LADISH VALVES

INSTALLATION, OPERATION, MAINTENANCE MANUAL

MANUALLY OPERATED GATE, GLOBE, SWING CHECK AND LIFT CHECK VALVES

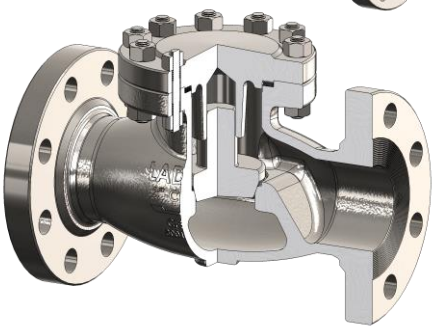

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Table of Contents

List of Figures

List of Tables

CHAPTER 1 – DESCRIPTION AND OPERATION

1.1 General

This manual contains maintenance instructions together with pertinent illustrations for servicing corrosion resistant steel alloy, manually operated gate, globe, and swing check valves. This manual is divided into two chapters; the first covering general information pertaining to the types of valves included; the second covering maintenance and service instructions for each group of valves in separate sections.

1.2 Descriptions

NOTE: Gate and globe valves may be supplied with PTFE gaskets and packing. Check valves may be supplied with PTFE gaskets. Ladish recommends not using PTFE in service temperatures exceeding 450°F.

Gate Valves. (See Figure 2) The manually operated gate valves covered by this manual are of the bolted bonnet type, having either a split disc or a flexible or a solid wedge design depending on the size and pressure class.

Globe Valves. (See Figure 3) The manually operated globe valves covered by this manual are of the bolted type bonnet, having plug type swivel disc and rotating stem with a rising handwheel.

Swing Check Valves. (See Figure 4 & 5) The self actuated swing check valves covered by this manual are of the bolted cover type, the clapper arm and the disc being suspended from the cover.

Lift Check Valves. (See Figure 6) The self actuated lift check valve covered by this manual are of the bolted cover type, with a guided disc.

Most check valves are allowed to have some leakage, according to API 598. Therefore, never rely on a swing check valve as a positive stop valve.

1.3 Packaging

Gate and Globe Valves. Gate and globe valves are shipped in the closed position to prevent damage to the seating surface during handling and shipping and should be maintained in the closed position until they are installed. No internal blocking is used on the gate and globe valves.

Swing Check Valves. The valves maybe shipped with the clapper arm and the disc blocked during handling and shipping.

CAUTION: The blocking must be removed through the valve waterway prior to installation.

Lift Check Valves. No internal blocking is used on lift check valves.

1.4 Installation

Preparation for Installation. It is highly recommended that before you install a valve, you inspect the valve and determine that it is in a satisfactory condition. Some suggested items to look for are:

1. Verify the identification plate is valid for the intended service.
2. Remove the end caps and ensure that the valve is reasonably clean and free of foreign material.
3. Open and close the valve to ensure that no damage has occurred in transporting the valve.

Prior to installing the valve, clean out the dirt and foreign matter from inside the piping system.

Check for adequate clearance around the valve to ensure that it may be operated properly and that enough free space is available for maintenance of the valve.

The valve body is a rugged structure but it is not intended to be a means for aligning improperly fitted pipe. Care must be taken to ensure that any stressed caused by the improper pipe alignment are relieved elsewhere in the piping system. The valves should be supported, as necessary, to prevent unnecessary stresses induced by the connecting piping.

Installation. The following general rules should be followed when installing the valve in the pipeline.

1. Keep pipe ends free of dirt, spatter or grit. Check for any damage on the raised faces, threaded ends or socket weld ends depending on the end connection procured.
2. Handle the valve only with apparatus that will adequately support it using safe and proper technique.
3. Install the valve using good piping practices (included the ones listed in the Manufacturers Standardization Society of the Valve and Fitting Industry Standard Practice MSS-SP-92 and as governed by applicable Industry Codes and Specifications. Assure that all bolting or welding (including preheat and post-weld heat treatment) associated with the installation of the valve in the piping system is in compliance with applicable codes and standards.

Gate and Globe Valves. The preferred installation for the gate and globe valves is with the valve in a horizontal line with the handwheel positioned vertically above the valve's centerline. When the stem points downward the bonnet acts as a pocket for debris and other foreign material in the line. Such material may interfere with the valve operation. Do not use split disc gate valves for steam service because the velocity will vibrate the disc and cause premature wear.

CAUTION: Split disc gate valves should never be installed with the stem pointed down because the weight of the disc will cause them to spread prematurely. This premature spread may not allow the disc to fully seat.

Globe Valves are marked with either bridge wall markings, or flow arrows, because it is recommended that the valves be installed with the flow pressure under the disc. However, depending on your application, they may be installed with flow pressure over the disc.

CAUTION: For Cryogenic application; For gas service, valve stem can be oriented at or above the horizontal position. For liquid service, valve stem can be at or above 45 degrees above the horizontal position.

Swing Check Valves. Swing check valves are normally used to prevent flow reversal. Since check valves have an allowable leakage rate per API 598, they are normally used in conjunction with gate valves which provides the positive stoppage of flow. The swing check valves can be installed in either horizontal lines or in vertical lines as required. When the valve is installed in the horizontal line, the valve cover must be up; when the valve is installed in a vertical line or for any angle from horizontal to vertical, they must be installed for upward flow only.

CAUTION: Flow through a swing check valve must open the disc to its full and stable position. Problems involving excessive wear of internal components, noisy operation, or premature failure can occur from the use of check valves which are not in their fully open and stable position.

Swing check valves should not be installed immediately after pump discharges, elbows, tees, pulsation dampeners, or throttling valves, because the turbulence may cause disc motion and excessive wear or premature failure.

NOTE: A generally accepted practice is to install check valves a minimum of five times the pipe diameter away from pumps, elbows, tees, pulsation dampeners, or throttling valves.

A swing check valve should not immediately discharge into a tee or elbow.

Lift Check Valves. Lift check valves, like all other check valves are designed to prevent back flow, and operate automatically to increases or decreases in line pressures. Generally, lift check valves are used in conjunction with globe valves, both of which have high flow resistance. The lift check can be installed either horizontal or vertical, but must be spring assisted if installed in a vertical line. If installed in a vertical line, the flow should be in an upward flow only. Lift check valves are unidirectional valves. The body of a lift check will be marked with a flow arrow showing the direction the direction of flow. The valve must be installed with the proper orientation for the valve to perform successfully.

CAUTION: Lift check valves must be spring assisted if used in a vertical flow line. Always make sure the flow in is proper orientation with the flow arrow on the valve body.

1.5 Operation

CAUTION: Wrenches should not be used with caution in the opening and closing of valves. This procedure can be dangerous as well as damaging the valve disc due to overloading of the stem and disc. In some case, disc and stem separation has resulted or permanent distortion of the disc making the valve inoperable.

Gate Valves. Opening and closing the gate valve is accomplished by operating the valve handwheel as desired. The gate valve disc moves down against or up and away from the seating surfaces in the valve body as the handwheel is rotated. The gate valve should not be used for the throttling purposes and should be operated only in the fully open or fully closed positions as erosion of the discs and seating surfaces, and stem "t-head" damage would result if the valve were operated in the partially open position.

NOTE: Cryogenic Gate valves have a relief hole on the wedge to allow the relief of pressures above normal working pressure due to thermal expansions of liquid build ups in trapped cavities back upstream. For that matter, they are marked with a unidirectional flow arrow on the valve body.

Globe Valves. Opening and closing of the globe valve is accomplished by operating the valve handwheel as desired.

The swivel disc and stem move down against or up away from the seating surface in the body. The globe valve can be used for throttling purposes as well as on-off services. Since closure is accomplished by forcing the disc against the stream rather than across it, problems of chatter, erosion, and excessive wear are minimized. In addition, the short travel of the disc allows for fast closing time.

Swing Check Valves. Operation of the swing check valve to the open position is accomplished by self-actuating from line pressure against the disc. As line pressure diminishes, the weight of the disc causes the valve to close. The swing check valve operates primarily to prevent any reversal of flow in the installation.

Lift Check Valves. Operation of the lift check valve, like other check valves, is accomplished automatically according to increases or decreases in line pressure. As the line pressure increases, the disc lifts to its highest position, and consequently as the pressure decreases, the disc lowers onto the seat, causing the valve to close. If the valve is spring loaded, depending on the size of the spring, the pressure to crack open the valve may be slightly more than if the valve

did not have a spring. The spring provides a security factor in assuring that the disc will close quicker, due to the force of the spring.

1.6 Torque Application on Reassembly

A. Preparation. Identify what type of bolts were provided with the valve. Clean all bolts and nuts with solvent, rinse in demineralized water and dry with clean, lint-free cloths. Visually inspect all threads to insure removal of all foreign material, corrosion products, burrs and previous lubrication. Lubricate all thread contact areas and nut facings. The importance of proper lubrication cannot be overstated! A proper lubricant will provide a low coefficient of friction for more consistent achieved bolt stress. An anti-seize compound, when used as a bolt and nut lubricant, will facilitate subsequent disassembly. Using solvent and clean, lint-free wiping cloths, wipe off any excess lubricant that might adhere to the adjacent flange areas.

B. Tightening Procedure.

Observe the tightening sequences shown in Figure 1 and using a torque wrench tighten each bolt within the required range as listed by bolt type in Table 1. Ladish recommends the following steps for proper assembly:

1. Loosely install stud bolts. Referencing Figure 1, identify the proper bolting sequence and number bolts accordingly. Each bolt should be numbered so that bolt torque sequences can be easily followed.

   Failure to follow proper bolt torque sequences can result in cocking flanges. Then, regardless of the amount of subsequent torqueing, they cannot be brought back to parallel. This can contribute heavily to a leaky joint.

2. Torque the Bolts. Bolts should be torqued in a proper bolting sequence, in a minimum of four stages as specified in Steps 3, 4, 5, and 6.

3. Torque the bolts up to a maximum of 30% of the final torque value required following the recommended bolt torque sequence.

4. Repeat Step 3, increasing the torque to approximately 60% of the final torque required.

5. Repeat Step 3, increasing the torque to the final torque value.

6. Retorque all studs. All studs should be retorqued using a rotational pattern of retorqueing to the final value of torque until no further rotation of the nuts can be achieved. This may require several retorqueings as torqueing of one stud causes relaxation in adjacent studs. Continue torqueing until equilibrium has been achieved.

TABLE 1 – BOLT TORQUE VALUES

Table: Torque Table, Body Heavy Hex Bolt Torque Values, ft.lb (Lubricated Boltings)																
Bolt Size	B7 B16 L7		B7M L7M		B8 B8M Class 1 (Note 1)		B8 B8M Class 2		Gr.660 A & B		N08020 (Alloy 20)		N05500 (K-Monel)		N10276 (Hastelloy C)	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
1/4"-20 UNC	10.5	11.9	8.0	9.1	3.0	3.4	9.5	10.8	8.5	9.7	3.5	4.0	10.0	11.4	4.1	4.7
5/16"-18 UNC	20.9	23.7	15.9	18.1	6.0	6.8	18.9	21.5	16.9	19.2	7.0	7.9	19.9	22.6	8.2	9.3
3/8"-16 UNC	37	42	28	32	11	12	34	38	30	34	12	14	35	40	15	16
7/16"-14 UNC	58	66	44	50	17	19	53	60	47	53	19	22	55	63	23	26
1/2-"13 UNC	89	101	68	77	26	29	81	92	72	82	30	34	85	96	35	40
9/16"-12 UNC	127	144	97	109	36	41	115	130	103	116	42	48	121	137	49	56
5/8"-11 UNC	176	199	134	152	50	57	159	180	142	161	59	66	168	190	69	78
3/4"-10 UNC	310	351	236	268	89	100	281	318	251	285	103	117	295	335	121	137
7/8"-9 UNC	497	563	379	429	142	161	379	429	402	456	166	188	473	536	194	220
1"-8 UN	495	742	377	565	141	212	377	565	400	601	165	247	471	707	193	290
1 1/16"-8 UN	609	913	464	695	174	261	377	565	493	739	203	304	580	869	238	356
1 1/8"-8 UN	728	1,092	555	832	208	312	451	676	589	884	243	364	693	1,040	284	426
1 1/4"-8 UN	1,015	1,523	774	1,160	290	435	484	725	822	1,233	338	508	967	1,451	396	595
1 3/8"-8 UN	1,375	2,063	1,048	1,572	393	589	655	982	1,113	1,670	458	688	1,310	1,964	537	805
1 1/2"-8 UN	1,811	2,717	1,380	2,070	517	776	862	1,294	1,466	2,199	604	906	1,725	2,587	707	1,061
1 5/8"-8 UN	2,344	3,517	1,786	2,679	670	1,005	893	1,340	1,898	2,847	781	1,172	2,233	3,349	915	1,373
1 3/4"-8 UN	2,940	4,410	2,240	3,360	840	1,260	1,120	1,680	2,380	3,570	980	1,470	2,800	4,200	1,148	1,722
1 7/8"-8 UN	3,647	5,471	2,779	4,169	1,042	1,563	1,390	2,084	2,953	4,429	1,216	1,824	3,474	5,211	1,424	2,136
2"-8 UN	4,235	6,353	3,227	4,840	1,210	1,815	1,613	2,420	3,428	5,143	1,412	2,118	4,033	6,050	1,654	2,481
Notes	1. For oval bonnet design, published values are for sheet or corrugated gasket only.															
	2. Stud threads and nut bearing face must be lubricated with a heavy graphite and oil mixture.															
	3. Non-lubricated bolt has an efficiency of about 50 percent of a well lubricated bolt and also that different lubricants produce results varying between the limits of 50 and 100 percent of the tabulated values.															

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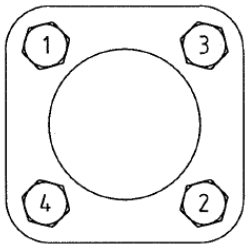
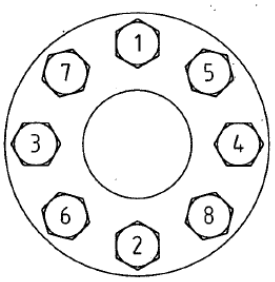
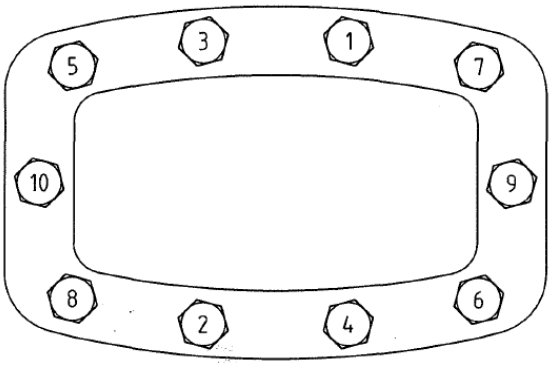
FIGURE 1 – BOLT TIGHTENING SEQUENCE



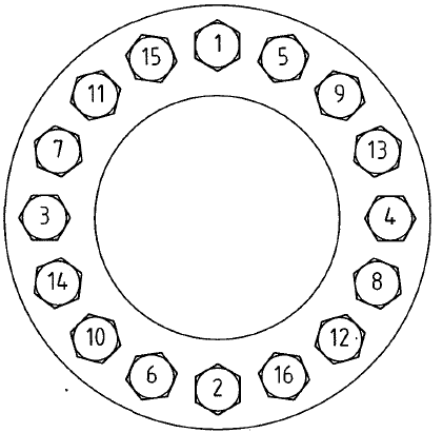
Small Valves



Small Valves



Large Valves - Oval Flange



Large Valves - Round Flange

CHAPTER 2 – MAINTENANCE

Section 1 GATE VALVES

2.1. General

Ladish Gate Valves are available in a variety of designs. Gate valves are furnished with round stem nuts with a keyway; hexagonal stem nuts with thrust washers; hexagonal stem nuts with yoke cap, and on larger sizes, with bevel gear operators. Valves will have either one piece bonnet/yoke, or as a two piece bonnet, 'if which has a bonnet and yoke arms. This section covers necessary maintenance instructions for manually operated gate valves, including routine maintenance, trouble shooting, disassembly, inspection, reassembly and recommended spare parts. Your maintenance function should develop procedures to ensure that the valve is maintained and in satisfactory and safe operating condition at all times.

CAUTION:
FACILITY DECONTAMINATION PROCEDURES SHOULD BE FOLLOWED PRIOR TO ANY MAINTENANCE

Before attempting any disassembly or packing replacement, the line should be depressurized to prevent possibility of personnel injury or equipment damage. As an added safeguard, the valve should be opened and the body relieved of any residual pressure.

2.2 Routine Maintenance

To ensure satisfactory valve operation, a routine maintenance check should be performed at regular intervals. The following actions are recommended:

1. Operate the valve through a complete cycle several times, checking for smoothness of action sand absence of any leakage.
2. Close the valve and check for leakage using a sonic leak detection device.
3. Lubricate the exposed threads of the stems of the manually operated gate valves.
4. Using a good grade of cup grease and a grease gun, apply the lubricant to the grease fitting on the yoke of the valves so equipped.
5. Check all the bonnet stud bolt nuts for proper torque values and tighten the nuts as necessary to meet requirements of Table 1.
6. Replace packing ring sets and the gasket if damaged or exposed to temperatures higher than maximum allowed.
7. Check the body and bonnet wall thickness using an Ultrasonic Thickness Tester. If under ASME B16.34 requirements, remove valve from service and either replace or repair, if economical.

2.3 Trouble Shooting

The following are the most common troubles experienced with gate valve operation together with the probable cause and recommended remedies. Observance of these procedures prior to valve disassembly will prevent unnecessary maintenance time and personnel involvement. Index numbers used in the listing refer to Figure 2 or 2A.

Trouble:
Leaking at the body/bonnet joint

Probable Cause:

1. Loose or improperly tightened bolt nuts (1).
2. Damaged or improperly seated gaskets (26).

Remedy:

1. Tighten nuts in accordance with Table 1 and Figure 1, observing the entire sequence of tightening.

NOTE: Tightening should be performed with the valve depressurized.

2. Break the body/bonnet joint and replace the gasket.

Trouble:
Leaking through valve seats.

Probable Cause:

Worn or damaged seating surfaces on disc (4 and 5) or solid wedge (6) and/or body (28).

Remedy:

Disassemble valve and inspect all seating surfaces for wear and mechanical damage. Polish minor damage. Remachine or replace components if damage is heavy.

Trouble:
Leaking at stuffing box

Probable Cause:

1. Loose or improperly tightened gland stud nuts (14).
2. Gland follower (17) improperly seated.
3. Corrosion or mechanical damage of stem (7) in stuffing box area.
4. Worn or damaged packing (25).

Remedy:

1. Tighten gland stud nuts, alternating at ¼ turns, to torque value of 15 to 30 ft/lbf or just enough to stop any leakage. Do not tighten nuts excessively.
2. Reposition gland follower on the packing rings. It may be necessary to replace or to install additional packing rings. If leakage continues, replace the packing.

CAUTION:
Ladish does not recommend the practice of back seating the valve and repacking the valve under pressure. In the event that the back seat fails to seal properly, a leak path to atmosphere is generated which constitutes a potential safety hazard to personnel.

3. Minor corrosion or damage of the stem can be polished out. Major damage necessitates stem replacement.

Trouble:
Rough or difficult valve operation.

Probable Cause:

1. Scored or otherwise damaged threads on the stem (7).
2. Damaged stem nut (13).
3. Excessively tight gland stud nuts (14).

Remedy:

1. Minor scoring or damage of the stem can be polished out. Major damage necessitates stem replacement.
2. Inspect stem nut (13) for damaged threads, galling or scoring. Polish out minor damage or replace the bushing for major damage.
3. Loosen gland stud nuts. Tighten gland stud nuts, alternating at ¼ turns, to torque value of 15 to 30 ft/lbf or just enough to stop any leakage. Do not tighten nuts excessively.

2.4 Disassembly

CAUTION: Before attempting any disassembly, the line should be depressurized to prevent possibility of personnel injury or equipment damage. As an added safeguard, the valve should be opened and the body relieved of any residual pressure.

All internal parts of the gate valve are made accessible by removal of the bolted bonnet (3) from the valves body (28). The two discs (4 and 5) of a split disc valve are actuated by the disc arm (8) on the end of the stem (7) and will be lifted out of the body (28) when the bonnet (3) is removed. The solid or flexible wedge (6) of a gate valve is actuated by a stem foot on the end of the stem and will be lifted out of the body when the bonnet is removed.

NOTE: Match – mark the bonnet flange and the body flange and disc to body before removing bonnet to ensure assembly of the parts in their original position.

CAUTION: Exercise care to prevent the disc or wedge from being dropped as they emerge from the valve body.

Disassemble the gate valve in accordance with the following procedure (See Figure 2 or 2A):

1. Operate the valve to approximately one-quarter of open position. Remove the bonnet stud nuts (1) and bonnet stud bolts (2) and lift the bonnet (3) of the body by raising the bonnet straight up. If required, use suitable hoist to lift the bonnet assembly.

CAUTION: Exercise care to prevent the discs (4) and (5) of a double disc gate valve or the solid wedge (6) from being disengaged from the stem (7) as the discs or wedge emerge from the body. This best accomplished on the double disc valve by taping the pair of discs together before lifting them clear of the body flange.

2. On split disc type valves, after the discs are lifted clear of the body, remove from the disc arm (8) and carefully lay aside disc. Although there is no preferred orientation of the disc assembly in the body, the disc is fitted to the valve, therefore the disc should be replaced in the body in the same position from which they are removed, unless the disc and the body seating surfaces are to be remachined. Remove and discard used gasket (26).

CAUTION: When working on unidirectional cryogenic valves with relief hole on the wedge, care should be taken to replace the wedge with the relief hole on the upstream side of the flow.

3. On the wedge type valves, keep the solid wedge (6) centered on the stem foot until the wedge is clear of the body flange; then slip the wedge off the stem foot and carefully lay aside. The wedge should be replaced in the body in the same orientation as it was originally placed. Remove and discard used gasket (26).

4. Loosen gland stud nuts (14) and gland eyebolt (15). Holding stem (7) so it does not rotate, turn the handwheel (11) in the direction to close the valve until the stem threads become disengaged from the threads of the yoke bushing (13). Remove the stem by pulling it down through the stuffing box.

5. Before removing the handwheel, determine which design of valve you have. Refer to Figure 2 or 2A to determine whether the stem nut is round with a keyway, hexagonal with a thrust washer, or hexagonal with a yoke cap. Loosen the set screw (9), then the stem nut lock nut (10). Remove the hand wheel (11), and the stem nut key (12); and thrust washer (13A) if so equipped. If the valve is equipped with a yoke cap (12), you must grind the tack weld first to be able to remove the yoke nut. This part will unthread from the yoke. The stem nut (13) will then be either withdrawn through the bottom of the yoke boss, or from the top of the yoke, depending on the design. Remove gland eyebolt nuts (14) and gland eyebolt (15) and remove gland yoke (16) and gland (17).

6. Remove the packing rings set (25).

2.5 Inspection

After disassembly of the gate valve, all parts should be inspected for evidence of wear, distortion or mechanical damage. Perform the inspection listed in Table 2 to ensure satisfactory operation of the affected parts.

TABLE 2 – GATE VALVE INSPECTION

Step	Part	Inspect For	Remarks
1	Body Seats	Evidence of wear or mechanical damage which could prevent tight sealing	Minor damage (less than .0005") such as can be corrected by lapping the seats with the body in the line. Major damage or wear will necessitate removal of the body from the line for replacement or remachining.
2	Disc or Wedge	Evidence of wear or mechanical damage to seating surface	Minor damage (less than .0005") such as out-of-flatness, can be corrected by lapping the seating surfaces. Major damage or wear will require remachining of the seating surfaces and many require replacement of the disc or wedge to ensure fit.
3	Stem Assembly	Evidence of wear or mechanical damage on stem area which passes through packing rings. Evidence of wear on stem threads	Remove minor damage by polishing; Major damage will require stem replacement. Replace stem assembly if wear is excessive
4	Yoke Bushing	Evidence of wear on the stem thread on the I.D., O.D. and shoulder of bushing	Replace Yoke bushing if wear is evident
5	Yoke Ends	Evidence of wear or roughness in bushing bore and adjacent machined areas	Remove minor damage by polishing and major damage will require remachining or replacement of yoke
6	Handwheel	Evidence of wear on underside surface which runs against yoke end	Remove minor wear by polishing or remachining. Replace handwheel if extensive wear is evident
7	Gland Follower	Evidence of wear or roughness on I.D.	Polish worn or rough areas or replace gland follower

2.6 Reassembly

Reassembly of the gate valve is performed essentially in the reverse order of disassembly, observing the following special procedures. See Figure 2 or 2A for reference.

1. Lubricate both the ID and the OD of the stem nut (13) with good grade of cup grease. Install the stem nut in the bushing bore of the yoke (3) from the underside of the bore. Position the stem nut key (12) in the key slot in the stem nut sizes (2" and smaller), or thrust washer, if so equipped, and slide the hand wheel (11) over the key and the stem nut. Secure the hand wheel in the position with the stem nut lock nut (10) and tighten the nut with a wrench. Lock the stem nut lock nut in place by tightening the set screw with an Allen wrench. Make sure that the yoke cap if so equipped is tack welded in place after assembly to prevent it from loosening while the valve is in operation.

2. Install the stem (7) through the bonnet (3), pushing the stem through the stuffing box far enough so that the packing rings, gland follower, and gland flange can be place onto the stem in this order. Position the packing in the stuffing box. Gently push the stem all the way until the end of the stem meets the bottom of the yoke bushing (13). Turn the handwheel in the direction to open the valve to engage the stem thread in the yoke bushing; continue to turn the handwheel until the stem is approximately in the half open position

3. Slide the gland follower (17) and the gland flange (16) into place on top of the packing rings. Assemble the gland studs (15) through the gland flange into the yoke (20) and tighten the gland stud nuts (14) to a torque value of 15 to 30 ft/lb. In order to maintain even pulldown, you should alternate tightening at ¼ turn intervals.

   NOTE: Tighten gland stud nuts evenly to avoid forcing the gland flange against the stem.

4. Install the new gasket (26). Assemble two discs (4 and 5) to the disc arm (8) or solid wedge(6) to the stem foot on the stem, making certain to hold the parts in place while carefully lowering the bonnet (3) over the body. As the discs or solid wedge is lowered in the body, guides in the body will guide the discs or wedge to the seat.

   NOTE: Be certain that the disc or the wedge are installed in the same position as noted during disassembly.

5. Replace the bonnet stud bolts (2) through the bonnet and body flanges and assemble the bonnet stud bolt nuts (1) to both ends of the bolt studs. Tighten the nuts in the sequence shown in Figure 1 and to the torque values specified in Table 1.

2.7 Spare Parts

The packing rings (25) and gasket (26) are the only recommended spare parts for a standard valve.

FIGURE 2 – EXPLODED VIEW GATE VALVE

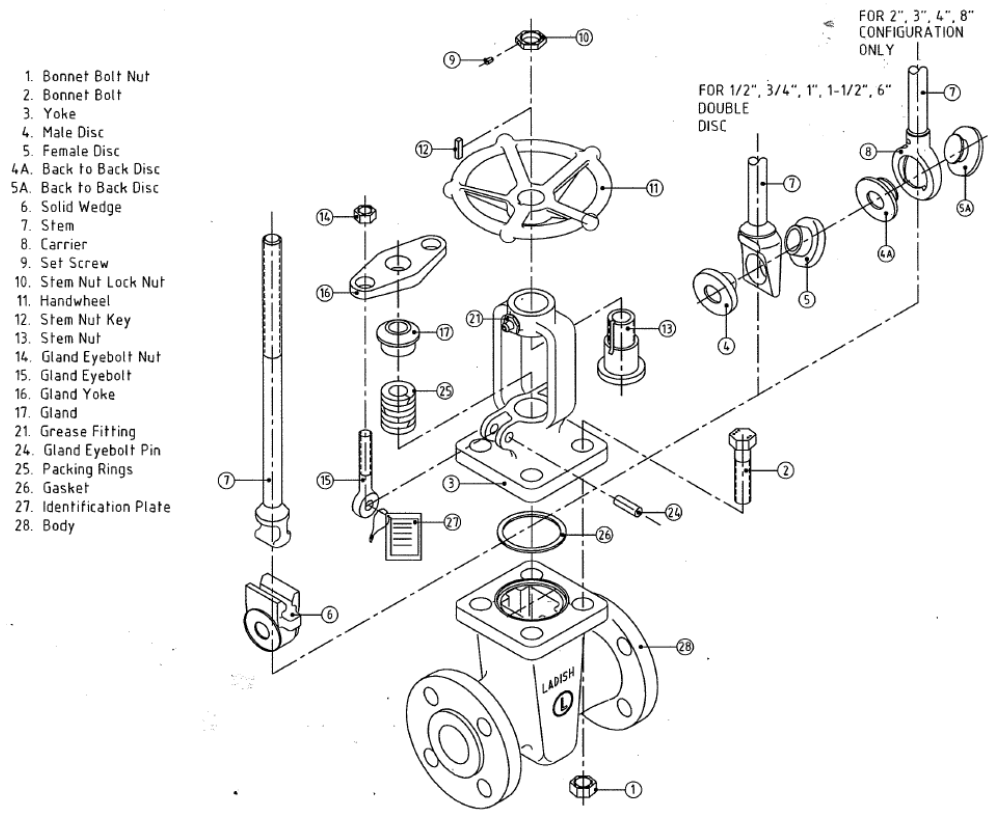
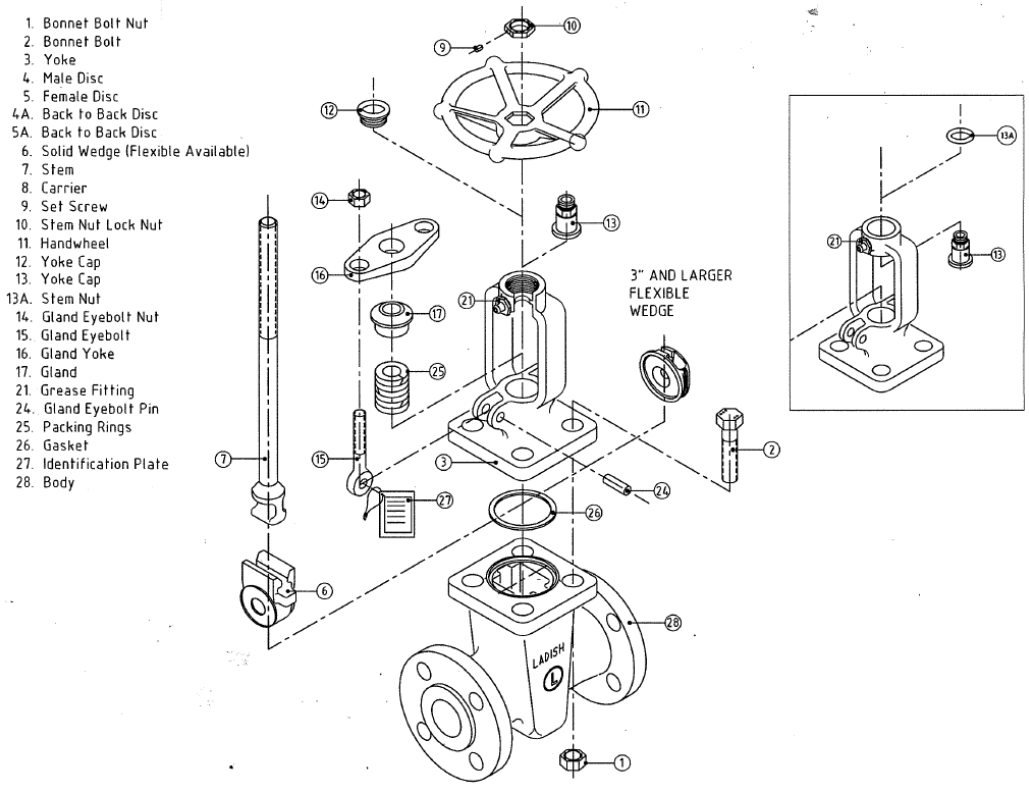


FIGURE 2A – EXPLODED VIEW GATE VALVE



Section 2. GLOBE VALVES

2.8 General

This section covers necessary maintenance instructions for Ladish manually operated globe valves, including routine maintenance, trouble shooting, disassembly, inspection, reassembly and recommended spare parts. Your maintenance function should develop procedures to ensure that the valve is maintained and in satisfactory and safe operating condition at all times.

CAUTION: FACILITY DECONTAMINATION PROCEDURES SHOULD BE FOLLOWED BEFORE ANY MAINTENANCE.

Before attempting any disassembly or packing replacement, the line should be depressurized to prevent possibility of personnel injury or equipment damage. As an added safeguard, the valve should be opened and the body relieved of any residual pressure

2.9 Routine Maintenance

To ensure satisfactory valve operation, a routine maintenance check should be performed at regular intervals. The following actions should be taken:

1. Operate the valve through a complete cycle several times, checking for smoothness of action sand absence of any leakage.
2. Close the valve and check for leakage using a sonic leak detection device.
3. Lubricate the exposed threads of the stems of the manually operated globe valves.
4. Check all the bonnet stud bolt nuts for proper torque values and tighten the nuts as necessary to meet requirements of Table 1.
5. Replace packing ring sets and the gasket if damaged or exposed to temperatures higher than maximum allowed.
6. Check the body and bonnet wall thickness using an Ultrasonic Thickness Tester. If under ASME B16.34 requirements, remove valve from service and either replace or repair, if economical.

2.10 Trouble Shooting

The following are common troubles of globe valve operations, together with the probable cause and recommended remedies. Observance of these procedures prior to valve disassembly will prevent unnecessary maintenance time and personnel involvement. Index numbers refer to Figure 3.

Trouble:
Leaking at the body/bonnet joint

Probable Cause:

1. Loose or improperly tightened bolt nuts (1)
2. Damaged or improperly seated gaskets (23)

Remedy:

1. Tighten nuts in accordance with Table 1 and Figure 1, observing the entire sequence of tightening.

2. Break the body/bonnet joint and replace the gasket.

Trouble:
Leaking through valve seats

Probable Cause:
Worn or damaged seating surfaces on disc (14) and/or body (26).

Remedy:
Disassemble valve and inspect all seating surfaces for wear and mechanical damage. Polish minor damage. Remachine or replace components if damage is heavy.

Trouble:
Leaking at stuffing box

Probable Cause:

1. Loose or improperly tightened gland stud nuts (5).
2. Gland follower (8) improperly seated.
3. Corrosion or mechanical damage of stem (15) in stuffing box area.
4. Worn or damaged packing (11).

Remedy:

1. Tighten gland stud nuts, alternating at ¼ turns to torque value of 15 to 30 ft/lbf or just enough to stop any leakage. Do not tighten nuts excessively.
2. Reposition gland follower on the packing rings. It may be necessary to replace or install additional packing rings. If leakage continues, replace the packing.

CAUTION: Ladish does not recommend the practice of back seating the valve and repacking the valve under pressure. In the event that the backseat fails to seal properly, a leak path to atmosphere is generated which constitutes a potential safety hazard to personnel.

3. Minor corrosion of damage can be polished out. Replace the stem if the damage is major.

Trouble:
Rough or difficult operation

Probable Cause:

1. Scored or otherwise damaged threads on stem (15).
2. Damaged yoke bushing (17).
3. Excessively tight gland stud nuts (5).

Remedy:

1. Minor scoring or damage of the stem can be polished out. Replace if stem damage is major.
2. Inspect the stem nut for damaged threads or scoring. Polish out minor damage or replace the bushing for major damage.
3. Loosen gland stud nuts. Tighten gland stud nuts, alternating at ¼ turns, to torque value of 15 to 30 ft/lbf or just enough to stop any leakage. Do not tighten nuts excessively.

2.11 Disassembly

CAUTION: Before attempting any disassembly, the line should be depressurized to prevent possibility of personal injury or equipment damage. As an added safeguard, the valve should be opened and the body relieved of any residual pressure.

All internal parts of the globe valve are made accessible by removal of the bolted bonnet (22) from the valve body (26). The assembled stem (15) and disc (14) will be lifted out of the body as a unit when the bonnet is removed.

NOTE: Place parts on a clean surface as they are removed from the valve. Exercise care to avoid damage to parts through contact with hard objects. Match-mark the bonnet flange and body flange before removing bonnet to ensure assembly of the parts in their original position.

Disassemble the globe valve in accordance with the following procedure:

1. Operate the valve to the fully open position. Remove the bonnet stud bolt nuts (1) and bonnet stud bolts (2) and lift the bonnet (22) and associated parts off the body (28) by raising the bonnet straight up. Lift the bonnet assembly carefully to avoid striking the disc seating surface against the body chest and damaging the seating surface. Remove and discard the PTFE gasket (26). If the only purpose of the maintenance procedure is to examine the condition of the disc and body seating surfaces, no further disassembly is necessary. DO NOT use any tool on the stem surface as this will damage the surface.

2. Loosen the gland stud nuts (5) a minimum of two turns; then turn the handwheel (4) in the direction to close the valve until the handwheel is down to the yoke bushing (17). Remove the handwheel nut (3) and the handwheel (11). Grasping the portion of the stem (15) extending below the bonnet (22) by hand, turn the stem until the threads are disengaged from the yoke bushing threads. Pull the stem with the disc (14) attached down through the stuffing box and out the underside of the bonnet.

3. Remove the gland stud nuts (5) from the gland stud (6) and lift off the gland flange (7) and the gland follower (8). Remove the packing rings (11) from the bonnet (22). Discard the packing rings.

2.12 Inspection

After disassembly of the globe valve, all parts should be inspected for evidence of wear, distortion or mechanical damage. Perform the inspections listed in Table 3 to ensure satisfactory operation of the affected parts.

TABLE 3 – GLOBE VALVE INSPECTION

Step	Part	Inspect For	Remarks
1	Body	Evidence of wear or mechanical damage which could prevent tight sealing	Minor damage (less than .0005") can be corrected by lapping the seat with the body in line. Major damage or wear will necessitate removal of the body from the line for replacement and remachining.
2	Disc	Evidence of wear or mechanical damage to seating surface	Minor damage (less than .0005") such can be corrected by lapping the seat surface. Major damage or wear will require remachining of the seating surface and may require replacement of the disc
		Evidence of galling on the stem side of the disc, particularly where the bottom of the stem bears against the disc	If galling is evident, remachine or replace the disc
		Damaged threads on the disc which mate with disc nut threads and may cause assembly difficulties	Repair threads with threads chaser or tap or replace the disc.
3	Stem	Evidence of galling on bottom surface which bears against the disc	Minor damage can be polished or repaired by machining, taking a very light cut. Major damage requires replacement of the stem
		Evidence of wear on stem area which passes through packing rings, particularly indications of a spiral being worn into the stem by rotation of the stem through the packing rings.	Minor damage can be polished out. Major damage requires replacement of the stem.
4	Yoke Bushing	Evidence of wear or roughness on the threads in bushing O.D.	If thread wear is evident, replace the yoke bushing and yoke bushing nut
5	Gland Follower	Evidence of wear or roughness on I.D.	Polish worn or rough areas or replace gland follower.

2.13 Reassembly

Reassembly of the globe valve is performed essentially in the reverse order of disassembly observing the following special procedures:

1. Assemble the disc (14) on the stem (15) and slide the disc nut (13) over the top of the stem and down to the stem foot. Engage the threads of the disc nut and the disc and using a wrench, tighten the nut onto the disc. Check to make sure that the disc and disc nut rotate freely on the stem with minimum of side and end play.

2. Push the stem (15) from the underside of the bonnet (22) through the stuffing box far enough so that the packing rings (11), gland follower (8) and gland flange (7) can be placed onto the stem. Install the packing in the stuffing box. Lightly lubricate the stem threads and push the stem through the stuffing box until the stem threads contact the threads of the yoke bushing (17). Manually turn the stem in the clockwise direction to engage the stem until it is far enough through the yoke bushing so that the handwheel (4) can be installed. Install the handwheel and ID plate (25) and secure the place with the handwheel nut (3) tightening the nut with a wrench.

3. With the packing rings installed, slide the gland follower (8) and gland flange (7) into place on top of the packing rings. Slide the gland studs (6) into the gland flange and thread the gland stud nuts (5) onto the gland studs. Tighten the gland stud nuts to a torque value of 15 to 30 ft/lbf. In order to maintain even pulldown, alternate tightening at ¼ turn intervals.

NOTE: Tighten gland stud nuts evenly to avoid forcing the gland follower or gland flange against the stem.

4. Install new PTFE gasket (23) in the recessed groove in the flange of the body (26). Turn the handwheel (4) to move the disc (14) into fully open position. Carefully lower the bonnet (22) and the assembled parts onto the body, making sure not to let the disc seating surface strike against the body chest as the bonnet is lowered into place.

NOTE: Be certain that the disc or the wedge are installed in the same position as noted during disassembly.

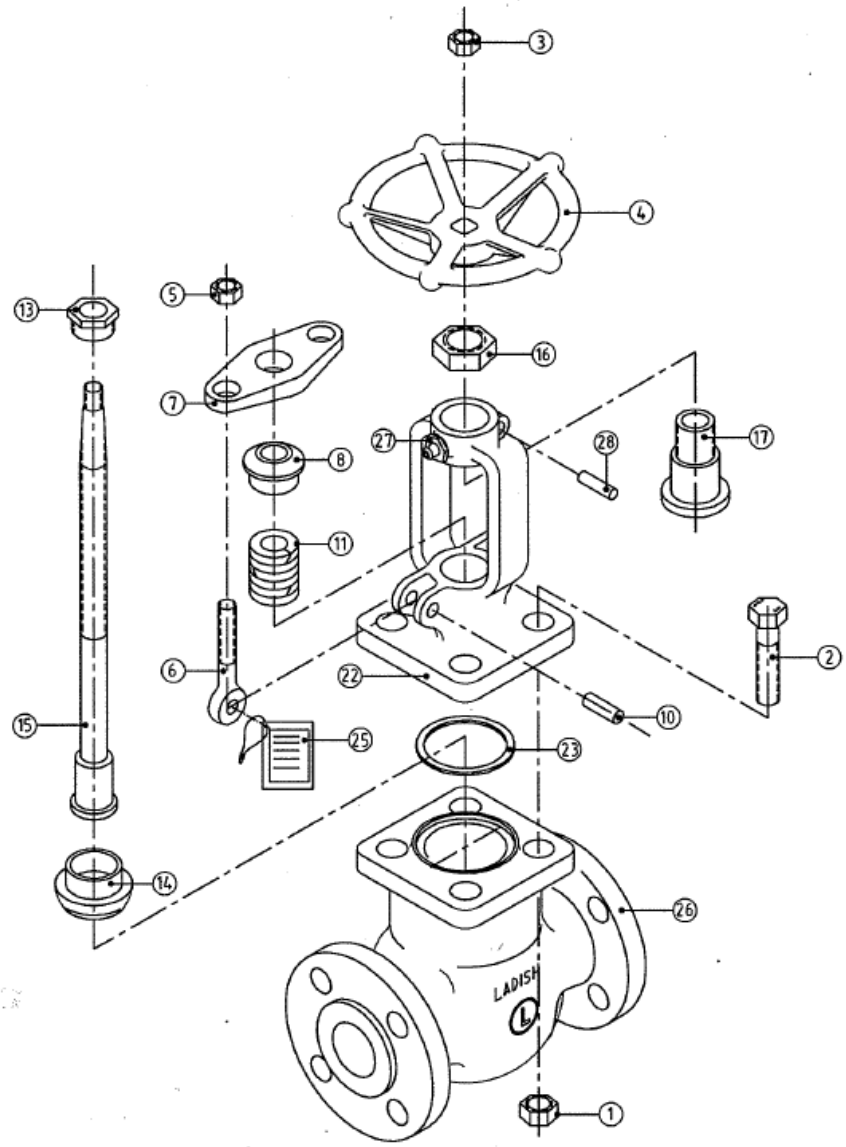
5. Replace the bonnet stud bolts (2) through the bonnet and body flanges and assemble the bonnet stud bolt nuts (1) to both ends of the bolt studs. Following the procedures contained in Chapter 1, tighten the nuts in the sequence shown in Figure 1 to the torque values specified in Table 1.

2.14 Spare Parts

The packing rings (11) and gasket (23) are the only recommended spare parts for a standard valve.

FIGURE 3 – EXPLODED VIEW GLOBE VALVE

1. Bonnet Bolt Nut
2. Bonnet Bolt
3. Handwheel Nut
4. Handwheel
5. Gland Eyebolt Nut
6. Gland Eyebolt
7. Gland Yoke
8. Gland
10. Gland Eyebolt Pin
11. Packing Rings
13. Disc Nut
14. Disc
15. Stem
16. Stem Nut Lock Nut
17. Stem Nut
22. Yoke
23. Gasket
25. Identification Plate
26. Body
27. Grease Fitting
28. Stem Nut Lock Pin



Section 3. SWING CHECK VALVES

2.15 General

Ladish Swing Check Valves are available either hinged from the cover, or hinged through _the valve body. This section covers necessary maintenance instructions for the self-actuating swing check valves, including disassembly, inspection, lubrication, assembly and trouble shooting. Your maintenance function should develop procedures to ensure that the valve is maintained and in satisfactory and safe operating condition at all times.

CAUTION: FACILITY DECONTAMINATION PROCEDURES SHOULD BE FOLLOWED BEFORE ANY MAINTENANCE.

Before attempting any disassembly or packing replacement, the line should be depressurized to prevent possibility of personnel injury or equipment damage. As an added safeguard, the valve should be opened and the body relieved of any residual pressure.

2.16 Routine Maintenance

One basic advantage of a swing check valve is its simplistic design. Other than a joint .leak, valve fluttering, noisy operation and an occasional binding between the hinge pin and the disc arm, little else can go wrong. To ensure satisfactory valve operation, a routine maintenance check and inspection should be performed at regular intervals. Early detection of a malfunction can prevent a minor defect from becoming a major problem. A small leak can become a major problem if it is not corrected promptly.

Inspect the valve for any visual leaks from the cover gasket area, or the side plug (if hinged through the valve body). If the valve is operating erratically, or making excessive noise, further investigation will be necessary by depressurizing the line, isolating the valve, and removing the cover to have a look inside the valve for any obvious problems.

2.17 Trouble Shooting - Hinged from Cover Design

The following are the most common troubles of the swing check valve operation, together with the probable causes and recommended remedies. Observance of these procedures prior to valve disassembly will prevent unnecessary maintenance time and personnel involvement. Index numbers used in the listing refer to Figure 4, which shows the valve hinged.

Trouble:
Leaking at cover body joint

Probable Cause:

Loose or improperly tightened cover stud nuts (1).

Remedy:

1. Tighten nuts in accordance with Table 1 and Figure 1.
2. Break the cover/body joint or replace gasket.

Trouble:

Leaking through valve seat

Probable Cause:

1. Worn or damaged seating surface on disc (7) and/or body (13).
2. Damaged or binding hinge pin (8) or hinge (9).
3. Disc (7) not free enough in the hinge (9) to align itself against the body seat.

Remedy:

1. Disassemble valve and check the seating surface for wear or mechanical damage. Polish out minor damage. Remachine or replace components if damage if heavy.
2. Check hinge pin for wear or out-of-roundness. Check hinge pin holes for roughness or wear. Polish out minor damage or replace parts with major damage.
3. Drive out disc pin (4) and loosen disc nut (5) until disc nut (7) is sufficiently free. Lock nut in place with replacement disc nut pin.

2.18 Disassembly – Hinged from Cover Design

All internal parts are accessible by removal of the bolted cover (10). The hinge (9) and the disc (7) are suspended from the cover and will be lifted out of the valve when the cover is removed.

Disassemble the swing check valve in accordance with the following procedure:

1. Remove the cover stud bolt nuts (1) and cover stud bolts (2) and lift cover (10) from the body (13) taking care to prevent any damage to the disc seating surface. Lift the cover straight up and then shift cover laterally in downstream direction so as to move the disc (7) away from the seat in the body (13). Lift cover, attached disc and hinge arm (9) clear of the body.

2. Push out the hinge pin (8) and remove the hinge arm (9) and disc assembly from the cover (10). The hinge pin should slide out easily.

NOTE: Place parts on a clean surface as they are remove from the valve. Exercise care to avoid damage to parts through contact with hard objects.

3. If necessary for rework or replacement, remove the disc (7) from the hinge (9). Using a hammer and punch, drive out the disc nut pin (4) and unscrew the disc nut (5). Remove the disc nut washer (if applicable) and withdraw the disc from the hinge.

2.19 Inspection

After disassembly of the swing check valve, all parts should be inspected for evidence of wear or distortion or mechanical damage. Perform the inspection listed in Table 4 to ensure satisfactory operation of the affected parts.

2.20 Reassembly

Reassembly of the swing check valve is performed essentially in the reverse order of disassembly, observing the following procedures (See Figure 3 for part reference):

1. Assemble the disc (7) to the hinge (9) and install the disc nut washer (if applicable) and disc nut (5).

2. Tighten the disc nut (5) against the disc nut washer (if applicable) until the pin through holes in the nut and disc are aligned. Install the disc nut pin (4) and peen over the ends of the pin to lock the disc nut in place. Check that the disc is free fitting in the hinge (9) and that adequate movement between the disc and the hinge is present so that the disc can align itself freely against the body seat for closure.

3. Assemble the hinge (9) and the disc (7) to the cover (10) by inserting the hinge pin (8) through the cover hinge holes and the hinge. Check that the movement of the hinge on the hinge pin is free with no binding.

4. Place the gasket (3) in the gasket recess on the body cover flange.

5. Install cover stud bolts (2) and cover stud bolts nuts (1) following the guidance in Figure 1 and Table 1.

2.21 Trouble Shooting - Hinged through Body Design

The following are the most common troubles of the swing check valve operations, together with the probable causes and recommended remedies. Observance of these procedures prior to valve disassembly will prevent unnecessary maintenance time and personnel involvement. Index numbers used in the listing refer to Figure 5, which shows the valve hinged.

Trouble:
Leaking at cover body joint.

Probable Cause:

Loose or improperly tightened cover stud nuts (1).

Remedy:

1. Tighten nuts in accordance with Table 1 and Figure 1.
2. Break the cover/body joint or replace gasket.

Trouble:
Leaking through valve seat

Probable Cause:
1. Worn or damaged seating surface on disc (7) and/or body (13).
2. Damaged or binding hinge pin (8) or hinge arm (9).
3. Disc (7) not free enough in the hinge (9) to align itself against the body seat.

Remedy:
1. Disassemble valve and check the seating surface for wear or mechanical damage. Polish out minor damage. Remachine or replace components if damage if heavy.
2. Check hinge pin for wear or out-of-roundness. Check hinge pin holes for roughness or wear. Polish out minor damage or replace parts with major damage.
3. Drive out disc pin (4) and loosen disc nut (5) until disc nut (7) is sufficiently free. Lock nut in place with replacement disc nut pin.

2.18 Disassembly – Hinged through Body Design

All internal parts are accessible by removal of the bolted cover (10). The hinge arm (9) and the disc (7) are suspended from the hinge pin (8), which goes through the body. The plug bolt (19) and plug gasket (18) must be removed in order to remove the hinge pin (8), and then lift the disc assembly out of the valve for inspection.

Disassemble the swing check valve in accordance with the following procedure (See Figure 4):

1. Remove the cover stud bolt nuts (1) and cover stud bolts (2). Although it is not imperative, it may be helpful to loosen the nuts in a criss-cross pattern or reverse of torqued sequence in Figure 1. With the cover (10) removed, the old gasket (3) should be lifted out of its groove. Take care to prevent damage to the gasket sealing surface while removing the gasket.

2. Removal of the disc assembly in this design necessitates withdrawing the hinge pin (8) from the side of the body (13). The plug bolt (19) in this design is used to seal the penetration of the body. The plug bolt (19) is threaded into the body (13) and sealed by the plug gasket (18). The plug bolt may be tack welded to prevent it from loosening.

NOTE: Prior to withdrawing the hinge pin, make sure the hinge arm / disc assembly is properly supported either by hand or with slings and that the weight of the assembly is not on the hinge pin.

3. The plug bolt (19) is removed by unthreading the plug bolt out of the body (13). The plug bolt is a separate part and can by removed by itself. If the plug bolt is tack welded, the weld must first be grinded off to allow the plug bolt to be removed. With the plug bolt off, the hinge pin (8) can be withdrawn and removed. Take care not to damage the plug gasket (18) when removing the plug bolt (19). A tapped hole is provided in the end of the hinge pin (8) to aid in removal.

4. The disc (7) in this design is attached to the hinge arm (9) by means of a disc nut (5). The disc nut may be pinned or tack welded to prevent it from loosening while in service. The disc (7) can be removed from the hinge arm (9) by removing the tack weld or the disc riut pin (4), then the disc nut (5), and the washer (20), in that order. The disc can then be separated from the hinge arm. Please take care to prevent any damage to the disc seating surface. Lift the disc assembly straight up and then shift over laterally in downstream direction so as to move the disc away from the seat in the body, prevent any damage to the sealing surface of the disc or seat.

2.23 Inspection

After disassembly of the swing check valve, all parts should be inspected for evidence of wear or distortion or mechanical damage. Perform the inspection listed in Table 4 to ensure satisfactory operation of the affected parts.

2.24 Reassembly

Reassembly of the swing check valve is performed essentially in the reverse order of disassembly, observing the following procedures:

Before starting reassembly of the valve, all parts should be thoroughly cleaned. All foreign material, including dirt, weld spatter, burrs and filings should be removed, especially on disc and seat sealing surfaces, gasket grooves, body bolting, hinge pin, plug gasket, and plug bolt.

1. Assemble the disc (7) to the hinge arm (9) and install the disc nut washer (20) and disc nut (5).

2. Tighten the disc nut (5) against the disc nut washer (20) until the pin through holes in the nut and disc are aligned. Install the disc nut pin (4) and peen over the ends of the pin to lock the disc nut in place, or tack weld. Check that the disc is free fitting in the hinge arm (9) and that adequate movement between the disc and the hinge is present so that the disc can align itself freely against the body seat for closure.

3. The disc assembly should be lowered into the body and supported either by hand or with a sling. With the hinge pin (8) partially inserted through the body wall, align the disc assembly with the hinge pin and push the hinge pin through the hinge arm, into the journal on the opposite side of the body wall. Check that the movement of the hinge on the hinge pin is free with no binding.

4. The plug gasket (18) should be affixed to the plug bolt (19) and the plug bolt screwed into the body. The plug bolt should be tightened until the plug gasket is compressed properly. Once the plug bolt is secured, it should be re-tack welded to prevent it from loosening while the valve is in service.

5. Place the gasket (3) in the gasket recess on the body cover flange.

6. Install cover bolts (2) and cover bolt nuts (1). Follow the procedure specified in Figure 1 and apply bolt torque as prescribed in Table 1.

2.25 Spare Parts

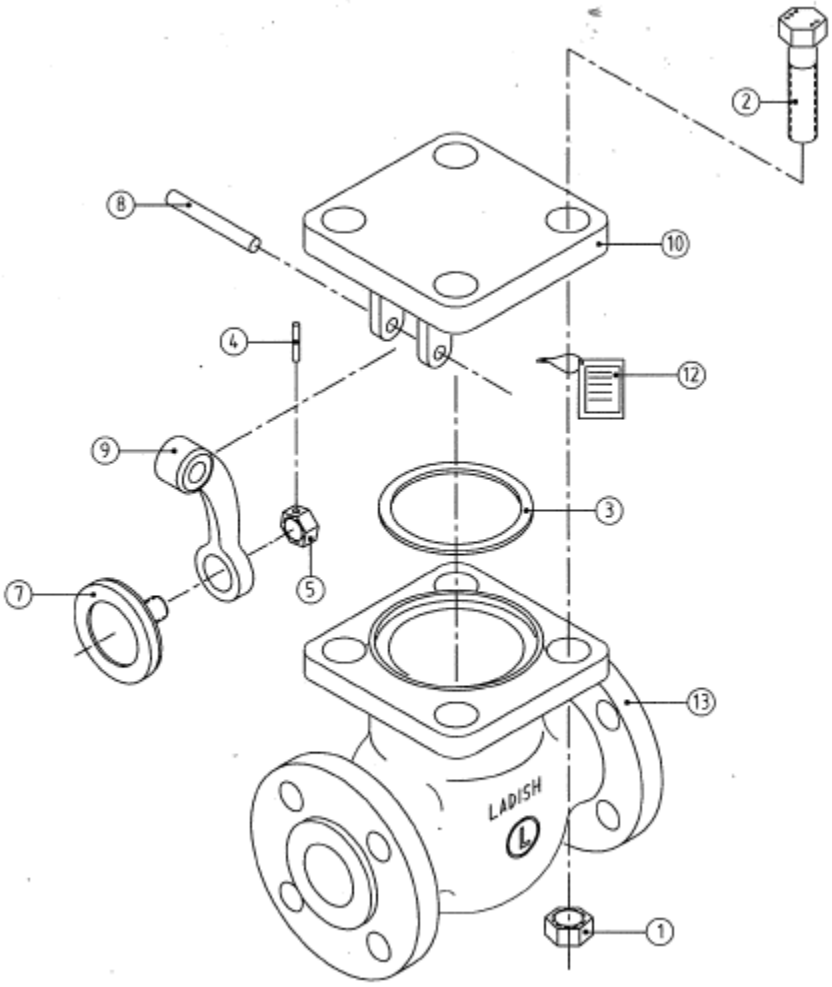
The gasket (3) is the only recommended spare part for the swing check valve.

TABLE 4 – SWING CHECK VALVE INSPECTION

Step	Part	Inspect For	Remarks
1	Hinge Pin	Evidence of wear resulting in out-of- roundness, galling or roughness.	Minor wear can be polished out. Major wear will necessitate hinge pin replacement.
2	Hinge Arm	Evidence of wear on hinge pin end resulting in out-of-roundness or roughness in hinge pin bore. Evidence of wear resulting from movement of the disc in the hinge arm.	Minor wear can be polished out. Major wear will necessitate hinge arm replacement.
3	Cover	Evidence of wear resulting in out-of-roundness or roughness in the hinge pin holes on the underside of the cover.	Minor wear can be polished out. Major wear will necessitate cover replacement.
4	Disc	Evidence of wear or damage on seating surface which could prevent sealing. Evidence of wear surfaces with mate with the hinge arm.	Lap, grind, or remachine the disc seating surface to assure adequate seating or replace disc. Minor damage can be polished out. Major damage requires replacement of the disc.
5	Body	Evidence of wear or damage on the body seat from hammering, sliding, etc. which could prevent tight sealing.	Correct minor seat surface damage by lapping seat to obtain a flat surface with the body in line. If damage or wear is extensive, remove the body from the line for remachining of the seat or replacement of the body.

FIGURE 4 – EXPLODED VIEW SWING CHECK VALVE – HINGED FROM COVER

1. Cover Bolt Nut
2. Cover Bolt
3. Gasket
4. Disc Nut Pin
5. Disc Nut
7. Disc
8. Hinge Pin
9. Hinge Arm
10. Cover
12. Identification Plate
13. Body
15. Disc Holder
16. Teflon Disc
17. Teflon Retainer



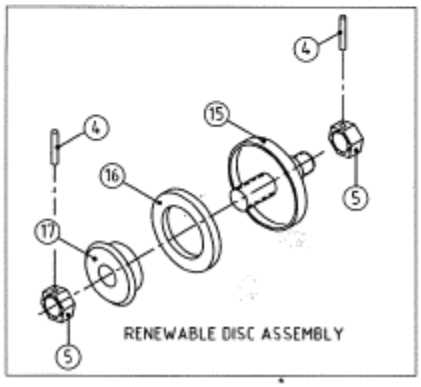
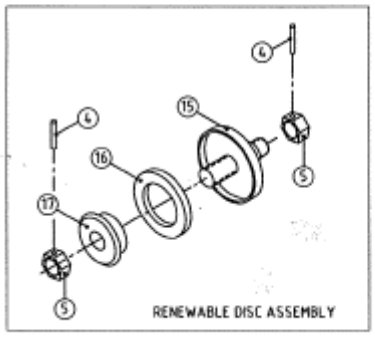
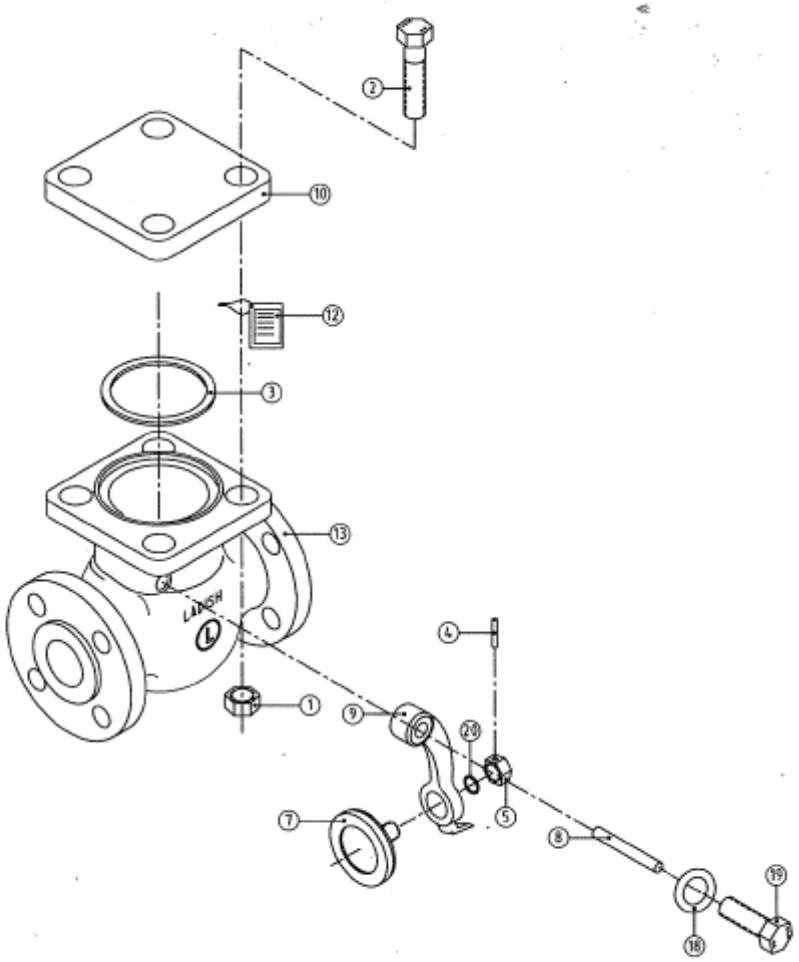


FIGURE 5 – EXPLODED VIEW SWING CHECK VALVE – HINGED THROUGH BODY

1. Cover Bolt Nut
2. Cover Bolt
3. Gasket
4. Disc Nut Pin
5. Disc Nut
7. Disc
8. Hinge Pin
9. Hinge Arm
10. Cover
12. Identification Plate
13. Body
15. Disc Holder
16. Teflon Disc
17. Teflon Retainer
18. Plug Gasket
19. Plug Bolt
20. Washer





Section 4. LIFT CHECK VALVES

2.26 General

This section covers necessary maintenance instructions for the self-actuating lift check valves, including disassembly, inspection, lubrication, reassembly and trouble shooting. Your maintenance function should develop procedures to ensure that the valve is maintained and in satisfactory and safe operating condition at all times.

CAUTION: Facility decontamination procedures should be followed prior to any maintenance.

Before attempting any disassembly, the line should be depressurized to prevent the possibility of personnel injury or equipment damage.

2.27 Routine Maintenance

One basic advantage of a lift check valve, like the swing check, is its simplistic design. Other than a joint leak, valve fluttering, or noisy operation, little else can go wrong. The lift check works automatically, according to increases and decreases in line pressures. To ensure satisfactory valve operation, a routine maintenance check and inspection should be performed at regular intervals. Early detection of a malfunction can prevent a minor defect from becoming a major problem. A small leak can become a major problem if it is not corrected promptly.

Inspect the valve for any visual leaks from the cover gasket area. If the valve is operating, erratically, or making excessive noise, further investigation will be necessary by depressurizing the line, isolating the valve, and removing the cover to have a look inside the valve for any obvious problems.

2.28 Trouble Shooting

The following are the most common troubles of lift check valve operations, together with the probable causes and recommended remedies. Observance of these procedures prior to valve disassembly will prevent unnecessary maintenance time and personnel involvement. Index numbers used in the listing refer to Figure 6.

NOTE: Place parts on a clean surface as they are removed from the valve. Exercise care to avoid damage to parts through contact with hard objects.

Trouble:
Leaking at cover body joint

Probable Cause:
Loose or improperly tightened cover bolt nuts (1).

Remedy:
1. Tighten nuts in accordance with Figure 1 and Table 1.
2. Break the cover/body joint to replace gasket.

Trouble:
Leaking through valve seat

Probable Cause:

1. Worn or damaged seating surface on disc (4) and/or body (7).
2. Damaged or binding disc (4) or cover (6).
3. Disc (4) not free enough in the cover (6) to move up and down against the body seat. ·
4. Valve may need the assistance of a spring (5) to help close against head pressure.

Remedy:

1. Disassemble valve and check the sealing surface of seat and disc for wear or mechanical damage. There should be no inclusions or marks on the sealing surfaces. Polish out minor damage. Remachine or replace components if damage is heavy.
2. Check disc for wear or out-of-roundness. Check hole in cover for roughness or wear. Polish out minor damage or replace parts with major damage.

2.29 Disassembly

All internal parts are accessible by removal of the bolted cover (6). The male end of the disc (4) is inserted into the female part of the bore extending from the cover. If the valve is spring loaded, one end of the spring will be inside a small hole in the cover, while the other end of the spring will be in a small hole in the disc, which prevents the spring from becoming disoriented inside the valve. Disassemble the lift check valve in accordance with the following procedure (See Figure 6):

1. Remove the cover bolt nuts (1) and cover bolts (2) and lift the cover (6) from the body (7) taking care to prevent any damage to the disc seating surface. Lift the cover straight up and be cautious as not to lose any parts. Lay all of the parts on a clean surface, taking note of the order of disassembly.

2. Clean all parts thoroughly using emery cloth to smooth out sealing surfaces.

2.30 Inspection

After disassembly of the lift check valve, all parts should be inspected for evidence of wear or distortion or mechanical damage. Perform the inspection listed in Table 5 to ensure satisfactory operation of the affected parts.

2.31 Reassembly

Reassembly of the lift check valve is performed essentially in the reverse order of disassembly, observing the following procedures:

1. Place the cover (6) in a table in an upside down configuration. If the valve is a spring loaded valve, place the spring (5) in the alignment hole in the cover (if not disregard). Place the disc (4) into the hole in the cover (6). If the valve is a spring loaded valve, align the end of the spring protruding from the cover into the alignment hole in the disc (if not, disregard).

2. Place a gasket on the serrated raised area of the cover.

3. Then place the body onto the cover assembly, aligning the bolt holes. Flip the entire valve over so that you can install the cover bolts (2), and cover bolt nuts (1).

4. Install the bolting, and snug up hand tight. Before tightening the bolts, make sure the disc moves up and down freely in the valve. If spring assisted, you will have to physically push the disc up and down from the bottom of the disc.

5. Inspect the valve to see that the parts are moving and working properly.

6. Referring to the tightening sequence in Figure 1, and the torque requirements in Table 1, tighten the bolts to the recommended torque.

2.32 Spare Parts

The gasket (3) is the only recommended spare part for the Lift Check Valve.

TABLE 5 – LIFT CHECK VALVE INSPECTION

Step	Part	Inspect For	Remarks
1	Cover	Evidence of wear resulting in out-of-roundness, galling or roughness.	Minor wear can be polished out. Major wear will necessitate cover replacement.
2	Disc	Evidence of wear or damage on seating surface which could prevent tight sealing. Evidence of wear on surfaces with mate with the cover.	Lap, grind, or remachine the disc seating surface to assure adequate seating or replace disc. Minor damage can be polished out. Major damage requires replacement of the disc.
3	Spring	Evidence of wear resulting in out-of-roundness or distortion of the spring.	Major damage will necessitate spring replacement.
4	Body	Evidence of wear or damage on the body seat from hammering, sliding, etc. which could prevent tight sealing.	Correct minor seat surface damage by lapping seat to obtain a flat surface with the body in line. If damage or wear is extensive, remove the body from the line for remachining of the seat or replacement of the body.

FIGURE 6 – EXPLODED VIEW LIFT CHECK VALVE

1. Cover Bolt Nut
2. Cover Bolt
3. Gasket
4. Disc

4A. Spring Loaded Disc

5. Spring
6. Cover
7. Body
8. Identification Plate