

# 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. 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.

## 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.



X0183-1

FISHER HP VALVE WITH 667 ACTUATOR AND FIELDVUE™ DVC6200 DIGITAL VALVE CONTROLLER

## 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<sup>(1)</sup> and Valve Sizes**

See table 1

**Common Characteristics:** Designed according to: ■ ASME B16.34 Valve-Flanges, Threaded and Welding End and ■ ANSI/ISA-75.08.06

**End Connections Styles<sup>(1)</sup>**

See table 1

**Maximum Inlet Pressure and Temperature<sup>(1,2)</sup>**

**Flanged, Socketwelding, or Buttwelding:** Consistent with CL900, 1500, and 2500 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<sup>(1)</sup>**

**Valve with Standard Cage:** See figure 12

**Valve with Cavitrol™ III Cage:** 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, for more information

**Valve with Whisper Trim™ III Cage:**

- 0.6  $\Delta P/P_1$  maximum for levels A1 and A3
- 0.75  $\Delta P/P_1$  maximum for levels B1 and B3
- 0.85  $\Delta P/P_1$  maximum for levels C1 and C3
- 0.99  $\Delta P/P_1$  maximum for levels D1 and D3

**Valve with WhisperFlo™ Trim:**

- **Levels X, Y, and Z:** 0.94  $\Delta P/P_1$  maximum. If greater than 0.94  $\Delta P/P_1$ , consult your Emerson Process Management sales office

**Shutoff Classifications**

See table 4

**Construction Materials**

**Valve Body and Bonnet:**

- WCC steel<sup>(3)</sup>, ■ WC9 Cr-Mo steel<sup>(3)</sup>, ■ C12A

chrome-moly alloy, ■ CF8M, CD3MN, and CD3MWCuN stainless steel, and ■ LCC for low temperature service

**Trim:** See table 12

**Other Parts:** See table 7

Consult your Emerson Process Management sales office for special trim and valve body material availability.

**Material Temperature Capabilities<sup>(1)</sup>**

**HPD, HPAD, HPS, and HPAS:** Up to 566°C (1050°F) unless limited (see tables 7 or 12 and figure 12)

**HPT and HPAT:** Up to 232°C (450°F) unless limited (see tables 7 or 12 and figure 12)

**Flow Characteristics<sup>(4)</sup>**

**Standard Cages:** ■ Linear, ■ equal percentage, ■ modified equal percentage<sup>(5)</sup>

**Cavitrol III and Whisper Trim III 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<sup>(6)</sup>
- **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 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, 8, 9, and 11

- continued -

**Specifications (continued)**

**Bonnet Style and Mounting<sup>(1)</sup>**

- **Standard Bonnet:** See figure 1
- Yoke Temperature Limit:** Standard bonnet with cast iron yoke is limited to 537°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 14 and 15)

**Packing Arrangements**

- Single, ■ Double, and ■ Leakoff standard packing, or optional ■ ENVIRO-SEAL™ and ■ HIGH-SEAL packing systems. See figure 4. Also see bulletin 59.1:061, ENVIRO-SEAL and HIGH-SEAL Packing System for Sliding-Stem Valves

**Yoke Boss Diameter for Actuator Mounting**

See tables 5 and 10, and figures 13, 14, and 15

**Approximate Weight**

See table 6

**Options<sup>(1)</sup>**

- Valves with weld-end fittings have increased pressure/temperature ratings, called intermediate ratings<sup>(7)</sup>. ■ Class V<sup>(6)</sup> shutoff for HPT and HPAT to 316°C (600°F) using PEEK anti-extrusion rings<sup>(8)</sup>, ■ Class V shutoff for HPD and HPAD to 593°C (1100°F) using C-seal trim, ■ expanded ends<sup>(7)</sup> 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<sup>(7)</sup>

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 Process Management 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 Process Management 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 Process Management sales office.  
 8. Required for all boiler feedwater applications.

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Figure 1. Fisher HPD Valve Assembly (NPS 2 to 6)

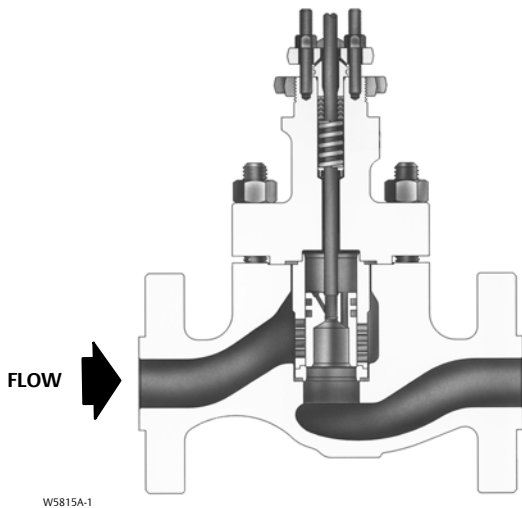
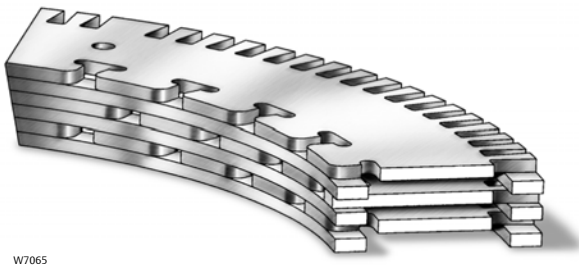


Figure 2. Typical WhisperFlo Trim Cut Section View for Fisher HP Valve



## 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, and HPAT control valves.

To help attenuate aerodynamic noise in gaseous service, Whisper Trim III and WhisperFlo (figure 2) cages are available with HPD, HPAD, HPS, HPAS, HPT, and HPAT control valves. Contact your Emerson Process Management 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.
- **Compliance with the Clean Air Act**—Optional ENVIRO-SEAL packing systems (figure 4) 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 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.

## 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 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 butt-weld end valve bodies are offered with expanded ends.

■ **Standard Hard Trim Materials**—The cage, valve plug, and other trim parts are manufactured from hardened materials. This standard feature provides excellent wear resistance.

■ **Control of Low Flow Rates/Tight Shutoff**—Micro-Flute and Micro-Form valve plugs (figures 6 and 7, 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 Process Management sales office for more information.

■ **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. Contact your Emerson Process Management sales office for further information on intermediate ratings.

■ **Trim Interchangeability**—Cavitrol III, Whisper Trim III, and WhisperFlo trims (figures 8, 9, and 10) are interchangeable with standard trims.

■ **Smooth Control at High Pressure Drops**—Available on NPS 2 through 6 valves, balanced trim provides smooth control at high pressure drops.

■ **High-Temperature Capability with Class V Shutoff**—Use of C-seal trim (see figure 5) permits Class V shutoff up to 593°C (1100°F) for 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**

DESIGN	VALVE SIZE, NPS	PRESSURE RATING	VALVE BODY MATERIAL AND END CONNECTION STYLE <sup>(1, 2)</sup>	
			WCC, WC9, LCC, C12A, CF8M, CD3MN, and CD3MWCuN Stainless Steel Cast Valves	SA-105, SA-182-F22, SA-182-F316, S31803 F51, and S32760 F55 forged SST (for forged steel HPA CL2500 angle valves)
			RF or RTJ Flanged, Butt Weld, and Socket Weld <sup>(3)</sup>	Socket Weld
HPAD	2 to 8	CL900 and 1500	X	---
	2	CL2500	---	X
HPAS	1 to 2	CL900 and 1500	X	---
		CL2500	---	X
HPAT	2 to 8	CL900 and 1500	X	---
	2	CL2500	---	X
HPD	2 to 6	CL900 and 1500	X	---
	2	CL2500	X	---
HPS	1 to 3	CL900 and 1500	X	---
	1 to 2	CL2500	X	---
HPT	2 to 6	CL900 and 1500	X	---
	2	CL2500	X	---

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 Process Management sales office.  
 3. Socket Weld available on NPS 1, 1-1/2, and 2 only.

**Table 2. Typical Flow Coefficients<sup>(1)</sup>**

Valve Size, NPS	Valve Style	Characteristic	Maximum Cv
1	HP CL1500	Modified Equal Percentage	17.1
2	HP CL1500	Linear	52.2
3	HP CL1500	Linear	121
4	HP CL1500	Linear	201
6	HP CL1500	Linear	425
1	HPA CL1500	Modified Equal Percentage	19.5
2	HPA CL1500	Linear	64.3
1	HPA CL2500	Modified Equal Percentage	14.3
2	HPA CL2500	Linear	47.4

1. See the section titled Coefficients in this bulletin and also Catalog 12 for a complete listing of flow coefficients.

**Table 3. Increased Pressure/Temperature Ratings for Steel Valves with BWE and SWE Connections<sup>(1)</sup>**

Valve Type	Valve Size, NPS	Pressure Rating	Intermediate Rating (ASME B16.34)
Globe Valves	1	CL900 and 1500	1675
		CL2500	2800
	2	CL900 and 1500	1694
		CL1500	1578
	4	CL1500	2017
		CL1500	1876

1. Contact your Emerson Process Management sales office for further information on intermediate ratings.

**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		47.6 (1.875)		II		
		58.7 (2.3125) to 92.1 (3.625)		II - Standard III - Optional		
		111.1 (4.375) and larger		III - Standard		
				IV - Optional		
HPD, HPAD w/ C-seal trim	Valve Size, NPS		Port Diameter, mm (Inches)	ANSI/FCI and IEC Leakage Class		
	HPD	HPAD				
	3	4	73 (2.875)		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)			Eq. %, Mod. Eq. %, 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)			
HPS, HPAS, HPT, HPAT		All	Cavitrol III and Micro-Flat Micro-Form, Micro-Flute, Eq. %, Mod Eq. %, Linear, Whisper III	V - Standard 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 <sup>(1)</sup> Anti-Extrusion Rings		47.6 (1.875) to 136.5 (5.375)	All	V - Standard (to 316°C [600°F]) IV - Optional (47.6 mm [1.875 inch] through 136.5 mm [5.375 inch] ports)		

1. PEEK (PolyEtherEtherKetone), required for all boiler feedwater applications.

## 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, 8, 11, and 12 and figure 12. The temperature capabilities determined from figure 12 may be further limited by the temperature capabilities of materials selected

from tables 7 and 12. Refer to figure 12 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.

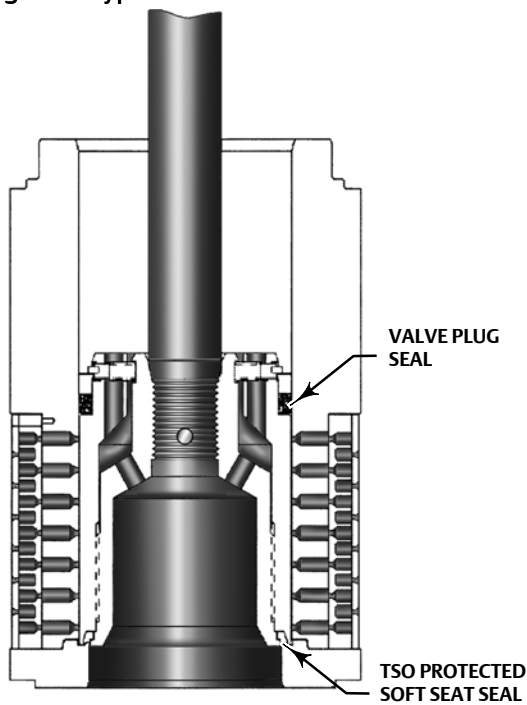
Overall dimensions are shown in figures 13, 14, and 15. Face-to-face dimensions are in compliance with ANSI/ISA-75.08.06. Actual end connection dimensions conform to ASME B16.25 for butt welding ends and to ASME B16.5 for flanged ends.

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 <sub>v</sub> REDUCTION AT 100% TRAVEL <sup>(1)</sup>	UNBALANCE AREA
		mm	Inch	mm	Inch	Nominal		Actual TSO			
						mm	Inch	mm	Inch		mm
<b>Balanced Plugs—Flow Down Only</b>											
HPT NPS 3 <sup>(2)</sup>	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	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	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
<b>Unbalanced Plugs—Flow Down Only</b>											
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<sub>v</sub> of the trim listed in the TRIM column.  
2. Not available with 5-inch yoke boss.

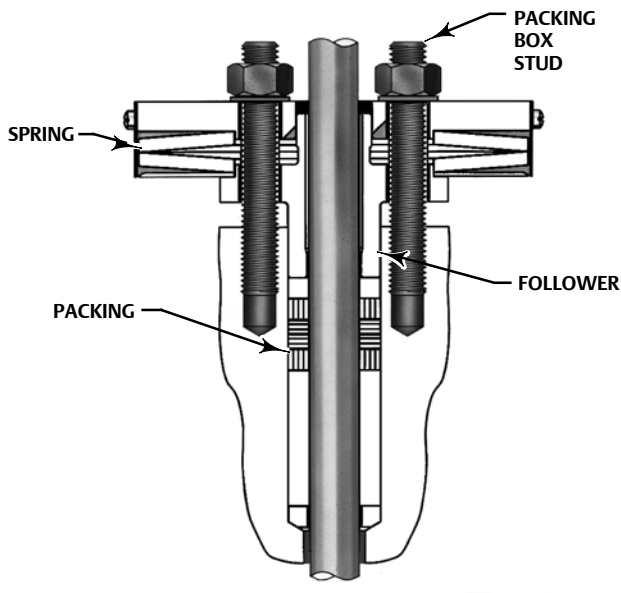
Figure 3. Typical Balanced TSO Trim



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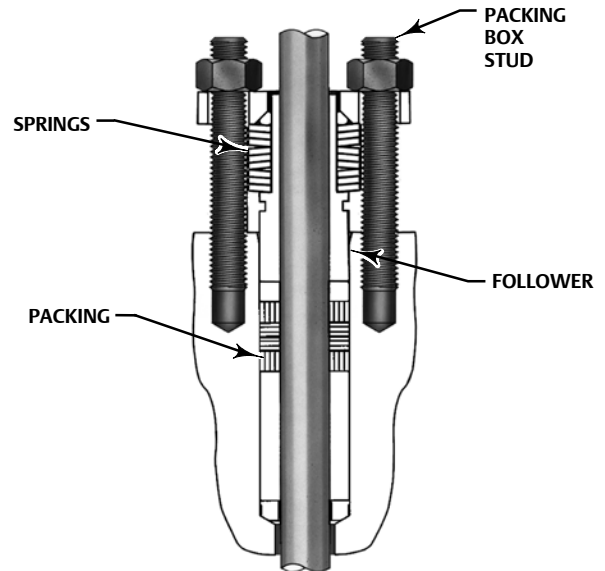


Figure 4. ENVIRO-SEAL and HIGH-SEAL Packing Systems



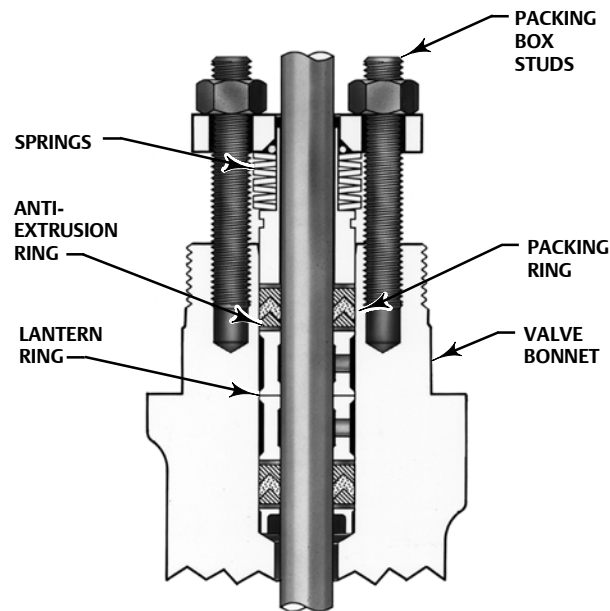
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TYPICAL HIGH-SEAL PACKING SYSTEM  
WITH GRAPHITE ULF PACKING



W8532-1

TYPICAL ENVIRO-SEAL PACKING SYSTEM  
WITH GRAPHITE ULF PACKING



W5803-3

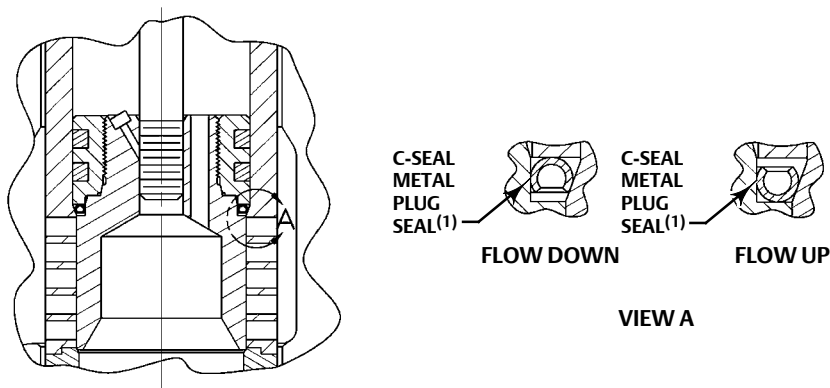
TYPICAL ENVIRO-SEAL PACKING SYSTEM  
WITH PTFE PACKING

**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
	4	CL900	230	---	507	---
		CL1500	249	201	548	444
	6	CL900	511	---	1127	---
CL1500		557	455	1228	1003	
Angle Valves	1	CL900 and 1500	40	36	88	80
		CL2500	---	72 <sup>(1)</sup>	---	160 <sup>(1)</sup>
	2	CL900 and 1500	69	50	153	110
		CL2500	---	109 <sup>(1)</sup>	---	240 <sup>(1)</sup>
	3	CL1500	123	78	272	173
	4	CL1500	181	117	399	258
	6	CL1500	357	202	788	445
	8	CL1500	648	405	1428	893

1. Only SWE is available for CL2500.

**Figure 5. C-seal Trim**



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**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 7. 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
		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)	-46 to 537 (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 <sup>(5)</sup>
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
Valve Body-to-bonnet bolting <sup>(1)</sup>	Studs Nuts	Steel SA193-B7 (all valve body materials) Steel SA194-2H (all valve body materials)	-29 to 427 (WCC and WC9) -46 to 371 (LCC) -48 to 427 (316 CF8M) <sup>(2)</sup>	-20 to 800 (WCC and WC9) -50 to 700 (LCC) -55 to 800 (316 CF8M) <sup>(2)</sup>
		Studs Nuts	Steel SA193-B7M for sour service Steel SA194-2HM for sour service	-29 to 427 (WCC) -46 to 371 (LCC)
	Studs Nuts	Steel SA193-B16 (WC9 and C12A valve body mat'ls) Steel SA194-7	-29 to 510	-20 to 950
	Studs Nuts	N07718 SST (SB637) <sup>(3)</sup> Steel SA194-7	-29 to 566 (WC9) -29 to 593 (C12A)	-20 to 1050 (WC9) -20 to 1100 (C12A)
	Studs Nuts	S31600 stainless steel SA193-B8M (strain hardened) (CF8M valve body mat'ls) <sup>(4)</sup> S31600 stainless steel SA194-8M (CF8M valve body mat'ls) <sup>(4)</sup>	-198 to 427	-325 to 800
	Studs Nuts	S20910 SST (SA479-XM-19) <sup>(3)</sup> (CF8M valve body mat'ls) Steel SA194-7	-198 to 593	-325 to 1100
Packing		PTFE V-ring	-46 to 232	-50 to 450
		Graphite ribbon filament (oxidizing service to 371 °C [700 °F])	-254 to 537	-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. Valve body materials with which these bolting materials may be used are shown in parentheses.  
2. Steel studs and nuts with NCF (non-corroding finish) coating are used with NPS 4 and 6 CF8M valve bodies.  
3. These stud materials are not listed in ASME B16.34.  
4. For valve sizes up through NPS 3.  
5. 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.

Table 8. Additional Globe Valve Specifications

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches
1	Equal percentage	HPS w/Micro-Flute	6.4 12.7	0.25 0.5	19 19	0.75 0.75	12.7 12.7	1/2 1/2
		HPS 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 12.7, 19.1	1/2 1/2 1/2, 3/4
	Modified equal percentage	HPS w/Micro-Form	19.1 25.4	0.75 1	29 29	1.125 1.125	12.7, 19.1 12.7, 19.1	1/2, 3/4 1/2, 3/4
	Linear (cage style: Cavitrol III, 2-stage)	HPS	22.2	0.875	38	1.5	12.7, 19.1	1/2, 3/4
2	Equal percentage	HPS 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 12.7, 19.1	1/2 1/2 1/2, 3/4
		HPS	47.6	1.875	29	1.125	12.7, 19.1, 25.4 <sup>(1)</sup>	1/2, 3/4, 1 <sup>(1)</sup>
	Linear (cage style: Std)							
	Linear (cage style: Whisper Trim III, level A1)	HPS, HPD, HPT	47.6	1.875	38	1.5	12.7, 19.1, 25.4 <sup>(1)</sup>	1/2, 3/4, 1 <sup>(1)</sup>
	Modified equal percentage	HPS w/Micro-Form	25.4 31.8 38.1	1 1.25 1.5	29 29 38	1.125 1.125 1.5	12.7, 19.1, 25.4 12.7, 19.1, 25.4 12.7, 19.1, 25.4	1/2, 3/4, 1 1/2, 3/4, 1 1/2, 3/4, 1
		HPS, HPD, HPT	47.6	1.875	38	1.5	12.7, 19.1, 25.4 <sup>(1)</sup>	1/2, 3/4, 1 <sup>(1)</sup>
	Linear (cage style: Cavitrol III, 2-stage)	HPT	44.5	1.75	51	2	12.7, 19.1	1/2, 3/4
Linear (cage style: Cavitrol III, 3-stage)	HPS	25.4	1	51	2	19.1	3/4	
3	Modified equal percentage	HPD, HPT	73	2.875	51	2	12.7, 19.1, 25.4	1/2, 3/4, 1
	Linear (cage style: Std)							
	Linear (cage style: Whisper Trim III, level A1, B1)							
	Linear (cage style: Cavitrol III, 2-stage)	HPT	63.5	2.5	64	2.5	12.7, 19.1, 25.4	1/2, 3/4, 1
	Linear (cage style: Cavitrol III, 3-stage)	HPT	47.6	1.875	64	2.5	12.7, 19.1, 25.4	1/2, 3/4, 1

-continued-

Table 8. Additional Globe Valve Specifications (Continued)

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches
4	Modified equal percentage	HPD, HPT	92.1	3.625	51	2	19.1, 25.4	3/4, 1
	Linear (cage style: Std)							
	Linear (cage style: Whisper Trim III level A1, A3, B3, C3)							
	Linear (cage style: Whisper Trim III level D3)	HPD, HPT	73	2.875	51	2	19.1, 25.4	3/4, 1
	Linear (cage style: Cavitrol III, 2-stage)	HPT	87.3	3.4375	76	3	19.1, 25.4	3/4, 1
	Linear (cage style: Cavitrol III, 3-stage)	HPT	73	2.875	76	3	19.1, 25.4	3/4, 1
6	Modified equal percentage <sup>(2)</sup>	HPD, HPT	136.5	5.375	76	3	19.1, 25.4, 31.8	3/4, 1, 1-1/4
	Linear (cage style: Std)							
	Linear (cage style: Whisper Trim III, level A1, B3, C3)	HPD, HPT	136.5	5.375	76	3	25.4, 31.8	1, 1-1/4
	Linear (cage style: Whisper Trim III, level D3)	HPD, HPT	111.1	4.375	76	3	25.4, 31.8	1, 1-1/4
	Linear (cage style: Cavitrol III, 2-stage)	HPD, HPT	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)	HPD, HPT	115.9	4.5625	102	4	19.1, 15.4, 31.8	3/4, 1, 1-1/4

1. Available only with HPS valve.  
2. The first 75% is equal percentage.

Table 9. Valve Stem Travels for CL2500 Globe Valves

VALVE SIZE, NPS	VALVE DESIGN / PLUG STYLE	CHARACTERISTIC	PORT DIAMETER		MAXIMUM VALVE STEM TRAVEL	
			mm	Inches	mm	Inches
1	HPS / Micro-Form or Micro-Flute	Equal Percentage	6.4, 9.5, 12.7, 19.1, 25.4	0.25, 0.375, 0.5, 0.75, 1	19.1	0.75
		Modified Equal Percentage	6.4, 9.5, 12.7, 19.1, 25.4	0.25, 0.375, 0.5, 0.75, 1	25.4	1
2	HPS / Micro-Form	Equal Percentage	6.4, 19.1, 25.4, 31.8	0.25, 0.75, 1, 1.25	19.1	0.75
		Modified Equal Percentage	6.4, 19.1, 25.4, 31.8	0.25, 0.75, 1, 1.25	28.6	1.125
	HPS / Micro-Form	Equal Percentage	38.1	1.5	28.6	1.125
		Modified Equal Percentage	38.1	1.5	38.1	1.5
	HPS	Linear	47.6	1.875	25.4	1
		Equal Percentage				
		Modified Equal Percentage				
	HPD, HPT	Linear	47.6	1.875	25.4	1
		Equal Percentage				
		Modified Equal Percentage				

Table 10. Globe and Angle Valve Yoke Boss and Valve Stem Diameter Combinations<sup>(1)</sup>

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	71	0.5	2-13/16	25.4	127	1	5
	19.1	90	0.75	3-9/16				
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	127	1	5	19.1	71	0.75	3-9/16
	31.8	127	1.25	5				
8 <sup>(2)</sup>	25.4	127	1	5	19.1	71	0.75	3-9/16
	31.8	127	1.25	5				

1. See tables 8, 9, and 11 for valve stem diameters available for specific constructions.  
2. Angle valve construction only (HPAD, HPAT).

Table 11. Additional Angle Valve Specifications

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	FLOW DIRECTION	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
				mm	Inches	mm	Inches	mm	Inches
1	Equal percentage	HPAS w/Micro-Flute	Up <sup>(2)</sup>	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
		HPAS w/Micro-Form	Up	6.4	0.25	19	0.75	12.7	1/2
				12.7	0.5	19	0.75	12.7	1/2
				19.1	0.75	19	0.75	12.7, 19.1	1/2, 3/4
	HPAS, equal percentage characterized cage	Down	19.1	0.75	19	0.75	19.1	3/4	
			12.7	0.5	29	1.125	12.7	1/2	
	Modified equal percentage	HPAS w/Micro-Form	Up	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
Linear (cage style: Std)	HPAS w/ Micro-Flat	Down	9.5	0.375	19	0.75	12.7	1/2	
			12.7	0.5	19	0.75	12.7	1/2	
			19.1	0.75	19	0.75	19.1	3/4	
Linear (cage style: Cavitrol III, 2-stage)	HPAS, HPAD	Down	22.2	0.875	38	1.5	12.7, 19.1	1/2, 3/4	
2	Equal percentage	HPAS w/Micro-Flute	Up <sup>(2)</sup>	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
		HPAS w/Micro-Form	Up	6.4	0.25	19	0.75	12.7	1/2
				12.7	0.5	19	0.75	12.7	1/2
				19.1	0.75	19	0.75	12.7, 19.1	1/2, 3/4
				25.4	1	19	0.75	12.7, 19.1, 25.4	1/2, 3/4, 1
		HPAS, equal percentage characterized cage	Down	19.1	0.75	19	0.75	19.1	3/4
				25.4	1	19	0.75	19.1	3/4
				31.8	1.25	19	0.75	25.4	1
	38.1			1.5	29	1.125	25.4	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
	Modified equal percentage	HPAS w/Micro-Form	Up	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
				19.1	0.75	29	1.125	19.1	3/4
		HPAS, equal percentage characterized cage	Down	25.4	1	29	1.125	19.1	3/4
				31.8	1.25	29	1.125	25.4	1
				38.1	1.5	38	1.5	25.4	1
HPAS				Up	47.6	1.875	38	1.5	12.7, 19.1, 25.4
HPAT, HPAD	Down	47.6	1.875	38	1.5	12.7, 19.1	1/2, 3/4		
Linear (cage style: std)	HPAS w/Micro-Flat	Down	25.4	1	29	1.125	19.1	3/4	
Linear (cage style: std)	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
Linear (cage style: Whisper III, level A1)	HPAS, HPAT, HPAD	Up	47.6	1.875	38	1.5	12.7, 19.1, 25.4 <sup>(1)</sup>	1/2, 3/4, 1 <sup>(1)</sup>	
Linear (cage style: Cavitrol III, 2-stage)	HPAT	Down	44.5	1.75	51	2	12.7, 19.1	1/2, 3/4	
Linear (cage style: Cavitrol III, 3-stage)	HPAS	Down	25.4	1	51	2	19.1	3/4	

-continued-

Table 11. Additional Angle Valve Specifications (continued)

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	FLOW DIRECTION	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
				mm	Inches	mm	Inches	mm	Inches
3	Equal percentage	HPAT, HPAD	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						
	Linear (cage style: Cavitrol III, 2-stage)	HPAT	Down	44.5	1.75	51	2	12.7, 19.1	1/2, 3/4
	Linear (cage style: Cavitrol III, 3-stage)	HPAS	Down	25.4	1	51	2	19.1	3/4
4	Equal percentage	HPAT, HPAD	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						
	Linear (cage style: Cavitrol III, 2-stage)	HPAT	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)	HPAT	Down	47.6	1.875	64	2.5	12.7, 19.1, 25.4	1/2, 3/4, 1
6	Equal percentage	HPAT, HPAD	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)	HPAT	Up	73	2.875	51	2	19.1, 25.4	3/4, 1
	Linear (cage style: Cavitrol III, 2-stage)	HPAT	Down	87.3	3.4375	76	3	19.1, 25.4	3/4, 1
	Linear (cage style: Cavitrol III, 3-stage)	HPAT	Down	73	2.875	76	3	19.1, 25.4	3/4, 1
8	Equal percentage	HPAT, HPAD	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)	HPAT, HPAD	Up	136.5	5.375	76	3	25.4, 31.8	1, 1-1/4
	Linear (cage style: Whisper III, level D3)	HPAT, HPAD	Up	111.1	4.375	76	3	25.4, 31.8	1, 1-1/4
	Linear (cage style: Cavitrol III, 2-stage)	HPAT	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)	HPAT	Down	115.9	4.5625	102	4	19.1, 25.4, 31.8	3/4, 1, 1-1/4

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.



Figure 6. Fisher HPS Trim with Micro-Flute Valve Plug

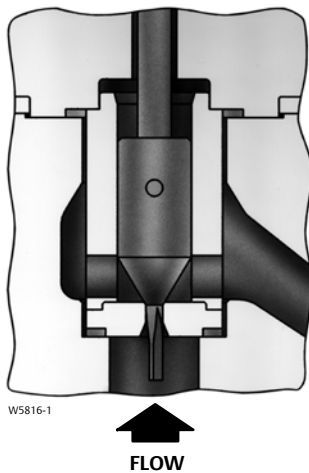
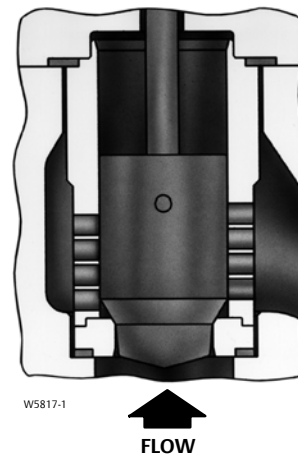


Figure 7. Fisher HPS Trim with Micro-Form Valve Plug

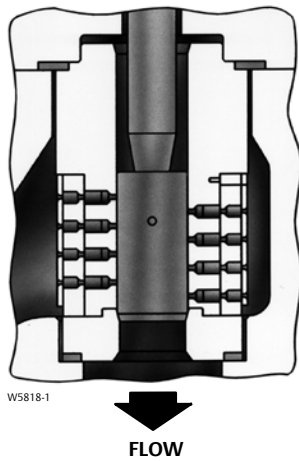


## Trim Selection Guidelines

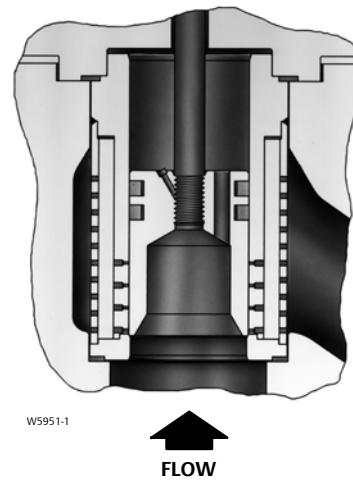
Refer to the following descriptions as a guideline for the selection of appropriate trims.

- **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 12, 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.

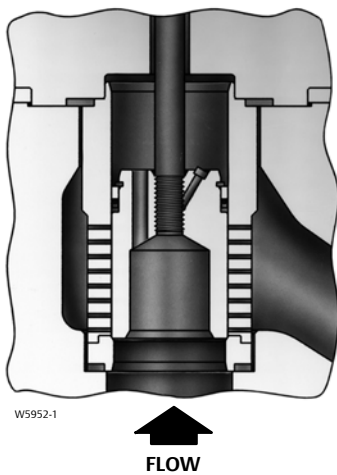
**Figure 8. NPS 2 Fisher HPS Trim with Cavitrol III 3-Stage Cage**



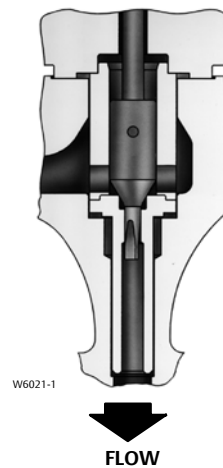
**Figure 10. Fisher HPD Trim with Whisper Trim III Level D Cage (also available in HPT and HPS)**



**Figure 9. Fisher HPT Trim with Whisper Trim III Level A1 Cage (also available in HPD [NPS 2-6] and HPS [NPS 2 and 3])**



**Figure 11. Fisher HPAS Trim with Micro-Flat Valve Plug**



## 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).

## 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 3 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 Process Management sales office.

Table 12. Trim Material Combinations

TRIM	USAGE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL <sup>(1)</sup>	OPERATING TEMPERATURE RANGE <sup>(2)</sup>	
						°C	°F
<b>With Standard Cage</b>							
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 <sup>(8)</sup>	-20 to 650 <sup>(8)</sup>
					LCC	-29 to 343	-20 to 650
					WC9	-29 to 343 <sup>(8)</sup>	-20 to 650 <sup>(8)</sup>
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 <sup>(3)</sup>	WCC	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 566	-20 to 1050
202H <sup>(4)</sup>	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) <sup>(5)</sup>	HP (NPS 1-6 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 <sup>(3)</sup>	CF8M	-198 to 593 <sup>(2)</sup>	-325 to 1100 <sup>(2)</sup>
204 (NACE) <sup>(5)</sup>	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 <sup>(3)</sup>	WCC	-29 to 427	-20 to 800
					LCC	-46 to 343	-50 to 650
					WC9	-29 to 427	-20 to 800
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 <sup>(9)</sup>	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
TC1 <sup>(10)</sup>	HPS & HPAS (NPS 1-2 CL900, 1500 & 2500)	S17400/tungsten carbide insert for seat & contour (for Micro trims) <sup>(11)</sup>	Alloy 6	S17400/tungsten carbide insert for seat & bore	WCC, WC9	-29 to 232	-20 to 450
TC2 <sup>(10)</sup>	HPS & HPAS (NPS 1-2 CL900, 1500 & 2500)	S32550/tungsten carbide insert for seat & contour (for Micro trims) <sup>(11)</sup>	Alloy 6	S32550/tungsten carbide insert for seat & bore	CF8M, CD3MN, CD3MWCuN	-29 to 232	-20 to 450
TC3 <sup>(10)</sup>	HPS & HPAS (NPS 1-2 CL900, 1500 & 2500)	N07718/tungsten carbide insert for seat & contour (for Micro trims) <sup>(11)</sup>	Alloy 6	N07718/tungsten carbide insert for seat & bore	CW6MC	-29 to 232	-20 to 450

-continued-

Table 12. Trim Material Combinations (continued)

TRIM	USAGE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL <sup>(1)</sup>	OPERATING TEMPERATURE RANGE <sup>(2)</sup>	
						°C	°F
<b>With Standard Cage</b>							
751	HP (NPS 1-6 CL900 & 1500)	≤ 1/4 inch Port: Alloy 6 > 1/4 inch, < 3 inch Port: S31803 with CoCr-A seat and guide ≥ 3 inch Port: S31803/Ultimet	S31803/Cr PI	S31803/CoCr A	CD3MN	-51 to 316	-60 to 600
752	HP (NPS 1-6 CL900 & 1500)	≤ 1/4 inch Port: Alloy 6 > 1/4 inch, < 3 inch Port: S32760 with CoCr-A seat and guide ≥ 3 inch Port: S32760/Ultimet	S32760/Cr PI	S32760/CoCr A	CD3MWCuN	-51 to 316	-60 to 600
<b>With Cavitrol III Cage</b>							
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 232 <sup>(7)</sup>	-20 to 450 <sup>(7)</sup>
					LCC		
					WC9		
215B <sup>(6)</sup>	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 232 <sup>(7)</sup>	-20 to 450 <sup>(7)</sup>
					LCC		
					WC9		
206 (NACE) <sup>(5)</sup>	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 232 <sup>(7)</sup>	-20 to 450 <sup>(7)</sup>
					LCC		
					WC9		
753	HP (NPS 1-6 CL900 & 1500)	≤ 1/4 inch Port: Alloy 6 > 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	-60 to 600
754	HP (NPS 1-6 CL900 & 1500)	≤ 1/4 inch Port: Alloy 6 > 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	-60 to 600

-continued-

Table 12. Trim Material Combinations (continued)

TRIM	USAGE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL <sup>(1)</sup>	OPERATING TEMPERATURE RANGE <sup>(2)</sup>	
						°C	°F
<b>With Whisper Trim III Cage</b>							
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 <sup>(8)</sup>	-20 to 650 <sup>(8)</sup>
					LCC		
					WC9		
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 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 <sup>(4)</sup>	HPD (NPS 6 CL900 & 1500) HPAD (NPS 8 CL900 & 1500 only)	S31600 with CoCr-A seat and guide	F22 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) <sup>(5)</sup>	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 <sup>(9)</sup>	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
751	HP (NPS 1-6 CL900 & 1500)	<b>≤ 1/4 inch Port:</b> Alloy 6 <b>&gt; 1/4 inch, &lt; 3 inch Port:</b> S31803 with CoCr-A seat and guide <b>≥ 3 inch Port:</b> S31803/Ultimet	S31803/Cr PI	S31803/CoCr A	CD3MN	-51 to 316	-60 to 600
752	HP (NPS 1-6 CL900 & 1500)	<b>≤ 1/4 inch Port:</b> Alloy 6 <b>&gt; 1/4 inch, &lt; 3 inch Port:</b> S32760 with CoCr-A seat and guide <b>≥ 3 inch Port:</b> S32760/Ultimet	S32760/Cr PI	S32760/CoCr A	CD3MWCuN	-51 to 316	-60 to 600

1. If using valve body/trim combinations other than those listed, consult your Emerson Process Management 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. Trims TC1, TC2, TC3 use S20910, S32550, and N07718 stem respectively. Use these trims for highly erosive applications.  
11. Use with Micro-Form trim in HPS, Micro-Form and Micro-Flat in HPAS valves.



Table 14. Globe Valve Dimensions with Standard Bonnet

VALVE SIZE, NPS	A <sup>(1)</sup>								
	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-buttwelding ends; SWE-socketweld ends.

Table 15. Globe Valve Dimensions with Standard Bonnet

VALVE SIZE, NPS	B <sup>(1)</sup>								
	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 <sup>(2)</sup>	221	222	230	---	230	232	---	---	
3 <sup>(3)</sup>	200	202	210	---	210	211	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 <sup>(2)</sup>	8.69	8.75	9.06	---	9.06	9.12	---	---	
3 <sup>(3)</sup>	7.88	7.94	8.25	---	8.25	8.31	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-buttwelding ends; SWE-socketweld ends.  
2. Manufactured in U.S.A.  
3. Manufactured in Europe and Japan.

Table 16. 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				
<b>CL900 and 1500</b>				
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 <sup>(1)</sup>	121	322	311	370
3 <sup>(2)</sup>	141	289	278	337
6x4, 4	175	---	300	368
8x6, 6	248	---	365	402
<b>CL2500</b>				
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				
<b>CL900 and 1500</b>				
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 <sup>(1)</sup>	4.75	12.69	12.25	14.56
3 <sup>(2)</sup>	5.56	11.38	10.94	13.25
6x4, 4	6.88	---	11.81	14.50
8x6, 6	9.75	---	14.38	15.81
<b>CL2500</b>				
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

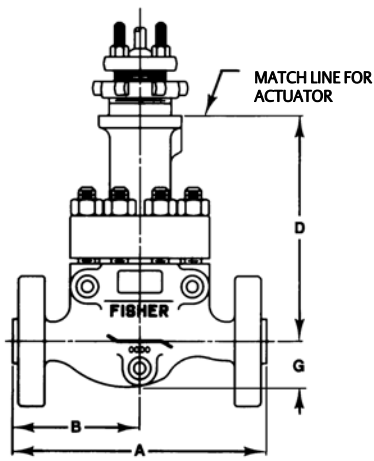
1. Manufactured in U.S.A.  
2. Manufactured in Europe and Japan.

Table 17. 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
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
2, Cavitrol III 2-Stage	77	448	464	518

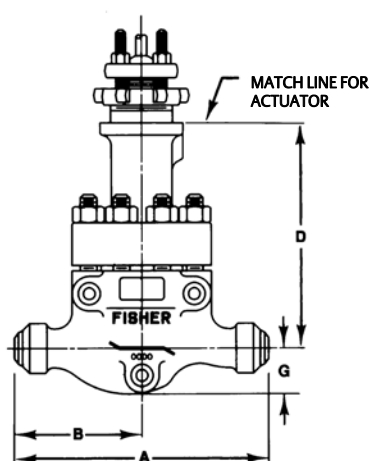


Figure 13. Globe Valve Dimensions with Standard Bonnet (also see tables 14, 15, and 16)

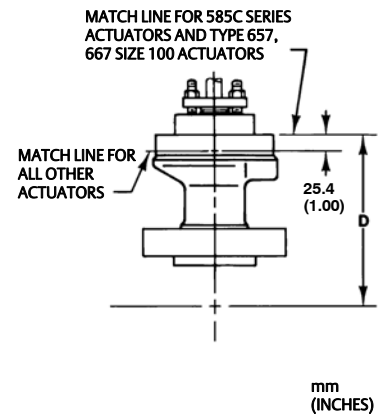


FLANGED VALVE WITH 71 OR 90 mm  
(2-13/16 OR 3-9/16 INCH)  
DIAMETER YOKE BOSS

A5700A-3



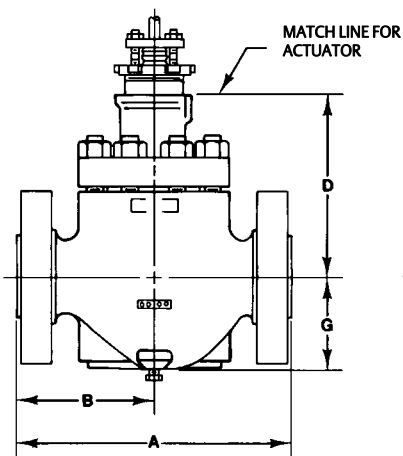
BUTTWELDING END VALVE WITH 71 OR 90 mm  
(2-13/16 OR 3-9/16 INCH)  
DIAMETER YOKE BOSS



127mm (5-INCH) DIAMETER YOKE BOSS  
FOR USE WITH ALL  
VALVES

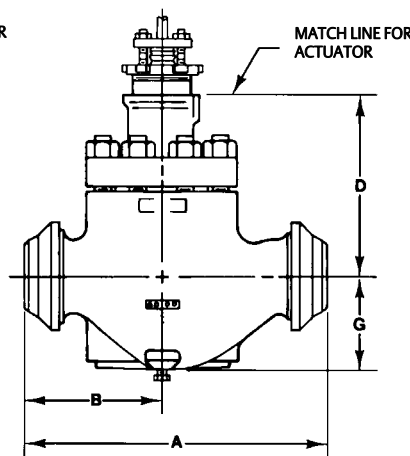
mm  
(INCHES)

TYPICAL NPS 1, 2, AND 3

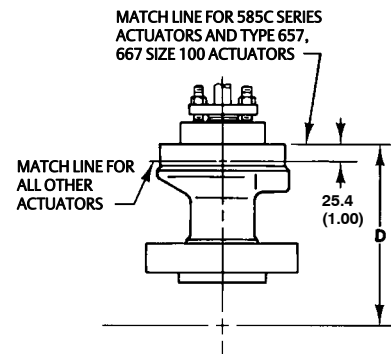


FLANGED VALVE WITH 71 OR 90 mm  
(2-13/16 OR 3-9/16 INCH)  
DIAMETER YOKE BOSS

A2719A-4



BUTTWELDING 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  
BUTTWELDING VALVE

mm  
(INCHES)

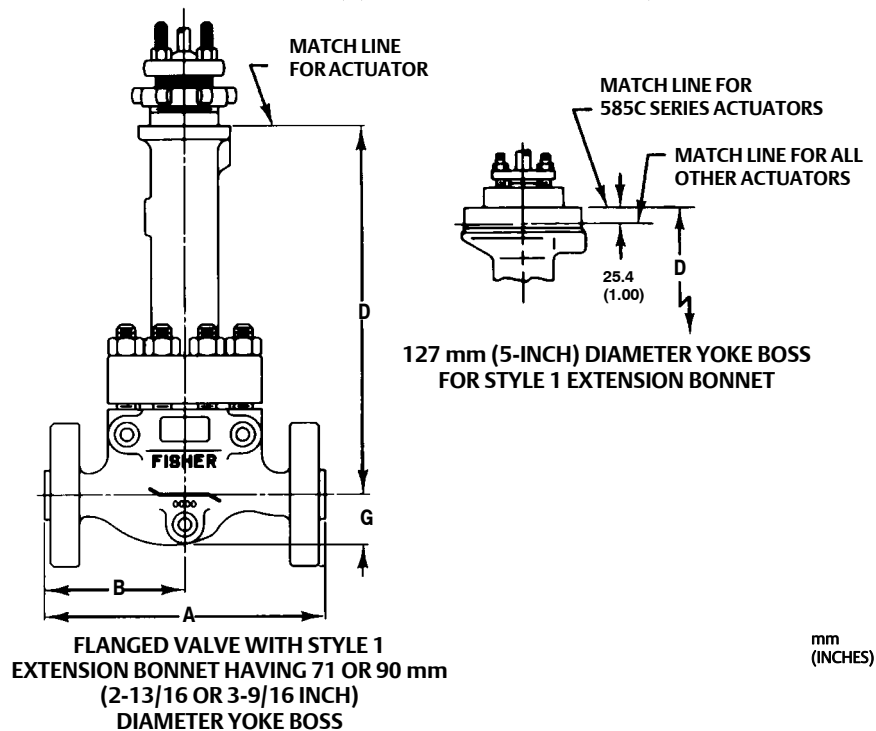
TYPICAL NPS 3 (EUROPE AND JAPAN MANUFACTURE), 4, AND 6

Note:  
For dimensions of valves with other end connections, consult your Emerson Process Management sales office.

**Table 18. Dimensions D for Style 1 Extension Bonnet (A, B, and G Dimensions Listed in Figure 13 Do Not Change When Extension Bonnet is Used)**

VALVE SIZE, NPS	D		
	Yoke Boss Diameters, mm (Inches)		
	71 (2-13/16)	90 (3-9/16)	127 (5)
<b>mm</b>			
1 (std trim)	383	390	---
2 (std, Whisper III, Cavitrol III, 3-stage trim)	430	445	504
2 (Cavitrol III 2-stage trim)	447	463	517
<b>Inches</b>			
1 (std trim)	15.09	15.34	---
2 (std, Whisper III, Cavitrol III 3-stage trim)	16.91	17.53	19.84
2 (Cavitrol III 2-stage trim)	17.59	18.22	20.34

**Figure 14. Dimensions D for Style 1 Extension Bonnet (A, B, and G Dimensions Listed in Figure 13 Do Not Change When Extension Bonnet is Used) (also see tables 17 and 18)**



A5701A-2

Table 19. Angle Valve Dimensions with Standard Bonnet

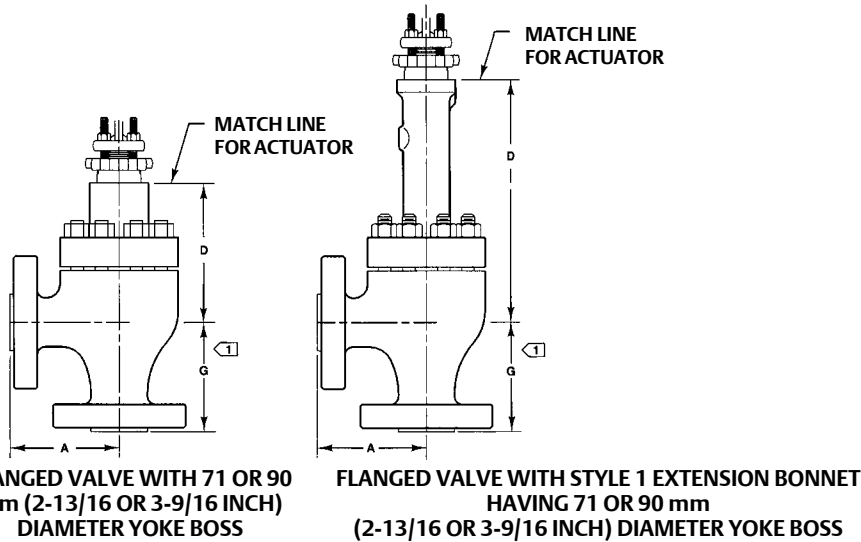
STANDARD BONNETS						
VALVE SIZE, NPS	D					
	Yoke Boss Diameters, mm (Inches)					
	71 (2-13/16)		90 (3-9/16)		127 (5)	
	CL900 and 1500	CL2500	CL900 and 1500	CL2500	CL900 and 1500	CL2500
mm						
1	230	204	238	210	---	---
2 Std, Whisper III, Cavitrol III 3-Stage	227	240	233	229	297	288
2 Cavitrol III 2-Stage	244	257	251	246	314	305
3	259	---	265	---	329	---
4	289	---	278	---	337	---
6	---	---	300	---	368	---
8	---	---	364	---	401	---
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	---	14.50	---
8	---	---	14.34	---	15.77	---
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 20. Angle Valve Dimensions with Standard Bonnet

VALVE SIZE, NPS	G		A & G <sup>(1)</sup>						EN	
			ASME							
			CL2500		CL900		CL1500			
	SWE	SWE	RF	RTJ	BWE	SWE	RF	RTJ	PN160	PN250
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—butt-welding ends; SWE—socket-weld ends.

Figure 15. Angle Valve Dimensions with Standard Bonnet (also see tables 19 and 20)



A6018A-1

① For CL900 and 1500 valves, G = A. For CL2500 valves, see table 20 for the G dimension.

Note:

For dimensions of valves with other end connections, consult your Emerson Process Management sales office.

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