

# Valtek Mark One and Mark Two Control Valves

## GENERAL INFORMATION

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on Valtek® Mark One and Mark Two control valves. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, operating or performing any maintenance on the valve. Separate installation, operation, maintenance instructions cover additional features (such as special trim, diaphragm actuator, handwheel and extension bonnets).

This publication does not contain information on Valtek positioners. Refer to the appropriate Installation, Operation, Maintenance Instructions for installing, maintaining, troubleshooting, calibrating and operating Valtek 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 parts or using maintenance procedures other than outlined could drastically affect performance and be hazardous to personnel and equipment and may void existing warranties.**

**WARNING:** Standard industry safety practices must be adhered to when working on this or any other process control product. Specifically, personal protective and lifting devices must be used as warranted.

**NOTE:** Selecting the proper fastener material is the responsibility of the customer. Typically, the supplier does not know what the valve service conditions or environment may be. Flowserve's standard body bolting material is B7/2H. B8 (stainless steel) is optional for applications more than 800° F / 425° C and with stainless steel or alloy body valves. The customer therefore must consider the material's resistance to stress corrosion cracking in addition to general corrosion. As with any mechanical equipment, **periodic inspection and maintenance is required**. For more information about fastener materials, contact your Flowserve representative.

## Unpacking

1. While unpacking the valve, check the packing list against materials received. Lists describing valve and accessories are in each shipping container.
2. When lifting the valve from shipping container, position the lifting straps through the yoke legs to avoid damage to the tubing and mounted accessories.

**WARNING:** When lifting an actuator with lifting straps through the yoke legs, be aware that 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, damage to the valve or nearby equipment.

3. Contact your shipper immediately if there is shipping damage.
4. Should any problem arise, call your representative.

## Installation

1. Before installing the valve, clean the line of dirt, welding chips, scale or other foreign material.
2. Whenever possible, the valve should be installed in an upright position. Vertical installation permits easier valve maintenance. This is also important for cryogenic applications to keep the packing isolated from the flowing medium, permitting the packing temperature to remain close to ambient temperature.

**CAUTION: Do not insulate extension bonnets that are provided for hot or cold services.**

**Table I: Overhead Clearance Requirement**

Valve Size (inches)	Clearance (inches)	Valve Size (inches)	Clearance (inches)
1/2, 3/4, 1	3 / 76	6	10 / 254
1 1/2, 2	5 / 127	8	13 / 330
3	6 / 152	10	14 / 356
4	8 / 203	12	15 / 381

3. Be sure to provide proper overhead clearance for the actuator to allow for disassembly of the plug from the valve body. Refer to Table I for the necessary clearance needed for valve disassembly.
4. Double-check flow direction to be sure the valve is installed correctly. Flow direction is shown by the

arrow attached to the body flange. Standard air-to-open valves close on air failure and should be installed so the flow tends to close the valve, except in rare circumstances that will be clearly indicated. Standard air-to-close valves open on air failure and should be installed with the flow tending to open the valve.

5. If welding the valve into the line, use extreme care to avoid excess heat buildup in the valve.
6. If the valve has separable end flanges, the half rings must be installed on the valve body before bolting the valve into the line to ensure a tight connection.

**WARNING: Failure to install half rings on the valve body can cause serious personal injury.**

7. Connect air supply and instrument signal (air or mA) lines. Throttling control valves are equipped with a valve positioner. Two connections are marked: one for the air supply and the other for the instrument signal. Both the actuator and the positioner are suitable for 150 psi / 10.3 Bar air supply. An air regulator is not required unless the supply pressure exceeds 150 psi / 10.3 Bar. An air filter should be installed before the positioner unless supply air is clean and dry. All connections must be free of leaks.

**CAUTION: On valves equipped with air filters, the air filter must point down to perform properly.**

**NOTE:** In some rare cases, the air supply must be limited to less than 150 psi / 10.3 Bar. This is indicated on a sticker found near the upper air port on the actuator cylinder. An air regulator should be installed to ensure the supply pressure does not exceed the line pressure indicated on the sticker.

**Table II: Common Lubricants**

Lubricant	Manufacturer	Temperature Range	Description Applications
Krytox 206	E.I. DuPont	-5° to 550° F / -20° to 285° C	Fluorinated general purpose grease; handles common liquids and gases; good lubricity in harsh mediums; nonflammable, chemically inert; will not harm plastic or metal parts
GP 460	Graphite Products Co.	32° to 1000° F / 0° to 540° C	Graphite in petrolatum; high pressures; anti-galling, graphite remains above 600° F / 316° C
Aeroshell Grease 7	Shell Oil Co.	-100° to 300° F / -75° to 150° C	Synthetic oil based; low temperature applications
Garlock Luball	Garlock Inc.	32° to 500° F / 0° to 260° C	General purpose molybdenum disulfide lubricant economical; good in water, steam and common chemicals; not good in harsh mediums where Krytox 206 is recommended



## Quick-check

Prior to start-up, check the control valve by following these steps:

1. Stroke the valve and observe the plug position indicator on the stem clamp compared to the stroke indicator plate. The plug should change position in a smooth, linear fashion.
2. Check for full stroke by making appropriate instrument signal change: 3-15, 3-9, 9-15 psi / 0-1, 0-0.6, 0.6-1 Bar or associated split ranges for pneumatic positioners, 4-20 or 10-50 mA for electro-pneumatic positioners).
3. Check all air connections for leaks.

4. Adjust the packing nuts to slightly over finger-tight.

**CAUTION: Do not overtighten packing. This can cause excessive packing wear and high stem friction that may impede plug movement.**

5. Make sure the valve fails in the correct direction in case of air failure. This is done by shutting off the air supply and observing the failure direction.
6. After temperature excursion has occurred, bonnet flange bolting should be retightened to ensure bonnet gaskets do not leak. See Table III.

## VALVE 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 valve is in-line and, in some cases, without interrupting service. If an internal problem is suspected, refer to the "Valve Disassembly and Reassembly" section.

1. Look for signs of gasket leakage through the end flanges and bonnet. Tighten flange and bonnet bolting (if required). See Table III.
2. Check for fluid leakage to the atmosphere through the pressure-balance sleeve, metal bellows seal and body drain plug.
3. Examine the valve for damage caused by corrosive fumes or process drippings.
4. Clean valve and repaint areas of severe oxidation.
5. Check packing box bolting for proper tightness. Packing nuts should be slightly over finger-tight; however, tighten only as necessary to prevent stem leakage.

**CAUTION: Do not overtighten packing. This can cause excessive packing wear and high stem friction that may impede stem movement.**

6. If the valve is supplied with a lubricator fitting, check lubricant supply and add lubricant if necessary. See Table II for common lubricants.

7. If possible, stroke the valve and check for smooth, full-stroke operation. Unsteady stem movement could indicate an internal valve problem.

**NOTE:** Jerky stem motion is normal whenever graphite packing is used.

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

8. Make sure positioner linkage and stem clamp are securely fastened. If the stem clamp is loose, check plug thread engagement (refer to the "Reassembling the Actuator" section for the correct procedure on aligning the plug with the seat.)
9. Ensure all accessories, brackets and bolting are securely fastened.
10. If possible, remove air supply and observe actuator for correct fail-safe action.
11. Check rubber bellows for wear.
12. Spray a soap solution around the cylinder actuator retaining ring, adjusting screw and actuator stem guide to check for air leaks through the O-rings.
13. Clean any dirt and other foreign material from the plug stem.
14. If an air filter is supplied, check and replace cartridge if necessary.

## VALVE DISASSEMBLY AND REASSEMBLY

### Disassembling the Body

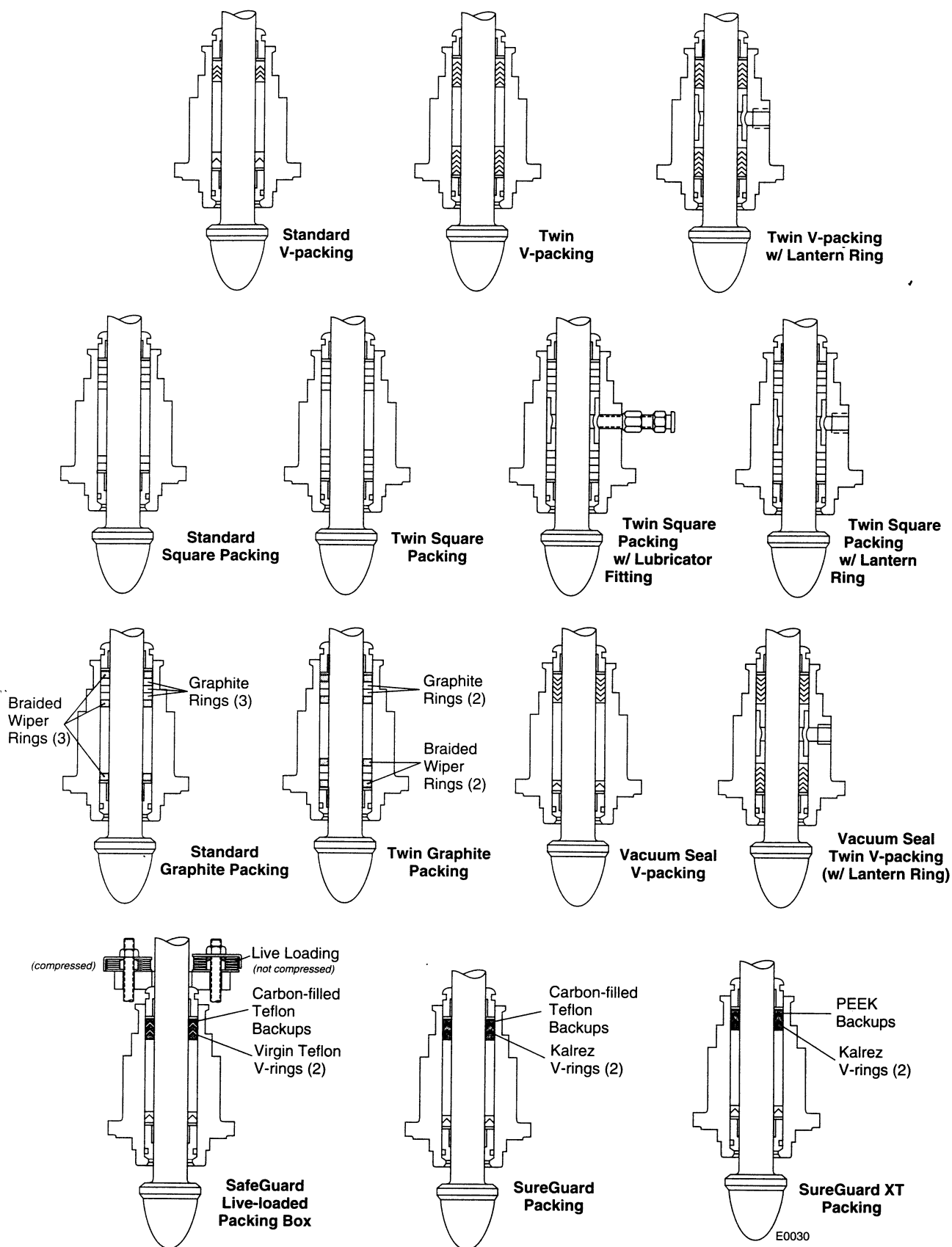
To disassemble the valve body, refer to Figures 1 and 4 then proceed as follows:

**WARNING: Depressurize line to atmospheric pressure and drain all fluids before working on the valve. Failure to do so can cause serious injury.**

1. If valve is air-to-open, apply air under the piston to lift the plug off the seat before taking the valve apart. If valve is air-to-close, proceed to step 2.
2. Remove the bonnet flange bolting and lift actuator, bonnet and plug out of the valve.

**CAUTION: Heavy actuators may require a hoist. Lift the valve with the yoke legs using a lifting strap and a hoist. Great care should be taken to lift the actuator and plug straight out of the body to avoid damage to the plug and seat.**

3. Lift retainer, seat ring and gaskets free of the body.
4. Check to see the seating surfaces on both the seat ring and plug are free of damage to ensure tight shutoff. Make sure the gasket surfaces on the seat ring, bonnet and body are clean and undamaged.
5. To inspect the plug, remove by loosening the stem clamp and gland flange and by taking off the yoke clamps.



**Figure 2: Typical Packing Configurations**

*NOTE: See step 1 in "Reassembling the Body" section.*

**NOTE:** With air-to-close, fail-open valves, it may be necessary to apply a small amount of air to the top of the actuator to move the plug away from the bonnet. Otherwise, plug galling may occur.

Turn the actuator off the plug and bonnet without allowing the plug to rotate within the bonnet. Pull the plug carefully through the packing box.

**CAUTION:** To avoid scoring guides and plug stem, follow the above procedure exactly.

6. If the seat surfaces need remachining, both surfaces on plug and seat ring must be reworked. The seat angle on the plug is 30 degrees (36 degrees for CavControl and Channel Stream valves); the seat ring, 33 degrees. Lapping is not necessary if proper assembly procedures are followed.

**CAUTION:** If remachining, protect the stem while turning. Ensure concentricity of the seat surface with the plug stem (or outside diameter of the seat ring, if machining the seat).

7. To replace packing or change the packing box configuration, from underneath the bonnet push out packing, spacer and guides with a dowel of the same approximate size as the plug stem.

**WARNING:** For valves equipped with separable end flanges, do not machine body gasket surfaces. Machining could cause failure of the separable flange lip causing end gasket leakage and valve failure.

8. If separable end flanges need to be removed, file off tack welds or pull rivets behind the flanges.

**CAUTION:** When using separable end flanges and spiral wound gaskets, use gaskets with outer backup rings. Failure to do so could result in excess stress in some applications.

**NOTE:** To prevent flanges from dropping off during shipping, a tack weld or stainless steel rivet has been installed behind the end flanges.

## Reassembling the Body

To reassemble the valve body, refer to Figures 1, 2 and 4 then proceed as follows:

1. If the packing has been removed, refer to Figure 2 and reinstall new packing exactly as shown. Make sure at least 1/8-inch is left at the top of packing box for the top guide to enter. Different spacer lengths permit a wide variety of packing configurations, such as twin seal and vacuum-pressure packing.

**WARNING:** Valves with extended bonnets or metal bellows seals must not have lower packing installed. Instead, lower packing rings

should be installed with the upper set. Lower packing installed in extended bonnets or metal bellows seal valves will diminish the integrity of the packing assembly.

The graphite guide liners should be replaced each time the valve packing is replaced. Do not rebuild the valve without graphite liners in the guides.

2. Reinsert the plug stem into the packing box, being careful not to score the stem or the guides.
3. Turn actuator back onto the plug, without turning the plug inside the bonnet. Make sure the gland flange and bonnet flange are in place before engaging the plug stem and actuator stem threads.

**NOTE:** Do not allow the gland flange to contact and gall the polished plug stem.

Leave approximately three to four plug stem threads exposed. Attach yoke clamp and gland flange bolting. For valves with a 2-inch spud, be sure the half rings are in place between the yoke and bonnet. Firmly tighten yoke clamp bolting. The packing box nuts should be just over finger tight.

4. Install new bonnet and seat gaskets with the beveled edge up for Teflon gaskets.
5. Insert the seat ring into the body with the step side down. Place the seat retainer into the body with the thin end of the cathedral window down.

**NOTE:** For ANSI Class 900 and above valves with valve sizes 1/2- through 1 1/2-inch, the seat retainer window should be placed in the body with the window facing toward the valve ports. With valves 2-inches and larger, the retainer's bar should face toward the valve ports.

6. Place air under the actuator piston on air-to-open valves to retract the plug.
7. Lower the plug and bonnet squarely into the body. Be careful not to scratch or gall the plug as it enters the body.
8. To properly align the seat ring and plug, first bring the bonnet bolting to finger-tightness.
  - a. With pneumatic actuators, apply air pressure above the piston to seat the plug in the seat ring. Proceed to step 9.
  - b. With electric or hydraulic actuators, move the actuator stem down until it is completely extended. Next, retract the actuator stem 1/8 inch / 3.175 mm. Install the stem clamp onto the plug stem / actuator stem and tighten the associated bolting. Move the actuator stem completely down. Adjust actuator limit switches according to the actuator's operating manual.

**NOTE:** Step 9 applies only to valves with pneumatic actuators. If an electric or hydraulic actuator is used, return the plug to the midstroke position and proceed to tighten.

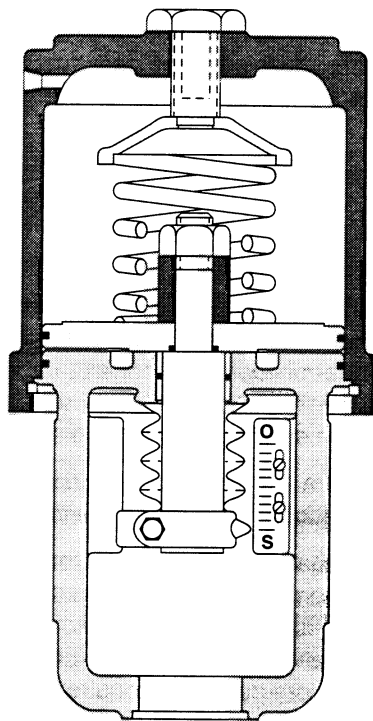
**CAUTION:** Failure to return the plug to a midstroke position (electric or hydraulic operators only) will cause damage to the actuator and / or the valve during the bonnet tightening sequence. This is due to the inability of most electric / hydraulic actuators to accommodate the  $\frac{1}{16}$  inch / 1.60 mm back-drive during the tightening sequence.

9. For air-to-close valves, skip this step and go to step 10. For air-to-open valves, check for proper plug seating as follows: When proper seating occurs, the bonnet flange will be forced up against the finger-tight body bolting with such force that it will be impossible to move the flange. If proper seating does not occur, the bonnet flange can be wiggled with light hand force. Should this occur, place air under the actuator piston and retract the actuator to approximate midstroke position. Turn the plug out of the actuator plug stem one additional thread and

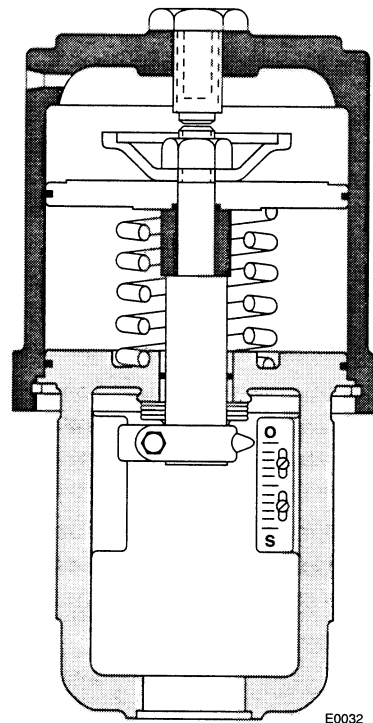
repeat above seating procedure. When the bonnet flange becomes tight against the finger-tight body bolting, the plug is properly seated. If necessary, repeat above procedure until proper seating occurs.

10. Move the plug to the extended (or closed) position for pneumatic actuators and to the midstroke position for electric, hydraulic or mechanical actuators. Begin tightening the bonnet flange bolting in a manner that will keep the bonnet flange square / parallel with the body. Tighten the first bolt  $\frac{1}{6}$  turn, then tighten the bolt directly opposite  $\frac{1}{6}$  turn and so on around the flange. Firmly tighten all bolts evenly and completely to compress the bonnet gasket and to seat the bonnet. Torque the bonnet bolts to the suggested torque values in Table III.
11. Apply air over the piston to seat the plug. For all throttling valves, adjust the stem clamp so that with full instrument signal to the positioner the full signal scribe line on the positioner cam points to the center of the cam roller bearing.

**NOTE:** For on / off valves, the bottom of the stem clamp should simply be lined up with the bottom of actuator stem (plus or minus  $\frac{1}{16}$  inch / 1.60 mm).



**Air-to-Open**



**Air-to-Close**

**Figure 3: Air-action Configurations**

Tighten the stem clamp bolting. Proper tightness is important since this adjustment secures the actuator stem to the plug stem. Adjust the stroke plate so the stem clamp points to the "closed" position.

12. If the valve has been taken out of the line, make sure the flow arrow indicates proper flow direction upon reinstallation.

**Table III: Suggested Bonnet Bolting**  
**Torque Values (ft-lbs / Nm,  $\pm 10$  percent)**

Bolt Size (inches)	Bolt/Stud Material	
	Carbon Steel	Stainless Steel
5/8	80 / 108	50 / 68
3/4	140 / 190	90 / 122
7/8	230 / 312	150 / 203
1	350 / 475	220 / 298
1 1/8	510 / 690	330 / 447
1 1/4	730 / 990	460 / 624
1 3/8	990 / 1342	630 / 854
1 1/2	1320 / 1790	840 / 1140
1 5/8	1710 / 2318	1080 / 1484
1 3/4	2170 / 2942	1400 / 1898
1 7/8	2700 / 3660	1700 / 2305
2	3350 / 4542	2100 / 2847

## Disassembling the Actuator

With air-to-open valves, the actuator may be disassembled while on the valve. With air-to-close valves, the actuator must be removed from the valve prior to disassembly. To disassemble the actuator, refer to Figures 1, 3 and 5 then proceed as follows:

**NOTE:** Steps 1 through 4 apply to removing the actuator from the valve. If disassembly is to take place with the actuator still attached to the valve, go on to step 5.

1. Make sure the plug is neither seated on the seat ring nor back-seated against the bonnet by attaching an air hose on the appropriate side of the cylinder and release the pressure on the opposite side.

**CAUTION:** Galling of critical surfaces may result if the plug is not positioned correctly between the seat ring and bonnet.

2. Loosen the stem clamp.
3. Remove packing box bolting and yoke clamps.
4. Completely turn the actuator off the plug and bonnet without rotating the plug inside the bonnet.

**CAUTION:** Do not allow the plug to drop and impact against the seat after turning the actuator off the plug threads.

5. Disconnect tubing.
6. Remove the adjusting screw to relieve the spring compression.

**WARNING:** The spring compression must be relieved before further disassembly; otherwise, serious personal injury can occur during disassembly.

7. Remove the retaining ring from the groove at the base of the cylinder by using two screwdrivers, inserting them in the ring's slot and prying the ring from the groove.
8. Pull the cylinder off of yoke and piston. Some O-ring resistance may be felt. Remove spring for cleaning and inspection (air-to-open configuration only).

**WARNING:** Do not use air pressure to remove cylinder. Serious personal injury can occur.

9. To remove the spring on air-to-close configurations, remove the piston retaining nut and slide piston off of the actuator stem. The spring may now be removed.

**NOTE:** Step 10 can only be performed if the actuator has been removed from the valve.

10. To inspect the actuator stem O-ring, remove the stem clamp and bellows. Push the actuator stem through the yoke, being careful not to gall the stem. The O-ring may now be removed for replacement.

**NOTE:** The actuator stem bushings are pressed into the yoke; it is not necessary to remove the bushing to replace the actuator stem O-ring.

## Reassembling the Actuator

To reassemble the actuator, refer to Figures 1, 3 and 5 then proceed as follows:

1. All O-rings should be replaced and the new ones lubricated with a silicone lubricant (Dow Corning 55M or equivalent). Silicone O-rings must be lubricated with Magnalube-G lubricant or equivalent. Do not use a silicone lubricant on silicone O-rings.
2. Make sure all internal parts are thoroughly cleaned and lubricated before beginning reassembly.
3. If the actuator stem has been removed, replace the piston stem O-ring and reassemble the piston and actuator spacer on the actuator stem according to the proper air-action (refer to Figures 3 and 5.) Air-to-close configurations require the spring button to be inserted under the actuator stem retaining nut. Tighten the retaining nut firmly.
4. For air-to-close configurations, place the spring under the piston and insert the actuator stem through the yoke, being careful to not gall the stem



or the bushings. Make sure the spring is retained in the groove provided in the top of the yoke. For air-to-open configurations, insert the actuator stem through the yoke and place the spring and spring button above the piston.

5. Install the cylinder, making sure the yoke is pushed deep enough into the cylinder to allow the retaining ring to be installed.
6. Reinsert the retaining ring by feeding it into the groove a little at a time until it snaps in place. Replace the stem bellows and stem clamp.
7. Using a new adjusting screw gasket, reinstall the gasket and adjusting screw. Tighten the adjusting screw only enough to provide an air seal with the gasket. Do not over tighten.

**NOTE:** On air-to-open configurations, make sure the hole in the spring button is directly centered under the adjusting screw hole.

8. Apply air over the piston and place the actuator subassembly onto the valve, making sure the gland flange and bonnet flange are in place. For valves with a 2-inch spud, be sure the half rings are in place between the yoke and bonnet. Engage the plug stem and actuator stem threads. Carefully turn the actuator clockwise until the plug stem is engaged (three to four turns).

**CAUTION:** To avoid possible stem and / or seat galling, do not allow the plug to turn on the seat.

9. Apply sufficient air under the piston (for air-to-open valves) or over the piston (for air-to-close valves) to prevent the plug head from touching either the seat or the bonnet. Continue turning the plug stem into the actuator stem until two to three plug stem threads remain exposed.

**CAUTION:** Do not allow the gland flange to contact or gall the polished plug stem.

**CAUTION:** To avoid possible stem and / or seat galling, do not allow the plug to turn on the seat.

10. Apply air over the piston. This will drive the plug into the seat and lift the yoke off the bonnet approximately  $\frac{1}{16}$  inch / 1.60 mm. If the space is not  $\frac{1}{16}$  inch / 1.60 mm, apply air under the piston to retract the actuator stem and screw the plug in or out as needed. Repeat this step until the  $\frac{1}{16}$  inch / 1.60 mm space is created.
11. Apply air under the piston and attach the yoke clamps and packing box bolting. Tighten the yoke clamp bolting firmly. The packing box nuts should be just over finger-tight.

**CAUTION:** Do not overtighten packing. This can cause excessive packing wear and high stem friction that may impede plug movement.

12. Apply air over the piston to seat the plug. For all throttling valves, adjust the stem clamp so that with full instrument signal to the positioner the full signal scribe line on the positioner cam points to the center of the cam roller bearing.

**NOTE:** For on / off valves, the bottom of the stem clamp should simply be lined up with the bottom of the actuator stem ( $\pm \frac{1}{16}$  inch / 1.60 mm).

Tighten the stem clamp bolting. Proper tightness is important since this adjustment secures the actuator stem to the plug stem. Adjust the stroke plate so the stem clamp points to the "closed" position.

13. Reconnect the actuator / positioner tubing, supply and signal lines.

## REVERSING THE AIR-ACTION

### Changing to Air-to-Open

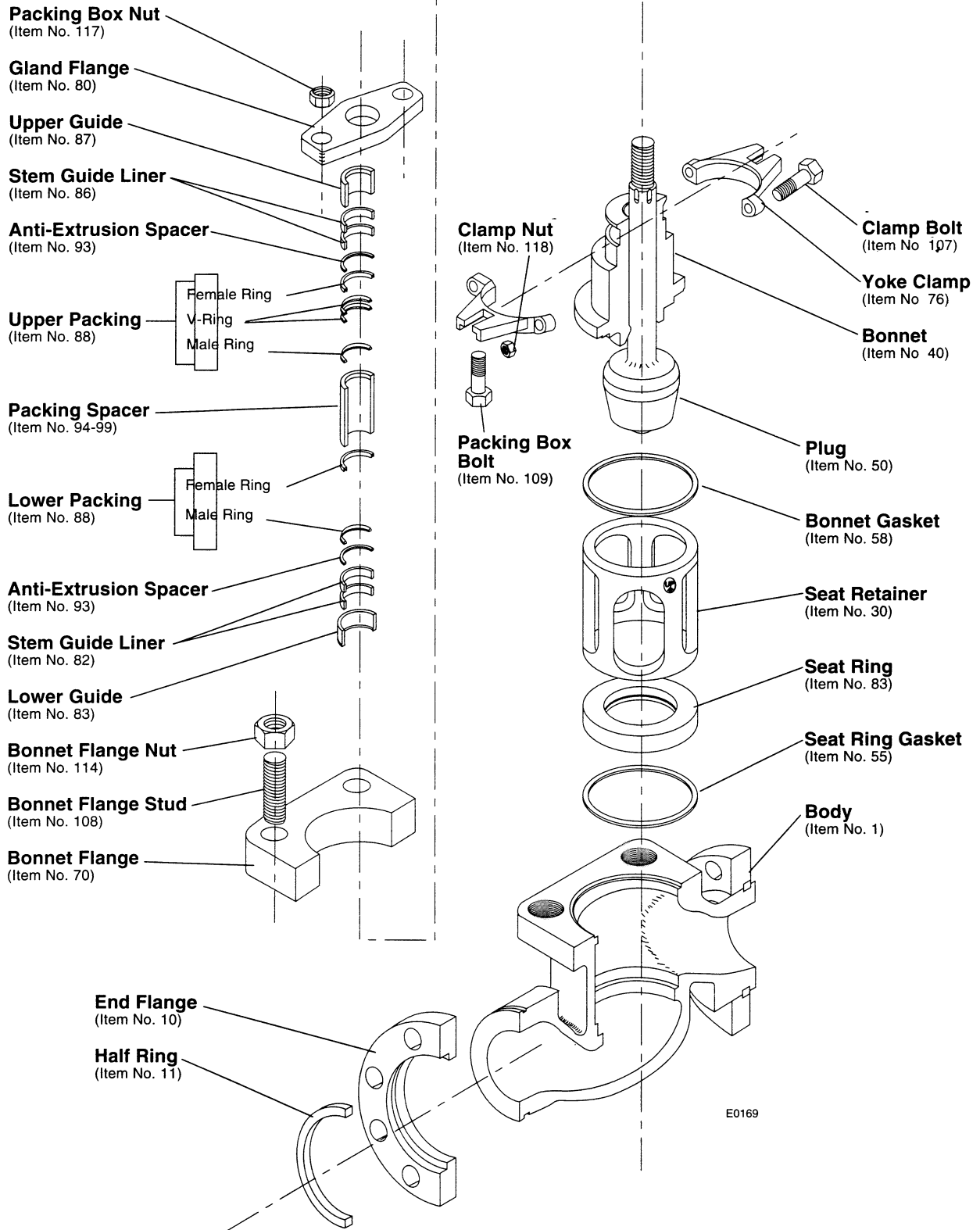
To change the air-action from air-to-close to air-to-open, refer to Figures 3 and 5 then proceed as follows:

1. Follow the instructions for disassembling the actuator (see "Disassembling the Actuator" section).
2. Reassemble the actuator with the spring, actuator stem spacer and spring button over the piston. For proper alignment, the center hole in the spring button should engage the end of the adjusting screw.
3. The positioner must also be changed. To do this, refer to the appropriate positioner Installation, Operation, Maintenance Instructions.

### Changing to Air-to-Close

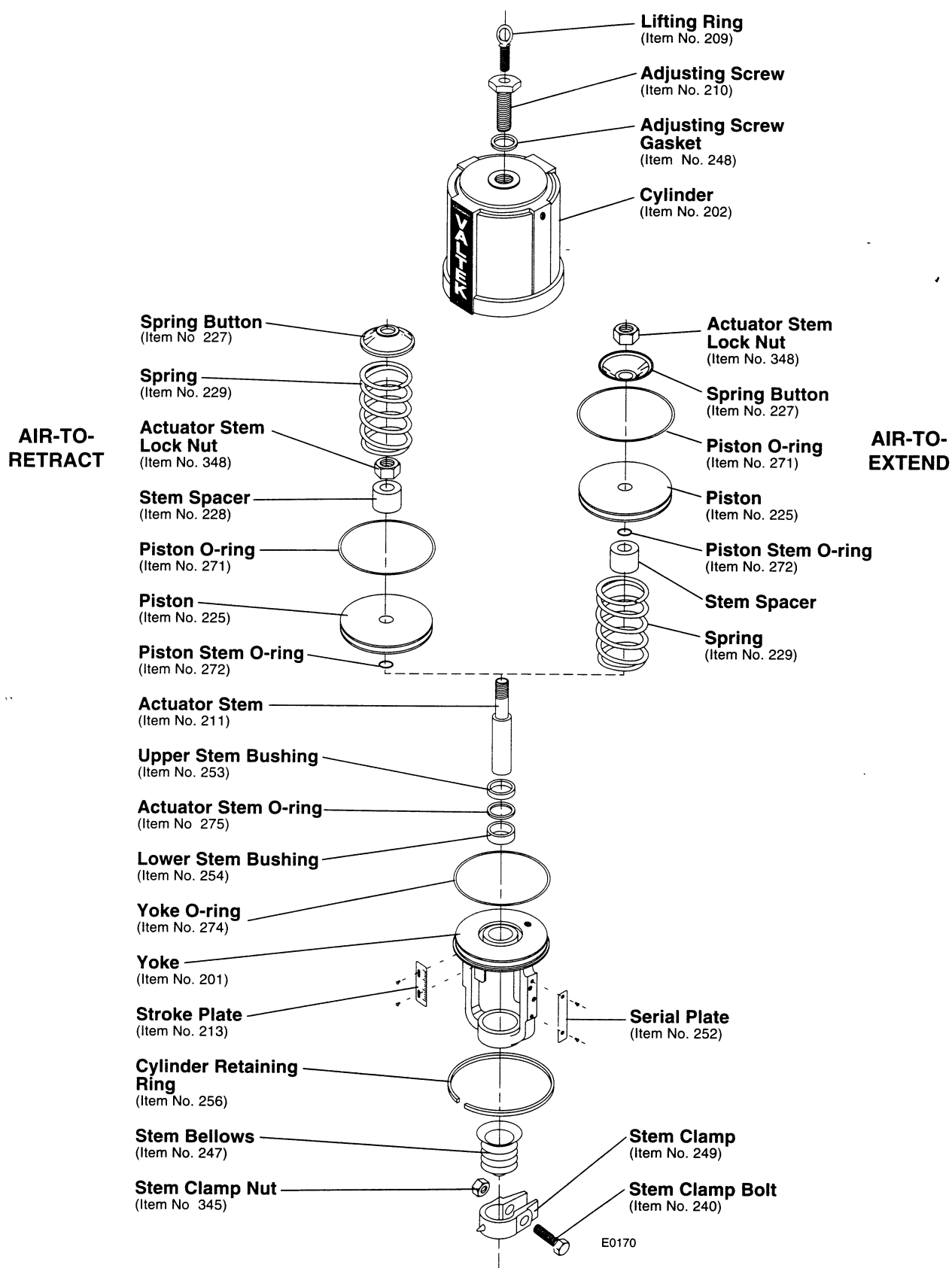
To change the air action from air-to-open to air-to-close, refer to Figures 3 and 5 then proceed as follows:

1. Follow the instructions for disassembling the actuator (see "Disassembling the Actuator" section).
2. Reassemble the actuator with spring and actuator stem spacer below the piston. The spring should sit in the spring groove on top of the yoke. The spring button is not used on air-to-extend configurations and is stored above the piston (the actuator stem retaining nut holds the spring button in place.)
3. The positioner must also be changed. To do this, refer to the appropriate positioner Installation, Operation, Maintenance Instructions.



**Figure 4: Exploded View – Body Assembly**

**NOTE:** Item numbers correspond directly to the valve's bill of material. Refer to it for specific part numbers.



**Figure 5: Exploded View – Actuator Assembly**

**NOTE:** Item numbers correspond directly to the valve's bill of material. Refer to it for specific part numbers.

## Troubleshooting Chart

Problem	Probable Cause	Corrective Action
Stem motion impeded	<ol style="list-style-type: none"> <li>1. Overtightened packing</li> <li>2. Service temperature is beyond operating limits of trim design</li> <li>3. Inadequate air supply</li> <li>4. Malfunctioning positioner</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust packing box nuts to slightly over finger-tight</li> <li>2. Reconfirm service conditions and contact factory</li> <li>3. Check for leaks in air supply or instrument signal system; tighten loose connections and replace leaky lines</li> <li>4. Refer to positioner maintenance instructions</li> </ol>
Excessive leakage	<ol style="list-style-type: none"> <li>1. Improperly tightened bonnet flange bolting</li> <li>2. Worn or damaged seat ring</li> <li>3. Worn or damaged seat or bonnet gasket</li> <li>4. Inadequate actuator thrust</li> <li>5. Incorrectly adjusted plug</li> <li>6. Improper flow direction</li> <li>7. Improper handwheel adjustment acting as a limit-stop</li> </ol>	<ol style="list-style-type: none"> <li>1. Refer to step 3 of "Reassembling the Body" section for correct tightening procedure</li> <li>2. Disassemble valve and replace or repair seat ring</li> <li>3. Disassemble and replace gaskets</li> <li>4. Check for adequate air supply to actuator; if air supply is adequate, reconfirm service conditions and contact factory</li> <li>5. Refer to steps 8 - 10 of "Reassembling the Body" section for correct plug adjustment</li> <li>6. Refer to original specifications or contact factory</li> <li>7. Adjust handwheel until plug seats properly</li> </ol>
Inadequate flow	<ol style="list-style-type: none"> <li>1. Improper plug adjustment, limiting stroke</li> <li>2. Malfunctioning positioner</li> <li>3. Service conditions exceed trim design capacity</li> </ol>	<ol style="list-style-type: none"> <li>1. Refer to steps 8 - 10 of "Reassembling the Body" section for correct plug adjustment</li> <li>2. Refer to positioner maintenance instructions</li> <li>3. Verify service conditions and consult factory</li> </ol>
Plug slams	<ol style="list-style-type: none"> <li>1. Incorrect plug adjustment allowing improper cushion of air between actuator piston and yoke</li> <li>2. Inadequate air supply</li> <li>3. Trim sized too large for flow rate</li> </ol>	<ol style="list-style-type: none"> <li>1. Refer to steps 8 - 10 of "Reassembling the Body" section for correct plug adjustment</li> <li>2. Check air supply to actuator; repair leaks and remove any restrictions in supply line</li> <li>3. Install reduced trim</li> </ol>
Valve does not fail in correct position	<ol style="list-style-type: none"> <li>1. Incorrect flow direction</li> </ol>	<ol style="list-style-type: none"> <li>1. Reconfirm direction and, if necessary, correct flow direction through valve</li> </ol>

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.

While the information and specifications presented in this literature are believed to be accurate, they are supplied for informative purposes only and should not be considered certified or as a guarantee of satisfactory results by reliance thereon. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding any matter with respect to this product. Because Flowserve is continually improving and upgrading its product design, the specifications, dimensions and information contained herein are subject to change without notice. Should any question arise concerning these provisions, the purchaser/user should contact Flowserve Corporation at any of its worldwide operations or offices.

For more information about Flowserve, contact [www.flowserve.com](http://www.flowserve.com) or call USA 972 443 6500

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