

INSTALLATION, OPERATION & MAINTENANCE MANUAL

KF SERIES T/TW

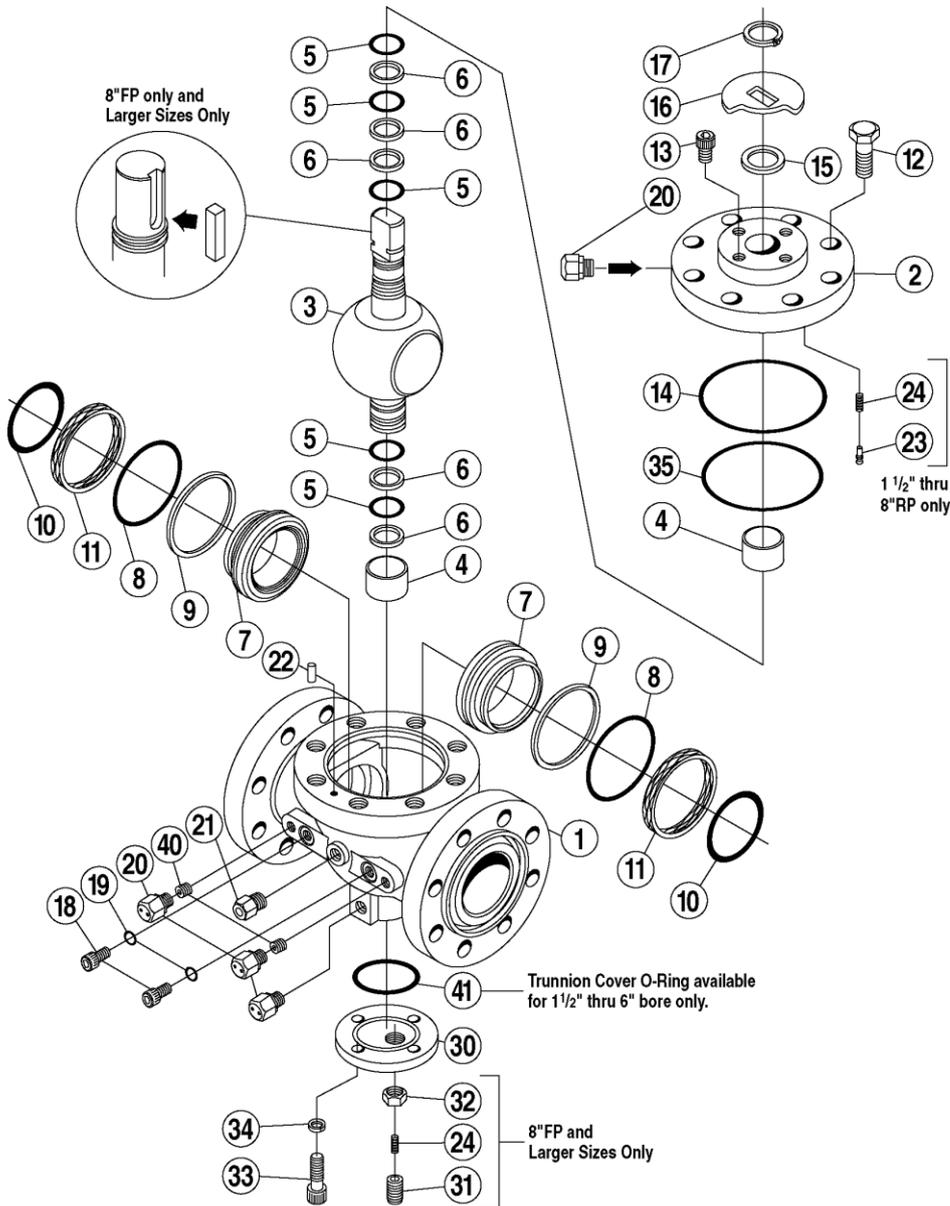
ONE-PIECE TOP ENTRY TRUNNION BALL VALVE



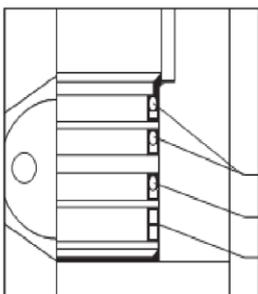
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BILL OF MATERIALS



Lower Stem Detail
 8" thru 12"



Primary Seal
 Secondary Seal
 Stem Packing

**Note: Weld End Configuration
 Not Shown (Series TW)**

PARTS LIST

No.	Description
1	Body
2	Bonnet
3	Ball/Stem
4	Trunnion Bearing
5	Stem Seal
6	Stem Back-up Ring
7	Seat
8	Seat O-Ring
9	Seat Back-up Ring
10	Seat Sub Seal
11	Wave Spring
12	Bonnet Cap Screw
13*	Stop Screw
14	Bonnet Seal
15*	Stem Bearing
16*	Stop Plate
17*	Retainer
18	Retract. Port Screw
19	Retract. Port Seal
20	Injection Fitting
21	Bleed Valve
22	Bonnet Align. Pin
23*	Grounding Plunger
24	Grounding Spring
29	Key
30	Thrust Plate
31	Thrust Adjust. Screw
32	Jam Nut
33	Thrust Plate Bolt
34	Lock washer
35	Bonnet Primary Seal
40	Internal Ball Check
41	Trunnion Cover O-Ring

* Not used in 8" FP & larger assemblies.

1) SCOPE

The following instructions are very important for the maintenance, disassembling and assembling of Series T Ball Valve. The instruction refers also to grease emergency seal valves with back-up rings for high pressure services.

2) INSTALLATION

2.1) SERIES T

Install valve in system using proper size and type mating flanges and appropriate gaskets (for RF) or seal rings (for RTJ). Valve design allows for line flow in either direction. Series T Valves are provided with a flatted diameter stem (6" bore and smaller) or a keyed stem (8" bore and larger) and four tapped holes in a machined bonnet surface for convenient actuator or gear operator mounting. Location and dimensions of these holes and stem sizes are listed on the appropriate KF Data Sheet (consult factory).

KF offers an optional gear operator with handwheel which can be field mounted. Installation requires that the gear operator covers be removed for access to the mounting holes. Attachment is accomplished by socket head cap screws through the operator case and into the mating threaded holes provided in the bonnet. After attachment to valve, adjust the threads "Open" and "Closed" travel stops by observing ball port and stem flats or key radial position. Complete assembly by installing covers.

2.2) SERIES TW

Series TW has the same installation, operation, and maintenance as Series T except the TW valve is to be welded into the pipeline with the following procedure.

- I. Prior to welding it is imperative that all welding surfaces be cleaned from contamination such as dirt, rust, and grease which may affect welding performance. Make sure the ball is in an open position.

Caution: *During the welding process, valve body temperature should be monitored around the circumference at a location in line with the seat sealant injection fittings. The temperature at this plane should be checked with the tempilstik or other reliable temperature indicator and not allowed to exceed 300°F. This precaution is necessary to assure that non-metallic seat/seals do not suffer heat damage.*

- II. Tack weld valve into position and check for proper alignment.
- III. Finish welding following proper welding procedure for material grade and condition, and the above caution.
- IV. If weld procedure being used requires post weld heat treatment one of the following is applicable: (A is preferred)
 - A. Localized post weld heat treatment limited to the heat affected zone does not require disassembly of the valve, and use of this method does not void the valves pressure test certifications. However, it is imperative that the valve body temperature be monitored and controlled as described in Note 1.
 - B. Post welding heat treatment of the entire body requires disassembly of the valve in order to prevent damage to the valve internals. Disassembly of the valve voids warranty and test certifications.

2.3) VALVE ORIENTATION

The orientation of the valve is not critical, but the optimal way is to position the stem vertically upwards for ease of use. Installing the valve upside down can cause the accumulation of dirt and other sediments on the stem seals. Install the ball valve with the valve stem facing upwards wherever possible.

3) OPERATION

3.1) INITIAL START-UP/COMMISSIONING

Once the valve has been installed on the line it shall be left either in fully open or fully closed position depending on start-up/commissioning operation

Important: *Do not leave the valve in half/partially open position for a long period of time. Ensure that the pipeline is free of any debris such as sand, tool, welding slag or weld splatter and rod ends. This will damage the valve ball and seat during start-up/commissioning operations.*

3.2) NORMAL OPERATING ACTIVITY

KF Series T Ball Valves are recommended for on-off service only. Throttling (partial opening) during flow conditions may cause excessive non-uniform wear on seats, preventing tight shut-off. All Series T Ball Valves open by rotating handle or gear operator handwheel in a counterclockwise direction. Exactly closed and open position is determined by the radial location of the stem flats or stem key with respect to the fluid bore centerline of the body. When the flats or key are perpendicular to the fluid bore, the valve is closed. Positive stops and arrow indication are provided on handles and gear operators.

3.3) BLOCK AND BLEED OPERATION

KF Series T Ball Valves are well suited for sealing fluids, concurrently, at both ends. The included bleed valve (21) provides a safe and convenient method for checking closed valves seat sealing effectiveness, as required, for Block and Bleed valves.

Caution! *Before opening the bleed valve note orientation of the exhaust hole in the bleed valve body. Stand clear of this direction when opening the bleed valve. Never remove bleed valve (21) while valve is exposed to line pressure.*

3.4) BODY CAVITY RELIEVING SYSTEMS

Trunnion mounted ball valves do have a body cavity where pressure can be trapped into a closed volume. Under this circumstance any increase of the contained fluid temperature or any degradation of the contained fluid can result in an uncontrolled pressure increase of the trapped fluid to figures that are above the design pressures of the pressure equipment.

To avoid the above scenario, all the KF trunnion mounted ball valves are provided with the following body cavity relieving systems (depending on the design of the seats):

Self-Relieving Seats: The design of self-relieving seat is such that when the pressure in the body cavity exceeds the maximum cavity pressure, the seat will automatically disconnect from the ball and allow pressure equalization between the body cavity and the pipeline.

When one or both the seats are of the Self Relieving type there is no need for any other type of body cavity relieving systems.

4) MAINTENANCE

Routine maintenance on KF Series T Ball Valves consists of periodic grease injections through the two body lube fittings (20). *See exploded view on pg. 3.* General purpose grease, such as VAL-TEX 2000, is recommended for this service. The use of thick, very viscous grease may hamper designed sealing action and make seat removal during any required disassembly more difficult. The suggested strokes required, per seat, for general maintenance is as follows: Valve sizes up thru 6", 4-6 strokes; 8"-10", 10-12 strokes; 12"-14", 14-16 strokes; 16", 20 strokes. The stem journals are permanently lubricated at the factory and require no routine maintenance.

Note: The stem journal fitting is for sealant injection to provide temporary sealing in the event of a stem seal failure (Sealweld "Ball Valve Sealant" No. 5050, available from Sealweld Corp., Houston, TX or Calgary, Alberta-Canada). Also, in the event of internal seat/ball interface leakage, sealant may be injected through the two body lube fittings to provide temporary sealing.

5) RECONDITIONING

KF Series T Ball Valves may be rebuilt to new condition without removing the valve from the pipeline.

Caution! Prior to disassembly, the valve must first be isolated from system pressure and flow. Also, with the valve seat at approximately half open, internal pressure must be bled to 0 psi. Finally, as a safety precaution open ball cavity bleed valve (21).

After observing the above caution, remove retainer (17), stop plate (16) and stem bearing (15). These items are not included on 8" bore and larger valves or gear operated assemblies. On gear operated valves, remove the covers for access to mounting screws (2 each on 2" bore valves, 4 each on all others). Use an Allen wrench to loosen and remove mounting screws. Segment gear position will have to be adjusted by rotating the handwheel in order to have access to all of the mounting screws. When screws are removed lift gear operator case from valve.

Rotate ball to fully open position and remove cap screws (12). Using a large flat blade screwdriver, pry up and remove bonnet (2) and bonnet seal (14). Next, remove the four seat retractor screws (18) and seals (19). Screw the four retraction tools into retraction ports until contacting seats (7).

Note: 1) It is very important not to overstress the seats by threading the seat retraction tools in too deep. 2) If thick, very viscous grease or

sealant has been injected to effect as a temporary seal, body lube injection fittings (20) and internal ball checks (40) (if included) should be removed to allow sealant to extrude during seat retraction.

Now, using two box end wrenches, screw the two seat retraction tools at one seat inward simultaneously. This action will retract the seat away from the ball. Watch for proper (even, not cocked) seat movement. Continue retraction of seat until approximately 1/16" clearance is obtained between seat face and port face of the ball. Now, using the two box end wrenches simultaneously, repeat the process, screwing the retraction tools in on the other seat until the 1/16" clearance for ball removal is obtained.

Remove Ball/Stem (3) by pulling up on upper stem. Be careful, observing that there is adequate clearance between the ball and seats for ball/stem removal. After the ball/stem is disengaged from body, release the seats by simultaneously unscrewing the seat retraction tools from each set. Reach into bonnet port and remove each seat, seat O-ring (8), seat back-up ring (9), seat sub seal (10) and wave spring (11) as a unit, by hand. Clean and inspect all parts for damage and wear. Observe seat pocket bores, stem seal bores and bonnet seal area for rust pits and scale. If necessary, use fine emery for removal of deposits on the machined surfaces. Fine emery may also be used "very lightly" on the ball sealing surfaces. Scratches or cuts on the Nylon®/Teflon® seal surfaces of the seats are cause for replacement. Flush lube and sealant injection fittings and channels with two or three pumps of general-purpose grease while valve is disassembled.

Inspect trunnion bearing (4) in both the body and the bonnet. *Do Not Attempt to Remove These Bearings Unless Replacement is required!!* If bearing removal is necessary, use a durable wide blade screwdriver or long chisel to split, then drive out bearing. Be careful not to gouge or score bearing journals.

6) REASSEMBLY

Use new replacement parts, as required. Install O-ring and back-up rings in their proper locations and orient as follows:

Stem seal back-up rings (6) belong on the side of the Stem O-ring (5) away from the ball and with the concave face toward the O-ring. The seat back-up ring (9) belongs on the side of the seat O-ring (8) closest to the ball and with the concave face toward the O-rings.

Use a liberal amount of general-purpose grease on seals and machined mating surfaces. Fill the reliefs between stem O-rings with grease.

Install new trunnion bearings utilizing a wooden block and hammer to drive them into position.

Install seat assemblies and wave springs as far as possible, by hand, into seat pockets of the body. Take care to assure that O-ring seals are not pinched during assembly. Seat assembly must be placed deep enough into seat pocket so that the conical point of the seat retraction tools will contact the angled metal seat surface when they are screwed into the threaded retraction ports of the body. Using the box end wrenches, screw the two seat retraction tools inward, simultaneously.

Note: *It is important not to overstress the seats by threading the seat retraction tools in too deep. Therefore, after both seats are installed and mechanical retraction is begun, continue to check ball clearance so that you do not exceed approximately 1/16" space per side to provide for ball/stem installation.*

Install ball/stem between retracted seats and pilot lower stem through trunnion bearing and into stem journal. Remove seat retraction tools, allowing seats to engage with the ball surface. Next, place a new bonnet seal in the recessed diameter on the body face. Install bonnet,

noting proper orientation with bonnet alignment pin (22). Tighten bonnet cap screws until bonnet is made up "metal-to-metal" with face of body. Complete assembly by reinstalling retraction port screws and seals, stem bearing, stop plate and retainer or gear operator assembly.

Clean the parts and inspect them for damage, wear, and corrosion. Observe seat pocket bores, stem seal bore and bonnet seal area for rust pits and scale. If necessary, use fine emery for removal of deposits on machined surfaces. Fine emery may also be used very lightly on the ball's spherical sealing surfaces.

Scratches or cuts on the sealing insert surface of the seats are cause for replacement. Flush lube and sealant injection fittings and channels with two or three pumps of grease while valve is disassembled. Replace seals and other parts, as required.

Reassemble in reverse order. Use a liberal amount of general-purpose grease (such as VAL-TEX 2000) on all seals and machined mating surfaces. Fill the relief area between the stem and lower trunnion O-ring grooves with grease. Finally, assemble the Bonnet to the body and uniformly tighten the Bonnet nuts.

7) VALVE SERVICING INTERVALS

Valve shall be inspected regularly during operation and subjected to scheduled maintenance. The operator is responsible for servicing the valve at regular intervals. The service intervals are determined by media in line, temperature, pressure, and number of cycles during the operations. High pressure accelerates the loss of lubricants.

8) VALVE MAINTENANCE GUIDELINES

To guarantee efficient valve operation, the valve shall be inspected on a regular basis during the operation and subject to scheduled maintenance. All maintenance work shall be

done by qualified personnel. Follow the grease gun or pump manufactures equipment's guidelines for proper use. Local regulations shall be strictly followed for the safety and health of the persons involved.

8.1) ROUTINE MAINTENANCE

The valve lubricants are designed for routine valve maintenance. It consists of injecting lubricant/sealant though the groove or channel inside the valve leading to seal points around the ball thus topping off the lubricant/sealant. The "Top Off" quantity can vary greatly due to frequency of valve operation and service conditions. The lubricant is available in stick or liquid form and should be free from heavy agent such as PTFE, clay and wax. The most widely used lubricant by manufacturers and users is "HYDROCARBON GREASE".

8.2) VALVE FLUSH

Valve flush is a blend of synthetic oils. It works through penetration by pressure and is often successful in softening hardened deposits of lubricants and sealants. It forms protective coating on the metal surface and impenetrable barrier which will withstand high pressure and friction in server service demands.

8.3) VALVE CLEANING

When the valve does not seal properly and is hard to turn, the valve cleaning is required. Valve cleaners are products that contains detergent, sealant and oils. It clears channels/passage where old grease may have been hardened, inject cleaner through the lubrication channels, leaves it for three-to-four hours. If possible, cycle the valve to evenly distribute the cleaner in the ball-seat contact area. This procedure is often successful in freeing seized or hard to turn valve.

Note: *Always displace the valve cleaner with equal quantities of Lubricant/Sealant after cleaning.*

8.4) EMERGENCY REPAIR

Severe seat or ball damage may cause the valve to leak. The valve sealants are designed to stop a leaking valve. The sealant contains heavier agents such as PTFE and clay in a grease base. The temporary seal can be achieved by injecting a heavy sealant. Displace a heavy sealant after use of a lighter lubricant/sealant to avoid complications. The valve which requires continuous heavy sealant injections shall be either replaced or repaired immediately.

9) QUICK REFERENCE

9.1) NEW INSTALLATION "START-UP"

Valves are frequently damaged by debris during hydro testing or start-up of a New Installation.

It is very important that the valve be in fully open position during this process.

- If the valve is closed or partially open, debris can damage the ball and find its way into seat pockets
- This can cause the valve to leak soon after start-up

9.2) PROPER VALVE TESTING

- I. Each valve is to be operated before and after testing for any unusual torque requirements.
- II. Test pressure measuring devices are to be either currently calibrated pressure gages or pressure transducers.
- III. Tests are to be done with ball and seat free of any sealant.
- IV. Fluid for shell and seat tests is to be water with a corrosion inhibitor.

V. Valves are to be substantially relieved of air or gas when tested with liquid.

VI. Seat closure tests are to be conducted after acceptable shell test.

9.3) SHELL TESTING

Prior to painting or other external coatings, Valves is to be subjected to a hydrostatic shell test. There is to be no leakage under the test pressure when both ends are blanked and the ball is partially open. Testing pressure is 1.5 times MOP. Test duration are 2 min for 4" and under valves, 5 min for 6" to 10" valves, 15 min for 12" to 18" valves and 30 min for 20" and larger.

I. Fit the vent valve and set it in an open position.

II. Operate the valve to the half-open position.

III. Fill in the valve with the fluid (Venting the air through the vent valve)

IV. Close the vent valve and apply pressure in accordance with max operating pressure of the pipeline.

V. Visually check the outside of the ball valve for possible deformations or leakage.

VI. Depressurize the valve.

9.4) HYDROSTATIC SEAT TESTING

Valves are to be subjected to a hydrostatic seat test. There is to be no leakage under test pressure. Test pressure is to be applied successively to both sides of closed valve with other side open to atmosphere. Testing pressure is 1.1 times MOP. Test durations are 2 min for 4" and under valves, 5 min for 6" and larger valves.

I. Operate the valve to the fully closed position and open the vent valve.

II. Pressurize one side in accordance with max operating pressure of the pipeline.

III. From the body vent, check for possible seat leakage.

IV. Repeat same operations as per points 2 & 3 on opposite side of the valve.

V. Depressurize the valve.

Note: For valves without a body vent or drain connection, it is necessary to install a control system on the pipeline to measure the pressure in upstream and downstream of the valve.

9.5) SUPPLEMENTAL AIR SEAT TEST

Valves subjected to an 80psi air seat test shall show no signs of visible leakage.

9.6) DOUBLE BLOCK AND BLEED (DBB) VALVES

If the valve has DBB, the test shall be performed as follows:

I. With the valve in half-open position, the valve shall be completely filled.

II. The valve shall then be closed and the valve vent opened to allow excess fluid to overflow from the cavity connection.

III. Apply pressure on both the seats simultaneously.

IV. Seat tightness shall be monitored from the cavity connection.

V. Depressurize the valve.

Note: For valve without a body vent or drain connection, the above test is not applicable

10) GEAR OPERATOR FIELD ADJUSTMENT

- I. Locate “closed” stop adjustment screw on gear operator. It is the screw on back of gear case on same side of operator as the hand wheel.
- II. Operate ball valve to full closed, “feel” the valve hit the stop.
- III. With pressure on closed ball valve, loosen the lock nut on “closed” stop adjustment screw then back out screw [CCW] 3 or 4 turns.
- IV. Open bleed fitting on side (center) of ball valve.
- V. Line media will escape from bleed fitting while evacuating ball cavity. Allow a minute or two for the body cavity to bleed down. If the media continues to escape thru bleed fitting, leakage is confirmed.
- VI. If leakage continues to be observed at bleed fitting, turn gear operator hand wheel clockwise (right) to further close the ball valve. As the hand wheel is turned, observe for change in amount of flow out bleed fitting. The objective is to find a position where flow no longer comes from bleed fitting. At each check position, it is necessary to allow some time to see if the flow changes. If a position is not found to stop leakage in the CW direction, turn hand wheel CCW to see if the valve may have been over-closing.
- VII. If a position is found where leakage stops, turn the stop-screw CW until it hits snugly then tighten the lock nut.
- VIII. If a position is not found where leakage stops, it can be concluded that the seat insert is damaged and repair is necessary.

11) VALVE MAINTENANCE OVERVIEW

- Establish a valve Maintenance group
- Have a set valve servicing schedule
 - Service schedule is dependent on the media and the number of times the valve is cycled
- Valves should be lubricated at least one time every six months.

12) LUBRICATION EQUIPMENT

- Hydraulic hand guns are efficient for 4” Bore and smaller
 - Hand guns require 50 Strokes to move 1oz of product
- Air operated guns are the most efficient for 6” bore and larger

13) PROPER VALVE STORAGE**INSIDE STORAGE**

- Ball valves should be in the full open position
- End connection protectors should be tight to prevent ingress of moisture and debris.
- Valves should be left in original shipping container (If possible).

14) TROUBLESHOOTING

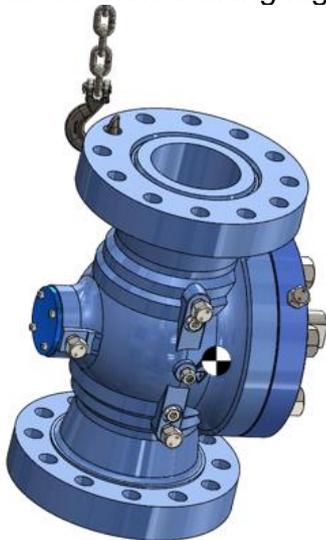
- Verify leakage (Block & Bleed)
- Cycle the valve 3-6 Times
 - Wipes the ball and often allows trapped debris to travel downstream
 - Can free-up a stubborn seat
- Adjust Gear Operator/Actuator Stops
 - Occasionally, a stop set on a gear operator may loosen causing the valve to over or under level.

FAULT	FINDING	CORRECTION
Internal Leakage	<ul style="list-style-type: none"> • Stroke the valve to the fully closed position. • Discharge the residual pressure left inside the cavity through the drain valve and the vent plug (when provided). • Allow the system to stabilize for half an hour minimum. • If the valve is tight no water should drip out the drain valve. 	<ul style="list-style-type: none"> ➤ Small leaks can be stopped by injecting sealant into grease nipples ➤ Bad ones require replacement of seat seals.
Body Leakage	<p>When any of the body flanged connections drips verify the bolt tightening torque of the joint concerned.</p>	<p>External leaks can be stopped replacing body gaskets.</p>
Increase in torque requirements	<ul style="list-style-type: none"> • A slight increase in the valve torque requirement is natural during the valve life and has been taken in account when designing the operator device. • This torque increment tends to stabilize with time. • Torque increasing rate that does not trend to stabilize can be caused by external affairs such as sand / debris trapped between ball-stem and bonnet flange or foreign objects, left into the pipeline that gets trapped between seats and ball. 	<ul style="list-style-type: none"> ➤ Inject lubricant grease through the ball-stem grease fitting. ➤ If this operation does not bring any benefit dismantle the stem/gland flange group and verify no galling, scores or damages have occurred. ➤ If possible, remove the foreign objects from the pipeline. ➤ Verify that the operator is correctly set and is delivering its nominal torque.
Ball-Stem leakage	<ul style="list-style-type: none"> • Leakages from ball-stem depend from damage of primary and secondary seal on the ball-stem in case the grease injector is not between the two sealing areas. In this case the leakage is recorded through ball-stem seal. • In case the grease injector is positioned between the seals (primary and secondary) the leakage of primary seal can be recorded removing the grease injector or plug forecast during the design stage. 	<ul style="list-style-type: none"> ➤ Small leakages can be stopped or reduced injecting grease sealant through the grease injector. ➤ Big leakages require the dismantling of the valve.

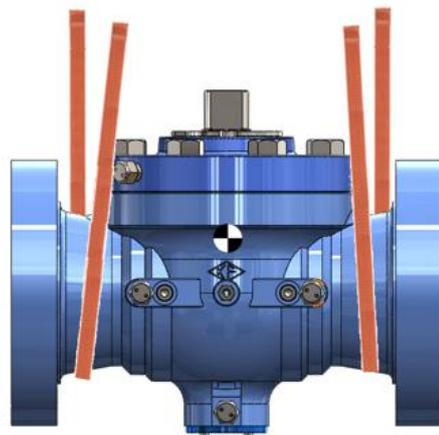
FAULT	FINDING	CORRECTION
Vent and drain leakage	<ul style="list-style-type: none"> Leakage through drains and vents caused by damage of elastomeric seal material or when minimum torque required is not achieved (wrong torque applied or threaded parts damaged). In this case there is a leakage of fluid or gas from vent and drain. 	<ul style="list-style-type: none"> If elastomeric seal material is damaged it is substituted after dismantling the vent and drain. In case there is any missing torque the correct torque is applied (after the verification of integrity for threaded area). Leak from the gasket seal can require the dismantling of the flange and substitution of gasket seal.

15) HANDLING INSTRUCTIONS

- Always keep the ball in an open position to avoid any possible damage on ball sealing surface.
- If the valve end protectors are removed for any check or testing, the same preservation and protection shall be done after the check or testing.
- Valve sizes 8" Reduced port and above are provided with lifting lugs for the purpose of proper lifting of the valve. Safe working limit of each lifting point is provided in Table-1. Valves without lifting lugs (sizes below 6" Full port) shall be handled using ropes/straps.
- Location of Centre of Gravity of the valve marked in the below images with the symbol "☉"
- The following are the right and wrong practices for lifting the valves.
 - Valves without lifting lugs (6" Full port and below)

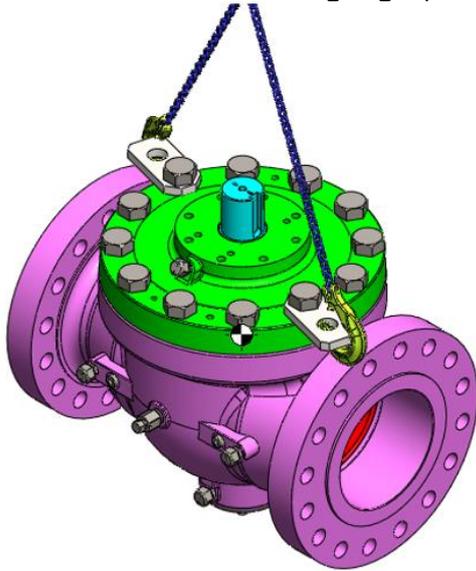


✓ Right

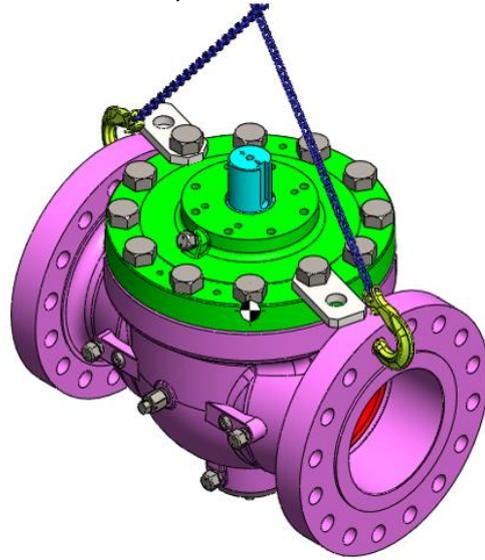


✓ Right

- Valves with lifting lugs (8" Reduced port and above)



✓ Right



✗ Wrong

TABLE-1: SAFE WORKING LIMIT OF LIFTING LUG				
SIZE	CLASS	No. of Lifting Lugs	SWL per Lifting Lug (Lbs.)	SWL per Lifting Lug (Kg)
8RP	600	2	1170	531
8FP	600	2	4679	2122
10RP	600	2	4679	2122
10FP	600	2	2451	1112
12RP	600	2	2451	1112
12FP	600	2	4335	1966
8RP	900	2	6795	3082
8FP	900	2	4679	2122
10RP	900	2	4679	2122
10FP	900	2	2451	1112
12RP	900	2	4335	1966
12FP	900	2	4335	1966
8RP	1500	2	1224	555
8FP	1500	2	2451	1112
10RP	1500	2	4335	1966
10FP	1500	2	4532	2056
12RP	1500	2	4532	2056
12FP	1500	2	7712	3498
8RP	2500	2	4335	1966
8FP	2500	2	4523	2052
10RP	2500	2	4523	2052

TABLE-1: SAFE WORKING LIMIT OF LIFTING LUG				
SIZE	CLASS	No. of Lifting Lugs	SWL per Lifting Lug (Lbs.)	SWL per Lifting Lug (Kg)
10FP	2500	2	7712	3498
12RP	2500	2	7712	3498
12FP	2500	2	7898	3582

REVISION HISTORY				
REV	PREPARED BY	DESCRIPTION	DATE	APPROVED BY
EC-15333	TamilSelvan.J	Initial Release	06/26/2015	SEE ELECTRONIC APPROVALS
EC-15838	Amuthageethan	Section "Handling" added	11/30/2017	SEE ELECTRONIC APPROVALS
EC-16221	Naveen M	Logo updated to KF Valves	02/16/2022	SEE ELECTRONIC APPROVALS
EC-16251	Silambarasan S	Valve center of gravity, safe working limit of Lifting lug, Valve Orientation added	04/28/2023	SEE ELECTRONIC APPROVALS