

Fisher™ 1052PSV Size 60 Rotary Actuator

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



Introduction

Scope of Manual

This instruction manual includes installation, adjustment, maintenance, and parts ordering information for the Fisher 1052PSV (Size 60) pneumatic spring-and-diaphragm rotary actuator (see figure 1).

The seismically qualified actuator design is based on the standard Fisher 1052 size 60 actuator. The 1052PSV size 60 actuator incorporates the tilting diaphragm rod, turnbuckle adjusting feature, upper diaphragm casing assembly, and SS-129 dual springs mounted within a fabricated box construction. The actuator box is designed for standard 3610J positioner mounting. Adjustable valve open position is provided by limiting lever rotation with adjustable travel limit bolts in the bottom of the fabricated actuator box.

To ensure proper assembly, the Vee-Ball™, valve drive shaft, and actuator lever connections are a missing-tooth spline design, allowing one-way only assembly.

Instructions for the control valve, positioner, and other accessories are covered in separate instruction manuals.

Table 1. Fisher 1052PSV Actuator Specifications

| | |
|--|---|
| <p>Operation Direct Acting: Increasing loading pressure extends the diaphragm rod out of the spring barrel Service: For on-off or throttling service with or without a positioner</p> <p>Actuator Sizes Size 60</p> <p>Maximum Diaphragm Sizing Pressure⁽¹⁾ 2.7 bar (39 psig)</p> <p>Maximum Diaphragm Casing Pressure⁽³⁾ 3.4 bar (50 psig)</p> <p>Nominal Valve Shaft Rotation 80 degrees rotation (standard) travel stop</p> <p>Valve Shaft Diameters 31.8 mm (1-1/4 inches)</p> <p>Stroking Time Opening requirement is 1 to 5 seconds</p> | <p>Material Temperature Capabilities⁽²⁾ EPDM Diaphragm: -40 to 107°C (-40 to 225°F)</p> <p>Travel Indication Graduated disk and pointer combination located on actuator end of valve shaft, with valve ball position indicator</p> <p>Pressure Conduit Connections Standard: 3/4 NPT internal thread</p> <p>Mounting Positions RH mount, PDT0, Vee-Ball rotates CCW to close, spring-fail closed</p> <p>Approximate Weights 136 kg (300 lb)</p> <p>Additional Specifications For casing pressure ranges and for material identification of the parts, see the Parts List</p> |
|--|---|

1. Use this value to determine the maximum torque output allowed.

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

3. This maximum casing pressure is not to be used for normal operating pressure. Its purpose is to allow for typical regulator supply settings and/or relief valve tolerances.

Do not install, operate, or maintain a 1052PSV actuator 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 1052PSV diaphragm rotary actuator is a pneumatic spring-return actuator for use with the SS-84PSV4 rotary-shaft control valve. The 1052PSV actuator can be used for on-off service, or it can be used for throttling service when equipped with or without a valve positioner. The 1052PSV actuator spring is adjustable (see figure 2).

Educational Services

For information on available courses for Fisher 1052PSV actuators, 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>



Figure 2. Fisher 1052PSV Actuator Adjustable Spring Seat

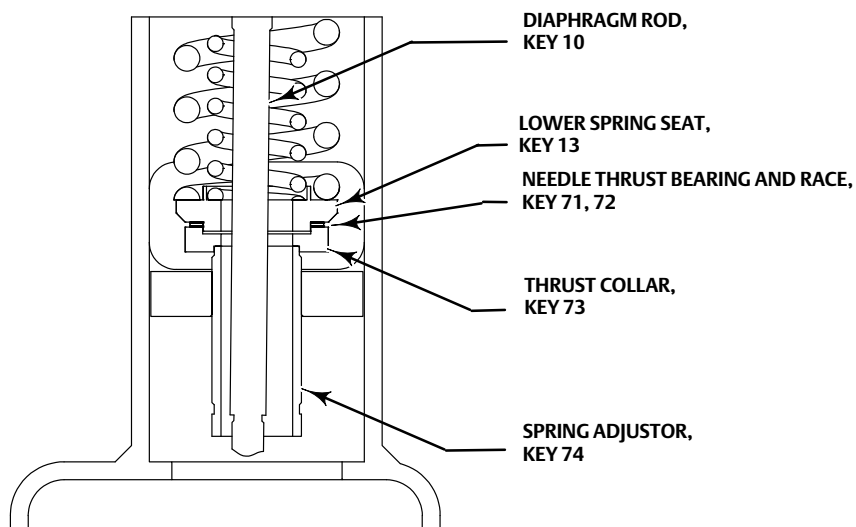


Table 2. Recommended Bolting Torques

| Description, Key Number | Size | Wrench Size | N•m | lbf•ft |
|--|-----------|-------------|-----|-----------------|
| Diaphragm Casing, 5 | 3/8-24 | 9/16 | 27 | 20 |
| Casing to Actuator Box, 7, 8 | 3/8-16 | 9/16 | 41 | 30 |
| Diaphragm Plate to Rod, 9 | 3/4-16 | 5/8 Allen | 102 | 75 |
| Rod end bearing locknut, 16 | 5/8-18 | 15/16 | 61 | 45 |
| Rod end bearing to lever, 18 | 5/8-11 | 15/16 | 163 | 120 |
| Lever Clamp, 28 | 5/8-11 | 15/16 | 163 | 120 |
| Cover, 34 | 1/2-13 | 3/4 | 81 | 68 |
| Turnbuckle locknut, 58 | 7/8-14-LH | 1-5/16 | 163 | 120 |
| Travel stop hex nut, 21 | 7/8-9 | 1-7/16 | 237 | 175 |
| Protective Bracket to Actuator Box, 23 | 3/8-16 | 9/16 | 41 | 30 |
| Accessory Mountings | | | | |
| Positioner – Sckt Hd Cap Screw | 5/16-18 | 5/16 | 23 | 17 |
| 546 to Bracket – Hex Hd Cap Screw | 5/16-18 | 1/2 | 23 | 17 |
| 546 Bracket to Actuator box – Hex Hd Cap Screw | 3/8-16 | 9/16 | 41 | 30 |
| 2625 V-blocks to Actuator Box – Hex Hd Cap Screw | 5/16-18 | 1/2 | 23 | 17 |
| 67CFSR to Actuator Box – Hex Hd Cap Screw | 5/16-18 | 1/2 | 23 | 17 |
| GO Switch™ Mounting | | | | |
| Go Switch Bracket – Hex Nut | 5/16-18 | 1/2 | 23 | 17 |
| Go Switch to Bracket – Hex Nut | 5/8-18 | 15/16 | 47 | 35 |
| Target Magnet to Trip Arm Bracket – Hex Nut | 7/16-20 | 11/16 | 47 | 35 |
| Trip Arm Bracket to Hub – Socket Hd Cap Screw | 8-32 | 9/64 | 3.4 | 2.5 (30 lbf-in) |

Principle of Operation

The diaphragm rod moves down as loading pressure is increased on top of the diaphragm. As the loading pressure is decreased, the spring forces the diaphragm rod upward.

The spring and diaphragm have been selected to meet the requirements of the application and, in service, the actuator should produce full travel of the valve with the diaphragm pressure as indicated on the nameplate.

Consult the separate positioner instruction manual for actuator principle of operation with positioner.

Specifications

Specifications are shown in table 1. Specifications for actuator operation, as it originally comes from the factory, are stamped on the nameplate attached to the actuator.

Installation

When an actuator and valve body are shipped together, the actuator is normally mounted on the valve. Follow the valve body instructions when installing the control valve in the pipeline, and then perform the procedures presented in the Loading Connection section. If the actuator is shipped separately or if it is necessary to mount the actuator on the valve, perform the procedures presented in the Actuator Mounting section.

⚠ WARNING

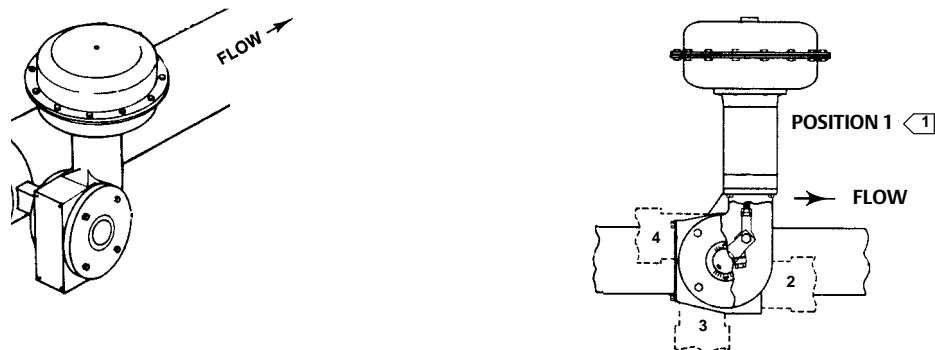
Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury. Be aware of pinching parts during installation, maintenance, and adjustments of valve/actuator components.

To avoid personal injury or property damage resulting from the sudden release of pressure, do not install the valve assembly where service conditions could exceed the limits given on the valve and actuator nameplates. Use pressure-relieving devices as required by accepted industry, local, state, or federal 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.

Figure 3. Mounting Styles and Positions for the Fisher 1052PSV Actuator



43A6505-A
A1584-3

1 NOTE: POSITION 1 IS STANDARD

FISHER SS-84PSV4 VALVE: RIGHT-HAND MOUNTING, PDO ACTION, CCW BALL/PLUG ROTATION TO CLOSE

CAUTION

To avoid parts damage, do not use an operating pressure that exceeds the Maximum Diaphragm Casing Pressure (table 1). Use pressure-limiting or pressure-relieving devices to prevent the diaphragm casing pressure from exceeding its limit.

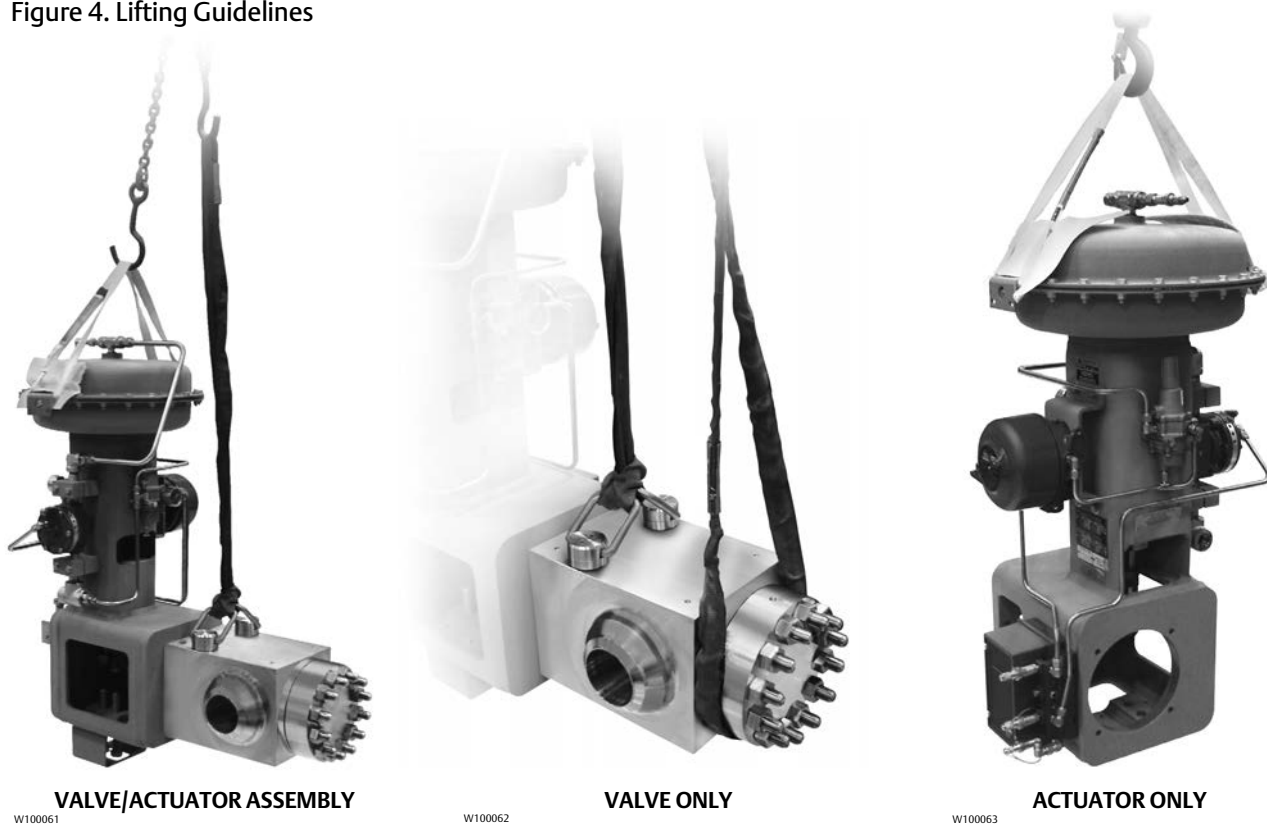
To avoid parts damage, do not stroke the actuator while cover (key 33) is off.

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 4. 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 4. The ends of the strap will be positioned underneath two L-shaped flanges or through eyebolts. Figure 4 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 4. The assembly can now be lifted using a hoist capable of leveling the 3 lifting points.

Lifting Actuator Only

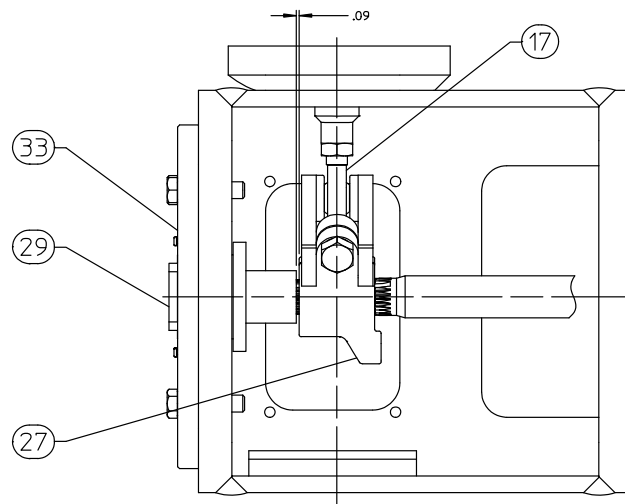
The actuator with accessories shall be lifted by the casing flange as shown in figure 4. Figure 4 shows L-shaped flanges attached to the casings. An alternative casing lift method is to use 3/8 inch eyebolts positioned 180 degrees apart. Use protective pads between the strap and the casing to help prevent 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.

Conduit Connection

Diagnostic test fittings are Swagelok tee fittings with 1/4 inch Swagelok QC-series quick connects and appropriate body protectors installed. Refer to the Bill of Material drawing for locations of diagnostic fittings.

The supply regulator for this assembly requires a 3/4 NPT pipe connection. Use a 3/4 NPT pipe run from the outlet of the supply regulator to the actuator assembly.

Figure 5. Lever Operating Clearance



See appropriate accessory instruction manuals for additional conduit connections.

Valve Flow Direction

Valve construction can change the flow direction for a control valve assembly. It is important to observe the flow direction in all valve applications **before** installing the valve in the pipeline (see figure 3). Refer to the appropriate valve bulletin or instruction manual.

Note

Observe all warnings and cautions provided in the appropriate valve instruction manual Installation section.

Actuator Mounting

Use the following steps in this and the loading connection, turnbuckle adjustment, precise adjustment, and spring adjustment section to connect a valve and an actuator. Key numbers are shown in figure 13.

⚠ WARNING

To avoid personal injury, perform the steps in the WARNING at the beginning of the Maintenance section to isolate the control valve and actuator.

1. Unscrew cap screws (key 34), and remove the cover (key 33).
2. Proper installation of this actuator is right-hand mounted, actuator stem positioned vertically with the valve in a horizontal pipeline.
3. Mount the actuator on the valve body and secure it with the washers and valve mounting screws. The torque for the 5/8 inch studs and nuts is 163 N•m (120 lbf•ft).

CAUTION

Exceeding any torque requirement may impair the safe operation of this actuator by causing broken or damaged parts. Refer to table 2 for the bolting torque requirements.

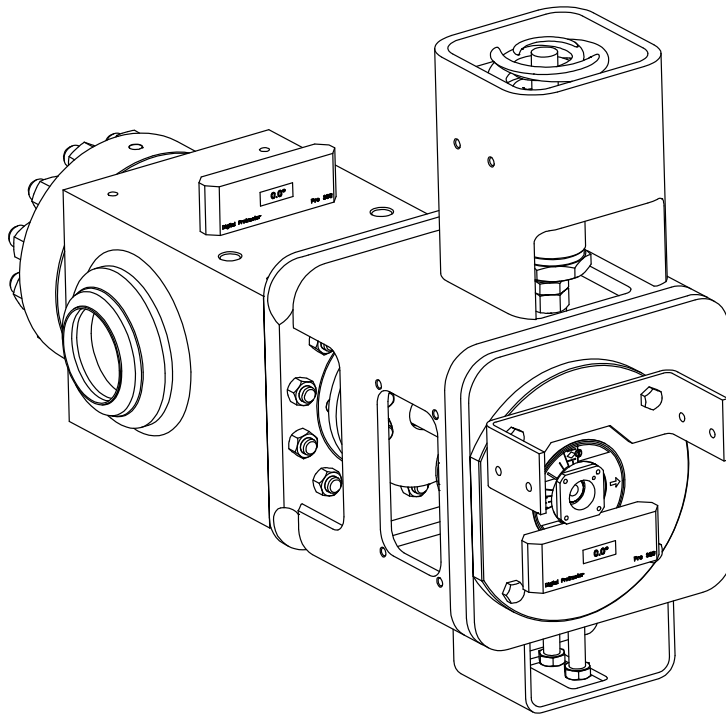
4. Screw the left-hand threaded locknut (key 58) onto the diaphragm rod (key 10) as far as possible.
5. Screw the turnbuckle (key 57) as far as it will go onto the actuator rod.
6. Screw the locknut (key 16) as far as it will go onto the rod end bearing (key 17). Thread this assembly completely into the turnbuckle (key 57).
7. If the lever (key 27) is attached to the rod end bearing, remove the cap screw and hex nut (keys 18 and 19).
8. If the 1052PSV spring adjustment has been changed, complete the Initial Setting portion of the 1052PSV Spring Adjustment section before proceeding.
9. Slide the lever into place (see figure 5). Clamp with the cap screw (key 28).
10. Rotate the lever (key 27) to align with the rod end bearing (key 17). This connection can be aided by moving the actuator off its up travel stop with a regulated air source and adjusting the turnbuckle (key 57) slightly.
11. Apply sealant (key 77) or equivalent thread-locking compound to the threads of the cap screw (key 18).
12. Connect the lever (key 27) and the rod end bearing (key 17) with the cap screw and hex nut (keys 18 and 19). Tighten the cap screw to the recommended bolt torque shown in table 2.
13. Note the valve position and direction of rotation. Position the travel indicator (key 37) according to the valve position just noted.

CAUTION

To avoid parts damage, do not stroke the actuator while the cover (key 33) is off.

14. Replace the cover (key 33), and secure with washers (key 31) and cap screws (key 34).

Figure 6. Precise Valve/Actuator Closed Position Adjustment



⚠ WARNING

Be aware of pinching parts during installation, maintenance, and adjustments of valve/actuator components. To avoid injury, keep hands and tools clear of actuator access windows when operating or adjusting the actuator.

Precise Valve/Actuator Closed Position and Turnbuckle Adjustment

Correct turnbuckle adjustment ensures that the valve is correctly closed when the actuator is against its travel stops. Key numbers are shown in figure 13.

A regulated air supply with appropriate gauge will be required to stroke the actuator. The following wrench sizes will be used to adjust the turnbuckle: 1-5/16 inch wrench for the turnbuckle (key 57), 15/16 inch wrench for the lower locknut (key 16), and 1-5/16 inch wrench for the left-hand upper locknut (key 58).

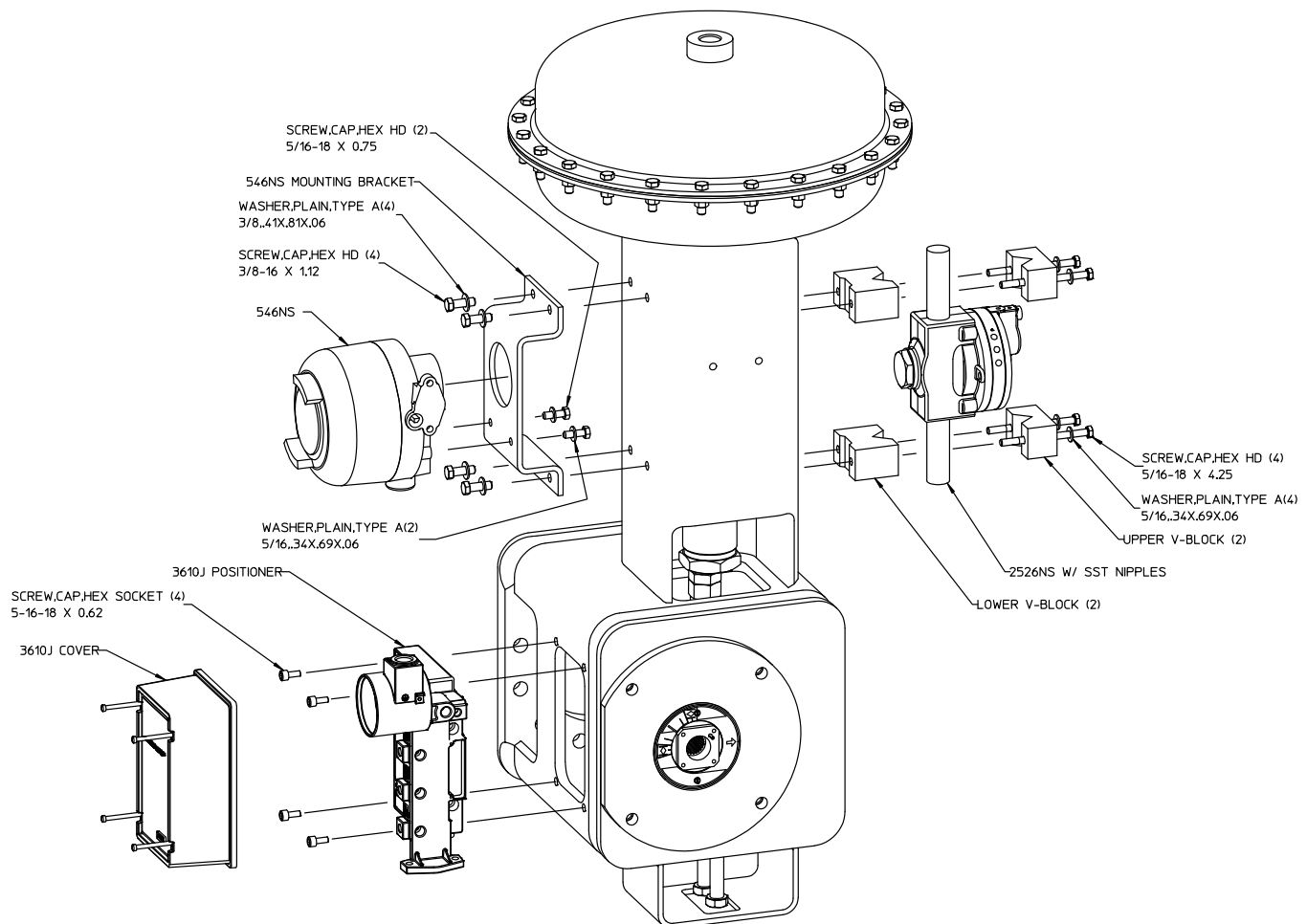
Note

For the most accurate adjustment of the actuator, do not remove the cover (key 33) during this procedure.

1. Loosen the lower locknut (key 16).
2. Make sure the actuator box assembly (key 14) is clear of any tools or other instruments that could obstruct the actuator stroke path. Pressure the diaphragm casing enough to stroke the actuator down so that the left-hand threaded upper locknut (key 58) is accessible through the access opening. Loosen the locknut.

3. Release all pressure from the actuator by venting the casing to atmosphere, making sure the diaphragm is against its up travel stop. Check the valve position using a digital protractor, to align the horizontal edge of the hub (key 29) to a flat surface on the top of the valve body (key 1 of the valve assembly). Refer to figure 6.
4. If the two surfaces are not within 0.3 degrees, adjust the turnbuckle (key 57) with a 1-5/16 inch wrench and recheck. Continue this procedure until the valve is in the closed position when the actuator is resting on its up travel stop.

Figure 7. Accessory Mounting - Fisher 546NS, 2625NS, and 3610J



5. Stroke the actuator to mid-travel to gain better access to the turnbuckle and locknuts for tightening. Tighten the 7/8-14-LH locknut (key 58) to 163 N•m (120 lbf•ft) with a 1-5/16 inch wrench and then tighten the 5/8-18 locknut (key 16) to 61 N•m (45 lbf•ft) with a 15/16 inch wrench.
6. Install the travel indicator scale (key 35) and secure with self-tapping screws (key 36). Refer to figure 10 for proper orientation.

CAUTION

The bolt pattern on the travel indicator scale (key 35) is symmetric, meaning the component could be installed in multiple orientations. Ensure the travel indicator scale is mounted correctly as shown in figure 10, otherwise there will be false valve position indication.

⚠ WARNING

Be aware of pinching parts during installation, maintenance, and adjustments of valve/actuator components. To avoid injury, keep hands and tools clear of actuator access windows when operating or adjusting the actuator.

Actuator Spring Adjustment

Initial Setting

The 1052PSV nameplate specifies an initial spring setting. Initial setting is the casing pressure at which the diaphragm and diaphragm rod begin to move away from the up travel stop with the actuator disconnected from the valve. (With the actuator connected to the valve and pressure applied to the valve, a higher pressure will be required to start actuator travel).

The initial setting was selected (based upon the service conditions specified when the actuator was ordered) so that, when the actuator and valve are in service, the valve will seat properly and full travel will be obtained within a diaphragm casing range of 0 to 2.7 bar (0 to 39 psig).

If the actuator has been disassembled or if the spring adjustment was changed, and it is desired to match the initial setting stated on the nameplate, make sure the rod end bearing (key 17, figure 13) has been disconnected from the lever (key 27, figure 13). Adjust the spring so that the diaphragm rod just starts to travel at the spring set pressure specified on the nameplate.

Be sure the rod end bearing does not hit the lever as the diaphragm and diaphragm rod move away from the up travel stop. To adjust the spring, use the special 2-1/2 inch wrench. Rotate the spring adjustor to move it toward the casing to increase initial setting or away from the casing to decrease initial setting (keys 1 and 2, figure 13).

1. A regulated air supply with an appropriate gauge will be required to supply air pressure on top of the diaphragm to stroke the actuator.
2. Rotate the spring adjustor (key 74), with the special 2-1/2 inch hex wrench, GE45169, so that the diaphragm rod (key 10) just starts to travel at the spring set pressure specified on the nameplate (0.34 bar [7.0 psig] typical).

Note

Perform this setting with the actuator disconnected from the valve. The spring adjustor will need to compress the springs (keys 11 and 12) approximately 1-7/8 inch for a 0.34 bar (7.0 psig) initial spring set.

Stroking Range

The initial spring setting listed on the nameplate has been determined to be the optimum setting, and it is not recommended to make spring adjustments that will cause this value to change or be exceeded. For

push-down-to-open valve action, the initial spring setting is the maximum allowable to provide the maximum spring closing force.

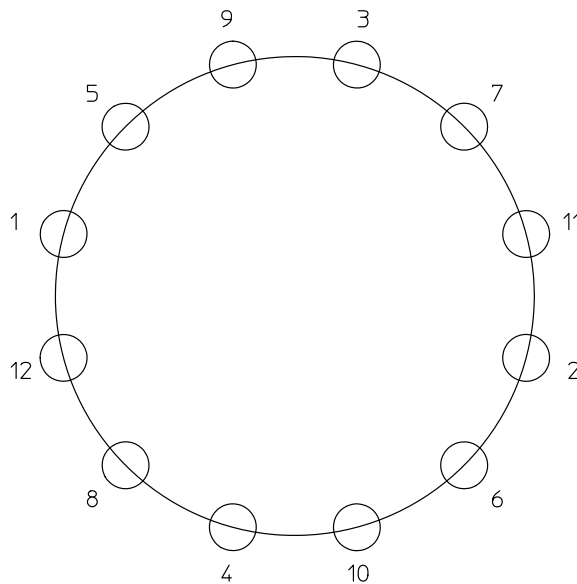
The following steps will set the stroking range or valve rotation to 80 degrees. There are two travel stop spacers located in the casing in case the adjustable stops are not set properly.

CAUTION

Any increase of this setting can over-stress the spring at full travel and may shorten the fatigue life of the spring.

1. Apply sufficient supply pressure on top of the diaphragm to stroke the valve to 80 degrees (+/- 2 degrees).
2. Apply nuclear grade anti-seize lubricant (key 30) to the two 7/8-9 x 6.50 cap screws (key 22) and the two 7/8-9 hex nuts (key 21), threading the nut as far as possible onto the cap screw.
3. Now thread the cap screws and nuts (keys 22 and 21), including washers (key 39), into the actuator box until each cap screw just touches the lever (key 27) without torquing. Using a 1-7/16 inch wrench, tighten the nuts (key 21) to 237 N•m (175 lbf•ft).

Figure 8. Bolting Sequence



Accessory Mounting

The following instructions describe how to install a 67CFSR regulator, 546NS I/P transducer, 2625NS volume booster, 3610J valve positioner, and Topworx™ GO™ proximity switches. For removal of each accessory, follow the steps in reverse.

Fisher 2625NS Mounting -- Bolt the 2625NS and SST nipples to the actuator box with the v-block assemblies. Apply thread locking adhesive, medium strength, (key 77) to the 5/16-18 x 4.25 cap screws and tighten to 23 N•m (17 lbf•ft) with a 1/2 inch wrench. Washers are included when v-blocks are painted.

Fisher 546 Mounting -- Attach the 546 I/P to the 546 mounting bracket with 5/16-18 x 0.75 cap screws and washers. Apply thread locking adhesive, medium strength, (key 77) to the 5/16-18 cap screws and tighten to 23 N•m (17 lbf•ft)

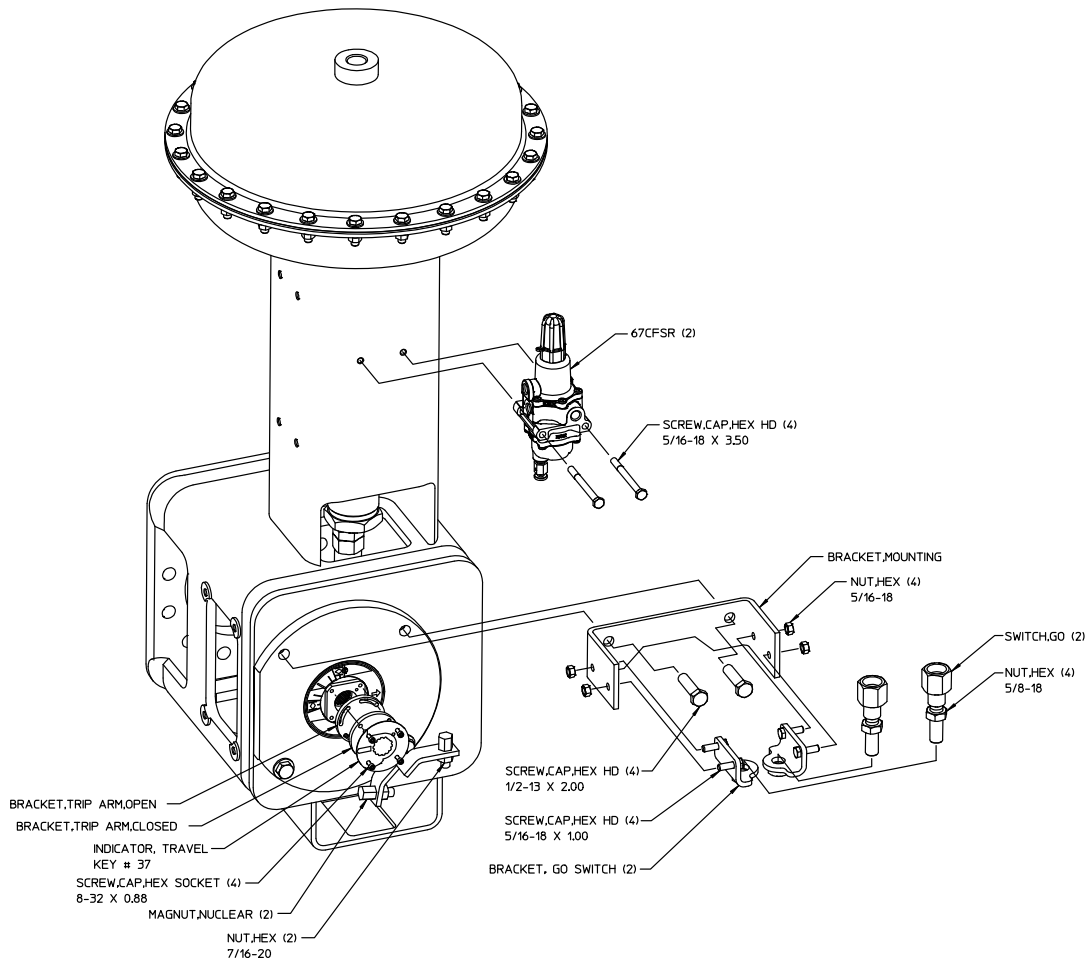
with a 1/2 inch wrench. Now apply thread locking adhesive, medium strength, (key 77) to the 3/8-16 x 1.12 cap screws and attach the 546 mounting bracket to the actuator box (key 14), including washers, tightening to 41 N•m (30 lbf•ft) with a 9/16 inch wrench. Washers are included when brackets are painted.

Fisher 3610J Mounting -- Attach the 3610J positioner to the actuator box with 5/16-18 x 0.62 cap screws as shown in figure 7. Apply thread locking adhesive, medium strength, (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 67CF SR Mounting -- Install two 67CF SR regulators to opposite sides of the 7 inch upper tube of the actuator box (key 14). Apply thread locking adhesive, medium strength, (key 77) to the 5/16-18 x 3.50 cap screws and tighten to 23 N•m (17 lbf•ft) with a 1/2 inch wrench.

1. Position the actuator box assembly (key 14) over the valve shaft, and secure it to the valve with the valve mounting cap screws.
2. Tighten the bolted joints on this valve/actuator assembly using the criss-cross pattern shown in figure 8. Tighten each bolt evenly and in the sequence shown in figure 8. Tighten the valve mounting cap screws to 163 N•m (120 lbf•ft).

Figure 9. Accessory Mounting - Fisher 67CF SR and GO Switch



⚠ WARNING

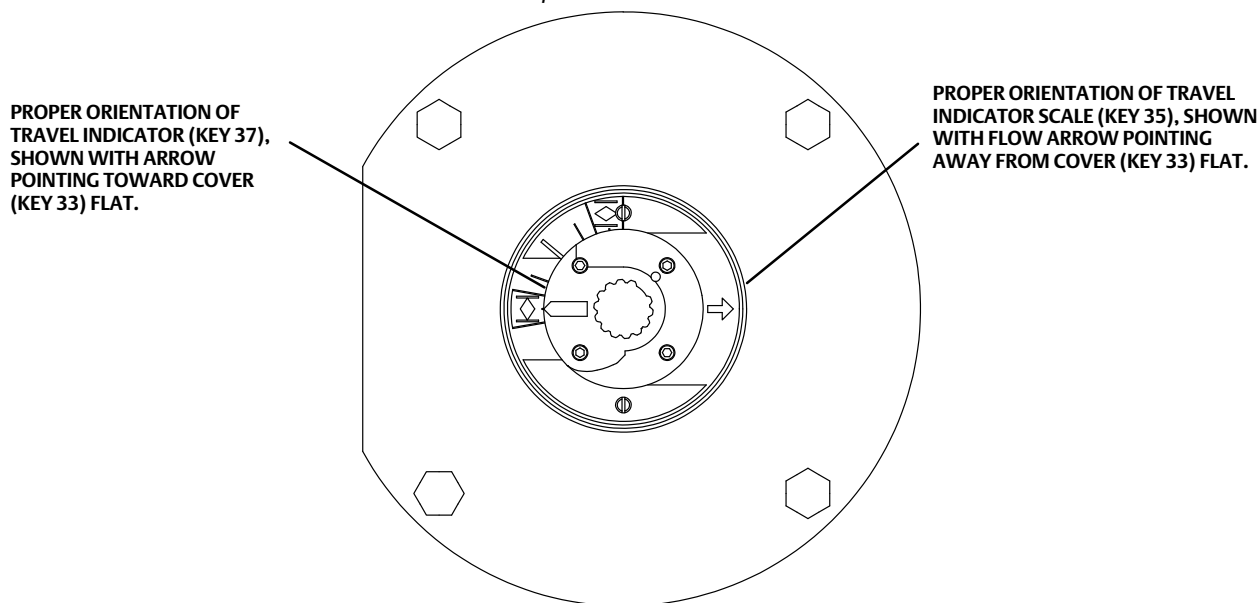
Be aware of pinching parts during installation, maintenance, and adjustments of valve/actuator components. To avoid injury, keep hands and tools clear of actuator access windows when operating or adjusting the actuator.

Loading Connection

Follow these steps if the tubing and fittings have been loosened or removed from the accessories.

1. Connect the loading pressure piping to the pressure connection in the top of the diaphragm casing. Run 3/8 inch tubing between the 1/4 NPT pressure connection and the instrument. Run 1/2 inch tubing between the volume booster and the upper casing.
2. Keep the length of pipe or tubing as short as possible to avoid transmission lag in the control signal. If an accessory (such as a volume booster or a valve positioner) is used, be sure that the accessory is properly connected to the actuator. If a valve positioner is part of the assembly, the pressure connection to the actuator will normally be made at the factory.
3. When the control valve is completely installed and connected to the instrument, check for correct action (air-to-open) to match the controlling instrument. For successful operation, the actuator stem and valve shaft must move freely in response to the loading pressure change on the diaphragm.

Figure 10. Indicator Orientation Shown When Valve/Actuator are in the Closed Position



⚠ WARNING

Be aware of pinching parts during installation, maintenance, and adjustments of valve/actuator components. To avoid injury, keep hands and tools clear of actuator access windows when operating or adjusting the actuator.

GO Switch Mounting

1. Coat two 1/2-13 x 2.00 cap screws (key 34) with nuclear grade anti-seize lubricant and bolt the GO Switch mounting bracket and actuator cover (key 33) to the actuator box (key 14) as shown in figure 9. Torque to 92 N•m (68 lbf•ft).
2. Apply thread locking adhesive, medium strength, (key 77) to the four 5/16-18 x 1.00 cap screws and bolt the two angle GO Switch brackets to the mounting bracket. Torque the 5/16-18 cap screws and nuts to 23 N•m (17 lbf•ft).
3. Apply thread locking adhesive, medium strength, (key 77) to the four 8-32 x 0.88 socket head cap screws (key 38). Install the slotted, open trip arm and closed trip arm brackets, with travel indicator scale (key 37), to the hub (key 29) as shown in figures 9 and 10. Install the 8-32 x 0.88 socket head cap screws (key 38) finger tight.

CAUTION

The bolt patterns on the travel indicator and travel indicator scale (keys 37 and 35) are symmetric, meaning the components could be installed in multiple orientations. Ensure the travel indicator and travel indicator scale are mounted correctly as shown in figure 10, otherwise there will be false valve position indication.

4. Install one GO Switch and hex nut on each GO Switch bracket and one target magnet with a hex nut on each trip arm bracket.
5. Adjust the valve to the desired full open rotation, typically 40 to 80 degrees.
6. With the valve in the desired open position, establish a 0.100 inch gap between the GO Switch and target magnet; this is accomplished by adjusting the open trip arm bracket rotationally and by changing the thread engagement of the switch and magnet. Torque the 8-32 x 0.88 inch socket head cap screws (key 38) to 3.4 N•m (2.5 lbf•ft [30 lbf•in]) using a 9/64 inch socket wrench.
7. Apply thread locking adhesive, medium strength, (key 77) to the target magnet 7/16-20 threads and torque to 47 N•m (35 lbf•ft). Apply thread locking adhesive, medium strength, (key 77) to the GO Switch 5/8-18 threads and torque to 47 N•m (35 lbf•ft).
8. Return the valve back to the closed position and verify the gap between the closed position GO Switch and target magnet is 0.100 inch.

Maintenance

Actuator 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 are shown in figure 13 for the 1052PSV actuator.

⚠ WARNING

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

- Do not remove the actuator from the valve while the valve is still pressurized.
- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury. Be aware of pinching parts during maintenance operations.
- 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.
 - The valve packing box may contain process fluids that are pressurized, *even when the valve has been removed from the pipeline*. Process fluids may spray out under pressure when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.
 - Check with your process or safety engineer for any additional measures that must be taken to protect against process media.
 - Be aware of pinching parts during installation, maintenance, and adjustments of valve/actuator components. To avoid injury, keep hands and tools clear of actuator access windows when operating or adjusting the actuator.
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CAUTION

To avoid parts damage, do not stroke the actuator while cover (key 33) is off.

Disassembly

The following procedure describes how to completely disassemble the actuator. When inspecting and replacing parts, perform only those steps necessary to accomplish the repair.

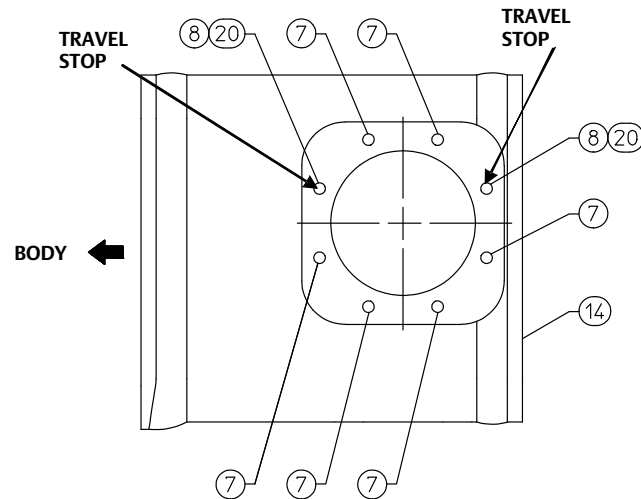
Do **not**, under ordinary circumstances, remove the cap screws (keys 7 and 8) at this time.

CAUTION

Cap screw (key 18) must be disengaged from the lever (key 27) before removing the diaphragm casing (key 1). Failure to do so will allow the spring precompression to rotate the valve beyond its fully open or closed position. This could cause damage to the valve components and/or seal.

1. Perform the steps in the WARNING at the beginning of the Maintenance section to isolate the control valve and actuator.
2. Remove the tubing or piping from the top of the actuator.
3. Remove the positioner, if used. If necessary, refer to the positioner instruction manual for removal instructions.
4. Unscrew the cap screws (key 34), and remove the washers (key 31), cover (key 33), and any accessories attached to this end of the actuator.
5. Remove the travel indicator (key 37) from the hub (key 29). Slide the hub (key 29) from the cover.
6. Inspect, and if necessary, replace the cover bushing (key 31). Remove the travel indicator scale (key 35) by removing the self-tapping screws (key 36). Press the bushing out of the cover (key 33).
7. Remove the cap screw and hex nut (keys 18 and 19).
8. Make note of the lever/valve shaft orientation, and then loosen the cap screw (key 28).

Figure 11. Lower Casing Travel Stop Orientation

**CAUTION**

When removing the actuator from the valve, do not use a hammer or similar tool to drive the lever (key 27) off the valve shaft. Driving the lever could damage internal valve parts. On some valve types, driving the lever off the shaft could move the valve disk or ball and bearings away from the centered position, causing subsequent damage to valve parts as the valve is operated.

A wheel puller may be used to remove the lever. It is okay to tap the wheel puller screw lightly to loosen the lever, but hitting the screw with excessive force could also damage valve parts or disrupt the centered position of the valve disk and bearings.

⚠ WARNING

To avoid personal injury from pre-compressed spring force suddenly thrusting the upper diaphragm casing (key 1) away from the actuator, relieve 1052PSV spring compression before proceeding further.

9. To relieve spring compression, use the special 2-1/2 inch wrench to rotate the spring adjustor (key 74), and move it away from the actuator casings. Continue rotating the spring adjustor until spring compression is completely removed.
10. Unscrew and remove the cap screws, washers, and hex nuts (keys 5, 26, and 6), and then remove the upper diaphragm casing and the diaphragm (key 3).
11. To remove the diaphragm plate (key 4), remove the rod end bearing (key 17), the lower locknut (key 16), turnbuckle (key 57), and the left hand threaded upper locknut (key 58) from the diaphragm rod (key 10).
12. Pull the diaphragm plate (key 4) and attached parts out of the actuator. Then remove the cap screw (key 9) to separate the diaphragm plate and the diaphragm rod.
13. Remove the actuator springs (keys 11 and 12) from the actuator. Then remove the lower spring seat (key 13), thrust bearing and bearing races (keys 71 and 72), and thrust collar (key 73).
14. If replacing the spring adjustor (key 74), rotate it away from the casing (keys 1 and 2) until disengaged.

15. Unbolt the actuator box assembly (key 14) from the valve.

Assembly

This procedure assumes that the actuator was completely disassembled. If the actuator was not completely disassembled, start these instructions at the appropriate step.

Key numbers are shown in figure 13.

1. Refer to figure 5 for the orientation of the actuator box assembly (key 14).

▲ WARNING

Exceeding any torque requirement may impair the safe operation of the actuator and lead to possible personal injury or property damage.

2. Place the lower diaphragm casing (key 2) on top of the actuator box (key 14) 7 inch square tube. Install six hex head cap screws (key 7) with washers (key 25) in holes identified with a number 7 in figure 11. Using a 9/16 inch hex wrench, tighten the cap screws to 41 N•m (30 lbf•ft).
3. Install two travel stop spacers (key 20) onto the two hex head cap screws (key 8) and install into the holes numbered 8/20 in figure 11. Using a 9/16 inch hex wrench, tighten the cap screws to 41 N•m (30 lbf•ft).
4. Clean and then lubricate the threads of the spring adjustor (key 74) with nuclear grade anti-seize lubricant (key 30). Install the spring adjustor in through the large window of the lower actuator tube (12 x 12 inch cross-section) and up into the upper actuator tube (7 x 7 inch cross-section). Thread in until the top of the spring adjustor is approximately 1/4 inch above the surface of spring plate.
5. Place the thrust collar (key 73) on top of the spring adjustor (key 74) by insertion into the window in the middle of the upper actuator tube. Coat both sides of the needle thrust bearing (key 71) with nuclear grade anti-seize lubricant (key 30), place between the two needle thrust bearing races (key 72), and install on top of the thrust collar (key 73). Install the lower spring seat (key 13) on top of the needle bearing assembly (keys 71, 72, and 73) and down into the counterbore of the thrust collar (key 73).
6. Install springs (keys 11 and 12) on top of the lower spring seat (key 13) through the center opening in the lower diaphragm casing (key 2).
7. Place the upper spring seat (key 15) on top of the center spring (key 11).
8. Coat the tapered end of the diaphragm rod (key 10) and the threads of the socket head cap screw (key 9) with nuclear grade anti-seize lubricant (key 30). Bolt the diaphragm plate (key 4) to the diaphragm rod tightening to 102 N•m (75 lbf•ft) with a 5/8 inch hex Allen wrench.

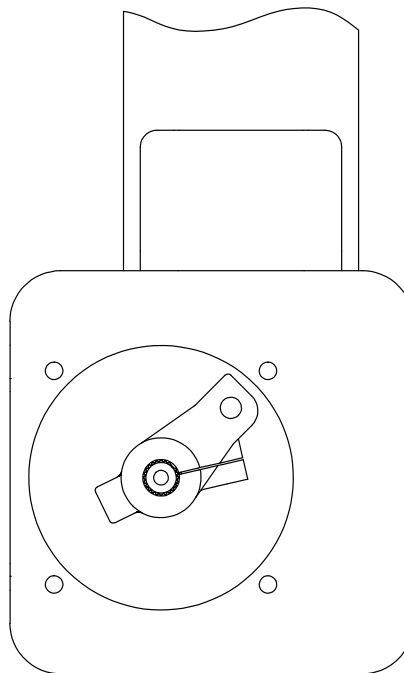
Note

Use the turnbuckle (key 57) and locknut (key 58) clamped into clean vise jaw inserts for anti-rotation while tightening.

9. Lubricate the external threads on the diaphragm rod (key 10) with nuclear grade anti-seize lubricant.
10. Install the diaphragm plate/diaphragm rod assembly into the actuator box.
11. Screw the 7/8-14 left-hand threaded upper locknut (key 58) onto the diaphragm rod as far as possible without torquing.
12. Screw the turnbuckle (key 57) as far as it will go onto the diaphragm rod without torquing.
13. Coat the threads of the rod end bearing (key 17) with nuclear grade anti-seize lubricant (key 30). Screw the 5/8-18 lower locknut (key 16) as far as it will go onto the rod end bearing (key 17) without torquing, to create a rod end bearing assembly.

14. Thread the rod end bearing assembly completely into the turnbuckle (key 57) without torquing.
15. Install the diaphragm (key 3) onto the diaphragm plate (key 4) and line up the perimeter holes in the diaphragm (key 3) and the lower diaphragm casing (key 2). Place the upper diaphragm casing (key 1) onto the lower diaphragm casing (key 2). If necessary, rotate the spring adjustor (key 74) so that the upper diaphragm casing will achieve solid contact with the diaphragm (key 3). Also ensure that the travel stop, in the upper diaphragm casing (key 1), will not contact the diaphragm (key 3) when the casing cap screws and nuts (keys 5 and 6) are tightened.
16. Using a 9/16 inch wrench, secure the upper diaphragm casing (key 1) with cap screws (key 5), washers (key 26), and hex nuts (key 6). Tighten the hex nuts (key 6) in the following manner.
 - a. The first four hex nuts tightened should be diametrically opposed and 90 degrees apart. Tighten these four hex nuts to 13.6 N•m (10 lbf•ft).
 - b. Tighten the remaining hex nuts in a clockwise, criss-cross pattern to 13.6 N•m (10 lbf•ft).
 - c. Repeat this procedure by tightening four hex nuts, diametrically opposed and 90 degrees apart, to a torque of 27 N•m (20 lbf•ft).
 - d. Tighten the remaining hex nuts in a clockwise, criss-cross pattern to a torque of 27 N•m (20 lbf•ft).
 - e. After the last hex nut is tightened to 27 N•m (20 lbf•ft), all of the hex nuts should be tightened again to 27 N•m (20 lbf•ft) in a circular pattern around the bolt circle.
17. Perform the initial spring setting per the 1052PSV Spring Adjustment section.
18. Refer to the Actuator Mounting section if the actuator is not already mounted.
19. Install the lever (key 27) on the valve drive shaft as shown in figure 12. **Note: The splined connection is a missing tooth design, ensuring a one-way assembly.**

Figure 12. Lever Angle in Valve Closed Position



20. Viewing from the actuator end, rotate the lever counter-clockwise (CCW) to 45 degrees from horizontal as shown in figure 12.

CAUTION

If the lever is rotated too far CCW, the trailing edge of the Vee-Ball can disengage the seal. To avoid damage to the ball and seal, DO NOT rotate clockwise (CW) back into the seat. Continue to rotate CCW and repeat previous step 3.

21. During the remaining actuator assembly procedures, care should be taken to keep the Vee-Ball in the closed position. **Note: Final Vee-Ball centering will be accomplished in the section titled Precise Valve/Actuator Closed Position Adjustment and Turnbuckle Tightening Instructions.**
22. Coat the outside bearing surface of the hub (key 29), and the inside diameter of the bushing (key 31), with nuclear grade anti-seize lubricant (key 30).
23. Install the hub (key 29) onto the valve drive shaft and place the actuator cover (key 33) over the hub.
24. Lubricate cap screws (key 34) with nuclear grade anti-seize lubricant (key 30) and bolt the actuator cover (key 33) and the GO Switch mounting bracket to the actuator box (key 14) including washers (key 31). Using a 3/4 inch wrench, tighten to 81 N•m (60 lbf•ft). Refer to figure 6 for an illustration of the GO Switch mounting bracket.
25. With the hub against the cover, slide the lever (key 27) towards the hub (key 29) leaving a 3/32 inch gap between them.
26. Clamp the lever (key 27) onto the valve drive shaft with the 5/8-11 x 1.25 cap screw (key 28). Using a 15/16 inch wrench, tighten to 163 N•m (120 lbf•ft).
27. Refer to the Precise Valve/Actuator Closed Position Adjustment section to connect the diaphragm rod to the valve drive shaft.
28. Refer to the Stroking Range section to set the down travel stop position.
29. Bolt the protective bracket (key 24) to the actuator box using 3/8-16 x 0.75 cap screws (key 23) and washers (key 40, only when bracket is painted). Using a 9/16 inch wrench tighten to 41 N•m (30 lbf•ft).
30. Install the travel indicator scale (key 35) and secure with self-tapping screws (key 36). Refer to figure 10 for proper orientation.
31. Apply thread locking adhesive, medium strength, (key 77) to the four 8-32 x 0.88 socket head cap screws (key 38). Install the slotted, open trip arm and closed trip arm brackets, with travel indicator scale (key 37), to the hub (key 29) as shown in figures 9 and 10. Install the 8-32 x 0.88 socket head cap screws (key 38) finger tight. Final torque of the 8-32 socket head cap screws is described in the GO Switch Mounting Section of this manual, page 14.

CAUTION

The bolt patterns on the travel indicator and travel indicator scale (keys 37 and 35) are symmetric, meaning the components could be installed in multiple orientations. Ensure the travel indicator and travel indicator scale are mounted correctly as shown in figure 10, otherwise there will be false valve position indication.

32. Reference the accessory mounting section of this instruction manual to install accessories.

Troubleshooting

Table 1. Troubleshooting

| Problem | Possible Solution |
|--|---|
| Diaphragm Casing Leak | Verify proper tightening procedure and torque on casing cap screws. |
| | Disassemble and inspect diaphragm for cracks or wear. |
| Actuator stroke is less than full rated travel | Verify the valve and actuator are in the closed position. Reference the Precise Valve/Actuator Closed Position Adjustment section of this instruction manual. |
| | Verify adjustable travel stops have been set properly. See Adjustable Travel Stops section of this instruction manual. |
| | Check bench set for proper actuator spring load. See Spring Adjustment section of this instruction manual. |
| Other | Consult your Emerson Process Management sales office . |

Adjustable Down Travel Stops

Note

When this valve is shipped, the manual travel stops are adjusted for 80 degrees rotation of the valve.

Adjustable down travel stops have been provided to limit the diaphragm rod travel away from the casing. This adjustment will limit the amount of valve rotation from 40° to 80° open.

⚠ WARNING

To avoid personal injury, perform the steps in the WARNING at the beginning of the Maintenance section to isolate the control valve and actuator.

Be aware of pinching parts during installation, maintenance, and adjustments of valve/actuator components. To avoid injury, keep hands and tools clear of actuator access windows when operating or adjusting the actuator.

1. A regulated air supply with appropriate gauge will be required to stroke the actuator to the desired angle of rotation.
2. The actuator should be fully assembled and connected to the valve before proceeding. If not, refer to the Assembly section to assemble the actuator.
3. Zero the valve and actuator using the Precise Valve/Actuator Closed Position Adjustment and turnbuckle adjustment instructions.
4. Apply pressure to the diaphragm casing while using a digital protractor to position the valve to the desired rotation. Using the top of the valve body as a reference for 0 degrees, rotate the valve until the square on the hub (key 29) is at the desired angle of rotation. Refer to figure 6.
5. Loosen both hex nuts (key 21) using a 1-5/16 inch wrench and rotate each nut away from the actuator box for adjustment.
6. Thread cap screws (key 22) towards the lever (key 27) until each contacts the lever without torquing.
7. Apply nuclear grade anti-seize lubricant to the 7/8-9x6.50 cap screws (key 22), threading the nut as far as possible onto the cap screw. Tighten the nuts (key 21) to 163 N•m (120 lbf•ft) with a 15/16 inch wrench.

Parts Ordering

When corresponding with your [Emerson Process Management sales office](#) about this equipment, refer to the serial number found on the actuator nameplate (key 41, figures 13). Also, specify the complete 11-character part number from the following parts list when ordering replacement parts. The Size 70 actuator is available only in Type 1052 actuators.

⚠ 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.

Spare Parts

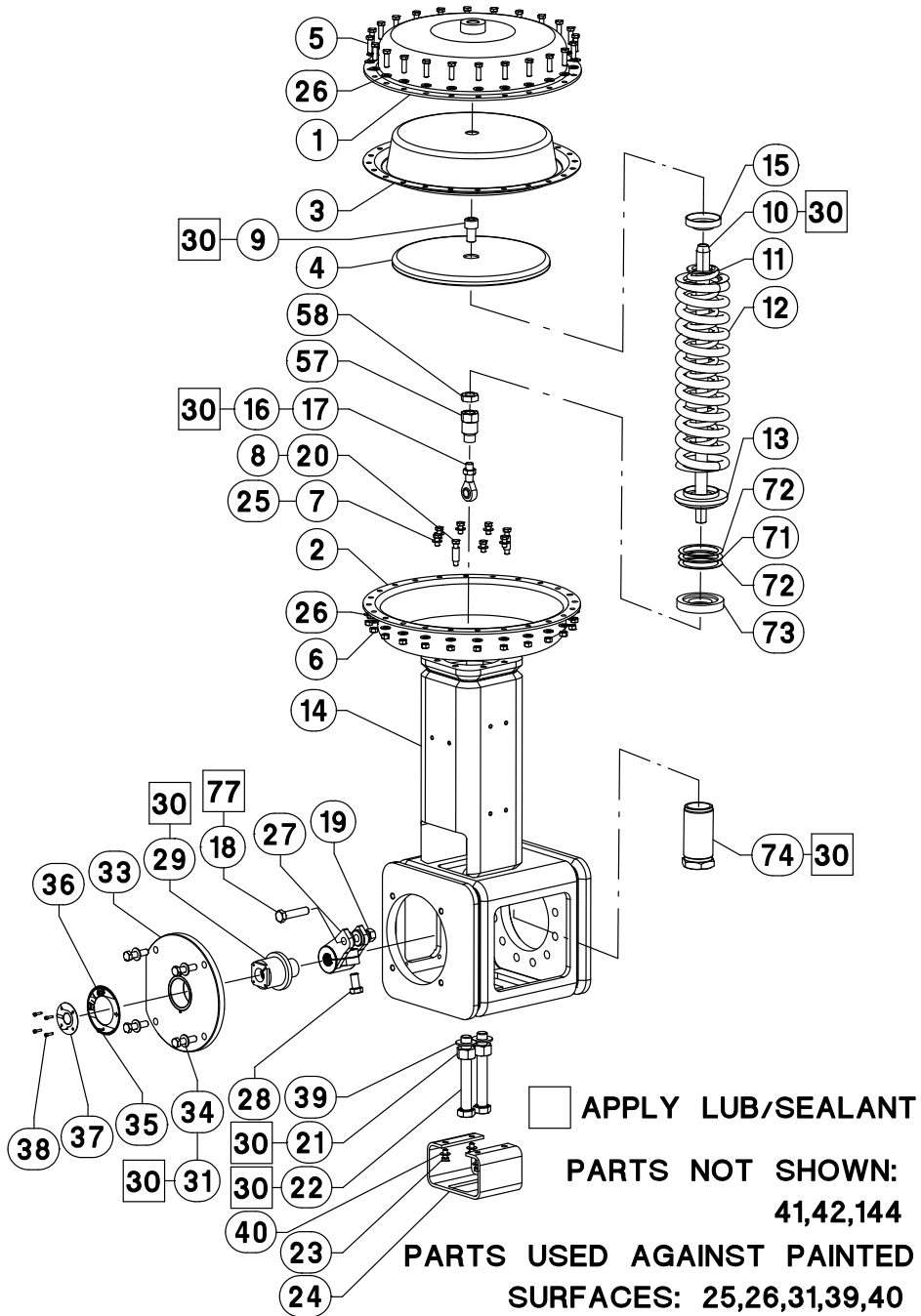
The spare parts replacement interval is based in part on plant operation, operating conditions, normal maintenance interval, process fluid, and other factors. Periodic inspection of the valve and actuator and diagnostics run on the control valve assembly are recommended to identify the optimum replacement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

Table 2. Fisher 1052PSV 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⁾ |
|--------------------|-------------------------|--|-----|--------------------|--------------------------------|---|--|---|
| GE39223 | GE39223X022 | Hub, Key 29 | 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. |
| 2E8597 | 2E8597X0062 | Diaphragm, size 60, Key 3 | 1 | Non-Safety Related | O/n | Recommendation to purchase this spare part is based on shelf life restrictions. The diaphragm is a key component within the actuator construction, required to ensure optimal performance over time. Degradation of the diaphragm could lead to inconsistencies with valve operation. Emerson Process Management recommends replacing this component every 6 years. | EPDM material shelf life is 4 years after shipment or 12 years from cure date. | See FGS8A31 rev. P (attached) for information regarding elastomer shelf life. |
| GE39188 GE39224 | GE39188X022 | Actuator Cover/ Bushing Assembly, Key 33 | 1 | Non-Safety Related | O/n | The bushing will see repeated cycles in contact with a metal hub. It is the manufacturer's recommendation to replace the cover/bushing assembly when wear or diagnostic testing shows degraded performance or after 30 years of operation, whichever comes first. | N/A | Does not exhibit a tendency to degrade over time. |
| GE45169 | GE45169X012 | Spring Adjustor Wrench | 1 | Non-Safety Related | O/n | The special wrench is not commercially available. This wrench is required to adjust actuator spring load. | 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 13. Fisher 1052PSV Actuator Assembly



Parts List

| Key | Description | Qty | Part Number | Key | Description | Qty | Part Number |
|-----|------------------------------------|-----|-------------|-----|--|-----|-------------|
| 1 | Upper Casing assy | 1 | 11A2925X012 | 31 | Washer, Plain, 1/2 | 4 | 1A5189X0022 |
| 2 | Lower Casing Diaphragm | 1 | 2E847425062 | 33* | Actuator Cover/Bushing assy | 1 | GE39188X022 |
| 3* | Diaphragm, size 60 | 1 | 2E8597X0062 | 34 | Cap Screw, Hex Hd, 1/2-13 X 2.00 | 4 | 1A3616X0042 |
| 4 | Diaphragm Plate assy | 1 | 28A6022X012 | 35 | Travel Indicator Scale | 1 | GE39243X012 |
| 5 | Cap Screw, Hex Hd, 3/8-24X1.25 | 24 | 1A3683X0042 | 36 | Self Tapping Screw 6-32 X 0.31 | 2 | 1B5613X0032 |
| 6 | Hex Nut, 3/8-24 | 24 | 1A3465X0092 | 37 | Travel Indicator | 1 | GE39241X012 |
| 7 | Cap Screw, Hex Hd, 3/8-16X0.75 | 6 | 1A3684X0082 | 38 | Cap Screw, Hex Socket, 8-32X 0.88 | 4 | 1H3284X0042 |
| 8 | Cap Screw, Hex Hd, 3/8-16X2.00 | 2 | 1A3445X0142 | 39 | Washer, Plain, 7/8 | 2 | 1A519828992 |
| 9 | Cap Screw, Hex Socket, 3/4-16X1.25 | 1 | 1E7754X0032 | 40 | Washer, Plain, 3/8 | 4 | 1B365428992 |
| 10 | Diaphragm Rod | 1 | GE39199X022 | 41 | Rotary Actuator Nameplate | 1 | 12B6401X012 |
| 11 | Spring, 2 3/4 X 15 3/4 right hand | 1 | 14A9017X052 | 42 | Drive Screw | 4 | 1A368228982 |
| 12 | Spring, 3 1/16 X 16 5/8 left hand | 1 | 14A9016X052 | 57 | Turnbuckle, 7/8-14LH X 5/8-18 | 1 | 22A9624X032 |
| 13 | Lower Spring Seat | 1 | GE39198X012 | 58 | Hex Jam Nut, 7/8-14 LH | 1 | 1R4389X0012 |
| 14 | Actuator Box assy (Mach) | 1 | GE39200X012 | 71 | Needle Thrust Bearing | 1 | 1N888799012 |
| 15 | Upper Spring Seat | 1 | 14A9025X012 | 72 | Needle Thrust Bearing Race | 2 | 1N888899012 |
| 16 | Hex Jam Nut, 5/8-18 | 1 | 1A354035072 | 73 | Thrust Collar | 1 | GE39237X012 |
| 17 | Rod Bearing, male end | 1 | 1R4408X0082 | 74 | Spring Adjustor | 1 | GE39236X012 |
| 18 | Cap Screw, Hex Hd, 5/8-11 X2.75 | 1 | 1P9832X0022 | 77 | Thread Locking Compound (Medium Strength) | 1 | 1M3812X0012 |
| 19 | Hex Nut 5/8-11 UNC-2B | 1 | 1A343324122 | 144 | Actuator Caution Tag | 1 | 18B9855X012 |
| 20 | Travel Stop Spacer | 2 | 18B2658X052 | | | | |
| 21 | Hex Nut, 7/8-9 | 2 | 1C1727K0012 | | | | |
| 22 | Cap Screw, Hex Hd, 7/8-9X6.50 | 2 | GE45339X012 | | | | |
| 23 | Cap Screw, Hex Hd, 3/8-16X0.75 | 4 | 1A3684X0082 | | | | |
| 24 | Protective Bracket | 1 | GE39230X012 | | | | |
| 25 | Washer, Plain, 3/8 | 6 | 1B365428992 | | | | |
| 26 | Washer, Plain, 3/8 | 48 | 1B365428992 | | | | |
| 27 | Lever | 1 | GE39229X012 | | | | |
| 28 | Cap Screw, Hex Hd, 5/8-11X1.25 | 1 | 12A9405X022 | | | | |
| 29* | Hub | 1 | GE39223X022 | | | | |
| 30 | Nuclear Grade Anti-Seize Lubricant | 1 | 1M3801X0012 | | | | |

Accessory Mounting Kits

| | | | |
|--|---------------------------------|---|-------------|
| | Mounting Assy,1052PSV GO Switch | 1 | GE50812X012 |
| | Mounting Assy,1052PSV 546 | 1 | GE42325X012 |
| | Mounting Assy,1052PSV 2625NS | 1 | GE42525X012 |

Special Tools

| | | | |
|---|------------------------|---|-------------|
| * | Spring Adjustor Wrench | 1 | GE45169X012 |
|---|------------------------|---|-------------|

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