

Fisher® EHAD, EHAS, and EHAT Valves

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Figure 1. Fisher EHA Series Valve with 657 Actuator



W4589

Introduction

Scope of Manual

This instruction manual includes installation, maintenance, and parts information for NPS 3 through 8, CL1500 Fisher EHAD, EHAS, and EHAT control valves. Refer to separate manuals for instructions covering the actuator, positioner, ENVIRO-SEAL™ packing, HIGH-SEAL packing, and accessories.

Do not install, operate, or maintain EHAD, EHAS, or EHAT 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

<p>End Connection Styles</p> <p>Buttwelding: Schedules per ASME B16.25 that are compatible with CL1500</p> <p>Flanged: CL1500 ■ ring-type joint (RTJ) or ■ raised-face (RF) flanges according to ASME B16.5</p> <p>Maximum Inlet Pressure⁽¹⁾</p> <p>Buttwelding: Consistent with CL1500 pressure/temperature ratings per ASME B16.34</p> <p>Flanged: Consistent with CL1500 pressure/temperature ratings per ASME B16.34</p> <p>Shutoff Classifications</p> <p>See table 2</p> <p>C-seal trim: High-temperature, Class V. See table 3</p> <p>Flow Characteristic</p> <p>Standard Cage: ■ Equal percentage, ■ modified equal percentage⁽²⁾, or ■ linear</p>	<p>Standard Cage with Micro-Form Valve Plug: ■ Equal percentage or ■ modified equal percentage⁽²⁾</p> <p>Cavitrol™ III or Whisper Trim™ III Cage: Linear</p> <p>Flow Direction</p> <p>EHAD or EHAT: Flow down, except flow up with either a Whisper Trim III cage or a valve plug with diverter cone</p> <p>EHAS: Flow up, except flow down with Cavitrol III cage</p> <p>Approximate Weights (Valve Body and Bonnet Assemblies)</p> <p>See table 4</p> <p>Additional Specifications</p> <p>For specifications such as materials, valve plug travels, and port, yoke boss, and stem diameters, and actuator group, see the Parts List section</p>
<p>1. The pressure or temperature limits in this manual and any applicable standard limitations should not be exceeded.</p> <p>2. Modified equal percentage characteristic is equal-percentage for the first 90% of travel, then quick-opening for additional capacity.</p>	

Description

EHAD, EHAS, and EHAT high-pressure angle valves (figure 1) have metal seats, cage guiding, and push-down-to-close valve plug action. EHAD and EHAT valves use balanced valve plugs. The EHAS valve uses an unbalanced valve plug. To provide a seal between the cage and a balanced valve plug, the EHAD valve plug uses piston rings; the EHAT valve plug uses a pressure-assisted seal ring. A Whisper Trim cage can be used with an EHAD, EHAS, or EHAT valve plug. A Cavitrol III cage can be used with NPS 3 through 8 EHAT valve plug.

C-seal trim is available for NPS 4, 6, and 8 CL1500 EHAD valves.

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 in this manual and any applicable standard are not exceeded.

Specifications

Specifications for the EHAD, EHAS, and EHAT valves are shown in table 1.

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.

Table 2. Shutoff Classifications⁽¹⁾

VALVE	VALVE SIZE, NPS	ANSI/FCI LEAKAGE CLASS
EHAD	3	II
	4, 6	II—Standard
		III—Optional ⁽²⁾
	8	III—Standard
IV—Optional ⁽²⁾		
EHAT w/Cavitrol III	All	V ⁽²⁾
EHAS, EHAT	All	IV—Standard
EHAS w/Micro-Form	All	V—Optional ⁽²⁾

1. Per ANSI/FCI 70-2 and IEC 60534-4
 2. O-ring seat ring construction recommended for this shutoff classification; for temperatures below 232°C (450°F) only.

Table 3. Additional Shutoff Classification

VALVE	VALVE SIZE, NPS	PORT DIAMETER, INCHES	CAGE STYLE	ANSI/FCI LEAKAGE CLASS
EHAD (CL1500)	4	2.875	Linear (Whisper III, D3) Linear (Cavitrol III, 3-stage)	V (for port diameters from 2.875 through 5.375 inch with optional C-seal trim)
	6	2.875 or 3.625	Linear (Whisper III, D3)	
	8	4.375 or 5.375	Equal Percentage Modified Equal Percentage Linear (std. cage) Linear (Whisper III, A1, B3, C3)	

Table 4. Approximate Weights (Valve Body and Bonnet Assemblies)

VALVE SIZE, NPS	KILOGRAMS		POUNDS	
	RTJ or RF Flanged Ends	Buttwelding or Socketwelding Ends	RTJ or RF Flanged Ends	Buttwelding or Socketwelding Ends
3	123	78	272	173
4	181	117	399	258
6	357	202	788	445
8	648	405	1428	893

CAUTION

The valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions. Because some valve 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. Also, take precautions to prevent personnel from being injured in case the hoist or rigging slips

unexpectedly. Refer to table 4 for valve body assembly weights. It is important to use adequately sized hoists and chains or slings to handle the valve.

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 body being installed has small internal flow passages, such as with Whisper Trim III or Cavitrol III cages, consider 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 34, figure 15, 16, or 17) 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.

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. Shrink-fit pieces and threaded connections might loosen. In general, if post-weld heat treating is needed, remove all trim 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.

⚠ 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.

7. If the valve body was shipped without packing installed in the packing box, install the packing before putting the valve body 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, trim removal, valve plug maintenance, lapping seats, and trim maintenance. 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.
-

Note

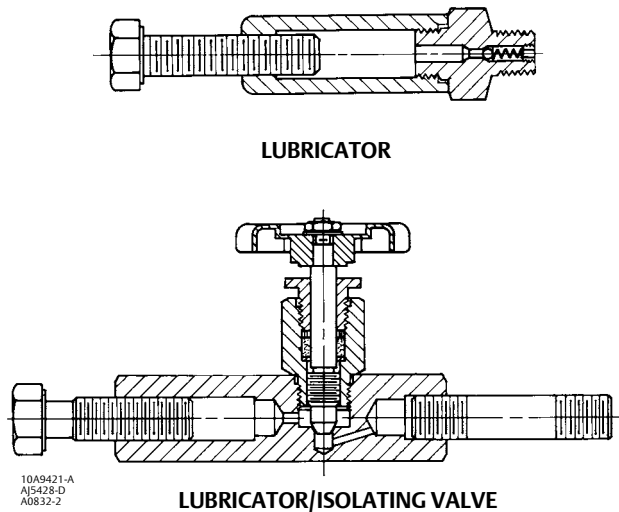
Whenever a gasket seal is disturbed by removing or shifting gasketed parts, a new gasket should be installed upon reassembly. This is necessary to ensure a good gasket seal.

Note

If the valve has ENVIRO-SEAL live-loaded packing installed (figure 14), see the Fisher instruction manual entitled ENVIRO-SEAL Packing System for Sliding Stem Valves for packing instructions.

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

Figure 2. Lubricator and Lubricator/Isolating Valve



Packing Lubrication

⚠ 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 13). Use a good quality silicone-base lubricant. Do not lubricate packing used in processes with temperatures over 260°C (500°F). 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

⚠ WARNING

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

Table 5. Torque for Valve Body-to-Bonnet Bolting Using Anti-Seize Lubricant⁽¹⁾

VALVE SIZE, NPS	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
3	258	195	190	140
4	556	420	410	310
6	786	597	580	440
8	1383	1044	1020	770

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

Table 6. Recommended Torque for Packing Flange Nuts

STEM DIAMETER		TORQUE			
		N•m		Lbf•Ft	
mm	Inches	Min	Max	Min	Max
12.7	1/2	15	22	11	16
19.1	3/4	34	50	25	37
25.4	1	52	77	38	57
31.8	1-1/4	68	102	50	75

Valves with ENVIRO-SEAL live-loaded packing or HIGH-SEAL live-loaded packing installed probably 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. To convert an existing packing arrangement to ENVIRO-SEAL packing, refer to the retrofit kits listed in the parts kit sub-section near the end of this manual. Figure 14 shows typical ENVIRO-SEAL packing systems.

Key numbers referenced in this procedure are shown in figure 13 except where indicated.

If there is undesirable packing leakage in spring-loaded PTFE V-ring packing (figure 3), tighten the packing flange nuts (key 5) until the shoulder on the packing follower (key 13) contacts the bonnet (key 1). If leakage continues, replace the packing by following the numbered steps presented in the Replacing Packing procedure.

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) to at least the minimum recommended torque in table 6. However, do not exceed the maximum recommended torque in table 6 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

⚠ WARNING

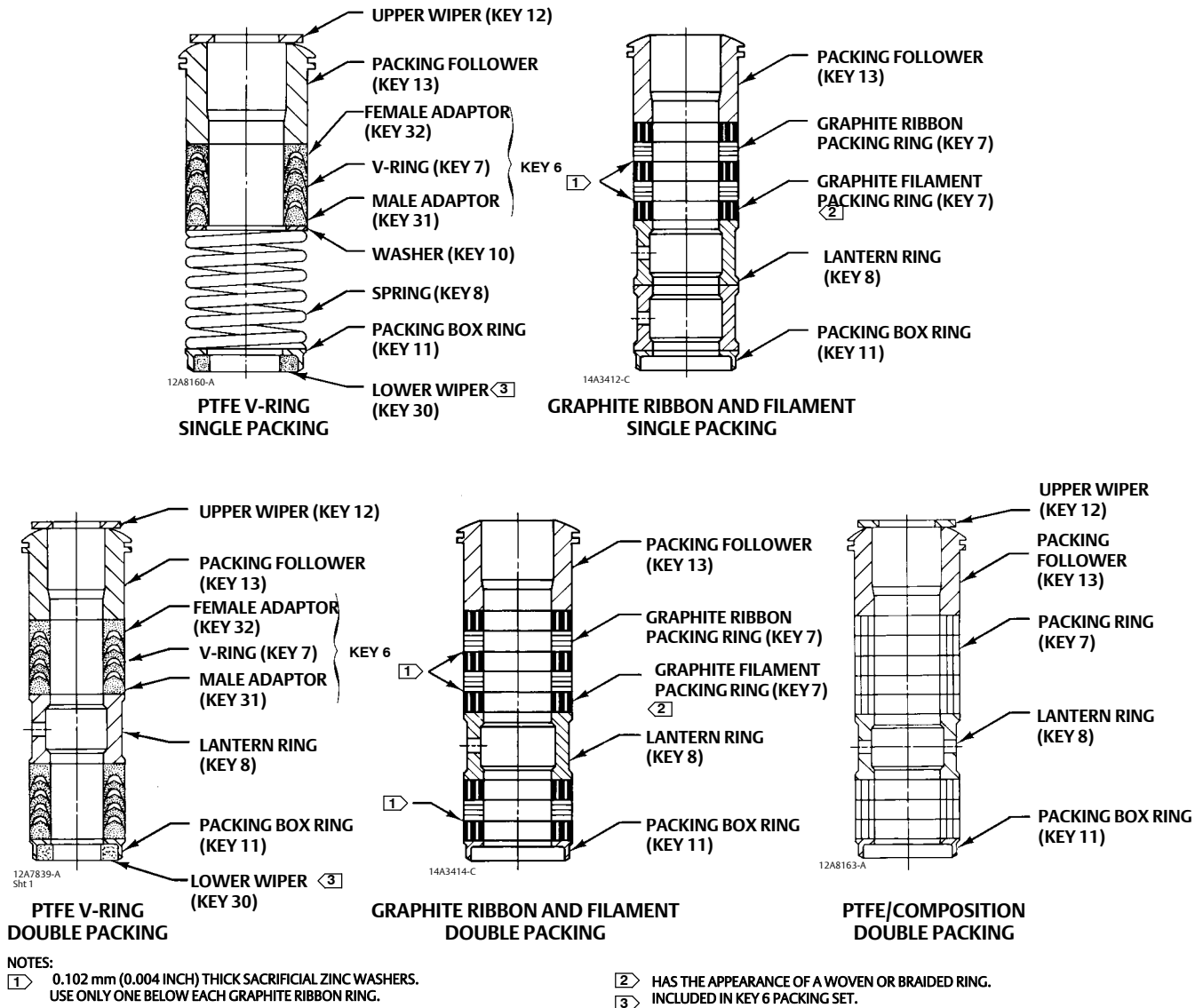
Refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

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 actuator stud nuts (key 26), and remove the actuator from the bonnet (key 1).
3. Loosen the packing flange nuts (key 5) so that the packing (figure 3) is not tight on the valve plug stem (key 3B, figure 15, 16, or 17). Remove any travel indicator disk and stem locknuts from the valve plug stem threads.

Figure 3. Packing Arrangements



CAUTION

When lifting the bonnet (key 1), be sure that the valve plug and stem assembly (keys 3A and 3B, figure 15, 16, or 17) remains on the seat ring (key 31, figure 15, 16, or 17). 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 EHAD piston rings (key 9, figure 15) are brittle and in two pieces. Avoid damaging the piston rings caused 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 bonnet stud nuts (key 11, figure 15, 16, or 17) and carefully lift the bonnet off the valve stem. For an NPS 8 valve only, also remove the bonnet washers (key 40, not shown). 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 3A, figure 15, 16, or 17), the cage (key 2, figure 15, 16, or 17), and the top and bottom cage gaskets (key 5, figure 15, 16, or 17).

CAUTION

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 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 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) and lift the packing flange, upper wiper if used, and packing follower (keys 3, 12, and 13) away from the bonnet (key 1). 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 an extension bonnet, also remove the baffle (key 2), then the retaining ring (key 35).
9. Clean the packing box and the following metal packing parts: the packing follower (key 13, figure 3), the packing box ring (key 11, figure 3), the spring or lantern ring (key 8, figure 3), and, for PTFE V-ring single packing only, the special washer (key 10, figure 3).
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 5, figure 13, 15, or 16), place the cage in 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 13, 15, or 16).

Note

The prelubricated hex nuts (key 11, figure 15, 16, or 17) 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, and that the hex nuts are evenly tightened to the specified torque values (table 5).

CAUTION

Failure to comply with good bonnet-to-body bolting practices and the torque values shown in table 5 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; it may result in damage to valve components.

12. Lubricate the stud threads and the faces of the bonnet stud nuts (key 11, figure 15, 16, or 17) with anti-seize lubricant (not necessary if new factory prelubricated hex nuts are used). For an NPS 8 valve only, install the bonnet washers (key 40, not shown). Replace the bonnet stud nuts but do not tighten them. Torque the nuts in a crisscross pattern to no more than 1/4 of the nominal torque value specified in table 5. When all nuts are tightened to that torque value, increase the torque by 1/4 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.

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 4).

13. Install new packing and the metal packing box parts according to the appropriate arrangement in figure 3. If desired, packing parts may be prelubricated with a silicone-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 body with extension bonnet, also install the baffle, then the retaining ring (keys 2 and 35, figure 13).
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 kinds of packing, tighten the packing flange nuts to the maximum recommended torque shown in table 6. Then, loosen the packing flange nuts, and retighten them to the recommended minimum torque shown in table 6.

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

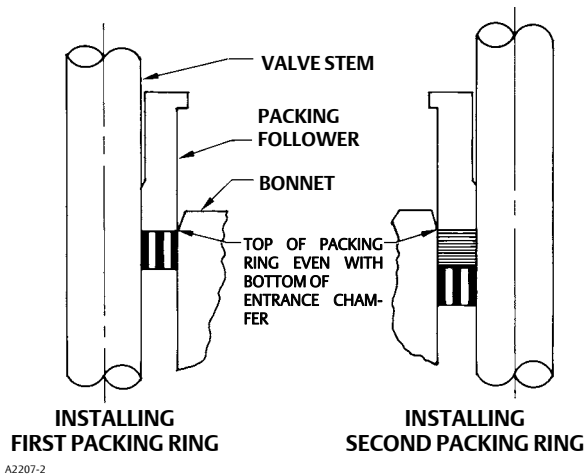
15. Mount the actuator on the valve body assembly, and reconnect the actuator and valve plug stems according to the procedures in the appropriate actuator instruction manual.

Trim Removal

▲ WARNING

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

Figure 4. Installing Graphite Ribbon/Filament Packing Rings One at a Time



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

Except where indicated, key numbers referenced in this procedure are shown in figure 15 for the EHAD valve body, figure 16 for the EHAS valve body, and/or figure 17 for the EHAT valve body.

Trim removal and replacement requires the use of a seat ring retainer tool (figure 5). If specifically ordered, a tool is supplied with a valve body; 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 body of specific size and valve class using the dimensions shown in figure 5. Machine the tool from a material listed in figure 5 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.

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 5). For a valve body with a Cavitrol III two- or three-stage cage, also remove the O-ring (key 36) that fits between the cage and the seat ring (key 31).
4. Use the seat ring retainer tool (figure 5) to remove the seat ring retainer (key 32) 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 8. 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 5 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 10) 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.
5. Remove the seat ring (key 31) and the seat ring gasket or O-ring (key 33).
6. Refer to the Valve Plug Maintenance procedure or to the Lapping Seats procedure.

Valve Plug Maintenance

Key numbers used in this procedure are shown in figure 15 for the EHAD valve body, in figure 16 for the EHAS valve body, and in figure 17 for the EHAT valve body.

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

For the EHAD valve body, the piston rings (key 9) are each in two sections; remove the sections from the grooves in the valve plug.

For the EHAS valve body, proceed to step 2.

For the EHAT valve body, work the retaining ring (key 7) off the valve plug with a screwdriver. Carefully slide the backup ring and seal ring (keys 8 and 9) off the valve plug. For an NPS 8 valve with a level D Whisper Trim III cage, also remove the piston ring (key 41) from the grooves in the valve plug.

2. To replace the valve plug stem (key 3B), drive out the pin (key 3C), and unscrew the stem from the valve plug.

CAUTION

Never reuse an old stem with a new valve plug. Using an old stem with a new plug requires drilling a new pin hole in the stem. 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 9. Using the valve plug pin hole as a guide, drill the pin hole through the stem. Refer to table 9 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 EHAD piston rings or the EHAT seal ring. The Trim Replacement procedure provides piston ring and seal ring installation instructions and valve body reassembly instructions.

Lapping Seats

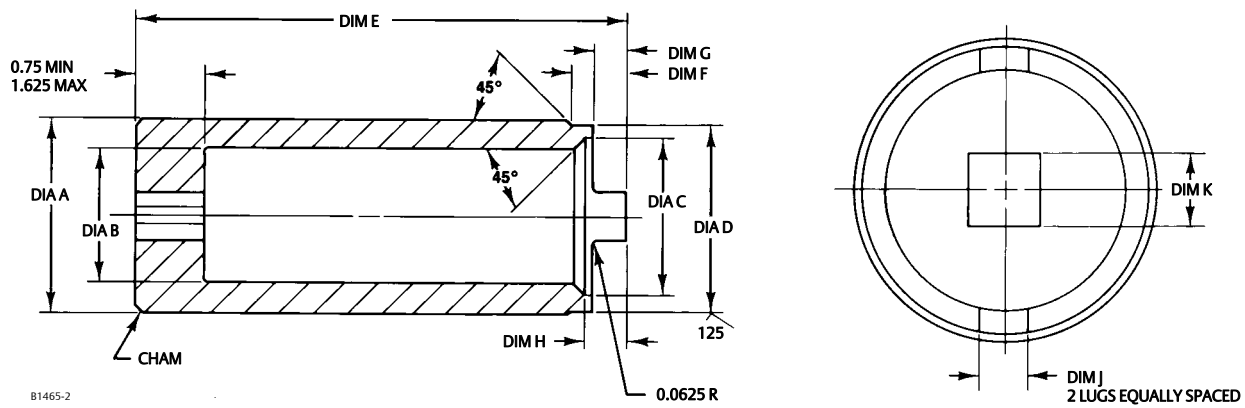
Key numbers referenced in this procedure are shown in figure 15 for the EHAD valve body, in figure 16 for the EHAS valve body, and in figure 17 for the EHAT valve body unless otherwise indicated.

Table 7. Information for Machining and Use of Seat Ring Retainer Tool

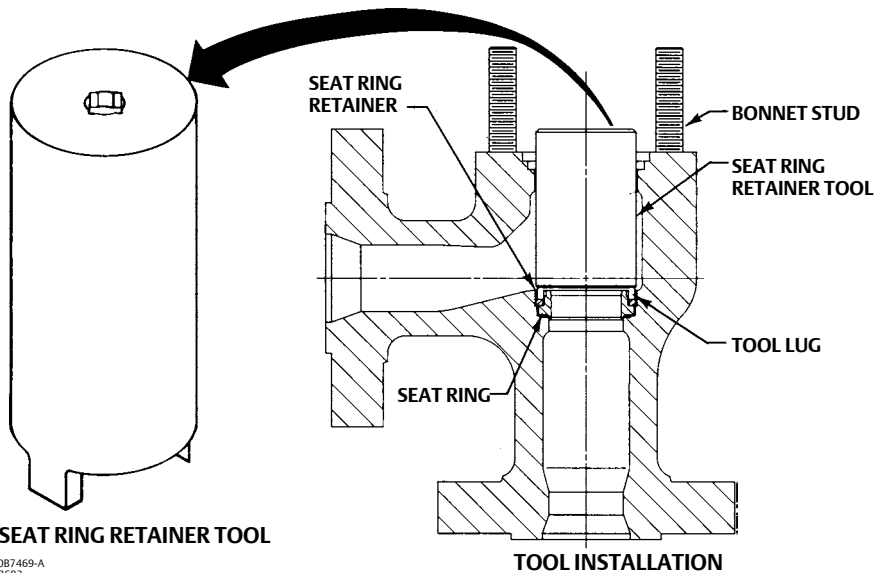
VALVE SIZE, NPS	TOOL DIMENSIONS																			
	mm										Inches									
	A	B	C	D ⁽¹⁾	E	F	G	H	J ⁽¹⁾	K	A	B	C	D ⁽¹⁾	E	F	G	H	J ⁽¹⁾	K
3	79.2	53.8	63.5	<u>76.6</u> 76.1	157.2	12.7	9.7	12.7	<u>12.4</u> 12.2	19.1	3.12	2.12	2.50	<u>3.015</u> 2.995	6.19	.50	.38	.50	<u>0.49</u> 0.48	.75
4	104.7	79.2	88.9	<u>102.0</u> 101.4	173.0	12.7	9.7	12.7	<u>25.1</u> 24.9	25.4	4.12	3.12	3.50	<u>4.015</u> 3.995	7.00	.50	.38	.50	<u>0.99</u> 0.98	1.00
6	130.0	104.6	109.5	<u>123.7</u> 124.2	200.1	14.2	11.2	14.2	<u>25.1</u> 24.9	25.4	5.12	4.12	4.31	<u>4.890</u> 4.870	7.88	.56	.44	.56	<u>0.99</u> 0.98	1.00
8	174.6	149.3	155.4	<u>171.8</u> 171.3	254.0	14.2	11.2	14.2	<u>25.1</u> 24.9	38.1	6.88	5.88	6.12	<u>6.765</u> 6.745	10.00	.56	.44	.56	<u>0.99</u> 0.98	1.50

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

Figure 5. Information for Machining and Use of Seat Ring Retainer Tool (also see tables 7 and 10)



B1465-2



4087469-A
A3603

Table 8. Recommended Torque for Installing Seat Ring Retainer

VALVE SIZE, NPS	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 NACE MR0175-2002		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
3	1187	875	136	100	881	650	678	500
4	2203	1625	271	200	1491	1100	1356	1000
6	3118	2300	373	275	2712	2000	2373	1750
8	6780	5000	780	575	6101	4500	5423	4000

1. Includes valves with Cavitrol III trim.

Table 9. Valve Stem Connection Torque and Drill Size for Pin Hole

VALVE SIZE, NPS	VALVE STEM DIAMETER		VALVE	VALVE STEM CONNECTION TORQUE (MINIMUM - MAXIMUM)		DRILL SIZE FOR PIN
	mm	Inches		N•m	Lbf•Ft	
	3	12.7		1/2	EHAD, EHAS, EHAT	
19.1		3/4	EHAS	237 - 339	175 - 250	0.1875
			EHAD, EHAT	237 - 339	175 - 250	0.125
25.4		1	EHAS	420 - 481	310 - 355	0.25
4	12.7	1/2	EHAD, EHAS, EHAT	81 - 115	60 - 85	0.125
	19.1	3/4	EHAD, EHAS, EHAT	237 - 339	175 - 250	0.1875
			EHAS	420 - 481	310 - 355	0.25
	25.4	1	EHAD, EHAT	420 - 481	310 - 355	0.25
6	19.1	3/4	EHAD, EHAS, EHAT	237 - 339	175 - 250	0.1875
	25.4	1	EHAD, EHAS, EHAT	420 - 481	310 - 355	0.25
8	19.1	3/4	EHAD, EHAS, EHAT	237 - 339	175 - 250	0.1875
	25.4	1	EHAD, EHAS, EHAT	420 - 481	310 - 355	0.25
	31.8	1-1/4	EHAD, EHAS, EHAT	827 - 908	610 - 670	0.25
	50.8	2	EHAD, EHAT	Contact factory for torque values and installation procedure		0.375

Table 10. Materials for Machining Tool (see figure 5)

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

Seating surfaces of the valve plug (key 3A) and the seat ring (key 31) can be lapped for improved shutoff. Use a good quality lapping compound of a mixture of 280 to 600 grit. Apply 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 33), seat ring (key 31), seat ring retainer (key 32), cage (key 2), cage gaskets (key 5), and, if used, the O-ring (key 36).
2. Proceed as appropriate:

For an EHAD or EHAT valve body, install the valve plug and stem assembly (keys 3A and 3B)—without piston rings (key 9 and, if used, key 41) or seal ring (key 9)—into the cage.

For an EHAS valve body, install the valve plug and stem assembly (keys 3A and 3B) into the cage.

3. Install the bonnet (key 1, figure 13) over the valve stem, and secure the bonnet with four of the bonnet stud nuts (key 11).

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.

Table 11. Seat Ring and Seat Ring Retainer Lubricants

Valve 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

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 body 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 15 for the EHAD valve, in figure 16 for the EHAS valve, and/or in figure 17 for the EHAT valve.

CAUTION

Thoroughly clean the seat ring (key 31), seat ring retainer (key 32), and the retainer threads in the valve body with a good-quality degreaser. Also clean all cage gasket surfaces. 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 the residual gasket material and/or burrs from the seat ring, cage, and valve body gasket surfaces will result in leakage.

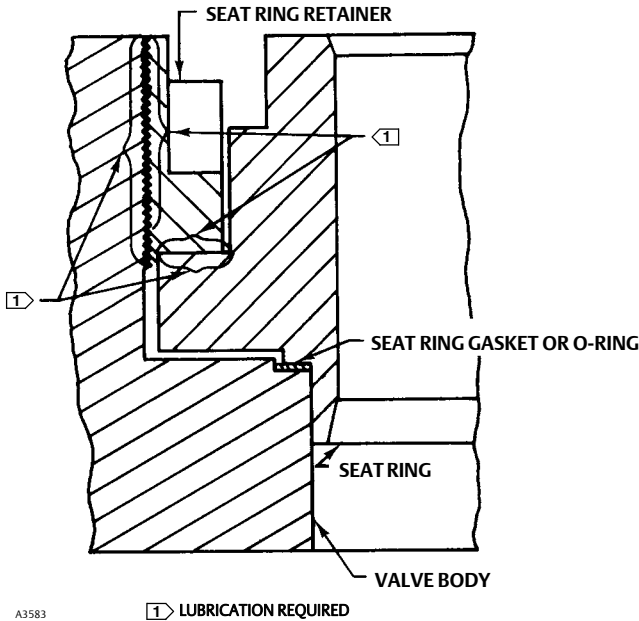
Thoroughly lubricate the surfaces indicated in figure 6 with the appropriate lubricant shown in table 11. Be certain to lubricate the mating surfaces of both parts involved (i.e., lubricate the threads on the seat ring retainer and the threads in the valve body; lubricate the mating surfaces of the seat ring retainer and seat ring).

Failure to lubricate as described may cause galling and improper loading of the seat ring gasket or O-ring (key 33) that may result in leakage.

1. For a gasketed seat ring construction, install the seat ring gasket (key 33) into the valve body. For an O-ring seat ring construction, install the O-ring (key 33) into the groove on the underside of the seat ring (key 31). Install the seat ring (key 31). Screw in the seat ring retainer (key 32). Use the seat ring retainer tool (figure 5) 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 8. 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 5 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 10) to prevent a power torque wrench from rotating.

Figure 6. Trim Surfaces Requiring Lubrication



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 8.

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 body. 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 Cavtrol III cage, slide the O-ring (key 36) over the seat ring (key 31) and against the shoulder in the outer diameter of the seat ring. Install the lower cage gasket (key 5) 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 cage gasket (key 5) 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

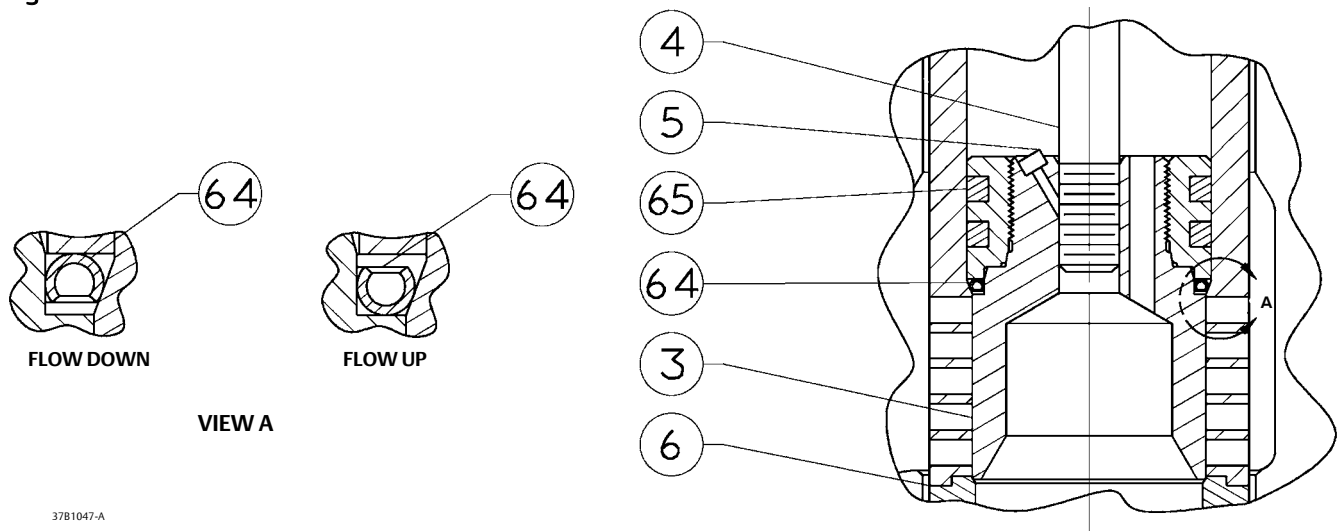
Rotate the cage clockwise by hand as much as possible once the cage lugs engage the slots in the seat ring retainer. Failure to do so may result in leakage at the seat ring-to-valve body seal.

3. To install the piston rings (key 9 and, if used, key 41) or seal ring (key 9), proceed as appropriate:

For an EHAD valve body (figure 15), 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.

Figure 7. Fisher EHAD with C-seal Trim



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For an EHAT valve body (figure 17), install the seal ring (key 9) onto the valve plug (key 3A). Install the ring with the open side facing the seat ring end of the valve plug for flow-down applications (view A of figure 17) or with the open side facing the valve plug stem end of the valve plug for flow-up applications. Slide the backup ring (key 8) onto the valve plug and secure with the retaining ring (key 7). For an NPS 8 valve with a level D Whisper Trim III cage, reinstall the piston ring (key 41) following the instructions given in the paragraph immediately preceding.

4. Install the valve plug into the cage.
5. Install the top cage gasket (key 5) on the cage.

6. Install the bonnet over the valve stem and onto the valve body.

Note

The prelubricated hex nuts (key 11, figure 15, 16, or 17) referred to in step 7 can be identified by a black film coating on the nut threads.

The proper bolting procedures in step 7 include—but are not limited to—ensuring that the bonnet stud threads are clean, 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 5 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; it may result in damage to valve components.

7. Lubricate the stud threads and the faces of the bonnet stud nuts (key 14) with anti-seize lubricant (not necessary if new factory prelubricated hex nuts are used). For an NPS 8 valve only, install the bonnet washers (key 40, not shown). Replace the bonnet stud nuts but do not tighten them. Torque the nuts in a crisscross pattern to no more than 1/4 of the nominal torque value specified in table 5. When all nuts are tightened to that torque value, increase the torque by 1/4 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.
8. 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.
9. 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 6).

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.

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

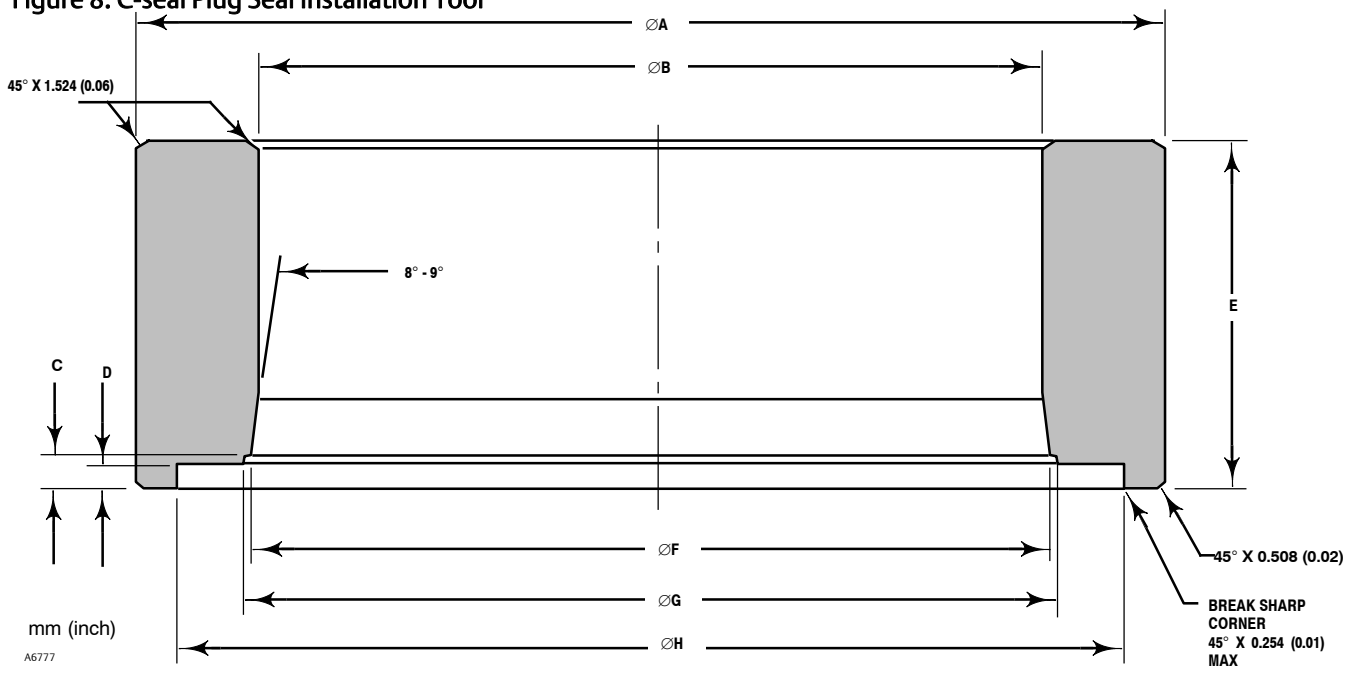
CAUTION

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.

Table 12. C-seal Plug Seal Installation Tool Dimensions

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 8. C-seal Plug Seal Installation Tool



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 7).
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 7).
 - The open interior of the C-seal plug seal must face down in a valve with flow-down construction (figure 7).

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 8.

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 9).
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 10) 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.

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.

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.

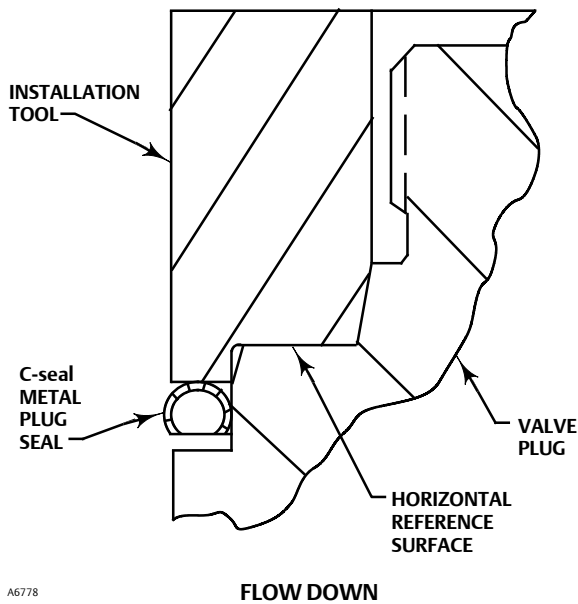
With full actuator force applied and the valve plug fully seated, align the actuator travel indicator scale with the lower end of valve travel. Refer to the appropriate actuator instruction manual for information on this procedure.

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.

Figure 9. Installing the C-seal Plug Seal Using the Installation Tool



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

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.

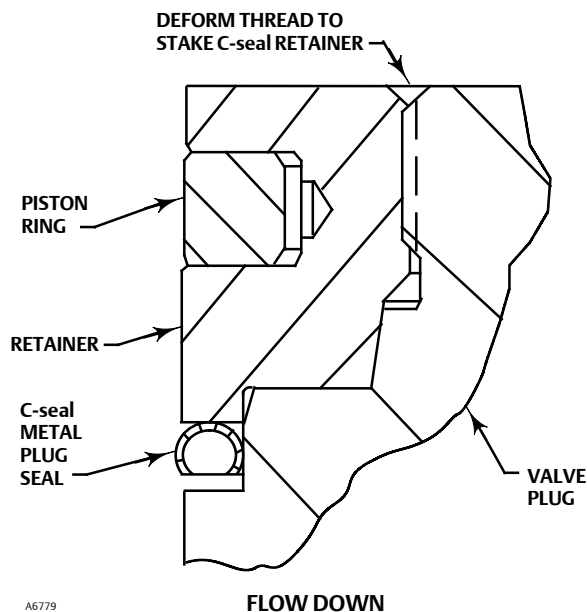
Use caution when removing piston ring(s) and C-seal plug seal to avoid scratching any sealing surface.

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.

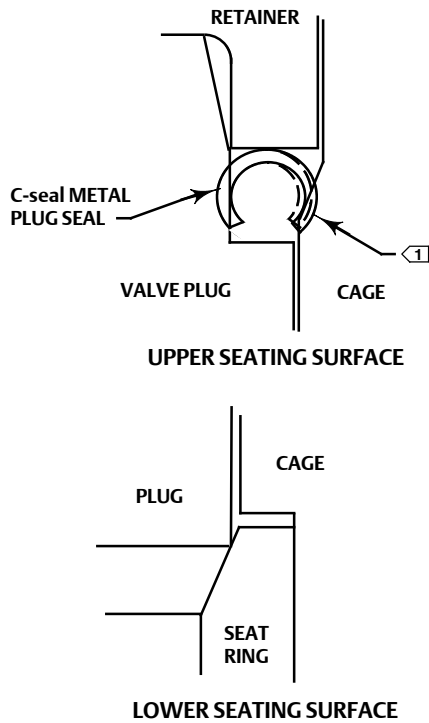
Figure 10. Stake the Threads of the C-seal Retainer



A6779

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 10). 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.
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 11).

Figure 11. Lower (Valve Plug to Seat Ring) and Upper (C-seal Plug Seal to Cage) Seating Surfaces



A6780

NOTE:

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

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 11).
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 11) following appropriate procedures in the Lapping Seats section of this manual.

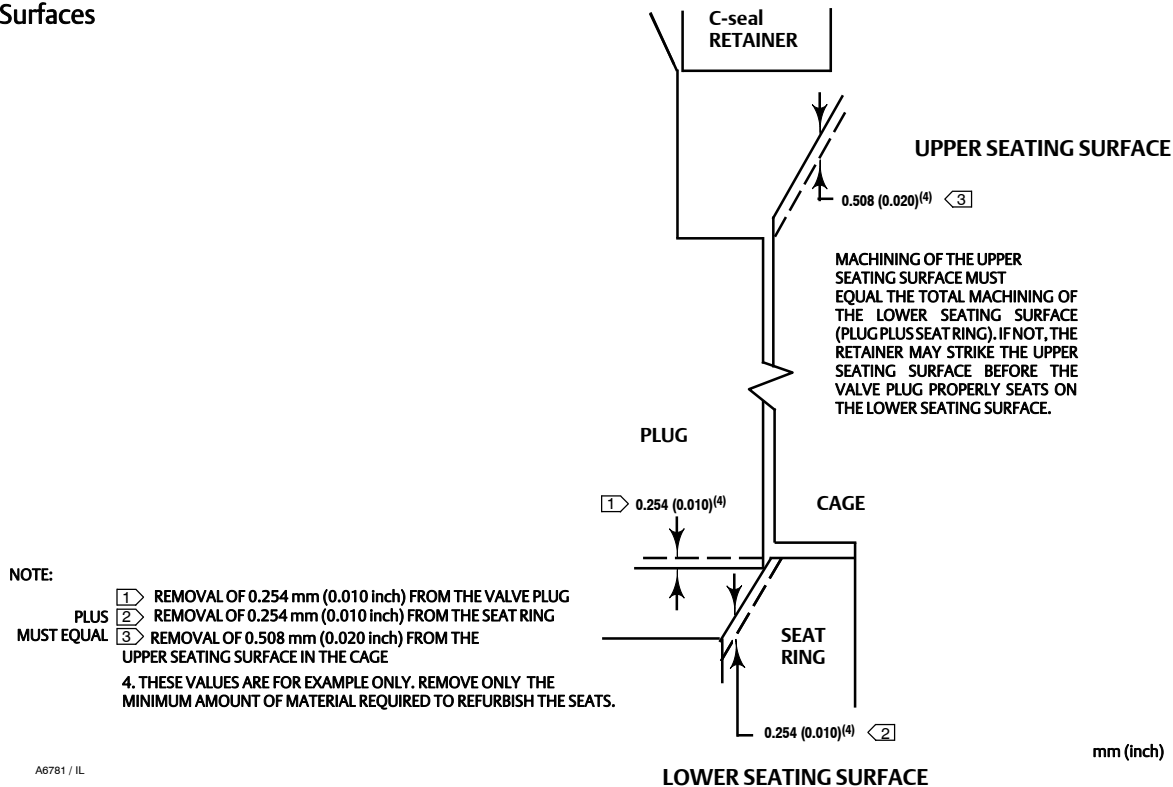
Remachining Metal Seats (C-seal Constructions)

See figure 12. 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.

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.

Figure 12. Example of Machining the Lower (Valve Plug to Seat Ring) and Upper (C-seal Plug Seal to Cage) Seating Surfaces



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 7).
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 7).
 - The open interior of the C-seal plug seal must face down in a valve with flow-down construction (figure 7).

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 8.

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 9).
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 10) 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.

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

Parts Ordering

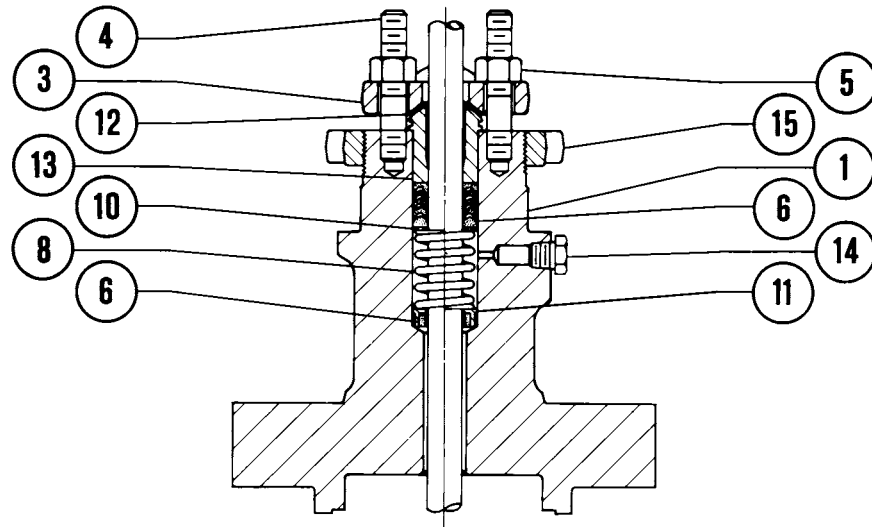
Each valve body-bonnet assembly is assigned a serial number, which can be found on the valve body. This same number also appears on the nameplate. Refer to the number when contacting your Emerson Process Management sales office for technical assistance or when ordering replacement parts.

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

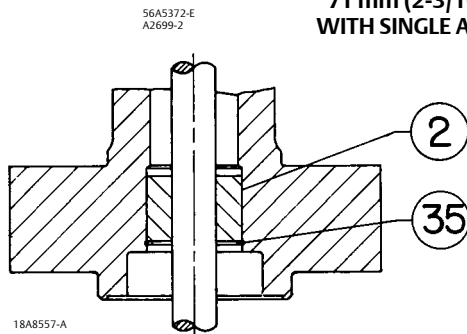
⚠ WARNING

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 will void your warranty, might adversely affect the performance of the valve, and could give rise to personal injury and property damage.

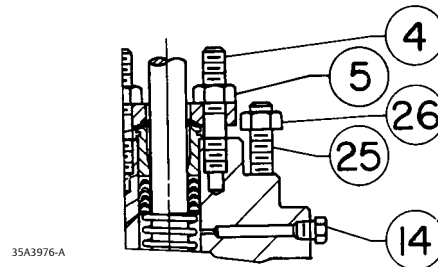
Figure 13. Bonnet Assemblies



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

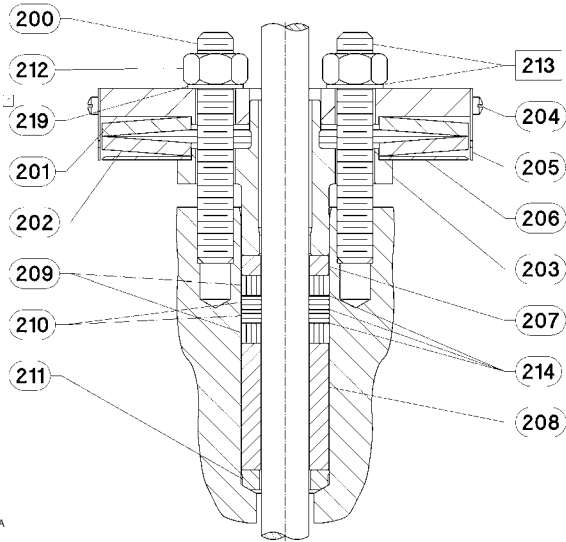


DETAIL OF BAFFLE AND RETAINING RING
 USED IN EXTENSION BONNET



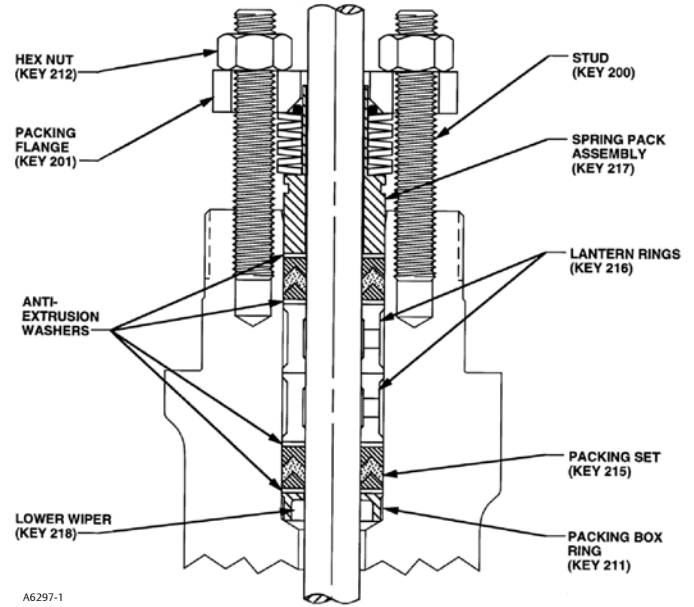
DETAIL OF 127 mm (5-INCH) YOKE BOSS ACTUATOR
 BOLTING FOR NPS 3, 4, 6 & 8 EHA SERIES VALVE BODIES

Figure 14. Live-Loaded Packing



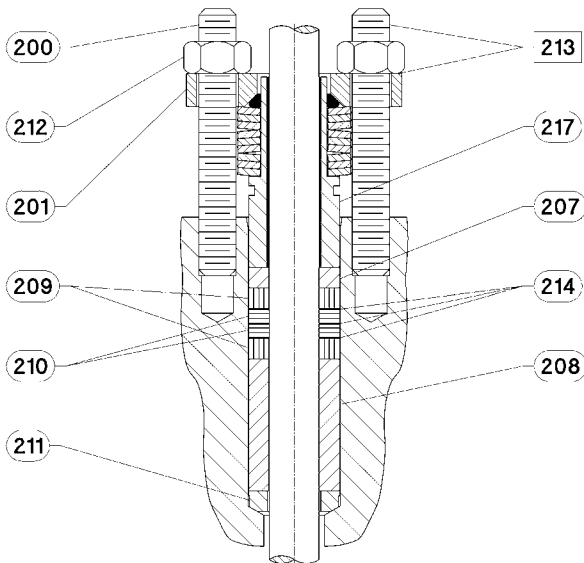
39B4153-A

Typical HIGH-SEAL ULF Packing System



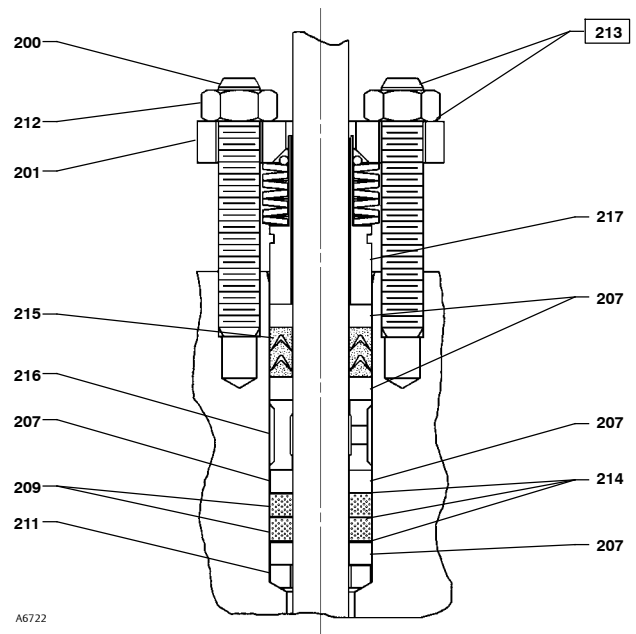
A6297-1

Typical ENVIRO-SEAL Packing System with PTFE Packing



39B4612/A

Typical ENVIRO-SEAL Packing System with Graphite ULF Packing



A6722

Typical ENVIRO-SEAL Packing System with Duplex Packing

Parts Kits

Packing 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)
PTFE (Contains keys 6, 8, 10, 11, and 12)	RPACKX00022	RPACKX00032
Double PTFE (Contains keys 8, 11, and 12)	RPACKX00052	RPACKX00062
PTFE/Composition (Contains keys 7, 8, 11 and 12)	RPACKX00082	RPACKX00092
Single Graphite Ribbon/Filament [Contains keys 7 (ribbon rings), 7 (filament rings), 8, and 11]	RPACKX00112	RPACKX00122
Single Graphite Ribbon/Filament [Contains keys 7 (ribbon rings) and 7 (filament rings)]	RPACKX00142	RPACKX00152
Double Graphite Ribbon/Filament [Contains keys 7 (ribbon rings), 7 (filament rings), 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
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
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.

Key	Description	Part Number
7*	Packing Ring, PTFE	See table 14
7*	Packing Ring, graphite ribbon	See table 14
7*	Packing Ring, graphite filament	See table 14
8	Packing Spring or Lantern Ring, 316 stainless steel	See table 15
10	Special Washer, 316 stainless steel	See table 15
11*	Packing Box Ring, 316 stainless steel	See table 15
12*	Upper Wiper, felt	See table 14
13	Packing Follower, 316 stainless steel	See table 15
14	Pipe Plug	
14	Lubricator, steel	
14	Lubricator/Isolating Valve	
15	Yoke Locknut, steel	
25	Actuator Mounting Stud, steel (8 req'd)	
26	Actuator Stud Nut (8 req'd)	
35	Retaining Ring, for use with extension bonnet only	

Bonnet Assembly (figure 13)

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	
3	Packing Flange	
4	Packing Flange Stud (2 req'd)	
5	Packing Flange Nut (2 req'd)	
6*	Packing Set	See table 14

Valve (figures 15-17)

2*	Cage	See tables 16-18
3A*	Valve Plug, Valve Plug/Stem, or Valve/Plug/ Ring Assembly	See tables 19-24
3B*	Valve Plug Stem	See tables 25-27
3C*	Pin	See table 28

Key	Description	Part Number	Key	Description	Part Number
5*	Cage Gasket (2 req'd)	See table 29		For use with 115.8 mm (4.5625 inch) port diameter	17A4415X032
7*	Retaining Ring (for EHAT only)			For use with 133.4 mm (5.25 inch) port diameter	17A4398X042
	302 stainless steel			For use with 136.5 mm (5.375 inch) port diameter	10A5410X052
	For use with 25.4 mm (1-inch) port diameter	11A3405X022	8*	Backup Ring	See tables 30-32
	For use with 44.5 mm (1.75 inch) port diameter	17A2298X022	9*	Piston Ring or Seal Ring	See tables 33-35
	For use with 47.6 mm (1.875 inch) port diameter	10A4220X02	10	Bonnet Stud	
	For use with 63.5 mm (2.5 inch) port diameter	17A4311X022	11	Bonnet Stud Nut	
	For use with 73.0 mm (2.875 inch) port diameter	10A4219X052	29	Nameplate, stainless steel	
	For use with 87.3 mm (3.4375 inch) port diameter	10A5350X062	30	Nameplate Wire, lead	
	For use with 98.4 mm (3.625 inch) port diameter	16A5484X042	31*	Seat Ring	See tables 36-41
	For use with 111.1 mm (4.375 inch) port diameter	10A4225X042	32*	Seat Ring Retainer	See tables 36-40 and 42
	For use with 115.8 mm (4.5625 inch) port diameter	17A4415X022	33*	Seat Ring Gasket or O-Ring	See table 43
	For use with 133.4 mm (5.25 inch) port diameter	17A4398X022	34	Flow Arrow, stainless steel	
	For use with 136.5 mm (5.375 inch) port diameter	10A5410X042	35	Drive Screw, stainless steel (4 req'd)	
	N07750 (NACE)		36*	O-Ring (for valve with Cavitrol III trim only), ethylene-propylene	See table 44
	For use with 25.4 mm (1-inch) port diameter	11A3405X042	37	Anti-seize lubricant, (not furnished with valve body)	
	For use with 44.5 mm (1.75 inch) port diameter	17A2298X042	38	Seat Ring Retainer Tool,	
	For use with 47.6 mm (1.875 inch) port diameter	10A4220X082	40	Bonnet Washer (for 8-inch valve only) (8 req'd) (not shown)	
	For use with 63.5 mm (2.5 inch) port diameter	17A4311X032	41*	Piston Ring (for EHAT with Level D Whisper Trim III cage only)	See table 34
	For use with 73.0 mm (2.875 inch) port diameter	10A4219X082			
	For use with 87.3 mm (3.4375 inch) port diameter	10A5350X082			
	For use with 98.4 mm (3.625 inch) port diameter	16A5484X052			
	For use with 111.1 mm (4.375 inch) port diameter	10A4225X062			

C-seal Trim (figure 7)

Note

Consult your Emerson Process Management sales office for availability.

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

Table 13. Actuator Groups by Type Number

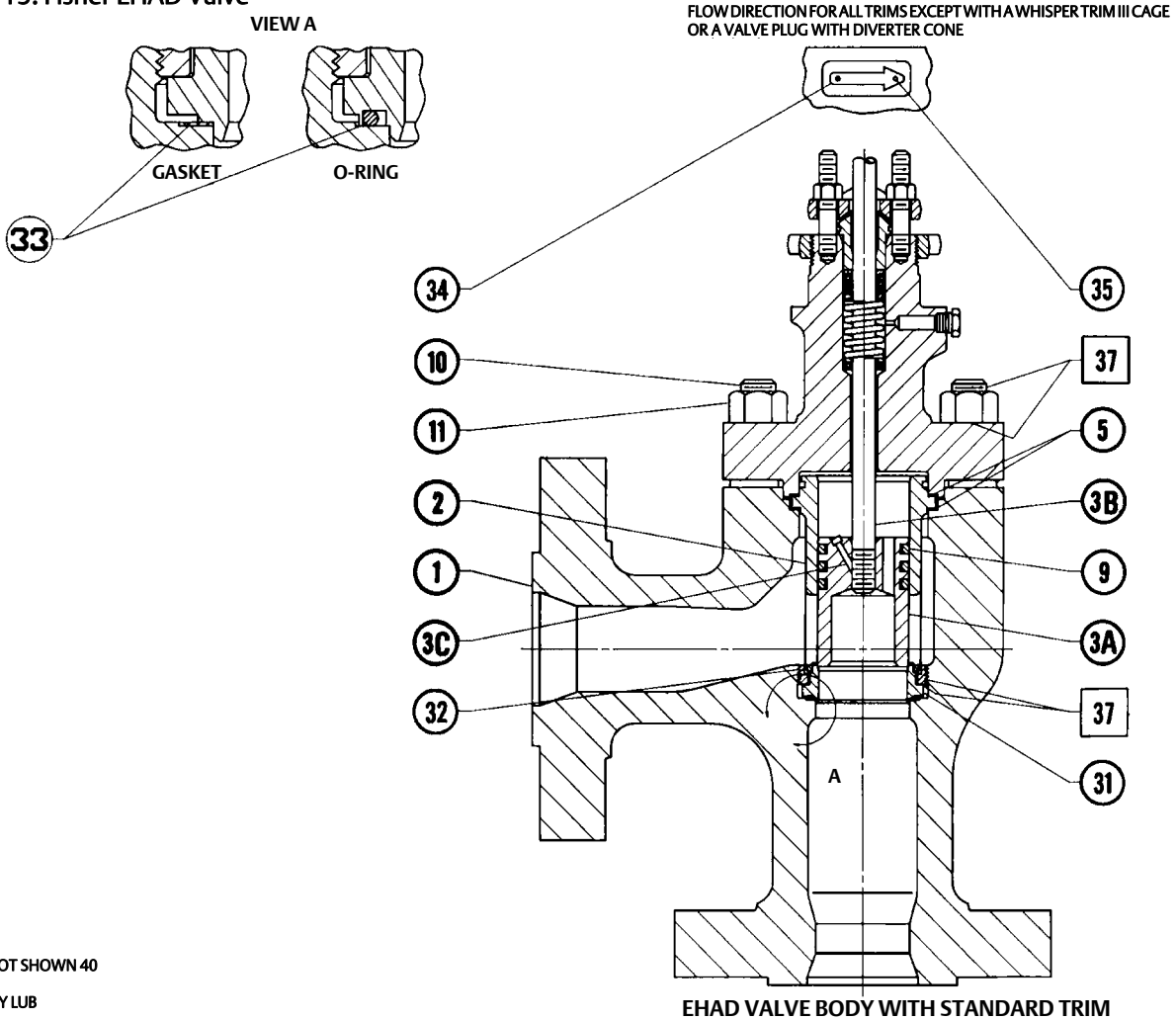
Group 1 54 mm (2-1/8"), 71 mm (2-13/16"), or 90 mm (3-9/16") Yoke Boss	Group 100 127 mm (5") Yoke Boss	Group 401 90.5 mm (3-9/16") Yoke Boss	Group 404 127 mm (5") Yoke Boss
585C Series—2" (50.8 mm) travel 472 & 473 1B 644 & 645 655 657 & 667—3" (76.2 mm) travel 1008—2-13/16" (71.4 mm) yoke boss	585C	657	667
	472	657 MO	667-4
	473	657-4	Group 405 127 mm (5") Yoke Boss
	474	657-4 MO	657 MO
	476	667	657-4 MO
	657	667 MO	Group 406 127 mm (5") Yoke Boss
	1008	667-4	667 MO
		1008	667-4 MO
		Group 402 90.5 mm (3-9/16") Yoke Boss	667 MO
		585C	667-4 MO
	Group 101 127 mm (5") Yoke Boss	Group 407 127 mm (5") Yoke Boss	
	667	585C	
	Group 400 71.4 mm (2-13/16") Yoke Boss	Group 403 90.5 mm (3-9/16") Yoke Boss	
	585C	585C	
		1008	
			657

Table 14. Keys 6*, 7*, and 12* Soft Packing Parts

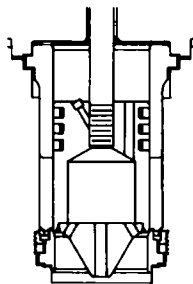
PACKING ARRANGEMENT	KEY NUMBER	PACKING PART DESCRIPTION	VALVE STEM CONNECTION			
			12.7 mm (1/2 Inch)	19.1 mm (3/4 Inch)	25.4 mm (1-Inch)	31.8 mm (1-1/4 Inch)
PTFE V-Ring Packing	6	Packing set, PTFE (1 req'd for single, 2 req'd for double) ⁽¹⁾	1R290201012	1R290401012	1R290601012	1R290801012
	12	Upper 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.

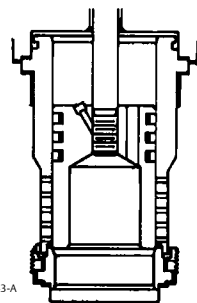
Figure 15. Fisher EHAD Valve



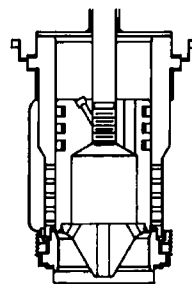
59A0236-A



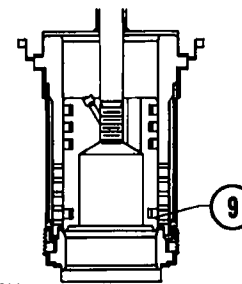
DETAIL OF PLUG WITH DIVERTER CONE, FOR NPS 8 VALVE ONLY



DETAIL OF WHISPER TRIM III CAGE FOR NPS 3 THROUGH 6 VALVES



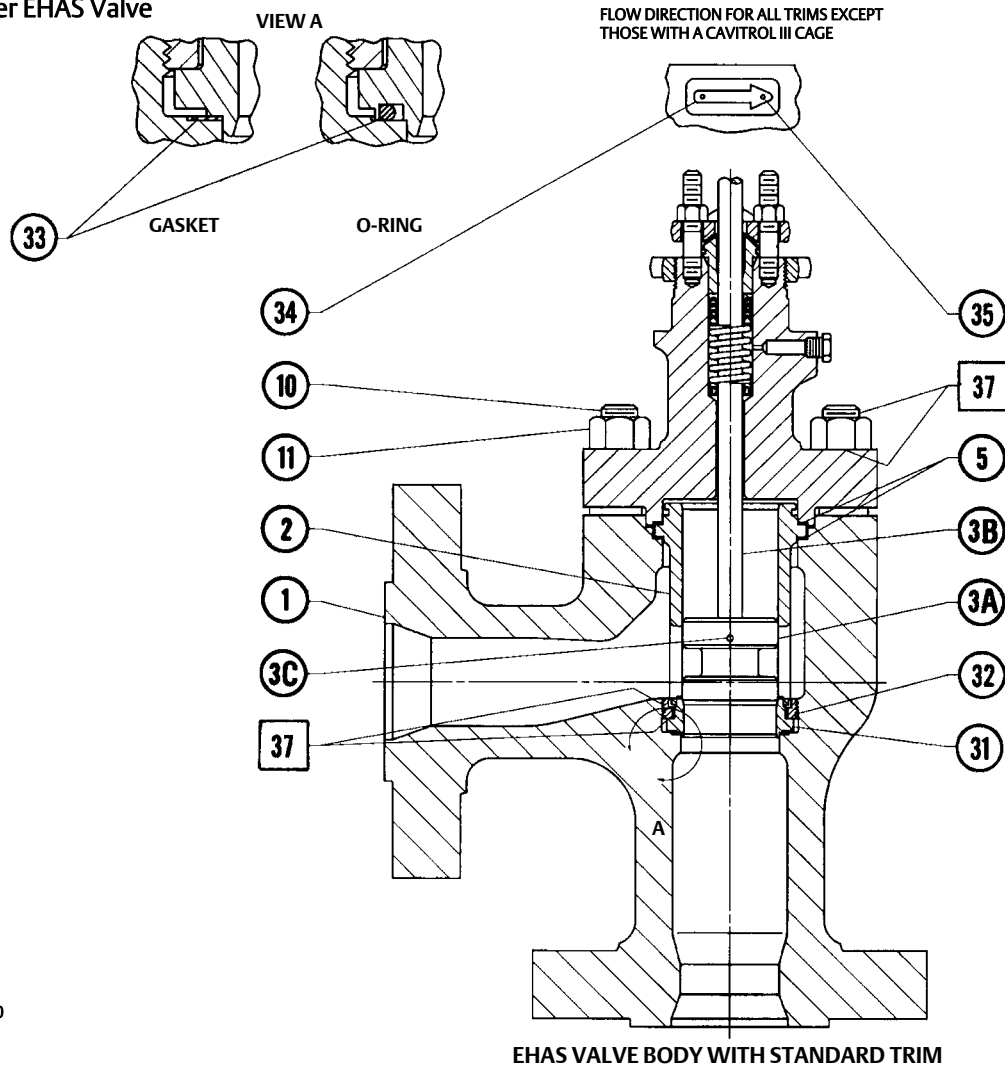
DETAIL OF LEVEL A, B, OR C WHISPER TRIM III CAGE AND VALVE PLUG WITH DIVERTER CONE, FOR NPS 8 VALVE ONLY



DETAIL OF LEVEL D WHISPER TRIM III CAGE AND VALVE PLUG, FOR NPS 8 VALVE ONLY

ALTERNATE CONFIGURATIONS
REFERENCE STANDARD TRIM KEY NUMBERS EXCEPT AS SHOWN

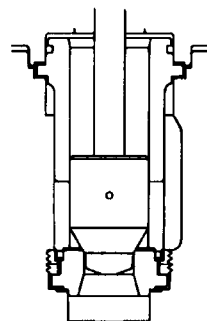
Figure 16. Fisher EHAS Valve



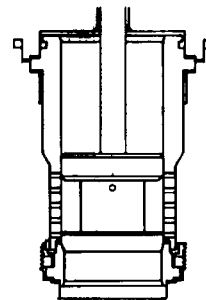
PART NOT SHOWN 40

APPLY LUB

59A0232-A



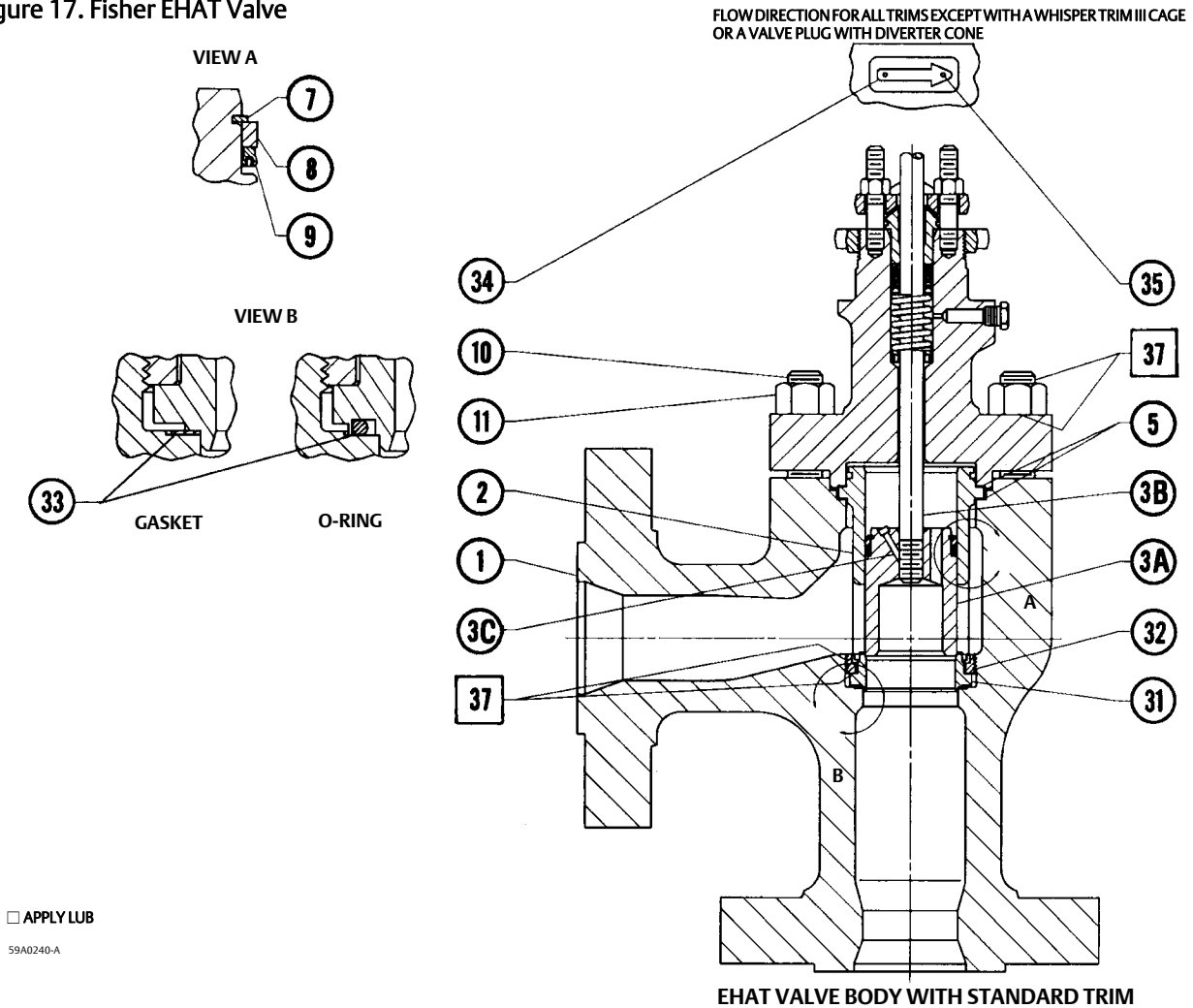
DETAIL OF MICRO-FORM VALVE PLUG,
FOR AN NPS 3 VALVE ONLY



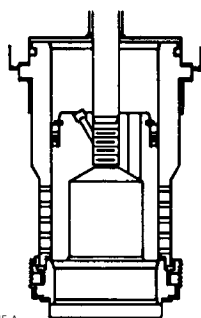
DETAIL OF WHISPER TRIM III CAGE,
FOR NPS 3 THROUGH 8 VALVE

ALTERNATE CONFIGURATIONS
REFERENCE STANDARD TRIM KEY NUMBERS EXCEPT AS SHOWN

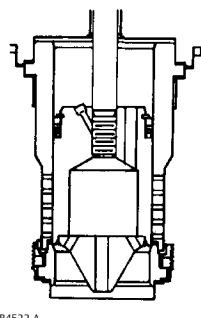
Figure 17. Fisher EHAT Valve



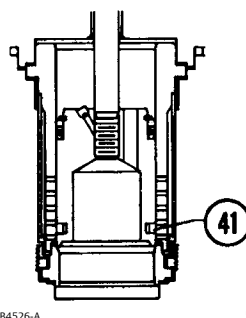
□ APPLY LUB
59A0240-A



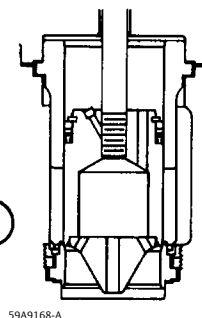
DETAIL OF WHISPER TRIM III CAGE FOR NPS 3 THROUGH 6 VALVES



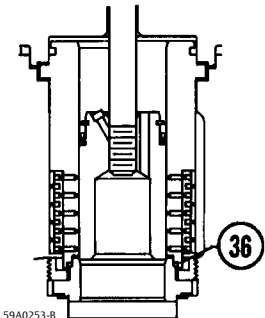
DETAIL OF LEVEL A, B, OR C WHISPER TRIM III CAGE AND VALVE PLUG WITH DIVERTER CONE, FOR NPS 8 VALVE ONLY



DETAIL OF LEVEL D WHISPER TRIM III CAGE AND VALVE PLUG, FOR NPS 8 VALVE ONLY



DETAIL OF VALVE PLUG WITH DIVERTER CONE, FOR NPS 8 VALVE ONLY



DETAIL OF 3-STAGE CAVITROL III CAGE, FOR ALL VALVES (2-STAGE CAGE IS AVAILABLE FOR NPS 3 THROUGH 8 VALVES)

ALTERNATE CONFIGURATIONS
REFERENCE STANDARD TRIM KEY NUMBERS EXCEPT AS SHOWN

Table 15. Keys 8, 10, 11* and 13 Metal Packing Parts

PACKING TYPE	KEY NUMBER	DESCRIPTION	QUANTITY REQUIRED		VALVE STEM CONNECTION		PART NUMBER
			Single Packing	Double Packing	mm	Inches	
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

Table 16. Key 2* Cage For Valves Without Whisper Trim III Cage or Cavitrol III Trim

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 Electroless Nickel Coated for NACE MR0175-2002 ⁽¹⁾
3	Equal percentage Linear	29, 38 38	1.125, 1.5 1.5	39A9224X012 39A9225X012	39A9224X052 39A9225X032	39A9226X022 39A9227X032	30B7095X012 31B4271X012
4	Equal percentage Linear	38, 51 51	1.5, 2 2	39A9055X012 39A9056X012	39A9055X062 39A9056X032	39A9057X022 39A9059X032	31B1176X012 31B3709X012
6	Equal percentage Linear	38, 51 38, 51	1.5, 2 1.5, 2	41B2046X012 41B2048X012	41B2046X022 41B2048X022	41B2047X012 41B2049X012	41B2018X012 41B2019X012
8	Equal percentage Linear	51, 76 51, 76	2.5, 3 2.5, 3	42B3570X012 42B3567X012	42B3570X022 42B3567X022	42B3571X012 42B3568X012	42B3572X012 42B3569X012

1. These materials are listed in NACE Standard MR0175-2002 as being accepted for direct exposure to sour environment when used under conditions stated in that standard.

Table 17. Key 2* Cage or Cage and Baffle Assembly for Valve with Whisper Trim III Cage

VALVE SIZE, NPS	DESCRIPTION	PORT DIAMETER		TRAVEL		MATERIAL			
		mm	Inches	mm	Inches	S17400 (17-4PH Stainless Steel) with H1075 Heat Treatment	S17400 with H1150 Heat Treatment For NACE MR0175-2002	S42200 (422 Stainless Steel) Ion Nitride	
3	Cage only	Level A1	47.6	1.875	38	1.5	37A2739X012	37A2739X022	37A2739X052
4	Cage only	Level A1	73.0	2.875	51	2	37A2762X012	37A2762X022	37A2762X042
		Level B1	73.0	2.875	51	2	37A2764X012	37A2764X022	37A2764X042
6	Cage only	Level A1	92.1	3.625	51	2	37A2782X012	37A2782X022	31B4276X012
		Level A3	92.1	3.625	51	2	37A9595X012	37A9595X022	31B4277X012
		Level B3	92.1	3.625	51	2	37A2784X012	37A2784X022	31B4278X012
		Level C3	92.1	3.625	51	2	37A2786X012	37A2786X022	31B4279X012
	Cage and baffle assembly	Level D3	73.0	2.875	51	2	27A2813X042	27A2813X052	31B4280X012
8	Cage only	Level A1	136.5	5.375	76	3	30B1107X022	30B1107X012	30B1107X032
		Level B3	136.5	5.375	76	3	30B1109X032	30B1109X012	30B1109X042
		Level C3	136.5	5.375	76	3	30B1111X022	30B1111X012	30B1111X032
	Cage and baffle assembly	Level D3	111.1	4.375	76	3	30B1179X032	30B1179X012	30B1179X022

Table 18. Key 2* Cage Assembly for Fisher EHAT Valve Body with Cavitrol III Trim

VALVE SIZE, NPS	CAGE ASSEMBLY DESCRIPTION	PORT DIAMETER		TRAVEL		MATERIAL
		mm	Inches	mm	Inches	S17400 (17-4PH Stainless Steel) with H1075 Heat Treatment
3	Full 2-stage	44.5	1.75	51	2	37A2291X022
	Full 3-stage	25.4	1	51	2	37A2302X012
4	Full 2-stage	63.5	2.5	64	2.5	37A4300X012
	Full 3-stage	47.6	1.875	64	2.5	37A4316X012
6	Full 2-stage	87.3	3.4375	76	3	37A4347X012
	Full 3-stage	73	2.875	76	3	37A4354X012
8	Full 2-stage	133.4	5.25	102	4	37A4387X012
	Full 3-stage	115.9	4.5625	102	4	37A4403X012

* Recommended spare parts

Table 19. Key 3A* Valve Plug/Stem Assembly for a Valve Body with Cavitrol III Trim

VALVE SIZE, NPS	VALVE	STAGE	ACTUATOR GROUP	VALVE STEM CONNECTION		PORT DIAMETER		MATERIAL
				mm	Inches	mm	Inches	S44004 (440C Stainless Steel)
3	EHAT	2	1	12.7 19.1	1/2 3/4	44.5 44.5	1.75 1.75	37A2294X012 37A2294X032
		3	1	12.7 19.1	1/2 3/4	25.4 25.4	1 1	22A5370X032 22A5370X042
4	EHAT	2	400	12.7 19.1	1/2 3/4	63.5 63.5	2.5 2.5	37A4303X012 37A4304X012
			100	25.4	1	63.5	2.5	37A4305X012
			101	25.4	1	63.5	2.5	37A4305X032
		3	400	12.7 19.1	1/2 3/4	47.6 47.6	1.875 1.875	37A4320X012 37A4321X012
			100	25.4	1	47.6	1.875	37A4321X032
			101	25.4	1	47.6	1.875	37A4321X042
6	EHAT	2	1 100 & 101	19.1 25.4	3/4 1	87.3 87.3	3.4375 3.4375	24A5259X062 24A5260X062
		3	1 100 & 101	19.1 25.4	3/4 1	73 73	2.875 2.875	38A0014X022 38A0015X022
8	EHAT	2	401 & 403	19.1	3/4	133.4	5.25	37A4390X022
			402	19.1	3/4	133.4	5.25	37A4390X032
			404	25.4	1	133.4	5.25	37A4391X022
			405 & 406	25.4	1	133.4	5.25	37A4391X032
			407	25.4	1	133.4	5.25	37A4391X042
			404	31.8	1-1/4	133.4	5.25	37A4392X022
		3	405 & 406	31.8	1-1/4	133.4	5.25	37A4392X032
			407	31.8	1-1/4	133.4	5.25	37A4392X042
			401 & 403	19.1	3/4	115.8	4.5625	37A4407X022
			402	19.1	3/4	115.8	4.5625	37A4407X032
			404	25.4	1	115.8	4.5625	37A4408X022
			405 & 406	25.4	1	115.8	4.5625	37A4408X032
407	25.4	1	115.8	4.5625	37A4408X042			
	404	31.8	1-1/4	115.8	4.5625	37A4409X022		
	405 & 406	31.8	1-1/4	115.8	4.5625	37A4409X032		
407	31.8	1-1/4	115.8	4.5625	37A4409X042			

Table 20. Key 3A* Valve Plug for Fisher EHAS Valve Body with Micro-Form Plug

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 D ⁽¹⁾
3	12.7	1/2	31.8	1.25	18A1637X012	28A1638X012	28A1638X042
	19.1	3/4	31.8	1.25	18A1639X012	28A1640X012	28A1640X072
	25.4	1	31.8	1.25	18A1641X012	28A1642X012	28A1642X052
	12.7	1/2	38.1	1.5	16A5402X012	26A5410X012	26A5410X042
	19.1	3/4	38.1	1.5	16A5333X012	26A5411X012	26A5411X102
	25.4	1	38.1	1.5	16A5334X012	26A5412X012	26A5412X052

1. See table 16A for plug diameters vs operating temperatures.

Table 16A. Valve Plug Diameters and Operating Temperatures

Cage Material	Stem Material	OPERATING TEMPERATURE RANGE		DIAMETER CODE	Valve
		°C	°F		
S31600 (316 Stainless Steel) Electrolyzed	S31600	-198 to +427	-325 to +800	A	EHAD, EHAS
	S31600 Electrolyzed	-29 to +593	-20 to +1100		
S17400 (17-4PH Stainless Steel) H1150 (NACE)	S20910	-40 to +232	-40 to +450	A	EHAS
S17400 H1150 (NACE)	S20910	-40 to +232	-40 to +450	B	EHAD
S42200 Ion Nitride	S31600 Electrolyzed	+427 to 566	+800 to 1050	D	EHAD, EHAS
S31600 Electrolyzed	S31600	-198 to +427	-325 to +800	D	EHAD, EHAS
	S31600 Electrolyzed	-29 to +593	-20 to +1100		
S42200 Ion Nitride	S31600 Electrolyzed	+427 to 566	+800 to 1050 ⁽¹⁾	E	EHAD, EHAS
S42200 Ion Nitride	S31600 Electrolyzed	+427 to 566	+800 to 1050 ⁽²⁾	F	EHAD, EHAS

1. Temperature limited to 427 to 510°C (800 to 950°F) for NPS 8 valve.
 2. Temperature limited to 510 to 566°C (950 to 1050F) for NPS 8 valve.

Table 21. Key 3A* Valve Plug for an NPS 3 through 6 Valve Without Micro-Form or Cavitrol III Trim. Also for Use with an NPS 3 or 4 Valve with a Whisper Trim III Cage

VALVE SIZE, NPS	VALVE	VALVE STEM CONNECTION		PORT DIAMETER		MATERIAL				
		mm	Inches	mm	Inches	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)
							Diameter A ⁽¹⁾	Diameter D ⁽¹⁾	Diameter E ⁽¹⁾	
3	EHAD	12.7	1/2	47.6	1.875	---	36A5419X012	36A5419X052	---	36A5340X012
		19.1	3/4	47.6	1.875	---	36A5420X012	36A5420X052	---	36A5341X012
		25.4	1	47.6	1.875	---	---	---	---	---
3	EHAT	12.7	1/2	47.6	1.875	36A5421X012	---	---	---	36A5342X012
		19.1	3/4	47.6	1.875	36A5422X012	---	---	---	36A5343X012
		25.4	1	47.6	1.875	---	---	---	---	---
3	EHAS	12.7	1/2	47.6	1.875	---	16A5423X012	16A5423X042	---	16A5344X012
		19.1	3/4	47.6	1.875	---	16A5424X012	16A5424X062	---	16A5345X012
		25.4	1	47.6	1.875	---	16A5425X012	16A5425X052	---	16A5346X012
4	EHAD	12.7	1/2	73.0	2.875	---	36A5426X012	36A5426X052	---	36A5347X012
		19.1	3/4	73.0	2.875	---	36A5427X012	36A5427X072	---	36A5348X012
		25.4	1	73.0	2.875	---	36A5428X012	36A5428X042	---	36A5349X012
4	EHAT	12.7	1/2	73.0	2.875	36A5429X012	---	---	---	36A5350X012
		19.1	3/4	73.0	2.875	36A5430X012	---	---	---	36A5351X012
		25.4	1	73.0	2.875	36A5431X012	---	---	---	36A5352X012
4	EHAS	12.7	1/2	73.0	2.875	---	16A5432X012	16A5432X042	---	16A5353X012
		19.1	3/4	73.0	2.875	---	16A5433X012	16A5433X042	---	16A5354X012
		25.4	1	73.0	2.875	---	16A5434X012	16A5434X062	---	16A5355X012
6	EHAD	19.1	3/4	92.1	3.625	---	36A5435X012	---	36A5435X082	36A5356X012
		25.4	1	92.1	3.625	---	36A5436X012	---	36A5436X052	36A5357X012
		19.1	3/4	92.1	3.625	36A5437X092	---	---	---	36A5358X012
6	EHAT	25.4	1	92.1	3.625	36A5438X092	---	---	---	36A5359X012
		19.1	3/4	92.1	3.625	---	16A5439X012	---	16A5439X042	16A5360X012
		25.4	1	92.1	3.625	---	16A5440X012	---	16A5440X052	16A5361X012

1. See table 16A for plug diameters vs operating temperatures.

Table 22. Key 3A* Valve Plug or Plug/Diverter for an NPS 8 Valve Without Micro-Form or Cavitrol III Trim

VALVE SIZE, NPS	VALVE	VALVE STEM CONNECTION		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)	
mm	Inch	mm	Inch								
8	EHAD	19.1	3/4	136.5	5.375	---	---	36A5441X052	36A5441X062	36A5441X072	36A5362X012
		25.4	1	136.5	5.375	---	---	36A5442X042	36A5442X052	36A5442X062	36A5363X012
		31.8	1-1/4	136.5	5.375	---	---	36A5443X042	36A5443X052	36A5443X062	36A5364X012
		50.8	2	136.5	5.375	---	---	38A6943X042	38A6943X052	39A6943X062	39A6740X012
	EHAD with diverter ⁽⁴⁾	50.8	2	136.5	5.375	---	31B4881X012	30B1702X062	30B1702X072	30B1702X082	---
	EHAT	19.1	3/4	136.5	5.375	36A5444X012	---	---	---	---	36A5365X012
		25.4	1	136.5	5.375	36A5445X012	---	---	---	---	36A5366X012
		31.8	1-1/4	136.5	5.375	36A5446X012	---	---	---	---	36A5367X012
		50.8	2	136.5	5.375	38A8300X012	---	---	---	---	30B2224X012
	EHAT with diverter ⁽⁴⁾	50.8	2	136.5	5.375	30B1701X012	31B4882X012	---	---	---	---
	EHAS	19.1	3/4	136.5	5.375	---	---	16A5447X042	16A5447X052	36A5447X062	16A5368X012
		25.4	1	136.5	5.375	---	---	16A5448X042	16A5448X052	36A5448X062	16A5369X012
		31.8	1-1/4	136.5	5.375	---	---	16A5449X042	16A5449X052	36A5449X062	16A5370X012
		---	---	---	---	---	---	---	---	---	---

1. See table 16A for plug diameters vs operating temperatures.
 2. Temperature limit due to plug/cage diametrical expansion 427 to 510°C (800 to 950°F).
 3. Temperature limit due to plug/cage diametrical expansion 510 to 566°C (950 to 1050°F).
 4. Flow up only.

Table 23. Key 3A* Valve Plug for an NPS 6 Valve Body With Whisper Trim III Cage

VALVE	VALVE STEM CONNECTION		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							
EHAD	19.1	3/4	92.1	3.625	36A5356X012	---	36A5435X072	---	36A5435X082	---
	25.4	1	92.1	3.625	36A5357X012	---	36A5436X042	---	36A5436X052	---
	19.1	3/4	73.0	2.875	37A6090X012	---	37A6092X012	37A6092X022	---	---
	25.4	1	73.0	2.875	37A6091X012	---	37A6093X012	37A6093X022	---	---
EHAT	19.1	3/4	92.1	3.625	36A5358X012	---	---	---	---	36A5437X012
	25.4	1	92.1	3.625	36A5359X012	---	---	---	---	36A5438X012
	19.1	3/4	73.0	2.875	37A6096X012	---	---	---	---	37A6098X012
	25.4	1	73.0	2.875	37A6097X012	---	---	---	---	37A6099X012
EHAS	19.1	3/4	92.1	3.625	16A5360X012	36A5439X012	---	---	36A5439X042	---
	25.4	1	92.1	3.625	16A5361X012	36A5440X012	---	---	36A5440X052	---
	19.1	3/4	73.0	2.875	16A5354X012	36A5433X012	---	36A5433X042	---	---
	25.4	1	73.0	2.875	16A5355X012	36A5434X012	---	36A5434X062	---	---

1. See table 16A for plug diameters vs operating temperatures.

Table 24. Key 3A* Valve Plug for NPS 8 EHAD and EHAT Valve Body with Whisper Trim III Cage

VALVE	MATERIAL	OPERATING TEMPERATURE RANGE		DIAMETER CODE STAMPED ON TOP OF VALVE PLUG	VALVE STEM CONNECTION		CAGE LEVEL	
		°C	°F		mm	Inches	Level A, B, or C	Level D
EHAD	S17400 (17-4PH stainless steel) with H900 heat treatment ⁽¹⁾	0 to 427	32 to 800	---	25.4	1	31B4883X012	39A9100X012
					31.8	1-1/4	31B4884X012	39A9102X012
	S31600 (316 stainless steel) with CoCr-A (Alloy 6) seat and guide	-40 to 232	-40 to 450	A ⁽²⁾	25.4	1	---	39A9104X012
					31.8	1-1/4	---	39A9106X012
		427 to 510	800 to 950	E ⁽³⁾	25.4	1	39A9108X052	39A9104X052
					31.8	1-1/4	39A9110X052	39A9106X052
		510 to 566	950 to 1050	F ⁽³⁾	25.4	1	39A9108X062	39A9104X062
					31.8	1-1/4	39A9110X062	39A9106X062
		-40 to 232	-40 to 450	K ⁽²⁾	25.4	1	39A9108X152	---
					31.8	1-1/4	39A9110X152	---
EHAT	S17400 (17-4PH stainless steel) with H900 heat treatment ⁽¹⁾	0 to 427	32 to 800	---	25.4	1	31B4885X012	39A9101X012
					31.8	1-1/4	31B4886X012	39A9103X012
	S31600 (316 stainless steel) with CoCr-A (Alloy 6) seat and guide	-40 to 232	-40 to 450	A ⁽²⁾	25.4	1	---	39A9105X012
					31.8	1-1/4	---	39A9107X012
		-40 to 232	-40 to 450	D ⁽²⁾	25.4	1	39A9109X072	---
					31.8	1-1/4	39A9111X072	---

1. For use with S17400 (17-4PH stainless steel) H1075 cage.
 2. For use with S17400 H1150 cage NACE MR0175-2002.
 3. For use with S42200 (422 stainless steel) ion nitride cage.

Table 25. Key 3B* Valve Plug Stem for CL1500 Valve without Whisper Trim III Cage or Cavitrol III Trim

VALVE SIZE, NPS	ACTUATOR GROUP PER TABLE	VALVE STEM CONNECTION		VALVE STEM TRAVEL		DESCRIPTION	MATERIAL					
		mm	Inches	mm	Inches		S31600 (316 Stainless Steel)	Electro-lized S31600	S20910 For NACE MR0175-2002			
3	1	12.7	1/2	19, 25, 29, 38	0.75, 1 1.125, 1.5	Micro-Form, EHAS EHAD, EHAT	10A8840XB42 10A8840X442	13A7368X062 13A7368X042	10A8840XT82 10A8840XT62			
		19.1	3/4			EHAD, EHAT, Micro-Form, EHAS	10A6088X012	17A2167X042	10A6088X052			
	100	25.4	1	19	0.75	Micro-Form with 1.25 (31.8 mm) port	1N325635162	15A9264X162	1N3256X0052			
				25	1	Micro-Form with 1.25 inch (31.8 mm) port	1N325635162	15A9264X162	1N3256X0052			
				29	1.125	Micro-Form with 1.5 inch (38.1 mm) port	1P597335162	15A9264X152	11A3429XG82			
				29	1.125	EHAS with 1.875 inch (47.6 mm) port	1P597335162	15A9264X152	11A3429XG82			
				38	1.5	Micro-Form with 1.5 inch (38.1 mm) port	10A3282X012	15A9264X142	10A3282X222			
				38	1.5	EHAS with 1.875 inch (47.6 mm) port	10A3282X012	15A9264X142	10A3282X222			
101	25.4	1	19, 25, 29, 38	0.75, 1 1.125, 1.5	Micro-Form, EHAS	1P516435162	15A9264X102	1P5164X0152				
4	1	12.7	1/2	38, 51	1.5, 2	EHAD, EHAT	10A8840XC52	13A7368X092	10A8840XU22			
						EHAS	10A8840XC62	13A7368X142	10A8840XU72			
		19.1	3/4	38, 51	1.5, 2	EHAD, EHAT	1U341635162	17A2167X032	1U3416X0042			
						EHAS	10A9265X202	17A2167X062	10A9265XV72			
	100	25.4	1	38	1.5	EHAD, EHAT	1P9972X0012	15A9264X122	1P9972X0032			
						EHAS	1N325635162	15A9264X162	1N3256X0052			
				51	2	EHAD, EHAT	1K928935162	15A9264X112	1K9289X0102			
						EHAS	10A3282X012	15A9264X142	10A3282X222			
				101	25.4	1	38, 51	1.5, 2	EHAD, EHAT	1K744735162	15A9264X092	1K7447X0042
									EHAS	1P9972X0012	15A9264X122	1P9972X0032
6	1	19.1	3/4	38, 51	1.5, 2	EHAD, EHAT	10A9265X122	17A2167X052	10A9265XV62			
						EHAS	1U507135162	17A2167X082	1U3416X0042			
	100	25.4	1	38	1.5	EHAD, EHAT	10A3282X012	15A9264X142	10A3282X222			
						EHAS	1N4180X0012	15A9264X242	1N4180X0072			
				51	2	EHAD, EHAT	11A3429X232	15A9264X012	11A3429XG52			
						EHAS	1U627735162	15A9264X222	1U6277X0062			
	101	25.4	1	38, 51	1.5, 2	EHAD, EHAT	1P516435162	15A9264X102	1P5164X0152			
						EHAS	1N325635162	15A9264X162	1N3256X0052			
	8	1	19.1	3/4	64, 76	2.5, 3	EHAD, EHAT	1U507135162	17A2167X082	1U5071X0042		
							EHAS	10A8200X012	17A2167X102	10A8200X022		
100		25.4	1	64	2.5	EHAD, EHAT	10A3282X012	15A9264X142	10A3282X222			
						EHAS	11A3429X102	15A9264X252	11A3429XJ22			
100 101		25.4	1	76 64, 76	3 2.5, 3	EHAD, EHAT	11A3429X232	15A9264X012	11A3429XG52			
						EHAS	1L3765X0012	15A9264X232	1L3765X0072			
100 101		25.4	1	76 64, 76	3 2.5, 3	EHAD, EHAT	1L2298X0012	15A4075X272	1L2298X0202			
						EHAS	1K747735162	15A4075X312	1K7477X0052			
100 101		31.8	1-1/4	64	2.5	EHAD, EHAT	10A6073X012	15A4075X262	10A6073X072			
						EHAS	11A3430X072	15A4075X302	11A3430XF22			
100 101	31.8x50.8	1-1/4x2	64	2.5	EHAD, EHAT	---	---	29A5895X482 29A6602X132 ⁽¹⁾				
					EHAD, EHAT	---	---	29A5895X472 29A6602X122 ⁽¹⁾				

1. Electrolyzed S20910 for temperatures above 430°C (800°F).

Table 26. Key 3B* Valve Plug Stem for NPS 6 or 8 Valve with Whisper Trim III Cage

VALVE SIZE, NPS	ACTUATOR GROUP PER TABLE	VALVE STEM CONNECTION		VALVE STEM TRAVEL		VALVE	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
6	1	19.1	3/4	51	2	EHAD, EHAT	All	---	10A9265X122	17A2167X052	10A9265XV62
						EHAS	All	---	1U507135162	17A2167X082	1U5071X0042
	100	25.4	1	51	2	EHAD, EHAT	A1, A3, B3, C3	---	11A3429X232	15A9264X012	11A3429XG52
						EHAD, EHAT	D3	---	1K778335162	15A9264X322	1K7783X0032
						EHAS	All	---	1U627735162	15A9264X222	1U6277X0062
	101	25.4	1	51	2	EHAD, EHAT	A1, A3, B3, C3	---	1P516435162	15A9264X102	1P5164X0152
EHAD, EHAT						D3	---	1K928935162	15A9264X112	1K9289X0102	
EHAS						All	---	1N325635162	15A9264X162	1N3256X0052	
8	100, 101	25.4	1	76	3	EHAD, EHAT	All	11A3429XJ82	11A3429X232	15A9264X312	11A3429XG52
		31.8	1-1/4	76	3	EHAD, EHAT	All	10A6073X022	10A6073X012	15A4075X262	10A6073X072

Table 27. Key 3B* Valve Plug Stem for Use with Style 1 Extension Bonnet

VALVE SIZE, NPS	ACTUATOR GROUP PER TABLE	VALVE STEM CONNECTION		VALVE STEM TRAVEL		DESCRIPTION	S31600 (316 STAINLESS STEEL)
		mm	Inches	mm	Inches		
3	1	12.7	1/2	19.1, 25.4, 28.6, 38.1	0.75, 1, 1.125, 1.5	Micro-Form, EHAS	28A2261X032
						EHAD, EHAT	28A2261X022
		19.1	3/4	19.1, 25.4, 28.6, 38.1	0.75, 0.875, 1.125, 1.5	EHAD, EHAT, Micro-Form, EHAS	28A2260X012
	100	25.4	1	19.1	0.75	Micro-Form with 1.25 inch (31.8 mm) port	28A2262X062
				25.4	1	Micro-Form with 1.25 inch (31.8 mm) port	28A2262X012
				28.6	1.125	Micro-Form with 1.5 inch (38.1 mm) port or EHAS with 1.875 inch (47.6 mm) port	28A2262X012
				38.1	1.5	Micro-Form with 1.5 inch (38.1 mm) port or EHAS with 1.875 inch (47.6 mm) port	28A2262X022
	101	25.4	1	19.1, 25.4, 28.6, 38.1	0.75, 1, 1.125, 1.5	Micro-Form, EHAS	28A2262X032

Table 28. Key 3C* Pin, 316 Stainless Steel

VALVE SIZE, NPS	VALVE	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)	50.8 mm (2-Inch)
3	EHAS	1B599635072	1F723635072	1D269735072	---	---
	EHAD, EHAT	1V322735072	1V322735072	---	---	---
4	EHAS	1B599635072	1F723635072	1D269735072	---	---
	EHAD, EHAT	1V322735072	1V326035072	1V334035072	---	---
6	EHAS	---	1F723635072	1D269735072	---	---
	EHAD, EHAT	---	1V326035072	1V334035072	---	---
8	EHAS	---	1F723635072	1D269735072	1K249838992	---
	EHAD, EHAT	---	1V326035072	1V334035072	1V334035072	15A4000X012

* Recommended spare parts

Table 29. Key 5* Cage Gasket (2 req'd)

VALVE SIZE, NPS	MATERIAL	
	N04400, Silver Plated	N04400, Tin Plated For MR0175-2002
3	26A5308X012	26A5308X022
4	26A5310X012	26A5310X022
6	26A5312X012	26A5312X022
8	26A5314X012	26A5314X022

Table 30. Key 8* Back-Up Ring for all EHAT Valves except those with Cavitrol III Trim or an NPS 8 Whisper Trim III Cage

VALVE SIZE, NPS	PORT DIAMETER		MATERIAL	
	mm	Inches	S31600 (316 Stainless Steel)	S41600 (416 Stainless Steel)
3	47.6	1.875	10A4218X012	10A4218X022
4	73.0	2.875	10A4217X022	10A4217X012
6	92.1	3.625	16A5483X022	16A5483X012
	72.0	2.875	10A4217X022	10A4217X012
8	136.5	5.375	10A5409X022	10A5409X012

Table 31. Key 8* Back-Up Ring for EHAT with NPS 8 Whisper Trim III Cage

VALVE SIZE, NPS	PORT DIAMETER		MATERIAL	
	mm	Inches	S31600 (316 Stainless Steel)	S41600 (416 Stainless Steel)
8	136.5	5.375	10A5409X022	10A5409X012
	111.1	4.375	10A4224X022	10A4224X012

Table 32. Key 8* Back-Up Ring for EHAT Valve with Cavitrol III Trim

VALVE SIZE, NPS	PORT DIAMETER		MATERIAL
	mm	Inches	S41600 (416 Stainless Steel)
3	44.5	1.75	17A2297X012
	25.4	1	11A3404X012
4	63.5	2.5	17A4310X012
	47.6	1.875	10A4218X022
6	87.3	3.4375	10A5349X012
	73.0	2.875	10A4217X012
8	133.4	5.25	17A4397X012
	115.9	4.5625	17A4414X012

Table 33. Key 9* Graphite Piston Ring for EHAD only (4 req'd for NPS 8 Valve with Level D Whisper Trim Cage; 3 req'd for all other valves)

VALVE SIZE, NPS	PORT DIAMETER		-253 to 426°C (-425 to 800°F)	427 to 537°C (801 to 1000°F)
	mm	Inches		
3	38.1	1.5	---	---
	47.6	1.875	1U2216X0012	1U2216X0022
4	58.7	2.3125	---	---
	73.0	2.875	1U2300X0012	1U2300X0022
6	73.0	2.875	1U2300X0012	1U2300X0022
	92.1	3.625	16A5482X012	16A5482X022
8	111.1	4.375	1U2392X0012	1U2392X0022
	136.5	5.375	11A9727X022	11A9727X032

Table 34. Key 9* R30003 Seal Ring and Key 41* Graphite Piston Ring for EHAT without Cavitrol III Trim

VALVE SIZE, NPS	PORT DIAMETER		KEY 9 SEAL RING	KEY 41 PISTON RING
	mm	Inches		
3	47.6	1.875	10A4216X032	N.A.
	38.1	1.5	---	
4	73.0	2.875	10A4215X032	N.A.
	58.7	2.3125	---	
6	73.0	2.875	10A4215X032	N.A.
	92.1	3.625	16A5485X062	
8 without Whisper Trim III	136.5	5.375	10A5411X032	N.A.
	111.1	4.375	---	
8 with Whisper Trim III	136.5	5.375	10A5411X032	N.A. 1U2392X0012 ⁽¹⁾
	111.1	4.375	10A4223X032	

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

Table 35. Key 9* Seal Ring for Cavitrol III Trim Only, Spring Loaded PTFE

VALVE SIZE, NPS	2-STAGE	3-STAGE
3	17A2296X012	11A3407X042
4	17A4309X012	10A4216X012
6	10A5351X022	10A4215X012
8	17A4396X012	17A4413X012

Table 36. Key 31* Seat Ring and Key 32* Seat Ring Retainer for Gasketed Seat Ring Construction without Cavitrol III or NPS 6 or 8 Whisper Trim III Cage

VALVE SIZE, NPS	DESIGN	PORT DIAMETER		PART DESCRIPTION	SEAT RING MATERIAL	
					S41600 (416 Stainless Steel)	R30006 (Alloy 6)
		mm	Inches		SEAT RING RETAINER MATERIAL	
				S17400 (17-4PH Stainless Steel) H1150, Electrolyzed	N07718, Electrolyzed	
3	Micro-Form	31.8	1.25	Seat Ring Seat Ring Retainer	28A1636X012 26A5296X082	28A1636X032 26A5296X022
		38.1	1.5	Seat Ring Seat Ring Retainer	26A5281X012 26A5296X082	26A5281X032 26A5296X022
	EHAD, EHAT, EHAS	47.6	1.875	Seat Ring Seat Ring Retainer	26A5282X012 26A5296X082	26A5282X032 26A5296X022
4	EHAD, EHAT, EHAS	73.0	2.875	Seat Ring Seat Ring Retainer	26A5283X012 26A5297X062	26A5283X032 26A5297X022
6	EHAD, EHAT, EHAS	92.1	3.625	Seat Ring Seat Ring Retainer	26A5284X012 26A5298X092	26A5284X032 26A5298X022
8	EHAD, EHAT, EHAS	136.5	5.375	Seat Ring Seat Ring Retainer	26A5285X012 26A5299X052	26A5285X032 26A5299X022

Table 37. Key 31* Seat Ring and Key 32* Seat Ring Retainer for O-Ring Seat Ring Construction without Cavitrol III or NPS 6 or 8 Whisper Trim III Cage

VALVE SIZE, NPS	DESIGN	PORT DIAMETER		PART DESCRIPTION	SEAT RING MATERIAL		
					S41600 (416 Stainless Steel)	R30006 (Alloy 6)	R30006 (Alloy 6)
		mm	Inches		SEAT RING RETAINER MATERIAL		
				S17400 (17-4PH Stainless Steel) H1150, Electrolyzed	N07718, Electrolyzed	S17400 H1150, Electrolyzed	
3	Micro-Form	31.8	1.25	Seat Ring Seat Ring Retainer	28A2402X042 26A5296X082	28A2402X022 26A5296X022	28A2402X022 26A5296X082
		38.1	1.5	Seat Ring Seat Ring Retainer	27A2747X052 26A5296X082	27A2747X022 26A5296X022	27A2747X022 26A5296X082
	EHAD, EHAT, EHAS	47.6	1.875	Seat Ring Seat Ring Retainer	27A2748X062 26A5296X082	27A2748X022 26A5296X022	27A2748X022 26A5296X082
4	EHAD, EHAT, EHAS	58.7	2.875	Seat Ring Seat Ring Retainer	27A2770X042 26A5297X062	27A2770X022 26A5297X022	27A2770X022 26A5297X062
6	EHAD, EHAT, EHAS	73.0	3.625	Seat Ring Seat Ring Retainer	27A2788X042 26A5298X092	27A2788X022 26A5298X022	27A2788X022 26A5298X092
8	EHAD, EHAT, EHAS	111.1	5.375	Seat Ring Seat Ring Retainer	27A2798X042 26A5299X052	27A2798X022 26A5299X022	27A2798X022 26A5299X052

Table 38. Key 31* Seat Ring and Key 32* Seat Ring Retainer for an NPS 6 or 8 Valve with Whisper Trim III Cage and Gasketed Seat Ring Construction

VALVE SIZE, NPS	PORT DIAMETER		PART DESCRIPTION	SEAT RING MATERIAL	
				S41600 (416 Stainless Steel)	R30006 (Alloy 6)
	mm	Inches		SEAT RING RETAINER MATERIAL	
			S17400 (17-4PH Stainless Steel) H1150, Electrolyzed	N07718, Electrolyzed	
6	92.1	3.625	Seat Ring Seat Ring Retainer	26A5284X012 26A5298X092	26A5284X032 26A5298X022
	73.0	2.875	Seat Ring Seat Ring Retainer	20B3695X012 27A4365X052	20B3695X032 27A4365X042
8	136.5	5.375	Seat Ring Seat Ring Retainer	26A5285X012 26A5299X052	26A5285X032 26A5299X022
	111.1	4.375	Seat Ring Seat Ring Retainer	20B3751X042 27A4419X052	20B3751X022 27A4419X032

Table 39. Key 31* Seat Ring and Key 32* Seat Ring Retainer for an NPS 6 or 8 Valve with Whisper Trim III Cage and O-Ring Seat Ring Construction

VALVE SIZE, NPS	PORT DIAMETER		PART DESCRIPTION	SEAT RING MATERIAL		
				S41600 (416 Stainless Steel)	R30006 (Alloy 6)	R30006 (Alloy 6)
	mm	Inches		SEAT RING RETAINER MATERIAL		
			S17400 (17-4PH Stainless Steel) H1150	N07718, Electrolyzed	S17400 H1150, For NACE MR0175-2002	
6	92.1	3.625	Seat Ring Seat Ring Retainer	27A2788X042 26A5298X092	27A2788X022 26A5298X022	27A2788X022 26A5298X092
	73.0	2.875	Seat Ring Seat Ring Retainer	20B3696X012 27A4365X052	20B3696X022 27A4365X042	20B3696X022 27A4365X052
8	136.5	5.375	Seat Ring Seat Ring Retainer	27A2798X042 26A5299X052	27A2798X022 26A5299X022	27A2798X022 26A5299X052
	111.1	4.375	Seat Ring Seat Ring Retainer	20B3752X042 27A4419X052	20B3752X022 27A4419X032	20B3752X022 27A4419X052

* Recommended spare parts

Table 40. Key 31 * Seat and Liner and Key 32 * Seat Ring Retainer for Liner-Style Constructions

VALVE SIZE, NPS	PORT DIAMETER		VALVE	PART DESCRIPTION	SEAT AND LINER MATERIAL	
					CB7CU-1 (17-4PH Stainless Steel) H1075	R30006 (Alloy 6)
	mm	Inches			SEAT RING RETAINER MATERIAL	
				S17400 (17-4PH Stainless Steel) H1150	N07718	
3	47.6	1.875	EHAD, EHAT, EHAS	Seat and Liner Seat Ring Retainer	38A6951X012 26A5296X082	38A6951X022 26A5296X022
4	73.0	2.875	EHAD, EHAT, EHAS	Seat and Liner Seat Ring Retainer	38A6953X012 26A5297X062	38A6953X022 26A5297X022
6	92.1	3.625	EHAD, EHAT, EHAS	Seat and Liner Seat Ring Retainer	38A6955X012 26A5298X092	38A6955X022 26A5298X022
8	136.5	5.375	EHAD, EHAT, EHAS	Seat and Liner Seat Ring Retainer	38A6957X012 26A5299X052	38A6957X022 26A5299X022

Table 41. Key 31 * Seat Ring for Valve with Cavitrol III Trim and O-Ring Seat Ring Construction

VALVE SIZE, NPS	2-STAGE	3-STAGE
	S44004 (440C Stainless Steel)	S44004 (440C Stainless Steel)
3	20B6735X032	20B6734X032
4	20B6724X032	20B1222X042
6	20B1223X042	20B1221X032
8	20B6725X032	20B1220X032

Table 42. Key 32 * Seat Ring Retainer for Valve with Cavitrol III Trim, Electrolyzed S17400 (17-4PH Stainless Steel) H1150

VALVE SIZE, NPS	2-STAGE	3-STAGE
3	27A2301X052	27A2308X032
4	27A4315X022	27A4327X042
6	27A4353X022	27A4365X052
8	27A4402X022	27A4419X052

Table 43. Key 33* Seat Ring O-Ring or Gasket

VALVE SIZE, NPS	O-RING			GASKET
	For Use With All O-Ring Seat Ring Constructions			For All Gasketed Seat Ring Constructions
	Ethylene Propylene	Nitrile For MR0175-2002	Fluorocarbon For MR0175-2002	S31600 (316 Stainless Steel)/Graphite
3	1D2269X0062	1D2269X0042	1D2269X0012	19A2543X012
4	1H6247X0072	1H624706992	1H6247X0032	19A4321X012
6	1H7774X0032	1H777406992	1H7774X0022	18A2808X012
8	13A5599X052	13A5599X012	13A5599X022	18A2810X012

Table 44. Key 36* O-Ring for Cavitrol III Trim Only

VALVE SIZE, NPS	2-STAGE	3-STAGE
3	1H2921X0022	1C6280X0042
4	1K8776X0052	1H2917X0022
6	1P5548X0032	1F7294X0032
8	1F4492X0012	1D2673X0032

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