Fisher® EHD, EHS, and EHT Valves NPS 1-1/2x1 through NPS 8x6

Contents

Figure 1. Fisher EH Valve with 657 Actuator

W3387

Introduction

Scope of Manual

This instruction manual includes installation, maintenance, and parts information for the Fisher EHD, EHS, and EHT control valves in NPS 1-1/2 x 1 through NPS 8x6. Refer to separate manuals for instructions covering the actuator, positioner, ENVIRO-SEAL™ packing, HIGH-SEAL packing, and accessories.

Do not install, operate, or maintain EHD, EHS, or EHT 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 Process Management sales office before proceeding.

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

Table 1. Specifications

End Connection Styles

Buttwelding: All available ASME B16.25 schedules that are compatible with ASME B16.34 pressure/temperature ratings
Flanged: CL2500 ■ ring-type joint (RTJ) or ■ raised-face (RF) flanges according to ASME B16.5
Socket Welding: Consistent with ASME B16.11

Maximum Inlet Pressure(1)

Buttwelding: Consistent with CL2500 pressure-temperature ratings per ASME B16.34
Flanged: Consistent with CL2500 pressure-temperature ratings per ASME B16.34
Socket Welding: Consistent with CL2500 pressure-temperature ratings per ASME B16.34

Shutoff Classifications

See table 2
C-seal trim: High-temperature, Class V. See table 3
TSO (Tight Shutoff) trim: See tables 4 and 5

Flow Characteristic

Standard Cage: ■ Equal percentage, ■ modified equal percentage(2), ■ or linear
Cavitrol™ III or Whisper Trim™ III Cage: Linear

Flow Direction

EHD or EHT: Flow down, except with either a Whisper Trim III cage or a valve plug with diverter cone, both of which are flow up
EHS: Flow up, except flow down with Cavitrol III cage

Approximate Weights (Valve Body and Bonnet Assemblies)

See table 6

Additional Specifications

For specifications such as materials, valve plug travels, and port, yoke boss, and stem diameters, see the Parts List section

1. The pressure or temperature limits in this manual and any applicable standard limitations should not be exceeded.
2. Modified equal percentage characteristic is equal-percentage for the first 90% of travel, then quick-opening for additional capacity.

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

Valve	Valve Size, NPS	ANSI/FCI Leakage Class
EHD	3x2	II
	3, 4x3, 4, 6x4	II—Standard
		III—Optional(1)
	6, 8x6	III—Standard
		IV—Optional(1)
EHS w/Cavitrol III, or EHT w/Cavitrol III	All	V(1)
EHS, EHT, EHS w/Micro-Form or EHS w/Micro Flute	All	IV—Standard
		V—Optional(1)
EHT w/ PEEK Anti-Extrusion Rings	3 to 6	V to 600°F (316°C)

1. O-ring seat ring construction recommended for this shutoff classification; for temperatures below 232°C (450°F) only.

Description

The EHD, EHS, and EHT high-pressure globe valves (figure 1) have metal seats, cage guiding, and push-down-to-close valve plug action. The EHD and EHT valves use balanced valve plugs.

The EHS valve uses an unbalanced valve plug. To provide a seal between the cage and a balanced valve plug, the EHD valve plug uses piston rings; the EHT valve plug uses a pressure-assisted seal ring. A Whisper Trim cage can be used with an EHD, EHS, or EHT valve plug. A Cavitrol III cage can be used with an EHS or EHT valve plug.

C-seal trim is available for EHD valves, CL2500, in sizes 4, 6, 6x4, and 8x6.

With C-seal trim, a balanced valve can achieve high-temperature, Class V shutoff. Because the C-seal plug seal is formed from metal (N07718 nickel alloy) rather than an elastomer, a valve equipped with the C-seal trim can be

applied in processes with a fluid temperature of up to 593°C (1100°F), provided other material limits are not exceeded. Contact your Emerson Process Management sales office for information.

Specifications

Specifications for the EHD, EHS, and EHT valves are shown in table 1.

Educational Services

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

Emerson Process Management
Educational Services - Registration
Phone: 1-641-754-3771 or 1-800-338-8158
E-mail: education@emerson.com
http://www.emersonprocess.com/education

Table 3. Additional Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4

Valve (Class)	Valve Size, NPS	Port Diameter, Inches	Cage Style	ANSI/FCI Leakage Class
EHD (CL2500)	4 6x4	2.875	Equal Percentage, Modified Equal Percentage, Linear (std. cage), Linear (Whisper III, A1, B3, C3)	V (for port diameters from 2.875 through 7-inch with optional C-seal trim)
			Linear (Cavitrol III, 2-stage)	
	6 8x6	4.375	Equal Percentage, Modified Equal Percentage, Linear (std. cage), Linear (Whisper III, A1, B3, C3, D3)	
	6 8x6	4.375	Linear (Cavitrol III, 2- and 3-stage)	

Table 4. TSO (Tight Shutoff) Leakage Class per ANSI/FCI 70-2 and IEC 60534-4

Leakage Class	Maximum Leakage	Test Medium	Test Pressure	ANSI/FCI Leakage Class
TSO (Tight Shutoff)	Valves with TSO trim are factory tested to a more stringent Emerson Process Management test requirement of no leakage at time of shipment.	Water	Service ΔP[1]	V

1. Specify service ΔP when ordering.

Table 5. TSO Shutoff Availability

VALVE	CONSTRUCTION	LEAKAGE CLASS	
		Standard	Optional
EHS, EHT	Cavitrol III trim. Replaceable, protected soft seat	TSO	---

Table 6. Approximate Weights (Valve Body and Bonnet Assemblies)

VALVE SIZE, NPS	CL2500			
	Kilograms		Pounds	
	Flg	SWE & BWE	Flg	SWE & BWE
1-1/2 x 1	---	46	---	101
2x1	78	47	173	104
3x2	161	94	355	207
3	223	163	492	359
4x3	265	162	585	357
4	338	243	745	536
6x4	526	257	1160	567
6	785	544	1731	1199
8x6	955	558	2106	1231

Installation

⚠ WARNING

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

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.

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

Responsibility for the safety of process media and compatibility of valve materials with process media rests solely with the purchaser and end-user. The valve configuration and construction materials meet particular pressure, temperature, pressure drop, and controlled fluid conditions specified in the customer's order. Because some body/trim material combinations are limited in their pressure drop and temperature range capabilities (especially due to differences in thermal expansion rates), do not apply any other conditions to the valve without first contacting your Emerson Process Management sales office.

CAUTION

If hoisting the valve, use a nylon sling to protect the painted surfaces. Carefully position the sling to prevent damage to the tubing or any accessories. Use adequately sized hoists and chains or slings to handle the valve and take precautions to prevent personnel from being injured in case the hoist or rigging slips unexpectedly. Refer to table 6 for valve assembly weights.

⚠ 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. Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

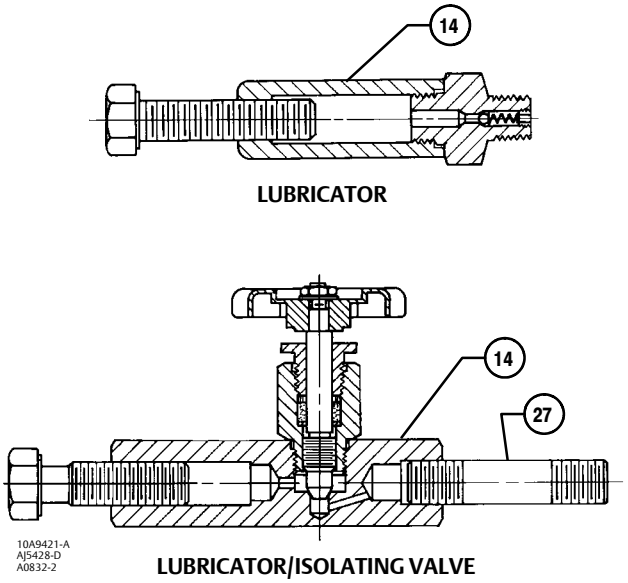
1. Before installing the valve, inspect it to ensure that the valve body cavity is free of foreign material.
2. Clean out all pipelines to remove scale, welding slag, and other foreign materials before installing the valve.

Note

If the valve being installed has small internal flow passages, such as with Whisper Trim III or Cavitrol III cages, consideration should be given to installing an upstream strainer to prevent the lodging of particles in these passages. This is especially important if the pipeline cannot be thoroughly cleaned or if the flowing medium is not clean.

3. The control valve must be installed with the actuator vertical above the valve body for proper operation. Flow through the valve must be in the direction indicated by the flow arrow (key 15, figure 17, 18, or 20) on the valve body.
4. Use accepted piping and welding practices when installing the valve in the line. For welding end valve bodies, completely disassemble the valve removing all trim parts before welding the valve body in the line. For flanged valve bodies, use suitable gaskets between the valve body flanges and pipeline flanges.

Figure 2. Lubricator and Lubricator/Isolating Valve



CAUTION

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.

If post-weld heat treating is needed, remove all trim parts to avoid any damage to internal elastomeric, plastic, and metal parts. Contact your Emerson Process Management sales office for additional information.

5. Install a three-valve bypass around the valve if continuous operation is required during maintenance.
6. If the actuator and valve body are shipped separately, refer to the actuator mounting procedure in the appropriate actuator instruction manual.
7. If the valve was shipped without packing installed in the packing box, install the packing before putting the valve into service. Refer to instructions given in the Packing Maintenance procedure.

Valves with ENVIRO-SEAL live-loaded packing or HIGH-SEAL Heavy-Duty live-loaded packing will not require this initial re-adjustment. See the Fisher instruction manuals titled ENVIRO-SEAL Packing System for Sliding-Stem Valves or HIGH-SEAL Live-Loaded Packing System (as appropriate) 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 lubrication, packing maintenance, adding packing rings, replacing packing, trim removal, valve plug maintenance, lapping seats, and trim replacement. All maintenance operations can 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.**

Table 7. Recommended Torque for Packing Flange Nuts

STEM DIAMETER		VALVE BODY RATING(1)	TORQUE			
			N•m		Lbf•Ft	
mm	Inches		Min	Max	Min	Max
12.7	1/2	CL1500	15	22	11	16
		CL2500	18	24	13	18
19.1	3/4	CL1500	34	50	25	37
		CL2500	41	61	30	45
25.4	1	CL1500	52	77	38	57
		CL2500	61	91	45	67
31.8	1-1/4	CL1500	68	102	50	75
		CL2500	81	122	60	90

1. Includes intermediate class ratings.

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.

Note

If the valve has ENVIRO-SEAL live-loaded packing installed (figure 3), see the Fisher instruction manual entitled ENVIRO-SEAL Packing System for Sliding Stem Valves for packing instructions.

If the valve has HIGH-SEAL heavy-duty live-loaded packing installed, see Fisher instruction manual entitled HIGH-SEAL Live-Loaded Packing Systems for packing instructions.

⚠ 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. Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Packing Lubrication

CAUTION

Do not lubricate graphite packing. Graphite packing is self-lubricated. Additional lubrication may result in slip-stick movement of the valve.

⚠ WARNING

To avoid personal injury or property damage resulting from fire or explosion, do not lubricate packing used in oxygen service or in processes with temperatures over 260°C (500°F).

A lubricator or lubricator/isolating valve (figure 2) is recommended for PTFE-composition packing. The lubricator or lubricator/isolating valve is installed in place of the pipe plug (key 14, figure 16). It is recommended that a good quality silicon-base lubricant be used. To operate the lubricator, simply turn the cap screw clockwise to force 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.

Packing Maintenance

If there is undesirable packing leakage in spring-loaded PTFE V-ring packing (figure 4), tighten the packing flange nuts (key 5, figure 16) until the shoulder on the packing follower (key 13, figure 16) contacts the bonnet (key 1, figure 16). If leakage continues, replace the packing by following the numbered steps presented in the Replacing Packing procedure.

CAUTION

When tightening packing flange nuts, do not exceed the maximum recommended torque in table 7 or excessive friction may result, resulting in keeping the valve from stroking fully and not attaining proper seat load.

If there is undesirable packing leakage with other than spring-loaded PTFE V-ring packing, first try to limit the leakage and establish a stem seal by tightening the packing flange nuts (key 5, figure 16) to at least the minimum recommended torque in table 7. However, do not exceed the maximum recommended torque in table 7 or excessive friction may result. If leakage continues, replace the packing by following the numbered steps presented in the Replacing Packing procedure.

If the packing is relatively new and tight on the valve plug stem, and if tightening the packing flange nuts does not stop the leakage, it is possible that the stem is worn or nicked so that a seal cannot be made. The surface finish of a 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. While replacing the packing according to the Replacing Packing procedure, inspect the valve plug stem and packing box wall for nicks or scratches.

Replacing Packing

Key numbers referred to in this procedure are shown in figure 16 unless otherwise indicated.

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.

Remove the cap screws in the stem connector, and separate the two halves of the stem connector. Then exhaust all actuator pressure, if any was applied, and disconnect the actuator supply and any leakoff piping.

2. Remove either the yoke locknut (key 15) or the hex nuts (key 26), and remove the actuator from the bonnet (key 1).
3. Loosen the packing flange nuts (key 5) so that the packing is not tight on the valve plug stem (key 4, figure 17, 18, or 20). Remove any travel indicator disk and stem locknuts from the valve plug stem threads.

Table 8. Torque for Body-to-Bonnet Bolting Using Anti-Seize Lubricant(1)

VALVE SIZE, NPS	VALVE BODY RATING	TORQUE			
		N•m		Lbf•Ft	
		B7, B16, BD and 660 Studs	B8 and B8M Studs	B7, B16, BD and 660 Studs	B8 and B8M Studs
1, 1-1/2 x 1, 2x1	CL1500	163	122	120	90
	CL2500	258	195	190	140
2, 3x2	CL1500	258	195	190	140
	CL2500	380	285	280	210
3, 4x3	CL1500	556	420	410	310
	CL2500	786	597	580	440
4, 6x4	CL1500	786	597	580	440
	CL2500	1058	800	780	590
6, 8x6	CL1500	1383	1044	1020	770
	CL2500	2807	2102	2070	1550

1. For other materials, contact your Emerson Process Management sales office for torques.

CAUTION

When lifting the bonnet (key 1), be sure that the valve plug and stem assembly (keys 3 and 4, figure 17, 18, or 20) remains on the seat ring (key 6, figure 17, 18, or 20). This avoids damage to the seating surfaces as a result of the assembly dropping from the bonnet after being lifted part way out. The parts are also easier to handle separately.

Use care to avoid damaging gasket sealing surfaces.

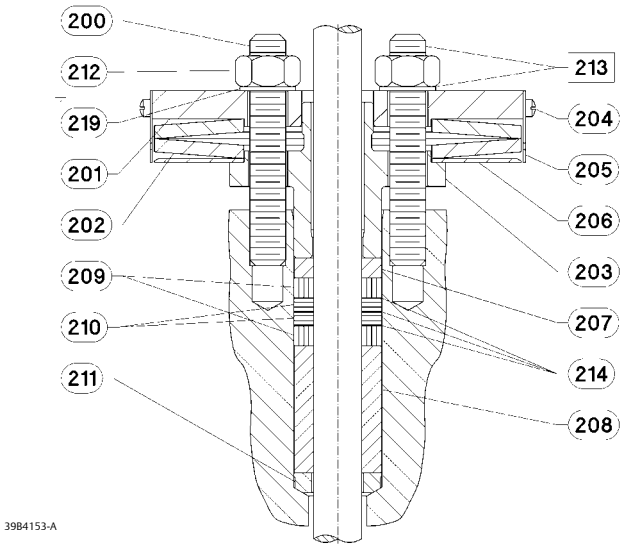
The EHD piston rings (key 8, figure 17) are brittle and in two halves. Avoid damaging the piston rings by dropping or rough handling.

⚠ WARNING

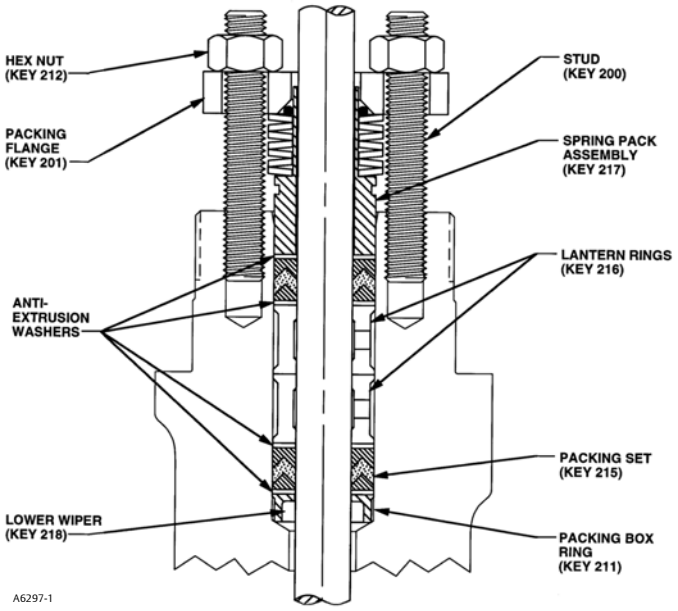
If the cage adheres to the bonnet as the bonnet is lifted, secure the cage to the bonnet so that it will not cause personal injury or equipment damage should it fall unexpectedly.

4. Unscrew the hex nuts (key 14, figure 17, 18, or 20) and carefully lift the bonnet off the valve stem. If present, remove the Belleville washers (key 33, figure 19) and flat washers (key 29, figure 17, 18, 19, or 20). 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.
5. Remove the valve plug (key 3, figure 17, 18, or 20), the cage (key 2, figure 17, 18, or 20), and the top and bottom cage gaskets (key 11, figure 17, 18, or 20).

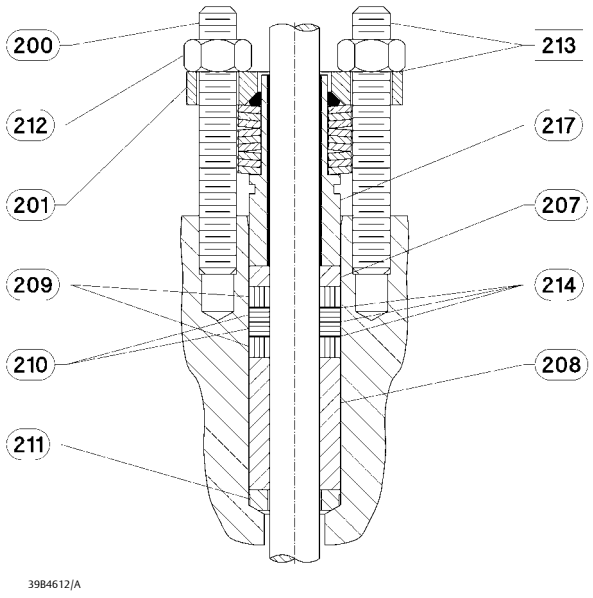
Figure 3. Live-Loaded Packing



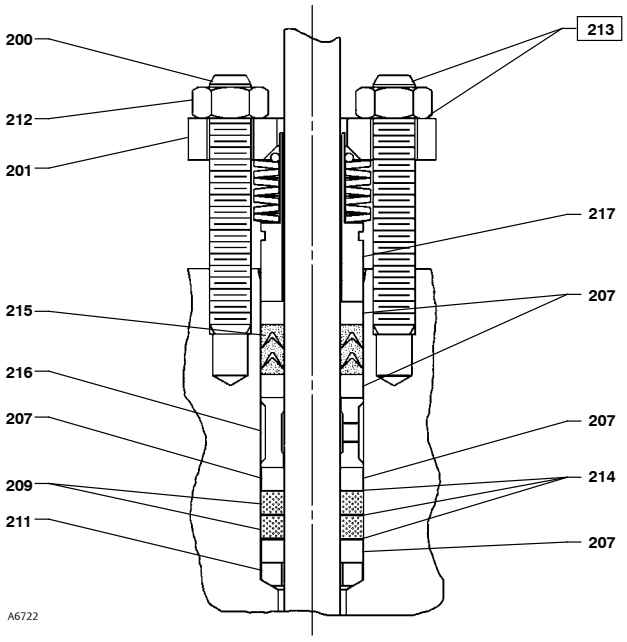
Typical HIGH-SEAL ULF Packing System



Typical ENVIRO-SEAL Packing System with PTFE Packing

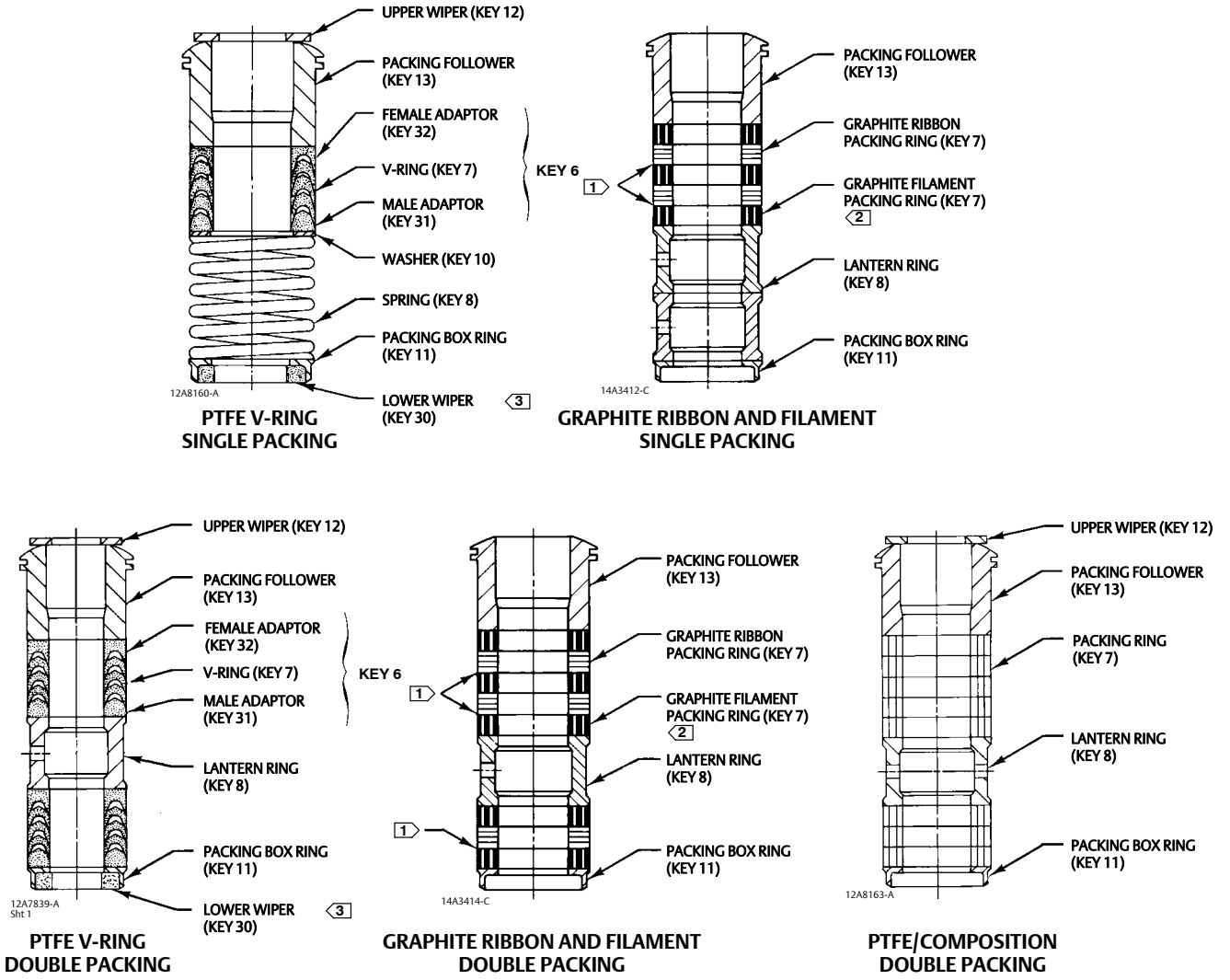


Typical ENVIRO-SEAL Packing System with Graphite ULF Packing



Typical ENVIRO-SEAL Packing System with Duplex Packing

Figure 4. Packing Arrangements



CAUTION

All residual gasket material must be removed from the cage gasket surfaces. If the gasket surfaces are scored or damaged during this process, smooth them by hand sanding with 360 grit paper using long, sweeping strokes. Failure to remove all residual gasket material and/or burrs from the gasket surfaces will result in leakage.

6. Clean all gasket surfaces with a good quality degreaser. Remove all residual tin or silver from all gasket surfaces.
7. Cover the opening in the valve body to protect the gasket surface and to prevent foreign material from getting into the valve body cavity.
8. Remove the packing flange nuts (key 5), packing flange (key 3), upper wiper (key 12), and packing follower (key 13, figures 4 and 16). 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. For extension bonnets, also remove the baffle (key 2) and retaining ring (key 35).

9. Clean the packing box and the following metal packing parts: packing follower (key 13), packing box ring (key 11), spring or lantern ring (key 8, figures 4 and 16), and, for single arrangements of PTFE V-ring packing only, special washer (key 10, figures 4 and 16).
10. Inspect the valve stem threads for any sharp edges that might cut the packing. A whetstone or emery cloth may be used to smooth the threads if necessary.
11. Remove the protective covering from the valve body cavity. Using new top and bottom cage gaskets (key 11, figure 17, 18, or 20), place the cage into the valve body. Be sure the cage lugs are engaged in the corresponding recesses of the seat ring retainer. Turn the cage clockwise until the lugs contact the seat ring retainer. Install the plug, then slide the bonnet over the stem and onto the studs (key 13, figure 17, 18, or 20).

Note

The prelubricated hex nuts (key 14, figure 17, 18, or 20) referred to in step 12 can be identified by a black film coating on the nut threads.

The proper bolting procedures in step 12 include--but are not limited to--ensuring that the bonnet stud threads are clean, Belleville washers (if present) are installed in the correct orientation, and that the hex nuts are evenly tightened to the specified torque values.

CAUTION

Failure to comply with good bonnet-to-body bolting practices and the torque values shown in table 8 may result in cage crushing, cage diameter reduction, and/or bonnet deformation. Cheater bars or slug wrenches should not be used for this procedure.

Hot torquing is not recommended.

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.

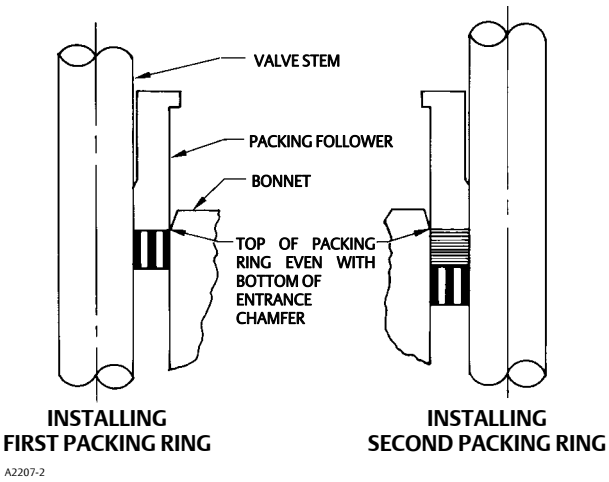
⚠ WARNING

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 Process Management representative immediately if a discrepancy between actual parts and approved parts is suspected.

12. Lubricate the stud threads and the faces of the hex nuts (key 14, figure 17, 18, or 20) with anti-seize lubricant (not necessary if new factory prelubricated hex nuts are used). Replace the flat washers (key 29, figure 17, 18, 19, or 20) if present. If the valve assembly includes Belleville washers (key 33, figure 19) install these onto the studs (key 14, figure 19) with the concave side facing towards the valve body. Replace the hex nuts but do not tighten them. Torque the nuts in a crisscross pattern to no more than one fourth of the nominal torque value specified in table 8.

When all nuts are tightened to that torque value, increase the torque by one fourth of the specified nominal torque and repeat the crisscross pattern. Repeat this procedure until all nuts are tightened to the specified nominal value. Apply the final torque value again and, if any nut still turns, tighten every nut again.

Figure 5. Installing Graphite Ribbon/Filament Packing Rings One at a Time



Note

If graphite ribbon/filament packing rings are used, special procedures must be observed to prevent entrapping air between the rings. Add the rings one at a time without forcing them below the chamfer of the packing box entrance chamber. As each successive ring is added, the stack should not be pushed down more than the thickness of the added ring (figure 5).

13. Install new packing and the metal packing box parts according to the appropriate arrangement in figure 4. If desired, packing parts may be pre-lubricated with a silicon base grease for easier installation. Slip a smooth-edged pipe over the valve stem, and gently tamp each soft packing part into the packing box, being sure that air is not trapped between adjacent soft parts. For a valve with extension bonnet, also install the baffle and retaining rings (keys 2 and 35).
14. Slide the packing follower, wiper, and packing flange into position. Lubricate the packing flange studs (key 4) and the faces of the packing flange nuts (key 5). Replace the packing flange nuts.

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

For other packing types, tighten the packing flange nuts to the maximum recommended torque shown in table 7. Then, loosen the packing flange nuts, and retighten them to the recommended minimum torque shown in table 7.

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

15. Mount the actuator on the valve body assembly, and reconnect the actuator and valve plug stems according to the procedures in the appropriate actuator instruction manual.

Trim Removal

For C-seal construction, see the appropriate C-seal sections in this instruction manual.

Trim removal and replacement requires the use of a seat ring retainer tool (key 25). If specifically ordered, a tool is supplied with a valve; but, the tool can also be ordered separately by referencing the tool part number in the Parts List.

If desired, a tool can also be machined for a valve of specific size and valve class using the dimensions shown in figure 9. Machine the tool from a material listed in figure 9 or from a material with a yield strength of at least 827 MPa (120,000 psi). Using a tool of lower strength material may result in damage to the seat ring retainer or valve body threads.

Key numbers referenced in this procedure are shown in figure 17 for the EHD valve, figure 18 for the EHS valve, and figure 20 for the EHT valve except where indicated.

1. Remove the actuator and bonnet by following steps 1 through 4 of the Replacing Packing procedure. Observe all warnings and cautions.
2. Lift the valve stem and attached valve plug out of the valve body. If the valve plug is to be reused, tape or otherwise protect the valve plug stem and the valve plug seating surface to prevent scratches.
3. Lift out the cage (key 2) and the top and bottom cage gaskets (key 11). For a valve with Cavitrol III two-or three-stage cage, also remove the O-ring (key 26, figure 21) that fits between the cage and the seat ring (key 6).

Constructions other than TSO trim

1. Use the seat ring retainer tool (figure 9) to remove the seat ring retainer (key 7) as follows:

   a. Insert the tool into the valve body. Be certain the tool lugs are engaged in the corresponding recesses in the retainer.

   b. Use a power torque wrench or driver having torque capabilities equal to or greater than those shown in table 9. Connect the torque wrench to an extension if necessary. The tool or extension must snugly fit the square hole in the seat ring retainer tool. Refer to figure 9 for square hole sizes.

   c. Insert the tool or extension into the square hole in the seat ring retainer tool.

   d. Use the bonnet studs (key 13) to prevent a power torque wrench from rotating.

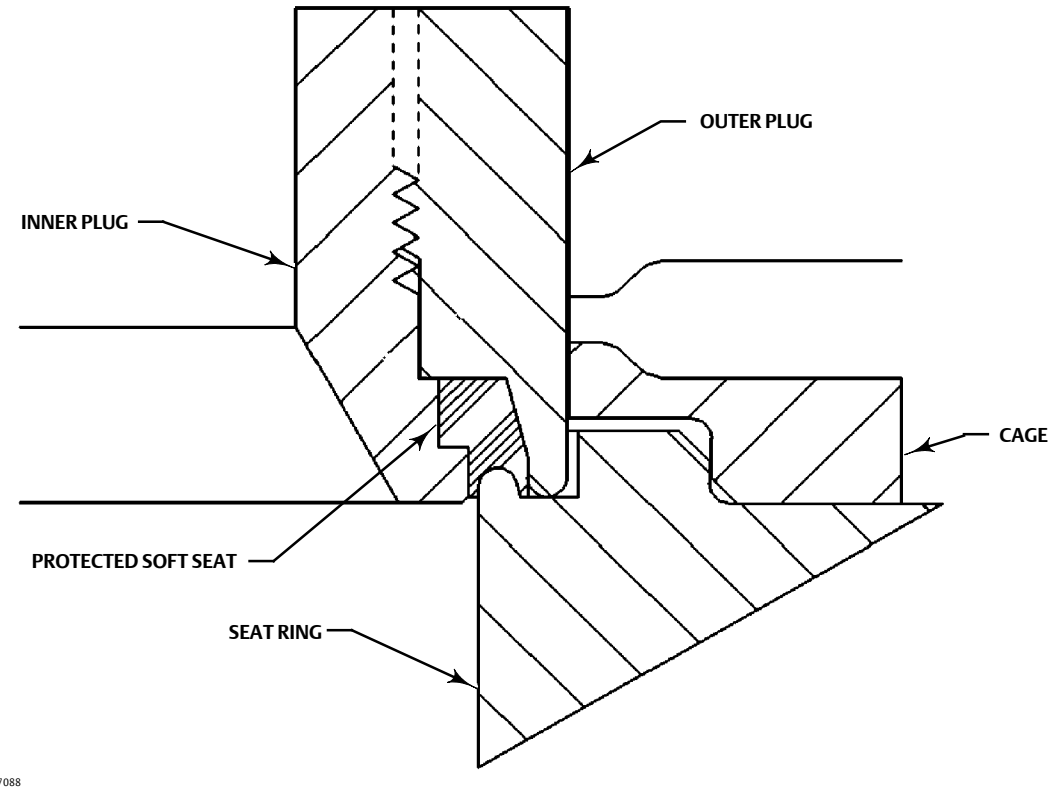
CAUTION

Hold the torque wrench or driver at right angles to the seat ring retainer when applying torque. Tilting the tool or extension while applying torque may cause the lugs on the seat ring retainer tool to suddenly disengage from the recesses in the retainer, damaging the retainer and seat ring.

   e. Unscrew and remove the seat ring retainer.

2. Remove the seat ring (key 6) and the seat ring gasket or O-ring (key 12).
3. Refer to the Valve Plug Maintenance procedure or to the Lapping Seats procedure.

Figure 6. Detail of Protected Soft Seat

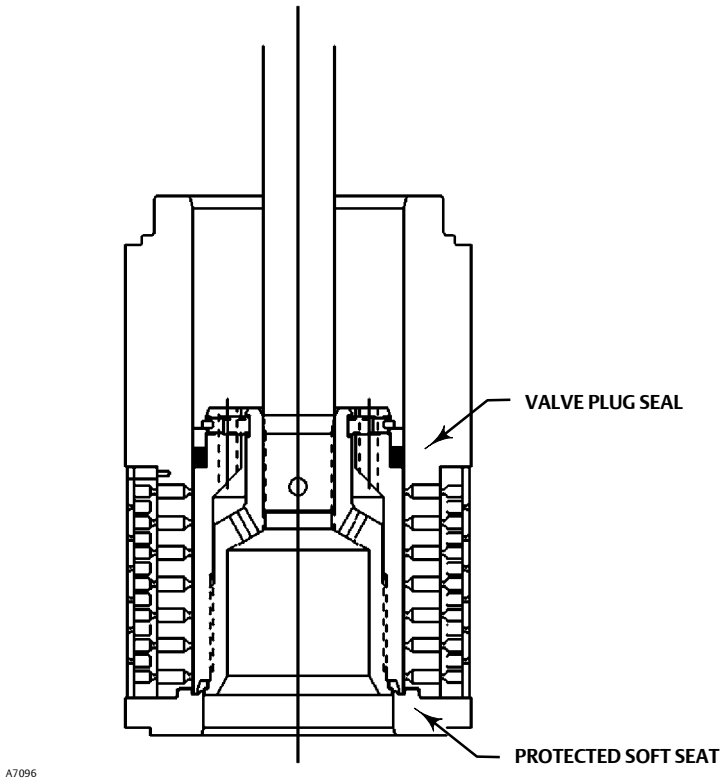


TSO Trim

Refer to figure 7.

1. Remove the retainer, backup ring, anti-extrusion rings, and piston ring.
2. Remove the set screws that lock the outer plug to the inner plug.
3. Using a strap wrench or similar tool, unscrew the outer plug from the inner plug. Do not damage the outer plug guide surfaces.
4. Remove the protected soft seat seal (see figure 5).
5. Inspect the parts for damage and replace if needed.
6. Refer to the Valve Plug Maintenance procedure or to the Lapping Seats procedure.

Figure 7. Typical Balanced TSO Trim



Valve Plug Maintenance

Key numbers used in this procedure are shown in figure 17 for the EHD valve, in figure 18 for the EHS valve, and in figure 20 for the EHT valve.

1. With the valve plug (key 3) removed according to the Trim Removal procedure, proceed as appropriate:

For the EHD valve, the piston rings (key 8) are each in two sections; remove the sections from the grooves in the valve plug.

For the EHS valve, proceed to step 2.

For the EHT valve, work the retaining ring (key 10) off the valve plug with a screwdriver. Carefully slide the backup ring and seal ring (keys 9 and 8) off the valve plug. For an NPS 6 valve with a level D Whisper Trim III cage, also remove the piston ring (key 30) from the grooves in the valve plug.

2. To replace the valve plug stem (key 4), drive out the pin (key 5), and unscrew the stem from the valve plug.

CAUTION

Never reuse an old stem with a new valve plug or reinstall a valve stem after it has been removed. Using an old stem with a new plug requires drilling a new pin hole in the stem. This weakens the stem and may cause the stem to fail in service. If a new valve plug is required, always order a valve plug, stem, and pin as an assembly. Specify the correct part number of each of the three parts, but state that the parts are being ordered as an assembly.

A used valve plug may be reused with a new stem. An exception is the Cavitrol III plug/stem assembly which must be ordered and replaced as a unit.

3. Thread the new stem into the valve plug and tighten it to the appropriate torque value given in table 10. Using the valve plug pin hole as a guide, drill the pin hole through the stem. Refer to table 10 for drill sizes.
4. Drive in the pin to lock the assembly.
5. If it is necessary to lap the seating surfaces, complete the Lapping Seats procedure before installing the EHD piston rings or the EHT seal ring. The Trim Replacement procedure provides piston ring and seal ring installation instructions and valve reassembly instructions.

Lapping Seats

Key numbers referenced in this procedure are shown in figure 17 for the EHD valve, in figure 18 for the EHS valve, and in figure 20 for the EHT valve unless otherwise indicated.

Seating surfaces of the valve plug (key 3) and the seat ring (key 6) can be lapped for improved shutoff. Use a good quality lapping compound with a mixture that contains 280 to 600 grit. Apply the compound to the bottom of the valve plug. Use the following procedure to lap the seating surfaces.

1. Install the following parts according to the instructions presented in the Trim Replacement procedure: seat ring gasket or O-ring (key 12), seat ring (key 6), seat ring retainer (key 7), cage (key 2), cage gaskets (key 11), and if used, the O-ring (key 26, figure 21).
2. Proceed as appropriate:

For an EHD or EHT valve, install the valve plug and stem assembly (keys 3 and 4)—without piston rings or seal ring (keys 8 and 30)—into the cage.

For an EHS valve, install the valve plug and stem assembly (keys 3 and 4) into the cage.

3. Install the bonnet (key 1, figure 16) over the valve stem, and secure the bonnet with four of the hex nuts (key 14).
4. Attach a handle, such as a piece of strap iron secured by stem locknuts, to the valve stem. Rotate the handle alternately in each direction to lap the seats.

Note

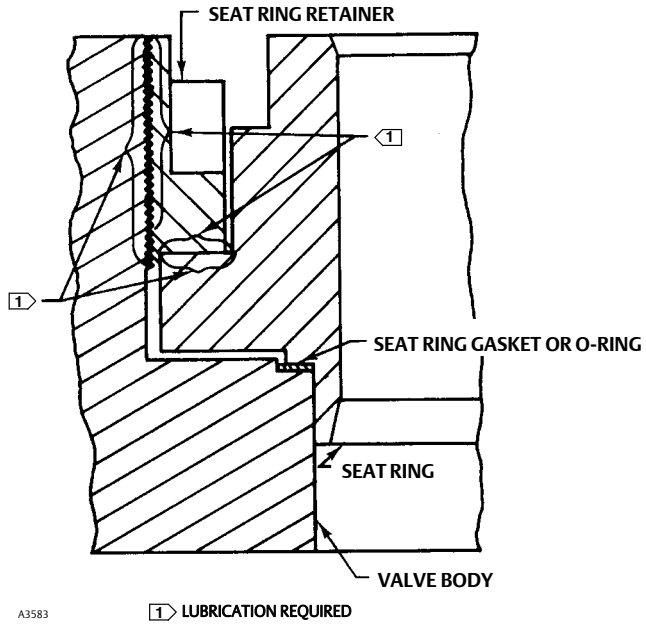
To preserve the effects of lapping, do not change either the position of the seat ring in the valve body cavity or the position of the cage on the seat ring after lapping the seating surfaces. If possible, clean the parts without disturbing their positions. If the parts must be removed for cleaning, return them to the original positions.

5. After lapping, again disassemble as necessary, clean the seating surfaces, reassemble, and test for shutoff. Repeat the lapping procedure if necessary.

Trim Replacement

After all trim maintenance has been completed, reassemble the valve by following the numbered steps below. Be certain that all gasketed surfaces have been well cleaned. Key numbers referenced in this procedure are shown in figure 17 for the EHD valve, in figure 18 for the EHS valve, and in figure 20 for the EHT valve.

Figure 8. Trim Surfaces Requiring Lubrication



CAUTION

Thoroughly clean the seat ring (key 6), seat ring retainer (key 7), and the retainer threads in the valve body with a good-quality degreaser. Also clean all cage gasket surfaces. All residual gasket material must be removed from the cage gasket surfaces and, in gasketed seat ring constructions, from the serrated valve body and seat ring gasket surfaces. If the serrations are scored or damaged during this process, smooth them by hand sanding with 360 grit paper using long, sweeping strokes. Failure to remove all residual gasket material and/or burrs from the seat ring, cage, and valve body gasket surfaces will result in leakage.

Thoroughly lubricate the surfaces indicated in figure 8 with the appropriate lubricant shown in table 11. Be certain to lubricate the mating surfaces of both parts involved (i.e., lubricate the threads on the seat ring retainer and the threads in the valve body; lubricate the mating surfaces of the seat ring retainer and seat ring).

Failure to lubricate as described may cause galling and improper gasket or O-ring (key 12) loading that may result in leakage.

1. For gasketed seat ring constructions, install the seat ring gasket (key 12) into the valve body. For O-ring seat ring constructions, install the O-ring (key 12) into the groove on the underside of the seat ring (key 6). Install the seat ring (key 6). Screw in the seat ring retainer (key 7). Use the seat ring retainer tool (figure 9) to tighten the seat ring retainer as follows:

   a. Insert the tool into the valve body. Be certain the tool lugs are engaged in the corresponding recesses in the retainer.

   b. Use a power torque wrench or driver having torque capabilities equal to or greater than those shown in table 9. Connect the torque tool to an extension if necessary. The tool or extension must snugly fit the square hole in the seat ring retainer tool. Refer to figure 9 for square hole sizes.

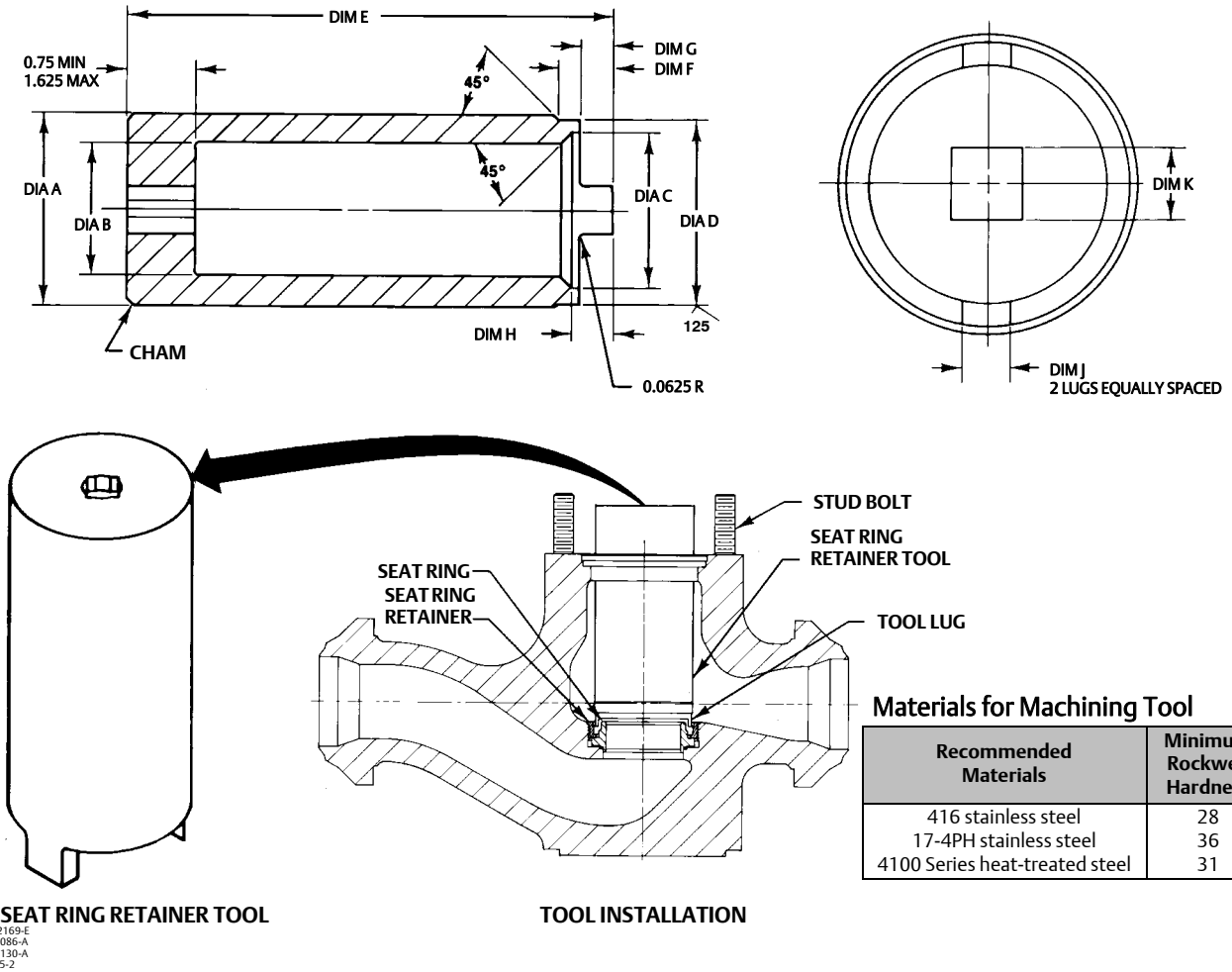
   c. Insert the tool or extension into the square hole in the seat ring retainer tool.

   d. Use the stud bolts (key 13) to prevent a power torque wrench from rotating.

VALVE SIZE, NPS/ RATING	TOOL DIMENSIONS																			
	mm										Inches									
	A	B	C	D(1)	E	F	G	H	J(1)	K	A	B	C	D(1)	E	F	G	H	J(1)	K
1-1/2 x 1 / CL2500	50.8	31.8	34.1	46.4 / 45.9	111.3	11.2	7.9	11.2	12.4 / 12.2	19.1	2.00	1.25	1.34	1.827 / 1.807	4.38	0.44	0.31	0.44	0.49 / 0.48	0.75
2 x 1 / CL2500	50.8	31.8	34.1	46.4 / 45.9	111.3	11.2	7.9	11.2	12.4 / 12.2	19.1	2.00	1.25	1.34	1.827 / 1.807	4.38	0.44	0.31	0.44	0.49 / 0.48	0.75
3 x 2 / CL2500	69.9	50.8	53.0	67.1 / 66.5	150.9	12.7	9.7	12.7	12.4 / 12.2	19.1	2.75	2.00	2.12	2.640 / 2.620	5.94	0.50	0.38	0.50	0.49 / 0.48	0.75
3, 4 x 3 / CL2500	90.5	65.0	74.6	86.1 / 85.6	185.7	12.7	9.7	12.7	18.8 / 18.5	25.4	3.56	2.36	2.94	3.390 / 3.370	7.31	0.50	0.38	0.50	0.74 / 0.73	1.00
4, 6 x 4 / CL2500	117.3	88.9	91.9	108.3 / 107.8	195.3	14.2	10.4	14.2	25.1 / 24.9	25.4	4.62	3.50	3.62	4.265 / 4.245	7.69	0.56	0.41	0.56	0.99 / 0.98	1.00
6, 8 x 6 / CL2500	177.8	130.0	134.9	156.0 / 155.4	254.0	14.2	10.4	14.2	25.1 / 24.9	38.1	7.00	5.12	5.31	6.140 / 6.120	10.00	0.56	0.41	0.56	0.99 / 0.96	1.50

1. D and J dimensions list maximum and minimum values.

Figure 9. Information for Machining and Use of Seat Ring Retainer Tool



Materials for Machining Tool

Recommended Materials	Minimum Rockwell Hardness
416 stainless steel	28
17-4PH stainless steel	36
4100 Series heat-treated steel	31

Table 9. Recommended Torque for Installing Seat Ring Retainer

VALVE SIZE, NPS	VALVE BODY RATING	TORQUE							
		For All Valves with Gasketed Seat Ring Construction Except Those with Cavitrol III Cage		For All Valves with O-Ring Seat Ring Construction(1) or for Sour Gas Service		For Valve with 2-Stage Cavitrol III Cage and Gasketed Seat Ring Construction		For Valve with 3-Stage Cavitrol III Cage and Gasketed Seat Ring Construction	
		N•m	Lbf•Ft	N•m	Lbf•Ft	N•m	Lbf•Ft	N•m	Lbf•Ft
1, 1-1/2x1, 2x1	CL1500	509	375	68	50	339	250	---	---
	CL2500	373	275	68	50	203	150	---	---
2, 3x2	CL1500	1187	875	136	100	881	650	678	500
	CL2500	848	625	102	75	542	400	407	300
3, 4x3	CL1500	2203	1625	271	200	1491	1100	1356	1000
	CL2500	1593	1175	203	150	949	700	678	500
4, 6x4	CL1500	3118	2300	373	275	2712	2000	2373	1750
	CL2500	2373	1750	271	200	2373	1750	1695	1250
6, 8x6	CL1500	6780	5000	780	575	6101	4500	5423	4000
	CL2500	5017	3700	576	425	4745	3500	4745	3500

1. Includes valves with Cavitrol III trim.

Table 10. Valve Stem Connection Torque and Drill Size for Pin Hole

VALVE SIZE, NPS	VALVE STEM DIAMETER		VALVE BODY RATING	VALVE	VALVE STEM CONNECTION TORQUE (MINIMUM - MAXIMUM)		DRILL SIZE FOR PIN
	mm	Inches			N•m	Lbf•Ft	Inches
1, 1-1/2x1, 2x1	12.7	1/2	CL1500, CL2500	EHS	81 - 115	60 - 85	1/8
	19.1	3/4	CL1500	EHS	237 - 339	175 - 250	3/16
2, 3x2	12.7	1/2	CL1500, CL2500	EHD, EHS, EHT	81 - 115	60 - 85	1/8
	19.1	3/4	CL1500, CL2500	EHS	237 - 339	175 - 250	3/16
				EHD, EHT	237 - 339	175 - 250	1/8
	25.4	1	CL1500, CL2500	EHS	420 - 481	310 - 355	1/4
3, 4x3	12.7	1/2	CL1500, CL2500	EHD, EHS, EHT	81 - 115	60 - 85	1/8
	19.1	3/4	CL1500, CL2500	EHD, EHS, EHT	237 - 339	175 - 250	3/16
	25.4	1	CL1500, CL2500	EHS	420 - 481	310 - 355	1/4
			CL1500	EHD, EHT	420 - 481	310 - 355	1/4
			CL2500	EHD, EHT	420 - 481	310 - 355	3/16
4, 6x4	19.1	3/4	CL1500, CL2500	EHD, EHS, EHT	237 - 339	175 - 250	3/16
	25.4	1	CL1500, CL2500	EHD, EHS, EHT	420 - 481	310 - 355	1/4
6, 8x6	19.1	3/4	CL1500, CL2500	EHD, EHS, EHT	237 - 339	175 - 250	3/16
	25.4	1	CL1500, CL2500	EHD, EHS, EHT	420 - 481	310 - 355	1/4
	31.8	1-1/4	CL1500, CL2500	EHD, EHS, EHT	827 - 908	610 - 670	1/4
	50.8	2	CL1500, CL2500	EHD, EHT	Contact factory for torque values and installation procedure		3/8

Table 11. Seat Ring and Seat Ring Retainer Lubricants

VALVE BODY MATERIAL	SEAT RING MATERIAL	LUBRICANT
WCC, WC9, C5, or LCC steel	S41600 (416 stainless steel)	Lithium grease, dry film lubricant, or anti-seize lubricant
	R30006 (Alloy 6)	Anti-seize lubricant
CF8M (316 stainless steel)	R30006	Dry film lubricant or anti-seize lubricant

CAUTION

Hold the torque wrench at right angles to the seat ring retainer when applying torque. Tilting the tool and extension while applying torque may cause the lugs on the seat ring retainer tool to suddenly disengage from the recesses in the retainer, damaging the retainer and seat ring.

e. Tighten the seat ring retainer to the torque shown in table 9.

Note

Some cages have one large window and several small windows. In step 2, install a cage that has different size windows so that the largest window faces toward the process outlet for a flow-down and toward the process inlet for a flow-up valve. Though it may not be possible to align the large window directly opposite the inlet or outlet, orient the window in the appropriate direction as much as possible. Incorrect orientation of cage windows causes a reduction of capacity.

2. Proceed as appropriate:

For a valve with a Cavitrol III cage, slide the O-ring (key 26, figure 21) over the seat ring (key 6) and against the shoulder in the outer diameter of the seat ring. Install the lower gasket (key 11) between the valve body and cage (key 2), and install the cage. Be certain the lugs on the bottom of the cage engage the corresponding slots in the seat ring retainer.

For all other valves, install the lower gasket (key 11) between the valve body and cage (key 2), and install the cage. Be certain the lugs on the bottom of the cage engage the corresponding slots in the seat ring retainer.

Note

Rotate the cage clockwise by hand as much as possible once the cage lugs engage the slots in the seat ring retainer. Failure to do so may result in leakage at the seat ring to valve body seal.

Constructions other than TSO trim

1. To install the piston rings and seal rings (keys 8 and 30), proceed as appropriate:

For an EHD valve (figure 17), if it is necessary to install new piston rings, the replacement piston rings will arrive in one piece. Use a vise with smooth or taped jaws to break a replacement piston ring into halves. Place the new ring in the vise so that the jaws compress the ring into an oval. Compress the ring slowly until the ring snaps on both sides. If one side snaps first, do not try to tear or cut the other side. Instead, keep compressing until the other side snaps. The piston ring can also be fractured by scoring and snapping over a hard surface such as a table edge. Sawing or cutting is not recommended.

Remove any protective tape or covering from the valve plug and stem assembly, and set it on a protective surface. Then, place the piston ring in the piston ring groove with the fractured ends matched.

For an EHT valve (figure 20), install the seal ring (key 8) onto the valve plug (key 3). Install the ring with the open side facing the seat ring end of the valve plug for flow-down applications (view A of figure 20) or with the open side facing the valve plug stem end of the valve plug for flow-up applications. Slide the backup ring (key 9) onto the valve plug.

Secure with the retaining ring (key 10). For an NPS 6 valve with a level D Whisper Trim III cage, reinstall the piston ring (key 30) following the instructions given in the paragraph immediately preceding.

2. Install the valve plug into the cage.

TSO Trim

Refer to figure 7.

1. Thread the outer plug onto the inner plug until the parts seat metal to metal, using a strap wrench or similar tool that will not damage the outer plug guide surfaces.
2. Mark the top of the inner plug and outer plug with alignment marks in the assembled position.
3. Disassemble the outer plug from the inner plug and install the seal over the inner plug, so that the seal rests below the threaded area.
4. Thread the outer plug onto the inner plug and tighten with a strap wrench or similar tool until the alignment marks line up. This will ensure that the plug parts are metal to metal and the seal is compressed properly. Do not damage the outer plug guide surfaces.
5. Install set screws centering the inner plug in the outer plug and torque to 11 N•m (8 lbf•ft).
6. Assemble the piston ring, anti-extrusion rings, backup ring, and retainer.

All Constructions

1. Install the top cage gasket (key 11) on the cage.
2. Install the bonnet over the valve stem and onto the valve body.

Note

The prelubricated hex nuts (key 14, figure 17, 18, or 20) referred to in step 3 can be identified by a black film coating on the nut threads.

The proper bolting procedures in step 3 include--but are not limited to--ensuring that the bonnet stud threads are clean, Belleville washers (if present) are installed in the correct orientation, and that the hex nuts are evenly tightened to the specified torque values.

CAUTION

Failure to comply with good bonnet-to-body bolting practices and the torque values shown in table 8 may result in cage crushing, cage diameter reduction, and/or bonnet deformation. Cheater bars or slug wrenches should not be used for this procedure.

Hot torquing is not recommended.

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.

⚠ 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 Process Management representative immediately if a discrepancy between actual parts and approved parts is suspected.

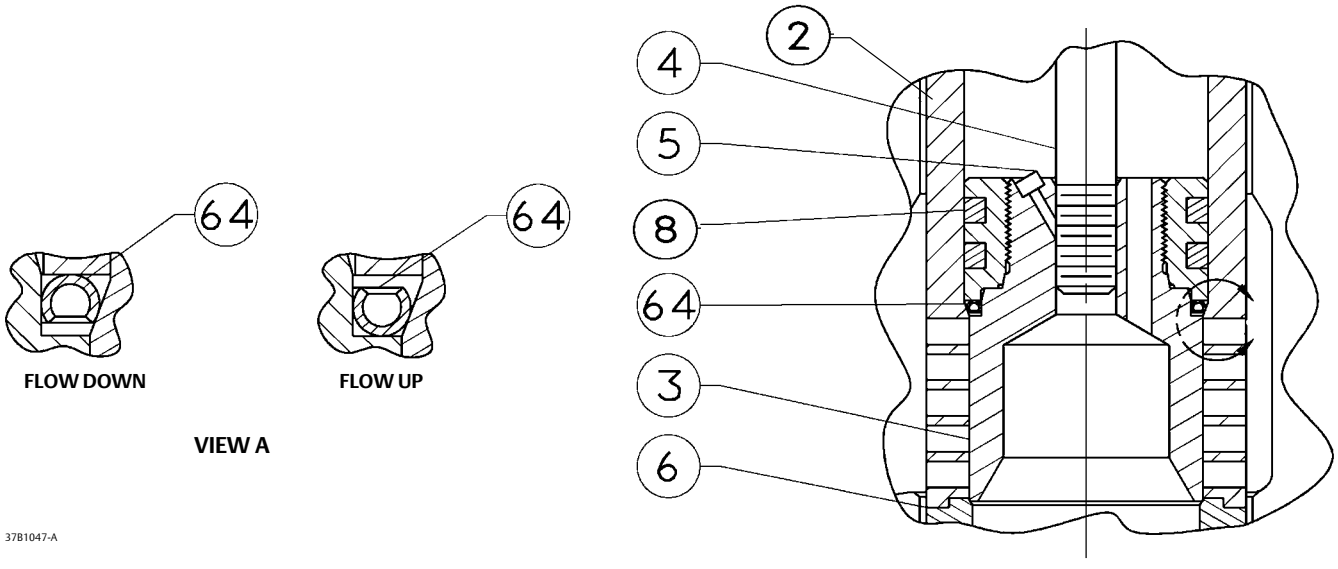
3. Lubricate the stud threads and the faces of the hex nuts (key 14, figure 17, 18, or 20) with anti-seize lubricant (not necessary if new factory prelubricated hex nuts are used). Replace the flat washers (key 29, figure 17, 18, 19, or 20) if present. If the valve assembly includes Belleville washers (key 33, figure 19) install these onto the studs (key 14, figure 19) with the concave side facing towards the valve body. Replace the hex nuts but do not tighten them. Torque the nuts in a crisscross pattern to no more than one fourth of the nominal torque value specified in table 8. When all nuts are tightened to that torque value, increase the torque by one fourth of the specified nominal torque and repeat the crisscross pattern. Repeat this procedure until all nuts are tightened to the specified nominal value. Apply the final torque value again and, if any nut still turns, tighten every nut again.
4. Install new packing and packing box parts per steps 13 and 14 of the Replacing Packing procedure. Be certain to observe the note given prior to step 13 of that procedure.
5. Mount the actuator by following the procedures in the actuator instruction manual. Check for packing leakage as the valve is being put into service. Retorque the packing flange nuts as required (see table 7).

Retrofit: Installing C-seal Trim

Note

Additional actuator thrust is required for a valve with C-seal trim. When installing C-seal trim in an existing valve, contact your Emerson Process Management sales office for assistance in determining new actuator thrust requirements.

Figure 10. Fisher EHD with C-seal Trim



Assemble the new valve plug/retainer assembly (with C-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 C-seal plug seal. Also, lubricate the outside diameter of the valve plug where the C-seal plug seal must be pressed into the proper sealing position (figure 10).
2. Orient the C-seal plug seal for correct sealing action based on the process fluid flow direction through the valve.

- The open interior of the C-seal plug seal must face up in a valve with flow-up construction (figure 10).
- The open interior of the C-seal plug seal must face down in a valve with flow-down construction (figure 10).

Note

An installation tool must be used to properly position the C-seal plug seal on the valve plug. A tool is available as a spare part from Emerson Process Management or a tool could be manufactured following the dimensions given in figure 11.

3. Place the C-seal plug seal over the top of the valve plug and press the C-seal plug seal onto the plug using the C-seal installation tool. Carefully press the C-seal plug seal onto the plug until the installation tool contacts the horizontal reference surface of the valve plug (figure 12).
4. Apply a suitable high-temperature lubricant to the threads on the plug. Then, place the C-seal retainer onto the plug and tighten the retainer using an appropriate tool such as a strap wrench.
5. Using an appropriate tool such as a center punch, stake the threads on top of the plug in one place (figure 13) to secure the C-seal retainer.
6. Install the new plug/retainer assembly with C-seal plug seal on the new stem following the appropriate instructions in the Trim Replacement section of this manual.
7. Install piston rings by following instructions in the Trim Replacement section of this manual.
8. 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.

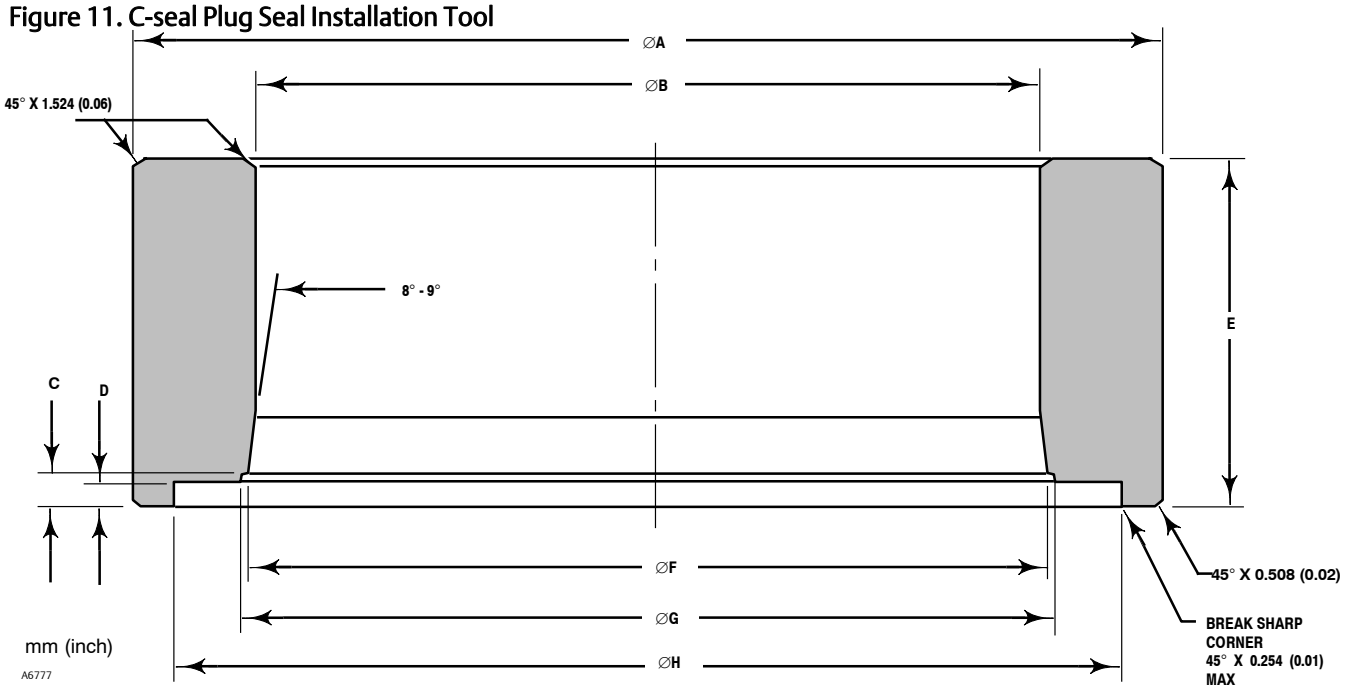
Never reuse an old valve stem with a new plug or reinstall a valve stem after it has been removed. Replacing a valve stem requires drilling a new pin hole in the stem. This drilling weakens the stem and may cause failure in service.

However, a used valve plug may be reused with a new valve stem. An exception is the Cavitrol III plug/stem assembly which must be ordered and replaced as a unit.

9. 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.
10. Replace all gaskets according to appropriate instructions in the Trim Replacement section of this manual.
11. 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.

FOR VALVE PLUGS FITTING PORT SIZE (Inches)	DIMENSIONS, mm (See Drawing Below)								Part Number (To Order A Tool)
	A	B	C	D	E	F	G	H	
2.875	82.55	52.324 - 52.578	4.978 - 5.029	3.708 - 3.759	41.148	52.680 - 52.781	55.118 - 55.626	70.891 - 71.044	24B9816X012
3.4375	101.6	58.674 - 58.928	4.978 - 5.029	3.708 - 3.759	50.8	61.011 - 61.112	63.449 - 63.957	85.166 - 85.319	24B5612X012
3.625	104.394	65.024 - 65.278	4.978 - 5.029	3.708 - 3.759	50.8	68.936 - 69.037	71.374 - 71.882	89.941 - 90.094	24B3630X012
4.375	125.984	83.439 - 83.693	4.978 - 5.029	3.708 - 3.759	50.8	87.351 - 87.452	89.789 - 90.297	108.991 - 109.144	24B3635X012
5.375	142.748	100.076 - 100.33	4.978 - 5.029	3.708 - 3.759	45.974	103.835 - 103.937	106.274 - 106.782	128.219 - 128.372	23B9193X012
7	184.15	141.376 - 141.630	4.978 - 5.029	3.708 - 3.759	60.198	145.136 - 145.237	147.574 - 148.082	169.520 - 169.672	23B9180X012
8	209.55	166.776 - 167.030	4.978 - 5.029	3.708 - 3.759	55.88	170.536 - 170.637	172.974 - 173.482	194.920 - 195.072	24B9856X012
FOR VALVE PLUGS FITTING PORT SIZE (Inches)	**Dimensions, Inches (See Drawing Below)**								**Part Number (To Order A Tool)**
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
2.875	3.25	2.060 - 2.070	0.196 - 0.198	0.146 - 0.148	1.62	2.074 - 2.078	2.170 - 2.190	2.791 - 2.797	24B9816X012
3.4375	4.00	2.310 - 2.320	0.196 - 0.198	0.146 - 0.148	2.00	2.402 - 2.406	2.498 - 2.518	3.353 - 3.359	24B5612X012
3.625	4.11	2.560 - 2.570	0.196 - 0.198	0.146 - 0.148	2.00	2.714 - 2.718	2.810 - 2.830	3.541 - 3.547	24B3630X012
4.375	4.96	3.285 - 3.295	0.196 - 0.198	0.146 - 0.148	2.00	3.439 - 3.443	3.535 - 3.555	4.291 - 4.297	24B3635X012
5.375	5.62	3.940 - 3.950	0.196 - 0.198	0.146 - 0.148	1.81	4.088 - 4.092	4.184 - 4.204	5.048 - 5.054	23B9193X012
7	7.25	5.566 - 5.576	0.196 - 0.198	0.146 - 0.148	2.37	5.714 - 5.718	5.810 - 5.830	6.674 - 6.680	23B9180X012
8	8.25	6.566 - 6.576	0.196 - 0.198	0.146 - 0.148	2.20	6.714 - 6.718	6.810 - 6.830	7.674 - 7.680	24B9856X012

Figure 11. C-seal Plug Seal Installation Tool



CAUTION

To avoid excessive leakage and seat erosion, the valve plug must be initially seated with sufficient force to overcome the resistance of the C-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 through the valve, this force will adequately drive the valve plug to the seat ring, thus giving the C-seal plug seal a predetermined permanent set. Once this is done, the plug/retainer assembly, the cage, and the seat ring become a matched set.

12. 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 C-seal Trim

Trim Removal (C-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 C-seal plug seal to avoid scratching any sealing surface.

CAUTION

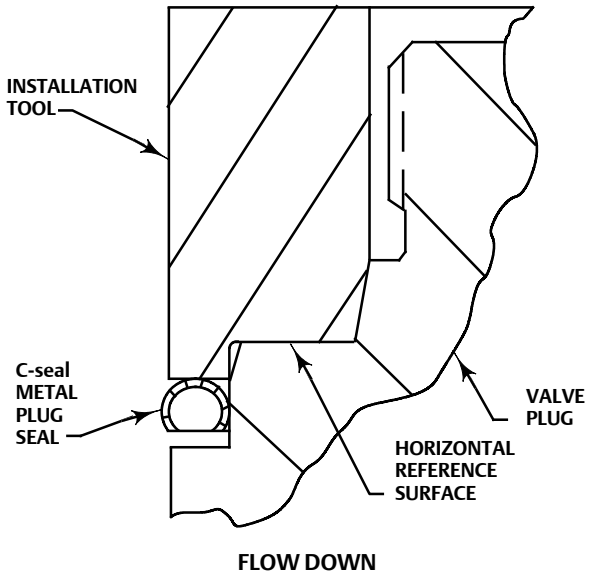
Do not remove the valve stem from the plug/retainer assembly unless you are planning to replace the valve stem.

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. An exception is the Cavitrol III plug/stem assembly which must be ordered and replaced as a unit.

2. Remove the plug/retainer assembly (with C-seal plug seal), cage, and seat ring 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 13). 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 C-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.

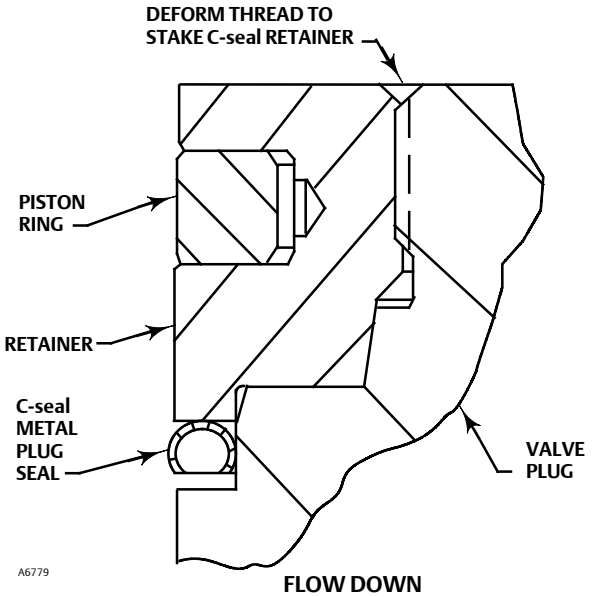
Figure 12. Installing the C-seal Plug Seal Using the Installation Tool



NOTE:
PRESS INSTALLATION TOOL OVER VALVE PLUG UNTIL THE TOOL CONTACTS THE HORIZONTAL REFERENCE SURFACE OF THE VALVE PLUG.

A6778

Figure 13. Stake the Threads of the C-seal Retainer



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 C-seal plug seal off the plug. Use caution to avoid scratches or other damage to the sealing surfaces where the C-seal plug seal makes contact with the valve plug (figure 14).
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 C-seal plug

seal contacts the cage, and inspect the sealing surface where the C-seal plug seal makes contact with the plug (figure 14).

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.

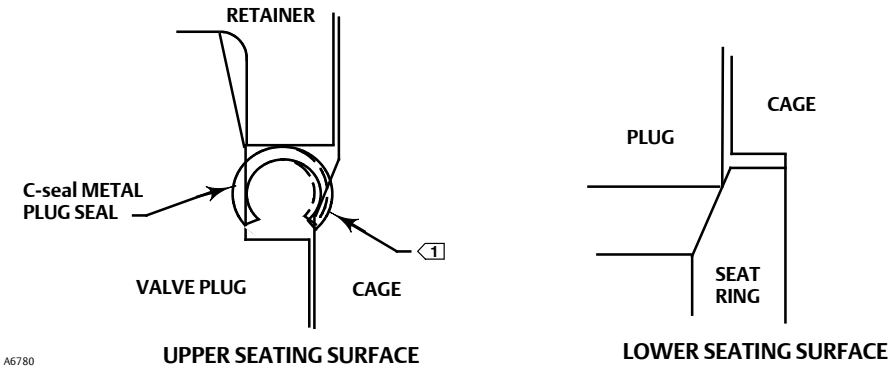
Lapping Metal Seats (C-seal Constructions)

Before installing a new C-seal plug seal, lap the lower seating surface (valve plug to seat ring, figure 14) following appropriate procedures in the Lapping Seats section of this manual.

Remachining Metal Seats (C-seal Constructions)

See figure 15. A valve plug with a C-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 C-seal plug seal contacts the upper seating surface in the cage. If you machine the seats on the seat ring and/or plug, you must machine an equal dimension from the seating area in the cage.

Figure 14. Lower (Valve Plug to Seat Ring) and Upper (C-seal Plug Seal to Cage) Seating Surfaces



NOTE:
1 UPPER SEATING SURFACE IS THE AREA OF CONTACT BETWEEN THE C-seal METAL PLUG SEAL AND THE CAGE.

CAUTION

If metal is removed from the seat ring and plug and a corresponding amount is not removed from the cage seating area, the C-seal plug seal will be crushed as the valve closes and the C-seal retainer will strike the seating area of the cage, preventing the valve from closing.

Trim Replacement (C-seal Constructions)

1. Apply a suitable high-temperature lubricant to the inside diameter of the C-seal plug seal. Also, lubricate the outside diameter of the valve plug where the C-seal plug seal must be pressed into the proper sealing position (figure 10).
2. Orient the C-seal plug seal for correct sealing action based on the process fluid flow direction through the valve.

- The open interior of the C-seal plug seal must face up in a valve with flow-up construction (figure 10).
- The open interior of the C-seal plug seal must face down in a valve with flow-down construction (figure 10).

Note

An installation tool must be used to properly position the C-seal plug seal on the valve plug. A tool is available as a spare part from Emerson Process Management or a tool could be manufactured following the dimensions given in figure 11.

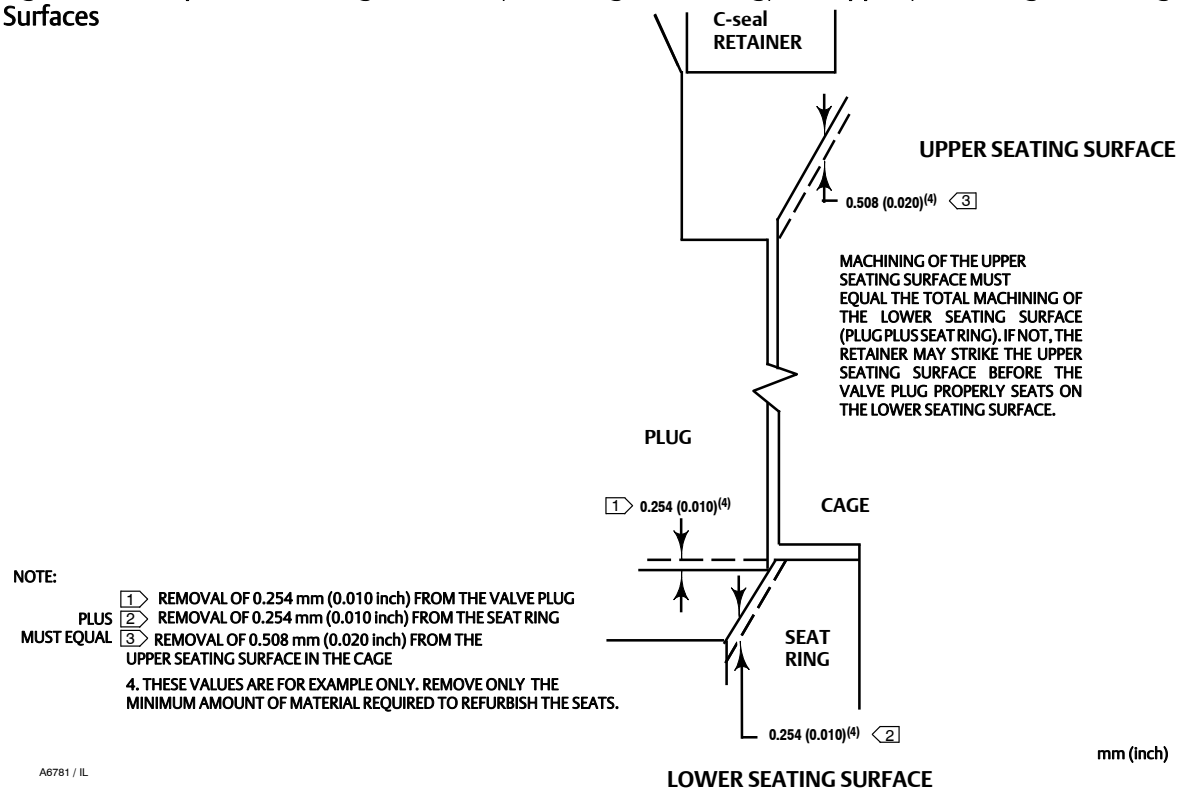
3. Place the C-seal plug seal over the top of the valve plug and press it onto the plug using the installation tool. Carefully press the C-seal plug seal onto the plug until the installation tool contacts the horizontal reference surface of the valve plug (figure 12).
4. Apply a suitable high-temperature lubricant to the threads on the plug. Then, place the C-seal retainer onto the plug and tighten the retainer using an appropriate tool such as a strap wrench.
5. Using an appropriate tool such as a center punch, stake the threads on top of the plug in one place (figure 13) to secure the C-seal retainer.
6. Replace the piston ring(s) following instructions in the Trim Replacement section of this manual.
7. Return the seat ring, 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 C-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 through the valve, this force will adequately drive the valve plug to the seat ring, thus giving the C-seal plug seal a predetermined permanent set. Once this is done, the plug/retainer assembly, the cage, and the seat ring become a matched set.

8. 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.

Figure 15. Example of Machining the Lower (Valve Plug to Seat Ring) and Upper (C-seal Plug Seal to Cage) Seating Surfaces



Parts Ordering

Each body-bonnet assembly is assigned a serial number, which can be found on the valve body. This same number also appears on the actuator nameplate when the valve body is shipped from the factory as part of a control valve assembly. Refer to the number when contacting your Emerson Process Management sales office for technical assistance or when ordering replacement parts.

When ordering replacement parts, also be sure to include the 11-character part number for each part required from the following parts list.

⚠ WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management 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

Standard Packing Repair Kits (Non Live-Loaded)

Stem Diameter, mm (Inches) Yoke Boss Diameter, mm (Inches)	12.7 (1/2) 71 (2-13/16)	19.1 (3/4) 90 (3-9/16)	25.4 (1) 127 (5)	31.8 (1-1/4) 127 (5, 5H)
PTFE (Contains keys 6, 8, 10, 11, and 12)	RPACKX00022	RPACKX00032	RPACKX00342	RPACKX00352
Double PTFE (Contains keys 6, 8, 11, and 12)	RPACKX00052	RPACKX00062	RPACKX00362	RPACKX00372
PTFE/Composition (Contains keys 7, 8, 11, and 12)	RPACKX00082	RPACKX00092	---	---
Single Graphite Ribbon/Filament (Contains keys 7 [ribbon ring], 7 [filament ring], 8, and 11)	RPACKX00112	RPACKX00122	---	---
Single Graphite Ribbon/Filament (Contains keys 7 [ribbon ring], 7 [filament ring], and 11)	---	---	RPACKX00532	RPACKX00542
Single Graphite Ribbon/Filament (Contains keys 7 [ribbon ring], 7 [filament ring])	RPACKX00142	RPACKX00152	---	---
Double Graphite Ribbon/Filament (Contains keys 7 [ribbon ring], 7 [filament ring], 8, and 11)	RPACKX00172	RPACKX00182	---	---

Repair Kits (ENVIRO-SEAL)

Stem Diameter, mm (Inches) Yoke Boss Diameter, mm (Inches)	12.7 (1/2) 71 (2-13/16)	19.1 (3/4) 90 (3-9/16)	25.4 (1) 127 (5)	31.8 (1-1/4) 127 (5, 5H)
Double PTFE (Contains keys 214, 215, 218)	RPACKX00202	RPACKX00212	RPACKX00222	RPACKX00232
Single Graphite ULF (Contains keys 207, 208, 209, 210, 214)	RPACKX00602	RPACKX00612	RPACKX00622	RPACKX00632
Duplex (Contains keys 207, 209, 214, 215)	RPACKX00302	RPACKX00312	RPACKX00322	RPACKX00332

Retrofit Kits (ENVIRO-SEAL)

Stem Diameter, mm (Inches) Yoke Boss Diameter, mm (Inches)	12.7 (1/2) 71 (2-13/16)	19.1 (3/4) 90 (3-9/16)	25.4 (1) 127 (5)	31.8 (1-1/4) 127 (5, 5H)
Double PTFE (Contains keys 200, 201, 211, 212, 214, 215, 216, 217, 218, tag, cable tie)	RPACKXRT022	RPACKXRT032	RPACKXRT042	RPACKXRT052
Single Graphite ULF (Contains keys 200, 201, 207, 208, 209, 210, 211, 212, 214, 217, tag, cable tie)	RPACKXRT272	RPACKXRT282	RPACKXRT292	RPACKXRT302
Duplex (Contains keys 200, 201, 207, 209, 211, 212, 214, 215, 216, 217, tag, cable tie)	RPACKXRT222	RPACKXRT232	RPACKXRT242	RPACKXRT252

Parts List

Note
Part numbers are shown for recommended spares only. For part numbers not shown, contact your Emerson Process Management sales office.

Bonnet Assembly (figure 16)

Key	Description	Part Number
1	Bonnet If you need a bonnet as a replacement part, order by valve size and stem diameter, serial number, and desired material.	
2	Baffle, for use with extension bonnet only	See following table
3	Packing Flange	
4	Packing Flange Stud (2 req'd)	
5	Packing Flange Nut (2 req'd)	
6*	Packing Set or Arrangement	See following table
7*	Packing Ring, low chloride graphite	See following table
8	Packing Spring, 316 stainless steel	See following table
8	Lantern Ring, 316 stainless steel	See following table
10	Special Washer, 316 stainless steel	See following table
11*	Packing Box Ring, 316 stainless steel	See following table
12*	Upper Wiper, felt	See table following
13	Packing Follower, 316 stainless steel	See table following
14	Pipe Plug	
14	Lubricator	
14	Lubricator/Isolating Valve	
15	Yoke Locknut	
25	Actuator Mounting Stud (8 req'd)	
26	Hex Nut (8 req'd)	
35	Retaining Ring, for use with extension bonnet only	

Valve Body (figures 17-21)

1	Valve Body, order by valve size, serial number, and desired material	
2*	Cage	See following table
3*	Valve Plug	See following table
4*	Valve Plug Stem	See following table
5*	Pin	See following table
6*	Seat Ring	See following table
7*	Seat Ring Retainer	See following table
8*	Piston Ring or Seal Ring	See following table
9*	Backup Ring	See following table
10*	Retaining Ring	See following table
10*	Retaining Ring (for EHT valve body only)	See following table
11*	Cage Gasket (2 req'd)	See following table
12*	Seat Ring O-Ring or Gasket	See following table
13	Bonnet Stud (8 req'd)	
14	Hex Nut (8 req'd)	
15	Flow Arrow	
16	Drive Screw (4 req'd)	
24	Anti-seize Lubricant	
25	Seat Ring Retainer Tool (see figure 9)	
	416 stainless steel	
	CL2500 valve body rating	
	NPS 1, 1-1.2x1, & 2x1 valves	26A5469X012
	NPS 2 & 3x2 valves	26A5495X012
	NPS 3 & 4x3 valves	26A5496X012
	NPS 4 & 6x4 valves	26A5497X012
	NPS 6 & 8x6 valves	26A5498X012
26*	O-Ring (for valve with Cavitrol III trim only), ethylene/propylene	See following table
27	Nameplate	
28	Nameplate Wire	
29	Bonnet Washer	
29	Flat Washer (8 req'd)	
30*	Piston Ring (for EHT with Level D Whisper Trim III cage only)	See following table
33	Belleville Washer, N07718 (8 req'd)	
63*	Anti-Extrusion Ring	See following table

C-seal Trim (figure 10)

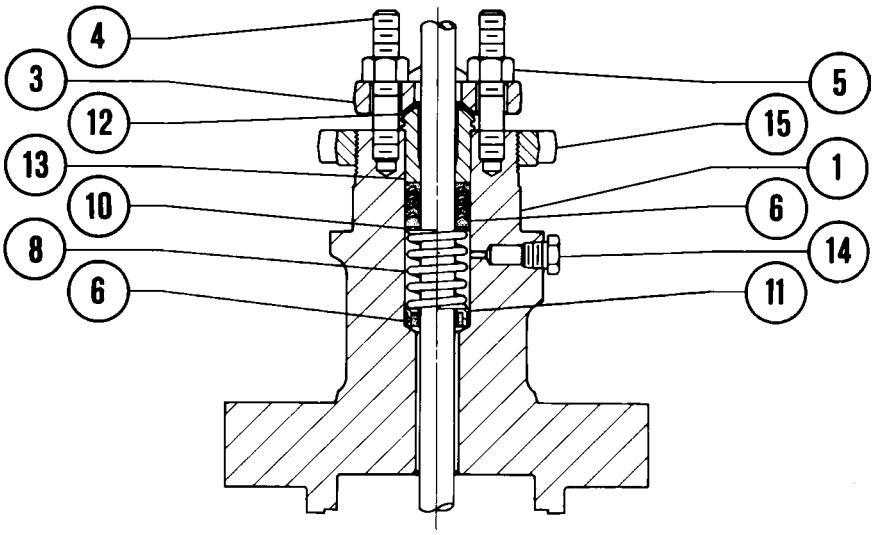
2*	Cage	see following table
3*	Valve Plug/Retainer	see following table
4*	Valve Plug Stem, S20910	see following table
6*	Seat Ring	see following table
8*	Piston Ring, graphite (2 req'd)	see following table
64*	C-seal, N07718	see following table

TSO Trim (figure 7)

2*	Cage	See following table
4*	Seat Ring	See following table
5*	Plug/Stem Assembly	See following table
8*	Seal Ring	See following table
63*	Anti-Extrusion Ring	See following table
9*	Back Up Ring	See following table
10*	Retaining Ring	See following table

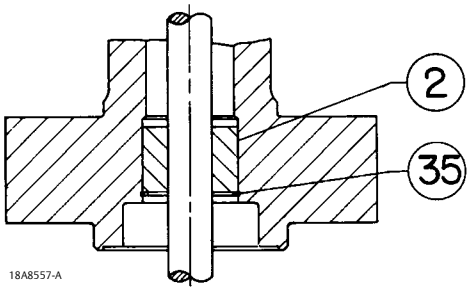
*Recommended spare parts

Figure 16. Fisher EH Bonnet Assembly

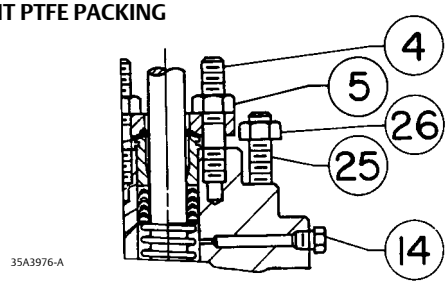


71 mm (2-3/16 INCH) YOKE BOSS BONNET WITH SINGLE ARRANGEMENT PTFE PACKING

56A5372-E
A2699-2

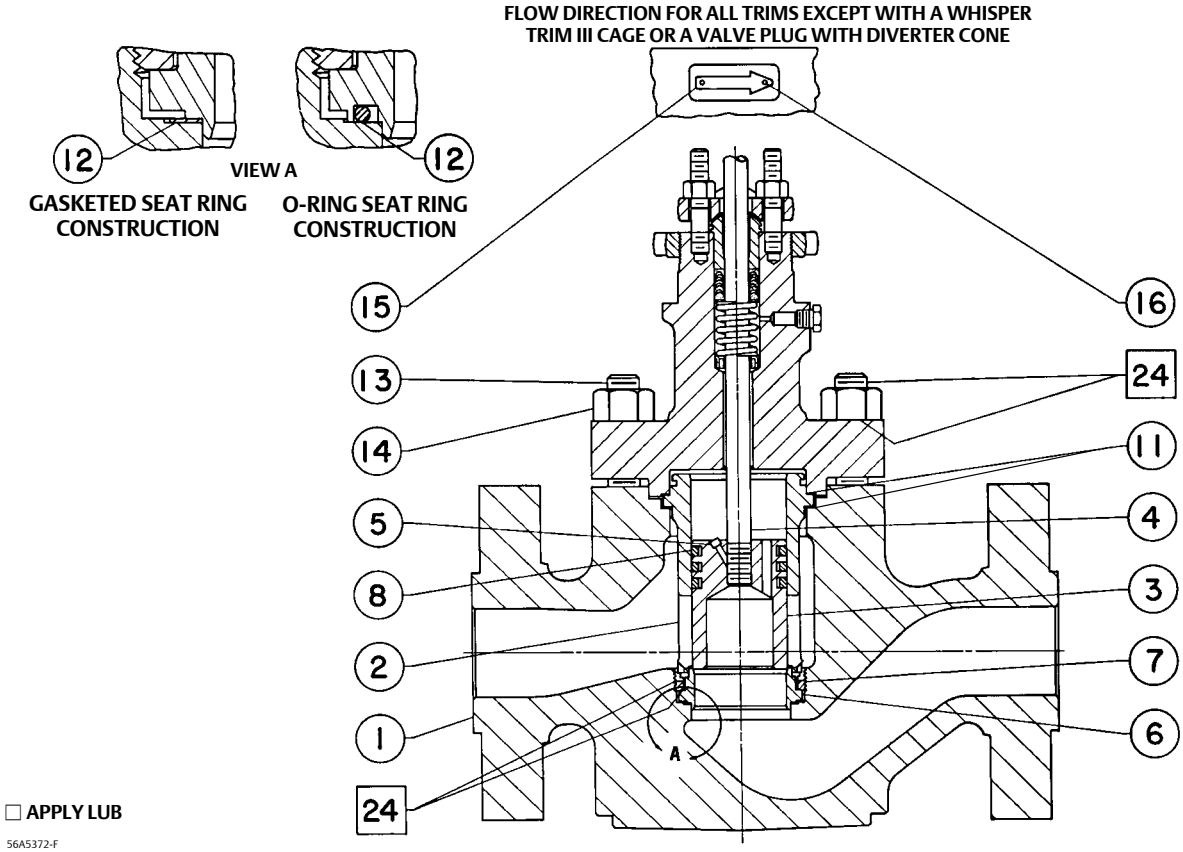


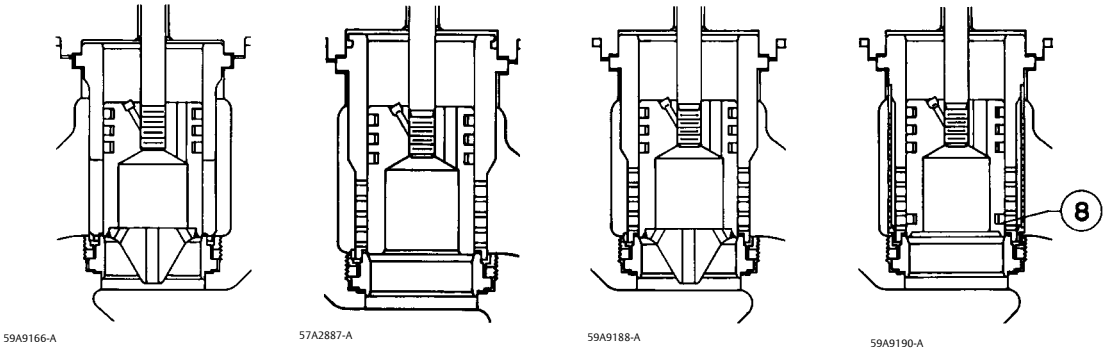
DETAIL OF BAFFLE AND RETAINING RING USED IN EXTENSION BONNET



DETAIL OF 127 mm (5-INCH) YOKE BOSS ACTUATOR BOLTING (OPTIONAL FOR NPS 3, 4, & 6 EH SERIES VALVE BODIES)

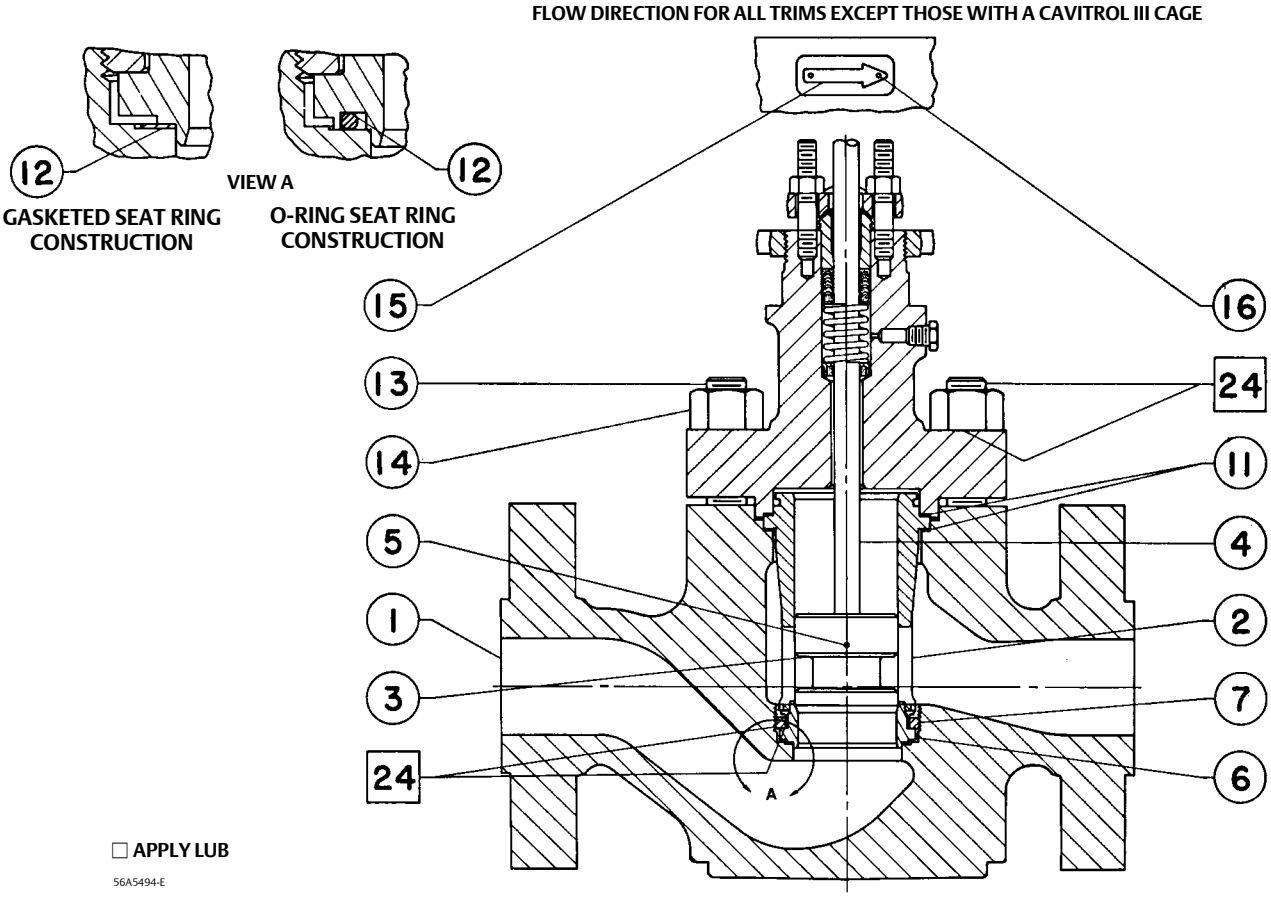
Figure 17. Fisher EHD Valve

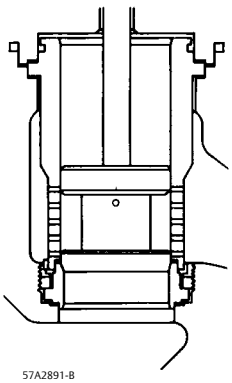




ALTERNATE CONFIGURATIONS
REFERENCE STANDARD TRIM KEY NUMBERS EXCEPT AS SHOWN

Figure 18. Fisher EHS Valve

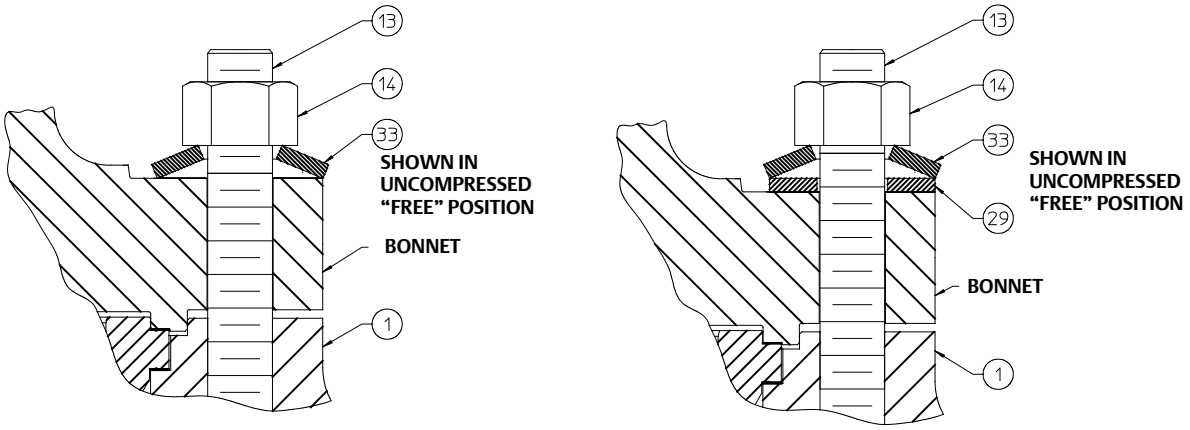




DETAIL OF WHISPER TRIM III CAGE, FOR NPS 2 THROUGH 6 BODIES

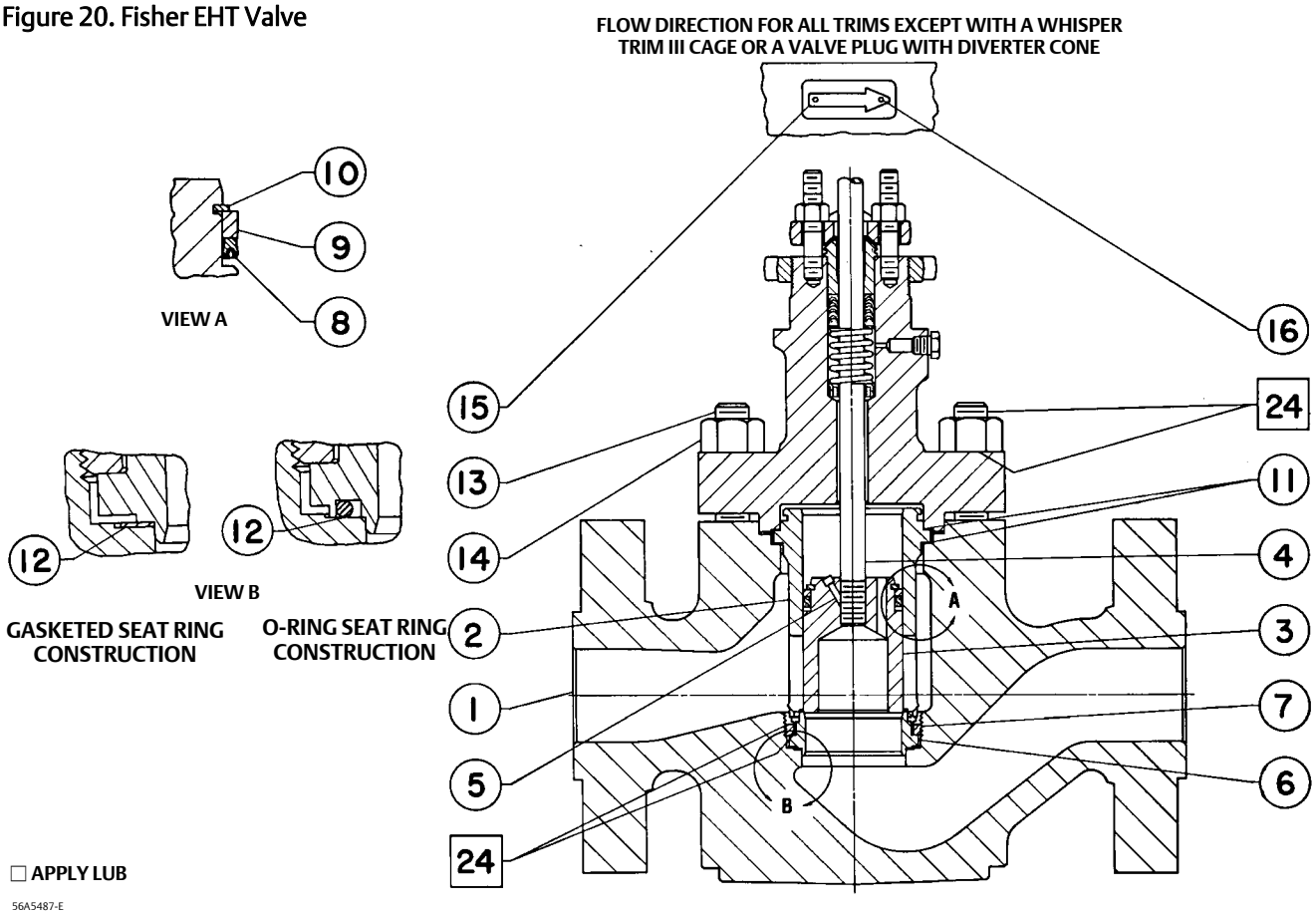
ALTERNATE CONFIGURATIONS
REFERENCE STANDARD TRIM KEY NUMBERS EXCEPT AS SHOWN

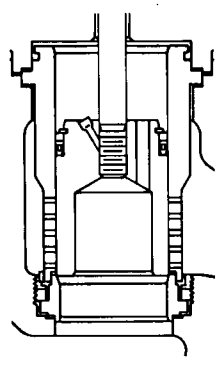
Figure 19. Belleville Washer Body-to-Bonnet Bolting



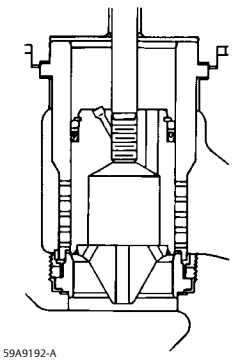
GE60624-C

Figure 20. Fisher EHT Valve

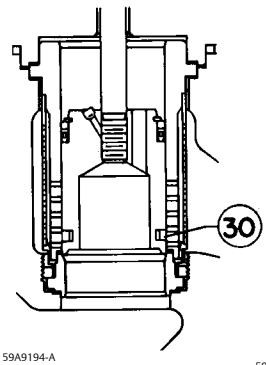



57A2889-A

DETAIL OF WHISPER TRIM III CAGE FOR NPS 3 THROUGH 4 BODIES

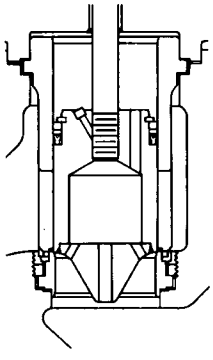

59A9192-A

DETAIL OF LEVEL A, B, OR C WHISPER TRIM III CAGE AND VALVE PLUG WITH DIVERTER CONE, FOR NPS 6 BODY ONLY

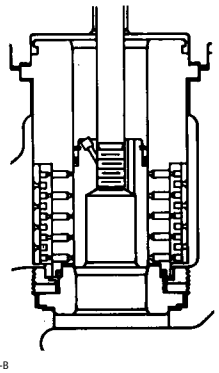


59A9194-A

DETAIL OF LEVEL D WHISPER TRIM III CAGE AND VALVE PLUG, FOR NPS 6 BODY ONLY


59A9168-A

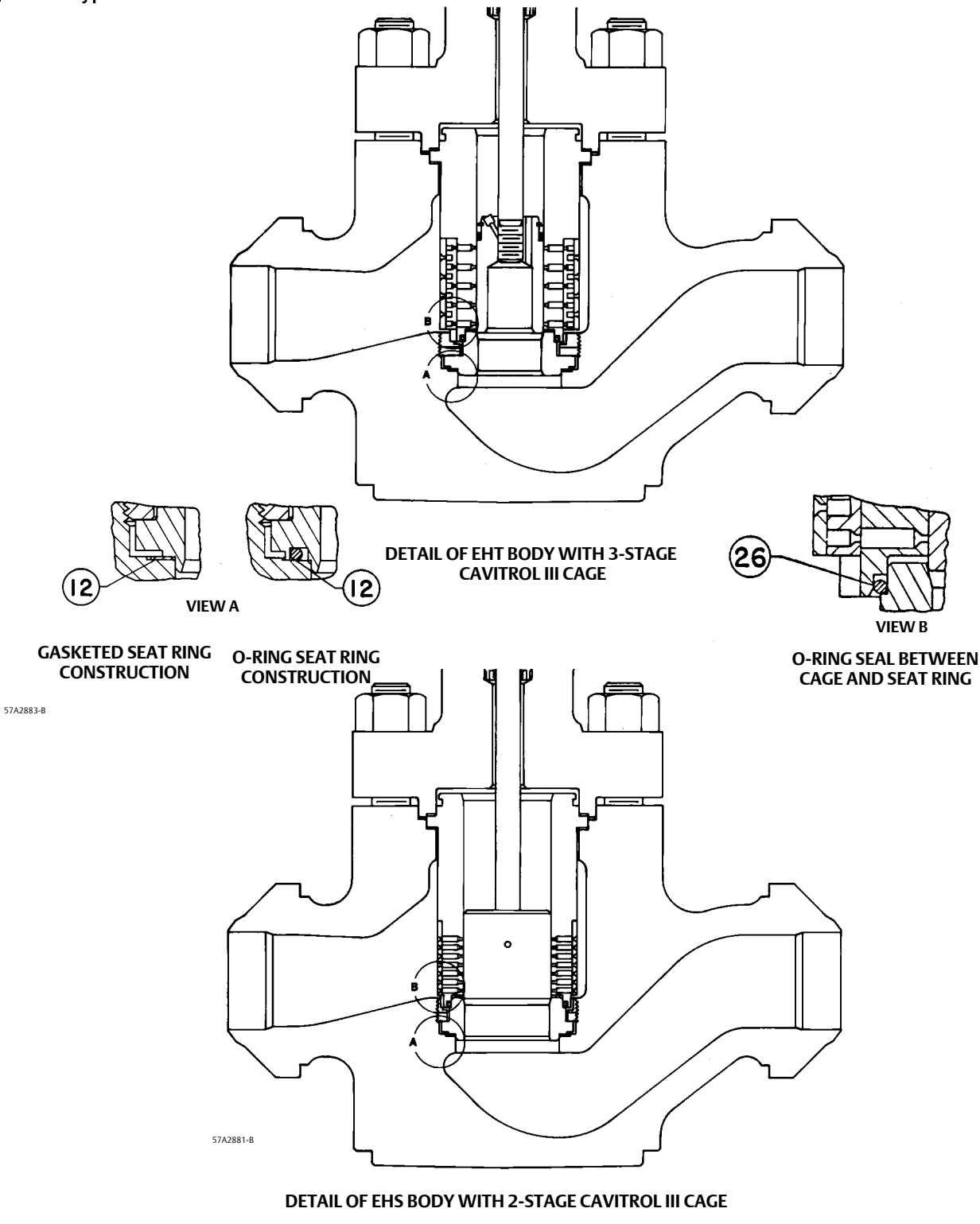
DETAIL OF VALVE PLUG WITH DIVERTER CONE, FOR NPS 6 BODY ONLY


57A2883-B

DETAIL OF 3-STAGE CAVITROL III CAGE, FOR ALL BODIES EXCEPT NPS 1 AND CL2500 NPS 2 BODIES (2-STAGE CAGE IS AVAILABLE FOR NPS 3 THROUGH 6 BODIES)

ALTERNATE CONFIGURATIONS
REFERENCE STANDARD TRIM KEY NUMBERS EXCEPT AS SHOWN

Figure 21. Typical Cavitrol III Constructions



Keys 6*, 7*, and 12* Soft Packing Parts

PACKING ARRANGEMENT	KEY NUMBER	PACKING PART DESCRIPTION	VALVE STEM CONNECTION			
			12.7 mm (1/2 Inch)	19.1 mm (3/4 Inch)	25.4 mm (1-Inch)	31.8 mm (1-1/4 Inch)
PTFE V-Ring Packing	6	Packing set, PTFE (1 req'd for single, 2 req'd for double)(1)	1R290201012	1R290401012	1R290601012	1R290801012
	12	Upper Wiper	1J872706332	1J872806332	1J872906332	1J873006332
Low chloride graphite ribbon and filament, single	6	Packing arrangement (includes key 7)	13A9775X012	13A9776X012	14A2340X012	14A3412X012
	7	Graphite Ribbon Ring (2 req'd)	1V3802X0022	1V2396X0022	1U6768X0022	1V5666X0022
	7	Graphite Filament Ring [2 required for 1/2 inch (12.7 mm) stem; 3 required for all others]	1E3190X0222	1E3191X0282	1D7518X0132	1D7520X0162
Low chloride graphite ribbon and filament, double	6	Packing arrangement (includes key 7)	14A1849X012	14A1780X012	14A3413X012	14A3414X012
	7	Graphite Ribbon Ring (3 req'd)	1V3802X0022	1V2396X0022	1U6768X0022	1V5666X0022
	7	Graphite Filament Ring [4 required for 1/2 inch (12.7 mm) stem; 5 req'd for all others]	1E3190X0222	1E3191X0282	1D7518X0132	1D7520X0162
PTFE/ composition, double	6	Packing arrangement (includes key 7)	12A7815X012	12A8173X012	12A8150X012	12A8163X012
	7	Packing Ring [10 required for 1/2 inch (12.7 mm) stem; 8 required for all others]	1E319001042	1E319101042	1D7518X0012	1D7520X0012
	12	Upper Wiper	1J872706332	1J872806332	1J872906332	1J873006332

1. Key 6 for double construction contains one extra lower wiper. Discard upon assembly.

Keys 8, 10, 11* and 13 Metal Packing Parts

PACKING TYPE	KEY NUMBER	DESCRIPTION	QUANTITY REQUIRED		VALVE STEM CONNECTION		MATERIAL
			Single Packing	Double Packing	mm	Inches	316 Stainless Steel
PTFE V-Ring	8	Packing Spring	1	---	12.7	1/2	1F125537012
			1	---	19.1	3/4	1F125637012
			1	---	25.4	1	1D582937012
			1	---	31.8	1-1/4	1D387437012
	8	Lantern Ring	---	2	12.7	1/2	1J962335072
			---	1	19.1	3/4	0N028435072
			---	1	25.4	1	0U099735072
			---	1	31.8	1-1/4	0W087135072
	10	Special Washer	1	---	12.7	1/2	1F125136042
			1	---	19.1	3/4	1F125036042
			1	---	25.4	1	1H982236042
			1	---	31.8	1-1/4	1H995936042
	11	Packing Box Ring	1	1	12.7	1/2	1J873235072
			1	1	19.1	3/4	1J873335072
			1	1	25.4	1	1J873435012
			1	1	31.8	1-1/4	1J873535012
	13	Packing Follower	1	1	12.7	1/2	1E944335072
			1	1	19.1	3/4	1E944735072
			1	1	25.4	1	1H982335072
			1	1	31.8	1-1/4	1H998435072
Low Chloride Graphite Ribbon/Filament	8	Lantern Ring	3	2	12.7	1/2	1J962335072
			2	1	19.1	3/4	0N028435072
			2	1	25.4	1	0U099735072
			2	1	31.8	1-1/4	0W087135072
	11	Packing Box Ring	1	1	12.7	1/2	1J873235072
			1	1	19.1	3/4	1J873335072
			1	1	25.4	1	1J873435012
			1	1	31.8	1-1/4	1J873535012
	13	Packing Follower	1	1	12.7	1/2	1E944335072
			1	1	19.1	3/4	1E944735072
			1	1	25.4	1	1H982335072
			1	1	31.8	1-1/4	1H998435072
PTFE/Composition	8	Lantern Ring	---	1	12.7	1/2	1J962335072
			---	1	19.1	3/4	0N028435072
			---	1	25.4	1	0U099735072
			---	1	31.8	1-1/4	0W087135072
	11	Packing Box Ring	---	1	12.7	1/2	1J873235072
			---	1	19.1	3/4	1J873335072
			---	1	25.4	1	1J873435012
			---	1	31.8	1-1/4	1J873535012
	13	Packing Follower	---	1	12.7	1/2	1E944335072
			---	1	19.1	3/4	1E944735072
			---	1	25.4	1	1H982335072
			---	1	31.8	1-1/4	1H998435072

*Recommended spare parts

Key 2* Cage For Valve Bodies Without Whisper Trim III Cage or Cavitrol III Trim

VALVE BODY RATING	VALVE SIZE, NPS	CAGE DESCRIPTION	TRAVEL		MATERIAL			
			mm	Inches	S17400 (17-4PH Stainless Steel) with H1075 Heat Treatment	S42200 (422 Stainless Steel) Ion Nitride	S31600 (316 Stainless Steel) Electrolized	S31600 (316 Stainless Steel) Electroless Nickel Coated for NACE MR0175-2002(1)
CL2500	1-1/2 x 1, 2 x 1	Quick opening	22	0.875	39A8550X042	39A8550X032	30B2539X012	31B4270X012
	3 x 2	Equal percentage Linear	22, 29 29	0.875, 1.125 1.125	39A9228X012 39A9229X012	39A9228X042 39A9229X042	39A9230X042 39A9231X022	30B7103X012 31B4272X012
	3, 4 x 3	Equal percentage Linear	29, 38 29, 38	1.125, 1.5 1.125, 1.5	39A9068X012 39A9069X012	39A9068X032 39A9069X032	39A9070X022 39A9071X022	30B9995X012 31B4273X012
	4, 6 x 4	Equal percentage Linear	38, 51 38, 51	1.5, 2 1.5, 2	42B3564X012 42B3561X012	42B3564X022 42B3561X022	42B3565X012 42B3562X012	42B3566X012 42B3563X012
	6, 8 x 6(2)	Equal percentage Linear	51, 76 51, 76	2, 3 2, 3	42B3576X012 42B3573X012	42B3576X022 42B3573X022	42B3577X012 42B3574X012	42B3578X012 42B3575X012

1. These materials are listed in NACE Standard MR0175-2002 as being acceptable for direct exposure to sour environment when used under conditions stated in that standard.
2. Flow down only with EHD and EHT style of valve plug. For flow up with balanced valve plug, contact factory.

Key 2* Cage or Cage and Baffle Assembly for Valve Body with Whisper Trim III Cage

VALVE BODY RATING	VALVE SIZE, NPS	CAGE DESCRIPTION	PORT DIAMETER		TRAVEL		MATERIAL		
			mm	Inches	mm	Inches	S17400 (17-4PH Stainless Steel) with H1075 Heat Treatment	S17400 (17-4PH Stainless Steel) with H1150 Heat Treatment For NACE MR0175-2002	S42200 (422 Stainless Steel) Ion Nitride
CL2500	3 x 2	Level A1	38.1	1.5	38	1.5	37A2741X012	37A2741X022	37A2741X032
	3, 4 x 3	Level A1 Level B1	58.7 58.7	2.3125 2.3125	38 38	1.5 1.5	37A2766X012 37A2768X012	37A2766X022 37A2768X022	37A2766X032 37A2768X032
	4, 6 x 4	Level A1 Level B1 Level B3	73.0 73.0 73.0	2.875 2.875 2.875	51 51 51	2 2 2	37A2774X012 37A2776X012 37A2778X012	37A2774X022 37A2776X022 37A2778X022	31B4630X012 31B4631X012 31B4632X012
	6, 8 x 6	Level A1 Level B3 Level C3 Level D3(1)	111.1 111.1 111.1 111.1	4.375 4.375 4.375 4.375	76 76 76 76	3 3 3 3	30B1113X022 30B1115X022 30B1117X022 30B1182X032	30B1113X012 30B1115X012 30B1117X012 30B1182X012	30B1113X032 30B1115X032 30B1117X032 30B1182X022

1. Cage and baffle assembly.

Key 2* Cage Assembly for Fisher EHS or EHT Valve Body with Cavitrol III Trim

VALVE BODY RATING	VALVE SIZE, NPS	CAGE ASSEMBLY DESCRIPTION	PORT DIAMETER		TRAVEL		MATERIAL
			mm	Inches	mm	Inches	S17400 (17-4PH Stainless Steel) with H1075 Heat Treatment
CL2500	1-1/2 x 1, 2 x 1	Full 2-stage	15.9	0.625	32	1.25	37A2283X022
	3 x 2	Full 2-stage Full 3-stage	31.8 15.9	1.25 0.625	51 51	2 2	37A2309X012 37A2319X012
	3, 4 x 3	Full 2-stage Full 3-stage	47.6 33.3	1.875 1.3125	64 64	2.5 2.5	37A4328X012 37A4335X012
	4, 6 x 4	Full 2-stage Full 3-stage	73.0 58.7	2.875 2.3125	70 70	2.75 2.75	37A4366X012 37A4376X012
	6, 8 x 6	Full 2-stage Full 3-stage	111.1 111.1	4.375 4.375	95 95	3.75 3.75	37A4420X012 37A4432X012

*Recommended spare parts

C-seal Parts for Fisher EHD Valve (Keys 2*, 3*, 6*, 64*, 8*, and 4*)

VALVE SIZE	PORT DIA	TRAVEL	TRIM	STEM DIAMETER		CHARACTER-ISTIC	CAGE	PLUG/ RETAINER	SEAT RING	C-seal	PISTON RING (2 req'd)	STEM
NPS	Inch	Inch		mm	Inch		Key 2	Key 3	Key 6	Key 64	Key 8	Key 4
4 CL2500	2.875	2	54	19.1	3/4	Equal %	44B9814X012	24B9002X012	34B9000X012	24B3621X012	14B3620X012	17A2167X202

Key 3* Valve Plug for Fisher EHS Valve Body with Micro-Form Plug

VALVE BODY RATING	VALVE SIZE, NPS	VALVE STEM CONNECTION		PORT DIAMETER		MATERIAL				
						S41600 (416 Stainless Steel)	S31600 (316 Stainless Steel) With CoCr-A (Alloy 6) Seat, Guide, and Contour			
		mm	Inches	mm	Inches		Diameter A(1)	Diameter B(1)	Diameter C(1)	Diameter D(1)
CL2500	1-1/2 x 1	12.7	1/2	6.4	0.25	16A5335X012	---	16A5413X012	16A5413X052	---
		12.7	1/2	12.7	0.5	16A5336X012	---	16A5414X012	16A5414X112	---
		12.7	1/2	19.1	0.75	16A5337X012	---	16A5415X012	16A5415X142	---
	3 x 2	12.7	1/2	25.4	1	16A5403X012	16A5416X012	---	16A5416X042	---
		19.1	3/4	25.4	1	16A5338X012	16A5417X012	---	16A5417X092	---
		25.4	1	25.4	1	16A5339X022	16A5418X012	---	16A5418X062	---

1. See table 12 for plug diameters vs operating temperatures.

Table 12. Valve Plug Diameters and Operating Temperatures

CAGE MATERIAL	STEM MATERIAL	OPERATING TEMPERATURE RANGE		DIAMETER CODE	VALVE BODY DESIGN
		°C	°F		
S31600 (316 Stainless Steel) Electrolized	S31600	-198 to +427	-325 to +800	A	EHD, EHS
	S31600 Electrolized	-29 to +593	-20 to +1100		
S31600 ENC (NACE)	S20910	-40 to +232	-40 to +450	A	EHD, EHS
S17400 (17-4PH Stain-less Steel) H1150 (NACE)	S20910	-40 to +232	-40 to +450	A	EHS
S17400 H1150 (NACE)	S20910	-40 to +232	-40 to +450	B	EHD
S31600 Electrolized	S31600	-198 to +427	-325 to +800	B	EHS
	S31600 Electrolized	-29 to +593	-20 to +1100		
S31600 ENC (NACE)	S20910	-40 to +232	-40 to +450	B	EHS
S42200 (422 Stainless Steel) Ion Nitride	S31600 Electrolized	427 to 566	+800 to 1050	C	EHD, EHS
S42200 Ion Nitride	S31600 Electrolized	427 to 510	+800 to 950	D	EHD, EHS
S31600 Electrolized	S31600	-198 to +427	-325 to +800	D	EHD, EHS
	S31600 Electrolized	-29 to +593	-20 to +1100		
S31600 ENC (NACE)	S20910	-40 to +232	-40 to +450	D	EHD, EHS
S42200 Ion Nitride	S31600 Electrolized	427 to 510	+800 to 950	E	EHD, EHS
S42200 Ion Nitride	S31600 Electrolized	510 to 566	+950 to 1050	F	EHD, EHS
S31600 Electrolized	S31600	-198 to +427	-325 to +800	K	EHD
	S31600 Electrolized	-29 to +593	-20 to +1100		
S31600 ENC (NACE)	S20910	-40 to +232	-40 to +450	K	EHD

*Recommended spare parts

Key 3* Valve Plug for 1-1/2 x 1 and 2 x 1 Fisher EHS Valve Body with Micro-Flute Valve Plug

VALVE BODY RATING	PLUG STYLE	PORT DIAMETER		MATERIAL		
				S31600 (316 Stainless Steel) With CoCr-A (Alloy 6) Seat, Guide, and Tip		S44004 (440C Stainless Steel) with Heat Treatment
		mm	Inches	Diameter B(1)	Diameter C(1)	
CL2500	1 Flute	6.4	0.25	18A1654X012	18A1654X042	18A1651X012
	2 Flutes	6.4	0.25	18A1655X012	18A1655X042	18A1652X012
	3 Flutes	6.4	0.25	18A1656X012	18A1656X042	18A1653X012
	3 Flutes	9.5	0.375	18A1658X012	18A1658X052	18A1657X012
	3 Flutes	12.7	0.5	18A1660X012	18A1660X052	18A1659X012

1. See table 12 for plug diameters vs operating temperatures.

Key 3* Valve Plug or Plug/Diverter for an NPS 2 through 4 CL2500 Valve Without Micro-Form, Micro-Flute, or Cavitrol III Trim. Also for Use With an NPS 2 or 3 Valve With a Whisper Trim III Cage

VALVE SIZE, NPS	VALVE BODY DESIGN	VALVE STEM CONNEC-TION		PORT DIAMETER		MATERIAL					
						S31600 (316 Stainless Steel) With CoCr-A (Alloy 6) Seat and Guide	S31600 (316 Stainless Steel) With CoCr-A (Alloy 6) Seat and Guide				S41600 (416 Stainless Steel)
		mm	Inches	mm	Inches		Diameter A(1)	Diameter C(1)	Diameter D(1)	Diameter E(1)	
3 x 2	EHD	12.7	1/2	38.1	1.5	---	36A5450X012	36A5450X072	---	---	36A5373X012
	EHT	12.7	1/2	38.1	1.5	36A5451X012	---	---	---	---	36A5374X012
	EHS	12.7	1/2	38.1	1.5	---	16A5452X012	16A5452X042	---	---	16A5375X012
		19.1	3/4	38.1	1.5	---	16A5453X012	16A5453X062	---	---	16A5376X012
		25.4	1	38.1	1.5	---	16A5454X012	16A5454X052	---	---	16A5377X012
3, 4 x 3	EHD	12.7	1/2	58.7	2.3125	---	36A5455X012	---	36A5455X042	---	36A5378X012
		19.1	3/4	58.7	2.3125	---	36A5456X012	---	36A5456X072	---	36A5379X012
		25.4	1	58.7	2.3125	---	36A5457X012	---	36A5457X062	---	36A5380X012
	EHT	12.7	1/2	58.7	2.3125	36A5458X012	---	---	---	---	36A5381X012
		19.1	3/4	58.7	2.3125	36A5459X012	---	---	---	---	36A5382X012
		25.4	1	58.7	2.3125	36A5460X012	---	---	---	---	36A5383X012
	EHS	12.7	1/2	58.7	2.3125	---	16A5461X012	---	36A5461X042	---	16A5384X012
		19.1	3/4	58.7	2.3125	---	16A5462X012	---	36A5462X042	---	16A5385X012
		25.4	1	58.7	2.3125	---	16A5463X012	---	36A5463X052	---	16A5386X012
4, 6 x 4	EHD	19.1	3/4	73.0	2.875	---	36A5464X012	---	---	36A5464X072	36A5387X012
		25.4	1	73.0	2.875	---	36A5465X012	---	---	36A5465X052	36A5388X012
	EHT	19.1	3/4	73.0	2.875	36A5466X012	---	---	---	---	36A5389X012
		25.4	1	73.0	2.875	36A5467X012	---	---	---	---	36A5390X012
	EHS	19.1	3/4	73.0	2.875	---	16A5433X012	---	16A5433X042	---	16A5354X042
		25.4	1	73.0	2.875	---	16A5434X012	---	16A5434X062	---	16A5355X042

1. See table 12 for plug diameters vs operating temperatures.

Key 3* Valve Plug or Plug/Diverter for an NPS 6 CL2500 Valve Without Micro-Form, Micro-Flute, or Cavitrol III Trim

VALVE SIZE, NPS	VALVE BODY DESIGN	VALVE STEM CONNEC-TION		PORT DIAMETER		MATERIAL						
						S31600 (316 Stainless Steel) With CoCr-A (Alloy 6) Seat and Guide	S17400 (17-4PH Stainless Steel) H900	S31600 (316 Stainless Steel) With CoCr-A (Alloy 6) Seat and Guide				S41600 (416 Stainless Steel)
								Diameter A(1)	Diameter D(1)(2)	Diameter E(1)(3)	Diameter K(1)	
		mm	Inches	mm	Inches							
6, 8 x 6	EHD	19.1	3/4	111.1	4.375	---	---	36A5470X012	36A5470X062	36A5470X052	---	36A5393X012
		25.4	1	111.1	4.375	---	---	36A5471X012	36A5471X062	36A5471X072	---	36A5394X012
		31.8	1-1/4	111.1	4.375	---	---	36A5472X012	36A5472X062	36A5472X052	---	36A5395X012
	EHD with diverter(4)	31.8	1-1/4	111.1	4.375	---	31B4887X012	---	39A9118X042	39A9118X052	39A9118X162	---
	EHT	19.1	3/4	111.1	4.375	36A5473X012	---	---	---	---	---	36A5396X012
		25.4	1	111.1	4.375	36A5474X012	---	---	---	---	---	36A5397X012
		31.8	1-1/4	111.1	4.375	36A5475X012	---	---	---	---	---	36A5398X012
	EHT with diverter(4)	31.8	1-1/4	111.1	4.375	39A9119X072	31B4889X012	---	---	---	---	---
	EHS	19.1	3/4	111.1	4.375	---	---	36A5476X012	36A5476X042	36A5476X052	---	16A5399X012
		25.4	1	111.1	4.375	---	---	36A5477X012	36A5477X042	36A5477X052	---	16A5400X012
		31.8	1-1/4	111.1	4.375	---	---	36A5478X012	36A5478X042	36A5478X052	---	16A5401X012

1. See table 12 for plug diameters vs operating temperatures.
2. Temperature limit due to diametrical expansion 427° to 510°C (800° to 950°F).
3. Temperature limit due to diametrical expansion 510° to 566°C (950° to 1050°F).
4. Flow up only.

Key 3* Valve Plug for NPS 4 and 6 x 4 Valve With Whisper Trim III Cage

VALVE BODY RATING	VALVE BODY DESIGN	VALVE STEM CONNEC-TION		PORT DIAMETER		MATERIAL					
						S41600 (416 Stainless Steel)	S31600 (316 Stainless Steel) With CoCr-A (Alloy 6) Seat and Guide				S31600 with CoCr-A Seat and Guide
							Diameter A(1)	Diameter B(1)	Diameter D(1)	Diameter E(1)	
		mm	Inches	mm	Inches						
CL2500	EHD	19.1	3/4	73.0	2.875	36A5387X012	36A5464X012	---	---	36A5464X072	---
		25.4	1	73.0	2.875	36A5388X042	36A5465X012	---	---	36A5465X052	---
	EHT	19.1	3/4	73.0	2.875	36A5389X012	---	---	---	---	36A5466X012
		25.4	1	73.0	2.875	36A5390X012	---	---	---	---	36A5467X012
	EHS	19.1	3/4	73.0	2.875	16A5354X012	36A5433X012	---	36A5433X042	---	---
		25.4	1	73.0	2.875	16A5355X012	36A5434X012	---	36A5434X062	---	---

1. See table 12 for plug diameters vs operating temperatures.

*Recommended spare parts

Key 3* Valve Plug for NPS 6 and 8 x 6 Valve with Whisper Trim III Cage

VALVE BODY DESIGN	MATERIAL	OPERATING TEMPERATURE RANGE		DIAMETER CODE STAMPED ON TOP OF VALVE PLUG	VALVE STEM CONNECTION		VALVE BODY RATING AND CAGE LEVEL	
							CL2500	
		°C	°F		mm	Inches	Level A, B, or C	Level D
EHD	17-4PH stainless steel with H900 heat treatment(1)	0 to 427	32 to 800	N.A.	25.4	1	31B4888X012	39A9100X012
					31.8	1-1/4	31B4887X012	39A9102X012
	316 stainless steel with alloy 6 (CoCr-A) seat and guide	-40 to 232	-40 to 450	A(2)	25.4	1	39A9116X012	39A9104X012
					31.8	1-1/4	39A9118X012	39A9106X012
		427 to 510	800 to 950	E(3)	25.4	1	39A9116X052	39A9104X052
					31.8	1-1/4	39A9118X052	39A9106X052
		510 to 566	950 to 1050	F(3)	25.4	1	39A9116X062	39A9104X062
					31.8	1-1/4	39A9118X062	39A9106X062
		-40 to 232	-40 to 450	K(2)	25.4	1	---	---
					31.8	1-1/4	---	---
EHT	17-4PH stainless steel with H900 heat treatment(1)	0 to 427	32 to 800	N.A.	25.4	1	31B4890X012	39A9101X012
					31.8	1-1/4	31B4889X012	39A9103X012
	316 stainless steel with alloy 6 (CoCr-A) seat and guide	-40 to 232	-40 to 450	A(2)	25.4	1	39A9117X012	39A9105X012
					31.8	1-1/4	39A9119X012	39A9107X012
		-40 to 232	-40 to 450	D(2)	25.4	1	---	---
					31.8	1-1/4	---	---

1. 17-4PH H1075 cage.
2. 17-4PH H1150 cage for NACE MR0175-2002.
3. S42200 (422 stainless steel) ion nitride cage.

Key 3* Valve Plug and Stem Assembly for a CL2500 Valve with Cavitrol III Trim

VALVE SIZE, NPS	DESIGN	STAGE	ACTUATOR GROUP	VALVE STEM CONNECTION		PORT DIAMETER		MATERIAL
				mm	Inches	mm	Inches	S44004 (440C Stainless Steel)
1.5 x 1 & 2 x 1	EHS	2	1	12.7 19.1	1/2 3/4	15.9 15.9	0.625 0.625	17A2286X012 17A2286X032
3 x 2	EHS	3	1	12.7 19.1	1/2 3/4	15.9 15.9	0.625 0.625	17A2323X012 17A2323X032
	EHT	2	1	12.7 19.1	1/2 3/4	31.8 31.8	1.25 1.25	27A2312X012 27A2312X032
3 & 4 x 3	EHT	2	400 1 100 101	12.7 19.1 25.4 25.4	1/2 3/4 1 1	47.6 47.6 47.6 47.6	1.875 1.875 1.875 1.875	37A4320X032 37A4321X052 37A4321X062 37A4321X072
		3	400 1 100 101	12.7 19.1 25.4 25.4	1/2 3/4 1 1	33.3 33.3 33.3 33.3	1.3125 1.3125 1.3125 1.3125	27A4339X012 27A4340X012 27A4340X032 27A4340X042
4 & 6 x 4	EHT	2	1 100 101	19.1 25.4 25.4	3/4 1 1	73 73 73	2.875 2.875 2.875	37A4358X032 37A4359X042 37A4359X052
		3	1 100 101	19.1 25.4 25.4	3/4 1 1	58.7 58.7 58.7	2.3125 2.3125 2.3125	37A4380X022 37A4381X022 37A4381X032
6 & 8 x 6	EHT	2 & 3	401 & 403 402	19.1 19.1	3/4 3/4	111.1 111.1	4.375 4.375	37A4423X022 37A4423X032
			404 405 406 407	25.4 25.4 25.4 25.4	1 1 1 1	111.1 111.1 111.1 111.1	4.375 4.375 4.375 4.375	37A4424X022 37A4424X032 37A4424X042 37A4424X052
			404 405 406 407	31.8 31.8 31.8 31.8	1-1/4 1-1/4 1-1/4 1-1/4	111.1 111.1 111.1 111.1	4.375 4.375 4.375 4.375	37A4425X022 37A4425X032 37A4425X042 37A4425X052

*Recommended spare parts

Key 4* Valve Plug Stem for CL2500 Valve without Whisper Trim III or Cavitrol III Trim

VALVE SIZE, NPS	ACTUATOR GROUP	VALVE STEM CONNECTION		VALVE STEM TRAVEL		DESCRIPTION	MATERIAL		
		mm	Inches	mm	Inches		S31600 (316 Stainless Steel)	Electrolized S31600	S20910 for NACE MR0175-2002
1-1/2 x 1, 2 x 1	1	12.7	1/2	19.1	0.75	Micro-Form or Micro-Flute with 6.4 mm (0.25-inch) port	10A8840XB42	13A7368X062	10A8840XT82
				19.1	0.75	Micro-Flute with 9.5 mm (0.375-inch) or 12.7 mm (0.5-inch) port	10A8840XB42	13A7368X062	10A8840XT82
				19.1, 22	0.75, 0.875	Micro-Form with 12.7 mm (0.5-inch) or 19.1 mm (0.75 inch) port	10A8840XC52	13A7368X092	10A8840X022
		19.1	3/4	19.1, 22	0.75, 0.875	Micro-Form with 12.7 mm (0.5-inch) or 19.1 mm (0.75-inch) port	16A4704X062	29A9091X012	16A4704X252
3 x 2	1	12.7	1/2	22.2, 28.6, 38.1	0.875, 1.125, 1.5	Micro-Form, EHS, EHD, EHT	1K587435162	13A7368X112	1K5874X0062
		19.1	3/4	22.2, 28.6, 38.1	0.875, 1.125, 1.5	Micro-Form, EHS	1U507135162	17A2167X082	1U5071X0042
	100	25.4	1	22.2	0.875	Micro-Form, EHS	1K7891X0012	15A9264X182	1K7891X0242
				28.6	1.125	Micro-Form, EHS	1N325635162	15A9264X162	1N3256X0052
				38.1	1.5	Whisper Trim III, EHS	1P597335162	15A2964X152	11A3429XG82
	101	25.4	1	22.2, 28.6, 38.1	0.875, 1.125, 1.5	Micro-Form, EHS	1P9972X0012	15A9264X122	1P9972X0032
3, 4 x 3	1	12.7	1/2	28.6, 38.1	1.125, 1.5	EHD, EHT EHS	10A8840X762 1U218035162	13A7368X142 13A7368X132	10A8840XU52 1U2180X0012
		19.1	3/4	28.6, 38.1	1.125, 1.5	EHD, EHT EHS	1U507135162 1U928235162	17A2167X082 17A2167X022	1U5071X0042 1U9282X0192
	100	25.4	1	28.6	1.125	EHD, EHT EHS	1L877635162 1N4180X0012	15A9264X192 15A9264X242	1L8776X0032 1N4180X0072
				38.1	1.5	EHD, EHT EHS	1N325635162 1L3765X0012	15A9264X162 15A9264X232	1N3256X0052 1L3765X0072
	101	25.4	1	28.6, 38.1	1.125, 1.5	EHD, EHT EHS	1L2687X0012 1P597335162	15A9264X302 15A9264X152	1L2687X0152 11A3429XG82
4, 6 x 4	1	19.1	3/4	38.1, 50.8	1.5, 2	EHD, EHT EHS	1U507135162 1U6674X0012	17A2167X082 17A2167X092	1U5071X0042 1U6674X0052
	100	25.4	1	38.1	1.5	EHD, EHT EHS	1K785135162 1L424935162	15A9264X212 15A9264X282	1K7851X0032 1L4249X0052
				50.8	2	EHD, EHT EHS	1K7891X0012 1L2273X00A2	15A9264X182 15A9264X262	1K7891X0242 1L2273X0042
	101	25.4	1	38.1, 50.8	1.5, 2	EHD, EHT EHS	10A3282X012 1U627735162	15A2964X142 15A9264X222	10A3282X222 1U6277X0062
6, 8 x 6	1	19.1	3/4	50.8, 76.2	2, 3	EHD, EHT EHS	1U928235162 10A9265X522	17A2167X122 17A2167X112	1U9282X0192 10A9265XW42
	100	25.4	1	50.8	2	EHD, EHT EHS	1L877635162 1L259635162	15A9264X192 15A9264X292	1L8776X0032 1L2596X0042
	100 101	25.4	1	76.2 50.8, 76.2	3 2, 3	EHD, EHT	1P597335162	15A9264X152	11A3429XG82
	100 101	25.4	1	76.2 50.8, 76.2	3 2, 3	EHS	1V578235162	15A9264X272	1V5782X0032
	100	31.8	1-1/4	50.8	2	EHD, EHT EHS	11A3430X432 1V4641X00A2	15A4075X292 15A4075X332	11A3430XF12 1V4641X0022
	100 101	31.8	1-1/4	76.2 50.8, 76.2	3 2, 3	EHD, EHT	1U3452X0012	15A4075X282	1U3452X0082
	100 101	31.8	1-1/4	76.2 50.8, 76.2	3 2, 3	EHS	1N928235162	15A4075X322	1N9282X0052

*Recommended spare parts

Key 4* Valve Plug Stem for NPS 4 or 6 Valve with Whisper Trim III Cage

VALVE BODY RATING, CLASS	VALVE SIZE, NPS	ACTUATOR GROUP	VALVE STEM CONNECTION		VALVE STEM TRAVEL		DESIGN	CAGE LEVEL	MATERIAL			
			mm	Inches	mm	Inches			S17400 (17-4PH Stainless Steel) with H1150 Heat Treatment	S31600 (316 Stainless Steel)	Electrolized S31600	S20910 For NACE MR0175-2002
2500	4, 6 x 4	1	19.1	3/4	51	2	EHD, EHT EHS	All All	--- ---	1U507135162 1U6674X0012	17A2167X082 17A2167X092	1U5071X0042 1U6674X0052
		100	25.4	1	51	2	EHD, EHT EHS	All All	--- ---	1K7891X0012 1L294135162	15A9264X182 15A9264X332	1K7891X0242 1L2273X0042
		101	25.4	1	51	2	EHD, EHT EHS	All All	--- ---	10A3282X012 1U627735162	15A9264X142 15A9264X222	10A3282X222 1U6277X0062
	6, 8 x 6	100, 101	25.4	1	76	3	EHD, EHT	All	11A3429XK22	1P597335162	15A9264X152	11A3429XG82
			31.8	1-1/4	76	3	EHD, EHT	All	1U3452X0092	1U3452X0012	15A4075X282	1U3452X0082

Key 4* Valve Plug Stem for Use with Style 1 Extension Bonnet

VALVE BODY RATING CLASS	VALVE SIZE, NPS	ACTUATOR GROUP	VALVE STEM CONNECTION		VALVE STEM TRAVEL		DESCRIPTION	S31600 (316 STAINLESS STEEL)
			mm	Inches	mm	Inches		
2500	1-1/2 x 1, 2 x 1	1	12.7	1/2	19.1	0.75	Micro-Form, Micro-Flute with 6.4 mm (0.25-inch) port	28A2261X012
					19.1	0.75	Micro-Flute with 9.5 mm (0.375-inch) and 12.7 mm (0.5-inch) port	28A2261X012
					19.1, 22.2	0.75, 0.875	Micro-Form with 12.7 mm (0.5-inch) and 19.1 mm (0.75-inch) port	28A2261X022
			19.1	3/4	19.1, 22.2	0.75, 0.875	Micro-Form with 12.7 mm (0.5-inch) or 19.1 mm (0.75-inch) port	16A4704X102
	3 x 2	1	12.7	1/2	22.2, 28.6, 38.1	0.875, 1.125, 1.5	Micro-Form, EHS, EHD, EHT	28A2261X032
			19.1	3/4	22.2, 28.6, 38.1	0.875, 1.125, 1.5	Micro-Form, EHS	28A2260X022
		100	25.4	1	22.2	0.875	Micro-Form, EHS	28A2262X012
					28.6	1.125	Micro-Form, EHS	28A2262X042
		101	25.4	1	22.2, 28.6, 38.1	0.875, 1.125, 1.5	Micro-Form, EHS	28A2262X032

Key 5* Pin, S31600 (316 Stainless Steel)

VALVE SIZE, NPS	VALVE BODY RATING, CLASS	DESIGN	STEM DIAMETER			
			12.7 mm (1/2-Inch)	19.1 mm (3/4-Inch)	25.4 mm (1-Inch)	31.8 mm (1-1/4 Inch)
1-1/2 x 1, 2 x 1	2500	EHS	1B627035072	---	---	---
3 x 2	2500	EHS	1B599635072	1F723635072	1D269735072	---
	2500	EHD, EHT	1V322735072	---	---	---
3 & 4 x 3	2500	EHS	1B599635072	1F723635072	1D269735072	---
	2500	EHD, EHT	1V322735072	1V326035072	1V326035072	---
4 & 6 x 4	2500	EHS EHD, EHT	--- ---	1F723635072 1V326035072	1D269735072 1V334035072	--- ---
6 & 8 x 6	2500	EHS	---	1F723635072	1D269735072	1K249838992
	2500	EHD, EHT	---	1V326035072	1V334035072	1V334035072

*Recommended spare parts

Key 6* Seat Ring and Key 7* Seat Ring Retainer for Gasketed Seat Ring Constructions without Cavitrol III or NPS 4 or 6 Whisper Trim III Cage

VALVE BODY RATING, CLASS	VALVE SIZE, NPS	DESIGN	PORT DIAMETER		PART DESCRIPTION	SEAT RING MATERIAL	
						S41600 (416 Stainless Steel)	R30006 (Alloy 6)
						SEAT RING RETAINER MATERIAL	
			mm	Inches		S17400 (17-4PH Stainless Steel) H1150 Electrolized	N07718 Electrolized
2500	1-1/2 x 1, 2 x 1	All	6.4	0.25	Seat Ring Seat Ring Retainer	26A5286X012 26A5300X042	26A5286X032 26A5300X022
			9.5	0.375	Seat Ring Seat Ring Retainer	28A0348X022 26A5300X042	28A0348X032 26A5300X022
			12.7	0.5	Seat Ring Seat Ring Retainer	26A5287X012 26A5300X042	26A5287X032 26A5300X022
			19.1	0.75	Seat Ring Seat Ring Retainer	26A5288X012 26A5300X042	26A5288X032 26A5300X022
	3 x 2	Micro-Form	25.4	1	Seat Ring Seat Ring Retainer	26A5290X012 26A5301X042	26A5290X032 26A5301X022
		EHD, EHT, EHS	38.1	1.5	Seat Ring Seat Ring Retainer	26A5291X012 26A5301X042	26A5291X032 26A5301X022
	3, 4 x 3	EHD, EHT, EHS	58.7	2.3125	Seat Ring Seat Ring Retainer	26A5292X012 26A5302X062	26A5292X032 26A5302X022
	4, 6 x 4	EHD, EHT, EHS	73.0	2.875	Seat Ring Seat Ring Retainer	26A5293X012 26A5303X042	26A5293X032 26A5303X022
	6, 8 x 6	EHD, EHT, EHS	111.1	4.375	Seat Ring Seat Ring Retainer	26A5294X012 26A5304X042	26A5294X032 26A5304X022

Key 6* Seat Ring and Key 7* Seat Ring Retainer for O-Ring Seat Ring Constructions without Cavitrol III or NPS 4 or 6 Whisper Trim III Cage

VALVE BODY RATING, CLASS	VALVE SIZE, NPS	DESIGN	PORT DIAMETER		PART DESCRIPTION	SEAT RING MATERIAL		
						S41600 (416 Stainless Steel)	R30006 (Alloy 6)	R30006 (Alloy 6)
						SEAT RING RETAINER MATERIAL		
			mm	Inches		S17400 (17-4PH Stainless Steel) H1150 Electrolized	N07718 Electrolized	S17400 (17-4PH Stainless Steel) H1150 Electrolized For NACE MR0175-2002
2500	1-1/2 x 1, 2 x 1	All	6.4	0.25	Seat Ring Seat Ring Retainer	27A2749X042 26A5300X042	27A2749X022 26A5300X022	27A2749X022 26A5300X042
			9.5	0.375	Seat Ring Seat Ring Retainer	28A2401X042 26A5300X042	28A2401X022 26A5300X022	28A2401X022 26A5300X042
			12.7	0.5	Seat Ring Seat Ring Retainer	27A2750X042 26A5300X042	27A2750X022 26A5300X022	27A2750X022 26A5300X042
			19.1	0.75	Seat Ring Seat Ring Retainer	27A2751X042 26A5300X042	27A2751X022 26A5300X022	27A2751X022 26A5300X042
	3 x 2	Micro-Form	25.4	1	Seat Ring Seat Ring Retainer	27A2752X042 26A5301X042	27A2752X022 26A5301X022	27A2752X022 26A5301X042
		EHD, EHT, EHS	38.1	1.5	Seat Ring Seat Ring Retainer	27A2753X042 26A5301X042	27A2753X022 26A5301X022	27A2753X022 26A5301X042
	3, 4 x 3	EHD, EHT, EHS	58.7	2.3125	Seat Ring Seat Ring Retainer	27A2771X042 26A5302X062	27A2771X022 26A5302X022	27A2771X022 26A5302X062
	4, 6 x 4	EHD, EHT, EHS	73	3.625	Seat Ring Seat Ring Retainer	27A2789X042 26A5303X042	27A2789X022 26A5303X022	27A2789X022 26A5303X042
	6, 8 x 6	EHD, EHT, EHS	111.1	4.375	Seat Ring Seat Ring Retainer	27A2809X042 26A5304X042	27A2809X022 26A5304X022	27A2809X022 26A5304X042

*Recommended spare parts

Key 6* Seat Ring and Key 7* Seat Ring Retainer for a NPS 4 or 6 Valve with Whisper Trim III Cage and Gasketed Seat Ring Construction

VALVE BODY RATING, CLASS	VALVE SIZE, NPS	PORT DIAMETER		PART DESCRIPTION	SEAT RING MATERIAL	
					S41600 (416 Stainless Steel)	R30006 (Alloy 6)
					SEAT RING RETAINER MATERIAL	
		mm	Inches		S17400 (17-4PH Stainless Steel) H1150, Electrolized	N07718 Electrolized
2500	4, 6 x 4	73.0	2.875	Seat Ring Seat Ring Retainer	26A5293X012 26A5303X042	26A5293X032 26A5303X022
	6, 8 x 6	111.1	4.375	Seat Ring Seat Ring Retainer	26A5294X012 26A5304X042	26A5294X032 26A5304X022

Key 6* Seat Ring and Key 7* Seat Ring Retainer for a NPS 4 or 6 Valve with Whisper Trim III Cage and O-Ring Seat Ring Construction

VALVE BODY RATING, CLASS	VALVE SIZE, NPS	PORT DIAMETER		PART DESCRIPTION	SEAT RING MATERIAL		
					S41600 (416 Stainless Steel)	R30006 (Alloy 6)	R30006 (Alloy 6)
					SEAT RING RETAINER MATERIAL		
		mm	Inches		S17400 (17-4PH Stainless Steel) H1150, Electrolized	N07718 Electrolized	S17400 (17-4PH Stainless Steel) H1150, Electrolized For NACE MR0175-2002
2500	4, 6 x 4	73.0	2.875	Seat Ring	27A2789X042	27A2789X022	27A2789X022
				Seat Ring Retainer	26A5303X042	26A5303X022	26A5303X042
	6, 8 x 6	111.1	4.375	Seat Ring	27A2809X042	27A2809X022	27A2809X022
				Seat Ring Retainer	26A5304X042	26A5304X022	26A5304X042

Key 6* Seat Ring for Valve with Cavitrol III Trim and O-Ring Seat Ring Construction

VALVE SIZE, NPS	VALVE BODY RATING, CLASS	2-STAGE	3-STAGE
		S44004/HT (440C Stainless Steel)	S44004/HT (440C Stainless Steel)
1-1/2 x 1, 2 x 1	2500	20B6726X032	- - -
3 x 2	2500	20B6728X032	20B6727X032
3, 4 x 3	2500	20B6730X032	20B6729X032
4, 6 x 4	2500	20B6732X032	20B6731X032
6, 8 x 6	2500	20B6733X032	20B6733X032

Key 7* Seat Ring Retainer for Valve with Cavitrol III Trim, S17400 (17-4PH Stainless Steel) H1150 Electrolized

VALVE SIZE, NPS	CL2500	
	2-Stage	3-Stage
1-1/2 x 1, 2 x 1	27A2290X022	- - -
3 x 2	27A2318X022	27A2327X022
3, 4 x 3	27A4333X022	27A4346X022
4, 6 x 4	27A4375X022	27A4386X022
6, 8 x 6	27A4431X022	27A4431X022

Key 8* Graphite Piston Ring for Fisher EHD Only (4 req'd for NPS 6 and 8 x 6 Valve with Level D Whisper Trim Cage; 3 req'd for all other Valves)

VALVE SIZE, NPS	PORT DIAMETER		CL2500	
	mm	Inches	-253°C to 426°C (-425°F to 800°F)	427°C to 537°C (801°F to 1000°F)
3 x 2	38.1 47.6	1.5 1.875	16A5481X012	16A5481X022
3, 4 x 3	58.7	2.3125	1U2258X0012	1U2258X0022
4, 6 x 4	73.0	2.875	1U2300X0012	1U2300X0022
6, 8 x 6	111.1	4.375	1U2392X0012	1U2392X0022

*Recommended spare parts

Key 8* R30003/PTFE Seal Ring and Key 30* Graphite Piston Ring for Fisher EHT without Cavitrol III Trim

VALVE SIZE, NPS	PORT DIAMETER		KEY 8 SEAL RING	KEY 30 PISTON RING
			Valve Body Rating	
	mm	Inches	CL2500	
3 x 2	38.1 47.6	1.5 1.875	13A8521X032 - - -	N.A.
3, 4 x 3	58.7	2.3125	10A4206X032	N.A.
4, 6 x 4	73.0	2.875	10A4215X032	N.A.
6, 8 x 6 without Whisper Trim III	111.1	4.375	10A4223X032	N.A.
6, 8 x 6 with Whisper Trim III	111.1	4.375	10A4223X032	1U2392X0012(1)

1. For use only with Whisper Trim III Level D with 111.1 mm (4.375 inch) orifice.

Key 8* Seal Ring for Cavitrol III Trim Only, Spring Loaded PTFE

VALVE SIZE, NPS	CL2500	
	2-Stage	3-Stage
3 x 2	17A2314X012	- - -
3, 4 x 3	10A4216X012	10A4207X012
4, 6 x 4	10A4215X012	10A4206X012
6, 8 x 6	10A4223X012	10A4223X012

Key 9* Back-Up Ring for all Fisher EHT Valves except those with Cavitrol III Trim

VALVE BODY RATING, CLASS	VALVE SIZE, NPS	PORT DIAMETER		MATERIAL	
		mm	Inches	S31600 (316 Stainless Steel)	S41600 (416 Stainless Steel)
2500	3 x 2	38.1	1.5	13A8520X022	13A8520X012
	3, 4 x 3	58.7	2.3125	10A4208X022	10A4208X012
	4, 6 x 4	73.0	2.875	10A4217X022	10A4217X012
	6, 8 x 6	111.1	4.375	10A4224X022	10A4224X012

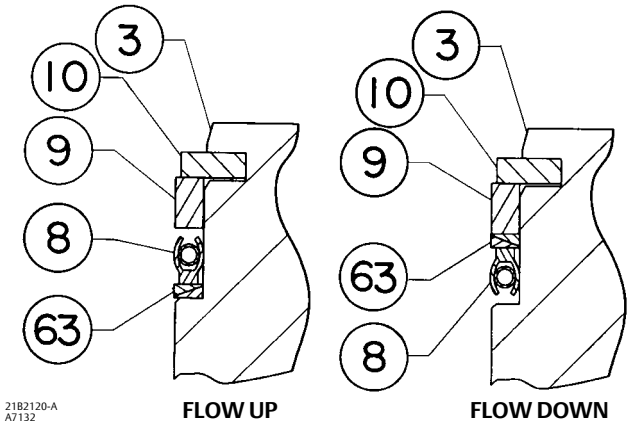
Key 9* Back-Up Ring for Fisher EHT Valve with Cavitrol III Trim

VALVE BODY RATING, CLASS	VALVE SIZE, NPS	PORT DIAMETER		MATERIAL
		mm	Inches	S41600 (416 Stainless Steel)
2500	3 x 2	31.8	1.25	17A2315X012
	3, 4 x 3	47.6 33.3	1.875 1.3125	10A4218X022 10A4209X012
	4, 6 x 4	73.0 58.7	2.875 2.3125	10A4217X012 10A4208X012
	6, 8 x 6	111.1	4.375	10A4224X012

Key 10* Retaining Ring (for Fisher EHT Valve Body Only)

S30200 (302 SST) FOR USE WITH SPECIFIED PORT DIAMETER, mm (INCH)							
25.4 (1)	**31.8 (1.25)**	**33.3 (1.3125)**	**38.1 (1.5)**	**44.5 (1.75)**	**47.6 (1.875)**	**58.7 (2.3125)**	**63.5 (2.5)**
11A3405X012	17A2316X012	10A4211X012	13A8519X012	17A2298X012	10A4220X012	10A4210X012	17A4311X012
73.0 (2.875)	**87.3 (3.4375)**	**98.4 (3.625)**	**111.1 (4.375)**	**115.8 (4.5625)**	**133.4 (5.25)**	**136.5 (5.375)**	
10A4219X012	10A5350X012	16A5484X012	10A4225X012	17A4415X012	17A4398X012	10A5410X012	
N07750 NACE FOR USE WITH SPECIFIED PORT DIAMETER, mm (INCH)							
25.4 (1)	**31.8 (1.25)**	**33.3 (1.3125)**	**38.1 (1.5)**	**44.5 (1.75)**	**47.6 (1.875)**	**58.7 (2.3125)**	**63.5 (2.5)**
11A3405X042	17A2316X032	10A4211X032	13A8519X032	17A2298X042	10A4220X082	10A4210X102	17A4311X032
73.0 (2.875)	**87.3 (3.4375)**	**98.4 (3.625)**	**111.1 (4.375)**	**115.8 (4.5625)**	**133.4 (5.25)**	**136.5 (5.375)**	
10A4219X082	10A5350X082	16A5484X052	10A4225X062	17A4415X032	17A4398X042	10A5410X052	

Figure 22. NPS 3 to 6 Fisher EHT Valve Using PEEK Anti-Extrusion Rings



Keys 5*, 8*, 9*, 10*, and 63* Fisher EHT Above 450°F (232°C) Using PEEK(1) Anti-Extrusion Rings (see figure 22)

VALVE SIZE, NPS	TRIM		PORT DIAMETER		KEY 63 Anti-Extrusion Ring	KEY 8 Seal Ring	KEY 9 Back-Up Ring	KEY 10 Retaining Ring	KEY 3 Anti-Extrusion Valve Plug	STEM CONNECTOR DIAMETER	
			mm	Inches	PEEK	N10276/PTFE	S41600	S30200	S41600	mm	Inches
3	Std, Whisper III		73.0	2.875	22B2617X012 22B2617X012 22B2617X012	10A4215X032 10A4215X032 10A4215X032	10A4217X012 10A4217X012 10A4217X012	10A4219X012 10A4219X012 10A4219X012	31B2148X012 31B2149X012 31B2150X012	12.7 19.1 25.4	1/2 3/4 1
4	Std, Whisper III A,B,C		92.1	3.625	21B2115X012 21B2115X012	16A5485X062 16A5485X062	16A5483X012 16A5483X012	16A5484X012 16A5484X012	31B2151X012 31B2152X012	19.1 25.4	3/4 1
4	Whisper III D		73.0	2.875	22B2617X012 22B2617X012	10A4215X032 10A4215X032	10A4217X012 10A4217X012	10A4219X012 10A4219X012	31B2102X012 31B2103X012	19.1 25.4	3/4 1
6	Std	DIA B DIA B DIA B DIA B	136.5	5.375	21B9342X012 21B9342X012 21B9342X012 21B9342X012	10A5411X032 10A5411X032 10A5411X032 10A5411X032	10A5409X012 10A5409X012 10A5409X012 10A5409X012	10A5410X012 10A5410X012 10A5410X012 10A5410X012	31B2153X012 31B2154X012 31B2155X012 31B2156X012	19.1 25.4 31.8 50.8	3/4 1 1-1/4 2
					PEEK	**N10276/PTFE**	**S41600**	**S30200**	**S17400 H900**		
6	Std	Diverter	136.5	5.375	21B9342X012	10A5411X032	10A5409X012	10A5410X012	31B2131X012	50.8	2
					PEEK	**N10276/PTFE**	**S41600**	**S30200**	**S17400 H900/Diverter**		
6	Whisper III A,B,C		136.5	5.375	21B9342X012 21B9342X012	10A5411X032 10A5411X032	10A5409X012 10A5409X012	10A5410X012 10A5410X012	31B2132X012 31B2133X012	25.4 31.8	1 1-1/4
					PEEK	**N10276/PTFE**	**S41600**	**S30200**	**S17400 H900**		
6	Whisper III D		111.1	4.375	21B9341X012 21B9341X012	10A4223X032 10A4223X032	10A4224X012 10A4224X012	10A4225X012 10A4225X012	31B2134X012 31B2135X012	25.4 31.8	1 1-1/4

1. PolyEtherEtherKetone.

Key 11* Cage Gasket (2 req'd)

VALVE BODY RATING, CLASS	VALVE SIZE, NPS	MATERIAL	
		N04400, Silver Plated	N04400, Tin Plated For NACE MR0175-2002
2500	1-1/2 x 1, 2 x 1	26A5316X012	26A5316X022
	3 x 2	26A5318X012	26A5318X022
	3, 4 x 3	26A5320X012	26A5320X022
	4, 6 x 4	26A5322X012	26A5322X022
	6, 8 x 6	29A9219X012	29A9219X022

*Recommended spare parts

TSO Parts for Fisher EHS and EHT Valves (Keys 2*, 6*, and 3*)

VALVE SIZE	CLASS	PORT DIA	TVL	TRIM	STEM DIAMETER		ACTUATOR GROUP	CHARACTER-ISTIC	CAGE	SEAT RING	PLUG/ STEM ASSY
NPS		Inch	Inch		mm	Inch			Key 2	Key 6	Key 3
6 EHT	2500	4.1875	3.75	810	19.1	3/4	401, 402, 403	Cavitrol III 3-Stage	37A4432X012	38B1892X012	38B1889X012
				816			401, 402, 403		37A4432X022	38B2265X012	38B1889X022
				810	25.4	1	404 405 406 407		37A4432X012	38B1892X012	38B2263X012 38B2263X022 38B2263X032 38B2263X042
				816			404 405 406 407		37A4432X022	38B2265X012	38B2263X052 38B2263X062 38B2263X072 38B2263X082
6 EHT	2500	4.1875	2 & 3	812	19.1	3/4	1	Linear Equal %	42B3573X012 42B3576X012	38B2267X012	38B2273X012
				818			1	Linear Equal %	42B3575X012 42B3578X012	38B2268X012	38B2273X022
			2	812	25.4	1	100	Linear Equal %	42B3573X012 42B3576X012	38B2267X012	38B1869X012
			3				100	Linear Mod Equal %	42B3573X012 42B3576X012		38B1869X022
			3				101	Linear Mod Equal %	42B3573X012 42B3576X012		38B1869X022
			2	818	25.4	1	100	Linear Equal %	42B3575X012 42B3578X012	38B2268X012	38B1869X032
			3				100	Linear Mod Equal %	42B3575X012 42B3578X012		38B1869X042
			3				101	Linear Mod Equal %	42B3575X012 42B3578X012		38B1869X042

*Recommended spare parts

TSO Parts for Fisher EHS and EHT Valves (Keys 8*, 63*, 9*, and 10*)

VALVE SIZE	CLASS	PORT DIA	TVL	TRIM	STEM DIAMETER		ACTUATOR GROUP	CHARACTER-ISTIC	SEAL RING	ANTI-EXT RING	BACKUP RING	RETAINING RING
NPS		Inch	Inch		mm	Inch			Key 8	Key 63	Key 9	Key 10
6 EHT	2500	4.1875	3.75	810	19.1	3/4	401, 402, 403	Cavitrol III 3-Stage	10A4223X142	21B9341X012	10A4224X012	10A4225X012
				816			401, 402, 403		10A4223X142	21B9341X012	10A4224X022	10A4225X062
				810	25.4	1	404 405 406 407		10A4223X142	21B9341X012	10A4224X012	10A4225X012
				816			404 405 406 407		10A4223X142	21B9341X012	10A4224X022	10A4225X062
6 EHT	2500	4.1875	2 & 3	812	19.1	3/4	1	Linear Equal %	10A4223X142	21B9341X012	10A4224X012	10A4225X012
				818			1	Linear Equal %	10A4223X142	21B9341X012	10A4224X022	10A4225X062
			2	812	25.4	1	100	Linear Equal %	10A4223X142	21B9341X012	10A4224X012	10A4225X012
			3				100	Linear Mod Equal %				
			3				101	Linear Mod Equal %				
			2	818	25.4	1	100	Linear Equal %	10A4223X142	21B9341X012	10A4224X022	10A4225X062
			3				100	Linear Mod Equal %				
			3				101	Linear Mod Equal %				

Key 12* Seat Ring Gasket or Seat Ring O-Ring

VALVE BODY RATING, CLASS	VALVE SIZE, NPS	GASKET	O-RING			
		For All Gasketed Seat Ring Constructions	For All O-Ring Seat Ring Constructions Without Cavitrol III Trim			For Cavitrol III Trim Only
		S31600 (316SST)/Graphite	Ethylene Propylene	Nitrile For NACE MR0175-2002	Fluoroelastomer For NACE MR0175-2002	Ethylene Propylene
2500	1-1/2 x 1, 2 x 1	10B4657X012	1H8498X0072	1H849806992	1H8498X0032	1H8498X0072
	3 x 2	19A2542X012	1C6280X0042	1C6280X0052	1C6280X0012	1C6280X0042
	3, 4 x 3	18A8274X012	1U2504X0062	1U2504X0042	1U250406382	1U2504X0062
	4, 6 x 4	19A4321X012	1H6247X0072	1H624706992	1H6247X0032	1H6247X0072
	6, 8 x 6	18A2812X012	1P5586X0042	1P5586X0032	1P5586X0022	1P5586X0042

Key 26* O-Ring, Ethylene Propylene (for Cavitrol III Trim Only)

VALVE SIZE, NPS	CL2500	
	2-Stage	3-Stage
1-1/2 x 1, 2 x 1	18A5457X022	- - -
3 x 2	1E8458X0042	10A0037X022
3 & 4 x 3	1H2917X0022	1K1365X0082
4 & 6 x 4	1N9563X0032	1H6247X0052
6 & 8 x 6	19A5774X012	19A5774X012

*Recommended spare parts

Actuator Groups by Type Number

Group 1 **54 mm (2-1/8 Inch),** **71 mm (2-13/16 Inch),** **or 90 mm (3-9/16 Inch) Yoke Boss**	**Group 101** **127 mm (5 Inch) Yoke Boss**	**Group 404** **127 mm (5 Inch, 5H) Yoke Boss** **101.6 mm (4 Inch) Maximum Travel**	**Group 408** **177.8 mm (5H, 7 Inch) Yoke Boss** **101.6 mm (4 Inch) Maximum Travel**
472 & 473 585C, 585CR (50.8 mm [2 inch] maximum travel) 1B & 655 657 & 667—76.2 mm (3 Inch) maximum travel 657-4, 667-4 (76.2 mm [3 inch] travel) 1008—Except 90 mm (3-9/16 Inch) yoke boss with 50.8 mm (2 inch) travel 3024C, 3025 685SE, 685SR (76.2 mm [3 inch] maximum travel)	667, 667 MO	667, 667-4 3025 (ATO)	657 Size 100 1008 Size 100 3025 (ATC)
	Group 401 **90.5 mm (3-9/16 Inch) Yoke Boss** **88.9 to 101.6 mm (3.25 to 4 inch) Travel**	**Group 405** **127 mm (5 Inch, 5H) Yoke Boss** **101.6 mm (4 Inch) Maximum Travel**	**Group 409** **177.8 mm (5H, 7 Inch) Yoke Boss** **101.6 mm (4 Inch) Maximum Travel**
	657, 657 MO 667, 667 MO 657-4, 657-4 MO 667-4, 667-4 MO 3025 685SE, 685SR	657 MO, 657-4 MO	667 Size 100 3025 (ATO)
		Group 406 **127 mm (5 Inch, 5H) Yoke Boss** **101.6 mm (4 Inch) Maximum Travel**	**Group 801** **90.5 mm (3-9/16 Inch) Yoke Boss** **203.2 mm (8 Inch) Maximum Travel**
		667 MO, 667-4 MO	585C, 585C MO Size 60 685SE, 685SR
Group 100 **127 mm (5 Inch, 5H) Yoke Boss**	**Group 402** **90.5 mm (3-9/16 Inch) Yoke Boss** **101.6 mm (4 Inch) Maximum Travel**	**Group 407** **127 mm (5 Inch, 5H) Yoke Boss** **101.6 mm (4 Inch) Maximum Travel**	**Group 802** **127 mm (5 Inch, 5H) Yoke Boss** **203.2 mm (8 Inch) Maximum Travel**
472, 473 585C, 585C MO 657, 657 MO 1008 PDTC	585C MO Size 60	585C, 585C MO 657 3025 (ATC) 685SE, 685SR	585C, 585C MO 685SE, 685SR
	Group 403 **90.5 mm (3-9/16 Inch) Yoke Boss** **101.6 mm (4 Inch) Maximum Travel**		
	585C Size 60 1008 Size 50		

*Recommended spare parts

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