

INSTALLATION, OPERATION & MAINTENANCE MANUAL

KF SERIES FAE

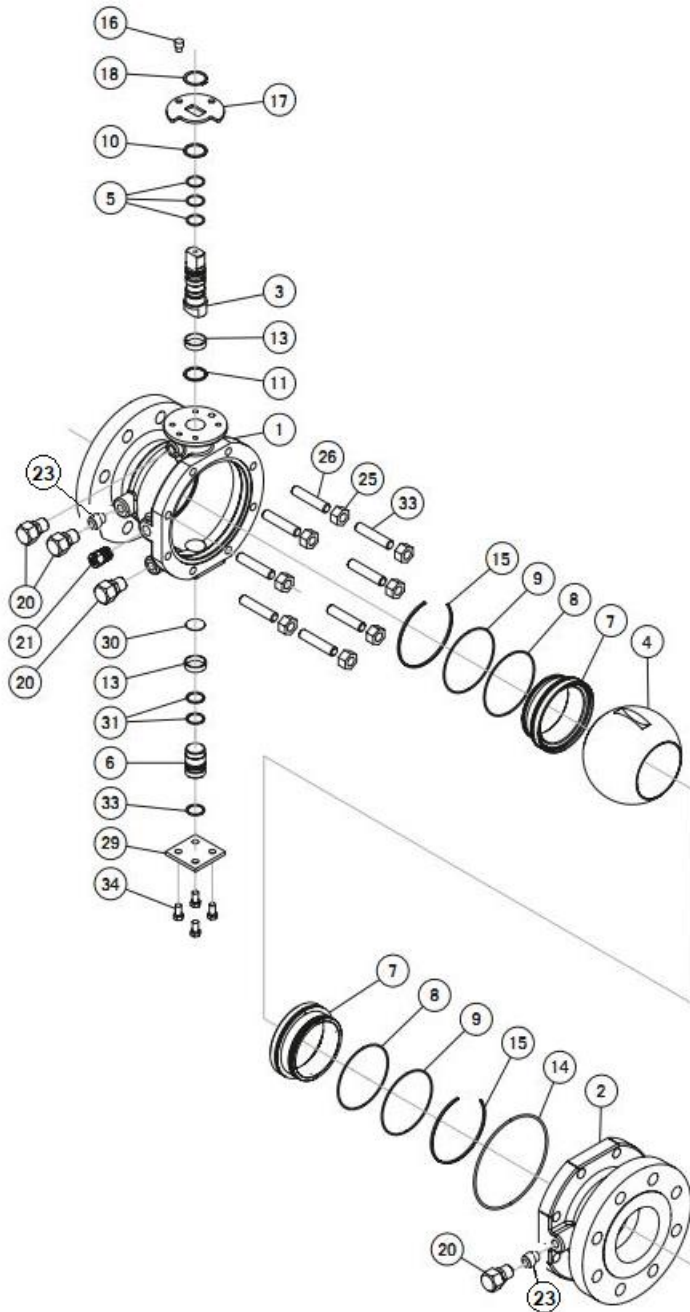
TWO – PIECE TRUNNION MOUNTED BALL VALVE



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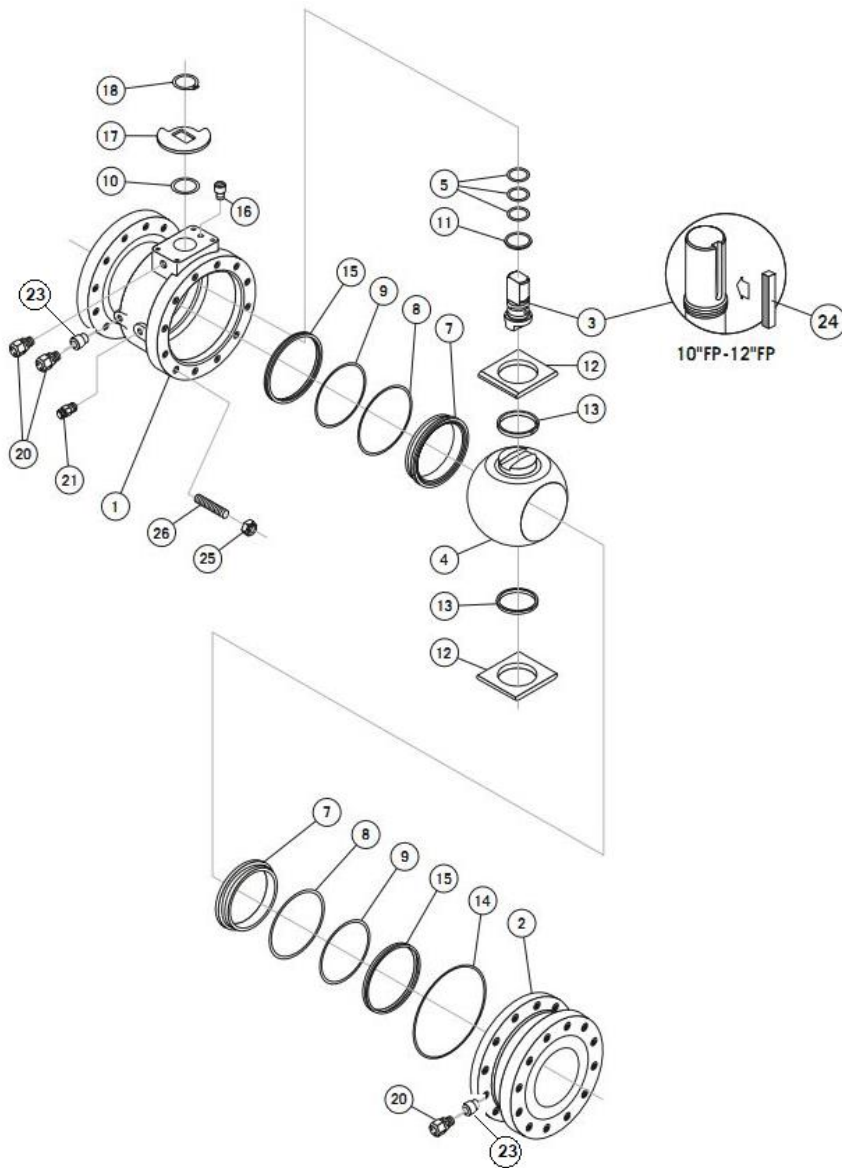
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BILL OF MATERIALS
 (FAE Component Part, 2" FP – 6" RP)



Part No.	Description
1	Body
2	Adapter
3	Stem Assembly
4	Ball
5	Stem Seal
6	Trunnion Support
7	Seat
8	Seat-O-Ring
9	Seat Sub Seal
10	Seat Bearing
11	Thrust Bearing
13	Trunnion Bearing
14	Body Seal
15	Wave Spring
16	Stop Screw
17	Stop Plate
18	Retainer
20	Injection Fitting
21	Bleed Valve
23	Ball Check
25	Hex Nut
26	Stud

(FAE Component Part, 6" FP – 12" FP)



Part No.	Description
1	Body
2	Adapter
3	Stem Assembly
4	Ball
5	Stem Seal
7	Seat
8	Seat-O-Ring
9	Seat Sub Seal
10	Seat Bearing
11	Thrust Bearing
12	Trunion Support
13	Trunion Bearing
14	Body Seal
15	Wave Spring
16	Stop Screw
17	Stop Plate
18	Retainer
20	Injection Fitting
21	Bleed Valve
23	Ball Check
24	Key, 10" FP thru 12"FP Only
25	Hex Nut
26	Stud

1) SCOPE

The following instructions are very important for the maintenance, disassembling and assembling of series FAE ball valve. The instruction refers also to grease emergency seal valves with back-up rings for high pressure services.

2) INSTALLATION

Install KF Series FAE Ball Valves in piping system using proper size and mating flanges and appropriate gaskets (for RF) or seal rings (for RTJ). Valve design allows for line flow in either direction. Series FAE Valves are provided with a flatted diameter stem (6" and 8" bores) or keyed diameter stem (10" and 12" bores) and four tapped holes in a machined top pad surface for convenient actuator or gear operator mounting. Location and dimensions of these holes are listed on KF Data Sheet DB-71 and DB-73.

2.1) 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

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.

NORMAL OPERATING ACTIVITY

KF Series FAE Ball Valves are recommended for on-off service only. Throttling (partial opening) may cause excessive and non-uniform wear on the seats, preventing tight shut-off. Series FAE Ball Valves open by rotating handle or gear operator hand wheel in a counter-clock- wise direction. Exact closed and open position is determined by the radial location of the stem flats or keyway with respect to the fluid bore centerline of the body. When the stem flats or keyway are perpendicular to the fluid bore, valve is closed. Positive stops and arrow indication are provided on handles and gear operators.

Double Block and Bleed Operation:

KF Series FAE Ball Valves are well suited for sealing fluids, concurrently, at both ends. The bleed valve (21) provides a safe and convenient method for checking closed valve seat sealing effectiveness as required for Double 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 while valve is exposed to line pressure.

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, KF FAE trunnion mounted ball valves are provided with the following body cavity relieving system:

Self-Relieving Seats: the design of self-relieving seat is such that when the pressure in the body cavity exceeds the pressure in the line by 1650 to 4620 kPa (16.5 to 46.2 bar) 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 of any other type of body cavity relieving systems.

4) MAINTENANCE

Routine maintenance on Series FAE Ball Valves consists of periodic grease injections through the two seat lube fittings (20), one on the body and one on the adapter. See exploded view on page 4. General purpose grease, such as Mystic JT-6, is recommended for this service. Two pump strokes per fitting twice a year are adequate. The use of thick, very viscous grease may hamper designed sealing action and make seat removal during any required disassembly more difficult. 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 (Seal weld "Ball Valve Sealant" No. 5050, available from Sealweld Corp., Houston, Texas or Calgary, Alberta-Canada). Also, in the event of internal seat/ball interface leakage, sealant may be injected through the two seat lube fittings to provide temporary sealing.*

5) RECONDITIONING

KF Series FAE Ball Valves may be rebuilt after removing the valve from the pipeline.

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

6" through 12" Bores: First, position valve with body (1) flange end down and rotate ball to full closed position. To disassemble, remove handle (19), retainer (18), stop plate (17) and stem bearing (10). These items are not included when valve is equipped with a gear operator. On gear operated valves, remove the cover for access to mounting screws. Use an Allen wrench to loosen and remove mounting screws. Segment gear position will have to be adjusted by rotating the hand wheel in order to have access to each of the mounting screws. When screws are removed, lift gear operator case from valve.

Remove hex nuts (25) and lift adapter (2) from body. Carefully remove ball (4) with trunnion supports (12) from body. Next, push stem assembly (3) inward and remove through the valve body bore. Remove seat assembly (7) and wave spring (15) from both the body and adapter sections. Finally, remove split trunnion bearing (13) from trunnion supports.

Clean and inspect all parts for damage and wear. Observe seat pocket bores, stem seal bore and adapter 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 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.

6) REASSEMBLY

Use new replacement parts, as required. Use a liberal amount of general purpose grease (such as Mystic JT-6) on seals and machined mating surfaces. Fill the reliefs between stem O-rings with grease.

Install seat assemblies and wave springs as far as possible, by hand, into seat pockets of body and adapter. Take care to assure that O-ring seals are not pinched during assembly. Seat assemblies must be placed deep enough into seat pockets so that the wave springs are in contact with both body and seat. Insert stem assembly complete with thrust bearing into lubricated stem journal. (Note: A thin screwdriver or like tool will be required to depress the stem's side anti-static plunger in order to engage the plunger into the stem journal.) Pull stem assembly through to full engagement and rotate it to a closed position. 10" and 12" valves require that the keyway be oriented radially toward the lube fitting in the body.

Place bearings in trunnion supports then install this assembly on each trunnion of the ball. The blocks must be oriented such that the 5/16" holes face toward the body and the tapered edges conform to the mating body inside diameters. Carefully lower this assembly into the ball cavity of the body. (Note: A thin strip of steel strap held in the ball's stem slot will depress the stem end plunger smoothly as the ball trunnion blocks are lowered into position.) Assure this assembly has reached its seated position within the body by noting engagement with trunnion alignment pin (27). Place body seal (14) in position on adapter pilot diameter then align adapter with body studs such that flange end holes match body end flange holes. After adapter is in contact with body fasten evenly and securely by tightening hex nuts in a cross-opposing order. Complete assembly by adding stem bearing, stop plate and retainer or gear operator assembly.

2" through 4" Bores: Stand the valve on end, resting on the body pipe flange. Take care to avoid scar- rring the raised sealing face of the flange. To disassemble, remove handle (19), retainer (18), stop plate (17) and stem bearing (10). These items are not included with a gear operated valve. On gear operated valves, remove the hex head screws or nuts which attach the operator to the valve's mounting flange then withdraw gear operator from valve. Loosen and remove the trunnion cover cap screws (34) and trunnion cover (29). Remove the lower trunnion (6) and trunnion cover gasket (33) from the valve body. Remove the nuts (25) from the studs (26) at the adapter connection. Carefully remove the adapter (2) from the body then lift the ball (4) straight out of the body. Be careful to prevent the ball from being damaged during this procedure. Set the ball on a clean surface. Push the stem (5) inward and remove through the valve body bore. Pull the seats (7) and seat springs (15) from both the adapter and body. Remove all seals and bearings from the valve components.

Clean the parts and inspect them for damage, wear and corrosion. Observe seat pocket bores, stem seal bore and adapter 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 Mystic JT-6) 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

adapter to the body and uniformly tighten the adapter 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

In order to guarantee efficient valve operation, the valve shall be inspected on 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 equipments guidelines for proper use. Local regulations shall be strictly followed for the safety and health of 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.

8.2) Valve flush:

Valve flush is a blend of synthetic oils. It works through penetration by pressure and 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 hard to turn, the valve cleaning is required. Valve cleaners are the product that contains detergent, sealant and oils. It clears channel/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:

A 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 agent 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 full 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

1. Each valve is to be operated before and after testing for any unusual torque requirements.
2. Test pressure measuring devices are to be either currently calibrated pressure gages or pressure transducers.
3. Tests are to be made with ball and seat free of any sealant.
4. Fluid for shell and seat tests is to be water with a corrosion inhibitor.
5. Valves are to be substantially relieved of air or gas when tested with liquid.
6. 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 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.

1. Fit the vent valve and set it in open position.
2. Operate the valve to the half-open position.
3. Fill in the valve with the fluid (Venting the air through the vent valve)

4. Close the vent valve and apply pressure in accordance with max operating pressure of the pipeline.
5. Visually check the outside of the ball valve for possible deformations or leakage.
6. 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.

1. Operate the valve to the fully close position and open the vent valve.
2. Pressurize one side in accordance with max operating pressure of the pipeline.
3. From the body vent, check for possible seat leakage.
4. Repeat same operations as per points 2 & 3 on opposite side of the valve.
5. Depressurize the valve.

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

1. With the valve in half-open position, the valve shall be completely filled.
2. The valve shall than be closed and the valve vent opened to allow excess fluid to overflow from the cavity connection.
3. Apply pressure on both the seats simultaneously.

4. Seat tightness shall be monitored from the cavity connection
5. Depressurize the valve.

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

10) GEAR OPERATOR FIELD ADJUSTMENT

1. 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.
2. Operate ball valve to full closed, “feel” the valve hit the stop.
3. With pressure on closed ball valve, loosen the lock nut on “closed” stop adjustment screw then back out screw [CCW] 3 or 4 turns.
4. Open bleed fitting on side (center) of ball valve.
5. Line media will escape from bleed fitting while evacuating ball cavity. Allow a minute or two for body cavity to bleed down. If media continues to escape thru bleed fitting, leakage is confirmed.
6. If leakage continues to be observed at bleed fitting, turn gear operator hand wheel clockwise (right) to further close the ball valve. As 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.
7. If a position is found where leakage stops, turn the stop-screw CW until it hits snugly then tighten the lock nut.
8. 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 handguns are efficient for 4” Bore and smaller
 - Handguns 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

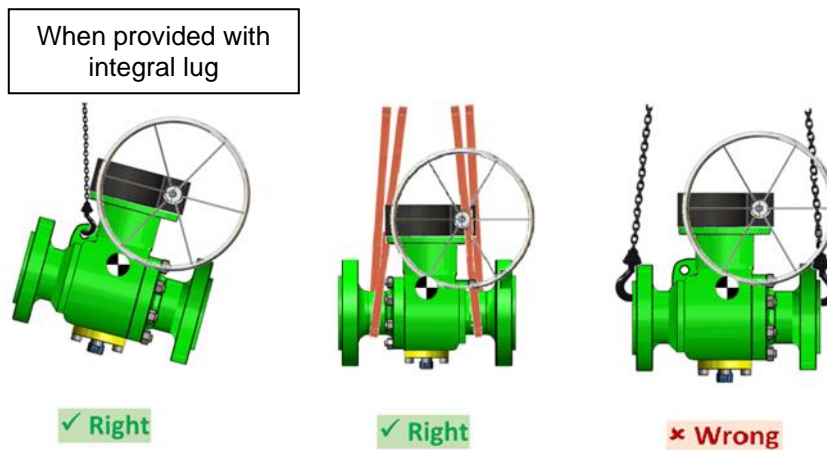
- Verify leakage (Block & Bleed)
- Cycle the valve 3-6 Times
 - Wipes the ball and often allows trapped debris to travel downstream
 - Can free-up a stubborn seat
- Adjust Gear Operator/Actuator Stops
 - Occasionally, a stop set on a gear operator may loosen causing the valve to over or under level.

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 stem and adapter 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 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.
Stem leakage	<ul style="list-style-type: none"> • Leakages from stem depend from damage of primary and secondary seal on the stem in case the grease injector is not between the two sealing areas. In this case the leakage is recorded through 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 dismounting of the valve.

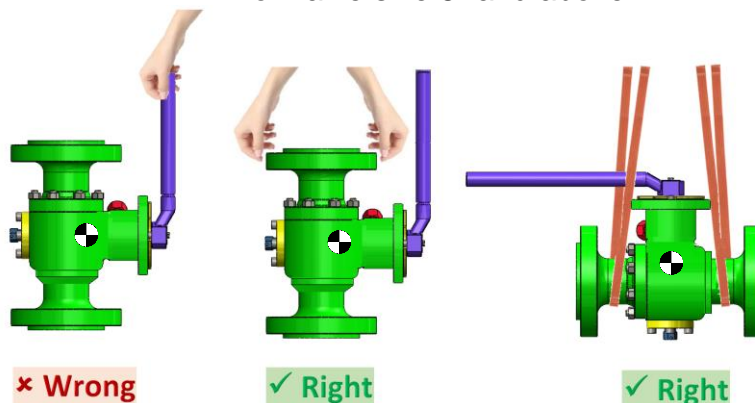
<p>Vent and drain leakage</p>	<ul style="list-style-type: none"> Leakage through drains and vents caused by damage of elastomeric seal material or when minimum torque required is not achieved (wrong torque applied or threaded parts damaged). In this case there is a leakage of fluid or gas from vent and 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.
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15) HANDLING

- Always keep the ball in open position to avoid any possible damages 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.
- Valves shall be handled using ropes/straps.
- Location of Center of Gravity of the valve marked in the below images with the symbol “”
- Following are the right and wrong practices for lifting the valves.



For valve size 8" and above



Valves without lifting lugs (Size Below 8")

REVISION HISTORY				
REV	PREPARED BY	DESCRIPTION	DATE	APPROVED BY
EC-15333	BHARATH D K	Initial Release	06/08/2015	SEE ELECTRONIC APPROVALS
EC-15838	AMUTHAGEETHA N	Handling has been added	11/30/2017	SEE ELECTRONIC APPROVALS
EC-16226	Naveen M	Logo changed from Circor to KF	03/21/2022	SEE ELECTRONIC APPROVALS
EC-16273	Sundhararaman S	Ball check added in Exploded view, Valve Orientation Notes added & Center of Gravity Logo added in valve Handling Images.	09/27/2023	SEE ELECTRONIC APPROVALS