

Product Instruction Manual



OpGL

Globe Control Valve

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INTRODUCTION

Scope of Manual

This instruction manual includes installation, maintenance, and parts information for the Optimux OpGL control valve. Refer to separate manuals for information regarding installation, operation, and maintenance of additional features such as the special trim diaphragm actuator, handwheel, extension bonnets, etc. Only qualified persons should install, operate, and maintain an Optimux OpGL valve. Any questions about these instructions should be directed to your Optimux sales office or sales representative before proceeding.

This publication does not contain information on Optimux positioners. Refer to the appropriate manual for information on positioner installation, operation, maintenance, and calibration.

Description

The OpGL is a spring-cylinder actuated globe valve in which the supply air pressure and the fluid pressure combine forces to produce an exceptionally tight shutoff. In addition, self-aligning seat rings make shutoff easier to achieve. Valve specifications are as follows:

Diameter	1/2" - 42" : ANSI Class 150-600
Body Style	Globe, Angle, Three-way, Steam-jacketed, Y-body
Connections	Separable flanges, Internal flanges, Socketweld, Buttweld
Materials	Carbon Steel, Stainless steel, Chromemolly, Alloy, Hastelloy, B&C, Titanium, and others...
Bonnet Types	Normal, Extended, Cryogenic, Coal box extended
Internals	Flow characteristics, equal percentage, linear, and quick-open. Seats available in metal or soft (for "bubble tight" shut off)

Table 1: Specifications

SAFETY INFORMATION



WARNING: Indicates a potentially hazardous situation, which, if not avoided, could result in **death or serious injury**.



CAUTION: Indicates a potentially hazardous situation, which, if not avoided, could result in **minor or moderate injury and/or property damage**.

Note: Indicates a potential situation, which, if not avoided, may result in an *undesired result or state*.

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.

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

INSTALLATION

1. Before installing the valve, inspect it, and other associated equipment, for any damage and any foreign material.
2. Be sure that the body interior is clean, that pipelines are free of foreign materials, and that the valve is oriented in such a way that pipeline flow is in the same direction as the arrow on the side of the valve.
3. The assembly of the control valve may be installed in any orientation unless otherwise limited. However, whenever possible, the valve should be installed with the actuator vertical above the body. 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.

4. Be sure to allow sufficient overhead clearance to provide for disassembly of the plug from the valve body. Refer to Table 2 below for overhead clearance requirements.

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

Table 2: Overhead Clearance Requirements

5. If welding the valve into the line, use accepted piping and welding practices. In the case that the valve has separable end flanges, the half rings must be installed on the body before bolting the valve into the line in order to insure a tight connection.

⚠ WARNING: Failure to install half rings on the valve body could result in serious injury.

Note: Depending on valve body materials used, post weld heat-treating may be required. This may cause damage to internal elastomeric and plastic parts. Shrunk-fit pieces and threaded connections may also loosen. In general, if post weld heat-treating is to be performed, all trim parts should be removed. Contact your Optimux sales office for additional information.

6. 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 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. The air filter should be installed before the positioner unless the supply air is unusually clean and dry.

⚠ CAUTION: On valves equipped with air filters, the filter must point down for proper performance.

Note: In some unusual cases, air supply must be limited to less than the previously mentioned amount of 150psi/10.3 Bar. In this case, a sticker found near the upper air port on the actuator cylinder will indicate this and an air regulator should be installed to insure that the supply pressure does not exceed the line pressure indicated on the sticker.

MAINTENANCE

Valve parts are subject to normal wear and must be inspected and replaced as necessary.

Inspection and maintenance frequency depends on the severity of service conditions. This section contains preventive maintenance steps which can be performed while the valve is still in-line and, in some cases, still in service. If a problem is suspected of being internal, refer to the Assembly/Disassembly section.

1. Inspect end flanges and bonnet for signs of gasket leakage. Tighten flange and bonnet bolting (if required). See Table 4
2. Check the pressure-balance sleeve, metal bellows seal, body drain plug, etc. (if included) for fluid leakage to the atmosphere.
3. Keep valve clean and repaint areas affected by severe oxidation
4. Examine the valve for damage caused by corrosive fumes or process drippings.
5. Check lubricant supply and add lubricant if necessary. See Table 3 for common lubricants.
6. Packing box bolting must be slightly over finger-tight. Tighten only as necessary to prevent stem leakage.

⚠ CAUTION: Do not over-tighten packing. This may cause excessive packing wear and high stem friction, which can

Lubricant	Manufacturer	Temperature Range	Description Applications
Krytox 206	E.I. DuPont	-5° to 550° F / -20° to 285°	Fluorinated general purpose grease; handles common liquids and gases; good lubricity in harsh mediums; non-flammable, 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

Table 3: Common Lubricants

impede stem movement.

7. Be sure that all accessories, brackets, and bolts are securely fastened.
8. Check rubber bellows for wear.
9. Remove any foreign substances from the plug system.
10. Spray a soap solution around the cylinder actuator that retains the ring, adjust screw and actuator stem guide for air leaks through the O-rings.
11. If possible, remove air supply and observe actuator for correct fail-safe action.
12. If the valve contains an air filter, check and replace cartridge if necessary.
13. Be certain that stem clamp and positioner linkage are securely fastened. If the stem clamp is loose, check the plug thread engagement. (For the correct procedure on aligning the plug with the seat, refer to the "Reassembly of the Actuator" section of this manual).
14. Stroke the valve, if possible, and check for smooth, full stroke operation. Wobbly stem movement could be a sign of an internal valve problem.

Note: *Erratic stem movement is common whenever Grafoil packing is utilized.*

⚠ WARNING: Keep hands, hair, clothing, etc. away from all moving parts when operating the valve.

ASSEMBLY AND DISASSEMBLY

Body Disassembly

In disassembling the valve body, refer to Figure 4 and continue as follows:

⚠ WARNING: Depressurize line to atmospheric pressure and drain all fluids before commencing work on the valve.

1. If valve is air-to-close, skip to step 2. If valve is air-to-open, apply air under piston to raise the plug off the seat before taking the valve apart.
2. Take out the bonnet flange bolting which will allow for removal of the actuator, bonnet, and plug from the valve.

⚠ CAUTION: Heavy actuators may require a hoist. A lifting ring is provided on most valves for this function; otherwise, lift the valve with the yoke legs using a lifting strap and a hoist. Care should be taken to lift the actuator and plug straight out of the body to avoid damage to the seat as well as to the plug.

3. Lift retainer, seat ring, and gaskets from the body.
4. See to it that the seating surfaces on both the seat ring and plug are free of damage so that a tight shutoff is ensured. Be sure that 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, also, take off the yoke clamps.

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. If not, some irritation may occur to the plug.*

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

6. If re-machining is necessary on the seat surfaces, both surfaces on plug and seat must be reworked. The seat angle on the plug is 30 degrees; the seat ring is 33 degrees. Lapping will not be necessary if proper assembly procedures are followed.

⚠ CAUTION: In the case that re-machining is necessary, be sure to protect the stem during turning. Insure 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, push out the packing, spacer, and guides with a dowel of a similar size as the plug stem.

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

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

⚠ CAUTION: If separable end flanges and spiral wound gaskets are used, use gaskets with outer back-up 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.

Body Reassembly

To reassemble the valve body, refer to Figure 4, and continue as follows:

1. In the case that packing was removed, refer to Figure 2 and install new packing exactly

as shown. Be sure to leave at least 1/8-inch at the top of the packing box for the top guide to enter. Different spacer lengths allow 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. Rather, lower packing rings should be installed with the upper set.

Wherever graphite guides are used, the graphite liners should be replaced each time the valve packing is replaced. Under no circumstance, should the valve be replaced without graphite liners and guides.

2. Insert the plug stem into the packing box, being sure not to scratch the stem or guides.
3. Turn actuator back onto the plug, without turning the plug inside the bonnet. Be certain that the gland flange and bonnet flange are in place prior to engaging the plug stem and actuator stem threads.

Note: To prevent galling, do not let the gland flange come into contact with the polished plug stem.

Leave about three to four plug stem threads exposed. Attach yoke clamp and gland flange bolting. When working with valves using a 2-inch spud, make sure that the half rings are in place between the yoke and bonnet. Tighten yoke clamp bolting firmly.

4. Install new seat gaskets as well as a new bonnet beveled edge up for Teflon gaskets.
5. Introduce 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, valve sizes up through 1.5-inch, the seat retainer window should be placed in the body with the window facing toward the valve ports. For valves 2-inches or greater in size, the bar of the retainer should face toward the valve ports.

6. For air-to-open valves, place air under the actuator piston to retract the plug.
7. Let down the plug and body squarely into the body. Take caution as not to scratch 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. If the actuator is pneumatic, apply air pressure above the piston to seat the plug in the seat ring, then skip to step 9.
 - b. If the actuator is electric or hydraulic, move the actuator stem down until it is fully extended. Then retract the actuator stem 1/8-inch/3.175-mm. Mount the stem clamp onto the plug stem/actuator limit switches according to the operating manual of the actuator.

Note: The following step (9) pertains only to valves with pneumatic actuators. In the case that an electric or hydraulic actuator is used, return the plug to the mid stroke position and proceed to tighten.

CAUTION: For electric or hydraulic actuators, failure to return the plug to a mid stroke position will cause damage to the actuator and/or the valve while the bonnet is being tightened.

9. If the valve is air-to-close, skip this step and continue to step 10. Check for proper plug seating in air-to-open valves as follows: If proper seating occurs, the bonnet flange will be forced up against the finger tight body with such force that it will not be

possible to wriggle the flange. If improper seating occurred, the bonnet flange can be wriggled with light hand force. If this occurs, place air under the actuator piston and retract the actuator to approximate mid-stroke position. Turn the plug out of the actuator stem one additional thread and repeat the seating procedure described above. When the bonnet flange becomes tight against the finger tight body bolting, the plug is then properly seated.

10. For pneumatic actuators, put the plug in the closed position. For electric, hydraulic, or mechanical actuators, move the plug to the mid-stroke position. Tighten the bonnet flange bolting in such a way that will maintain the bonnet flange square (or parallel) with the body. Tighten the first bolt 1/6 of a turn, then, tighten the bolt directly opposite 1/6 of a turn and so on around the flange. Tighten all the bolts firmly and evenly to compress the bonnet gasket and seat the bonnet. Torque the bonnet bolts to the suggested torque values in Table 4.

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

Table 4: Suggested Bonnet Bolting Torque Values (ft. lbs. /Nm, $\pm$ 10%)

11. To seat the plug, apply air over the piston. For 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: Concerning on/off valves, the bottom of the stem clamp should be lined up with the bottom of the actuator stem ($\pm 1/16$ -inch/1.60mm).

Make the stem clamp bolting tight. Proper tightness is important since this adjustment fastens the actuator stem to the plug stem. Adjust the stroke plate so that the stem clamp points to the "closed" position.

12. Lastly, if the valve was taken out of the line, when reinstalling, be sure that the flow arrow shows correct flow direction.

Actuator Disassembly

When dealing with air-to-open valves, the actuator may be disassembled while still on the valve. In the case of air-to-close valves, the actuator must be removed from the valve before it is disassembled. Refer to Figure 5 to disassemble the actuator. Proceed as follows:

Note: Steps 1-4 pertain to the removal of the actuator from the valve. If the actuator is to be disassembled while still on the valve, skip to step 5.

1. Be certain that the plug is not seated on the seat ring as well as not back-seated against the bonnet. To insure this, attach an air hose to the appropriate side of the cylinder and release pressure on the opposite side.

⚠ CAUTION: Critical surfaces may be galled if the plug is not positioned correctly between the bonnet and seat ring.

2. Loosen the stem clamp.
3. Take out the packing box bolting and yoke clamps.
4. Completely unscrew the actuator off of the plug and bonnet without rotating the plug inside the bonnet.

⚠ CAUTION: Do not allow the plug to drop and collide against the seat after turning the actuator off of the plug threads.

5. Disconnect tubing.
6. Alleviate the spring compression by taking out the adjusting screw.

⚠ CAUTION: Do not put a screwdriver through the lifting ring to take out the adjusting screw; doing so may cause damage to the weld between the lifting ring and the adjusting screw.

⚠ WARNING: Spring compression **MUST** be relieved before continuing with disassembly.

7. Use two screwdrivers to remove the retaining ring from the groove. Insert them in the ring's slot and pry it from the groove.
8. For air-to-open configurations, pull the cylinder off of the yoke and piston. Remove spring for cleaning and inspection.

⚠ WARNING: Do not use air pressure to remove the cylinder.

For air-to-close configurations, remove piston-retaining nut and slide piston off of the actuator stem. The spring can then be removed.

9. Inspect the actuator stem O-ring by proceeding as follows: remove the stem clamp and bellows, and push the actuator stem through the yoke being careful not to gall the stem. The O-ring can then be removed and replaced.

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

Actuator Reassembly

For actuator reassembly, refer to Figure 5. Continue as follows:

1. All O-rings should be replaced and the new ones should be lubricated. Most O-rings can be lubricated with a silicone lubricant. (Do not use a silicone lubricant on silicone O-rings)
2. Be certain to clean and lubricate all internal parts before beginning reassembly.
3. In the case that 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 valve's air-action. If air-to-close, the spring button has 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 – be careful not to gall the stem or bushings. Be sure that the spring is retained in the groove on 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. Mount the cylinder and make certain that the yoke is pushed deep enough into the cylinder for the retaining ring to be installed.
6. Reintroduce the retaining ring by pushing it into the groove a section at a time until it is in place. Replace the stem bellows and the stem clamp.
7. Reinstall the gasket and adjusting screw using a new adjusting screw gasket. The adjusting screw should be tightened only to the point where it creates an air seal with the gasket.

Note: For air-to-open configurations, be sure that the hole in the spring button is directly centered under the adjusting screw.

⚠ CAUTION: Do not put a screwdriver through the lifting ring to reinstall the adjusting screw; doing so may damage the weld between the lifting ring and adjusting screw.

8. Apply air over the piston and place the actuator subassembly, making certain that the gland and bonnet flanges are in place, onto the valve. If the valve has a 2-inch spud, make sure that the half rings are in place between the yoke and bonnet. Connect the plug stem and actuator stem threads. Cautiously turn the actuator clockwise until the plug stem is engaged 3 to 4 turns.

⚠ CAUTION: Do not allow the plug to turn on the seat to avoid possible stem and/or seat galling.

9. For air-to-open valves, apply air under the piston, for air-to-close valves, apply air over the piston, do either in order to prevent the plug head from touching either the seat or the bonnet. Continue turning the plug stem into the actuator stem until 2 to 3 plug stem threads remain exposed.

⚠ CAUTION: To prevent galling of the polished plug system, do not allow the gland flange to make contact with the polished plug system.

⚠ CAUTION: Do not allow the plug to turn on the seat so as to prevent possible stem and/or seat galling.

10. Apply air over the piston to drive the plug and lift the yoke off of the bonnet. The yoke will lift approximately 1/16-inch (1.60mm). If the space is not that size, apply air under the piston to retract the actuator stem and screw the plug in or out as needed. Repeat until the 1/16-inch (1.60mm) space is created.
11. To attach the yoke clamps and packing box bolting, apply air under the piston. Tighten the yoke clamp bolting firmly. The packing box nuts should be just over finger-tight.

 **CAUTION:** Do not over-tighten packing.

12. To seat the plug, apply air over the piston. 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 line up with the bottom of the actuator stem ($\pm 1/16$ -inch).

Tighten the stem clamp bolting to secure the actuator stem to the plug stem. Adjust the stroke plate so that the stem clamp points to the "closed" position.

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

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 be changed as well, to do so, refer to the appropriate positioner manual.

Air-to-Close

To switch the air action from air-to-open to air-to-close continue as follows:

1. Adhere to the instructions for disassembly of the actuator (see "Actuator Disassembly" 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 be changed as well. To do this, refer to the appropriate positioner manual.

AIR-ACTION REVERSAL

Air-to-Open

To switch the air-action from air-to-close to air-to-open continue as follows:

1. Adhere to the instructions for disassembly of the actuator (see "Actuator Disassembly" section).

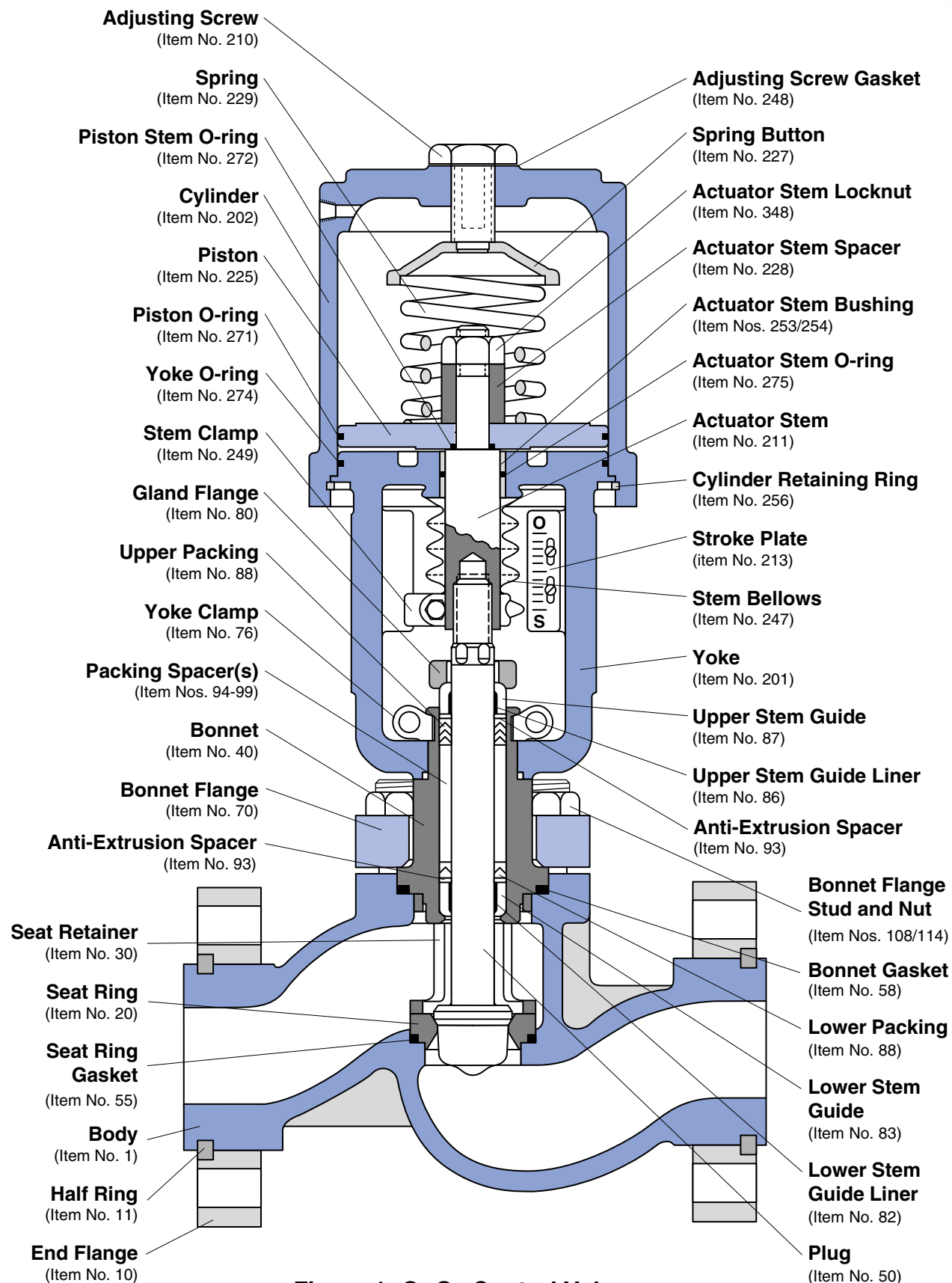


Figure 1: OpGL Control Valve

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

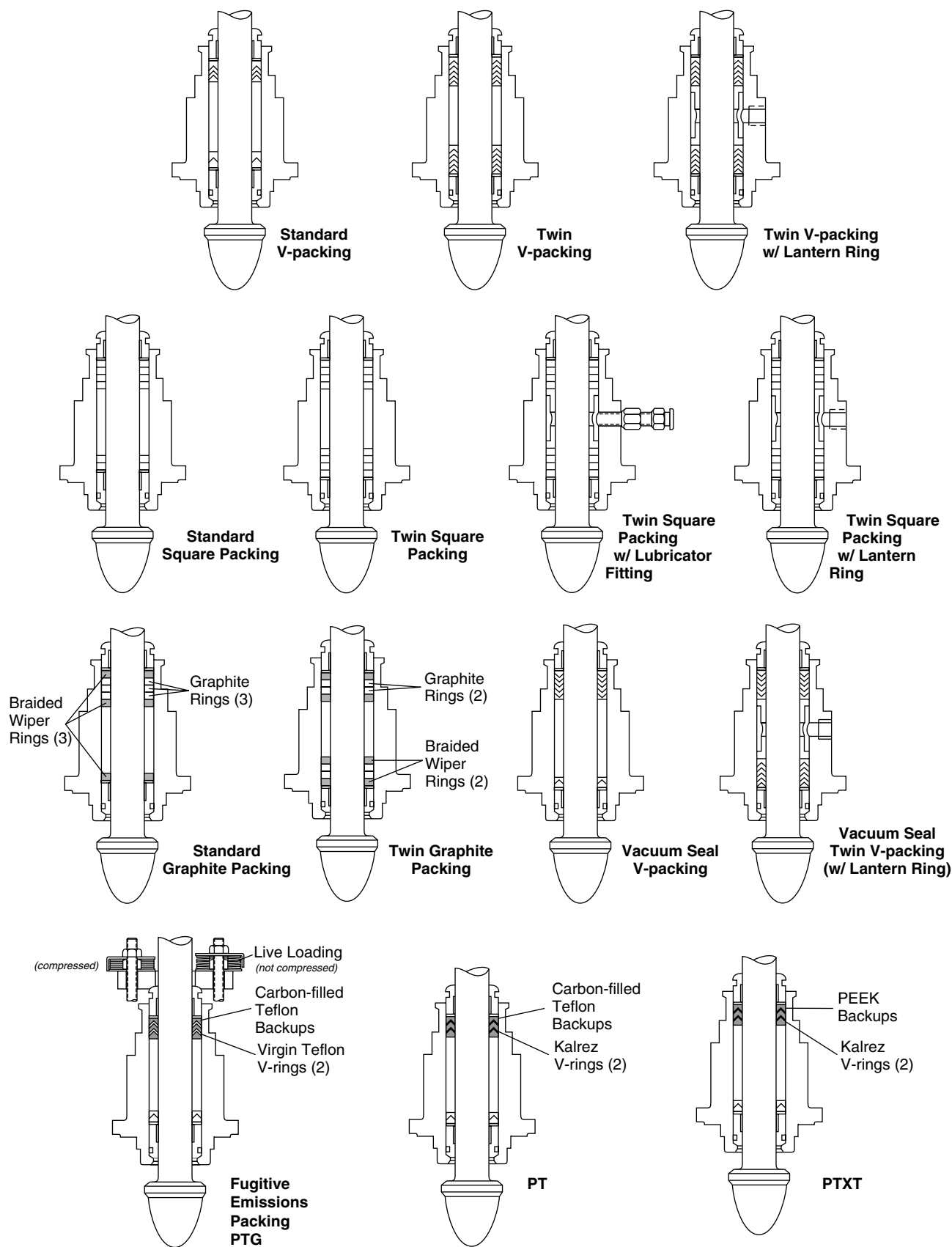
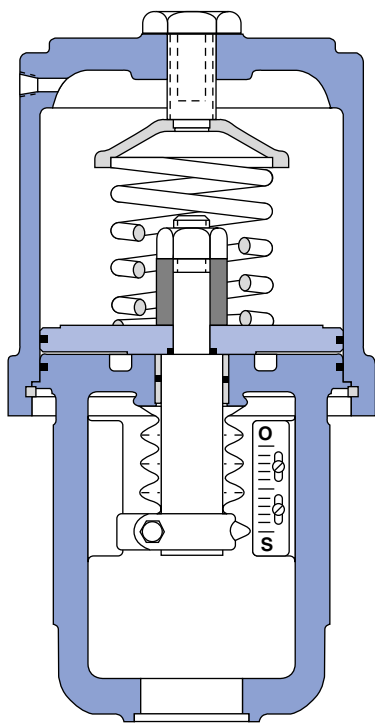
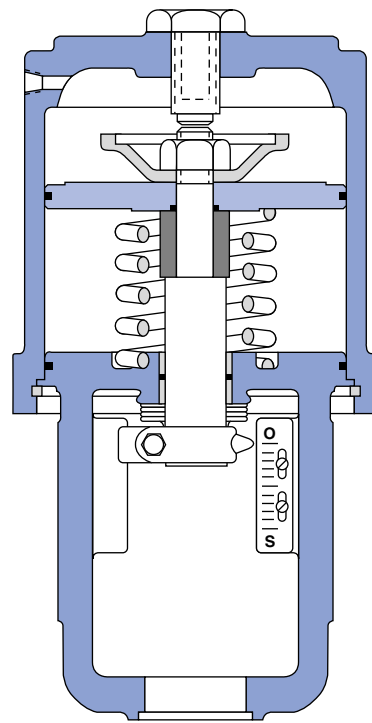


Figure 2: Typical Packing Configurations

NOTE: See step 1 in "Body Reassembly" section.



Air-to-Open



Air-to-Close

Figure 3: Air-action Configurations

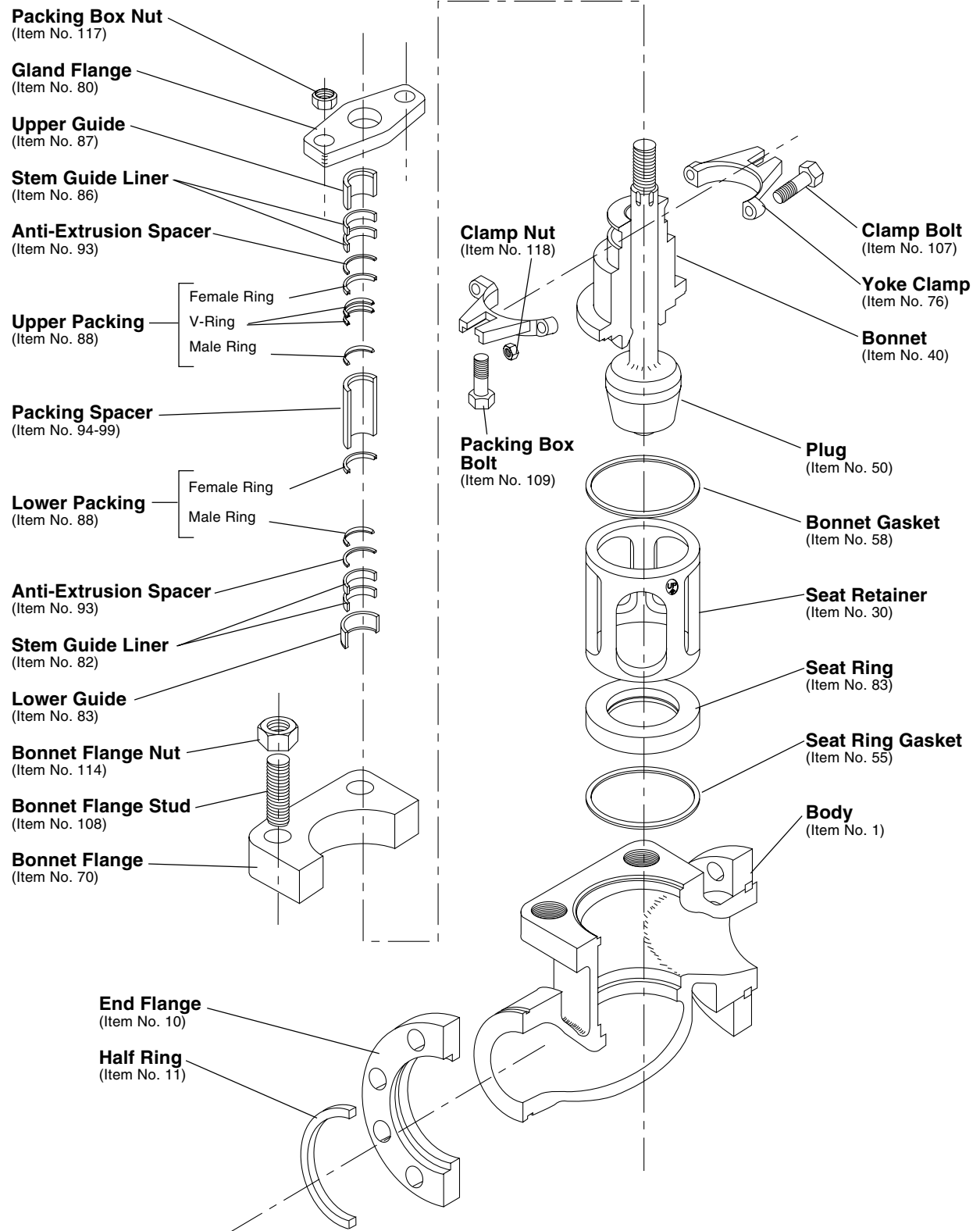


Figure 4: Exploded View – Body Assembly

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

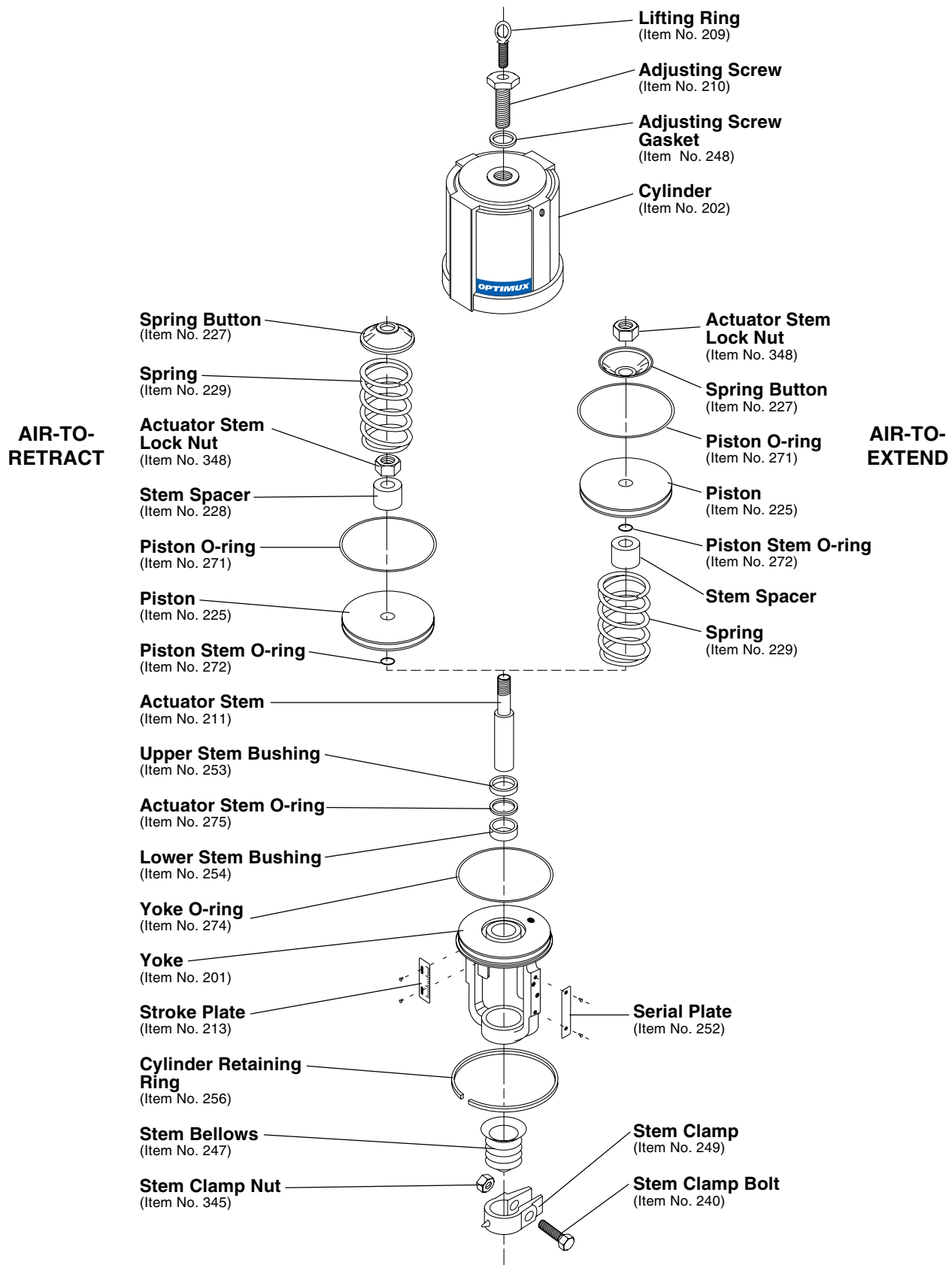
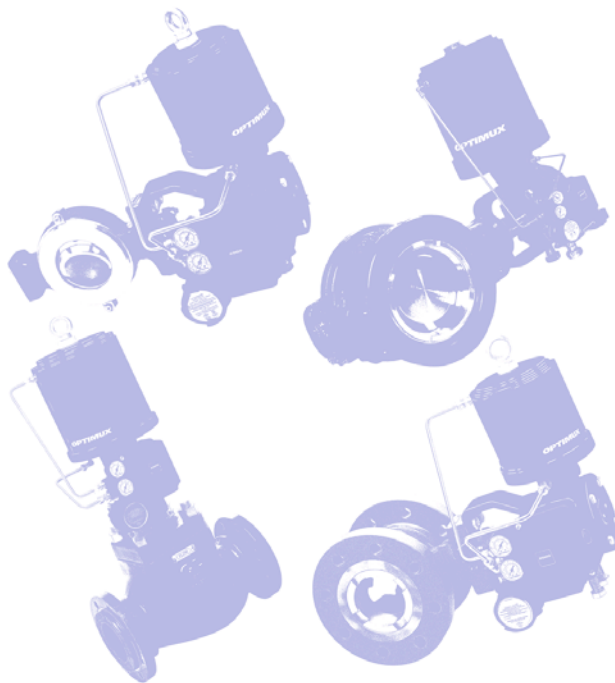


Figure 5: Exploded View – Actuator Assembly

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

Troubleshooting OpGL Globe Control Valve

Problem	Probable Cause	Corrective Action
Stem motion impeded	1. Overtightened packing 2. Service temperature is beyond operating limits of trim design 3. Inadequate air supply 4. Malfunctioning positioner	1. Adjust packing box nuts to slightly over finger-tight 2. Reconfirm service conditions and contact factory 3. Check for leaks in air supply or instrument signal system; tighten loose connections and replace leaky lines 4. Refer to positioner maintenance instructions
Excessive leakage	1. Improperly tightened bonnet flange bolting 2. Worn or damaged seat ring 3. Worn or damaged seat or bonnet gasket 4. Inadequate actuator thrust 5. Incorrectly adjusted plug 6. Improper flow direction 7. Improper handwheel adjustment acting as a limit-stop	1. Refer to step 3 of "Reassembling the Body" section for correct tightening procedure 2. Disassemble valve and replace or repair seat ring 3. Disassemble and replace gaskets 4. Check for adequate air supply to actuator; if air supply is adequate, reconfirm service conditions and contact factory 5. Refer to steps 8 - 10 of "Reassembling the Body" section for correct plug adjustment 6. Refer to original specifications or contact factory 7. Adjust handwheel until plug seats properly
Inadequate flow	1. Improper plug adjustment, limiting stroke 2. Malfunctioning positioner 3. Service conditions exceed trim design capacity	1. Refer to steps 8 - 10 of "Reassembling the Body" section for correct plug adjustment 2. Refer to positioner maintenance instructions 3. Verify service conditions and consult factory
Plug slams	1. Incorrect plug adjustment allowing improper cushion of air between actuator piston and yoke 2. Inadequate air supply 3. Trim sized too large for flow rate	1. Refer to steps 8 - 10 of "Reassembling the Body" section for correct plug adjustment 2. Check air supply to actuator; repair leaks and remove any restrictions in supply line 3. Install reduced trim
Valve does not fail in correct position	1. Incorrect flow direction	1. Reconfirm direction and, if necessary, correct flow direction through valve



Optimux customers should be aware that Optimux products might be used in numerous applications under a wide variety of industrial service conditions. Although Optimux 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 Optimux products. The purchaser/user should read and understand the Product Instruction Manual (PIM) included with the product, and train its employees and contractors in the safe use of Optimux products in connection with the specific application.

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