Fisher™ SS-264 NPS 14 Rotary Control Ball Valve

Contents

Figure 1. Fisher SS-264 Valve with Bettis™ NG4020-SR3 Actuator and 3610J Positioner

09AA03200

Introduction

Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts information for the Fisher SS-264 NPS 14 rotary control valve (see figure 1). It also outlines the assembly and testing procedures for the NPS 14 CL1725 SS-264 rotary ball valve designed for use with the Bettis NG4020-SR3 rotary actuator.

The SS-264 valve is the passive residual heat removal valve for use in third generation PWR Nuclear Generating Stations. The valve body has NPS 14 buttweld ends with a cammed ball operating against a one-piece metal seal.

Features include the following:

- Cammed, segmented ball with hard faced seat band manufactured from forged bar.
- Fisher involute spline connection for ball/shaft and a keyed connection which is used for the Bettis actuator connection.
- Tight tolerances and heavily loaded ball/seal interface.

Table 1. Specifications

Valve Sizes and End Connection Styles SS-264: NPS 14 valve with Schedule 160 buttweld ends **Standard Flow Direction** Forward (into the convex face of the ball) **Actuator Mounting** Counterclockwise to open	**Maximum Ball Rotation** Standard: Ball rotates clockwise to close when viewed from the top of the valve Ball rotation is 90 degrees **Valve/Actuator Action** Clockwise to close on air stroke, counterclockwise to open on spring stroke. See actuator manual for details

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

- Emerson Process Management designed live-loaded packing with positive stop screws controlling Belleville spring deflection.
- The zero positioning of the ball is achieved by torque seating.

Do not install, operate, or maintain an SS-264 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-264 ball valve (figure 1) is used in throttling or on-off service. The SS-264 valve is an NPS 14 schedule 160 buttweld construction, per Westinghouse weld end configuration requirements. The keyed valve shaft of this valve connects to a Bettis spring-return actuator.

Specifications

Specifications for these valves are shown in table 1.

Educational Services

For information on available courses for Fisher SS-264 valves, as well as a variety of other products, contact:

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

Principle of Operation

The 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 counterclockwise out of the seal to a standard open rotation of 90 degrees. The ball is cammed into the seal 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.

Table 2. Recommended Bolting Torques

Description, Key Number	Size	Wrench Size	N • m	lbf • ft
Seat ring to Body - Sckt Hd Cap Screw, 28	1/2-13	3/8 Allen	92	68
Body to Bonnet - Hex Nut, 117	2 1/2-8	3 3/4	10970	8090
Bonnet to Actuator - Hex Hd Cap Screw, 3	3/4-10	1 1/4	271	200
Washer to Drive Shaft - Hex Hd Cap Screw, 31	5/8-11	15/16	163	120
Travel stop hex nut,	1 1/8-8	1 1/2	136	100
Go Switch/Positioner Mounting				
Go Switch Bracket to Actuator - Hex Hd Cap Screw	1/2-13	3/4	92	68
Namur Disc to Actuator - Sckt Hd Cap Screw	M6	4mm	10.2	90 in-lb
Trip Arm Bracket to Namur Disc - Sckt Hd Cap Screw	M6	5mm	10.2	90 in-lb
Target Magnet to Trip Arm Bracket - Hex Nut	7/16-20	11/16	47	35
Go Switch to Go Switch Bracket- Hex Nut	5/8-18	15/16	47	35
Standoff - Pan Hd Mach Phillip Screw	6-32	Phillips	1.9	17 in-lb
Travel Ind. Scale - Pan Hd Mach Phillip Screw	6-32	Phillips	1.9	17 in-lb
Positioner - Sckt Hd Cap Screws	5/16-18	5/16	23	17
546/67CFSR Mounting				
546 Bracket to Actuator - Hex Hd Cap Screw	1/2-13	3/4	92	68
546 to Bracket - Hex Hd Cap Screw	5/16-18	1/2	23	17
67CFSR to Bracket - Hex Hd Cap Screw	5/16-18	1/2	23	17
Solenoid/2625 Booster Mounting				
2625 Bracket to Actuator - Hex Hd Cap Screw	1/2-13	3/4	92	68
2625 V-blocks to Bracket - Hex Hd Cap Screw	5/16-18	1/2	23	17
Solenoid to Bracket - Hex Hd Cap Screw	5/16-18	1/2	23	17

Installation

Key numbers in installation procedures are shown in figure 9 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.

⚠ 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.

⚠ 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.

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).

1. If the valve is to be stored before installation, protect the buttweld 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.
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 vertical position.
5. The actuator is counterclockwise to open with the shaft in a vertical 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.

⚠ 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 3, 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.

Figure 2. Lifting Guidelines

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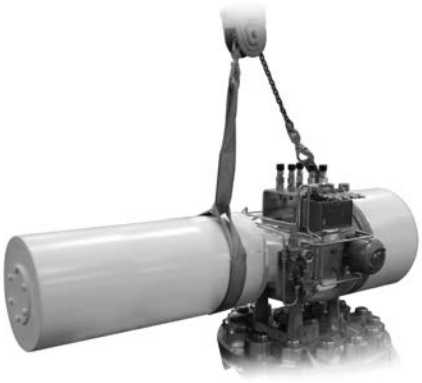

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X0420

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 3560 kg (7850 lb). Make sure to use appropriate lifting straps/eyebolts/hoists capable of lifting this weight.

Lifting Valve/Actuator Assembly

To lift the assembly, insert 1-1/4-7 UNC swivel hoist rings into the four lifting hole locations on the outside diameter of the bonnet flange. The lifting point must be high enough away from the top of the accessory mountings to prevent damage to accessories or piping. The h-beam illustrated in figure 2 is adjustable axially along the pipe run in order to lift at the center of gravity (CG) of the assembly. Two adjustable length chains on one side of the valve body ensure the assembly is lifted vertically. Refer to the appropriate drawing for the CG of your assembly.

Lifting Actuator Only

⚠ WARNING

Do NOT attempt to lift the actuator while attached to the bonnet or valve body as this will damage components and could cause bodily harm.

To lift the actuator, choke two straps, one around the spring barrel and one around the air cylinder, and connect to an adjustable chain leveler. The chain leveler ensures the actuator and bonnet mating surfaces are parallel prior to removal or installation. Proper alignment of the actuator and bonnet is critical to prevent binding of the shaft and actuator. If accessories are not removed prior to lifting, use care to keep straps or chains away from piping and accessories.

Alternatively, if the four actuator lifting lugs are accessible, chains can be used to lift the actuator. Similarly, the actuator and bonnet mating surfaces must remain parallel.

Lifting Bonnet Only

To lift the bonnet, insert 1-1/4-7 UNC swivel hoist rings into the four lifting hole locations on the outside diameter of the bonnet flange. Use proper length, or adjustable chains to ensure the bonnet and valve body mating surfaces remain parallel when hoisted.

Lifting Valve Only

To lift the valve, insert two 2-1/2-8 swivel hoist rings, diametrically opposed and on opposite sides of the valve body run, into the body-to-bonnet bolt circle. An alternative to the swivel hoist rings is to use an internal thread lifting ring which can be threaded onto the existing 2-1/2-8 studs (key 4).

Lifting Ball/Shaft Assembly

To lift the ball/shaft assembly, install the lifting plate (GE48210) and 5/8-11x1.00 cap screw (key 31) as shown in figure 2. Line up the lifting plate edge with the keyway groove of the shaft; this will position the lifting end of the plate over

the ball. Torque the cap screw to 163 N • m (120 lbf • ft). Install a ½-13 eye bolt into the lifting end of the plate and torque to 92 N • m (68 lbf • ft). Lift the ball/shaft assembly vertically out of the body, being careful not to damage the sealing surface of the ball.

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.

Important - the open and closed travel stops of the actuator DO NOT require adjustment unless the bonnet-to-body joint is loosened. If the actuator is removed for packing replacement, simply remount the actuator per the Actuator Mounting section of this manual. If the bonnet-to-body joint is loosened for any reason, establish the zero position per the Determining Closed Position section of this manual.

Key numbers in this procedure are shown in figure 9, unless otherwise noted.

⚠ WARNING

The 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 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 9, unless otherwise noted. A detailed view of the packing is also shown in figure 3.

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

Important - the open and closed travel stops of the actuator DO NOT require adjustment unless the bonnet-to-body joint is loosened. If the actuator is removed for packing replacement, simply remount the actuator per the Actuator Mounting section of this manual.

Disassembly

⚠ WARNING

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

1. Remove the actuator from the bonnet by removing the eight cap screws (key 3).
2. Remove the yoke key (key 23), coupler (key 22), and square key (key 9) from the drive shaft.
3. Loosen and remove packing nuts (key 27), packing flange (key 26), Belleville springs (key 160), and the stop flange (key 16).

Note
Do not loosen or adjust the stop cap screws on the packing flange or the stop flange.

4. Use packing removal tools to pull the packing set (key 15) out of the bonnet.
5. Carefully clean the drive shaft (key 2) and packing box bore of the bonnet (key 5). Using a flashlight, look into the packing box bore and ensure all packing and residue are cleaned out.
6. Properly dry out the packing box bore of the bonnet before repacking the valve.

⚠ 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.

⚠ 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.

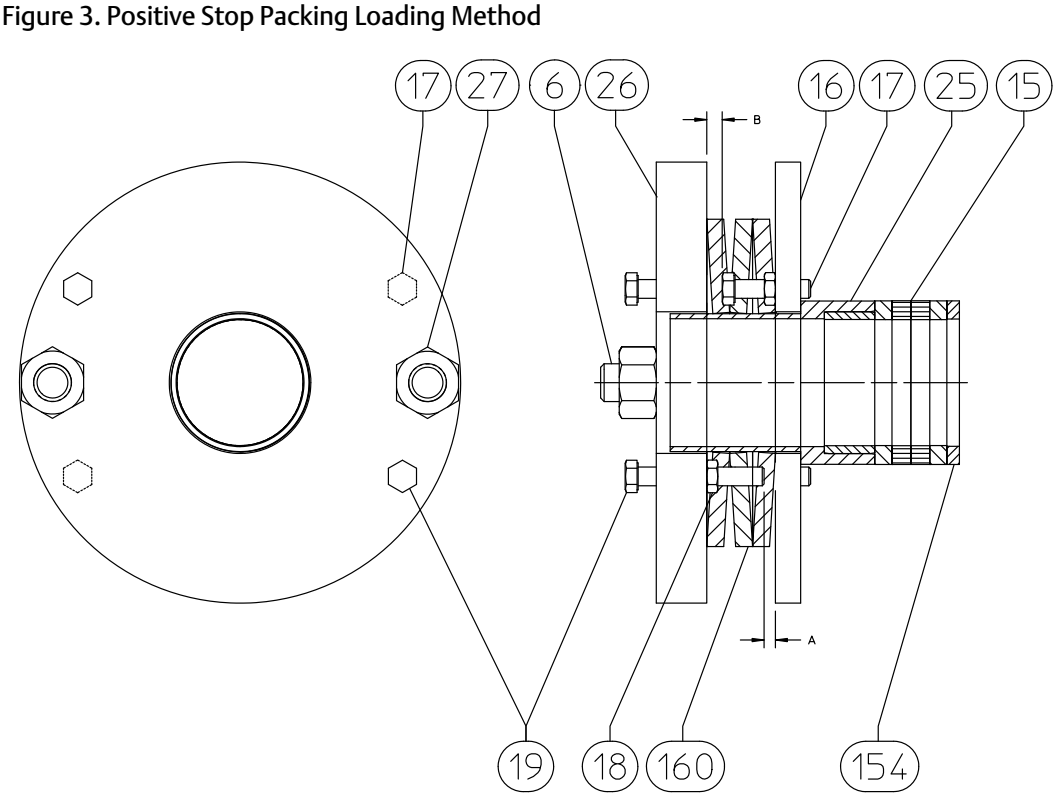
Packing Installation

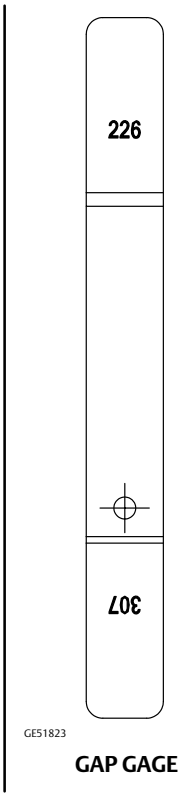
1. Refer to figure 3 and install the following parts in the packing box bore by aligning each part's ID with the OD of the drive shaft. First in is one packing box ring (key 154), then one anti-extrusion ring (key 15), two graphite ribbon packing rings (key 15), and lastly one anti-extrusion ring (key 15).
2. Install the packing follower/bushing assembly (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. Apply Loctite 242 (key 77) to the two 3/8-24x1.50 hex cap screws (key 17). Install the cap screws with two 3/8-24 hex nuts (key 18) in the stop flange (key 16). Final stop screw lock position will be set with gauged clearance to the packing flange.
4. Install the stop flange assembly against the packing follower/bushing assembly (key 25).
5. Install three Belleville springs (key 160) on top of the stop flange (key 16). Orient the Belleville stack as shown in figure 3 (top spring with large OD against packing flange).
6. Apply Loctite 242 (key 77) to two 3/8-24x2.50 stop cap screws (key 19). Install the two stop cap screws (key 19) with 3/8-24 hex nuts (key 18) in the packing flange (key 26). Final stop screw lock position will be set with gauged clearance to the stop flange.
7. Install the packing flange assembly on top of the Belleville springs (key 160).
8. Lubricate the two 3/4-10x5.75 continuous thread packing box studs (key 6) with Nuclear Grade Never-Seez® (key 30) and install into the bonnet (key 5).
9. Lubricate the threads and seating surface of the two 3/4-10 hex nuts (key 27) with Nuclear Grade Never-Seez and install onto the packing studs (key 6).
10. Tighten, without torque, the packing 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). (Reference figure 3).
11. Use gap gage GE51823 to set the nominal, 5.74 mm (0.226 inch), Gap A for the packing flange stop screws (key 19) and the top of the stop flange (key 16). Torque nut (key 18) to 41 N • m (30 lbf • ft).
12. Use gap gage GE51823 to set the maximum, 7.80 mm (0.307 inch), Gap B for the stop flange stop screws (key 17) and the packing flange (key 26). Torque nut (key 18) to 41 N • m (30 lbf • ft).
13. Tighten the packing flange nuts (key 27) until the nominal, 5.74 mm (0.226 inch), Gap A for the packing flange stop screws (key 19) goes to zero and just contacts the stop flange (key 16) which will set the packing stress to its nominal value.

Figure 3. Positive Stop Packing Loading Method





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 Loctite 242 (key 77) to the two 3/8-24 x 1.50 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 3.
4. Apply Loctite 242 (key 77) to the two 3/8-24 x 2.50 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 3/4-10 packing flange studs (key 6) with Nuclear Grade Never-Seez lubricant (key 30). Install two 3/4-10 packing flange nuts (key 27), using a 1-1/4 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 3).
8. Use gap gage GE51823 to set the 5.74 mm (0.226 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 GE51823 to set the 7.80 mm (0.307 inch) gap B for the stop flange stop screws (key 17) 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 2.50 stop cap screws (key 19) three full turns.
2. Apply Loctite 242 (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 7.80 mm (0.307 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.

Replacing the Trim Parts

Important - the open and closed travel stops of the actuator will need adjustment after any trim replacement per the Actuator Mounting section of this manual. If the bonnet-to-body joint is loosened for any reason, establish the zero position per the Determining Closed Position section of this manual.

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 bearing, thrust washers, Belleville spring, ball/shaft assembly, and seal components (keys 12, 13, 7, 8, 14, 2, and 20).

Disassembly

1. Remove actuator taking care not to bind the coupler (key 22) on the drive shaft.

2. Loosen and remove packing nuts. Now remove the packing flange (key 26), Belleville springs (key 160), stop plate (key 16), and packing follower (key 25).
3. Rotate the ball 180 degrees out of the seal so that the sphere and pin hole point downstream. The keyway at the top of the shaft will be facing towards the inlet side of the body. **Note: there is a linear indicating mark just above the packing parts on the drive shaft indicating the sphere-side of the ball.**
4. Loosen and remove the body/bonnet nuts (key 117).
5. Using a safe lifting method, lift the bonnet (key 5) vertically off of the valve body (key 1); make sure the ball/shaft assembly (key 2) does not lift with the bonnet.

CAUTION

Ensure the bonnet flange remains level and parallel to body mounting face. Failure to maintain parallel will lead to binding of the drive shaft to the bonnet. If done improperly, this could damage the ball, shaft, bonnet, and body.

6. Remove cap screw (key 31) and washer (key 10) from the ball/shaft assembly (key 2).
7. Install lifting plate, GE48210, onto the drive shaft with the 5/8-11x1.00 cap screw (key 31). The 1/2-13 threaded hole should be centered directly over the ball sphere. Torque to 163 N • m (120 lbf • ft).
8. Install a 1/2-13 eye bolt into the ball/shaft lifting plate. Torque to 92 N • m (68 lbf • ft).
9. Lift the ball/shaft assembly (key 2) vertically out from the valve body.

CAUTION

While lifting the ball/shaft assembly, ensure the sphere does not come into contact with the valve body. Damage to the sphere will affect the seat leakage performance of the valve.

10. Remove the lower thrust washer (key 8), follower bearing (key 13), and ball Belleville spring (key 14).
11. Remove qty 16 socket head cap screws (key 28) from the seal (key 20).
12. Remove seal (key 20), taking care not to damage the guide diameter of the valve body.
13. Completely remove any remaining flat sheet gasket (key 21) material from the valve body gasket surface.

⚠ WARNING

Perform the steps in the WARNING at the beginning of the Maintenance section of this manual.

CAUTION

Exercise care to avoid damaging components in the following procedure.

Assembly

1. Inspect parts, ensuring no rust, corrosion, or foreign material is present and that bearing, guide, and sealing surfaces do not have nicks or scratches.

2. Install the Belleville spring (key 14), follower bearing (key 13), and thrust washer (key 8) as shown in figure 4.
3. Install lifting plate, GE48210, on the keyed end of the ball/shaft assembly.
4. With the ball facing 180 degrees away from the seal, carefully lower the ball/shaft assembly (key 2) into the valve body until the follower shaft of the ball/shaft assembly (key 2) is guided and fully seated in the follower bearing.
5. Loosen and remove the cap screw (key 31) and lifting plate, GE48210.
6. Lubricate the 5/8-11x1.00 cap screw (key 31) with Nuclear Grade Never-Seez (key 30) and install the washer (key 10) and cap screw (key 31) into the end of the drive shaft. Tighten to 163 N • m (120 lbf • ft).
7. Install the special thrust washer (key 7) onto the drive shaft and mate against the ball.

Note

If the ball/shaft assembly (key 2), drive bearing (key 12), or bonnet (key 5) are new or replacement parts, then a new special thrust washer (key 7) must be ordered. All four of the components are a matched set and ensure proper alignment of the ball with the seal. Contact your Emerson Process Management sales office for assistance with procuring a new special thrust washer.

8. Install the drive bearing (key 12) onto the drive shaft and mate against the special thrust washer (key 7).
9. Lubricate with Nuclear Grade Never-Seez (key 30) and install fourteen 2-1/2-8x12.50 studs (key 4) into the valve body (key 1).
10. Install the spiral wound gasket (key 11) into the groove on top of the valve body (key 1).
11. Carefully lower the bonnet (key 5) over the drive shaft, ensuring the alignment pin hole of the bonnet is guided over the alignment pin of the valve body.
12. Lubricate the threads and seating surface of fourteen 2-1/8 UNC-2B heavy hex nuts (key 117) with Nuclear Grade Never-Seez (key 30) and install onto each stud (key 4). Torque all nuts to an initial 5484 N • m (4045 lbf • ft) and then to a final torque of 10969 N • m (8090 lbf • ft). Tighten the bolted joint using a criss-cross pattern shown in figure 5. Tighten each bolt evenly and in the sequence described.

Figure 4. Lower Thrust Washer and Ball Belleville Spring Installation

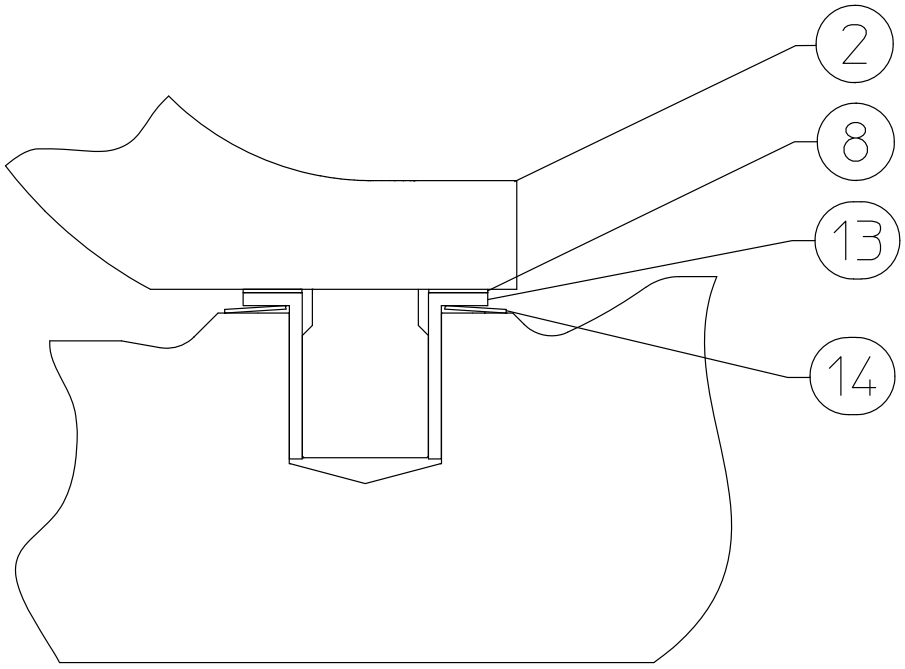
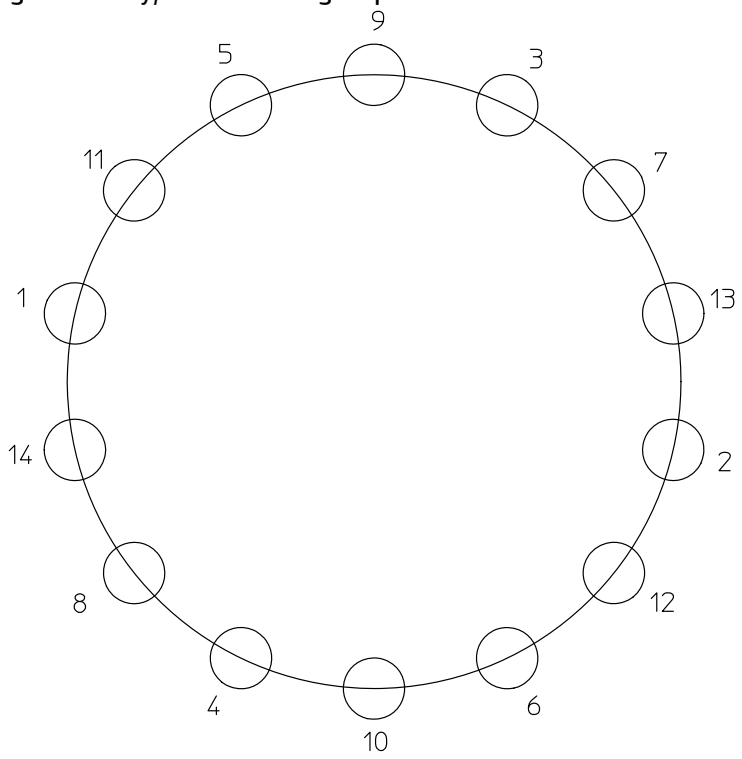


Figure 5. Body/Bonnet Bolting Sequence



Troubleshooting

Table 3. 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.
Bonnet 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 ball is positioned correctly in the closed position. Reference the Determining Closed Position section of this instruction manual.
	Disassemble and inspect ball, sleeve seal, and piston ring for excessive wear or scratches.
Other	Consult your Emerson Process Management sales office.

Actuator Mounting

Important - the open and closed travel stops of the actuator DO NOT require adjustment unless the bonnet-to-body joint is loosened. If the actuator is removed for packing replacement, simply remount the actuator per the Actuator Mounting section of this manual. If the bonnet-to-body joint is loosened for any reason, establish the zero position per the Determining Closed Position section of this manual.

1. Prior to actuator installation, install shaft key (key 9) on drive shaft key slot.
2. Drive spring pin (key 24) into coupler (key 22).
3. Install coupler (key 22) over drive shaft, holding shaft key (key 9) in place.

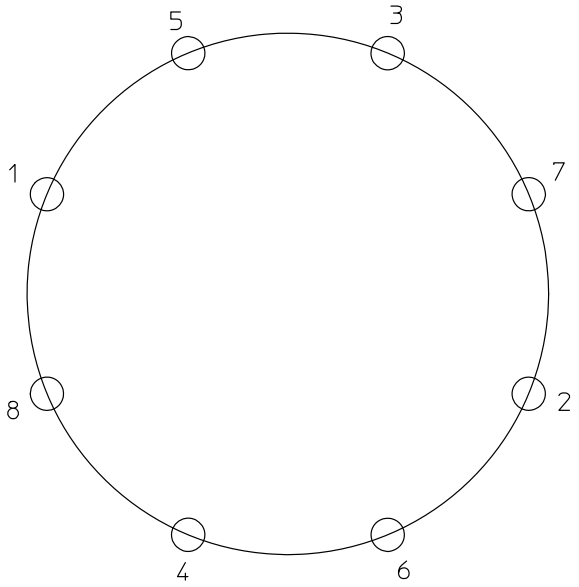
4. Drive spring pin (key 32) into yoke key (key 23).
5. Install yoke key (key 23), with the spring pin toward the drive shaft, onto the coupler (key 22). This yoke key will need to be held in place while lowering actuator onto shaft.
6. Lower the actuator over the drive shaft and onto the bonnet (key 5). Ensure the actuator and bonnet mounting surfaces remain parallel to prevent binding. A long metal rod or screwdriver can be used to hold the yoke key (key 23) in place until it is fully seated into actuator.
7. Lubricate with Nuclear Grade Never-Seez (key 30) and install 8 3/4-10x2.62 hex cap screws (key 3) finger-tight through the bonnet (key 5) into the actuator. Now rotate the entire actuator counter-clockwise (ccw) as far as the bolted joint will allow. This will skew the actuator slightly, relative to the valve pipe run; this is acceptable.

Note

Step 7 is essential to ensure the valve is always returned to the same closed position after removing the actuator and replacing the packing.

8. With the actuator rotated counter-clockwise on the bolted joint, tighten the cap screws (key 3) to an initial torque of 136 N • m (100 lbf • ft) and a final torque of 271 N • m (200 lbf • ft). Tighten the bolted joint using a criss-cross pattern illustrated below in figure 6. Tighten each bolt evenly and in the sequence described.

Figure 6. Actuator/Bonnet Bolting Sequence



Determining Closed Position

1. With the ball shaft assembly approximately 90° from the seal fill the valve full of water on inlet and outlet section. Do not pressurize the system at this time as it could alter the zero positioning of the valve.
2. On the Bettis, back out the closed travel stop by turning the stop counterclockwise (ccw) approximately 5 turns.
3. Using a calibrated regulator capable of supplying 0-689 kPa (0-100 psig), increase the pressure to the Bettis air cylinder to 317 kPa (46 psig). Do not fill cylinder too fast, as the fast stroking speed could alter the zero positioning of the valve.

4. When the ball/shaft assembly stops rotating, the valve is in the closed position.
5. Turn the Bettis closed travel stop clockwise (cw) until the stop is firmly seated against the internal scotch yoke of the actuator. Snug the stop up against the yoke with a light turn of a wrench. Do not tighten so much as to change the position of the ball/shaft assembly.
6. Securely tighten the closed travel stop lock nut using a 1-13/16 inch wrench.
7. Now, back out the Bettis open travel stop by turning the stop ccw approximately 5 turns.
8. Reduce pressure in the Bettis air cylinder until the ball/shaft assembly has rotated 90° ± 2° away from the closed position established above.
9. Turn the Bettis open travel stop clockwise (cw) until the stop is firmly seated against the internal scotch yoke of the actuator. Snug the stop up against the yoke with a light turn of a wrench. Do not tighten so much as to change the position of the ball/shaft assembly.
10. Securely tighten the open travel stop lock nut using a 1-13/16 inch wrench.
11. Set the supply regulator pressure to the appropriate pressure per Type III drawing or serial card.

Accessory Mounting Instructions

Fisher 2625NS/Solenoid Mounting

Reference figure 7 for this accessory mounting section.

1. Apply Loctite 242, (key 77) to the four 1/2-13 x 1.12 cap screws and attach the mounting bracket to the actuator, tightening to 92 N • m (68 lbf • ft) with a 3/4 inch wrench.
2. Bolt the 2625NS and SST nipples to the mounting bracket with the v-block assemblies as shown in figure 7. Apply Loctite 242, (key 77) to the four 5/16-18 x 4.25 cap screws and tighten to 23 N • m (17 lbf • ft) with a 1/2 inch wrench.
3. Attach the solenoid to the mounting bracket with 5/16-18 x 0.62 cap screws. Apply Loctite 242, (key 77) to the 5/16-18 cap screws and tighten to 23 N • m (17 lbf • ft) with a 1/2 inch wrench.

Fisher 546 i/P Transducer/67CFSR Mounting

Reference figure 8 for this accessory mounting section. For ease of installation, install the 546 i/P to the bracket prior to mounting the bracket to the actuator.

1. Attach the 546 I/P to the mounting bracket with 5/16-18 x 0.88 cap screws as shown in figure 8. Apply Loctite 242, (key 77) to the 5/16-18 cap screws and tighten to 23 N • m (17 lbf • ft) with a 1/2 inch wrench.
2. Apply Loctite 242, (key 77) to the 1/2-13 x 1.50 cap screws and attach the mounting bracket, with spacer plate, to the actuator, tightening to 92 N • m (68 lbf • ft) with a 3/4 inch wrench.
3. Apply Loctite 242, (key 77) to the 5/16-18 x 3.50 cap screws and attach the two 67CFSR regulators to the mounting bracket, tightening to 23 N • m (17 lbf • ft) with a 1/2 inch wrench.

Fisher 3610J Positioner/GO Switch Mounting

Reference figure 8 for this accessory mounting section.

1. Apply Loctite 242, (key 77) to the four 1/2-13 x 0.88 cap screws and attach the mounting bracket to the actuator, tightening to 92 N • m (68 lbf • ft) with a 3/4 inch wrench as shown in figure 8.
2. Apply Loctite 242, (key 77) to M6 x 1 x 12 socket head cap screw and attach the namur disc to the actuator, tightening to 10.2 N • m (90 lbf • in) with a 4 mm allen wrench.
3. Attach each magnet to the trip arm assembly by using two 7/16-20 hex nuts, two 7/16 star washers, and two 7/16 plain washers as shown in figure 8, tightening to 47 N • m (35 lbf • ft) with a 11/16 wrench.

4. Apply Loctite 242, (key 77) to the two M6 x 1 x 20 socket head cap screws and attach the trip arm assembly with magnets, cam, and pointer to the namur disc as shown in figure 8, tightening to 10.2 N • m (90 lbf • in) with a 5mm allen wrench.
5. Install each GO switch with a switch adaptor, 5/8 plain washer, 5/8 star washer and 5/8-18 hex nut to the bracket as shown in figure 8, tightening to finger tight.
6. Apply Loctite 242, (key 77) to the standoffs and attach to the bracket as shown in figure 8, tightening to 1.9 N • m (17 lbf • in) with a 1/4 inch allen wrench.
7. Attach the travel indicator scale to the standoff with 6-32 x 0.31 phillips pan head cap screws and No. 6 plain washers, tightening to average mechanics torque with a phillips screw driver.
8. Attach the 3610J positioner to the mounting bracket with 5/16-18 x 0.75 cap screws as shown in figure 8. Apply Loctite 242, (key 77) to the 5/16-18 cap screws and tighten to 23 N • m (17 lbf • ft) with a 5/16 inch wrench.
9. Adjust the valve to the desired closed/open position.
10. With the valve in the desired closed/open position, line up the target magnet and GO Switch, and then establish a 4.06 – 5.08 mm (0.160 – 0.200 inch) gap between the ends of the GO switch and target magnet. Now torque the 5/8-18 hex nuts to 47 N • m (35 lbf • lb).
11. Return the valve back to the closed/open position; line up the target magnet and GO switch. Then establish a 4.06 – 5.08 mm (0.160 – 0.200 inch) gap. Now torque the 5/8-18 hex nuts to 47 N • m (35 lbf • ft)

Figure 7. Fisher 2625NS/Solenoid Mounting

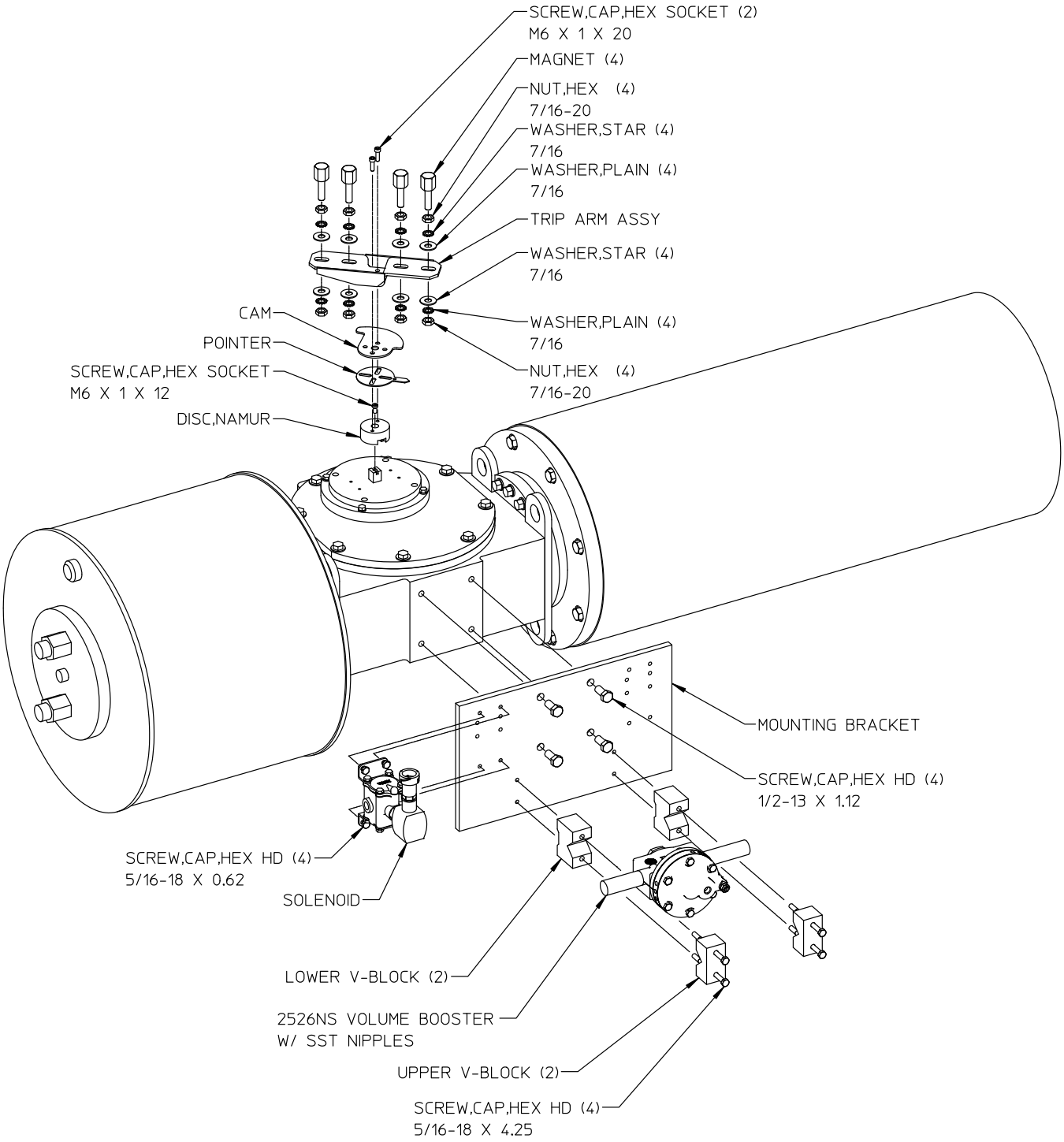
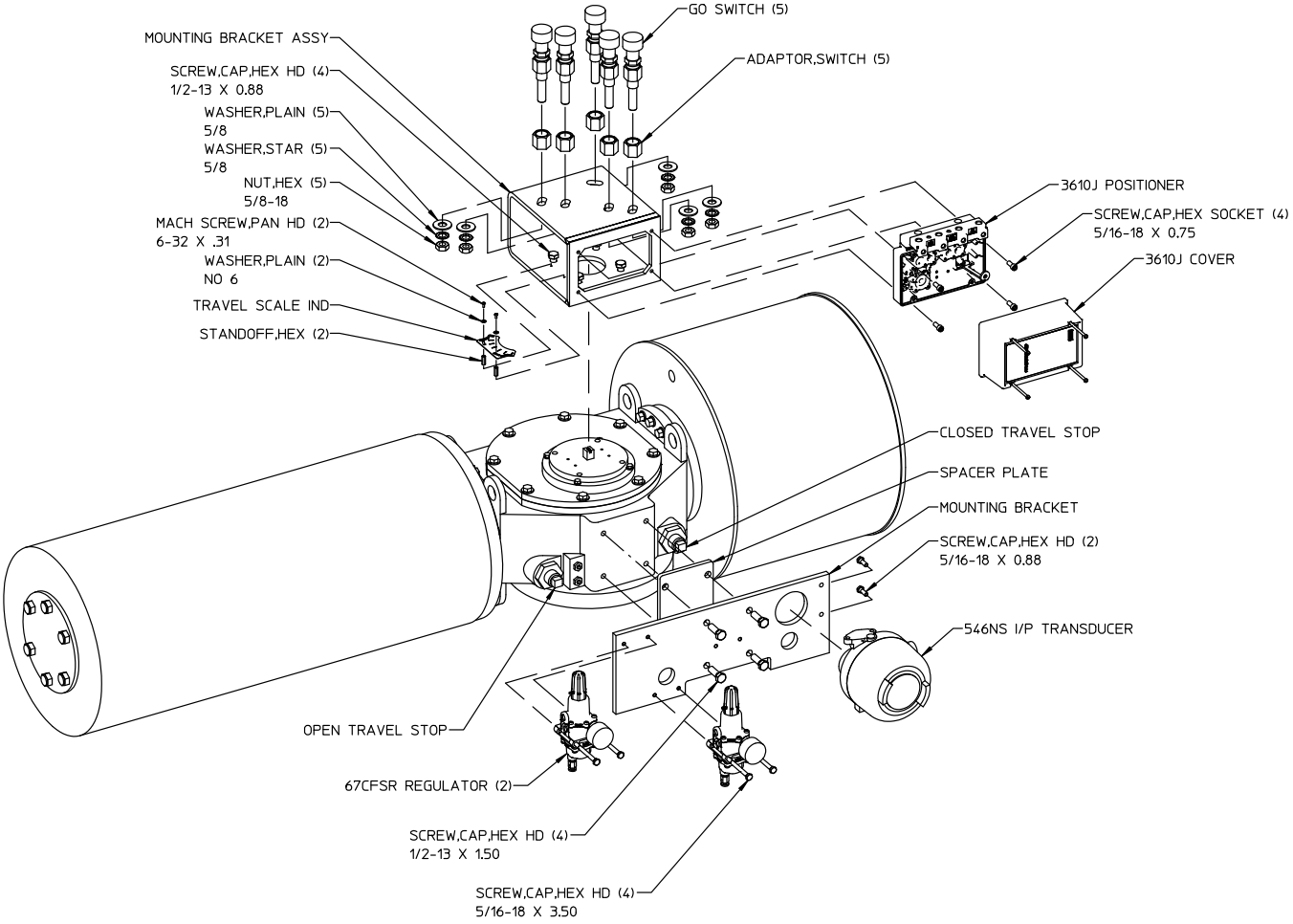


Figure 8. Fisher 546 I/P Transducer/67CFSR Mounting and 3610J Positioner/GO Switch Mounting



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.

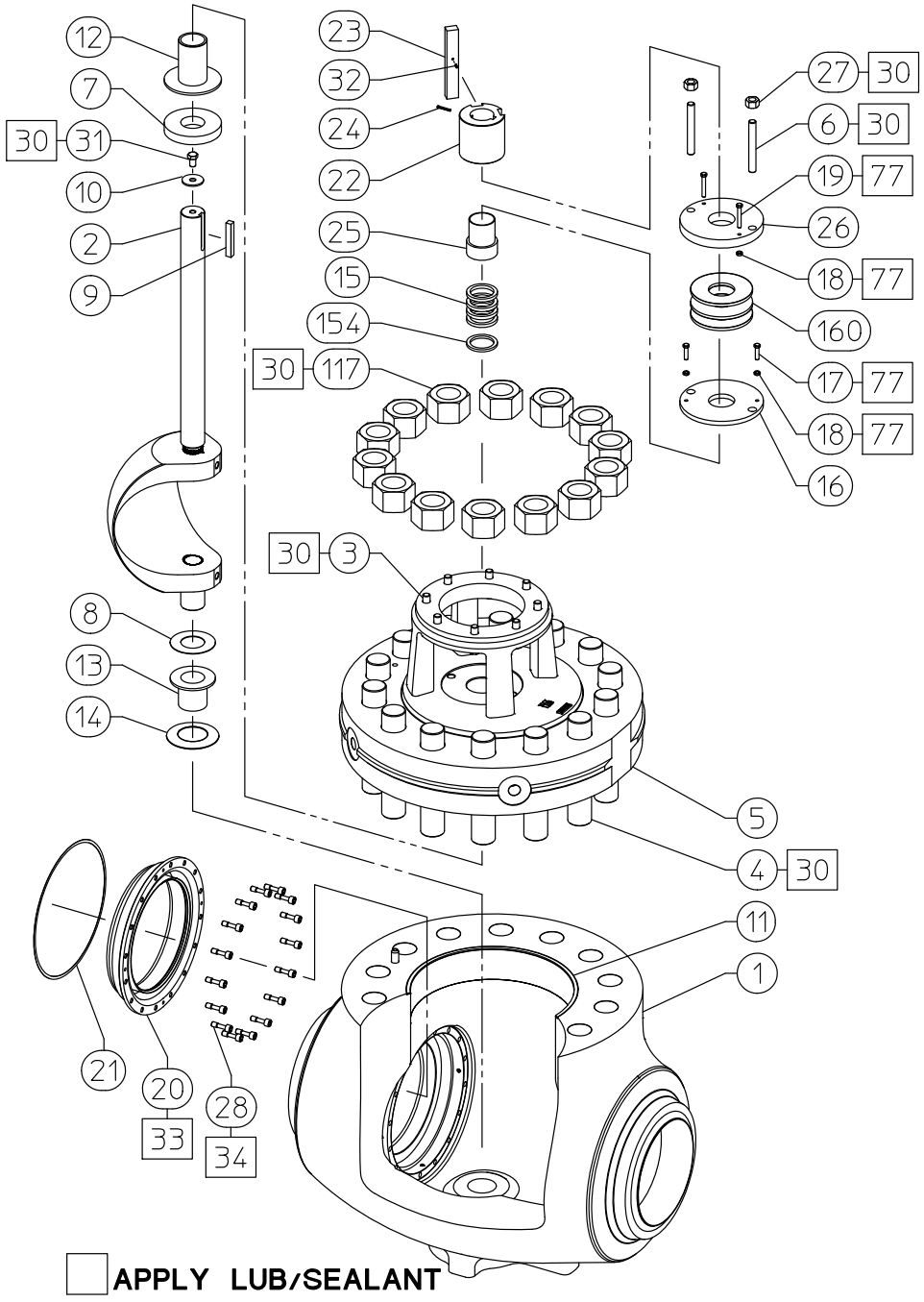
Parts List

Key	Description	Qty	Part Number
1	VALVE BODY ASSY	1	GE48000X022
2*	BALL/SHAFT ASSY	1	GE48198X012
3	SCREW,CAP,HEX HD 3/4-10X2.62	8	12A9458X022
4	STUD, CONT W/STOP 2 1/2 - 8 X 12.50	14	GE48228X012
5	BONNET	1	GE48043X012
6	STUD,CONT THREAD 3/4-10 X 5.75	2	17B3084X012
7*	WASHER, THRUST, SPCL	1	GE50801X012
8*	WASHER, THRUST, LOWER	1	GE46768X012
9*	KEY, SHAFT	1	V153364X042
10	WASHER	1	V151142X022
11*	GASKET, SPIRAL WOUND	1	GE46776X022
12*	BEARING, DRIVE	1	GE46775X012
13*	BEARING, FOLLOWER	1	GE48207X012
14	SPRING, BELLEVILLE, BALL	1	GE46777X012
15*	PACKING SET	1	GE48229X012
	SPRING PACK ASSY	1	GE46782X012
17	SCREW, CAP, HEX, HD 3/8-24 X 1.50	2	1A3464X0022
18	NUT, HEX, JAM 3/8-24	4	1A680335252
19	SCREW, CAP, HEX, HD 3/8-24 X 2.50	2	GE51734X012
20*	RING, SEAL	1	GE49053X012
21*	GASKET	1	GE48209X022
22	BETTIS COUPLER	1	GE56443X012
23	YOKE KEY	1	16B5430X032
24	PIN,ROLL	1	T1182636402
26	FLANGE, PACKING	1	GE46781X012
27	NUT, HEX 3/4-10 UNC-2B	2	1A352035252
28	SCREW, CAP, SPCL 1/2-13 X 1.75	16	GE47980X012
31	SCREW, CAP	1	V151143X022
32	PIN, ROLL, DRIV-LOK	1	V143150X012
40	NAMEPLATE	1	12B6400X012
41	NAMEPLATE, NUCLEAR	1	16A4171X012
42	DRIVE SCREW	4	1A368228982
117	NUT, HEX HEAVY 2 1/2-8 UNC-2B	14	1P3683X0322
154*	RING, PACKING BOX	1	13B8709X012

Key	Description	Qty	Part Number
Special Tools			
	LIFTING PLATE	1	GE48210X012
	GAP GAGE	1	GE51823X012
Solenoid/2625 Mtg			
	MTG ASSY, 2625NS	1	GE42525X022
	PLATE, MOUNTING	1	GE48227X012
	SCREW,CAP,HEX HD 5/16-18X3.50	4	T14109T0052
	SCREW,CAP,HEX HD 1/2-13X1.12	4	1H4469X0052
546NS/67CFSR Mtg			
	PLATE, MOUNTING	1	GE48235X012
	SPACER, PLATE	1	GE57096X012
	SCREW,CAP,HEX HD 5/16-18X3.50	4	T14109T0052
	SCREW,CAP,HEX HD 5/16-18X0.88	2	1C5958X0032
	SCREW,CAP,HEX HD 1/2-13X1.50	4	1A4533K0022
Positioner / GO Switch Mtg			
	POSITIONER/GO SWITCH MTG KIT	1	GE47904X012
Lubricant/Sealant			
30	Nuclear Grade Never-Seez		
77	Loctite 242		

*Recommended spare parts

Figure 9. Exploded View, Fisher SS-264 Valve Body Assembly



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 4. Fisher SS-264 Spare Parts

Drawing Number	Replacement Part Number	Part Description / Key No.	Qty	Classification	Spare Part Code[1]	Spare Part Requirement Rationale	Shelf Life	Shelf Life Rationale[2]
GE48229	GE48229X012	Packing Set, Key 15	1	Non-Safety Related	O/1	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.
13B8709	13B8709X012	Packing Box Ring, Key 154	1	Non-Safety Related	O/1	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.
GE46776	GE46776X012	Spiral Wound Gasket, Key 11	1	Non-Safety Related	O/1	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. Replace every time Bonnet is removed.	N/A	Graphite does not exhibit a tendency to degrade over time.
GE51823	GE51823X012	Gap Gage	1	Non-Safety Related	O/1	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.
GE48198	GE48198X012	Ball Assy, Key 2	1	Safety Related	O/1	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.
GE49053	GE49053X012	Seal Ring, Key 20	1	Non-Safety Related	O/1	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.
GE48209	GE48209X012	Gasket, Key 21	1	Non-Safety Related	O/1	The gasket should be replaced at same time as seal ring. 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.
1V87294	1V87294X022	Bettis Coupler, Key 22	1	Safety Related	O/1	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.

Table 4. Fisher SS-264 Spare Parts (continued)

Drawing Number	Replacement Part Number	Part Description / Key No.	Qty	Classification	Spare Part Code(1)	Spare Part Requirement Rationale	Shelf Life	Shelf Life Rationale(2)
GE46784	GE46784X022	Packing Follower/Bushing Assy, Key 25	1	Non-Safety Related	O/1	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.
GE46783	GE46783X012	Belleville Spring, Key 160	3	Non-Safety Related	O/3	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.
GE46786	GE46786X012	Stop Plate, Key 16	1	Non-Safety Related	O/1	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.
GE46781	GE46781X012	Packing Flange, Key 26	1	Non-Safety Related	O/1	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.
GE51734	GE51734X012	Cap Screw, 2.50 in. Lg, Key 19	2	Non-Safety Related	O/2	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.
1A3464	1A3464X0022	Cap Screw, 1.50 in. Lg, Key 17	2	Non-Safety Related	O/2	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/4	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.
17B3084	17B3084X012	Packing Flange Stud, Key 6	2	Non-Safety Related	O/2	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.
1A3520	1A352035252	Packing Flange Nut, Key 27	2	Non-Safety Related	O/2	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.
GE46768	GE46768X012	Thrust Washer, Lower, Key 8	1	Safety Related	O/1	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.
GE46775	GE46775X012	Drive Bearing, Key 12	2	Safety Related	O/2	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.
V153364	V153364X042	Key, Shaft, Key 9	1	Safety Related	O/1	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.

Table 4. Fisher SS-264 Spare Parts (continued)

Drawing Number	Replacement Part Number	Part Description / Key No.	Qty	Classification	Spare Part Code(1)	Spare Part Requirement Rationale	Shelf Life	Shelf Life Rationale(2)
GE48207	GE48207X012	Follower Bearing, Key 13	1	Safety Related	O/1	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.
GE50801	GE50801X012	Thrust Washer, SPCL, Key 7	1	Safety Related	O/1	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.
T11826	T1182636402	Pin, Roll, Key 24	1	Safety Related	O/1	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.
16B5430	16B5430X032	Yoke Key, Key 23	1	Safety Related	O/1	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.
V143150	V143150X012	Roll Pin, Driv-Lok, Key 32	1	Safety Related	O/1	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.

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