

Val-Matic®

3-Way Tapered Plug Valve

Operation, Maintenance and Installation Manual

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VAL-MATIC'S 3-WAY TAPERED PLUG VALVE OPERATION, MAINTENANCE AND INSTALLATION

INTRODUCTION

Val-Matic's 3-Way Tapered Plug Valve has been designed to give many years of trouble free operation. This manual will provide you with the information needed to properly install and maintain the valve and to ensure a long service life. All parts are inspected prior to final assembly to insure complete interchangeability of parts. After assembly, each valve receives a hydrostatic shell test, using a pressure equal to twice the valves rated working pressure and a leak test, using a pressure equal to the test pressure for the specified system operation or equal to the CWP for the valve. The standard pressure rating of the 3" through 12" is 150 psi (CWP). An optional 250 psi (CWP) pressure rating is available.

Optional Limit Switches may be mounted on the valve to provide local and remote position indication.

The valve is capable of handling a wide range of fluids including flows containing suspended solids. The size, flow direction, maximum working pressure, and Model No. are stamped on the nameplate for reference.

CAUTION

Do not use valve for line testing at pressures higher than nameplate rating or damage to valve may occur.

The "Maximum Cold Working Pressure" (CWP) is the non-shock pressure rating of the valve at 150°F. The valve is not intended as an isolation valve for line testing above the valve rating.

RECEIVING AND STORAGE

Inspect valves upon receipt for damage in shipment. Unload all valves carefully to the ground without dropping. Valves should remain crated, clean and dry until installed to prevent weather related damage. When lifting the valve for installation, make sure that lifting chains, slings or straps are not attached to or allowed to come in contact with the seat areas or actuator handwheel.

Do not rest the weight of the valve on the actuator or handwheel.

Improper storage and installation procedures will void warranty. For long term storage greater than six months, the rubber surfaces of the plug should be coated with a thin film of FDA approved grease such as Lubriko #CW-606. Do not expose plug to sunlight or ozone for any extended period.

VALVE CONSTRUCTION

The 3-Way Tapered Plug Valve consists of a body section having three integrally cast flanges. The top portion of the body has a large integrally cast flanged access port, to which the top access cover is bolted. The size of this access port permits full access to the plug and seat for maintenance or replacement.

The flow area through the body inlet, body seat ring and the body outlet is equal to 100% of the nominal inside area of the standard pipe.

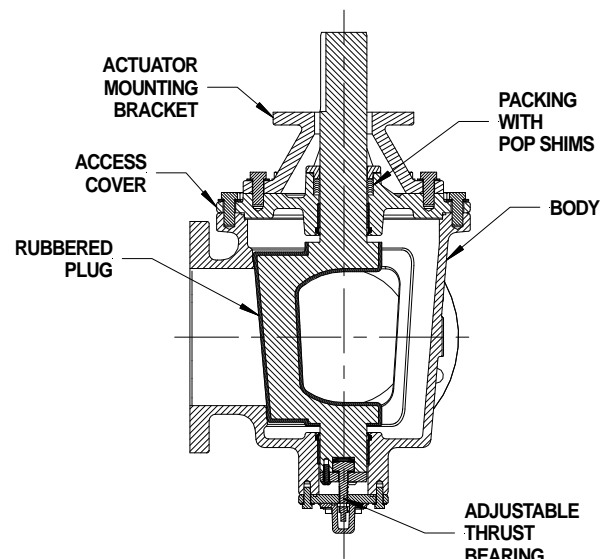


FIGURE 1. 3-WAY PLUG VALVE

The body has chevron type packing with Val-Matic standard pop shims. The plug and shafts are a single piece construction and is keyed to connect to the actuator. The Buna-N covered plug is fully encapsulated and has three O-ring type sealing beads that provide low pressure sealing when it contacts the body seat. The body seat is fully fusion bonded epoxy (FBE) coated or is optionally available with a welded nickel seating surface.

The face to face dimensions of the valve are the same as those of a standard flanged "tee" for easy installation and interchangeability.

VAL-MATIC'S 3-WAY PLUG VALVE OPERATION, MAINTENANCE AND INSTALLATION

DESCRIPTION OF OPERATION

The valve is designed to block flow to one of the three ports or allow flow through all ports.

The plug location is shown by the actuator position indication arrow and blocks the port it is pointing toward.

The valve is equipped with an adjustable thrust bearing. This adjustment pulls or lifts the tapered plug into intimate contact with the body seating surfaces. It should be adjusted to just seal against the system operating pressure to provide for the longest seal life and additional future adjustment when needed.

INSTALLATION

The 3-Way Tapered Plug Valve can be used in any orientation relative to vertical. Avoid locating the valve immediately downstream of a pipe elbow or in a cavitation zone because the turbulence in these regions will cause premature wear or damage.

Before installing the valve in the space provided, check to make sure that the piping is free of foreign objects such as lumber, tools, rocks, etc., which can damage the 3-Way Plug Valve when it is placed in service.

When lifting the valve for installation, make sure that lifting chains or straps are not attached to or allowed to come in contact with the plug face or sealing surfaces. Also do not allow the weight of the valve to rest on the actuator handwheel.

Three-Way Plug Valves are furnished with flat faced flanges and should only be mated to a flat faced companion flange. A full faced or ring gasket, that has been lubricated with a gasket joint compound, must be installed between the valve's flange and the companion flange to affect a seal. Flange bolting shall be in accordance with ANSI B16.1 Section 5.2 for cast iron bodies and ANSI B16.42 for ductile iron bodies. Note: Val-Matic does not recommend the use of high strength flange bolting with these valves.

Before installing the flange bolting, the valve and the adjacent piping must be supported and aligned to prevent cantilevered stress being transferred to the valve's flanges when installing the flange bolts or studs.

Apply a thread lubricant to the flange bolt threads and install the flange bolts and nuts around the flange. Once all the flange bolts or studs are inserted around the flange bolt circle, hand-tighten them.

Recommended flange bolt lubricated target torque values for use with resilient gaskets (75 durometer) are given in Table 1. If leakage occurs, allow gaskets to absorb system fluid and check torque and leakage after 24 hours. Do not exceed the bolt rating, the maximum torque of Table 1, compress to more than the gasket manufacturer's thickness recommendation or extrude gasket.

TABLE 1. Flange Bolt Target Torque

Valve Size (in)	Bolt Dia (in)	Target Torque (ft-lbs)	Maximum Torque (ft-lbs)
2" to 4"	5/8	25	90
6"-8"	3/4	30	150
10"-12"	7/8	45	205

The target torque for flange bolting is based on the flange construction, system pressure, system temperature, and the gasket material. The valve flange construction is per ASME B16.1 Class 125 (cast iron bodies) or ASME B16.42 Class 150 (ductile iron bodies). The gasket material and design is often the limiting factor for the flange bolt target torque and should best be obtained from the gasket manufacturer. Note: Flange joint leakage can be caused by exceeding the recommended target torque as well as inadequate or non-uniform bolt torque.

The flange bolt torque should be applied in several graduated steps using the cross-over bolt tightening method to load the bolts evenly and eliminate concentrated stresses which could fracture or crack the piping or valve's flange. See ASME PCC-1-2010 for details of the cross-over bolt tightening sequence and torque methods. Note that the target torque values provided in ASME PCC-1-2010 are based on the ANSI/ASME steel flange pressure and temperature ratings which exceed those of AWWA and are, therefore, often higher than appropriate for AWWA rated iron valves and flanges.

VAL-MATIC'S 3-WAY PLUG VALVE OPERATION, MAINTENANCE AND INSTALLATION

CAUTION

The use of ring gaskets or excessive bolt torque may damage valve flanges.

VALVE START-UP PROCEDURE

When the 3-Way Plug is completely installed, follow the steps outlined below to place valve into service.

Once installed, manually operate the valve through all positions of normal operation, check for smooth operation, and pressure test the pipeline. Become familiar with the following adjustments that will affect the closing characteristics of the 3-Way Plug Valve.

THRUST BEARING ADJUSTMENT

The thrust bearing adjusting screw is covered by a sealed lock cap. After removal of the cap the thrust bearing adjusting screw can be turned to affect the proper seal. Turning the screw to the right pulls the plug farther down into the tapered seat and increases the sealing pressure ability. Turning the screw to the left pushes the plug farther upward away from the tapered seat and decreases the sealing pressure ability. For best long term operation the thrust bearing screw should be adjusted first left (upward) to initiate a small leakage and then back to the right (downward) just until the leakage is stopped. This minimizes seat wear and prolongs the seat life. If after extended service leakage occurs, the thrust bearing can be re-adjusted to eliminate the leakage or the rubbered plug may be replaced.

TROUBLESHOOTING

Several problems and solutions are presented below to assist you in troubleshooting the valve assembly in an efficient manner.

- **Leakage at Cover or Flanges:** Tighten cover or flange bolts, replace cover seal or flange gasket.
- **Valve Leaks When Closed:** Adjust thrust bearing or replace rubbered plug. Inspect rubbered plug for damage or debris. Clean or replace as needed. Inspect body seating surface for damage or debris. Clean, polish, or replace as needed.

- **Valve Does Not Open:** Check for obstruction in valve or pipeline; see disassembly procedure.

DISASSEMBLY

The valve can be disassembled without removing it from the pipeline. The valve may also be removed from the pipeline. All work on the valve should be performed by a skilled mechanic with proper tools and a power hoist for larger valves. Disassembly may be required to inspect the disc for wear or the valve for debris or deposits.

Refer to Figure 3 and Table 3 for parts identification. Always relieve pressure and drain pipeline before working on the valve.

WARNING

The pipeline must be relieved of all pressure and drained before removing the actuator, valve, or the valve cover or pressure may be released causing bodily harm.

ACTUATOR REMOVAL

The valve plug may be positioned to block any port or to leave all ports open by rotating through a 360° arc. The actuator may limit some of these positions based on the application of travel stops in the actuator. The possible configurations are shown in Figure 2 and designations are given in Table 2 below. The actuator should be match-marked before removal and the actuator configuration designation should be recorded. This configuration should also be indicated on the submittal drawings if available.

VAL-MATIC'S 3-WAY PLUG VALVE OPERATION, MAINTENANCE AND INSTALLATION

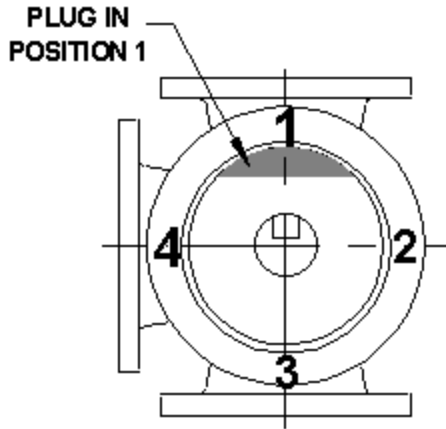


FIGURE 2. 3-WAY PLUG POSITIONS
(NOTE: Key in-line with plug face)

Table 2. ACTUATOR CONFIGURATION					
Actuator Configuration Designation	Plug Travel	Plug Positions			
		1	2	3	4
012	90°	XX	XX		
023	90°		XX	XX	
034	90°			XX	XX
041	90°	XX			XX
123	180°	XX	XX	XX	
234	180°		XX	XX	XX
341	180°	XX		XX	XX
412	180°	XX	XX		XX
1234	360°	XX	XX	XX	XX

1. Remove nuts from the studs holding the actuator to the bonnet (11).
2. Carefully sling and lift the actuator from the valve's plug shaft (3).
3. Remove actuator key.

VALVE DISASSEMBLY

1. Remove the bonnet bolts and washers (13 & 14) on the bonnet (11).
2. Remove bonnet (11).

3. Remove the packing bolts, packing shims, and packing gland follower (9, 29, & 34) on the cover (2).
4. Remove the packing (7) from the cover (2) recess.
5. Remove the cover bolts and washers (4 & 5) on the cover (2).
6. Pry cover (2) loose and lift off valve body.
7. If desired, remove the upper Grit-Guard™ seal (10) and shaft bearing (6).
8. Remove the lock cap bolt, washers, lock cap, and lock cap o-ring (24, 25, 21, & 32) from bottom valve trunnion.
9. Remove hex nut (12) from the thrust bearing stud (17). Turn thrust bearing stud (17) counter clockwise as far as possible to raise the plug (3).
10. Remove thrust plate bolts (19) and thrust plate washers (20). If the thrust bearing stud (17) is still engaged with the thrust plate (18) pry and rotate the clockwise to remove. If desired remove the thrust plate o-ring (33).
11. Sling and support rubbered plug (3) and lift out of valve body being careful not to damage scratch, or mar the rubbered face.
12. If desired, remove the shaft cap bolts (16), shaft cap (15), thrust bearing stud (17), and spring washers (31) for the lower plug shaft.
13. If desired, remove the lower Grit-Guard™ seal (10) and shaft bearing (6).

VAL-MATIC'S 3-WAY PLUG VALVE
OPERATION, MAINTENANCE AND INSTALLATION

3-WAY PLUG VALVE PARTS CONSTRUCTION

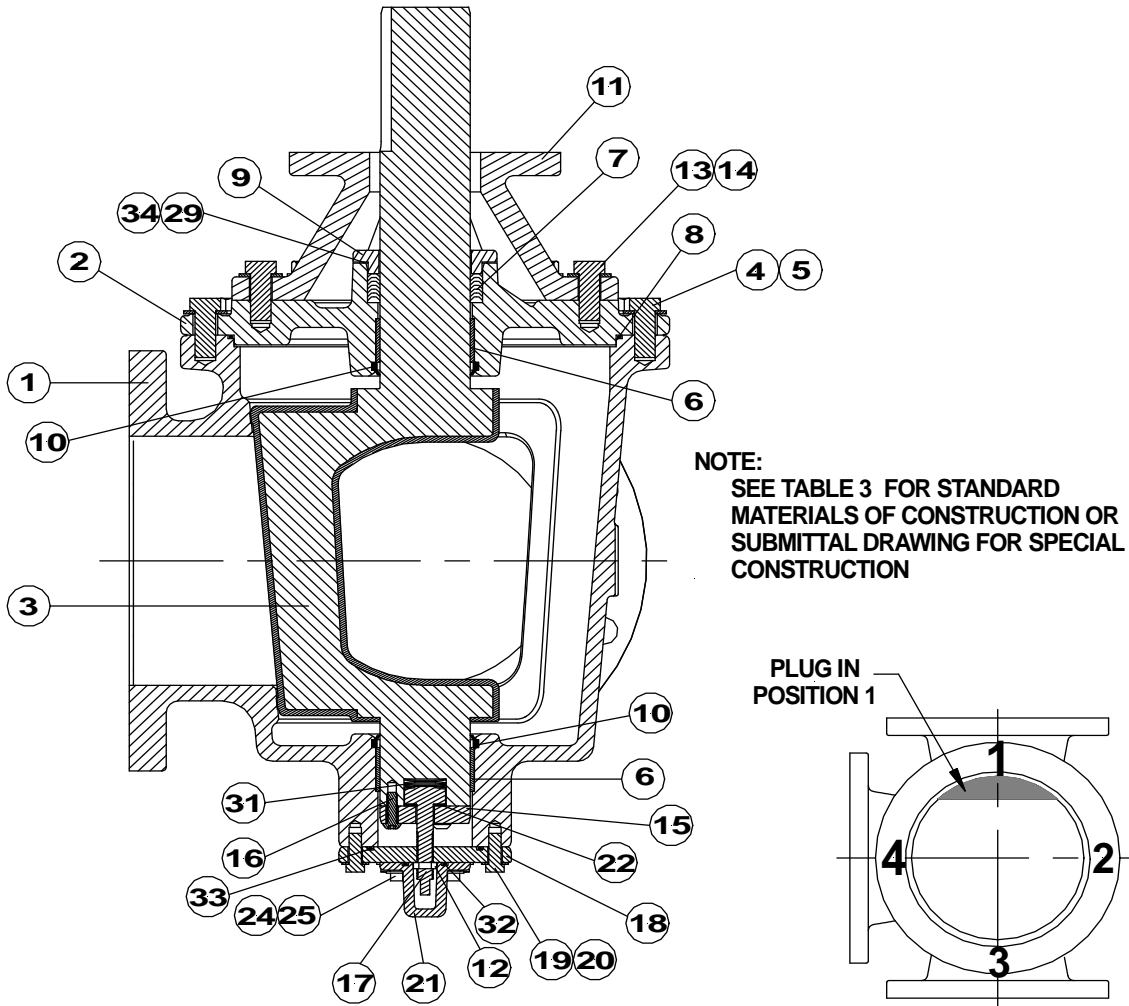


FIGURE 3. VALVE CONSTRUCTION

VAL-MATIC'S 3-WAY PLUG VALVE OPERATION, MAINTENANCE AND INSTALLATION

TABLE 3. PARTS AND MATERIALS OF CONSTRUCTION			
PART NO.	*	PART NAME	MATERIAL
1		Body	Ductile Iron Fusion Bonded Epoxy Interior/Exterior
2		Cover	Ductile Iron Fusion Bonded Epoxy Interior/Exterior
3	*	Plug	Ductile Iron With Buna-N Facing
4		Cover Bolt	Steel, Zinc Plated
5		Cover Bolt Washer	Steel, Zinc Plated
6		Shaft Bearings	Permanently Lubricated Stainless Steel
7	*	Vee Type Packing	Buna-N
8	*	Cover Seal (O-Ring)	Buna-N
9		Packing Gland Follower	Cast Iron
10	*	Grit-Guard™ Seal	Molythane
11		Bonnet	Ductile Iron
12		Hex Nut	Stainless Steel
13		Bonnet Bolt	Steel, Zinc Plated
14		Bonnet Bolt Washer	Steel, Zinc Plated
15		Shaft Cap	Ductile Iron
16		Shaft Cap Bolt	Stainless Steel
17		Thrust Bearing Stud	Bronze
18		Thrust Plate	Ductile Iron
19		Thrust Plate Bolt	Steel, Zinc Plated
20		Thrust Plate Bolt Washer	Steel, Zinc Plated
21		Lock Cap	Ductile Iron
22		Thrust Stud Washer	Stainless Steel
24		Lock Cap Bolt	Steel, Zinc Plated
25		Lock Cap Bolt Washer	Steel, Zinc Plated
29		Packing Shims	Stainless Steel
31		Spring Washer	Stainless Steel
32	*	Lock Cap Seal (O-Ring)	Buna-N
33	*	Thrust Plate Seal (O-Ring)	Buna-N
34		Packing Bolt	Steel, Zinc Plated

* = Recommended Spare Part

RE-ASSEMBLY

All work on the valve should be performed by a skilled mechanic with proper tools and a power hoist for larger valves. Note: All packing, O-rings, Grit-Guard™ seals, and the rubbered plug face should be coated with FDA approved grease such as Lubriko #CW-606.

CAUTION

All packing, O-rings, Grit-Guard™ seals, and the rubbered plug face should be clean and coated with FDA approved grease such as Lubriko #CW-606 at assembly.

VALVE RE-ASSEMBLY

1. Install the lower Grit-Guard™ seal (10) and shaft bearing (6).
2. Install the shaft cap bolts (16), shaft cap (15), thrust bearing stud (17), and spring washers (31) for the lower plug shaft. Note and stack the spring washers in the correct orientation as shown in Figure 4 below.

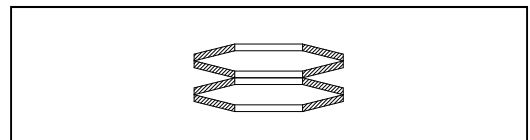


FIGURE 4. SPRING WASHER STACK ORIENTATION

VAL-MATIC'S 3-WAY PLUG VALVE OPERATION, MAINTENANCE AND INSTALLATION

3. Sling and support rubbered plug (3) and insert into valve body being careful not to damage scratch, or mar the rubbered face. Guide the lower plug shaft through the lower Grit-Guard™ seal (10) and shaft bearing (6).
4. Lubricate and install thrust plate o-ring (33) into thrust plate (18) groove. Thread thrust plate (18) counter clockwise onto thrust stud (17). (Note: These are left hand threads.) Install thrust plate bolts (19) and washers (20). Turn thrust stud (17) counter clockwise to lift the plug (3) slightly off the body (1) seats.
5. Place a 0.003" thick shim between plug (3) face and the body (1) seat from the top of the valve. Turn the thrust bearing stud (17) clockwise until the shim is held tightly against the body seat, but do not over-tighten. Remove the shim and turn the thrust bearing stud (17) ¼ turn. Install hex nut (12) on the thrust bearing stud (17). Tighten hex nut (12) against the thrust plate (18). This is a jam nut and should be a snug fit without over-tightening.
6. Install the lock cap bolt, washers, lock cap, and lubricated lock cap o-ring (24, 25, 21, & 32) from bottom valve trunnion.
7. Install the lubricated upper Grit-Guard™ seal (10) and shaft bearing (6) in the cover (2).
8. Install the cover bolts and washers (4 & 5) on the cover (2). The cover bolt torque from Table 4 should be applied in several graduated steps using the cross-over bolt tightening method to load the bolts evenly to eliminate concentrated stresses which could fracture or crack the valve's cover flange.

Table 4. Cover Bolt Torque		
Valve <u>Size</u>	Bolt <u>Size</u>	Torque <u>(ft-lbs)</u>
4"-6"	½"	75
8"	5/8"	125
10"-12"	¾"	200

9. Install bonnet, bonnet bolts and washers (11, 13, & 14). The bonnet bolt torque from Table 5 should be applied in several graduated steps using the cross-over bolt tightening method to load the bolts evenly to eliminate concentrated stresses which could fracture or crack the valve's bonnet flange.

Table 5. Bonnet Bolt Torque		
Valve <u>Size</u>	Bolt <u>Size</u>	Torque <u>(ft-lbs)</u>
4"-6"	½"	75
8"-12"	5/8"	125

10. Install actuator key, actuator studs, actuator, and actuator nuts. The actuator nut torque from Table 6 should be applied in several graduated steps using the cross-over bolt tightening method to load the bolts evenly to eliminate concentrated stresses which could fracture or crack the valve's bonnet flange.

Table 6. Actuator Nut Torque		
Valve <u>Size</u>	Bolt <u>Size</u>	Torque <u>(ft-lbs)</u>
4"	½"	75
6"- 8"	¾"	200
10"-12"	5/8"	125

11. Pressure test the valve if possible. If necessary, remove the lock cap bolt, washers, lock cap, and lock cap o-ring (24, 25, 21, & 32) from bottom valve trunnion and adjust thrust bearing stud until leak tight.

VAL-MATIC'S 3-WAY PLUG VALVE OPERATION, MAINTENANCE AND INSTALLATION

PARTS AND SERVICE

Parts and service are available from your local representative or the factory. Make note of the valve Model No. and Working Pressure located on the valve nameplate and contact:

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A sales representative will quote prices for parts or arrange for service as needed.

LIMITED WARRANTY

All products are warranted to be free of defects in material and workmanship for a period of one year from the date of shipment, subject to the limitations below.

If the purchaser believes a product is defective, the purchaser shall: (a) Notify the manufacturer, state the alleged defect and request permission to return the product; (b) if permission is given, return the product with transportation prepaid. If the product is accepted for return and found to be defective, the manufacturer will, at his discretion, either repair or replace the product, f.o.b. factory, within 60 days of receipt, or refund the purchase price. Other than to repair, replace or refund as described above, purchaser agrees that manufacturer shall not be liable for any loss, costs, expenses or damages of any kind arising out of the product, its use, installation or replacement, labeling, instructions, information or technical data of any kind, description of product use, sample or model, warnings or lack of any of the foregoing. NO OTHER WARRANTIES, WRITTEN OR ORAL, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, ARE MADE OR AUTHORIZED. NO AFFIRMATION OF FACT, PROMISE, DESCRIPTION OF PRODUCT OF USE OR SAMPLE OR MODEL SHALL CREATE ANY WARRANTY FROM MANUFACTURER, UNLESS SIGNED BY THE PRESIDENT OF THE MANUFACTURER. These products are not manufactured, sold or intended for personal, family or household purposes.



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