

Fisher™ FB Control Valve

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Figure 1. Fisher FBT Valve with ODV High Performance Actuation Package



X1843

Introduction

Scope of Manual

This instruction manual includes installation, maintenance, and parts information for Fisher FB valves. For information on availability of complete assemblies and spare parts, contact your local [Emerson sales office](#). Refer to separate manuals for instructions covering the actuator and accessories.



Do not install, operate, or maintain an FB 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.

Description

FB valves, which include FBD and FBT (figure 1), are fabricated or cast angle valves that are custom built for special applications. The basic construction, however, is similar in all the valves. For applications up to 232°C (450°F) or up to 316°C (600°F) with the use of anti-extrusion rings, the seat ring is screwed to the free end of the cage assembly of the FBT valve.

Table 1. Specifications

Valve Sizes See table 2 End Connection Styles⁽¹⁾ <i>Flanged:</i> CL150, 300, and 600 raised-face or ring-type joint flanges per ASME B16.5 <i>Buttwelding:</i> All available ASME B16.25 schedules that are consistent with ASME B16.34 Maximum Inlet Pressure⁽¹⁾ <i>Flanged:</i> Consistent with CL150, 300, and 600 pressure-temperature ratings per ASME B16.34 <i>Buttwelding:</i> Consistent with CL600 pressure-temperature ratings per ASME B16.34	Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4 FBD: ■ Standard--Class II, ■ Optional--Class IV(with multiple piston rings), and ■ Optional Class V with Bore seal trim FBT: ■ Standard--Class IV ■ Optional--Class V Flow Characteristic Linear Flow Direction Flow direction is typically up through the valve body port and out through the cage Approximate Weights See tables 3, 4, 5, and 6
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1. The pressure or temperature limits in this manual and any applicable standard limitations should not be exceeded.

The top of the cage assembly is clamped between the valve flange and bonnet, permitting unrestricted movement during thermal expansion and contraction (see figures 9 and 16). A spring-loaded seal ring provides a seal around the outside of the seat ring. The top of the cage assembly is also clamped between the valve flange and the bonnet for applications above 232°C (450°F), leaving the cage assembly free to expand and contract. For these high temperature applications, however, the seat ring is separate from the cage assembly and is welded into the FBD valve (see figure 10). No seat ring seal ring is required. The cage assembly is free to expand and contract.

These valves are available in CL150, 300, or 600 with flanged or butt weld ends. Special constructions with a CL900 rating, or with the inlet designed for a valve class rating greater than the outlet, are available on an individual basis. If the valve has an inlet pressure rating greater than the outlet pressure rating, it is especially important to have adequate overpressure protection downstream to protect against the possibility of full inlet pressure reaching the downstream system.

Specifications

Typical specifications for these valves are shown in table 1.

Educational Services

For information on available courses for the Fisher FB 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

To avoid personal injury or property damage resulting from the sudden release of pressure, do not install the valve assembly where service conditions could exceed the limits given in this manual or on the appropriate nameplates. Use pressure-relieving devices as required by government or accepted industry codes and good engineering practices.

Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.

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.

Table 2. Valve Sizes

FABRICATED FB VALVE SIZE INLET X OUTLET, NPS	Whisper Trim™ III Levels A, B, C		Whisper Trim III Level D		WhisperFlo™ Trim	
	Port Diameter		Port Diameter		Port Diameter	
	mm	Inches	mm	Inches	mm	Inches
8 x 12 10 x 12	171	6.75	132	5.18	178	7
10 x 16 12 x 16 16 x 16	197	7.75	171	6.75	178	7
12 x 18 16 x 18	252	9.93	197	7.75	178	7
10 x 20 12 x 20 16 x 20 20 x 20	275	10.81	224	8.81	279	11
12 x 24 16 x 24 18 x 24 20 x 24 24 x 24	352	13.87	275	10.81	375	14.75
16 x 30 20 x 30 24 x 30 30 x 30	430	16.93	378	14.87	464	18.25
20 x 36 24 x 36 30 x 36 36 x 36	506	19.93	430	16.93	464	18.25
CAST FBT VALVE SIZE INLET X OUTLET, NPS						
8 x 12	171	6.75	132	5.18	---	---
10 x 16	197	7.75	171	6.75	---	---
12 x 16	197	7.75	171	6.75	---	---
12 x 18	252	9.93	197	7.75	---	---
12 x 20	275	10.81	224	8.81	---	---
16 x 24	352	13.87	275	10.81	---	---
20 x 30	430	16.93	378	14.87	---	---
24 x 36	506	19.93	430	16.93	---	---
30 x 36	506	19.93	430	16.93	---	---
36 x 42	660	26.0	559	22.0	---	---
42 x 48	813	32.0	660	26.0	---	---

CAUTION

The valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions. Because some body/trim material combinations are limited in their pressure drop and temperature range capabilities, do not apply any other conditions to the valve without first contacting your Emerson sales office.

1. Before installing the valve, inspect the valve and associated equipment for any damage and any foreign material. A strainer should be installed upstream of the valve to prevent particles from plugging the holes in the cage.
2. It is important to remember to install all FB valves in a flow up direction.
3. The control valve assembly should be installed with the actuator vertical above the valve. This orientation facilitates sliding the cage assembly into the valve without the use of special tools and rigging. In addition, vertical installation minimizes the possibility of damaging the seat ring seal ring or the mating chamfers, minimizes the possibility of bending the stem, and greatly reduces wear on the cage. Vertical installation, therefore, significantly extends valve life.

Table 3. Fisher Fabricated FB Approximate Weights

FABRICATED VALVE SIZE (NPS) INLET X OUTLET	VALVE AND BONNET ASSEMBLY					
	Pressure Rating ⁽¹⁾					
	CL150		CL300		CL600	
	Approximate Weight		Approximate Weight		Approximate Weight	
	kg	lb	kg	lb	kg	lb
8 X 12	416	925	509	1130	509	1130
10 X 12	421	935	526	1170	545	1210
10 X 16	612	1360	801	1780	1125	2500
12 X 16	619	1375	810	1800	1148	2550
16 X 16	666	1480	761	1690	1260	2800
12 X 18	810	1800	1071	2380	1496	3325
16 X 18	833	1850	1112	2470	1609	3575
10 X 20	1060	2355	1418	3150	1980	4400
12 X 20	1013	2250	1373	3050	1901	4225
16 X 20	1037	2305	1395	3100	2009	4465
20 X 20	1062	2360	1418	3150	2104	4675
12 X 24	1575	3500	2070	4600	2894	6430
16 X 24	1564	3475	2106	4680	3011	6690
18 X 24	1575	3500	2115	4700	3060	6800
20 X 24	1589	3530	2129	4730	3105	6900
24 X 24	1620	3600	2160	4800	3231	7180
16 X 30	2610	5800	3330	7400	---	---
20 X 30	2651	5890	3357	7460	---	---
24 X 30	2684	5965	3420	7600	---	---
30 X 30	2745	6100	3555	7900	---	---
20 X 36	3848	8500	4928	10,950	---	---
24 X 36	3897	8660	4995	11,100	---	---
30 X 36	4019	8860	5130	11,400	---	---
36 X 36	4100	9110	5400	12,000	---	---

1. Pressure rating for all sizes through NPS 24 outlet. The NPS 30 and 36 outlets conform to ASME B16.47. Dimensions and weights and or butt welding-end valves are available on request.

Table 4. Fisher Cast FBT CL150 Flanged Body Information⁽¹⁾

VALVE SIZE, NPS	Free-Standing						Integral Flange					
	Approximate Weight		G Dimension		A Dimension		Approximate Weight		A Dimension		G Dimension	
	kg	lb	mm	in	mm	in	kg	lb	mm	in	mm	in
8 x 12	---	---	---	---	---	---	---	---	---	---	---	---
16 x 24	2531	5580	620	24.4	597	23.5	2377	5240	476	18.74	597	23.5
20 x 30 ⁽²⁾	4260	9392	997	39.25	717	28.22	4133	9111	761	29.97	717	28.22
24 x 36 ⁽²⁾	4947	10907	959	37.75	794	31.25	4823	10632	749	29.5	794	31.25
36 x 42 ⁽²⁾	10974	24193	932	36.7	1011	39.82	10106	22279	747	29.4	1011	39.82
1. For FBD face-to-face dimensions, please contact your Emerson sales office for additional information. 2. Option for ASME B16.47 series A or series B flange(s).												

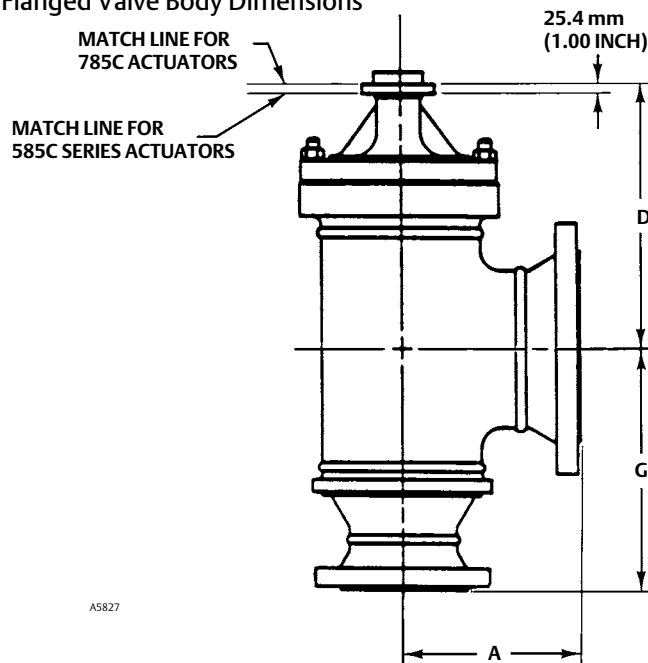
Table 5. Fisher Cast FBT CL300 Flanged Body Information⁽¹⁾

VALVE SIZE, NPS	Free-Standing						Integral Flange					
	Approximate Weight		G Dimension		A Dimension		Approximate Weight		A Dimension		G Dimension	
	kg	lb	mm	in	mm	in	kg	lb	mm	in	mm	in
8 x 12	---	---	---	---	---	---	---	---	---	---	---	---
10 x 16	---	---	---	---	---	---	---	---	---	---	---	---
12 x 16	---	---	---	---	---	---	---	---	---	---	---	---
12 x 18	---	---	---	---	---	---	---	---	---	---	---	---
12 x 20	---	---	---	---	---	---	---	---	---	---	---	---
16 x 24	2672	5890	620	24.4	597	23.5	2458	5420	476	18.74	597	23.5
20 x 30 ⁽²⁾	4512	9947	997	39.25	717	28.22	4322	9528	761	29.97	717	28.22
24 x 36 ⁽²⁾	5322	11732	917	36.12	803	31.62	4897	10797	756	29.75	803	31.62
30 x 36 ⁽²⁾	5671	12502	943	37.12	803	31.62	5633	12419	857	33.75	803	31.62
36 x 42 ⁽²⁾	11014	24281	932	36.7	1011	39.82	10081	22224	747	29.4	1011	39.82
42 x 48 ⁽²⁾	14158	31213	1041	41	1067	42	12551	27671	768	30.25	1067	42
1. For FBD face-to-face dimensions, please contact your Emerson sales office for additional information. 2. Option for ASME B16.47 series A or series B flange(s).												

Table 6. Fisher Cast FBT CL600 Flanged Body Information⁽¹⁾

VALVE SIZE, NPS	Free-Standing						Integral Flange					
	Approximate Weight		G Dimension		A Dimension		Approximate Weight		A Dimension		G Dimension	
	kg	lb	mm	in	mm	in	kg	lb	mm	in	mm	in
8 x 12	---	---	---	---	---	---	---	---	---	---	---	---
10 x 16	---	---	---	---	---	---	---	---	---	---	---	---
12 x 16	---	---	---	---	---	---	---	---	---	---	---	---
12 x 18	---	---	---	---	---	---	---	---	---	---	---	---
12 x 20	---	---	---	---	---	---	---	---	---	---	---	---
16 x 24	2889	6370	787	31	641	25.25	2898	6390	660	26	641	25.25
20 x 30 ⁽²⁾	5512	12152	997	39.25	762	30	5193	11448	761	29.97	762	30
24 x 36 ⁽²⁾	6644	14647	965	38	883	34.75	6145	13547	756	29.75	883	34.75
1. For FBD face-to-face dimensions, please contact your Emerson sales office for additional information. 2. Option for ASME B16.47 series A or series B flange(s).												

Figure 2. Fisher Cast FBT Flanged Valve Body Dimensions



4. Use accepted piping and welding practices when installing the valve in the line. You can leave internal elastomeric parts in the valve when you weld it. For flanged valves, use suitable gaskets between the valve flanges and pipeline flanges.

Note

Depending on valve body materials used, post-weld heat treating might be needed. Post-weld heat treatment can damage internal elastomeric, plastic, and metal parts. Shrunk-fit pieces and threaded connections might loosen. In general, if post-weld heat treating is needed, remove all trim parts. Contact your [Emerson sales office](#) for additional information.

5. If continuous operation is required during maintenance, install a three-valve bypass around the valve.
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 prior to shipment; however some readjustment will be required to meet specific service conditions.

Lifting Valve Assembly

⚠ WARNING

Failure to follow these lifting guidelines and accepted lifting and rigging practices could result in property damage and personal injury or death.

All lifting and rigging must be completed in accordance with federal/national/provincial, state and local regulations and applicable lifting and rigging equipment standards. Only personnel trained in proper lifting and rigging practices shall perform valve/actuator assembly lifting, rigging and installation. Because each lift will be unique, the method of lifting the valve assembly, the correct location for attaching and lifting the valve assembly, and what the valve assembly will do when lifted shall be considered for each lift.

Lifting and rigging equipment used to lift, install or remove a valve assembly or component must be properly selected and sized for the weight and configuration of the valve assembly or component being lifted. The weight of the complete valve assembly, including attached accessories, must be taken in consideration for this purpose. The lifting and rigging equipment must be properly maintained and inspected for damage before each use.

If the valve is supplied with an actuator or handwheel, do not use the actuator or handwheel to lift the complete valve assembly. Lifting lugs attached to the actuator must not be used to lift the complete valve assembly unless clearly marked as being rated to support the complete valve assembly weight.

Lifting lugs or other lifting equipment attached to the valve or actuator must never be used to lift or support the weight of attached piping.

CAUTION

Care must be taken when lifting the valve/actuator assembly to ensure all accessories and tubing are not damaged in the process. Accessories and tubing may need to be removed prior to lifting to prevent damage and properly reinstalled before use. Protect valve flange faces, butt weld ends, and other connection surfaces from damage during lifting.

Remove the valve/actuator assembly from its shipping container with appropriate lifting and rigging equipment for the valve/actuator assembly weight and configuration to be lifted. The valve and bonnet assembly weight is provided in tables 3, 4, 5, and 6. Consult the appropriate actuator and valve accessory instruction manuals for the weight of each additional component, then determine the total weight of the complete valve assembly. The location of the valve/actuator assemblies center of gravity must be considered during lifting, installation, and removal. Additional slings or other lifting equipment, such as a load leveler, may be necessary to prevent toppling of the equipment during lifting or to rotate the valve assembly into a different orientation for installation.

For cast FB valve constructions that include lifting lugs cast integral to the body, use of properly sized shackles in each lifting lug eye is required. The correct shackle pin diameter is provided in table 7. If the valve body includes attached lifting lugs, use all the lugs provided to lift the complete valve assembly. If lifting lugs are not provided on the valve body, lift the valve assembly with lifting straps secured around the valve body flanges, valve body neck, and/or bonnet neck area.

Table 7. Fisher Cast FB Lifting Lug Dimensions

VALVE SIZE, NPS	CLASS	LIFTING EYE ID	SHACKLE PIN DIAMETER
		in	in
8x12	CL150	---	---
	CL300	---	---
	CL600	---	---
10x16	CL300	---	---
	CL600	---	---
12x16	CL300	---	---
	CL600	---	---
12x18	CL300	---	---
	CL600	---	---
12x20	CL300	---	---
	CL600	---	---
16x24	CL150	1.32	1.13
	CL300	1.32	1.13
	CL600	1.32	1.13
20x30	CL150	2.1	2.0
	CL300	2.1	2.0
	CL600	2.1	2.0
24x36	CL150	1.73	1.63
	CL300	1.73	1.63
	CL600	1.73	1.63
30x36	CL300	1.73	1.63
36x42	CL150	2.12	2.0
	CL300	2.12	2.0
42x48	CL300	2.4	2.25

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 lubrication, temporary packing maintenance, packing replacement, trim maintenance, and lapping metal seats. All maintenance operations may be performed with the valve in the line.

WARNING

Avoid personal injury 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 on both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power 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.**
-

Note

Whenever a gasket seal is disturbed by removing or shifting gasketed 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.

Note

If the valve has ENVIRO-SEAL™ live-loaded packing installed, see the Fisher instruction manual entitled ENVIRO-SEAL Packing System for Sliding-Stem Valves, [D101642X012](#), for packing instructions.

If the valve has HIGH-SEAL Heavy-Duty live-loaded packing installed, see the Fisher instruction manual entitled HIGH-SEAL ULF Live-Loaded Packing System, [D101453X012](#), for packing instructions.

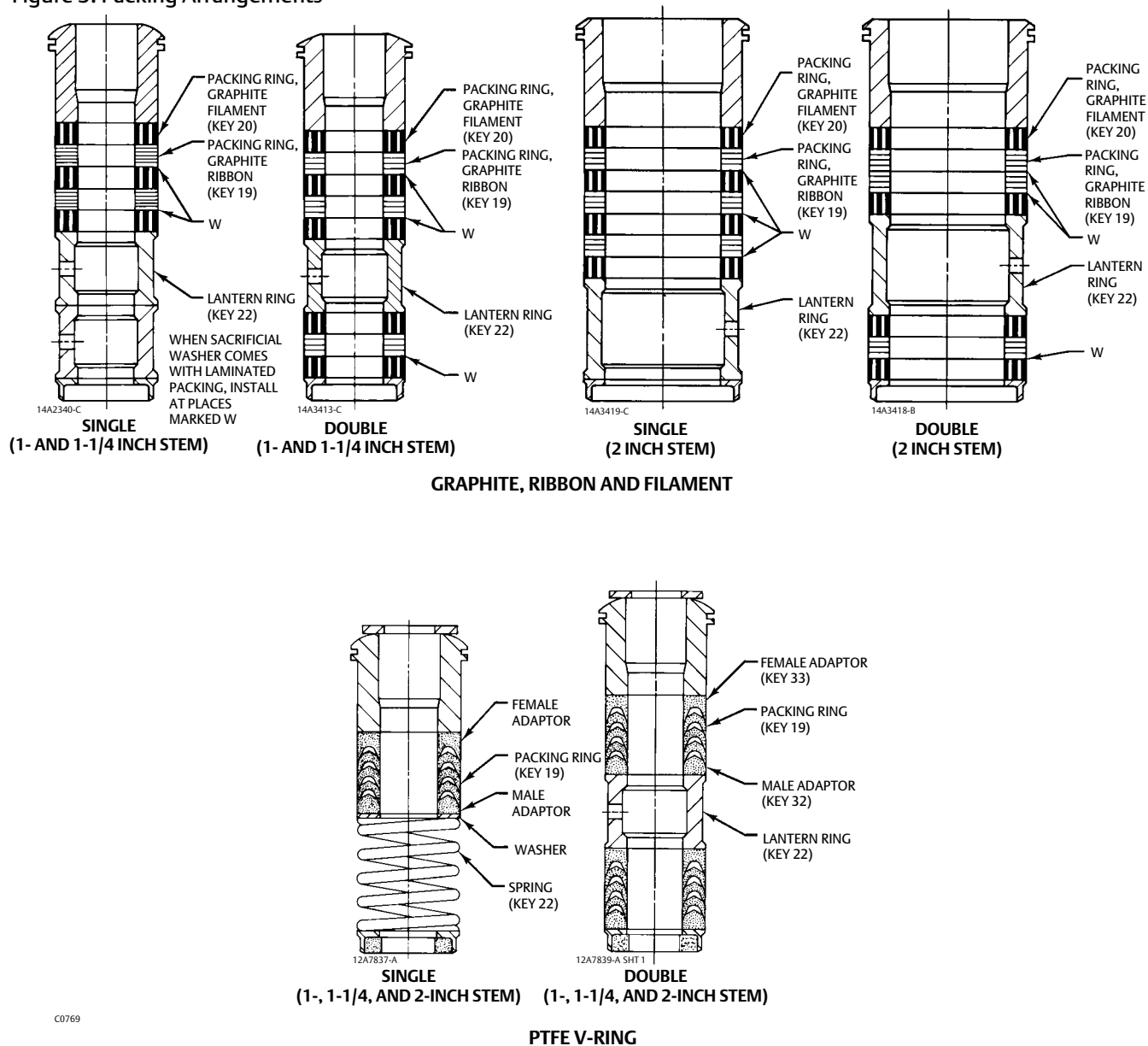
Packing Lubrication

If a lubricator or lubricator/isolating valve (figure 4) is provided for PTFE/composition or other packings that require lubrication, it will be installed in place of the pipe plug (key 28, figures 11 and 13). Use a good quality silicon-base lubricant. Packing used in oxygen service or in processes with temperatures over 260°C (500°F) should not be lubricated. To operate the lubricator, simply turn the cap screw clockwise to force the lubricant into the packing box. The lubricator/isolating valve operates the same way except the isolating valve must first be opened and then closed after lubrication is completed.

Temporary Packing Maintenance

With most jam-type packing, new packing rings can be added on top of the old packing rings as a temporary measure until a more complete disassembly and packing replacement can be made.

Figure 3. Packing Arrangements



To do this with split ring packing, 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. Pressurize the actuator to open the valve. Unbolt the packing flange (key 15, figures 11 and 13) and slide the packing flange wiper (key 21, figures 11 and 13) and packing follower (key 25, figures 11 and 13) up the valve stem to add packing rings. To improve the seal, the old packing rings on top of the lantern ring (key 22, figure 3) may be removed with a packing hook whenever possible. If this is done, use care to avoid scratching the valve stem or packing box wall. Clean all metal parts to remove any particles which would prevent the packing from sealing evenly against the valve stem or packing box wall.

Table 8. Recommended Torque for Packing Flange Nuts

VALVE STEM DIAMETER		PRESSURE RATING	GRAPHITE TYPE PACKING				PTFE TYPE PACKING (NON SPRING-LOADED)			
			Minimum Torque		Maximum Torque		Minimum Torque		Maximum Torque	
mm	Inches		N•m	Lbf•ft	N•m	Lbf•ft	N•m	Lbf•ft	N•m	Lbf•ft
25.4	1	CL150/300	24	18	37	27	12	9	16	12
		CL600	34	25	50	37	16	12	24	18
31.8	1-1/4	CL150/300	33	24	49	36	16	12	24	18
		CL600	45	33	66	49	22	16	33	24
50.8	2	CL150/300	43	32	65	48	20	15	31	23
		CL600	61	45	91	67	27	20	41	30

⚠ WARNING

To prevent injury to personnel and damage to equipment, make certain the valve is fully closed before separating the stem connector.

If solid ring packing is used, separate the stem connector and raise the actuator so that the packing flange and packing follower can be removed, and the packing rings can be slipped over the end of the valve stem. After the packing has been tightened down, reconnect the valve/actuator stem connection according to the appropriate actuator instruction manual.

Replacing Packing

CAUTION

Handle tools carefully around the valve plug stem (key 12, figures 9, 10, and 16) and the packing box. A gouge or scratch in the packing box wall could create a leak path. A damaged valve stem could cut a groove in the packing, allowing leakage.

1. Before removing the actuator, disconnect air, electrical, and leakoff lines which would interfere with actuator removal or valve maintenance. 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.

⚠ WARNING

To prevent injury to personnel and damage to equipment, make certain the valve is fully closed before separating the stem connector.

2. With the plug seated, remove the stem connector by loosening the stem locknuts and unscrewing the cap screws which hold the two halves together.

CAUTION

To avoid damaging the seating surface caused by the valve plug and stem assembly dropping from the bonnet after being lifted part way out, be sure that the assembly remains in the valve and on the seat. The parts are also easier to handle separately.

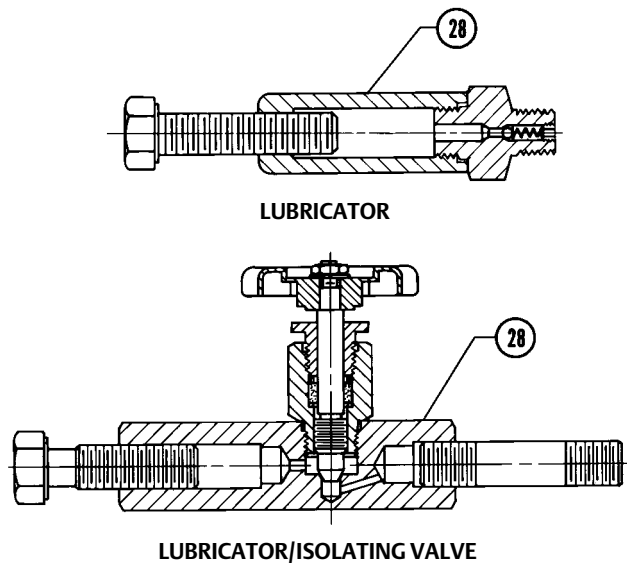
3. Remove the hex nuts (key 27, figures 11 and 13) from the yoke boss cap screws or stud bolts (key 26, figures 11 and 13) and lift off the actuator.
4. Remove the stem locknuts and loosen the packing flange nuts (key 17, figures 11 and 13) so that the packing is not tight on the valve stem (key 12, figures 9, 10, and 16). Then remove the large hex nuts (key 11, figures 9, 10, and 16) that bolt the bonnet and valve together.

Table 9. Recommended Bolt Torque⁽¹⁾⁽²⁾

Stud Bolt Size, Inches	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2
Torque (N•m)	271	393	549	746	990	1329	1749
Torque (Lbf•ft)	200	290	405	550	730	980	1290

1. Based on alloy steel bolting ASME SA 193-B7 with heavy hex nuts. For other materials, contact your [Emerson sales office](#) for torques.
 2. Lubricate with lithium grease. For other lubricants or coated bolting, contact your Emerson sales office for torques.

Figure 4. Lubricator and Lubricator/Isolating Valve



10A9421-A
A5428-D
A0832-2"

5. Attach the ringed ends of a lifting chain (not furnished) to two of the yoke boss stud bolts 180 degrees apart. Then replace the nuts on the two stud bolts selected. (Use washers to retain the chain rings if necessary).
6. Check to be sure that the chain will not damage the stem threads and lift the bonnet straight up with the hoist. If the valve plug and stem assembly starts to lift with the bonnet, use a brass or lead hammer on the end of the stem and tap it back down. Set the bonnet on a cardboard or wooden surface to prevent damage to the bonnet gasket surface.
7. Remove the packing flange nuts (key 17), packing flange (key 15), upper wiper (key 21), and packing follower (key 25), all shown in figures 11 and 13.
8. Using care to avoid scratching the packing box wall, pull the packing box components out with a wire hook. The packing box components can also be pushed out of the packing cavity with a rod inserted from the bottom of the bonnet, whenever the bonnet can be positioned to permit access from the bottom.
9. Clean the packing box and the metal packing box components. Spray PTFE packing with a silicone-based lubricant.
10. Install new bonnet gaskets (key 6, figures 9, 10, and 16) and replace the bonnet.
11. Install the new packing as shown in figure 3, 11, or 13.

For spring-loaded PTFE V-ring packing, tighten the packing flange nuts until the shoulder on the packing follower (key 25, figures 11 and 13) contacts the bonnet.

For **graphite packing**, tighten the packing flange nuts to the maximum recommended torque shown in table 8. Then, loosen the packing flange nuts, and retighten them to the recommended minimum torque shown in table 8.

For **other packing types**, tighten the packing flange nuts alternately in small equal increments until one of the nuts reaches the minimum recommended torque shown in table 8. Then, tighten the remaining flange nuts until the packing flange is level and at a 90-degree angle to the valve stem.

For **ENVIRO-SEAL or HIGH-SEAL live-loaded packing**, refer to the note at the beginning of the Maintenance section.

12. Lubricate the stud bolts (key 10, figures 9, 10, and 16) and replace the nuts (key 11, figures 9, 10, and 16). Tighten the nuts down gradually in a criss-cross pattern to ensure that the bonnet is drawn down evenly. The maximum recommended torque values are shown in table 9 for the various stud bolt sizes used in the fabricated valves.
13. Mount the actuator on the valve assembly and reconnect the actuator and valve stem according to the procedure in the appropriate actuator instruction manual.
14. After the valve has operated at line temperature for a time, retighten the hex nuts to the recommended torque value.

Trim Maintenance

The following procedure provides instruction for replacing the trim. Complete only those steps necessary to accomplish the required maintenance operations.

Key numbers in this section are referenced in figures 9, 10, and 16 and apply to FB valves, unless otherwise specified.

1. Remove the actuator and the bonnet according to steps 1 through 6 of the Replacing Packing section.
2. Screw an eyed adaptor (not furnished) onto the valve stem threads and lift the valve plug and stem assembly out of the valve. Lower it onto a cushioned surface to protect the valve plug seating surface.
3. If the valve plug (key 2) is damaged and requires replacement, always replace the entire valve plug and stem assembly.

CAUTION

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 weakens the stem. However, a used valve plug may be reused with a new stem.

- a. Drive out the old pin (key 13), unscrew the old stem, and replace it with a new stem. Screw the new stem completely into the valve plug until the thread bottoms out against the plug.
- b. Locate the pin guide hole in the valve plug and drill a matching hole through a new stem. Use a 6.4 mm (1/4-inch) diameter drill for constructions with port sizes through 378 mm (14.875 inches); use a 9.5 mm (3/8 inch) diameter drill for constructions with 430 mm (16.9375 inch) or 506 mm (19.9375 inch) port sizes. Install a new pin.
4. If the piston ring (key 4, figure 10) in FBD or the seal ring (key 4, figures 9 and 16) in FBT is visibly damaged, remove it and replace it with a new part. Be careful not to scratch the surface of the ring groove in the valve plug or the new ring may not seal properly. Since the FBT seal ring must be pried and/or cut from the groove, it cannot be used over again.

Note

Lapping metal seats, if required, should be done before installing the piston or seal ring.

- a. Before replacing the piston ring or the valve plug seal ring, be sure the ring groove in the valve plug is clean and free of scratches. The FBD piston ring is split and can be easily placed in the groove.

CAUTION

Avoid jerking sharply on the seal ring. The PTFE or FEP material in the seal ring must be permitted time to cold-flow during the stretching procedure.

- b. The FBT seal ring is a one-piece, spring-loaded ring which must be carefully stretched over the top end of the valve plug and into the groove. First lubricate the seal ring generously and place it over the valve stem. Since the flow direction is up through the seat ring and out through the cage, the open portion of the seal ring should be up. Start the ring in the groove on one side of the valve plug and slowly and gently work it over the top edge of the valve plug.

Stretching the seal over the valve plug may make it seem unduly loose when first placed in the groove, but it will contract to its original size without requiring a waiting period before insertion into the cage.

- c. If no further trim maintenance is required, the valve can be reassembled at this point by carefully replacing the valve plug, and proceeding to step 10. If an FBT valve plug is being replaced, make sure the seal ring is evenly engaged in the entrance chamfer at the top of the cage assembly (key 3) to avoid damaging the seal ring.
5. Attach a lifting chain to the cage assembly. The cage is tapped on the top in two places to facilitate rigging. Hoist the cage assembly straight out of the valve and set it on a flat surface.

CAUTION

Avoid jerking sharply on the seal ring. The PTFE or FEP material in the seal ring must be permitted time to cold-flow during the stretching procedure.

6. The standard design for applications up to 232°C (450°F) will have a seat ring seal ring (key 5). Inspect this seal ring and, if necessary, remove it and install a new seal ring. Lubricate the seal ring generously, and place it over the bottom end of the seat ring. Start the ring in the groove on one side of the seat ring, and gently work it over the seat ring. The open portion of the seat ring seal ring should be down since flow is up through the seat ring and out through the cage.
7. In the standard design where the seat ring is screwed into the cage, it is secured with two tack welds, one on each side of the cage. The seat ring can be removed by grinding or filing off the tack welds, then inserting a bar through slots cut in the seat ring to turn it out of the cage.
8. Tack weld the new seat ring to the cage using minimal heat. Two welds, 6.4 mm (1/4-inch) long and 180 degrees apart, are required. Using a hoist, lower the cage assembly into the valve. Use care to avoid damaging the seal rings or other sealing surfaces while handling the heavy parts. To facilitate inserting the cage assembly into the valve, lubricate the outside diameter of the seat ring and the seal with lithium grease.
9. Replace the valve plug/stem assembly.

CAUTION

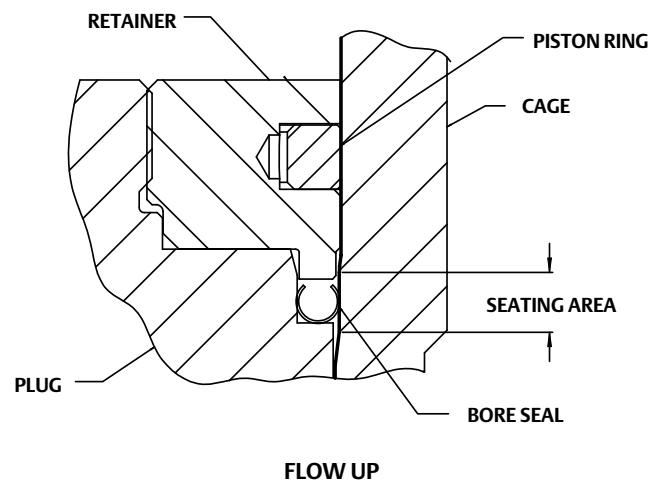
Place the bonnet carefully over the stem to avoid damaging the packing.

10. Install new gaskets (key 6), and replace the bonnet.
11. Lubricate the stud bolts (key 10, figures 9, 10, and 16) and replace the nuts (key 11, figures 9, 10, and 16). Tighten the nuts down gradually in a criss-cross pattern to ensure that the bonnet is drawn down evenly. The maximum recommended torque values are shown in table 9 for the various stud bolt sizes used in the fabricated valves.
12. Mount the actuator on the valve assembly and reconnect the actuator and valve stem according to the procedure in the appropriate actuator instruction manual.

Lapping Metal Seats

A certain amount of leakage should be expected with metal-to-metal seating in any valve. If the leakage becomes excessive, however, the condition of the seating surfaces of the valve plug and seat ring can be improved by lapping. (Deep nicks should be machined out rather than ground out.) Use a good quality lapping compound of a mixture of 280 to 600-grit. Apply the compound to the bottom of the valve plug.

Figure 5. Fisher FB with Bore Seal Trim



Assemble the valve to the extent that the cage is in place and the bonnet is bolted to the valve. A simple handle can be made from a piece of strap iron locked to the valve plug stem with nuts. Rotate the handle alternately in each direction to lap the seats. After lapping, remove the bonnet and clean the seating surfaces. Completely assemble and test the valve for shutoff. Repeat the lapping procedure if leakage is still excessive.

Retrofit: Installing Bore Seal Trim

Note

Additional actuator thrust is required for a valve with Bore Seal trim. When installing Bore Seal trim in an existing valve, contact your [Emerson sales office](#) for assistance in determining new actuator thrust requirements.

Assemble the new valve plug/retainer assembly (with Bore Seal plug seal) using the following instructions:

CAUTION

To avoid leakage when the valve is returned to service, use appropriate methods and materials to protect all sealing surfaces of the new trim parts while assembling the individual parts and during installation in the valve body.

1. Apply a suitable high-temperature lubricant to the inside diameter of the Bore Seal plug seal. Also, lubricate the outside diameter of the valve plug where the Bore Seal plug seal must be pressed into the proper sealing position (figure 5).
2. Orient the Bore Seal plug seal for correct sealing action based on the process fluid flow direction through the valve.
 - a. The open interior of the Bore Seal plug seal must face up in a valve with flow-up construction (figure 5).
3. Place the Bore Seal plug seal over the top of the valve plug. The retainer will help guide the Bore Seal down onto the plug (figure 5). Do not force the Bore Seal over the plug.
4. An installation tool (see table 10) must be inserted into the Bore Seal prior to using the retainer to guide it down the plug.
5. Apply a suitable high-temperature lubricant to the threads on the plug. Then, place the Bore Seal retainer onto the plug and tighten the retainer using an appropriate tool such as a strap wrench.
6. Remove the retainer and then the installation tool. Place the Bore Seal retainer back onto the plug and tighten the retainer using an appropriate tool such as a strap wrench.
7. Using an appropriate tool such as a center punch, stake the threads on top of the plug in one place (figure 7) to secure the Bore Seal retainer.
8. Install the new plug/retainer assembly with Bore Seal plug seal on the new stem following the appropriate instructions in the Trim Replacement section of this manual.
9. Install piston rings by following instructions in the Trim Replacement section of this manual.
10. Remove the existing valve actuator and bonnet following the appropriate instructions in the Replacing Packing section of this manual.

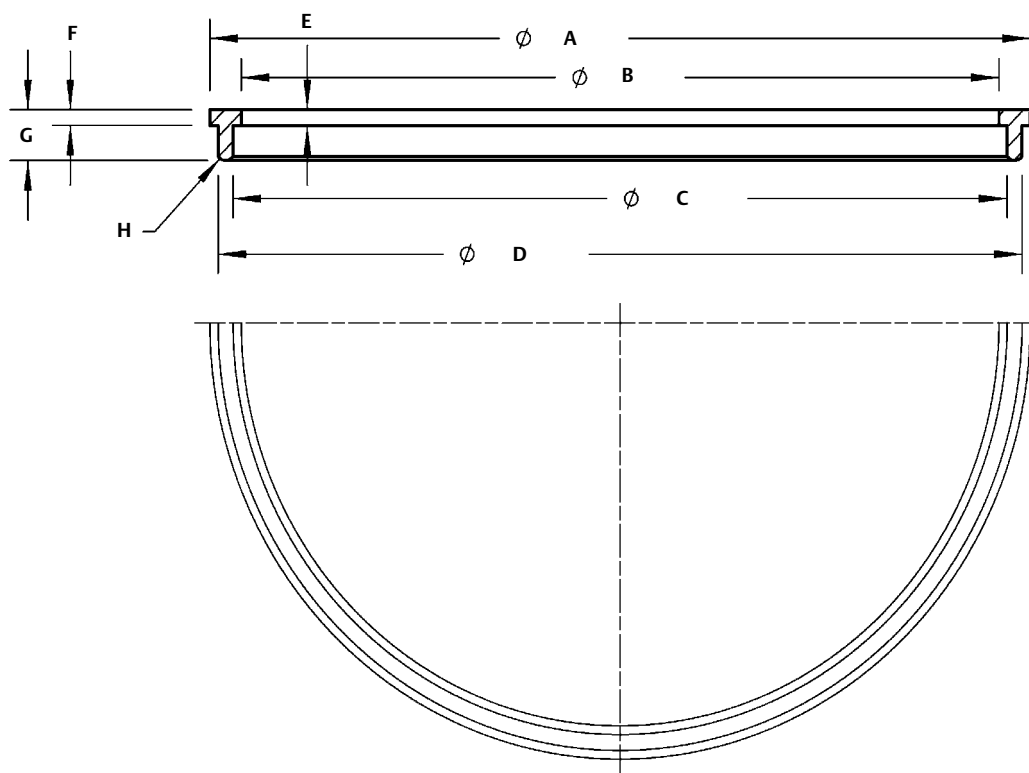
CAUTION

Do not remove the existing valve stem from the valve plug unless you are planning to replace the valve stem.

Never reuse an old valve stem with a new plug or reinstall a valve stem after it has been removed. Replacing a valve stem requires drilling a new pin hole in the stem. This drilling weakens the stem and may cause failure in service. However, a used valve plug may be reused with a new valve stem.

11. Remove the existing valve stem and plug, cage, and seat ring from the valve body following the appropriate instructions in the Trim Removal section of this manual.
12. Replace all gaskets according to appropriate instructions in the Trim Replacement section of this manual.

Figure 6. Bore Seal Installation Tool



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Table 10. Bore Seal Installation Tool Dimensions

VALVE PORT SIZE, INCH	Dimensions, Inches (See Figure 6)								Tool Part Number
	A	B	C	D	E	F	G	H	
5.1875	---(1)								n/a
6.75	7.11	6.69	6.79-6.81	7.01-6.99	0.09	0.10	0.32	R.06	GE18264X012
7.00	7.11	6.69	6.79-6.81	7.01-6.99	0.09	0.10	0.32	R.06	GE18264X012
7.75	---(1)								n/a
8.8125	---(1)								n/a
9.9375	---(1)								n/a
10.8125	---(1)								n/a
11.00	---(1)								n/a
13.875	---(1)								n/a
14.75	14.84	14.424-14.416	14.516-14.536	14.736-14.716	0.1	0.1	0.32	R.05	GE34073X012
14.875	---(1)								n/a
16.9375	---(1)								n/a
18.25	---(1)								n/a
19.9375	---(1)								n/a

1. For sizes, contact your [Emerson sales office](#).

13. Install the new seat ring, cage, valve plug/retainer assembly, and stem into the valve body and completely reassemble the valve package following the appropriate instructions in the Trim Replacement section of this manual.

CAUTION

To avoid excessive leakage and seat erosion, the valve plug must be initially seated with sufficient force to overcome the resistance of the Bore Seal plug seal and contact the seat ring. You can correctly seat the valve plug by using the same force calculated for full load when sizing your actuator. With no pressure drop across the valve, this force will adequately drive the valve plug to the seat ring, thus giving the Bore Seal plug seal a predetermined permanent set.

With full actuator force applied and the valve plug fully seated, align the actuator travel indicator scale with the lower end of valve travel. Refer to the appropriate actuator instruction manual for information on this procedure.

Replacement of Installed Bore Seal Trim

Trim Removal (Bore Seal Constructions)

1. Remove the valve actuator and bonnet following the appropriate instructions in the Replacing Packing section of this manual.

CAUTION

To avoid leakage when the valve is returned to service, use appropriate methods and materials to protect all sealing surfaces of the trim parts during maintenance.

Use caution when removing piston ring(s) and the Bore Seal plug seal to avoid scratching any sealing surface.

CAUTION

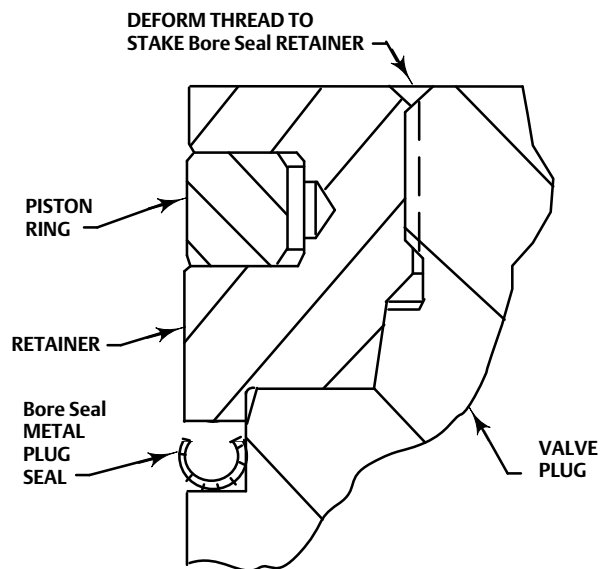
Do not remove the valve stem from the plug/retainer assembly unless you are planning to replace the valve stem.

Never reuse an old valve stem with a new plug or reinstall a valve stem after it has been removed. Replacing a valve stem requires drilling a new pin hole in the stem. This drilling weakens the stem and may cause failure in service. However, a used valve plug may be reused with a new valve stem.

2. Remove the plug/retainer assembly (with Bore Seal plug seal) and cage from the valve body following the appropriate instructions in the Trim Removal section of this manual.
3. Locate the staked thread on top of the valve plug (figure 7). The staked thread secures the retainer. Use a drill with a 1/8 inch bit to drill out the staked area of the thread. Drill approximately 1/8 inch into the metal to remove the staking.
4. Locate the break between sections of the piston ring(s). Using an appropriate tool such as a flat-blade screwdriver, carefully pry out the piston ring(s) from the groove(s) in the Bore Seal retainer.
5. After removing the piston ring(s), locate the 1/4-inch diameter hole in the groove. In a retainer with two piston ring grooves, the hole will be found in the upper groove.
6. Select an appropriate tool such as a punch and place the tip of the tool into the hole with the body of the tool held tangent to the outside diameter of the retainer. Strike the tool with a hammer to rotate the retainer and free it from the valve plug. Remove the retainer from the plug.

7. Use an appropriate tool such as a flat-blade screwdriver to pry the Bore Seal plug seal off the plug. Use caution to avoid scratches or other damage to the sealing surfaces where the Bore Seal plug seal makes contact with the valve plug (figure 5).
8. Inspect the lower seating surface where the valve plug contacts the seat ring for wear or damage which would prevent proper operation of the valve. Also, inspect the upper seating surface inside the cage where the Bore Seal plug seal contacts the cage, and inspect the sealing surface where the Bore Seal plug seal makes contact with the plug (figure 5).

Figure 7. Stake the Threads of the Bore Seal Retainer



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9. Replace or repair trim parts according to the following procedure for lapping metal seats, remachining metal seats, or other valve plug maintenance procedures as appropriate.

Lapping Metal Seats (Bore Seal Constructions)

Before installing a new Bore Seal plug seal, lap the lower seating surface (valve plug to seat ring, figure 5) following appropriate procedures in the Lapping Seats section of this manual.

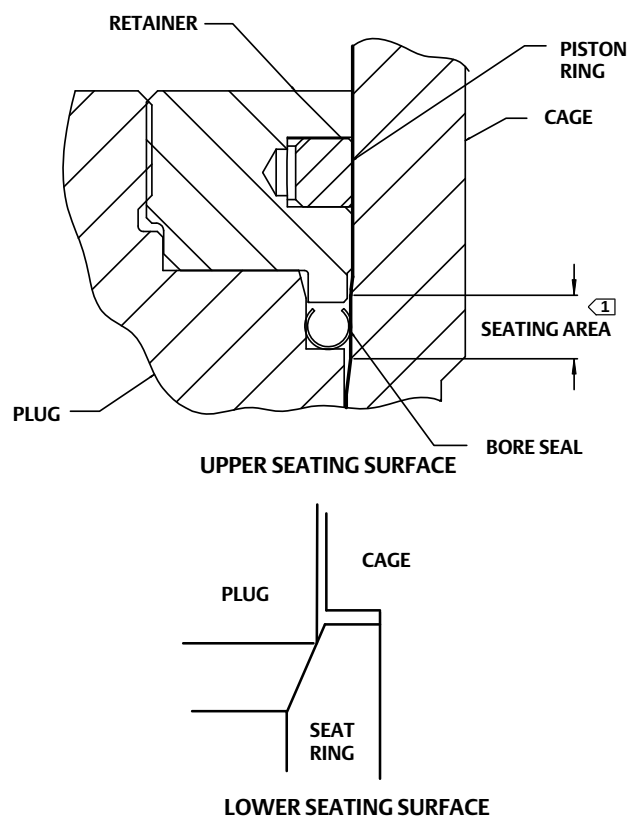
Remachining Metal Seats (Bore Seal Constructions)

A valve plug with a Bore Seal metal plug seal features two seating surfaces. One seating surface is found where the valve plug contacts the seat ring. The second seating surface is found where the Bore Seal plug seal contacts the upper seating surface in the cage. The cage does not require any machining, even when the plug and / or seat ring have been machined.

Trim Replacement (Bore Seal Constructions)

1. Apply a suitable high-temperature lubricant to the inside diameter of the Bore Seal plug seal. Also, lubricate the outside diameter of the valve plug where the Bore Seal plug seal must be pressed into the proper sealing position (figure 5).
2. Orient the Bore Seal plug seal for correct sealing action based on the process fluid flow direction through the valve.
 - a. The open interior of the Bore Seal plug seal must face up in a valve with flow-up construction (figure 5).
3. Place the Bore Seal plug seal over the top of the valve plug. The retainer will help guide the Bore Seal down onto the plug. Do not force the Bore Seal over the plug.

Figure 8. Lower (Valve Plug to Seat Ring) and Upper (Bore Seal Plug Seal to Cage) Seating Surfaces



NOTE:

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1 UPPER SEATING SURFACE IS THE AREA OF CONTACT BETWEEN THE BORE SEAL METAL PLUG SEAL AND THE CAGE.

4. An installation tool (see table 10) must be inserted into the Bore Seal prior to using the retainer to guide it down the plug.
5. Apply a suitable high-temperature lubricant to the threads on the plug. Then, place the Bore Seal retainer onto the plug and tighten the retainer using an appropriate tool such as a strap wrench.
6. Remove the retainer and then the installation tool. Place the Bore Seal retainer back onto the plug and tighten the retainer using an appropriate tool such as a strap wrench.
7. Using an appropriate tool such as a center punch, stake the threads on top of the plug in one place (figure 7) to secure the Bore Seal retainer.
8. Replace the piston ring(s) following instructions in the Trim Replacement section of this manual.

9. Return the cage, plug/retainer assembly, and stem to the valve body and completely reassemble the valve package following the appropriate instructions in the Trim Replacement section of this manual.

CAUTION

To avoid excessive leakage and seat erosion, the valve plug must be initially seated with sufficient force to overcome the resistance of the Bore Seal plug seal and contact the seat ring. You can correctly seat the valve plug by using the same force calculated for full load when sizing your actuator. With no pressure drop across the valve, this force will adequately drive the valve plug to the seat ring, thus giving the Bore Seal plug seal a predetermined permanent set.

With full actuator force applied and the valve plug fully seated, align the actuator travel indicator scale with the lower end of valve travel. Refer to the appropriate actuator instruction manual for information on this procedure.

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 key number and part name from the following list. Specify the desired material, if known. Part numbers are shown for packing box parts. Specify the part number if you are ordering packing parts.

⚠ 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 List

Note

Contact your [Emerson sales office](#) for part ordering information.

Valve (figures 9, 10, and 16)

Key	Description
1	Valve Body
2*	Valve Plug
3*	Cage Assembly

- | | |
|-----|---|
| 4* | Seal Ring (Plug Ass'y) FBT valve
PTFE Spring Loaded
FBD Valve - Piston Ring |
| 5* | Seal Ring (Seat Ring-Cage Ass'y) |
| 6* | Gasket (2 req'd) |
| 8 | Flow Arrow |
| 9 | Drive Screw |
| 10 | Stud Bolt |
| 11 | Hex Nut |
| 12* | Valve Plug Stem |
| 13* | Pin |
| 29* | Retaining Ring (not shown) |
| 30* | Back-Up Ring (not shown) |
| 36 | Nameplate |
| 37 | Wire |

Key	Description
4*	Seal Ring (Plug Ass'y) FBT valve PTFE Spring Loaded FBD Valve - Piston Ring
5*	Seal Ring (Seat Ring-Cage Ass'y)
6*	Gasket (2 req'd)
8	Flow Arrow
9	Drive Screw
10	Stud Bolt
11	Hex Nut
12*	Valve Plug Stem
13*	Pin
29*	Retaining Ring (not shown)
30*	Back-Up Ring (not shown)
36	Nameplate
37	Wire

Key	Description
-----	-------------

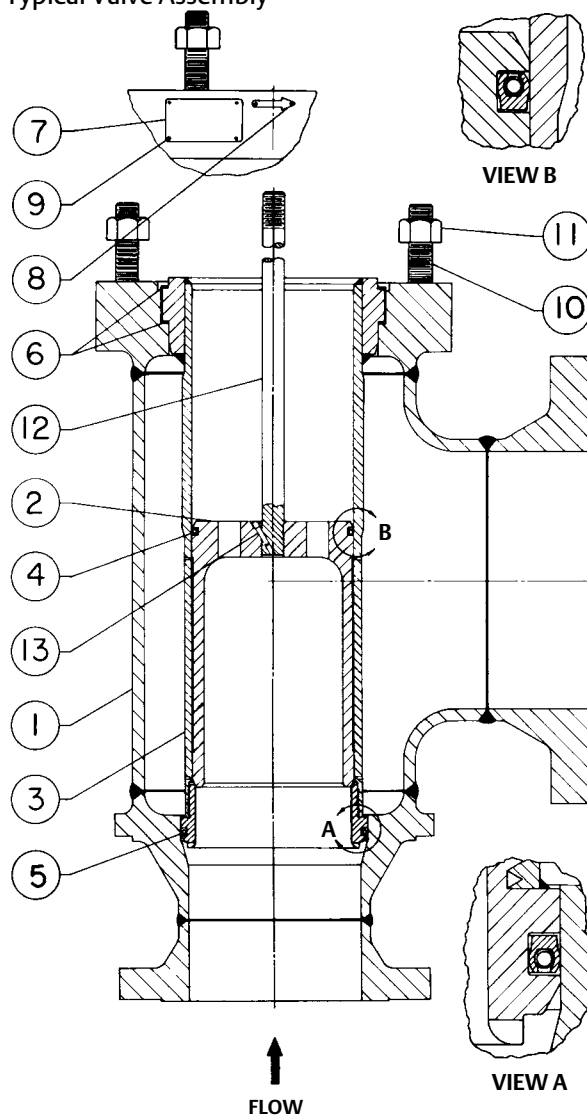
Bonnet (figures 11, 13, 12, 14, and 15)

14	Bonnet
15	Packing Flange
16	Packing Flange Stud
17	Packing Flange Nut
18*	PTFE V-Ring Packing Set
19*	Packing Ring
20*	Packing Ring
21*	Upper Wiper
22	Spring (single PTFE packing only)
22	Lantern Ring
23	Washer (single PTFE packing only)
24	Packing Box Ring
25	Packing Follower
26	Stud
27	Hex Nut
28	Pipe Plug or Lubricator or Lubr/Iso Valve
34	Bearing
35	Retaining Ring

Key	Description
-----	-------------

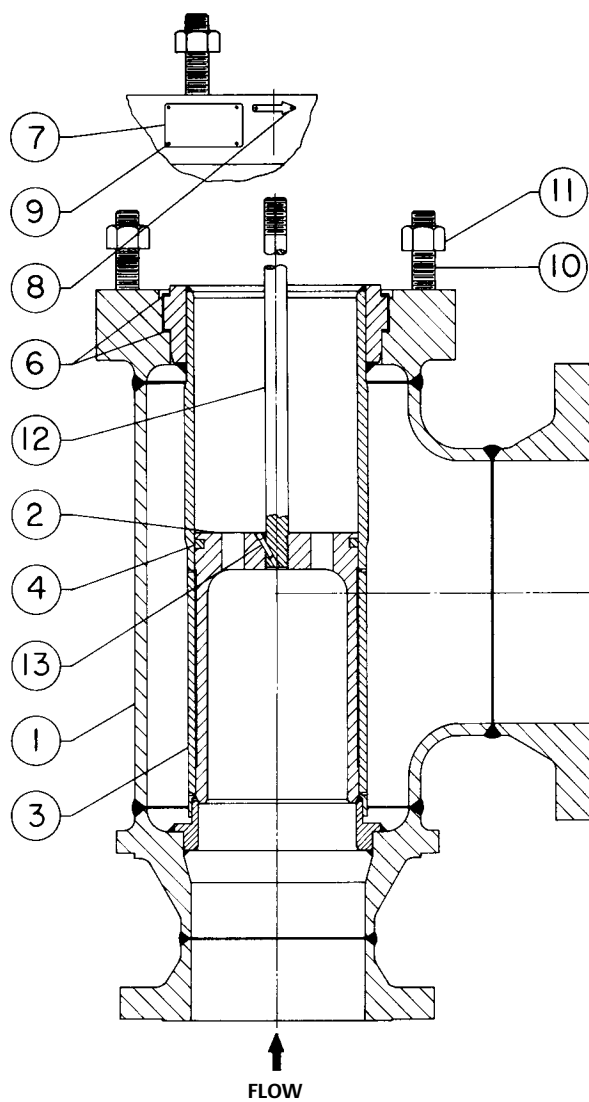
200	Stud (2 req'd)
201	Packing Flange
202	Spring, (2 req'd)
203	Spring guide packing follower
204	Screw (4 req'd) For HIGH-SEAL packing
205	Load Scale (2 req'd)
206	Indicator Disk
207*	Guide Bushing, white (2 req'd)
208*	Guide Bushing, no color
209*	Packing Ring (3 req'd)
210*	Packing Ring (2 req'd)
211*	Packing Box Ring
212	Hex Nut (2 req'd)
213	Anti-Seize Lubricant
214*	Anti-extrusion washer (4 req'd)
214*	Packing washer (5 req'd)
215*	Packing set (2 req'd)
217	Spring pack assembly
218*	Lower wiper
216	Lantern ring

Figure 9. Fisher Fabricated FBT—Typical Valve Assembly



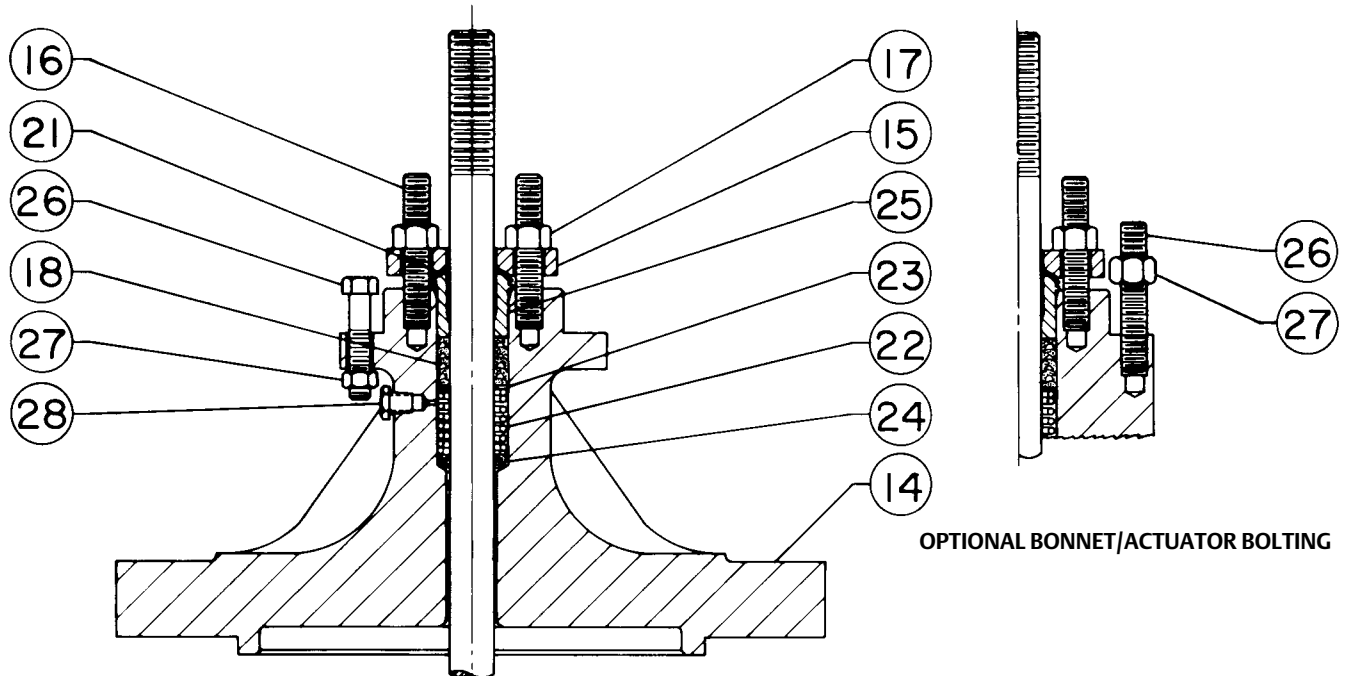
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Figure 10. Fisher Fabricated FBD—Typical Valve Assembly



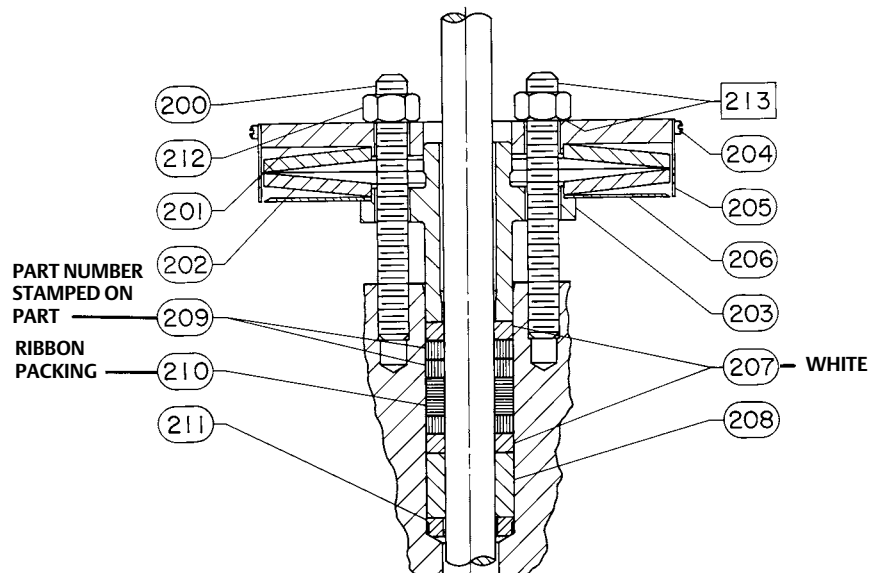
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Figure 11. Bonnet Assembly with PTFE V-Ring Packing



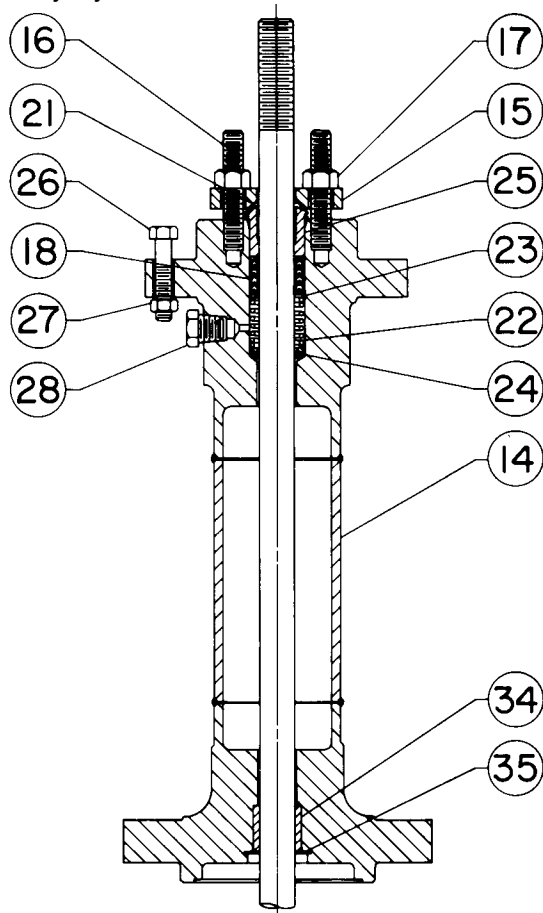
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Figure 12. Typical HIGH-SEAL Packing System



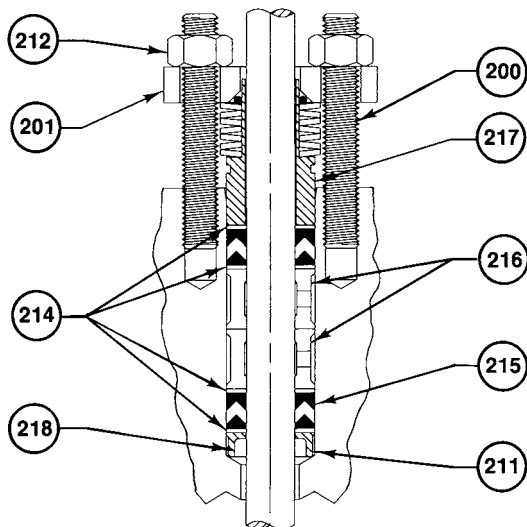
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Figure 13. Extension Bonnet Assembly Style 3



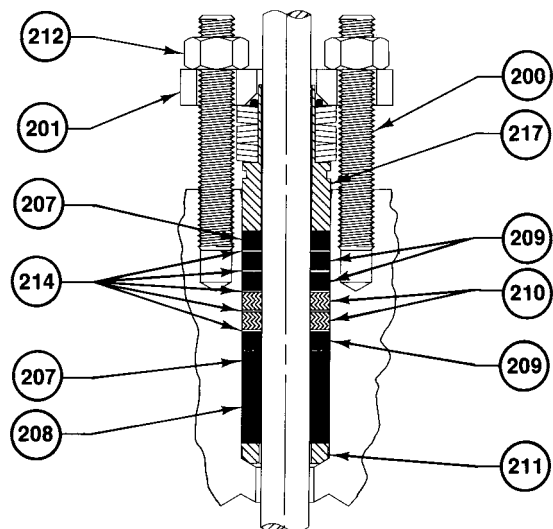
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Figure 14. Typical ENVIRO-SEAL Packing System with PTFE Packing



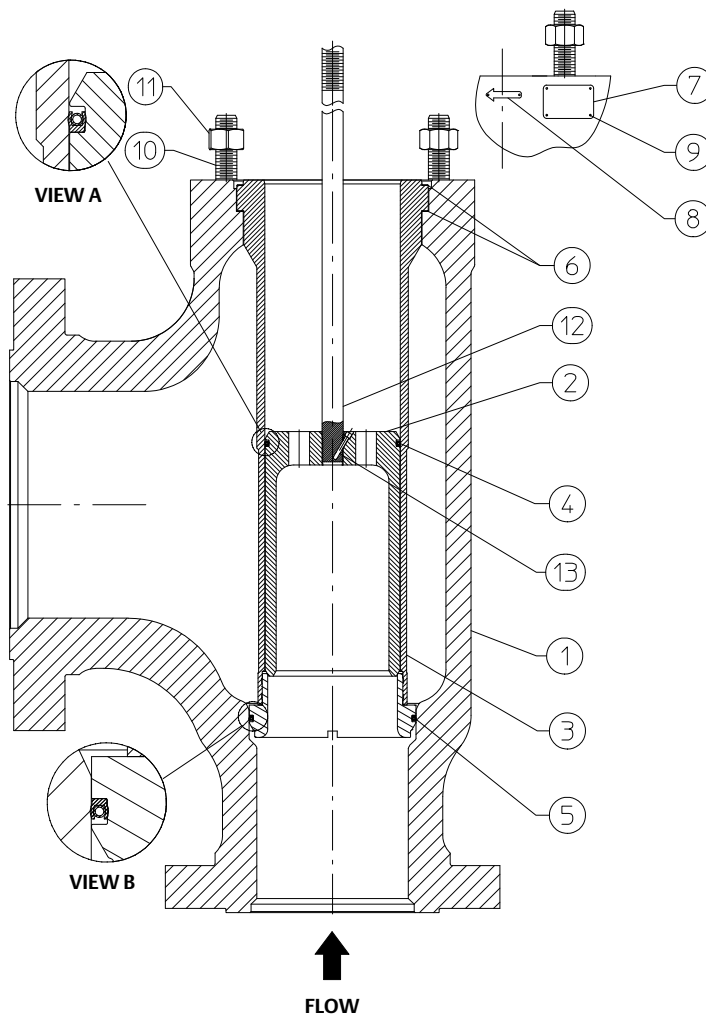
A6111

Figure 15. Typical ENVIRO-SEAL Packing System with Graphite Packing



A6110

Figure 16. Fisher Cast FBT Typical Valve Assembly



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