



TIANSHENG VALVE GROUP CO.,LTD

Document No. TSV.18.001-06

INSTRUCTION OPERATION MANUAL FOR BUTTERFLY VALVES





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1. Forewords

- 1.1.** The butterfly valves described in this manual have been designed for bubble-tight sealing up to rated pressure and are capable of throttling service. They are easily adapted to automatic actuators.
- 1.2.** TSV butterfly valves are available in flange, lug and wafer style and are designed with following features:
- The face to face dimensions are provided in accordance with ASME B16.10.
 - Provisions to connect with actuator are provided in accordance with ISO standard.
 - The retainer and seat are positioned free from any other obstacles such as mating flange for constant torque.
 - The parts are interchangeable each other for easy maintenance.

2. Transportation and Storage

2.1. Transportation

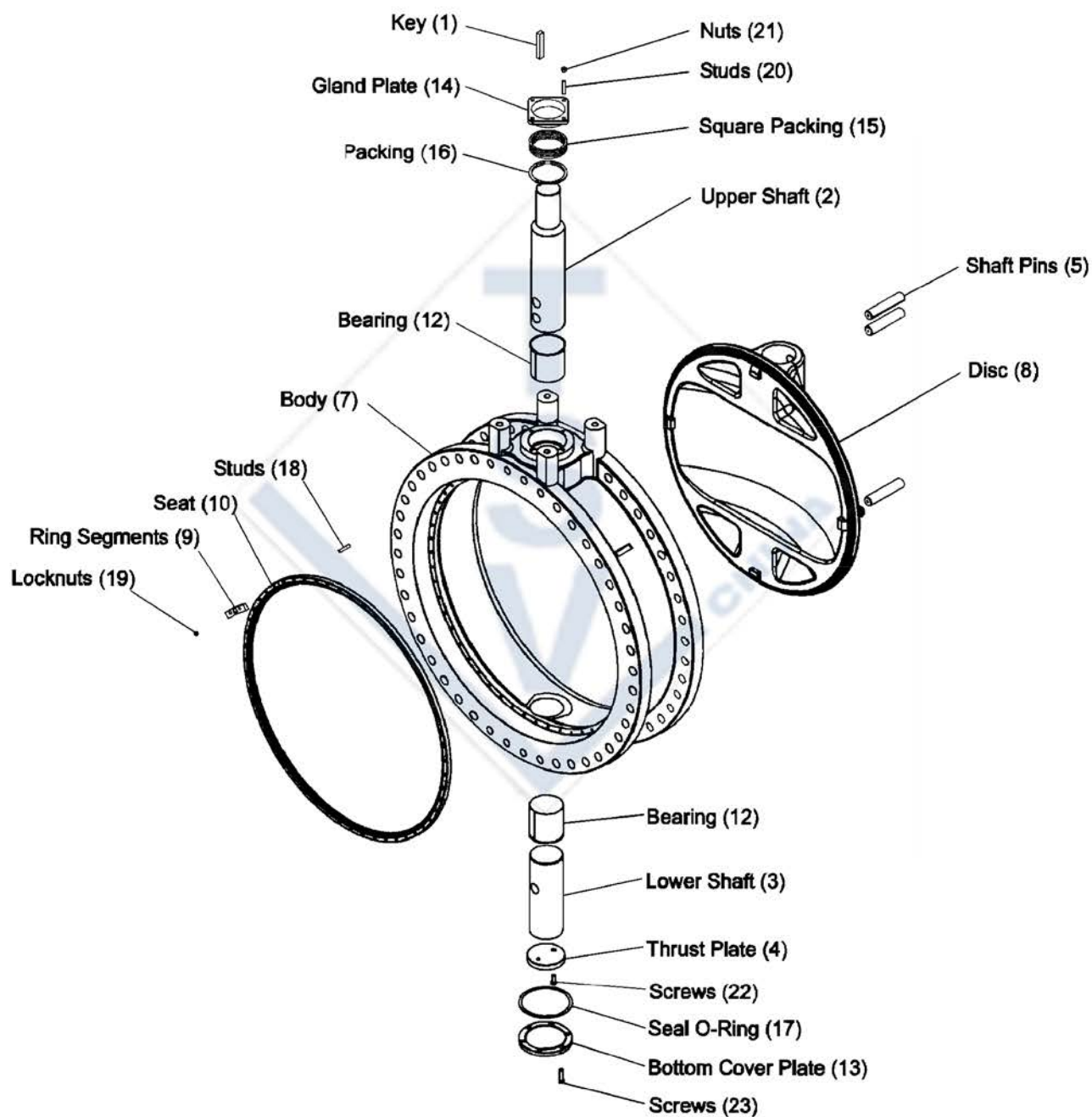
- 2.1.1.** TSV butterfly valves are individually boxed thru the 12" size. The 14" through 60" butterfly valves are shipped individually with the faces covered using cardboard or plywood to protect the flange sealing surfaces.
- 2.1.2.** The disc is shipped in the nearly closed position to protect the sealing edge and prevents the liner from taking a temporary set. The stem bushings and disc edge have been coated with a factory-applied lubricant to prolong storage and service life.
- 2.1.3.** Valves may be shipped or stored in any position.

2.2. Storage

- 2.2.1.** When storing the unit in unpacked conditions, take care so that no dust, dirt or oil-intrudes into the unit.
- 2.2.2.** When storing the unit either temporarily or for a long period of time, avoid direct sunlight. Always store the unit in a dry place indoors and flange sealing surface protected.
- 2.2.3.** Long-time-stored valve shall be re-inspected prior to use. Close attention shall be paid against sealing damage when removal of dirties for the cleanness of sealing surface. Of necessary, valve shall be pressure tested once more.



3. Butterfly Valve Construction



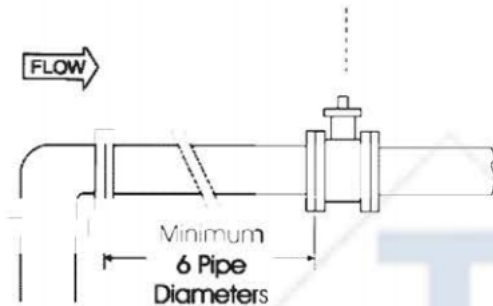


4. Installation Guidelines

4.1. General

4.1.1. Valves can be installed in the pipeline in any position.

4.1.2. Butterfly valves should be installed a minimum of six (6) pipe diameters from other line components.



4.1.3. Before beginning installation, disc/pipe clearance should be checked to avoid the possibility of scraping the disc edge on the pipe ID and damaging the sealing surface. Minimum pipe ID requirements are shown below in Table 1.

TABLE 1 - Piping/Flange Inside Diameter Requirements

Valve Size	Minimum Pipe/Flange ID for Disc Clearance	Maximum Pipe/Flange ID for Proper Seal	Minimum Pipe/Flange ID for Disc Clearance	Maximum Pipe/Flange ID for Proper Seal	Minimum Pipe/Flange ID for Disc Clearance	Maximum Pipe/Flange ID for Proper Seal
2"	2.00	2.49	1.31	2.43	1.38	2.24
2-1/2"	2.37	2.86	1.89	3.06	1.95	2.74
3"	2.67	3.43	2.64	3.65	2.66	3.33
4"	3.69	4.55	3.67	4.75	3.67	4.55
5"	4.76	5.62	4.44	5.54	4.48	5.50
6"	5.96	6.62	5.96	6.84	5.96	6.66
8"	8.01	8.62	7.85	8.89	7.85	8.61
10"	10.00	10.80	9.73	10.70	9.76	10.75
12"	11.99	13.12	11.71	12.74	11.72	12.79
14"	13.16	13.77	13.02	15.50	—	—
16"	15.34	16.30	15.20	17.90	—	—
18"	17.23	18.31	17.16	19.67	—	—
20"	19.04	20.08	19.10	21.05	—	—
24"	23.05	24.71	23.04	25.57	—	—
28"	—	—	27.10	29.31	—	—
30"	29.06	30.29	29.08	31.28	—	—
32"	—	—	30.91	33.93	—	—
36"	33.59	35.78	33.60	36.77	—	—
42"	39.83	42.77	39.87	44.96	—	—
48"	44.85	48.27	44.86	51.57	—	—
54"	—	—	50.67	54.25	—	—
60"	—	—	54.93	60.25	—	—



- 4.1.4. Before installing valves, the pipeline must be cleaned from dirt and welding residues, otherwise seat may be damaged.
- 4.1.5. Also, the pipeline must be free from tension and electric current.
- 4.1.6. When handling valves, be careful to avoid contact with or impact by other equipment, vault walls or trench walls.
- 4.1.7. Check carefully to see if valve seat/disc surface as well as flange are all clean.
- 4.1.8. Tighten again, if any, all bolts loosened during transport and/or handling.
- 4.1.9. Open and close valves to check for proper operation.
- 4.1.10. If possible, install valves in the direction of arrow mark on it for easy access and maintenance.
- 4.1.11. Do not use valve as a substitute for jack when putting pipes alignment.
- 4.1.12. The span of pipeline having connection between valve and pipe should be free from such excessive loading as may cause serious bending.
- 4.1.13. Do not weld the piping around the valve area under the condition that the valve is installed.

4.2. Installation on the existing pipeline

- 4.2.1. Verify the distance between two flanges to be equal to face to face valve dimension.
- 4.2.2. In order to facilitate installation of the valve, allow with adequate tools a sufficient room in between flanges.
- 4.2.3. Insert at least two flange-bolts through the two bottom pipe flange holes to rest valve on during installation.
- 4.2.4. Close valve disc partially so that disc edge is at least 10mm within the body.
- 4.2.5. Insert valve in between flanges. Flange gaskets should be positioned and aligned with valve bore.
- 4.2.6. Secure the valve between flanges using desired bolts or studs as listed in Table 3.
- 4.2.7. Valve will be held by the two flange-bolts previously fitted in the lower part of flanges.
- 4.2.8. Insert the flange-bolt through centering lugs/tapped holes of valve.
- 4.2.9. Insert the remaining flange-bolts aligning the valve with the flanges and tightening bolts manually.



4.2.10. Maintain the valve aligned, remove flange spreaders gradually and tighten bolts partially.

4.2.11. Adjust open and close operation of valve to be easy and smooth.

4.2.12. Open the valve complete and close tight the bolts to adequate torque listed in Table 2 below.

Installation of lug type butterfly valves has same procedure of wafer type using studs instead of bolts and nuts.

4.3. Installation in new pipeline

4.3.1. Shut valve disc partially until disc profile is at least 10mm within the body.

4.3.2. Align the two flanges with the valve body.

4.3.3. Flange gaskets should be positioned and aligned with valve bore.

4.3.4. Span the body with some flange-bolts and tighten the bolts partially. Finish tightening by uniform cross bolting.

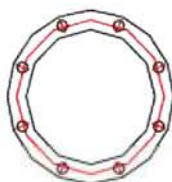
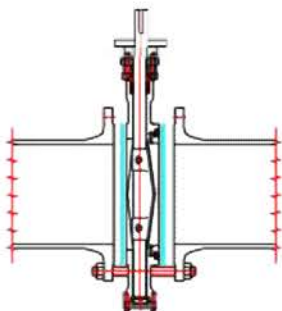
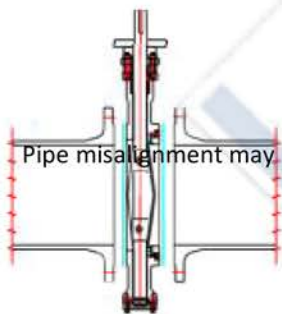
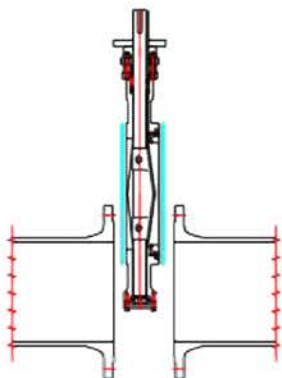
4.3.5. Use the flange-valve-flange unit for pipe centering.

4.3.6. Install the valve following the installation instruction on existing pipeline.



4.4. Correct Installation

Correct Installation



3.4.1. Spread flange enough to allow the valves with disc in semi-closed position.

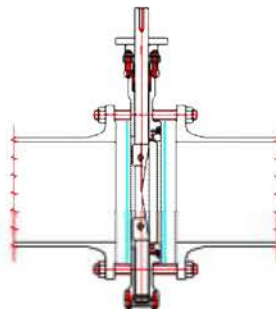
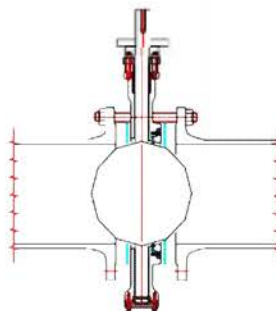
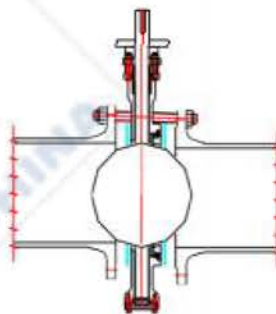
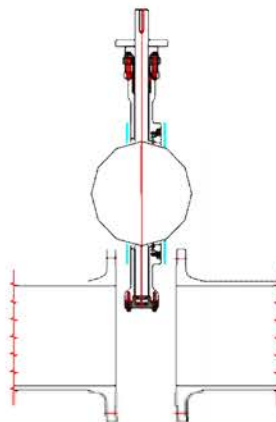
This prevents the damage of disc and seat during installation.

3.4.2. Flange gaskets should be positioned aligned with valve bore. cause interference between disc edge and flange face, creating leakage and excessive torque to open valve.

3.4.3. Insert bolts through the two bottom pipe flange holes to rest valves on during installation. Disc should not be in full open position after flange alignment and before evenly tightening flange bolts.

3.4.4. Tighten the flange bolts evenly to prevent the leakage between flange and valve.

Incorrect Installation





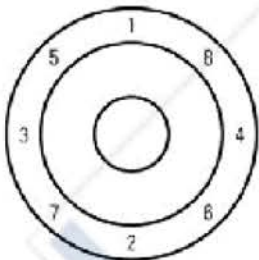
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TABLE 2 - Recommended Bolt Tightening Torques

Flange Size	Bolt Size	Minimum Bolt Torque (ft./lbs.)	Maximum Bolt Torque (ft./lbs.)
2" – 4"	5/8"	20	70
5" – 8"	3/4"	30	120
10" and 12"	7/8"	50	200
14" and 16"	1"	70	240
18" and 20"	1-1/8"	100	380
24" – 30"	1-1/4"	140	520
32" – 48"	1-1/2"	200	800
54" – 60"	1-3/4"	350	1800

BOLT
TIGHTENING
CROSS-OVER
PATTERN



SUGGESTED BOLTING METHODS



WAFER
STYLE



LUG
STYLE



LUG
STYLE



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TABLE 2 - Recommended Bolt Lengths

Valve Size	Total Valve Body Width (in)	Cap Screw Length (Lugged Valves) (in)	Bolt Length (Wafer Valves) (in)	Total Quantity Cap Screw/Bolts (To mount 2 flanges)	Cap Screw Size (in)
2"	1.69	1.25	4.00	8/4	5/8 – 11 UNC
		1.50	4.00	8/4	
2-1/2"	1.81	1.50	5.00	8/4	5/8 – 11 UNC
		1.75	5.00	8/4	
3"	1.81	1.50	5.00	8/4	5/8 – 11 UNC
		1.75	5.00	8/4	
4"	2.06	1.75	5.00	16/8	5/8 – 11 UNC
5"	2.19	1.75	5.00	16/8	3/4 – 10 UNC
6"	2.19	2.00	6.00	16/8	3/4 – 10 UNC
8"	2.38	2.25	6.00	16/8	3/4 – 10 UNC
10"	2.69	2.25	7.00	24/12	7/8 – 9 UNC
12"	3.00	2.50	7.00	24/12	7/8 – 9 UNC
14"	3.01	2.50	7.00	24/12	1 – 8 UNC
16"	3.38	3.00	8.00	32/16	1 – 8 UNC
18"	4.12	3.00	9.00	32/16	1-1/8 – 7 UNC
20"	5.14	3.50	10.00	40/20	1-1/8 – 7 UNC
24"	5.98	4.00	11.00	40/20	1-1/4 – 7 UNC
28"	6.42	—	—	56	1-1/4 – 7 UNC
		4.00	—	56	
		4.00	—	56	
		5.00	—	56	
30"	6.57	3.50	—	56	1-1/4 – 7 UNC
		3.00	—	56	
		3.50	—	56	
		4.25	—	56	
32"	7.40	—	—	56	1-1/2 – 6 UNC
		4.00	—	56	
		4.00	—	56	
		5.00	—	56	
36"	8.00	4.00	—	64	1-1/2 – 6 UNC
		3.50	—	64	
		4.00	—	64	
		5.00	—	64	
42"	9.88	4.50	—	72	1-1/2 – 6 UNC
		4.00	—	72	
		4.50	—	72	
		5.50	—	72	
48"	10.87	4.50	—	88	1-1/2 – 6 UNC
		4.50	—	88	
		5.00	—	88	
		6.00	—	88	
54"	15.00	7.00	—	88	1-3/4 – 5 UNC
		7.00	—	88	
		7.50	—	88	
		8.50	—	88	
58"	15.00	7.00	—	104	1-3/4 – 5 UNC
		7.00	—	104	
		8.00	—	104	
		9.00	—	104	



5. Operation

TSV Butterfly Valves should never be operated without a handle or other means of controlling the disc.

Caution: Failure to restrain the disc under flow conditions can result in the disc slamming closed and possible damage or broken parts.

2" through 12" valves have flats on the upper stem. 14" and larger valves have a single square key. Stem flats or the square key indicate valve position. When they are in line with the flow stream, the valve is open. When perpendicular, the valve is closed.

5.1. Manually Operated

DTSV Butterfly Valves operate from fully-open to fully-closed by a 90° turn of the handle. The handle is marked with a flow arrow. When this arrow is in line with the pipe axis, the valve is open (Figure 1). When perpendicular to the pipe, the valve is closed (Figure 2).

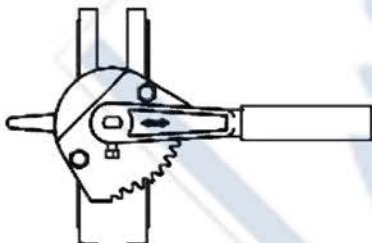


Figure 1 – Valve Shown Open



Figure 12 – Valve Shown Closed



5.2. Worm Gear Operated

Worm gear operators are recommended for valves larger than 6 inches. Clockwise rotation of the handwheel closes the butterfly valve. Counterclockwise rotation opens the valve.

Gear operators are always mounted with the input shaft perpendicular to the pipe axis for handwheel clearance. Each operator has an arrow on the top of the gear, which indicates the "OPEN - CLOSED" position of the valve (Figure 3).

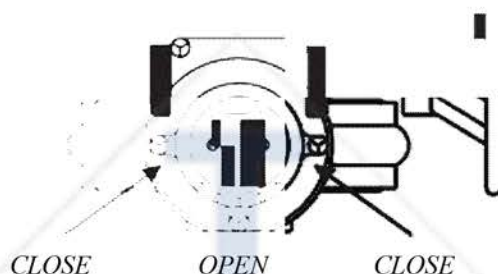


Figure 3 – Valve with Gear Operator

5.3. Automatic Valves

Butterfly valves with their quarter turn operation are easily adapted to automatic actuators for remote operation. To prevent water hammer, actuators should close the valve slower than 6 to 8 seconds, open-to-close. Rapid closure causes water hammer which can break or otherwise damage valve parts.

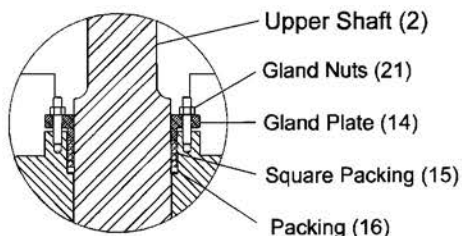


6. Maintenance

6.1. Maintenance and Repair

6.1.1. Lubrication: No routine lubrication is required. The bushings are permanently lubricated. Silicone grease is required during seat replacement.

6.1.2. Replacement of Packing



- Remove the gland nuts (21) and slide the gland plate (14) up along the upper shaft (2).
- Carefully remove the old packing rings.
- Install the new packing (16).
- Install new square packing (15), alternating the packing joints on opposite sides of the shaft.
- Replace the gland plate (14) and gland nuts (21), tightening evenly until the packing is compressed about 1 mm. At this point, you may pressurize the valve and tighten the packing gland until leakage stops.

CAUTION: Do not over-tighten the packing gland nuts. Doing so will increase torque and may cause premature seal failure.

6.1.3. Seat Replacement (See Butterfly Valve Construction Figure)

The seat (10) may be replaced with the valve open or closed and while the valve is in the pipeline.

- Remove the locknuts (19) and ring segments (9) from studs (18). A box or open-end wrench is required if the valve is in the pipeline.
- Remove the old seat (10) off of the studs (18) with a screwdriver or similar tool. Take care not to damage the disc (8) seating edge.
- Install the replacement seat (10) over the studs (18) with the beveled base toward the ring segments (9).
- Replace ring segments (9) and install locknuts (19).

6.1.4. Shaft Bearing Replacement (See Butterfly Valve Construction Figure)

The valve must be oriented with the stem in the vertical position and the disc open in order to remove the bearings.

Top Shaft Bearing

- Remove actuator. Remove nuts (21), and slide gland plate (14) off the upper shaft (2).



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- Pry out old square packing (15) and remove packing (16).
- Using a dental pick or similar tool, catch the lip of the bearing (12) and lift while working the bearing out. The bearing may be pushed out from inside the valve to facilitate reaching under the bearing lip.
- Slide the replacement bearing (12) in place.
- Replace packing (16), square packing (15), and gland plate (14) as described for replacement of packing.

Bottom Shaft Bearing

- Remove screws (23), bottom cover (13) and seal o-ring (17).
- Remove screws (22) holding the thrust plate (4) to the lower shaft (3).
- Using a dental pick or similar tool, catch the lip of the bearing (12) and lift while working the bearing out. The bearing may be pushed out from inside the valve to facilitate reaching under the bearing lip.
- Slide the replacement bearing (12) in place.
- Fasten thrust plate (4) to the lower shaft (3) with screws (22).
- Replace seal o-ring (17) with a new one and secure the bottom cover plate (13) with screws (23).



6.2. Troubleshooting

TABLE 4 - Troubleshooting

Trouble	Probable Cause	Remedy
The valve will not seal properly	The seat and/or disc is worn or damaged	Replace worn parts
	Foreign matter is present between seat and disc	Operate several times to wipe clean
	Operator stops are not set properly	Adjust stops to proper setting
The valve is hard to operate	Build-up of solids or roughness on edge of disc	Operate several times to wipe clean or disassemble valve and clean disc edge
	Operator is not installed properly	Reinstall operator in proper alignment with valve stem
The valve will not open	Disc hits on side of pipe	Check for proper pipe clearance
The valve is leaking around stem	Seat is damaged or worn	Replace Seat
	Disc is bent	Replace disc, stems and seat as required
	Flange seal is leaking	Correct flange seal leak to prevent fluid from migrating behind seat and out stem
The valve closes with line flow	Handle or actuator does not provide proper restraint	Restrain disc with handle or actuator
	Line flow too great	Choose larger valve or slow down flow
Flange leaks	Flange seal surface on seat is damaged	Replace seat
	Flange surfaces are damaged or corroded	Clean, repair or replace flanges
	Flange bore is too large	Replace with proper flanges
Clockwise rotation of Gear Operator handwheel opens valve. Open-Shut indicators do not coincide with valve disc position	Gear operator has been rotated 90° on valve top. Handwheel shaft aligns with pipe (should be perpendicular)	Rotate gear operator 90° on valve top to put input shaft perpendicular with pipe axis
Automatic actuator slams valve shut or open	Speed control valves missing or not adjusted	Install and/or adjust speed control valves
Hard, soft or cracked seat damage is present	Heat or chemical damage to seat	Replace elastomer seat with compatible material and/or correct offending fluid conditions



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7. Contact

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