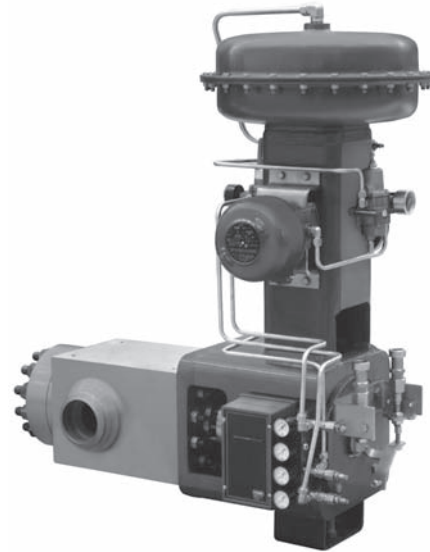


# Fisher® Vee-Ball™ SS-84PSV4 NPS 4x3 Rotary Control Valve

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Figure 1. Fisher SS-84PSV4 Valve  
with 1052PSV Actuator and 3610J Positioner



W9722

## Introduction

### Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts information for the Fisher Vee-Ball SS-84PSV4 NPS 4x3 rotary control valve (see figure 1). It also outlines the assembly and testing procedures for the NPS 4x3 CL2155 SS-84PSV4 rotary ball valve designed for use with the 1052PSV size 60 rotary actuator.

The SS-84PSV4 valve is the pressurizer spray valve for use in third generation PWR Nuclear Generating Stations. The NPS 4x3 valve body has NPS 4 butt weld ends with 3 inch Fisher Vee-Ball internal trim, which operates against a spring-loaded sleeve seal.

This valve contains several enhanced features compared to the original SS-84 designs which operated in previous PWR Reactors. These features include the following:

- Vee-Ball, drive shaft, and actuator lever connections are a missing tooth spline design ensuring One-Way only assembly.
- Side body flange allows trim removal without actuator removal.



Table 1. Specifications

|  |  |
|--|--|
| <p><b>Valve Sizes and End Connection Styles</b><br/>SS-84PSV4: NPS 4x3 valve with Schedule 120 buttweld ends</p> <p><b>Standard Flow Direction</b><br/>Forward (into the convex face of the Vee-ball)</p> <p><b>Actuator Mounting</b><br/>Right-hand</p> | <p><b>Maximum Ball Rotation</b><br/>Standard: Ball rotates counterclockwise to close when viewed from actuator side of valve<br/>Ball rotation is 80 degrees</p> <p><b>Valve/Actuator Action</b><br/>Push-down-to-open (extending actuator rod opens valve.) See actuator manual for details</p> |
|--|--|

1. The pressure/temperature limits in this manual, and any applicable code or standard limitation, should not be exceeded.

- Actuator closed position adjustment features an external alignment procedure without the need to *position and* hold the Vee-Ball precisely centered in the sleeve seal.
- Integrated actuator turnbuckle adjustment feature to precisely position the Vee-Ball without any linkage disconnects.
- Fisher live-loaded packing, with positive stop screws controlling Belleville deflection, ensures correct packing stress which maximizes cycle life and prevents premature packing wear.

Do not install, operate, or maintain an SS-84PSV4 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 Process Management sales office before proceeding.

## Description

The SS-84PSV4 Vee-Ball valve (figure 1) with a V-notch ball is used in throttling or on-off service. The SS-84PSV4 valve is an NPS 4 schedule 120 buttweld construction, per Westinghouse weld end configuration requirements. The splined valve shaft of this valve connects to a variety of rotary-shaft actuators.

## Specifications

Specifications for these valves are shown in table 1.

## Principle of Operation

The Vee-Ball and machined body combine to create smoothly transitioning flow geometry which enables efficient flow through the valve. The drive shaft and follower shaft center the ball in the flow stream to minimize dynamic torque and permit easy ball rotation.

The ball rotates clockwise out of the sleeve seal to a standard open rotation of 80 degrees. In the closed position, the sleeve seal is spring loaded against the ball to create an effective seal. The drive linkage between the ball and shaft has been designed for minimal lost motion using a “spline connection” on the shaft and ball.

## Installation

Key numbers in installation procedures are shown in figure 8 unless otherwise indicated.

### **⚠ 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 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.

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### **⚠ WARNING**

When ordered, the valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions. Responsibility for the safety of process media and compatibility of valve materials with process media rests solely with the purchaser and end-user. To avoid possible personal injury and because some valve/trim material combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting your Emerson Process Management sales office.

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### **⚠ WARNING**

The valve drive shaft is not necessarily grounded to the pipeline when installed. Personal injury or property damage could result from an explosion caused by a discharge of static electricity from valve components if the process fluid or the atmosphere around the valve is flammable. If the atmosphere around the valve or the process fluid is flammable, electrically bond the drive shaft to the valve.

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#### Note

Standard graphite packing is composed of all conductive graphite ribbon packing. 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).

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1. If the valve is to be stored before installation, protect the butt weld ends and keep the valve body cavity dry and free of foreign material.
2. The valve is normally shipped as part of a control valve assembly, with an actuator mounted on the valve. If the valve and actuator have been purchased separately or if the actuator has been removed, mount the actuator according to the Actuator Mounting section and the appropriate actuator instruction manual.

3. Standard flow direction is forward flow, spherical face of the ball is upstream.
4. Install the valve in a horizontal pipeline with the drive shaft in the horizontal position.

### CAUTION

**Do not allow the valve to be installed in the pipeline with the drive shaft in the vertical position because of excessive wear to valve component parts.**

5. The actuator is right-hand mounted with the shaft in a horizontal orientation as shown in figure 1. If necessary, refer to the appropriate actuator instruction manual for actuator installation and adjustment procedures.

### CAUTION

**Ensure the valve and adjacent pipelines are free of foreign material that could damage the valve seating surfaces.**

6. Be certain the valve and adjacent pipelines are free of any foreign material that could damage the valve sealing surfaces.
7. Be sure the pipelines are in line with each other.
8. Use accepted pipeline piping and welding practices when installing the valve in the pipeline.
9. Connect pressure lines to the actuator as indicated in the actuator instruction manual. When an auxiliary manual actuator is used with a power actuator, install a bypass valve on the power actuator (if one is not supplied) for use during manual operation.

### ⚠ 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.**

10. Verify that gap “A”, in figure 7, is closed before pressurizing the pipeline.

### ⚠ WARNING

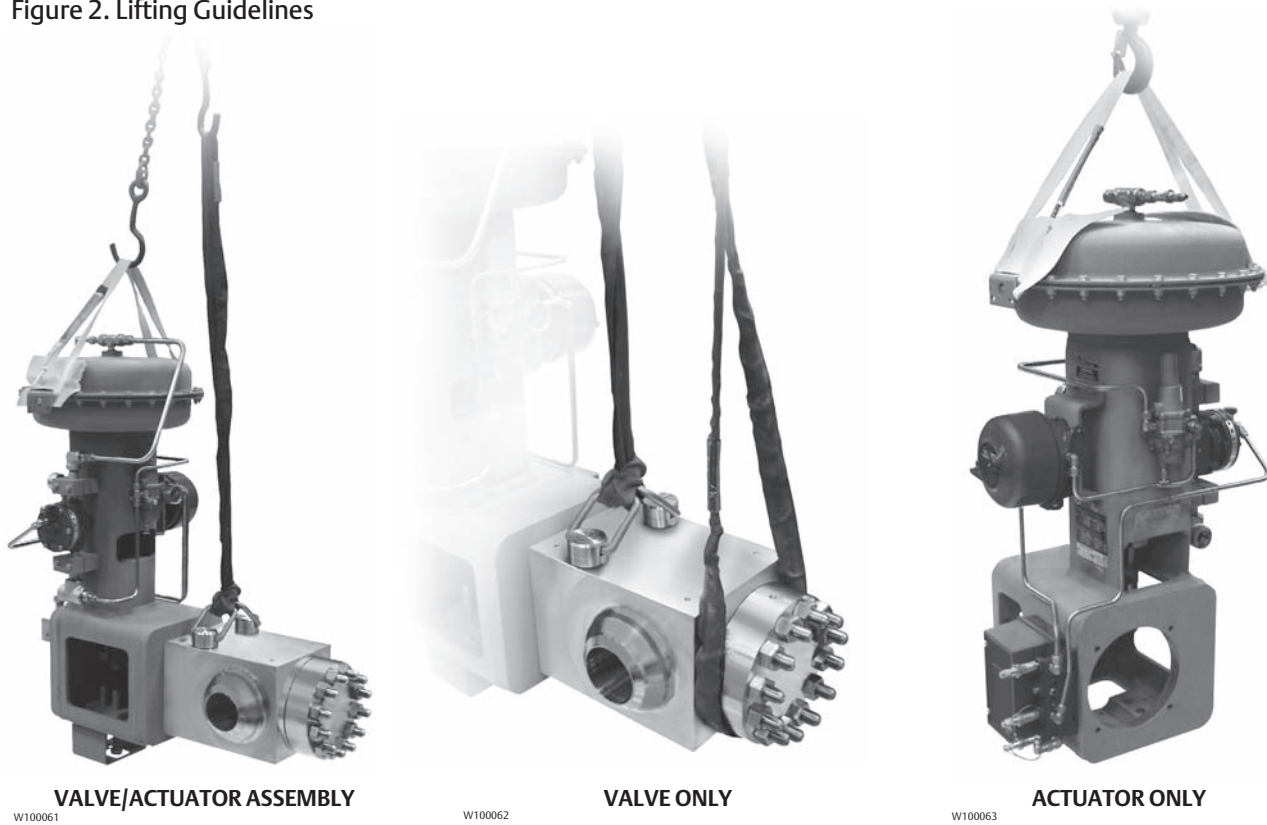
**Personal injury could result from packing leakage. Valve packing was tightened before shipment; however the packing might require some readjustment to meet specific service conditions. Check with your process or safety engineer for any additional measures that must be taken to protect against process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

## Lifting Guidelines

### CAUTION

**Care must be taken when lifting the valve/actuator assembly to ensure the accessories and tubing are not damaged in the process. The entire assembly with accessories weighs approximately 340 kg (750 lb). Make sure to use appropriate lifting straps/eyebolts/hoists capable of lifting this weight.**

Figure 2. Lifting Guidelines



### Lifting Valve/Actuator Assembly

To lift the assembly, insert 3/4-10 eyebolts into the two tapped holes on the top of the valve body. These two tapped holes will carry most of the weight, but the assembly must be balanced using a strap on the 1052PSV casing as shown in figure 2. The ends of the strap will be positioned underneath two L-shaped flanges or through eyebolts. Figure 2 shows L-shaped flanges attached to the casings. An alternative casing lift method is to use 3/8 inch eyebolts positioned 180 degrees apart. Use protective pads between the strap and the casing to help prevent damage to the painted surface. Torque the 3/8-24 cap screws or eyebolts and nuts to 20 lbf • -ft. The assembly can now be lifted using a hoist capable of leveling these lifting points.

### Lifting Valve Only

To lift the valve, insert 3/4-10 eyebolts into the two tapped holes on the top of the valve body. These two tapped holes will carry most of the weight, but the assembly must be balanced using a strap underneath the valve bottom flange (key 5 in the SS-84PSV4 instruction manual, D103416X012), as shown in figure 2. The assembly can now be lifted using a hoist capable of leveling the 3 lifting points.

### Lifting Actuator Only

The actuator with accessories shall be lifted by the casing flange as shown in figure 2. Figure 2 shows L-shaped flanges attached to the casings. An alternative casing lift method is to use 3/8 inch eyebolts positioned 180 degrees apart. Use protective pads between the strap and the casing to help prevent damage to the painted surface. Torque the 3/8-24 cap screws or eyebolts and nuts to 20 lbf • ft. A single hoist lift point on the strap will balance and lift the actuator in a level manner.

## Maintenance

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.

Key numbers in this procedure are shown in figure 8, unless otherwise noted.

### **⚠ WARNING**

**The Vee-ball closes with a shearing, cutting motion, which could result in personal injury. To avoid injury, keep hands, tools, and other objects away from the Vee-ball while stroking the valve.**

**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.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.
- Vent the 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. 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.

## Packing Maintenance

Key numbers in this procedure are shown in figure 8, unless otherwise noted. A detailed view of the packing is also shown in figure 7.

Refer to the Parts List section of this manual for individual parts.

If the packing is relatively new and tight on the drive shaft (key 9), and if tightening the packing nuts (key 27) does not stop leakage, it is possible that the drive 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 drive shaft and packing box wall for nicks or scratches while performing the following procedure.

### Replacing Packing

#### Disassembly

### **⚠ WARNING**

**Observe the steps in the WARNING at the beginning of the Maintenance section.**

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, release pressure from the actuator and disconnect the pressure lines from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you are working on the equipment.
2. Remove the actuator cover (key 33 from the Fisher 1052PSV Size 60 Rotary Actuator Instruction Manual, D103407X012).

### **⚠ WARNING**

**When the actuator is removed from the valve, the ball/shaft assembly may suddenly rotate, with a shearing, cutting motion, which could result in personal injury. To avoid injury, carefully rotate the ball to a stable position after the actuator is removed.**

### **CAUTION**

**When removing the actuator from the valve, do not use a hammer or similar tool to drive the lever or actuator off the valve shaft. Driving the lever or actuator off the valve shaft could damage the ball, seal, and valve.**

**If necessary, use a puller to remove the lever or actuator from the valve shaft. It is okay to tap the puller screw lightly to loosen lever or actuator, but hitting the screw with excessive force could damage the ball, seal, and valve.**

3. Remove the clamped lever (do not loosen the actuator turnbuckle adjustment), and remove the actuator mounting fasteners. (If necessary, refer to the 1052PSV actuator instruction manual for assistance.)

### **⚠ WARNING**

**Personal injury could result from packing leakage. Do not scratch the drive shaft or packing box wall while removing packing parts in the following procedure.**

#### **Note**

Do not change the position of the stop cap screws and nuts (key 17, 19, and 18) in the following step.

4. Remove the live-loaded packing parts (see figure 7, keys 27, 26, 160, 16, and 25)
5. Remove the hex nuts (key 14) and bottom flange (key 5). The bushing (key 7) should come out with the bottom flange, otherwise remove the bushing now.
6. After removal of the spiral wound gasket (key 11), inspect the sealing surfaces on the bottom flange and the valve body.
7. Rotate the Vee-Ball counterclockwise (ccw) 180° out of the closed position. This can be accomplished using the following method:
  - a. Use the actuator lever and rotate the drive shaft (key 9) by hand.
  - b. Use a 7/8 inch hex socket wrench and rotate the Vee-Ball assembly (key 2) by the flats on the follower shaft.
8. Remove the Vee-Ball assembly from the valve body, taking care not to damage the sealing surface of the ball.
9. Remove the drive shaft/collar assembly, bushing, and thrust washer (keys 9, 7, and 8) from the valve body. If needed, use a rubber mallet or blunt tool to tap the drive shaft out from the actuator end of the valve body. Take care not to damage the drive shaft spline.

10. With the trim parts removed, use packing removal tools to pull the metal packing box rings and packing set (keys 154 and 15) out of the packing bore of the valve body.
11. Do not scratch the packing box wall; scratching this surface could cause leakage. Clean all accessible surfaces of the packing box to remove particles that would prevent the packing from sealing.

Figure 3. Drive Shaft, Collar, Bearing, Vee-Ball Assembly

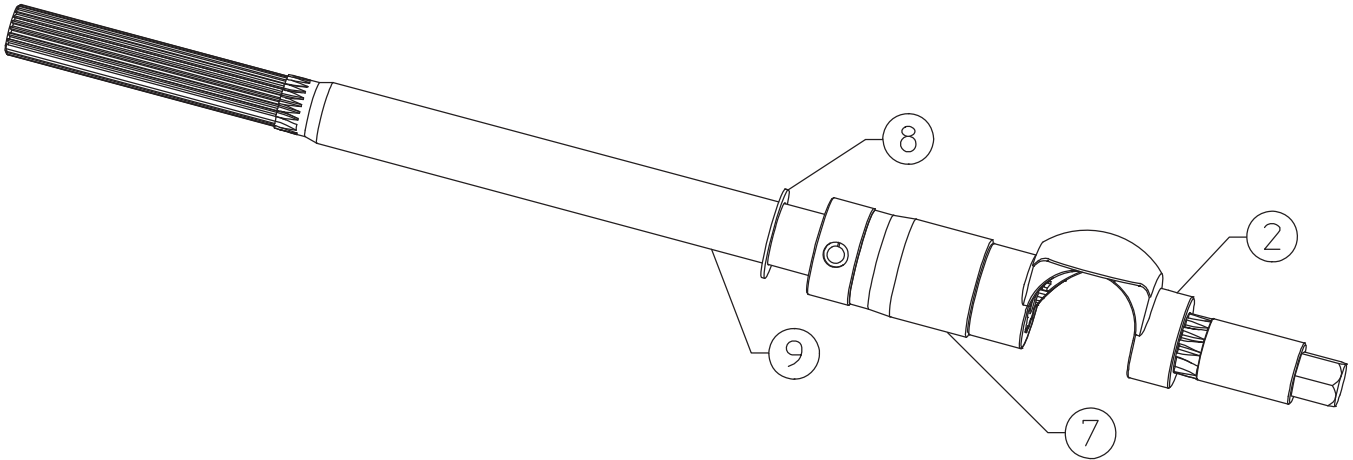
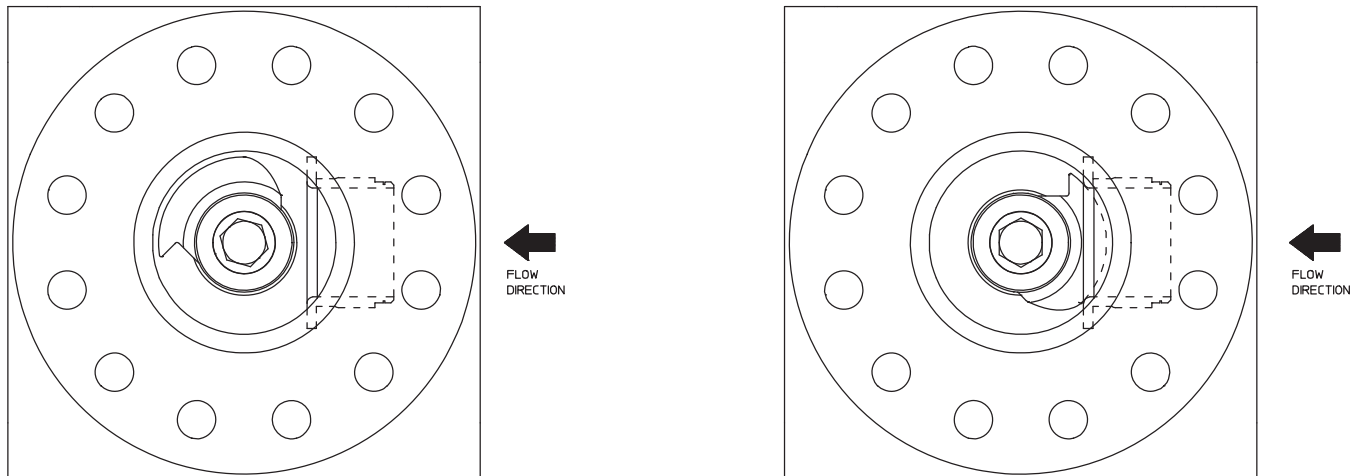


Figure 4. Drive Train Inserted into the Valve Body 145-180 Degrees Out of Seat



## Assembly

If needed, refer to the appropriate sections of the 1052PSV actuator instruction manual to connect the valve to the actuator and assemble the actuator.

Refer to figure 5 for key number locations during seal installation. Valve key number locations are shown in figure 8.

1. Thoroughly clean all parts that are to be re-used and obtain replacement parts. Be sure that all sealing surfaces are in good condition without scratches or wear.
2. Clean the valve body, removing burrs and debris. Inspect the packing box bore, sleeve seal bore, and bearing bore ensuring there is no rust or corrosion. Inspect the spiral wound gasket groove for nicks or defects.



3. Inspect the sleeve seal (key 20), piston ring area, and the radius seat for scratches or defects.
4. Install the wave spring (key 21) against the sleeve seal (key 20) flange with the gap against the sleeve seal flange. See figure 5.

Figure 5. Sleeve Seal Assembly

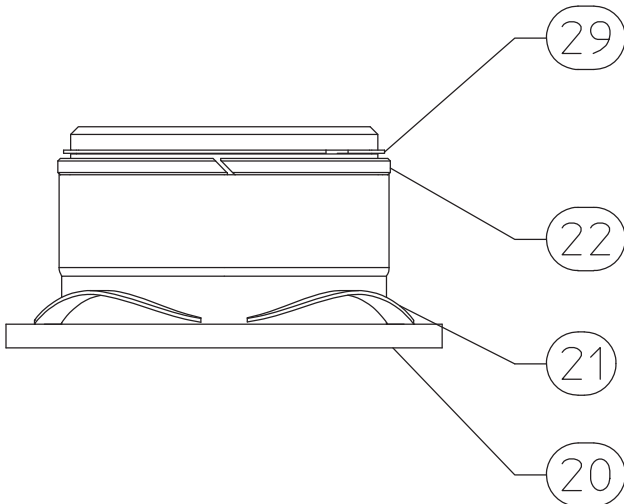
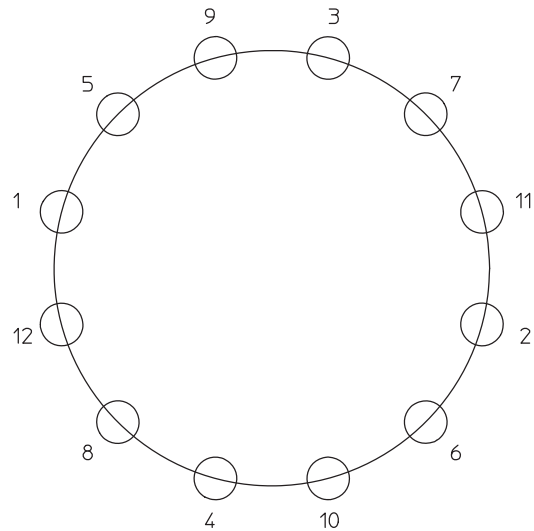


Figure 6. Bolting Sequence



5. Install the carbon piston ring (key 22) and the retaining ring (key 29) onto the sleeve seal (key 20).
6. Install the sleeve seal assembly in the valve body through the bottom flange hole.
7. Install the thrust washer (key 8) on the drive shaft / thrust collar / pin assembly (key 9). Locate the thrust washer on the actuator side of the thrust collar in figure 3.
8. Install a journal bushing (key 7) on the drive shaft / thrust collar / pin assembly (key 9) on the side next to the Vee-Ball splined connection end. **Note: Place the smaller OD end next to the thrust collar (see figure 3).**
9. Install the Vee-Ball assembly (key 2) on the drive shaft (key 9). **Note: The splined connection is missing a tooth allowing One-Way assembly.**
10. Make sure the sleeve seal assembly has remained all the way in the valve body and that the wave spring is still engaged with the valve body. Orient the Vee-Ball and shaft assembly (see figure 4) with the Vee-Ball positioned 180 degrees out of the sleeve seal seat (key 20). Install into the valve body through the bottom flange hole. Use care to avoid any scratches to the drive shaft as it slips through the bottom of the packing box area in the valve body.
11. The outer end of the Vee-Ball follower shaft has a 7/8 inch hex. Use a 7/8 inch socket to assist rotating the Vee-Ball into the sleeve seal seat. With the ball and shaft assembly held tightly against the thrust washer (key 8), rotate the Vee-Ball clockwise (cw as viewed from the bottom flange side of the valve body) allowing the vee contour to start to engage the sleeve seal seat.

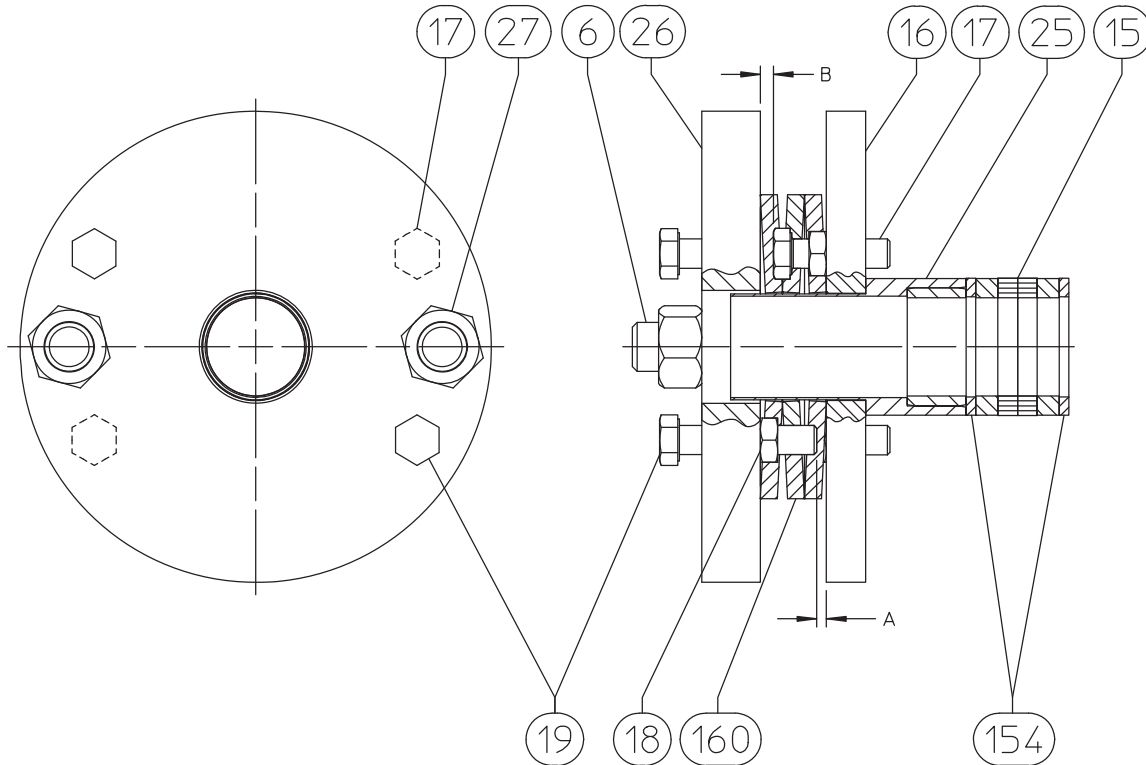
**CAUTION**

**In the following step, if the Vee-Ball is accidentally rotated too far, allowing a gap from the trailing edge of the Vee-Ball, DO NOT rotate counter clockwise (ccw) back into the seat. Continue to rotate around clockwise (cw) and repeat step 15.**

12. Visually rotate the Vee-Ball to the closed position until it is centered in the seat. Final closed position will be accomplished using the Precise Valve/Actuator Closed Position Adjustment procedure in the 1052PSV actuator instruction manual.
13. During the remaining body assembly procedures care should be taken to keep the Vee-Ball in the closed position. **Note: The Vee-Ball open position is restricted to 80 degree rotation from the closed position so the vee-notch contour on the Vee-Ball will retain the sleeve seal package in place.**

14. Install a journal bushing (key 7) into the bottom flange (key 5). The small OD end of the bushing is placed toward the bottom flange.

Figure 7. Positive Stop Packing Loading Method



15. Install the spiral wound gasket (key 11) in the groove on the valve body (key 1).
16. Coat the twelve 7/8-9 x 5.25 bottom flange studs (key 3) with nuclear grade anti-seize lubricant up to the deformed thread. Thread the studs into the valve body (key 1) until hitting the deformed thread.
17. Install the bottom flange and bushing over the Vee-Ball follower shaft and tightly against the spiral wound gasket.  
**Note:** The Vee-Ball / Follower shaft assembly may be slightly off center due to the wave spring loading, but will self-center.
18. Lubricate the twelve 7/8-9 bottom flange nuts (key 14) with nuclear grade anti-seize lubricant. Install the nuts using a 1-7/16 inch hex wrench. Torque all nuts to an initial 217 N•m (160 lbf•ft), then a final torque of 434 N•m (320 lbf•ft). Follow the bolting procedure described in figure 6.

### Packing Installation

1. Refer to figure 7 and install the following parts into the packing box bore: packing box ring (key 154), packing set (key 15) which includes two die-molded graphite ribbon packing rings between two anti-extrusion rings, then another packing box ring (key 154).
2. Install the packing follower (key 25).

### Note

If the stop screws and nuts (keys 17 and 18) were adjusted during disassembly, refer to the Packing Adjustment section in this instruction manual before proceeding.

3. Install the stop flange (key 16), with cap screws and hex nuts (keys 17 and 18) against the packing follower (key 25).
4. Install three Belleville springs (key 160) on top of the stop flange (key 16). Orient the Belleville stack as shown in figure 7.
5. Install the packing flange (key 26), with cap screws and hex nuts (keys 19 and 18) on top of the Belleville springs (key 160).
6. If not already installed, lubricate the two 5/8-11 packing flange studs (key 6) with nuclear grade anti-seize lubricant. Install two 5/8-11 packing flange nuts (key 27), using a 15/16 inch hex wrench.
7. Tighten, without torquing, the packing flange nuts (key 27) until they are snug and finger-tight against the packing flange (key 26). Use care to keep the packing flange parallel to the stop flange (key 16) (see figure 7).
8. Use gap gage GE39245 to verify the 0.122 inch gap A, see figure 7.
9. Use gap gage GE39245 to verify the 0.164 inch gap B, see figure 7.
10. Tighten the packing flange nuts (key 27) until the 0.122 inch gap for the packing flange stop screws (key 19) goes to zero and just contacts the stop flange (key 16). This will set the packing stress to its nominal value.
11. Refer to the Packing Adjustment section below for maximum packing stress loading.

## Packing Adjustment

The following instructions describe how to set the correct stop screw gaps A and B for proper packing load. Gap A is the nominal packing load and should be used under normal circumstances. Gap B is the maximum packing load and should not be exceeded.

### Stop Screw Gap Settings

1. Apply thread-locking compound (medium strength) (key 77) to the two 3/8-24 x 1.25 stop cap screws (key 17). Install the stop screws with two 3/8-24 jam nuts (key 18) in the stop flange (key 16). Final stop screw lock position will be set with gauged clearance to the packing flange.
2. Install the stop flange assembly against the packing follower (key 25).
3. Install three Belleville springs (key 160) on top of the stop flange (key 16). Orient the Belleville stack as shown in figure 7.
4. Apply thread-locking compound (medium strength) (key 77) to the two 3/8-24 x 1.75 stop cap screws (key 19). Install the stop screws with two 3/8-24 jam nuts (key 18) in the packing flange (key 26). Final stop screw lock position will be set with gauged clearance to the stop flange.
5. Install the packing flange assembly on top of the Belleville springs (key 160).
6. Lubricate the two 5/8-11 packing flange studs (key 6) with nuclear grade anti-seize lubricant (key 30). Install two 5/8-11 packing flange nuts (key 27), using a 15/16 inch hex wrench.
7. Tighten, without torquing, the packing flange nuts (key 27) until they are snug and finger-tight against the packing flange (key 26). Use care to keep the packing flange parallel to the stop flange (key 16) (see figure 7).
8. Use gap gage GE39245 to set the 0.122 inch gap A for the packing flange stop screws (key 19) and the top of the stop flange (key 16). Torque the nut (key 18) to 41 N•m (30 lbf•ft).
9. Use gap gage GE39245 to set the 0.164 inch gap B for the stop flange stop screws (key 19) and the bottom of the packing flange (key 26). Torque the nut (key 18) to 41 N•m (30 lbf•ft).

### Packing Load Adjustment

Use the following steps to increase the packing load from nominal to maximum packing load.

1. Loosen the stop nuts (key 18) and retract the two 3/8-24 x 1.75 stop cap screws (key 19) three full turns.
2. Apply thread-locking compound (medium strength) (key 77) to the two stop cap screws (key 19) and torque to 41 N•m (30 lbf•ft).

3. Tighten the packing flange nuts (key 27) until the 0.164 inch gap B for the stop flanges stop screws (key 17) goes to zero and just contacts the packing flange (key 26). This will set the packing stress to the maximum value.

If needed, refer to the appropriate sections of the Fisher 1052PSV Size 60 Rotary Actuator Instruction Manual, D103407X012, to connect the valve to the actuator and assemble the actuator.

## Replacing the Trim Parts

Perform this procedure if the control valve components are at a recommended replacement interval, scratched or damaged, showing performance degradation at routine diagnostics, or the valve is not shutting off properly.

This section describes how to replace the drive shaft assembly, thrust washer, bushings, Vee-Ball assembly, and sleeve seal components (keys 9, 8, 7, 2, and 20, 21, 22, 29).

### Disassembly

The actuator may remain mounted on the valve as you replace these components.

Key numbers are shown in figure 8, unless otherwise indicated. The sleeve seal assembly with key numbers is shown in figure 5. If necessary, refer to the Fisher 1052PSV Size 60 Rotary Actuator Instruction Manual, D103407X012, for disassembly and assembly instructions.

### **▲ WARNING**

**Perform the steps in the WARNING at the beginning of the Maintenance section of this 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, release pressure from the actuator, disconnect the pressure lines from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you are working on the equipment.
2. Remove the actuator cover (key 33 from the 1052PSV Instruction Manual).
3. Remove the clamped lever (do not loosen the actuator turnbuckle adjustment), and remove the actuator mounting fasteners. (If necessary, refer to the actuator instruction manual for assistance.)
4. Remove the live-loaded packing parts (see figure 7, keys 27, 26, 160, 16, and 25).
5. Remove the hex nuts (key 14) and bottom flange (key 5). The bushing (key 7) should come out with the bottom flange, otherwise remove the bushing now.
6. After removal of the spiral wound gasket (key 11), inspect the sealing surfaces on the bottom flange and the valve body.

### **CAUTION**

**Exercise care to avoid damaging components in the following procedure.**

7. Rotate the Vee-Ball counterclockwise (ccw) 180° out of the closed position. This can be accomplished by the following methods:
  - a. Use the actuator lever and rotate the shaft/collar/pin assembly (key 9) by hand.
  - b. Use a 7/8 inch hex socket wrench and rotate the Vee-Ball Assembly (key 2) by the flats on the follower shaft.

8. Remove the Vee-Ball Assembly from the valve body, taking care not to damage the sealing surface of the ball.
9. Remove the drive shaft/collar assembly, bushing, and thrust washer (keys 9, 7, and 8) from the valve body. If needed, use a rubber mallet or blunt tool to tap the drive shaft out from the actuator end of the valve body.
10. With the trim parts removed, use packing removal tools to pull the metal packing box rings and packing set (keys 154, and 15) out of the packing bore of the valve body.
11. Do not scratch the packing box wall; scratching this surface could cause leakage. Clean all accessible surfaces of the packing box to remove particles that would prevent the packing from sealing.

## Assembly

Refer to the Packing Installation section of this instruction manual to install packing. If necessary, refer to the appropriate sections of the Fisher 1052PSV Size 60 Rotary Actuator Instruction Manual, D103407X012, to connect the valve to the actuator and assemble the actuator.

Refer to figure 5 for key number locations during seal installation. Valve key number locations are shown in figure 8.

1. Thoroughly clean all parts that are to be re-used and obtain replacement parts. Be sure that all sealing surfaces are in good condition without scratches or wear.
2. Clean the valve body, removing burrs and debris. Inspect the packing box bore, sleeve seal bore, and bearing bore ensuring there is no rust or corrosion. Inspect the spiral wound gasket groove for nicks or defects. Place the valve body on an assembly platform or work table with the shaft and flow passage lying horizontal.
3. Inspect the sleeve seal (key 20), piston ring area, and the radius seat for scratches or defects.
4. Install the wave spring (key 21) against the sleeve seal (key 20) flange with the gap against the sleeve seal flange. See figure 5.
5. Install the carbon piston ring (key 22) and the retaining ring (key 29) onto the sleeve seal (key 20).
6. Install the sleeve seal assembly in the valve body through the bottom flange hole.
7. Install the thrust washer (key 8) on the drive shaft / thrust collar / pin assembly (key 9). Locate the thrust washer on the actuator side of the thrust collar (key 10) in figure 3.
8. Install a journal bushing (key 7) on the drive shaft / thrust collar / pin assembly (key 9) on the side next to the Vee-Ball splined connection end. **Note: Place the smaller OD end next to the thrust collar (see figure 3).**
9. Install the Vee-Ball assembly (key 2) on the drive shaft (key 9). **Note: The splined connection is missing a tooth allowing One-Way assembly.**
10. Make sure the sleeve seal assembly has remained all the way in the valve body and that the wave spring is still engaged with the valve body. Orient the Vee-Ball and shaft assembly (see figure 4) with the Vee-Ball positioned 180 degrees out of the sleeve seal seat (key 20). Install into the valve body through the bottom flange hole. Use care to avoid any scratches to the drive shaft as it slips through the bottom of the packing box area in the valve body.
11. The outer end of the Vee-Ball follower shaft has a 7/8 inch hex. Use a 7/8 inch socket to assist rotating the Vee-Ball into the sleeve seal seat. With the ball and shaft assembly held tightly against the thrust washer (key 8), rotate the Vee-Ball clockwise (cw as viewed from the bottom flange side of the valve body) allowing the vee contour to start to engage the sleeve seal seat.

## CAUTION

**In the following step, if the Vee-Ball is accidentally rotated too far, allowing a gap from the trailing edge of the Vee-Ball, DO NOT rotate counter clockwise (ccw) back into the seat. Continue to rotate around clockwise (cw) and repeat step 15.**

12. Visually rotate the Vee-Ball to the closed position until it is centered in the seat. Final closed position will be accomplished using the Precise Valve/Actuator Closed Position Adjustment procedure in the 1052PSV actuator instruction manual.

13. During the remaining body assembly procedures care should be taken to keep the Vee-Ball in the closed position.  
**Note: The Vee-Ball open position is restricted to 80 degree rotation from the closed position so the vee-notch contour on the Vee-Ball will retain the sleeve seal package in place.**
14. Install a journal bushing (key 7) into the bottom flange (key 5). The small OD end of the bushing is placed toward the bottom flange.
15. Install the spiral wound gasket (key 11) in the groove on the valve body (key 1).
16. Coat the twelve 7/8-9 x 5.25 bottom flange studs (key 3) with nuclear grade anti-seize lubricant up to the deformed thread. Thread the studs into the valve body (key 1) until hitting the deformed thread.
17. Install the bottom flange and bushing over the Vee-Ball follower shaft and tightly against the spiral wound gasket.  
**Note: The Vee-Ball / Follower shaft assembly may be slightly off center due to the wave spring loading, but will self-center.**
18. Lubricate the twelve 7/8-9 bottom flange nuts (key 14) with nuclear grade anti-seize lubricant. Install the nuts using a 1-7/16 inch hex wrench. Torque all nuts to an initial 217 N•m (160 lbf•ft), then a final torque of 434 N•m (320 lbf•ft). Follow the bolting procedure described in figure 6.

## Troubleshooting

Table 2. Troubleshooting

| Problem                      | Possible Solution  |
|------------------------------|--|
| Packing Leakage              | Verify the correct packing load. Use gap gage to verify correct gap distances.   |
|                              | Disassemble and inspect packing box bore and drive shaft for graphite adhesion, excessive wear or scratches.   |
|                              | If needed, increase packing load to maximum per the Packing Adjustment section of this manual. Replace packing parts and inspect packing box and shaft at next available maintenance interval. |
| Bottom Flange Gasket Leakage | Verify proper torque on bottom flange studs and nuts.  |
|                              | Disassemble and inspect sealing surfaces on the bottom flange and valve body for scratches or nicks.   |
| Excessive Ball Seal Leakage  | Verify the Vee-Ball is positioned correctly in the closed position. Reference the Determining Closed Position section of this instruction manual.  |
|                              | Disassemble and inspect Vee-Ball, sleeve seal, and piston ring for excessive wear or scratches.  |
| Other                        | Consult your Emerson Local Business Partner.   |

## Actuator Mounting

The actuator is right-hand mounted in a push-down-to-open (PDTO) configuration.

1. Tighten the bolted joints on this valve/actuator assembly using the criss-cross pattern shown in figure 6. Tighten each bolt evenly and in the sequence described.
2. Coat the twelve 5/8-11 x 2.75 actuator mounting studs (key 4) with nuclear grade anti-seize lubricant.
3. Mount the actuator onto the valve body (key 1).
4. Install washers (key 146) and tighten the 5/8-11 hex nuts (key 117) to 163 N•m (120 lb•ft).

After attaching the actuator to the valve, refer to the Fisher 1052PSV Size 60 Rotary Actuator Instruction Manual, D103407X012, to connect the lever to the drive shaft.

## Determining Closed Position

This instruction manual assumes the bottom flange (key 5) has not been attached to the valve body. If the bottom flange is already attached, refer to the 1052PSV instruction manual.

The Vee-Ball is visually positioned into the sleeve seal in this instruction manual. Final closed position will be set using the Precise Valve/Actuator Close Position section of the 1052PSV instruction manual.

## Parts Ordering

A serial number is assigned to each valve and stamped on the nameplate. Always refer to the valve serial number when corresponding with your Emerson Process Management sales office regarding spare parts or technical information. When ordering replacement parts, also specify the complete 11-character part number from the parts kits or parts list information.

### **⚠ WARNING**

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

#### Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use, or maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end user.

## Parts List

| Key | Description                       | Qty | Part Number | Key                         | Description                               | Qty | Part Number |
|-----|-----------------------------------|-----|-------------|-----------------------------|---|-----|-------------|
| 1   | Valve Body                        | 1   | GE39202X012 | 26*                         | Packing Flange                            | 1   | GE39214X012 |
| 2*  | Vee-Ball assy                     | 1   | GE39240X012 | 27*                         | Packing Flange Nut, hex 5/8-11 UNC-2B     | 2   | 1A343335252 |
| 3   | Stud, cont w/stop 7/8-9 X 5.25    | 12  | 1L1838X0252 | 28                          | Drive Screw                               | 4   | 1A368228982 |
| 4   | Stud, cont w/stop 5/8-11 X 2.75   | 12  | 1L1838X0252 | 29*                         | Retaining Ring                            | 1   | GE39213X012 |
| 5   | Bottom Flange                     | 1   | GE39204X012 | 30                          | Nuclear Grade Anti-Seize Lubricant        |     |             |
| 6*  | Packing Flange Stud 5/8-11 X 4.50 | 2   | 1P2616X0022 | 77                          | Thread-Locking Compound (Medium Strength) |     |             |
| 7*  | Bushing                           | 2   | 1V9110X00A2 | 92                          | Flow Direction Arrow                      | 1   | 1V106038982 |
| 8   | Thrust Washer                     | 1   | 19A3683X102 | 93                          | Drive Screw                               | 2   | 1A368228982 |
| 9*  | Shaft/Collar/Pin assy             | 1   | GE39207X012 | 117                         | Hex Nut, Heavy 5/8-11 UNC-2B              | 12  | 1A3433X0122 |
| 11* | Spiral Wound Gasket               | 1   | 17A4147X022 | 146                         | Washer, Plain, 5/8                        | 12  | 1A3517X0012 |
| 14  | Nut, Hex Heavy 7/8-9 UNC-2B       | 12  | 1C1727X0912 | 154                         | Packing Box Ring                          | 2   | GE39238X012 |
| 15* | Packing Set                       | 1   | GE39218X012 |                             |   |     |             |
| 17* | Cap Screw, Hex Hd 3/8-24 X 1.25   | 2   | 1A3683X0022 | <b>Spring Pack Assembly</b> |   |     |             |
| 18* | Hex Nut, Jam 3/8-24               | 4   | 1A680335252 | 16*                         | Stop Plate                                | 1   | GE44650X012 |
| 19* | Cap Screw, Hex Hd 3/8-24 X 1.75   | 2   | GE19845X022 | 25*                         | Packing Follower/Bushing assy             | 1   | GE39215X022 |
| 20* | Sleeve Seal                       | 1   | GE39210X012 | 160*                        | Belleville Spring                         | 3   | GE39235X012 |
| 21* | Wave Spring                       | 1   | GE39211X012 |                             |   |     |             |
| 22* | Piston Ring                       | 1   | GE39212X012 | <b>Special Tools</b>        |   |     |             |
| 23  | Nameplate                         | 1   | 12B6400X0A2 | *                           | Gap Gage                                  | 1   | GE39245X012 |
| 24  | Nuclear Nameplate                 | 1   | 16A4171X0A2 |                             |   |     |             |

\* Recommended spare parts

## Spare Parts

The spare parts replacement interval is based in part on plant operation, operating conditions, normal maintenance interval, process fluid, and other factors. Periodic inspection of the valve and actuator and diagnostics run on the control valve assembly are recommended to identify the optimum replacement timing.

Table 3. Fisher SS-84PSV4 Spare Parts

| Drawing Number | Replacement Part Number | Part Description / Key No.  | Qty | Classification     | Spare Part Code <sup>(1)</sup> | Spare Part Requirement Rationale   | Shelf Life | Shelf Life Rationale <sup>(2)</sup>                        |
|----------------|-------------------------|-----------------------------|-----|--------------------|--------------------------------|--|------------|--|
| GE39218        | GE39218X012             | Packing Set, Key 15         | 2   | Non-Safety Related | O/n                            | Routine maintenance of the valve, including replacing the packing, is a manufacturer's recommendation. Maintenance is a necessary requirement to ensure positive performance during the expected life of the valve. Emerson Process Management recommends replacing this component every 6 years.  | N/A        | Graphite does not exhibit a tendency to degrade over time. |
| GE39238        | GE39238X012             | Packing Box Ring, Key 154   | 2   | Non-Safety Related | O/n                            | Routine maintenance of the valve, including replacing the packing, is a manufacturer's recommendation. Maintenance is a necessary requirement to ensure positive performance during the expected life of the valve. Emerson Process Management recommends replacing this component every 6 years.  | N/A        | Graphite does not exhibit a tendency to degrade over time. |
| 17A4147        | 17A4147X022             | Spiral Wound Gasket, Key 11 | 2   | Non-Safety Related | O/n                            | Routine maintenance of the valve, including replacing the gasket, is a manufacturer's recommendation. Maintenance is a necessary requirement to ensure positive performance during the expected life of the valve. In order to replace the packing, the bottom flange needs to be removed. Once this seal is broken, the gasket should be replaced. Replace every time Bottom Flange is removed. | N/A        | Graphite does not exhibit a tendency to degrade over time. |
| GE39245        | GE39245X012             | Gap Gage                    | 1   | Non-Safety Related | O/n                            | This tool is required in order to adequately set the packing deflection to achieve nominal or maximum packing load.  | N/A        | Does not exhibit a tendency to degrade over time.          |
| GE39240        | GE39240X012             | Vee-Ball Assy, Key 2        | 1   | Non-Safety Related | O/n                            | Cycled parts will exhibit wear over time. Based on experience and testing, Emerson Process Management recommends replacing this component every 12 years.  | N/A        | Does not exhibit a tendency to degrade over time.          |
| GE39210        | GE39210X012             | Sleeve Seal, Key 20         | 1   | Non-Safety Related | O/n                            | Cycled parts will exhibit wear over time. Based on experience and testing, Emerson Process Management recommends replacing this component every 12 years.  | N/A        | Does not exhibit a tendency to degrade over time.          |
| GE39211        | GE39211X012             | Wave Spring, Key 21         | 1   | Non-Safety Related | O/n                            | The wave spring should be replaced at same time as Vee-Ball assy. Based on experience and testing; Emerson Process Management recommends replacing this component every 12 years.  | N/A        | Does not exhibit a tendency to degrade over time.          |
| GE39212        | GE39212X012             | Piston Ring, Key 22         | 1   | Non-Safety Related | O/n                            | Cycled parts will exhibit wear over time. Based on experience and testing, Emerson Process Management recommends replacing this component every 12 years.  | N/A        | Does not exhibit a tendency to degrade over time.          |

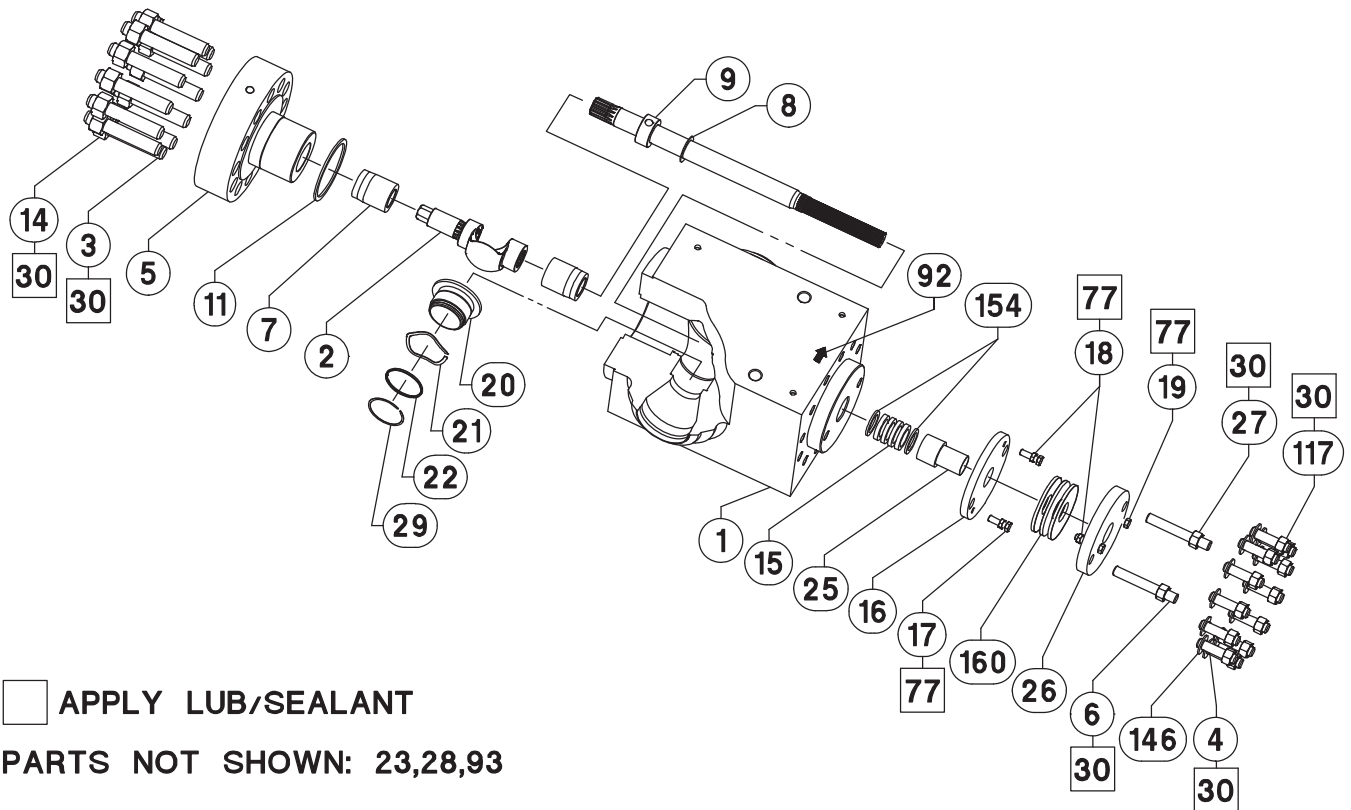


Table 3. Fisher SS-84PSV4 Spare Parts (continued)

| Drawing Number | Replacement Part Number | Part Description / Key No.            | Qty | Classification     | Spare Part Code <sup>(1)</sup> | Spare Part Requirement Rationale   | Shelf Life | Shelf Life Rationale <sup>(2)</sup>               |
|----------------|-------------------------|---------------------------------------|-----|--------------------|--------------------------------|--|------------|---|
| GE39215        | GE39215X022             | Packing Follower/Bushing Assy, Key 25 | 1   | Non-Safety Related | O/n                            | Cycled parts will exhibit wear over time. Based on experience and testing, Emerson Process Management recommends replacing this component every 30 years.                            | N/A        | Does not exhibit a tendency to degrade over time. |
| GE39235        | GE39235X012             | Belleville Spring, Key 160            | 3   | Non-Safety Related | O/n                            | Replacement parts should be on hand in case of loss, damage, or excessive wear during maintenance.   | N/A        | Does not exhibit a tendency to degrade over time. |
| GE44650        | GE44650X012             | Stop Plate, Key 16                    | 1   | Non-Safety Related | O/n                            | Replacement parts should be on hand in case of loss, damage, or excessive wear during maintenance.   | N/A        | Does not exhibit a tendency to degrade over time. |
| GE39214        | GE39214X012             | Packing Flange, Key 26                | 1   | Non-Safety Related | O/n                            | Replacement parts should be on hand in case of loss, damage, or excessive wear during maintenance.   | N/A        | Does not exhibit a tendency to degrade over time. |
| GE19845        | GE19845X022             | Cap Screw, 1.75 in. Lg, Key 19        | 2   | Non-Safety Related | O/n                            | Replacement parts should be on hand in case of loss, damage, or excessive wear during maintenance.   | N/A        | Does not exhibit a tendency to degrade over time. |
| 1A3683         | 1A3683X022              | Cap Screw, 1.25 in. Lg, Key 17        | 2   | Non-Safety Related | O/n                            | Replacement parts should be on hand in case of loss, damage, or excessive wear during maintenance.   | N/A        | Does not exhibit a tendency to degrade over time. |
| 1A6803         | 1A680335252             | Hex Nut, Jam 3/8-24, Key 18           | 4   | Non-Safety Related | O/n                            | Replacement parts should be on hand in case of loss, damage, or excessive wear during maintenance.   | N/A        | Does not exhibit a tendency to degrade over time. |
| 1P2616         | 1P2616X0022             | Packing Flange Stud, Key 6            | 2   | Non-Safety Related | O/n                            | Replacement parts should be on hand in case of loss, damage, or excessive wear during maintenance.   | N/A        | Does not exhibit a tendency to degrade over time. |
| 1A3433         | 1A343335252             | Packing Flange Nut, Key 27            | 2   | Non-Safety Related | O/n                            | Replacement parts should be on hand in case of loss, damage, or excessive wear during maintenance.   | N/A        | Does not exhibit a tendency to degrade over time. |
| GE39213        | GE39213X012             | Retaining Ring, Key 29                | 1   | Non-Safety Related | O/n                            | The Retaining Ring should be replaced at same time as Vee-Ball assy. Based on experience and testing, Emerson Process Management recommends replacing this component every 12 years. | N/A        | Does not exhibit a tendency to degrade over time. |
| 1V9110         | 1V9110X00A2             | Bushing, Key 7                        | 2   | Non-Safety Related | O/n                            | Cycled parts will exhibit wear over time. Based on experience and testing, Emerson Process Management recommends replacing this component every 30 years.                            | N/A        | Does not exhibit a tendency to degrade over time. |
| GE39207        | GE39207X012             | Shaft/Collar/Pin Assy, Key 9          | 1   | Non-Safety Related | O/n                            | Cycled parts will exhibit wear over time. Based on experience and testing, Emerson Process Management recommends replacing this component every 30 years.                            | N/A        | Does not exhibit a tendency to degrade over time. |

1. ME/n = construction/installation spares. P/n = preoperational spares. S/n = start-up spares. O/n = operational spares.  
 2. Dependant on good storage practices and conditions.

Figure 8. Exploded View, Fisher SS-84PSV4 Valve Body Assembly





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