

Valtek Spring Cylinder Rotary Actuators

GENERAL INFORMATION

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on Valtek® Spring Cylinder Rotary Actuators. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, operating or performing any maintenance on the actuator. Separate maintenance instructions cover additional components (such as Valdisk and ShearStream body assemblies, fail-safe systems, limit switches, hand-levers, position transmitters and handwheels.

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

IMPORTANT

Three designs of the Spring Cylinder Rotary Actuator exist in service today. The original design contained a diaphragm seal assembly in the actuator. This assembly was later replaced with a sliding seal assembly. Life-cycle testing under rigorous conditions shows sliding seals will last many times longer than diaphragm stem seals. Made of Delrin 100 and bronze, sliding seals are durable and much easier to maintain. Since the sliding seal design has replaced the diaphragm as Flowserve's standard, it is highly recommended that the diaphragm stem seal be replaced with the sliding seal.

The third design uses a standard rotary actuator with a sliding seal assembly in the actuator and a clamping lever arm in the transfer case.

Maintenance personnel should become familiar with the particular rotary actuator design needing service and follow the appropriate maintenance instructions for that design.

This bulletin contains instructions on maintaining the clamping and non-clamping splined lever design.

Contact the factory or your Flowserve representative for more information on the diaphragm seal assembly design.

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 parts, or using maintenance procedures other than outlined could void warranties, drastically affect performance and be hazardous to personnel and equipment.

Unpacking

1. While unpacking the actuator, check the packing list against the materials received.
2. When lifting the actuator from the shipping container, position lifting straps and hoist to avoid damage to tubing and mounted accessories.

WARNING: When lifting an actuator with lifting straps, be aware the center of gravity may be above the lifting point. Therefore, support must be given to prevent the actuator from rotating. Failure to do so can cause serious injury to personnel and damage to actuator or nearby equipment.

3. Contact your shipper immediately for any shipping damage.
4. Contact your Flowserve representative for any problems.

Installation

Prior to installation, make sure adequate overhead and side clearance for the actuator is provided to allow for proper removal and for proper maintenance. Refer to Table I.

NOTE: If the actuator is attached to a Valtek Valdisk or ShearStream valve body assembly, see Installation, Operation, Maintenance Instructions 10 or 27 for overhead clearances.

**Table I: Overhead Clearance
for Disassembly**

Actuator Size	Minimum Clearance
25	6 inches
50	8 inches
100, 200	9 inches

NOTE: Although Valtek rotary spring cylinder actuators can be mounted in any position, mounting the cylinder vertically is the preferred installation.

1. Mount the actuator on the desired valve or other mechanical device.
2. 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 air supply, an air regulator should not be used unless the air supply exceeds 150 psi.

CAUTION: In some cases, the air supply must be limited to less than 150 psi. A sticker found near the upper air port on the actuator cylinder will indicate this condition.

CAUTION: The transfer case cover plate and yoke must be mounted on the actuator prior to it being stroked, otherwise damage will result. On older designs, the actuator must also be attached to a valve or other mechanical device.

3. The installation of an air filter on the supply line is recommended.
4. Make sure all air connections are free of leaks, using a soap solution.

PREVENTIVE MAINTENANCE

At least once every six months, check for proper operation by following the preventive maintenance steps outlined below. These steps can be performed while the actuator is in service and, in some cases, without interrupting service.

WARNING: Keep hands, hair and clothing away from all moving parts while operating the actuator. Failure to do so can cause serious injury.

If an internal problem is suspected with the actuator, refer to the "Disassembly and Reassembly" section.

1. Examine the actuator for damage caused by corrosive fumes and process splatter.
2. Clean actuator and repaint oxidized areas.
3. If possible, stroke actuator and check for smooth, full-stroke operation.
4. Remove the transfer case cover plate and make sure the positioner linkage and splined lever arm are securely fastened.

CAUTION: Never apply air to the actuator without the cover plate installed; otherwise, the unsupported shaft will sustain damage. Do not remove the cover plate with the valve in service.

5. Be sure all accessories, brackets and bolting are securely fastened.
6. If possible, remove air supply and observe the position indicator plate for correct fail-safe action.
7. Spray a soap solution around the cylinder retaining ring and the adjusting screw to check for air leaks through the O-rings.
8. Clean any dirt or other foreign material from the shaft.
9. If an air filter is supplied, check and replace cartridge if necessary.

Removing Rotary Actuators From Valtek Valve Bodies

1. Support actuator assembly before disconnecting it from the body assembly.
2. Remove the actuator cover bolts. Carefully pry or slide cover plate from the lever arm.
3. On Flowserve actuators with a clamping lever arm design, loosen the clamp bolt.
4. Loosen the actuator adjusting screw to release spring pressure.
5. Remove the actuator from the body by separating the actuator at the yoke. This is done by removing the four transfer case bolts and pulling the actuator off the valve shaft.

ACTUATOR DISASSEMBLY

Disassembling Actuators with clamping and Non-clamping Lever Arm

If it is necessary to disassemble an actuator with a non-clamping lever arm, refer to Figures 1 and 2, and proceed as follows:

1. Depressurize actuator and disconnect all tubing.

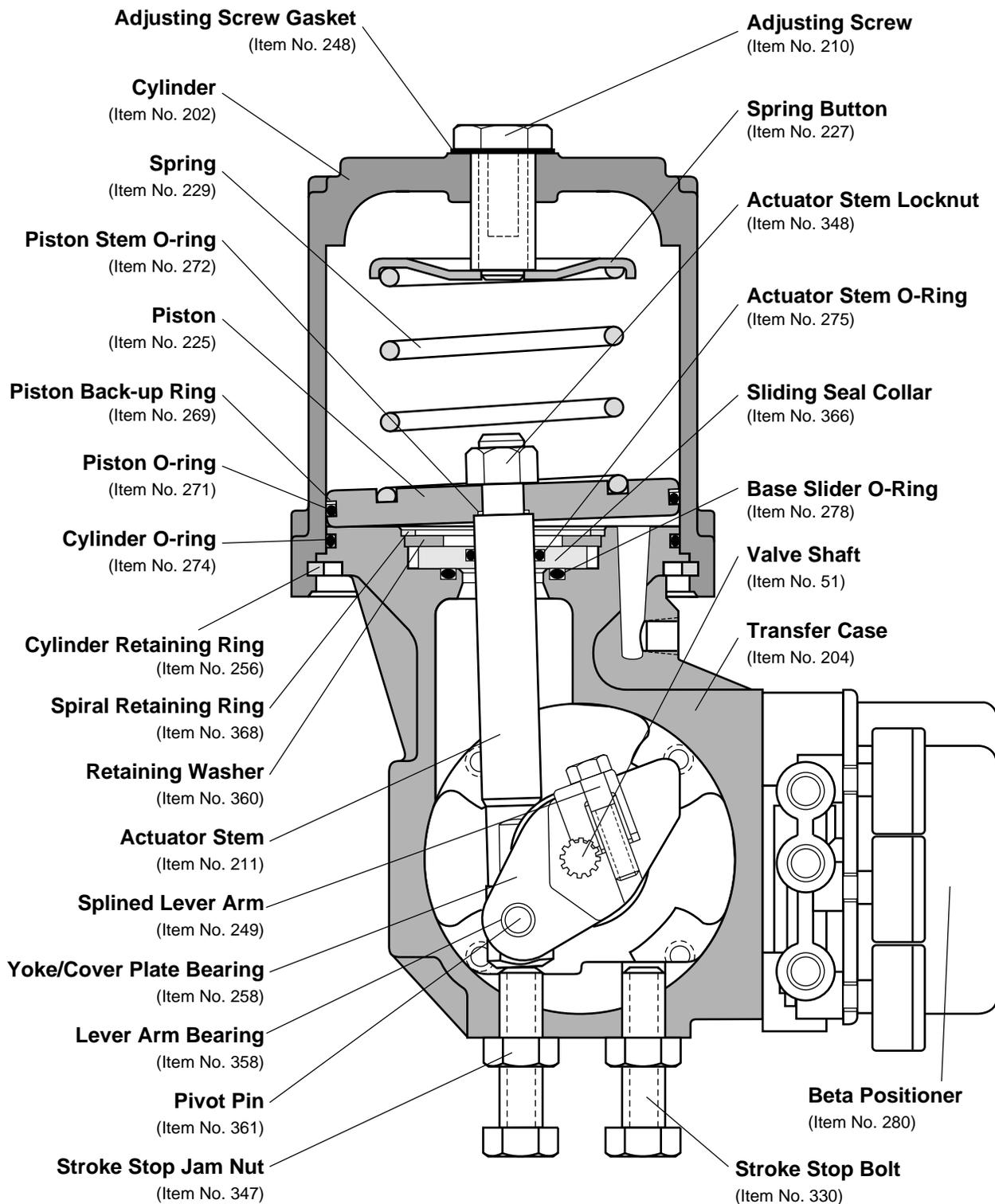


Figure 1: Sectional View of Actuator with Non-clamping Lever Arm
Note : Item numbers correspond directly to the bill of material; refer to it for specific part numbers.

2. Relieve the spring compression by removing the adjusting screw.

WARNING: Spring is under compression. Failure to relieve spring compression by removing adjusting screw can result in serious personal injury.

3. Using a screwdriver, remove the retaining ring from the groove at the base of the cylinder.
4. Pull the cylinder off the transfer case and piston.

NOTE: Substantial O-ring resistance may be felt.

WARNING: Do not use air pressure to remove cylinder. Personal injury may result.

5. Remove spring button and spring.

CAUTION: Care must be taken not to damage the sliding seal assembly or actuator stem O-ring when removing the actuator stem.

6. Remove the actuator stem locknut. The piston and piston stem O-ring may now be removed from the actuator stem.
7. Remove the spiral snap-ring holding the sliding seal assembly in place.
8. Remove the retaining washer and sliding seal collar. These components can usually be removed by hand or by gently prying the outside surface of the collar upward.

WARNING: Do not scratch the bottom surface of the sliding seal collar with a screwdriver or sharp object. Scratches can cause excessive wear and possible leakage.

9. Remove the transfer case cover plate by removing the four bolts.
10. Remove the yoke from the transfer case by removing the four lug bolts.
11. Remove the pivot pin from the non-clamping lever arm by removing a retaining ring.
12. The actuator stem can now be easily removed from the transfer case.
13. The non-clamping lever arm can be removed by first removing the positioner according to the appropriate positioner maintenance bulletin.
14. If the yoke/cover plate bearings need to be replaced, press them out of the yoke and/or cover plate using a press and arbor.
15. The non-clamping lever arm bearings can be replaced by pressing them out with a press and arbor.

ACTUATOR REASSEMBLY

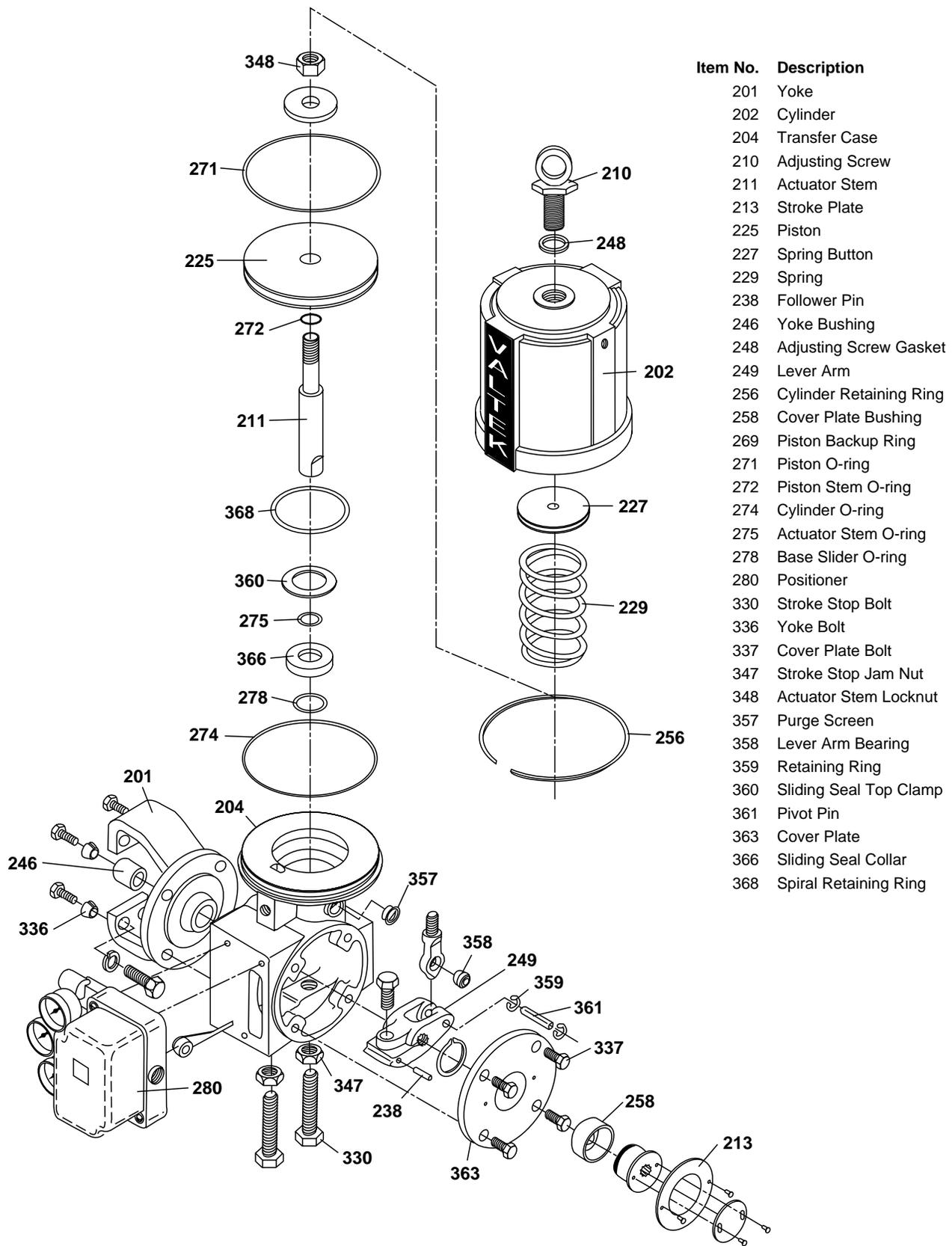
Reassembling Actuators with clamping and Non-clamping Lever Arm

To reassemble an actuator with a non-clamping lever arm, refer to Figures 1 and 2, and proceed as follows:

1. Clean and lubricate all internal parts. All O-rings should be replaced and lubricated using a silicone lubricant (Dow Corning 55M or equivalent). The bore that houses the sliding seal assembly in the transfer case must be smooth and clean.
2. If lever arm bearings were removed, install new bearings by pressing them into place with a press and arbor.
3. Install lever arm into transfer case through cover plate/yoke openings.
4. Slide actuator stem through the top opening of transfer case and connect to the lever arm with the pivot pin and two retaining rings.
5. If the yoke/cover plate bearings were removed, press new bearings into the yoke and cover plate using a press and arbor.
6. On clamping lever design, firmly tighten clamp bolt on clamping lever arm actuators.
7. Install cover plate and yoke onto transfer case. The four tapered lug bolts are used with the yoke and standard hex bolts are used with the cover plate.
8. Install base slider O-ring into sliding seal groove machined in the transfer case.
9. Install actuator stem O-ring into the sliding seal collar. Then slide the collar over the actuator stem.
10. Place retaining washer over the collar and install the spiral retaining ring into the transfer case.
11. Replace the piston O-ring and piston backup ring onto piston, making certain the piston backup ring is on top (toward the top of cylinder) of the piston O-ring.

NOTE: 200 square-inch actuators use two piston backup rings. They are placed on each side of the piston O-ring.
12. Install the piston stem O-ring and piston on to the actuator stem.
13. Install the spring guide (50, 100, and 200 square-inch actuators only) and actuator stem locknut onto the actuator stem. Tighten the actuator stem locknut firmly.
14. Install the cylinder O-ring into transfer case groove.

NOTE: Replace cylinder O-ring if damaged.



Item No.	Description
201	Yoke
202	Cylinder
204	Transfer Case
210	Adjusting Screw
211	Actuator Stem
213	Stroke Plate
225	Piston
227	Spring Button
229	Spring
238	Follower Pin
246	Yoke Bushing
248	Adjusting Screw Gasket
249	Lever Arm
256	Cylinder Retaining Ring
258	Cover Plate Bushing
269	Piston Backup Ring
271	Piston O-ring
272	Piston Stem O-ring
274	Cylinder O-ring
275	Actuator Stem O-ring
278	Base Slider O-ring
280	Positioner
330	Stroke Stop Bolt
336	Yoke Bolt
337	Cover Plate Bolt
347	Stroke Stop Jam Nut
348	Actuator Stem Locknut
357	Purge Screen
358	Lever Arm Bearing
359	Retaining Ring
360	Sliding Seal Top Clamp
361	Pivot Pin
363	Cover Plate
366	Sliding Seal Collar
368	Spiral Retaining Ring

Figure 2: Exploded View of Actuator with Non-clamping Lever Arm

Note: Item numbers correspond directly to the bill of materials; refer to it for specific numbers.

15. Install the spring and spring button.
16. Slide cylinder down over piston and transfer case.

CAUTION: The cylinder must be perpendicular with the piston when sliding it over the piston O-ring. If this is not done, the O-ring could be damaged.

17. Reinsert the cylinder retaining ring in the cylinder by feeding it a little at a time into the groove. Make sure it is securely fastened.

WARNING: Ensure that the cylinder retaining ring is completely seated in the cylinder groove, or serious personal injury may occur.

18. Center the hole in the spring button directly under the adjusting screw hole. Install the adjusting screw and tighten only enough to provide an air seal with the gasket. **Do not overtighten.**
19. If actuator is to be used with a positioner, mount positioner and connect tubing.

CAUTION: The actuator cover plate and yoke must be installed prior to stroking the actuator or damage will result.

Mounting Rotary Actuators with non-clamping lever Valtek Valve Bodies

When mounting a rotary actuator to a Valtek valve body, refer to Installation, Operation, Maintenance Instructions 10 in the case of Valdisk, 27 for ShearStream, or 39 for MaxFlo valves. When mounting a rotary actuator on other manufacturers' valve bodies, refer to the appropriate literature.

When mounting an actuator with clamping lever arm, firmly tighten the clamping bolt on the splined lever arm.

Adjusting External Stroke Stops

After disassembly and reassembly it may be necessary to readjust the external stroke stops to avoid valve leakage. The external stroke stops should be adjusted while the valve is out of line. To adjust the external stroke stops, proceed as follows:

CAUTION: Actuators with clamping lever arms must be attached to a valve or other mechanical device and the transfer cover plate must be installed prior to stroking the actuator or damage will result.

1. Cycle the valve (or mechanical device) to just beyond the closed position with very low supply air pressure (10-15 psi).
2. Turn the stroke stop in clockwise (as viewed from the end) until resistance is felt. Turn the stroke stop an additional 1/8 turn. Check to see that the valve is closed on dead center. If not, adjust the stop until the valve is closed on dead center.

3. Cycle the valve open. Adjust the other stroke stop until valve is 90 degrees from the closed position.
4. Cycle the valve several times to make certain the position indicator returns to the same position with each cycle.
5. Tighten the stroke stop jam nuts.

REVERSING THE ACTUATOR ACTION

The rotary actuator transfer case allows for four different mounting positions and for either fail-close or fail-open air failure operation, without retubing or changing the fail-safe spring in the actuator. Before reversing the actuator action, make sure there is no line pressure in the valve and support the actuator assembly by the lifting ring. Refer to Figures 1 and 2 and proceed as follows:

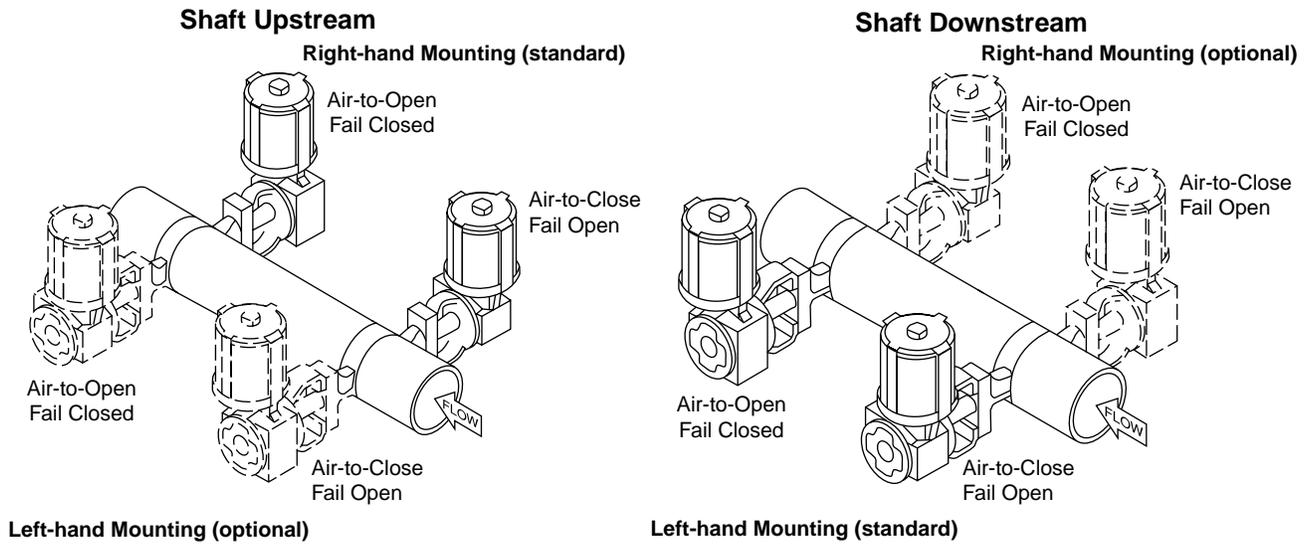
NOTE: Not all positions are available on all actuator sizes; contact factory if a problem occurs while reversing the actuator action.

1. Disconnect the air and relieve spring compression.
2. Remove the transfer case cover plate bolts. Carefully slide cover plate off the end of the splined lever.
3. On older designs with clamping lever arms, loosen the linkage bolt.
4. Remove bolts connecting transfer case to the yoke.
5. On older designs with clamping lever arms, slide the actuator assembly off the shaft. If necessary, wedge the splined lever arm apart to loosen it on the shaft spline.
6. Index the valve by manually rotating it 90 degrees. If the valve is closed, rotate it to the open position or vice versa.
7. Reverse the transfer case on the yoke by turning it 180 degrees. The yoke side now becomes the cover plate side and the cover plate side becomes the yoke side. Since this changes the direction of the actuator's rotation, it may be necessary to change the mounting position of the valve in line to achieve the proper orientation.

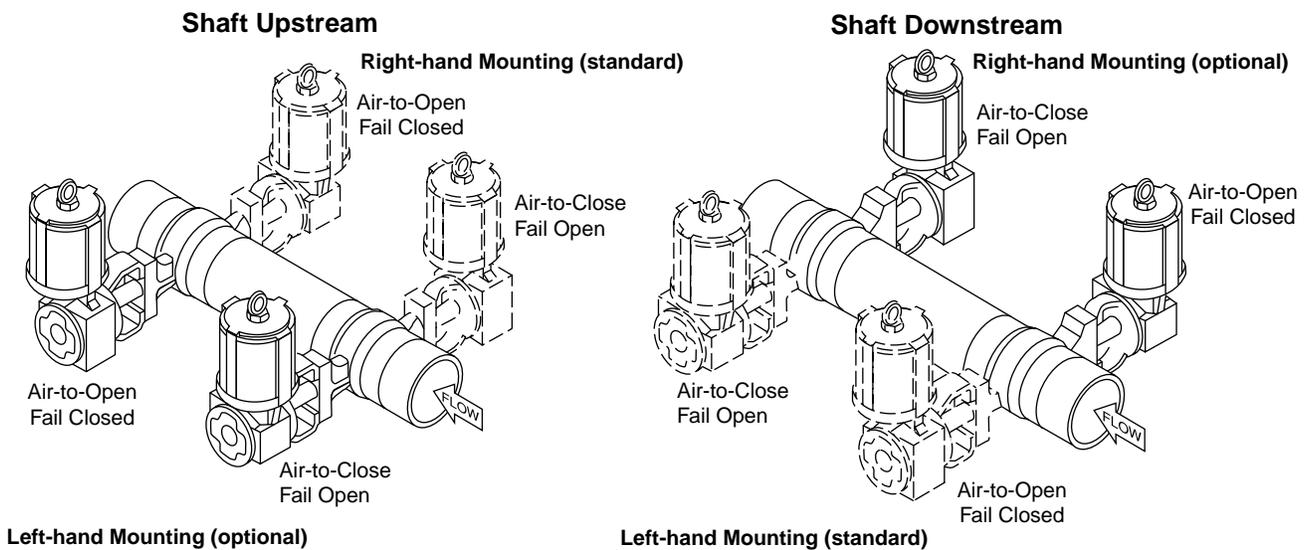
NOTE: Before reconnecting the actuator to the valve, verify that the valve rotation matches the actuator rotation and complies with the air failure requirement.

8. Reconnect the actuator to the valve or mechanical device. On actuators with clamping lever arm, center the splined lever arm and tighten the linkage bolt according to the data in Table II.

Actuator Orientations for Valdisk, Valdisk 150 and ShearStream Control Valves

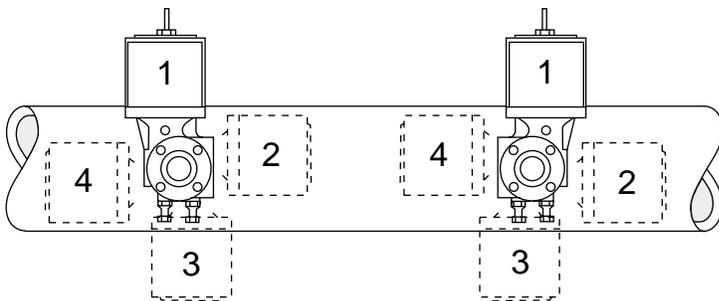


Actuator Orientations for Maxflo Control Valves



Actuator Orientation

Note: Orientations 2 and 4 are not available on some actuator sizes.



Handwheel Orientation

Note: These orientations are in relation to the pipeline.

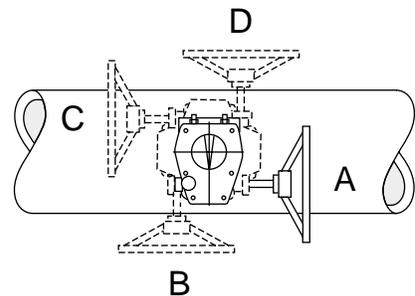


Figure 3: Transfer Case Mounting

Troubleshooting Rotary Actuators

Failure	Probable Cause	Corrective Action
Actuator operates, shaft does not rotate	<ol style="list-style-type: none"> 1. Broken actuator stem 2. Broken pivot pin 3. Sheared connection at splined lever arm 	<ol style="list-style-type: none"> 1. Replace actuator stem 2. Replace pivot pin 3. Replace splined lever arm or valve shaft
Jerky shaft rotation	<ol style="list-style-type: none"> 1. Cylinder wall not lubricated 2. Worn piston O-ring or load bearing ring, allowing piston to gall on cylinder wall 3. Worn (or damaged) valve thrust bearings, shaft bearings or packing followers 	<ol style="list-style-type: none"> 1. Lubricate cylinder with silicone lubricant 2. Replace O-ring or load bearing ring; if galling has occurred, replace all damaged parts 3. Disassemble and inspect parts; replace any worn or damaged parts
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 gasket 4. Worn O-rings in sliding stem seal assembly 	<ol style="list-style-type: none"> 1. Tighten connections and replace any leaking lines 2. Refer to positioner's maintenance instructions 3. Replace O-rings or gasket 4. Replace assembly

Flowserve Corporation has established industry leadership in the design and manufacture of its products. When properly selected, this Flowserve product is designed to perform its intended function safely during its useful life. However, the purchaser or user of Flowserve products should be aware that Flowserve products might be used in numerous applications under a wide variety of industrial service conditions. Although Flowserve can (and often does) provide general guidelines, it cannot provide specific data and warnings for all possible applications. The purchaser/user must therefore assume the ultimate responsibility for the proper sizing and selection, installation, operation and maintenance of Flowserve products. The purchaser/user should read and understand the Installation Operation Maintenance (IOM) instructions included with the product, and train its employees and contractors in the safe use of Flowserve products in connection with the specific application.

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For more information, contact:

For more information about Flowserve and its products, contact www.flowserve.com or call USA 972 443 6500

Regional Headquarters

Quick Response Centers

1350 N. Mt. Springs Prkwy.
Springville, UT 84663
Phone 801 489 8611
Facsimile 801 489 3719

5114 Railroad Street
Deer Park, TX 77536 USA
Phone 281 479 9500
Facsimile 281 479 8511

12 Tuas Avenue 20
Republic of Singapore 638824
Phone (65) 862 3332
Facsimile (65) 862 4940

104 Chelsea Parkway
Boothwyn, PA 19061 USA
Phone 610 497 8600
Facsimile 610 497 6680

12, av. du Québec, B.P. 645
91965, Courtaboeuf Cedex, France
Phone (33 1) 60 92 32 51
Facsimile (33 1) 60 92 32 99

1300 Parkway View Drive
Pittsburgh, PA 15205 USA
Phone 412 787 8803
Facsimile 412 787 1944

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