



TIANSHENG VALVE GROUP CO.,LTD

Document No. TSV.14.001-02

INSTRUCTION OPERATION MANUAL (IOM)





1. INTRODUCTION AND SAFETY INFORMATION

1.1. Introduction

This manual has been prepared to serve as a guide to insure continuous satisfactory service and assist in restoring a valve to proper working condition.

It covers TSV Class 150 through 2500, bolted bonnet, pressure seal, outside screw and yoke, flanged/buttweld ends, carbon steel, stainless steel and alloy steel valves. The installation, storage, operation, disassembly / reassembly inspection and repair, service problems, maintenance and preventive maintenance covering these valves are also included in this manual.

Prior to performing any work on these valves, it would be useful to have a general understanding of their construction. Chapter 4 shows the valve's basic construction.

1.2. Safety Information

The following general safety notices supplement the specific warnings and cautions appearing elsewhere in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered herein.

- a. **To avoid injury, never attempt disassembly while there are pressures either upstream or downstream. Even when replacing packing rings, caution is necessary to avoid possible injury.**
- b. **Do not attempt to disassemble a valve while there is pressure in the line. Make sure both upstream and downstream pressures are removed. Disassemble with caution in the event all pressures have not been relieved.**
- c. **Prior to replacing packing rings, remove all pressure from the valve. The packing can also be replaced while there is pressure BUT the valve must be tightly backseated. This will not insure complete safety and it is not recommended. If the backseat faces have been damaged by foreign material the backseat may leak into the packing chamber.**
- d. **To prevent valve distortion, inefficient operation, or early maintenance problems, support piping on each side of the valve.**

2. STORAGE, PREPARATION AND INSTALLATION

2.1. Storage.

2.1.1. Temporary Storage.

If valves are to be stored before installation, the following should be observed:

- a. Keep the valves wrapped and protected as shipped from the manufacturer.
- b. Do not remove the protective end covering until the valve is ready for installation. This will reduce the possibility of foreign material damaging internal valve components.



- c. Valves stored outdoors should be positioned such that water does not accumulate in the valve body.

2.1.2. Long Term Storage.

If the valves are to be stored more than of one year, they should be prepared in the following manner:

- a. Remove the packing and apply a preservative to the packing chamber.
- b. Do not remove the protective end covering.
- c. Valve which will remain in storage for an excessive period of time should have a preservative applied to the external surface.
- d. Do not store the valves outdoors.

2.2. Preparation.

- a. Remove the valve end protection.
- b. Prior to shipment from the manufacturer, a preservative may have been applied to the inner body of the valve. This preservative may be removed with a solvent.
- c. The inside of the valve should be inspected and blown out with compressed air. Adjacent piping must be clean and free from debris to prevent damage to the valve.
- d. **To prevent valve distortion, inefficient operation or early maintenance problems, support piping on each side of the valve.**
- e. Make sure the valve is positioned such that there is sufficient space so that the hand wheel is easily and safely reached and there is enough clearance for the stem when the valve is open.
- f. Install the valve according to the flow indicator on the valve body. Note gate valves can be installed in any position without regard for the direction of the flow, unless marked in the flow direction.
- g. **Gate valves are not designed for throttling and should be kept in the fully open or closed position. Should the valve be used in a partially open or closed position, the bottom of the wedge and the seat may become eroded in a very short time. This may also cause a chatter noise in the line.**

2.3. Installation

2.3.1. Flanged Valves.

Bolting and gasket material should be compatible with the valve's body material and pressure. Care should be taken that flanges are straight and parallel. Bolts should be evenly tightened in a star pattern. This will ensure a uniform gasket loading.

2.3.2. Butt weld End Valves.

Clean the weld ends as necessary and weld into the line using an approved weld procedure. Make sure the body and pipe material given on the nameplate is compatible with the welding procedure.

2.3.3. Valve Installation by Welding.

Unless the valve contains PTFE packing and/or gasket, leave valves assembled and in the lightly closed position during installation, welding and post-weld heat treatment. This will prevent the valve seat from floating or warping during the process. After welding completion, open the valve and flush the line to clean out any foreign matter.

Valves containing PTFE packing and/or gasket must be disassembled for installation as the welding



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temperature can adversely affect the PTFE components. Match mark each component during disassembly for proper reassembly.

The responsibility for welding of the valves into piping systems is that of those performing the welding. Refer to ASME B31.1, B31.3, etc. Written welding procedures covering all attributes of the process and materials to be welded shall be in accordance with Section IX of the ASME Boiler and Pressure Vessel Code and any additional requirements from the applicable piping code including any possible necessary localized PWHT depending on material specifications.

2.3.4. Valve Orientation.

2.3.4.1 Large Bore Gate Valve Orientation for Proper Operation:

Do not recommend the installation of 24" and larger gate valves in anything other than the stem vertical-up orientation. The stem should be kept within +/- 20 deg of vertical-up to ensure proper wedge to seat alignment. The installation of large bore gate valves (24" and up) in the stem horizontal position may result in the weight of the wedge shifting and jamming in the wedge guides. For 20" and under it is permissible to mount the valves in other positions. A gate valve can be installed in line with disregard to flow direction.

2.3.4.2 Check Valves / Stop Check Valves Rely On Gravity For Proper Operation:

These valves must be fitted in horizontal pipe runs with the cover facing vertically upward. Variance to either side of the vertical axis must not exceed 5 degrees. Swing-check valves and spring-loaded check valves designs allow for additional positioning, such as vertical upwards flow. Valves must not be installed in a vertical down flow pipe run or in a horizontal pipe run with the cover in the vertical down position. Always install valves in the direction indicated by the flow arrow stamped on the body. Note: Do not install Tilting Disc check valves in a vertical line as the center of gravity for the disc may cause them to stick open.

2.3.4.3 Positioning Globe Valves In The Pipe Run:

Globe valves should be installed with the stem in a vertical upward position on horizontal lines. However an alternate acceptable stem position is at an angle between the vertical and horizontal axis which still allows for complete drainage. If installed with the stem below the horizontal axis, complete drainage is not possible and solids may accumulate in the valve bonnet, which will greatly affect the valve operation and service life. These items may also be installed in vertical lines. Globe valves can operate in either direction of flow, but it is strongly recommended that the pressure always act under the disc.

3. MAINTENANCE AND REPAIR

3.1. Inspection and Maintenance

A periodic inspection and maintenance schedule should be established for each valve. The time frame given for the implementation of these schedules are to be used as a guide only in establishing routine inspection and maintenance schedules. Exact time periods for performing these procedures cannot be provided due to the



unknown nature of the service conditions each valve is in.

3.1.1. Periodic Inspection.

A periodic inspection should be performed on each unit. The time frame should be adjusted depending on usage and service conditions. An infrequently used unit may have more time between inspections than a valve in constant service.

A periodic inspection should include the following:

- a. Examine the valve stem for cleanliness and lubrication. The stem threads should be coated with a clean grease lubricant.
- b. Some valves have a grease fitting in the bonnet or yoke. If it is dry, lubricate with a hand grease gun.
- c. Open and close the valve. The actions should be smooth without any binding of the stem through full travel.
- d. If valve is in service and under pressure:
 - i) **Examine the body to bonnet connection for leakage through the gasket. If leakage is found, tighten the bonnet nuts evenly in a star pattern until the leakage stops. Do not exceed the maximum torque values in Table A. If the leakage persists, see section 3.2.**
 - ii) **Check the stem packing for any leakage during the opening and closing action. If a leak is found tighten the gland nuts alternately with no more than a quarter turn on each nut until the leak stops. If the leakage persists, see section 3.2.**
 - iii) **Inspect the exterior of the valves for cleanliness. Remove any dirt, grime or oil from the valve body and bonnet.**

3.1.2. Post Inspection.

After completion of a periodic inspection, valves that are providing satisfactory service require no further disassembly or inspection. Should a valve be found which is not performing satisfactorily, see section 3.2 "Troubleshooting".

3.1.3. Maintenance.

Other than periodic inspection, no routine maintenance is required. Routine replacement of parts, such as gasket and packing is not usually performed until required. Once in service, it may become apparent that these and other parts require repair or replacement due to usage and service conditions. A maintenance schedule should be developed taking these conditions into consideration. Parts can be replaced during a routine overhaul.

3.1.4 Valves in cyclic pressure and/or temperature operating conditions.

Bolted bonnet valves that are used in cyclic pressure and/or temperature operating conditions are subject to a high possibility of developing body/bonnet joint leakage for a variety of reasons.

These include such items as stud/nut embedment relaxation, gasket creep, bolt creep, vibration, differential thermal expansion, flange creep and others. All of these circumstances result in the unloading of the gasket clamping forces, which results in joint leakage.

To overcome these issues, recommends a maintenance program that includes the periodic inspection of the body/bonnet joint and the re-tightening of the body/bonnet bolting as necessary.



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Because cyclic operating conditions vary greatly from one operation to another, we are unable to provide definitive recommendations for the timing of the periodic inspections but as a minimum the periodic inspections should be scheduled at least twice a year.

We do however recommend that the inspections and the re-tightening of the body/bonnet bolting should take place within the first four weeks after the valve has been placed in full operation. Thereafter, a periodic inspection program should be followed.

Re-tightening of the body/bonnet bolting needs to follow the instructions and recommendations stated elsewhere in the document.

3.2. Trouble-shooting

The following chart will cover the various problems which are common to most valves. The information provided will aid in isolating and correcting these problems.

Table 3-2 Valve Troubleshooting

PROBLEM	PROBABLE CAUSE	SOLUTION
Leakage through the stem packing	a. Gland nuts are loose b. Gland is binding against the stem or packing chamber wall c. Inadequate amount of packing rings d. Packing is hard and dry e. Packing was not properly cut and staggered f. Stem is damaged	a. Tighten gland bolts. b. Check to insure gland is centered and evenly tightened c. Install additional packing rings see section 3.3 d. Replace with new packing see section 3.3 e. Replace with new packing see section 3.3 f. Repair or replace as required.
Problems in operating valve	g. Stem binding during travel h. Stem packing is exerting excessive force on the stem i. Stem is damaged Internal components may be damaged j.	g. Remove dirt and lubricate stem with grease h. Check torque on gland nuts. i. Examine stem through full open and close action. Repair or replace as required j. Disassemble the valve. Inspect and repair as needed.
Bonnet Leakage	k. Bonnet nuts are loose l. Gasket is damaged m. Flange faces are damaged	k. Tighten to values listed in Table A. l. Disassemble and install a new gasket. Repair m. and install a new gasket
Seat Leakage	n. Valve not properly seated o. Internal components are damaged or worn	n. Check to see if valve is tightly closed Inspect internal components and repair as required (for detailed repair consult Newmans representative).

3.3. Stem Packing Replacement

WARNING

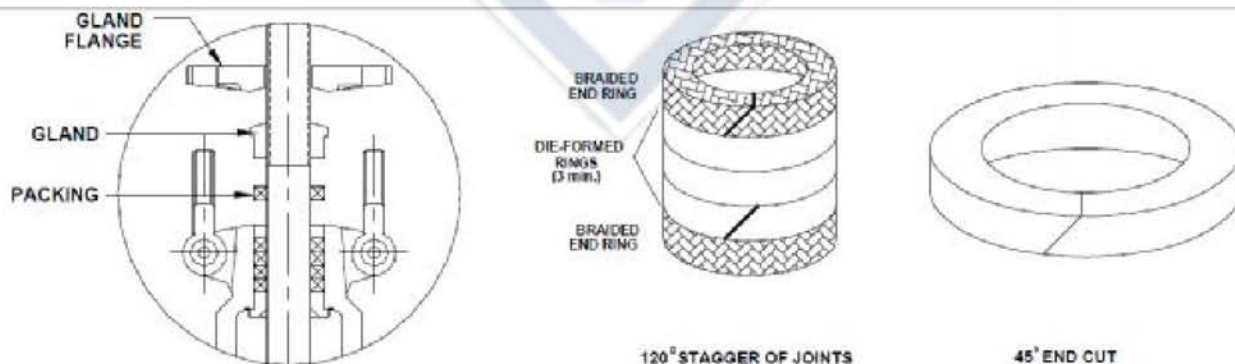
To prevent injury ensure that all pressure is removed from the valve both upstream and downstream before



disassembly.

- a. Check original tightness of valve operation. Remove gland nuts. Lift the gland up the stem clear of the packing chamber.
- b. Remove the existing or defective packing rings with a sharp tool or packing remover. Do not scratch or score the machined surfaces of the stem or packing chamber.
- c. Examine the machined surfaces of the stem and packing chamber. Remove any scratches, scoring or burrs with emery cloth or hand filing. Clean the stem with a solvent soaked rag.
- d. Count original number of rings and measure x-section thickness. If original packing cannot be counted or measured, follow the steps below:
 - 1.) Measure the stem diameter (OD), stuffing box diameter (ID) and stuffing box depth (d).
 - 2.) Packing x-section (R) = (ID - OD)/2
 - 3.) # rings = (1.25 x d)/R
- e. Install new packing. Cut each ring at a 45-degree angle and stagger the joints at 120 degrees, every fourth joint will be in the same position as the first. Install rings individually using a split ring spacer, compressing each ring by hand tightening + 1/4 turns on each gland nut.
- f. When packing chamber becomes filled with packing, reassemble gland and gland flange. Alternate tightening gland flange nuts 1/4 turn at a time until eyebolts begin to get tight. (If gland travels more than the height of one packing ring into the packing chamber, insert one more ring and repeat step F until chamber is filled.
- g. Compare valve operation to original tightness. If valve operation is considerably tighter than original operating tightness, back off 1/4 turn on each gland nut and recheck tightness.
- h. Several hours after a repacked valve has been returned to service, inspect the packing area to ensure full compression, tight bolting and no leakage. Should leakage occur, tighten gland nuts at 1/4 turn increments until leakage stops.

Figure 3.1.3-1 (a) Valve Stuffing Box Assembly (b) Packing Detail





4. TSV CAST STEEL VALVES

4.1. Bolted Bonnet Gate and Globe Valves

4.1.1. Operation

By turning the hand wheel counter-clockwise, the stem, to which the wedge (or disc) is attached at the base, is drawn up through the yoke sleeve. By turning the hand wheel clockwise, the action is reversed and the wedge (or disc) is lowered into the closed position.

4.1.2. Disassembly

WARNING

To prevent injury ensure that all pressure is removed from the valve both upstream and downstream before disassembly.

- a. Close the valve and then open, two full hand wheel turns. Match or mark flange with a metal tool or paint to clearly show the original position for reassembly.
- b. Caution should be taken when loosening body-bonnet bolting, as pressure may still be present in bonnet.
- c. Once assured there is no more pressure in the line, remove the bonnet nuts and studs. Lift the bonnet-stem-wedge (or disc) assembly out of the body, taking care not to scratch the seating surface. For gate valves, as the assembly is drawn out of the body, match or mark the wedge so that it can be replaced in the same position.
- d. Remove the bonnet gasket from the valve body flange.
- e. For **gate valves**, remove the wedge from the stem "T" head, carefully protecting the seating surface. For **globe valves**, remove the disc from the stem by cutting tack welds and unthreading the disc nut or bushing.
- f. Unfasten the hand wheel nut. Remove the hand wheel from the valve.
- g. To remove the valve stem, loosen the gland bolting and gland. Disengage the stem from the yoke sleeve by rotating it counterclockwise and pulling from below until the stem is free of the packing chamber. Be careful not to score or scratch the stem machined surface or the threads.

4.1.3. Reassembly

- a. Thoroughly clean the valve interior and all components. Remove all scale, oil, grease or other foreign material. Wipe the seating surface of the wedge (or disc) and valve seat with a solvent soaked cloth. Clean the body and bonnet flange surfaces and all bolting.
- b. Install the stem carefully, sliding it through the packing and gland until the threads are engaged with the yoke sleeve. Slowly rotate the stem clockwise until it extends beyond the bonnet.
- c. Place hand wheel in position atop the valve, stem nut for gate valves and stem for globe valves. Secure with hand wheel nut.
- d. Position a new gasket on the body flange aligned with the bolt holes. The gasket should not extend over the open body cavity. Do not reuse a gasket. The gasket may be coated with a light oil.
- e. For gate valves, install the wedge to the "T" head of the stem connection. For globe valves, install the disc and secure it with the bushing or disc nut to the stem and tackweld.
- f. Lift the bonnet-stem-wedge assembly up and over the body. Check the location marks on the body, bonnet flange and wedge. Carefully lower the assembly until the body and bonnet flanges and the location marks meet. Again, caution must be used to prevent scoring or scratching of the seating surfaces. Keeping the bonnet stationary, open the valve a few turns to ensure the wedge (or disc) is not touching the seat.
- g. Line up the body and bonnet holes. Make sure the gasket does not extend into any of the bolt holes. Install



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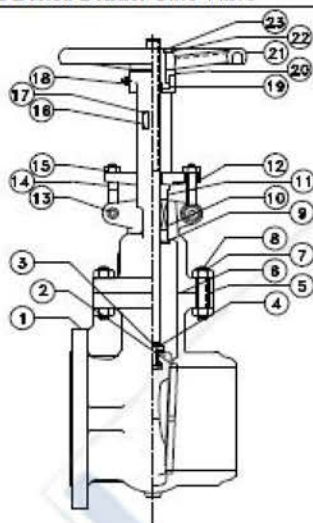
the bonnet bolting and tighten in a star pattern to evenly load the gasket to the torque values listed in Table A.

h. Install new packing as per section 3.3.

i. Align and center the gland in the packing chamber. Evenly tighten the gland nuts until snug, then alternate tightening with no more than a quarter turn on each.

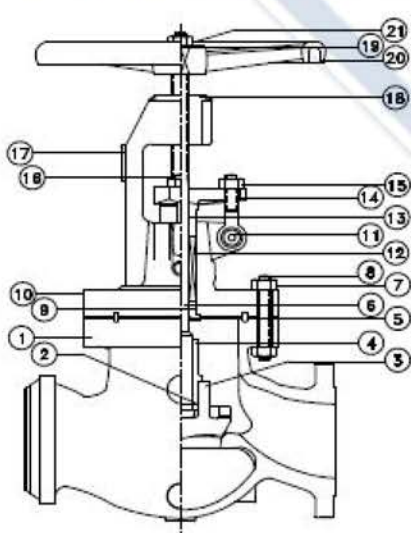
j. Open and close the valve using the hand wheel. The action should be smooth and regular through full stem travel.

Figure 4.1-1 Bolted Bonnet Gate Valve

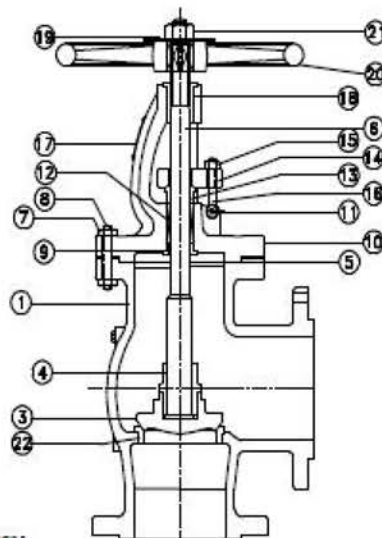


22	SETSCREW
21	HANDWHEEL NUT
20	HANDWHEEL
19	YOKE NUT
18	STEM NUT
17	LUBRICANT FITTING
16	NAMEPLATE
15	GLAND EYEBOLT NUT
14	GLAND EYEBOLT
13	GLAND EYEBOLT PIN
12	GLAND FLANGE
11	GLAND
10	STEM PACKING
09	BACKSEAT BUSHING
08	BONNET STUD BOLT
07	BNT STUD BOLT NUT
06	BONNET GASKET
05	BONNET
04	STEM
03	WEDGE
02	SEAT RING
01	BODY

Figure 4.1-2 Bolted Bonnet Globe Valve



22*	SEAT RING
21	HANDWHEEL NUT
20	HANDWHEEL
19	WASHER
18	STEM NUT
17	NAMEPLATE
16	GLAND EYEBOLT
15	GLAND EYEBOLT NUT
14	GLAND FLANGE
13	GLAND
12	STEM PACKING
11	GLAND EYEBOLT PIN
10	BONNET
09	BACKSEAT BUSHING
08	BONNET STUD
07	BONNET STUD NUT
06	STEM
05	GASKET
04	DISC NUT
03	DISC
02*	STEM WASHER
01	BODY



* SEAT DESIGN MAY VARY WITH VALVE DESIGN

4.2. Bolted Cap Swing-Type Check Valves



4.2.1. Operation

The Swing Check valve's operation is automatic and requires no assistance. When the flow exerts sufficient pressure against the disc to overcome the disc's weight, the disc, which is set on a hinge, lifts allowing the flow to continue through the piping system. As the pressure decreases, the disc lowers until its own weight forces it to seat. This prevents the possibility of a reversal in the flow.

These valves should be sized by Engineering to insure there is sufficient flow to keep the valves from chattering. Chattering will caused premature wear which could lead to loss of performance by the valve

4.2.2. Disassembly

WARNING

To prevent injury ensure that all pressure is removed from the valve both upstream and downstream before disassembly.

- a. Match or mark flange with a metal tool or paint to clearly show the original position for reassembly.
- b. Caution should be taken when loosening body-cover bolting, as pressure may still be present.
- c. Once assured there is no more pressure in the line, remove the cover bolting and lift the cover off the body.
- d. Remove the gasket from the valve body flange.
- e. If so equipped remove tack welds and bolts (for internally hung disc.). Remove the side plug. This will allow the hinge pin to be removed.
- f. Remove the hinge pin while supporting the disc and arm to prevent damage to the seating surface.
- g. To remove the disc from swing arm, remove the cotter pin and unfasten the disc nut.

4.2.3. Reassembly

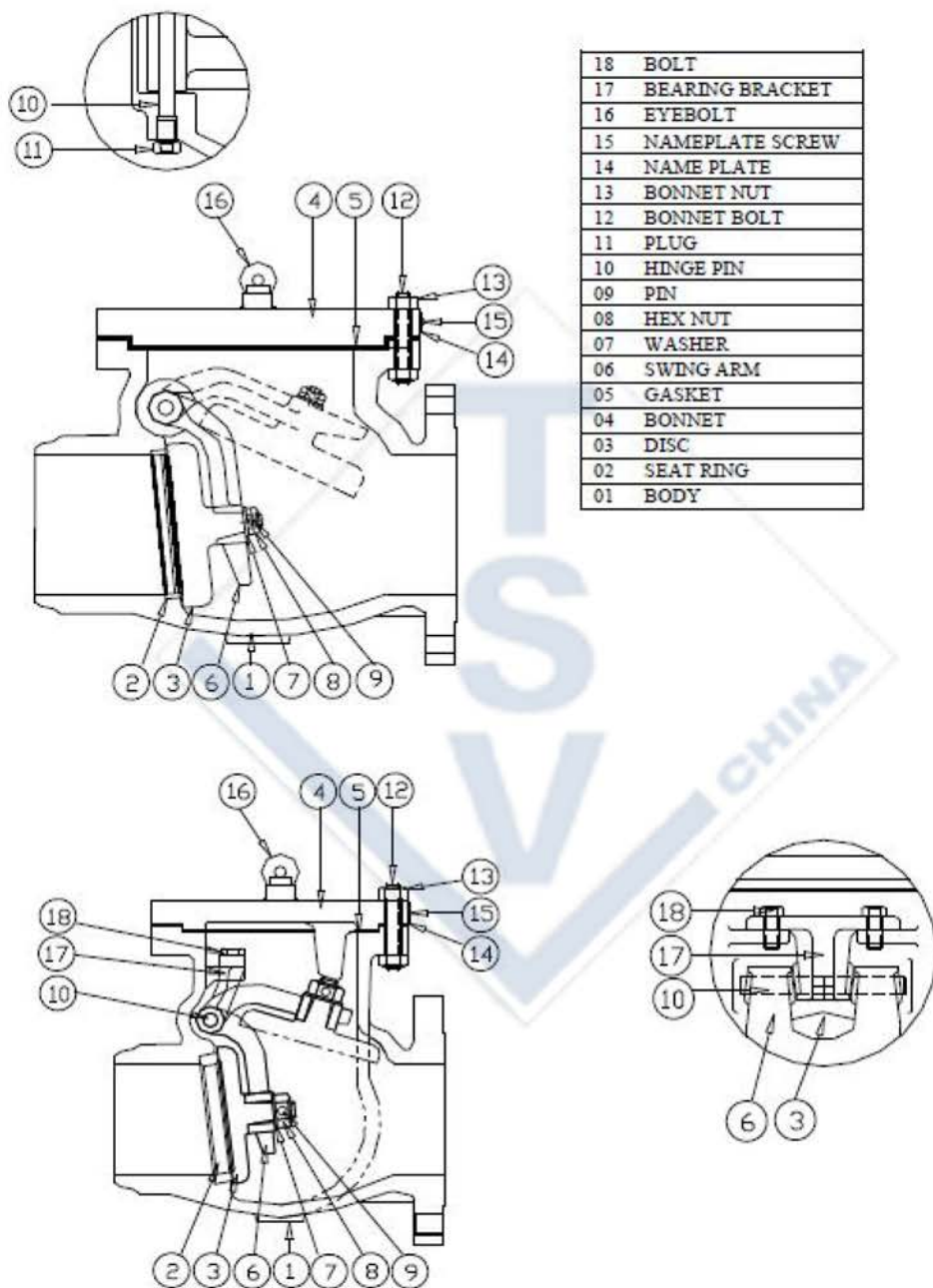
- a. Thoroughly clean the valve interior and all components. Remove all scale, oil, grease, or other foreign material. Wipe the seating surface of the disc and valve seat with a solvent soaked cloth. Clean the body and cover flange surfaces and all bolting.
- b. Install the disc and secure it to the arm with the disc nut. Insert and secure a new pin. Do not use the old pin unless a new one is unavailable.
- c. Place the disc-arm assembly in the valve and insert the hinge pin.
- d. Replace and secure the side plug, bolts and tack welds as required.
- e. Open the valve by lifting the arm. The action should be smooth and regular through full hinge pin rotation.
- f. Position a new gasket on the body flange aligned with the bolt holes. The gasket should not extend over the open body cavity. Do not reuse a gasket. The gasket may be coated with a light oil.
- g. Line up the body and cover holes. Make sure the gasket does not extend into any of the bolt holes. Install the cover bolting and tighten in a star pattern to evenly load the gasket to the torque values listed in Table A.



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Figure 4.2-1 Bolted Cap Swing-Type Check Valve





4.3. Bolted Body Tilting Disc Check Valves

4.3.1. Operation

The tilting disc check valve's operation is automatic and requires no assistance. When the flow exerts sufficient pressure against the disc to overcome the disc's weight, the disc lifts allowing the flow to pass. As pressure decreases, gravity forces the disc to seat preventing a possibility of a flow reversal.

These valves should be sized by Engineering to insure there is sufficient flow to keep the valves from chattering. Chattering will caused premature wear which will lead to loss of performance by the valve.

4.3.2. Disassembly

WARNING

To prevent injury ensure that all pressure is removed from the valve both upstream and downstream before disassembly.

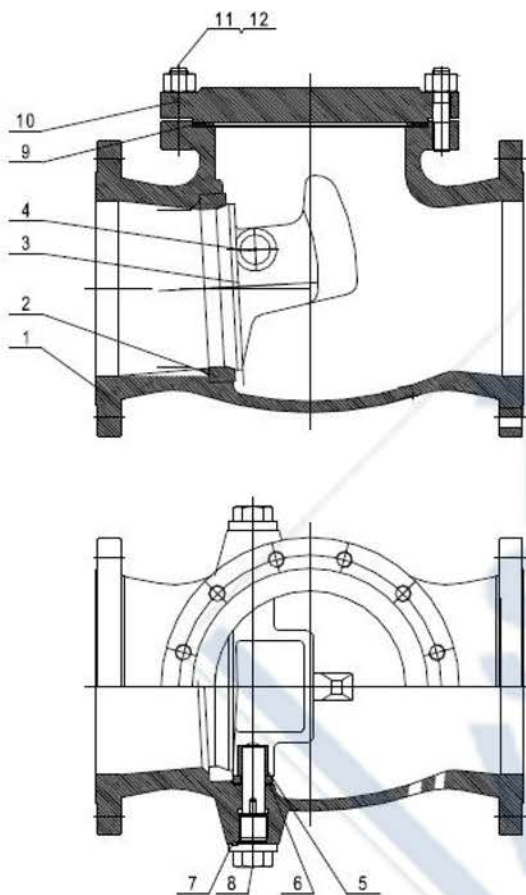
- a. Match or mark body with a metal tool or paint to clearly show the original position for reassembly.
- b. Caution should be taken when loosening body-cap bolting, as pressure may still be present.
- c. Once assured there is no pressure in the line, remove the body bolting and remove the cap.
- d. Remove the gasket from the body flange.
- e. Remove the plug, securing the hinge pin in the body.
- f. Slide the hinge pins out of the disc to free the disc from the body.

4.3.3. Reassembly

- a. Thoroughly clean the valve interior and all components. Remove all scale, oil, grease or other foreign material. Wipe the seating surface of the disc and valve seat with a solvent soaked cloth. Clean the body surfaces and all bolting.
- b. Install the disc into the seat, aligning the hinge pinholes of the body with those of the disc.
- c. Place the collar between the arms and insert the hinge pin. Repeat for the other hinge pin (note some valves may have only one pin depending on design).
- d. Replace the plug used to hold the pin inside the body.
- e. Position a new gasket on the body flange. Do not reuse a gasket. The gasket may be coated with a light oil.
- f. Line up the body markings. Install the bolting and tighten in a star pattern to the torque valves listed in table A.



Figure 4.3-1 Bolted Body Tilting Disc Check Valve



ITEM	NAME
1	Body
2	Seat Ring
3	Disc
4	Pin
5	Gland
6	Washer
7	Plug Gasket
8	Plug
9	Gasket
10	Cover stud Bolts
11	Stud Bolt Nuts
12	Cover
13	Eye Bolt

4.4. Pressure Seal Gate and Globe Valves

4.4.1. Operation

By turning the hand wheel counter-clockwise, the stem, to which the wedge (or disc) is attached at the base, is drawn up through the yoke sleeve. By turning the hand wheel clockwise, the action is reversed and the wedge (or disc) is lowered into the closed position.

4.4.2. Disassembly

WARNING



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To prevent injury ensure that all pressure is removed from the valve both upstream and downstream before disassembly.

- a. Close the valve and then open two full hand wheel turns. Mark the bonnet flanges with a metal tool or paint to clearly show the original position for reassembly.
- b. Loosen and remove the body-yoke bolting,
- c. For **gate valves**, and **globe valves with non-rotating stems**: i) un-fasten the stopper located at the top of stem, and ii) remove the yoke assembly by rotating it clockwise until the yoke sleeve is clear of the stem.
- d. For **globe valves with rotating stems**: i) remove the handwheel nut and handwheel, ii) remove the yoke assembly by rotating it counterclockwise until the yoke sleeve is clear of the stem, and iii) remove the washer located above the body flange.
- e. Loosen and remove the gland nuts. Remove the gland flange and gland.
- f. Loosen the bolting located on the bonnet retainer.
- g. Unthread the bonnet retainer and remove from valve.
- h. Strike the bonnet in a star pattern using a soft punch to release pressure on the seal ring retainer (segment rings).
- i. Remove the segment rings from the valve.
- j. Replace the yoke assembly by rethreading it onto the stem (For **globe valves with rotating stems**, replace the handwheel). Place spacer blocks on the body flange and backseat of the valve. Continue to open the valve until the "seal" on the spacer ring and seal ring is broken.
- k. Lift the internal assembly out of the valve. For **gate valves**, as the wedge is lifted, mark it so it can be placed in its original position.
- l. For **gate valves**, remove the wedge from the stem "T" head, carefully protecting the seating surface. For **globe valves**, remove the disc from the stem by unthreading the disc nut or bushing.
- m. Loosen the set screw located in the nut on top of the stem. Remove the nut and the hand wheel.
- n. To fully expose the stem, unthread the yoke assembly and remove the bonnet. Be careful not to score or scratch the stem machined surface or the threads.
- o. Remove the spacer ring and discard the seal ring.

4.4.3. Reassembly

- a. Thoroughly clean the valve components. Wipe the seating surface of the wedge (or disc) and valve seat with a solvent soaked cloth.
- b. Slide the stem through the bonnet. For **gate valves**, install the wedge in the "T" head of the stem connection. Check the location marks to ensure wedge is installed in it's original position. For **globe valves**, install the disc and



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secure it with the bushing or disc nut to the stem. Lift the assembly up and over the body.

- c. Insert a new seal ring and existing spacer ring on the bonnet.
- d. Replace the segment rings in the body, and place the washer in position on top of the body flange.
- e. Secure the bonnet retainer by threading it onto the bonnet.
- f. Slide the gland down the stem until it rests on the bonnet retainer. The gland flange should then be placed on the gland sliding it down the stem and through the gland bolts.
- g. Tighten the bonnet bolting in a star pattern to evenly load the seal ring
- h. Tighten the gland bolting evenly until snug, then alternate tightening with no more than a quarter-turn on each.
- i. Place the yoke assembly on the valve stem and thread it down until the yoke-body holes are aligned. Install body-yoke bolting and tighten in a star pattern.
- j. Secure the hand wheel in position by placing the hand wheel nut on top of the hand wheel and tightening the set screw.
- k. Insert the stopper at the top of the stem.
- l. Open and close the valve using handwheel. The action should be smooth and regular through full stem travel.



Figure 4.4-1 Pressure Seal Gate Valve

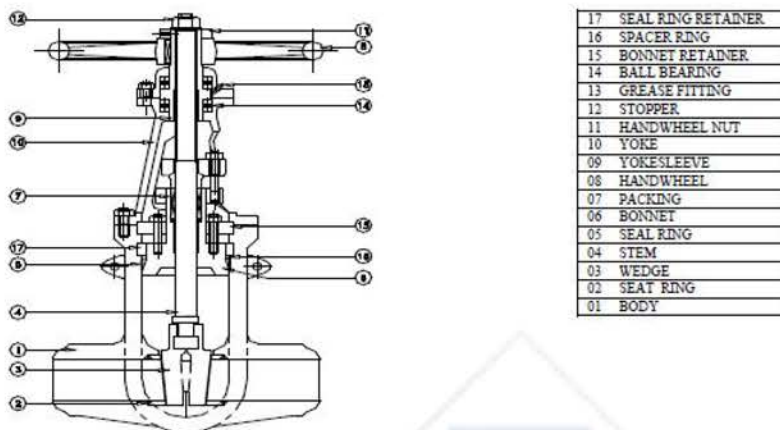
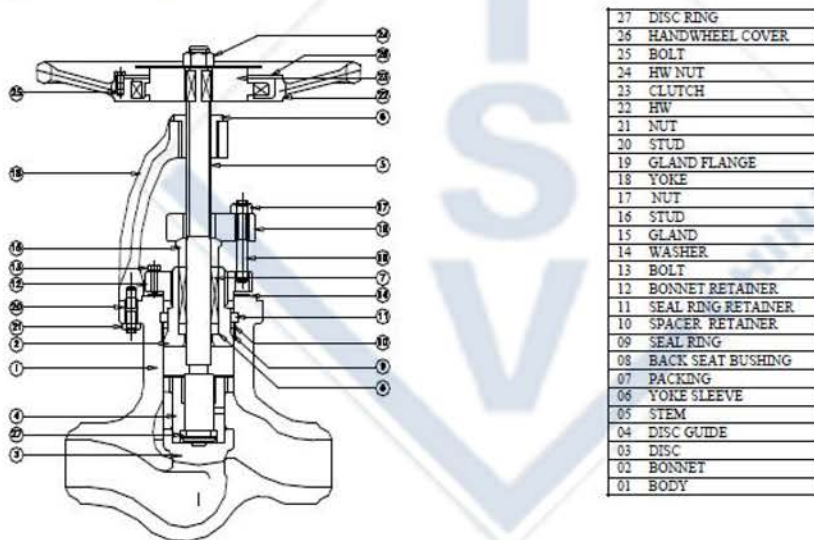


Figure 4.4-2 Pressure Seal Globe Valve



4.5. Pressure Seal Swing-Type and Tilting Disc Check Valves

4.5.1. Operation

The Swing Check and Tilting Disc operation is automatic and requires no assistance. When the flow exerts sufficient pressure against the disc to overcome the disc's weight, the disc, which is set on a hinge, lifts allowing the flow to continue through the piping system. As the pressure decreases, the disc lowers until its own weight forces it to seat. This prevents the possibility of a reversal in the flow.



4.5.2. Disassembly

WARNING

To prevent injury ensure that all pressure is removed from the valve both upstream and downstream before disassembly.

- a. Match/mark bonnet retainer to body to ensure original position.
- b. Remove bonnet retainer nuts.
- c. Remove bonnet retainer.
- d. Remove seal ring retainers.
- e. Remove spacer ring.
- f. Ensure inside of valve is clean and gently pull bonnet & seal ring out of body. Be sure to lift them out carefully so the seal ring is not scratched upon removal.
- g. Loosen set screws on both sides of disc and mark collars, bushings and disc to ensure original assembly.
- h. Remove hinge pin nut.
- i. Mark original alignment of flange to body.
- j. Unbolt and remove flange.
- k. Reach through top of valve and hold disc while sliding pin out of disc and through body. Be sure to remove hinge pin evenly so the seal ring is not damaged.
- l. Remove disc along with collar and bushing (also swing arm assembly for swing check).
- m. Remove old seal rings and clean all parts as well as inside of valve.

4.5.3. Reassembly

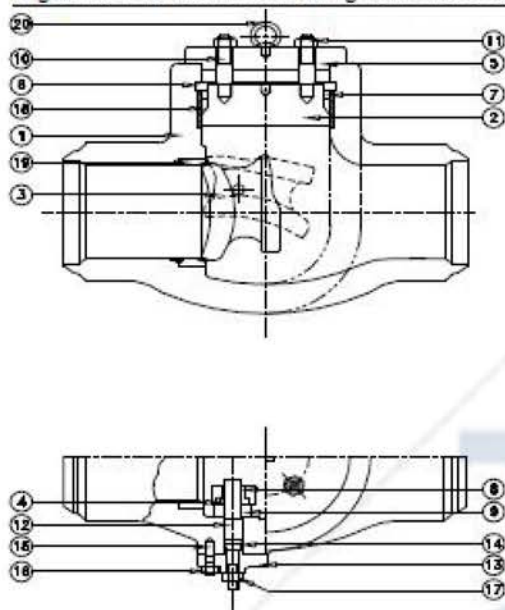
- a. Thoroughly clean the valve interior and all components. Remove all scale, oil, grease, or other foreign material. Wipe the seating surface of the disc and valve seat with a solvent soaked cloth. Clean the body, cover, flange surfaces and all bolting.
- b. Grease new seal rings and male counter parts as well as body guide areas of valve.
- c. Gently slide new seal ring onto hinge pin.
- d. Reach through top of valve and align disc (also swing arm assembly for swing check), collars and bushings to original position, with hinge pin hole in side of valve.
- e. Carefully slide hinge pin through side of body and into collars and bushings (do not force in or seal ring may be damaged)
- f. Realign flange in original position and bolt to body.
- g. Hold the hinge pin in place and tighten down hinge pin bolt just enough to ensure seal ring has been pulled tight.
- h. Align disc so that it is seating properly and tighten down set screws.
- i. Gently slide new seal ring over bonnet and lower into the valve body (do not force in or seal ring may be damaged).
- j. Grease and lower spacer ring onto bonnet.
- k. Grease and install seal ring retainers.
- l. Realign bonnet retainer to original position and tighten bolting in a star pattern to recommended torque.



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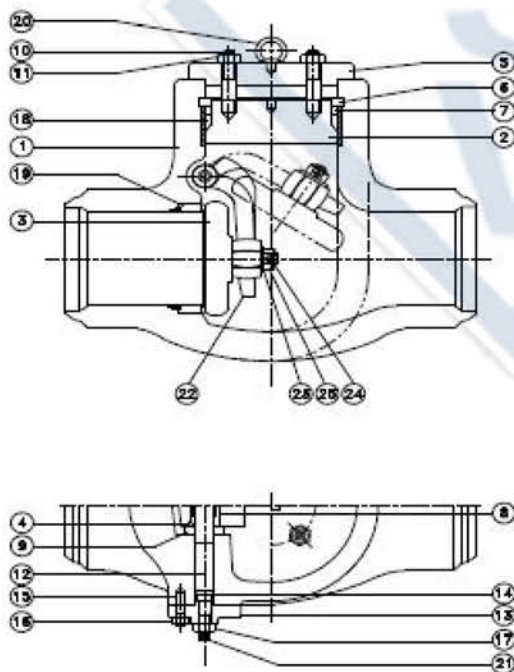
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Figure 4.5-1 Pressure Seal Tilting Disc Check Valve



20	EYEBOLT
19	SEAT RING
18	SEAL RING
17	NUT
16	NUT
15	STUD
14	SEAL RING
13	FLANGE
12	PIN
11	NUT
10	STUD
09	COLLAR
08	BUSHING
07	SPACER RING
06	SEAL RING RETAINER
05	BONNET RETAINER
04	SET SCREW
03	DISC
02	BONNET
01	BODY

Figure 4.5-2 Pressure Seal Swing Type Check Valve



25	NUT
24	COTTER PIN
23	WASHER
22	HOLDER
21	SEAL PIN
20	EYEBOLT
19	SEAT RING
18	SEAL RING
17	NUT
16	NUT
15	STUD
14	SEAL RING
13	FLANGE
12	PIN
11	NUT
10	STUD
09	COLLAR
08	BUSHING
07	SPACER RING
06	SEAL RING RETAINER
05	BONNET RETAINER
04	SET SCREW
03	DISC
02	BONNET
01	BODY