

# Fisher™ EZ-C, ET-C, and EWT-C Cryogenic Sliding-Stem Control Valves

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Figure 1. Typical Fisher Cryogenic Valve with Extension Bonnet and 585C Series Actuator



W6370

## Introduction

### Scope of Manual

This instruction manual includes installation, maintenance, and parts information for Fisher EZ-C, ET-C and EWT-C valves (see figure 1). Refer to separate manuals for instructions covering the actuator and accessories.



Do not install, operate, or maintain EZ-C, ET-C or EWT-C valves 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.

### Description

EZ-C: globe-style, single-port, unbalanced valves with integral end connections, post guiding, metal-to-metal seating, and quick-change trim. They feature stainless steel construction materials and extension bonnets.

ET-C and EWT-C: metal-to-metal seated globe-style, single-port, cage-guided, pressure-balanced valves featuring stainless steel construction materials and extension bonnets.

Table 1. Specifications

**Valve Sizes**

EZ-C: NPS ■ 1, ■ 1-1/2, ■ 2, ■ 3, and ■ 4  
 ET-C: NPS ■ 3, ■ 4, ■ 6, and ■ 8  
 EWT-C: NPS ■ 6X4<sup>(1)</sup>, ■ 8X4, ■ 8X6, ■ 12X6, and ■ 10X8

**End Connection Styles<sup>(2)</sup>**

CL150, 300, and 600 raised-face flanges per ASME B16.5

**Maximum Inlet Pressure<sup>(2)</sup>**

CL150 and 300—Valves are consistent with 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:

EZ-C VALVES		
Valve Size, NPS	Maximum Inlet Pressure	
	Bar	Psig
1	77	1110
2	83	1200
3	94	1370

ET-C AND EWT-C VALVES		
Valve Size, NPS	Maximum Inlet Pressure	
	Bar	Psig
3	94	1370
6, 8 x 6, 12 x 6	75	1085
8, 10 x 8	96	1390

CL600—Valves with optional S20910 (XM-19) bolting are consistent with CL600 pressure-temperature ratings per ASME B16.34

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

VALVE	SHUTOFF CLASS
EZ-C	Class IV—Standard
	Class VI—Optional
ET-C and EWT-C	Class IV—Standard
	Class V Air Test <sup>(3)</sup> —Optional

**Material Temperature Capability<sup>(2)</sup>**

EZ-C: -198 to 149°C (-325 to 300°F)

ET-C and EWT-C:  
-198 to 66°C (-325 to 150°F)

**Maximum Allowable Actuator Thrust**

See table 2

**Flow Characteristics**

EZ-C: Equal percentage, linear, and quick opening  
 ET-C and EWT-C: Equal percentage and linear

**Flow Directions**

EZ-C: Up through the seat ring only  
 ET-C and EWT-C: Normally down<sup>(4)</sup>

**Approximate Weights**

EZ-C:

NPS 1: 11 kg (33 lb)

NPS 1-1/2: 23 kg (48 lb)

NPS 2: 41 kg (90 lb) / 43 kg (95 lb)<sup>(5)</sup>

NPS 3: 60 kg (130 lb)

NPS 4: 95 kg (210 lb)

ET-C:

NPS 3: 51 kg (135 lb)

NPS 4: 95 kg (210 lb)

NPS 6: 211 kg (465 lb) / 216 kg (476 lb)<sup>(5)</sup>

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 12X6: 730 kg (1610 lb) / 323 kg (711 lb)<sup>(5)</sup>

NPS 10X8: 753 kg (1660 lb) / 735 kg (1621 lb)<sup>(5)</sup>

1. Valve size number is end connection size by normal trim size. For example, an NPS 6X4 valve has NPS 6 end connections with NPS 4 trim.

2. Do not exceed the pressure/temperature limits in this manual and any applicable code limitation.

3. Class V Air Test is optional. Test will be 50 psid air. Class V shutoff cannot be performed with water. The residual trapped moisture from testing with water can cause valve and trim damage from ice crystals formed at below freezing service temperatures.

4. Down is in through the cage and out the seal ring. (see figure 9).

5. Weight with one-piece extension bonnet. The one-piece extension bonnet for this valve size is larger than the fabricated extension bonnet.

Table 2. Maximum Allowable Actuator Thrust for Standard Style 3 Bonnet Extension Length

VALVE SIZE, NPS	STEM DIAMETER		MAXIMUM ALLOWABLE STEM LOAD FOR S20910 (XM-19) STEM MATERIAL	
	mm	Inches	N	Lb
1	9.5	3/8	5382	1210
	12.7	1/2	13166	2960
1-1/2	9.5	3/8	5338	1200
	12.7	1/2	13166	2960
2	12.7	1/2	14367	3230
	19.1	3/4	44169	9930
3	12.7	1/2	15301	3440
	19.1	3/4	45459	10220
4, 6X4, 8X4	12.7	1/2	16458	3700
	19.1	3/4	46971	10560
6, 8X6, 12X6	19.1	3/4	36385	8180
	25.4	1	81487	18320
8, 10X8	19.1	3/4	41366	9300
	25.4	1	87003	19560

## Educational Services

Emerson Automation Solutions  
 Educational Services - Registration  
 Phone: 1-800-338-8158  
 E-mail: education@emerson.com  
 emerson.com/mytraining

## Installation

Isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. Remove actuator supply pressure, and use lockout procedures to be sure that the above measures stay in effect while you work on the equipment. Refer to the Warnings at the beginning of the Maintenance section for additional information.

### **▲ 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 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.

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

**⚠ WARNING**

The valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions indicated when the valve was ordered. Responsibility for the safety of process media and compatibility of valve materials with process media rests solely with the purchaser and end-user. To avoid possible personal injury and because some valve/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](#).

**NOTICE**

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

1. Before installing the valve, inspect the valve and associated equipment for any damage and any foreign material.
2. Make certain the valve body interior is clean, that pipelines are free of foreign material, and that the valve is oriented so that pipeline flow is in the same direction as the arrow on the side of the valve.
3. **Gas Service:** The normal method of mounting for gas service is with the actuator vertical above the valve body. However, the control valve assembly may be installed in any orientation unless limited by seismic criteria. Other positions may result in uneven valve plug and cage wear that could result in improper operation. For mounting assistance, consult your Emerson sales office.

**NOTICE**

To avoid possible damage to the packing, do not allow the installed actuator angle to be so flat as to allow liquid inside the bonnet to come in contact with the packing.

Also, if insulation is applied, do not let the insulation run up the extension bonnet. This could cause the packing to freeze and be damaged.

**Liquid Service:** The preferred method of mounting for liquid service is with the actuator vertical above the valve body. This will allow a vapor layer to form between the liquid and the packing. If there are piping constraints, the actuator can be angled slightly from vertical. However, in no case should the angle be so flat as to allow liquid inside the bonnet to come in contact with the packing. For mounting assistance, consult your Emerson sales office.

4. If insulation is applied, make sure it is applied only to the body/bonnet joint. Do not let the insulation run up the extension bonnet.
5. Use accepted piping and welding practices when installing the valve in the line. For flanged valve bodies, use a suitable gasket between the valve body and pipeline flanges.
6. If the actuator and valve are shipped separately, refer to the actuator mounting procedure in the appropriate actuator instruction manual.

**⚠ WARNING**

Personal injury could result from packing leakage. Valve packing was tightened before shipment; however, the packing might require some readjustment to meet specific service conditions.

Valves with ENVIRO-SEAL™ live-loaded packing will not require this initial readjustment. See the Fisher instruction manual titled ENVIRO-SEAL Packing System for Sliding-Stem Valves ([D101642X012](#)) for packing instructions. If you wish to convert your present packing arrangement to ENVIRO-SEAL packing, refer to the retrofit kits listed in the parts kit sub-section near the end of this manual.

# Maintenance

Valve parts are subject to normal wear and must be inspected and replaced as necessary. Inspection and maintenance frequency depends on the severity of service conditions. This section includes instructions for packing maintenance and trim maintenance. All maintenance operations may be performed with the valve in the line.

## ⚠ WARNING

**Avoid personal injury or property damage from sudden release of process pressure. 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.

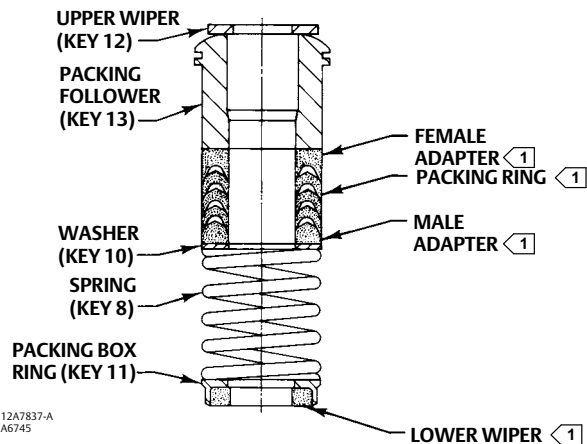
## NOTICE

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

### Note

Whenever a gasket seal is disturbed by removing or shifting parts, a new gasket should be installed upon reassembly. This is necessary to ensure a good gasket seal since the used gasket may not seal properly.

Figure 2. Single PTFE V-Ring Packing Arrangement

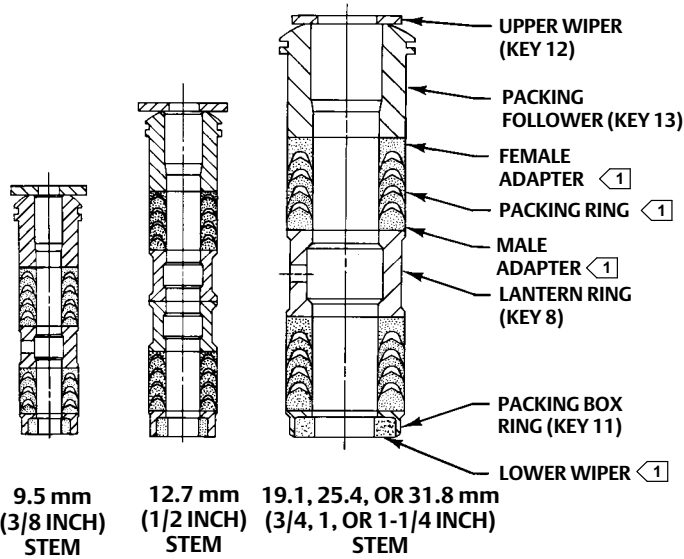


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NOTE:

1 PACKING SET (KEY 6) CONTAINS A FEMALE ADAPTER, V-RING PACKING RINGS, MALE ADAPTER, AND LOWER WIPER RINGS.

Figure 3. Double PTFE V-Ring Packing Arrangements

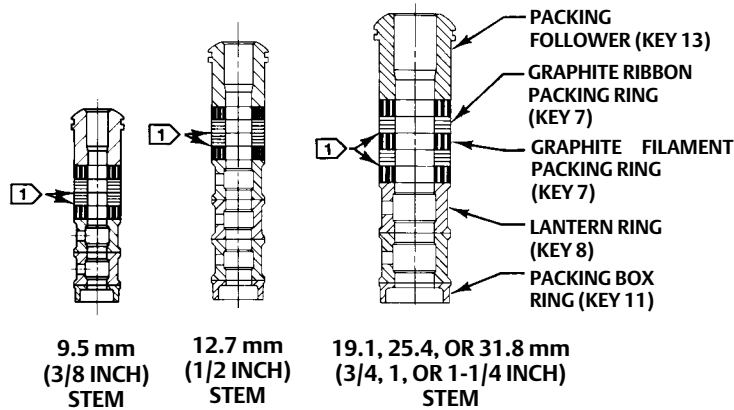


NOTE:

1 PACKING SET (KEY 6) CONTAINS A FEMALE ADAPTER, V-RING PACKING RINGS, MALE ADAPTER, AND LOWER WIPER RINGS.

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Figure 4. Graphite Ribbon/Filament Packing Arrangements



NOTE:

1 0.102 mm (0.004 INCH) THICK SACRIFICIAL ZINC WASHERS: USE ONLY ONE BELOW EACH GRAPHITE RIBBON RING.

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## Packing Maintenance

This section covers PTFE V-ring, double PTFE, and graphite packing used in extension bonnets (figures 2, 3, and 4).

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### Note

If the valve has ENVIRO-SEAL live-loaded packing installed, refer to the instruction manual ENVIRO-SEAL Packing System for Sliding Stem Valves for packing instructions. Figure 6 shows typical ENVIRO-SEAL arrangements.

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Standard packing key numbers are shown in figures 2, 3, and 4. ENVIRO-SEAL packing key numbers are shown in figure 6. Bonnet key number locations are shown in figure 7, and valve key numbers are shown in figures 8 and 9.

For spring-loaded single PTFE V-ring packing, the spring (key 8) maintains a sealing force on the packing. If leakage is noted around the packing follower (key 13), check to be sure the shoulder on the packing follower is touching the bonnet. If the shoulder is not touching the bonnet, tighten the packing flange nuts (key 5), until the shoulder is against the bonnet. If leakage cannot be stopped in this manner, proceed with replacing packing procedures.

If there is undesirable packing leakage with other than spring-loaded packing, first try to limit the leakage and establish a stem seal by tightening the packing flange nuts.

If the packing is relatively new and tight on the stem, and if tightening the packing flange nuts does not stop the leakage, it is possible that the valve stem is worn or nicked so that a seal cannot be made. The surface finish of a new valve stem is critical for making a good packing seal. If the leakage comes from the outside diameter of the packing, it is possible that the leakage is caused by nicks or scratches around the packing box wall. If performing any of the following procedures, inspect the valve stem and packing box wall for nicks and scratches.

## Replacing Packing

### **⚠ WARNING**

Refer to the **WARNING** at the beginning of the Maintenance section in this instruction manual.

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Key numbers and sequence of assembly of packing parts are shown in figures 2, 3, and 4. Bonnet key number locations are shown in figure 7, and valve key number locations are shown in figures 8 and 9, unless otherwise noted.

1. Isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. 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 you work on the equipment. Observe the **Warnings** at the start of the Maintenance section.
2. Disconnect the operating lines from the actuator and any leak-off piping from the bonnet. Disconnect the stem connector and remove the actuator from the valve by unscrewing the yoke locknut (key 15) or hex nuts (key 26, not shown).
3. Loosen the packing flange nuts (key 5) so that the packing is not tight on the valve stem. Remove any travel indicator parts and stem locknuts from the valve stem threads.

### **⚠ WARNING**

- To avoid personal injury or property damage caused by uncontrolled movement of the bonnet, loosen the bonnet by following the instructions in the next steps.

**Do not remove a stuck bonnet by pulling on it with equipment that can stretch or store energy in any other manner. The sudden release of stored energy can cause uncontrolled movement of the bonnet.**

- To avoid personal injury or damage to the seating surface caused by the valve plug and stem assembly dropping from the bonnet after being lifted out of the valve body, observe the following instructions.

4. When lifting an EZ-C bonnet, temporarily install a valve stem locknut on the valve stem. This locknut will prevent the valve plug and stem assembly from dropping out of the bonnet.
5. When lifting an ET-C or EWT-C bonnet, be sure the plug and stem assembly and cage remain in the valve body.

**⚠ WARNING**

**To avoid possible personal injury, review your process shutdown procedures to be sure process pressure is not applied to the valve for the following procedure.**

6. Hex nuts (key 16) attach the bonnet to the valve body (key 1). Loosen these nuts or cap screws approximately 3 mm (1/8 inch). Then, loosen the body-to-bonnet joint by either rocking the bonnet or prying between the bonnet and valve body. Work with a prying tool around the bonnet until the bonnet loosens.

Table 3. Recommended Torque for Packing Flange Nuts

VALVE STEM DIAMETER		PRESSURE RATING	GRAPHITE PACKING				PTFE PACKING			
			Minimum Torque		Maximum Torque		Minimum Torque		Maximum Torque	
			N•m	Lbf-in	N•m	Lbf-in	N•m	Lbf-in	N•m	Lbf-in
9.5	3/8	150	3	27	5	40	1	13	2	19
		300	4	36	6	53	2	17	3	26
		600	6	49	8	73	3	23	4	35
12.7	1/2	150	5	44	8	66	2	21	4	31
		300	7	59	10	88	3	28	5	42
		600	9	81	14	122	4	39	7	58
19.1	3/4	150	11	99	17	149	5	47	8	70
		300	15	133	23	199	7	64	11	95
		600	21	182	31	274	10	87	15	131
25.4	1	150	19	169	29	254	9	80	14	120
		300	26	226	38	339	12	108	18	162
		600	35	310	53	466	17	149	25	223
31.8	1-1/4	150	27	238	40	357	13	113	19	169
		300	36	318	54	477	17	152	26	228
		600	49	437	74	655	24	209	36	314

Table 4. Body-to-Bonnet Torque Guidelines

VALVE SIZE, NPS	BOLT TORQUES <sup>(1)</sup>	
	Bolt Material <sup>(2)</sup>	
	B8M <sup>(3)</sup> or S20910 (XM-19) <sup>(4)</sup>	
	N•m	Lbf-ft
1	122	90
1-1/2 or 2	91	67
3	163	120
4, 6X4, or 8X4	258	190
6, 8X6, or 12X6	522	385
8 or 10X8	712	525

1. Determined from laboratory testing.  
 2. For bolting materials not listed in table 4, contact your [Emerson sales office](#) for torque information.  
 3. SA193-B8M strain hardened.  
 4. Hot rolled.



- If fluid leaks from the joint, it may indicate that process pressure is applied to the valve. Review your process shutdown procedures, and be sure process pressure is not applied to the valve.
  - If no fluid leaks from the joint, remove the nuts completely and carefully lift the bonnet off the valve body.
7. For EZ-C valves, remove the stem locknut. Separate the valve plug and stem from the bonnet, and set the parts on a protective surface to prevent damage to gasket or seating surfaces.
  8. For ET-C and EWT-C: If it is necessary to remove and inspect the valve trim, refer to the following Trim Maintenance section.
  9. Remove the bonnet gasket (key 10) and cover the opening in the valve to protect the gasket surface and prevent foreign material from getting into the valve body cavity.
  10. Remove the packing flange nuts, packing flange, upper wiper, and packing follower (keys 5, 3, 12, and 13). Carefully push out all the remaining packing parts from the valve side of the bonnet using a rounded rod or other tool that will not scratch the packing box wall. Clean the packing box and metal packing parts.
  11. Inspect the valve stem threads and packing box surfaces for any sharp edges which might cut the packing. Scratches or burrs in the packing box surfaces could cause leakage or damage to the new packing. If the surface condition cannot be improved by light sanding, replace the damaged parts.
  12. If necessary, go to the Trim Maintenance procedures to remove, inspect or replace trim parts. Return to this section when installing the bonnet on the valve body.

### Installing the Bonnet

13. Remove the covering protecting the valve body cavity and install a new bonnet gasket (key 10), making sure the gasket seating surfaces are clean and smooth. Then slide the bonnet over the stem and onto the stud bolts (key 15).

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#### Note

Proper performance of the bolting procedures in step 10 compresses the spiral wound gasket (key 12) or load ring (key 26) to both load and seal the seat ring gasket (key 13). It also compresses the outer edge of the bonnet gasket (key 10) to seal the body-to-bonnet joint.

The proper bolting procedures in step 14 include, but are not limited to, ensuring that bolting threads are clean and evenly tightening the cap screws or nuts onto the studs in a crisscross 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.

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#### 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.

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### **⚠ WARNING**

**Personal injury or damage to equipment could occur if improper stud and nut materials or parts are used. Do not operate or assemble this product with stud(s) and nut(s) that are not approved by Emerson/Fisher engineering and/or listed on the serial card provided with this product. Use of unapproved materials and parts could lead to stresses exceeding the design or code limits intended for this particular service. Install studs with the material grade and manufacturer's identification mark visible. Contact your Emerson representative immediately if a discrepancy between actual parts and approved parts is suspected.**

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14. Lubricate the bolting with anti-seize lubricant and install it, using accepted bolting procedures during tightening, so that the body-to-bonnet joint will withstand test pressures and application service conditions. Use the bolt torques in table 4 as guidelines.
15. Install new packing and the metal packing box parts according to the appropriate arrangement in figures 2, 3, or 4. Place a smooth-edged pipe over the valve stem and gently tap each soft packing part into the packing box.
16. Slide the packing follower, upper wiper, and packing flange (keys 12, 13, and 3) into position. Lubricate the packing flange studs (key 4) and faces of the packing flange nuts (key 5). Install the packing flange nuts.
17. Tightening packing flange nuts (key 5):
  - a. For **spring-loaded PTFE V-ring packing**, tighten the packing flange nuts until the shoulder on the packing follower (key 13) contacts the bonnet.
  - b. For **graphite packing**, tighten the packing flange nuts to the maximum recommended torque shown in table 3. Then, loosen the packing flange nuts, and retighten them to the recommended minimum torque shown in table 3.
  - c. For **double PTFE V-ring packing**, tighten the packing flange nuts alternately in small equal increments until one of the nuts reaches the minimum recommended torque shown in table 3. Then, tighten the remaining nut until the packing flange is level and at a 90 degree angle to the valve stem.
  - d. For **ENVIRO-SEAL live-loaded packing**, refer to the Fisher instruction manual titled: ENVIRO-SEAL Packing System for Sliding-Stem Valves.
18. Mount the actuator on the valve assembly and reconnect the actuator and valve stem according to the procedure in the appropriate actuator instruction manual.

## Trim Maintenance

### **▲ WARNING**

Refer to the **WARNING** at the beginning of the Maintenance section in this instruction manual.

This procedure describes how the valve trim can be completely disassembled. When inspection or repairs are required, perform only those steps necessary to accomplish the task. Observe the **Warning** at the start of the Maintenance section.

Key number locations are shown in figures 8 and 9, unless otherwise noted.

### EZ-C Trim Disassembly

Key number locations are shown in figure 8, unless otherwise noted.

1. Remove the actuator and the bonnet according to steps 1 through 9 of the Replacing Packing procedures in the Maintenance section.

### **▲ WARNING**

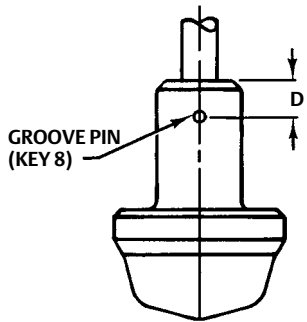
To avoid personal injury due to leaking fluids, avoid damaging gasket sealing surfaces.

The surface finish of the valve stem (key 7) is critical for making a good packing seal.

The seating surfaces of the valve plug (key 2) and seat ring (key 9) are critical for proper shutoff.

Protect these surfaces accordingly.

Figure 5. Fisher EZ-C Valve Stem Torque and Pin Replacement



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VALVE STEM		STEM TORQUE		DRILL SIZE, INCHES	D DIMENSION	
mm	Inch	N•m	Lbf-ft		mm	Inch
9.5	3/8	40-47	25-35	3/32	16	0.625
12.7	1/2	81-115	60-85	1/8	19	0.75
19.1	3/4	237-339	175-250	3/16	25	1

Perform the following steps to remove the valve trim.

**Note**

With some valve plug sizes and configurations, the seat ring retainer and bushing assembly (keys 3 and 26, figure 7, 8, and 9) will come out of the valve body with the valve plug and stem assembly, and in other valve plug sizes and configurations, the valve plug will slide through the seat ring retainer and bushing assembly, leaving the retainer and bushing assembly in the valve body.

2. With the valve plug and stem assembly out of the valve body, either slide the seat ring retainer, bushing assembly (keys 3 and 26), gaskets, and shim (keys 10, 12, and 25) up over the valve plug and stem or, lift the seat ring retainer and bushing assembly, associated gaskets, and shim out of the valve body. If the valve plug is to be reused, protect the valve plug seating surface to prevent damage.
3. To disassemble the stem, plug, and pin, drive or drill out the pin (key 8) and unscrew the valve stem (key 7) from the valve plug (key 2).
4. Remove the seat ring and seat ring gasket (keys 9 and 13).
5. Inspect parts for wear or damage that could prevent proper operation of the valve. Clean, inspect and obtain replacement parts as necessary for reassembly.

**EZ-C Trim Assembly**

This procedure assumes that all the trim and associated gaskets were removed from the valve body. If these parts were not all removed, start the assembly procedure at the appropriate step.

**NOTICE**

To avoid weakening the stem that may cause failure in service, never reuse an old stem with a new valve plug. Using an old stem with a new plug requires drilling a new pin hole in the stem, which will weaken the stem. However, a used valve plug may be reused with a new stem.

Key number locations are shown in figure 8, unless otherwise noted.

1. Screw the valve stem (key 7) into the valve plug (key 2). Tighten to the torque valve given in figure 5. Refer to figure 5 to select the proper drill size. Drill through the stem using the hole in the valve plug as a guide. Remove any chips or burrs and drive in a new pin (key 8) to lock the assembly.
2. Install the seat ring gasket (key 13) and seat ring (key 9).

---

**Note**

With some valve plug sizes and configurations, the valve plug will slide through the seat ring retainer and bushing assembly (keys 3 and 26), and in other configurations, it will not.

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3. If the valve plug (key 2) will not slide through the seat ring retainer and bushing assembly (keys 3 and 26), proceed as follows:
  - a. Place the seat ring retainer and bushing assembly (keys 3 and 26) over the stem of the valve plug and stem assembly.
  - b. Install the seat ring retainer and bushing assembly, which also includes the valve plug and stem assembly, on top of the seat ring, ensuring that the seat ring retainer slips onto the seat ring properly. Any rotational orientation of the seat ring retainer with respect to the valve body is acceptable.

Table 5. Fisher ET-C and EWT-C Valve Stem Torque and Pin Replacement

VALVE STEM DIAMETER		TORQUE, MINIMUM TO MAXIMUM		DRILL SIZE, INCHES
mm	Inches	N•m	Lbf-ft	
9.5	3/8	40-47	25-35	3/32
12.7	1/2	81-115	60-85	1/8
19.1	3/4	238-339	175-250	3/16
25.4	1	421-482	310-355	1/4
31.8	1-1/4	827-908	610-670	1/4

- c. Place the spiral wound gasket, shim, and bonnet gasket (keys 12, 25, and 10) on the shoulder of the seat ring retainer.
4. If the valve plug (key 2) will slide through the seat ring retainer and bushing assembly (keys 3 and 26), proceed as follows:
  - a. Install the seat ring retainer and bushing assembly on top of the seat ring, ensuring that the seat ring retainer slips onto the seat ring properly. Any rotational orientation of the seat ring retainer with respect to the valve body is acceptable.
  - b. Place the spiral wound gasket, shim, and bonnet gasket (keys 12, 25, and 10) on the shoulder of the seat ring retainer.
  - c. Slide the valve plug and stem assembly or the valve plug guide and stem assembly into the seat ring retainer and bushing assembly (keys 3 and 26).
5. Mount the bonnet on the valve body and complete assembly using the Replacing Packing procedures in the Maintenance section.
6. If the valve has soft metal-to-metal seats, refer to the Coining Soft Metal-to-Metal Seats section.

## ET-C and EWT-C Trim Disassembly

Key number locations are shown in figure 9, unless otherwise noted.

1. Remove the actuator and the bonnet according to steps 1 through 9 of the Replacing Packing procedure in the Maintenance section.

### **⚠ WARNING**

To avoid personal injury due to leaking fluids, avoid damaging gasket sealing surfaces.

The surface finish of the valve stem (key 7) is critical for making a good packing seal.

The inside surface of the cage (key 3) is critical for tight shutoff and smooth operation of the valve plug.

The seating surfaces of the valve plug (key 2) and seat ring (key 9) are critical for proper shutoff.

Protect these surfaces accordingly.

Perform the following steps to remove the valve trim.

2. Remove the load ring (key 26) from an NPS 8 ET-C or NPS 10X8 EWT-C valve, and wrap it for protection.
3. Remove the plug and stem assembly from the valve body. The cage (key 3) might come out of the valve body with the plug, due to seal ring friction.
  - a. If so, carefully separate the cage from the plug and stem assembly.
  - b. If the cage was not removed from the valve body with the plug and stem assembly, remove it, the associated gaskets (keys 10 and 12), and shim (key 51).
4. Remove the seat ring (key 9) and seat ring gasket (key 13). Composition seat constructions use a disk (key 23) sandwiched between a disk seat (key 22) and disk retainer (key 21).
5. Clean, inspect, and if necessary obtain replacement parts.

## ET-C and EWT-C Valve Plug Maintenance

### **NOTICE**

To avoid the valve plug seal ring (key 28) not sealing properly and affecting valve performance, be careful not to scratch the surfaces of the ring groove on the valve plug or any of the surfaces of the replacement ring.

1. With the valve plug (key 2) removed, according to the disassembly portion of the Trim Maintenance procedure, proceed as follows:
2. The spring-loaded seal ring may be removed by first working the retaining ring (key 27) off with a screwdriver. Then carefully slide the metal backup ring (key 29) and seal ring (key 28) off the valve plug (key 2).
3. A spring-loaded seal ring must be installed so that its open side faces toward the valve stem, or toward the seat of the plug depending on flow direction, as shown in view A of figure 9. To install a spring-loaded seal ring, slide the seal ring (key 28) onto the valve plug followed by the metal backup ring (key 29).
4. Then install the retaining ring (key 27) by inserting one end in the groove and, while turning the plug, press the ring into the groove. Again, be careful not to scratch any surfaces of the ring or plug.

### **NOTICE**

To avoid weakening the stem that may cause failure in service, never reuse an old stem with a new valve plug. Using an old stem with a new plug requires drilling a new pin hole in the stem, which will weaken the stem. However, a used valve plug may be reused with a new stem.

5. To replace the valve stem (key 7), drive or drill out the pin (key 8). Unscrew the valve plug from the stem.
6. Screw the new stem into the valve plug. Tighten to the torque value given in table 5. Refer to table 5 to select the proper drill size. Drill through the stem using the hole in the valve plug as a guide. Remove any chips or burrs and drive in a new pin to lock the assembly.

## ET-C and EWT-C Trim Assembly

Key number locations are shown in figure 9, unless otherwise noted.

1. Install the seat ring gasket (key 13), and seat ring (key 9) or disk seat (key 22). With composition seat constructions, install the disk (key 23) and disk retainer (key 21).
2. Install the cage (key 3). Any rotational orientation of the cage with respect to the valve body is acceptable.
3. Lower the valve plug (key 2) and stem assembly into the cage. Make sure the seal ring (key 28) is evenly engaged in the entrance chamfer at the top of the cage (key 3) to avoid damaging the ring.
4. Place the gaskets (keys 12 and 10) and the shim (key 51) on top of the cage.
5. With an NPS 8 ET-C or NPS 10X8 EWT-C valve, install the load ring (key 26).
6. Mount the bonnet on the valve body and complete assembly using the Replacing Packing procedures in the Maintenance section. Torque guidelines for body-to-bonnet bolting are shown in table 4.
7. If the valve has soft metal-to-metal seats, refer to the Coining Soft Metal-to-Metal Seats section, below.

## Coining Soft Metal-to-Metal Seats

Soft metal-to-metal seat constructions consist of a valve plug with hardfaced CoCr-A seat and a non-hardfaced S31600 seat ring. For optimum shutoff performance of these constructions, coin seats by stroking the valve plug into the seat ring at least three times with maximum actuator force.

### NOTICE

To avoid possible product damage which may affect performance, do not lap soft metal-to-metal seats.

## 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.

Refer to the serial number when contacting your [Emerson sales office](#) for technical assistance. When ordering replacement parts, refer to the serial number and to the eleven-character part number for each part required from the following parts kit or parts list 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

### Gasket Kits

Includes keys 10, 12, 13, and 25 for EZ-C valves. Includes keys 10, 12, 13, and 51 for ET-C and EWT-C valves.

VALVE SIZE, NPS	KIT PART NUMBER
1	RGASKETX162
1-1/2	RGASKETX172
2	RGASKETX182
3	RGASKETX202
4, 6X4, 8X4	RGASKETX212
6	RGASKETX222
8X6, 12X6	RGASKETX392
8, 10X8	RGASKETX232

### Packing Kits

Packing kits for standard packing includes keys 6, 8, 10, 11, and 12. Packing kits do not apply to N10276, N08020, or N04400 trims.

#### Standard Packing Repair Kits (Non Live-Loaded)

Stem Diameter, mm (Inches) Yoke Boss Diameter, mm (Inches)	9.5 (3/8) 54 (2-1/8)	12.7 (1/2) 71 (2-13/16)	19.1 (3/4) 90 (3-9/16)	25.4 (1) 127 (5)
PTFE (Contains keys 6, 8, 10, 11, and 12)	RPACKX00012	RPACKX00022	RPACKX00032	RPACKX00342
Double PTFE (Contains keys 6, 8, 11, and 12)	RPACKX00042	RPACKX00052	RPACKX00062	RPACKX00362
Single Graphite Ribbon/Filament (Contains keys 7 [ribbon ring], 7 [filament ring], 8, and 11)	RPACKX00102	RPACKX00112	RPACKX00122	---
Single Graphite Ribbon/Filament (Contains keys 7 [ribbon ring], 7 [filament ring], and 11)	---	---	---	RPACKX00532
Single Graphite Ribbon/Filament (Contains keys 7 [ribbon ring], 7 [filament ring])	RPACKX00132	RPACKX00142	RPACKX00152	---
Double Graphite Ribbon/Filament (Contains keys 7 [ribbon ring], 7 [filament ring], 8, and 11)	RPACKX00162	RPACKX00172	RPACKX00182	---

### ENVIRO-SEAL Packing Retrofit Kits

Retrofit kits include parts to convert valves with existing standard bonnets to the ENVIRO-SEAL packing box construction. Refer to figure 6 for key numbers for PTFE and Graphite ULF packing.

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

#### ENVIRO-SEAL Packing Retrofit Kits

PACKING MATERIAL	STEM DIAMETER AND YOKE BOSS DIAMETER, mm (INCH)			
	9.5 (3/8) 54 (2-1/8)	12.7 (1/2) 71 (2-13/16)	19.1 (3/4) 90 (3-9/16)	25.4 (1) 127 (5)
Double PTFE	RPACKXRT012	RPACKXRT022	RPACKXRT032	RPACKXRT042
Graphite ULF	RPACKXRT262	RPACKXRT272	RPACKXRT282	RPACKXRT292
Duplex	RPACKXRT212	RPACKXRT222	RPACKXRT232	RPACKXRT242

## 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 6 for key numbers for PTFE and Graphite ULF packing.

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

### ENVIRO-SEAL Packing Repair Kits

Stem Diameter, mm (Inches) Yoke Boss Diameter, mm (Inches)	9.5 (3/8) 54 (2-1/8)	12.7 (1/2) 71 (2-13/16)	19.1 (3/4) 90 (3-9/16)	25.4 (1) 127 (5)
Double PTFE (Contains keys 214, 215, & 218)	RPACKX00192	RPACKX00202	RPACKX00212	RPACKX00222
Graphite ULF (Contains keys 207, 208, 209, 210, and 214)	RPACKX00592	RPACKX00602	RPACKX00612	RPACKX00622
Duplex (Contains keys 207, 209, 214, and 215)	RPACKX00292	RPACKX00302	RPACKX00312	RPACKX00322

Figure 6. ENVIRO-SEAL Packing System

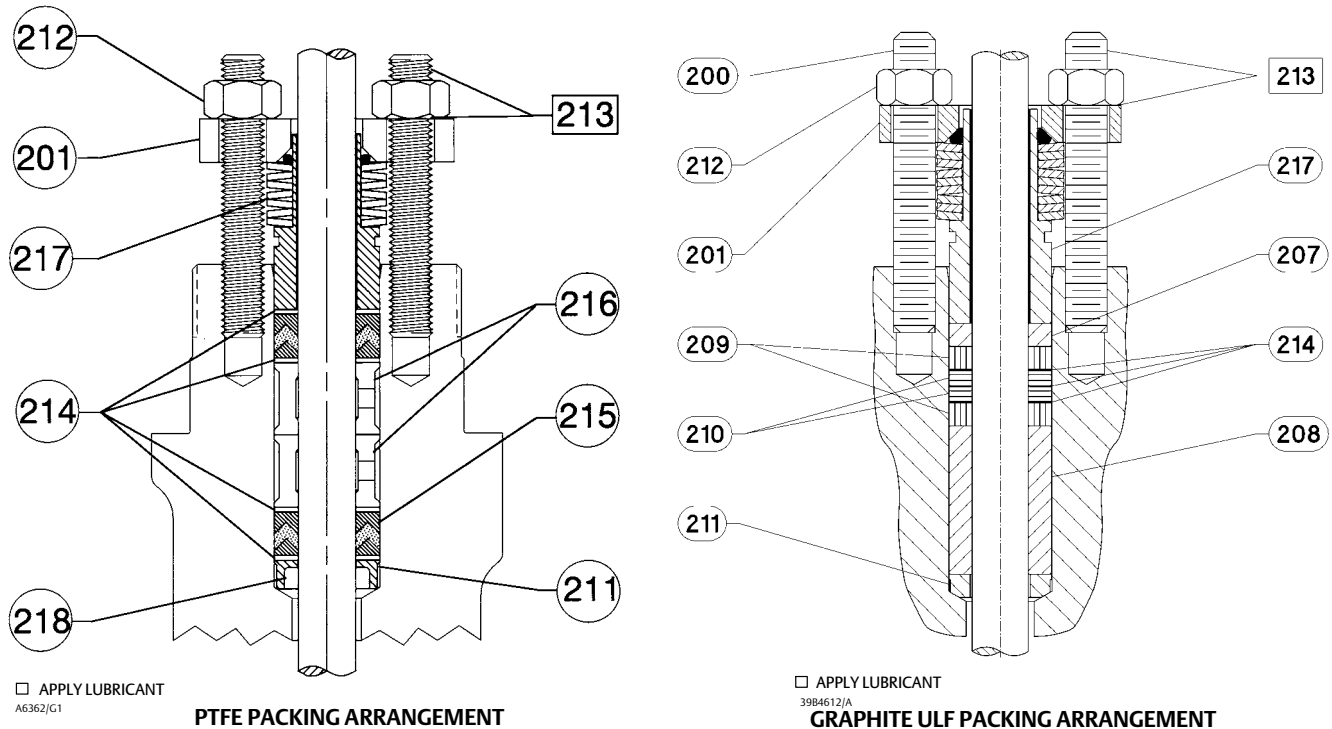
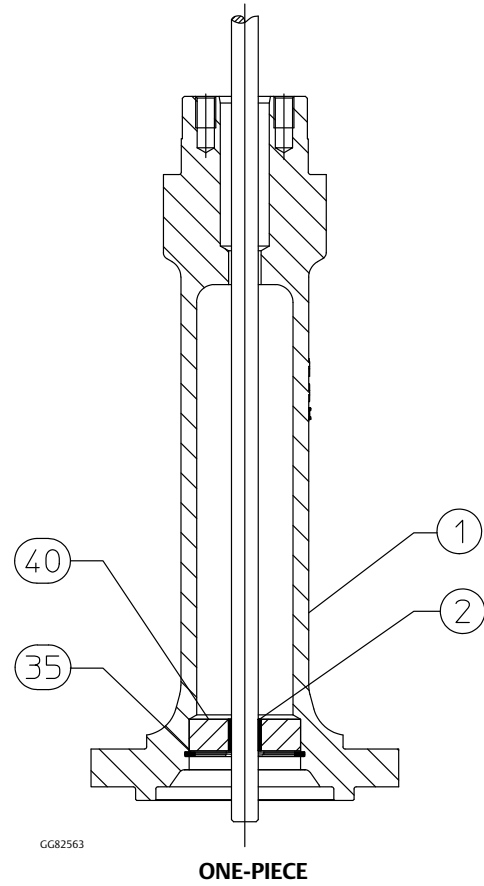
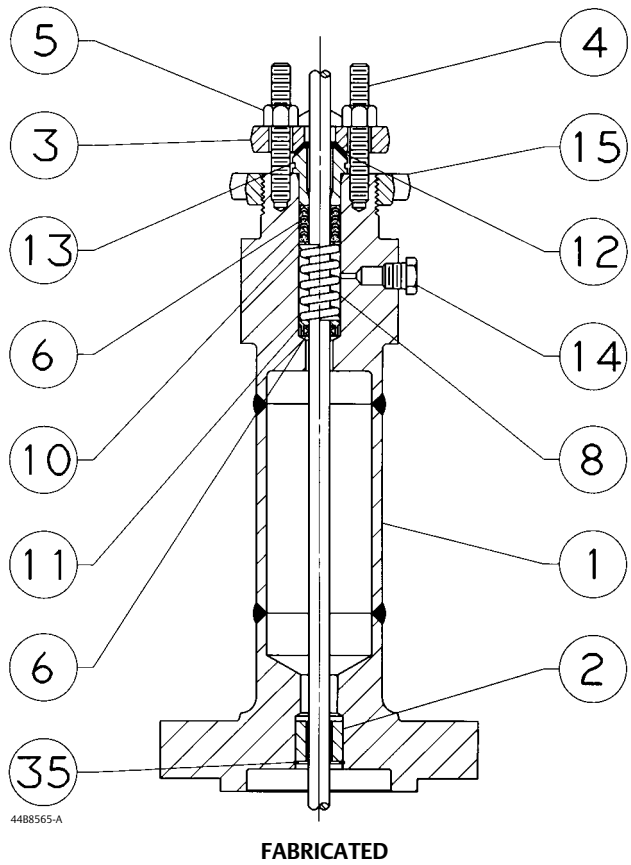




Figure 7. Extension Bonnet Assembly



**NOTE:**

- 1 KEY 6 CONTAINS SEVERAL PARTS; REFER TO FIGURES 2, 3, AND 4 FOR PACKING ARRANGEMENTS.
- 2 KEY 2 CONTAINS INFORMATION FOR BOTH THE FABRICATED AND ONE-PIECE EXTENSION BONNETS.

## Parts List

### Note

Part numbers are shown for recommended spares only. For part numbers not shown, contact your [Emerson sales office](#).

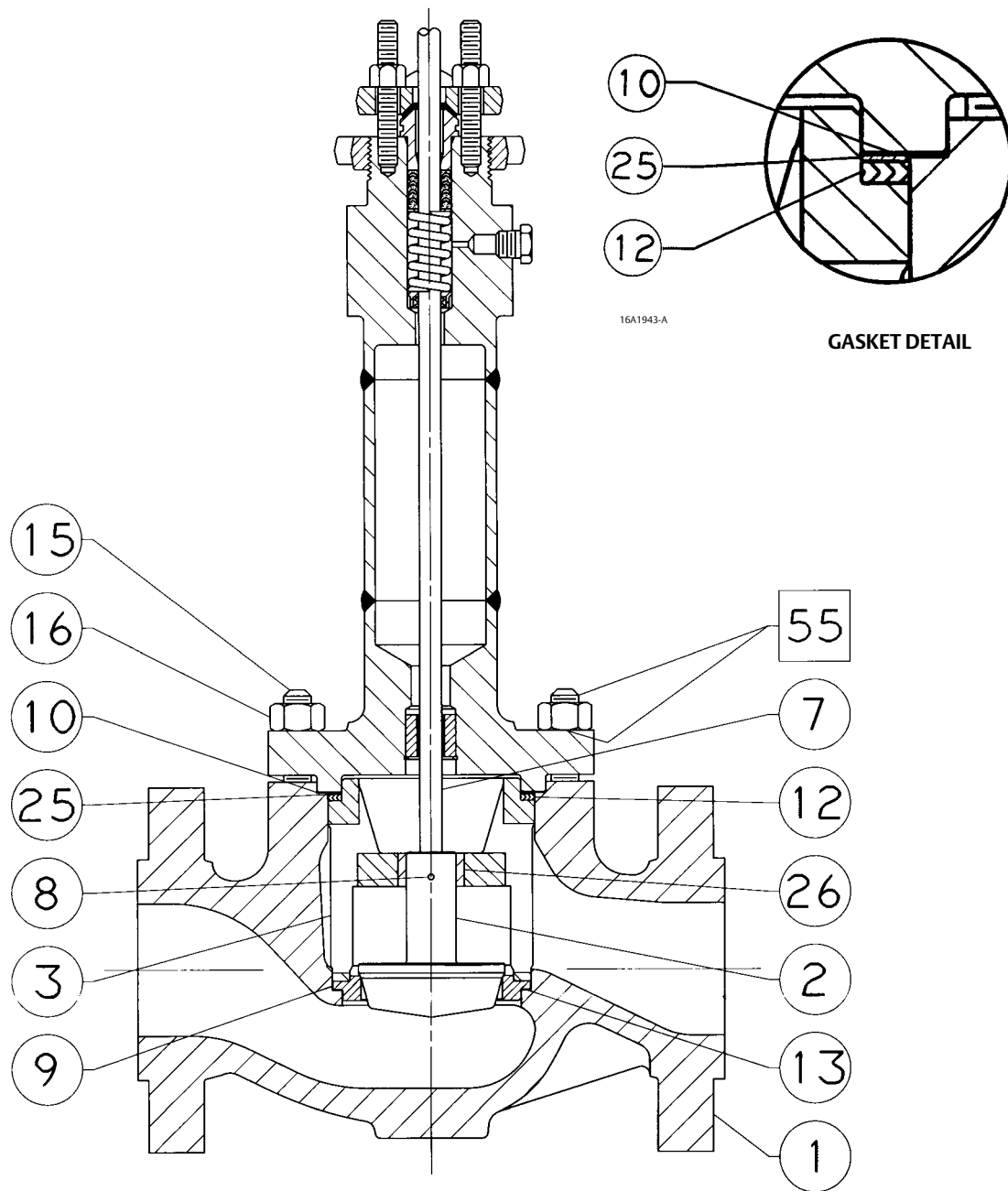
### Bonnet Parts (figure 7)

Key	Description
1	Bonnet If you need a bonnet as a replacement part, order by valve size and stem diameter, serial number, and desired material.
2	Bushing
3	Packing Flange
4	Packing Flange Stud
5	Packing Flange Nut
6*	Single V-Ring Packing Set
7*	Individual Packing Ring
8	Packing Box Ring or Lantern Ring
10	Special Washer
11	Packing Box Ring
12*	Upper Wiper
13	Packing Follower
14	Pipe Plug
15	Yoke Locknut
25	Cap Screw
26	Hex Nut
35	Retaining Ring
40	Spacer for one-piece bonnet (NPS 3, 4, 6, and 8)

### EZ-C Valve Body Parts (figure 8)

Key	Description
1	Valve Body If you need a valve body as a replacement part, order by valve size, serial number, and desired material.
2*	Valve Plug
3*	Seat Ring Retainer
7*	Stem
8*	Pin
9*	Seat Ring
10*	Bonnet Gasket
12*	Gasket
13*	Seat Ring Gasket
15	Stud Bolt
16	Hex Nut
18	Flow Arrow
19	Drive Screw
25*	Shim
26*	Bushing,
33	Nameplate
---	Warning Plate
34	Wire
55	Lubricant, anti-seize (not included with valve)

Figure 8. Fisher EZ-C Valve Assembly



□ APPLY LUBRICANT

NOTE:  
EZ-C KEY NUMBERS NOT SHOWN ARE: 18, 19, 33, AND 34.

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## ET-C and EWT-C Valve Body Parts (figure 9)

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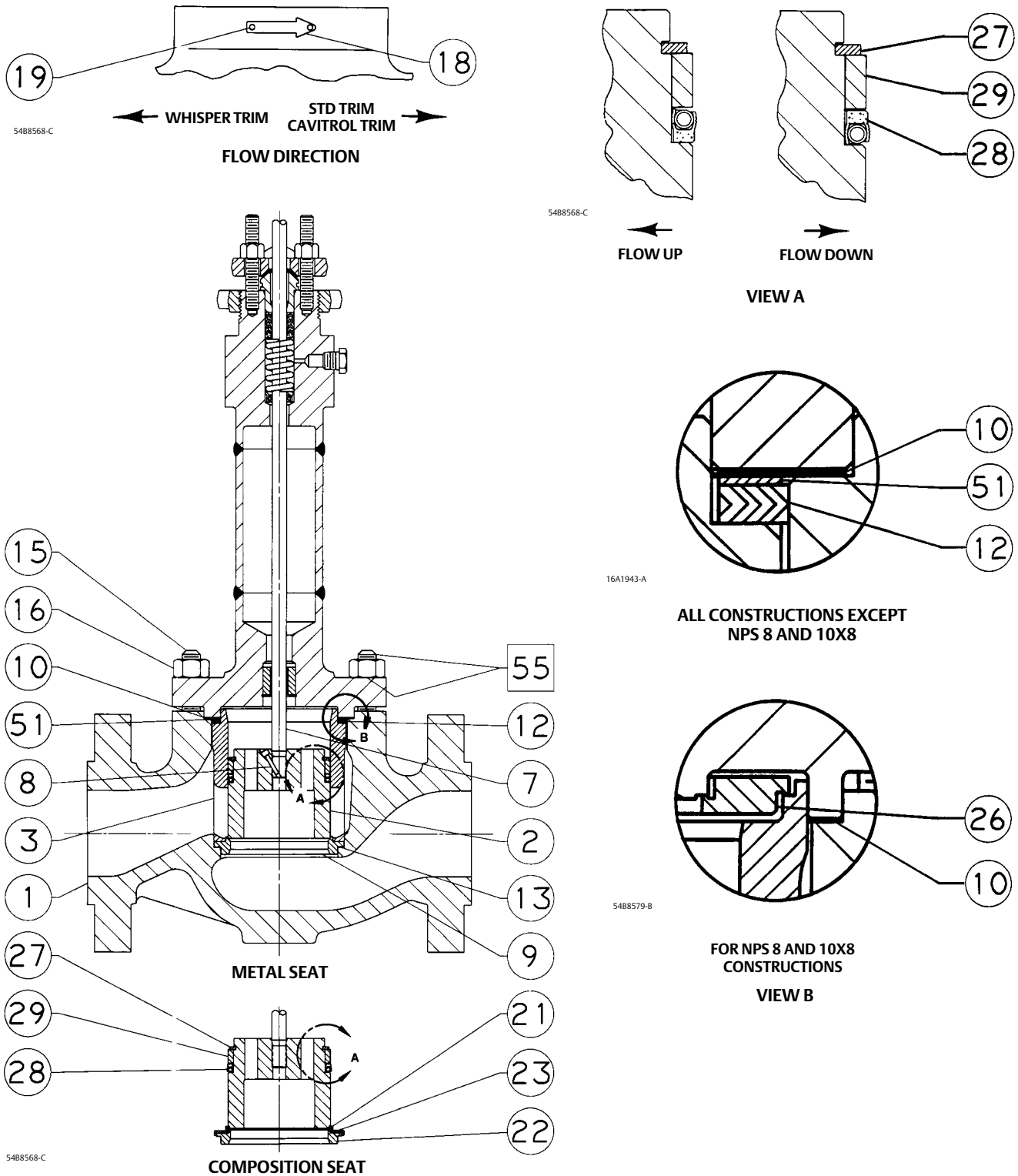
### Note

Part numbers are shown for recommended spares only. For part numbers not shown, contact your [Emerson sales office](#).

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Key	Description
1	Valve Body If you need a valve body as a replacement part, order by valve size, serial number, and desired material.
2*	Valve Plug
3*	Cage
7*	Stem
8*	Pin
9*	Seat Ring
10*	Bonnet Gasket
12*	Spiral Gasket
13*	Seat Ring Gasket
15	Stud Bolt
16	Hex Nut
18	Flow Arrow
19	Drive Screw
21*	Disk Retainer, w/Composition Seat
22*	Disk Seat, w/Composition Seat
23*	Disk
26	Load Ring
27	Retaining Ring
28*	Seal Ring
29	Back-Up Ring
51*	Shim
53	Nameplate
55	Lubricant, anti-seize (not included with valve)

Figure 9. Fisher ET-C and EWT-C Valve Assembly







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

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