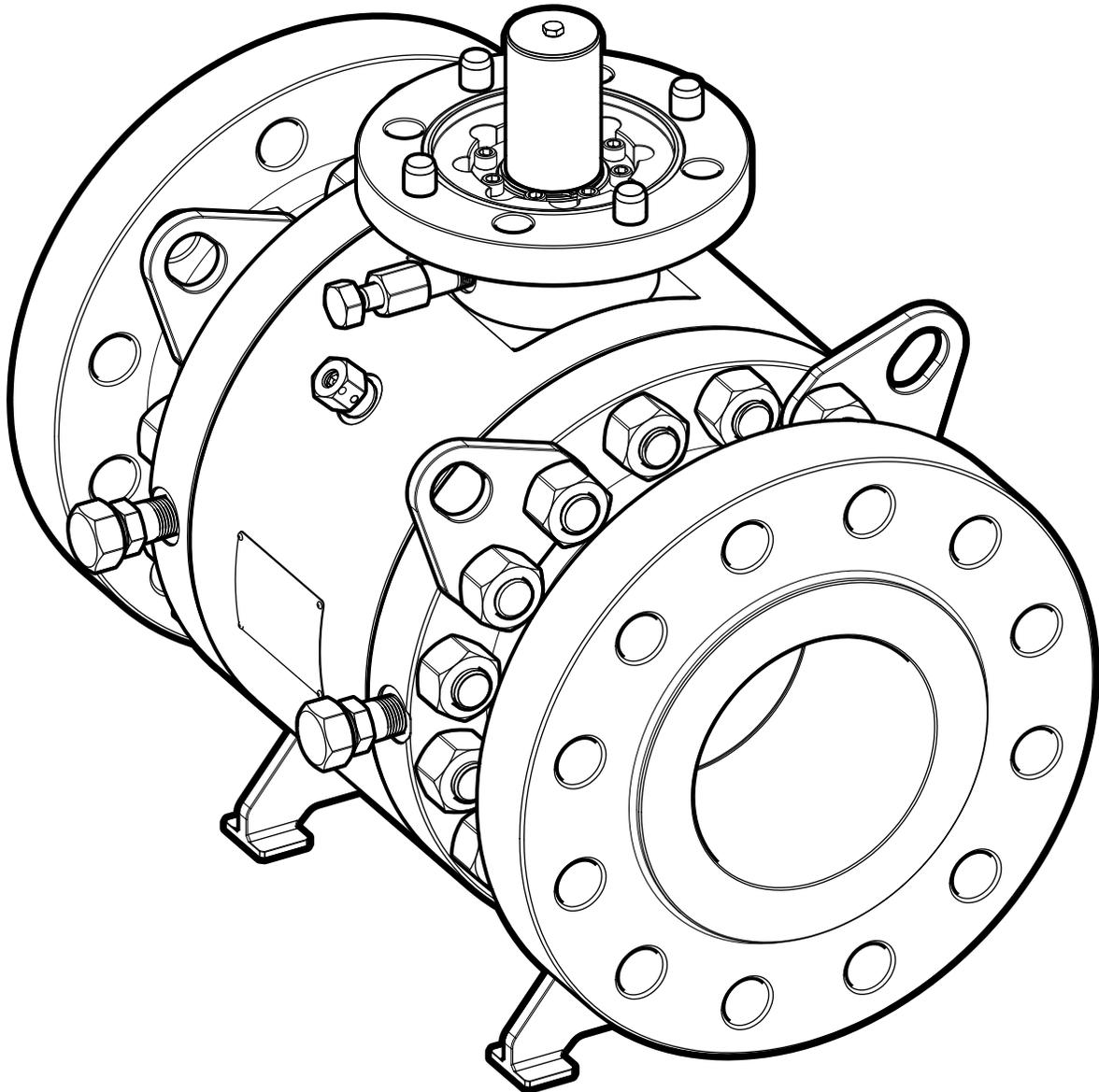

FLOW-TEK

CAST STEEL TRUNNION BALL VALVE

Installation, Operation and Maintenance Manual



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**READ AND FOLLOW THESE INSTRUCTIONS CAREFULLY.
SAVE THIS MANUAL FOR LATER USE.**

1.0 DEFINITION OF TERMS

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Used without the safety alert symbol, indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

2.0 SCOPE

- 2.1 This manual is prepared for users to obtain useful information to install, operate and perform maintenance on our valves.

3.0 CAUTION

- 3.1 It is important to ensure safe operation of our valves that you read, understand, and follow all the contents of this manual, including all safety cautions and warnings to avoid personal injury or property damage. DO NOT install, operate, or maintain valve without being fully trained and qualified in valve installation, operation, and maintenance. If you have any questions about this manual, contact Bray International, Inc. before proceeding.
- 3.2 Always wear protective gloves, clothing, and eye wear when performing any installation operations to avoid personal injury. Personal injury or equipment damage caused by sudden release of pressure or bursting of pressure retaining parts might result if service conditions exceed those for which the product was intended. Check with your process or safety engineer for any additional measures that must be taken to protect against process media.
- 3.3 No repairs, such as welding and painting touch up, should be conducted when the valve is operating online.

CAUTION

Ball valves can trap pressurized fluids in ball cavity when closed. If the valve has been used to control hazardous media, it must be decontaminated before disassembly. It is recommended that the following steps are taken for safe removal and reassembly:

- > Relieve the line pressure
- > Place valve in half-open position and flush the line to remove any hazardous material from valve
- > When being repaired offline, the valves closest to either end of the valve being repaired should be opened first, in order to relieve the line pressure

3.4 After being removed from the pipeline, the valve should be vertically placed on the workbench for disassembly. In doing so, position the valve so that its inlet port faces the work surface to drain and remove any remaining liquid medium or rigid granules possibly left over inside the valve cavity.

4.0 WAREHOUSING, STORAGE, INSTALLATION AND OPERATIONS

4.1 Warehousing

4.1.1 For acceptance inspection and testing before warehousing, it shall be carried out according to API 6D, API 598 or PO requirements;

4.1.2 For the trunnion ball valves, the pressure tests shall be performed to the pressure-temperature rating of the valve body material.

4.1.3 The order of testing should be:

- > Shell
- > High Pressure Hydrostatic Seat Closure
- > Low Pressure Pneumatic Seat Closure

4.1.4 For shell test, no observable leakage is allowed.

CAUTION

After shell test, the fluid can be remained but the pressure shall be relieved before proceeding seat tests.

4.1.5 For bi-directional ball valves, seat leakage shall be monitored from each seat via the valve body cavity vent or drain connection, where provided.

4.1.6 For valves without a body-cavity vent or drain connection, seat leakage shall be monitored from the respective downstream end of the valve.

4.1.7 If the testing procedure and inspection method different than the standard procedure, the PO requirements shall be followed.

4.1.8 The shell test pressure shall be 1.5 or more times the pressure rating determined in accordance with Pressure-Temperature Rating for material at 38 °C (100 °F) in ASME B16.34-2009.

4.1.9 For testing during, please see Table 1 and 2 (API 6D reference).

Valve Size DN	Valve Size NPS	Test Duration Minutes
15 to 100	½ to 4	2
150 to 250	6 to 10	5
300 to 450	12 to 18	15
≥ 500	≥ 20	30

Valve Size DN	Valve Size NPS	Test Duration Minutes
15 to 100	½ to 4	2
≥ 150	≥ 6	5

4.2 Storage and Protection

4.2.1 The valve must be stored in a dry and ventilated space

4.2.2 During the storage, the valve should be kept in a full-open state and then periodically closed and opened to prevent valve blockage.

4.2.3 For valves to be stored for a longer period of time, anti-rust agents shall be applied to un-painted surface to prevent rusting.

4.2.4 Valves stored for long periods should be subject to scheduled inspections, which include:

- > removal of foreign substances, rust, or stains
- > re-application of a coating of rust preventive oil (grease) on any non-machined surfaces
- > opening and closing of the valve to verify proper and agile operation
- > visually inspect to assure that it is free of rust which could cause jamming during operation. After the inspection, seal the valve and store it back in place.

4.3 Installation

4.3.1 Before valve installation, the operator must check and make sure the information contained on the valve marking and nameplate is consistent with the working condition, medium and pressure requirements.

4.3.2 Before installation, remove the end connection seal covers and make sure that the flange or butt-weld ends are free of rust or dirt.

4.3.3 During installation, keep the valve in the full-open position.

4.3.4 For uni-directional single seated and bi-directional double seated valves, the direction of valve installation shall comply with the direction mark on the valve body.

- 4.3.5 When lifting the valve with chains, the operation device should not touch the chains. At the same time, avoid the angle between the chains to be less than 60 degrees, see Figure 1.

 **CAUTION**

NEVER use hand wheels, gearbox, actuator or any other protruding part of the valve as a support for lifting the valve. Lifting lugs, if provided, are attached to balance the weight. Never use just one lifting lug for lifting.

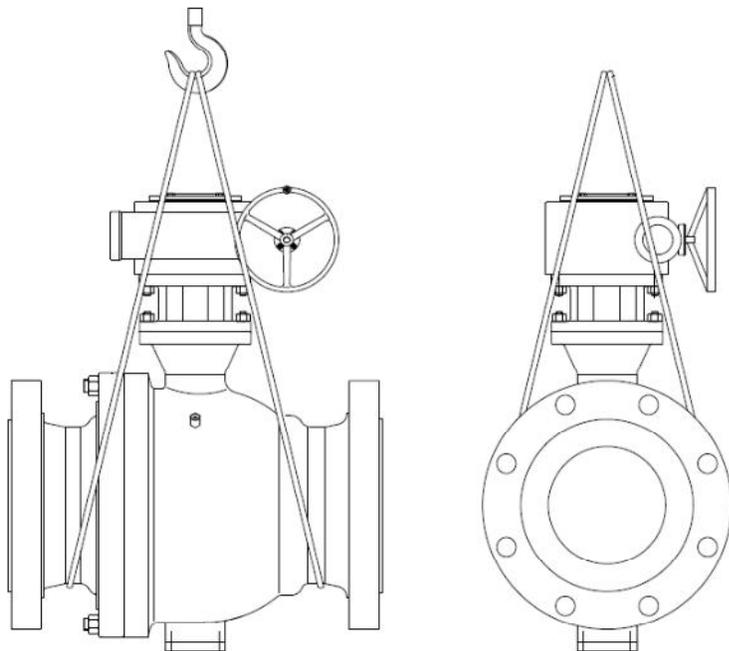


Figure 1

- 4.3.6 The valve should be mounted in its natural state (i.e. without additional fabrication modifications, such as piping or supports) to prevent undue and improper installation stresses which will be generated by added pipe or supports.
- 4.3.7 Before the installation of a threaded valve, a socket-weld valve or a butt-weld valve, make sure that there is no rust or dirt remaining on the thread, socket, or butt-weld end. For weld connections, greasy dirt left over on the weld end must be cleaned.
- 4.3.8 When tightening flange bolts, use the crisscross method and gradually tighten each nut, repeating several times, to ANSI or gasket manufacturer's specifications. Excessive tightening can cause damage and/or leakage to the end flanges or body-to-body end joint.

- 4.3.9 In high temperature applications, valves and piping can get very hot causing possible skin injury when in contact. Proper pipe and valve insulation is suggested. An eye-catching warning should be provided to avoid scalding or burns in such applications.
- 4.3.10 After installation, the valve should be fully opened for pipe purging and pressure testing so as to examine the sealing performance of valve, valve connection ends and the entire pipeline system as well as the valve operation.
- 4.3.11 For the bare stem valves without actuator, when the actuator is being installed, please do not impose the high downward install stress from the stem side to avoid high levels of impact strength from stem to ball, and make the ball supporting part lose effectiveness, diverge to the middle and cause leakage.
- 4.4 Operation
 - 4.4.1 The practical condition intending to use valves must conform to the requirements specified on nameplate and in the operation instruction.
 - 4.4.2 DO NOT impose any external stress on the pipe where the valve is mounted during operation, such as hanging or supporting any weight.

5.0 TROUBLESHOOTING

Problems	Possible Causes	Possible Remedies
Body-to-Bonnet connection leaks.	Connecting bolts are not evenly tightened up	Tighten up bolts evenly.
	Gasket is broken or invalid	Replace gasket.
Stem leaks	Packing and gasket are damaged	Replace with new packing and gasket.
Seat leaks	The seat spring exceeds its designed service life and generates insufficient pre-tightening force	Check seat bracing ring and replace supporting spring.
	The ball or seal face is deformed	It can't be used to control the flow any more except opening.
	Valve isn't fully closed	Close the valve completely.
	Seating surface is damaged	Use the emergency grease fitting to block up the leakage and then arrange the timing for inspecting the damaged seal face according to the actual operation of the pipeline.
Valve can't operate normally	Actuator is damaged	Repair and replace the actuator.

6.0 DISASSEMBLY

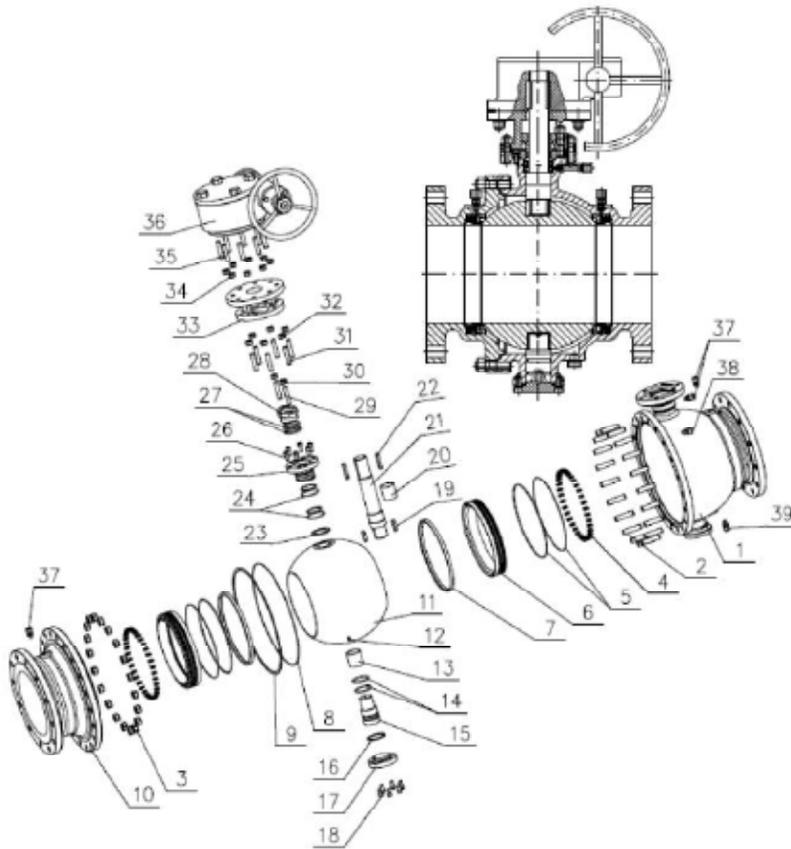


Figure 2

No	Part Name	No	Part Name	No	Part Name
1	Body	14	O-Ring	27	Packing
2	Bolt	15	Trunnion	28	Bushing
3	Nut	16	Gasket	29	Bolt
4	Spring	17	Plug	30	Nut
5	O-Ring	18	Hex Socket Screw	31	Bolt
6	Seat Insert	19	Gland	32	Nut
7	Seat	20	Bearing	33	Yoke
8	O-Ring	21	Upper Stem	34	Nut
9	Gasket	22	Gland	35	Bolt
10	Cover	23	Gasket	36	Gearbox
11	Ball	24	O-Ring	37	Grease Fitting
12	Anti-static Device	25	Gland	38	Vent Valve
13	Bearing	26	Hex Socket Screw	39	Drain Plug

Before taking any step to remove the valve from the pipeline, make sure you have read and understand all instructions as prescribed in “Caution”. Key steps of valve removal are shown below:

- 6.1 Before removing the actuator, fully close the valve, see Figure 3;

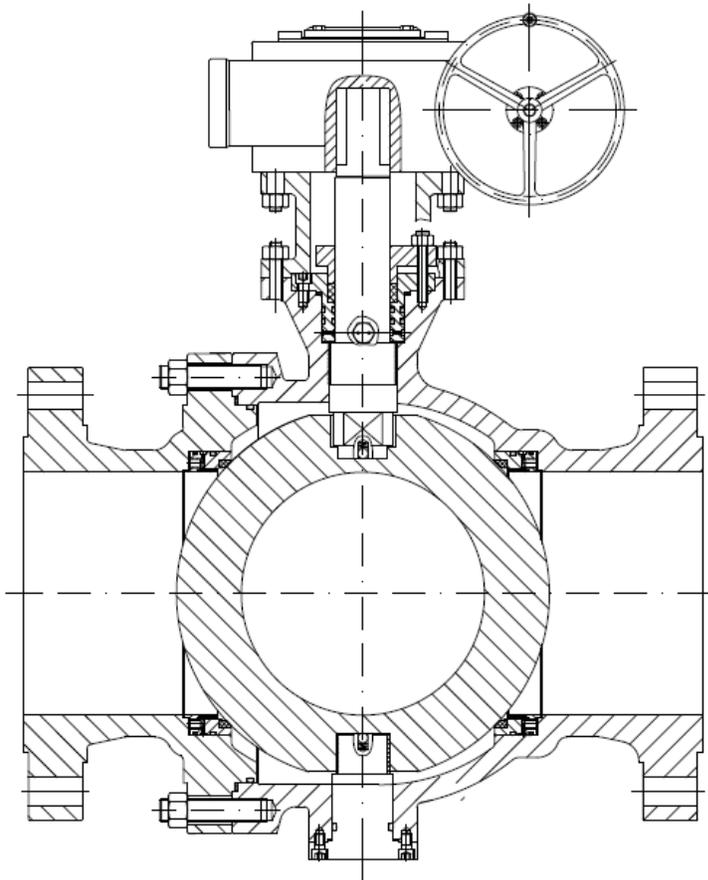


Figure 3

- 6.2 After the valve is fully closed, remove valve actuating parts and sealing parts, like actuator (12), top-mounted flange, stem (9), packing and packing case, and lay them out in order on the workbench to prevent the loss of parts, see Figure 4

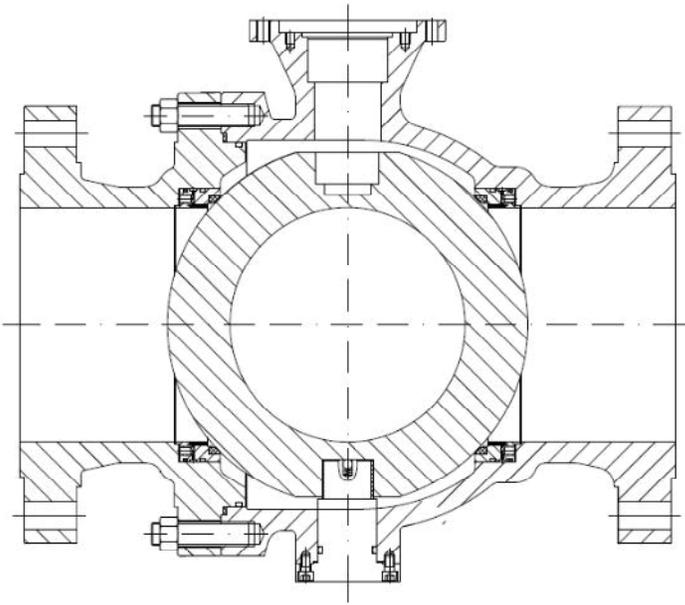


Figure 4

- 6.3 Place the valve vertically on a rubber-cushioned surface to prevent the flange face from being damaged, see Figure 5

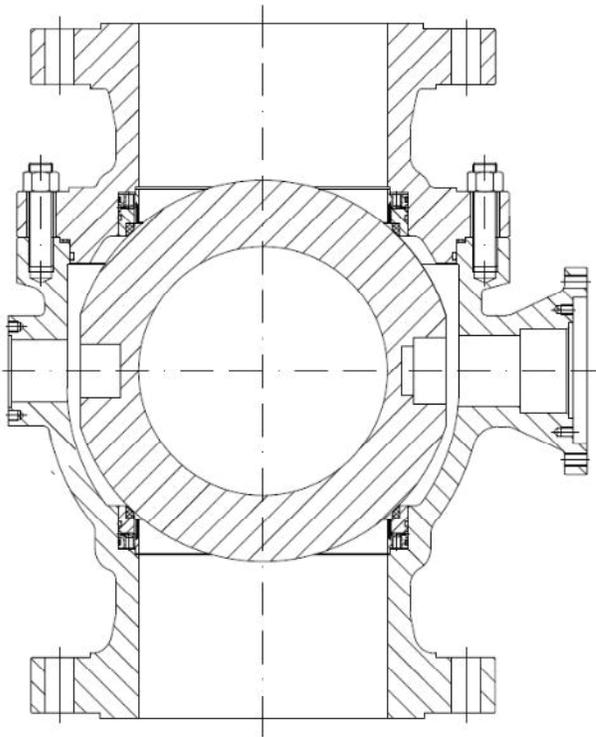


Figure 5

- 6.4 Remove the exposed accessories including grease injection valve, drain valve (blow-out cock), and pressure relief valve.
- 6.5 Remove the lower end cover, lower fixed shaft, lower fixed shaft sleeve, and O-ring.
- 6.6 Remove the intermediate flange bolts (10, 11), valve seat (6) sub-assembly, and left upper valve body (8), and the pin from the supporting plate, see Figure 6.
- 6.7 Wrap up a rope with a piece of soft cloth and pass it through the ball (7) passageway. In doing so, the ball port or ball surface can be protected from scratches. Then hoist the ball as shown in Figure 6

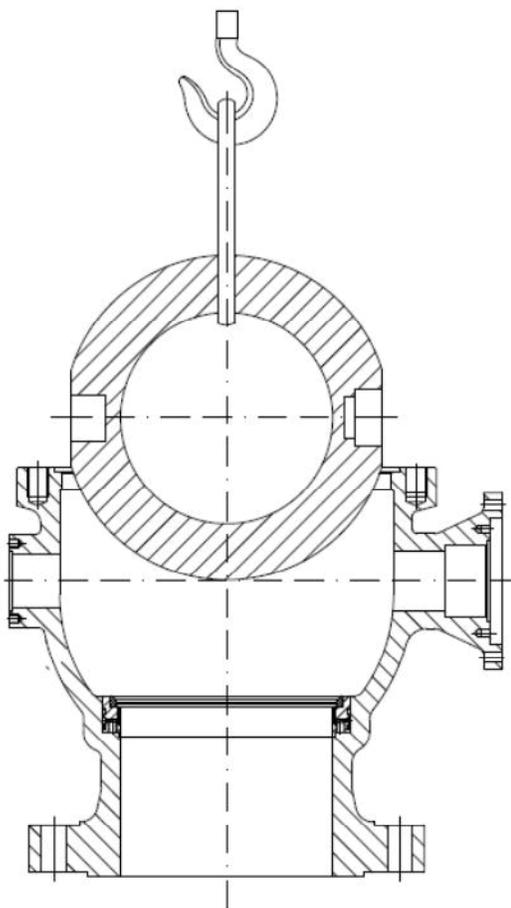


Figure 6

7.0 ASSEMBLY

- 7.1 Inspect all parts prior to assembly looking for possible damage. Replace spiral-wound gaskets, thrust bearings and sleeves. Other parts and components which are believed to have an impact on valve operation must be replaced as well.

- 7.2 The repair of damaged ball and seat seal faces must be done by licensed valve manufacturer.
- 7.3 Start valve re-assembly after all components have been inspected and vulnerable replacements parts are ready in place.
- 7.4 Valve Seat Subassembly: Insert the valve seat seal ring into the valve seat bracing ring. Apply a small amount of non-corrosive non-liquid grease on the valve seat spring and then insert it into the bracing ring, preventing the spring from dropping off during installation. Mount the seat O-ring followed by the seat insert, as shown in Fig.7. Place the valve seat into the valve body

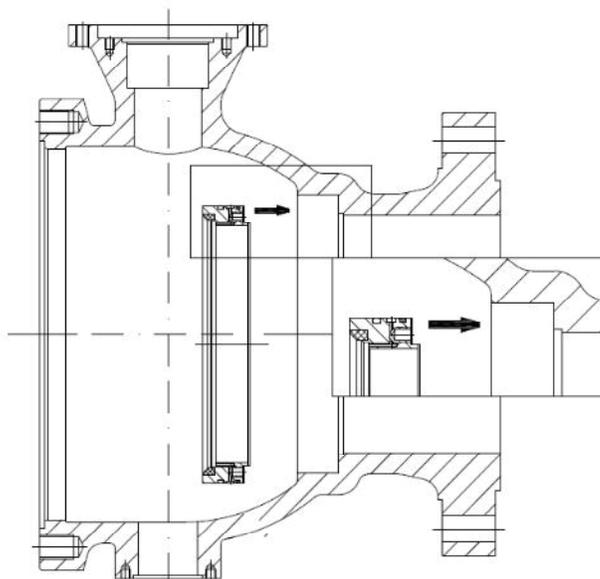


Figure 7

- 7.5 Place the other valve seat into the valve body in the same fashion. Mount O-ring on the intermediate flange of the bonnet.
- 7.6 After the valve seats are mounted in place, point the flange face of valve body downward and then place the body vertically on the work surface. Lift up the ball and place it carefully into the body. Hold the ball while it is lifted and being placed in order to prevent scratches and abrasions to the ball due to swinging. For specific steps, see Figure 5.
- 7.7 Place the intermediate flange gasket seal on the body (4).
- 7.8 Lift and assemble the bonnet to the body and initially hand-tighten the bolts located in the symmetrical bolt holes on the intermediate flange. When final tightening flange bolts, use the crisscross method and gradually tighten each nut, repeating several times.
- 7.9 Mount the trunnion, the stem, the bushing, the thrust washer, the stuffing box, the packing, the gland flanged respectively.

- 7.10 Hoist the valve placing it horizontally on the work surface. Mount the grease injection valve, pressure relief valve, drain valve, and operating mechanism;
- 7.11 Without placing the valve under pressure, operate the valve, fully opening and closing the valve several times;
- 7.12 Carry out a pressure test to determine the post-repair operating performance of the valve.

8.0 GEARBOX

8.1 Environmental Requirements

- 8.1.1 Operating temperature: -20°C to 60°F.
- 8.1.2 Operating condition shall not contain corrosive, flammable or explosive medium.

8.2 Installation

- 8.2.1 Check if the adjusting bolts (3)(8) are unfastened, if not, do so;
- 8.2.2 Install flat key (14) to the worm, then handwheel (12), fix them with gasket (11) and screw (10);
- 8.2.3 Turn handwheel until the position indicator pointing to the fully closed position, meanwhile check if valve is fully closed, if not, close valve;
- 8.2.4 Install flat key (13) to valve stem, followed by gearbox, fine tune handwheel for easier positioning of the bolts (9);
- 8.2.5 Turn handwheel clockwise until valve is fully closed, then fasten adjusting bolts (8) tightly, lock the position with adjusting nut (7) and then install the cap nut (6);
- 8.2.6 Adjust the position indicator to point to fully closed position, fix the position indicator with rivets;
- 8.2.7 Turn handwheel counter clockwise until the valve is fully opened, then install adjusting bolt (3), nut (4) and cap nut (5) in order, after confirming that position indicator is pointing to fully open position, install O-ring (2) and then the glass (16) and finally the glass cover (1) fixed with bolts (17). The gearbox is now ready to be used.

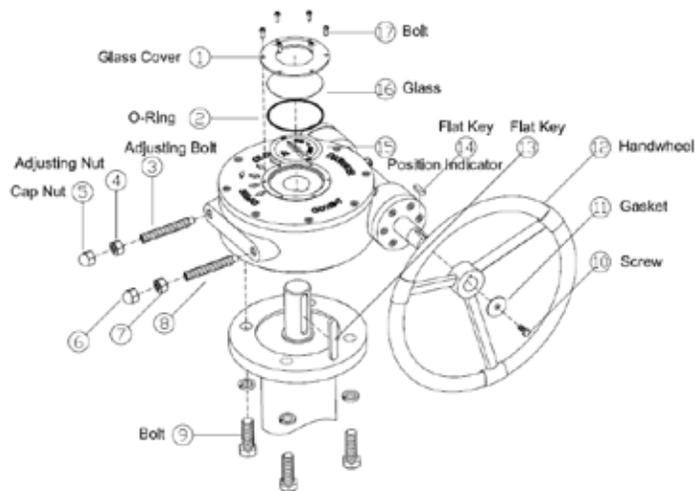


Figure 8

8.3 8.3 Maintenance

8.3.1 Humidity, outdoor and high temperature environment can cause problems for which routine check for good lubricating every half a year is required, injecting suitable amount of lubricants as necessary.

8.3.2 Under normal operating condition, routine check every year for lubricating is recommended, injecting suitable amount of lubricants as necessary.

8.4 Cautions

8.4.1 When the position indicator indicates the valves is fully opened or closed, DO NOT apply excessive force to operate the gearbox, doing so could cause damage to the gearbox.

8.4.2 DO NOT operate when the gearbox cover is not installed or present.

9.0 DISCLAIMER

9.1 The customer is obliged to consider the suitability of each valve's material for actual working conditions and determine the applicability of such material in terms of corrosion, temperature and impact resistances.

9.2 The maximum operating temperature-pressure rating of the valve shall not exceed the rating specified in Table 2 Rated Temperatures-Pressures, ASME B16.34-2009. If there exists such a working condition where the working pressure exceeds the limit of the specified pressure but the temperature-pressure rating table of such material lacks corresponding working temperature (including operation beyond tolerance in extreme working condition), then the user should given full consideration to such case during the selection of a specific type of valve.

- 9.3 This valve takes into account only applications considered ordinary working conditions during its design. In case of special working environments, such as unattended standby on field or the existence of any vibration, fire, storm, or earthquake, or prior special requirements, if any, regarding valve design must be given prior to order.
- 9.4 In general, a slight corrosive working condition is taken into account for valve design. If the selected material for a valve housing has to be exposed to a good deal of corrosive substances in the working condition or medium, which may result in a greater possibility of leakage at sealing positions inside the valve, like gasket, packing and O-ring, such material is regarded as not suitable for such kind of medium having special and high corrosive property. When the user selects a material to satisfy this kind of working condition, he shall consider the impact of internal and external leakage caused by corrosion on seal face to the process pipe when there is a sufficient corrosion allowance for the housing material.
- 9.5 For a valve which has a relatively high degree of vacuum in its cavity and whose housing has to be subject to an external pressure, due notice should be given to the manufacturer when selecting a proper model.

10.0 SHORT AND LONG-TERM STORAGE

10.1 Short-Term Storage

- 10.1.1 Short-term storage is defined as storage of products and equipment to be used in the construction of a project for periods of one to three months. Short-term storage must be carried out in a controlled manner as follows:
1. Valves must be stored in a closed, clean, and dry environment.
 2. Ball valves should be stored in the fully open position to protect the ball and seats.
 3. Ball valves should remain in the original shipping container and be placed on pallets of wood or other suitable materials. End protectors should remain on the valve ends to prevent the entrance of dirt, and removed only at time of installation.

10.2 Long-Term Storage

- 10.2.1 Long-term storage is defined as storage of products and/or equipment for periods longer than 3 months. Long-term storage must be carried out in a controlled manner as follows:
1. Valves must be stored in a closed, clean, and dry environment.
 2. Ball valves should be stored in the fully open position to protect the ball and seats.
 3. Ball valves should remain in the original shipping container and be placed on pallets of wood or other suitable materials. End protectors should remain on the valve ends to prevent the entrance of dirt, and removed only at time of installation.
 4. Periodically, the valves should be checked to ensure the above conditions are maintained.

These are general guidelines for valve storage. Please consult the factory for information regarding specific requirements.



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