Product Instruction Manual

OpEXL
Eccentric Plug Valve

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INTRODUCTION

Scope of Manual

This instruction manual includes installation, maintenance, and parts information for the Optimux™ OpEXL control valve. Refer to separate manuals for information regarding installation, operation, and maintenance of additional features such as actuators, positioners, special accessories, fail-safe systems, etc. Only qualified persons should install, operate, and maintain an Optimux OpEXL 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.

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.*

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. Optimux's standard bolting material is B7/2H. Grade 660 bolting material is standard with stainless steel or NACE 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 local Optimux representative or factory.

Spare Parts

Trimteck recommends quality, factory-built parts be used when servicing Optimux valves. In the USA phone (954) 753-5545 for spare parts information.

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 OpEXL 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 your shipper immediately.
4. Should any problem arise, contact your Optimux representative.

INSTALLATION

1. Before installing the valve, clean the line of dirt, scale, welding chips, and other foreign material. Clean gasket surfaces thoroughly to insure leak-proof joints. Refer to Figure 1 and install valve. With 10 and 12-inch, air-to-close valves, the plug must be closed during installation; otherwise the plug may be damaged.
2. Check the flow direction to be sure the valve is installed correctly. Fail-closed valves should be installed with the shaft upstream only in gas service. It is preferred that liquid service valves be installed with the shaft downstream regardless of air failure action. However, under certain flow conditions the valve can 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.**

3. Connect the air supply and instrument signal. Throttling valves are usually equipped with valve positioners. Two connections are marked for the air supply and for the instrument signal. The cylinder actuator is 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 insure 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 1/2 to one full turn (Teflon only).

Valve Size (in.)	ANSI Class Rating	Tie Rod** Length (in./mm)	Stud** Length (in./mm)	Size (dia.) (in./mm)	Torque* (ft. lbs. / Nm)	
					Low Strength	Intermediate Strength
1	150	7.0 / 180	-	1/2 / M14	23 / 30	61 / 82
	300	8.0 / 200	-	5/8 / M16	46 / 62	122 / 165
	600	8.0 / 200	-	5/8 / M16	46 / 62	122 / 165
1 1/2	150	7.75 / 195	-	1/2 / M14	23 / 30	61 / 82
	300	9.0 / 230	-	3/4 / M20	82 / 110	218 / 295
	600	9.0 / 230	-	3/4 / M20	82 / 110	218 / 295
2	150	9.0 / 230	-	5/8 / M16	46 / 62	122 / 165
	300	9.0 / 230	-	3/4 / M20	46 / 62	122 / 165
	600	9.0 / 230	-	3/4 / M20	46 / 62	122 / 165
3	150	10.25 / 260	-	5/8 / M16	46 / 62	122 / 165
	300	12.0 / 300	4.0 / 97	3/4 / M20	82 / 110	218 / 295
	600	12.0 / 300	4.0 / 97	3/4 / M20	82 / 110	218 / 295
4	150	11.5 / 290	5.75 / 101	5/8 / M16	46 / 62	122 / 165
	300	12.25 / 310	4.75 / 120	3/4 / M20	82 / 110	218 / 295
	600	13.75 / 345	5.25 / 135	7/8 / M22	132 / 180	353 / 480
6	150	13.25 / 335	2.75 / 70	3/4 / M20	82 / 110	218 / 295
	300	14.25 / 360	3.25 / 80	3/4 / M20	82 / 110	218 / 295
	600	16.25 / 410	3.5 / 90	1 / M27	199 / 270	531 / 720
8	150	14.25 / 360	3.25 / 80	3/4 / M20	82 / 110	218 / 295
	300	15.25 / 390	4.0 / 100	7/8 / M22	132 / 180	353 / 480
	600	17.25 / 440	4.0 / 100	1 / M27	296 / 400	789 / 1070
10	150	15.25 / 390	3.25 / 85	7/8 / M22	132 / 180	353 / 480
	300	17.25 / 440	4.25 / 110	1 / M27	199 / 270	531 / 720
	600	19.25 / 490	4.5 / 120	1 1/8 / M30	420 / 570	1119 / 1518
12	150	16.25 / 415	3.25 / 85	7/8 / M22	132 / 180	353 / 480
	300	18.5 / 470	4.25 / 110	1 1/8 / M30	296 / 400	789 / 1070
	600	20.0 / 510	4.5 / 120	1 1/4 / M33	420 / 570	1119 / 1518

Table I: Line Flange Bolting Specifications

*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. Long thru-bolted joints generally require higher strength bolting and torque values than shorter flanged bolting depending on operating conditions.

**Lengths are based on ANSI B16.5 stud bolts and raised face ends.

⚠ **CAUTION: Do not over-tighten 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 the "Actuator Action Reversal" section in the appropriate Actuator Instruction Manual.

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 the "Assembly and Disassembly" section.

1. Look for signs of gasket leakage through body and line flanges. 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 over-tighten 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 Grafoil packing is used).
7. Check positioner calibration by observing the gauges and plug position indicator plate. Make sure the positioner is calibrated to the correct range. Refer to positioner instructions for additional preventive maintenance.
8. If possible, depressurize the actuator, and 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 securely fastened.
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.

ASSEMBLY AND DISASSEMBLY

Body Disassembly

To disassemble the OpEXL valve (not including the seat), refer to Figures 2 through 6 and proceed as follows. See "Replacing Seat" section for that operation.

1. Remove the actuator cover plate. (Loosen the spline-lever connection on applicable actuators.)
2. Remove the actuator from the body by separating the actuator at the yoke. This is done by removing the four transfer case bolts and pulling the actuator off the valve shaft.
3. Remove the shaft snap-rings, retaining washer and thrust bearing.

> ⚠ **WARNING: Excess fluid pressure or caustic fumes may be released during this step. Use caution while performing this procedure.**

Next, remove the yoke and packing box nuts, slightly lift up the yoke and remove the remaining snap-rings. Remove the yoke and gland flange/packing follower.

4. Pull the valve shaft from the body. The packing, packing guide, spacer and shaft bearing, antiextrusion ring will come out of the body along with the shaft. Remove the retaining ring.
5. Remove the end plug from the body, the Allen head screw from the end of the locking cone, and finally the locking cone. The plug/post bearing assembly can now be removed from the valve body through the valve port opposite the seat.

***Note:** The locking cone is threaded and may need to be pulled out using a puller. With one inch valves, the post bearing is pressed in place.*

6. Inspect all parts for wear and refurbish as needed.

Body Reassembly

To reassemble the OpEXL valve body (not including the seat), refer to Figures 2, 3, 4 and 5 and proceed as follows. See "Replacing Seat" section for that operation.

1. Place the body into a vise with the outboard end down.
2. Place the post into the plug and then add the thrust washer onto the post.

***Note:** On one-inch valves, the post bearing is pressed in place. Place this plug/post assembly into the body with the post end aligning with the outboard end of the body. (See Figure 4)*

***Note:** Lubricating the post and thrust washer with a graphite-based grease will help hold them in place during assembly*

3. Remove the valve body from the vise and place it on a bench. Using a flat-headed screwdriver, turn the slot in the post until it is horizontal (parallel to the body ports). From the outboard end, insert the locking cone with locking screw and washer into the post and tighten per the torque values in Table II. Note that the post may need to be slightly rotated before the locking cone can be inserted.
4. Apply thread sealant material to the threads on the end plug and screw it into the valve body and tighten in place.
5. Install a new retaining ring on the shaft. Lubricate the shaft and shaft bearing with a graphite-based grease and slide the shaft into the valve body, orienting the shaft end mark parallel with valve plug face.
6. Next, place the shaft bearing, spacer and antiextrusion ring over the shaft and into the valve body in that order.

***Note:** The shaft should slide freely inside the valve body and within the plug. This is critical to the operation of the valve.*

Valve Size (in.)	Torque Value		
	Foot-pounds	Newton-Meters	Meter-Kilograms
1	N/A	N/A	N/A
1 1/2 - 2	1.7	2.3	.23
3 - 4	5.9	8.0	.82
6 - 8	15.4	21	2.1
10 - 12	37	50	5.1

Table II: Locking Screw Torque Values

7. Install new packing per Figure 3.
8. Place the gland flange and lower shaft retaining parts in order within the yoke (refer to Table III) and place this assembly halfway onto the valve shaft. Continue placing the yoke onto the shaft followed by the upper shaft retaining parts; the smooth side of the thrust bearing is always toward the yoke. Place the yoke nuts onto the packing studs; rotate the yoke counterclockwise, and securely tighten it to the valve body. Place the packing box nuts onto the studs and tighten the gland flange until just finger-tight. (Rope packing should be tightened to 14 ft-lbs, or 19 newtonmeters.)

Valve Size	Placement Order (left-to-right, lower-to-upper)
1	S B Y B S
1 1/2 - 4	S W T Y T W S
6 - 12	R W T Y T W S

S = **S**nap ring
W = retaining **W**asher
T = **T**hrust bearing
B = **B**ronze bushing
R = **R**etaining ring
Y = **Y**oke

Table III: Shaft Retaining Parts

9. If the seat has been removed from the valve, proceed to the "Replacing Seat" section.
10. Reinstall the valve in line per the Installation section.

REPLACING SEAT

(Class IV Shutoff)

To replace the OpEXL valve seat, refer to Figures 2 and 5 and proceed as follows.

1. Using the appropriate OpEXL retainer tool (see Table IV), remove the seat retainer. (Note: Retainer tools are available from the factory. In the USA telephone (954) 753-5545 for information.)
2. Remove the seat and any seat spacers that may be installed under the seat.

***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. In the USA telephone (954) 227-8353.*

3. Check both seat and plug surfaces for wear and galling. Replace these parts as needed.
4. Clean the retainer and body threads of old silicone sealant.
5. To reinstall the seat, place the seat (without spacers) into the valve body. Refer to Figure 5 and measure distance "A," which has no spacers between the seat and body, and the plug is rotated open 90 degrees.

Valve Size (in.)	Retainer Tool (Part #)	Retainer Torque Value		
		Foot-Pounds	Newton-Meters	Meter-Kilograms
1	VF820588	40	54	5.5
1 1/2	VF820591	101	137	14
2	VF820594	152	206	21
3	VF820697	398	540	55
4	VF820664	420	570	58
6	VF820667	940	1275	130
8	VF820670	687	931	95
10	VF820673	542	735	75
12	VF820676	738	1000	102

Table IV: Retainer Tools / Torque Values

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 in.) spacer is required on valve sizes 1 thru 8-inches.

Valve Size	Rounding Rule	Example	Spacer Selection
1	Down to $^{5}/_{100}$ mm	A - B = 0.27/.011 Round to 0.25/.010	0.1/.004+ 0.15/.006
$1^{1}/_{2}$ - 8	Down to $^{1}/_{10}$ mm	A - B = 0.27/.011 Round to 0.2/.008	0.2/.008
10 - 12	Down to A - B - 0.3 $^{1}/_{2}$/.020	A - B = 0.5/.02 A - B - 0.3/.012= 0.2/.008; Round to 0	0.7/.030

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

On 10 and 12-inch valves, the 0.7 mm (.030 in.) seat spacer is a wound type and compresses to 0.3 mm (.012 in.). Always install one 0.7 mm (.030 in.) seat spacer next to the valve body and adjust seat position with 0.5 mm (.020 in.) spacer as required.

6. Again remove the seat and add the appropriate thickness of seat spacer(s). Place a small bead of silicone sealant around the OD of the seat ring. Optimux recommends using a sealant with a temperature range of -100° F to 400° F (-70° C 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 1/4 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.)

REMOUNTING ACTUATOR

Before mounting an OpEXL valve to an Optimux 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.

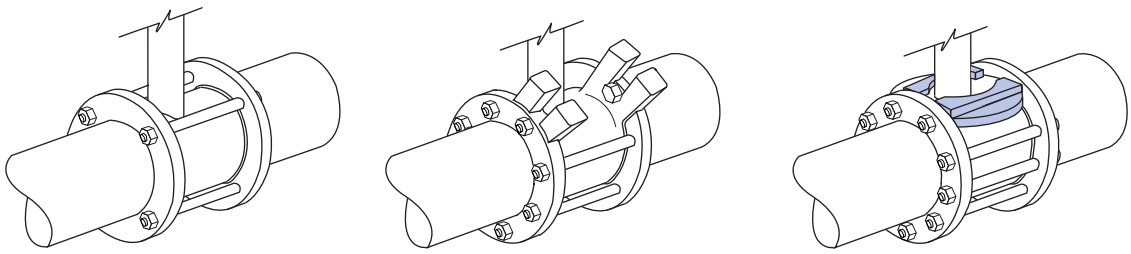
***Note:* The OpEXL valve opens clockwise when looking down the shaft.**

1. Slide the actuator assembly onto the shaft and align the transfer case bolt holes with the yoke. To ensure full rotation of the plug, 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 over-stroking. If incorrectly adjusted the valve seat, plug or shaft may be damaged.**

4. Install the valve in line as outlined in the "Installation" section.

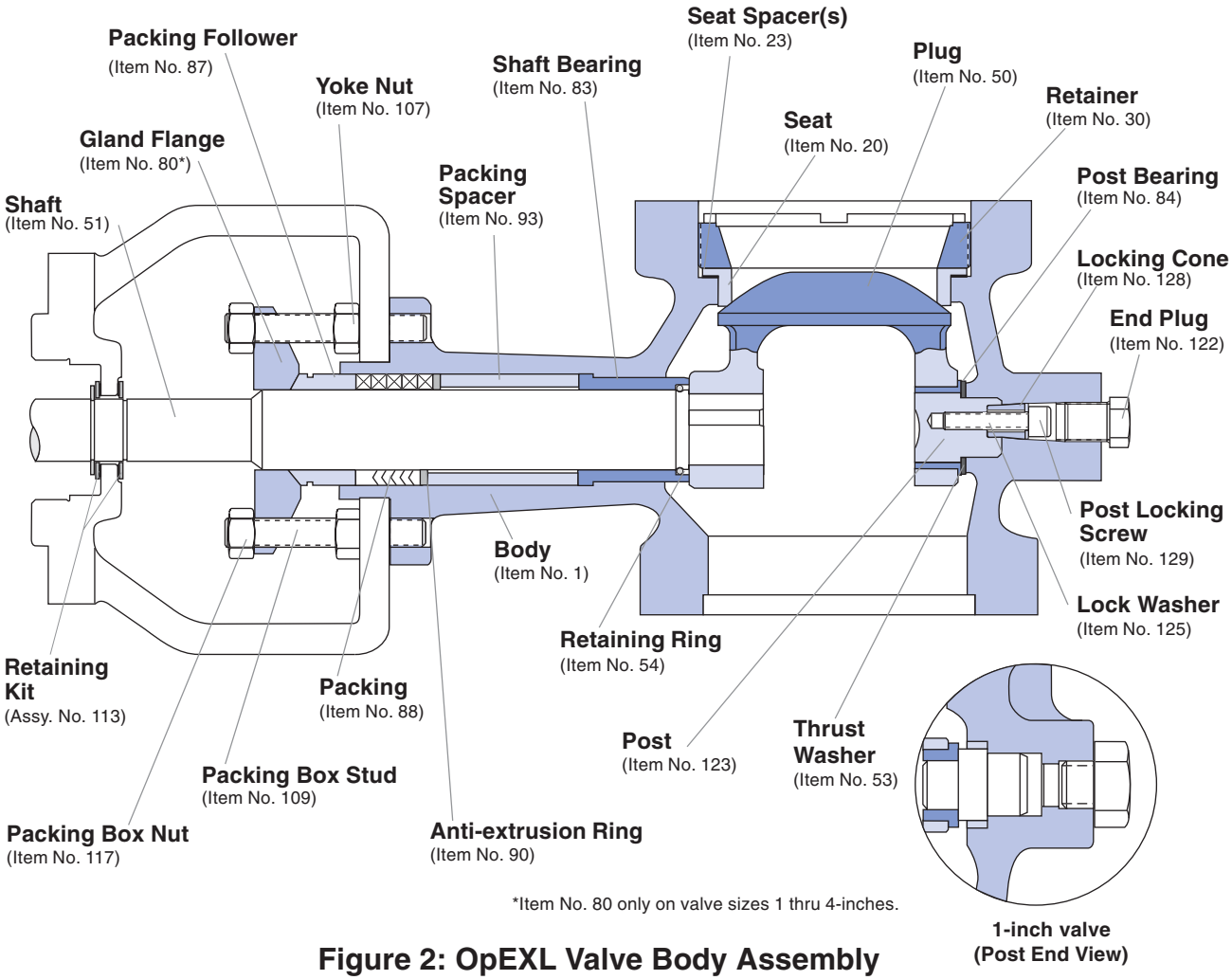


With tie-rods for sizes 1", 1½" and 2"

With tie-rods and bolts for sizes 3" and 4"

With tie-rods, threaded spacers and bolts for sizes 6" thru 12"

Figure 1: Mounting Styles



*Item No. 80 only on valve sizes 1 thru 4-inches.

Figure 2: OpEXL Valve Body Assembly

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

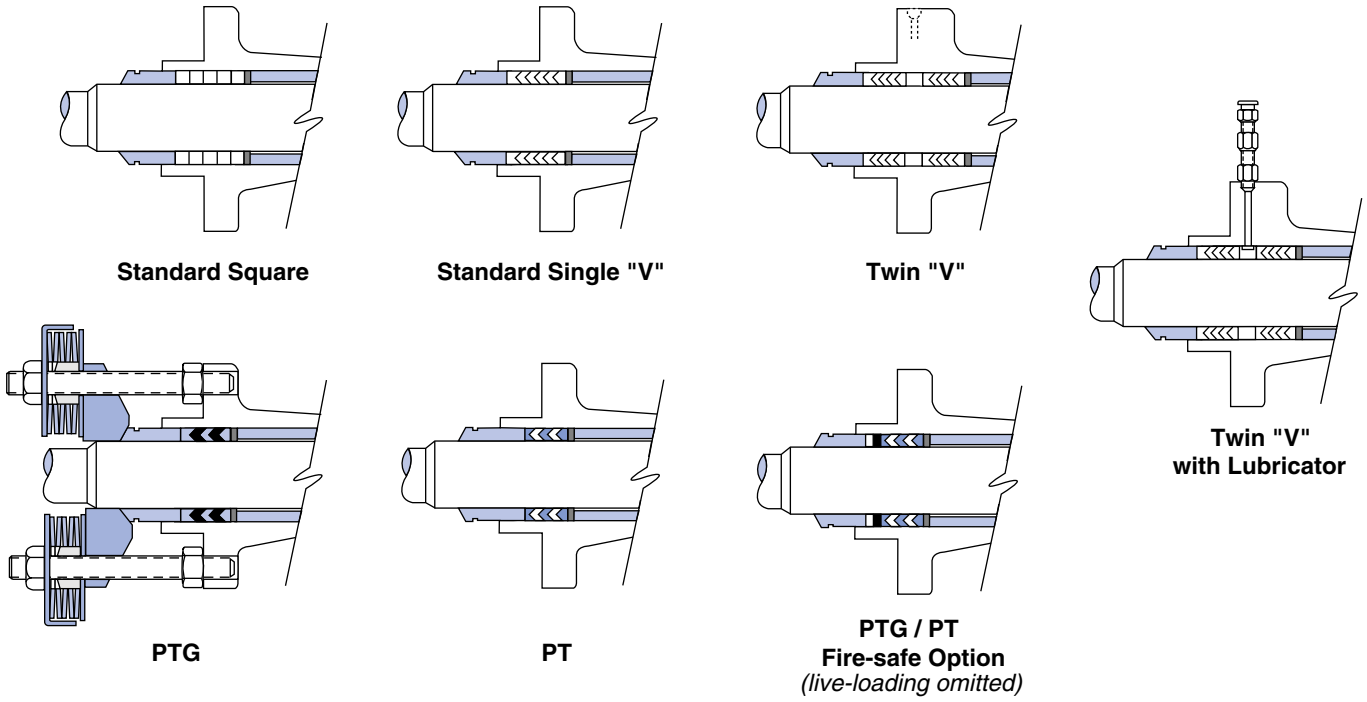


Figure 3: Typical Packing Configuration

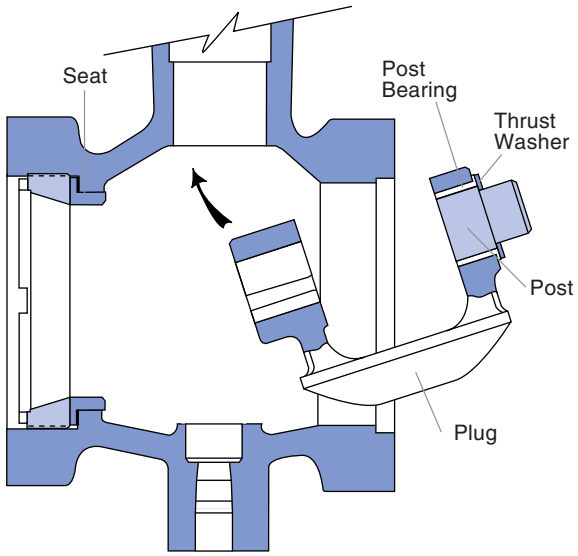


Figure 4: Placing Post/Plug Assembly in Body

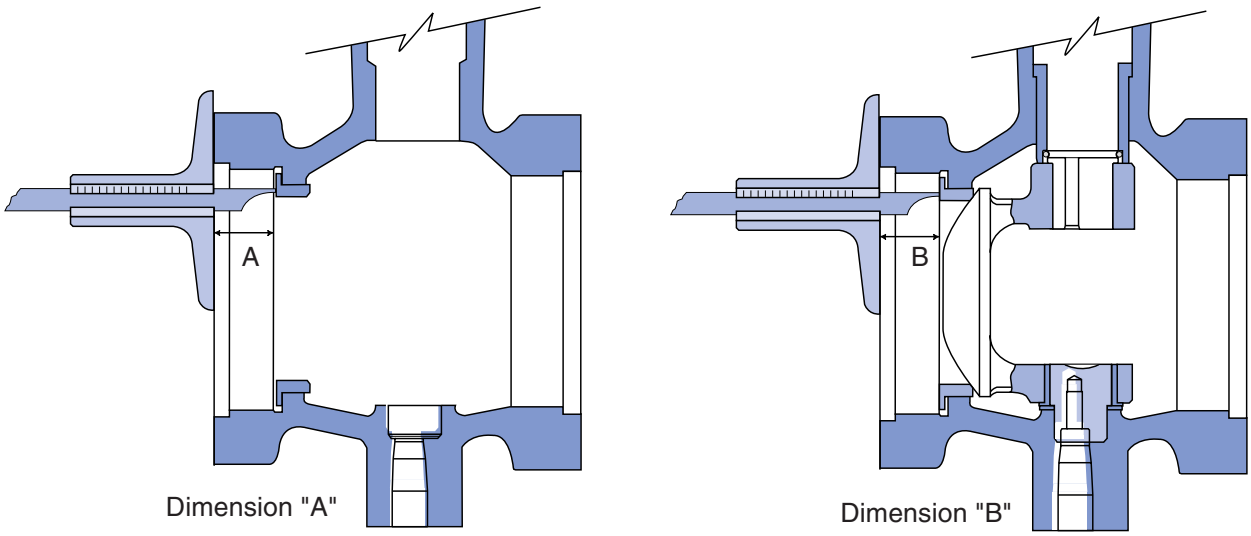
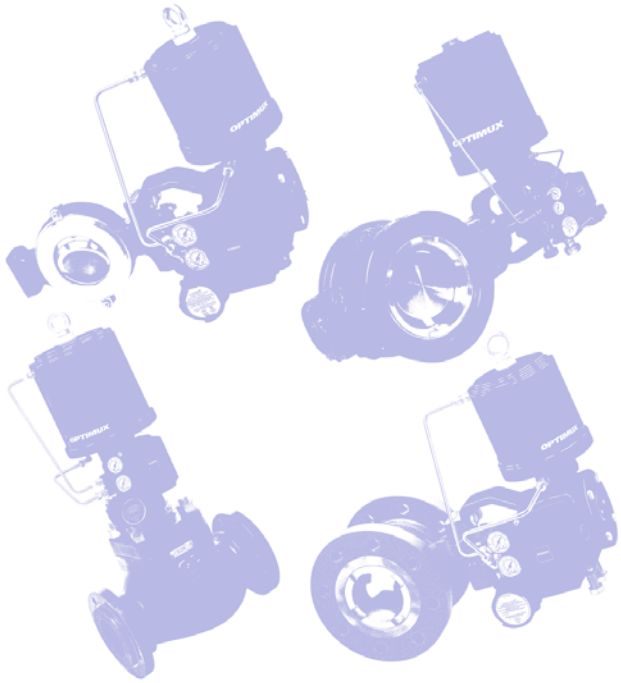


Figure 5: Correct Packing Shim Procedure

Troubleshooting OpEXL Eccentric Plug Valve

Failure	Probable Cause	Corrective Action
Valve moves to failure position, excessive air bleeding from transfer case	1. Failure of actuator O-ring 2. Failure of sliding seal assembly	1. Replace actuator stem O-ring 2. Repair or replace sliding seal assembly
Jerky shaft rotation	1. Overtightened packing 2. Improper adjustment of lever arm on shaft causing arm to contact transfer case 3. Cylinder wall not lubricated 4. Worn piston O-ring allowing piston to gall on cylinder wall 5. Worn actuator stem O-ring causing actuator stem to gall on stem collar 6. Worn (or damaged) thrust bearings, shaft bearings or packing followers	1. Retighten packing box nuts to slightly over finger-tight for V-ring packing, 14 ft-lbs / 19 Nm for braided packing 2. Readjust lever arm (see step 1 in the "Remounting Actuator" section) 3. Lubricate cylinder wall with silicone lubricant 4. Replace O-ring; if galling has occurred replace all damaged parts 5. Replace O-ring; if actuator stem is galled replace it 6. Disassemble and inspect parts; replace any worn or damaged parts
Excessive leakage	1. Improper adjustment of external stroke stops 2. Improper seat adjustment 3. Worn or damaged seat 4. Damaged plug seating surface 5. Improper handwheel adjustment acting as limitstop	1. See "Remounting Actuator" section 2. See "Replacing Seat" section 3. Replace seat 4. Replace plug 5. Adjust handwheel until plug seats properly
Leakage through line	1. Dirty line gasket surfaces 2. Improper sealing of line flanges 3. Flange or pipe misalignment	1. Clean gasket surfaces and reinstall valve 2. Tighten line flanges evenly and completely (see Table 1 for proper torque) 3. Reinstall valve in line; check piping system
Leakage through packing box	1. Loose packing box nuts 2. Worn or damaged packing 3. Dirty or corroded packing	1. Tighten packing box nuts to slightly over finger-tight for V-ring packing, 14 ft-lbs / 19 Nm for braided packing 2. Replace packing 3. Clean body bore and stem, replace packing
Valve slams, won't open, or causes severe water hammer	1. Improper valve installation	1. See step 2 in "Installation" section and correct flow direction
Shaft rotates, plug remains open or closed	1. Broken shaft	1. Replace shaft, make sure plug does not overstroke and contact plug stop
Actuator operates, shaft does not rotate	1. Broken internal actuator parts	1. Refer to appropriate actuator maintenance instructions



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.

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 Optimux 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 TRIMTECK, LLC at any of its worldwide operations or offices.

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