

Valtek VL-HC Spring Cylinder Linear Actuators

GENERAL INFORMATION

The following instructions are designed to assist in installing, troubleshooting and servicing Valtek VL-HC spring cylinder actuators. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, operating or disassembling the actuator. Separate installation, operation and maintenance instructions cover additional features (such as handwheels, limit stops, fail-safe systems or limit switches).

This publication does not contain information on Flowserve positioners. Refer to the appropriate installation, operation and maintenance instructions for installing, maintaining, troubleshooting, calibrating and operating Flowserve positioners.

To avoid possible injury to personnel or damage to valve parts, WARNING and CAUTION notes must be strictly followed. Modifying this product, substituting non-factory or inferior parts or using maintenance procedures other than outlined could drastically affect performance, void product warranties and be hazardous to personnel and equipment.

WARNING: Standard industry safety practices must be followed when working on this or any process control product. Specifically, personal protection and lifting devices must be used as warranted.

Unpacking

While unpacking the actuator, check packing list against materials received. Lists describing the actuator and accessories are included in each shipping container.

1. Position the lifting straps and hoist to avoid damage to the tubing and mounted accessories when lifting the actuator from the shipping container.

WARNING: When lifting an actuator with lifting straps through the yoke legs, be aware the center of gravity may be above the lifting point. Therefore, support must be given to prevent the actuator from rotating or causing serious injury to personnel or damage to nearby equipment.

2. Contact your shipper immediately in the event of shipping damage.
3. Contact your Flowserve representative for any problems.

Installation

Prior to installation, make sure adequate overhead clearance for the actuator is provided to allow for proper removal from the valve body and for proper maintenance. Refer to Table 1.

NOTE: If the actuator is attached to a valve body assembly, see Appropriate Installation, Operation and Maintenance instructions for overhead clearances.

**Table 1:
Overhead Clearance for Disassembly**

Actuator Size	Minimum Clearance
25	6 inches
50	8 inches
100	9 inches

1. Connect the air supply and instrument signal air lines to the two appropriately marked connections on the positioner. Since both the cylinder and positioner are suitable for 150 psi (10.3 bar) air supply, an air regulator should not be used unless the supply exceeds 150 psi (10.3 bar).

NOTE: *In some cases, air supply must be limited to 100 psi (6.9 bar) rather than 150 psi (10.3 bar); this will be indicated by a sticker found near the upper air port on the cylinder.*

WARNING: **To avoid personal injury or equipment damage, do not exceed recommended supply pressure.**

2. Installation of an air filter on the supply line is recommended.
3. Use a soap solution to make sure all air connections are leak free.

MAINTENANCE

At least once every six months, check for proper operation by following the preventative maintenance steps outlined below. These steps can be performed while the actuator is in service and, in some cases, without interrupting service. If an internal problem is suspected with the actuator, refer to the “Disassembly and Reassembly” section. It is recommended that all soft goods are replaced every four years or 500,000 cycles, whichever comes first.

1. Examine the actuator for damage caused by corrosive fumes and process drippings.
2. Clean the actuator and repaint any areas of severe oxidation.
3. If possible, stroke the actuator and check for smooth, full-stroke operation.

WARNING: **To avoid serious injury, keep hands, hair and clothing away from all moving parts while operating the actuator.**

4. Make sure positioner mounting bolts, linkage and stem clamp are securely fastened.
5. Ensure all accessories, brackets and associated bolting are securely fastened.
6. If possible, remove air supply and observe actuator for correct fail-safe action.
7. Check rubber bellows for wear.
8. Spray soap solution around the cylinder retaining ring, the adjusting screw and the lower actuator

stem bushing to check for air leaks through the O-rings and gasket.

9. Clean any dirt or foreign material from the actuator stem.
10. If an air filter is supplied, check and replace cartridge as necessary.

DISASSEMBLY AND REASSEMBLY

Disassembling the Actuator

Refer to Figures 1 through 4 to disassemble the cylinder actuator.

1. Shut off air supply. If actuator is installed on a Flowserve valve, remove the valve per the appropriate installation, operation, maintenance instructions.

WARNING: **To avoid serious injury, depressurize the line to atmospheric pressure and drain all fluids before working on the actuator.**

2. Disconnect all tubing. Remove stem clamp and stem bellows from the actuator stem.
3. Relieve spring compression completely by removing the adjusting screw. Remove adjusting screw O-ring from adjusting screw.

CAUTION: **Do not use a screwdriver or bar to turn the adjusting screw; instead, use a wrench on the flats of the screw.**

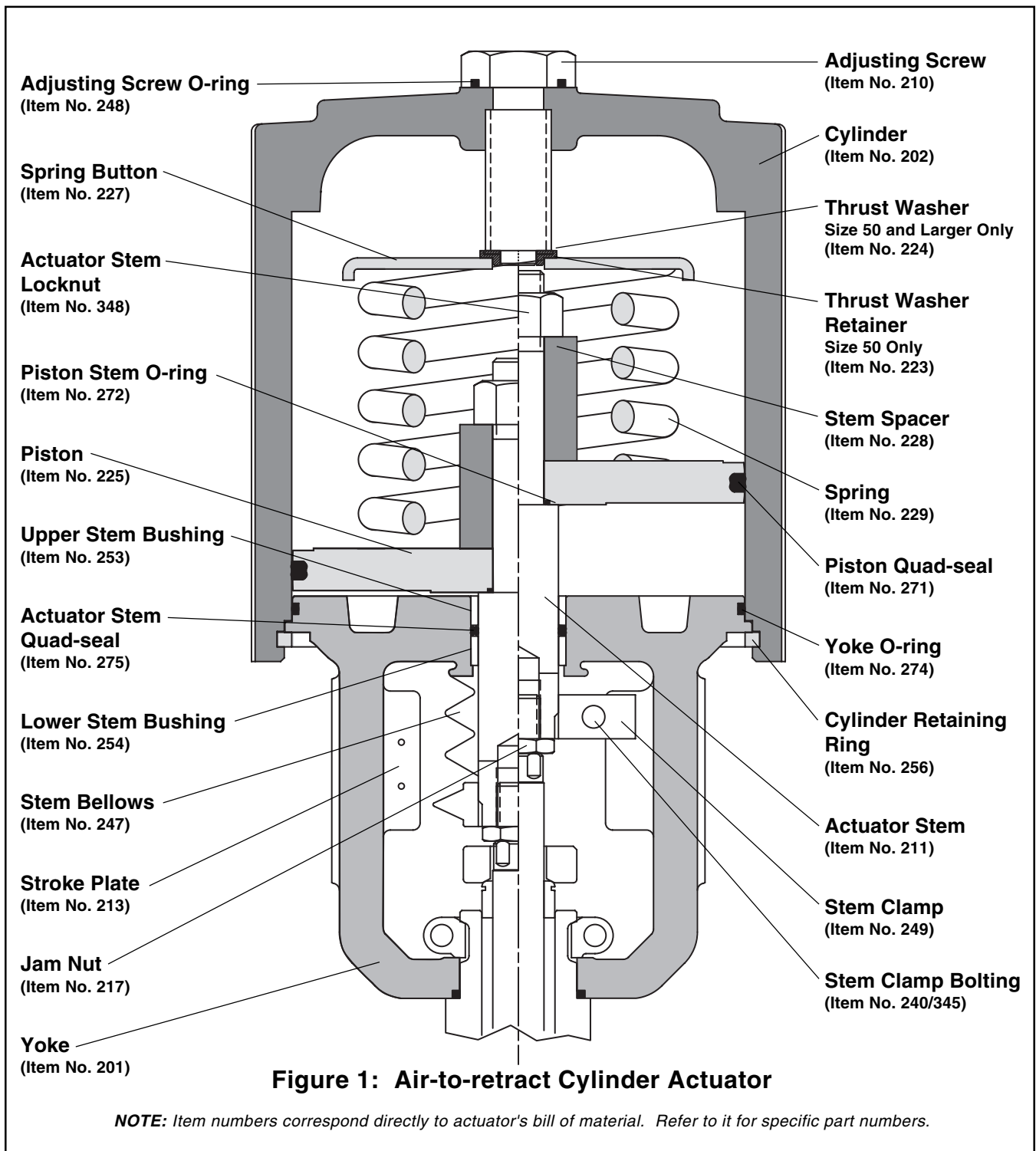
WARNING: **To avoid serious personal injury, relieve the spring compression before further disassembly. The cylinder could possibly fly off the yoke when removing the cylinder retaining ring.**

4. Remove the cylinder retaining ring from the groove at the base of the cylinder by using two screwdrivers. Insert one screwdriver in slot found in the ring and pry the ring from the groove. Use the other screwdriver to help work the ring out of the cylinder groove.
5. Pull the cylinder off the yoke and piston; some O-ring and quad-seal resistance may be felt.

WARNING: **To avoid serious personal injury, do not use air pressure to remove the cylinder. The cylinder could possibly fly off the yoke.**

6. For extended spring designs using a spring cap (see Figure 4), remove the spring cap and cap O-ring from the cylinder.
7. For air-to-retract configurations, remove the spring(s) and spring button for cleaning and inspection (see Figures 1, 3 and 5). Remove the actuator stem locknut and slide the piston and stem spacer off the actuator stem. The spring guide should be removed when using dual or extended spring designs.

NOTE: *The dual, spring configuration (Figure 3) has two springs, one inside the other. Remove both springs during this step.*



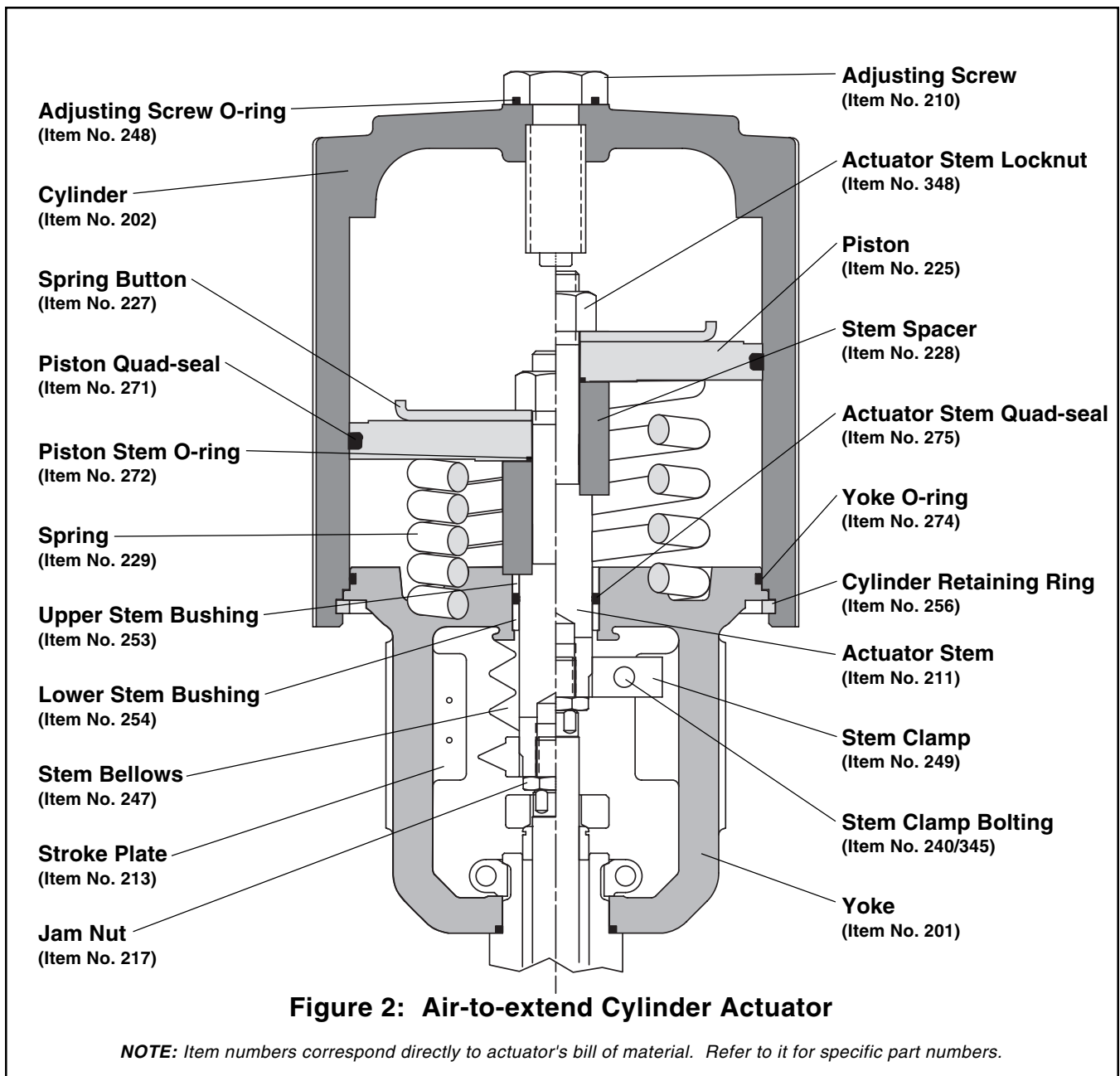
For air-to-extend configurations, slowly loosen and remove the actuator stem locknut. Be certain the piston follows the stem locknut up the actuator stem and does not bind on the actuator stem. Remove the actuator stem locknut, spring button, piston, spring and stem spacer.

WARNING: To avoid personal injury, be certain the spring force is completely relieved before removing actuator stem locknut.

8. Remove the piston quad-seal, piston stem O-ring and yoke O-ring.
9. Remove the actuator stem quad-seal.

NOTE: The upper and lower stem bushings are pressed into the yoke. Removal of the bushings to replace the actuator stem O-ring is unnecessary.

10. Use appropriately sized press to push worn or damaged bushings out of yoke.



Reassembling the Actuator

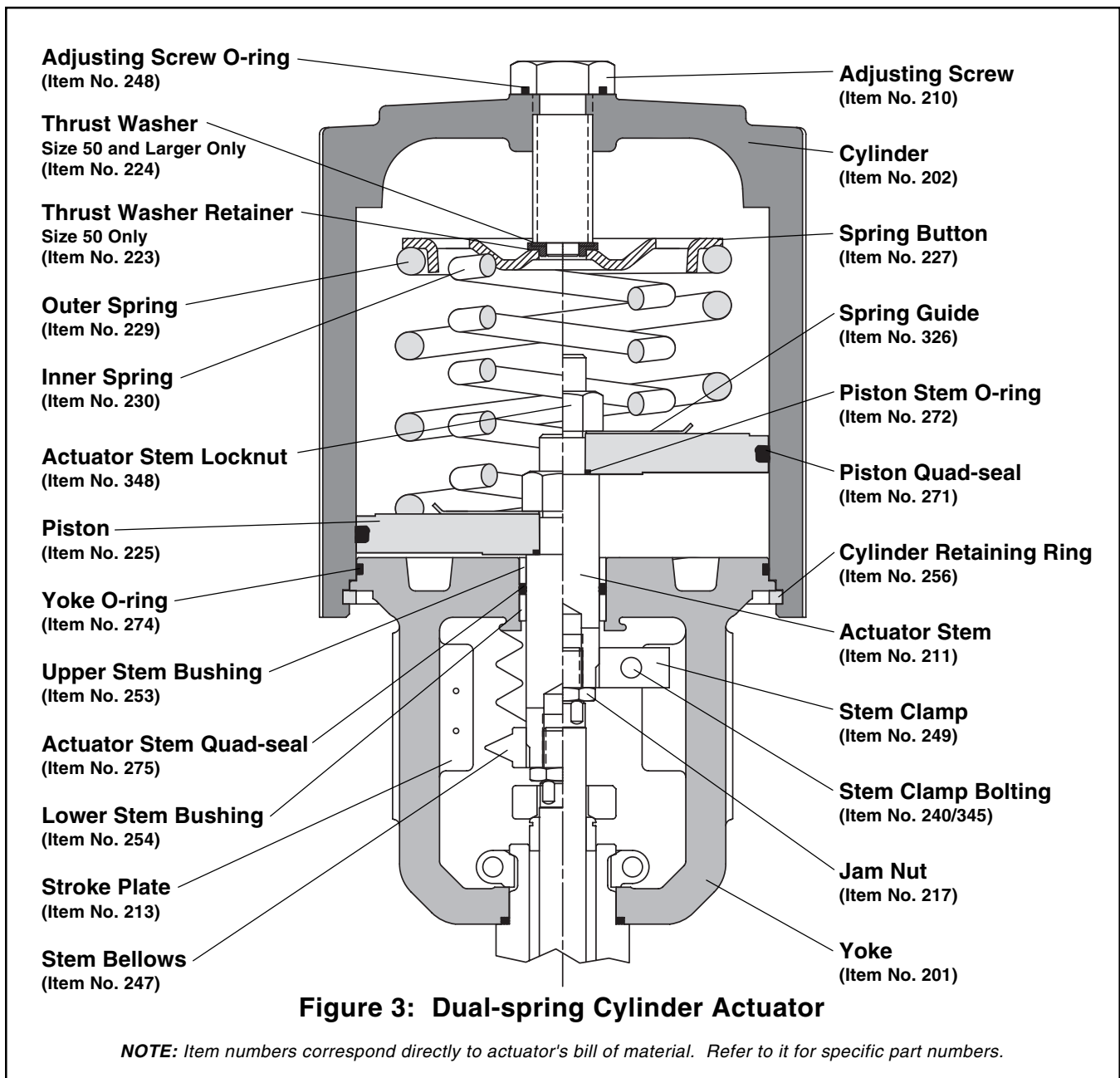
To reassemble the cylinder actuator, refer to Figures 1 through 4:

1. All O-rings and quad-seals should be replaced and lubricated with a silicone lubricant (Dow Corning® 55M or equivalent). Fill the concave grooves on the quad-seals with grease prior to installing these seals. Silicone O-rings must be lubricated with Magnalube-G® lubricant or equivalent. Do not use silicone lubricant on silicone O-rings.
2. Thoroughly clean all internal parts before beginning assembly. Check the cylinder bore for scratches, pitting or worn areas. Lubricate cylinder wall and all internal surfaces with appropriate lubricant.
3. Lubricate the outside of the replacement bushings if the stem bushings have been removed. Press a new

lower stem bushing into the actuator stem bore in the yoke until it bottoms out. Press the upper stem bushing into the bore until it is flush with the top of the yoke (refer to Figures 1 or 2).

4. Replace the actuator stem quad-seal and yoke O-ring.
5. Reassemble the piston, piston stem O-ring and stem spacer on the actuator stem according to the proper air-action (refer to either Figure 1 or 2). Replace the piston quad-seal. Air-to-extend configurations require the spring button to be stored under actuator stem locknut. Tighten the locknut firmly.

CAUTION: When installing the actuator stem lock nut, do not hold the actuator stem with a pipe wrench as the sealing surface may be

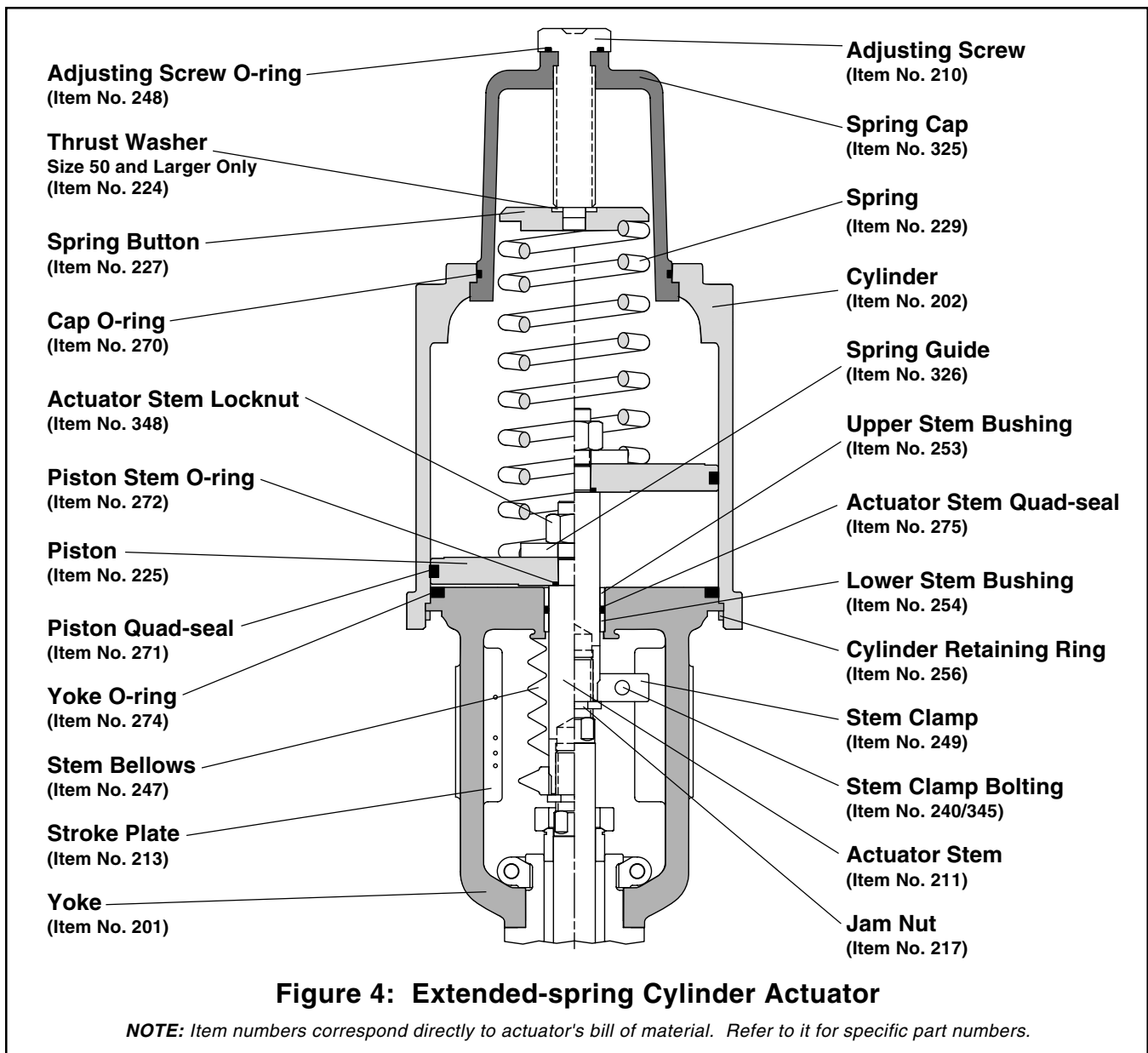


damaged; instead, use a wrench on the flats of the actuator stem.

NOTE: When reassembling dual or extended, spring- design actuators, the spring guide must be first inserted under the actuator stem locknut (see Figures 3 and 4).

6. Size 50 through 200 actuators use a thrust washer between the spring button and the adjusting screw. Replace the plastic thrust washer, and clean its gland in the spring button (thrust washer retainer in the size 50). Lubricate a new thrust washer with Dow Corning® 55M or equivalent grease on both sides and insert it into the spring button or thrust washer retainer gland.
7. VL-HC actuators require that the piston be placed into the cylinder prior to the actuator stem being

inserted through the yoke. Place the cylinder on a flat surface with the open end up. For *air-to-retract* configurations, place the thrust washer (and the thrust washer retainer on size 50) and the spring button on the bottom of the cylinder centered on the adjusting screw hole. The size 25 actuator does not utilize a thrust washer. Place the spring(s) onto the spring button and place the piston assembly over the springs in the actuator. With the piston at a slight angle, insert one side of it no more than one inch into the cylinder bore. Slowly push the rest of the piston into the bore until the quad-seal stops the movement. While applying a small amount of pressure to the piston, carefully push the extruded portion of the quad-seal into the piston gland with a dull, flat screwdriver until the piston continues its downward



movement into the bore. For *air-to-extend* configurations, repeat this process without the thrust washers or springs. Once the piston is installed and leveled, center the spring on the piston.

WARNING: Do not pound the piston into the cylinder bore. This could damage or shear the quad-seal. Take extreme care to not damage the quad-seal with the screwdriver.

NOTE: To ensure maximum clamping strength when installing the stem clamp, make sure the slots in the actuator stem will be in line with the inside webs of the yoke when the cylinder and yoke air ports are lined up.

8. For extended spring design actuators, assemble per steps 6 and 7 while the cylinder sits on a table or fixture with a hole sufficient to allow clearance of

the spring cap. Be sure to replace the O-ring in the spring cap prior to installation.

9. Install the yoke onto the cylinder making sure the yoke is pushed deeply enough into the cylinder to allow the cylinder retaining ring to be installed. Care should be taken not to scar or cut the yoke O-ring.
10. Reinsert the cylinder retaining ring until it snaps in place. Use a hammer and drift punch to lightly tap the retaining ring in the groove.

WARNING: To avoid personal injury, the cylinder retaining ring must be solidly in place. The cylinder could possibly fly off when pressurized. Be careful not to pinch or cut fingers on the square edges of the retaining ring during installation.

11. Reinstall the adjusting screw using a new adjusting screw O-ring.

NOTE: Be certain the hole in the spring button or thrust washer is directly centered under the adjusting screw hole in the cylinder on air-to-retract configurations. Move as required with a screwdriver.

12. Tighten the adjusting screw enough to provide an air seal with the O-ring. Do not overtighten.

13. Reinstall the stem bellows and stem clamp.

NOTE: To ensure maximum clamping strength when installing the stem clamp, make sure the stem clamp bolting is perpendicular to one of the slots machined into the actuator stem.

14. Apply air over the piston. Tighten the stem clamp bolting with the stem clamp adjusted to point at the closed position of the stroke plate.

NOTE: If the actuator is installed on a Flowserve valve, refer to the appropriate installation, operation, maintenance instructions for correct plug stem thread engagement.

15. Reconnect tubing, supply and signal lines.

Reversing the Air-action

To change the air action from air-to-retract to air-to-extend, or vice versa, refer to Figures 1, or 2 :

NOTE: Dual or extended spring actuators are not reversible. Thrust washers are not used on air-to-extend actuators.

1. Disassemble the actuator according to the “Disassembling the Actuator” section.
2. For air-to-retract action, reassemble the actuator with stem spacer and spring button over the piston.
3. For air-to-extend action, reassemble with spring and stem spacer below the piston and with the spring button stored above the piston.
4. Reassemble the actuator according to the “Reassembling the Actuator” section.
5. The positioner must also be reversed. See the appropriate positioner maintenance instructions.

Troubleshooting

Problem	Probable Cause	Corrective Action
High air consumption or leakage	<ol style="list-style-type: none"> 1. Leaks in the air supply or instrument signal system 2. Malfunctioning positioner 3. Leaks through O-rings or adjusting screw O-ring 	<ol style="list-style-type: none"> 1. Tighten connections and replace any leaking lines 2. Refer to appropriate positioner maintenance bulletin 3. Replace O-rings
Actuator does not move to fail position upon loss of air supply pressure	<ol style="list-style-type: none"> 1. Air pressure in cylinder not venting because of faulty positioner 2. Spring failure 3. Internal valve problem 	<ol style="list-style-type: none"> 1. Refer to appropriate positioner maintenance bulletin 2. Replace spring 3. Refer to valve’s maintenance bulletin
Jerky or sticking stem travel	<ol style="list-style-type: none"> 1. Insufficient air supply pressure 2. Unlubricated cylinder wall 3. Worn or damaged stem bushings 4. Improperly assembled spring 5. Internal valve problem 	<ol style="list-style-type: none"> 1. Check air supply and any filters or regulators; check for leaking O-rings 2. Lubricate cylinder wall with Dow Corning® 55M or equivalent lubricant 3. Check actuator stem for damage; replace actuator stem, O-ring, and stem bushings, if necessary 4. Disassemble actuator and check cylinder and piston for damage; reassemble actuator correctly 5. Refer to valve’s maintenance instructions

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