

# Valtek MaxFlo 3 Control Valves

## GENERAL INFORMATION

The following instructions are designed to assist in unpacking, installing, operating and performing maintenance as required on MaxFlo™ 3 rotary valves. Product users and maintenance personnel should thoroughly review this bulletin prior to working on the valve. Separate maintenance instructions cover additional features (such as positioners, special accessories, fail-safe systems, etc.)

This publication does not contain information on installing, maintaining, troubleshooting, calibrating, and operating Valtek® actuators or positioners. Refer to the appropriate Valtek Installation, Operation, Maintenance Instructions when this information is required.

**To avoid possible injury to personnel or damage to valve parts, WARNING and CAUTION notes must be adhered to strictly. Modifying this product, substituting nonfactory parts, or using maintenance procedures other than outlined could drastically affect performance, 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. Standard MaxFlo 3 bolting material is 193 B8 CL2 / 194 Gr 8. The standard bolting

*material for NACE valves is A453 grade 660. Therefore, the customer 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 the 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 tubing and mounted accessories. Most MaxFlo 3 valves may be lifted by the actuator lifting ring. If no lifting ring is provided, lift the valve using lifting straps or hook through the yoke legs and outer end of the body.
3. In the event of shipping damage, contact the shipper immediately.
4. Should any problem arise, contact a Flowserve representative.

## Installation

1. Before installing the valve, clean the line of dirt, scale, welding chips, and other foreign material. Clean gasket surfaces thoroughly to ensure leak-proof joints.
2. Check flow direction to be sure the valve is installed correctly. Fail-closed valves should be installed with the **shaft upstream only in gas service**. Liquid service valves should be installed with the shaft downstream regardless of air failure action. How-

ever, under certain flow conditions the valve can be installed with the flow shaft upstream. Consult with the factory if the valve must be mounted with the shaft upstream in liquid service. Fail-open valves should be installed with the shaft downstream.

**WARNING: Keep hands, hair, clothing, etc. away from the rotating plug and the seat when operating the valve. Failure to do so could result in serious injury.**

3. Connect the air supply and instrument signal. Throttling valves are usually equipped with valve positioners. Connections are marked for the air supply or for the instrument signal. Both the cylinder and positioner are suitable for 150 psi (10 bar) air supply. An air regulator is not required unless the supply pressure exceeds 150 psi (10 bar). An air filter is recommended unless the supply air is unusually clean and dry. All connections must be free of leaks.

**NOTE:** *In some rare cases, the air supply must be limited to 80 psi (5.5 bar) rather than 150 psi (10 bar). In this case, a sticker found near the upper air port on the cylinder will indicate this and an air regulator may need to be installed to ensure the supply pressure does not exceed 80 psi (5.5 bar).*

4. Apply the recommended torque values to the line flange bolting for proper sealing (see Table I).

### Quick-check

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

1. Check for full stroke by making the appropriate instrument signal change. Observe the plug position indicator plate mounted on the actuator transfer case cover plate. The plug should change position in a smooth, rotary fashion.
2. Check all air connections for leaks. Tighten or replace any leaking lines.
3. Evenly tighten the packing nuts on the valve to finger tight plus one-half to one full turn (PTFE only).

**CAUTION: Do not overtighten packing. This can cause excessive packing wear and high shaft friction, which may impede shaft rotation.**

After the valve has been in operation for a short time, check the packing nuts to make sure they are just over finger-tight (readjust if necessary). If packing box leaking occurs, tighten the packing nuts only enough to stop leakage.

4. To observe the valve failure mode in case of air failure, position the valve to mid-stroke and shut off the air supply or disconnect the instrument signal. Observe the indicator plate to see that the plug fails open or closed. If incorrect, refer to *Reversing the Actuator* in the appropriate Actuator Installation, Operation, Maintenance Instructions.

**Table I: Line Flange Bolting Specifications**

Valve Class (inch)	ANSI Rating	Stud** Quantity	Size (in./mm)		Torque* (ft. lbs. / Nm)			
					Low Strength		Intermediate Strength	
1	150	4	1/2	M14	23	30	61	82
	300	4	5/8	M16	46	62	122	165
1 1/2	150	4	1/2	M14	23	30	61	82
	300	4	3/4	M20	82	110	218	295
2	150	4	5/8	M16	46	62	122	165
	300	8	5/8	M16	46	62	122	165
3	150	4	5/8	M16	46	62	122	165
	300	8	3/4	M20	82	110	218	295
4	150	8	5/8	M16	46	62	122	165
	300	8	3/4	M20	82	110	218	295

\*Torque values are recommended for low and intermediate strength bolting per ANSI B16.5 ¶5.3.2. Higher torques may be used with high strength bolting (ANSI B16.5 ¶5.3.1). In all cases the user must verify the selected bolting's ability to seat the joint under expected operating condition.

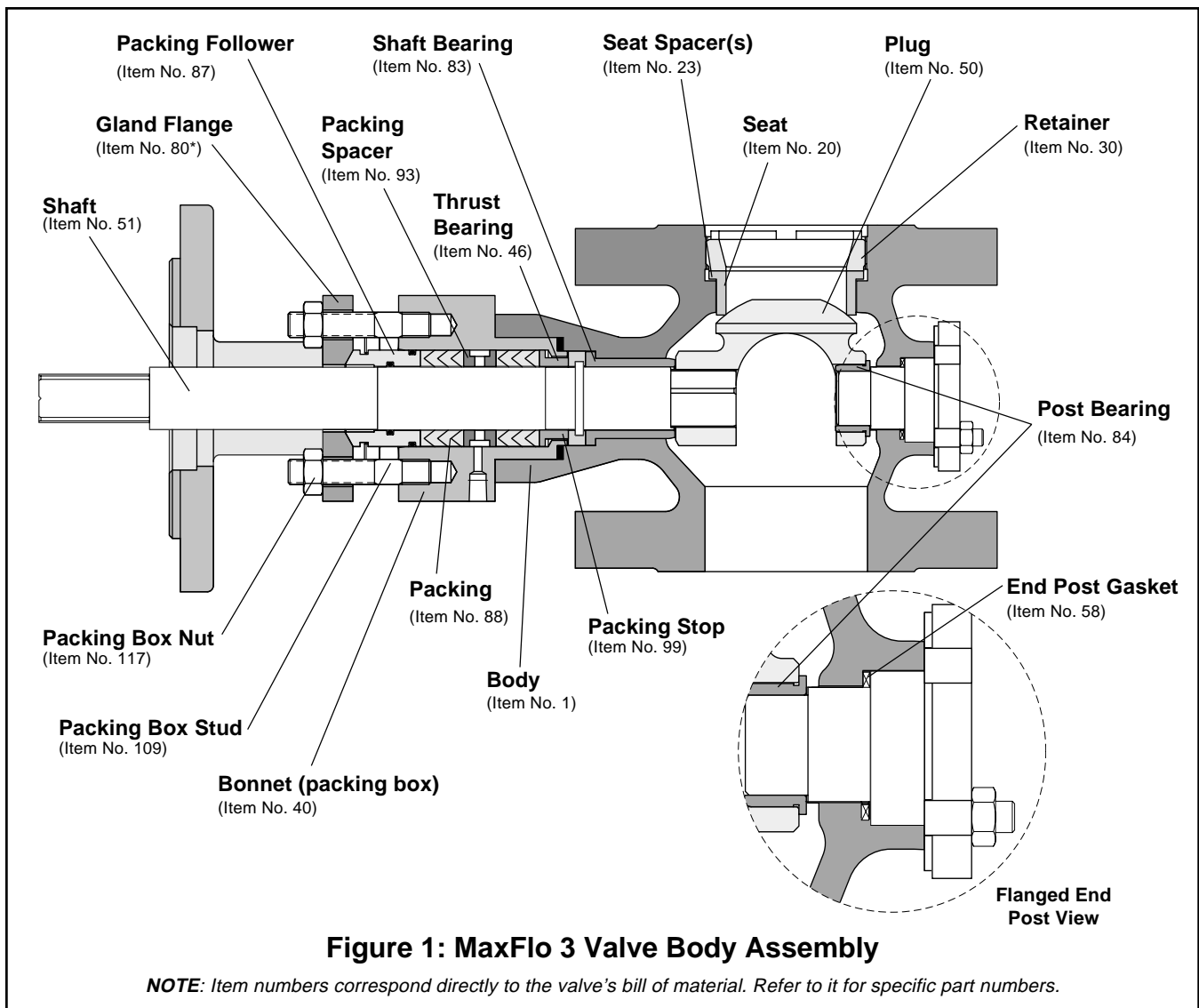
### PREVENTIVE MAINTENANCE

At least once every six months, check for proper operation by following the preventive maintenance steps outlined below. These steps can be performed while the valve is in line and, in some cases, without interrupting service. If an internal problem is suspected, refer to *Disassembly and Reassembly*.

1. Look for signs of gasket leakage through body and line flanges. Examine the end post and bonnet for leaky gaskets. Tighten flange bolting if necessary.
2. Note if any corrosive fumes or process drippings are damaging the valve.
3. Clean valve and repaint areas of severe oxidation.
4. Check packing box bolting for proper tightness. Packing nuts should be slightly over finger-tight; however, tighten to prevent stem leakage.

**CAUTION: Do not overtighten packing.**

5. If the valve is supplied with a lubricator, check the lubricant supply and add lubricant if necessary.
6. If possible, stroke the valve and check for smooth, full-stroke operation by observing the plug position indicator plate mounted on the transfer case. Unsteady movement of the plug could indicate an internal valve problem (jerky motion is normal when graphite packing is used).
7. Check positioner calibration by observing the gauges and plug position indicator plate. Ensure the positioner is calibrated to the correct range. Refer to positioner instructions for additional preventive maintenance.
8. If possible, depressurize the actuator, remove the actuator transfer case cover plate and make sure the positioner linkage is securely fastened.



**CAUTION: Never apply air to the actuator without the cover plate installed; otherwise, the unsupported shaft may sustain damage.**

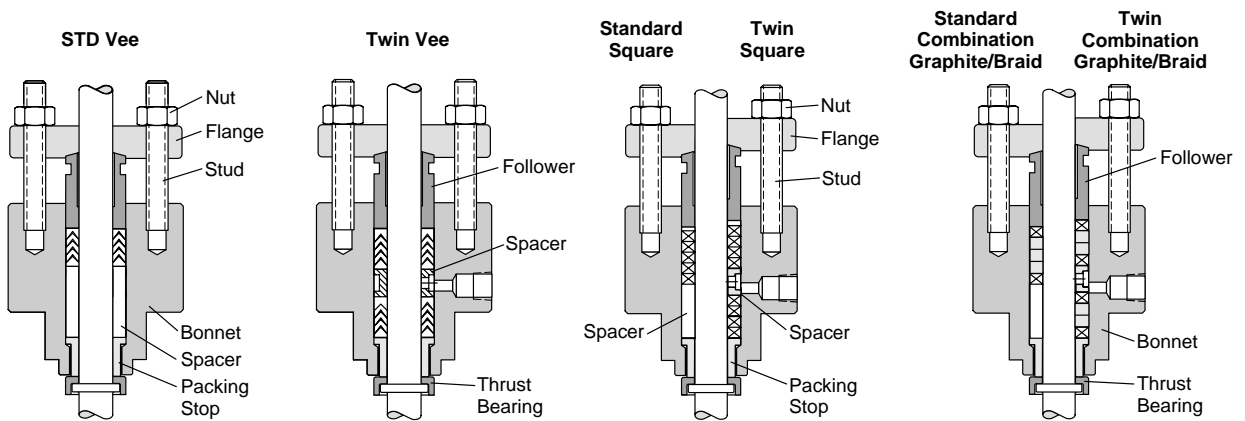
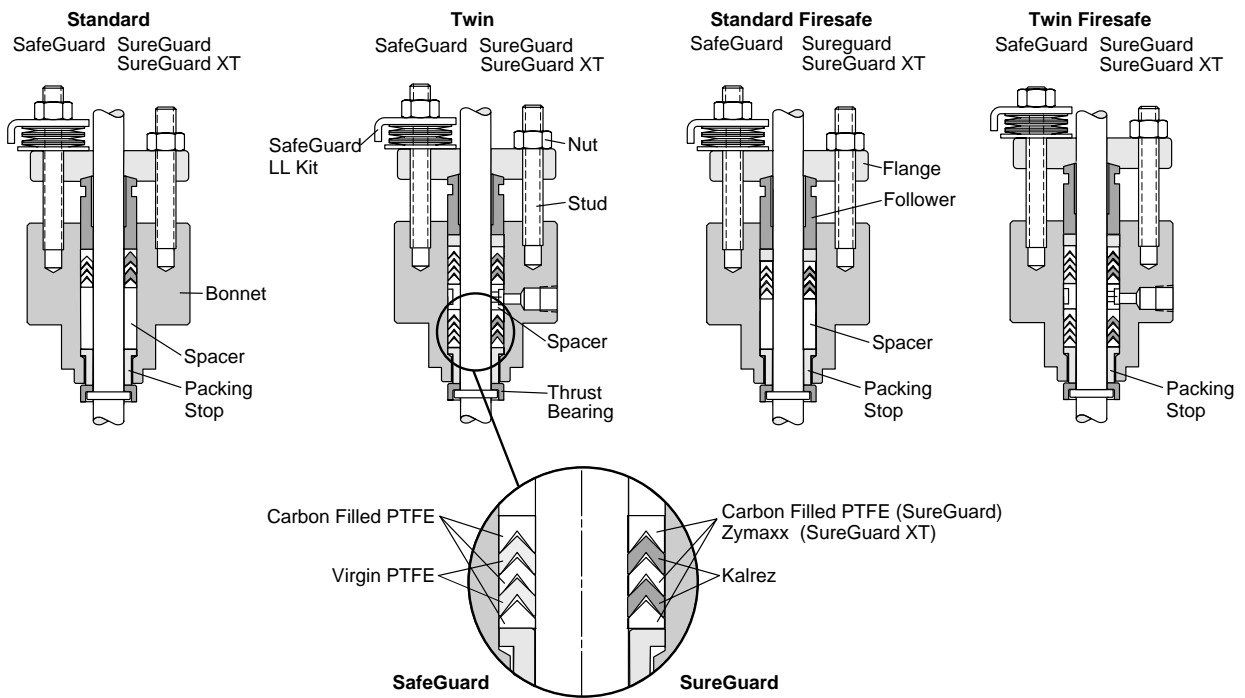
9. Be certain all accessories, brackets and bolting are fastened securely.
10. If possible, remove the air supply and observe the position indicator plate for correct fail-safe action.
11. Spray soap solution around the cylinder retaining ring and the adjusting screw to check for air leaks through the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

**Valve Disassembly:**

To disassemble the MaxFlo 3 Valve (not including the seat) refer to Figures 1, 2, 3 and 5 then proceed as follows. See *Seat Replacement* for that operation.

1. Remove the actuator and cover plate. (Loosen the spline lever connection on applicable actuators.)
2. Remove the actuator from the body by separating the actuator from yoke. This is done by removing the four yoke bolts and pulling the actuator off the valve shaft.
3. Remove the nuts from the bonnet studs.
4. Gently pull the shaft out of the body. The bonnet, bonnet gasket, packing, thrust and shaft bearings, will all slide out of the body bore as an assembly. It will be snug as the shaft is removed.
5. Remove the end post nuts and gently pull the end post out of the body bore.
 

*NOTE: At this point in the operation, the plug is inside the valve body and is only supported by the end post. When removing the end post, support the plug so it does not drop into the bottom of the valve body.*
6. Remove the plug from the body. See Figure 3.



**Figure 2: Typical Packing Configuration**

7. Slide the bonnet and thrust bearing off the valve shaft and slide the shaft bearing off the other end of the shaft.
8. Remove the packing nuts, gland flange, packing follower, packing, spacers and packing stop.
9. Clean all bearing and sealing surfaces thoroughly.

**Body Reassembly:**

To reassemble the MaxFlo 3 valve body (not including the seat) refer to Figures 1, 2, 3 and 5 then proceed as follows. See *Seat Replacement* for that operation.

1. Place the body into a vice and hold securely in a vertical position.
2. Always use new packing and gaskets when reassembling a valve.
3. Ensure the shaft, bonnet bore and gasket surfaces in the body have been thoroughly cleaned. (These are sealing surfaces and it is important to remove any contamination before reassembly.)
4. Make sure all bearing surfaces have been cleaned.
5. Place the plug into the body as illustrated in Figure 3. **NOTE:** *The end post bearing is pressed into the plug; lubricating the end post bearing and post will simplify assembly.*
6. Place the end post gasket on the end post. Insert the end post into the small flanged port in the side of the body. As you insert the end post into the body, locate the plug so the end post journal will insert into the bearing located in the plug.
7. Tighten the end post studs and nuts to finger tight.

8. Place the shaft bearing on the shaft until it stops at the shaft's thrust runner. See Figure 5.
9. Place the thrust bearing onto the shaft, slide it up to the thrust runner. The shaft thrust bearings will enclose the thrust runner.
10. Place the shaft into the large flanged port in the side of the body. After the shaft passes through the body, locate the shaft into the plug.
11. Place the packing stop into the bonnet, then install the spacers and packing as illustrated in Figure 2.
12. Install the packing follower and gland flange then tighten the packing nuts to finger tight.
13. Place the bonnet gasket on the end of the bonnet. With the body bolting installed into the body, slide the bonnet onto the shaft. Next, push the bonnet gently into the bonnet bore. It will be snug as the gasket squeezes into the body bore.
14. Install the body bolting nuts and tighten to finger tight.
15. Torque the body and end post bolting to the values listed in Table II.
16. Install the seat as described in *Seat Replacement*.
17. Install the actuator and yoke as described in *Actuator Remounting*.
18. Install the valve into the process line as described in the installation section.

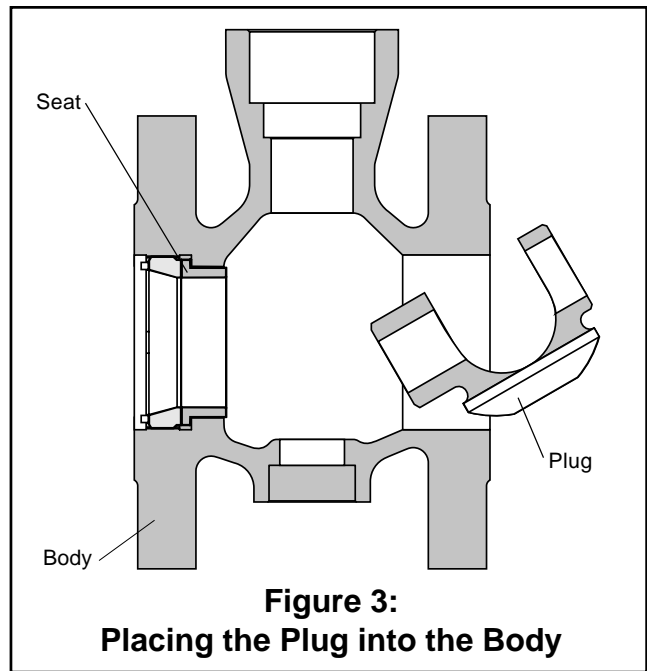
### Seat Replacement (Class IV Shutoff)

To replace the MaxFlo 3 valve seat, refer to Figures 1, 4 and 5 then proceed as follows.

1. Using the appropriate MaxFlo 3 retainer tool (see Table IV), remove the seat retainer. (Retainer tools are available from the factory.)
2. Remove the seat and any seat spacers that may be installed under the seat.

**Table II: Stud Torque Values**

Stud Size	193-B8	193-B8 Class 2	A453-Gr660 NACE
M6 x 28 End Post Studs: 1, 1.5, 2 inches	4 ft-lbs 5.5 Nm	3 ft-lbs 4 Nm	3.5 ft-lbs 4.5 Nm
M8 x 65 Bonnet Studs: 1, 1.5, 2 inches	10 ft-lbs 13.5 Nm	7.5 ft-lbs 10 Nm	10 ft-lbs 13.5 Nm
M8 x 34 End Post Studs: 3, 4 inches	10 ft-lbs 13.5 Nm	7.5 ft-lbs 10 Nm	10 ft-lbs 13.5 Nm
M12 x 81 Bonnet Studs: 3, 4 inches	35 ft-lbs 47 Nm	27 ft-lbs 36.5 Nm	30 ft-lbs 41 Nm



**Figure 3:  
Placing the Plug into the Body**

**NOTE:** Normally two seat spacers are required to adjust the seat position, but occasionally, up to four spacers may be needed. Different thickness spacers are available from the factory.

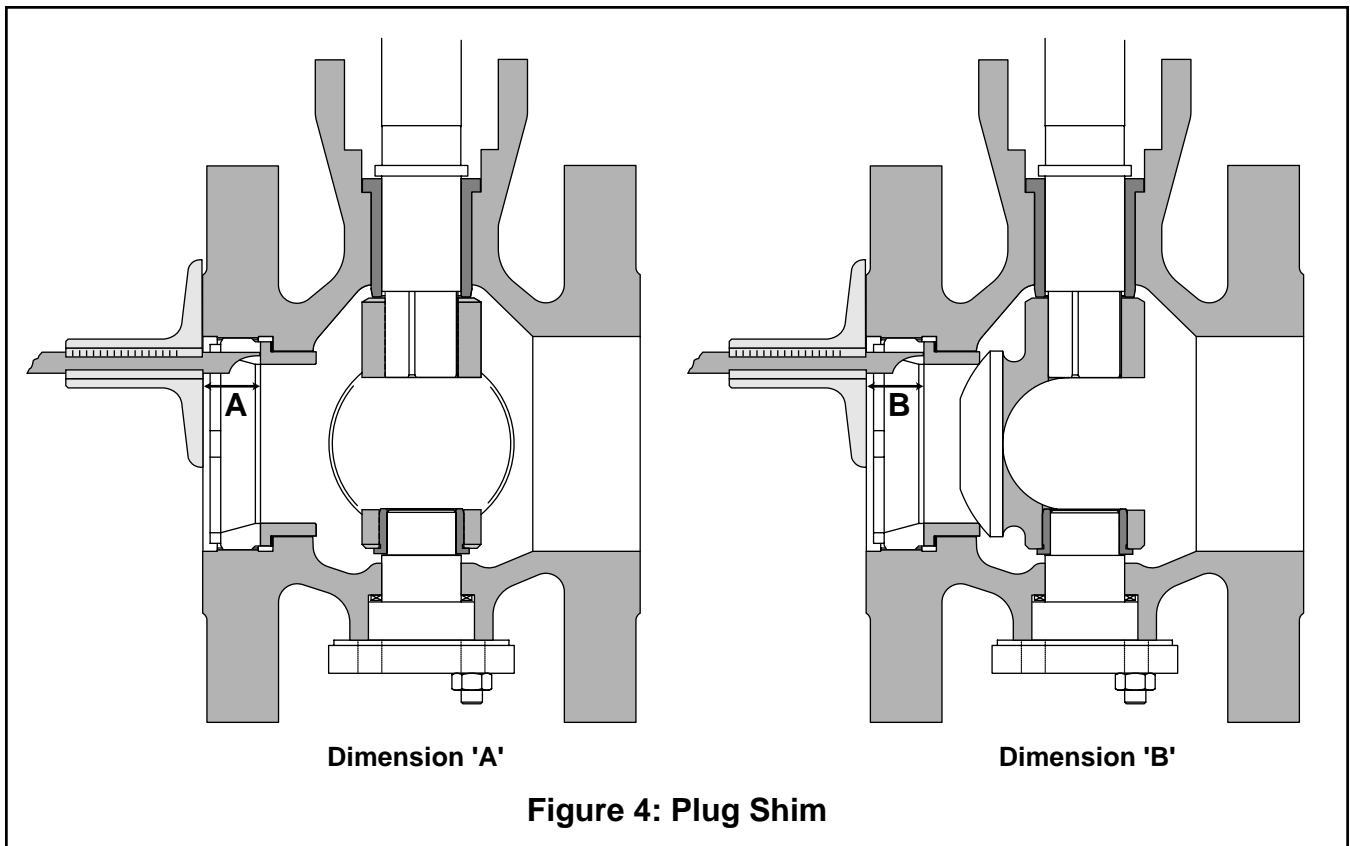
3. Check both seat and plug surfaces for wear and galling. Replace these parts as needed.
4. Clean retainer and body threads of old silicone sealant.

**Table IV: Retainer Tools / Torque Values**

Valve Size (inch)	Retainer Tool (Part No.)	Retainer Torque Value		
		Foot-Pounds	Newton-Meters	Meter-Kilograms
1	820588	40	54	5.5
1 1/2	820591	101	137	14
2	820594	152	206	21
3	820697	398	540	55
4	820664	420	570	58

5. To reinstall the seat, place the seat (without spacers) into the valve body. Refer to Figure 4 and measure distance 'A,' which has no spacers between the seat and body, and the plug is rotated open 90 degrees. Next, measure dimension 'B,' which is the same dimension except the plug has been rotated closed. The difference between dimension 'A' and 'B' is the thickness of the seat spacers to be added between the seat and the valve body. Refer to Table V and select the proper spacer(s) needed.

When two seat spacers are required, place the thinner one next to the body. As a minimum, one 0.1 mm (.004 inch) spacer is required on valve sizes 1-through 4-inches.



**Table V: Seat Spacer Selection** (mm / in.)

Valve Size	Rounding Rule	Example	Spacer Selection
1	Down to $\frac{5}{100}$ mm	A – B = 0.27 / .011 Round to 0.25 / .010	0.1 / .004+ 0.15 / .006
1½ – 4	Down to $\frac{1}{10}$ mm	A – B = 0.27 / .011 Round to 0.2 / .008	0.2 / .008

6. Again remove the seat and add the appropriate thickness of seat spacer(s). Place a small bead of silicone sealant around the seat ring's outside diameter. (Flowserve recommends using a sealant with a temperature range of -100° to 400° F (-70° to 200° C), such as Dow Corning RTV 736 sealant.
7. Applying thread lubricating material, replace the seat retainer and tighten it, then loosen it a quarter turn. Open and close the valve several times; close the valve and tighten the seat retainer snug. Finally, open the valve again and tighten the seat retainer according to the values listed in Table IV. (This procedure will properly center the seat in the valve body and prepare it to be correctly clamped in place by the seat retainer.)

### Actuator Remounting

Before mounting a MaxFlo 3 valve to a Valtek actuator, verify that the plug rotation matches the actuator rotation and complies with the air failure requirements. Procedures for mounting the actuator are as follows.

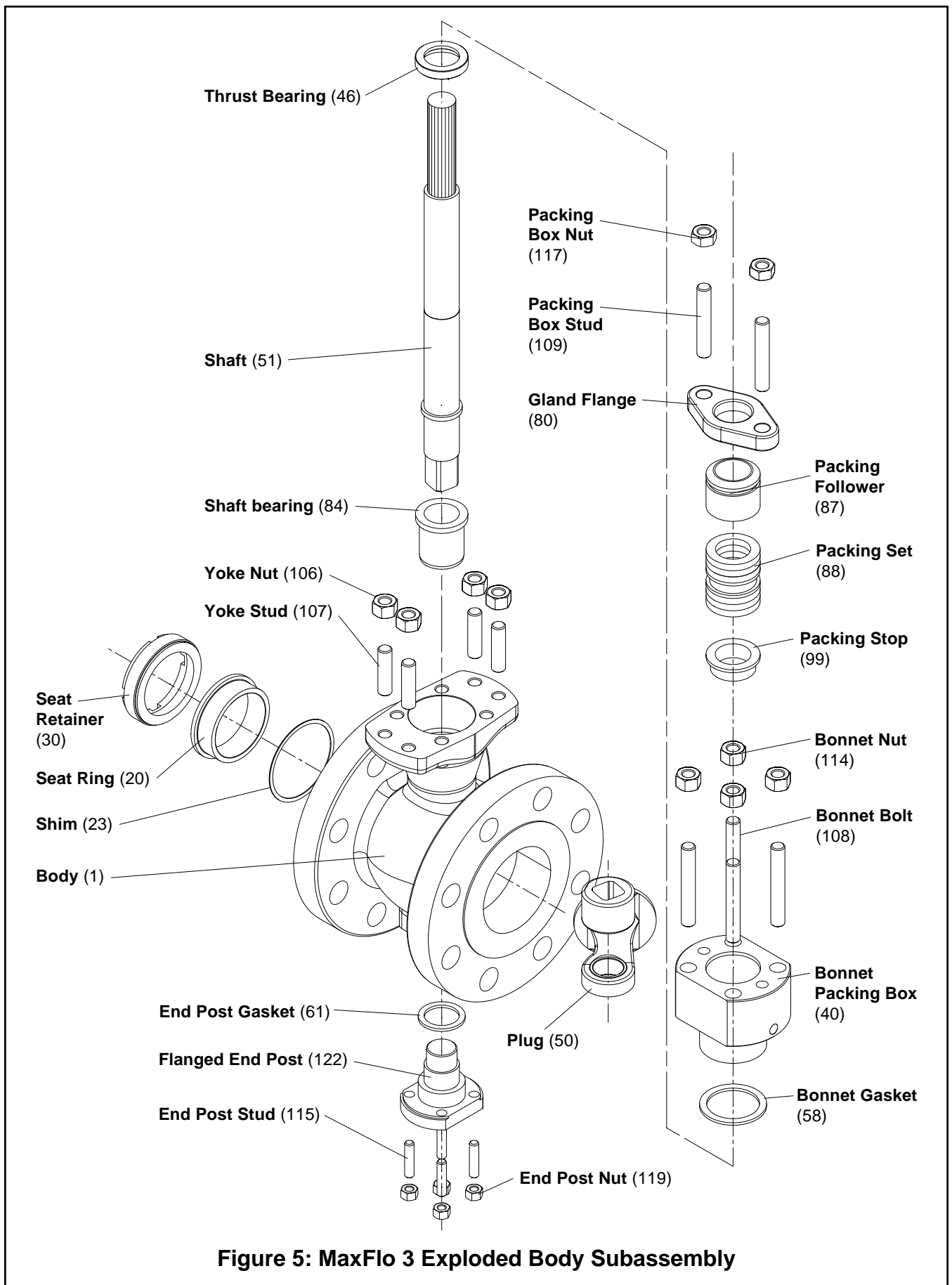
**NOTE:** The MaxFlo 3 valve opens clockwise when looking down the shaft.

1. Slide the actuator assembly onto the shaft and align the transfer case bolt holes with the yoke. To ensure full plug rotation, marks provided on the end of the valve shaft and on the actuator lever arm should be aligned.
2. Bolt the yoke to the transfer case. Be certain the stroke indicator plate is positioned properly to accurately indicate the valve's rotation.
3. Adjust the actuator stroke stop bolts until the plug is barely seated in the seat surface.

**NOTE:** A useful method to determine if the seat spacers are correctly adjusted is to place a light source in the body and check to see if the light fully disappears when the valve is closed. Adjust the actuator stroke stop bolts accordingly.

**CAUTION:** Actuator stroke stop bolts must be properly adjusted to prevent the valve plug from overstroking. If incorrectly adjusted the valve seat, plug or shaft may be damaged.

4. Install the valve in line as outlined in *Installation*.



**Figure 5: MaxFlo 3 Exploded Body Subassembly**

## Troubleshooting MaxFlo 3 Valves

Failure	Probable Cause	Corrective Action
Valve moves to failure position, excessive air bleeding from transfer case	<ol style="list-style-type: none"> <li>1. Failure of actuator O-ring</li> <li>2. Failure of sliding seal assembly</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace actuator stem O-ring</li> <li>2. Repair or replace sliding seal assembly</li> </ol>
Jerky shaft rotation	<ol style="list-style-type: none"> <li>1. Overtightened packing</li> <li>2. Improper adjustment of lever arm on shaft causing arm to contact transfer case</li> <li>3. Cylinder wall not lubricated</li> <li>4. Worn piston O-ring allowing piston to gall on cylinder wall</li> <li>5. Worn actuator stem O-ring causing actuator stem to gall on stem collar</li> <li>6. Worn (or damaged) thrust bearings, shaft bearings or packing followers</li> </ol>	<ol style="list-style-type: none"> <li>1. Retighten packing box nuts to slightly over finger-tight for V-ring packing, 14 ft-lbs / 19 Nm for braided packing</li> <li>2. Readjust lever arm (see step 1 in <i>Actuator Remounting</i>)</li> <li>3. Lubricate cylinder wall with silicone lubricant</li> <li>4. Replace O-ring; if galling has occurred replace all damaged parts</li> <li>5. Replace O-ring; if actuator stem is galled replace it</li> <li>6. Disassemble and inspect parts; replace any worn or damaged parts</li> </ol>
Excessive leakage	<ol style="list-style-type: none"> <li>1. Improper adjustment of external stroke stops</li> <li>2. Improper seat adjustment</li> <li>3. Worn or damaged seat</li> <li>4. Damaged plug seating surface</li> <li>5. Improper handwheel adjustment acting as limit stop</li> </ol>	<ol style="list-style-type: none"> <li>1. See <i>Actuator Remounting</i></li> <li>2. See <i>Seat Replacement</i></li> <li>3. Replace seat</li> <li>4. Replace plug</li> <li>5. Adjust handwheel until plug seats properly</li> </ol>
Leakage through line	<ol style="list-style-type: none"> <li>1. Dirty line gasket surfaces</li> <li>2. Improper sealing of line flanges</li> <li>3. Flange or pipe misalignment</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean gasket surfaces and reinstall valve</li> <li>2. Tighten line flanges evenly and completely (see Table I for proper torque)</li> <li>3. Reinstall valve in line; check piping system</li> </ol>
Leakage through packing box	<ol style="list-style-type: none"> <li>1. Loose packing box nuts</li> <li>2. Worn or damaged packing</li> <li>3. Dirty or corroded packing</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten packing box nuts to slightly over finger-tight for V-ring packing, 14 ft-lbs (19 Nm) for braided packing</li> <li>2. Replace packing</li> <li>3. Clean body bore and stem, replace packing</li> </ol>
Valve slams, won't open, or causes severe water hammer	<ol style="list-style-type: none"> <li>1. Improper valve installation</li> </ol>	<ol style="list-style-type: none"> <li>1. See step 2 in <i>Installation</i> and correct flow direction</li> </ol>
Shaft rotates, plug remains open or closed	<ol style="list-style-type: none"> <li>1. Broken shaft</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace shaft, make sure plug does not overstroke and contact plug stop</li> </ol>
Actuator operates, shaft does not rotate	<ol style="list-style-type: none"> <li>1. Broken internal actuator parts</li> </ol>	<ol style="list-style-type: none"> <li>1. Refer to appropriate actuator maintenance instructions</li> </ol>
Leakage through bonnet joint; leakage from end post	<ol style="list-style-type: none"> <li>1. Loose bolting or damaged gasket</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten bolting as recommended in Table II.</li> <li>2. Clean gasket surfaces, replace gaskets and retighten bolting per Table II.</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.

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