

Fisher™ CV500 Rotary Globe Control Valve

Contents

Introduction	1
Scope of Manual	1
Description	1
Specifications	2
Educational Services	2
Installation	3
Maintenance	7
Packing Maintenance	8
Stopping Leakage	8
Replacing Packing	8
Replacing Retainer, Seat Ring, and Face Seals	9
Disassembly	10
Assembly	13
Replacing Ball, Shaft, and Bearings	16
Disassembly	16
Assembly	19
Cavitrol Hex Replacement	23
Disassembly	23
Assembly	24
Adjusting Actuator Travel	24
Changing Valve Flow Direction	26
Changing Actuator Mounting Style	26
Parts Ordering	27
Parts Kits	27
Parts List	36

Introduction

Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts ordering information for NPS 3 through 20 Fisher CV500 Cam Vee-Ball™ rotary control valves. Refer to separate manuals for information concerning the actuator and accessories.

Description

The CV500 Cam-Vee-Ball rotary control valve, has a Vee-Ball style segmented ball in a valve body similar to the V500 valve. The CV500 is a flanged valve (figure 1) with a self-centering seat, eccentrically rotating V-notch ball, and splined valve shaft. Suitable for forward or reverse flow use, this valve mates with a variety of actuators to provide throttling or on-off service. The flanged valve mates with ASME flanges or EN flanges.



Do not install, operate, or maintain a CV500 valve without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand, and follow all the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your [Emerson sales office](#) before proceeding.

Figure 1. Fisher CV500 Valve



X0189

Fisher CV500 VALVE WITH 2052 ACTUATOR AND
FIELDVUE™ DVC6200 DIGITAL VALVE CONTROLLER

Table 1. Specifications

<p>Valve Sizes</p> <p>■ NPS 3, ■ 4, ■ 6, ■ 8, ■ 10, ■ 12, ■ 14, ■ 16, and ■ 20</p> <p>End Connection Style</p> <p>■ Raised-face flanges or ■ ring-type joint flanges (ASME B16.5). Valve bodies with EN flanges also available. Consult your Emerson sales office.</p> <p>Maximum Inlet Pressure⁽¹⁾</p> <p>Consistent with applicable ASME B16.34 or EN 12516-1 ratings</p> <p>Shutoff Classification</p> <p>Class IV per ANSI/FCI 70-2 and IEC 60534-4, (0.01% of valve capacity at full travel), for either flow direction</p> <p>Flow Characteristic</p> <p>Approximately equal percentage</p> <p>Flow Direction</p> <p>■ Forward (normal) flow is into the convex side of the V-notch ball</p>	<p>■ Bidirectional flow is into either side of the V-notch ball</p> <p>Actuator Mounting</p> <p>■ Right-hand or ■ left-hand as viewed from the upstream side of the valve</p> <p>Mounting position depends on the desired open valve position and flow direction required by operating conditions</p> <p>Valve Ball Rotation</p> <p>Counterclockwise to close (when viewed from actuator side of valve body) through 90 degrees of ball rotation</p> <p>Valve Body/Actuator Action</p> <p>With diaphragm or piston rotary actuator, field-reversible between ■ push-down-to-close (extending actuator rod closes valve body) and ■ push-down-to-open (extending actuator rod opens valve body)</p> <p>Shaft Diameters⁽²⁾ and Approximate Weights</p> <p>See table 2</p>
<p><small>1. The pressure/temperature limits in this manual and any applicable standard limitations should not be exceeded. 2. Shaft diameter and spline end must match available shaft diameter of actuator.</small></p>	

Specifications

Specifications for the CV500 rotary control valve are listed in table 1.

Educational Services

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

Installation

⚠ WARNING

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

Personal injury or equipment damage caused by sudden release of pressure may result if the valve assembly is installed where service conditions could exceed either the valve body rating or the mating pipe flange joint rating. To avoid such injury or property damage, provide a relief valve for overpressure protection as required by government or accepted industry codes and good engineering practices.

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

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

⚠ WARNING

When ordered, the valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions indicated when the valve was ordered. Because some body/trim material combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting your [Emerson sales office](#).

Table 2. Shaft Diameters and Approximate Weights

VALVE SIZE, NPS	SHAFT DIAMETERS		APPROXIMATE WEIGHTS		
	Through Valve Body	At Spline End ⁽¹⁾	Flanged		
			CL150	CL300	CL600
mm		kg			
3	25.4	25.4	19	24	26
	25.4	19.1			
4	31.8	31.8	36	42	50
6	38.1	38.1	54	69	93
	38.1	31.8			
8	38.1	38.1	79	98	135
10	44.5	44.5	181	208	312
12	53.8	53.8	215	253	367
	53.8	50.8			
14	53.8	53.8	247	345	454
16	76.2	76.2	322	426	610
20	76.2	76.2	388	558	801
Inches		lbs			
3	1	1	42	52	57
	1	3/4			
4	1-1/4	1-1/4	79	93	111
6	1-1/2	1-1/2	120	152	204
	1-1/2	1-1/4			
8	1-1/2	1-1/2	175	217	298
10	1-3/4	1-3/4	398	458	687
12	2-1/8	2-1/8	473	558	810
	2-1/8	2			
14	2-1/8	2-1/8	545	760	1000
16	3	3	710	940	1345
20	3	3	855	1230	1765

1. Spline diameter that connects to actuator versus shaft diameter.

Key numbers are shown in figure 10 for NPS 3 through 8, figure 11 for NPS 10 and 12, and figure 12 for NPS 14 through 20, unless otherwise indicated.

1. If the valve body (key 1) is to be stored before installation, protect the flange mating surfaces and keep the valve body cavity dry and clear of foreign material.
2. Install a three-valve bypass around the control valve assembly if continuous operation will be necessary during inspection and maintenance of the valve.
3. A CV500 valve is normally shipped as part of a control valve assembly, with a power or manual actuator mounted on the valve. If the valve and actuator have been purchased separately or if the actuator has been removed from the valve, mount the actuator according to the actuator instruction manual. Also, adjust the actuator travel using the Adjusting Actuator Travel procedure in this manual before installing the valve; the required measurements cannot be made with the valve installed.
4. Before starting the actual installation of the valve, determine the proper installation orientation of the V-notch ball (key 2) and actuator. Determine the flow direction of the process fluid through the valve. See figure 2.

Figure 2. Index Marks for Actuator Lever Orientation

ACTUATOR		VALVE OPEN	ACTUATOR POSITION			
MOUNTING	STYLE		1	2	3	4
RIGHT-HAND	STYLE A (PDTC)					
	STYLE B (PDTO)					
LEFT-HAND	STYLE C (PDTO)					
	STYLE D (PDTC)					

NOTES:
 1. ARROW ON LEVER INDICATES DIRECTION OF ACTUATOR THRUST TO CLOSE VALVE.
 2. PDTC= PUSH DOWN TO CLOSE; PDTO= PUSH DOWN TO OPEN.
 3. F= FORWARD FLOW; R= REVERSE FLOW.

C0741

Note

For control valves used in slurry service, mount the actuator and install the control valve so that the V-notch ball rotates above the valve drive shaft (refer to figure 2), if possible.

5. Before installing the valve, make sure the flow direction arrow (key 32) on the valve (key 1) matches the actual process fluid flow direction through the valve for the application where the valve will be installed.
-

Note

For best shutoff performance, install the valve with the drive shaft horizontal and the Vee-Ball closing in the downward direction for standard right hand mounting.

6. Install the flange gaskets and insert the valve between the mating pipeline flanges. Use flat sheet gaskets compatible with the process media, or spiral wound gaskets with compression-controlling center rings.
7. Install the line bolts and nuts; then, tighten them using accepted bolting procedures. These procedures include, but are not limited to, lubricating the line bolts and hex nuts and tightening the nuts in a crisscross sequence to ensure proper gasket load.
8. If a purge is desired for the purged bearing construction, remove the pipe plugs (keys 29 and 24) and install the purge lines. Purge pressure should be greater than the pressure within the valve and the purge fluid should be as clean as possible.

⚠ WARNING

A CV500 drive shaft is not necessarily grounded when installed in a pipeline unless the shaft is electrically bonded to the valve.

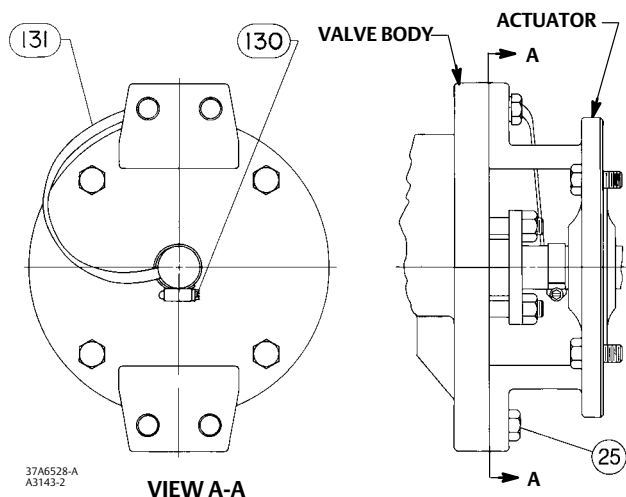
To avoid personal injury or property damage resulting from the effects of a static electricity discharge from valve components in a hazardous atmosphere or where the process fluid is combustible, electrically bond the drive shaft (key 3) to the valve according to the following step.

Note

Standard CV500 packings (key 13) are composed either entirely of conductive packing rings (graphite ribbon packing) or partially of conductive packing rings (a carbon-filled PTFE female adaptor with PTFE V-ring packing or a graphited-composition packing ring with PTFE/composition packing) in order to electrically bond the shaft to the valve body. Alternate shaft-to-valve body bonding is available for hazardous service areas where the standard packing is not sufficient to bond the shaft to the valve (see the following step).

9. For hazardous applications, attach the bonding strap assembly (key 131, figure 3) to the shaft with the clamp (key 130, figure 3) and connect the other end of bonding strap assembly to the valve body with the cap screw (key 25, figure 3).
10. Connect pressure lines to the actuator as indicated in the actuator instruction manual. When a manual actuator (handwheel) is used with a power actuator, install a bypass valve on the power actuator (if not already supplied) for use during manual operation.

Figure 3. Optional Shaft-to-Body Bonding Strap Assembly



⚠ WARNING

Personal injury could result from packing leakage. Valve packing was tightened before shipment; however, the packing might require some readjustment to meet specific service conditions. Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If the valve has ENVIRO-SEAL™ live-loaded packing installed, readjustment will probably not be required. See the instruction manual titled Fisher ENVIRO-SEAL Packing System for Rotary Valves ([D101643X012](#)) 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

⚠ WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:

- Do not remove the actuator from the valve while the valve is still pressurized.
- 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.
- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations.
- The valve packing area 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.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Valve parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement depends upon the severity of service conditions.

Packing Maintenance

Key numbers refer to figure 10 for NPS 3 through 8, figure 11 for NPS 10 and 12, and figure 12 for NPS 14 through 20, unless otherwise indicated.

Note

For the ENVIRO-SEAL packing system, refer to the Parts List section for retrofit kits, parts kits, and individual parts (see figures 13 and 14). Refer to separate ENVIRO-SEAL instruction manual ([D101643X012](#)) for maintenance instructions.

Standard ENVIRO-SEAL packing systems can be used in vacuum service with packing rings in the standard orientation. It is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.

Stopping Leakage

All maintenance procedures in this section may be performed with the valve body (key 1) in the line.

For packings other than spring-loaded packing, leakage around the packing follower (key 14) may be stopped by tightening the packing flange nuts (key 16). If leakage cannot be stopped in this manner, replace the packing according to the Replacing Packing procedure in this manual.

If the packing is relatively new and tight on the drive shaft (key 3), and if tightening the packing nuts does not stop leakage, it is possible that the shaft is worn or nicked so that a seal cannot be made. If the leakage comes from the outside diameter of the packing, it is possible that the leakage is caused by nicks or scratches on the packing box wall. Inspect the shaft and packing box wall for nicks or scratches when performing the following procedures.

Replacing Packing

Note

If the valve has ENVIRO-SEAL live-loaded packing installed, see the manual entitled Fisher ENVIRO-SEAL Packing System for Rotary Valves ([D101643X012](#)).

This procedure may be performed without removing the actuator from the valve if adding PTFE/composition packing rings as a temporary measure. However, the actuator must be removed if replacing any other kind of packing or if the metal packing parts (keys 14, 17, and, if used, 18) need to be replaced.

⚠ 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. If using a power actuator, also shut-off all pressure lines to the power actuator, release all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.

NOTICE

To avoid increased leakage, increased valve component wear or possible damage to the valve body, ball, shaft, and bearings resulting from a sharp blow to the shaft, use a wheel puller to separate the actuator parts from the drive shaft.

Do not drive the actuator parts off the drive shaft since this could move the valve bearings, shaft, and ball away from proper alignment, causing improper seating of the ball. Such misalignment may result in damage to valve components if the valve is returned to service without disassembly and inspection of the valve ball alignment.

2. If necessary, remove the cap screws (key 25) and hex nuts (key 26). Then remove the actuator while referring to the actuator instruction manual for assistance.
3. Remove the packing nuts (key 16). For NPS 3 through 8, remove the packing follower (key 14). For NPS 10 through 20, remove the packing flange (key 45) and then remove the packing follower (key 14).

⚠ WARNING

In the following step, take care not to scratch the valve shaft or packing box wall, as this may cause leakage.

4. Remove the old packing rings (key 13), packing box ring (key 17), and, if used, the lantern ring (key 18). Do not scratch the valve shaft or packing box wall; scratching these surfaces could cause leakage. Clean all accessible metal parts and surfaces to remove particles that would prevent the packing from sealing.
5. Whenever you are installing new packing, be sure the ball (key 2) is closed while you install and tighten the new packing. Install the new packing rings and packing box ring by stacking the parts as shown in figure 4. Make sure split rings are arranged so that the splits do not line up to form a leak path. Then slide the stack into the packing box as far as they will go while being careful to avoid trapping air among the rings.
6. Install the packing follower (key 14), and, for NPS 10 through 20, also install the packing flange (key 45). Install the nuts (key 16), and tighten them far enough to stop leakage under normal conditions.
7. Mount the actuator while referring to the actuator mounting procedures in the actuator instruction manual. Complete the Adjusting Actuator Travel procedure in this manual before installing the valve in the pipeline. This is necessary due to the measurements that must be made during the actuator adjustment process.
8. When the control valve is being put back into operation, check the packing follower for leakage, and retighten the packing nuts as necessary.

Replacing Retainer, Seat Ring, and Face Seals

This procedure is to be performed if the control valve is not shutting off properly, if installing a different seat ring, or if seat ring inspection is necessary. The actuator and valve must be removed from the pipeline; however, the actuator may remain mounted during this procedure. Key numbers refer to figure 10 for NPS 3 through 8, figure 11 for NPS 10 and 12, and figure 12 for NPS 14 through 20, unless otherwise indicated.

A retainer tool is required to remove the retainer (key 5) on sizes NPS 3 through 12. If specifically ordered, a tool is supplied with the valve; a tool can also be ordered individually by referencing key 33 of the Parts List. If desired, a tool can be machined using the dimensions shown in figure 5.

NOTICE

During assembly, handle the retainer, seat ring, and face seals carefully. Critical areas that must be protected are the threads and inner surface of the retainer (key 5), the sealing surfaces of the face seals (key 8), the face seal grooves in the seat ring (key 4), the shutoff surface of the seat ring, and the face seal surface in the valve body.

A new retainer gasket (key 11) is required whenever the retainer (key 5) is removed. Other parts that are in good condition can be reused.

Disassembly**⚠ WARNING**

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

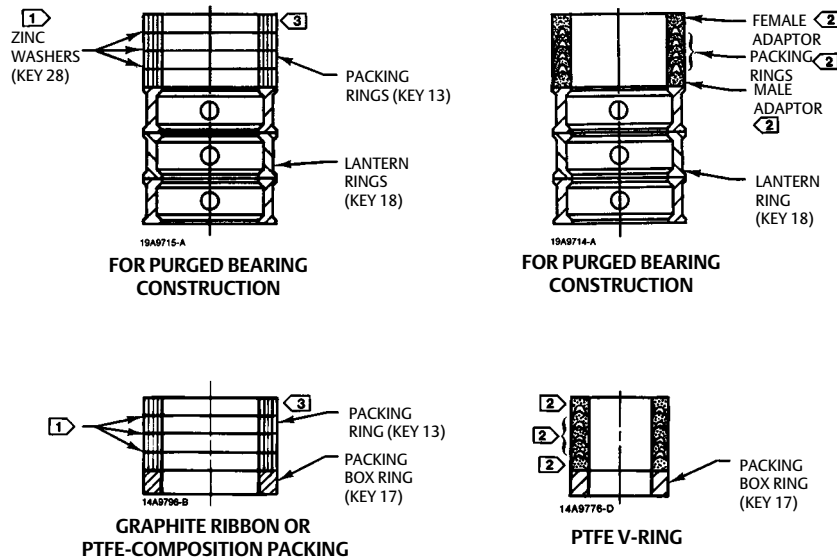
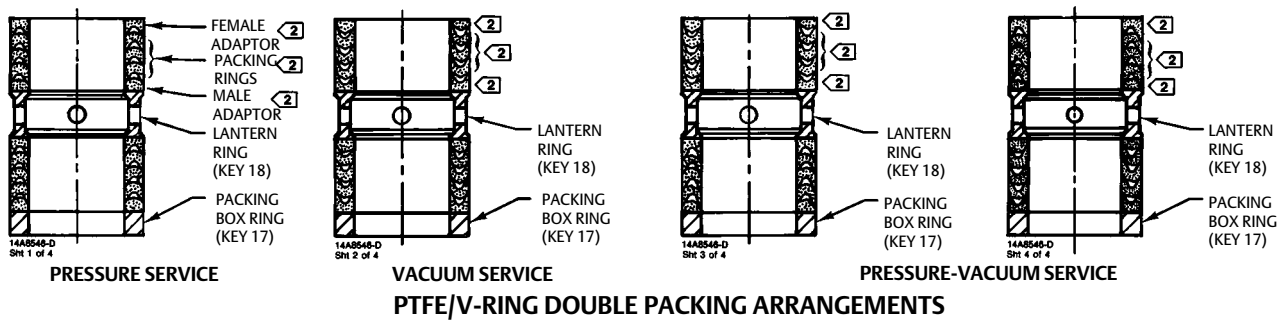
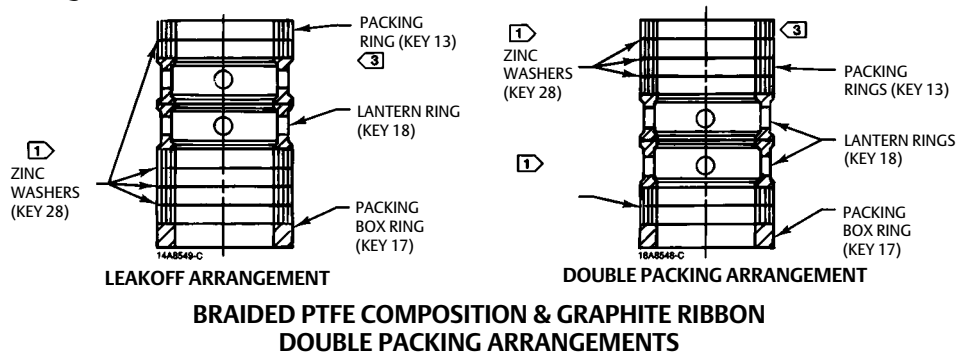
The ball closes with a shearing, cutting motion, which could result in personal injury. To avoid personal injury or damage to tools, valve parts, or other items resulting from the ball closing, prevent against ball travel by using travel stops, manual actuators, constant supply pressure to a pneumatic actuator, or other steps as appropriate. When installing the seat ring, keep hands, tools, and other objects out of the valve.

Table 3. Assembly Clearance

PROCESS TEMPERATURE	SEAT RING AND RETAINER CLEARANCE			
	mm		Inches	
	Minimum	Maximum	Minimum	Maximum
To 260°C (500°F) ⁽¹⁾	0.08	0.30	0.003	0.012
Over 260°C (500°F) ⁽²⁾	0.20	0.43	0.008	0.017

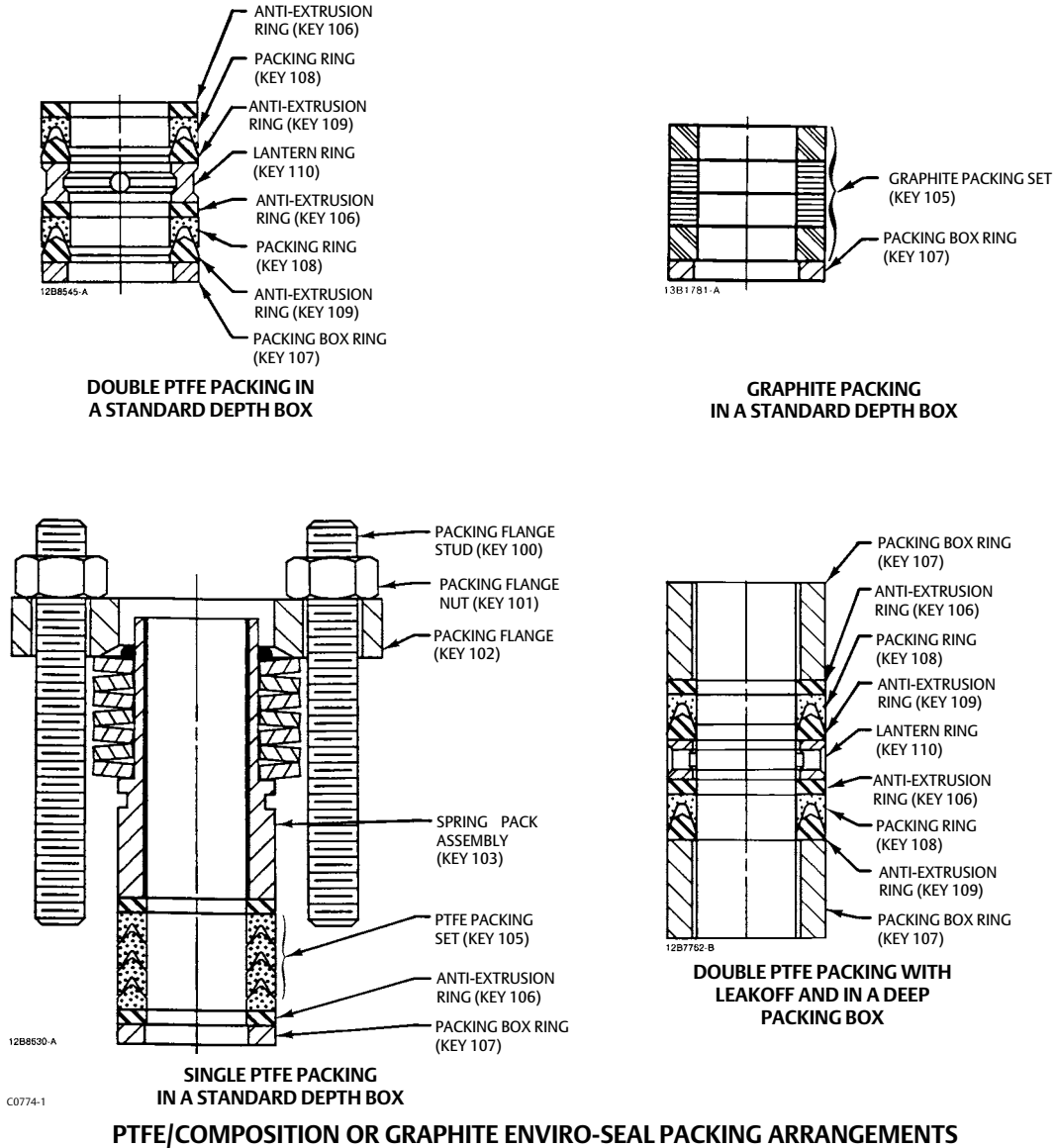
1. Standard Trim
2. Special High Temperature Trim

Figure 4. Packing Arrangements



- NOTES:
- 1 INCLUDES ZINC WASHERS (KEY 28) FOR GRAPHITE RIBBON PACKING ONLY
 - 2 INCLUDED IN PTFE/V-RING PACKING SET (KEY 13).
 - 3 FOR ONLY PTFE/BOUND-COMPOSITION PACKING, TOP RING IS CONDUCTIVE GRAPHITE FILAMENT RING.

Figure 4. Packing Arrangements (continued)



1. Isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. If using a power actuator, also shut-off all pressure lines to the power actuator, release all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
2. Remove line bolting. Then, remove the control valve from the pipeline and place the valve on a flat surface with the retainer (key 5) facing up.

3. Rotate the drive shaft (key 3) to move the ball (key 2) into the open position.

Note

For sizes NPS 3 through 12 the retainer (key 5) was installed at the factory using the torque listed in figure 5.

NOTICE

After performing the following procedures, place the retainer, the seat ring, and both face seals on a protected, flat surface where the threads and sealing surfaces will not be contaminated or damaged.

4. For sizes NPS 3 through 12, remove the retainer (key 5) by engaging the retainer tool, attaching an impact wrench or other suitable tool, and unscrewing the retainer. Inspect the retainer. Place it on a protected, flat surface where the threads and sealing surfaces will not be contaminated or damaged.
5. For sizes NPS 14 through 20, remove the retainer (key 5) by removing each of the four retainer bolts (key 48) and gently lifting it out of the valve body. Inspect the retainer. Place it on a protected, flat surface where the sealing surfaces will not be contaminated or damaged.
6. Remove the retainer gasket (key 11). Inspect the gasket surface in the valve body.
7. Lift out the seat ring (key 4) and both face seals (key 8). Inspect the parts and place them on a flat, protected surface.
8. Inspect the shutoff surface of the V-notch ball. If it is worn, nicked, or scratched, proceed to the Replacing Ball, Shaft, and Bearings procedure in this manual. If the parts are in good condition and do not require replacement, continue to the Assembly procedure in this manual.

Assembly

⚠ WARNING

Seat ring installation requires that the ball (key 2) remain in the open position.

The ball closes with a shearing, cutting motion, which could result in personal injury. To avoid personal injury or damage to tools, valve parts, or other items resulting from the ball closing, prevent against ball travel by using travel stops, manual actuators, constant supply pressure to a pneumatic actuator, or other steps as appropriate. When installing the seat ring, keep hands, tools, and other objects out of the valve.

1. Apply enough supply pressure to the actuator to open the ball, or take other steps to hold the ball open.
2. Clean the valve body, the retainer threads, the retainer gasket surface, and the seat ring sealing surfaces.
3. Using either face seals (key 8) in good condition or new face seals, place one seal in the seat ring cavity of the valve body.

Note

The seat ring (key 4) may have one or two shutoff surfaces. The shutoff surfaces are the narrow, rounded edges of the seat ring bore. Inspect the seat ring and locate the shutoff surfaces before proceeding.

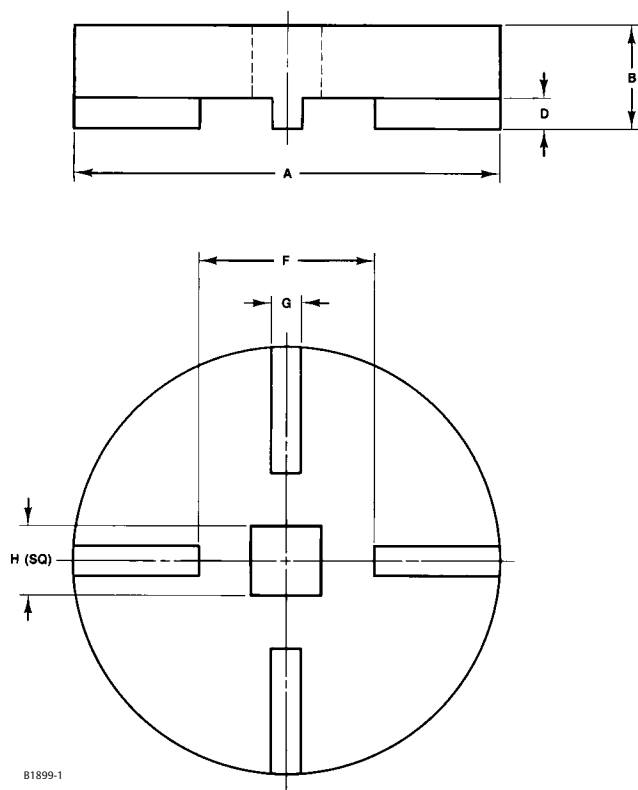
Table 4. Data for Making and Using the Retainer Tool

VALVE SIZE, NPS	A	B	D	F	G	H (SQUARE)	A	B	D	F	G	H (SQUARE)
	mm						Inches					
3	79.2	33.3	7.9	41.4	7.9	19.0	3.12	1.31	.31	1.62	.31	.75
4	104.6	33.3	7.9	41.4	7.9	25.4	4.12	1.31	.31	1.62	.31	1.00
6	155.4	38.1	11.2	63.5	11.2	25.4	6.12	1.50	.44	2.50	.44	1.00
8	203.2	50.8	11.2	101.6	11.2	38.1	8.00	2.00	.44	4.00	.44	1.50
10	241.3	50.8	11.2	127.0	19.1	38.1	9.5	2.00	.44	5.00	.75	1.50
12	273.0	50.8	11.2	127.0	25.4	38.1	10.75	2.00	.44	5.00	1.00	1.50

Table 5. Data for Making and Using the Retainer Tool

VALVE SIZE, NPS	RETAINER TORQUE	
	N•m	Lbf•ft
3	515	380
4	1170	860
6	2305	1700
8	3120	2300
10	4750	3500
12	6100	4500

Figure 5. Data for Making and Using the Retainer Tool



B1899-1

RETAINER TOOL FOR NPS 3 THROUGH 12 VALVES

4. Insert the seat ring into the seat ring cavity with the correct shutoff surface facing the V-notch ball and shaft. The seat ring will cover the face seal installed in step 3.
5. Place the second face seal (key 8) on the seat ring (key 4).
6. Apply anti-seize lubricant to the gasket surface in the valve body. Install the gasket (key 11), while making certain that the concave surface of the gasket is up (hump surface of gasket down).
7. For valve sizes NPS 3 through 12
 - a. Apply anti-seize lubricant to the gasket surface in the valve body. Install the gasket (key 11), while making certain that the concave surface of the gasket is up (hump surface of gasket down).
 - b. Apply anti-seize lubricant to the threads and bottom of the retainer (key 5) only in the area that contacts the gasket. Thread the retainer into the valve body till it begins to compress the face seals.
 - c. Insert a screwdriver, pry bar, or similar tool between the lower ear of the ball and the valve body. Use the pry to move the ball tightly against the thrust washer and bearing stop (key 7) on the actuator side of the valve.
 - d. Rotate the drive shaft to move the ball till it contacts and centers the seat ring. Once the seat ring is centered return ball to the open position.
 - e. Refer to table 5. Find the correct retainer torque for the valve size. With the appropriate tool, tighten the retainer to the torque listed in table 5.
 - f. A gap between the seat ring (key 4) and retainer (key 5) allows the seat ring to self-center. Applying the proper amount of torque during installation should position the retainer and seat ring properly. Use a feeler gage to measure between the parts as shown in figures 9 and 10, making certain the necessary clearance exists. Compare the measured gap to the clearance in table 4.
 - g. If the measured clearance is within the values specified in table 4, proceed to the next step.
 - If the measured gap is larger than the maximum, tighten the retainer--apply more torque than that listed in figure 5, if necessary, until the clearance is within the maximum and minimum values.
 - If the measured clearance is smaller than the minimum, remove the retainer, seat ring, and face seals, clean the parts, and reassemble so as to obtain the necessary minimum clearance.
 - h. Perform the Adjusting Actuator Travel procedure in this manual (pg. 22) and then install the control valve in the pipeline.
8. For valve sizes NPS 14 through 20
 - a. Prior to Actuator Travel Adjustment procedure:

Note

For valve sizes NPS 14, 16, and 20 the retainer gasket (key 11) should not be installed for the Actuator Travel Adjustment procedure.

- Gently lower the retainer (key 5) into the valve body, while making certain that the countersunk bolt holes line up with threaded holes in the body.
- Lubricate and install the retainer bolts (key 48) and torque them to 32 in • lbf (3.6 N • m).
- Perform the Actuator Travel Adjustment procedure in this manual.

b. Post Actuator Travel Adjustment procedure:

- Remove the retainer bolts (key 48) and retainer (key 5) from the valve body.

▲ WARNING

To avoid personal injury from process fluid leakage, the retainer gasket must be installed prior to installation of the valve in the pipeline.

- Install the retainer gasket (key 11) into the groove in the valve body.
- Gently lower the retainer (key 5) into the valve body, while making certain that the countersunk bolt holes line up with threaded holes in the body.
- Lubricate and install the retainer bolts (key 48) and torque them to 32 in • lbf (3.6 N • m).

Replacing Ball, Shaft, and Bearings

Perform this procedure to replace the ball (key 2), expansion pin (key 9), taper pin (key 10), drive shaft (key 3), follower shaft (key 38), groove pins (key 39), or bearings (keys 6 and 42). These parts are independently replaceable; for example, installing a new ball does not require replacing a reusable valve shaft or expansion pin assembly. For key numbers refer to figure 10 for NPS 3 through 8, figure 11 for NPS 10 and 12, and figure 12 for NPS 14 through 20, unless otherwise indicated.

Disassembly

▲ WARNING

To avoid personal injury resulting from contact with edges of the V-notch ball (key 2) and seat ring (key 4) during ball rotation, stay clear of its edges when rotating the ball. To avoid damage to tools, valve parts, or other items resulting from V-notch ball rotation, keep tools and other property away from the edges of the ball.

The ball closes with a shearing, cutting motion, which could result in personal injury. When the actuator is removed from the valve, the ball/shaft assembly may suddenly rotate, resulting in personal injury or property damage. To avoid injury or damage, carefully rotate the ball/shaft assembly to a stable position in the valve body after the actuator is disconnected.

NOTICE

To avoid increased leakage, increased valve component wear or possible damage to the valve body (key 1), ball (key 2), drive shaft (key 3), follower shaft (key 38), and bearings (keys 6 and 42) resulting from a sharp blow to the actuator or valve parts, use a wheel puller to separate the actuator parts from the valve drive shaft.

Do not drive the actuator parts off the valve drive shaft since this could move the valve bearings, shafts, and ball away from proper alignment, causing improper seating of the ball. Such misalignment may result in damage to valve components if the valve is returned to service without disassembly and inspection of the ball alignment.

▲ 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. If using a power actuator, also shut-off all pressure lines to the power actuator, release all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
2. Remove the actuator cover. Note the actuator orientation with respect to the valve body and the lever orientation with respect to the valve drive shaft (see figure 2). Remove the lever but do not loosen the actuator turnbuckle adjustment. Remove the actuator mounting screws and nuts, and remove the actuator. If necessary, refer to the actuator instruction manual for assistance.
3. With the valve body (key 1) out of the pipeline, loosen the packing nuts (key 16). If the packing is to be reused, do not remove it. However, Emerson recommends that the packing be replaced whenever the drive shaft is removed.

Table 6. Data for Tapped Holes on Valve Shaft

VALVE SIZE, NPS	SHAFT DIAMETER				THREAD SIZE, UNC
	Through Valve	At Spline End	Through Valve	At Spline End	
	mm		Inches		
3	25.4	25.4	1.00	1.00	3/8-16
	25.4	19.1	1.00	0.75	5/16-18
4	31.8	31.8	1.25	1.25	3/8-16
6	38.1	38.1	1.50	1.50	1/2-13
	38.1	31.8	1.50	1.25	3/8-16
8	38.1	38.1	1.50	1.50	1/2-13
10	44.5	44.5	1.75	1.75	1/2-13
12	53.8	53.8	2.12	2.12	3/4-10
	53.8	50.8	2.12	2.00	
14	53.8	52.3	2.12	2.06	3/4-10
16	76.2	73	3	2.87	3/4-10
20	76.2	73	3	2.87	3/4-10

4. Rotate the V-notch ball (key 2) to the fully open position.
5. Drive out the groove pin (key 39) that secures the ball (key 2) to the follower shaft (key 38). Remove the groove pin from the ball ear in the direction shown in figure 6.
6. For NPS 3 through 8, refer to figure 6. The expansion pin (key 9) and the taper pin (key 10) inside of it are holding the ball in position on the drive shaft. Find the larger hole in the ball ear where these pins enter the ear. On the opposite side of the ear is a smaller hole where the chamfered end of the expansion pin rests on the inner lip of the hole.
7. For NPS 10 through 20, drive out the groove pin from the drive shaft (key 3) in the direction shown in figure 6.
8. For NPS 3 through 8, remove the pipe plug (key 29). Using a punch, drive the follower shaft (key 38) into the center of the ball (key 2). Use care to avoid dropping the follower shaft.
9. For NPS 10 through 20, remove the hex nuts (key 44), and then remove the bottom flange (key 40). Thread a bolt into the end of the follower shaft and pull the follower shaft out of the valve. Refer to table 6 for thread sizes. The bearing (key 6) may come out with the follower shaft. For NPS 14 through 20 the follower shaft can alternatively be pushed out into the into the center of the ball.

Note

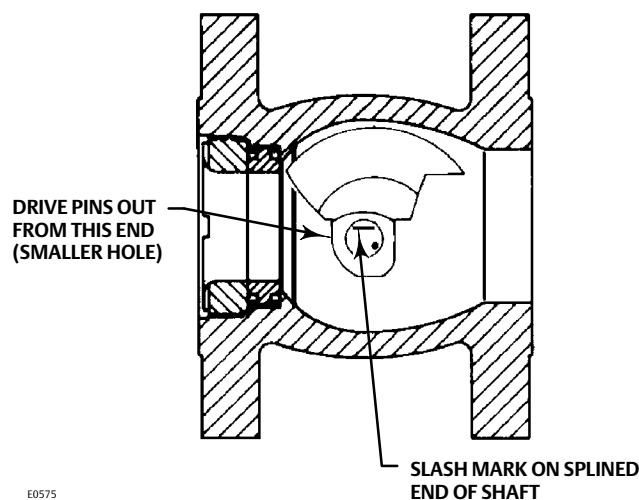
For the NPS 14 through 20 if the valve is mounted with the shaft vertical relative to the ground a spring (key 54), two spring seats (key 53), and a thrust washer (key 55) will also be removed with the follower shaft ones the bottom flange has been unbolted.

⚠ WARNING

To avoid personal injury or damage to tools, valve parts, or other items resulting from the ball (key 2) falling from the valve body, support the ball to prevent it from falling as the drive shaft (key 3) is being removed.

10. Pull the drive shaft (key 3) from the valve body. If the shaft cannot be removed by hand, attach a slide hammer or similar tool to the spline end of the shaft that was attached to the actuator. If the shaft has a tapped hole at the spline end of the shaft, refer to table 6 for thread sizes.
11. Remove the ball (key 2), and thrust washers (key 12) from the valve body. For sizes NPS 3 through 12, if using 17-7PH thrust washers there will be two, if using alloy 6 there will only be one thrust washer.

Figure 6. Taper and Expansion Pin Removal from Ball and Drive Shaft



E0575

Note

For NPS 3 through 8, two shaft bearings (key 6) are located inside the valve body on either side of the ball. Only one of these two bearings is identified by key 6. The other bearing is located along the drive shaft on the other side of the V-notch ball.

For NPS 10 through 20, there are two shaft bearings. One is identified as key 6, and the other is identified as key 42.

12. If the shaft bearings are to be replaced, remove the packing (key 13).
13. If the bearing closest to the packing (key 6 on NPS 3 through 8 and key 42 on NPS 10 and 12) requires replacement and cannot be removed by hand, press it out using a ram with dimensions as given in figure 7.

For valve sizes NPS 3 through 12, the ram has a smaller diameter than the bearing stop (key 7) so the bearing stop need not be removed when pressing out the bearing on the drive shaft. Insert the ram through the packing box and press the bearing into the valve body cavity. Take care not to move the bearing stop when pressing out the bearing.

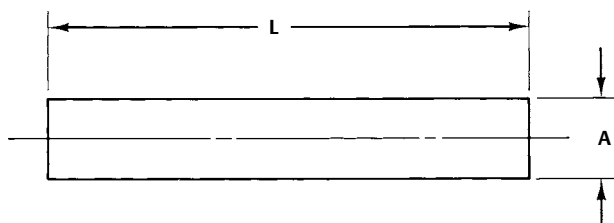
14. For valve sizes NPS 3 through 8, if the second bearing (key 6) requires replacement and cannot be removed by hand, use one of the following methods:
 - a. Knock or pry the bearing out, or

- b. Use the valve drive shaft as a piston to drive the bearing from the valve body. To accomplish this, install the pipe plug (key 29). Fill the bearing bore with a heavy grease and then insert the end of the shaft back through the valve body and into the grease-filled bearing. Protect the splined end of the shaft with, for example, a block of wood; then strike the protected end. When the shaft is struck, it will act as a piston, pushing the grease into the bearing bore. The grease will then force the bearing out of the bore and farther along the shaft. Soon, the bearing will be positioned for easy removal.
15. For NPS 10 through 20, if the bearing (key 6) on the follower shaft requires replacement and cannot be removed by hand, press it out using a ram with dimensions as given in figure 7. Press the bearing into the valve body cavity. Alternatively, for sizes NPS 14 through 20 the follower shaft (key 38) can be used to pull the bearing out by attaching a slide hammer or similar tool to the threaded hole in the bottom. Refer to table 6 for thread size.
16. If used, remove the O-rings (keys 19 and 20) from the bearings.

Table 7. Ram Dimension for Bearing Removal

VALVE SIZE, NPS	A		L	
	mm	Inches	mm	Inches
3	27.8	1.094	165	6.50
	27.4	1.078		
4	34.1	1.344	165	6.50
	33.7	1.328		
6	42.1	1.656	197	7.75
	41.7	1.641		
8	42.1	1.656	229	9.00
	41.7	1.641		
10	48.4	1.905	229	9.00
	48.0	1.890		
12	57.8	2.275	260	10.25
	57.4	2.260		
14	62.5	2.46	228.6	9
	57.4	2.26		
16	84.5	3.325	279.4	11
	79.6	3.135		
20	84.5	3.325	279.4	11
	79.6	3.135		

Figure 7. Ram Dimension for Bearing Removal



A3308

Assembly

Note

Before starting to assemble the valve components, place the valve body (key 1) on a flat surface with the retainer (key 5) facing down as shown in figure 8. This orientation of the valve allows easier installation of the V-notch ball.

1. Thoroughly clean the parts before assembly.
2. If O-rings (keys 19 and 20) are used on the bearings, apply a small amount of lubricant to the O-rings so the bearings will easily slide into the valve body. Insert the smaller O-ring (key 20) inside the bearing and the larger O-ring (key 19) around the outside of the bearing.

NOTICE

To avoid damage to O-rings resulting from contact with sharp edges within the bearing holes, use appropriate care when installing the O-rings.

3. Slide the bearing (key 6) and, if used, O-rings (keys 19 and 20) into the follower shaft bore located on the valve body (key 1) opposite the packing box. For NPS 10 and 12, make certain the groove located on the outside diameter of the bearing is positioned towards the bottom flange side of the valve body.
4. Slide the bearing located on the packing box side (key 6 for NPS 3 through 8 and key 42 for NPS 10 through 20) into the valve body and against the bearing stop.
5. For NPS 3 through 8, inspect the drive shaft (key 3). Insert the shaft end with the expansion or groove pin hole into the packing box and through the bearing that was previously installed in the packing box in step 4. Stop before the drive shaft enters the main valve body cavity. Support the splined or keyed end of the shaft.

For NPS 10 and 12, inspect the drive shaft (key 3). Insert the splined shaft end with the groove pin hole into the packing box and through the bearing that was previously installed in step 4. Stop before the drive shaft enters the main valve body cavity. Support the end of the drive shaft that extends out from the valve body.

6. For NPS 3 and 4, insert the follower shaft through the outside of the ear of the V-notch ball that has the smaller diameter (non-stepped) hole. Push the follower shaft through the ear until the end of the follower shaft with the groove pin hole is between the ears and the other end of the follower shaft is flush with the outside edge of the ear. Place the ball in the valve body cavity with the ear containing the follower shaft adjacent to the follower shaft bore. Slide the follower shaft through the ear of the ball and into the bearing (key 6) which was previously installed in step 3.

For NPS 6 and 8, locate the smaller diameter hole in the V-notch ball ear. Place the ball in the valve body cavity with the ear containing the smaller diameter hole adjacent to the follower shaft bore. Place the follower shaft between the ears of the ball. Slide the follower shaft through the ear of ball and into the bearing (key 6) that was previously installed in step 3.

For NPS 10 and 12, place the ball in the valve body cavity. Slide the follower shaft, splined end first, through the bearing (key 6) that was previously installed in step 3, and into the ear of the ball. Align the groove pin hole in the follower shaft with the hole in the ball ear.

For NPS 14 through 20, place the thrust washer (key 12) in the groove on the drive ear of the V-notch ball using anti seize lubricant to hold in place if needed. Place the ball in the valve body cavity with the splined V-notch ball ear on the packing box side of the body. Slide the follower shaft through the ear of the ball and into the follower bearing (key 6) installed in step 3. Align the groove pin hole in the follower shaft with the hole in the V-notch ball ear.

7. For NPS 3 through 8, position the ball so that the larger of the two expansion pin holes is facing up, away from the seat ring and retainer. Determine the correct orientation of the V-notch ball (key 2) required by the specific installation orientation of the valve and the flow direction of the process fluid. See figure 2.

For NPS 10 through 20, determine the correct orientation of the V-notch ball (key 2) required by the specific installation orientation of the valve and the flow direction of the process fluid. See figure 2. The groove pin hole in both the drive shaft (key 3) and the ear of the ball are offset from center. Make certain the holes will align.

Note

Before proceeding, inspect the V-notch ball position once again to ensure the correct orientation. If the ball is not properly installed, it will not rotate properly and will not shutoff in service.

- For NPS 3 through 12, Hold the thrust washer (key 12) between the ball (key 2) and the bearing installed next to the packing (key 6 for NPS 3 through 8 and key 42 for NPS 10 and 12).

Note

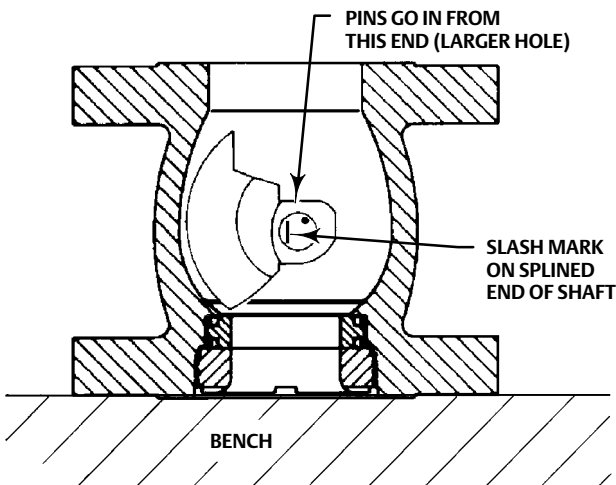
To obtain the correct thickness, two thrust washers (key 12) are needed when using 17-7PH or a single 17-4PH for the NPS 14 through 20. When using alloy 6, only one thrust washer is needed to get the correct thickness.

For NPS 10 through 20, align the zero mark located on the end of the drive shaft with the zero mark located on the ball ear.

Slide the valve drive shaft (key 3) from the packing box into the valve body through the thrust washer and into the ear of the ball. The expansion or groove pin hole in both the drive shaft (key 3) and the ear of the vee-ball are offset from center. Make certain the holes will align.

- For NPS 3 through 8, secure the ball in the correct open position. Locate the slash mark on the actuator end of the valve drive shaft. Rotate the drive shaft until the slash mark is vertical and facing out from the center of the shaft in the same direction as the ball seating surface. See figure 8.

Figure 8. Taper and Expansion Pin Insertion into Ball and Drive Shaft



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Note

When the valve drive shaft is correctly positioned for NPS 3 through 8, the slash mark on the splined end will be parallel with the ball shutoff surface. See figure 8. If the ball is not properly aligned with the slash mark, the valve will not function correctly.

Step 9 is not required for NPS 10 through 20 because the drive shaft and the ear of the ball are both splined and were aligned in step 8.

10. Secure the ball to the follower shaft by aligning the groove pin hole in the ball ear and the hole on the opposite side of this ear with the groove pin hole through the follower shaft (key 38).
11. Use pin punches to drive in the groove pin until it is flush with the surface of the ball ear. Stake both ends of the pin hole in the ball ear to retain the pin during this step.
12. Secure the ball to the drive shaft (key 3) as follows:
 - For NPS 3 through 8:
 - c. The holes in both the drive shaft (key 3) and the ear of the ball are offset from center. Make certain the holes in the ear of the ball will align with the hole in the drive shaft.

Note

If the holes in the ball ear do not line up with the hole in the drive shaft, check the slash mark on the splined end of the shaft. Make sure the shaft and ball are properly oriented.

- d. Place the chamfered end of the expansion pin (key 9) into the larger hole in the ball ear (see figure 8).

NOTICE

To avoid damage to the expansion pin, ball, or drive shaft resulting from the application of excessive force on the expansion pin, use appropriate care when driving the expansion pin through the ball and drive shaft. Use the correct tool. Do not use excessive force.

- e. Drive the expansion pin into the larger hole until the chamfered end of the pin reaches the inner lip of the smaller hole on the opposite side of the ball. Closely observe the progress of the pin to avoid striking it after it has reached the lip of the smaller hole.
- f. Place the taper pin (key 10) into the open end of the expansion pin. Drive the taper pin into the expansion pin until the pins, ball, and drive shaft are snug. Do not attempt to drive either pin flush with the ear.

For NPS 10 through 20, the groove pin holes in both the drive shaft (key 3) and the ear of the ball are offset from center and have spline ridges. Make certain the holes in the ear of the ball will align with the hole in the drive shaft. Secure the ball to the drive shaft by using pin punches and driving in the groove pin until it is flush with the surface of the ball ear. Make certain that the groove pin goes completely through the drive shaft and into the opposite side of the ball ear.
13. Rotate the ball by hand to check that it rotates properly. If rotation interferes with the valve body, drive out the taper and expansion pins (keys 9 and 10) for NPS 3 through 8 and the groove pin (key 39) that fastens the drive shaft to the ball for NPS 10 and 12. Remove the drive shaft (key 3), and repeat this procedure starting with step 5.
14. For NPS 3 through 8, install the pipe plug (key 29).
15. For NPS 14 through 20, if the valve has a vertical mounting spring (key 54) then install a spring seat (key 53) into the follower shaft as shown in figure 13 followed by the spring (key 54) and another spring seat (key 53) and finally the thrust washer (key 55) can sit in the bottom flange (key 40) groove.

- For NPS 10 through 20, lubricate the bottom flange studs (key 43) and hex nuts (key 43) with appropriate anti-seize lubricant. Install the bottom flange studs (key 43), gasket (key 41), bottom flange (key 40), and then install and tighten the hex nuts (key 44) using accepted bolting procedures. See table 8 for torque values. Make sure the pipe plug (key 29) is installed in the bottom flange if applicable.

Table 8. NPS 10 through 20 Torque Levels

VALVE SIZE, NPS	TORQUE		STUD SIZE
	N•m	Lbf•ft	
10	141	104	9/16-12
12	176	130	5/8-11
14	442	325	7/8-9
16			
20			

- If the seat ring (key 4), face seals (key 8), and retainer (key 5) need to be installed, complete the Assembly portion of the Replacing Retainer, Seat Ring, and Face Seals procedure in this manual. If the seat ring has previously been installed, proceed to Adjusting Actuator Travel in this manual. If the packing has been removed, be sure to refer to the Packing Maintenance procedures in this manual to replace the packing before installing the actuator on the valve.

Cavitrol Hex Replacement

Disassembly

⚠ WARNING

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

- Isolate the control valve from line pressure, drain the process media from both sides of the valve, and remove the control valve/actuator assembly from the pipeline as described in the replacing retainer, seat ring, and face seals section.
- Place the valve on a protected flat surface with the body outlet flange facing up.
- Refer to figures 15 and 16. Remove the two fasteners (key 48) securing the Cavitrol Hex trim to the valve body.

⚠ WARNING

To avoid personal injury or property damage, do not use the two threaded lifting holes provided in the NPS 8 through NPS 12 Cavitrol Hex trim to lift the complete valve assembly. The two threaded holes are sized for lifting the Cavitrol Hex trim only.

All lifting and rigging must be completed in accordance with federal/national/provincial, state and local regulations, and applicable lifting and rigging equipment standards. Lifting and rigging equipment used to lift, install, or remove the Cavitrol Hex trim must be properly selected and sized for the weight of the component. The weights of the Cavitrol Hex trim are provided in table 9.

- For sizes NPS 8 through NPS 12, install hoist rings or other appropriate lifting equipment into the two 3/8"-16 threaded holes in the Cavitrol Hex flange.
- Remove the Cavitrol Hex trim (key 49) and place on a protected flat surface.
- Remove gasket (key 50) from the valve body outlet flange.

Assembly

The Cavitrol Hex anti-cavitation trim (key 49) is available for the NPS 4 through NPS 12 CV500 with raised-face flanged body constructions. To retrofit the Cavitrol Hex to an existing valve assembly, special body machining is required. Two threaded holes must be added to the valve body outlet flange. Contact your [Emerson sales office](#) for retrofit information.

Note

The Cavitrol Hex anti-cavitation trim will add 12.7 mm (1/2-inch) to the face to face dimension of the valve.

1. The Cavitrol Hex anti-cavitation trim (key 49) is to be installed last, after the CV500 valve body assembly is complete. The recommended valve orientation for assembly is with the body outlet flange facing up. Refer to figures 15 and 16.
2. Ensure the ball is in the open position.
3. Place the gasket (key 50) over the body outlet flange serrated surface as illustrated in figure 15.
4. For sizes NPS 8 through NPS 12, install hoist rings or other appropriate lifting equipment into the two 3/8"-16 threaded holes in the Cavitrol Hex flange.

Table 9. Fisher Cavitrol Hex Dimensions and Weight

VALVE SIZE	FLANGE THICKNESS C (ADD TO OVERALL FACE-TO-FACE DIMENSION)		WEIGHT	
	NPS	mm	Inch	kg
4	12.7	0.5	3.3	7.3
6	12.7	0.5	7.8	17.3
8	12.7	0.5	12.8	28.3
10	12.7	0.5	24.0	53.1
12	12.7	0.5	35.7	78.8

5. Insert the Cavitrol Hex anti-cavitation trim into the valve, ensuring the holes in the body outlet flange align with the holes in the trim flange. If applicable, remove the lifting equipment used to install Cavitrol Hex trim.
6. Install two fasteners (key 48) and adequately tighten to secure the trim to the valve assembly.

Adjusting Actuator Travel

Note

For valve sizes NPS 14 through 20 this procedure should be done without the retainer gasket installed.

For valve sizes NPS 14 through 20 ordered without an actuator a temporary zero mark will exist on the shaft (key 3) and packing flange (key 102). The closed position of the valve is achieved when the two marks are aligned, and the actuator travel stops can be adjusted accordingly.

The temporary marks indicating the closed position on sizes NPS 14 through 20 ordered without an actuator are only to be used when setting the travel stops on the actuator for the first time. The marks should be removed after.

Perform this procedure whenever the actuator is removed or disconnected from the valve and whenever the seat ring and retainer (keys 4 and 5) are removed. Too little actuator travel will increase shutoff leakage; too much travel will cause excessive ball and seat ring torque and wear.

Any of the Fisher pneumatic, electric, electrohydraulic, or manual actuators--or any other actuator--must be adjusted for use with a CV500 valve so that the ball is rotated to the fully closed position. For sizes NPS 3 through 12, a gap of approximately 0.0254 mm (0.001 inch) for temperatures to 260°C (500°F) or 0.1524 mm (0.006 inch) for higher temperatures measured between the seat ring (key 5) and retainer (key 4) indicates the fully closed position. For sizes 14 through 20, a gap of approximately 0.0254 mm (0.001 inch) is applicable for the entire temperature range of the product.

Note that this gap is also measured when assembling the seat ring, retainer, and face seals to ensure correct assembly. Measure the gap according to this procedure to ensure proper actuator adjustment. Merely completing the assembly measurement is not sufficient.

Travel adjustments vary with the type of actuator (some use turnbuckle assemblies; some use externally adjusted travel stops; others use internal limit switches). Refer to the actuator instruction manual for adjustment instructions.

Note

When mounting the actuator, be sure the ball (key 2) is closed. Do not use a hammer or other tool to drive the actuator lever onto the valve shaft. Clean the valve shaft and actuator lever splines to be sure the actuator lever will slide on easily.

If the lever does not slide on easily, carefully wedge the ball solidly against the actuator-side thrust washer using a screw driver or similar tool in the same location as the pry bar in the installation. Keep the wedge in place while installing the lever, but again, do not drive on the lever.

Remove the wedge after you have clamped the actuator lever on the valve shaft and connected the lever to the actuator piston rod or diaphragm rod.

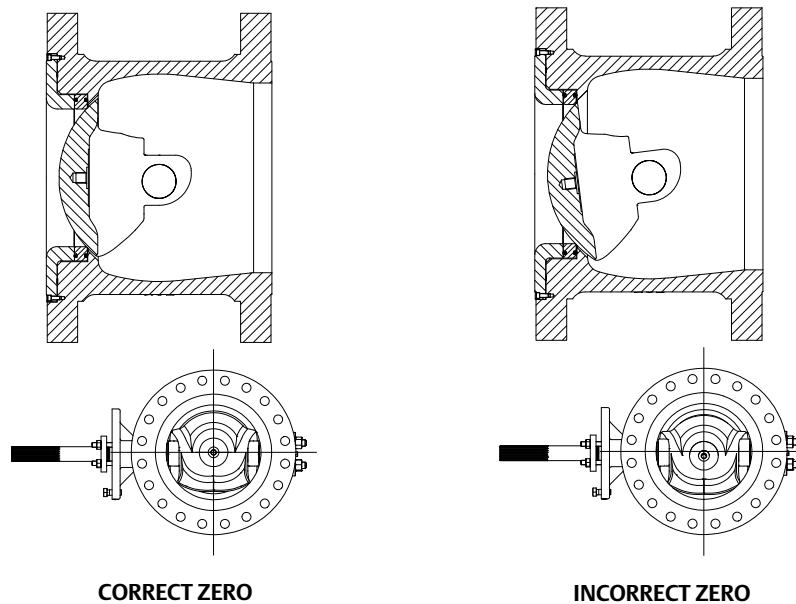
1. Mount the actuator following the instructions in the actuator instruction manual. Refer to figure 2 to select actuator mounting style and position and to orient the actuator lever with the valve drive shaft (key 3).
2. For actuators with clamped levers, pull the drive shaft (key 3) by hand toward the packing (key 13) so that the ball (key 2) and thrust washer (key 12) are tight against the bearing closest to the packing (key 6 for NPS 3 through 8 and key 42 for NPS 10 and 12). Clamp the lever to the valve drive shaft.

NOTICE

Do not apply full actuator signal (pressure or power) to the actuator in the next step. A full signal may wedge the ball into the seat ring. Use a regulated signal source and gradually increase the signal to slowly stroke the actuator.

3. Adjust the actuator travel and stroke the actuator so that the ball is close to but not contacting the seat ring at full actuator travel. If available on electric actuators, use the manual handwheel to position the plug.
4. Adjust the travel, using a full actuator signal, until the ball contacts the seat ring around its full circumference. This contact self-centers the seat ring on the V-notch ball.
5. Continue to adjust the travel until a gap of approximately 0.0254 mm (0.001 inch) exists between the seat ring and retainer, as shown in figure 11, at full actuator travel.
6. Refer to the actuator instruction manual to lock the actuator travel adjustment.
7. For valve sizes NPS 14 through 20, refer to the Assembly procedure of the Replacing Retainer, Seat Ring, and Face Seals section in this manual prior to installing the valve in line.
8. After Zeroing the actuator verify that the seat is not visible when looking at the back face of the vee ball. If it is visible remove the retainer cap screws and retainer and repeat the zeroing procedure and ensure that the retainer cap screws are torqued to 32 in • lbf (3.6 N • m). See figure 9 showing a correctly zeroed valve vs an incorrectly zeroed valve with the seat ring visible.

Figure 9. Zeroing the Actuator



Changing Valve Flow Direction

The CV500 valve may be installed in either forward or reverse flow service. Standard flow direction is forward flow enters the seat ring first, then flows past the V-notch ball. If Cavitrol Hex trim is installed, the valve should be used in the forward flow direction for the anti-cavitation trim to be most effective. If changing flow direction is necessary, release all pressure from the valve and actuator. Remove the control valve assembly from the pipeline and rotate the assembly about the valve drive shaft to put the retainer end of the valve where the other end was. Refer to the procedure for changing actuator mounting style if the actuator must be repositioned, and refer to the installation section to install the control valve assembly. Be sure to reposition the flow direction arrow on the valve.

Changing Actuator Mounting Style

Refer to figure 2 of this manual and the actuator instruction manual when changing mounting styles or positions. Right-hand mounting places the actuator on the right side of the valve as viewed from the upstream side of the valve; left-hand mounting places the actuator on the left side of the valve. Remember that the upstream side of the valve inlet is the retainer end of the valve body for forward flow and the other end of the valve body is the upstream side for reverse flow.

Complete the Adjusting Actuator Travel procedure in this manual whenever the actuator is removed.

Parts Ordering

A serial number is assigned to each valve body and stamped on the nameplate. Always refer to this serial number when corresponding with your [Emerson sales office](#) regarding spare parts or technical information.

⚠ WARNING

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

Parts Kits

Repair Kits

Repair kits include recommended spares for standard and sealed bearing constructions.

VALVE SIZE, NPS		REPAIR KIT NUMBER
3		RV500X00042
4		RV500X00052
6		RV500X00062
8		RV500X00072
Parts Included in Kits		Quantity in Kit
Key Number	Description	
9	Expansion pin	1
10	Taper pin	1
11	Retainer gasket	1
19	O-ring (sealed bearing only)	2
20	O-ring (sealed bearing only)	2

Retrofit Kits for ENVIRO-SEAL Packing

Retrofit kits include parts to convert existing CV500 valves with single depth packing box to the ENVIRO-SEAL packing box construction. Retrofit kits include single PTFE or graphite packing box construction (see the following table).

VALVE SIZE, NPS	SHAFT DIAMETER		PART NUMBER	
	mm	Inches	Single PTFE	Graphite
3	25.4	1	RRTYXRT0052	RRTYXRT0352
4	31.8	1-1/4	RRTYXRT0062	RRTYXRT0362
6 & 8	38.1	1-1/2	RRTYXRT0072	RRTYXRT0372
10	44.5	1-3/4	RRTYXRT0682	RRTYXRT0822
12 & 14	53.8	2-1/8	RRTYXRT0722	RRTYXRT0862
16 & 20	76.2	3	RRTYX000272	13B8816X212

Parts Included in Kits			Quantity in Kit	
Key	Description		Single PTFE	Graphite
100	Packing Stud	Packing Stud	2	2
101	Packing Nut	Packing Nut	2	2
102	Packing Flange	Packing Flange	1	1
103	Spring Pack Assembly	Spring Pack Assembly	1	1
105	Packing Set	Packing Set	1	1
106	Anti-Extrusion Washer	Anti-Extrusion Washer	2	---
107	Packing Box Ring	Packing Box Ring	1	1

Repair Kits for ENVIRO-SEAL Packing

Packing boxes in these valves may be deep drilled. If the valve body being repaired has a deep packing box, additional parts are required. Refer to the Packing Maintenance section in this manual.

VALVE SIZE, NPS	SHAFT DIAMETER		PART NUMBER	
	mm	Inches	PTFE	Graphite
3	25.4	1	RRTYX000052	13B8816X092
4	31.8	1-1/4	RRTYX000062	13B8816X112
6 & 8	38.1	1-1/2	RRTYX000072	13B8816X142
10 ⁽¹⁾	44.5	1-3/4	RRTYX000232	13B8816X152
12 & 14 ⁽¹⁾	53.8	2-1/8	RRTYX000252	13B8816X182
16 & 20	76.2	3	---	---
Parts Included in Kits			Quantity in Kit	
Key Number	Description			
105	Packing Set	Packing Set	1	1
106	Anti-Extrusion Washer	Anti-Extrusion Washer	2	---(2)

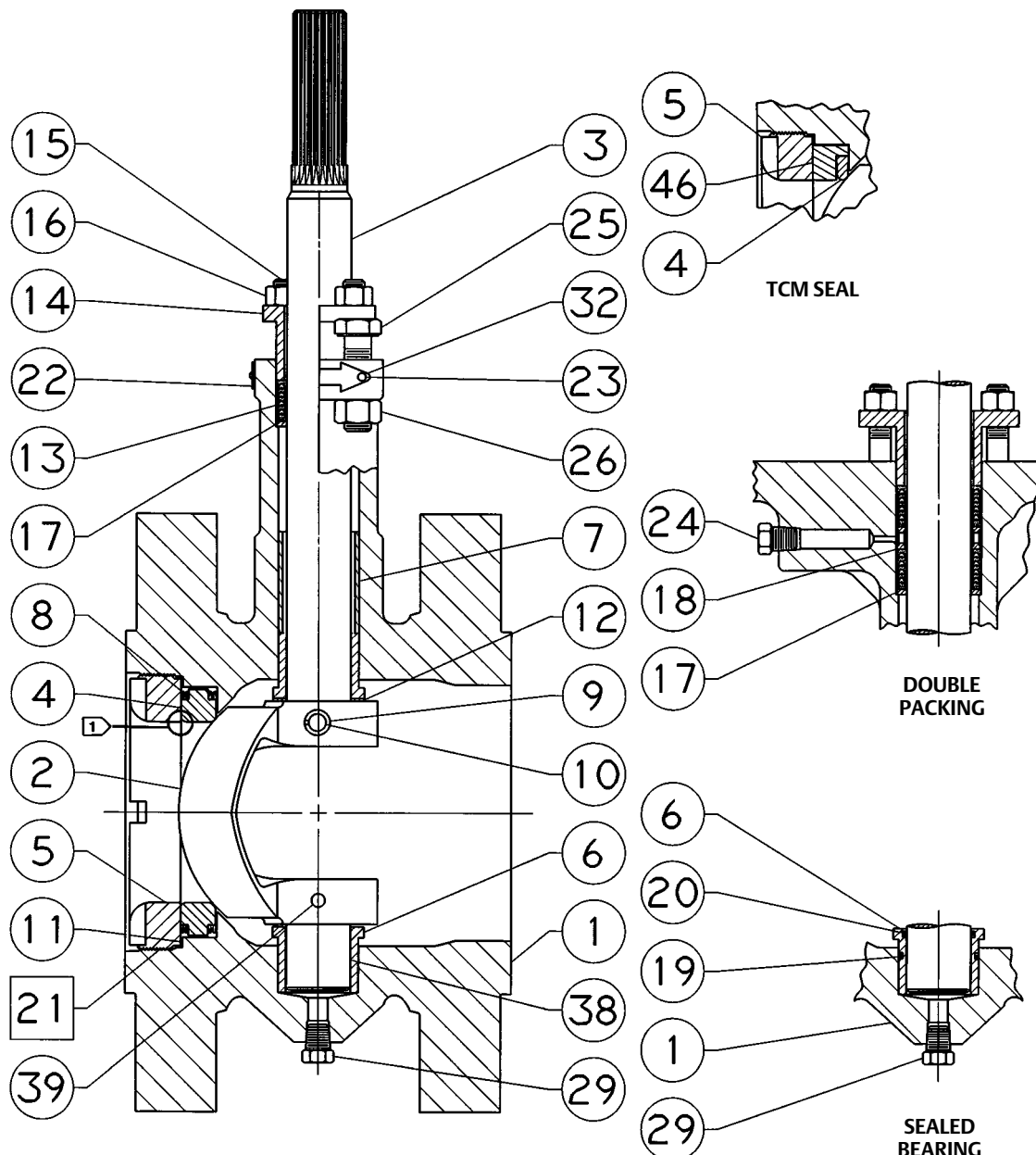
1. Order individual parts from the Parts List.
2. Included in packing set key 105.

Cavitrol Hex Retrofit Kit

Kit includes the Cavitrol Hex (key 47), gasket (key 48), and fasteners (key 46). Kits are available for the NPS 4 through 12 CV500 flanged, raised-face body constructions. To retrofit the Cavitrol Hex anti-cavitation trim to an existing valve assembly, special body machining is required. Two threaded holes must be added to the valve body outlet flange. Contact your [Emerson sales office](#) for retrofit information.

VALVE SIZE, NPS	MATERIAL	
	S31603 (316L)	R31233 (Cobalt Alloy)
	KIT PART NUMBER	
4	RCAVHEX0242	RCAVHEX0252
6	RCAVHEX0162	RCAVHEX0172
8	RCAVHEX0182	RCAVHEX0192
10	RCAVHEX0202	RCAVHEX0212
12	RCAVHEX0222	RCAVHEX0232

Figure 10. Fisher CV500 Valve, NPS 3 Through 8

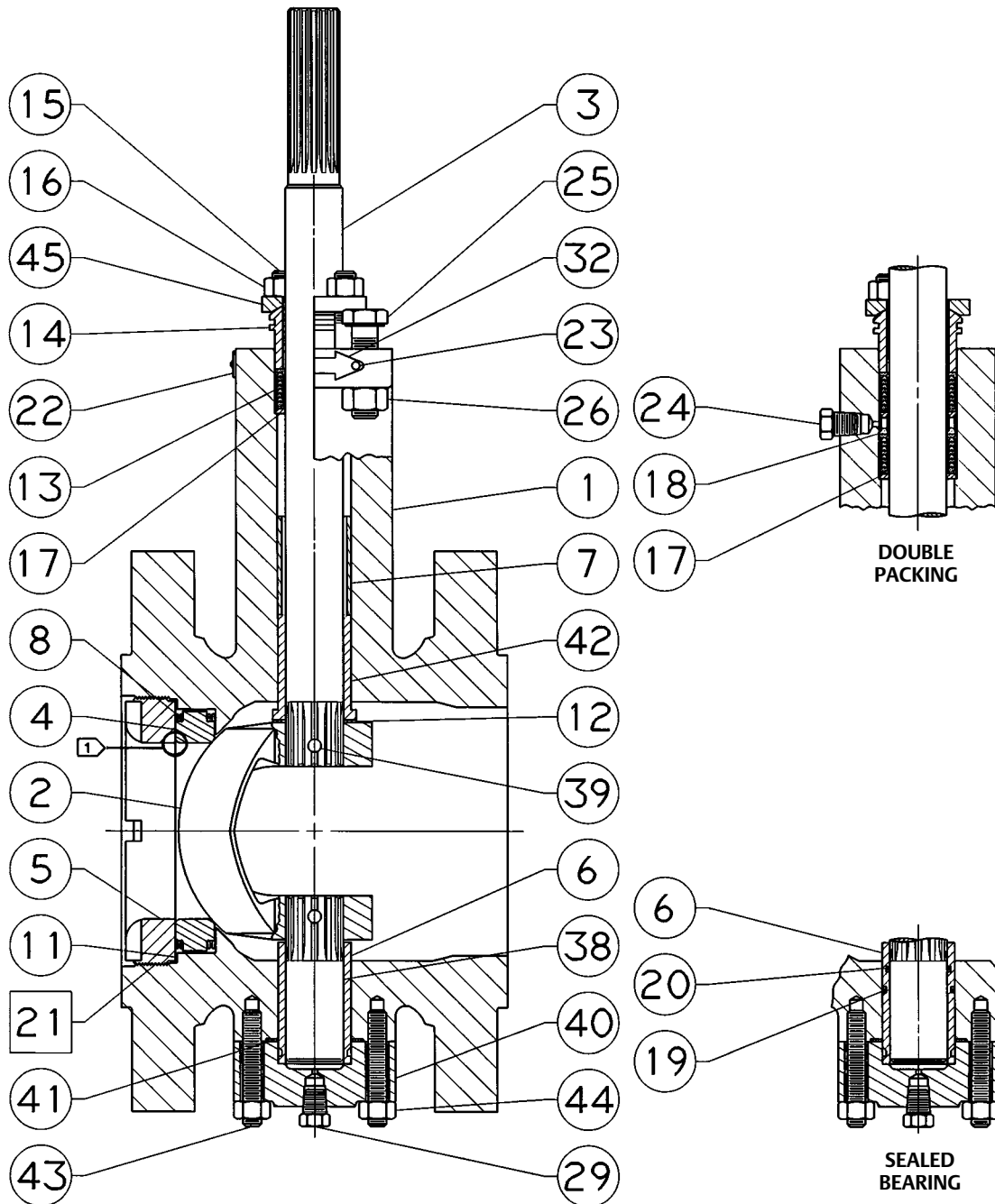


□ APPLY LUB
 KEY NUMBERS NOT SHOWN ARE 28, 30, 31, 33, 36, 37, 130, AND 131

NOTE:
 1 → MEASURE GAP HERE

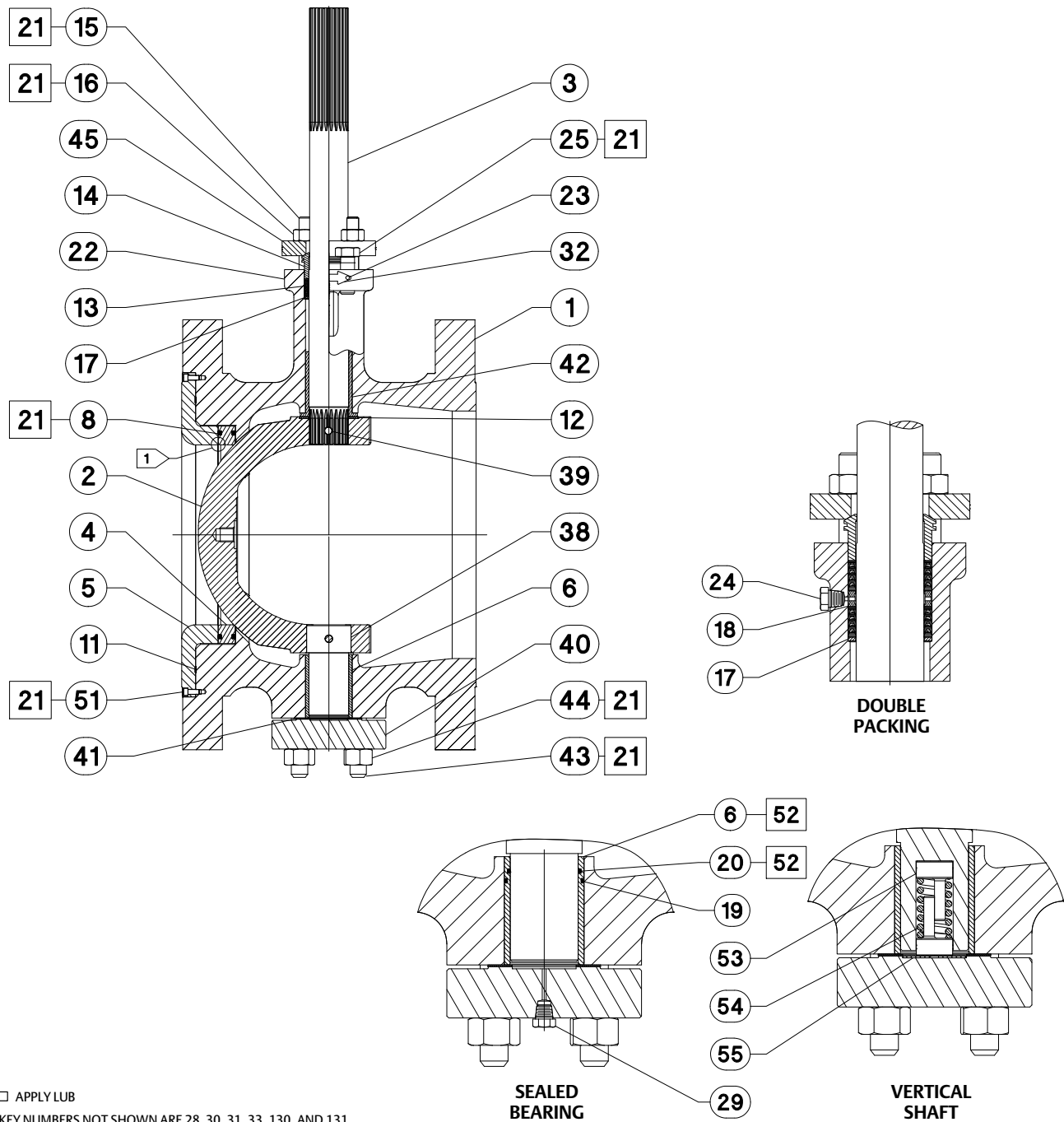
4283374-A

Figure 11. Fisher CV500 Valve, NPS 10 and 12



□ APPLY LUB
KEY NUMBERS NOT SHOWN ARE 28, 30, 31, 33, 36, 37, 130, AND 131
NOTE:
↳ MEASURE GAP HERE

Figure 12. Fisher CV500 Valve, NPS 14 through 20



□ APPLY LUB

KEY NUMBERS NOT SHOWN ARE 28, 30, 31, 33, 130, AND 131

NOTE:

1 MEASURE GAP HERE

198A0414300

Figure 13. Typical ENVIRO-SEAL Rotary Packing Arrangements with PTFE Packing

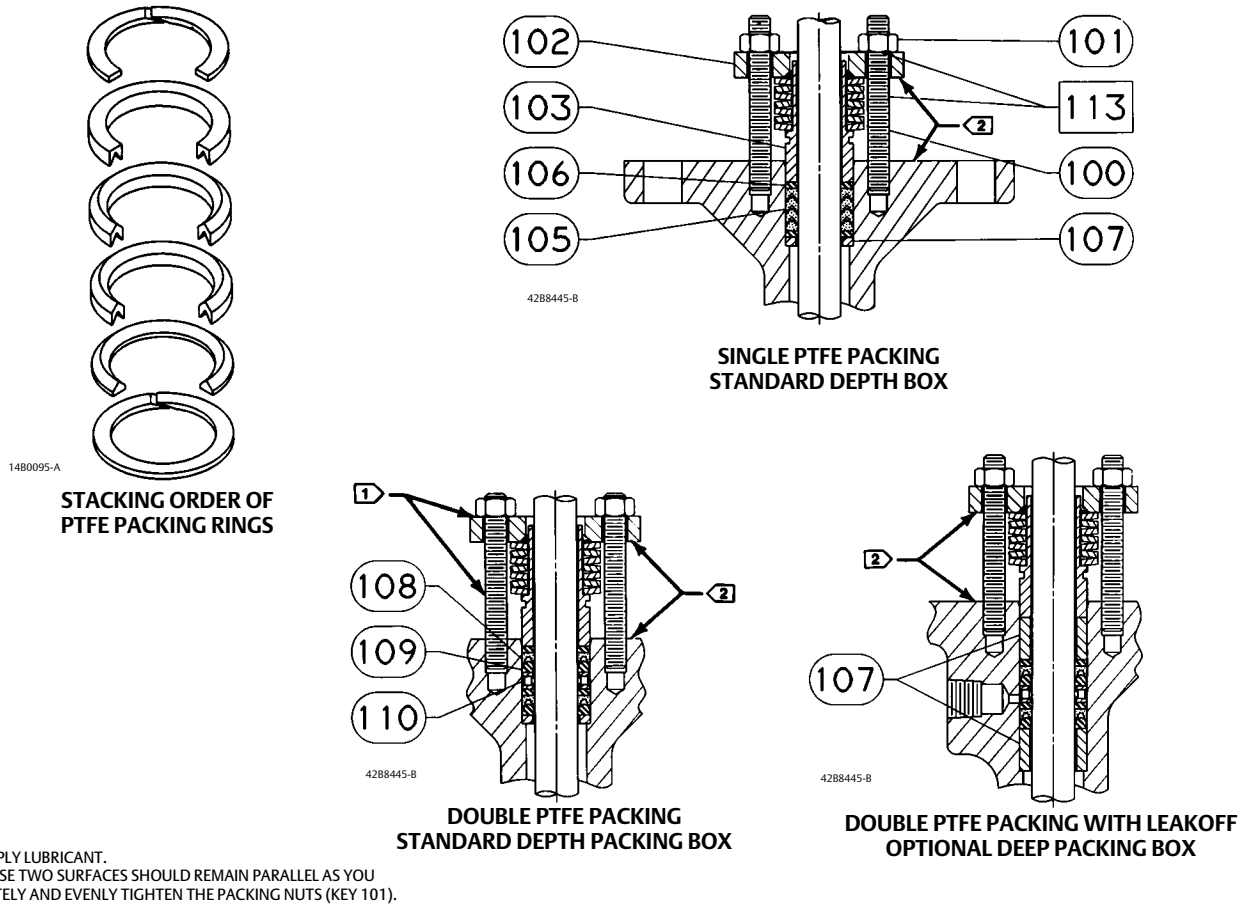


Figure 14. Typical ENVIRO-SEAL Rotary Packing Arrangements with Graphite Packing

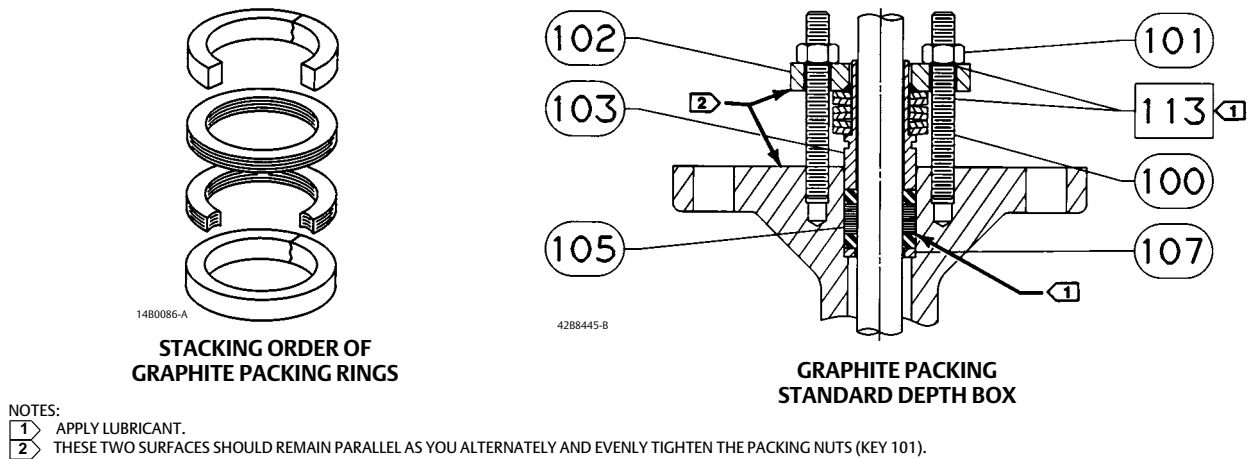
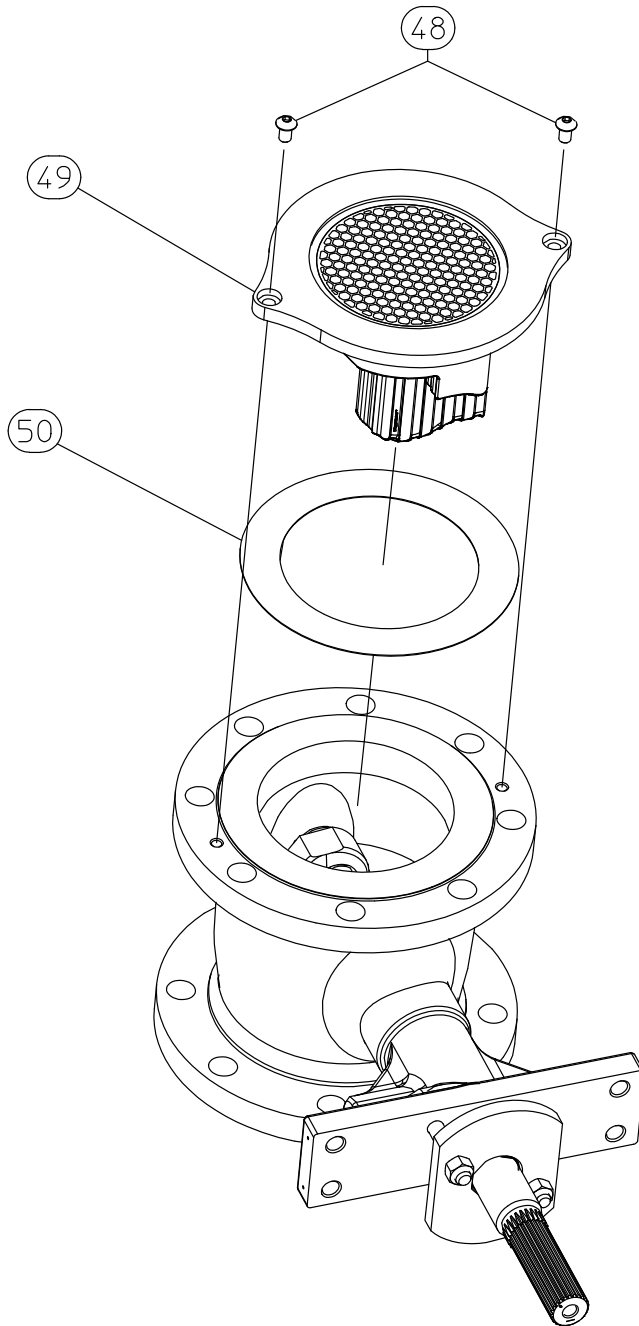
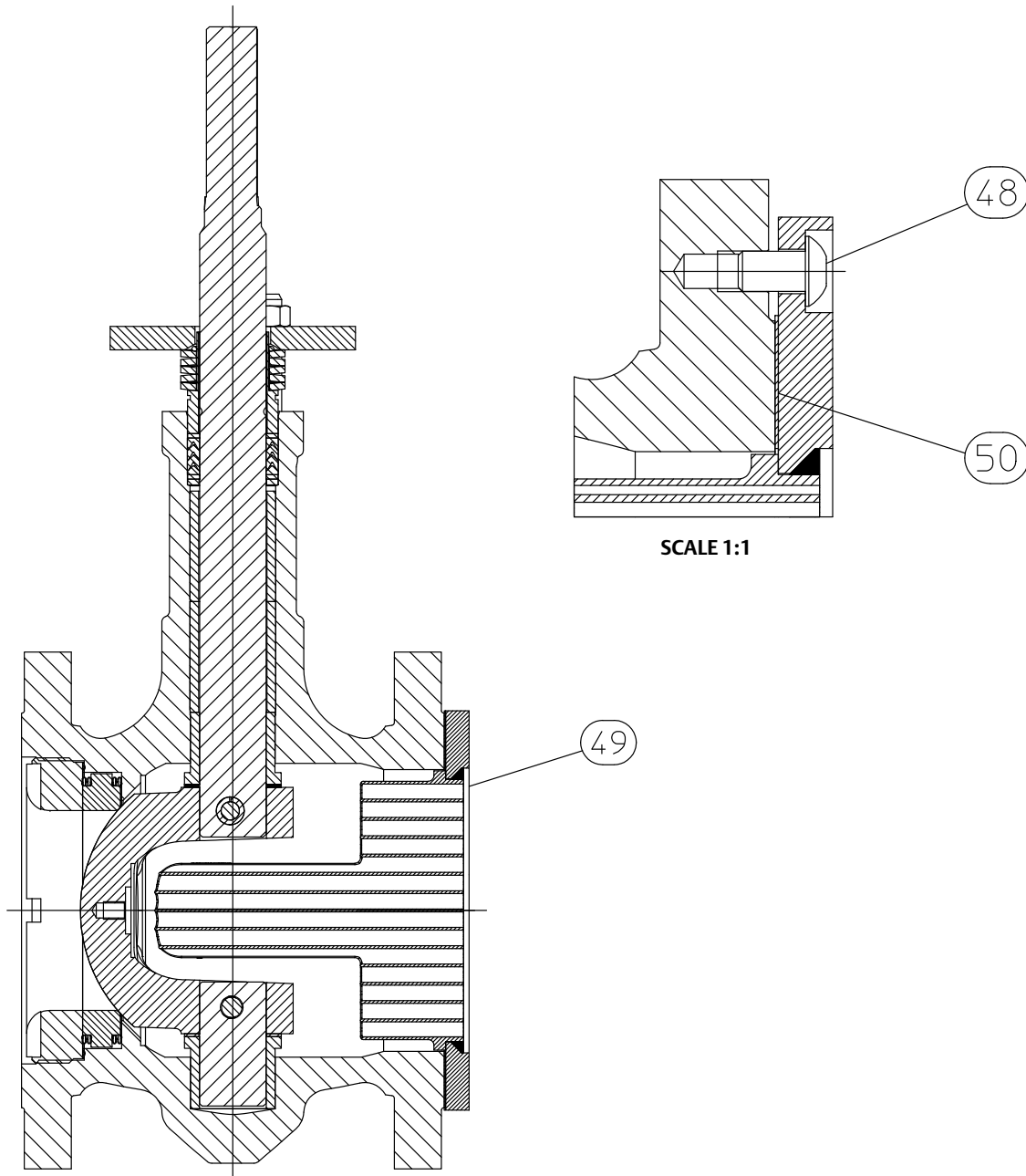


Figure 15. Fisher CV500 Valve with Cavitrol Hex



GH12213

Figure 16. Fisher CV500 Valve Assembly with Cavitrol Hex



Parts List

Note

Contact your [Emerson sales office](#) for Part Ordering information.

Valve Body (figures 10 and 11)

Key	Description
1	Body/Bearing Assembly Keys 1 and 7 are included in the valve body/bearing assembly. If a part number is required, contact your Emerson sales office for assistance
2*	Ball
3*	Drive Shaft
4*	Seat Ring
5	Retainer Ring
6*	Bearing (2 req'd for NPS 3 through 8) (1 req'd for NPS 10 through 20)
7	Bearing Stop
8*	Face Seal (2 req'd)
9*	Expansion Pin
10*	Taper Pin
11*	Retainer Gasket
12	Thrust Washer (2 req'd for 17-7PH) ⁽¹⁾ (1 req'd for alloy 6)
13*	Packing Set
14	Packing Follower
15	Packing Flange Stud
16	Packing Flange Nut
17*	Packing Box Ring
18	Lantern Ring
19*	O-Ring (for sealed bearings, 2 req'd)
20*	O-Ring (for sealed bearings, 2 req'd)
21	Anti-seize lubricant
22	Identification Nameplate
23	Drive Screw
24	Pipe plug
25	Cap Screw
26	Hex Nut
28*	Packing Washer (not shown)
29	Pipe Plug
30	Nameplate

Key	Description
32	Flow Arrow
33	Retainer Tool (Not Shown)
36	Stud
37	Cap Screw
38*	Follower Shaft
39	Groove Pin
40	Bottom Flange
41*	Gasket
42*	Drive Bearing
43	Stud (for bottom flange bolting)
44	Hex Nut (for bottom flange bolting)
45	Packing Flange
48	Screw
49	Cavitrol Hex
50	Gasket
51	Socketed Cap Screw
52	O-ring Lubricant
53	Follower Spring Seat
54	Follower Spring
55	Washer
130	Clamp (Req'd w/non-conductive packing)
131	Bonding Strap Assembly (Req'd w/non-conductive packing)

ENVIRO-SEAL Packing System (figures 13 and 14)

Key	Description
100	Packing Flange Stud
101	Packing Flange Nut
102	Packing Flange
103	Spring Pack Assembly
105*	Packing Set
106*	Anti-Extrusion Ring
107*	Packing Box Ring
108*	Packing Ring
109*	Anti-Extrusion Ring
110	Lantern Ring
111	Tag
112	Cable Tie
113	Lubricant

*Recommended spare parts

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