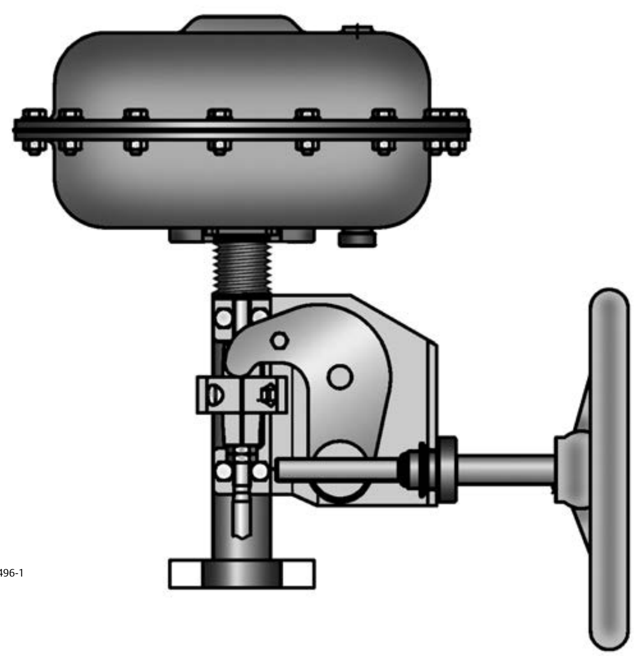
Figure 1. Typical Applications


W8466-1

3024C (AIR RETRACTS STEM)


W8495-1

3024C (AIR EXTENDS STEM)


W8496-1

3024C FITTED WITH A SIDE-MOUNTED HANDWHEEL

Figure 2. Side-Mounted Handwheel with Air-Extends-Stem Actuator

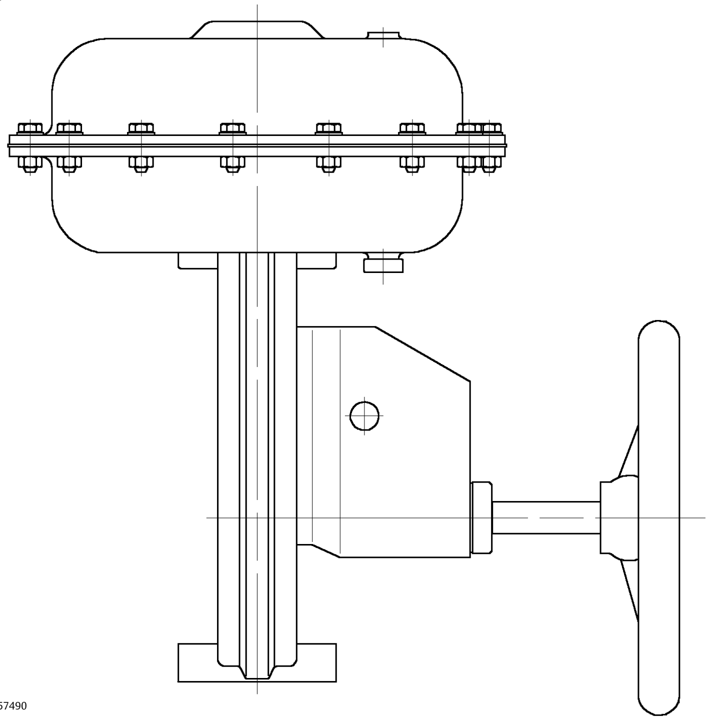


Figure 3. Side-Mounted Handwheel with Air-Retracts-Stem Actuator

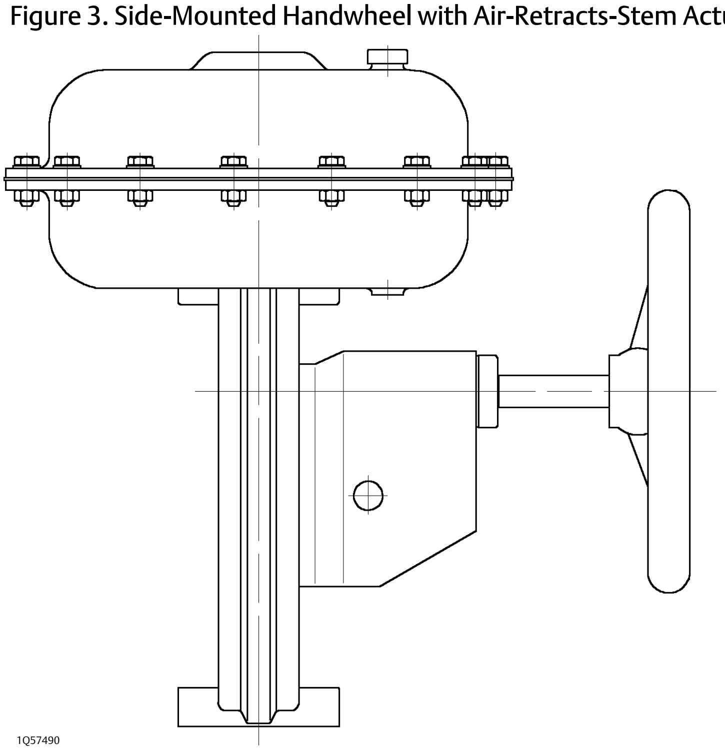


Figure 4. Up Stop for Actuator Sizes up to 40 and 40E

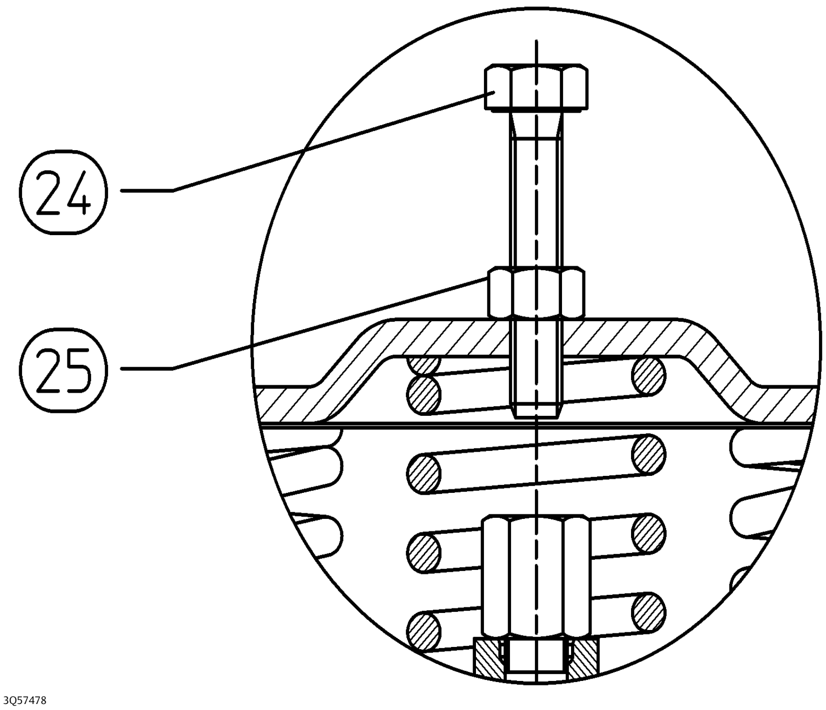
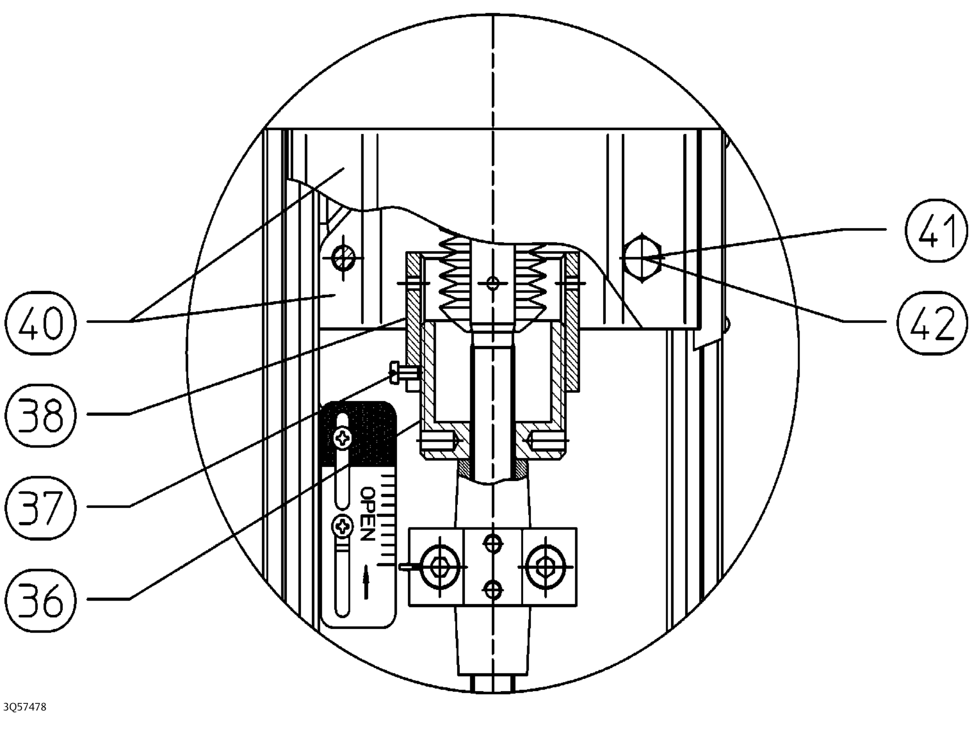


Figure 5. Up Stop for Actuator Sizes 45 and 45E



Construction Materials

Refer to figure 1.

Diaphragm Casings: Steel

Diaphragm: Nitrile

Diaphragm Plate: Aluminium

Springs: Steel

Spring locator: Steel

Actuator Stem: Stainless steel

O-Rings: Nitrile

Yoke: Cast steel

Stem Connector: Steel

Nameplate: Stainless steel

Travel Indicator Scale: Stainless steel

General Specifications

The sizes 30, 34, 40 and 45 are typically used with the 1018S valve bodies. The sizes 30E, 34E, 40E and 45E are used with such valves as the easy-e or RSS.

Table 2. Volumetric Data
(Air-to-Open and Air-to-Close)

ACTUATOR SIZE	ACTUATOR TRAVEL	VOLUME (L)	
		0% Travel	100% Travel
30	16 mm	0.6	0.9
30E	0.75 inch		
34	16 mm	1.9	2.6
34E	0.75 inch		
40	32 mm	1.5	2.8
40E	1.125 inch	1.5	2.8
	1.5 inch	1.8	3.3
	2 inch	1.5	3.5
45	32 mm	3.0	5.7
45E	1.125 inch	3.0	5.7
	1.5 inch	3.8	7.0
	2 inch	3.0	7.4

Table 3. Specifications

Specification		Actuator Size							
		30	30E	34	34E	40	40E	45	45E
Nominal Effective Area		See tables 4 and 5							
Maximum Operating Pressure to Diaphragm	Bar	6							
	psig	87							
Maximum Travel	mm	16	- - -	16	- - -	32	- - -	32	- - -
	Inch	- - -	0.75	- - -	0.75	- - -	2	- - -	2
Yoke Boss Diameter	mm	54 mm	54 mm	54 mm	54 mm	71 mm	71 mm	71 mm	71mm
	Inch	2-1/8	2-1/8	2-1/8	2-1/8	2-13/16	2-13/16	2-13/16	2-13/16
Valve Stem Connector Thread	mm	M12 x 1.75	- - -	M12 x 1.75	- - -	M16 x 2	- - -	M16 x 2	- - -
	Inch	- - -	3/8-24	- - -	3/8-24	- - -	1/2-20	- - -	1/2-20
Temperature Range	°C	Nitrile diaphragm and steel studs and nuts: -40 to +82							
	°F	Nitrile diaphragm and steel studs and nuts: -40 to + 180							
Pressure Connections	Inch	1/4 – 18 NPT							
Maximum Approximate Weight (without handwheel)	kg	9.5	9.5	18.0	18.0	19.5	21.5	33.5	35.5
	lb	20.9	20.9	39.7	39.7	43.0	47.4	73.9	78.3
Maximum Approximate Weight (with handwheel)	kg	16.5	16.5	25.0	25.0	26.5	28.5	40.5	42.5
	lb	36.4	36.4	55.1	55.1	58.4	62.8	89.3	93.7

Table 4. Additional Specifications (Action - Air Extends Stem)

SIZE	SPRING SET/QTY	TRAVEL		SPRING RANGE		EFFECTIVE DIAPHRAGM AREA (1)		MAXIMUM OUTPUT THRUST (MAXIMUM ACTUATOR STEM FORCE)(2)	
		mm	Inch	Bar	Psig	cm^2	$Inches^2$	N	Lb
30	217/3	16	- - -	0.3 - 1.1	4 - 16	160	24.8	7840	1760
	218/5			1.3 - 2.0	19 - 29	160	24.8	6400	1440
	218/7			1.8 - 2.9	26 - 42	160	24.8	4960	1120
30E	217/3	- - -	0.75	0.3 - 1.3	4 - 19	160	24.8	7520	1690
	218/5			1.3 - 2.2	19 - 32	160	24.8	6080	1360
	218/7			1.8 - 3.0	26 - 44	160	24.8	4800	1070
34	219/3	16	- - -	0.3 - 1.1	4 - 16	400	62.0	19,600	4400
	212/5			0.9 - 1.7	13 - 25	400	62.0	17,200	3840
	212/7			1.3 - 2.3	19 - 33	400	62.0	14,800	3350
34E	219/3	- - -	0.75	0.3 - 1.3	4 - 19	400	62.0	18,800	4220
	212/5			0.9 - 1.8	13 - 26	400	62.0	16,800	3780
	212/7			1.3 - 2.5	19 - 36	400	62.0	14,000	3160
40	212/3	32	- - -	0.4 - 1.3	6 - 19	390	60.5	18,300	4110
	213/6			0.8 - 1.8	12 - 26	390	60.5	16,400	3690
	214/7			1.2 - 2.4	17 - 35	390	60.5	14,000	3150
40E	212/3	- - -	1.125	0.4 - 1.2	6 - 17	390	60.5	18,700	4230
	213/6			0.8 - 1.7	12 - 25	390	60.5	16,800	3750
	214/7			1.2 - 2.3	17 - 33	390	60.5	14,400	3270
	213/4	- - -	1.5	0.3 - 1.0	4 - 15	380	58.9	19,000	4240
	214/5			0.6 - 1.5	9 - 22	380	58.9	17,100	3830
	214/7			0.9 - 2.1	13 - 30	380	58.9	14,800	3360
	213/4	- - -	2	0.2 - 1.2	3 - 17	370	57.4	17,800	4220
	214/5			0.5 - 1.7	7 - 25	370	57.4	15,900	3560
	214/7			0.7 - 2.4	10 - 35	370	57.4	13,300	2980
45	221/8	32	- - -	0.8 - 1.6	12 - 23	790	122	34,800	7810
	221/12			1.2 - 2.5	17 - 36	790	122	27,600	6220
	223/12			1.5 - 3.1	22 - 45	790	122	22,900	5120
45E	221/8	- - -	1.125	0.8 - 1.6	12 - 23	790	122	34,800	7810
	221/12			1.2 - 2.3	17 - 33	790	122	29,200	6590
	223/12			1.5 - 3.0	22 - 44	790	122	23,700	5250
	221/8	- - -	1.5	0.5 - 1.4	7 - 20	780	121	35,900	8110
	221/12			0.8 - 2.2	12 - 32	780	121	29,600	6650
	223/12			1.0 - 2.7	15 - 39	780	121	25,700	5810
	221/8	- - -	2	0.5 - 1.7	7 - 25	770	119	33,100	7380
	221/12			0.7 - 2.5	10 - 36	770	119	26,900	6070
	223/12			0.9 - 3.1	12 - 45	770	119	22,300	5000

1. Effective diaphragm area at 0% valve travel from seat.
2. Based upon 6 bar operating pressure to the diaphragm and valve travel at 0% from seat. This does not consider limitation to the valve such as stem buckling load. Consult your Emerson sales office for details.

Table 5. Additional Specifications (Action - Air Retracts Stem)

SIZE	SPRING SET/QTY	TRAVEL		SPRING RANGE		EFFECTIVE DIAPHRAGM AREA(1)		MAXIMU M OUTPUT THRUST (MAXIMUM ACTUATOR STEM FORCE)(2)	
		mm	Inch	Bar	Psig	cm^2	$Inches^2$	N	Lb
30	217/3 218/5 218/7	16	- - -	0.5 - 1.3	7 - 19	170	26.4	780	170
				1.4 - 2.2	20 - 32	170	26.4	2360	530
				2.0 - 3.1	29 - 45	170	26.4	3360	760
30E	217/3 218/5 218/7	- - -	0.75	0.3 - 1.3	4 - 19	175	27.1	550	120
				1.2 - 2.2	17 - 32	175	27.1	2180	490
				1.8 - 3.1	26 - 45	175	27.1	3110	700
34	219/3 212/5 212/7	16	- - -	0.6 - 1.4	9 - 20	410	63.6	2450	550
				1.1 - 1.9	16 - 28	410	63.6	4610	1040
				1.6 - 2.7	23 - 39	410	63.6	6560	1480
34E	219/3 212/5 212/7	- - -	0.75	0.4 - 1.4	6 - 20	420	65.1	1880	420
				1.0 - 1.9	15 - 28	420	65.1	4120	930
				1.4 - 2.7	20 - 39	420	65.1	5870	1320
40	212/3 213/6 214/7	32	- - -	0.4 - 1.3	6 - 19	450	69.8	1880	420
				0.8 - 1.8	12 - 26	450	69.8	3640	820
				1.2 - 2.4	17 - 35	450	69.8	5530	1240
40E	212/3 213/6 214/7	- - -	1.125	0.5 - 1.3	7 - 19	440	68.2	2200	500
				0.9 - 1.8	13 - 26	440	68.2	3970	890
				1.3 - 2.4	19 - 35	440	68.2	5920	1330
	213/4 214/5 214/7	- - -	1.5	0.4 - 1.1	6 - 16	410	63.6	1560	350
				0.7 - 1.6	10 - 23	410	63.6	3010	680
				1.0 - 2.3	15 - 33	410	63.6	4270	960
	213/4 214/5 214/7	- - -	2	0.2 - 1.2	3 - 17	440	68.2	1060	240
				0.5 - 1.8	7 - 26	440	68.2	2390	540
				0.8 - 2.5	12 - 36	440	68.2	3400	760
45	221/8 221/12 223/12	32	- - -	0.8 - 1.7	12 - 25	940	146	7790	1750
				1.2 - 2.5	17 - 36	940	146	11,700	2630
				1.6 - 3.2	23 - 46	940	146	14,700	3300
45E	221/8 221/12 223/12	- - -	1.125	0.9 - 1.7	13 - 25	910	141	8350	1880
				1.4 - 2.5	20 - 36	910	141	12,500	2810
				1.7 - 3.2	25 - 46	910	141	15,700	3530
	221/8 221/12 223/12	- - -	1.5	0.7 - 1.6	10 - 23	870	135	6150	1380
				1.1 - 2.4	16 - 35	870	135	9230	2080
				1.3 - 3.1	19 - 45	870	135	11,500	2590
	221/8 221/12 223/12	- - -	2	0.5 - 1.7	7 - 25	940	146	4740	1070
				0.8 - 2.6	12 - 38	940	146	7110	1600
				0.9 - 3.2	13 - 46	940	146	8800	1980

1. Effective diaphragm area at 0% valve travel from seat.
2. Based on zero operating pressure to the diaphragm and valve travel at 0% from valve seat. This does not consider limitations such as stem buckling load. Consult your Emerson sales office details.

Actuator Dimensions

See table 6.

Table 6. Dimensions(1)

ACTUATOR SIZE	VALVE TRAVEL	YOKE BOSS, INCHES	C	E	F(2)	AR	Js	Hs	M (ARS)(3)	M (AES)(4)
			Millimeters							
30	16 mm	2-1/8 (54 mm)	215	370	140	105	205	280	185	80
34	16 mm	2-1/8 (54 mm)	315	400	140	105	250	280	185	80
40	32 mm	2-13/16 (71 mm)	315	420	170	133	250	280	210	100
45	32 mm	2-13/16 (71 mm)	420	450	170	133	250	280	210	100
Inches										
30E	0.75	2-1/8	8.5	14.6	5.6	4.7	8.1	11.0	7.3	3.1
34E	0.75	2-1/8	12.4	15.8	5.6	4.7	9.8	11.0	7.3	3.1
40E	1.125	2-13/16	12.4	17.9	8.1	6.6	9.8	11.0	9.6	5.5
40E	1.5	2-13/16	12.4	18.9	8.3	6.6	9.8	- - -	- - -	- - -
40E	2	2-13/16	12.4	18.9	8.5	6.2	9.8	- - -	- - -	- - -
45E	1.125	2-13/16	16.5	19.3	8.1	6.6	9.8	11.0	9.6	5.5
45E	1.5	2-13/16	16.5	20.1	8.3	6.6	9.8	- - -	- - -	- - -
45E	2	2-13/16	16.5	20.1	8.5	6.2	9.8	- - -	- - -	- - -

1. See figures 6 and 7.
2. This is the centre of the stem connector at the fully-up postion. This ensures the positioner feedback arm, if fitted, is horizontal at mid-travel.
3. ARS - air retracts stem.
4. AES - air extends stem.

Ordering Information

When ordering please specify the following information:

Application Details:

1. On-off or throttling service

2. Input signal range

3. Maximum supply pressure

4. Valve body type and size with which the actuator will be used

5. Valve plug travel

6. Actuator thrust required with the actuator stem both fully retracted and fully extended

7. Stroking time requirements, if critical

8. Ambient temperature range

Actuator and Positioner

Be sure to specify the actuator type number required, whether a positioner is needed, whether a handwheel is required and whether an adjustable travel stop is required. Refer to the Specifications section in this bulletin. Review the information under each specification and in the referenced tables and figures. Specify the desired choice wherever there is a selection to be made.

Valve Body and Accessories

Refer to the separate valve body bulletin and bulletins covering accessories for ordering information.

Figure 6. Actuator Dimensions with Handwheel (see table 6)

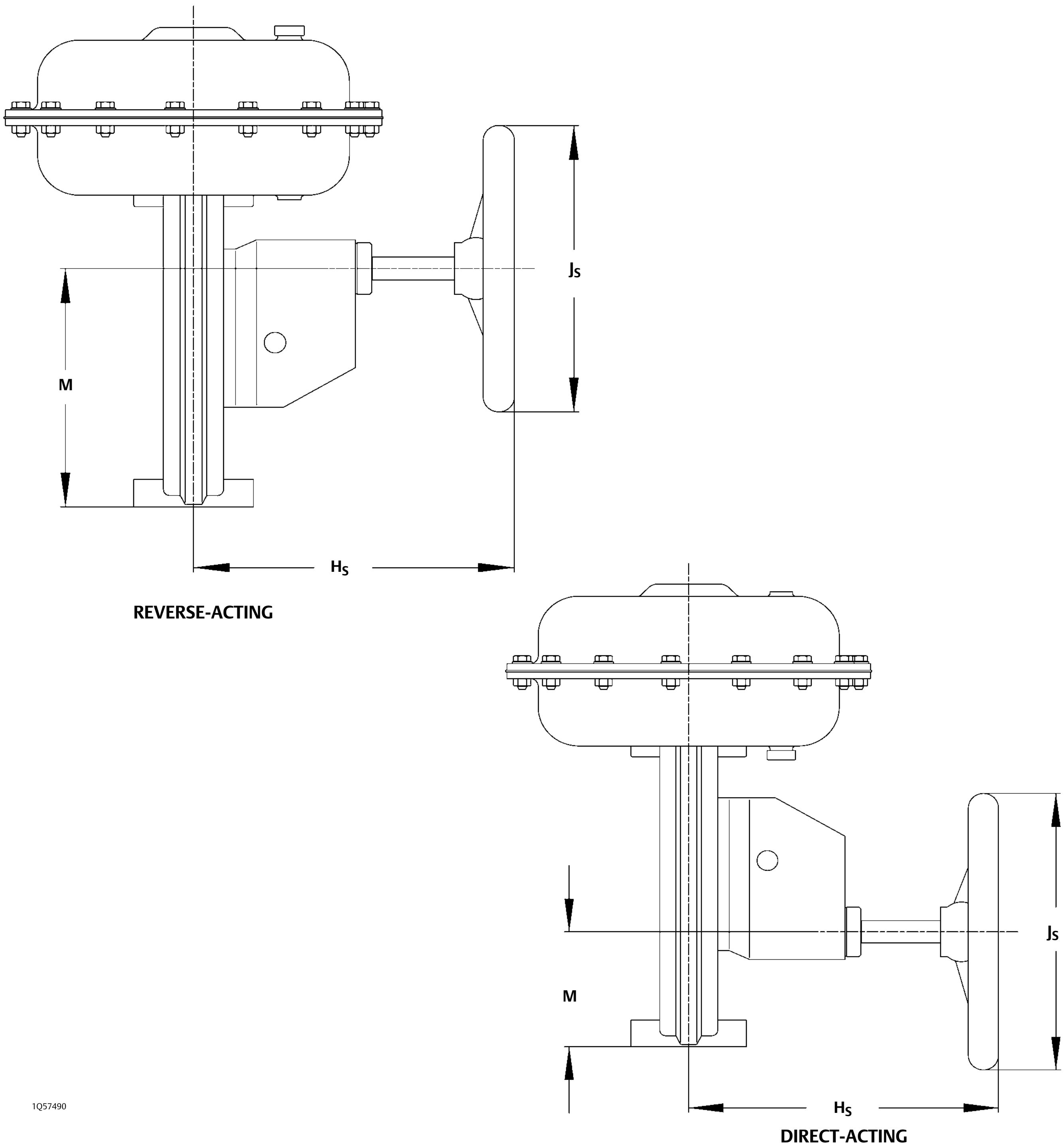
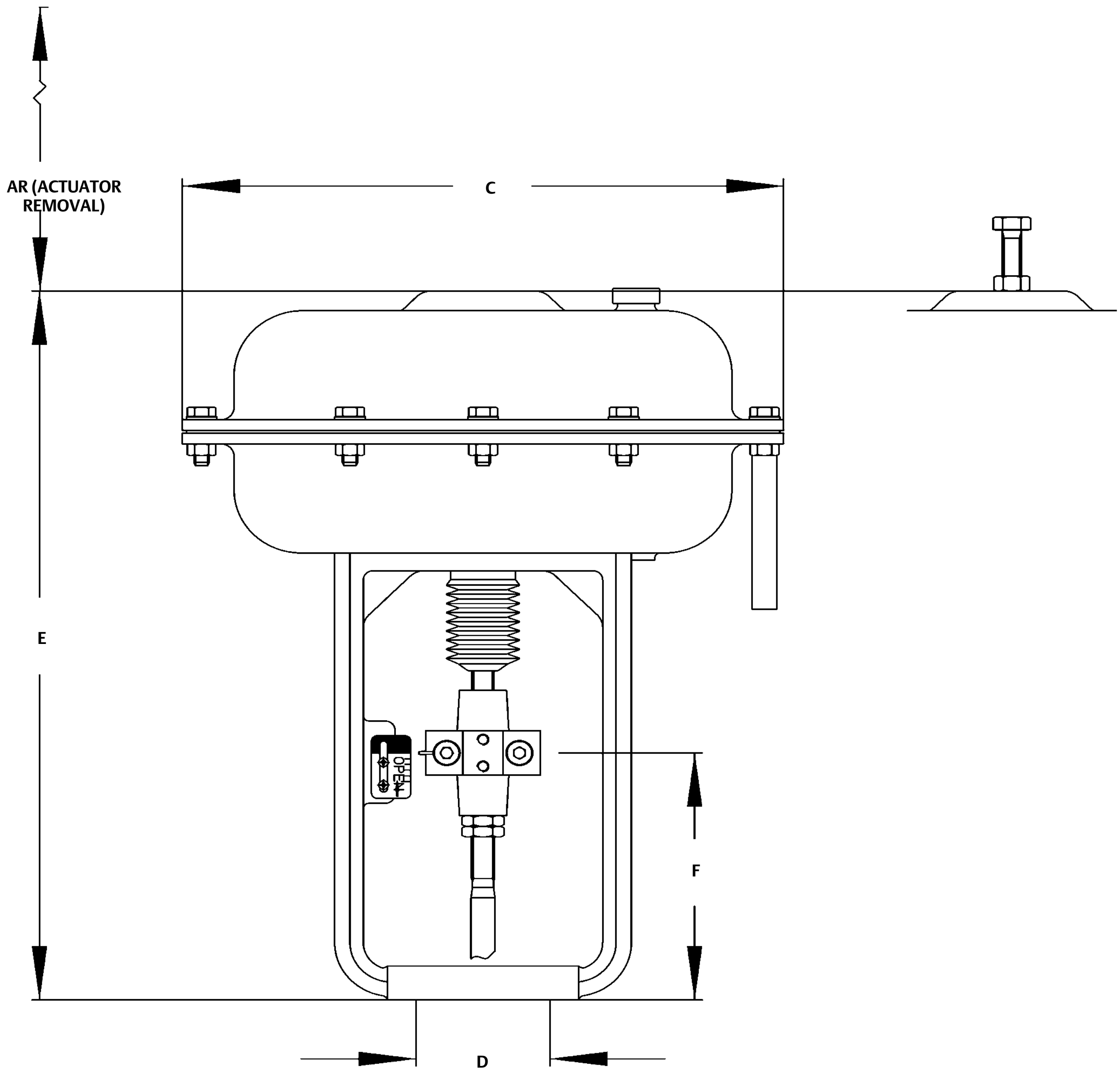


Figure 7. Actuator Dimensions (see table 6)



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3025 Actuator
D102789X012

Product Bulletin
61.1:3025
September 2017

Fisher™ 3025 Sizes P462, P460-200, and P900 Diaphragm Actuator

Fisher 3025 Size P460-200, P462 and P900 spring opposed diaphragm actuators position the valve plug in the valve body in response to varying controller or valve positioner pneumatic output signals applied to the actuator diaphragm. They can be specified as either direct, e.g. air-to-close, or reverse acting e.g. air-to-open (see figure 1). These actuators are designed to provide dependable on-off or throttling operation of automatic control valves.

The size P462 is available for travels up to 120 mm, 4.75 inches with air-to-open and air-to-close action.

The size P460-200 is available for travels up to 200 mm, 8 inches with air-to-open and air-to-close action.

The size P900 is available for travels up to 120 mm, 4.75 inches with air-to-open and air-to-close action.


W9088-2

Fisher 3025 Actuator Air-to-Open Action

Features

- Long Travel Capability—Suitable for valves with valve plug travels of up to 200 mm (8 inches).
- Application Versatility—Yoke boss mountings, travel stops, and manual operators are available for nearly any control valve requiring longer valve plug travels.
- Positive Connections—Split block stem connection provides for a solid transfer of motion while allowing easy mounting, and it includes no linkages to create lost motion and inaccurate valve positioning.
- Reversible Construction—Actuator action can be easily changed on site without need of additional parts.
- Long Service Life—Rugged steel construction provides stability and corrosion protection.

Specifications

Operating Pressure Range
See tables 3 and 4

Maximum Travel
Sizes P462 and P900: 120 mm (4.75 inches)
Size P460-200: 200 mm (8 inches)

Output Indication
Stainless steel disc or pointer and graduated scale

Stroking Speed
Dependent on actuator size, travel, spring rate, initial spring compression, and supply pressure. If stroking speed is critical, consult your Emerson sales office or Local Business Partner

Operating Temperature Range
-30 to 80°C

Volumetric Displacement
See table 2

Signal Connection
1/2 NPT internal

Effective Diaphragm Area
See table 4

Maximum Pressure
4 barg

Construction Materials
Diaphragm Casing: Steel
Diaphragm: Nitrile on nylon
Diaphragm Plate: Steel
Actuator Spring: Steel alloy
Actuator Stem: Steel alloy
Travel Indicator: Stainless steel
Yoke: Steel

Stem and Yoke Boss Diameters

ACTUATOR SIZE	YOKE BOSS DIAMETER (Inches)	STEM DIAMETER	
		mm	Inches
P462 and P460-200	3-9/16 5 5H(1)	19.1 25.4 31.8	3/4 1 1-1/4
P900	5 5H(1)	25.4 31.8	1 1-1/4

1. H = Heavy actuator to valve bolting.

Dimensions and Weights
See tables 5, 6, and 7 and figures 3, 4, and 5

Options
■ Side-mounted gear handwheel, ■ Oversize signal connections

Available Configurations

The 3025 actuator can be supplied in either direct or reverse action.

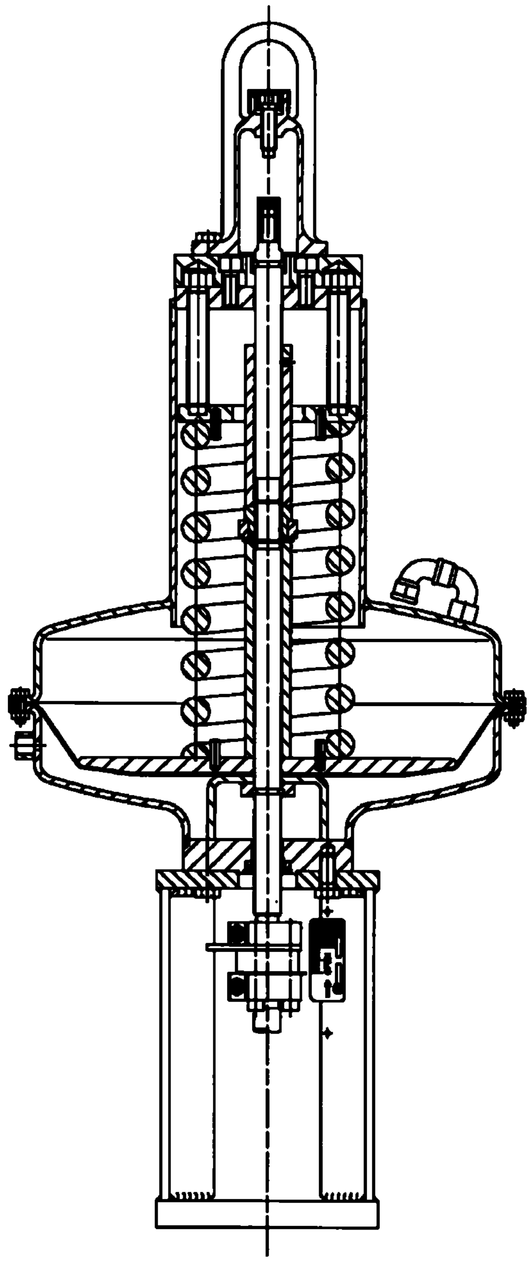
Direct Action

In direct action, applying air pressure to the upper diaphragm casing forces the actuator stem downward. When this pressure is reduced, the opposing spring force moves the actuator stem upward. Should the loading pressure fail, the spring forces the stem to the extreme upward position. This provides fail-open action for push-down-to-close valves and fail-closed action for push-down-to-open valves.

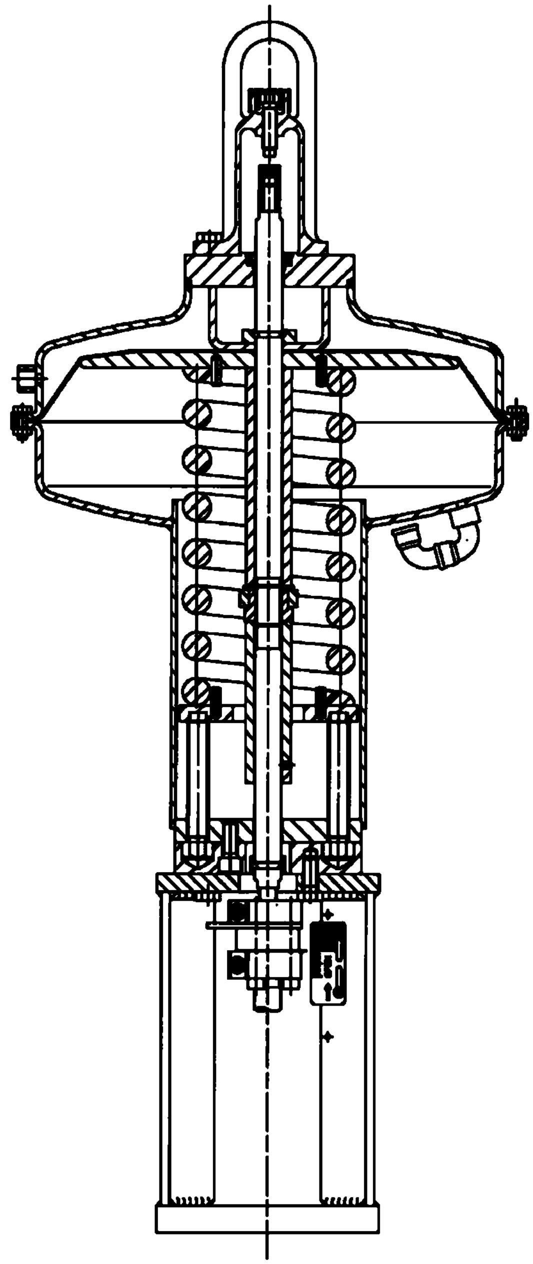
Reverse Action

In reverse action, applying air pressure to the lower diaphragm casing forces the actuator stem upward against the opposing spring force. When this loading pressure is reduced, the spring moves the actuator stem to the extreme downward position. Should the loading pressure fail, the spring forces the stem to the extreme downward position. Reverse acting actuators provide fail-closed action for push-down-to-close valves and fail-open action for push-down-to-open valves.

Figure 1. Typical Actuators



FISHER 3025 SIZE P462
AIR-TO-OPEN



FISHER 3025 SIZE P462
AIR-TO-CLOSE

E0990

Accessories

Instruments

Mounting parts exist for the following instruments (see table 1):

Table 1. Instruments Used with Fisher 3025 Actuators

Actuator Size	Travel	Instruments
P462 and P900	Up to 102 mm (4 inches)	■ FIELDVUE™ DVC6200 digital valve controller, ■ 3582 pneumatic positioner and ■ 3582i electropneumatic positioner
	Over 102 mm (4 inches)	■ DVC6200 digital valve controller and ■ 3610/3620 Series positioners
P460-200	All	

Handwheels

A geared handwheel is available for all sizes of the 3025 Actuator to manually position the valve plug. The valve is opened by turning the handwheel to the left and closed by turning to the right. See figure 2.

Other

Accessories such as transducers, position transmitters, air relays, volume boosters, switching valves, lockable valves, limit switches and solenoid valves are also available for actuator mounting. They are described in separate publications. Contact your Emerson sales office or Local Business Partner for details.

Table 2. Volumetric Casing Displacement

ACTUATOR SIZE	CLEARANCE VOLUME(1)	TRAVEL, mm								
		51	76	102	120	127	152	165	178	203
	cm^3	Casing Volume, cm^3								
P462	8600	17900	22500	27100	30500	---	---	---	---	---
P460-200	17400	---	---	---	---	46000	51700	54500	57400	63100
P900	17200	35800	45100	54400	61200	---	---	---	---	---
		TRAVEL, inches								
	$Inch^3$	2	3	4	4.75	5	6	6.5	7	8
		Casing Volume, $inch^3$								
P462	522	1089	1373	1657	1862	---	---	---	---	---
P460-200	1062	---	---	---	---	2806	3154	3329	3503	3852
P900	1050	2186	2755	3323	3735	---	---	---	---	---

1. Clearance volume indicates casing volume at zero travel.

Table 3. Fisher 3025 Air-to-Open Action (Spring Closes) Actuator Thrust Capabilities for Push-Down-to-Close Valves

ACTUATOR SIZE	VALVE TRAVEL		SPRING RANGE		TOTAL THRUST WHEN VALVE CLOSED		EFFECTIVE DIAPHRAGM AREA			
							Valve Closed		Valve Open	
	mm	Inches	Bar	Psig	N	lbs	cm^2	$Inch^2$	cm^2	$Inch^2$
P462	51	2	0.5 - 0.8 1.1 - 1.8 1.6 - 2.5	7 - 12 16 - 26 23 - 36	8140 19240 26740	1830 4325 6010	1800	279	1724	267
	76	3	0.5 - 0.9 1.1 - 2.2 1.5 - 2.4	7 - 13 16 - 32 22 - 35	8140 19240 26180	1830 4625 5885	1800	279	1686	261
	102	4	0.5 - 1.1 1.3 - 2.5	7 - 16 19 - 36	8140 22780	1830 5120	1800	279	1648	255
	120	4.75	0.5 - 1.2 1.2 - 2.6	7 - 17 17 - 38	8140 20230	1830 4550	1800	279	1620	251
P460-200	127	5	0.6 - 1.2 0.8 - 1.9 1.5 - 2.8	9 - 17 12 - 28 22 - 41	10460 16000 27070	2350 3595 6085	1800	279	1603	248
	152	6	0.6 - 1.3 0.8 - 2.1 1.5 - 3	9 - 19 12 - 30 22 - 44	10460 16000 27070	2350 3595 6085	1800	279	1564	242
	165	6.5	0.6 - 1.4 0.8 - 2.2 1.5 - 3.1	9 - 20 13 - 32 22 - 45	10460 16000 27070	2350 3595 6085	1800	279	1544	239
	178	7	0.6 - 1.5 0.8 - 2.3 1.5 - 3.3	9 - 22 12 - 33 22 - 48	10460 16000 27070	2350 3595 6085	1800	279	1524	236
	203	8	0.6 - 1.6 0.8 - 2.5 1.5 - 3.5	9 - 23 12 - 36 22 - 51	10460 16000 27070	2350 3595 6085	1800	279	1485	230
P900	51	2	1.1 - 1.9	16 - 28	34670	7795	3600	558	3378	524
	76	3	1.1 - 2.3 1.7 - 2.8	16 - 33 25 - 41	34670 61150	7795 13750	3600	558	3192	495
	102	4	1.2 - 2.4 1.7 - 3.1	17 - 35 25 - 45	38360 55970	8625 12580	3600	558	3108	482
	120	4.75	1.2 - 2.6 1.7 - 3.3	17 - 38 25 - 48	38360 55970	8625 12580	3600	558	3085	478

Table 4. Fisher 3025 Air-to-Close Action (Spring Opens) Actuator Thrust Capabilities for Push-Down-to-Close Valves

ACTUATOR SIZE	VALVE TRAVEL		SPRING RANGE		TOTAL THRUST WHEN VALVE CLOSED					
					Supply Pressure, bar			Supply Pressure, psig		
					2	3	4	29	44	58
	mm	Inch	Bar	Psig	Force, N			Force, lbs		
P462	51	2	0.5 - 0.8	7 - 12	21620	38860	56100	4860	8735	12610
	76	3	0.5 - 0.9	7 - 13	18500	35360	52220	4160	7950	11740
	102	4	0.5 - 1.1	7 - 16	15370	31850	48330	3455	7160	10865
	120	4.75	0.5 - 1.2	7 - 17	13100	29300	45500	2945	6585	10230
P460-200	127	5	0.6 - 1.2	9 - 17	12700	28730	44760	2855	6460	10065
	152	6	0.6 - 1.3	9 - 19	10150	25790	41430	2280	5795	9315
	165	6.5	0.6 - 1.4	9 - 20	9750	25190	40630	2190	5660	9135
	178	7	0.6 - 1.5	9 - 22	7570	22810	38050	1700	5125	8555
	203	8	0.6 - 1.6	9 - 23	5010	19860	34710	1125	4465	7805
P900	51	2	1.1 - 1.9	16 - 28	- - -	42530	76310	- - -	9560	17155
	76	3	1.1 - 2.3	16 - 33	- - -	24890	56810	- - -	5595	12770
	102	4	1.2 - 2.4	17 - 35	- - -	22680	53760	- - -	5100	12085
	120	4.75	1.2 - 2.6	17 - 38	- - -	16150	47000	- - -	3630	10565

Figure 2. Typical Geared Handwheel

W9089-1

W9090

Table 5. Fisher 3025 Dimensions and Weights - Size P462 Actuator

YOKE BOSS DIAMETER	TRAVEL	SPRING RANGE	DIMENSION REFERENCE				WEIGHT	
			D	E (w/o handwheel)	E (with handwheel)	M	w/o handwheel	with handwheel
	mm	bar	mm				kg	
3-9/16	51	All	90	1305	1670	495	180	215
	76	0.5 - 0.9 1.1 - 2.2 1.5 - 2.4	90	1370 1370 1600	1750 1750 1980	550	180 180 200	215 215 235
	102	0.5 - 1.1 1.3 - 2.5	90	1405 1635	1970 2200	550	180 200	225 245
	120	0.5 - 1.2 1.2 - 2.6	90	1405 1635	1970 2200	550	180 200	225 245
5 and 5H(1)	51	All	127	1360	1725	550	180	215
	76	0.5 - 0.9 1.1 - 2.2 1.5 - 2.4	127	1370 1370 1600	1750 1750 1980	550	180 180 200	215 215 235
	102	0.5 - 1.1 1.3 - 2.5	127	1405 1635	1970 2200	550	180 200	225 245
	120	0.5 - 1.2 1.2 - 2.6	127	1405 1635	1970 2200	550	180 200	225 245
Inches		psig	Inches				lbs	
3-9/16	2	All	3.6	51.4	65.7	19.5	395	475
	3	7 - 13 16 - 32 25 - 35	3.6	54 54 63	69 69 76	21.7	395 395 440	475 475 515
	4	7 - 16 19 - 36	3.6	55.3 64.4	77.6 86.6	21.7	395 440	495 540
	4.75	7 - 17 17 - 38	3.6	55.3 64.4	77.6 86.6	21.7	395 440	495 540
5 and 5H(1)	2	All	5	53.5	68	21.7	395	475
	3	7 - 13 16 - 32 25 - 35	5	54 54 63	69 69 78	21.7	395 395 440	475 475 515
	4	7 - 16 19 - 36	5	55.3 64.4	77.6 86.6	21.7	395 440	495 540
	4.75	7 - 17 17 - 38	5	55.3 64.4	77.6 86.6	21.7	395 440	495 540

1. H = Heavy actuator to valve bolting.

Figure 3. Fisher 3025 Dimensions and Weights - Size P462 Actuator (see table 5)

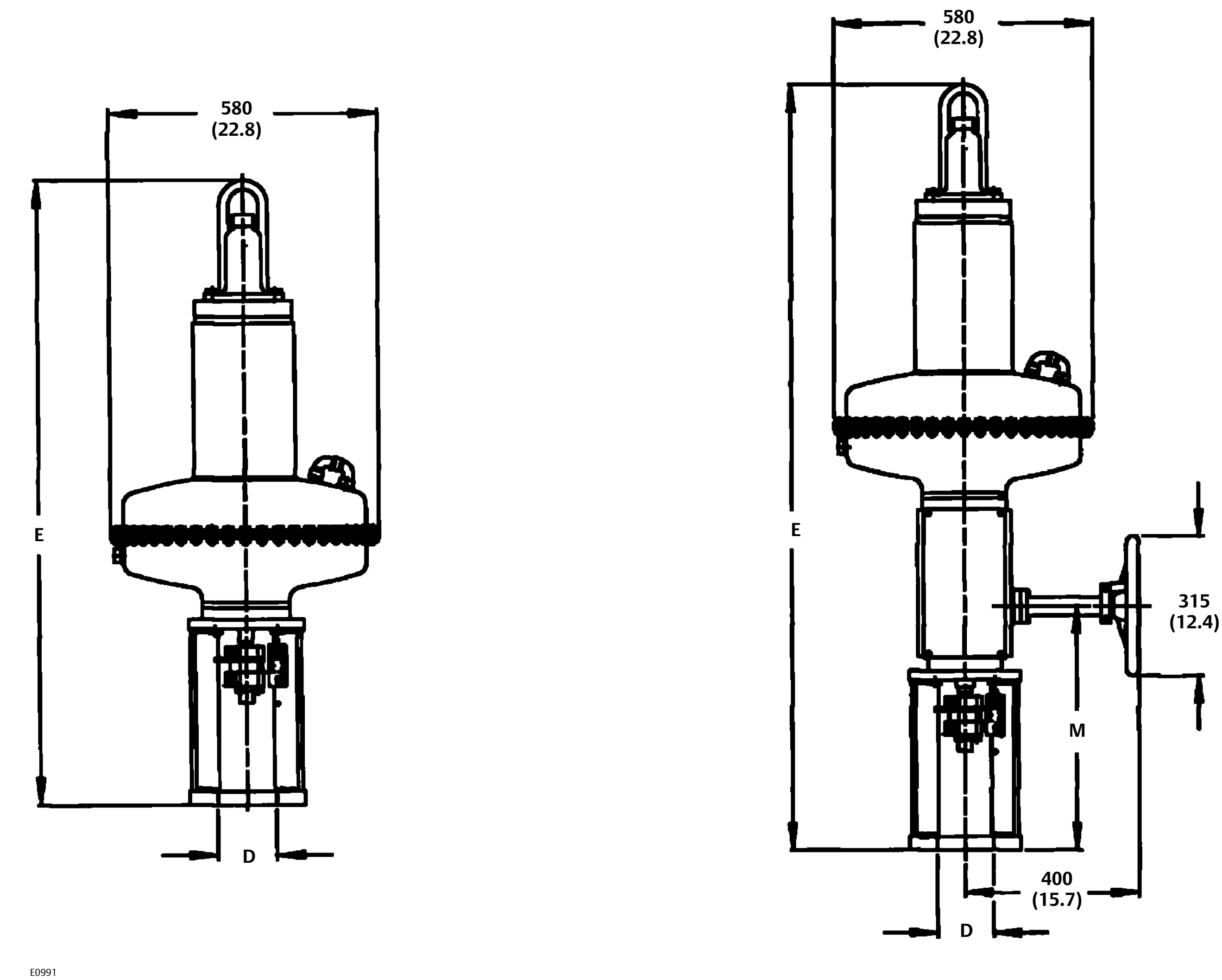


Table 6. Fisher 3025 Dimensions and Weights - Size P460-200 Actuator

YOKE BOSS DIAMETER	TRAVEL	SPRING RANGE	DIMENSION REFERENCE		WEIGHT	
			E (w/o handwheel)	E (with handwheel)	w/o handwheel	with handwheel
	mm	bar	mm		kg	
3-9/16, 5, and 5H(1)	127	0.6 - 1.2 0.8 - 1.9 1.5 - 2.8	1690 1690 1900	2510 2510 2720	220 235 280	320 335 380
	152	0.6 - 1.3 0.8 - 2.1 1.5 - 3.0	1690 1690 1900	2510 2510 2720	220 235 280	320 335 380
	165	0.6 - 1.4 0.8 - 2.2 1.5 - 3.1	1690 1690 1900	2510 2510 2720	220 235 280	320 335 380
	178	0.6 - 1.5 0.8 - 2.3 1.5 - 3.3	1690 1690 1900	2510 2510 2720	220 235 280	320 335 380
	203	0.6 - 1.6 0.8 - 2.5 1.5 - 2.5	1690 1690 1900	2510 2510 2720	220 235 280	320 335 380
Inches		psig	Inches		lbs	
3-9/16, 5, and 5H(1)	5	9 - 17 12 - 28 22 - 41	66.5 66.5 74.8	98.8 98.8 107	485 515 615	705 735 835
	6	9 - 19 12 - 30 22 - 44	66.5 66.5 74.8	98.8 98.8 107	485 515 615	705 735 835
	6.5	9 - 20 13 - 32 22 - 45	66.5 66.5 74.8	98.8 98.8 107	485 515 615	705 735 835
	7	9 - 22 12 - 33 22 - 48	66.5 66.5 74.8	98.8 98.8 107	485 515 615	705 735 835
	8	9 - 23 12 - 36 22 - 51	66.5 66.5 74.8	98.8 98.8 107	485 515 615	705 735 835

1. H = Heavy actuator to valve bolting.

Figure 4. Fisher 3025 Dimensions and Weights - Size P460-200 Actuator (see table 6)

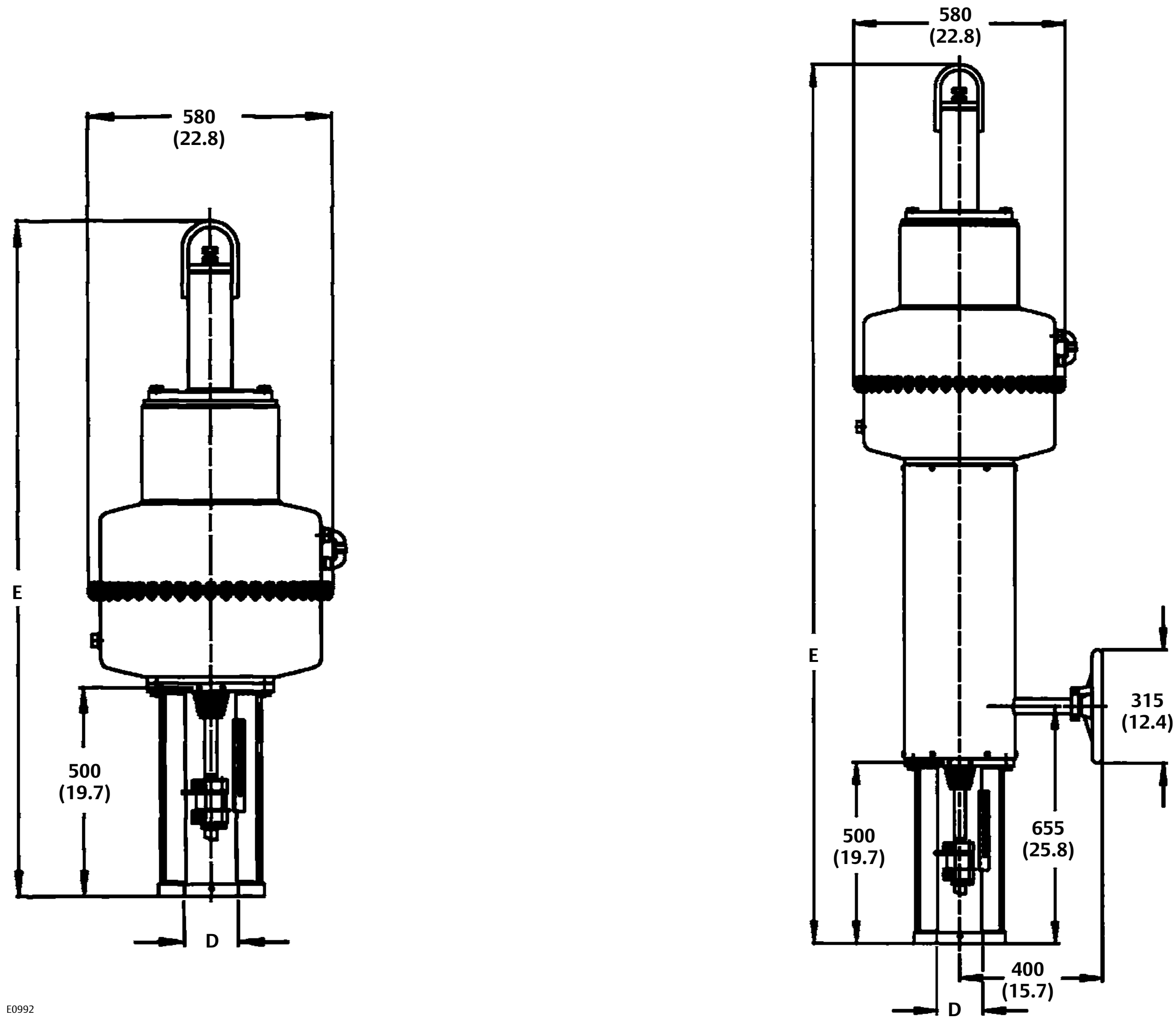
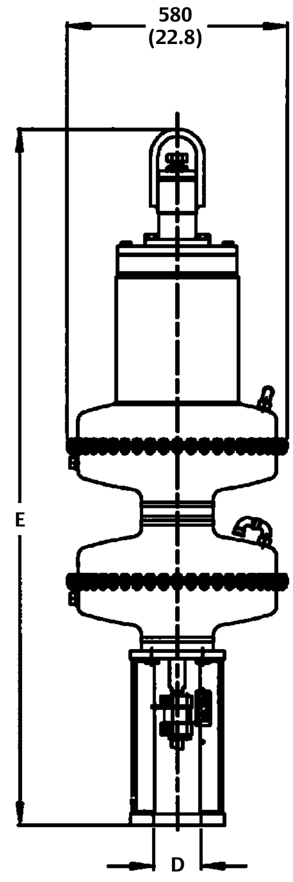


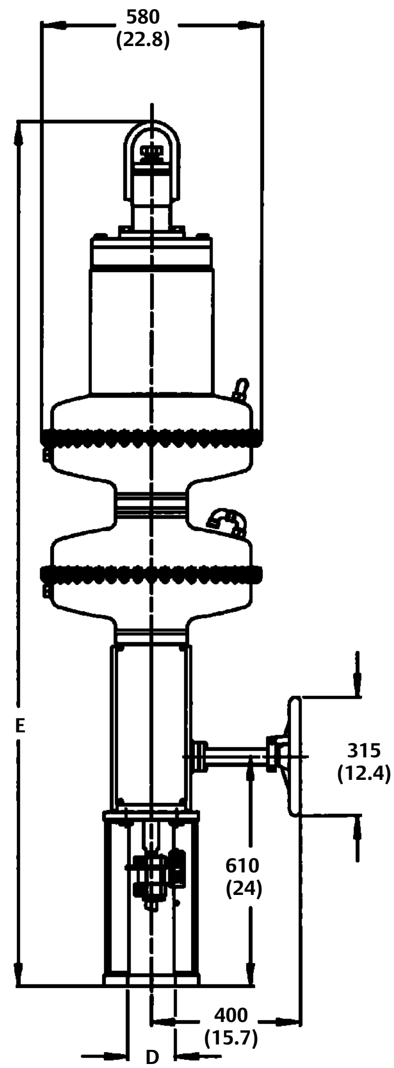
Table 7. Fisher 3025 Dimensions and Weights - Size P900 Actuator

YOKE BOSS DIAMETER	TRAVEL	SPRING RANGE	DIMENSION REFERENCE			WEIGHT	
			D	E (w/o handwheel)	E (with handwheel)	w/o handwheel	with handwheel
	mm	bar	mm			kg	
5 and 5H(1)	51	1.1 - 1.9	127	1845	2290	380	440
	76	1.1 - 2.3 1.7 - 2.8	127	1845 2020	2290 2470	380 430	440 490
	102	1.2 - 2.4 1.7 - 3.1	127	2060 2280	2630 2845	430 480	490 550
	120	1.2 - 2.6 1.7 - 3.3	127	2060 2280	2630 2845	430 480	490 550
Inches		psig	Inches			lbs	
5 and 5H(1)	2	16 - 26	5	72.6	90.2	835	970
	3	16 - 33 25 - 41	5	72.6 79.5	90.2 97.2	835 945	970 1080
	4	17 - 35 25 - 45	5	81.1 89.8	103.5 112	945 1055	1080 1210
	4.75	17 - 38 25 - 48	5	79.5 89.8	103.5 112	945 1055	1080 1210

1. H = Heavy actuator to valve bolting.

Figure 5. Fisher 3025 Dimensions and Weights - Size P900 Actuator (see table 7)





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Fisher™ 480 Series Yokeless Piston Actuators

Fisher 480 Series actuators are yokeless piston actuators that are used in either throttling or on-off applications with ball valves, butterfly valves, louvers, dampers, and rheostats. They require pneumatic pressure loading from double-acting positioners (Fisher 3570) or from on-off loading and unloading devices.

Fisher 480-15 Piston Actuator

Features

- **Actuator Versatility**—Actuator with or without positioners and snubbers is available in an assortment of sizes, stroking speeds, thrusts, and travels to handle most control requirements.
- **Compact Design**—Yokeless construction permits a low-profile assembly by allowing close coupling to the control device; either through a bracket or, with some versions, by direct mounting on a bonnet flange.
- **Wide Range Supply Pressure Capability**—The cylinder (and 3570 positioner if used) can operate with supply pressures as low as 2.4 bar (35 psig) or as high as 10.3 bar (150 psig).
- **Long Stroke**—Actuators have maximum rated travels of up to 206 mm (8.125 inches).
- **Positioner Versatility**—Positioner/actuator action is easily reversed in the field with no additional parts. Positioner sensitivity, travel span, and travel starting point are factory set and need to be reset only if operating conditions have changed or if the positioner has been reversed. See figure 1.

Actuator Frequency Response

Figure 3 shows how various size actuators respond when the input supply pressure is cycled at small amplitude (3 to 5 percent) and increasing frequency.

Assume the cycling supply pressure and the movement of the actuator rod are represented by sine waves. As the actuator rod is forced to move faster, its motion begins to fall behind the input in both time (shown as phase lag) and amplitude (shown as normalized gain). Both of these parameters are affected by the inertia of the actuator and, consequently, changes are more pronounced in the larger constructions.

480 Series Actuator Specifications

Available Configurations

See the Actuator Configurations section

Cylinder Pressure

Maximum Allowable:(4) 10.3 bar (150 psig)
Required to Produce a Given Thrust: See figure 2
Minimum Recommended: Valves with low torque requirements - (2.4 bar [35 psig]); all other valves - (3.4 bar [50 psig])

Maximum Supply Source Consumption

With Positioner and Constant Input Signal: 0.54 normal m^3/hr(1) (20 scfh(1)) of air at 6.9 bar (100 psig)
Without Positioner: Depends on cylinder volume and supply pressure

Travel Information

Maximum Rated Travels, All 480 Series actuators with Linear Output: See table 1
Travel Stops Available for 480 Series actuators with 105 mm (4.125 inch) Maximum Rated Travels: See table 1

Thrust Information

See figure 2

Torque Output

480, 480-15, and 480-16 (for butterfly valves): Contact your Emerson sales office or Local Business Partner

Stroking Speeds

See table 1

Operative Ambient Temperature(2)

With Nitrile O-Rings: -46 to 80°C (-50 to 175°F)
With Fluorocarbon O-Rings (Optional):(3) -18 to 149°C (0 to 300°F)

Actuator Size and Piston Size

See table 1

Pressure Connections

Standard is 1/4 NPT. For larger sizes, contact your Emerson sales office or Local Business Partner.

Construction Materials

Actuator:

Part	Material
Cylinder and Piston	Aluminum
Piston Rod Extension	SST, Chrome Plated
Cylinder Seal Bushings	Brass
O-Rings	Nitrile or Fluorocarbon

Linkage Connections and Mounting Information

See figures 7, 8, 9, and 10

Options

■ 376 Series trip valve system to fail actuator ■ up or ■ down or ■ lock in last position
■ TopWorx™ DXP M21GNEB electrical valve stem position switch
■ Micro-Switch limit switches

1. Normal m^3/hr.- normal cubic meters per hour (0°C and 1.01325 bar, absolute); Scfh - standard cubic feet per hour (60°F and 14.7 psia).
2. These terms are defined in ANSI/ISA Standard S51.1
3. Without snubber. If this actuator has a snubber, the temperature specification is the same for the nitrile version.
4. The pressure limits in this bulletin and any applicable standard or code limitation for actuator should not be exceeded.

3570 Actuator Specifications

Available Configurations

3570: Valve positioner with two relays and three pressure gauges for monitoring input signal and output pressures to the top and underside of the actuator piston
3570C: Similar to 3570 except that the positioner is equipped with automotive tire valves instead of pressure gauges. The valves can be used for clip-on test pressure gauges. The relay nozzles on these positioners are locked in place with locknuts to resist unwanted nozzle movement due to vibration

Input Signal

Standard Ranges: 0.2 to 1.0 bar (3 to 15 psig) or 0.4 to 2.0 bar (6 to 30 psig)
Split Ranges: Typically uses one half of standard range when two control valves are operated by one input signal from a single controller
Optional Ranges: As required within the limits of the bellows

Bellows Pressure Rating

Standard Bellows: 3.4 bar (50 psig)
Optional Bellows: 6.2 bar (90 psig)

Supply Pressure

Maximum: 10.3 bar (150 psig)
Minimum: 2.4 bar (35 psig)

Output Signal

Type: Pneumatic pressure as required by the actuator
Action: Field reversible between direct and reverse (see table 2)

Hysteresis[1,2]

0.15% of total stroke or instrument pressure span

Resolution[1,2]

0.2% of instrument pressure span

Repeatability[1,2]

0.3% of instrument pressure span

Frequency Response[1,2]

See figure 3

Pressure Connections

Vent: 3/8 NPT
All Others: 1/4 NPT

Pressure Indications

3570C: Tire valves accept standard pressure gauge chucks
3570: See table below

Type of Indication	Number Used	Standard Gauge Range bar (psig)
Positioner input signal gauge	1	0 to 2.1 (0 to 30) or 0 to 4.1 (0 to 60)
Cylinder supply pressure gauge	0	0 to 11.0 (0 to 160)

Static Air Consumption[3]

0.56 normal m^3/hr (20 scfh) with 6.9 bar (100 psig) supply pressure

Operative Ambient Temperature[1,2]

With Nitrile O-Rings: -34 to 79°C (-30 to 175°F)
With Fluorocarbon O-Rings (Optional):[3] -18 to 149°C (0 to 300°F)

Construction Materials

Actuator:

Part	Material
Base, Cover and Beam	Aluminum, die cast
Bellows	Brass
Bias and Range Spring	Steel, Plated
Relay Body	Zinc, Die Cast
Relay Nozzle(s)	SST
Diaphragm	Nitrile or Fluorocarbon
O-Rings	Nitrile or Fluorocarbon

Options

Fisher SS-52 clip-on chuck (with or without gauge) for 3570C positioners

1. These terms are defined in ANSI/ISA Standard S51.1
2. For actuator with positioner only. Does not apply to other constructions or actuator-valve combination.
3. Normal m^3/hr.- normal cubic meters per hour (0°C and 1.01325 bar, absolute); Scfh - standard cubic feet per hour (60°F and 14.7 psia).

Table 1. Size, Piston, Stroking Speed, and Travel Information

ACTUATOR SIZE	EFFECTIVE PISTON AREA		PISTON DIAMETER		STROKING SPEED(1)		SINGLE-FLANGE				TRAVEL STOPS AVAILABLE FOR ACTUATORS WITH 105 mm (4.125 INCHES) MAXIMUM RATED TRAVEL	
							—16 Versions		All Others Except Fisher 487, 487-1(2)			
	cm²	Inch²	mm	Inch	mm/s	Inch/s	mm	Inch	mm	Inch	mm	Inch
30	107	16.5	121	4.75	102	4	---	---	105	4.125	89	3.5
40 60	182 258	28.25 55.5	156 216	6.125 8.5	52 33	2.05 1.30	206	8.125	105	4.125	89	3.5

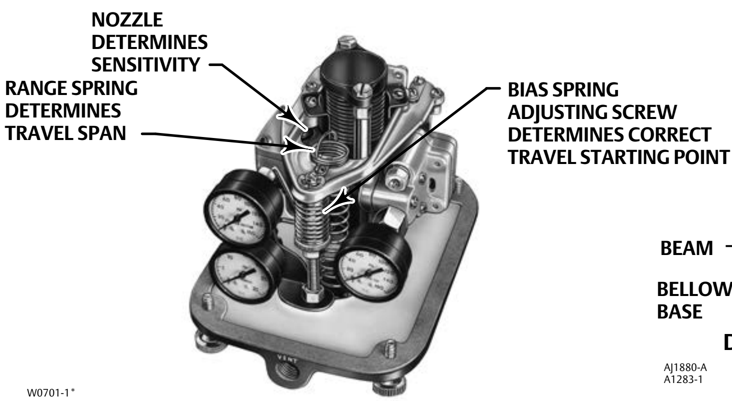
1. For actuators with positioners at 6.9 bar (100 psig) supply pressure and all prestroke conditions satisfied. Stroking speeds for actuators without positioners or with snubbers will depend on the particular construction involved.
2. See 480 Series Actuators Specifications for these travels.

Table 2. Action Under Normal Operating Conditions

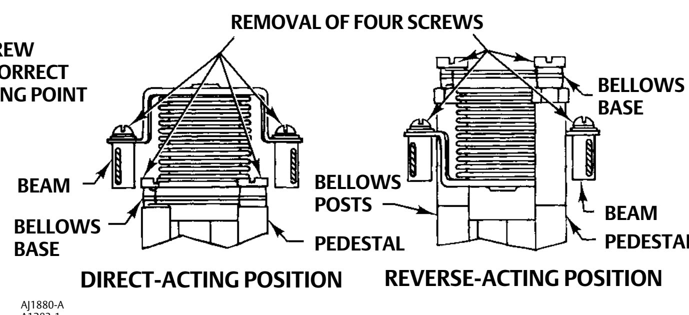
ACTUATOR DESCRIPTION		DESIRED PISTON MOTION	
		Down	Up
With Positioner	Direct-acting	Increasing input signal pressure to bellows(1)	Decreasing input signal pressure to bellows(1)
	Reverse-acting	Decreasing input signal pressure to bellows(1)	Increasing input signal pressure to bellows(1)
Without positioner		Supply pressure loaded on top of piston, exhausted from bottom	Supply pressure loaded on bottom of piston, exhausted from top

1. Supply pressure is routed through relays to piston.

Figure 1. Positioner Simplicity



ADJUSTMENTS



REVERSAL

Actuator Configurations

480: Yokeless piston actuator with positioner.

481: Yokeless piston actuator without positioner. Other actuators may be obtained without positioner by adding -1 to the type number.

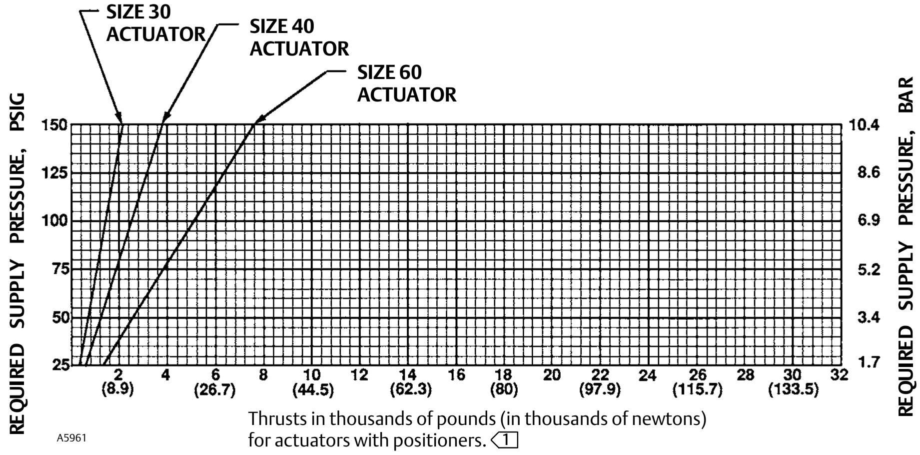
The above actuators come with standard mounting flange, 105 mm (4.125 inch) maximum rated travel, and threaded piston rod connection with sizes 30 through 60 for mounting on ball valves, louvers, and dampers with brackets.

These actuators may be obtained with the following alternate universal mounting flange constructions:

-15 Added to Type Number: Allows butterfly valve mounting for a standard actuator with 105 mm (4.125 inch) maximum travel and threaded piston rod connection, and comes in sizes 30 through 60.

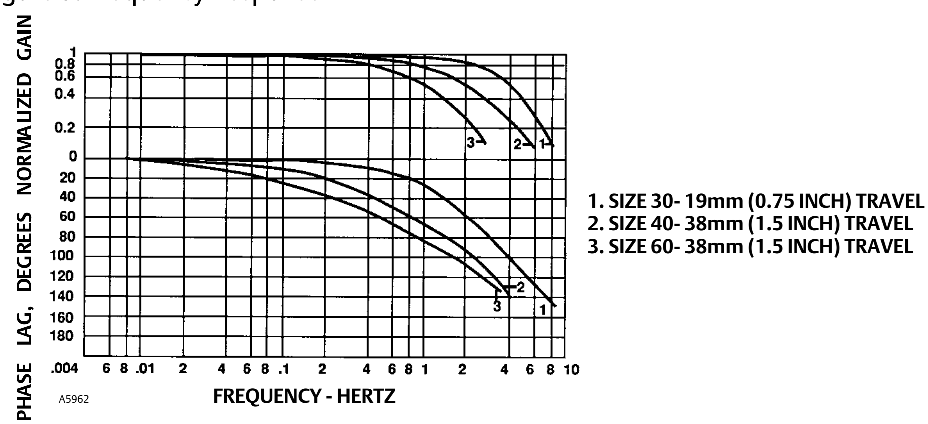
-16 Added to Type Number: Provides 206 mm (8.125 inch) maximum travel and threaded piston rod connection, and comes in sizes 40 through 60.

Figure 2. Supply Pressure and Thrusts



Note:
1 May be increased by 10% for actuators without positioners. Either this thrust, or the maximum allowable loading for the control device is the limiting factor for usable actuator force.

Figure 3. Frequency Response



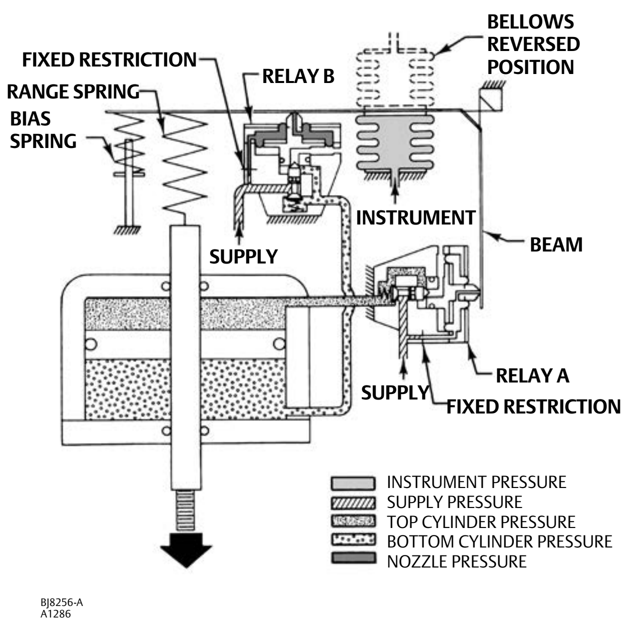
Principle of Operation

Actuator

These actuators react to a pressure unbalance that is created by loading supply pressure on one side of the piston and unloading the opposite side. Some type of switching device is required to shift the supply pressure from one side of the piston to the other. For most actuators in the 480 Series, this device is a 3570 positioner. However, a separate loading device must be provided for actuators without positioners.

For actuators with positioners (figure 4), the pneumatic output signal from a controller or instrument is piped to the positioner bellows. As long as the bellows receives a constant input signal pressure, the beam remains motionless and allows supply pressure to bleed through both relay nozzles such that a constant pressure is maintained between the nozzle and the fixed orifice. The relays are in equilibrium with their inlet and exhaust valves closed.

Figure 4. Operation of Actuator with Positioner

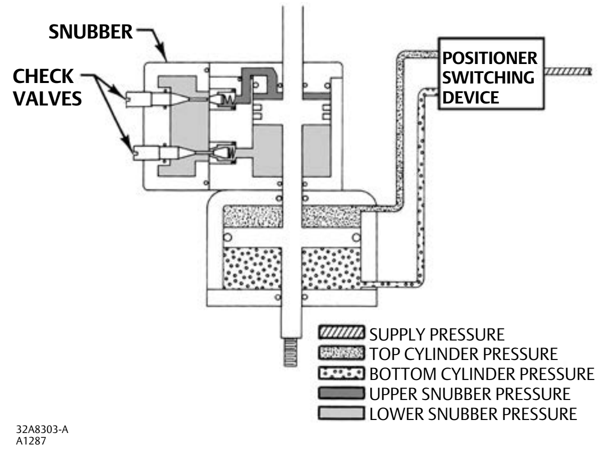


Assume that a downward piston motion is required and the bellows receives a corresponding change in input signal pressure. This causes the beam to pivot so that it covers the nozzle on relay A. (Beam movement is accomplished either by increasing the input signal pressure on a direct-acting positioner to expand the bellows, or by decreasing the input signal pressure on a reverse-acting positioner to contract the bellows.)

The nozzle pressure in relay A increases due to the restriction created by the beam over the nozzle. Through relay action, the air pressure to the top of the piston is increased. At the same time, relay B reacts to the change in beam position to decrease the pressure to the underside of the piston. Due to the resulting unbalanced forces acting on the piston, it moves down, changing the valve plug position.

Piston movement is fed back to the beam by means of a range spring which is connected to the beam and to the piston rod extension, applying a force to the beam opposite to that caused by the expanding or contracting bellows. This feedback arrangement prevents overcorrection and ensures a definite position of the piston and valve plug for a given instrument signal.

Figure 5. Operation of Actuator with Snubber



If upward piston motion is required, the beam pivots over the nozzle on relay B. The result is relay, piston, and feedback action opposite that for downward piston motion.

Reversal of positioner action is accomplished simply by removing four screws, inverting the bellows, and installing two bellows posts for support it the change is from direct to reverse action. Bellows posts are stored in the positioner case and are not used if the change is from reverse to direct.

Actuator with Snubber

As the actuator piston strokes, the snubber piston moves inside an oil-filled cylinder, forcing oil from one side of the piston to the other through two check valves (see figure 5). The resistance to flow created by the settings of the check valves and the shock absorbing quality of the oil combine to damp out any tendency of the valve plug to jump. The plug of each check valve is held off its seat by the positioning of the adjusting screws. Thus, with the adjusting screws backed off all the way, maximum damping will be obtained.

Installation

The actuator may be installed in any position, but normal installation is with the actuator vertical above the valve. Dimensions are given in figures 6, 7, 8, 9, and 10.

Ordering Information

When ordering, specify:

1. Type number

    a. For actuator, suffix dash numbers of desired constructions are appropriate.

    b. For positioner (if used)

2. Supply Pressure

3. Actuator size and connection size and style desired

4. Input signal range

5. Desired stroking time and direction, if applicable

6. Operative ambient temperature

7. Travel

8. Desired options

9. Application requirements

    a. Type, body size, port diameter, stem connection size, and the action of the valve to be used with the actuator.

    b. Valve inlet pressure

    c. Valve shutoff pressure drop

    d. Valve flowing pressure drop

    e. Process fluid temperature

Table 3. Cylinder Diameter and Bolt Center Location, All Actuators

ACTUATOR SIZE	C		H, DEGREE OF ARC	
	mm	Inch	Standard Flange	Universal Mounting Flange
30	171	6.75	0	45
40	206	8.12	45	45
60	267	10.50	22.5	45

Figure 6. Cylinder Diameter and Bolt Center Location, All Actuators (refer to table 3)

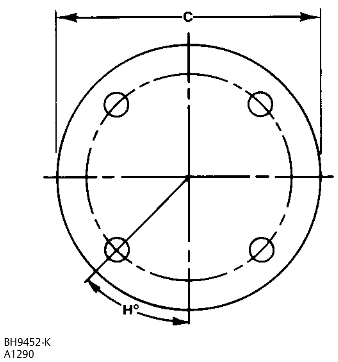
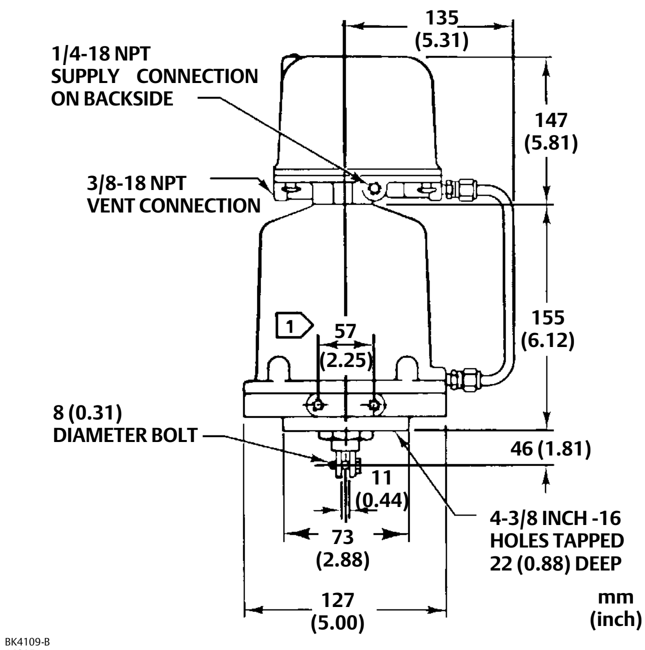


Figure 7. Dimensions for Actuators with Clevis Connection

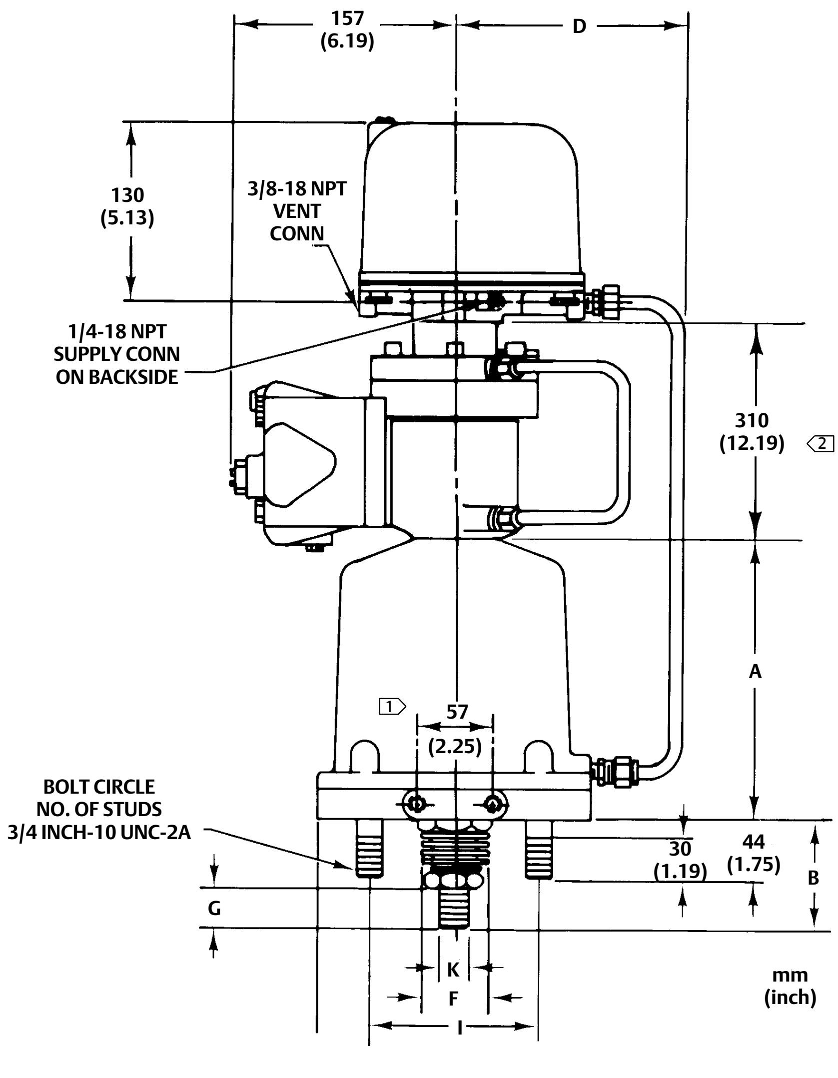


1 Duplicated on opposite side; each hole is 5/16 inch-18 UNC-2B and tapped 13 (0.50) deep.

Table 4. Dimensions and Mounting Information for Actuators with Threaded Piston Rod and Standard Mounting Flange, or Positioner, or Snubber

ACTUATOR SIZE	A		B		D		F		G		I			K
											Number	Bolt Circle Diameter		THREADED PISTON ROD CONNECTION UNF-2A
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch		mm	Inch	
30	250	8.06	86	3.38	170	6.69	63	2.50	33	1.31	2	146	5.75	7/8 inch - 14
40	208	8.19	83	3.25	173	6.81	63	2.50	33	1.31	4	181	7.12	
60	211	8.31	79	3.12	203	8.00	63	2.50	33	1.31	8	241	9.50	

Figure 8. Dimensions and Mounting Information for Actuators with Threaded Piston Rod and Standard Mounting Flange, or Positioner, or Snubber (refer to table 4)

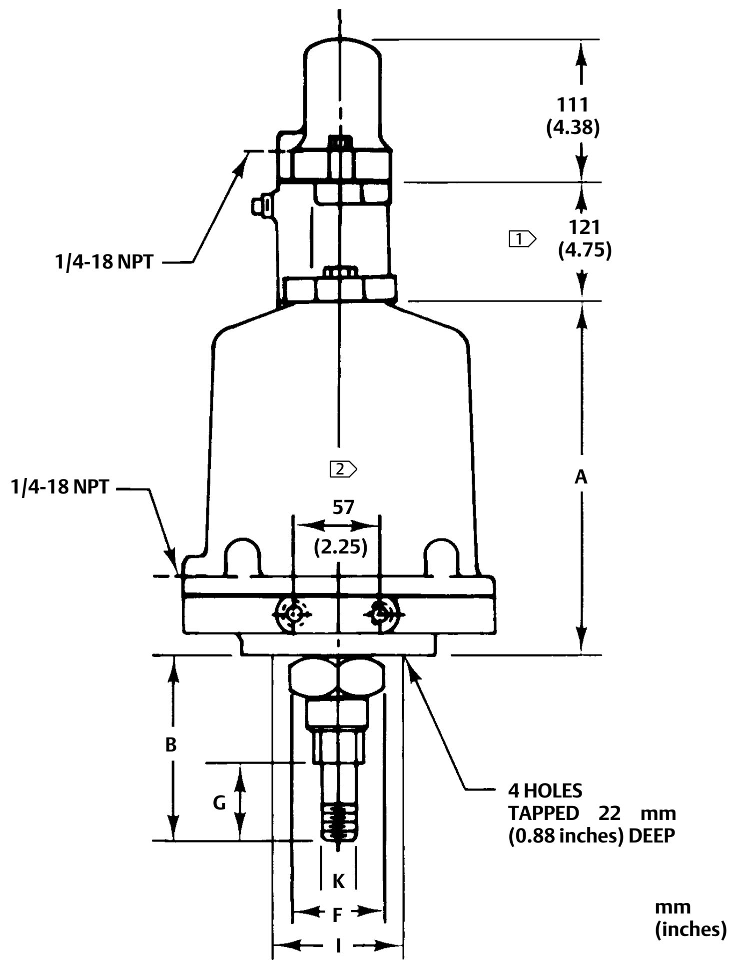


1 Duplicated on opposite side; each hole is 5/16 inch-18 UNC-2B and tapped 13 (0.50) deep.
2 This dimension does not exist if no snubber is used.

Table 5. Dimensions for Actuators without Positioner, with Long Stroke, or with Threaded Piston Rod and Universal Mounting Flange

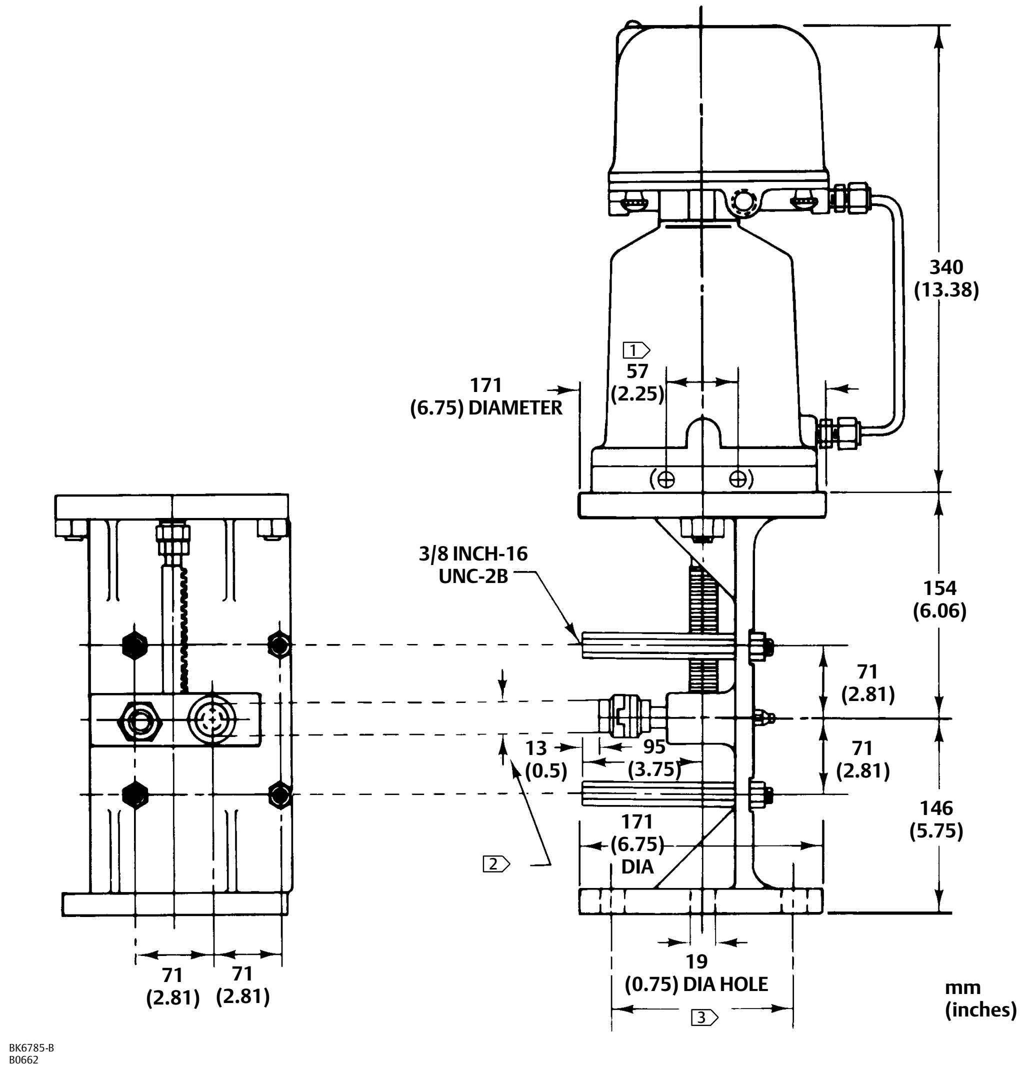
Actuator Size	A				B				F				G				I			K
	—15 Versions		—16 Versions		—15 Versions		—16 Versions		—15 Versions		—16 Versions		—15 Versions		—16 Versions		Bolt Circle Diameter		Thread Diameter	Threaded Piston Rod Connection UNF-2A
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	mm	mm	Inch	mm	Inch	mm	Inch		
30	222	8.75	- -	- -	90	3.56	- -	- -	64	2.5	- -	- -	33	1.31	- -	- -	99	3.88	1/2-13	7/8-inch-14
40, 60	222	8.75	343	13.5	90	3.56	108	4.25	64	2.5	47	1.87	33	1.31	51	2.00	99	3.88	1/2-13	7/8-inch-14

Figure 9. Dimensions for Actuators without Positioner, with Long Stroke, or with Threaded Piston Rod and Universal Mounting Flange (refer to table 5)



1 For -16 version only.
2 Duplicated on opposite side; each hole is 5/16 inch-18 UNC-2B and tapped 13 mm (0.50 inches) deep.

Figure 10. Dimensions for Actuators with Rotary Couplings



1 Duplicated on opposite side; each hole is 5/16 inch-18 UNC-2B and tapped 13 mm (0.50 inches) deep.
2 Socketed coupling with setscrew adjustment. 6 mm (0.25 inch), 10 mm (0.38 inch), and 13 mm (0.50 inch) inside diameters.
3 Four holes total on 140 mm (5.5 inch) bolt circle.

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Fisher™ 585C Piston Actuators

The 585C linear piston actuator is a powerful, double-acting actuator that provides accurate throttling or on-off operation for sliding-stem control valves.

The 585C piston actuator family is available in sizes 25 to 130 to cover a wide range of thrust and travel length requirements. It can be used with switching valves for on-off control, or with the DVC6200 digital valve controller or 3600 positioner for throttling applications.

The 585C has a wide-range of supply pressure capabilities, up to 150 psig. As the 585C is double-acting, the positioner supplies air to both sides of the piston, resulting in stiff, precise movement and control.

For more information contact your Emerson sales office.

X0175-2

FISHER 585C PISTON ACTUATOR
WITH FIELDVUE™ DVC6200f DIGITAL VALVE CONTROLLER

Features

- **High Thrust Capability--** With standard air supply, the Size 130 Fisher 585C can produce up to 111,000 Newtons (25,000 lbs) of force.

- **Wide Range of Sizes--** The 585C family of actuators offers a wide range of sizes, with piston areas of 168 sq cm (26 sq in) up to 1,429 sq cm (221.5 sq in).

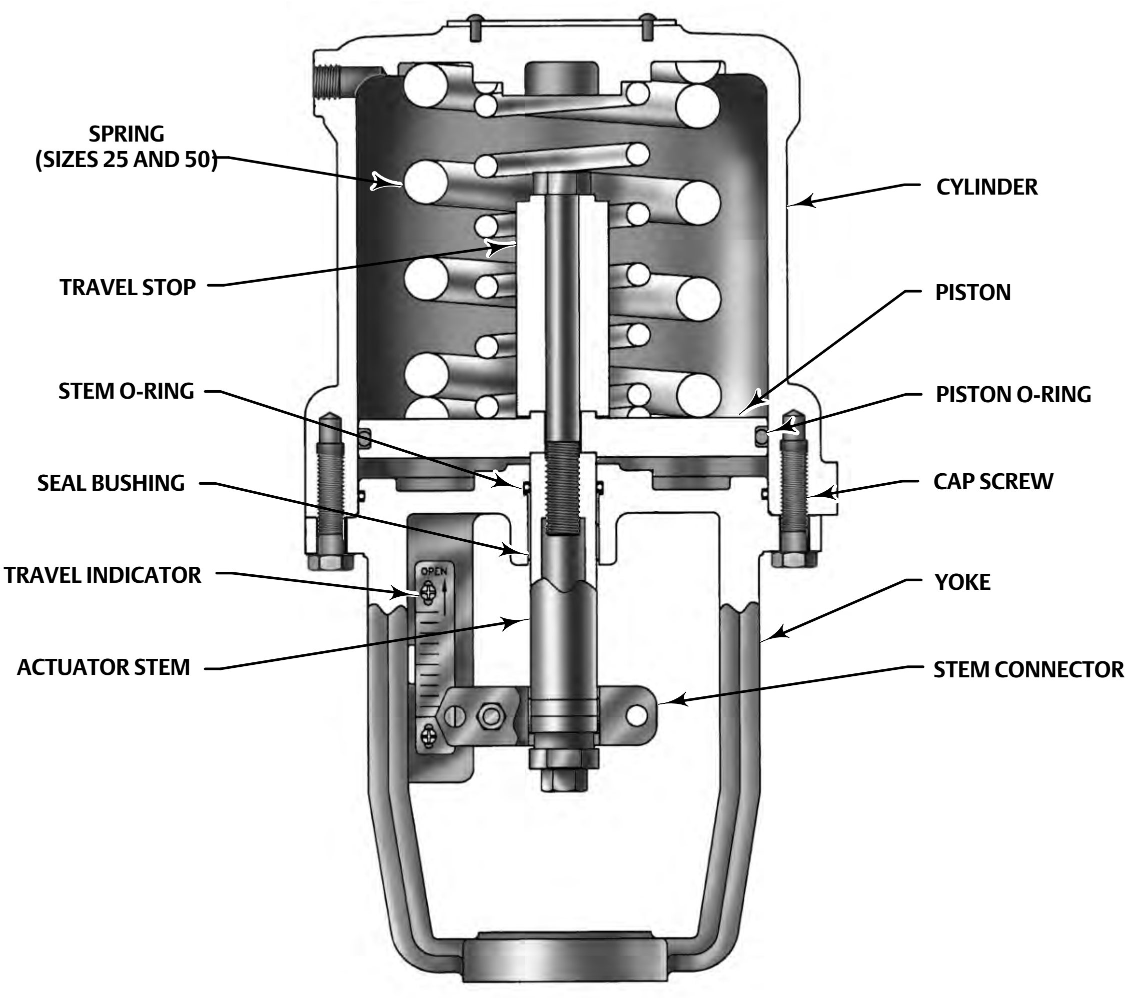
- **Rugged Construction--** The 585C standard yoke material is ductile iron, resulting in robust construction and increased thrust capability.

- **Broad Travel Capability--** 585C piston actuators provide standard travel lengths of up to 203 mm (8 inches).

- **High-Performance Instrumentation--** 585C actuators are available with a variety of positioners and accessories, including the FIELDVUE DVC6200 digital valve controller. The 377 trip valve and tank system are also available for fail-safe action.

- **Low Ambient Temperature--** Option available for applications with ambient temperatures down to -60° C (-76° F). Uses Fluorosilicone O-rings and Nitronic 50 stem connector assembly. Compliant to GOST 15150.

Figure 1. Fisher 585C Piston Actuator Components



Contents

Specifications

Operating Pressure[1]

Sizes 25-50:
Maximum Allowable: 10.3 bar (150 psig)
Minimum Recommended: 1.4 bar (20 psig)
Sizes 60-130:
Maximum Allowable: See table 8.
Minimum Recommended: 2.4 bar (35 psig)

Travel

See table 2

Thrust Capabilities

See tables 4, 5, 6, 7, and 8

Stroking Speeds

Varies with actuator size, actuator spring, travel, and supply pressure. If stroking speed is critical, consult your Emerson sales office

Piston Area

See table 8

Cylinder Volumetric Displacement

See table 2

Operative Temperature Limits[1]

For All Sizes:
Standard Construction (Nitrile O-Rings): -40 to 80°C (-40 to 175°F)
Optional Construction (Fluorocarbon O-Rings): -18 to 149°C (0 to 300°F)

For Sizes 60 through 130:
Optional Low Ambient Temperature (Fluorosilicone O-Rings): -60 to 80°C (-76 to 175°F)

Yoke Boss and Valve Stem Diameters

See table 3

Pressure Connections

Sizes 25 and 60:
■ 1/4 NPT internal (standard), or ■ 3/8 NPT internal (optional)
Size 50:
■ 1/4 NPT internal (standard), or ■ 1/2 NPT internal (optional)
Sizes 68-130:
■ 1/2 NPT internal (standard)

Dimensions

See figures 6 and 7

Construction Materials

Part	Material
Yoke	Ductile Iron
Piston	Aluminum
Cylinder	Aluminum
Bolting and Fasteners	Steel NCF (std)
	Stainless Steel (std and low ambient)
Springs (sizes 25 & 50 only)	Alloy Steel
O-Rings	Nitrile (std), Fluorocarbon, Fluorosilicone, or EPDM
Actuator Stem	Chrome-plated Steel
Stem Connection (sizes 60-130 only)	Zinc-plated Steel (std)
	Stainless Steel (std and low ambient)
Travel Indicator Scale	Stainless Steel
Paint	Polyester Powder
Actuator Stem (sizes 60-130 only)	S41600 (416) SST, Chrome Plate
Cylinder Seal Bushings (sizes 60-130 only)	Brass

Instrument Mounting

Universal NAMUR mounting

Approximate Weights (less positioner and handwheel)

Size 25:
2-1/8 inch yoke boss, 7 kg (16 lbs)
2-13/16 inch yoke boss, 8 kg (17 lbs)
Size 50:
2-13/16 inch yoke boss, 20 kg (45 lbs)
3-9/16 inch yoke boss, 22 kg (48 lbs)
Size 60: 31 kg (68 lbs)
Size 68: 54 kg (120 lbs)
Size 80: 102 kg (225 lbs)
Size 100: 113 kg (250 lbs)
Size 130: 188 kg (415 lbs)

Options

Sizes 25 and 50:
■ Top-mounted handwheel, see figures 6 and 7 and table 9
■ Cylinder bypass valve ■ Limit switches ■ Fisher 4200 position transmitter
Sizes 60-130:
■ Integral side-mounted handwheel, see figure 8 and tables 9 and 12
Sizes 25-130:
■ FIELDVUE mounting options
■ Fisher 377 trip valve system to fail actuator
■ Up or ■ down or ■ lock in last position
■ TopWorx DXP M21GNEB electrical valve stem position switch
■ Micro-Switch limit switches

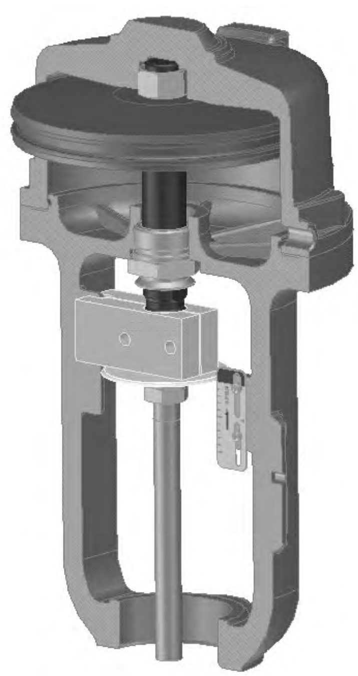
1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.

Features and Advantages

Table 1. Features and Advantages

FEATURES	ADVANTAGES
High thrust capability	With air supply capability of up to 150 psig, the 585C can produce up to 111,000 Newtons (25,000 pounds) thrust to overcome high valve unbalance.
Stroke Length Capability	Depending on size, strokes of up to 203 mm (8 inches) are available.
Wide range of sizes	The 585C is available in standard sizes 25, 50, 60, 68, 80, 100, and 130.
Valve mounting capability	Depending on size, the 585C can be mounted to yoke boss diameters of 2-1/8 inches through 5-inches, and valve stem diameters of up to 1-1/4 inch.
Positioner mounting capability	Universal NAMUR mounting provides a consistent mounting method for all sizes. This mounting capability provides vibration resistance per ISA-S75.13.
High frequency response	The double acting construction allows quick response to instrument signals.
Stiff construction	Pressure on both sides of the piston, plus the relatively small volume of air within the cylinder, results in stiff, precise positioning.
Handwheels	585C size 25 and 50 actuators are available with a top-mounted handwheel. All other 585C actuator sizes can accommodate a side-mounted handwheel.
Bias springs	The sizes 25 and 50 are available with bias springs. A bias spring under the piston fully retracts the actuator stem upon loss of supply air, while a bias spring on top of the piston fully extends the actuator stem. The spring bias mode is easily reversed without the need for additional parts.

Figure 2. Fisher 585C Piston Actuator Without Springs



E0409

Principle of Operation

The 585C piston actuator (figures 1 and 2) uses a piston that moves inside the actuator cylinder. An O-ring (see figure 1) provides a seal between the piston and the cylinder.

From an equilibrium state, the actuator reacts to a force unbalance that is created by increasing supply pressure on one side of the piston,and decreasing it on the other. This moves the piston up or down, and results in a repositioning of the valve control element.

Figure 3. Fisher 585C Piston Actuator with Handwheel

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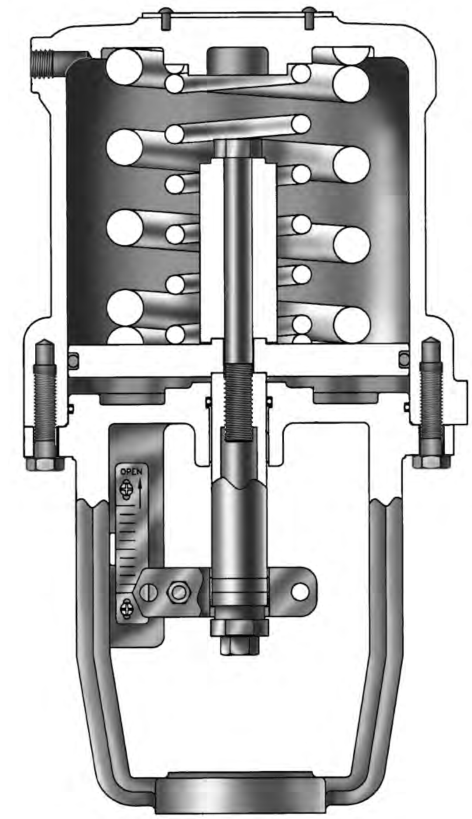
Figure 4. Fisher 585C Piston Actuator with Spring Return



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Actuator with Handwheel (figures 3 and 6)

The handwheel version can be used to open or close the valve manually (either during normal operation or in an emergency), to position the valve at any point in the stroke, or to act as a travel stop.

Size 25 and 50 actuators use an integral top-mounted handwheel. See figure 6.

Size 60 to 130 actuators use a side-mounted handwheel, and come with a spring-loaded ball detent which prevents vibration from changing the handwheel setting. Handwheels for most types are either 203 mm (8 inches) in diameter with beveled gears or 432 mm (17 inches) in diameter with worm gears.

Actuator with Spring Return (figure 4)

585C size 25 and 50 actuators are available with bias springs. The 585C actuator with bias spring has the spring under the piston and fully retracts the actuator stem upon loss of cylinder pressure. The bias spring in the 585CR actuator is on top of the piston and fully extends the actuator stem upon loss of cylinder pressure. No additional parts are required to convert from one actuator type to the other.

Instrument and Accessory Selection

An excellent selection of sensitive and accurate instruments and accessories is available for 585C piston actuators. These include FIELDVUE DVC6200 digital valve controllers, 3600 pneumatic (P/P) and electro-pneumatic (I/P) positioners, TopWorx™ DXP M21GNEB electrical valve stem position switch, 377 trip valve, 4200 electronic position transmitter, and limit switches. They are described in separate publications. Contact your Emerson sales office for details.

Installation

The actuator may be installed in any orientation but normal installation is with the actuator vertical above the valve. Actuator and positioner dimensions are shown in figures 6, 7, and 8.

If the supply source is capable of exceeding the maximum actuator operating pressure or instrument supply pressure, appropriate steps must be taken during installation to protect the instrument and all connected equipment against overpressure.

Actuator Data

See table 2 for piston cylinder clearance volumes, table 3 for yoke boss and valve stem diameters, and tables 4, 5, 6, 7, and 8 for actuator thrust capabilities.

Table 2. Fisher 585C Piston Cylinder Clearance Volumes

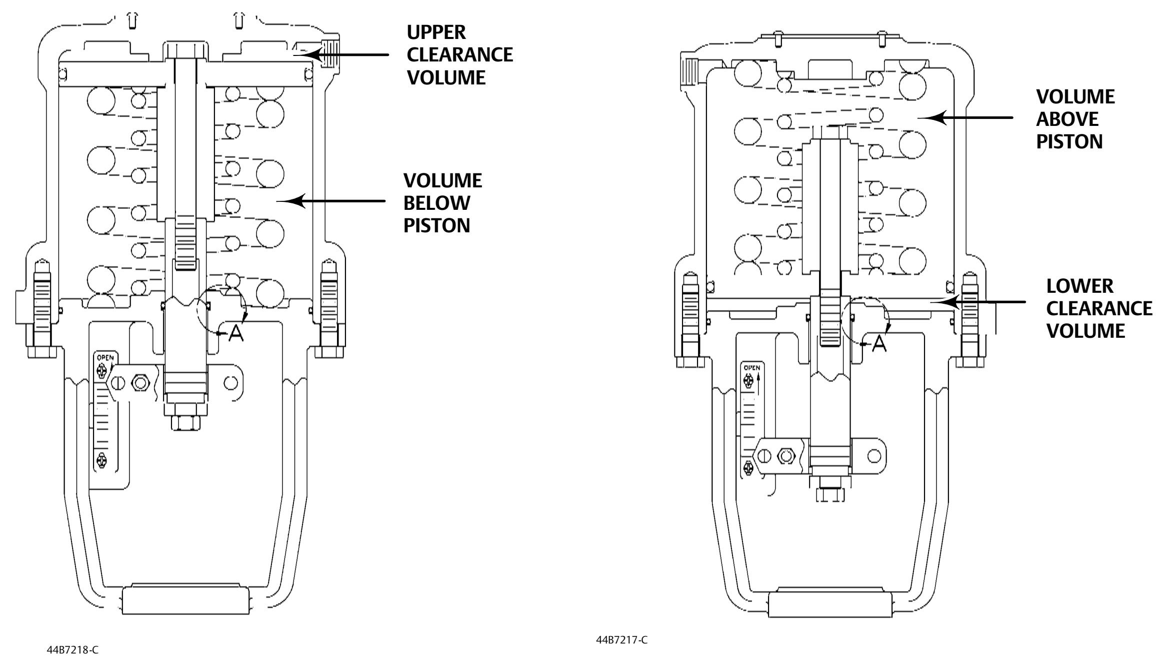
PISTON AT TOP OF CYLINDER (SPRINGS BELOW PISTON FOR SIZE 25 AND 50)								
Actuator Size	Piston Area		Maximum Actuator Travel		Upper Clearance Volume (figure 5)		Volume Below Piston (figure 5)	
	cm^2	$Inches^2$	mm	Inches	cm^3	$Inches^3$	cm^3	$Inches^3$
25	168	26	29	1.125	104	6.3	1750	107
50	303	47	51	2	330	20	5200	320
60	358	55.5	51	2	310	19	2700	163
			100	4	310	19	4400	270
			200	8	310	19	8200	500
68	571	88.5	51	2	1230	75	7500	460
			102	4	1230	75	7500	460
			203	8	1230	75	13300	810
80	571	88.5	102	4	1230	75	7500	460
			203	8	1230	75	13300	810
100	842	130.5	102	4	1700	104	10700	650
			203	8	1700	104	19200	1170
130	1430	221.5	102	4	4600	280	18500	1130
			203	8	4600	280	33000	2000
PISTON AT BOTTOM OF CYLINDER (SPRINGS ABOVE PISTON FOR SIZE 25 AND 50)								
Actuator Size	Piston Area		Maximum Actuator Travel		Lower Clearance Volume (figure 5)		Volume Above Piston (figure 5)	
	cm^2	$Inches^2$	mm	Inches	cm^3	$Inches^3$	cm^3	$Inches^3$
25	168	26	29	1.125	77	4.7	1790	109
50	303	47	51	2	350	22	5200	320

Table 3. Yoke Boss and Valve Stem Diameters

ACTUATOR SIZE	YOKE BOSS DIAMETER		VALVE STEM DIAMETER	
	mm	Inches	mm	Inches
25	54 71	2-1/8 2-13/16	9.5 12.7	3/8 1/2
50	71 90	2-13/16 3-9/16	12.7 19.1	1/2 3/4
60	90	3-9/16	19.1	3/4
68	90	3-9/16	19.1	3/4
80	127	5, 5H	25.4 31.8	1 1-1/4
100	127	5, 5H	25.4 31.8	1 1-1/4
130	127	5, 5H	25.4 31.8	1 1-1/4

1. Heavy actuator to bonnet bolting.

Figure 5. Clearance Volumes



Actuator Thrust Capabilities

Table 4. Fisher 585C Size 25 and 50 Actuator Thrust Capabilities, U.S. Units (Spring Retracts Stem)

ACTUATOR SIZE	SPRING RATE, lb/in	ACTUATOR STEM TRAVEL, INCHES	SPRING THRUST, POUNDS		NET THRUST FOR 585C WITH ACTUATOR STEM FULLY EXTENDED AT FULL TRAVEL										SPRING COLOR
					Operating Pressure, psig(1)										
			Stem Retracted	Stem Extended	40	50	60	70	80	90	100	110	125	150	
					Force, Pounds										
25	0	All	0	0	1040	1300	1560	1820	2080	2340	2600	2860	3250	3900	Springs Not Used
	200	0.5625	200	313	730	990	1250	1510	1760	2020	2280	2540	2930	3580	Gold
		0.75	200	350	690	950	1210	1470	1730	1990	2250	2510	2900	3550	
		0.875	200	375	660	920	1180	1440	1700	1960	2220	2480	2870	3520	
		1.125	200	425	610	870	1130	1390	1650	1910	2170	2430	2820	3470	
	400	0.5625	400	625	410	670	930	1190	1450	1710	1970	2230	2620	3270	Light Green
		0.75	400	700	340	600	860	1120	1380	1640	1900	2160	2550	3200	
		0.875	400	750	290	550	810	1070	1330	1590	1850	2110	2500	3150	
		1.125	400	850	190	450	710	970	1230	1490	1750	2010	2400	3050	
	500	0.5625	500	781	260	520	780	1040	1300	1560	1820	2080	2460	3110	White
		0.75	500	875	160	420	680	940	1200	1460	1720	1980	2370	3020	
		0.875	500	938	100	360	620	880	1140	1400	1660	1920	2310	2960	
		1.125	500	1063	X	240	500	760	1010	1270	1530	1790	2180	2830	
	700	0.5625	700	1094	X	200	460	720	980	1240	1500	1760	2150	2800	Gold & White
		0.75	700	1225	X	70	330	590	850	1110	1370	1630	2020	2670	
		0.875	700	1313	X	X	250	510	760	1020	1280	1540	1930	2580	
		1.125	700	1488	X	X	70	330	590	850	1110	1370	1760	2410	
	900	0.5625	900	1406	X	X	150	410	670	930	1190	1450	1840	2490	Light Green & White
		0.75	900	1575	X	X	X	240	500	760	1020	1280	1670	2320	
		0.875	900	1688	X	X	X	130	390	650	910	1170	1560	2210	
		1.125	900	1913	X	X	X	X	160	420	680	940	1330	1980	
50	0	All	0	0	1840	2300	2760	3220	3680	4140	4600	5060	5750	6900	Springs Not Used
	330	0.75	330	578	1310	1780	2250	2720	3190	3660	4140	4610	5310	6490	Pink
		0.875	330	619	1270	1740	2210	2680	3150	3620	4090	4570	5270	6450	
		1.125	330	701	1180	1660	2130	2600	3070	3540	4010	4480	5190	6370	
		1.5	330	825	1060	1530	2000	2470	2950	3420	3890	4360	5070	6250	
		2	330	990	900	1370	1840	2310	2780	3250	3720	4190	4900	6080	
	600	0.75	600	1050	840	1310	1780	2250	2720	3190	3660	4130	4840	6020	Light Blue
		0.875	600	1125	760	1230	1700	2170	2650	3120	3590	4060	4770	5950	
		1.125	600	1275	610	1080	1550	2020	2500	2970	3440	3910	4620	5800	
		1.5	600	1500	390	860	1330	1800	2270	2740	3210	3680	4390	5570	
		2	600	1800	90	560	1030	1500	1970	2440	2910	3380	4090	5270	
	930	0.75	930	1628	260	730	1200	1670	2140	2610	3090	3560	4260	5440	Pink & Light Blue
		0.875	930	1744	140	610	1080	1560	2030	2500	2970	3440	4150	5330	
		1.125	930	1976	X	380	850	1320	1790	2270	2740	3210	3910	5090	
		1.5	930	2325	X	30	500	970	1450	1920	2390	2860	3570	4750	
		2	930	2790	X	X	40	510	980	1450	1920	2390	3100	4280	
	1550	0.75	1550	2710	X	X	110	580	1050	1520	1990	2460	3165	4345	Green
		0.875	1550	2906	X	X	X	385	855	1325	1795	2265	2970	4150	
		1.125	1550	3294	X	X	X	X	465	935	1405	1875	2580	3760	
		1.5	1550	3875	X	X	X	X	X	355	825	1295	2000	3180	
		2	1550	4650	X	X	X	X	X	X	50	520	1225	2405	
	1880	0.75	1880	3290	X	X	X	X	470	940	1410	1880	2585	3765	Pink & Green
		0.875	1880	3525	X	X	X	X	235	705	1175	1645	2350	3530	
		1.125	1880	3995	X	X	X	X	X	235	705	1175	1880	3060	
		1.5	1880	4700	X	X	X	X	X	X	X	470	1175	2355	
		2	1880	5640	X	X	X	X	X	X	X	X	235	1415	

X indicates where the listed supply pressure is not sufficient to overcome the opposing bias spring effect.
1. The maximum design pressure for size 25 and 50 actuator is 150 psig. Maximum rating for applications is 125 psig.

Table 5. Fisher 585C Size 25 and 50 Actuator Thrust Capabilities, Metric Units (Spring Retracts Stem)

ACTUATOR SIZE	SPRING RATE, N/mm	ACTUATOR STEM TRAVEL, mm	SPRING THRUST, N: Stem Retracted	SPRING THRUST, N: Stem Extended	NET THRUST FOR 585C WITH ACTUATOR STEM FULLY EXTENDED AT FULL TRAVEL — Operating Pressure, bar(1): 2.8	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.6	10.3	SPRING COLOR
					Force, N										
25	0	All	0	0	4626	5783	6939	8096	9252	10,409	11,565	12,722	14,457	17,348	Springs Not Used
25	35.0	14.3	890	1393	3247	4404	5560	6717	7829	8985	10,142	11,298	13,033	15,925	Gold
25	35.0	19.1	890	1558	3069	4226	5382	6539	7695	8852	10,008	11,165	12,900	15,791	Gold
25	35.0	22.2	890	1669	2936	4092	5249	6405	7562	8718	9875	11,032	12,766	15,658	Gold
25	35.0	28.6	890	1891	2713	3870	5026	6183	7340	8496	9653	10,809	12,544	15,435	Gold
25	70.1	14.3	1780	2781	1824	2980	4137	5293	6450	7606	8763	9919	11,654	14,546	Light Green
25	70.1	19.1	1780	3115	1512	2669	3825	4982	6139	7295	8452	9608	11,343	14,234	Light Green
25	70.1	22.2	1780	3338	1290	2447	3603	4760	5916	7073	8229	9386	11,121	14,012	Light Green
25	70.1	28.6	1780	3783	845	2002	3158	4315	5471	6628	7784	8941	10,676	13,567	Light Green
25	87.6	14.3	2225	3475	1156	2313	3470	4626	5783	6939	8096	9252	10,943	13,834	White
25	87.6	19.1	2225	3894	712	1868	3025	4181	5338	6494	7651	8807	10,542	13,434	White
25	87.6	22.2	2225	4174	445	1601	2758	3914	5071	6227	7384	8541	10,275	13,167	White
25	87.6	28.6	2225	4730	X	1068	2224	3381	4493	5649	6806	7962	9697	12,588	White
25	122.6	14.3	3115	4868	X	890	2046	3203	4359	5516	6672	7829	9564	12,455	Gold & White
25	122.6	19.1	3115	5451	X	311	1468	2624	3781	4938	6094	7251	8985	11,877	Gold & White
25	122.6	22.2	3115	5843	X	X	1112	2269	3381	4537	5694	6850	8585	11,476	Gold & White
25	122.6	28.6	3115	6622	X	X	311	1468	2624	3781	4938	6094	7829	10,720	Gold & White
25	157.7	14.3	4005	6257	X	X	667	1824	2980	4137	5293	6450	8185	11,076	Light Green & White
25	157.7	19.1	4005	7009	X	X	X	1068	2224	3381	4537	5694	7428	10,320	Light Green & White
25	157.7	22.2	4005	7512	X	X	X	578	1735	2891	4048	5204	6939	9831	Light Green & White
25	157.7	28.6	4005	8513	X	X	X	X	712	1868	3025	4181	5916	8807	Light Green & White
50	0	All	0	0	8180	10,200	12,300	14,300	16,400	18,400	20,500	22,500	25,600	30,700	Springs Not Used
50	57.8	19.1	1468	2571	5827	7918	10,008	12,099	14,190	16,280	18,416	20,506	23,620	28,869	Pink
50	57.8	22.2	1468	2753	5649	7740	9831	11,921	14,012	16,102	18,193	20,328	23,442	28,691	Pink
50	57.8	28.6	1468	3118	5249	7384	9475	11,565	13,656	15,747	17,837	19,928	23,086	28,335	Pink
50	57.8	38.1	1468	3670	4715	6806	8896	10,987	13,122	15,213	17,303	19,394	22,552	27,801	Pink
50	57.8	50.8	1468	4404	4003	6094	8185	10,275	12,366	14,457	16,547	18,638	21,796	27,045	Pink
50	105.1	19.1	2669	4671	3736	5827	7918	10,008	12,099	14,190	16,280	18,371	21,529	26,778	Light Blue
50	105.1	22.2	2669	5004	3381	5471	7562	9653	11,788	13,878	15,969	18,060	21,218	26,467	Light Blue
50	105.1	28.6	2669	5671	2713	4804	6895	8985	11,121	13,211	15,302	17,392	20,551	25,800	Light Blue
50	105.1	38.1	2669	6672	1735	3825	5916	8007	10,097	12,188	14,279	16,369	19,528	24,777	Light Blue
50	105.1	50.8	2669	8007	400	2491	4582	6672	8763	10,854	12,944	15,035	18,193	23,442	Light Blue
50	162.9	19.1	4137	7242	1157	3247	5338	7428	9519	11,610	13,745	15,836	18,949	24,198	Pink & Light Blue
50	162.9	22.2	4137	7758	623	2713	4804	6939	9030	11,121	13,211	15,302	18,460	23,709	Pink & Light Blue
50	162.9	28.6	4137	8790	X	1690	3781	5872	7962	10,097	12,188	14,279	17,392	22,641	Pink & Light Blue
50	162.9	38.1	4137	10,342	X	133	2224	4315	6450	8541	10,631	12,722	15,880	21,129	Pink & Light Blue
50	162.9	50.8	4137	12,410	X	X	178	2269	4359	6450	8541	10,631	13,789	19,038	Pink & Light Blue
50	271.4	19.1	6894	12054	X	X	489	2580	4670	6761	8852	10942	14078	19,328	Green
50	271.4	22.2	6894	12925	X	X	X	1712	3803	5894	7984	10075	13211	18,460	Green
50	271.4	28.6	6894	14652	X	X	X	X	2068	4159	6249	8340	11476	16,725	Green
50	271.4	38.1	6894	17236	X	X	X	X	X	1579	3670	5760	8896	14,145	Green
50	271.4	50.8	6894	20683	X	X	X	X	X	X	222	2313	5449	10,698	Green
50	329.2	19.1	8362	14634	X	X	X	X	2091	4181	6272	8362	11498	16,748	Pink & Green
50	329.2	22.2	8362	15679	X	X	X	X	1045	3136	5226	7317	10453	15,702	Pink & Green
50	329.2	28.6	8362	17770	X	X	X	X	X	1045	3136	5226	8362	13,612	Pink & Green
50	329.2	38.1	8362	20906	X	X	X	X	X	X	X	2091	5226	10,476	Pink & Green
50	329.2	50.8	8362	25087	X	X	X	X	X	X	X	X	1045	6294	Pink & Green

X—Indicates where the listed supply pressure is not sufficient to overcome the opposing bias spring effect.
1. The maximum design pressure for size 25 and 50 actuator is 10.3 bar. Maximum rating for applications is 8.6 bar.

Table 6. Fisher 585CR Size 25 and 50 Actuator Thrust Capabilities, U.S. Units (Spring Extends Stem)

ACTUATOR SIZE	SPRING RATE, lb/in	SPRING THRUST W/ ACTUATOR STEM EXTENDED, POUNDS	TOTAL THRUST FOR 585CR WITH ACTUATOR STEM FULLY EXTENDED										SPRINGS USED, BY COLOR
			Operating Pressure, psig(1)										
			40	50	60	70	80	90	100	110	125	150	
			Force, Pounds										
25(2)	0	0	1040	1300	1560	1820	2080	2340	2600	2860	3250	3900	Springs Not Used
	200	200	1240	1500	1760	2020	2280	2540	2800	3060	3450	X	Gold
	400	400	1440	1700	1960	2220	2480	2740	3000	3260	3650	X	Light Green
	500	500	1540	1800	2060	2320	2580	2840	3100	3360	3750	X	White
	700	700	1740	2000	2260	2520	2780	3040	3300	3560	X	X	Gold & White
	900	900	1940	2200	2460	2720	2980	3240	3500	3760	X	X	Light Green & White
50(3)	0	0	1840	2300	2760	3220	3680	4140	4600	5060	5750	6900	Springs Not Used
	330	330	2210	2680	3150	3620	4090	4560	5030	5500	6205	X	Pink
	600	600	2480	2950	3420	3890	4360	4830	5300	5770	6475	X	Light Blue
	930	930	2810	3280	3750	4220	4690	5160	5630	6100	6805	X	Pink & Light Blue
	1550	1550	3430	3900	4370	4840	5310	5780	6250	6720	X	X	Green
	1880	1880	3760	4230	4700	5170	5640	6110	6580	7050	X	X	Pink & Green

X indicates where the listed supply pressure is not sufficient to overcome the opposing bias spring effect.
1. The maximum design pressure for size 25 and 50 actuator is 150 psig.
2. Maximum thrust is 3900 lbs.
3. Maximum thrust is 6900 lbs.

Table 7. Fisher 585CR Size 25 and 50 Actuator Thrust Capabilities, Metric Units (Spring Extends Stem)

ACTUATOR SIZE	SPRING RATE, N/mm	SPRING THRUST W/ ACTUATOR STEM EXTENDED, N	TOTAL THRUST FOR 585CR WITH ACTUATOR STEM FULLY EXTENDED										SPRINGS USED, BY COLOR
			Operating Pressure, bar(1)										
			2.8	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.6	10.3	
			Force, N										
25(2)	0	0	4626	5782	6939	8095	9251	10408	11565	12721	14456	17347	Springs Not Used
	35.0	890	5516	6672	7828	8985	10141	11298	12454	13610	15346	X	Gold
	70.0	1780	6405	7562	8718	9874	11031	12188	13344	14500	16235	X	Light Green
	87.6	2225	6850	8006	9163	10319	11476	12632	13789	14945	16680	X	White
	122.6	3115	7740	8896	10052	11209	12365	13655	14678	15835	X	X	Gold & White
	157.6	4005	8629	9786	10942	12099	13255	14412	15568	16724	X	X	Light Green & White
50(3)	0	0	8180	10200	12300	14300	16400	18400	20500	22500	25600	30700	Springs Not Used
	57.8	1468	9830	11921	14011	16102	18192	20282	22373	24464	27600	X	Pink
	105.1	2670	11031	13122	15212	17303	19393	21484	23574	25665	28800	X	Light Blue
	162.8	4135	12499	14589	16680	18770	20861	22952	25042	27133	30269	X	Pink & Light Blue
	271.4	6894	15256	17347	19438	21528	23619	25709	27800	29891	X	X	Green
	329.2	8362	16724	18815	20906	22996	25087	27177	29268	31358	X	X	Pink & Green

X indicates where the listed supply pressure is not sufficient to overcome the opposing bias spring effect.
1. The maximum design pressure for size 25 and 50 actuator is 10.3 bar.
2. Maximum thrust is 17347 N.
3. Maximum thrust is 30700 N.

Table 8. Fisher 585C Thrust (Springless Construction)

ACTUATOR SIZE	PISTON AREA	TOTAL THRUST FOR 585C(1)										MAXIMUM ALLOWABLE THRUST
		Operating Pressure, bar(3)										
		2.8	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.6	10.3	
	cm^2	Force, Newtons(2)										Newtons
25	168	4630	5780	6940	8100	9260	10400	11600	12700	14500	17300	17300
50	303	8180	10200	12300	14300	16400	18400	20500	22500	25600	30700	31400
60(3)	358	9880	12300	14800	17300	19800	22200	24700	27200	30900	36900	36900
68(3)	571	15700	19700	23600	27600	31500	35400	39400	43300	49200	X	55600(4)
80(3)	571	15700	19700	23600	27600	31500	35400	39400	43300	49200	58700	58700
100(3)	842	23200	29000	34800	40600	46400	52200	58000	63900	72600	86700	86700
130(3)	1430	39400	49300	59100	69000	78700	88500	98800	108100	X	X	111200
ACTUATOR SIZE	PISTON AREA	Operating Pressure, psig(3)										MAXIMUM ALLOWABLE THRUST
		40	50	60	70	80	90	100	110	125	150	
	Inches^2	Force, Pounds(2)										Pounds
25	26	1040	1300	1560	1820	2080	2340	2600	2860	3250	3900	3900
50	47	1840	2300	2760	3220	3680	4140	4600	5060	5750	6900	7050
60(3)	55.5	2220	2780	3330	3890	4440	5000	5550	6110	6940	8300	8300
68(3)	88.5	3540	4430	5310	6200	7080	7970	8850	9740	11100	X	12500(4)
80(3)	88.5	3540	4430	5310	6200	7080	7970	8850	9740	11100	13200	13200
100(3)	130.5	5220	6530	7830	9140	10440	11700	13100	14400	16300	19500	19500
130(3)	221.5	8860	11100	13300	15500	17700	19900	22200	24300	X	X	25000

X indicates where the listed supply pressure will exceed the maximum thrust allowable.
1. The maximum design pressure for size 25 through 100 actuators is 10.3 bar (150 psig). Size 68 and 130 actuators are limited to 9.7 and 7.8 bar (140 and 113 psig) respectively.
2. The size 25 and 50 data is for the construction without a bias spring.
3. Minimum operating pressure for sizes 60-130 actuators is 2.4 bar (35 psig).
4. The size 68 actuator with a handwheel is limited to 40000 Newtons (9000 lb) thrust.

Handwheel Specifications

Table 9. Fisher 585C Handwheel Specifications

ACTUATOR SIZE	HANDWHEEL MOUNTING	HANDWHEEL DIAMETER	TURNS PER mm TRAVEL	MAXIMUM RIM FORCE REQUIRED	HANDWHEEL OUTPUT FORCE	HANDWHEEL WEIGHT
		mm		Newtons	Newtons	kg
25	Top-Mounted	356	0.5	325	12,810	17
50		482	0.5	445	23,790	20
60(1)	Integral Side-Mounted	203	0.6	276	40000	28
60(2)		356	0.6	160	40000	30
68(1)		203	0.6	276	40000	30
68(2)		356	0.6	160	40000	33
80		432	0.4	423	50000	35
100		432	0.4	623	75600	94
130		432	0.4	623	75600	123
ACTUATOR SIZE	**HANDWHEEL MOUNTING**	**HANDWHEEL DIAMETER**	**TURNS PER INCH TRAVEL**	**MAXIMUM RIM FORCE REQUIRED**	**HANDWHEEL OUTPUT FORCE**	**HANDWHEEL WEIGHT**
		Inches		**Pounds**	**Pounds**	**Pounds**
25	Top-Mounted	14	12	73	2880	37
50		19	12	100	5350	45
60(1)	Integral Side-Mounted	8	16	62	9000	61
60(2)		14	16	36	9000	66
68(1)		8	16	62	9000	66
68(2)		14	16	36	9000	71
80		17	10	95	11250	77
100		17	10	140	17000	208
130		17	10	140	17000	272

1. 2 and 4 inch maximum travel constructions.
2. 8 inch maximum travel construction.

Table 10. Fisher 585C Dimensions—Size 25 and 50 Actuator with 3611 Pneumatic (P/P) Positioner

ACTUATOR SIZE	YOKE BOSS SIZE	E	H	C	AR(1)	F	∅Jc	L	P	T	X
mm											
25	54.0	324.4	693.7	205.2	127.0	259.6	355.6	47.8	255.8	19.1	114.3
	71.4	352.3	720.9	205.2	176.3	259.6	355.6	19.8	255.8	23.9	139.3
50	71.4	464.3	841.5	257.0	176.3	265.4	482.6	13.7	281.7	23.9	152.4
	90.5	503.4	881.1	257.0	225.6	265.4	482.6	- - -	281.7	35.1	193.5
Inches											
25	2-1/8	12.77	27.31	8.08	5.00	10.22	14.00	1.88	10.07	0.75	4.50
	2-13/16	13.87	28.38	8.08	6.94	10.22	14.00	0.78	10.07	0.94	5.50
50	2-13/16	18.28	33.13	10.12	6.94	10.45	19.00	0.54	11.09	0.94	6.00
	3-9/16	19.82	34.69	10.12	8.88	10.45	19.00	- - -	11.09	1.38	7.62

1. Actuator removal clearance

Figure 6. Fisher 585C Dimensions—Size 25 and 50 Actuator with 3611 Pneumatic (P/P) Positioner (See Table 10)

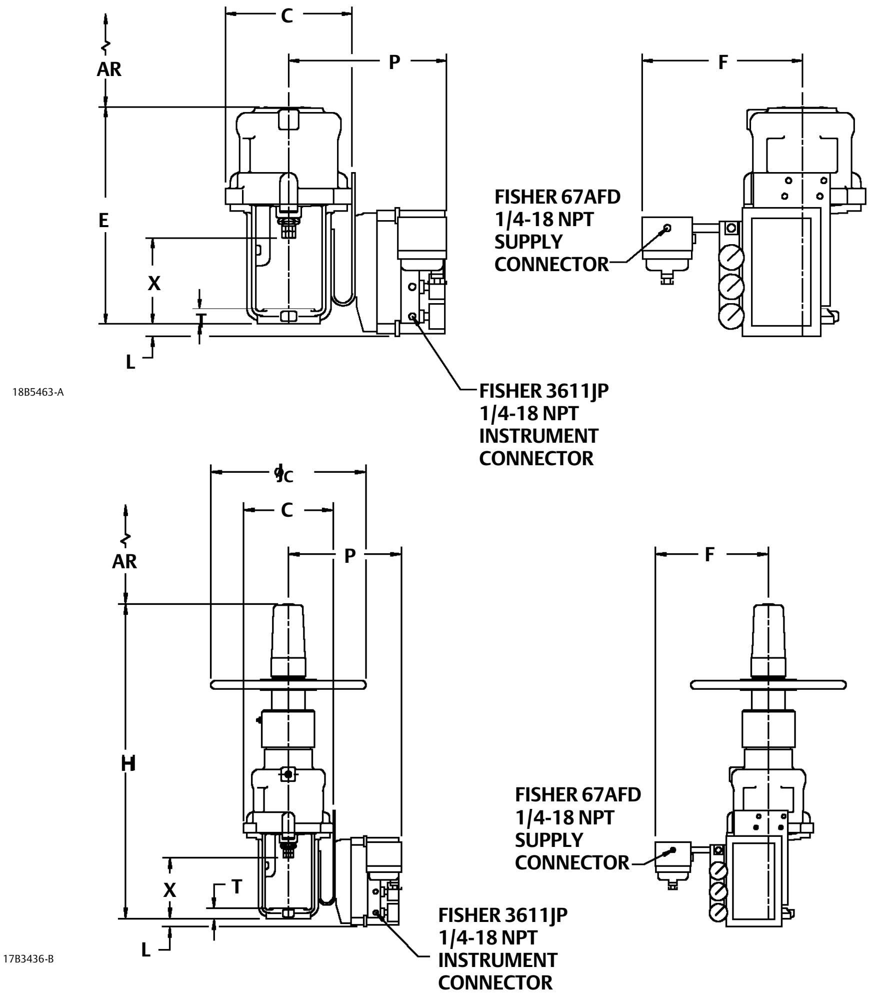


Table 11. Fisher 585C Dimensions—Size 25 and 50 Actuator with 3621 Electro-Pneumatic (I/P) Positioner

ACTUATOR SIZE	YOKE BOSS SIZE	E	H	C	AR[(1)]	F	∅Jc	L	P
mm									
25	54.0	322.1	681.0	205.2	127.0	216.7	355.6	96.0	303.5
	71.4	350.0	720.9	205.2	176.3	216.7	355.6	68.1	303.5
50	71.4	462.0	836.4	257.0	176.3	222.5	482.6	62.5	329.4
	90.5	501.1	875.6	257.0	225.6	222.5	482.6	23.4	329.4
Inches									
25	2-1/8	12.68	26.81	8.08	5.00	8.53	14.00	3.78	11.95
	2-13/16	13.78	28.38	8.08	6.94	8.53	14.00	2.68	11.95
50	2-13/16	18.19	32.93	10.12	6.94	8.76	19.00	2.46	12.97
	3-9/16	19.73	34.47	10.12	8.88	8.76	19.00	0.92	12.97

1. Actuator removal clearance

Figure 7. Fisher 585C Dimensions—Size 25 and 50 Actuator with 3621 Electro-Pneumatic (I/P) Positioner (See Table 11)

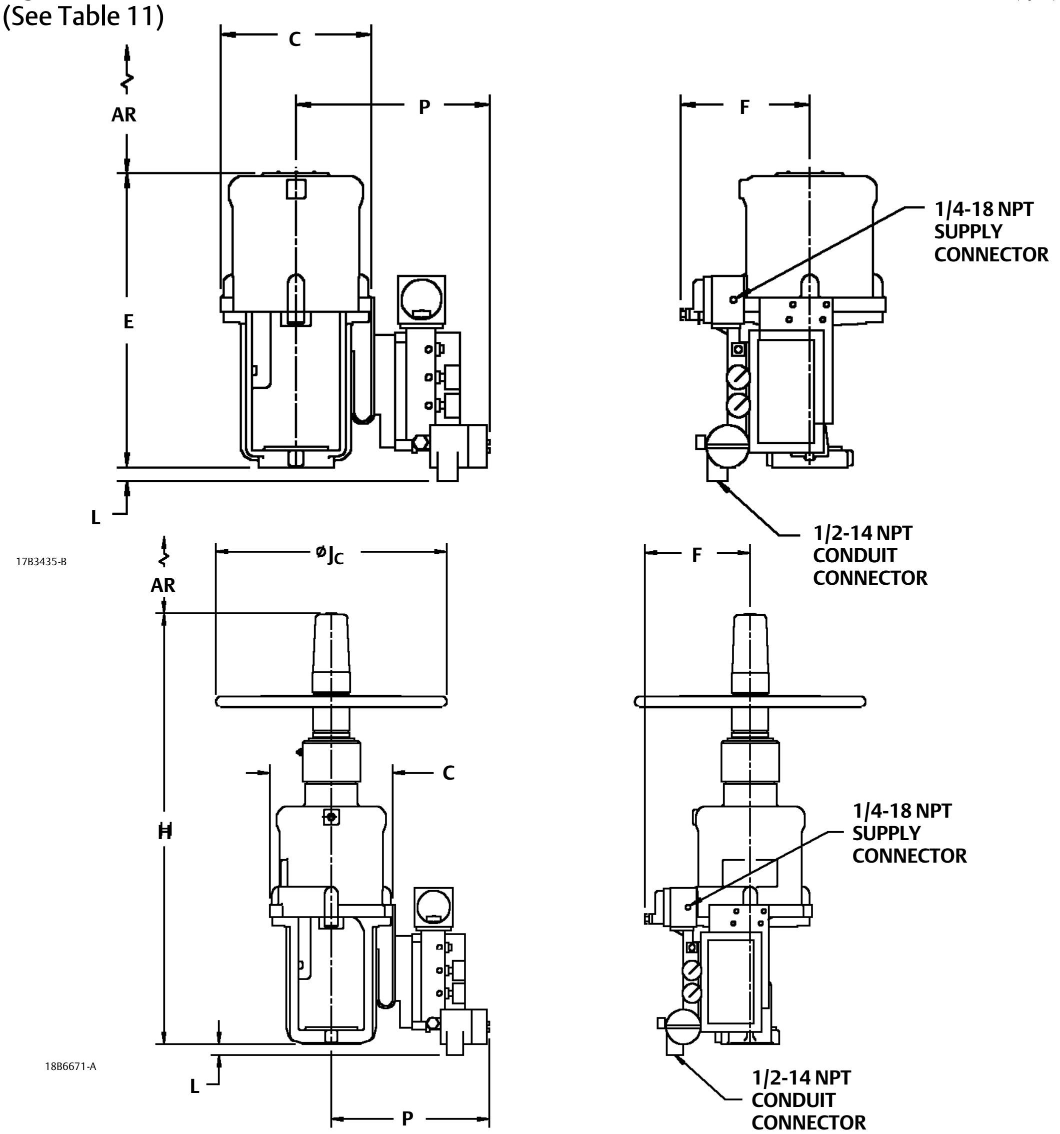
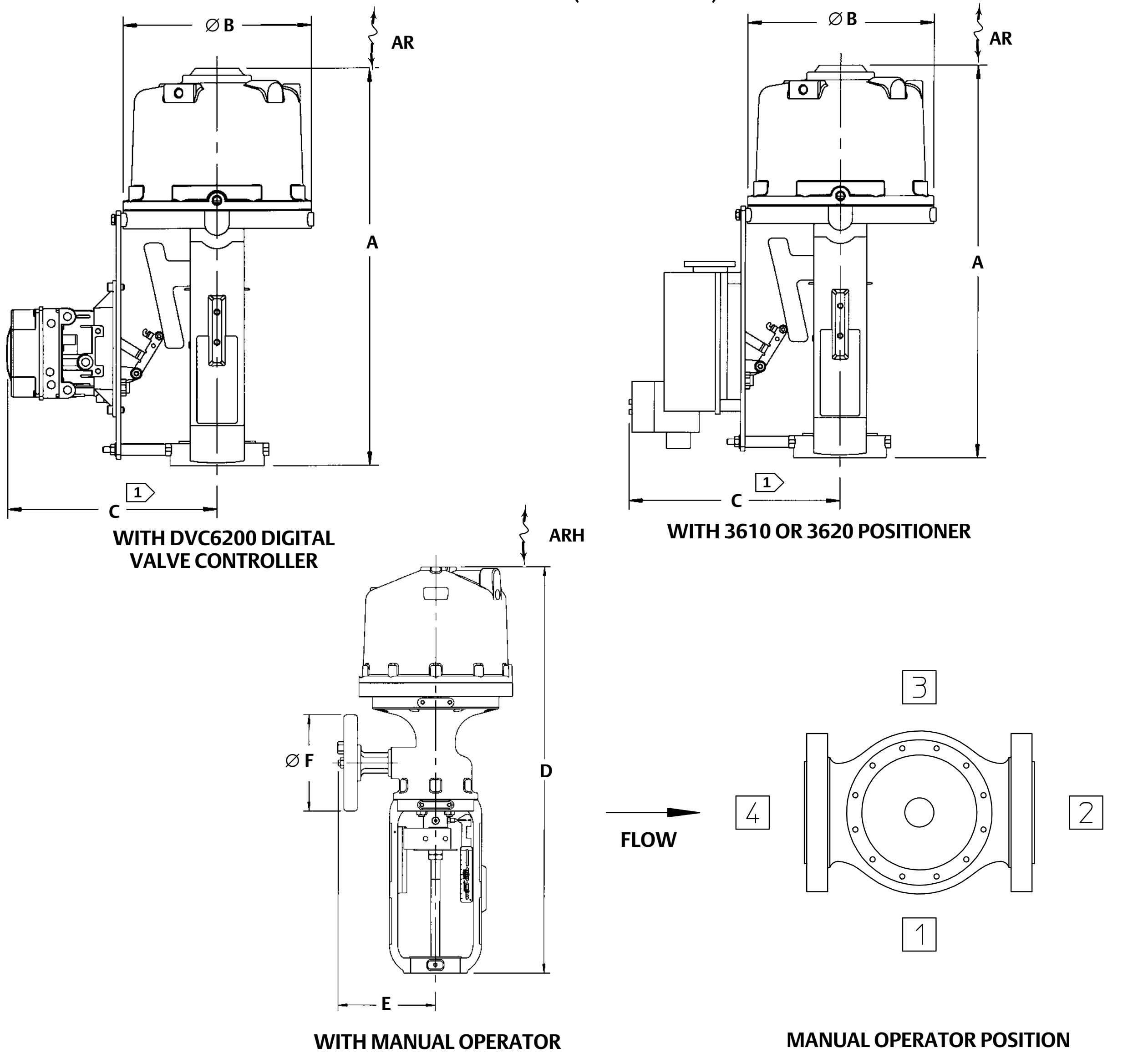


Table 12. Fisher 585C Dimensions—Size 60 to 130 Actuator

ACTUATOR		A		B DIAMETER		C(1)		AR(2)		D		E		F DIAMETER		ARH(2)	
SIZE	TRAVEL	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
60	2	462	18.2	267	10.5	305	12.0	232	9.1	734	28.9	206	8.1	203	8.0	232	9.1
	4	564	22.2	267	10.5	305	12.0	292	11.5	785	30.9	206	8.1	203	8.0	241	9.5
	8	782	30.8	267	10.5	305	12.0	279	11.0	1074	42.3	206	8.1	356	14.0	279	11.0
68	2	597	23.5	325	12.8	330	13.0	232	9.1	853	33.6	206	8.1	203	8.0	232	9.1
	4	729	28.7	325	12.8	330	13.0	292	11.5	853	33.6	206	8.1	203	8.0	241	9.5
	8	828	32.6	325	12.8	330	13.0	279	11.0	1143	45.0	206	8.1	356	14.0	279	11.0
80	4	714	28.1	325	12.8	330	13.0	321	12.6	1245	49.0	305	12	432	17.0	321	12.6
	8	965	38.0	325	12.8	330	13.0	406	16.0	1344	52.9	305	12	432	17.0	406	16.0
100	4	714	28.1	381	15.0	361	14.2	321	12.6	1245	49.0	305	12	432	17.0	321	12.6
	8	958	37.7	381	15.0	361	14.2	321	12.6	1346	53.0	305	12	432	17.0	406	16.0
130	4	833	32.8	483	19.0	411	16.2	321	12.6	1410	55.5	305	12	432	17.0	321	12.6
	8	1006	39.6	483	19.0	411	16.2	406	16.0	1725	67.9	305	12	432	17.0	406	16.0

1. The C dimension shown is for FIELDVUE DVC6200 digital valve controllers. Add 38.1 mm (1.5 inches) to this dimension for 3620JP positioners. Subtract 12.7 mm (0.5 inches) from this dimension for 3610JP positioners.
2. Actuator removal clearance.

Figure 8. Fisher 585C Dimensions—Size 60 to 130 Actuator (See Table 12)



1 The C dimension listed in the table is for the actuator with the FIELDVUE digital valve controller. Add to this dimension for 3620JP positioners. Subtract from this dimension for 3610JP positioners. Refer to the footnote in the table.

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Fisher™ 685 Piston Actuator

The 685 is a double-acting piston actuator that provides accurate, high thrust output for short to long travel applications. This actuator is designed for use with a variety of medium to large Fisher sliding-stem control valves including the easy-e™, FB, TBX, HP, EH, and 461.

The 685 family is available in several configurations to cover a wide range of application requirements. Typical travels range from 25 to 610 mm (1 to 24 inches) and cylinder diameters range from 305 to 660 mm (12 to 26 inches). Thrust capabilities extend to 354 kN (79,000 lbf) and above with special constructions.

The 685 can be used with the FIELDVUE™ DVC6200 digital valve controller for throttling applications, or with switching valves for on-off control. This actuator can also be fitted with volume boosters for fast stroking requirements.

X0922

Features

- **High Thrust Capability –** Maximum thrusts of up to 354 kN (79,000 lbf) can be produced.
- **Broad Application Coverage –** Standard constructions offer travels of up to 610 mm (24 inches) and cylinder diameters of up to 660 mm (26 inches). Even larger constructions are available upon request.
- **Low Friction –** Low friction piston seals and either chrome plated or fluoropolymer coated cylinder bores reduce sliding friction and wear.
- **Wide Temperature Range –** Standard constructions offer a temperature range of -40 to 93°C (-40 to 200°F), however higher or lower temperatures are possible. Special constructions can operate as low as -54°C (-65°F) and as high as 204°C (400°F).
- **Manual Override –** An optional side-mounted handwheel is capable of extending or retracting the actuator manually and can be engaged at any position from full open to full closed.

Table 1. Specifications

Operating Pressure(1)

Minimum: 2.7 bar (40psig)

Maximum Allowable: 10.3 bar (150 psig)

Consult your Emerson sales office or Local Business Partner for supply pressures under 2.7 bar (40 psig)

Travel(2)

25 mm (1 inch) through 610 mm (24 inch)
See table 4

Thrust Capabilities

See table 5

Piston Diameter and Area(2)

Available in 51 mm (2 inch) increments between 305 mm (12 inch) and 660 mm (26 inch)
See table 4

For additional sizes, contact your Emerson Automation Solutions sales office.

Operative Temperature Limits

Standard: -40 to 93°C (-40 to 200°F)

Low Temperature: -54 to 93°C (-65 to 200°F)(3)
High Temperature: -29 to 204°C (-20 to 400°F)(3)

Yoke Boss and Valve Stem Diameter

■ 127 mm (5H inch) yoke boss with 32 mm (1-1/4 inch) stem ■ 178 mm (7 inch) yoke boss with 51 mm (2 inch) stem

Pressure Connections

Standard: 3/4 NPT

Optional: 1 and 1-1/4 NPT
See figure 2 and table 6

Instrument Mounting

Mounting kits are available for use with the FIELDVUE DVC6200 series positioner

Construction Materials

PART	MATERIAL
Yoke	ASTM A36 (steel)
Piston	ASTM A36 (steel)
Cylinder	**305 to 559 mm (12 to 22 inch) cylinder:** 1026 DOM (steel) with chrome-plated bore **610 to 660 mm (24 to 26 inch) cylinder:** ASTM A516 Grade 70 (steel) with fluoropolymer coated bore
Upper/Lower Heads	ASTM A36 (steel)
Tie Bolt	ASTM A311 1045, Class B (steel)
Piston Rod	S31603 (316L stainless steel)
Stem Connector	ASTM A36 (steel)

Weights

See tables 11 and 12

Lifting Point Load Ratings

See table 2

Options

■ Mechanical Handwheel, ■ Pneumatic fail mode via Fisher 377 trip valve, ■ Volume Boosters, ■ Fisher Optimized Digital Valve (ODV) Package

Dimensions

See figure 3 and tables 7, 8, 9, and 10

Optional Certifications(4)

■ Pressure Equipment Directive (PED) 97/23/EC,
■ ATEX Group II Category 2 Gas and Dust

CE Ex II 2 G D ,

■ Customs Union Technical Regulations (CUTR) 010/2011 and 012/2011

EAC Ex II Gb c T* X/III Db c T* X ,
Fisher 685 actuators have been evaluated for ignition hazard and certified for CUTR 012/2011 under "protection by constructional safety." To ensure conformity with CUTR, only Fisher parts and materials can be used.
■ Safety Instrumented System, SIL 2 Capable - certified by TUV Rheinland

1. The pressure/temperature limits in this bulletin and any other applicable standard or code should not be exceeded.
2. Consult your Emerson sales office for larger travels or cylinder diameters. The Fisher 585C family of actuators can be used for smaller travels or cylinder diameters.
3. Consult your Emerson sales office for applications requiring low or high temperature requirements.
4. Refer to the product nameplates to determine which certifications each actuator construction possesses.

Principle of Operation

685 piston actuators utilize a pneumatically controlled piston that moves inside of a cylinder to generate thrust. A seal contained on the circumference of the piston provides a seal between the piston and the cylinder, preventing supply pressure leakage.

From an equilibrium state, the actuator operates by reacting to a force unbalance that is created by increasing supply pressure on one side of the piston, and decreasing it on the other. This moves the piston up or down, and results in a repositioning of the attached control valve. Travel can be adjusted using travel limits within a valve positioner, which limit the travel range of the actuator. The optional handwheel manual override does not have the ability to act as a hard travel stop.

An optional handwheel manual override is capable of extending or retracting the actuator manually and can be engaged at any position from full open to full close. This override utilizes a worm gear assembly that is attached to the stem connector and not attached to the cylinder or piston rod. This enables the manual override to reposition the control valve even if the actuator cylinder or piston is removed for maintenance.

Instrument Selection

An excellent selection of sensitive and accurate instruments is available for 685 piston actuators. These include the FIELDVUE DVC6200 digital valve controller, as well trip valves and volume boosters.

DVC6200 Digital Valve Controller

FIELDVUE DVC6200 digital valve controllers are communicating, microprocessor-based current-to-pneumatic instruments. In addition to the traditional function of converting a current signal to a pressure signal, DVC6200 digital valve controllers, using HART® or FOUNDATION™ fieldbus communications protocol, give easy access to information critical to process operation.

For additional information, refer to Fisher bulletin 62.1:DVC6200 (D103415X012) or 62.1:DVC6200f (D103399X012), available at www.Fisher.com or from your Emerson sales office or Local Business Partner.

Figure 1. Fisher 685 Piston Actuator

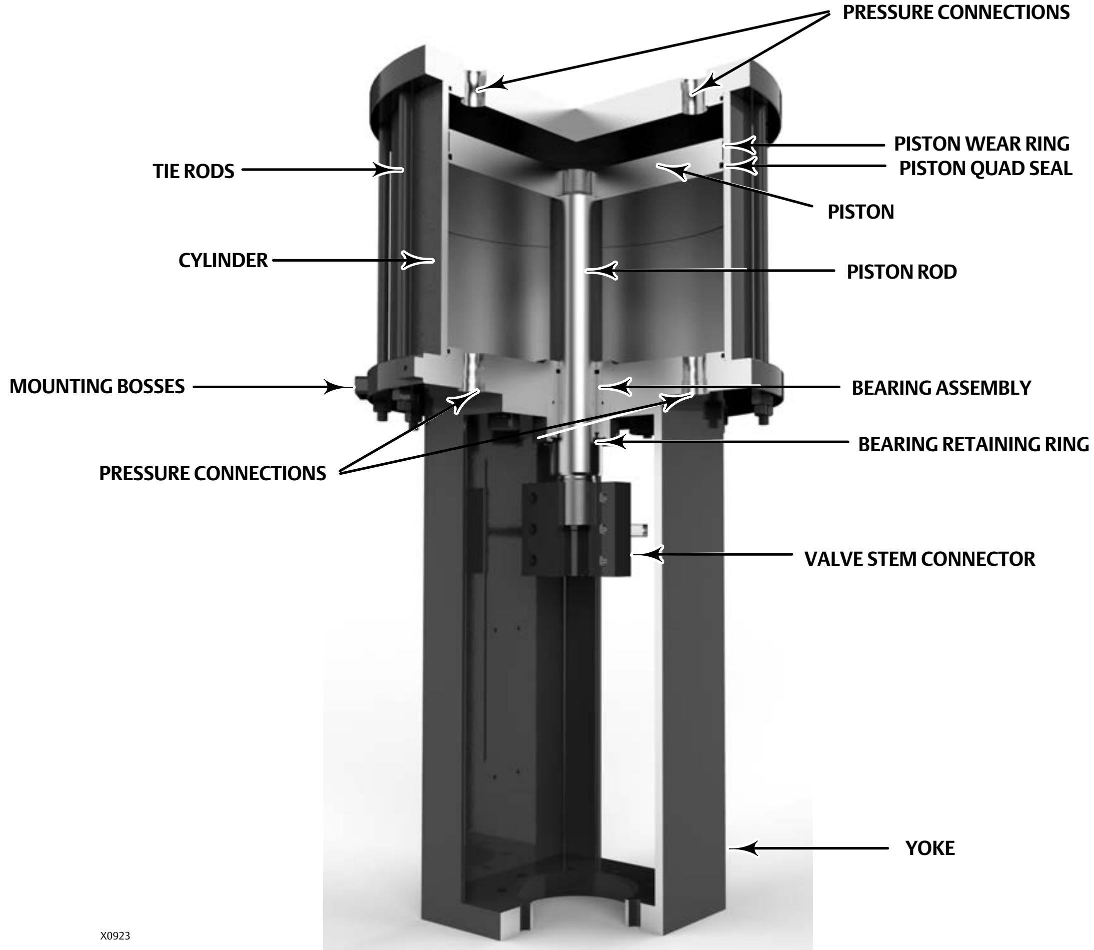

Table 2. Lifting Point Load Ratings

ACTUATOR SIZE	LIFTING ORIENTATION	NUMBER OF LIFTING POINTS USED	MAXIMUM LOAD	
			kg	lbs
12 to 24	Actuator Centerline Horizontal	2	1540	3400
26		2	2860	6300
12 to 24	Actuator Centerline Vertical	2	3760	8300
26		2	6350	14000

Table 3. Handwheel Specification

ACTUATOR SIZE	OUTPUT THRUST		HANDWHEEL DIAMETER		TURNS PER mm OF TRAVEL	TURNS PER INCH OF TRAVEL	MAXIMUM RIM FORCE REQUIRED	
	N	lbs	mm	Inch			N	lbs
12	44482	10000	305	12	3.8	96	290	65
14 to 18	88964	20000	406	16	3.0	80	380	85
20 to 26	133447	30000	610	24	2.8	72	450	100

Table 4. Standard Constructions(1)

ACTUATOR SIZE	PISTON DIAMETER	PISTON ROD AREA	PISTON AREA	VALVE STEM CONNECTOR SIZE	YOKE BOSS DIAMETER	VALVE TRAVEL	
						Minimum	Maximum
mm (cm^2 for Area)							
12	305	16	730	32 or 51	127 or 178	>203	610
14	356	32	993	32 or 51	127 or 178	>203	610
16	406	32	1297	32 or 51	127 or 178	>203	610
18	457	32	1642	32 or 51	127 or 178	>203	610
20	508	46	2027	32 or 51	127 or 178	25	610
22	559	46	2452	32 or 51	127 or 178	25	610
24	610	62	2919	32 or 51	127 or 178	25	610
26	660	62	3425	32 or 51	127 or 178	25	610
Inches ($inch^2$ for Area)							
12	12	2.41	113	1 1/4 or 2	5H or 7	>8	24
14	14	4.91	154	1 1/4 or 2	5H or 7	>8	24
16	16	4.91	201	1 1/4 or 2	5H or 7	>8	24
18	18	4.91	254	1 1/4 or 2	5H or 7	>8	24
20	20	7.07	314	1 1/4 or 2	5H or 7	1	24
22	22	7.07	380	1 1/4 or 2	5H or 7	1	24
24	24	9.62	452	1 1/4 or 2	5H or 7	1	24
26	26	9.62	531	1 1/4 or 2	5H or 7	1	24

1. Consult your Emerson sales office for additional sizes.

Table 5. Thrust

ACTUATOR SIZE	STROKE	THRUST AT SUPPLY PRESSURE, N (LBF)(1)			
		4.1 barg (60 psig)	5.5 barg (80 psig)	6.9 barg (100 psig)	10.3 barg (150 psig)(2)
12	Push	30183 (6786)	40245 (9048)	50306 (11310)	75459 (16965)
14		41083 (9236)	54777 (12315)	68472 (15394)	102707 (23091)
16		53659 (12064)	71546 (16085)	89432 (20106)	134149 (30159)
18		67913 (15268)	90550 (20358)	113188 (25447)	169782 (38170)
20		83843 (18850)	111790 (25133)	139738 (31416)	209607 (47124)
22		101450 (22808)	135266 (30411)	169083 (38013)	253625 (57020)
24		120734 (27143)	160978 (36191)	201223 (45239)	301834 (67858)
26		141694 (31856)	188926 (42474)	236157 (53093)	354236 (79639)
12	Pull	29540 (6641)	39387 (8855)	49234 (11069)	73851 (16603)
14		39773 (8942)	53030 (11922)	66288 (14903)	99432 (22354)
16		52349 (11769)	69799 (15692)	87248 (19615)	130873 (29423)
18		66602 (14974)	88803 (19965)	111004 (24956)	166506 (37434)
20		81956 (18425)	109275 (24567)	136593 (30709)	204890 (46063)
22		99563 (22384)	132751 (29845)	165938 (37306)	248907 (55959)
24		118166 (26566)	157555 (35422)	196944 (44277)	295416 (66415)
26		139127 (31279)	185503 (41705)	231878 (52131)	347817 (78196)

1. Consult your Emerson sales office for supply pressures below 40 psig.
2. Maximum available thrust.

Figure 2. Position of Pressure Connections

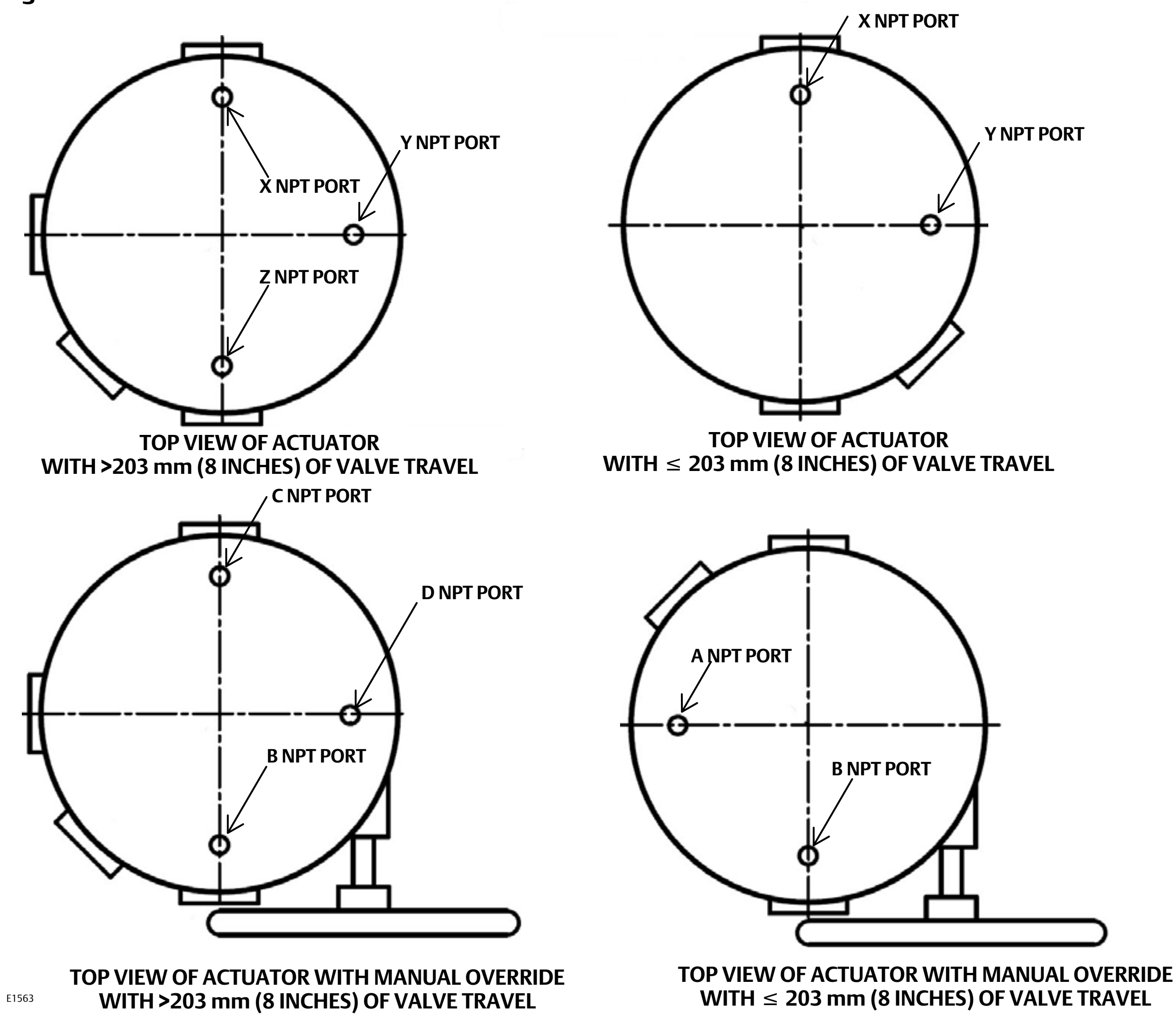

Table 6. Pressure Connections

WITH MANUAL OVERRIDE	ACTUATOR SIZE	TRAVEL		SUPPLY CONNECTION		
		mm	Inches	Size, NPT(2)	Quantity (Top/Bottom)(2)	Location(1)
No	12	>203	>8	3/4	1/1	Z
					2/2	X and Z
	14 to 26	>203	>8	3/4, 1, or 1-1/4	1/1	Z
					2/2	Y and Z
	20 to 26	≤ 203	≤ 8	3/4, 1, or 1-1/4	1/1	Y
					2/2	X and Y
Yes	12	>203	>8	3/4	1/1	B
					2/2	B and C
	14 to 26	>203	>8	3/4, 1, or 1-1/4	1/1	B
					2/2	B and D
	20 to 26	≤ 203	≤ 8	3/4, 1, or 1-1/4	1/1	A
					2/2	A and B

1. Refer to figure 2.
2. Quantity of 2 top and 2 bottom is available as standard for 3/4 NPT only.

Figure 3. Fisher Double-Acting Actuator

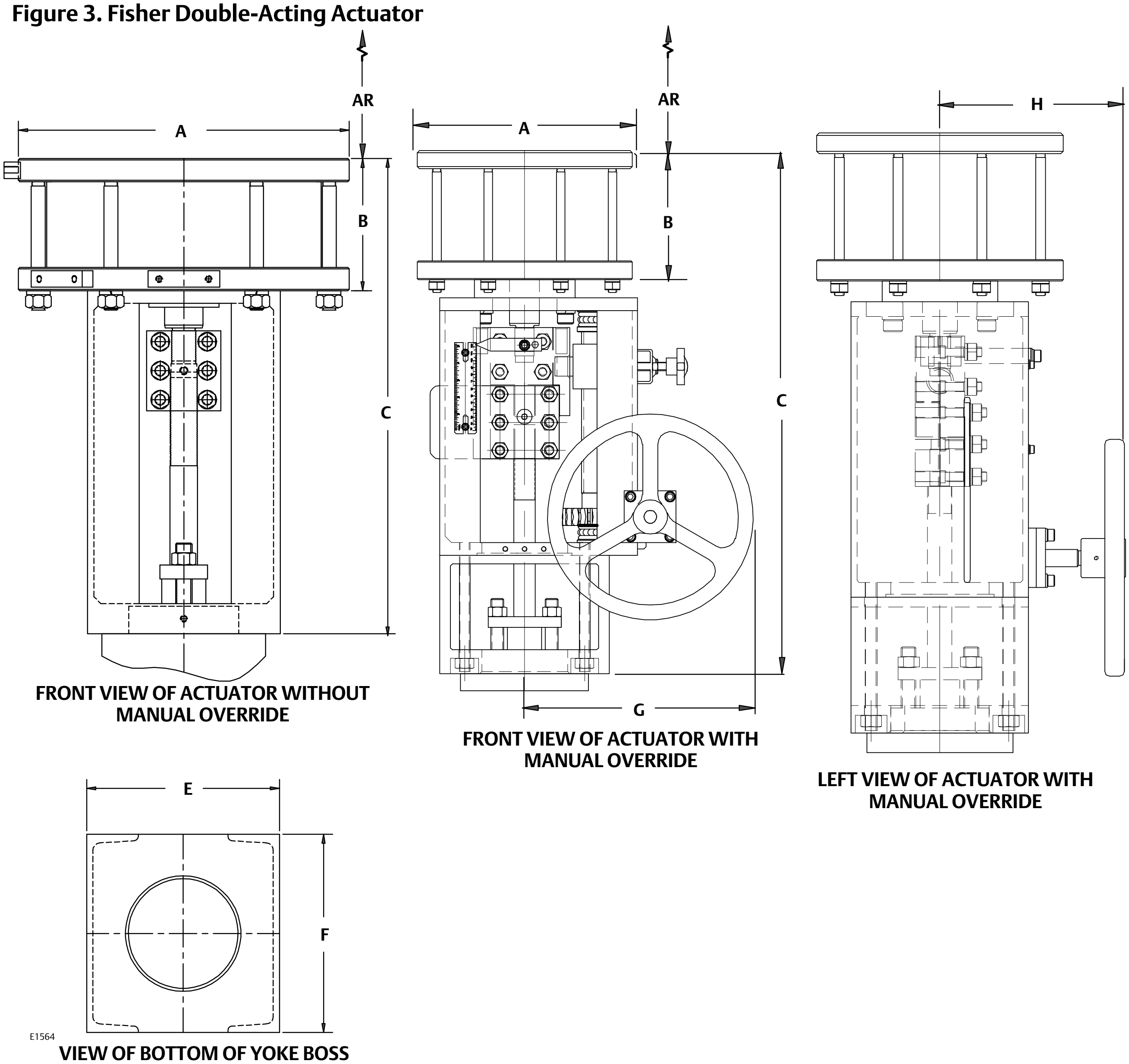

Table 7. Dimensions A, G, and H

ACTUATOR SIZE	A		G		H	
	mm	Inch	mm	Inch	mm	Inch
12	381	15.00	338	13.31	235	9.25
14	432	17.00	435	17.13	253	9.98
16	489	19.25	435	17.13	253	9.98
18	543	21.38	435	17.13	253	9.98
20	591	23.25	581	22.88	434	17.10
22	654	25.75	581	22.88	434	17.10
24	711	28.00	584	23.00	484	19.06
26	775	30.50	584	23.00	484	19.06

Table 8. Dimension B

ACTUATOR SIZE	Dimension B for Maximum Valve Travel, mm (Inch)											
	102 mm (4 inch)		203 mm (8 inch)		305 mm (12.00 inch)		406 mm (16.00 inch)		508 mm (20.00 inch)		610 mm (24.00 inch)	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
12					432	17.00	533	21.00	635	25.00	737	29.00
14					445	17.50	546	21.50	648	25.50	749	29.50
16					445	17.50	546	21.50	648	25.50	749	29.50
18					445	17.50	546	21.50	648	25.50	749	29.50
20	259	10.20	361	14.20	462	18.20	564	22.20	665	26.20	767	30.20
22	259	10.20	361	14.20	462	18.20	564	22.20	665	26.20	767	30.20
24	265	10.45	367	14.45	469	18.45	570	22.45	672	26.45	773	30.45
26	265	10.45	367	14.45	469	18.45	570	22.45	672	26.45	773	30.45

Table 9. Dimensions E and F

ACTUATOR SIZE	WITHOUT MANUAL OVERRIDE								WITH MANUAL OVERRIDE							
	E				F				E				F			
	5H Yoke Boss		7 Inch Yoke Boss		5H Yoke Boss		7 Inch Yoke Boss		5H Yoke Boss		7 Inch Yoke Boss		5H Yoke Boss		7 Inch Yoke Boss	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
12	222	8.75	267	10.50	203	8.00	229	9.00	251	9.88	279	11.00	229	9.00	229	9.00
14	229	9.00	267	10.50	203	8.00	229	9.00	238	9.38	279	11.00	305	12.00	305	12.00
16	229	9.00	267	10.50	203	8.00	229	9.00	238	9.38	279	11.00	305	12.00	305	12.00
18	229	9.00	267	10.50	203	8.00	229	9.00	238	9.38	279	11.00	305	12.00	305	12.00
20	305	12.00	305	12.00	305	12.00	305	12.00	305	12.00	305	12.00	330	13.00	330	13.00
22	305	12.00	305	12.00	305	12.00	305	12.00	305	12.00	305	12.00	330	13.00	330	13.00
24	406	16.00	406	16.00	457	18.00	457	18.00	476	18.75	476	18.75	457	18.00	457	18.00
26	406	16.00	406	16.00	457	18.00	457	18.00	476	18.75	476	18.75	457	18.00	457	18.00

Table 10. Dimensions C and AR (Actuator Removal Clearance)

ACTUATOR SIZE	MAXIMUM VALVE TRAVEL		WITHOUT MANUAL OVERRIDE								WITH MANUAL OVERRIDE							
			C				AR (Actuator Removal Clearance)				C				AR (Actuator Removal Clearance)			
			5H Yoke Boss		7 Inch Yoke Boss		5H Yoke Boss		7 Inch Yoke Boss		5H Yoke Boss		7 Inch Yoke Boss		5H Yoke Boss		7 Inch Yoke Boss	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
12	267	10.50	1078	42.44	1078	42.44	381	15.00	381	15.00	1192	46.94	1192	46.94	381	15.00	381	15.00
	279	11.00	1078	42.44	1078	42.44	318	12.50	318	12.50	1192	46.94	1230	48.44	318	12.50	356	14.00
	305	12.00	1078	42.44	1078	42.44	305	12.00	305	12.00	1218	47.94	1230	48.44	330	13.00	343	13.50
	368	14.50	1281	50.44	1281	50.44	381	15.00	381	15.00	1319	51.94	1395	54.94	305	12.00	381	15.00
	381	15.00	1281	50.44	1281	50.44	318	12.50	318	12.50	1319	51.94	1434	56.44	241	9.50	356	14.00
	406	16.00	1281	50.44	1281	50.44	305	12.00	305	12.00	1421	55.94	1434	56.44	330	13.00	343	13.50
	470	18.50	1484	58.44	1484	58.44	381	15.00	381	15.00	1599	62.94	1599	62.94	381	15.00	381	15.00
	483	19.00	1484	58.44	1484	58.44	318	12.50	318	12.50	1599	62.94	1637	64.44	318	12.50	356	14.00
	508	20.00	1484	58.44	1484	58.44	305	12.00	305	12.00	1624	63.94	1637	64.44	330	13.00	343	13.50
	572	22.50	1688	66.44	1688	66.44	381	15.00	381	15.00	1802	70.94	1802	70.94	381	15.00	381	15.00
	584	23.00	1688	66.44	1688	66.44	318	12.50	318	12.50	1802	70.94	1840	72.44	318	12.50	356	14.00
	610	24.00	1688	66.44	1688	66.44	305	12.00	305	12.00	1827	71.94	1840	72.44	330	13.00	343	13.50
14, 16, and 18	267	10.50	1124	44.25	1124	44.25	381	15.00	381	15.00	1294	50.94	1294	50.94	381	15.00	381	15.00
	279	11.00	1124	44.25	1124	44.25	318	12.50	318	12.50	1294	50.94	1332	52.44	318	12.50	356	14.00
	305	12.00	1124	44.25	1124	44.25	305	12.00	305	12.00	1319	51.94	1332	52.44	330	13.00	343	13.50
	368	14.50	1327	52.25	1327	52.25	381	15.00	381	15.00	1421	55.94	1497	58.94	305	12.00	381	15.00
	381	15.00	1327	52.25	1327	52.25	318	12.50	318	12.50	1421	55.94	1535	60.44	241	9.50	356	14.00
	406	16.00	1327	52.25	1327	52.25	305	12.00	305	12.00	1522	59.94	1535	60.44	330	13.00	343	13.50
	470	18.50	1530	60.25	1530	60.25	381	15.00	381	15.00	1700	66.94	1700	66.94	381	15.00	381	15.00
	483	19.00	1530	60.25	1530	60.25	318	12.50	318	12.50	1700	66.94	1738	68.44	318	12.50	356	14.00
	508	20.00	1530	60.25	1530	60.25	305	12.00	305	12.00	1726	67.94	1738	68.44	330	13.00	343	13.50
	572	22.50	1734	68.25	1734	68.25	381	15.00	381	15.00	1903	74.94	1903	74.94	381	15.00	381	15.00
	584	23.00	1734	68.25	1734	68.25	318	12.50	318	12.50	1903	74.94	1942	76.44	318	12.50	356	14.00
	610	24.00	1734	68.25	1734	68.25	305	12.00	305	12.00	1929	75.94	1942	76.44	330	13.00	343	13.50
20 and 22	102	4.00	754	29.69	786	30.94	334	13.13	365	14.38	937	36.88	949	37.38	381	15.00	394	15.50
	152	6.00	941	37.06	967	38.06	343	13.50	368	14.50	1140	44.88	1102	43.38	406	16.00	368	14.50
	203	8.00	941	37.06	1018	40.06	292	11.50	368	14.50	1140	44.88	1153	45.38	356	14.00	368	14.50
	267	10.50	1183	46.56	1183	46.56	381	15.00	381	15.00	1318	51.88	1318	51.88	381	15.00	381	15.00
	279	11.00	1183	46.56	1183	46.56	318	12.50	318	12.50	1318	51.88	1356	53.38	318	12.50	356	14.00
	305	12.00	1183	46.56	1183	46.56	305	12.00	305	12.00	1343	52.88	1356	53.38	330	13.00	343	13.50
	368	14.50	1386	54.56	1386	54.56	381	15.00	381	15.00	1445	56.88	1521	59.88	305	12.00	381	15.00
	381	15.00	1386	54.56	1386	54.56	318	12.50	318	12.50	1445	56.88	1559	61.38	241	9.50	356	14.00
	406	16.00	1386	54.56	1386	54.56	305	12.00	305	12.00	1546	60.88	1559	61.38	330	13.00	343	13.50
	470	18.50	1589	62.56	1589	62.56	381	15.00	381	15.00	1724	67.88	1724	67.88	381	15.00	381	15.00
	483	19.00	1589	62.56	1589	62.56	318	12.50	318	12.50	1724	67.88	1762	69.38	318	12.50	356	14.00
	508	20.00	1589	62.56	1589	62.56	305	12.00	305	12.00	1750	68.88	1762	69.38	330	13.00	343	13.50
	572	22.50	1792	70.56	1792	70.56	381	15.00	381	15.00	1927	75.88	1927	75.88	381	15.00	381	15.00
	584	23.00	1792	70.56	1792	70.56	318	12.50	318	12.50	1927	75.88	1965	77.38	318	12.50	356	14.00
	610	24.00	1792	70.56	1792	70.56	305	12.00	305	12.00	1953	76.88	1965	77.38	330	13.00	343	13.50

-continued-

Table 10. Dimensions C and AR (Actuator Removal Clearance) (continued)

ACTUATOR SIZE	MAXIMUM VALVE TRAVEL		WITHOUT MANUAL OVERRIDE								WITH MANUAL OVERRIDE							
			C				AR (Actuator Removal Clearance)				C				AR (Actuator Removal Clearance)			
			5H Yoke Boss		7 Inch Yoke Boss		5H Yoke Boss		7 Inch Yoke Boss		5H Yoke Boss		7 Inch Yoke Boss		5H Yoke Boss		7 Inch Yoke Boss	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
24 and 26	102	4.00	794	31.26	826	32.51	334	13.13	365	14.38	1000	39.38	1013	39.88	381	15.00	394	15.50
	152	6.00	981	38.63	1007	39.63	343	13.50	368	14.50	1203	47.38	1165	45.88	406	16.00	368	14.50
	203	8.00	981	38.63	1057	41.63	292	11.50	368	14.50	1203	47.38	1216	47.88	356	14.00	368	14.50
	267	10.50	1223	48.13	1223	48.13	381	15.00	381	15.00	1381	54.38	1381	54.38	381	15.00	381	15.00
	279	11.00	1223	48.13	1223	48.13	318	12.50	318	12.50	1381	54.38	1419	55.88	318	12.50	356	14.00
	305	12.00	1223	48.13	1223	48.13	305	12.00	305	12.00	1407	55.38	1419	55.88	330	13.00	343	13.50
	368	14.50	1426	56.13	1426	56.13	381	15.00	381	15.00	1508	59.38	1584	62.38	305	12.00	381	15.00
	381	15.00	1426	56.13	1426	56.13	318	12.50	318	12.50	1508	59.38	1623	63.88	241	9.50	356	14.00
	406	16.00	1426	56.13	1426	56.13	305	12.00	305	12.00	1610	63.38	1623	63.88	330	13.00	343	13.50
	470	18.50	1629	64.13	1629	64.13	381	15.00	381	15.00	1788	70.38	1788	70.38	381	15.00	381	15.00
	483	19.00	1629	64.13	1629	64.13	318	12.50	318	12.50	1788	70.38	1826	71.88	318	12.50	356	14.00
	508	20.00	1629	64.13	1629	64.13	305	12.00	305	12.00	1813	71.38	1826	71.88	330	13.00	343	13.50
	572	22.50	1832	72.13	1832	72.13	381	15.00	381	15.00	1991	78.38	1991	78.38	381	15.00	381	15.00
	584	23.00	1832	72.13	1832	72.13	318	12.50	318	12.50	1991	78.38	2029	79.88	318	12.50	356	14.00
	610	24.00	1832	72.13	1832	72.13	305	12.00	305	12.00	2016	79.38	2029	79.88	330	13.00	343	13.50

Table 11. Approximate Weights for Constructions without Handwheels

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)							
mm (inches)	12	14	16	18	20	22	24	26
102 (4.00)					402 (886)	475 (1048)	662 (1459)	761 (1677)
203 (8.00)					430 (947)	505 (1114)	702 (1548)	804 (1771)
305 (12.00)	157 (346)	245 (541)	292 (643)	337 (742)	457 (1008)	535 (1180)	743 (1637)	847 (1866)
406 (16.00)	168 (370)	262 (577)	311 (686)	358 (789)	485 (1069)	565 (1246)	783 (1726)	889 (1961)
508 (20.00)	179 (395)	278 (614)	331 (729)	379 (836)	512 (1129)	595 (1311)	823 (1815)	932 (2056)
610 (24.00)	190 (420)	295 (650)	350 (773)	401 (883)	540 (1190)	625 (1377)	864 (1904)	975 (2150)

Table 12. Approximate Weights for Constructions with Handwheels

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)							
mm (inches)	12	14	16	18	20	22	24	26
102 (4.00)					591 (1304)	664 (1463)	834 (1838)	925 (2038)
203 (8.00)					622 (1372)	696 (1535)	873 (1924)	965 (2128)
305 (12.00)	226 (499)	363 (800)	292 (643)	454 (1000)	653 (1440)	729 (1607)	912 (2010)	1006 (2218)
406 (16.00)	239 (527)	380 (838)	311 (686)	474 (1046)	684 (1508)	762 (1679)	951 (2096)	1047 (2308)
508 (20.00)	252 (555)	397 (876)	331 (729)	495 (1092)	715 (1576)	794 (1751)	990 (2182)	1088 (2398)
610 (24.00)	264 (583)	415 (914)	350 (773)	516 (1138)	746 (1644)	827 (1823)	1029 (2268)	1129 (2488)

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Fisher™ 685SE and 685SR Piston Actuators

The 685SE and 685SR are medium to large spring-return, double-acting piston actuators that provide accurate, high thrust output for short to long travel applications. These actuators are designed for use with a variety of medium to large Fisher sliding-stem control valves including the easy-e™, FB, TBX,CVX, HP, EH, and 461.

These actuators feature an internal bias spring that forces the actuator piston rod to extend (685SE) or retract (685SR) upon a loss of supply pressure, thereby ensuring a fail-closed or fail-open mode of operation. This effectively eliminates the need for a trip valve and volume tank in most constructions.

Several configurations are available to cover a wide range of application requirements. Typical travels range from 25 to 610 mm (1 to 24 inches) and cylinder diameters range from 254 to 711 mm (10 to 28 inches).

The 685SE and 685SR can be used with the FIELDVUE™ DVC6200 digital valve controller for throttling applications, or with switching valves for on-off control. This actuator can also be fitted with volume boosters for fast stroking requirements.

X0993

Features

- **High Thrust Capability –** Maximum thrusts of up to 354 kN (79,000 lbf) can be produced, when supply pressure is available.
- **Broad Application Coverage –** Standard constructions offer travels of up to 610 mm (24 inches) and cylinder diameters of up to 711 mm (28 inches). Even larger constructions are available upon request.
- **Low Friction –** Low friction piston seals and either chrome plated or fluoropolymer coated cylinder bores reduce sliding friction and wear.
- **Double Acting Construction –** Pressure on both sides of the piston results in stiff, precise positioning.
- **Wide Temperature Range –** Standard constructions offer a temperature range of -40 to 93°C (-40 to 200°F), however higher or lower temperatures are possible. Special constructions can operate as low as -54°C (-65°F) and as high as 204°C (400°F).
- **Mechanical Fail Mode –** Depending on construction, an internal bias spring will force the piston rod to retract or extend upon a loss of supply pressure.
- **Manual Override –** An optional side-mounted handwheel or hydraulic hand-pump is capable of extending or retracting the actuator manually and can be engaged at any position from full open to full closed.

Table 1. Specifications

Operating Pressure(1)

Minimum: 2.7 bar (40psig)

Maximum Allowable: 10.3 bar (150 psig)

Consult your Emerson sales office or Local Business Partnerfor supply pressures under 2.7 bar (40 psig)

Travel(2)

25 mm (1 inch) through 610 mm (24 inch)
See table 2

Thrust Capabilities

Designed to meet the application requirements

Piston Diameter and Area(2)

Available in 51 mm (2 inch) increments between 254 mm (10 inch) and 711 mm (28 inch)
See table 2

For additional sizes, contact your Emerson Automation Solutions sales office.

Operative Temperature Limits

Standard: -40 to 93°C (-40 to 200°F)

Low Temperature: -54 to 93°C (-65 to 200°F)(3)
High Temperature: -32 to 204°C (-25 to 400°F)(3)

Yoke Boss and Valve Stem Diameter

■ 90.5 mm (3-9/16 inch) yoke boss with 19.1 mm (3/4 inch) stem ■ 127 mm (5 inch) yoke boss with 25.4 mm (1 inch) stem ■ 127 mm (5 inch) yoke boss with 31.8 mm (1-1/4 inch) stem ■ 127 mm (5H inch) yoke boss with 32 mm (1-1/4 inch) stem ■ 178 mm (7 inch) yoke boss with 51 mm (2 inch) stem

Pressure Connections

See table 3

Instrument Mounting

Mounting kits are available for use with the FIELDVUE DVC6200 series digital valve controller

Manual Override (optional)

Size 10 to 26: Handwheel

Size 28: Hydraulic Hand-pump(4)

Construction Materials

PART	MATERIAL
Yoke	ASTM A36 (steel)
Piston	ASTM A36 (steel)
Cylinder	**254 to 559 mm (10 to 22 inch) cylinder:** 1026 DOM (steel) with chrome-plated bore **610 to 711 mm (24 to 28 inch) cylinder:** ASTM A516 Grade 70 (steel) with fluoropolymer coated bore
Upper/Lower Heads	ASTM A36 (steel)
Outer Spring Cartridge	ASTM A36 (steel)
Tie Bolt	ASTM A311 1045, Class B (steel)
Piston Rod	S31603 (316L SST)
Stem Connector	ASTM A36 (steel)

Weights

See tables 9 and 10

Lifting Point Load Ratings

See table 11

Options

■ Manual Override, ■ Volume Boosters,
■ Fisher Optimized Digital Valve (ODV) Package

Dimensions

See figures 2 and 3 and tables 4 and 5

Optional Certifications(5)

■ Pressure Equipment Directive (PED) 97/23/EC,
■ ATEX Group II Category 2 Gas and Dust

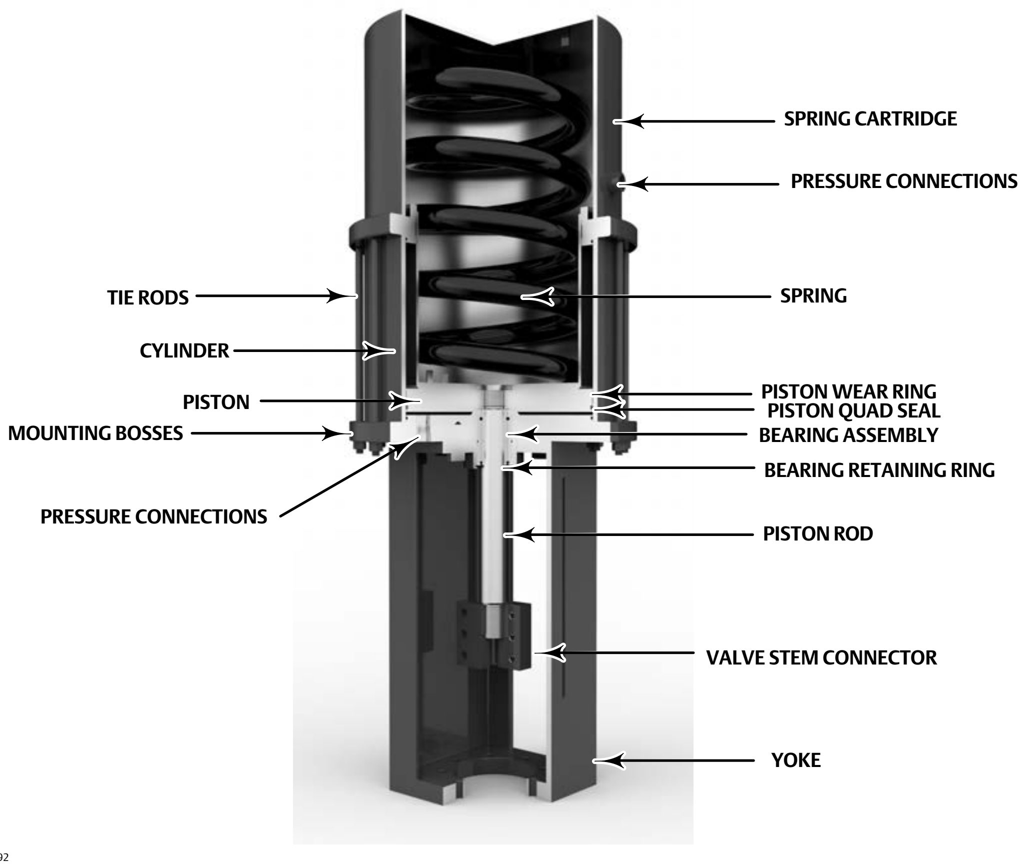
CE Ex II 2 G D ,

■ Customs Union Technical Regulations (CUTR) 010/2011 and 012/2011

EAC Ex II Gb c T* X/III Db c T* X ,
Fisher 685SE and 685SR actuators have been evaluated for ignition hazard and certified for CUTR 012/2011 under “protection by constructional safety.” To ensure conformity with CUTR, only Fisher parts and materials can be used.
■ Safety Instrumented System, SIL 2 Capable - certified by TUV Rheinland

1. The pressure/temperature limits in this bulletin and any other applicable standard or code should not be exceeded.
2. Consult your Emerson sales office for larger travels or cylinder diameters. The Fisher 657, 667, and 585C family can be used for smaller travels or cylinder diameters.
3. Consult your Emerson sales office for applications requiring low or high temperature requirements.
4. Consult your Emerson sales office for applications requiring a manual override on a size 28 actuator.
5. Refer to the product nameplates to determine which certifications each actuator construction possesses.

Figure 1. Fisher 685SE Piston Actuator



Principle of Operation

685SE and 685SR piston actuators utilize a piston that moves inside of a cylinder to generate thrust. A seal contained on the circumference of the piston provides a seal between the piston and the cylinder, preventing supply pressure leakage. A bias spring that is either below or above the piston, depending on construction, will retract or extend the piston rod upon a loss of supply pressure. This fail action will result in forcing an attached control valve to either fail-open or fail-closed.

From an equilibrium state, the actuator operates by reacting to a force unbalance that is created by increasing supply pressure on one side of the piston, and decreasing it on the other. This moves the piston up or down, and results in a repositioning of the attached control valve. Travel can be adjusted using travel limits within a valve positioner, which limit the travel range of the actuator. The optional handwheel manual override does not have the ability to act as a hard travel stop.

An optional handwheel or hydraulic hand-pump manual override is capable of extending or retracting the actuator manually and can be engaged at any position from full open to full close. This handwheel override utilizes a worm gear assembly that is attached to the stem connector and not attached to the cylinder or piston rod. This enables the handwheel override function to reposition the control valve even if the actuator cylinder or piston is removed for maintenance. The hydraulic hand-pump override utilizes a hydraulic cylinder that is connected to the piston rod, which is controlled by a manual hand-pump.

Instrument Selection

An excellent selection of sensitive and accurate instruments is available for 685SE and 685SR spring-return piston actuators. These include the FIELDVUE DVC6200 digital valve controller, as well as volume boosters.

DVC6200 Digital Valve Controller

FIELDVUE DVC6200 digital valve controllers are communicating, microprocessor-based current-to-pneumatic instruments. In addition to the traditional function of converting a current signal to a pressure signal, DVC6200 digital valve controllers, using HART® or FOUNDATION™ fieldbus communications protocol, give easy access to information critical to process operation.

For additional information, refer to Fisher bulletin 62.1:DVC6200 (D103415X012) or 62.1:DVC6200f (D103399X012), available at www.Fisher.com or from your Emerson sales office or Local Business Partner.

Table 2. Standard Constructions[1]

ACTUATOR SIZE	PISTON DIAMETER		PISTON ROD		PISTON AREA		VALVE STEM CONNECTOR SIZE		YOKE BOSS DIAMETER		VALVE TRAVEL Minimum		VALVE TRAVEL Maximum	
	mm	Inch	mm	Inch	cm^2	$Inch^2$	mm	Inch	mm	Inch	mm	Inch	mm	Inch
10	254	10	16	2.41	507	79	19	3/4	90	3-9/16	25	1	203	8
							25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24
12	305	12	16	2.41	730	113	19	3/4	90	3-9/16	25	1	154	6
							25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24
14	356	14	32	4.91	993	154	25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24
16	406	16	32	4.91	1297	201	25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24
18	457	18	32	4.91	1642	254	25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24
20	508	20	46	7.07	2027	314	25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24
22	559	22	46	7.07	2452	380	25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24
24	610	24	62	9.62	2919	452	25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24
26	660	26	62	9.62	3425	531	25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24
28	711	28	62	9.62	3973	616	25	1	127	5	25	1	203	8
							32 or 51	1-1/4 or 2	127 or 178	5H or 7	25	1	610	24

1. Consult your Emerson sales office for additional sizes.

Table 3. Pressure Connections

ACTUATOR SIZE	SUPPLY CONNECTION	
	Size, NPT	Quantity (Top/Bottom)
10	3/8	1/1
		2/2 (standard)
12	3/4	1/1
		2/2 (standard)
14 to 28	3/4 (standard), 1, or 1-1/4	1/1
		2/2 (standard for 3/4 NPT only)

Table 4. Dimensions A, G, H, and L

ACTUATOR		A		G		H		L	
Type	Size	mm	Inch	mm	Inch	mm	Inch	mm	Inch
685SE	10	318	12.50	338	13.31	235	9.25	394	15.50
	12	381	15.00	338	13.31	235	9.25	457	18.00
	14	432	17.00	435	17.13	253	9.98	508	20.00
	16	489	19.25	435	17.13	253	9.98	559	22.00
	18	543	21.38	435	17.13	253	9.98	610	24.00
	20	591	23.25	581	22.88	434	17.10	660	26.00
	22	654	25.75	581	22.88	434	17.10	711	28.00
	24	711	28.00	584	23.00	484	19.06	762	30.00
	26	775	30.50	584	23.00	484	19.06	845	33.25
	28	826	32.50	(1)	(1)	(1)	(1)	895	35.25
685SR	10	318	12.50	338	13.31	235	9.25	Not Applicable	
	12	381	15.00	338	13.31	235	9.25		
	14	432	17.00	435	17.13	253	9.98		
	16	489	19.25	435	17.13	253	9.98		
	18	543	21.38	435	17.13	253	9.98		
	20	591	23.25	581	22.88	434	17.10		
	22	654	25.75	581	22.88	434	17.10		
	24	711	28.00	584	23.00	484	19.06		
	26	775	30.50	584	23.00	484	19.06		
	28	826	32.50	(1)	(1)	(1)	(1)		

1. Consult your Emerson sales office.

Table 5. Dimensions E and F

ACTUATOR SIZE	WITHOUT MANUAL OVERRIDE								WITH MANUAL OVERRIDE							
	E				F				E				F			
	5H or 3-9/16 Inch Yoke Boss		7 Inch Yoke Boss		5H or 3-9/16 Inch Yoke Boss		7 Inch Yoke Boss		5H or 3-9/16 Inch Yoke Boss		7 Inch Yoke Boss		5H or 3-9/16 Inch Yoke Boss		7 Inch Yoke Boss	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
10	222	8.75	267	10.50	203	8.00	229	9.00	251	9.88	279	11.00	229	9.00	229	9.00
12	222	8.75	267	10.50	203	8.00	229	9.00	251	9.88	279	11.00	229	9.00	229	9.00
14	229	9.00	267	10.50	203	8.00	229	9.00	238	9.38	279	11.00	305	12.00	305	12.00
16	229	9.00	267	10.50	203	8.00	229	9.00	238	9.38	279	11.00	305	12.00	305	12.00
18	229	9.00	267	10.50	203	8.00	229	9.00	238	9.38	279	11.00	305	12.00	305	12.00
20	305	12.00	305	12.00	305	12.00	305	12.00	305	12.00	305	12.00	330	13.00	330	13.00
22	305	12.00	305	12.00	305	12.00	305	12.00	305	12.00	305	12.00	330	13.00	330	13.00
24	406	16.00	406	16.00	457	18.00	457	18.00	476	18.75	476	18.75	457	18.00	457	18.00
26	406	16.00	406	16.00	457	18.00	457	18.00	476	18.75	476	18.75	457	18.00	457	18.00
28	457	18.00	457	18.00	457	18.00	457	18.00	476	18.75	476	18.75	457	18.00	457	18.00

Table 6. Dimensions B and C

ACTUATOR SIZE	MAXIMUM VALVE TRAVEL		MAXIMUM B		C (WITHOUT MANUAL OVERRIDE)						C (WITH MANUAL OVERRIDE)					
					3-9/16 Inch Yoke Boss		5/5H Inch Yoke Boss		7 Inch Yoke Boss		3-9/16 Inch Yoke Boss		5/5H Inch Yoke Boss		7 Inch Yoke Boss	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
10, 12	25	1	457	18.00	808	31.82	878	34.57	910	35.82	992	39.06	992	39.06	1024	40.31
	51	2	559	22.00	935	36.82	980	38.57	1011	39.82	1094	43.06	1094	43.06	1125	44.31
	76	3	584	23.00	986	38.82	1005	39.57	1037	40.82	1167	45.93	1167	45.93	1179	46.43
	102	4	705	27.75	1118	44.00	1126	44.32	1157	45.57	1287	50.68	1287	50.68	1300	51.18
	127	5	737	29.00	1243	48.94	1243	48.94	1268	49.94	1357	53.43	1421	55.93	1383	54.43
	140	5.5	800	31.50	1307	51.44	1307	51.44	1332	52.44	1421	55.93	1484	58.43	1446	56.93
	152	6	813	32.00	1319	51.94	1319	51.94	1345	52.94	1497	58.93	1497	58.93	1459	57.43
	178	7	838	33.00	1345	52.94	1345	52.94	1421	55.94	1522	59.93	1522	59.93	1535	60.43
	203	8	1092	43.00	1599	62.94	1599	62.94	1675	65.94	1776	69.93	1776	69.93	1789	70.43
	229	9	1118	44.00			1764	69.44	1764	69.44			1878	73.93	1878	73.93
	254	10	1143	45.00			1789	70.44	1789	70.44			1903	74.93	1903	74.93
	267	10.5	1156	45.50			1802	70.94	1802	70.94			1916	75.43	1916	75.43
	279	11	1168	46.00			1815	71.44	1815	71.44			1929	75.93	1967	77.43
	305	12	1346	53.00			1992	78.44	1992	78.44			2132	83.93	2145	84.43
	610	24	(1)	(1)			(1)	(1)	(1)	(1)			(1)	(1)	(1)	(1)
14	25	1	521	20.50			968	38.13	1000	39.38			1129	44.44	1160	45.69
	51	2	597	23.50			1045	41.13	1076	42.38			1205	47.44	1237	48.69
	76	3	622	24.50			1070	42.13	1102	43.38			1278	50.31	1291	50.81
	102	4	673	26.50			1121	44.13	1153	45.38			1329	52.31	1341	52.81
	127	5	749	29.50			1283	50.50	1308	51.50			1507	59.31	1468	57.81
	140	5.5	787	31.00			1321	52.00	1346	53.00			1545	60.81	1507	59.31
	152	6	800	31.50			1334	52.50	1359	53.50			1557	61.31	1519	59.81
	178	7	883	34.75			1416	55.75	1492	58.75			1640	64.56	1653	65.06
	203	8	978	38.50			1511	59.50	1588	62.50			1735	68.31	1748	68.81
	229	9	1003	39.50			1676	66.00	1676	66.00			1837	72.31	1837	72.31
	254	10	1035	40.75			1708	67.25	1708	67.25			1869	73.56	1869	73.56
	267	10.5	1124	44.25			1797	70.75	1797	70.75			1957	77.06	1957	77.06
	279	11	1137	44.75			1810	71.25	1810	71.25			1970	77.56	2008	79.06
	305	12	1162	45.75			1835	72.25	1835	72.25			2021	79.56	2034	80.06
	610	24	(1)	(1)			(1)	(1)	(1)	(1)			(1)	(1)	(1)	(1)
16	25	1	521	20.50			968	38.13	1000	39.38			1129	44.44	1160	45.69
	51	2	597	23.50			1045	41.13	1076	41.63			1205	47.44	1237	48.69
	76	3	673	26.50			1121	44.13	1153	44.63			1329	52.31	1341	52.91
	102	4	699	27.50			1146	45.13	1178	47.38			1354	53.31	1367	53.81
	127	5	730	28.75			1264	49.75	1289	51.75			1488	58.56	1449	57.06
	140	5.5	819	32.25			1353	53.25	1378	54.25			1576	62.06	1538	60.56
	152	6	832	32.75			1365	53.75	1391	54.75			1589	62.56	1551	61.06
	178	7	933	36.75			1467	57.75	1543	59.75			1691	65.56	1703	67.06
	203	8	1035	40.75			1568	61.75	1645	62.75			1792	68.56	1805	71.06
	229	9	1060	41.75			1734	68.25	1734	69.25			1894	75.56	1894	74.56
	254	10	1086	42.75			1759	69.25	1759	70.25			1919	76.56	1919	75.56
	267	10.5	1200	47.25			1873	73.75	1873	70.75			2034	77.06	2034	80.06
	279	11	1213	47.75			1886	74.25	1886	71.25			2046	77.56	2084	82.06
	305	12	1238	48.75			1911	75.25	1911	75.25			2097	82.56	2110	83.06
	610	24	(1)	(1)			(1)	(1)	(1)	(1)			(1)	(1)	(1)	(1)

Table 6. Dimensions B and C (continued)

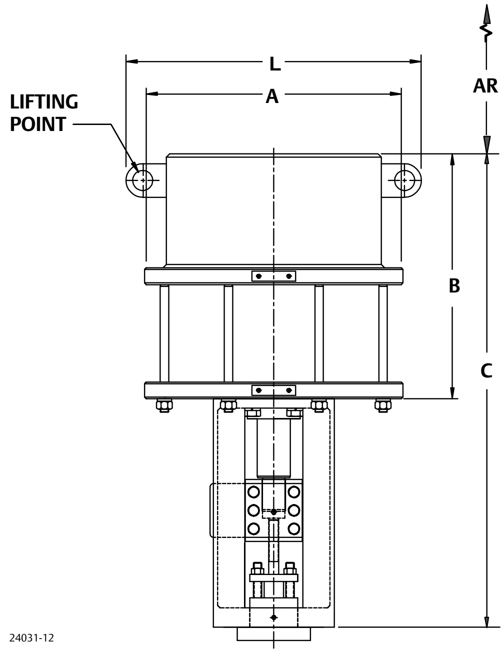
ACTUATOR SIZE	MAXIMUM VALVE TRAVEL		MAXIMUM B		C (WITHOUT MANUAL OVERRIDE)				C (WITH MANUAL OVERRIDE)			
					5/5H Inch Yoke Boss		7 Inch Yoke Boss		5/5H Inch Yoke Boss		7 Inch Yoke Boss	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
18	25	1	521	20.50	968	38.13	1000	39.38	1129	44.44	1160	45.69
	51	2	578	22.75	1026	40.38	1057	41.63	1186	46.69	1218	47.94
	76	3	654	25.75	1102	43.38	1133	44.63	1310	51.56	1322	52.06
	102	4	724	28.50	1172	46.13	1203	47.38	1380	54.31	1392	54.81
	127	5	756	29.75	1289	50.75	1314	51.75	1513	59.56	1475	58.06
	140	5.5	819	32.25	1353	53.25	1378	54.25	1576	62.06	1538	60.56
	152	6	832	32.75	1365	53.75	1391	54.75	1589	62.56	1551	61.06
	178	7	908	35.75	1441	56.75	1518	59.75	1665	65.56	1678	66.06
	203	8	984	38.75	1518	59.75	1594	62.75	1742	68.56	1754	69.06
	229	9	1086	42.75	1759	69.25	1759	69.25	1919	75.56	1919	75.56
	254	10	1111	43.75	1784	70.25	1784	70.25	1945	76.56	1945	76.56
	267	10.5	1124	44.25	1797	70.75	1797	70.75	1957	77.06	1957	77.06
	279	11	1137	44.75	1810	71.25	1810	71.25	1970	77.56	2008	79.06
	305	12	1238	48.75	1911	75.25	1911	75.25	2097	82.56	2110	83.06
	610	24	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
20	25	1	565	22.25	1052	41.44	1084	42.69	1188	46.76	1219	48.01
	51	2	641	25.25	1129	44.44	1160	45.69	1264	49.76	1296	51.01
	76	3	699	27.50	1186	46.69	1218	47.94	1369	53.88	1381	54.38
	102	4	724	28.50	1211	47.69	1243	48.94	1394	54.88	1407	55.38
	127	5	819	32.25	1392	54.81	1418	55.81	1591	62.63	1553	61.13
	140	5.5	914	36.00	1487	58.56	1513	59.56	1686	66.38	1648	64.88
	152	6	927	36.50	1500	59.06	1526	60.06	1699	66.88	1661	65.38
	178	7	1003	39.50	1576	62.06	1653	65.06	1775	69.88	1788	70.38
	203	8	1099	43.25	1672	65.81	1748	68.81	1870	73.63	1883	74.13
	229	9	1181	46.50	1894	74.56	1894	74.56	2029	79.88	2029	79.88
	254	10	1207	47.50	1919	75.56	1919	75.56	2054	80.88	2054	80.88
	267	10.5	1238	48.75	1951	76.81	1951	76.81	2086	82.13	2086	82.13
	279	11	1251	49.25	1964	77.31	1964	77.31	2099	82.63	2137	84.13
	305	12	1327	52.25	2040	80.31	2040	80.31	2200	86.63	2213	87.13
	610	24	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
22	25	1	572	22.50	1059	41.69	1091	42.94	1194	47.01	1226	48.26
	51	2	673	26.50	1160	45.69	1192	46.94	1296	51.01	1327	52.26
	76	3	749	29.50	1237	48.69	1268	49.94	1419	55.88	1432	56.38
	102	4	826	32.50	1313	51.69	1345	52.94	1496	58.88	1508	59.38
	127	5	851	33.50	1424	56.06	1449	57.06	1623	63.88	1584	62.38
	140	5.5	864	34.00	1437	56.56	1462	57.56	1635	64.38	1597	62.88
	152	6	876	34.50	1449	57.06	1475	58.06	1648	64.88	1610	63.38
	178	7	1029	40.50	1602	63.06	1678	66.06	1800	70.88	1813	71.38
	203	8	1054	41.50	1627	64.06	1703	67.06	1826	71.88	1838	72.38
	229	9	1105	43.50	1818	71.56	1818	71.56	1953	76.88	1953	76.88
	254	10	1130	44.50	1843	72.56	1843	72.56	1978	77.88	1978	77.88
	267	10.5	1295	51.00	2008	79.06	2008	79.06	2143	84.38	2143	84.38
	279	11	1308	51.50	2021	79.56	2021	79.56	2156	84.88	2194	86.38
	305	12	1334	52.50	2046	80.56	2046	80.56	2207	86.88	2219	87.38
	610	24	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]

Table 6. Dimensions B and C (continued)

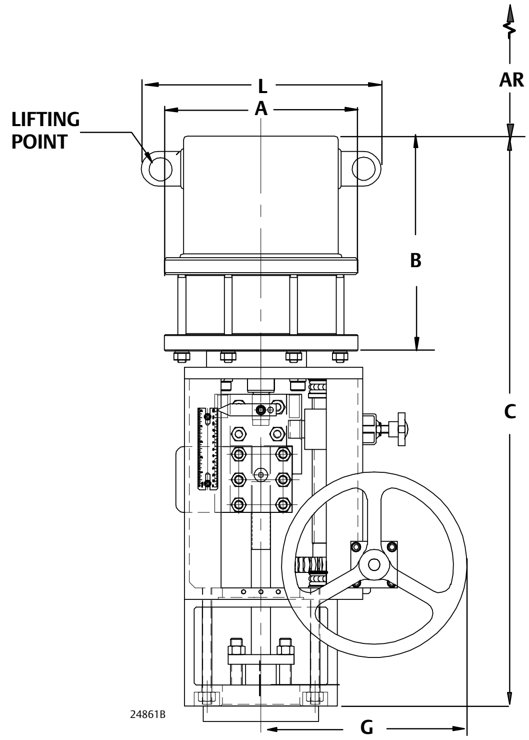
ACTUATOR SIZE	MAXIMUM VALVE TRAVEL		MAXIMUM B		C (WITHOUT MANUAL OVERRIDE)				C (WITH MANUAL OVERRIDE)			
					5/5H Inch Yoke Boss		7 Inch Yoke Boss		5/5H Inch Yoke Boss		7 Inch Yoke Boss	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
24	25	1	572	22.50	1092	43.01	1124	44.26	1254	49.38	1286	50.63
	51	2	629	24.75	1149	45.26	1181	46.51	1311	51.63	1343	52.88
	76	3	679	26.75	1200	47.26	1232	48.51	1410	55.50	1422	56.00
	102	4	775	30.50	1296	51.01	1327	52.26	1505	59.25	1518	59.75
	127	5	800	31.50	1407	55.38	1432	56.38	1632	64.25	1594	62.75
	140	5.5	895	35.25	1502	59.13	1527	60.13	1727	68.00	1689	66.50
	152	6	908	35.75	1515	59.63	1540	60.63	1740	68.50	1702	67.00
	178	7	933	36.75	1540	60.63	1616	63.63	1765	69.50	1778	70.00
	203	8	1010	39.75	1616	63.63	1692	66.63	1842	72.50	1854	73.00
	229	9	1162	45.75	1908	75.13	1908	75.13	2070	81.50	2070	81.50
	254	10	1187	46.75	1934	76.13	1934	76.13	2096	82.50	2096	82.50
	267	10.5	1200	47.25	1946	76.63	1946	76.63	2108	83.00	2108	83.00
	279	11	1213	47.75	1959	77.13	1959	77.13	2121	83.50	2159	85.00
	305	12	1365	53.75	2112	83.13	2112	83.13	2299	90.50	2311	91.00
	610	24	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
26, 28	25	1	597	23.50	1118	44.01	1149	45.26	1280	50.38	1311	51.63
	51	2	622	24.50	1143	45.01	1175	46.26	1305	51.38	1337	52.63
	76	3	705	27.75	1226	48.26	1257	49.51	1435	56.50	1448	57.00
	102	4	730	28.75	1251	49.26	1283	50.51	1461	57.50	1473	58.00
	127	5	806	31.75	1413	55.63	1438	56.63	1638	64.50	1600	63.00
	140	5.5	921	36.25	1527	60.13	1553	61.13	1753	69.00	1715	67.50
	152	6	933	36.75	1540	60.63	1565	61.63	1765	69.50	1727	68.00
	178	7	959	37.75	1565	61.63	1642	64.63	1791	70.50	1803	71.00
	203	8	1137	44.75	1743	68.63	1819	71.63	1969	77.50	1981	78.00
	229	9	1162	45.75	1908	75.13	1908	75.13	2070	81.50	2070	81.50
	254	10	1187	46.75	1934	76.13	1934	76.13	2096	82.50	2096	82.50
	267	10.5	1200	47.25	1946	76.63	1946	76.63	2108	83.00	2108	83.00
	279	11	1213	47.75	1959	77.13	1959	77.13	2121	83.50	2159	85.00
	305	12	1238	48.75	1985	78.13	1985	78.13	2172	85.50	2184	86.00
	610	24	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)

1. Consult your Emerson sales office.

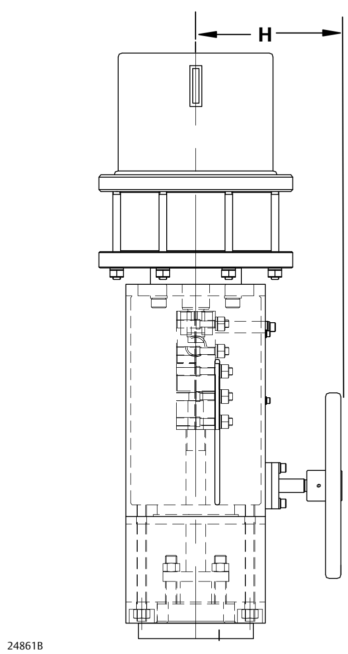
Figure 2. Fisher 685SE Actuator Dimensions



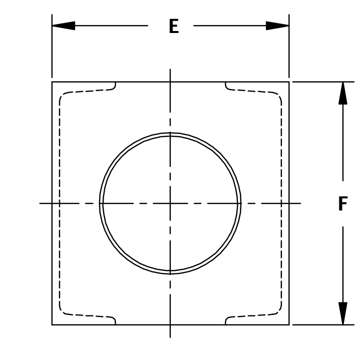
FRONT VIEW OF ACTUATOR
WITHOUT MANUAL OVERRIDE



FRONT VIEW OF ACTUATOR
WITH HANDWHEEL MANUAL OVERRIDE

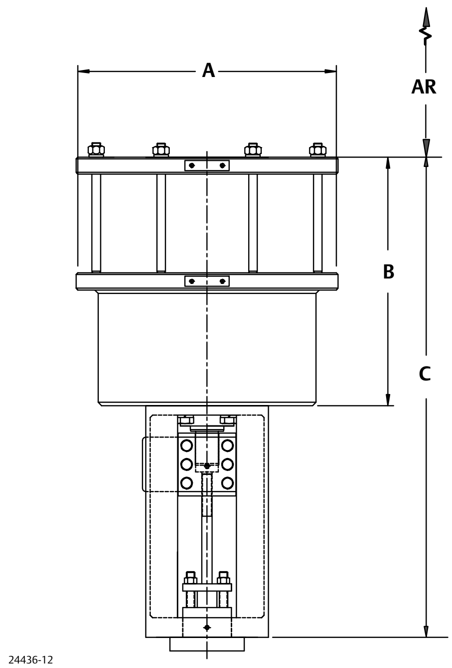


LEFT VIEW OF ACTUATOR WITH
HANDWHEEL MANUAL OVERRIDE

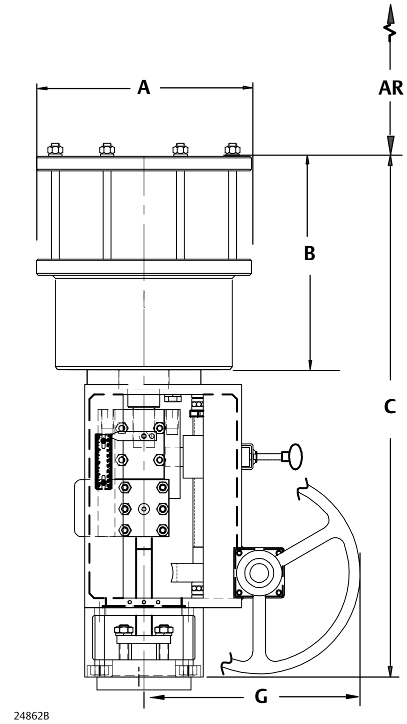


VIEW OF BOTTOM OF
YOKE BOSS

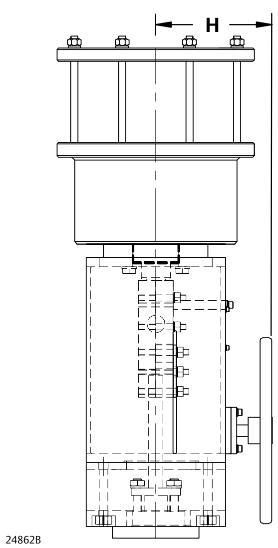
Figure 3. Fisher 685SR Actuator Dimensions



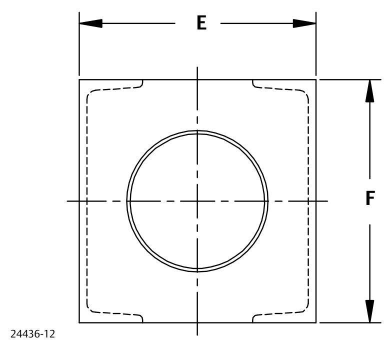
FRONT VIEW OF ACTUATOR WITHOUT MANUAL OVERRIDE



FRONT VIEW OF ACTUATOR WITH HANDWHEEL MANUAL OVERRIDE



LEFT VIEW OF ACTUATOR WITH HANDWHEEL MANUAL OVERRIDE



VIEW OF BOTTOM OF YOKE BOSS

Table 7. Actuator Removal Clearance (AR)

MAXIMUM VALVE TRAVEL		AR (WITHOUT MANUAL OVERRIDE)						AR (WITH MANUAL OVERRIDE)					
		3-9/16 Inch Yoke Boss		5/5H Inch Yoke Boss		7 Inch Yoke Boss		3-9/16 Inch Yoke Boss		5/5H Inch Yoke Boss		7 Inch Yoke Boss	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
102	4.0	267	10.50	343	13.50	368	14.50	343	13.50	343	13.50	368	14.50
203	8.0	318	12.50	318	12.50	343	13.50	356	14.00	381	15.00	343	13.50
305	12.0			356	14.00	356	14.00			356	14.00	356	14.00
406	16.0			356	14.00	356	14.00			356	14.00	356	14.00
508	20.0			356	14.00	356	14.00			356	14.00	356	14.00
610	24.0			356	14.00	356	14.00			356	14.00	356	14.00

Table 8. Handwheel Specifications

ACTUATOR SIZE	OUTPUT THRUST		HANDWHEEL DIAMETER		TURNS PER mm OF TRAVEL	TURNS PER INCH OR TRAVEL	MAXIMUM RIM FORCE REQUIRED	
	N	lbs	mm	Inch			N	lbs
10 to 12	44482	10000	305	12	3.8	96	290	65
14 to 18	88964	20000	406	16	3.0	80	380	85
20 to 26	133447	30000	610	24	2.8	72	450	100

Table 9. Approximate Weights for Constructions without Manual Override

ACTUATOR TYPE	MAX VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)									
	mm (inches)	10	12	14	16	18	20	22	24	26	28
685SE	25 (1.00)	109 (241)	147 (324)	221 (487)	270 (596)	315 (694)	462 (1018)	489 (1079)	680 (1500)	776 (1710)	931 (2053)
	51 (2.00)	114 (251)	156 (344)	231 (510)	284 (625)	329 (725)	479 (1056)	510 (1124)	704 (1551)	802 (1768)	957 (2110)
	102 (4.00)	122 (270)	174 (383)	252 (556)	310 (683)	358 (789)	514 (1132)	551 (1215)	750 (1654)	855 (1884)	1009 (2225)
	152 (6.00)	131 (289)	192 (423)	273 (601)	336 (740)	387 (852)	548 (1209)	592 (1305)	797 (1757)	907 (2000)	1061 (2339)
	203 (8.00)	140 (308)	210 (462)	293 (647)	362 (798)	415 (916)	583 (1285)	633 (1396)	843 (1859)	960 (2116)	1113 (2454)
	254 (10.00)	148 (327)	227 (501)	314 (693)	388 (855)	444 (979)	617 (1361)	674 (1486)	890 (1962)	1012 (2232)	1165 (2569)
	305 (12.00)	157 (346)	245 (541)	335 (738)	414 (913)	473 (1042)	652 (1437)	715 (1577)	937 (2065)	1065 (2348)	1217 (2683)
	356 (14.00)	165 (365)	263 (580)	356 (784)	440 (971)	502 (1106)	686 (1513)	756 (1667)	983 (2168)	1118 (2464)	1269 (2798)
	406 (16.00)	174 (384)	281 (619)	376 (829)	466 (1028)	530 (1169)	721 (1589)	797 (1758)	1030 (2270)	1170 (2580)	1321 (2912)
	457 (18.00)	183 (403)	299 (659)	397 (875)	493 (1086)	559 (1233)	756 (1667)	838 (1848)	1076 (2373)	1223 (2696)	1373 (3027)
	508 (20.00)	191 (422)	317 (698)	418 (921)	519 (1143)	588 (1296)	790 (1742)	879 (1939)	1123 (2476)	1275 (2812)	1425 (3142)
	559 (22.00)	200 (441)	334 (737)	438 (966)	545 (1201)	617 (1359)	825 (1818)	921 (2029)	1170 (2578)	1328 (2928)	1477 (3256)
	610 (24.00)	209 (460)	352 (776)	459 (1012)	571 (1259)	645 (1423)	859 (1894)	962 (2120)	1216 (2681)	1381 (3044)	1529 (3371)
685SR	25 (1.00)	127 (281)	165 (363)	242 (533)	311 (685)	353 (778)	479 (1056)	557 (1228)	760 (1676)	869 (1915)	1101 (2427)
	51 (2.00)	132 (291)	174 (384)	253 (557)	325 (716)	368 (812)	497 (1096)	578 (1273)	784 (1727)	895 (1973)	1127 (2485)
	102 (4.00)	142 (312)	193 (426)	275 (605)	352 (776)	398 (878)	534 (1176)	619 (1364)	830 (1830)	948 (2089)	1179 (2599)
	152 (6.00)	151 (333)	212 (468)	297 (654)	380 (837)	429 (945)	570 (1257)	660 (1454)	877 (1933)	1000 (2206)	1231 (2714)
	203 (8.00)	161 (354)	232 (511)	318 (702)	407 (898)	459 (1012)	606 (1337)	701 (1545)	923 (2035)	1053 (2322)	1283 (2829)
	254 (10.00)	170 (375)	251 (553)	340 (750)	435 (958)	489 (1079)	643 (1417)	742 (1635)	970 (2138)	1106 (2438)	1335 (2944)
	305 (12.00)	180 (396)	270 (595)	362 (798)	462 (1019)	520 (1146)	679 (1497)	783 (1726)	1016 (2241)	1159 (2554)	1387 (3059)
	356 (14.00)	189 (417)	289 (638)	384 (847)	490 (1079)	550 (1212)	716 (1577)	824 (1816)	1063 (2344)	1211 (2670)	1439 (3173)
	406 (16.00)	199 (438)	308 (680)	406 (895)	517 (1140)	580 (1279)	752 (1657)	865 (1907)	1110 (2446)	1264 (2786)	1491 (3288)
	457 (18.00)	208 (459)	328 (722)	428 (943)	545 (1201)	611 (1346)	788 (1738)	906 (1997)	1156 (2549)	1317 (2903)	1544 (3403)
	508 (20.00)	218 (480)	347 (765)	450 (991)	572 (1261)	641 (1413)	825 (1818)	947 (2088)	1203 (2652)	1369 (3019)	1596 (3518)
	559 (22.00)	227 (501)	366 (807)	472 (1039)	600 (1322)	671 (1480)	861 (1898)	988 (2178)	1249 (2754)	1422 (3135)	1648 (3633)
	610 (24.00)	237 (522)	385 (849)	493 (1088)	627 (1382)	702 (1547)	897 (1978)	1029 (2269)	1296 (2857)	1475 (3251)	1700 (3747)

Table 10. Approximate Weights for Constructions with Handwheels

ACTUATOR TYPE	MAX VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)								
	mm (inches)	10	12	14	16	18	20	22	24	26
685SE	25 (1.00)	167 (369)	212 (468)	336 (742)	381 (839)	432 (953)	603 (1330)	675 (1489)	853 (1881)	941 (2075)
	51 (2.00)	173 (383)	221 (488)	347 (765)	394 (869)	447 (985)	621 (1370)	697 (1536)	876 (1932)	967 (2132)
	102 (4.00)	186 (410)	240 (529)	368 (811)	421 (928)	475 (1048)	658 (1450)	739 (1630)	922 (2033)	1019 (2246)
	152 (6.00)	199 (438)	259 (570)	389 (858)	448 (987)	504 (1111)	694 (1529)	782 (1723)	968 (2134)	1070 (2359)
	203 (8.00)	211 (465)	277 (611)	410 (904)	474 (1046)	532 (1174)	730 (1609)	824 (1817)	1014 (2235)	1122 (2473)
	254 (10.00)	224 (493)	296 (652)	431 (951)	501 (1105)	561 (1237)	766 (1689)	867 (1910)	1060 (2336)	1173 (2586)
	305 (12.00)	236 (521)	314 (693)	452 (997)	528 (1164)	590 (1300)	802 (1769)	909 (2004)	1106 (2438)	1225 (2700)
	356 (14.00)	249 (548)	333 (734)	473 (1043)	555 (1223)	618 (1363)	838 (1849)	951 (2098)	1152 (2539)	1276 (2814)
	406 (16.00)	261 (576)	352 (775)	494 (1090)	581 (1282)	647 (1426)	875 (1928)	994 (2191)	1197 (2640)	1328 (2927)
	457 (18.00)	274 (603)	370 (816)	515 (1136)	608 (1341)	675 (1489)	911 (2008)	1036 (2285)	1243 (2741)	1379 (3041)
	508 (20.00)	286 (631)	389 (857)	536 (1183)	635 (1400)	704 (1552)	947 (2088)	1079 (2378)	1289 (2842)	1431 (3154)
	559 (22.00)	299 (659)	407 (898)	557 (1229)	662 (1459)	732 (1615)	983 (2168)	1121 (2472)	1335 (2944)	1482 (3268)
	610 (24.00)	311 (686)	426 (939)	579 (1275)	688 (1518)	761 (1678)	1019 (2248)	1164 (2566)	1381 (3045)	1534 (3382)
685SR	25 (1.00)	185 (407)	230 (506)	357 (788)	421 (929)	471 (1038)	666 (1468)	743 (1638)	933 (2057)	1034 (2280)
	51 (2.00)	191 (422)	239 (528)	368 (812)	435 (960)	486 (1071)	685 (1510)	764 (1685)	956 (2108)	1060 (2337)
	102 (4.00)	204 (451)	259 (572)	391 (861)	463 (1022)	516 (1137)	723 (1594)	807 (1779)	1002 (2209)	1112 (2451)
	152 (6.00)	218 (480)	279 (616)	413 (910)	491 (1084)	546 (1204)	761 (1677)	849 (1872)	1048 (2310)	1163 (2565)
	203 (8.00)	231 (509)	299 (660)	435 (959)	520 (1146)	576 (1270)	799 (1761)	892 (1966)	1094 (2411)	1215 (2679)
	254 (10.00)	244 (538)	319 (704)	457 (1008)	548 (1208)	606 (1337)	837 (1845)	934 (2059)	1140 (2512)	1267 (2792)
	305 (12.00)	257 (568)	339 (748)	480 (1057)	576 (1270)	636 (1403)	875 (1929)	977 (2153)	1185 (2614)	1318 (2906)
	356 (14.00)	271 (597)	359 (792)	502 (1106)	604 (1332)	667 (1469)	913 (2013)	1019 (2247)	1231 (2715)	1370 (3020)
	406 (16.00)	284 (626)	379 (836)	524 (1155)	632 (1394)	697 (1536)	951 (2096)	1061 (2340)	1277 (2816)	1421 (3134)
	457 (18.00)	297 (655)	399 (880)	546 (1204)	660 (1456)	727 (1602)	989 (2180)	1104 (2434)	1323 (2917)	1473 (3248)
	508 (20.00)	310 (684)	419 (924)	568 (1253)	688 (1518)	757 (1669)	1027 (2264)	1146 (2527)	1369 (3018)	1525 (3361)
	559 (22.00)	324 (714)	439 (968)	591 (1302)	716 (1580)	787 (1735)	1065 (2348)	1189 (2621)	1415 (3120)	1576 (3475)
	610 (24.00)	337 (743)	459 (1012)	613 (1351)	745 (1642)	817 (1801)	1103 (2432)	1231 (2715)	1461 (3221)	1628 (3589)

Table 11. Lifting Point Load Ratings

ACTUATOR SIZE	LIFTING ORIENTATION	NUMBER OF LIFTING POINTS USED	MAXIMUM LOAD	
			kg	lbs
10	Actuator Center line Horizontal	2	810	1800
12 to 24		2	1540	3400
26 to 28		2	2860	6300
10	Actuator Center line Vertical	2	2080	4600
12 to 24		2	3760	8300
26 to 28		2	6350	14000

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Fisher™ 785C Piston Actuators

The 785C is a piston actuator that provides accurate, high thrust output for a wide range of travel applications. This actuator can be single- or double-acting and spring-return or springless with a selection of spring-fail options available.

The 785C family is designed for use with a variety of Fisher sliding-stem control valves. It is available in several configurations to cover a wide range of application requirements. Typical travels range from 25 to 610 mm (1 to 24 inches) and cylinder diameters range from 280 to 685 mm (11 to 27 inches). Thrust capabilities extend to 1600 kN (359,000 lbf) for double-acting springless and 540 kN (121,000 lbf) for spring-return.

The 785C can be used with the FIELDVUE™ DVC6200 digital valve controller for throttling applications, or with switching valves for on/off control. This actuator can also be fitted with volume boosters for fast stroking requirements.

785C DOUBLE-ACTING SPRINGLESS

Features

- **High Thrust Capability**—Thrusts of up to 1600 kN (359,000 lbf) for double acting springless and 540 kN (121,000 lbf) for spring-return can be produced. Consult your Emerson sales office.

- **Broad Application Coverage**—Standard constructions offer travels of up to 609.5 mm (24 inches) and cylinder diameters of up to 685 mm (27 inches). For travels greater than 610 mm (24 inches) consult your Emerson sales office.

- **Double-Acting Springless Construction**—Pressure on both sides of the piston results in stiff, precise positioning.

- **Single-Acting Spring Return**—Allows for full ANSI/FCI 70-2 CL V shutoff upon loss of air without use of a volume tank.

- **Low Friction**—Low friction piston seals and electroless nickel plated cylinders reduce sliding friction and wear.

- **Wide Temperature Range**—Standard constructions offer a temperature range of -20 to 100°C (-4 to 212°F), however lower and higher temperatures are possible. Low temperature constructions offer ranges of -40 to 100°C (-40 to 212°F) or -60 to 100°C (-76 to 212°F) and high temperature constructions offer ranges of -20°C to 200°C (-4°F to 392°F).

- **Mechanical Fail Mode**—Depending on construction, an internal bias spring will force the piston rod to retract or extend upon a loss of supply pressure.

- **Manual Override**—An optional top-mounted handwheel or side-mounted handpump is capable of extending or retracting the actuator manually.

Specifications

Operating Pressure[1]

Minimum: 2.7 bar (40 psig)
Maximum Allowable: 10.3 bar (150 psig)

Consult your Emerson sales office for supply pressures up to 2.7 bar (40 psig)

Travel[2]

25 mm (1 inch) through 610 mm (24 inch)
See table 1 and 3

Thrust Capabilities

See table 2, 5, and 6

Stroking Speeds

Varies with actuator size, spring, travel, and supply pressure. If stroking speed is critical, consult your Emerson sales office.

Piston Diameter and Area[2]

Available diameters range from 280 to 685 mm (11 to 27 inches).

See table 1 and 3

For additional sizes, contact your Emerson sales office.

Operative Temperature Limits[3]

Standard: -20 to 100°C (-4 to 212°F)

Low Temperature Options:

-40 to 100°C (-40 to 212°F) or
-60 to 100°C (-76 to 212°F)

High Temperature Option:

-20 to 200°C (-4 to 392°F)

Yoke Boss and Valve Stem Diameter

- 90 mm (3-9/16 inch) yoke boss with 19 mm (3/4 inch) stem
- 127 mm (5 inch) yoke boss with 25.4 mm (1 inch) stem
- 127 mm (5 inch) yoke boss with 32 mm (1-1/4 inch) stem or
- 178 mm (7 inch) yoke boss with 51 mm (2 inch) stem

Instrument Mounting

Mounting kits are available for use with FIELDVUE DVC6200 Series digital valve controllers

Pressure Connections

Standard: 3/4 NPT
Optional: 1 and 1-1/4 NPT

See figure 2 and table 7

Construction Materials[4]

Part	Material
Yoke	Carbon Steel
Piston	Carbon Steel
Cylinder	Carbon Steel
Upper/Lower Heads	Carbon Steel
Tie Rod	Carbon Steel or Stainless Steel
Piston Rod	Stainless Steel
Stem Connector	Carbon Steel or Stainless Steel
Nameplate and Travel Scale	Stainless Steel

Weights

See table 16, 17, 18, and 19

Lifting Point Load Ratings

See table 20 and figure 9 and 10

Options

- Top mounted handwheel
- Side mounted handpump,
- Pneumatic fail mode via Fisher 377 trip valve
- Volume Boosters

Dimensions

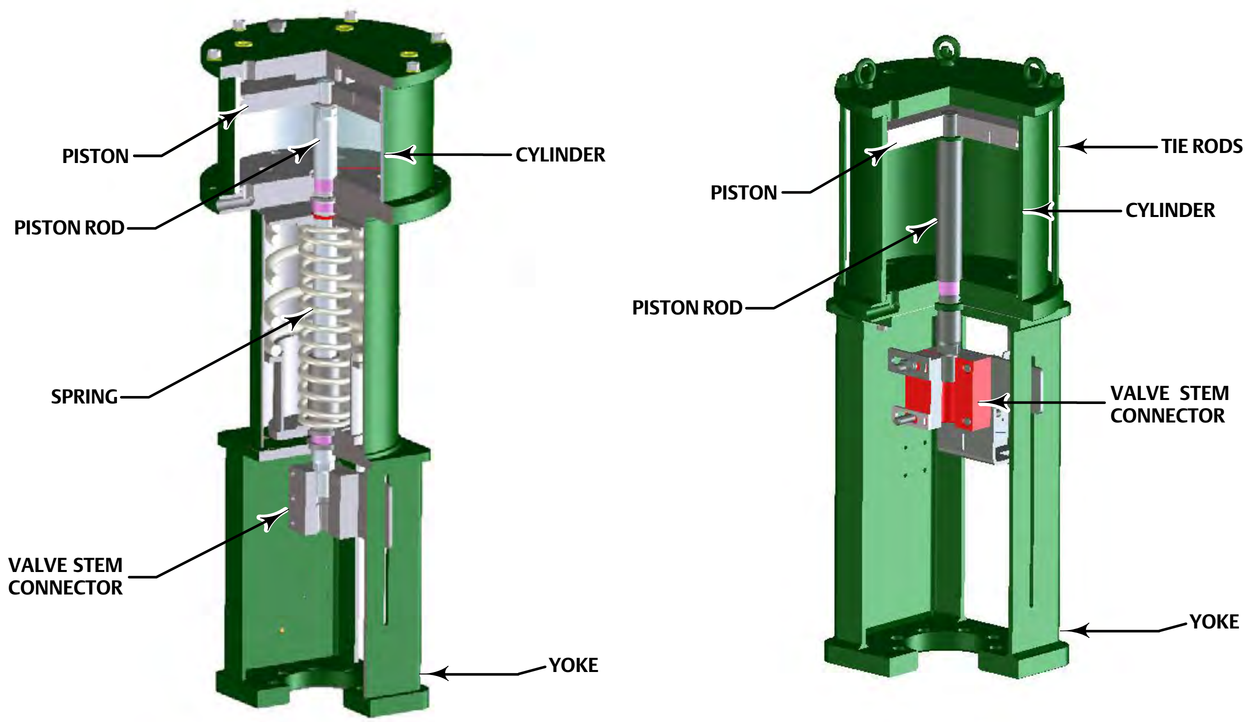
See figure 3 and 6 and table 8, 10, 11, 13, and 15

Optional Certifications[5]

- Pressure Equipment Directive (PED) 2014/68/EU and Machinery Directive 2006/42/EC
- ATEX Group II Category 2 Gas and Dust
- Customs Union Technical Regulations (CUTR) 010/2011 and 012/2011
- Safety Instrumented System, SIL 3 Capable

1. The pressure/temperature limits in this bulletin and any other applicable standard or code should not be exceeded.
2. Consult your Emerson sales office for longer travels or larger cylinder diameters. The Fisher 585C family of actuators can be used for smaller travels or cylinder diameters.
3 Standard temperature -20 to 100°C (-4 to 212°F) and -40 to 100°C (-40 to 212°F) are PED 2014/68/EU and 2006/42/EC compliant. The low ambient temperature option, -60 to 100°C (-76 to 212°F) is not PED compliant. The high temperature option, if used in conjunction with ATEX, is limited to 135°C (275°F).
4. Full stainless steel constructions are available upon request.
5. Refer to the product nameplates to determine which certifications each actuator construction possesses

Figure 1. Fisher 785C Actuator



Principle of Operation

785C piston actuators utilize a pneumatically controlled piston that moves inside of a cylinder to generate thrust. A seal contained on the circumference of the piston provides a seal between the piston and the cylinder, preventing supply pressure leakage.

785C single-acting or double-acting spring-return piston actuators utilize a spring below the piston (outside the pressurized chamber) that will drive the piston rod upon a loss of supply pressure. This fail action will result in forcing an attached control valve to either fail-open or fail-closed.

From an equilibrium state, the actuator operates by reacting to a force unbalance that is created by increasing supply pressure on one side of the piston, and decreasing it on the other. This moves the piston up or down, and results in a repositioning of the attached control valve. Travel can be adjusted using travel limits within a valve positioner, which limit the travel range of the actuator. The optional manual override does not have the ability to act as a hard travel stop.

An optional manual override (top mounted handwheel or side mounted handpump) is capable of extending or retracting the actuator manually and can be engaged at any position from full open to full close. The top-mounted handwheel utilizes an engagement lever that couples the handwheel and piston rod. The handpump has a hydraulic cylinder attached to the piston rod. This enables the handpump to operate the actuator manually unless the handpump is set to bypass position.

Instrument Selection

An excellent selection of sensitive and accurate instruments are available for 785C piston actuators. These include FIELDVUE DVC6200 digital valve controllers, as well as trip valves and volume boosters.

Integrated mounting interfaces are offered for DVC6200 digital valve controller, Topworx™ DXP Valve Controller, and Topworx 70 Series GO Switch.

DVC6200 Digital Valve Controller

FIELDVUE DVC6200 digital valve controllers are communicating, microprocessor-based current-to-pneumatic instruments. In addition to the traditional function of converting an electric signal to a pressure signal, DVC6200 digital valve controllers, using HART®, FOUNDATION™ Fieldbus or PROFIBUS communications protocol, give easy access to information critical to process operation.

For additional information, refer to Fisher bulletin 62.1:DVC6200 (D103415X012), 62.1:DVC6200p (D103564X012) or 62.1:DVC6200f (D103399X012), available at Fisher.com or from your Emerson sales office.

Installation

The actuator may be installed in any orientation, but normal installation is with the actuator vertical above the valve.

If using a manual handpump, the handpump must be installed vertical above the valve.

If the supply source is capable of exceeding the maximum actuator operating pressure or instrument supply pressure, appropriate steps must be taken during installation to protect the instrument and all connected equipment against overpressure.

Table 1. 785C Double Acting Springless Standard Constructions(1)

ACTUATOR SIZE	PISTON AREA				VALVE STEM CONNECTOR SIZE		YOKE BOSS DIAMETER		AVAILABLE TRAVEL	
	Without Manual Override		With Manual Override(2)							
	cm²	Inch²	cm²	Inch²	mm	Inch	mm	Inch	mm	Inch
280	616	95	616	95	19	3/4	90	3-9/16	25 - 203	1 - 8
					25	1	127	5	25 - 609	1 - 24
					32	1 1/4	127	5H		
335	881	137	881	137	19	3/4	90	3-9/16	25 - 203	1 - 8
					25	1	127	5	25 - 609	1 - 24
					32	1 1/4	127	5H		
385	1164	180	1164	180	19	3/4	90	3-9/16	25 - 203	1 - 8
					25	1	127	5	25 - 609	1 - 24
					32	1 1/4	127	5H		
435	1486	230	1474	228	25	1	127	5		
					32	1 1/4	127	5H		
					51	2	178	7		
485	1847	286	1828	283	25	1	127	5		
					32	1 1/4	127	5H		
					51	2	178	7		
535	2248	348	2228	345	25	1	127	5		
					32	1 1/4	127	5H		
					51	2	178	7		
585	2688	417	2660	412	32	1 1/4	127	5H		
					51	2	178	7		
635	3167	491	3139	487	32	1 1/4	127	5H		
					51	2	178	7		
685	3685	571	3657	567	32	1 1/4	127	5H		
					51	2	178	7		

1. Consult your Emerson sales office for additional sizes.
2. Actuator size 280-385 are available with a top mounted handwheel. Size 435-685 are available with a manual handpump.

Table 2. 785C Double-Acting Springless Available Thrust

ACTUATOR SIZE	MAXIMUM ALLOWABLE CYLINDER PRESSURE		MAXIMUM ALLOWABLE THRUST			
			Without Manual Override		With Manual Override(1)	
	barg	psig	N	lb	N	lb
280	10.3	150	63682	14316	32635	7337
335			91157	20493	46715	10502
385			120399	27067	61700	13871
435			153702	34554	78726	17698
485			191066	42953	132291	29740
535			232492	52266	132291	29740
585			277979	62492	172788	38844
635			327527	73631	172788	38844
685			381137	85683	238555	53629

1. Actuator size 280-385 are available with a top mounted handwheel. Size 435-685 are available with a manual handpump.

Table 3. 785C Single-Acting Spring Return Standard Constructions(1)

ACTUATOR SIZE	PISTON AREA								VALVE STEM CONNECTOR SIZE		YOKE BOSS DIAMETER		AVAILABLE TRAVEL	
	Without Manual Override				With Manual Override(2)									
	Spring Extends		Spring Retracts		Spring Extends		Spring Retracts							
	cm^2	$Inch^2$	cm^2	$Inch^2$	cm^2	$Inch^2$	cm^2	$Inch^2$	mm	Inch	mm	Inch	mm	Inch
335	881	137	869	135	881	137	869	135	19	3/4	90	3-9/16	25 - 203	1 - 8
									25	1	127	5		
									32	1 1/4	127	5H		
385	1164	180	1152	179	1164	180	1152	179	19	3/4	90	3-9/16		
									25	1	127	5		
									32	1 1/4	127	5H		
435	1486	230	1474	228	1474	228	1474	228	25	1	127	5		
									32	1 1/4	127	5H		
									51	2	178	7		
485	1847	286	1835	284	1828	283	1835	284	25	1	127	5		
									32	1 1/4	127	5H		
									51	2	178	7		
535	2248	348	2235	347	2228	345	2235	347	25	1	127	5		
									32	1 1/4	127	5H		
									51	2	178	7		
585	2688	417	2660	412	2660	412	2660	412	32	1 1/4	127	5H		
									51	2	178	7		
635	3167	491	3139	487	3139	487	3139	487	32	1 1/4	127	5H		
									51	2	178	7		
685	3685	571	3657	567	3657	567	3657	567	32	1 1/4	127	5H		
									51	2	178	7		

1. Consult your Emerson sales office for additional sizes.
2. Actuator size 335-385 are available with a top mounted handwheel. Size 435-685 are available with a manual handpump.

Table 4. 785C Double-Acting Spring Return Standard Constructions(1)

ACTUATOR SIZE	PISTON AREA								VALVE STEM CONNECTOR SIZE		YOKE BOSS DIAMETER		AVAILABLE TRAVEL	
	Without Manual Override				With Manual Override(2)									
	Rod Extends		Rod Retracts		Rod Extends		Rod Retracts							
	cm^2	$Inch^2$	cm^2	$Inch^2$	cm^2	$Inch^2$	cm^2	$Inch^2$	mm	Inch	mm	Inch	mm	Inch
280	615.75	95.44	603.19	93.49	615.75	95.44	603.19	93.49	19	3/4	90	3-9/16	25 - 203	1 - 8
									25	1	127	5		
									32	1 1/4	127	5H		
335	881.41	136.62	868.85	134.67	881.41	136.62	868.85	134.67	19	3/4	90	3-9/16		
									25	1	127	5		
									32	1 1/4	127	5H		
385	1164.16	180.45	1151.59	178.5	1164.16	180.45	1151.59	178.5	19	3/4	90	3-9/16		
									25	1	127	5	0-305	0-12
									32	1 1/4	127	5H		
									51	2	178	7		
435	1486.17	230.36	1473.6	228.41	1473.6	228.41	1473.6	228.41	25	1	127	5	25-406	1-16
									32	1 1/4	127	5H		
									51	2	178	7		
485	1847.45	286.36	1834.89	284.41	1827.82	283.31	1834.89	284.41	25	1	127	5		
									32	1 1/4	127	5H		
									51	2	178	7		
535	2248.01	348.44	2235.44	346.49	2228.37	345.4	2235.44	346.49	25	1	127	5		
									32	1 1/4	127	5H		
									51	2	178	7		
585	2687.83	416.61	2659.55	412.23	2659.55	412.23	2659.55	412.23	32	1 1/4	127	5H		
									51	2	178	7		
635	3166.92	490.87	3138.65	486.49	3138.65	486.49	3138.65	486.49	32	1 1/4	127	5H		
									51	2	178	7		
685	3685.28	571.22	3657.01	566.84	3657.01	566.84	3657.01	566.84	32	1 1/4	127	5H		
									51	2	178	7		

1. Consult your Emerson sales office for additional sizes.
2. Actuator size 280-385 are available with a top mounted handwheel. Size 435-685 are available with a manual handpump.

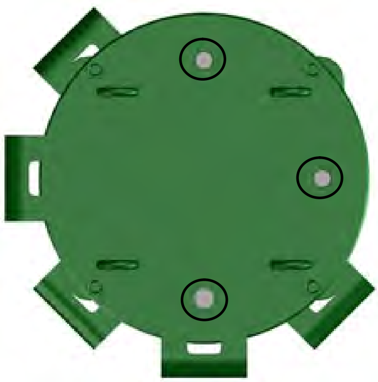
Table 5. Handwheel Specification

ACTUATOR SIZE	OUTPUT THRUST		TURNS PER mm OF TRAVEL	TURNS PER INCH OF TRAVEL	MAXIMUM RIM FORCE REQUIRED	
	N	lbs			N	lbs
280	32635	7337	0.2	4.2	437	98
335	46715	10502	0.2	4.2	435	98
385	61700	13871	0.2	4.2	489	110

Table 6. Handpump Specification

ACTUATOR SIZE	HYDRAULIC CYLINDER		OUTPUT THRUST	
	mm	Inch	N	lbf
435	135	5.3	78726	17698
485	175	6.9	132291	29740
535	175	6.9	132291	29740
585	200	7.9	172788	38844
635	200	7.9	172788	38844
685	235	9.3	238555	53629

Figure 2. Position of Pressure Connections



TOP VIEW OF ACTUATOR

Table 7. Pressure Connections

ACTUATOR SIZE	STANDARD PRESSURE CONNECTION SIZE, NPT (Top)/(Bottom)	OPTIONAL PRESSURE CONNECTION SIZE, NPT (Top)/(Bottom)	PORT TYPE (Top)/(Bottom)	QUANTITY (Top/Bottom)
280	3/4 (T) - 3/4 (B)	3/4 (T) - 3/4 (B)	Face tapped(2) / Side tapped	3(1) / 3(1)
335	3/4 (T) - 3/4 (B)	1 (T) - 3/4 (B)	Face tapped(2)/ Side tapped	
385	3/4 (T) - 3/4 (B)	1 1/4 (T) - 3/4 (B)	Face tapped / Side tapped	
435	3/4 (T) - 3/4 (B)	1 1/4 (T) - 3/4 (B)	Face tapped / Side tapped	
485 to 685	3/4 (T) - 3/4 (B)	1 1/4 (T) - 1 1/4 (B)	Face tapped / Side tapped	

1. With use of top mounted handwheel, pressure connection size is 1/2 NPT.
2. Manual handwheel execution is side tapped.

Figure 3. Fisher 785C Double-Acting Springless Piston Actuator (see table 8 and 10)

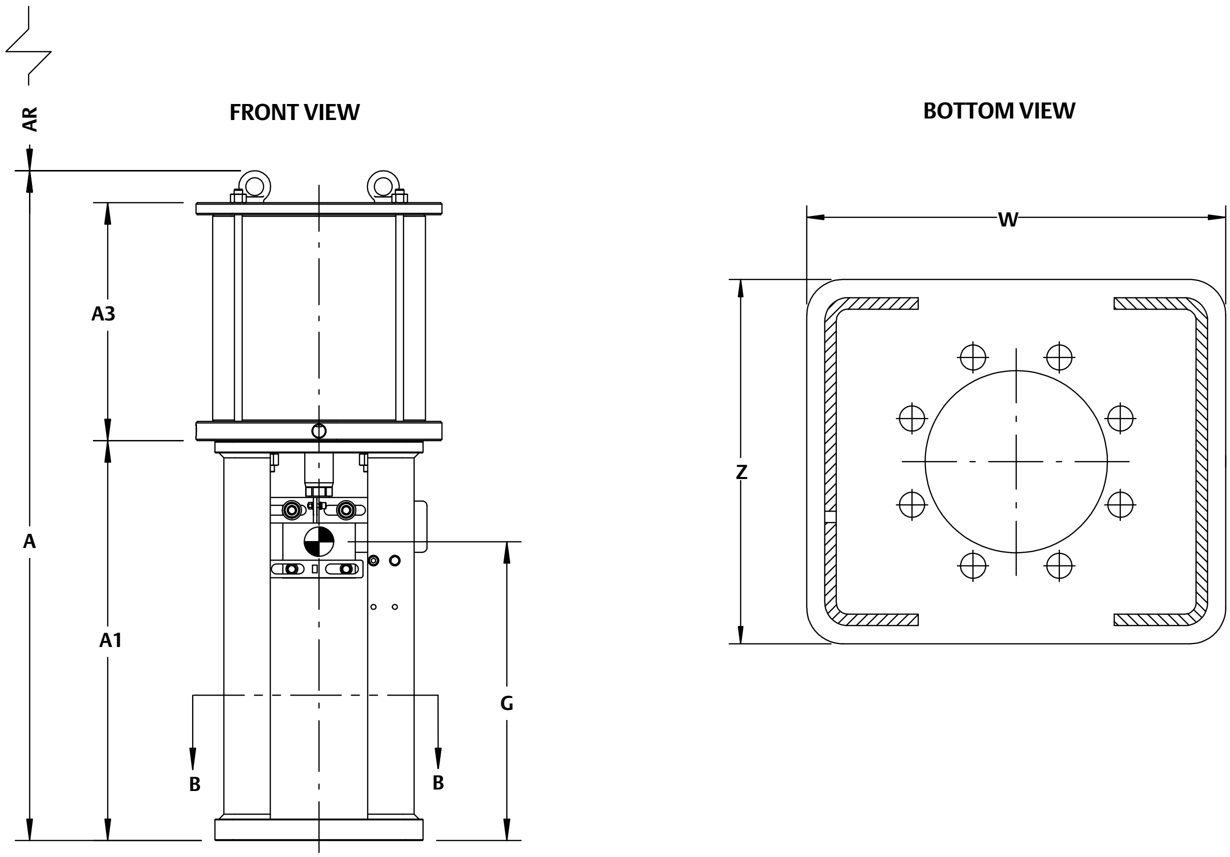


Table 8. 785C Double-Acting Springless Dimensions A, A1, A3, G, B, and C(1)

ACTUATOR SIZE	YOKE BOSS, Inch	MAXIMUM TRAVEL		A		A1		A3		G		B		C	
		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	3-9/16	115	4.5	717	28.2	416	16.4	245	9.6	359	14.1	419	16.5	419	16.5
		216	8.5	926	36.5	524	20.6	346	13.6	463	18.2	419	16.5	419	16.5
	5 or 5H	115	4.5	739	29.1	438	17.2	245	9.6	370	14.5	419	16.5	419	16.5
		216	8.5	926	36.5	524	20.6	346	13.6	463	18.2	419	16.5	419	16.5
		318	12.5	1168	46.0	664	26.1	448	17.6	584	23.0	419	16.5	419	16.5
		420	16.5	1372	54.0	766	30.2	550	21.7	686	27.0	419	16.5	419	16.5
		521	20.5	1574	62.0	867	34.1	651	25.6	787	31.0	419	16.5	419	16.5
		623	24.5	1778	70.0	969	38.1	753	29.6	889	35.0	419	16.5	419	16.5
335	3-9/16	115	4.5	720	28.3	416	16.4	248	9.8	360	14.2	472	18.6	472	18.6
		216	8.5	929	36.6	524	20.6	349	13.7	465	18.3	472	18.6	472	18.6
	5 or 5H	115	4.5	742	29.2	438	17.2	248	9.8	371	14.6	472	18.6	472	18.6
		216	8.5	929	36.6	524	20.6	349	13.7	465	18.3	472	18.6	472	18.6
		318	12.5	1171	46.1	664	26.1	451	17.8	586	23.1	472	18.6	472	18.6
		420	16.5	1375	54.1	766	30.2	553	21.8	688	27.1	472	18.6	472	18.6
		521	20.5	1577	62.1	867	34.1	654	25.7	789	31.0	472	18.6	472	18.6
		623	24.5	1781	70.1	969	38.1	756	29.8	891	35.1	472	18.6	472	18.6

-continued-

Table 8. 785C Double-Acting Springless Dimensions A, A1, A3, G, B, and C(1) (cont.)

ACTUATOR SIZE	YOKE BOSS, Inch	MAXIMUM TRAVEL		A		A1		A3		G		B		C	
		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
385	3-9/16	115	4.5	720	28.3	416	16.4	248	9.8	360	14.2	519	20.4	519	20.4
		216	8.5	929	36.6	524	20.6	349	13.7	465	18.3	519	20.4	519	20.4
	5 or 5H	115	4.5	742	29.2	438	17.2	248	9.8	371	14.6	519	20.4	519	20.4
		216	8.5	929	36.6	524	20.6	349	13.7	465	18.3	519	20.4	519	20.4
		318	12.5	1171	46.1	664	26.1	451	17.8	586	23.1	519	20.4	519	20.4
		420	16.5	1375	54.1	766	30.2	553	21.8	688	27.1	519	20.4	519	20.4
		521	20.5	1577	62.1	867	34.1	654	25.7	789	31.0	519	20.4	519	20.4
		623	24.5	1782	70.2	970	38.2	756	29.8	891	35.1	519	20.4	519	20.4
	7	115	4.5	774	30.5	470	18.5	248	9.8	387	15.2	519	20.4	519	20.4
		216	8.5	1005	39.6	600	23.6	349	13.7	503	19.8	519	20.4	519	20.4
		318	12.5	1171	46.1	664	26.1	451	17.8	586	23.1	519	20.4	519	20.4
		420	16.5	1375	54.1	766	30.2	553	21.8	688	27.1	519	20.4	519	20.4
		521	20.5	1577	62.1	867	34.1	654	25.7	789	31.0	519	20.4	519	20.4
		623	24.5	1780	70.1	968	38.1	756	29.8	890	35.0	519	20.4	519	20.4
435	5 or 5H	115	4.5	742	29.2	438	17.2	248	9.8	371	14.6	572	22.5	572	22.5
		216	8.5	929	36.6	524	20.6	349	13.7	465	18.3	572	22.5	572	22.5
		318	12.5	1171	46.1	664	26.1	451	17.8	586	23.1	572	22.5	572	22.5
		420	16.5	1375	54.1	766	30.2	553	21.8	688	27.1	572	22.5	572	22.5
		521	20.5	1577	62.1	867	34.1	654	25.7	789	31.0	572	22.5	572	22.5
		623	24.5	1782	70.2	970	38.2	756	29.8	891	35.1	572	22.5	572	22.5
	7	115	4.5	774	30.5	470	18.5	248	9.8	387	15.2	572	22.5	572	22.5
		216	8.5	1005	39.6	600	23.6	349	13.7	503	19.8	572	22.5	572	22.5
		318	12.5	1171	46.1	664	26.1	451	17.8	586	23.1	572	22.5	572	22.5
		420	16.5	1375	54.1	766	30.2	553	21.8	688	27.1	572	22.5	572	22.5
		521	20.5	1577	62.1	867	34.1	654	25.7	789	31.0	572	22.5	572	22.5
		623	24.5	1780	70.1	968	38.1	756	29.8	890	35.0	572	22.5	572	22.5
485	5 or 5H	115	4.5	790	31.1	438	17.2	276	10.9	395	15.6	636	25.0	636	25.0
		216	8.5	977	38.5	524	20.6	377	14.8	489	19.2	636	25.0	636	25.0
		318	12.5	1219	48.0	664	26.1	479	18.9	610	24.0	636	25.0	636	25.0
		420	16.5	1423	56.0	766	30.2	581	22.9	712	28.0	636	25.0	636	25.0
		521	20.5	1625	64.0	867	34.1	682	26.9	813	32.0	636	25.0	636	25.0
		623	24.5	1830	72.0	970	38.2	784	30.9	915	36.0	636	25.0	636	25.0
	7	115	4.5	822	32.4	470	18.5	276	10.9	411	16.2	636	25.0	636	25.0
		216	8.5	1053	41.5	600	23.6	377	14.8	527	20.7	636	25.0	636	25.0
		318	12.5	1219	48.0	664	26.1	479	18.9	610	24.0	636	25.0	636	25.0
		420	16.5	1423	56.0	766	30.2	581	22.9	712	28.0	636	25.0	636	25.0
		521	20.5	1625	64.0	867	34.1	682	26.9	813	32.0	636	25.0	636	25.0
		623	24.5	1828	72.0	968	38.1	784	30.9	914	36.0	636	25.0	636	25.0
535	5 or 5H	115	4.5	792	31.2	438	17.2	278	10.9	396	15.6	684	26.9	694	27.3
		216	8.5	979	38.5	524	20.6	379	14.9	490	19.3	684	26.9	694	27.3
		318	12.5	1221	48.1	664	26.1	481	18.9	611	24.0	684	26.9	694	27.3
		420	16.5	1425	56.1	766	30.2	583	23.0	713	28.1	684	26.9	694	27.3
		521	20.5	1627	64.1	867	34.1	684	26.9	814	32.0	684	26.9	694	27.3
		623	24.5	1832	72.1	970	38.2	786	30.9	916	36.1	684	26.9	694	27.3
	7	115	4.5	824	32.4	470	18.5	278	10.9	412	16.2	684	26.9	694	27.3
		216	8.5	1055	41.5	600	23.6	379	14.9	528	20.8	684	26.9	694	27.3
		318	12.5	1221	48.1	664	26.1	481	18.9	611	24.0	684	26.9	694	27.3
		420	16.5	1425	56.1	766	30.2	583	23.0	713	28.1	684	26.9	694	27.3
		521	20.5	1627	64.1	867	34.1	684	26.9	814	32.0	684	26.9	694	27.3
		623	24.5	1830	72.0	968	38.1	786	30.9	915	36.0	684	26.9	694	27.3

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Table 8. 785C Double-Acting Springless Dimensions A, A1, A3, G, B, and C(1) (cont.)

ACTUATOR SIZE	YOKE BOSS, Inch	MAXIMUM TRAVEL		A		A1		A3		G		B		C	
		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
585	5H	115	4.5	833	32.8	461	18.1	296	11.7	417	16.4	737	29.0	750	29.5
		216	8.5	1020	40.2	547	21.5	397	15.6	510	20.1	737	29.0	750	29.5
		318	12.5	1262	49.7	687	27.0	499	19.6	631	24.8	737	29.0	750	29.5
		420	16.5	1466	57.7	789	31.1	601	23.7	733	28.9	737	29.0	750	29.5
		521	20.5	1668	65.7	890	35.0	702	27.6	834	32.8	737	29.0	750	29.5
		623	24.5	1872	73.7	992	39.1	804	31.7	936	36.9	737	29.0	750	29.5
	7	115	4.5	862	33.9	490	19.3	296	11.7	431	17.0	737	29.0	750	29.5
		216	8.5	1093	43.0	620	24.4	397	15.6	547	21.5	737	29.0	750	29.5
		318	12.5	1259	49.6	684	26.9	499	19.6	630	24.8	737	29.0	750	29.5
		420	16.5	1462	57.6	785	30.9	601	23.7	731	28.8	737	29.0	750	29.5
		521	20.5	1665	65.6	887	34.9	702	27.6	833	32.8	737	29.0	750	29.5
		623	24.5	1869	73.6	989	38.9	804	31.7	935	36.8	737	29.0	750	29.5
635	5H	115	4.5	833	32.8	461	18.1	296	11.7	417	16.4	779	30.7	799	31.5
		216	8.5	1020	40.2	547	21.5	397	15.6	510	20.1	779	30.7	799	31.5
		318	12.5	1262	49.7	687	27.0	499	19.6	631	24.8	779	30.7	799	31.5
		420	16.5	1466	57.7	789	31.1	601	23.7	733	28.9	779	30.7	799	31.5
		521	20.5	1668	65.7	890	35.0	702	27.6	834	32.8	779	30.7	799	31.5
		623	24.5	1872	73.7	992	39.1	804	31.7	936	36.9	779	30.7	799	31.5
	7	115	4.5	862	33.9	490	19.3	296	11.7	431	17.0	779	30.7	799	31.5
		216	8.5	1093	43.0	620	24.4	397	15.6	547	21.5	779	30.7	799	31.5
		318	12.5	1259	49.6	684	26.9	499	19.6	630	24.8	779	30.7	799	31.5
		420	16.5	1462	57.6	785	30.9	601	23.7	731	28.8	779	30.7	799	31.5
		521	20.5	1665	65.6	887	34.9	702	27.6	833	32.8	779	30.7	799	31.5
		623	24.5	1869	73.6	989	38.9	804	31.7	935	36.8	779	30.7	799	31.5
685	5H	115	4.5	868	34.2	486	19.1	306	12.0	434	17.1	832	32.8	855	33.7
		216	8.5	1055	41.5	572	22.5	407	16.0	528	20.8	832	32.8	855	33.7
		318	12.5	1297	51.1	712	28.0	509	20.0	649	25.5	832	32.8	855	33.7
		420	16.5	1501	59.1	814	32.0	611	24.1	751	29.5	832	32.8	855	33.7
		521	20.5	1703	67.0	915	36.0	712	28.0	852	33.5	832	32.8	855	33.7
		623	24.5	1907	75.1	1017	40.0	814	32.0	954	37.5	832	32.8	855	33.7
	7	115	4.5	897	35.3	515	20.3	306	12.0	449	17.7	832	32.8	855	33.7
		216	8.5	1128	44.4	645	25.4	407	16.0	564	22.2	832	32.8	855	33.7
		318	12.5	1294	50.9	709	27.9	509	20.0	647	25.5	832	32.8	855	33.7
		420	16.5	1497	58.9	810	31.9	611	24.1	749	29.5	832	32.8	855	33.7
		521	20.5	1700	66.9	912	35.9	712	28.0	850	33.5	832	32.8	855	33.7
		623	24.5	1904	75.0	1014	39.9	814	32.0	952	37.5	832	32.8	855	33.7

1. Dimensions of A, A1, A3, B, C and G (Center of Gravity) are the max value of each travel. Contact your Emerson sales office for details.

Table 9. 785C Double-Acting Springless with Manual Override Dimensions A, A1, A3, A4, AR, G, B, and C(1)

ACTUATOR SIZE	YOKE BOSS, Inch	MANUAL OVERRIDE	MAXIMUM TRAVEL		A		A1		A3		A4	
			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	3-9/16	MHW	115	4.5	1002	39.4	416	16.4	296	11.7	290	11.4
			216	8.5	1312	51.7	524	20.6	397	15.6	391	15.4
	5 or 5H		115	4.5	1024	40.3	438	17.2	296	11.7	290	11.4
			216	8.5	1312	51.7	524	20.6	397	15.6	391	15.4
			318	12.5	1655	65.2	664	26.1	499	19.6	492	19.4
			420	16.5	1960	77.2	766	30.2	601	23.7	593	23.3
			521	20.5	2263	89.1	867	34.1	702	27.6	694	27.3
			623	24.5	2568	101.1	969	38.1	804	31.7	795	31.3
335	3-9/16		115	4.5	1009	39.7	416	16.4	302.5	11.9	290	11.4
			216	8.5	1319	51.9	524	20.6	403.5	15.9	391	15.4
	5 or 5H		115	4.5	1031	40.6	438	17.2	302.5	11.9	290	11.4
			216	8.5	1319	51.9	524	20.6	403.5	15.9	391	15.4
			318	12.5	1662	65.4	664	26.1	505.5	19.9	492	19.4
			420	16.5	1967	77.4	766	30.2	607.5	23.9	593	23.3
			521	20.5	2270	89.4	867	34.1	708.5	27.9	694	27.3
			623	24.5	2575	101.4	969	38.1	810.5	31.9	795	31.3
385	3-9/16		115	4.5	991	39.0	416	16.4	285	11.2	290	11.4
			216	8.5	1301	51.2	524	20.6	386	15.2	391	15.4
	5 or 5H		115	4.5	1013	39.9	438	17.2	285	11.2	290	11.4
			216	8.5	1301	51.2	524	20.6	386	15.2	391	15.4
			318	12.5	1644	64.7	664	26.1	488	19.2	492	19.4
			420	16.5	1949	76.7	766	30.2	590	23.2	593	23.3
			521	20.5	2252	88.7	867	34.1	691	27.2	694	27.3
			623	24.5	2558	100.7	970	38.2	793	31.2	795	31.3
	7		115	4.5	1045	41.1	470	18.5	285	11.2	290	11.4
			216	8.5	1377	54.2	600	23.6	386	15.2	391	15.4
			318	12.5	1644	64.7	664	26.1	488	19.2	492	19.4
			420	16.5	1949	76.7	766	30.2	590	23.2	593	23.3
			521	20.5	2252	88.7	867	34.1	691	27.2	694	27.3
			623	24.5	2556	100.6	968	38.1	793	31.2	795	31.3
435	5 or 5H	MHP	115	4.5	1095	43.1	438	17.2	282	11.1	375	14.8
			216	8.5	1403	55.2	524	20.6	383	15.1	496	19.5
			318	12.5	1746	68.7	664	26.1	485	19.1	597	23.5
			420	16.5	2051	80.7	766	30.2	587	23.1	698	27.5
			521	20.5	2354	92.7	867	34.1	688	27.1	799	31.5
			623	24.5	2660	104.7	970	38.2	790	31.1	900	35.4
	7		115	4.5	1127	44.4	470	18.5	282	11.1	375	14.8
			216	8.5	1479	58.2	600	23.6	383	15.1	496	19.5
			318	12.5	1746	68.7	664	26.1	485	19.1	597	23.5
			420	16.5	2051	80.7	766	30.2	587	23.1	698	27.5
			521	20.5	2354	92.7	867	34.1	688	27.1	799	31.5
			623	24.5	2658	104.6	968	38.1	790	31.1	900	35.4
485	5 or 5H		115	4.5	1126	44.3	438	17.2	313	12.3	375	14.8
			216	8.5	1434	56.5	524	20.6	414	16.3	496	19.5
			318	12.5	1777	70.0	664	26.1	516	20.3	597	23.5
			420	16.5	2082	82.0	766	30.2	618	24.3	698	27.5
			521	20.5	2385	93.9	867	34.1	719	28.3	799	31.5
			623	24.5	2691	105.9	970	38.2	821	32.3	900	35.4
	7		115	4.5	1158	45.6	470	18.5	313	12.3	375	14.8
			216	8.5	1510	59.4	600	23.6	414	16.3	496	19.5
			318	12.5	1777	70.0	664	26.1	516	20.3	597	23.5
			420	16.5	2082	82.0	766	30.2	618	24.3	698	27.5
			521	20.5	2385	93.9	867	34.1	719	28.3	799	31.5
			623	24.5	2689	105.9	968	38.1	821	32.3	900	35.4

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Table 9. 785C Double-Acting Springless with Manual Override Dimensions A, A1, A3, A4, AR, G, B, and C(1) (cont.)

ACTUATOR SIZE	YOKE BOSS, Inch	MANUAL OVERRIDE	MAXIMUM TRAVEL		A		A1		A3		A4	
			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
535	5 or 5H	MHP	115	4.5	1130	44.5	438	17.2	317	12.5	375	14.8
			216	8.5	1438	56.6	524	20.6	418	16.5	496	19.5
			318	12.5	1781	70.1	664	26.1	520	20.5	597	23.5
			420	16.5	2086	82.1	766	30.2	622	24.5	698	27.5
			521	20.5	2389	94.1	867	34.1	723	28.5	799	31.5
			623	24.5	2695	106.1	970	38.2	825	32.5	900	35.4
	7		115	4.5	1162	45.7	470	18.5	317	12.5	375	14.8
			216	8.5	1514	59.6	600	23.6	418	16.5	496	19.5
			318	12.5	1781	70.1	664	26.1	520	20.5	597	23.5
			420	16.5	2086	82.1	766	30.2	622	24.5	698	27.5
			521	20.5	2389	94.1	867	34.1	723	28.5	799	31.5
			623	24.5	2693	106.0	968	38.1	825	32.5	900	35.4
585	5H		115	4.5	1201	47.3	461	18.1	348	13.7	392	15.4
			216	8.5	1509	59.4	547	21.5	449	17.7	513	20.2
			318	12.5	1852	72.9	687	27.0	551	21.7	614	24.2
			420	16.5	2157	84.9	789	31.1	653	25.7	715	28.1
			521	20.5	2460	96.9	890	35.0	754	29.7	816	32.1
			623	24.5	2765	108.9	992	39.1	856	33.7	917	36.1
	7		115	4.5	1230	48.4	490	19.3	348	13.7	392	15.4
			216	8.5	1582	62.3	620	24.4	449	17.7	513	20.2
			318	12.5	1849	72.8	684	26.9	551	21.7	614	24.2
			420	16.5	2153	84.8	785	30.9	653	25.7	715	28.1
			521	20.5	2457	96.7	887	34.9	754	29.7	816	32.1
			623	24.5	2762	108.7	989	38.9	856	33.7	917	36.1
635	5H		115	4.5	1202	47.3	461	18.1	349	13.7	392	15.4
			216	8.5	1510	59.4	547	21.5	450	17.7	513	20.2
			318	12.5	1853	73.0	687	27.0	552	21.7	614	24.2
			420	16.5	2158	85.0	789	31.1	654	25.7	715	28.1
			521	20.5	2461	96.9	890	35.0	755	29.7	816	32.1
			623	24.5	2766	108.9	992	39.1	857	33.7	917	36.1
	7		115	4.5	1231	48.5	490	19.3	349	13.7	392	15.4
			216	8.5	1583	62.3	620	24.4	450	17.7	513	20.2
			318	12.5	1850	72.8	684	26.9	552	21.7	614	24.2
			420	16.5	2154	84.8	785	30.9	654	25.7	715	28.1
			521	20.5	2458	96.8	887	34.9	755	29.7	816	32.1
			623	24.5	2763	108.8	989	38.9	857	33.7	917	36.1
685	5H		115	4.5	1251	49.3	486	19.1	373	14.7	392	15.4
			216	8.5	1559	61.4	572	22.5	474	18.7	513	20.2
			318	12.5	1902	74.9	712	28.0	576	22.7	614	24.2
			420	16.5	2207	86.9	814	32.0	678	26.7	715	28.1
			521	20.5	2510	98.8	915	36.0	779	30.7	816	32.1
			623	24.5	2815	110.8	1017	40.0	881	34.7	917	36.1
	7		115	4.5	1280	50.4	515	20.3	373	14.7	392	15.4
			216	8.5	1632	64.3	645	25.4	474	18.7	513	20.2
			318	12.5	1899	74.8	709	27.9	576	22.7	614	24.2
			420	16.5	2203	86.7	810	31.9	678	26.7	715	28.1
			521	20.5	2507	98.7	912	35.9	779	30.7	816	32.1
			623	24.5	2812	110.7	1014	39.9	881	34.7	917	36.1

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Table 9. 785C Double-Acting Springless with Manual Override Dimensions A, A1, A3, A4, AR, G, B, and C(1) (cont.)

ACTUATOR SIZE	YOKE BOSS, Inch	MANUAL OVERRIDE	MAXIMUM TRAVEL		G		∅B / B		B1		C		C1	
			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	3-9/16	MHW	115	4.5	501	19.7	850	33.5	419	16.5	464	18	- - -	- - -
			216	8.5	656	25.8	850	33.5	419	16.5	464	18	- - -	- - -
	5 or 5H		115	4.5	512	20.2	850	33.5	419	16.5	464	18	- - -	- - -
			216	8.5	656	25.8	850	33.5	419	16.5	464	18	- - -	- - -
			318	12.5	828	32.6	850	33.5	419	16.5	464	18	- - -	- - -
			420	16.5	980	38.6	850	33.5	419	16.5	464	18	- - -	- - -
			521	20.5	1132	44.5	850	33.5	419	16.5	464	18	- - -	- - -
			623	24.5	1284	50.6	850	33.5	419	16.5	464	18	- - -	- - -
335	3-9/16		115	4.5	504	19.9	1250	49.2	472	18.6	517	20	- - -	- - -
			216	8.5	659	26.0	1250	49.2	472	18.6	517	20	- - -	- - -
	5 or 5H		115	4.5	515	20.3	1250	49.2	472	18.6	517	20	- - -	- - -
			216	8.5	659	26.0	1250	49.2	472	18.6	517	20	- - -	- - -
			318	12.5	831	32.7	1250	49.2	472	18.6	517	20	- - -	- - -
			420	16.5	983	38.7	1250	49.2	472	18.6	517	20	- - -	- - -
			521	20.5	1135	44.7	1250	49.2	472	18.6	517	20	- - -	- - -
			623	24.5	1287	50.7	1250	49.2	472	18.6	517	20	- - -	- - -
385	3-9/16		115	4.5	496	19.5	1400	55.1	519	20.4	564	22	- - -	- - -
			216	8.5	651	25.6	1400	55.1	519	20.4	564	22	- - -	- - -
	5 or 5H		115	4.5	507	19.9	1400	55.1	519	20.4	564	22	- - -	- - -
			216	8.5	651	25.6	1400	55.1	519	20.4	564	22	- - -	- - -
			318	12.5	822	32.4	1400	55.1	519	20.4	564	22	- - -	- - -
			420	16.5	975	38.4	1400	55.1	519	20.4	564	22	- - -	- - -
			521	20.5	1126	44.3	1400	55.1	519	20.4	564	22	- - -	- - -
			623	24.5	1279	50.4	1400	55.1	519	20.4	564	22	- - -	- - -
	7		115	4.5	523	20.6	1400	55.1	519	20.4	564	22	- - -	- - -
			216	8.5	689	27.1	1400	55.1	519	20.4	564	22	- - -	- - -
			318	12.5	822	32.4	1400	55.1	519	20.4	564	22	- - -	- - -
			420	16.5	975	38.4	1400	55.1	519	20.4	564	22	- - -	- - -
			521	20.5	1126	44.3	1400	55.1	519	20.4	564	22	- - -	- - -
			623	24.5	1278	50.3	1400	55.1	519	20.4	564	22	- - -	- - -
435	5 or 5H	MHP	115	4.5	548	21.6	908	35.7	572	22.5	846	33	565	22.2
			216	8.5	702	27.6	908	35.7	572	22.5	846	33	565	22.2
			318	12.5	873	34.4	908	35.7	572	22.5	846	33	565	22.2
			420	16.5	1026	40.4	908	35.7	572	22.5	846	33	565	22.2
			521	20.5	1177	46.3	908	35.7	572	22.5	846	33	565	22.2
			623	24.5	1330	52.4	908	35.7	572	22.5	846	33	565	22.2
	7		115	4.5	564	22.2	908	35.7	572	22.5	846	33	565	22.2
			216	8.5	740	29.1	908	35.7	572	22.5	846	33	565	22.2
			318	12.5	873	34.4	908	35.7	572	22.5	846	33	565	22.2
			420	16.5	1026	40.4	908	35.7	572	22.5	846	33	565	22.2
			521	20.5	1177	46.3	908	35.7	572	22.5	846	33	565	22.2
			623	24.5	1329	52.3	908	35.7	572	22.5	846	33	565	22.2
485	5 or 5H		115	4.5	563	22.2	940	37.0	636	25.0	858	34	630	24.8
			216	8.5	717	28.2	940	37.0	636	25.0	858	34	630	24.8
			318	12.5	889	35.0	940	37.0	636	25.0	858	34	630	24.8
			420	16.5	1041	41.0	940	37.0	636	25.0	858	34	630	24.8
			521	20.5	1193	46.9	940	37.0	636	25.0	858	34	630	24.8
			623	24.5	1346	53.0	940	37.0	636	25.0	858	34	630	24.8
	7		115	4.5	579	22.8	940	37.0	636	25.0	858	34	630	24.8
			216	8.5	755	29.7	940	37.0	636	25.0	858	34	630	24.8
			318	12.5	889	35.0	940	37.0	636	25.0	858	34	630	24.8
			420	16.5	1041	41.0	940	37.0	636	25.0	858	34	630	24.8
			521	20.5	1193	46.9	940	37.0	636	25.0	858	34	630	24.8
			623	24.5	1345	52.9	940	37.0	636	25.0	858	34	630	24.8

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Table 9. 785C Double-Acting Springless with Manual Override Dimensions A, A1, A3, A4, AR, G, B, and C[1] (cont.)

ACTUATOR SIZE	YOKE BOSS, Inch	MANUAL OVERRIDE	MAXIMUM TRAVEL		G		∅B / B		B1		C		C1	
			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
535	5 or 5H	MHP	115	4.5	565	22.2	962	37.9	684	26.9	915	36	680	26.8
			216	8.5	719	28.3	962	37.9	684	26.9	915	36	680	26.8
			318	12.5	891	35.1	962	37.9	684	26.9	915	36	680	26.8
			420	16.5	1043	41.1	962	37.9	684	26.9	915	36	680	26.8
			521	20.5	1195	47.0	962	37.9	684	26.9	915	36	680	26.8
			623	24.5	1348	53.1	962	37.9	684	26.9	915	36	680	26.8
	7		115	4.5	581	22.9	962	37.9	684	26.9	915	36	680	26.8
			216	8.5	757	29.8	962	37.9	684	26.9	915	36	680	26.8
			318	12.5	891	35.1	962	37.9	684	26.9	915	36	680	26.8
			420	16.5	1043	41.1	962	37.9	684	26.9	915	36	680	26.8
			521	20.5	1195	47.0	962	37.9	684	26.9	915	36	680	26.8
			623	24.5	1347	53.0	962	37.9	684	26.9	983	36	680	26.8
585	5H		115	4.5	601	23.6	1102	43.4	737	29.0	983	39	730	28.7
			216	8.5	755	29.7	1102	43.4	737	29.0	983	39	730	28.7
			318	12.5	926	36.5	1102	43.4	737	29.0	983	39	730	28.7
			420	16.5	1079	42.5	1102	43.4	737	29.0	983	39	730	28.7
			521	20.5	1230	48.4	1102	43.4	737	29.0	983	39	730	28.7
			623	24.5	1383	54.4	1102	43.4	737	29.0	983	39	730	28.7
	7		115	4.5	615	24.2	1102	43.4	737	29.0	983	39	730	28.7
			216	8.5	791	31.1	1102	43.4	737	29.0	983	39	730	28.7
			318	12.5	925	36.4	1102	43.4	737	29.0	983	39	730	28.7
			420	16.5	1077	42.4	1102	43.4	737	29.0	983	39	730	28.7
			521	20.5	1229	48.4	1102	43.4	737	29.0	983	39	730	28.7
			623	24.5	1381	54.4	1102	43.4	737	29.0	983	39	730	28.7
635	5H		115	4.5	601	23.7	1127	44.4	779	30.7	1007	40	785	30.9
			216	8.5	755	29.7	1127	44.4	779	30.7	1007	40	785	30.9
			318	12.5	927	36.5	1127	44.4	779	30.7	1007	40	785	30.9
			420	16.5	1079	42.5	1127	44.4	779	30.7	1007	40	785	30.9
			521	20.5	1231	48.4	1127	44.4	779	30.7	1007	40	785	30.9
			623	24.5	1383	54.4	1127	44.4	779	30.7	1007	40	785	30.9
	7		115	4.5	616	24.2	1127	44.4	779	30.7	1007	40	785	30.9
			216	8.5	792	31.2	1127	44.4	779	30.7	1007	40	785	30.9
			318	12.5	925	36.4	1127	44.4	779	30.7	1007	40	785	30.9
			420	16.5	1077	42.4	1127	44.4	779	30.7	1007	40	785	30.9
			521	20.5	1229	48.4	1127	44.4	779	30.7	1007	40	785	30.9
			623	24.5	1382	54.4	1127	44.4	779	30.7	1007	40	785	30.9
685	5H		115	4.5	626	24.6	1153	45.4	832	32.8	1035	41	840	33.1
			216	8.5	780	30.7	1153	45.4	832	32.8	1035	41	840	33.1
			318	12.5	951	37.4	1153	45.4	832	32.8	1035	41	840	33.1
			420	16.5	1104	43.4	1153	45.4	832	32.8	1035	41	840	33.1
			521	20.5	1255	49.4	1153	45.4	832	32.8	1035	41	840	33.1
			623	24.5	1408	55.4	1153	45.4	832	32.8	1035	41	840	33.1
	7		115	4.5	640	25.2	1153	45.4	832	32.8	1035	41	840	33.1
			216	8.5	816	32.1	1153	45.4	832	32.8	1035	41	840	33.1
			318	12.5	950	37.4	1153	45.4	832	32.8	1035	41	840	33.1
			420	16.5	1102	43.4	1153	45.4	832	32.8	1035	41	840	33.1
			521	20.5	1254	49.4	1153	45.4	832	32.8	1035	41	840	33.1
			623	24.5	1406	55.4	1153	45.4	832	32.8	1035	41	840	33.1

1. Dimensions of A, A1, A3, A4, ØB/B, B1, C, and G (Center of Gravity) are the max value of each travel. Contact your Emerson sales office for details.

Table 10. 785C Double-Acting Springless Dimension Z and W

ACTUATOR SIZE	WITHOUT MANUAL OVERRIDE				WITH MANUAL OVERRIDE			
	Z		W		Z		W	
	3-9/16, 5, 5H, or 7 Inch Yoke Boss				3-9/16, 5, 5H, or 7 Inch Yoke Boss			
	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	254	10	292	11.5	254	10	292	11.5
335	254	10	292	11.5	254	10	292	11.5
385	330	13	330	13	330	13	330	13
435	330	13	330	13	330	13	330	13
485	330	13	330	13	330	13	330	13
535	330	13	330	13	330	13	330	13
585	487	19.2	436	17.2	487	19.2	436	17.2
635	487	19.2	436	17.2	487	19.2	436	17.2
685	487	19.2	436	17.2	487	19.2	436	17.2

Figure 4. Fisher 785C Double-Acting Springless Piston Actuator with Manual Hand Wheel (MHW) (see table 9 and 10)

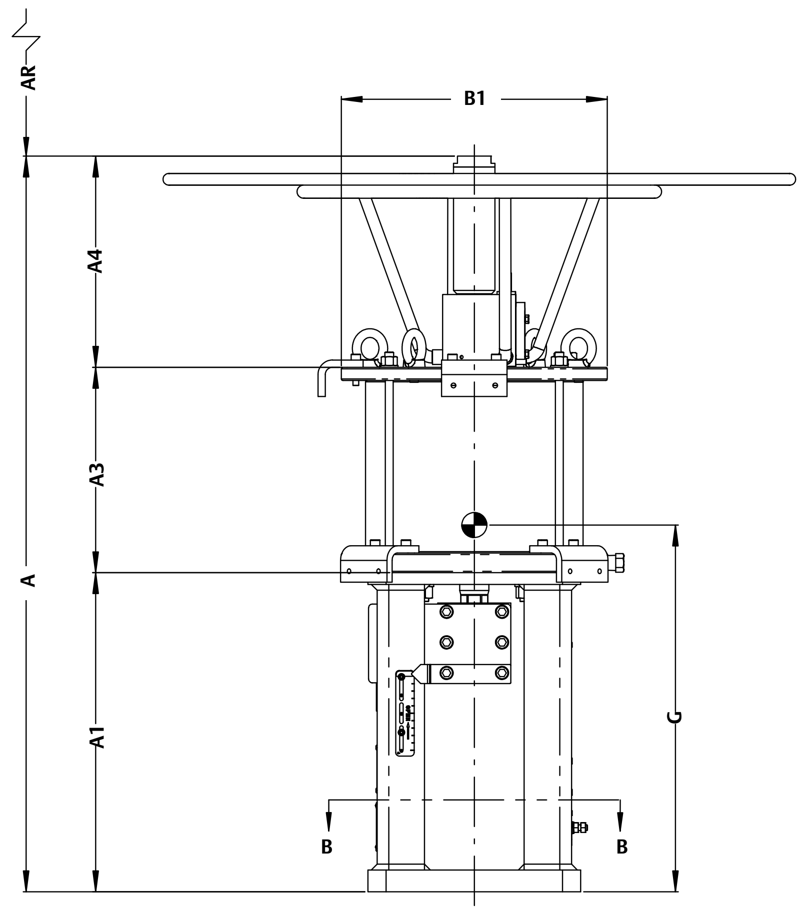

Figure 5. Fisher 785C Double-Acting Springless Piston Actuator with Manual Hand Pump (MHP) (see table 9 and 10)

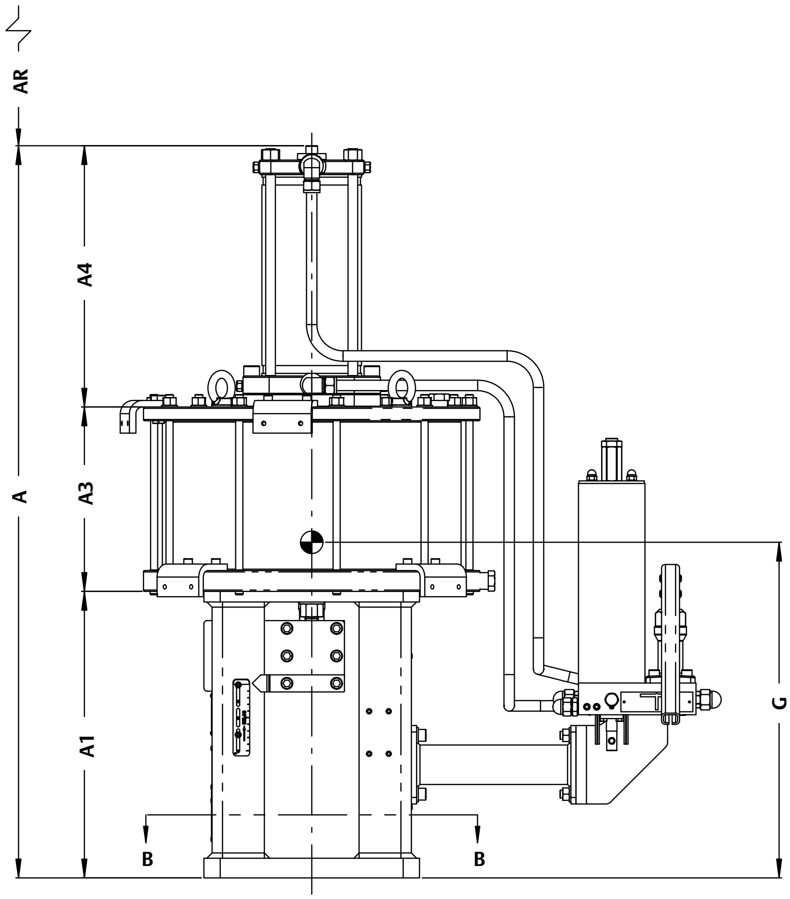

Figure 6. Fisher 785C Single-Acting Spring Return Piston Actuator (see table 11, 12, 13, 14, and 15)

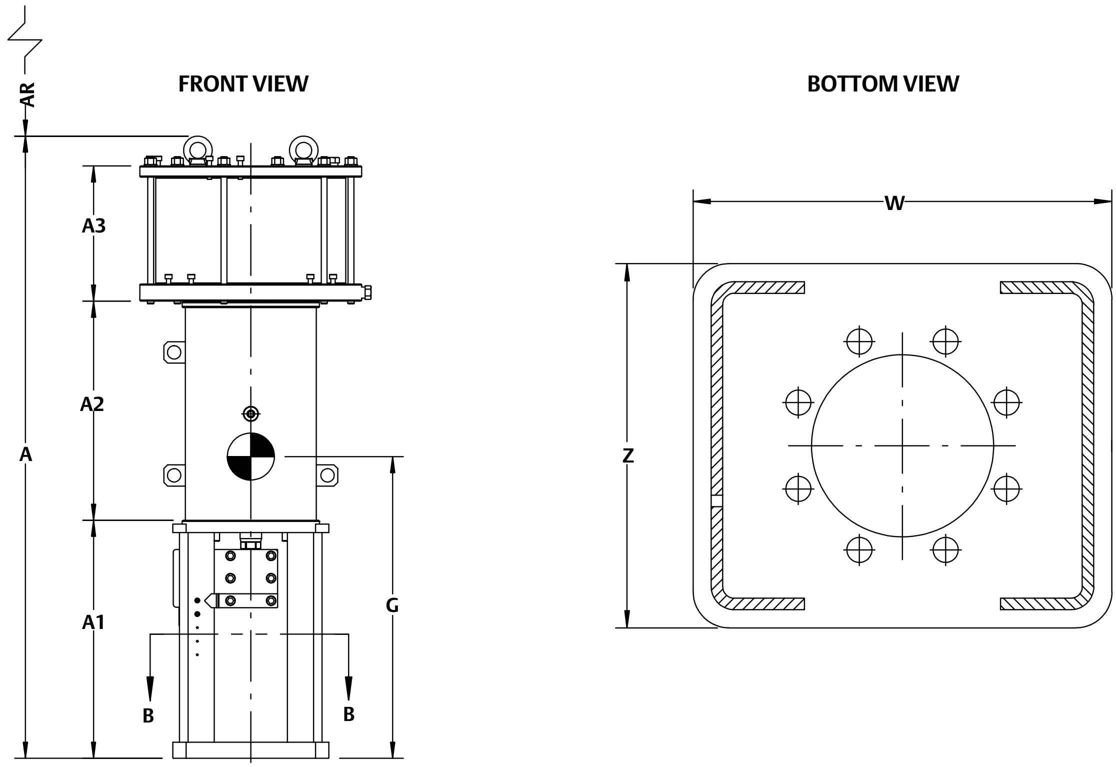

Table 11. 785C Single-Acting Spring Return (Spring Retracts) Dimensions A, A1, A2, A3, G, B and C(1)

ACTU-ATOR SIZE	YOKE BOSS	Maximum Travel		Spring	A		A1		A2		A3		G		B		C	
	Inch (mm)	mm	Inch		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	3-9/16	115	4.5	F1	1360	53.5	416	16.4	643	25.3	245	9.6	680	26.8	419	16.5	419	16.5
		216	8.5	F1	1849	72.8	524	20.6	923	36.3	346	13.6	925	36.4	419	16.5	419	16.5
	5 or 5H	115	4.5	F1	1382	54.4	438	17.2	643	25.3	245	9.6	691	27.2	419	16.5	419	16.5
		216	8.5	F1	1849	72.8	524	20.6	923	36.3	346	13.6	925	36.4	419	16.5	419	16.5
335	3-9/16	115	4.5	F1	1425	56.1	416	16.4	705	27.8	248	9.8	713	28.1	472	18.6	472	18.6
		216	8.5	F2	1700	66.9	524	20.6	771	30.4	349	13.7	850	33.5	472	18.6	472	18.6
	5 or 5H	115	4.5	F1	1447	57.0	438	17.2	705	27.8	248	9.8	724	28.5	472	18.6	472	18.6
		216	8.5	F2	1700	66.9	524	20.6	771	30.4	349	13.7	850	33.5	472	18.6	472	18.6
385	3-9/16	115	4.5	F2	1425	56.1	416	16.4	705	27.8	248	9.8	713	28.1	519	20.4	519	20.4
		216	8.5	F1	1860	73.2	524	20.6	931	36.7	349	13.7	930	36.6	519	20.4	519	20.4
	5 or 5H	115	4.5	F2	1447	57.0	438	17.2	705	27.8	248	9.8	724	28.5	519	20.4	519	20.4
		216	8.5	F1	1860	73.2	524	20.6	931	36.7	349	13.7	930	36.6	519	20.4	519	20.4
		318	12.5	F1	2281	89.8	664	26.1	1110	43.7	451	17.8	1141	44.9	519	20.4	519	20.4
	7	115	4.5	F2	1479	58.2	470	18.5	705	27.8	248	9.8	740	29.1	519	20.4	519	20.4
		216	8.5	F1	1936	76.2	600	23.6	931	36.7	349	13.7	968	38.1	519	20.4	519	20.4
		318	12.5	F1	2281	89.8	664	26.1	1110	43.7	451	17.8	1141	44.9	519	20.4	519	20.4
435	5 or 5H	115	4.5	F1	1447	57.0	438	17.2	705	27.8	248	9.8	724	28.5	572	22.5	572	22.5
		216	8.5	F1	1769	69.6	524	20.6	840	33.1	349	13.7	885	34.8	572	22.5	572	22.5
		318	12.5	F1	2206	86.9	664	26.1	1035	40.7	451	17.8	1103	43.4	572	22.5	572	22.5
		420	16.5	F1	2507	98.7	766	30.2	1132	44.6	553	21.8	1254	49.4	572	22.5	572	22.5
	7	115	4.5	F1	1479	58.2	470	18.5	705	27.8	248	9.8	740	29.1	572	22.5	572	22.5
		216	8.5	F1	1845	72.6	600	23.6	840	33.1	349	13.7	923	36.3	572	22.5	572	22.5
		318	12.5	F1	2206	86.9	664	26.1	1035	40.7	451	17.8	1103	43.4	572	22.5	572	22.5
		420	16.5	F1	2507	98.7	766	30.2	1132	44.6	553	21.8	1254	49.4	572	22.5	572	22.5
485	5 or 5H	115	4.5	F1	1428	56.2	438	17.2	638	25.1	276	10.9	714	28.1	636	25.0	636	25.0
		216	8.5	F1	1817	71.5	524	20.6	840	33.1	377	14.8	909	35.8	636	25.0	636	25.0
		318	12.5	F1	2252	88.7	664	26.1	1033	40.7	479	18.9	1126	44.3	636	25.0	636	25.0
		420	16.5	F1	2548	100.3	766	30.2	1125	44.3	581	22.9	1274	50.2	636	25.0	636	25.0
	7	115	4.5	F1	1460	57.5	470	18.5	638	25.1	276	10.9	730	28.7	636	25.0	636	25.0
		216	8.5	F1	1893	74.5	600	23.6	840	33.1	377	14.8	947	37.3	636	25.0	636	25.0
		318	12.5	F1	2252	88.7	664	26.1	1033	40.7	479	18.9	1126	44.3	636	25.0	636	25.0
		420	16.5	F1	2548	100.3	766	30.2	1125	44.3	581	22.9	1274	50.2	636	25.0	636	25.0
535	5 or 5H	115	4.5	F1	1563	61.5	438	17.2	771	30.4	278	10.9	782	30.8	684	26.9	694	27.3
		216	8.5	F2	1772	69.8	524	20.6	793	31.2	379	14.9	886	34.9	684	26.9	694	27.3
		318	12.5	F1	2216	87.2	664	26.1	995	39.2	481	18.9	1108	43.6	684	26.9	694	27.3
		420	16.5	F1	2469	97.2	766	30.2	1044	41.1	583	23.0	1235	48.6	684	26.9	694	27.3
	7	115	4.5	F1	1595	62.8	470	18.5	771	30.4	278	10.9	798	31.4	684	26.9	694	27.3
		216	8.5	F2	1848	72.8	600	23.6	793	31.2	379	14.9	924	36.4	684	26.9	694	27.3
		318	12.5	F1	2216	87.2	664	26.1	995	39.2	481	18.9	1108	43.6	684	26.9	694	27.3
		420	16.5	F1	2469	97.2	766	30.2	1044	41.1	583	23.0	1235	48.6	684	26.9	694	27.3

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Table 11. 785C Single-Acting Spring Return (Spring Retracts) Dimensions A, A1, A2, A3, G, B and C(1) (cont.)

ACTUATOR SIZE	YOKE BOSS	Maximum Travel		Spring	A		A1		A2		A3		G		B		C	
	Inch (mm)	mm	Inch		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
585	5H	115	4.5	F1	1613	63.5	461	18.1	780	30.7	296	11.7	807	31.8	737	29.0	750	29.5
		216	8.5	F1	1824	71.8	547	21.5	804	31.7	397	15.6	912	35.9	737	29.0	750	29.5
		318	12.5	F1	2284	89.9	687	27.0	1022	40.2	499	19.6	1142	45.0	737	29.0	750	29.5
		420	16.5	F1	2555	100.6	789	31.1	1089	42.9	601	23.7	1278	50.3	737	29.0	750	29.5
	7	115	4.5	F1	1642	64.6	490	19.3	780	30.7	296	11.7	821	32.3	737	29.0	750	29.5
		216	8.5	F1	1897	74.7	620	24.4	804	31.7	397	15.6	949	37.3	737	29.0	750	29.5
		318	12.5	F1	2281	89.8	684	26.9	1022	40.2	499	19.6	1141	44.9	737	29.0	750	29.5
		420	16.5	F1	2551	100.4	785	30.9	1089	42.9	601	23.7	1276	50.2	737	29.0	750	29.5
635	5H	115	4.5	F2	1355	53.3	461	18.1	522	20.6	296	11.7	678	26.7	779	30.7	799	31.5
		216	8.5	F1	1824	71.8	547	21.5	804	31.7	397	15.6	912	35.9	779	30.7	799	31.5
	7	115	4.5	F2	1384	54.5	490	19.3	522	20.6	296	11.7	692	27.2	779	30.7	799	31.5
		216	8.5	F1	1897	74.7	620	24.4	804	31.7	397	15.6	949	37.3	779	30.7	799	31.5
685	5H	115	4.5	F1	1628	64.1	486	19.1	760	29.9	306	12.0	814	32.0	832	32.8	855	33.7
		216	8.5	F1	1864	73.4	572	22.5	809	31.9	407	16.0	932	36.7	832	32.8	855	33.7
	7	115	4.5	F1	1657	65.2	515	20.3	760	29.9	306	12.0	829	32.6	832	32.8	855	33.7
		216	8.5	F1	1937	76.3	645	25.4	809	31.9	407	16.0	969	38.1	832	32.8	855	33.7

1. Dimensions of A, A1, A2, A3, B, C, and G (Center of Gravity) are the max value of each travel. Contact your Emerson sales office for details.

Figure 7. Fisher 785C Single-Acting Spring Return Piston Actuator with Manual Hand Wheel (MHW) (see table 11, 12, 13, 14, and 15)

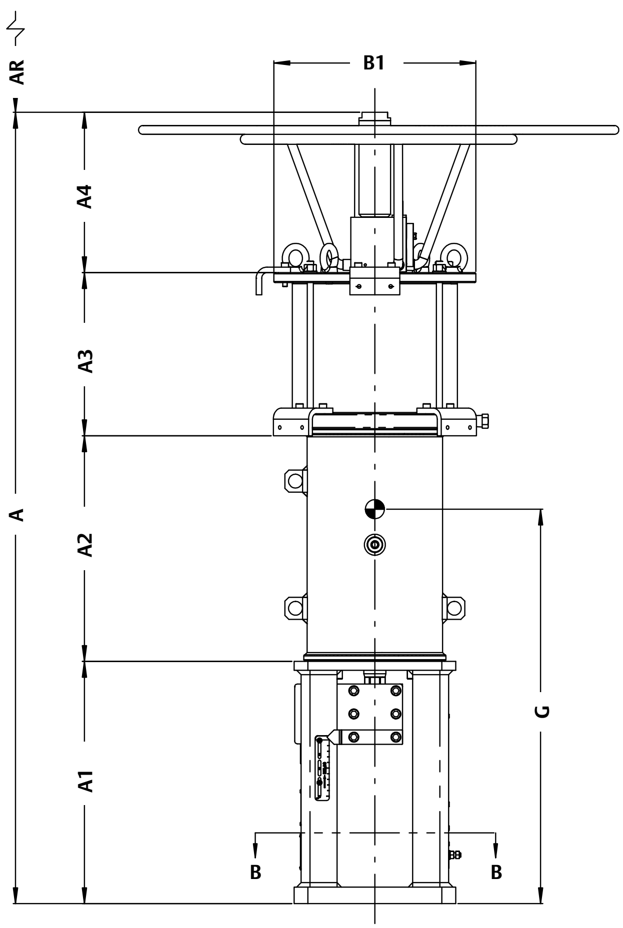

Figure 8. Fisher 785C Single-Acting Spring Return Piston Actuator with Manual Hand Pump (MHP) (see table 11, 12, 13, 14, and 15)

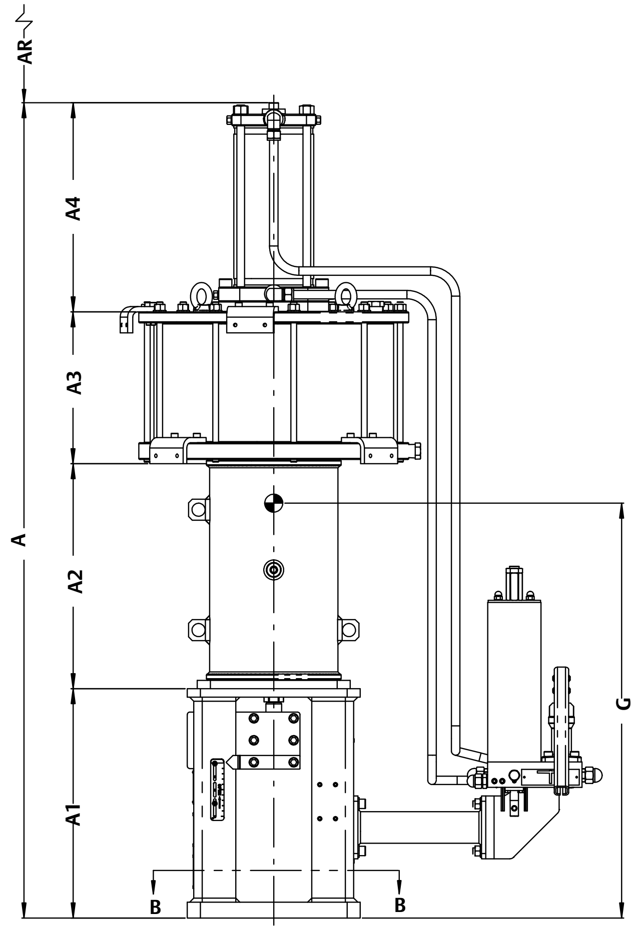

Table 12. 785C Single-Acting Spring Return (Spring Retracts) with Manual Override Dimensions A, A1, A2, A3, A4, G, B, and C(1)

ACTUATOR SIZE	YOKE BOSS	Maximum Travel		Spring	Manual Override	A		A1		A2		A3		A4	
	Inch (mm)	mm	Inch			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	3-9/16	115	4.5	F1	MHW	1645	65	416	16	643	25.3	296	11.7	290	11.4
		216	8.5	F1		2235	88	524	21	923	36.3	397	15.6	391	15.4
	5 or 5H	115	4.5	F1		1667	66	438	17	643	25.3	296	11.7	290	11.4
		216	8.5	F1		2235	88	524	21	923	36.3	397	15.6	391	15.4
335	3-9/16	115	4.5	F1		1714	67	416	16	705	27.8	302.5	11.9	290	11.4
		216	8.5	F2		2090	82	524	21	771	30.4	403.5	15.9	391	15.4
	5 or 5H	115	4.5	F1		1736	68	438	17	705	27.8	302.5	11.9	290	11.4
		216	8.5	F2		2090	82	524	21	771	30.4	403.5	15.9	391	15.4
385	3-9/16	115	4.5	F2		1696	67	416	16	705	27.8	285	11.2	290	11.4
		216	8.5	F1		2232	88	524	21	931	36.7	386	15.2	391	15.4
	5 or 5H	115	4.5	F2		1718	68	438	17	705	27.8	285	11.2	290	11.4
		216	8.5	F1		2232	88	524	21	931	36.7	386	15.2	391	15.4
		318	12.5	F1		2754	108	664	26	1110	43.7	488	19.2	492	19.4
	7	115	4.5	F2		1750	69	470	19	705	27.8	285	11.2	290	11.4
		216	8.5	F1		2308	91	600	24	931	36.7	386	15.2	391	15.4
		318	12.5	F1		2754	108	664	26	1110	43.7	488	19.2	492	19.4
435	5 or 5H	115	4.5	F1	MHP	1800	71	438	17	705	27.8	282	11.1	375	14.8
		216	8.5	F1		2243	88	524	21	840	33.1	383	15.1	496	19.5
		318	12.5	F1		2781	109	664	26	1035	40.7	485	19.1	597	23.5
		420	16.5	F1		3183	125	766	30	1132	44.6	587	23.1	698	27.5
	7	115	4.5	F1		1832	72	470	19	705	27.8	282	11.1	375	14.8
		216	8.5	F1		2319	91	600	24	840	33.1	383	15.1	496	19.5
		318	12.5	F1		2781	109	664	26	1035	40.7	485	19.1	597	23.5
		420	16.5	F1		3183	125	766	30	1132	44.6	587	23.1	698	27.5
485	5 or 5H	115	4.5	F1		1764	69	438	17	638	25.1	313	12.3	375	14.8
		216	8.5	F1		2274	90	524	21	840	33.1	414	16.3	496	19.5
		318	12.5	F1		2810	111	664	26	1033	40.7	516	20.3	597	23.5
		420	16.5	F1		3207	126	766	30	1125	44.3	618	24.3	698	27.5
	7	115	4.5	F1		1796	71	470	19	638	25.1	313	12.3	375	14.8
		216	8.5	F1		2350	93	600	24	840	33.1	414	16.3	496	19.5
		318	12.5	F1		2810	111	664	26	1033	40.7	516	20.3	597	23.5
		420	16.5	F1		3207	126	766	30	1125	44.3	618	24.3	698	27.5
535	5 or 5H	115	4.5	F1		1901	75	438	17	771	30.4	317	12.5	375	14.8
		216	8.5	F1		2265	89	524	21	827	32.6	418	16.5	496	19.5
		318	12.5	F1		2776	109	664	26	995	39.2	520	20.5	597	23.5
		420	16.5	F1		3130	123	766	30	1044	41.1	622	24.5	698	27.5
	7	115	4.5	F1		1933	76	470	19	771	30.4	317	12.5	375	14.8
		216	8.5	F1		2341	92	600	24	827	32.6	418	16.5	496	19.5
		318	12.5	F1		2776	109	664	26	995	39.2	520	20.5	597	23.5
		420	16.5	F1		3130	123	766	30	1044	41.1	622	24.5	698	27.5
585	5H	115	4.5	F1		1981	78	461	18	780	30.7	348	13.7	392	15.4
		216	8.5	F1		2313	91	547	22	804	31.7	449	17.7	513	20.2
		318	12.5	F1		2874	113	687	27	1022	40.2	551	21.7	614	24.2
		420	16.5	F1		3246	128	789	31	1089	42.9	653	25.7	715	28.1
	7	115	4.5	F1		2010	79	490	19	780	30.7	348	13.7	392	15.4
		216	8.5	F1		2386	94	620	24	804	31.7	449	17.7	513	20.2
		318	12.5	F1		2871	113	684	27	1022	40.2	551	21.7	614	24.2
		420	16.5	F1		3242	128	785	31	1089	42.9	653	25.7	715	28.1

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Table 12. 785C Single-Acting Spring Return (Spring Retracts) with Manual Override Dimensions A, A1, A2, A3, A4, G, B, and C(1) (cont.)

ACTUATOR SIZE	YOKE BOSS	Maximum Travel		Spring	Manual Override	A		A1		A2		A3		A4	
	Inch (mm)	mm	Inch			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
635	5H	115	4.5	F2	MHP	1724	68	461	18	522	20.6	349	13.7	392	15.4
		216	8.5	F1		2314	91	547	22	804	31.7	450	17.7	513	20.2
	7	115	4.5	F2		1753	69	490	19	522	20.6	349	13.7	392	15.4
		216	8.5	F1		2387	94	620	24	804	31.7	450	17.7	513	20.2
685	5H	115	4.5	F1		2011	79	486	19	760	29.9	373	14.7	392	15.4
		216	8.5	F1		2368	93	572	23	809	31.9	474	18.7	513	20.2
	7	115	4.5	F1		2040	80	515	20	760	29.9	373	14.7	392	15.4
		216	8.5	F1		2441	96	645	25	809	31.9	474	18.7	513	20.2

ACTUATOR SIZE	YOKE BOSS	Maximum Travel		Spring	Manual Override	G		∅B / B		B1		C		C1	
	Inch (mm)	mm	Inch			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	3-9/16	115	4.5	F1	MHW	823	32	850	33.5	419	16.5	464	18.3	- - -	- - -
		216	8.5	F1		1118	44	850	33.5	419	16.5	464	18.3	- - -	- - -
	5 or 5H	115	4.5	F1		834	33	850	33.5	419	16.5	464	18.3	- - -	- - -
		216	8.5	F1		1118	44	850	33.5	419	16.5	464	18.3	- - -	- - -
335	3-9/16	115	4.5	F1		857	34	1250	49.2	472	18.6	517	20.4	- - -	- - -
		216	8.5	F2		1045	41	1250	49.2	472	18.6	517	20.4	- - -	- - -
	5 or 5H	115	4.5	F1		868	34	1250	49.2	472	18.6	517	20.4	- - -	- - -
		216	8.5	F2		1045	41	1250	49.2	472	18.6	517	20.4	- - -	- - -
385	3-9/16	115	4.5	F2		848	33	1400	55.1	519	20.4	564	22.2	- - -	- - -
		216	8.5	F1		1116	44	1400	55.1	519	20.4	564	22.2	- - -	- - -
	5 or 5H	115	4.5	F2		859	34	1400	55.1	519	20.4	564	22.2	- - -	- - -
		216	8.5	F1		1116	44	1400	55.1	519	20.4	564	22.2	- - -	- - -
		318	12.5	F1		1377	54	1400	55.1	519	20.4	564	22.2	- - -	- - -
	7	115	4.5	F2		875	34	1400	55.1	519	20.4	564	22.2	- - -	- - -
		216	8.5	F1		1154	45	1400	55.1	519	20.4	564	22.2	- - -	- - -
		318	12.5	F1		1377	54	1400	55.1	519	20.4	564	22.2	- - -	- - -
435	5 or 5H	115	4.5	F1	MHP	900	35	908	35.7	572	22.5	846	33.3	565	22.2
		216	8.5	F1		1122	44	908	35.7	572	22.5	846	33.3	565	22.2
		318	12.5	F1		1391	55	908	35.7	572	22.5	846	33.3	565	22.2
		420	16.5	F1		1592	63	908	35.7	572	22.5	846	33.3	565	22.2
	7	115	4.5	F1		916	36	908	35.7	572	22.5	846	33.3	565	22.2
		216	8.5	F1		1160	46	908	35.7	572	22.5	846	33.3	565	22.2
		318	12.5	F1		1391	55	908	35.7	572	22.5	846	33.3	565	22.2
		420	16.5	F1		1592	63	908	35.7	572	22.5	846	33.3	565	22.2
485	5 or 5H	115	4.5	F1		882	35	940	37.0	636	25.0	858	33.8	630	24.8
		216	8.5	F1		1137	45	940	37.0	636	25.0	858	33.8	630	24.8
		318	12.5	F1		1405	55	940	37.0	636	25.0	858	33.8	630	24.8
		420	16.5	F1		1604	63	940	37.0	636	25.0	858	33.8	630	24.8
	7	115	4.5	F1		898	35	940	37.0	636	25.0	858	33.8	630	24.8
		216	8.5	F1		1175	46	940	37.0	636	25.0	858	33.8	630	24.8
		318	12.5	F1		1405	55	940	37.0	636	25.0	858	33.8	630	24.8
		420	16.5	F1		1604	63	940	37.0	636	25.0	858	33.8	630	24.8

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Table 12. 785C Single-Acting Spring Return (Spring Retracts) with Manual Override Dimensions A, A1, A2, A3, A4, G, B, and C(1) (cont.)

ACTUATOR SIZE	YOKE BOSS	Maximum Travel		Spring	Manual Override	G		∅B / B		B1		C		C1	
	Inch (mm)	mm	Inch			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
535	5 or 5H	115	4.5	F1	MHP	951	37	962	37.9	684	26.9	915	36.0	680	26.8
		216	8.5	F1		1133	45	962	37.9	684	26.9	915	36.0	680	26.8
		318	12.5	F1		1388	55	962	37.9	684	26.9	915	36.0	680	26.8
		420	16.5	F1		1565	62	962	37.9	684	26.9	915	36.0	680	26.8
	7	115	4.5	F1		967	38	962	37.9	684	26.9	915	36.0	680	26.8
		216	8.5	F1		1171	46	962	37.9	684	26.9	915	36.0	680	26.8
		318	12.5	F1		1388	55	962	37.9	684	26.9	915	36.0	680	26.8
		420	16.5	F1		1565	62	962	37.9	684	26.9	915	36.0	680	26.8
585	5H	115	4.5	F1		991	39	1102	43.4	737	29.0	983	38.7	730	28.7
		216	8.5	F1		1157	46	1102	43.4	737	29.0	983	38.7	730	28.7
		318	12.5	F1		1437	57	1102	43.4	737	29.0	983	38.7	730	28.7
		420	16.5	F1		1623	64	1102	43.4	737	29.0	983	38.7	730	28.7
	7	115	4.5	F1		1005	40	1102	43.4	737	29.0	983	38.7	730	28.7
		216	8.5	F1		1193	47	1102	43.4	737	29.0	983	38.7	730	28.7
		318	12.5	F1		1436	57	1102	43.4	737	29.0	983	38.7	730	28.7
		420	16.5	F1		1621	64	1102	43.4	737	29.0	983	38.7	730	28.7
635	5H	115	4.5	F2		862	34	1127	44.4	779	30.7	1007	39.6	785	30.9
		216	8.5	F1		1157	46	1127	44.4	779	30.7	1007	39.6	785	30.9
	7	115	4.5	F2		877	35	1127	44.4	779	30.7	1007	39.6	785	30.9
		216	8.5	F1		1194	47	1127	44.4	779	30.7	1007	39.6	785	30.9
685	5H	115	4.5	F1		1006	40	1153	45.4	832	32.8	1035	40.7	840	33.1
		216	8.5	F1		1184	47	1153	45.4	832	32.8	1035	40.7	840	33.1
	7	115	4.5	F1		1020	40	1153	45.4	832	32.8	1035	40.7	840	33.1
		216	8.5	F1		1221	48	1153	45.4	832	32.8	1035	40.7	840	33.1

1. Dimensions of A, A1, A2, A3, A4, ØB/B, B1,C, C1, and G (Center of Gravity) are the max value of each travel. Contact your Emerson sales office for details

Table 13. 785C Single-Acting Spring Return (Spring Extends) Dimensions A, A1, A2, A3, G, B, and C(1)

ACTU-ATOR SIZE	YOKE BOSS	Maximum Travel		Spring	A		A1		A2		A3		G		B		C	
	Inch (mm)	mm	Inch		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	3-9/16	115	4.5	F1	1360	53.5	416	16.4	643	25.3	245	9.6	680	26.8	419	16.5	419	16.5
		216	8.5	F1	1849	72.8	524	20.6	923	36.3	346	13.6	925	36.4	419	16.5	419	16.5
	5 or 5H	115	4.5	F1	1382	54.4	438	17.2	643	25.3	245	9.6	691	27.2	419	16.5	419	16.5
		216	8.5	F1	1849	72.8	524	20.6	923	36.3	346	13.6	925	36.4	419	16.5	419	16.5
335	3-9/16	115	4.5	F1	1425	56.1	416	16.4	705	27.8	248	9.8	713	28.1	472	18.6	472	18.6
		216	8.5	F2	1700	66.9	524	20.6	771	30.4	349	13.7	850	33.5	472	18.6	472	18.6
	5 or 5H	115	4.5	F1	1447	57.0	438	17.2	705	27.8	248	9.8	724	28.5	472	18.6	472	18.6
		216	8.5	F2	1700	66.9	524	20.6	771	30.4	349	13.7	850	33.5	472	18.6	472	18.6
385	3-9/16	115	4.5	F2	1425	56.1	416	16.4	705	27.8	248	9.8	713	28.1	519	20.4	519	20.4
		216	8.5	F1	1860	73.2	524	20.6	931	36.7	349	13.7	930	36.6	519	20.4	519	20.4
	5 or 5H	115	4.5	F2	1447	57.0	438	17.2	705	27.8	248	9.8	724	28.5	519	20.4	519	20.4
		216	8.5	F1	1860	73.2	524	20.6	931	36.7	349	13.7	930	36.6	519	20.4	519	20.4
		318	12.5	F1	2281	89.8	664	26.1	1110	43.7	451	17.8	1141	44.9	519	20.4	519	20.4
	7	115	4.5	F2	1479	58.2	470	18.5	705	27.8	248	9.8	740	29.1	519	20.4	519	20.4
		216	8.5	F1	1936	76.2	600	23.6	931	36.7	349	13.7	968	38.1	519	20.4	519	20.4
		318	12.5	F1	2281	89.8	664	26.1	1110	43.7	451	17.8	1141	44.9	519	20.4	519	20.4
435	5 or 5H	115	4.5	F1	1447	57.0	438	17.2	705	27.8	248	9.8	724	28.5	572	22.5	572	22.5
		216	8.5	F1	1769	69.6	524	20.6	840	33.1	349	13.7	885	34.8	572	22.5	572	22.5
		318	12.5	F1	2206	86.9	664	26.1	1035	40.7	451	17.8	1103	43.4	572	22.5	572	22.5
		420	16.5	F1	2507	98.7	766	30.2	1132	44.6	553	21.8	1254	49.4	572	22.5	572	22.5
	7	115	4.5	F1	1479	58.2	470	18.5	705	27.8	248	9.8	740	29.1	572	22.5	572	22.5
		216	8.5	F1	1845	72.6	600	23.6	840	33.1	349	13.7	923	36.3	572	22.5	572	22.5
		318	12.5	F1	2206	86.9	664	26.1	1035	40.7	451	17.8	1103	43.4	572	22.5	572	22.5
		420	16.5	F1	2507	98.7	766	30.2	1132	44.6	553	21.8	1254	49.4	572	22.5	572	22.5
485	5 or 5H	115	4.5	F1	1428	56.2	438	17.2	638	25.1	276	10.9	714	28.1	636	25.0	636	25.0
		216	8.5	F1	1817	71.5	524	20.6	840	33.1	377	14.8	909	35.8	636	25.0	636	25.0
		318	12.5	F1	2254	88.7	664	26.1	1035	40.7	479	18.9	1127	44.4	636	25.0	636	25.0
		420	16.5	F1	2555	100.6	766	30.2	1132	44.6	581	22.9	1278	50.3	636	25.0	636	25.0
	7	115	4.5	F1	1460	57.5	470	18.5	638	25.1	276	10.9	730	28.7	636	25.0	636	25.0
		216	8.5	F1	1893	74.5	600	23.6	840	33.1	377	14.8	947	37.3	636	25.0	636	25.0
		318	12.5	F1	2254	88.7	664	26.1	1035	40.7	479	18.9	1127	44.4	636	25.0	636	25.0
		420	16.5	F1	2555	100.6	766	30.2	1132	44.6	581	22.9	1278	50.3	636	25.0	636	25.0
535	5 or 5H	115	4.5	F1	1563	61.5	438	17.2	771	30.4	278	10.9	782	30.8	684	26.9	694	27.3
		216	8.5	F1	1778	70.0	524	20.6	799	31.5	379	14.9	889	35.0	684	26.9	694	27.3
		318	12.5	F1	2223	87.5	664	26.1	1002	39.4	481	18.9	1112	43.8	684	26.9	694	27.3
		420	16.5	F1	2476	97.5	766	30.2	1051	41.4	583	23.0	1238	48.7	684	26.9	694	27.3
	7	115	4.5	F1	1595	62.8	470	18.5	771	30.4	278	10.9	798	31.4	684	26.9	694	27.3
		216	8.5	F1	1854	73.0	600	23.6	799	31.5	379	14.9	927	36.5	684	26.9	694	27.3
		318	12.5	F1	2223	87.5	664	26.1	1002	39.4	481	18.9	1112	43.8	684	26.9	694	27.3
		420	16.5	F1	2476	97.5	766	30.2	1051	41.4	583	23.0	1238	48.7	684	26.9	694	27.3

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Table 13. 785C Single-Acting Spring Return (Spring Extends) Dimensions A, A1, A2, A3, G, B, and C[(1)] (cont.)

ACTU-ATOR SIZE	YOKE BOSS	Maximum Travel		Spring	A		A1		A2		A3		G		B		C	
	Inch (mm)	mm	Inch		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
585	5H	115	4.5	F1	1613	63.5	461	18.1	780	30.7	296	11.7	807	31.8	737	29.0	750	29.5
		216	8.5	F1	1820	71.7	547	21.5	800	31.5	397	15.6	910	35.8	737	29.0	750	29.5
		318	12.5	F1	2284	89.9	687	27.0	1022	40.2	499	19.6	1142	45.0	737	29.0	750	29.5
		420	16.5	F1	2555	100.6	789	31.1	1089	42.9	601	23.7	1278	50.3	737	29.0	750	29.5
	7	115	4.5	F1	1642	64.6	490	19.3	780	30.7	296	11.7	821	32.3	737	29.0	750	29.5
		216	8.5	F1	1893	74.5	620	24.4	800	31.5	397	15.6	947	37.3	737	29.0	750	29.5
		318	12.5	F1	2281	89.8	684	26.9	1022	40.2	499	19.6	1141	44.9	737	29.0	750	29.5
		420	16.5	F1	2551	100.4	785	30.9	1089	42.9	601	23.7	1276	50.2	737	29.0	750	29.5
635	5H	115	4.5	F1	1579	62.2	461	18.1	746	29.4	296	11.7	790	31.1	779	30.7	799	31.5
		216	8.5	F1	1830	72.0	547	21.5	810	31.9	397	15.6	915	36.0	779	30.7	799	31.5
		318	12.5	F1	2264	89.1	687	27.0	1002	39.4	499	19.6	1132	44.6	779	30.7	799	31.5
		420	16.5	F1	2458	96.8	789	31.1	992	39.1	601	23.7	1229	48.4	779	30.7	799	31.5
	7	115	4.5	F1	1608	63.3	490	19.3	746	29.4	296	11.7	804	31.7	779	30.7	799	31.5
		216	8.5	F1	1903	74.9	620	24.4	810	31.9	397	15.6	952	37.5	779	30.7	799	31.5
		318	12.5	F1	2261	89.0	684	26.9	1002	39.4	499	19.6	1131	44.5	779	30.7	799	31.5
		420	16.5	F1	2454	96.6	785	30.9	992	39.1	601	23.7	1227	48.3	779	30.7	799	31.5
685	5H	115	4.5	F3	1622	63.9	486	19.1	754	29.7	306	12.0	811	31.9	832	32.8	855	33.7
		216	8.5	F3	1840	72.4	572	22.5	785	30.9	407	16.0	920	36.2	832	32.8	855	33.7
		318	12.5	F1	2299	90.5	712	28.0	1002	39.4	509	20.0	1150	45.3	832	32.8	855	33.7
		420	16.5	F1	2493	98.1	814	32.0	992	39.1	611	24.1	1247	49.1	832	32.8	855	33.7
	7	115	4.5	F3	1651	65.0	515	20.3	754	29.7	306	12.0	826	32.5	832	32.8	855	33.7
		216	8.5	F3	1913	75.3	645	25.4	785	30.9	407	16.0	957	37.7	832	32.8	855	33.7
		318	12.5	F1	2296	90.4	709	27.9	1002	39.4	509	20.0	1148	45.2	832	32.8	855	33.7
		420	16.5	F1	2489	98.0	810	31.9	992	39.1	611	24.1	1245	49.0	832	32.8	855	33.7

1. Dimensions of A, A1, A2, A3, B, C, and G (Center of Gravity) are the max value of each travel. Contact your Emerson sales office for details.

Table 14. 785C Single-Acting Spring Return (Spring Extends) with Manual Override Dimensions A, A1, A2, A3, A4, G, B, and C(1)

ACTUATOR SIZE	YOKE BOSS	Maximum Travel		Spring	Manual Override	A		A1		A2		A3		A4	
	Inch (mm)	mm	Inch			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	3-9/16	115	4.5	F1	MHW	1645	65	416	16	643	25.3	296	11.7	290	11.4
		216	8.5	F1		2235	88	524	21	923	36.3	397	15.6	391	15.4
	5 or 5H	115	4.5	F1		1667	66	438	17	643	25.3	296	11.7	290	11.4
		216	8.5	F1		2235	88	524	21	923	36.3	397	15.6	391	15.4
335	3-9/16	115	4.5	F1		1714	67	416	16	705	27.8	302.5	11.9	290	11.4
		216	8.5	F2		2090	82	524	21	771	30.4	403.5	15.9	391	15.4
	5 or 5H	115	4.5	F1		1736	68	438	17	705	27.8	302.5	11.9	290	11.4
		216	8.5	F2		2090	82	524	21	771	30.4	403.5	15.9	391	15.4
385	3-9/16	115	4.5	F2		1696	67	416	16	705	27.8	285	11.2	290	11.4
		216	8.5	F1		2232	88	524	21	931	36.7	386	15.2	391	15.4
	5 or 5H	115	4.5	F2		1718	68	438	17	705	27.8	285	11.2	290	11.4
		216	8.5	F1		2232	88	524	21	931	36.7	386	15.2	391	15.4
		318	12.5	F1		2754	108	664	26	1110	43.7	488	19.2	492	19.4
	7	115	4.5	F2		1750	69	470	19	705	27.8	285	11.2	290	11.4
		216	8.5	F1		2308	91	600	24	931	36.7	386	15.2	391	15.4
		318	12.5	F1		2754	108	664	26	1110	43.7	488	19.2	492	19.4
435	5 or 5H	115	4.5	F1	MHP	1800	71	438	17	705	27.8	282	11.1	375	14.8
		216	8.5	F1		2243	88	524	21	840	33.1	383	15.1	496	19.5
		318	12.5	F1		2781	109	664	26	1035	40.7	485	19.1	597	23.5
		420	16.5	F1		3183	125	766	30	1132	44.6	587	23.1	698	27.5
	7	115	4.5	F1		1832	72	470	19	705	27.8	282	11.1	375	14.8
		216	8.5	F1		2319	91	600	24	840	33.1	383	15.1	496	19.5
		318	12.5	F1		2781	109	664	26	1035	40.7	485	19.1	597	23.5
		420	16.5	F1		3183	125	766	30	1132	44.6	587	23.1	698	27.5
485	5 or 5H	115	4.5	F1		1764	69	438	17	638	25.1	313	12.3	375	14.8
		216	8.5	F1		2274	90	524	21	840	33.1	414	16.3	496	19.5
		318	12.5	F1		2812	111	664	26	1035	40.7	516	20.3	597	23.5
		420	16.5	F1		3214	127	766	30	1132	44.6	618	24.3	698	27.5
	7	115	4.5	F1		1796	71	470	19	638	25.1	313	12.3	375	14.8
		216	8.5	F1		2350	93	600	24	840	33.1	414	16.3	496	19.5
		318	12.5	F1		2812	111	664	26	1035	40.7	516	20.3	597	23.5
		420	16.5	F1		3214	127	766	30	1132	44.6	618	24.3	698	27.5
535	5 or 5H	115	4.5	F1		1901	75	438	17	771	30.4	317	12.5	375	14.8
		216	8.5	F1		2237	88	524	21	799	31.5	418	16.5	496	19.5
		318	12.5	F1		2783	110	664	26	1002	39.4	520	20.5	597	23.5
		420	16.5	F1		3137	124	766	30	1051	41.4	622	24.5	698	27.5
	7	115	4.5	F1		1933	76	470	19	771	30.4	317	12.5	375	14.8
		216	8.5	F1		2313	91	600	24	799	31.5	418	16.5	496	19.5
		318	12.5	F1		2783	110	664	26	1002	39.4	520	20.5	597	23.5
		420	16.5	F1		3137	124	766	30	1051	41.4	622	24.5	698	27.5
585	5H	115	4.5	F1		1981	78	461	18	780	30.7	348	13.7	392	15.4
		216	8.5	F1		2309	91	547	22	800	31.5	449	17.7	513	20.2
		318	12.5	F1		2874	113	687	27	1022	40.2	551	21.7	614	24.2
		420	16.5	F1		3246	128	789	31	1089	42.9	653	25.7	715	28.1
	7	115	4.5	F1		2010	79	490	19	780	30.7	348	13.7	392	15.4
		216	8.5	F1		2382	94	620	24	800	31.5	449	17.7	513	20.2
		318	12.5	F1		2871	113	684	27	1022	40.2	551	21.7	614	24.2
		420	16.5	F1		3242	128	785	31	1089	42.9	653	25.7	715	28.1

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Table 14. 785C Single-Acting Spring Return (Spring Extends) with Manual Override Dimensions A, A1, A2, A3, A4, G, B, and C(1) (cont.)

ACTUATOR SIZE	YOKE BOSS	Maximum Travel		Spring	Manual Override	A		A1		A2		A3		A4	
	Inch (mm)	mm	Inch			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
635	5H	115	4.5	F1	MHP	1948	77	461	18	746	29.4	349	13.7	392	15.4
		216	8.5	F1		2320	91	547	22	810	31.9	450	17.7	513	20.2
		318	12.5	F1		2855	112	687	27	1002	39.4	552	21.7	614	24.2
		420	16.5	F1		3150	124	789	31	992	39.1	654	25.7	715	28.1
	7	115	4.5	F1		1977	78	490	19	746	29.4	349	13.7	392	15.4
		216	8.5	F1		2393	94	620	24	810	31.9	450	17.7	513	20.2
		318	12.5	F1		2852	112	684	27	1002	39.4	552	21.7	614	24.2
		420	16.5	F1		3146	124	785	31	992	39.1	654	25.7	715	28.1
685	5H	115	4.5	F3		2005	79	486	19	754	29.7	373	14.7	392	15.4
		216	8.5	F3		2344	92	572	23	785	30.9	474	18.7	513	20.2
		318	12.5	F1		2904	114	712	28	1002	39.4	576	22.7	614	24.2
		420	16.5	F1		3199	126	814	32	992	39.1	678	26.7	715	28.1
	7	115	4.5	F3		2034	80	515	20	754	29.7	373	14.7	392	15.4
		216	8.5	F3		2417	95	645	25	785	30.9	474	18.7	513	20.2
		318	12.5	F1		2901	114	709	28	1002	39.4	576	22.7	614	24.2
		420	16.5	F1		3195	126	810	32	992	39.1	678	26.7	715	28.1

ACTUATOR SIZE	YOKE BOSS	Maximum Travel		Spring	Manual Override	G		∅B/B		B1		C		C1	
	Inch (mm)	mm	Inch			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	3-9/16	115	4.5	F1	MHW	823	32	850	33.5	419	16.5	464	18.3	- - -	- - -
		216	8.5	F1		1118	44	850	33.5	419	16.5	464	18.3	- - -	- - -
	5 or 5H	115	4.5	F1		834	33	850	33.5	419	16.5	464	18.3	- - -	- - -
		216	8.5	F1		1118	44	850	33.5	419	16.5	464	18.3	- - -	- - -
335	3-9/16	115	4.5	F1		857	34	1250	49.2	472	18.6	517	20.4	- - -	- - -
		216	8.5	F2		1045	41	1250	49.2	472	18.6	517	20.4	- - -	- - -
	5 or 5H	115	4.5	F1		868	34	1250	49.2	472	18.6	517	20.4	- - -	- - -
		216	8.5	F2		1045	41	1250	49.2	472	18.6	517	20.4	- - -	- - -
385	3-9/16	115	4.5	F2		848	33	1400	55.1	519	20.4	564	22.2	- - -	- - -
		216	8.5	F1		1116	44	1400	55.1	519	20.4	564	22.2	- - -	- - -
	5 or 5H	115	4.5	F2		859	34	1400	55.1	519	20.4	564	22.2	- - -	- - -
		216	8.5	F1		1116	44	1400	55.1	519	20.4	564	22.2	- - -	- - -
		318	12.5	F1		1377	54	1400	55.1	519	20.4	564	22.2	- - -	- - -
	7	115	4.5	F2		875	34	1400	55.1	519	20.4	564	22.2	- - -	- - -
		216	8.5	F1		1154	45	1400	55.1	519	20.4	564	22.2	- - -	- - -
		318	12.5	F1		1377	54	1400	55.1	519	20.4	564	22.2	- - -	- - -
435	5 or 5H	115	4.5	F1	MHP	900	35	908	35.7	572	22.5	846	33.3	565	22.2
		216	8.5	F1		1121.5	44	908	35.7	572	22.5	846	33.3	565	22.2
		318	12.5	F1		1391	55	908	35.7	572	22.5	846	33.3	565	22.2
		420	16.5	F1		1592	63	908	35.7	572	22.5	846	33.3	565	22.2
	7	115	4.5	F1		916	36	908	35.7	572	22.5	846	33.3	565	22.2
		216	8.5	F1		1160	46	908	35.7	572	22.5	846	33.3	565	22.2
		318	12.5	F1		1391	55	908	35.7	572	22.5	846	33.3	565	22.2
		420	16.5	F1		1592	63	908	35.7	572	22.5	846	33.3	565	22.2
485	5 or 5H	115	4.5	F1		882	35	940	37.0	636	25.0	858	33.8	630	24.8
		216	8.5	F1		1137	45	940	37.0	636	25.0	858	33.8	630	24.8
		318	12.5	F1		1406	55	940	37.0	636	25.0	858	33.8	630	24.8
		420	16.5	F1		1607	63	940	37.0	636	25.0	858	33.8	630	24.8
	7	115	4.5	F1		898	35	940	37.0	636	25.0	858	33.8	630	24.8
		216	8.5	F1		1175	46	940	37.0	636	25.0	858	33.8	630	24.8
		318	12.5	F1		1406	55	940	37.0	636	25.0	858	33.8	630	24.8
		420	16.5	F1		1607	63	940	37.0	636	25.0	858	33.8	630	24.8

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Table 14. 785C Single-Acting Spring Return (Spring Extends) with Manual Override Dimensions A, A1, A2, A3, A4, G, B, and C[(1)] (cont.)

ACTUATOR SIZE	YOKE BOSS	Maximum Travel		Spring	Manual Override	G		∅B/B		B1		C		C1	
	Inch (mm)	mm	Inch			mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
535	5 or 5H	115	4.5	F1	MHP	951	37	962	37.9	684	26.9	915	36.0	680	26.8
		216	8.5	F1		1119	44	962	37.9	684	26.9	915	36.0	680	26.8
		318	12.5	F1		1392	55	962	37.9	684	26.9	915	36.0	680	26.8
		420	16.5	F1		1569	62	962	37.9	684	26.9	915	36.0	680	26.8
	7	115	4.5	F1		967	38	962	37.9	684	26.9	915	36.0	680	26.8
		216	8.5	F1		1157	46	962	37.9	684	26.9	915	36.0	680	26.8
		318	12.5	F1		1392	55	962	37.9	684	26.9	915	36.0	680	26.8
		420	16.5	F1		1569	62	962	37.9	684	26.9	915	36.0	680	26.8
585	5H	115	4.5	F1		991	39	1102	43.4	737	29.0	983	38.7	730	28.7
		216	8.5	F1		1155	45	1102	43.4	737	29.0	983	38.7	730	28.7
		318	12.5	F1		1437	57	1102	43.4	737	29.0	983	38.7	730	28.7
		420	16.5	F1		1623	64	1102	43.4	737	29.0	983	38.7	730	28.7
	7	115	4.5	F1		1005	40	1102	43.4	737	29.0	983	38.7	730	28.7
		216	8.5	F1		1191	47	1102	43.4	737	29.0	983	38.7	730	28.7
		318	12.5	F1		1436	57	1102	43.4	737	29.0	983	38.7	730	28.7
		420	16.5	F1		1621	64	1102	43.4	737	29.0	983	38.7	730	28.7
635	5H	115	4.5	F1		974	38	1127	44.4	779	30.7	1007	39.6	785	30.9
		216	8.5	F1		1160	46	1127	44.4	779	30.7	1007	39.6	785	30.9
		318	12.5	F1		1428	56	1127	44.4	779	30.7	1007	39.6	785	30.9
		420	16.5	F1		1575	62	1127	44.4	779	30.7	1007	39.6	785	30.9
	7	115	4.5	F1		989	39	1127	44.4	779	30.7	1007	39.6	785	30.9
		216	8.5	F1		1197	47	1127	44.4	779	30.7	1007	39.6	785	30.9
		318	12.5	F1		1426	56	1127	44.4	779	30.7	1007	39.6	785	30.9
		420	16.5	F1		1573	62	1127	44.4	779	30.7	1007	39.6	785	30.9
685	5H	115	4.5	F3		1003	39	1153	45.4	832	32.8	1035	40.7	840	33.1
		216	8.5	F3		1172	46	1153	45.4	832	32.8	1035	40.7	840	33.1
		318	12.5	F1		1452	57	1153	45.4	832	32.8	1035	40.7	840	33.1
		420	16.5	F1		1600	63	1153	45.4	832	32.8	1035	40.7	840	33.1
	7	115	4.5	F3		1017	40	1153	45.4	832	32.8	1035	40.7	840	33.1
		216	8.5	F3		1209	48	1153	45.4	832	32.8	1035	40.7	840	33.1
		318	12.5	F1		1451	57	1153	45.4	832	32.8	1035	40.7	840	33.1
		420	16.5	F1		1598	63	1153	45.4	832	32.8	1035	40.7	840	33.1

1. Dimensions of A, A1, A2, A3, A4, ØB/B, B1, C, C1 and G (Center of Gravity) are the max value of each travel. Contact your Emerson sales office for details

Table 15. 785C Single Acting Spring Return (Spring Retracts or Spring Extends) Dimensions Z and W

ACTUATOR SIZE	WITHOUT MANUAL OVERRIDE				WITH MANUAL OVERRIDE			
	Z		W		Z		W	
	3-9/16, 5, 5H, or 7 Inch Yoke Boss				3-9/16, 5, 5H, or 7 Inch Yoke Boss			
	mm	Inch	mm	Inch	mm	Inch	mm	Inch
280	254	10	292	11.5	254	10	292	11.5
335	254	10	292	11.5	254	10	292	11.5
385	330	13	330	13	330	13	330	13
435	330	13	330	13	330	13	330	13
485	330	13	330	13	330	13	330	13
535	330	13	330	13	330	13	330	13
585	487	19.2	436	17.2	487	19.2	436	17.2
635	487	19.2	436	17.2	487	19.2	436	17.2
685	487	19.2	436	17.2	487	19.2	436	17.2

Table 16. 785C Double-Acting Springless Approximate Weights for Constructions without Manual Override

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)								
	280		335		385			435	
mm (inches)	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	7 Yoke Boss	5 or 5 Yoke Boss	7 Yoke Boss
115 (4.5)	129 (284)	125 (275)	160 (352)	156 (343)	209 (460)	204 (451)	203 (448)	237 (524)	236 (521)
216 (8.5)	141 (312)	137 (302)	174 (383)	170 (374)	226 (498)	221 (487)	222 (490)	256 (565)	257 (568)
318 (12.5)	- - -	151 (332)	- - -	186 (410)	- - -	240 (530)	237 (523)	278 (613)	275 (606)
420 (16.5)	- - -	163 (359)	- - -	201 (443)	- - -	257 (568)	254 (561)	297 (656)	294 (649)
521 (20.5)	- - -	175 (385)	- - -	215 (473)	- - -	274 (606)	271 (599)	317 (699)	314 (692)
623 (24.5)	- - -	187 (412)	- - -	230 (507)	- - -	292 (644)	289 (637)	336 (742)	333 (735)

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)									
	485		535		585		635		685	
mm (inches)	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	7 Yoke Boss	5 or 5 Yoke Boss	5 or 5 Yoke Boss	7 Yoke Boss
115 (4.5)	326 (720)	325 (717)	381 (842)	380 (839)	512 (1130)	511 (1128)	589 (1299)	588 (1298)	696 (1535)	695 (1534)
216 (8.5)	347 (766)	348 (768)	405 (893)	406 (895)	540 (1192)	543 (1197)	624 (1376)	626 (1381)	732 (1615)	735 (1620)
318 (12.5)	371 (818)	368 (811)	431 (951)	428 (944)	573 (1263)	569 (1256)	662 (1460)	659 (1453)	772 (1702)	769 (1695)
420 (16.5)	393 (866)	390 (859)	455 (1004)	452 (997)	602 (1328)	599 (1321)	698 (1538)	694 (1531)	809 (1784)	806 (1777)
521 (20.5)	414 (914)	411 (908)	479 (1057)	476 (1051)	631 (1392)	628 (1386)	733 (1617)	730 (1610)	846 (1865)	843 (1858)
623 (24.5)	436 (962)	433 (955)	503 (1110)	500 (1104)	661 (1457)	658 (1450)	769 (1695)	766 (1688)	883 (1947)	880 (1940)

Table 17. 785C Double-Acting Springless Approximate Weights for Constructions with Manual Override

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)								
	280		335		385			435	
mm (inches)	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	7 Yoke Boss	5 or 5 Yoke Boss	7 Yoke Boss
115 (4.5)	129 (284)	125 (275)	160 (352)	156 (343)	209 (460)	204 (451)	203 (448)	237 (524)	236 (521)
216 (8.5)	141 (312)	137 (302)	174 (383)	170 (374)	226 (498)	221 (487)	222 (490)	256 (565)	257 (568)
318 (12.5)	- - -	151 (332)	- - -	186 (410)	- - -	240 (530)	237 (523)	278 (613)	275 (606)
420 (16.5)	- - -	163 (359)	- - -	201 (443)	- - -	257 (568)	254 (561)	297 (656)	294 (649)
521 (20.5)	- - -	175 (385)	- - -	215 (473)	- - -	274 (606)	271 (599)	317 (699)	314 (692)
623 (24.5)	- - -	187 (412)	- - -	230 (507)	- - -	292 (644)	289 (637)	336 (742)	333 (735)

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)									
	485		535		585		635		685	
mm (inches)	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	7 Yoke Boss	5 or 5 Yoke Boss	5 or 5 Yoke Boss	7 Yoke Boss
115 (4.5)	326 (720)	325 (717)	381 (842)	380 (839)	512 (1130)	511 (1128)	589 (1299)	588 (1298)	696 (1535)	695 (1534)
216 (8.5)	347 (766)	348 (768)	405 (893)	406 (895)	540 (1192)	543 (1197)	624 (1376)	626 (1381)	732 (1615)	735 (1620)
318 (12.5)	371 (818)	368 (811)	431 (951)	428 (944)	573 (1263)	569 (1256)	662 (1460)	659 (1453)	772 (1702)	769 (1695)
420 (16.5)	393 (866)	390 (859)	455 (1004)	452 (997)	602 (1328)	599 (1321)	698 (1538)	694 (1531)	809 (1784)	806 (1777)
521 (20.5)	414 (914)	411 (908)	479 (1057)	476 (1051)	631 (1392)	628 (1386)	733 (1617)	730 (1610)	846 (1865)	843 (1858)
623 (24.5)	436 (962)	433 (955)	503 (1110)	500 (1104)	661 (1457)	658 (1450)	769 (1695)	766 (1688)	883 (1947)	880 (1940)

Table 18. 785C Single-Acting Spring Approximate Weights for Constructions without Manual Override

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)								
	280		335		385			435	
mm (inches)	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	7 Yoke Boss	5 or 5 Yoke Boss	7 Yoke Boss
115 (4.5)	232 (511)	229 (504)	288 (634)	285 (628)	376 (828)	372 (820)	371 (817)	394 (868)	393 (866)
216 (8.5)	344 (758)	340 (749)	315 (694)	310 (683)	415 (914)	409 (901)	410 (903)	493 (1086)	494 (1089)
318 (12.5)	- - -	- - -	- - -	- - -	- - -	452 (996)	449 (989)	480 (1058)	477 (1051)
420 (16.5)	- - -	- - -	- - -	- - -	- - -	- - -	- - -	527 (1161)	524 (1155)

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)									
	485		535		585		635		685	
mm (inches)	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	7 Yoke Boss	5 or 5 Yoke Boss	5 or 5 Yoke Boss	7 Yoke Boss
115 (4.5)	496 (1093)	494 (1089)	646 (1424)	645 (1421)	794 (1750)	793 (1748)	944 (2081)	943 (2078)	1171 (2581)	1171 (2581)
216 (8.5)	588 (1296)	589 (1298)	675 (1488)	676 (1490)	892 (1966)	894 (1970)	1095 (2414)	1097 (2418)	1195 (2634)	1197 (2638)
318 (12.5)	574 (1265)	571 (1258)	888 (1957)	885 (1951)	949 (2092)	945 (2083)	1045 (2303)	1042 (2297)	1155 (2546)	1152 (2539)
420 (16.5)	623 (1373)	620 (1366)	920 (2028)	917 (2021)	996 (2195)	993 (2189)	1172 (2583)	1169 (2577)	1284 (2830)	1281 (2824)

Table 19. 785C Single-Acting Spring Approximate Weights for Constructions with Manual Override

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)								
	280		335		385			435	
mm (inches)	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	7 Yoke Boss	5 or 5 Yoke Boss	7 Yoke Boss
115 (4.5)	258 (568)	255 (562)	324 (714)	320 (705)	395 (870)	391 (862)	389 (857)	468 (1031)	467 (1029)
216 (8.5)	373 (822)	368 (811)	352 (776)	348 (767)	436 (961)	430 (948)	431 (950)	573 (1263)	574 (1265)
318 (12.5)	- - -	- - -	- - -	- - -	- - -	476 (1049)	473 (1042)	566 (1247)	563 (1241)
420 (16.5)	- - -	- - -	- - -	- - -	- - -	- - -	- - -	619 (1364)	616 (1358)

MAXIMUM VALVE TRAVEL	APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs)									
	485		535		585		635		685	
mm (inches)	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	3-9/16 Yoke Boss	5 or 5H Yoke Boss	7 Yoke Boss	5 or 5 Yoke Boss	5 or 5 Yoke Boss	7 Yoke Boss
115 (4.5)	594 (1309)	592 (1305)	744 (1640)	743 (1638)	903 (1990)	903 (1990)	1053 (2321)	1052 (2319)	1328 (2927)	1327 (2925)
216 (8.5)	694 (1529)	695 (1532)	781 (1721)	782 (1723)	1012 (2231)	1015 (2237)	1215 (2678)	1217 (2682)	1364 (3007)	1366 (3011)
318 (12.5)	688 (1516)	685 (1510)	1002 (2209)	999 (2202)	1080 (2380)	1077 (2374)	1175 (2590)	1171 (2581)	1336 (2945)	1333 (2938)
420 (16.5)	745 (1642)	742 (1635)	1042 (2297)	1039 (2290)	1139 (2511)	1136 (2504)	1315 (2899)	1312 (2892)	1478 (3258)	1475 (3251)

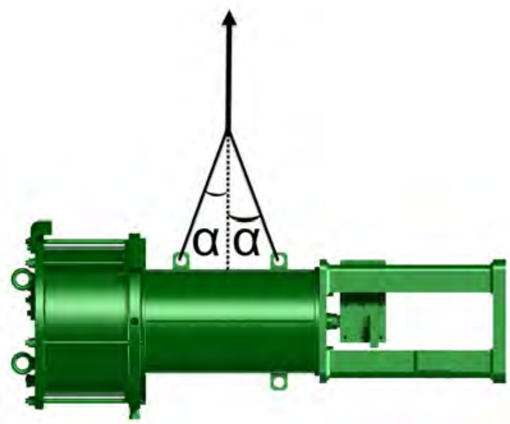
Table 20. Lifting Point Load Ratings

ACTUATOR SIZE	LIFTING ORIENTATION	NUMBER OF LIFTING POINTS USED	MAXIMUM LOAD AT LIFTING (SEE FIGURE 9 AND 6)	
			Kg	lbs
280	Actuator Centerline Horizontal(1)	2	1747	3851
335		2	1747	3851
385		2	1747	3851
435		2	1747	3851
485		2	6330	13955
535		2	6330	13955
585		2	6330	13955
635		2	6330	13955
685		2	6330	13955
ACTUATOR SIZE	LIFTING ORIENTATION	NUMBER OF LIFTING POINTS USED	MAXIMUM LOAD AT LIFTING (SEE FIGURE 9 AND 6)	
			Kg	lbs
280	Actuator Centerline Vertical(2)	4	864	1905
335		4	864	1905
385		4	864	1905
435		4	864	1905
485		4	3096	6826
535		4	3096	6826
585		4	3096	6826
635		4	3096	6826
685		4	3096	6826

1. Welded eyelets for horizontal lifting are only available for the 785C Spring Return.
2. Vertical lifting loads are applicable to both the 785C Springless and Spring Return.

Figure 9. Lifting Angle for Welded Eyelets

Figure 10. Actuator Centerline Horizontal



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Fisher™ 1061 Pneumatic Piston Rotary Actuator

Fisher 1061 pneumatic piston rotary actuators are used to operate splined-shaft rotary control valves such as Vee-Ball™ valves, eccentric disk valves, and butterfly valves. The actuator/valve body linkage of this actuator can be positioned for either push-down-to-open or push-down-to-close action.

Additionally, the 1061 actuator can be used with a two-position control signal for on-off service or with a valve positioner for throttling service. An optional handwheel actuator is also available to allow for auxiliary or emergency manual valve operation when the 1061 piston actuator is not in use. For complete information on the valve positioner and the manual handwheel actuator, refer to the appropriate bulletin.

1061 Actuator with FIELDVUE™ DVC6200 Digital Valve Controller Mounted on a Fisher V500 Valve

Features

- Application Flexibility—Actuator is available in push-down-to-open or push-down-to-close construction and may be mounted in any of four actuator/valve body mounting positions (see figure 2).
- Minimal Dead Band—Single-point linkage with splined and clamped lever minimizes lost motion and improves control accuracy.
- Compact Construction—Compared to similar actuators, overall size is reduced by as much as 30 percent.
- Long Service Life—Rugged construction provides stability, corrosion resistance, and protection from deformation should the actuator be over-pressured.
- Accessibility—Actuator/valve body linkage is completely enclosed, yet the valve packing adjustment remains accessible without removing any parts.
- Monitoring Ease—Highly visible travel indicator allows easy determination of valve position.

Specifications

Available Configuration

Actuator Sizes: ■ 30, ■ 40, ■ 60, ■ 68, ■ 80, ■ 100, and ■ 130

Action: Double-acting pneumatic piston rotary actuator for ■ throttling service when used with positioner, or ■ on-off service when used with switching devices

Cylinder Operating Pressure

Minimum Recommended: ■ 1.4 bar (20 psig) without positioner, or ■ 0.35 bar (5 psi) above actuator requirement with positioner(1).

Maximum Allowable(2)

Sizes 30 and 60: 6.9 bar (100 psig)
Size 40: 10.3 bar (150 psig)
Size 68: 5.9 bar (85 psig)
Size 80: 10.3 bar (150 psig)
Size 100: 10.3 bar (150 psig)
Size 130: 10.3 bar (150 psig)

Valve Shaft Diameters, mm (Inch)

Size 30: ■ 12.7 (1/2), ■ 15.9 (5/8),■ 19.1 (3/4), ■ 22.2 (7/8), ■ 25.4 (1), and ■ 31.8 (1-1/4)
Sizes 40, 60, and 68: ■ 19.1 (3/4), ■ 22.2 (7/8), ■ 25.4 (1), ■ 31.8 (1-1/4), ■ 38.1 (1-1/2), ■ 44.5 (1-3/4), and ■ 50.8 (2)
Sizes 80 and 100: ■ 44.5 (1-3/4), ■ 50.8 (2), and ■ 63.5 (2-1/2)
Size 130: ■ 76.2 (3) and ■ 88.9 (3-1/2)

Maximum Valve Shaft Rotation

■ 90 degrees without travel stop or ■ 60 degrees with optional travel stop

Maximum Breakout Torque(1)

Size 30: Up to 282 N•m (2500 lbf•in)
Size 40: Up to 847 N•m (7500 lbf•in)
Size 60: Up to 1130 N•m (10,000 lbf•in)
Size 68: Up to 1540 N•m (13,600 lbf•in)
Size 80: Up to 5080 N•m (45,000 lbf•in)
Size 100: Up to 6290 N•m (55,700 lbf•in) with 63.5 mm (2-1/2 in.) valve shaft diameter

Size 130: Up to 19,800 N•m (175,000 lbf•in)

Stroking Time

Dependent on actuator size, rotation, and positioner if used. If stroking time is critical, consult your Emerson sales office or Local Business Partner

Construction Materials

Cylinder and Cylinder Flange: Aluminum

Housing Cover: ■ Cast iron or ■ aluminum (only for size 130)

Piston: ■ Aluminum or ■ Nylon-coated piston (optional only for sizes 30 to 100)

Piston Rod: Chrome-plated stainless steel

Lever: Ductile iron

Sliding Seal: Aluminum

O-Rings: Nitrile

Housing:

Sizes 30, 40, 60, and 68: Cast iron
Sizes 80, 100 and 130: Aluminum

Mounting Yoke: Cast iron

Mounting Yoke Bushing: PTFE and steel

Material Temperature Capabilities with Standard Elastomers(2)

-34 to 82°C (-30 to 180°F)

Pressure Connections

■ 1/4 NPT internal (standard)
■ 1/2 and 3/4 NPT internal (optional on sizes 68, 80, and 100)
■ 3/4 NPT internal for Pipe-Away Vent option
■ 1 NPT internal for size 130

Travel Indication

Graduated scale and pointer located on actuator end of valve shaft

Mounting Positions

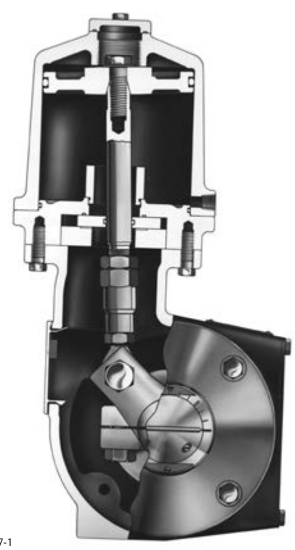
See figure 2

Approximate Weight

See table 2

1. Actual actuator torque available depends on specific construction and casing pressure. For information on torque requirements of the valve being considered, contact your Emerson sales office.
2. The pressure/temperature limits in this manual and any applicable standard or code limitation for actuator should not be exceeded.

Figure 1. Sectional of Fisher 1061 Actuator



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W2288-3

Table 1. Displacement for 90 Degree Rotation

SIZE	PISTON DOWN		PISTON UP	
	cm^3	$Inch^3$	cm^3	$Inch^3$
30	1100	67	1200	74
40	2130	130	2230	136
60	4060	248	4380	267
68	7210	440	7110	434
80	13,000	794	12,900	788
100	19,100	1165	18,800	1150
130	41,100	2508	40,200	2454

Table 2. Approximate Weight

ACTUATOR SIZE	kg	Lb
30	22	49
40	29	63
60	39	86
68	56	123
80	122	246
100	135	298
130	299	660

Options

Pneumatic Instruments: ■ 3710, ■ 3610JP, or ■ 3620JP pneumatic or electro-pneumatic positioners or ■ FIELDVUE DVC6200 Digital Valve Controllers are available. Also, the 377 Series trip valves are available with ■ lock-in-last position, ■ fail-up, or ■ fail-down action (for specifications, see separate bulletins).

Potentiometer: It is used for remote valve rotation indication.

Cylinder Bypass: The bypass valve is required when a handwheel actuator is specified.

Limit Switches: ■ TopWorx™ DXP M21GNEB limit switch for one through six single-pole, double-throw contacts (see separate bulletin), ■ GO Switch™ proximity switches for one or two single-pole, double-throw contacts, or ■ Micro-Switches or NAMCO switches for one or two single-pole, double-throw or double-pole, double-throw contacts. GO Switch proximity switch is not available for size 80, 100 or 130 actuators.

Handwheel Actuator: The Fisher 1078 manual declutchable actuator (see figure 3) allows auxiliary or emergency valve operation of sizes 30 through 100 when engaged see Fisher bulletin 61.8:1078 (D101339X012).

Locking Mechanism: The locking mechanism shown in figure 4 is available for sizes ■ 30, ■ 40, ■ 60, and ■ 68 actuators. The locking mechanism shown in figure 5 is available for sizes ■ 80 and ■ 100 actuators.

FlowScanner™ Connections: Optional quick disconnect connections are available for use with the portable FlowScanner microprocessor-based diagnostic testing unit.

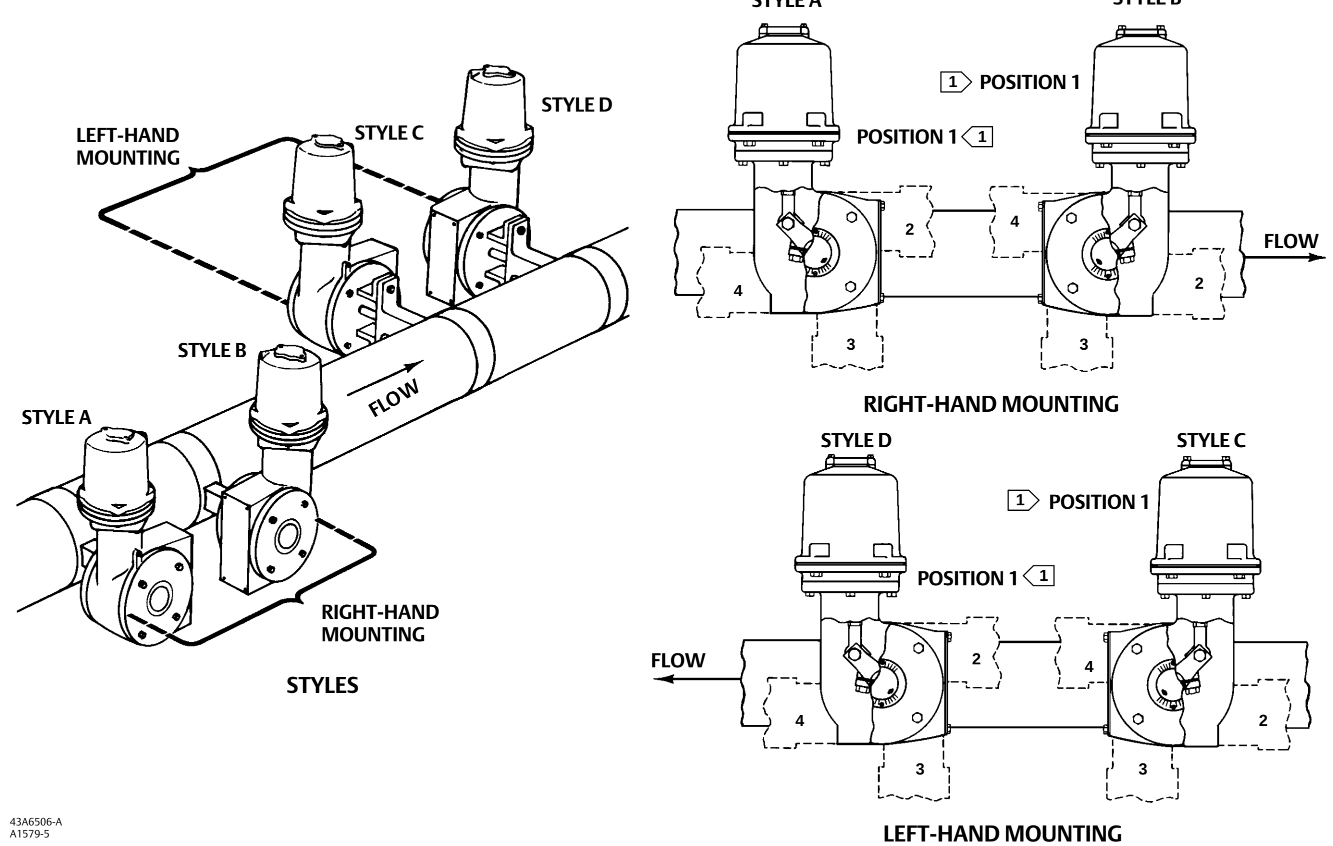
Pipe-Away Vent: Some applications use natural gas or other hazardous gases as a supply pressure to the actuator. These applications require the actuator housing to be vented, reducing the accumulation of gases. For new constructions and retrofit kit information, contact your Emerson sales office or Local Business Partner with complete service conditions.

Table 3. Mounting Styles and Positions

MOUNTING	ACTION[1]	VALVE SERIES OR DESIGN				VALVE SERIES OR DESIGN		
		BALL/PLUG ROTATION TO CLOSE	V250	V150, V200 and V300	CV500 and V500	DISK/BALL ROTATION TO CLOSE	V250	8510B, 8532, 8560 and 9500
Right-Hand	PDTC PDTO	CCW CCW	A B	A B	A B	CW CW	NA NA	B A
Left-Hand	PDTC PDTO	CCW CCW	NA NA	D C	D C	CW CW	C D	C D
Left-Hand (Optional)[2]	PDTC PDTO	CW CW	NA NA	C D	NA NA	NA NA	NA NA	NA NA

1. PDTC—Push-down-to-close, and PDTO—Push-down-to-open.
2. A left hand ball will be required for the 3- through 12-inch Series B and the 14- to 20-inch, with or without attenuator.

Figure 2. Mounting Styles and Positions (also see table 3)



Notes:
1 Position 1 is standard; positions 2 through 4 (shown in dotted lines) are alternates.

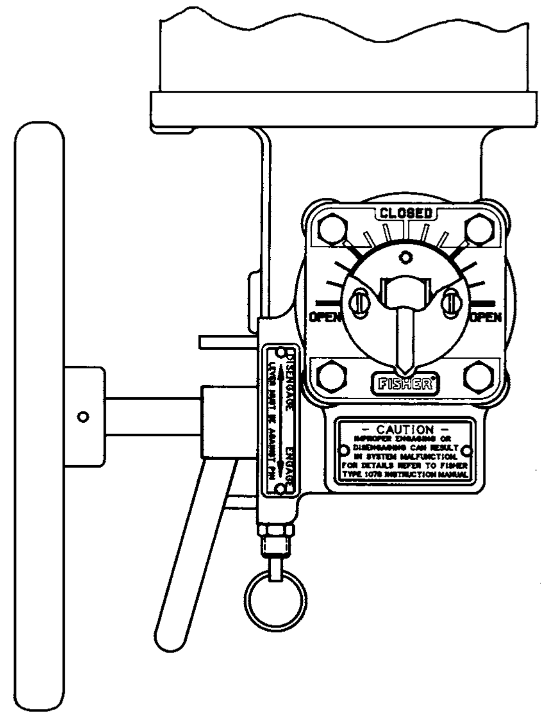
2. By Emerson definition:
- Forward flow is into the face side of the disk , or ball sealing surface.
- Reverse flow is into the hub side of the disk or ball.

Installation

The actuator is normally positioned vertically in a horizontal pipeline. However, four mounting styles and four positions are possible for each style (see figure 2).

When looking in the direction of flow in the pipeline, an actuator is right-hand mounted when it is on the right side of the pipeline, and an actuator is left-hand mounted when it is mounted on the left side of the pipeline.

Figure 3. Fisher 1078 Declutchable Manual Actuator



41B0314-A

By Emerson Automation Solutions definition, forward flow is into the face side of the disk or ball, and reverse flow is into the hub side of the disk or ball.

Dimensions for the 1061 actuator are shown in figure 6. These dimensions should be used in conjunction with the mounting positions shown in figure 2.

Actuator Locking Mechanism

The 1061 actuator (sizes 30 through 100) is available with a locking mechanism which may be used to keep the actuator in the locked position during maintenance shutdowns (see figures 4 and 5). The device is intended to prevent accidental operation of the valve during shutdown and does not imply or qualify a control valve as a safety shutdown device.

Adjustable Travel Stops

An adjustable down travel stop for the 1061 size 30, 40, 60, and 68 actuators is installed in a special actuator housing. The assembly consists of locking screws, locknut, special end rod bearing, and special lever.

As used here, down or downward means in a direction toward the valve shaft and away from the piston and diaphragm. Up or upward means in a direction away from the valve shaft and toward the piston and diaphragm.

The locking screw can be positioned to limit downward travel of the actuator lever to any rotation between 0 and 90 degrees. The travel stop is installed similar to the locking mechanism shown in figure 4, except the travel stop does not accommodate a padlock and the travel stop can be completely unscrewed from the housing.

An adjustable up travel stop for the 1061 sizes 40 through 100 actuators is installed in the top of a special actuator cylinder. The top of the special cylinder is tapped and faced (machined) for the travel stop. The assembly consists of a screw, locknut, and pressure seal. The screw can be positioned to limit upward travel of the piston to any rotation between 30 and 90 degrees for PDTC, and 0 to 60 degrees for PDTO. Longer screws are available to further limit travel.

Figure 4. Actuator Locking Mechanism for Size 30, 40, 60, and 68 Actuators

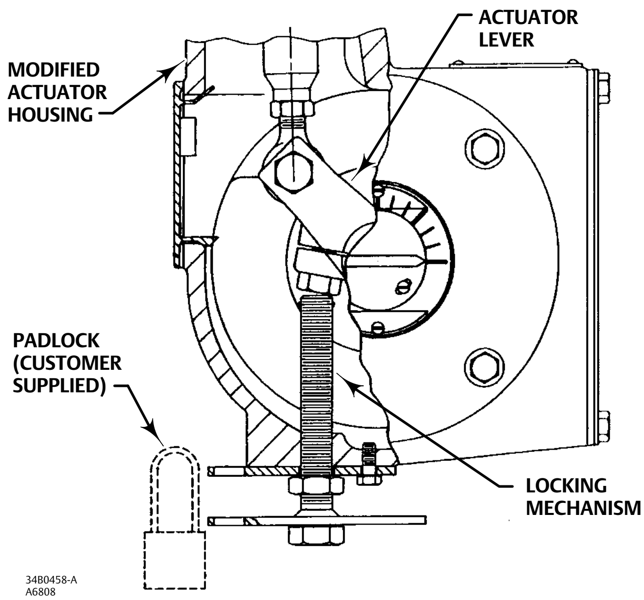


Figure 5. Actuator Locking Mechanism for Size 80 and 100 Actuators

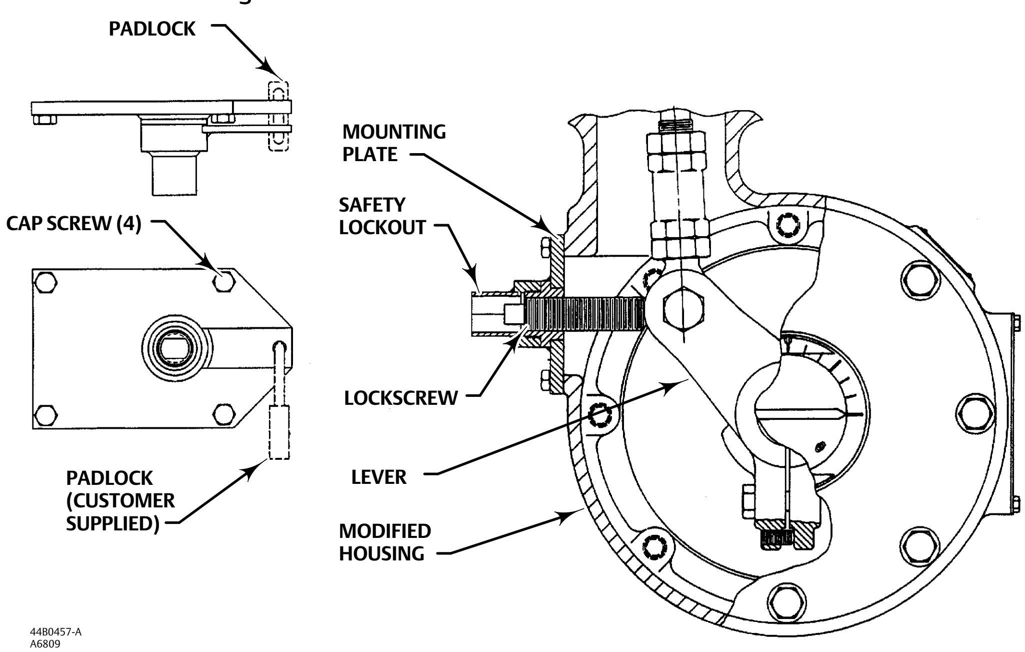


Table 4. Dimensions

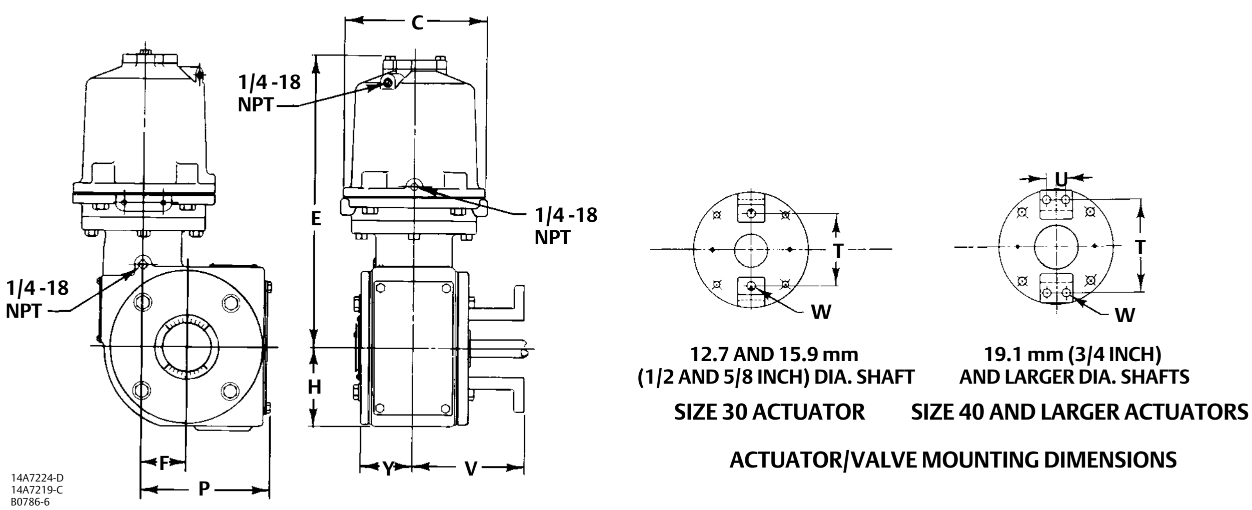
ACTUATOR SIZE	C		E		F		H		P				Y	
									w/o Positioner		w/3610JP Pos.			
	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
30	171	6.75	378	14.88	53.8	2.12	114	4.50	175	6.88	281	11.07	73.2	2.88
40	206	8.12	425	16.75	63.5	2.50	121	4.75	186	7.31	292	11.50	76.2	3.00
60	267	10.50	406	16.00	63.5	2.50	121	4.75	186	7.31	292	11.50	76.2	3.00
68	324	12.75	483	19.00	63.5	2.50	121	4.75	186	7.31	292	11.50	76.2	3.00
80	324	12.75	714	28.12	123	4.84	213	8.38	345	13.62	452	17.81	127	5.00
100	381	15.00	714	28.12	123	4.84	213	8.38	345	13.62	452	17.81	127	5.00
130	489	19.24	926	36.47	169	6.67	291	11.46	471	18.55	578	22.74	167	6.56

Table 5. Dimensions

VALVE SHAFT DIAMETER		STYLE F MOUNTING: V-LINE, 8532, 8560, AND ECCENTRIC DISK VALVES						STYLE G MOUNTING: 9500 SERIES VALVES						V	
		T		U		W		T		U		W			
mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
12.7	1/2	117	4.62	- - -	- - -	14.3	0.56	117	4.62	- - -	- - -	11.1	0.44	137	5.38
15.9	5/8	117	4.62	- - -	- - -	14.3	0.56	146	5.75	31.7	1.25	11.1	0.44	137(1)	5.38(1)
19.1 and 25.4	3/4 and 1	152	6.00	31.7	1.25	14.3	0.56	146	5.75	31.7	1.25	11.1	0.44	160	6.31
31.8 and 38.1	1-1/4 and 1-1/2	235	9.25	45.9	1.81	17.5	0.69	210	8.25	50.8	2.00	17.5	0.69	148	5.81
44.5 and 50.8	1-3/4 and 2	273	10.75	50.8	2.00	20.5	0.81	241	9.50	69.8	2.75	17.5	0.69	286(2)	11.25(2)
63.5	2-1/2	337	13.25	76.2	3.00	23.8	0.94	---	---	---	---	---	---	235	9.25
76.2	3(3)	533	21.00	127	5.00	33.5	1.32	---	---	---	---	---	---	322	12.68
88.9	3-1/2(3)	533	21.00	127	5.00	33.5	1.32	---	---	---	---	---	---	322	12.68

1. Dimension shown is for eccentric disk, V150, V200, V300, CV500, 8532, and 8560 valves only; For 7600 and 9500 valves, dimension “V” is 160 mm (6.31 inches).
2. Dimension shown is for size 60 and 68 actuators only; for Size 80 and 100 actuators, the dimension “V” is 235 mm (9.25 inches).
3. Dimensions shown are for V260 valves only.

Figure 6. Dimensions (also see tables 4 and 5)



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Fisher™ 1068 Rotary Vane Actuator

Fisher 1068 rotary vane spring return and double acting pneumatic actuators have a large range of sizes that can be mounted to rotary shaft valves. The 1068 rotary vane actuator is one of the simplest and most reliable units for quarter-turn rotary actuation.

The 1068 design offers a wide torque range. The double acting actuator is capable of outputting the same torque at every valve rotation. The spring return actuator has torque outputs that are linear, and balanced for both air-to-open and air-to-close applications.

X1591

1068 SPRING RETURN ACTUATOR

X1590

1068 DOUBLE ACTING ACTUATOR

Features

- Accuracy -- The 1068 actuator vane and shaft are an integral casting, removing a means of lost motion or dead band. Clamped coupler used on size 5i through 15i spring return minimizes the possibility of lost motion between the actuator and valve shaft connection.

- Integral Air Passage -- The 1068 sizes 5i through 15i spring return actuator incorporates an integral air passage that eliminates the need for external tubing and fittings when paired with a Fisher FIELDVUE™ DVC2000 and DVC6200 digital valve controllers. The double acting unit will require minimal external tubing.

- Compact Construction -- Reduced valve/actuator envelope dimensions leads to more mounting flexibility when space is at a premium.

- Long Life Service -- Tested to over 1 million cycles. Rugged construction provides stability, corrosion resistance, and protection from demanding process control applications.

- Improved Ease of Use -- Integral mounting pad for DVC2000 and DVC6200 eliminates the traditional mounting bracket and reduces the number of parts required to mount for the size 5i through 15i spring return and double acting actuators.

Specifications

Available Configuration

Actuator Sizes:

Spring Return and Double Acting: ■ 5i (spring return), ■ 7i, ■ 8i, ■ 9i, ■ 10i, ■ 12i, ■ 14i, and ■ 15i

Spring Return and Double Acting: ■ 16, ■ 18, ■ 20, and ■ 30

Mounting Connections

Square Shaft: ISO 5211 5i through 15i
Keyed Shaft: 16 through 30

Operating Pressure

Double Acting: 20 psig (1.5 bar) to 100 psi (7 bar); 80 psig (5.5 bar), standard

Spring Return: 80 psig (5.5 bar) standard(1)

Operation:

Fail-Safe Spring Return: *Clock type spring return gives fail-safe operation with high torque output throughout spring stroke in either clockwise or counter-clockwise direction*

Double Acting:
Air to close CW or CCW

Spring Return:
Spring to close CW or CCW/ Air to close CW or CCW

Pressure Connections

See table 5

Adjustable Travel Stops

Standard: 80° minimum rotation, 84° size 5i
Fixed Travel: To replace CamFlex; see table 3

Torque Output

Refer to table 6

Digital Valve Controllers

DVC6200 Series

Temperature Range

Standard: -40 to 80°C (-40 to 176°F)

Materials of Construction

See table 1

Approximate Weight

See table 4

1. The torque output of the spring return actuator is optimized for an 80 psig operating pressure. The actuators are still capable of creating usable torque at 60 or 70 psig, but the net torque output will be significantly reduced and will no longer be balanced with the spring torque. See table 5 for spring return torque valves at 60 or 70 psig.

Features (cont.)

- **Large Size Range --** The 1068 actuator offers sizes that cover torques up to 150,000 in•lb.
- **Single Moving Part --** The rotary vane actuator ensures a long service life with minimal maintenance.
- **Corrosion Resistant --** Robust epoxy coated zinc/titanium alloy, or aluminum housings, epoxy enamel coated inside/out to provide substantial corrosion resistance.
- **Efficiency --** The small internal volume minimizes the air consumption of the 1068.

Options/Available Configurations

- **Double Acting --** Air supplied to both sides of the vane which is the only moving part. Allowing for the highest torque values and compact design.
- **Spring Return --** Designed for long cycle life and have a balanced net and spring stroke torque.
- **Fixed Travel Spring Return --** Designed to limit travel of V150, V200, and V300 Vee-Ball valves. See Management of Change document (D353155X012) for more information.

Fisher 1068 size 5i through 15i spring return actuators feature an integral air passage that eliminates the need for tubing and fittings with the DVC2000 and DVC6200. The 1068 actuator with a Fisher FIELDVUE digital valve controller is a combination for precision and repeatability in the field.

Table 1. Materials

Component	Material
Yoke	Diecast Aluminum Alloy (5i through 15i)
Casing	Aluminum Alloy (8i through 30), Zinc (5i and 7i)
Vane and Output Shaft	Stainless Steel (5i), Ductile Iron Zinc Plated (7i through 15i and 16 through 30)
Seals	Molded Polyurethane
Couplers	Stainless Steel 5i through 15i
Shaft Bushings	PTFE Coated Bronze

Table 2. Shaft Size Compatibility

Spring Return Size	Square Size (mm)					
	9	11	14	19	22	27
	Shaft Size (inches)					
	0.5	0.62	0.75	1	1.25	1.5
5i	X	X				
7i	X	X	X	X		
8i	X	X	X	X	X	X
9i	X	X	X	X	X	X
10i	X	X	X	X	X	X
12i			X	X	X	X
14i			X	X	X	X
15i					X	X
16	Contact your Emerson sales office					
18						
20						
30						
Double Acting Size	**Square Size (mm)**					
	9	**11**	**14**	**19**	**22**	**27**
	Shaft Size (inches)					
	0.5	**0.62**	**0.75**	**1**	**1.25**	**1.5**
7i	X	X				
8i	X	X	X	X	X	
9i			X	X	X	X
10i			X	X	X	X
12i				X	X	X
14i				X	X	X
15i					X	X
16	Contact your Emerson sales office					
18						
20						
30						

Table 3. Restricted Travel

Valve Size, NPS	Actuator Size	Travel, Degrees	Approx. C_v +/- 5%
1	7i	55	8.4
1-1/2			19.8
2	8i	52	30
3			81
4	9i	51	138
6	12i	60	300
8	14i	64	510
10		56	780
12	15i	52	1050

Table 4. Approximate Shipping Weight

Size	Shaft Diameter, inch	Spring Return		Double Acting	
		lb	kg	lb	kg
5i	1/2	9	4.1	- - -	- - -
	5/8				
7i	1/2	19	8.6	10	4.5
	5/8				
	3/4			- - -	- - -
	1				
8i	1/2	22	10	12	5.4
	5/8				
	3/4				
	1				
	1 1/4				
	1 1/2			- - -	- - -
9i	1/2	29	13.1	- - -	- - -
	5/8				
	3/4			15	6.8
	1				
	1 1/4				
	1 1/2				
10i	1/2	38	17.2	- - -	- - -
	5/8				
	3/4			18	8.2
	1				
	1 1/4				
	1 1/2				
12i	3/4	72	32.6	- - -	- - -
	1			26	11.8
	1 1/4				
	1 1/2				
14i	3/4	167	75.7	- - -	- - -
	1			40	18.1
	1 1/4				
	1 1/2				
15i	1 1/4	241	109.3	59	26.8
	1 1/2				
16	1 1/2	272	123.4	88	39.9
	1 3/4				
	2				
	2 1/8				
18	2 1/2	530	240.4	170	77.1
	3				
	3 1/2				
20	2 1/2	1058	480	464	210.5
	3				
	3 1/2				
30	2 1/2	1701	771.6	635	288.0
	3				
	3 1/2				

Table 5. Pressure Connections

Actuator Size	PRESSURE CONNECTION, NPT					
	1/8	1/4	3/8	1/2	3/4	1
5i	X					
7i		X				
8i		X				
9i		X				
10i		X				
12i			X			
14i				X		
15i				X		
16				X		
18					X	
20						X
30						X

Table 6. 1068 Spring Return Torques at Various Operating Pressures

FAIL OPEN 1068 SPRING RETURN ACTUATOR(1)								
Actuator Size	Spring Torque (all pressures)		60 psi		70 psi		80 psi	
	Torque (in • lb)		Net Torque (in • lb)					
	0°	90°	0°	90°	0°	90°	0°	90°
5i	185	155	63	93	109	139	155	185
7i	450	375	150	225	263	338	375	450
8i	720	580	229	368	405	544	580	720
9i	925	830	356	452	593	688	830	925
10i	1450	1270	523	703	896	1076	1270	1450
12i	2110	1810	763	1063	1286	1586	1810	2110
14i	5200	4230	1748	2717	2990	3959	4230	5200
15i	8514	6992	2848	4370	4921	6442	6992	8514
16	11691	9567	4100	6224	6833	8957	9567	11691
18	26143	21390	8723	13476	15056	19809	21390	26143
20	48286	39506	16506	25286	28006	36786	39506	48286
30	72428	59260	24760	37928	42010	55178	59260	72428
FAIL CLOSED 1068 SPRING RETURN ACTUATOR(1)								
Actuator Size	Spring Torque (all pressures)		60 psi		70 psi		80 psi	
	Torque (in • lb)		Net Torque (in • lb)					
	0°	90°	0°	90°	0°	90°	0°	90°
5i	155	185	93	63	139	109	185	155
7i	375	450	225	150	338	263	450	375
8i	580	720	368	229	544	405	720	580
9i	830	925	452	356	688	593	925	830
10i	1270	1450	703	523	1076	896	1450	1270
12i	1810	2110	1063	763	1586	1286	2110	1810
14i	4230	5200	2717	1748	3959	2990	5200	4230
15i	6992	8514	4370	2848	6442	4921	8514	6992
16	9567	11691	6224	4100	8957	6833	11691	9567
18	21390	26143	13476	8723	19809	15056	26143	21390
20	39506	48286	25286	16506	36786	28006	48286	39506
30	59260	72428	37928	24760	55178	42010	72428	59260

1. 0° and 90° for valve rotation.

Table 7. Actuator/Valve Body Mounting Dimensions A through G (see figures 1, 2, and 3)

SPRING RETURN ACTUATOR SIZE OPTIONS														
Square Shaft (9 mm)														
Size	**A**		**B**		**C**		**D**		**E**		**F**		**G**	
	mm	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**Inch**
5i	137	5.39	79.4	3.13	67	2.64	36	1.42	50	1.97	105	4.13	57	2.24
7i	178	7.01	102.6	4.04	100	3.94	36	1.42	82	3.23	105	4.13	57	2.24
8i	208	8.19	120.7	4.75	110	4.33	36	1.42	87	3.43	105	4.13	57	2.24
9i	227	8.94	132.3	5.21	126	4.96	36	1.42	92	3.62	105	4.13	57	2.24
10i	229	9.02	131	5.16	175	6.89	36	1.42	110	4.33	105	4.13	57	2.24
Square Shaft (11 mm)														
5i	137	5.39	79.4	3.13	67	2.64	36	1.42	50	1.97	105	4.13	60	2.36
7i	178	7.01	102.6	4.04	100	3.94	36	1.42	82	3.23	105	4.13	60	2.36
8i	208	8.19	120.7	4.75	110	4.33	36	1.42	87	3.43	105	4.13	60	2.36
9i	227	8.94	132.3	5.21	126	4.96	36	1.42	92	3.62	105	4.13	60	2.36
10i	229	9.02	131	5.16	175	6.89	36	1.42	110	4.33	105	4.13	60	2.36
Square Shaft (14 mm)														
7i	178	7.01	102.6	4.04	100	3.94	41	1.61	82	3.23	150	5.91	83	3.27
8i	208	8.19	120.7	4.75	110	4.33	41	1.61	87	3.43	150	5.91	83	3.27
9i	227	8.94	132.3	5.21	126	4.96	41	1.61	92	3.62	150	5.91	83	3.27
10i	229	9.02	131	5.16	175	6.89	41	1.61	110	4.33	150	5.91	83	3.27
12i	294	11.57	171	6.73	172	6.75	41	1.61	136	5.35	150	5.91	83	3.27
14i	380	14.96	224	8.82	216	8.48	41	1.61	187	7.36	150	5.91	83	3.27
Square Shaft (19 mm)														
7i	178	7.01	102.6	4.04	100	3.94	41	1.61	82	3.23	150	5.91	83	3.27
8i	208	8.19	120.7	4.75	110	4.33	41	1.61	87	3.43	150	5.91	83	3.27
9i	227	8.94	132.3	5.21	126	4.96	41	1.61	92	3.62	150	5.91	83	3.27
10i	229	9.02	131	5.16	175	6.89	41	1.61	110	4.33	150	5.91	83	3.27
12i	294	11.57	171	6.73	172	6.75	41	1.61	136	5.35	150	5.91	83	3.27
14i	380	14.96	224	8.82	216	8.48	41	1.61	187	7.36	150	5.91	83	3.27
Square Shaft (22 mm)														
8i	208	8.19	120.7	4.75	110	4.33	42	1.65	87	3.43	160	6.30	77	3.03
9i	227	8.94	132.3	5.21	126	4.96	42	1.65	92	3.62	160	6.30	77	3.03
10i	229	9.02	131	5.16	175	6.89	42	1.65	110	4.33	160	6.30	77	3.03
12i	294	11.57	171	6.73	171.5	6.75	42	1.65	136	5.35	160	6.30	77	3.03
14i	380	14.96	224	8.82	215.5	8.48	42	1.65	187	7.36	160	6.30	77	3.03
15i	433	17.05	252	9.92	260.5	10.26	42	1.65	187	7.36	160	6.30	77	3.03
Square Shaft (27 mm)														
8i	208	8.19	120.7	4.75	110	4.33	42	1.65	87	3.43	160	6.30	77	3.03
9i	227	8.94	132.3	5.21	126	4.96	42	1.65	92	3.62	160	6.30	77	3.03
10i	229	9.02	131	5.16	175	6.89	42	1.65	110	4.33	160	6.30	77	3.03
12i	294	11.57	171	6.73	171.5	6.75	42	1.65	136	5.35	160	6.30	77	3.03
14i	380	14.96	224	8.82	215.5	8.48	42	1.65	187	7.36	160	6.30	77	3.03
15i	433	17.05	252	9.92	260.5	10.26	42	1.65	187	7.36	160	6.30	77	3.03

-continued-

Table 7. Actuator/Valve Body Mounting Dimensions A through G (cont.) (see figures 1, 2, and 3)

Size	A		B		C		D		E[1]		F		G	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
DOUBLE ACTING ACTUATOR SIZE OPTIONS														
Square Shaft (9 mm)														
7i	178	7.01	102.6	4.04	100	3.94	36	1.42	- - -	- - -	105	4.13	57	2.24
8i	208	8.19	120.7	4.75	110	4.33	36	1.42	- - -	- - -	105	4.13	57	2.24
Square Shaft (11 mm)														
7i	178	7.01	102.6	4.04	100	3.94	36	1.42	- - -	- - -	105	4.13	60	2.36
8i	208	8.19	120.7	4.75	110	4.33	- - -	- - -	- - -	- - -	105	4.13	60	2.36
Square Shaft (14 mm)														
8i	208	8.19	120.7	4.75	110	4.33	41	1.61	- - -	- - -	150	5.91	83	3.27
9i	227	8.94	132.3	5.21	126	4.96	41	1.61	- - -	- - -	150	5.91	83	3.27
10i	229	9.02	131.0	5.16	175	6.89	41	1.61	- - -	- - -	150	5.91	83	3.27
Square Shaft (19 mm)														
8i	208	8.19	120.7	4.75	110	4.33	41	1.61	- - -	- - -	150	5.91	83	3.27
9i	227	8.94	132.3	5.21	126	4.96	41	1.61	- - -	- - -	150	5.91	83	3.27
10i	229	9.02	131.0	5.16	175	6.89	41	1.61	- - -	- - -	150	5.91	83	3.27
12i	294	11.57	171	6.73	172	6.75	41	1.61	- - -	- - -	150	5.91	83	3.27
14i	380	14.96	224	8.82	216	8.48	41	1.61	- - -	- - -	150	5.91	83	3.27
Square Shaft (22 mm)														
8i	208	8.19	120.7	4.75	110	4.33	42	1.65	- - -	- - -	160	6.30	77	3.03
9i	227	8.94	132.3	5.21	126	4.96	42	1.65	- - -	- - -	160	6.30	77	3.03
10i	229	9.02	131	5.16	175	6.89	42	1.65	- - -	- - -	160	6.30	77	3.03
12i	294	11.57	171	6.73	171.5	6.75	42	1.65	- - -	- - -	160	6.30	77	3.03
14i	380	14.96	224	8.82	215.5	8.48	42	1.65	- - -	- - -	160	6.30	77	3.03
15i	433	17.05	252	9.92	260.5	10.26	42	1.65	- - -	- - -	160	6.30	77	3.03
Square Shaft (27 mm)														
8i	208	8.19	120.7	4.75	110	4.33	42	1.65	- - -	- - -	160	6.30	77	3.03
9i	227	8.94	132.3	5.21	126	4.96	42	1.65	- - -	- - -	160	6.30	77	3.03
10i	229	9.02	131	5.16	175	6.89	42	1.65	- - -	- - -	160	6.30	77	3.03
12i	294	11.57	171	6.73	171.5	6.75	42	1.65	- - -	- - -	160	6.30	77	3.03
14i	380	14.96	224	8.82	215.5	8.48	42	1.65	- - -	- - -	160	6.30	77	3.03
15i	433	17.05	252	9.92	260.5	10.26	42	1.65	- - -	- - -	160	6.30	77	3.03

1. Double Acting Actuators will not have the Spring Return Chamber (E).

Table 8. Actuator/Valve Body Mounting Dimensions H through O (see figures 1, 2, and 3)

SPRING RETURN ACTUATOR SIZE OPTIONS														
Square Shaft (9 mm)														
Size	H		I		J		K		M (NPT)	N		O		
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	
5i	148	5.83	40	1.57	105	4.13	9	0.35	1/8	41.2	1.62	- - -	- - -	
7i	148	5.83	40	1.57	105	4.13	9	0.35	1/4	41.2	1.62	- - -	- - -	
8i	148	5.83	40	1.57	105	4.13	9	0.35	1/4	41.2	1.62	- - -	- - -	
9i	148	5.83	40	1.57	105	4.13	9	0.35	1/4	41.2	1.62	- - -	- - -	
10i	148	5.83	40	1.57	105	4.13	9	0.35	1/4	41.2	1.62	- - -	- - -	
Square Shaft (11 mm)														
5i	148	5.83	40	1.57	105	4.13	11	0.43	1/8	41.2	1.62	- - -	- - -	
7i	148	5.83	40	1.57	105	4.13	11	0.43	1/4	41.2	1.62	- - -	- - -	
8i	148	5.83	40	1.57	105	4.13	11	0.43	1/4	41.2	1.62	- - -	- - -	
9i	148	5.83	40	1.57	105	4.13	11	0.43	1/4	41.2	1.62	- - -	- - -	
10i	148	5.83	40	1.57	105	4.13	11	0.43	1/4	41.2	1.62	- - -	- - -	
Square Shaft (14 mm)														
7i	189	7.44	62	2.44	135	5.31	14	0.55	1/4	41.2	1.62	- - -	- - -	
8i	189	7.44	62	2.44	135	5.31	14	0.55	1/4	41.2	1.62	- - -	- - -	
9i	189	7.44	62	2.44	135	5.31	14	0.55	1/4	41.2	1.62	- - -	- - -	
10i	189	7.44	62	2.44	135	5.31	14	0.55	1/4	41.2	1.62	- - -	- - -	
12i	189	7.44	62	2.44	135	5.31	14	0.55	1/8	41.2	1.62	15.5	0.61	
14i	189	7.44	62	2.44	135	5.31	14	0.55	1/2	41.2	1.62	15.5	0.61	
Square Shaft (19 mm)														
7i	189	7.44	62	2.44	135	5.31	19	0.75	1/4	41.2	1.62	- - -	- - -	
8i	189	7.44	62	2.44	135	5.31	19	0.75	1/4	41.2	1.62	- - -	- - -	
9i	189	7.44	62	2.44	135	5.31	19	0.75	1/4	41.2	1.62	- - -	- - -	
10i	189	7.44	62	2.44	135	5.31	19	0.75	1/4	41.2	1.62	- - -	- - -	
12i	189	7.44	62	2.44	135	5.31	19	0.75	1/8	41.2	1.62	15.5	0.61	
14i	189	7.44	62	2.44	135	5.31	19	0.75	1/2	41.2	1.62	15.5	0.61	
Square Shaft (22 mm)														
8i	278	10.94	82	3.23	155	6.10	22	0.87	1/4	41.2	1.62	- - -	- - -	
9i	278	10.94	82	3.23	155	6.10	22	0.87	1/4	41.2	1.62	- - -	- - -	
10i	278	10.94	82	3.23	155	6.10	22	0.87	1/4	41.2	1.62	- - -	- - -	
12i	278	10.94	82	3.23	155	6.10	22	0.87	1/8	41.2	1.62	15.5	0.61	
14i	278	10.94	82	3.23	155	6.10	22	0.87	1/2	41.2	1.62	15.5	0.61	
15i	278	10.94	82	3.23	155	6.10	22	0.87	1/2	41.2	1.62	15.5	0.61	
Square Shaft (27 mm)														
8i	278	10.94	82	3.23	155	6.10	27	1.06	1/4	41.2	1.62	- - -	- - -	
9i	278	10.94	82	3.23	155	6.10	27	1.06	1/4	41.2	1.62	- - -	- - -	
10i	278	10.94	82	3.23	155	6.10	27	1.06	1/4	41.2	1.62	- - -	- - -	
12i	278	10.94	82	3.23	155	6.10	27	1.06	1/8	41.2	1.62	15.5	0.61	
14i	278	10.94	82	3.23	155	6.10	27	1.06	1/2	41.2	1.62	15.5	0.61	
15i	278	10.94	82	3.23	155	6.10	27	1.06	1/2	41.2	1.62	15.5	0.61	

-continued-

Table 8. Actuator/Valve Body Mounting Dimensions H through O (cont.) (see figures 1, 2, and 3)

DOUBLE ACTING ACTUATOR SIZE OPTIONS														
Square Shaft (9 mm)														
Size	H		I		J		K		M (NPT)	N		O	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm	Inch	mm	Inch
7i	148	5.83	40	1.57	105	4.13	9	0.35	1/8	41.2	1.62	- - -	- - -
8i	148	5.83	40	1.57	105	4.13	9	0.35	1/4	41.2	1.62	- - -	- - -
Square Shaft (11 mm)													
7i	148	5.83	40	1.57	105	4.13	11	0.43	1/8	41.2	1.62	- - -	- - -
8i	148	5.83	40	1.57	105	4.13	11	0.43	1/4	41.2	1.62	- - -	- - -
Square Shaft (14 mm)													
8i	189	7.44	62	2.44	135	5.31	14	0.55	1/4	41.2	1.62	- - -	- - -
9i	189	7.44	62	2.44	135	5.31	14	0.55	1/4	41.2	1.62	- - -	- - -
10i	189	7.44	62	2.44	135	5.31	14	0.55	1/4	41.2	1.62	- - -	- - -
Square Shaft (19 mm)													
8i	189	7.44	62	2.44	135	5.31	19	0.75	1/4	41.2	1.62	15.5	0.61
9i	189	7.44	62	2.44	135	5.31	19	0.75	1/4	41.2	1.62	15.5	0.61
10i	189	7.44	62	2.44	135	5.31	19	0.75	1/4	41.2	1.62	15.5	0.61
12i	189	7.44	62	2.44	135	5.31	19	0.75	1/8	41.2	1.62	15.5	0.61
14i	189	7.44	62	2.44	135	5.31	19	0.75	1/2	41.2	1.62	15.5	0.61
Square Shaft (22 mm)													
8i	278	10.94	82	3.23	155	6.10	22	0.87	1/4	41.2	1.62	- - -	- - -
9i	278	10.94	82	3.23	155	6.10	22	0.87	1/4	41.2	1.62	- - -	- - -
10i	278	10.94	82	3.23	155	6.10	22	0.87	1/4	41.2	1.62	- - -	- - -
12i	278	10.94	82	3.23	155	6.10	22	0.87	1/8	41.2	1.62	15.5	0.61
14i	278	10.94	82	3.23	155	6.10	22	0.87	1/2	41.2	1.62	15.5	0.61
15i	278	10.94	82	3.23	155	6.10	22	0.87	1/2	41.2	1.62	15.5	0.61
Square Shaft (27 mm)													
8i	278	10.94	82	3.23	155	6.10	27	1.06	1/4	41.2	1.62	- - -	- - -
9i	278	10.94	82	3.23	155	6.10	27	1.06	1/4	41.2	1.62	- - -	- - -
10i	278	10.94	82	3.23	155	6.10	27	1.06	1/4	41.2	1.62	- - -	- - -
12i	278	10.94	82	3.23	155	6.10	27	1.06	1/8	41.2	1.62	15.5	0.61
14i	278	10.94	82	3.23	155	6.10	27	1.06	1/2	41.2	1.62	15.5	0.61
15i	278	10.94	82	3.23	155	6.10	27	1.06	1/2	41.2	1.62	15.5	0.61

Figure 1. 1068 Actuator — Spring Return and Double Acting Dimension Drawing for 9 and 11 mm Square Shaft (see tables 7 and 8)

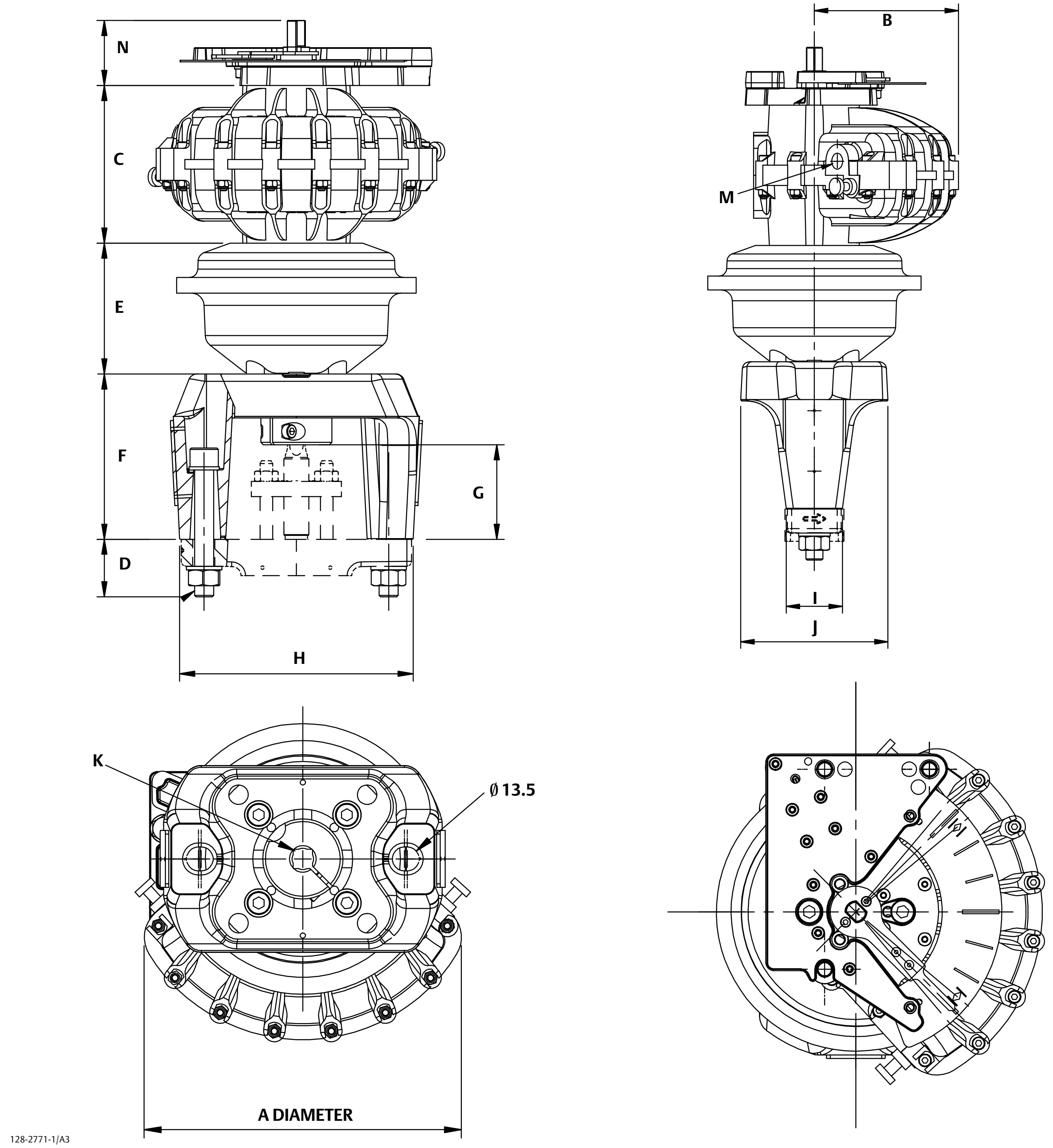


Figure 2. 1068 Actuator — Spring Return and Double Acting Dimension Drawing for 14 and 19 mm Square Shaft (see tables 7 and 8)

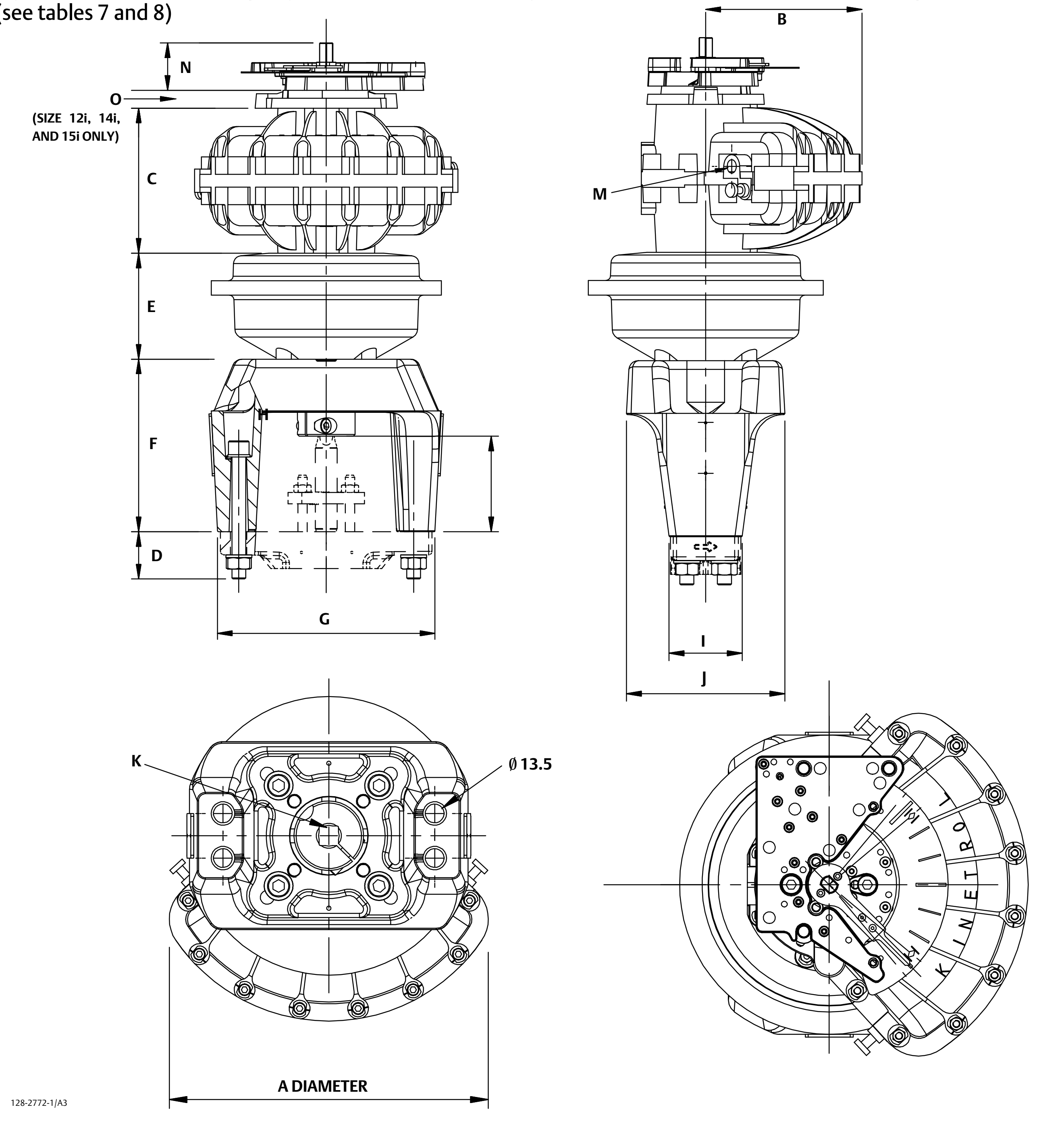


Figure 3. 1068 Actuator — Spring Return and Double Acting Dimension Drawing for 22 and 27 mm Square Shaft (see tables 7 and 8)

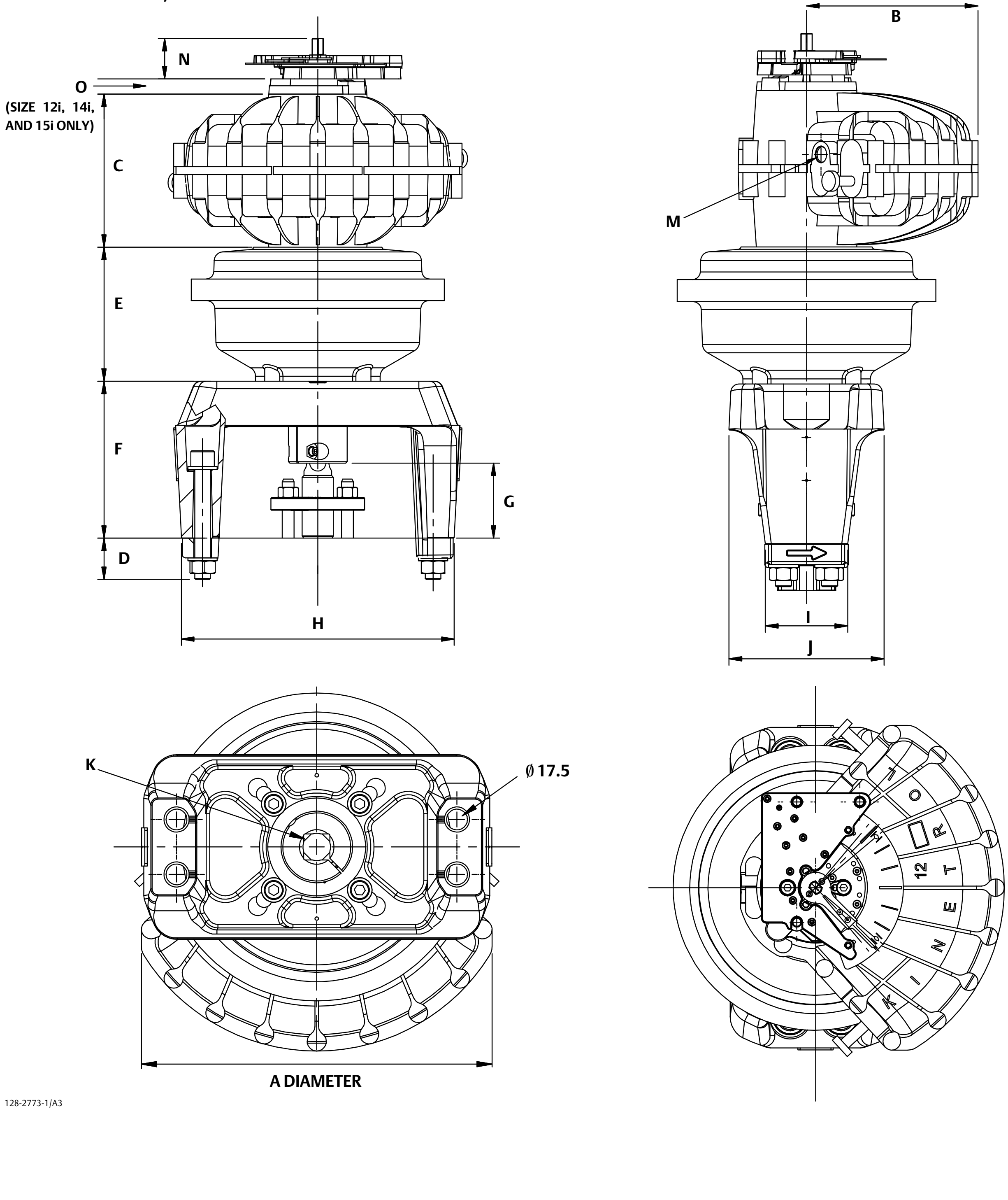
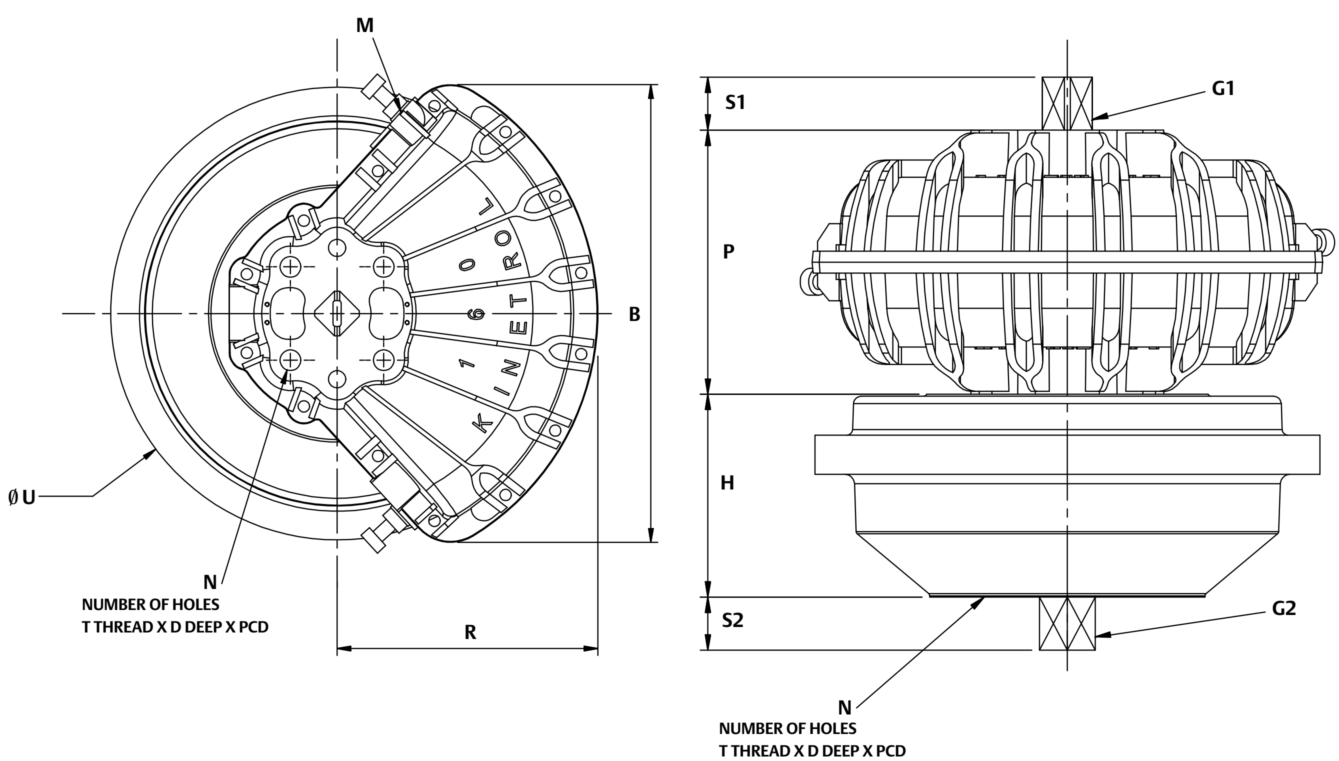


Table 9. Actuator/Valve Body Mounting Dimensions 16 through 30 (see figure 4)

Size	B		D		G1/G2		H(1)		M (NPT)	N		OU		P		PCD		R		S1/S2		T (UNC)
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch
SPRING RETURN ACTUATOR SIZE OPTIONS																						
16	530	20.87	38	1.50	40.95	1.61	212	8.35	1/8	4	0.16	524	20.63	274	10.79	152.7	6.01	302	11.89	55	2.17	7/8
18	680	26.77	50	1.97	56.95	2.24	312	12.28	1/4	4	0.16	524	20.63	360	14.17	226.3	8.91	392	15.43	78	3.07	1 1/8
20	680	26.77	50	1.97	72.95	2.87	512	20.16	1/4	8	0.31	524	20.63	620	24.41	226.3	8.91	392	15.43	100	3.94	1 1/8
30	680	26.77	50	1.97	72.95	2.87	712	28.03	1/4	8	0.31	524	20.63	880	34.65	226.3	8.91	392	15.43	100	3.94	1 1/8
DOUBLE ACTING ACTUATOR SIZE OPTIONS																						
16	530	20.87	38	1.50	40.95	1.61	---	---	1/8	4	0.16	524	20.63	274	10.79	152.7	6.01	302	11.89	55	2.17	7/8
18	680	26.77	50	1.97	56.95	2.24	---	---	1/4	4	0.16	524	20.63	360	14.17	226.3	8.91	392	15.43	78	3.07	1 1/8
20	680	26.77	50	1.97	72.95	2.87	---	---	1/4	8	0.31	524	20.63	620	24.41	226.3	8.91	392	15.43	100	3.94	1 1/8
30	680	26.77	50	1.97	72.95	2.87	---	---	1/4	8	0.31	524	20.63	880	34.65	226.3	8.91	392	15.43	100	3.94	1 1/8

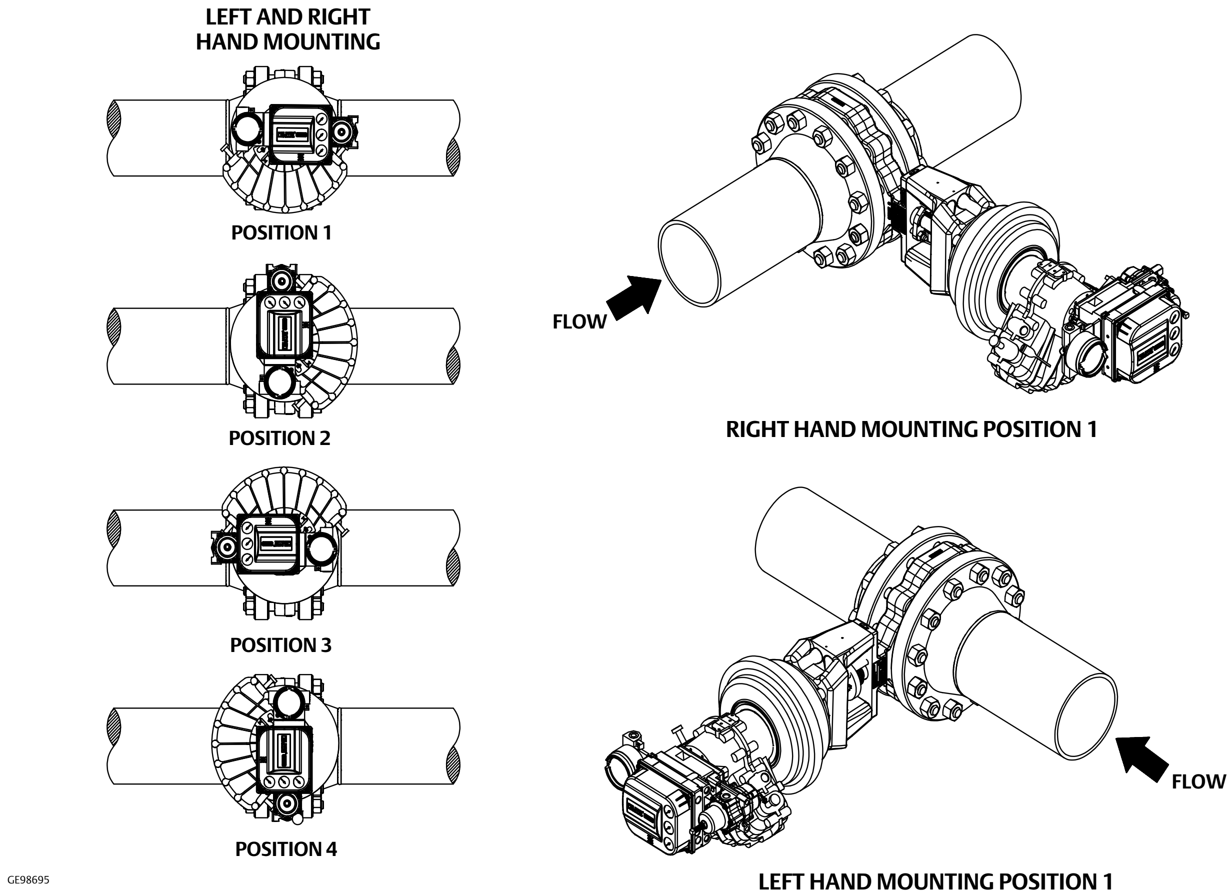
1. Double Acting Actuators will not have the Spring Return Chamber (H).

Figure 4. 1068 Actuator/Valve Body Mounting for Spring Return and Double Acting 16 through 30 (see table 9)



128-2774-1/A3

Figure 5. 1068 Actuator Mounting



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Fisher™ 1010 Electric Actuator Mounting System

The Fisher 1010 Electric Actuator Mounting System allows the integration of an ISO 5210 compliant electric actuator to a Fisher sliding-stem valve. The Fisher 1010 system includes a cast yoke, valve stem connector, actuator rod adaptor, travel scale, and spacers required to accommodate ISO 5210 mounted actuators.

X1156

Fisher 1010 Electric Actuator Mounting System mounted on an easy-e™

Features

- **Versatile ISO 5210 Mounting —** The 1010 mounting system offers the ability to mount ISO 5210 compliant electric actuators to Fisher valves with standard stems. The Fisher 1010's cast yoke is machined to fit the valve bonnet and can comply with ISO 5210 F07, F10, F12, and F14 mounting styles, providing flexibility in electric actuator selection.

Note

The 1010 electric actuator mounting system DOES NOT include the valve or actuator.


X1157

Mounting Interface of the Fisher 1010 Electric Actuator Mounting System

Table 1. Specifications

Materials

Yoke: LCC

Stem Connector: Stainless Steel

Travel Scale: Stainless Steel

Actuator Rod Adaptor: Stainless Steel

Fasteners: ISO CL8.8 with NCF3 coating

Operating Temperature Limit

Lower: -46°C (-50°F)

Note: The temperature range is subject to limitations of the selected electric actuator model.

Approximate Weight

See table 3

Dimensions

See figure 1 and table 3

Available Actuator Rod Adaptor Thread Sizes

F07: M10x1.5 and M16x1.5
F10: M12x1.25, M16x1.5, M18x1.5, and M20x1.5
F12: M20x2.5
F14: M30x2 and M36x3

Note: Additional sizes and special adaptors may be available upon request. Please consult your Emerson sales office or Local Business Partner.

Other

Accessories such as transducers, positioners, and position transmitters are also available for actuator mounting. They are described in separate publications. Contact your Emerson sales office or Local Business Partner for details.

Table 2. Maximum Travel and Thrust

YOKE BOSS DIAMETER		VALVE STEM SIZE		AVAILABLE ISO 5210 STYLE	MAXIMUM TRAVEL		MAXIMUM THRUST(1)	
mm	Inches	mm	Inches		mm	Inches	kN	lbf
54	2-1/8	9.5	3/8	F07	29	1-1/8	20	4496
				F10	29	1-1/8	40	8992
71	2-13/16	12.7	1/2	F07	51	2	20	4496
				F10	51	2	40	8992
				F12	51	2	70	15737
90	3-9/16	19.1	3/4	F10	102	4	40	8992
				F12	102	4	70	15737
				F14	102	4	100	22481
127	5	25.4	1	F14	203	8	100	22481
		31.8	1-1/4	F14	203	8	100	22481
127	5H	25.4	1	F14	203	8	100	22481
		31.8	1-1/4	F14	203	8	100	22481

1. Maximum allowable valve stem load must also be considered. Consult your Emerson sales office for more details.

Figure 1. Fisher 1010 Yoke Dimensions

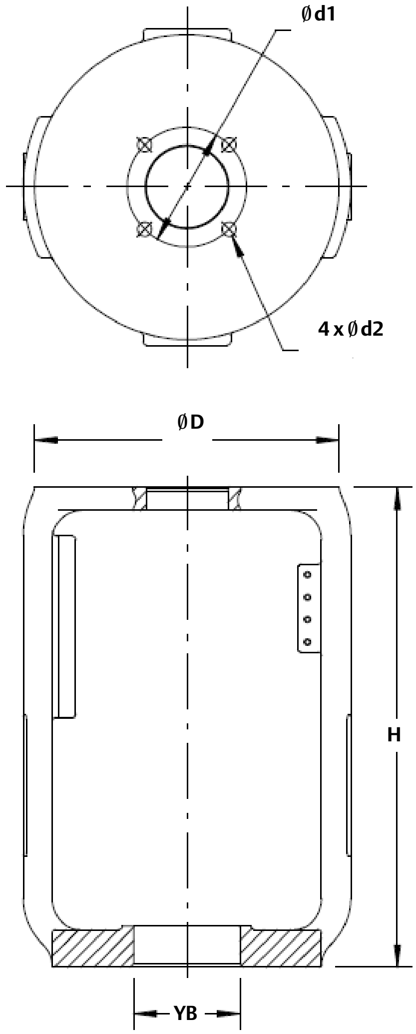

Table 3. Fisher 1010 Yoke Dimensions and Weight

YB		ISO	H	D	d1	d2	WEIGHT	
mm	Inches		mm (Inches)	mm (Inches)	mm (Inches)		kg	lb
54	2-1/8	F07(3)	320 (12.60)	180 (7.09)	70 (2.76)	M8	9.0	20
		F10	285 (11.22)	180 (7.09)	102 (4.02)	M10	9.0	20
71	2-13/16	F07(3)	290 (11.42)	180 (7.09)	70 (2.76)	M8	8.9	20
		F10	325 (12.80)	180 (7.09)	102 (4.02)	M10	8.9	20
		F12	290 (11.42	180 (7.09)	125 (4.98)	M12	8.6	19
90	3-9/16	F10	410 (16.14)	260 (10.24)	102 (4.02)	M10	32	71
		F12	410 (16.14)	260 (10.24)	125 (4.98)	M12	32	71
		F14	410 (16.14)	260 (10.24)	140 (5.51)	M16	35	77
127(1)	5(1)	F14	420 (16.54)	260 (10.24)	140 (5.51)	M16	35	77
127(2)	5(2)	F14	510 (20.08)	260 (10.24)	140 (5.51)	M16	39	86
127(1)	5H(1)	F14	420 (16.54)	260 (10.24)	140 (5.51)	M16	35	77
127(2)	5H(2)	F14	510 (20.08)	260 (10.24)	140 (5.51)	M16	39	86

1. 102 mm (4 inch) travel.
2. 203 mm (8 inch) travel.
3. Requires spacer adaptor (not shown).

Ordering Information

Your Emerson sales office or Local Business Partner can assist you with the proper sizing and selection of the Fisher 1010 Electric Actuator Mounting System for your Fisher valve.

When ordering, specify:

1. Application and sizing conditions

2. Valve body type and size to which the mounting system will be attached

3. Valve travel

4. Electric actuator type and model

5. Minimum and maximum electric actuator thrust values

Valve Body and Accessories

Refer to the separate valve body bulletin and bulletins covering accessories for ordering information.

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Fisher™ easy-Drive™ 200L

The Fisher easy-Drive 200L is a compact, rugged electric actuator designed for throttling or on/off applications. The actuator can be controlled via Modbus RTU, 4-20mA, or dry contact signals. Set up and calibration is made with the Fisher easy-Drive configurator which provides one button calibration. The actuator is designed to provide dependable on-off or throttling operation of control valves.

X1520-1

Fisher easy-Drive 200L

Features

- Low Temperature— The easy-Drive 200L design allows use in ambient temperatures as low as -20°C (-4°F) without use of a heater.

- Easy Installation—The compact actuator design allows installation where space is a premium. Fisher easy-Drive calibrates by simply opening and closing the valve.

- Application Flexibility— Choice of control method including 4-20mA Positioning and 4-20mA Level along with configurable Loss of Signal Position and Deadband suits this actuator to many applications.

- Low Power Consumption— The Fisher easy-Drive 200L operates with 9 to 30VDC and less than 0.1 watt hours per operation, using Modbus, 4-20 mA, or dry contact control signals.

- Optional Loss of Power Positioning— With the reserve power unit, RPU-100, loss of power position is programmable over Modbus.

- Remote Monitoring and Configuration— Loss of signal position is programmable over Modbus.

Installation

Fisher easy-Drive 200L may be installed in any position, but normally the actuator is vertical above the valve.

Table 1. Specifications

Material Temperature Capabilities[1]

Electric Actuator Assembly:
-20 to 70°C (-4 to 158°F)

Available Actuator Configurations

Positioning (flow or pressure control)

Power Requirements

9-30VDC, minimum 4 amp power supply required (fuse to 5 amps)

Maximum Current Draw

4 amps

Idle Current Draw

15 mA at 24VDC
25 mA at 12VDC

30 mA at 24VDC,
50 mA at 12VDC with RPU-100

Conduit Connections

Two 3/4 NPT connections

Maximum Stroke Length

19 mm (0.75 inch)

Maximum Thrust Force

3336 N (750 lbf)

Average Thrust Force

2446 N (550 lbf)

Nominal Stroke Speed[2]

3.9 mm/s (0.15 inch/s) at 24 VDC
2.2 mm/s (0.09 inch/s) at 12 VDC[3]

Control Signals

On/Off: Dry contact, Modbus RTU
Positioning: 4-20 mA, 4-20 mA level, Modbus RTU
Auxiliary Digital Input: Dry contact
Auxiliary Digital Output: 10VDC, 25 mA maximum

Hazardous Area Approvals

CSA (C/US): Explosion-Proof Class I, Division 1, Groups C and D, T6, Ex d IIA T6, Class I, Zone 1, AEx d IIA T6
ATEX Flameproof - Gas:
Ex II 2 G, Ex db IIA T6
IECEx Flameproof - Gas: Ex db IIA T6

Enclosure Rating

Type 4X and IP66

Electromagnetic Compatibility

Meets EN 61326-1 (2013)
Immunity: Industrial locations per table 2 of EN 61326-1 Standard. Performance is shown in table 2
Emissions: Class A
ISM Equipment Rating: Group 1, Class A

Optional Loss of Power Positioning

With the reserve power unit, RPU-100, loss of power positioning is programmable over Modbus.

Duty Cycle

50% maximum

Enclosure Material

Cast aluminum alloy with powder coat paint

Approximate Weight:

9.5 kg (21 lbs)

10 kg (22 lbs) with RPU-100

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.
2. 10% variation can be expected, based on temperature and pressure of application.
3. Stroke speed when RPU-100 is providing power.

Table 1. Hazardous Area Classifications - CSA (Canada and United States)

CERTIFICATION BODY	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	CONDUIT CONNECTIONS	ENCLOSURE RATING
CSA	Class I, Division 1, GP C, D T6	- - -	T6 (Tamb ≤ 70°C)	Two 3/4 NPT Connections	CSA Type 4X Enclosure

Table 2. EMC Summary Results - Immunity

PORT	PHENOMENON	BASIC STANDARD	TEST LEVEL	PERFORMANCE CRITERIA(1)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4kV Contact 8kV Air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m 1kHz AM at 80% 1400 to 2000 MHz @ 3V/m 1kHz AM at 80% 2000 to 2700 MHz @ 1V/m 1kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	30 A/m @ 50 and 60 Hz	A
I/O signal/ control	Burst	IEC 61000-4-4	1kV	B
	Surge	IEC 61000-4-5	1kV cable shield, and line to ground	B
	Conducted RF	IEC 61000-4-6	3V 150 kHz to 80 MHz at 3 Vrms	A

Performance criteria is +/- 5% stem position
1. A= No degradation during testing. B = Temporary degradation during testing, but is self recovering.

easy-Drive RPU-100

Designed for use in Fisher easy-Drive actuators, the RPU-100 provides energy for positioning the actuator to the user-defined location on loss of incoming power.

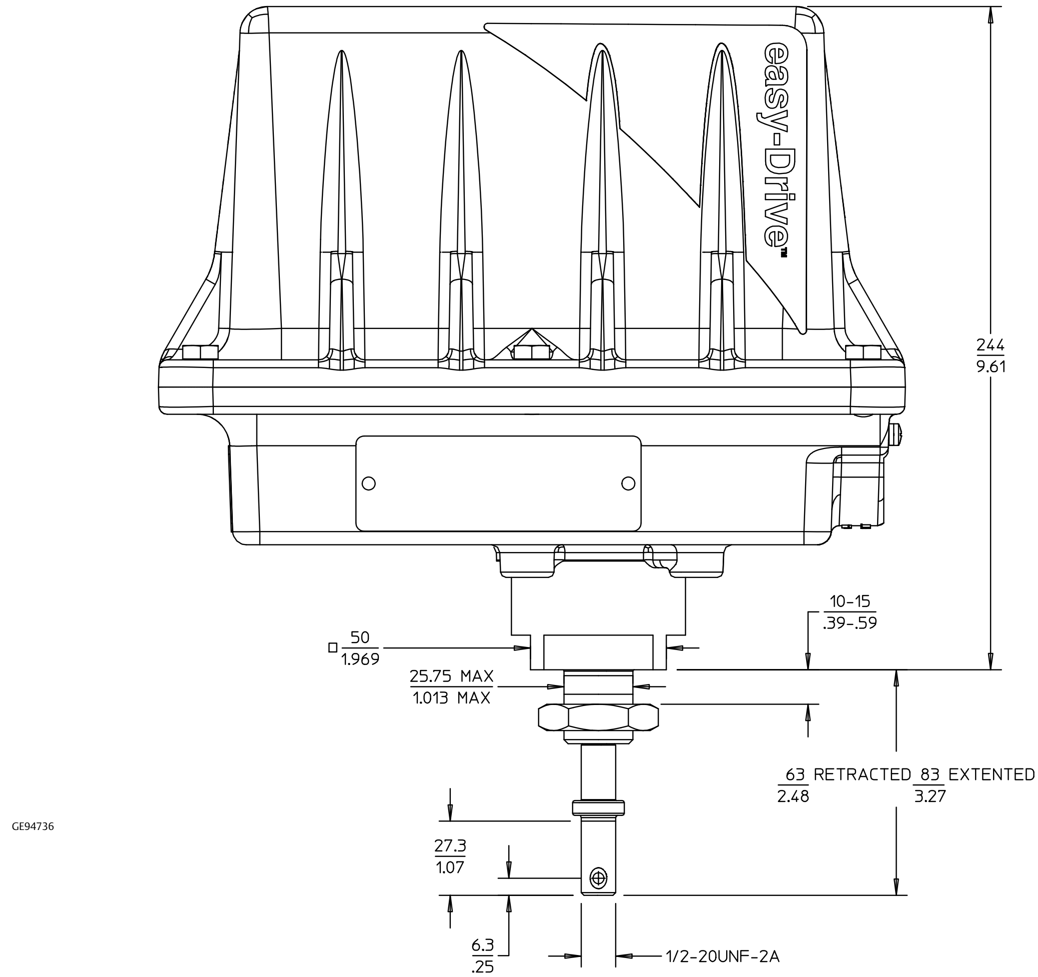
Figure 1. Fisher RPU-100 with Wiring Harness

X1718

Figure 2. Fisher easy-Drive Actuator with RPU-100

X1717

Figure 3. Fisher easy-Drive 200L Electric Actuator



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Fisher™ 1008 Handwheel Actuator

The Fisher 1008 manual handwheel actuator is used in applications that require a throttling type of control valve that can be manually operated and set. This actuator can be used on nearly all standard globe‐style or angle‐style control valve body assemblies. No special valve body adaptor is required for use with the 1008 actuator, so that future conversion from manual to automatic control can be accomplished at minimum cost.

The 1008 actuator is capable of giving precise manual throttling control. A travel indicator mounted on the actuator yoke provides a visual indication of valve plug position at all times. A dial type valve plug position indicator is also available as optional equipment.

Fisher 1008, Size 80 Actuator

W0590-1

Features

- **Easy to Install and Maintain**—For sizes 30, 40, and 50, the yoke is attached to the valve body with a forged steel hammer locknut (figure 1 shows a typical locknut attachment). For the size 80, the yoke is bolted to the valve body. The handwheel mechanism on all sizes is totally enclosed.

- **Easy to Operate**—Regardless of the valve plug action, counterclockwise rotation of the handwheel always opens the valve. In size 40 and larger, two ball bearings are used in the handwheel assembly to facilitate rotation. A spring loaded ball detent in the handwheel prevents it from rotating due to vibration.

- **Accurate Valve Plug Positioning**—The valve stem does not revolve, assuring the same seating surface with each full stroke. Also, the yoke construction ensures that the force required to turn the handwheel cannot be transmitted to the valve body. Sizes 30, 40, and 50 actuators can be furnished with a Tejax Model A35 valve position indicator (figure 2). This indicator enables you to turn the handwheel to the desired position without guesswork. The dial on the indicator is divided into turns and fractions of turns so that you can return to a predetermined valve setting quickly and easily.

Specifications

Available Configuration

Manual-only handwheel actuator for use with sliding-stem valves

Actuator Size

See table 1

Stem and Yoke Boss Diameters

See table 1

Maximum Stem Travel

See table 1

Maximum Usable Thrust

See table 1

Handwheel Rotation

Clockwise handwheel rotation closes the valve
For sizes 30, 40, and 50: ■ Left hand screw assembly for push-down-to-close; ■ Right hand screw assembly for push-down-to-open valve
For size 80: Handwheel assembly is reversible so that it can be arranged for clockwise-to-close rotation.

Maximum Handwheel Force

See table 1

Handwheel Revolutions per Inch of Stem Travel

See table 1

Construction Materials

Sizes 30, 40, and 50:
Handwheel:
Size 30: Ductile Iron
Sizes 40 and 50: Cast Iron
Yoke: Ductile Iron
Acme Power Nut: Stainless Steel (Not used on Size 30)
Acme Power Screw:
Size 30: Stainless steel
Size 40 and 50: Aluminum Bronze
Size 80:
Handwheel: Cast Iron
Yoke: Cast Iron
Worm Gear: Phosphor Bronze
Worm Shaft: Steel
Stem Screw: Steel

Approximate Weight

Size 30: 6.4 kg (15 lb)
Size 40: 15.9 kg (35 lb)
Size 50: 20.4 kg (45 lb)
Size 80: 45.4 kg (100 lb)

Options

■ **Sizes 40 and 50:** Set screw to permit locking handwheel in place
■ **Sizes 30, 40, and 50:** Tejax Model A35 valve stem position indicator[1].
Indicator dial calibrated in turns and fractions of turns

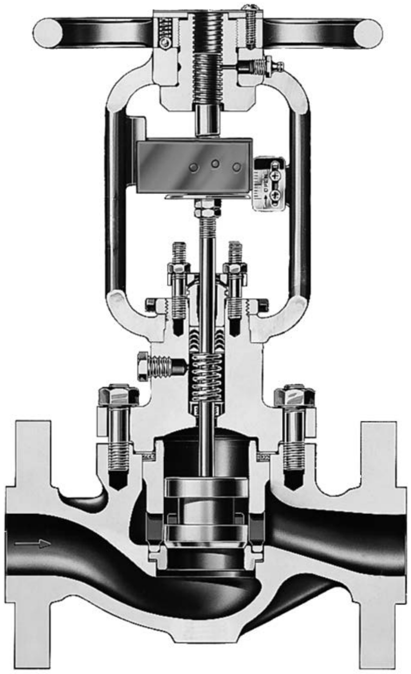
1. When a Tejax indicator is used, the actuator must be installed in a horizontal position.

Table 1. Actuator Size Selection and Specifications

ACTUATOR SIZE	BOSS SIZE	STEM DIAMETER	MAXIMUM USABLE THRUST[1]	MAXIMUM FORCE ON HANDWHEEL	MAXIMUM TRAVEL	REVOLUTIONS PER mm OF TRAVEL
	mm	mm	N	N	mm	
30	54	10	7340	173.5	19	0.3
40	71	13	13122	160	51	0.3
50	90	19	29581	276	51	0.3
80	127	25	50042	423	76[2]	0.4
		32	75620	623		
	Inch	Inch	Lbf	Lbf	Inch	REVOLUTIONS PER INCH OF TRAVEL
30	2-1/8	3/8	1650	39	0.75	8
40	2-13/16	1/2	2950	36	2	8
50	3-9/16	3/4	6650	62	2	8
80	5	1	11250	95	3[2]	10
		1-1/4	17000	140		

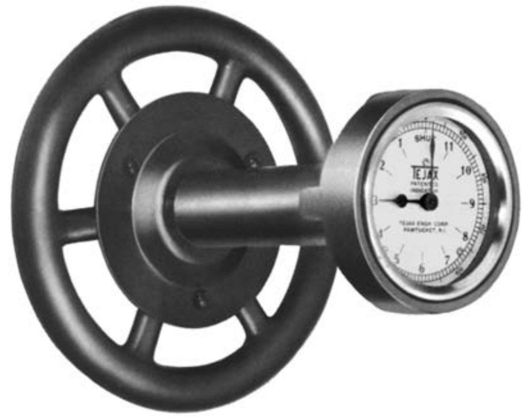
1. For S31600 stem at 38°C (100°F).
2. Alternate 102 mm (4 inch) travel construction is available.

Figure 1. Fisher 1008, Size 30 Actuator Mounted on ES Valve



W0595-3

Figure 2. Tejax Model A35 Valve Position Indicator



W6811-1

Ordering Information

Application

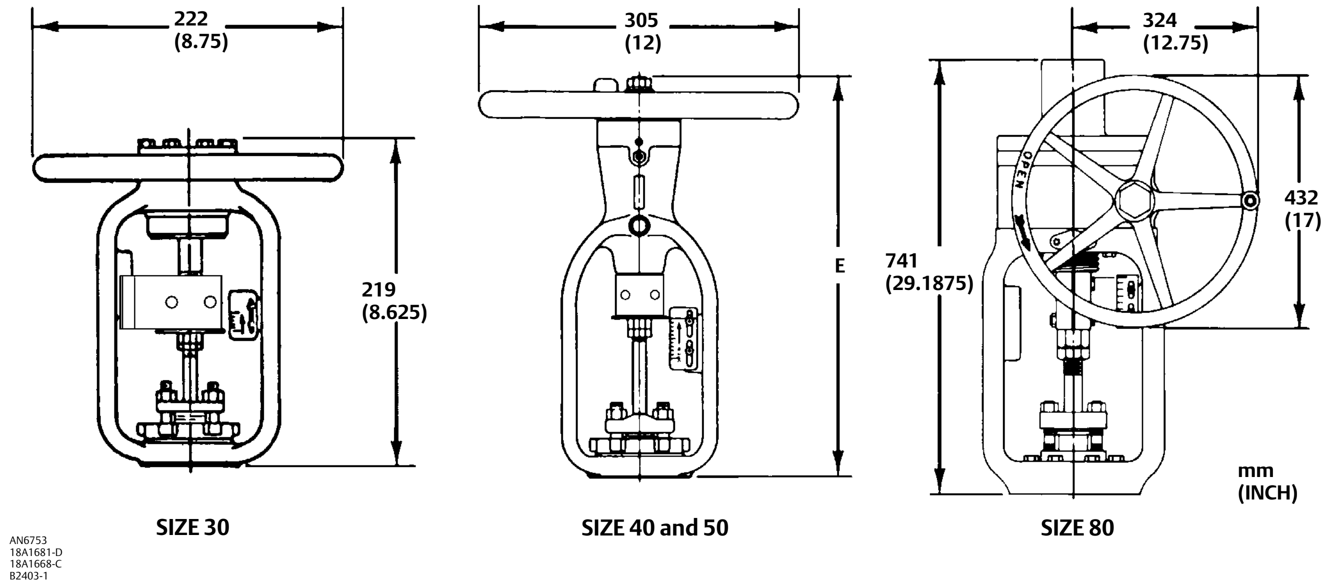
When ordering, specify:

1. Valve body type or design, size, and stem diameter.
2. Valve plug action, push-down-to-open or push-down-to-close.
3. For sizes 30, 40, and 50: Tejax model A35 dial indicator, if required.
4. For size 40 and 50: Set screw handwheel lock.

Table 2. Overall Dimensions

ACTUATOR SIZE	E	
	mm	Inches
40	386	15.19
50	448	17.63

Figure 3. Overall Dimensions (also see table 2)



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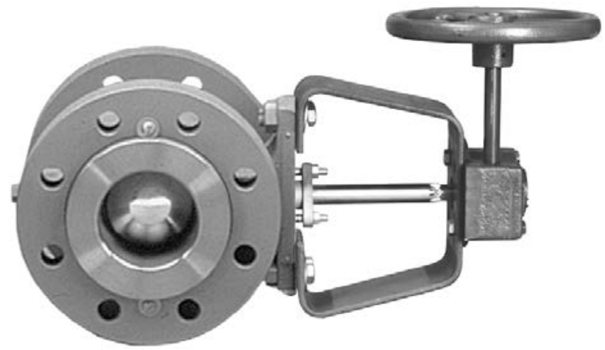
Product Bulletin
61.8:1077
September 2017

Fisher™ 1077 Manual Handwheel Rotary Actuator

Fisher 1077 manual-only handwheel actuator is for use with rotary-shaft valves such as the 9500 butterfly valve; 8532, 8560, and 8580 High Performance Butterfly valves; V150, V200 and V300 Vee-Ball ™ valves; V250 valves; and CV500 and V500 valves.

Figure 1 shows the gearbox of the actuator. In this actuator, torque is transmitted from the handwheel through the handwheel input shaft to a worm and drive sleeve gear (sector) with splined bore. The worm and drive sleeve gear multiply the torque and transmit it to a splined valve shaft or splined stub shaft. The size 10-KE:6 actuator additionally has a spur gear reduction drive for increased torque capability.



W8176-1

Fisher 1077 Handwheel Actuator

Features

- **Easy to Operate**—Handwheel rotation direction required to open the valve disk or ball is marked on the handwheel; the rotation indicator is marked in bold print at the open and closed positions and with bold incremental lines to indicate the valve disk or ball position.
- **Easy to Install and Maintain**—Splined valve shaft mates directly with the drive gear sleeve, reducing the number of parts required and simplifying installation and maintenance.
- **Consistency of Operation**—When installed according to instructions, clockwise handwheel rotation closes the valve in all applications.
- **Accurate Valve Disk or Ball Positioning**—Travel stops can be adjusted and locked in place to provide accurate disk or ball positioning at closed (0-degree) and open (90-degree) positions. Travel stops for 60-degree operation may be used to establish a disk or ball closing stop at any angle between 0 and 30 degrees and/or to establish a disk or ball opening stop at any angle between 60 and 90 degrees. This option is available on sizes 2-KE and 7-KE as a set screw change. For sizes 0-KE, 6-KE, 9-KE, and 10-KE:6, a different actuator is required when changing from 90-degree to 60-degree ball rotation.

Specifications

Available Configuration

Manual-only handwheel actuator for use with splined rotary-shaft valves

Actuator Sizes

See tables 1 and 2

Acceptable Valve Shaft Diameters

See tables 1 and 2

Output Torque

See tables 1 and 2

Wheel-Rim Force

See tables 1 and 2

Handwheel Turns Required for Full Rotation

See tables 1 and 2

Handwheel Rotation

Direct Acting Construction: Clockwise handwheel rotation closes the valve (produces clockwise rotation of the valve shaft) as shown in figure 2.
Reverse Acting Construction: Clockwise handwheel rotation closes the valve (produces counterclockwise rotation of the valve shaft) as shown in figure 2.

Maximum Output Rotation

Standard: 90 degrees
Optional: 60 degrees ■ valve ball or disk closed position may be set to any angle between 0 and 30 degrees, and/or ■ valve ball or disk open position may be set to any angle between 60 and 90 degrees. (This option is available on actuator sizes 2-KE and 7-KE as a set screw change. For sizes 0-KE, 6-KE, 9-KE, and 10-KE:6, a different actuator is required when changing from 90-degree to 60-degree ball rotation.)

Construction Materials

Housing: Cast iron
Housing Cover: Cast iron
Worm: Steel
Drive Sleeve Gear:
For Sizes 0-KE through 7-KE: Phosphor bronze sector with steel hub
For Sizes 9-KE and 10-KE:6: Manganese bronze sector with ductile iron hub
Worm Gear Shaft and Handwheel Shaft: Steel
Handwheel:
Through 431 mm (16-Inch) Diameter: Cast iron
Over 431 mm (16-Inch) Diameter: Fabricated steel
Mounting Yoke
For NPS 30 and 36 8510, NPS 16 V250, and any other valve with 76.2 or 88.9 mm (3 or 3-1/2 Inch) Shaft Diameter: Cast iron
For All Valve Bodies Other Than Those Listed Above: Painted steel

Mounting Positions

■ Right-hand (actuator on the right side of the valve when viewed from the valve inlet) or ■ Left-hand (actuator on the left side of the valve when viewed from the valve inlet). Position 1 as shown in figure 3 is standard; however, the actuator may be mounted in any of the positions shown in figure 3. Refer to figure 2 to determine the correct actuator construction.

Approximate Weight

ACTUATOR	METRIC UNITS		U.S. UNITS	
	Handwheel Diameter, mm	Weight of Actuator Assembly, kg	Handwheel Diameter, Inches	Weight of Actuator Assembly, Pounds
0-KE	152	3.7	6	8
	203	4.7	8	10
2-KE	203	10.3	8	22
	305	11.3	12	24
6-KE	610	20.2	24	43
7-KE	762	28.2	30	60
9-KE	914	40.9	36	87
10-KE:6	432	62.6	16	133
	610	62.6	24	133

Accessories

Position and Limit Switches: ■ One position switch, or ■ One or two limit switches, can be mounted

Table 1. Actuator Size Selection (Metric Units)

ACTUATOR SIZE	ACCEPTABLE VALVE SHAFT DIAMETER	MAXIMUM ALLOWABLE TORQUE[1]	HAND-WHEEL DIAMETER	WHEEL-RIM FORCE: To Produce Maximum Allowable Torque	WHEEL-RIM FORCE: To Produce Torque Lower Than Maximum Allowable Shaft Torque	HANDWHEEL TURNS REQUIRED FOR FULL VALVE DISK OR BALL ROTATION: 60-Degree Rotation	HANDWHEEL TURNS REQUIRED FOR FULL VALVE DISK OR BALL ROTATION: 90-Degree Rotation
	mm	N•m	mm	N	N		
0-KE	12.7 15.9	58 138	152 152	129 307	Torque Req'd (N•m) ÷ 0.4572	4	6
	19.1 22.2 and 25.4	240 271[2]	203 203	396 445[3]	Torque Req'd (N•m) ÷ 0.6096	4	6
2-KE	22.2 and 25.4	468	203	485	Torque Req'd (N•m) ÷ 0.9652	6-1/2	9-1/2
	31.8 38.1	678[2] 678[2]	305 305	467[3] 467[3]	Torque Req'd (N•m) ÷ 1.4478	6-1/2	9-1/2
6-KE	31.8 38.1 44.5 50.8	1110 1360 1360[2] 1360[2]	610 610 610 610	365 445 445[2] 445[2]	Torque Req'd (N•m) ÷ 3.0480	6-1/2	10
7-KE	44.5 50.8	2260[2] 2260[2]	762 762	440[3] 440[3]	Torque Req'd (N•m) ÷ 5.1435	9	13-1/2
9-KE	44.5 50.8	2260 2260	762 762	436 436	Torque Req'd (N•m) ÷ 6.096	10-1/2	16
	63.5	3390[2]	914	463[3]	Torque Req'd (N•m) ÷ 7.3152	10-1/2	16
10-KE:6	63.5	6305	431	431	Torque Req'd (N•m) ÷ 15.476	48	72
	76.2	6780[2]	610	310[3]	Torque Req'd (N•m) ÷ 21.848	48	72
	88.9	6780[2]	610	310[3]	Torque Req'd (N•m) ÷ 21.848	48	72

1. Values shown are the maximum allowable torque of a splined valve shaft except where indicated. Without regard to the shaft, maximum allowable torque output is 271 N•m for the size 0-KE actuator, 678 N•m for the size 2-KE actuator, 1360 N•m for the size 6-KE actuator, 2260 N•m for the size 7-KE actuator, 3390 N • m for the size 9-KE actuator, and 6780 N•m for the size 10-KE:6 actuator.
2. Limited to this value by the maximum allowable output torque of the actuator.
3. Wheel-rim force required to produce maximum actuator output torque.

Figure 1. Gearbox Subassembly

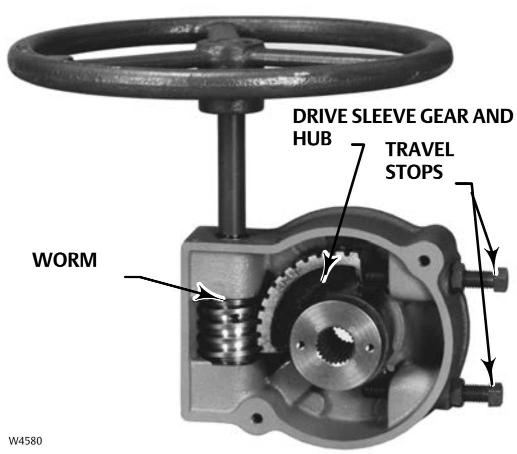


Table 2. Actuator Size Selection (U.S Units)

ACTUATOR SIZE	ACCEPTABLE VALVE SHAFT DIAMETER	MAXIMUM ALLOWABLE TORQUE[(1)]	HAND-WHEEL DIAMETER	WHEEL-RIM FORCE		HANDWHEEL TURNS REQUIRED FOR FULL VALVE DISK OR BALL ROTATION	
				To Produce Maximum Allowable Torque	To Produce Torque Lower Than Maximum Allowable Shaft Torque	60-Degree Rotation	90-Degree Rotation
	Inches	Inch-Pounds	Inches	Pounds	Pounds		
0-KE	1/2 5/8	515 1225	6 6	29 69	Torque Req'd (In.-Lb.) ÷ 18.00	4	6
	3/4 7/8 and 1	2120 2400[(2)]	8 8	89 100[(3)]	Torque Req'd (In.-Lb.) ÷ 24.00	4	6
2-KE	7/8 and 1	4140	8	109	Torque Req'd (In.-Lb.) ÷ 38.00	6-1/2	9-1/2
	1-1/4 1-1/2	6000[(2)] 6000[(2)]	12 12	105[(3)] 105[(3)]	Torque Req'd (In.-Lb.) ÷ 57.00	6-1/2	9-1/2
6-KE	1-1/4 1-1/2 1-3/4 2	9820 12,000 12,000[(2)] 12,000[(2)]	24 24 24 24	82 100 100[(3)] 100[(3)]	Torque Req'd (In.-Lb.) ÷ 120.00	6-1/2	10
7-KE	1-3/4 2	20,000[(2)] 20,000[(2)]	30 30	99[(3)] 99[(3)]	Torque Req'd (In.-Lb.) ÷ 202.50	9	13-1/2
9-KE	1-3/4 2	23,524 23,524	30 30	98 98	Torque Req'd (In.-Lb.) ÷ 240.00	10-1/2	16
	2-1/2	30,000[(2)]	36	104[(3)]	Torque Req'd (In.-Lb.) ÷ 288.00	10-1/2	16
10-KE:6	2-1/2	55,762	16	97	Torque Req'd (In.-Lb.) ÷ 612.00	48	72
	3	60,000[(2)]	24	69[(3)]	Torque Req'd (In.-Lb.) ÷ 864	48	72
	3-1/2	60,000[(2)]	24	69[(3)]	Torque Req'd (In.-Lb.) ÷ 864	48	72

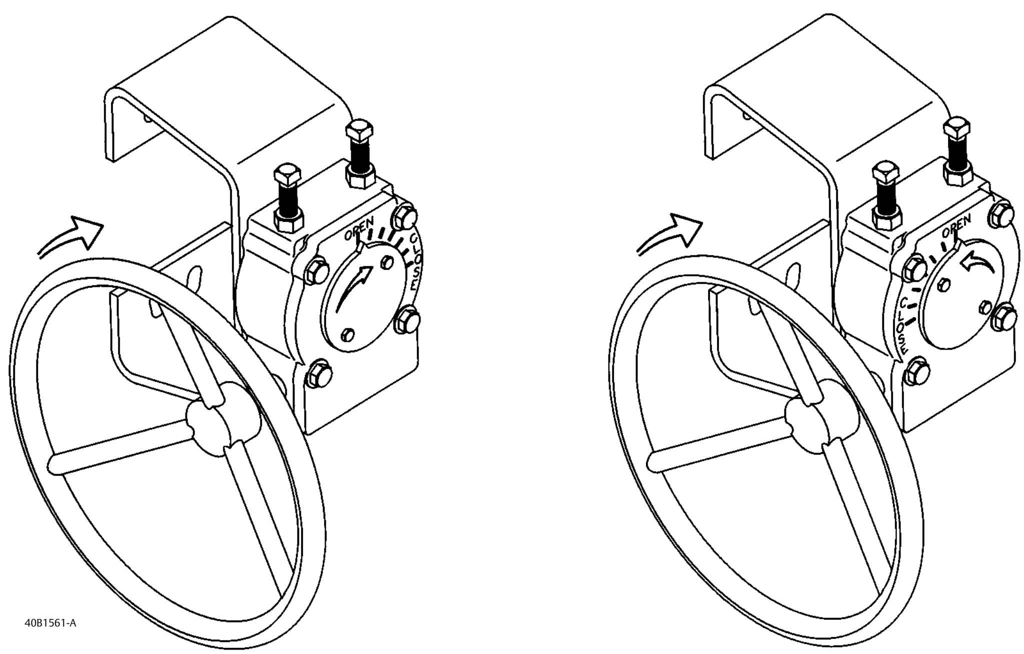
1. Values shown are the maximum allowable torque of a splined valve shaft except where indicated. Without regard to the shaft, maximum allowable torque output is 2400 inch-pounds for the size 0-KE actuator, 6000 inch-pounds for the size 2-KE actuator, 12,000 inch-pounds for the size 6-KE actuator, 20,000 inch-pounds for the size 7-KE actuator, 30,000 inch-pounds for the size 9-KE actuator, and 60,000 inch-pounds for the size 10-KE:6 actuator.
2. Limited to this value by the maximum allowable output torque of the actuator.
3. Wheel-rim force required to produce maximum actuator output torque.

Table 3. Direct and Reverse Acting Actuator Constructions

MOUNTING	VALVE SERIES OR DESIGN				VALVE SERIES OR DESIGN		
	Ball/Plug Rotation To Close	V250	V150, V200 and V300	CV500 V500	Disk/Ball Rotation To Close	V250	8532, 8560 8580, and 9500
Right-Hand	CCW CCW	REVERSE	REVERSE	REVERSE	CW CW	NA NA	DIRECT
Left-Hand	CCW CCW	NA NA	REVERSE	REVERSE	CW CW	DIRECT	DIRECT
Left-Hand (Optional)(1)	CW CW	NA NA	DIRECT	NA NA	NA NA	NA NA	NA NA

1. A left hand ball will be required for the NPS 3 through 12 Series B and the NPS 14 to 20, with or without attenuator.

Figure 2. Direct and Reverse Acting Actuator Constructions (also see table 3)



DIRECT ACTING CONSTRUCTION

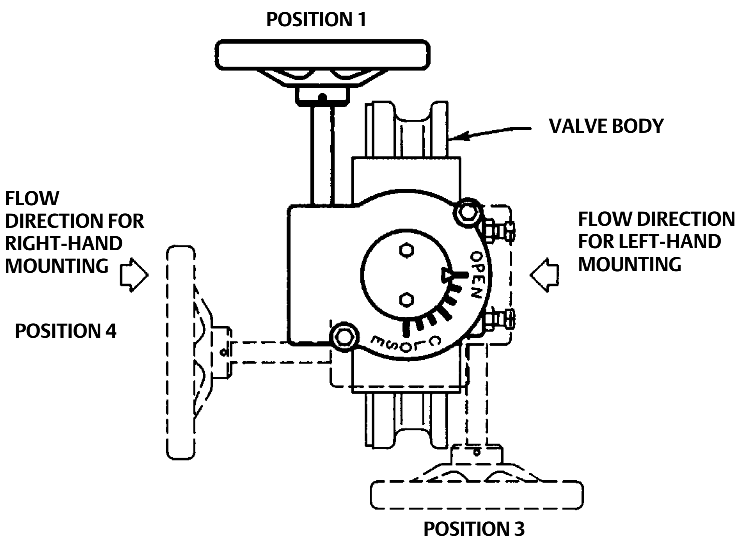
REVERSE ACTING CONSTRUCTION

Installation

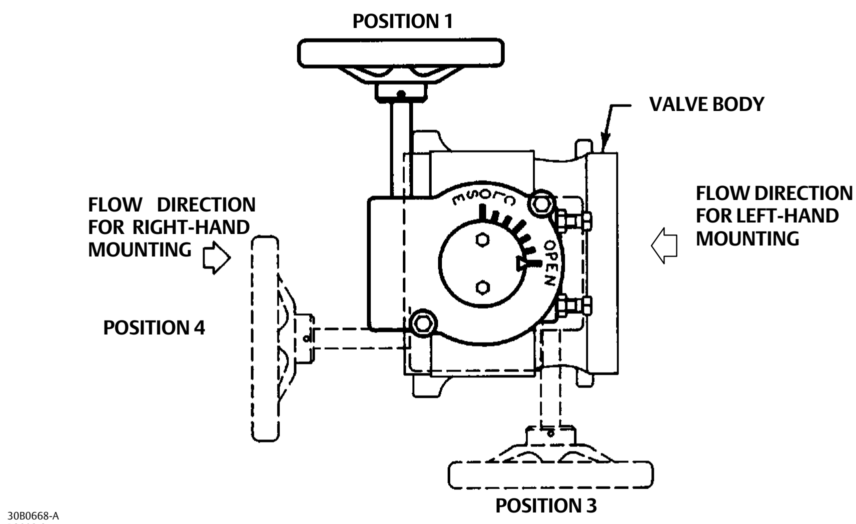
The valve body and actuator assembly may be installed in any of the positions shown in figure 3. The actuator will be factory mounted on the valve body in the position specified.

Dimensions are shown in figure 4. Make clearance considerations before mounting the actuator to determine the most suitable mounting position.

Figure 3. Available Mounting Positions



DIRECT ACTING ACTUATOR CONSTRUCTION

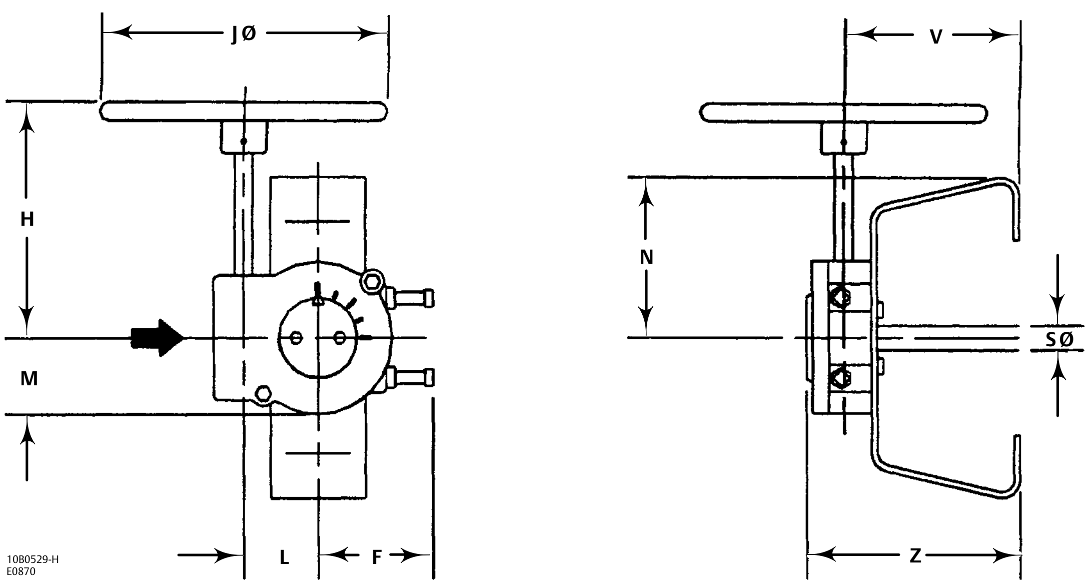


REVERSE ACTING ACTUATOR CONSTRUCTION

Table 4. Envelope Dimensions

<table>
<tr><th>ACTUATOR SIZE</th><th>HANDWHEEL DIAMETER J∅</th><th>VALVE SHAFT DIAMETER</th><th>F</th><th>H</th><th>L</th><th>M</th><th>N</th><th>V</th><th>Z</th></tr>
<tr><td colspan="10">mm</td></tr>
<tr><td rowspan="2">0-KE</td><td>152</td><td>12.7, 15.9</td><td rowspan="2">70</td><td>164</td><td rowspan="2">45</td><td rowspan="2">52</td><td rowspan="2">111</td><td rowspan="2">186</td><td rowspan="2">222</td></tr>
<tr><td>203</td><td>19.1, 22.2, 25.4</td><td>170</td></tr>
<tr><td rowspan="2">2-KE</td><td>203</td><td>22.2, 25.4</td><td rowspan="2">124</td><td>221</td><td rowspan="2">79</td><td rowspan="2">79</td><td>111</td><td>187</td><td>230</td></tr>
<tr><td>305</td><td>31.8, 38.1</td><td>238</td><td>165</td><td>200</td><td>243</td></tr>
<tr><td rowspan="2">6-KE</td><td rowspan="2">610</td><td>31.8, 38.1</td><td rowspan="2">145</td><td rowspan="2">356</td><td rowspan="2">83</td><td rowspan="2">84</td><td>165</td><td>213</td><td>260</td></tr>
<tr><td>44.5, 50.8</td><td>191</td><td>321</td><td>368</td></tr>
<tr><td>7-KE</td><td>762</td><td>44.5, 50.8</td><td>152</td><td>381</td><td>105</td><td>103</td><td>191</td><td>324</td><td>384</td></tr>
<tr><td rowspan="3">9-KE</td><td>762</td><td>44.5, 50.8</td><td rowspan="3">178</td><td rowspan="3">406</td><td rowspan="3">119</td><td rowspan="3">117</td><td>191</td><td rowspan="2">346</td><td>432</td></tr>
<tr><td rowspan="2">914</td><td>63.5</td><td>241</td><td rowspan="2">533</td></tr>
<tr><td>63.5[1]</td><td>305</td><td>448</td></tr>
<tr><td rowspan="3">10-KE:6</td><td rowspan="2">406</td><td>63.5</td><td rowspan="3">178</td><td rowspan="3">419</td><td rowspan="3">127</td><td rowspan="3">117</td><td>241</td><td>346</td><td>432</td></tr>
<tr><td>63.5[1]</td><td rowspan="2">305</td><td rowspan="2">448</td><td rowspan="2">533</td></tr>
<tr><td>610</td><td>76.2, 88.9</td></tr>
<tr><td colspan="10">Inches</td></tr>
<tr><td rowspan="2">0-KE0</td><td>6.00</td><td>1/2, 5/8</td><td rowspan="2">2.75</td><td>6.44</td><td rowspan="2">1.75</td><td rowspan="2">2.06</td><td rowspan="2">4.38</td><td rowspan="2">7.31</td><td rowspan="2">8.75</td></tr>
<tr><td>8.00</td><td>3/4, 7/8, 1</td><td>6.69</td></tr>
<tr><td rowspan="2">2-KE</td><td>8.00</td><td>7/8, 1</td><td rowspan="2">4.88</td><td>8.69</td><td rowspan="2">3.12</td><td rowspan="2">3.12</td><td>4.38</td><td>7.38</td><td>9.06</td></tr>
<tr><td>12.00</td><td>1-1/4, 1-1/2</td><td>9.38</td><td>6.50</td><td>7.88</td><td>9.56</td></tr>
<tr><td rowspan="2">6-KE</td><td rowspan="2">24.00</td><td>1-1/4, 1-1/2</td><td rowspan="2">5.69</td><td rowspan="2">14.00</td><td rowspan="2">3.25</td><td rowspan="2">3.31</td><td>6.50</td><td>8.38</td><td>10.25</td></tr>
<tr><td>1-3/4, 2</td><td>7.50</td><td>12.62</td><td>14.50</td></tr>
<tr><td>7-KE</td><td>30.00</td><td>1-3/4, 2</td><td>6.00</td><td>15.00</td><td>4.12</td><td>4.06</td><td>7.50</td><td>12.75</td><td>15.12</td></tr>
<tr><td rowspan="3">9-KE</td><td>30.00</td><td>1-3/4, 2</td><td rowspan="3">7.00</td><td rowspan="3">16.00</td><td rowspan="3">4.69</td><td rowspan="3">4.62</td><td>7.50</td><td rowspan="2">13.62</td><td>17.00</td></tr>
<tr><td rowspan="2">36.00</td><td>2-1/2</td><td>9.50</td><td rowspan="2">21.00</td></tr>
<tr><td>2-1/2[1]</td><td>12.00</td><td>17.62</td></tr>
<tr><td rowspan="3">10-KE:6</td><td rowspan="2">16.00</td><td>2-1/2</td><td rowspan="3">7.00</td><td rowspan="3">16.50</td><td rowspan="3">5.00</td><td rowspan="3">4.62</td><td>9.50</td><td>13.62</td><td>17.00</td></tr>
<tr><td>2-1/2[1]</td><td rowspan="2">12.00</td><td rowspan="2">17.62</td><td rowspan="2">21.00</td></tr>
<tr><td>24.00</td><td>3, 3-1/2</td></tr>
<tr><td colspan="10">1. Used with NPS 30, 36 8510 and NPS 16 V250.</td></tr>
</table>

Figure 4. Envelope Dimensions (also see table 4)



Ordering Information

When ordering, specify:

Application

1. Valve body type or design, size, and shaft diameter.

2. Valve disk or ball rotation (e.g., 0 to 60 or 0 to 90 degrees). For adjustability between 0 and 30 degrees for the closed stop position, or for adjustability between 60 and 90 degrees for the open stop position, the 60-degree travel stop is used.

   a. This option is available on actuator sizes 2-KE, 7-KE, 9-KE, and 10-KE:6 as a set screw change.

   b. For sizes 0-KE and 6-KE a different actuator is required when changing from 90-degree to 60-degree ball rotation.

3. Right- or left-hand mounting and desired mounting position from figure 3. If the control valve assembly is to be used for bidirectional flow, assume that the flow direction arrows in figure 3 point to the seal retainer or flow ring end of the valve body.

Handwheel Actuator

Refer to the Specifications section. Review the description for each specification and in the referenced tables and figures. Indicate a choice whenever there is a selection to be made.

Note

When specifying a mounting position, make certain the handwheel diameter specified will not interfere with the valve body, pipe flanges, or line bolting connected to the system.

Accessories

If ordering limit switches, specify the number of switches desired (one or two). For one limit switch, specify whether switching is to occur at the open or closed valve position.

Valve Body and Accessories

Refer to the separate valve body and accessory information bulletins for ordering information.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 1078 Declutchable Manual Actuator

Fisher 1078 manual actuators are declutchable actuators for manual operation of control valves and equipment that use power actuators. The 1078 manual actuator mounts directly to Fisher 1052 size 70; 1061 sizes 30, 40, 60, 68, 80, and 100; and to all sizes of 2052 actuators.

X0178

FISHER 1078 DECLUTCHABLE MANUAL ACTUATOR MOUNTED ON A 2052 SIZE 1 ACTUATOR

Features

- Direct Attachment to the Power Actuator — Direct mounting to the actuator housing simplifies installation and eliminates the need for yokes and other brackets.

- Engage Manual Actuator At Any Point of Rotation — A lever-operated eccentric bearing support on the input shaft allows engagement of the worm gear with the sector at any point of rotation. Because the travel indicator components are mounted on a through shaft, accurate travel indication is maintained during manual actuator disengagement or engagement.

- Positive Operation — The disengagement lever is locked in both the engaged and disengaged positions by a detent mechanism, which must be released before the lever can be moved. This provision reduces the possibility of inadvertent or accidental operation. In addition, stop-pins at the fully engaged and fully disengaged positions provide positive limits for lever travel. (Note that stop pins are not available on 1078 size II-FA actuators.)

X0177-1

FISHER 1078 DECLUTCHABLE MANUAL ACTUATOR MOUNTED ON A 2052 SIZE 1 ACTUATOR AND V300 VALVE WITH FIELDVUE™ DVC6200 DIGITAL VALVE CONTROLLER

Table 1. Specifications

Available Configurations

Direct and reverse acting; see Handwheel Rotation and the Ordering Information section. (Standard construction is with the handwheel shaft pointing down away from the power actuator as shown in the figure on page 1)

This construction is suitable for cold climate regions and compliant to GOST 15150. However, when ambient temperature is below -50°C (-58°F), it is not advised to operate the handwheel

Manual Actuator Sizes

See tables 1, 2, and 3
See figures 1 and 2 for dimensions

Coupling Shaft Diameters

See tables 1, 2, and 3

Power Actuator Compatibility

See tables 1, 2, and 3

Maximum Torque Output

See tables 1, 2, and 3

Wheel-Rim Force

See tables 1, 2, and 3

Handwheel Rotation

Clockwise handwheel rotation closes the valve. Direct-acting units produce output rotation matching input rotation; reverse-acting units produce output rotation opposite input rotation

Construction Materials

Housing and Cover: Cast iron
Drive Sleeve/Gear (Sector): Aluminum/bronze
Worm Gear: Heat-treated steel
Input Shaft and Eccentric: Low-carbon steel
Pin Detent: 300 Series stainless steel
Handwheel or Input Shaft Bearings: Bronze

Standard Mounting Positions

■ 1052 (size 70)(1): Handwheel down (std) or handwheel right-hand or left-hand mount (optional)
■ 1061 (sizes 30, 40, 60, 68, 80, and 100)(1): Handwheel down (std) or handwheel right-hand or left-hand mount (optional)
■ 2052 (sizes 1, 2, and 3)(1): Handwheel down (standard) or handwheel right-hand or left-hand mount (optional)

Approximate Weight Without Handwheel

Size AAA: 2.7 kg (6 lbs)
Size AA: 6.8 kg (15 lbs)
Size A: 9.5 kg (21 lbs)
Size 2A: 13.6 kg (30 lbs)
Size 1A: 15.9 kg (35 lbs)
Size B: 23.1 kg (51 lbs)
Size C: 29.9 kg (66 lbs)
Size D: 63.5 kg (140 lbs)
Size II-FA: 81.6 kg (180 lbs)

Handwheel Weight

6-inch: 1.8 kg (4 lbs)
8-inch: 2.3 kg (5 lbs)
12-inch: 3.2 kg (7 lbs)
16-inch: 6.8 kg (15 lbs)
24-inch: 5.4 kg (12 lbs)
30-inch: 6.4 kg (14 lbs)
36-inch: 7.3 kg (16 lbs)

1. If a positioner is used, the right-hand or left-hand mounting option will be limited to the side away from the positioner.

Table 1. Fisher 2052 Actuator Size Selection and Specifications for Sizes AAA, A, and C

MANUAL ACTUATOR SIZE	SHAFT SIZE		POWER ACTUATOR		STANDARD HANDWHEEL DIAMETER		MAXIMUM TORQUE		WHEEL-RIM-FORCE				HANDWHEEL TURNS FOR ROTATION	
									For Maximum Torque		For Less Than Maximum Torque		Degrees	
	mm	Inch	Type	Size	mm	Inch	N•m	Lbf•in	N	Pounds	N	Pounds	60	90
AAA (2400 in • lbs)	12.7	1/2	2052	1	203	8	131	1156	144	32	Divide N•m req'd by 0.91	Divide lbf•in req'd by 36	4	6
	14.2x15.9 15.9	9/16x5/8 5/8					211	1866	232	52				
	19.1	3/4					271	2400	298	67				
A (8000 in • lbs)	14.3x15.9 15.9	9/16x5/8 5/8	2052	2	406	16	489	4326	204	45	Divide N•m req'd by 2.4	Divide lbf•in req'd by 96	5.3	8
	19.1	3/4					590	5221	246	54				
	22.2 25.4	7/8 1					818	7241	341	75				
	28.6x31.8 31.8	1-1/8x1-1/4 1-1/4					904	8000	377	83				
C (18000 in • lbs)	19.1	3/4	2052	3	610	24	1338	11842	279	61	Divide N•m req'd by 4.8	Divide lbf•in req'd by 194	9	13.5
	22.2 25.4	7/8 1					1566	13862	326	71				
	28.6x31.8 31.8 38.1 39.7x44.5 44.5 50.8	1-1/8x1-1/4 1-1/4 1-1/2 1-9/16x1-3/4 1-3/4 2					2034	18000	424	93				

Table 2. Fisher 1052 Actuator Size Selection and Specifications for Sizes 1A, B, and C

MANUAL ACTUATOR SIZE (max output torque)	SHAFT SIZE		POWER ACTUATOR(1)		STANDARD HANDWHEEL DIAMETER		MAXIMUM TORQUE(2)		WHEEL-RIM-FORCE				HANDWHEEL TURNS FOR ROTATION	
									For Maximum Torque		For Less Than Maximum Torque		Degrees	
	mm	Inch	Type	Size	mm	Inch	N•m	Lbf•in	N	Pounds	N	Pounds	60	90
1A (8200 in.lbs)	31.8, 28.6x 31/8	1-1/4, 1-1/8x 1-1/4	1052	70(3)	610	24	929	8200	378	85	Divide N•m req'd by 2.4	Divide lbf•in req'd by 96	5.3	8
	38.1 31.8x 38.1	1-1/2, 1-1/4x 1-1/2												
	(44.4, 50.8), 39.7 x44.5	(1-3/4, 2), 1-9/16 x1-3/4												
B (12,000 in.lbs)	31.8	3/4	1052	70	610	24	1356	12,000	369	83	Divide N•m req'd by 3.6	Divide lbf•in req'd by 144	6.7	10
		7/8-1												
		1-1/4												
	38.1, (44.4, 50.8)	1-1/2, (1-3/4, 2)												
C (18,000 in.lbs)	31.8	1-1/4	1052	70	610	24	1735	15,355	361	79	Divide N•m req'd by 4.8	Divide lbf•in req'd by 194	9	13.5
							1839	16,275	383	84				
							2034	18,000	414	93				
	(44.4, 50.8)	(1-3/4, 2)					2034	18,000	414	93				

1. Field conversion of actuators for F and G mounting adaptations requires installation of new parts.
2. Compare table value with torque requirements of the valve plus the torque required to compress the power actuator spring (from Fisher Catalog 14). Note that dynamic torque of the valve may have a positive or negative effect on total torque required.
3. If mounted on the 1052 size 70, the travel is for only 60 Degrees.

Table 3. Fisher 1061 Actuator Size Selection and Specifications for Sizes 2A, 1A, B, C, D, and II-FA

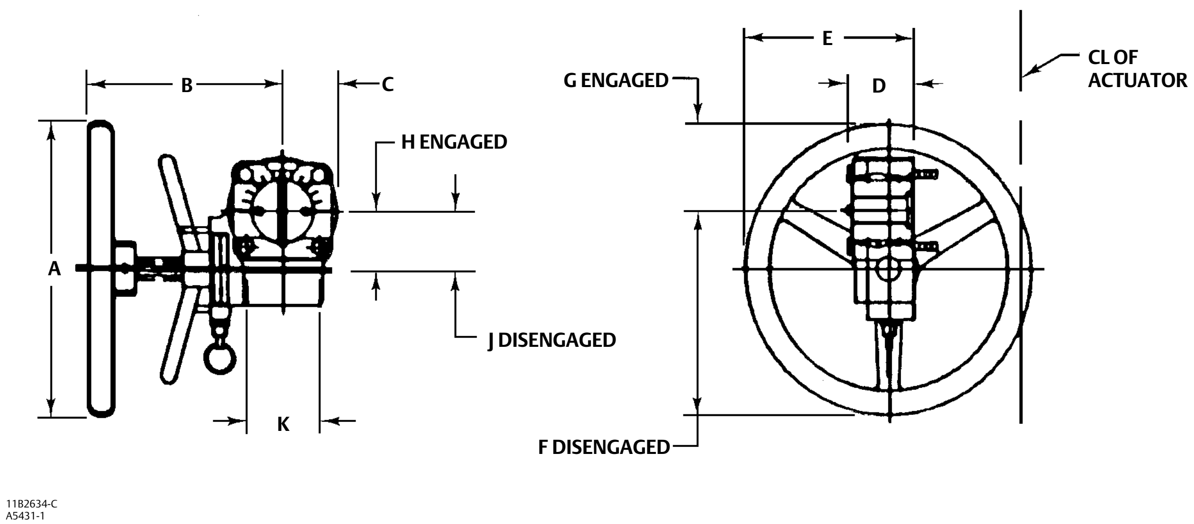
MANUAL ACTUATOR SIZE (max output torque)	SHAFT SIZE		POWER ACTUATOR		STANDARD HANDWHEEL DIAMETER		MAXIMUM TORQUE[1]		WHEEL-RIM-FORCE				HANDWHEEL TURNS FOR ROTATION	
									For Maximum Torque		For Less Than Maximum Torque		Degrees	
	mm	Inch	Type	Size	mm	Inch	N•m	Lbf•in	N	Pounds	N	Pounds	60	90
2A (4800 in.lbs)	12.7	1/2	1061	30	152	6	58	515	89	20	Divide N•m req'd by 0.66	Divide lbf•in req'd by 26	5.7	8.5
	15.9, 14.3x 9.5	5/8, 9/16x 5/8					138	1225	214	48				
	19.1	3/4[3]			203	8	239	2120	276	62	Divide N•m req'd by 0.86	Divide lbf•in req'd by 34		
	(22.2, 25.4)	(7/8,1)			305	12	467[4]	4140[4]	360	81	Divide N•m req'd by 1.3	Divide lbf•in req'd by 51		
	31.8	1-1/4					541	4800	416	94				
1A (8200 in.lbs)	19.1	3/4	1061	40, 60, 68	305	12	239	2120	276	62	Divide N•m req'd by 1.2	Divide lbf•in req'd by 48	5.3	8
	(22.2, 25.4)	(7/8,1)	1061				467	4140	382	86				
	31.8, 28.6x 31/8	1-1/4, 1-1/8x 1-1/4	1061	40, 60, 68	610	24	929	8200	378	85	Divide N•m req'd by 2.4	Divide lbf•in req'd by 96	5.3	8
	38.1 31.8x 38.1	1-1/2, 1-1/4x 1-1/2												
	(44.4, 50.8), 39.7 x44.5	(1-3/4, 2), 1-9/16 x1-3/4												
B (12,000 in.lbs)	19.1	3/4	1061	40, 60, 68	610	24	239	2120	66	15	Divide N•m req'd by 3.6	Divide lbf•in req'd by 144	6.7	10
	22.2, 25.4	7/8,1					468	4140	130	29				
	31.8	1-1/4	1061				1109	9815	308	68				
	38.1, (44.4, 50.8)	1-1/2, (1-3/4, 2)					1356	12,000	377	83				
C (18,000 in.lbs)	31.8	1-1/4	1061	40, 60, 68	610	24	1109	9815	231	51	Divide N•m req'd by 4.8	Divide lbf•in req'd by 194	9	13.5
	(44.4, 50.8)	(1-3/4, 2)					2034	18,000	424	93				
D (30,000 in.lbs)	(44.4, 50.8)	(1-3/4, 2)	1061	80, 100	762	30	2658	23,524	369	82	Divide N•m req'd by 7.2	Divide lbf•in req'd by 287	10.7	16
	54, 63.5 57.2x 63.5	2-1/8, 2-1/2, 2-1/4x 2-1/2			914	36	3390	30,000	394	87	Divide N•m req'd by 8.6	Divide lbf•in req'd by 345		
	76x 63.5, 101.6x 63.5	3x2 1/2,4x 2 1/2	1061											
II-FA[2] (60,000 in.lbs)	76x 63.5, 101.6x 63.5	3x2 1/2,4x 2 1/2	1061	80, 100	406	16	6301	55,762	400	90	Divide N•m req'd by 15.7	Divide lbf•in req'd by 619	48	72

1. Compare table value with torque requirements of the valve (from Fisher Catalog 14). Note that dynamic torque of the valve may have a positive or negative effect on total torque required.
2. Has spur gear.
3. 2A 3/4 inch shaft will also mount on the 1061 size 40, 60, and 68.
4. Maximum torque of connection between power and manual actuator.

Table 4. Dimensions for Actuator Sizes AAA, AA, and A

1078 Size	A	B	C	D	E	F	G	H	J	Square Bolt Pattern	Circular Bolt Pattern
mm											
AAA	305	184	40	67	178	204	106	46	51	57.1 SQ	- - -
AA	305	203	56	70	181	216	94	59	64	76.2 SQ	- - -
A	610	381	68	83	337	378	238	67	73	88.9 SQ	- - -
Inches											
AAA	12.00	7.25	1.56	2.62	7.00	8.02	4.18	1.82	2.02	2.25 SQ	- - -
AA	12.00	8.00	2.19	2.75	7.12	8.50	3.69	2.31	2.50	3.00 SQ	- - -
A	24.00	15.00	2.69	3.25	13.25	14.88	9.38	2.63	2.88	3.50 SQ	- - -

Figure 1. Dimensions for Actuator Sizes AAA, AA, and A (also see table 4)

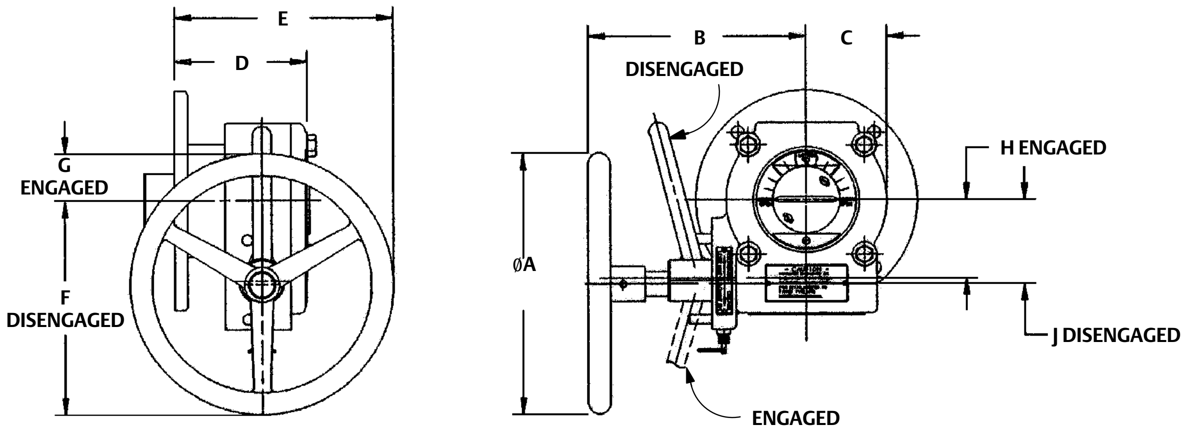


Note: This drawing is a typical view only. For some valves, the handwheel is on the opposite side.

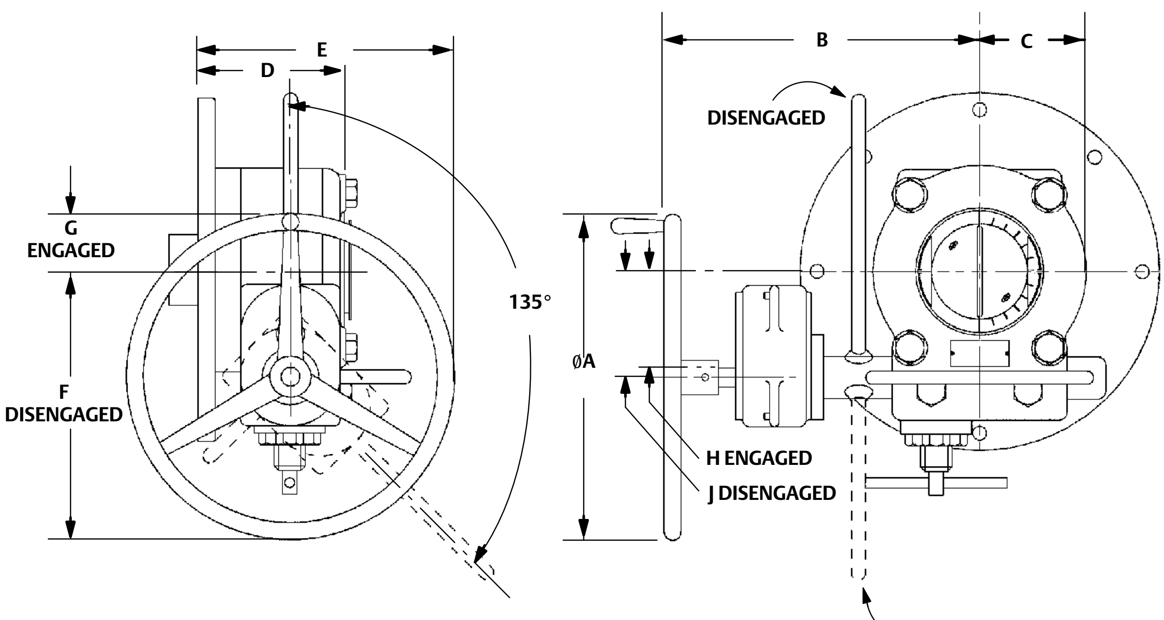
Table 5. Dimensions for Actuator Sizes 2A, 1A, B, C, D, and II-FA

1078 Size	A	B	C	D	E	F	G	H	J
mm									
2A	152 203 305	230	55.4	116	155 181 232	140 165 216	17.5 42.9 93.7	58.7	63.5
1A	305 610	229	68.3	124	235 387	229 381	82.6 235	69.9	76.2
B	203 305 610	229	84.1	140	194 244 397	191 241 394	19.1 69.9 222	82.6	88.9
C	610	254	102	149	400	416	200	105	111
D	762 914	406	117	203	505 581	506 583	262 338	119	125
II-FA	406	356	117	203	337	328	84	119	125
Inches									
2A	6.00 8.00 12.00	8.00	2.18	4.56	6.12 7.12 9.12	5.5 6.5 8.5	0.69 1.69 3.69	2.31	2.50
1A	12.00 24.00	9.00	2.69	4.88	9.25 15.25	9.00 15.00	3.25 9.25	2.75	3.00
B	8.00 12.00 24.00	9.00	3.31	5.50	7.62 9.62 15.62	7.50 9.50 15.50	0.75 2.75 8.75	3.25	3.50
C	24.00	10.00	4.00	5.88	15.75	16.38	7.88	4.12	4.38
D	30.00 36.00	16.00	4.62	8.00	20.25 23.25	19.94 22.94	10.31 13.31	4.69	4.94
II-FA	16.00	14.00	4.62	8.00	13.25	12.94	3.31	4.69	4.94

Figure 2. Dimensions for Actuator Sizes 2A, 1A, B, C, D, and II-FA (also see table 5)



SIZES 2A, 1A, B, C, D



SIZE II-FA

B2463

Ordering Information

Whenever a power actuator is ordered with a 1078 manual actuator, all components are configured and mounted according to specifications of the order.

Size AAA, AA, and A

Field installation of the 1078 onto existing actuators with F or G mounting adaptations requires installation of new power actuator parts. (The F and G mounting adaptations are the mounting methods normally used to mount 1052 and 2052 (size 1 and 2) actuators on Fisher valves.) Installation of a valve to bypass cylinder or diaphragm pressure during manual operation is also recommended.

Size 2A, 1A, B, C, D, and II-FA

Field installation of the 1078 onto the following existing actuators with F or G mounting adaptations [1052 (size 70), 2052 (size 3), and 1061 (sizes 30, 40, 60, 68, 80, and 100)] requires additional parts in most cases. Remove the cover and hub and then replace with the 1078 actuator. Most assemblies require a new lever and splined adaptor.

Table 6. Handwheel/Valve Shaft Rotation

VALVE	1078 ACTUATOR ACTION		
	Actuator Mounting		
	Right-Hand	Left-Hand	Left-Hand (Optional)(3)
8510, 8532, 8580, 8590, and 9500	Direct Acting(1)	Direct Acting	NA
V150, V200, and V300	Reverse Acting(2)	Reverse Acting	Direct Acting
V250	Reverse Acting	Direct Acting	NA
V500 and CV500	Reverse Acting	Reverse Acting	NA

1. Direct acting is when the clockwise handwheel rotation produces clockwise valve shaft rotation to close the valve.
2. Reverse acting is when the clockwise handwheel rotation produces counter clockwise valve shaft rotation to close the valve.
3. A left hand ball will be required for the NPS 3 through 12 series B and the NPS 14 through 20, with or without an attenuator.

When ordering, specify:

1. Power actuator type and size, and valve shaft size.

2. Right or left hand mounting and desired mounting position.

3. Direct or reverse acting manual actuator construction. Refer to the mounting positions shown in the appropriate actuator bulletin and order according to the guidelines in table 6.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 1079 Declutchable Manual Actuator

The 1079 manual actuator is a declutchable unit for manual operation of keyed or square shaft control valves and equipment that use a Hytork™ actuator. The 1079 manual actuator mounts directly on the Hytork actuator and can be engaged to allow manual operation of the valve when the power actuator is not in use or disengaged to allow automatic operation of the valve by the power actuator. The mechanism used allows manual actuator engagement at any point of power actuator rotation.

W6214

Fisher 1079 Manual Actuator Mounted on a Hytork Actuator and A41 Valve

Features

- Direct Attachment to the Power Actuator-- Direct mounting to the actuator housing simplifies installation and eliminates the need for yokes and other brackets.

- Engage Manual Actuator At Any Point of Rotation-- A lever-operated eccentric bearing support on the input shaft allows engagement of the worm gear with the sector at any point of rotation.

- Positive Operation-- The disengagement lever is held in both the engaged and disengaged positions by a spring-loaded pin, which must be released before the lever can be moved. This reduces the possibility of inadvertent or accidental operation. In addition, stop-pins at the fully engaged and fully disengaged positions provide positive limits for lever travel.

Specifications

Available Configurations

Direct acting; see Handwheel Rotation

Manual Actuator Sizes

See tables 1, 2, and 3

Power Actuator Compatibility

Compatible with all sizes of Hytork actuator; see tables 1, 2, and 3

Maximum Torque Output

See tables 1, 2, and 3

Wheel-Rim Force

See tables 1, 2, and 3

Handwheel Rotation

Clockwise handwheel rotation closes valve (produces clockwise valve shaft rotation, as viewed from the actuator end of the shaft)

Construction Materials

Housing and Cover: Cast iron
Drive Sleeve/Gear (Sector): Low-carbon steel/bronze
Worm Gear: Heat-treated steel
Input Shaft and Eccentric: Low-carbon steel
Pin Detent: 300 Series stainless steel
Shaft Bearings: Bronze

Standard Mounting Positions (see figure 1)

■ Standard mounting is with the input shaft perpendicular to the Hytork piston travel, with the handwheel opposite the actuator supply connections; ■ Optional mounting is with the handwheel on the same side as the Hytork actuator supply connections

Approximate Weight without Handwheel

Size AAA: 7.3 kg (16 lb)
Size AA: 10 kg (22 lb)
Size A: 14 kg (31 lb)
Size B: 16 kg (35 lb)
Size C: 24 kg (52 lb)
Size D: 33 kg (72 lb)

Handwheel Weight

6-inch: 1.0 kg (2.25 lb)
8-inch: 2.0 kg (4.50 lb)
12-inch: 4.0 kg (8.75 lb)
24-inch: 5.4 kg (12.00 lb)
30-inch: 6.7 kg (14.75 lb)
36-inch: 7.8 kg (17.25 lb)

Figure 1. Fisher 1079 Actuator Mounting Positions

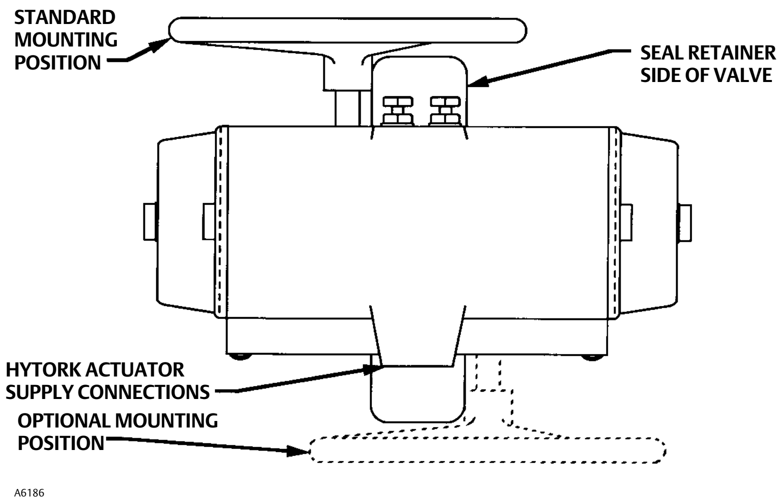


Table 1. Actuator Size Selection and Specifications for Keyed Shaft Valves (Fisher A31A)

ACTUATOR SIZE	HYTORK ACTUATOR SIZE	GEAR RATIO	HANDWHEEL DIAMETER		VALVE SHAFT DIAMETER[1]		MAXIMUM ALLOWABLE TORQUE[2]		WHEEL-RIM FORCE FOR MAXIMUM TORQUE	
			mm	Inches	mm	Inches	N•m	lbf•in	N	lbf
AAA	70 thru 280	24:1	203	8	14.3	0.5625	129	1145	214	48
			305	12	17.5	0.6875	245	2165	267	60
					23.8	0.9375	271	2400[3]	298	67
AA	70 thru 280	24:1	203	8	14.3	0.5625	129	1145	151	34
					17.5	0.6875	245	2165	298	64
			305	12	23.8	0.9375	542	4800[3]	418	94
					28.6	1.125	542	4800[3]	418	94
					30.2	1.1875	542	4800[3]	418	94
					31.8	1.25[4]	542	4800[3]	418	94
					41.3	1.625	542	4800[3]	418	94
A	680A	40:1	610	24	14.3	0.5625	129	1145	44	10
					17.5	0.6875	245	2165	80	18
					23.8	0.9375	671	5941	222	50
					28.6	1.125	834	7383	276	62
					30.2	1.1875	926	8200[3]	302	68
					31.8	1.25[4][5]	926	8200[3]	302	68
					41.3	1.625	926	8200[3]	302	68
B	1125	40:1	610	24	23.8	0.9375	671	5941	182	41
					28.6	1.125	834	7383	227	51
					31.8	1.25[4]	927	8205	254	57
					30.2	1.1875	1171	10,360	320	72
					31.8	1.25[5]	1233	10,911	338	76
					38.1	1.5	1582	14,000[3]	431	97
					41.3	1.625	1582	14,000[3]	431	97
					44.5	1.75	1582	14,000[3]	431	97
					47.6	1.875	1582	14,000[3]	431	97
C	1370	54:1	610	24	23.8	0.9375	671	5941	138	31
					28.6	1.125	834	7383	169	38
					31.8	1.25[4]	927	8205	187	42
					30.2	1.1875	1171	10,360	236	53
					31.8	1.25[5]	1233	10,911	249	56
					38.1	1.5	2203	19,494	445	100
			762	30	41.3	1.625	2530	22,396	409	92
					44.5	1.75	2568	22,728	418	94
					47.6	1.875	2712	24,000[3]	440	99
D	2585 & 4580	64:1	610	24	31.8	1.25[4]	927	8205	160	36
					30.2	1.1875	1171	10,360	200	45
					31.8	1.25[5]	1233	10,911	209	47
					38.1	1.5	2203	19,494	378	85
			762	30	41.3	1.625	2530	22,396	347	78
					44.5	1.75	2568	22,728	351	79
			914	36	47.6	1.875	4067	36,000[3]	463	104
					57.2	2.25	4067	36,000[3]	463	104

1. Shaft diameter at the keyway.
2. Unless otherwise noted, torque is limited by S17400 stainless steel (17-4PH H1025) shaft material at 38°C (100°F). For other shaft materials, consult your Emerson sales office or Local Business Partner.
3. Maximum manual actuator output.
4. NPS 12 CL150 A31A and NPS 8 CL300 A31A.

Table 2. Actuator Size Selection and Specifications for Valves (Fisher A41)

ACTUATOR SIZE	HYTORK ACTUATOR SIZE	GEAR RATIO	HANDWHEEL DIAMETER		VALVE SHAFT DIAMETER(1)		MAXIMUM ALLOWABLE TORQUE(2)		WHEEL-RIM FORCE FOR MAXIMUM TORQUE	
			mm	Inches	mm	Inches	N•m	lbf•in	N	lbf
AAA	70 thru 280	24:1	152	6	12.7 15.9	0.500 0.625	58 138	515 1225	127 305	29 69
			203	8	15.9	0.625	138	1225	229	51
			305	12	15.9	0.625	138	1225	152	34
			152	6	12.7 15.9	0.500 0.625	58 138	515 1225	127 305	29 69
			203	8	19.1	0.750	240	2120	392	88
AA	70 thru 280	24:1	203	8	19.1 25.4 31.8	0.750 1.000 1.250	240 468 542	2120 4140 4800(3)	280 546 629	63 123 141
			305	12	31.8 38.1	1.250 1.500	542 542	4800(3) 4800(3)	418 418	94 94
A	680A	40:1	610	24	19.1 25.4 31.8 38.1	0.750 1.000 1.250 1.500	240 468 926 926	2120 4140 8200(3) 8200(3)	78 153 303 303	18 34 68 68
B	1125	40:1	610	24	31.8 38.1 44.5	1.250 1.500 1.750	1110 1356 1582	9820 12000 14,000(3)	303 371 431	68 83 97
C	1370	54:1	610	24	31.8 38.1	1.250 1.500	1110 1356	9820 12000	227 278	51 63
			762	30	44.5	1.750	2658	23524	433	97
D	2585 & 4580	64:1	610	24	31.8 38.1	1.250 1.500	1110 1356	9820 12000	190 231	43 52
			762	30	44.5	1.750	2658	23524	365	82

1. Shaft diameter at packing box.
2. Unless otherwise noted, torque is limited by S17400 (17-4 PH H1025) stainless steel shaft. For other shaft materials, contact your Emerson sales office.
3. Maximum manual actuator output. For AAA, C, and D, the maximum output is 2400, 24000, and 36000 in-lb, respectively.

Table 3. Actuator Size Selection and Specifications for Square Shaft Valves (Fisher A11)

ACTUATOR SIZE	HYTORK ACTUATOR SIZE	GEAR RATIO	HANDWHEEL DIAMETER		VALVE SHAFT DIAMETER(1)		MAXIMUM ALLOWABLE TORQUE(2)		WHEEL-RIM FORCE FOR MAXIMUM TORQUE	
			mm	Inches	mm	Inches	N•m	lbf•in	N	lbf
AAA	70 thru 280	24:1	203	8	10.3	0.40625	89	790	147	33
			305	12	15.9	0.625	271	2400(3)	298	67
AA	70 thru 280	24:1	203	8	10.3	0.40625	89	790	102	23
			305	12	15.9 22.2	0.625 0.875	318 542	2813 4800(3)	245 418	55 94
A	680A	40:1	610	24	15.9 22.2 25.4	0.625 0.875 1	318 782 926	2813 6922 8200(3)	102 254 302	23 57 68
B	1125	40:1	610	24	15.9 22.2 25.4 34.9 34.9	0.625 0.875 1 1.375 1.375	318 782 1351 1582 1582	2813 6922 11,956 14,000(3) 14,000(3)	85 214 369 431 431	19 48 83 97 97
C	1370	54:1	610	24	15.9 22.2 25.4	0.625 0.875 1	318 782 1351	2813 6922 11,956	67 160 276	15 36 62
			762	30	34.9 34.9	1.375 1.375	2712 2712	24,000(3) 24,000(3)	440 440	99 99
D	2585 & 4580	64:1	610	24	15.9 22.2 25.4	0.625 0.875 1	318 782 1351	2813 6922 11,956	53 133 231	12 30 52
			914	36	34.9 34.9	1.375 1.375	3520 3520	31,157 31,157	400 400	90 90

1. Shaft diameter at square connection.
2. Unless otherwise noted, torque is limited by S17400 stainless steel (17-4 PH H1025) shaft material at 38°C (100°F). For other shaft materials, consult your Emerson sales office.
3. Maximum manual actuator output.

Figure 2. Dimensions (also see table 4)

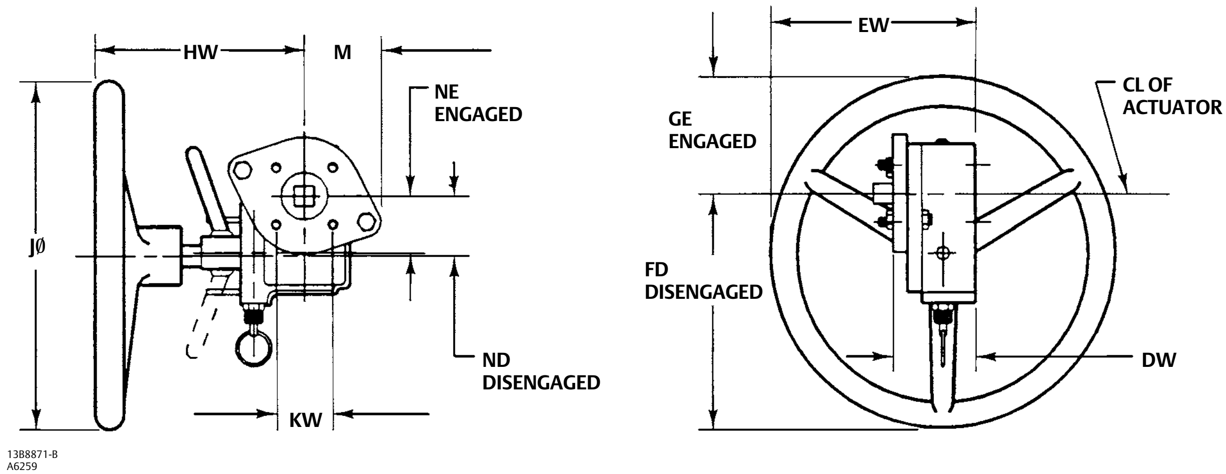


Table 4. Dimensions (also see figure 2)

1079 Actuator Size	1032 Actuator Size	J∅	HW	M	DW	EW	FD	GE	NE	ND	KW Bolt Pattern
mm											
AAA	45	152	184	67	73	106	128	30	46	52	35 SQ
AAA	45	203	184	67	73	132	153	55	46	52	35 SQ
AAA	45	305	184	67	73	183	204	106	46	52	35 SQ
AAA	70-280	152	184	67	73	106	128	30	46	52	50 SQ
AAA	70-280	203	184	67	73	132	153	55	46	52	50 SQ
AAA	70-280	305	184	67	73	183	204	106	46	52	50 SQ
AA	425A	203	203	90	78	130	165	43	59	64	72 SQ
AA	425A	305	203	90	78	181	216	94	59	64	72 SQ
A	680A	610	381	105	89	337	378	238	67	73	72 SQ
B	1125	610	381	108	105	346	394	222	83	89	88 SQ
C	1370	610	406	143	117	349	416	200	105	111	88 SQ
C	1370	762	406	143	117	425	492	276	105	111	88 SQ
D	2585 & 4580	610	406	152	162	371	430	186	119	125	117 SQ
D	2585 & 4580	762	406	152	162	448	506	262	119	125	117 SQ
D	2585 & 4580	914	406	152	162	524	583	338	119	125	117 SQ
Inches											
AAA	45	6.00	7.25	2.62	2.88	4.19	5.03	1.17	1.83	2.03	1.39 SQ
AAA	45	8.00	7.25	2.62	2.88	5.19	6.03	2.17	1.83	2.03	1.39 SQ
AAA	45	12.00	7.25	2.62	2.88	7.19	8.03	4.17	1.83	2.03	1.39 SQ
AAA	70-280	6.00	7.25	2.62	2.88	4.19	5.03	1.17	1.83	2.03	1.95 SQ
AAA	70-280	8.00	7.25	2.62	2.88	5.19	6.03	2.17	1.83	2.03	1.95 SQ
AAA	70-280	12.00	7.25	2.62	2.88	7.19	8.03	4.17	1.83	2.03	1.95 SQ
AA	425A	8.00	8.00	3.56	3.06	5.12	6.50	1.69	2.31	2.50	2.84 SQ
AA	425A	12.00	8.00	3.56	3.06	7.12	8.50	3.69	2.31	2.50	2.84 SQ
A	680A	24.00	15.00	4.12	3.50	13.25	14.88	9.38	2.62	2.88	2.84 SQ
B	1125	24.00	15.00	4.25	4.12	13.62	15.50	8.75	3.25	3.50	3.48 SQ
C	1370	24.00	16.00	5.62	4.62	13.75	16.38	7.88	4.12	4.38	3.48 SQ
C	1370	30.00	16.00	5.62	4.62	16.75	19.38	10.88	4.12	4.38	3.48 SQ
D	2585 & 4580	24.00	16.00	5.97	6.38	14.62	16.94	7.31	4.69	4.94	4.60 SQ
D	2585 & 4580	30.00	16.00	5.97	6.38	17.62	19.94	10.31	4.69	4.94	4.60 SQ
D	2585 & 4580	36.00	16.00	5.97	6.38	20.62	22.94	13.31	4.69	4.94	4.60 SQ

Ordering Information

When ordering, specify:

1. Manual actuator size
2. Handwheel size
3. Standard or optional mounting

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Fisher™ 1080 Declutchable Manual Actuator

The Fisher 1080 manual actuator is a Declutchable Actuator for manual operation of Fisher valves with double D or square shaft control valves that use a rack and pinion power actuator. As shown in the following figure, the 1080 manual actuator mounts directly on the FieldQ actuator. It can be engaged to allow manual operation of the valve when the power actuator is not in use or disengaged to allow automatic operation of the valve by the power actuator.

Fisher 1080 Manual Actuator Mounted on a FieldQ Actuator

Features

- **Direct Attachment to the Power Actuator—** Direct mounting to the actuator housing simplifies installation and eliminates the need for additional mounting parts.

- **Engage Manual Actuator At Any Point of Rotation—** A lever-operated eccentric bearing support on the input shaft allows engagement of the worm gear with the sector at any point of rotation.

- **Simplified Selection—** Each size of the 1080 corresponds to the capabilities of a size of the FieldQ. So you need only calculate the size of the FieldQ, when ordering both a FieldQ and 1080 (see table 1).

- **Positive Operation—** The disengagement lever is held in both the engaged and disengaged positions by a spring-loaded pin, which must be released before the lever can be moved. This reduces the possibility of inadvertent or accidental operation. In addition, stop-pins at the fully engaged and fully disengaged positions provide positive limits for lever travel.

Specifications

Available Configurations

Direct acting; see Handwheel Rotation

Manual Actuator Sizes

See table 1

Power Actuator Compatibility

Compatible with the FieldQ actuator; see table 1

Maximum Torque Output

See table 1, Wheel-Rim Force

Handwheel Rotation

Clockwise handwheel rotation closes valve (produces clockwise valve shaft rotation)

Construction Materials

Housing and Cover: Cast iron
Drive Sleeve/Gear (Sector): Low-carbon steel/bronze
Worm Gear: Heat-treated steel
Input Shaft and Eccentric: Low-carbon steel/bronze
Pin Detent: 300 Series stainless steel
Shaft Bearings: Bronze

Mounting Positions (see figure 1)

■ Standard mounting is with the input shaft perpendicular to the FieldQ actuator piston travel, with the handwheel opposite the actuator supply connections; ■ optional mounting is with the handwheel on the same side as the FieldQ actuator supply connections

Dimensions

See figure 2

Approximate Weight without Handwheel

Size AAA: 5.4 kg (12 lb)
Size AA: 10 kg (22 lb)
Size A: 14 kg (31 lb)
Size B: 22 kg (49 lb)
Size C: 34 kg (76 lb)
Size D: 52 kg (115 lb)
Size F: 68 kg (150 lb)

Handwheel Weight

8-inch: 2.0 kg (4.50 lb)
12-inch: 4.0 kg (6.75 lb)
16-inch: 6.8 kg (15.00 lb)
24-inch: 5.4 kg (12.00 lb)
30-inch: 6.8 kg (15.00 lb)
36-inch: 7.8 kg (17.25 lb)

Ordering Information

Each size of the 1080 corresponds to a specific size of FieldQ as shown in table 1. The torque output of the 1080 actuator is matched to the capabilities of the FieldQ power actuator.

The 1080 actuator can handle the Spring Return FieldQ actuator torques as well as the Double Acting FieldQ actuator, because the Double Acting torque at 100 psig is approximately equal to the sum of both the Spring Return spring start torque and the Spring Return air end torque at 100 psig.

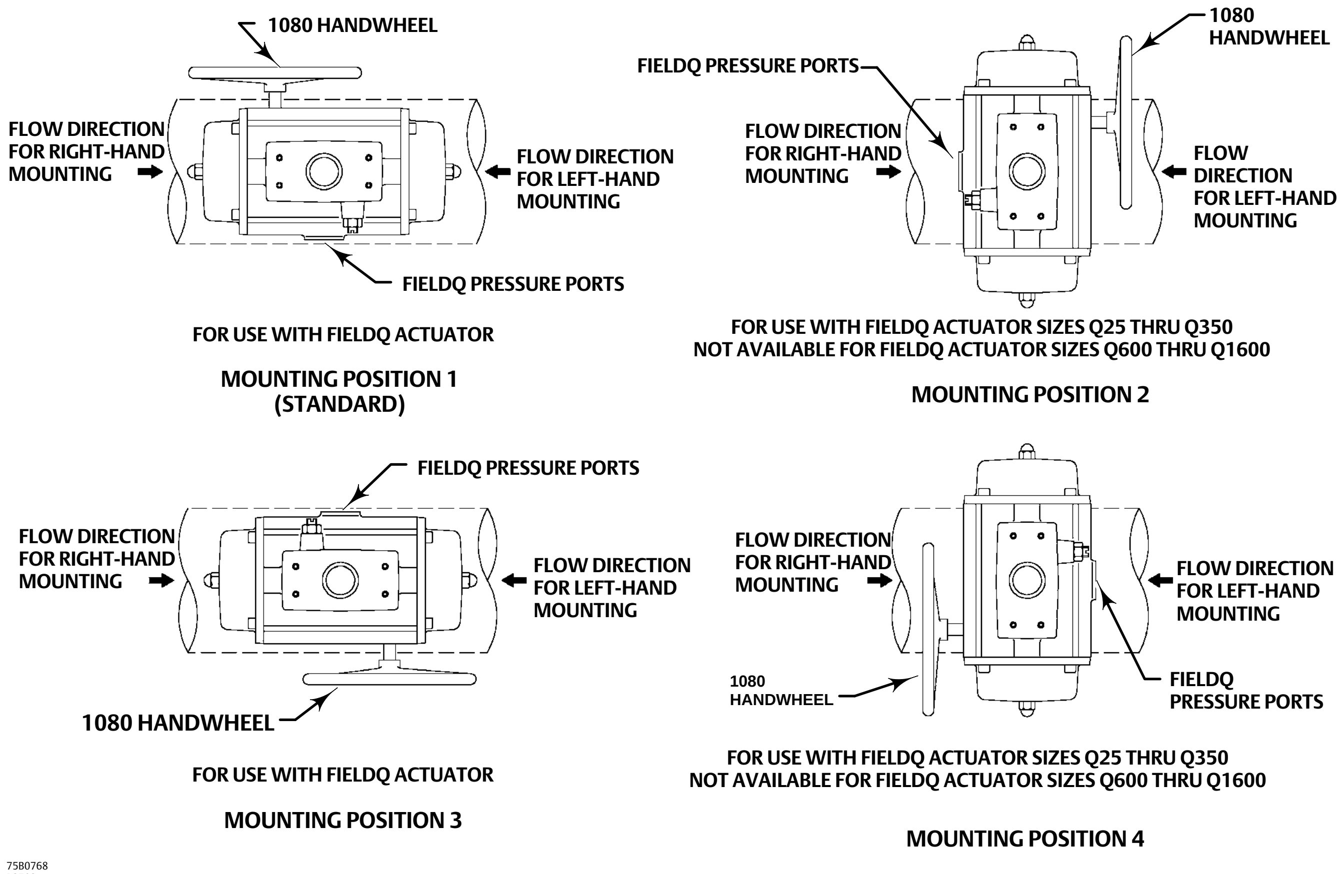
An optional bypass valve should be ordered for use on a FieldQ actuator if you plan to engage the manual actuator while the power actuator has air pressure applied to it. For activation of the 1080, air pressure must not be trapped in the FieldQ or must be equalized between the pistons by a bypass valve.

Table 1. Actuator Size Selection and Specifications(1)

ACTUATOR SIZE	FIELDQ ACTUATOR SIZE	GEAR RATIO	NUMBER OF TURNS TO CLOSE	HANDWHEEL DIAMETER		1080 MAXIMUM TORQUE(2)		FIELDQ TORQUE(3)		WHEEL RIM FORCE FOR MAXIMUM TORQUE(4)	
				mm	Inches	N•m	lb•in	N•m	lb•in	N	lbf
AAA/S2	Q40 Q65	24:1	6	203	8	271	2,400	58 89	513 788	93 147	21 33
AAA/S3	Q100							132	1,168	218	49
AA/S4	Q200 Q350	34:1	8.5	305	12	542	4,800	289 502	2,558 4,443	222 387	50 87
A/S4	Q600	32:1	8	610	24	926	8,200	866	7,550	276	62
B/S5	Q950	40:1	10			1,356	12,000	1,290	11,300	271	61
C/S6	Q1600	54:1	13.5	762	30	2,034	18,000	2,140	18,600	298	67

1. Only the 1080/FieldQ combinations shown are available.
2. Maximum torque output of the 1080 actuator only.
3. Torque output of the FieldQ actuator at 100 psig and required 1080 torque output for use with the FieldQ.
4. Amount of force necessary at rim of the handwheel to match torque output of the FieldQ at 100 psig.

Figure 1. Fisher 1080 Actuator Mounting Positions

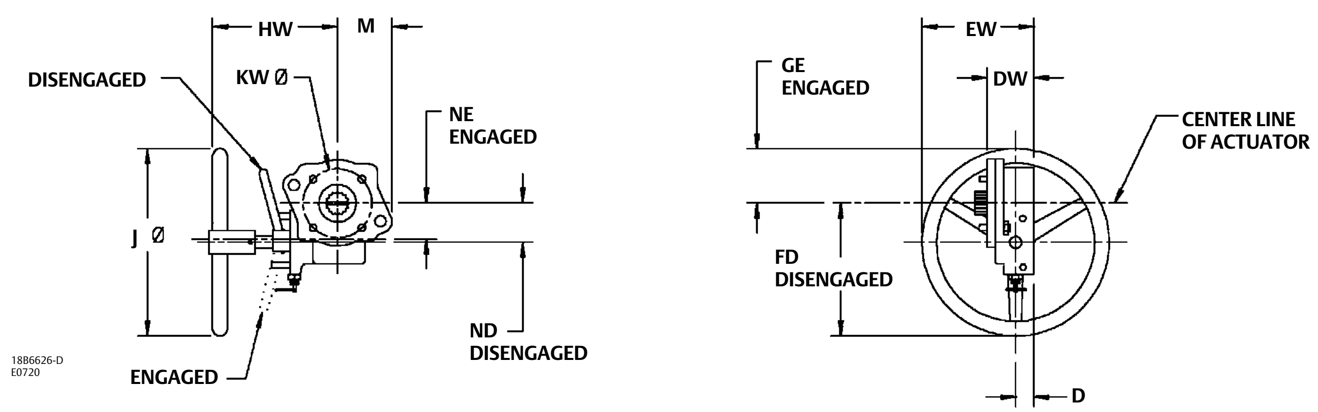


Note:
Right- and left-hand mounting is based on the 8580 valve drive shaft being mounted in the recommended horizontal position.

Table 2. Dimensions

1080 Actuator Size	FIELDQ Actuator Size	J∅	HW	M	D	DW	EW	FD	GE	NE	ND	KW Bolt Circle Diameter
mm												
AAA/S2	Q40, Q65	203	191	68	30	73	132	153	55	46	51	70
AAA/S3	Q100	203	191	68	30	73	132	153	55	46	51	70
AA/S4	Q200, Q350	305	210	89	29	83	181	216	94	59	64	102
A/S4	Q600	610	381	105	32	89	337	378	238	67	73	125
B/S5	Q950	610	381	114	41	105	346	394	222	83	89	140
C/S6	Q1600	762	406	143	44	117	425	492	276	105	111	165
Inches												
AAA/S2	Q40, Q65	8	7.50	2.69	1.188	2.88	5.19	6.03	2.18	1.83	2.03	2.756
AAA/S3	Q100	8	7.50	2.69	1.188	2.88	5.19	6.03	2.18	1.83	2.03	2.756
AA/S4	Q200, Q350	12	8.25	3.50	1.126	3.25	7.13	8.50	3.69	2.31	2.50	4.016
A/S4	Q600	24	15.00	4.13	1.253	3.50	13.25	14.88	9.38	2.63	2.88	4.921
B/S5	Q950	24	15.00	4.50	1.625	4.12	13.62	15.50	8.75	3.25	3.50	5.512
C/S6	Q1600	30	16.00	5.62	1.750	4.62	16.75	19.38	10.88	4.12	4.38	6.496

Figure 2. Dimensions (also see table 2)



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Lever-Lock Handlever Actuators for Fisher™ 8560, A41, and A11 Valves

The lever-lock handlever actuator is used for reliable manual operation of NPS 3 through 8 Fisher 8560, A41, and NPS 3 and 4 A11 high-performance butterfly valves. Spring loading secures the handlever in the notched quadrant plate, allowing the valve disk to be locked in intermediate positions.

W4896

Lever-Lock Handlever Actuator Mounted on Valve

Features

- **Rugged Construction**—Lever-lock handlever actuator consists of ductile iron quadrant plate, handle, and grip.
- **Monitoring Ease**—Lever-lock handlever configuration offers positive on/off and intermediate locked positions for throttling control.
- **Tamper Resistant**—Handle can be provided with padlock for tamper-resistant open/closed position.
- **Accessory Mounting Available**—Limit switches can be mounted to the handlever actuator for remote valve position indication.
- **Adjustable Travel Stops**—Positioning device available for setting repeatable stops from 0 to 90 degrees rotation.

Installation

The lever-lock handlever actuator is normally mounted on a valve at the factory. However, the handlever actuator can be field-mounted. Dimensions are shown in figure 1 and table 2.

Specifications

Lever-Lock handlever Actuator Sizes

See table 1

Valve Compatibility

■ Accepts 8560 and A41 valve Double-D shafts from 12.7 to 25.4 mm (1/2 to 1 inches)
■ Accepts A11 valve square-end shafts from 10.3 to 15.9 mm (13/32 to 5/8 inches)

Maximum Torque Output

See table 1

Handlever Length

Maximum of 432 mm (17 inches). See figure 1 and table 2

Construction Materials

Handle, quadrant plate, and handle grip are all ductile iron

Dimensions and Approximate Weights

See figure 1 and table 2

Options

■ Adjustable travel stops
■ Limits Switches

Table 1. Handlever Actuator Sizes for Fisher 8560, A41, and A11 Valves Sizes, and Maximum Allowable Torque for Handlever Actuators

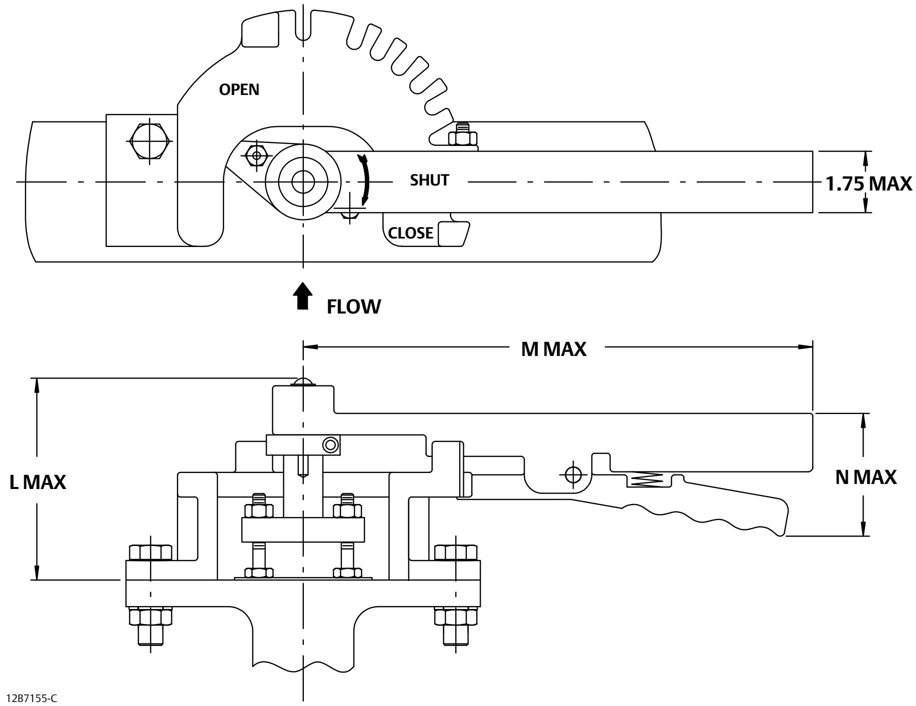
HANDLEVER ACTUATOR SIZE	VALVE SIZE, NPS	8560 AND A41 VALVES(1)		A11 VALVES(2)
		CL150	CL300	CL600
		Maximum Allowable Torque, N•m		
I	3	58.2(3)	124.3	90.4
	4	124.3	- - -	- - -
II	4	- - -	163.9	163.9
	6	163.9	163.9	- - -
	6	163.9	- - -	- - -
HANDLEVER ACTUATOR SIZE	VALVE SIZE, NPS	Maximum Allowable Torque, Lbf•in		
I	3	515(3)	1100	800
	4	1100	- - -	- - -
II	4	- - -	1450	1450
	6	1450	1450	- - -
	6	1450	- - -	- - -

1. 8560 and A41 torque values are based on S17400 (17-4PH stainless steel) H1075 stem material.
2. A11 torque values are based on S17400 (17-4PH stainless steel) H1025 stem material.
3. Do not exceed this torque regardless of actuator size.

Table 2. Handlever Actuator Dimensions and Weights

VALVE SIZE, NPS	DIMENSION			HANDLEVER ACTUATOR WEIGHT
	L	M	N	
	mm			Kg
3	114	276	76	2.3
4	114	276	76	2.3
6	117	432	97	4.1
8	117	432	97	4.1
	Inches			Lbs
3	4.50	10.88	3.00	5
4	4.50	10.88	3.00	5
6	4.62	17.00	3.81	9
8	4.62	17.00	3.81	9

Figure 1. Handlever Actuator Dimensions and Weights (also see table 2)



Ordering Information

When ordering, specify:

Application

1. Valve type number, size, and shaft diameter or shaft size with which the lever-lock handlever actuator will be used.

2. Valve disk rotation

Actuator

Refer to table 1 for maximum output torque and select the proper size of lever-lock handlever. For service conditions that require higher torque capabilities than those listed in table 1, use a manual gear actuator.

Valve

Refer to separate valve bulletins for ordering information.

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M Series Manual Handwheel Gear Actuators for Fisher™ Butterfly Valves

M Series handwheel gear actuators are totally enclosed, weatherproof, worm gear actuators for reliable manual operation with Fisher A11, A31A, A41, and 8560 High Performance Butterfly Valves. The M Series actuator consists of a body housing, cover, worm gear, input shaft, and handwheel. The housing is grease-packed.

W4715-1

M SERIES HANDWHEEL GEAR ACTUATOR

Features

- **Long Service Life**—Rugged construction provides stability and corrosion resistance. The unit is totally enclosed for weatherproof operation.
- **Accurate Valve Disk Positioning**—Two adjustable stops are located in the housing for correct adjustment of disk position. The actuator is inherently self-locking, unless subjected to high vibration.
- **Overtravel Capability**—Provides for five degrees of overtravel in both directions for precise positioning of the valve disk.

Installation

The M Series gear actuator is normally mounted on a valve at the factory. However, the actuator can be field-mounted; it can be mounted in any position on the A11 or A31A and it can be mounted in positions 1 and 3 on the A41 and 8560, as shown in figure 1. Make clearance considerations before mounting the actuator to determine the most suitable mounting position. Dimensions are shown in figure 2.

Specifications

Actuator Sizes

See tables 1, 2, and 3

Valve Compatibility

- Accepts A11 valve square-end shafts from 10.3 to 34.9 mm (0.405 to 1.375 inches), keyed shafts from 38.1 to 44.5 mm (1-1/2 to 1-3/4 inches)[1]
- Accepts A31A valve keyed shafts from 44.5 to 57.2 mm (1-3/4 to 2-1/4 inches)
- Accepts A41 and 8560 valves Double D shafts from 12.7 to 44.5 mm (1/2 to 1-3/4 inches)

See tables 1, 2, and 3

Maximum Torque Output

See tables 1, 2, and 3

Handwheel Rotation

Clockwise handwheel rotation closes the valve (produces clockwise rotation of the valve shaft)

Construction Materials

Housing and Cover: Cast iron

Worm: Steel

Worm Gear: Manganese Bronze

Input Shaft: Steel (S30300 on request)

Handwheel: Cast Iron

Mounting Positions

See figure 1

Approximate Weight without Handwheel

ACTUATOR	A11		A31A	
	WEIGHT			
	kg	lb	kg	lb
1KE	7.3	16	5.4	12
2KE	10	22	8.6	19
5KE	12.2	27	10	22
7KE	22.6	50	20.4	45
9KE	31.8	70	31.8	70
10KE	56.7	125	56.7	125

ACTUATOR	WEIGHT	
	kg	lb
0KE/D1, D2, D3, D1A, D2A, D3A	2.7	6
2KE/D4, D4A	8.2	18
6KE/D5, D6, D5A, D6A	13.6	30
9KF/D7	29.5	65

Handwheel Weight

8-inch: 2.0 kg (4.50 lb)
12-inch: 4.0 kg (6.75 lb)
18-inch: 4.5 kg (10 lb)
24-inch: 5.4 kg (12 lb)
36-inch: 7.8 kg (17.25 lb)

Dimensions

See figures 2

Options

- Locking plates with padlock for fixed positioning
- Stops are typically set every 10 degrees, but can be special ordered with stops set up to 45 degrees from both ends.
- Handwheel extensions

1. As an option, CL600 NPS 10 (with 1-1/2 inch keyed shaft) and NPS 12 (with 1-3/4 inch shaft) A11 valves require a keyed connection if being used with size 9KE or 10KE-6 actuators.

Table 1. M Series Gear Actuator for A11 (CL600)

VALVE SIZE, NPS	VALVE SHAFT SIZE, INCHES	MAXIMUM RECOMMENDED TORQUE(1)		ACTUATOR SIZE	HANDWHEEL DIAMETER, INCHES	RIM FORCE(2)		NUMBER OF TURNS TO CLOSE(3)	MAXIMUM TORQUE RATING OF ACTUATOR	
		N•m	lbf•in			N	lbf		N•m	lbf•in
3	13/32	113	1000(4)	1KE	12	80	18	9.5	452	4000
4	5/8	303	2690(4)	1KE	12	209	47	9.5	452	4000
6	7/8	643	5700	2KE	12	445	100	9.5	678	6000
		765	6780(4)	5KE		400	90	12.5	904	8000
8	1	643	5700	2KE	12	445	100	9.5	678	6000
		846	7500	5KE	12	445	100	12.5	904	8000
		1349	11960(4)	7KE	18	436	98	13.5	2260	20000
10	1-3/8	1354	12000	7KE	18	440	99	13.5	2260	20000
	1-1/2	2144	19000	9KE	24	440	99	16	3390	30000
	1-1/2	3520	31160(4)	10KE-6	18	214	48	72	8474	75000
12	1-3/8	1354	12000	7KE	18	440	99	13.5	2260	20000
	1-3/4	2144	19000	9KE	24	440	99	16	3390	30000
	1-3/4	3520	31160(4)	10KE-6	18	214	48	72	8474	75000

1. Maximum recommended torque for the valve/actuator combination is based on valve shaft rating, actuator rating and rim force.
2. Rim force required to produce Maximum recommended torque.
3. This column shows the number of times the handwheel must be turned to close the valve 90 degrees.
4. Shaft rating of the A11 valve.

Ordering Information

Because the M Series actuators for the A11 and A31A valves are often available in more than one size for any given valve size, they should be chosen according to torque requirements of the valve. Please specify actuator size when specifying valve size and class.

M Series actuators for the A41 and 8560 valves have been matched to the requirements of each valve size and should be chosen according to the valve size requested.

Table 2. M Series Gear Actuator for A31A

VALVE SIZE, NPS	VALVE SHAFT SIZE, INCHES	MAXIMUM RECOMMENDED TORQUE[1]		ACTUATOR SIZE	HANDWHEEL DIAMETER, INCHES	RIM FORCE[2]		NUMBER OF TURNS TO CLOSE[3]	MAXIMUM TORQUE RATING OF ACTUATOR	
		N•m	lbf•in			N	lbf		N•m	lbf•in
CL150										
14	1-3/16	644	5700	2KE	12	445	100	9.5	271	6000
		847	7500	5KE	12	445	100	12.5	904	8000
		1287	11390[4]	7KE	18	418	94	13.5	2260	20000
16	1-1/4	644	5700	2KE	12	445	100	9.5	271	6000
		847	7500	5KE	12	445	100	12.5	904	8000
		1,579	13970[4]	7KE	18	512	115	13.5	2260	20000
18	1-1/2	1356	12000	7KE	18	440	99	13.5	2260	20000
		2188	19370[4]	9KE	24	449	101	16	3390	30000
		2188	19370	10KE-6	18	133	30	72	8474	75000
20	1-3/4	1356	12000	7KE	18	440	99	13.5	2260	20000
		2147	19000	9KE	24	440	99	16	3390	30000
		2555	22620[4]	10KE-6	18	156	35	72	8474	75000
24	2-1/4	2147	19000	9KE	24	440	99	16	3390	30000
		8,474	75000	10KE-6	18	516	116	72	8474	75000
CL300										
14	1-3/4	1356	12000	7KE	18	440	99	13.5	2260	20000
		2555	22620[4]	9KE	24	525	118	16	3390	30000
16	1-3/4	1356	12000	7KE	18	440	99	13.5	2260	20000
		2555	22620[4]	9KE	24	525	118	16	3390	30000
18	2-1/4	2147	19000	9KE	24	440	99	16	3390	30000
		6,985	61830[4]	10KE-6	18	423	95	72	8474	75000
20	2-3/4	2147	19000	9KE	24	440	99	1672	3390	30000
		8474	75000	10KE-6	18	516	116		8474	75000
24	2-3/4	8474	75000	10KE-6	18	516	116	72	8474	75000

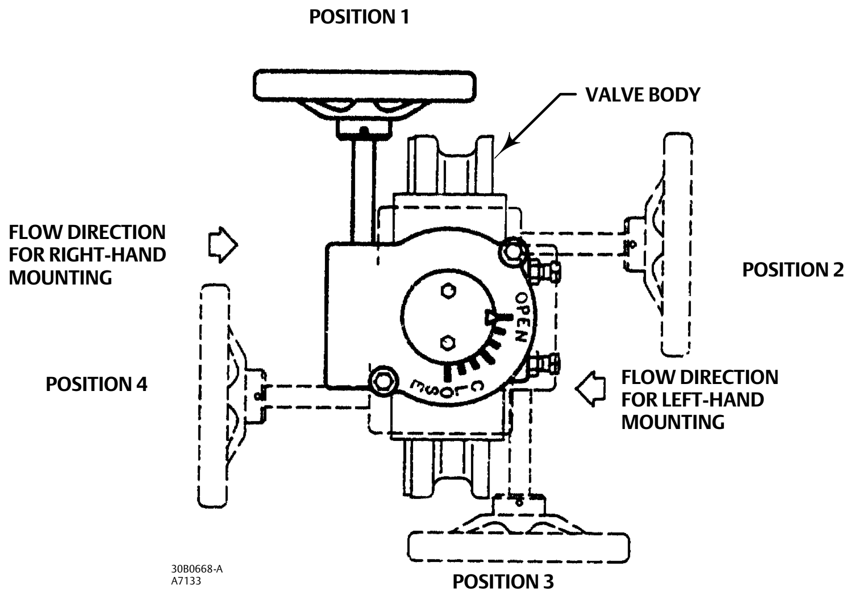
1. Maximum recommended torque for the valve/actuator combination is based on valve shaft rating, actuator rating and rim force.
2. Rim force required to produce Maximum recommended torque.
3. This column shows the number of times the handwheel must be turned to close the valve 90 degrees.
4. Shaft rating of the A31A valve.

Table 3. M Series Gear Actuator for A41 and 8560

VALVE SHAFT SIZE, INCHES	ACTUATOR SIZE	SHAFT RATING		HANDWHEEL DIAMETER, INCHES	RIM FORCE[1]		NUMBER OF TURNS TO CLOSE[2]	MAXIMUM TORQUE RATING OF ACTUATOR	
		N•m	lbf•in		N	lbf		N•m	lbf•in
1/2	0KE/D1	58	515	8	441	21	6	271	2400
5/8	0KE/D2	138	1230	8	227	51			
3/4	0KE/D3	240	2120	8	391	88			
1	2KE/D4	468	4140	12	325	73	9.5	678	6000
1-1/4	6KE/D5	1110	9820	24	365	82	10	1356	12000
1-1/2	6KE/D6	1356	12000	24	445	100			
1-3/4	9KE/D7	2658	23520	36	365	82	16	3390	30000

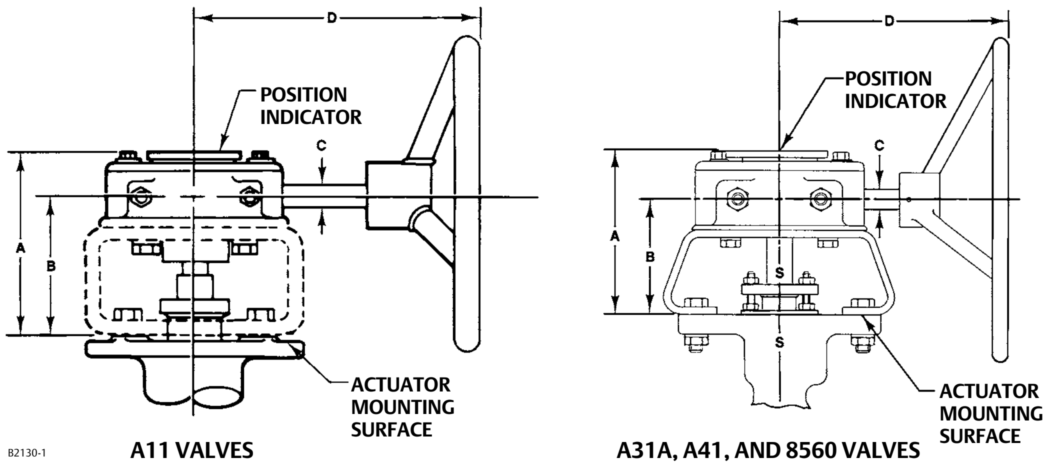
1. Rim force required to produce shaft rating torque.
2. This column shows the number of times the handwheel must be turned to close the valve 90 degrees.

Figure 1. Available Mounting Positions



Note: Only positions 1 and 3 are applicable to A41 and 8560.

Figure 2. M Series Dimensions (also see tables 4 and 5)



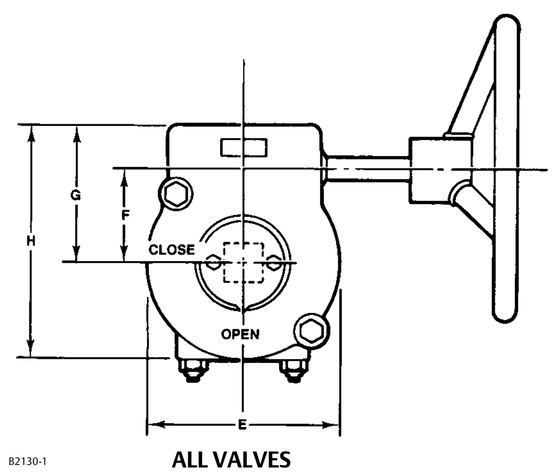


Table 4. Dimensions for A11 and A31A Compatible Actuators

ACTUATOR SIZE	DIMENSIONS												
	A			B			C	D	E	F	G	H	Handwheel Diameter
	A11	A31A CL150	A31A CL300	A11	A31A CL150	A31A CL300							
	mm												
1KE	146(1)	---	---	105(1)	---	---	15.7	168	127	64	92	156	203
2KE	171	155	---	130	114	---	19.1	206	165	79	117	191	305
5KE	189	173	---	140	124	---	19.1	206	165	79	114	197	305
7KE	203	206(2)	254	146	130(3)	197	25.4	314	203	106	140	241	457
9KE	298	298	298	219	219	219	25.4	375	235	119	156	273	610
10KE-6	298	298	298	219	219	219	19.1	394	235	127	156	273	457
	Inches												
1KE	5.75(1)	---	---	4.12(1)	---	---	0.62	6.62	5.00	2.50	3.62	6.12	8
2KE	6.75	6.12	---	5.12	4.50	---	0.75	8.12	6.50	3.12	4.62	7.50	12
5KE	7.44	6.81	---	5.50	4.88	---	0.75	8.12	6.50	3.12	4.50	7.75	12
7KE	8.00	8.12(2)	10.00	5.75	5.12(3)	7.75	1.00	12.38	8.00	4.12	5.50	9.50	18
9KE	11.75	11.75	11.75	8.62	8.62	8.62	1.00	14.75	9.25	4.69	6.12	10.75	24
10KE-6	11.75	11.75	11.75	8.62	8.62	8.62	0.75	15.50	9.25	5.00	6.12	10.75	18

1. The 1KE uses the 2KE A and B dimensions when it is mounted on an NPS 4 valve.
2. If the 7KE is used on an NPS 14 valve the A dimension is 206 mm (8.12 inches), on an NPS 16 valve it is 187 mm (7.38 inches), on an NPS 18 or 20 valve it is 254 mm (10.00 inches).
3. If the 7KE is used on an NPS 14 or 16 valve, the B dimension is 130 mm (5.12 inches), on an NPS 18 or 20 valve it is 197 mm (7.75 inches).

Table 5. Dimensions for A41 and 8560 Compatible Actuators

ACTUATOR SIZE	DIMENSIONS								
	A	B	C	D	E	F	G	H	Handwheel Diameter
	mm								
0KE/D1 0KE/D2 0KE/D3	127	97	16	178	105	44	67	119	203
2KE/D4	137	102	19	203	165	79	117	191	305
6KE/D5 6KE/D6	159 210	111 162	25	376	168	83	119	200	762 914
9KE/D7	267	187	25	427	235	119	156	273	914
	Inches								
0KE/D1 0KE/D2 0KE/D3	5.0	3.814	0.625	7	4.125	1.725	2.625	4.6875	8
2KE/D4	5.38	4.005	0.75	8	6.50	3.125	4.625	7.50	12
6KE/D5 6KE/D6	6.25 8.25	4.375 6.375	1.0	14.81	6.625	3.25	4.688	7.875	30 36
9KE/D7	10.5	7.375	1.0	16.81	9.25	4.6875	6.125	10.75	36

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Pump Governor Sizing
D100182X012

Product Bulletin
61.9:005
September 2017

Determining the Size of Fisher™ Pump Governors

Calculation

The sizes of Fisher valves required for particular applications can be easily determined by using Emerson valve sizing techniques. However, before using these techniques for sizing pump governors that are to control the discharge pressure from steam driven direct acting pumps, the average steam cylinder pressure (valve outlet pressure) and the steam required should be calculated. These values can be found by the use of the following equations:

$$Pd = (P_1 - P_2)\frac{df^2}{ds^2} + F + Pe \qquad \text{Equation 1}$$

$$S = \frac{(P_1 - P_2)\ QC}{1714} \qquad \text{Equation 2}$$

Where:

Pd = Average steam cylinder pressure, psig
P_1 = Pump discharge, psig
P_2 = Pump suction, psig
Pe = Exhaust steam pressure, psig (If not given assume it to be Zero gauge)
df = Diameter fluid cylinder, inches
ds = Diameter steam cylinder, inches
F = Correction factor for mechanical efficiency. (from table below)
Q = Quantity of liquid, gpm
C = Approximate steam consumption in lbs./hr. per delivered horse power hour. (from table below)
S = Actual steam required, lbs./hr.

Stroke, Inches	Mech. Eff., %	Corr. Factor "F"	Approximate Steam Consumption, Pounds Dry Steam per Delivered Horsepower Hour For Direct Acting Duplex, Packed Piston, Non-condensing, Non-Jacketed Pumps																		
			Steam Pressure at Pump, Psig																		
			50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	220	240	250
3	50	50	241	227	217	210	204	200	196	194	191	189	187	185	184	183	182	180	178	177	177
4	55	41	208	197	188	182	177	173	170	167	165	163	162	160	159	158	157	156	154	153	152
5	60	33	186	175	168	162	158	154	151	149	147	145	144	143	142	141	140	139	137	136	136
6	65	28	168	158	151	146	142	139	137	134	132	131	130	129	128	127	126	125	124	123	123
8	70	21	146	138	132	127	124	121	119	117	116	114	113	112	111	110	110	109	108	107	107
10	75	17	129	121	116	112	109	107	105	103	102	101	100	99	98	97	97	97	95	95	94
12	77.5	15	118	111	106	103	100	98	96	95	93	92	92	91	90	89	89	88	87	87	86
18	82.5	10	100	95	90	87	85	83	82	81	80	79	78	77	77	76	76	75	74	74	73
24	85	9	93	88	84	81	79	77	76	75	74	73	72	72	71	70	70	70	69	68	68

Example:

Required to size a pump governor which is to control the discharge pressure from an 8 x 5 x 10 inch (steam cylinder diameter x fluid cylinder diameter x stroke) duplex pump at 180 psig total head pressure pumping 100 gpm of fuel oil. Steam pressure is 120 psig with 15 psig exhaust steam pressure.

Steam Cylinder Pressure (Valve Outlet Pressure):

$$Pd = 180 \times \frac{(5)^2}{(8)^2} + 17 + 15 = 102 \text{ psig}$$

Steam Required:

$$S = \frac{180 \times 100 \times 107}{1714} = 1124 \text{ lb/hr}$$

Service Conditions:

Inlet = 120 psig

Pressure Drop = 18 psi

Steam Required = 1124 lb/hr

With the service conditions known, the size of the valve can be determined with Emerson valve sizing techniques.

Care must be taken not to use an extreme maximum value for the pump discharge pressure. If this is done, the steam cylinder pressure will be found, by equation 1, to exceed the steam supply pressure which may make the pump stall. If you still have difficulty obtaining a rational result, your Emerson sales office or Local Business Partner can assist you in the selection of the proper size pump governor for your particular application.

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1B Pump Governor
D100181X012

Product Bulletin
61.9:1B
September 2017

Fisher™ 1B and 1BR Constant-Pressure Pump Governor Actuators

The Fisher 1B pump governor actuator (figure 1) is used to maintain a constant discharge pressure on steam driven turbine or reciprocating pumps and for pressure reducing or pressure relief applications. Typical pump governor applications include fire pumps, boiler feedwater pumps, and industrial or refining pumps where the discharge medium is oil, steam, air, or other noncorrosive fluid.

The 1BR pump governor actuator is combined with a push-down-to-open valve for service as a relief governor. A relief governor is used to divert excess pump discharge to the suction side of the pump.


W2232-1

Fisher 1B Actuator on Direct-Acting easy-e ™ Valve

Features

- **Rugged Construction**—Brass and steel construction combats wear for long service life.
- **Ease of Maintenance**—Few moving parts and easy access reduce maintenance and downtime.
- **Ease of Adjustment**—Readily accessible spring adjustment without removing any parts.
- **Leakfree Service**—Leakfree piston cups available to 66°C (150°F).
- **Fast Acting**— Direct-operated configuration provides fast speed of response.

Specifications

Available Configurations

1B: Direct-acting with increased control pressure closing push-down-to-close valves such as Fisher ED and ET
1BR: Reverse-acting with increased control pressure opening push-down-to-open valves such as Fisher EDR and ETR

Maximum Cylinder Pressure(1)

48.3 bar (700 psi)

Spring Ranges

See table 1

Effective Piston Area

45 cm^2 (7.07 square inches)

Travel

Up to 19.1 mm (0.75 inch)

Travel Stops

Available for 6 and 11.1 mm (0.25 and 0.4375 inch) travels (reverse acting constructions)

Construction Materials

Cylinder Cap and Yoke: Cast iron
Piston: Brass, chrome-plated
Cylinder: Brass
Piston Rod: Steel, zinc-plated
Piston Cup: Partial Nitrile or 100% Nitrile for leakfree service

Maximum Cylinder Operating Temperature(1)

130°C (265°F)
or 66°C (150°F) for leakfree service

Cylinder Connections

See figure 2

Yoke Boss and Stem Diameters

mm		INCHES	
Yoke Boss	Stem	Yoke Boss	Stem
54	9.5	2-1/8	3/8
71	12.7	2-13/16	1/2

APPROXIMATE WEIGHTS

Actuator with 54 mm (2-1/8 Inch) Yoke Boss: 9.1 kg (20 pounds)
Actuator with 71 mm (2-13/16 Inch) Yoke Boss: 20.4 kg (45 pounds)

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.

Table 1. Spring Information

TYPE NUMBER		METRIC UNITS				U.S. UNITS				SPRING PART NUMBER
		Pressure Range, Bar	Spring Rate, N/mm	Sensitivity mm/Bar	Safe Load, N	Pressure Range, Psig	Spring Rate, Lbf/in	Sensitivity In./Psi	Safe Load, Lbf	
1B		6.6 to 8.3	85.8	0.524	4715	95 to 120	490	0.014	1060	1F176827092
		8.3 to 13.5	221	0.204	8184	120 to 195	1260	0.006	1840	1E795327082
		13.5 to 15.9	257	0.175	9786	195 to 230	1470	0.005	2200	1E792427082
		15.9 to 22.1	368	0.122	13,545	230 to 320	2100	0.003	3045	1E793327082
		22.1 to 34.5	928	0.048	23,575	320 to 500	5300	0.001	5300	1H106827082
1BR	9.5 mm (3/8 inch) stem	6.6 to 8.3	85.8	0.524	4715	95 to 120	490	0.014	1060	1F176827092
		8.3 to 13.5	221	0.204	8184	120 to 195	1260	0.006	1840	1E795327082
		13.5 to 15.9	257	0.175	9786	195 to 230	1470	0.005	2200	1E792427082
		15.9 to 22.1	368	0.122	13,545	230 to 320	2100	0.003	3045	1E793327082
	12.7 mm (1/2 inch) stem(1)	6.6 to 8.3	85.8	0.524	4715	95 to 120	490	0.014	1060	1F176827092
		8.3 to 13.5	221	0.204	8184	120 to 195	1260	0.006	1840	1E795327082
		13.5 to 15.9	257	0.175	9786	195 to 230	1470	0.005	2200	1E792427082
		15.9 to 22.1	368	0.122	13,545	230 to 320	2100	0.003	3045	1E793327082
		22.1 to 34.5	928	0.048	23,575	320 to 500	5300	0.001	5300	1H106827082

1. If the valve/stem connection is cut down to 9.5 mm (3/8 inch), then the maximum relief pressure range is limited to 22.1 bar (320 psig).

Figure 1. Fisher 1B-ED Pump Governor Sectional

W2254-1

Sizing Information

The following procedure is used to select the correct spring for the actuator:

1. Determine the average steam cylinder pressure and steam required by the pump from the Pump Governor Sizing bulletin (61.9:005, D100182X012).

2. Determine the proper valve size from Catalog 12.

3. Find:

Push-Down-To-Close Valve

$$P_t = P_c - \frac{(P_1 A - F_P + F_S)}{7.07}$$

Push-Down-To-Open Valve

$$P_t = P_c - \frac{(P_1 A - F_P - F_S)}{7.07}$$

where:

- P_t = force summation, pressure acting on piston (psig)
- P_c = cylinder pressure (psig)
- P_1 = valve inlet pressure (psig)
- A = valve plug unbalance area (in square inches) (from Catalog 12)
- F_P = packing friction force (lbf) (from Catalog 12)
- F_S = seat load force (lbf) (from Catalog 12). If tight shutoff is not a service condition, F_S may be considered to be zero

4. Select the spring from table 1 that has the pressure range which includes P_t. If P_t is equal to the upper pressure range, go to the next larger size spring.

Table 2. Dimensions

VALVE SIZE, NPS	DIMENSION H	
	mm	Inches
1/2 to 1-1/2	548	21-9/16
2 to 4	597	23-1/2

Figure 2. Dimensions (also see table 2)

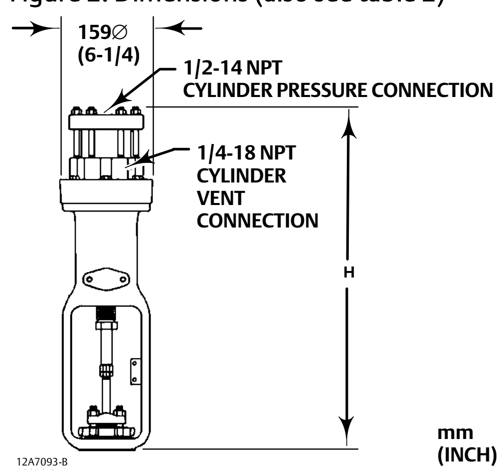
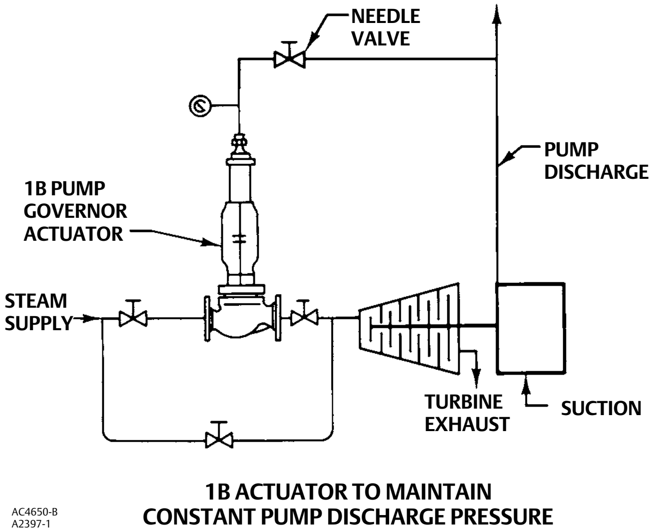
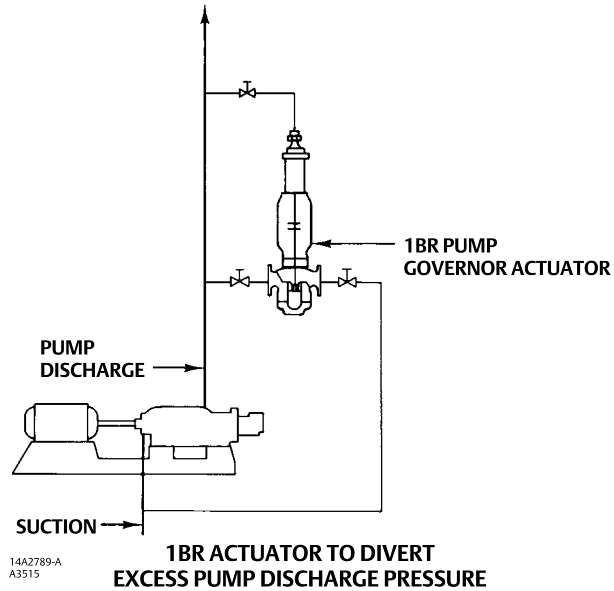


Figure 3. Typical Installations





Installation

1B and 1BR pump governor actuators may be installed in any position. Typical installations are shown in figure 3. See figure 2 for dimensions.

Ordering Information

Application Information

When ordering a 1B or 1BR pump governor actuator, specify:

1. Action (direct or reverse)
2. Pressure range
3. Temperature (normal operating and maximum)
4. Flow rate (normal and maximum)
5. Required spring (see Sizing Information)

Actuator Information

Refer to the specifications table. Review the description to the right of each specification and in the referenced table. Specify choice where there is a selection to be made.

Valve Body and Accessories Information

Refer to separate valve body and accessories bulletins for ordering information.

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Fisher™ 644 and 645 Differential Pressure Pump Governor Actuators

Fisher 644 and 645 actuators are used in combination with any of several sliding-stem valves to automatically control steam-driven boiler feedwater pumps (reciprocating or turbine). The 644 or 645 actuator (see figure 2), when used in combination with one of several push-down-to-close sliding-stem valves, forms a pump governor.

644 and 645 actuators may also be combined with push-down-to-open valves to be used as relief governors. Relief governors are used to divert excess pump discharge back to the suction side of the pump.

Fisher 644 Actuator Mounted on easy-e™ Valve Body

Features

- **Rugged Construction**—Steel and cast iron construction provides long service life.
- **Ease of Maintenance**—Few moving parts and easy access reduce maintenance and downtime.
- **Ease of Adjustment**—Spring adjustment is readily accessible without removing any parts.
- **Fast Acting**—Direct-operated configuration provides fast speed of response.

Determining Buildup or Droop

To determine the buildup (for relief applications) or droop (for pressure reducing applications):

1. Find a pressure setting limit range that includes the required pressure setting from table 1.

2. Find the sensitivity factor for the desired spring and actuator casing combination from table 1.

3. Use the formula below to determine the buildup or droop required for normal actuator travel.

$$P = \frac{Y}{X}$$

where,

P = Buildup (for pressure relief) or Droop (for pressure reduction), bar (psig)
Y = Normal actuator travel, mm (inches)
X = Sensitivity factor from table 1 mm/newtons (inches/psig)

Specifications

Actuator Sizes

See table 1

Actuator Travel

Chloroprene Diaphragm: 11 mm (0.4375 inch) maximum
Stainless Steel Diaphragm: 3 mm (0.125 inch) maximum

Operating Principle

■ Direct-acting with push-down-to-close valve
■ Reverse-acting with push-down-to-open valve

Differential Pressure Ranges

See table 1

Maximum Casing Pressure

644 Actuator:
Cast-Iron Casing: 20.7 bar (300 psig)
Steel Casing: 41.4 bar (600 psig)
645 Actuator:
Cast-Iron Casing: 34.5 bar (500 psig)
Steel Casing: 69.0 bar (1000 psig)

Construction Materials

Diaphragm:
644: ■ Chloroprene or ■ Stainless steel
645: Chloroprene
Diaphragm Casing: ■ Cast iron or ■ Steel
Diaphragm Head: ■ Cast iron or ■ Steel
Diaphragm Rod: Stainless Steel
Packing: ■ Graphite or ■ PTFE

Maximum △P Across Diaphragm

13.8 bar (200 psi)

Effective Diaphragm Area

644:
Size 1: 146 cm^2 (8.9 $inch^2$)
Size 2: 243 cm^2 (14.8 $inch^2$)
Size 3: 364 cm^2 (22.2 $inch^2$)
645: 338 cm^2 (20.6 $inch^2$)

Material Temperature Capabilities

644:
Chloroprene Diaphragm:-40 to 82°C (-40 to 180°F)
Stainless Steel Diaphragm:
Cast-iron casing: -40 to 232°C (-40 to 450°F); Steel casing: -40 to +399°C (-40 to 750°F)
645: -37 to 82°C (-35° to 180°F)

Casing Pressure Connections

1/4 NPT internal

Spring Ranges and Sensitivity

See table 1

Stem Size

644: 9.5 mm (3/8 inch)
645: 12.7 mm (1/2 inch)

Yoke Boss Diameters

644: ■ 54 mm (2-1/8 inch) or
■ 71 mm (2-13/16 inch)
645: 71 mm (2-13/16 inch)

Installation

These actuators may be installed in any position. Typical installations are shown in figure 1. Dimensions are shown in figure 3.

Ordering Information

Application

1. Differential pressure
2. Temperature (normal operating and maximum)
3. Required spring

Actuator

Refer to the specifications table. Review the description to the right of each specification and in the referenced table. Specify a choice wherever there is a selection to be made.

Valve Body and Accessories

Refer to separate valve bulletin and bulletins covering accessories for ordering information.

Figure 1. Typical Installation for Pump Governors

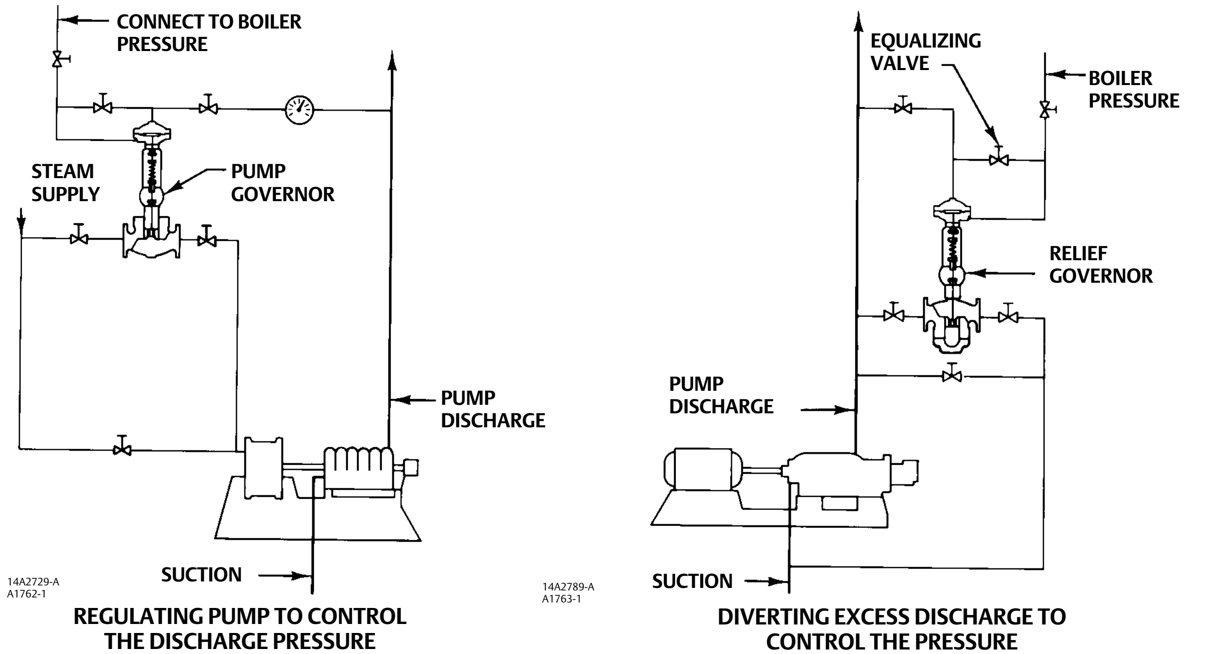
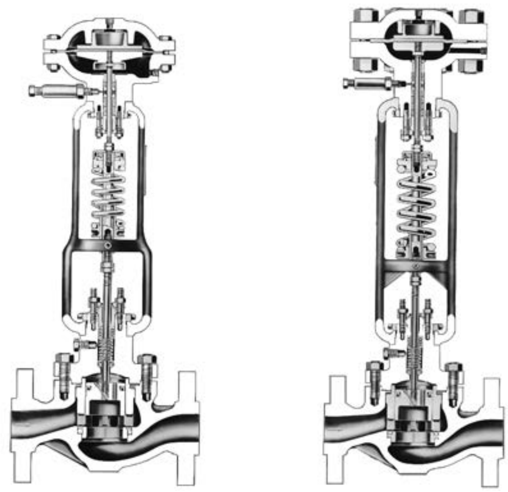


Table 1. Spring Information

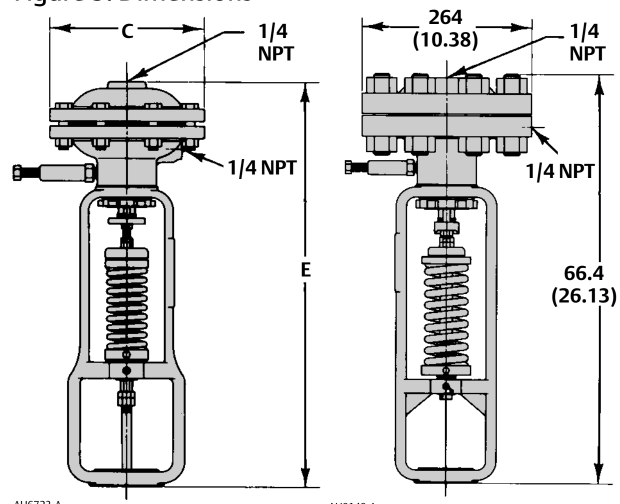
ACTUATOR		DIFFERENTIAL PRESSURE RANGE		SPRING RATE		SENSITIVITY		SPRING PART NUMBER
		Bar	Psi	N/mm	Lbf/in	mm/N	In/Psi	
644	Size 3 Casing	0.3-1.2	5-18	56	314	26.1	0.0707	1F945527032
		1.2-1.9	18-27	107	609	13.5	0.0365	1F945627032
	Size 2 Casing	1.9-2.8	27-40	107	609	9.0	0.0244	1F945627032
		2.8-3.8	40-55	165	940	6.2	0.0168	1F945727042
	Size 1 Casing	3.8-4.7	55-68	107	609	5.4	0.0146	1F945627032
		4.7-6.9	68-100	165	940	3.7	0.0101	1F945727042
645		1.0-1.7	14-24	43	246	21.0	0.057	1F714427112
		1.7-2.4	24-35	64	368	14.0	0.038	1F176727032
		2.4-3.2	35-47	86	490	10.5	0.0286	1F176827092
		3.2-4.1	47-59	107	612	11.0	0.0299	1F176927092
		4.1-4.3	59-62	129	735	7.1	0.0191	1E792327092
		4.3-5.9	62-85	145	830	6.2	0.0169	1F714327092
		5.9-6.8	85-99	221	1260	4.1	0.0111	1E795327082
		6.8-8.2	99-119	257	1470	3.5	0.0095	1E792427082
		8.2-9.7	119-140	310	1770	2.9	0.0079	1E795427082
		9.7-10.7	140-155	368	2100	2.5	0.0067	1E793327082

Figure 2. Typical Pump Governor Sectionals



W2263-1 **644 ED** W2264-1 **645 ED**

Figure 3. Dimensions



644 **645** mm (INCH)

Table 2. Dimensions

ACTUATOR	YOKE BOSS DIAMETER		E						C (DIAMETER)					
			SIZE 1		SIZE 2		SIZE 3		SIZE 1		SIZE 2		SIZE 3	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
644	54 71	2-1/8 2-13/16	503 548	19.81 21.56	521 565	20.50 22.25	522 567	20.56 22.31	152	6.00	206	8.12	229	9.00

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 655 and 655R Actuators for Self-Operated Control

Fisher 655 and 655R diaphragm actuators, in combination with Fisher valves, provide control for a wide variety of pressure regulation applications. The 655 is used for pressure reduction service on push-down-to-close valves, and the 655R is primarily for pressure relief use on push-down-to-open valves. These actuators may be either self-operated or remote-loaded.

W2239

Fisher 655R on Reverse-acting easy-e™ **Valve Body**

W0451-1

Fisher 655-ED Construction Details

Features

- **Versatility**—Typical industrial service includes pressure control of water, steam, oil, gas, and other fluids. Actuators can be operated by pneumatic switches, solenoid valves, pilot valves, or remote panel loaders for shutoff service.

- **Large Valve Body Selection**—easy-e valves up through the NPS 4 (NPS 6 for Fisher EA angle valves) with wide choice of end connections, flow directions, flow characteristics, valve plug designs, and seating constructions can be specified.

- **Broad Actuator Spring Selection**—Spring of the proper rate is available for nearly any control valve application. Spring selection procedure is quick and accurate.

- **Severe Service Capability**—Rugged yoke and casings help provide stability and corrosion protection.

- **Fast Acting**— Direct-operated configuration provides faster speed of response.

Specifications

Maximum Actuator Temperature Capability

150°F with standard diaphragm material[(1)]

Actuator Sizes and Maximum Casing Ratings

Size	Maximum Casing Pressure, Psig
3A, 4A	250
3B, 4B	175
32, 42	100
33, 43	65
34, 44	45
35, 45	30
36, 46	15

Actuator Pressure Setting Ranges

655: See table 3
655R: See table 1

Actuator Yoke Boss Diameters and Valve Stem Connections

Sizes 3A-36: ■ 2-1/8 inch yoke boss with ■ 3/8 inch stem connection
Sizes 4A-46: ■ 2-13/16 inch yoke boss with ■ 1/2 inch stem connection

Actuator Travel Information

Maximum Rated Travels:
Sizes 3A and 4A: 0.4375 inch plus 0.125 inch for seating
All Other Sizes: 0.75 inch plus 0.125 inch for seating
Other Travel Information: See tables 3, 1, and 2

Effective Diaphragm Areas

See table 2

Actuator Construction Materials

See table 4

Valve Body Flow Coefficients

See Fisher Catalog 12

Actuator Casing Connection

1/2 - 14 NPT

Actuator Options

■ Travel indicator
■ Casing-mounted handwheel/adjustable travel stop
■ Steel upper diaphragm for sizes A and B
■ PTFE diaphragm protectors
■ Fluorocarbon diaphragm for high temperature service (up to 149°C [300°F])

1. Consult your Emerson sales office or Local Business Partner for fluid and temperature capabilities of nonstandard diaphragm materials.

Table 1. Fisher 655R Pressures and Sensitivities at 0.4375 Inch Maximum Travel[1] (Relief Service)

SPRING INFORMATION	PART NUMBER		1E7933 27082	1E7954 27082	1E7924 27082	1F7143 27092	1F1769 27092	1F1768 27092	1F1767 27032	1F7144 27112	1F7130 27112
	Spring Rate, Pounds per Inch		**2100**	**1770**	**1470**	**830**	**612**	**490**	**368**	**246**	**123**
	Safe Load, Pounds		**3045**	**2600**	**2200**	**1630**	**1170**	**1060**	**843**	**545**	**290**
Actuator Pressure Settings Ranges, Psig	Sizes 3A and 4A	Minimum	NA[3]	NA[3]	65[4]	43[5]	37[5]	34[5]	20[5]	NA[3]	NA[3]
		Maximum[2]	NA[3]	NA[3]	146	119	85	75	57		
	Minimum, Sizes 3B and 4B		43[4]	35[4]	29[4]	19[5]	17[5]	NA[3]	NA[3]		
	Maximum[2]	Size 3B	64	64	64	53	38				
		Size 4B	89	77							
	Minimum, Sizes 32 and 42		26[4]	22[4]	18[4]	12[5]	NA[3]				
	Maximum[2]	Size 32	38	38	38	31					
		Size 42	53	45							
	Minimum, Sizes 33 and 43		16[4]	13[4]	11[4]	7[5]	6.5[5]				
	Maximum[2]	Size 33	24	24	24	20	14.5[6]				
		Size 43	33	28							
	Minimum, Sizes 34 and 44		11[4]	9[4]	7[4]	5[5]	4[5]	4.1[5]			
	Maximum[2]	Size 34	16	16	16	13	10	7.9[6]			
		Size 44	23	19							
	Minimum, Sizes 35 and 45		7[4]	5.5[4]	5[4]	3.2[5]	2.8[5]	2.5[5]	1.5[5]	1.3[5]	
	Maximum[2]	Size 35	11	11	11	9	6.3	5.5[6]	4.2[6]	2.8[6]	
		Size 45	15	13							
	Minimum, Sizes 36 and 46		5[4]	4.2[4]	3.5[4]	2.3[5]	2[5]	1.8[5]	1.1[5]	.9[5]	.7[5]
	Maximum[2]	Size 36	7.7	7.7	7.7	6.3	4.5	4[6]	3[6]	2[6]	1[6]
		Size 46	10.5	9							
Actuator Sensitivities, Inches of Travel Obtained per Psig of Change[7]	Sizes 3A and 4A		NA[3]	NA[3]	.0064	.0098	.0131	.0163	.0216	NA[3]	NA[3]
	Sizes 3B and 4B		.0087	.0103	.0124	.0209	.0286	NA[3]	NA[3]		
	Sizes 32 and 42		.013	.015	.018	.0294	NA[3]				
	Size 33 and 43		.022	.026	.031	.051	.069				
	Sizes 34 and 44		.033	.039	.046	.078	.104	.128			
	Sizes 35 and 45		.052	.061	.076	.126	.169	.214	.278	.416	
	Sizes 36 and 46		.076	.089	.106	.183	.250	.309	.410	.603	1.19

1. Effects of packing box friction, unbalance & weight of valve plug not considered in calculations.
2. Greatest allowable pressure (with the value closed) that will not exceed the safe load of the actuator spring but will still allow 0.4375 inch travel.
3. This spring-actuator size combination not available.
4. Least pressure required (at 0.25 inch travel) to assure 1/8 inch spring compression.
5. Least pressure required (at 0.25 inch travel) to assure 200 pounds of seating force.
6. Limited by adjusting screw.
7. Average for minimum and maximum pressures at zero and 0.25 inch travel.

Table 2. Effective Diaphragm Area, Square Inches

ACTUATOR SIZE	INCHES TRAVEL DOWN FROM UPPER CASING STOP									
	0	**0.125**	**0.1875**	**0.25**	**0.375**	**0.4375**	**0.5**	**0.5625**	**0.75**	**0.875**
3A, 4A	10.2	9.6	9.5	9.4	9.2	9.1	8.9	8.7	7.4	6
3B, 4B	23.5	21.6	21.1	20.8	20.5	20.3	20.1	19.8	18.1	16
32, 42	40	36.4	35.2	34.2	32.6	31.8	31	30.3	28.2	26.4
33, 43	63	58	56.8	55.5	53.5	52.7	52	51.2	49.3	47.6
34, 44	93	84.8	82.8	81	78.8	77.8	77	76	73.5	72
35, 45	134	129.2	127.2	125.4	122.2	120.5	119	117.6	114.1	112
36, 46	190	181.5	179	177	173.5	172.3	171	169.8	166.5	163.5

Table 3. Fisher 655 Pressures and Sensitivities at 0.4375 Inch Maximum Travel[1] (Reducing Service)

<table>
<tr><th rowspan="3">SPRING INFORMATION</th><th colspan="2">PART NUMBER</th><th>1E7933 27082</th><th>1E7954 27082</th><th>1E7924 27082</th><th>1F7143 27092</th><th>1F1769 27092</th><th>1F1768 27092</th><th>1F1767 27032</th><th>1F7144 27112</th><th>1F7130 27112</th></tr>
<tr><th colspan="2">Spring Rate, Pounds per Inch</th><th>2100</th><th>1770</th><th>1470</th><th>830</th><th>612</th><th>490</th><th>368</th><th>246</th><th>123</th></tr>
<tr><th colspan="2">Safe Load, Pounds</th><th>3045</th><th>2600</th><th>2200</th><th>1630</th><th>1170</th><th>1060</th><th>843</th><th>545</th><th>290</th></tr>
<tr><td rowspan="14">Actuator Pressure Setting Ranges, Psig</td><td rowspan="2">Sizes 3A and 4A</td><td>Minimum[2]</td><td>NA[4]</td><td>NA[4]</td><td>78</td><td>44</td><td>32</td><td>26</td><td>19</td><td rowspan="10">NA[4]</td><td rowspan="12">NA[4]</td></tr>
<tr><td>Maximum[3]</td><td>NA[4]</td><td>NA[4]</td><td>174</td><td>135</td><td>96</td><td>78[5]</td><td>59[5]</td></tr>
<tr><td rowspan="2">Sizes 3B and 4B</td><td>Minimum[2]</td><td>50</td><td>42</td><td>35</td><td>20</td><td>14</td><td rowspan="6">NA[4]</td><td rowspan="8">NA[4]</td></tr>
<tr><td>Maximum[3]</td><td>107</td><td>92</td><td>78</td><td>60</td><td>43</td></tr>
<tr><td rowspan="2">Sizes 32 and 42</td><td>Minimum[2]</td><td>32</td><td>26</td><td>22</td><td>12</td><td rowspan="2">NA[4]</td></tr>
<tr><td>Maximum[3]</td><td>65</td><td>55</td><td>47</td><td>36</td></tr>
<tr><td rowspan="2">Sizes 33 and 43</td><td>Minimum[2]</td><td>19</td><td>16</td><td>14</td><td>7</td><td>5.2</td></tr>
<tr><td>Maximum[3]</td><td>40</td><td>34</td><td>29</td><td>22</td><td>16</td></tr>
<tr><td rowspan="2">Sizes 34 and 44</td><td>Minimum[2]</td><td>13</td><td>11</td><td>9</td><td>5</td><td>3.8</td><td>2.8</td></tr>
<tr><td>Maximum[3]</td><td>27.5</td><td>23.4</td><td>20</td><td>15.5</td><td>11</td><td>8.5</td></tr>
<tr><td rowspan="2">Sizes 35 and 45</td><td>Minimum[2]</td><td>8.3</td><td>7</td><td>5.8</td><td>3.3</td><td>2.4</td><td>2</td><td>1.5</td><td>1</td></tr>
<tr><td>Maximum[3]</td><td>17.8</td><td>15.2</td><td>13</td><td>10</td><td>7.2</td><td>5.9[5]</td><td>4.4[5]</td><td>2.9[5]</td></tr>
<tr><td rowspan="2">Sizes 36 and 46</td><td>Minimum[2]</td><td>5.8</td><td>4.9</td><td>4.1</td><td>2.3</td><td>1.7</td><td>1.3</td><td>1</td><td>0.7</td><td>0.34</td></tr>
<tr><td>Maximum[3]</td><td>12.7</td><td>10.8</td><td>9.2</td><td>7.1</td><td>5.1</td><td>4.2[5]</td><td>3.1[5]</td><td>2.1[5]</td><td>1.1[5]</td></tr>
<tr><td rowspan="7">Actuator Sensitivities, Inches of Travel Obtained per Psig of Change[6]</td><td colspan="2">Sizes 3A and 4A</td><td>NA[4]</td><td>NA[4]</td><td>0.0055</td><td>0.0095</td><td>0.0121</td><td>0.0161</td><td>0.0212</td><td rowspan="5">NA[4]</td><td rowspan="6">NA[4]</td></tr>
<tr><td colspan="2">Sizes 3B and 4B</td><td>0.0087</td><td>0.0103</td><td>0.0126</td><td>0.0217</td><td>0.029</td><td rowspan="3">NA[4]</td><td rowspan="4">NA[4]</td></tr>
<tr><td colspan="2">Sizes 32 and 42</td><td>0.012</td><td>0.014</td><td>0.017</td><td>0.028</td><td>NA[4]</td></tr>
<tr><td colspan="2">Sizes 33 and 43</td><td>0.021</td><td>0.026</td><td>0.031</td><td>0.050</td><td>0.069</td></tr>
<tr><td colspan="2">Sizes 34 and 44</td><td>0.032</td><td>0.037</td><td>0.045</td><td>0.076</td><td>0.104</td><td>0.132</td></tr>
<tr><td colspan="2">Sizes 35 and 45</td><td>0.055</td><td>0.059</td><td>0.072</td><td>0.121</td><td>0.167</td><td>0.200</td><td>0.264</td><td>0.380</td></tr>
<tr><td colspan="2">Sizes 36 and 46</td><td>0.075</td><td>0.086</td><td>0.106</td><td>0.183</td><td>0.244</td><td>0.303</td><td>0.400</td><td>0.610</td><td>1.21</td></tr>
<tr><td colspan="12">1. Effects of packing box friction, unbalance & weight of valve plug not considered in calculations.
2. Least pressure required to seat the valve and still allow 0.4375 inch travel when the pressure is released.
3. Greatest allowable pressure (at 0.25 inch travel) that will let the valve be stroked closed without exceeding the safe load of the actuator spring.
4. This spring-actuator size combination not available.
5. Limited by adjusting screw.
6. Average for minimum and maximum pressures at zero and 0.25 inch travels.</td></tr>
</table>

Installation

These regulators may be installed in any position, as orientation is not a problem. But for steam service, the control line should be installed so that condensate drains back into the diaphragm casing, thus maintaining a water seal on the diaphragm. A strainer (such as the Fisher 262K) is always recommended ahead of the valve body to protect body and trim from damaging particles.

Dimensions are given in figure 1. Refer to the appropriate instructions before installing the regulator.

Ordering Information

When ordering, specify:

1. All information requested in the Ordering Information section of the valve body bulletin.

2. Actuator type number and size

3. Actuator travel

4. Valve plug stem diameter and connection size

5. Desired regulator orientation in pipeline

6. Magnitude and type of remote loading pressure, if applicable (for instance, 3-15 psig controller output signal)

7. Desired actuator options

Figure 1. Actuator Dimensions, Inches (also see table 5)

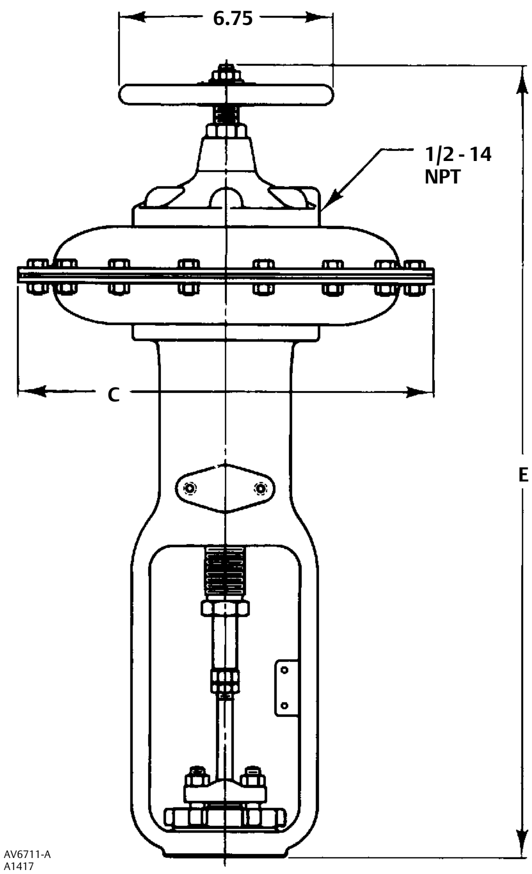


Table 4. Actuator Construction Materials

Part	Material	
Diaphragm casings	Sizes 3A, 3B, 4A, and 4B	Cast iron standard, steel available
	All other sizes	Pressed steel, zinc plated
Yoke	Cast iron standard, steel available	
Spring	Steel alloy	
Spring seat	Forged steel	
Travel stop	Steel	
Diaphragm plate	Cast iron	
Diaphragm	CR (Chloroprene) (standard)(1)	
Stem and adjusting screw	Steel, cadmium plated	

1. Consult your Emerson sales office or Local Business Partner for fluid and temperature capabilities of nonstandard diaphragm materials.

Table 5. Actuator Dimension, Inches

SIZE	C DIAMETER	Without Handwheel	With Handwheel
3A	5.88	17.56	22.44
3B	9.00	18.19	24.50
32	9.88	17.81	23.00
33	11.38	17.81	23.00
34	13.12	18.44	23.62
35	16.00	19.19	24.38
36	18.62	19.19	24.38
4A	5.88	19.50	24.38
4B	9.00	20.12	26.44
42	9.88	19.75	24.94
43	11.38	19.75	24.94
44	13.12	20.38	25.56
45	16.00	21.12	26.31
46	18.62	21.12	26.31

Total Capability of Fisher 655-ED

The following charts (figures 2 through 11) show the complete capability of the 655-ED, including travels greater than 0.25 inch. Included are charts for C_v, C_g, and C_s for the ED valves of various sizes and charts for various casing sizes for the 655 actuator.

An example on the use of the charts follows:

1. Refer to the chart showing the C_v for the ED design. Assume your customer says his normal C_v is 37, but can vary from 30 to 44 and the customer wants to control at 110 psi. The NPS 2 will fit this quite well and at the top of the chart you will notice that this requires a travel from 0.25 inch to 0.375 inch with the normal travel at 0.3125 inch.

2. Next, refer to the curve on the 655-ED, A-CASING chart of diaphragm pressure versus valve travel. Enter the chart at 0.3125 inch valve travel and proceed up until you intersect the 110 psi pressure. You will note that spring drawing 1F7143 is at this intersection. You can then readily see that when the flows vary, the pressure will vary from approximately 118 psi to 105 psi as the valve travels from 0.25 inch to 0.375 inch.

Figure 2. ED Design, Liquid Flow

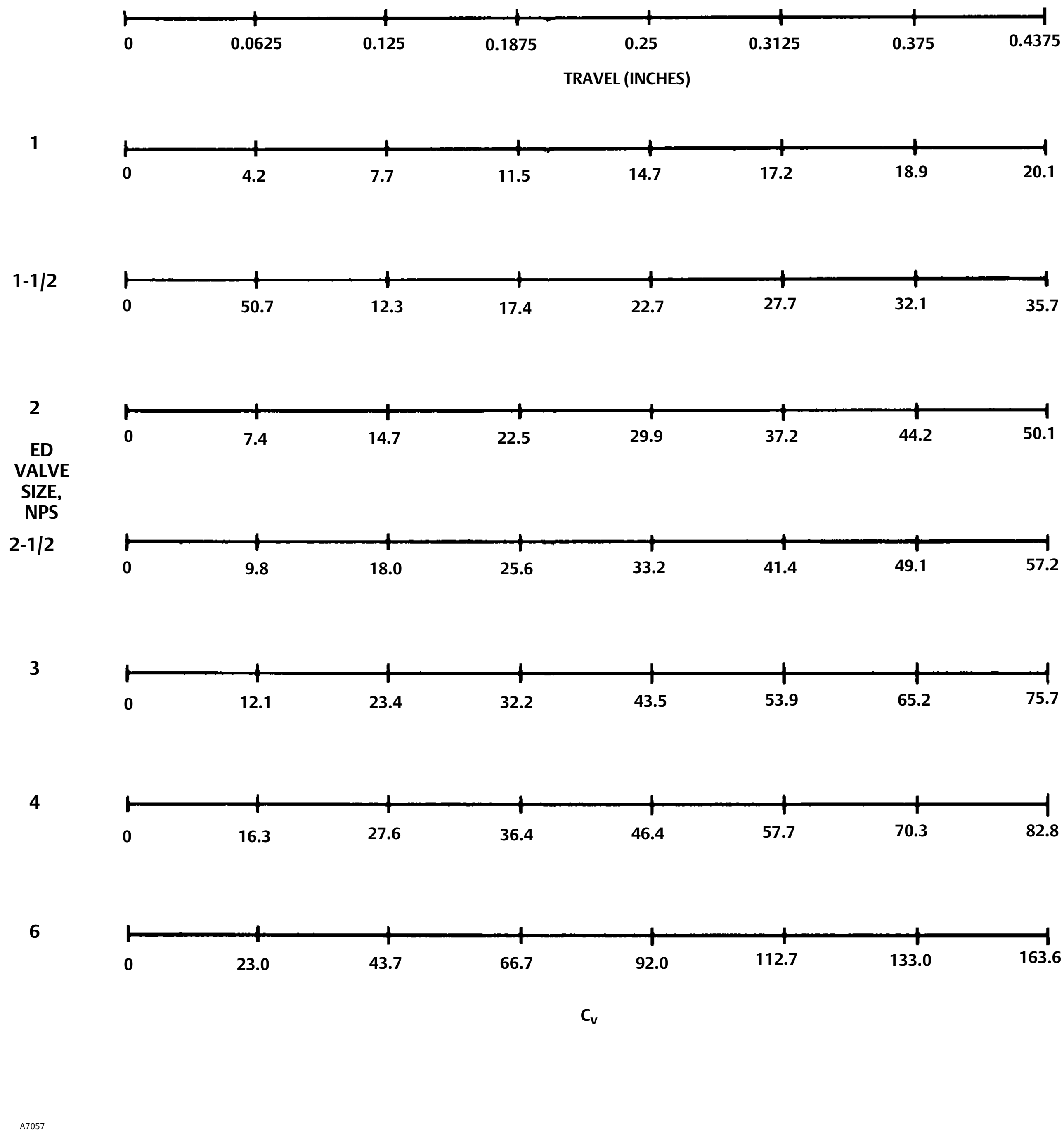


Figure 3. ED Design, Gas Flow

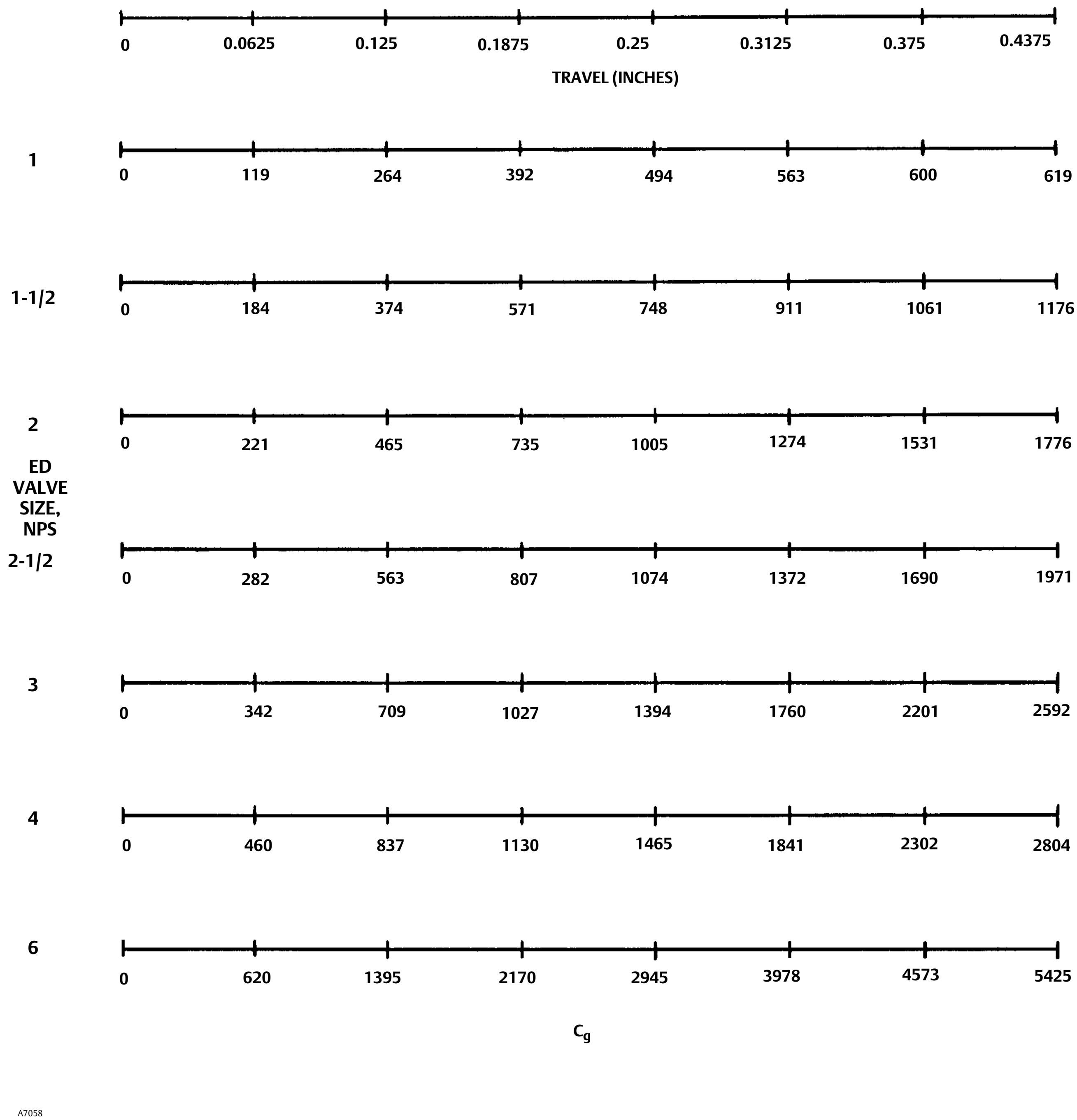
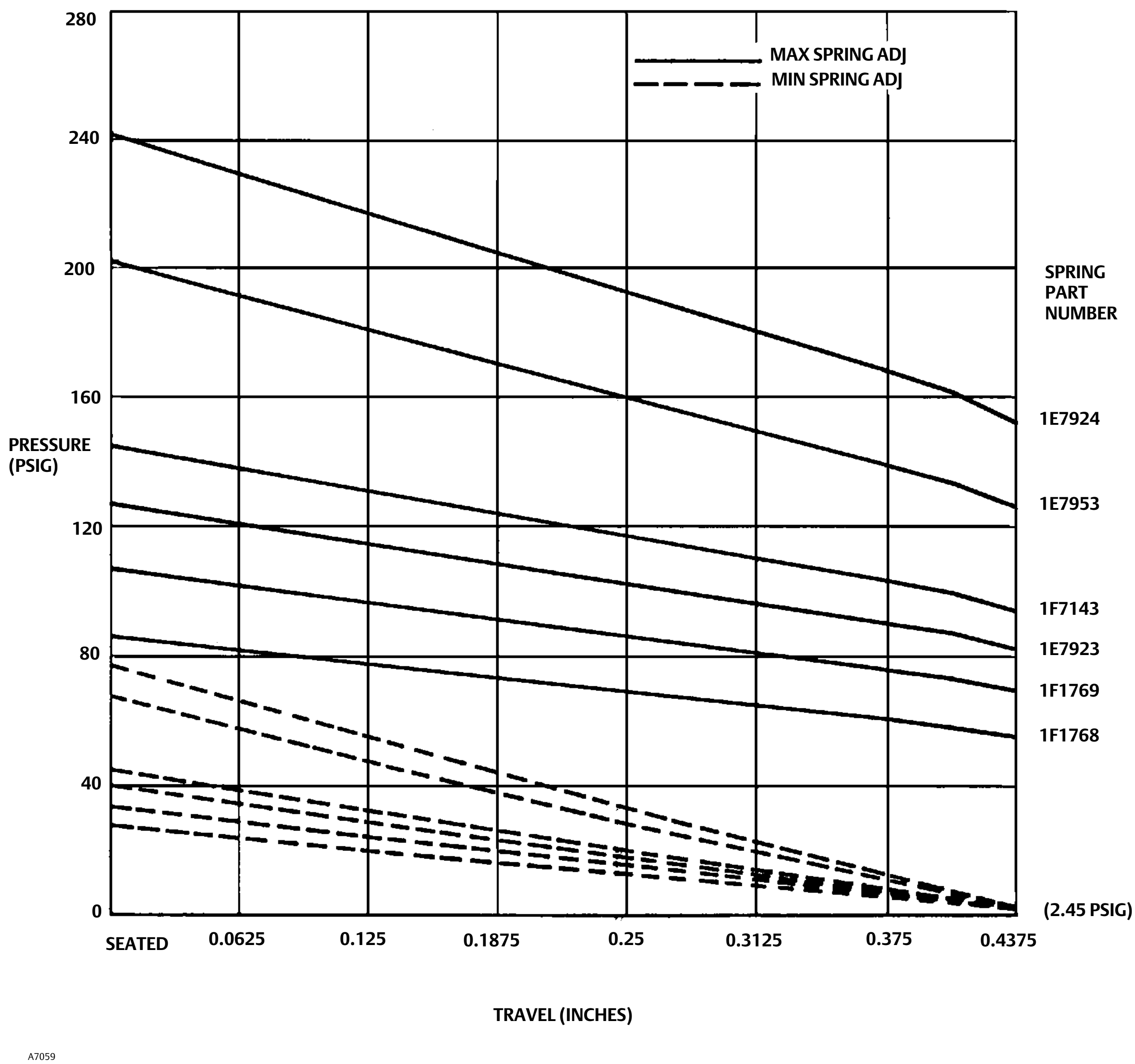


Figure 4. 655 ED, A Casing, Diaphragm Pressure versus Valve Travel



MAX, MIN CURVES POSITIONED RESPECTIVELY

Figure 5. ED Design, Steam Flow

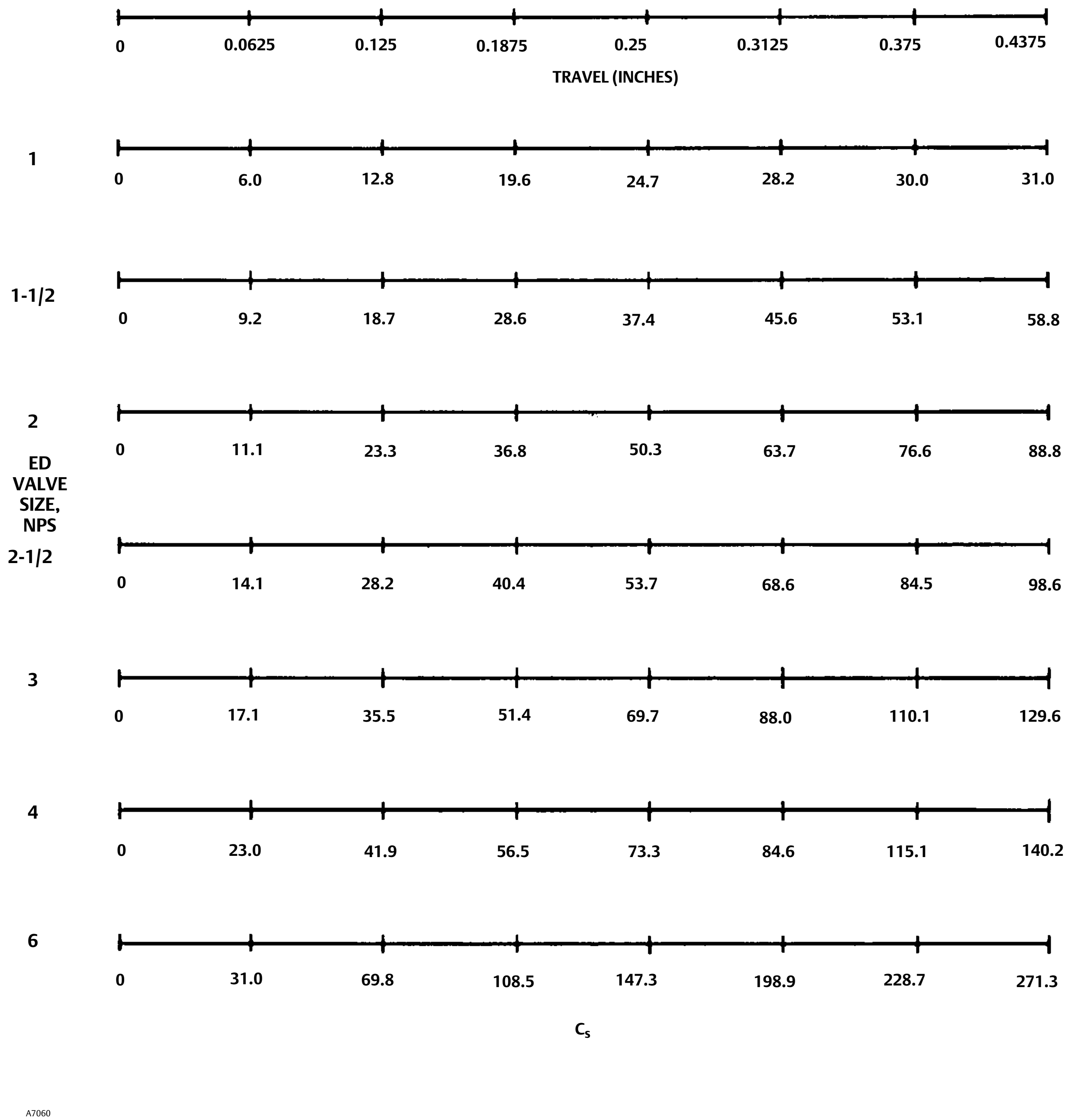


Figure 6. 655 ED, B Casing, Diaphragm Pressure versus Valve Travel

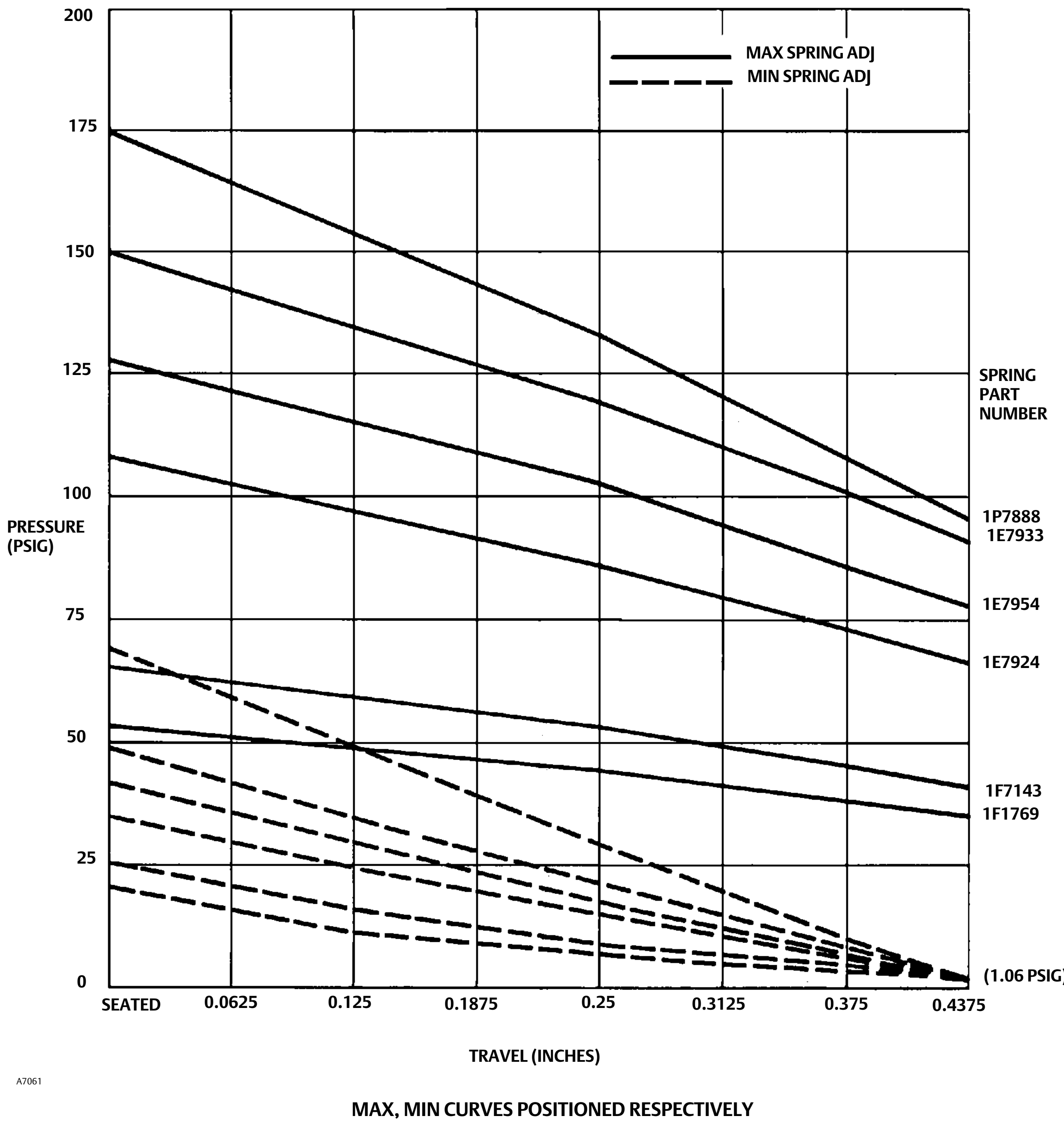
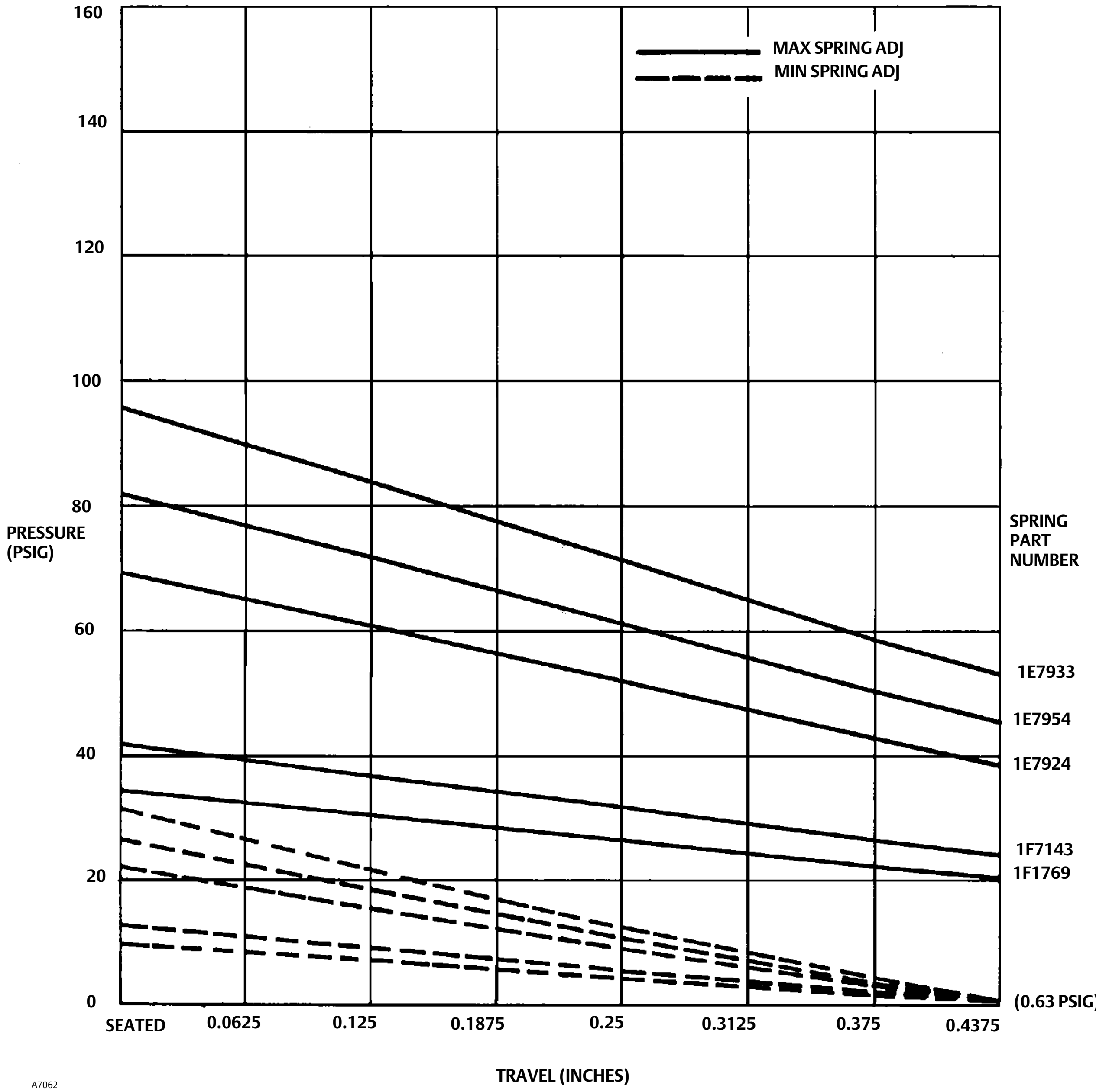
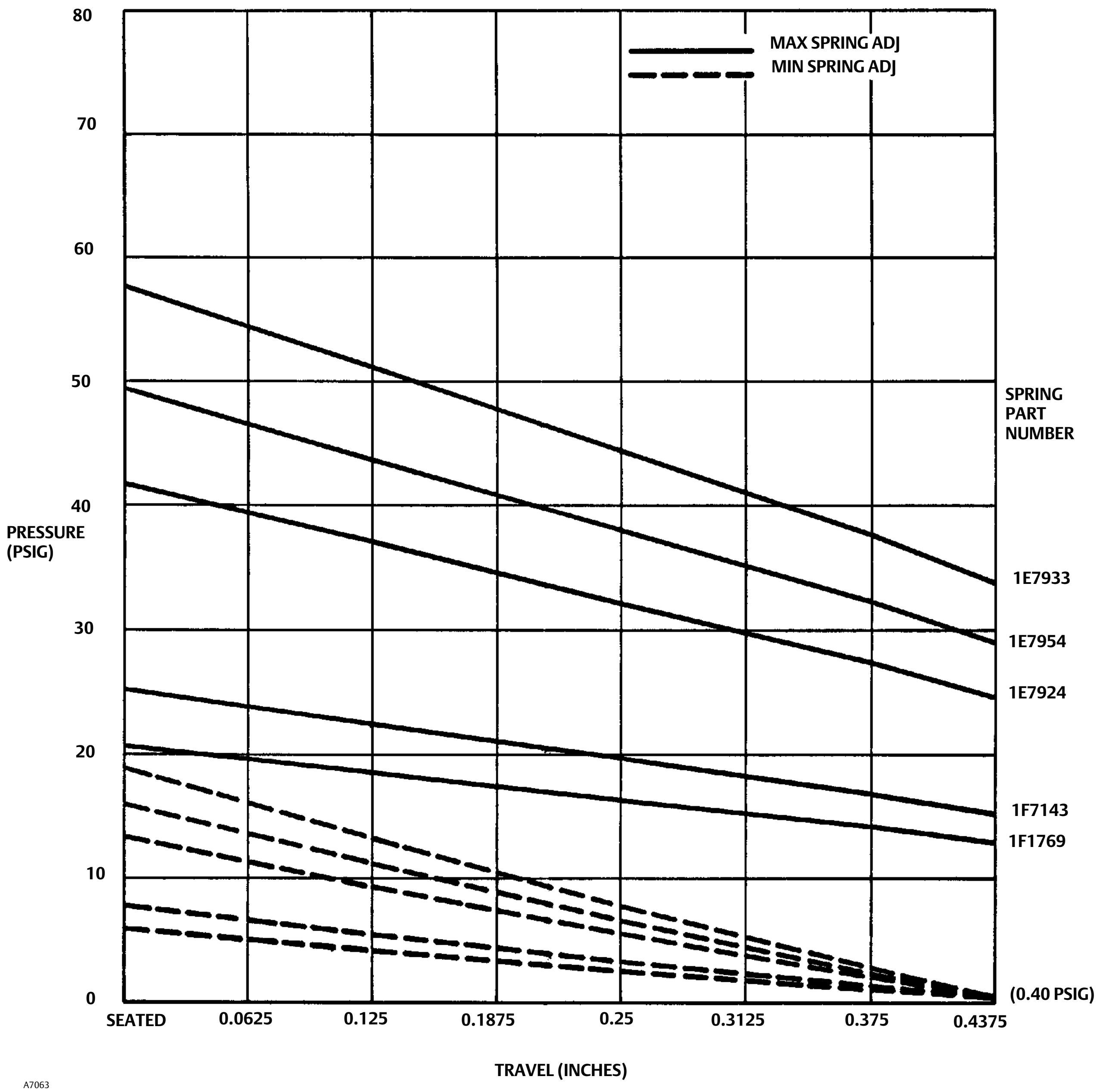


Figure 7. 655 ED, #20 Casing, Diaphragm Pressure versus Valve Travel



MAX, MIN CURVES POSITIONED RESPECTIVELY

Figure 8. 655 ED, #30 Casing, Diaphragm Pressure versus Valve Travel



MAX, MIN CURVES POSITIONED RESPECTIVELY

Figure 9. 655 ED, #40 Casing, Diaphragm Pressure versus Valve Travel

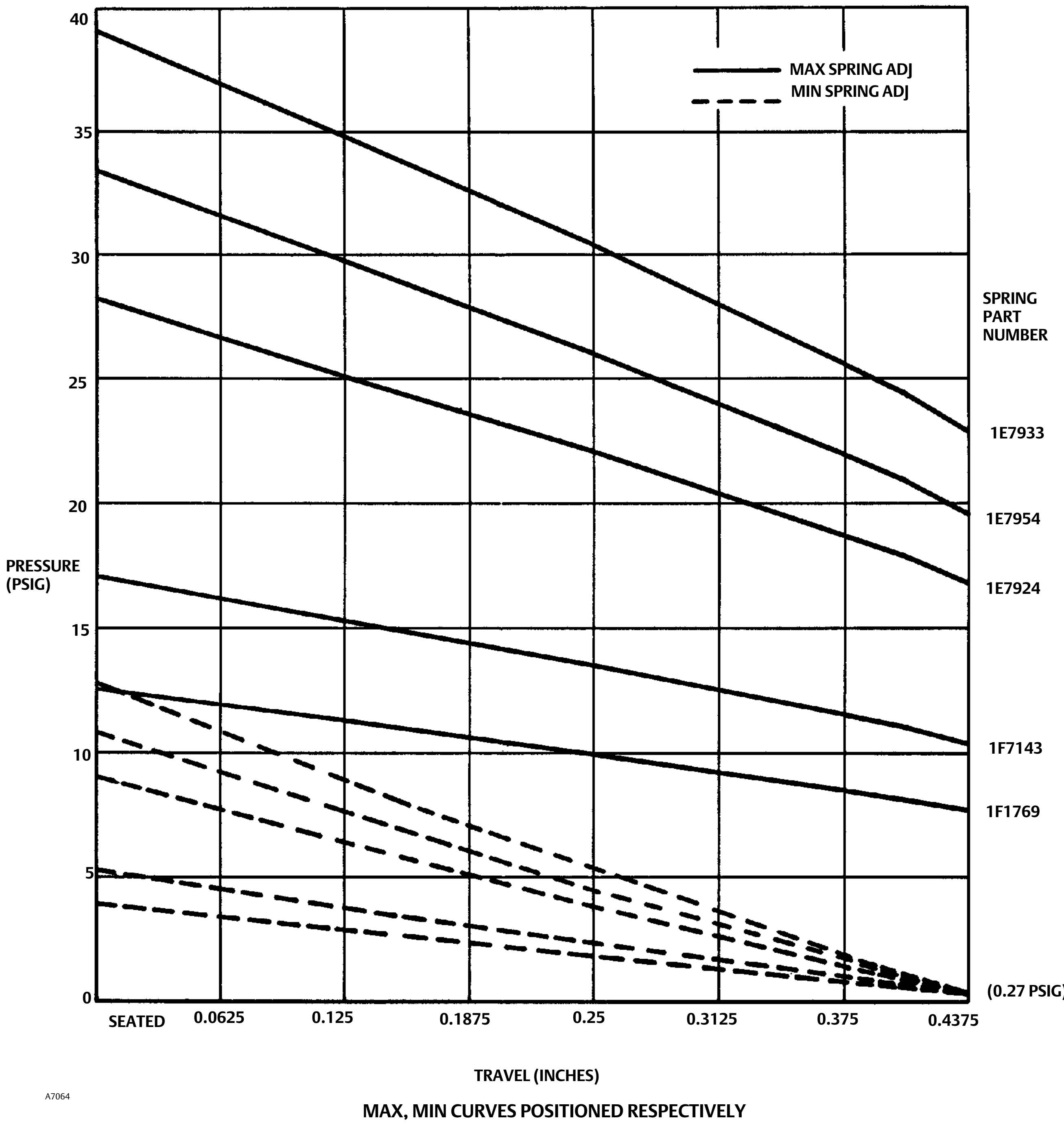
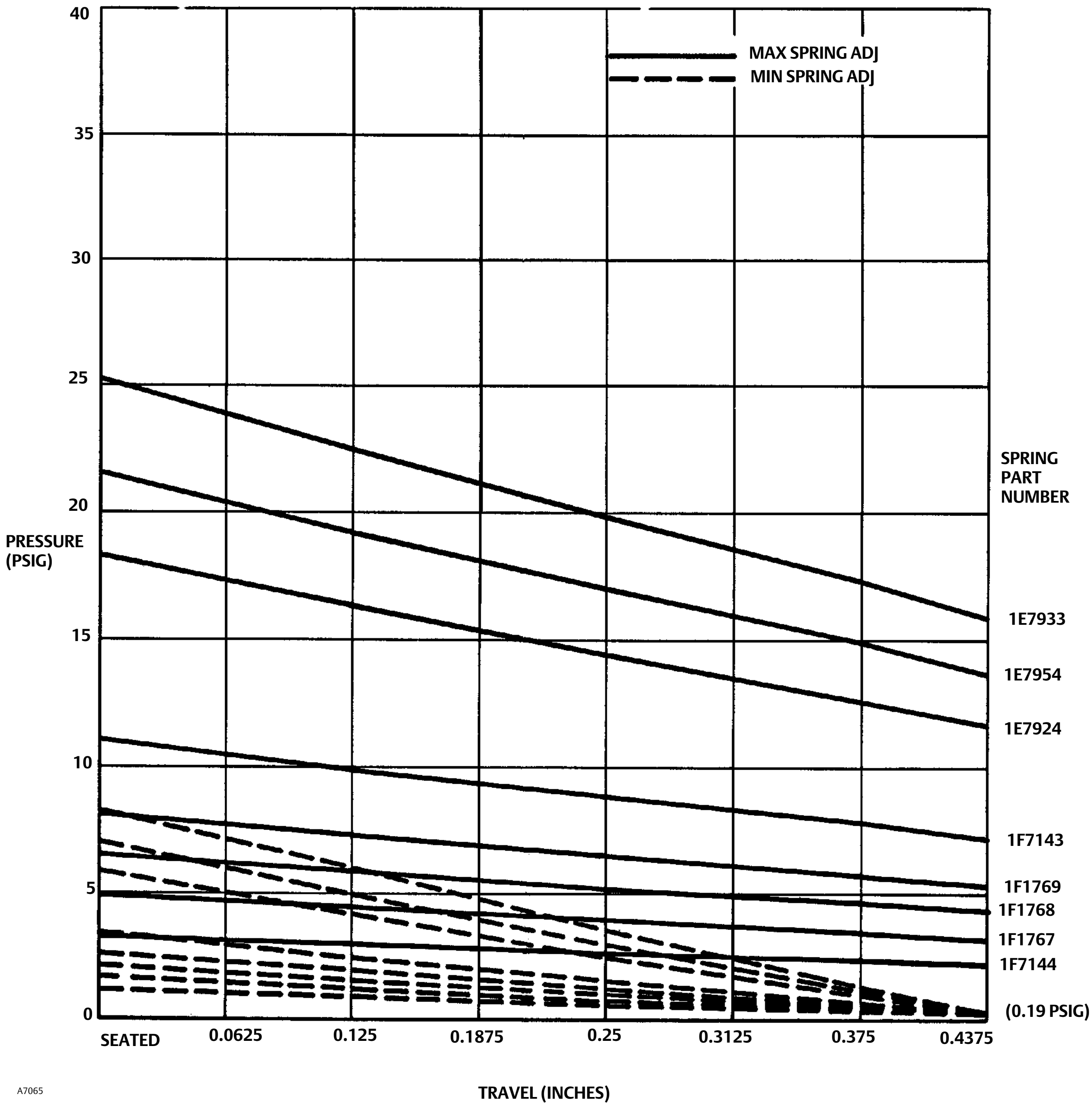
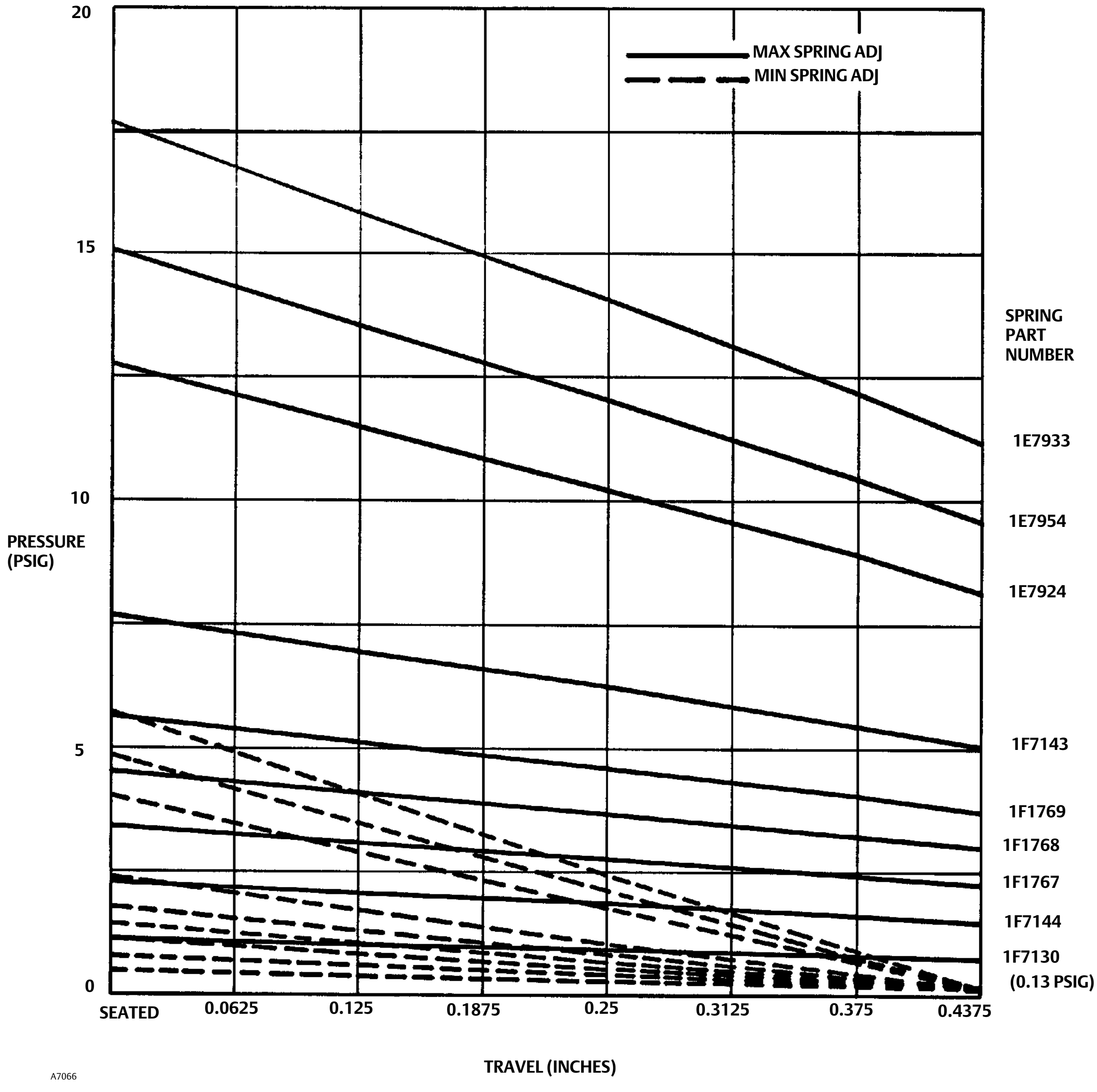


Figure 10. 655 ED, #50 Casing, Diaphragm Pressure versus Valve Travel



MAX, MIN CURVES POSITIONED RESPECTIVELY

Figure 11. 655 ED, #60 Casing, Diaphragm Pressure versus Valve Travel



MAX, MIN CURVES POSITIONED RESPECTIVELY

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Dubai, United Arab Emirates
Singapore 128461 Singapore

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EMERSON

Fisher™ 546NS Electro-Pneumatic Transducer

The Fisher 546NS transducer receives a direct-current input signal and use a torque motor, nozzle-flapper, and pneumatic relay to convert the signal to a proportional pneumatic output signal. Nozzle pressure, which operates the relay, is also piped to the torque motor feedback bellows. This provides a comparison between input signal and nozzle pressure and reduces errors in nozzle pressure.

The transducer can be mounted on a pneumatic diaphragm control valve actuator to provide accurate operation of the valve. The integrated high-capacity pneumatic relay eliminates the need for additional boosters or relays for operation of control valves.

The transducer also can be used to provide stable operation when its output signal is transmitted to small terminal volume chambers such as control bellows in pneumatic valve positioners.

Fisher 546NS Transducer Mounted on 657 Pneumatic Diaphragm Actuator

W2115

Features

- Vibration Resistance—High natural frequency of torque motor moving parts results in negligible vibration influence. Meets typical seismic requirements for nuclear service when a qualified seismic mounting bracket is used.
- Easy Adjustment—Screwdriver adjustments for span and zero are conveniently located and have arrows indicating rotation to increase settings (as shown in figure 1).
- Field-Reversible Action—No additional parts required to reverse action.
- Simple Relay Removal—Integrated pneumatic relay is mounted outside case and can be removed without disturbing electrical or pressure connections or impairing explosion safety.

Specifications

Available Configuration

Electro-pneumatic signal transducer with explosion-proof case and cover, with EPDM elastomers for use in elevated temperature and radiation environments

The 546NS can be ordered ■ with or ■ without a Fisher 67 series filter regulator. The 51 mm (2 inch) supply pressure gauge mounted on the regulator may be ■ 0 to 30 psig or ■ 0 to 60 psig range

Input Signals

■ 4 to 20 mA DC, ■ 10 to 50 mA DC, or ■ two-way split range using either half of one of the standard input signal spans

Internal Resistance of Torque Motor

4 to 20 mA DC Input Signal: 176 ±10 ohms
10 to 50 mA DC Input Signal: 90 ±10 ohms

Output Signals

Ranges:
■ 0.2 to 1.0 bar (3 to 15 psig), ■ 0.4 to 2.0 bar (6 to 30 psig)
Action: Field reversible between ■ direct and ■ reverse

Supply Pressure(1)

Recommended: 0.3 bar (5 psi) higher than upper range limit of output signal
Maximum: 3.5 bar (50 psig)

Average Steady-State Air Consumption(2)(3)

0.44 m^3/hr (16.5 scfh) at 1.4 bar (20 psi) supply pressure

Maximum Output Air Capacity(2)

At 1.4 bar (20 psig) Supply Pressure:
12.9 m^3/hr (480 scfh)
At 2.4 bar (35 psig) Supply Pressure:
18.5 m^3/hr (690 scfh)

Performance(4)

Actuator Loading Time: see figure 3

Reference Accuracy(5): ±0.75% of output signal span

Independent Linearity: ±0.50% of output signal span

Open Loop Gain: 26

Frequency Response: Gain is attenuated 3 dB at 20 Hz with transducer output signal piped to a typical instrument bellows with 305 mm (12 inch) of 1/4 inch tubing

Electromagnetic Interference (EMI): Tested per IEC 61326-1 (Edition 1.1). Meets emission levels for Class A equipment (industrial locations) and Class B equipment (domestic locations). Meets immunity requirements for industrial locations (Table A.1 in the IEC specification document). Immunity performance shown in table 1.

Operative Ambient Temperature Limits(1)

-40 to 66°C (-40 to 150°F)

Electrical Classification

Hazardous Area:

CSA—Explosion-proof, Dust Ignition-proof, Div 2

FM—Explosion-proof, Dust Ignition-proof, Non-incendive

Refer to tables 2 and 3 for specific approval information

NEMA 3R, CSA Enclosure 3

NEMA 3R mounting orientation requires vent location to be below horizontal.

Adjustments

Zero and Span Adjustments: Screwdriver adjustments located inside case (see figure 1)

Connections

Supply Pressure: 1/4 NPT internal located on side of case (located on filter-regulator if a 67CFR is mounted to transducer)
Output Pressure: 1/4 NPT internal located on side of case
Vent: 1/4 NPT internal with screen located on relay
Electrical: 1/2 NPT internal located on bottom of case

-continued-

Specifications (continued)

Construction Materials

Case and Cover: Aluminum
O-Rings: EPDM
Flame Arrestors: Stainless steel
Supporting Bracket/Torsion Member: Stainless steel
Magnets: Alloy steel
Nozzle: Stainless steel
Feedback Bellows: Brass
Relay Body: Aluminum
Relay Restriction: Aluminum/Stainless steel
Relay Diaphragm: EPDM/Nomex®
Relay Valve Plug and Seat Ring: Brass

Mounting

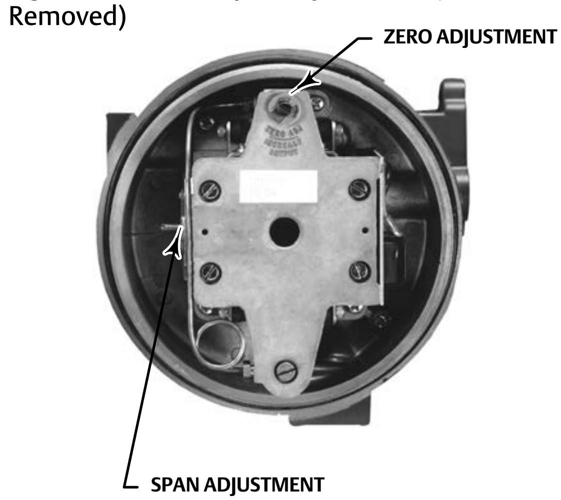
Mounting parts are available for ■ control valve actuator mounting, ■ pipestand (2 inch nominal) mounting, ■ surface mounting, ■ seismic control valve actuator mounting, or ■ wall mounting

Approximate Weight

4.1 kg (9 lb)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any applicable standard or code limitation should not be exceeded.
2. Normal m^3/hr--Normal cubic meters per hour (0°C and 1.01325 bar, absolute). Scfh--Standard cubic feet per hour (60°F and 14.7 psia).
3. Average flow rate determined at 12 mA and 0.6 bar (9 psig) output.
4. Performance values are obtained using a 546 transducer with a 4 to 20 mA DC input signal and a 0.2 to 1.0 bar (3 to 15 psig) or a 0.4 to 2.0 bar (6 to 30 psig) output signal. Ambient temperature is 24°C (75°F). A transducer with other input or output signals may exceed these values.
5. Reference accuracy includes the effects of non-linearity, hysteresis, and deadband per SAMA Standard PMC 20.1-1973.

Figure 1. Zero and Span Adjustments (Cover Removed)



Principle of Operation

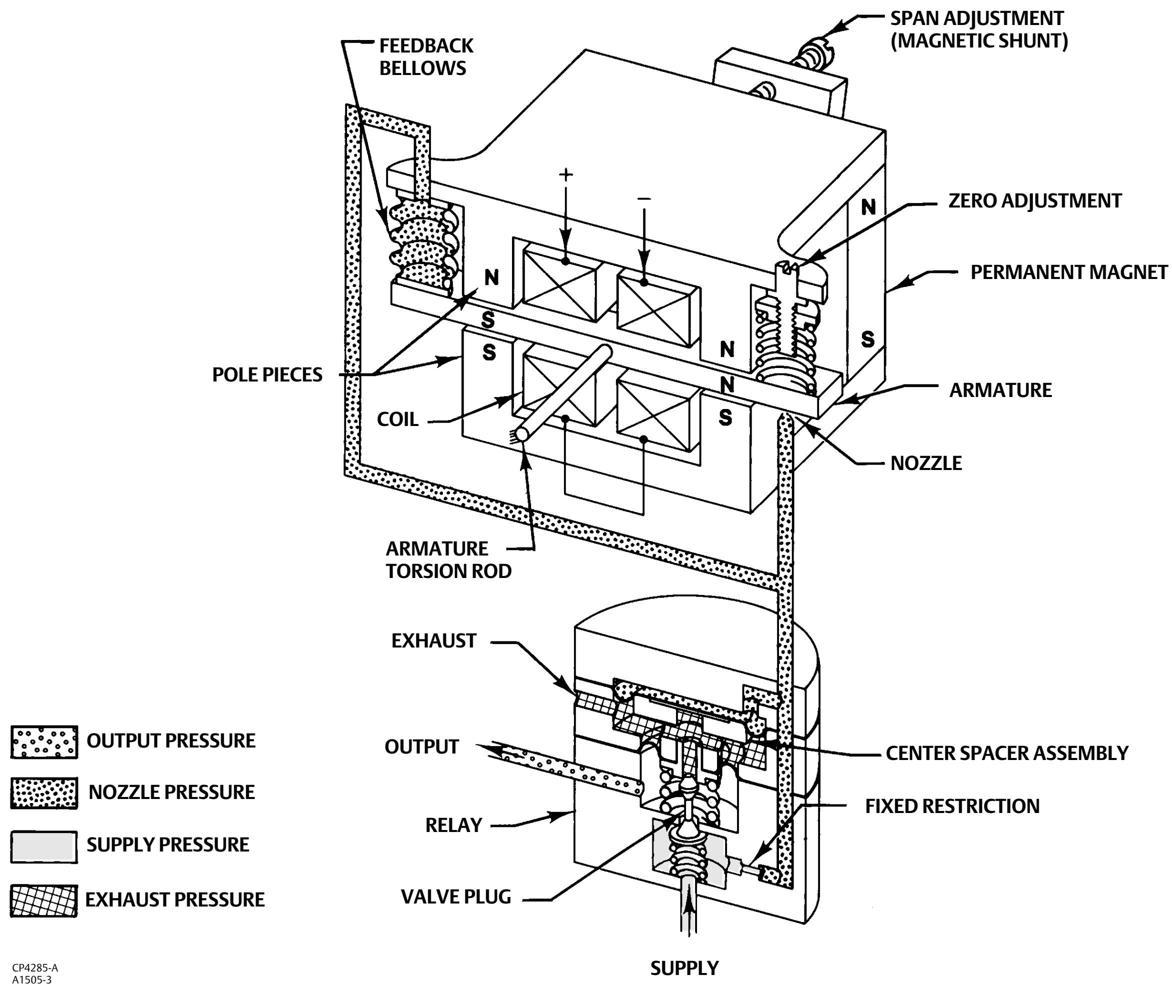
Refer to figure 2, and assume that the transducer is direct acting. As the DC milliamp signal increases, so does the magnetic field around the coils. This results in an increased magnetic attraction between the armature and the pole pieces. The armature rotates slightly clockwise to cover the nozzle, increasing pressure in the nozzle, the upper chamber of the relay, and the feedback bellows. Increased nozzle pressure and increased pressure in the upper chamber of the relay cause the relay supply port to open, increasing the output pressure to the actuator and the control valve.

At the same time, the increased pressure in the feedback bellows acts to move the armature back to the equilibrium position. In this way, the new nozzle pressure is compared to the DC input signal by the force balance principle.

As the DC input signal decreases, magnetic attraction is reduced and the armature rotates slightly in the counterclockwise direction to uncover the nozzle. Decreased nozzle pressure and decreased pressure in the upper chamber of the relay cause the relay exhaust port to open and allow output pressure to bleed to atmosphere. Pressure to the control valve is reduced until equilibrium is attained.

Reverse-acting transducers operate in a similar manner except that when the DC input signal increases, pressure to the actuator and control valve decreases.

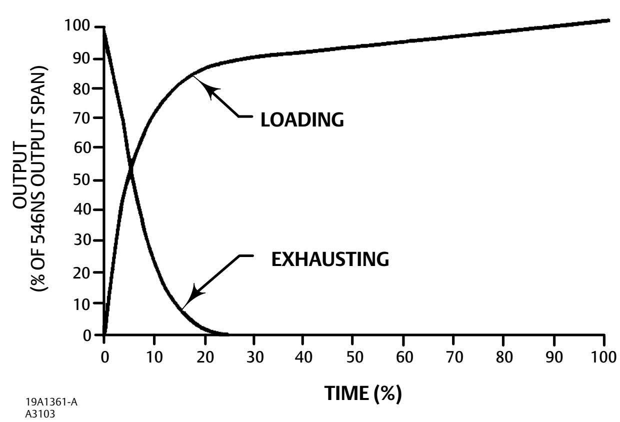
Figure 2. Transducer Schematic



Valve Stroking Time

Figure 3 shows relative times for loading and exhausting an actuator. Exhausting times are nominally 25 percent of the loading times. Stroking time depends upon the size of the actuator,travel, relay characteristics and the magnitude and rate of change of the input signal. If stroking time is critical, contact your [Emerson sales office]() or Local Business Partner.

Figure 3. Output-Time Relationships



Nuclear-Service Applications

The 546NS transducer is designed for nuclear power applications. The 546NS construction includes materials that provide superior performance in elevated temperature and radiation environments.

The O-rings are EPDM (ethylene propylene) and the diaphragms are EPDM/Nomex. EPDM demonstrates superior temperature capability and shelf life over nitrile. (Use a clean, dry, oil-free air supply with instruments containing EPDM components. EPDM is subject to degradation when exposed to petroleum-based lubricants.) The Nomex diaphragm fabric demonstrates improved strength retention at elevated temperature and radiation conditions.

Under the 10CFR50, Appendix B, quality assurance program, the 546NS transducer is qualified “commercial grade dedicated”. These can be supplied as 10CFR, Part 21 items.

Qualification

The 546NS is qualified to meet stringent environmental conditions encountered in nuclear power plant containment areas. Samples were subjected to the tests summarized below:

- Thermal Aging: accelerated service temperature of 54°C (130°F) over 10 years.
- Radiation Aging: 6 MRads Total Integrated Dose (TID)
- Seismic Event Simulation (DBE): no natural frequencies found between 5-100 Hz and seismic dwells of 8g uniaxial from 3-40 Hz when mounted using Fisher specified seismic mounting brackets.
- LOCA/MSLB Event Simulation: saturated steam for 14 hours at 160°C (320°F) followed by a gradual reduction to 83°C (182°F) over a 10 hour period.

Upon conclusion of the above tests, no loss of function or visible degradation was found.

Installation

Standard positions for actuator mounting and pipestand mounting are shown on the front cover and figure 4, respectively. Dimensions are shown in figure 4.

Ordering Information

To determine what ordering information is required, refer to the Specifications table. Carefully review the information under each specification and in the referenced table. Specify the desired choice wherever there is a selection to be made. Always specify the type number as identified in the Available Configurations specification.

For transducers that are to be used in intrinsically safe installations, specify the rating required and the system with which the unit will be used.

When ordering actuator mounting parts, specify the actuator type, size, travel, and diaphragm pressure range. For all Fisher 657 and 667 actuators except size 80, specify whether actuator yoke or actuator casing mounting is desired (yoke mounting is only available on size 80 actuators).

For split-range operation, specify the portion of input signal to be used; e.g. 4 to 12 milliamps of a standard 4 to 20 milliamp signal.

For nuclear service applications, consult your Emerson sales office or Local Business Partner for additional information and order assistance.

Figure 4. Dimensions

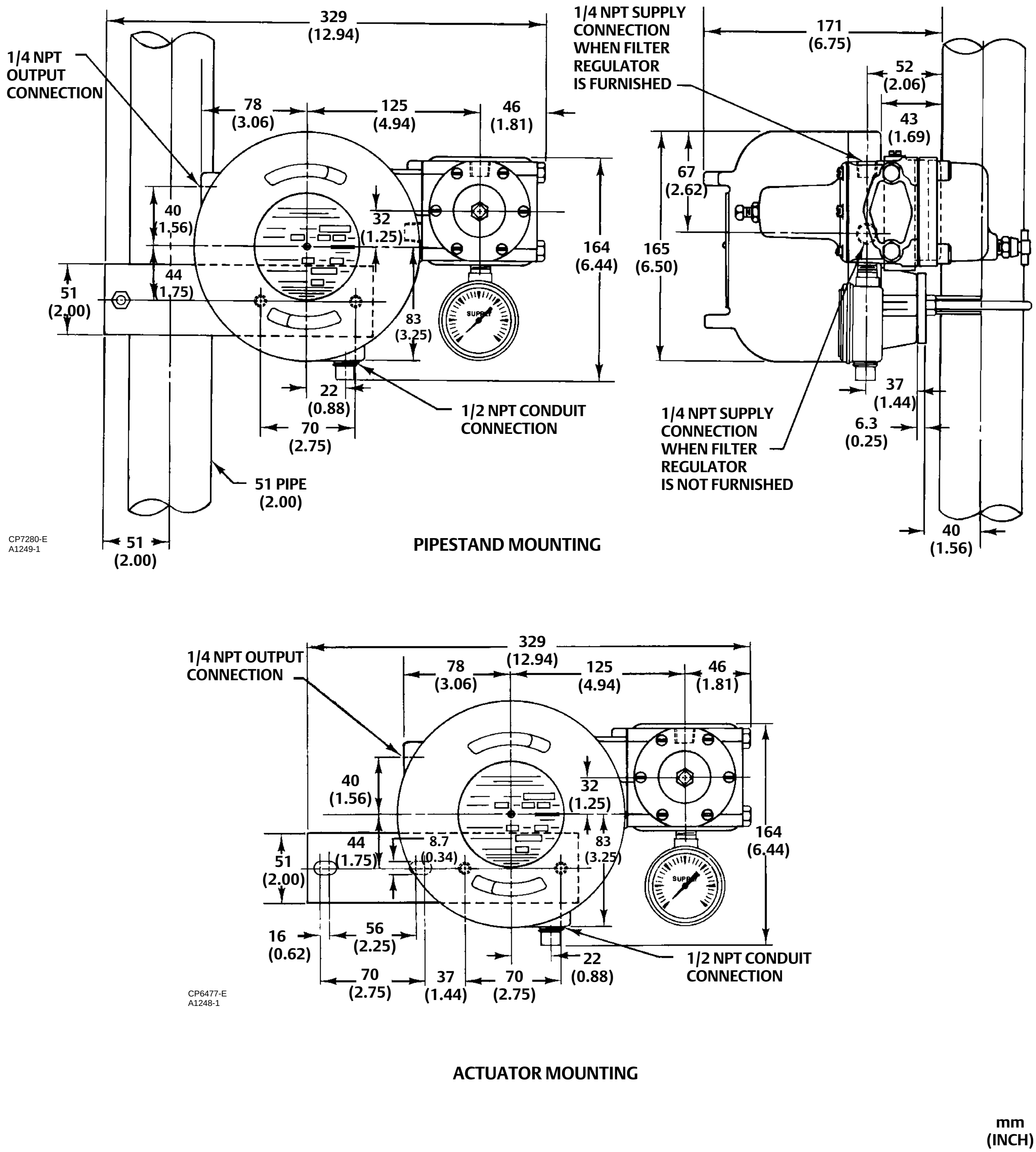


Table 1. Electromagnetic Immunity Performance

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(1)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	A
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms with 1kHz AM at 80%	A

Specification limit = ±1% of span
1. A=No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

For Declaration of Conformity available in multiple languages:

Table 2. Hazardous Area Classifications—CSA (Canada)

Certification Body	Certification Obtained	Temperature Code
CSA	Explosion-proof Class I, Division 1, Group C,D	T5 (Tamb = 66°C)
	Class II, Division 1, Groups E,F,G Class I, Division 2, Groups A,B,C,D Class II, Division 2, Groups F,G	T5

Table 3. Hazardous Area Classifications—FM (United States)

Certification Body	Certification Obtained	Temperature Code
FM	Explosion-proof Class I, Division 1, Groups C,D	T5 (Tamb = 60°C)
	Class II, Division 1, Groups E,F,G Class I, Division 2, Groups A,B,C,D Class II, Division 2, Groups F,G	T5

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Fisher™ 646 Electro-Pneumatic Transducer

The Fisher 646 electro-pneumatic transducer uses a converter module that converts a 4 to 20 milliampere input signal to a proportional 0.2 to 1.0 bar (3 to 15 psig) pneumatic output signal. The converter module uses small parts of minimum mass, which are balanced symmetrically around a pivot point at the center of the mass. This balanced arrangement results in a high performance instrument that reduces sensitivity to vibration.

An integral pneumatic relay provides the high capacity necessary to drive pneumatic control valve/actuator assemblies without additional boosters or positioners. The transducer also provides stable, accurate operation when its output is transmitted to small volume chambers, such as a pneumatic positioner or other pneumatic instrument. Reduced sensitivity to vibration combined with high capacity and first order lag characteristics make the 646 transducer ideal for direct mounting on control valve/actuator combinations.

Connectors and piping can be installed with each 646 transducer for diagnostic testing.

W6783-2

FISHER 646 ELECTRO-PNEUMATIC TRANSDUCER WITH FISHER 657 ACTUATOR AND E VALVE

W4908-1

FISHER 646 ELECTRO-PNEUMATIC TRANSDUCER

Features

- **Small Size**—The small size and light-weight design of the transducer facilitate mounting and provide improved space utilization.
- **Vibration Resistance**—The transducer, used in a standard valve/actuator mounted application, exhibits an output shift of less than 1 percent of span when tested to SAMA Standard PMC 31.1, Condition 3.
- **High Output Capability**—The output volume of the transducer is adequate to drive valve/actuator combinations without requiring a positioner or volume booster.
- **Low Air Consumption**—The transducer has low air consumption which cuts operating costs.
- **Easy Maintenance**—Modular design of the converter allows easy replacement in the field for reduced maintenance costs.
- **Superior Performance**—The accuracy, linearity, and frequency response coupled with minimal hysteresis far exceed the requirements of most control systems.

Specifications

Input Signal

4 to 20 mA DC, constant current with 30 VDC maximum compliance voltage

Equivalent Circuit

The 646 equivalent circuit is a series circuit consisting of a constant voltage drop (battery) of approximately 2.1 VDC and a total resistance of 143 ohms. Input is shunted by three 6.8 V zener diodes (see figure 1).

Output Signal

0.2 to 1.0 bar (3 to 15 psig) direct acting only

Supply Pressure(1)

Recommended: 1.4 bar (20 psig)

Minimum: 1.4 bar (20 psig)
Maximum: 3.4 bar (50 psig)

Average Steady-State Air Consumption(2)(3)

0.08 m^3/hr (3 scfh) at 1.4 bar (20 psi) supply pressure

Maximum Output Air Capacity(2)

8.0 m^3/hr (300 scfh) at 1.4 bar (20 psig) supply pressure

Performance(4)

Reference Accuracy: ±0.5% of full scale output span; includes combined effects of hysteresis, linearity, and deadband

Independent Linearity: ±0.5% of full scale output span

Hysteresis: 0.4% of full scale output span

Frequency Response: Gain is attenuated 3 dB at 10 Hz with transducer output signal piped to a typical instrument input

Temperature Effect: ±4% of full scale output span per 55°C (100°F) change

Supply Pressure Effect: 0.2% of full scale output span per psi supply pressure change

Vibration Effect: Less than 1% of full scale output span when tested to SAMA PMC 31.1, Condition 3

Electromagnetic Compatibility:
Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 1 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Operating Ambient Temperature Limits(1)

-40 to 71°C (-40 to +160°F)

Electrical Classification

CSA— Intrinsically Safe, Explosion-proof, Type n, Dust-Ignition proof, Div 2

FM— Intrinsically Safe, Explosion-proof, Type n, Non-incendive, Dust-Ignition proof

ATEX— Intrinsically Safe, Flameproof, Type n

IECEx— Intrinsically Safe, Flameproof, Type n

Housing

CSA— Type 3 Encl.

FM— NEMA 3, IP54

ATEX— IP64

IECEx— IP54

Mount instrument with vent on side or bottom if weatherproofing is a concern

Other Classifications/Certifications

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, and Belarus)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KGS— Korea Gas Safety Corporation (South Korea)

Contact your Emerson sales office for classification/certification specific information

Construction Materials

Housing, Cap, and Relay Body
ASTM: A03600 material composition alloy

Adjustments

Zero and Span: Trim potentiometers (20 turn) for zero and span adjustments are located under the housing cap

Connections

Supply and Output Pressure: 1/4 NPT internal connection
Vent: 1/4 NPT internal
Electrical: ■ Standard 1/2 NPT or, ■ Optional M20 or PG13 conduit adapter (see figure 3)
Wire Size: 18 to 22 AWG

-continued-

Specifications (continued)

Mounting Position

Any position is acceptable for standard pipestand, panel, or actuator mounting. For weatherproof housing, mount the transducer to allow the vent to drain.

Approximate Weight (Transducer Only)

1.6 kg (3.5 pounds)

Options

Output pressure gauge

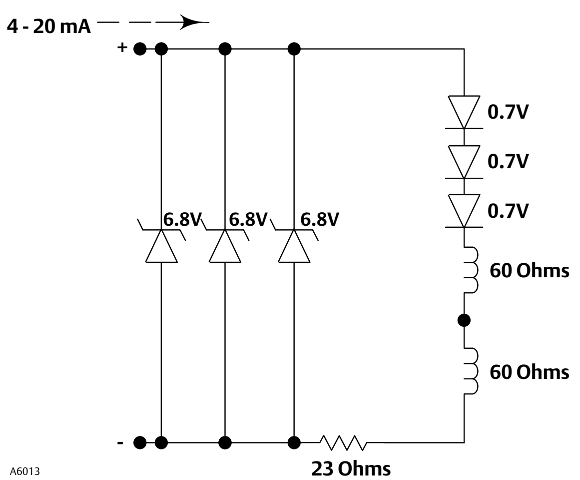
NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.
2. Normal m^3/hour--Normal cubic meters per hour (0°C and 1.01325 bar, absolute). Scfh--Standard cubic feet per hour (60°F and 14.7 psig).
3. Average flow rate determined at 12 mA and 0.6 bar (9 psig) output.
4. Performance values are obtained using a transducer with a 4 to 20 mA dc input signal and a 0.2 to 1.0 bar (3 to 15 psig) output signal at an ambient temperature of 24°C (75°F).

Table 1. EMC Summary Results—Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria[1]
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

Specification Limit = +/- 1% of span.
1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Figure 1. Equivalent Circuit



Valve Stroking Time

Figure 2 shows relative times for loading and exhausting an actuator. Stroking time depends upon the size of the actuator, travel, relay characteristics and the magnitude and rate of change of the input signal. If stroking time is critical, contact your [Emerson sales office].

Figure 2. Output-Time Relationships

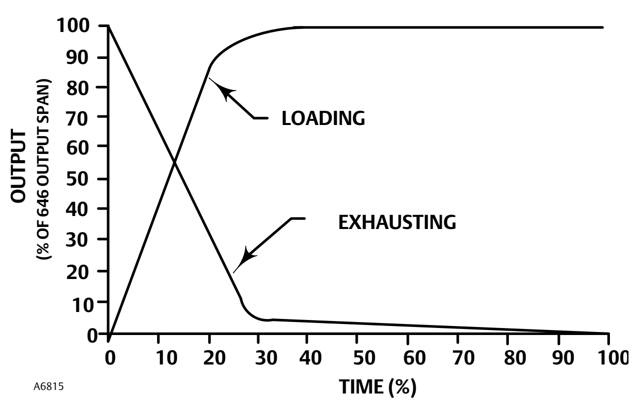
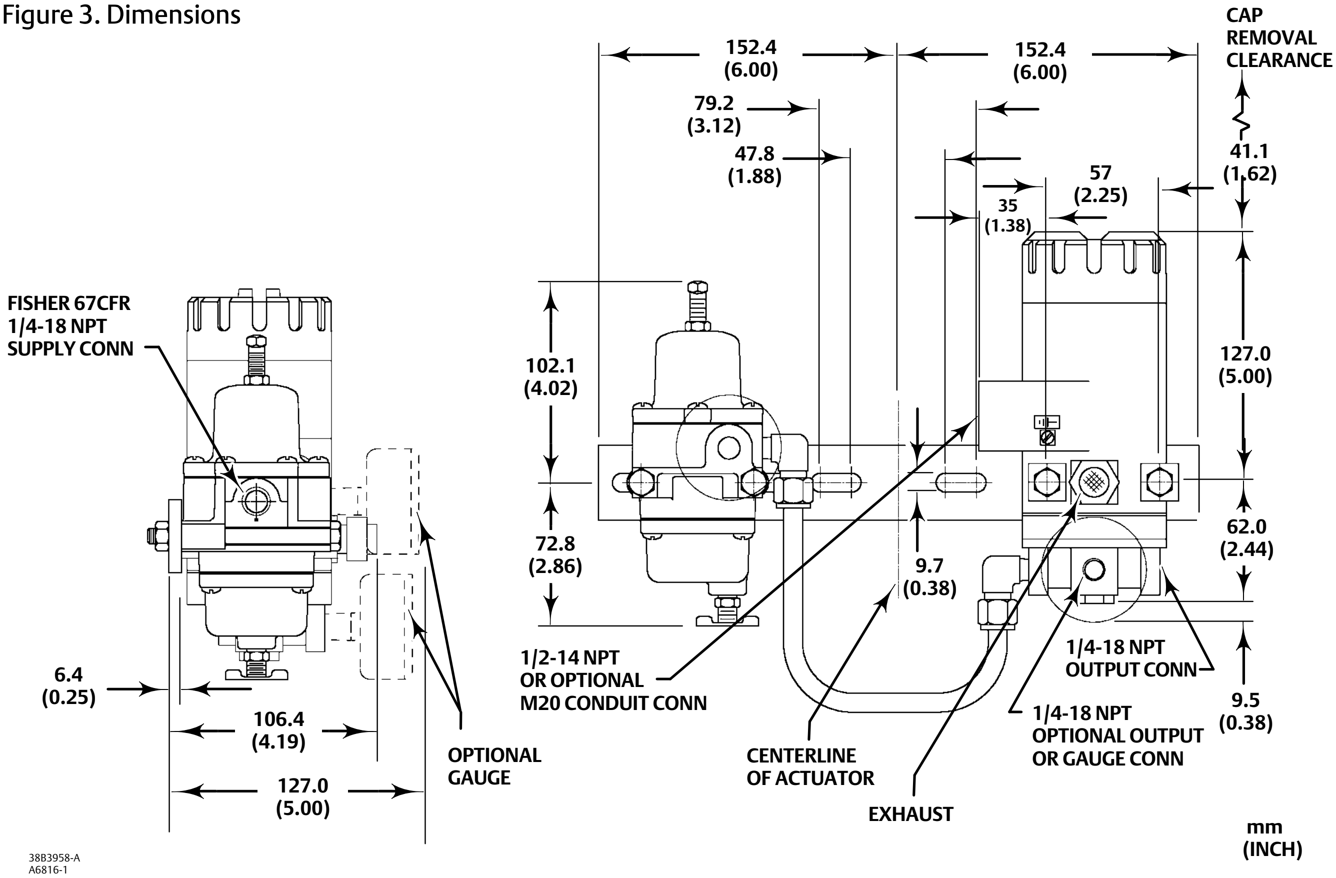


Figure 3. Dimensions



Installation

Refer to figure 3 for location of standard mounting holes in the housing. Standard mounting hardware is provided for mounting on the actuator, a pipestand, or a panel. Field wiring connections are made to the terminal block accessible under the housing cap. Dimensions are shown in figure 3.

Ordering Information

To determine what ordering information is required, refer to the specification table. Carefully review the description of each specification. Specify the desired choice whenever there is a selection available. Also, specify options that are applicable to the application.

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Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

775 Smart Wireless THUM™ Adapter

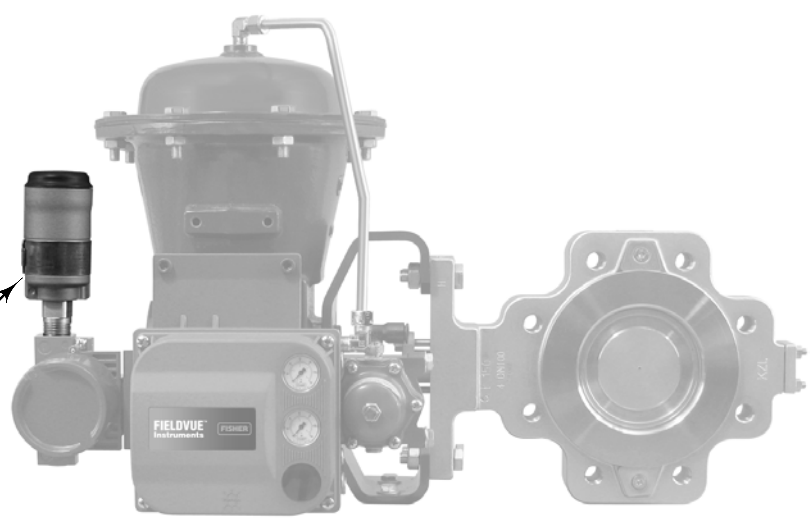
The Smart Wireless THUM adapter is a device for use on HART® communicating instruments such as the Fisher™ FIELDVUE™ digital valve controller. The THUM adapter adapts the wired HART protocol to the *Wireless*HART® protocol.

In many process facilities, HART communicating field devices have been installed and working for years. However, getting important information such as valve health to the people who need it is a challenge, as diagnostic information is often inaccessible.

A wireless network can be deployed to gain access to valve diagnostics. The THUM adapter is installed on field devices one at a time - significantly reducing the risk and impact of installation error. Plus, the network is scalable. Start with one THUM adapter on a FIELDVUE digital valve controller. Then, as you see the value it brings, add more devices to the network.

Features

- Loop Powered—No batteries; power scavenging technology. No maintenance required.
- Reliable Wireless—The *Wireless*HART communication protocol provides the high level of communication reliability required in process control applications.
- Rugged Construction—The electronics are fully encapsulated and enclosed in an aluminum housing.
- Security—The *Wireless*HART self-organizing mesh network includes encryption, authentication, and authorization mechanisms to provide industry leading security.
- Wireless Connectivity—The THUM adapter enables configuration, calibration, and valve health monitoring via AMS.
- Installation Flexibility—The THUM adapter can be installed anywhere along the control wires.



FISHER CONTROL-DISK WITH 2052 ACTUATOR,
FIELDVUE DVC6200 DIGITAL VALVE CONTROLLER, AND THE WIRELESS THUM ADAPTER

Specifications

Functional Specifications

Input

Any 2- or 4-wire HART 5.0 powered device

Output

*Wireless*HART Communication Protocol

Humidity Limits

0-100% relative humidity

Burst Rate

User selectable, 8 sec. to 60 min.

Physical Specifications

Electrical Connections

The THUM adapter is connected in series with the 4-20 mA loop.

Power Requirements

SmartPower™: Power scavenging technology (no battery required)

The THUM adapter draws power by drawing voltage from the loop. The drop is linear from 2.25 volts at 3.5 mA to 1.2 volts at 25 mA, but does not affect the 4-20 mA current signal. Under fault conditions, the maximum voltage drop is 2.5 volts.

Materials of Construction

Enclosure

Housing: ■ Low-copper aluminum or ■ 316 SST
Paint: Polyurethane
M20-Conduit Adapter: SST
M20-Conduit Adapter O-ring: Buna-n

Antenna

Poly butadine terephthalate (PBT)/Polycarbonate (PC) integrated omnidirectional antenna

Weight

THUM Adapter only AL	0.29 kg (0.65 lb)
THUM Adapter only SST	0.5 kg (1.1 lb)
AL THUM Adapter with AL remote kit	3.2 lbs. (1.45 kg)
SST THUM Adapter with SST remote kit	5.8 lbs. (2.65 kg)
AL THUM Adapter with M20 conduit adapter	0.85 lbs. (0.38 kg)
SST THUM Adapter with M20 conduit adapter	1.3 lbs. (0.59 kg)

Enclosure Rating

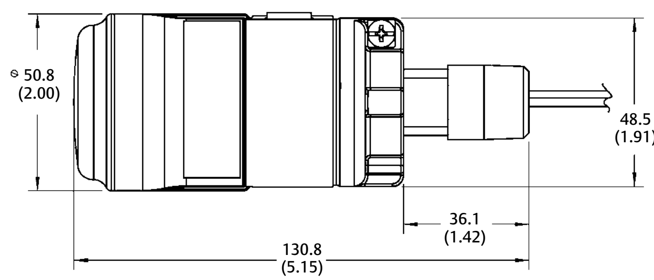
NEMA 4X and IP66

Mounting

May be installed anywhere on the control wiring loop. Typically, mounting will be on or near the control valve. May be mounted directly on the available conduit opening of the terminal box or remotely using remote mount kit.

Mounting Connection: 1/2 NPT external

Dimensions



Performance Specifications

ElectroMagnetic Compatibility (EMC)

Meets all relevant requirements of EN 61326-1 (2006) when installed with shielded wiring. The sub-device must also use shielded wiring for installation.

Vibration Effect

Output unaffected when tested per the requirements of IEC60770-1 field with general application or pipeline with low vibration level (10-60 Hz 0.15mm displacement peak amplitude / 60-500 Hz 2g).

When the THUM adapter is used on wired devices that are subject to vibration levels greater than 2 g, it is recommended that the THUM adapter be remotely mounted.

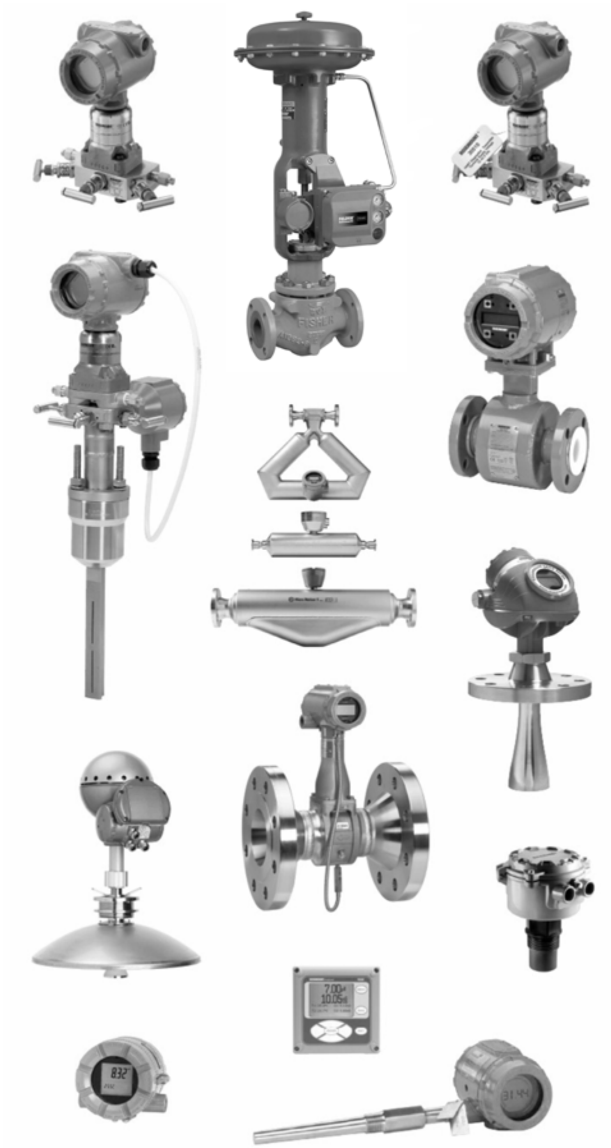
Temperature Limits

Operating and Storage Limits: -40 to 85°C (-40 to 185°F)

Smart Wireless THUM Adapter Applications

Figure 1. THUM Adapter

Figure 2. HART Devices Available from Emerson Automation Solutions



Enable Enhanced Valve Capabilities

- Online, in-service valve testing through ValveLink™ SNAP-ON™ for AMS
- Monitor alerts such as travel deviation, supply pressure, and electronics health with AMS Device Manager
- Trend actual valve position

Gain Access to Advanced Instrument Diagnostics

- Rosemount™ 3051S with Advanced Process Diagnostics
- Micro Motion™ Coriolis Meter Verification with optional AMS Meter Verification SNAP-ON
- Rosemount Radar Echo Curve
- Rosemount Magnetic Flow Meter Verification™ with AMS Device Manager

Efficiently Gather Data from Multivariable Devices

- Rosemount 3051SMV MultiVariable™ and 3095 Mass Flow Transmitters
- Rosemount 3300 and 5300 Radar Level Transmitters
- Micro Motion Coriolis Meters
- Rosemount TankRadar Rex and TankRadar Pro
- Rosemount Magnetic Flowmeters
- Rosemount Multivariable Vortex Flowmeter

Make any HART Device Wireless to Enable New Measurement Points

- Level
- Flow
- Valves
- Liquid and Gas Analytical
- Pressure
- Temperature

Remotely Manage Device and Monitor Health with AMS Device Manager

- Reduce troubleshooting time
- As found, as left data
- Calibration tracking

Product Certifications

European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found at www.rosemount.com. A hard copy may be obtained by contacting an Emerson representative.

Emerson complies with following directives:
- ATEX Directive (94/9/EC)
- Electro Magnetic Compatibility (EMC) (2004/108/EC)
- Radio and Telecommunications Terminal Equipment Directive (R&TTE) (1999/5/EC)

Telecommunication Compliance

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Emerson is working with governmental agencies around the world in order to comply with country directives and laws that govern wireless device usage.

FCC and IC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

Ordinary Location Certification for FM

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

Hazardous Locations Certificates

North American Certificates

Factory Mutual (FM) Approvals

FM Intrinsically Safe and Non-incendive
Intrinsically Safe for Class I/II/III, Division 1, Groups A, B, C, D, E, F, G.
Zone Marking: Class I, Zone 0, AEx ia IIC
Temperature Codes T4 (-50°C ≤ Tamb ≤ 70°C)
Non-incendive for Class I, Division 2, Groups A, B, C, D.
Intrinsically safe and non-incendive when installed according to Rosemount Drawing 00775-0010.
Enclosure Type 4X/IP66

CSA - Canadian Standards Association

CSA Intrinsically Safe
Intrinsically Safe for Class I, Division 1, Groups A, B, C, D.
T3C (-50°C ≤ Tamb ≤ 70°C)
Intrinsically Safe when installed according to Rosemount Drawing 00775-0012.
Suitable for Class 1, Division 2, Groups A, B, C, D.
Enclosure Type 4X / IP66

European Certifications

ATEX Intrinsic Safety
Certificate No.: Baseefa09ATEX0125X Ex II 1G
Ex ia IIC T4 (-50°C ≤ Tamb ≤ 70°C) IP66 CE 1180
Loop Power: Ui = 30V; Li = 200 mA; Pi = 1.0 W; Ci = 0; Li = 0

Special conditions for safe use (X)
The surface resistivity of the antenna is greater than one gigaohm. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth.

The enclosure is made of aluminium alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in a zone 0.

ATEX Type n
Certificate No.: Baseefa09ATEX0131 Ex II 3G
Ex nA IIC T4 (-50°C ≤ Tamb ≤ 70°C)
Ui = 45 Vdc MAX IP66 CE 1180

IECEx Certifications

IECEx Intrinsic Safety
Certificate No.: IECEx BAS 09.0050X
Ex ia IIC T4 (-50°C ≤ Tamb ≤ 70°C) IP66

Loop Power: Ui = 30V; Li = 200 mA; Pi = 1.0 W; Ci = 0; Li = 0

Special conditions for safe use (X)
The surface resistivity of the antenna is greater than one gigaohm. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth.

The enclosure is made of aluminium alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in a zone 0.

IECEx Type n
Certificate No.: IECEx BAS 09.0058
Ex nA IIC T4 (-50°C ≤ Tamb ≤ 70°C)
Ui = 45 Vdc MAX IP66

Additional Certifications/Appprovals Available

INMETRO, NEPSI, CCoE, KOSHA, and GOST. Contact your Emerson sales office or Local Business Partner for certification specific information.

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Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore
www.Fisher.com

Fisher™ 846 Electro-Pneumatic Transducer

The Fisher 846 electro-pneumatic transducer is a rugged, field-mountable transducer that accepts an electrical input signal and converts it to a pneumatic output signal. Typically, the 4 to 20 mA is converted to 0.2 to 1.0 bar (3 to 15 psi). In the most common application, the transducer converts an electrical output signal from a controller to a pneumatic signal necessary to operate a control valve actuator or pneumatic positioner.

The transducer includes a deflector/nozzle design (figure 1) that consists of two nozzles positioned so that the constant air flow exiting the supply nozzle is directed at the entrance of the receiver nozzle. Each nozzle has a large bore of 0.41 mm (0.016 inches), which provides good resistance to plugging. The input current signal positions a deflector bar within the nozzle's flow stream. As the input signal changes, the deflector bar moves to alter the flow stream to the receiver nozzle, establishing a pilot pressure at the receiver nozzle. The pilot pressure, in turn, controls the booster stage and output of the transducer.

An electronic feedback control network constantly compares the value of the pneumatic output signal with the input current signal. A solid-state pressure sensor is part of the electronics package monitoring the pneumatic output (figure 3). A comparator circuit in the control network detects input-output deviations and adjusts the output by moving the deflector in the pilot stage to a corrected position. Because of this feedback network, the transducer can correct for error-producing effects such as variations in supply pressure and downstream leakage.

X0234

FISHER 846 ELECTRO-PNEUMATIC TRANSDUCER

W6307-1

846 MOUNTED ON FISHER 667 ACTUATOR

Specifications

Input Signal

4-20 mA DC, field adjustable split ranging

Equivalent Circuit

See figure 4

Output Signal

Standard Performance: ■ 0.2 to 1.0 bar (3 to 15 psi). Rangeability between 0.1 to 1.2 bar (1 and 18 psi)
Multirange Performance: ■ 0 to 1.2 bar (0 to 18 psi), ■ 0.4 to 2.0 bar (6 to 30 psi), and ■ 0 to 2.3 bar (0 to 33 psi) nominal ranges. Actual rangeability available between 0.03 to 2.3 bar (0.5 and 33 psi)
Action: ■ Direct (increasing input signal increases transducer output) (Minimum span, 6 psi) or ■ Reverse (increasing input signal decreases transducer output) (Minimum span, 11 psi)

Supply Pressure

Standard Performance: 1.2 to 1.6 bar (18 to 24 psi)
Multirange Performance:
Minimum: 0.2 bar (3 psi) [0.14 bar (2 psi) for a 2.3 bar (33 psi) output] greater than the maximum calibrated output pressure.
Maximum: 2.4 bar (35 psi)

Supply Pressure Medium

Clean, dry air

Per ISA Standard 7.0.01
A maximum 40 micrometer particle size in the air system is acceptable. Further filtration down to 5 micrometer particle size is recommended. Lubricant content is not to exceed 1 ppm weight (w/w) or volume (v/v) basis. Condensation in the air supply should be minimized.

Per ISO 8573-1
Maximum particle density size: Class 7
Oil content: Class 3
Pressure Dew Point: Class 3 or at least 10°C less than the lowest ambient temperature expected

Maximum Steady-State Air Consumption(1)

0.3 m^3/hr (12 scfh) at 1.4 bar (20 psi) supply pressure

Output Air Capacity(1)

Standard Performance: 6.4 m^3/hr (240 scfh) at 1.4 bar (20 psi) supply pressure

Multirange Performance: 9.7 m^3/hr (360 scfh) at 2.5 bar (35 psi) supply pressure

Temperature Limits

Operating: -40 to 85°C (-40 to 185°F)
Storage: -40 to 93°C (-40 to 200°F)

Humidity Limits

0-100% condensing relative humidity

Performance(2)

Linearity, Hysteresis, and Repeatability: ±0.3% of span

Temperature Effect (total effect including zero and span): ±0.07%/°C (0.045%/°F) of span

Vibration Effect: ±0.3% of span per g during the following conditions:
5-15 Hz at 4 mm constant displacement
15-150 Hz at 2 g. 150-2000 Hz at 1 g.
per SAMA Standard PMC 31.1, Sec. 5.3, Condition 3, Steady State

Shock Effect: ±0.5% of span, when tested per SAMA Standard PMC 31.1, Sec. 5.4

Supply Pressure Effect: Negligible

Electromagnetic Interference (EMI): Tested per IEC 61326-1:2013. Meets emission levels for Class A equipment (industrial locations) and Class B equipment (domestic locations). Meets immunity requirements for industrial locations (Table A.1). Immunity performance is shown in table 1.

Leak Sensitivity: Less than 1.0% of span for up to 4.8 m^3/hr (180 scfh) downstream leakage

Overpressure Effect: Less than 0.25% of span for misapplication of up to 7.0 bar (100 psi) supply pressure for less than 5 minutes to the input port

Reverse Polarity Protection: No damage occurs from reversal of normal supply current (4-20 mA) or from misapplication of up to 100 mA

Connections

Supply and Output Pressure: 1/4-18 NPT internal connection
Electrical: 1/2-14 NPT internal conduit connection

- continued -

Specifications (Continued)

Adjustments

Zero and Span: Screwdriver adjustments located in terminal compartment

Remote Pressure Reading (optional)

ON or OFF; jumper selectable
Frequency Range: 0-10,000 Hz
Amplitude: 0.4-1.0 $V_{p\text{-}p}$

Required Operating Voltage

Min. 6.0 V (at 4 mA)
Max. 7.2 V (at 20 mA)
with Remote Pressure Reading ON
Min. 6.4 V (at 4 mA)
Max. 8.2 V (at 20 mA)

Electrical Classification

Hazardous Area
see Bulletin 9.2:001 (D103222X012)

CSA C/US—Intrinsically Safe, Explosion-proof, Non-Incendive

FM—Intrinsically Safe, Explosion-proof, Non-Incendive

ATEX—Intrinsically Safe, Flameproof, Type n

IECEx—Intrinsically Safe, Flameproof

Electrical Housing

Tropicalization (Fungus test per MIL-STD-810)

CSA C/US—Type 4X

FM—Type 4X

ATEX—IP66(3)

IECEx—IP66(3)

Other Classifications/Certifications

CUTR— Customs Union Technical Regulations (Russian, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO—National Institute of Metrology, Quality, and Technology (Brazil)

KGS—Korea Gas Safety Corporation (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organization - Chief Controller of Explosives (India)

Contact your Emerson sales office for classification/certification specific information

Construction Materials

Housing
■ ASTM: A03600 material composition alloy or
■ CF8M
O-Rings
Nitrile, except silicone for sensor O-rings

Mounting

■ Actuator, ■ pipestand, or ■ surface

Weight

Aluminum: 2.9 kg (6.5 lb) excluding options
Stainless Steel: 6.7 kg (14.8 lb) excluding options

Options

■ Fisher 67CFR filter regulator, ■ supply and output gauges, ■ remote pressure reading, or ■ stainless steel mounting bracket

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology
1. Normal m^3/hr: normal cubic meters per hour (m^3/hr, 0°C and 1.01325 bar, absolute). Scfm: standard cubic feet per minute (ft^3/min, 60°F and 14.7 psig).
2. Performance values are obtained using a transducer with a 4 to 20 mA dc input signal, a 3 to 15 psig output, and 20 psig supply pressure.
3. ATEX and IECEx Flameproof — IP66 per CSA Letter of Attestation.

Table 1. EMC Immunity Performance Criteria

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria[1]
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1kHz AM at 80%	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 8 MHz at 3 Vrms	B
			8 MHz to 80 MHz at 3 Vrms	A

Specification limit = ±1% of span
1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Features

- **Vibration Resistant**—The low-mass pilot stage, mechanically damped deflector bar, and rugged construction provide stable performance in vibration.

- **Large Diameter Nozzles**—Large diameter nozzles, free-flow pilot stage design, and large internal pneumatic supply passages provide excellent tolerance to reducing the effects of contaminant buildup and erosion.

- **Increased Accuracy, Reduced Sensitivity to Supply Pressure Variations and Downstream Leakage**—The electronic feedback control network monitors the pneumatic output signal, detects any input-output deviations and corrects them. This provides very high accuracy and allows the transducer to sense changes in the final element condition and rapidly optimize its air delivery.

- **Easy Maintenance**—Major mechanical and electrical components are incorporated into a single field-replaceable “master module” (figure 2). The transducer does not have to be removed from its mounting to facilitate troubleshooting or service. A separate field wiring compartment eases installation and maintenance.

Figure 1. Detail of Deflector/Nozzle Pilot Stage

W6287

- **Quick Diagnostic Checks and Remote Performance Monitoring**—With *Stroke Port,* a constant bleed from the pilot stage vents through a hole in the module cover. Covering the hole increases the transducer output to confirm the proper operation of the pilot and booster stages and stroke the actuator. With optional *Remote Pressure Reading*, a frequency directly proportional to the output pressure is superimposed on the input signal wires.

  Using a frequency counter, an operator can monitor the 846 output pressure.

Figure 2. Master Module Construction

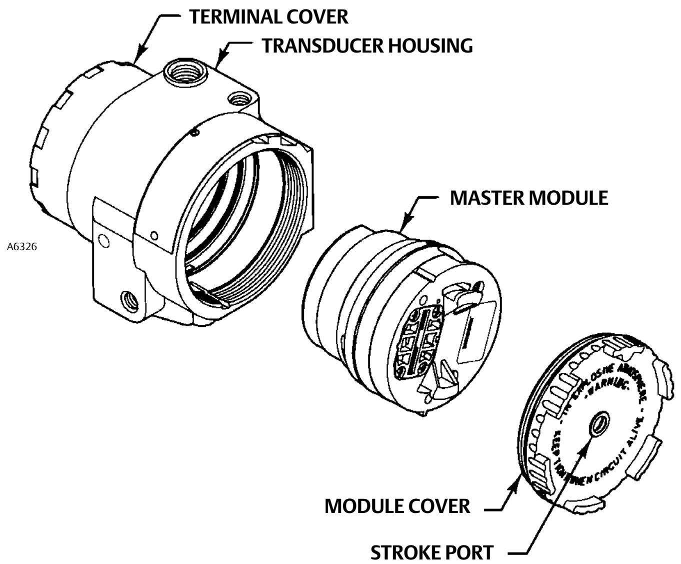


Figure 3. Functional Block Diagram

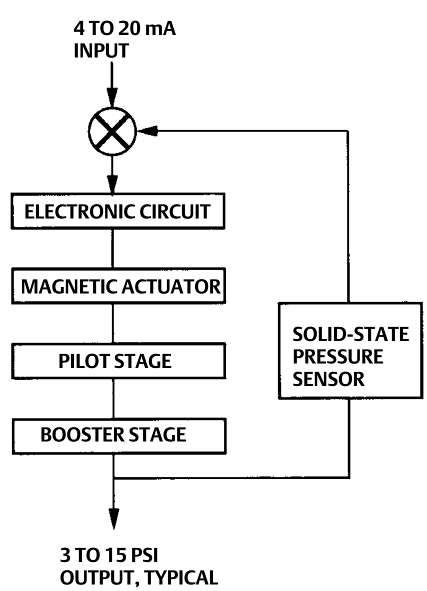
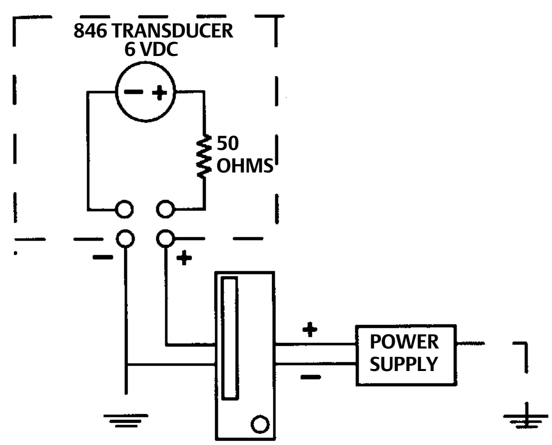


Figure 4. Equivalent Circuit



Note:
The 846 is not a constant resistor in series with an inductor. It is better modeled in the loop as a 50 ohm resistor in series with a 6 volt DC voltage drop with negligible inductance.

A6325

Installation

The transducer may be actuator, wall, panel, or pipestand mounted. Dimensions are shown in figures 5, 6, 7, and 8.

Ordering Information

To determine what ordering information is required, refer to the specification table. Carefully review the description of each specification. Specify the desired choice whenever there is a selection available.

When ordering mounting parts, specify actuator, surface, or pipestand mounting. For actuator mounting, specify the actuator type, size, travel, and diaphragm pressure range. For all 657 and 667 actuators except size 80, specify whether actuator yoke or actuator casing mounting is desired (yoke mounting only is available on size 80 actuators).

Figure 5. Dimensions

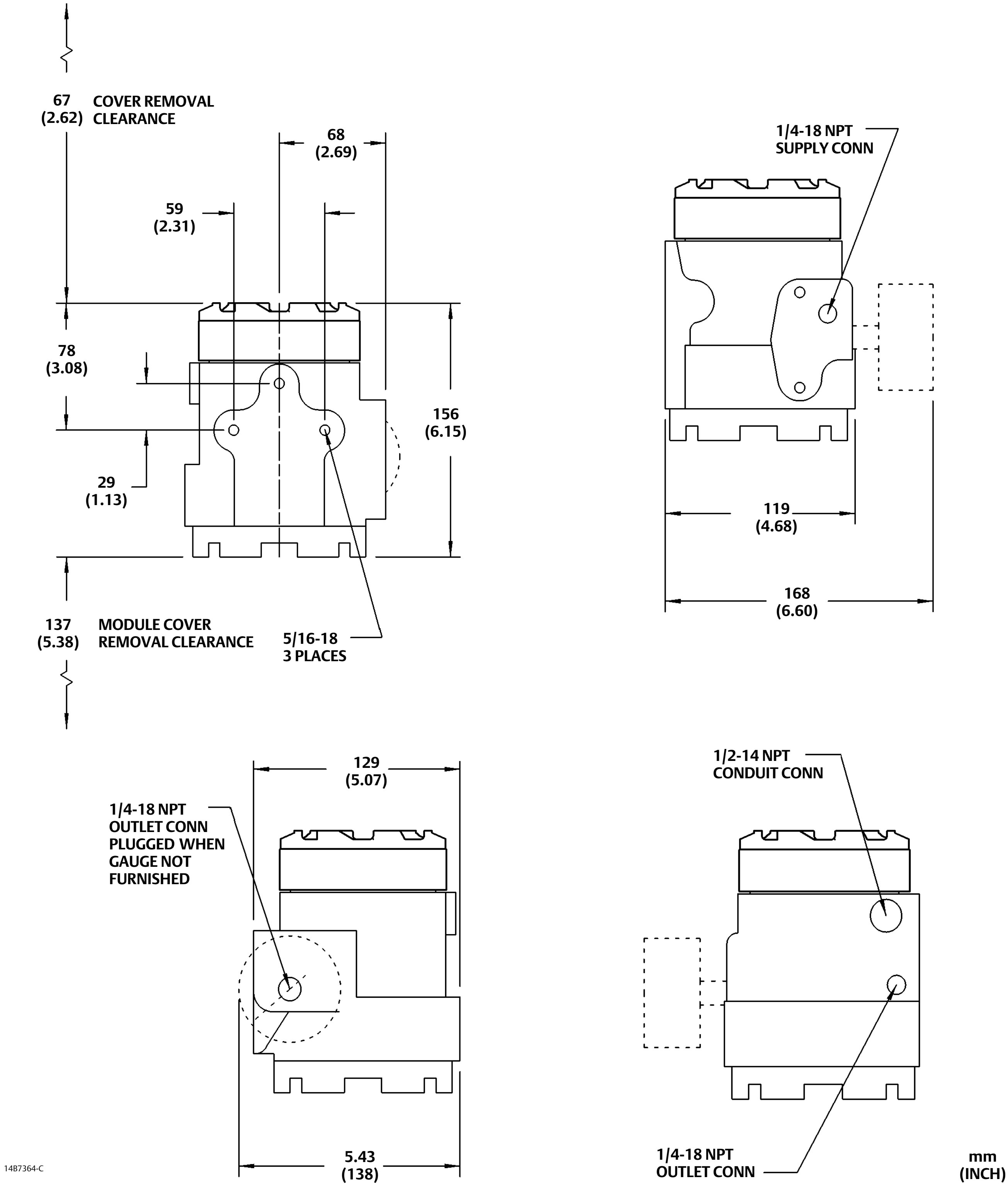
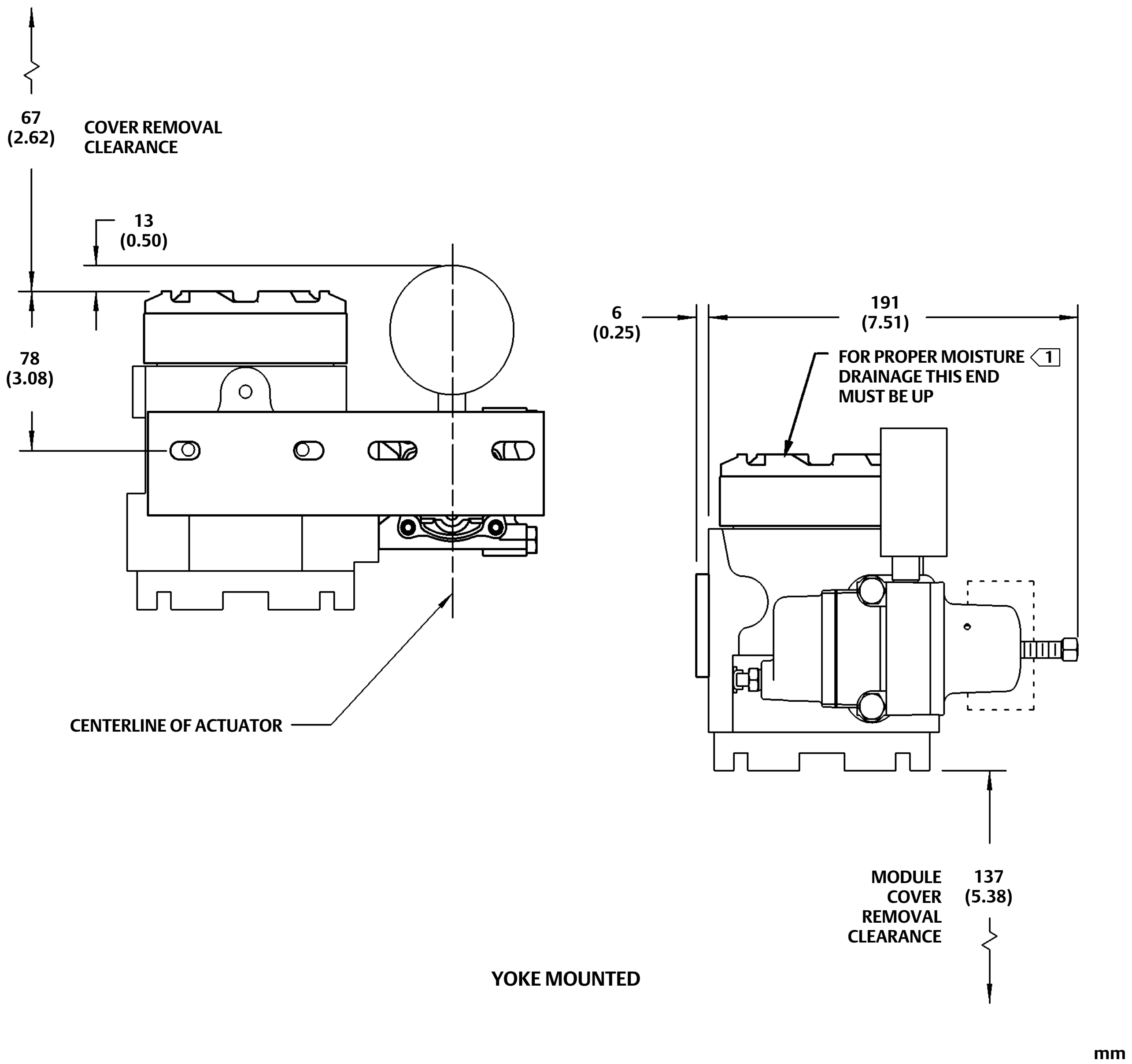


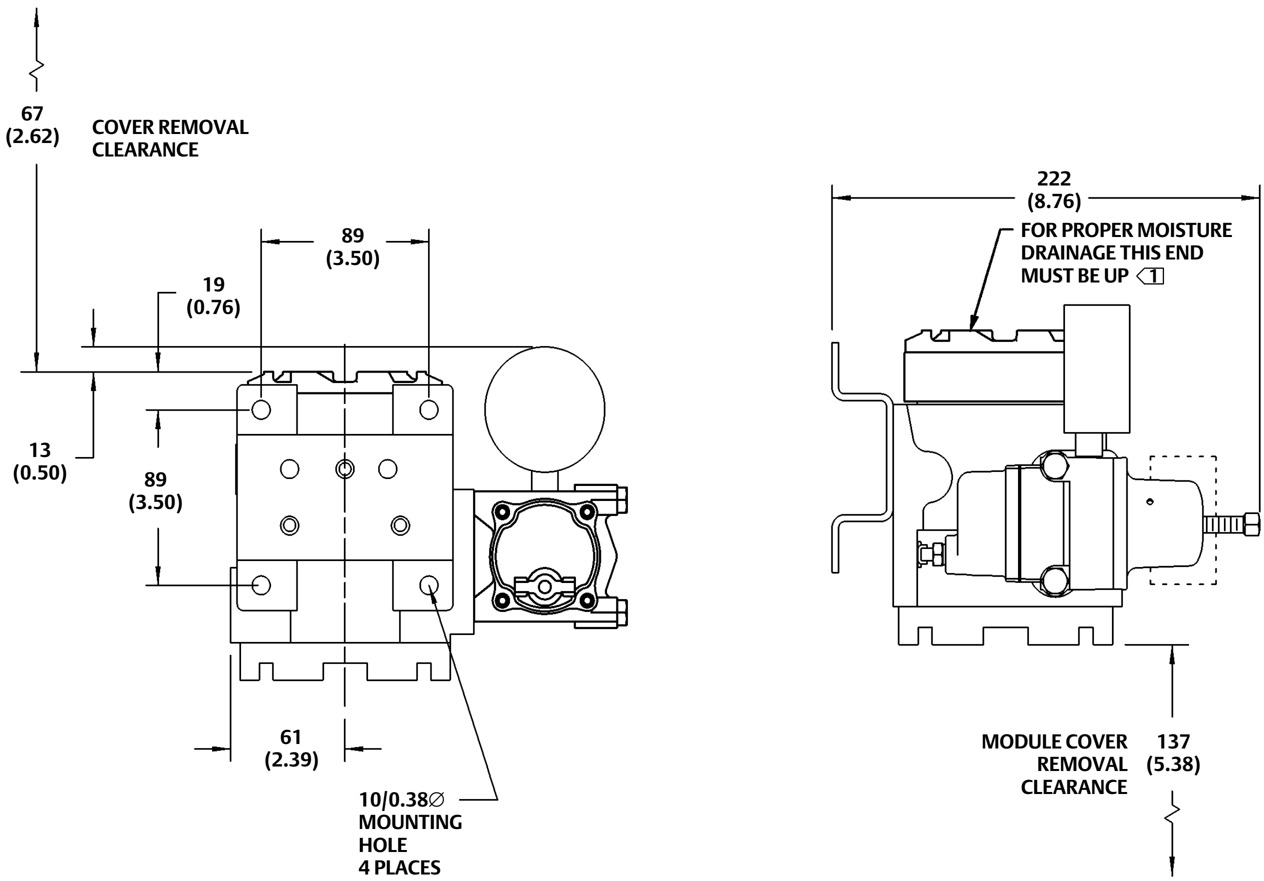
Figure 6. Dimensions with Optional Fisher 67CFR Filter-Regulator (Yoke Mounted)



Note:
1 The mounting positions shown allow any moisture buildup in the terminal compartment to drain to the signal wire conduit entrance. Do not mount the transducer with the terminal compartment cover on the bottom; moisture may accumulate in the terminal compartment or pilot stage, preventing proper transducer operation. The vertical mount is most effective for moisture drainage in wet applications.

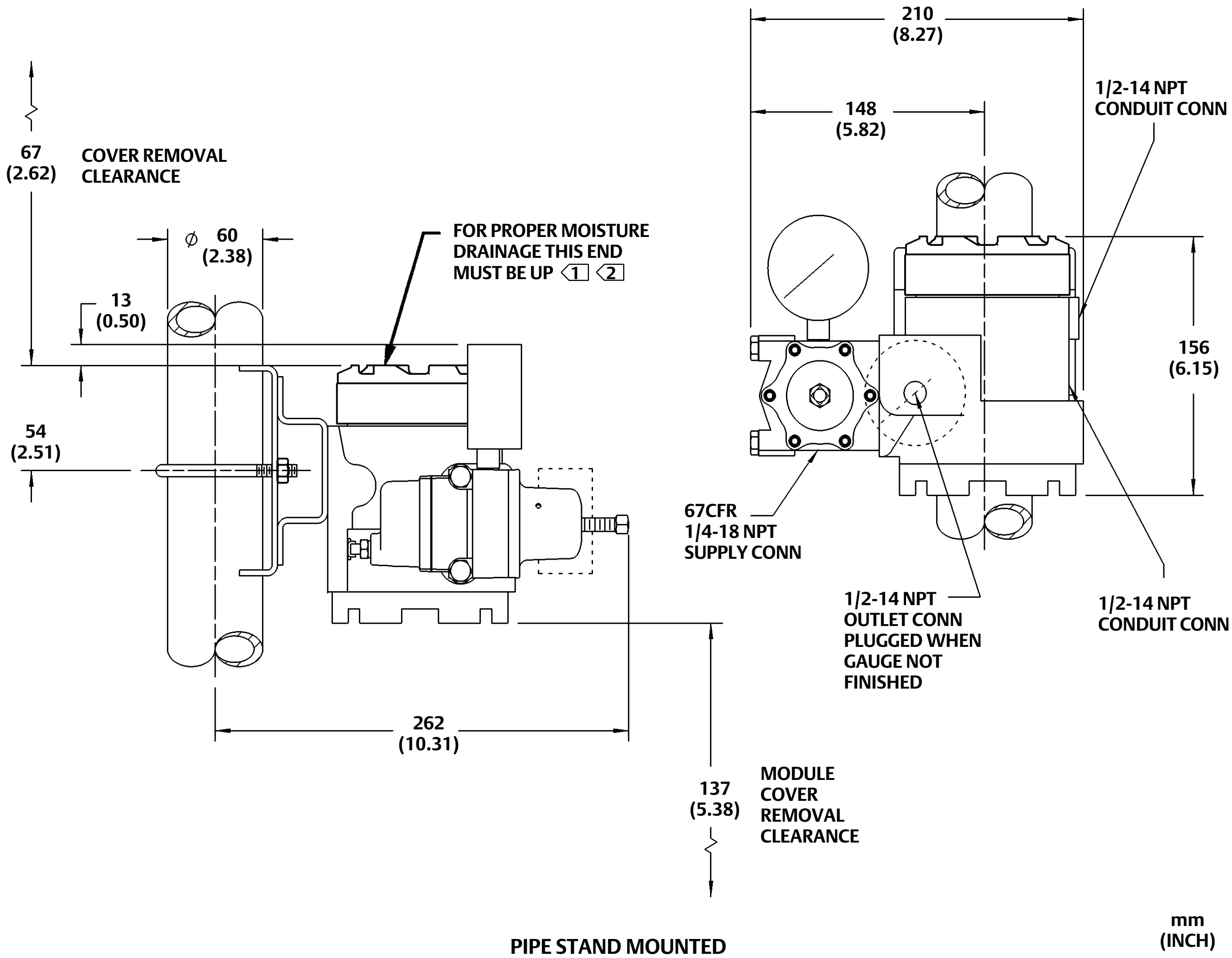
14B7361-D

Figure 7. Dimensions with Optional Fisher 67CFR Filter-Regulator (Surface/Wall Mounted)



Note:
1 The mounting positions shown allow any moisture buildup in the terminal compartment to drain to the signal wire conduit entrance. Do not mount the transducer with the terminal compartment cover on the bottom; moisture may accumulate in the terminal compartment or pilot stage, preventing proper transducer operation. The vertical mount is most effective for moisture drainage in wet applications.
14B7332-D

Figure 8. Dimensions with Optional Fisher 67CFR Filter-Regulator (Pipe Stand Mounted)



Notes:
1 The mounting positions shown allow any moisture buildup in the terminal compartment to drain to the signal wire conduit entrance. Do not mount the transducer with the terminal compartment cover on the bottom; moisture may accumulate in the terminal compartment or pilot stage, preventing proper transducer operation. The vertical mount is most effective for moisture drainage in wet applications.
2 If mounted on horizontal pipe, the I/P must be on top of the pipe for proper moisture drainage.

14B7363-D

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Fisher™ 3582 and 3582i Positioners and 582i Electro-Pneumatic Converter

Fisher 3582 pneumatic valve positioners and 3582i electro-pneumatic valve positioners, shown in figure 1, are used with diaphragm-actuated, sliding-stem control valve assemblies. The pneumatic valve positioners receive a pneumatic input signal from a control device and modulate the supply pressure to the control valve actuator, providing an accurate valve stem position that is proportional to the pneumatic input signal.

3582NS positioners are designed for nuclear power applications. The 3582NS construction includes materials that provide superior performance at elevated temperature and radiation levels. The O-rings are EPDM (ethylene propylene) and the diaphragms are EPDM/meta-aramid. EPDM demonstrates superior temperature capability and shelf life over nitrile.

Note

Use a clean, dry, oil-free air supply with instruments containing EPDM components. EPDM is subject to degradation when exposed to petroleum-based lubricants.

The meta-aramid diaphragm fabric demonstrates improved strength retention at elevated temperature and radiation conditions.

Under the 10CFR50, Appendix B, quality assurance program, the 3582NS positioner is qualified commercial grade dedicated. These can be supplied as 10CFR, Part 21 items.

The 3582i electro-pneumatic valve positioner consists of a Fisher 582i electro-pneumatic converter installed on a 3582 pneumatic valve positioner. The 3582i provides an accurate valve stem position that is proportional to a DC current input signal.

W5498-1

FISHER 3582 PNEUMATIC VALVE POSITIONER

The 582i electro-pneumatic converter, shown in figure 3, is a modular unit that can be installed at the factory or in the field.

The converter receives a DC current input signal and provides a proportional pneumatic output signal through a nozzle/flapper arrangement. The pneumatic output signal provides the input signal to the pneumatic positioner, eliminating the need for a remote mounted transducer.

Note

Upgrading an existing 3582 positioner by field installation of a 582i electro-pneumatic converter may require changing the existing positioner mounting and the input signal range. Contact your Emerson sales office when planning an upgrade.

Specifications

Note: Specifications for 3582 positioners include 3582A, 3582C, 3582D, 3582G, and 3582NS unless otherwise indicated

Available Configurations

Refer to Type Number Description on page 7

Input Signal

3582
■ 0.2 to 1.0 bar (3 to 15 psig), ■ 0.4 to 2.0 bar (6 to 30 psig), or ■ split range, see table 2.
3582i
4-20 mA DC constant current with 30 VDC maximum compliance voltage, can be split range, see table 2.

Equivalent Circuit for 3582i

120 ohms shunted by three 5.6-volt zener diodes, see figure 2

Output Signal

Type: Pneumatic pressure as required by actuator up to 95 percent of maximum supply
Action: Field-reversible between ■ direct and ■ reverse within the pneumatic valve positioner

Supply Pressure(1)

Recommended: 0.3 bar (5 psi) above actuator requirement
Maximum: 3.4 bar (50 psig) or pressure rating of actuator, whichever is lower

Supply Medium

Air or Natural Gas

The 3582i positioner is not approved for use with Natural Gas as the supply medium

Maximum Input Bellows Pressure Rating(1)

2.4 bar (35 psig)

Maximum Steady-State Air Consumption(2)

3582:
1.4 bar (20 psig) Supply: 0.38 normal m^3/hr (14.0 scfh)
2.0 bar (30 psig) Supply: 0.48 normal m^3/hr (18.0 scfh)
2.4 bar (35 psig) Supply: 0.54 normal m^3/hr (20.0 scfh)

3582i:
1.4 bar (20 psig) Supply: 0.46 normal m^3/hr (17.2 scfh)
2.0 bar (30 psig) Supply: 0.57 normal m^3/hr (21.4 scfh)
2.4 bar (35 psig) Supply: 0.64 normal m^3/hr (23.8 scfh)

Maximum Supply Air Demand(2)

1.4 bar (20 psig) Supply: 4.4 normal m^3/hr (164.5 scfh)
2.0 bar (30 psig) Supply: 6.7 normal m^3/hr (248.5 scfh)
2.4 bar (35 psig) Supply: 7.7 normal m^3/hr (285.5 scfh)

Performance

3582
Independent Linearity: ±1 percent of output signal span
Hysteresis: 0.5 percent of span

3582i
Independent Linearity: ±2 percent of output signal span
Hysteresis: 0.6 percent of span

Electromagnetic Compliance for 582i electro-magnetic converter
Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 1 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Note: Electromagnetic Compatibility also applies to the 3582i positioner

3582 and 3582i
Open Loop Gain (Output Signal):
■ 100 in the range of 0.2 to 1.0 bar (3 to 15 psig)
■ 55 in the range of 0.4 to 2.0 bar (6 to 30 psig)

Operating Influences

Supply Pressure, For 3582: Valve travel changes less than 1.67 percent per bar (0.25 percent per 2 psi) change in supply pressure
Supply Pressure, For 3582i: Valve travel changes less than 3.62 percent per bar (1.5 percent per 2 psi) change in supply pressure

- continued -

Specifications (Continued)

Operative Temperature Limits(1)

Standard Construction
3582 and 3582i: -40 to 71°C (-40 to 160°F)
3582NS: -40 to 82°C (-40 to 180°F) with EPDM elastomers
High-Temperature Construction(3)
3582A and C Only: -18 to 104°C (0 to 220°F) without gauges

Electrical Classification for 582i

CSA— Intrinsically Safe, Explosion-proof, Type n, Dust-Ignition proof, Division 2,
FM—Intrinsically Safe, Explosion-proof, Type n, Non-incendive, Dust-Ignition proof,
ATEX—Intrinsically Safe, Type n, Flameproof
IECEx—Intrinsically Safe, Type n, Flameproof (Gas Atmospheres Only)

Note: These classifications also apply to the 3582i positioner

Housing Classification for 582i

CSA—Type 3 Encl.
FM—NEMA 3, IP54
ATEX—IP64
IECEx—IP54

Mount instrument with vent on the side or the bottom if weatherproofing is a concern.

Note: These classifications also apply to the 3582i positioner

Other Classifications/Certifications for 582i

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)
INMETRO— National Institute of Metrology, Quality, and Technology (Brazil)
KGS— Korea Gas Safety Corporation (South Korea)
NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

Contact your Emerson sales office for classification/certification specific information

Note: These classifications also apply to the 3582i positioner

Hazardous Area Classifications for 3582

3582 valve positioners comply with the requirements of ATEX Group II Category 2 Gas and Dust

CE Ex II 2 G D   Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T4, T5, T6
Dust: T85...T104

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

Ex II Gb c T*X
III Db c T*X EAC

Note: These ratings do *not* apply to the 3582i positioner

Construction Materials

Refer to table 3

Pressure Gauges

40 mm (1.5 inch) diameter with plastic case and brass connection
■ triple scale (PSI, MPa, and bar) or
■ dual scale (PSI and kg/cm^2)

Pressure Connections

1/4 NPT internal

Electrical Connection for 3582i

1/2-14 NPT conduit connection

Maximum Valve Stem Travel

105 mm (4.125 inches); adjustable to obtain lesser travel with standard input signal

- continued -

Specifications (Continued)

Characterized Cams

See characterized cams section

Approximate Weight

3582: 2.5 kg (5-1/2 pounds)
3582i: 3.6 kg (8 pounds)

Options

■ Instrument, output, and supply pressure gauges; automotive tire valves; or pipe plugs (see Type Number Description section) ■ Bypass valve (only for direct-acting, 3582 positioners using a full input signal range) ■ Characterized cams B and C ■ Connectors for diagnostic testing ■ High vibration

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.
2. Normal m^3/hr--normal cubic meters per hour (0°C and 1.01325 bar absolute); Scfh--standard cubic feet per hour (60°F and 14.7 psia).
3. Not available with bypass or pressure gauges.

Table 1. Fisher 582i Electro-Pneumatic Converter(1) EMC Summary Results—Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(2)
Enclosure	Electrostatic Discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

Specification limit = ±1% of span
1. The information contained in the table also applies to the 3582i positioner.
2. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Table 2. Split-Range Capabilities

3582 POSITIONERS				
Split	0.2 to 1.0 Bar or 3 to 15 Psig Input Signal		0.4 to 2.0 Bar or 6 to 30 Psig Input Signal	
	Bar	Psig	Bar	Psig
Two-way	0.2 to 0.6 0.6 to 1.0	3 to 9 9 to 15	0.4 to 1.2 1.2 to 2.0	6 to 18 18 to 30
Three-way	0.2 to 0.5 0.5 to 0.7 0.7 to 1.0	3 to 7 7 to 11 11 to 15	0.4 to 0.9 0.9 to 1.5 1.5 to 2.0	6 to 14 14 to 22 22 to 30
3582i POSITIONER				
Split	**4-20 Milliampere Input Signal**			
Two-way	4 to 12 12 to 20			
Three-way	4 to 9.3 9.3 to 14.7 14.7 to 20			

Figure 1. Fisher 3582i Electro-Pneumatic Valve Positioner

Figure 2. Equivalent Circuit

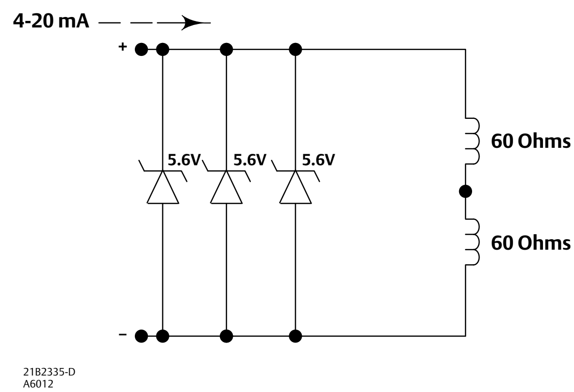
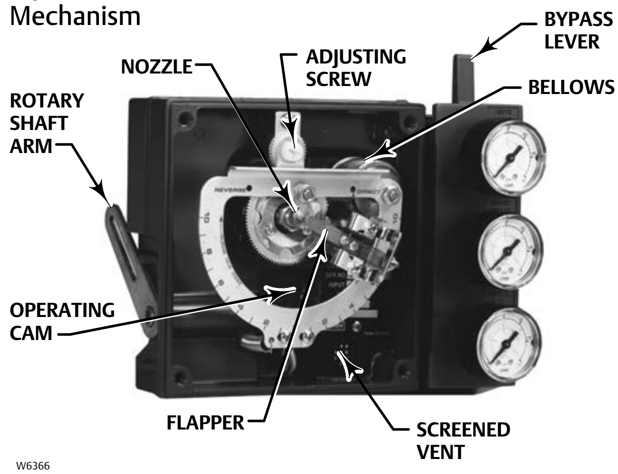


Table 3. Construction Materials

PART	MATERIAL	
	Standard	High-Temperature
Positioner		
Case	Low copper aluminum alloy	---
Cover	Impact-resistant plastic	---
Bellows	Phosphor bronze	---
O-Ring		
All 3582 except 3582NS	Nitrile	Fluorocarbon
3582NS	EPDM	---
Connectors for Diagnostic Testing	Stainless Steel or Brass	---
Relay		
Castings	Aluminum	---
Diaphragms		
All 3582 except 3582NS	Nitrile/Polyester	Polyacrylate-Nylon
3582NS	EPDM/meta-aramid	---
O-Rings		
All 3582 except 3582NS	Nitrile	Fluorocarbon
3582NS	EPDM	---
Gaskets	Nitrile/polyester	Polyacrylate-Nylon
582i Converter		
Case and Cover	Low copper aluminum alloy	---
O-Rings	Nitrile	---

Figure 3. Fisher 582i Electro-Pneumatic Converter

Figure 4. Fisher 3582 Pneumatic Valve Positioner Mechanism



Features

- **Versatile Modular Design**—3582 positioners can be upgraded in the field to an electro-pneumatic 3582i by replacing the gauge block with the 582i electro-pneumatic converter (figure 3) assembly. The converter assembly attaches to the positioner case, providing a cost-effective conversion. Thus, in the field, 3582 positioners can be upgraded from pneumatic to electronic to match new control strategies.

Note

Upgrading existing 3582 positioners by field installation of a 582i electro-pneumatic converter may require changing the existing positioner mounting and the input signal range. Contact your Emerson sales office when planning an upgrade.

- **Accurate, Efficient, Vibration-Resistant Operation**—3582 and 3582i positioners offer a field-proven positioner design which is accurate, fast-responding and able to withstand the vibrations of most plant environments. Low steady-state air consumption contributes to efficient operation.

- **Rangeability**—Both 3582 and 3582i positioners provide split range capabilities. The range of the adjustable zero and span permits the use of all standard input signals including split ranges.

- **Simplified Spare Parts Inventories**—Because units from one positioner family can be used in a variety of control applications, basic spare parts inventory requirements are simplified and fewer spare parts are needed to support a plant-wide positioner applications base.

- **Easy Positioner Adjustments**—With the cover removed, as shown in figure 4, zero and span adjustments are easily accessible and can be made with a screw driver. Zero adjustments can be made with a spanner.

- **Stable Operation**—Changes in supply pressure and valve load have minimal effect on positioner operation.

- **Corrosion Resistance**—Case, components, and gasket materials withstand harsh environments. Positioner bleed air purges internal parts for additional protection.

- **Field Reversible**—Simple adjustments permit switching between direct and reverse action.

- **Control Valve Diagnostic Testing Capability**—To support diagnostic testing of valve/actuator/positioner packages with the FlowScanner™ valve diagnostic system, connectors, piping, and other hardware can be installed between the 3582 or 3582i and the actuator.

Type Number Description

The Fisher 3582 series of positioners include the models listed below.

3582—Pneumatic valve positioner with bypass and instrument, supply, and output pressure gauges.

3582A—Pneumatic valve positioner without bypass and without pressure gauges.

3582C—Pneumatic valve positioner without bypass and with automotive tire valves instead of pressure gauges.

3582D—Pneumatic valve positioner with bypass and with automotive tire valves instead of pressure gauges.

3582G—Pneumatic valve positioner without bypass and with instrument, supply, and output pressure gauges.

3582NS—Pneumatic valve positioner for nuclear service applications with or without bypass and with automotive tire valves instead of pressure gauges.

3582i—Electro-pneumatic valve positioner without bypass; with 582i converter; and with: ■ supply and output pressure gauges, ■ automotive tire valves, or ■ pipe plugs.

582i—Electro-pneumatic converter with: ■ supply and output pressure gauges, ■ automotive tire valves, or ■ pipe plugs. Used for conversion of a 4-20 milliampere input signal to a 0.2 to 1.0 bar (3 to 15 psig) input signal for the pneumatic valve positioner.

83L—Pneumatic relay included as part of both 3582 and 3582i positioners.

Principle of Operation

3582 positioners (3582, 3582NS and 3582A, C, D, and G pneumatic valve positioners) accept a pneumatic input signal from a control device. The operational schematic in figure 5 depicts the direct-acting pneumatic valve positioner.

Supply pressure is connected to the 83L relay. A fixed restriction in the relay limits flow to the nozzle so that when the flapper is not restricting the nozzle, air can bleed out faster than it is being supplied.

The input signal from the control device is connected to the bellows. When the input signal increases, the bellows expands and moves the beam. The beam pivots about the input axis moving the flapper closer to the nozzle. The nozzle pressure increases and, through relay action, increases the output pressure to the diaphragm actuator. The increased output pressure to the actuator causes the actuator stem to move downward. Stem movement is fed back to the beam by means of a cam. As the cam rotates, the beam pivots about the feedback axis to move the flapper slightly away from the nozzle. The nozzle pressure decreases and reduces the output pressure to the actuator. Stem movement continues, backing the flapper away from the nozzle, until equilibrium is reached.

When the input signal decreases, the bellows contracts (aided by an internal range spring) and the beam pivots about the input axis to move the flapper away from the nozzle. Nozzle pressure decreases and the relay permits the release of diaphragm casing pressure to atmosphere. The actuator stem moves upward. Through the cam, stem movement is fed back to the beam to reposition the flapper closer to the nozzle. When equilibrium conditions are obtained, stem movement stops and the flapper is positioned to prevent any further decrease in diaphragm case pressure.

The principle of operation for reverse acting units is similar except that as the input signal increases, the diaphragm casing pressure is decreased. Conversely, a decreasing input signal causes an increase in the pressure to the diaphragm casing.

As shown in figure 6, the 3582i electro-pneumatic positioner accepts a DC current input signal provided to the 582i electro-pneumatic converter attached to the positioner. The 582i provides the pneumatic input signal pressure used by the pneumatic positioner.

Figure 5. Fisher 3582 Positioner Schematic Diagram

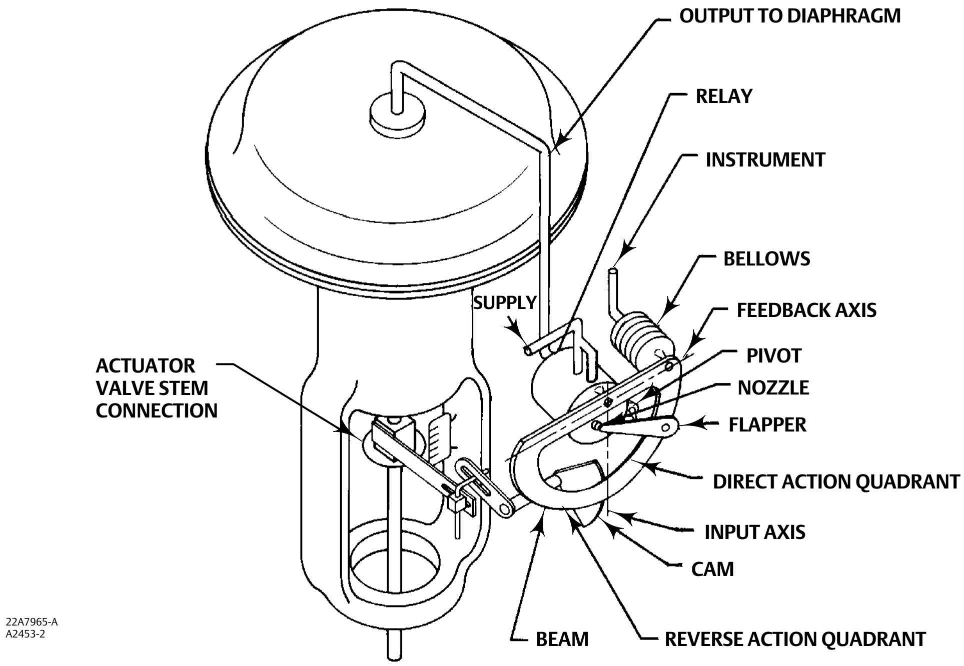
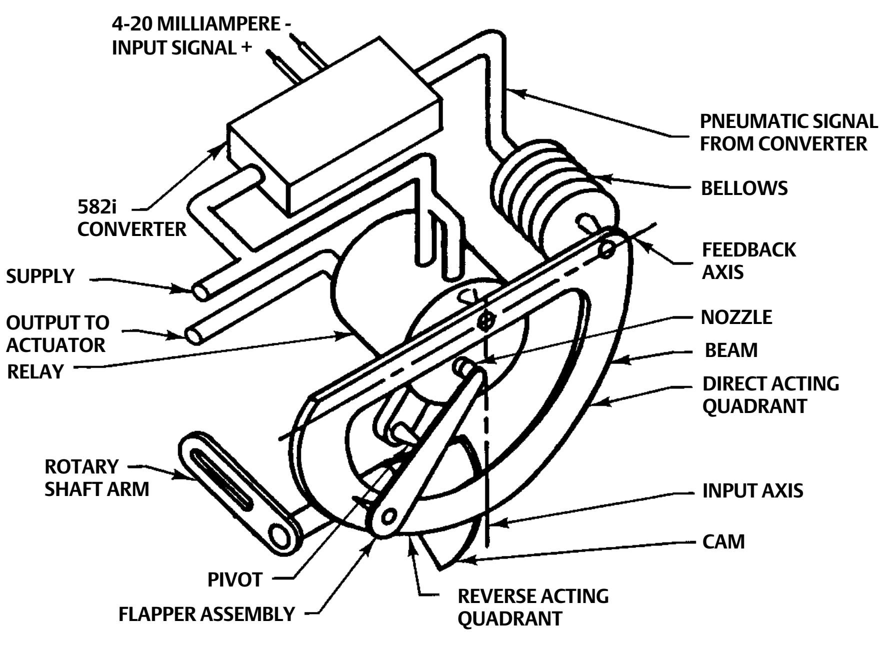


Figure 6. Fisher 3582i Positioner Schematic Diagram

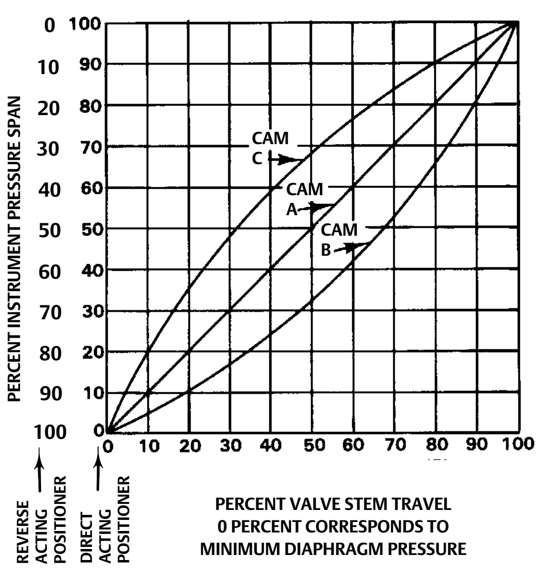


Characterized Cams

Three cams are available for 3582 valve positioners. A linear cam (cam A) is supplied with the unit. Two characterized cams (cams B and C) are available as options. Figure 7 shows the resultant stem travel due to an incremental instrument pressure change for each cam. When the linear cam is the operating cam, there is a linear relationship between an incremental input signal change and valve travel, and the flow characteristic of the valve is that of the control valve. When either characterized cam is the operating cam, the relationship between an incremental input signal change and valve travel changes thereby modifying the valve flow characteristics. Figure 8 shows how the characteristic is modified for an equal percentage valve. Figure 9 shows how the characteristic is modified for a linear valve.

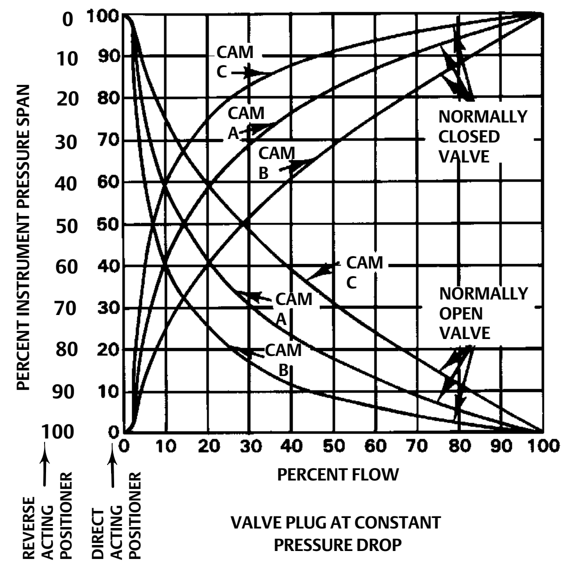
Because 3582 positioners mount the same way on either direct-acting or reverse-acting diaphragm actuators, the cams are reversible.

Figure 7. Instrument Pressure Versus Valve Travel



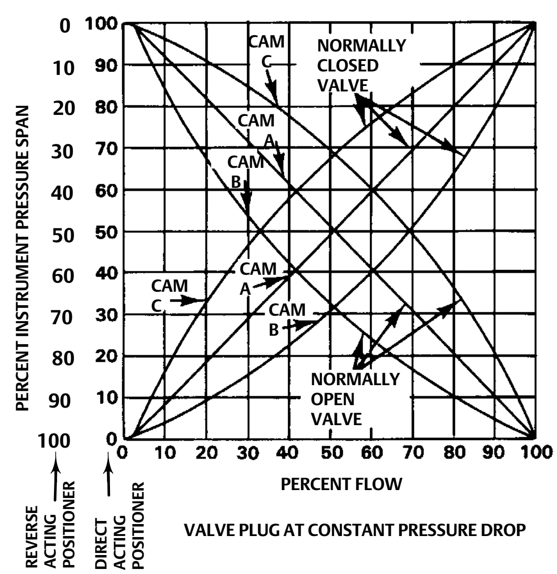
CK4832-A
A1413

Figure 8. Equal Percentage Valve Flow Characteristics as Modified by Various Cams



CK4835-A
A1415-1

Figure 9. Linear Valve Flow Characteristics as Modified by Various Cams



CK4833-A
A1414

Installation

Figure 10 shows a typical positioner mounting for a direct- or reverse-acting actuator. Positioner overall dimensions and connections are shown in figure 10 and table 4.

Ordering Information

When ordering, please specify the product application and construction:

Application

1. Positioner type number. When ordering a 3582i electro-pneumatic positioner, specify: ■ supply and output pressure gauges, ■ automotive tire valves, or ■ pipe plugs

2. Maximum supply pressure available

3. Direct or reverse acting

4. Valve stroke in inches; actuator type and size

5. Initial cam set-up (cam A, B, or C)

6. Input signal

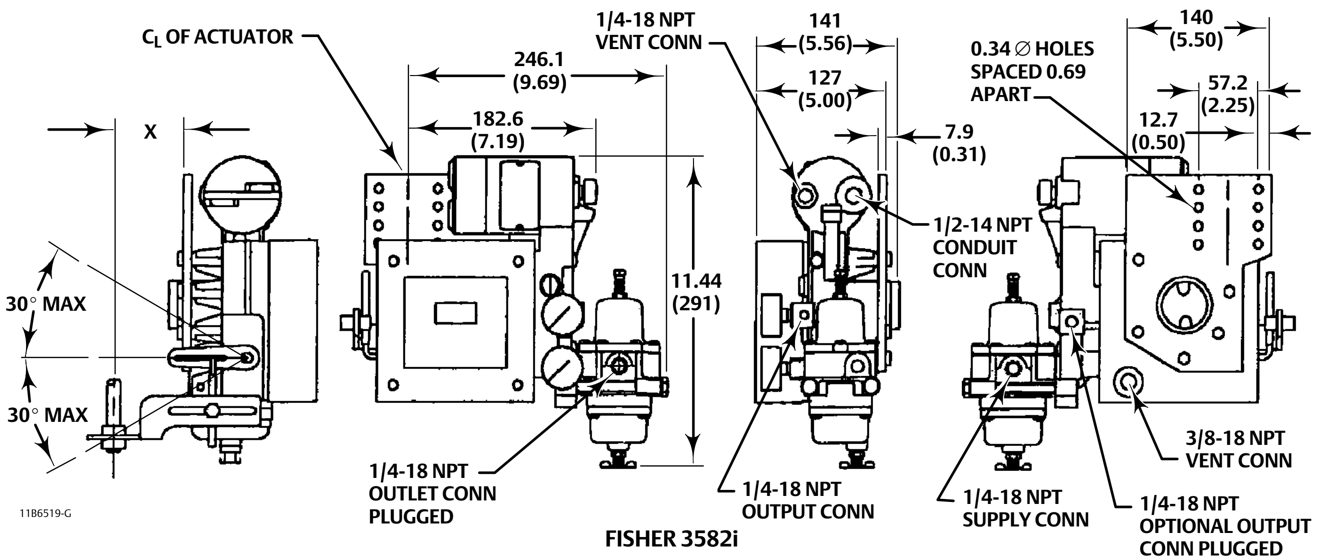
7. Supply pressure regulator and test pressure gauge

8. Connectors for diagnostic testing, if required

Construction

Refer to the specifications. Carefully review each specification; indicate your choice whenever a selection is offered.

Figure 10. Valve Positioner Dimensions and Connections (see table 4 for the X dimension)



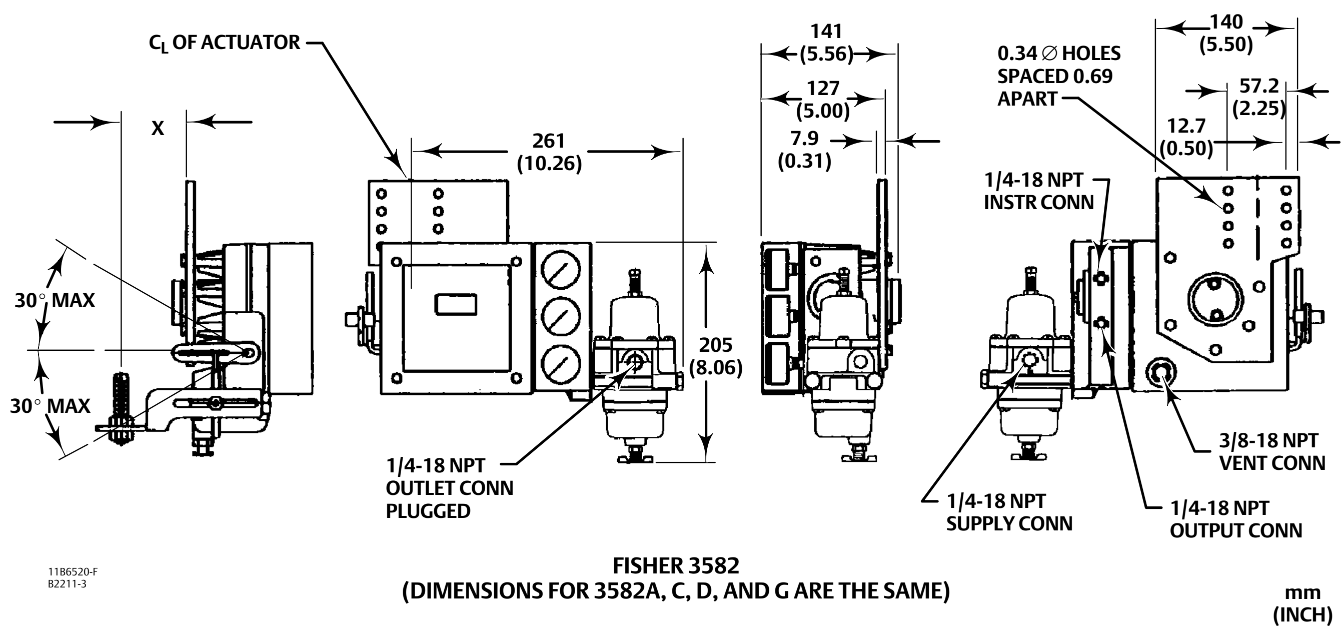


Table 4. Dimensions

STEM TRAVEL		X					
		9.5 mm (0.375 inch) Stem		12.7 mm (0.50 inch) Stem		19.1 mm (0.75 inch) Stem	
mm	Inch	mm	Inch	mm	Inch	mm	Inch
29 or less	1.125 or less	81	3.19	87	3.44	100	3.94
38	1.50	90	3.56	97	3.81	109	4.31
51	2	102	4.00	108	4.25	121	4.75
64	2.50	113	4.44	119	4.69	132	5.19
76	3	124	4.88	130	5.12	143	5.62
89	3.50	135	5.31	141	5.56	154	6.06
102	4	146	5.75	152	6.00	165	6.50

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Fisher™ 3610J and 3620J Positioners and 3622 Electro-Pneumatic Converter

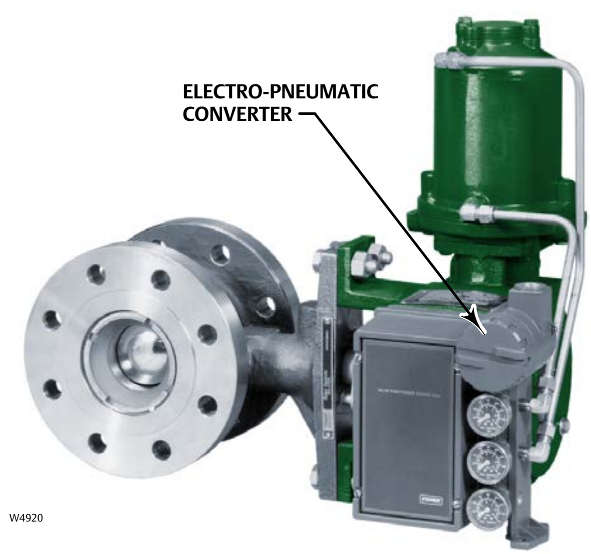
Fisher 3610J, 3610JP, 3620J, 3620JP, 3621JP, and 3622 instruments are part of the 3600 series of positioners. 3610J or 3610JP pneumatic and 3620J or 3620JP electro-pneumatic positioners are used in combination with either single or double-acting actuators to accurately position control valves used in throttling applications. These rugged positioners provide a valve position proportional to a pneumatic or a DC current input signal.

The 3610J or 3610JP pneumatic positioner in combination with the Fisher 3622 electro-pneumatic converter becomes the 3620J or 3620JP positioner, respectively. This integral electro-pneumatic converter, can be factory installed or installed in the field on existing positioners. The electro-pneumatic converter receives the DC current input signal and provides a proportional pneumatic output signal through a nozzle/flapper arrangement.

The output signal from the converter becomes the input signal pressure to the pneumatic positioner, eliminating the need for a remote mounted transducer.

The positioner mounts on the actuator as shown below. Figure 1 shows the cam feedback mechanism for a positioner mounted on the actuator. Positioner bleed air continually purges the enclosure containing the feedback lever and the feedback linkages.

To support diagnostic testing of valve/actuator/positioner packages, connectors, piping, and other hardware can be installed between the 3610J or 3620J positioner and the actuator.



3620JP ELECTRO-PNEUMATIC POSITIONER WITH 1061 ACTUATOR AND V500 VALVE

3610J PNEUMATIC POSITIONER WITH 2052 ACTUATOR AND V500 VALVE

Specifications

Available Configurations

Refer to the type number description on page 6

Input Signal

3610J or 3610JP:
Standard: ■ 0.2 to 1.0 bar (3 to 15 psig), ■ 0.4 to 2.0 bar (6 to 30 psig), or ■ split range, see table 1.
Adjustable: Zero is adjustable from 0.07 to 1.5 bar (1 to 22 psig) for standard valve rotations. Span is adjustable from 0.2 to 2.0 bar (3.2 to 28.8 psi) for standard valve rotations. Location of adjustments are shown in figure 2.

3620J and 3620JP:
4-20 mA DC constant current with 30 VDC maximum compliance voltage. Minimum terminal voltage is 2.4 VDC at 20 mA. Split range is also available, see table 1.

Output Signal

Pneumatic pressure as required by the actuator up to full supply pressure
Action(1): Field-reversible between ■ direct and ■ reverse within the pneumatic positioner

Equivalent Circuit

3620J and 3620JP: 120 ohms shunted by three 5.6 V zener diodes

Typical Performance

Independent Linearity:
Direct-Acting 3610J and 3620J: ±1.5% of output span
Reverse-Acting 3610J and 3620J: ±0.75% of output span
Direct-Acting 3610JP and 3620JP: ±1.25% of output span
Reverse-Acting 3610JP and 3620JP: ±0.5% of output span

Hysteresis:
3610J: 1.0% of output span
3620J: 0.75% of output span
3610JP: 0.5% of output span
3620JP: 0.6% of output span

Deadband: 0.1% of input span

Electromagnetic Compliance for 3622 electro-pneumatic converter:
Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 2 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Note:The Electromagnetic Compliance specifications also apply to 3620J positioners

Maximum Supply Air Demand(2)

3610J and 3620J:
1.4 bar (20 psig) Supply: 13 normal m^3/hour (490 scfh)
2.4 bar (35 psig) Supply: 17 normal m^3/hour (640 scfh)

3610JP and 3620JP:
5.2 bar (75 psig) Supply: 37 normal m^3/hour (1380 scfh)
6.9 bar (100 psig) Supply: 46 normal m^3/hour (1700 scfh)

Operating Influences

Supply Pressure Sensitivity: A 10% change in supply pressure changes the valve shaft position less than the following percentages of valve rotation:
3610J and 3620J:
1.0% at 1.4 bar (20 psig) supply pressure
3610JP and 3620JP: 1.5% at 4.1 bar (60 psig) supply pressure

Supply Pressure(3)

Minimum Recommended: 0.3 bar (5 psig) above actuator requirement [1.4 bar (20 psig) for a 0.2 to 1.0 bar (3 to 15 psig) nominal actuator signal; 2.4 bar (35 psig) for a 0.4 to 2.0 bar (6 to 30 psig) nominal actuator signal].
Maximum: 10.3 bar (150 psig) or maximum pressure rating of the actuator, whichever is lower.

Supply Medium: Air or Natural Gas

3620J and 3620JP are not approved for use with natural gas as the supply medium

- continued -

Specifications (continued)

Steady-State Air Consumption(2)

3610J: 0.40 normal m^3/hour (15 scfh) at 1.4 bar (20 psig) supply pressure

3610JP: 0.64 normal m^3/hour (24 scfh) at 6.9 bar (100 psig) supply pressure

3620J: 0.49 normal m^3/hour (18 scfh) at 1.4 bar (20 psig) supply pressure

3620JP: 0.93 normal m^3/hour (35 scfh) at 6.9 bar (100 psig) supply pressure

Operative Temperature Limits(3)

-40 to 82°C (-40 to 180°F)

Electrical Classification for 3622

Hazardous Area:

CSA— Intrinsically Safe, Explosion proof, Type n Dust-Ignition proof, Division 2

FM— Intrinsically Safe, Explosion proof, Type n, Non-incendive, Dust-Ignition proof,

ATEX— Intrinsically Safe, Type n, Flameproof

IECEx— Intrinsically Safe, Type n, Flameproof (Gas Atmospheres Only)

Note: These classifications also apply to 3620J positioners

Housing Classification for 3622

CSA— Type 3 Encl.

FM— NEMA 3, IP54

ATEX— IP64

IECEx— IP54

Mount instrument with vent on side or bottom if weatherproofing is a concern.

Note: These classifications also apply to 3620J positioners

Other Classifications/Certifications for 3622

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KGS— Korea Gas Safety Corporation (South Korea)

Contact your Emerson sales office for classification/certification specific information

Note: These classifications also apply to 3620J positioners

Hazardous Area Classification for 3610J Positioners

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

CE Ex II 2 G D
Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T6
Dust: T82

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

Ex II Gb c T*X
III Db c T*X EAC

Note: These ratings do *not* apply to 3620J positioners

Construction Materials

All Positioners:
Case: Low copper aluminum alloy
Cover: Polyester plastic
Feedback Lever: Stainless steel
Range Spring: Zinc-plated steel
Input Module and Relay Diaphragms: Nitrile and polyester
Relay Valve Plugs and Seats: Stainless steel
Tubing: Copper (standard)
Fittings: Brass (standard)
Gauges: Chrome-plated brass connection with plastic case

3620J and 3620JP:
Housing and Cap: Low copper aluminum alloy

Pressure Connections

1/4 NPT internal

- continued -

Specifications (continued)

Rotary Valve Rotation

60, 75, or 90 degrees

Characterized Cams

See Characterized Cams section

Electrical Connection for 3620J and 3620JP

1/2-14 NPT Conduit Connection

Options

3610J and 3610JP:
■ Supply pressure gauge, ■ tire valves, or ■ plugs,
■ Integral mounted bypass valve on 3610J only

3620J and 3620JP:
■ Supply pressure gauge, ■ tire valves, or ■ plugs

Approximate Weight

3610J positioners: 2.5 kg (5.6 pounds)
3620J positioners: 3.6 kg (8.0 pounds)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. For direct action, an increasing input signal extends the actuator rod. For reverse action, an increasing input signal retracts the actuator rod.
2. Normal m^3/hr--normal cubic meters per hour (0°C and 1.01325 bar absolute). Scfh--standard cubic feet per hour (60°F and 14.7 psia).
3. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.

Table 1. Split-Range Capabilities

3610J AND 3610JP POSITIONERS(1)				
Split	0.2 to 1.0 Bar (3 to 15 Psig) Input Signal		0.4 to 2.0 Bar (6 to 30 Psig) Input Signal	
	Bar	Psig	Bar	Psig
Two-way	0.2 to 0.6 0.6 to 1.0	3 to 9 9 to 15	0.4 to 1.2 1.2 to 2.0	6 to 18 18 to 30
Three-way	0.2 to 0.5 0.5 to 0.7 0.7 to 1.0	3 to 7 7 to 11 11 to 15	0.4 to 0.9 0.9 to 1.5 1.5 to 2.0	6 to 14 14 to 22 22 to 30
3620J AND 3620JP POSITIONERS(1)				
Split	**4-20 Milliampere Input Signal**			
Two-way	4 to 12 12 to 20			
Three-way	4 to 9.3 9.3 to 14.7 14.7 to 20			

1. This table is only valid for the following standard valve rotations/range spring combinations: 90°/18A7845X012 (blue), 75°/18A7846X012 (yellow), and 60°/18A5118X012 (red). Contact your Emerson sales office for input signal ranges not listed.

Table 2. Fisher 3622 Electro-Pneumatic Converter(1) EMC Summary Results—Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(2)
Enclosure	Electrostatic Discharge (ESD)	IEC 61000-4-2	4 kV contact; 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

Specification limit = ±1% of span
1. The information contained in the table also applies to 3620J, 3620JP, and 3621JP electro-pneumatic positioners.
2. A=No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Figure 1. Typical Fisher 3610J and 3620J Positioner Mounting

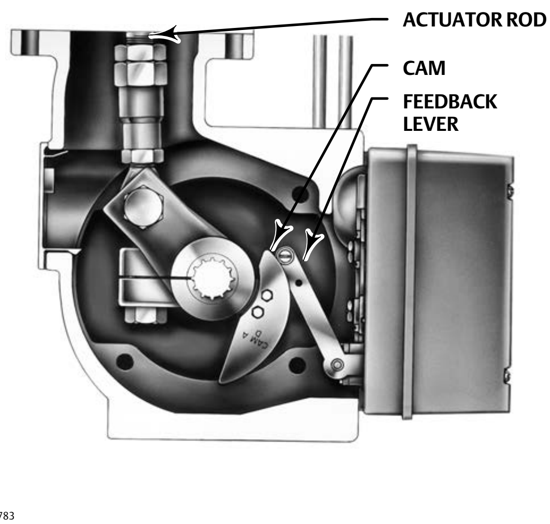
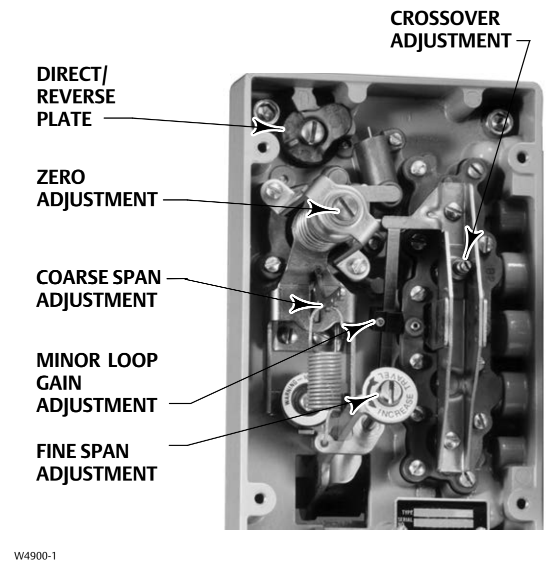


Figure 2. Adjustments for Fisher 3610J and 3620J Positioners



Features

- **Accurate, Efficient, Vibration-Resistant Operation**—The positioner provides accurate, fast-response and can withstand the vibrations of most plant environments. Low steady-state air consumption contributes to efficient operation.

- **Modular Design**— The pneumatic 3610J positioner easily converts to an electro-pneumatic 3620J positioner by replacing the existing gauge block with the 3622 electro-pneumatic converter assembly. The converter assembly attaches to the existing positioner, providing a simple, compact, and cost-effective conversion.

- **Versatility**—3610J and 3610JP positioners accept a pneumatic input signal and 3620J and 3620JP positioners accept a DC current input signal from a control device. The pneumatic and electro-pneumatic positioners provide split range capabilities and adjustable zero and span. The rangeability of the positioner zero and span permits using a single range spring for all standard input signals including split ranges.

- **Fewer Spare Parts**—Most of the parts for 3610J and 3610JP or 3620J and 3620JP positioners are interchangeable, requiring fewer spare parts to support these positioners.

- **Easy Positioner Adjustments**—With the cover removed, zero, span, and cross-over adjustments, shown in figure 2, are easily accessible and can be made with a screwdriver.

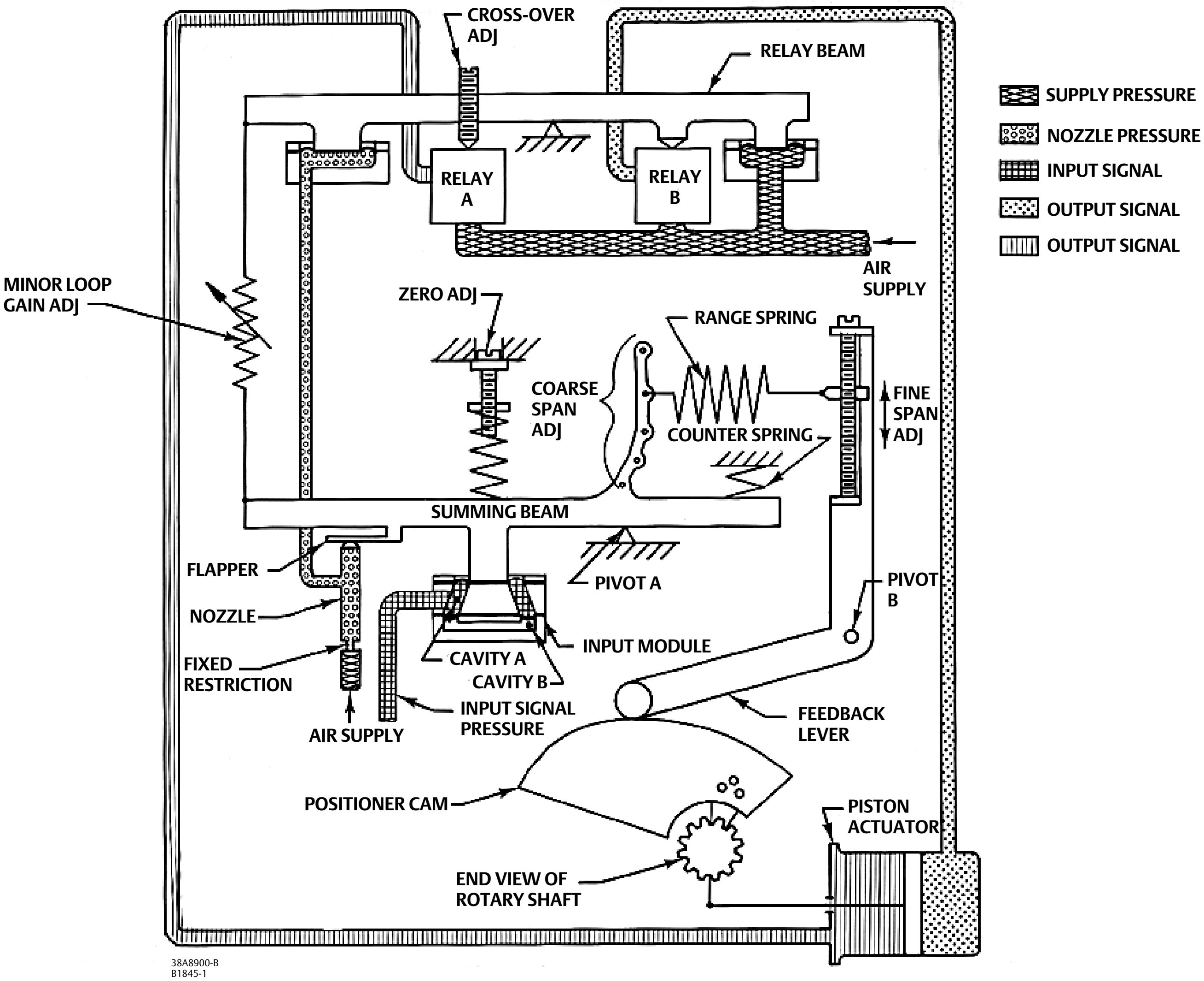
- **Application Flexibility**—Easily adjustable minor loop gain fine tunes the positioner to optimize dynamic response for each specific actuator size and application.

- **Stable Operation**—Changes in supply pressure have minimal effect on positioner operation.

- **Corrosion Resistant**—Case, components, and gasket materials withstand harsh environments. Positioner bleed air purges internal parts and actuator housing for additional protection.

- **Field Reversible**—Simple adjustments permit switching between direct and reverse action; no additional parts are required.

Figure 3. Schematic of Fisher 3610JP Positioner



Type Number Description

The Fisher 3600 series of positioners include the models listed below.

The following descriptions provide specific information on the different positioner constructions.

3610J: A single-acting pneumatic rotary valve positioner for use with Fisher 1051 and 1052 actuators.

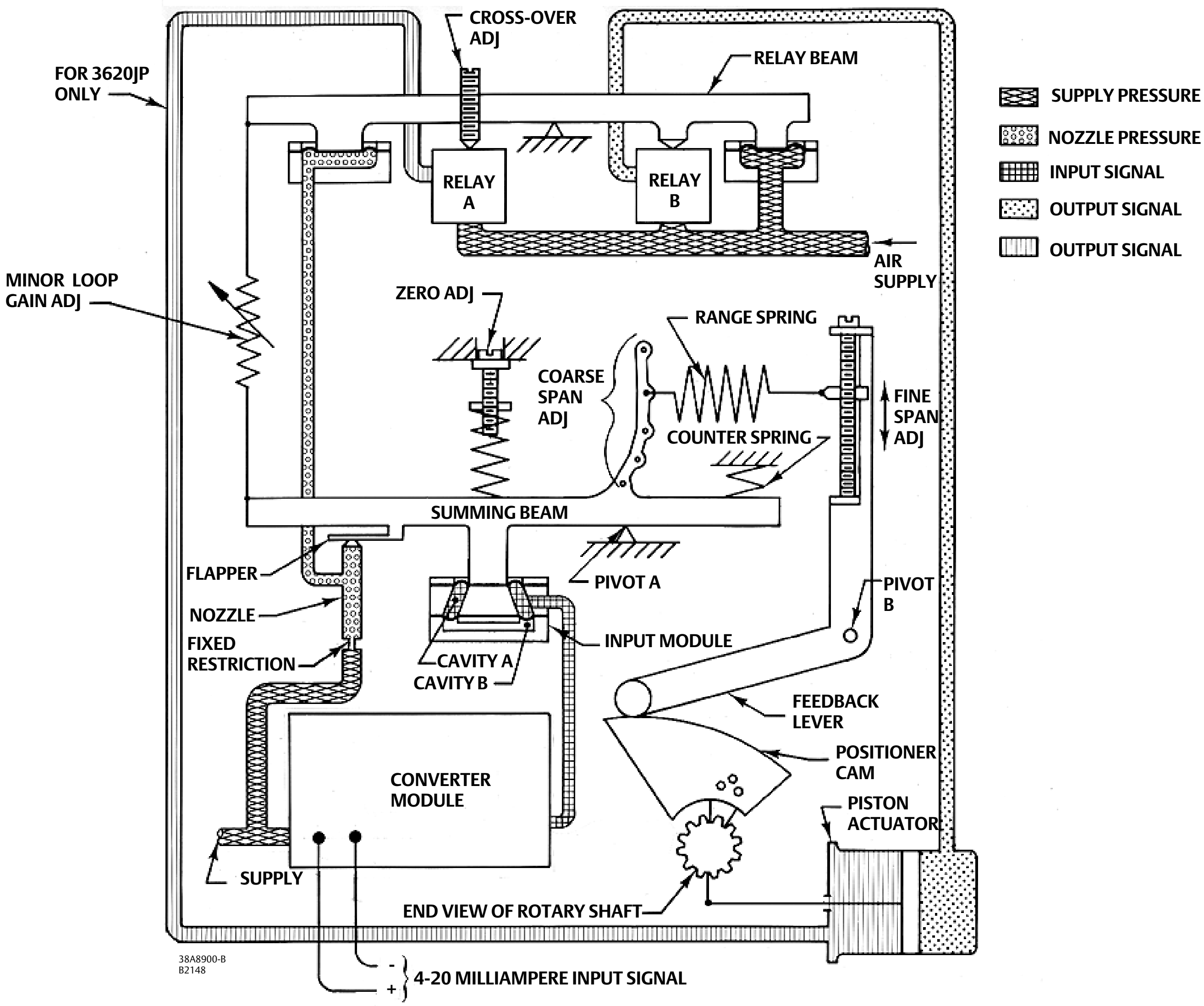
3610JP: A double-acting pneumatic rotary valve positioner for use with Fisher 1061 and 1069 actuators.

3620J: A single-acting electro-pneumatic rotary valve positioner for use with 1051 and 1052 actuators.

3620JP: A double-acting electro-pneumatic rotary valve positioner for use with 1061 and 1069 actuators.

3622: An electro-pneumatic converter that converts a 4-20 mA DC input signal to a 3 to 15 psig (0.2 to 1.0 bar) input signal for the pneumatic positioner. Combining this unit with a 3610J or 3610JP positioner produces a 3620J or 3620JP positioner, respectively.

Figure 4. Schematic of Fisher 3620JP Positioner



Principle of Operation

3610J positioners accept a pneumatic input signal and 3620J positioners accept a DC current input signal from a control device.

These positioners are force-balanced instruments that provide a valve shaft position proportional to the input signal. The following describes the principle of operation for 3610JP and 3620JP positioners. The principle of operation for 3610J and 3620J positioners is similar except relay A is not used. Refer to figures 3 and 4 while reading the following descriptions.

For direct action, input signal pressure from a control device is channeled to cavity A in the input module. An increase in input signal pressure results in a downward force on the summing beam, pivoting the summing beam counterclockwise. This moves the flapper slightly toward the nozzle, increasing the nozzle pressure. As nozzle pressure increases, the relay beam pivots clockwise, causing relay B to increase upper cylinder pressure and relay A to exhaust lower cylinder pressure of the actuator.

As a result, the actuator rod extends and the actuator rotary shaft rotates clockwise. This causes the feedback lever to pivot clockwise and the force applied to the summing beam by the range spring increases. This force, which opposes the downward force on the summing beam caused by the increasing input signal pressure, continues to increase until the summing beam torques are in equilibrium. At this point, the valve shaft is in the correct position for the specific input signal applied.

For reverse action, input signal pressure is channeled to both cavities A and B. An increase in signal pressure results in an upward force on the summing beam, pivoting the summing beam clockwise and causing relay B to exhaust upper actuator cylinder pressure to atmosphere and relay A to increase lower actuator cylinder pressure. As a result, the actuator rod retracts and the actuator rotary shaft rotates counterclockwise. This causes the feedback arm to pivot counterclockwise reducing the force applied to the summing beam by the range spring.

As the valve shaft rotates counterclockwise, the range spring force to the summing beam continues to reduce until the summing beam torques are in equilibrium. At this point, the valve shaft is in the correct position for the specific input signal applied.

3620J or 3620JP positioners (figure 4) are a combination of a 3610J or a 3610JP positioner with a 3622 electro-pneumatic converter. The electro-pneumatic converter provides a 0.2 to 1.0 bar (3 to 15 psig) output pressure proportional to the 4-20 mA DC input signal. The 0.2 to 1.0 bar (3 to 15 psig) output pressure becomes the input signal pressure to the 3610J or 3610JP pneumatic positioner.

Installation

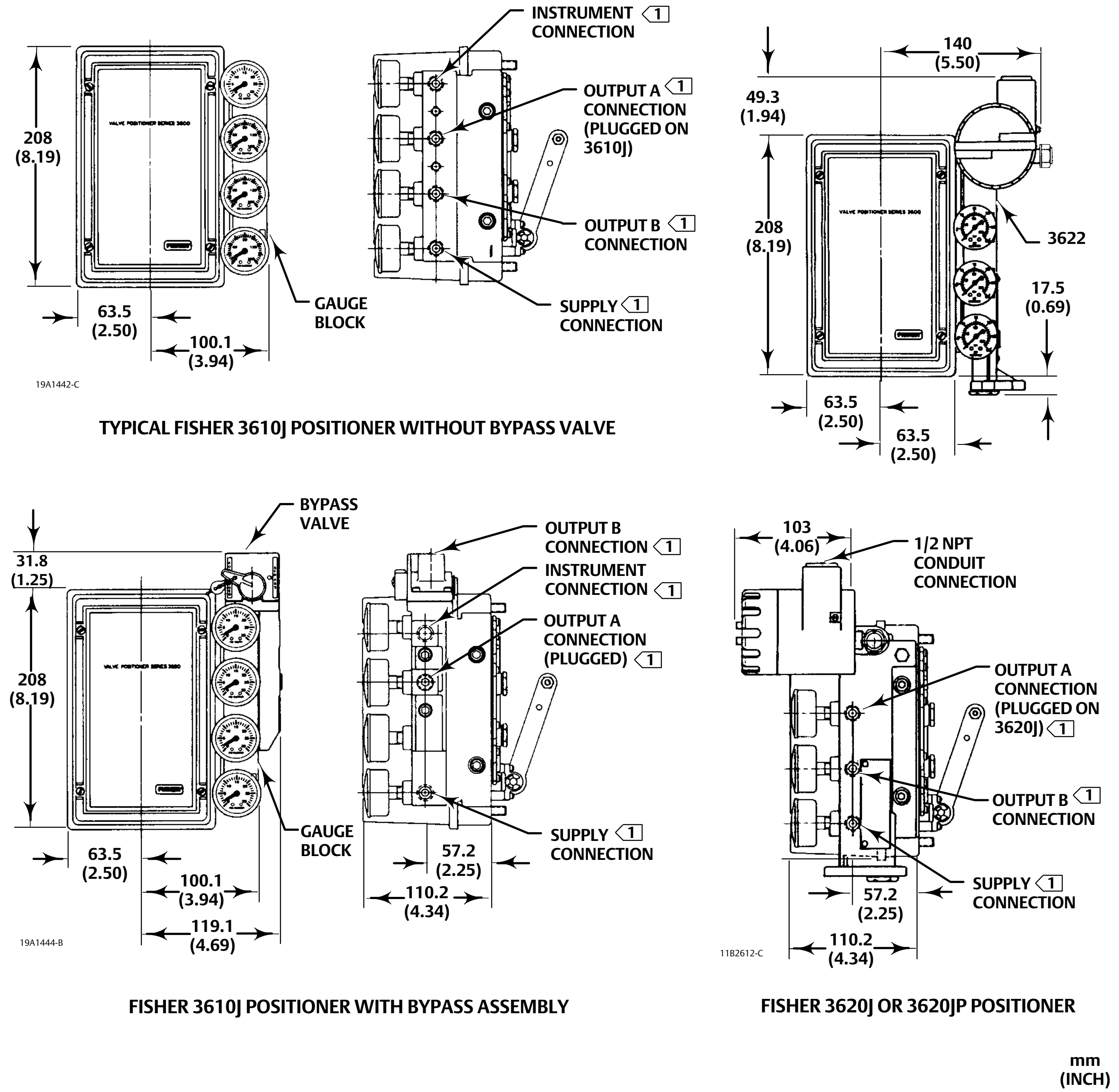
The supply pressure medium must be a clean, dry, and oil-free air, or noncorrosive gas (3610J positioners only). If the supply pressure source is capable of exceeding the maximum actuator operating pressure or positioner supply pressure, appropriate steps must be taken during installation to protect the positioner and all connected equipment against overpressure.

Typical positioner mounting on an actuator is shown on the front page. Overall dimensions are shown in figure 5.

Note

3620J and 3620JP positioners are not approved for use with natural gas as the supply medium.

Figure 5. Typical Mounting Dimensions and Connections



TYPICAL FISHER 3610J POSITIONER WITHOUT BYPASS VALVE

FISHER 3610J POSITIONER WITH BYPASS ASSEMBLY

FISHER 3620J OR 3620JP POSITIONER

Note:
1 Instrument, Output, and Supply connections are 1/4 NPT.

C0681-2

Figure 6. Input Span Versus Valve Rotation

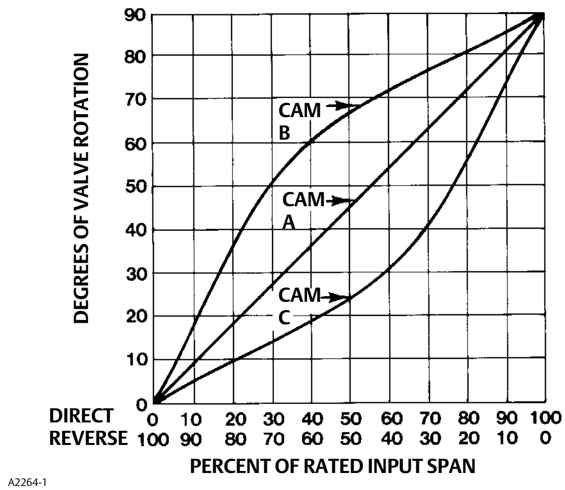
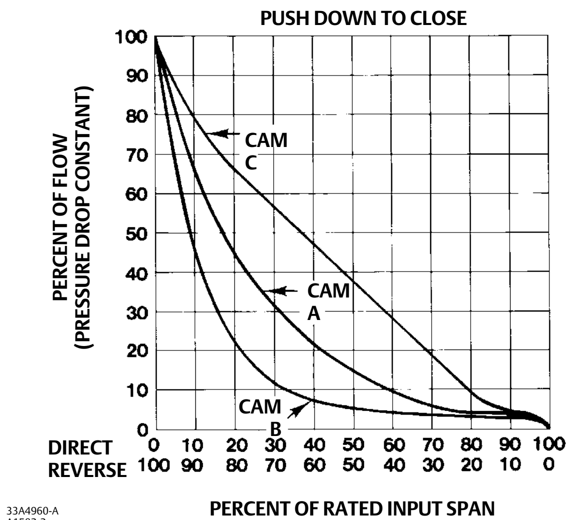


Figure 7. Flow Characteristics for the Various Cams When Used with an Equal Percentage Characteristic, Push-Down-to-Close Valve

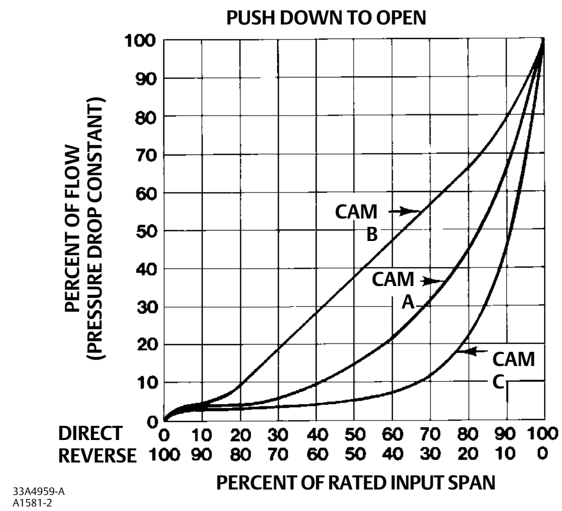


Characterized Cams

3610J and 3620J positioners are available with any one of three cams, a linear cam (cam A) or two characterized cams (cams B and C). Figure 6 shows the resultant valve rotation due to an incremental instrument pressure change for the three cams.

Figures 7 and 8 show how the flow characteristics change when using the cams with a valve that has equal percentage characteristics.

Figure 8. Flow Characteristics for the Various Cams When Used with an Equal Percentage Characteristic, Push-Down-to-Open Valve



When the linear cam is the operating cam, there is a linear relationship between an incremental instrument pressure change and the resultant valve stem rotation. The flow characteristic is that of the control valve.

As shown in figure 6, installing either characterized cam as the operating cam changes the relationship between the incremental instrument pressure change and valve stem travel, thereby modifying the valve flow characteristics.

Ordering Information

When ordering, specify the product application and construction:

Application

1. Positioner type number
2. Maximum supply pressure available
3. Actuator size and type number
4. Cam characteristic
5. Input signal

Construction

Refer to the specifications. Carefully review each specification; indicate your choice whenever a selection is to be made.

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Fisher™ 3660 and 3661 Positioners

Fisher 3660 pneumatic and 3661 electro-pneumatic single-acting positioners are part of the 3660 series of positioners. They are used with various actuators on sliding-stem valves for throttling applications. These rugged positioners provide a valve position proportional to a pneumatic input or a standard millampere DC input signal received from a control device.

W7174-1

Fisher 3660 Positioner with Baumann™ Valve and Actuator

Features

- Accurate, Efficient, Vibration-Resistant Operation—Positioner design provides accurate, fast-responding instruments able to withstand the vibrations of most plant environments. Low steady-state air consumption contributes to efficient operation.

- Variable Gain—Easily adjustable gain and damping adjustments fine tune the positioner stability to specific application requirements.

- Versatility—Positioner accepts a standard pneumatic input signal (3660) or a standard milliampere DC input signal (3661) from a control device. This positioner provides split range capabilities and adjustable zero and spans.

- Fewer Spare Parts Required—Most of the parts for 3660 and 3661 positioners are interchangeable, requiring fewer spare parts to support these positioners.

- Rugged Construction—The case and cover are designed to withstand mechanical vibration and rough handling.

- Easy Positioner Adjustments—Zero and span adjustments can be made with the cover in place.

- Control Valve Diagnostic Testing Capability—To support diagnostic testing of valve/actuator/positioner packages with the FlowScanner™ valve diagnostic system, connectors, piping, and other hardware can be installed between the 3660 or 3661 positioner and the actuator. A typical connector installation is shown in figure 4.

Specifications

Available Configuration

The Fisher 3660 series of positioners include the following models:

3660: Single-acting pneumatic valve positioner
3661: Single-acting electro-pneumatic valve positioner

Input Signal

3660:
■ 0.2 to 1.0 bar (3 to 15 psig), ■ 0.4 to 2.0 bar (6 to 30 psig), or ■ Split range, see table 2
3661:
■ 4-20 mA DC constant current with 30 VDC maximum compliance voltage ■ Split range is also available, see table 2

Equivalent Circuit (3661)

120 ohms shunted by three 5.6 V zener diodes

Output Signal

Type: Pneumatic pressure as required by the actuator up to full supply pressure
Action: ■ Direct (increasing input signal increases positioner output), ■ Reverse (increasing input signal decreases positioner output)

Supply Pressure(1)

Recommended: 10% above actuator requirements
Maximum: 6.2 bar (90 psig) or pressure rating of actuator, whichever is lower

Medium: Air

3660 and 3661 are not compatible with natural gas as the supply medium

Performance

Independent Linearity: ±1% of output span
Hysteresis: 0.5% of output span(2)
Deadband: 0.1% of input span

Electromagnetic Compatibility for 3661 electro-pneumatic positioner:
Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 1 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Positioner Adjustments

Span: Adjustable from 19 mm to 50 mm (0.75 to 2 inches) stem travel
Zero: 0 to 100%
Gain: 0.5 to 6% PB (proportional band)(3)
Output Volume Damping: Loop dynamic response adjustment

Delivery Capacity(4):

1.4 Bar (20 Psig) Supply: 4.3 normal m^3/hour (150 scfh)
2.4 Bar (35 Psig) Supply: 6.6 normal m^3/hour (230 scfh)

Exhaust Capacity(4):

1.4 Bar (20 Psig) Supply: 4.8 normal m^3/hour (170 scfh)
2.4 Bar(35 Psig) Supply: 7.4 normal m^3/hour (260 scfh)

Steady-State Air Consumption(4,5)

3660: 0.17 normal m^3/hour (6.0 scfh) at 1.4 bar (20 psig) supply pressure.
0.22 normal m^3/hour (7.9 scfh) at 2.4 bar (35 psig) supply pressure
3661: 0.24 normal m^3/hour (8.8 scfh) at 1.4 bar (20 psig) supply pressure. 0.33 normal m^3/hour (12.3 scfh) at 2.4 bar (35 psig) supply pressure

Operating Influences

Supply Pressure: 69 mbar (1 psig) change in supply pressure changes the actuator stem position less than 0.16%(6) of the travel

Operative Temperature Limits(1)

-40 to 82°C (-40 to 180°F)

- continued -

Specifications (continued)

Hazardous Area Classification for 3660

3660 pneumatic positioners comply with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D   Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T6
Dust: T82

3660 pneumatic positioners meet Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

II Gb c T*X
III Db c T*X

Hazardous Area Classification for 3661

CSA & FM—Intrinsically Safe, Type n, Non-incendive

ATEX & IECEx—Intrinsically Safe, Type n (Gas Atmospheres Only)

Housing Classification for 3661

CSA—Type 3 Encl.

FM—NEMA 3, IP54

ATEX & IECEx—IP44

Mounting orientation requires vent location to be below horizontal

Other Classifications/Certifications for 3661

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

INMETRO— National Institute of Metrology, Quality, and Technology (Brazil)

KGS—Korea Gas Safety Corporation (South Korea)

Contact your Emerson sales office for classification/certification specific information

Mounting

The positioner can be mounted in one of four different configurations. See figure 1.

Pressure Connections

1/4 NPT internal

Conduit Connection for 3661

1/2 NPT (M20 or PG13 adaptors optional)

Vent Connection

1/4 NPT internal

Maximum Valve Stem Travel

50 mm (2 inch); adjustable to obtain lesser travel with standard input signal—minimum 19 mm (0.75 inch)

Construction Materials

See table 4

Approximate Weight

3660: 2.6 pounds (1.2 kg)
3661: 3.0 pounds (1.4 kg)

Options

3660:
■ Instrument and output pressure gauges,
■ Integrally mounted bypass valve

3661: Output pressure gauge
3660 and 3661: Connectors for diagnostic testing
■ stainless steel or ■ brass

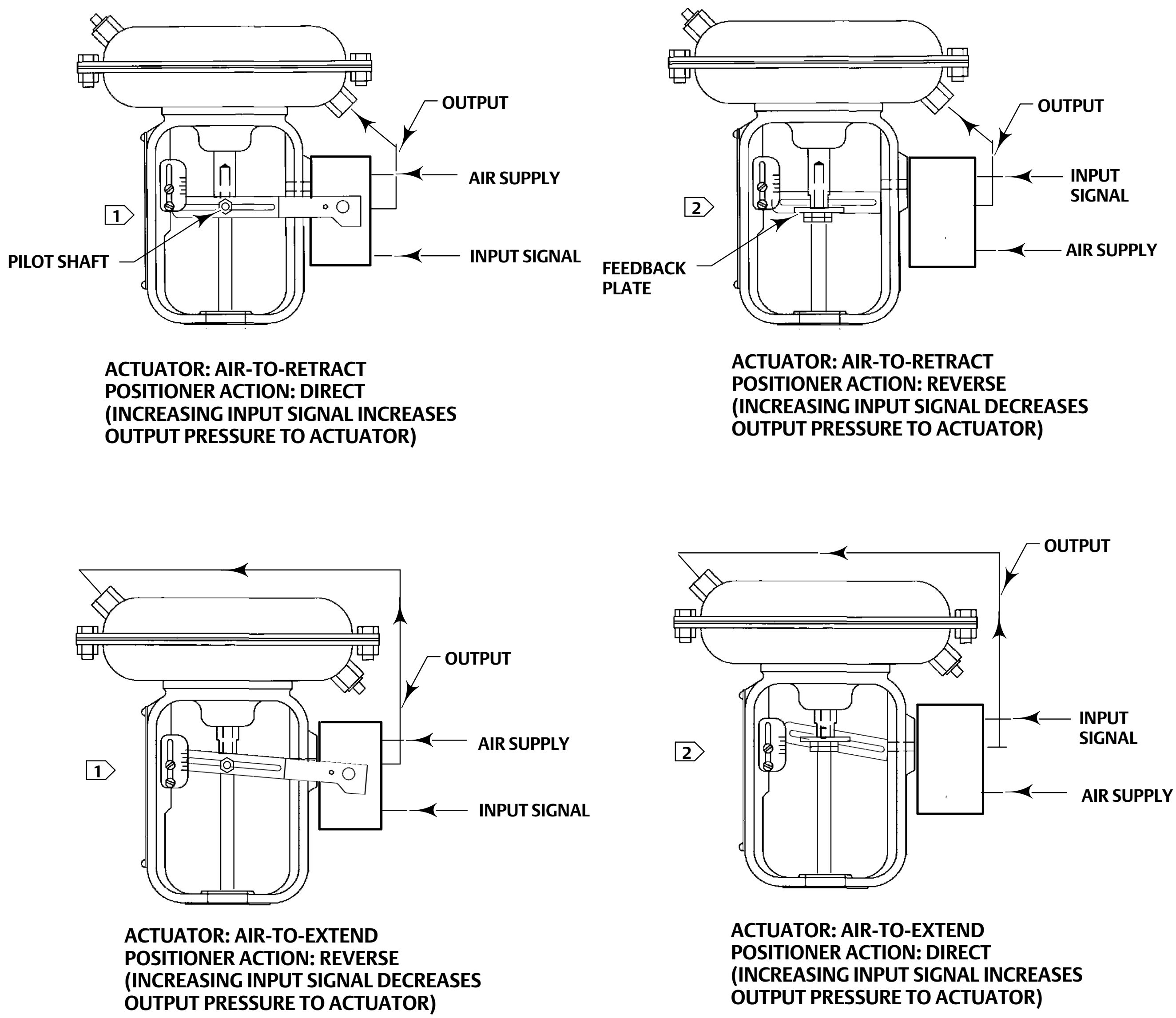
NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation should not be exceeded.
2. Hysteresis value at a gain setting of 1/2 turn.
3. Adjusting the gain (PB) adjustment will change the nozzle flapper relationship. This nozzle flapper change affects the actuator/positioner response time.
4. Normal m^3/hr--normal cubic meters per hour (0°C and 1.01325 bar absolute). Scfh--standard cubic feet per hour (60°F and 14.7 psia).
5. Air consumption at a gain setting of 1/2 turn.
6. At supply pressure of 2.4 bar (35 psig).

Table 1. Fisher 3661 Electro-Pneumatic Positioner EMC Summary Results—Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(1)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A
I/O signal/control	Burst	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

Specification limit = ±1% of span
1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Figure 1. Mounting Configurations (see table 3 for Positioner Action and Signals)



Notes:
1 When mounting on Baumann actuators, install feedback plate so lip is up. Install feedback lever arm assembly so pilot shaft is on top of the feedback plate.
2 When mounting on Baumann actuators, install feedback plate so lip is down. Install feedback lever arm assembly so pilot shaft is underneath the feedback plate.

17B9106-B
17B9105-B
38B0195-B
A4035-2

Table 2. Standard and Split Range Capabilities

POSITIONER	3660		3660		3661
Split	0.2 to 1.0 bar (3 to 15 Psig) Input Signal		0.4 to 2.0 bar (6 to 30 Psig) Input Signal		4 to 20 mA DC Input Signal
	Bar	Psig	Psig	Bar	
One Way 1:1	0.2 to 1.0	3 to 15	6 to 30	0.4 to 2.0	4 to 20
Two Way 2:1	0.2 to 0.6 0.6 to 1.0	3 to 9 9 to 15	6 to 18 18 to 30	0.4 to 1.2 1.2 to 2.0	4 to 12 12 to 20
Three Way 3:1	0.2 to 0.5 0.5 to 0.8 0.8 to 1.0	3 to 7 7 to 11 11 to 15	6 to 14 14 to 22 22 to 30	0.4 to 1.0 1.0 to 1.6 1.6 to 2.0	4 to 9.33 9.33 to 14.66 14.66 to 20
Four Way 4:1	0.2 to 0.4 0.4 to 0.6 0.6 to 0.8 0.8 to 1.0	3 to 6 6 to 9 9 to 12 12 to 15	6 to 12 12 to 18 18 to 24 24 to 30	0.4 to 0.8 0.8 to 1.2 1.2 to 1.6 1.6 to 2.0	4 to 8 8 to 12 12 to 16 16 to 20

Table 3. Positioner Input Signal, Action, and Output Signal

Input Signal	Positioner Output
Direct 0.2 to 1.0 bar (3 to 15 psig) 0.4 to 2.0 bar (6 to 30 psig) 4 to 20 mA	Up to 6.2 bar (90 psig)
Reverse 1.0 to 0.2 bar (15 to 3 psig) 2.0 to 0.4 bar (30 to 6 psig) 20 to 4 mA	
For split range signal refer to table 2	

Table 4. Construction Materials

PART	MATERIAL	
	Standard	Optional
Case and Cover	Aluminum	---
Feedback Lever Assembly	Stainless Steel	---
Range Spring	N09902	---
Input Module Diaphragm Relay Gasket O-Ring	Nitrile Nitrile Silicone Rubber Ethylene/Propylene	---
Nozzle	Aluminum	---
Flapper	Aluminum	---
Relay Metal Parts	Aluminum and Stainless Steel	---
Gauges	Brass and Plastic	---
All Fasteners	Stainless Steel	
Exterior Tubing and Fitting	Copper/Brass	Stainless Steel
Connectors for Diagnostic Testing	Stainless Steel or Brass	---

Principle of Operation

Refer to figure 2 for operational schematic.

The instrument pressure acts on the input module, which controls the flapper-nozzle system of the relay. Supply pressure is applied to the relay, and the output pressure of the relay is supplied to the control valve actuator.

For a direct-acting positioner, increases in instrument pressure causes the input module to pivot the beam. The beam pivots the flapper and restricts the nozzle. The nozzle pressure increases and causes the relay assembly to increase output pressure to the actuator. With a direct-acting actuator, this increased pressure moves the actuator stem downward. Stem movement is fed back to the beam by means of a feedback lever and range spring, which cause the flapper to pivot slightly away from the nozzle to prevent any further increases in relay output pressure. The positioner is once again in equilibrium but at a higher instrument pressure, a slightly different flapper position, and a new actuator stem position.

A decrease in instrument pressure decreases nozzle pressure, which allows the relay to bleed off actuator loading pressure.

Operation of a reverse-acting positioner is similar except that the flapper position is reversed from that shown in figure 2. The reversed position uses the alternate flapper pivot point so that increases in instrument pressure rotate the flapper away from the nozzle to reduce nozzle pressure.

With a 3661 electro-pneumatic positioner, the electro-pneumatic converter provides a 0.2 to 1.0 bar (3 to 15 psig) output pressure proportional to the 4-20 mA input signal. The 0.2 to 1.0 bar (3 to 15 psig) output pressure becomes the input signal pressure to the input module.

Figure 2. Operational Schematic

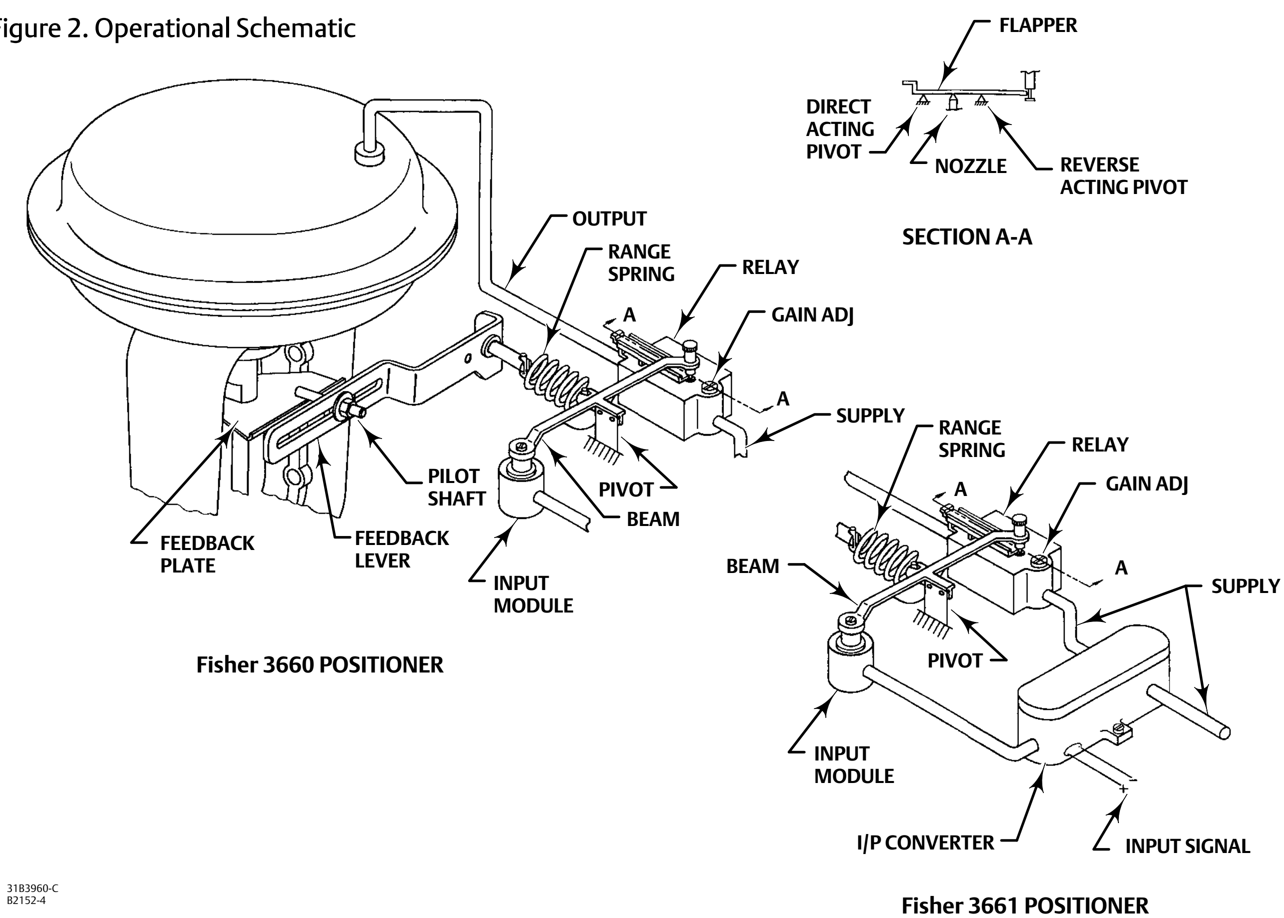


Figure 3. Positioner Dimensions and Connections (see table 5 for the X dimension)

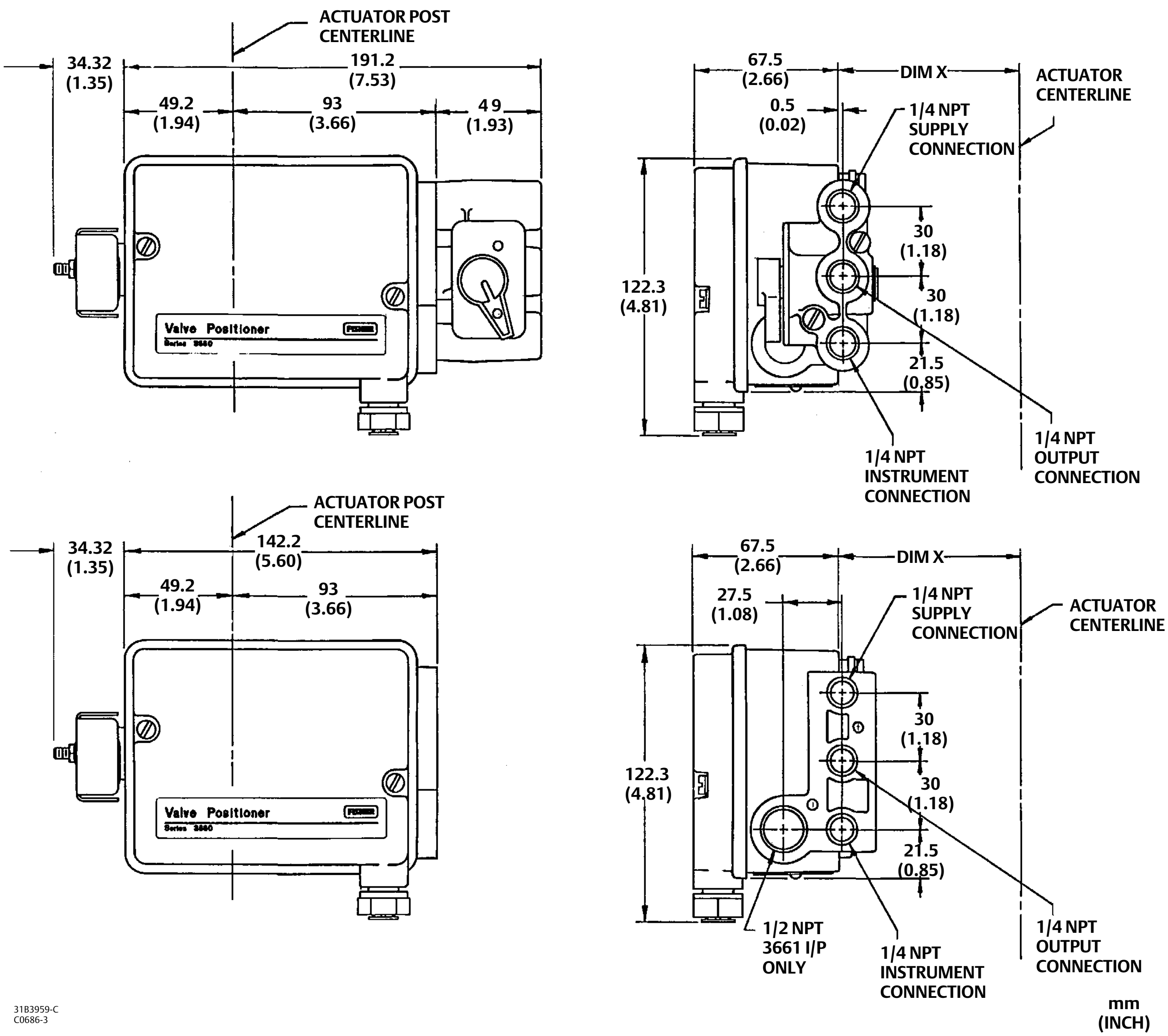


Table 5. Dimension X for figure 3

ACTUATOR CENTERLINE TO POSITIONER			
Type	Size	X	
		mm	Inch
657/667	30 34 40 45/46 50/60	92.2 95.3 104.9 108.0 128.5	3.63 3.75 4.13 4.25 5.06
	30i 34i 40i 45i/46i 50i/60i	121.5 123.2 / 121.5 129.5 129.5 / 134.9 144.5	4.78 4.85 / 4.78 5.10 5.10 / 5.31 5.69
1250	225 450 675	86.0 86.0 110.0	3.39 3.39 4.33
3024S	1.21 1.31 1.41	83.5 87.5 87.5	3.29 3.44 3.44
Baumann	$16in^2$ $32in^2$ $54in^2$ $70in^2$	53.8 71.4 71.4 71.4	2.12 2.81 2.81 2.81
GX	225 750 1200	81.0 81.0 81.0	3.19 3.19 3.19

Installation

The supply pressure medium should be clean, dry, filtered air. If the supply source is capable of exceeding the maximum actuator operating pressure or positioner supply pressure, appropriate steps must be taken during installation to protect the positioner and all connected equipment against overpressure.

Overall dimensions and connections are shown in figure 3 and table 5.

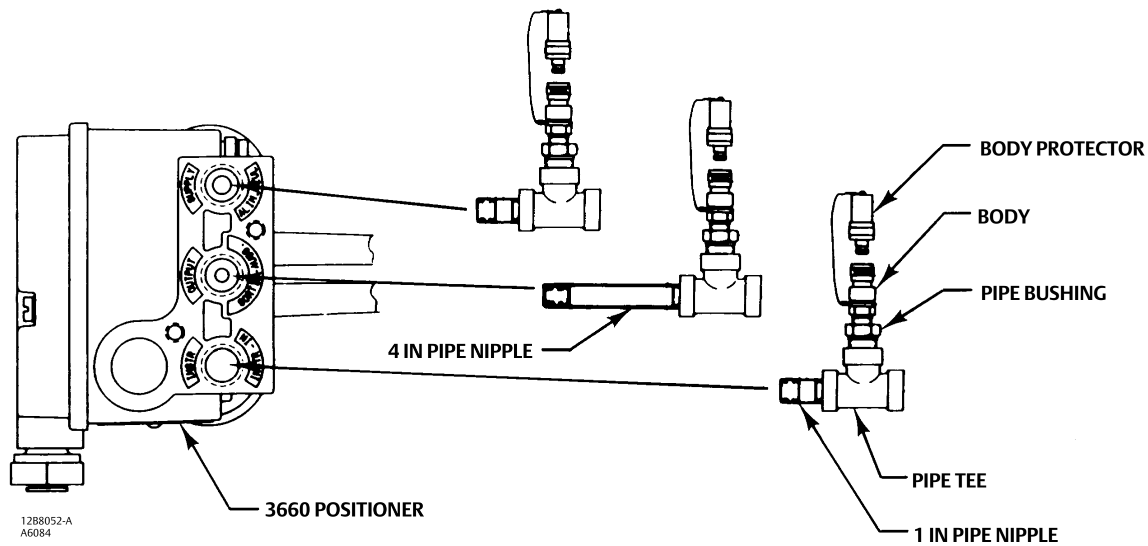
Ordering Information

Application

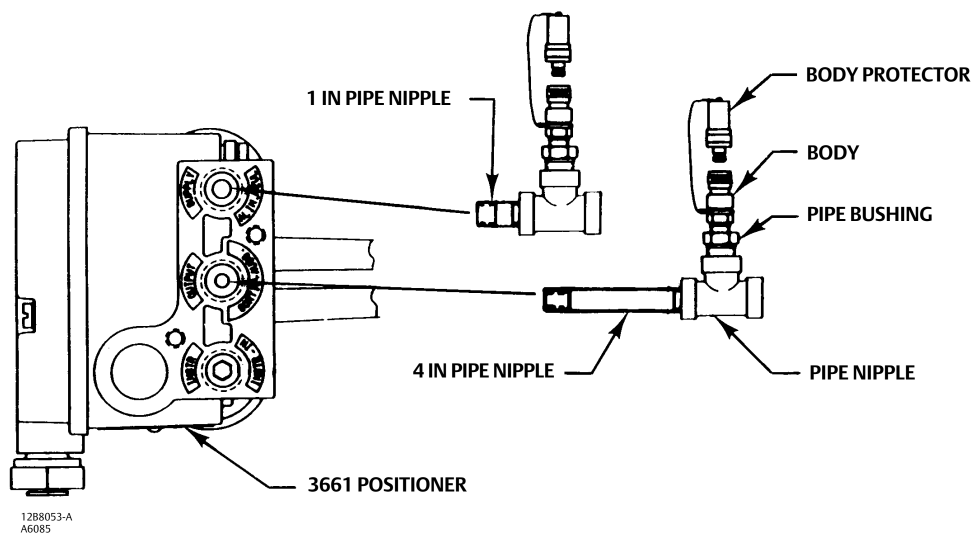
When ordering, specify:

1. Type number
2. Input signal range: pneumatic or milliampere
3. Maximum supply pressure available
4. Valve plug travel: actuator type and size
5. Stroking time requirements, if critical
6. Ambient temperature range
7. Direct or reverse acting
8. Supply pressure regulator, gauges, and bypass, if required
9. Hazardous area classification (3661)
10. Connectors for diagnostic testing, if required

Figure 4. FlowScanner Diagnostic System Connections



Fisher 3660 POSITIONER



Fisher 3661 POSITIONER

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Sorocaba, 18087 Brazil
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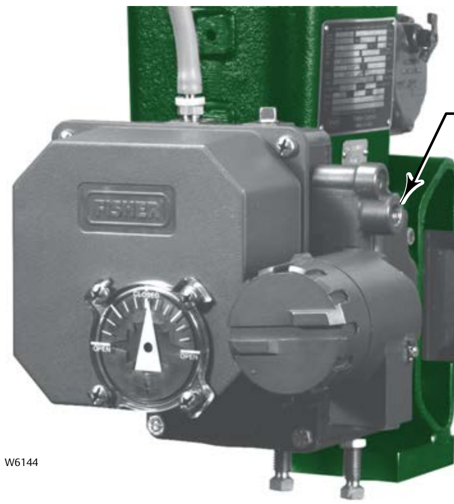
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 3710 and 3720 Positioners and 3722 Electro-Pneumatic Converter

Fisher 3710 pneumatic and 3720 electro-pneumatic positioners are part of the 3700 positioner series. They are designed for use with either diaphragm or piston rotary actuators. These positioners provide a valve ball or disk position for a specific input signal. The 3710 provides a valve position in response to a pneumatic input signal. The 3720 is created by the addition of a Fisher 3722 electro-pneumatic converter to the 3710 positioner. The positioner provides a valve position in response to a DC current input signal. Either type can easily be configured as single- or double- acting for rotary actuators.



**3720 POSITIONER
MOUNTED ON A 1052 ACTUATOR**

**3710 POSITIONER
MOUNTED ON A 1066 ACTUATOR**

3722 ELECTRO-PNEUMATIC CONVERTER

Specifications

Available Configuration

The Fisher 3700 series of positioners include the following models:

3710: ■ Single- or ■ double-acting pneumatic rotary valve positioner
3720: ■ Single- or ■ double-acting electro-pneumatic rotary valve positioner consisting of a 3710 with a 3722 attached
3722: An electro-pneumatic converter that converts a 4-20 mA DC input signal to a 0.2 to 1.0 bar (3 to 15 psig) signal for the pneumatic positioner

Input Signal

3710:
Standard: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)
Split-Range: ■ 0.2 to 0.6 bar (3 to 9 psig) and 0.6 to 1.0 bar (9 to 15 psig) or ■ 0.4 to 1.2 bar (6 to 18 psig) and 1.2 to 2.0 bar (18 to 30 psig)
3720:
Standard: ■ 4-20 mA DC constant current with 30 VDC maximum compliance voltage
Split-Range: ■ 4-12 mA DC or 12-20 mA DC

Equivalent Circuit

3720: 120 ohms shunted by three 5.6 V zener diodes

Output Signal

Pneumatic pressure as required by the actuator up to full supply pressure
Action(1): Field reversible between direct and reverse

Supply Pressure(2)

Minimum Recommended: 0.3 bar (5 psig) above actuator requirement
Maximum: 10.3 bar (150 psig) or maximum pressure rating of the actuator, whichever is lower

Supply Medium

3710: Air or Natural Gas
3720: Air

The 3720 positioner is not approved for use with Natural Gas as the supply medium

Steady-State Air Consumption(3)

3710:
6 mm Spool Valve: 0.82 normal m^3/hr (29 scfh) at 4.1 bar (60 psig) supply pressure
3720:
6mm Spool Valve: 1.0 normal m^3/hr (36 scfh) at 4.1 bar (60 psig) supply pressure

Maximum Supply Air Demand(3) **(Double-Acting)**

6 mm Spool Valve: 20 normal m^3/hr (700 scfh) at 4.1 bar (60 psig) supply pressure

Typical Performance(4)

3710 Pneumatic Positioner
Independent Linearity: ±0.5% of output span
Hysteresis: 0.5% of output span
Deadband: 0.3% of input span

3720 Electro-Pneumatic Positioner
Independent Linearity: ±1.0% of output span
Hysteresis: 0.6% of output span
Deadband: 0.35% of input span

Electromagnetic Compatibility for 3722 electro-pneumatic converter:
Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 1 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Note: Electromagnetic Compatibility specifications also apply to the 3720 positioner

Operating Influences

Supply Pressure Sensitivity: A 10% change in supply pressure changes the valve shaft position less than the following percentages of valve rotation:
3710: 1.0% at 4.1 bar (60 psig) supply pressure
3720: 1.5% at 4.1 bar (60 psig) supply pressure

Operative Temperature Limits(2)

■ -40 to 80°C (-40 to 180°F),
■ -50 to 107°C (-58 to 225°F)

Construction Materials

Positioner Base: Low copper aluminum alloy
Cover: Polyester plastic
Feedback Shaft: Stainless steel
Range Spring: Stainless steel
Input Module Diaphragm, O-rings: ■ Nitrile or ■ Ethylene-propylene (EPDM)
Spool Valve: SST/C72900
Tubing: Copper (standard)

-continued-

Specifications (Continued)

Construction Materials (continued)

Fittings: Brass (standard)
Gauges: Chrome-plated brass connection with plastic case
Connectors for diagnostic testing: ■ Stainless steel or ■ Brass

Electrical Classifications for 3722 Converter

CSA—Intrinsically Safe, Explosion-proof, Type n, Dust-Ignition Proof

FM—Intrinsically Safe, Explosion-proof, Type n, Non-incendive, Dust-Ignition Proof

ATEX—Intrinsically Safe, Flameproof, Type n

IECEx—Intrinsically Safe, Flameproof, Type n

Note: These classifications also apply to the 3720 positioner

Housing Classification for 3722 Converter

CSA— Type 3 Encl.	ATEX— IP64
FM— NEMA 3, IP54	IECEx— IP54

Mount instrument with vent on side or bottom if weatherproofing is a concern

Note: These classifications also apply to the 3720 positioner

Other Classifications/Certifications for 3722 Converter

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

INMETRO—National Institute of Metrology, Quality and Technology (Brazil)

KGS—Korea Gas Safety Corporation (South Korea)

Contact your Emerson sales office for classification/certification specific information

Note: This classification also applies to the 3720 positioner

Hazardous Area Classification for 3710 Positioner

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D
Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T4, T5, T6
Dust: T85...T107

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

II Gb c T*X
III Db c T*X

Note: These ratings do *not* apply to the 3720 positioner

Pressure Connections

1/4 NPT internal

Electrical Connection for 3720 Positioner

1/2-14 NPT conduit connection

Rotary Valve Rotation

■ 90 degrees (standard) ■ 60 degrees (optional)

Options

Span Adjuster Assembly: ■ 0.2 to 1.0 bar (3 to 15 psig) input range or, ■ 0.4 to 2.0 bar (6 to 30 psig) input range
Elastomers (O-rings, diaphragm): ■ standard temperature range, -40 to 80°C (-40 to 180°F), ■ extended temperature range -50 to 107°C (-58 to 225°F)

■ Special applications, ■ Beacon indicator, ■ Gauges(5), tire valves, or connectors for diagnostic testing

Approximate Weight

3710: 2.04 kg (4.5 pounds)
3720: 2.72 kg (6.0 pounds)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Direct-acting, an increasing input signal extends actuator rod. Reverse-acting, an increasing input signal retracts actuator rod.
2. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.
3. Normal m^3/hr--Normal cubic meters per hour (0°C and 1.01325 bar, absolute); Scfh--Standard cubic feet per hour (60°F and 14.7 psia).
4. Typical values determined by tests with a 1061 size 30 actuator at 4.1 bar (60 psig) supply pressure. Performance may vary with other actuator types and supply pressures.
5. Gauges not available for high temperature range.

Table 1. Fisher 3722 Electro-Pneumatic Converter(1) EMC Summary Results—Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(2)
Enclosure	Electrostatic Discharge (ESD)	IEC 61000-4-2	4 kV contact; 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 volts	A

Specification limit = ±1% of span
1. The information contained in the table also applies to the 3720 positioner.
2. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Features

- **Accurate, Fast Response**—3710 and 3720 positioners use field-proven spool valve technology for a simple design that gives accurate, fast-responding operation with high cycle life. These positioners are able to withstand the severe vibrations of most plant environments.

- **Modular Construction**—The 3710 positioner converts easily to a 3720 positioner by adding the 3722 electro-pneumatic converter. The converter mounts over the instrument and supply ports in the 3710 positioner base. This provides a simple, compact, and cost-effective field conversion from pneumatic to electro-pneumatic valve positioning.

- **Corrosion-Resistant Construction with Air Purge**—Case, components, and gasket materials withstand harsh environments. Proven engineered resins and 300 Series stainless steel construction is used throughout each unit. Die castings are low copper aluminum alloy to maximize corrosion resistance. Positioner bleed air purges internal positioner parts. As an option with some Fisher actuators, bleed air also purges the actuator housing for additional protection.

- **Extended Temperature Capability**—With EPDM O-rings and input module diaphragm, 3710 and 3720 positioners can be used in low-temperature and high-temperature applications.

- **Meets Special Application Requirements**— 3710 and 3720 positioners with EPDM O-rings and input module diaphragm can be used in applications with special material requirements as in the food and beverage industry, pharmaceuticals, and tobacco processing.

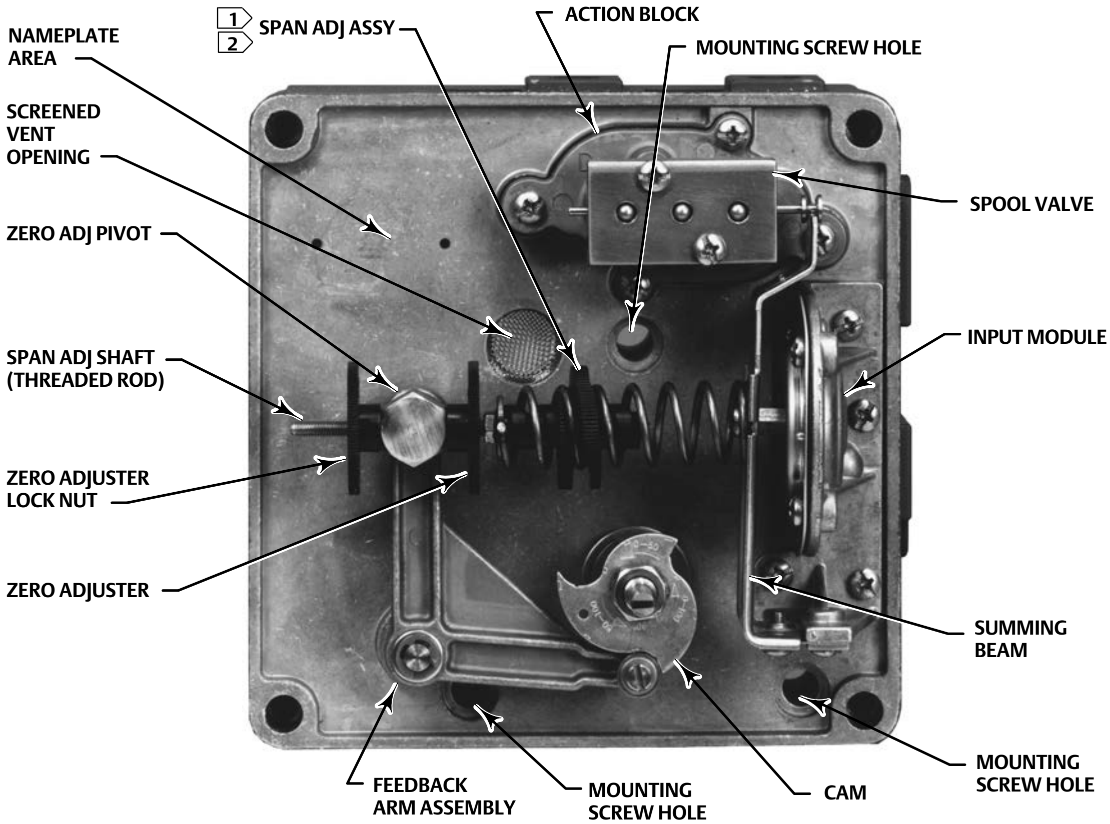
- **Easy Positioner Adjustments**—With the cover removed (figure 1), all internal components are easily accessed. Zero and span adjustments are made by hand with no tools required.

- **Stable Operation**—Changes in supply pressure and ambient temperature have minimal effect on positioner operation.

- **Control Valve Diagnostic Testing Capability**—To support diagnostic testing of valve/actuator/positioner packages, connectors, piping, and other hardware can be installed between the 3710 positioner and the actuator. A typical connector installation is shown in figure 5.

- **Valve Position Indicator**—Standard, low-profile indicator or optional, beacon-style indicator mount easily to the positioner cover.

Figure 1. Features and Adjustments



Notes:
1 The Span Adj Assy is made up of the range spring, span adj shaft (threaded rod) and span adj knob.
2 The Span Adj Assy features a red color-coded range spring for a 0.4 to 2.0 bar (6 to 30 psig) input signal.

W5947

Actuators

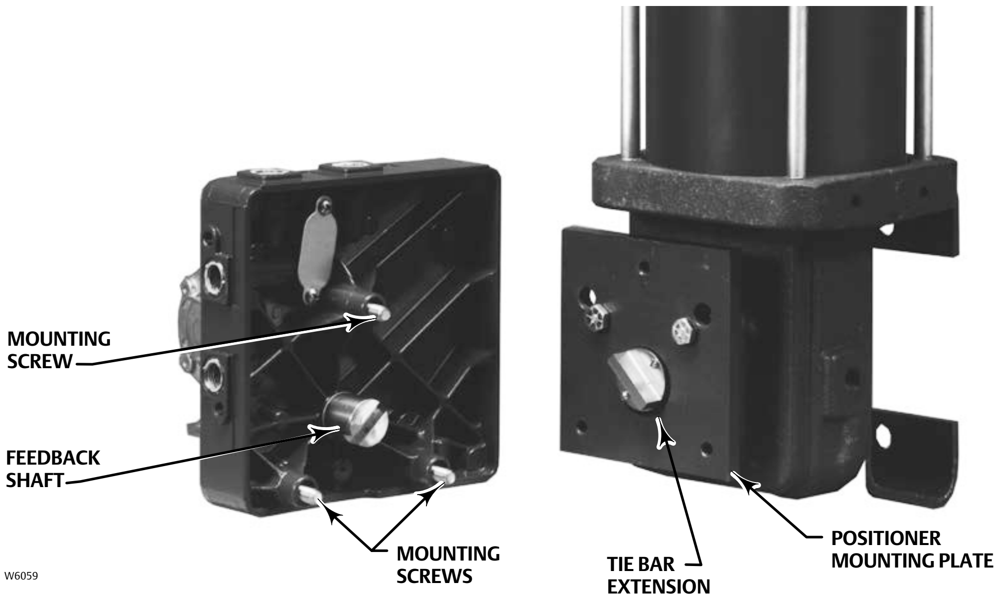
The positioner mounts integrally to the actuator cover plate (figure 2) of the following Fisher actuators:

- 1051 and 1052, size 30: The size 30 actuator is no longer manufactured by Emerson. The 3710 positioner is available for field installation on existing size 30 actuators.
- 1051, size 40 and 60
- 1052, size 40, 60, and 70
- 1061, size 30, 40, 60, and 68

A mounting plate is used to mount the 3710 positioner to the following Fisher actuators:

- 1051, size 33
- 1052, size 20, 33
- 1061, size 80, 100
- 1066, size 20, 27, and 75
- 2052, size 1, 2, and 3
- NAMUR Mounting

Figure 2. Mounting the Positioner Base Plate



Principle of Operation

Refer to the positioner schematic (figure 3). The operational description here follows the schematic layout and orientation.

The 3710 pneumatic positioner is a force-balance instrument that provides a control valve position proportional to a pneumatic input signal. The balance of opposing forces in the positioner occurs at the summing beam.

One force applied to the summing beam is developed from the input signal pressure on the diaphragm. The other force is from the feedback spring and is proportional to the position of the feedback lever.

When the input pressure is increased to the diaphragm of the input module, the diaphragm strokes down, increasing the effective force from the input module and compressing the feedback spring. The summing beam moves the spool down in the spool body, opening output port B to supply air to the left side of the actuator. At the same time, output port A of the spool valve opens, allowing the right side of the actuator to vent to atmosphere.

The piston in the actuator moves to the right, rotating the feedback shaft and cam counterclockwise. This rotation causes the feedback lever to rotate clockwise, increasing the compression on the feedback spring. These rotations continue until the additional force from the spring balances with the input module force on the summing beam. When the forces are equal, the summing beam returns to its steady state or neutral position and the actuator is held at a new position.

In a 3720 positioner, the 3722 converter receives the milliampere (mA), direct current (DC), input signal and provides a proportional pneumatic output signal through a nozzle/flapper arrangement. Nozzle pressure from the converter module travels through the converter housing to provide the input signal pressure to the 3710 pneumatic positioner.

The feedback lever position is determined by the location or rise of the cam (figure 4) which is attached to the feedback shaft. When the two opposing forces are equal or at a steady state, the summing beam holds the spool in a neutral position. At steady state, a small flow of air passes from supply through both outputs of the spool valve to the actuator, holding the actuator at a constant position. At the same time, another small flow of air exhausts out each end of the spool valve.

Figure 3. Fisher 3710 Positioner Schematic

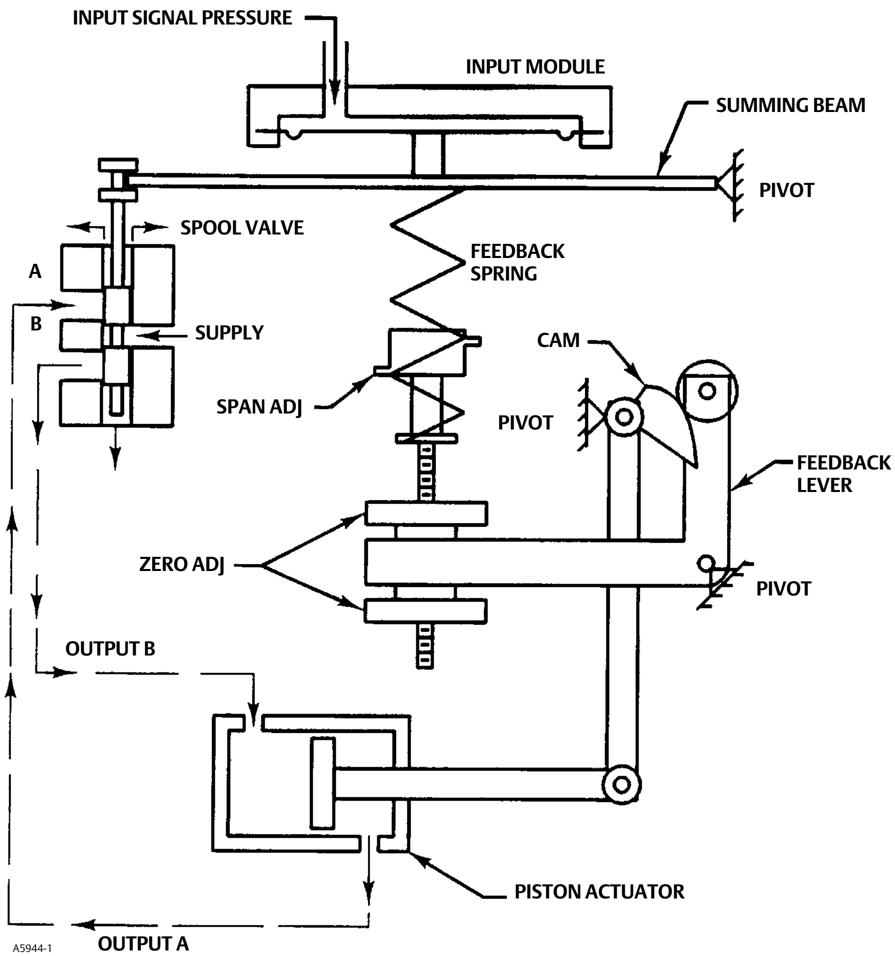
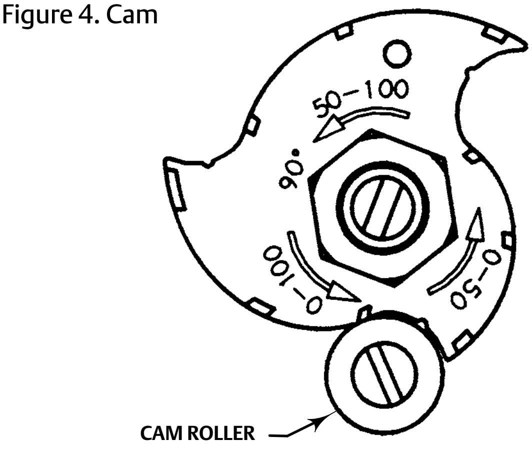


Figure 4. Cam

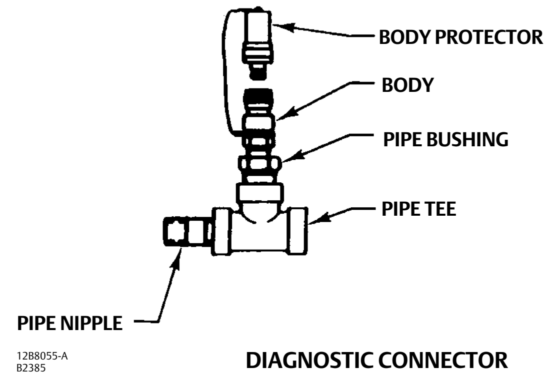


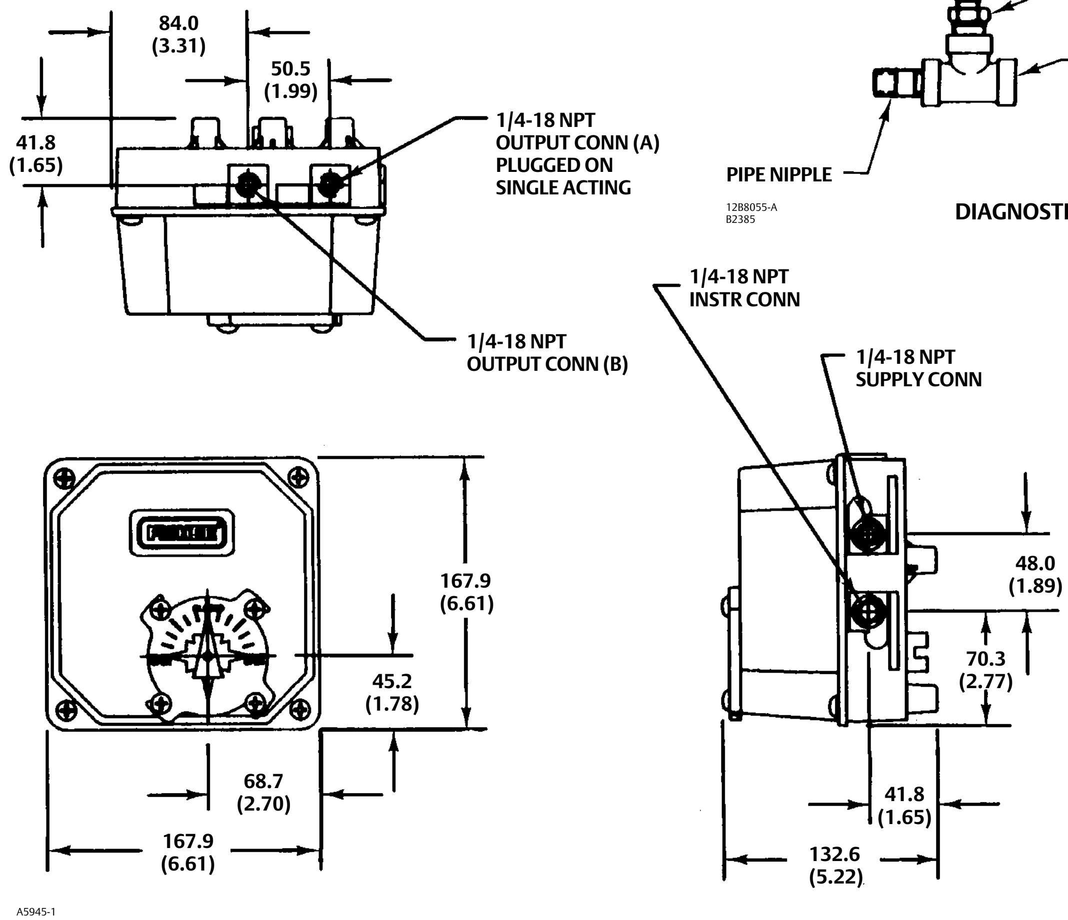
Installation

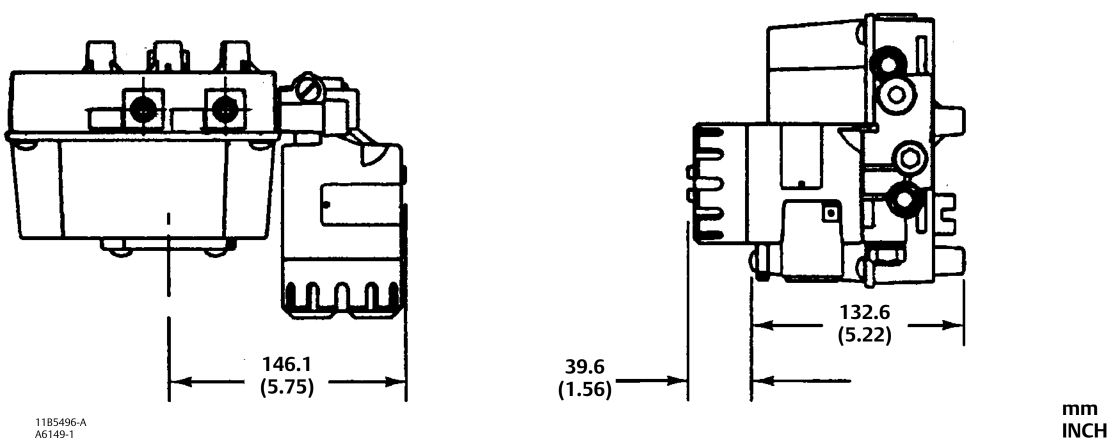
The supply pressure medium must be a clean, dry, filtered air, or noncorrosive gas (3710 positioner only). If the supply source is capable of exceeding the maximum actuator operating pressure or positioner supply pressure, take appropriate steps during installation to protect the positioner and all connected equipment against overpressure.

Positioner connections including connections for diagnostic testing and overall dimensions are shown in figure 5.

Figure 5. Dimensions and Connections







Ordering Information

When ordering, specify:

Required Application Information

1. Positioner type number
2. Pneumatic or DC current input signal range
3. Direct- or reverse-acting
4. Actuator type, size, and degrees of rotation
5. Maximum supply pressure available
6. Ambient temperature range
7. Special application material requirements such as EPDM elastomers
8. Supply pressure regulator and options such as gauges or tire valves, if required
9. Connectors for diagnostic testing, if required

Construction Specifications

Refer to the construction details given in the Specifications. If different materials of construction are required, contact your Emerson sales office.

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Product Bulletin
62.1:Digital Valve Controller
October 2019

Fisher™ FIELDVUE™ Digital Valve Controller Product Selection

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DIGITAL VALVE CONTROLLER

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DIGITAL VALVE CONTROLLER

DVC6200 SIS
DIGITAL VALVE CONTROLLER

DVC2000 Product Selection

- DVC2000 digital valve controller, with aluminum construction.
- Single-acting, HART® 5 communicating electro-pneumatic valve positioner. Input signal 4-20 mA, 4-button Local User Interface (LUI) with full text LCD display, and 12 languages.
- Linkageless stem feedback solution using magnetic Hall-Effect contactless technology in conjunction with stem/shaft mounted magnet array.
- Temperature range -40 to +80°C (-40 to + 176°F). Maximum inlet pressure 7 barg (100 psig).
- Contact your Emerson sales office for additional information or visit Fisher.com.

Base Instrument Model*	
DVC2000	Digital Valve Controller, single-acting, HART-based 4-20 mA input signal
1. Hazardous Area Approvals*	
1A	CSA - Intrinsically Safe, Non-incendive
1B	FM - Intrinsically Safe, Non-incendive
1C	ATEX - Intrinsically Safe, Ex ia
1D	IECEx - Intrinsically Safe, Ex ia
1E	INMETRO (Brazil) - Intrinsically Safe, Ex ia
1F	KGS (South Korea) - Intrinsically Safe, Ex ia
1G	NEPSI (China) - Intrinsically Safe, Ex ia
1H	CUTR EAC (Russia, Belarus, Kazakhstan, Armenia) - Intrinsically Safe, Ex ia
1I	PESO (India) - Intrinsically Safe, Ex ia
2. Housing Style*	
2A	Housing B (Standard design)
2B	Housing A (Integrated housing for use with Fisher GX valves only)
3. Threaded Connections*	
3A	1/2 NPT conduit & 1/4 NPT pneumatic
3B	M20 conduit & G1/4 pneumatic
3C	1/2 NPT conduit with M20 x 1.5 ISO brass adaptor(s) & 1/4 NPT pneumatic
3D	1/2 NPT conduit with M20 x 1.5 ISO SST adaptor(s) & 1/4 NPT pneumatic
3E	1/2 NPT conduit with PG 13.5 adaptor & 1/4 NPT pneumatic
4. Actuator Operating Pressure Range*	
4A	1.3 to 3.3 barg (20 to 49 psig)
4B	3.4 to 7.0 barg (50 to 100 psig)

5. Position Feedback Indication*	
5A	None
5B	(1) 4-20 mA Position Transmitter and (2) Isolated Switches
6. Diagnostic Level*	
AC	Auto Calibration: Basic positioner functionality with remote interaction via HART handheld communicator
HC	HART Communication: Basic HART communication with alerts; compatible with ValveLink™ software
AD	Advanced Diagnostics: HC features plus off-line diagnostics when used with ValveLink software
PD	Performance Diagnostics: AD features plus on-line in-service diagnostics when used with ValveLink software
7. Local User Interface Language*(1)	
EN	English
DE	German
ES	Spanish
FR	French
IT	Italian
CH	Chinese
JA	Japanese
PT	Portuguese
RU	Russian
PO	Polish
CZ	Czech
AR	Arabic
8. Additional Options* *	
XX	None
SF	10-micron in-line air supply filter
VC	Pipe-away vent connection threaded 3/8 NPT or G3/8 (thread-type will match pneumatic connections)
CG	Conduit Cable Gland(s): Intrinsically safe, blue plastic
HF	HART Filter (DIN Rail mounted to support HART communications with HART incompatible hosts)
PP	Protective Plastic Pipe Plugs for pneumatic or conduit openings
CC	Custom Configuration - Please detail requirements separately

* Select only one option
* * Select more than one if required
1. Select the Code of the language you want enabled on the local interface. Standard Language Pack includes: English, German, Spanish, French, Italian, Chinese, Japanese, Portuguese, Russian, Polish, and Czech. Optional Language Pack includes: English, Arabic, German, Spanish, French, Italian, Chinese, and Japanese.

Typical model number: DVC2000 1C_2A_3A_4B_5A_HC_EN_SF HF

	1	2	3	4	5	6	7	8
DVC2000	1C	2A	3A	4B	5A	HC	EN	SF HF

Enter your choices to start the selection process:

	1	2	3	4	5	6	7	8
DVC2000								

DVC6200 Product Selection

- DVC6200 digital valve controller for modulating control service with HART 5, HART 7, FOUNDATION fieldbus™ or PROFIBUS PA protocol.
- Aluminum or Stainless Steel constructions, Single-Acting Direct and Reverse and Double-Acting operation available.
- Linkageless stem feedback solution using magnetic Hall-Effect contactless technology in conjunction with stem/shaft mounted magnet array.
- Temperature range -40 to +85 °C (-40 to + 185 F); -52°C (-61.6°F) with fluorosilicone elastomers. Maximum inlet pressure 10 barg (145 psig).
- Contact your Emerson sales office for additional information or visit Fisher.com.

Base Instrument Model*	
DVC6200H	Digital Valve Controller with 4-20 mA input and HART 5 communication
DVC6200F	Digital Valve Controller with FOUNDATION fieldbus digital communication
DVC6200P	Digital Valve Controller with PROFIBUS PA digital communication
1. Hazardous Area Approvals*	
1A	CSA - Explosion proof, Intrinsically Safe, Non-incendive; Class/Division & Zone
1B	FM - Explosion proof, Intrinsically Safe, Non-incendive; Class/Division & Zone
1C	ATEX - Intrinsically Safe, Ex ia (Gas & Dust)
1D	ATEX - Flameproof, Ex d
1E	ATEX - Non-incendive, Type n
1F	IECEx - Flameproof, Intrinsically Safety, Non-incendive (Gas & Dust)
1G	INMETRO (Brazil) - Flameproof, Intrinsically Safe, Type n
1H	KGS (South Korea) - Flameproof, Intrinsically Safe
1I	NEPSI (China) - Flameproof, Intrinsically Safe, Type n
1J	CUTR EAC (Russia, Belarus, Kazakhstan, Armenia)
1K	PESO (India) - Flameproof, Intrinsically Safe, Type n
1L	TIIS (Japan) - Flameproof (not applicable for DVC6200P)
2. Housing Material*	
2A	Aluminum
2B	Stainless Steel, includes fluorosilicone elastomers. Housing B only

3. Housing Style*	
3A	Housing B (Standard design)
3B	Housing A (Integrated aluminum housing for use with Fisher GX valves only)
4. Foundation Fieldbus Function Blocks*	
4A	Not Applicable, DVC6200H or DVC6200P selected
4B	DVC6200F with Fieldbus Logic (on/off control): DO, DI (4) function blocks
4C	DVC6200F with Fieldbus Control (modulating control): AO function block ONLY
4D	DVC6200F with Standard Control (modulating control): ALL available function blocks
5. Pneumatic Action*	
5A	Single-Acting DIRECT operation (RELAY C)
5B	Single-Acting REVERSE operation (RELAY B)
5C	DOUBLE-Acting operation (RELAY A)
6. Position Feedback I/O Options for DVC6200H*	
6A	Not Applicable, DVC6200F or DVC6200P selected
6B	DVC6200H without I/O options
6C	DVC6200H with 4-20 mA Position Feedback Transmitter enabled (Limit Switch disabled)
6D	DVC6200H with Single Limit Switch enabled (Position Feedback Transmitter disabled)
7. Gauges*	
7A	None - Outlets will be plugged
7B	None - Tire valve connections required
7C	Supply & Output gauges, dual scaled 0-60 psig, 0-4 bar
7D	Supply & Output gauges, dual scaled 0-60 psig, 0-0.4 Mpa
7E	Supply & Output gauges, dual scaled 0-60 psig, 0-4 kgm^2
7F	Supply & Output gauges, dual scaled 0-160 psig, 0-11 bar
7G	Supply & Output gauges, dual scaled 0-160 psig, 0-1.1 Mpa
7H	Supply & Output gauges, dual scaled 0-160 psig, 0-11 kgm^2
8. Threaded Connections*	
8A	1/2 NPT conduit & 1/4 NPT pneumatic
8B	1/2 NPT conduit with M20 x 1.5 ISO brass adaptor & 1/4 NPT pneumatic
8C	1/2 NPT conduit with M20 x 1.5 ISO SST adaptor & 1/4 NPT pneumatic
8D	M20 conduit with 1/4 NPT pneumatic(1)
9. Diagnostic Level*	
AC	Auto Calibration for DVC6200H: Set-up via Device Communicator (not applicable for DVC6200F or DVC6200P
HCFD	HART Communication/Fieldbus Diagnostics: Basic digital communication with alerts; applicable to all protocols.
AD	Advanced Diagnostics: HCFD features plus off-line diagnostics when used with ValveLink software (Not applicable for DVC6200P)
PD	Performance Diagnostics: AD features plus on-line in-service diagnostics when used with ValveLink software (Not applicable for DVC6200P)
PS	Partial Stroke Testing for DVC6200F devices ONLY (Not Applicable for DVC6200H or DVC6200P. See DVC6200 SIS for PST with HART)

10. Additional Options**	
XX	None
XT	Extreme temperature construction down to -52°C (-62°F) using fluorosilicone elastomers, Aluminum constructions only (SST constructions include fluorosilicone elastomers as standard and are rated to -52°C [-62°F] by default)
LL	Lloyds Marine Approval
RM	Remote mount version: DVC6205 with separate remote travel sensor (DVC6215) rated to 125°C (257°F), Aluminum constructions only
GC	Natural Gas Certified terminal box assembly - Single Seal Device
LB	Low Bleed Relay
CG1	Cable Gland: Intrinsically Safe, blue plastic
CG2	Cable Gland: Flameproof, ENC Brass
H7	HART 7 protocol enabled (requires HART 7 compatible host)
SF	10-micron in-line air supply filter
PP	Protective Plastic Pipe Plugs for pneumatic or conduit openings
CC	Custom Configuration - Please detail requirements separately
* Select only one option ** Select more than one if required 1. Available for ATEX approved devices.	

Typical model number: DVC6200H 1D_2A_3A_4A_5A_6B_7C_8A_PD_XT H7

	1	2	3	4	5	6	7	8	9	10
DVC6200H	1D	2A	3A	4A	5A	6B	7C	8A	PD	XT H7

Enter your choices to start the selection process:

	1	2	3	4	5	6	7	8	9	10

DVC6200 SIS Product Selection

- DVC6200 SIS digital valve controller with Partial Stroke Testing capability, HART 5 Communications (HART 7 optional), SIS diagnostics.
- Capable of being used in SIL3 safety applications as the safety shutdown device, exida certified.
- Linkageless stem feedback solution using magnetic Hall-Effect contactless technology in conjunction with stem/shaft mounted magnet array.
- Temperature range -52 to +85°C (-61.6 to + 185°F) with with fluorosilicone elastomers as standard. Maximum inlet pressure 10 barg (145 psig), low bleed relay standard.
- Contact your Emerson sales office for additional information or visit Fisher.com.

Base Instrument Model*	
DVC6200-SIS	Digital valve controller with PST capability, HART 5, SIS diagnostics
1. Hazardous Area Approvals*	
1A	CSA - Explosion proof, Intrinsically Safe, Non-incendive; Class/Division & Zone
1B	FM - Explosion proof, Intrinsically Safe, Non-incendive; Class/Division & Zone
1C	ATEX - Intrinsically Safe, Ex ia (Gas & Dust)
1D	ATEX - Flameproof, Ex d
1E	ATEX - Non-incendive, Type n
1F	IECEx - Flameproof, Intrinsically Safe, Non-incendive (Gas & Dust)
1G	INMETRO (Brazil) - Flameproof, Intrinsically Safe, Type n
1H	KGS (South Korea) - Flameproof, Intrinsically Safe
1I	NEPSI (China) - Flameproof, Intrinsically Safe, Type n
1J	CUTR EAC (Russia, Belarus, Kazakhstan, Armenia)
1K	PESO (India) - Flameproof, Intrinsically Safe, Type n
1L	TIIS (Japan) - Flameproof
2. Housing Material*	
2A	Aluminum
2B	Stainless Steel (Housing B only)
3. Housing Style*	
3A	Housing B (Standard design)
3B	Housing A (Integrated aluminum housing for use with Fisher GX valves only)

4. Input Signal*	
4A	4-20 mA (Point-to-Point mode) with HART, exida Certified
4B	0-24 V DC (Multi-Drop mode), exida Certified
4C	0-24 V DC (Multi-Drop mode) with HART, exida Certified. Supplied with DIN rail-mount LC340 Line Conditioner to support HART communication
5. Pneumatic Action*	
5A	Single-Acting DIRECT operation in De-Energize-to-Trip configuration (RELAY C)
5B	Single-Acting REVERSE operation in Energize-to-Trip configuration (RELAY B)
5C	DOUBLE-Acting operation in De-Energize-to-Trip configuration (RELAY A)

6. Position Feedback I/O Options*	
6A	DVC6200-SIS with SIL 2 rated 4-20 mA Position Feedback Transmitter enabled (Limit Switch disabled)
6B	DVC6200-SIS with SIL 2 rated Single Limit Switch enabled (Position Feedback Transmitter disabled)
7. Gauges*	
7A	None - Outlets will be plugged
7B	None - Tire valve connections required
7C	Supply & Output gauges, dual scaled 0-60 psig, 0-4 bar
7D	Supply & Output gauges, dual scaled 0-60 psig, 0-0.4 Mpa
7E	Supply & Output gauges, dual scaled 0-60 psig, 0-4 kgm^2
7F	Supply & Output gauges, dual scaled 0-160 psig, 0-11 bar
7G	Supply & Output gauges, dual scaled 0-160 psig, 0-1.1 Mpa
7H	Supply & Output gauges, dual scaled 0-160 psig, 0-11 kgm^2
8. Threaded Connections*	
8A	1/2 NPT conduit & 1/4 NPT pneumatic
8B	1/2 NPT conduit with M20 x 1.5 ISO brass adaptor & 1/4 NPT pneumatic
8C	1/2 NPT conduit with M20 x 1.5 ISO SST adaptor & 1/4 NPT pneumatic
8D	M20 conduit with 1/4 NPT pneumatic(1)
9. Additional Options**	
XX	None
RM	Remote Mount version: DVC6205 SIS with DVC6215 remote travel sensor rated to 125°C (257°F), aluminum constructions only
CG1	Cable Gland: Intrinsically Safe, blue plastic
CG2	Cable Gland: Flameproof, ENC Brass
LL	Lloyds Marine Approval
SV	Solenoid Valve testing capability (available on single-acting devices only, includes third pressure gauge)
H7	HART 7 protocol (for use with HART 7 hosts)
SF	10-micron in-line air supply filter
PP	Protective Plastic Pipe Plugs for pneumatic or conduit openings
CC	Custom Configuration - Please detail requirements separately

* Select only one option
** Select more than one if required
1. Available for ATEX approved devices.

Typical model number: DVC6200-SIS 1D_2A_3A_4A_5A_6B_7F_8D_SV H7

	1	2	3	4	5	6	7	8	9
DVC6200-SIS	1D	2A	3A	4A	5A	6B	7F	8D	SV H7

Enter your choices to start the selection process:

	1	2	3	4	5	6	7	8	9
DVC6200-SIS									

Model Numbers

Model numbers generated using the above matrices can be referenced on suppporting documentation, including the order acknowledgement, serial card, packing list and boxing labels. Contact your Emerson sales office to ensure the generated model number is included with your order.

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Fisher™ FIELDVUE™ DVC2000 Digital Valve Controller

The FIELDVUE DVC2000 digital valve controller is simple to use, compact, and designed for easy mounting. It converts a 4-20 mA input signal into a pneumatic output signal, which feeds the control valve actuator. Instrument setup is performed with an enclosed push button and liquid crystal display (LCD) interface. The interface supports multiple languages, available in two language pack options.

The DVC2000 uses a two-stage positioner design. The pre-amplifier stage provides high static gain for responsiveness to small changes in the input signal. The power amplifier stage delivers the right volume of air to the actuator, combining superior dynamic performance with minimal steady-state air consumption.

The high performance, linkage-less feedback system eliminates physical contact between the valve stem and the positioner. There is no wear of parts so cycle life is maximized. Additionally, the elimination of levers and linkages reduces the number of mounting parts and the mounting complexity. Positioner replacement and maintenance is simplified because the feedback parts stay connected to the actuator stem.

Designed to meet intrinsically safe and non-incendive requirements, this instrument delivers scalable functionality and high performance in a small package.

W8755-3

Specifications

Available Mountings

- Integral mounting to Fisher 657/667 or GX actuators
- Sliding-stem applications
- Quarter-turn rotary applications

DVC2000 digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards.

Input Signal

Analog Input Signal: 4-20 mA DC, nominal; can be configured for split range
Minimum Voltage: Voltage available at instrument terminals must be 8.5 volts for analog control, 9.0 volts for HART® communication
Maximum Voltage: 30 VDC
Minimum Control Current: 4.0 mA (below 3.5 mA may cause microprocessor restart)
Overcurrent Protection: Input circuitry limits current to prevent internal damage
Reverse Polarity Protection: No damage occurs from reversal of loop current

Output Signal

Pneumatic signal as required by the actuator, up to full supply pressure
Minimum Span: 0.5 bar (7 psig)
Maximum Span: 7 bar (101 psig)
Action: Single Acting, direct

Supply Pressure(1)

Recommended: 0.5 bar (7 psig) greater than the maximum actuator requirements
Maximum: 7 bar (101 psig)

Supply medium must be clean, dry air or noncorrosive gas that meets the requirements of ISA Standard 7.0.01 or ISO 8573-1

Temperature Limits(1)

-40 to 80°C (-40 to 176°F). LCD may not be readable below -20°C (-4°F).

Air Consumption(2)

Supply pressure
At 1.5 bar (22 psig)(3): 0.06 normal m^3/h (2.3 scfh)
At 4 bar (58 psig)(4): 0.12 normal m^3/h (4.4 scfh)

Air Capacity(2)

Supply pressure
At 1.5 bar (22 psig)(3): 4.48 normal m^3/h (167 scfh)
At 4 bar (58 psig)(4): 9.06 normal m^3/h (338 scfh)

Independent Linearity

±0.5% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 1 below
Emissions—Class A
ISM equipment rating: Group 1, Class A

Tested to NAMUR NE21 requirements

Vibration Testing Method

Tested per ANSI/ISA-75.13.01 Section 5.3.5. A resonant frequency search is performed on all three axes. The instrument is subjected to the ISA specified 1/2 hour endurance test at each major resonance, plus an additional two million cycles.

Input Impedance

The input impedance of the DVC2000 active electronic circuit is not purely resistive. For comparison to resistive load specifications, an equivalent impedance of 450 ohms may be used. This value corresponds to 9 V @ 20 mA.

Electrical Classification

Hazardous Area:

CSA—Intrinsically Safe and Non-incendive
FM—Intrinsically Safe and Non-incendive
ATEX—Intrinsically Safe
IECEx—Intrinsically Safe

Contact your Emerson sales office if additional information is required

Electrical Housing:

CSA—IP66, Type 4X
FM—IP66
ATEX—IP66
IECEx—IP66

-continued-

Specifications (continued)

Other Classifications/Certifications

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KGS— Korea Gas Safety Corporation (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

SABS— South African Bureau of Standards (South Africa)

Contact your Emerson sales office for classification/certification specific information

Connections

Standard
Supply and Output Pressure: G1/4 internal
Electrical: M20 internal

Optional
Supply and Output Pressure: 1/4 NPT internal
Electrical: 1/2 NPT internal

Materials of Construction

Housing and Cover: A03600 low copper aluminum alloy
Elastomers: nitrile, fluorosilicone

Stem Travel(6)

Minimum: 6.35 mm (0.25 inch)
Maximum: 606 mm (23-7/8 inches)

Shaft Rotation(6)

Minimum: 0 - 45°
Maximum: 0 - 90°

Mounting

Designed for direct actuator mounting. For weatherproof housing capability, the vent must be positioned at the lowest point of the instrument.

Weight

1.5 kg (3.3 lbs)

Dimensions

Refer to figure 3

Options

■ **Airset:** Fisher 67CFR with filter
Language Packs: ■ *Standard:* English, German, French, Italian, Spanish, Japanese, Chinese, Portuguese, Russian, Polish, and Czech
■ *Optional:* English, German, French, Italian, Spanish, Japanese, Chinese, and Arabic
■ Pipe-away vent
■ **Limit Switches:** Two isolated switches, configurable throughout calibrated travel range
Supply Voltage: 5-30 VDC
OFF State: 0.5 to 1.0 mA
ON State: 3.5 to 4.5 mA (above 5 volts)
Reference Accuracy: 2.5% of travel span(5)
■ **Transmitter:** 4-20 mA output, isolated
Supply Voltage: 8-30 VDC
Fault Indication: offrange high or low
Reference Accuracy: 1% of travel span(5)

1. The pressure/temperature limits in this document and any applicable standard or code limitation should not be exceeded. Note: Temperature limits vary based on hazardous area approval.
2. Normal m^3/hour - Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh - Standard cubic feet per hour at 60°F and 14.7 psia.
3. Low pressure relay: 0 to 3.3 bar (0 to 49 psig).
4. High pressure relay: 3.4 to 7.0 bar (50 to 102 psig).
5. Typical values when calibrated at temperature.
6. Stem Travel or Shaft Rotation can be modified with special mounting kits. Contact your Emerson sales office for maximum angle or shaft rotation.

Features

- Simplicity—The DVC2000 is easy to use. If you are mounting the instrument for the first time, the linkage-less feedback system is easy to install. Once a magnet array is assembled to the valve stem, positioner replacement is simple since there are no physically connected parts.

  At its very basic functionality, the DVC2000 digital valve controller has a local user interface that will allow you to configure, calibrate, and tune the instrument. If the I/O Options Package is installed, you can calibrate the 4-20 mA transmitter and configure the limit switch action. Running the Quick Setup routine calibrates and tunes the instrument specifically for that actuator.

  The full text display in the local interface is easy to navigate, in part due to the selection of languages. Each unit can be configured to display English, German, French, Italian, Spanish, Japanese or Chinese. The standard language pack also includes Portuguese, Russian, Polish, and Czech. An optional language pack replaces these four languages with Arabic.

- Reliability—The DVC2000 is based on the field-proven FIELDVUE technology. Years of control experience has brought this product line to a high level of reliability and dependability.

- Performance—The two-stage positioner design provides a mechanical platform that enables responsiveness to small input changes and tighter process control. The digital tuning algorithm allows optimal response to get the valve to its desired position quickly.

- Diagnostics
  Local User Interface: DVC2000 instruments come standard with a liquid crystal display. Predefined instrument and valve diagnostics are built into the firmware to alert you if there are any problems with the mounting, electronics, hardware, or valve performance.

  Handheld Field Communicator: DVC2000 instruments are packed with user-configurable alerts and alarms. These flags provide notification of current status and potential valve and instrument problems through alerts such as travel deviation, travel limit, cycle count, and travel accumulation.

  ValveLink™ software: Tests can be performed to identify problems with the entire control valve assembly using ValveLink software. Using valve stem travel feedback, actuator pressure sensor, and other sensors on the instrument, the health of the control valve can be evaluated while the valve is still in service and fully operational. This helps to pinpoint problems without disrupting the process - before the equipment fails.

- I/O Options Package— The DVC2000 is available with an I/O Options Package which includes two (2) integral limit switches and a stem position transmitter. The limit switches are configurable for open and closed valve indication at any point throughout the calibrated travel range. The position transmitter provides a 4-20 mA signal for valve position feedback verification. As an integral component to the instrument, this option module avoids the need for difficult-to-mount external switches and transmitters.

Integration

Traditional 4-20 mA Systems

Because the DVC2000 instrument operates with a 4-20 mA control signal, it directly replaces older analog instruments. Microprocessor based electronics provide improved control performance along with repeatable and reliable configuration and calibration.

Modbus with ValveLink Software and HART Multiplexers

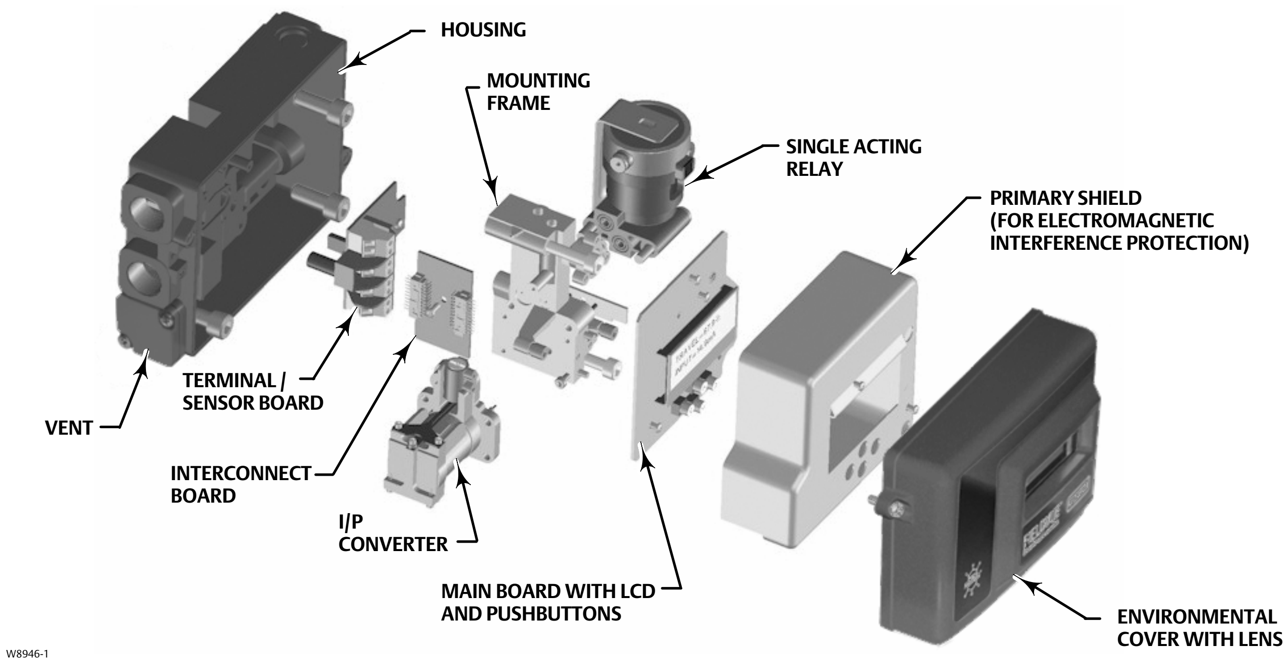
HART communication allows you to extract more value from the DVC2000 instrument beyond its inherent improved performance. When integrated into a multiplexer network and using ValveLink software, the device and valve information is real-time. From the safety of a control room, multiple instruments can be monitored for alerts and alarms.

Additionally, tasks such as configuration, calibration, and diagnostic testing do not require special trips to the field. ValveLink software can communicate via Modbus to the distributed control system (DCS) to provide critical information such as valve travel alerts and alarms.

Integrated Control System

A control system with HART communication capabilities has the ability to directly gather information from DVC2000 digital valve controllers. Information such as valve travel, alerts and alarms can be seamlessly accessed to provide a view into the field device from the safety of the control room.

Figure 1. FIELDVUE DVC2000 Digital Valve Controller Assembly (Exploded View)



Principle of Operation

The DVC2000 (figures 1 and 2) receives a 4-20 mA set point and position the valve by increasing or decreasing the air output to an actuator.

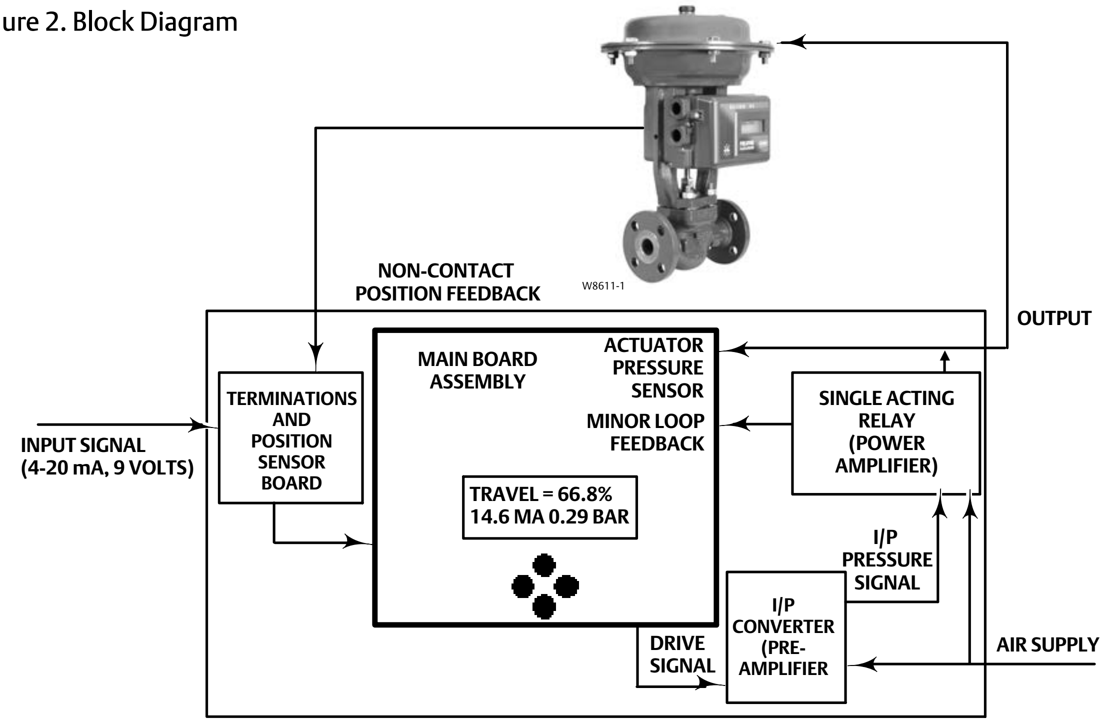
- The **input signal** provides electrical power and the set point simultaneously. The 4-20 mA signal is routed into the **terminals** through a twisted pair of wires.
- The unit's **mainboard** contains a microprocessor that continuously runs a digital control algorithm. This algorithm produces a “drive signal” to the I/P converter.
- The **I/P converter** assembly (or pre-amplifier) is connected to supply pressure and converts the electronic “drive signal” into a pneumatic “pressure signal.” This pressure signal is the input to the pneumatic relay assembly.
- The **relay** (or power amplifier) is also connected to supply pressure and amplifies the small pressure signal from the I/P converter into a larger pressure output signal used by the actuator. The change in relay output pressure to the actuator causes the valve to move.

  There are two relay options. The low pressure relay operates with actuators that require less than 3.5 bar (50 psi) of supply air. The high pressure relay operates with actuators that require 3.5 to 7.0 bar (50 to 100 psi) of supply air.
- Valve position is sensed through the linkage-less feedback system. The travel sensor is electrically connected to the printed wiring board to provide a travel feedback signal used in the control algorithm. The valve continues to move until the correct position is attained.

Installation

The DVC2000 is designed for mounting on any single acting pneumatic actuator up to 606 mm (23-7/8 inches) of travel. The envelope and travel feedback system conforms to VDI/VDE 3845, IEC 60534-6-1, and IEC 60534-6-2 standards.

Figure 2. Block Diagram



Furthermore, the DVC2000 instrument can be integrally mounted to the GX actuator, avoiding the need for complicated mounting brackets. The positioner mounts directly to an interface pad on the actuator yoke leg with a secure 3-point mounting. Internal passages inside the actuator yoke legs route the pneumatic output of the digital valve controller to the actuator casing, eliminating the need for external tubing (only for the air-to-open configuration).

Electrical connections are made on the termination strip, which uses cage clamp style wiring connectors. The electrical wiring entry point is available with either M20 or 1/2 NPT internal connections. Pressure connections are available with either G1/4 or 1/4 NPT internal connections.

Ordering Information

Refer to the Specifications section. Carefully review each specification and indicate your choice whenever a selection is to be made.

When ordering, specify:

1. Actuator type and size
2. Maximum actuator travel or rotation
3. Minimum actuator operating pressure
4. Hazardous area certification requirements
5. Options
   a. ■ G1/4 pneumatic and M20 conduit connections or ■ 1/4 NPT pneumatic and 1/2 NPT conduit connections
   b. Language pack: ■ Standard—English, German, French, Italian, Spanish, Japanese, Chinese, Portuguese, Russian, Polish, and Czech or ■ Optional—English, German, French, Italian, Spanish, Japanese, Chinese, and Arabic
   c. Supply pressure regulator
   d. Valve diagnostic level (online performance testing, offline advanced testing, basic alerts/alarms)
   e. I/O Options Package (includes position transmitter and two (2) limit switches)
   f. Pipe-away vent connector
   g. HART filter

Figure 3. Dimensions for FIELDVUE DVC2000 Digital Valve Controller

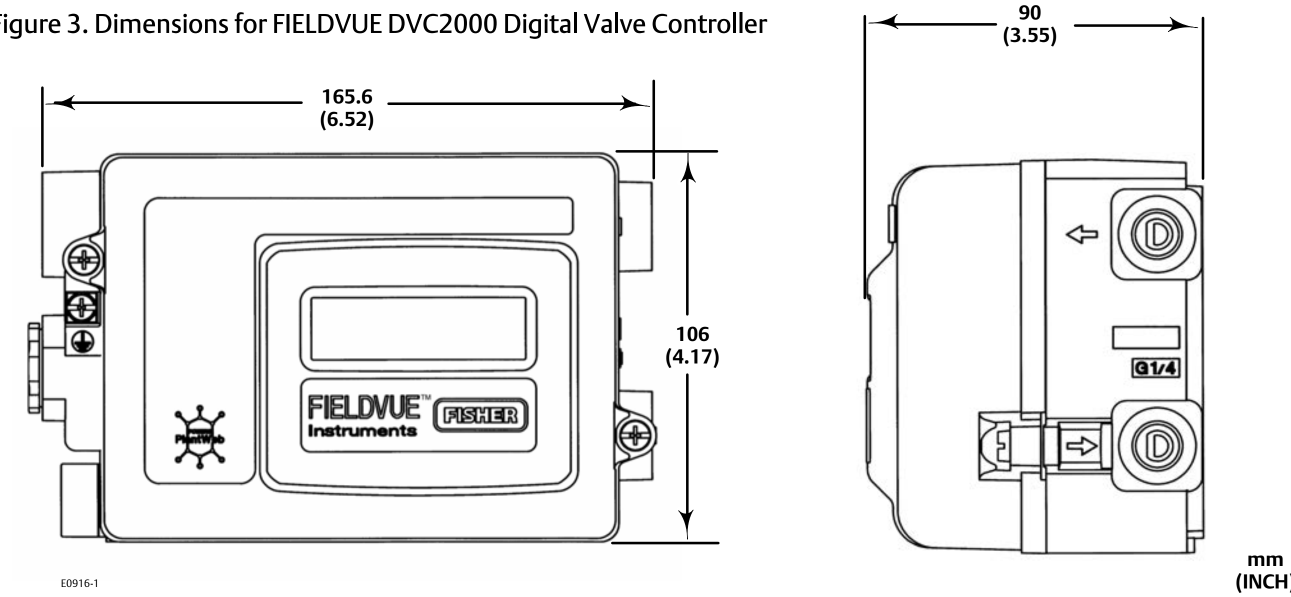


Table 1. EMC Summary Results—Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(1)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	6 kV contact 8 kV air	B
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	30 A/m at 50 Hz, 60 sec	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	± 1 kV	A
	Surge	IEC 61000-4-5	± 1 kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 10 Vrms	A

Performance criteria is + / - 1% effect.
1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

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Fisher™ FIELDVUE™ DVC6000 HW2 Digital Valve Controller

The FIELDVUE DVC6000 HW2 digital valve controller is a HART® communicating instrument that converts a two-wire 4-20 mA control signal into a pneumatic output to an actuator. It can easily be retrofitted in place of existing analog positioners on most Fisher and non-Fisher pneumatic actuators.

W8373-1

Features

Reliability

- Built to Survive— The field proven DVC6000 HW2 has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres. A weather-tight wiring terminal box isolates field wiring connections from other areas of the instrument.
- Actuator Overpressure Prevention

Performance

- Accurate and Responsive— The two-stage positioner design provides quick response to large step changes and precise control for small setpoint changes.
- Travel Control/Pressure Fallback— Valve position feedback is critical to the operation of a digital valve controller. The DVC6000 HW2 can detect position feedback problems and automatically revert to pressure control mode to keep the valve operational.
- Ramped Cutoff provides smooth transition from throttling control to shutoff

Ease of Use

- Enhanced Safety— The DVC6000 HW2 is a HART communicating device, so information can be accessed anywhere along the loop. This flexibility can reduce exposure to hazardous environments and make it easier to evaluate valves in hard to reach locations.
- Faster Commissioning— HART communications allows you to quickly commission loops with a variety of tools, either locally at the valve assembly or remotely.
- Easy Maintenance— The DVC6000 HW2 is modular in design. Critical working components can be replaced without removing field wiring or pneumatic tubing.

Value

- Hardware Savings— When installed in an integrated control system, significant hardware and installation cost savings can be achieved. Valve accessories such as limit switches and position transmitters can be eliminated due to the integrated position transmitter or switch option.

- Increased Uptime— The self-diagnostic capability of the DVC6000 HW2 provides valve performance and health evaluation without shutting down the process or pulling the valve assembly from the line.

- Improved Maintenance Decisions— Digital communication provides easy access to the condition of the valve. Sound process and asset management decisions can be made by analysis of valve information through Fisher ValveLink™ software.

Valve Diagnostics

The DVC6000 HW2 digital valve controller provides a broad and deep portfolio of valve diagnostic capabilities. Whether an Emerson Field Communicator is used to check for valve alerts and operational status, or ValveLink software is used for comprehensive diagnostic test and analysis, the tools are easy to use. When installed as part of a HART communicating system, the DVC6000 HW2 delivers prompt notification of current or potential equipment issues and supports NAMUR NE107 alert categorization.

Alerts assist in identification and notification of the following situations:

- Valve travel deviation due to excessive valve friction or galling

- High cycle due to dither or improper tuning

- Total travel movement accumulation beyond a specified point resulting in packing wear

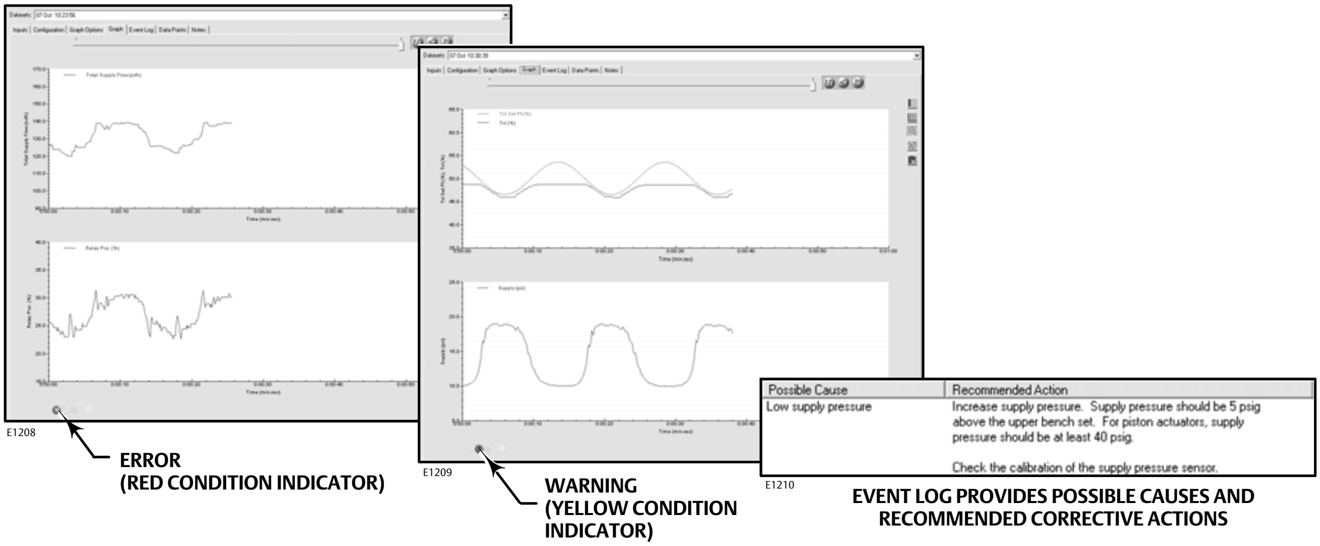
- Valve travel above or below a specified point

- Various instrument mechanical and electrical issues

These alerts are stored in memory on board the DVC6000 HW2.

Additionally, Performance Diagnostics enable condition and performance monitoring of the entire valve assembly (not just the instrument) while the valve is actively controlling the process. When conducting Performance Diagnostics tests, the valve does NOT move beyond the normal setpoint changes driven by the process controller. The DVC6000 HW2 uses statistical algorithms to determine condition and performance related issues based on live readings from the many on-board sensors. Results are then displayed graphically, with severity indicated by a red/yellow/green indicator (figure 1). A detailed description of the identified issue as well as suggestions for recommended actions are provided.

Figure 1. Condition Indicators (Performance Diagnostics)



Examples of identifiable issues are:

- Low or high air supply or pressure droop
- Incorrect regulator setting
- Dirty air supply
- External air leak (actuator diaphragm or tubing)
- Calibration shift
- Valve stuck
- Piston actuator O-ring failure
- Excessive or insufficient valve assembly friction
- Excessive valve assembly deadband
- Elastomer failure in the DVC6000 HW2
- Broken actuator spring

Performance Diagnostics also provide access to full-stroke dynamic testing of the valve assembly including: valve signature, dynamic error band, step response, and stroke check. These tests change the instrument setpoint at a controlled rate and are performed while the valve assembly is isolated from the process.

For additional information on FIELDVUE diagnostics and ValveLink software refer to Fisher Bulletin 62.1:ValveLink Software (D102227X012).

Specifications

Available Configurations

DVC6000 HW2 digital valve controllers can be mounted on Fisher and other manufacturers rotary and sliding-stem actuators(1)

DVC6005 HW2*:* Base unit for 2 inch pipestand or wall mounting

■ DVC6015: Remotely mounted feedback unit for sliding-stem applications
■ DVC6025: Remotely mounted feedback unit for rotary or long-stroke sliding-stem applications, or
■ DVC6035: Remotely mounted feedback unit for quarter-turn rotary applications

Mounting kit required for mounting feedback unit on actuator

Communication Protocol

■ HART 5 or ■ HART 7

Input Signal

Point-to-Point:.
Analog Input Signal: 4-20 mA DC, nominal; split ranging available
Minimum Voltage Available at Instrument Terminals must be 9.5 VDC for analog control, 10 VDC for HART communication
Minimum Control Current: 4.0 mA
Minimum Current w/o Microprocessor Restart: 3.5 mA
Maximum Voltage: 30 VDC
Overcurrent protected
Reverse Polarity protected

Multi-drop:.
Instrument Power: 11 to 30 VDC at 10 mA
Reverse Polarity protected

Supply Pressure(2)

Recommended: 0.3 bar (5 psig) higher than maximum actuator requirements
Maximum: 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Medium: Air or Natural Gas

Supply pressure must be clean, dry oil-free and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1.

Output Signal

Pneumatic signal as required by the actuator, up to full supply pressure

Minimum Span: 0.4 bar (6 psig)
Maximum Span: 9.5 bar (140 psig)
Action: ■ Double, ■ Single Direct, or ■ Single Reverse

Steady-State Air Consumption(3)(4)

Standard Relay:
At 1.4 bar (20 psig) supply pressure:
Less than 0.38 normal m^3/hr (14 scfh)
At 5.5 bar (80 psig) supply pressure:
Less than 1.3 normal m^3/hr (49 scfh)

Maximum Output Capacity(3)(4)

At 1.4 bar (20 psig) supply pressure:
10.0 normal m^3/hr (375 scfh)
At 5.5 bar (80 psig) supply pressure:
29.5 normal m^3/hr (1100 scfh)

Operating Ambient Temperature Limits(2)(5)

-40 to 85°C (-40 to 185°F) for base unit
-52 to 85°C (-62 to 185°F) for base unit utilizing the Extreme Temperature option (fluorosilicone elastomers)
-52 to 125°C (-62 to 257°F) for remote-mount feedback unit

Independent Linearity(6)

Typical Value:±0.50% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Vibration Testing Method

Tested per ANSI/ISA-S75.13.01 Section 5.3.5

Input Impedance

An equivalent impedance of 500 ohms may be used. This value corresponds to 10V @ 20 mA.

Humidity Limits

Tested per IEC 61514-2

-continued-

Specifications (continued)

Electrical Classification

Hazardous Area:

CSA—Intrinsically Safe, Explosion-proof, Division 2, Dust Ignition-proof

FM—Intrinsically Safe, Explosion-proof, Non-incendive, Dust Ignition-proof

ATEX—Intrinsically Safe, Flameproof, Type n, Dust by intrinsic safety

IECEx—Intrinsically Safe, Flameproof, Type n, Dust by intrinsic safety or by enclosure

Electrical Housing:

CSA— Type 4X, IP66

FM— Type 4X, IP66

ATEX— IP66

IECEx— IP66

Other Classifications/Certifications

Lloyds Register— Marine Type Approval

CUTR—Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO— National Institute of Metrology, Quality, and Technology (Brazil)

KTL— Korea Testing Laboratory (South Korea)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

SANS— South African Bureau of Standards

Contact your Emerson sales office for classification/certification specific information

Connections

Supply Pressure: 1/4 NPT internal and integral pad for mounting 67CFR regulator
Output Pressure: 1/4 NPT internal
Tubing: 3/8-inch recommended
Vent (pipe-away): 3/8 NPT internal
Electrical: 1/2 NPT internal or M20

Actuator Compatibility

Stem Travel (Sliding-Stem Linear)
Linear actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Shaft Rotation (Quarter-Turn Rotary)
Rotary actuators with rated travel between 45 degrees and 180 degrees

Weight

DVC6005 HW2 Base Unit: 4.1 kg (9 lbs)

DVC6015 Feedback Unit: 1.3 kg (2.9 lbs)
DVC6025 Feedback Unit: 1.4 kg (3.1 lbs)
DVC6035 Feedback Unit: 0.9 kg (2.0 lbs)

Construction Materials

Housing, module base and terminal box: A03600 low copper aluminum alloy
Cover: Thermoplastic polyester
Elastomers: ■ Nitrile (standard) ■ Fluorosilicone (optional)

Options

■ Supply and output pressure gauges or ■ Tire valves
■ Integral mounted filter regulator
■ Low-Bleed Relay(7) ■ Extreme Temperature

■ **Integral 4-20 mA Position Transmitter(8)(9):**
4-20 mA output, isolated
Supply Voltage: 8-30 VDC
Reference Accuracy: 1% of travel span

■ **Integral Switch(8):**
One isolated switch, configurable throughout the calibrated travel range or actuated from a device alert
Off State: 0 mA (nominal)
On State: up to 1 A
Supply Voltage: 30 VDC maximum
Reference Accuracy: 2% of travel span

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. 3-conductor shielded cable, 22 AWG minimum wire size, is required for connection between base unit and feedback unit. Pneumatic tubing between base unit output connection and actuator has been tested to 91 meters (300 feet). At 15 meters (50 feet) there was no performance degradation. At 91 meters there was minimal pneumatic lag.
2. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
3. Normal m^3/hour - Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh - Standard cubic feet per hour at 60°F and 14.7 psia.
4. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
5. Temperature limits vary based on hazardous area approval.
6. Not applicable for DVC6020 digital valve controllers in long-stroke applications or remote-mounted DVC6005 digital valve controllers with long pneumatic tubing lengths.
7. The Quad O steady-state consumption requirement of 6 scfh can be met by a DVC6000 HW2 with low bleed relay A option, when used with up to 4.8 bar (70 psi) supply of Natural Gas at 16°C (60°F). The 6 scfh requirement can be met by low bleed relay B and C when used with up to 5.2 bar (75 psi) supply of Natural Gas at 16°C (60°F).
8. The electronic output is available with either the position transmitter or the switch.
9. Position transmitter meets the requirements of NAMUR NE43; selectable to show failure low (< 3.6 mA) or failure high (> 22.5 mA). Fail high available only when the positioner is powered.

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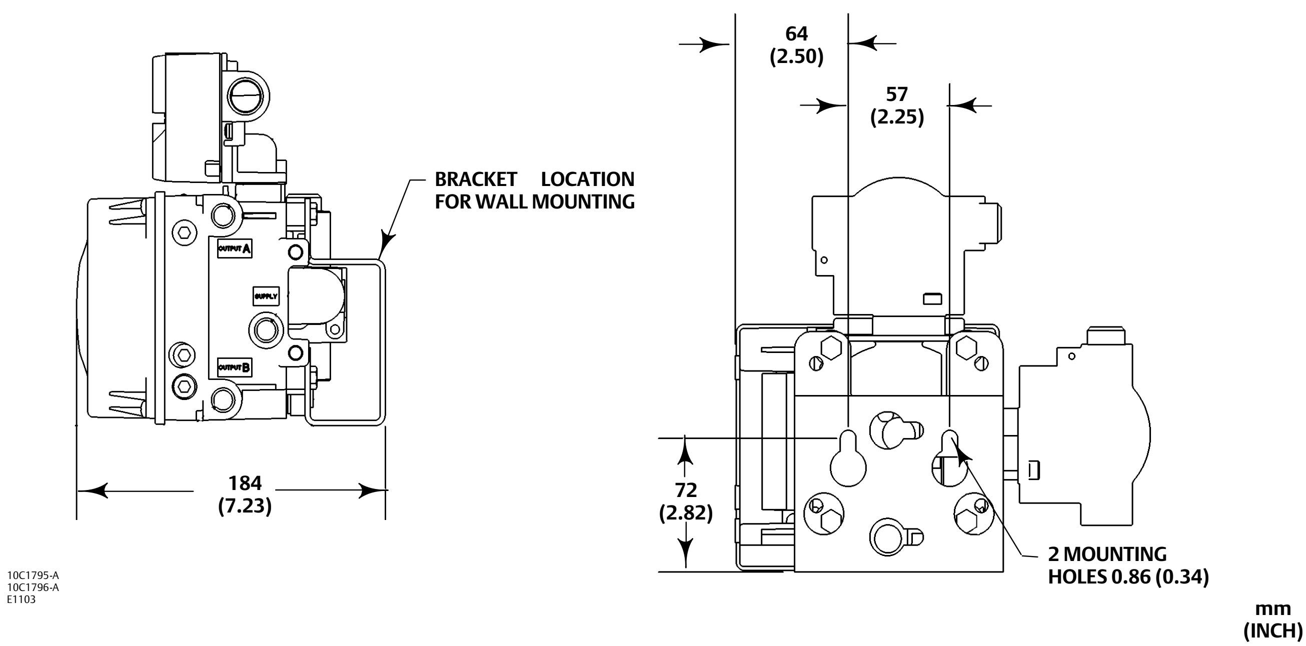
Fisher™ FIELDVUE™ DVC6005 Series Digital Valve Controller and DVC6015, DVC6025, and DVC6035 Feedback Unit Dimensions

Digital Valve Controller	Configuration	Mounting	Figure	Page
DVC6005 HW2 DVC6005f	Remote mount base unit	Wall	1	1
		2 Inch Pipestand	2	2
DVC6015	Feedback unit for sliding-stem applications	Sliding-stem actuator up to 102 mm (4 inch) travel	3	3
DVC6025	Feedback unit for rotary and long-stroke sliding-stem applications	Rotary and long-stroke sliding-stem actuator	4	3
DVC6035	Feedback unit for quarter-turn rotary applications	Rotary actuator shaft	5	4

Figure 1. FIELDVUE DVC6005 HW2 and DVC6005f Base Unit; Wall Mounted



HART COMMUNICATION PROTOCOL

FOUNDATION

Figure 2. FIELDVUE DVC6005 HW2 and DVC6005f Base Unit; Pipestand Mounted

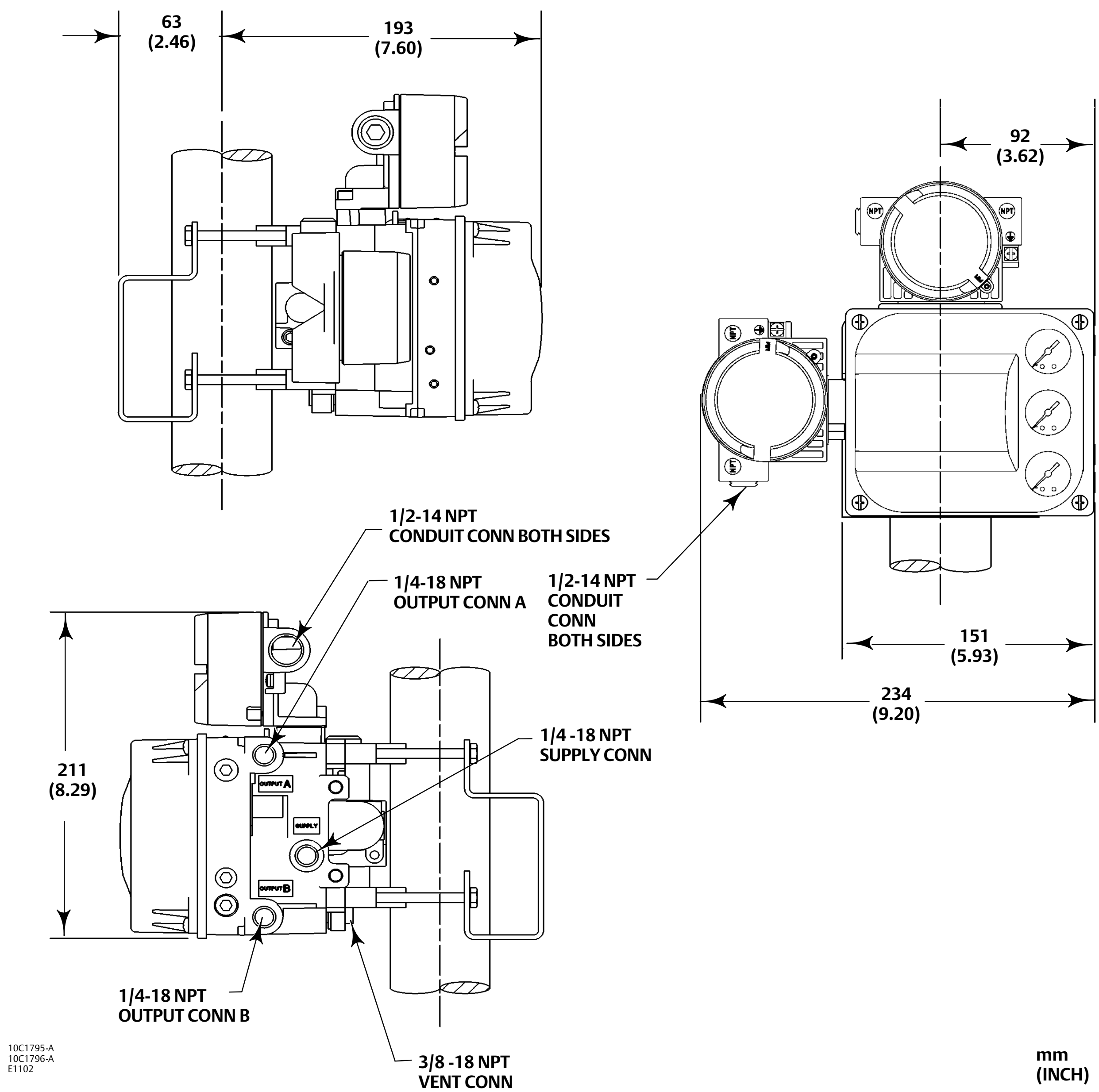


Figure 3. FIELDVUE DVC6015 Feedback Unit; Sliding-Stem Actuator Mounting up to 102 mm (4 inch) Travel

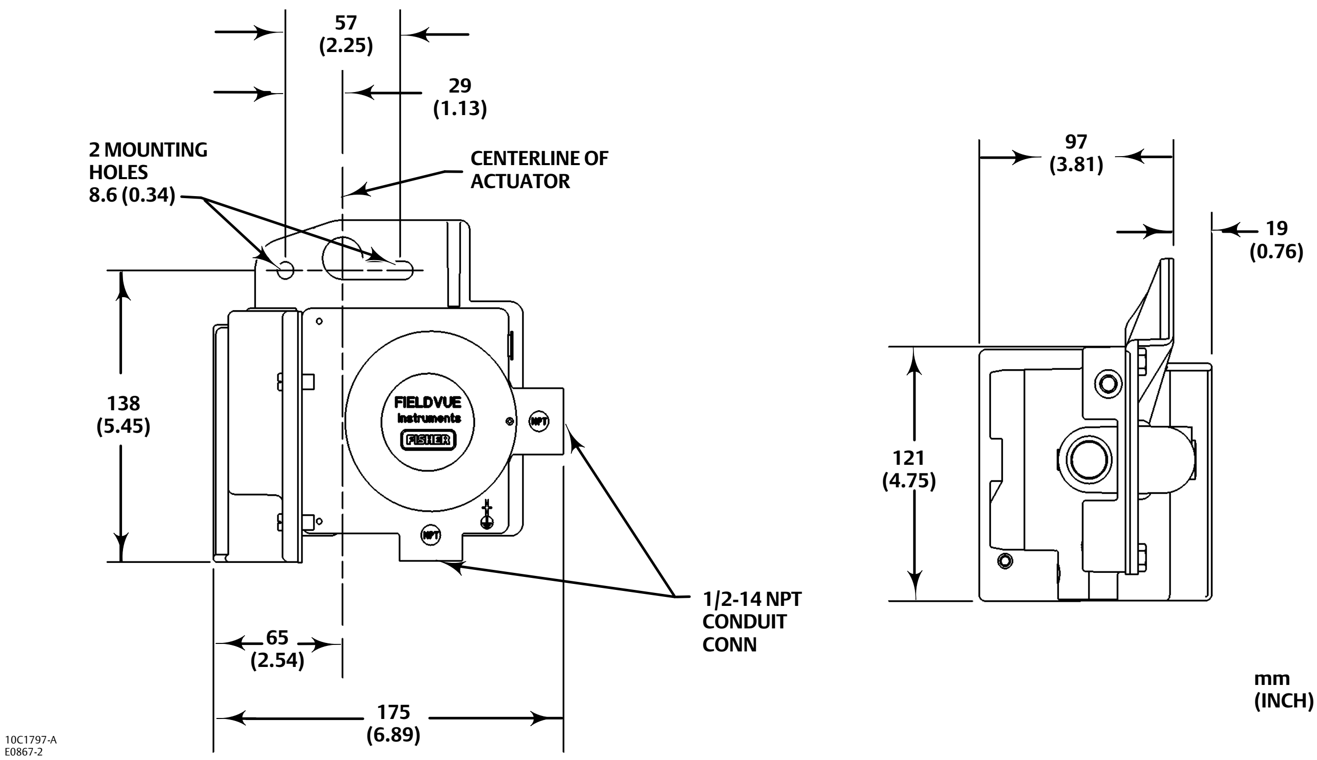


Figure 4. FIELDVUE DVC6025 Feedback Unit; Rotary and Long-Stroke Sliding-Stem Actuator Mounting

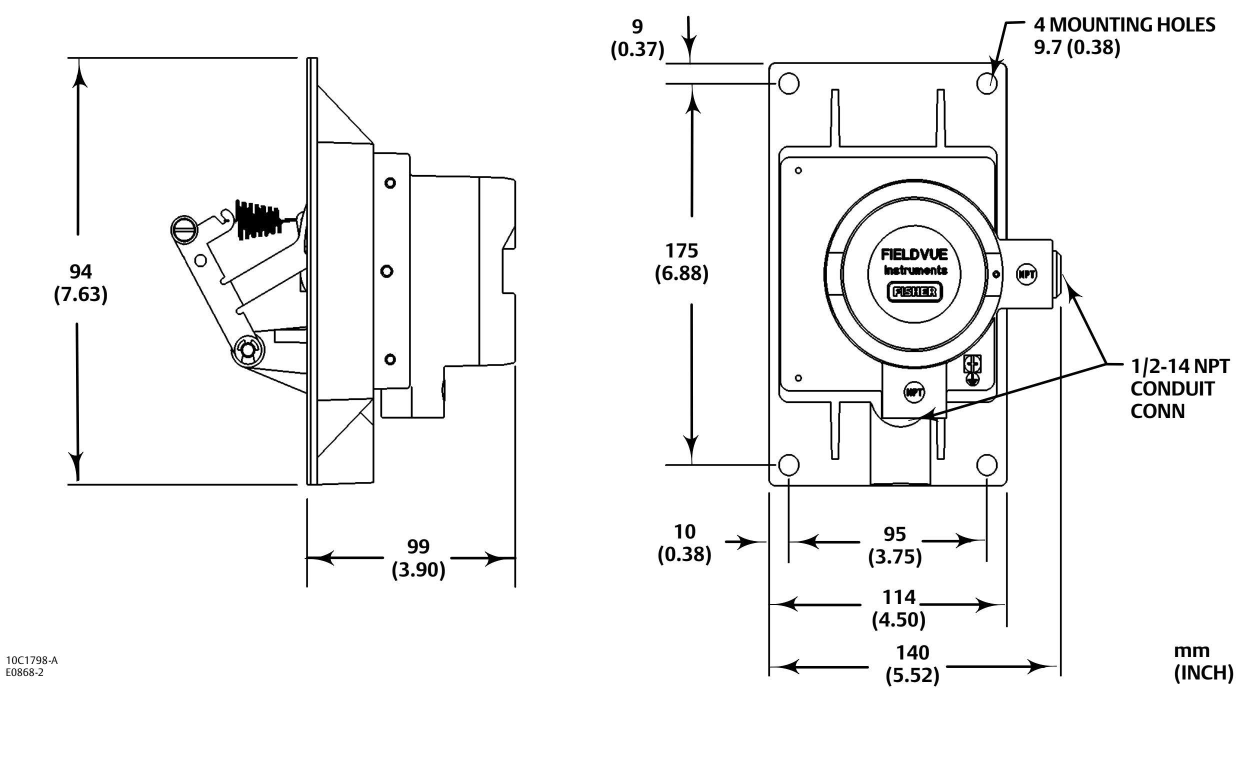
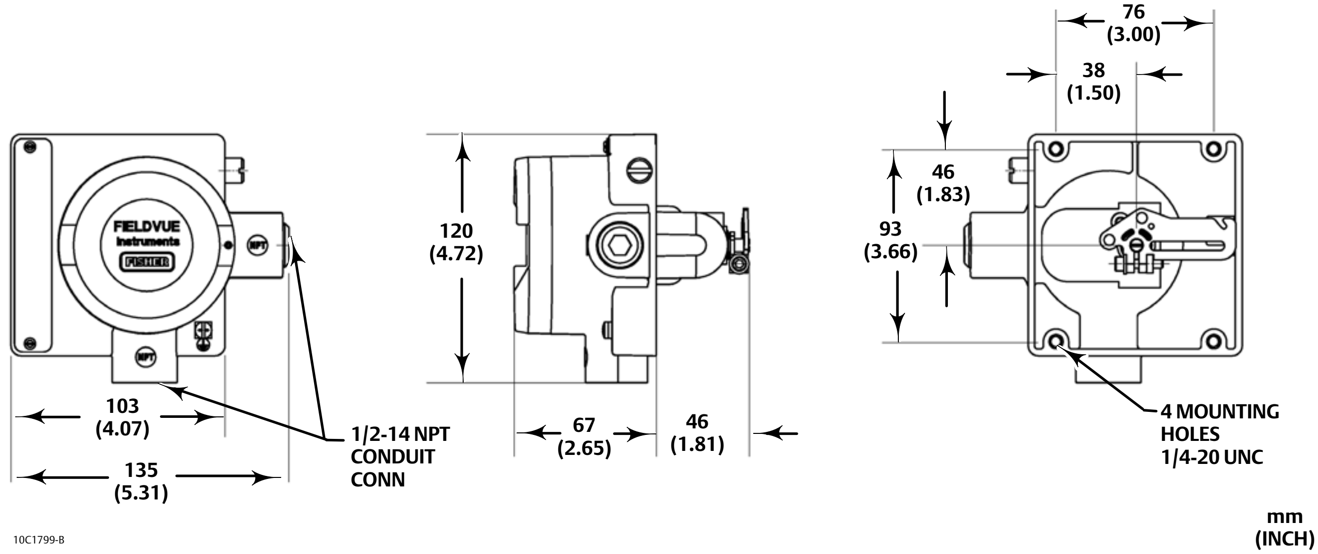


Figure 5. FIELDVUE DVC6035 Feedback Unit; Rotary Actuator Shaft Mounting



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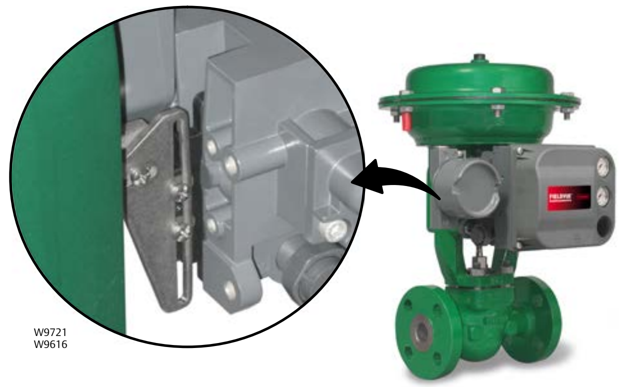
DVC6200 Digital Valve Controller
D103415X012

Product Bulletin
62.1:DVC6200
November 2020

Fisher™ FIELDVUE™ DVC6200 Digital Valve Controller

The FIELDVUE DVC6200 digital valve controller is a HART® communicating instrument that converts a two-wire 4-20 mA control signal into a pneumatic output to an actuator. It can easily be retrofitted in place of existing analog positioners on most Fisher and non-Fisher pneumatic actuators.



LINKAGE-LESS FEEDBACK SYSTEM

Features

Reliability

- **Linkage-Less Non-Contact Position Feedback—** The high performance, linkage-less feedback system eliminates physical contact between the valve stem and the DVC6200. There are no wearing parts so cycle life is maximized.

- **Built to Survive—**The field proven DVC6200 has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres. A weather-tight wiring terminal box isolates field wiring connections from other areas of the instrument.

- **Actuator Overpressure Prevention**

Performance

- **Accurate and Responsive—** The two-stage positioner design provides quick response to large step changes and precise control for small setpoint changes.

- **Travel Control/Pressure Fallback—** Valve position feedback is critical to the operation of a digital valve controller. The DVC6200 can detect position feedback problems and automatically revert to pressure control mode to keep the valve operational.

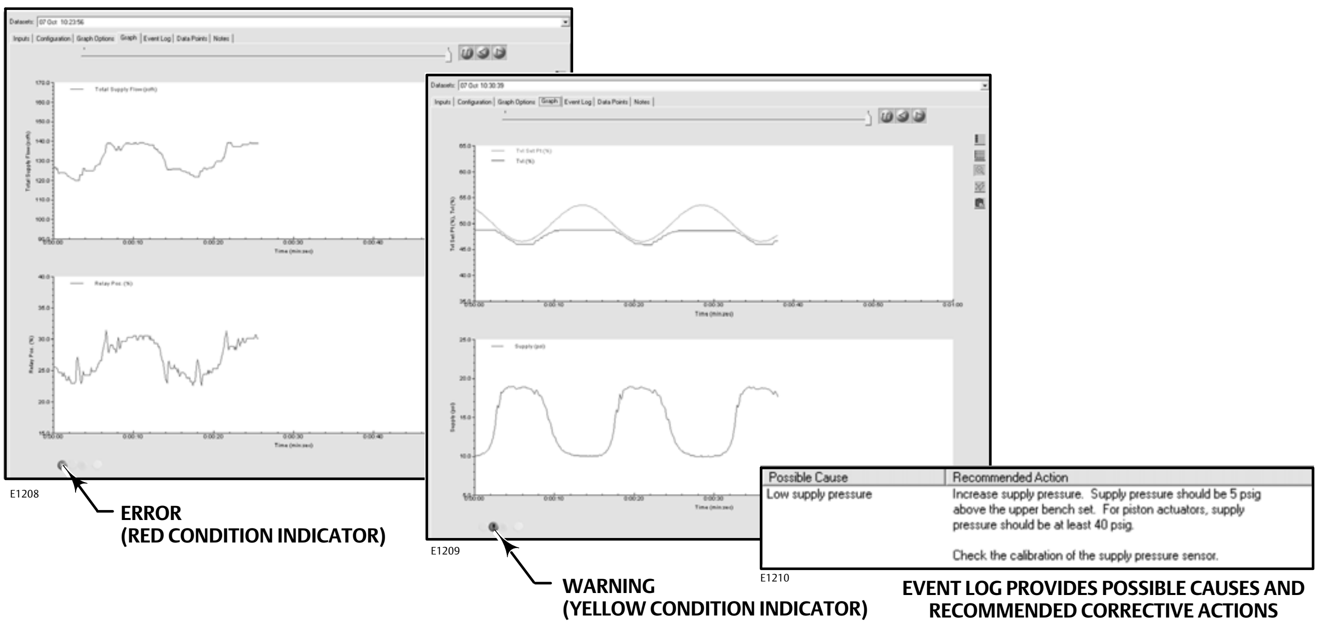
- **Ramped Cutoff provides smooth transition from throttling control to shutoff**

Ease of Use

- **Enhanced Safety—** The DVC6200 is a HART communicating device, so information can be accessed anywhere along the loop. This flexibility can reduce exposure to hazardous environments and make it easier to evaluate valves in hard to reach locations.

- **Faster Commissioning—** HART communications allows you to quickly commission loops with a variety of tools, either locally at the valve assembly or remotely.

Figure 1. Condition Indicators



- Easy Maintenance— The DVC6200 is modular in design. Critical working components can be replaced without removing field wiring or pneumatic tubing.

Value

- Hardware Savings— When installed in an integrated control system, significant hardware and installation cost savings can be achieved. Valve accessories such as limit switches and position transmitters can be eliminated due to the integrated position transmitter or switch option.

- Increased Uptime— The self-diagnostic capability of the DVC6200 provides valve performance and health evaluation without shutting down the process or pulling the valve assembly from the line.

- Improved Maintenance Decisions— Digital communication provides easy access to the condition of the valve. Sound process and asset management decisions can be made by analysis of valve information through Fisher ValveLink™ software.

Valve Diagnostics

The DVC6200 digital valve controller provides a broad and deep portfolio of valve diagnostic capabilities. Whether an Emerson Field Communicator is used to check for valve alerts and operational status, or ValveLink software is used for comprehensive diagnostic test and analysis, the tools are easy to use. When installed as part of a HART communicating system, the DVC6200 delivers prompt notification of current or potential equipment issues and supports NAMUR NE107 alert categorization.

Performance Diagnostics enable condition and performance monitoring of the entire valve assembly (not just the digital valve controller) while the valve is actively controlling the process. When conducting Performance Diagnostics tests, the valve does NOT move beyond the normal setpoint changes driven by the process controller. The DVC6200 uses statistical algorithms to determine condition and performance related issues based on live readings from the many on-board sensors. Results are then displayed graphically, with severity indicated by a red/yellow/green indicator (figure 1). A detailed description of the identified issue as well as suggestions for recommended actions are provided.

Examples of identifiable issues are:

- Low or high air supply or pressure droop
- Incorrect regulator setting
- Dirty air supply
- External air leak (actuator diaphragm or tubing)
- Calibration shift
- Valve stuck
- Piston actuator O-ring failure
- Excessive or insufficient valve assembly friction
- Excessive valve assembly deadband
- Elastomer failure in the DVC6200
- Broken actuator spring

Performance Diagnostics also provide access to full-stroke dynamic testing of the valve assembly including; valve signature, dynamic error band, step response, and stroke check. These tests change the instrument setpoint at a controlled rate and are performed while the valve assembly is isolated from the process.

For additional information on FIELDVUE diagnostics and ValveLink software refer to Fisher Bulletin 62.1:ValveLink Software (D102227X012).

Specifications

Available Mounting

- ■ Integral mounting to Fisher 657/667 or GX actuators
- ■ Integral mounting to Fisher rotary actuators
- ■ Sliding-stem linear applications
- ■ Quarter-turn rotary applications

DVC6200 digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards.

Communication Protocol

■ HART 5 or ■ HART 7

Input Signal

Point-to-Point

Analog Input Signal: 4-20 mA DC, nominal; split ranging available

Minimum Voltage Available at Instrument Terminals must be 9.5 VDC for analog control, 10 VDC for HART communication
Minimum Control Current: 4.0 mA
Minimum Current w/o Microprocessor Restart: 3.5 mA
Maximum Voltage: 30 VDC
Overcurrent protected
Reverse Polarity protected

Multi-drop

Instrument Power: 11 to 30 VDC at 10 mA
Reverse Polarity protected

Supply Pressure(1)

Minimum Recommended: 0.3 bar (5 psig) higher than maximum actuator requirements

Maximum: 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Supply Medium

Air or Natural Gas

Supply medium must be clean, dry, and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1

Output Signal

Pneumatic signal, up to full supply pressure
Minimum Span: 0.4 bar (6 psig)
Maximum Span: 9.5 bar (140 psig)
Action: ■ Double, ■ Single Direct or ■ Reverse

Steady-State Air Consumption(2)(3)

At 1.4 bar (20 psig) supply pressure: Less than 0.38 normal m^3/hr (14 scfh)
At 5.5 bar (80 psig) supply pressure: Less than 1.3 normal m^3/hr (49 scfh)

Maximum Output Capacity(2)(3)

At 1.4 bar (20 psig) supply pressure: 10.0 normal m^3/hr (375 scfh)
At 5.5 bar (80 psig) supply pressure: 29.5 normal m^3/hr (1100 scfh)

Operating Ambient Temperature Limits(1)(4)

-40 to 85°C (-40 to 185°F)
-52 to 85°C (-62 to 185°F) for instruments utilizing the Extreme Temperature option (fluorosilicone elastomers)

Independent Linearity(5)

Typical Value: ±0.50% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Vibration Testing Method

Tested per ANSI/ISA-S75.13.01 Section 5.3.5.

Input Impedance

An equivalent impedance of 550 ohms may be used. This value corresponds to 11V @ 20 mA.

Humidity Testing Method

Tested per IEC 61514-2

Electrical Classification

Hazardous Area Approvals

CSA— Intrinsically Safe, Explosion-proof, Division 2, Dust Ignition-proof

FM— Intrinsically Safe, Explosion-proof, Non-Incendive, Dust Ignition-proof

ATEX— Intrinsically Safe, Flameproof, Type n, Dust by intrinsic safety

IECEx— Intrinsically Safe, Flameproof, Type n, Dust by intrinsic safety or by enclosure

-continued-

Specifications (continued)

Electrical Housing

CSA— Type 4X, IP66

FM— Type 4X, IP66

ATEX— IP66

IECEx— IP66

Other Classifications/Certifications

Natural Gas Certified, Single Seal Device— CSA, FM, ATEX, and IECEx

Lloyds Register— Marine Type Approval

CML— Certification Management Limited (Japan)

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KOSHA— Korean Occupational Safety & Health Agency (South Korea)

KTL— Korea Testing Laboratory (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

SANS— South Africa National Standards

Not all certifications apply to all constructions. Contact your Emerson sales office for classification/certification specific information.

Connections

Supply Pressure: 1/4 NPT internal and integral pad for mounting 67CFR regulator
Output Pressure: 1/4 NPT internal
Tubing: 3/8-inch recommended
Vent: 3/8 NPT internal
Electrical: 1/2 NPT internal or M20

Actuator Compatibility

Stem Travel (Sliding-Stem Linear)
Linear actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Shaft Rotation (Quarter-Turn Rotary)
Rotary actuators with rated travel between 45 degrees and 180 degrees

Weight

Aluminum: 3.5 kg (7.7 lbs)
Stainless Steel: 8.6 kg (19 lbs)

Construction Materials

Housing, module base and terminal box:
A03600 low copper aluminum alloy (standard), Stainless Steel (optional)
Cover: Thermoplastic polyester
Elastomers: Nitrile (standard)

Options

■ Supply and output pressure gauges or ■ Tire valves ■ Integral mounted filter regulator ■ Low-Bleed Relay(6) ■ Extreme Temperature ■ Natural Gas Certified, Single Seal Device ■ Remote Mount(7) ■ Stainless Steel ■ Integral 4-20 mA Position Transmitter(8)(9) ■ Integral Limit Switch(10)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. Normal m^3/hour - Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh - Standard cubic feet per hour at 60°F and 14.7 psia.
3. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
4. Temperature limits vary based on hazardous area approval. Lower temperature limit for CUTR Ex d approval with fluorosilicone elastomers is -53°C (-63.4°F).
5. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also not applicable for digital valve controllers in long-stroke applications.
6. The Quad O steady-state consumption requirement of 6 scfh can be met by a DVC6200 with low bleed relay A option, when used with up to 4.8 bar (70 psi) supply of Natural Gas at 16°C (60°F). The 6 scfh requirement can be met by low bleed relay B and C when used with up to 5.2 bar (75 psi) supply of Natural Gas at 16°C (60°F).
7. 4-conductor shielded cable, 18 to 22 AWG minimum wire size, in rigid or flexible metal conduit, is required for connection between base unit and feedback unit.
8. 4-20 mA output, isolated; *Supply Voltage:* 8-30 VDC; *Reference Accuracy:* 1% of travel span.
9. Position transmitter meets the requirements of NAMUR NE43; selectable to show failure low (< 3.6 mA) or failure high (> 22.5 mA). Fail high available only when the positioner is powered.
10. One isolated switch, configurable throughout the calibrated travel range or actuated from a device alert; *Off State:* 0 mA (nominal); *On State:* up to 1 A; *Supply Voltage:* 30 VDC maximum; *Reference Accuracy:* 2% of travel span.

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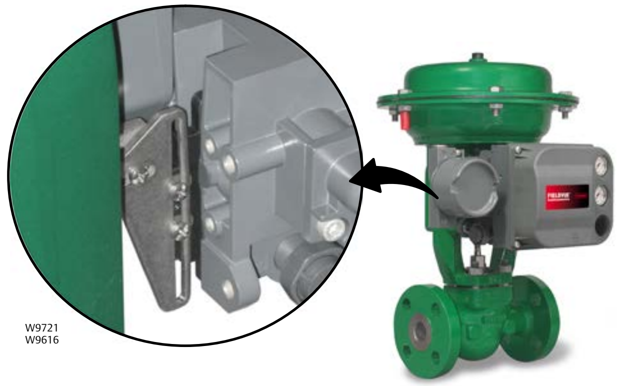
Fisher™ FIELDVUE™ DVC6200 Digital Valve Controller

The FIELDVUE DVC6200 digital valve controller is a HART® communicating instrument that converts a two-wire 4-20 mA control signal into a pneumatic output to an actuator. It can easily be retrofitted in place of existing analog positioners on most Fisher and non-Fisher pneumatic actuators.



LINKAGE-LESS FEEDBACK SYSTEM

Features

Reliability

- **Linkage-Less Non-Contact Position Feedback—** The high performance, linkage-less feedback system eliminates physical contact between the valve stem and the DVC6200. There are no wearing parts so cycle life is maximized.
- **Built to Survive—**The field proven DVC6200 has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres. A weather-tight wiring terminal box isolates field wiring connections from other areas of the instrument.
- **Actuator Overpressure Prevention**

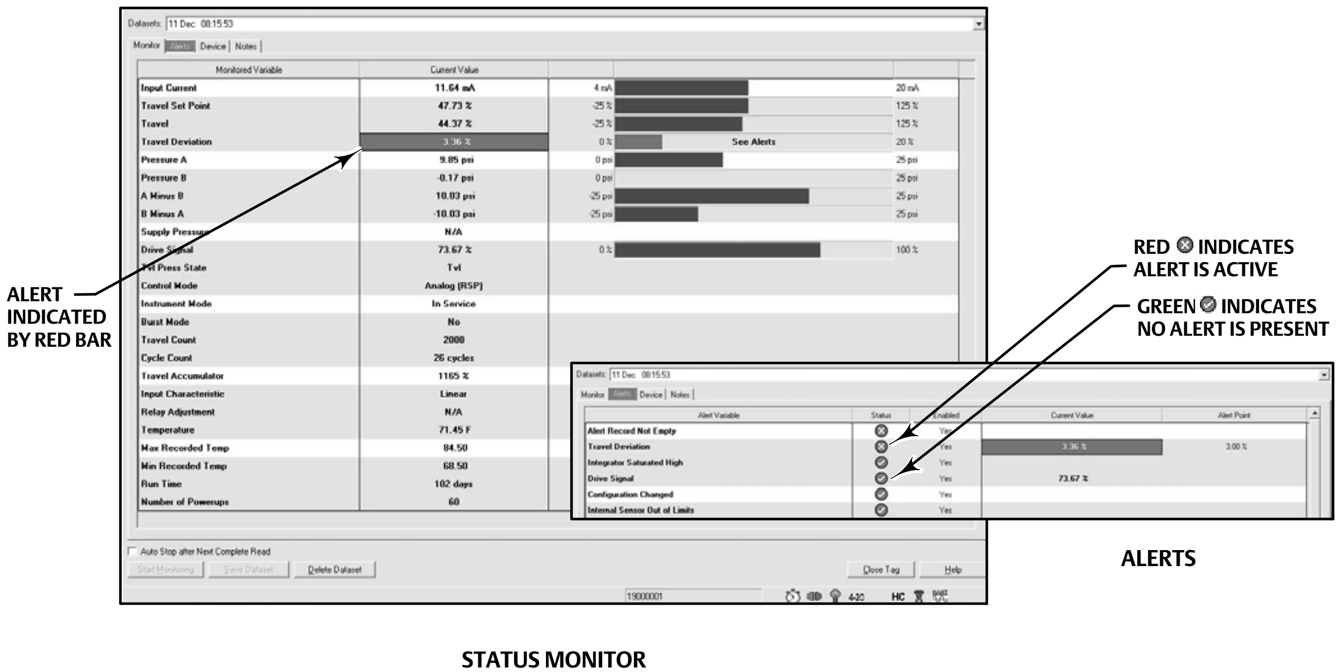
Performance

- **Accurate and Responsive—** The two-stage positioner design provides quick response to large step changes and precise control for small setpoint changes.
- **Ramped Cutoff provides smooth transition from throttling control to shutoff**

Ease of Use

- **Enhanced Safety—** The DVC6200 is a HART communicating device, so information can be accessed anywhere along the loop. This flexibility can reduce exposure to hazardous environments and make it easier to evaluate valves in hard to reach locations.
- **Faster Commissioning—** HART communications allows you to quickly commission loops with a variety of tools, either locally at the valve assembly or remotely.
- **Easy Maintenance—** The DVC6200 is modular in design. Critical working components can be replaced without removing field wiring or pneumatic tubing.

Figure 1. Alerts Status Screen



Value

- **Hardware Savings—** When installed in an integrated control system, significant hardware and installation cost savings can be achieved. Valve accessories such as limit switches and position transmitters can be eliminated due to the integrated position transmitter or switch option.
- **Increased Uptime—** The self-diagnostic capability of the DVC6200 provides valve performance and health evaluation without shutting down the process or pulling the valv e assembly from the line.
- **Improved Maintenance Decisions—** Digital communication provides easy access to the condition of the valve. Sound process and asset management decisions can be made by analysis of valve information through Fisher ValveLink™ software.

Valve Diagnostics

The DVC6200 digital valve controller provides a comprehensive library of valve diagnostic alerts, as shown in figure 1. These alerts are easily accessed with an Emerson Field Communicator. When installed as part of a HART communicating system, the DVC6200 delivers prompt notification of current or potential equipment issues directly to the asset management system and supports NAMUR NE107 alert categorization.

Alerts assist in identification and notification of the following situations:

- Valve travel deviation due to excessive valve friction or galling
- High cycle due to dither or improper tuning
- Total travel movement accumulation beyond a specified point resulting in packing wear
- Valve travel above or below a specified point
- Various instrument mechanical and electrical issues

These alerts are stored in memory on board the DVC6200.

For additional information on FIELDVUE diagnostics and ValveLink software refer to Fisher Bulletin 62.1:ValveLink Software (D102227X012).

Specifications

Available Mounting

- ■ Integral mounting to Fisher 657/667 or GX actuators
- ■ Integral mounting to Fisher rotary actuators
- ■ Sliding-stem linear applications
- ■ Quarter-turn rotary applications

DVC6200 digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards.

Communication Protocol

■ HART 5 or ■ HART 7

Input Signal

Point-to-Point

Analog Input Signal: 4-20 mA DC, nominal; split ranging available

Minimum Voltage Available at Instrument Terminals must be 9.5 VDC for analog control, 10 VDC for HART communication
Minimum Control Current: 4.0 mA
Minimum Current w/o Microprocessor Restart: 3.5 mA
Maximum Voltage: 30 VDC
Overcurrent protected
Reverse Polarity protected

Multi-drop

Instrument Power: 11 to 30 VDC at 10 mA
Reverse Polarity protected

Supply Pressure(1)

Minimum Recommended: 0.3 bar (5 psig) higher than maximum actuator requirements

Maximum: 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Supply Medium

Air or Natural Gas

Supply medium must be clean, dry, and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1

Output Signal

Pneumatic signal, up to full supply pressure
Minimum Span: 0.4 bar (6 psig)
Maximum Span: 9.5 bar (140 psig)
Action: ■ Double, ■ Single Direct or ■ Reverse

Steady-State Air Consumption(2)(3)

At 1.4 bar (20 psig) supply pressure: Less than 0.38 normal m^3/hr (14 scfh)
At 5.5 bar (80 psig) supply pressure: Less than 1.3 normal m^3/hr (49 scfh)

Maximum Output Capacity(2)(3)

At 1.4 bar (20 psig) supply pressure:
10.0 normal m^3/hr (375 scfh)
At 5.5 bar (80 psig) supply pressure:
29.5 normal m^3/hr (1100 scfh)

Operating Ambient Temperature Limits(1)(4)

-40 to 85°C (-40 to 185°F)
-52 to 85°C (-62 to 185°F) for instruments utilizing the Extreme Temperature option (fluorosilicone elastomers)

Independent Linearity(5)

Typical Value: ±0.50% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Vibration Testing Method

Tested per ANSI/ISA-S75.13.01 Section 5.3.5.

Input Impedance

An equivalent impedance of 550 ohms may be used. This value corresponds to 11V @ 20 mA.

Humidity Testing Method

Tested per IEC 61514-2

Electrical Classification

Hazardous Area Approvals

CSA— Intrinsically Safe, Explosion-proof, Division 2, Dust Ignition-proof

FM— Intrinsically Safe, Explosion-proof, Non-Incendive, Dust Ignition-proof

ATEX— Intrinsically Safe, Flameproof, Type n, Dust by intrinsic safety

IECEx— Intrinsically Safe, Flameproof, Type n, Dust by intrinsic safety or by enclosure

-continued-

Specifications (continued)

Electrical Housing

CSA— Type 4X, IP66

FM— Type 4X, IP66

ATEX— IP66

IECEx— IP66

Other Classifications/Certifications

Natural Gas Certified, Single Seal Device— CSA, FM, ATEX, and IECEx

Lloyds Register— Marine Type Approval

CML— Certification Management Limited (Japan)

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KOSHA— Korean Occupational & Health Agency (South Korea)

KTL— Korea Testing Laboratory (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

SANS— South Africa National Standards

Not all certifications apply to all constructions. Contact your Emerson sales office for classification/certification specific information.

Connections

Supply Pressure: 1/4 NPT internal and integral pad for mounting 67CFR regulator
Output Pressure: 1/4 NPT internal
Tubing: 3/8-inch recommended
Vent: 3/8 NPT internal
Electrical: 1/2 NPT internal or M20

Actuator Compatibility

Stem Travel (Sliding-Stem Linear)
Linear actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Shaft Rotation (Quarter-Turn Rotary)
Rotary actuators with rated travel between 45 degrees and 180 degrees

Weight

Aluminum: 3.5 kg (7.7 lbs)
Stainless Steel: 8.6 kg (19 lbs)

Construction Materials

Housing, module base and terminal box: A03600 low copper aluminum alloy (standard), Stainless Steel (optional)
Cover: Thermoplastic polyester
Elastomers: Nitrile (standard)

Options

■ Supply and output pressure gauges or ■ Tire valves ■ Integral mounted filter regulator ■ Low-Bleed Relay(6) ■ Extreme Temperature ■ Natural Gas Certified, Single Seal Device ■ Remote Mount(7) ■ Stainless Steel ■ Integral 4-20 mA Position Transmitter(8)(9) ■ Integral Limit Switch(10)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. Normal m^3/hour - Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh - Standard cubic feet per hour at 60°F and 14.7 psia.
3. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
4. Temperature limits vary based on hazardous area approval. Lower temperature limit for CUTR Ex d approval with fluorosilicone elastomers is -53°C (-63.4°F).
5. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also not applicable for digital valve controllers in long-stroke applications.
6. The Quad O steady-state consumption requirement of 6 scfh can be met by a DVC6200 with low bleed relay A option, when used with up to 4.8 bar (70 psi) supply of Natural Gas at 16°C (60°F). The 6 scfh requirement can be met by low bleed relay B and C when used with up to 5.2 bar (75 psi) supply of Natural Gas at 16°C (60°F).
7. 4-conductor shielded cable, 18 to 22 AWG minimum wire size, in rigid or flexible metal conduit, is required for connection between base unit and feedback unit.
8. 4-20 mA output, isolated; *Supply Voltage:* 8-30 VDC; *Reference Accuracy:* 1% of travel span .
9. Position transmitter meets the requirements of NAMUR NE43; selectable to show failure low (< 3.6 mA) or failure high (> 22.5 mA). Fail high available only when the positioner is powered.
10. One isolated switch, configurable throughout the calibrated travel range or actuated from a device alert; *Off State:* 0 mA (nominal); *On State:* up to 1 A; *Supply Voltage:* 30 VDC maximum; *Reference Accuracy:* 2% of travel span.

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DVC6200 Digital Valve Controller
D103543X012

Product Bulletin
62.1:DVC6200(S1)
September 2017

Fisher™ FIELDVUE™ DVC6200 Digital Valve Controller / Magnet Assembly Dimensions

Digital Valve Controller	Configuration[1]	Mounting	Figure	Page
DVC6200 DVC6200 SIS DVC6200f DVC6200p	Integral mounting to the Fisher 657/667 size i or GX actuator Integral mounting to Fisher rotary actuators Sliding-stem linear applications Quarter-turn rotary applications	With integrally mounted filter regulator	1	1, 2
DVC6205 DVC6205 SIS DVC6205f DVC6205p	Remote mount base unit	- - -	2	3
DVC6215	Feedback unit	- - -	3	4

1. DVC6200 digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards.

Magnet Assembly[1]		Figure	Page
Stem #19	19 mm / 3/4 inch	4	4
Stem #25	25 mm / 1 inch	5	4
Stem #38	38 mm / 1-1/2 inch	6	5
Stem #50	50 mm / 2 inch	7	5
SStem #110	110 mm / 4-1/8 inch	8	6
SStem #210	210 mm / 8-1/4 inch	9	6
RShaft #1 / LRC[2]	Fisher 2052 Size 2 & 3, 1051/1052 Size 40-70, 1061 Size 30-100, Sliding Stem > 210 mm (8.25 inches)	10	7
RShaft #2 / LRC[2]	2052 Size 1, 1051/1052 Size 20-33	10	7
RShaft End	90 degree	11	8

1. Linear magnet assembly width dimensions are shown in figure 6.
2. Linear Roller Cam.

Figure 1. FIELDVUE DVC6200, DVC6200 SIS, DVC6200f, and DVC6200p Digital Valve Controller with Integrally Mounted Filter Regulator

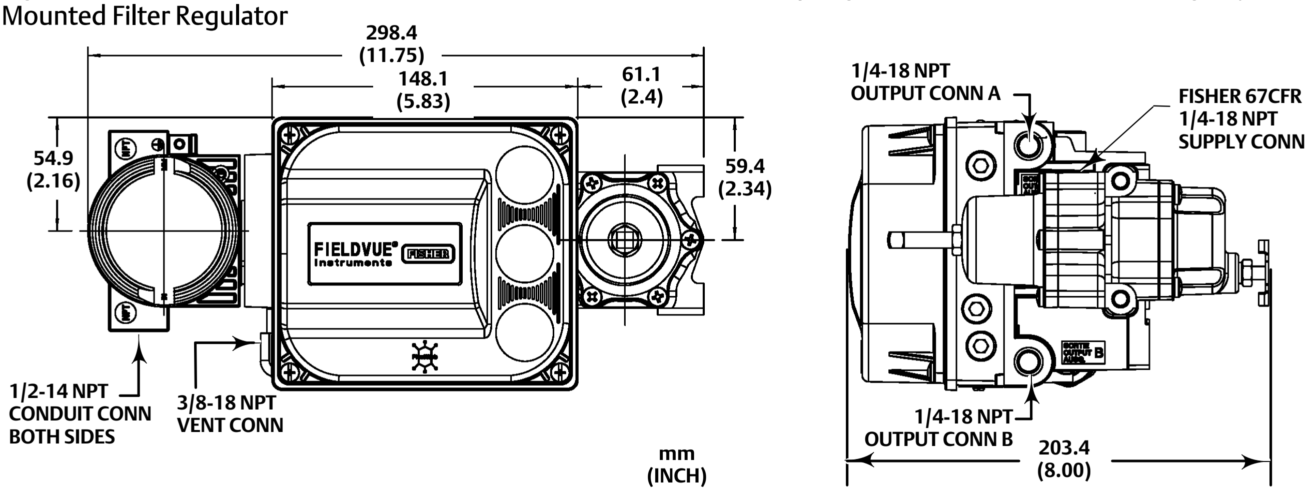
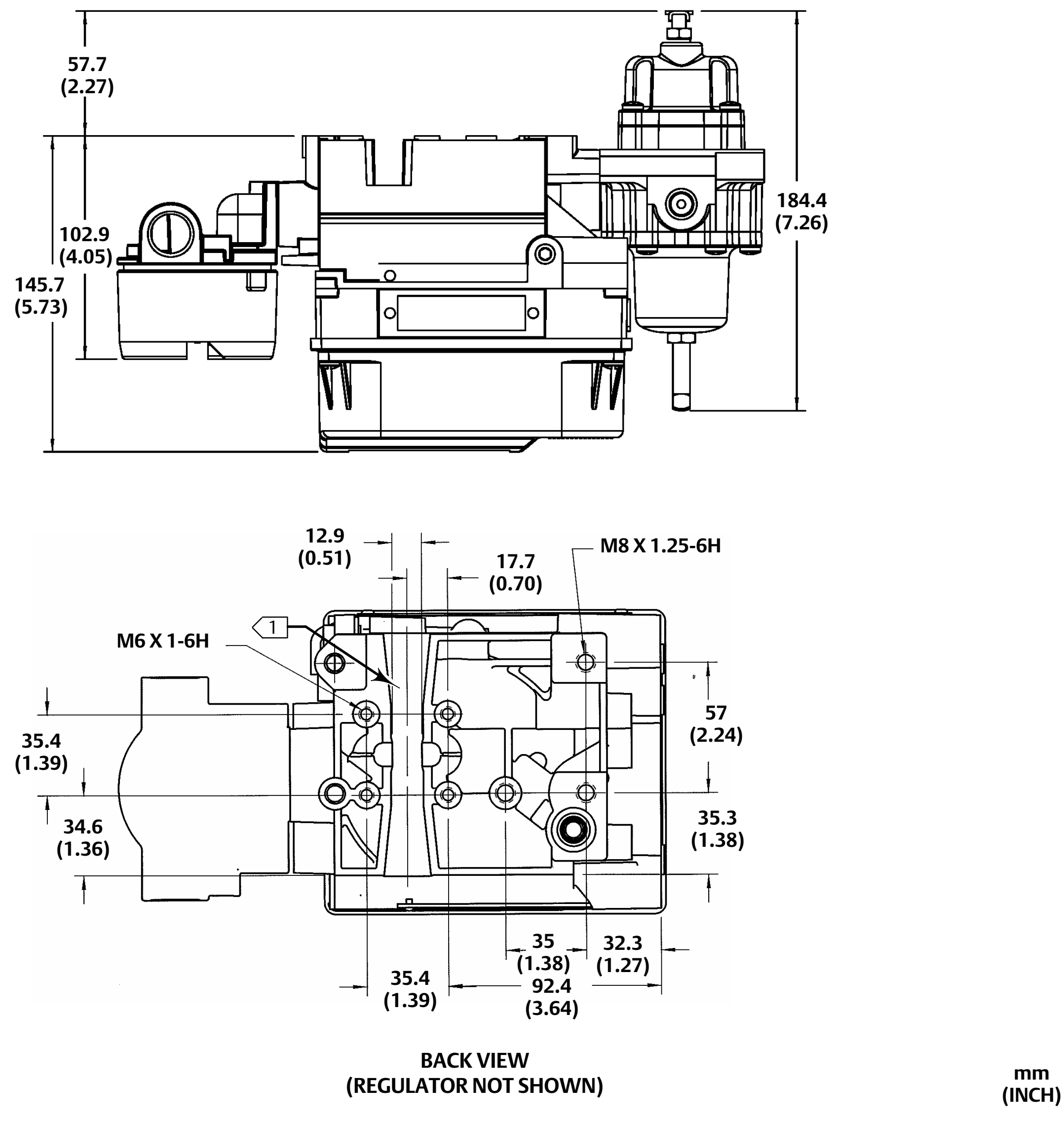


Figure 1. FIELDVUE DVC6200, DVC6200 SIS, DVC6200f, and DVC6200p Digital Valve Controller with Integrally Mounted Filter Regulator (continued)



1 Housing insert for SSTEM #210 magnet assembly (figure 9) inserted here.

Figure 2. FIELDVUE DVC6205, DVC6205 SIS, DVC6205f, and DVC6205p
Remote Mount Base Unit Envelope Dimensions

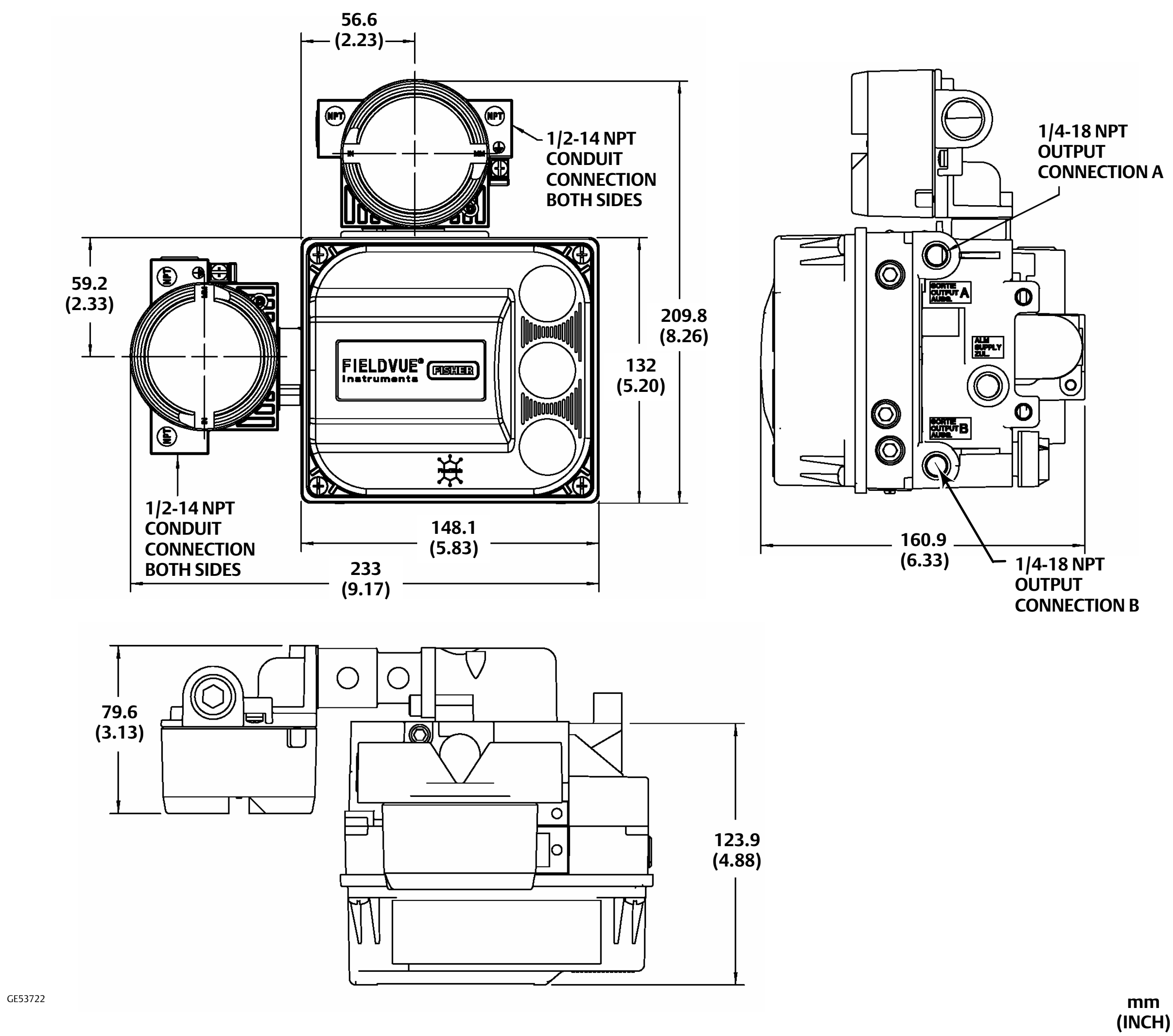
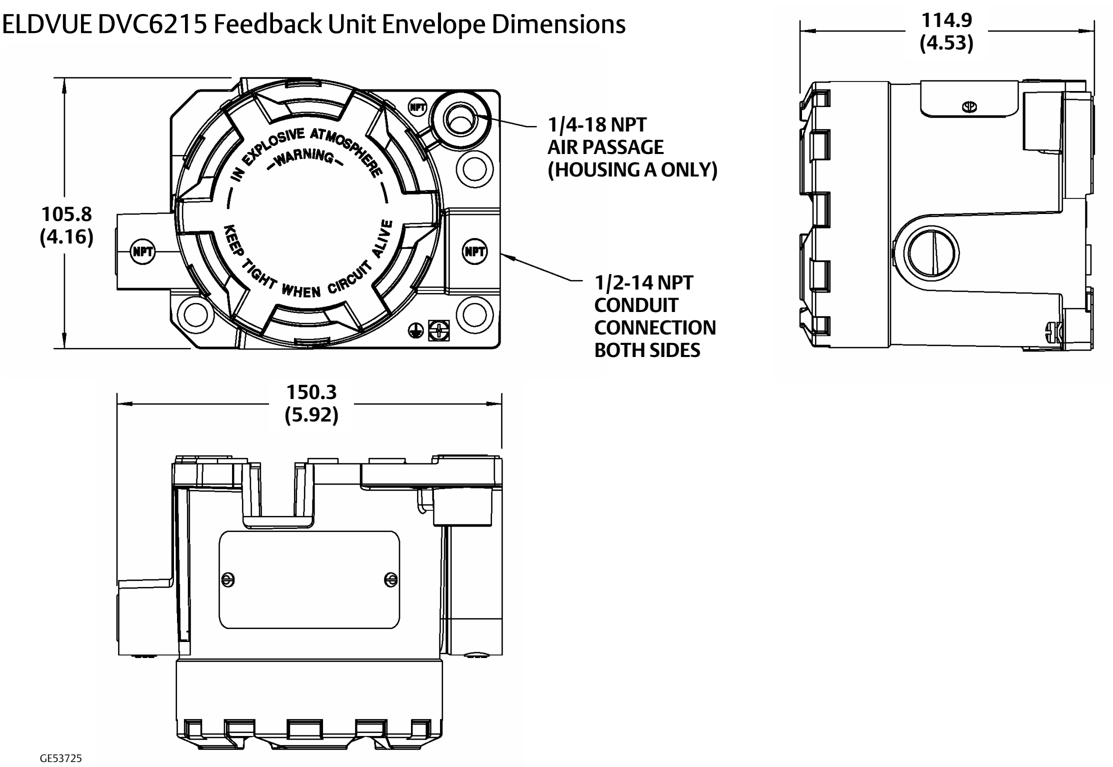


Figure 3. FIELDVUE DVC6215 Feedback Unit Envelope Dimensions



Mounting hole locations for the DVC6215 feedback unit are the same as for the DVC6200, DVC6200 SIS, DVC6200f, and DVC6200p digital valve controller. Refer to the back view in figure 1.

Magnet Assemblies

Figure 4. SStem #19 Magnet Assembly
(Also see 2 in figure 6)

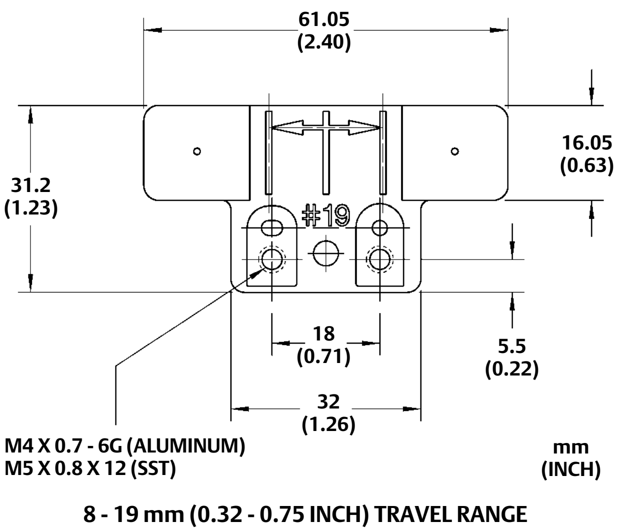


Figure 5. SStem #25 Magnet Assembly
(Also see 2 in figure 6)

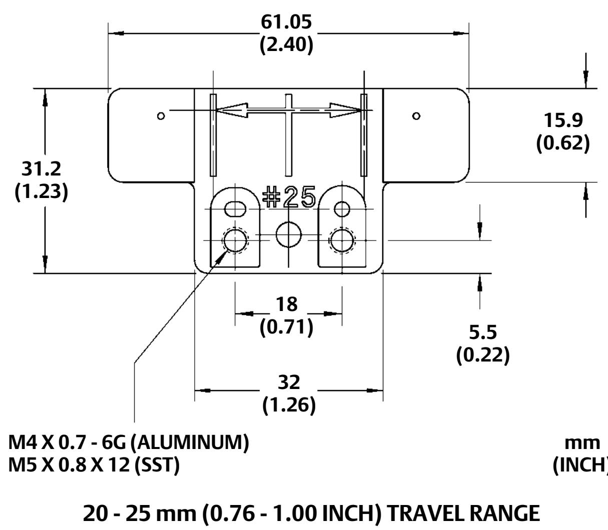


Figure 6. SStem #38 Magnet Assembly

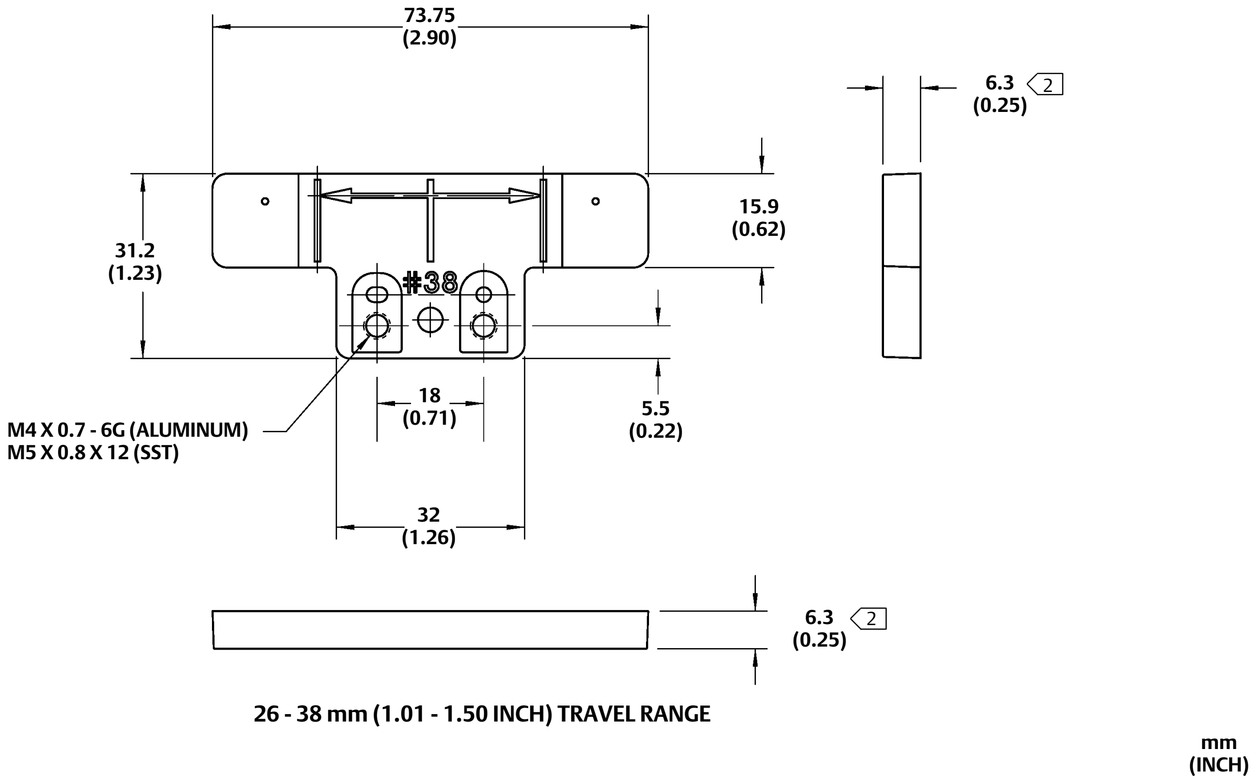


Figure 7. SStem #50 Magnet Assembly (Also see 2 in figure 6)

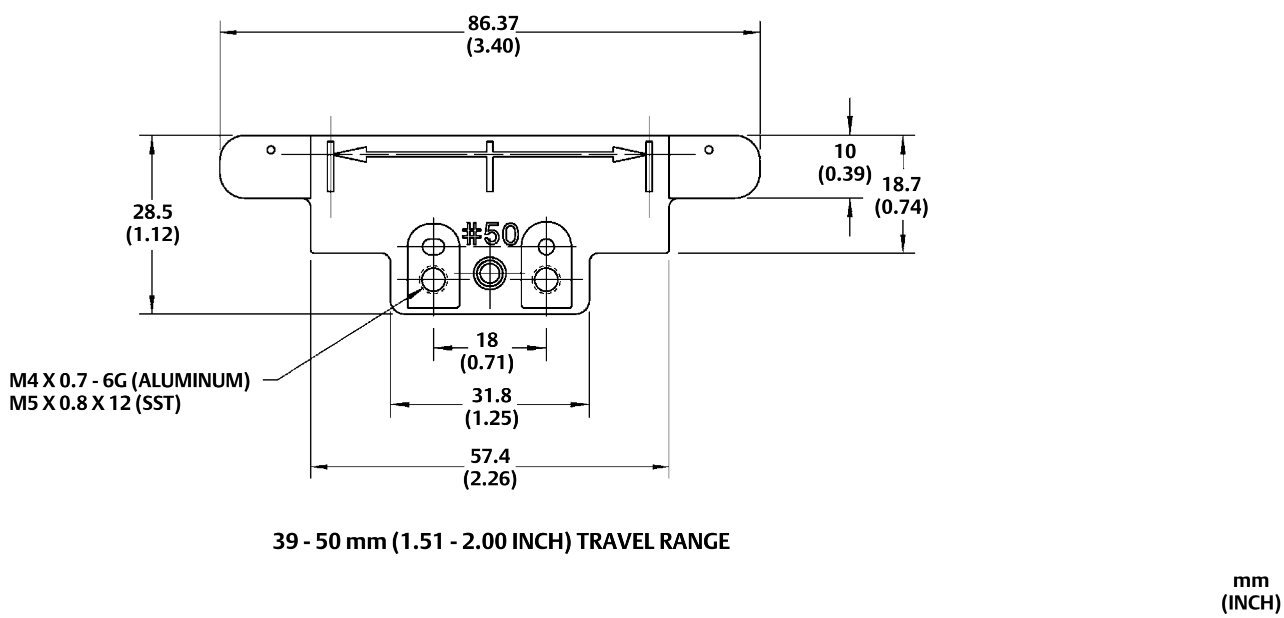


Figure 8. SStem #110 Magnet Assembly (Also see 2 in figure 6)

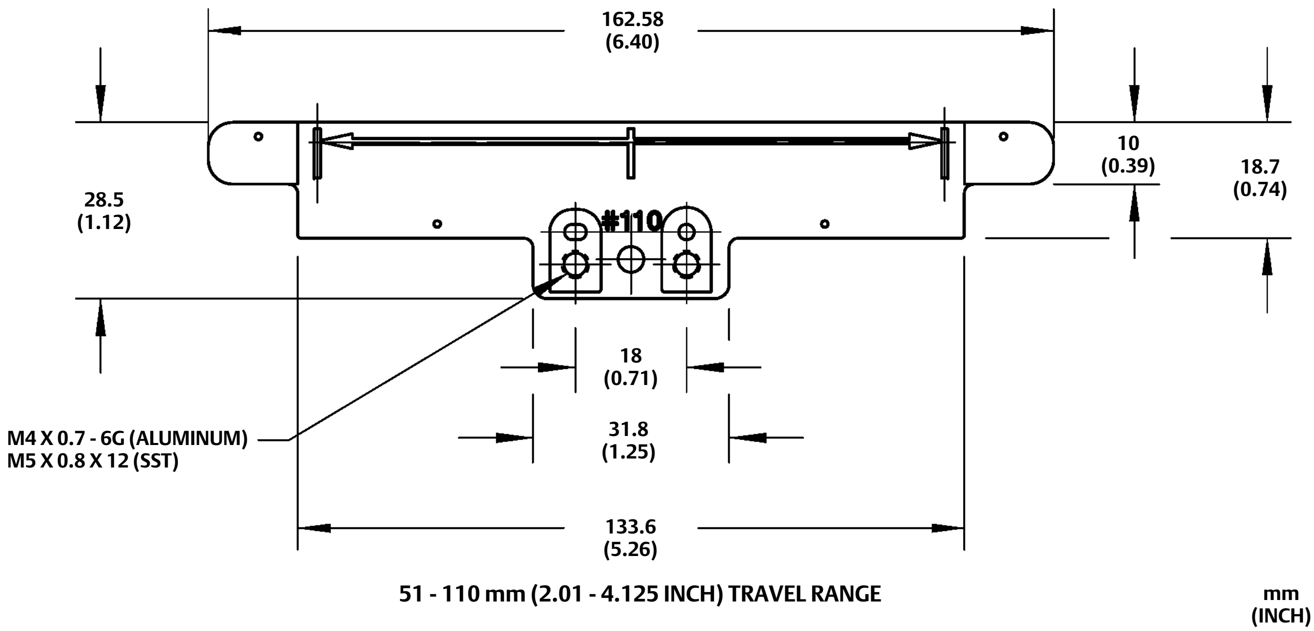
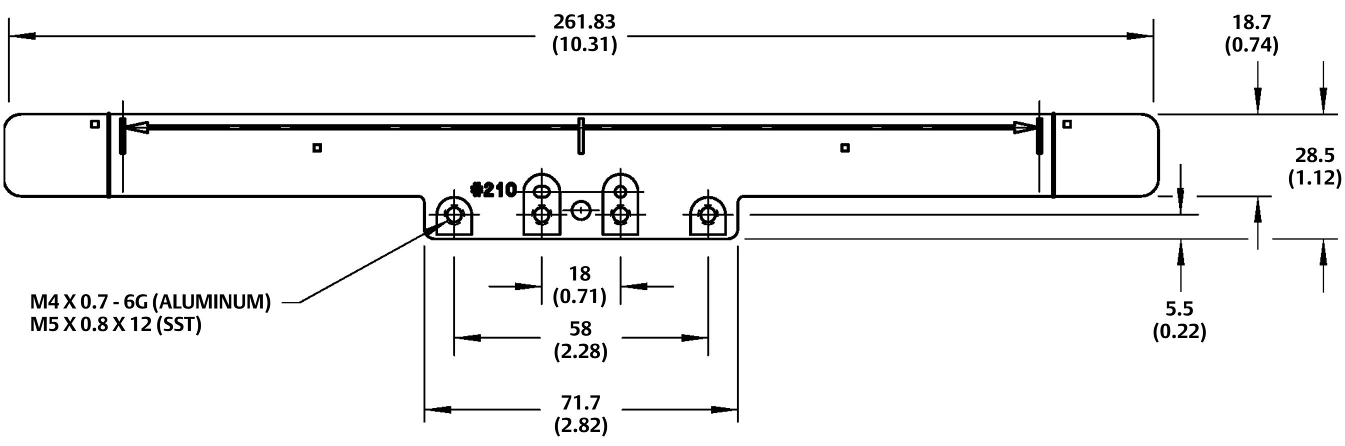
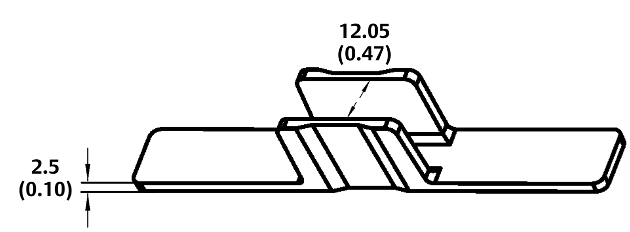


Figure 9. SStem #210 Magnet Assembly (Also see 2 in figure 6)





HOUSING INSERT FOR SSTEM #210 MAGNET ASSEMBLY 1

mm
(INCH)

1 Refer to back view of figure 1 for housing insert placement.

Figure 10. RShaft Window Magnet Assemblies

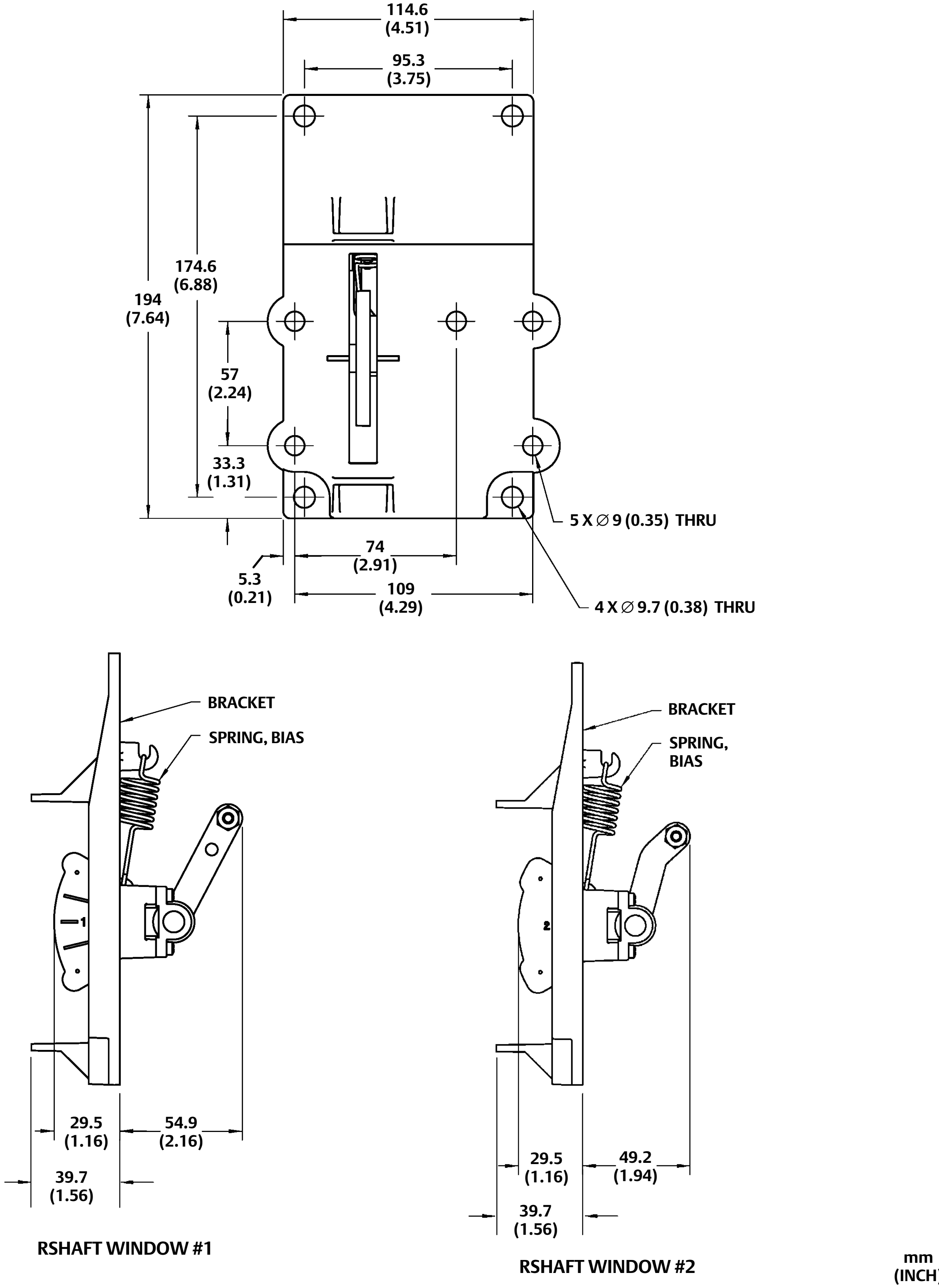
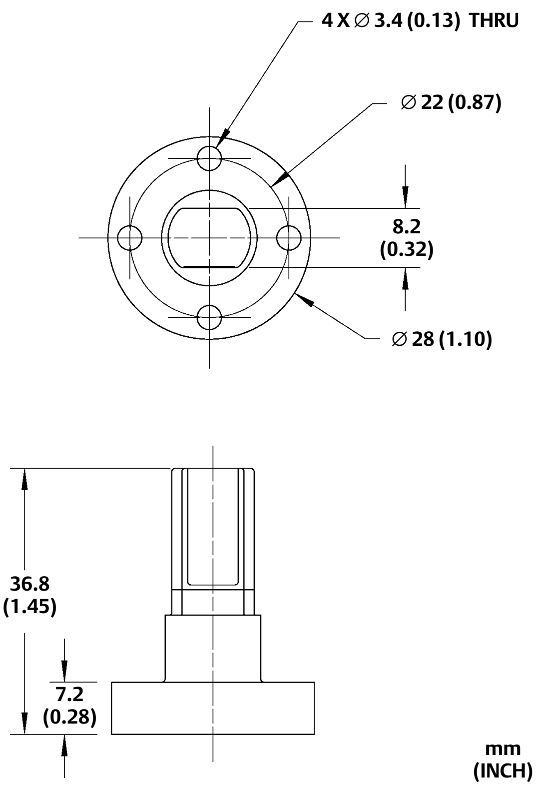


Figure 11. RShaft End Mount Magnet Assembly



Related Documents

- Bulletin 62.1:DVC6200
  DVC6200 Digital Valve Controller (D103415X012)
- Bulletin 62.1:DVC6200 SIS
  DVC6200 SIS Digital Valve Controller (D103555X012)
- Bulletin 62.1:DVC6200f
  DVC6200f Digital Valve Controller (D103399X012)
- Bulletin 62.1:DVC6200p
  DVC6200p Digital Valve Controller (D103564X012)

All documents are available from your Emerson sales office or Local Business Partner. Also visit our website at Fisher.com.

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Fisher™ FIELDVUE™ DVC6200 SIS Digital Valve Controller for Safety Instrumented Systems (SIS)

The FIELDVUE DVC6200 SIS digital valve controller is a HART® communicating instrument for use in valve applications such as Emergency Shutdown, Emergency Blow Down, Emergency Venting, and Emergency Isolation. The DVC6200 SIS is capable of monitoring the health of and controlling the safety shutdown function of a valve and can easily be installed on most Fisher and non-Fisher pneumatic actuators.

X0079

Features

Reliability

- **Linkage-less Position Feedback**—The high performance, linkage-less feedback system eliminates physical contact between the valve stem and the DVC6200 SIS. This minimizes the affects of pipeline vibration and environmental corrosion.
- **Built to Survive**—The field proven DVC6200 SIS instrument has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres. A weather-tight wiring terminal box isolates field wiring connections from other areas of the instrument.

Safety

- **Partial Stroke Testing (PST)**—An on-line diagnostic to detect valve failure modes such as stuck valve by performing a user-defined ramp test, without disrupting the process. Testing can be automated or initiated manually.
- **Full Stroke Testing (FST)**—An off-line diagnostic test to reveal additional valve failures undetected by the PST by performing a ramp over the entire valve travel range. FST is typically performed during a shut down.

Ease of Use

- **Remote Access**—Valve diagnostic information can be accessed anywhere along the loop, reducing personnel exposure to hazardous environments or difficult to reach locations.
- **Faster Commissioning**—HART communication allows you to quickly commission loops with a variety of tools, either locally at the valve assembly or remotely.
- **Easy Maintenance**—The DVC6200 SIS digital valve controller is modular in design. Critical working components can be replaced without removing field wiring or pneumatic tubing.
- **Hassle-free diagnostics**—Partial stroke and full stroke tests result in an easy to understand Pass/Abnormal criteria including reason for any Abnormal result.

Value

- **Spurious Trip Protection**—An outgoing pressure threshold will abort the partial stroke test if exceeded. This prevents a sticking valve and actuator from overtraveling and potentially causing a spurious trip.
- **Increased Uptime**—The self-diagnostic capability of the DVC6200 SIS provides valve availability and health evaluation without shutting down the process or pulling the valve assembly from the line.
- **Audit Documentation**—Using ValveLink™ software, a time and date stamp on all tests and reports provides compliance with requirements of statutory authorities.
- **Hardware Savings**—When installed in an integrated control system, significant hardware and installation cost savings can be achieved. Valve accessories such as limit switches and position transmitters can be eliminated because this information is available via the HART communication protocol. In addition, an integrated 4-20 mA position transmitter or limit switch option is available.
- **Improved Maintenance Decisions**—Digital communication provides easy access to the condition of the valve. Sound process and asset management decisions can be made by analysis of valve diagnostic information through ValveLink software, DD's, or DTM's.

Safety Certification

The functional safety assessment was performed to the requirements of IEC 61508: ed2, 2010, SIL3.

The DVC6200 SIS digital valve controller, in the de-energize to trip (DETT) or energize to trip (ETT) configuration, meets the systematic integrity requirements of SIL 3.

The DVC6200 SIS position monitor, in the position transmitter or limit switch configuration, meets the systematic integrity requirements of SIL 2.

Packaged Solutions

LCP100/LCP200—A local control panel can be connected directly to the DVC6200 SIS to provide manual control of the SIS valve, including manual reset. A partial stroke test can also be initiated with the local control panel (see figure 1).

Figure 1. Fisher LCP200 Local Control Panel

X1543

Figure 2. exida Certificates

Valve Diagnostics

The DVC6200 SIS digital valve controller provides a broad and deep portfolio of valve diagnostic capabilities. Whether an Emerson Field Communicator is used to check for valve alerts and operational status, or ValveLink software is used for comprehensive diagnostic test and analysis, the tools are easy to use. When installed as part of a HART communicating system, the DVC6200 SIS delivers prompt notification of current or potential equipment issues and supports NAMUR NE107 alert categorization.

Valve diagnostic tests enable condition and performance monitoring of the entire valve assembly - not just the digital valve controller. Results are displayed graphically, with severity indicated by a red/yellow/green icon. A detailed description of the identified issue as well as suggestions for recommended actions are provided.

In the event that the DVC6200 SIS is commanded to trip, diagnostic data can be gathered automatically to be used for troubleshooting.

Examples of identifiable issues are:

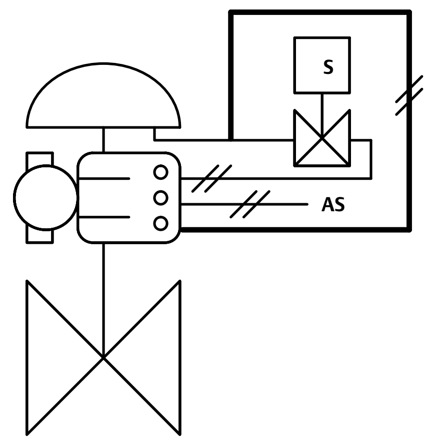
- Valve Stuck
- Solenoid Stuck
- Low or high air supply or pressure droop
- Dirty air supply
- External air leak (actuator diaphragm or tubing)
- Piston actuator O-ring failure
- Excessive or insufficient valve assembly friction
- Broken actuator spring
- Broken valve/actuator shaft

For additional information on FIELDVUE diagnostics and ValveLink software refer to Fisher Bulletin 62.1:ValveLink Software (D102227X012).

Solenoid Valve Health Monitoring

If a solenoid valve is installed between the DVC6200 SIS pressure output and the actuator, as shown in figure 3, the operation of the solenoid valve can be verified by configuring the DVC6200 SIS. In single-acting actuator applications, the “unused” output port of the DVC6200 SIS can be piped such that the pressure downstream of the of solenoid valve is measured. When the solenoid valve is pulsed, either by the DVC6200 SIS or externally, the DVC6200 SIS can sense the momentary pressure drop across the solenoid valve. The solenoid should be pulsed long enough to detect a pressure drop across the solenoid valve, but not so long that it affects the travel of the final control element. This not only increases the availability of the solenoid valve during a safety demand, but also enhances the reliability of the SIF (Safety Instrumented Function) loop.

Figure 3. Solenoid Valve Testing



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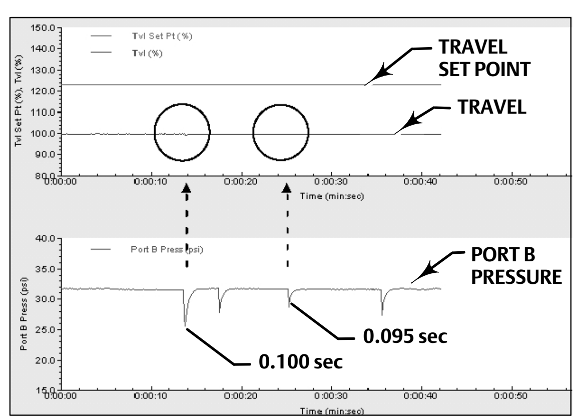
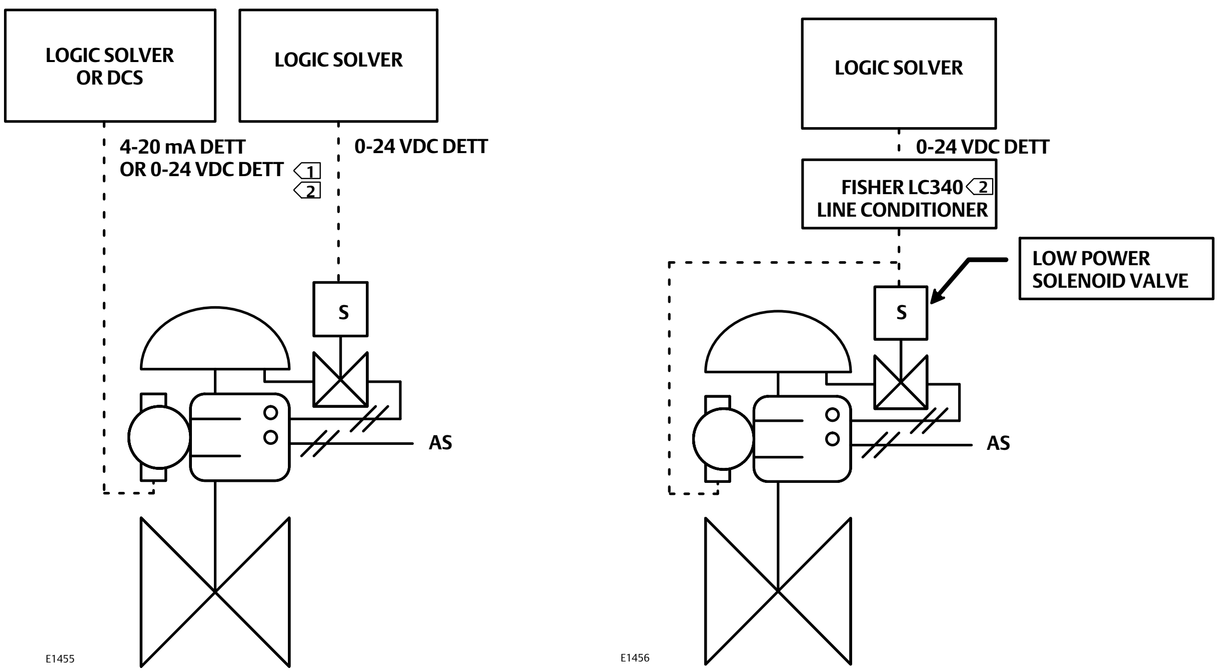


E1028

ValveLink Software Screen Image Showing Pressure Drop Across the Solenoid Valve

Application Examples

Figure 4. De-Energize to Trip (DETT) FIELDVUE DVC6200 SIS and DETT Solenoid Valve



Options Available

- LCP100/LCP200 Local Control Panel or external pushbutton
- Integral 4-20 mA position transmitter or discrete switch

Benefits

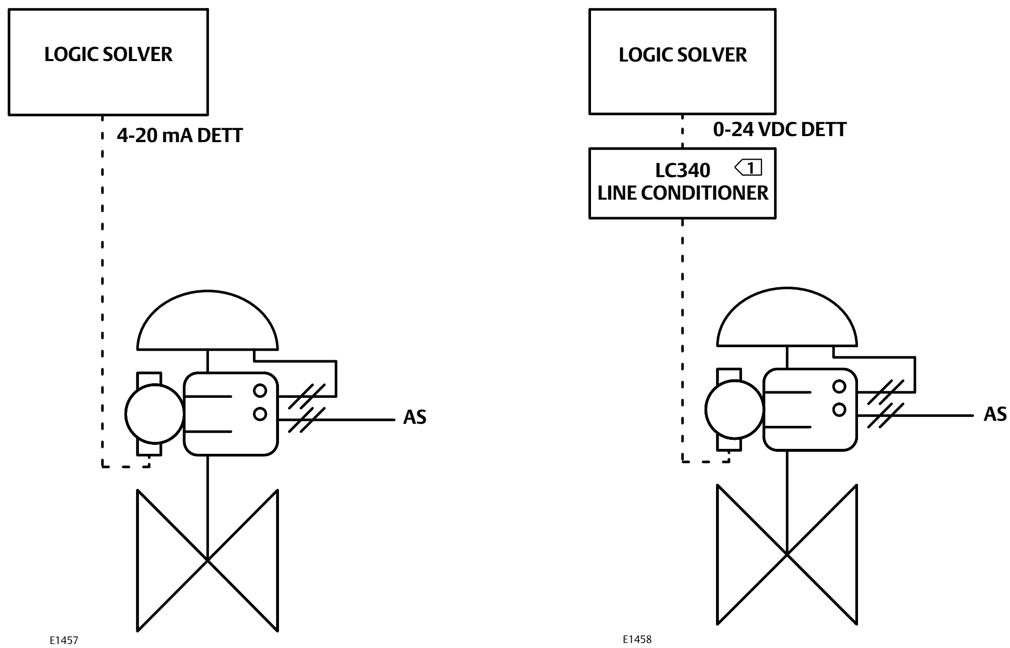
- DVC6200 SIS provides diagnostic coverage with PST
- DVC6200 SIS used with solenoid can provide redundant safety function
- DVC6200 SIS can provide additional diagnostic coverage when optional solenoid pulse recording is utilized
- When powered by 4-20 mA, the DVC6200 SIS is capable of recording the demand and reset stroke

Operation

- DVC6200 SIS will move to the safety demand state upon signal de-energization, loss of power, or loss of pneumatic supply

1 LC340 line conditioner is required for 0-24 VDC DETT
2 LC340 mounting requires standard 35 mm DIN rail; install in marshalling or I/O cabinet, or junction box.
For additional information refer to the LC340 instruction manual (D102797X012), available at www.Fisher.com or from your Emerson sales office.

Figure 5. De-Energize to Trip (DETT) FIELDVUE DVC6200 SIS; No Solenoid Valve



Options Available

- LCP100/LCP200 Local Control Panel or external pushbutton
- Integral 4-20 mA position transmitter or discrete switch

Benefits

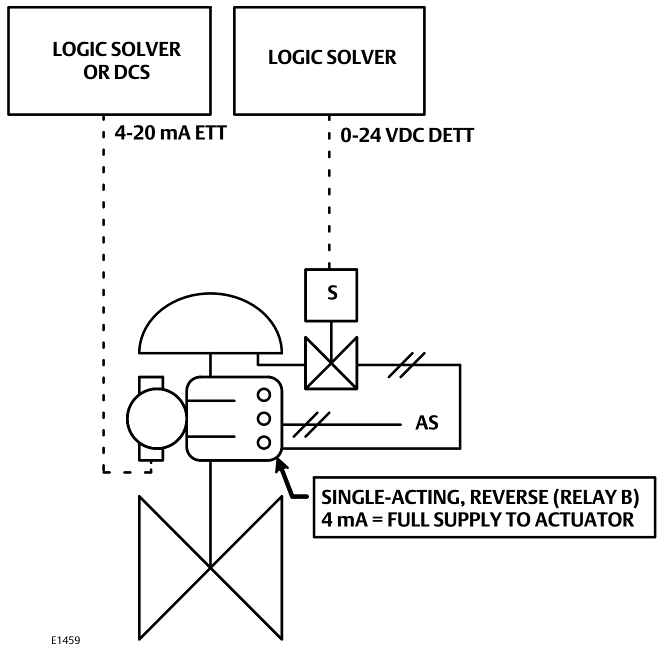
- DVC6200 SIS provides diagnostic coverage with PST
- Eliminates solenoid valve
- When powered by 4-20 mA, the DVC6200 SIS is capable of recording the demand and reset stroke

Operation

- DVC6200 SIS will move to the safety demand state upon signal de-energization, loss of power, or loss of pneumatic supply

1 LC340 mounting requires standard 35 mm DIN rail; install in marshalling or I/O cabinet, or junction box.
For additional information refer to the LC340 instruction manual (D102797X012), available at www.Fisher.com or from your Emerson sales office.

Figure 6. FIELDVUE DVC6200 SIS for PST only and DETT Solenoid Valve



Options Available

- LCP100/LCP200 Local Control Panel or external pushbutton
- Integral 4-20 mA position transmitter or discrete switch

Benefits

- The energize to trip option provides maximum actuator pressure at minimum control signal (4 mA). Therefore, loss of the control signal will not cause the valve to trip.
- Prevents spurious trip on loss of electrical power to DVC6200 SIS
- DVC6200 SIS can provide additional diagnostics coverage when performing PST
- DVC6200 SIS can provide additional diagnostic coverage when optional solenoid pulse recording is utilized

Operation

- DVC6200 SIS will move to the safety demand state upon signal energization or loss of pneumatic supply
- The solenoid valve will move to the safety demand state upon signal de-energization

Specifications

Available Mounting

- ■ Sliding-stem linear applications
- ■ Quarter-turn rotary applications
- ■ Integral mounting to Fisher rotary actuators
- ■ Integral mounting to Fisher 657/667 or GX actuators

DVC6200 SIS digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE-3845, and NAMUR mounting standards

Communication Protocol

■ HART 5 or ■ HART 7

Input Signal

Point-to-Point
Analog Input Signal: 4-20 mA DC, nominal

Minimum Voltage Available at Instrument Terminals must be 9.5 VDC for analog control, 10 VDC for HART communication
Minimum Control Current: 4.0 mA
Minimum Current w/o Microprocessor Restart: 3.5 mA
Maximum Voltage: 30 VDC
Overcurrent protected
Reverse Polarity protected

Multi-Drop
Instrument Power: 11 to 30 VDC at 10 mA
Reverse Polarity protected

Supply Pressure(1)

Minimum Recommended: 0.3 bar (5 psig) higher than maximum actuator requirements

Maximum: 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Supply Medium

Air or Natural Gas

Supply medium must be clean, dry, and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1

Output Signal

Pneumatic Output: up to full supply pressure
Minimum Span: 0.4 bar (6 psig)
Maximum Span: 9.5 bar (140 psig)
Action: Double, Single Direct, or Single Reverse

Electronic Output(2)

■ Integral 4-20 mA Position Transmitter(3):
4-20 mA output, isolated

Supply Voltage: 8-30 VDC

Reference Accuracy: 1% of travel span

Safety Accuracy: 5% of travel span
■ Integral Limit Switch: One isolated switch, configurable throughout the calibrated travel range or actuated from a device alert

Off State: 0 mA (nominal)

On State: up to 1 A

Supply Voltage: 30 VDC maximum

Reference Accuracy: 2% of travel span

Safety Accuracy: 5% of travel span

Steady State Air Consumption(4)(5)

Low Bleed Relay(6)
At 1.4 bar (20 psig) supply pressure:
0.056 normal m3/hr (2.1 scfh), average
At 5.5 bar (80 psig) supply pressure:
0.184 normal m3/hr (6.9 scfh), average

Maximum Output Capacity(4)(5)

At 1.4 bar (20 psig) supply pressure:
10.0 normal m3/hr (375 scfh)
At 5.5 bar (80 psig) supply pressure:
29.5 normal m3/hr (1100 scfh)

Operating Ambient Temperature Limits(1)(7)

-52 to 85°C (-62 to 185°F)

Independent Linearity(8)

Typical Value: +/-0.50% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity-Industrial locations per Table 2 of the EN 61326-1 standard
Emissions-Class A
ISM equipment rating: Group 1, Class A

-continued-

Specifications (continued)

Vibration Testing Method

Tested per ANSI/ISA S75.13.01 Section 5.3.5

Input Load Impedance

An equivalent impedance of 500 ohms may be used. This value corresponds to 10V @ 20 mA.

Humidity Testing Method

Tested per IEC 61514-2

Electrical Classification

Hazardous Area Approvals

CSA— Intrinsically Safe, Explosion-proof, Division 2, Dust Ignition-proof

FM— Intrinsically Safe, Explosion-proof, Dust Ignition-proof, Non-Incendive

ATEX— Intrinsically Safe, Flameproof, Type n, Dust by intrinsic safety

IECEx— Intrinsically Safe, Flameproof, Type n, Dust by intrinsic safety or by enclosure

Auxiliary Terminal Contact: Nominal Electrical Rating 5 V, <1 mA; It is recommended that the switch be sealed or have gold plated contacts to avoid corrosion

Electrical Housing

CSA— Type 4X, IP66

FM— Type 4X, IP66

ATEX— IP66

IECEx— IP66

Other Classifications/Certifications

Lloyds Register— Marine Type Approval

CML— Certification Management Limited (Japan)

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO— National Institute of Metrology, Quality, and Technology (Brazil)

KOSHA— Korean Occupational Safety & Health Agency (South Korea)

KTL— Korea Testing Laboratory (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

SANS— South Africa National Standards

Contact your Emerson sales office for classification/certification specific information

IEC 61010 Compliance Requirements

Power Source: The loop current must be derived from a separated extra-low voltage (SELV) power source

Environmental Conditions: Installation Category I

Connections

Supply Pressure: 1/4 NPT internal and integral pad for mounting Fisher 67CFR regulator

Output Pressure: 1/4 NPT internal

Tubing: 3/8-inch recommended

Vent: 3/8 NPT internal

Electrical: 1/2 NPT internal or M20

Actuator Compatibility

Stem Travel (Sliding-Stem Linear)
Linear actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Shaft Rotation (Quarter-Turn Rotary)
Rotary actuators with rated travel between 45 degrees and 180 degrees

Weight

Aluminum: 3.5 kg (7.7 lbs)

Stainless Steel: 8.6 kg (19 lbs)

-continued-

Specifications (continued)

Construction Materials	Options
Housing, module base, and terminal box: A03600 low copper aluminum alloy (standard) Stainless steel (optional) **Cover:** Thermoplastic polyester **Elastomers:** Fluorosilicone	■ Supply and output pressure gauges or tire valves ■ Integral mounted filter regulator ■ Energize to trip ■ Standard Bleed Relay ■ Remote mount(9)(10) ■ LCP100 local control panel ■ LC340 line conditioner ■ Stainless steel

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 – Process Instrument Terminology.
1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. The electronic output is available with either the position transmitter or the switch.
3. Position transmitter meets the requirements of NAMUR NE43; selectable to show failure low (< 3.6 mA) or failure high (> 22.5 mA). Fail high available only when the positioner is powered.
4. Normal m3/hour – Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh – Standard cubic feet per hour at 60°F and 14.7 psia.
5. Values at 1.4 bar (20 psig) based on single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
6. The Quad O steady-state consumption requirement of 6 scfh can be met by a DVC6200 SIS with low bleed relay A option, when used with up to 4.8 bar (70 psi) supply of Natural Gas at 16°C (60°F). The 6 scfh requirement can be met by low bleed relay B and C when used with up to 5.2 bar (75 psi) supply of Natural Gas at 16°C (60°F).
7. Temperature limits vary based on hazardous area approval. Lower temperature limit for CUTR Ex d approval with fluorosilicone elastomers is -53°C (-63.4°F).
8. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also not applicable for digital valve controllers in long-stroke applications over 4-inch.
9. 4-conductor shielded cable, 18 to 22 AWG minimum wire size, in rigid or flexible metal conduit, is required for connection between base unit and feedback unit.
10. The position monitor (transmitter or switch) with the remote mount construction is not safety certified.

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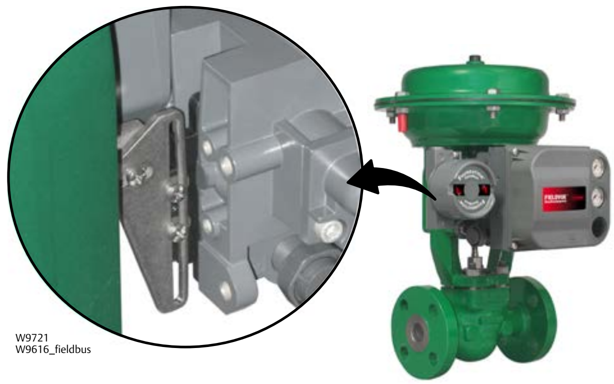
Fisher™ FIELDVUE™ DVC6200f Digital Valve Controller

The FIELDVUE DVC6200f digital valve controller is a FOUNDATION fieldbus™ communicating instrument that converts a digital control signal into a pneumatic output to an actuator. It can easily be retrofitted in place of existing analog positioners on most Fisher and non-Fisher pneumatic actuators.



LINKAGE-LESS FEEDBACK SYSTEM

Features

Reliability

- **Linkage-Less Non-Contact Position Feedback—** The high performance, linkage-less feedback system eliminates physical contact between the valve stem and the DVC6200f. There are no wearing parts so cycle life is maximized.

- **Built to Survive—** The field proven DVC6200f has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres. A weather-tight wiring terminal box isolates field wiring connections from other areas of the instrument.

Performance

- **Accurate and Responsive—** The two-stage positioner design provides quick response to large step changes and precise control for small setpoint changes.

- **Travel Control/Pressure Fallback—** Valve position feedback is critical to the operation of a digital valve controller. The DVC6200f can detect position feedback problems and automatically revert to pressure control mode to keep the valve operational.

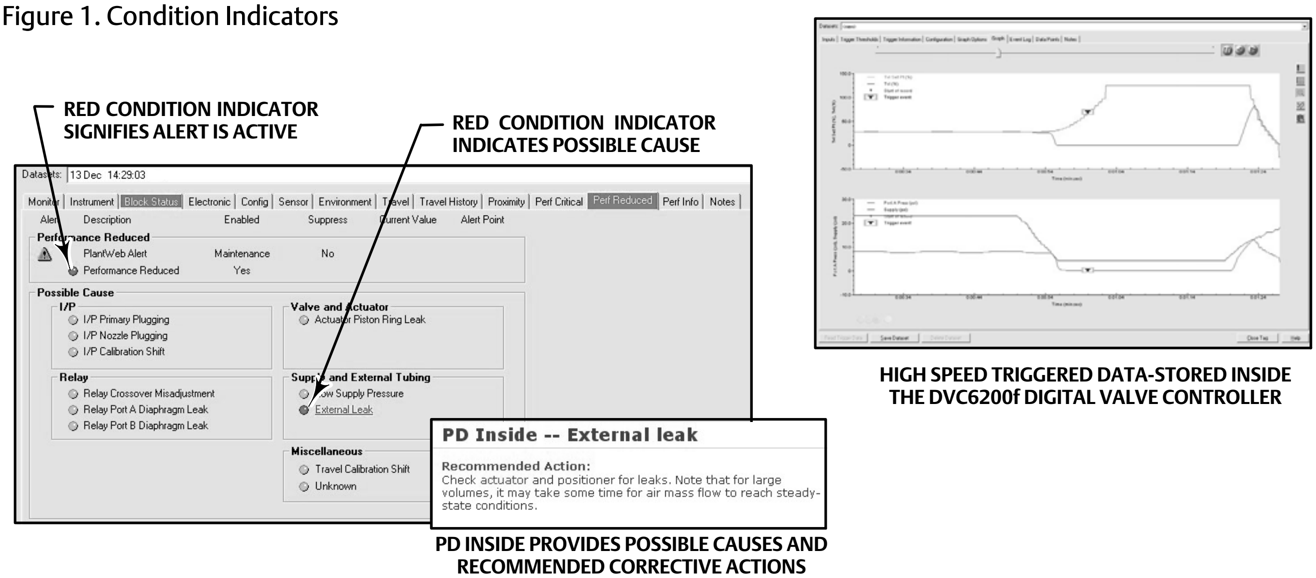
Ease of Use

- **Enhanced Safety—** The DVC6200f is a FOUNDATION fieldbus communicating device, so information can be accessed anywhere along the loop. This flexibility can reduce exposure to hazardous environments and make it easier to evaluate valves in hard to reach locations.

- **Faster Commissioning—** FOUNDATION fieldbus communications allows you to quickly commission loops with a variety of tools, either locally at the valve assembly or remotely.

- **Easy Maintenance—** The DVC6200f is modular in design. Critical working components can be replaced without removing field wiring or pneumatic tubing.

Figure 1. Condition Indicators



Value

- **Hardware Savings—** When installed in an integrated control system, significant hardware and installation cost savings can be achieved. Valve accessories such as limit switches and position transmitters can be eliminated because this information is available through the function blocks.

- **Increased Uptime—** The self-diagnostic capability of the DVC6200f provides valve performance and health evaluation without shutting down the process or pulling the valve assembly from the line.

- **Improved Maintenance Decisions—** Digital communication provides easy access to the condition of the valve. Sound process and asset management decisions can be made by analysis of valve information through Fisher ValveLink™ software.

- **Block Instantiation—**The DVC6200f supports the use of Function Block Instantiation. When a device supports block instantiation, the number of blocks and block types can be customized to match specific application needs. Block Instantiation does not apply to standard device blocks such as Resource and Transducer Blocks.

Notes

Block instantiation must be supported by the host system.

Only the function blocks available in the function block suite can be instantiated by the host system.

A maximum of 20 function blocks can be instantiated in the device at any given time from the available function blocks, which may include AO (1), DO (1), AI (4), DI (6), MAI (1), PID (4), OS (3), ISEL (2), CSEL (2).

Valve Diagnostics

The DVC6200f digital valve controller provides a broad and deep portfolio of valve diagnostic capabilities. Whether an Emerson Field Communicator is used to check for valve alerts and operational status, or ValveLink software is used for comprehensive diagnostic testing and analysis, the tools are easy to use. When installed as part of a FOUNDATION fieldbus communicating system the DVC6200f delivers prompt notification of current or potential equipment issues and supports Field Diagnostics.

Performance Diagnostics enable condition and performance monitoring of the entire valve assembly (not just the digital valve controller) while the valve is actively controlling the process. When conducting Performance Diagnostics tests, the valve does NOT move beyond the normal setpoint changes driven by the process controller. The DVC6200f uses statistical algorithms to determine condition and performance related issues based on live readings from the many on-board sensors. Results are then displayed graphically, with severity indicated. A detailed description of the identified issue as well as suggestions for recommended actions are provided, as shown in figure 1.

Examples of identifiable issues are:

- Low or high air supply or pressure droop
- Incorrect regulator setting
- Dirty air supply
- External air leak (actuator diaphragm or tubing)
- Calibration shift
- Valve stuck
- Piston actuator O-ring failure
- Excessive or insufficient valve assembly friction
- Excessive valve assembly deadband
- Elastomer failure in the DVC6200f
- Broken actuator spring

Performance Diagnostics also provide access to full-stroke dynamic testing of the valve assembly including; valve signature, dynamic error band, step response, and stroke check. These tests change the instrument setpoint at a controlled rate and are performed while the valve assembly is isolated from the process.

For additional information on FIELDVUE diagnostics and ValveLink software refer to Fisher bulletin 62.1:ValveLink Software (D102227X012).

Specifications

Available Mounting

- ■ Integral mounting to Fisher 657/667or GX actuators
- ■ Integral mounting to Fisher rotary actuators,
- ■ Sliding-stem linear applications
- ■ Quarter-turn rotary applications

DVC6200f digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards

Function Block Suites

- ■ SC (Standard Control) (throttling control) Includes AO, PID, ISEL, OS, AI, MAI, DO, CSEL, and DI function blocks
- ■ FC (Fieldbus Control) (throttling control) Contains the AO function block
- ■ FL (Fieldbus Logic) [discrete (on/off) connectivity] Includes DO and DI function blocks

Block Execution Times

AO Block: 20 ms	**MAI BLock:** 35 ms
PID Block: 20 ms	**DO Block:** 20 ms
ISEL Block: 20 ms	**DI Block:** 15 ms
OS Block: 20 ms	**CSEL Block:** 15 ms
AI Block: 20 ms	

Electrical Input

Voltage Level: 9 to 32 volts
Maximum Current: 19 mA
Reverse Polarity Protection: Unit is not polarity sensitive
Termination: Bus must be properly terminated per ISA SP50 guidelines

Digital Communication Protocol

FOUNDATION fieldbus registered device

Physical Layer Type(s):

121—Low-power signaling, bus-powered, Entity Model I.S.
511—Low-power signaling, bus-powered, FISCO I.S.

Fieldbus Device Capabilities

Backup LAS (Link Active Scheduler)

Supply Pressure(1)

Minimum Recommended: 0.3 bar (5 psig) higher than maximum actuator requirements

Maximum: 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Supply Medium

Air or Natural Gas

Supply medium must be clean, dry, and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1

Output Signal

Pneumatic signal, up to full supply pressure
Minimum Span: 0.4 bar (6 psig)
Maximum Span: 9.5 bar (140 psig)
Action: ■ Double, ■ Single Direct or ■ Reverse

Steady-State Air Consumption(2)(3)

At 1.4 bar (20 psig) supply pressure: Less than 0.38 normal m^3/hr (14 scfh)
At 5.5 bar (80 psig) supply pressure: Less than 1.3 normal m^3/hr (49 scfh)

Maximum Output Capacity(2)(3)

At 1.4 bar (20 psig) supply pressure: 10.0 normal m^3/hr (375 scfh)
At 5.5 bar (80 psig) supply pressure: 29.5 normal m^3/hr (1100 scfh)

Operating Ambient Temperature Limits(1)(4)

-40 to 85°C (-40 to 185°F)
-52 to 85°C (-62 to 185°F) for instruments utilizing the Extreme Temperature option (fluorosilicone elastomers)

Independent Linearity(5)

Typical Value: ±0.50% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard.
Emissions—Class A
ISM equipment rating: Group 1, Class A

-continued-

Specifications (continued)

Vibration Testing Method

Tested per ANSI/ISA-S75.13.01 Section 5.3.5.

Humidity Testing Method

Tested per IEC 61514-2

Electrical Classification

Hazardous Area Approvals

CSA— Intrinsically Safe, FISCO, Explosion-proof, Division 2, Dust Ignition-proof

FM— Intrinsically Safe, FISCO, Explosion-proof, Non-Incendive, Dust Ignition-proof

ATEX— Intrinsically Safe, FISCO, Flameproof, Type n, Dust by intrinsic safety

IECEx— Intrinsically Safe, FISCO, Flameproof, Type n, Dust by intrinsic safety or by enclosure

Electrical Housing

CSA— Type 4X, IP66	ATEX— IP66
FM— Type 4X, IP66	IECEx— IP66

Other Classifications/Certifications

Natural Gas Certified, Single Seal Device— CSA, FM, ATEX, and IECEx

Lloyds Register— Marine Type Approval

CML— Certification Management Limited (Japan)

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KOSHA— Korean Occupational Safety & Health Agency (South Korea)

KTL— Korea Testing Laboratory (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

SANS— South Africa National Standards

Contact your Emerson sales office for classification/certification specific information

Connections

Supply Pressure: 1/4 NPT internal and integral pad for mounting 67CFR regulator
Output Pressure: 1/4 NPT internal
Tubing: 3/8-inch recommended
Vent: 3/8 NPT internal
Electrical: 1/2 NPT internal or M20

Actuator Compatibility

Stem Travel (Sliding-Stem Linear)
Linear actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Shaft Rotation (Quarter-Turn Rotary)
Rotary actuators with rated travel between 45 degrees and 180 degrees

Weight

Aluminum: 3.5 kg (7.7 lbs)
Stainless Steel: 8.6 kg (19 lbs)

Construction Materials

Housing, module base and terminal box: A03600 low copper aluminum alloy (standard), Stainless Steel (optional)
Cover: Thermoplastic polyester
Elastomers: Nitrile (standard)

Options

■ Supply and output pressure gauges or ■ Tire valves ■ Integral mounted filter regulator ■ Low-Bleed Relay(6) ■ Extreme Temperature ■ Natural Gas Certified, Single Seal Device ■ Remote Mount(7) ■ Stainless Steel

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. Normal m^3/hour - Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh - Standard cubic feet per hour at 60°F and 14.7 psia.
3. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
4. Temperature limits vary based on hazardous area approval.
5. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also not applicable for digital valve controllers in long-stroke applications.
6. The Quad O steady-state consumption requirement of 6 scfh can be met by a DVC6200f with low bleed relay A option, when used with up to 4.8 bar (70 psi) supply of Natural Gas at 16°C (60°F). The 6 scfh requirement can be met by low bleed relay B and C when used with up to 5.2 bar (75 psi) supply of Natural Gas at 16°C (60°F).
7. 4-conductor shielded cable, 18 to 22 AWG minimum wire size, in rigid or flexible metal conduit, is required for connection between base unit and feedback unit.

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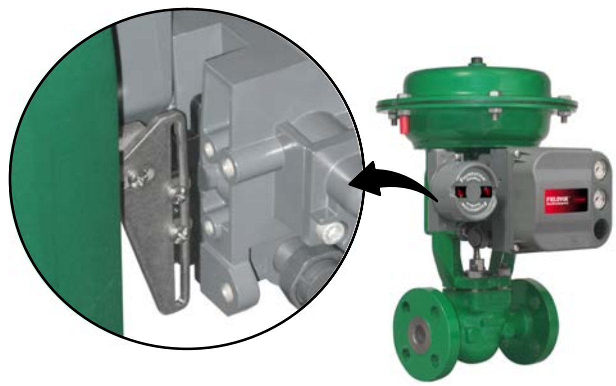
Fisher™ FIELDVUE™ DVC6200f Digital Valve Controller

The FIELDVUE DVC6200f digital valve controller is a FOUNDATION fieldbus™ communicating instrument that converts a digital control signal into a pneumatic output to an actuator. It can easily be retrofitted in place of existing analog positioners on most Fisher and non-Fisher pneumatic actuators.



LINKAGE-LESS
FEEDBACK SYSTEM

W9721
W9616_fieldbus

Features

Reliability

- **Linkage-Less Non-Contact Position Feedback—** The high performance, linkage-less feedback system eliminates physical contact between the valve stem and the DVC6200f. There are no wearing parts so cycle life is maximized.

- **Built to Survive—** The field proven DVC6200f has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres. A weather-tight wiring terminal box isolates field wiring connections from other areas of the instrument.

Performance

- **Accurate and Responsive—** The two-stage positioner design provides quick response to large step changes and precise control for small setpoint changes.

Ease of Use

- **Enhanced Safety—** The DVC6200f is a FOUNDATION Fieldbus communicating device, so information can be accessed anywhere along the loop. This flexibility can reduce exposure to hazardous environments and make it easier to evaluate valves in hard to reach locations.

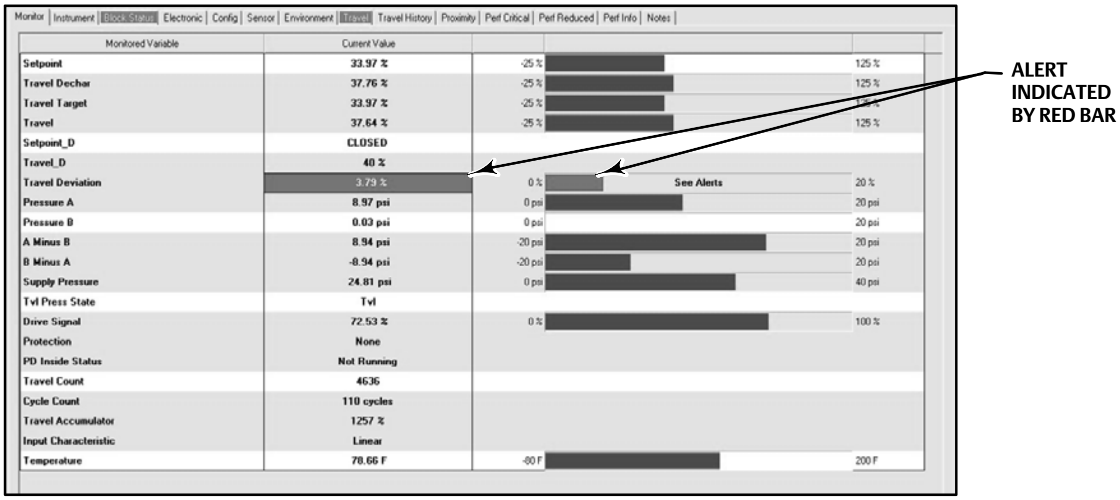
- **Faster Commissioning—** FOUNDATION fieldbus communications allows you to quickly commission loops with a variety of tools, either locally at the valve assembly or remotely.

- **Easy Maintenance—** The DVC6200f is modular in design. Critical working components can be replaced without removing field wiring or pneumatic tubing.

Value

- **Hardware Savings—** When installed in an integrated control system, significant hardware and installation cost savings can be achieved. Valve accessories such as limit switches and position transmitters can be eliminated because this information is available through the function blocks.

Figure 1. Status Monitor



- **Increased Uptime—** The self-diagnostic capability of the DVC6200f provides valve performance and health evaluation without shutting down the process or pulling the valve assembly from the line.

- **Improved Maintenance Decisions—** Digital communication provides easy access to the condition of the valve. Sound process and asset management decisions can be made by analysis of valve information through Fisher ValveLink™ software.

- **Block Instantiation**—The DVC6200f supports the use of Function Block Instantiation. When a device supports block instantiation, the number of blocks and block types can be customized to match specific application needs. Block Instantiation does not apply to standard device blocks such as Resource and Transducer Blocks.

Notes

Block instantiation must be supported by the host system.

Only the function blocks available in the function block suite can be instantiated by the host system.

A maximum of 20 function blocks can be instantiated in the device at any given time from the available function blocks, which may include AO (1), DO (1), AI (4), DI (6), MAI (1), PID (4), OS (3), ISEL (2), CSEL (2).

Valve Diagnostics

The DVC6200f digital valve controller provides a comprehensive library of valve diagnostic alerts. These alerts are easily accessed with an Emerson Field Communicator. When installed as part of a FOUNDATION fieldbus communicating system the DVC6200f delivers prompt notification of current or potential equipment issues directly to the asset management system and supports Field Diagnostics.

Alerts assist in identification and notification of the following situations:

- Valve travel deviation due to excessive valve friction or galling (see figure 1)
- High cycle due to dither or improper tuning
- Total travel movement has accumulated beyond a specified point resulting in packing wear
- Valve travel is above or below a specified point
- Various instrument mechanical and electrical issues

For additional information on FIELDVUE diagnostics and ValveLink software refer to Fisher bulletin 62.1:ValveLink Software (D102227X012).

Specifications

Available Mounting

- ■ Integral mounting to Fisher 657/667 or GX actuators
- ■ Integral mounting to Fisher rotary actuators,
- ■ Sliding-stem linear applications
- ■ Quarter-turn rotary applications

DVC6200f digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards

Function Block Suites

- ■ SC (Standard Control) (throttling control) Includes AO, PID, ISEL, OS, AI, MAI, DO, CSEL, and DI function blocks
- ■ FC (Fieldbus Control) (throttling control) Contains the AO function block
- ■ FL (Fieldbus Logic) [discrete (on/off) connectivity] Includes DO and DI function blocks

Block Execution Times

AO Block: 20 ms	**MAI BLock:** 35 ms
PID Block: 20 ms	**DO Block:** 20 ms
ISEL Block: 20 ms	**DI Block:** 15 ms
OS Block: 20 ms	**CSEL Block:** 15 ms
AI Block: 20 ms	

Electrical Input

Voltage Level: 9 to 32 volts
Maximum Current: 19 mA
Reverse Polarity Protection: Unit is not polarity sensitive
Termination: Bus must be properly terminated per ISA SP50 guidelines

Digital Communication Protocol

FOUNDATION fieldbus registered device

Physical Layer Types(s):

121: Low-power signaling, bus-powered, Entity Model I.S.
511: Low-power signaling, bus-powered, FISCO I.S.

Fieldbus Device Capabilities

Backup LAS (Link Active Scheduler)

Supply Pressure(1)

Minimum Recommended: 0.3 bar (5 psig) higher than maximum actuator requirements

Maximum: 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Supply Medium

Air or Natural Gas

Supply medium must be clean, dry, and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1

Output Signal

Pneumatic signal, up to full supply pressure
Minimum Span: 0.4 bar (6 psig)
Maximum Span: 9.5 bar (140 psig)
Action: ■ Double, ■ Single Direct or ■ Reverse

Steady-State Air Consumption(2)(3)

At 1.4 bar (20 psig) supply pressure: Less than 0.38 normal m^3/hr (14 scfh)
At 5.5 bar (80 psig) supply pressure: Less than 1.3 normal m^3/hr (49 scfh)

Maximum Output Capacity(2)(3)

At 1.4 bar (20 psig) supply pressure: 10.0 normal m^3/hr (375 scfh)
At 5.5 bar (80 psig) supply pressure: 29.5 normal m^3/hr (1100 scfh)

Operating Ambient Temperature Limits(1)(4)

-40 to 85°C (-40 to 185°F)
-52 to 85°C (-62 to 185°F) for instruments utilizing the Extreme Temperature option (fluorosilicone elastomers)

Independent Linearity(5)

Typical Value: ±0.50% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Vibration Testing Method

Tested per ANSI/ISA-S75.13.01 Section 5.3.5.

-continued-

Specifications (continued)

Humidity Testing Method

Tested per IEC 61514-2

Electrical Classification

Hazardous Area Approvals

CSA— Intrinsically Safe, FISCO, Explosion-proof, Division 2, Dust Ignition-proof

FM— Intrinsically Safe, FISCO, Explosion-proof, Non-Incendive, Dust Ignition-proof

ATEX— Intrinsically Safe, FISCO, Flameproof, Type n, Dust by instrinsic safety

IECEx— Intrinsically Safe, FISCO, Flameproof, Type n, Dust by intrinsic safety or by enclosure

Electrical Housing

CSA— Type 4X, IP66	ATEX— IP66
FM— Type 4X, IP66	IECEx— IP66

Other Classifications/Certifications

Natural Gas Certified, Single Seal Device— CSA, FM, ATEX, and IECEx

Lloyds Register— Marine Type Approval

CML— Certification Management Limited (Japan)

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KOSHA— Korean Occupational Safety & Health Agency (South Korea)

KTL— Korea Testing Laboratory (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

SANS— South Africa National Standards

Contact your Emerson sales office for classification/certification specific information

Connections

Supply Pressure: 1/4 NPT internal and integral pad for mounting 67CFR regulator
Output Pressure: 1/4 NPT internal
Tubing: 3/8-inch recommended
Vent: 3/8 NPT internal
Electrical: 1/2 NPT internal or M20

Actuator Compatibility

Stem Travel (Sliding-Stem Linear)
Linear actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Shaft Rotation (Quarter-Turn Rotary)
Rotary actuators with rated travel between 45 degrees and 180 degrees

Weight

Aluminum: 3.5 kg (7.7 lbs)
Stainless Steel: 8.6 kg (19 lbs)

Construction Materials

Housing, module base and terminal box:
A03600 low copper aluminum alloy (standard), Stainless Steel (optional)
Cover: Thermoplastic polyester
Elastomers: Nitrile (standard)

Options

■ Supply and output pressure gauges or ■ Tire valves ■ Integral mounted filter regulator ■ Low-Bleed Relay(6) ■ Extreme Temperature ■ Natural Gas Certified, Single Seal Device ■ Remote Mount(7) ■ Stainless Steel

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. Normal m^3/hour - Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh - Standard cubic feet per hour at 60°F and 14.7 psia.
3. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
4. Temperature limits vary based on hazardous area approval.
5. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also not applicable for digital valve controllers in long-stroke applications.
6. The Quad O steady-state consumption requirement of 6 scfh can be met by a DVC6200f with low bleed relay A option, when used with up to 4.8 bar (70 psi) supply of Natural Gas at 16°C (60°F). The 6 scfh requirement can be met by low bleed relay B and C when used with up to 5.2 bar (75 psi) supply of Natural Gas at 16°C (60°F).
7. 4-conductor shielded cable, 18 to 22 AWG minimum wire size, in rigid or flexible metal conduit, is required for connection between base unit and feedback unit.

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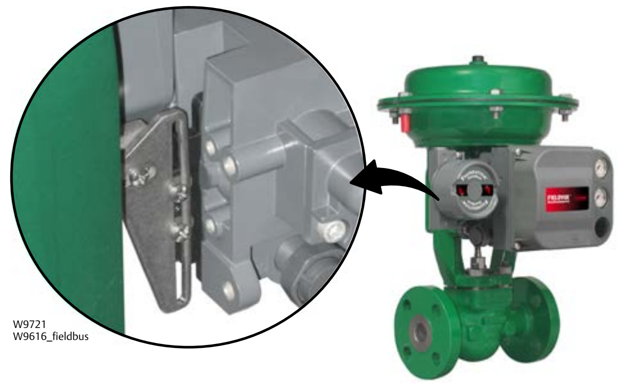
Fisher™ FIELDVUE™ DVC6200f Digital Valve Controller - PST Instrument Level

The FIELDVUE DVC6200f digital valve controller is a FOUNDATION fieldbus™ communicating instrument that converts a digital control signal into a pneumatic output to an actuator. The DVC6200f PST instrument level enables on-line partial stroke valve testing, which can be used in conjunction with a SIL capable solenoid valve (SOV) to provide additional diagnostic coverage to the SIS valve assembly. It can easily be retrofitted in place of existing analog positioners on most Fisher and non-Fisher pneumatic actuators.



LINKAGE-LESS
FEEDBACK SYSTEM

Features

Reliability

- **Linkage-Less Non-Contact Position Feedback**—The high performance, linkage-less feedback system eliminates physical contact between the valve stem and the DVC6200f. There are no wearing parts so cycle life is maximized.

- **Built to Survive**—The field proven DVC6200f instrument has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres. A weather-tight wiring terminal box isolates field wiring connections from other areas of the instrument.

- **Increased Process Uptime**—The DVC6200f instrument reduces the risk of spurious trip on loss of segment power by using a reverse acting relay.

Performance

- **Accurate and Responsive**—The two-stage positioner design provides quick response to large step changes and precise control for small setpoint changes.

- **Travel Control/Pressure Fallback**—Valve position feedback is critical to the operation of a digital valve controller. The DVC6200f can detect position feedback problems and automatically revert to pneumatic control mode to keep the valve operational.

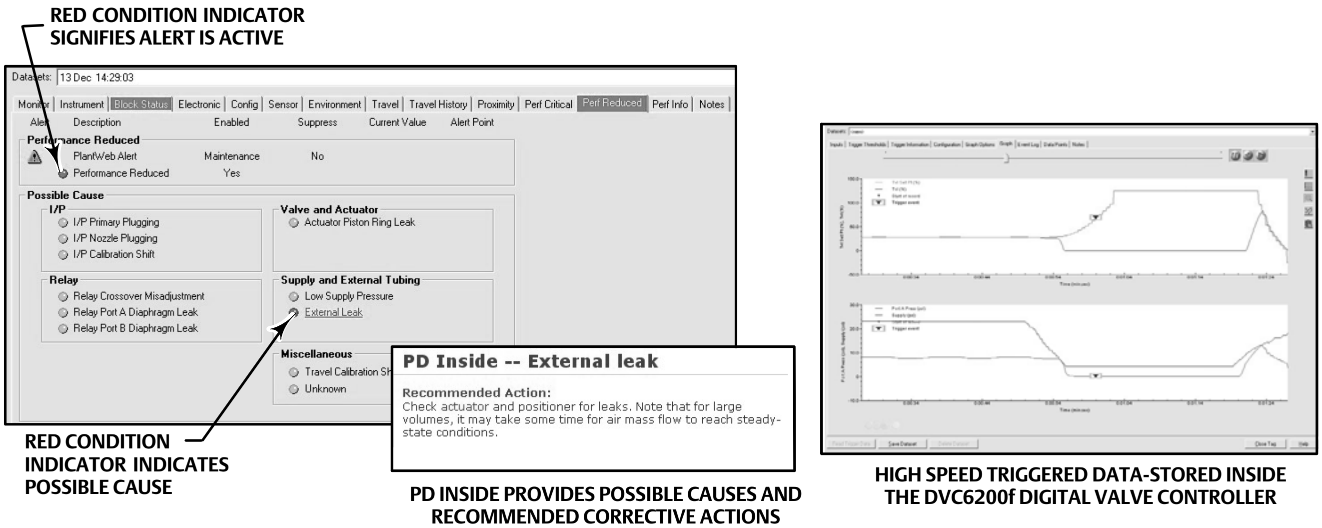
Shutdown Valve Stroke Testing

- **Partial Stroke Testing (PST)**—An on-line diagnostic to detect valve failure modes such as stuck valve by performing a small ramp test that moves the valve, without disrupting the process. Testing can be automated or initiated manually.

- **Full Stroke Testing (FST)**—An off-line diagnostic test to reveal additional valve failure modes undetected by the PST by performing a full ramp over the entire valve travel range. FST is typically performed during a shut down.

- **FF906 Certified**—Partial and full stroke tests can be initiated from any host which supports the FOUNDATION fieldbus standard FF-906 Specification.

Figure 1. Condition Indicators



Ease of Use

- **Enhanced Personnel Safety**—Valve diagnostic information can be accessed anywhere along the communication loop, reducing personnel exposure to hazardous environments or difficult to reach locations.
- **Faster Commissioning—** FOUNDATION fieldbus communications allows you to quickly commission loops with a variety of tools, either locally at the valve assembly or remotely.
- **Easy Maintenance—** The DVC6200f digital valve controller is modular in design. Critical working components can be replaced without removing field wiring or pneumatic tubing.
- **Hassle-free diagnostics—**Partial stroke and full stroke tests result in an easy to understand Pass/Abnormal criteria including reason for any Abnormal result

Value

- **Hardware Savings—** When installed in an integrated control system, significant hardware and installation cost savings can be achieved. Valve accessories such as limit switches and position transmitters can be eliminated because this information is available as function blocks.
- **Increased Uptime—** The self-diagnostic capability of the DVC6200f digital valve controller provides valve performance and health evaluation without shutting down the process or pulling the valve assembly from the line.
- **Improved Maintenance Decisions—** Digital communication provides easy access to the condition of the valve. The DVC6200f alerts comply with the FOUNDATION fieldbus specifications for Field Diagnostics. Sound process and asset management decisions can be made by analysis of valve information through Fisher ValveLink™ software.
- **Audit Documentation**—The device provides a time and date stamp on all tests allowing the means to comply with requirements of statutory authorities.
- **Block Instantiation**—The DVC6200f supports the use of Function Block Instantiation. When a device supports block instantiation, the number of blocks and block types can be customized to match specific application needs. Block Instantiation does not apply to standard device blocks such as Resource and Transducer Blocks.

Valve Diagnostics

The DVC6200f digital valve controller provides a broad and deep portfolio of valve diagnostic capabilities. Whether an Emerson Field Communicator is used to check for valve alerts and operational status, or ValveLink software is used for comprehensive diagnostic test and analysis, the tools are easy to use. Because the FOUNDATION Fieldbus system provides continuous digital communication to field devices, the DVC6200f delivers prompt notification of current or potential equipment issues.

The DVC6200f captures the stroke history when a demand stroke or return stroke occurs. The data is date and time stamped.

Partial Stroke Test (PST) enables valves that are in one position to be ramped as far as the process will tolerate to detect a stuck valve. The results are date and time stamped and stored in the device, available for upload by ValveLink software.

Means to prevent spurious trips are included with the DVC6200f PST instrument level, including an outgoing pressure threshold that will abort the partial stroke test if exceeded. This prevents a sticking valve and actuator from overtraveling and potentially causing a spurious trip.

Additionally, the DVC6200f PST instrument level provides access to all the capabilities of Performance Diagnostics (PD). Performance Diagnostics (PD) enable condition and performance monitoring of the entire valve assembly (not just the digital valve controller) while the valve is actively controlling the process. When conducting Performance Diagnostics tests, the valve does NOT move beyond the normal setpoint changes driven by the process controller. The DVC6200f uses statistical algorithms to determine condition and performance related issues based on live readings from the many on-board sensors. Results are then displayed graphically, with severity indicated. A detailed description of the identified issue as well as suggestions for recommended actions are provided, as shown in figure 1.

Examples of identifiable issues are:

- Valve Stuck
- Solenoid Stuck
- Low air supply or pressure droop
- Incorrect regulator setting
- Dirty air supply
- External air leak (actuator diaphragm or tubing)
- Calibration shift
- Piston actuator O-ring failure
- Excessive or insufficient valve assembly friction
- Excessive valve assembly deadband
- Elastomer failure in the DVC6200f
- Broken actuator spring
- Broken valve/actuator shaft

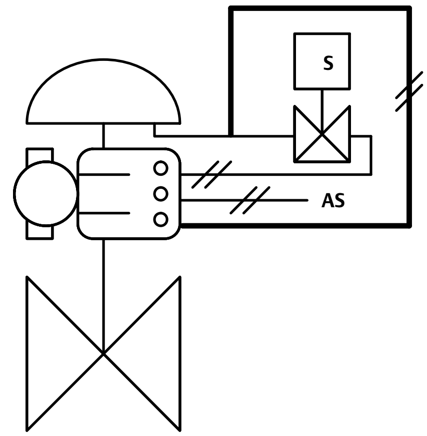
Performance Diagnostics also provide access to full-stroke dynamic testing of the valve assembly including; valve signature, dynamic error band, step response, and stroke check. These tests change the instrument setpoint at a controlled rate and are performed while the valve assembly is isolated from the process.

For additional information on FIELDVUE diagnostics and ValveLink software refer to Fisher bulletin 62.1:ValveLink Software (D102227X012).

Solenoid Valve Health Monitoring

If a solenoid valve is installed between the DVC6200f pressure output and the actuator, as shown in figure 2, the valve assembly can be configured to verify the operation of the solenoid valve during online operation. In single-acting actuator applications, the “unused” output port of the DVC6200f can be piped such that the pressure downstream of the of solenoid valve is measured. When the solenoid valve is pulsed, the DVC6200f can sense the momentary pressure drop across the solenoid valve. The solenoid should be pulsed long enough to detect a pressure drop across the solenoid valve, but not so long that it affects the travel of the final control element. This can increase the availability of the solenoid valve during a safety demand and can also enhance the reliability of the SIF (Safety Instrumented Function) loop.

Figure 2. Solenoid Valve Testing



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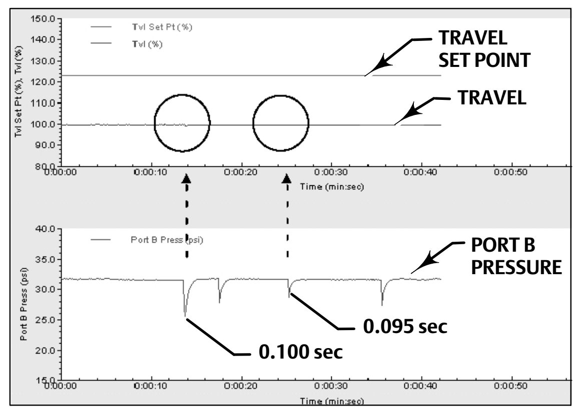

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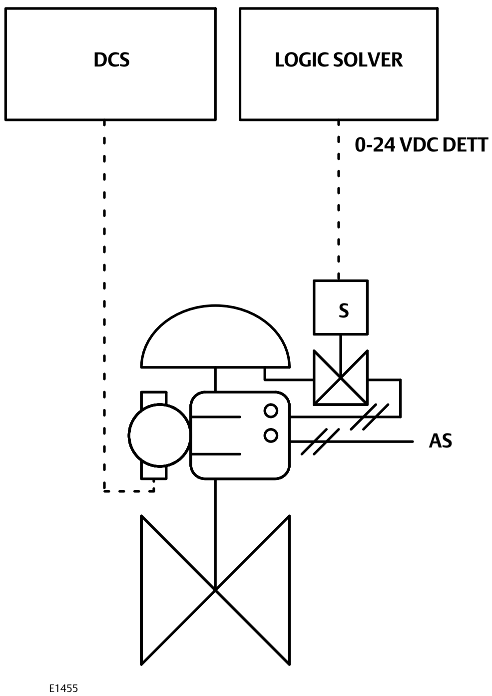
ValveLink Software Screen Image Showing Pressure Drop Across the Solenoid Valve

Application Examples

Figure 3. De-Energize to Trip (DETT) FIELDVUE DVC6200f and Solenoid Valve



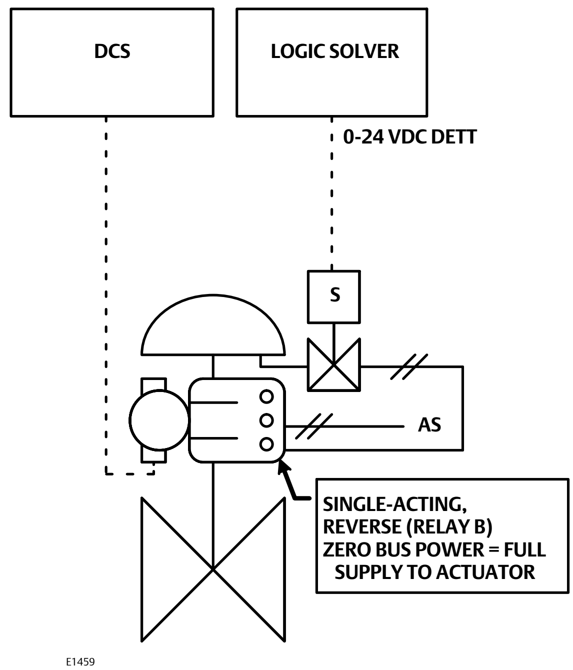
Benefits

- DVC6200f provides diagnostic coverage with PST
- DVC6200f can provide additional diagnostic coverage when optional solenoid pulse recording is utilized
- The DVC6200f is capable of recording the demand and reset stroke of the valve

Operation

- DVC6200f will move to the safety demand state upon loss of power or loss of pneumatic supply
- The DVC6200f can be configured to move to the safety demand state upon loss of communication signal
- The solenoid valve will move the valve to the safety demand state

Figure 4. FIELDVUE DVC6200f Energize to Trip (ETT) and Solenoid Valve



Benefits

- The energize to trip option provides maximum actuator pressure when power to the instrument is lost. Therefore, loss of power to the instrument will not cause the valve to trip.
- DVC6200f can provide additional diagnostics coverage when performing PST
- DVC6200f can provide additional diagnostic coverage when optional solenoid pulse recording is utilized

Operation

- DVC6200f will move to the safety demand state upon command or loss of pneumatic supply
- The solenoid valve will move the valve to the safety demand state

Specifications

Available Mounting

- ■ Sliding-stem linear applications
- ■ Quarter-turn rotary applications
- ■ Integral mounting to Fisher 657/667 or GX actuators
- ■ Integral mounting to Fisher rotary actuators,

DVC6200f digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards

Instrument Blocks

Resource Block

Transducer Block complies with FOUNDATION Fieldbus specification FF-906 for valve stroke testing

Function Block Suites

- ■ SC (Standard Control) - throttling control
  Includes AO, PID, ISEL, OS, AI, MAI, DO, CSEL, and DI function blocks
- ■ FC (Fieldbus Control) - throttling control
  Contains the AO function block
- ■ FL (Fieldbus Logic) - discrete (on/off) connectivity
  Includes DO, and DI function blocks

Function Block Instantiation

If a host system supports block instantiation, a maximum of 20 function blocks can be instantiated in the device at any given time from the available function blocks, which may include AO (1), DO (1), AI (4), DI (6), MAI (1), PID (4), OS (3), ISEL (2), CSEL (2)

Note: Only the function blocks available in the function block suite can be instantiated by the host system

Function Block Execution Times

AO Block: 20 ms	**MAI BLock:** 35 ms
PID Block: 20 ms	**DO Block:** 20 ms
ISEL Block: 20 ms	**DI Block:** 15 ms
OS Block: 20 ms	**CSEL Block:** 15 ms
AI Block: 20 ms	

Electrical Input

Voltage Level: 9 to 32 volts
Maximum Current: 19 mA
Reverse Polarity Protection: Unit is not polarity sensitive
Termination: Bus must be properly terminated per ISA SP50 guidelines

Digital Communication Protocol

FOUNDATION Fieldbus registered device

Physical Layer Types(s):

121: Low-power signaling, bus-powered, Entity Model I.S.
511: Low-power signaling, bus-powered, FISCO I.S.

Fieldbus Device Capabilities

Backup LAS (Link Active Scheduler)

Supply Pressure(1)

Minimum Recommended: 0.3 bar (5 psig) higher than maximum actuator requirements

Maximum: 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Supply Medium

Air or Natural Gas

Supply medium must be clean, dry, and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1

Output Signal

Pneumatic signal, up to full supply pressure
Minimum Span: 0.4 bar (6 psig)
Maximum Span: 9.5 bar (140 psig)
Action: ■ Double, ■ Single Direct or ■ Reverse

Steady-State Air Consumption(2)(3)

At 1.4 bar (20 psig) supply pressure:
Less than 0.38 normal m^3/hr (14 scfh)
At 5.5 bar (80 psig) supply pressure:
Less than 1.3 normal m^3/hr (49 scfh)

Maximum Output Capacity(2)(3)

At 1.4 bar (20 psig) supply pressure:
10.0 normal m^3/hr (375 scfh)
At 5.5 bar (80 psig) supply pressure:
29.5 normal m^3/hr (1100 scfh)

-continued-

Specifications (continued)

Operating Ambient Temperature Limits(1)(4)

-40 to 85°C (-40 to 185°F)
-52 to 85°C (-62 to 185°F) for instruments utilizing the Extreme Temperature option (fluorosilicone elastomers)

Independent Linearity(5)

Typical Value: ±0.50% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Vibration Testing Method

Tested per ANSI/ISA-S75.13.01 Section 5.3.5.

Humidity Testing Method

Tested per IEC 61514-2

Electrical Classification

Hazardous Area Approvals

CSA— Intrinsically Safe, FISCO, Explosion-proof, Division 2, Dust Ignition-proof

FM— Intrinsically Safe, FISCO, Explosion-proof, Non-Incendive, Dust Ignition-proof

ATEX— Intrinsically Safe, FISCO, Flameproof, Type n, Dust by intrinsic safety

IECEx— Intrinsically Safe, FISCO, Flameproof, Type n, Dust by intrinsic safety or by enclosure

Electrical Housing

CSA— Type 4X, IP66

FM— Type 4X, IP66

ATEX— IP66

IECEx— IP66

Other Classifications/Certifications

IEC61508 Functional Safety Certifications— Not applicable, for diagnostic use only in conjunction with appropriate SIL capable solenoid valve (SOV)

Natural Gas Certified, Single Seal Device— CSA, FM, ATEX, and IECEx

Lloyds Register— Marine Type Approval

CML— Certification Management Limited (Japan)

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KOSHA— Korean Occupational Safety & Health Agency (South Korea)

KTL— Korea Testing Laboratory (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

SANS— South Africa National Standards

Contact your Emerson sales office for classification/certification specific information

Connections

Supply Pressure: 1/4 NPT internal and integral pad for mounting 67CFR regulator
Output Pressure: 1/4 NPT internal
Tubing: 3/8-inch recommended
Vent: 3/8 NPT internal
Electrical: 1/2 NPT internal or M20

Actuator Compatibility

Stem Travel (Sliding-Stem Linear)
Linear actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Shaft Rotation (Quarter-Turn Rotary)
Rotary actuators with rated travel between 45 degrees and 180 degrees

Weight

Aluminum: 3.5 kg (7.7 lbs)
Stainless Steel: 8.6 kg (19 lbs)

-continued-

Specifications (continued)

Construction Materials

Housing, module base and terminal box
A03600 low copper aluminum alloy (standard), Stainless Steel (optional)
Cover: Thermoplastic polyester
Elastomers: Nitrile (standard)

Options

■ Supply and output pressure gauges or ■ Tire valves ■ Integral mounted filter regulator ■ Low-Bleed Relay(7) ■ Extreme Temperature ■ Natural Gas Certified, Single Seal Device ■ Remote Mount(6) ■ Stainless Steel

Additional Information

For additional information contact your Emerson sales office or go to Fisher.com

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. Normal m^3/hour - Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh - Standard cubic feet per hour at 60°F and 14.7 psia.
3. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
4. Temperature limits vary based on hazardous area approval.
5. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also not applicable for digital valve controllers in long-stroke applications.
6. 4-conductor shielded cable, 18 to 22 AWG minimum wire size, in rigid or flexible metal conduit, is required for connection between base unit and feedback unit.
7. The Quad O steady-state consumption requirement of 6 scfh can be met by a DVC6200f PST with low bleed relay A option, when used with up to 4.8 bar (70 psi) supply of Natural Gas at 16°C (60°F). The 6 scfh requirement can be met by low bleed relay B and C when used with up to 5.2 bar (75 psi) supply of Natural Gas at 16°C (60°F).

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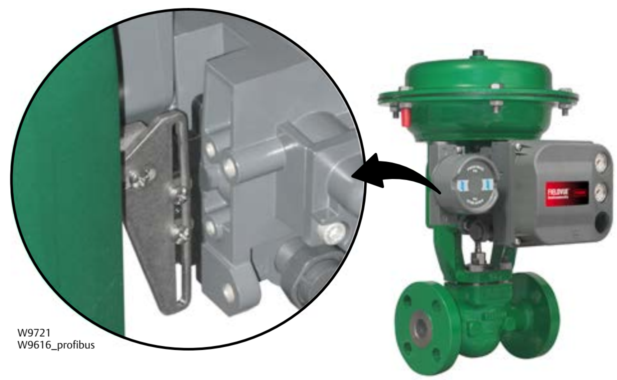
Fisher™ FIELDVUE™ DVC6200p Digital Valve Controller

The FIELDVUE DVC6200p digital valve controller is a PROFIBUS PA communicating instrument that converts a digital control signal into a pneumatic output to an actuator. It can easily be retrofitted in place of existing analog positioners on most Fisher and non-Fisher pneumatic actuators.



LINKAGE-LESS FEEDBACK SYSTEM

Features

Reliability

- **Linkage-Less Non-Contact Position Feedback—** The high performance, linkage-less feedback system eliminates physical contact between the valve stem and the DVC6200p. There are no wearing parts so cycle life is maximized.

- **Built to Survive—**The field proven DVC6200p instrument has fully encapsulated electronics that resist the effects of vibration, temperature, and corrosive atmospheres. A weather-tight wiring terminal box isolates field wiring connections from other areas of the instrument.

Performance

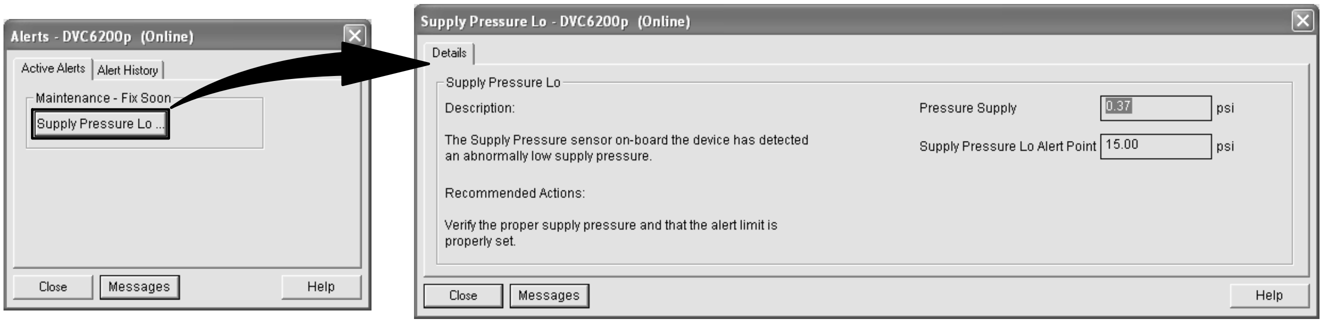
- **Accurate and Responsive—** The two-stage positioner design provides quick response to large step changes and precise control for small setpoint changes.

- **Travel Control/Pressure Fallback—** Valve position feedback is critical to the operation of the digital valve controller. The DVC6200p can detect position feedback problems and automatically revert to I/P transducer mode to keep the valve operational.

Ease of Use

- **Enhanced Safety—** The DVC6200p is a PROFIBUS PA communicating device, so information can be accessed anywhere along the loop. This flexibility can reduce exposure to hazardous environments and make it easier to evaluate valves in hard to reach locations.

Figure 1. Active Alerts



ACTIVE ALERTS

ALERT DETAILS

- **Fast Commissioning—** PROFIBUS communication allows you to quickly commission loops remotely using the PROFIBUS configuration tool with the DVC6200p Electronic Device Description (EDD). The DVC6200p can also be locally calibrated/commissioned by shorting the auxiliary terminal located in the terminal box.

- **Easy Maintenance—** The DVC6200p digital valve controller is modular in design. Critical working components can be replaced without removing field wiring or pneumatic tubing.

- **Stroke Valve—** The Stroke Valve Test is used to confirm proper valve operation. It helps to validate the auto-calibration after guided setup is complete.

Value

- **Hardware and Installation Savings—** Significant savings can be achieved in reduced wiring, installation, and hardware requirements compared to traditional integrated control systems. By utilizing function blocks such as Discrete Input and Analog Input blocks, the need for limit switches and position transmitters can be eliminated, providing additional savings in hardware and installation costs.

- **Improved Maintenance Decisions—** Digital communication provides easy access to the condition of the valve. Sound process and asset management decisions can be made by analysis of valve information through device alerts that provide details of the operational state of the final control element (see figure 1).

Figure 2. Overview Page

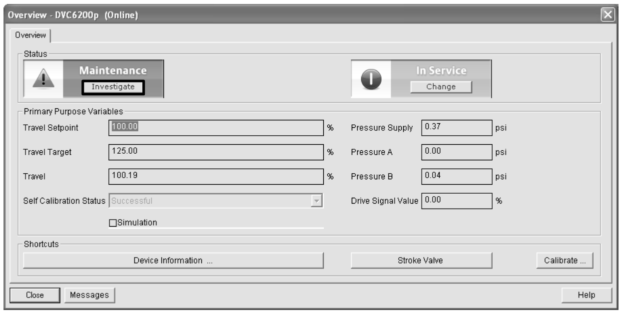
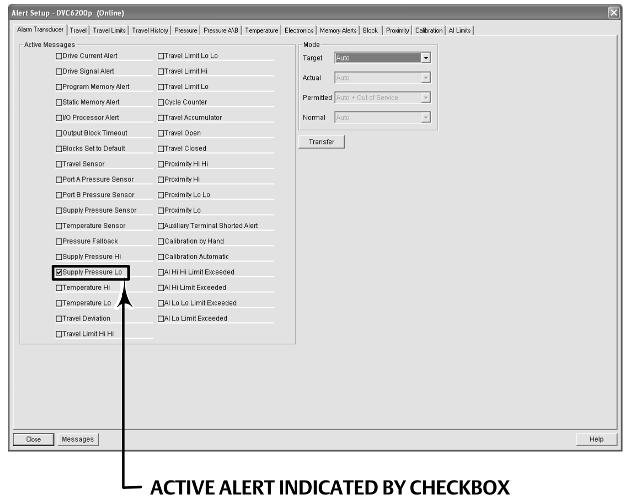


Figure 3. Alerts Summary



Device Alerts

The DVC6200p digital valve controller provides a comprehensive library of device alerts and fully supports NAMUR NE 107. Using Emerson's Human Centered Design concept of the Device Dashboard graphical user interface, device alerts are easily accessed via a PROFIBUS configuration tool such as Siemens PDM. When installed as part of a PROFIBUS communicating system, the DVC6200p delivers prompt notification of current issues directly on the Overview Page and Alerts Summary Page (see figure 2 and 3).

Alerts assist in identification and notifications, along with recommended actions to resolve situations such as the following:

- Valve travel deviation due to excessive valve friction or galling
- High cycle due to dither or improper tuning
- Total travel movement has accumulated beyond a specified point resulting in packing wear
- Travel sensor failure
- Valve travel is above or below a specified point
- Various instrument mechanical and electrical issues

Specifications

Available Mounting

- ■ Integral mounting to Fisher 657/667 or GX actuators
- ■ Integral mounting to Fisher rotary actuators,
- ■ Sliding-stem linear applications
- ■ Quarter-turn rotary applications

DVC6200p digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1,
IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards.

Function Block Suite

Standard (throttling) control includes AO, AI, DO, and DI function blocks. Also included are a Logbook block and an Alarm Transducer block.

Function Block Execution Times

AO Block: 6 ms
AI Block: 6 ms
DO Block: 6 ms
DI Block: 6 ms

Minimum Device Interval: 25 ms

Electrical Input

Voltage Level: 9 to 32 volts
Maximum Current: 19 mA
Reverse Polarity Protection: Unit is not polarity sensitive
Termination: Bus must be properly terminated per ISA SP50 guidelines

Digital Communication Protocol

PROFIBUS registered device
Certified to PROFIBUS Profile 3.02

Supply Pressure(1)

Minimum Recommended: 0.3 bar (5 psig) higher than maximum actuator requirements

Maximum: 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Supply Medium

Air or Natural Gas

Supply medium must be clean, dry, and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1

Output Signal

Pneumatic signal, up to full supply pressure
Minimum Span: 0.4 bar (6 psig)
Maximum Span: 9.5 bar (140 psig)
Action: ■ Double, ■ Single Direct or ■ Reverse

Steady-State Air Consumption(2)(3)

At 1.4 bar (20 psig) supply pressure: Less than 0.38 normal m^3/hr (14 scfh)
At 5.5 bar (80 psig) supply pressure: Less than 1.3 normal m^3/hr (49 scfh)

Maximum Output Capacity(2)(3)

At 1.4 bar (20 psig) supply pressure:
10.0 normal m^3/hr (375 scfh)
At 5.5 bar (80 psig) supply pressure:
29.5 normal m^3/hr (1100 scfh)

Operating Ambient Temperature Limits(1)(4)

-40 to 85°C (-40 to 185°F)
-52 to 85°C (-62 to 185°F) for instruments utilizing the Extreme Temperature option (fluorosilicone elastomers)

Independent Linearity(5)

Typical Value: ±0.50% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Vibration Testing Method

Tested per ANSI/ISA-S75.13.01 Section 5.3.5.

Humidity Testing Method

Tested per IEC 61514-2

-continued-

Specifications (continued)

Electrical Classification

Hazardous Area Approvals

CSA— Intrinsically Safe, FISCO, Explosion-proof, Division 2, Dust Ignition-proof

FM— Intrinsically Safe, FISCO, Explosion-proof, Non-Incendive, Dust Ignition-proof

ATEX— Intrinsically Safe, FISCO, Flameproof, Type n, Dust by intrinsic safety

IECEx— Intrinsically Safe, FISCO, Flameproof, Type n, Dust by intrinsic safety and enclosure

Electrical Housing

CSA— Type 4X, IP66

FM— Type 4X, IP66

ATEX— IP66

IECEx— IP66

Other Classifications/Certifications

Natural Gas Certified, Single Seal Device— CSA, FM, ATEX, and IECEx

Lloyds Register— Marine Type Approval

CML— Certification Management Limited (Japan)

CUTR— Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

ESMA— Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

INMETRO— National Institute of Metrology, Quality and Technology (Brazil)

KOSHA— Korean Occupational Safety & Health Agency (South Korea)

KTL— Korea Testing Laboratory (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE— Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

SANS— South African Bureau of Standards

Contact your Emerson sales office for classification/certification specific information

Connections

Supply Pressure: 1/4 NPT internal and integral pad for mounting 67CFR regulator
Output Pressure: 1/4 NPT internal
Tubing: 3/8-inch recommended
Vent: 3/8 NPT internal
Electrical: 1/2 NPT internal or M20

Actuator Compatibility

Stem Travel (Sliding-Stem Linear)
Linear actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Shaft Rotation (Quarter-Turn Rotary)
Rotary actuators with rated travel between 45 degrees and 180 degrees

Weight

Aluminum: 3.5 kg (7.7 lbs)
Stainless Steel: 8.6 kg (19 lbs)

Construction Materials

Housing, module base and terminal box:
A03600 low copper aluminum alloy (standard)
Stainless Steel (optional)
Cover:
Thermoplastic polyester
Elastomers:
Nitrile (standard)
Fluorosilicone (optional)

Options

■ Supply and output pressure gauges or ■ Tire valves, ■ Integral mounted filter regulator, ■ Low-Bleed Relay(6), ■ Extreme Temperature, ■ Natural Gas Certified, Single Seal Device ■ Remote Mount(7), ■ Stainless Steel

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. Normal m^3/hour - Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh - Standard cubic feet per hour at 60°F and 14.7 psia.
3. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
4. Temperature limits vary based on hazardous area approval. Lower temperature limit for CUTR Ex d approval with fluorosilicone elastomers is -53°C (-63.4°F).
5. Typical value. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also not applicable for digital valve controllers in long-stroke applications.
6. The Quad O steady-state consumption requirement of 6 scfh can be met by a DVC6200p with low bleed relay A option, when used with up to 4.8 bar (70 psi) supply of Natural Gas at 16°C (60°F). The 6 scfh requirement can be met by low bleed relay B and C when used with up to 5.2 bar (75 psi) supply of Natural Gas at 16°C (60°F).
7. 4-conductor shielded cable, 18 to 22 AWG minimum wire size, in rigid or flexible metal conduit, is required for connection between base unit and feedback unit.

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Corrosion Protection for Fisher™ FIELDVUE™ Digital Valve Controllers

Standard Instrument Paint

Standard paints applied to instruments are formulated to withstand extreme exposures to corrosive atmospheres and are tested to confirm this benefit. Due to the excellent surface preparation and superior coatings applied to the prepared substrate, other more expensive coating systems are not necessary. The coatings used for instruments are baked-on finishes that will withstand the toughest environments and will keep on performing for years to come.

Comparisons of paints other than standard have shown no advantages in using other paints. Because of the potential impact on instrument performance, we are unable to apply coatings or paints other than our standard.

Figure 1. Fisher DVC6200 Digital Valve Controller with Standard Finish

W9699

Table 1. Standard Instrument Paint Specifications

Technical Specifications—Standard Instrument Paint	
Surface Preparation	Clean, desmut, apply chromate conversion coating
Coating Thickness	31 to 37 microns (1.25 to 1.5 mils)
Standard Acceptance Test	Refer to the Standard Instrument Paint Panel Results in table 2
Standard Color Specifications	**Regal Gray**—Munsell #8.4 B 3.47/0.60 **Rosemount Blue**—Federal Standard 595A- #25177

Standard Instrument Paint Test-Panel Results

Standardized flat-panel tests show the effect of common chemical exposures and physical attributes. Tests were performed on chromate conversion coated aluminum alloy panels. For more information about test conditions, procedures, and results, contact your Emerson sales office or Local Business Partner.

Table 2. Standard Instrument Paint Panel Results

TEST	RESULT	TEST	RESULT	TEST	RESULT
Hot and Cold Cycle	No effect	10% NH_4OH	No effect	Mandrel Bend ASTM D522	PASSED
10% HNO_3	Slight loss of gloss to no effect	15% Xylene; 85% Mineral Spirits	Slightly lighter to no effect	Impact ASTM D2794	PASSED
10% HCL	No effect	Unleaded Gasoline	No effect	Thread-locking Sealant Resin	PASSED
3% H_2SO_4	No effect	Cross-Hatch Adhesion ASTM D3359	PASSED	Humidity, Ultraviolet, and Gravel Tests	PASSED
10% NaOH	Slight loss of gloss to no effect	Pencil Hardness ASTM D3363	PASSED	Salt Cabinet ASTM B117	PASSED

DVC6200 Stainless Steel Alternative

As an alternative to painted instruments, the FIELDVUE DVC6200 digital valve controller can be furnished with a stainless steel module base, housing and an all-stainless mounting kit. The sealed terminal box isolates field wiring connections from other areas of the instrument and keeps water and harsh atmosphere away from electronic components. The DVC6200 stainless steel version eliminates all diecast aluminum parts, which greatly increases its resistance to the tough, corrosive environments found on offshore platforms, within chemical plants, and inside refinery processing units.

Figure 2. Fisher DVC6200 Digital Valve Controller Stainless Steel Version

X0350

Proprietary NCF (Non-Corroding Finish) Coating for Steel Fasteners

Standard steel fasteners such as bonnet bolting, actuator casing bolting, and steel fasteners for Fisher instruments have NCF (non-corroding finish) coating.

NCF coating was developed by Emerson Automation Solutions to greatly improve resistance to corrosion from acids, bases, salts, and many other chemicals and to follow the parameters listed in ASTM F1136 (Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners). NCF coating is a polymer-based coating consisting of multiple coats applied to all surfaces of bolts, studs, and nuts. (NCF coating is not used on steel bolting for temperatures over 427°C or 800°F). NCF coating is silver or gray in color and the finish is dull when compared with zinc plating.

The effectiveness of this proprietary coating designed specifically for the control valve market has been proven by actual testing on offshore platforms and accelerated salt-spray tests in the laboratory. NCF coated fasteners remain easily maintainable after offshore exposure. Original replacement NCF bolting is only available from Emerson Automation Solutions.

Figure 3. NCF-Coated Fasteners Exhibit Superior Performance in Accelerated Laboratory Tests

W7698

STANDARD ZINC PLATED **NCF COATED**

Table 3. NCF Coating Specifications

Technical Specifications—NCF Coating	
Surface Preparation	**Pressure-retaining parts:** Light blast **Non pressure-retaining parts:** Light blast or zinc plating
Coating Thickness	Approximately 0.025 mm (0.001 inches)
Standard Acceptance Test	No red rust after 500 hours of ASTM B117 salt-spray test conducted on products after assembly with a pneumatic impact wrench
Color	Light silver-gray

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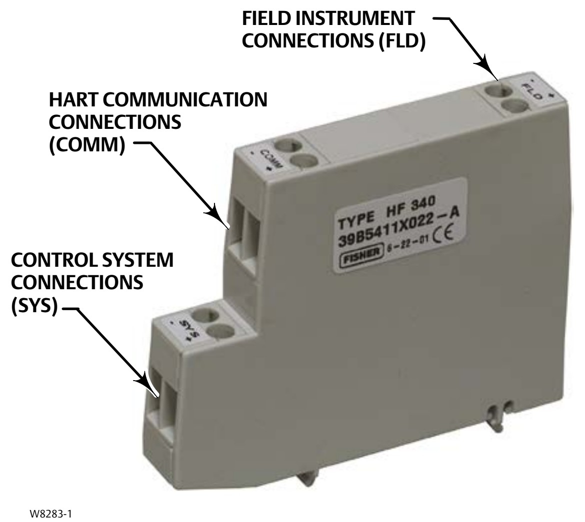
Fisher™ HF340 Filter

The Fisher HF340 HART® filter is used with HART communicating FIELDVUE™ instruments, such as FIELDVUE DVC2000, DVC6200, or DVC6000 digital valve controllers. HART filters are used when the instrument is connected to a 4 to 20 mA DC control system output not designed for the HART (Highway Addressable Remote Transducer) communication protocol.

The filter receives a 4 to 20 mA DC current signal from the control system and passes the signal, uninterrupted, to the field device. A third connection to the filter provides HART communication to a device that accepts HART signals, such as a multiplexer or a 475 Field Communicator.



Features

- **Versatile Mounting**—Mounts on standard type 35 DIN rails.
- **Small Size**—Fits easily in existing installations.
- **Allows HART Communications on 4 to 20 mA Control Systems**— The HF340 HART filter prevents the HART signal from interfering with the control system analog output and prevent the analog output signal from interfering with HART communication. Table 2 lists some of the control systems that require a filter.

Product Description

The HF340 HART filter is a passive device that is inserted in-line with both wires of a HART 4 to 20 mA DC output loop. The purpose of the filter is to effectively isolate the control system analog output from modulated HART communication signals. Whether or not HART communication can take place depends upon the control system impedance. Impedance, simply, is the property of an electrical circuit to resist the flow of alternating current.

As shown in figure 1, the HART signal from a transmitter is not normally affected because the control system *analog input* has high impedance (typically 250 ohms). However, the control system *analog output* may have low enough impedance to reduce the amplitude of the HART signal to an unreadable level.

The HF340 filter increases the impedance. Therefore, placing a filter between the control system output and the field instrument restores the HART signal amplitude to a readable level.

Table 2 lists those control systems that have been tested with FIELDVUE Instruments. If your control system is not listed in table 2 you can either always use a filter, or contact your Emerson sales office or Local Business Partner for a recommendation.

Specifications

Mounting

Standard 35 mm DIN rail mounting with filtering components.

Connections

Three 2-pin cage-clamp style connectors accept up to 12 AWG wire

Power Requirements

Input Current: 4-20 mA DC (nominal)
Input Voltage: At 20 milliamps DC, 2 volts above input voltage required by the field instrument (2 volt drop across filter at 20 milliamps DC)

Ambient Operating Temperature

-40 to 85°C (-40 to 185°F)

Ambient Relative Humidity

5 to 95%

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table below 1.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Dimensions

75 mm (3 inches) long by 12.5 mm (0.5 inches) wide by 60 mm (2.4 inches) deep

Approximate Weight

0.1 kg (4 oz)

Option

HF341 communications tap: Standard 35 mm DIN rail mounting *without* filtering components (straight through with capacitor blocking on COMM terminals). In case of an accidental short circuit across the COMM terminal, a capacitor blocking circuit prevents disruption of the 4 to 20 mA DC control signal.

Table 1. EMC Summary Results; Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	EM field	IEC 61000-4-3	80 to 100 MHz @ 10V/m with 1 kHz at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	N/A(1)	N/A(1)
I/O signal/control	Burst	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	A
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

A = During testing, normal performance within the specification limits.
1. Not applicable; only applicable to magnetically sensitive equipment.

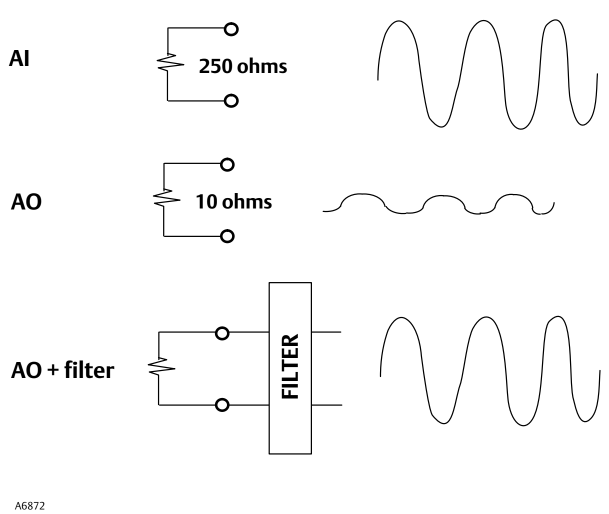
Table 2. Control System Installation Requirements for HART Communicating FIELDVUE Digital Valve Controllers

Control System[(1)]		Installation Requirement
Bailey™ Infi 90™		Filter required
Fischer-Porter DCI 40PC2000C		Filter required
Honeywell™ TDC2000		Filter required
Honeywell TDC3000	Multi-function controller	Filter required
	High-Density Process Manager (HPM) controller	No filter required
FOXBORO™ I/A (1988)		No filter required
Moore™ 352		No filter required
Valmet™ (output configured for straight through, not for 250 ohms)		No filter required
Rosemount™ RS-3 Multiport with HART I/O		No filter required
Fisher-Rosemount DeltaV™ (AO and HART I/O)		No filter required
Fisher-Rosemount PROVOX™ Configurable, Computing, and Interactive (IAC) Controllers		Filter required
Fisher-Rosemount PROVOX MUX (parallel) I/O		No filter required
Fisher-Rosemount PROVOX Control (serial) I/O	for AO	Filter required
	for HART I/O	No filter required
Fisher-Rosemount TL108 with 24 or 45 volt DC power		No filter required
Fisher-Rosemount DPR900		Filter required
Fisher-Rosemount ROC 364		No filter required
Transmation™ 1028 mA Calibrator		No filter required

NOTE: The information presented in this table reflects the feedback of users of the HF340 filter. Your experiences and usage may vary depending on your control system, conditions, and other factors.

1. For control systems not listed, a filter is recommended, if the voltage available at the instrument is adequate. See appropriate instrument instruction manual for procedures for determining voltage available. Filtering ensures proper communication and simplifies connecting a HART communicator or HART interchange multiplexer.

Figure 1. Effect of Control System Impedance on the HART Signal Amplitude



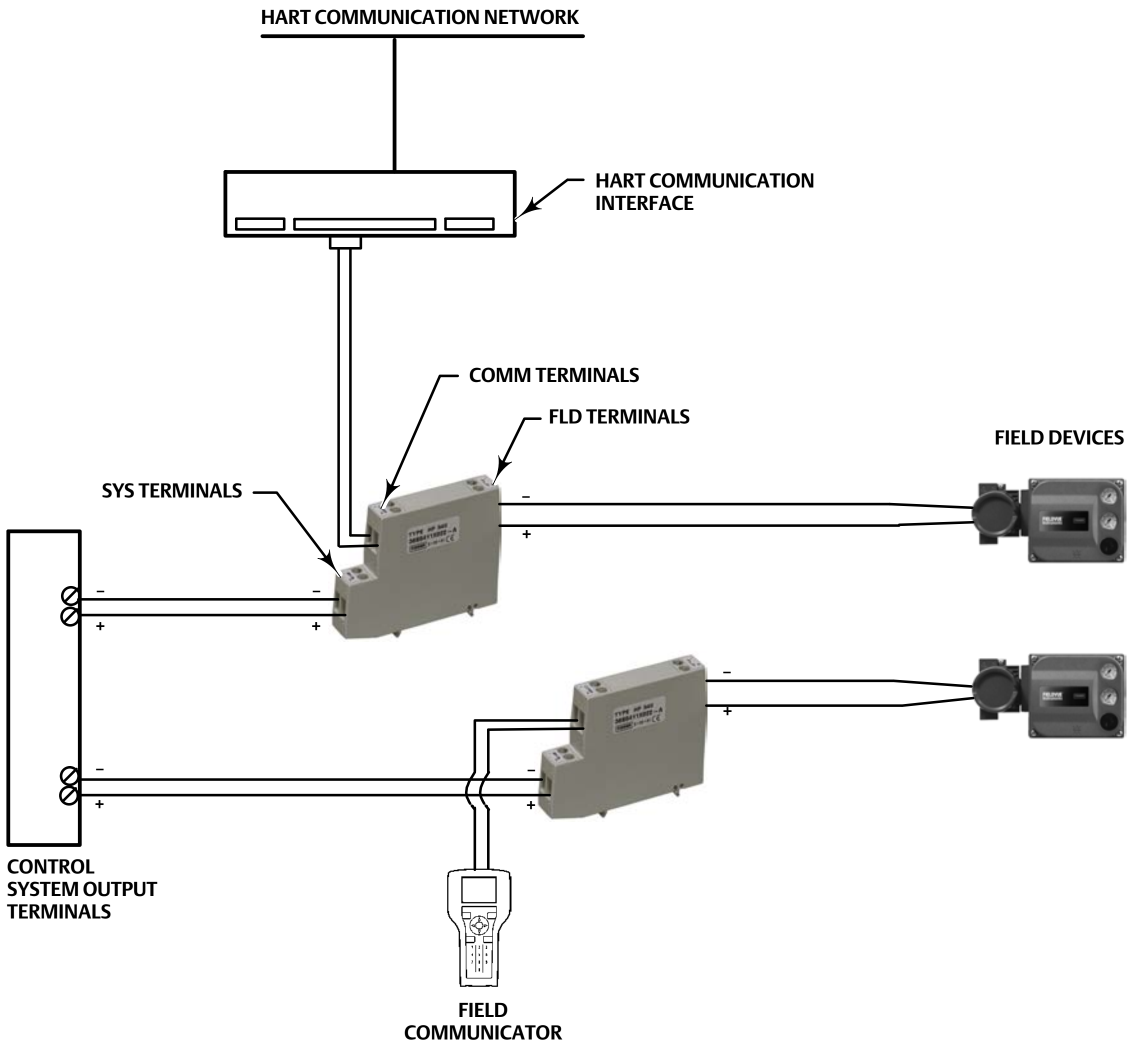
Installation

Figure 2 shows a typical HART filter installation. The filter is normally installed near the field wiring terminals of the control system I/O. The HF340 filter mounts on DIN rails. HART communication is only possible between the filter and the field instrument and at the COMM terminals, but not on the control system side of the filter. The filter is not approved for use in hazardous areas. However, it can be used with instruments in hazardous areas by following the appropriate wiring and installation guidelines.

Ordering Information

When ordering, specify the filter type number HF340 or the optional HF341 communications tap.

Figure 2. Typical Fisher HF340 HART Filter Installation



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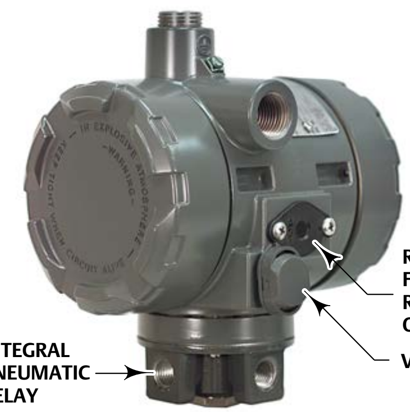
www.Fisher.com

Fisher™ i2P-100 Electro-Pneumatic Transducer

The Fisher i2P-100 electro-pneumatic transducer, uses a converter module that converts a milliampere input to a proportional pressure output. Both the current input and pressure output range are user-configurable in the field. The converter module uses small parts of minimum mass, which are balanced symmetrically around a pivot point at the center of the mass. This balanced arrangement results in a high performance instrument that reduces sensitivity to vibration.

An integral pneumatic relay provides the high capacity necessary to drive pneumatic control valve/actuator assemblies without additional boosters or positioners. The transducer also provides stable, accurate operation when its output is transmitted to small volume chambers, such as a pneumatic positioner or other pneumatic instrument. Reduced sensitivity to vibration, combined with high capacity and first order lag characteristics, make the i2P-100 transducer suitable for direct mounting on control valve/actuator combinations.



W8710

Features

- **Approved for use with Natural Gas**—The i2P-100 is approved for use with natural gas as the pneumatic supply.

- **Low Pneumatic Supply Consumption**—The transducer has low pneumatic supply consumption which lowers operating costs. Maximum steady state consumption is less than the 6 SCFH requirement set for the oil and gas industry by the US Environmental Protection Agency (New Source Performance Standards Subpart OOOO, EPA-HQ-QAR-2010-0505).

- **Single Sealed Device**— The i2P-100 has been tested in accordance with ANSI/ISA Standard 12.27.01 (Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids) as a single sealed device.

- **High Output Capability and Rangeability**— The integral output relay volume of the transducer is adequate to drive valve/actuator combinations without requiring a positioner or volume booster. Selectable user field-configurable dip switch setting for output range of 0.14 to 2.3 bar (2 to 33 psi).

- **Split Range**—Selectable user field-configurable two-way split range, using either half of the standard input signal.

- **Corrosion Resistant**—Separate housing compartments isolate the electronics from the pneumatic process. The electronics module is encased in a rugged plastic shell which helps to prevent damage to the electronics. The printed wiring board and dip switches are conformal coated to help prevent corrosion. Converter module coils have corrosion resistant coating and all flexures are gold plated to provide protection from hostile environments.

- **Tolerant of Dirty Supply Medium**—Free-flow pilot stage design and large internal air passages provide excellent tolerance to dirty pneumatic supply, by reducing the effects of contaminant buildup and erosion. The removable primary orifice and replaceable 5 micrometer filter are easy to remove for service and maintenance.

Figure 1. Fisher i2P-100 Electro-Pneumatic Transducer Mounted on a Rotary Actuator

Figure 2. Fisher i2P-100 Electro-Pneumatic Transducer Mounted on a Sliding-Stem Actuator

- **Easy Maintenance**—Modular electronics and converter modules contained in separate housing compartments, isolating the electronics from the process, allow for easy replacement in the field for reduced maintenance time and costs.

- **Vibration Resistance**—The transducer, used in a standard valve/actuator mounted application, exhibits an output shift of less than 1 percent of span when tested to ISA S75.13.

Valve Stroking Time

Figure 3 shows relative times for loading and exhausting an actuator. Stroking time depends upon the size of the actuator, travel, relay characteristics and the magnitude and rate of change of the input signal. If stroking time is critical, contact your Emerson sales office.

Table of Contents

Specifications

Input Signal

Available as standard with 4-20 mA.
User configurable by dip switch for split ranging, see table below.

Output Signal

Available as standard 0.2 to 1.0 bar (3 to 15 psig), 0.4 to 2.0 bar (6 to 30 psig), or 0.14 to 2.3 bar (2 to 33 psig). User configurable by dip switch selection and zero and span potentiometer adjustment, see table below.

INPUT SIGNAL	OUTPUT PRESSURE	
	Bar	Psig
4 to 20 mA DC	0.2 to 1.0	3 to 15
	0.4 to 2.0	6 to 30
	0.14 to 2.3	2 to 33
4 to 12 mA DC	0.2 to 1.0	3 to 15
12 to 20 mA DC	0.2 to 1.0	3 to 15

Equivalent Circuit

The i2P-100 equivalent circuit is a series circuit consisting of a constant voltage drop (battery) of approximately 4 VDC and a total resistance of 40 ohms. Input is shunted by two 6.8 V zener diodes (see figure 4).

Supply Pressure(1)

Recommended: 0.34 bar (5 psi) higher than upper range limit of output signal

Maximum: 3.4 bar (50 psig)

Medium: Air or Non-Corrosive Natural Gas

Maximum Steady-State Flow Rate(2)(3)

Refer to tables 2 and 3

Maximum Output Air Capacity(3)

8.04 m^3/hr (300 scfh) at 1.4 bar (20 psig) supply pressure

Performance(4)

Reference Accuracy: ±1.0% of full scale output span; includes combined effects of hysteresis, linearity, and deadband

Independent Linearity: ±0.5% of full scale output span

Hysteresis: 0.4% of full scale output span

Frequency Response: Gain is attenuated 3 dB at 3 Hz with transducer output signal piped to a typical instrument input

Temperature Effect: ± 0.14% per degrees Celsius (± 0.075 per degrees Fahrenheit) of span

Supply Pressure Effect: 0.2% of full scale output span per psi supply pressure change)

Vibration Effect: Less than 1% of full scale output span when tested to ISA S75.13

Electromagnetic Compatibility
Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of EN 61326-1 Standard. Performance is shown in table 1 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Operating Ambient Temperature Limits(1)

-40 to 85°C (-40 to +185°F)

Electrical Seal

Single sealed device per ANSI/ISA 12.27.01

Electrical Classification

Hazardous Area Approvals

CSA — Intrinsically Safe, Explosion proof, Type n, Dust-Ignition proof

FM— Intrinsically Safe, Explosion proof, Type n, Non-incendive, Dust-Ignition proof

ATEX— Intrinsically Safe, Flameproof , Type n

IECEx— Intrinsically Safe, Flameproof, Type n

CUTR—Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

(continued on next page)

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Specifications (continued)

Hazardous Area Approvals (continued)

INMETRO— National Institute of Metrology, Quality, and Technology (Brazil)

KTL—Korea Testing Laboratory (South Korea)

NEPSI— National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

Contact your Emerson sales office for classification/certification specific information

Electrical Housing:

When Remotely Vented	No Remote Venting
CSA—Type 4X Encl.	CSA—Type 3 Encl.
FM— NEMA 4X	FM— NEMA 3
ATEX—IP66	ATEX—IP64
IECEx—IP66	IECEx—IP64

Construction Materials

Housing: ASTM: A03600 material composition alloy
O-rings: Nitrile
Diaphragms: Nitrile

Adjustments(5)

Zero and Span: Trim potentiometers (20 turn) for zero and span adjustments are located under the housing cap.

Switch: Allows input signal split range and user-configurable 0.14 to 2.3 bar (2 to 33 psig) output.

Connections

Supply and Output Pressure: 1/4 NPT internal connection
Vent: 1/4 NPT internal
Electrical: ■ Standard 1/2 NPT
Wire Size: 18 to 22 AWG

Mounting Position

■ Actuator ■ pipestand or ■ surface

Approximate Weight

2.5 kg (5.5 lbs)

Options

■ Output pressure gauge ■ M20 or PG13 conduit adapter

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology
1. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.
2. Average flow rate determined at 12 mA and 0.6 bar (9 psig) output.
3. Normal m^3/hour--Normal cubic meters per hour (0°C and 1.01325 bar, absolute). Scfh--Standard cubic feet per hour (60°F and 14.7 psig).
4. Performance values are obtained using a transducer with a 4 to 20 mA DC input signal and a 0.2 to 1.0 bar (3 to 15 psig) output signal at an ambient temperature of 24°C (75°F).
5. For other ranges, zero and span adjustments needed.

Energy Responsible Tool

The web based Energy Responsible Tool provides calculations for estimating operating costs and emissions for instrument air and natural gas in tonnes of Equivalent Carbon Dioxide (Co2e).

Scan or click the QR code to calculate pneumatic energy savings.

Table 1. EMC Summary Results—Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(1)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4kV Contact 8kV Air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	A
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A

Specification limit = ±1% of span
1. A=No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Figure 3. Output-Time Relationships

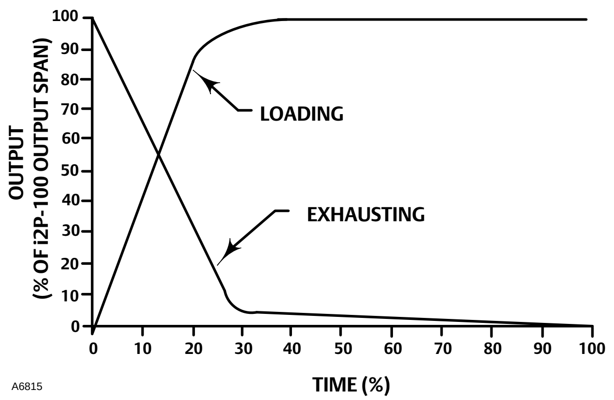


Figure 4. Equivalent Circuit

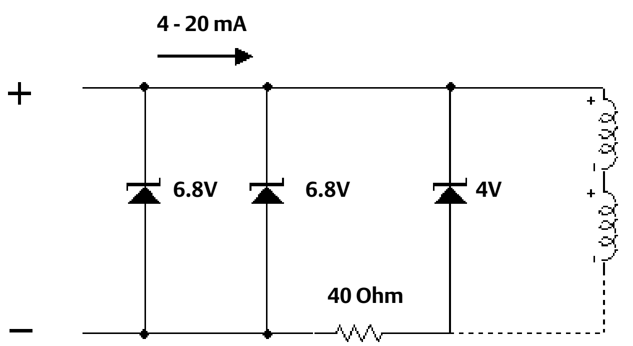


Table 2. Maximum Steady-State Flow Rate (Air)

SUPPLY PRESSURE		OUTPUT PRESSURE		STEADY STATE FLOW RATE(1)	
Bar	Psi	Bar	Psi	m^3/hr	Scfh
1.4	20	**0.2 - 1.0**	**3 - 15**		
		0.2	3	0.04	1.5
		0.62	9	0.06	2.0
		1.0	15	0.07	2.6
2.4	35	**0.4 - 2.0**	**6 - 30**		
		0.4	6	0.05	1.7
		1.2	18	0.08	2.9
		2	30	0.12	4.1
2.6	38	**0.1 - 2.3**	**2 - 33**		
		0.1	2	0.04	1.5
		1.2	17.5	0.08	2.9
		2.3	33	0.12	4.3

1. Normal m3/hour - Normal cubic meters per hour (0C and 1.0135 bar, absolute).
Scfh - Standard cubic feet per hour (60F and 14.7psig).

Table 3. Maximum Steady-State Flow Rate (Natural Gas)

SUPPLY PRESSURE		OUTPUT PRESSURE		STEADY STATE FLOW RATE(1,2)	
Bar	Psi	Bar	Psi	m^3/hr	Scfh
1.4	20	**0.2 - 1.0**	**3 - 15**		
		0.2	3	0.06	1.95
		0.62	9	0.07	2.6
		1.0	15	0.1	3.38
2.4	35	**0.4 - 2.0**	**6 - 30**		
		0.4	6	0.6	2.21
		1.2	18	0.11	3.77
		2	30	0.15	5.33
2.6	38	**0.1 - 2.3**	**2 - 33**		
		0.1	2	0.06	1.94
		1.2	17.5	0.11	3.74
		2.3	33	0.18	5.55

1. Normal m3/hour - Normal cubic meters per hour (0C and 1.0135 bar, absolute).
Scfh - Standard cubic feet per hour (60F and 14.7psig).
2. Natural gas steady state flow based on natural gas specific gravity of 0.6.
Flow decreases as specific gravity increases.

Installation

Refer to figure 5 for location of standard mounting holes in the housing. See figures 1 and 2 for typical mounting configurations. Standard mounting hardware is provided for mounting on the actuator, a pipestand, or surface mount. Field wiring connections are made to the terminal block accessible under the housing cap, via the 1/2 NPT conduit connection. Dimensions are shown in figures 5, 6, 7, and 8.

Ordering Information

To determine what ordering information is required, refer to the Specifications table. Carefully review the description of each specification. Specify the desired choice whenever there is a selection available. Also, specify options that are applicable to the application.

Figure 5. Dimensions

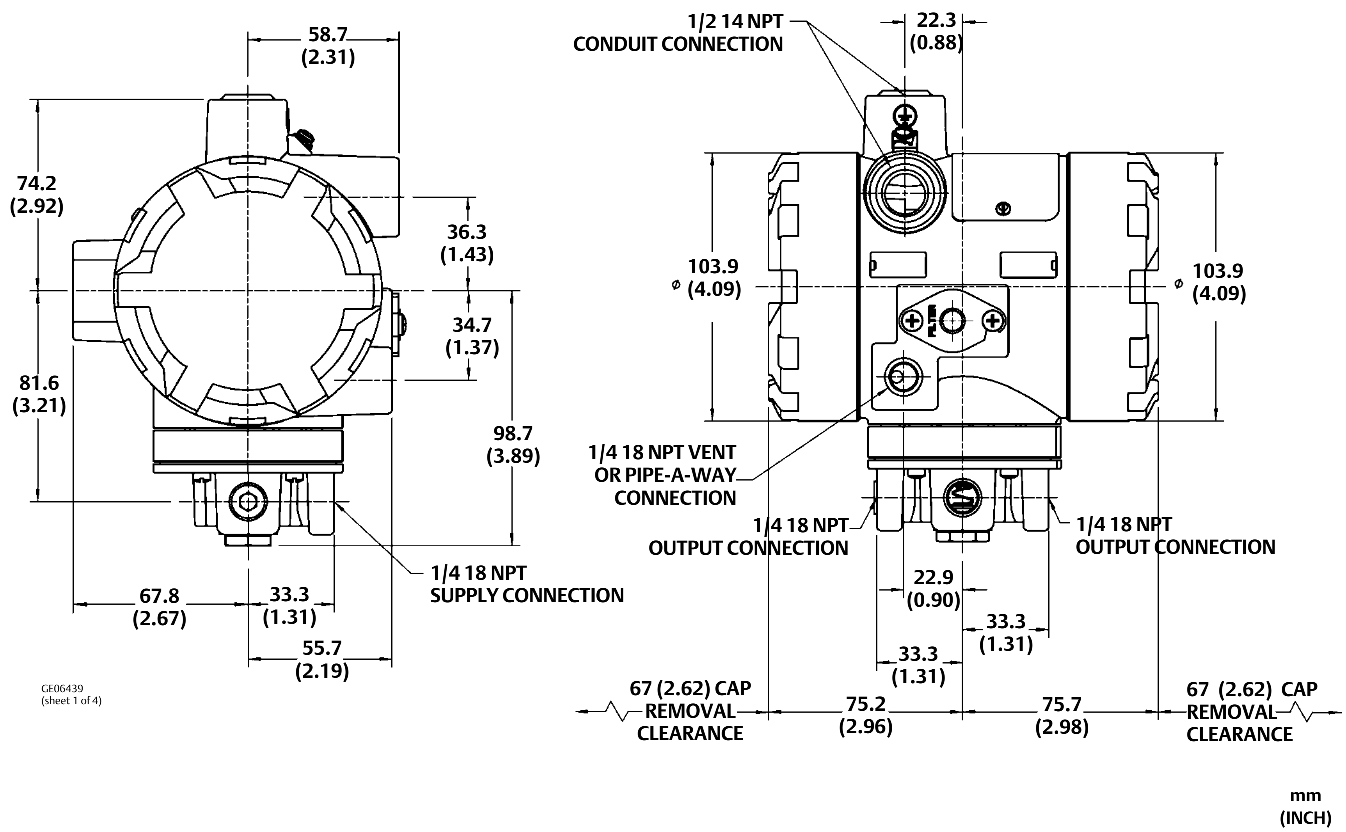


Figure 6. Dimensions with Optional Fisher 67 Filter-Regulator (Yoke/Bracket Mounted)

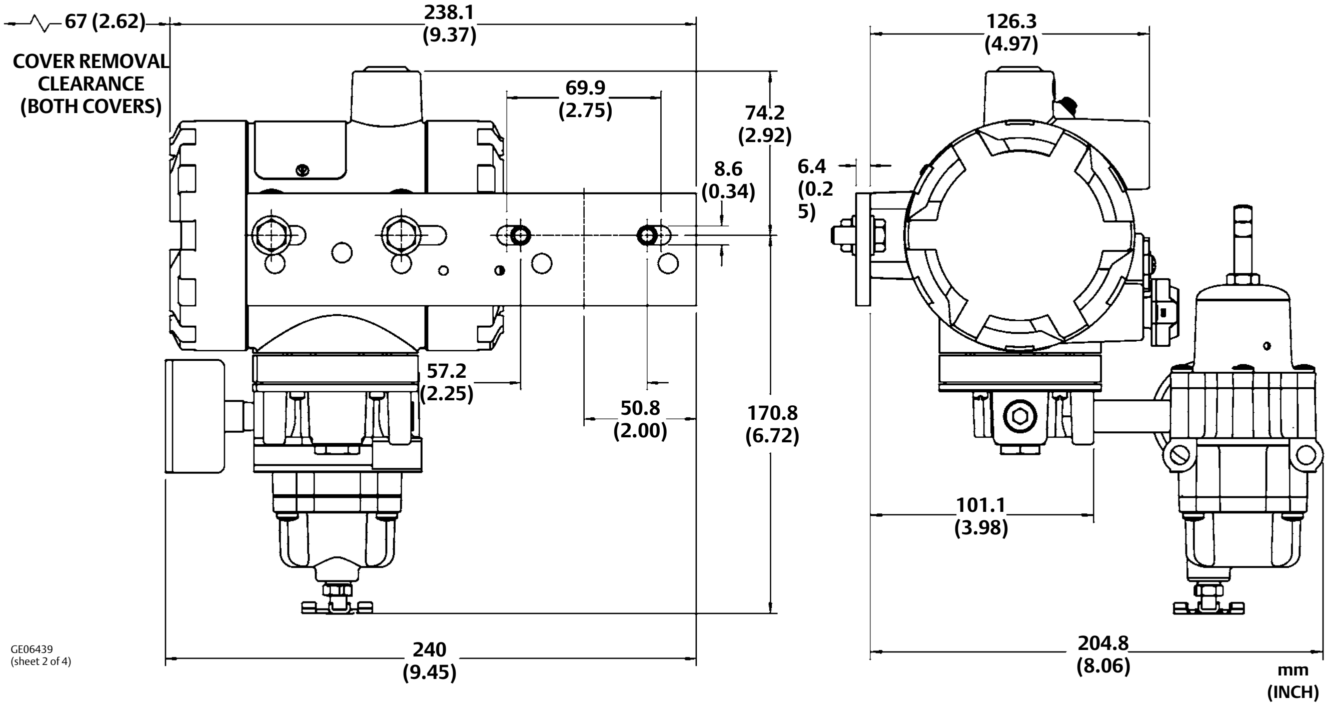


Figure 7. Dimensions with Optional Fisher 67 Filter-Regulator (Surface/Wall Mounted)

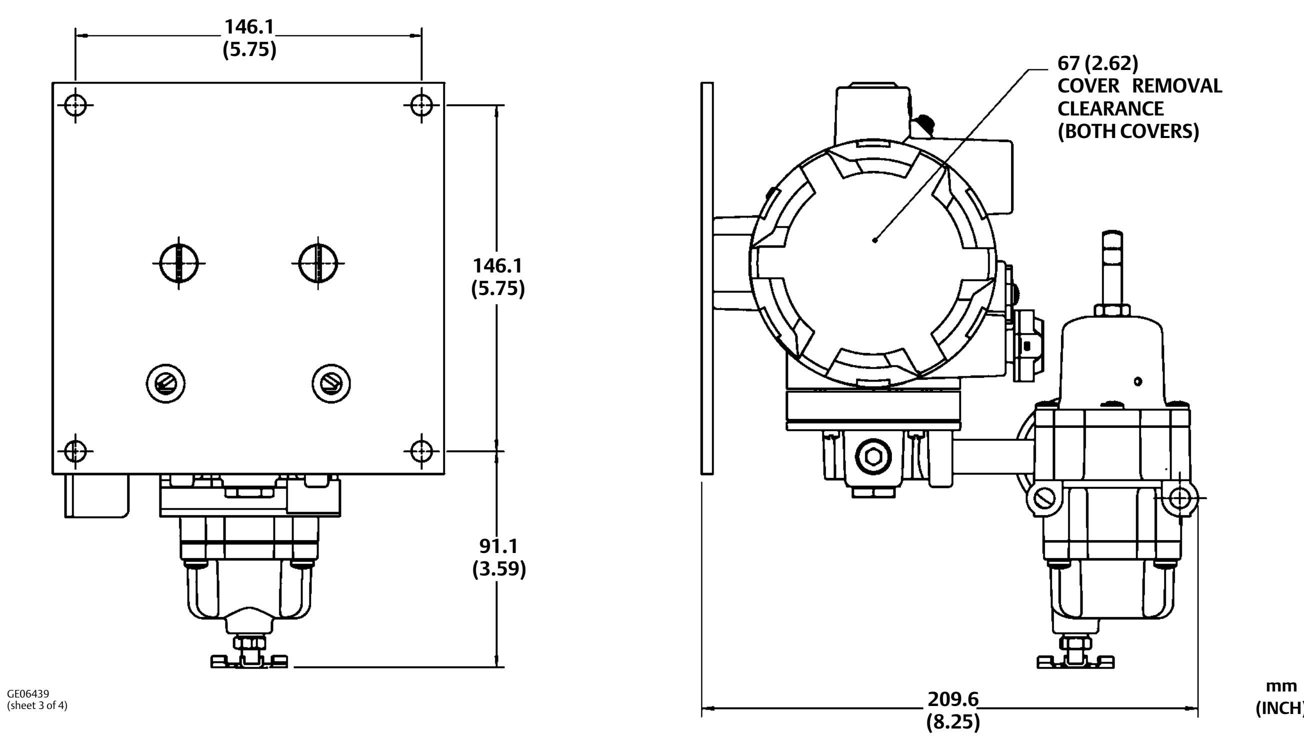
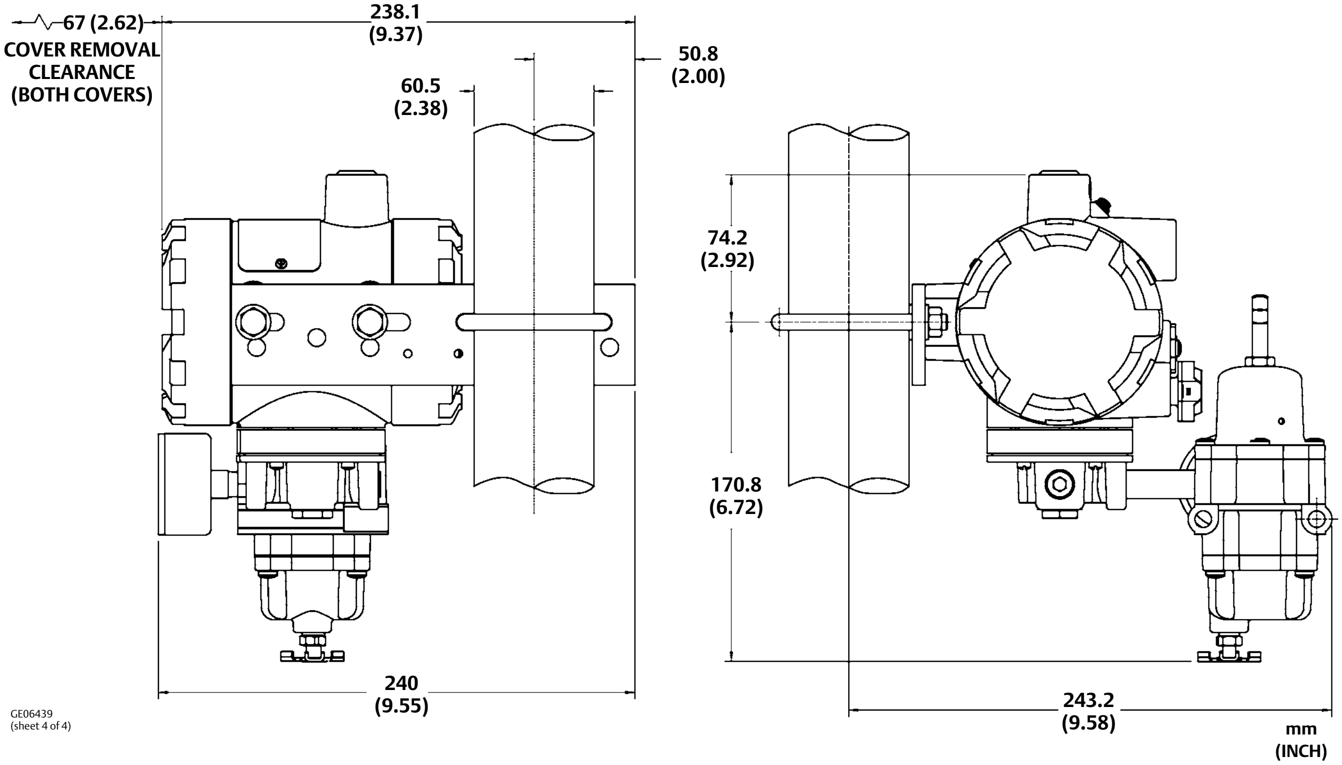


Figure 8. Dimensions with Optional Fisher 67 Filter-Regulator (Pipestand Mounted)



Scan or click the QR code to find out more about the i2P-100 transducer

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Fisher™ LCP100 Local Control Panel

The LCP100 local control panel is used in conjunction with the FIELDVUE™ DVC6200 SIS digital valve controller to manually open, close, or test a safety shutdown valve. The LCP100 has three protected pushbuttons to allow the user to open, close or test the safety valve. There are also three lights to visually indicate if the valve is open, closed, or locked in safety and ready for reset.

FISHER LCP100 LOCAL CONTROL PANEL, WITH FIELDVUE DVC6200 SIS DIGITAL VALVE CONTROLLER AND BETTIS™ ACTUATOR

Features

Reliability

- Rugged Enclosure—The filled polyester enclosure, encapsulated electronics, pushbuttons, and lights are designed to withstand harsh industrial environments.
- Proof Testing—The open and close pushbuttons provide a means to manually perform an offline full stroke test to help identify dangerous undetected failures.
- Partial Valve Stroke Test—The test pushbutton provides a means to manually perform an online partial stroke test to help improve the diagnostic coverage factor.

Safety

- Manual Reset—After a safety demand, the DVC6200 SIS will remain locked in the safe state. The manual reset pushbutton provides user control over when the valve can return to the normal operating state.
- Lockable Pushbutton Covers—Each pushbutton can be locked to prevent unauthorized access to the safety valve operation.
- Safety Certification—The LCP100 contribution to failure rates is documented in the DVC6200 SIS safety manual.

Ease of Use

- Loop vs. External Power—The LCP100 can be powered by the same loop as the DVC6200 SIS or independently powered by a 24 VDC source.
- Simple Configuration—The DVC6200 SIS setup wizard automatically configures the LCP100 functions.

Value

- Visual Indication—The LCP100 can be mounted remote from the valve in an easily accessible location to view the status and perform periodic testing.
- Reduce I/O Count—The LCP100 combines open/closed/ready-to-reset lights and open/close pushbuttons into a single field enclosure, thus eliminating 3 discrete out (DO) and 2 discrete in (DI) channels from the logic solver.

Specifications

Power Options (switch selectable)

■ External: 24 VDC +/- 10% @ 50 mA maximum continuous current (100 mA maximum inrush)
■ Loop: 8-20 mA (LCP100 and DVC6200 SIS combined)

Power Consumption

External: 1.32 W max continuous
Loop (Point-to-Point): 0.042 W max continuous
Loop (Multi-Drop): 0.126 W max continuous

Temperature Limits(1)

-40 to 65°C (-40 to 149°F)

Maximum distance between LCP100 and DVC6200 SIS digital valve controller

Cable length is limited by maximum cable capacitance of 100,000 pF(2). Typical 314 meters (1030 feet) with 18 AWG shielded Audio, Control and Instrumentation Cable

Electrical Classification

CSA (C/US)
AEx ia IIB T4 Ga(3) – Zone 0, 1, 2
AEx e mb [ib] IIC T4 Gb – Zone 1, 2
AEx ic IIC T4 Gc – Zone 2
Class I Division 2 Groups ABCD T4

ATEX
Ex ia IIB T4 Ga(3) – Zone 0, 1, 2
Ex e mb [ib] IIC T4 Gb – Zone 1, 2
Ex ic IIC T4 Gc – Zone 2

IECEx
Ex ia IIB T4 Ga(3) – Zone 0, 1, 2
Ex e mb [ib] IIC T4 Gb – Zone 1, 2
Ex ic IIC T4 Gc – Zone 2
Ex tb IIIC T71°C Db – Zone 21, 22

Other Classifications/Certifications

CUTR—Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, Armenia)

ESMA—Emirates Authority for Standardization and Metrology - ECAS-Ex (UAE)

Electrical Housing

IP66

Electromagnetic Interference (EMI)

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of EN 61326-1 S1tandard. Performance is shown in table below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Connections

Conduit: ■ 3/4 NPT or ■ M20

Wiring

14 to 26 AWG

Electrical Installation

Wire connections are polarity sensitive

Installation Orientation

Wiring entrance must be facing down

Dimensions

253.1 mm (10 inches) long by 109.5 mm (4.3 inches) wide by 127.8 mm (5 inches) deep. See figure 1.

Construction Materials

Housing material: filled polyester

Approximate Weight

2.2 kg (4.9 lbs)

-continued-

Specifications (continued)

Lights

Green: Solid when the valve is at its normal operating position, and loop current is normal. Flashing when the valve is not at its normal operating position, and loop current is normal.

Red: Solid when the valve is at its Fail Safe State and loop current is tripped. Flashing when valve is not at its Fail Safe State and loop current is tripped.

Yellow (Ready-to-Reset): Solid when the valve is latched in the trip position, and loop current is normal.

Pushbuttons

Protected with lockable covers

Green: After an emergency demand— commands the valve to its normal position only after control current is restored (manual reset).

Red: Always commands the valve to its Fail Safe State regardless of the control current.

Black: Commands the configured partial stroke test. Can be overridden by the Close button, Open button, or Emergency Demand.

1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. DVC6000 SIS: Cable length is limited by maximum cable capacitance of 18000 pF.
3. LOOP Powered only.

Figure 1. Dimensions

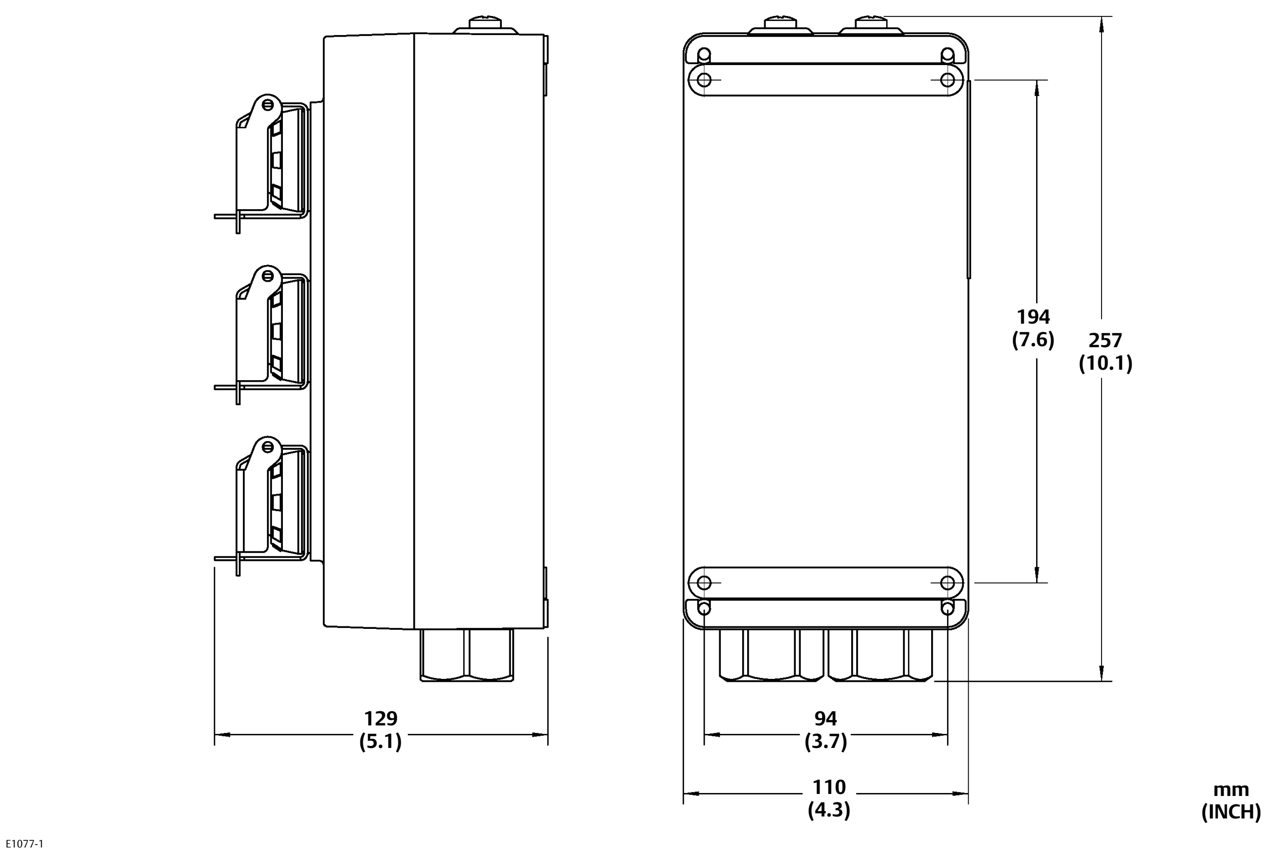

Table 1. Electromagnetic Immunity Performance for Fisher LCP100

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(1)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	± 4 kV contact ± 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	± 1 kV, I/O lines ± 2 kV, DC power lines	A
	Surge	IEC 61000-4-5	± 1 kV, I/O lines ± 2 kV, DC power lines)	A
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms with 1 kHz AM at 80%	A

Specification limit = ±1% of span
1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

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Fisher™ LCP200 Local Control Panel

The LCP200 local control panel is used with the HART® communicating DVC6200 SIS digital valve controller. This panel is used to manually open, close or test a safety shutdown valve using three protected pushbuttons. The LCP200 also provides three lights to visually indicate if the valve is open, closed or locked in safety/ ready to reset.

Unless otherwise noted, the information in this document applies to both FIELDVUE DVC6200 SIS and DVC6000 SIS digital valve controllers. For simplicity, the DVC6200 SIS model name will be used throughout.

X1536

Features

Reliability

- **Rugged Enclosure**—The explosion-proof stainless steel enclosure is designed to withstand harsh industrial environments.
- **Proof Testing**—The open and close pushbuttons provide a means to manually perform a proof test to reduce the number of dangerous undetected failures.
- **Partial Valve Stroke Test**—The test pushbutton provides a means to manually perform an online partial stroke test to reduce the frequency of proof tests.

Safety

- **Reset Options**—The DVC6200 SIS can be configured to be locked in the safe state until a manual reset is performed or go to the normal position on reset of the loop. A third option is available that allows you to vary the reset behavior based on the trip initiator.
- **Lockable Pushbutton Covers**—Each pushbutton can be locked to prevent unauthorized access to the safety valve operation.
- **Safety Certification**—The LCP200 contribution to failure rates is documented in the DVC6200 SIS safety manual.
- **Safety Certified Relay Outputs**—The trip and reset push buttons provide a corresponding change in the state of the associated single pole double throw (SPDT) relay. The trip and reset relays can be used as input to initiate Trip or Reset action in the logic solver.

Ease of Use

- **Loop vs. External Power**—The LCP200 can be powered by the same loop as the DVC6200 SIS or independently powered by a 24 VDC source.
- **Simple Configuration**—The DVC6200 SIS guided setup automatically configures the LCP200 functions.

Specifications

Power Options

■ External: 12 VDC to 26 VDC @ 50 mA maximum continuous current (100 mA maximum inrush)
■ Loop: 8-20 mA (LCP200 and DVC6200 SIS combined)

Continuous Power Consumption

External: 1.4 W max
Loop (Point-to-Point): 48 mW
Loop (Multi-Drop): 120 mW

Temperature Limits(1)

-40 to 65°C (-40 to 149°F)

Maximum distance between LCP200 and DVC6200 SIS digital valve controller

Cable length is limited by maximum cable capacitance of 340,000 pF(2). Typical 1000 meters (3280 feet) with 18 AWG shielded Audio, Control and Instrumentation Cable

Contact Type and Ratings

Three single-pole double-throw (SPDT) relay switches

Each output is capable of 30 VDC with maximum current of 200 mA at room temperature

Contact Operation
Reset: Activated for 1.5 to 3 seconds when Reset button is pressed for 0.5 seconds or more
Trip: Activated for 1.5 to 3 seconds when Trip button is pressed for 0.5 seconds or more
Test: Activated when partial stroke test is in progress

Electrical Classification

FM (United States and Canada)—Intrinsically Safe for Gas and Dust

ATEX—Intrinsically Safe for Gas and Dust

IECEx—Intrinsically Safe for Gas and Dust

Electrical Housing

IP66

Electromagnetic Interference (EMI)

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of EN 61326-1 Standard. Performance is shown in table 1 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Connections

Two Conduit entries: ■ 3/4 NPT or ■ M20

Wiring

14 to 26 AWG

Electrical Installation

Wire connections are polarity sensitive

Compatibility

DVC6200 SIS with Firmware revision 3 or later(3)(4)
DVC6000 SIS with Firmware revision 7 or later

Installation Orientation

Conduit entry locations must be facing down

Dimensions

406 mm long by 165 mm wide by 105 mm deep
See figure 2

Adapter is available for replacing the LCP100

Construction Materials

Housing material: 316SST

Approximate Weight

16.8 kg (37 lbs)

Lights

Top (Green/Normal): Solid when the valve is at its normal operating position, and loop current is normal

Middle (Red/Trip): Solid when the valve is at its Trip Position and Middle (Trip) loop current is tripped

Bottom (Yellow/Ready-to-Reset): Solid when the valve is latched in the trip position, and loop current is normal

-continued-

Specifications (continued)

Pushbuttons

Protected with lockable covers

Top (Reset): After an emergency demand—commands the valve to its normal position only after loop current is restored (manual reset)

Middle (Trip): Commands the valve to the configured trip position

Bottom (Test): Commands the configured partial stroke test. Can be overridden by the Trip button, Reset button, or Emergency Demand

1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. DVC6000 SIS: Cable length is limited by maximum cable capacitance of 240,000 pF, typically 765 meters (2510 feet).
3. DVC6200 SIS FW7 or later required for Auto detection of power source.
4. DVC6200 SIS FW7 or later is required for the test contact to change state.

Table 1. Electromagnetic Immunity Performance for Fisher LCP200

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(1)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	± 4 kV contact ± 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Radiated Power Magnetic	IEC 61000-4-8	30 A/m	A
I/O signal/ control/power	Burst (fast transients)	IEC 61000-4-4	± 1 kV, I/O lines ± 2 kV, DC power lines	A
	Surge	IEC 61000-4-5	± 1 kV, I/O lines (line-to-ground) ± 2 kV, DC power line (line-to-ground) ± 1 kV, DC power line (line-to-line)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms with 1 kHz AM at 80%	A

1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Value

- Visual Indication—The LCP200 can be mounted remote from the valve in an easily accessible location to view the status and perform periodic testing.
- Reduce I/O Count—The LCP200 combines open/closed/ready-to-reset lights and open/close pushbuttons into a single field enclosure, thus eliminating 3 discrete output (DO) and 2 discrete input (DI) channels from the logic solver.

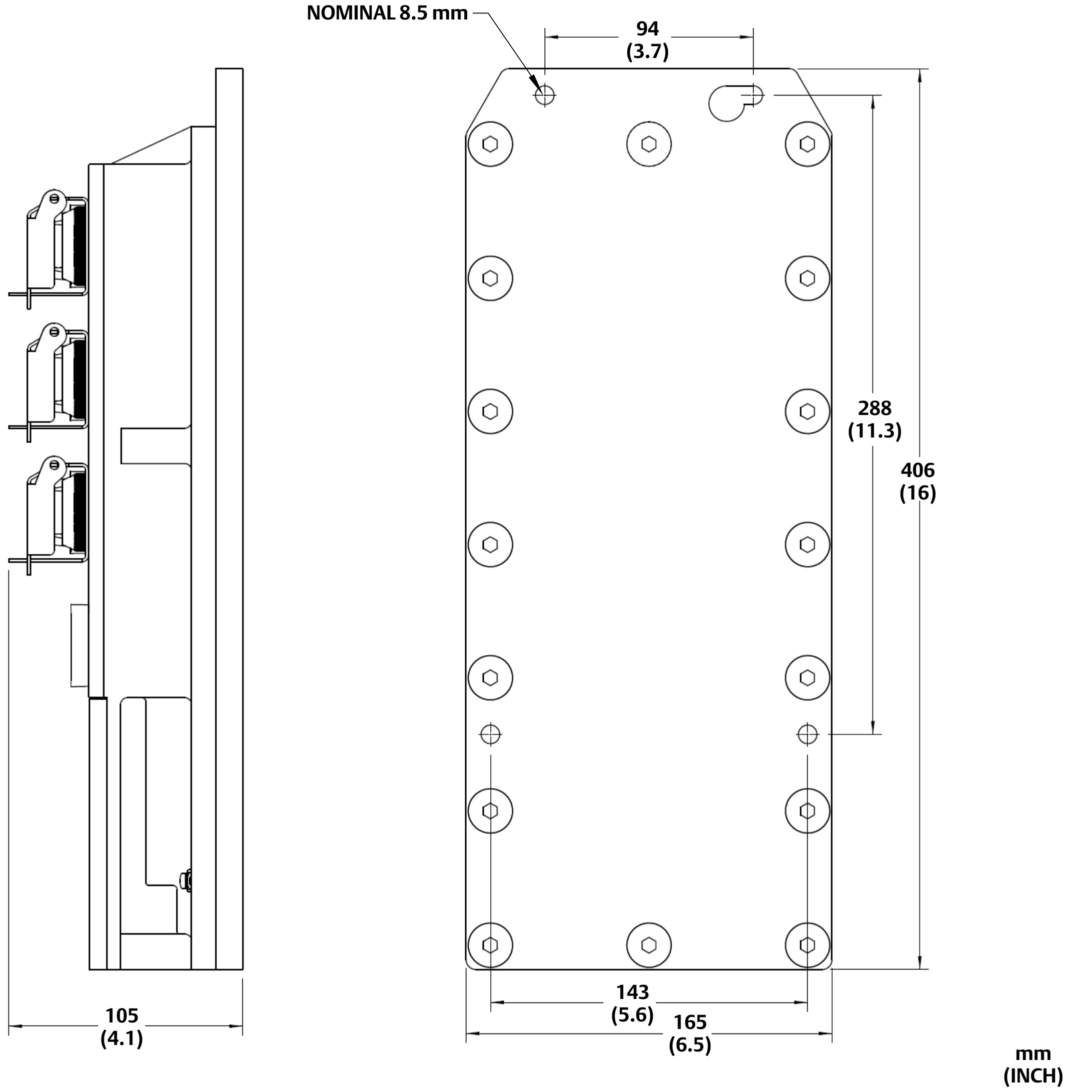
Mounting

The LCP200 has a mounting kit that adapts it to the LCP100 installation. See figure 1 for details.

Refer to figure 2 for dimensional information. The LCP200 local control panel has four mounting holes for on-site mounting of the device. The LCP200 must be installed so that the wiring connections are on the bottom to prevent accumulation of moisture inside the box.

Figure 1. LCP200 with Mounting Bracket

Figure 2. Dimensions



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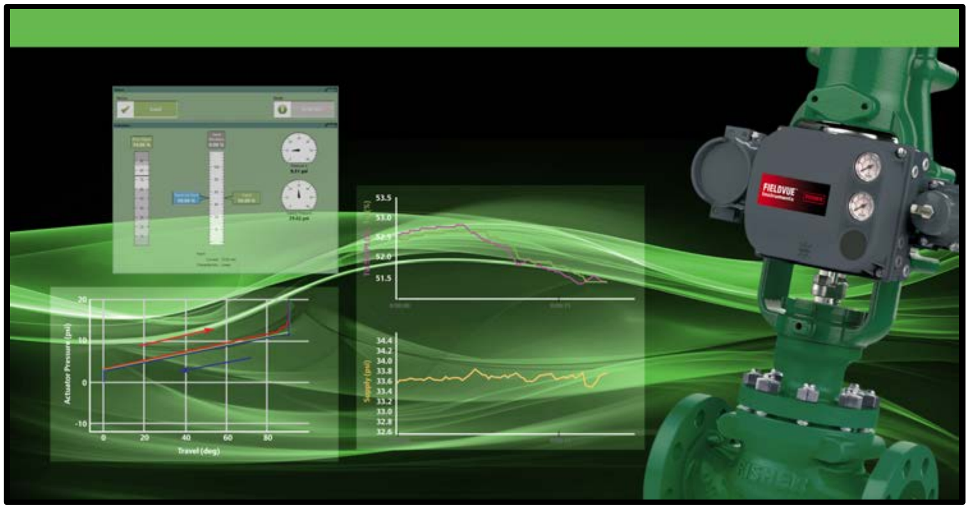
ValveLink™ Software



ValveLink™ Solo
ValveLink™ SNAP-ON™
ValveLink™ DTM
ValveLink™ PLUG-IN for PRM®

- **Communicate with both HART® and FOUNDATION™ Fieldbus FIELDVUE™ digital valve controllers**
- **Configure, calibrate, and diagnose FIELDVUE instruments from one location**
- **Use Stabilize & Optimize and Performance Tuner to easily optimize tuning**
- **Performance Diagnostics provide in-service diagnostics for monitoring the health of the valve assembly without disturbing the process**
- **Diagnostics provide validation of assembly rebuild and detailed insight into the physical condition of the valve/actuator assembly**
- **Setup and test FIELDVUE instruments for Safety Instrumented System (SIS) Solutions**
- **Solenoid Valve Test to test and monitor the health of the solenoid connected to the valve assembly (SIS only)**
- **Scheduler allows you to specify a time and date to automatically run tasks on a regular basis**
- **Ability to preconfigure calibration and diagnostics in the workshop with Batch Runner or setup your own "Macro" file**
- **Time saving Concurrent Batch allows executing a diagnostic test or Calibration on multiple valves at the same time**
- **Merge Database feature provides the ability to automate multiple ValveLink databases and tags to a single or multiple stations**
- **ValveLink Express licensing allows you to obtain a free version of ValveLink software that allows FIELDVUE instrument setup, calibration and verification**
- **Generate diagnostic, calibration, and configuration reports in Microsoft® Word and PDF format**

ValveLink Software Product Suite

ValveLink software is available in a variety of configurations to allow you to realize the full benefit of FIELDVUE digital valve controllers.

ValveLink Solo

ValveLink Solo permits users to perform configuration, calibration, and diagnostics on HART and FOUNDATION Fieldbus FIELDVUE digital valve controllers.

Integrate ValveLink software into AMS Device Manager

ValveLink SNAP-ON provides integration with AMS Device Manager to perform configuration, calibration, and diagnostics. Integration with AMS Device Manager provides the ability to communicate with FIELDVUE digital valve controllers via DeltaV™, Ovation™, PROVOX™, HART multiplexers, and HART modems. Non-Emerson host integration, including Invensys and Honeywell (HART only) systems, can be provided through HSI (Host System Integration).

Integrate ValveLink DTM into Field Device Tool - FDT

ValveLink DTM provides integration into a Field Device Tool frame application to perform configuration, calibration, and diagnostics on FIELDVUE digital valve controllers. The ValveLink DTM is certified with the FDT group.

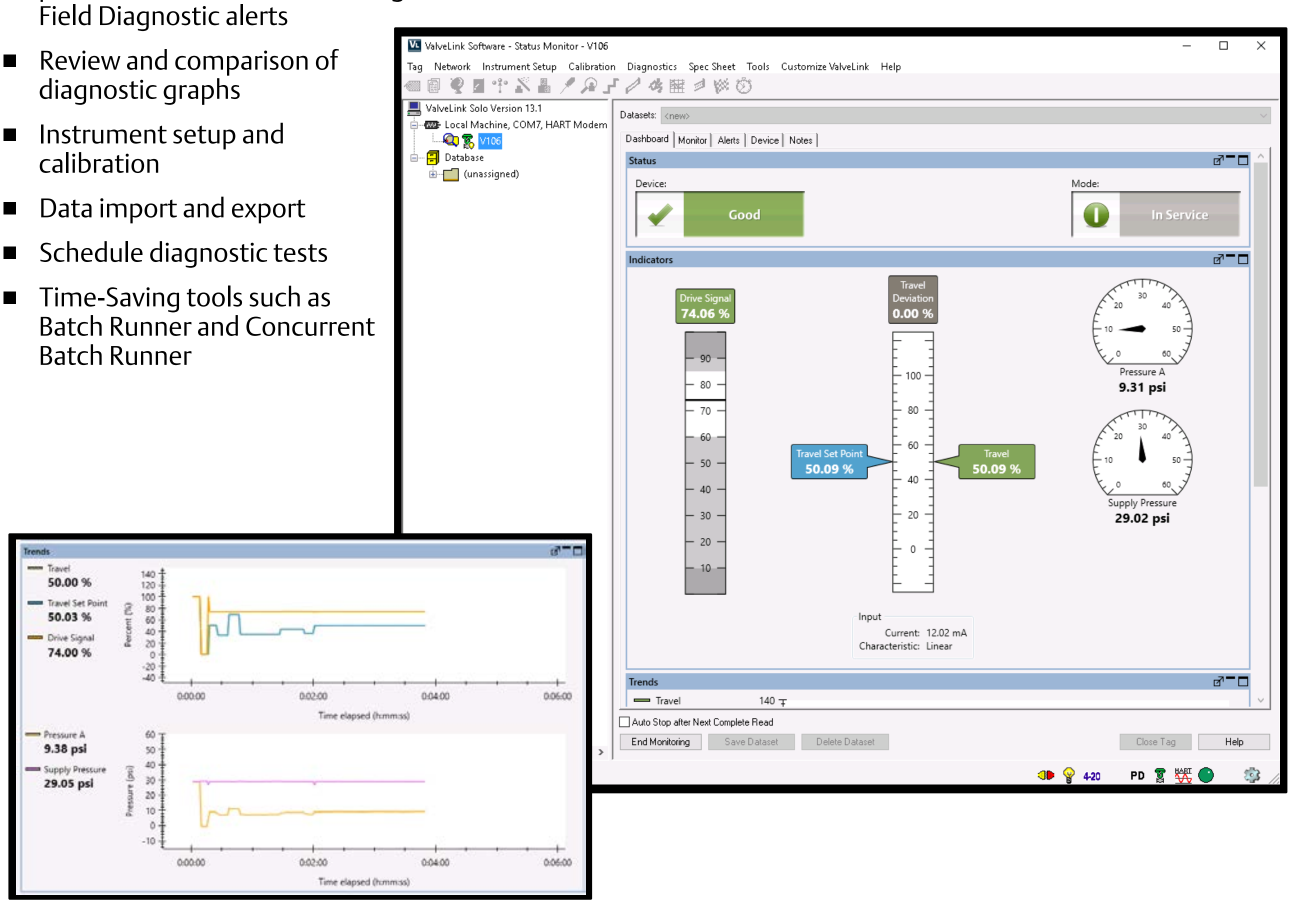
Integrate ValveLink Software into the Yokogawa Plant Resource Manager (PRM)

ValveLink PLUG-IN for PRM provides integration with the Yokogawa Plant Resource Manager (PRM). This integration provides PRM users with the ability to launch the ValveLink PLUG-IN for PRM directly from PRM and to communicate with HART and FOUNDATION fieldbus FIELDVUE digital valve controllers through PRM and the Yokogawa CENTUM CS 3000 R3 and CENTRUM VP.

Communicate with both HART and FOUNDATION fieldbus FIELDVUE digital valve controllers

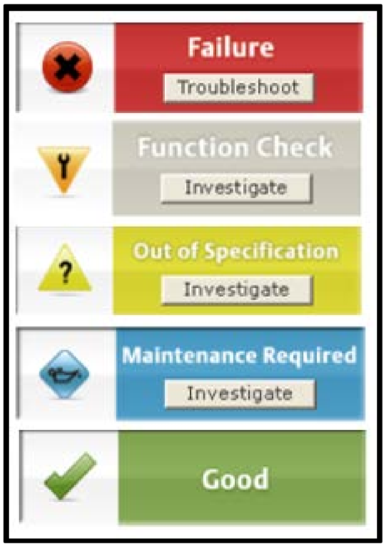
Integrated or standalone ValveLink software remotely communicates with HART FIELDVUE instruments over the existing 4-20 mA signal wiring using the HART communication standard. The same software also can communicate with FOUNDATION Fieldbus FIELDVUE instruments over the fieldbus H1 segment. Information is presented in a consistent, easy-to-interpret interface that provides the capability to configure, calibrate, and diagnose FIELDVUE instruments from one location:

- Dashboard of critical instrument information
- A device connection view of all connected instruments
- Monitoring of instrument operational parameters and alerts, including Field Diagnostic alerts
- Review and comparison of diagnostic graphs
- Instrument setup and calibration
- Data import and export
- Schedule diagnostic tests
- Time-Saving tools such as Batch Runner and Concurrent Batch Runner



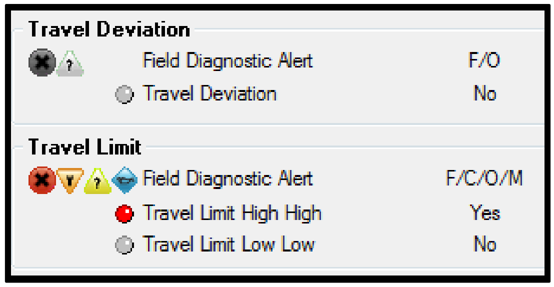
Trend Travel, Pressure, and Drive Signal

Field Diagnostic Alerts, which follow the NAMUR NE107 Standard, allow categorization of Device Alerts with the highest severity displayed on the dashboard.



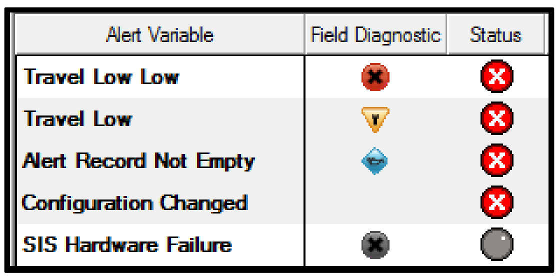
Alert categorization

Status Monitor



Device alerts, such as Travel Deviation, are permanently mapped to a Field Diagnostic Alert in FOUNDATION Fieldbus applications. Multiple Field Diagnostic categories can be selected per Field Diagnostic Alerts.

Status Monitor

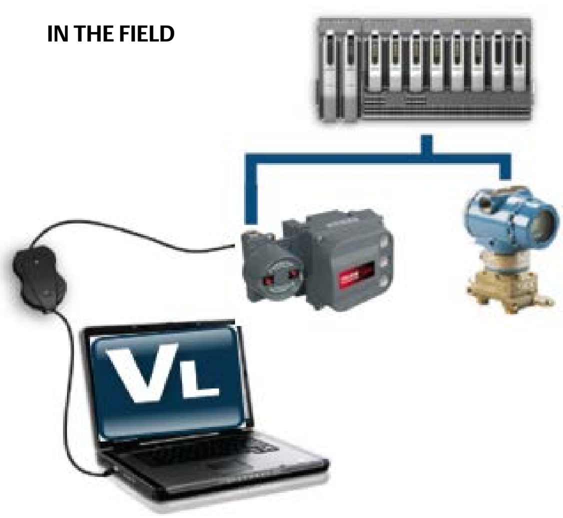


HART applications allow one Field Diagnostic Category per Field Diagnostic Alert

Standalone ValveLink software can use the Emerson USB Fieldbus Interface, as well as the National Instruments (NI-Fbus) interface to connect to Fieldbus FIELDVUE instruments (DVC6200f and DVC6000f) to configure, calibrate, and diagnose the device on a bench or in the field:

ON THE BENCH

IN THE FIELD



Use the Performance Tuner to easily optimize tuning

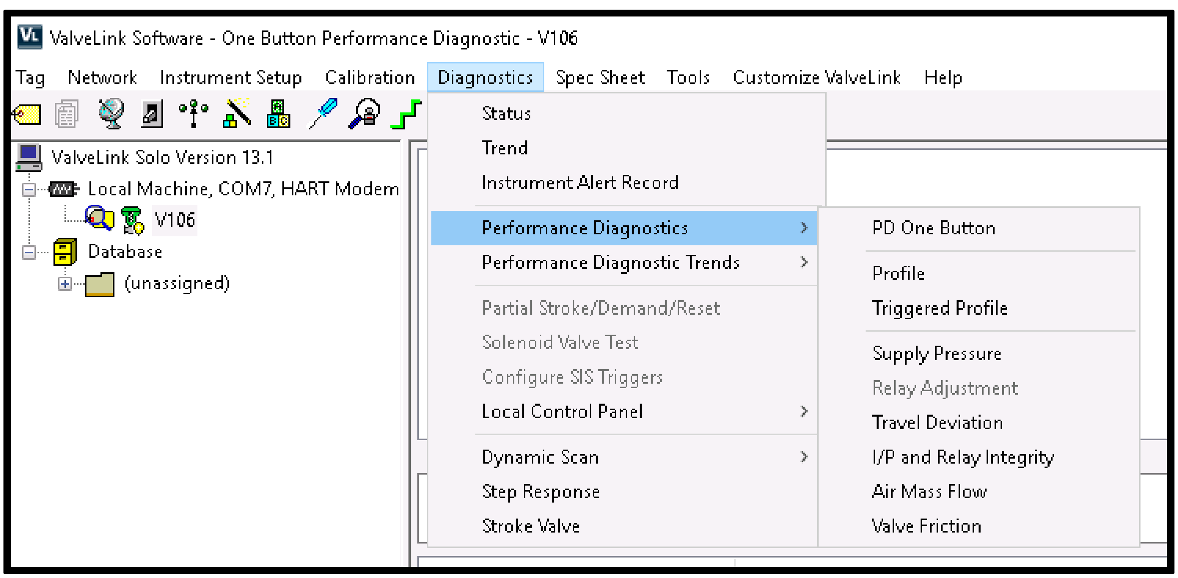
The Performance Tuner lets you easily adjust a FIELDVUE digital valve controller for optimum performance. When mounting a FIELDVUE digital valve controller, to either a Fisher or a non‐Fisher valve, the Performance Tuner can optimize valve performance for you.

Performance Diagnostics provide in-service diagnostics for monitoring the health of the valve assembly without disturbing the process

Performance Diagnostics (PD) provides predictive in‐service diagnostics for monitoring the health of the valve assembly and customized diagnostics for advanced troubleshooting. Performance Diagnostics continuously analyze the valve assembly and passively gather data without disturbing or interrupting the control valve while it is in the process.

PD may be used to help detect problems with air leakage, valve assembly friction and deadband, instrument air quality, loose connections, supply pressure restriction, and valve assembly calibration. When a problem is identified, the diagnostic provides a description and severity of the problem, a probable cause, and recommended action.

In‐service diagnostics for troubleshooting allow custom diagnostics to be set up to collect data at a high‐frequency collection rate and present the data in a graphical format.



Performance Diagnostics tests are available upon user request or a pre‐selected daily, weekly, monthly, or yearly schedule without user intervention for HART instruments

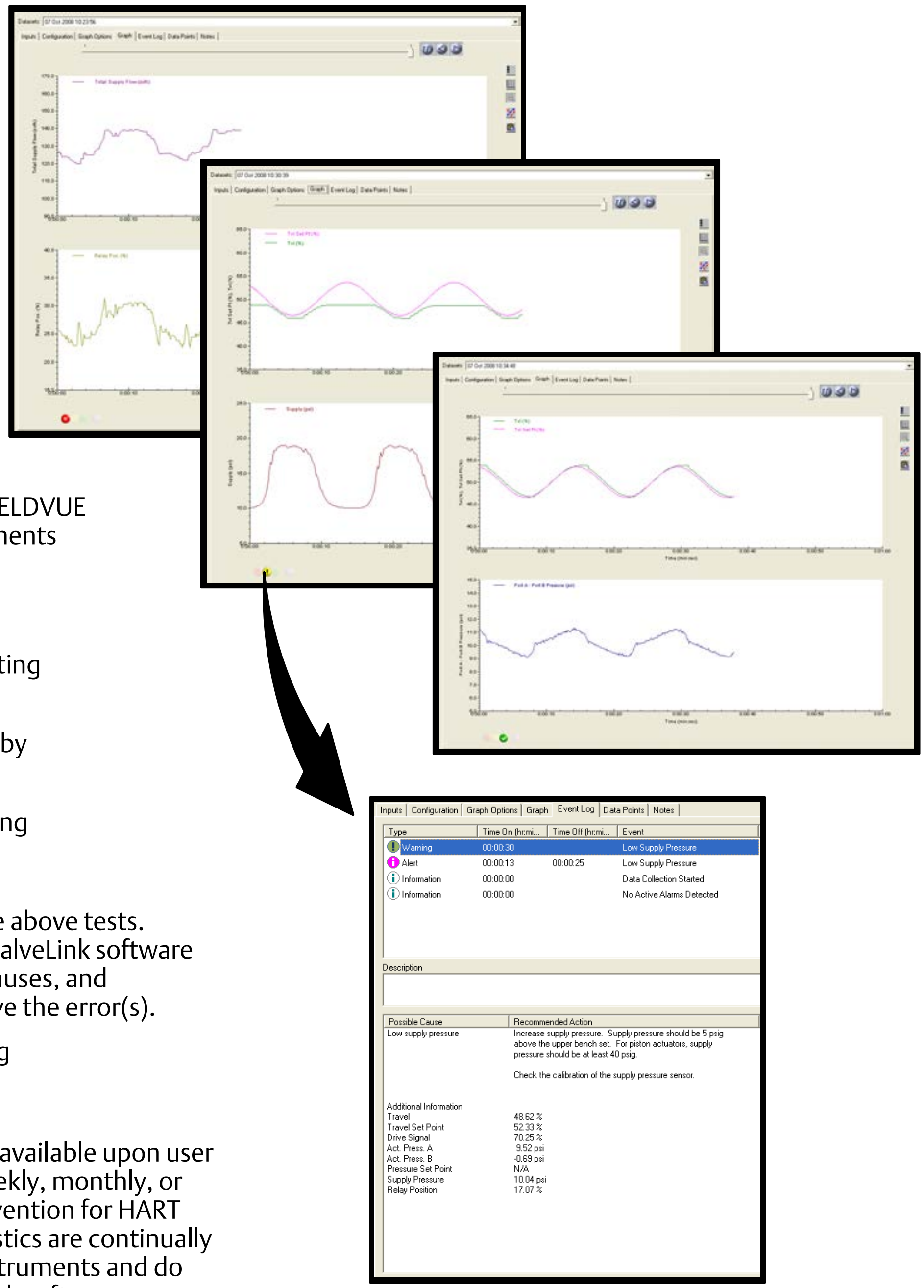
Performance Diagnostics are continually running in FOUNDATION Fieldbus Instruments and do not need to be initiated by ValveLink software

Provide Real-Time Notification of Current and Potential Valve and Instrument Problems using Performance Diagnostics

Performance Diagnostics enable the use of diagnostics while the valve is in-service and operating without disturbing the process. Tests can be performed to identify problems with the entire control valve assembly, such as:

- Red/Yellow/Green condition indicator provides a quick visual indication of the following:
  - the physical condition of the FIELDVUE instrument pneumatic components
  - instrument air supply pressure and volume
  - relay adjustment on double acting piston actuators
  - the total air received and used by the instrument, and
  - why a valve assembly is deviating from the set point
- PD One Button is a sweep of the above tests. When the sweep is complete, ValveLink software will show any errors, possible causes, and recommended actions to resolve the error(s).
- Friction and Deadband Trending

Performance Diagnostics tests are available upon user request or a pre-selected daily, weekly, monthly, or yearly schedule without user intervention for HART instruments. Performance Diagnostics are continually running in Foundation Fieldbus Instruments and do not need to be initiated by ValveLink software.



Performance Diagnostics provide on-line/in-service predictive diagnostics to identify faults and list possible causes and recommended corrective actions for each fault

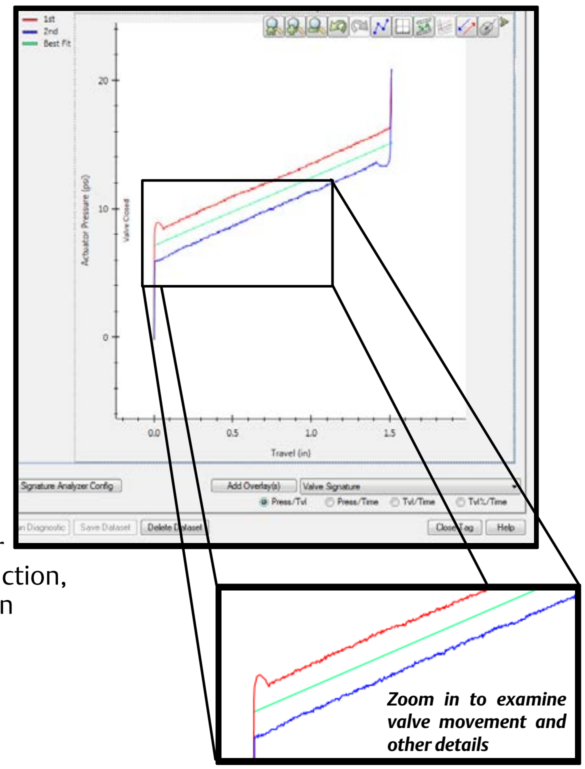
Provide validation of assembly rebuild and detailed insight into the physical condition of the valve/actuator assembly

Performance Diagnostics monitor the digital valve controller set point and plot valve operation to provide insight into the dynamic performance of the valve/actuator assembly. Out-of-service diagnostics such as valve signature, dynamic error band, and step response assist in the identification of emerging valve problems quickly and accurately.

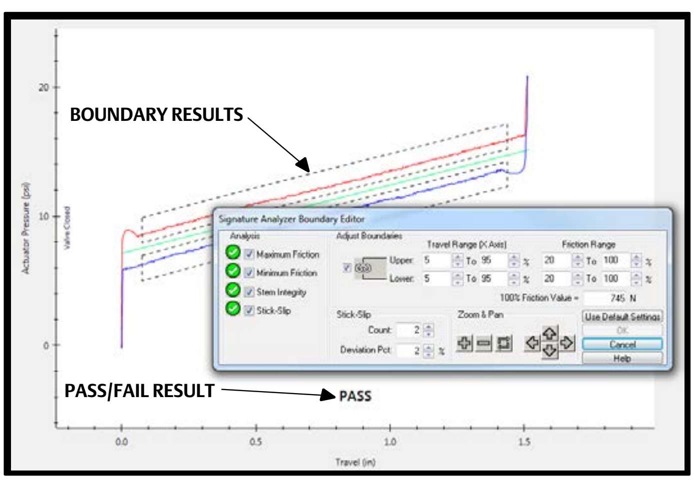
Use out-of-service diagnostics to prioritize and plan maintenance activities when the process is shut down.

The Valve Signature diagnostic is used to:

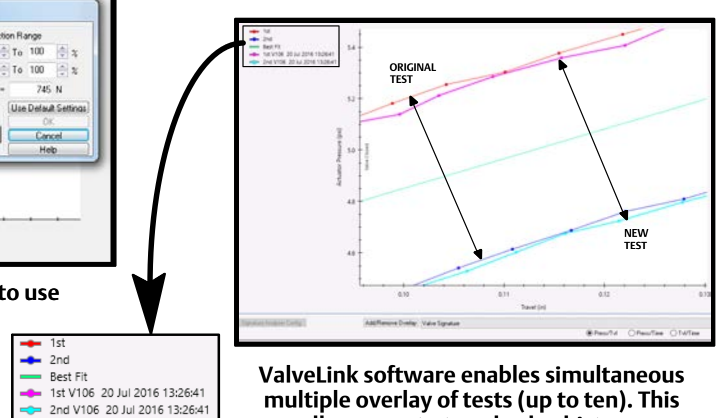
- Evaluate valve friction, deadband, and shutoff capability.
- Calculate actuator spring rate and bench set.
- Identify potential packing problems.
- Compare current condition to previous baseline condition.
- Signature Analyzer enables rapid analysis of the Valve Signature to more efficiently manage your plant assets. Based on default or user defined settings, Signature Analyzer provides pass/fail results for Maximum Friction, Minimum Friction, Stem Integrity, and Stick Slip, enabling better documentation for required maintenance or validation of valve repairs.



Diagnostic tests, such as the Valve Signature Diagnostic example shown here, help you detect emerging valve repair requirements before they impact performance



Signature Analyzer Boundary Editor allows you to use default or customized test criteria



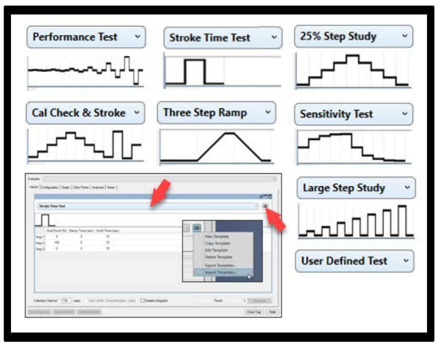
ValveLink software enables simultaneous multiple overlay of tests (up to ten). This allows you to trend valve history.

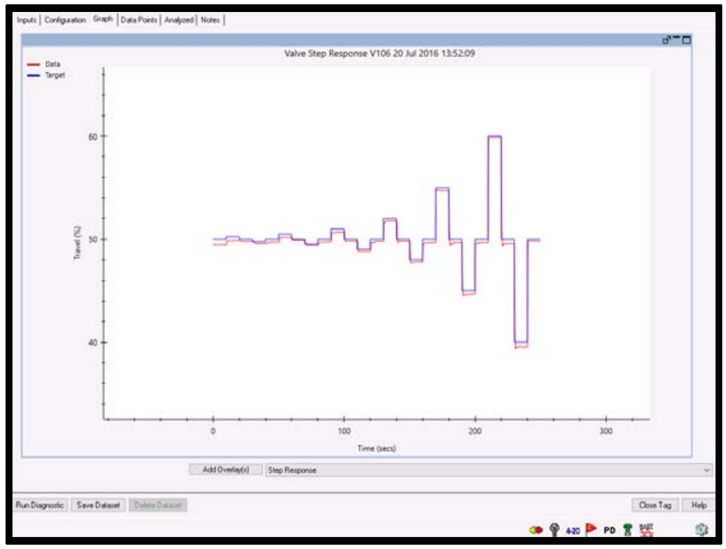
The Dynamic Error Band diagnostic is used to analyze hysteresis, deadband, and dynamic error.

The Step Response diagnostic allows you to evaluate how well the valve tracks an input change. By minimizing dead time, deadband, and overshoot, process control is greatly enhanced. With the Step Response test you can:

- Validate tuning parameters.
- Obtain a numerical analysis for overshoot, hysteresis, dead time, t63, and t86.
- Define up to 30 steps.

Select pre-configured Step Tests to evaluate valve performance or create and save custom tests.



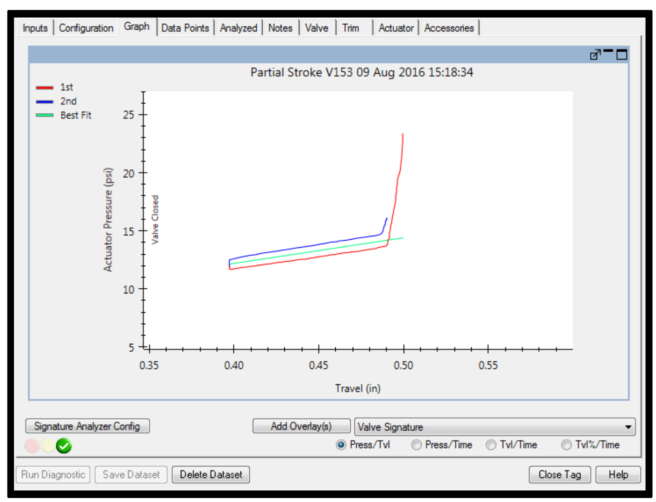


Use Step Response tests to verify instrument tuning and valve response to signal changes

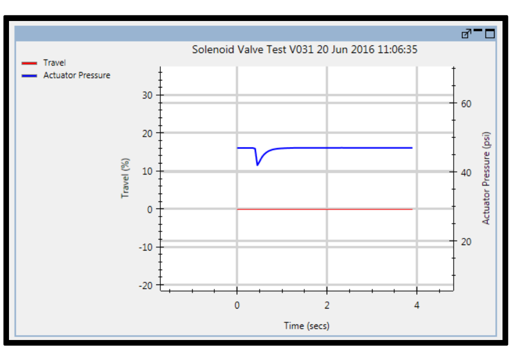
Setup and test FIELDVUE instruments for Safety Instrumented System (SIS) Solutions

Use ValveLink software to set up and test the final control element in safety instrumented system applications. ValveLink software for DVC6200 SIS digital valve controllers provides:

- A Setup Wizard to set up the digital valve controller for use in a Safety Instrumented System.
- The capability to initiate a partial stroke test of the final control element without requiring a process shutdown. You can run a partial stroke test to prove the valve will respond on demand.

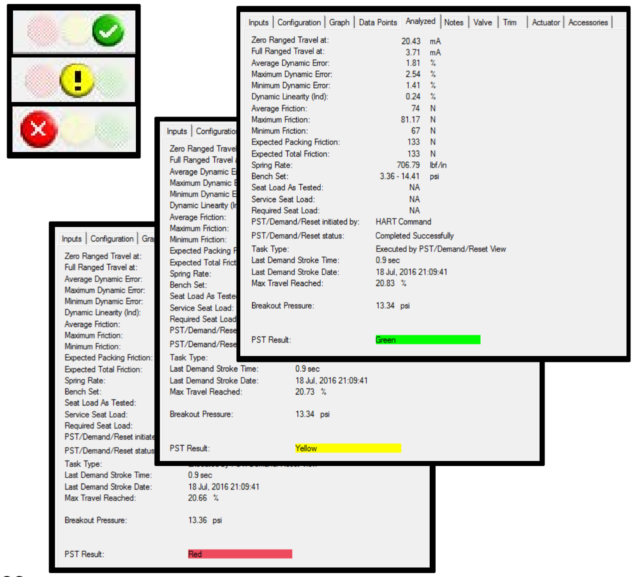


At the same time the instrument performs the partial stroke test, ValveLink software also gathers diagnostic data. Use this data to evaluate valve performance and determine if maintenance is required.



- ValveLink software enables the Solenoid Valve Test for SIS instruments. This is to verify that a solenoid used in conjunction with a DVC6200 SIS digital valve controller is operational.

Each PST will be scored as Red/Yellow/Green based on a user selection of acceptance (Abort or Abnormal) criteria and result criticality. This result will be shown as an indicator bulb on the graph and in the analyzed section as PST Result.

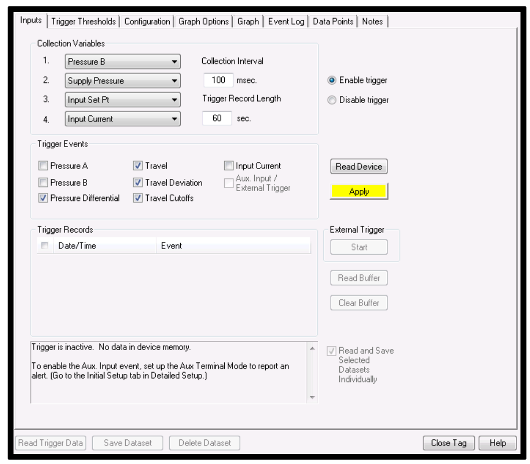


- Signature Analyzer that automates diagnostics results of Valve Signature and Partial Stroke diagnostic data. The Signature Analyzer uses a set of user configurable limits to help determine possible issues with the valve assembly, such as a broken shaft or stem.

- A Trigger event that allows you to log the “Safety Demand” event and reset valve stroke while storing pre-event and post-event data for additional valve diagnostics. Trip event data can also be accessed for an audit and presented to regulatory insurance authorities.

The Trigger functionality allows data to be collected and stored in the instrument. Trip event data can be accessed for an audit and presented as required. The trigger will initiate on-board data collection based on a change in actuator pressure, valve travel, input current, pressure differential, travel deviation, or travel cutoff. The data is retained in the event of a power loss.

Every event performed with ValveLink software is logged with a time and date stamp to document that tests were run and how the valve assembly responded.

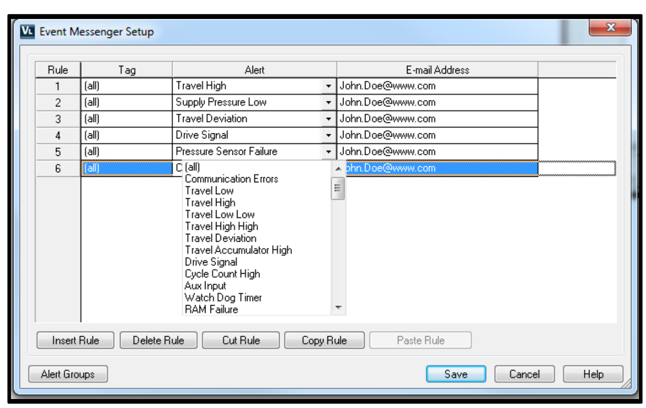


A Trigger event, based on one of eight process variables, documents a “Safety Demand” event when used in a safety instrumented system

- Diagnostic information to allow predictive maintenance of the final control element. No need to unnecessarily shutdown the process to perform maintenance on the safety shutdown valve.

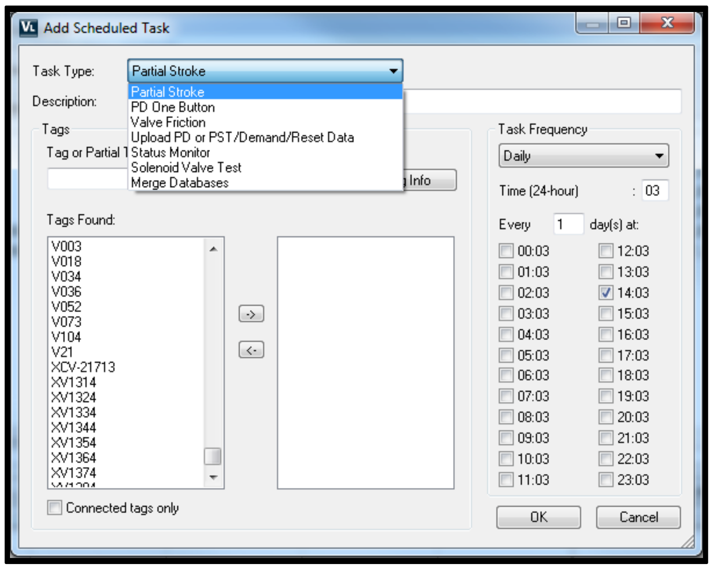
- The capability to monitor the health of a solenoid valve downstream of the digital valve controller. This can improve safety reliability and provide assurance that the solenoid valve is not stuck in the open position.

- ValveLink Solo Event Messenger capability to send notification via email, pager, or cell phone if a specific alert, or set of alerts, occurs on a predefined set of safety shutdown valves.

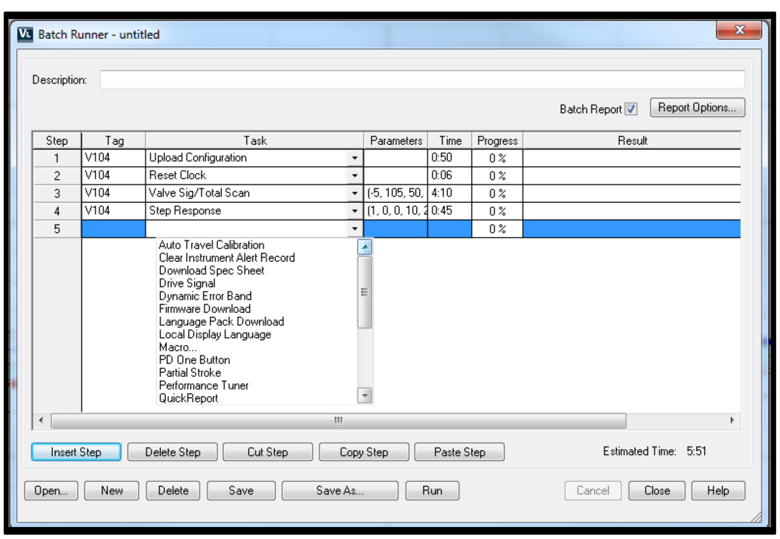


Scheduler allows you to specify a time and date to automatically run tasks on a regular basis

With Scheduler, you can schedule tasks, such as in-service Performance Diagnostics and SIS Partial Stroke diagnostics to run on a recurring daily, weekly, monthly, or yearly schedule that you specify. A summary of the outcome of scheduled tasks is available from within Scheduler and for complete details you can view the resulting diagnostic graphs and analyses.



Ability to preconfigure calibration and diagnostics in the workshop with Batch Runner or setup your own "Macro"



Use Batch Runner to automate diagnostic tests and other repetitive activities

With Batch Runner you can setup ValveLink software to automatically run diagnostic tests, calibrate, or upload configuration data from multiple valves with a user specified routine. During a turnaround or production change, you can download firmware, upload configurations, run the Performance Tuner to optimize tuning, or even reset the instrument clock without any interaction by personnel.

Batch Runner increases efficiency by allowing you to set up a batch once, and repeatedly run that set of actions on different groups of valve assemblies.

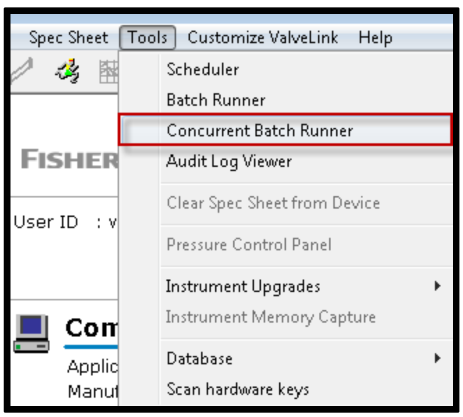
Time saving Concurrent Batch Runner to run Signature test, Step-Response test, or Auto-Calibration on multiple valves at the same time

In addition to the Batch Runner, ValveLink software includes the time-saving Concurrent Batch Runner capability. This allows executing a diagnostic test or Auto-Calibration on multiple valves at the same time. The diagnostic results from the tested valves can be collected at the completion of the concurrent batch or at a later time after the tags have been put back “In-Service”.

The Concurrent Batch Runner is a 2-part process:

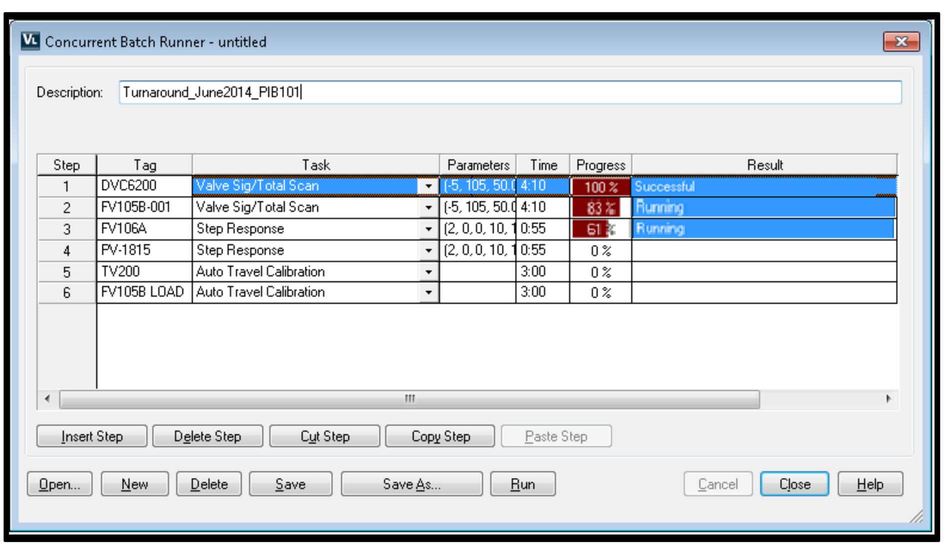
1. Executes diagnostic or calibration on multiple valves simultaneously, then,

2. the follow up batch uploads the diagnostic results in ValveLink software either during current outage or once valves are back “In-Service”.



Key benefits

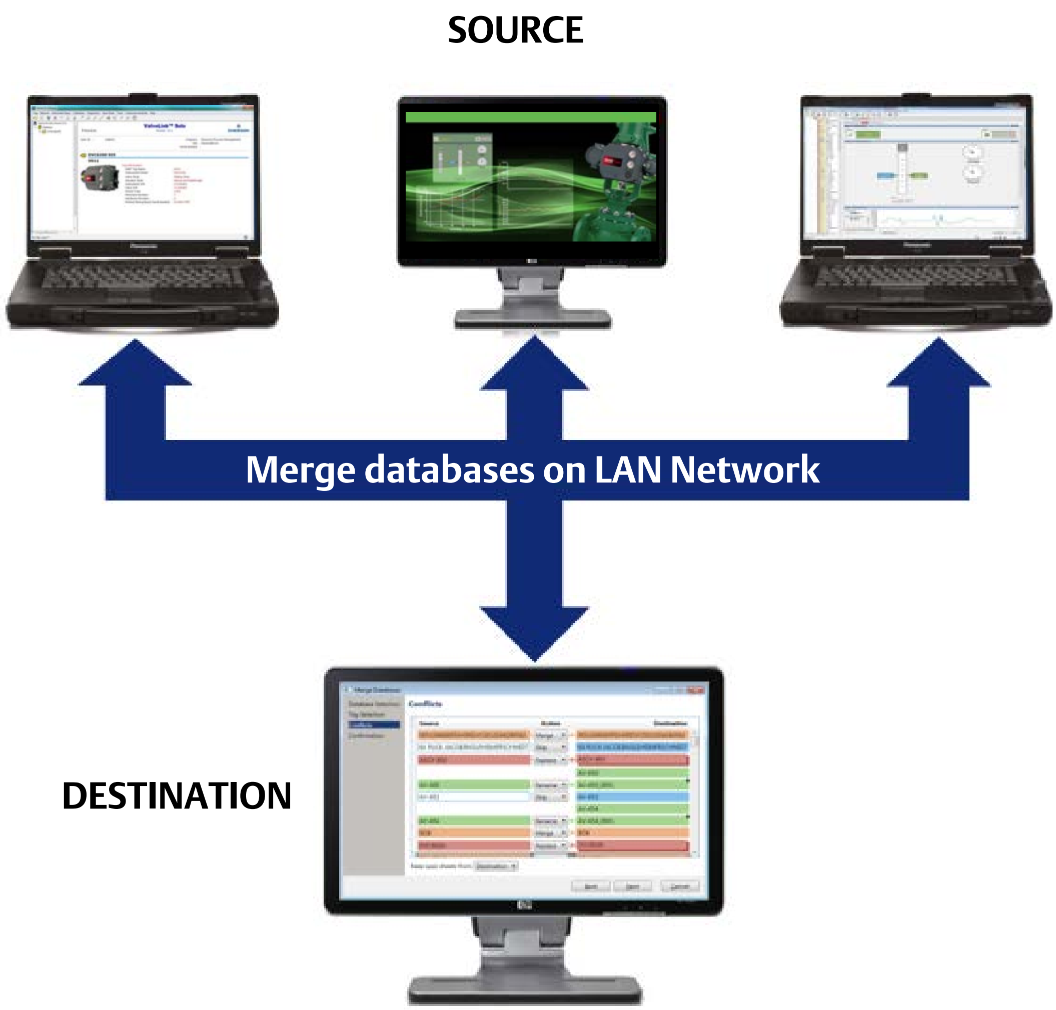
- Further increase process uptime and improve productivity with up to 80% time saving when running Concurrent Batch over a Batch Runner for similar tasks.
- Run up to three tasks in Concurrent Batch for one tag with the DVC6200 FW7 device only.
- Diagnostics are stored in the instrument after the concurrent batch is executed, allowing for data retrieval immediately after completion of the test or at a later time when valve is In-Service.
- Available with all configurations of the ValveLink software suite (ValveLink SOLO, ValveLink SNAP-ON, ValveLink DTM and ValveLink PLUG-IN for PRM).
- Supported on DVC6200, DVC6200f, DVC6000, and DVC6000f instruments.
- Fits into the proactive maintenance strategy of monitoring and diagnosing problems and correcting root cause sooner by gathering maximum data in a minimum amount of time.



Merge Database feature provides ability to automate multiple ValveLink software databases and tags into single or multiple stations

Available with ValveLink SOLO, ValveLink DTM and ValveLink PLUG-IN for PRM.

Manually or automatically, using scheduler feature, merge multiple ValveLink software databases to a single or multiple stations, helping to eliminate diagnostic data silos on individual stations.



ValveLink Express—free version of ValveLink software license designed to setup, calibrate, verify, and configure alerts on FIELDVUE instruments

ValveLink Express license is available for ValveLink SOLO, ValveLink DTM, and ValveLink PLUG-IN for PRM.

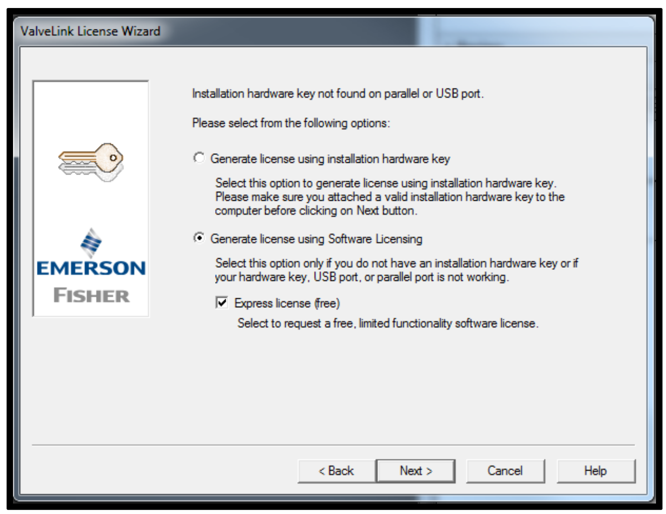
After the 60 days of full functionality temporary license available with each installation, the express license can be enabled by running the ValveLink License Wizard and requesting a New License using software licensing (Express).

ValveLink Express is designed primarily to allow you to perform key tasks such as setup, calibration, and alert configuration and to set the instrument In-Service.

The Express license can be upgraded to a full functionality license to add diagnostic capabilities at anytime. Contact your Emerson sales office for further information.

ValveLink Express provides:

- Users and Security Group setup
- Instrument specification sheet update
- Setup, Calibration (Auto, Manual, Partial Stroke and Hardware)
- Dashboard overview, Multi-Tag status, Status Monitoring and Alert monitoring
- Instrument Detailed Setup (parameter modification)
- Instrument Firmware upgrades
- Stroke valve for verification
- Monitor Instrument Alert Event Record
- Allow HART, Fieldbus and Multiplexer capabilities
- Network Alert Scan capabilities
- Trending



Specifications

Hardware Requirements

Computer and processor:

1 gigahertz (GHz) processor

Memory:

512 megabytes (MB) RAM (Windows XP)

1 gigabyte (GB) RAM (All other Operating Systems)

Hard disk:

No Trending - 65 MB available storage space

Trending - 125 MB available storage space

Drive:

CD-ROM Drive

Display:

1024 X 768 resolution

I/O (ValveLink Solo):

USB Port required for instrument level step-ups

HART communications require at least one of the following interfaces:

HART Modem - Standard RS-232 Port (requires dedicated interrupt)

HART Multiplexer - Standard RS-232 Port (requires RS-485 converter)

MACTek VIATOR USB HART Modem - USB Port

MACTek VIATOR Bluetooth HART Interface - Windows Bluetooth Serial Port Profile (SPP)

Modbus communications require the following:

Standard RS-232 Port

Additional HART Interface (see above)

FOUNDATION Fieldbus communications require at least one of the following:

National Instruments Fieldbus H1 interfaces

NI USB-8486

PCI-FBUS/2 and above

PCMCIA-FBUS/2 Series 2 and above

Emerson USB Fieldbus Interface (v3.0)

NI-FBUS Configuration - 2 Port Card

The following settings are applicable for configuration of a NI-FBUS 2 Port Card:

a) If only one port will be connected to a LIVE segment, the other port must be set to "LAS" (not "Bus Monitor")

b) If both ports will be connected to LIVE segments, then both ports must be set to "Basic" mode.

NI driver software must be installed BEFORE installing the NI hardware.

Other configurations may result in initialization failure of the NI Communication Manager software

Supported Languages

ValveLink Software v13.3 is only available in English

Supported Operating Systems

ValveLink Solo
Windows® 7 Professional SP1 (32 and 64 bit)
Windows 7 Enterprise SP1 (32 and 64 bit)
Windows Server® 2008 SP2 (64 bit)
Windows Server 2008 R2 SP1 (64 bit)
Windows 8 Professional (64 bit)
Windows 8 Enterprise (64 bit)
Windows 8.1 Professional (64 bit)
Windows 8.1 Enterprise (64 bit)
Windows Server 2012 Essential (64 bit)
Windows Server 2012 Datacenter (64 bit)
Windows Server 2012 R2 Essential (64 bit)
Windows Server 2012 R2 Datacenter (64 bit)
Windows 10 Professional (64 bit)
Windows 10 Enterprise (64 bit)
Windows IoT Enterprise (64 bit)
Windows Server 2016 Standard (64 bit)
Windows Server 2016 Datacenter (64 bit)
Windows Server 2016 LTSC (64 bit)
Windows Server 2019 (64 bit)

ValveLink SNAP-ON for AMS Device Manager
Operating systems supported by AMS Device Manager v11.5, v12.0, v12.5, v13.0, v13.1.1, v13.5 v14.0

ValveLink PLUG-IN for PRM
Operating systems supported by Yokogawa Plant Resource Manager (PRM) v3.12 or newer.

Software Requirements

Internet Explorer 6.0 or later
Microsoft Windows Installer 3.1 or later (3.5 recommended; required by Microsoft .NET Framework)

Table 1. ValveLink Software Capability

	CAPABILITY	PRODUCT TYPE						
		ValveLink Solo		ValveLink SNAP-ON	ValveLink DTM	ValveLink PLUG-IN for PRM	VaveLink Mobile	ValveLink Express(8)
		VLDATA_UNLM Database Only	VLSOLO-XXXX(1)		VLDTM-XXXX(1)	VLPRM-XXXX(1)	VLMOBILE-1(4)	
	HART Modem		●	●(2)				●
	HART Multiplexer		●	●(2)				●
	*Wireless*HART® Communications			●(2)				
	FOUNDATION Fieldbus PC Card		●					●
	FOUNDATION USB Interface		●	●				●
Performance Diagnostics	Valve Signature(3)	○	●	●	●	●	●	
Performance Diagnostics	Dynamic Error Band(3)	○	●	●	●	●	●	
Performance Diagnostics	Drive Signal Test(3)	○	●	●	●	●	●	
Performance Diagnostics	Step Response(3)	○	●	●	●	●	●	
Performance Diagnostics	Step Response Analysis	○	●	●	●	●	●	
Performance Diagnostics	Performance Step Test(3)	○	●	●	●	●	●	
Performance Diagnostics	Graph Overlay	○	●	●	●	●		
Performance Diagnostics	Stroke Valve		●	●	●	●	●	
Performance Diagnostics	I/P & Relay Integrity	○	●	●	●	●	●(7)	
Performance Diagnostics	Travel Deviation	○	●	●	●	●	●(7)	
Performance Diagnostics	Supply Pressure(4)	○	●	●	●	●	●(7)	
Performance Diagnostics	Relay Adjustment(4)	○	●	●	●	●	●(7)	
Performance Diagnostics	Air Mass Flow(4)	○	●	●	●	●	●(7)	
Performance Diagnostics	PD One Button	○	●	●	●	●	●(7)	
Performance Diagnostics	Valve Friction/Deadband Estimation	○	●	●	●	●		
Performance Diagnostics	Valve Friction/ Deadband Trend	○	●	●	●	●		
Performance Diagnostics	Profiler	○	●	●	●	●	●	
Performance Diagnostics	Triggered Profile	○	●	●	●	●		
	Status Monitor	○	●	●	●	●	●	●
	Network Scan(5)		●					●
	Trending(5)	○	●					●
	Event Messenger(5)		●					●
	Modbus(5)		●					
	Batch Runner		●	●	●(6)	●		
	Scheduler		●	●	●(6)	●		
	Merge Database	●	●		●	●		
	Export Tag Data	●	●	●	●	●	●	●
	Firmware Download(4)		●	●	●	●(5)		●
	Temporary Tiering(4)		●	●	●	●	●	
	Instrument Level StepUp		●	●	●	●		●
	Initial Tag Limit	Unlimited	5	25	5	5	Unlimited	Unlimited
	Max Tag Limit	Unlimited	Unlimited	---(2)	Unlimited	Unlimited	Unlimited	Unlimited

● Indicates capability available
○ Indicates diagnostics can be reviewed but not run
1. XXXX indicates tag count.
2. AMS based capability. ValveLink SNAP-ON does not control or limit this functionality.
3. Diagnostic can only be run when the instrument is out of service.
4. DVC6200, DVC6200f, DVC6000, DVC6000f, and DVC2000 only.
5. HART only.
6. Limited to Host FDT Frame connected devices.
7. Only available through PD One Button.
8. Applies to SOLO/DTM/PRM

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ValveLink Software
D102687X012

Product Bulletin
62.1:ValveLink Software(S2)
April 2017

ValveLink™ Software Signature Series Performance Testing

ValveLink Software Signature Series factory-executed performance testing is available for any Fisher™ control valve assembly that includes a FIELDVUE™ digital valve controller.

Signature Series performance testing creates a benchmark of an assembled valve's performance just prior to shipment. This benchmark provides a starting point for future data comparison, enabling you to track the operating condition of your control valve and maximize valve performance.

When ordered with your FIELDVUE equipped control valve, our factory uses the diagnostic capability of ValveLink software to thoroughly test each valve assembly.

W9363-3

Test Levels

Three levels of Signature Series tests are available, with each level providing valuable diagnostic data. When you order a Signature Series test, you will receive the test results electronically from your Emerson sales office or Local Business Partner.

Signature Series 1

Within the Signature Series 1 test level, you receive:

- Instrument Configuration
- Status Monitor (@50% travel)
- Valve Spec Sheet
- Valve Signature, as recorded from -5 to 105% input.
- Dynamic Error Band Curve, as recorded from -5 to 105% input
- Drive Signal, as recorded from -5 to 105% input

Signature Series 2

In addition to Signature Series 1 information, you receive:

- Performance Step Test
- Status Monitor (0, 25, 50, 75, 100% travel)

Signature Series 3

Series 3 testing provides user specified Series 1 and 2 tests and allows customization of end points or scan times. This capability lets you tailor the testing to your specific requirements or process needs.

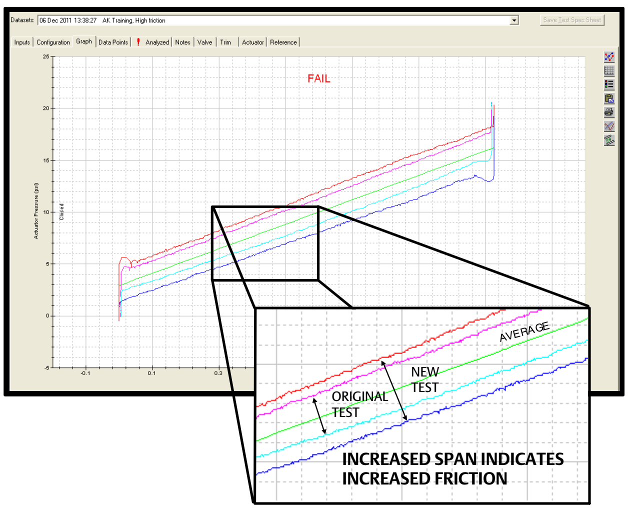
Signature Series 3 with Dead Band plus Hysteresis

Provides user specifications from Series 1, 2, 3, and Dead Band plus Hysteresis estimation per dead band specifications. Refer to Bulletin 62.1:ValveLink Software(S3) D103549X012, available from your Emerson sales office, Local Business Partner, or at Fisher.com, for details.

Data Comparison

If your control valve is equipped with a FIELDVUE instrument that includes diagnostic capability, after the valve has been in service you can use ValveLink Software to run the same tests that were originally run at the factory. Then, by importing the Signature Series data into ValveLink Software, you can compare the as-shipped performance with the valve's current operating condition. The current data can be compared to the baseline data to quickly pinpoint issues, as shown in figure 1.

Figure 1. Data Comparison



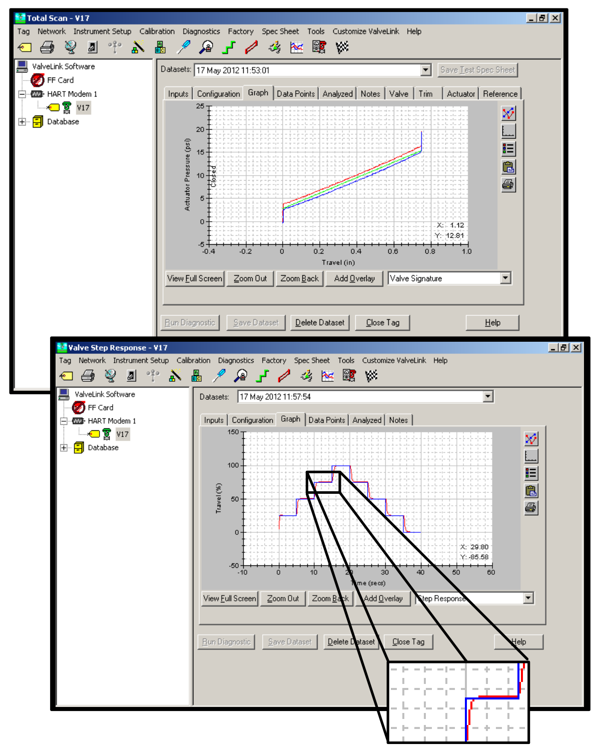
Signature Series Availability

Signature Series testing is available for all Fisher control valves when specified as part of the original valve order. To order Signature Series testing, simply specify your Signature Series testing requirements on your Fisher control valve orders. Signature Series tests are only available when specified as part of the original valve order.

Take Advantage of the Signature Series

You can begin to take advantage of the Signature Series by contacting your Emerson sales office or Local Business Partner. Remember to specify your Signature Series testing requirements when placing your order. Emerson Automation Solutions can provide you with the diagnostic data you need to keep your valves operating at top performance!

Figure 2. Performing a Diagnostic Test with ValveLink Software Provides an Analysis of Control Valve Operating Parameters



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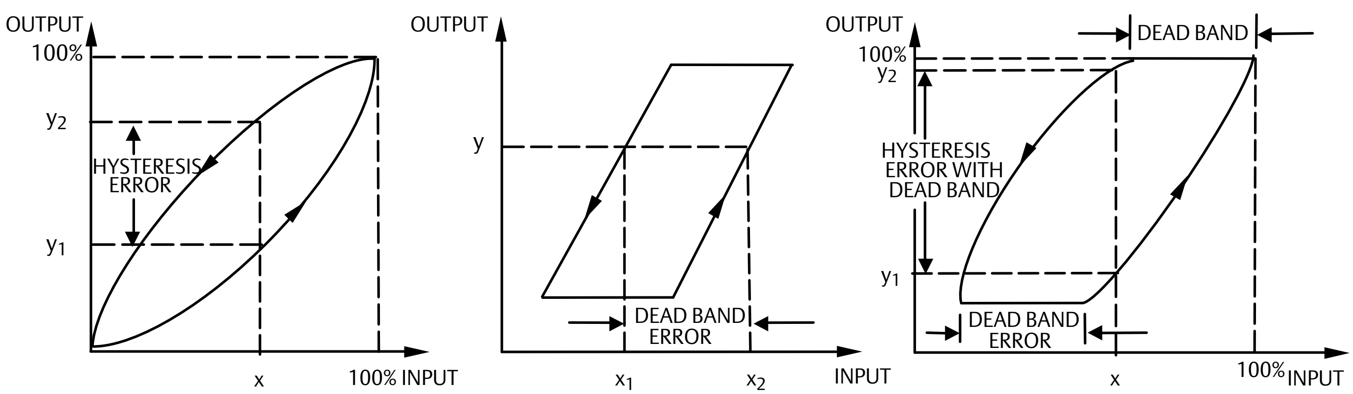
EMERSON

Dead Band Plus Hysteresis Estimation with ValveLink™ Diagnostics

Background

Dead band and hysteresis are important nonlinearities that can adversely affect process control. Figure 1 shows input and output graphs for hysteresis, dead band, and dead band plus hysteresis. Hysteresis is a path dependent characteristic that can be attributed to materials not being able to return to their original shape and size after being stretched or deformed. Dead band represents the amount of signal change required to reverse direction and is characterized by a zero slope region where the input signal reverses. Dead band can usually be attributed to valve friction (packing, actuator seal rings, and valve seal rings) and pneumatic dead zones in the instrumentation.

Figure 1. Hysteresis, Dead Band, and Dead Band plus Hysteresis Curves



For control valves, dead band is the dominant nonlinearity whereas hysteresis is a secondary effect. Hysteresis can be estimated by subtracting dead band from the dead band plus hysteresis data. However, since hysteresis is generally negligable and difficult to discern from experimental error, dead band and hysteresis are not separated and test results are reported as the sum of these nonlinearities.

Allowable dead band plus hysteresis is process dependent but is typically specified to be ≤ 1% for the entire valve assembly, which comprises the valve, actuator, and positioner.

Dead Band plus Hysteresis Test Definition

Dead band plus hysteresis can be estimated at the factory using a Series 3 Factory ValveLink test. Although dead band plus hysteresis is a factory test, results can be imported and viewed in all versions of ValveLink software. Dead band plus hysteresis tests can be run at nominal travels of 5%, 25%, 50%, 75%, and 95%. If a test point is not specified, dead band plus hysteresis will be evaluated at a nominal travel of 50%.

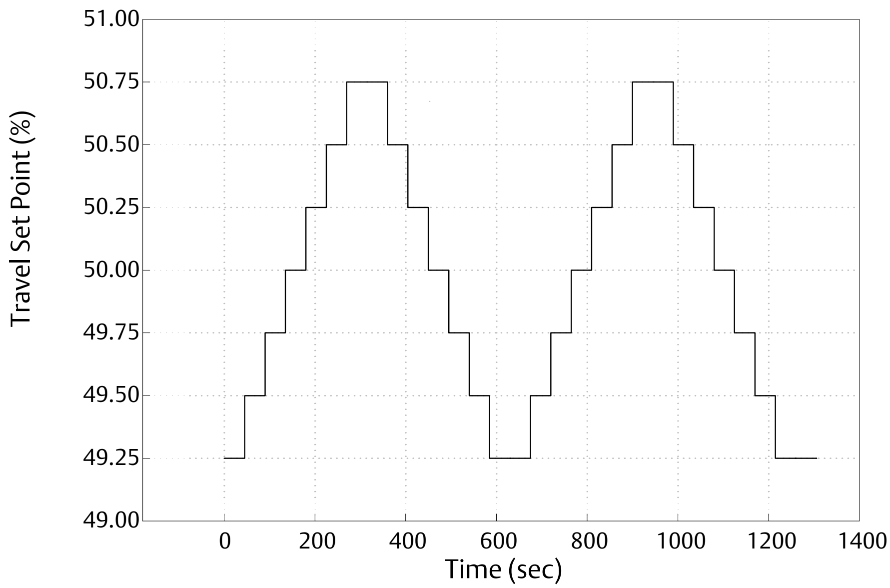
Test Procedures

Dead band plus hysteresis is a static measurement that can be estimated using a quasi steady-state test signal. All tests are performed using standard digital valve controller diagnostic procedures with the cutoffs and characterization disabled and with the travel integrator disabled. This is done to prevent limit cycles, overshoots, or other transients that would invalidate the dead band plus hysteresis estimate.

The dead band plus hysteresis test is a 29 point step test that consists of series of 0.25% steps that slowly move the valve in the opening and closing directions. Figure 2 shows a test signal centered around 50%. Test signal span is 1.5% and each step is held for 45 seconds, although this can be set to 60 or 90 seconds in the factory to ensure that quasi steady-state conditions are met.

The dead band plus hysteresis test consists of two sequences. The first sequence is a break-in cycle that moves the valve through its dead band and establishes a valid starting point for the second sequence. Data from the break-in cycle are not analyzed. The second sequence is the test cycle and data from this sequence are used to estimate dead band plus hysteresis.

Figure 2. Dead Band plus Hysteresis Test about a Nominal Set Point of 50%



Test Results

Four graphs are used to display test results: step response time series, step response with supply pressure, step response with drive, and dead band plus hysteresis X-Y plot.

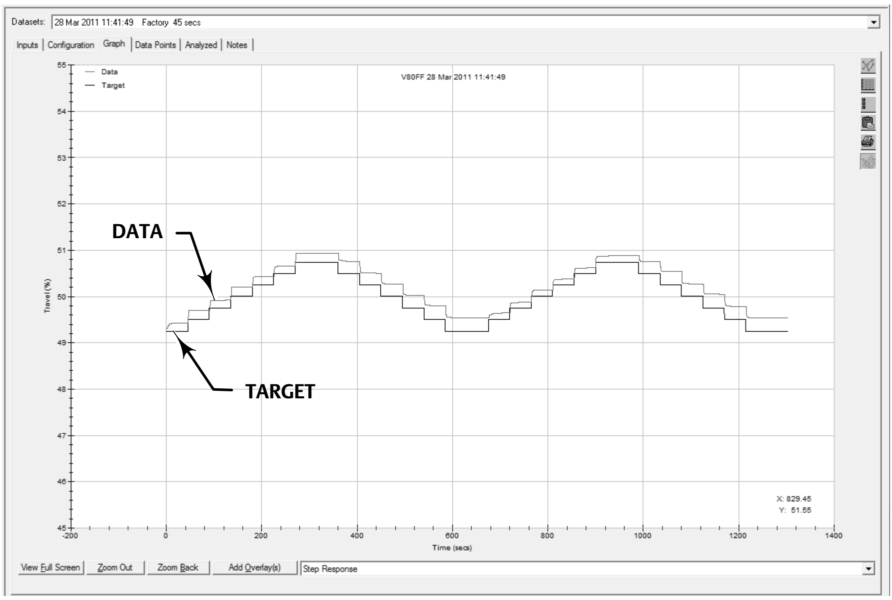
The step response graph displays travel set point and travel time series data. A typical time series plot of travel set point and travel is presented in figure 3. This graph is used to make sure that steady-state conditions have been reached before the next step is implemented. If this is not the case, the dead band plus hysteresis test can be rerun with a longer step hold time. This graph can also be used to roughly estimate dead band by counting the number of 0.25% steps required to reverse direction.

Step response time series data with supply pressure and drive signal are also available and are recorded for completeness.

Finally, steady-state data can be displayed on an X-Y plot where set point is plotted on the x-axis (input signal) and travel is plotted on the y-axis (output signal). A sample X-Y dead band plus hysteresis is shown in figure 4.

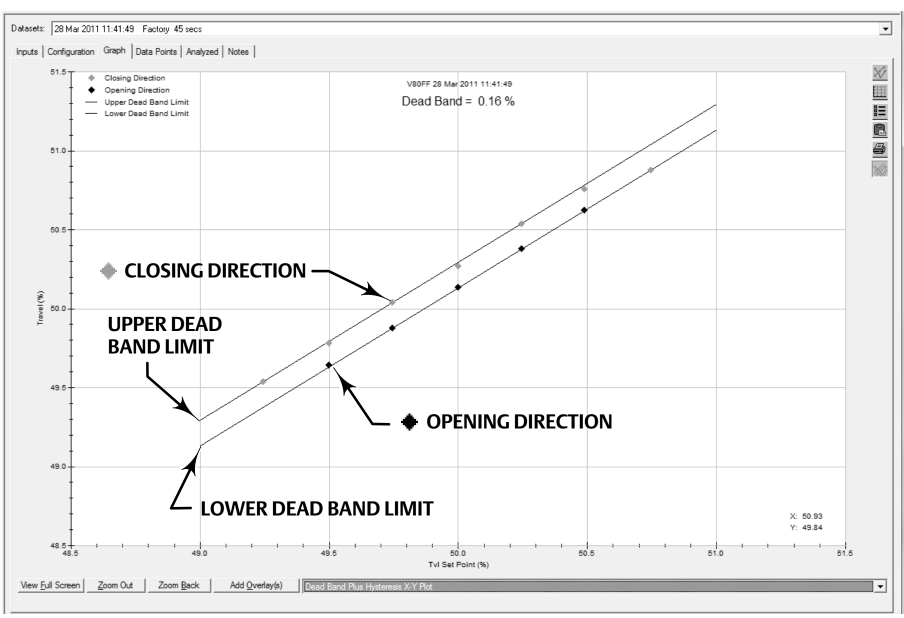
The ideal response of a control valve is a straight line with unity slope. Dead band plus hysteresis can be estimated by drawing lines parallel to the ideal response that band the data. The width between the bands provides the best estimate of dead band plus hysteresis.

Figure 3. Typical Travel Set Point and Travel Time Series Plots



Note: The first cycle is a break-in cycle. The second is a test cycle.

Figure 4. Dead Band plus Hysteresis X-Y Plot with Unity Slope Bands



Data Export

Dead band plus hysteresis data from factory ValveLink can be exported as a standard step study test. When imported into ValveLink 11.5 or higher, time series and dead band plus hysteresis X-Y plots can be displayed. For earlier versions of ValveLink, only time series data will be displayed.

References

[1] ANSI/ISA-75.05.01-2000 (R2005), “Control Valve Terminology.”

[2] ANSI/ISA-75.13.01-1996 (2007), “Method of Evaluating the Performance of Positioners with Analog Input Signals and Pneumatic Output.”

[3] ANSI/ISA-75.25.01-2000, “Test Procedures for Control Valve Response Measurement from Step Inputs.”

[4] ANSI/ISA-TR75.25.02-2002, “Control Valve Response Measurements from Step Inputs.”

[5] IEC 60534-1, “Industrial-process control valves - Part 1: Control valve terminology and general considerations.”

[6] IEC 60534-4, “Industrial-process control valves - Part 4: Inspection and routine testing.”

[7] “Control Valve Dynamic Specification,” Version 3.0, EnTech, 1998.

[8] ANSI/ISA-51.1-1979 (R1993), “Process Instrumentation Terminology.”

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Marshalltown, Iowa 50158 USA
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www.Fisher.com

Fisher™ 377 Trip Valve

Fisher 377 pressure-sensing trip valves are for control applications where a specific valve/actuator action is required when supply pressure falls below a specific point. When supply pressure falls below the trip point (see figure 1), the trip valve causes the actuator to fail up, lock in the last position, or fail down. When the supply pressure rises above the trip point, the 377 trip valve automatically resets, allowing the system to return to normal operation. The trip valve can be top-mounted on a manifold, yoke-mounted, or bracket-mounted to match the application requirements. 377 trip valves can be used with Fisher 480, 585C, 685, 1061, 1066, 1069, and Bettis™ G Series piston actuators.

W4292-1

Features

- Cost Effective—Single trip valve construction reduces costs and spare part requirements of those systems using three separate switching valves to perform the failure functions. A single trip valve greatly simplifies piping requirements.
- Ease of Mode Conversion—Conversion to any of the fail modes requires only minor hookup changes.
- Adjustable Trip Valve—The trip point is adjustable for specific supply pressure requirements.
- Reliable Operation—The trip valve design includes large diaphragm areas and few moving parts for efficient performance, minimum maintenance, and long service life.

W8435-1

Fisher 377 Trip Valve Mounted on Size 130 585C Actuator

Specifications

Available Configurations

When supply pressure falls below the trip point,

377D Trip Valve: Fails actuator piston down. Includes check valve and volume tank.

377L Trip Valve: Locks actuator piston in the last position.

377U Trip Valve: Fails actuator piston up. Includes check valve and volume tank.

377CW Trip Valve: Fails fully clockwise to close the valve. Requires check valve and volume tank. Trip valve moves piston to either up/down position and requires actuator configuration for actual clockwise movement.

377CCW Trip Valve: Fails fully counterclockwise to close the valve. Requires check valve and volume tank. Trip valve moves piston to either up/down position and requires actuator configuration for actual counterclockwise movement.

All 377 trip valves can be converted to any of the above fail modes with minor hookup changes

Allowable Supply Pressure for Trip Valve[1]

Maximum: 10.3 bar (150 psig)
Minimum: 3.8 bar (55 psig)

Outlet Pressure[1]

Normal Operation: Pressure from control device
Fail-Up or Fail-Down Mode: Maximum volume tank pressure
Lock-In-Last-Position: Respective cylinder pressure

Trip Point[2]

Adjustable from a minimum of 2.8 bar (40 psig) to a maximum of 72 percent of supply pressure; see figure 1
Reset: 12.5 to 33 percent above adjusted trip point

Flow Coefficients (C_v)[3]

Depends on flow path (shown in figure 3) as follows:

Port A to Port B and Port D to Port E: 0.5
Port B to Port C and Port E to Port F: 0.6

Body Connections

1/4 NPT internal

Temperature Capabilities[1]

Nitrile Diaphragms and O-Rings: -40 to 82°C (-40 to 180°F)

Fluorocarbon Diaphragms and O-Rings: -18 to 104°C (0 to 220°F)

Volume Tank Maximum Internal Working Pressure (for 377D, 377U, 377CW and 377CCW trip valves)

Standard: 10.3 bar (150 psig) for non-ASME approved applications[4]
ASME Approved Applications: Rated 10.3 bar (150 psig), maximum; 9.3 bar (135 psig), recommended

Volume Tank Sizing

See sizing section

Note: Volume tank capacity values are nominal values only. Actual volume may vary slightly due to tolerances within the volume tank and supplier variability.

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D
Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T4, T5, T6
Dust: T85...T104

377 SST

Safety Instrumented System Classification
SIL 3 capable - certified by exida Consulting LLC

Mounting

Top-Mounted: Manifold-mounted between a 3570 positioner and a 480 actuator (manifolds cannot be supplied with 585C, 685, 1061, 1066, and 1069 piston actuators)
Side-Mounted: Yoke-mounted or bracket-mounted for use with a FIELDVUE™ DVC6200, DVC6200f, DVC6200p, DVC6000, or DVC6000f digital valve controller

Approximate Weight

Trip Valve
Aluminum: 0.95 kg (2.1 pounds)
Stainless Steel: 2.31 kg (5.1 pounds)

Mounting Manifold: 0.5 kg (1.2 pounds)
Volume Tank: Varies between 5.4 and 363 kg (12 and 800 pounds) depending on size

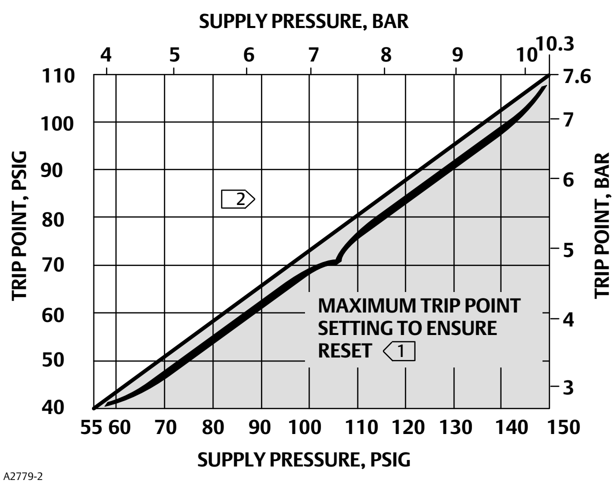
-Continued-

Specifications (continued)

Construction Materials **Housing:** ■ Aluminum or ■ Stainless steel **Cover:** 25% mineral-filled thermoplastic polyester **O-Rings:** Nitrile or fluorocarbon	**Diaphragms:** Nitrile or fluorocarbon **Interior parts** *Aluminum construction:* Brass, aluminum, steel, and stainless steel *Stainless Steel construction:* Stainless steel

1. The pressure/temperature limits in this document and any applicable standard or code limitation should not be exceeded.
2. If the trip point is not specified, the trip point is factory-set at 72 percent of supply pressure or 2.8 bar (40 psig), whichever is higher.
3. Values represent nominal C_V measures for each port pair using a trip valve/actuator combination.
4. This tank is rated at 14.5 bar (240 psig) in LP service. When used with air, the rating should be considered to be 10.3 bar (150 psig), consistent with the maximum pressure allowed for the 377 trip valve.

Figure 1. Maximum Trip Point Settings



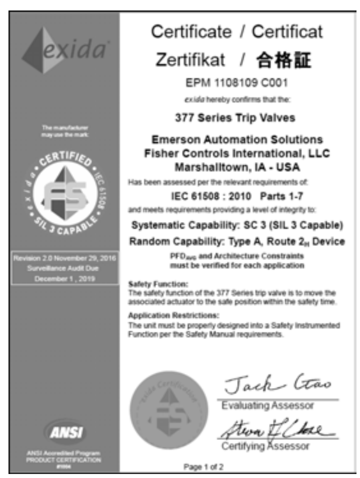
1 Trip point may be set to any value between 2.8 bar (40 psig) and the maximum trip point line.
2 Reset occurs a 12.5 to 33 percent above adjusted trip point.

Safety Certification

The 377 SST is certified for use in Safety Instrumented System (SIS) applications. Certification is by exida Consulting LLC, a global provider of functional safety and control system security (see figure 2). SIS certification is identified on the product by a label affixed to the pilot body.

The functional safety assessment was performed to the requirements of IEC 61508: ed2, 2010, SIL3 for mechanical components.

Figure 2. exida Certificate



Certificate / Certificat
Zertifikat / 合格証
EPM 1108109 C001
exida hereby confirms that the:
377 Series Trip Valves
Emerson Automation Solutions
Fisher Controls International, LLC
Marshalltown, IA - USA
Has been assessed per the relevant requirements of:
IEC 61508 : 2010 Parts 1-7
and meets requirements providing a level of integrity to:
Systematic Capability: SC 3 (SIL 3 Capable)
Random Capability: Type A, Route 2_H Device
PFD_{avg} and Architecture Constraints must be verified for each application

Safety Function:
The safety function of the 377 Series trip valve is to move the associated actuator to the safe position within the safety time.

Application Restrictions:
The unit must be properly designed into a Safety Instrumented Function per the Safety Manual requirements.

The manufacturer may use the mark:
CERTIFIED exida IEC 61508 SIL 3 CAPABLE
Revision 2.0 November 29, 2016
Surveillance Audit Due
December 1, 2019
ANSI
ANSI Accredited Program PRODUCT CERTIFICATION

Jack Gao
Evaluating Assessor
Certifying Assessor
Page 1 of 2

Principle of Operation

377D Trip Valve

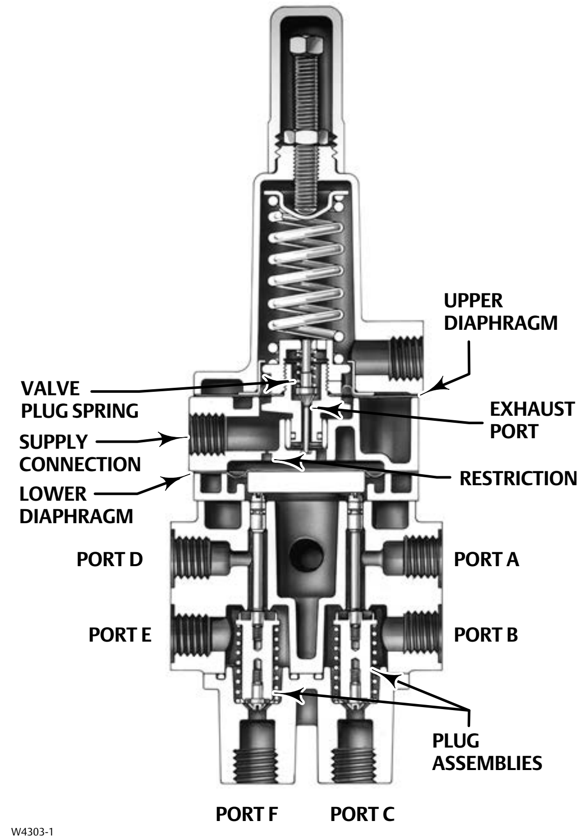
In normal operation, supply pressure loads the upper diaphragm (see figure 3) of the unit. The valve plug spring keeps the exhaust port closed. Supply pressure also loads the lower diaphragm through the restriction, causing the plug assemblies to move down and isolate ports C and F while connecting port A to B and port D to E.

Normal actuator control pressure flows from the control device to the top of the cylinder through ports A and B and to the bottom of the cylinder through ports D and E. A volume tank is charged to maximum supply pressure through a check valve in order to retain maximum supply pressure in the volume tank if supply pressure drops.

When supply pressure falls below the trip point pressure in the fail-down mode (see figure 4), the exhaust port opens, venting the supply pressure that is loading the lower diaphragm. This causes the upper ports of the plug assemblies to close and shut off normal pressure flow from the control device to the actuator.

Volume tank pressure then flows through ports C and B to the top of the actuator cylinder, while pressure in the bottom of the actuator cylinder is vented through ports E and F. The pressure imbalance created forces the actuator piston down.

Figure 3. Simplified Sectional View of Trip Valve



When supply pressure is restored, it loads the upper and lower diaphragms, causing the trip valve to reset. The exhaust port closes. The upper ports of the plug assemblies open, and the lower ports close. Normal actuator control pressure flow from the control device is restored through ports A and B and ports D and E. The check valve opens and recharges the volume tank to the maximum supply pressure.

Figure 4. Fisher 377D Trip Valve Shown Tripped

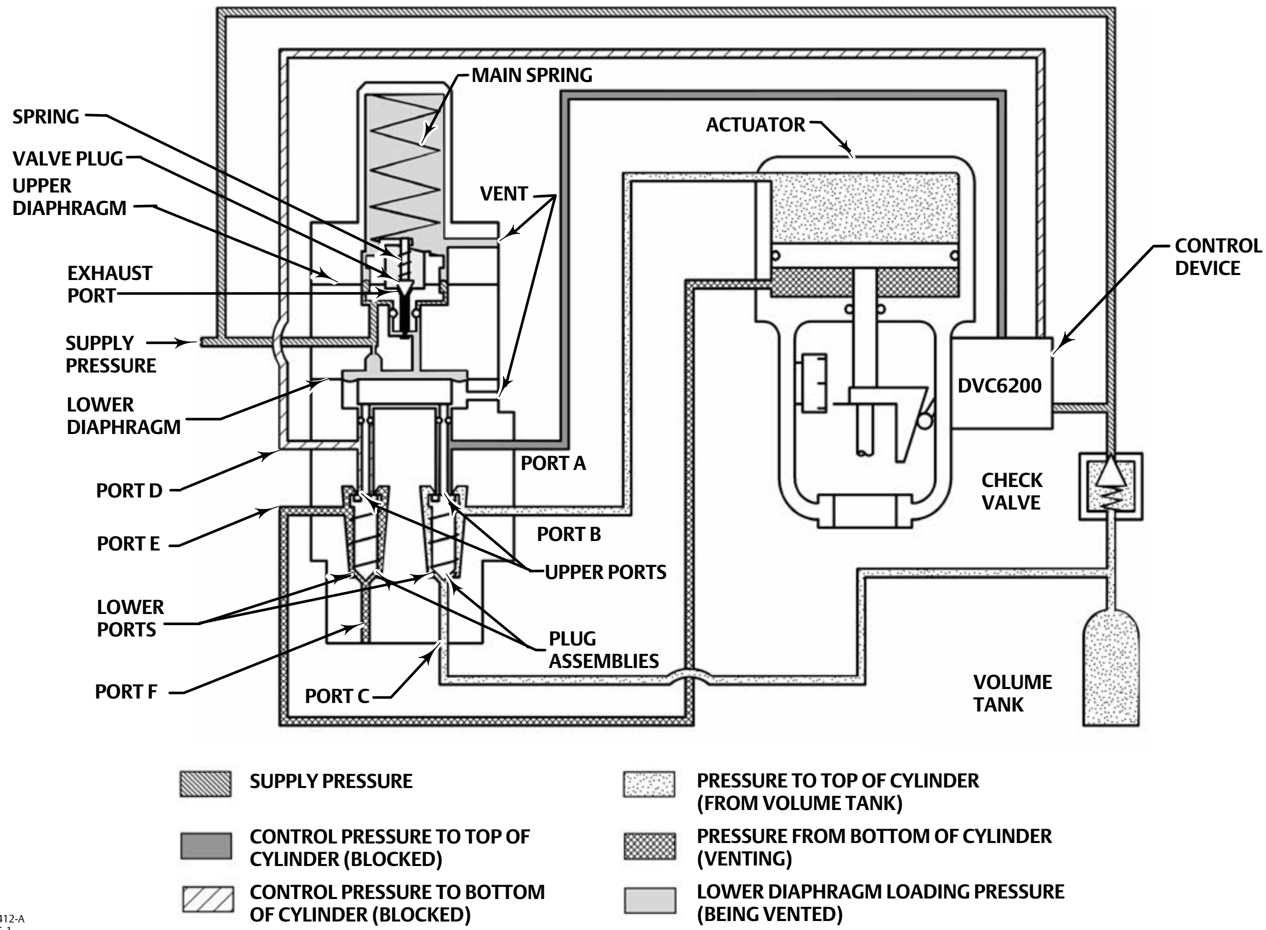


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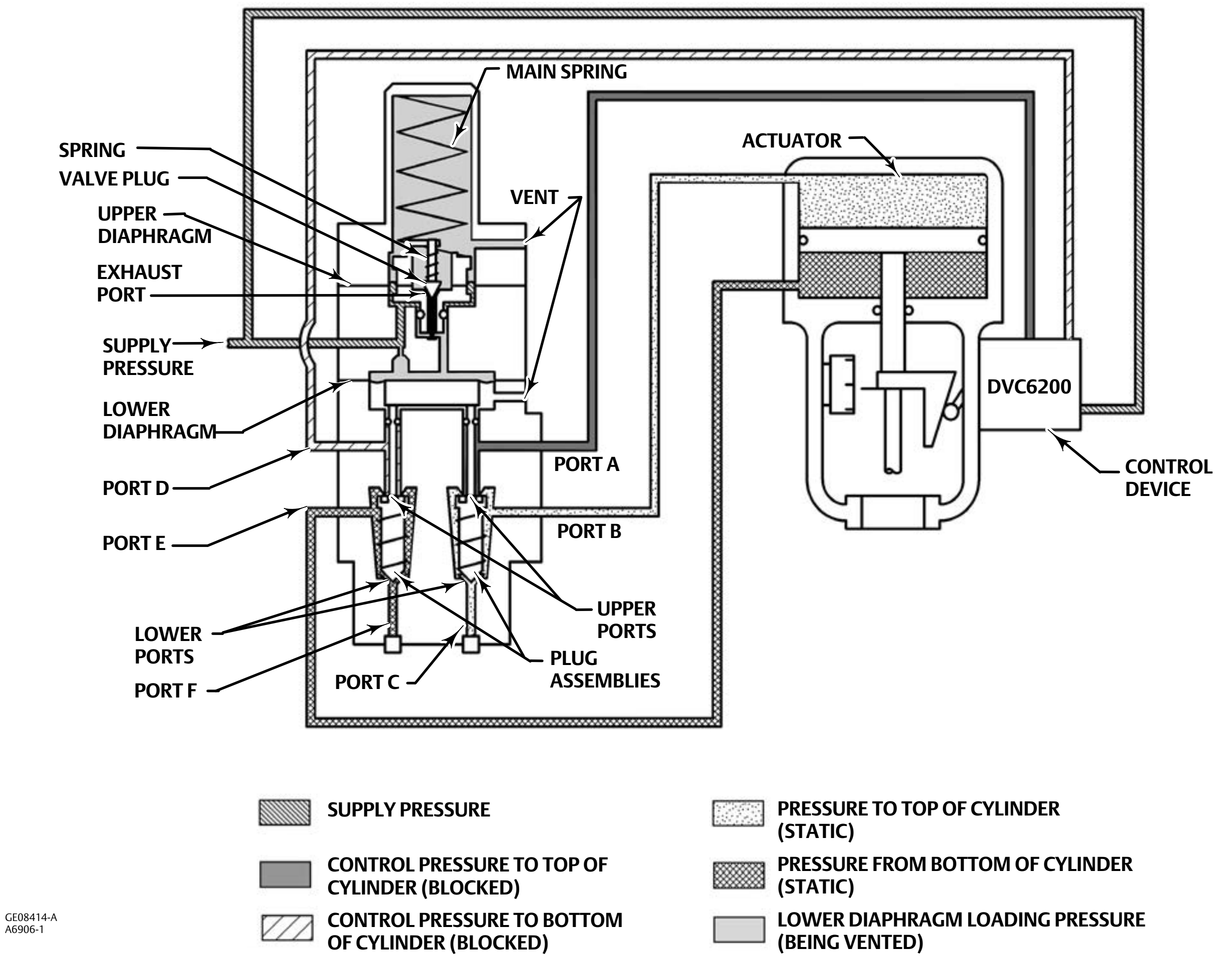
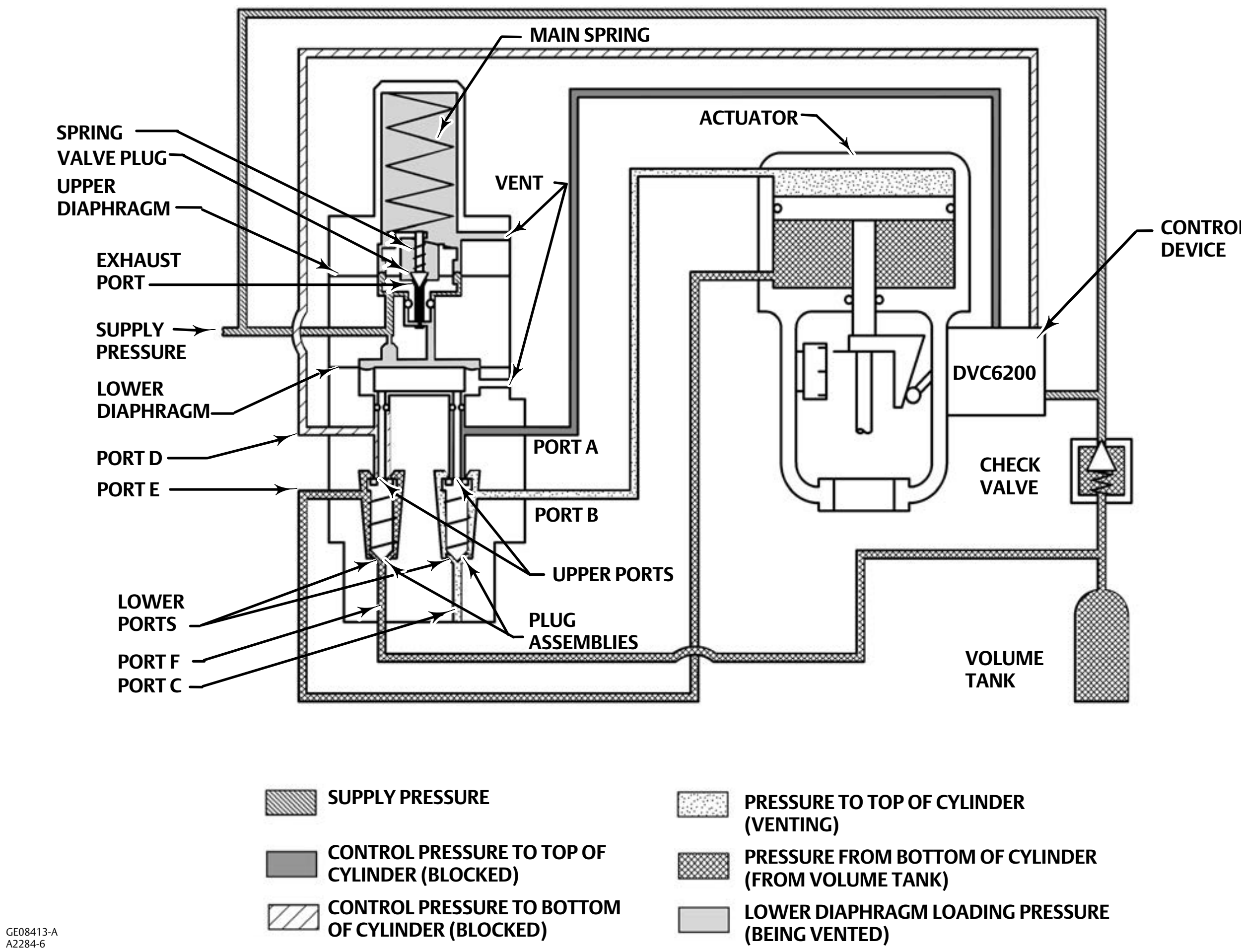
Figure 5. Fisher 377L Trip Valve Shown Tripped



377L Trip Valve

When supply pressure falls below the trip point in the lock-in-last-position mode (see figure 5), the exhaust port opens, venting supply pressure from the lower diaphragm. This causes the upper ports of the plug assemblies to close and the lower ports to open. Since ports C and F are plugged, no pressure change occurs on either side of the actuator piston, and the piston is pressure-locked in position upon loss of supply pressure. No volume tank is necessary in this mode. When supply pressure is restored, the plug assemblies move back into the normal operating position, and supply pressure flows from the control device through ports A and B to the actuator.

Figure 6. Fisher 377U Trip Valve Shown Tripped



377U Trip Valve

The fail-up mode of operation (figure 6) is similar to the fail-down mode of operation except that connections to port C and F are reversed. When supply pressure falls below the trip point, the top of the actuator cylinder vents, and volume tank pressure loads the bottom of the actuator cylinder. The pressure imbalance created forces the actuator piston up.

377CW and 377CCW Trip Valves

Makes use of the 377D or 377U trip valve configurations, a piston actuator, and volume tank with check valve to move the piston actuator to either the up or down position. Requires the actuator and valve configuration for actual clockwise or counterclockwise movement.

Volume Tank Sizing

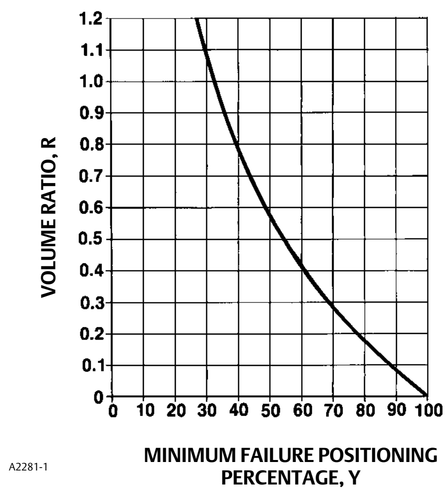
Notes

State and local regulations may require the use of ASME-approved volume tanks. It is the user's responsibility to determine requirements and applicable regulations for proper volume tank selection.

Volume tank capacity values are nominal values only. Actual volume may vary slightly due to tolerances within the volume tank and supplier variability.

Several different tanks of varying capacities are available. The volume tank must be selected so that its pressure at any time is greater than the minimum percentage of maximum supply pressure required to stroke the actuator (see figure 7).

Figure 7. Volume Tank Sizing Graph



1. Size the volume tank as indicated below:

For Actuators on Sliding Stem Valves, Determine:	For Actuators on Rotary-Shaft Valves, Determine:
$Y = F/AP \times 100$	$Y = P_r/P \times 100$

Where:

Y = Minimum failure positioning percentage
F = Actuator thrust required in normal operation to position the valve at the desired limit of travel
A = Effective piston area (from the appropriate actuator bulletin)
P = Maximum supply pressure available
P_r = Highest pressure required by the actuator to stroke the valve (from the appropriate actuator sizing technique)

2. With the minimum failure positioning percentage obtained in step 1, enter the value on the abscissa of the graph in figure 7. Locate the corresponding point on the curve, and read across to find the volume ratio, R.

3. Determine:

$V_T = (XA)/R$

Where:

X = Maximum actuator travel from the appropriate actuator bulletin. For rotary actuators, substitute total displacement (XA). Actuator displacement can be found in the product bulletin, or contact your Emerson sales office.
V_T = Minimum volume tank size required
R = Volume ratio from step 2

Note

Volume tank capacity values are nominal values only. Actual volume may vary slightly due to tolerances within the volume tank and supplier variability.

Installation

The 377 trip valve may be mounted in any position without affecting normal operation. Dimensions are shown in figure 8 and tables 1 and 2.

Table 1. Standard Volume Tank Dimensions(1)

Tank Volume		J		L	
Liters	Inch^3/Gal	mm	Inches	mm	Inches
11.8	721/3.1	309	12.16	318	12.5
21.6	1315/5.7	310	12.19	451	17.75
32.3	1970/8.5	309	12.16	595	23.43
42.9	2615/11.3	309	12.16	737	29.00
65.6	4001/17.3	309	12.16	1095	43.12
131.1	8002/34.6	Requires two 65.6 liter (4001 inch^3/17.3 gal) volume tanks			

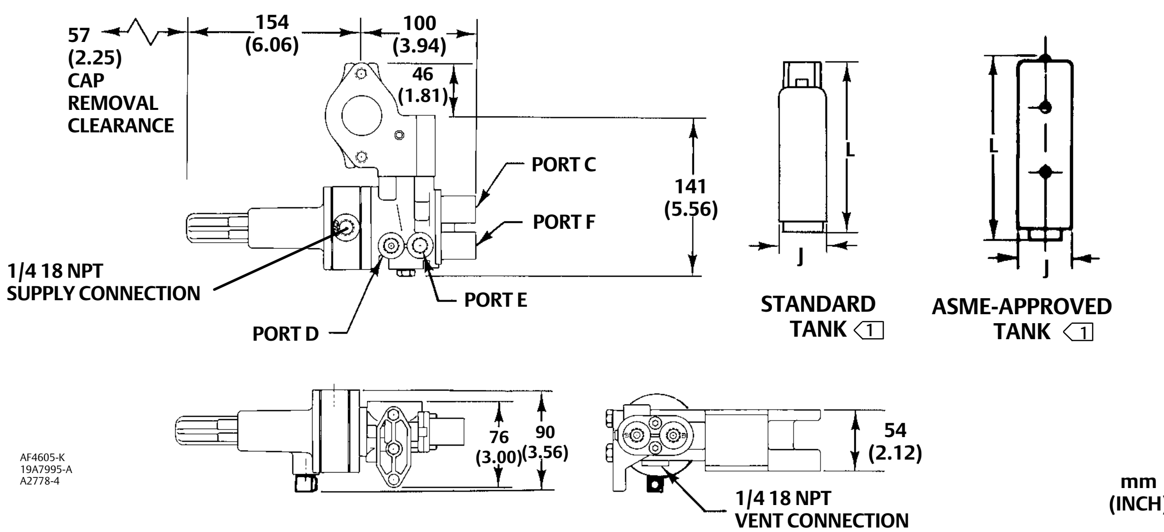
1. Volume tank capacity values are nominal values only. Actual volume may vary slightly due to tolerances within the volume tank and supplier variability.

Table 2. ASME-Approved, Canadian Registered Volume Tank Dimensions(1)

Tank Volume		J		L	
Liters	Inch^3/Gal	mm	Inches	mm	Inches
8.5	518/2.2	208	8.19	337	13.25
24.9	1520/6.6	305	12	427	16.81
30	1831/7.9	254	10	684	26.94
42.8	2609/11.3	305	12	681	26.81
68.8	4199/18.1	360	14.19	792	31.19
71.6	4371/18.9	305	12	1087	42.81
143.3	8742/37.86	Requires two 71.6 liter (4371 inch^3/8.9 gal volume tanks			
114	6930/30	406	16	965	38
227	13860/60	508	20	1219	48
303	18480/80	610	24	1600	63
454	27720/120	610	24	1702	67
908	55440/240	762	30	2134	87

1. Volume tank capacity values are nominal values only. Actual volume may vary slightly due to tolerances within the volume tank and supplier variability.

Figure 8. Dimensions of Trip Valve with Manifold (also see tables 1 and 2)



1 Refer to table 1 and 2 for J and L dimensions

Ordering Information

When ordering specify:

Application

1. Available supply pressure

2. Actuator type number and size

3. Aluminum or stainless steel construction

4. Input signal range

5. Operating ambient temperature

6. Trip point (If the trip point is not specified, the unit is factory-set to trip at 72 percent of supply pressure or 2.8 bar (40 psig), whichever is higher.)

7. Volume tank size

Trip Valve

Refer to the specifications. Review the information under each specification and in the referenced figures. Specify the desired choice wherever there is a selection to be made. Be sure to specify the type number as described in the Available Configurations specification.

Refer to table 3 for guidelines on specifying the correct trip valve.

Table 3. Guidelines for Specifying Fisher 377 Trip Valve

Actuator Type	Fail Mode	Valve Action[1]	Trip Valve
Sliding-Stem	Fail Open	PDTC	377U
		PDTO	377D
	Fail Closed	PDTC	377D
		PDTO	377U
Rotary: 1035 Bettis G Series	Fully Clockwise	Clockwise to Close	377CW
	Fully Counterclockwise		377CCW
Rotary: 1069	Fully Clockwise	- - -	377CW
	Fully Counterclockwise	- - -	377CCW

1. PDTC—Push Down to Close; PDTO—Push Down to Open

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 2625, 2625SST, and 2625NS Volume Boosters

A Fisher 2625, 2625SST, or 2625NS volume booster is part of the 2625 Series volume boosters and is used in conjunction with a positioner on a throttling control valve to increase stroking speed. The 2625NS is a nuclear-service version and uses elastomeric components that better withstand high temperature and radiation environments.

W4727-1

The booster incorporates fixed deadband, soft seat construction, and an integral bypass restriction to eliminate positioner saturation problems that can occur with volume boosters that do not have these features. Adjustment of the integral bypass restriction is necessary for system stability. This adjustment does not affect the deadband of the volume booster, but does permit the control valve to respond to small input signal changes without sacrificing steady-state accuracy. It also allows the booster to deliver high-volume output for fast stroking when large, rapid input signal changes occur.

The volume booster is used to improve stroking speed. If precision valve control is required, the use of a positioner is recommended. If the volume booster is to be used for on/off control, the integral bypass restriction on the booster must be closed (turned fully clockwise).

Connectors and piping can be installed with either 2625, 2625SST, or 2625NS volume booster for diagnostic testing.

The 2625 and 2625SST are certified for use in Safety Instrumented System (SIS) applications. Certification is by exida Consulting LLC, a global provider of functional safety and control system security. SIS certification is identified on the product by the EXIDA logo on the 2625 nameplate.

Features

- Fast Response—Booster delivers the volume needed for rapid actuator stroking when large input changes suddenly occur.
- Adjustable Response—Integral bypass restriction tunes the booster response so that smooth actuator motion follows the slow signal changes.
- Efficient Operation—Soft seats provide tight shutoff to reduce unnecessary air consumption and eliminate saturation of positioner relays.
- Maintains Accuracy—Booster permits high actuator stroking speeds upon demand without degrading the positioner steady-state accuracy.
- SIL 3 Capable - Certified for use in Safety Instrumented System (SIS) applications.

Specifications

Supply Pressure Ranges

When used in conjunction with a positioner or other pneumatic accessory, always pipe the positioner and volume booster with one common supply through a Fisher 67D, 67DR, or 95H regulator (see figure 2). A high-capacity filter, such as the Fisher 262K, should be installed in the supply line to the regulator. Supply pressure also must not exceed the maximum pressure rating of the actuator. Constructions are available in two maximum supply ranges.
When Normally Used With Diaphragm Actuators: Up to 2.8 bar (40 psig)
When Normally Used With Piston Actuators: Up to 10.3 bar (150 psig)

Input Signal Pressure

Positioner output

Maximum Input Signal Pressure

10.3 bar (150 psig)

Fixed Input-to-Output Pressure Ratio

1 to 1

Nominal Deadband

Percent of Positioner Output Span(1):
2.4 mm (0.094 inch) exhaust port: 2%
9.5 mm (0.375 inch) exhaust port: 3.5%
12.7 mm (0.5 inch) exhaust port: 5%

Construction Materials

Body: Aluminum or CF8M (316 SST, cast)
Seat Ring: Brass or S31600 (316 SST)

Diaphragms
2625 and 2625SST
Standard: Nitrile/nylon
High Temperature: FKM/TPES
2625
Low Temperature: FVMQ
2625NS: EPDM/meta-aramid

Upper and Lower Valves
2625 and 2625SST
Standard: Nitrile/aluminum/stainless steel
High Temperature: FKM/aluminum/stainless steel
2625
Low Temperature: FVMQ
2625NS: EPDM/aluminum/stainless steel

O-Rings
2625 and 2625SST
Standard: Nitrile
High Temperature: FKM
2625
Low Temperature: FVMQ
2625NS: EPDM

Connectors for Diagnostic Testing: ■ Stainless steel or ■ brass

Operative Temperature Limits(2)

2625 and 2625SST
Standard: -40 to 71°C (-40 to 160°F)
High Temperature: 0 to 121°C (32 to 250°F)
2625
Low Temperature(3): -60 to 65°C (-76 to 149°F)
2625NS: -40 to 93°C (-40 to 200°F)

Connections

Input Signal: 1/4 NPT
Supply and Output: 3/4 NPT

Port Diameters(4)

Supply Port: ■ 9.5 mm (0.375 inch) or ■ 12.7 mm (0.5 inch)
Exhaust Port: ■ 2.4 mm (0.094 inch)(5), ■ 9.5 mm (0.375 inch) or ■ 12.7 mm (0.5 inch)

Maximum Flow Coefficients

See table 1

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D

Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T4, T5, T6
Dust: T85...T121

-Continued-

Specifications (continued)

Hazardous Area Classification (continued)

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

Ex II Gb c T*X
III Db c T*X EAC

Safety Instrumented System Classification

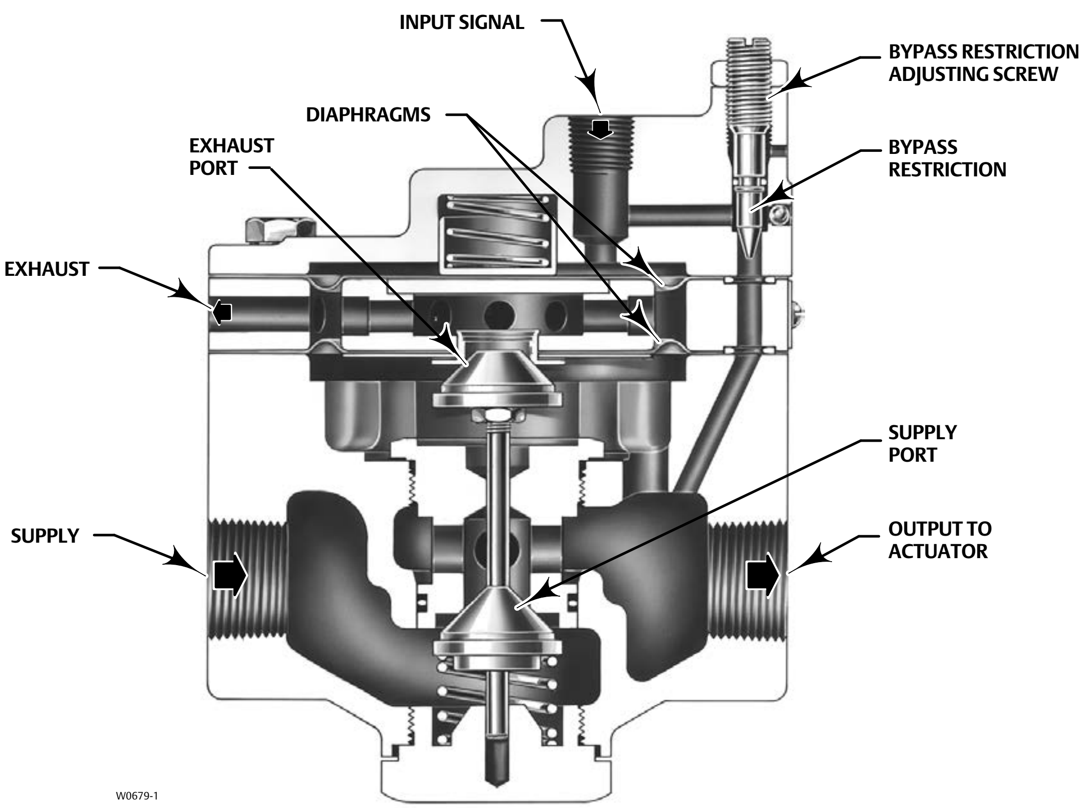
SIL3 capable - certified by exida Consulting LLC

Approximate Weight

Aluminum: 2.3 kg (5 lb)
Stainless Steel: 4.8 kg (10.6 lb)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. Zero to maximum supply.
2. The pressure/temperature limits in this document and any applicable code or standard should not be exceeded.
3. Low Temperature option only available with CUTR approval.
4. May be used in any combination.
5. Aluminum 2625 volume booster only.

Figure 1. Sectional View of Volume Booster

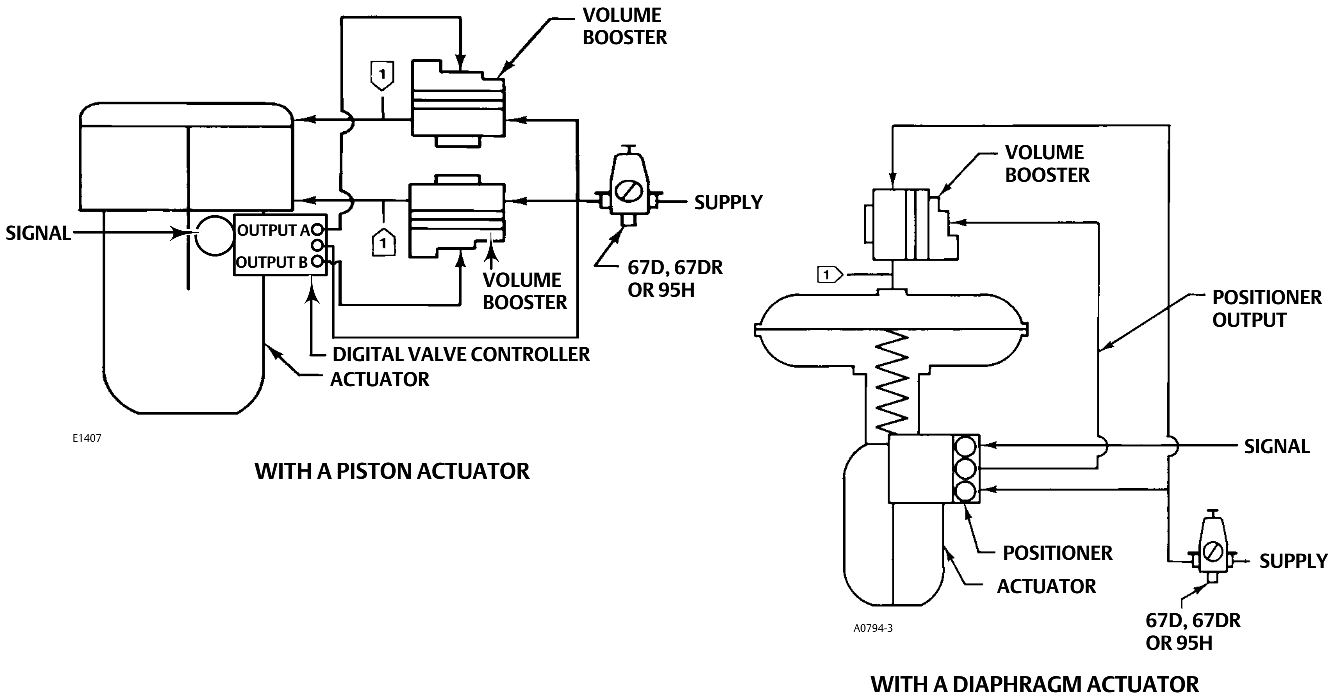


Principle of Operation

Refer to figures 1 and 2. Because of the bypass restriction, large input signal changes register on the booster input diaphragm sooner than in the actuator. A large, sudden change in input signal causes a pressure differential to exist between the input signal and the output of the booster. When this occurs, the diaphragms move to open either the supply port or the exhaust port, whichever action is required to reduce the differential. The port remains open until the difference between the booster input and output pressures returns to within the deadband limit of the booster. With the bypass restriction adjusted for stable operation, a signal with small magnitude and rate changes passes through the bypass restriction and into the actuator without initiating booster operation.

Both supply and exhaust ports remain closed, preventing unnecessary air consumption and possible saturation of positioner relays.

Figure 2. Typical Installations



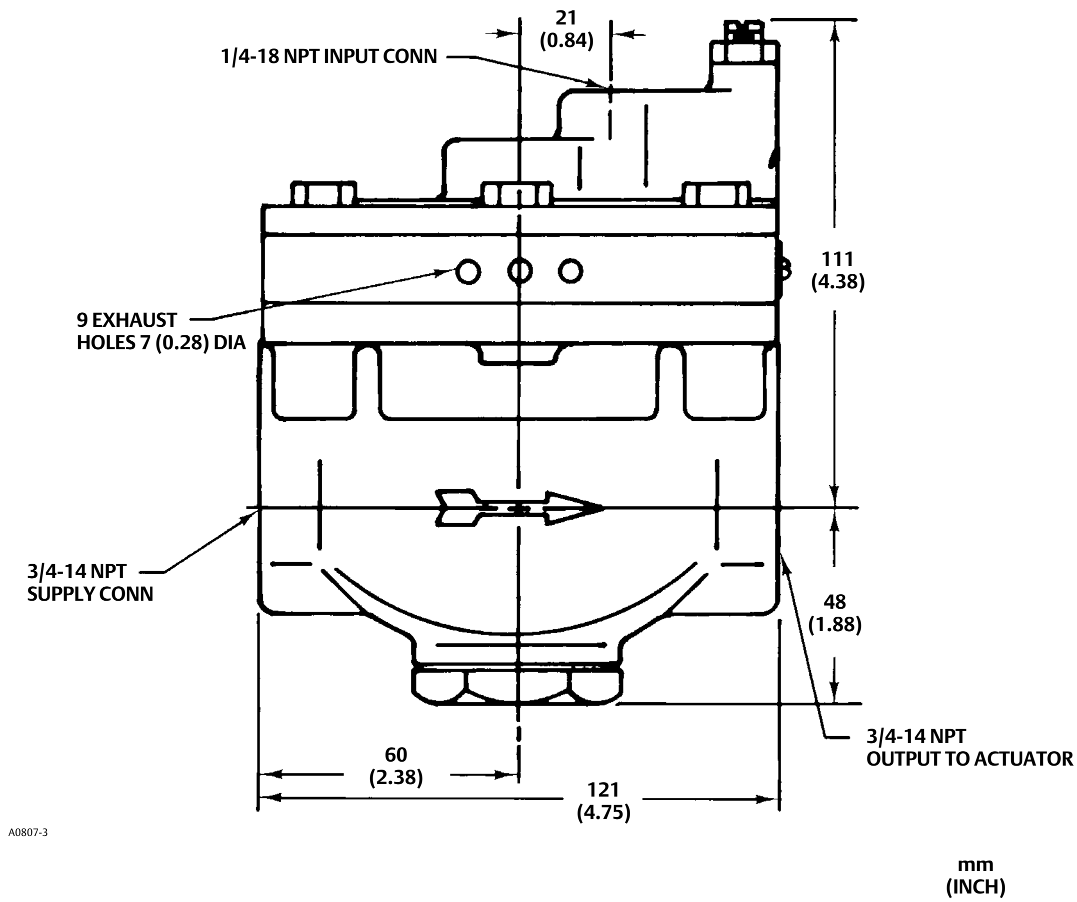
Note:
1 Connection location for diagnostic testing

Table 1. Maximum Flow Coefficients(1)

PORT SIZE COMBINATIONS				COEFFICIENTS	
Supply Port		Exhaust Port		Supply Port	Exhaust Port
mm	Inch	mm	Inch	C_v	C_v
9.5	3/8	2.4 9.5 12.7	3/32 3/8 1/2	3.74 3.74 3.74	0.23 2.29 3.40
12.7	1/2	2.4 9.5 12.7	3/32 3/8 1/2	4.98 4.98 4.98	0.24 2.30 3.40
FIELDVUE™ DVC6200, DVC6200 SIS, DVC6200f, DVC6200p, DVC6000, DVC6000 SIS, DVC6000f digital valve controllers				0.37	0.31
FIELDVUE DVC2000 digital valve controller Low Pressure Relay High Pressure Relay				 0.13 0.19	 0.15 0.20
Fisher 3570 valve positioner				0.25	0.25
Fisher 3582 valve positioner				0.17	0.19
Fisher 3610J, 3610JP, 3611JP, 3620J, 3620JP, 3621JP valve positioners				0.37	0.30

1. Consult your Emerson sales office for special stroking speed requirements.

Figure 3. Dimensions



2625NS for Nuclear Service Applications

The 2625NS volume booster uses EPDM (ethylene-propylene) elastomeric parts. These parts have superior resistance to degradation at elevated temperature and radiation levels. This version is designed for nuclear service applications where oil-free supply air is available.

The 2625, 2625SST, and 2625NS are available as safety-related items when processed using the commercial grade dedication section of the 10CFR50, Appendix B, quality assurance program. 10CFR21 reporting is also part of the safety related processing program. Seismic operability testing has been done to qualify both versions as rigid items at levels up to 9g's uniaxial (in each axis). Further nuclear service qualification data is available on request.

Installation

Figure 2 shows typical installations for the 2625, 2625SST, or 2625NS volume booster on piston and diaphragm actuators. A single regulator that supplies both the positioner and booster (or boosters) is recommended. The supply medium must be clean, dry, oil-free air or non-corrosive gas.

Note

Use a clean, dry, oil-free air supply with instruments containing EPDM components. EPDM is subject to degradation when exposed to petroleum-base lubricants.

Keep in mind that many actuators require larger casing or cylinder connections to take full advantage of the booster's ability to deliver its high-volume output. Dimensions are shown in figure 3. Ensure that the supply pressure is connected to correspond with the flow arrow on the booster.

Ordering Information

When ordering, specify:

1. Aluminum or stainless steel
2. Supply and exhaust port sizes. See table 1 for Cv values.
3. Supply pressure range of up to 2.8 bar (40 psig) or up to 10.3 bar (150 psig).
4. Stroking speed information when being mounted at the factory, for proper tuning of the instruments. Specify either critical or non-critical stroke speed time.

Note

Critical stroke speed time example: Valve to stroke in both directions in 4 seconds or less.

Non-critical stroke speed time example: Valve to stroke in approximately 4 seconds in both directions.

5. Nuclear service, if applicable. Consult your Emerson sales office for ordering assistance.

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

4200 Transmitters
D200357X012

Product Bulletin
62.3:4200
August 2018

Fisher™ 4200 Electronic Position Transmitters

Fisher 4210, 4211, 4212, 4215, 4220, 4221, and 4222 instruments are part of the 4200 transmitter series. These instruments can sense the position of rotary or sliding-stem valves, vents, dampers or other devices. When the instrument is mounted, a potentiometer shaft is mechanically connected to the device to sense mechanical motion. For a standard instrument, a single potentiometer is provided for position input or an optional dual element potentiometer is available to allow independent electrical operation of the transmitter and alarm circuits.

The instrument has standard, or long-stroke (see figure 3), capabilities for sliding-stem actuator applications. For long-stroke applications, a multi-turn potentiometer attached to a travel transducer assembly is used to sense linear motion of the actuator stem or other devices. The instrument with standard capabilities can also be used on quarter-turn actuators.

For instruments equipped with electronic travel limit alarms, individual electronic high and low alarm circuits drive separate high and low alarm SPDT relays. The user adjusts the trip point and deadband of the high and low alarms to the desired travel limits.

When the sense potentiometer voltage is higher than the high trip point, the electronic high alarm circuit de-energizes the high alarm relay. When the sense potentiometer voltage is lower than the low trip point, the low alarm circuit de-energizes the low alarm relay. The low trip point may be offset from the high trip point by as little as 5% of the remaining span.

In the event of a power loss to the alarm circuits, both alarms are tripped (both relays are de-energized). This indicates a system failure because the actuator cannot be physically at both travel limits simultaneously. The relay contacts are isolated from the transmitter and alarm circuits.

W9274

FISHER 4200 TRANSMITTER

W4271-1

FISHER 4200 TRANSMITTER ON A CONTROL VALVE

Specifications

Available Configurations

See table 1

Input Signal Source

■ Standard single potentiometer, or optional ■ dual potentiometer is the source for the transmitter and travel limit alarm circuit inputs. Refer to table 2 for zero and span limits.

Transmitter Output Signal

Range: 4-20 mA DC transmitter output
Load Impedance: See figure 1
Output Current Limit: 30 mA DC maximum

Travel Limit Alarms

Number of Possible Alarms: Two or none. Each SPDT relay indicates limit and fault conditions as follows:

Operating Condition	Relay Coil State	NC Contact State	NO Contact State
Travel within limits	energized	open	closed
Travel beyond limits	de-energized	closed	open
Power loss	de-energized	closed	open

NC—Normally closed. Contacts are closed when relay is de-energized
NO—Normally open. Contacts are open when relay is de-energized.

Power Supply Requirements

See table 3

Recommended Power Supply

+24 volts DC nominal

Reference Accuracy

±1% of output span. Includes combined effects of hysteresis, linearity, and deadband

Repeatability

±0.25% of span

Operating Influences

Ambient Temperature: For a 38°C (100°F) change in normal operating conditions, maximum zero shift is ±0.5%, and the maximum span shift is ±0.75% of span
Power Supply: Output signal changes less than ±0.1% when operating terminal voltage varies between 11 and 30 volts DC

Electromagnetic Compatibility for 4211 and 4221

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard. Performance is shown in table 4 below.
Emissions—Class A
ISM equipment rating: Group 1, Class A

Travel Limit Alarm Relays

Type: Two single-pole, double-throw relays
Contacts: 1 Form C, silver-nickel alloy with gold overlay
Service Rating: The relay rating is 5 amperes at either 30 volts DC or 120 volts AC (resistive load).
Life Expectancy: 100,000 operations at rated load, or 50,000 operations at a typical in-rush current of 10 amperes with a 120 volt AC lamp or motor load

Operating Conditions

Condition	Normal and Operative Limits	Transportation and Storage Limits	Normal Reference
Ambient Temperature	-40 to 71°C (-40 to 160°F)	-50 to 80°C (-60 to 180°F)	25°C (77°F)
Ambient Relative Humidity	10 to 95%	10 to 95%	40%

Construction Materials

Transmitter Housing and Covers: Aluminum Alloy
O-Rings: Nitrile
Mounting Hardware: Steel
Pipe Plug: Nickel coated steel
Cable: Nylon-coated stainless steel (long-stroke only)

Mounting

The instrument can mount on the actuator of sliding-stem or rotary valves (refer to figure 3), or it can be used for other applications

-continued-

Specifications (continued)

Electrical Classification

CSA—Intrinsically Safe, Explosion-proof, Dust-Ignition proof

FM—Intrinsically Safe, Explosion-proof, Dust-Ignition proof, Non-Incendive

ATEX—Intrinsically Safe, Type n, Dust, Flameproof

IECEx—Intrinsically Safe, Type n, Dust, Flameproof

Housing

NEMA 4X; CSA Enclosure 4X; IP66

Approximate Weight

Transmitter Without Mounting Bracket: 1.8 kg (4 pounds)

Options

Long-stroke applications: ■ 12 or ■ 24 inch travel

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.

Table 1. Available Configurations

TYPE NUMBER	TRANSMITTER	TRAVEL LIMIT ALARMS	TRAVEL: Standard Stroke Up to 105 mm(1) (Up to 4.125 Inches)	TRAVEL: Long Stroke Up to 610 mm(1) (Up to 24 Inches)	DUAL POTENTIOMETER
4210	X	X	X	- - -	- - -
4211	X	- - -	X	- - -	- - -
4212	- - -	X	X	- - -	- - -
4215	X	X	X	- - -	X
4220	X	X	- - -	X	- - -
4221	X	- - -	- - -	X	- - -
4222	- - -	X	- - -	X	- - -

1. See table 2 for zero and span limits.

Table 2. Zero and Span Limits(1)

TYPE NUMBER	DEGREES OF POTENTIOMETER ROTATION: Zero Position	DEGREES OF POTENTIOMETER ROTATION: Span Min.	DEGREES OF POTENTIOMETER ROTATION: Span Max.	LINKAGE CONNECTION(2)	mm: Zero Position	mm: Span Min.	mm: Span Max.	INCHES: Zero Position	INCHES: Span Min.	INCHES: Span Max.
4210 4211 4212 4215	0 to 90	15	90	1	0 to 51	8	51	0 to 2	0.315	2
				2	0 to 105	17	105	0 to 4.125	0.670	4.125
4220 4221 4222	0 to 884	150	884	12-inch Transducer	0 to 305	105	305	0 to 12	4.125	12
				24-inch Transducer	0 to 610	305	610	0 to 24	12	24

1. Zero position is the range of values over which the transmitter zero can be adjusted. Span is the range of shaft rotation or stem travel the transmitter span can be adjusted. For example, a zero position of 45 degrees and a span of 15 degrees means the transmitter output is 4 mA DC after 45 degrees of shaft rotation. The output then increases from 4 mA DC to 20 mA DC as the shaft rotates from 45 to 60 degrees.
2. Refer to figure 4 for location of connections.

Table 3. Power Supply Requirements and Wiring Connections

	TRANSMITTER TERMINAL VOLTAGE (VDC): Min	TRANSMITTER TERMINAL VOLTAGE (VDC): Max	CURRENT REQUIRED (mA)	FIELD WIRING CONNECTIONS: Supply Wire(1)	FIELD WIRING CONNECTIONS: Signal Wire(2)	FIELD WIRING CONNECTIONS: Relay Return Wire(3)
Transmitter Only	11	30	20 max.	X	X	- - -
Transmitter with Travel Limit Alarms	20	30	80 max.	X	X	X
Travel Limit Alarms without Transmitter	20	30	50 max.	X	- - -	X

X indicates this connection required.
1. Supply wire provides power supply positive connection for electronic circuits and relay coils (in instruments with travel limit alarms).
2. Signal wire provides connection for device receiving 4 to 20 mA transmitter signal.
3. Relay return wire provides separate return wire for relay coil currents.

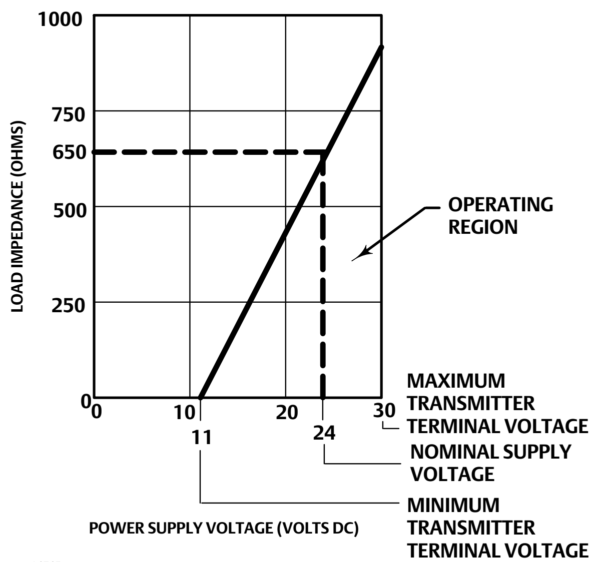
Table 4. Fisher 4211 and 4221 Electronic Position Transmitter EMC Summary Results—Immunity

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(1)
Enclosure	Electrostatic Discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80% 1400 to 2000 MHz @ 3V/m with 1 kHz AM at 80% 2000 to 2700 MHz @ 1V/m with 1 kHz AM at 80%	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	1 kV	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	B
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms 1 kHz AM at 80%	A

Specification limit = ±1% of span
1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

To reduce field wiring requirements from 4 to 3 wires, the transmitter and alarm circuits share the positive supply wire. A separate return wire is required to isolate relay coil currents from the 4-20 mA transmitter signal.

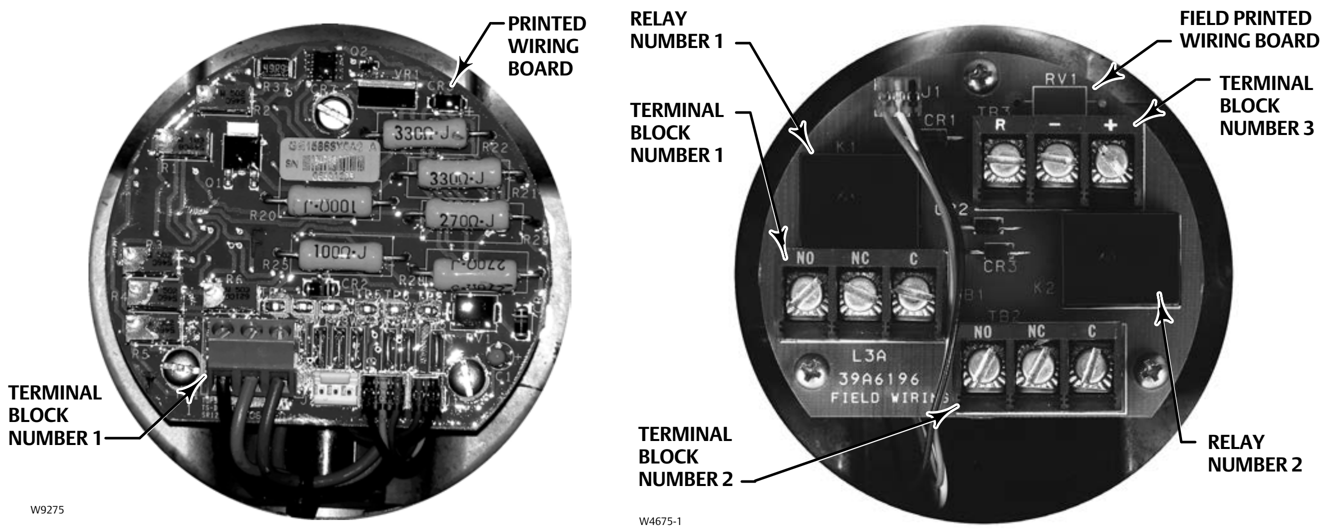
Figure 1. Transmitter Load Limitations



Features

- **High Accuracy**—A precision film-element potentiometer in the standard unit and a precision multi-turn wirewound potentiometer in the long-stroke unit provide exceptional linearity by matching the span of the sense element to the application.
- **Application Versatility**—This instrument may be used with sliding-stem or rotary valves as well as with other mechanical devices such as furnace dampers or louvers.
- **Electronic Travel Limit Alarms**—To eliminate the need for externally mounted mechanical limit switches, instruments with travel limit alarms incorporate comparator circuits that monitor the sense potentiometer voltage output.
- **Adjustable Deadband**—Electronic travel limit alarms have an adjustable deadband up to 10 percent of the maximum span.
- **Compact Design**—The instrument, even with travel limit alarms, uses little space when mounted, allowing room for additional devices.
- **Durable Construction**—A rugged housing and a corrosion-resistant coating on the printed wiring board help protect the instrument from harsh environments.
- **Simple Circuitry**—A simple electronic design combines the best qualities of discrete components and integrated circuits for improved reliability and performance.

Figure 2. Fisher 4210 Transmitter Details



TRANSMITTER COMPARTMENT **FIELD WIRING COMPARTMENT**

- Easy Maintenance—The simple design of the transmitter and alarms allows easy maintenance. The high reliability of the instrument requires minimum spare parts inventory.

- Moisture Resistant—The field wiring compartment is isolated from the electronic compartment. This protects the electronic circuits from any moisture brought into the housing via the field wiring ports.

- Field Reversible Action—The output is easily reversed in the field simply by switching two potentiometer leads on the printed wiring board.

- Electromagnetic Interference (EMI) Filters—Filters between the electronic compartment and the field wiring compartment of the housing help provide protection against electromagnetic interference.

Applications

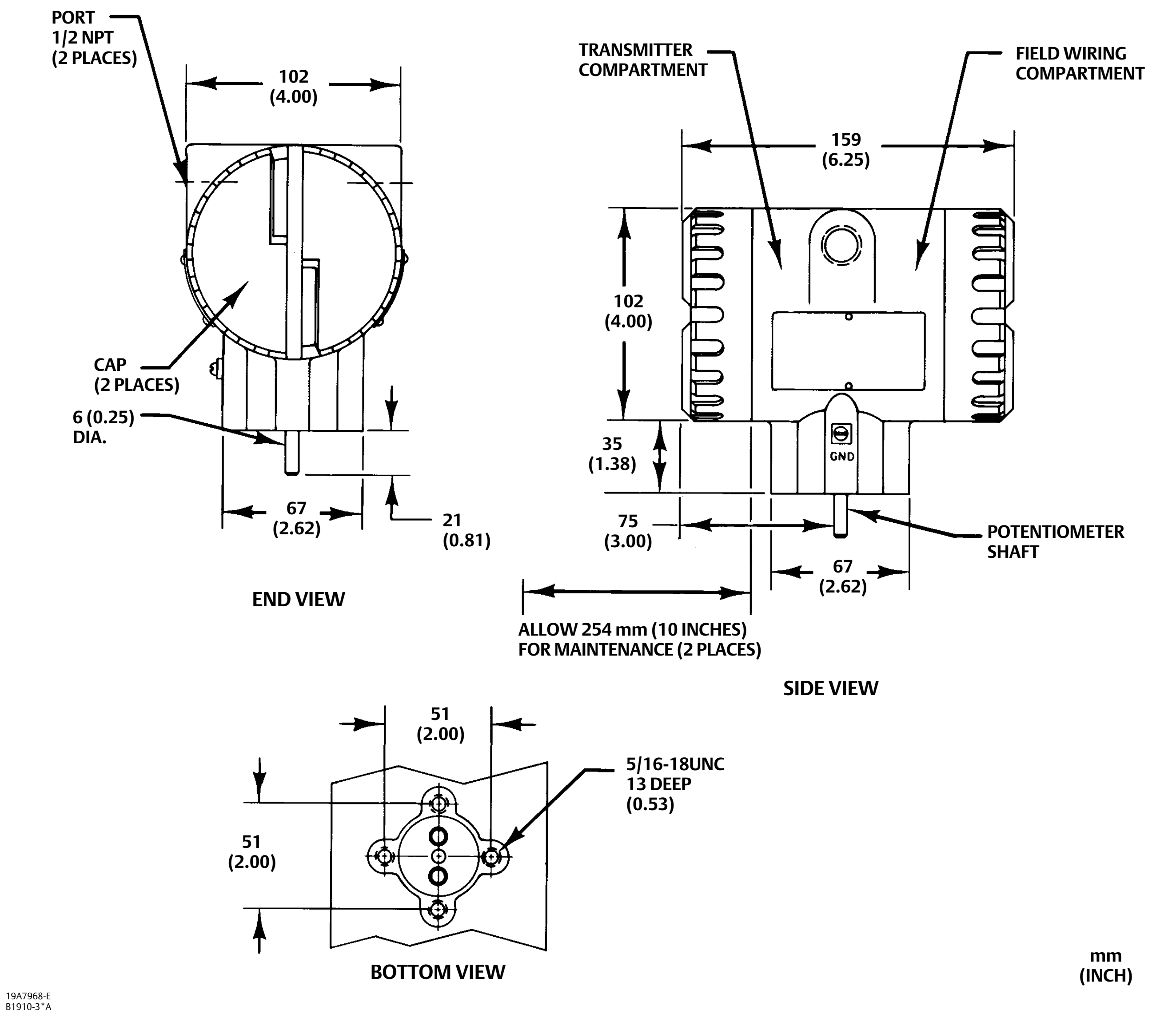
Standard Position Transmitter

Sliding-Stem Valve—In typical valve applications, the transmitter is mounted on the actuator. Two linkage configurations sense up to 51 mm (2 inches) or up to 105 mm (4.125 inches) of stem travel. The linkages incorporate mechanical gearing to linearize the transformation from linear motion to rotational. To reduce the possibility of physical damage if the linkage should slip, the potentiometer has no physical stops. Zero and span can be adjusted as follows:

- *Zero*—Between 0 and 51 mm (2 inches) of travel, or between 0 and 105 mm (4.125 inches) of travel.

- *Span*—Between 9 mm (0.3 inch) minimum span and 51 mm (2 inches) maximum span, or between 17 mm (0.6 inch) minimum span and 105 mm (4.125 inches) maximum span.

Figure 3. Dimensions



Rotary-Shaft Valve—In typical valve applications, the transmitter is mounted on the actuator. A coupling connects the hub of the actuator to the potentiometer shaft. To reduce the possibility of physical damage if the coupling should slip, the potentiometer has no physical stops. Zero and span can be adjusted as follows:

- *Zero*—Between 0 and 90 degrees of shaft rotation.
- *Span*—Between 15 and 90 degrees of shaft rotation.

Other Devices—The transmitter is mounted such that the potentiometer shaft or linkage aligns with the motion of the device. The motion of the device should not exceed the zero and span input signal limits in degrees of rotation.

Long-Stroke Position Transmitter

Long-Stroke Sliding-Stem Valve—The transmitter is mounted on the actuator as shown in figure 3. The travel transducer assembly can sense from a 105 mm (4.125 inch) minimum to a 610 mm (24 inch) maximum stem travel. The sensing element is a multi-turn potentiometer with physical stops. Two travel transducer sizes are available for long stroke applications.

- *Zero*—Between 0 and 305 mm (12 inches) for the small transducer. Between 0 and 610 mm (24 inches) for the large transducer.
- *Span*—Between 105 mm (4.125 inches) minimum and 305 mm (12 inches) maximum for the small transducer. Between 305 mm (12 inches) minimum and 610 mm (24 inches) maximum for the large transducer.

Other Devices—The transmitter is mounted such that the travel transducer aligns with the motion of the device to allow straight retraction of the cable to the transducer. The motion of the device should not exceed the zero and span limits in mm (inches).

Installation

Field wiring is inserted into one of the ports and connected to the terminal blocks mounted on the printed wiring board in the field wiring compartment. The instrument with transmitter circuits and travel limit alarms, and the instrument with alarms only (no transmitter circuits), use terminal blocks numbered 1, 2, and 3 (see figure 2) on the printed wiring board. These terminal blocks are accessible when the field wiring compartment cover is removed. The instrument with transmitter circuits only (no alarms) uses a barrier strip mounted in the field wiring compartment without the printed wiring board. Dimensions of the transmitter housing are shown in figure 3. Mounting dimensions are shown in figure 4.

Ordering Information

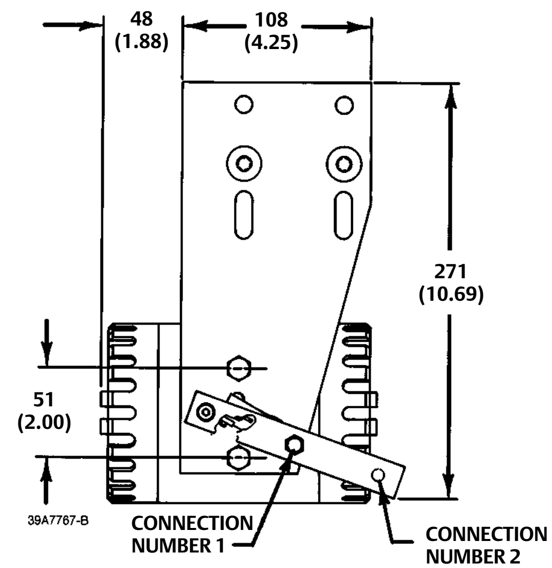
When ordering, specify:

1. Transmitter type number.
2. Actuator type, size, and length of stroke. (Note: For Fisher 585CLS actuators, specify yoke boss and cylinder size.)
3. Valve body design.
4. Other applications

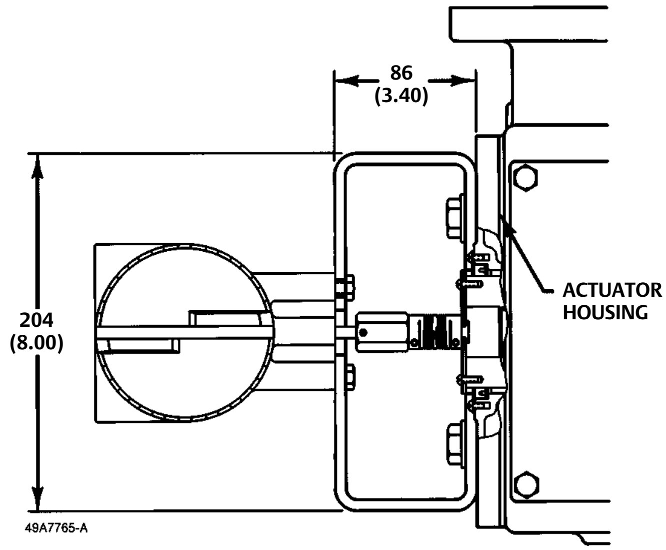
Note

Contact your Emerson sales office or Local Business Partner for assistance in determining the type and style of linkage and mounting hardware required for the application.

Figure 4. Mounting Dimensions

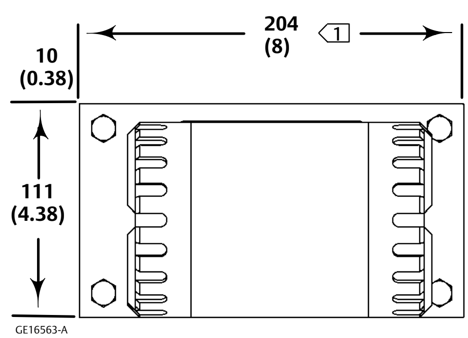


TYPICAL MOUNTING BRACKET DIMENSIONS FOR SLIDING-STEM ACTUATORS



TYPICAL MOUNTING BRACKET DIMENSIONS FOR ROTARY-SHAFT ACTUATORS

FISHER 4200 TRANSMITTER MOUNTING



MOUNTING BRACKET DIMENSIONS FOR FISHER 585CLS ACTUATORS WITH A 152 mm (6-INCH) CHANNEL

Note:
1 For other sizes of 585CLS actuators, the mounting plate length will change depending on the channel width.

FISHER 4200 TRANSMITTER (LONG-STROKE) MOUNTING

Emerson Automation Solutions
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Dubai, United Arab Emirates
Singapore 128461 Singapore

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EMERSON

Fisher™ 4320 Wireless Position Monitor

The Fisher 4320 eliminates the need for wiring to an on/off pneumatically actuated valve. It provides a precise wireless feedback signal to indicate equipment position with a percent (%) of span plus on/off indication. The 4320 can be used to control and/or monitor valves, sliding-stem regulators, displacement and float level sensors, and relief valves. It is designed to be simple to use, compact, and easily mounted.

The control portion of the 4320 accepts commands through the wireless network from a control system and provides a pneumatic on/off signal to an actuator. The feedback portion of the instrument periodically reads the position of a measured device and transmits that data over the wireless network. Transmitted data includes the percent of span value, limit switch status indications, valve set point, internal device temperatures, and power module voltage. It also checks for service and configuration instructions from host systems such as distributed control systems (DCS), asset management systems (AMS), and supervisory control and data acquisition (SCADA) systems.

The 4320 is normally powered by a battery sourced power module. This makes it easier to design new applications or implement into retrofit locations. An external power option is also available.

The 4320 uses a linkage-less feedback design that eliminates direct contact with the measured device (e.g., valve, regulator, level, louver, or other devices) eliminating physical contact and wear.

IEC 62591/ *Wireless*HART® communication protocol, operating at 2.4 Ghz, is utilized and is approved for use globally.

Instrument calibration and commissioning is performed with a push button and liquid crystal display (LCD) interface. This simplicity eliminates the need for tools or the setting of cams during set-up, saving you time.

Designed to meet intrinsically safe and non-incendive requirements, this instrument delivers scalable functionality in a small package. Due to the energy-limiting nature of the design, this intrinsically safe device is suitable for use in all zone locations. The battery sourced power module option has no cable conduits.

Specifications

Available Mountings

- Quarter-turn rotary-shaft,
- Sliding-stem, or
- Linear applications

Can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards.

Input Measurement (Valve or Process)

Stem Travel (linear movement)

Minimum: 2.5 mm (0.10 inch)
Maximum: 210 mm (8.25 inches)

Shaft Rotation (rotary movement)

Minimum: 45°
Maximum: 90°

Shaft Rotation (rotary movement, arced array)

Minimum: 13°
Maximum: 30°

Measurement Output

Analog: 0-100%
Discrete: on/off switches (2)

Reference Accuracy

Standard: 1% of span
Optional: 0.4% of span

On/Off Control

Output Signal

Pneumatic signal as required by the actuator, up to 95% of supply pressure

Minimum Span: 3.1 bar (45 psig)
Maximum Span: 7 bar (101 psig)
Action: Single or Double Acting

Supply Pressure

Minimum: 3.1 bar (45 psig)
Maximum: 7 bar (101 psig)

Supply Medium

Air or Natural Gas

Supply medium must be clean, dry, and non-corrosive. The supply air at the device should have a dew point less than -20°C (-4°F).

Per ISA Standard 7.0.01

A maximum 40 micrometer particle size in the air system is acceptable. Further filtration down to 5 micrometer particle size is recommended. Lubricant content is not to exceed 1 ppm weight (w/w) or volume (v/v) basis. Condensation in the air supply should be minimized.

Per ISO 8573-1

Maximum particle density size: Class 7
Oil content: Class 3
Pressure Dew Point: Class 3 or at least 10°C less than the lowest ambient temperature expected

Air Consumption(1)

4320

At 5.5 bar (80 psig) supply pressure:
0.036 m^3/hr (1.27 scfh)

Pilot Valve Leakage

Maximum at 20°C: 8 ml/min (0.0003 scfm/min)
Maximum at -20°C: 800 ml/min (0.028 scfm/min)

Air Capacity / Flow Rate

Supply Pressure: 1.2 Cv

Connections (Optional)

Supply, Output Pressure, and Vent: 1/4 NPT

Wireless Set Point Command

IEC 62591 (*Wireless*HART) 2.4 GHz DSSS

Local User Interface

Liquid Crystal Display (LCD)
Two pushbuttons for navigation, setup, and calibration

Communication Protocol

HART 7 and IEC 62591 (*Wireless*HART)

-continued-

Table of Contents

Specifications (continued)

Maintenance Port Communication Signal

Bell 202 Voltage Signaling: 1200 bps binary phase-continuous Frequency-Shift-Keying (1220 Hz mark, 2400 Hz space) superimposed on voltage level

Initial Dynamic Variable Assignments (Default)

Dynamic Variable Assignment	DEVICE STRUCTURE		
	Control	**Snap Control**	**Monitor**
Primary (PV)	Position	Position	Position
Secondary (SV)	Set Point	Set Point	Switch States
Tertiary (TV)	Switch States	Switch States	Cycle Counter
Quaternary (QV)	Supply Voltage	Supply Voltage	Supply Voltage

Wireless Communication Signal

2.4 Ghz, DSSS, IEC 62591 (*Wireless*HART)
Maximum 10 dBm (10 mW) EIRP at 2.46 GHz

Wireless Classifications

Class A digital device, complies with part 15 of the FCC Rules
Contains FCC ID: LW2RM2510
Contains IC: 2731A-RM2510

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard
Emissions—Class A & B
ISM equipment rating: Group 1, Class A & B

Vibration Testing

Meets or exceeds vibration levels specified in ANSI/ISA 75.13.01 1996 (2007):
4 mm peak to peak at 5 Hz,
2 g from 15-150 Hz, and
1 g from 150- 2000 Hz

European Directive Information

This product complies with the following directives:

ATEX Directive (94/9/EC)

Electro Magnetic Compatibility (EMC) (2004/108/EC)

Radio and Telecommunications Terminal Equipment Directive (R&TTE) (1999/5/EC)

Refer to Safety Instructions (D103022X012) for the Declaration of Conformity

Operating Temperature Limits(2)

Monitoring
Battery Power: -40 to 85°C (-40 to 185°F)
External Power: -40 to 80°C (-40 to 176°F)
LCD may not be readable below -20°C (-4°F)

With Pneumatic Output (On/Off Control Option): -20 to 50°C (-4 to 122°F)

Temperature Sensitivity

0.06% change per degree C

Storage Temperature Limits(2)

-40 to 70°C (-40 to 158°F)

Humidity Limits

10-95% Non-Condensing Relative Humidity

Electrical Classification

CSA (C/US)— Intrinsically Safe

ATEX— Intrinsically Safe

IECEx— Intrinsically Safe

Electrical Housing

Type 4X, IP66 & IP67

Other Classifications/Certifications

CUTR—Customs Union Technical Regulations (Russia, Kazakhstan, Belarus, and Armenia)

INMETRO—National Institute of Metrology, Quality and Technology (Brazil)

NEPSI—National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (China)

PESO CCOE—Petroleum and Explosives Safety Organisation - Chief Controller of Explosives (India)

TIIS—Technology Institution of Industrial Safety (Japan)

Contact your Emerson sales office or Local Business Partner for classification/certification specific information

-continued-

Specifications (continued)

IEC 61010 Compliance

Meets Pollution Degree 2

Adjustments

Zero and Maximum Span through local interface

Dimensions

See figure 1, 2, and 3

Weight

Monitoring: 0.57 kg (1.25 lbs)
On/Off Control: 1.6 kg (3.4 lbs)

Power Module

Standard —Lithium (non-rechargeable)

Power Module Limits

Standard— 5 years at update rate of 16 seconds or longer with 3 additional devices communicating through it
Extended-Life— 10 years at update rate of 8 seconds or longer with 3 additional devices communicating through it

Shelf life —10 years (radio off)

External Power (Optional)

12 - 28 volts DC
100 mA maximum operating current
Polarity Insensitive
Wire Size— 14-20 gauge

Update Rates

For position feedback, temperature, and power module voltage—selectable from 1 second to 1 hour; 1s, 2s, 4s, 8s, 16s, 32s, 1 to 60 minutes

Note: Sample rate for position feedback is normally the same as the update rate.

Construction Material

Housing: A03600 low copper aluminum alloy
Elastomers: nitrile, fluorosilicone

1. Normal m3/hour - Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh - Standard cubic feet per hour at 60°F and 14.7 psia.
2. The temperature limits in this document and any applicable standard or code limitation for valve should not be exceeded.

Features

- Simplicity— The 4320 is easy to use. The linkage-less feedback system is easy to install with a magnet array assembled to the valve stem. The 4320 has a local user interface that will allow you to calibrate the instrument. The full text display in the local interface is easy to navigate, in part due to the selection of languages.
- Quick Installation—Simply attach the 4320, calibrate and commission to any control system. With the pneumatic output option, only air is needed to automate an on/off valve. No conduit easements or permits are required with the standard or extended life power modules, thus saving time, costs, and effort in documenting cable runs and associated design reviews. Because there is no wiring, implementation times are shortened for device installation, setup, and commissioning.
- Energy Efficiency—The optional pneumatic output has ultra-low steady state air consumption. Air generation costs can be reduced.
- Reliability—The *Wireless*HART self-organizing mesh network provides the high level of communication reliability required in process control.
- Power Options—More than 5 years operation is typical using standard life and extended life power modules. Optional ability to use local 12-28 V power in the field.
- Minimized Maintenance—The feedback design provides more accurate monitoring and eliminates physical wear-out common in traditional valve instruments. This results in less frequent maintenance, repair, and re-calibration. Power modules can be easily replaced without losing power to the device, using the “hot swap” feature to maintain network reliability.
- Diagnostics—Predefined device, network, and system diagnostics provide details on the health of the device and its ability to communicate. Device diagnostics include whether the device calibration has been completed and power module health. The number of completed cycles is measured for the monitored equipment.

Note

A cycle is the change from open to closed position or vice versa. This is determined by moving past the trigger point in each direction.

- Security—The *Wireless*HART self-organizing mesh network includes encryption, authentication, and authorization mechanisms to provide the level of security required in process locations and by the Information Technology (IT) industry.

Integration

The 4320 is designed for use in most monitoring applications, replacing manual efforts to audit or verify equipment position. Examples include startup and shutdown situations, product changeover, product isolation, and sampling activities.

One implementation method can be accomplished using an overlay approach; adding wireless instrumentation on top of existing instrumentation. This preserves the existing infrastructure and enables improved information for operation, reactiveness, maintenance, and safety.

A second approach is to replace older limit switches and position transmitters, either because of increased maintenance requirements or dated wiring infrastructure that has become or is believed to become an operational concern.

A third approach is to use the 4320 where feedback is not possible with standard wired options. For example, on rotating equipment, where the elimination of wires makes feedback possible.

The wireless nature of this device leads to its implementation in a wide range of systems, from programmable logic controllers (PLC), to DCS, AMS, and SCADA systems.

System integration for typical in-plant operations is available through a Smart Wireless Gateway.

Principle of Operation

Valve position is sensed through the non-contact, linkage-less feedback sensor. There are no moving linkages and the 4320 is physically separated from the valve or actuator through the use of a magnetic Hall effect sensor. A magnetic array is mounted to the valve or actuator stem and the sensor is embedded in the 4320 housing. The sensor is electrically connected to the printed wiring board to provide a wireless travel feedback signal.

The control portion of the 4320 accepts commands through the wireless network from a control system and provides a pneumatic on/off signal to an actuator.

The internal electronics periodically reads the position of travel and transmits that data over the wireless network. The device also checks for instructions from host systems like DCS, SCADA and asset management systems. The device “sleeps” until the next reading, enabling longer power module life. The device is still powered up in the sleep mode but operating at ultra-low power consumption levels.

Setup/Installation

Device setup is typically performed prior to installation and includes setting two network parameters. These parameters are entered using a handheld such as the 475 Field Communicator. Calibration is performed after installation and requires using the local interface to place the device at the end points of travel range. The device is then ready for commissioning and service.

Battery Sourced Power Module Life

The 4320 uses power efficient measures to keep energy consumption to a minimum. However, there is a finite amount of energy within the power module. The life expectancy of the module is affected by two things; 1) the reporting rate, and 2) the number of devices in the network that must communicate through the 4320.

Typical on/off applications will operate effectively at one minute reporting periods.

Ordering Information

When ordering, specify:

1. Position monitor control
   - Monitoring
   - On/off control option
2. Power source
   - Battery sourced power module
   - External power option
3. Mounting requirements

Feedback sensor and mounting brackets are part of the mounting.

For rotary movement indicate if mounting requirements are:

- 90° NAMUR,
- 90° ISO mounting, or
- 30° for special applications

For linear movement, indicate travel length:

- 7 mm (1/4 inch),
- 19 mm (3/4 inch),
- 25 mm (1 inch),
- 38 mm (1-1/2 inch),
- 50 mm (2 inch),
- 100 mm (4 inch), or
- 210 mm (8-1/4 inch) strokes

Note

As a general rule, do not use less than 50% of the magnet assembly for full travel measurement. Performance will decrease as the assembly is increasingly subranged.

Contact your Emerson sales office or Local Business Partner if longer travel lengths are required.

Note

Contact your Emerson sales office if mounting on non-Emerson valves is required.

Figure 1. Dimensions

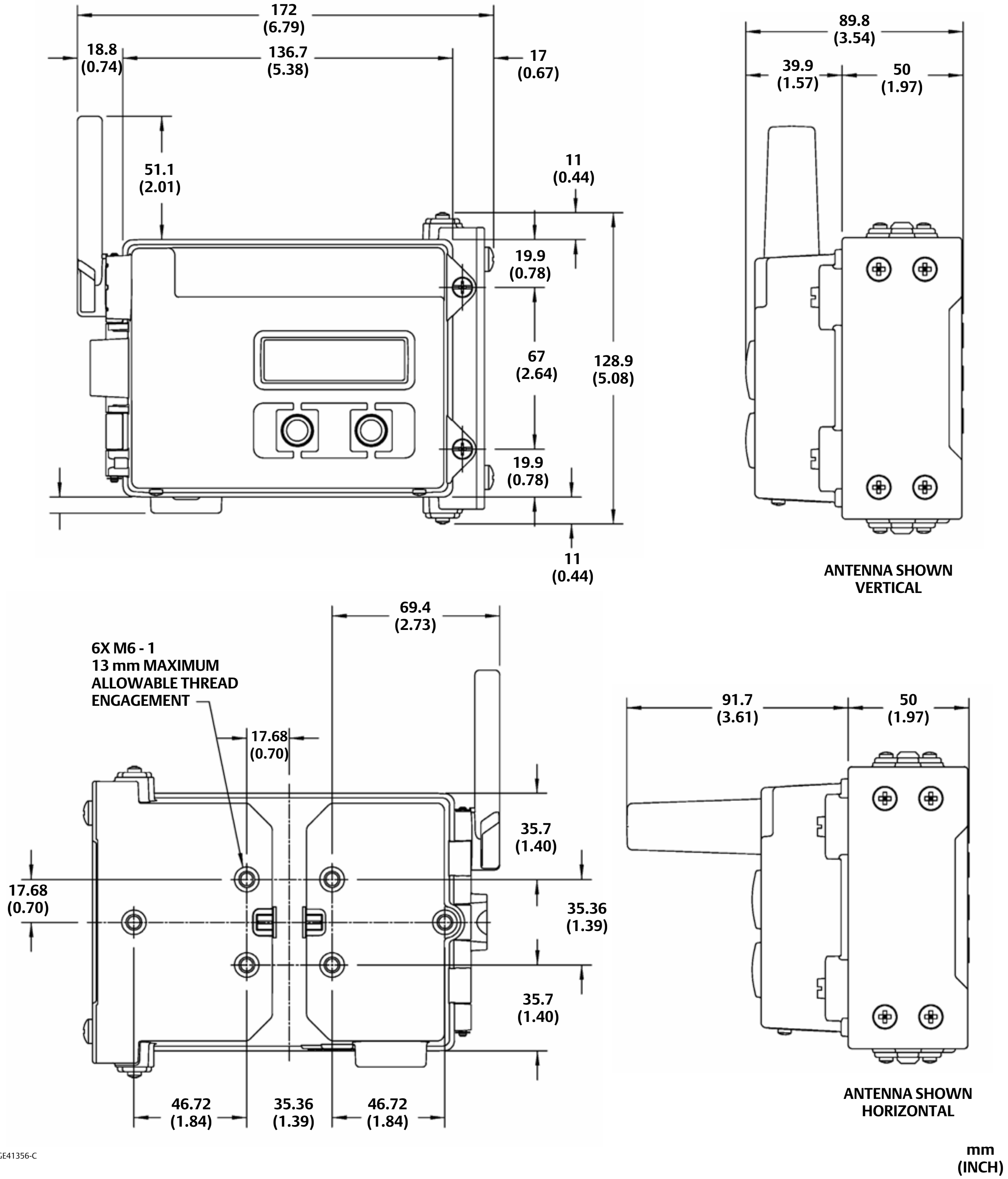


Figure 2. Dimensions with On/Off Control Option

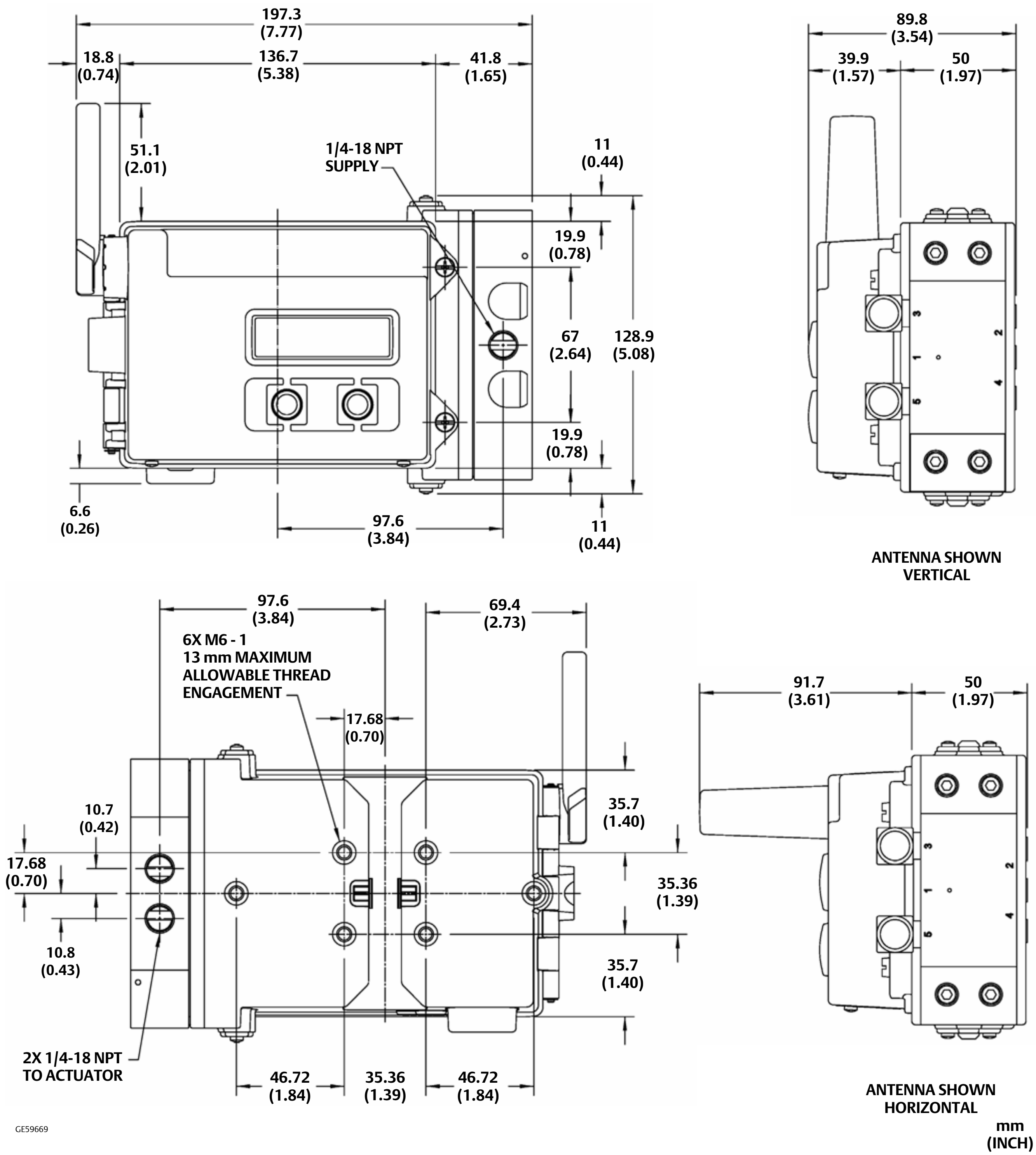
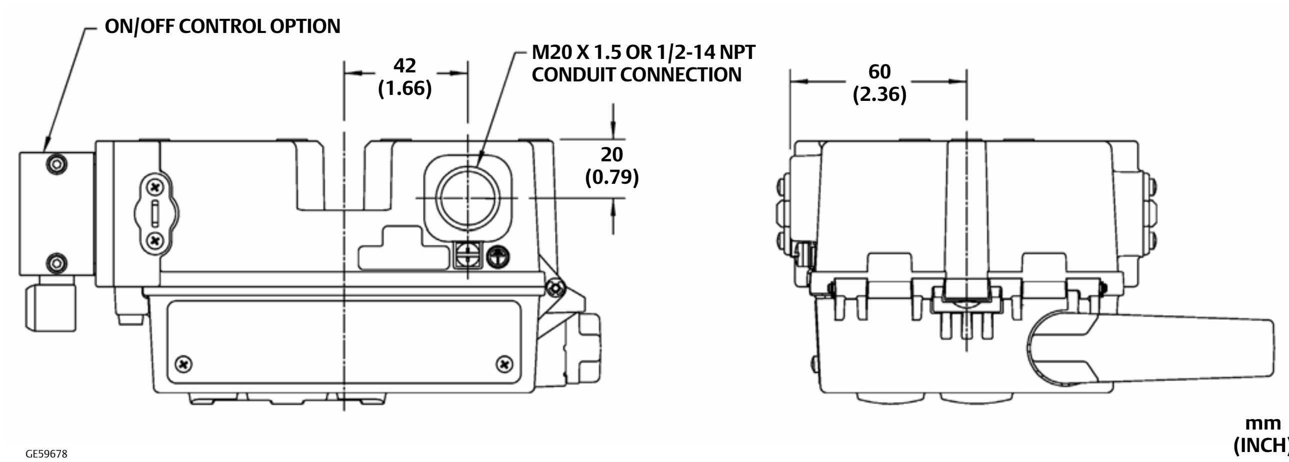


Figure 3. Dimensions—External Power Option



Product Bulletin
62.3:4320
October 2017

4320 Position Monitor
D103286X012

For additional information on the 4320 scan or click the QR code

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Fisher™ SS-263 Volume Booster

The Fisher SS-263 volume booster is used in conjunction with Fisher control valves with double-acting piston actuators. Large piston actuators require proportionally larger volumes of air to stroke; typical valve positioner output cannot usually provide enough of a volume of air to quickly and fully stroke actuators such as these. The SS-263 volume booster solves this by amplifying the output from the valve positioner to increase actuator stroking speed. The dual-ported design of the booster amplifies both the supply and exhaust flow, which are both precisely controlled by means of a pneumatic signal from the valve positioner.

The booster incorporates fixed deadband, soft seat construction, and an integral bypass restriction. The booster can be tuned by adjusting the bypass restriction to respond to small or large input signal changes, without sacrificing steady-state accuracy. The SS-263 is essentially a higher capacity Fisher 2625 booster allowing up to three 2625's to be replaced with just one SS-263. The booster also incorporates a robust flanged-style mounting that increases the unit's resilience to vibration damage, while allowing for easy removal during field maintenance.

The standard noise attenuating exhaust trim allows air to be exhausted quickly and quietly from the actuator. Several integrated diagnostic connections on the body of the booster allow connections to be made without the need to remove the unit from the actuator. Such connections allow for diagnostic testing, actuator bypass assembly hook-up for use with handwheel operated actuators, and multiple accessory connections. Multiple accessories can be connected directly to the booster, eliminating long lengths of tubing and simplifying the overall hook-up schematic for easy field maintenance.

The SS-263 complies with the requirements of ATEX Group II Category 2 Gas and Dust and is certified for use in Safety Instrumented Systems (SIS) applications. Compliance is identified on the product by labels affixed to the housing.

Features

- Fast Response – The SS-263 delivers high-volume output for fast stroking speeds when responding to large input signal changes and low-volume output when responding to small input changes.

- High Capacity – Flow capacities of roughly three times higher than the 2625 booster result in the need for fewer fittings, tubing, and units.

- Noise Attenuation – Exhaust is passed through specially designed passages to reduce the amount of ambient noise that is generated.

- Adjustable Response – The integral bypass restriction allows the booster to be easily and readily tuned to operate under small or large input signal changes.

- **Auxiliary Supply Connections –** Supply air is readily available through two 1/4 NPT connections that are built into both sides of the unit for use with a Fisher 377 trip valve or other accessory.

- **3 in 1 Connection –** This special connection can provide any of the following connections, if needed.

  - 1/4 NPT diagnostic connection for easy testing

  - 1/4 NPT actuator bypass assembly connection for use on an actuator with a handwheel

  - 3/4 NPT connection, with the removal of a bushing, for use with a high capacity dump valve

- **Soft Seated Construction -** Soft seated exhaust and supply valves provide for bubble tight shutoff to reduce unnecessary air consumption and ensure fail mode upon loss of plant air.

- **Robust Mounting –** Flanged-style actuator mounting provides ease of maintenance, simplified tubing, compactness, and high vibration resistance.

Table of Contents

Specifications

Supply Pressure Ranges
Maximum pressure must not exceed 10.3 bar (150 psig).

Input Signal
Positioner output

Maximum Input Signal Pressure(1)
10.3 bar (150 psig)

Input-to-Output Pressure Ratio
Fixed at 1 to 1

Construction Materials
Body: Aluminum, S31600
Seat Ring: Brass, S31600
Diaphragms: Nitrile/Nylon
Upper and Lower Valves: Nitrile/Aluminum
O-Rings: Nitrile and Fluorocarbon
Cap Screws: SAE GR 5 NCF3, 316 SST
Mounting Adaptor: S17400 DBL 1150
Mounting Studs: SA193-B7 NCF2
Mounting Nuts: SA194-2H NCF2
Mounting Washers: Plated Carbon Steel

Operative Temperature Limits(1)
-40 to 71°C (-40 To 160°F)

Connections:
Input Signal: 1/4 NPT
Supply: 1 NPT
Output: 1 NPT or 1-1/4 NPT(2)

Port Diameters
Supply Port: 19 mm (0.750 inch)
Exhaust Port: 19 mm (0.750 inch)

Maximum Flow Coefficients
Supply: 9.5 Cv
Exhaust: 9.5 Cv
C1: 35
Xt: 0.77

Hazardous Area Classification
Complies with the requirements of ATEX Group II Category 2 Gas and Dust

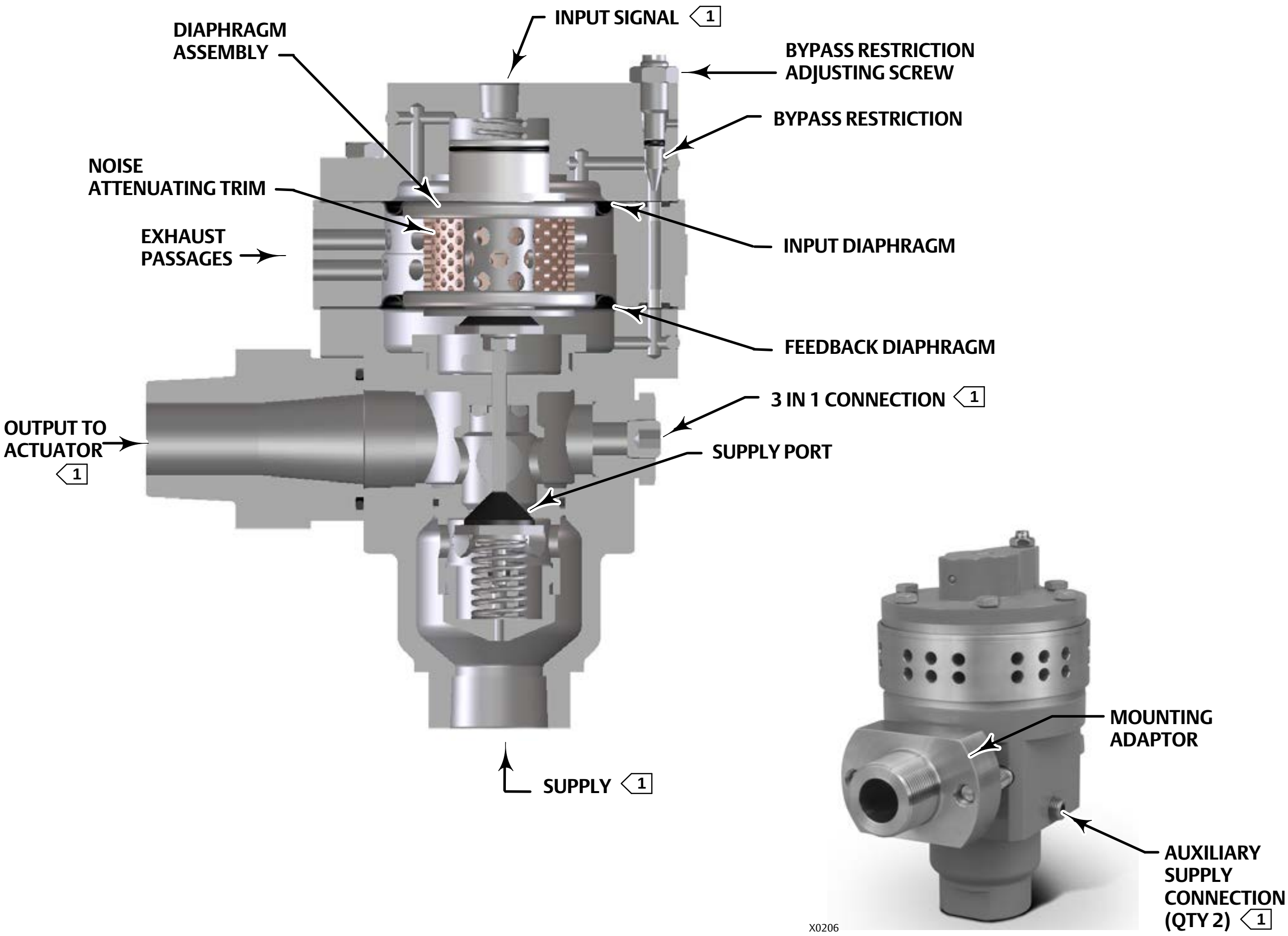
CE Ex II 2 G D

Safety Instrumented System (SIS) Classification
SIL3 capable - certified by exida Consulting LLC

Approximate Weight
Aluminum: 3.6 kg (8 lbs)
Stainless Steel: 10.8 kg (24 lbs)

1. The pressure/temperature limits in this manual and any applicable standard or code limitation for valve should not be exceeded.
2. Consult your Emerson sales office or Local Business Partner for additional sizes.

Figure 1. Sectional View



1 See figure 2 for pressure connection information.

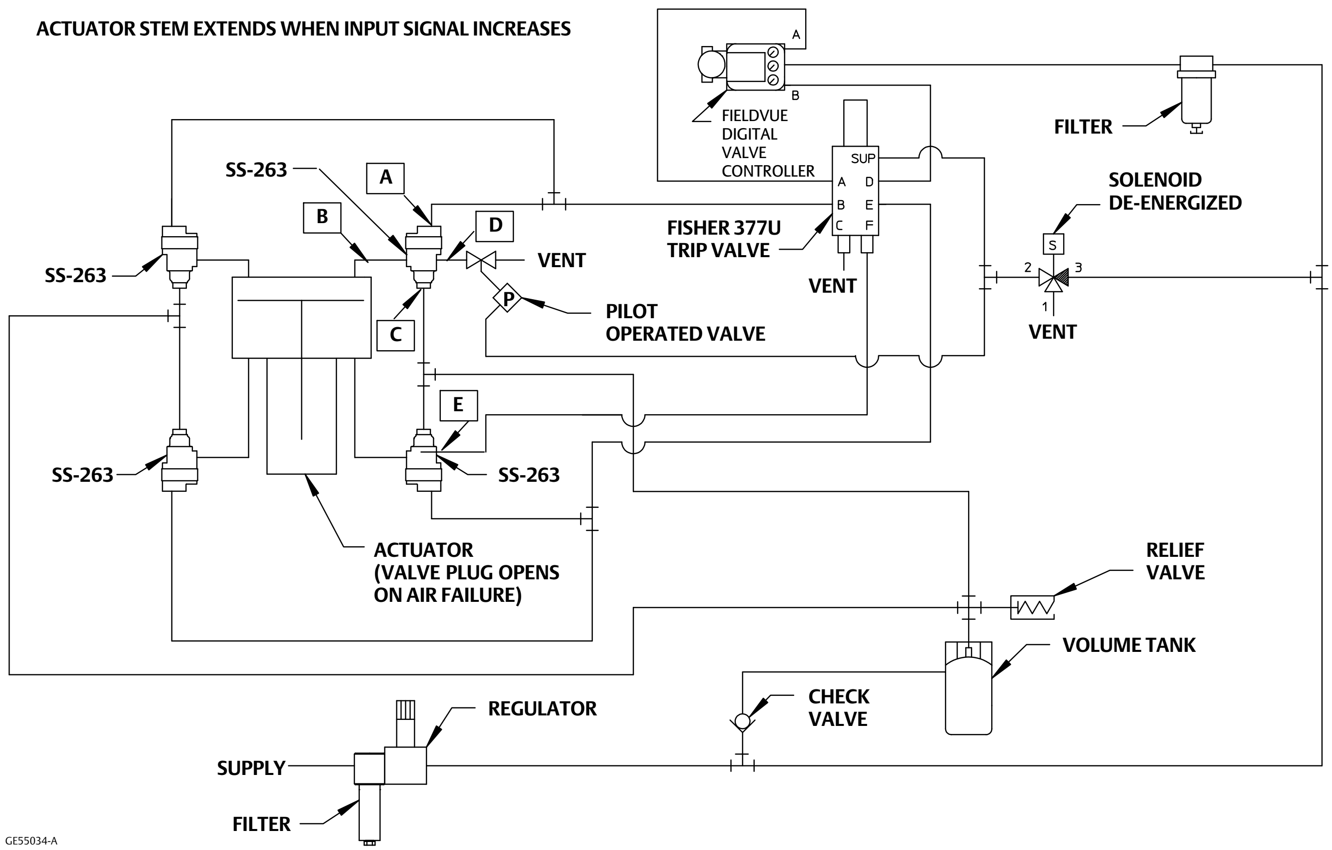
Principle of Operation

Refer to figure 1.

Because of the restriction, large input signal changes register on the booster input diaphragm sooner than in the actuator. A large, sudden change in the input signal causes a pressure differential to exist between the input signal and the feedback diaphragm of the booster. When this occurs, the diaphragms move to open either the supply port or the exhaust port, whichever action is required to reduce the pressure differential. The port remains open until the difference between the booster input and output pressures returns to within the deadband limits of the booster.

With the bypass restriction adjusted for stable operation, signals having small magnitude and rate changes pass through the bypass restriction and into the actuator without initiating booster operation. Both the supply and exhaust ports remain closed, allowing the output of the digital valve controller to act directly on the actuator piston.

Figure 2. Typical Installation



SS-263 Pressure Connections:
A: Input Signal
B: Output
C: Supply
D: Diagnostics, dump valve, or actuator bypass assembly connection
E: Auxiliary Supply

Fisher Optimized Digital Valve Package

The SS-263 volume booster is available as an accessory(s) in Fisher Optimized Digital Valve (ODV) packages, see figure 2 for a typical installation in a compressor antisurge application. An ODV package is a complete, engineered solution designed for demanding applications including, but not limited to, compressor antisurge and turbine bypass. The package includes the actuator, FIELDVUE digital valve controller, and all other accessories; everything necessary for a complete installation.

ODV packages are suited towards applications that typically require fast stroking time and the ability to respond accurately to small travel setpoint changes. Applications such as compressor antisurge and turbine bypass can call for very large valves, over NPS 36, which require full travels of up to 23-7/8 inches.

Typically valves such as these will need large pneumatic double acting piston actuators, to provide the thrust needed for excellent dynamic performance and ANSI Class V seat leakage.

The SS-263 provides the necessary flow capacity to quickly fill and quietly exhaust either side of the piston cylinder in these large actuators, providing full stroke times in less than 2 seconds on positioner control and in under 1 second on solenoid trip.

Existing installations including, but not limited to the applications above can greatly benefit with a retrofit ODV package including the SS-263 volume booster by not only simplifying piping and connections, but also by increasing performance and reliability of the installation.

Please contact your Emerson sales office or Local Business Partner for more information on Optimized Digital Valve packages.

Installation

Figure 2 shows a typical installation for the SS-263 volume booster on the Fisher 685 double-acting piston actuator. A single regulator that supplies both the positioner and booster (or boosters) is recommended. The supply medium must be clean, dry, oil-free air.

Due to the large size of the supply connection and weight of the volume booster the special mounting adaptor should be used when possible. This adaptor is provided by Emerson Automation Solutions as a component of the SS-263.

The SS-263 exhausts air through specially designed ports located on the perimeter of the diaphragm spacer assembly. These passages must be kept clear and free of debris or foreign materials for proper performance.

Ordering Information

The SS-263 will only be available to order as an accessory for Fisher control valve assemblies and will not be sold individually. Please contact your local Emerson sales office or Local Business Partner for more information or to request a quote.

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Fisher™ VBL Volume Booster

The Fisher VBL volume booster is used in conjunction with a positioner on a throttling control valve to increase stroking speed.

The booster incorporates fixed deadband, soft seat construction, and an integral bypass restriction to eliminate positioner saturation problems that can occur with volume boosters that do not have these features. Adjustment of the integral bypass restriction is necessary for system stability. This adjustment does not affect the deadband of the volume booster, but does permit the control valve to respond to small input signal changes without sacrificing steady-state accuracy. It also allows the booster to deliver high-volume output for fast stroking when large, rapid input signal changes occur.

The volume booster is used to improve stroking speed. If precision valve control is required, the use of a positioner is recommended. If the volume booster is to be used only with an actuator, for on-off control, the integral bypass restriction on the booster must be closed (turned fully clockwise).

Connectors and piping can be installed with the VBL volume booster for diagnostic testing.

X0648

Features

- **Fast Response**—Booster delivers the volume needed for rapid actuator stroking when large input changes suddenly occur.
- **Adjustable Response**—Integral bypass restriction tunes the booster response so that smooth actuator motion follows the slow signal changes.
- **Efficient Operation**—Soft seats provide tight shutoff to reduce unnecessary air consumption and eliminate saturation of positioner relays.
- **Maintains Accuracy**—Booster permits high actuator stroking speeds upon demand without degrading the positioner steady-state accuracy.

Specifications

Input Signal

Positioner output

Maximum Input Signal Pressure(1)

VBL-1 and VBL-3: 5.5 bar (80 psig)
VBL-2 and VBL-4: 10.3 bar (150 psig)

Input to Output Pressure Ratio

Fixed at 1 to 1

Supply Pressure Ranges(1)

When used in conjunction with a positioner or other pneumatic accessory, always pipe the positioner and booster with one common supply through a Fisher 67D, 67DR, or 95H regulator (see figure 2). A high-capacity filter, such as the Fisher 262K, should be installed in the supply line to the regulator. Supply pressure also must not exceed the maximum pressure rating of the actuator.

Operative Temperature Limits(1)

-40 to 93°C (-40 to 200°F)

Maximum Flow Coefficients

See table 1

Connections

Input Signal: 1/4 NPT
Supply and Output: 1/2 NPT

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

II 2 G D Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature (Tx) depends on operating conditions

Gas: T5, T6
Dust: T85...T93

Safety Instrumented System Classification

SIL3 capable - certified by exida Consulting LLC

Construction Materials

Body: Aluminum
Diaphragms: HNBR with nylon fabric
Upper and Lower Valves: HNBR
O-Rings: HNBR
Connectors for Diagnostic Testing: ■ Stainless steel or ■ brass

Approximate Weight

1.0 kg (2.2 lb)

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any applicable code or standard should not be exceeded.

Table 1. Maximum Flow Coefficients

Instrument	Supply Port Coefficients	Exhaust Port Coefficients
	C_v	C_v
VBL-1 volume booster	2.5	1.1
VBL-2 volume booster	2.5	1.1
VBL-3 volume booster	2.5	1.8
VBL-4 volume booster	2.5	1.8
FIELDVUE™ DVC6200, DVC6200 SIS, DVC6200f, DVC6200p, DVC6000, DVC6000 SIS, DVC6000f digital valve controllers	0.37	0.31
FIELDVUE DVC2000 digital valve controller: Low pressure relay High pressure relay	 0.13 0.19	 0.15 0.20
Fisher 3570 valve positioner	0.25	0.25
Fisher 3582 valve positioner	0.17	0.19
Fisher 3610J, 3610JP, 3611JP, 3620J, 3620JP, 3621JP valve positioners	0.37	0.30

Principle of Operation

Refer to figures 1, 2, and 3. Because of the restriction, large input signal changes register on the booster input diaphragm sooner than in the actuator. A large, sudden change in the input signal causes a pressure differential to exist between the input signal and the output of the booster. When this occurs, the diaphragms move to open either the supply port or the exhaust port, whichever action is required to reduce the pressure differential. The port remains open until the difference between the booster input and output pressures returns to within the deadband limits of the booster. With the bypass restriction adjusted for stable operation, signals having small magnitude and rate changes pass through the bypass restriction and into the actuator without initiating booster operation.

Both the supply and exhaust ports remain closed, preventing unnecessary air consumption and possible saturation of positioner relays.

Figure 1. Volume Booster Sectional View

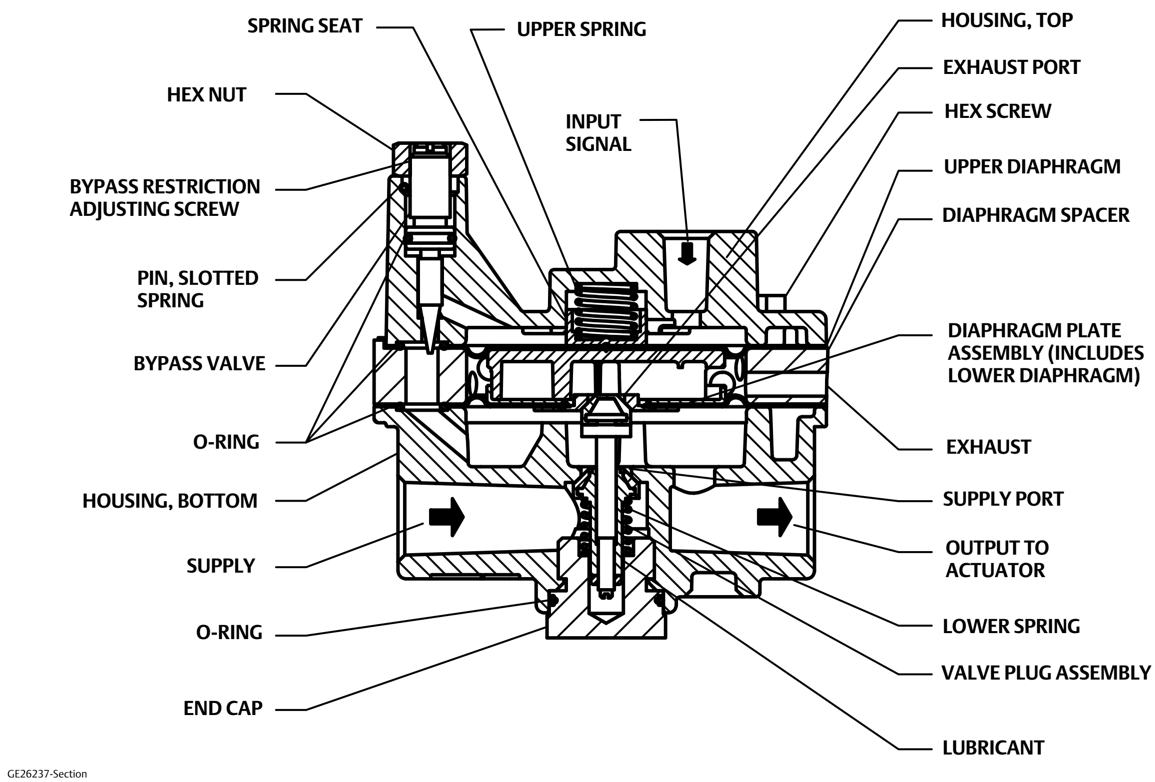


Figure 2. Typical Installation with Piston Actuator

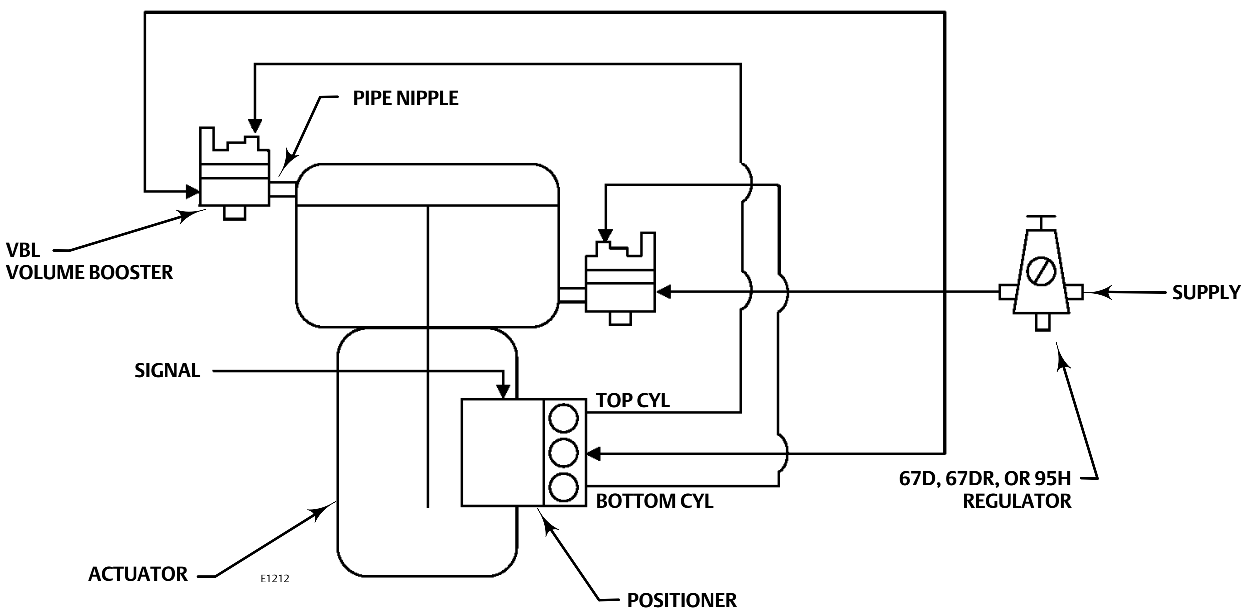
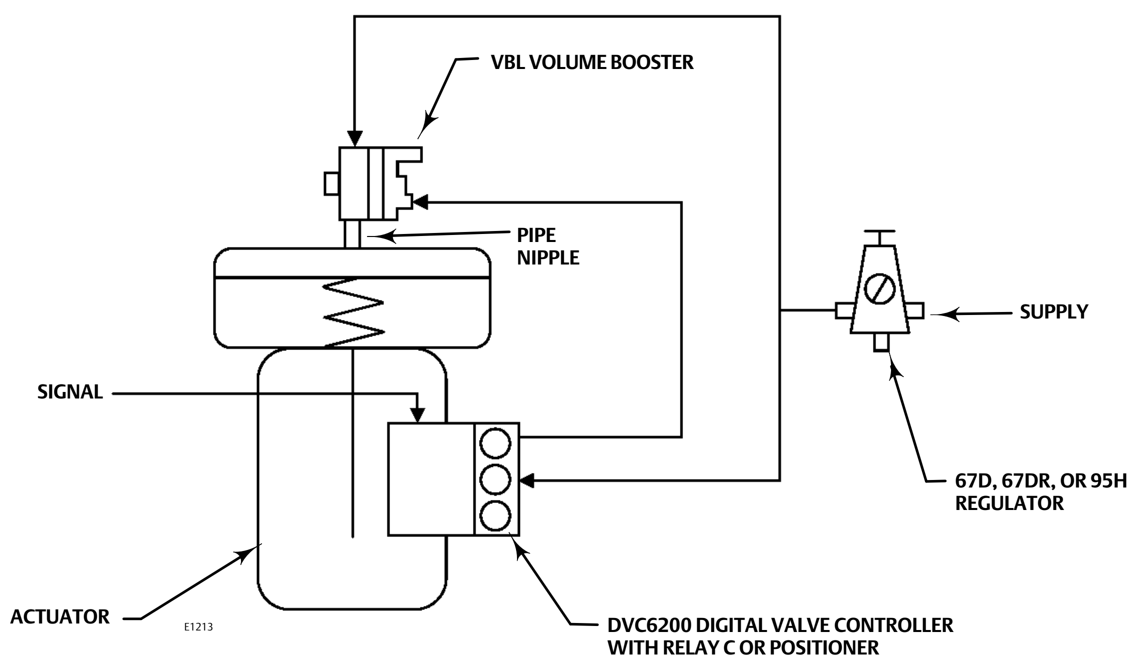


Figure 3. Typical Installation with Diaphragm Actuator



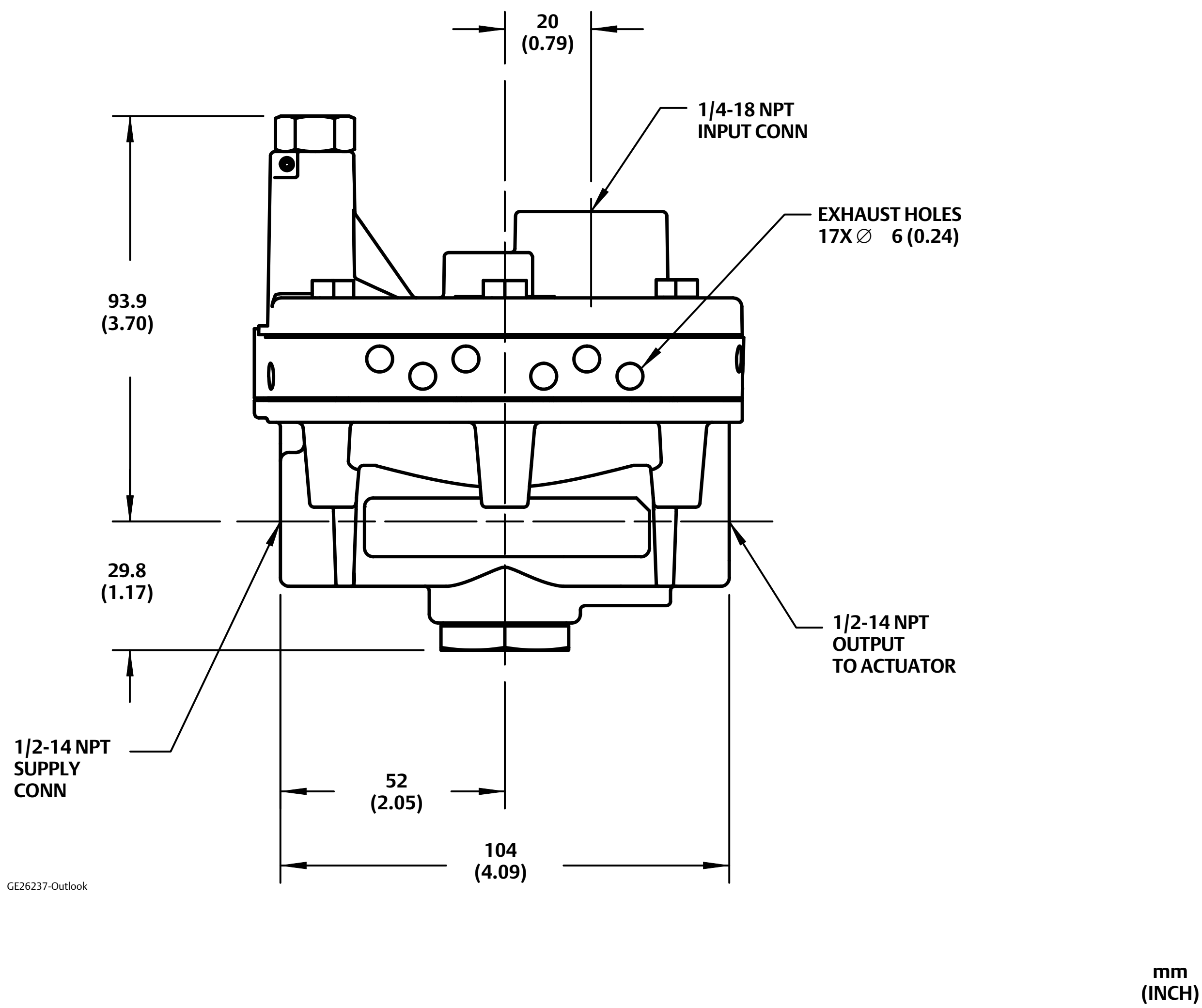
Installation

Figures 2 and 3 show typical installations for the VBL volume booster on piston and diaphragm actuators. A single regulator that supplies both the positioner and booster (or boosters) is recommended. The supply medium must be clean, dry, oil-free air or non-corrosive gas.

Keep in mind that many actuators require larger casing or cylinder connections to take full advantage of the booster's ability to deliver its high-volume output. Dimensions are shown in figure 4. Ensure that the supply pressure is connected to correspond with the flow arrow on the booster.

Verify that the capacity of the regulator meets the stroking capacity requirements.

Figure 4. Dimensions



Ordering Information

Specify stroking speed information when being mounted at the factory, for proper tuning of the instruments. Specify either critical or non-critical stroke speed time.

Note

Critical stroke speed time example: valve to stroke in both directions in 4 seconds or less.

Non-critical stroke speed time example: valve to stroke in approximately 4 seconds in both directions.

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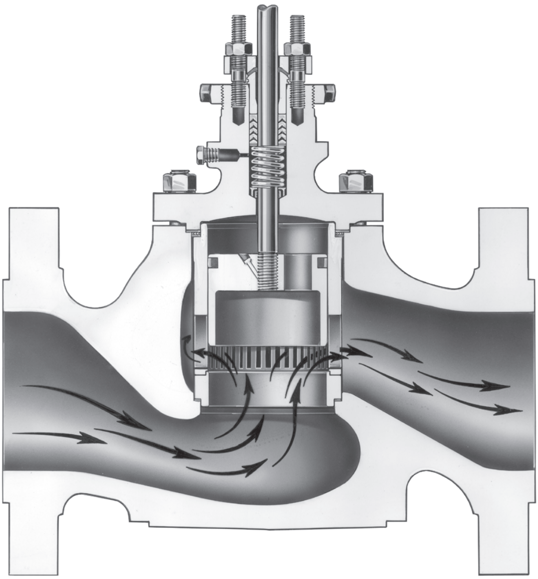
Fisher™ Whisper Trim™ I Cage

The Whisper Trim I cage offers proven aerodynamic noise control that is effective for vapor, gas, or steam flow applications.

The Whisper Trim I cage utilizes multiple orifices of a special shape, size, and spacing to minimize noise generated by the flow of vapor, gas, or steam through a control valve. Using a Whisper Trim I cage in conjunction with a properly sized valve body can substantially reduce the noise level below that of valves with standard trim.

Refer to the appropriate valve body bulletin for additional construction details and pressure drop limits.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.



W0997-2

FISHER EWT METAL-SEAT VALVE WITH WHISPER TRIM I CAGE

W0961-2

WHISPER TRIM I CAGE

Specifications

Availability

See table 2.
For valve designs and sizes not listed, use a Whisper Trim III level A1 cage instead of a Whisper Trim I cage. Base the noise attenuation and velocity limits in accordance with Whisper Trim I cage performance.

Trim Material

See table 1

Trim Selection

See appropriate valve body bulletin

Flow Characteristic

Linear; (characterized cages available--consult with your Emerson sales office)

Flow Direction

Up through the seat ring and out the cage openings

Noise Attenuation

See Fisher Catalog 12, section 3 for calculation procedure

(Whisper Trim I is most effective when $\Delta P/P_1 \leq 0.65$. It can be used above this, but the addition of a diffuser is recommended to split the pressure drop.)

Sizing Coefficients

See Fisher Catalog 12, section 1 for actual values

Shutoff Classification

Soft seats are available. See appropriate valve body bulletin

Pressure/Temperature Capability

See appropriate valve body bulletin

Features

- **Optimum Performance**—The Whisper Trim I cage offers excellent noise reduction and high flow capacity. This combines with the well known control and durability offered by standard easy-e™ trims to give optimum overall performance at a minimum investment.

- **Noise Control**—Use of a Whisper Trim I cage in a properly sized valve can result in up to 18 dBA noise reduction compared to the same valve with standard trim. An 18 dBA reduction in noise represents approximately 98 percent reduction in sound intensity. This is similar to moving away from the noise source by 24m (78 feet).

- **Easy Maintenance**—Quick change trim allows fast and easy inspection or replacement of the cage without taking the valve body out of the pipeline. It is interchangeable with the cages in all standard easy-e control valve bodies.

- **Long Trim Life**—Hardened material is standard to provide exceptional wear resistance.

Table 1. Trim Material Selection for CL125-600 easy-e and CL125-900 Fisher EW Using a Whisper Trim I Cage

Trim Number	Valve Plug	Whisper Trim I Cage	Seat Ring
1	S41600 SST(1)	S17400 SST(2)	S41600 or S41000 SST(1)
3	S31600 SST alloy 6 (CoCr-A) faced seat and guide	Cast alloy 6	Cast alloy 6(3)
4	S31600 SST	S17400 SST(2)	S31600 SST
5(7)	S31600 SST alloy 6 (CoCr-A) faced seat and guide	R31233	Cast alloy 6(3)
6(8)	S31600 SST alloy 6 (CoCr-A) faced seat and guide	S31603 SST	Cast alloy 6(3)
27 & 87	S31600 SST alloy 6 faced seat and guide	S31600 SST with electroless nickel coating (ENC)(5)	Cast alloy 6(3)
28(6)	S31600 SST alloy 6 faced seat	S31600 SST with electroless nickel coating (ENC)(5)	S31600 SST(3)
29 & 85(6)	S31600 SST	S31600 SST with electroless nickel coating (ENC)(5)	S31600 SST
37	S31600 SST alloy 6 faced seat and guide	S17400 SST(2)	Cast alloy 6(3)
57	S41600 SST(1)	S17400 SST(2)	S31600 SST(4)

1. Hardened to 38 Rockwell C minimum.
2. Hardened to 40 Rockwell C minimum.
3. S31600 SST alloy 6 faced seat used on NPS 6x4, 8x4, 8x6, and 12x6 valves.
4. S31600 SST disk seat and disk retainer for soft seat construction.
5. S17400 NACE MR0175-2002 with ENC used on NPS 8 easy-e, NPS 10x8 and 12x8 Design EW valves.
6. These trims are not available for port sizes larger than 111 mm (4-3/8 inches).
7. Available only for NPS 8, 8x6, 12x6, 10x8, and 12x8 sizes of Whisper Trim I cages.
8. Available only for NPS 8, 10x8, and 12x8 sizes Whisper Trim I cages.

Table 2. Whisper Trim I Cage Availability

Pressure Rating	Available Valve Design	Valve Size, NPS
CL125 through 600	ED, ES, & ET	1, 1-1/2, 2, 2-1/2, 3, 4, 6, 8
CL300 through 600	EWD, EWS, & EWT	4x2(1), 6x4(1), 8x4(1), 8x6(1), 12x6(1), 10x8(1), 12x8(1)
CL900	EWD, EWS, & EWT	8x6(1), 12x8(1, 2)

1. The first number indicates both valve body inlet and outlet size. The second number indicates nominal trim size.
2. Will accept CL900 inlet pressure but limited to CL600 pressure drop.

Installation

In any installation, the valve must be oriented so the flow complies with the arrow on the side of the valve body. Flow is always up through the seat ring.

Because the Whisper Trim I cage design utilizes a multiple-orifice design, a strainer should be installed upstream of any Whisper Trim I application.

The cage has 1.6 mm (0.06 inch) width slots.

Ordering Information

When ordering, please specify:

1. Required C_v
2. Trim material
3. Valve body design
4. Valve body size
5. Valve body material
6. Service conditions

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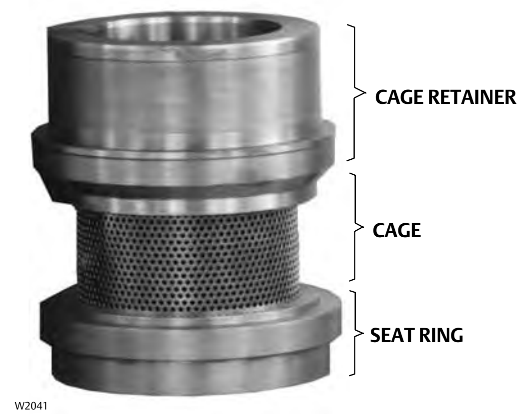
www.Fisher.com

Fisher™ Whisper Trim™ III Cages

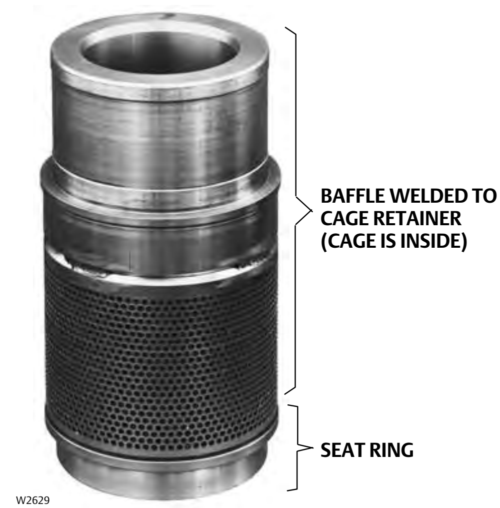
Whisper Trim III cages provide effective attenuation of aerodynamic noise in vapor, gas, or steam applications involving high pressure drops or high pressure drop ratios. Using a Whisper Trim III cage in conjunction with a properly-sized valve body can substantially reduce the noise level of the control application.

Aerodynamic noise is generated by the turbulence created in the flow of vapor, gas, or steam as the fluid passes through a control valve. To achieve effective noise attenuation, a Whisper Trim III cage utilizes multiple orifices of a special shape, size, and spacing. These orifices break up turbulent fluid streams, reducing noise-producing interactions.

Whisper Trim III cages are available for a variety of valve body types (see table 1). Please refer to the appropriate valve body bulletin for additional construction details.



LEVELS A1 THROUGH C3



LEVEL D1 OR D3

Features

- Outstanding Noise Control—Use of a Whisper Trim III cage in a properly sized valve can result in a noise reduction up to 30 dBA compared to the same valve with standard trim. Such a reduction would be similar to the reduction in noise level noticed when moving away from the noise source 94m (308 feet).
- Optimum Performance—Use of a Whisper Trim III cage provides excellent noise reduction and high flow capacity with the proven control and durability offered by standard Fisher valve trims. The result: optimum overall performance at a minimum investment.
- Easy Maintenance—Quick change trim allows fast and easy inspection of the cage without taking the valve body out of the pipeline. Whisper Trim III is interchangeable with standard control valve trim.
- Long Trim Life—Hardened materials of construction are standard to provide exceptional wear resistance. For more information about trim materials, see the appropriate valve body bulletin.

Specifications

Availability
See table 1

Trim Material and Selection
See appropriate valve body bulletin

Pressure/Temperature Capability
See appropriate valve body bulletin

Maximum Pressure Drops
As shown in appropriate valve body bulletin

Flow Characteristic(1)
Linear (restricted linear cages, modified parabolic cages, and special, characterized cages are available--consult your Emerson sales office)

Flow Direction
Up--through the seat ring and out through the cage orifices

Noise Attenuation
See Catalog 12, section 3 for calculation procedure

Sizing Coefficients(1)
See Catalog 12, section 1 for actual values

Shutoff Classification
See appropriate valve body bulletin

1. For additional sizing information, contact your Emerson sales office.

Installation

In any installation, the valve must be oriented so the flow complies with the arrow on the side of the valve body. Flow is always up through the seat ring.

Because the Whisper Trim III cage design utilizes a multiple-orifice design, a strainer should be installed upstream of any Whisper Trim III application.

The level A1 through D1 cages have 3.2 mm (0.125 inch) diameter orifices. The level A3 through D3 have 1.6 mm (0.0625 inch) diameter orifices.

Figure 1. Whisper Trim III Cage in Fisher ED Valve

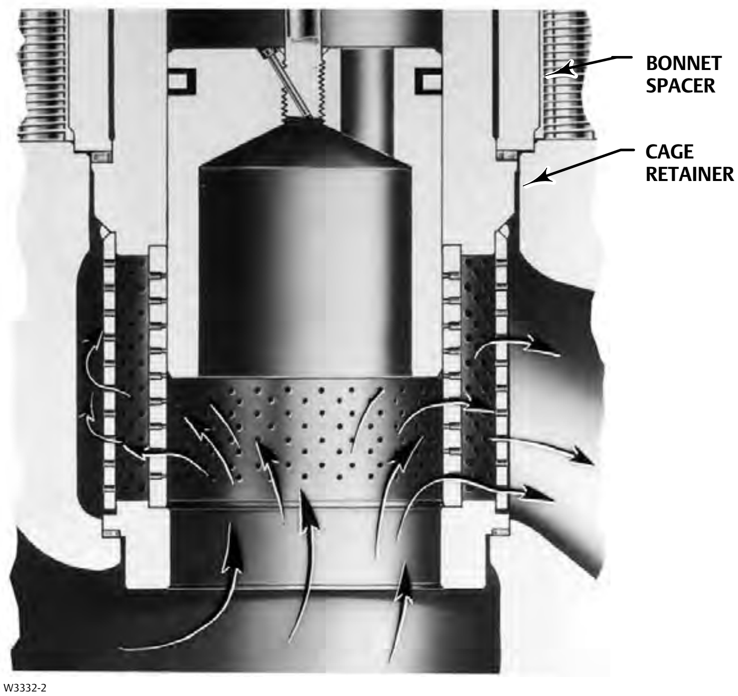


Figure 2. Whisper Trim III Cage in NPS 12 x 8 Fisher EWNT-2 Valve with Seat Ring Threaded Into the Cage

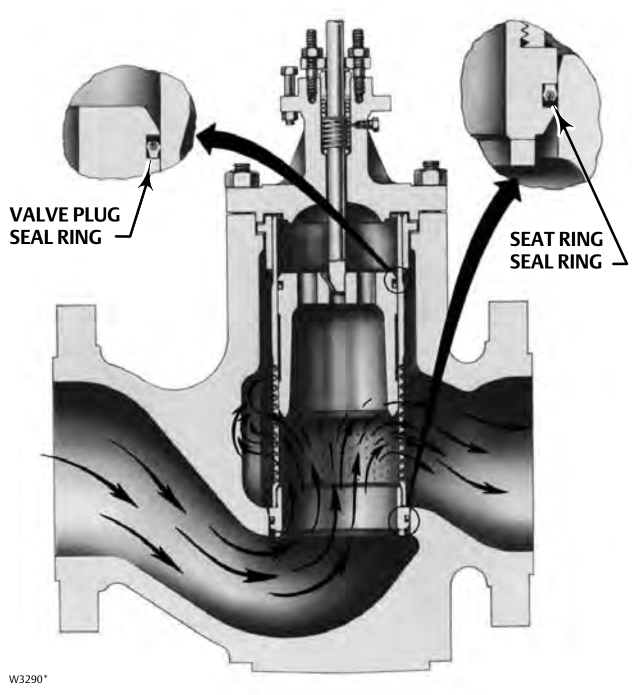


Table 1. Valve Body Constructions with Whisper Trim III Cages

VALVE DESIGN	VALVE SIZE, NPS(3)	PRESSURE RATING	PORT DIAMETER		VALVE PLUG, TRAVEL		PERFORMANCE LEVEL, MAX 0.999 $\Delta P/P_1$(4)							
			mm	Inch	mm	Inch	A1	A3	B1	B3	C1	C3	D1	D3
GX	DN 80 (NPS 3)	PN 10 - PN 40 (CL150, 300)	70	- - -	40	- - -	X							
	DN 100 (NPS 4)		90		40		X							
			70(5)		40		X							
	DN 150 (NPS 6)		136		60		X							
			90(5)		40		X							
ED, ES, ET,ET-C(6)	1	CL150, CL300, CL600	33.3	1 5/16	19	3/4	X							
	1 1/2		47.6	1 7/8	19	3/4	X							
			33.3	1 5/16	19	3/4		X	X	X				
			19.1	3/4(7)	29	1 1/8					X	X	X	X
	2		58.7	2 5/16	35	1 3/8	X							
			33.3	1 5/16	29	1 1/8		X	X	X	X	X	X	X
	2 1/2		73.0	2 7/8	38	1 1/2	X							
			47.6	1 7/8				X	X	X	X	X	X	X
	3		87.3	3 7/16	38	1 1/2	X							
			58.7	2 5/16				X	X	X	X	X	X	X
	4		111.1	4 3/8	51	2	X							
			87.3	3 7/16				X	X	X	X	X	X	X
	6(1)		177.8	7	51	2	X							
			136.5	5 3/8	76	3	X	X	X	X	X	X	X	X
	8(1)		203.2	8	76	3	X							
					95	3-3/4	X	X	X	X	X	X		
					102	4	X	X	X	X	X	X		
	12 and larger		Consult Fisher bulletin 51.1:ET/ED Large (D103554X012)											
EAD, EAS, EAT	1	CL150, CL300, CL600	33.3	1 5/16	19	3/4	X							
	2		47.6	1 7/8	19	3/4	X							
			33.3	1 5/16	19	1		X	X	X				
			19.1	3/4	29	1 1/8					X	X	X	X
	3		73.0	2 7/8	38	1 1/2	X							
			47.6	1 7/8				X	X	X	X	X	X	X
	4		87.3	3 7/16	38	1 1/2	X							
			58.7	2 5/16				X	X	X	X	X	X	X
	6	CL150, CL300, CL600	111.1	4 3/8	51	2	X							
			87.3	3 7/16				X	X	X	X	X	X	X

-continued-

Table 1. Valve Body Constructions with Whisper Trim III Cages (continued)

VALVE DESIGN	VALVE SIZE, NPS[3]	PRESSURE RATING	PORT DIAMETER		VALVE PLUG, TRAVEL		PERFORMANCE LEVEL, MAX 0.999 $\Delta P/P_1$[4]							
							A1	A3	B1	B3	C1	C3	D1	D3
EHD, EHS, EHT	2, 3 x2	CL2500	38.1	1.5	38	1.5	X							
	3, 4x3		58.7	2.3125	38	1.5	X		X					
	6, 6x4		73	2.875	51	2	X		X	X				
	6, 8x6		111.1	4.375	76	3	X			X		X		X
	8,10	CL1500	178	7	178	7	X	X	X	X	X	X	X	X
		CL2500	136	5.375	146	5.75								
	12,14	CL1500	254	10	184	7.25								
		CL2500	178	7	178	7								
EWD, EWS, EWT, EWT-C(6)	4X2	CL150, CL300, CL600	58.7	2.3125	34.9	1.375	X							
			33.3	1.3125	31.8	1.25		X	X	X	X		X	
					28.6	1.125						X		X
	6X4[1]		111.1	4.375	50.8	2	X	X	X	X				
			87.3	3.4375	50.8	2					X	X		
					76.2	3							X	X
	8X4		111.1	4.375	50.8	2	X		X					
			87.3	3.4375	50.8	2		X		X	X	X	X	X
					76.2	3							X	X
	8X6, 10X6[1]		177.8	7	76.2	3	X							
					101.6[8]	4[8]	X	X						
			136.5	5.375	127.0	5		X	X	X	X	X	X	X
	12X6[1]		136.5	5.375	165.1	6.5	X	X	X	X	X	X	X	X
	10X8		203.2	8	152.4	6	X	X	X	X	X	X		
			177.8	7	152.4	6							X	X
	12X8	CL150, CL300, CL600, CL900	203.2	8	152.4	6	X	X	X	X	X	X		
			177.8	7	152.4	6							X	X
	12 and larger	CL150, CL300, CL600	Consult Fisher bulletin 51.1:ET/ED Large (D103554X012)											
EWD-1, EWT-1	12 x 8	CL900	197	7.75	146	5.75	X	X	X	X	X	X		
			172	6.75	146	5.75							X	X
EWND-1, EWNT-1	8 x 6	CL900	136	5.375	127	5	X	X		X		X		X
	12 x 8	CL900	197	7.75	203	8	X	X	X	X	X	X		
			172	6.75	203	8							X	X
EWND-1, EWNT-2	12 x 8	CL300, 600	197	7.75	203	8	X	X	X	X	X	X		
			172	6.75	203	8							X	X
FBD, FBT	8 x 12 thru 24 x 24	Consult Fisher bulletin 51.1:FB (D100195X012)					X	X	X	X	X	X	X	X
	16 x 30 thru 36 x 36	Consult Fisher bulletin 51.1:FB (D100195X012)					X		X	X	X	X	X	X

-continued-

Table 1. Valve Body Constructions with Whisper Trim III Cages (continued)

VALVE DESIGN	VALVE SIZE, NPS[3]	PRESSURE RATING	PORT DIAMETER		VALVE PLUG, TRAVEL		PERFORMANCE LEVEL, MAX 0.999 $\Delta P/P_1$[4]							
							A1	A3	B1	B3	C1	C3	D1	D3
HPD, HPS, HPT	1	CL1500, 2500	19	0.75	29	1.125	X							
			25	1	19	0.75	X							
	2		19	0.75	29	1.125	X					X		
			25	1	19	0.75	X							
			48	1.875	51	2	X			X		X		
	3	CL1500	48	1.875	51	2	X					X		X
			73	2.875	51	2	X		X					
	4		73	2.875	51	2								X
			92	3.625	51	2	X		X	X	X	X		
	6		111	4.375	76	3								
			136	5.375	76	3	X	X		X		X		
HPAD, HPAS, HPAT	2	CL1500, 2500	48	1.875	38	1.5	X							
	3	CL1500	48	1.875	38	1.5	X							
	4		73	2.875	51	2	X		X					
	6		73	2.875	51	2								X
			92	3.625	51	2	X			X		X		
	8		111	4.375	76	3								X
			136	5.375	76	3	X			X		X		

1. Please note that the body/bonnet height may be greater after installing a Whisper Trim III cage. A spacer is required for ED, ET, ET-C, EWD, EWT, and EWT-C configurations.
2. Other sizes may be available--consult your Emerson sales office.
3. Two-number valve body size designation for EH, EW, and EWN Series valves indicates end connection size by trim size, but for FB Series valves, it indicates inlet size by outlet size.
4. The X indicates performance level available for given body-trim configuration. Other cage/body configurations available to meet specific applications.
5. GX unbalanced, restricted trim.
6. ET-C available for sizes NPS 3-8 and EWT-C available for sizes NPS 6x4 - NPS 12x8.
7. Available only with ES construction.
8. Travel limited to 3.75" for EWD valves with Class IV multiple piston rings and EWT with PEEK anti-extrusion seal ring.

Ordering Information

When ordering, please specify:

1. Required C_v
2. Trim material
3. Valve body design
4. Valve body size
5. Valve materials of construction
6. Service conditions and all other information requested in the valve body bulletin

Emerson Automation Solutions
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ 6010, 6011, 6012, 6013, and Whisper Disk Diffusers

Because valves can be substantial noise contributors when controlling industrial processes, a complete line of Fisher diffusers is offered to provide optimum noise attenuation. A diffuser is a pressure-reducing device that is installed downstream from the control valve. When installed, the total pressure drop of the system is divided across the valve and diffuser. This enables the valve to operate at a lower pressure drop ratio, thereby lowering the noise level generated from the process flowing through the control valve.

Inline Diffusers

Fisher 6010, 6011 and Whisper Disk inline diffusers are installed downstream of any control valve. These diffusers do not need to be placed adjacent to a control valve. Multiple diffuser types are available, providing an increased level of flexibility to meet a range of applications. Inline diffusers are used in steam, gas, and vapor flow applications to achieve minimum noise generation.

Vent Diffusers

Fisher 6012 and 6013 (figure 1) vent diffusers reduce the noise generated by the venting of compressible fluids to atmosphere.

W1162-2

6010

W4888

WHISPER DISK

W1155-2

6011

X0347

6012

Note: Diffusers are not hydrostatically tested

Specifications

Available Configurations

6010: Inline diffuser (with integral outlet head)
6011: Inline diffuser (pipe-style)
Whisper Disk: Inline diffuser (flat plate)
6012: Drilled-hole vent diffuser
6013: Drilled-hole vent diffuser (with outer shell)

Sizes

6010: NPS 1 x 3 to NPS 26 x 48 (inlet x outlet)
6011: NPS 2 to NPS 30
Whisper Disk: NPS 2 to NPS 24
6012: NPS 2 to NPS 26
6013: NPS 2 to NPS 26 (outer shell NPS 4 to 36)

End Connections

6010: Any combination of flanged (raised-face, ring-type joint, and flat-face) or welded end (buttweld or socket weld)
6011: Wafer flanged
Whisper Disk: Raised-face or ring-type joint flanged
6012 and 6013: Raised-face flanged, ring-type joint flanged, or buttweld end

Materials

See table 1

Weights & Dimensions[1]

6010: See figure 2 and table 3.
6011: See figure 3 and table 5.
6012: See figure 5 and table 9.
6013: See figure 6 and table 10.
Whisper Disk: See figure 4

Design Standards

Diffuser wall thicknesses are designed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and materials used are listed in Section II, Part D

End connection flanges are in compliance with ASME B16.5 and buttweld ends are in compliance with ASME B16.25

Contact your Emerson sales office or Local Business Partner for availability of PED 97/23/EC compliant materials of construction

Note

Inline and vent diffusers are not hydrostatically tested.

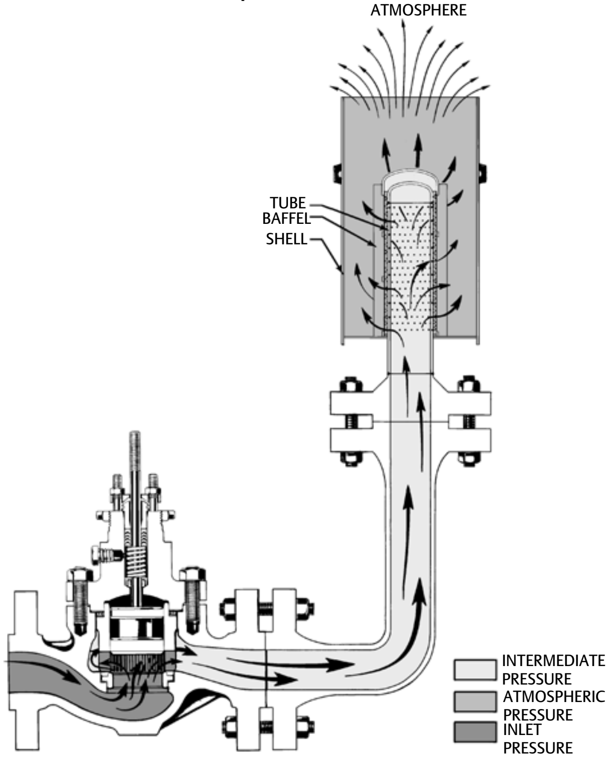
1. Your Emerson sales office or Local Business Partner can determine actual weights and lengths after the diffuser has been sized for pressure and noise conditions.

Table 1. Construction Materials

MATERIAL	DIFFUSER FLANGE OR WHISPER DISK	DIFFUSER TUBE	DIFFUSER HEAD CAP	TEMPERATURE LIMITS	
				°C	°F
Steel[1]	Steel (SA-105)	Grade B (SA-106)	Grade WPB (SA-234)	-29 to 427	-20 to 800
Alloy Steel[2] (1-1/4 Cr-1/2 MO)	Grade F11 (SA-182)	Grade P11 (SA-335)	Grade WP11 (SA-234)	-29 to 593	-20 to 1100
Alloy Steel[3] (2-1/4 Cr-1 MO)	Grade F22 (SA-182)	Grade P22 (SA-335)	Grade WP22 (SA-234)	-29 to 593	-20 to 1100
S31600 (316 SST)	Grade F316 (SA-182)	Grade TP316 (SA-312)	Grade WP316H (SA-403)	-198 to 649	-325 to 1200
S30400 (304 SST)	Grade F304 (SA-182)	Grade TP304 (SA-312)	Grade WP304H (SA-403)	-198 to 649	-325 to 1200
Nickel Alloy (Alloy 400)	Grade 400 (B564)	Grade 400 (B165)	Grade WPNC (B366)	-198 to 482	-325 to 900

1. Sour gas diffuser assembly can be heat treated to 22 RHC (Rockwell C) maximum hardness as required by NACE MR0175.
2. Wrought equivalent to WC6.
3. Wrought equivalent to WC9.

Figure 1. Control Valve and Diffuser Divide the Overall Pressure Drop



TYPICAL FISHER 6013 DIFFUSER INSTALLATION

Features

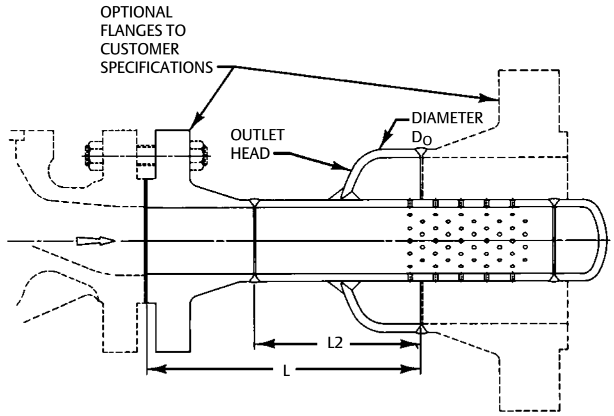
- **Versatility—** The diffuser concept is used in several unique versions, providing optimum solutions for various applications. The diffuser need not be installed adjacent to the control valve.
- **Noise Attenuation—** A properly selected diffuser-valve combination can result in up to 40 dBA noise reduction.
- **Total Control—** A diffuser-valve combination retains the pressure/flow control associated with a standard control valve. Just as important, it controls the generation of potentially damaging noise and vibration.
- **Lower Life-Cycle Cost—** All Fisher diffusers, both inline and vent, are ruggedly built static devices requiring no maintenance after installation. These features combine to offer increased noise control at a minimum investment.

Ordering Information

Contact your [Emerson sales office] or Local Business Partner to order diffusers. Sales representatives should complete standard order entry in addition to the Diffuser Engineering Form that is available on FishWeb. Sales representatives should also send the Diffuser Engineering Form and Customer Data Sheet to DiffuserSpecSheets@Emerson.com.

Fisher 6010 Inline Diffuser

Figure 2. Fisher 6010 Diffuser Dimensions



6010

NOTE:
Overall diffuser tube length may exceed face-to-face length.

Table 2. Typical Fisher 6010 Diffuser Dimensions(1)

DIFFUSER SIZE(2)	FLANGED L		BUTTWELD L_2		D_o(3)		APPROXIMATE WEIGHT(4)	
	mm	Inch	mm	Inch	mm	Inch	kg	lb
1 x 3	152	6.00	84	3.31	76	3	1.3	2.75
1.5 x 3	165	6.50	89	3.50	76	3	1.6	3.50
2 x 4	203	8.00	122	4.81	102	4	2.5	5.50
2 x 6	229	9.00	148	5.81	152	6	4.3	9.50
2.5 x 6	229	9.00	141	5.56	152	6	5.2	11.50
3 x 6	229	9.00	138	5.44	152	6	7.8	17
3 x 8	241	9.50	151	5.94	203	8	10	23
4 x 8	279	11.00	170	6.69	203	8	14	31
6 x 12	330	13.00	205	8.06	305	12	33	72
8 x 16	381	15.00	240	9.44	406	16	48	105
10 x 14	356	14.00	195	7.69	356	14	73	160
10 x 16	406	16.00	246	9.69	406	16	77	170
10 x 20	457	18.00	297	11.69	508	20	93	205
12 x 24	483	19.00	319	12.56	610	24	122	270
14 x 28	483	19.00	310	12.19	711	28	249	550
16 x 32	483	19.00	297	11.69	813	32	374	824
18 x 36	508	20.00	316	12.44	914	36	443	976
20 x 36	508	20.00	310	12.19	914	36	536	1181
24 x 36	533	21.00	322	12.69	914	36	714	1573

1. Dimensions may vary to meet specific sound attenuation or piping requirements.
2. Inlet x outlet nominal pipe sizes.
3. Dimensions are nominal pipe size.
4. Weights do not include optional flanges.

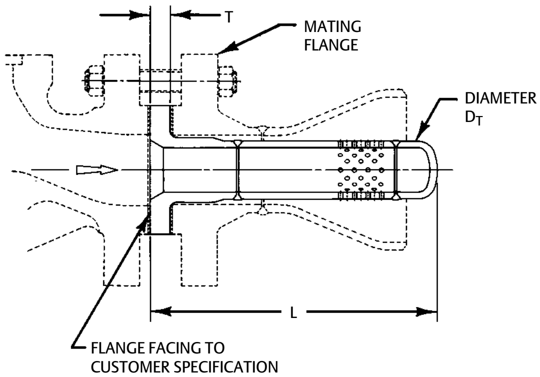
Table 3. Minimum Outlet Head Size for Fisher 6010 Diffusers(1)

INLET TUBE SIZE, NPS	MINIMUM OUTLET HEAD(2) SIZE, NPS	MAXIMUM HEAD SCHEDULE	MAXIMUM HEAD WALL THICKNESS	
			mm	Inches
1	2	80	5.5	0.218
1	2.5	80	7.0	0.276
1.5	3	80	7.6	0.300
2	4	XXS	17.1	0.674
2.5	4	80	8.6	0.337
3	5	80	9.5	0.375
4	6	80	10.9	0.432
6	10	160	28.6	1.125
8	12	160	33.3	1.312
10	14	XS	12.7	0.500
12	18	80	23.8	0.938
14	20	80	26.2	1.031
16	20	STD only	9.5	0.375
18	24	40	17.5	0.688
20	26	20	12.7	0.500
24	30	30	15.9	0.625

1. This chart may be used to determine physical size limitations. It is not intended to be used as a guide or substitute for outlet velocity calculations or outlet sizing.
2. Larger head sizes are available on all inlet sizes.

Fisher 6011 Inline Diffuser

Figure 3. Fisher 6011 Diffuser Dimensions



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6011

Table 4. Typical Fisher 6011 Diffuser Dimensions(1)

DIFFUSER SIZE(2), NPS (MATING FLANGE)	MAXIMUM L		T		MAXIMUM TUBE SIZE D_T(3,4)		APPROXI-MATE WEIGHT	
	mm	Inch	mm	Inch	mm	Inch	kg	lb
2	483	19	16	0.63	32	1.25	2.7	6
3	635	25	19	0.75	64	2.50	9	20
4	711	28	22	0.88	76	3	14	30
6	1295	51	28	1.12	127	5	41	90
8	1473	58	32	1.25	152	6	68	150
10	1778	70	38	1.50	203	8	113	250
12	2134	84	44	1.75	254	10	159	350
14	2184	86	44	1.75	254	10	181	400
16	2286	90	51	2.00	305	12	268	590
18	2286	90	51	2.00	356	14	340	750
20	2286	90	51	2.00	406	16	397	875
24	2286	90	51	2.00	508	20	544	1200
26	2286	90	70	2.75	508	20	544	1200
30	2286	90	70	2.75	610	24	635	1400

1. Dimensions may vary to meet specific sound attenuation or piping requirements.
2. Specify mating flange size for diffuser size.
3. Heavy schedule mating flange may require smaller tube size.
4. Smaller tube sizes available for increased annular area.

Table 5. Maximum Tube Size for Fisher 6011 Diffusers(1)

MATING LINE				MAXIMUM 6011 TUBE SIZE, NPS
Mating Flange Line Size, NPS	Maximum Schedule Allowed	Maximum Allowable Wall Thickness		
		mm	Inches	
2	STD only	3.9	0.154	1-1/2
2	XS	5.5	0.218	1-1/4
3	STD only	5.4	0.216	2-1/2
3	160	11.1	0.438	2
4	80	8.6	0.337	3
6	80	11.0	0.432	5
6	160	18.3	0.719	4
8	120	18.3	0.719	6
10	100	18.3	0.719	8
12	160	33.3	1.312	8
12	60	14.3	0.562	10
14	80	19.1	0.750	10
16	80	21.4	0.844	12
18	80	23.8	0.938	14
20	60	20.6	0.812	16
24	XS	12.7	0.500	20
26	XS	12.7	0.500	20
30	XS	12.7	0.500	24

1. This chart may be used to determine physical size limitations. It is not intended to be used as a guide or substitute for outlet velocity calculations, or outlet sizing.

Whisper Disk Inline Diffuser

Table 6. Available Size/Pressure Class for Whisper Disk Diffusers

SIZE, NPS	PRESSURE RATING[1]						
	CL150	CL300	CL400	CL600	CL900	CL1500	CL2500
2	X	X	X	X	X	X	X
2-1/2	X	X	X	X	X	X	NA
3	X	X	X	X	X	X	NA
4	X	X	X	X	X	NA	NA
6	X	X	X	X	NA	NA	NA
8	X	X	X	NA	NA	NA	NA
10	X	X	NA	NA	NA	NA	NA
12	X	X	NA	NA	NA	NA	NA
14-24	X	NA	NA	NA	NA	NA	NA

1. Ratings are for raised face flanges. Flange ratings higher than those listed may be available. Consult your Emerson sales office for higher flange ratings, other sizes, and RTJ (ring-type joint) facing.

Table 7. Whisper Disk Maximum Allowable C_V Per Disk Size and Pressure Drop Ratio (Pressure Drop Ratio of Disk, Not System)[1, 2]

Size, NPS	$\triangle P/P_1$ (psia) Maximum of 0.60	$\triangle P/P_1$ (psia) Maximum of 0.75	$\triangle P/P_1$ (psia) Maximum of 0.85	$\triangle P/P_1$ (psia) Maximum of 0.99
2	14	6	3	1
2-1/2	22	10	5	2
3	37	33	14	12
4	95	35	32	21
6	189	119	74	36
8	321	196	101	82
10	500	321	167	125
12	718	482	246	196
14	889	500	304	234
16	893	650	407	324
18	893	839	529	343
20	893	893	771	432
24	893	893	893	643

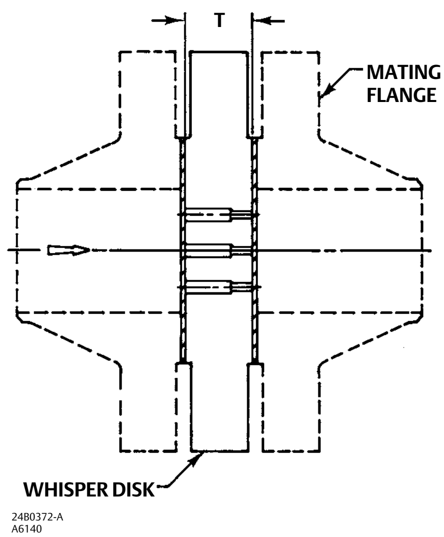
1. Above Cv values based on standard weight pipe upstream and downstream of disk diffuser. For heavier schedule or heavier flange maximum Cv values, consult your Emerson sales office.
2. All maximum Cv values assume an Xt of 0.496.

Table 8. Thickness Dimension T for Whisper Disk Diffusers

SIZE, NPS[1]	T, MILLIMETERS						T, INCHES					
	Pressure Rating						Pressure Rating					
	CL150	CL300	CL400	CL600	CL900	CL1500	CL150	CL300	CL400	CL600	CL900	CL1500
2	19	22	32	32	44	44	0.75	0.88	1.25	1.25	1.75	1.75
2-1/2	22	25	35	35	48	48	0.88	1.00	1.38	1.38	1.88	1.88
3	24	28	38	38	44	54	0.94	1.12	1.50	1.50	1.75	2.12
4	24	32	41	44	51	54	0.94	1.25	1.62	1.75	2.00	2.12
6	25	37	48	54	- - -	- - -	1.00	1.44	1.88	2.12	- - -	- - -
8	28	41	54	- - -	- - -	- - -	1.12	1.62	2.12	- - -	- - -	- - -
10	30	48	- - -	- - -	- - -	- - -	1.19	1.88	- - -	- - -	- - -	- - -
12	32	51	- - -	- - -	- - -	- - -	1.25	2.00	- - -	- - -	- - -	- - -
14	35	- - -	- - -	- - -	- - -	- - -	1.38	- - -	- - -	- - -	- - -	- - -
16	37	- - -	- - -	- - -	- - -	- - -	1.44	- - -	- - -	- - -	- - -	- - -
18	40	- - -	- - -	- - -	- - -	- - -	1.56	- - -	- - -	- - -	- - -	- - -
20	43	- - -	- - -	- - -	- - -	- - -	1.69	- - -	- - -	- - -	- - -	- - -
24	48	- - -	- - -	- - -	- - -	- - -	1.88	- - -	- - -	- - -	- - -	- - -

1. For sizes and ratings not shown, contact your Emerson sales office.

Figure 4. Thickness Dimension T for Whisper Disk Diffusers



Fisher 6012 Vent Diffuser

Figure 5. Fisher 6012 Vent Diffuser Dimensions

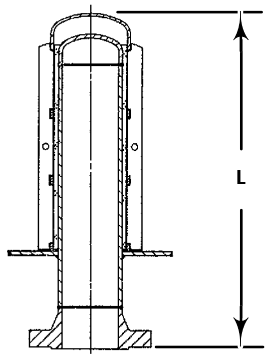


Table 9. Typical Fisher 6012 Diffuser Dimensions(1)

INLET SIZE, NPS	L		WEIGHT(2)	
	mm	Inches	kg	lb
2	533	21.00	14	30
3	610	24.00	21	47
4	914	36.00	32	70
6	1143	45.00	61	135
8	1626	64.00	136	300
10	2032	80.00	206	455
12	2642	104.00	354	780
14	2743	108.00	372	820
16	2794	110.00	499	1100
18	3353	132.00	782	1725
20	3962	156.00	816	1800

1. Dimensions may vary to meet specific sound attenuation or piping requirements.
2. Weights do not include flanges.

Fisher 6013 Vent Diffuser

Figure 6. Fisher 6013 Vent Diffuser Dimensions

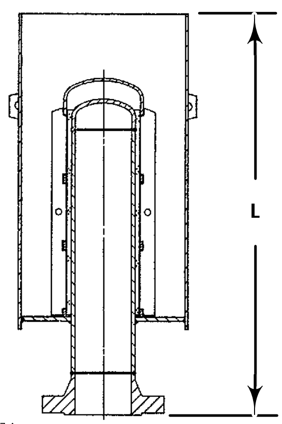


Table 10. Typical Fisher 6013 Diffuser Dimensions(1)

INLET SIZE, NPS	L		WEIGHT(2)	
	mm	Inches	kg	lb
2	1118	44.00	64	140
3	1219	48.00	88	195
4	1524	60.00	113	250
6	1829	72.00	191	420
8	2134	84.00	329	725
10	2743	108.00	465	1025
12	3353	132.00	748	1650
14	3353	132.00	767	1690
16	3505	138.00	984	2170
18	3962	156.00	1383	3050
20	4572	180.00	1569	3460

1. Dimensions may vary to meet specific sound attenuation or piping requirements.
2. Weights do not include flanges.

Table 11. Minimum Shell Size for Fisher 6013 Diffuser

Diffuser Inlet Size	**mm**	51	76	102	152	203	254	305	356	406	457	508
	NPS	2	3	4	6	8	10	12	14	16	18	20
Nominal Shell Size	**mm**	203	254	305	356	406	508	610	610	711	762	813
	Inches	8	10	12	14	16	20	24	24	28	30	32

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Fisher™ Dirty Service Anti-Cavitation Trim (DST)

Fisher Dirty Service Trim (DST) is a multi-stage, anti-cavitation control valve trim for use in services where the fluid may have entrained particulate that could plug the passages, or cause erosion damage to conventional anti-cavitation trims. DST is frequently used in high pressure drop applications up to 4200 psid in the chemical, refining, oil and gas production, and power industries.

FISHER DIRTY SERVICE TRIM

Features

- Cavitation Control—2-, 3-, 4-, 5-, or 6-stage DST used in a valve properly selected for flow conditions can eliminate cavitation and associated damage and noise.
- Versatility—Available in globe and angle valves, flow down (figure 2) or flow up (figure 3), from NPS 1 to 16 having weld-end or flanged-end connections. Can be used in easy-e ™ , EH, EHA, EW, HP, and HPA valves.
- Long Trim Life—This trim concept uses a combined axial and radial flow that features large, open flow paths and decreased clearance flow erosion.
- Flexibility— In many cases DST can be retrofitted to replace Cav III trims that are currently in service. DST can pass 1/4 to 3/4-inch particles without plugging.
- Easy Maintenance—In-line trim removal allows inspection of parts without taking the valve body out of the pipeline.
- Sour Service Capability—Materials are available for applications handling sour fluids. Please contact your Emerson sales office for additional information.
- Trim Materials—Typical trim materials include S17400 cages, S44004 valve plug and seat, S31600/ENC/CoCr-A cages with S31600/CoCr-A valve plug and seat, or S32550/ENC/CoCr-A cages with S32550/CoCr-A valve plug and seat, or R31233 cages with R31233 valve plug and seat. Other materials are available to satisfy application requirements.
- Shutoff—DST also features a protected seat design where the shutoff function of the valve is separate from the throttling areas of the trim.
- High-Temperature Class V Shutoff—Use of the metal C-seal permits Class V shutoff above 316°C (600°F).

Specifications

Available Valves

easy-e, EH, EHA, EU, EW, HP, and HPA.
See table 3

End Connection Styles

Refer to appropriate valve bulletin

Valve Body Dimensions and Weights

Valve type, pressure class, and number of stages will result in changes to these values. Please consult your Emerson sales office for more information on finished dimensions and weights

Shutoff Classifications

Class V per ANSI/FCS 70-2 and IEC 60534-4

Maximum Inlet Pressures and Temperatures(1)

Consistent with applicable CL150, CL300, CL600, CL900, CL1500, and CL2500 pressure/temperature ratings according to ASME B16.34 ratings unless limited by individual temperature and pressure limits shown in tables 1 and 2

Maximum Pressure Drop(1)

See table 1

Construction Materials

Trim Parts: ■ S17400 cages, S44004 valve plug and seat or S31600/ENC/CoCr-A cages with S31600/CoCr-A valve plug and seat ■ S32550/ENC/CoCr-A cages, S32550/CoCr-A valve plug and seat ■ R31233 cages, R31233 valve plug and seat. Trim can be made from several other bar stock alloys. Consult your Emerson sales office for your specific application

Temperature Capabilities

Valve Body/Trim Combinations: See table 2
All Other Parts: Consult your Emerson sales office

Flow Coefficients

See table 3

Flow Characteristic

Linear

Flow Direction

Flow down (typical) or Flow up (available)

Valve Cavitation Coefficient

K_c = 1.0 for all valves when trim is used within applicable pressure drop limits.

Maximum Valve Plug Travel

Typical plug travels are 0.75 inch through 2 inch. Contact your Emerson sales office for your specific application

Minimum Seating Force

Use Class V seat load requirements

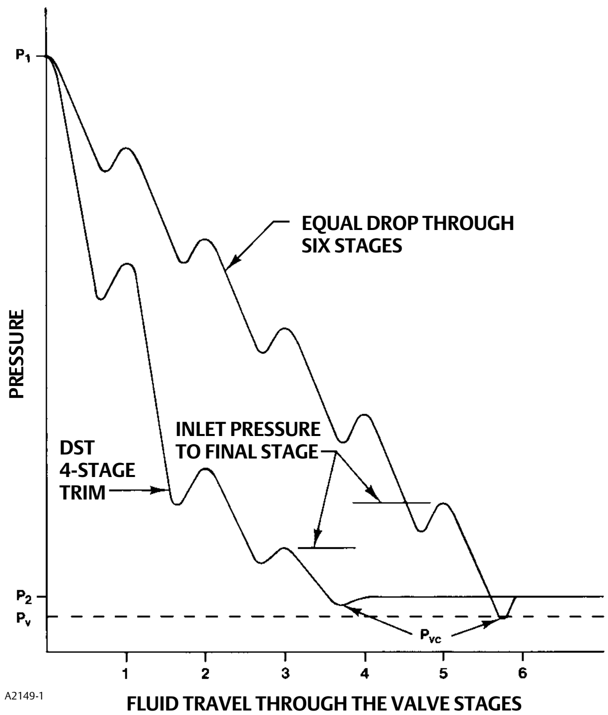
1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.

Contents

Table 1. Allowable Pressure Drop Limits

PRESSURE DROP LIMITS				
Number of Stages	Flowing Pressure Drop Limit (bar)	Flowing Pressure Drop Limit (psi)	Fl	Kc
2	52	750	0.95	1.0
3	103	1500	0.97	1.0
4	207	3000	0.99	1.0
5	241	3500	0.99	1.0
6	289	4200	0.99	1.0

Figure 1. Staged Pressure Drop Patterns



Principle of Operation

DST provides cavitation control for applications with entrained particulate that could potentially plug the inlet passages or cause severe erosion damage to conventional anti-cavitation trim. The DST design uses a combined axial and radial flow path that features large openings allowing particulate up to 3/4 inches in diameter to pass through the valve.

Due to the need for tight shutoff, the multi-stage design incorporates a protected seating surface that separates the shutoff and the throttling locations. All significant pressure drops are taken downstream of the seating surface. As a result, the seating surfaces are not worn away by throttling control action, (valve must always be throttled above the min C_V) resulting in extended shutoff capabilities.

In conventional staged-trim designs, cavitation usually does not exist until the final stage. Figure 1 illustrates why this happens. As shown, the greater the pressure drop through the final stage, the lower the vena contracta pressure (P_{VC}). If P_{VC} is less than or equal to P_V, and P_2 is greater than P_V, then cavitation will result.

The DST valve avoids this by means of its unique expanding flow area design. Each of the stages has a successively larger flow area. The result is a very efficient operation because more than 90 percent of the overall pressure drop is taken in the stages prior to the final stage where there is little danger of bubble formation. Consequently, a relatively low inlet pressure to the final stage is achieved. Figure 1 also compares the pressure drop pattern through the four stages in the expanding area DST design with a pattern representing a six-stage trim design with each stage taking an equal portion of the total pressure drop. As can be seen, the inlet pressure to the last stage of DST trim is always less than the inlet pressure to the sixth stage of an equal-drop cage. Therefore the P_{VC} of the DST cage remains higher than the P_{VC} of an equal-drop cage. If the pressure drops were all equivalent to that of the last stage in DST trim, 11 stages would be required in the equal-drop trim.

Availability

DST trim is available in numerous body designs and pressure classes. Table 1 shows the pressure drop limits for each design relative to the number of stages used.

Table 3 shows the different valve constructions that DST can be used in. It also shows typical min and max C_V values each valve can achieve. Any deviation from the sizes listed in table 3, or temperatures in table 2, will result in different C_V limitations. Please contact your Emerson sales office for any requests that do not fall within these ranges.

Table 2. Trim Combinations for Fisher DST(1)

TRIM DESIGNATION	VALVE BODY MATERIAL	VALVE PLUG	CAGE	SEAT RING	MAXIMUM TEMPERATURE LIMIT	
					°C	°F
A	WCC	S44004	S17400	S17400 or S44004	316	600
B	WCC	S31600/CoCr-A	S31600/CoCr-A/ENC	S31600/CoCr-A/ENC	204	400
	SST				316	600
C	WCC	S32550/ CoCr-A	S32550/CoCr-A/ENC	S32550/CoCr-A/ENC	316	600
	SST				204	400
581	WCC	R31233	R31233	R31233	316	600
	LCC					
	CF8M(2)					

1. Contact your Emerson sales office for higher temperature capabilities.
2. NPS 4 ET with 3-stage DST is limited to 204°C (400°F) maximum temperature. NPS 6 EAT with 3-stage DST is limited to 149°C (300°F) maximum temperature. NPS 6 ET with 3-stage DST is limited to 191°C (375°F) maximum temperature. NPS 8 ET with 3-stage DST is limited to 177°C (350°F) maximum temperature. These temperature limits take into consideration the body/bonnet/bolting combination.

Trim Selection Guidelines

The standard trim materials are listed below, and in table 2. Other materials such as superaustenitic SST, S34700, Solid CoCr-A, N08800, and tungsten carbide trim are available upon request. Contact your Emerson sales office for more information.

- Trim A: Trim A is the typical trim used with carbon steel and alloy steel valve bodies. It can generally be used in severe service applications up to 316°C (600°F). Higher temperature can be achieved with alternate trim parts. Contact your Emerson sales office for higher temperature requirements. Typical applications for Trim A include boiler feedwater, water, non-sour hydrocarbons, and other non-sour liquids.

- Trim B: Trim B is the typical trim used with stainless steel valve bodies. It can generally be used in severe service applications up to 316°C (600°F). Higher temperatures can be achieved with alternate trim parts. Contact your Emerson sales office for higher temperature requirements. Typical applications for Trim B include produced water, water, sour hydrocarbons, and other sour liquids. Not for use with boiler feedwater.

- Trim C: Trim C can commonly be seen in carbon steel and Duplex SST valve bodies. This trim is most commonly used in sea water applications, produced water, and other offshore crude oil applications.

- Trim 581: Trim 581 can be used with carbon steel or stainless steel valve bodies. It can generally be used in severe service applications up to 316°C (600°F). Typical applications for Trim 581 include boiler feedwater, water, sour and non-sour hydrocarbons and other liquids.

Please contact your Emerson sales office for more information on DST trim.

Characteristics

The DST trim is designed to have a linear flow characteristic. It is also designed to have no significant flow for the first 10-15% travel. Special characterizations may be possible, including special low minimum C_v designs. Contact your Emerson sales office for assistance.

Valve Sizing Guidelines

Sizing procedures from Catalog 12 or Fisher Specification Manager can be used to size DST control valves. Noise calculations are best performed by using Fisher Specification Manager. The multi-stage configuration of the DST design reduces valve trim noise significantly. Select CAV III 2-Stage as the valve type in Fisher Specification Manager to perform the noise prediction calculation.

Ordering Information

When ordering, specify:

Application Information

1. Process Liquid: State particle size and type of entrained impurities, if any.
2. Specific gravity of liquid
3. Temperature and vapor pressure of liquid
4. Critical pressure
5. Range of flowing inlet pressures
6. Pressure drops
   a. Range of flowing pressure drops
   b. Maximum at shutoff
7. Flow rates
   a. Minimum controlled flow
   b. Normal flow
   c. Maximum flow
8. Required C_v
9. Line size and schedule

Table 3. Fisher DST Flow Down Availability[4]

VALVE DESIGN	PRESSURE RATING	VALVE SIZE	PORT SIZE	TRAVEL	UNBALANCED AREA	MINIMUM AND MAXIMUM FLOW COEFFICIENTS, Cv [3]							
						2-Stage		3-Stage		4-Stage		6-Stage	
		NPS	inch	inch	inch^2	Min	Max	Min	Max	Min	Max	Min	Max
easy-e Globe	CL600	1[5]	0.875	0.63	0.610	[1]		0.15	4.4	NA[2]		NA[2]	
		1.5[5]	1.125	0.75	0.800	[1]		0.22	8.9	NA[2]		NA[2]	
		2	1.75	0.75	0.029	0.3	23.1	0.22	18.5	NA[2]		NA[2]	
		2.5	2.188	0.75	0.061	0.5	30.5	0.4	23.4	NA[2]		NA[2]	
		3	2.50	0.75	0.041	0.8	46	0.8	36	NA[2]		NA[2]	
		4	3.438	1.25	0.118	1.7	81	1.5	64	NA[2]		NA[2]	
		6	4.375	1.50	0.154	2.8	174	2.8	128	NA[2]		NA[2]	
		8	5.375	2.00	0.206	5.5	253	5	185	NA[2]		NA[2]	
easy-e Angle	CL600	2[5]	1.125	0.75	0.800	[1]		0.22	8.9	NA[2]		NA[2]	
		3	2.188	0.75	0.061	0.5	30.5	0.4	23.4	NA[2]		NA[2]	
		4	2.50	0.75	0.041	0.8	46	0.8	36	NA[2]		NA[2]	
		6	3.438	1.25	0.118	1.7	81	1.5	64	NA[2]		NA[2]	
EH	CL1500	2	1.50	0.75	0.051	NA[2]		[1]		0.3	7.5	[1]	
		3	1.875	1.00	0.031	NA[2]		[1]		0.58	23	[1]	
		4	2.875	1.50	0.047	NA[2]		1.4	54	1	44	[1]	
		6	3.625	1.75	0.118	NA[2]		1.2	106	1	88.5	[1]	
		8	5.375	1.50	0.142	NA[2]		4	147	3	115	[1]	
		10	5.375	1.50	0.142	NA[2]		4	147	3	115	[1]	
		12	8.00	2.00	0.350	NA[2]		[1]		10	298	[1]	
		14	8.00	2.00	0.350	NA[2]		[1]		10	298	[1]	
	CL2500	3[5]	1.50	0.75	0.780	NA[2]		NA[2]		[1]		0.4	9.4
		4[5]	1.875	0.75	1.534	NA[2]		NA[2]		0.5	16	0.5	13.7
EHA	CL1500	4	1.875	1.00	0.031	NA[2]		[1]		0.45	19.2	[1]	
		6	2.875	1.50	0.047	NA[2]		1.4	54	1	44	[1]	
		8	3.625	1.75	0.118	NA[2]		1.2	105	1	88.5	[1]	
	CL2500	4[6]	3.625	1.75	0.118	NA[2]		NA[2]		1	86	[1]	
		6[6]	2.875	1.50	0.047	NA[2]		NA[2]		1	46	1	28
EU	CL600	12	8.00	1.50	0.350	10	382	10	292	NA[2]		NA[2]	
		16	11.00	4.00	0.490	[1]		10	617	NA[2]		NA[2]	
EW	CL600	4X2	1.75	0.75	0.029	[1]		0.22	18.5	NA[2]		NA[2]	
		6X4	3.438	1.25	0.118	1.7	81	1.5	64	NA[2]		NA[2]	
		8X6	4.375	1.75	0.154	2.8	187	2.8	150	NA[2]		NA[2]	
		12X8	5.375	2.00	0.142	5.5	253	5	185	NA[2]		NA[2]	
HP	CL1500	3	1.875	1.00	0.031	NA[2]		0.65	24.8	0.45	19.4	[1]	
		4	2.875	1.00	0.047	NA[2]		1	39.5	1	34.6	[1]	
		6	3.625	1.50	0.118	NA[2]		1.2	89.3	1	71	[1]	

-continued-

Table 3. Fisher DST Flow Down Availability[4] (Cont.)

HP & HPA	CL1500	1[5]	0.875	0.63	0.589	NA[2]	(1)		0.09	3.2	(1)	
		2[5]	1.25	0.75	0.785	NA[2]	0.2	8.3	0.28	7.1	(1)	
	CL2500	1[5]	0.875	0.63	0.589	NA[2]	NA[2]		(1)		(1)	
		2[5]	1.00	0.75	0.785	NA[2]	NA[2]		(1)		0.3	4.3

1. Consult your Emerson sales office.
2. Construction not available.
3. 5-stage DST is available upon request.
4. For flow up constructions consult your Emerson sales office.
5. Unbalanced constructions.
6. These valves are from block forged angle valve bodies. Cast valve bodies are available and may change these values.

Figure 2. 4-Stage Fisher DST Flow Down Trim

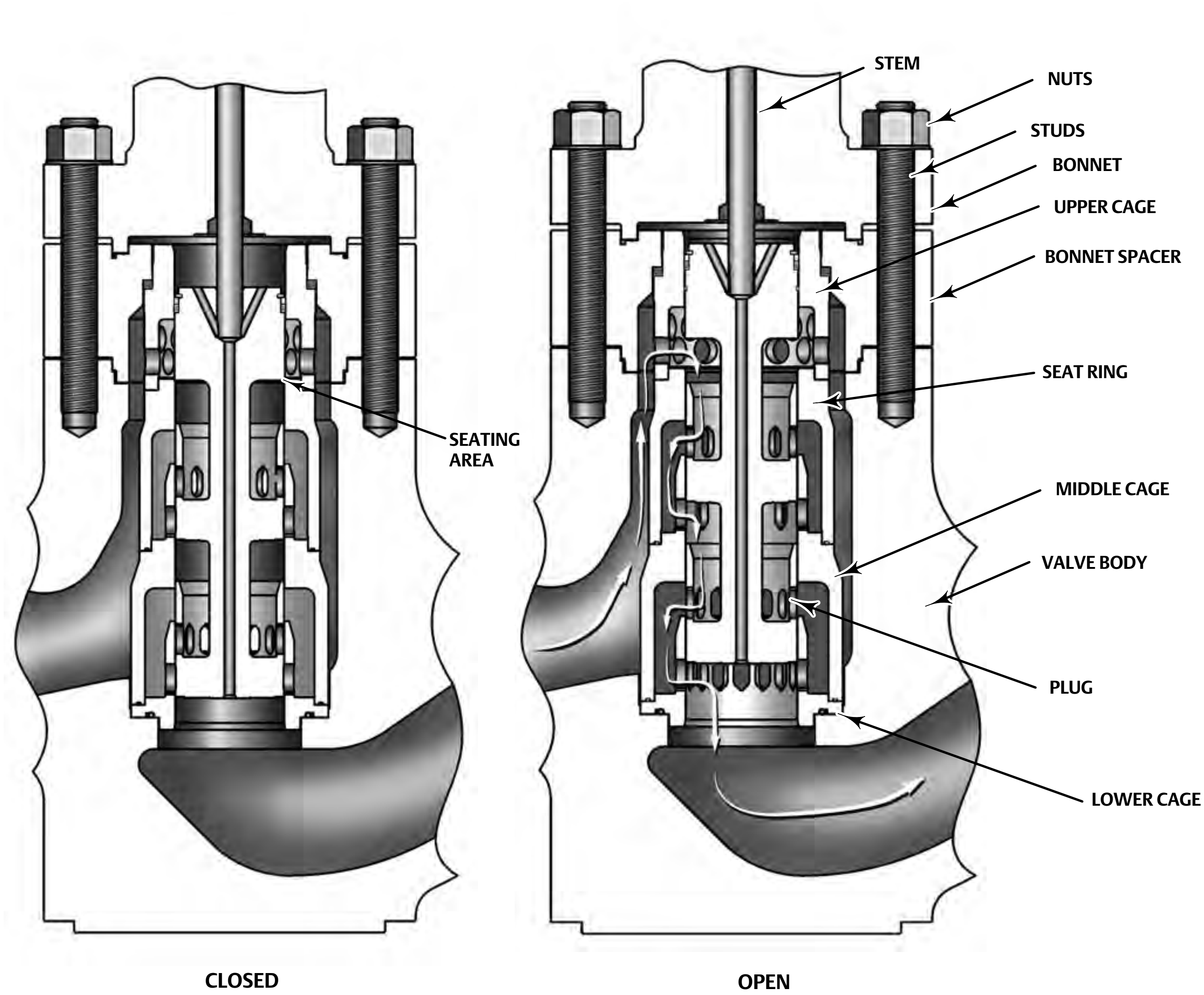
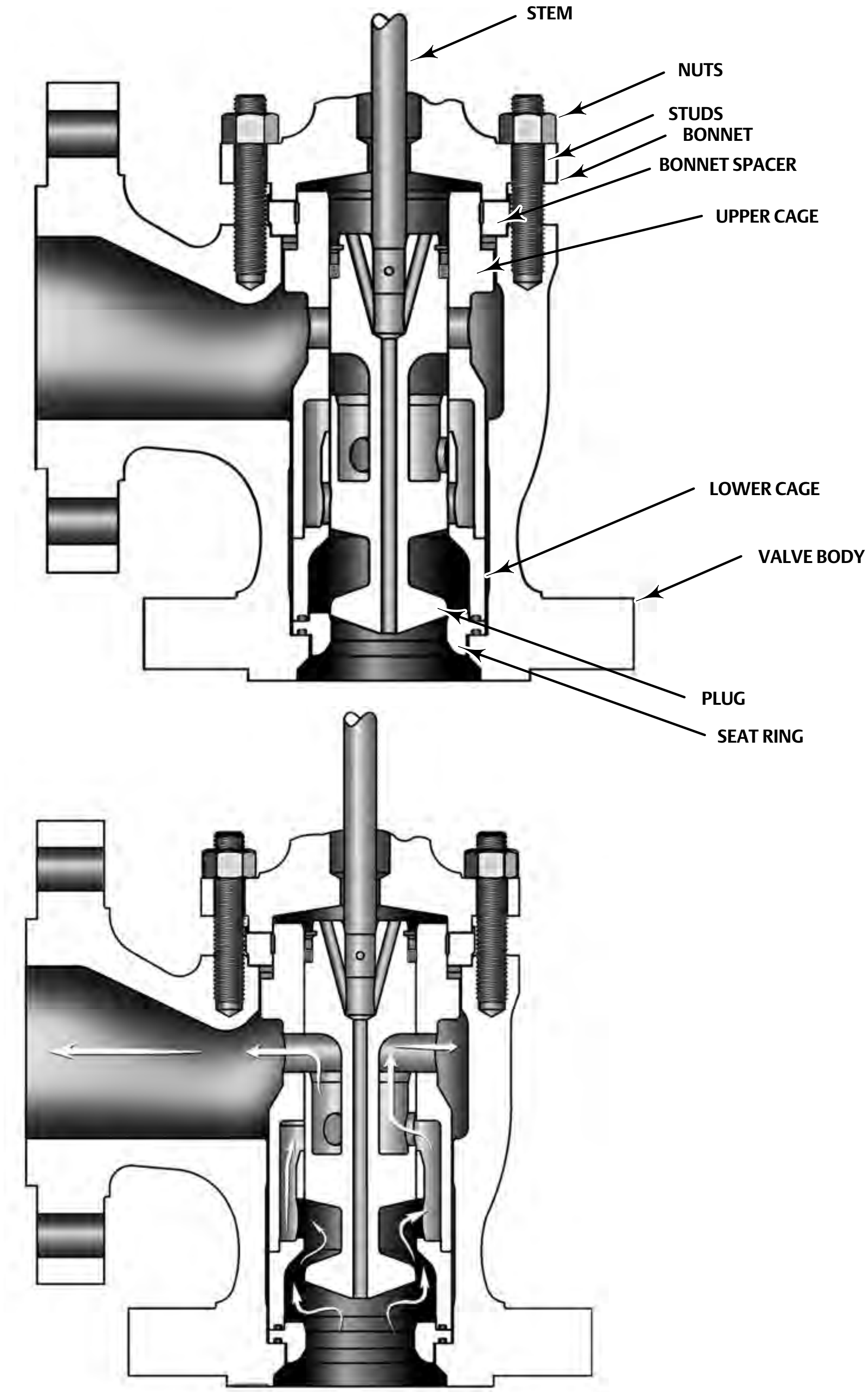


Figure 3. 3-Stage Fisher DST Flow Up Trim



CLOSED

W9632-2

OPEN

W9631-2

Table 4. Typical Applications

POWER/COGENERATION	Boiler feed pump recirculation
	Desuperheater spray water control
	Feedwater start-up regulators
	Condensate pump recirculation
	Superheater bypass
OIL AND GAS PRODUCTION	Water injection pump recirculation
	Produced/waste water injection well control
	Separator letdown
	Chemical injection pump bypass
	Main oil line or export flow control valve
	Main oil line or export pump recirculation
NATURAL GAS PROCESSING	Contactor (rich amine) letdown
	Rich and lean amine pump spillback
REFINING	Contactor letdown
	Rich and lean amine pump spillback
	Pump spillback/recirculation
	Various high pressure and low pressure separator letdown

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Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

Fisher™ NotchFlo™ DST Control Valve

Fisher NotchFlo DST control valves offer excellent control of liquid services with high pressure drops and entrained particulate. The dirty service anti-cavitation trims (figure 1) feature multi-stage protection against damaging effects of cavitation and erosive solids. Fisher NotchFlo DST offers trim selections for CL600 3-stage, CL900/1500 4-stage, and CL1500 or CL2500 6-stage.

W9050-2

Fisher NotchFlo DST Control Valve

Features

- **Long Trim Life**—NotchFlo DST control valves feature a protected seat design whereby the shutoff function is separate from the throttling areas of the trim.
- **Class V Shutoff**—Use of hardened metal seats provides tight shutoff to minimize seat erosion.
- **High Pressure Drops**—Rugged cage guiding of the plug, combined with a staged pressure drop, enables the NotchFlo DST control valve to be effective in a wide range of allowable high pressure drop applications. It can be operated by either spring and diaphragm or piston actuators, depending on plug design (balanced or unbalanced) and application requirements.
- **Sour Service Capability**—Materials are available for applications handling sour fluids. All references in this document are for NACE MR0175-2002 and MR0103 unless otherwise noted. Contact your Emerson sales office for information on NACE MR0175/ISO 15156.
- **Availability**—NotchFlo DST control valves are available in both globe and angle valve body designs.

Specifications

Valve Sizes and End Connection Styles

CL600 3-Stage: See table 1
CL900 and CL1500 4-Stage: See table 2
CL1500 6-Stage: See table 3
CL2500 6-Stage: See table 4

Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4

Class V: 0.0005 mL/min/psid/in of water at service pressure drop

Maximum Inlet Pressures and Temperatures(1)

Consistent with applicable CL600, CL900, CL1500, and CL2500 pressure/temperature ratings according to ASME B16.34 unless limited by individual temperature limits shown in tables 7, 8, 9, 10, 11, or 12

Maximum Pressure Drop(1)

See table 5

Construction Materials

Valve Body and Bonnet, Plug, Seat Ring, and Cage: See tables 7, 8, 9, and 10
Other Parts: See table 11

Temperature Capabilities(1)

3-Stage, 4-Stage, and 6-Stage: See tables 7, 8, 9, 10, 11, and 12

Valve Body/Trim Combinations: See tables 7, 8, 9, and 10

Bolting for Sour Applications: See table 12 (CL600 -- 3-Stage only). For all other valve pressure ratings, contact your Emerson sales office

All Other Parts: See table 11

Flow Coefficients

See Fisher Catalog 12

Flow Characteristic

Linear

Flow Direction

Flow up

Port Diameter, Travel, Stem, Yoke Boss Diameters, Unbalance Area

See tables 27, 28, 29, and 30

Minimum Seating Force

Use Class V seat load requirements (refer to Fisher Catalog 14 or contact your Emerson sales office

Noise Level

Use Fisher liquid noise prediction methods available in the Fisher sizing program

Bonnet Style

Plain Bonnet: See figures 2, 3, 4, 6, 7, and 8

Packing Arrangements

Standard Material: Single PTFE V-ring
Optional Material: Double PTFE V-ring, single graphite ribbon filament, and ENVIRO-SEAL packing systems. See bulletin 59.1:061, ENVIRO-SEAL and HIGH-SEAL Packing System for Sliding-Stem Valves (Live-Loaded) (D101633X012)

Approximate Weights

See table 13

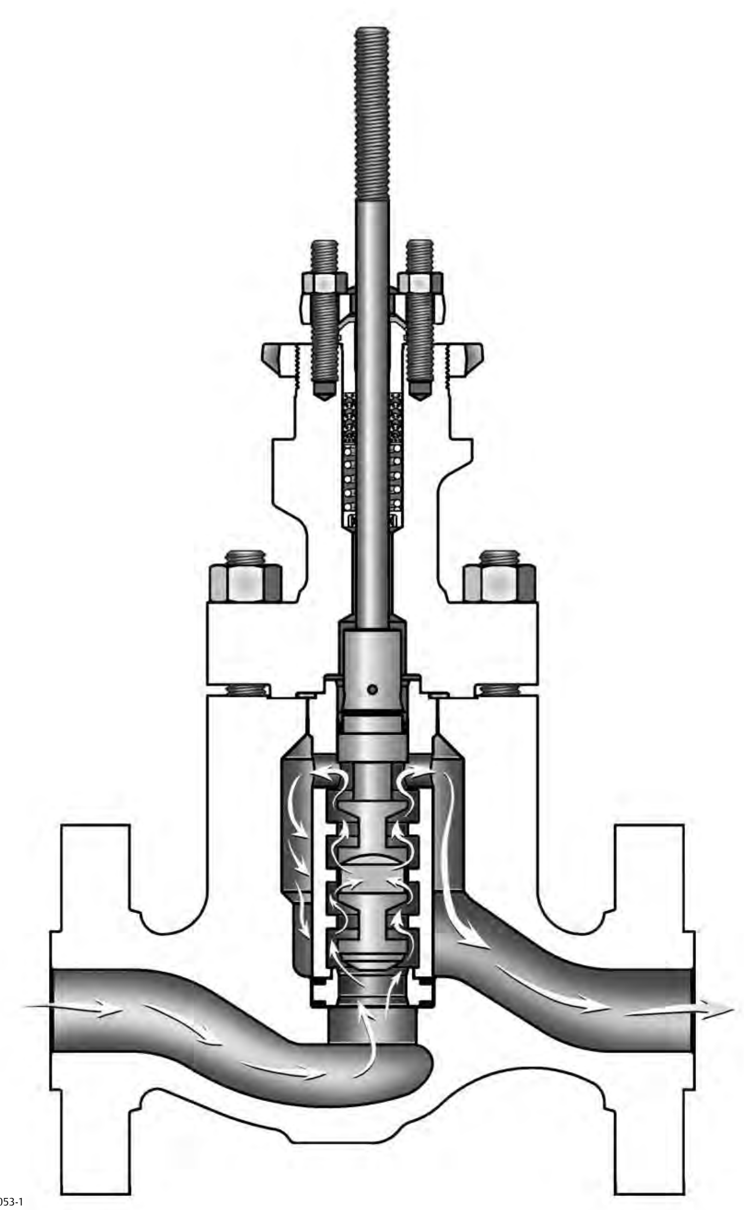
Dimensions

Globe Valve CL300, CL600: See tables 14 and 15
Globe Valve CL900, CL1500 4-Stage: See tables 16 and 17
Globe Valve CL1500 6-Stage: See table 23
Globe Valve CL2500 6-Stage: See table 24
Angle Valve CL300, CL600: See table 18
Angle (Forged) Valve CL900 and CL1500: See tables 19 and 20
Angle (Cast) Valve CL900, CL1500: See tables 21 and 22
Angle (Forged) Valve CL2500: See table 25
Angle (Cast) Valve CL2500: See table 26

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.

Contents

Figure 1. NotchFlo DST 4-Stage Trim



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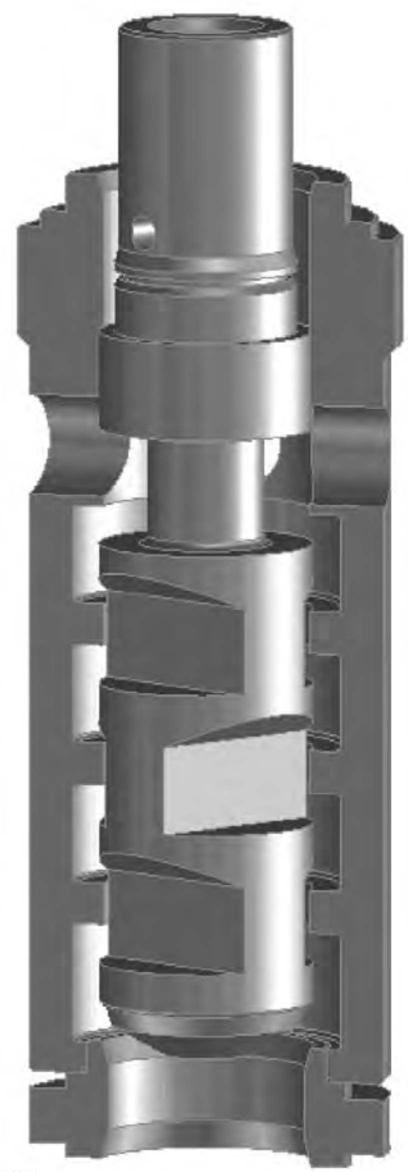

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Principle of Operation

NotchFlo DST control valves utilize a high resistance, multi-stage, axial flow path (or passage) where fluid flow is parallel to the axis of the plug and cage (see figure 1).

Pressure reduction occurs throughout the length of the plug; thus individual stages aren't exposed to the full pressure differential. Therefore, trim life is enhanced.

NotchFlo DST trim utilizes a series of notched flow restrictions and expansions to control the pressure drop of the fluid. The amount of pressure drop per stage is controlled to prevent cavitation problems and minimize erosion issues on a properly sized valve.

Flow passage configuration provided by the multi-stage plug and cage design make CL600 3-stage, CL900 and CL1500 4-stage, and CL1500 and CL2500 6-stage valves well-suited for applications involving fluids with entrained particles. This is a potentially serious problem for other anti-cavitation valve designs which are subject to clogged flow passages.

Design of the trim allows for high rangeability.

Characteristics

The NotchFlo DST control valve has a linear flow characteristic.

To maximize seat life, the trim is designed not to have significant flow for the first 15% of travel.

The multi-stage clearance flow design helps prevent high pressure drops in the seating area during throttling at low capacity. This design feature extends the shutoff capability significantly, while enhancing throttling control capability at low travels.

Table 1. CL300 and CL600 3-Stage Available Constructions

VALVE STYLE	VALVE BODY MATERIAL	VALVE SIZE, NPS	END CONNECTION STYLE(1)			
			Screwed	RF or RTJ Flanged	Butt Weld	Socket Weld
Globe	WCC, LCC(2), WC9, CF8M, CF8C, CD3MN	1 and 2	X	X	X	X
		3, 4, 6, and 8	- - -	X	X	- - -
Angle	SA-105, F22, F316, F347, S31803	1 and 2	X	X	X	X
		3, 4, 6, and 8	- - -	X	X	- - -

X = Available Construction.
1. End connection style abbreviations: RF - Raised Face, RTJ - Ring Type Joint.
2. LCC available with RF and RTJ flanged constructions only. Contact your Emerson sales office for other end connections.

Table 2. CL900 and CL1500, 4-Stage Available Constructions

VALVE STYLE	VALVE BODY MATERIAL	VALVE SIZE, NPS	END CONNECTION STYLE(1)		
			RF or RTJ Flanged	Butt Weld	Socket Weld
Globe	WCC, LCC(2), WC9, CF8M, CF8C, CD3MN	1, 1-1/2, and 2	X	X	X
		3 and 4	X	X	---
Angle	WCC, WC9, CF8M, CF8C, CD3MN	1, 1-1/2, and 2	X	X	X
		3, 4, 6, and 8	X	X	---
	SA-105, F22, F316, F347, S31803	1, 1-1/2, and 2	X	X	X
		3, 4, 6, and 8	X	X	---

X = Available Construction.
1. End connection style abbreviations: RF - Raised Face, RTJ - Ring Type Joint.
2. LCC available with RF and RTJ flanged constructions only. Contact your Emerson sales office for other end connections.

Table 3. CL1500 6-Stage Available Constructions

VALVE STYLE	VALVE BODY MATERIAL	VALVE SIZE, NPS	VALVE BODY MATERIAL AND END CONNECTION STYLE(1)		
			RF or RTJ Flanged	Butt Weld	Socket Weld
Globe	WCC, LCC, WC9, CF8M, CF8C, CD3MN	1	X	- - -	X
		2, 3, 4, and 6	X	X	- - -

X = Available Construction
1. End connection style abbreviations: RF = Raised Face, RTJ = Ring Type Joint

Table 4. CL2500 6-Stage Available Constructions

VALVE STYLE	VALVE BODY MATERIAL	VALVE SIZE, NPS	VALVE BODY MATERIAL AND END CONNECTION STYLE(1)		
			RF or RTJ Flanged	Butt Weld	Socket Weld
Angle	SA-105, F22, F316, F347, S31803	1	X	- - -	X
		2, 3, 4, and 6	X	X	- - -
	WCC, WC9, CF8M, CF8C	1, 2, 3, 4, and 6	X	X	- - -
Globe	WCC, WC9, CF8M, CF8C,CF3M	1, 2, 3, 4, and 6	X	- - -	- - -

X = Available Construction
1. End connection style abbreviations: RF = Raised Face, RTJ = Ring Type Joint

Table 5. Application Guidelines for NotchFlo DST Trim

VALVE PRESSURE RATING	TRIM TYPE	VALVE SIZE, NPS	K_C = 1		K_C = 0.8	
			bar	psid	bar	psid
CL600	3-Stage, Level C	All	<103	<1500	- - -	- - -
CL900 and CL1500	4-Stage, Level A	All	<128	<1850	128 - 160	1850 - 2325
	4-Stage, Level B		<130	<1890	130 - 163	1890 - 2360
	4-Stage, Level C		<179	<2600	179 - 224	2600 - 3250
CL1500	6-Stage, Level C	All	<285	<3750	- - -	- - -
CL2500			<289	<4200	289 - 362	4200 - 5250

Table 6. Typical Applications

POWER/COGENERATION	Boiler feed pump recirculation
	Desuperheater spray water control
	Feedwater start-up regulators
	Condensate pump recirculation
	Superheater bypass
OIL AND GAS PRODUCTION	Water injection pump recirculation
	Produced/waste water injection well control
	Separator letdown
	Chemical injection pump bypass
NATURAL GAS PROCESSING	Contactor (rich amine) letdown
	Rich and lean amine pump spillback
REFINING	Contactor letdown
	Rich and lean amine pump spillback
	Pump spillback/recirculation
	Various high pressure and low pressure separator letdown

Trim Selection Guidelines

Refer to the following descriptions and tables 7, 8, 8, and 10 as guidelines for the selection of appropriate trims.

- **Trim 277--** Trim 277 is the standard trim for carbon steel and alloy steel valve bodies and recommended for general and severe service applications up to 316°C (600°F). See tables 7, 8, 9, and 10 for operating temperature ranges per valve size. Typical applications for Trim 277 include services in boiler feedwater, water, non-sour hydrocarbons, and other non-sour liquids.

- **Trim 279--** Trim 279 should be used for sour liquid service in carbon steel, alloy steel, and stainless steel valve bodies. Trim 279 complies with the metallurgical requirements of NACE MR0103 and MR0175-2002. Trim 279 can be used up to 316°C (600°F). See tables 7, 8, 9, and 10 for operating temperature ranges per valve size.

- **Trim 282--** Trim 282 should be used in stainless steel valve bodies only. Trim 282 complies with the metallurgical requirements of NACE MR0103 and MR0175-2002. Trim 282 can be used up to 316°C (600°F). See table 7, 8, 9, or 10 for operating temperature ranges per valve size.

- **Trim 283--** Trim 283 should be used in stainless steel valve bodies only. Trim 283 complies with the metallurgical requirements of NACE MR0103 and MR0175-2002. Trim 283 can be used up to 316°C (600°F). See tables 7, 8, 9, and 10 for operating temperature ranges per valve size.

- **Trim 284--** Trim 284 should be used in duplex stainless steel valve bodies only. Trim 284 can be used up to 316°C (600°F). See tables 7, 8, 9, and 10 for operating temperature ranges.

- **Trim 285--** Trim 285 is the standard trim for stainless steel valve bodies and is optional for use in carbon steel and alloy steel valve bodies. This trim is recommended for general and severe service applications up to 316°C (600°F). Trim 285 can be used in sour or moderately corrosive services and complies with the metallurgical requirements of NACE MR0175-2002. See tables 7, 8, 9, and 10 for operating temperature ranges per valve size.

- **Trim 286--** Trim 286 is available for use in severe service applications, including high pressure separators. Trim 286 can be used in highly corrosive services and complies with the metallurgical requirements of NACE MR0103 and MR0175-2002. See tables 7, 8, 9, and 10 for operating temperature ranges per valve size.

Table 7. CL600 3-Stage Metal Trim Material Combinations and Valve Body/Trim Temperature Capabilities(1)

TRIM DESIGNATION	VALVE PLUG	VALVE PLUG STEM	CAGE	SEAT RING	VALVE BODY MATERIAL	VALVE SIZE	OPERATING TEMPERATURE	
						NPS	°C	°F
277	S44004	S20910	S17400 H900 (NPS 1-4) S17400 H1075 (NPS 6-8)	S44004	SA105, WCC, F22 WC9, LCC	1, 2, 3, 4, 6, and 8	-29 to 316	-20 to 600
					CF8M, S31600	1	-29 to 149	-20 to 300
						2	-29 to 121	-20 to 250
						3 and 4	-29 to 93	-20 to 200
279(2)	R30006 or R30016	S20910	R30006 or R30016	R30006 or R30016	S31600, CF8M, S34700, CF8C	1	-29 to 232	-20 to 450
						2	-29 to 177	-20 to 350
						3 and 4	-29 to 121	-20 to 250
					SA105, WCC, LF2 LCC	1 and 2	-29 to 316	-20 to 600
						3	-29 to 260	-20 to 500
						4	-29 to 204	-20 to 400
					CD3MN (Duplex SST)	1, 2, 3, and 4	-29 to 316	-20 to 600
282(2)	R30016 (NPS 1) S31600/ CoCr-A (NPS 2-8)	S20910	S20910	S31600/ CoCr-A	S31600, CF8M	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
						8	-29 to 232	-20 to 450
283(2)	R30016 (NPS 1) S34700/ CoCr-A (NPS 2-8)	S20910	S20910	S34700/ CoCr-A	S34700, CF8C	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
						8	-29 to 232	-20 to 450
284	R30016 (NPS 1) S31803/ CoCr-A (NPS 2-8)	S20910	S32760	S31803/ CoCr-A	CD3MN (Duplex SST)	1, 2, 3, 4, 6, and 8	-29 to 316	-20 to 600
285	S20910 Annealed	S20910	S17400 H1150 Double HT	S31600/ CoCr-A	SA105, WCC, LF2, LCC	1, 2, 3, 4, 6, and 8	-29 to 316	-20 to 600
					S31600, CF8M	1	-29 to 204	-20 to 400
						2	-29 to 177	-20 to 350
						3 and 4	-29 to 121	-20 to 250
						6	-29 to 177	-20 to 350
						8	-29 to 121	-20 to 250
286	N07718	S20910	S32550	R30006 or R30016	SA105, WCC, LF2, LCC, F22, WC9	1	(3)	(3)
				316 SST/ CoCr-A		2, 3, 4, 6, and 8	(3)	(3)

1. For metal trim parts only.
2. Contact your Emerson sales office for information on NACE MR0175/ISO 15156.
3. Contact your Emerson sales office for operating temperature ranges.

Table 8. CL900/CL1500 4-Stage Metal Trim Material Combinations and Temperature Capabilities[1]

TRIM DESIGNATION	VALVE PLUG	VALVE PLUG STEM	CAGE	SEAT RING	VALVE BODY MATERIAL	VALVE SIZE	OPERATING TEMPERATURE	
						NPS	°C	°F
277	S44004	S20910	S17400 H900 (NPS 1-4) S17400 H1075 (NPS 6-8)	S44004	SA105, WCC, F22 WC9, LCC	1, 1-1/2, 2, 3, 6, and 8	-29 to 316	-20 to 600
						4	-29 to 288	-20 to 550
					CF8M, S31600	1	-29 to 177	-20 to 350
						1-1/2	-29 to 149	-20 to 300
						2	-29 to 121	-20 to 250
						3 and 4	-29 to 93	-20 to 200
279[2]	R30006 or R30016	S20910	R30006 or R30016	R30006 or R30016	S31600, CF8M	1	-29 to 260	-20 to 500
						1-1/2	-29 to 232	-20 to 450
						2	-29 to 177	-20 to 350
						3	-29 to 121	-20 to 250
						4	-29 to 93	-20 to 200
					S34700, CF8C	1, 1-1/2	-29 to 232	-20 to 450
						2	-29 to 177	-20 to 350
						3	-29 to 121	-20 to 250
						4	-29 to 93	-20 to 200
					SA105, WCC, LF2 LCC	1, 1-1/2, and 2	-29 to 316	-20 to 600
						3	-29 to 232	-20 to 450
						4	-29 to 93	-20 to 200
					CD3MN (Duplex SST)	1, 1-1/2, 2, 3, and 4	-29 to 316	-20 to 600
282[2]	R30016 (NPS 1) S31600/ CoCr-A (NPS 1-1/2 to 8)	S20910	S20910	S31600/ CoCr-A	S31600, CF8M	1, 1-1/2, 2, and 3	-29 to 316	-20 to 600
						4	-29 to 93	-20 to 200
						6 and 8	-46 to 316	-50 to 600
283[2]	R30016 (NPS 1) S34700/ CoCr-A (NPS 1-1/2 to 8)	S20910	S20910	S34700/ CoCr-A	S34700, CF8C	1, 1-1/2, 2, and 3	-29 to 316	-20 to 600
						4	-29 to 93	-20 to 200
						6 and 8	-46 to 316	-50 to 600
284	R30016 (NPS 1) S31803/ CoCr-A (NPS 1-1/2 to 8)	S20910	S32760	S31803/ CoCr-A	CD3MN (Duplex SST)	1, 1-1/2, 2, and 3	-29 to 316	-20 to 600
						4	-29 to 204	-20 to 400
						6 and 8	-29 to 316	-20 to 600
285	S20910 Annealed	S20910	S17400 H1150 Double HT	S31600/ CoCr-A	SA105, WCC, LF2, LCC	1, 1-1/2, 2, 3, 4, 6, and 8	-29 to 316	-20 to 600
					S31600, CF8M	1	-29 to 232	-20 to 450
						1-1/2	-29 to 205	-20 to 400
						2	-29 to 177	-20 to 350
						3	-29 to 121	-20 to 250
						4	-29 to 93	-20 to 200
						6	-29 to 149	-20 to 300
						8	-29 to 121	-20 to 250
286	N07718	S20910	S32550	R30006 or R30016	SA105, WCC, LF2, LCC, F22, WC9	1 and 1-1/2	-29 to 316	-20 to 600
				316 SST/ CoCr-A		2 and 3	-29 to 316	-20 to 600
						4	-29 to 204	-20 to 400
						6 and 8	-29 to 316	-20 to 600

1. For metal trim parts only.
2. Contact your Emerson sales office for information on NACE MR0175/ISO 15156.

Table 9. CL1500 6-Stage Metal Trim Material Combinations and Temperature Capabilities(1)

TRIM DESIGNATION	VALVE PLUG	VALVE PLUG STEM	CAGE	SEAT RING	VALVE BODY MATERIAL	VALVE SIZE	OPERATING TEMPERATURE	
						NPS	°C	°F
277	S44004 HT	S20910	S17400 H1075	S44004 HT	WCC, LCC, WC9	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
					CF8M	4 and 6	-29 to 93	-20 to 200
279(2)	R30006 or R30016	S20910	R30006 or R30016	R30006 or R30016	WCC, LCC, CD3MN	1 and 2	-29 to 316	-20 to 600
					CF8M, CF8C	1	-29 to 177	-20 to 350
					CF8M, CF8C	2	-29 to 232	-20 to 450
					WCC, LCC	3	-29 to 260	-20 to 500
					CF8M, CF8C	3	-29 to 149	-20 to 300
					WCC, LCC, WC9	4	-29 to 232	-20 to 450
					CD3MN	3 and 4	-29 to 316	-20 to 600
					CF8M, CF8C	4	-29 to 121	-20 to 250
282(2)	R30006 or R30016 (NPS 1) S31600/CoCr-A (NPS 2 - 6)	S20910	S20910	S31600/CoCr-A	CF8M	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
283(2)	R30006 or R30016 (NPS 1) S34700/CoCr-A (NPS 2 - 6)	S20910	S20910	S34700/CoCr-A	CF8C	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
284	R30006 or R30016 (NPS 1) S31803/CoCr-A (NPS 2 - 6)	S20910	S32760	S31803/CoCr-A	CD3MN	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
285	S20910 Annealed	S20910	S17400 H1150 Double HT	S31600/CoCr-A	WCC, LCC, WC9	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
					CF8M, CF8C	1	-29 to 163	-20 to 325
					CF8M, CF8C	2	-29 to 210	-20 to 410
					CF8M, CF8C	3	-29 to 135	-20 to 275
					CF8M, CF8C	4 and 6	-29 to 149	-20 to 300
286	N07718	S20910	S32550	R30006 or R30016 (NPS 1) S31600/CoCr-A (NPS 2 - 6)	WCC, LCC, WC9	1, 2, 3, 4, and 6	-29 to 316	-20 to 600

1. For metal trim parts only.
2. Contact your Emerson sales office for information on NACE MR0175/ISO 15156.

Table 10. CL2500 6-Stage Metal Trim Material Combinations and Temperature Capabilities(1)

TRIM DESIGNATION	VALVE PLUG	VALVE PLUG STEM	CAGE	SEAT RING	VALVE BODY MATERIAL(3)	VALVE SIZE	OPERATING TEMPERATURE	
						NPS	°C	°F
277	S4404 HT	S20910	S17400 H1075 HT	S44004 HT	SA105, LF2 & F22, WCC, WC9	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
					S31600, CF8M, CF3M	4	-29 to 93	-20 to 200
						6	-29 to 93	-20 to 200
279(2)	R30006 or R30016	S20910	R30006 or R30016	R30006 or R30016	S31600, S34700, CF8M, CF8C, CF3M	1	-29 to 177	-20 to 350
						2	-29 to 232	-20 to 450
						3	-29 to 149	-20 to 300
						4	-29 to 121	-20 to 250
					SA105, LF2, WCC	1, 2, 3 and 4	-29 to 316	-20 to 600
					S31803 (Duplex SST)	1, 2, 3 and 4	-29 to 316	-20 to 600
282(2)	R30016 (NPS 1) S31600/ CoCr-A (NPS 2-6)	S20910	S20910	S31600/CoCr-A	S31600, CF8M, CF3M	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
283(2)	R30016 (NPS 1) S34700/ CoCr-A (NPS 2-6)	S20910	S20910	S34700/CoCr-A	S34700, CF8C	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
284	R30016 (NPS 1) S31803/ CoCr-A (NPS 2-6)	S20910	S32760	S31803/ CoCr-A	S31803 (Duplex SST)	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
285	S20910 Annealed	S20910	S17400 H1150 Double HT	S31600/CoCr-A	SA105, LF2 & F22, WCC, WC9	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
					S31600, S34700, CF8M, CF8C, CF3M	1	-29 to 163	-20 to 325
						2	-29 to 210	-20 to 410
						3	-29 to 135	-20 to 275
						4 and 6	-29 to 149	-20 to 300
286	N07718	S20910	S32550	R30006 or R30016	SA105, LF2 & F22, WCC, WC9	1, 2, 3, 4, and 6	-29 to 316	-20 to 600
				316 SST/ CoCr-A				

1. For metal trim parts only.
2. Contact your Emerson sales office for information on NACE MR0175/ISO 15156.
3. Forging materials for forged angle bodies, casting materials for cast globe and/or angle bodies.

Table 11. Construction Materials and Temperature Capabilities for Parts Other than Valve Body and Trim

PART		MATERIAL	TEMPERATURE CAPABILITIES °C	TEMPERATURE CAPABILITIES °F
Valve plug stem		S20910 S31600	- - -[4]	- - -[4]
Spring-loaded valve plug seal[6]	Backup ring	S41600 S31600 S41000 S34700 S31803 N07718	-29 to [4]	-20 to [4]
	Retaining ring	18-8 N07750	- - -[4]	- - -[4]
	Seal ring	Modified PTFE w/ R30003 Spring (standard) UHMWPE[5] with N10276 Spring	-73 to 316[3] -73 to 93	-100 to 600[3] -100 to 200
	Anti-extrusion rings	PEEK (PolyEtherEtherKetone)	- - -[4]	- - -[4]
Bonnet gasket (CL600)		Graphite/S31600	- - -[4]	- - -[4]
Bonnet gasket (CL900, CL1500, and CL2500)		N06600/Graphite	- - -[4]	- - -[4]
Seat ring gasket		N06600/Graphite	- - -[4]	- - -[4]
Cage gasket		N06600/Graphite	- - -[4]	- - -[4]
Valve Body-to-bonnet bolting[1] See table 12 for NACE bolting materials and temperature limits.	Studs Nuts	Steel SA193-B7 (all valve body materials) Steel SA194-2H (all valve body materials)	-29 to [4] (WCC, WC9, SA105, F22) -48 to [4] (LCC, CF8M, S31600, and S34700) -29 to 316 (CD3MN, S31803 [Duplex SST])	-20 to [4] (WCC, WC9, SA105, F22) -55 to [4] (LCC, CF8M, S31600, and S34700) -20 to 600 (CD3MN, S31803 [Duplex SST])
	Studs Nuts	Steel SA193-B7M for sour service Steel SA194-2HM for sour service	-29 to [4] (WCC and SA105) -46 to [4] (LCC)	-20 to [4] (WCC and SA105) -50 to [4] (LCC)
	Studs Nuts	S31600 SA193-B8M (strain hardened) (CF8M and S31600 valve body mat'ls) S31600 SA194-8M (CF8M and S31600 valve body mat'ls)	(CF8M and S31600)- - -[4]	(CF8M and S31600)- - -[4]
	Studs Nuts	S20910 (SA479-XM-19)[2] (CF8M and S31600 valve body mat'ls) Steel SA194-7	(CF8M and S31600)- - -[4]	(CF8M and S31600)- - -[4]
Packing		PTFE V-ring	-40 to 232	-40 to 450
		Graphite ribbon filament (oxidizing service to 700°F)	- - -[4]	- - -[4]
		Graphite ULF (non-environmental service)	- - -[4]	- - -[4]
Packing follower, spring, or lantern ring		S31600 S34700 S31803	- - -[4]	- - -[4]
Packing box ring		S31600	- - -[4]	- - -[4]
Packing flange, studs, or nuts		S31600	- - -[4]	- - -[4]

1. Valve body materials with which these bolting materials may be used are shown in parentheses.
2. This stud material is not listed in ASME B16.34.
3. With PEEK anti-extrusion rings in non-oxidizing service. Maximum operating temperature limited to 260°C (500°F) in oxidizing service.
4. These materials are not limiting factors.
5. Ultra high molecular weight polyethylene
6. Not required for NPS 1 or 1-1/2 CL900 and CL1500 4-stage valves.

Table 12. CL600 3-Stage Bolting Materials and Temperature Limits for Bolting Compliance with NACE MR0175-2002, NACE MR0175/ISO 15156, and NACE MR0103

VALVE BODY MATERIAL		BOLTING MATERIAL	TEMPERATURE CAPABILITIES	
			°C	°F
Non-exposed bolting (Standard)				
WCC, CF8M, CD3MN, SA105, S31600, and S31803	Studs	Steel SA-193-B7	-48(2) to 427 (WCC, CF8M, SA105 and S31600) -29 to 316 (CD3MN and S31803)	-55(2) to 800 (WCC, CF8M, SA105 and S31600) -20 to 600 (CD3MN and S31803)
	Nuts	Steel SA-194-2H		
Exposed bolting (Optional) May require derating of valve(1) when these body-to-bonnet bolting materials are used				
WCC, CF8M, CD3MN, SA105, S31600, and S31803	Studs	Steel SA-193-B7M	-48(2) to 427 (WCC, CF8M, SA105 and S31600) -29 to 316 (CD3MN and S31803)	-55(2) to 800 (WCC, CF8M, SA105 and S31600) -20 to 600 (CD3MN and S31803)
	Nuts	Steel SA-194-2HM		

1. Derating may be required for valves rated at CL600. Contact your Emerson sales office for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used. Derating is not required for CL900 and CL1500 valves.
2. -29°C (-20°F) with WCC valve body material.

Table 13. Approximate Weights (Valve and Bonnet Assemblies)

VALVE DESIGN	VALVE SIZE, NPS	PRESSURE RATING	KG		LBS	
			Flanged	Socket Weld(1), Butt Weld, Screwed(2)	Flanged	Socket Weld(1), Butt Weld, Screwed(2)
3-Stage Angle Valves	1	CL600	20	---	44	---
	2		42	---	93	---
	3		86	---	190	---
	4		140	---	315	---
	6		300	---	660	---
	8		605	---	1340	---
3-Stage Globe Valves	1	CL600	20	15	45	35
	2		40	30	90	70
	3		70	50	155	110
	4		120	80	265	175
	6		275	230	610	510
	8		510	445	1130	980
4-Stage Angle Valves	1	CL900 and CL1500	50	40	110	90
	1-1/2		55	45	120	95
	2		95	95	210	210
	3		185	---	405	---
	4		285	---	625	---
	6		560	---	1230	---
	8		1260	---	2770	---
4-Stage Cast Angle Valves	1	CL900 and CL1500	40	32	88	71
	1-1/2		43	35	95	77
	2		75	57	165	126
	3		148	118	326	260
	4		243	200	536	441
	6		523	443	1153	977
	8		1062	920	2342	2029
4-Stage Globe Valves	1	CL900 and CL1500	58	42	128	93
	1-1/2		75	48	165	106
	2		95	85	210	185
	3		185	140	405	310
	4		340	280	750	620

-continued-

Table 13. Approximate Weights (Valve and Bonnet Assemblies) (cont.)

VALVE DESIGN	VALVE SIZE, NPS	PRESSURE RATING	KG		LBS	
			Flanged	Socket Weld(1), Butt Weld, Screwed(2)	Flanged	Socket Weld(1), Butt Weld, Screwed(2)
6-Stage Angle Valves	1	CL2500	64	67	140	148
	2		180	170	405	375
	3		500	473	1110	1043
	4		465	433	1025	955
	6		1060	1030	2330	2271
6-Stage Cast Angle Valves	1	CL2500	50	42	110	93
	2		135	108	298	238
	3		352	293	776	646
	4		385	300	849	662
	6		921	692	2031	1526
6-Stage Globe Valves	1	CL1500	47	43	103	94
	2		98	84	217	186
	3		354	307	781	677
	4		406	386	896	852
	6		975	866	2149	1909
	1	CL2500	53	- - -	117	- - -
	2		130	- - -	287	- - -
	3		321	- - -	708	- - -
	4		427	- - -	942	- - -
	6		1026	- - -	2262	- - -

1. SWE available on NPS 1, 1-1/2, and 2 only. Please check tables 1 to 5 for available end connection selections.
2. Screwed end available on NPS 1 and 2 CL600 only.

Figure 2. Typical CL300 and CL600 3-Stage NotchFlo DST Valve Dimensions (also see tables 14 and 15)

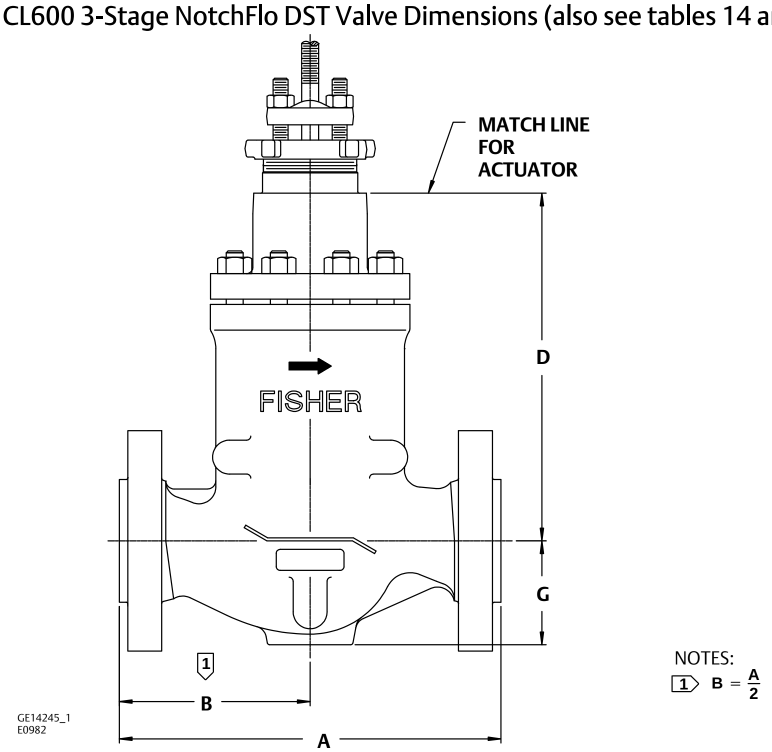


Table 14. CL300 and CL600 3-Stage Globe Valve Dimensions with Plain Bonnet

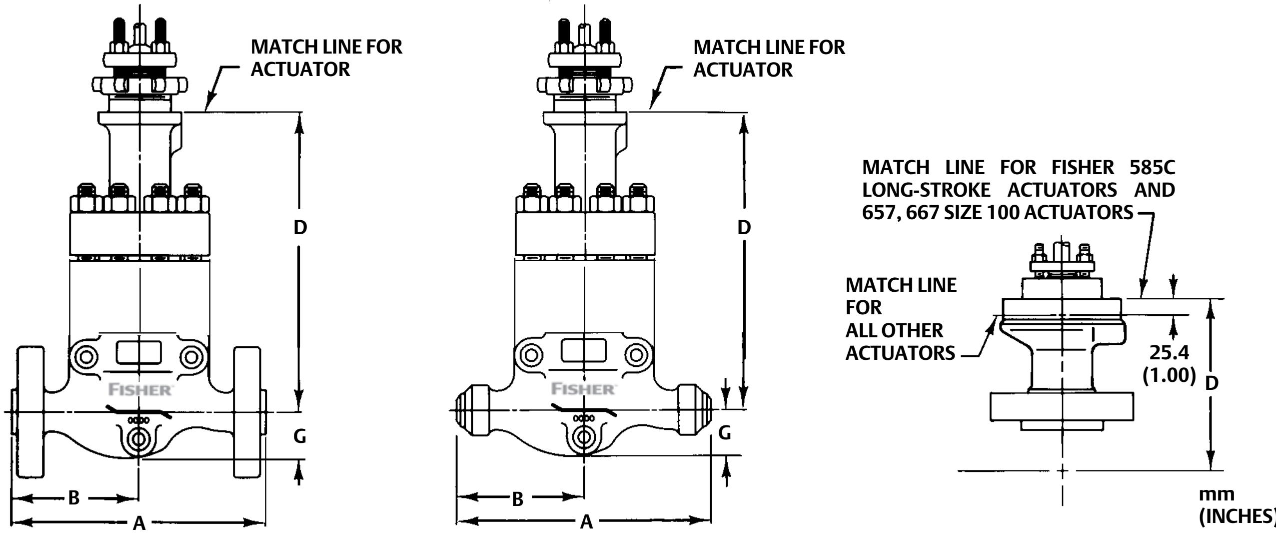
VALVE SIZE, NPS	A(1)							
	CL300				CL600			
	Scrd or SWE	BWE	RF	RTJ	Scrd or SWE	BWE	RF	RTJ
	mm							
1	---	---	197	---	209.6	209.6	209.6	209.6
2	---	---	267	---	285.8	285.8	285.8	289.1
3	---	---	318	---	---	336.6	336.6	339.9
4	---	---	368	---	---	393.7	393.7	396.7
6	---	---	473	489	---	508	508	511
8	---	---	568	584	---	609.6	609.6	612.6
	Inches							
1	---	---	7.75	---	8.25	8.25	8.25	8.25
2	---	---	10.50	---	11.25	11.25	11.25	11.38
3	---	---	12.50	---	---	13.25	13.25	13.38
4	---	---	14.50	---	---	15.50	15.50	15.62
6	---	---	18.62	19.25	---	20	20	20.12
8	---	---	22.38	23.00	---	24	24	24.12

1. RF: raised-face flanges, RTJ: ring-type-joint flanges, BWE: buttwelding ends, SWE: socketweld ends; Scrd: screwed

Table 15. CL300 and CL600 3-Stage Globe Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	YOKE BOSS DIAMETER	D	G
	mm		
1	71	220.7	60.5
2	71	260.4	77.7
	90	257.3	77.7
3	90	318.5	96.8
4	90	329.4	128.5
	127	375.4	128.5
6	90	515.6	138.1
	127	549.3	138.1
8	90	653	189.6
	127	697.6	189.6
	Inches		
1	2-13/16	8.69	2.38
2	2-13/16	10.25	3.06
	3-9/16	10.13	3.06
3	3-9/16	12.54	3.81
4	3-9/16	12.97	5.06
	5	14.78	5.06
6	3-9/16	20.3	5.44
	5	21.63	5.44
8	3-9/16	25.71	7.46
	5	27.46	7.46

Figure 3. Typical CL900 and CL1500 ≤ NPS 4, 4-Stage NotchFlo DST Globe Valve Dimensions (also see tables 16 and 17)



FLANGED VALVE WITH 90 mm (3-9/16 INCH) DIAMETER YOKE BOSS

BUTTWELDING END VALVE WITH 90 mm (3-9/16 INCH) DIAMETER YOKE BOSS

127 mm (5-INCH) DIAMETER YOKE BOSS FOR USE WITH NPS 4 VALVES

Figure 4. Typical CL300 3-Stage, CL600 3-Stage, CL900 4-Stage, and CL1500 4-Stage NotchFlo DST Angle Valve Dimensions (also see tables 18, 19, and 20)

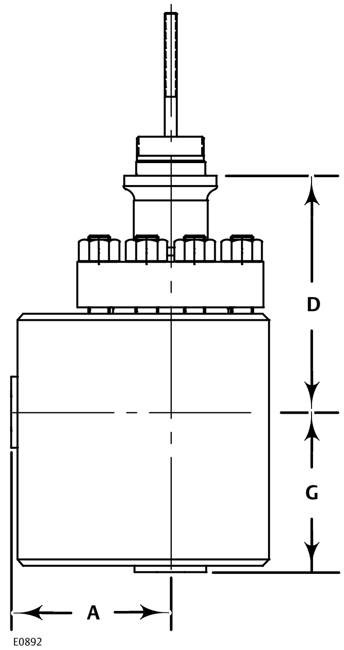


Figure 5. Typical CL1500 4-Stage NotchFlo DST Cast Angle Valve Dimensions (also see tables 21 and 22)

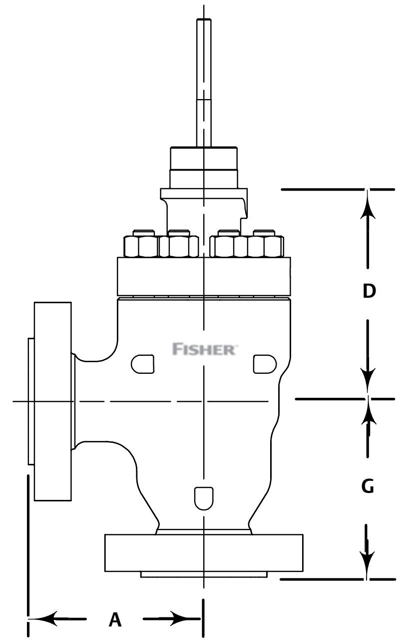


Table 16. CL900 and CL1500 ≤ NPS 4, 4-Stage Globe Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A(1)					
	CL900		CL1500			
	RF	RTJ	BWE	SWE	RF	RTJ
	mm					
1	292	292	---	292	292	292
1-1/2	298	298	---	292	298	298
2	375	378	375	375	375	378
3	442	445	460	---	460	464
4	511	514	530	---	530	533
	Inches					
1	11.5	11.5	---	11.5	11.5	11.5
1-1/2	11.75	11.75	---	11.5	11.75	11.75
2	14.75	14.88	14.75	14.75	14.75	14.88
3	17.38	17.50	18.12	---	18.12	18.25
4	20.12	20.25	20.88	---	20.88	21.00
VALVE SIZE, NPS	B					
	CL900		CL1500			
	RF	RTJ	BWE	SWE	RF	RTJ
	mm					
1	148	148	---	148	148	148
1-1/2	151	151	---	148	151	151
2	187	189	187	187	187	189
3	221	222	230	---	230	232
4	229	230	238	---	238	240
	Inches					
1	5.81	5.81	---	5.81	5.81	5.81
1-1/2	5.93	5.93	---	5.81	5.93	5.93
2	7.38	7.44	7.38	7.38	7.38	7.44
3	8.69	8.75	9.06	---	9.06	9.12
4	9.00	9.06	9.38	---	9.38	9.44

1. RF: raised-face flanges, RTJ: ring-type-joint flanges, BWE: buttwelding ends, SWE: socketweld ends

Table 17. CL900 and CL1500 ≤ NPS 4, 4-Stage Globe Valve Dimensions

VALVE SIZE, NPS	D			G
	Plain Bonnet			
	71 mm (2-13/16 Inch) Yoke Boss	90 mm (3-9/16 Inch) Yoke Boss	127 mm (5-Inch) Yoke Boss	
	mm			
1	305	---	---	59
1-1/2	294	---	---	75
2	---	333	---	77
3	---	412	---	121
4	---	427	495	175
	Inches			
1	12.01	---	---	2.32
1-1/2	11.57	---	---	2.94
2	---	13.12	---	3.06
3	---	16.24	---	4.75
4	---	16.79	19.48	6.88

Table 18. CL300 and CL600 3-Stage Angle Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A(1)		YOKE BOSS DIAMETER	D	G(1)	
	RF	RTJ			RF	RTJ
	mm					
1	76	76	71	165.3	88	88
2	96	96	71	185.3	123	123
			90	182.1	123	123
3	118	118	90	224.1	149	149
4	151	151	90	232.1	174	174
			127	278.2	174	174
6(2)	177	177	90	335.6	235.5	235.5
			127	369.3	235.5	235.5
8(2)	221	221	90	306	418	418
			127	350.5	418	418
	Inches					
1	2.99	2.99	2-13/16	6.51	3.46	3.46
2	3.78	3.78	2-13/16	7.3	4.84	4.84
			3-9/16	7.17	4.84	4.84
3	4.64	4.64	3-9/16	8.82	5.87	5.87
4	5.94	5.94	3-9/16	9.14	6.85	6.85
			5	10.95	6.85	6.85
6(2)	6.97	6.97	3-9/16	13.21	9.27	9.27
			5	15.54	9.27	9.27
8(2)	8.7	8.7	3-9/16	12.05	16.46	16.46
			5	13.8	16.46	16.46

1. RF: Raised-face flanges, RTJ: Ring-type-joint flanges.
2. NPS 6 and 8 are only available in CL1500.

Table 19. CL900 and CL1500, 4-Stage Angle Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A(1)		
	CL900 - CL1500		
	RF	RTJ	SWE
	mm		
1	115	115	74
1-1/2	140	140	74
2	99	100	102
3	120	122	- - -
4	140	142	- - -
6	184	187	- - -
8	260	263	- - -
	Inches		
1	4.50	4.50	2.88
1-1/2	5.50	5.50	2.88
2	3.88	3.94	4.00
3	4.75	4.81	- - -
4	5.50	5.56	- - -
6	7.25	7.35	- - -
8	10.24	10.33	- - -

1. RF: raised-face flanges, RTJ: ring-type-joint flanges, SWE: socketweld ends

Table 20. CL900 and CL1500, 4-Stage Angle Valve Dimensions

VALVE SIZE, NPS	YOKE BOSS DIAMETER	D	G
		Plain Bonnet	
	mm		
1	71	260	70 (FLG) or 64 (SWE)
1-1/2	71	274	83 (FLG) or 70 (SWE)
2	90	251	153
3	90	294	197
4	90	319	223
	127	387	223
6	127	497	290
8	127	613	403
	Inches		
1	2-13/16	10.25	2.75 (FLG) or 2.50 (SWE)
1-1/2	2-13/16	10.75	3.25 (FLG) or 2.75 (SWE)
2	3-9/16	9.87	6.00
3	3-9/16	11.56	7.75
4	3-9/16	12.54	8.75
	5	15.23	8.75
6	5	19.57	11.4
8	5	24.14	15.85

Table 21. CL1500, 4-Stage Cast Angle Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A(1)			
	CL900 - CL1500			
	RF	RTJ	BWE	SWE
	mm			
1	142	142	142	142
1-1/2	152	152	152	152
2	184	184	184	184
3	235	235	235	- - -
4	273	273	273	- - -
6	353	353	353	- - -
8	416	416	416	- - -
	Inches			
1	5.59	5.59	5.59	5.59
1-1/2	5.98	5.98	5.98	5.98
2	7.24	7.24	7.24	7.24
3	9.25	9.25	9.25	- - -
4	10.75	10.75	10.75	- - -
6	13.9	13.9	13.9	- - -
8	16.38	16.38	16.38	- - -

1. RF: raised-face flanges, RTJ: ring-type-joint flanges, SWE: socketweld ends

Table 22. CL1500, 4-Stage Cast Angle Valve Dimensions

VALVE SIZE, NPS	YOKE BOSS DIAMETER	D	G			
		Plain Bonnet	RF	RTJ	BWE	SWE
	mm					
1	71	247	142	142	142	142
1-1/2	71	260	152	152	152	152
2	90	237	184	184	184	184
3	90	285	235	235	235	- - -
4	90	339	273	273	273	- - -
	127	407				
6	127	464	353	353	353	- - -
8	127	665	416	416	416	- - -
	Inches					
1	2-13/16	9.72	5.59	5.59	5.59	5.59
1-1/2	2-13/16	10.24	5.98	5.98	5.98	5.98
2	3-9/16	9.33	7.24	7.24	7.24	7.24
3	3-9/16	11.22	9.25	9.25	9.25	- - -
4	3-9/16	13.35	10.75	10.75	10.75	- - -
	5	16.02				
6	5	18.27	13.9	13.9	13.9	- - -
8	5	26.18	16.38	16.38	16.38	- - -

Figure 6. Typical CL1500 and CL2500 6-Stage NotchFlo DST Globe Valve Dimensions (also see table 23 and 24)

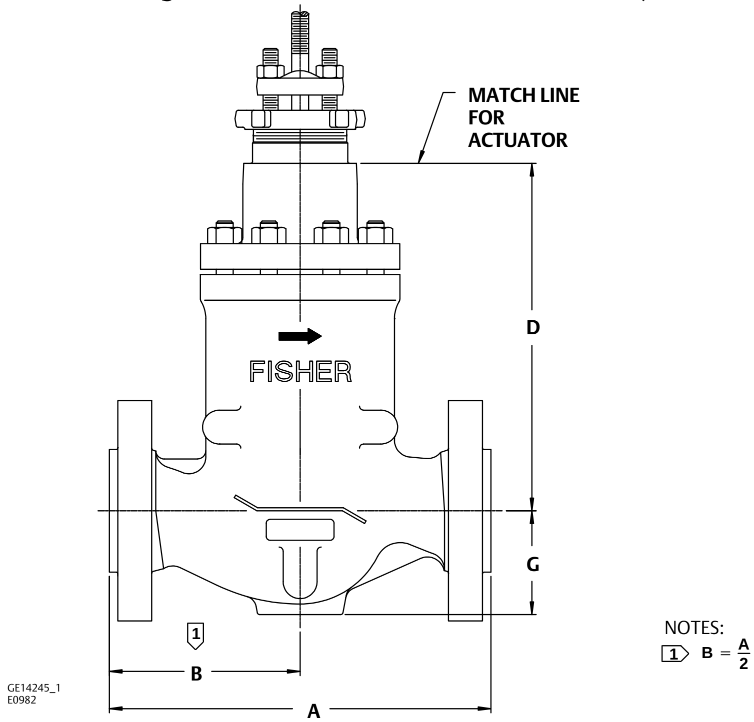


Table 23. CL1500 6-Stage Globe Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A(1)				YOKE BOSS DIAMETER	D	G(1)
	RF	RTJ	BWE	SWE		Plain Bonnet	
	mm						
1	292	292	---	292	90	372	69.1
2	375	378	375	---	90	442	76.9
3	460	464	460	---	90	721	141
					127	751.5	
4	530	533	530	---	90	653.8	172
					127	677.6	
6	768	775	768	---	127	862	240
	Inches						
1	11.5	11.5	---	11.5	3-9/16	14.66	2.44
2	14.76	14.88	14.76	---	3-9/16	17.41	3.03
3	18.11	18.25	18.11	---	3-9/16	28.39	5.56
					5	29.58	
4	20.88	21	20.88	---	3-9/16	25.74	6.77
					5	26.68	
6	30.25	30.5	30.25	---	5	33.93	9.47

1. RF: Raised-face flanges, RTJ: Ring-type-joint flanges

Table 24. CL2500 6-Stage Globe Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A(1)				YOKE BOSS DIAMETER	D	G(1)
	RF	RTJ	BWE	SWE		Plain Bonnet	
	mm						
1	308	308	---	---	71	361	69.0
					90		
2	412.75	415.75	---	---	90	478	78.7
3	498	504	---	---	127	751.5	106.7
4	575	585	---	---	127	677.6	123.8
6	819	832	---	---	127	852.5	185.4
	Inches						
1	12.12	12.12	---	---	2-13/16	14.23	2.70
					3-9/16		
2	16.25	16.37	---	---	3-9/16	18.80	3.10
3	19.62	19.87	---	---	5	29.58	4.20
4	22.62	23	---	---	5	26.68	4.87
6	32.25	32.75	---	---	5	33.56	7.30

1. RF: Raised-face flanges, RTJ: Ring-type-joint flanges

Figure 7. Typical CL2500 6-Stage NotchFlo DST Forged Angle Valve Dimensions (also see table 25)

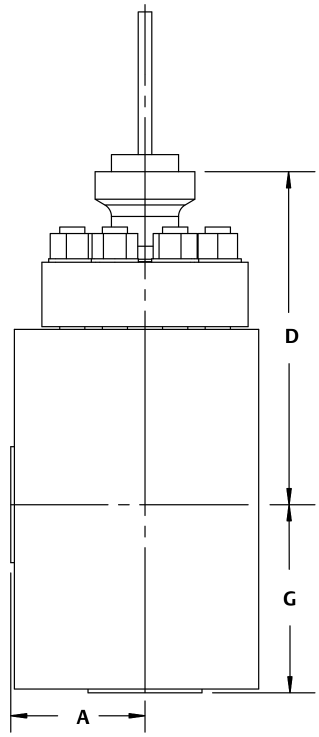


Figure 8. Typical CL2500 6-Stage NotchFlo DST Cast Angle Valve Dimensions (also see table 26)

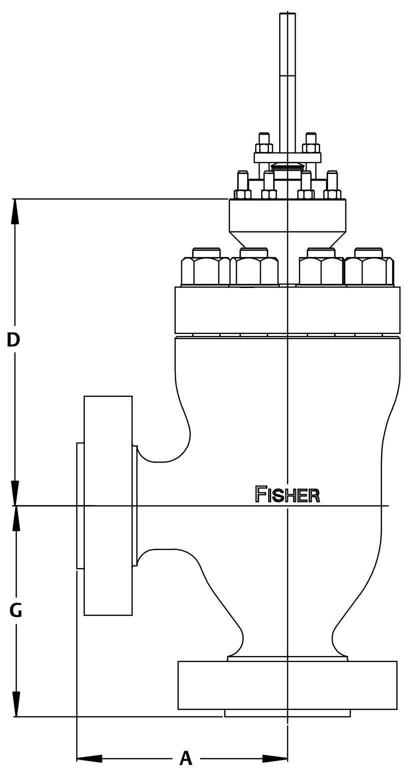


Table 25. CL2500 6-Stage Forged Angle Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A[1]				YOKE BOSS DIAMETER	D	G[1]			
	RF	RTJ	BWE	SWE		Plain Bonnet	RF	RTJ	BWE	SWE
	mm									
1	114	114	---	114	71 90	280.6	104	104	---	104
2	169	169	169	---	90	347.6	173	173	173	---
3	222	222	222	---	127	563.2 (FLG) 578.2 (BWE)	237	237	237	---
4	190	193	194	---	127	470.3	250	253	254	---
6	254	257	259	---	127	554.1 (FLG) 594.1 (BWE)	350	353	355	---
	Inches									
1	4.49	4.49	---	4.49	2-13/16 3-9/16	11.05	4.09	4.09	---	4.09
2	6.65	6.65	6.65	---	3-9/16	13.69	6.81	6.81	6.81	---
3	8.74	8.74	8.74	---	5	22.17 (FLG) 22.76 (BWE)	9.33	9.33	9.33	---
4	7.48	7.58	7.64	---	5	20.83	9.84	9.94	10	---
6	10.00	10.10	10.2	---	5	21.82 (FLG) 23.39 (BWE)	13.78	13.88	13.98	---

1. RF: Raised-face flanges, RTJ: Ring-type-joint flanges

Table 26. CL2500 6-Stage Cast Angle Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A[1]				YOKE BOSS DIAMETER	D	G[1]			
	RF	RTJ	BWE	SWE		Plain Bonnet	RF	RTJ	BWE	SWE
	mm									
1	154	154	154	---	71 90	333.8	154	154	154	---
2	226	227.5	226	---	90	436.6	226	227.5	226	---
3	289	292	289	---	127	699.7	289	292	289	---
4	337	342	342	---	127	497.6	337	342	342	---
6	457	463.5	457	---	127	646.9	457	463.5	457	---
	Inches									
1	6.06	6.06	6.06	---	2-13/16 3-9/16	13.14	6.06	6.06	6.06	---
2	8.90	8.96	8.90	---	3-9/16	17.19	8.90	8.96	8.90	---
3	11.38	11.50	11.38	---	5	27.55	11.38	11.50	11.38	---
4	13.27	13.46	13.46	---	5	19.59	13.27	13.46	13.46	---
6	17.99	18.25	17.99	---	5	25.47	17.99	18.25	17.99	---

1. RF: Raised-face flanges, RTJ: Ring-type-joint flanges

Table 27. CL600 3-Stage Port Diameter, Travel, Stem, Yoke Boss Diameter, and Unbalance Area

VALVE SIZE, NPS	PORT DIAMETER	TRAVEL	STEM DIAMETER	YOKE BOSS DIAMETER	UNBALANCE AREA
	mm				cm²
1	25.4	9.5	12.7	71	0.1[2]
2	38.1	9.5	12.7	71	0.3[2]
			19.1[1]	90[1]	
3	55.6	15.9	19.1	90	0.5[2]
4	73.2	19.1	19.1	90	0.4[2]
			25.4[1]	127[1]	
6	111.1	19.1	19.1	90	0.5[2]
			25.4[1]	127[1]	
8	136.5	25.4	19.1	90	0.6[2]
			25.4[1]	127[1]	
	Inch				Inch²
1	1.0	0.375	1/2	2-13/16	0.02[2]
2	1.5	0.375	1/2	2-13/16	0.05[2]
			3/4[1]	3-9/16[1]	
3	2.19	0.625	3/4	3-9/16	0.07[2]
4	2.88	0.75	3/4	3-9/16	0.06[2]
			1[1]	5[1]	
6	4.38	0.75	3/4	3-9/16	0.08[2]
			1[1]	5[1]	
8	5.38	1	3/4	3-9/16	0.09[2]
			1[1]	5[1]	

1. Optional.
2. Balanced trim, PTTC (pressure tends to close).

Table 28. CL900 and CL1500, 4-Stage Port Diameter, Travel, Stem, Yoke Boss Diameter, and Unbalance Area

VALVE SIZE, NPS	PORT DIAMETER	TRAVEL	STEM DIAMETER	YOKE BOSS DIAMETER	UNBALANCE AREA
	mm				cm²
1	17.8	6.4	12.7	71	2.5[1]
1-1/2	25.4	6.4	12.7	71	5.1[1]
2	38.1	9.5	19.1	90	0.3[2]
3	55.6	15.9	19.1	90	0.5[2]
4	73.2	19.1	19.1	90	0.4[2]
			25.4 (optional)	127 (optional)	
6	111.1	25.4	25.4	127	0.6[2]
8	136.5	31.8	31.8	127	0.6[2]
	Inch				Inch²
1	0.7	0.25	1/2	2-13/16	0.39[1]
1-1/2	1.0	0.25	1/2	2-13/16	0.79[1]
2	1.5	0.375	3/4	3-9/16	0.05[2]
3	2.19	0.625	3/4	3-9/16	0.07[2]
4	2.88	0.75	3/4	3-9/16	0.06[2]
			1 (optional)	5 (optional)	
6	4.38	1	1	5	0.09[2]
8	5.38	1.25	1-1/4	5	0.1[2]

1. Unbalanced trim, PTTO (pressure tends to open).
2. Balanced trim, PTTC (pressure tends to close).

Table 29. CL1500 6-Stage Port Diameter, Travel, Stem, Yoke Boss Diameter, and Unbalance Area

VALVE SIZE, NPS	PORT DIAMETER	TRAVEL	STEM DIAMETER	YOKE BOSS DIAMETER	UNBALANCE AREA
	mm				cm^2
1	17.8	6.4	19.1	90	2.5
2	38.1	9.5	19.1	90	0.3
3	55.6	15.9	19.1	90	0.5
			25.4	127	
4	73.2	19.1	19.1	90	0.4
			25.4	127	
6	111.1	25.4	25.4	127	0.6
	Inch				$Inch^2$
1	0.7	0.25	3/4	3-9/16	0.39
2	1.5	0.375	3/4	3-9/16	0.05
3	2.19	0.625	3/4	3-9/16	0.07
			1	5	
4	2.88	0.75	3/4	3-9/16	0.06
			1	5	
6	4.38	1	1	5	0.09

Table 30. CL2500 6-Stage Port Diameter, Travel, Stem, Yoke Boss Diameter, and Unbalance Area

VALVE SIZE, NPS	PORT DIAMETER	TRAVEL	STEM DIAMETER	YOKE BOSS DIAMETER	UNBALANCE AREA
	mm				cm^2
1	17.8	6.4	12.7	71	2.5(1)
			19.1	90	
2	38.1	9.5	19.1	90	0.3(2)
3	55.6	15.9	25.4	127	0.5(2)
4	73.2	19.1	25.4	127	0.4(2)
6	111.1	25.4	25.4	127	0.6(2)
	Inch				$Inch^2$
1	0.7	0.25	1/2	2-13/16	0.39(1)
			3/4	3-9/16	
2	1.5	0.375	3/4	3-9/16	0.05(2)
3	2.19	0.625	1	5	0.07(2)
4	2.88	0.75	1	5	0.06(2)
6	4.38	1	1	5	0.09(2)

1. Unbalanced trim, PTTO (pressure tends to open).
2. Balanced trim, PTTC (pressure tends to close).

Valve Sizing Guidelines

Standard ISA equations, sizing procedures from Catalog 12, or Fisher Specification Manager can be used to size NotchFlo DST control valves.

Noise calculations are best performed by using Fisher Specification Manager. The serial stage configuration of the NotchFlo DST design reduces valve trim noise significantly.

Selection of the correct trim can be made by determining the K_C value from table 5.

Ensure that the correct K_C value for the appropriate valve size, trim type, and pressure drop are selected.

Ordering Information

When ordering, specify:

Application Information

1. Process liquid—State particle size and type of entrained impurities, if any.
2. Specific gravity of liquid
3. Temperature and vapor pressure of liquid
4. Critical pressure
5. Range of flowing inlet pressures
6. Pressure drops
   a. Range of flowing pressure drops
   b. Maximum at shutoff
7. Flow rates
   a. Minimum controlled flow
   b. Normal flow
   c. Maximum flow
8. Required C_v
9. Line size and schedule

Valve Body Information

To determine what information is needed for ordering the valve body and trim, refer to the Specifications section. Review the description at the right of each specification or in the referenced tables, figures, and bulletins, and indicate the desired choice wherever a selection is to be made.

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DST-G Trim
D103396X012

Product Bulletin
80.2:023
September 2017

Fisher™ Dirty Service Trim for Out-Gassing Applications (DST-G)

Fisher Dirty Service Trim for out-gassing applications (DST-G) is a multi-stage control valve trim design. It is used in services where the fluid has dissolved gases that are released from the solution due to a reduction in pressure and may also contain entrained particulate. DST-G is mainly used in Refining and Oil & Gas applications.

W9607

Fisher DST-G Plug and Cage

Features

- Out-gassing Control— Multi-stage DST-G, used in a valve properly selected for flow conditions, can minimize effects from out-gassing and associated damage, vibration, and noise.
- Long Trim Life— The trim concept uses a combined axial and radial flow that features large, open flow paths similar to the standard multi-stage DST. The lower cage utilizes large slots to separate the flow into smaller jets containing less energy and therefore extending trim life.
- Easy Maintenance— Inline trim removal allows inspection of parts without taking the valve body out of the pipeline.
- Trim Materials— Standard trim materials consist of a plug, seat ring, and upper cage fabricated from 316 SST with Alloy 6 hardfacing, and a lower cage machined from solid Alloy 6. Additional trim combinations can be found in table 2.
- Shutoff— DST-G also features a protected seat design where the shutoff function of the trim is separate from the throttling areas. DST-G comes standard with class V shutoff.

Specifications

Available Valve Sizes

See table 1

End Connection Styles

CL150 through CL2500 raised-face or ring-type joint flanges per ASME B16.5

For other end connections, contact your Emerson sales office or Local Business Partner for details

Shutoff Classification

Class V: per ANSI/FCI 70-2 and IEC 60534-4

Maximum Inlet Pressures and Temperatures[1]

Consistent with applicable pressure/temperature ratings according to ASME B16.34 unless limited by individual temperature limits shown in table 2

Maximum Pressure Drop[1]

Standard: 2500 psid unless limited by applicable pressure/temperature ratings in accordance with ASME B16.34 guidelines
Optional: Contact your Emerson sales office or Local Business Partner for pressure drops greater than 2500 psid

Construction Materials

See table 2

Temperature Capabilities

Valve Body/Trim Combinations: See table 2

All Other Parts: Consult your Emerson sales office or Local Business Partner

Flow Characteristic

Linear

Flow Direction

Flow down

Flow Coefficients

Typical maximum and minimum flow coefficients can be found in table 1

Noise Levels

Noise level is expected to be less than 80 or 85 dBA

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation should not be exceeded.

Contents

Principle of Operation

Throughout the process industry, certain valve applications experience the phenomenon of out-gassing as the flowing media passes through the control valve. Out-gassing is the process by which gases dissolved in a fluid come out of solution due to a change in pressure. One way to illustrate this concept is to consider a can of soda. At first glance, the soda appears to be a homogeneous liquid. If the can is shaken and opened, the dissolved CO2 comes out of solution and will fizz or spray out of the can. This occurrence is known as out-gassing.

Out-gassing generally causes two types of damage. One type of damage occurs due to the high velocity jets coming out of solution, which carry small liquid particles. These liquid particles impinge on internal surfaces at very high velocities causing erosion damage. Secondly, the high velocity jets coming out of solution tend to impinge on the body wall and trim parts causing vibration. The jet size is determined by the size of the cage hole/window through which the fluid flows. Breaking up the large jets into smaller jets helps to prevent vibration, as well as damage from entrained particulate.

The DST-G trim employs the basic design from the standard DST trim, but utilizes a different component in place of the lower cage. The slotted lower cage design facilitates smaller jet formation as the jets discharge from the cage into the body expansion area. By separating the jets, damage is prevented by forming many smaller jets that contain far less energy. The large slotted design also allows particles up to 1/4 inch in size to pass through the trim, reducing problems associated with plugging.

The DST-G block forged valve body is also unique whereby it utilizes an expanded body cavity that allows the entrained gases to expand. This expansion reduces the damaging effects of the previously mentioned high velocity jets. The protected seat design also allows the shutoff function of the valve to be separate from the throttling areas of the trim.

Availability

DST-G comes in a block forged valve body. Typical body sizes and capacities are shown in table 1. The maximum pressure drop across the valve is limited to 2500 psid in standard constructions. Typical applications are shown below.

- Hot high pressure separators (HHPS) letdown
- Cold high pressure separators (CHPS) letdown
- Hot low pressure separators (HLPS) letdown
- Cold low pressure separators (CLPS) letdown
- Rich amine letdown
- Contact your local Emerson sales office or Local Business Partner for any applications outside of these parameters.

Trim Selection Guidelines

Refer to table 2 in selecting appropriate trim materials. Trim materials and their corresponding temperature limits are given in table 2. Other materials such as superaustenitic stainless steel, N08825, and tungsten carbide trims are available upon request. Contact your Emerson sales office or Local Business Partner for more information.

Characteristics

DST-G is designed to have no significant flow characteristic for the first 10-15% of travel in order to allow for the protected seat function, in which no significant pressure drop will occur across the seating surfaces. After 15% of travel, the flow characteristic becomes linear. See figures 1 and 2.

Figure 1. Fisher DST-G in Closed Position

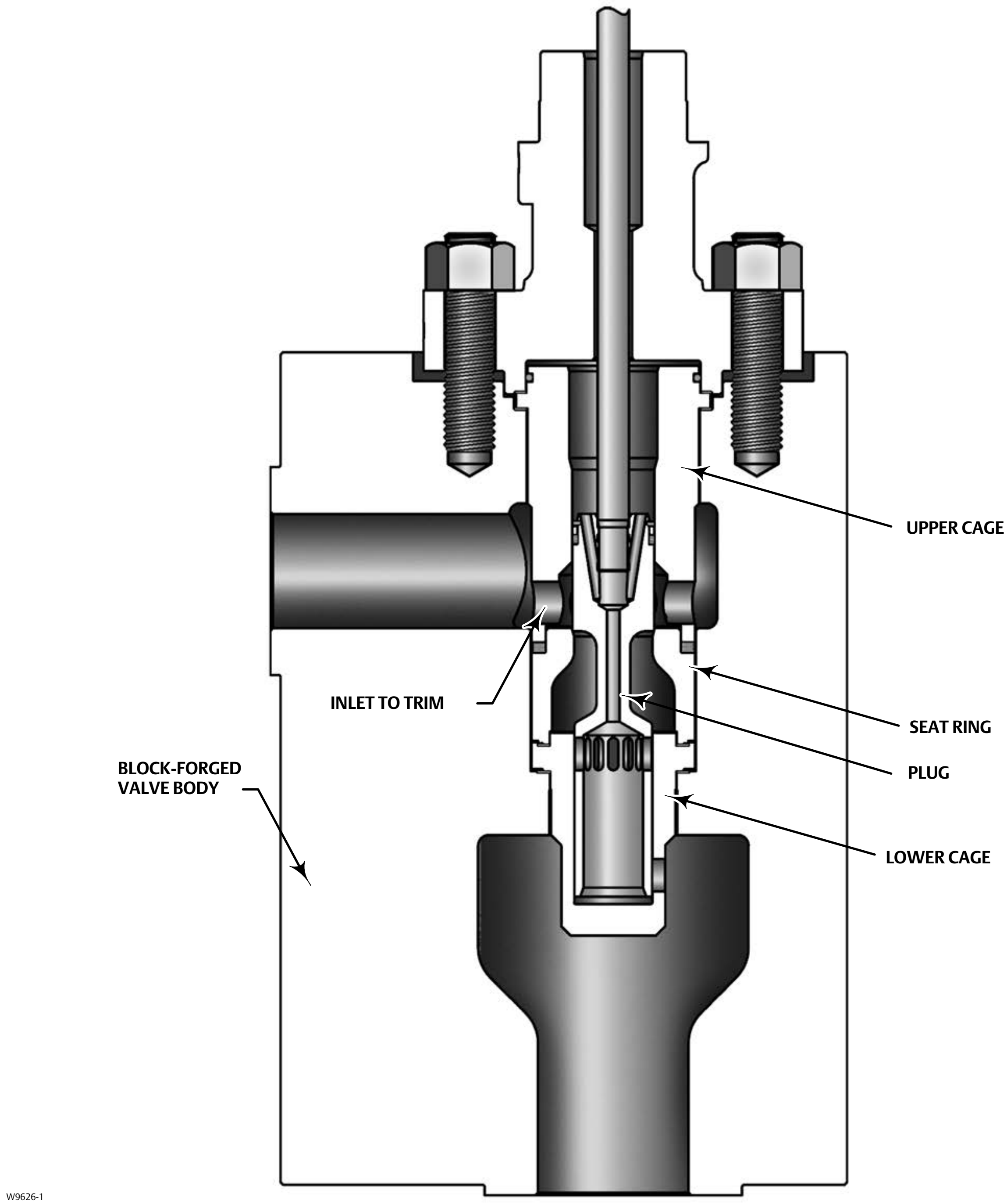

Figure 2. Fisher DST-G in Open Position

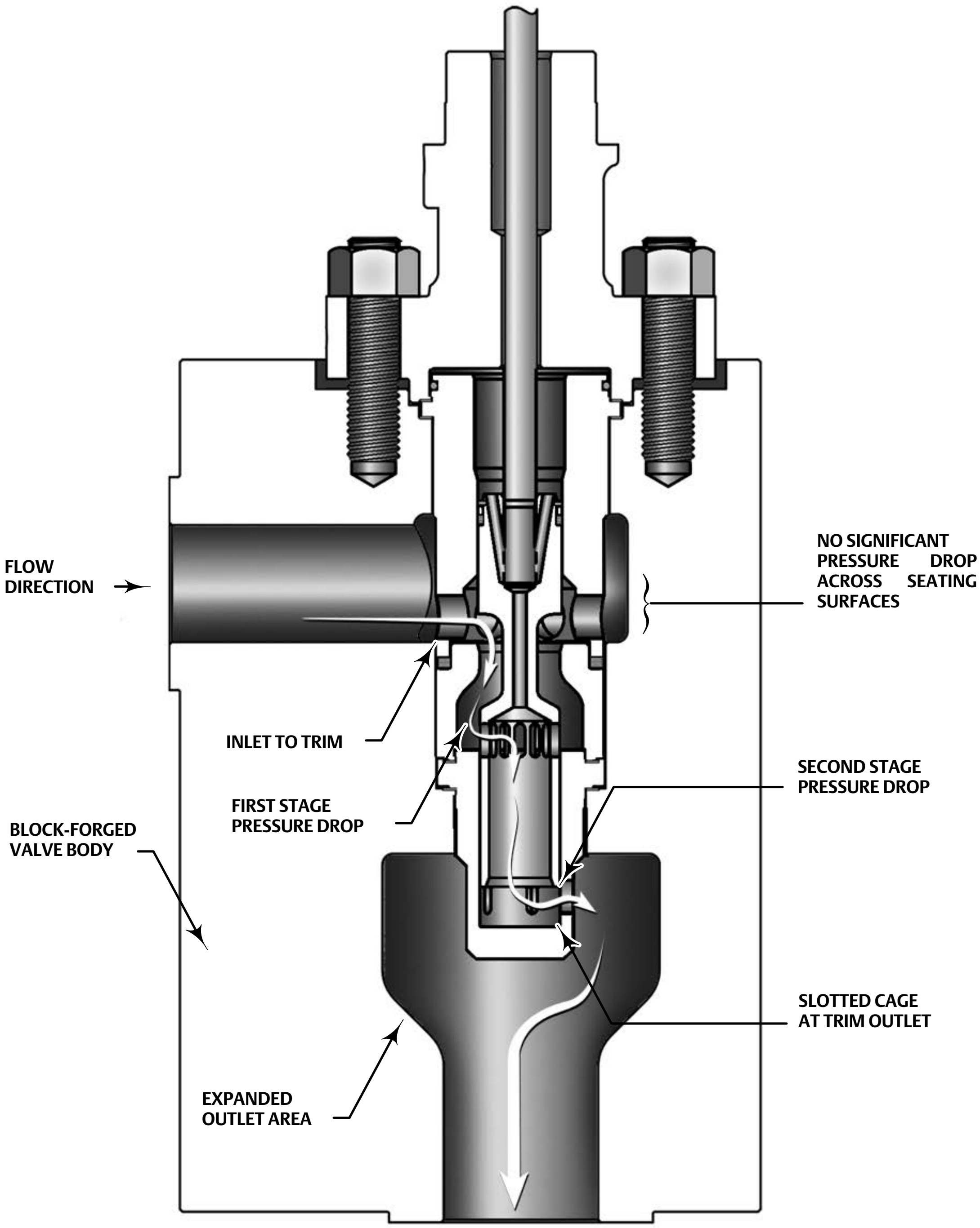

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Table 1. Fisher DST-G Availability and Typical Capacities

PRESSURE CLASS	VALVE SIZE	PORT DIAMETER		TRAVEL		MINIMUM C_V	MAXIMUM C_V	UNBALANCE AREA
	NPS	mm	Inch	mm	Inch			Inch^2
CL150 through CL600	2 2x3	47.6	1.88	19.1	0.75	0.78	32	0.031
	4	73.0	2.88	38.1	1.50	1.4	60	0.047
	6	111.1	4.38	63.5	2.50	2.6	153	0.154
	8	136.5	5.38	101.6	4.00	4	230	0.142
CL900 &1500	2 3	33.3	1.31(1)	19.1	0.75	0.46	10	- - -
	2 2x3 3x4	47.6	1.88	19.1	0.75	0.75	17.7	0.031
	3x4 4 6	73.0	2.88	38.1	1.50	1.4	60	0.047
	6 6x8	92.1	3.63	38.1	1.50	1.9	80	0.118
	6 6x8 8	111.1	4.38	50.8	2.00	2.6	130	0.154
	10	111.1	4.38	63.5	2.50	2.6	150	0.054
CL1500 only	8x8	136.7	5.38	76.2	3.00	4.0	180	0.142
CL2500	2	33.3	1.31(1)	19.1	0.75	0.46	10	- - -
	3	73.0	2.88	38.1	1.50	1.4	60	0.047
	4	92.1	3.63	38.1	1.50	1.9	80	0.118
	6	111.1	4.38	50.8	2.00	2.6	130	0.154
	8	111.1	4 38	63.5	2 1/2	2.6	150	0.154

1. Unbalanced

Table 2. Typical Trim Combinations for Fisher DST-G(2)

VALVE BODY/ BONNET MATERIAL	VALVE PLUG	UPPER CAGE	LOWER CAGE	SEAT RING	MAXIMUM TEMPERATURE LIMIT	
					°C	°F
SA105/WCC S31600/CF8M S34700/CF8C S30400/CF8 F22/WC9	316/CoCr-A	316/CoCr-A	CoCr-A	316/CoCr-A	316	600
SA105/WCC F22/WC9	N07718/CoCr-A	N07718/CoCr-A	CoCr-A	N07718/CoCr-A	316	600
F22/WC9 SA105/WCC S31600/CF8M S34700/CF8C S30400/CF8	316/CoCr-A	316/CRCT or 316 ENC	CoCr-A	316/CoCr-A	316(1)	600(1)
SA105/WCC F22/WC9	N06625/CoCr-A	N06625/CoCr-A	CoCr-A	N06625/CoCr-A	316	600

1. CL150 to CL600 valves only.
2. Contact your Emerson sales office or Local Business Partner for additional trim combinations and higher temperatures.

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Cavitrol III Trims
D100196X012

Product Bulletin
80.2:030
September 2017

Fisher™ Cavitrol™ III One-, Two-, and Three-Stage Trims

Cavitrol III trims (figures 1, 2, and 3) are used for cavitating liquid applications in various globe and angle valve bodies (see tables 1, 2, and 3). (Contact your Emerson sales office or Local Business Partner for angle valve information.) One-stage trims are normally used where the pressure drop is below 99 bar (1440 psi); two- and three-stage trims are normally used where the pressure drop is between 99 and 207 bar (1440 and 3000 psi). The Cavitrol III trims are frequently used in pump recirculation and startup systems in the power, process, oil production, chemical refining, and other industries.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

CAVITROL III ONE-STAGE TRIM PARTS

CAVITROL III TWO- OR THREE-STAGE TRIM PARTS

Features

- **Controls or Helps to Eliminate Cavitation Damage**—Cavitrol III trim can lengthen valve service life and reduce maintenance downtime. The shape and spacing of holes in the cage wall circumference helps prevent cavitation in a properly sized valve, effectively controlling or helping to eliminate (depending upon service conditions) cavitation damage and resulting valve failure.

- **Rangeability**—Many special characterizations are available in Cavitrol III cages to match rangeability requirements of specific systems.

- **Resistance to Erosion Damage**—Standard hardened trim materials provide excellent wear resistance, resulting in long trim life. The contoured valve plug seat reduces fluid separation, helps direct fluid away from trim, and helps protect against erosion damage.

- **Versatility**—Available in NPS 1 to 24 globe or angle valves with weld-end or flanged-end connections.

- **Easy Maintenance**—Cage-type trim allows removal and inspection of parts without taking the valve body out of the pipeline. Fine particles very seldom cause the accumulation problem associated with labyrinth-type trim.

- **Efficient Operation**—A low inlet pressure to the final stage is maintained by the flow-down configuration and the successively larger flow area of each stage. At the third stage inlet (see figure 6), about 85% of the total pressure drop has already occurred and the vena contracta pressure remains above the liquid vapor pressure. This helps to prevent cavitation in a properly-sized valve.

- **Trim Interchangeability**—Cavitrol III one-stage trim is interchangeable with standard trims. Quick trim changes can be made with no additional parts, such as spacers, longer bolts, and special gaskets for valve sizes greater than NPS 1.

Specifications

Available Valves

One-stage: See table 1
Two- and three-stage Cavitrol III: See table 3
Two- and three-stage Characterized Cavitrol III: Consult your Emerson sales office or Local Business Partner

End Connection Styles

Refer to appropriate valve bulletin

Shutoff Classification

Class IV (standard for one-stage trim only): [0.01% of valve capacity at full travel tested with air at 3.4 bar (50 psid)] per ANSI/FCI 70-2 and IEC 60534-4
Class V (standard for two- and three-stage trims, optional for one-stage trim): [$5 \times 10^{-12} m^3$/sec/bar/mm of port diameter (0.0005 mL/min/psid/in) of water at service pressure drop] per ANSI/FCI 70-2 and IEC 60534-4
TSO (Tight Shutoff Trim) (optional for one-, two-, and three-stage trims): Valves with TSO trim are factory tested to a more stringent Emerson test requirement of no leakage at time of shipment using ANSI/FCI Class V procedures. Consult your Emerson sales office or Local Business Partner for additional information. See figure 5

Maximum Inlet Pressures(1)

Consistent with applicable ASME B16.34 pressure/temperature ratings as shown in tables 1 and 3 up to 232°C (450°F)

Maximum Pressure Drop(1)

One-stage: 99.3 bar (1440 psi) but do not exceed the maximum pressure and temperature for the class rating of the valve body material used
Two-stage: 149 bar (2160 psi), but do not exceed maximum allowable inlet pressure
Three-stage: 207 bar (3000 psi), but do not exceed maximum allowable inlet pressure

Pressure drops are valve size and trim stage dependent. For additional Cavitrol trim application guidelines, contact your Emerson sales office or Local Business Partner.

Construction Materials

See table 5

Temperature Capabilities(1)

One-stage: -29 to 232°C (-20 to 450°F)
Two- and three-stage: See table 5 and figure 7

Flow Characteristic

Standard Cage: Linear
Characterized Cage: Consult your Emerson sales office or Local Business Partner

Flow Direction

Flow down (in through cage openings and out through seat ring as shown in figure 2)

Flow Coefficients(2)

Values given in tables 2 and 3; also see Fisher Catalog 12

Valve Recovery Coefficients(2)

F_L of One-Stage Cage: See table 2
F_L of Two-Stage Cage: 0.98
F_L of Three-Stage Cage: 0.99
These values define the maximum allowable pressure drop that is effective in producing flow as shown in the following equation:

$\Delta P_{allowable} = F_L\, [P_{1(flowing)} - r_c\, P_v]$
Where
$\Delta P_{allowable}$ = maximum allowable pressure drop that is effective in producing flow, bar (psi)
$P_{1(flowing)}$ = flowing inlet pressure, bar, absolute (psia)
r_c = critical pressure ratio from Catalog 12
P_v = vapor pressure of liquid at inlet temperature, bar, absolute (psia)

Port Diameters and Circumferences

See tables 1 and 3

Maximum Valve Plug Travel

See tables 2 and 3

- continued -

Specifications (continued)

Minimum Seating Force

Refer to figure 4 to determine minimum seat load per unit of port circumference; multiply that value by the port circumference from table 1 or Catalog 14

Valve Plug Stem and Yoke Boss Diameters

See tables 1, 6, and 7 and figure 8

Valve Plug Unbalance Area

See tables 1, 3, and 4

Noise Level

Use Emerson liquid noise prediction methods available in the Emerson sizing program

Options

■ Cage with Special Characterization or ■ Valve Plug for applications over 232°C (450°F)

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.
2. For standard linear cage. Consult your Emerson sales office or Local Business Partner for flow coefficients and valve recovery coefficients of cages with optional characteristics.

Principle of Operation

Cavitation, the formation and subsequent collapse of vapor bubbles in liquid flow streams, is a major source of damage in control valves and adjacent piping.

As liquid passes through a restriction in a control valve, the liquid velocity increases, while the liquid pressure decreases. The pressure reaches a minimum at a point called the vena contracta, and if the pressure at this point falls to or below the vapor pressure of the liquid (the pressure at which the liquid vaporizes), vapor bubbles form in the flow stream.

Downstream of the vena contracta, flow area increases, velocity decreases, and pressure increases. If this recovered pressure is sufficient to raise the pressure above the liquid vapor pressure, the vapor bubbles will collapse. The collapsing bubbles generate significant noise and vibration, and can mechanically attack pipe walls and valve components. This attack can lead to the failure of conventional valve components, particularly the valve plug and seat ring.

Cavitrol III One-Stage Trim

The Cavitrol III one-stage trim (figures 1 and 2) can effectively eliminate cavitation damage in a properly sized and selected control valve. Each cage hole is shaped to create a small flow stream with a vena contracta pressure higher than that typically present in the flow stream of a standard cage. This higher vena contracta pressure reduces the fluid's tendency to cavitate. Each hole in a Cavitrol III one-stage cage is also designed to reduce fluid turbulence, and the holes are spaced diametrically around the cage circumference; both features dissipate fluid pressure and help to increase capacity.

Cavitrol III one-stage trim can also be used to control cavitation damage. When selected and sized for this type of service, the radius edge on the valve plug and the diametrically opposed cage holes direct the cavitating fluid flow away from metal surfaces into the valve body cavity void. In this manner, damage from cavitating fluid flow is controlled.

Service conditions of each application govern whether cavitation damage is effectively eliminated or controlled.

Cavitrol III Two- and Three-Stage Trims

The Cavitrol III two-and three-stage cages are concentric cylinders (or stages) (figure 3) with specially-shaped orifices. The choice of cage depends on the inlet pressure and the required pressure drop. In operation, liquid passes through the orifices in each stage, undergoing a portion of the total required pressure drop. This partial pressure drop in each stage of a properly-sized valve normally prevents the liquid pressure from falling to or below its vapor pressure, eliminating the formation of vapor bubbles.

A characterized Cavitrol III two-or three-stage trim can be specified on those applications where the pressure drop across the valve decreases with increasing valve plug travel. Characterized Cavitrol III two- or three-stage trim consists of two or three stages at the beginning of valve plug travel. Then, as the valve is required to take less pressure drop, cage sections with fewer stages are used.

Figure 1. Sectional View of Fisher ET Valve with Cavitrol III One-Stage Trim

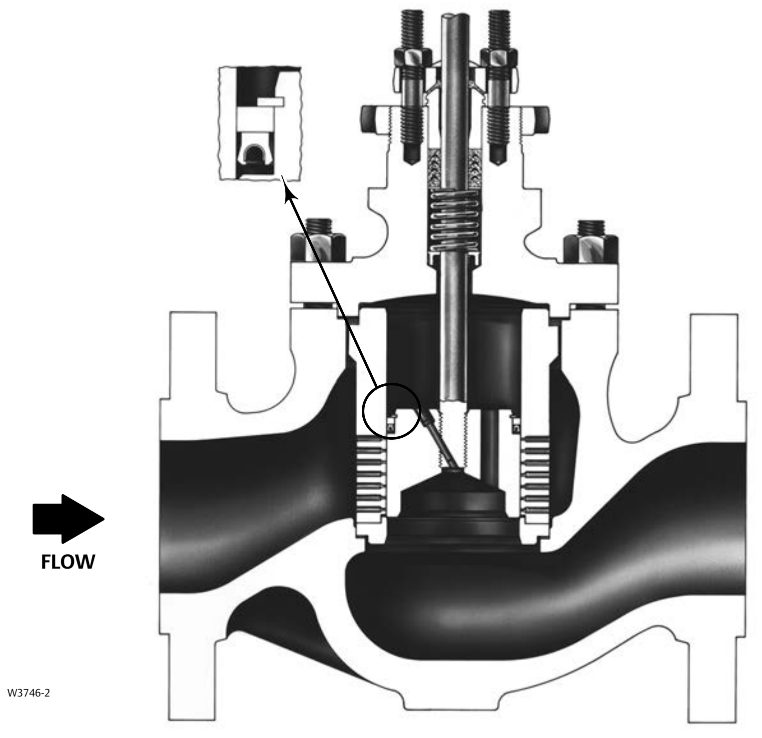


Figure 2. Operation of Cavitrol III One-Stage Trim

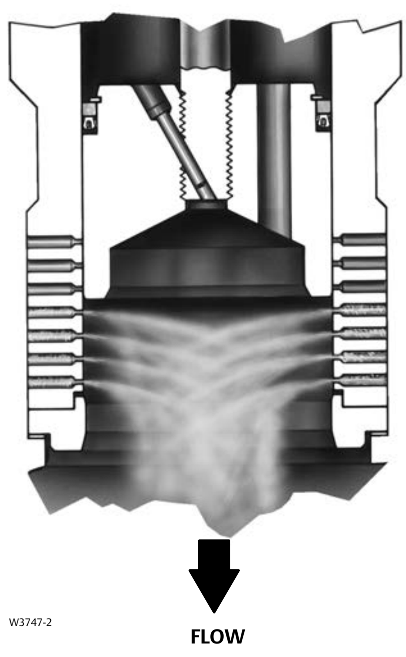


Figure 3. Fisher HPT with Cavitrol III Three-Stage Trim

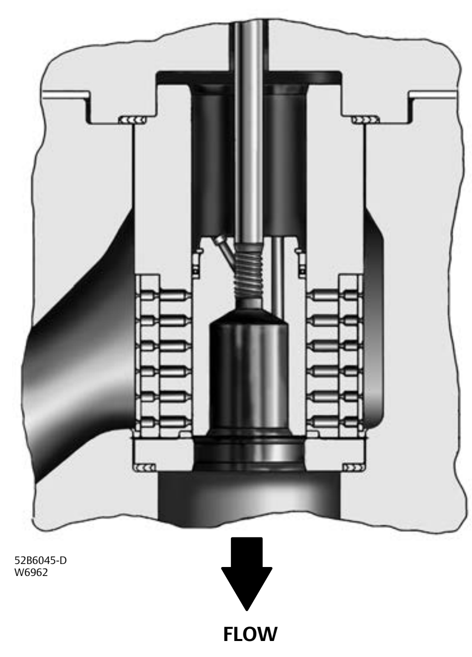


Table 1. Additional Specifications for Cavitrol III One-Stage Trim

VALVE RATING AND DESIGN	VALVE SIZE, NPS	PORT DIAMETER(1)		UNBALANCE AREA		PORT CIRCUMFERENCE		STEM DIAMETER(2)		YOKE BOSS DIAMETER	
		mm	Inch	cm^2	$Inch^2$	mm	Inch	mm	Inch	mm	Inch
CL125 through 600 ET	1	33.3	1.3125	0.13	0.02	104.6	4.12	12.7	1/2	71	2-13/16
	1-1/2	47.6	1.875	0.20	0.031	149.6	5.89	12.7	1/2	71	2-13/16
	2	58.7	2.3125	0.25	0.038	184.4	7.26	12.7 19.1	1/2 3/4	71 90	2-13/16 3-9/16
	2-1/2	73.0	2.875	0.30	0.047	229.4	9.03	12.7 19.1	1/2 3/4	71 90	2-13/16 3-9/16
	3	87.3	3.4375	0.36	0.056	274.3	10.80	12.7 19.1	1/2 3/4	71 90	2-13/16 3-9/16
	4	111.1	4.375	0.50	0.077	349.0	13.74	19.1 25.4	3/4 1	90 127	3-9/16 5
	6	177.8	7	0.84	0.13	558.5	21.99	25.4 or 31.8	1 or 1-1/4	127	5
	8	203.2	8	0.97	0.15	638.3	25.13	25.4 or 31.8	1 or 1-1/4	127	5
CL600 EWT	4x2	58.7	2.3125	0.25	0.038	184.4	7.26	12.7 19.1	1/2 3/4	71 90	2-13/16 3-9/16
	6x4 or 8x4	111.1	4.375	0.50	0.077	349.0	13.74	19.1 25.4	3/4 1	90 127	3-9/16 5
	8x6 or 12x6	177.8	7	0.84	0.13	558.5	21.99	25.4 or 31.8	1 or 1-1/4	127	5
	10x8 or 12x8	203.2	8	0.97	0.15	638.3	25.13	25.4 or 31.8	1 or 1-1/4	127	5
CL150 through 600 EUT-2	16	374.7	14.75	4.19	0.65	1177	46.32	31.8	1-1/4	127	5
CL150 through 600 EWT-2	20x16 and 24x16	374.7	14.75	4.19	0.65	1177	46.32	31.8	1-1/4	127	5
	24x20	463.6	18.25	5.29	0.81	1456	57.31	31.8	1-1/4	127	5
CL150 through 600 Large ET	12, 14, and 16	279.4	11	3.16	0.49	877.3	34.54	31.8	1-1/4	127	5H

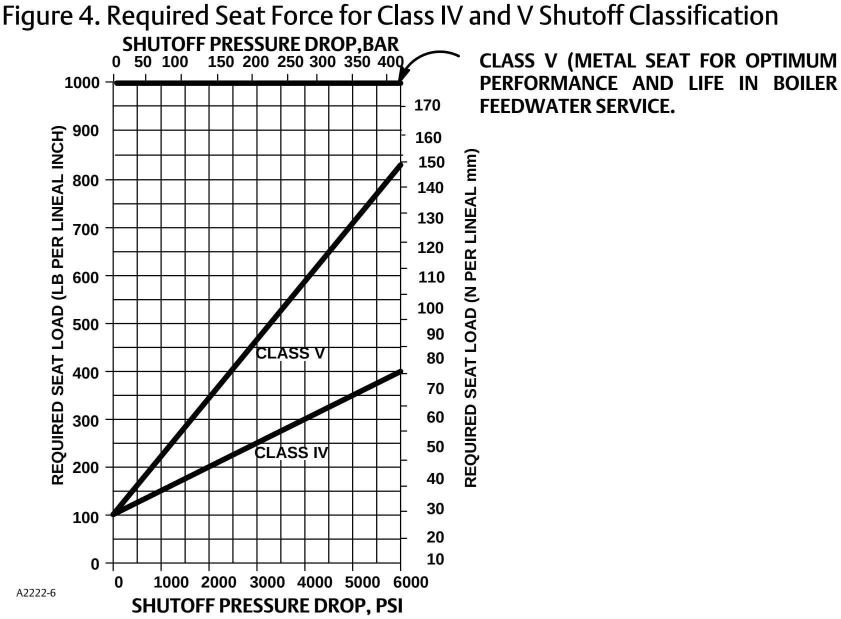
1. Same as ET or EWT port diameter. Also listed in valve bulletin.
2. When two stem diameters are shown for a particular valve size, the smaller stem diameter is standard and the larger stem diameter is optional.

Table 2. Valve Travels and Flow Coefficients (Cavitrol III One-Stage Trim)

VALVE RATING AND DESIGN	VALVE SIZE, NPS	STANDARD				OPTIONAL FOR DESIGN ET AND EWT DUE TO OVERTRAVEL			F_L at Maximum Travel
		Travel		Min(1) C_v	Max C_v	Maximum Travel		Max C_v(2)	
		mm	Inch			mm	Inch		
CL125 through 600 ET	1	19	0.75	1.9	12.2	25	1	15.5	0.90
	1-1/2	19	0.75	2.5	19.4	22	0.875	22.5	0.93
	2	29	1.125	3.9	36.1	- - -	- - -	- - -	0.93
	2-1/2	38	1.5	4.2	64.4	- - -	- - -	- - -	0.91
	3	38	1.5	4.6	81.5	41	1.625	86.7	0.89
	4	51	2	5.2	148	54	2.125	151	0.90
	6	51	2	10	238	57	2.25	259	0.91
	8	76	3	15	408	86	3.375	439	0.94
CL600 EWT	4x2	29	1.125	3.9	43.6	- - -	- - -	- - -	0.91
	6x4	51	2	5.2	162	54	2.125	169	0.95
	8x4	51	2	5.2	165	54	2.125	171	0.95
	8x6	51	2	10	267	57	2.25	293	0.93
	12x6	51	2	10	280	57	2.25	305	0.93
	10x8	76	3	15	418	76	3.375	455	0.92
	12x8	76	3	15	433	86	3.375	487	0.90
CL150 through 600 EUT-2	16	203	8	46	1790	- - -	- - -	- - -	0.91
		276	10.88	46	2120	- - -	- - -	- - -	0.91
CL150 through 600 EWT-2	20x16	276	10.88	46	2390	- - -	- - -	- - -	0.91
		378	14.88	46	2800	- - -	- - -	- - -	0.91
	24x16	276	10.88	46	2390	- - -	- - -	- - -	0.91
		378	14.88	46	2800	- - -	- - -	- - -	0.91
		429	16.88	46	2940	- - -	- - -	- - -	0.91
	24x20	276	10.88	56	3160	- - -	- - -	- - -	0.91
		378	14.88	56	3810	- - -	- - -	- - -	0.91
		429	16.88	56	4050	- - -	- - -	- - -	0.91
CL150 through 600 Large ET	12	203	8	40	1160	- - -	- - -	- - -	0.91
	14	203	8	40	1262	- - -	- - -	- - -	0.91
	16	203	8	40	1330	- - -	- - -	- - -	0.91

1. Valves should not be required to throttle at a Cv less than the minimum Cv for an extended period of time. Erosion damage to the valve seats may result.
2. Minimum Cv for the Optional category is the same as the minimum Cv in the Standard category.

Figure 4. Required Seat Force for Class IV and V Shutoff Classification



NOTE: CLASS IV SHUTOFF IS FOR CAVITROL III ONE-STAGE TRIM ONLY

Figure 5. Detail of TSO (Tight Shutoff Trim) Protected Soft Seat

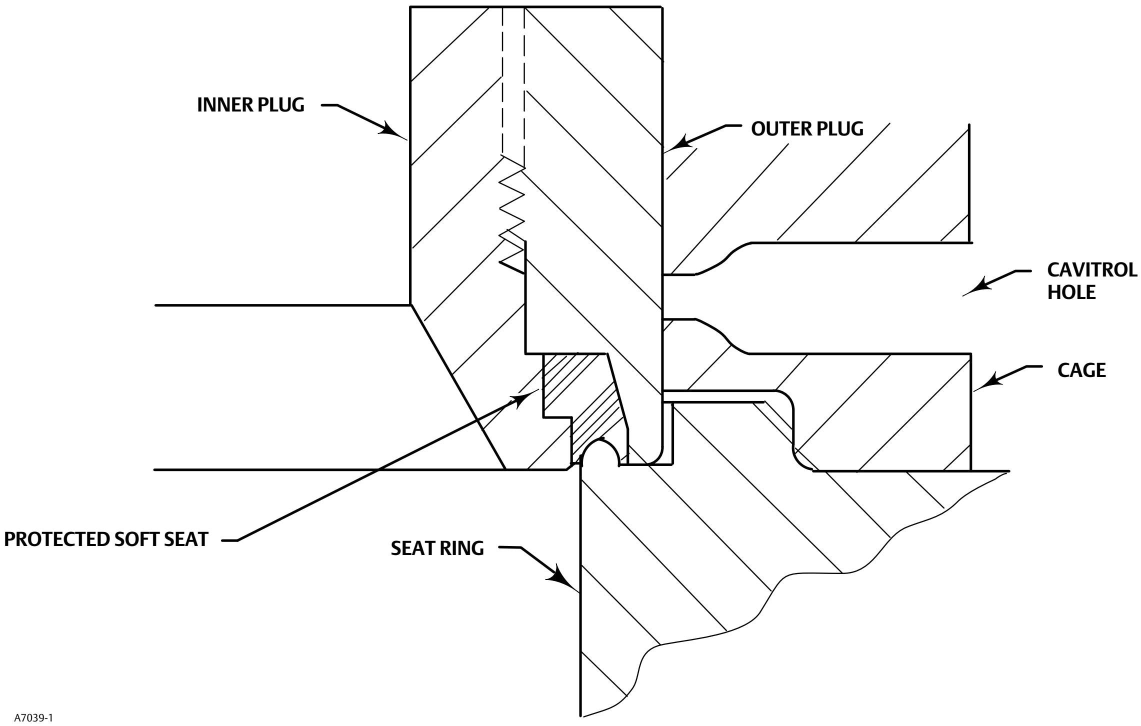


Figure 6. Pressure Drop Patterns (Cavitrol III Three-Stage Trim)

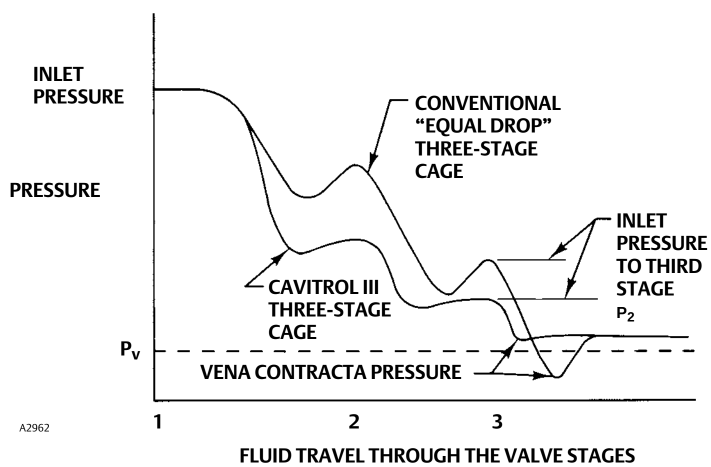


Table 3. Standard Cavitrol III Trim (Linear Characteristic for Cavitrol III Two-Stage Trims)[1, 2]

VALVE BODY RATING AND DESIGN	VALVE SIZE, NPS	Port Diameter		Travel		Min[3] C_v	Max C_v	UNBALANCE AREA		F_L at Maximum Travel
		mm	Inch	mm	Inch			cm[2]	Inch[2]	
CL600 ET	1	25.4	1	25	1	0.28	5.8	0.13	0.02	0.98
	1-1/2	33.3	1.3125	38	1.5	0.44	9.4	0.13	0.02	0.98
	2	47.6	1.875	51	2	0.92	21	0.20	0.031	0.98
	2-1/2	58.7	2.3125	64	2.5	1.1	33	0.25	0.038	0.98
	3	73.0	2.875	76	3	1.2	49	0.30	0.047	0.98
	4	73.0	2.875	102	4	1.9	69	0.30	0.047	0.98
	6	136.5	5.375	102	4	3.0	144	0.65	0.10	0.98
	8	177.8	7	152	6	7.0	265	0.84	0.13	0.98
CL600[4, 6] EWT	4 x 2	47.6	1.875	51	2	0.92	22	0.20	0.031	0.98
	6 x 4	73.0	2.875	102	4	1.9	71	0.30	0.047	0.98
	8 x 4	73.0	2.875	102	4	1.9	81.5	0.30	0.047	0.98
	8 x 6	136.5	5.375	127	5	3.0	178	0.65	0.10	0.98
	12 x 6	136.5	5.375	152	6	3.0	208	0.65	0.10	0.98
	12 x 8	177.8	7	152	6	7.0	272	0.84	0.13	0.98
CL2500 EHT	3, 4 x 3	47.6	1.875	64	2.5	0.61	24.1	0.20	0.031	0.98
	4, 6 x 4	73	2.875	70	2.75	0.91	43.9	0.30	0.047	0.98
	6, 8 x 6	111.1	4.375	95	3.75	1.5	75.8	0.50	0.077	0.98
CL900 and 1500 HPAS and HPAT	1	22.2	0.875[5]	38	1.5	0.36	7.39	3.88	0.601	0.98
	2	44.5	1.75	51	2	0.58	14.0	0.19	0.029	0.98
CL2500 HPAS and HPAT	1	22.2	0.875[5]	38	1.5	0.36	6.91	3.88	0.601	0.98
	2	44.5	1.75	51	2	0.58	14.0	0.19	0.029	0.98
CL900, 1500, and 2500 HPS and HPT	1	22.2	0.875[5]	38	1.5	0.36	7.39	3.88	0.601	0.98
	2	44.5	1.75	51	2	0.58	14.0	0.19	0.029	0.98
CL900 and 1500 HPS and HPT	3	63.5	2.5	64	2.5	0.73	34.4	0.26	0.041	0.98
	4	87.3	3.4375	76	3	0.90	58.1	0.31	0.056	0.98
	6	133.4	5.25	102	4	1.72	123	0.59	0.092	0.98

1. Characterized cages are available. Consult your Emerson sales office or Local Business Partner for information.
2. Cv as low as 0.04 is available. Consult your Emerson sales office for information.
3. Valves should not be required to throttle at a Cv less than the minimum Cv for an extended period of time. Erosion damage to the valve seats may result.
4. Values for CL900 NPS 8 x 6 and 12 x 8 EWT available in two-stage trim same as CL600 NPS 8 x 6 and 12 x 8 EWT.
5. Cavitrol III trim in the CL1500 and 2500, NPS 1, two-stage and in the NPS 2, three-stage valve uses unbalanced valve plugs. These sizes and constructions are Design HPS/HPAS valves; other valves in this section of the table are HPT/HPAT valves.
6. For larger sizes, consult your Emerson sales office.

Table 4. Standard Cavitrol III Trim (Linear Characteristic for Cavitrol III Three-Stage Trims)[1,2]

VALVE BODY RATING AND DESIGN	VALVE SIZE, NPS	Port Diameter		Travel		Min[3] C_v	Max C_v	UNBALANCE AREA		F_L at Maximum Travel
		mm	Inch	mm	Inch			cm[2]	Inch[2]	
CL2500 EHT	3, 4 x 3	33.3	1.3125	64	2.5	0.73	13.1	0.13	0.02	0.99
	4, 6 x 4	58.7	2.3125	70	2.75	1.0	20.8	0.25	0.038	0.99
	6, 8 x 6	111.1	4.375	95	3.75	2.8	66.7	0.50	0.077	0.99
CL900, 1500, and 2500 HPAS and HPAT	1	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
	2	25.4	1[4]	51	2	0.59	6.73	5.06	0.785	0.99
CL900, 1500, and 2500 HPS and HPT	1	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
	2	25.4	1[4]	51	2	0.59	6.73	5.06	0.785	0.99
CL900 and 1500 HPS and HPT	3	47.6	1.875	38	1.5	1.20	16.5	0.20	0.031	0.99
	4	73	2.875	76	3	1.70	27.8	0.30	0.047	0.99
	6	115.9	4.5625	102	4	3.10	65.0	0.52	0.080	0.99

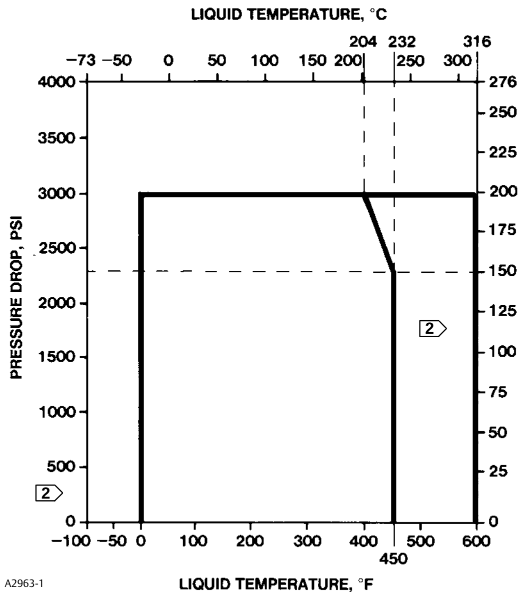
1. Characterized cages are available. Consult your Emerson sales office for information.
2. Cv as low as 0.04 is available. Consult your Emerson sales office for information.
3. Valves should not be required to throttle at a Cv less than the minimum Cv for an extended period of time. Erosion damage to the valve seats may result.
4. Cavitrol III trim in the CL1500 and 2500, NPS 1, two-stage and in the NPS 2, three-stage valve uses unbalanced valve plugs. These sizes and constructions are HPS/HPAS valves; other valves in this section of the table are HPT/HPAT valves.

Table 5. Trim Material and Temperature Limit

VALVE DESIGN	VALVE RATING	TRIM DESIGNATION	VALVE PLUG	CAGE	SEAT RING	VALVE STEM	BONNET SPACER(6, 7)	MAXIMUM TEMPERATURE	
								°C	°F
ET	CL600	76	Heat-treated S42000 (420 SST)	S17400 (17-4PH SST) with H900 heat-treat condition S31600(1)	S17400 stainless steel with H900 heat-treat condition	S31600 stainless steel (316 SST)	S31600 stainless steel (316 SST)	See figure 7	See figure 7
EWT	CL600 and 900	76	Heat-treated S42000	S17400 stainless steel with H900 heat-treat condition S31600(1)	S17400 stainless steel with H900 heat-treat condition	S31600 stainless steel	S31600 stainless steel		
EHT	CL2500	58	Heat-treated S44004 (440C SST)	CB7CU-1 (17-4PH SST) with H1075 heat-treat condition	S44004 S17400 H1150 chrome coat(2)	S31600 stainless steel	None		
		59	S31600 with CoCr-A seat and guide	CB7CU-1 with H1150 heat-treat condition	CoCr-A S17400 H1150 chrome coat(2)	S31600 stainless steel	None		
HPS, HPAS, HPT, and HPAT	CL900 and 1500	205A	Heat-treated S44004	S17400 stainless steel with H1075 heat-treat condition	S44004	S20910 stainless steel	Same as body / bonnet material	232(5)	450(5)
		205B	Heat-treated S44004	S17400 stainless steel with H1075 heat-treat condition	S44004	S31600 stainless steel	Same as body / bonnet material		
		206 (NACE)(3,4)	S31600 with CoCr-A seat and guide	S17400 stainless steel with double H1150 heat-treat condition	S31600/ CoCr-A	S20910 stainless steel	Same as body / bonnet material		

1. Second material shown is cage retainer.
2. Second material shown is seat ring retainer.
3. If using valve body/trim combinations other than those listed, consult your Emerson sales office.
4. NACE MR0175-2002.
5. NPS 1 2 stage and NPS 2 3 stage HPS can be used at temperatures up to 343°C (650°F).
6. Bonnet spacer is not used with easy-e™ and EW series one-stage trims or with EH Series valves.
7. Bonnet spacer is used only with 2-stage trims in NPS 2 HPT/HPAT valves.

Figure 7. Pressure Drop/Temperature Capabilities with Seal Ring (Cavitrol III Two- and Three-Stage Trims)



NOTES:
1 FOR BOTH GLASS-FILLED AND GRAPHITE-FILLED PTFE AND N10276 SEAL RING
2 FOR PEEK ANTI-EXTRUSION RING WITH GRAPHITE-FILLED PTFE AND N10276 SEAL RING
3. DO NOT EXCEED 143 BAR (2160 PSI) WITH TWO-STAGE CAVITROL III CAGE.
4. PEEK REQUIRED FOR ALL BOILER FEEDWATER APPLICATIONS.
5. FOR STAINLESS STEEL PRESSURE BOUNDARY MATERIALS, CONTACT YOUR EMERSON SALES OFFICE.

Installation

Valve bodies with Cavitrol III trim must be installed so that the flow direction is in through the cage openings and out through the seat ring. This will be indicated by an arrow on the valve body.

Exterior dimensions for ET and EWT valve bodies with Cavitrol III one-stage trim and EHT valve bodies with Cavitrol III trims do not change from their standard trim constructions. For ET and EWT valve bodies with Cavitrol III two-stage trims, see figure 8 and tables 6 and 7 for details of dimensions that change from standard. For all other dimensions, refer to the appropriate valve body bulletin.

Ordering Information

When ordering, specify:

Application Information

1. Process liquid—State particle size and type of entrained impurities, if any.
2. Specific gravity of liquid
3. Temperature and vapor pressure of liquid
4. Critical pressure
5. Range of flowing inlet pressures
6. Pressure drops
   a. Range of flowing pressure drops
   b. Maximum at shutoff
7. Flow rates
   a. Minimum controlled flow
   b. Normal flow
   c. Maximum flow
8. Required C_v
9. Line size and schedule

Valve Body Information

To determine what information is needed for ordering the valve body and trim, refer to the Specifications section. Review the description at the right of each specification or in the referenced tables, figures, and bulletins, and indicate the desired choice wherever a selection is to be made. Always specify the body design being ordered as selected from table 1 or 3.

Actuator and Accessory Information

Select the specific actuator and accessories from the appropriate bulletins. Typically piston actuators must be used where the required valve plug travel is greater than 102 mm (4 inches). Typically diaphragm actuators may be used for 102 mm (4 inches) or less required travel. Specify any additional ordering information as required from actuator or accessory bulletins.

If operating below minimum published C_vs (see tables 2, 3, and 4), added trim reliability may be obtained through use of low travel cutoff features available with FIELDVUE™ digital valve controllers.

Table 6. Non-Standard Dimensions (Cavitrol III Two-Stage Trims Only)

ET CL600						
Valve Size, NPS	Yoke Boss Diameter		Stem Diameter		Dimension D	
	mm	Inch	mm	Inch	mm	Inch
1	71	2-13/16	12.7	1/2	184	7.25
1-1/2	54 71	2-1/8 2-13/16	9.5 12.7	3/8 1/2	155 178	6.12 7.00
2	71 90	2-13/16 3-9/16	12.7 19.1	1/2 3/4	202 198	7.94 7.81
2-1/2	71 90	2-13/16 3-9/16	12.7 19.1	1/2 3/4	230 227	9.06 8.94
3	71 90	2-13/16 3-9/16	12.7 19.1	1/2 3/4	260 257	10.25 10.12
4	90 127	3-9/16 5	19.1 25.4	3/4 1	308 379	12.12 14.94
6(1)	90 127	3-9/16 5	19.1 25.4 or 31.8	3/4 1 or 1-1/4	337 406	13.25 16.00
8	90 127	3-9/16 5	19.1 25.4 or 31.8	3/4 1 or 1-1/4	511 586	20.12 23.06

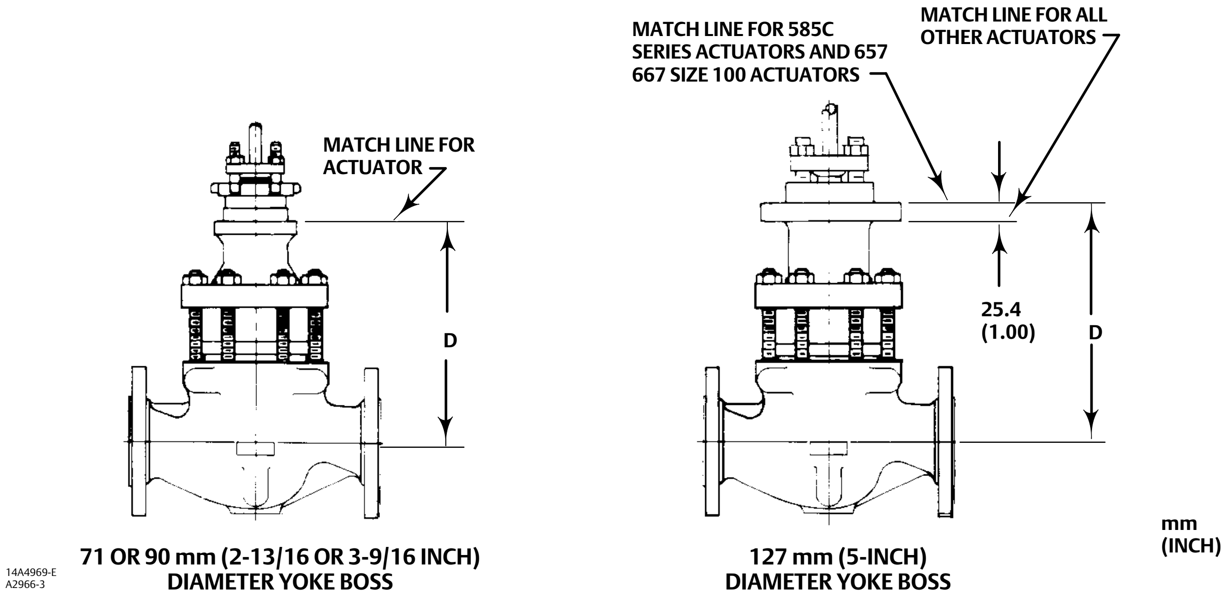
1. 102 mm (4 inch) travel construction. D dimension does not change for 51 mm (2 inch) travel construction.

Table 7. Non-Standard Dimensions (Cavitrol III Two-Stage Trims Only)

EWT CL600(1)						
Valve Size, NPS	Yoke Boss Diameter		Stem Diameter		Dimension D	
	mm	Inch	mm	Inch	mm	Inch
4 x 2	71 90	2-13/16 3-9/16	12.7 19.1	1/2 3/4	252 249	9.94 9.81
6 x 4	71 90 127	2-13/16 3-9/16 5	12.7 19.1 25.4 or 31.8	1/2 3/4 1 or 1-1/4	346 343 389	13.62 13.50 15.32
8 x 4	71 90 127	2-13/16 3-9/16 5	12.7 19.1 25.4 or 31.8	1/2 3/4 1 or 1-1/4	348 344 391	13.69 13.56 15.38
8 x 6(2)	90 127	3-9/16 5	19.1 25.4 or 31.8	3/4 1 or 1-1/4	402 446	15.82 17.56
12 x 6(2)	90 127	3-9/16 5	19.1 25.4 or 31.8	3/4 1 or 1-1/4	478 522	18.82 20.56
10 x 8	90 127	3-9/16 5	19.1 25.4 or 31.8	3/4 1 or 1-1/4	511 586	20.12 23.06
12 x 8	90 127	3-9/16 5	19.1 25.4 or 31.8	3/4 1 or 1-1/4	559 613	22.00 24.12

1. CL600 and CL900 NPS 8 x 6 and 12 x 8 are the same.
2. Long travel construction. D dimension does not change for 51 mm (2 inch) travel construction.

Figure 8. Non-Standard Dimensions (Cavitrol III Two-Stage Trims Only) (also see tables 6 and 7)



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Fisher™ WhisperFlo™ Aerodynamic Noise Attenuation Trim

Fisher WhisperFlo trim represents state of the art solutions for applications that demand ultimate noise attenuation.

Control valves with WhisperFlo cages provide additional attenuation for aerodynamic noise in very demanding vapor or gas applications with high-pressure drops. A WhisperFlo cage with an appropriately sized valve body is designed to reduce the noise level up to -40 dBA. For special applications, -50 dBA attenuation can be achieved.

Features

- High Performance—Use of the WhisperFlo trim provides excellent noise attenuation for very demanding applications. It should be considered for those applications that more conventional solutions can't reach.
- Easy Maintenance—Quick change trim allows fast and easy inspection of the cage without taking the valve body out of the line. WhisperFlo trim is interchangeable with standard control valve trim.
- Long Trim Life—Hardened materials or a unique wear surface construction are standard to provide excellent wear resistance. The three dimensional flow path, pressure-staging, and special passage shapes uniquely combine to equalize energy dissipation.
- High Capacity—WhisperFlo trim has higher capacity at conventional valve travels and port sizes than tortuous path designs.
- Simple Retrofit—Standardized port sizes provide capability to retrofit existing valves.

W6980

WhisperFlo CAGE

W8916-1

VALVE WITH WhisperFlo AERODYNAMIC TRIM

Specifications

Availability

For standard offerings, see table 1.
Designs are also available for Fisher HP, EH, FB, and TBX valves. Contact your Emerson sales office or Local Business Partner for details.

Trim Material and Selection

- 316L Stainless Steel/R31233 Wear Resistant Surfaces (7-inch port and smaller only)
- 316L Stainless Steel/Chrome Coat Bore (11-inch port and larger)
- N04400/R31233 Wear Resistant Surfaces (7-inch port and smaller only)
- Duplex Stainless Steel/R31233 Wear Resistant Surfaces (7-inch port and smaller only)
- 4130 Alloy Steel/R31233 Wear Resistant Surfaces (7-inch port and smaller only)
- 410 Stainless Steel (all port sizes)
- Other materials available per application

See appropriate valve bulletin or contact your Emerson sales office or Local Business Partner.

Temperature Capability(1)

- -73 to 593°C (-100 to 1100°F)
- Cryogenic cages for use to -198°C (-324°F) are available. Contact your Emerson sales office or Local Business Partner for special information on specifying Cryogenic cages
- Others per application

See appropriate valve bulletin for complementary information

Maximum Pressure Drops(1)

As shown in appropriate valve bulletin, do not exceed these limits. WhisperFlo trim is available up to CL2500 and higher

Velocity Limits

WhisperFlo trim is designed to control the throttling noise source in the control valve. A valve-outlet or downstream velocity greater than 0.3 MACH1 may create a second noise source. IEC 60534-8-3 noise prediction will account for both sources

Flow Characteristic

Linear (restricted linear cages and characterized cages are available--consult your Emerson sales office or Local Business Partner)

Rangeability

Varies with size.
NPS 4 ET, level X: 30:1
NPS 24x20 EW, level X: 65:1
High rangeability in excess of 250:1 is available in some constructions.
Contact your Emerson sales office or Local Business Partner for details

Flow Direction

Flow up--through the seat ring and out through the cage orifices

Noise Attenuation

Approximately -40 dBA maximum depending on the $\Delta P/P_1$ ratio per IEC 60534-8-3 calculation procedure.

WhisperFlo levels X, Y, and Z are useable up to 0.999 $\Delta P/P_1$ maximum

Sizing Coefficients

See Coefficients section in this bulletin or Catalog 12, section 1

Shutoff Classification

- Class IV
- Others per application

See appropriate valve bulletin

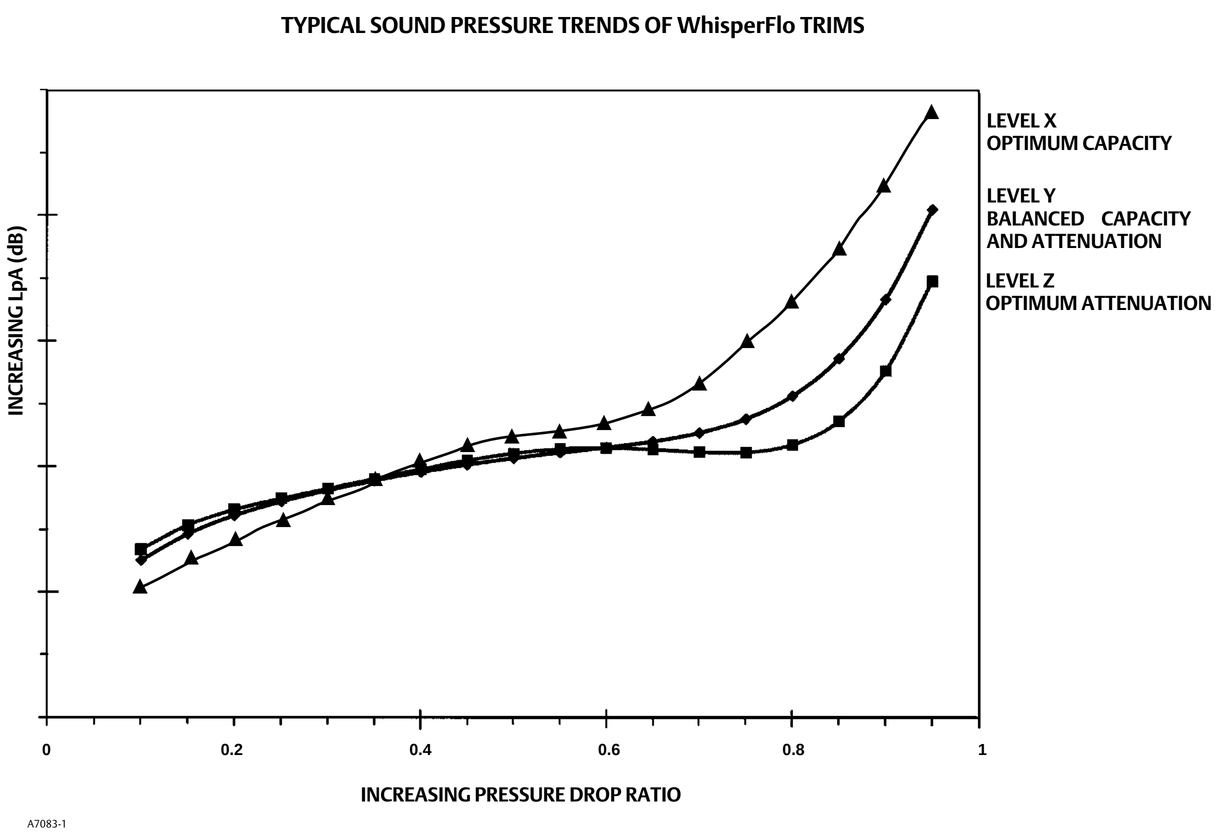
1. Do not exceed the pressure/temperature limits in this bulletin. Any applicable standard or code limitations should not be exceeded.

Table 1. Standard Fisher WhisperFlo Cages (Levels X, Y, and Z)

VALVE TYPE	VALVE SIZE(1)	PORT DIAMETER		MAXIMUM VALVE PLUG TRAVEL	
		mm	Inch	mm	Inch
easy-e™	4 6X4 8X4	87 87 87	3.4375 3.4375 3.4375	76 102 102	3 4 4
	6 8X6 or 10X6(2) 12X6	136 136 136	5.375 5.375 5.375	76 127 165	3 5 6.5
	8 10X8 12X8	178 178 178	7 7 7	152 152 203	6 6 8
	12 16X12	279 279	11 11	203 203	8 8
	16 20X16 24X16	375 375 375	14.75 14.75 14.75	203 276 378	8 10.875 14.875
	20 24X20	464 464	18.25 18.25	378 378	14.875 14.875

1. For a two-number valve size, the first number indicates nominal valve body size and the second number indicates nominal port size.
2. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

Figure 1. Fisher WhisperFlo $\triangle P/P_1$ Ranges



Coefficients

Table 2. Fisher WhisperFlo, X Level, Flow Up through the Seat Ring and out through the Cage Orifices

WhisperFlo Level X																**Linear Characteristic**
Valve Size, NPS	**Port Diameter**		**Maximum Travel**		**Flow Coeffi-cient**	**Valve Opening—Percent of Total Travel**										
	mm	**Inch**	**mm**	**Inch**		**Min**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
4	87.3	3.4375	76	3	C_v	6.4	12.7	27.8	41.9	55.4	68.5	81.4	91.9	101	108	114
					X_T	0.654	0.654	0.753	0.737	0.727	0.714	0.708	0.732	0.760	0.831	0.842
6x4	87.3	3.4375	102	4	C_v	6.4	16.7	35.3	52.5	69.5	87.6	105	121	136	154	164
					X_T	0.763	0.763	0.783	0.751	0.726	0.696	0.691	0.699	0.738	0.719	0.720
8x4	87.3	3.4375	102	4	C_v	6.4	17.8	35.8	52.5	69.7	86.9	104	121	137	153	165
					X_T	0.705	0.705	0.790	0.763	0.747	0.720	0.722	0.717	0.701	0.691	0.676
6	136.5	5.375	76	3	C_v	10.4	20.7	47.3	70.4	94.6	116	137	159	175	189	199
					X_T	0.638	0.638	0.673	0.716	0.688	0.692	0.723	0.708	0.735	0.747	0.770
8x6 or 10x6(1)	136.5	5.375	127	5	C_v	10.4	45.7	92.0	138	181	223	265	299	331	350	365
					X_T	0.640	0.640	0.648	0.633	0.617	0.624	0.642	0.682	0.710	0.769	0.803
12x6	136.5	5.375	165	6.5	C_v	10.4	56.9	114	170	224	288	328	377	425	472	510
					X_T	0.735	0.735	0.759	0.741	0.726	0.661	0.699	0.707	0.706	0.718	0.724
8	177.8	7	152	6	C_v	30.4	60.9	120	179	237	287	331	368	397	421	441
					X_T	0.702	0.702	0.704	0.669	0.647	0.668	0.699	0.740	0.783	0.809	0.829
10x8	177.8	7	152	6	C_v	30.4	61.4	120	179	238	296	352	408	459	508	550
					X_T	0.694	0.694	0.713	0.662	0.641	0.629	0.637	0.632	0.640	0.667	0.673
12x8	177.8	7	203	8	C_v	30.4	103	188	277	353	432	515	583	652	703	736
					X_T	0.656	0.656	0.678	0.627	0.656	0.666	0.657	0.667	0.684	0.709	0.749
12	279.4	11	140	5.5	Cv	62.2	92	180	274	366	454	538	616	689	757	820
					Xt	0.53	0.71	0.7	0.69	0.68	0.68	0.69	0.69	0.7	0.71	0.73
			203	8	Cv	62.2	128	257	382	508	633	728	820	901	978	1019
					Xt	0.886	0.886	0.777	0.799	0.737	0.688	0.727	0.776	0.734	0.721	0.758
14	279.4	11	140	5.5	Cv	62.2	92	180	276	370	461	549	633	714	791	863
					Xt	0.53	0.71	0.70	0.69	0.68	0.67	0.68	0.67	0.68	0.68	0.69
			203	8	Cv	62.2	126	258	386	517	642	762	866	961	1049	1113
					Xt	0.69	0.69	0.66	0.69	0.66	0.65	0.66	0.71	0.70	0.70	0.73
16x12	279.4	11	203	8	C_v	62.2	124	258	388	523	648	784	896	1001	1096	1175
					X_T	0.556	0.556	0.580	0.614	0.612	0.629	0.615	0.665	0.678	0.691	0.719
16	279.4	11	140	5.5	Cv	62.2	92	180	277	372	465	556	645	730	813	892
					Xt	0.53	0.71	0.7	0.69	0.68	0.67	0.67	0.66	0.66	0.66	0.66
			203	8	Cv	62.2	124	258	388	523	648	784	896	1001	1096	1175
					XT	0.556	0.556	0.58	0.614	0.612	0.629	0.615	0.665	0.678	0.691	0.719
20x16	374.7	14.75	203	8	C_v	60.2	170	359	546	731	912	1089	1260	1427	1587	1741
					X_T	0.534	0.713	0.699	0.687	0.677	0.669	0.663	0.659	0.656	0.655	0.654
20x16	374.7	14.75	276	10.875	C_v	60.2	238	494	745	990	1226	1452	1667	1870	2061	2240
					X_T	0.534	0.708	0.690	0.676	0.666	0.659	0.656	0.654	0.655	0.658	0.662
20x16	374.7	14.75	378	14.875	C_v	60.2	332	679	1015	1339	1633	1911	2165	2397	2606	2793
					X_T	0.534	0.701	0.679	0.665	0.657	0.654	0.656	0.660	0.667	0.676	0.686
24x16	374.7	14.75	203	8	C_v	60.2	170	360	548	735	921	1104	1285	1462	1636	1807
					X_T	0.534	0.716	0.703	0.692	0.682	0.673	0.665	0.658	0.652	0.647	0.642
24x16	374.7	14.75	276	10.875	C_v	60.2	238	495	750	1001	1248	1490	1725	1953	2173	2385
					X_T	0.534	0.711	0.695	0.681	0.669	0.659	0.651	0.644	0.639	0.635	0.632
24x16	374.7	14.75	378	14.875	C_v	60.2	333	683	1027	1363	1687	1999	2296	2578	2843	3092
					X_T	0.534	0.705	0.685	0.668	0.655	0.645	0.638	0.633	0.630	0.628	0.628

(continued)

Table 2. Fisher WhisperFlo, X Level, Flow Up through the Seat Ring and out through the Cage Orifices (continued)

WhisperFlo Level X — Linear Characteristic

Valve Size, NPS	Port Diameter mm	Port Diameter Inch	Maximum Travel mm	Maximum Travel Inch	Flow Coefficient	Valve Opening—Percent of Total Travel: Min	10	20	30	40	50	60	70	80	90	100
20	463.6	18.25	203	8	C_v	86.5	207	431	655	834	1087	1294	1493	1683	1865	2036
					X_T	0.534	0.713	0.701	0.692	0.686	0.683	0.682	0.683	0.687	0.693	0.700
20	463.6	18.25	276	10.875	C_v	86.5	286	592	891	1179	1453	1712	1954	2179	2386	2576
					X_T	0.534	0.708	0.694	0.685	0.682	0.683	0.688	0.696	0.708	0.722	0.738
20	463.6	18.25	378	14.875	C_v	86.5	399	813	1208	1577	1917	2223	2497	2740	2954	3141
					X_T	0.534	0.702	0.687	0.682	0.685	0.695	0.711	0.731	0.755	0.781	0.809
24x20	463.6	18.25	203	8	C_v	86.5	207	431	658	882	1104	1322	1537	1747	1952	2152
					X_T	0.534	0.714	0.703	0.692	0.683	0.676	0.669	0.664	0.660	0.657	0.655
24x20	463.6	18.25	276	10.875	C_v	86.5	286	595	900	1200	1493	1779	2056	2322	2578	2823
					X_T	0.534	0.710	0.695	0.683	0.673	0.665	0.659	0.656	0.654	0.653	0.654
24x20	463.6	18.25	378	14.875	C_v	86.5	400	820	1231	1630	2012	2376	2720	3043	3343	3622
					X_T	0.534	0.704	0.686	0.672	0.662	0.656	0.653	0.653	0.655	0.659	0.665

1. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

Table 3. Fisher WhisperFlo, Y Level, Flow Up through the Seat Ring and out through the Cage Orifices

WhisperFlo Level Y — Linear Characteristic

Valve Size, NPS	Port Diameter mm	Port Diameter Inch	Maximum Travel mm	Maximum Travel Inch	Flow Coefficient	Valve Opening—Percent of Total Travel: Min	10	20	30	40	50	60	70	80	90	100
4	87.3	3.4375	76	3	C_v	6	12	23	35	47	59	70	82	94	105	117
					X_T	0.536	0.536	0.532	0.525	0.510	0.503	0.507	0.514	0.528	0.532	0.575
6x4	87.3	3.4375	102	4	C_v	6	16	31	47	63	79	94	110	126	141	157
					X_T	0.536	0.536	0.532	0.525	0.510	0.503	0.507	0.514	0.528	0.532	0.575
8x4	87.3	3.4375	102	4	C_v	6	16	31	47	63	79	94	110	126	141	157
					X_T	0.536	0.536	0.532	0.525	0.510	0.503	0.507	0.514	0.528	0.532	0.575
6	136.5	5.375	76	3	C_v	9	18	36	55	73	91	109	127	146	164	182
					X_T	0.536	0.536	0.532	0.525	0.510	0.503	0.507	0.514	0.528	0.532	0.575
8x6 or 10x6(1)	136.5	5.375	127	5	C_v	10	31	61	92	123	154	184	215	246	276	307
					X_T	0.536	0.536	0.532	0.525	0.510	0.503	0.507	0.514	0.528	0.532	0.575
12x6	136.5	5.375	165	6.5	C_v	9	39	78	116	155	194	233	272	310	349	388
					X_T	0.536	0.536	0.532	0.525	0.510	0.503	0.507	0.514	0.528	0.532	0.575
8	177.8	7	152	6	C_v	11	42	84	125	167	209	251	293	334	376	418
					X_T	0.510	0.510	0.543	0.547	0.536	0.460	0.496	0.496	0.514	0.547	0.609
10x8	177.8	7	152	6	C_v	11	42	84	125	167	209	251	293	334	376	418
					X_T	0.510	0.510	0.543	0.547	0.536	0.460	0.496	0.496	0.514	0.547	0.609
12x8	177.8	7	203	8	C_v	12	59	118	177	236	295	354	413	472	531	590
					X_T	0.562	0.562	0.573	0.543	0.525	0.539	0.558	0.558	0.577	0.577	0.577
12	279.4	11	140	5.5	Cv	35	55	109	168	225	282	338	392	445	496	546
					Xt	0.53	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.54	0.54	0.55
			203	8	C_v	35	90	180	270	360	450	540	630	720	810	900
					X_T	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532
14	279.4	11	140	5.5	Cv	35	55	109	168	226	284	340	396	452	505	558
					Xt	0.53	0.56	0.56	0.55	0.54	0.54	0.54	0.53	0.53	0.53	0.54
			203	8	Cv	35	90	180	270	360	450	540	630	720	810	900
					Xt	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
16x12	279.4	11	203	8	C_v	35	90	180	270	360	450	540	630	720	810	900
					X_T	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532

(continued)

Table 3. Fisher WhisperFlo, Y Level, Flow Up through the Seat Ring and out through the Cage Orifices (continued)

WhisperFlo Level Y																**Linear Characteristic**
Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										
	mm	Inch	mm	Inch		Min	10	20	30	40	50	60	70	80	90	100
16	279.4	11	140	5.5	Cv	35	55	109	168	227	285	342	399	456	511	566
					Xt	0.53	0.56	0.56	0.55	0.54	0.54	0.54	0.53	0.53	0.53	0.53
			203	8	Cv	35	90	180	270	360	450	540	630	720	810	900
					XT	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532
20x16	374.7	14.75	203	8	C_v	53.4	124	259	394	529	662	794	923	1051	1176	1298
					X_T	0.534	0.617	0.608	0.601	0.594	0.588	0.584	0.580	0.577	0.575	0.573
20x16	374.7	14.75	276	10.875	C_v	53.4	171	356	539	720	897	1070	1239	1402	1560	1712
					X_T	0.534	0.614	0.603	0.594	0.586	0.581	0.577	0.574	0.573	0.573	0.574
20x16	374.7	14.75	378	14.875	C_v	53.4	239	491	738	979	1212	1435	1648	1849	2038	2216
					X_T	0.534	0.609	0.596	0.586	0.579	0.574	0.573	0.573	0.575	0.579	0.585
24x16	374.7	14.75	203	8	C_v	53.4	125	259	395	531	666	800	933	1065	1195	1324
					X_T	0.534	0.619	0.611	0.604	0.598	0.592	0.587	0.582	0.578	0.574	0.570
24x16	374.7	14.75	276	10.875	C_v	53.4	171	357	541	724	906	1085	1262	1436	1607	1774
					X_T	0.534	0.616	0.606	0.597	0.590	0.583	0.577	0.572	0.568	0.564	0.561
24x16	374.7	14.75	378	14.875	C_v	53.4	240	492	743	991	1234	1472	1703	1928	2146	2356
					X_T	0.534	0.612	0.600	0.589	0.580	0.573	0.567	0.562	0.559	0.556	0.555
20	463.6	18.25	203	8	C_v	77.3	148	294	448	601	751	899	1045	1188	1267	1462
					X_T	0.534	0.578	0.572	0.567	0.563	0.560	0.558	0.557	0.557	0.558	0.560
20	463.6	18.25	276	10.875	C_v	77.3	198	405	612	816	1016	1210	1397	1577	1750	1915
					X_T	0.534	0.576	0.568	0.562	0.559	0.557	0.557	0.559	0.562	0.567	0.574
20	463.6	18.25	378	14.875	C_v	77.3	272	558	837	1108	1367	1614	1849	2063	2265	2452
					X_T	0.534	0.573	0.564	0.558	0.557	0.559	0.563	0.571	0.581	0.593	0.607
24x20	463.6	18.25	203	8	C_v	77.3	148	294	449	603	757	909	1060	1209	1357	1503
					X_T	0.534	0.579	0.573	0.568	0.563	0.558	0.554	0.551	0.548	0.545	0.543
24x20	463.6	18.25	276	10.875	C_v	77.3	198	406	615	823	1029	1232	1433	1629	1822	2010
					X_T	0.534	0.577	0.569	0.562	0.556	0.552	0.548	0.544	0.542	0.540	0.539
24x20	463.6	18.25	378	14.875	C_v	77.3	272	560	845	1125	1401	1669	1931	2183	2427	2662
					X_T	0.534	0.574	0.564	0.556	0.550	0.545	0.542	0.540	0.539	0.540	0.541

1. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

Table 4. Fisher WhisperFlo, Z Level, Flow Up through the Seat Ring and out through the Cage Orifices

WhisperFlo Level Z																**Linear Characteristic**
Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										
	mm	Inch	mm	Inch		Min	10	20	30	40	50	60	70	80	90	100
4	87.3	3.4375	76	3	C_v	3	6	13	19	25	32	38	44	50	57	63
					X_T	0.600	0.600	0.539	0.521	0.528	0.528	0.547	0.539	0.525	0.507	0.525
6x4	87.3	3.4375	102	4	C_v	3	9	17	26	34	43	52	60	69	77	86
					X_T	0.600	0.600	0.539	0.521	0.528	0.528	0.547	0.539	0.525	0.507	0.525
8x4	87.3	3.4375	102	4	C_v	3	9	17	26	34	43	52	60	69	77	86
					X_T	0.600	0.600	0.539	0.521	0.528	0.528	0.547	0.539	0.525	0.507	0.525
6	136.5	5.375	76	3	C_v	5	10	20	30	40	51	61	71	81	91	101
					X_T	0.600	0.600	0.539	0.521	0.528	0.528	0.547	0.539	0.525	0.507	0.525
8x6 or 10x6(1)	136.5	5.375	127	5	C_v	5	17	35	52	69	87	104	121	138	156	173
					X_T	0.600	0.600	0.539	0.521	0.528	0.528	0.547	0.539	0.525	0.507	0.525
12x6	136.5	5.375	165	6.5	C_v	5	23	45	68	90	113	135	158	180	203	225
					X_T	0.600	0.600	0.539	0.521	0.528	0.528	0.547	0.539	0.525	0.507	0.525

(continued)

Table 4. Fisher WhisperFlo, Z Level, Flow Up through the Seat Ring and out through the Cage Orifices (continued)

WhisperFlo Level Z

Linear Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coeffi-cient	Valve Opening—Percent of Total Travel										
	mm	Inch	mm	Inch		Min	10	20	30	40	50	60	70	80	90	100
8	177.8	7	152	6	C_v	7	26	52	78	104	130	156	182	208	234	260
					X_T	0.600	0.600	0.539	0.521	0.528	0.528	0.547	0.539	0.525	0.507	0.525
10x8	177.8	7	152	6	C_v	7	26	52	78	104	130	156	182	208	234	260
					X_T	0.600	0.600	0.539	0.521	0.528	0.528	0.547	0.539	0.525	0.507	0.525
12x8	177.8	7	203	8	C_v	7	35	71	106	141	177	212	247	282	318	353
					X_T	0.600	0.600	0.539	0.521	0.528	0.528	0.547	0.539	0.525	0.507	0.525
12	279.4	11	140	5.5	Cv	21	42	80	119	160	202	242	282	322	361	399
					Xt	0.53	0.44	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
			203	8	C_v	21	55	110	165	220	275	330	385	440	495	550
					X_T	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532
14	279.4	11	140	5.5	Cv	21	42	80	119	161	202	243	284	324	364	404
					Xt	0.53	0.44	0.44	0.43	0.43	0.43	0.43	0.42	0.42	0.42	0.42
			203	8	Cv	21	55	110	165	220	275	330	385	440	495	550
					Xt	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
16x12	279.4	11	203	8	C_v	21	55	110	165	220	275	330	385	440	495	550
					X_T	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532
16	279.4	11	140	5.5	Cv	21	42	80	119	161	202	244	285	326	366	407
					Xt	0.53	0.44	0.44	0.43	0.43	0.43	0.43	0.42	0.42	0.42	0.42
			203	8	Cv	21	55	110	165	220	275	330	385	440	495	550
					XT	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532	0.532
20x16	374.7	14.75	203	8	C_v	48.1	91	179	273	367	460	553	645	737	827	917
					X_T	0.534	0.467	0.463	0.459	0.456	0.453	0.45	0.448	0.446	0.445	0.444
20x16	374.7	14.75	276	10.875	C_v	48.1	121	247	374	501	627	751	874	994	1113	1229
					X_T	0.534	0.465	0.46	0.456	0.452	0.449	0.446	0.444	0.443	0.442	0.442
20x16	374.7	14.75	378	14.875	C_v	48.1	166	341	514	685	854	1019	1180	1336	1488	1634
					X_T	0.534	0.463	0.457	0.451	0.447	0.444	0.443	0.442	0.442	0.443	0.445
24x16	374.7	14.75	203	8	C_v	48.1	91	179	273	368	462	555	649	742	834	926
					X_T	0.534	0.468	0.464	0.461	0.458	0.455	0.453	0.45	0.448	0.446	0.444
24x16	374.7	14.75	276	10.875	C_v	48.1	121	267	375	503	630	756	881	1006	1129	1251
					X_T	0.534	0.466	0.462	0.458	0.454	0.451	0.447	0.445	0.442	0.44	0.438
24x16	374.7	14.75	378	14.875	C_v	48.1	166	341	516	689	861	1032	1200	1365	1528	1688
					X_T	0.534	0.465	0.459	0.454	0.449	0.445	0.442	0.439	0.437	0.435	0.434
20	463.6	18.25	203	8	C_v	71.8	113	214	323	434	544	653	761	868	974	1078
					X_T	0.534	0.454	0.45	0.448	0.445	0.443	0.442	0.441	0.44	0.44	0.441
20	463.6	18.25	276	10.875	C_v	71.8	148	288	437	585	731	875	1016	1155	1290	1422
					X_T	0.534	0.453	0.448	0.445	0.443	0.441	0.44	0.44	0.441	0.442	0.445
20	463.6	18.25	378	14.875	C_v	71.8	200	403	607	808	1005	1196	1381	1560	1730	1894
					X_T	0.534	0.451	0.446	0.442	0.441	0.44	0.441	0.444	0.448	0.453	0.459
24x20	463.6	18.25	203	8	C_v	71.8	113	214	324	435	546	657	767	877	986	1094
					X_T	0.534	0.454	0.451	0.448	0.446	0.443	0.441	0.439	0.437	0.436	0.434
24x20	463.6	18.25	276	10.875	C_v	71.8	149	292	444	595	745	894	1042	1188	1333	1476
					X_T	0.534	0.453	0.449	0.446	0.442	0.44	0.437	0.435	0.433	0.432	0.431
24x20	463.6	18.25	378	14.875	C_v	71.8	200	404	610	815	1018	1218	1416	1609	1800	1986
					X_T	0.534	0.452	0.446	0.442	0.438	0.435	0.433	0.431	0.43	0.43	0.43

1. NPS 10x6 has a valve outlet area identical to the NPS 8x6.

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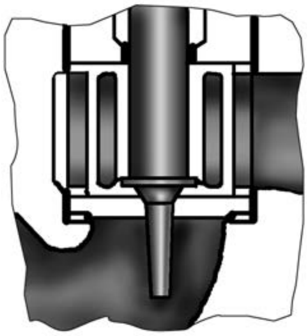
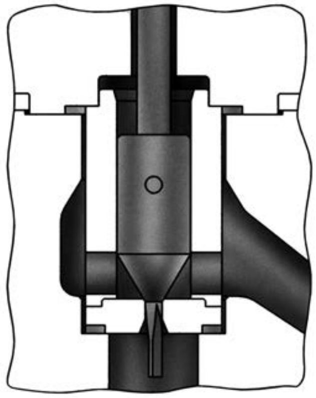


W8282
Micro-Flow



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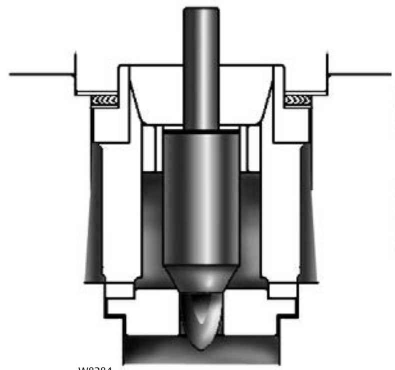

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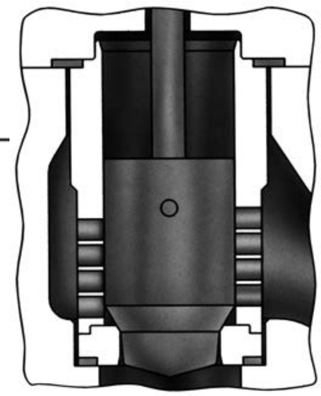

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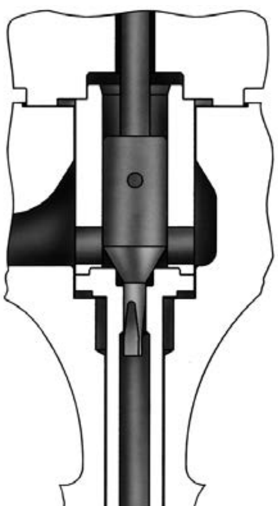
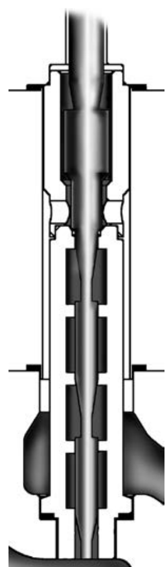
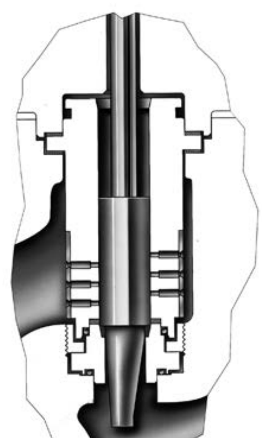
Micro-Form



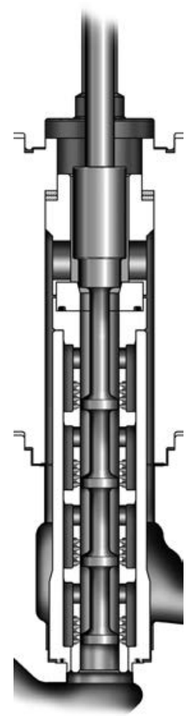
W6021
Micro-Flat CAVITATION



W8285
MULTI-STAGE Micro-Flat



W5624LG
CAV III Micro-Flat



X0469-1
CAV4 Globe

Micro Trims

Fisher micro trims are used in those applications where the control of low flow rates is a requirement. A variety of micro trims are offered that provide application solutions for standard and severe service conditions. This bulletin lists the various micro trims available and their service capability.

Trim Descriptions: An Overview

Fisher micro trims fall into two basic application categories: “Standard Service” and “Severe Service”.

Standard Service Micro Trims

These are Plug-Characterized trims. Flow characterization is controlled by the plug.

(A)— Micro-Flow— Ultra low flow control. Linear flow characteristic. Plug-characterized, port-guided. Gas and liquid applications. See figure 1.

(B)— Micro-Flute— Low flow control. Bridges the gap between Micro-Flow and Micro-Form trims. Equal percent flow characteristic. Plug-characterized, port-guided. Gas and liquid applications. See figure 2.

(C)— Micro-Form— Equal percent, contoured plug used in a variety of valve designs. See figure 3.

(D)— Micro-Flat/Form— General service gas or liquid applications where high rangeability (>200:1) is required. See figure 4.

Severe Service Micro Trims

Cavitation Isolation Trim— Controls where cavitation occurs in the valve to minimize trim damage. Does not prevent formation of cavitation.

Cavitation Elimination Trim— Trim design eliminates the effects of cavitation.

(E)— Micro-Flat Cavitation Trim— Cavitation isolation trim. Very low flow control. Isolates cavitation to minimize trim degradation. Plug-characterized, port-guided, unbalanced trim. See figure 5.

(F)— Multi-Stage Micro-Flat— Plug/Cage design with a series of flats on a common stem. High ΔP's and C_V's down to approximately 0.01. This is a cavitation elimination trim for use on liquids. Not intended for gas service. See figure 6.

(G)— CAV III Micro-Flat— Cage-guided cavitation elimination trim. This trim is a CAV III multi-stage trim with the addition of a Micro-Flat style plug to provide staged performance at low flows. Allows CAV III staged cavitation control as low as C_V = 0.05. See figure 7.

(H)— CAV4 Globe— Plug/Cage design with a series of staged pressure drops. This multi-stage cavitation elimination valve trim is used in high pressure drops and low flows. See figure 8.

Table 1. Micro Trim Application[1]

Trim	Trim Name	Valve Type	Valve Size Range, NPS	C_v Availability[2, 3]
(A)	Micro-Flow	EZ HP D	1/2, 3/4, 1, 1-1/2, and 2 1 1	0.015 - 0.181 0.00365 - 0.294 0.00365 - 0.294
(B)	Micro-Flute	EZ HPS D	1/2, 3/4, 1, 1-1/2, and 2 1 1	0.0385 - 1.07 0.039 - 4.21 0.0385 - 1.07
(C)	Micro-Form	easy-e™ HPS EH D	1, 1-1/2, and 2 1 and 2 2 1 and 2	0.075 - 10.2 0.072 - 52.2 0.062 - 50.1 0.070 - 34.5
(D)	Micro-Flat/Form	easy-e HPS EH D	1, 1-1/2, and 2 1 and 2 2 1 and 2	0.02 - 28.9 0.02 - 28.9 0.02 - 28.9 0.02 - 8.8
(E)	Micro-Flat Cavitation	ES EAS HPAS DA	1, 1-1/2, and 2 1 and 2 1 and 2 1	0.001 - 3.4 0.001 - 10.49 0.01 - 7.8 0.01 - 3.4
(F)	Multi-Stage Micro-Flat	ES HPS EHS	1, 1-1/2, and 2 1 and 2 2	0.01 - 1.4 0.01 - 1.4 0.01 - 1.4
(G)	CAV III Micro-Flat	ES HPS EHS	1, 1-1/2, and 2 1 and 2 2	0.05 - 4.9 0.05 - 5.5 0.05 - 5.5
(H)	Cavitrol IV	CAV4	2	0.1 - 1.1 0.1 - 1.6 0.1 - 2.9

1. Configurations shown are standard. Other configurations are available. Consult your Emerson sales office.
2. The trim selected may have the minimum or the maximum Cv, as shown below, but usually not both. Refer to Fisher Catalog 12 for further detail on flow coefficients for the various valve types.
3. Consult your Emerson sales office for C_v requirements and availability, dependent on valve size, design, etc.

Detailed Trim Description

Standard Service Trims

Figure 1. Micro-Flow Trim

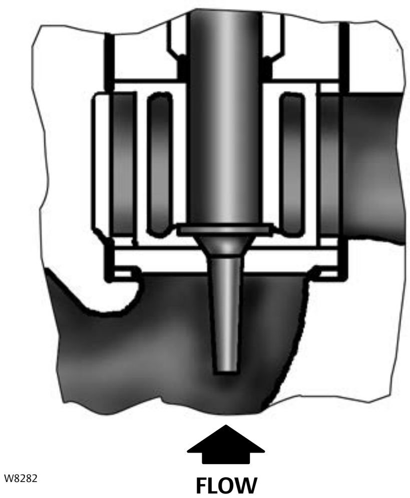
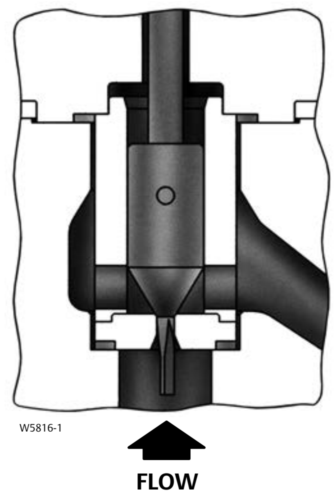


Figure 2. Micro-Flute Trim



(A)—Micro-Flow Trim

Micro-Flow trim (figure 1) provides linear ultra low flow control in gas and liquid applications. Typical application for this trim is flow up, 0.1875 inch port diameter, and 0.75 inch travel.

This is a very rugged, tough trim and therefore available in limited materials, such as R30006/CoCr-A. Micro-Flow trim construction consists of a very tightly controlled angle milled on a flat. This low angle flat provides the required flow control.

This unbalanced trim, with a linear plug characteristic, is available in most valve styles, including easy-e, D, and HP.

(B)—Micro-Flute Trim

Micro-Flute trim (figure 2) is for low flow equal percent control applications and fills the niche between Micro-Flow applications and Micro-Form applications. Standard trim material is R30006/CoCr-A and S44004.

Micro-Flute trim is port guided. The plug tip rides in the seat ring, which is the area where energy is dissipated. Typical applications are port diameters as small as 0.25 inch and flow up (with some flow down applications).

Figure 3. Micro-Form Valve Plug

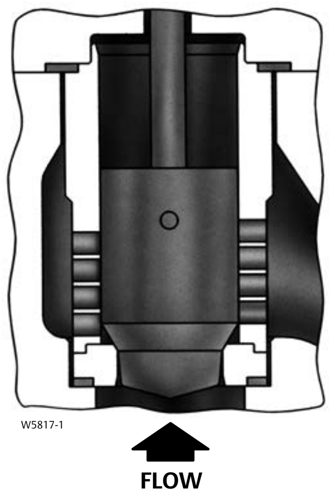
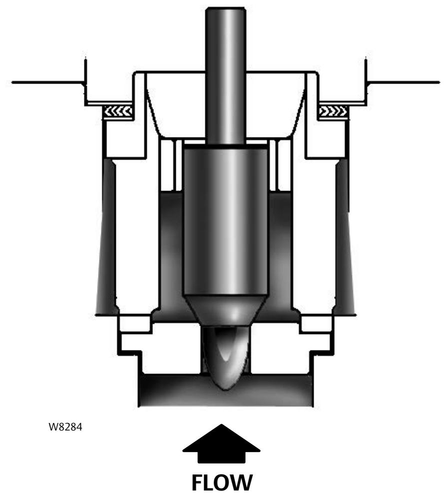


Figure 4. Micro-Flat/Form Trim



(C)—Micro-Form Trim

Micro-Form trim (figure 3) is a contoured plug, equal percent trim for low flow applications. This plug characterized trim is available in 0.25 inch and larger ports. Micro-Form trim is used in flow up applications and not recommended for flow down use.

Depending on valve type, this trim is either cage-guided, stem-guided, or post-guided. Micro-Form trim is widely used in EZ, as well as small size EH and HP control valves.

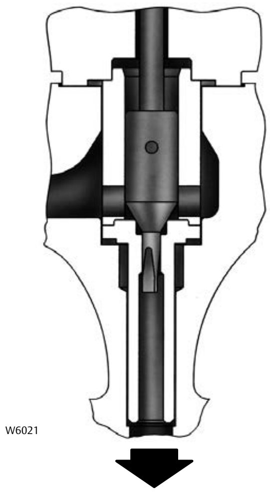
(D)—Micro-Flat/Form Trim

Micro-Flat/Form trim (figure 4) is a special plug design for flow up service only. Using features from both Micro-Flat and Micro-Flow trims, this trim is designed for high rangeability flow service.

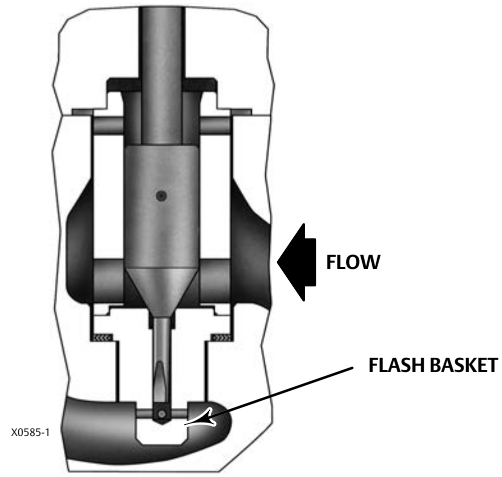
Micro-Flat/Form trim initially operates as Micro-Flat, where it is tightly tolerenced to optimize low flow control. Further up in the stroke, the trim transitions to a Micro-Form style plug contour. This provides improved C_V coefficient control. Rangeability is possible in excess of 200 to 1. This trim is available in Micro-Form materials. When choosing materials, be aware of the sliding contact at low lifts.

Severe Service Trims

Figure 5. Micro-Flat Cavitation Trim



EAS



ES

(E)—Micro-Flat Cavitation Trim

Micro-Flat Cavitation trim (figure 5) is available in both NPS 1 and 2 Fisher EAS valve bodies and NPS 1, 1-1/2, and 2 Fisher ES valve bodies and is designed for very low flow applications where cavitation is a concern. This trim design does not eliminate cavitation, but isolates the cavitation to minimize trim degradation. Micro-flat Cavitation trim is only available for flow down applications.

Micro-Flat Cavitation trim features a protected seat design to maximize seat life in cavitating environments. This trim is available in 0.25 inch and larger port diameters with a minimum C_V of 0.001. Recommended maximum pressure drop is 1000 psi. Above this, shortened trim life will result.

This plug-characterized, port-guided trim is available in hardened materials only, such as R30006/CoCr-A and S44004. These materials are needed to provide wear resistance between the plug and seat ring, where cavitation and vibration problems exist.

Micro-Flat Cavitation trim is recommended for angle valve applications. In special cases, use with a globe valve and flash basket is possible. Consult your Emerson sales office for additional information.

Table 2. Trim Materials(1)

TRIM DESIGNATION	VALVE BODY MATERIAL	VALVE BODY SIZE, NPS	VALVE PLUG	CAGE	SEAT RING / LINER	TEMPERATURE LIMITS	
						°C	°F
26	WCC	all	S44004 SST	S17400 H900	S44004 SST	-29 to 427	-20 to 800
39 (NACE)(2)	WCC	all	CoCr-A	CoCr-A	CoCr-A	-29 to 427	-20 to 800
38	WCC	all	CoCr-A	S17400 H900	CoCr-A	-29 to 427	-20 to 800
39 (NACE)(2)	CF8M	all	CoCr-A	CoCr-A	CoCr-A	-198 to 482	-325 to 900
38	CF8M	1 and 1-1/2	CoCr-A	S17400 H900	CoCr-A	-18 to 343	0 to 650
		2				-18 to 288	0 to 550

1. For additional trim materials, contact your Emerson sales office.
2. Meets the metallurgical requirements of NACE MR0175, ISO 15156, and MR0103.

Figure 6. Multi-Stage Micro-Flat Trim

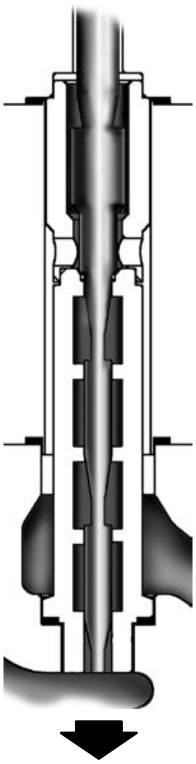
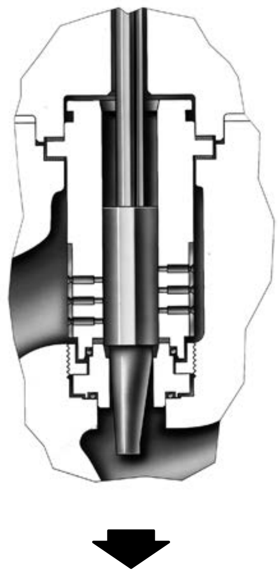


Figure 7. CAV III Micro-Flat Trim



(F)—Multi-Stage Micro-Flat Trim

Multi-Stage Micro-Flat trim (figure 6) is a plug-characterized design with a series of flats on a common stem to provide staged cavitation control. Flow direction is typically flow down, but flow up use is possible in special cases. Consult your [Emerson sales office]() for additional information.

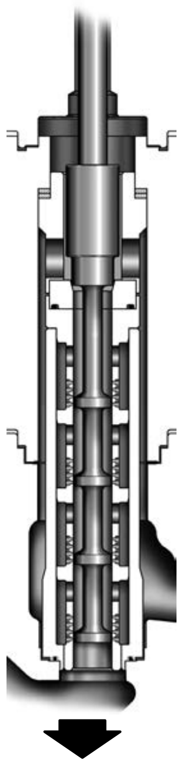
This trim is used to eliminate cavitation. Features include a protected seat design and pressure drops in excess of 4000 psi. To maximize seat life in cavitating environments, staged flow control as low as $C_V = 0.01$ is possible. This trim must be used with hardened materials, such as R30006/CoCr-A and S44004.

(G)—CAV III Micro-Flat Trim

CAV III Micro-Flat trim (figure 7) is a cavitation elimination trim. Designed as an enhancement to extend the low flow capability of Cavitrol™ III, this is a cage-guided trim with the addition of a Micro-Flat plug.

This trim incorporates a protected seat design and the trim is able to provide a staged cavitation control down to approximately 0.05 C_V. Use of this trim below 0.05 C_V is not recommended. Standard trim materials include an S17400 cage with an S44004 plug and seat ring. Contact your Emerson sales office for additional materials.

Figure 8. CAV4 Globe



(H)—CAV4 Globe

CAV4 Globe (figure 8) is a multi-stage cavitation elimination trim. Designed as an enhancement to extend the low flow capability of CAV4, this cage-guided trim can be used in services with 6000 psi pressure drops and capacities as low as 0.1 - 2.9 C_V.

Standard trim materials include an S17400 cage with an S44004 plug and seat ring. Contact your Emerson sales office for additional materials.

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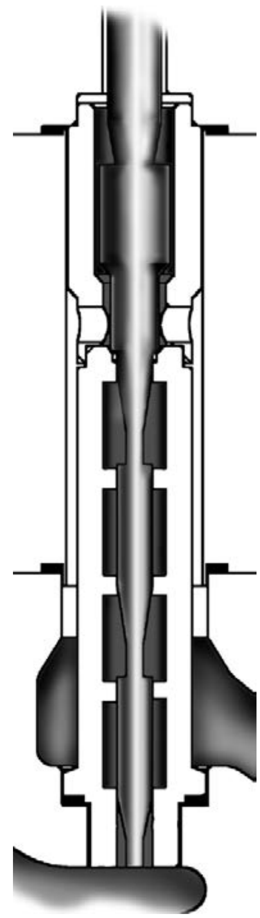
Fisher™ Multi-Stage Micro-Flat Trim

Fisher Multi-Stage Micro-Flat is a multi-stage, anti-cavitation control valve trim concept for use in services where high pressure drop, staged cavitation control is needed along with low-flow capability. The trim concept uses an axial, expanding area flow path and features a protected seat design where the shutoff function of the valve is separate from the throttling areas of the trim. The plug and cage are a matched pair and must be replaced as a set if either one is damaged in service.



FISHER MULTI-STAGE MICRO-FLAT TRIM

W8285

Features

- **Versatility—** Retrofits into existing angle and globe valve designs. Flows up or down. Can provide up to 50-1 turndown.
- **Cavitation Control—** 3-8 stage used properly can help eliminate cavitation damage.
- **Trim Materials—** S44004 plug and S17400 seat ring or NACE option of R30016 plug and seat ring.
- **Resistance to Erosion Damage—** Standard hardened trim materials provide excellent wear resistance, resulting in long trim life. The contoured valve plug seat reduces fluid separation, helps direct fluid away from trim, and protect against erosion damage.
- **Cavitation Control Trim—** Trim design eliminates the effects of cavitation.
- **Multi-Stage Micro-Flat—** Multi-Stage Micro-Flat trim is a cage-guided unbalanced characterized plug design with a series of flats on a common stem. High ΔP's and C_V's down to approximately 0.01. This is a cavitation control trim for use on liquids. Not intended for gas service. See figure 1.

Principle of Operation

Multi-Stage Micro-Flat trim is a plug-characterized design with a series of flats on a common stem to provide staged cavitation control. Flow direction is typically flow down, but flow up use is possible in special cases. Consult your Emerson sales office for additional information.

This trim is used to control cavitation. Features include a protected seat design and pressure drops as high as 6500 psi. To maximize seat life in cavitating environments, staged flow control as low as $C_V = 0.01$ is possible. This trim must be used with hardened materials, such as R30016 and S44004/S17400.

Specifications

Available Valves

easy-e, EH, EHA, HP, and HPA

End Connection Styles

Refer to appropriate valve bulletin

Valve Body Dimensions and Weights

Valve type, pressure class, and number of stages will result in changes to these values. Please consult your Emerson sales office for more information on finished dimensions and weights

Shutoff Classifications

Class V per ANSI/FCS 70-2 and IEC 60534-4

Maximum Inlet Pressures and Temperatures[1]

Consistent with applicable CL900, CL1500, and CL2500 pressure/temperature ratings according to ASME B16.34 ratings unless limited by individual temperature and pressure limits

Maximum Pressure Drop[1]

See table 2

Construction Materials

Typical materials are 440C or Solid Alloy 6. Consult your Emerson sales office for your specific application

Flow Characteristic

Typically equal percent

Flow Direction

Flow down (typical) or Flow up (available)

Valve Cavitation Coefficient

K_c = 1.0 for all valves when trim is used within applicable pressure drop limits.

Maximum Valve Plug Travel

Plug travels is 0.75 inch through 2 inch. Contact your Emerson sales office for your specific application

Minimum Seating Force

Use Class V seat load requirements

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.

Trim Applications and Limits

Table 1. Applications

VALVE	PRESSURE CLASS	VALVE SIZE	SHUTOFF PORT SIZE		FLOWING PORT SIZE(1)		UNBALANCED AREA		TRAVEL		PERFORMANCE LEVEL	AVAILABLE CAPACITIES	
		NPS	mm	Inch	mm	Inch	cm^2	$Inch^2$	mm	Inch	Number of Stages	Min C_v	Max C_v
ES	600	1	12.7	0.5	9.525	0.375	1.503	0.233	19.05	0.75	3	0.01	0.5
		1 1/2											
		2											
EAS		2	15.875	0.625	9.525	0.375	1.503	0.233	19.05	0.75	3	0.01	0.7
HPS/HPAS EHS/EHAS	1500	1	15.875	0.625	12.7	0.5	2.316	0.359	19.05	0.75	3	0.01	0.7
			12.7	0.5	9.525	0.375	1.503	0.233			4		0.5
			15.875	0.625	12.7	0.5	2.316	0.359			5		0.7
	2500	1	15.875	0.625	12.7	0.5	2.316	0.359	19.05	0.75	4	0.1	0.7
											5		
											6	0.01	0.6
	1500	2	15.875	0.625	12.7	0.5	2.316	0.359	19.05	0.75	3	0.01	0.7
			12.7	0.5	9.525	0.375	1.503	0.233			4		
			15.875	0.625	12.7	0.5	2.316	0.359			5		
	2500	2	15.875	0.625	12.7	0.5	2.316	0.359	19.05	0.75	4	0.1	0.7
											5		
											6	0.01	0.6

1. Other port sizes and higher Cv are available upon request. Consult your Emerson sales office for additional information.

Table 2. Pressure Drop Limits

Number of Stages	ΔP (psi)	ΔP (bar)	K_c
3	1500	103.4	1.0
4	2500	172.4	
5	3500	241.3	
6	4500	310.3	
7	5500	379.2	
8	6500	448.2	

Figure 1. Fisher EHA Valve Assembly with 8-Stage Micro-Flat Flow Down Trim Design

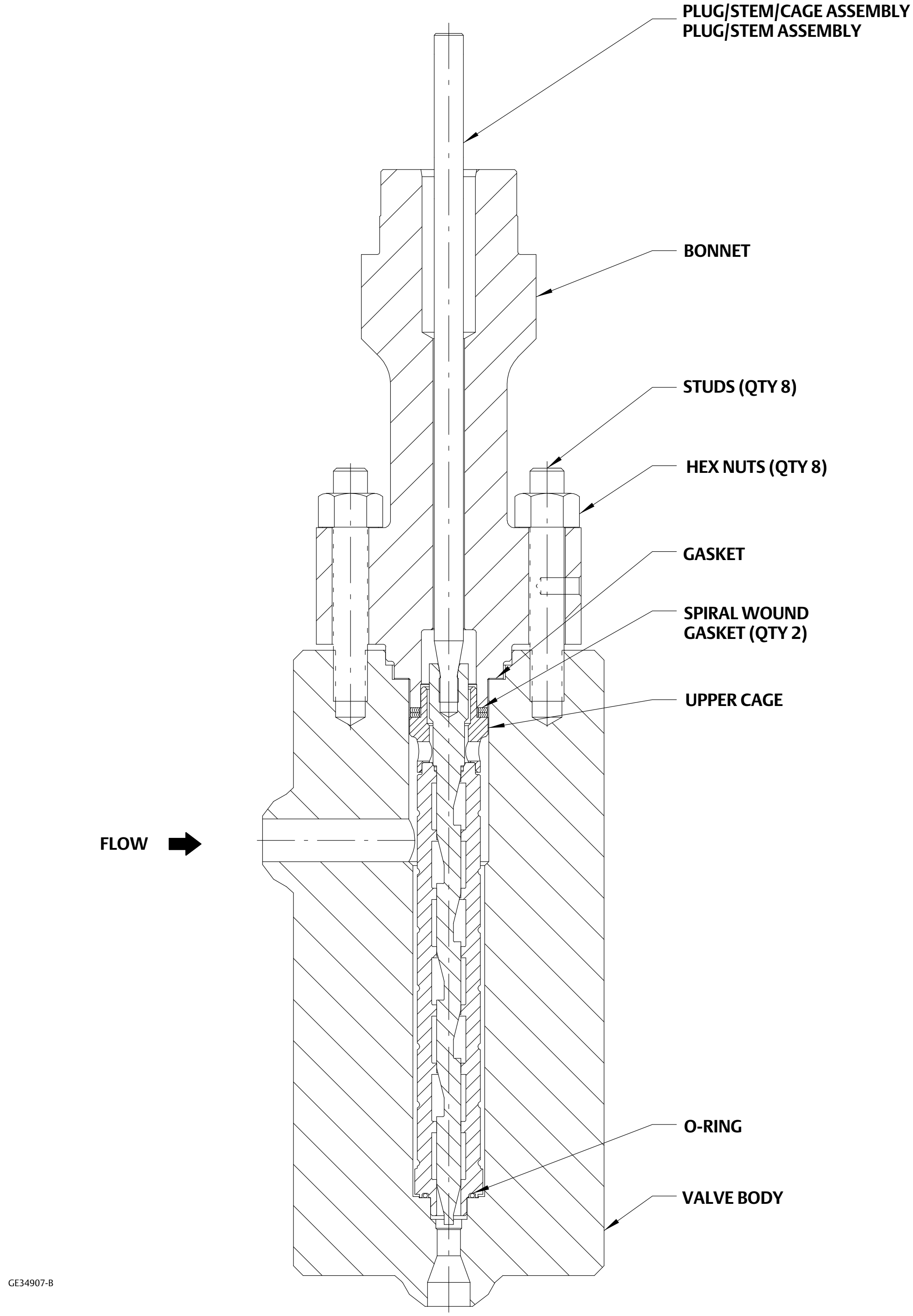


Figure 2. Fisher HPA Valve Assembly with 4-Stage Micro-Flat Flow Up Trim Design

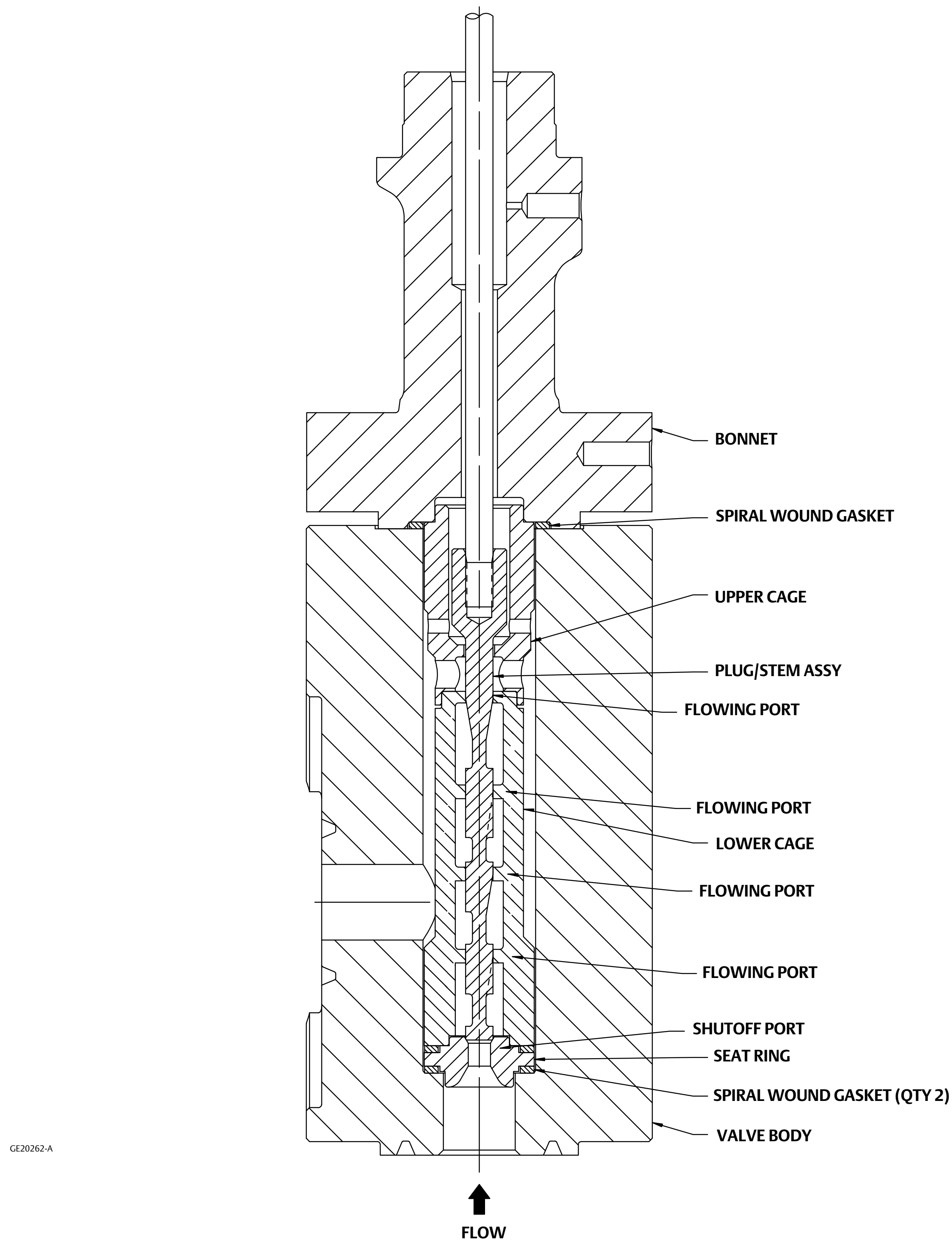
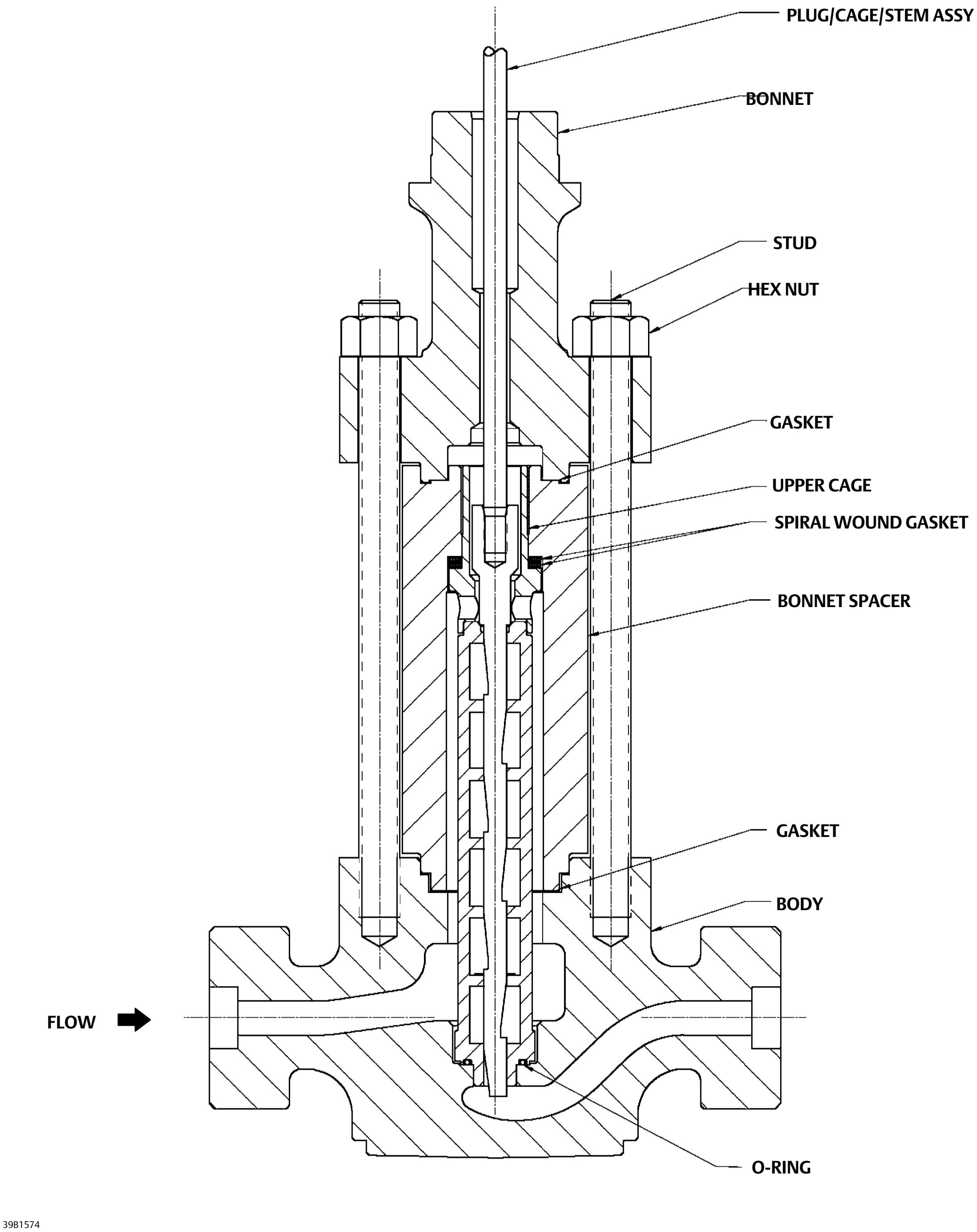


Figure 3. Fisher Globe Body Valve Assembly



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Product Bulletin
85.1:015
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Fisher™ Steam Conditioning Valves Installation Guidelines

Statement of Intent

This installation guide is designed to assist you in understanding important system guideline considerations as you prepare for steam conditioning valve installation. Although the following information is considered to be correct, every installation will have unique aspects. This installation guide is intended to be for general guidance only. If you have any questions about these guidelines, contact your Emerson sales office or Local Business Partner before proceeding.

⚠ WARNING

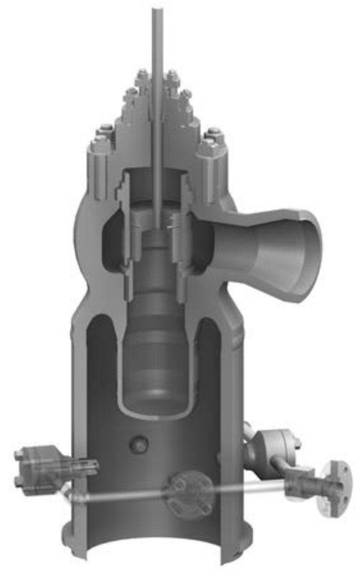
Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.

Personal injury or equipment damage caused by sudden release of pressure may result if the steam conditioning valve is installed where service conditions could exceed the limits of the pressure class noted on the nameplate. To avoid such injury or damage, provide a relief valve for over pressure protection as required by government or accepted industry codes and good engineering practices.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

CAUTION

This valve is intended for a specific range of service conditions. Applying different conditions to the valve could result in parts damage, malfunction of the valve, or loss of control of the process. ***Do not expose this valve to service conditions or variables other than those for which this valve is intended.*** **If you are not sure what these conditions are, you should contact Emerson Automation Solutions for more complete specifications. Provide the product serial number (shown on the nameplate) and all other pertinent information.**



FISHER CVX STEAM CONDITIONING VALVE

X0165

FISHER TBX STEAM CONDITIONING VALVE

Overview of the Installation as a “System”

A steam conditioning valve's performance is dependent on its physical environment, the service conditions, and the desired control objectives and strategies. It is, therefore, a part of a much larger “system” in which all elements are interdependent. This installation guideline is intended to recognize these various elements and show how their parameters affect the steam conditioning valve. Following is a summary of items that are important to design considerations.

- Pipe length requirements
- Temperature and pressure sensor locations
- Control approaches
- Spraywater conditions and use of strainers
- Drain usage
- Velocity limitations
- Vibration and noise
- Valve insulation and preheating
- Valve and actuator orientation and accessibility
- Startup

Contents

Primary System Elements and Parameters

Straight Pipe Length Requirement

The proper design and layout configuration of the piping arrangement is critical for the effective operation of the steam conditioning valve. Within the initial straight pipe length (SPL) (figure 1), the important heat transfer and flow mixing functions must take place quickly and efficiently. It is expected that during this time approximately 80% of the injected spraywater will have vaporized into steam. This is a minimum requirement for preventing phase separation when the newly combined flows encounter an elbow or other flow directing piping element. If the injected water is not properly mixed and thermally transformed into the steam flow, the water could be separated out of the main flow causing poor control and possible thermal shock of the piping elements.

Determination of the exact length required from the steam conditioning valve is a complicated multiple function transient computation of independent variables, such as remaining superheat, velocity, droplet size, etc. A simplified and fairly accurate approximation of minimum length, however, can be obtained by considering the known relationship between the time for heat transfer and velocity.

For general estimation purposes, the following calculation will be sufficient for most applications requiring less than 15% injected spraywater and water temperatures that are in the 100-200°F range:

$$SPL(L) = 0.1 \times VEL_{MAX}\ (L/SEC)$$

Where:

SPL(L)= Straight Pipe Length in units of length, L
VEL_{MAX}(L/SEC)= The Maximum Outlet Steam Velocity in units of length per second, L/SEC

This method of calculation is merely an approximation. When physical piping parameters make this length difficult to incorporate there are other considerations that could potentially lessen the requirement. They are:

1. **Temperature of the Spraywater--** High temperature water is much better for desuperheating than cold water. It has a lower latent heat of vaporization, as well as a reduced fluid surface tension and viscosity. Because of this, high temperature water will mix and vaporize more quickly and, therefore, require less time/distance to reach thermal equilibrium. Generally speaking, water above 93°C (200°F) will provide a vaporization benefit. It should be noted that the use of hotter water will result in greater quantities of water, but is usually insignificant in comparison to the benefits. A general rule is that the spraywater flow will increase by 1 to 1.5% for each 28°C (50°F) increase over 93°C (200°F).

2. **Remaining Superheat--** The amount of residual superheat remaining in the steam, after thermal equilibrium is reached, is an indicator of how rapidly the water will vaporize to steam. When the amount of superheat remaining in the steam exceeds 11°C (20°F), the process can be expected to be completed in a reduced length.

3. **Quantity of Water--** The amount of water required to desuperheat to desired temperature is a factor. When very large amounts of water are required, then the sheer volume can impede the vaporization. This volume of water can either be measured in terms of volumetric flow rate or in terms of the percentage of spraywater flow to steam flow. In most instances it is more meaningful to use the percentage of flow approach. When the flow of water required exceeds 15% of the steam flow, it is beginning to act as a deterrent. It increases the time for vaporization, which proportionally increases the distance requirement.

4. **Steam Pipe Size--** The size of the steam outlet pipe has a direct effect on the performance of water vaporization. Larger pipe sizes have larger flow areas thus a larger cross-sectional flow area of steam that must be exposed to the desuperheating water. The mixing of the turbulent steam with the water can be affected by the outlet pipe size because of this large diameter pipe flow. For this reason, the evaporation and mixing time will take longer for large diameter pipes.

5. **Proximity to the Pressure Reducing Valve--** If the water is injected within three pipe diameters of the PRV the turbulence coming out of the valve aids in the mixing, which can in turn reduce pipe length requirements.

Consult your Emerson sales office or Local Business Partner for the appropriate straight pipe length requirement.

Figure 1. Straight Pipe Length Requirement

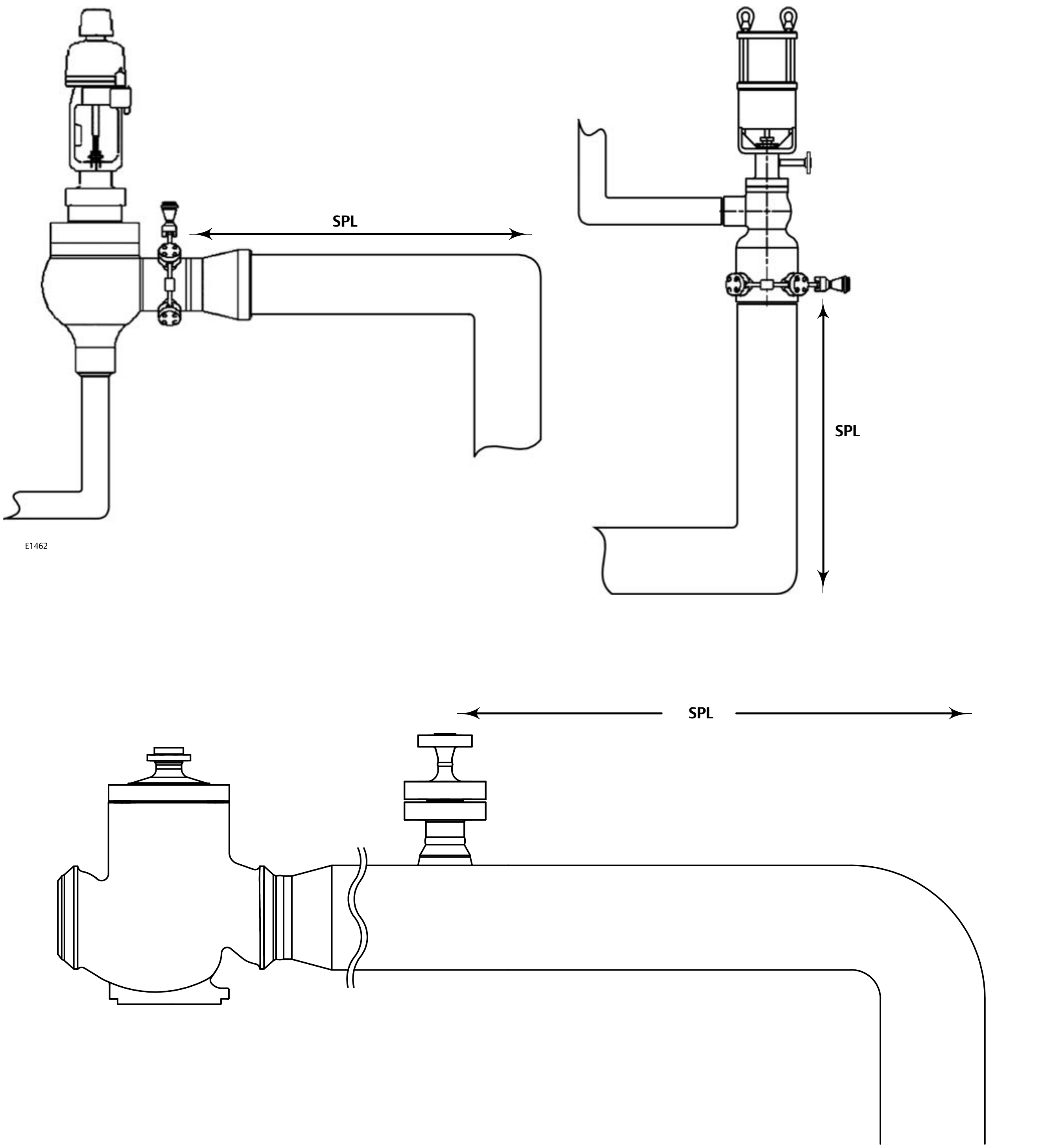
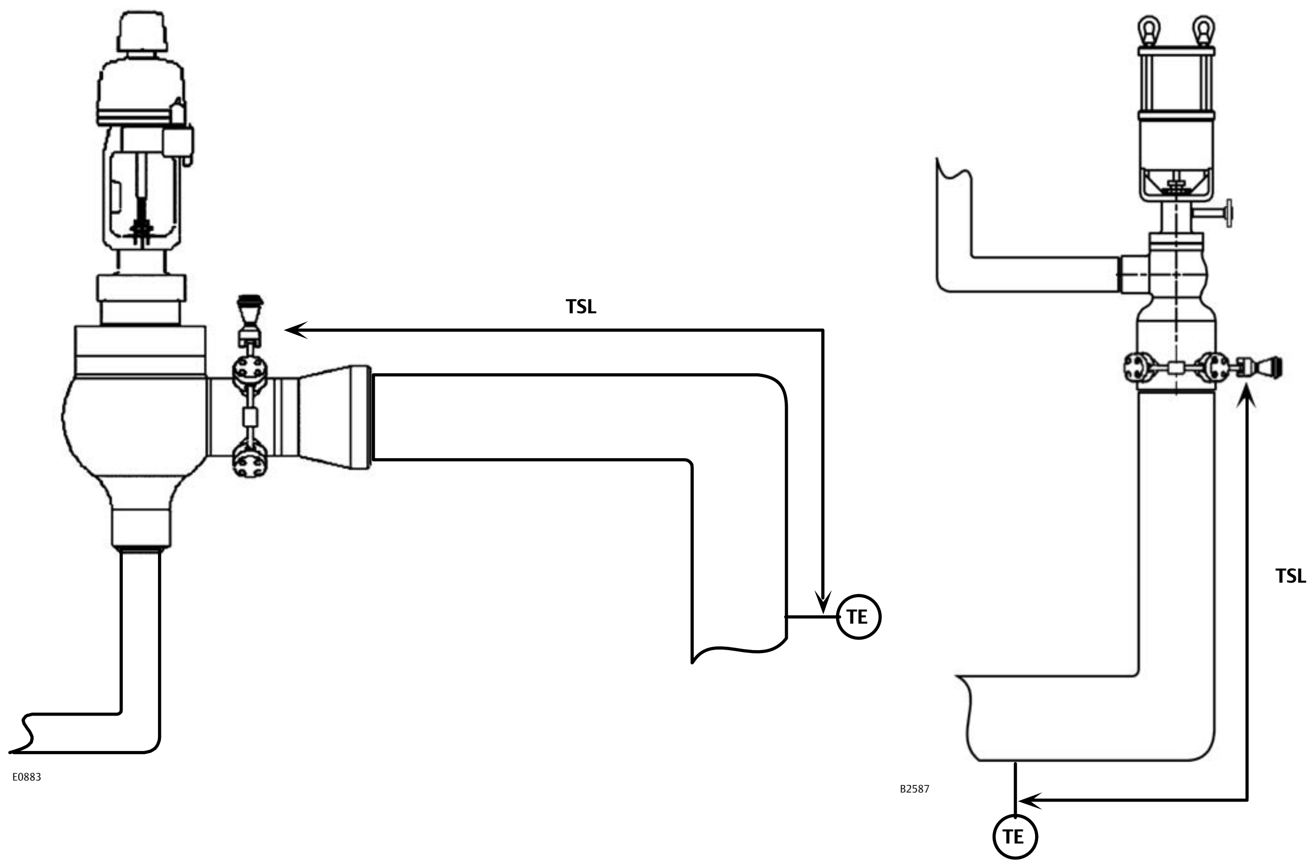


Figure 2. Temperature Sensor Pipe Length Requirement



Temperature Sensor Pipe Length Requirements

The temperature sensor length (TSL) (figure 2), after the steam conditioning valve, is needed for the water to complete its vaporization into steam and become evenly distributed across the pipe area before interfacing with the temperature sensor in a feedback control system. If the water has not completely vaporized, the resulting input control data will be inaccurate due to moisture contacting the sensing temperature element. The exact length required after the valve is a function of several of the factors already described in the straight pipe length section. The primary considerations are the amount of water being added and the steam velocity within the pipeline during maximum flow conditions. For general estimation purposes, use the following simplified calculation.

Applications with less than 15% spray water

$TSL(L) = 0.2 \times VEL_{MAX}$ (L/SEC)

Applications with greater than 15% spray water

$TSL(L) = 0.3 \times VEL_{MAX}$ (L/SEC)

Where:

TSL(L)= Temperature Sensor Length in units of length, L
VEL_{MAX}(L/SEC)= The Maximum Outlet Steam Velocity in units of length per second, L/SEC

This method of calculation is merely an approximation. When piping requirements make this formula's result difficult to obtain, other considerations could potentially reduce the requirement. These other factors are:

- Temperature of the spraywater
- Amount of remaining superheat
- Exact quantity of water required
- Piping geometry

For further explanation of these factors, refer to Straight Pipe Length Requirement. Consult your Emerson sales office or Local Business Partner for the appropriate temperature sensor length (TSL) requirement.

Steam Conditioning Valve Control Approaches

The reasons for combining the pressure and temperature reduction in steam conditioning valves are numerous, but the strategy for accurate temperature control is the key function in the control strategy.

Pressure control design is standard, seldom encounters any problems, and is always a closed loop feedback system. The process variable can be either the upstream or downstream pressure, depending on the application.

The temperature control strategy can be either feedforward or feedback depending on external factors and application requirements.

Feedback Temperature Control

A closed loop feedback temperature control system is used when there is an accurate and consistent method for temperature measurement. By definition, the system is dependent on detecting a deviation in setpoint and feeding this information back to the control system to initiate final control element adjustment. The primary factor that can adversely influence the accuracy of this type of system in steam conditioning is the presence of water in the steam. In many instances, especially in heat transfer applications, there is a need for controlling the steam temperature as close to saturation as possible. The inherent problem with this is that the closer the temperature gets to saturation the more likely the steam flow will have residual water droplets. This is due to the fact that the temperature profile of a steam flow is uneven, often with cooler temperatures in the center and progressively hotter temperatures moving outwards. It is, therefore, important to not control too close to the point of saturation. It is recommended that the setpoint should not be less than 6°C (10°F) above the steam saturation point. See figure 3.

Feedforward Temperature Control

A feedforward control system is one that responds to input variables, other than that which it is responsible to control, and makes pre-empted or anticipated adjustments to the final control element so as to keep the desired setpoint constant.

An external feedforward control strategy is used when it is not possible to get accurate temperature measurement using normal feedback control techniques, when control performance requires more responsiveness, or when the control variables are changing in a disproportionate manner. Such control is available via the use of an external logic controlling device, e.g. PLC or DCS, and incorporating a control algorithm to determine the appropriate system response to achieve the desired outlet temperature. In order to calculate the quantity of spraywater required, via a heat balance, the enthalpy of the inlet and outlet steam and spraywater must be known. The enthalpies can be calculated by measuring the inlet/outlet steam pressure and temperature and spraywater temperature. Additionally, steam flow can be determined by a flow meter or by calculation from measured process variables. The algorithm controlling for outlet temperature, or more accurately outlet enthalpy, can vary in complexity depending on how the steam generating plant operates. In general, the measured spraywater flow is used as a feedback signal in the feedforward outlet steam temperature control loop. See figure 4.

Figure 3. Feedback Temperature Control

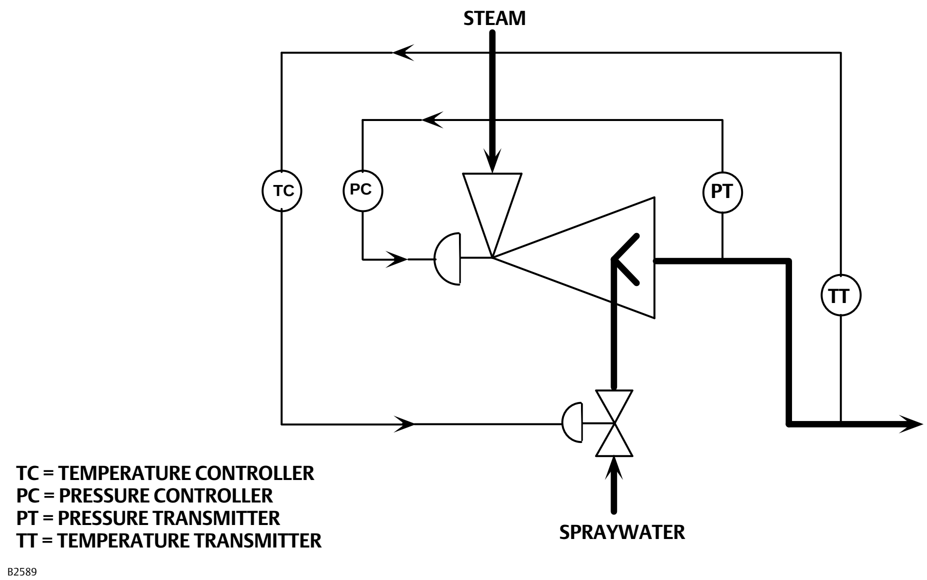
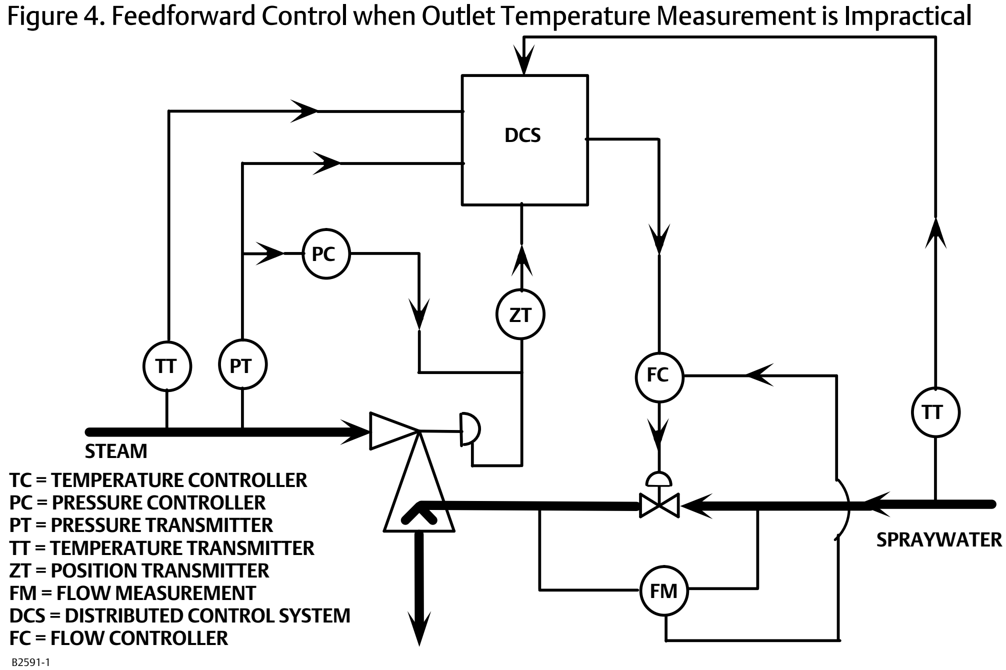


Figure 4. Feedforward Control when Outlet Temperature Measurement is Impractical



Spraywater Pressure and Temperature Requirements

Spraywater pressure and temperature factors affect desuperheating performance of a steam conditioning valve. The important considerations are:

1. **Spraywater Pressure--** The spraywater pressure entering the spraywater control valve should exceed the outlet steam pressure by at least 150 psid. Differences less than this amount can affect the rangeability of the steam conditioning valve and could contribute to the incomplete atomization of the water droplets. If the available differential is between 500-1000 psid, the performance of the system will be enhanced, but some limitations may apply to the type of spraywater control valve employed. This is especially important when water temperature is very high. At higher pressure differentials, cavitation potential increases, therefore the factory should be consulted before any control elements are selected.

2. **Spraywater Temperature--** Spraywater temperature will directly affect the quantity of water required, the distances required for straight pipe, and the distance for the temperature sensor location. Colder water requires reduced quantities. This is important if there is a shortage of available water supply, however, hotter water is best for desuperheating performance. This is due to the fact that hot water requires less heat to vaporize, has reduced surface tension, and lower viscosity; all important factors in speeding up the vaporization process. At water conditions approaching vaporization, care should be taken to prevent flashing across the spraywater control valve.

Spraywater Strainer Considerations

Many steam conditioning valve applications require nozzles/orifices with small diameter openings. The supply of some industrial water, additionally, can be filled with considerable particulate material. It is best therefore, to include a strainer immediately before the spraywater control valve. The strainer needs to be sized based on the smallest opening which is usually located in the spray nozzle/drilled orifice inside the steam conditioning valve. When selecting a strainer, consideration must be given to the pressure drop created by the strainer. Consult your Emerson sales office or Local Business Partner when ordering a steam conditioning valve for the size of strainer required (generally in the 40-100 mesh range).

Drain Considerations

Drains are important in any steam conditioning system. They assist in the protection of the system piping by collecting and eliminating free water that has accumulated over time or in operation. This water may be the result of condensation during system inactivity or by incomplete water evaporation. The presence of water in the steam line upstream of the steam conditioning valve can be very damaging to the internals of the valve. Unvaporized water after the steam conditioning valve can cause damage to piping and other instrumentation, and create inaccurate temperature measurements. It is, therefore, highly recommended to have drains upstream and downstream of the steam conditioning valve if there is any chance of condensation or incomplete water evaporation. Due to the special nature of steam conditioning equipment, consideration must be made in trap sizing. For steam conditioning applications that require quick opening, upstream drains must be sized to take into account the potential for rapid condensate formation.

Downstream drains should be located at the lowest point after the valve and a dripleg should connect the pipe to the drain. The dripleg should typically be located before the temperature sensor. Drain connections on steam conditioning valves are available upon request.

Steam Pipe Liner

Liners are sometimes used to protect the steam pipes against water impingement and thermal shock where spraywater is injected. If spraywater comes in contact with liners, the potential for serious damage exists. Careful consideration of installation factors can replace the need for such a device. However, when no alternative is available and the potential for spraywater fallout is great, a liner can protect against cracking of the main pressure retaining pipe.

Steam Piping Velocity Considerations

An important consideration in designing a steam conditioning system is the issue of the velocity of steam at the point of water injection, and downstream piping. Minimum steam velocities should be adequate to keep the water in suspension until it can evaporate and ensure proper mixing. Maximum steam velocities should be limited to prevent pipeline vibration and avoid excessive distances before evaporation. These velocity limitations vary by installation geometry and desuperheater model. Contact your Emerson sales office or Local Business Partner for these limitations.

Piping Vibration and Noise Considerations

For Fisher products, the IEC (International Electrotechnical Commission) method for noise considerations is used in order to determine the potential noise that will be generated by the operation of a steam conditioning valve. This method attempts to take into consideration all the various elements of noise generation from the pressure reduction. In order to minimize noise generation, numerous piping design aspects should be considered. They are as follows:

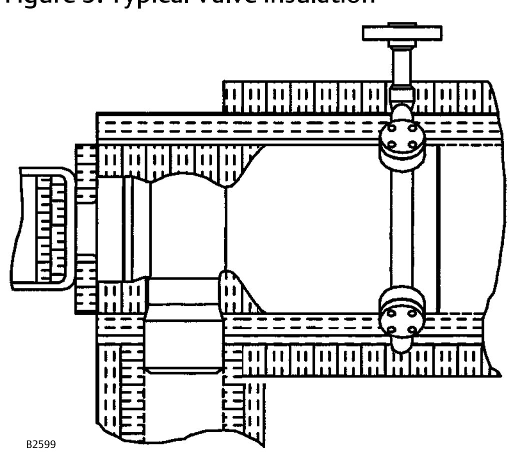
- Avoid multiple bends/ elbows immediately before and after the valve.
- Noise levels that exceed 110 dba, as predicted with standard weight pipe with no insulation, may cause structural fatigue leading to associated failures. Noise abatement trims, insulation, and downstream silencers can be used to reduce transmitted noise.
- Avoid deadlegging tees directly upstream or downstream of the valve.
- When piping several valves on branches from a common header, locate them at different distances from the header to avoid pressure oscillations caused by resonance phenomena.
- Piping layout should avoid projections, branches, T-connections, manifolds, or short radius elbows prior to previously discussed recommended straight pipe requirement.
- Use of T-connection instead of long radius elbow for the first directional change is not recommended due to the potential for increasing equipment vibration levels.

Valve Insulation Requirements

The steam conditioning valve and its associated spraywater control valve should be insulated with appropriate materials that will address both noise and thermal reduction requirements. The entire valve should be insulated, including the valve's bonnet surface that faces the actuator (see figure 5). This insulation should be designed with easily removable covers over the area of the bonnet and, on applicable models, over each externally mounted spraywater nozzle fixture. Be certain not to create thermal and noise bridges to uninsulated taps, anchors, or other external attachments. Typical insulation used on steam conditioning valves is as follows:

- Insulation thickness and density should be based on the thermal/noise requirement.
- The insulation should be clad with aluminum or steel lagging.

Figure 5. Typical Valve Insulation



Preheating Recommendation

Preheating is recommended when the steam conditioning valve is normally closed (e.g. startup, turbine bypass, etc.) and the difference in temperature between the inlet live steam and the valve body is in excess of 100°C (212°F). When the live steam line is passing at a point within four to five feet from the actual location of the valve, the goal is to preheat the valve adequately with the minimum of piping/valving cost and least energy consumption. Quite often the most effective method is determined by the existing or planned piping layout. Typically a preheating arrangement requires an isolation valve and varies upon application. The ideal preheating temperature is within 200°F of the steam operating temperature. Preheating valve connections are available upon request.

Orientation and Accessibility Requirements

Orientation/Support

Due to the size of many modern steam conditioning valves, Emerson Automation Solutions recommends the piping system be designed for vertical orientation of the valve actuator. Vertical actuator orientation allows for easier disassembly and reassembly during required maintenance operations and reduced wear of internal components.

At no time should the valve body or the actuator be used as a fixed anchor point in the design of the pipe hanger and support system. From the valve manufacturer's standpoint, a piping system is properly designed if the valve body can accept and transmit forces and torques without exceeding allowable stress levels, thus permitting operation without impairing the functionality of the valve trim.

If the use of a pipe support is required, a constant load spring hanger is recommended to minimize the possibility of overloading the actuator or valve during movement from the hot to cold piping condition.

Accessibility

Due to the size and weight of many actuators, bonnets, and trim, adequate adjacent space should be allowed for installation and maintenance functions, including crane or chain lift access. Factory drawings address this requirement and should be followed. When the valve is in an elevated position, a platform should be located at the valve that is large enough to accommodate a minimum of two people, their tools and temporary space for the valve parts.

Startup Considerations

Each steam conditioning valve is intended for a specific range of pressures, pressure drops, temperatures, process fluids, and possibly other specifications. Do not expose the product to service conditions or variables other than those for which the product was intended. If you are not sure what these conditions are, contact your Emerson sales office or Local Business Partner for complete specifications. Provide the product project number and all other pertinent information.

If hoisting the equipment, use a nylon sling to protect the surfaces. Carefully position the sling to prevent damage to the actuator tubing and any accessories. Take care to prevent people from being injured in case the hoist or rigging slips. Be sure to use adequately sized hoists and chains or slings to handle the valve.

Before a new installation is placed in operation, all dirt, scale, and debris within the newly constructed piping must be removed. This normally is achieved by acid-cleaning, flushing, or steam blowdown of the system. Without appropriate precautions or protection, the valve trim could be irreparably damaged before it is ever put into service. To prevent this from happening, it is strongly recommended that all valve trim be removed from the valve body and that an appropriate blowdown device be inserted in its place. For assistance in this matter consult your Emerson sales office or Local Business Partner.

There are a number of other considerations when preparing to install a steam conditioning valve. Several of these are:

- **Post Weld Heat Treatment--** This is normally dictated by the applicable pressure vessel code in the state/country of installation. It is highly recommended that the valve trim be removed before any such treatment is performed.

- **Blowout/Blowdown Trim--** These fixtures clean the piping upstream of the steam conditioning valve while taking care not to damage internal valve parts. The blowout fixture replaces the valve cage, plug, and bonnet allowing steam flow from the inlet or outlet to be directed through the valve, out the blowout fixture, and through temporary piping. The blowdown fixture replaces the valve plug and cage allowing steam flow from the upstream piping to be directed through the valve body and out the valve outlet and downstream piping.

- **Hydrostatic Test Trim--** This fixture is needed in order to properly hydro-test the upstream piping system, including the newly installed steam conditioning valve, before startup.

- **Startup Spares--** A complete set of consumable spares is recommended for startup and should include as a minimum replacement gaskets and packing to be used on site when reassembling valve after testing.

- **Standard Spares--** Major components such as plug/stem assemblies and cages often have lengthy leadtimes. It is recommended that a standard set of spares be stocked to minimized downtime in the event of an unexpected part replacement.

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CVX Valve
D101423X012

Product Bulletin
85.1:CVX
February 2020

Fisher™ CVX Steam Conditioning Valve

The Fisher CVX Steam Conditioning Valve is designed to handle the moderate to severe applications in today's cycling power plants as well as provide precise pressure and temperature control for process applications. The CVX incorporates over 30 years of steam conditioning experience and product development. The valve body is designed with the latest finite element analysis (FEA) and computational fluid dynamics (CFD) tools to optimize performance and reliability for demanding steam systems.

The CVX valve design provides an exceptional combination of performance and maintainability. The simplified trim configuration is thermally compensated to handle rapid changes in temperatures, as expected during a turbine trip, without any sticking or binding.

Water atomization and vaporization are key elements in any steam conditioning application. The CVX design incorporates a spraywater manifold of variable geometry AF nozzles that produce an optimized spray pattern over a wide operating range. These nozzles are strategically placed to achieve optimal mixing and quick vaporization at all flowing conditions. Years of research in spray atomization and vaporization were key to optimizing the water injection system. Extensive use of CFD analysis, in addition to field performance feedback, was used to validate spray system enhancements.

Features

- **Total Steam Control--** Combines pressure and temperature control in a single valve.
- **Full Pressure Drop Capability--** Rugged cage-guided design enables handling of full pressure drop of main steam.
- **Forged Valve Body--** FEA designed valve body can handle the most demanding applications without thermal stress problems.
- **High Temperature Capability with Available Class V Shutoff--** Use of the Fisher Bore Seal trim gives capability of Class V shutoff up to 621°C (1150°F). This unique balanced trim is field-proven. See figure 3.
- **Thermally Compensated Trim--** The cage is nitrided for maximum life and is allowed to grow during thermally induced excursions. The plug is continuously guided and employs cobalt-based overlays for guide bands and tight metal-to-metal shutoff against the seat.
- **Easy Maintenance Seat Ring--** Welded design provides Class V shutoff and long life. Deep Alloy 6 overlay can be refinished multiple times to maintain tight shutoff. Optional bolted seat rings and clamped cartridge trim are also available.

- **Spiral-Wound Gaskets for Excellent Bonnet Sealing Under All Service Conditions--** Premium gaskets provided with N07750 windings and graphite filler material.

- **Precise Spraywater Injection--** CFD designed spray manifold determines water injection point and insertion depth to maximize mixing and quick vaporization.

- **High Turndown--** Standard trim control rangeability is 50:1. Special construction can provide up to 75:1 turndown.

- **Quick Stroking Actuation--** High performance pneumatic piston actuators with FIELDVUE™ digital valve controllers can achieve full stroke in less than 2 seconds while still maintaining highly accurate step response. Optimized digital valve controllers are available when high stroke speeds are required. Contact your Emerson sales office for assistance.

- **Performance Diagnostics--** With the self-diagnostic capability, questions can be answered about a valve's performance, without pulling the valve from the line. The present valve/actuator signature (seat load, friction, etc.) can be compared against previously stored signatures to discover performance changes before they cause process control problems.

- More compact body and trim profile, creating a lighter valve that requires less support without compromising structural integrity

Options

- **Startup Trim--** Protects the working trim and machined surfaces of the valve body during steam blow.

- **Hydro-Plug--** Provides a convenient way to establish hydrotest boundaries associated with using a split pressure class valve.

- **Split Functionality--** When piping dictates, the CVX valve can be provided as separate components allowing the pressure control in the valve body and separate temperature reduction downstream in a steam cooler.

- **Commissioning Service--** Proper installation of flushing trim and hydro-plug fixtures, along with reassembly and calibration of turbine bypass valves, is critical for the valves to be ready for service when needed. Let skilled Emerson Automation Solutions technicians take care of this vital commissioning service to protect this very important plant asset.

- **Diagnostic Services--** The Emerson Automation Solutions Diagnostic Services Group delivers world class services and innovative technologies for top performance of critical service valves and other production assets.

- **Enhanced low noise diffuser technology--** Helps eliminate noise generated by recirculated and expanded flow

- **Seat ring diffusers --** incorporate bolted or clamped seat ring with diffuser technology for easy maintenance.

Table 1. Physical Specifications

End Connection Sizes[1]

- Inlet: NPS 4 - 24
- Outlet: NPS 8 - 60

End Connection Types

- Buttweld (all sizes)
- Raised Face Flanges (all sizes)
- Ring Type Joint Flanges (all sizes)

Configuration

Angle Pattern (Flow Down)

Valve Body Ratings[2][4]

See table 2

Maximum Pressure Drop[1]

Valve bodies and trim capable of full ASME rated pressure drops

Flow Characteristics[3]

Linear

Flow Direction

Linear: Flow Down

Port Diameter and Maximum Travel

See table 2

Bonnet Type

Bolted

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

- Class V (standard)
- Class IV (optional)

1. Standard end connection sizes. Contact your Emerson sales office for additional options.
2. Not all valve sizes are available in all pressure ratings.
3. Contact your Emerson sales office for special characterized cages.
4. Intermediate classes above CL2500 available upon request. PN pressure ratings available per pressure requirements of EN1092-1. Contact your Emerson sales office for additional options.

Table 2. Port Diameter and Maximum Travel Offerings for Fisher CVX Trim[1][2]

SEAT RING TYPE	INLET PRESSURE RATING	PORT DIAMETER		MAXIMUM TRAVEL		MAXIMUM CAPACITY[1]	
		mm	Inches	mm	Inches	C_v	X_t
Welded Seat	CL150 to CL2500	120	4.70	89	3.5	373	0.65
		159	6.25	102	4	544	0.65
		194	7.62	146	5.75	960	0.65
		234	9.20	178	7	1412	0.65
	CL150 to CL1500	285	11.20	203	8	2078	0.65
		349	13.75	267	10.5	3208	0.65
	CL150 to CL900	424	16.70	318	12.5	4627	0.65
Bolted Seat	CL150 to CL2500	87	3.44	70	2.75	200	0.65
		120	4.70	89	3.5	373	0.65
		159	6.25	102	4	544	0.65
		194	7.62	146	5.75	960	0.65
	CL150 to CL1500	234	9.20	178	7	1412	0.65
		285	11.20	203	8	2078	0.65
	CL150 to CL900	349	13.75	267	10.5	3208	0.65
		424	16.70	318	12.5	4627	0.65

1. Value shown is trim capacity only. Overall valve capacity will be affected by outlet diffuser sizing requirements.
2. Contact your Emerson sales office for additional options.

Table 3. Material Specifications

Body/Bonnet

■ SA105 (Carbon Steel)
■ SA182 Grade F22 (2.25 Cr-1 Mo)
■ SA182 Grade F91 (9 Cr-1 Mo-V)
■ SA182 Grade F92 (9 Cr-2 W-V)

Bonnet Bolting

■ SA105 Valve Body — SA193 Grade B7 up to 427°C (800°F)
■ SA182 Grade F22 Valve Body — SA193 Grade B16 up to 524°C (975°F), N07718 above 524°C (975°F) to maximum of 566°C (1050°F)
■ SA182 Grade F91 or F92 Valve Body — N07718 up to 621°C (1150°F)

Control Plug

■ 2.25 Cr-1 Mo with Alloy 6 guiding and seating surfaces(1)
■ 9 Cr-1 Mo-V with Alloy 6 guiding and seating surfaces(2)

Stem

■ SA479 Type S20910
■ N07718 stems

Cage

■ 2.25 Cr-1 Mo Nitrided(1)
■ 9 Cr-1 Mo-V Nitrided(2)

Welded Seat (standard)

■ SA105 Valve Body -- Carbon Steel with Alloy 6 Seating Surface
■ SA182 Grade F22 Valve Body -- 2.25 Cr-1 Mo with Alloy 6 Seating Surface
■ SA182 Grade F91 Valve Body -- 9 Cr-1 Mo-V with Alloy 6 Seating Surface

Bolted Seat (optional)

■ 2.25 Cr-1 Mo with Alloy 6 seating surface up to 482°C (900°F)
■ N06625 with Alloy 6 seating surface up to 593°C (1100°F)
■ N07718 with Alloy 6 seating surface up to 593°C (1100°F)

Clamped Seat/Clamped Seat and Diffuser (optional)

■ 2.25 Cr-1 Mo with Alloy 6 seating surface(1)
■ 9 Cr-1 Mo-V with Alloy 6 seating surface(2)

Welded Diffuser

■ Carbon Steel ■ 2.25 Cr-1 Mo
■ 9 Cr-1 Mo-V ■ 9 Cr-2 W-V

Bolted Diffuser

■ 2.25 Cr-1 Mo ■ 9 Cr-1 Mo-V

Piston Rings

Alloy 6 with N07750 Expander

Bore Seal

N07718

Gaskets

N07750/Graphite

Packing

Graphite/Flexible Graphite

Nozzles

■ S41000 SST
■ N07718

1. For use with SA105 or F22 valve body.
2. For use with F91 valve body.

Figure 1. Fisher CVX

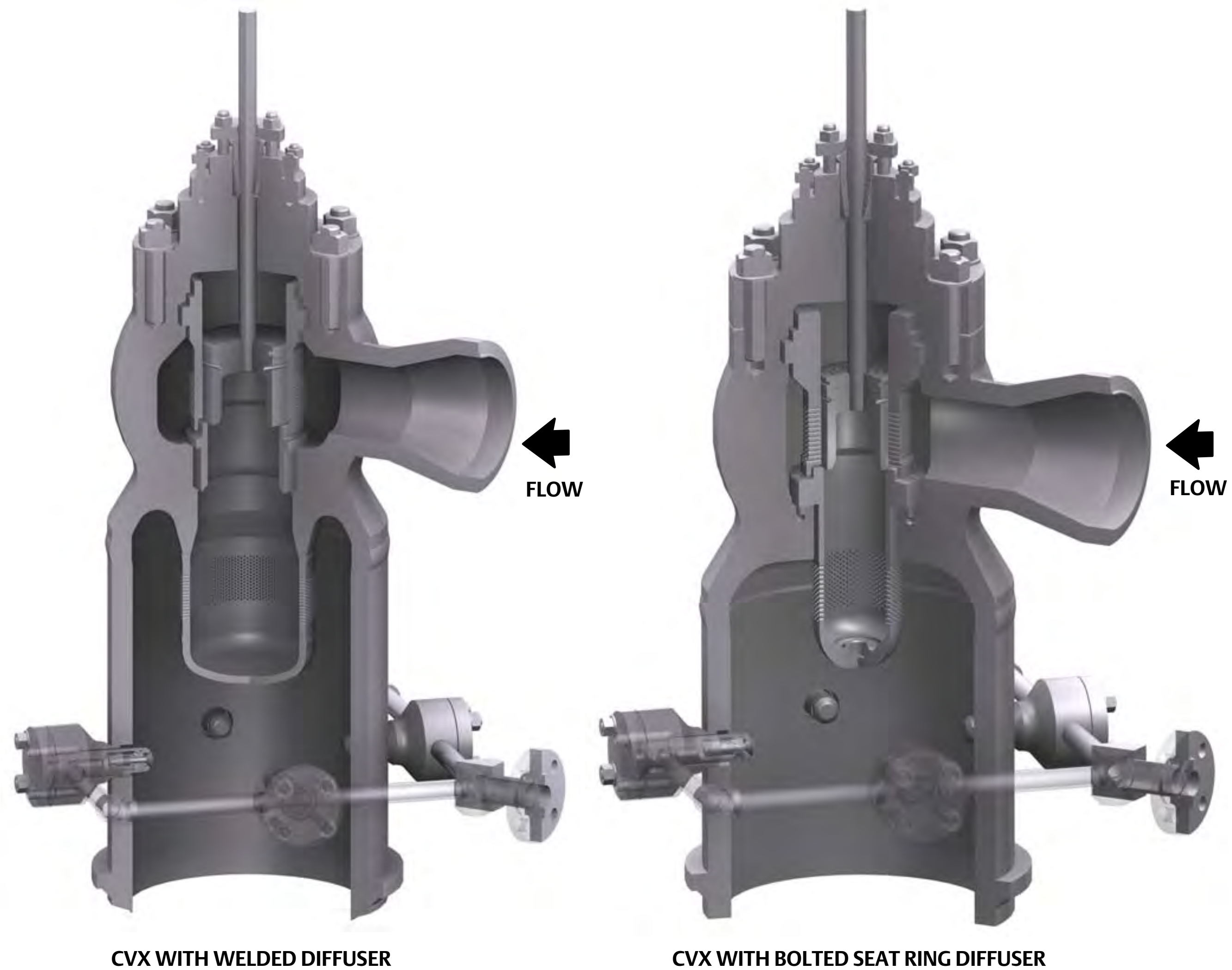
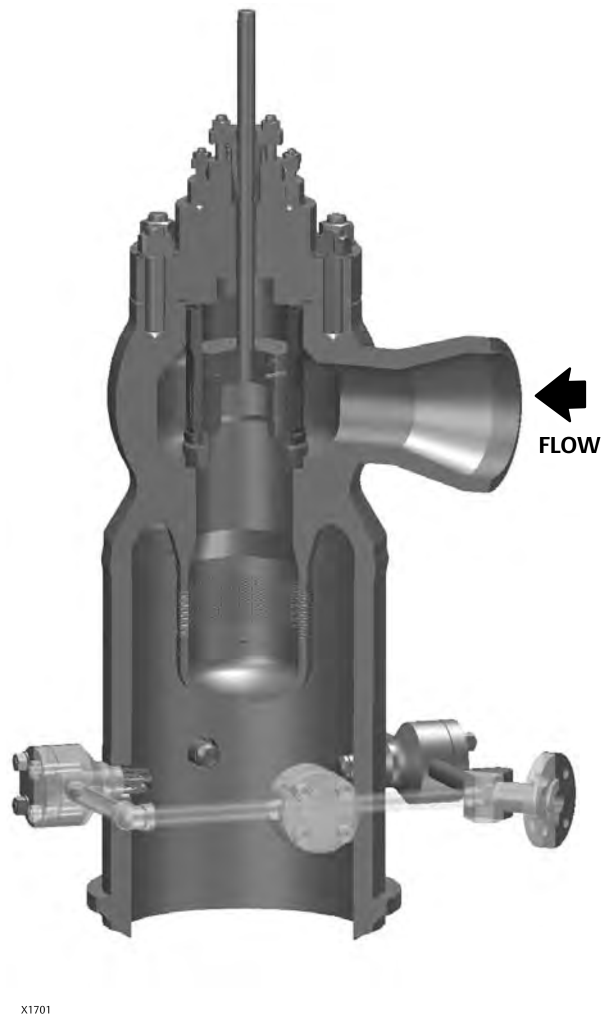
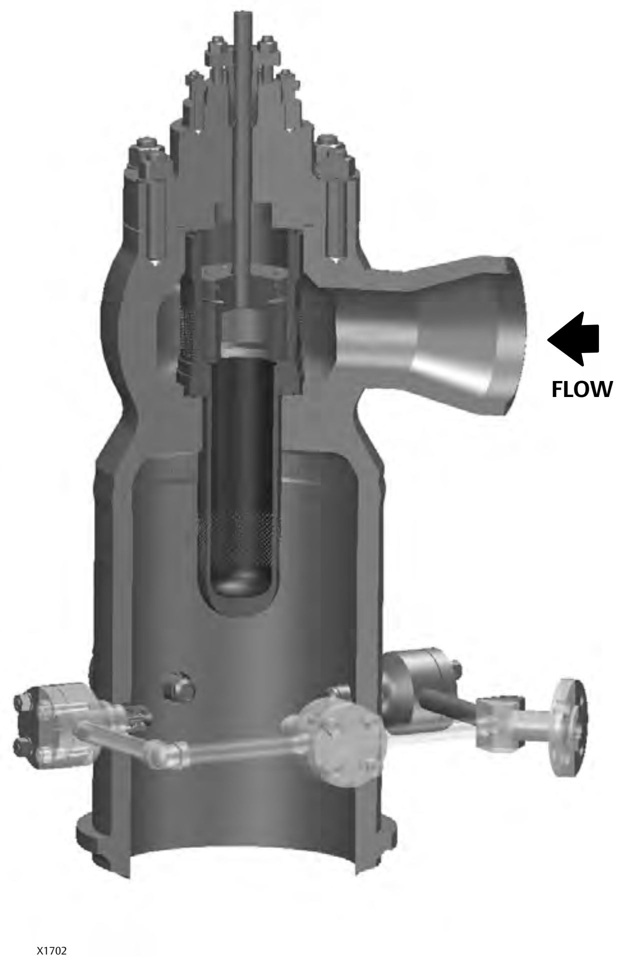


Figure 2. Fisher CVX with Clamped Trim

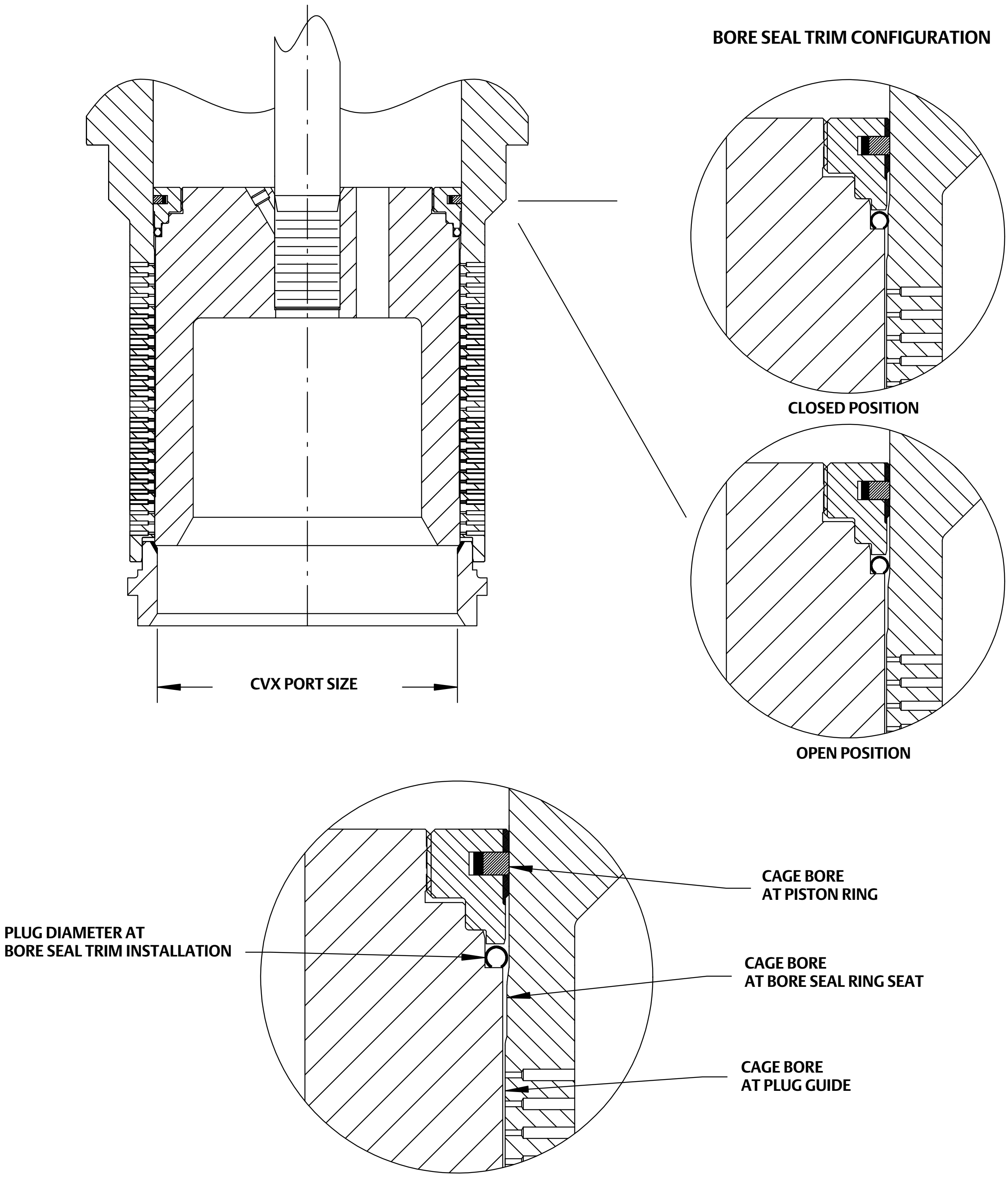


CVX WITH CLAMPED TRIM AND WELDED DIFFUSER



CVX WITH CLAMPED TRIM AND DIFFUSER

Figure 3. Fisher CVX Bore Seal Trim in Closed Position



Ordering Information

Application Information

When ordering, specify:

1. Steam Flow, PPH (Inlet/Outlet)
2. Inlet Pressure, PSIA
3. Outlet Pressure, PSIA
4. Inlet Temperature, °F
5. Outlet Temperature, °F
6. Water Pressure, PSIA
7. Water Temperature, °F
8. Required Noise Level, dBA
9. Pipeline Size, inches (Inlet/Outlet)
10. Turndown Required

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Product Bulletin
85.1:TBX
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Fisher™ TBX Steam Conditioning Valve

The Fisher TBX Steam Conditioning Valve is designed to handle the most severe applications in today's cycling power plants as well as provide precise pressure and temperature control for process applications. The TBX incorporates over 30 years of steam conditioning experience and product development. The valve body is designed with the latest finite element analysis (FEA) and computational fluid dynamics (CFD) tools to optimize performance and reliability for demanding steam systems.

The TBX valve design provides the ultimate combination of performance and maintainability (see figure 2). The TBX valve incorporates low noise Whisper Trim™ technology. The simplified trim configuration is thermally compensated to handle rapid changes in temperatures, as expected during a turbine trip, without any sticking or binding.

Water atomization and vaporization are key elements in any steam conditioning application. The TBX design incorporates a spraywater manifold of variable geometry AF nozzles that produce an optimized spray pattern over a wide operating range. These nozzles are strategically placed to achieve optimal mixing and quick vaporization at all flowing conditions (see figure 2). Years of research in spray atomization and vaporization were key to optimizing the water injection system. Extensive use of CFD analysis, in addition to field performance feedback, was used to validate spray system enhancements.

W8740-3

Whisper Trim and WhisperFlo Cages

To help attenuate aerodynamic noise, Whisper Trim III cages are standard with TBX control valves.

WhisperFlo™ cages (figure 1) are also available to attenuate aerodynamic noise. Contact your Emerson sales office for more information.

Features

- **Total Steam Control--** Combines pressure and temperature control in a single valve.

- **Full Pressure Drop Capability--** Rugged cage-guided design enables handling of full pressure drop of main steam.

- **Noise Attenuation--** Whisper III and WhisperFlo trims help to attenuate the noise by 30 to 40 dBA.

- **High Temperature Capability with Available Class V Shutoff--** Use of the Fisher Bore Seal trim gives capability of standard Class V shutoff up to 621°C (1150°F). This unique balanced trim is field-proven. See figure 4.

- **Forged Valve Body--** FEA designed valve body can handle the most demanding applications without thermal stress problems.

- **Flow Up Angle--** Permits vertical stem orientation for ease of maintenance in most applications.

- **Flow Down Angle--** Permits vertical stem orientation for ease of maintenance in most applications.

- **Thermally Compensated Trim--** The cage is case-hardened for maximum life and is allowed to grow during thermally induced excursions. The plug is continuously guided and employs cobalt-based overlays for guide bands and tight metal-to-metal shutoff against the seat.

- **Easy Maintenance Seat Ring--** Welded design provides Class V shutoff and long life. Deep Alloy 6 overlay can be refinished multiple times to maintain tight shutoff. Bolted seat rings are also available for ease of maintenance.

- **Spiral-Wound Gaskets for Excellent Bonnet Sealing Under All Service Conditions--** Premium gaskets provided with N06600 windings and graphite filler material.

- **Precise Spraywater Injection--** CFD designed spray manifold determines water injection point and insertion depth to maximize mixing and quick vaporization.

- **High Turndown--** Standard trim control rangeability is 50:1. Special construction can provide up to 75:1 turndown.

- **Quick Stroking Actuation--** High performance pneumatic piston actuators with FIELDVUE™ digital valve controllers can achieve full stroke in less than 2 seconds while still maintaining highly accurate step response. Optimized digital valve controllers and accessory packages are available when high stroke speeds are required. Contact your Emerson sales office for assistance.

- **Customized Valve Body and Trim--** Valve is designed to meet your exact demanding application needs.

- **Performance Diagnostics--** With the self-diagnostic capability, questions can be answered about a valve's performance, without pulling the valve from the line. The present valve/actuator signature (seat load, friction, etc.) can be compared against previously stored signatures to discover performance changes before they cause process control problems.

- **More Compact Valve Body and Trim Profile--** Creates a lighter valve that requires less support without compromising structural integrity.

Options

- **Blowdown Trim--** Protects the working trim and machined surfaces of the valve body during steam blow.

- **Hydro-Plug--** Provides a convenient way to establish hydrotest boundaries associated with using a split pressure class valve.

- **Split Functionality--** When piping dictates, the TBX valve can be provided as separate components allowing the pressure control in the valve body and separate temperature reduction downstream in a steam cooler.

- **Commissioning Service--** Proper installation of blowdown trim and hydro-plug fixtures, along with reassembly and calibration of turbine bypass valves, is critical for the valves to be ready for service when needed. Let skilled Emerson Automation Solutions technicians take care of this vital commissioning service to protect this very important plant asset.

- **Diagnostic Services--** The Emerson Automation Solutions Services Group delivers world class services and innovative technologies for top performance of critical service valves and other production assets.

- **Magnetite Strainer Design (flow up only)--** protects the bore seal and piston ring from magnetite buildup that can contribute to trim sticking.

- **Bolted Seat Ring--** Seat ring is bolted to the valve body for easy removal, replacement, or maintenance.

Figure 1. Magnetite Catcher

Table 1. Physical Specifications

End Connection Sizes and Valve Body Ratings[1][2]

VALVE INLET, NPS	INLET PRESSURE RATINGS
4-18	CL150 - CL2500
20-24	CL150 - CL1500

VALVE OUTLET, NPS	OUTLET PRESSURE RATINGS
8-18	CL150 - CL2500
20	CL150 - CL1500
24	CL150 - CL900
30	CL150 - CL600
36-60	CL150 - CL300

End Connection Types

- Buttweld (all sizes)
- Raised Face Flanges (all sizes)
- Ring Type Joint Flanges (all sizes)

Configuration

Angle Pattern (Flow Up or Flow Down)

Maximum Pressure Drop

Valve with Whisper Trim III Cage: 0.999 $\Delta P/P_1$ maximum for levels A1 through D3

Valve with WhisperFlo Trim (Flow Up Only):
- Levels X, Y, and Z: 0.999 $\Delta P/P_1$ maximum

Flow Characteristics[3]

Whisper Trim III Cages: Linear
WhisperFlo: Linear

Flow Direction

Whisper Trim III Cage: Flow Up or Flow Down
WhisperFlo: Flow Up only

Port Diameter and Maximum Travel

See table 2 for Whisper Trim III cages
See table 5 for WhisperFlo

Bonnet Type

Bolted

Seat Ring Type

- Welded in (standard)
- Bolted in (optional)

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

- Class V (standard) (Whisper Trim III)
- Class V (standard) (WhisperFlo)
- Class IV (available)

1. Standard end connection sizes. Intermediate classes above CL2500 available upon request. PN pressure ratings available per pressure requirements of EN1092-1. Additional sizes available upon request Consult your Emerson sales office for additional options.
2. Not all valve sizes are available in all pressure ratings. Consult your Emerson sales office for specific size and class combinations.
3. Contact your Emerson sales office for special characterized cages.

Table 2. Port Diameter and Maximum Travel for Flow Up Whisper Trim III(1)

SEAT RING TYPE	WHISPER LEVEL	INLET PRESSURE RATING	PORT DIAMETER		MAXIMUM TRAVEL	
			mm	Inches	mm	Inches
Welded Seat	A1-C3	CL150 - CL2500	120	4.70	197	7.75
			159	6.25	264	10.38
			194	7.62	321	12.62
			234	9.20	391	15.38
		CL150 - CL1500	285	11.20	473	18.62
			349	13.75	581	22.88
		CL150 - CL900	424	16.70	606	23.88
			507	19.94	606	23.88
	D1-D3	CL150 - CL2500	87	3.44	165	6.5
			120	4.70	197	7.75
			159	6.25	264	10.38
			194	7.62	321	12.62
		CL150 - CL1500	234	9.20	391	15.38
			285	11.20	473	18.62
		CL150 - CL900	349	13.75	571	22.88
			424	16.70	606	23.88
Bolted Seat	ALL	CL150 - CL2500	87	3.44	165	6.5
			120	4.70	197	7.75
			159	6.25	264	10.38
			194	7.62	321	12.62
		CL150 - CL1500	234	9.20	391	15.38
			285	11.20	473	18.62
		CL150 - CL900	349	13.75	571	22.88
			424	16.70	606	23.88

1. Consult your Emerson sales office for additional options.

Table 3. Port Diameter and Maximum Travel for Flow Down Whisper Trim III(1)

INLET PRESSURE RATING	PORT DIAMETER		WHISPER LEVEL	MAXIMUM TRAVEL	
	mm	Inches		mm	Inches
CL150 - CL2500	159	4.70	A1,A3,B1,B3	73	2.88
			C1,C3	121	4.75
	194	6.25	A1,A3,B1,B3	92	3.62
			C1,C3	159	6.25
	234	7.62	A1,A3,B1,B3	117	4.62
			C1,C3	213	8.38
CL150 - CL1500	285	9.20	A1,A3,B1,B3	137	5.38
			C1,C3	235	9.25
	349	11.20	A1,A3,B1,B3	171	6.75
			C1,C3	311	12.25
CL150 - CL900	424	13.75	A1,A3,B1,B3	219	8.62
			C1,C3	397	15.62
	507	16.70	A1,A3,B1,B3	267	10.5
			C1,C3	480	18.88

1. Consult your Emerson sales office for additional options.

Table 4. Material Specifications

Body/Bonnet

- SA105 (Carbon Steel)
- SA182 Grade F22 (2.25Cr-1Mo) up to 566°C (1050°F)
- SA182 Grade F91 (9Cr-1Mo-V)
- SA182 Grade F92 (9Cr-2W-V)

Bonnet Bolting

- SA105 Valve Body — SA193 Grade B7 up to 427°C (800°F)
- SA182 Grade F22 Valve Body — SA193 Grade B16 up to 524°C (975°F), N07718 above 524°C (975°F) to 566°C (1050°F)
- SA182 Grade F91 or F92 Valve Body — N07718 up to 621°C (1150°F)

Control Plug

- 2.25Cr-1Mo with Alloy 6 guiding and seating surfaces(3)
- 9 Cr-1Mo-V with Alloy 6 guiding and seating surfaces(4)

Stem

- SA479 Type S20910(3)
- N07718 stems

Cage

- S41000 cage, 9 Cr-1Mo-V retainer(2,4) 2.25Cr-1Mo Nitrided(1)
- S41000 cage, 2.25Cr-1Mo Nitrided retainer(2, 3)
- 9 Cr-1Mo-V retainer Nitrided(1,4)

Bolted Seat

- 2.25Cr-1Mo with Alloy 6 up to 482°C (900°F)
- N06625 with Alloy 6 up to 593°C (1100°F)
- N07718 with Alloy 6 up to 593°C (1100°F)

Welded Seat (standard)

- Carbon Steel with Alloy 6 Seating Surface(3)
- 2.25Cr-1Mo with Alloy 6 Seating Surface(3)
- 9 Cr-1Mo-V with Alloy 6 Seating Surface(4)
- 9 Cr-2W-V with Alloy 6 Seating Surface(5)

Piston Rings

Alloy 6 with N07750 Expander

Bore Seal

N07718

Gaskets

N07750/Graphite

Packing

Graphite/Flexible Graphite

Nozzles

- S41000 SST, ■ N07718

1. For Whisper III constructions.
2. For WhisperFlo constructions.
3. For use with SA105 or F22 valve body.
4. For use with F91 valve body.
5. For use with F92 valve body.

Table 5. Port Diameter and Maximum Travel for Flow Up WhisperFlo Trim(1)

SEAT RING TYPE	INLET PRESSURE RATING	PORT DIAMETER		MAXIMUM TRAVEL	
		mm	Inches	mm	Inches
ALL	CL150-CL2500	87	3.44	165	6.5
		109	4.28	241	9.5
		137	5.38	241	9.5
		178	7.00	311	12.25
	CL150-CL1500	203	8.00	384	15.12
		254	10.00	457	18
		279	11.00	527	20.75
	CL150-CL900	375	14.75	606	23.88
		464	18.25	606	23.88

1. Consult your Emerson sales office for additional options.

Figure 2. Fisher TBX Operation - Flow Up

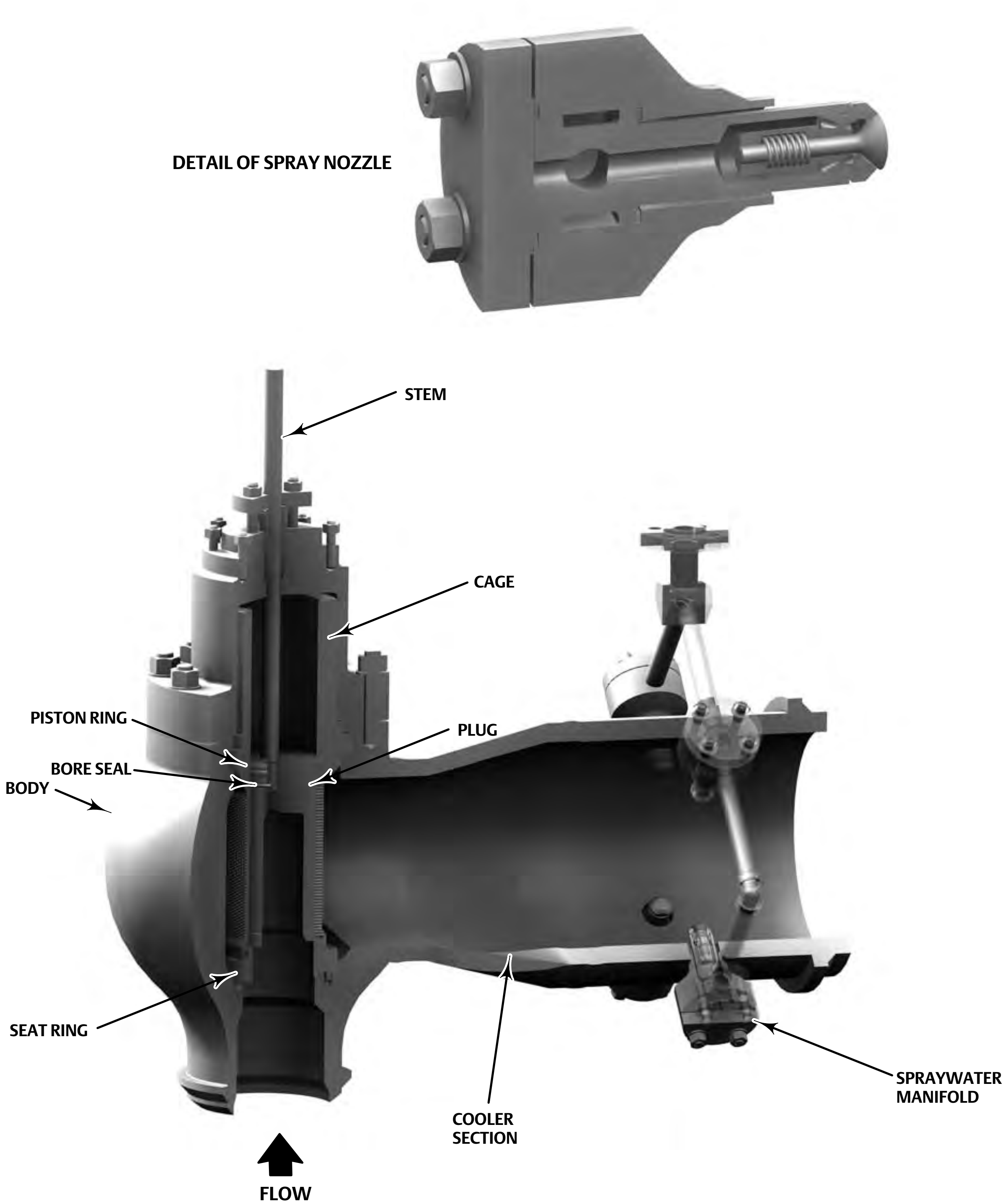
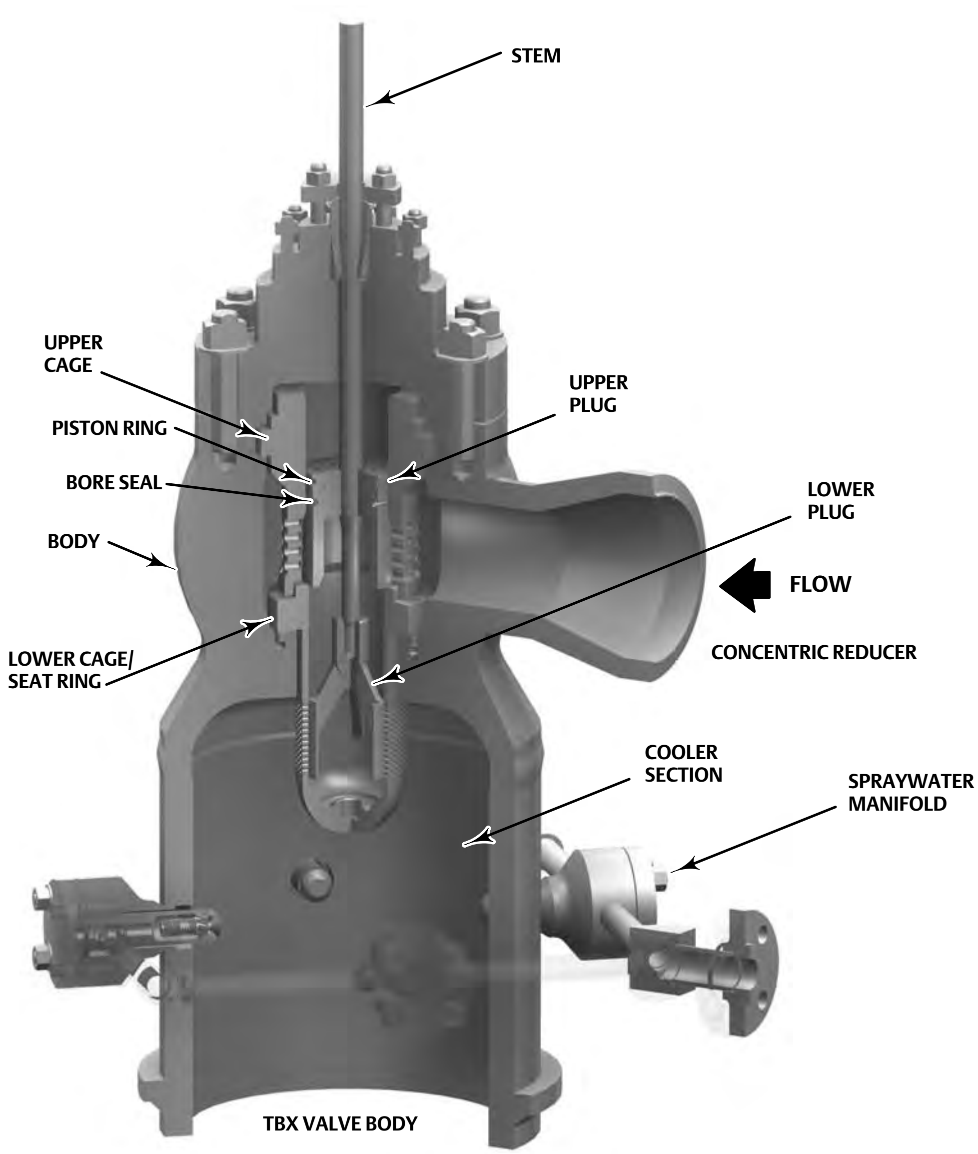


Figure 3. Alternative Fisher TBX Design - Flow Down



Coefficients

Table 6. Fisher TBX, Whisper Trim III, Flow Up Through the Port, Linear Characteristic(1)(2)

Port Diameter, mm	Port Diameter, Inches	Inlet Size, NPS and Inlet Class	Whisper III Levels	Maximum C_v Flow Coefficient	X_t
120	4.70	4 CL600 to 1500	A1 and A3	259	0.65
			B1 and B3	259	0.65
			C1 and C3	228	0.65
			D3	228	0.65
		4 CL2500	A1 and A3	219	0.65
			B1 and B3	209	0.65
			C1 and C3	206	0.65
			D3	206	0.65
		6 CL600 to 1500 and 8 through 12 CL600 to 2500	A1 and A3	578	0.65
			B1 and B3	397	0.65
			C1 and C3	291	0.65
			D3	291	0.65
		6 CL2500	A1 and A3	484	0.65
			B1 and B3	369	0.65
			C1 and C3	278	0.65
			D3	278	0.65
159	6.25	6 CL600 to 1500	A1 and A3	722	0.65
			B1 and B3	619	0.65
			C1 and C3	456	0.65
			D3	475	0.65
		6 CL2500	A1 and A3	488	0.65
			B1 and B3	488	0.65
			C1 and C3	403	0.65
			D3	475	0.65
		8 CL600 to 1500 and 10 through 14 CL600 to 2500	A1 and A3	1009	0.65
			B1 and B3	719	0.65
			C1 and C3	497	0.65
			D3	475	0.65
		8 CL2500	A1 and A3	888	0.65
			B1 and B3	675	0.65
			C1 and C3	478	0.65
			D3	475	0.65
194	7.62	8 CL600 to 1500	A1 and A3	1244	0.65
			B1 and B3	978	0.65
			C1 and C3	691	0.65
			D3	691	0.65
		8 CL2500	A1 and A3	913	0.65
			B1 and B3	844	0.65
			C1 and C3	641	0.65
			D3	641	0.65
		10 CL600 to 1500 and 12 through 16 CL600 to 2500	A1 and A3	1481	0.65
			B1 and B3	1063	0.65
			C1 and C3	725	0.65
			D3	725	0.65
		10 CL2500	A1 and A3	1375	0.65
			B1 and B3	1025	0.65
			C1 and C3	709	0.65
			D3	709	0.65

1. Reduction of standard inlet size may affect capacity. Consult your Emerson sales office for additional information.
2. Consult your Emerson sales office for additional options.

Table 7. Fisher TBX, Whisper Trim III, Flow Up Through the Port, Linear Characteristic(1)(2)

Port Diameter mm	Port Diameter Inches	Inlet Size, NPS and Inlet Class	Whisper III Levels	Maximum C_v Flow Coefficient	X_t
234	9.20	10 CL600 to 1500	A1 and A3	1913	0.65
			B1 and B3	1441	0.65
			C1 and C3	1044	0.65
			D3	1044	0.65
		10 CL2500	A1 and A3	1466	0.65
			B1 and B3	1284	0.65
			C1 and C3	975	0.65
			D3	975	0.65
		12 CL600 to 1500 and 14 through 18 CL600 to 2500	A1 and A3	2181	0.65
			B1 and B3	1528	0.65
			C1 and C3	1081	0.65
			D3	1081	0.65
		12 CL2500	A1 and A3	1994	0.65
			B1 and B3	1466	0.65
			C1 and C3	1053	0.65
			D3	1053	0.65
285	11.20	12 CL600 to 1500	A1 and A3	2791	0.65
			B1 and B3	2128	0.65
			C1 and C3	1503	0.65
			D3	1503	0.65
		14 through 20 CL600 to 1500	A1 and A3	3181	0.65
			B1 and B3	2269	0.65
			C1 and C3	1556	0.65
			D3	1556	0.65
349	13.75	16 CL600 to 1500	A1 and A3	4300	0.65
			B1 and B3	3225	0.65
			C1 and C3	2291	0.65
			D3	2291	0.65
		18 through 24 CL600 to 1500	A1 and A3	4781	0.65
			B1 and B3	3394	0.65
			C1 and C3	2359	0.65
			D3	2359	0.65
424	16.70	18 CL600 to 900	A1 and A3	5359	0.65
			B1 and B3	4088	0.65
			C1 and C3	2866	0.65
			D3	2866	0.65
		20 CL600 to 900	A1 and A3	5891	0.65
			B1 and B3	4300	0.65
			C1 and C3	2953	0.65
			D3	2953	0.65
		22 through 24 CL600 to 900	A1 and A3	6153	0.65
			B1 and B3	4406	0.65
			C1 and C3	2997	0.65
			D3	2997	0.65
507	19.94	22 CL600 to 900	A1 and A3	7131	0.65
			B1 and B3	5119	0.65
			C1 and C3	3503	0.65
		24 CL600 to 900	A1 and A3	7875	0.65
			B1 and B3	5406	0.65
			C1 and C3	3581	0.65

1. Reduction of standard inlet size may affect capacity. Consult your Emerson sales office for additional information.
2. Consult your Emerson sales office for additional options.

Table 8. Fisher TBX Whisper III flow down through the Port, Linear Characteristic(1)

Port Diameter		Whisper III Level	Max Cv Flow Coefficient	Xt
mm	Inch			
120	4.7	A1	178.4	0.81
		A3	170.7	0.8
		B1	169.4	0.799
		B3	173.7	0.802
		C1	140.7	0.752
		C3	140.2	0.752
160	6.25	A1	301.2	0.812
		A3	287.7	0.801
		B1	299.9	0.811
		B3	293.6	0.806
		C1	245.6	0.764
		C3	235.8	0.753
194	7.62	A1	475.3	0.814
		A3	447.6	0.798
		B1	475.8	0.814
		B3	468.5	0.81
		C1	379.6	0.759
		C3	378.1	0.758
215	8.5	A1	619.8	0.805
		A3	596	0.794
		B1	611.7	0.802
		B3	601.6	0.798
		C1	484.2	0.747
		C3	481	0.746
285	11.2	A1	1009.8	0.81
		A3	966.59	0.798
		B1	1018.2	0.812
		B3	1007.3	0.809
		C1	814.5	0.756
		C3	812.5	0.756
350	13.75	A1	1590.7	0.809
		A3	1518.7	0.797
		B1	1576.7	0.807
		B3	1576.1	0.807
		C1	1280.9	0.756
		C3	1280.4	0.756
425	16.7	A1	2356.6	0.811
		A3	2245.7	0.799
		B1	2346	0.811
		B3	2309.7	0.806
		C1	1917.8	0.76
		C3	1860	0.753

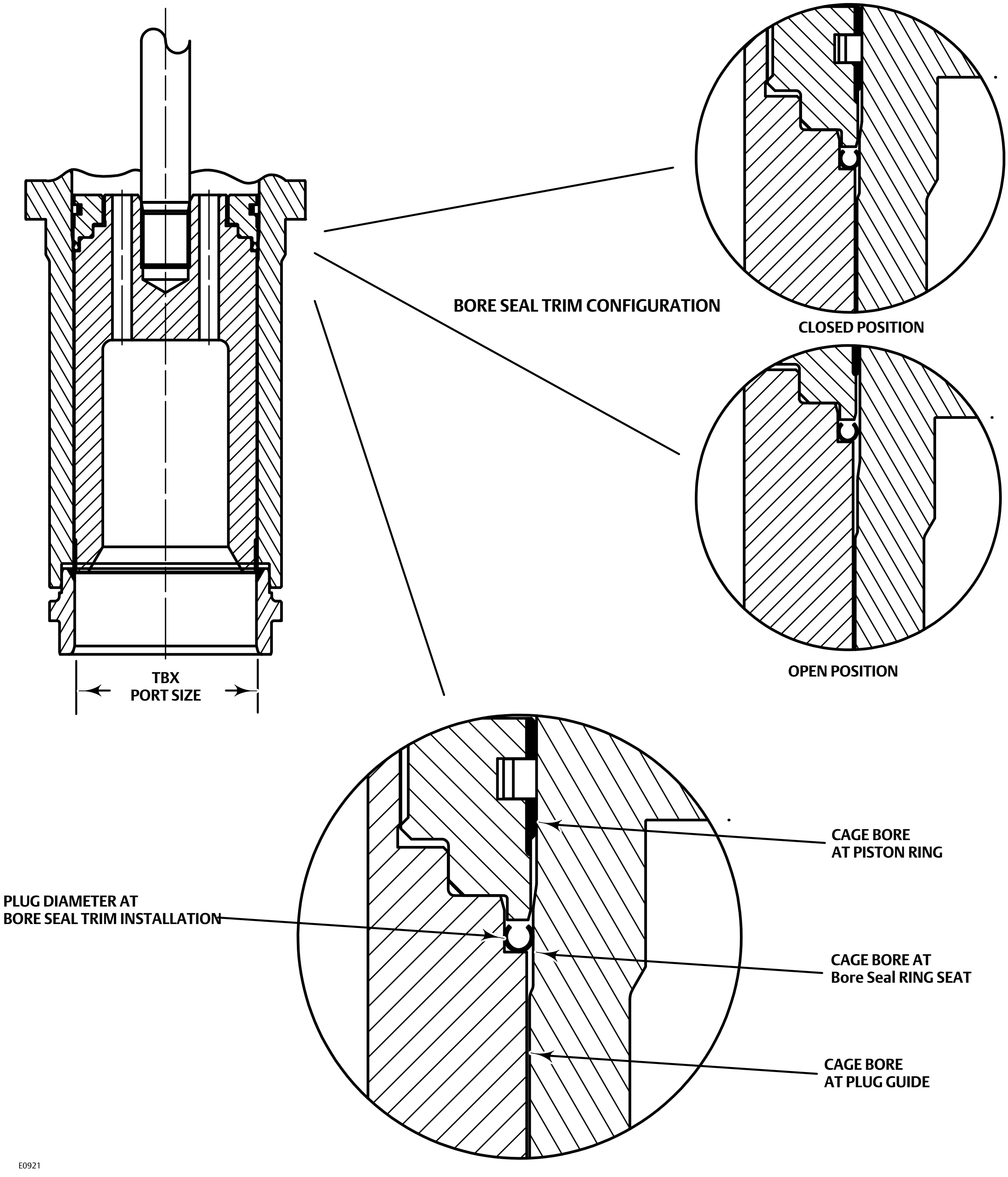
1. Consult your Emerson sales office for additional options.

Table 9. Fisher TBX, WhisperFlo Trim, Flow Up Through the Port, Linear Characteristic[1]

Port Diameter		WhisperFlo Level	Max Cv Flow Coefficient	Xt
mm	Inch			
3.43	7.75	X	288	0.575
		Y	213	0.575
		Z	133	0.525
4.28	9.5	X	446	0.575
		Y	352	0.575
		Z	234	0.525
5.375	9.5	X	703	0.575
		Y	508	0.575
		Z	312	0.525
7	12.625	X	1171	0.532
		Y	808	0.532
		Z	505	0.525
8	15.375	X	1558	0.532
		Y	1247	0.532
		Z	748	0.532
10	18.625	X	2435	0.532
		Y	1635	0.532
		Z	1040	0.532
11	22.875	X	2814	0.532
		Y	2314	0.532
		Z	1286	0.532
14.75	22.875	X	5297	0.532
		Y	3947	0.532
		Z	2368	0.532
18.25	22.875	X	7105	0.532
		Y	4342	0.532
		Z	2763	0.532

1. Consult your Emerson sales office for additional options.

Figure 4. Fisher TBX Bore Seal Trim in Closed Position



System Noise Level

Today's power plants must comply with strict noise limitations, especially those that are located close to residential areas. Satisfying a low fence line noise requirement requires a complete understanding of the system and how individual components can affect the total noise transmitted to the plant boundary.

Extensive steam conditioning noise research has been conducted at the Marshalltown research facility, resulting in a new understanding of the impact of sparger installations in turbine exhaust ducts. Testing has revealed critical spatial relationships of multiple spargers that must be maintained to prevent noise generation.

This knowledge, together with the application of low noise technology trims and pressure reducing devices, allows the Emerson research facility to accurately predict the system noise level.

Bore Seal Trim

TBX valves provide Class V leakage as a standard. The design employs a variation of the proven C-seal trim with enhancements for use with the TBX hung cage. The sealing design is called Bore Seal trim (figure 4).

In the Bore Seal trim, the primary plug-to-seat interface is a metal-to-metal line contact while the secondary metallic seal engages a controlled bore region in the cage when the plug is seated.

During modulation, the secondary seal does not contact the upper cage wall and the controlled bore region remains protected, which extends the shutoff life of the valve.

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Fisher™ TBX-P Steam Pressure Reducing Valve

The Fisher TBX-P Steam Pressure Reducing Valve is designed to handle the most severe applications in today's cycling power plants as well as provide precise pressure control for process applications. The TBX-P incorporates more than 30 years of steam experience and product development. The valve body is designed with the latest finite element analysis (FEA) and computational fluid dynamics (CFD) tools to optimize performance and reliability for demanding steam systems.

The TBX valve design provides the ultimate combination of performance and maintainability (see figure 2). The TBX-P valve incorporates low noise Whisper Trim™ technology. The simplified trim configuration is thermally compensated to handle rapid changes in temperatures, as expected during a turbine trip, without any sticking or binding.


X1715

FISHER TBX-P WITH 585C ACTUATOR

Whisper Trim and WhisperFlo Cages

To help attenuate aerodynamic noise, Whisper Trim III cages are standard with TBX-P control valves.

WhisperFlo™ cages (figure 1) are also available to attenuate aerodynamic noise. Contact your Emerson sales office for more information.

Features

- **Full Pressure Drop Capability--** Rugged cage-guided design enables handling of full pressure drop of main steam.

- **Noise Attenuation--** Whisper III and WhisperFlo trims help to attenuate the noise by 30 to 40 dBA.

- **High Temperature Capability with Available Class V Shutoff--** Use of the Fisher Bore Seal trim gives capability of standard Class V shutoff up to 621°C (1150°F). This unique balanced trim is field-proven. See figure 4.

- **Forged Valve Body--** FEA designed valve body can handle the most demanding applications without thermal stress problems.

- **Flow Up Angle--** Permits vertical stem orientation for ease of maintenance in most applications.

- **Flow Down Angle--** Permits vertical stem orientation for ease of maintenance in most applications.

- **Thermally Compensated Trim--** The cage is case-hardened for maximum life and is allowed to grow during thermally induced excursions. The plug is continuously guided and employs cobalt-based overlays for guide bands and tight metal-to-metal shutoff against the seat.

- **Easy Maintenance Seat Ring--** Welded design provides Class V shutoff and long life. Deep Alloy 6 overlay can be refinished multiple times to maintain tight shutoff. Bolted seat rings are also available for ease of maintenance.

- **Spiral-Wound Gaskets for Excellent Bonnet Sealing Under All Service Conditions--** Premium gaskets provided with N007750 windings and graphite filler material.

- **High Turndown--** Standard trim control rangeability is 50:1. Special construction can provide up to 75:1 turndown.

- **Quick Stroking Actuation--** High performance pneumatic piston actuators with FIELDVUE™ digital valve controllers can achieve full stroke in less than 2 seconds while still maintaining highly accurate step response. Optimized digital valve controllers and accessory packages are available when high stroke speeds are required. Contact your Emerson sales office for assistance.

- **Customized Valve Body and Trim--** Valve is designed to meet your exact demanding application needs.

- **Performance Diagnostics--** With the self-diagnostic capability, questions can be answered about a valve's performance, without pulling the valve from the line. The present valve/actuator signature (seat load, friction, etc.) can be compared against previously stored signatures to discover performance changes before they cause process control problems.

- **More Compact Valve Body and Trim Profile--** Creates a lighter valve that requires less support without compromising structural integrity.

Options

- **Blowdown Trim--** Protects the working trim and machined surfaces of the valve body during steam blow.

- **Hydro-Plug--** The hydro kit is intended to be used so that the upstream piping can be tested at the required pressure for body and inlet piping pressure class without over pressurizing any attached lower pressure class piping or equipment downstream.

- **Diagnostic Services--** The Emerson Automation Solutions Services Group delivers world class services and innovative technologies for top performance of critical service valves and other production assets.

- **Commissioning Service--** Proper installation of blowdown trim and hydro-plug fixtures, along with reassembly and calibration of turbine bypass valves, is critical for the valves to be ready for service when needed. Let skilled Emerson technicians take care of this vital commissioning service to protect this important plant asset.

- **Magnetite Strainer Design (flow up only)--** Protects the bore seal and piston ring from magnetite buildup and prevents trim strokage.

- **Bolted Seat Ring--** Seat ring is bolted to the valve body for easy removal, replacement, or maintenance.

Figure 1. Magnetite Catcher

Table 1. Physical Specifications

End Connection Sizes and Valve Body Ratings(1)(2)(3)

VALVE INLET, NPS	INLET PRESSURE RATINGS
4-18	CL150 - CL2500
20-24	CL150 - CL1500

VALVE OUTLET, NPS	OUTLET PRESSURE RATINGS
8-18	CL150 - CL2500
20	CL150 - CL1500
24	CL150 - CL900
30	CL150 - CL600
36	CL150 - CL300

End Connection Types

- Buttweld (all sizes)
- Raised Face Flanges (all sizes)
- Ring Type Joint Flanges (all sizes)

Configuration

Angle Pattern (Flow Up or Flow Down)

Maximum Pressure Drop

Valve with Whisper Trim III Cage: 0.999 $\Delta P/P_1$ maximum for levels A1 through D3

Valve with WhisperFlo Trim (Flow Up Only):
- **Levels X, Y, and Z:** 0.999 $\Delta P/P_1$ maximum

Flow Characteristics(4)

Whisper Trim III Cages: Linear
WhisperFlo: Linear

Flow Direction

Whisper Trim III Cage: Flow Up or Flow Down
WhisperFlo: Flow Up only

Port Diameter and Maximum Travel

See tables 2 and 3 for Whisper Trim III cages
See table 5 for WhisperFlo

Bonnet Type

Bolted

Seat Ring Type

- Welded in (standard)
- Bolted in (optional)

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

- Class V (standard) (Whisper Trim III)
- Class V (standard) (WhisperFlo)
- Class IV (available)

1. Standard end connection sizes. Intermediate classes above CL2500 available upon request. PN pressure ratings available per pressure requirements of EN1092-1. Additional sizes available upon request Consult your Emerson sales office for additional options.
2. Not all valve sizes are available in all pressure ratings. Consult your Emerson sales office for specific size and class combinations.
3. Additional sizes available upon request. Consult your Emerson sales office for options.
4. Contact your Emerson sales office for special characterized cages.

Table 2. Port Diameter and Maximum Travel for Flow Up Whisper Trim III[1]

SEAT RING TYPE	WHISPER LEVEL	INLET PRESSURE RATING	PORT DIAMETER		MAXIMUM TRAVEL	
			mm	Inches	mm	Inches
Welded Seat	A1-C3	CL150 - CL2500	120	4.70	197	7.75
			159	6.25	264	10.38
			194	7.62	321	12.62
			234	9.20	391	15.38
		CL150 - CL1500	285	11.20	473	18.62
			349	13.75	581	22.88
		CL150 - CL900	424	16.70	606	23.88
			507	19.94	606	23.88
	D1-D3	CL150 - CL2500	87	3.44	165	6.5
			120	4.70	197	7.75
			159	6.25	264	10.38
			194	7.62	321	12.62
		CL150 - CL1500	234	9.20	391	15.38
			285	11.20	473	18.62
		CL150 - CL900	349	13.75	571	22.88
			424	16.70	606	23.88
Bolted Seat	ALL	CL150 - CL2500	87	3.44	165	6.5
			120	4.70	197	7.75
			159	6.25	264	10.38
			194	7.62	321	12.62
		CL150 - CL1500	234	9.20	391	15.38
			285	11.20	473	18.62
		CL150 - CL900	349	13.75	571	22.88
			424	16.70	606	23.88

1. Consult your Emerson sales office for additional options.

Table 3. Port Diameter and Maximum Travel for Flow Down Whisper Trim III[1]

INLET PRESSURE RATING	PORT DIAMETER		WHISPER LEVEL	MAXIMUM TRAVEL	
	mm	Inches		mm	Inches
CL150 - CL2500	159	4.70	A1,A3,B1,B3	73	2.88
			C1,C3	121	4.75
	194	6.25	A1,A3,B1,B3	92	3.62
			C1,C3	159	6.25
	234	7.62	A1,A3,B1,B3	117	4.62
			C1,C3	213	8.38
CL150 - CL1500	285	9.20	A1,A3,B1,B3	137	5.38
			C1,C3	235	9.25
	349	11.20	A1,A3,B1,B3	171	6.75
			C1,C3	311	12.25
CL150 - CL900	424	13.75	A1,A3,B1,B3	219	8.62
			C1,C3	397	15.62
	507	16.70	A1,A3,B1,B3	267	10.5
			C1,C3	480	18.88

1. Consult your Emerson sales office for additional options.

Table 4. Material Specifications

Body/Bonnet	Cage
■ SA105 (Carbon Steel) ■ SA182 Grade F22 (2.25Cr-1Mo) ■ SA182 Grade F91 (9Cr-1Mo-V) ■ SA182 Grade F92 (9Cr-2W-V)	■ S41000 cage, 9 Cr-1Mo-V retainer(2,4) ■ 2.25Cr-1Mo Nitrided(1) ■ S41000 cage, 2.25Cr-1Mo Nitrided retainer(2, 3) ■ 9 Cr-1Mo-V Nitrided(1,4)
Bonnet Bolting	**Bolted Seat**
■ SA105 Valve Body — SA193 Grade B7 up to 427°C (800°F) ■ SA182 Grade F22 Valve Body — SA193 Grade B16 up to 524°C (975°F), N07718 above 524°C (975°F) to 566°C (1050°F) ■ SA182 Grade F91 Valve Body — N07718 up to 593°C (1100°F)	■ 2.25Cr-1Mo with Alloy 6 up to 482°C (900°F) ■ N06625 with Alloy 6 up to 593°C (1100°F) ■ N07718 with Alloy 6 up to 593°C (1100°F)
Control Plug	**Welded Seat (standard)**
■ 2.25Cr-1Mo with Alloy 6 guiding and seating surfaces(3) ■ 9 Cr-1Mo-V with Alloy 6 guiding and seating surfaces(4)	■ Carbon Steel with Alloy 6 Seating Surface(3) ■ 2.25Cr-1Mo with Alloy 6 Seating Surface(3) ■ 9 Cr-1Mo-V with Alloy 6 Seating Surface(4) ■ 9 Cr-2W-V with Alloy 6 Seating Surface(5)
	Piston Rings Alloy 6B with N07750 Expander
	Bore Seal N07718
	Gaskets N07750/Graphite
Stem	**Packing**
■ SA479 Type S20910(3) ■ N07718	Graphite/Flexible Graphite

1. For Whisper III constructions.
2. For WhisperFlo constructions.
3. For use with SA105 or F22 valve body.
4. For use with F91 valve body.
5. For use with F92 valve body.

Table 5. Port Diameter and Maximum Travel for Flow Up WhisperFlo Trim(1)

SEAT RING TYPE	INLET PRESSURE RATING	PORT DIAMETER		MAXIMUM TRAVEL	
		mm	Inches	mm	Inches
ALL	CL150-CL2500	87	3.44	165	6.5
		109	4.28	241	9.5
		137	5.38	241	9.5
		178	7.00	311	12.25
	CL150-CL1500	203	8.00	384	15.12
		254	10.00	457	18
		279	11.00	527	20.75
	CL150-CL900	375	14.75	606	23.88
		464	18.25	606	23.88

1. Consult your Emerson sales office for additional options.

Figure 2. Fisher TBX-P Operation - Flow Up

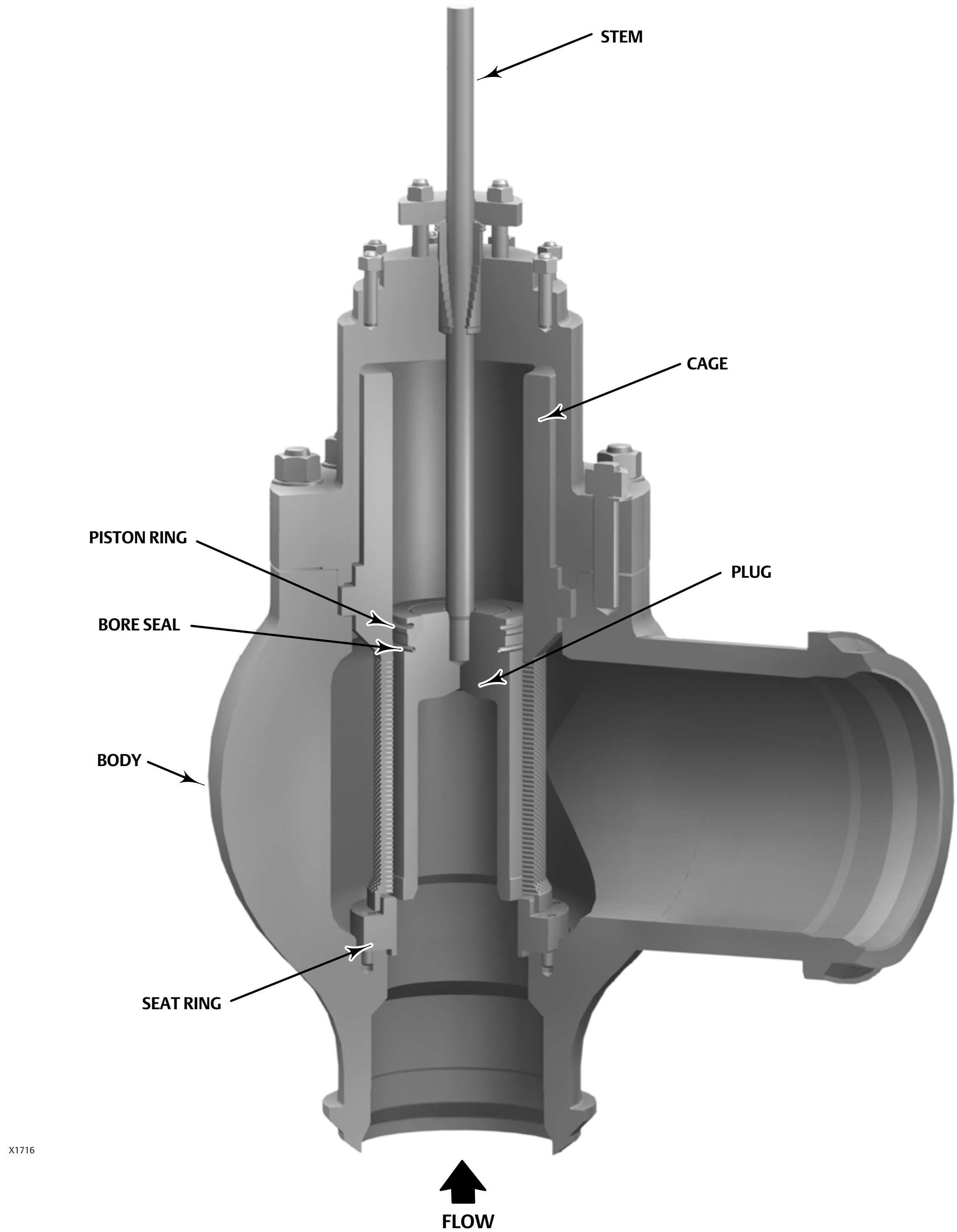
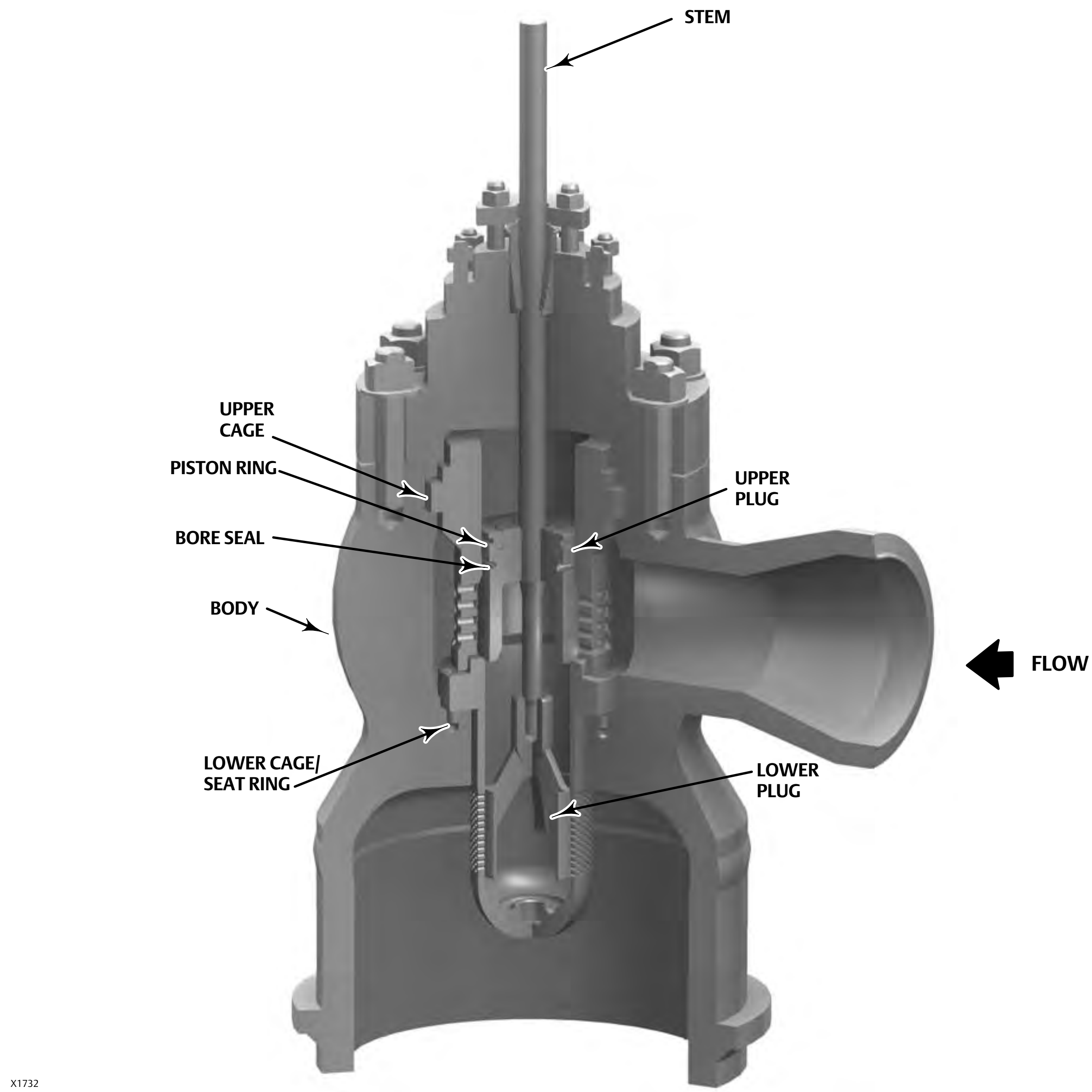


Figure 3. Alternative Fisher TBX-P Design - Flow Down



TBX-P VALVE BODY

Coefficients

Table 6. Fisher TBX-P, Whisper Trim III, Flow Up Through the Port, Linear Characteristic(1)(2)

Port Diameter		Inlet Size, NPS and Inlet Class	Whisper III Levels	Maximum C_V Flow Coefficient	X_T
mm	Inches				
120	4.70	4 CL600 to 1500	A1 and A3	259	0.65
			B1 and B3	259	0.65
			C1 and C3	228	0.65
			D3	228	0.65
		4 CL2500	A1 and A3	219	0.65
			B1 and B3	209	0.65
			C1 and C3	206	0.65
			D3	206	0.65
		6 CL600 to 1500 and 8 through 12 CL600 to 2500	A1 and A3	578	0.65
			B1 and B3	397	0.65
			C1 and C3	291	0.65
			D3	291	0.65
		6 CL2500	A1 and A3	484	0.65
			B1 and B3	369	0.65
			C1 and C3	278	0.65
			D3	278	0.65
159	6.25	6 CL600 to 1500	A1 and A3	722	0.65
			B1 and B3	619	0.65
			C1 and C3	456	0.65
			D3	475	0.65
		6 CL2500	A1 and A3	488	0.65
			B1 and B3	488	0.65
			C1 and C3	403	0.65
			D3	475	0.65
		8 CL600 to 1500 and 10 through 14 CL600 to 2500	A1 and A3	1009	0.65
			B1 and B3	719	0.65
			C1 and C3	497	0.65
			D3	475	0.65
		8 CL2500	A1 and A3	888	0.65
			B1 and B3	675	0.65
			C1 and C3	478	0.65
			D3	475	0.65
194	7.62	8 CL600 to 1500	A1 and A3	1244	0.65
			B1 and B3	978	0.65
			C1 and C3	691	0.65
			D3	691	0.65
		8 CL2500	A1 and A3	913	0.65
			B1 and B3	844	0.65
			C1 and C3	641	0.65
			D3	641	0.65
		10 CL600 to 1500 and 12 through 16 CL600 to 2500	A1 and A3	1481	0.65
			B1 and B3	1063	0.65
			C1 and C3	725	0.65
			D3	725	0.65
		10 CL2500	A1 and A3	1375	0.65
			B1 and B3	1025	0.65
			C1 and C3	709	0.65
			D3	709	0.65

1. Reduction of standard inlet size may affect capacity. Consult your Emerson sales office for additional information.
2. Consult your Emerson sales office for additional options.

Table 7. Fisher TBX-P, Whisper Trim III, Flow Up Through the Port, Linear Characteristic(1)(2)

Port Diameter mm	Port Diameter Inches	Inlet Size, NPS and Inlet Class	Whisper III Levels	Maximum C_v Flow Coefficient	X_T
234	9.20	10 CL600 to 1500	A1 and A3	1913	0.65
			B1 and B3	1441	0.65
			C1 and C3	1044	0.65
			D3	1044	0.65
		10 CL2500	A1 and A3	1466	0.65
			B1 and B3	1284	0.65
			C1 and C3	975	0.65
			D3	975	0.65
		12 CL600 to 1500 and 14 through 18 CL600 to 2500	A1 and A3	2181	0.65
			B1 and B3	1528	0.65
			C1 and C3	1081	0.65
			D3	1081	0.65
		12 CL2500	A1 and A3	1994	0.65
			B1 and B3	1466	0.65
			C1 and C3	1053	0.65
			D3	1053	0.65
285	11.20	12 CL600 to 1500	A1 and A3	2791	0.65
			B1 and B3	2128	0.65
			C1 and C3	1503	0.65
			D3	1503	0.65
		14 through 20 CL600 to 1500	A1 and A3	3181	0.65
			B1 and B3	2269	0.65
			C1 and C3	1556	0.65
			D3	1556	0.65
349	13.75	16 CL600 to 1500	A1 and A3	4300	0.65
			B1 and B3	3225	0.65
			C1 and C3	2291	0.65
			D3	2291	0.65
		18 through 24 CL600 to 1500	A1 and A3	4781	0.65
			B1 and B3	3394	0.65
			C1 and C3	2359	0.65
			D3	2359	0.65
424	16.70	18 CL600 to 900	A1 and A3	5359	0.65
			B1 and B3	4088	0.65
			C1 and C3	2866	0.65
			D3	2866	0.65
		20 CL600 to 900	A1 and A3	5891	0.65
			B1 and B3	4300	0.65
			C1 and C3	2953	0.65
			D3	2953	0.65
		22 through 24 CL600 to 900	A1 and A3	6153	0.65
			B1 and B3	4406	0.65
			C1 and C3	2997	0.65
			D3	2997	0.65
507	19.94	22 CL600 to 900	A1 and A3	7131	0.65
			B1 and B3	5119	0.65
			C1 and C3	3503	0.65
		24 CL600 to 900	A1 and A3	7875	0.65
			B1 and B3	5406	0.65
			C1 and C3	3581	0.65

1. Reduction of standard inlet size may affect capacity. Consult your Emerson sales office for additional information.
2. Consult your Emerson sales office for additional options.

Table 8. Fisher TBX-P Whisper III, Flow Down Through the Port, Linear Characteristic[1]

Port Diameter		Whisper III Level	Max Cv Flow Coefficient	X_T
mm	Inch			
120	4.7	A1	178.4	0.81
		A3	170.7	0.8
		B1	169.4	0.799
		B3	173.7	0.802
		C1	140.7	0.752
		C3	140.2	0.752
160	6.25	A1	301.2	0.812
		A3	287.7	0.801
		B1	299.9	0.811
		B3	293.6	0.806
		C1	245.6	0.764
		C3	235.8	0.753
194	7.62	A1	475.3	0.814
		A3	447.6	0.798
		B1	475.8	0.814
		B3	468.5	0.81
		C1	379.6	0.759
		C3	378.1	0.758
215	8.5	A1	619.8	0.805
		A3	596	0.794
		B1	611.7	0.802
		B3	601.6	0.798
		C1	484.2	0.747
		C3	481	0.746
285	11.2	A1	1009.8	0.81
		A3	966.59	0.798
		B1	1018.2	0.812
		B3	1007.3	0.809
		C1	814.5	0.756
		C3	812.5	0.756
350	13.75	A1	1590.7	0.809
		A3	1518.7	0.797
		B1	1576.7	0.807
		B3	1576.1	0.807
		C1	1280.9	0.756
		C3	1280.4	0.756
425	16.7	A1	2356.6	0.811
		A3	2245.7	0.799
		B1	2346	0.811
		B3	2309.7	0.806
		C1	1917.8	0.76
		C3	1860	0.753

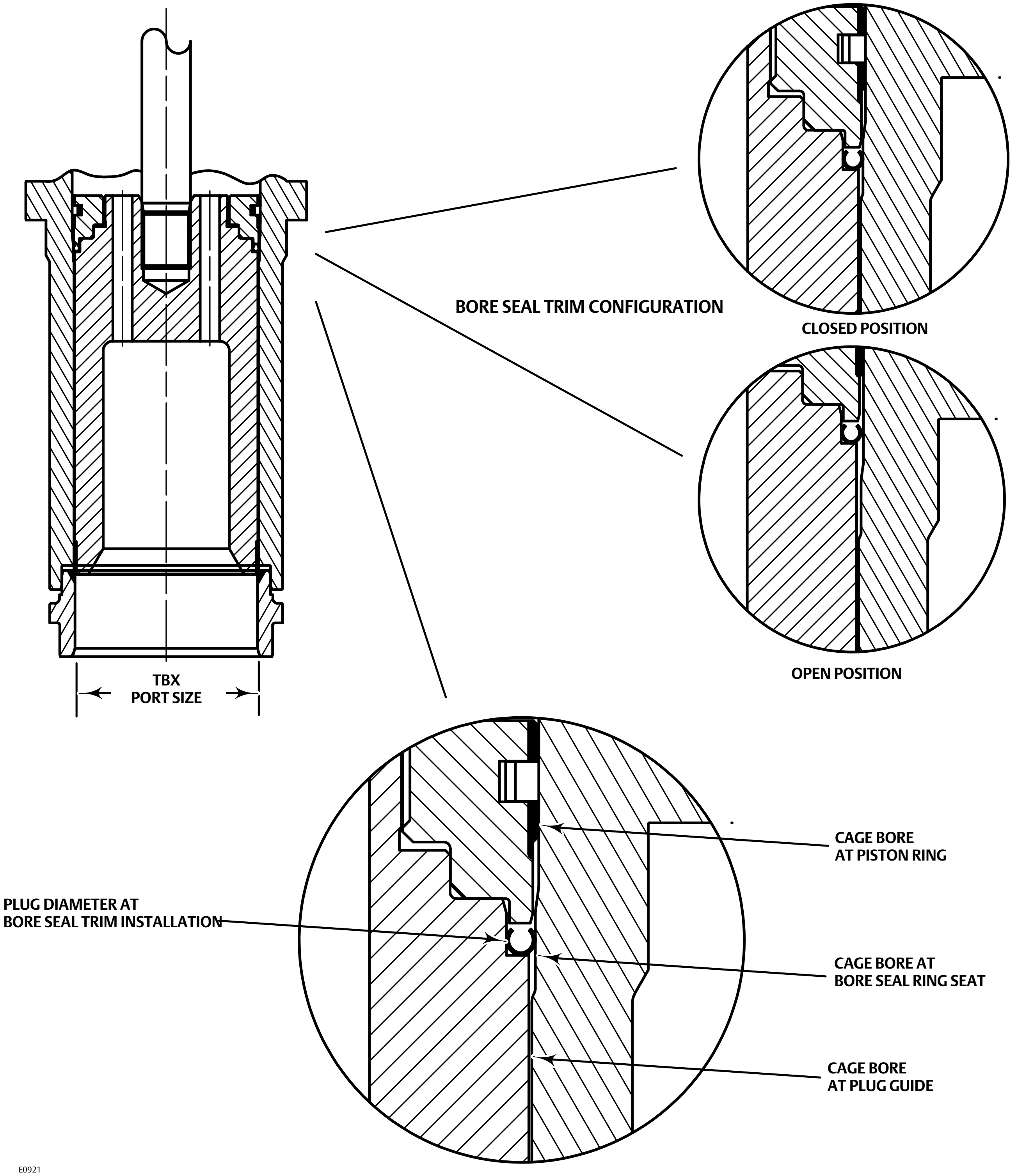
1. Consult your Emerson sales office for additional options.

Table 9. Fisher TBX-P, WhisperFlo Trim, Flow Up Through the Port, Linear Characteristic(1)

Port Diameter		WhisperFlo Level	Max Cv Flow Coefficient	X_T
mm	Inch			
3.43	7.75	X	288	0.575
		Y	213	0.575
		Z	133	0.525
4.28	9.5	X	446	0.575
		Y	352	0.575
		Z	234	0.525
5.375	9.5	X	703	0.575
		Y	508	0.575
		Z	312	0.525
7	12.625	X	1171	0.532
		Y	808	0.532
		Z	505	0.525
8	15.375	X	1558	0.532
		Y	1247	0.532
		Z	748	0.532
10	18.625	X	2435	0.532
		Y	1635	0.532
		Z	1040	0.532
11	22.875	X	2814	0.532
		Y	2314	0.532
		Z	1286	0.532
14.75	22.875	X	5297	0.532
		Y	3947	0.532
		Z	2368	0.532
18.25	22.875	X	7105	0.532
		Y	4342	0.532
		Z	2763	0.532

1. Consult your Emerson sales office for additional options.

Figure 4. Fisher TBX-P Bore Seal Trim in Closed Position



System Noise Level

Today's power plants must comply with strict noise limitations, especially those that are located close to residential areas. Satisfying a low fence line noise requirement requires a complete understanding of the system and how individual components can affect the total noise transmitted to the plant boundary.

This knowledge, together with the application of low noise technology trims and pressure reducing devices, allows the Emerson research facility to accurately predict the system noise level.

Bore Seal Trim

TBX-P valves provide Class V leakage as a standard. The design employs a variation of the proven C-seal trim with enhancements for use with the TBX-P hung cage. The sealing design is called Bore Seal trim (figure 4).

In the Bore Seal trim, the primary plug-to-seat interface is a metal-to-metal line contact while the secondary metallic seal engages a controlled bore region in the cage when the plug is seated.

During modulation, the secondary seal does not contact the upper cage wall and the controlled bore region remains protected, which extends the shutoff life of the valve.

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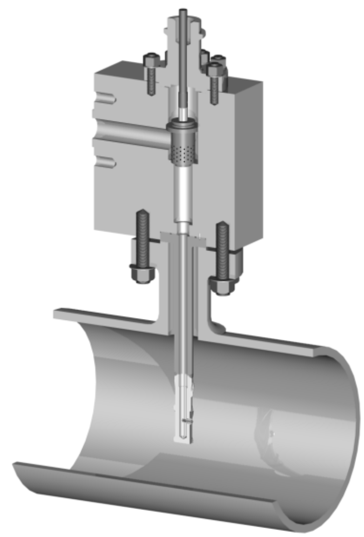
Fisher™ DFA Variable Geometry Desuperheater

The Fisher DFA (Desuperheater with Flexible Architecture) can be used in many applications to efficiently control the spraywater and reduce the temperature of superheated steam to the desired set point. The valve is available with a wide range of standard and anti-cavitation trim styles. The desuperheater is mechanically atomized with a variable geometry nozzle. Desuperheaters are available for installation in steam lines from DN200 through DN1500 (NPS 8 through 60) in diameter and are capable of maintaining steam temperatures to within 6°C (10°F) of saturation temperatures.

- DFA —The Fisher DFA desuperheater's flexible architecture incorporates both a water control element and a variable-geometry mechanically atomized, self-contained desuperheater for moderate to high flow variation. It is installed through a flanged connection on the side of an NPS 8 or larger pipeline.

This unit offers separate desuperheating and spray water control elements packaged together to match many of the standard face-to-face dimensions offered in today's marketplace. The angle body can be offered to match most ASME pressure classes with either BWE or Flanged configurations. Multiple trim configurations can be offered and include equal percentage, linear, anti-cavitation micro-flat, Cavitrol™ III, and multi-stage micro-flat trim styles.

The desuperheater is a variation of the DMA/AF-HTC. This device can be used in less severe applications, such as temperature control to paper machines to more severe applications such as boiler interstage attemperation.



DFA CONSTRUCTION INCLUDES VALVE BODY, TRIM, AND INSERTION STYLE DESUPERHEATER (PIPE NOT INCLUDED)

Similar to the DMA/AF-HTC, the DFA uses a construction optimized to move weld joints away from high stress regions.

The desuperheater design incorporates an integral thermal liner inside the desuperheater body pipe. This minimizes the potential for thermal shock when cool water is introduced to the unit that is already heated to the operating steam temperature.

The nozzle mount for the DFA shares vortex suppressor geometry with the DMA/AF-HTC, which is engineered to minimize the potential for excitation due to vortex shedding and flow induced vibration.

The desuperheater (figure 2) is installed through a flanged connection on a DN200 (NPS 8) or larger pipeline. Maximum nozzle C_v is 15.0.

Specifications

Available Configurations(1) and Valve Sizes

■ DFA valve body style: Angle

Common Characteristics: Designed according to ASME B16.34 Valve-Flanges, Threaded and Welding End

End Connections Styles(1)

See tables 2 and 1

Maximum Inlet Pressure and Temperature(1)(2)(6)

Flanged, Socketwelding, or Buttwelding: Consistent with CL150, 300, 600, 900, 1500, and 2500 according to ASME B16.34, unless limited by maximum pressure drop or material temperature capabilities

Maximum Pressure Drop(1)

Valve with Cavitrol III Cage: 149 bar (2160 psi) for two-stage and 207 bar (3000 psi) for three-stage cage. Consult bulletin 80.2:030, Fisher Cavitrol III One-, Two-, and Three-Stage trims (D100196X012), for more information

Anti-cavitation MicroFlat: <51.7 bard (<750 psid)

Inherent Rangeability

Up to 50:1. The ratio of maximum to minimum controllable C_v is dependent upon the available water pressure differential

Spray Water Pressure Required(3)

6.9 bar (100 psi) above steam pressure

Spray Nozzle Capacities(7)

0.25-15.0 C_v

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

Class V only

Flow Characteristics(4)

Standard Cages: ■ Linear, ■ Equal Percentage, ■ Modified Equal Percentage(5)
Cavitrol III: Linear
Micro-Flat (with or without liner): Linear

Flow Direction

All: Flow down

Flow Coefficients

See table 8 and also Fisher Catalog 12

Port Diameters, Valve Plug Travel, and Stem Diameters

See table 8

Bonnet Style and Mounting(1)

Standard Bonnet
Yoke Temperature Limit: Standard bonnet with cast iron yoke is limited to 537°C (1000°F)

Packing Arrangements

■ Single, ■ Double, and ■ Leakoff standard graphite packing, or optional ■ ENVIRO-SEAL™ and ■ HIGH-SEAL packing systems. See bulletin 59.1:061, Fisher ENVIRO-SEAL and HIGH-SEAL Packing System for Sliding-Stem Valves (Live-Loaded) (D101633X012)

Approximate Weight

See table 9

Construction Materials

Valve Body and Bonnet(8):
■ SA105 (Carbon Steel), ■ SA-182 Grade F22 (2.25Cr-1Mo), ■ SA-182 Grade F91 (9Cr-1Mo-V)
Trim: See table 4
Other Parts: See table 3(8)

Desuperheater Body (DFA)(8): ■ SA105 (Carbon Steel), ■ SA-182 Grade F22 (2.25Cr-1Mo), ■ SA-182 Grade F91 (9Cr-1Mo-V)
Note: Will have body-matched cast equivalent material for nozzle mount

Nozzle Material
■ S41000 SST, or ■ N07718

Material Temperature Capabilities(1)

See table 3

1. Do not exceed the pressure or temperature limits in this bulletin, nor any applicable code or standard limitations.
2. EN (or other valve body material) ratings and end connections can usually be supplied; consult your Emerson sales office or Local Business Partner.
3. A function of required turndown and equipment selection.
4. Special characterized cages are available. Contact your Emerson sales office or Local Business Partner.
5. Modified equal percentage characteristic is equal percentage for the first 75% of travel, then opens quickly for additional capacity.
6. Inlet and outlet of DFA must have the same pressure class rating.
7. Custom nozzle configurations can be supplied, consult your Emerson sales office or Local Business Partner.
8. Consult your Emerson sales office or Local Business Partner for special trim and valve body material availability.

Table 1. Available Valve Connections

Valve Inlet Size, NPS	ASME Pressure Rating Raised-Face Flange(2)	Connection	
		Inlet(1,2,3)	Outlet(1,2)
1,1-1/2, and 2	CL150-2500	RF, RTJ, BW, and SW	RF

1. End connection style abbreviations: RF-Raised Face, RTJ-Ring Type Joint, BW-Butt weld, SW-Socket Weld.
2. EN (or other valve body material) ratings and end connections can usually be supplied; consult your Emerson sales office or Local Business Partner.
3. Socket weld available on NPS 1, 1-1/2, and 2 only.

Table 2. Available Desuperheater Body Connections

Design	Steam Line Size, NPS	Steam Line Connection	
		Size, NPS	ASME Pressure Rating Raised-Face Flange(1)(2)
DFA	8 - 60	3 or 4	CL150-2500

1. Other standard flanges and connections are also available.
2. Steam line connection pressure rating must match the valve inlet connection pressure rating.

Features

- Valve Plug Stability-- Rugged seat guided and cage guiding provides increased valve plug stability, which reduces vibration and mechanical noise.

- Full Pressure Drop Capability-- Rugged construction allows full pressure drop capability.

- Quick Change Trim-- Maintenance is simple and can easily be performed using common tools. Trim components can be quickly removed and changed with no need for special tools.

- Cost-Effective Trim Operation and Maintenance Economy-- Increased wear resistance of hardened stainless steel trim means longer-lasting service. When inspection or maintenance is necessary, the body can stay in the pipeline during removal of trim parts. And, trim inventory costs are cut because dimensional standardization permits use of most standard easy-e™ or HP trim parts.

- Short Nozzle Replacement Turnarounds-- Nozzles can be easily removed, maintained, or replaced without having to replace the entire unit.

- Accurate Temperature Control Near Saturation-- Optimized spray pattern with AF nozzle technology allows for a wide operating range to achieve optimal mixing and quick vaporization at all flowing conditions.

- Flexible Architecture-- Custom designed bodies with a probe-style desuperheater, matched with multiple trim styles, to meet almost any face-to-face, piping, or application requirements.

- Cracked Weld Avoidance-- DFA desuperheater uses a forged construction, optimized to move weld joints away from high stress regions.

- Managing Large Temperature Reductions-- Nozzles in multiple configurations capable of providing large amounts of spraywater to cool steam to required temperature.

- Thermal Cycling-- The desuperheater design incorporates an integral thermal liner inside the desuperheater body pipe to minimize the potential for thermal shock when cool water is introduced.

- Minimize Vibration-Related Failures-- The nozzle mount for the Fisher DFA desuperheater is engineered to minimize the potential for excitation due to vortex shedding and flow induced vibration.

Table 3. Fisher DFA Construction Materials and Temperature Capabilities for Parts Other than Valve Body and Trim

PART		MATERIAL	TEMPERATURE CAPABILITIES	
			°C	°F
Valve plug stem		S20910	-198 to 593	-325 to 1100
Spring-loaded valve plug seal	Backup ring	S41600 (416 SST)	-29 to 427	-20 to 800
		S31600 (316 SST)	-198 to 593	-325 to 1100
	Retaining ring	S30200 (302 SST)	-254 to 593	-425 to 1100
	Seal ring	PTFE with N10276 Spring	-73 to 232(2)	-100 to 450(2)
	Anti-extrusion rings	PEEK (PolyEtherEtherKetone)	-73 to 316	-100 to 600
Cage gasket		N06600/Graphite	-240 to 593	-400 to 1100
Seat ring gasket		Flexible Graphite (standard), CL150 to CL600 N06600/Graphite, CL900 to CL2500	-240 to 593	-400 to 1100
Valve Body-to-bonnet bolting(1)	Studs Nuts	Steel SA193-B7 (all valve body materials) Steel SA194-2H (all valve body materials)	-29 to 427	-20 to 800
	Studs Nuts	Steel SA193-B16 (F91 valve body mat'ls) Steel SA194-7	-29 to 482(3) -29 to 510	-20 to 900(3) -20 to 950
	Studs Studs Nuts	Steel SA193-B16 (F22 valve body mat'l CL600 and below) Steel SA193-B16 (F22 valve body mat'l CL900 and above) Steel SA194-7	-29 to 566 -29 to 510 -29 to 566	-20 to 1050 -20 to 950 -20 to 1050
	Studs Nuts	N07718 SST (SB637) Steel SA194-7	-29 to 593 (F22) -29 to 593 (F91)	-20 to 1100 (F22) -20 to 1100 (F91)
Packing		Graphite	-198 to 538(4)	-325 to 1000(4)
Packing follower, spring, or lantern ring		S31600 stainless steel	-254 to 593	-425 to 1100
Packing box ring		S31600 stainless steel	-254 to 593	-425 to 1100
Packing flange, studs, or nuts		Steel	-29 to 427	-20 to 800
		S31600 stainless steel	-198 to 593	-325 to 1100

1. Valve body materials with which these bolting materials may be used are shown in parentheses.
2. If used with PEEK anti-extrusion rings, PTFE/carbon seal ring may be used in temperatures up to 316°C (600°F) for non-oxidizing service or up to 260°C (500°F) for oxidizing service.
3. B16 studs are rated to 510°C (950°F) for NPS 1 CL300, NPS 2 CL600, and all NPS CL900 and above.
4. Except 371°C (700°F) for oxidizing service.

Table 4. Fisher DFA Trim Material Combinations

TRIM	VALVE BODY MATERIALS	PRESSURE CLASS AVAILABILITY (1)	VALVE PLUG	CAGE	SEAT RING	STEAM DESIGN TEMPERATURE RANGE			
						°C		°F	
						Min	Max	Min	Max
Standard Plug and Cage									
291	SA105, F22 and F91	CL150-CL2500	S41600	CB7Cu-1 H1075	S41600	-29	427	-20	800
292A	F22 and F91	CL150-CL600	S31600 with CoCr-A seat and guide	R30006	R30006	427	593	800	1100
292B	F22	CL900-CL2500	S31600 with CoCr-A seat and guide	F22/Nitrided	S31600/CoCr-A	427	593	800	1100
292C	F91 only	CL900-CL2500	F91 with CoCr-A Seat and guide	F91/Nitrided	F91 with CoCr-A	427	593	800	1100
Standard Cage, Anti-Cav Micro-Flat Plug									
293	SA105, F22 and F91	CL150-CL2500	S44004	17-4 PH H1075	S44004	-29	427	-20	800
294A	F22	CL150-CL2500	410 SST with R30016 tip	F22/Nitride	R30006	427	593	800	1100
294B	F91 only	CL150-CL2500	410 SST with R30016 tip	F91/Nitride	R30006	427	593	800	1100
Cavitrol III Cage, Standard Plug									
295B(2)	SA105, F22 and F91	CL150-CL600	420SST	17-4 H1075	17-4 H900	-29	427	-20	800
295A	SA105, F22 and F91	CL900-CL2500	S44004	17-4 H1075	S44004	-29	343	-20	650
296	SA105, F22 and F91	CL150-CL2500	410 / CoCr-A Seat & Guide	422/Nitrided	410 / CoCr-A	427	593	650	1100
Cavitrol III Cage, Micro-Flat Plug(2)									
295A	SA105, F22 and F91	CL150-CL2500	S44004	17-4 H1075	S44004	-29	343	-20	650
297	F22 and F91	CL150-CL2500	410 SST with R30016 tip	422/Nitrided	R30006	427	593	650	1100

1. Pressure class at the inlet to the water control valve.
2. Consult your Emerson sales office or Local Business Partner for these trim options.

Principle of Operation

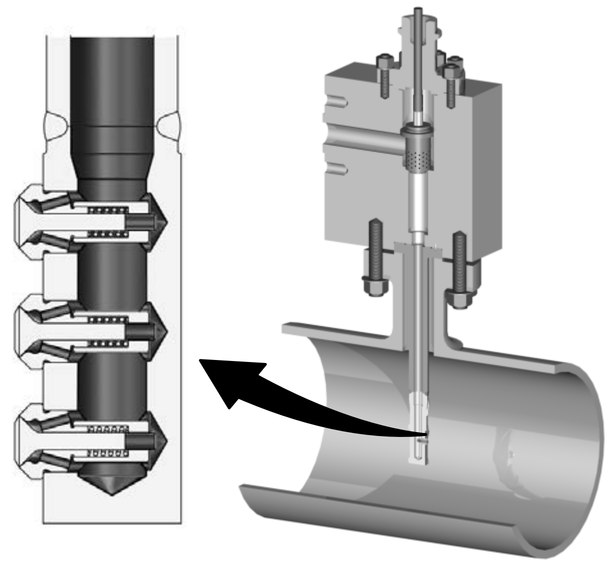
For the most efficient use of heat energy from steam, it is necessary to reduce the temperature of steam to near the saturation temperature. With steam that is at or near the saturation temperature, it is possible to recover the large amount of energy that was put into the steam when it was heated from water to steam. Desuperheating, or attemperation as it is sometimes called, is most often used to:

- Improve thermal efficiency of heat transfer processes by using steam near saturation.
- Control unintentional superheat from pressure reduction of the steam.
- Protect downstream equipment and piping from elevated temperatures and pressure.

DFA desuperheaters produce a spray of cooling water in a steam line (figure 2). The spraywater cools the steam to near the saturation temperature or to a custom setpoint. The rate of cooling is dependent on spraywater droplet size, distribution, flow turbulence of the steam, and velocity. The temperature is controlled by varying the amount of spraywater flow.

The desuperheater utilizes the proven, spring-loaded AF nozzle to provide a uniform hollow cone spray pattern over a wide range of flow conditions. The water is injected through holes drilled at a compound angle to induce spin as the AF nozzle plug is opened with increasing water pressure.

Figure 1. Fisher DFA Desuperheater



The design of the AF nozzle is such that water flows only after sufficient backpressure is available to provide a good spray pattern. The full opening of the AF nozzle is limited by a travel stop to keep the spring within its proper working range and to maintain the water film thickness at the necessary thickness for proper atomization.

In operation, spraywater is supplied to a connection on the desuperheater. The body, trim, insertion length, and face-to-face can be custom engineered for specific needs. This offers convenient replacement of common products on the market today without the need for piping modifications.

Figure 2. Typical DFA Installation

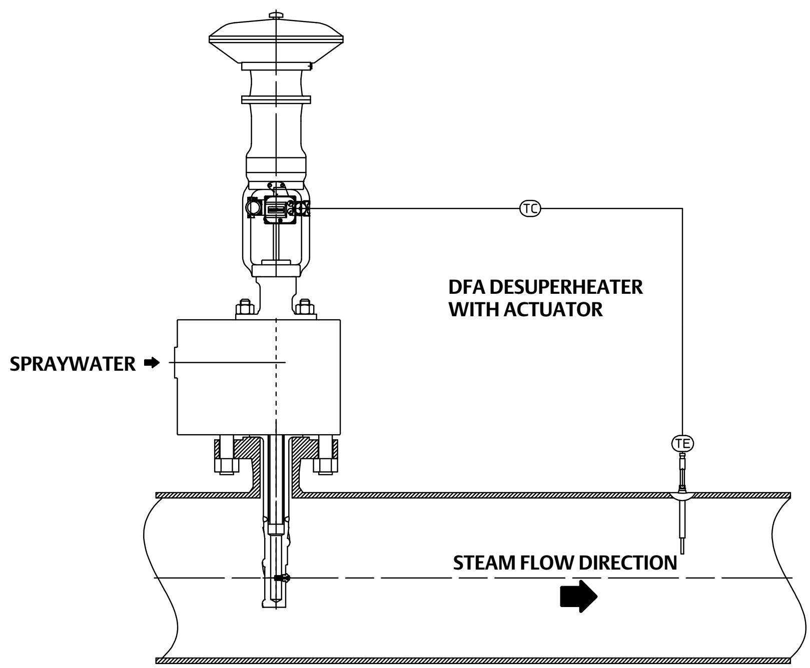
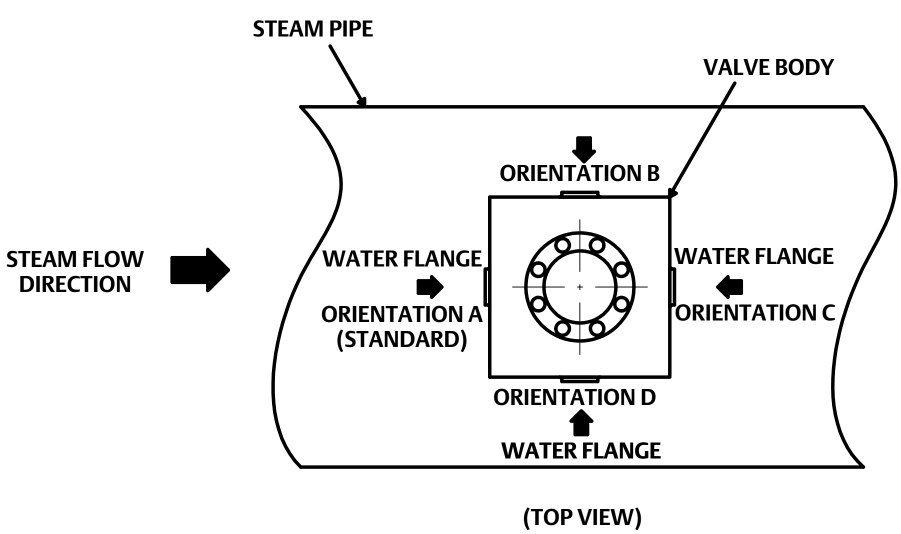


Figure 3. DFA Orientation Options



Ordering Information

When ordering, specify the following information. Items 1 through 6 are required for desuperheater sizing.

1. Maximum, normal, and minimum steam flow rate.

2. Steam pressure and temperature at the inlet and outlet.

3. Spraywater pressure and temperature.

4. Design conditions, if different from operating conditions.

5. Steam line size.

6. Desuperheater steam connection size, type, and rating.

7. Spraywater connection size from table 2.

8. Face-to-face dimension (if replacing existing unit).

9. Water flange orientation (see figure 3).

Figure 4. Fisher DFA Desuperheater Dimensions (also see tables 5 and 6)

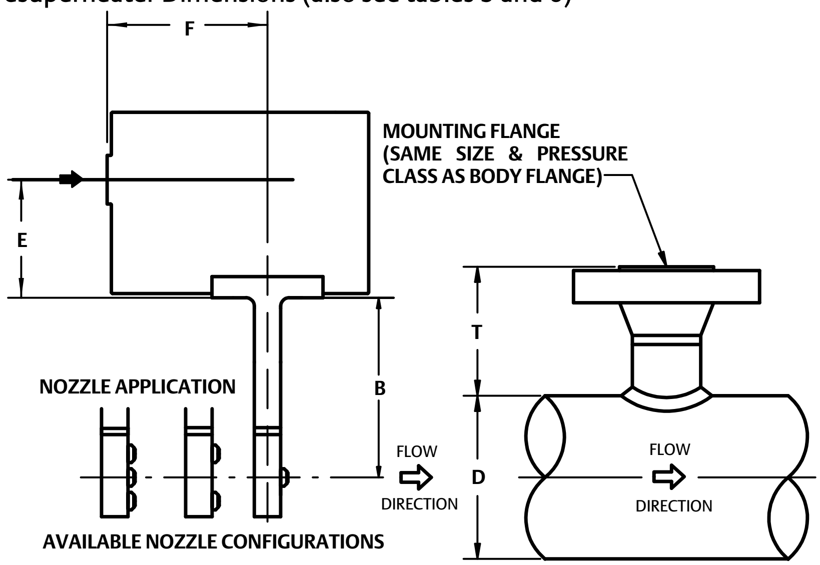


Table 5. Fisher DFA Desuperheater Dimensions

DESUPERHEATER BODY FLANGE(1)		E INLET CENTERLINE TO OUTLET FLANGE FACE(2)		F INLET FLANGE FACE TO OUTLET CENTERLINE(2)	
Size, NPS	Pressure Rating	mm	Inches	mm	Inches
3 and 4	CL150-1500	152	6	229	9
	CL2500	178	7	241	9.5

1. The NPS 4 DFA requires a 4.00 inch minimum mounting I.D. Contact your Emerson sales office or Local Business Partner for NPS 3 DFA minimum mounting I.D.
2. For different centerline to flange face distances Contact your Emerson sales office or Local Business Partner.

Table 6. Fisher DFA Desuperheater Installation Dimensions

DESUPERHEATER BODY FLANGE SIZE, NPS	("D" DIMENSION) PIPE LINE	("B" DIMENSION) INSERTION LENGTH		("T" DIMENSION) T-HEIGHT	
	Size, NPS	mm	Inch	mm	Inch
3 and 4	8	330	13.00	222	8.75
	10	362	14.25	222	8.75
	12	387	15.25	222	8.75
	14	400	15.75	222	8.75
	16	425	16.75	222	8.75
	18	445	17.50	216	8.50
	20	451	17.75	222	8.75
	22	451	17.75	222	8.75
	24, 26, 28	451	17.75	222	8.75
	30 or larger	448	17.63	219	8.63

Table 7. Fisher DFA Desuperheater Minimum Mounting I.D.

MINIMUM BODY FLANGE	NOZZLE MODEL	MINIMUM MOUNTING I.D.
3	DFA- A,B,C	2.624
3	DFA- D, E	2.9
4	DFA- A through H	4

Table 8. Typical Valve Flow Coefficients(1) - Flow Down (without Liner)

<table>
<tr><th rowspan="2">WATER CLASS</th><th rowspan="2">VALVE TRIM SIZE, NPS</th><th rowspan="2">TRIM TYPE</th><th rowspan="2">CHARACTERISTIC (2,3)</th><th colspan="2">PORT</th><th colspan="2">TRAVEL</th><th rowspan="2">MAXIMUM C_V</th></tr>
<tr><th>mm</th><th>inch</th><th>mm</th><th>inch</th></tr>
<tr><td rowspan="18">CL150-600</td><td rowspan="7">1, 1 1/2</td><td rowspan="2">Standard</td><td>Equal Percentage</td><td>33.3</td><td>1.3125</td><td rowspan="2">19.1</td><td rowspan="2">0.75</td><td>19</td></tr>
<tr><td>Linear</td><td>33.3</td><td>1.3125</td><td>22.3</td></tr>
<tr><td rowspan="5">M-Flat</td><td rowspan="5">Linear</td><td>6.3</td><td>0.25</td><td rowspan="4">19.1</td><td rowspan="4">0.75</td><td>0.292</td></tr>
<tr><td>9.5</td><td>0.375</td><td>0.873</td></tr>
<tr><td>12.7</td><td>0.5</td><td>1.76</td></tr>
<tr><td>19.1</td><td>0.75</td><td>3.38</td></tr>
<tr><td>19.1</td><td>0.75</td><td>28.6</td><td>1.125</td><td>4.46</td></tr>
<tr><td rowspan="11">2</td><td rowspan="4">Standard</td><td rowspan="2">Equal Percentage</td><td>33.3</td><td>1.3125</td><td rowspan="4">19.1</td><td rowspan="4">0.75</td><td>26.8</td></tr>
<tr><td>47.6</td><td>1.875</td><td>47.2</td></tr>
<tr><td rowspan="2">Linear</td><td>33.3</td><td>1.3125</td><td>37.6</td></tr>
<tr><td>47.6</td><td>1.875</td><td>52.5</td></tr>
<tr><td rowspan="7">M-Flat</td><td rowspan="7">Linear</td><td>6.3</td><td>0.25</td><td rowspan="4">19.1</td><td rowspan="4">0.75</td><td>0.292</td></tr>
<tr><td>9.5</td><td>0.375</td><td>0.873</td></tr>
<tr><td>12.7</td><td>0.5</td><td>1.76</td></tr>
<tr><td>19.1</td><td>0.75</td><td>3.38</td></tr>
<tr><td>19.1</td><td>0.75</td><td rowspan="3">28.6</td><td rowspan="3">1.125</td><td>4.46</td></tr>
<tr><td>25.4</td><td>1</td><td>7.81</td></tr>
<tr><td>28.6</td><td>1.125</td><td>10.49</td></tr>
<tr><td rowspan="18">CL900-1500</td><td rowspan="6">1, 1 1/2</td><td rowspan="2">Standard</td><td>Modified Equal Percentage</td><td>19.1</td><td>0.75</td><td>28.6</td><td>1.125</td><td>10.7</td></tr>
<tr><td>Equal Percentage</td><td>19.1</td><td>0.75</td><td>19.1</td><td>0.75</td><td>5.58</td></tr>
<tr><td>Cavitrol III 2-Stage</td><td>Linear</td><td>22.2</td><td>0.875</td><td>38.1</td><td>1.5</td><td>7.39</td></tr>
<tr><td rowspan="3">Micro-Flat</td><td rowspan="3">Linear</td><td>9.5</td><td>0.375</td><td rowspan="3">19.1</td><td rowspan="3">0.75</td><td>0.961</td></tr>
<tr><td>12.7</td><td>0.5</td><td>1.71</td></tr>
<tr><td>19.1</td><td>0.75</td><td>2.92</td></tr>
<tr><td rowspan="12">2</td><td rowspan="8">Standard</td><td rowspan="4">Modified Equal Percentage</td><td>19.1</td><td>0.75</td><td rowspan="3">28.6</td><td rowspan="3">1.125</td><td>10.7</td></tr>
<tr><td>25.4</td><td>1</td><td>21</td></tr>
<tr><td>31.8</td><td>1.25</td><td>31</td></tr>
<tr><td>38.1</td><td>1.5</td><td>38.1</td><td>1.5</td><td>48</td></tr>
<tr><td rowspan="4">Equal Percentage</td><td>19.1</td><td>0.75</td><td rowspan="3">19.1</td><td rowspan="3">0.75</td><td>5.58</td></tr>
<tr><td>25.4</td><td>1</td><td>9.5</td></tr>
<tr><td>31.8</td><td>1.25</td><td>13</td></tr>
<tr><td>38.1</td><td>1.5</td><td>28.6</td><td>1.125</td><td>35</td></tr>
<tr><td>Cavitrol III 2-Stage</td><td>Linear</td><td>44.4</td><td>1.75</td><td>50.8</td><td>2</td><td>14</td></tr>
<tr><td>Cavitrol III 3-Stage</td><td>Linear</td><td>25.4</td><td>1</td><td>50.8</td><td>2</td><td>6.73</td></tr>
<tr><td>Micro-Flat</td><td>Linear</td><td>25.4</td><td>1</td><td>28.6</td><td>1.125</td><td>7.61</td></tr>
</table>

-continued-

Table 8. Typical Valve Flow Coefficients(1) - Flow Down (without Liner) (continued)

WATER CLASS	VALVE TRIM SIZE, NPS	TRIM TYPE	CHARACTERISTIC (2,3)	PORT		TRAVEL		MAXIMUM C_V
				mm	inch	mm	inch	
CL2500	1, 1 1/2	Standard	Modified Equal Percentage	19.1	0.75	28.6	1.125	9.73
			Equal Percentage	19.1	0.75	19.1	0.75	5.38
		Cavitrol III 2-Stage	Linear	22.2	0.875	38.1	1.5	6.91
		Micro-Flat	Linear	9.5	0.375	19.1	0.75	0.961
				12.7	0.5			1.71
				19.1	0.75			2.92
	2	Standard	Modified Equal Percentage	19.1	0.75	28.6	1.125	10.7
				25.4	1			21
				31.8	1.25			31
				38.1	1.5	38.1	1.5	36.8
			Equal Percentage	19.1	0.75	19.1	0.75	5.58
				25.4	1			9.5
				31.8	1.25			13
				38.1	1.5	28.6	1.125	31.5
		Cavitrol III 2-Stage	Linear	44.4	1.75	50.8	2	14
		Cavitrol III 3-Stage	Linear	25.4	1	50.8	2	6.73
		Micro-Flat	Linear	25.4	1	28.6	1.125	7.61

1. See Catalog 12 for a complete listing of flow coefficients.
2. Characteristic is equal percentage through 75% of travel.
3. Micro-Flat Anti-Cavitation trims use a shutoff port diameter which is 0.125 inch larger than the flowing port diameter. Use the shutoff port diameter for actuator sizing

Table 9. Fisher DFA Weights(1)

OUTLET CONNECTION	INLET CONNECTION	CLASS	APPROXIMATE WEIGHT	
			kg	lbs
3	1	600	128	283
		1500	183	403
		2500	253	558
	1-1/2	600	137	301
		1500	193	426
		2500	273	602
	2	600	138	304
		1500	206	454
		2500	287	633
4	1	600	179	394
		1500	224	494
		2500	312	688
	1-1/2	600	191	420
		1500	237	522
		2500	337	743
	2	600	193	425
		1500	253	558
		2500	354	781

1. Desuperheater section weighs about 11.4 kg (25 lbs).

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Fisher™ DMA, DMA-AF, DMA-AF-HTC, DSA, and DVI Desuperheaters

Fisher DMA, DMA-AF, DMA-AF-HTC, DSA, and DVI desuperheaters can be used in many applications to efficiently reduce the temperature of superheated steam to the desired set point. Available variations are mechanically atomized (both fixed geometry and variable geometry) and steam assisted. Desuperheaters are available for installation in steam lines from DN25 through DN1500 (NPS 1 through 60) in diameter and are capable of maintaining steam temperatures to within 6°C (10°F) of saturation temperatures.


W9320
DMA


W6298
DMA-AF


X0260
DMA-AF-HTC


W6299
DSA


W6297
DVI

Available Insertion Style Desuperheaters

- DMA—A simple mechanically atomized desuperheater with single or multiple, fixed-geometry spray nozzles is intended for applications with nearly constant load. The DMA is installed through a flanged connection on the side of a DN150 (NPS 6) or larger pipeline. Maximum unit C_V is 3.8.

- DMA-AF—A variable-geometry, mechanically atomized, back-pressure-activated desuperheater with one, two, or three spray nozzles is designed for applications requiring control over moderate load fluctuations. The DMA-AF desuperheater (figure 1) is installed through a flanged connection on the side of a DN200 (NPS 8) or larger pipeline. Maximum unit C_V is 15.0.

- **DMA-AF-HTC—** The DMA-AF-HTC is functionally equivalent to the DMA-AF, however it is structurally suited for severe applications. The most common applications include boiler interstage attemperation, where the desuperheater is exposed to high thermal cycling and stress, high steam velocities and flow induced vibration. In addition to this specific application, the DMA-AF-HTC is suitable for other severe desuperheating application environments. The DMA-AF-HTC uses a construction optimized to move weld joints away from high stress regions.

  The desuperheater design incorporates an integral thermal liner inside the desuperheater body pipe. This minimizes the potential for thermal shock when cool water is introduced to the unit that is already heated to the operating steam temperature.

  The nozzle mount for the DMA-AF-HTC is engineered to minimize the potential for excitation due to vortex shedding and flow induced vibration. The DMA-AF-HTC desuperheater (figure 3) is installed through a flanged connection on a DN200 (NPS 8) or larger pipeline. Maximum unit C_V is 15.0.

- **DSA—**The DSA desuperheater uses high-pressure steam for rapid and complete atomization of spraywater in low-velocity steam lines. This desuperheater (figure 2) is installed through a flanged connection on a DN200 (NPS 8) or larger pipeline. This desuperheater is intended for applications requiring high rangeability. Maximum unit C_V is 9.97.

Available Ring Style Desuperheaters

- **DVI—**This desuperheater injects spraywater in the outlet of the venturi section, assuring excellent mixing and rapid atomization. The DVI desuperheater (figure 4) is easily installed between flanges in DN25 through DN600 (NPS 1 through 24) steam lines. There are no moving parts, and the water injection pattern provides rapid and thorough cooling. It is intended for applications with moderate load changes and low-velocity steam. Maximum unit C_V is 9.48.

Specifications

Available Types

■ DMA, ■ DMA-AF, ■ DMA-AF-HTC, ■ DSA, and ■ DVI (see the Available Desuperheater Types section for descriptions)

Connections

See table 1

Maximum Pressure Rating(1)

Consistent with applicable pressure-temperature ratings (as shown in table 1) per ASME B16.34

Inherent Rangeability

Up to 50:1. The ratio of maximum to minimum controllable C_V is dependent upon the available water pressure differential

Spray Water Pressure Required(2)

3.5 to 35 bar (50 to 500 psi) greater than steam line pressure

Atomizing Steam (Design DSA)

Atomizing steam should be at least 2.0 times the pressure of the steam to be desuperheated. Amount of atomizing steam will be 10% of maximum spraywater flow

Maximum Unit C_V (for Spraywater Flow)

DMA: 3.8
DMA-AF: 15.0
DMA-AF-HTC: 15.0
DSA: 9.97
DVI: 9.48

Construction Materials

Desuperheater Body (all designs except DMA-AF-HTC): ■ Carbon steel, ■ Chrome-moly alloy steel (F22, F91), or ■ 300 series stainless steel
Desuperheater Body (DMA-AF-HTC): ■ Chrome-moly alloy steel (F22, F91), or ■ Carbon Steel (SA105)
Note: NPS 3 will have body-matched cast equivalent material for nozzle mount
Nozzle Material
DMA: ■ 303 or ■ 316
DMA-AF, DMA-AF-HTC, and DSA: ■ 410 stainless steel
DVI: ■ 303 or ■ 316 stainless steel or ■ F22 venturi with drilled hole

1. Do not exceed the pressure or temperature limits in this bulletin, nor any applicable code or standard limitations.
2. A function of required turndown and equipment selection.

Table 1. Connection Sizes

DESIGN	STEAM LINE SIZE, NPS	STEAM LINE CONNECTION		SPRAYWATER CONNECTION		ATOMIZING STEAM CONNECTION	
		Size, NPS	ASME Pressure Rating Raised-Face Flange(1)	Size, NPS	ASME Pressure Rating Raised-Face Flange(1)	Size, NPS	ASME Pressure Rating Raised-Face Flange(1)
DMA	6- 60	3, 4, or 6	CL150 - 1500	1, 1-1/2, or 2	CL150 - 1500	N/A	N/A
DMA-AF	8-60	3(2), 4, or 6		1, 1-1/2, 2, 2-1/2, or 3		N/A	N/A
DMA-AF-HTC	8-60	3 or 4	CL150, 300, 600, 900, 1500, or 2500	1-1/2(3), or 2	CL150 - 2500	N/A	N/A
DSA	8-60	3(2), 4, or 6	CL150, 300, 600, 900, or 1500	1, 1-1/2, or 2	CL150 - 2500	1, 1-1/2, or 2	CL150, 300, 600, 900, or 1500
DVI	1-24	1-24	CL150 - 2500	1/2, 3/4, 1, or 2	CL150 - 2500	N/A	N/A

1. Other standard flanges and connections are also available.
2. Consult your Emerson sales office or Local Business Partner for acceptability of NPS 3 mounting connection for size and pressure class specified.
3. DN 40 (NSP 1-1/2) spraywater connection is only available for CL150 - 900.

Principle of Operation

For the most efficient use of heat energy from steam, it is necessary to reduce the temperature of steam to near the saturation temperature. With steam that is at or near the saturation temperature, it is possible to recover the large amount of energy that was put into the steam when it was heated from water to steam. Desuperheating, or attemperation as it is sometimes called, is most often used to • improve thermal efficiency of heat transfer processes by using steam near saturation, • control unintentional superheat from pressure reduction of the steam, and • protect downstream equipment and piping from elevated temperatures and pressure.

The DMA, DMA-AF, DMA-AF-HTC, DSA, and DVI desuperheaters produce a spray of cooling water in a steam line (figure 5). The spraywater cools the steam to near the saturation temperature or to a custom setpoint. The rate of cooling is dependent on spraywater droplet size, distribution, and velocity. The temperature is controlled by varying the amount of spraywater flow.

In operation, spraywater is supplied to a connection on the desuperheater. A signal from a downstream controller positions an actuator or valve to control the amount of spraywater flow for cooling. The spraywater control valve is a separate valve in the spraywater line.

In the DSA desuperheater, high pressure steam is mixed with the spraywater to produce a critical or near-critical pressure drop in the atomizing steam for a very high velocity. The high velocity disperses the spraywater into very small particles for rapid cooling.

In the DVI desuperheater, spraywater enters the desuperheater water tube. It continues into the distribution chamber and is forced into the injection orifices. Steam enters the desuperheating venturi and is accelerated to maximize the velocity at the point of water injection. The high steam velocity and turbulent steam flow improves mixing of water and steam, increasing rangeability.

Figure 1. Fisher DMA-AF Desuperheater

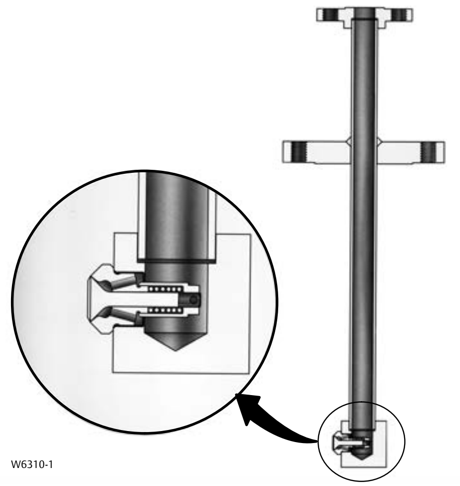


Figure 2. Fisher DSA Desuperheater

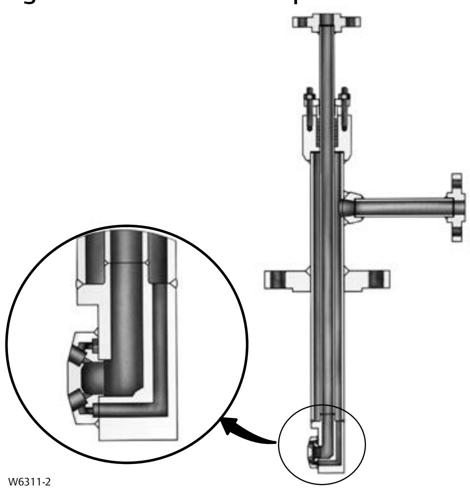


Figure 3. Fisher DMA-AF-HTC Desuperheater

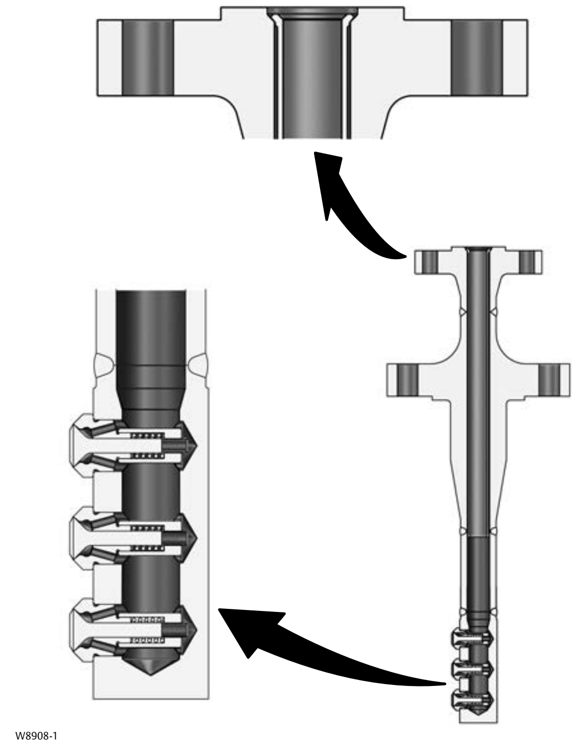


Figure 4. Fisher DVI Desuperheater

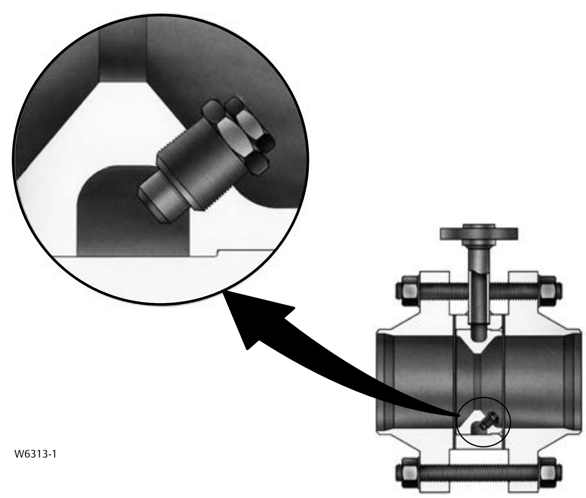
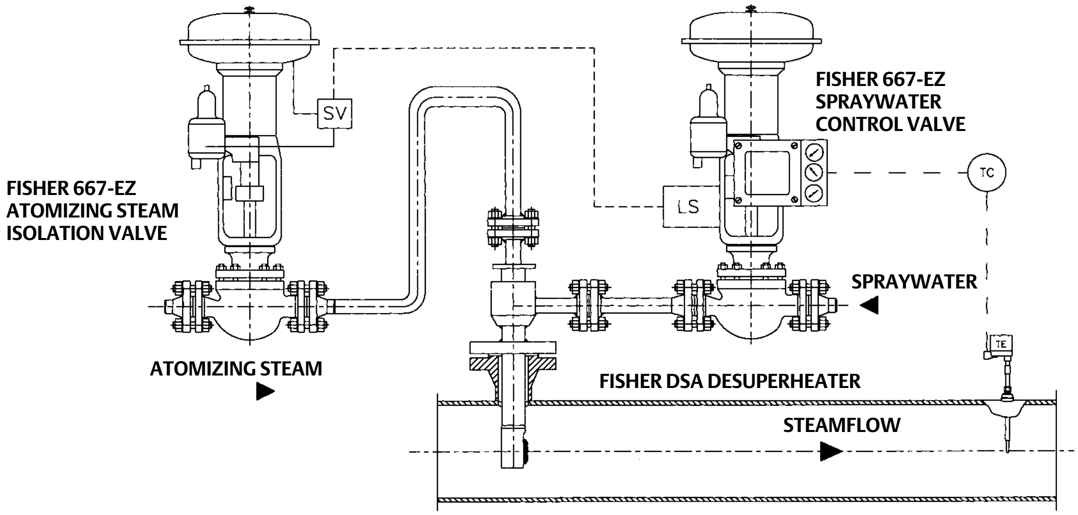
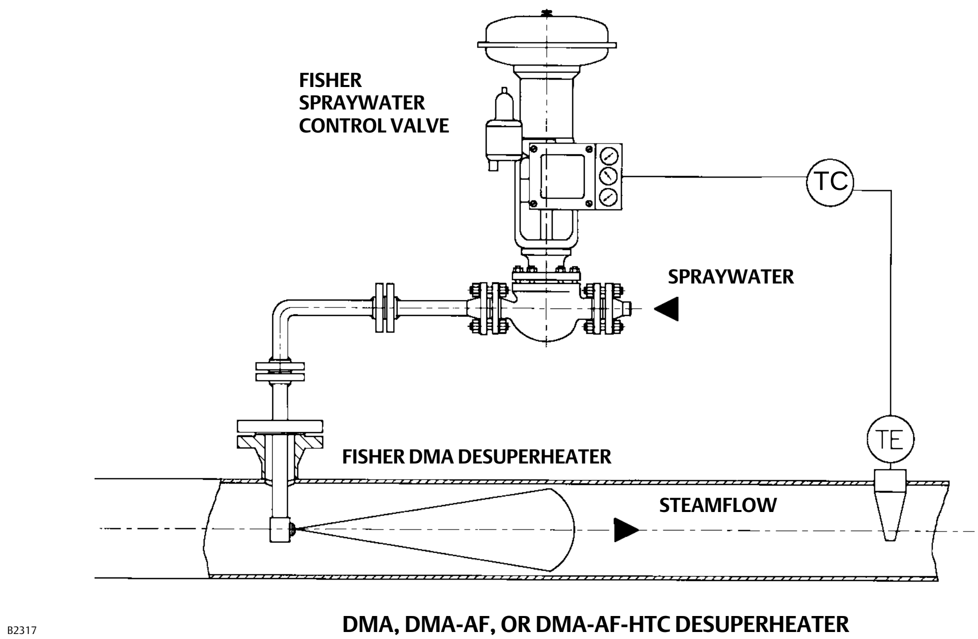


Figure 5. Typical Installation

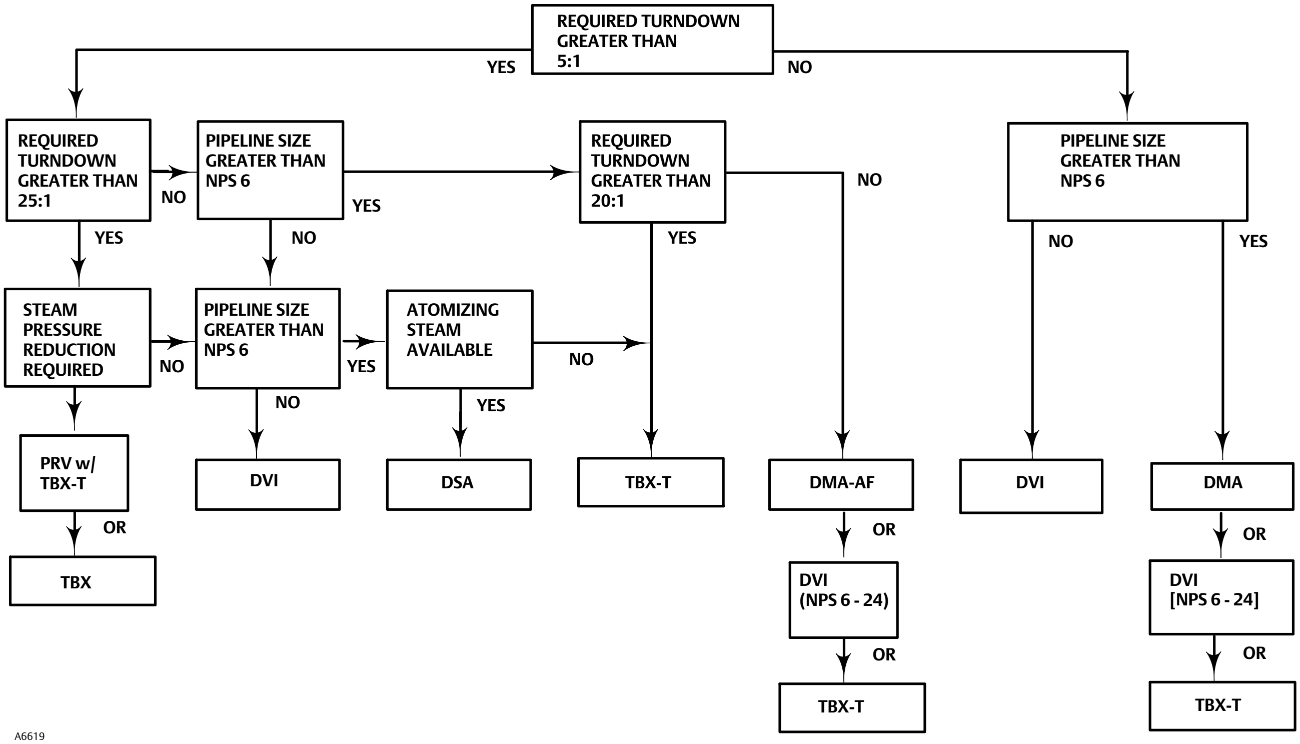


DSA DESUPERHEATER



DMA, DMA-AF, OR DMA-AF-HTC DESUPERHEATER

Figure 6. Selection Flow Chart



Ordering Information

Use the flow chart in figure 6 to select the appropriate desuperheater for your requirements. Dimensions are shown in figures 7, 8, 9, and 10.

When ordering, specify the following information. Items 1 through 6 are required for desuperheater sizing.

1. Maximum, normal, and minimum steam flow rate.

2. Steam pressure and temperature at the inlet and outlet.

3. Spraywater pressure and temperature.

4. Atomizing steam pressure and temperature (DSA desuperheater only).

5. Design conditions, if different from operating conditions.

6. Steam line size.

7. Desuperheater steam connection size, type, and rating.

8. Spraywater connection size from table 1.

9. Atomizing steam connection size from table 1 (DSA desuperheater only).

Figure 7. Fisher DMA and DMA-AF Dimensions (also see table 2)

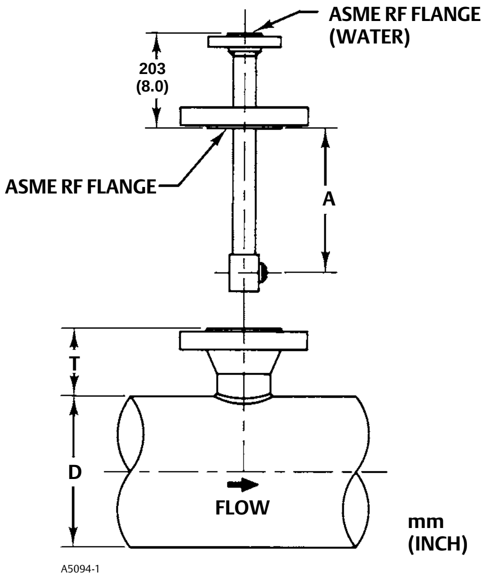


Table 2. Fisher DMA and DMA-AF Face-to-Face Dimensions

DIMENSION				
A		D (Nominal Pipe Size), NPS	T	
mm	Inches		mm	Inches
360	14.19	6(1) 8 10	273 248 216	10.75 9.75 8.50
448	17.63	12 14 16 18	279 267 241 216	11.00 10.50 9.50 8.50
524	20.63	20 22 24 >24	267 241 216 216	10.50 9.50 8.50 8.50

1. DMA only.
Note: For NPS 6 and 8 (DMA-AF only) mounting flange, add 69.6 mm (2.75 inches) to the A and T dimensions. For CL2500 mounting, consult your Emerson sales office or Local Business Partner. Refer to the certified drawing to verify the inside-diameter requirements of mounting for DMA-AF.

Table 3. Fisher DMA-AF Minimum Mounting I.D.

NOZZLE MODEL	VALVE BODY PIPE	MINIMUM BODY FLANGE	WATER FLANGE	MINIMUM MOUNTING I.D.	
	Size, NPS	Size, NPS	Size, NPS	mm	Inches
DMA - M Spray Nozzle	1	3	1, 1-1/2, or 2	73.66	2.9
DMA -A through DMA - U Spray Nozzle				58.42	2.3
DMA-AF-A,B,C			1	66.65	2.624
DMA-AF-D,E				73.66	2.9
DMA-AF-A,B,C,D	1-1/2	4	1, 1-1/2, or 2	77.98	3.07
DMA-AF-E				80.06	3.152
DMA-AF-F				87.33	3.438
DMA-AF-G				92.05	3.624
DMA-AF-H				97.18	3.826
DMA-AF-J		6	1, 1-1/2, or 2	129.5	5.1

Figure 8. Fisher DSA Dimensions (also see table 4)

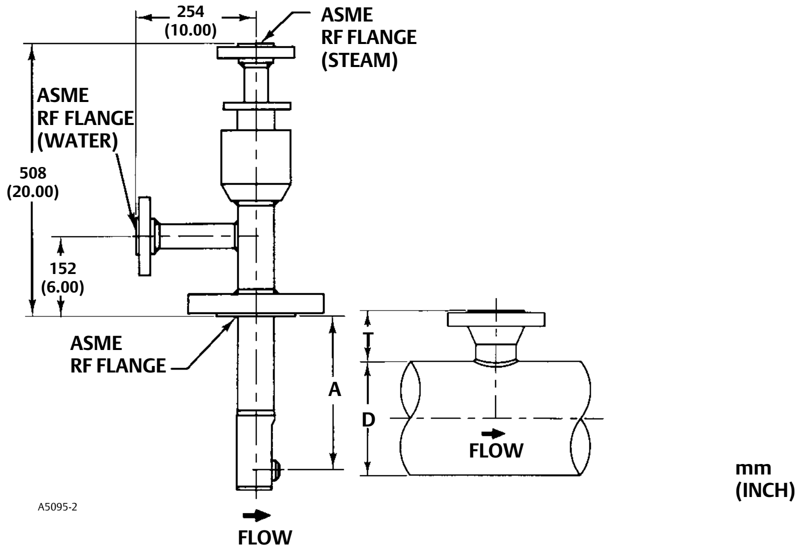


Table 4. Fisher DSA Dimensions

DIMENSION				
A		D (Nominal Pipe Size), NPS	T	
mm	Inches		mm	Inches
360	14.19	8 10	248 216	9.75 8.50
448	17.63	12 14 16 18	279 267 241 216	11.00 10.50 9.50 8.50
524	20.63	20 22 24 >24	267 241 216 216	10.50 9.50 8.50 8.50

Note: For NPS 6 mounting flange, add 69.6 mm (2.75 inches) to the A and T dimensions. For CL2500 mounting, consult your Emerson sales office or Local Business Partner.

Figure 9. Fisher DVI Dimensions (also see table 5)

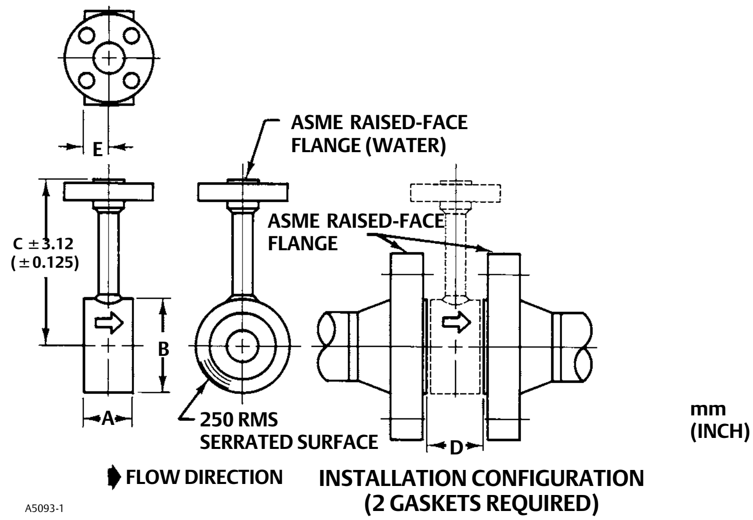


Table 5. Fisher DVI Dimensions

NOMINAL PIPE SIZE, NPS	A	B	C—WATER CONNECTION TO MATING FLANGE					D	E
			PRESSURE RATING						
			CL150	CL300	CL600	CL900	CL1500		
	mm								
1	76	51	254	254	254	254	254	83	38
1-1/2	76	73	254	254	254	254	254	83	38
2	76	92	254	254	254	254	254	83	38
2-1/2	76	105	254	254	254	254	254	83	38
3	76	127	254	254	254	254	254	83	38
4	76	157	254	254	254	254	254	83	38
6	76	216	254	254	254	406	406	83	38
8	102	270	254	406	406	406	406	108	51
10	102	324	406	406	406	406	406	108	51
12	152	381	406	406	406	406	508	159	76
14	152	413	406	406	406	508	508	159	76
16	152	470	406	406	508	508	508	159	76
18	203	533	406	508	508	508	559	210	102
20	203	584	508	508	508	559	660	210	102
24	203	692	508	559	559	660	711	210	102
	Inches								
1	3	2.00	10	10	10	10	10	3.25	1.50
1-1/2	3	2.88	10	10	10	10	10	3.25	1.50
2	3	3.63	10	10	10	10	10	3.25	1.50
2-1/2	3	4.13	10	10	10	10	10	3.25	1.50
3	3	5.00	10	10	10	10	10	3.25	1.50
4	3	6.19	10	10	10	10	10	3.25	1.50
6	3	8.50	10	10	10	16	16	3.25	1.50
8	4	10.63	10	16	16	16	16	4.25	2.00
10	4	12.75	16	16	16	16	16	4.25	2.00
12	6	15.00	16	16	16	16	20	6.25	3.00
14	6	16.25	16	16	16	20	20	6.25	3.00
16	6	18.50	16	16	20	20	20	6.25	3.00
18	8	21.00	16	20	20	20	22	8.25	4.00
20	8	23.00	20	20	20	22	26	8.25	4.00
24	8	27.25	20	22	22	26	28	8.25	4.00

Figure 10. Fisher DMA-AF-HTC Dimensions (also see tables 6 and 7)

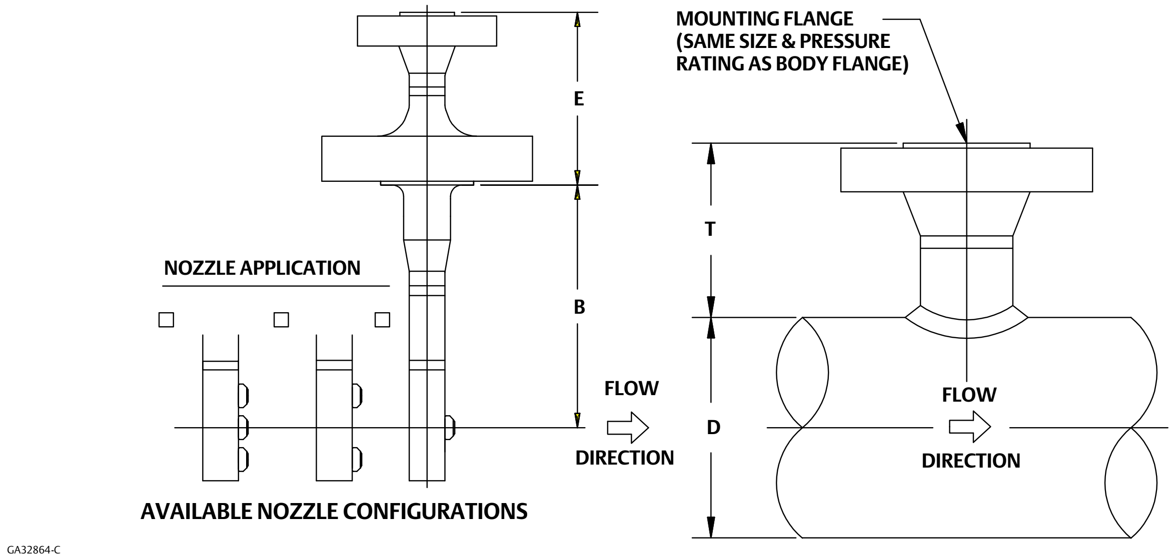


Table 6. Fisher DMA-AF-HTC Dimensions

WATER FLANGE		DESUPERHEATER BODY FLANGE(1)		DIMENSION	
Size, NPS	Pressure Rating	Size, NPS	Pressure Rating	E (Standard)	
				mm	Inches
1-1/2	CL150	3 or 4	CL150	203	8
	CL300	3 or 4	CL300	203	8
	CL600	3 or 4	CL600	203	8
	CL900	3 or 4	CL900	203	8
2	CL150	3 or 4	CL150	203	8
	CL300	3 or 4	CL300	203	8
	CL600	3 or 4	CL600	203	8
	CL900	3 or 4	CL900	254	10
	CL1500	3 or 4	CL1500	254	10
	CL2500	3 or 4	CL2500	292	11.5

1. The NPS 4 DMA-AF-HTC requires a 4.00 inch minimum mounting I.D. Contact your Emerson sales office or Local Business Partner for NPS 3 DMA-AF-HTC minimum mounting I.D.

Table 7. Fisher DMA-AF-HTC Installation Dimensions

DIMENSION						
D (Nominal Pipe Size)		Desuperheater Body Flange Size, NPS	B (Insertion Length)		T (Height)	
mm	NPS		mm	Inches	mm	Inches
200	8	3 or 4	356	14.00	248	9.75
250	10	3 or 4	356	14.00	216	8.5
300	12	3 or 4	444	17.50	279	11.0
350	14	3 or 4	444	17.50	267	10.5
400	16	3 or 4	444	17.50	241	9.5
450	18	3 or 4	444	17.50	216	8.5
500	20	3 or 4	444	17.50	216	8.5
550	22	3 or 4	444	17.50	216	8.5
600-900	24-36	3 or 4	444	17.50	216	8.5

Table 8. Fisher DMA-AF-HTC Minimum Mounting I.D.

MINIMUM BODY FLANGE	NOZZLE MODEL	WATER FLANGE	MINIMUM MOUNTING I.D.
3	DMA-AF-A,B,C	1-1/2 to 2	2.624
3	DMA-AF-D,E	1-1/2 to 2	2.9
4	DMA-AF-A through H	1-1/2 to 2	4

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Fisher™ TBX-T Desuperheater

The Fisher TBX-T desuperheater can be used in many applications to efficiently reduce the temperature of superheated steam to the desired set point. The TBX-T desuperheater is available for installation in steam lines from DN200 through DN1500 (NPS 8 through 60) in diameter and are capable of maintaining steam temperatures to within 6°C (10°F) of saturation temperatures.

Water atomization and vaporization are key elements in any steam conditioning application. The TBX-T design incorporates a spraywater manifold of variable geometry AF nozzles that produce an optimized spray pattern over a wide operating range. These nozzles are strategically placed to achieve optimal mixing and quick vaporization at all flowing conditions (see figure 4). Years of research in spray atomization and vaporization were key to optimizing the water injection system. Extensive use of CFD analysis, in addition to field performance feedback, was used to validate spray system enhancements.

X0162-1

- **TBX-T—**The TBX-T desuperheater incorporates a spraywater manifold of variable geometry Type AF nozzles that produce an optimized spray pattern over a wide operating range. These nozzles are strategically placed to achieve optimal mixing and quick vaporization at all flowing conditions (see figure 3).

The TBX-T desuperheater can be configured with a pressure reducing valve (PRV) immediately upstream, with an integral diffuser, or as a standalone device.

The TBX-T (figure 1) is normally used when an application requires a separation of the pressure reduction and desuperheating functions. The TBX-T is equipped with a water supply manifold which includes a spraywater connection (NPS 1 to 4). The manifold provides cooling water flow to a number of individual spray nozzles installed in the pipe wall of the outlet section. The result is a fine spray injected radially into the high turbulence of the axial steam flow. The combination of large surface area contact of the water and high turbulence in the steam make for very efficient mixing and rapid vaporization.

Features

- **Precise Spraywater Injection--** CFD designed spray manifold determines water injection point and insertion depth to maximize mixing and quick vaporization.

- **Thermal Liner in Body--** The TBX-T has the option of including an integral thermal liner inside the steam pipe. This construction is most commonly used in boiler interstage attemperation applications, where the desuperheater is exposed to high thermal cycling and stress, high steam velocities , and flow-induced vibration. The liner minimizes the potential for thermal shock when cool water is introduced to the unit that is already heated to the operating steam temperature.

Table 1. Specifications

Connections	Spraywater Pressure Required(2)
Steam Line: NPS 8 to 60(3); CL150 to CL2500(4); BWE, RF, and RTJ **Spraywater:** NPS 1 to NPS 4(3), CL150 to CL2500(4), RF, RTJ, BWE, and SWE	3.5 to 35 bar (50 to 500 psi) greater than steam line pressure
Maximum Pressure Rating(1)(4)	**Maximum Unit C_V (for Spraywater Flow)**
Consistent with applicable pressure-temperature ratings per ASME B16.34	Contact your Emerson sales office
Inherent Rangeability	**Construction Materials**
Up to 50:1. The ratio of maximum to minimum controllable C_v is dependent upon the available water pressure differential	**Steam Pipe:** ■ SA105 carbon steel, ■ SA182 Grade F22 (2-1/4 Cr-1 Mo) ■ SA182 Grade F91 (9 Cr-1 Mo-V) ■ SA182 Grade F92 (9 Cr-2 W-V) **Nozzles:** ■ S41000 stainless steel ■ N07718 **Gaskets:** ■ N06600/Graphite **Bolting:** ■ SA193 Grade B7, ■ SA193 Grade B16, ■ N07718

1. Do not exceed the pressure or temperature limits in this bulletin, nor any applicable code or standard limitations.
2. A function of required turndown and equipment selection.
3. Consult your Emerson sales office for additional options.
4. Intermediate rating above CL2500 available upon request. PN ratings also available per pressure requirements of EN1092-1. Consult your Emerson sales office for additional information.

Figure 1. Fisher TBX-T Cooler

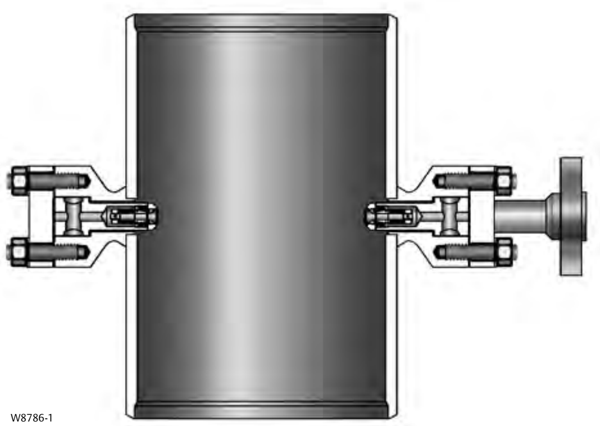


Figure 2. Fisher TBX-T Desuperheater with Optional Liner

Principle of Operation

For the most efficient use of heat energy from steam, it is necessary to reduce the temperature of steam to near the saturation temperature. With steam that is at or near the saturation temperature, it is possible to recover the large amount of energy that was put into the steam when it was heated from water to steam. Desuperheating, or attemperation as it is sometimes called, is most often used to • improve thermal efficiency of heat transfer processes by using steam near saturation, • control unintentional superheat from pressure reduction of the steam, and • protect downstream equipment and piping from elevated temperatures and pressure.

In the TBX-T desuperheater, spraywater is supplied to the manifold and distributed to the nozzles. These nozzles are strategically placed to achieve optimal mixing and quick vaporization at all flowing conditions. The TBX-T desuperheater can be configured with a pressure reducing valve (PRV) immediately upstream, with an integral diffuser, or as a standalone device. Dimensions are dependent of the design requirements. Consult your Emerson sales office with service conditions to obtain dimensions.

Figure 3. Fisher TBX-T Desuperheater

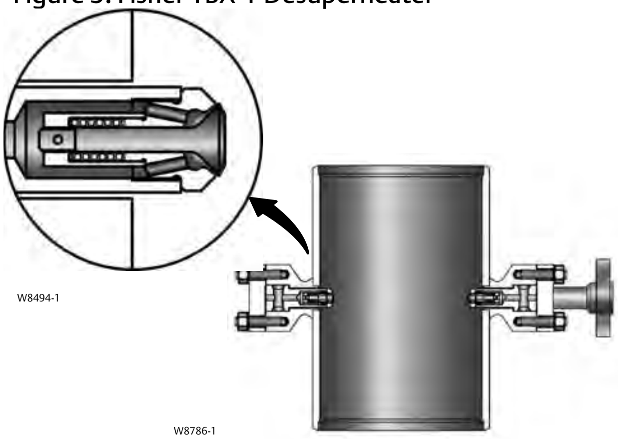


Figure 4. Detail of Spray Nozzle

Ordering Information

Use the flow chart in figure 5 to select the appropriate desuperheater for your requirements.

When ordering, specify the following information. Items 1 through 5 are required for desuperheater sizing.

1. Maximum, normal, and minimum steam flow rate.

2. Steam pressure and temperature at the inlet and outlet.

3. Spraywater pressure and temperature.

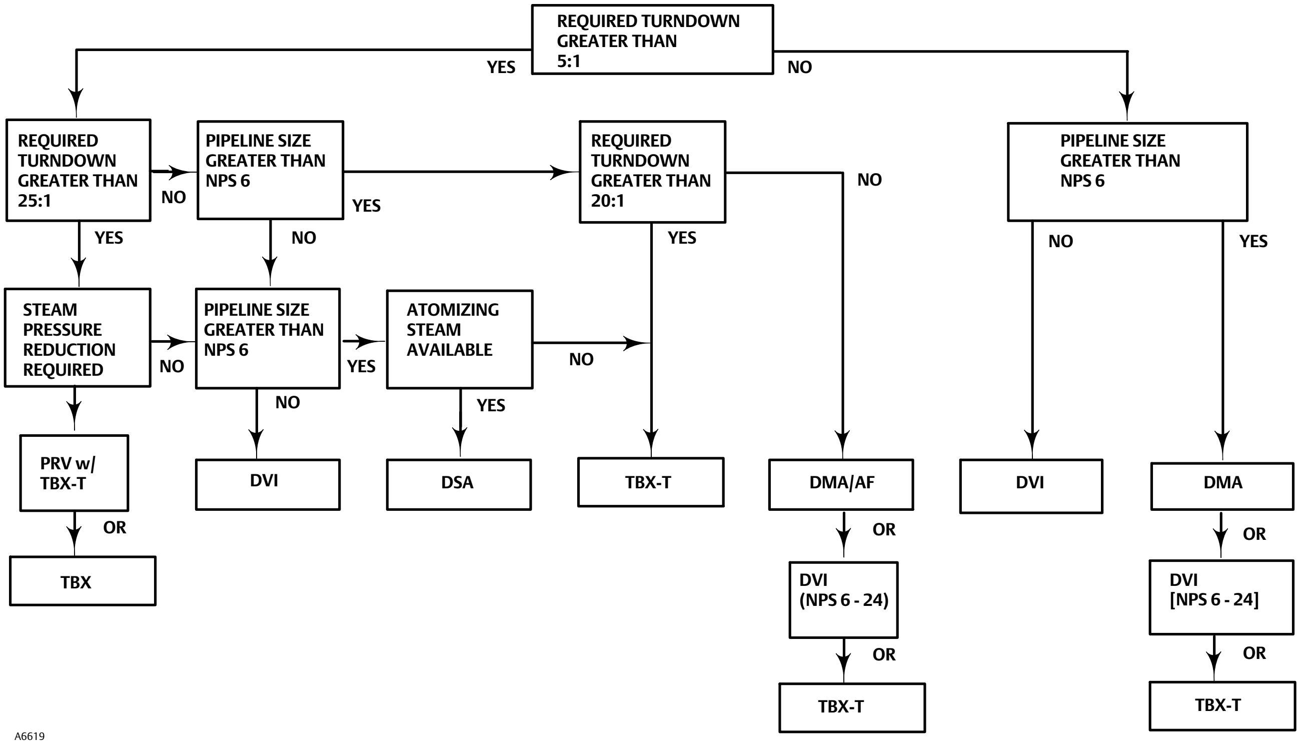
4. Design conditions, if different from operating conditions.

5. Steam line size.

6. Desuperheater steam connection size, type, and rating.

7. Spraywater connection size from table 1.

Figure 5. Selection Flow Chart



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Yarway AT-18/28
D104418X012

Product Bulletin
85.3:18/28
August 2019

Bulletin for Yarway™ AT-18/28 Heavy Duty A.T.-Temp Desuperheater

This bulletin was prepared by Emerson.

Do not install, operate or maintain this product without being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance.

To avoid personal injury or property damage it is important to carefully read, understand, and follow all of the contents of this manual, including all safety cautions and warnings.

If you have any questions about these instructions, contact your Emerson sales office before proceeding.

Installation

⚠ WARNING

Always wear protective gloves, clothing, and eyewear when performing any installation operations. Check with your process or safety engineer for any other hazards that may be present from exposure to process media.

Personal injury or equipment damage caused by sudden release of pressure may result if the desuperheater is installed where service conditions could exceed the limits given on the product nameplate. To avoid such injury or damage, provide a relief valve for over-pressure protection as required by government or accepted industry codes and good engineering practices.

CAUTION

When ordered, the desuperheater configuration and construction materials were specified to meet particular pressure, temperature, pressure drop, and fluid conditions. Do not apply any other conditions to the desuperheater without first contacting your local Emerson sales office .

Maintenance

⚠ WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:

- **Do not remove the actuator from the valve while the valve is still pressurized.**
- **Always wear protective gloves, clothing, and eyewear when performing any maintenance operations.**
- **Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.**
- **Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.**
- **Safely vent the power actuator loading pressure.**
- **Use lock-out procedures to be sure the above measures stay in effect with you work on the equipment.**
- **The valve packing box may contain process fluids that are pressurized, even with the valve has been removed from the pipeline. Process fluids may spray out under pressure when removing the packing hardware or packing rings.**
- **Check with your process or safety engineer for any other hazards that may be present from exposure to process media.**

CAUTION

When adjusting the travel stop for the closed position of the valve ball or disk, refer to the appropriate valve instruction manual for detailed procedures. Undertravel or overtravel at the closed position may result in poor valve performance and/or damage to the equipment .

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YARWAY MODEL 18 AND 28

HEAVY DUTY HEAVY DUTY A.T.-TEMP DESUPERHEATER

FEATURES

- Forged construction
- High quality stuffing box
- Variable nozzle type
- Wide range of C_V (K_V) capacities available
- Special nozzle combinations available
- Semi balanced internals for economic actuator selection
- Pressure ratings
  - ASME B16.34 class 900 to 2500
  - EN 1092 PN 160 to 400
- Materials
  - ASTM SA 182 F22 or 1.7383
  - ASTM SA 182 F347H or 1.4550
  - ASTM SA 182 F91 or 1.4903
  - Other materials upon request

GENERAL APPLICATION

Desuperheaters are used for temperature control of:

- Cooling of process steam or gas
- Boiler superheater
- Boiler reheater
- Turbine bleed steam
- Pressure reducing valve

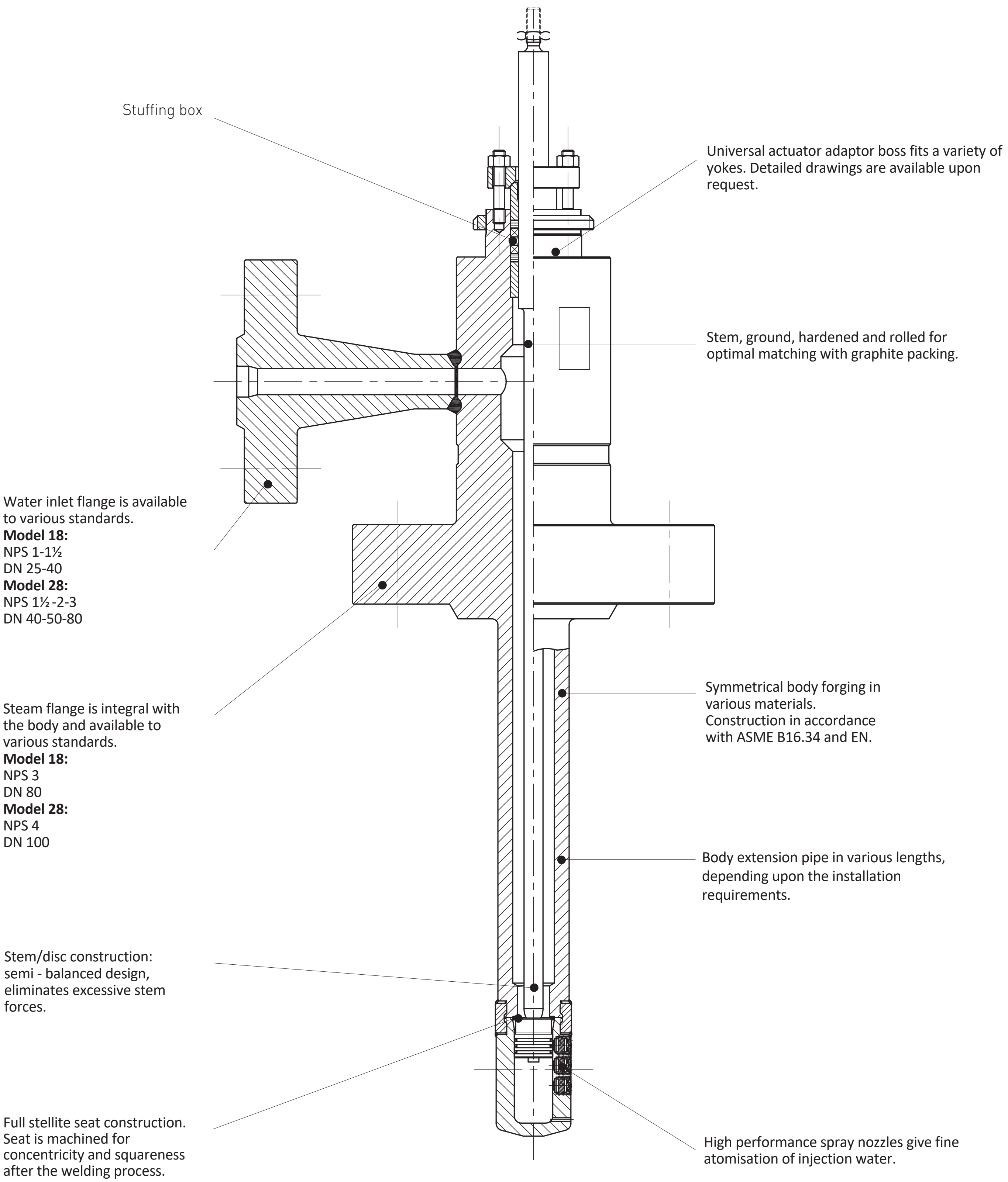
TECHNICAL DATA

AT18	Steam NPS 3 / DN 80
	Water NPS 1-1½ -2 / DN 25-40-50
AT28	Steam NPS 4 / DN 100
	Water NPS 1½-2-3 / DN 40-50-80

YARWAY MODEL 18 AND 28

HEAVY DUTY HEAVY DUTY A.T.-TEMP DESUPERHEATER

FIGURE 1



The Yarway Heavy Duty A.T.-Temp Desuperheater is specifically developed for use on medium/high pressure steam applications. The fabricated construction makes it easy adaptable to meet various boiler codes and material specifications. The unit can also be used as a liquid into gas injector for which high grade alloy such as stainless steel is often used. The vital trim components are identical to those used in Yarway Standard Duty A.T.-Temp Desuperheater.

More than 3800 units of both Heavy - and Standard Duty A.T.-Temp Desuperheaters are in service today. The valve stem is rolled to obtain a smooth finish. This highly finished surface is then nitrided to give a hardness of > 1000 Vickers. The combination of these processes improves sealing tightness, whilst reducing packing friction. Piston rings are specially hardened and subsequently nitrided and are provided with a special gas tight slot. These rings offer excellent running properties and enable controllable C_v (K_v) values as low as 0.005 (0.0043).

SYSTEM COMPARISON

Conventional

Conventional injection water systems consist of:

- Fixed size spray nozzle
- Control valve
- Steam pipe section

The water injection quantity is regulated by the control valve. As a consequence of this flow regulation the downstream water pressure P2, varies as a function of the valve plug position. At reduced capacity the control valve starts to throttle, reducing P2 and hence the available water to steam 'Δp', resulting in larger droplet size and poor atomization. The water evaporation rate slows down and temperature control becomes troublesome. This typical system problem becomes compounded as nozzles and valves are usually sized for the design capacity but normally operate significantly below these design conditions. This oversizing results in a partially open control valve, even at normal operating conditions. With reducing load, downstream water pressure P2 decays rapidly resulting in larger droplet size. Conventional systems therefore will work satisfactorily only at relatively steady load conditions. Improvement of their performance is realized by applying Venturi type pipeline sections.

A.T.-Temp Desuperheater

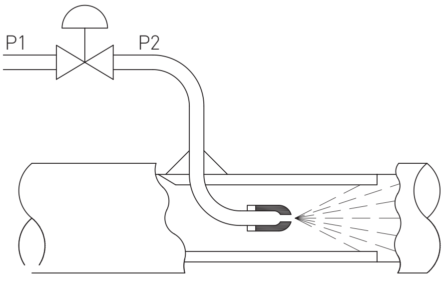
The A.T.-Temp Desuperheater valve regulates the amount of injection water by varying the number of injection nozzles. This enables the water pressure to remain constant, independently of the number of injection nozzles in operation. This results in an excellent and near uniform spray quality over the entire operating range. Control of nozzle opening is achieved by the positioning of a piston which is operated directly by an actuator mounted onto the valve.
Through this simple design, there is no separate water control valve necessary.

APPLICATIONS

Yarway A.T.-Temp Desuperheaters are used for temperature control of:

- Boiler superheaters
- Boiler reheaters
- Turbine bleed steam
- Pressure reducing valve outlet steam
- Process steam
- Process gases

FIGURE 2



SUPERIOR SPRAY NOZZLE

Yarway has incorporated the latest technology in the spray nozzle design.
The high quality surface finish minimizes frictional losses, thereby ensuring that the total water to steam Δp is available for atomization of the water (see Figure 4).
The nozzle consists of two components A) the orifices and B) the nozzle body. Each nozzle is served by individual feed holes in the cylinder wall. Water enters the chamber behind the orifice plate through these openings.
The relatively large volume of this chamber ensures that water is proportioned evenly through each orifice.
The Δp across this orifice plate results in an increase in the fluid velocity. The water is subsequently rotated in the nozzle chamber before being emitted through the central hole. The combination of splitting the feed flow, increasing velocity and rotating effect, ensures that the water is injected into the system in a fine symmetrical hollow cone spray.

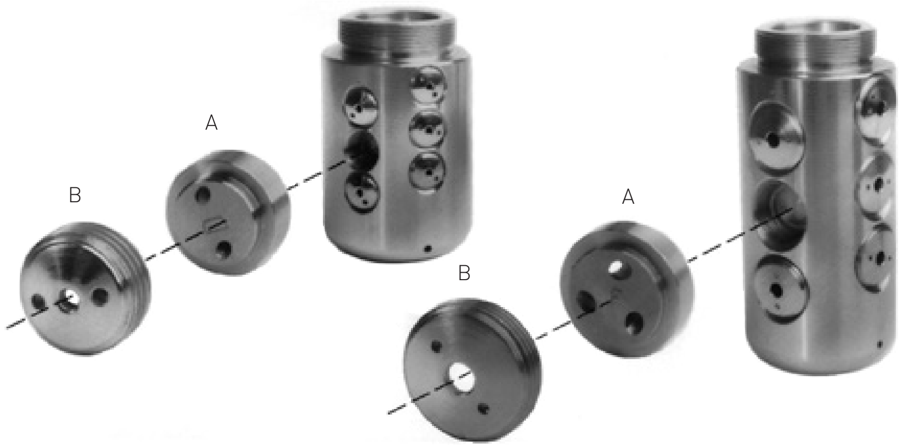
The nozzles are assembled with the spray cylinder and sealed by a vacuum brazing process. This maintains the integrity of these components even under the most extreme conditions.
Material compatibility of spray cylinder, piston and piston rings is well proven in hot/cold service conditions, as typically found in steam attemperators. This enables reliable operation over an extended period.
Surfaces are finely machined to reduce frictional losses and internal contours are so designed as to optimize water swirl action, ensuring uniform and consistent droplet size.

Minimum Δp available from the A.T.-Temp Desuperheater inlet flange to steam pressure must be:
Nozzles A through Dx: 1 bar
Nozzles E through K: 2 bar

CODES AND STANDARDS

The A.T.-Temp Desuperheater is designed and manufactured to meet a wide variety of international codes and standards. Certified acceptance documents are available upon request. If special codes or standards are required by your local authority, then we would be pleased to discuss them.

FIGURE 3



MULTIPLE NOZZLE HEADS

The A.T.-Temp Desuperheater may be equipped with a variety of spray heads.
The uniform body threading accepts spray cylinder heads with a wide range of C_V (K_V) values.
Standard configurations are with either 6 or 9 equally sized spray nozzles but combinations are available.
This feature enables the A.T.-Temp Desuperheater to be customized to specific system requirements. Consult your local representative for details at www.emerson.com.

A.T.-Temp standard capacity range

Type Number	Nozzle Configuration	Max Kv	Max Cv
1	6A	0,0648	0,0749
2	4A-2B	0,0888	0,1027
3	2A-3B-1C	0,1338	0,1547
4	1A-2B-3C	0,1878	0,2171
5	1A-2B-1C-2D	0,2686	0,3105
6	1A-1B-2C-1D-1Dx	0,3721	0,4302
7	1A-2B-3C-1D-1Dx-1D	0,5229	0,6045
8	3B-2C-1D-3Dx	0,7403	0,8558
9	1C-2D-1Dx-2D-3Dx	1,0474	1,2109
10	9Dx	1,5003	1,7345
11	1B-1C-1D-1Dx-1E-1F	0,9988	1,1547
12	1C-1D-1Dx-1E-2F	1,3840	1,6000
13	1C-1D-1Dx-1E-2G	2,3014	2,6606
14	1C-1D-1E-1F-1G-1H	3,0260	3,4983
15	1D-1Dx-2F-1H-1K	4,3549	5,0346
16	2D-1E-1G-1E-1F-1K-1H-1G	6,1444	7,1034
17	1E-2Dx-1H-2F-3K	8,5867	9,9268
18	1G-1F-1G-1K-2H-3K	12,5934	14,5588
19	9K	17,4420	20,1642

Definition

$$K_V = Q\sqrt{\frac{S.G}{\Delta p}}$$

Q = m³/hr

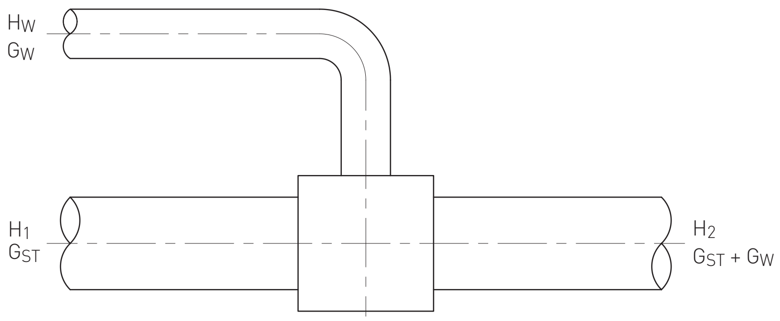
S.G. = kg/dm³

ΔP = bar

Flow capacity limitations are:

- Model 18 with a maximum water flow capacity of 25 m^3/hr. in continuous service.
- Model 28 with a maximum water flow capacity of 50 m^3/hr. in continuous service.

FIGURE 4



SIZING FORMULA

Every desuperheating station is a mixing point where there is a heat and mass balance.
The universal formula is:

$$G_W = G_{ST} (H_1 - H_2) : (H_2 - H_W)$$

In which:

G_W = Injection water mass

G_{ST} = Inlet steam mass

H_1 = Enthalpy of the inlet steam

H_2 = Enthalpy of the outlet steam

H_W = Enthalpy of the injection water

This formula enables calculation of the quantity of water required to lower the inlet steam temperature to the set - point temperature of the outlet steam.

IMPORTANT SYSTEM PARAMETERS

Apart from the spray quality of the atomizer (primary atomization) there are other system parameters which influence the Desuperheater stations performance. These are:

Inlet steam velocity

At high steam velocities, water droplets are easily disintegrated. This factor contributes to the overall atomization quality (secondary atomization). The minimum acceptable steam velocity varies as a function of the nozzle size and pipe diameter. In case of doubt, consult Yarway.

Water to steam ratio

This ratio is determined by dividing G_W by G_{ST}. For system steam pressures below 15 bar, this ratio should not exceed 10% for the normal operating conditions. Systems operating between 15 and 25 bar can have a ratio of up to 15%. For higher pressure duties, consult Yarway.

Distance to sensor

The distance from the injection point to the temperature sensor should be 12 to 15 meters. Systems operating at pressures above 25 bar can have significantly less run to the sensor, consult Yarway.

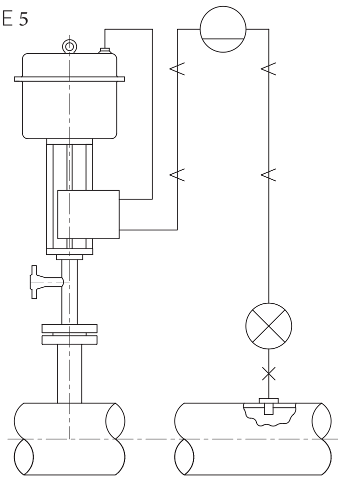
Required straight pipe run

The distance from injection point to the first pipe bend is also a function of steam pressure, temperature and nozzle size. Experience has shown that in systems up to 25 bar, 4 to 6 meters, is an acceptable distance.

CONTROL SYSTEMS

The injection water quantity is controlled as a function of the outlet steam temperature. The A.T.-Temp Desuperheater actuation is compatible with conventional control systems operated from temperature transmitters, temperature indicating controllers and positioners. Fully pneumatic or fully electric systems are compatible and also combinations of the two. Exact requirements should be specified in the ordering / sizing data paragraph of this brochure.

FIGURE 5



ACTUATOR STEM FORCES

The stem forces for the Heavy Duty A.T.-Temp Desuperheater are determined by the following formula:

Model 18: P water x 36 + 1000 = Newton (P water in bar)
The maximum stem force must be limited to 15 kN.

Model 28: P water x 68 + 1250 = Newton (P water in bar)
The maximum stem force must be limited to 50 kN.

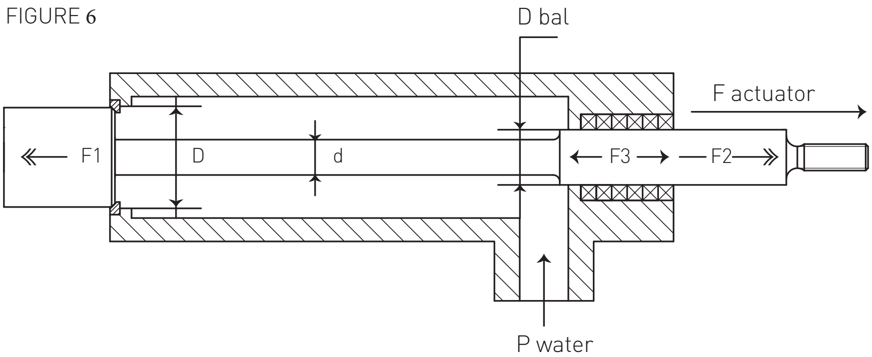
Special care should be taken when electric actuators are used. By their momenta of inertia these actuators can generate stem forces exceeding the specified nominal stem force during short intervals. Yarway supplies special spring loaded couplings for such applications.

Actuator sizing formula

Units:
D seat in cm
d stem in cm
D bal in cm
P water in bar

F1 = π / 4 (**D** seat^2 - **d** stem^2) x **P** water
F2 = π / 4 (**D** bal^2 - **d** stem^2) x **P** water
F3 = **F** friction (+ or -).

FIGURE 6



ORDERING / SIZING DATA

Steam desuperheaters are selected specifically against application data. For optimal sizing, the following comprehensive data should always be supplied.

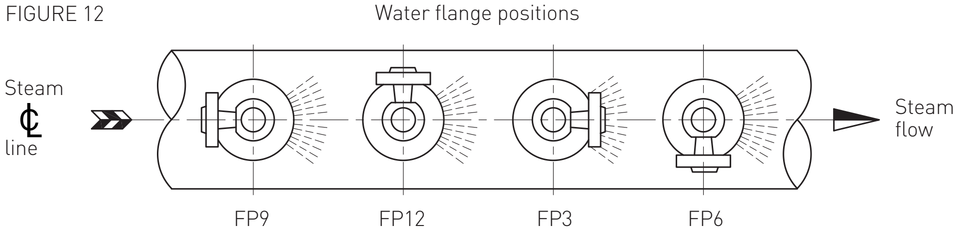
Steam data
Inlet pressure bar
Inlet temperature °C Outlet
temperature °C setpoint
Steam flow max. t / hr
Steam flow normal t / hr
Steam flow min. t / hr

Water data Water
pressure Water bar
temperature °C

General
Pipe size mm
Pipe schedule Required
waterflange
position (9) (12) (3) (6)
It is essential not to over specify the required turndown ratio i.e.: $\frac{\text{steam flow max.}}{\text{steam flow min.}}$

Otherwise this will necessitate selection of special nozzle heads which are non-stock items. Standard stock consists of nozzles with 6 or 9 equally sized atomizers giving turndown ratios of 18:1 and 27:1 respectively, on the water flow control. Experience shows that the majority of applications fall within this range.

FIGURE 12



Spray water must be injected in the direction of the steam flow. To facilitate installation of the water supply line, 4 different spray head positions are available in relation to the water connecting flange. Specification of this spray head orientation is required with the ordering data.

Yarway always recommends a strainer with a mesh size of approx. 100 µ (400 µ upon request) in the water supply line to protect the A.T.-Temp Desuperheater from clogging.

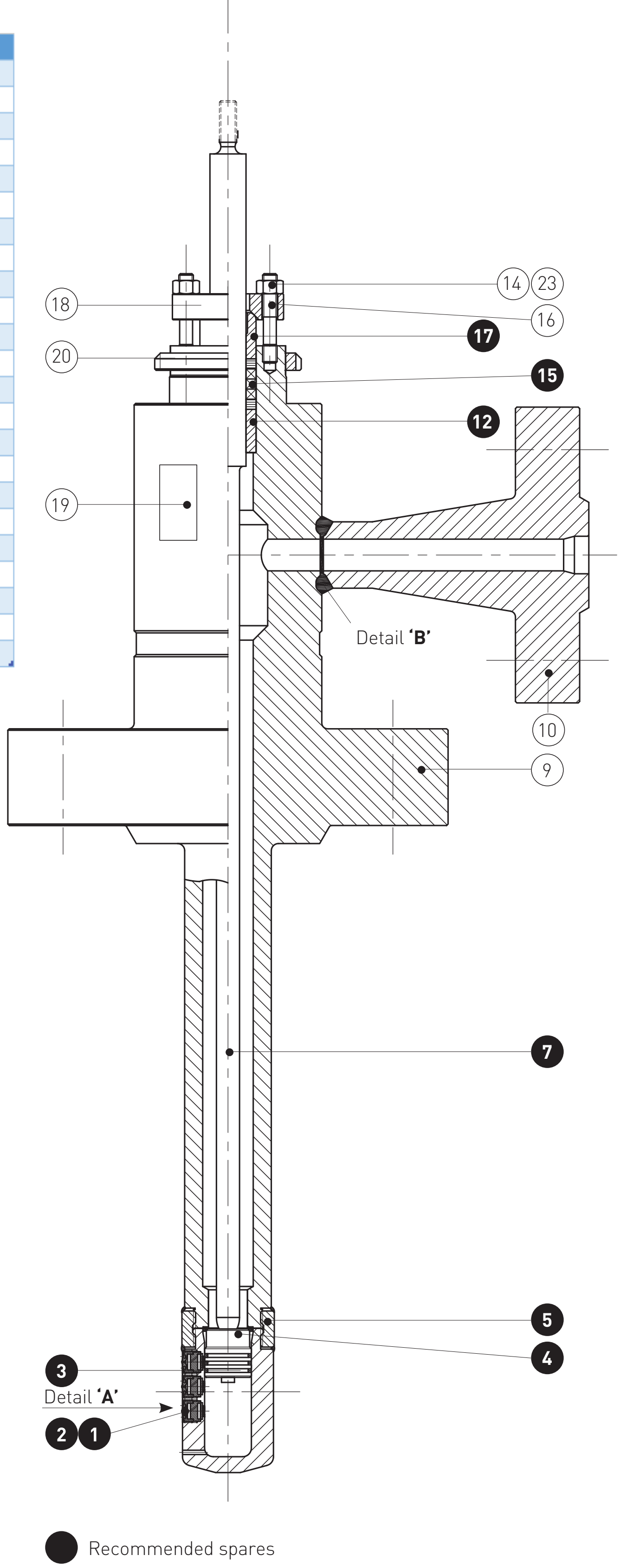
YARWAY MODEL 18 AND 28

HEAVY DUTY HEAVY DUTY A.T.-TEMP DESUPERHEATER

TABLE 1 - STANDARD MATERIALS

Item	Name	ASME material	EN material
1+2	Spray Cylinder/Nozzle	S41000/S41000	1.4006/1.4006
		S41000/Alloy 6	1.4006/Alloy 6
		N07718/N07718	N07718/N07718
3	Piston Ring	S43100 (1)	1.4057 (1)
4	Piston	S43100 (1)	1.4057 (1)
5	Fastener Ring	SA182 F11 Class 2	1.7335
		ALLOY 800H (1)	ALLOY 800H (1)
7	Stem	S43100 (1)	1.4057 (1)
9	Body/Seat	SA 182 F22/Alloy 6 or 17% Cr	1.7383/Alloy 6 or 17% Cr
		SA 182 F347H/Alloy 6 or 17% Cr	1.4550/Alloy 6 or 17% Cr
		SA 182 F91/Alloy 6 or 17% Cr	1.4903/Alloy 6 or 17% Cr
10	Water Flange	SA 182 F22	1.7383
		SA 182 F347H	1.4550
		SA 182 F91	1.4903
12	Packing Box Ring	S43100 (1)	1.4057 (1)
14	Nut,Hex	SA194 GR7 (4)	SA194 GR7 (4)
15	Packing Set	GRAPHITE K80/K80S	GRAPHITE K80/K80S
16	Stud Bolt	SA193 GR B16 (4)	SA193 GR B16 (4)
17	Packing Follower	S43100 (1)	1.4057 (1)
18	Flange, Packing	S30400	1.4301
19	Nameplate	SST	SST
20	Yoke Locknut	SA105 (3)	SA105 (3)
23	Securing Washer	CARBON STEEL (2)	CARBON STEEL (2)

FIGURE 8



NOTE

(1) Nitrided
(2) Zinc plated
(3) NCF
(4) ENC

Certification

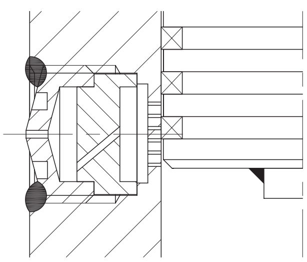
A.T.-Temp Desuperheaters comply with the requirements of ASME B16.34 and EN 12516.

All data subject to changes.

Other materials are available upon request.

Materials and data of units supplied, may deviate from this brochure. Please consult order documents in case of doubt.

Detail 'A'



YARWAY MODEL 18 AND 28

HEAVY DUTY HEAVY DUTY A.T.-TEMP DESUPERHEATER

TABLE 2 - DIMENSIONS (mm)

		Model 38	Model 48
		Qmax = 25 m³/ hr.	Qmax = 50 m³/ hr.
	Standard length for steam line sizes up to 12" (DN 300)		
A	55 mm travel	380	
	90 mm travel	399	399
B	55 mm travel	436	
	90 mm travel	476	476
	Option: standard length for steam line sizes 14" (DN 350) and higher		
A	55 mm travel	580	
	90 mm travel	599	599
B	55 mm travel	636	
	90 mm travel	676	676
C		200	250
D		290	340
E		300	300
F		108	108
G		M16 X 2.00	M16 x 2.00
K		3 9/16" Yoke Boss	3 9/16" Yoke Boss
L		See table 2-1	See table 2-2
M		min. 68.0	min. 80.0
N		60.3 x 12.6	73.0 x 14.0
P		64.0	78.0

STROKE

55 mm travel - Minimum pipeline diameter 6"

90 mm travel - Minimum pipeline diameter 8"

TABLE 2-1 DIMENSIONS (mm)

		PN100	PN160	PN250	PN320	PN400
	DN 25	150	150	150	150	200
	DN 40	150	150	150	200	250
	DN 50	150	150	200	250	250
L (mm) AT18		CL600	CL900	CL1500	CL2500	
	NPS 1	150	150	150	200	
	NPS 1-1/2	150	200	200	250	
	NPS 2	150	250	250	250	

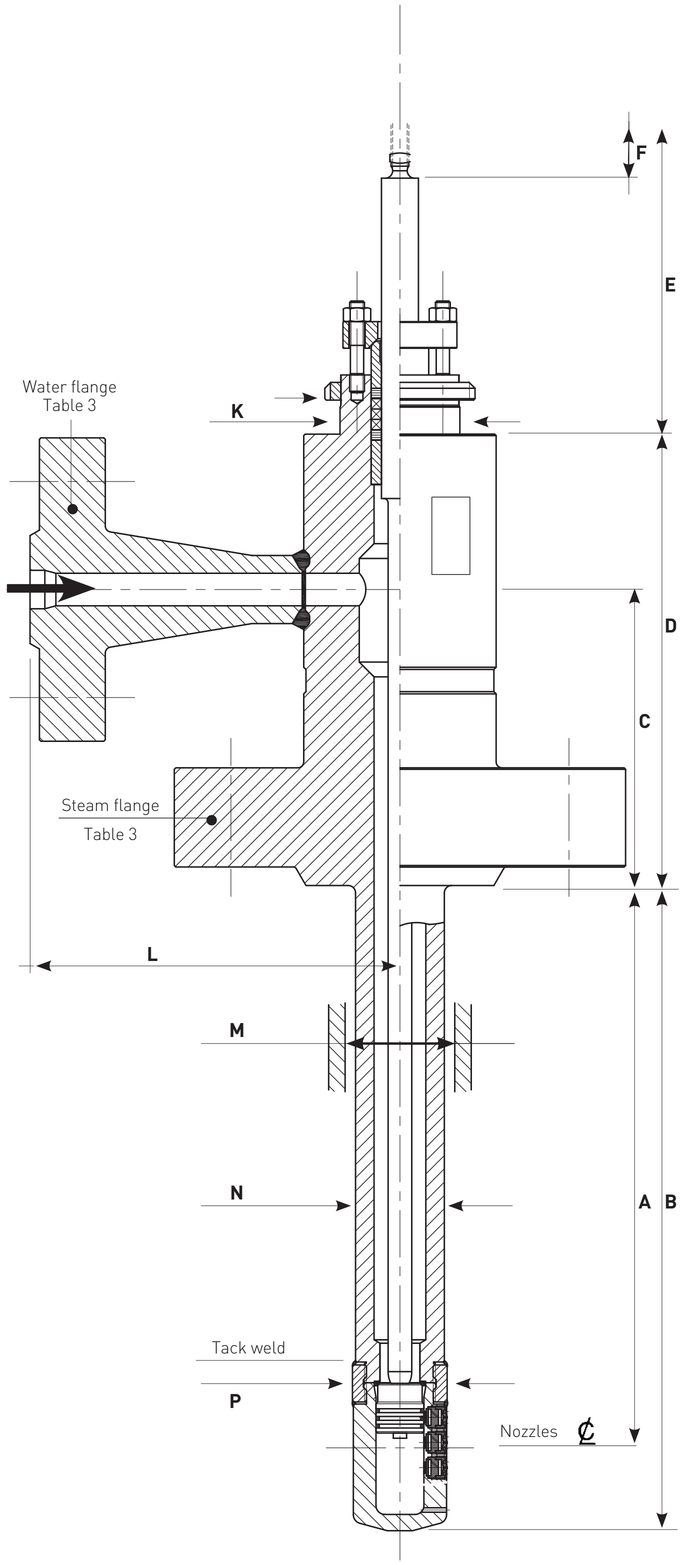
TABLE 2-2 DIMENSIONS (mm)

		PN100	PN160	PN250	PN320	PN400
	DN 40	150	150	150	200	200
	DN 50	150	150	200	200	200
	DN 80	150	150	200	300	300
L (mm) AT28		CL600	CL900	CL1500	CL2500	
	NPS 1-1/2	150	200	200	200	
	NPS 2	150	200	200	250	
	NPS 3	200	200	300	300	

TABLE 3 - FLANGE CONNECTIONS

	Model 18	Model 28
	Qmax = 25 m³/ hr.	Qmax = 50 m³/ hr.
Steam flange	NPS 3 Class 600 through 2500	NPS 4 Class 600 through 2500
	DN 80 PN 100 through 400	DN 100 PN 100 through 400
Water flange	NPS 1 - 1½ - 2 Class 600 through 2500	NPS 1½ - 2 - 3 Class 600 through 2500
	DN 25- 40 - 50 PN 100 through 400	DN 40 - 50 - 80 PN 100 through 400

FIGURE 9



Yarway AT-38/48
D104419X012

Product Bulletin
85.3:38/48
August 2019

Bulletin for Yarway™ AT-38/48 Standard Duty A.T.-Temp Desuperheater

This bulletin was prepared by Emerson.

Do not install, operate or maintain this product without being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance.

To avoid personal injury or property damage it is important to carefully read, understand, and follow all of the contents of this manual, including all safety cautions and warnings.

If you have any questions about these instructions, contact your Emerson sales office before proceeding.

Installation

⚠ WARNING

Always wear protective gloves, clothing, and eyewear when performing any installation operations. Check with your process or safety engineer for any other hazards that may be present from exposure to process media.

Personal injury or equipment damage caused by sudden release of pressure may result if the desuperheater is installed where service conditions could exceed the limits given on the product nameplate. To avoid such injury or damage, provide a relief valve for over-pressure protection as required by government or accepted industry codes and good engineering practices.

CAUTION

When ordered, the desuperheater configuration and construction materials were specified to meet particular pressure, temperature, pressure drop, and fluid conditions. Do not apply any other conditions to the desuperheater without first contacting your local Emerson sales office .

Maintenance

⚠ WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:

- **Do not remove the actuator from the valve while the valve is still pressurized.**
- **Always wear protective gloves, clothing, and eyewear when performing any maintenance operations.**
- **Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.**
- **Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.**
- **Safely vent the power actuator loading pressure.**
- **Use lock-out procedures to be sure the above measures stay in effect with you work on the equipment.**
- **The valve packing box may contain process fluids that are pressurized, even with the valve has been removed from the pipeline. Process fluids may spray out under pressure when removing the packing hardware or packing rings.**
- **Check with your process or safety engineer for any other hazards that may be present from exposure to process media.**

CAUTION

When adjusting the travel stop for the closed position of the valve ball or disk, refer to the appropriate valve instruction manual for detailed procedures. Undertravel or overtravel at the closed position may result in poor valve performance and/or damage to the equipment .

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Singapore 128461 Singapore

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YARWAY MODEL AT 38/48

STANDARD DUTY A.T.-TEMP DESUPERHEATER

FEATURES

- Fabricated construction
- High quality stuffing box,
- Variable nozzle type
- Wide range of C_V (K_V) capacities available
- Special nozzle combinations available
- Non/semi balanced internals for economic actuator selection
- Pressure rating
  - ASME B16.34 Class 150 to 1500
  - EN 1092-1 PN 25 to 250
- Materials
  - ASTM SA 105 / SA 106 Gr.B or SA 182 F11 / SA 335 P11
  - 1.0460 / 1.0345 or 1.7335
    Other materials upon request

GENERAL APPLICATION

- Cooling of process steam or gas
- Boiler superheater
- Boiler reheater
- Turbine bleed steam
- Pressure reducing valve

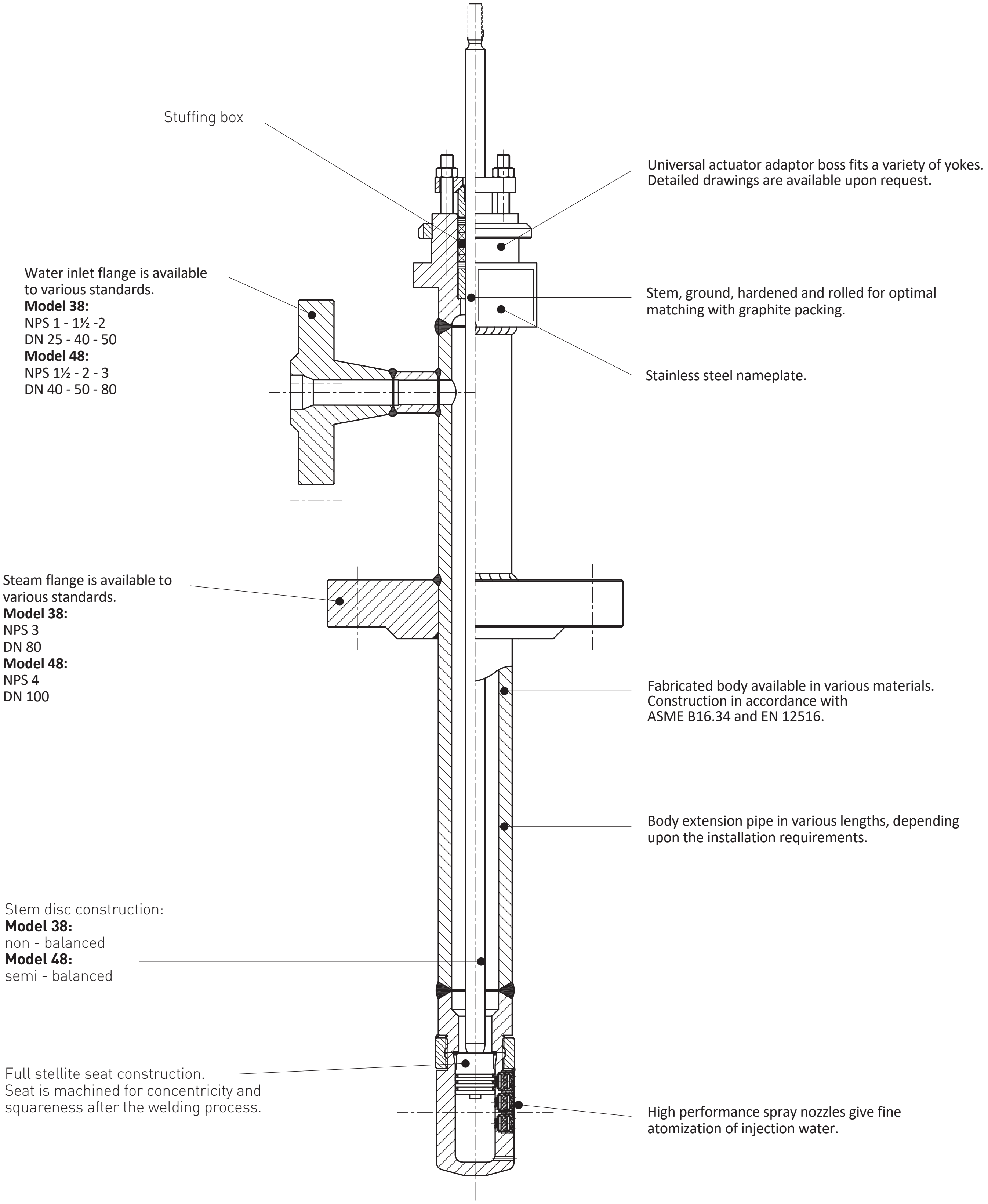
TECHNICAL DATA

AT 38	Steam NPS 3 / DN 80
	Water NPS 1 - 1½ / DN 25 - 40
AT 48	Steam NPS 4 / DN 100
	Water NPS 1½ - 2 - 3/ DN 40 - 50 - 80

YARWAY MODEL AT 38/48

STANDARD DUTY A.T.-TEMP DESUPERHEATER

FIGURE 1



YARWAY MODEL AT 38/48

STANDARD DUTY A.T.-TEMP DESUPERHEATER

The Standard Duty A.T.-Temp Desuperheater is specifically developed for use on medium / low pressure steam applications.
The fabricated construction makes it easy adaptable to meet various boiler codes and material specifications.
The unit can also be used as a liquid into gas injector for which high grade alloy such as stainless steel is often used.
The vital trim components are identical to those used in Heavy Duty A.T.-Temp Desuperheater.
More than 3800 units of both Heavy - and Standard Duty A.T.-Temp Desuperheaters are in service today.

The valve stem is rolled to obtain a smooth finish. This highly finished surface is then nitrided to give a hardness of > 1000 Vickers. The combination of these processes improves sealing tightness, whilst reducing packing friction.
Piston rings are specially hardened and subsequently nitrided and are provided with a special gas tight slot.
These rings offer excellent running properties and enable controllable C_v (K_v) values as low as 0.005 (0.0043).

SYSTEM COMPARISON

Conventional
Conventional injection water systems consist of:
- •Fixed size spray nozzle
- •Control valve
- •Steam pipe section

The water injection quantity is regulated by the control valve. As a consequence of this flow regulation the downstream water pressure P2, varies as a function of the valve plug position. At reduced capacity the control valve starts to throttle, reducing P2 and hence the available water to steam 'Δp', resulting in larger droplet size and poor atomization. The water evaporation rate slows down and temperature control becomes troublesome.

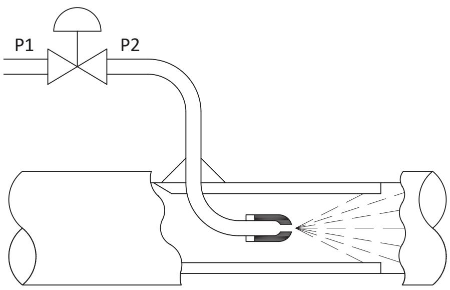
This typical system problem becomes compounded as nozzles and valves are usually sized for the design capacity but normally operate significantly below these design conditions. This oversizing results in a partially open control valve, even at normal operating conditions.
With reducing load, downstream water pressure P2 decays rapidly resulting in larger droplet size. Conventional systems therefore will work satisfactorily only at relatively steady load conditions.

A.T.-Temp Desuperheater
The A.T.-Temp Desuperheater valve regulates the amount of injection water by varying
the number of injection nozzles. This enables the water pressure to remain constant, independently of the number of injection nozzles in operation. This results in an excellent and near uniform spray quality over the entire operating range. Control of nozzle opening is achieved by the positioning of a piston which is operated directly by an actuator mounted onto the valve.
Through this simple design, there is no separate water control valve necessary.

APPLICATIONS

Yarway A.T.-Temp Desuperheaters are used for temperature control of:
- •Boiler superheaters
- •Boiler reheaters
- •Turbine bleed steam
- •Pressure reducing valve outlet steam
- •Process steam
- •Process gases

FIGURE 2



YARWAY MODEL AT 38/48

STANDARD DUTY A.T.-TEMP DESUPERHEATER

SUPERIOR SPRAY NOZZLE

Yarway has incorporated the latest technology in the spray nozzle design.
The high quality surface finish minimizes frictional losses, thereby ensuring that the total water to steam Δp is available for atomization of the water (see Fig. 4).
The nozzle consists of two components
A)the orifices and B) the nozzle body.
Each nozzle is served by individual feed holes in the cylinder wall. Water enters the chamber behind the orifice plate through these openings. The relatively large volume of this chamber ensures that water is proportioned evenly through each orifice.

The Δp across this orifice plate results in an increase in the fluid velocity. The water is subsequently rotated in the nozzle chamber before being emitted through the central hole. The combination of splitting the feed flow, increasing velocity and rotating effect, ensures that the water is injected into the system in a fine symmetrical hollow cone spray.
The nozzles are assembled with the spray cylinder and sealed by a vacuum brazing process. This maintains the integrity of these components even under the most extreme conditions.

Material compatibility of spray cylinder, piston and piston rings is well proven in hot/cold service conditions, as typically found in steam attemperators. This enables reliable operation over an extended period.
Surfaces are finely machined to reduce frictional losses and internal contours are so designed as to optimize water swirl action, ensuring uniform and consistent droplet size.

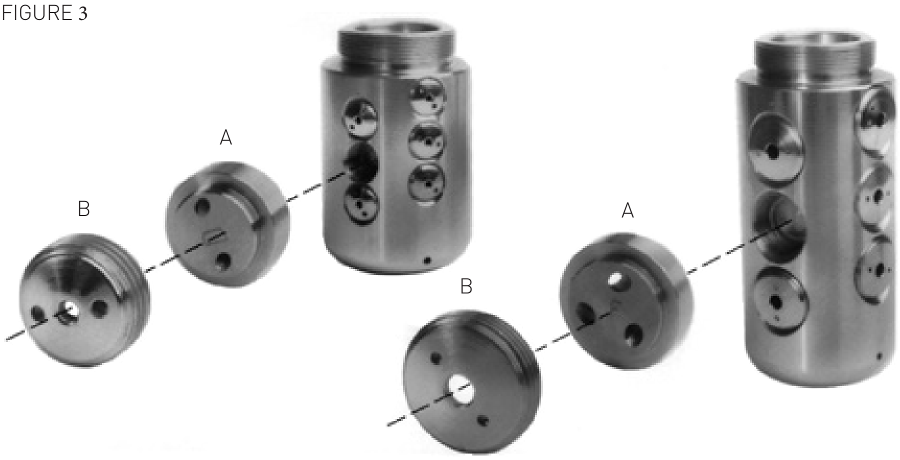
Minimum Δp available from the A.T.-Temp Desuperheater inlet flange to steam pressure must be:
Nozzles A through Dx: 1 bar
Nozzles E through K: 2 bar

CODES AND STANDARDS

The A.T.-Temp Desuperheater is designed and manufactured to meet a wide variety of international codes and standards.
Certified acceptance documents are available upon request.

If special codes or standards are required by your local authority, then we would be pleased to discuss them.

FIGURE 3



MULTIPLE NOZZLE HEADS

The A.T.-Temp Desuperheater may be equipped with a variety of spray heads.
The uniform body threading accepts spray cylinder heads with a wide range of C_v (K_v) values.
Standard configurations are with either 6 or 9 equally sized spray nozzles but combinations are available.

This feature enables the A.T.-Temp Desuperheater to be customized to specific system requirements. Consult your local representative for details at www.emerson.com

YARWAY MODEL AT 38/48

STANDARD DUTY A.T.-TEMP DESUPERHEATER

A.T.-Temp standard capacity range

Type Number	Nozzle Configuration	Max Kv	Max Cv
1	6A	0,0648	0,0749
2	4A-2B	0,0888	0,1027
3	2A-3B-1C	0,1338	0,1547
4	1A-2B-3C	0,1878	0,2171
5	1A-2B-1C-2D	0,2686	0,3105
6	1A-1B-2C-1D-1Dx	0,3721	0,4302
7	1A-2B-3C-1D-1Dx-1D	0,5229	0,6045
8	3B-2C-1D-3Dx	0,7403	0,8558
9	1C-2D-1Dx-2D-3Dx	1,0474	1,2109
10	9Dx	1,5003	1,7345
11	1B-1C-1D-1Dx-1E-1F	0,9988	1,1547
12	1C-1D-1Dx-1E-2F	1,3840	1,6000
13	1C-1D-1Dx-1E-2G	2,3014	2,6606
14	1C-1D-1E-1F-1G-1H	3,0260	3,4983
15	1D-1Dx-2F-1H-1K	4,3549	5,0346
16	2D-1E-1G-1E-1F-1K-1H-1G	6,1444	7,1034
17	1E-2Dx-1H-2F-3K	8,5867	9,9268
18	1G-1F-1G-1K-2H-3K	12,5934	14,5588
19	9K	17,4420	20,1642

Definition

$$K_V = Q\sqrt{\frac{S.G}{\Delta p}}$$

Q = m³/hr

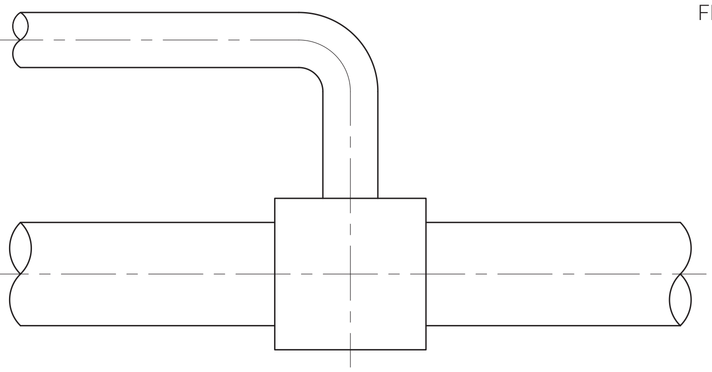
S.G. = kg/dm³

ΔP = bar

Flow capacity limitations are:

- Model 38 with a maximum water flow capacity of 25 m³/hr. in continuous service.
- Model 48 with a maximum water flow capacity of 50 m³/hr. in continuous service.

FIGURE 4



SIZING FORMULA

Every desuperheating station is a mixing point where there is a heat and mass balance.

The universal formula is:

$$G_W = G_{ST} \,(H_1 - H_2) : (H_2 - H_W)$$

In which:

G_W = Injection water mass

G_{ST} = Inlet steam mass

H_1 = Enthalpy of the inlet steam

H_2 = Enthalpy of the outlet steam

H_W = Enthalpy of the injection water

This formula enables calculation of the quantity of water required to lower the inlet steam temperature to the set - point temperature of the outlet steam.

YARWAY MODEL AT 38/48

STANDARD DUTY A.T.-TEMP DESUPERHEATER

IMPORTANT SYSTEM PARAMETERS

Apart from the spray quality of the atomizer (primary atomization) there are other system parameters which influence the Desuperheater stations performance. These are:

Inlet steam velocity

At high steam velocities, water droplets are easily disintegrated. This factor contributes to the overall atomization quality (secondary atomization). The minimum acceptable steam velocity varies as a function of the nozzle size and pipe diameter. In case of doubt, consult Yarway.

Water to steam ratio

This ratio is determined by dividing G_W by G_{ST}. For system steam pressures below 15 bar, this ratio should not exceed 10% for the normal operating conditions. Systems operating between 15 and 25 bar can have a ratio of up to 15%. For higher pressure duties, consult Yarway.

Distance to sensor

The distance from the injection point to the temperature sensor should be 12 to 15 meters. Systems operating at pressures above 25 bar can have significantly less run to the sensor, consult Yarway.

Required straight pipe run

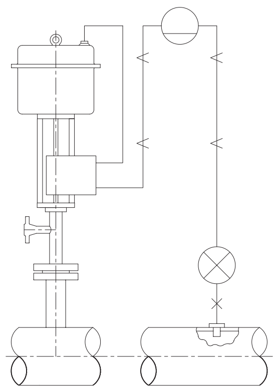
The distance from injection point to the first pipe bend is also a function of steam pressure, temperature and nozzle size. Experience has shown that in systems up to 25 bar, 4 to 6 meters, is an acceptable distance.

ACTUATORS

Control systems

The injection water quantity is controlled as a function of the outlet steam temperature. The A.T.-Temp Desuperheater actuation is compatible with conventional control systems operated from temperature transmitters, temperature indicating controllers and positioners. Fully pneumatic or fully electric systems are compatible and also combinations of the two. Exact requirements should be specified in the ordering/sizing data paragraph of this brochure.

FIGURE 5



ACTUATOR STEM FORCES

The stem forces for the Standard Duty A.T.-Temp Desuperheater are determined by the following formula:

Model 38: P water x 62 + 1000 = Newton (P water in bar)
The maximum stem force must be limited to 15 kN.

Model 48: P water x 68 + 1250 = Newton (P water in bar)
The maximum stem force must be limited to 50 kN.

Special care should be taken when electric actuators are used. By their momenta of inertia these actuators can generate stem forces exceeding the specified nominal stem force during short intervals. Special spring loaded couplings are supplied for such applications.

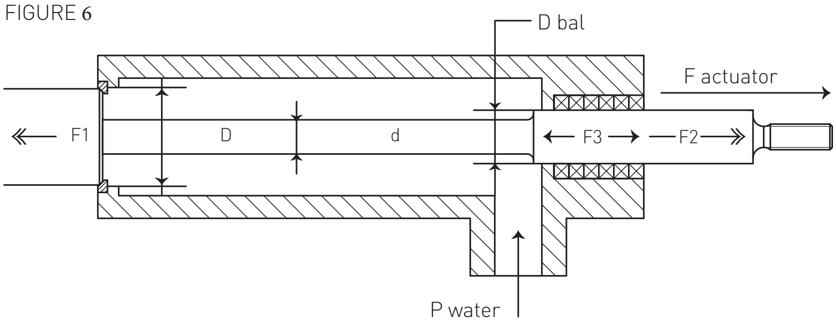
Actuator sizing formula

Units:

D seat in cm
d stem in cm
D bal in cm
P water in bar

F1 = π / 4 (**D** seat^2 - **d** stem^2) x **P** water
F2 = π / 4 (**D** bal^2 - **d** stem^2) x **P** water
F3 = **F** friction (+ or -).

FIGURE 6



ORDERING / SIZING DATA

Steam Desuperheaters are selected specifically against application data. For optimal sizing, the following comprehensive data should always be supplied.

Steam data

Inlet pressure	bar
Inlet temperature	°C
Outlet temperature	°C setpoint
Steam flow max.	t / hr
Steam flow normal	t / hr
Steam flow min.	t / hr

Water data

Water pressure	bar
Water temperature	°C

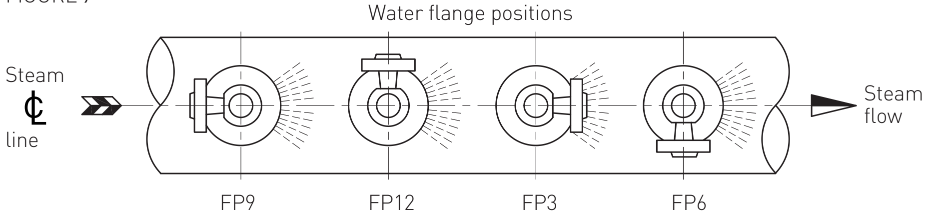
General

Pipe size	mm
Pipe schedule	
Required water flange position	(9) (12) (3) (6)

It is essential not to over specify the required turndown ratio i.e.: $\frac{\text{Steam flow max.}}{\text{Steam flow min.}}$

Otherwise this will necessitate selection of special nozzle heads which are non - stock items. Standard stock consists of nozzles with 6 or 9 equally sized atomizers giving turndown ratios of 18:1 and 27:1 respectively, on the water flow control. Experience shows that the majority of applications fall within this range.

FIGURE 7



Spray water must be injected in the direction of the steam flow. To facilitate installation of the water supply line, 4 different spray head positions are available in relation to the water connecting flange. Specification of this spray head orientation is required with the ordering data.

Yarway always recommends a strainer with a mesh size of approx. 100 μ (400 μ upon request) in the water supply line to protect the A.T.-Temp Desuperheater from clogging.

YARWAY MODEL AT 38/48

STANDARD DUTY A.T.-TEMP DESUPERHEATER

TABLE 1 - STANDARD MATERIALS

Item	Name	ASME	EN
1+2	Spray Cylinder/Nozzle	S41000/S41000	1.4006/1.4006
		S41000/Alloy 6	S41000/Alloy 6
3	Piston ring	S43100 (1)	1.4057 (1)
4	Piston	S43100 (1)	1.4057 (1)
5	Fastener ring	SA182 F11 Class 2	1.4057 (1)
7	Stem	S43100 (1)	1.4057 (1)
8	Seat housing	SA 105/Alloy 6 or 17% Cr	1.0460/Alloy 6 or 17% Cr
		SA182 F11 Class2/Alloy 6 or 17% Cr	1.0460/Alloy 6 or 17% Cr
9	Body pipe	SA106 Grade B	1.0345
		SA335 P11	1.7335
10	Water flange	SA105	1.0460
		SA182 F11 Class 2	1.7335
11	Adaptor	SA106 Grade B	1.0345
		SA335-P11	1.7335
12	Packing Box Ring	S43100 (1)	1.4057 (1)
13	Packing box	SA105	1.0460
		SA182 F11 Class2	1.7335
14	Nut, Hex	SA194 GR7 (4)	SA194 GR7 (4)
15	Packing set	GRAPHITE K80/K80S	GRAPHITE K80/K80S
16	Stud Bolt	SA193 GR B16 (4)	SA193 GR B16 (4)
17	Packing Follower	S43100 (1)	1.4057 (1)
18	Packing Flange	S30400	1.4301
19	Name plate	SST	SST
20	Yoke Locknut	SA105 (3)	SA105 (3)
23	Securing Washer	CARBON STEEL (2)	CARBON STEEL (2)
24	Body flange	SA105	1.0460
		SA182 F11 Class2	1.7335

NOTE

(1) Nitrided
(2) Zinc plated
(3) NCF
(4) ENC

Certification

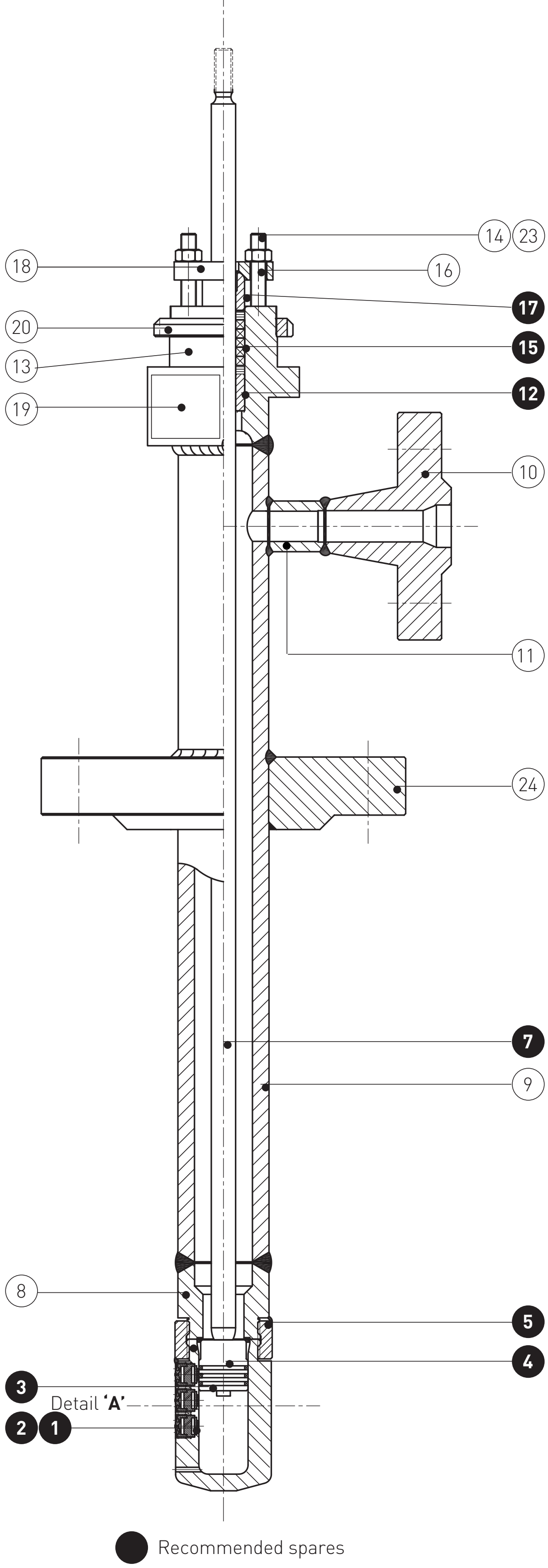
A.T.-Temp Desuperheaters comply with the requirements of ASME B16.34 and EN 12516.

All data subject to changes.

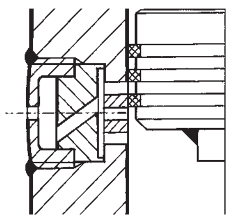
Other materials are available upon request.

Materials and data of units supplied, may deviate from this brochure. Please consult order documents in case of doubt.

FIGURE 8



Detail 'A'



YARWAY MODEL AT 38/48

STANDARD DUTY A.T.-TEMP DESUPERHEATER

TABLE 2 - DIMENSIONS (mm)

		Model 38	Model 48
		Qmax = 25 m³/ hr.	Qmax = 50 m³/ hr.
	Standard length for steam line sizes up to 12" (DN 300)		
A	55 mm travel	380	
	90 mm travel	399	399
B	55 mm travel	436	
	90 mm travel	476	476
	Option: standard length for steam line sizes 14" (DN 350) and higher		
A	55 mm travel	580	
	90 mm travel	599	599
B	55 mm travel	636	
	90 mm travel	676	676
C		200	200
D		290	380
E		300	300
F		108	108
G		M16 X 2.00	M16 x 2.00
K		3 9/16" Yoke Boss	3 9/16" Yoke Boss
L		See table 2-1	See table 2-2
M		min. 68.0	min. 80.0
N		60.3 x 11.1	73.0 x 14.0
P		64.0	78.0

STROKE

55 mm travel - Minimum pipeline diameter 6"

90 mm travel - Minimum pipeline diameter 8"

TABLE 2-1 DIMENSIONS (mm)

		PN25/40	PN63	PN100	PN160	PN250
	DN 25	150	150	150	150	150
	DN 40	150	150	150	150	150
	DN 50	150	150	150	150	150
L (mm) AT38		CL150	CL300	CL600	CL900	CL1500
	NPS 1	150	150	150	150	150
	NPS 1-1/2	150	150	150	150	150
	NPS 2	150	150	150	200	200

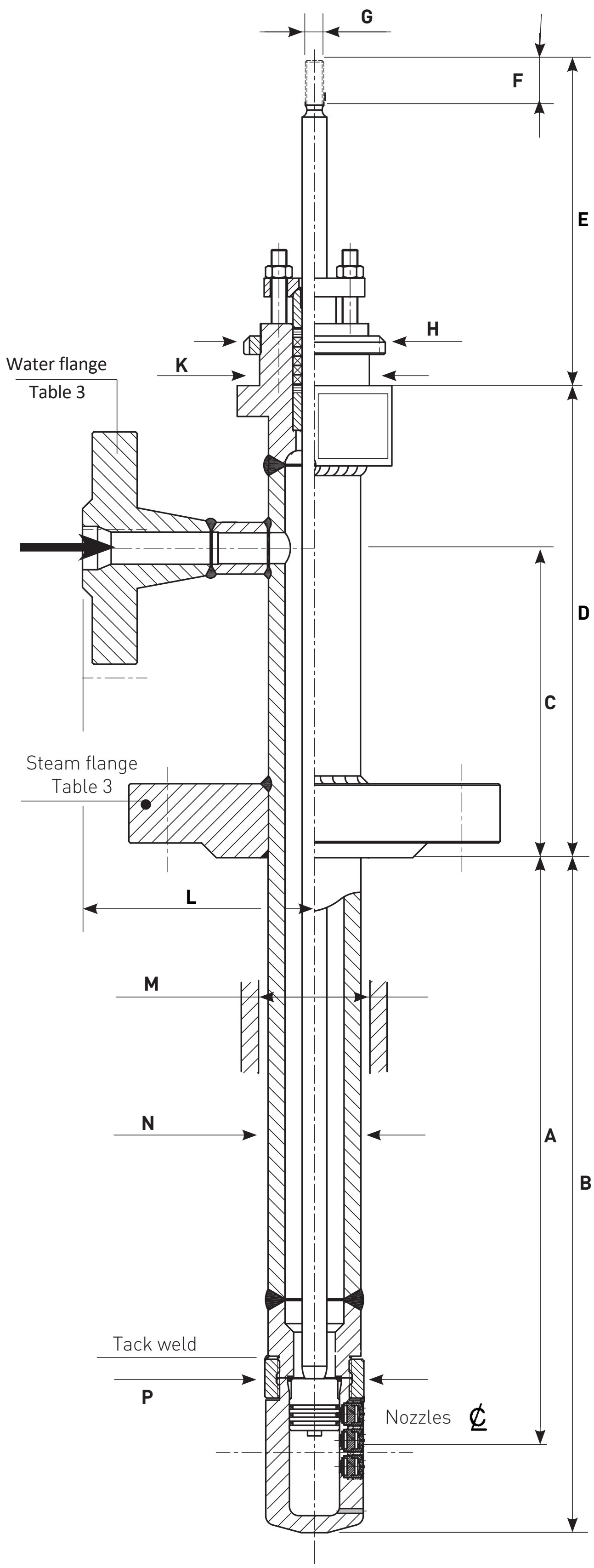
TABLE 2-2 DIMENSIONS (mm)

		PN25/40	PN63	PN100	PN160	PN250
	DN 40	150	150	150	150	150
	DN 50	150	150	150	150	200
	DN 80	150	200	200	200	250
L (mm) AT48		CL150	CL300	CL600	CL900	CL1500
	NPS 1-1/2	150	150	150	200	200
	NPS 2	150	150	150	250	250
	NPS 3	200	200	200	250	250

TABLE 3 - FLANGE CONNECTIONS

	Model 38	Model 48
	Qmax = 25 m³/ hr.	Qmax = 50 m³/ hr.
Steam flange	NPS 3 Class 150 through 1500	NPS 4 Class 150 through 1500
	DN 80 PN 25 through 250	DN 100 PN 25/40 PN 25 through 250
Water flange	NPS 1 - 1½ - 2 Class 150 through 1500	NPS 1½ - 2 - 3 Class 150 through 1500
	DN 25- 40 - 50 PN 25 through 250	DN 40 - 50 - 80 PN 25 through 250

FIGURE 9



YARWAY MODEL AT 38/48
STANDARD DUTY A.T.-TEMP DESUPERHEATER

Fisher™ 262K Filter

The Fisher 262K Y-type filter is designed to remove dirt, scale, and other solid substances from the air supply to actuators and instruments.

Typical Fisher 262K Filter

W7910

Features

- **Excellent Filtration**—Resin-impregnated cellulose filter captures particles as small as 40 microns.

- **Application Flexibility**—Versatility, reliability, and ease of maintenance permits meeting needs of virtually all users of pipelines carrying liquids, gases, or vapors.

Construction

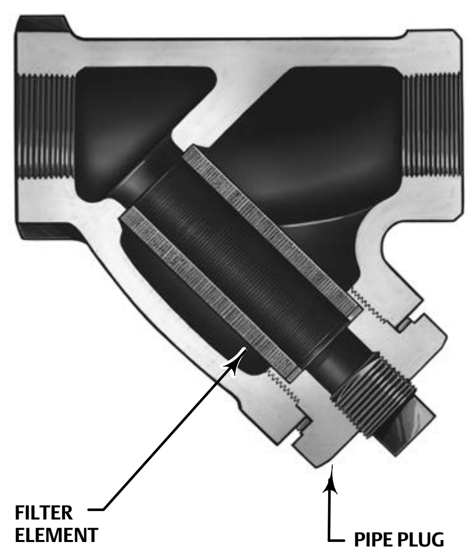
Screwed body available in cast iron (Style B) or stainless steel (Style SSB), with resin-impregnated cellulose filter, and screwed clean-out connection.

Installation

Orientation must be so that flow is in the direction of the arrow cast on the body. As shown in figure 1, when the 262K filter is mounted in a horizontal line, the filter element must be pointed down. When mounted in a vertical line, the filter element must also point down, with the flow passing from top to bottom.

Dimensions are shown in figure 2.

Figure 1. Construction Details



W0225

Specifications

Body Size

NPS 3/4

End Connection Styles

3/4 NPT screwed

Maximum Inlet and Outlet Pressure Capabilities(1, 2)

Cast Iron: 28 bar at 65°C (400 psig at 150°F)
Stainless Steel: 41 bar at 65°C (600 psig at 150°F)

Temperature Capabilities(1)

Cast Iron: -28 to 208°C (-20 to 406°F)
Stainless Steel: -54 to 208°C (-65 to 406°F)

Flow Coefficients

C_V : 3.96

Clean Out Connection

Screwed

Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

CE Ex II 2 G D Ex h IIC Tx Gb
Ex h IIIC Tx Db

Maximum surface temperature depends on operating conditions
Gas: T6...T2
Dust: T85...T208

Construction Materials

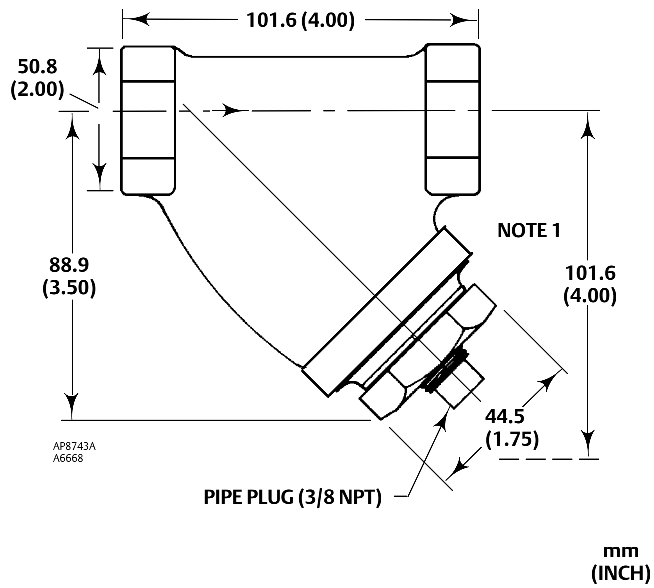
Body: ■ Cast Iron or ■ Stainless Steel (CF8M)
Drain Plug: ■ Bronze (B62) or ■ Stainless Steel (316 SST)
Pipe Plug: ■ Brass or ■ Stainless Steel (316 SST)
Gaskets: Chloroprene
Filter Element: Resin-impregnated cellulose

Approximate Shipping Weight

Cast Iron: 1.36 kg (3 lbs)
Stainless Steel: 5 .4 kg (12 lbs)

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation should not be exceeded.
2. A pressure exceeding this value can cause failure of, or leakage from, pressure-containing components.

Figure 2. Fisher 262K Dimensions



1. Minimum clearance required to remove filter element.

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Sorocaba, 18087 Brazil
Cernay 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com