Trim Cartridge for Fisher™ ET and EZ easy-e™ Control Valves

Contents

Figure 1. Fisher ET Control Valve with Trim Cartridge and 667 Actuator

Introduction

Scope of Manual

This instruction manual includes installation, maintenance, and parts information for NPS 1 through 4 Fisher ET and EZ valves with Trim Cartridge. Refer to separate manuals for instructions covering the actuator and accessories.

Do not install, operate, or maintain an ET or EZ valve 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 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.

Table 1. Specifications

Maximum Inlet Pressure(1,2)

Cast Iron Valves
Flanged: Consistent with CL125B or 250B pressure-temperature ratings per ASME B16.1
Steel and Stainless Steel Valves
Flanged: Consistent with CL150, 300, or 600(3) pressure-temperature ratings per ASME B16.34
Screwed or Welding: Consistent with CL600 pressure-temperature ratings per ASME B16.34

Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

■ Class IV, standard ■ Class V, optional

Flow Characteristics

■ Equal percentage ■ Linear

Flow Direction

ET Linear or Equal Percentage Cage: Normally down
EZ Linear or Equal Percentage Cage: Normally up

Approximate Weights

VALVE SIZE, NPS	TRIM CARTRDIGE WEIGHT		VALVE ASSEMBLY WEIGHT	
	kg	lb	kg	lb
1	7	14	14	30
1-1/2	8	16	20	45
2	10	22	30	67
3	15	32	54	125
4	21	46	77	170

1. The pressure/temperature limits in this manual and any applicable standard or code limitation for valve should not be exceeded.
2. Trim Cartridge contains a pressure retaining bonnet. Ensure Trim Cartridge is suitable for the application's required pressure class rating.
3. Certain bonnet bolting material selections may require a CL600 easy-e valve assembly to be derated. Contact your Emerson sales office.

Description

Trim Cartridge is a complete control valve repair solution that incorporates a full trim recommended spare parts list (RSPPL) replacement plus a new bonnet in a single, factory assembled repair cartridge. Trim Cartridge has the same fit and function of traditional easy-e trim, making it backwards compatible into existing easy-e constructions. In addition to being pre-assembled, each Trim Cartridge is tested to ensure CL V shutoff capability and has the live loaded ENVIRO-SEAL™ packing set, allowing for a simplified installation that reduces trim repair time and complexity.

Specifications

Typical specifications for these valves are shown in table 1.

Educational Services

For information on available courses for the Fisher ET and EZ valve, as well as a variety of other products, contact:

Emerson Automation Solutions
Educational Services - Registration
Phone: 1-641-754-3771 or 1-800-338-8158
E-mail: education@emerson.com
emerson.com/fishervalvetraining

Installation

⚠ 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 valve assembly is installed where service conditions could exceed the limits given in table 1 or on the appropriate nameplates. To avoid such injury or damage, provide a relief valve for overpressure 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.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

CAUTION

When ordered, the valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions. Responsibility for the safety of process media and compatibility of valve materials with process media rests solely with the purchaser and end-user. Since some body/trim material combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting your Emerson sales office.

Before installing the valve, inspect the valve and pipelines for any damage and any foreign material which may cause product damage.

1. Isolate the control valve from the pipeline pressure.
2. Release pressure and drain process media from both sides of the control valve.
3. If using a power actuator, also shut off all pressure lines to the power actuator, and release all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while the working on the equipment.
4. Disconnect the operating lines from the actuator and any leak-off piping from the bonnet.
5. Disconnect the stem connector and remove the actuator from the valve by unscrewing the yoke locknut. Remove any travel indicator parts and stem locknuts from the valve stem threads.

⚠ WARNING

To avoid personal injury due to leaking fluid, avoid damaging gasket sealing surfaces on the valve body, bonnet, and cage. The surface finish of the valve stem is critical for making a good packing seal. Unless inspection reveals otherwise, assume all these parts are in good condition and protect them accordingly.

6. Loosen the body/bonnet nuts (figure 2, key 2) approximately 3 mm (1/8 inch). Then loosen the body-to-bonnet gasket joint by either rocking the bonnet or prying between the bonnet and valve. Work the prying tool around the bonnet until the bonnet loosens. If no fluid leaks from the joint, remove the nuts completely (see figure 6, key 2).
7. Remove the bonnet and all trim components.
8. Remove and discard the cage gasket (key 4) and the bonnet gasket (key 3).
9. Clean and inspect the cage and bonnet gasket surfaces.
10. Install a new cage gasket (key 4) and a new bonnet gasket (key 3) into the valve body.

11. Install the new Trim Cartridge (key 1) into the valve body.

Note

Trim Cartridge is a single use repair solution. Once the spiral wound gasket has been compressed during installation, it may not provide the proper seat load if the Trim Cartridge is removed and reinstalled.

12. Apply lithium-based lubricant to body-to-bonnet bolting, install bolting, and tighten in a criss-cross pattern using the torque guidelines in table 2.

Note

The proper bolting procedures include--but are not limited to--ensuring that bolting threads are undamaged and lubricated, and evenly tightening the cap screws, or the nuts onto the studs, in a criss-cross pattern. Tightening one cap screw or nut may loosen an adjacent cap screw or nut. Repeat the crisscross tightening pattern several times until each cap screw or nut is tight and the body- to - bonnet seal is made.

Proper performance of the bolting procedures compresses the spiral wound gasket enough to both load and seal the cage gasket (key 4). It also compresses the bonnet gasket (key 3) enough to seal the body-to-bonnet joint.

Figure 2. Fisher ET Valve with Trim Cartridge Assembly

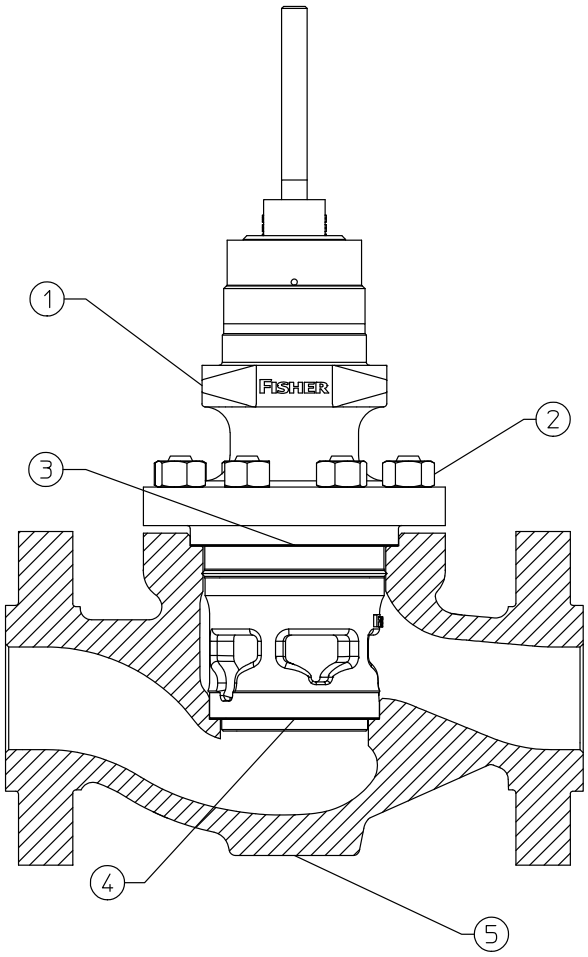


Table 2. Body-to-Bonnet Torque Guidelines using Lithium-based Lubricant(3)

VALVE SIZE, NPS	TORQUES(1,3)			
	Bolt Material			
	SA193-B7		SA193-B8M(2)	
	N•m	Lbf•ft	N•m	Lbf•ft
1	129	95	64	47
1-1/2 or 2	96	71	45	33
3	169	125	88	65
4	271	200	156	115

1. Determined from laboratory tests.
2. SA193-B8M annealed.
3. For other lubricants, bolting materials, or coated bolting, contact your Emerson sales office for torques.

Note

Stud(s) and nut(s) should be installed such that the manufacturer's trademark and material grade marking is visible, allowing easy comparison to the materials selected and documented in the Emerson/Fisher serial card provided with this product.

Maintenance

Inspection and maintenance frequency depends on the severity of service conditions. When the Trim Cartridge is installed, the spiral wound gasket (which is not repairable) is compressed in order to load and seal the cage gasket (figure 2, key 4). If the Trim Cartridge is removed and reinstalled, the spiral wound gasket may not provide sufficient load after initial compression. Therefore, it is not recommended to remove and reinstall Trim Cartridge after initial installation. Valve packing can be serviced as it does not require decompression of the spiral wound gasket. This section includes instructions for packing maintenance in the Trim Cartridge.

⚠ 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 to avoid personal injury.**
- **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.**
- **Vent the pneumatic actuator loading pressure and relieve any actuator spring precompression.**
- **Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.**
- **The valve packing box may contain process fluids that are pressurized, *even when the valve has been removed from the pipeline.* Process fluids may spray out under pressure when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.**
- **Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

CAUTION

Follow instructions carefully to avoid damaging the product surfaces, which could result in damage to the product

Packing Replacement

ENVIRO-SEAL packing systems are designed for quality performance over extended periods. This longevity allows for packing maintenance to be performed at regularly scheduled plant outages or turnarounds.

Use the following instructions when inspecting or replacing ENVIRO SEAL packing. Additional information can be found in the ENVIRO-SEAL Sliding-Stem Valves Instruction Manual (D101642X012)

If changing the packing system material to a different material, such as PTFE to Graphite ULF, it is good practice to review the actuator sizing, as packing friction will change.

CAUTION

To prevent product damage caused by scratching or damaging the packing box wall, take care when removing the old packing parts from the packing box.

1. Isolate the control valve from the line pressure.
2. Release pressure and drain process media from both sides of the control valve.
3. If using a power actuator, also shut off all pressure lines to the power actuator, and release all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while working on the equipment.
4. Disconnect the operating lines from the actuator and any leak-off piping from the bonnet.
5. Disconnect the stem connector and then remove the actuator from the valve by unscrewing the yoke locknut.
6. Remove any travel indicator parts and stem locknuts from the valve stem threads.
7. Remove the packing nut (figure 3, 4, or 5, key 3) from bonnet.
8. Remove packing parts from bore using a packing extraction tool and check for damage to valve stem or packing box bore.
9. Install the ENVIRO-SEAL packing parts into the packing box. Use figure 3, 4, or 5 to ensure the packing parts and spring pack are assembled in correct order.
10. Install the spring pack assembly with the attached springs, onto the stem, ensuring the Belleville springs are stacked properly and packing box parts are assembled in the correct order (figures 3, 4, or 5). Packing parts cannot function properly if the Belleville springs or other packing parts are not stacked correctly.
11. Lubricate the packing nut (figure 3, 4, or 5, key 3) with anti-seize lubricant and install hand tight.

Tightening Procedures - Packing Nut

1. To achieve maximum benefit from the ENVIRO-SEAL packing system, the packing nut must compress the Belleville springs to their “target load.” The target load is the point where the Belleville springs are designed for optimum performance, when compressed to 85% of their maximum deflection, or nearly flat. (Maximum deflection is when the springs are 100% compressed, or completely flat). To obtain the target load of 85% compression of maximum deflection, perform the following:

- Tighten the packing nut until the Belleville springs are compressed 100% (or completely flat), as detected by a rapid increase in nut torque.
- For PTFE or Duplex packing, loosen packing flange nut 1/2 turn (180° of rotation).
- For Graphite ULF packing, loosen packing flange nut 1/4 turn (90° of rotation).

  The “target load” of 85% compression has now been reached.

  Refer to the appropriate valve and actuator instruction manuals when connecting the valve to the actuator. Under normal conditions, the packing nut should not require retightening.

2. However, when servicing, if the springs do not remain at the target load of 85% compression, retighten the packing box nut according to step 1 above.

Other Considerations

When repacking a valve with ENVIRO-SEAL packing that has been in service, check the condition of the packing bore after the packing has been removed. A good guideline to use in checking the condition of the packing bore is the 20/20 rule. If less than 20% of the surface area of the bore is pitted and if there are no pits deeper than 0.020 inch, then the packing should work as designed. This does not need to be an exact measurement; visual inspection is adequate. If the packing bore does not meet these criteria, the unit should be replaced.

Figure 3. ENVIRO-SEAL PTFE Packing Arrangement

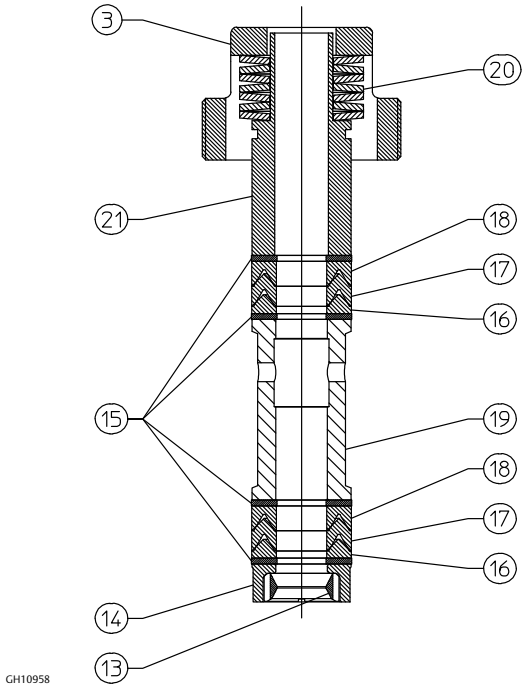


Figure 4. ENVIRO-SEAL Duplex Packing Arrangement

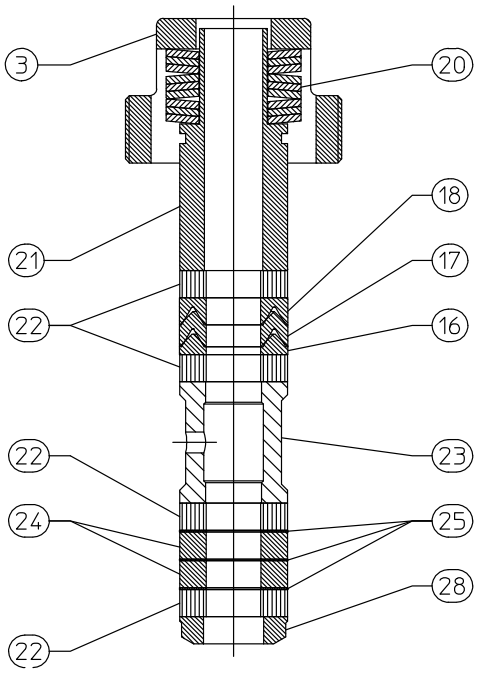
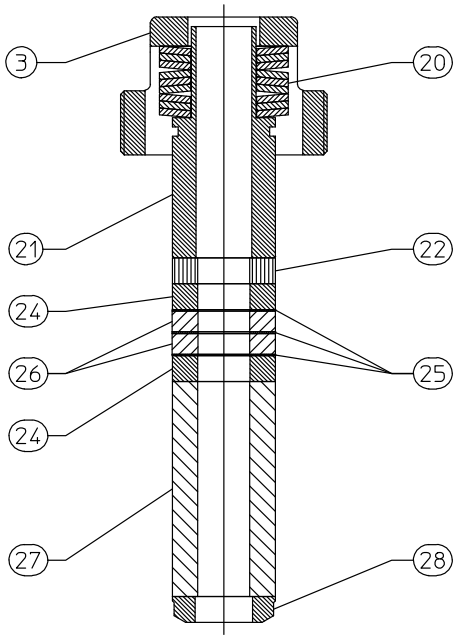


Figure 5. ENVIRO-SEAL Graphite ULF Packing Arrangement



Parts Ordering

Each body-bonnet assembly is assigned a serial number which can be found on the valve. This same number also appears on the actuator nameplate when the valve is shipped from the factory as part of a control valve assembly. In addition, each Trim Cartridge is assigned a part serial number which can be found on the Trim Cartridge bonnet. Refer to either the body-bonnet serial number or Trim Cartridge part serial number when contacting your Emerson sales office for technical assistance. When ordering replacement parts, refer to the serial number or part serial number and to the eleven-character part number for each part required from the following parts kit information.

⚠ WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson should not, under any circumstances, be used in any Fisher valve, because they may void your warranty, might adversely affect the performance of the valve, and could cause personal injury and property damage.

Parts Kits

ENVIRO-SEAL Packing Repair Kits

Repair kits include parts to replace the "soft" packing materials in valves that already have ENVIRO-SEAL packing arrangements installed or in valves that have been upgraded with ENVIRO-SEAL retrofit kits. Refer to figure 3 for key numbers for PTFE packing, to figure 4 for key numbers for Graphite ULF packing, and to figure 5 for key numbers for duplex packing. PTFE repair kits include keys 13, 15, 16, 17, and 18. Graphite ULF repair kits include keys 22, 24, 25, 26, and 27. Duplex repair kits include keys 16, 17, 18, 22, 24, and 25.

Stems and packing box constructions that do not meet Emerson stem finish specifications, dimensional tolerances, and design specifications, may adversely alter the performance of this packing kit.

Packing Kits (ENVIRO-SEAL) Repair

PACKING MATERIAL	STEM DIAMETER, mm (INCH) YOKE BOSS DIAMETER, mm (INCH)	
	9.5 (3/8) 54 (2-1/8)	12.7 (1/2) 71 (2-13/16)
	Part Number	
Double PTFE (Contains keys 13, 15, 16, 17, and 18)	RPACKX00192	RPACKX00202
Graphite ULF (Contains keys 22, 24, 25, 26, and 27)	RPACKX00592	RPACKX00602
Duplex (Contains keys 16, 17, 18, 22, 24, and 25)	RPACKX00292	RPACKX00302

Parts List

Note
Contact your Emerson sales office for part numbers.

Trim Cartridge Assembly (Figure 2)

Key	Description
1	Bonnet
2	Body/Bonnet Nut
3	Bonnet Gasket
4	Cage Gasket
5	Valve Body

ENVIRO-SEAL Packing Assembly (Figures 3, 4, and 5)

Key	Description
3	Packing Nut
13	Packing Lower Wiper
14	Packing Box Ring
15	Anti-Extrusion Washer
16	Packing Ring, Male Adaptor
17	Packing Ring
18	Packing Ring, Female Adaptor
19	Lantern Ring
20	Belleville Spring
21	Packing Follower
22	Guide Bushing
23	Lantern Ring
24	Packing Ring
25	Packing Washer
26	Packing Ring
27	Guide Bushing
28	Packing Box Ring

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