


# FlowTop General Service Control Valves


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## TERMS CONCERNING SAFETY

The safety terms DANGER, WARNING, CAUTION and NOTE are used in these instructions to highlight particular dangers and/or to provide additional information on aspects that may not be readily apparent.

 **DANGER:** indicates that death, severe personal injury and/or substantial property damage will occur if proper precautions are not taken.

 **WARNING:** indicates that death, severe personal injury and/or substantial property damage can occur if proper precautions are not taken.

 **CAUTION:** indicates that minor personal injury and/or property damage can occur if proper precautions are not taken.


 **NOTE:** indicates and provides additional technical information, which may not be very obvious even to qualified personnel. Compliance with other, not particularly emphasized notes, with regard to transport, assembly, operation and maintenance and with regard to technical documentation (e.g., in the operat-


ing instruction, product documentation or on the product itself) is essential, in order to avoid faults, which in themselves might directly or indirectly cause severe personal injury or property damage.


## GENERAL INFORMATION

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on FlowTop general service control valves. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, calibrating, operating, troubleshooting or performing any maintenance on the valve or actuator. Separate instructions cover additional features such as positioners, solenoid valves, limit switches, etc.

**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.**

 **CAUTION:** The FlowTop is a general service, light-duty valve and is not intended for severe service applications such as cavitation, flashing or extreme noise levels. Refer to the FlowTop Control Valves technical bulletin for application guidelines and other limitations.

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

 **NOTE:** Selecting the proper fastener material is the responsibility of the user. Typically, the supplier does not know the valve service conditions or environment. The user 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.

## Unpacking

1. While unpacking the valve, check the packing list against materials received. Lists describing the valve and accessories are included in each shipping container.
2. When lifting the valve from the shipping container, position lifting straps to avoid damage to external tubing and mounted accessories.
3. Contact your shipper immediately if shipping damage has occurred.
4. Should any problem arise, contact your Flowserve representative.

## Installation

**⚠ CAUTION: Before installation and disassembly, ensure the actuator is secured with a suitable method (crane or support) and cannot topple over.**

1. This valve can be installed in alternate service conditions. Check data on name plate and verify sizing with local Flowserve office.
2. Before installing the valve, clean the line of dirt, welding chips, scale or other foreign material.
3. Whenever possible, the valve should be installed in an upright position; vertical installation permits easier valve maintenance. (See Figure 1.)
4. 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 clearance needed for valve disassembly.

**Table I: Overhead Clearance Requirement**

Valve Size (inches)	Clearance (inches / mm)
1, 1.5, 2, 3, 4	5.6 / 142
3, 4	9.0 / 229

5. Double-check flow direction to **ensure the valve is installed with the flow under the plug**. Flow direction is shown by the arrow on the body.
6. Connect the air supply and instrument signal lines. Throttling control valves may be equipped with a valve positioner. In most cases, both the actuator and positioner are suitable for a maximum of 90 psi (6 bar) air supply. However, with tandem actuators, the air supply to the actuator assembly must be limited to 50 psi (3.5 bar). Check the nameplate to determine the correct air supply requirements.

**⚠ WARNING: Tandem actuators require a maximum of 50 psi (3.5 bar) air supply. Check nameplate to determine correct air supply requirements.**

**! NOTE: The air supply should conform to ISA 7.0.01. See specific positioner IOM for details.**

**⚠ WARNING: On valves equipped with air filters, the air filter bowl must point down – otherwise, the air filter will not perform properly.**

7. Excessive piping stresses, if transmitted to the valve body, may cause plug friction, seat leakage or other operating faults.

**! NOTE: Every effort should be made to minimize external stresses on the valve during installation.**

## PREVENTIVE 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 *Overhauling* section.

1. Look for signs of gasket leakage through the end flanges and bonnet. Tighten flange and bonnet bolting (if required). (See Table II.)
2. Ensure the air supply is within the specified range indicated on the nameplate. Insufficient or excessive air supply can affect valve operation.
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.

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

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


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

7. Ensure all accessories, brackets and bolting are fastened securely.
8. If possible, remove air supply and observe actuator for correct fail-safe action.
9. Check the actuator stem seal assembly (257) for wear or leakage. Apply an acceptable lubricant (such as Dow 55) to the actuator stem then retract and extend the stem to work the lubricant into the seal.

10. Spray a soap solution around the diaphragm joint between the upper and lower diaphragm cases (203, 202). Check the actuator case bolts (335) to be certain they are tight.
11. Clean any dirt and other foreign material from the plug stem.
12. If an air filter is supplied, check and replace the cartridge if necessary.
13. Check the tightness of the bonnet nuts (114). See Table II.
14. Check the tightness of the yoke leg nuts (349).
15. Check stem clamp bolting tightness (240, 345).

## OVERHAULING PROCEDURE


Valve overhaul requires disassembling the valve body.

 **WARNING: Depressurize the line to atmospheric pressure and drain all fluids before working on the valve.**

Make a thorough inspection of the plug, seat rings and stem to determine whether these parts should be reused, reworked or replaced.

**! NOTE:** *For an easy inspection of the valve trim, the bonnet may be removed from the valve body with the actuator still mounted and attached to the valve stem. To minimize the possibility of leakage, always replace the bonnet gasket and packing whenever the valve is disassembled.*

### Actuator removal

1. Disconnect actuator and valve stem by removing stem clamp bolts and clamp (240, 345).
-  **WARNING: On fail-closed actuators, the preadjusted spring force is effective. Therefore, apply enough air pressure to the actuator to stroke the stem to the mid-position (50 percent stroke) before disconnecting actuator and valve stem.**
2. Reduce the loading pressure in the actuator to atmosphere.
3. Disconnect the pneumatic connection to the actuator.
4. Remove the yoke nut (XXX) from the bonnet (40).
5. If the actuator does not lift freely off the bonnet (40), then apply pressure to the actuator and drive the plug into the seat. This should drive lift the yoke off the bonnet.
6. Lift the actuator off the valve.

## Mounting actuator on valve

1. Determine the stroke length of the valve, 0.79-inches (20 mm) or 1.57" (40 mm). Check the stroke plate (213) to verify if necessary.
2. Push the plug stem down into the seat by hand to fully close the valve.
3. Replace the complete actuator. Clean the threads on the bonnet, using a light oil or fluid. Replace the complete actuator onto the bonnet and install yoke nut loosely.
4. Connect an adjustable air supply to the actuator.
5. On direct-acting actuators (air-to-close / fail-open): Apply sufficient air pressure to the actuator to extend the actuator stem (211) to 100 percent of stroke (0.79- or 1.12-inches). Using a scale, measure and verify the stroke of the actuator stem. Stop stem travel once full stroke has been reached. With the stem in this positioner, adjust the two stem clamp halves and connect them using the stem clamp bolting.
6. On reverse-acting actuators (air-to-open / fail-closed): Retract the actuator stem (211) until it stops against the upper diaphragm case (203). From this position, using an adjustable air supply and a scale, measure and verify the valve stroke. Once the stem has traveled full stroke, stop the travel and hold the stem in this position. Adjust the two stem clamp halves and install the stem clamp bolting.
7. While attaching the stem clamp (249), make sure there is full engagement of the threads on the stems. Make sure to install the stroke indicator pointer (248) and fully tighten the stem clamp cap bolts and nuts (345, 240).
8. With the yoke nut loose, stroke the valve two or three times to line up the yoke. Next, position the valve at mid stroke (50 percent open).
9. Completely tighten the yoke nut securing the actuator firmly to the valve.
10. Slight adjustments can be made (with the plug off the seat) by re-adjusting the stem clamp positions.
11. Readjust the stroke plate (213) as necessary.

**Table II: Bonnet Bolting Torque Values**

Valve size (inches)	Metric Bolt	Torque	
		ft/lbs	Nm
0.75, 1, 1.5, 2	M12	45	60
3	M16	90	120
4	M20	165	220

## Replacing plug

1. On fail-closed actuators, the preadjusted spring force is effective. Therefore, apply enough air pressure to the actuator to stroke the stem to mid-stroke (50 percent stroke) before disconnecting actuator and valve stem.
2. Remove the bonnet nuts (114).
3. Lift off the bonnet (40), actuator and plug (50) as an assembly.
4. Disconnect actuator stem (211) and plug stem (50) by removing the stem clamp bolting (345 and 240) and the stem clamp (249).
5. Loosen the packing box gland nuts (117) until finger-tight.
6. Remove the plug (50) from the bonnet (40). A replacement plug may now be fitted if required. When withdrawing or replacing the valve stem use a gentle turning motion to avoid damage to the packing material.

! **NOTE:** The plug and packing should be replaced at the same time. (See *Packing Replacement*.)

**Table III: Maximum Supply Pressure**

Model	psi	bar
19 in <sup>2</sup> (127 cm <sup>2</sup> )	90	6
39 in <sup>2</sup> (252 cm <sup>2</sup> )	90	6
78 in <sup>2</sup> (502 cm <sup>2</sup> )	90	6
109 in <sup>2</sup> (700 cm <sup>2</sup> )	90	6

## Replacing seat ring

1. Remove the actuator, bonnet (40) and plug (50) from the valve body. (See *Replacing Plug Procedure* steps 1-5.)
2. Replace the seat ring using a suitable seat-ring tool (Figure 2). Seat removal tools can be purchased from Flowserve if required. (See Table III.)
3. Apply high-performance lubricant to the threads on the seat ring. When refitting the seat ring, Mo S<sub>2</sub> additives are also advantageous if compatible with the process fluid.

**Table IV: Seat Removal Tools**

Item	SIZE (inches)	Part No.
Seat Tools	1/2-1	93979
	1.5	93981
	2	93982
	3	93976
	4	93978

**Table V: Seat Ring Torque**

Valve size (inches)	Torque	
	ft-lbs	Nm
0.75, 1, 1.5, 2	150	200
3	225	305
4	300	400

## Lapping the seat (not required)

**Lapping the seat is not required for class 4 shut off.**

1. The plug and seat sealing surfaces can be improved by lapping, using a good quality carborundum paste with 280 grit size. Type *2-F-Crystolon lapping compound* has a proven suitability and can be purchased from US Products, 518 Melwood Avenue, Pittsburgh, PA, 15213 PH: 412 621 2130.
2. Apply lapping compound to seating surfaces of plug and seat ring. For smaller trims, only apply lapping compound to the seat (0.39-inches and smaller).
3. Prior to lapping the plug into the seat ring, assemble the body sub-assembly. Torque the bonnet nuts (114) to the specified values from Table II. Install the stem guide (82), packing (88) and packing follower (83) to support the plug stem when lapping the plug and seat. It is not required to install the bonnet gasket (55) for lapping procedure. Lapping tools are available if needed. The plug and seat can be lapped by replacing the packing with a lapping bushing (See Table V for wrench and bushing part numbers.)
4. Lap the plug into the seat ring (Figure 3) to obtain good seating surfaces on both. Grind the seating surfaces by applying moderate axial pressure on the plug stem. Avoid a full 360 degree rotation. Best results will be achieved by a limited rotation, back and forth, approximately 60 degrees. Do not remove too much metal; stop the lapping after seating surfaces of 0.031-inch (0.8 mm) wide has been obtained in seating of plug. Ensure plug is seated completely. Lapping the seat usually only takes a few minutes, provided the seating surface is free of damage and the seat ring is fully round. After lapping is complete, keep the plug and the seat in the same contact orientation; this ensures better shut-off.
5. After lapping is complete, it is recommended to clean the lapping compound off the trim. Prior to disassembly, 'match mark' the plug (50), bonnet (40) and body (1). After cleaning the lapping compound from the trim, rebuild the valve aligning the match marks of the body, bonnet and plug stem, ensure bonnet gasket (55) is installed.

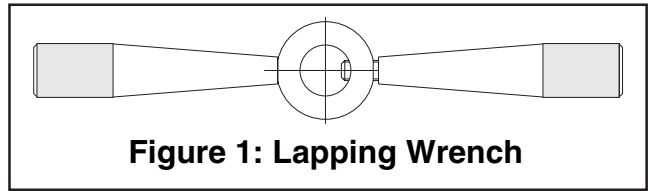


**WARNING:** Do not scratch or score the plug stem.



**Table VI: Seat Lapping Tools**

Description	Part Number
Wrench, 12mm Stem	10158171
Wrench, 16mm Stem	10158172
Bushing, 12mm Stem	10156817
Bushing, 16mm Stem	10156815

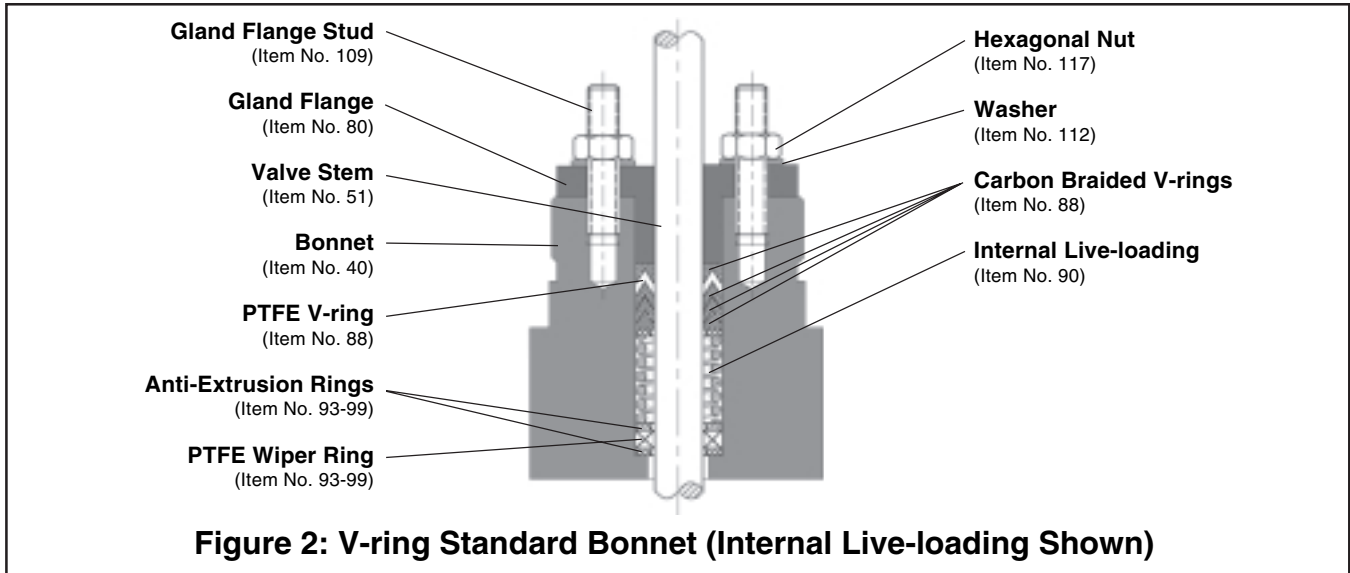


**Figure 1: Lapping Wrench**

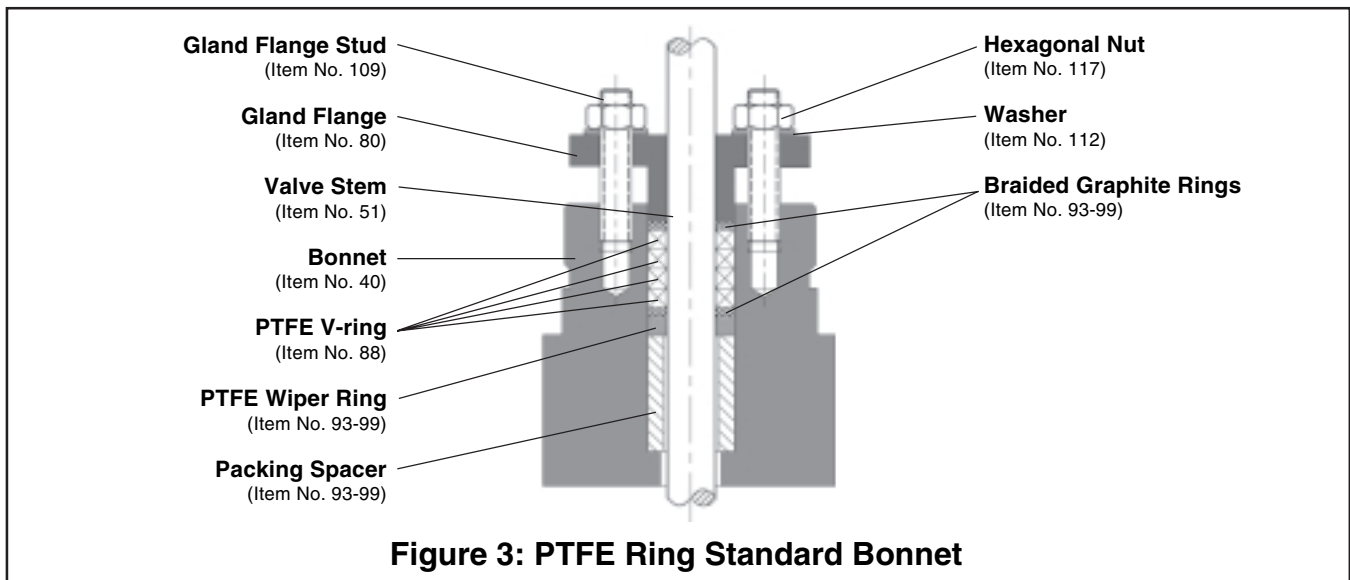
**Packing replacement**

1. Disconnect actuator and valve (see *Replacing Plug*).
2. Remove the gland packing nuts (117), gland flange (80) and packing follower (83). Remove the packing, being careful to avoid scratching the bonnet bore or the plug stem.
3. Clean and polish the bonnet bore, plug stem and all other metal parts in the packing box (stem guide, spring, follower).
4. Install new packing and associated parts in correct sequence and replace the packing flange and nuts.

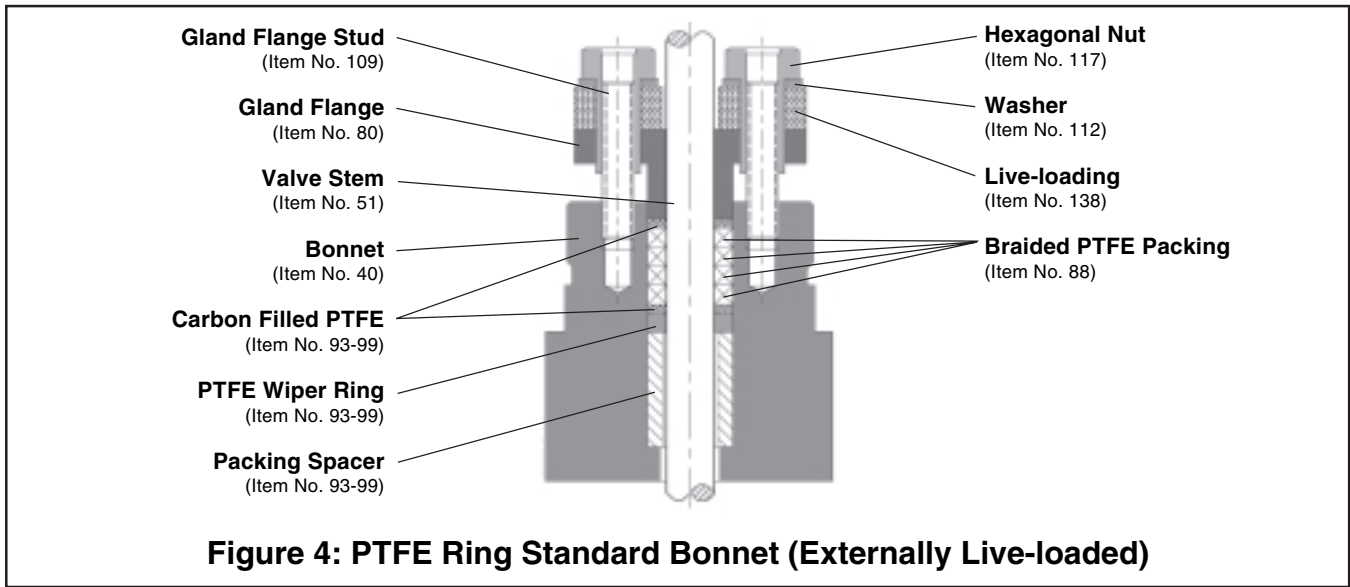
**Non-Environmental Packing**



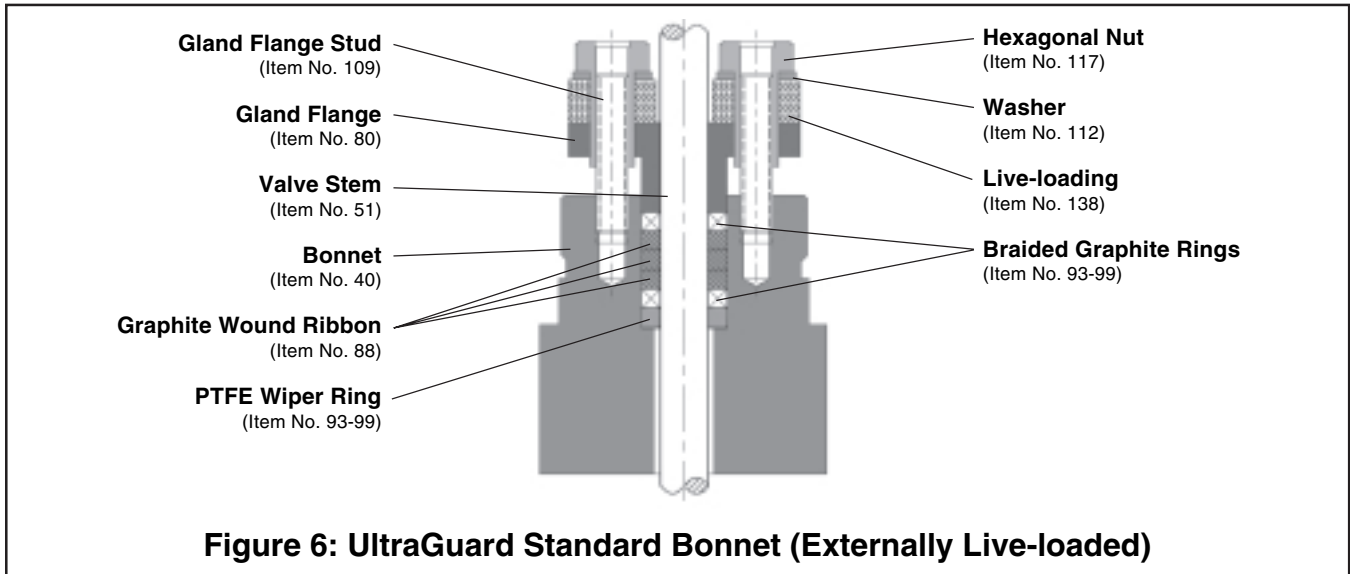
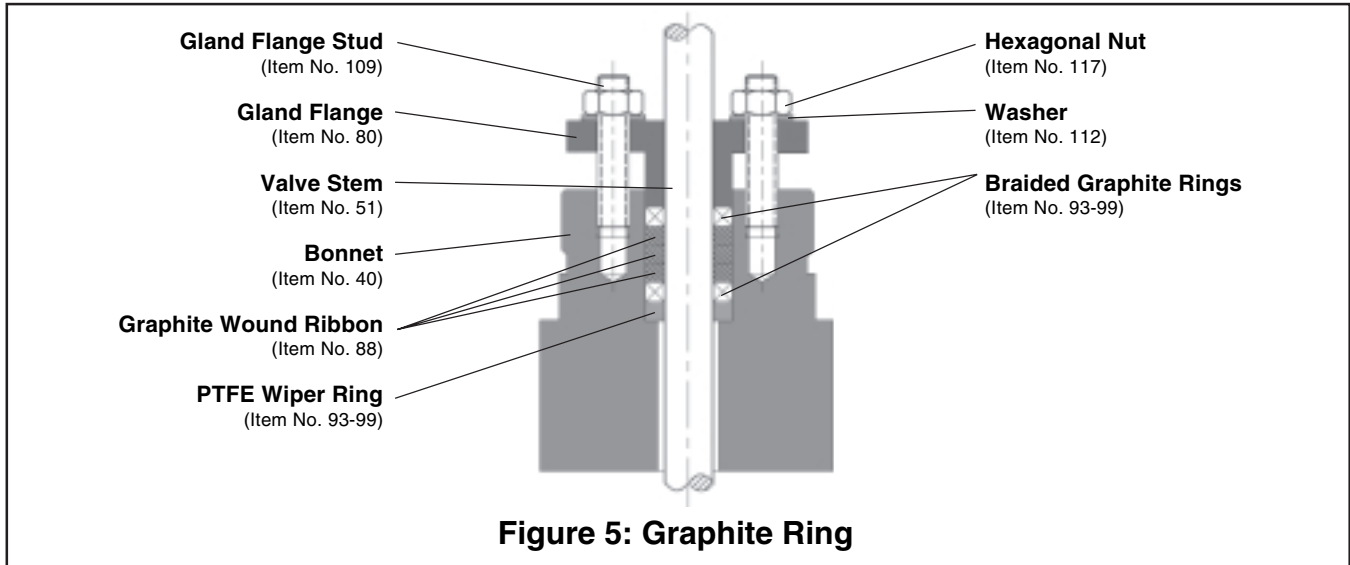
**Figure 2: V-ring Standard Bonnet (Internal Live-loading Shown)**



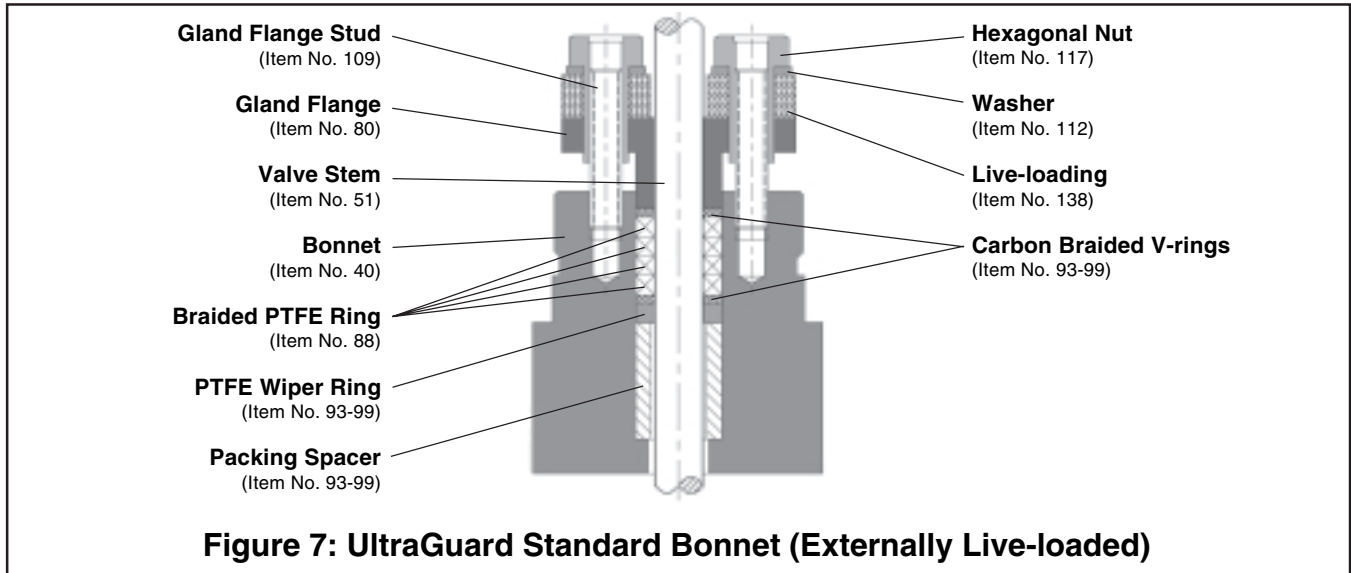
**Figure 3: PTFE Ring Standard Bonnet**



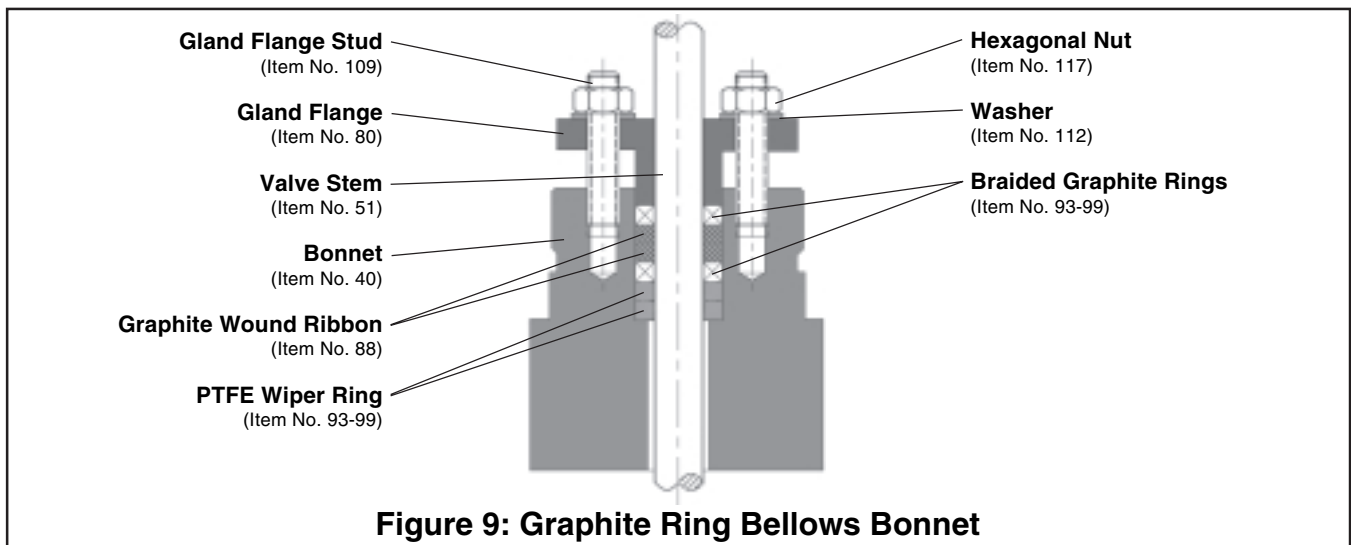
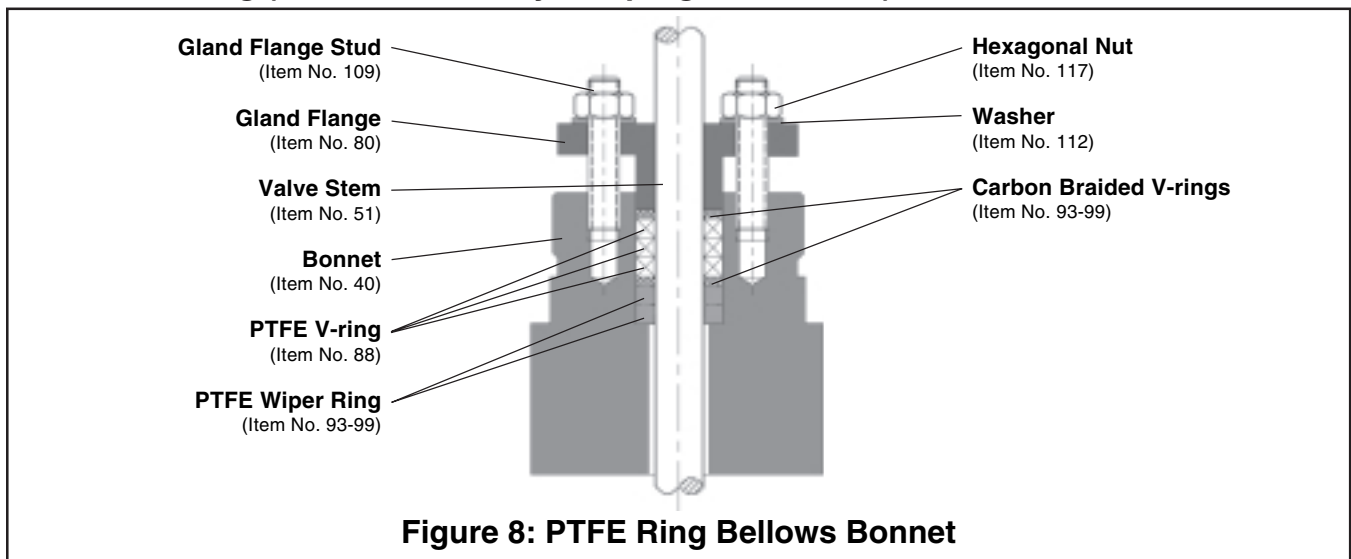
**Extended Bonnet (Packing configuration only – extension not shown)**

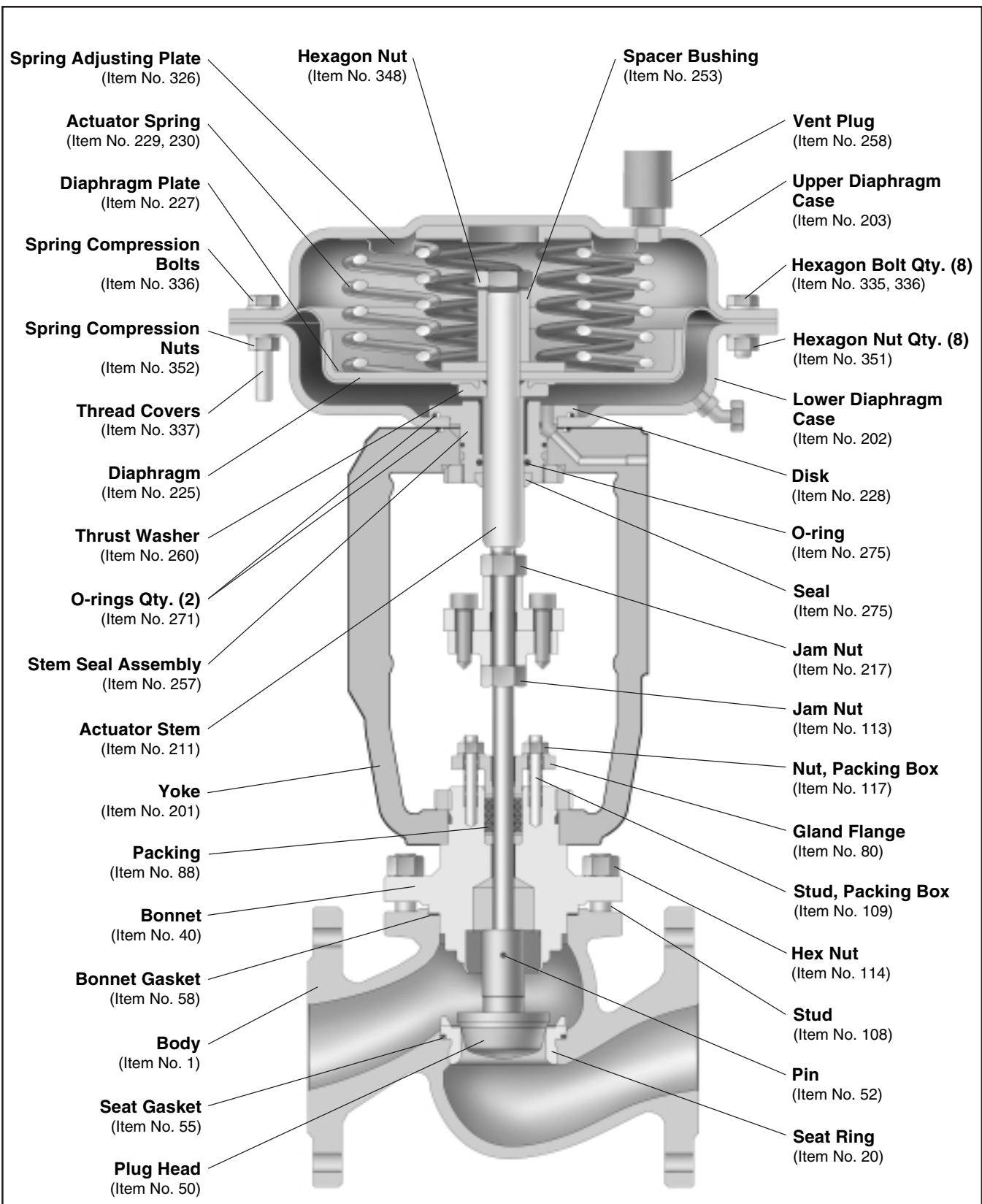


## Environmental Packing



## Bellows Packing (Bellows assembly and purge not shown)





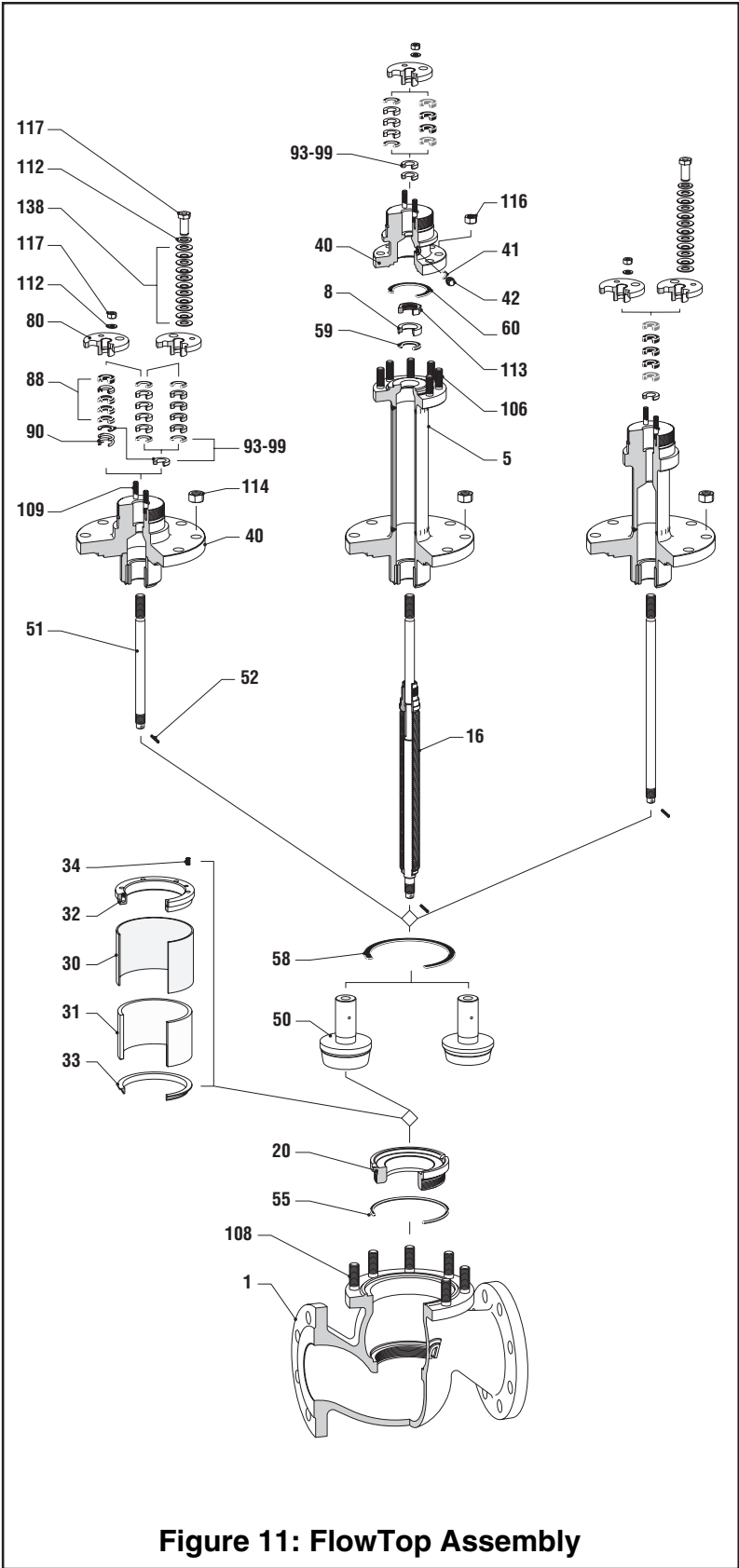
**Figure 10: FlowTop General Service Control Valve**

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



**Table VII: Parts List**

BOM	Designation	Materials	
1	Body	A216WCB	A351 CF8M
5	Bellows Housing	A105	A 182 F 316 L
6	MBS Seal Assembly	316 SS	
20	Seat Ring	316 SS	
30	Multi-hole Stage	1.4571	
31	Wire Netting	1.4404 (SS)	
32	Upper Retaining Ring	1.4571	
33	Ring, Lower	316 SS	
34	Spring, Silent Pack	1.4310	
40	Standard Bonnet	A105	A 182 F 316 L
40	Extended Bonnet		
40	MBS Bonnet	A	A 182 F 316 L
41	Gasket Purge Plug	Pure Graphite	
42	Purge Plug	A2 (SS)	
50	Plug Head	316 SS	
51	Stem		
52	Spring Pin	A2 (SS)	
55	Seat Gasket	Pure Graphite	
59	MBS Gasket	Pure Graphite	
60	MBS Gasket	Pure Graphite	
80	Gland Flange	316	
88	Packing Box Unloaded	PTFE-Pure-Graphite	
	Loaded	PTFE-Rings Pure-Graphite	
90	Pressure Spring	1,4571 (SS)	
93-99	Packing Spacer	1,4571 (SS)	
106	Stud	A193	A193 B8 M2
108	Stud	A193	A193 B8 M2
109	Stud, Packing Box	A193 B8 M2	
117	Hex Nut	316	
112	Plain Washer	A2 (SS)	
112	Plain Washer	316	
113	Jam Nut	316 SS	
114	Hex Nut	A194 3	A194 8 M
116	Hex Nut		
117	Nut, Packing Box	A194 8 M	
138	Belleville Spring	A2 (SS)	




**Figure 11: FlowTop Assembly**

## Reversing Actuator Action

1. Remove actuator from valve body (see *Actuator Removal Procedures* steps 1-6 and *Replacing Plug Procedure*, steps 1-5).
2. Remove the short diaphragm case bolts (335) and nuts (351) around the diaphragm chamber.

Remove the thread covers (337) from the long spring compression bolts (336). Lubricate the threads of the spring compression bolts (336) with a light oil or grease. Gradually loosen each of the long spring compression nuts (335), alternatively by one or two turns to progressively relieve the compression of the actuator springs inside the chamber.

 **WARNING: Long spring compression bolts (336) must always be removed last to ensure the spring compression is fully released before the diaphragm upper casing (203) is removed.**

**! NOTE: Sometimes it is easier to use a press to hold the diaphragm casing in place while the spring compression bolts (335) are removed, the springs can be relieved by using the press, in place of the bolts (335).**

3. Remove the upper diaphragm case (203).
4. Remove the actuator stem nut (248). Flats are provided on the lower end of the actuator stem (211) to prevent rotation. The diaphragm washer (360), diaphragm (225), spring plate (227), bushing (253) and springs (229) may now be removed.
5. Assemble the internal parts in accordance with Figure 9 air-to-close / fail-open (direct-acting) or Figure 10 air-to-open / fail-closed (reverse-acting). Follow above disassembly procedure 1 to 4 in reverse sequence. To simplify assembly, position the actuator in a vertical position.

**! NOTE: When reassembling the actuator, apply lubricant to O-rings seals (Like Dow 55)**


## ACTUATOR SERVICE

### Replacing actuator diaphragm

1. Remove the stem clamp and disconnect the air supply (see *Replacing Plug Procedure*, steps 1-5).
2. Disassemble the actuator in accordance with steps 1-4 in the *Reversing Single Actuator Action* procedure.
3. Use a new actuator diaphragm (225) and assemble the internal parts in accordance with Figure 9 air-to-close / fail-open (direct-acting) or Figure 10 air-to-open / fail-closed (reverse-acting) for 2109.

## Replacing the stem seal assembly

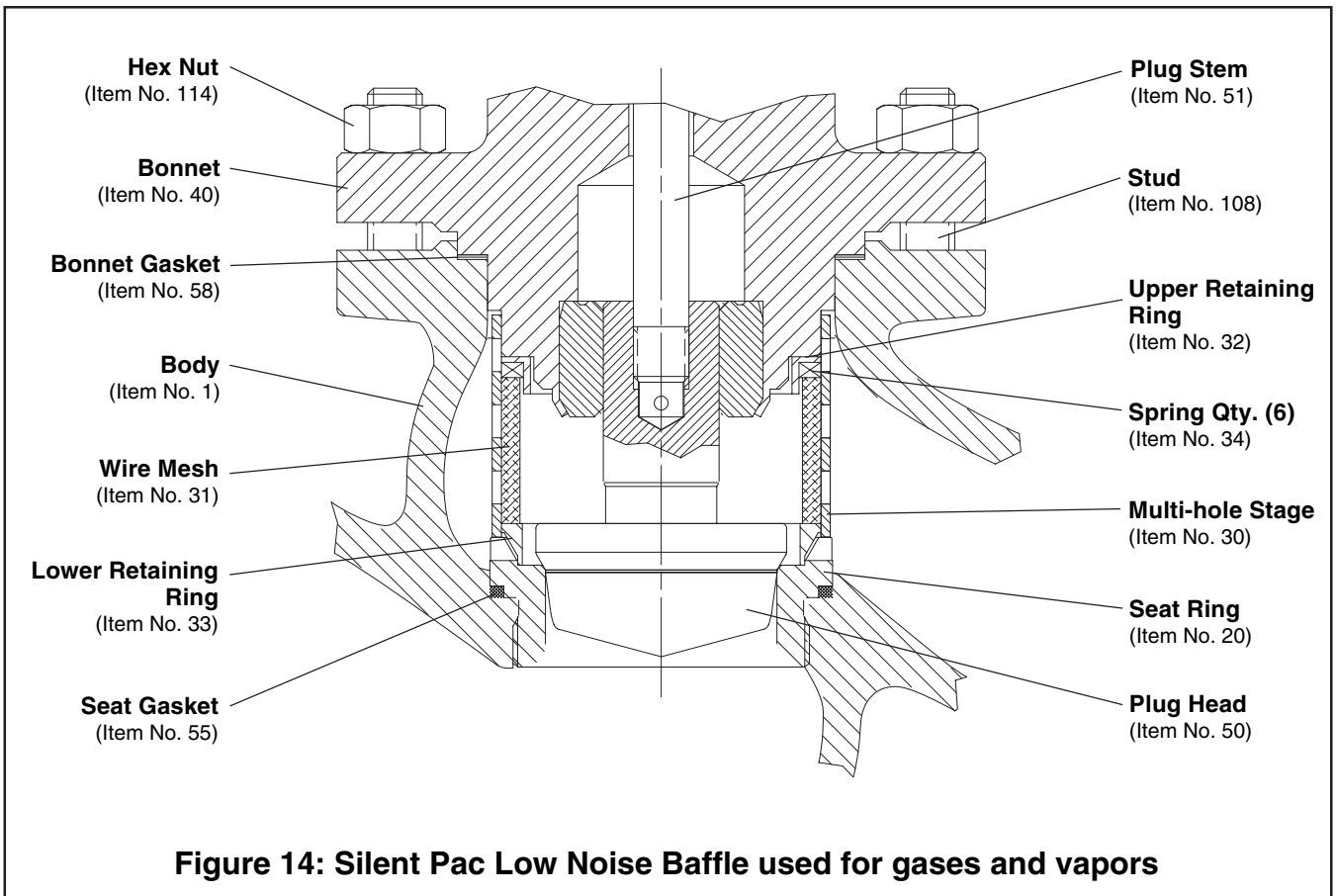
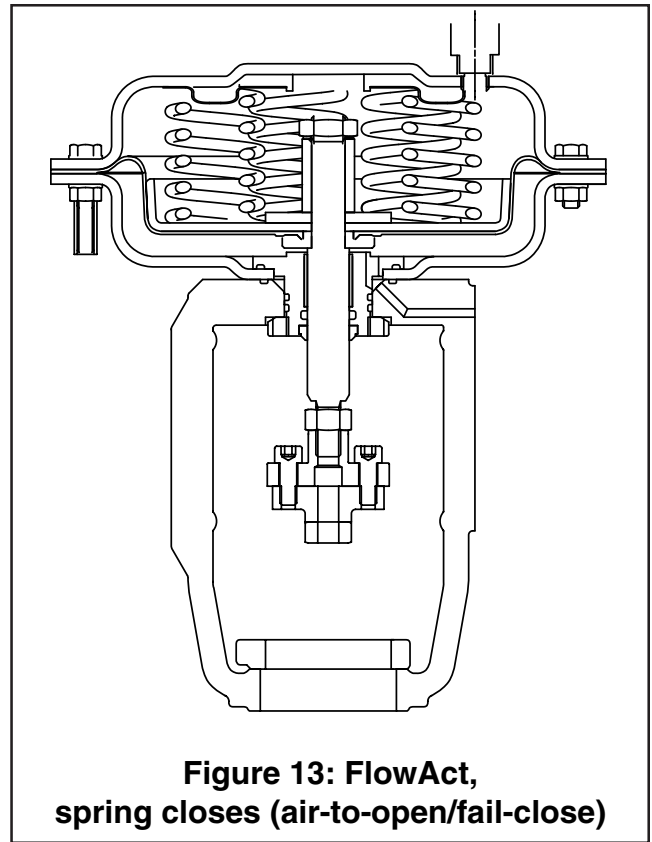
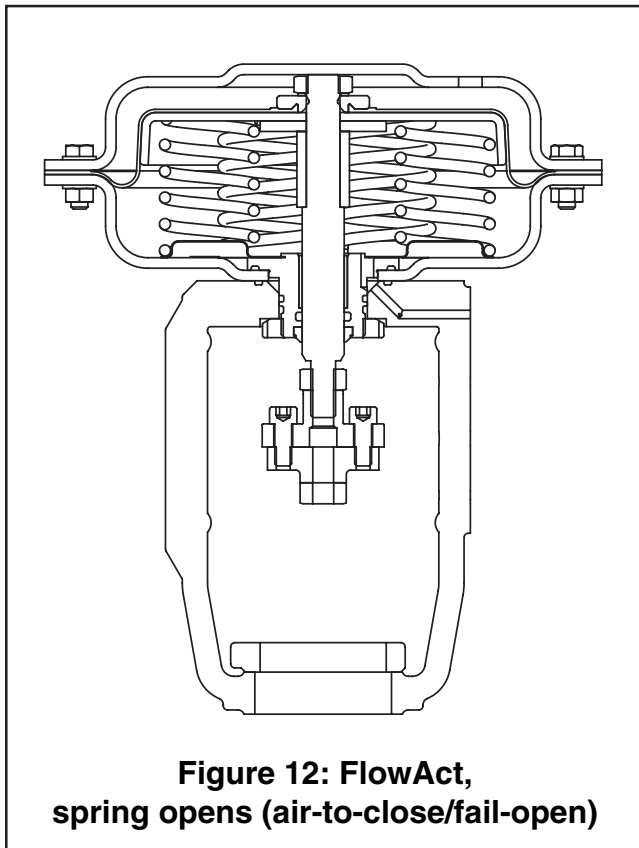
1. Remove the actuator by following steps 1-6 of *Actuator Removal*.
2. Disassemble the actuator by following steps 1-4 of *Reversing Single Actuator Action*.
3. Remove the actuator stem (211) through the lower diaphragm case (202).
4. The stem seal assembly (257) is pressed into the lower diaphragm case (202). Remove the stem seal assembly (257) by wedging the blade of a screwdriver between the lower portion of the metal seal housing and the lower diaphragm case (202). Or give the assembly a firm bump. It is a snug fit, but should be easily removed.
5. To install the seal assembly, lubricate all the seals with a good lubricant (like Dow 55). Firmly press the assembly into the lower diaphragm housing.

 **WARNING: If lubricant is not used on the seal, seal life will be reduced.**

6. Install the seal by pressing it into the bore of the diaphragm case (202). Tapping it slightly with a soft rubber mallet may ease installation.
7. Install the actuator stem (211) through the bottom of the diaphragm case (202).
8. Reassemble the internal parts according to the air action and size.

## ACTUATOR MOUNTING

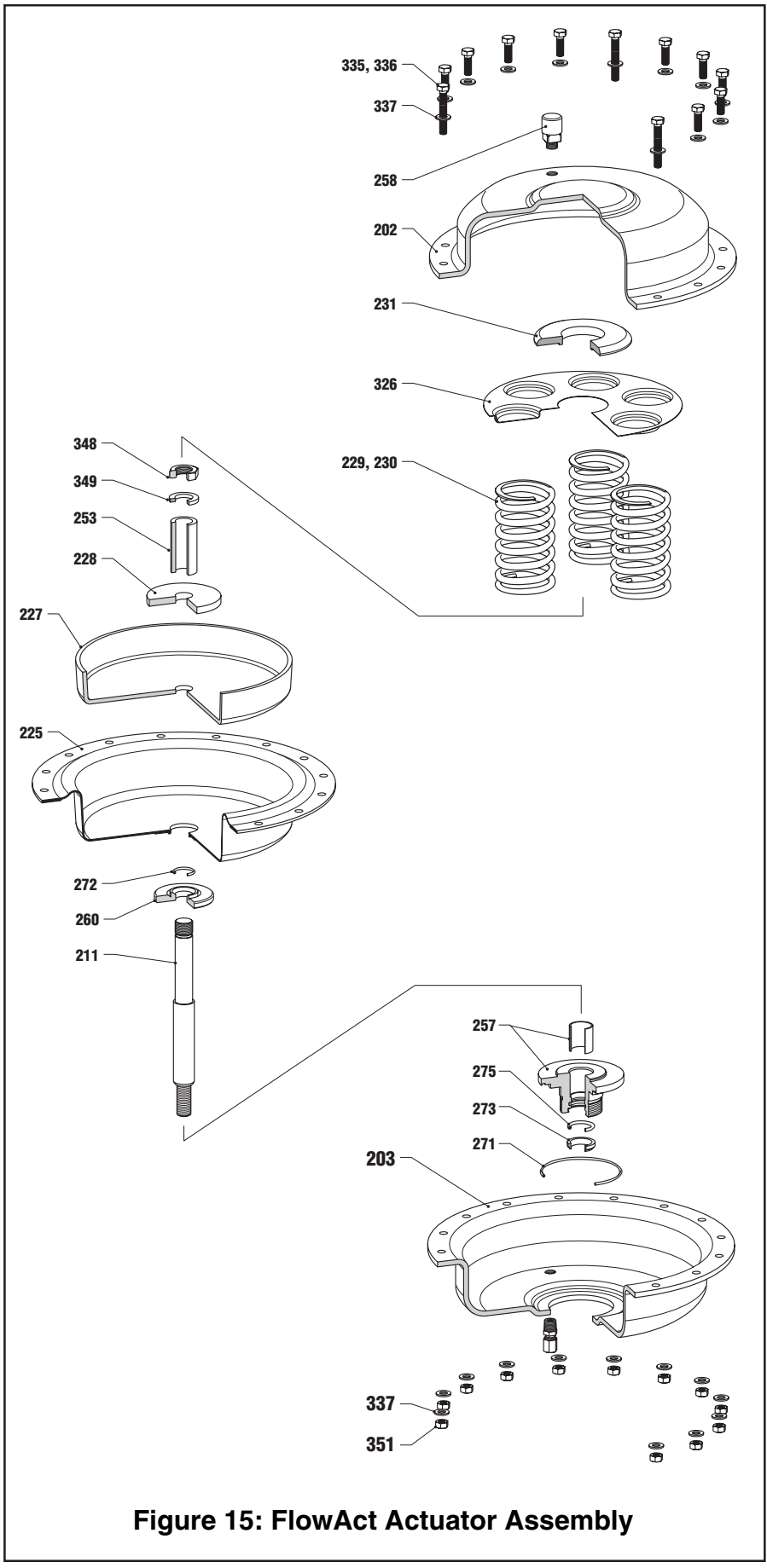
1. Push the plug into the seat.
2. Mount the actuator to the yoke by inserting the threaded seal assembly through the yoke. Install the actuator nut and tighten it. Next mount the yoke to the bonnet and position the yoke nut.
3. Connect the air supply to the actuator.
4. Set a direct-acting (air-to-close / fail-open) actuator to mid-stroke by adjusting the air supply pressure.
5. For reverse-acting (air-to-open / fail-closed) actuators, apply the minimum air supply pressure to the actuator (listed on the name plate) to position the actuator stem to its minimum setting.
6. Connect the plug stem (50) and the actuator stem (211) at the set position using the stem clamp (249) with the plug in the fully CLOSED position. While connecting the stem clamp with the stem clamp bolts, install the stroke indicator (248).
7. Tighten the post yoke nut (349).
8. If necessary, adjust stroke plate (213) while the valve is fully CLOSED.



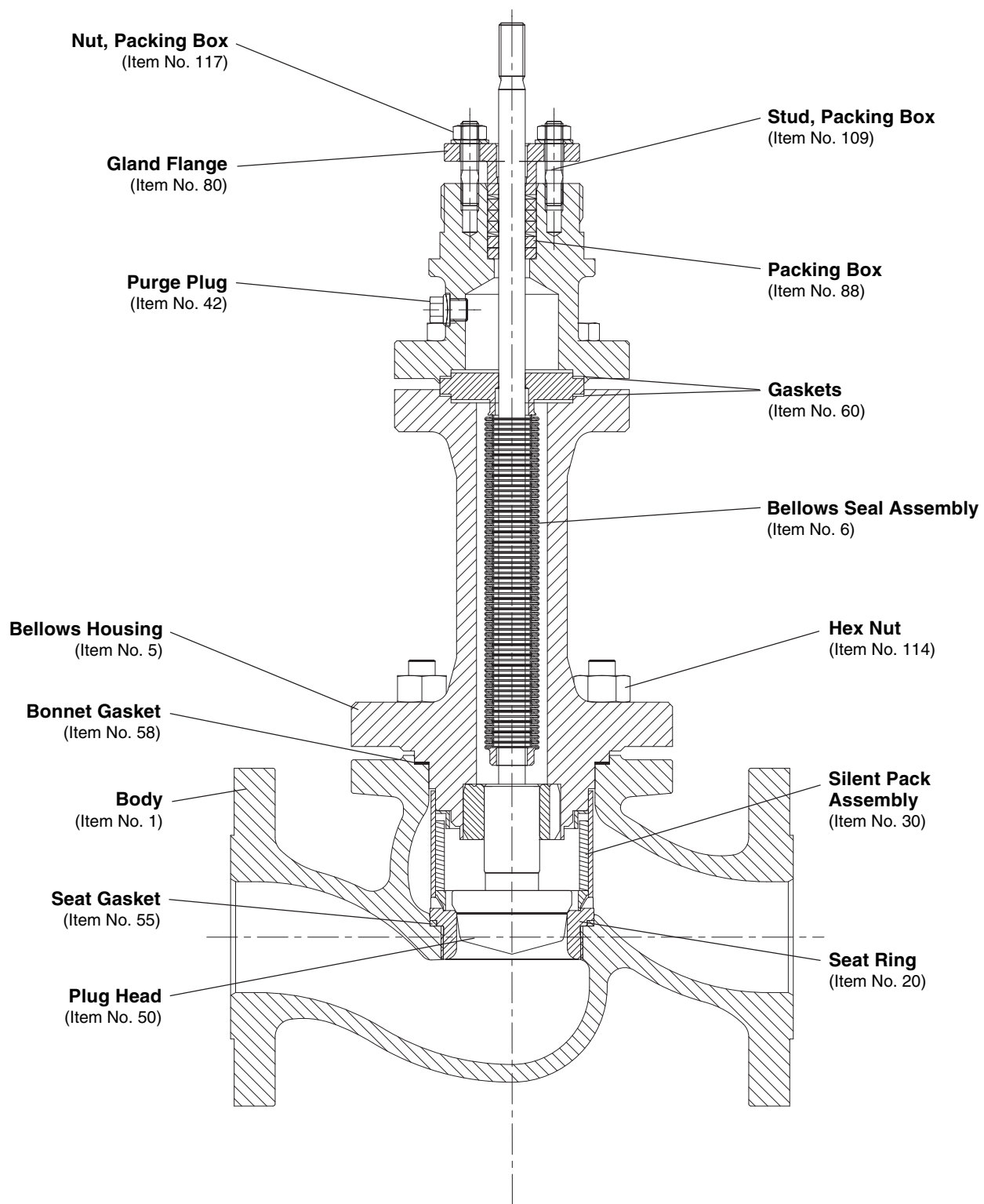
**Table VIII: Parts List**

Part	Designation	Materials
203	Diaphragm Casing	1.0322 <sup>2</sup>
202	Diaphragm Casing	1.0322 <sup>2</sup>
335, 336	Hexagon Bolt	A2-70
351	Hexagon Nut	A2-70
337	Plain Washer	A2
257	Guide Bush	1.0736 <sup>1</sup>
	Plain Bearing	-
271	O-Ring	NBR 70
275	O-Ring	NBR 70
273	Scraper Ring	NBR 90
211	Stem	1.4571
253	Spacer Bush	1.0308 <sup>1</sup>
228	Disk	1.0736 <sup>1</sup>
227	Diaphragm Plate	1.0332 <sup>1</sup>
225	Diaphragm	NBR 60
272	O-Ring	NBR 70
260	Thrust Washer	1.0736 <sup>1</sup>
349	Lock Washer	Federstahl
348	Hexagon Nut	17H <sup>1</sup>
229, 230	Actuator Spring	1.7102
231	Distance Plate3	1.0736 <sup>1</sup>
326	Spring Adjusting Plate	1.0330.03 <sup>1</sup>
258	Vent Plug	Polyamid

<sup>1</sup> chromatised acc. to DIN 50 961 Fe/Zn 12C  
<sup>2</sup> powder coating

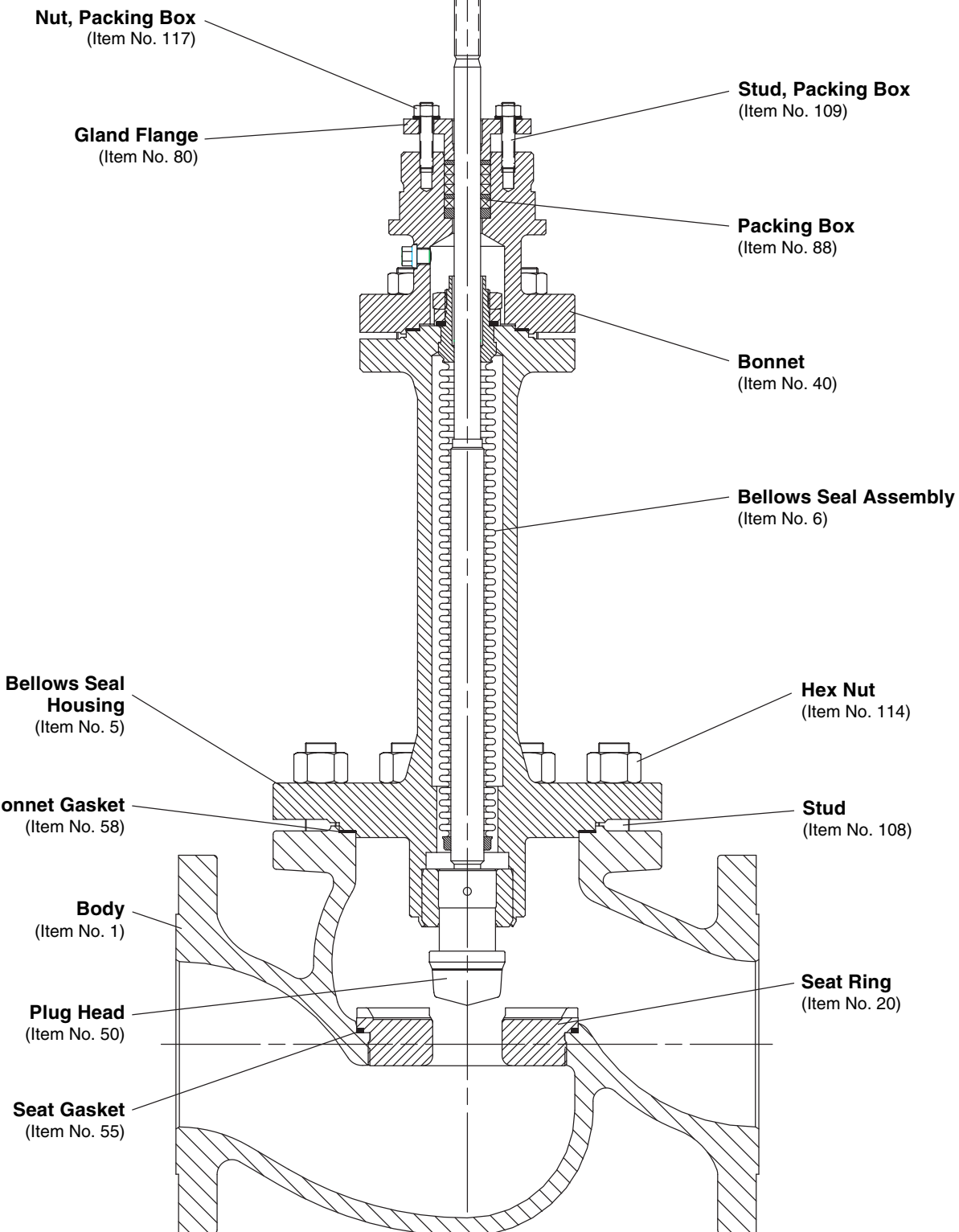


**Figure 15: FlowAct Actuator Assembly**



**Figure 16: Bellow 2 inches and smaller  
(shown with a Silent Pac Low Noise Baffle)**





**Figure 17: Bellow 3-4 inches**

## Air Supply Connection

For actuators without positioners, control air is connected directly to the air supply port of the appropriate actuator housing: for direct-acting actuators (air-to-close / fail-open) to the upper housing and for reverse-acting actuators (air-to-open / fail-close) to the lower actuator housing. The air connections for tandem actuators are illustrated in Figure 12.

For actuators with positioners, the air piping is factory installed depending on the required action direction. In the field, only the air supply needs to be connected to the positioner or to the air filter regulator.

The threads of the actuator supply ports are 0.25-inch NPT. Other air connections are available on request.

## Troubleshooting FlowTop Control Valves

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> </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, verify spring set values</li> </ol>
Excessive leakage	<ol style="list-style-type: none"> <li>1. Malfunctioning positioner</li> <li>2. Improperly tightened bonnet flange bolting</li> <li>3. Worn or damaged seat ring</li> <li>4. Inadequate actuator thrust</li> <li>5. Incorrectly adjusted plug</li> <li>6. Incorrectly adjusted zero adjustment locknut</li> <li>7. Improper handwheel adjustment acting as a limitstop</li> </ol>	<ol style="list-style-type: none"> <li>1. Refer to positioner maintenance instruction manual</li> <li>2. Refer to <i>Preventive Maintenance</i> and Table II section for correct tightening procedure</li> <li>3. Disassemble valve and replace or repair seat ring, follow procedure in <i>Replacing Plug and Seat</i></li> <li>4. Check for adequate air supply to actuator; verify spring set values; if air supply is adequate, reconfirm service conditions and contact factory</li> <li>5. Refer to <i>Stroke Length Adjustment</i> for correct plug adjustment</li> <li>6. Recalibrate positioner (see Step 1)</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> <li>4. Insufficient air supply pressure</li> </ol>	<ol style="list-style-type: none"> <li>1. Refer to <i>Stroke Length Adjustment</i> for correct plug adjustment</li> <li>2. Refer to positioner maintenance IOM</li> <li>3. Verify service conditions and consult factory</li> <li>4. Verify air supply requirements, spring set values</li> </ol>
Plug slams	<ol style="list-style-type: none"> <li>1. Incorrect flow direction</li> </ol>	<ol style="list-style-type: none"> <li>1. Install valve in flow-under direction</li> </ol>
Valve does not fail in correct position	<ol style="list-style-type: none"> <li>1. Incorrect flow direction</li> <li>2. Wrong failure direction</li> </ol>	<ol style="list-style-type: none"> <li>1. Reconfirm direction and, if necessary, correct flow direction through valve</li> <li>2. Reverse spring failure direction on actuator; refer to <i>Reversing the Actuator Action</i></li> </ol>

# Installation, Operation, Maintenance Instructions

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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