

KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Before installation these instructions must be fully read and understood

TABLE OF CONTENTS

1. Scope.....	1
2. Receipt, handling and storage.....	1
3. Installation	3
4. Operation	4
5. Gear operator instructions	5
6. Emergency sealant injection system	6
7. Preventive / periodic maintenance	7
8. Possible misuse of ball valve	7
9. Troubleshooting	8
10. Ordering spares.....	8
11. Disassembly and re-assembly (EL and UL series).....	9
12. Body cavity relief operation	15
13. Gland packing assembly procedure	15
14. Recommended tightening torques for fasteners and plugs	16
15. Service of valves with API monogram.....	17
16. Information for PED 2014/68/EU compliant valve.....	17
17. Warranty	18
18. Factory address for correspondence.....	18

1 SCOPE

This manual is provided to ensure proper installation, operation and maintenance for KTM Virgo series Top Entry Trunnion Ball valve, manufactured and supplied by Emerson (Applicable to Soft / Metal seated, Cast, EL, UL subseries.)

⚠ WARNING

Always use Personal Protective Equipment (PPE) when carrying out above activities.

2 RECEIPT, HANDLING AND STORAGE

- Identify the valve contained in the box using the packing list fixed on the box.
- While loading and unloading the box, check for handling instructions/symbols marked on the box and handle the box accordingly. Ensure lifting of valve box in upright position using fork lift as shown in Figure 1. Do not drag the box.
- Before removing the valve from the box, ensure valve is not fastened/fixed inside the box with wooden battens and bolts which are provided to prevent the valve from toppling or moving inside the box during transportation.
- Remove the valve from the box using proper D-Shackle or lifting hooks and straps. These must be sized depending upon the weight that must be lifted at lifting points (lifting lugs) provided on valve as shown in Figure 2. Do not use chains or hooks in contact with the machined or painted surfaces.

FIGURE 1

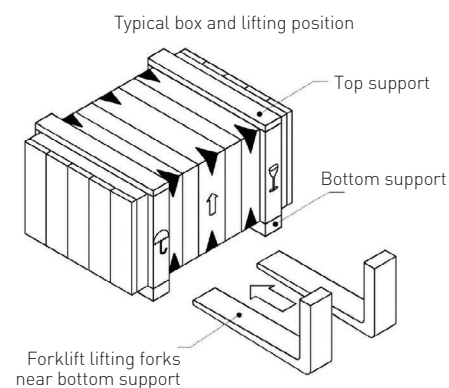
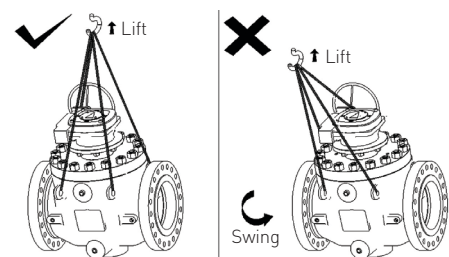


FIGURE 2



KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

- If lifting lugs are not provided on the valve, hold the valve with lifting strap around neck area and gently lift it as shown in Figure 3. Ensure the lifting strap is sized appropriately for the weight that must be lifted and is holding the neck area of valve firmly, to prevent damages.

⚠ WARNING

- If the valve is supplied with an operator (gear operator or actuator) do not use the operator or the operator lifting lugs to lift the valve assembly.
- For stem extension valve, use proper support as shown in Figure 4 to prevent toppling of valve.
- During handling, pay attention to prevent any damage to the flange faces, butt weld ends, operator, auxiliary fittings and piping (as applicable). Do not drag the valve during handling.
- The identification of the valve is given on the body or on the nameplate or both. (Figure 5).
- If a tag number is specified by the customer, identify the valve using tag number stamped on the name plate or tag plate affixed to the valve.
- After removing from box, always store the valve under roof and in a dry and clean atmosphere, protected from rain and storm.
- Always place the valve on 'soft' surface like rubber sheets or wooden planks free of dirt/debris/hardware like nails and moisture to avoid damage to the valve surfaces.
- Ensure that valve ends are covered with protective end caps. Do not remove any protection from the valve during storage period.
- In case of automated valve assembly, refer to actuator/accessory manufacturer instructions for handling and storage.
- Always keep the valve either in fully open or fully closed position. Full open position is preferred. The valve is normally shipped in the full open position (exception is valve with a 'fail close' spring return actuator arrangement)

FIGURE 3

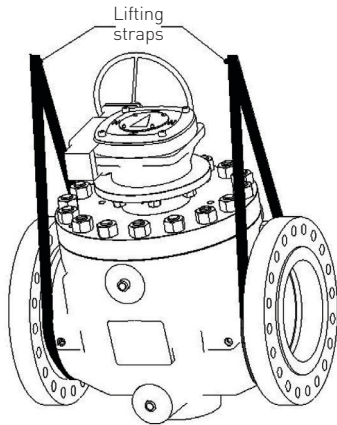


FIGURE 4

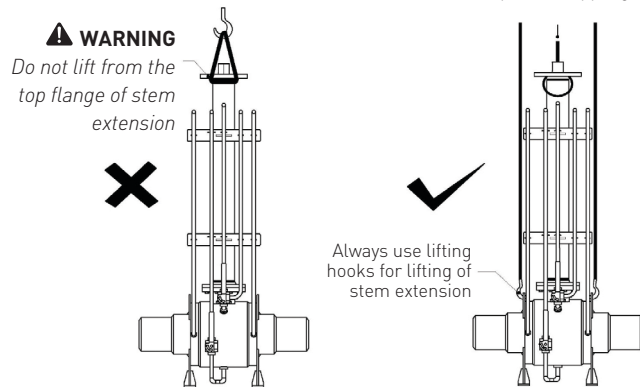
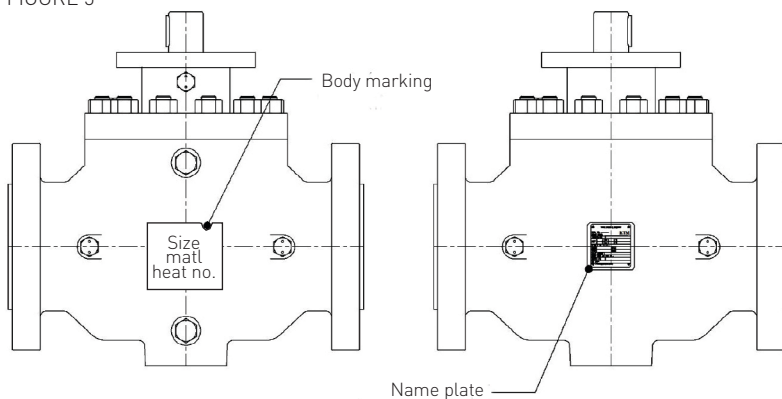


FIGURE 5



KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

3 INSTALLATION

⚠ WARNING

- To prevent personal injury or property damage resulting from the bursting of pressure retaining parts, be certain the service conditions do not exceed the limits given on name plate / tag plate of valve.
- Personal injury could result from packing leakage. The valve packing was tightened before shipment however; the packing might require some readjustment to meet specific service conditions.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.
- Before valve installation, ensure that the pipeline is free from dirt, debris, scale, weld-slag etc. to prevent damage to the internal trim parts and seals of the valve.
- Ensure that the valve end protectors are removed and the valve ends and bore are cleaned before installation.
- If mounting stand or support stand of valve is provided on end flange they shall be removed before installation on the pipeline (refer Figure 6).

- Mounting/support stand is only for handling and transportation and not for carrying piping loads. Hence Emerson recommends to give supports to the pipeline appropriately and shall not exceed following recommendations.
 - For sizes, up to DN 100 (NPS 4), support to be provided at a distance of '2D' to '3D' from both valve ends
 - For sizes, DN 150 (NPS 6) and higher, support to be provided at distance 'D' from both valve ends, where 'D' is the nominal diameter of pipeline.
- For removing mounting/support stand from valve assembly, lift the valve above ground level by using appropriate material handling/lifting equipment. Refer handling section of this IOM. Loosen and remove the nuts from respective mounting stand bolts/studs and remove the stands. Fasten the nuts and bolts/studs only to the mounting stand again and store the entire set appropriately to reuse whenever required for maintenance, storage etc.
- To reinstall the mounting/support stand on valve, position the valve above ground level by using appropriate material handling/lifting equipment. Refer handling section of this IOM. Loosen and remove the nuts and bolts/

studs from mounting stand set. Position the stand aligning its holes with valve flange holes and retighten the nuts with bolts/studs as shown in Figure 6.

- Examples of valve support configurations are shown in Figure 7.
- The valve should preferably be in fully open condition during installation. Exception being the 'fail close' valves.
- Never install the Valve with the Actuator upside down on the pipeline, refer Figure 8.

FIGURE 6

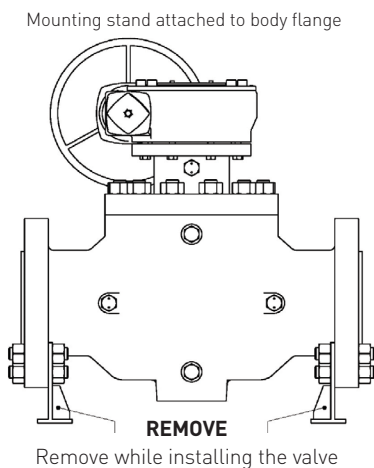


FIGURE 7

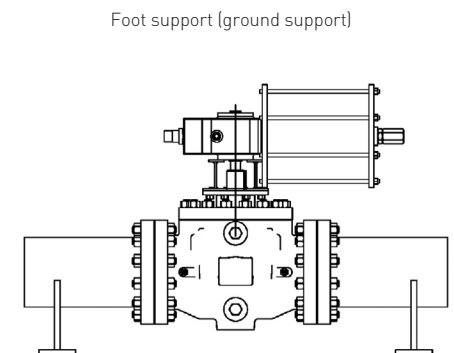
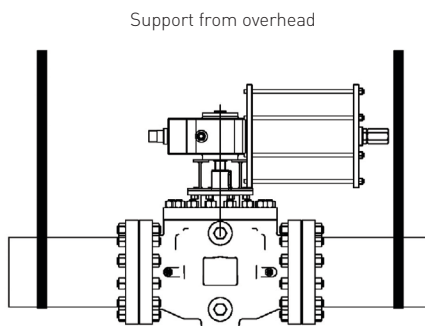
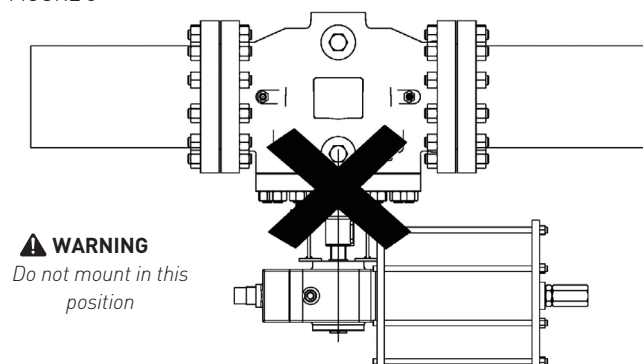


FIGURE 8



KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Installation of valve in vertical pipeline or horizontal stem

- Installation of valve in vertical pipeline:
 - This design does not permit the valve installation in vertical pipeline.
- Installation of valve with horizontal stem:
 - This design does not permit the valve installation with stem in horizontal or inclined position. Only vertical position is allowed.

4 OPERATION

- For lever operated valve, the lever is either shipped loose or assembled with valve depending upon the size of the valve / lever. Rotation of lever in the clockwise direction closes the valve and counterclockwise rotation opens the valve.
- For gear operated valve, THE GEAR OPERATOR OPEN / CLOSE ADJUSTMENT HAS BEEN DONE PRIOR TO SHIPMENT AND MUST NOT BE CHANGED. Rotation of hand wheel in the clockwise direction closes the valve and counterclockwise rotation opens the valve.
- It is recommended that the valve should be opened and closed slowly to prevent hammering effect on the valve and pipeline.
- If the valve is not operating to fully open or fully close position and/or leaking, do not apply excessive force to operate the valve. This can damage the valve internals and/or the operator parts.

- Do not apply extra force using inappropriate extensions to levers and handwheel like pipes or bars.

Note: International standards typically restrict the input force on lever/handwheel rim to max. of 360N and the valves are designed accordingly.

- For valve with pneumatic and gas actuator, do not exceed the operating pressure of actuator.
- Always use dry, moisture free air while operating the valve with pneumatic actuator.

KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

5 GEAR OPERATOR INSTRUCTIONS

5.1 Assembly of gear operator with bracket and coupling

- It is recommended that the valve should be kept in upright position (stem vertical).
- Valve shall be fully open.
- Place the bracket over valve top mounting flange and fasten it with suitable fasteners. Refer to tables in Section 14 of this IOM for recommended tightening torques.
- Fit the key in stem keyway slot and then mount coupling over stem.
- Fit the key in the coupling keyway slot and assemble the gear operator on the bracket with suitable fasteners ensuring that gear operator position indicator matches the open position of the valve.
- Gear operator setting should be done as given in Section 5.3.

5.2 Assembly of gear operator without bracket and coupling

- It is recommended that the valve should be kept in upright position (stem vertical).
- Valve shall be fully open.
- Fit the key in the stem keyway slot and mount the gear operator on valve top mounting flange and fasten it with suitable fasteners ensuring that gear operator position indicator matches the open position of the valve. Refer to tables in Section 14 of this IOM for recommended tightening torques.
- Gear operator setting to be done as given in Section 5.3.

5.3 Procedure for gear operator setting

⚠ CAUTION

If the valve has been supplied by Emerson with the gear operator assembled on the valve - open / close adjustment has been done prior to shipment and must not be changed. In case of gear operator replacement or mounting of new gear operator on bare shaft valve, the steps below shall be followed.

- Figure 11 shows the open and close positions of position indicator, adjustment bolts and lock nuts.
- Loosen the lock/check nut and unscrew both left and right side bolt by minimum one rotation.
- Match ball bore with valve bore. Fully tighten the right-side bolt and then tighten the lock nut.
- Rotate the ball by 90 degrees. Fully tighten the left-side bolt and then tighten the lock nut.

5.4 Possible orientations of gear operator

Figure 12 below illustrates the two possible orientations for a gear operator when assembled together with the series EL and UL - Top entry Soft / Metal Seated Trunnion Ball Valve

FIGURE 9

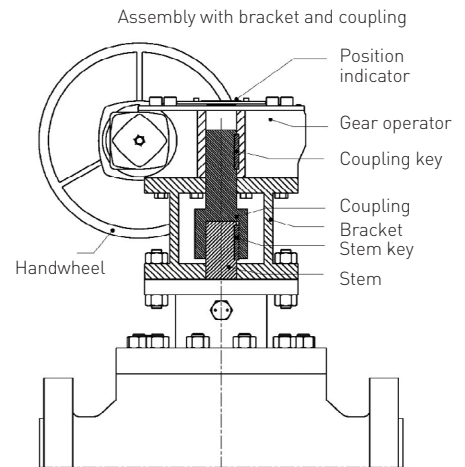


FIGURE 10

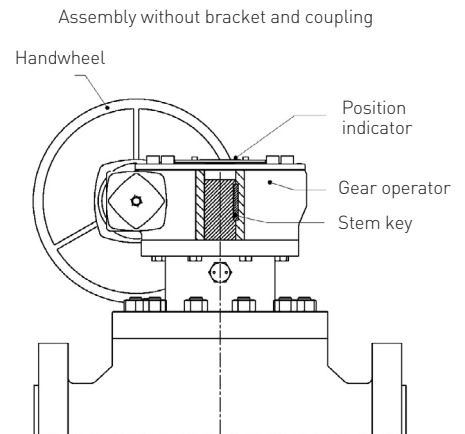


FIGURE 11

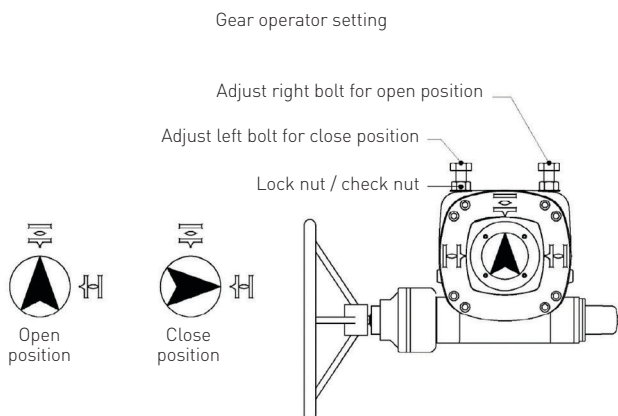
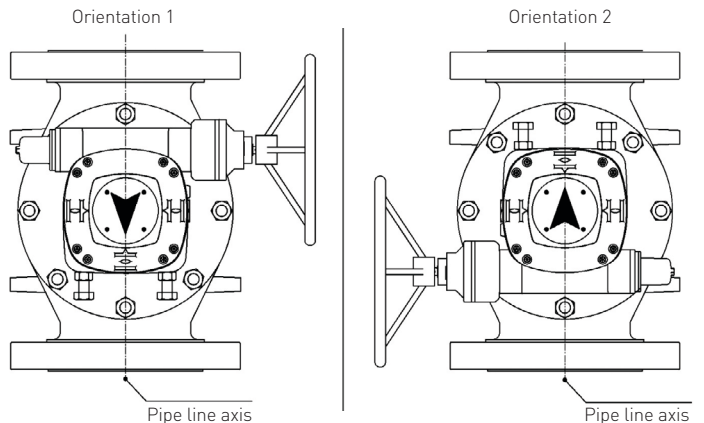


FIGURE 12



KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

6 EMERGENCY SEALANT INJECTION SYSTEM

Typically provided on DN 150 (NPS 6) and larger valves

- Emergency Sealant injection system is provided on valve seat and/or stem packing area to temporarily reduce seat leakage when the valve is in the closed position or to reduce packing leakage.
- Typically, for valve size DN 350 (NPS 14) and above, 1 sealant injection fitting is provided for stem and 2 fittings for each seat. For valve sizes DN 300 (NPS 12) and below, 1 sealant injection fitting is provided for stem and 1 fitting for each seat.
- This emergency sealant injection system is to be used only when valve is not able to achieve the desired shutoff due to damage / wear and tear on the seats and seals and it is not possible to take the valve off the line for repair and maintenance.
- Always flush the sealant port with suitable cleaner/solution, before injecting sealant. Sealant / cleaning agents shall be selected based on service fluid / condition. References can be drawn from manufacturers like Climax Lubricants and Equipment Co®, Sealweld® etc.

Sealant injection fitting - Type A (standard supply)

See Figure 13

Seat sealant injection

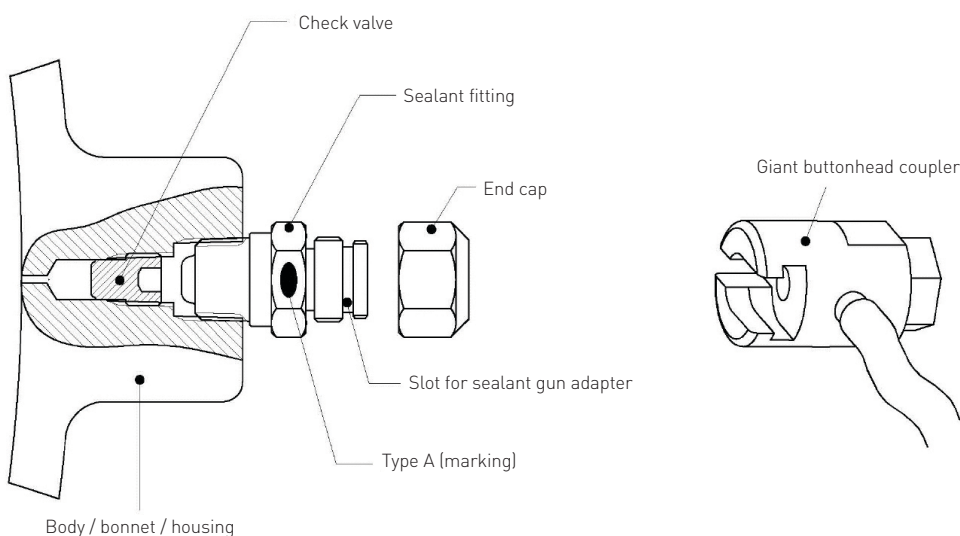
- Fully close the valve.
- Remove the fitting end cap and slide giant buttonhead coupler (Climax® model 1699/1700) on sealant fitting. Inject sealant into each of the sealant fitting. Injection pressure shall be more than pipeline pressure but shall not exceed 1.5 times the pipeline pressure at operating temperature.
- Fully open the valve. Inject sealant into each of the sealant fitting.
- Again, close the valve to uniformly distribute the sealant over the ball surface.
- Repeat above steps multiple times until desired sealing is achieved. Ensure last injection is always made with valve in close position.

Stem sealant injection

- Remove the fitting end cap and slide giant buttonhead coupler on sealant fitting. Inject sealant into the sealant fitting. Injection pressure shall be more than pipeline pressure but shall not exceed 1.5 times the pipeline pressure at operating temperature.
- Cycle valve once to uniformly distribute the sealant around the stem.

FIGURE 13

Sealant injection fitting - Type A (standard supply)



KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

7 PREVENTIVE / PERIODIC MAINTENANCE

Preventive / periodic maintenance is essential as the failure to do so may result in inadequate performance of the valve or also failures like seat leakage, environmental leakage, increased torque, jerky operation etc.

All valves in operation should be periodically inspected thoroughly to evaluate the condition of ball, seats and seals as these parts are subject to normal wear and tear. The frequency of inspection depends upon the severity of service conditions and location of the valve and should be conducted during partial or total shutdown.

Special attention is to be paid to inspect for damage and / or wear due to corrosion or erosion.

Periodic inspection of valve typically includes following activities:

- Inspection for any visible defect or failure such as packing or body joint leakage
- Tightening of bolts/nuts to recommended torques
- Valve stroking to prevent jamming and corrosion every six months

Section 11 describes the procedure for disassembly and reassembly of the valve. Once a valve is refurbished / repaired it should undergo a complete set of tests to make sure that the valve is fit to use for the intended working conditions. Hydrostatic or Pneumatic tests should be carried out as per the specifications relevant to the valve.

Gear operators are packed with grease. It is recommended that the grease should be changed after approximately 5-7 years if operated frequently or after 10-12 years if operated infrequently. Contact factory for appropriate grease grades if grease needs to be changed.

8 POSSIBLE MISUSE OF BALL VALVE

Sr. no.	Possible misuse	Actions to prevent misuse
1	Exceeding the pressure and / or temperature limits of the valve.	Do not exceed pressure and / or temperature limits mentioned on name plate affixed to the valve.
2	Valve material not suitable for service fluid.	Check Tag number (as applicable) and ensure correct valve is used as per process diagram. Verify valve material mentioned on Name plate is suitable with service fluid.
3	Use for control application.	These ball valves are designed for on/off application and should not be used for control / throttling.
4	Mounting of valve upside down.	Follow 'Installation' section of this document.
5	Wrong installation in case of uni-directional valve.	Verify flow direction on valve body or on additional plate affixed to valve.
6	Use of improper actuator when customer automates valve on site.	Contact factory for correct sizing of actuator.
7	Opening/closing of valve by using inappropriate extensions like pipes/bars etc.	Operate valve only with levers, gear operator, hand wheel or actuator provided / recommended by Emerson.
8	Any modification by customer in valve e.g. drilling, tapping, change of valve ends etc.	Unauthorized modifications are not allowed. Modification voids warranty. Contact factory if any such case arises.
9	Testing the valve with water without corrosion inhibitor.	Corrosion inhibitor shall be used to prevent corrosion of valve components. Requirements of international standards such as API 6D, API 598, BS EN 12266 etc. should be followed.
10	Inadequate draining and drying of valve after hydro test.	When valves are hydro tested onsite, they shall be drained and dried completely before installing on pipeline to prevent corrosion of parts and contamination of service fluid.
11	Not using lock open/close feature.	Ensure to use this provision (as applicable) based on process requirement.
12	Improper long term storage.	For long term storage and preservation of valves at site refer Emerson procedure QAC/KM-028. Contact Factory.
13	Damage to valve fittings during handling.	Follow handling instructions.

KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

9 TROUBLESHOOTING

Problem	Possible cause	Remedy
Leakage across closed valve	1. Damaged ball surface. 2. Damaged seats / seat seals. 3. Ball not closed fully. 4. Seat not moving freely resulting in inadequate contact between ball and seat.	1. Refurbish or replace the ball. 2. Refurbish or replace seats. Replace seat seals. 3. Check and reset ball. Open/close settings. 4. Open valve, check for accumulation of dirt, debris, corrosion between seat and body, clean and re-assemble.
Valve too hard to operate / valve torque too high / stick-slip operation	1. Damaged seats / seat seals / ball. 2. Seat not moving freely due to accumulation of dirt, debris, corrosion between seat and body or seat and ball. 3. Operator not sized properly, damaged operator parts. 4. Actuator not sized properly, damaged actuator parts, insufficient input air/gas pressure to actuator, restriction/clogging of actuator vent.	1. Refurbish or replace the seats / seat seals / ball. 2. Open valve, clean and reassemble. 3. Select correct operator and replace. 4. Select correct actuator and replace. Check input air supply, clean actuator vent.
Leakage through stem	1. Loose gland fasteners. 2. Damaged stem, stem sealing surface. 3. Damaged stem seal. 4. Accumulation of dirt, debris, corrosion between stem and housing.	1. Tighten the fasteners. 2. Refurbish or replace the stem. 3. Replace the stem seal. 4. Open valve, clean and reassemble.
Leakage through body to bonnet joint; bonnet to housing joint	1. Damaged seal/gasket. 2. Relaxation of joint fasteners. 3. Accumulation of dirt, debris, corrosion between body and bonnet.	1. Replace seal/gasket. 2. Retighten the fasteners evenly in criss-cross manner. 3. Open valve, clean and reassemble.
Leakage through drain, vent and sealant fittings.	1. Loosening of fittings.	1. Retighten. If leakage persists may require fresh thread sealant or replacement of fitting. ⚠ WARNING: Do not remove fittings when valve / body cavity is under pressure.

10 ORDERING SPARES

When ordering spares, please furnish the following information.

Size	Available on name plate or body of the valve
Class	Available on name plate or body of the valve
Batch number / serial number	Available on name plate or body of the valve
Manufacturing date	Available on name plate or body of the valve
Part number	Available on general arrangement drawing
Part name	Available on general arrangement drawing
Purchase order number	Available on general arrangement drawing

KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

11 DISASSEMBLY AND RE-ASSEMBLY

Sections

- 11.1 Warnings
- 11.2 Notes
- 11.3 **Series EL and UL – Top entry Soft / Metal Seated Trunnion Ball Valve**
 - Construction: One-Piece
 - Type: Integral trunnion
 - 11.3.1 Disassembly procedure
 - 11.3.2 Re-assembly procedure
 - 11.3.3 General arrangement view
 - 11.3.4 Assembly tool

11.1 Warnings

For removal of valve from pipeline, disassembly, re-assembly

- Pay attention to prevent personal injury or equipment damage from sudden release of process pressure or uncontrolled movement of parts.
- Always wear PPE like protective gloves, safety shoes, helmet, clothing, eyewear and other PPE as mandated by site/project when performing any maintenance operations to prevent personal injury.
- Do not remove the operator from the valve while the valve is still pressurized.
- In case of an actuated valve, before removal of actuator, disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot accidentally open or close the valve.
- In case of spring return actuators ensure that the spring is at its uncompressed position.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.
- Ball valves can retain pressure and process fluid in cavity even after process pressure has been removed from both sides of the valve. Relieve this pressure before disassembling or removing the valve from the line. Take additional care if the process fluid is hot, flammable, caustic, or hazardous.
- Carefully secure the valve in an upright position. The roundness of the flanges and valve body allow it to easily roll from side-to-side. The combined weight of the valve and actuator assembly could cause injury or property damage when falling to the side.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- Exercise caution when working on the valve stem packing as it may contain process fluids that are pressurized, even when the valve has been removed from the pipeline. Process fluids may spray out under pressure when removing the packing hardware or packing rings.
- Prevent injury by keeping hands, tools and other objects away from the ball while stroking the valve.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

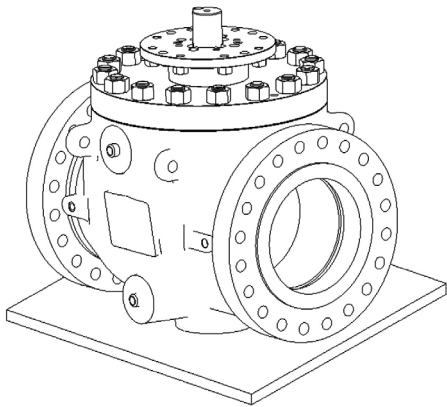
KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

11.2 Notes

- Ensure clean environment during disassembly and re-assembly of valve.
- Use appropriate material handling / lifting equipment. Refer handling section of this IOM.
- Prior to disassembly, it is recommended to mark mating parts like body and bonnet, bonnet and housing, gear operator or actuator and ISO pad or housing to ensure same orientation during re-assembly.
- Before disassembly, it is recommended to keep the ball in fully closed position and then remove the operator from valve assembly.
- Valve shall be positioned on clean and flat surface as shown in Figure 14.
- It is recommended to use original spares.
 - Graphite gaskets shall be replaced.
 - Elastomer and plastomer seals can be re-used, however it is recommended to replace them to maximize valve service life.
- Protect every sealing surface from nicks, dents and damages.
- Lubricate the o-ring and seals and lip seals before re-assembly.
- During re-assembly, refer to tables in Section 14 of this IOM for recommended tightening torques.
- Assembly drawing shows the standard configuration for valve with o-ring seals but can be considered as a reference for lip-seal configuration also.

FIGURE 14



KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

11.3 Series EL and UL - top entry soft / metal seated trunnion ball valve

Construction: One-piece

Type: Integral trunnion

Refer Section 11.3.3 for general arrangement view and location of parts.

11.3.1 Disassembly procedure

1. Position the valve with ball in closed position as shown in Figure 15.
2. Slowly remove the vent / drain plug (20) to relieve any residual pressure from the body cavity.
3. Remove the stem key (9) from the stem (5).
4. Remove cap-screws (14a).
5. Remove ISO pad (8).
6. Unscrew and remove body nuts (13) from body studs (12).
7. Screw an eyebolt inside the tapping provided on the top surface of the bonnet and lift the bonnet-housing sub-assembly. Ensure that stem will not fall while lifting bonnet-housing assembly.
8. If it is necessary to replace the stem gasket, follow instructions 9 to 11 below. Otherwise do not disassemble the stem-bonnet sub-assembly and go to instruction no. 12.
9. Push the stem (5) out of its housing on the bonnet (2).
10. Remove stem o-rings (10c) and backup rings (if provided) from bonnet and then remove graphite stem gasket (11a).
11. Remove stem thrust washer (22) from the stem.
12. Insert the two hydraulic pistons inside body cavity and clamp the external profile of the spring holder ring (3a) (Refer assembly tool view 11.3.4 and Figure 15).
13. Close the hydraulic pistons together to pull the seat spring holder rings towards center of the valve.
14. Remove spacer (3b) from both spring holder rings. (Refer Figure 16).
15. Use the hydraulic pistons to push spring holder ring (3a) back inside body recess.
16. Remove hydraulic pistons from body cavity.
17. Rotate the ball (4) to fully open position using two eye bolts screwed on ball.
18. Remove the ball from the body (1) using eye bolts.
19. Remove seat assembly (3, 3a, 3b) from body.
20. Remove the Bearing Retainer (7), ball bushing (21) and ball thrust washer (23) from the body if provided.
21. Remove seat (3) from the seat spring holder ring (3a).
22. Remove o-rings (10a, 10b) and its back-up ring (if present) from seat and seat spring holder ring.
23. Remove all the springs (15) from the seat spring holder ring.

FIGURE 15

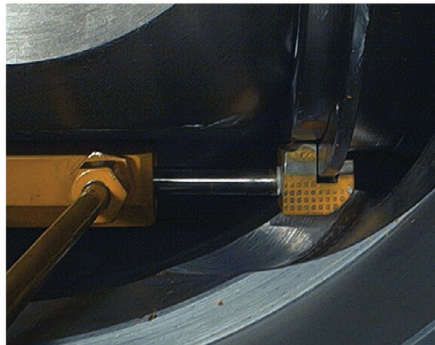
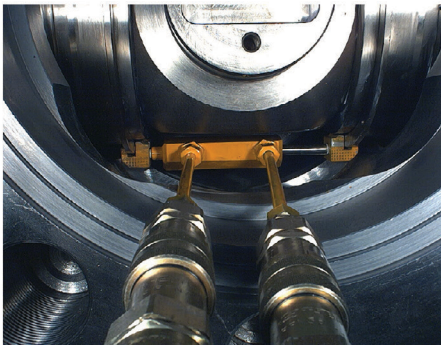
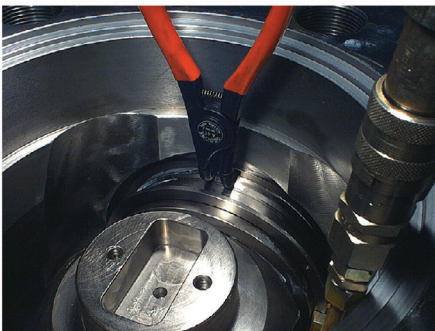
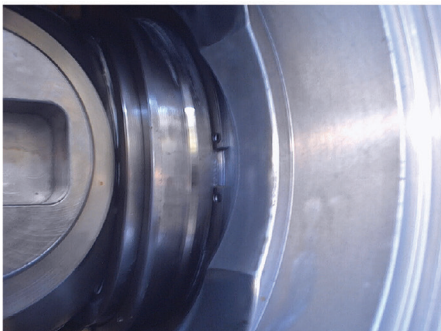


FIGURE 16



KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

11.3.2 Re-assembly procedure

1. Install all the springs (15) in spring holder ring (3a) then put spacer (3b) on spring holder ring and move till the end of spring holder ring.
2. Assemble the spring holder ring over the seat (3).
3. Install seat o-ring (10a) and retainer o-ring (10b) with backup ring (if provided) on seat (3).
4. Insert seat assemblies inside the body (1) and push them till the end of the pocket in the body.
5. Install bearing retainer (if not integral with body) (7), ball bushing (21) and ball thrust washer (23) inside body.
6. Insert ball (4) inside body using eye bolt screwed on ball, such that ball is in the open position.
7. Rotate the ball to fully closed position. Remove eye bolts.
8. Insert anti-static spring (15a) in the central hole of the ball.
9. Using hydraulic pistons, pull the two seat assemblies towards the ball.
10. Move spacer (3b) in the groove provided on spring holder ring (3a).
11. Remove hydraulic pistons from body.
12. If the stem was disassembled from housing, follow instructions from 13 to 16 otherwise go to Section 17.
13. Insert stem thrust washer (22) over the stem (5).
14. Insert stem o-rings (10c) along with backup rings (10c) (if provided) inside the housing (6).
15. Install o-ring (10d) and graphite gasket (11b) between housing (6) and bonnet (2). Now fasten the housing to bonnet using fasteners (14).
16. Insert stem inside the bonnet and housing with respect to ball in the closed position. While inserting stem inside the housing, the edges of keyway slot may damage the o-rings. Hence take suitable protection like wrapping stem keyway side with common adhesive tape.
17. Install o-ring (10) and graphite gasket (11) between bonnet and body and fasten the assembly using fasteners (12 / 13).
18. Install stem gasket (11a) inside housing and then assemble the ISO pad (8) using cap screw (14a) and pins (24). Install stem key (9).
19. Install the drain plug and vent plug and injection fittings as applicable.

KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

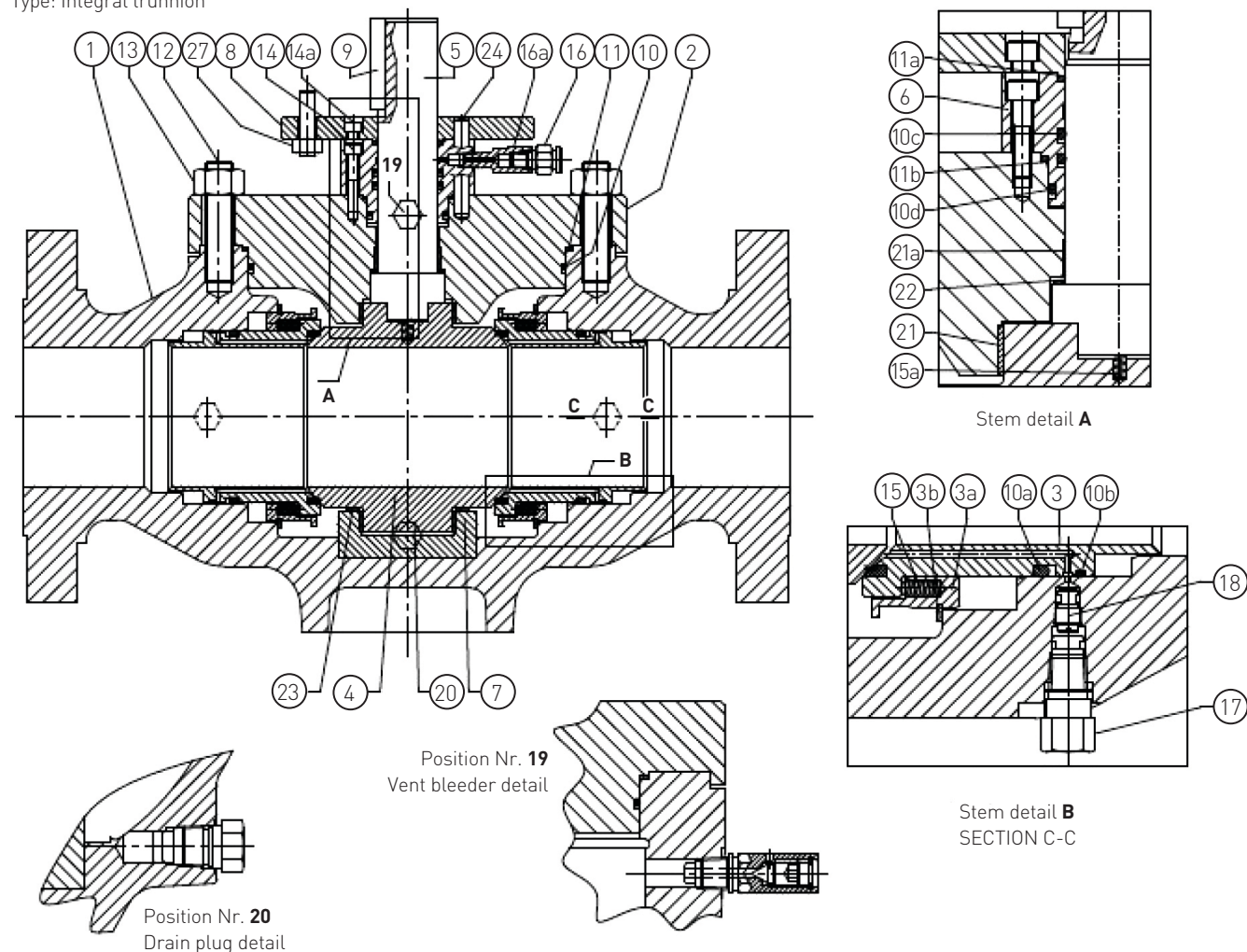
INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

11.3.3 General arrangement view

E and U series top entry ball valve

Construction: One-piece

Type: Integral trunnion



PARTS LIST

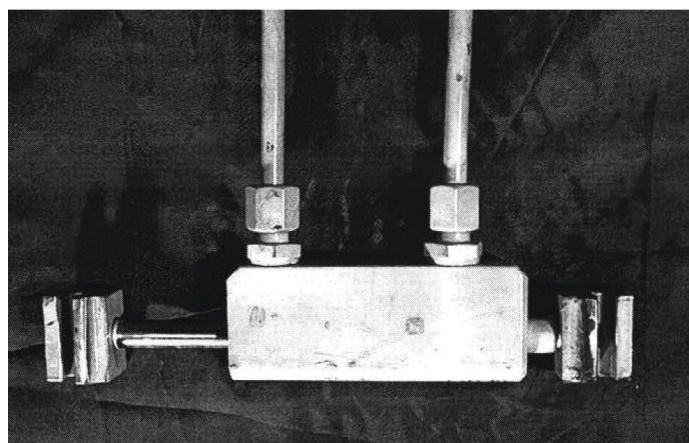
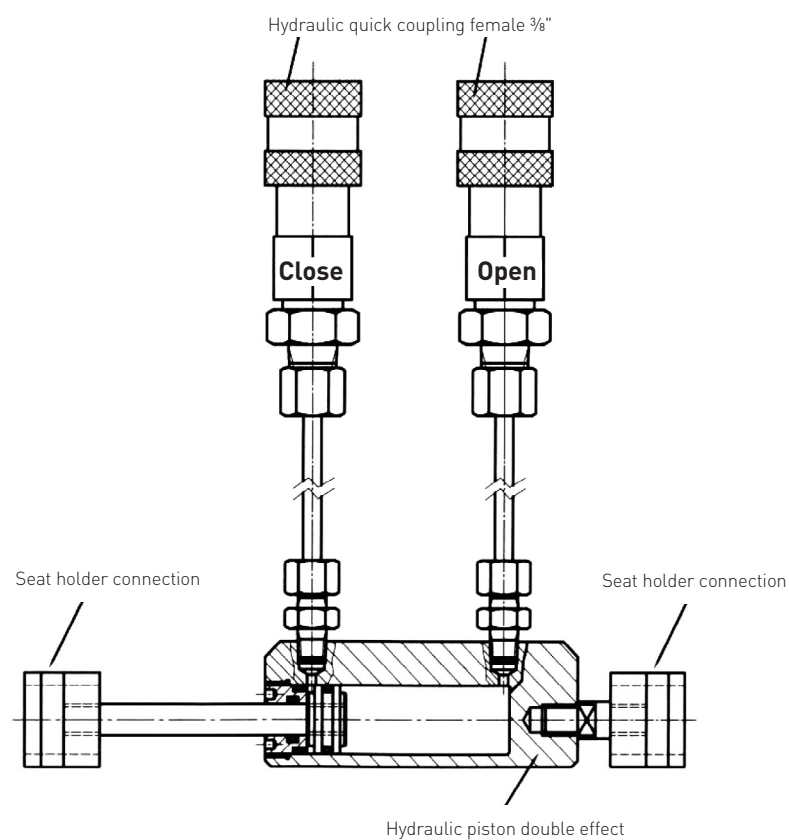
Item No.	Part name	Item No.	Part name
1	Body	12	Body studs
2	Bonnet	13	Body nuts
3	Seat ring	14	Housing capscrew
3a	Spring holder ring	14a	ISO pad capscrew
3b	Retainer ring	15	Springs
4	Ball	15a	Antistatic spring
5	Stem	16	Stem grease fitting
6	Housing	16a	Nipple
7	Bearing retainer	17	Seat grease fitting
8	ISO pad	18	Check valve
9	Stem key	19	Vent bleeder valve
10	Body o-ring	20	Drain plug
10a	Seat o-ring	21	Ball bushing
10b	Grease retaining o-ring	21a	Stem bushing
10c	Stem o-ring	22	Stem thrust washer
10d	Housing o-ring	23	Ball thrust washer
11	Body gasket	24	Pin
11a	Stem gasket		
11b	Housing gasket		

KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

11.3.4 Assembly tool view

Quantity Nr: 2 For maintenance 1 valve



KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

12 BODY CAVITY RELIEF OPERATION

Single piston effect seat - self relieving seat

When seats are under pressure in pipeline, upstream and downstream both, the resultant thrust from pressure pushes the seat rings towards the ball.

At the same time, pressure in the body cavity creates a thrust that pushes the seat rings away from the ball.

The single piston effect (SPE) permits the automatic release of overpressure in the body cavity when the valve is in the fully open or closed position. In single piston effect design, seat rings are thus "self-relieving".

Double piston effect seat (DEP) - non relieving type of seats

When seats are under pressure in pipeline, upstream and downstream both, the resultant thrust from pressure pushes the seat rings towards the ball.

Also, pressure in the body cavity creates a thrust that pushes the seat rings towards the ball.

When the valve is designed with double piston effect (DPE), self-relieving does not occur and hence PR (pressure relief) valve is mandatory with pre-setting to avoid over pressure building in the cavity.

13 GLAND PACKING ASSEMBLY PROCEDURE

1. In case of packing contain braided graphite, it shall be placed at bottom and top. Position of packing arrangement such that the oblique cut of these braided graphite is 180° apart. Refer Figure below for appropriate arrangement for die molded and for VEE type packing.
2. Place the gland into the housing and disk spring (for VEE type packing) and the cap screw / hex bolt.
3. Hand tighten cap screw / hex bolt in crisscross pattern.
4. Tighten gland cap screws / hex bolt in crisscross pattern by using 25% torque as specified in Section 14 against mentioned fasteners material.
5. Ensure no bottoming up of gland or otherwise one ring needs to be added in packing set.
6. Verify that the gland top surface is at equal depth from top face of housing.

NOTE

Full tightening of screws shall be done during performance testing depending on leakage observed.

FIGURE 18

Square/rectangular type stem packing arrangement

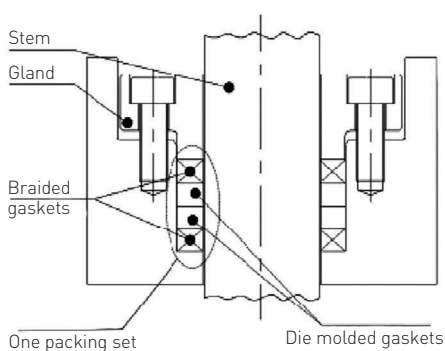
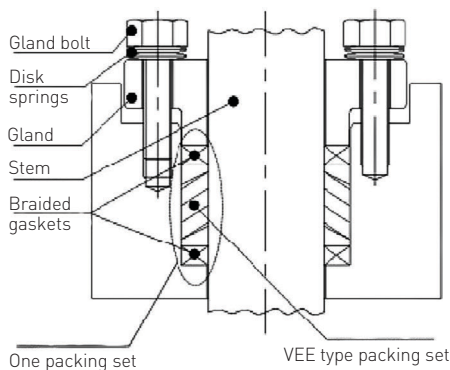


FIGURE 19

VEE type stem packing arrangement



KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

14 RECOMMENDED TIGHTENING TORQUES FOR FASTENERS AND PLUGS

NOTES

1. Ensure that all the nuts/bolts are tightened to the torque values as specified in below tables.
2. Torque values for carbon and low alloy steel material are for dry and non-lubricated fasteners.
3. Torque values for austenitic stainless steel material are with anti-seize lubricant.
4. Apply pipe thread sealant to the threads of the drain and vent plugs.
5. 1 Nm = 0.737 ft-lb

FOR METRIC SERIES (Nm)

Thread size (Metric) Pitch		Non-coated bolts / nuts					Coated bolts / nuts				
		Low resistance bolt / stud material			High resistance bolt / stud material		Low resistance bolt / stud material grade			High resistance bolt / stud material	
		L7M, B7M	B8M Class 1	B8M Class 2	L7, B7	Gr 660	L7M, B7M	B8M Class 1	B8M Class 2	L7, B7	Gr 660
M8	1.25	15	6	18	20	16	9	3	11	12	10
M10	1.50	30	11	36	40	32	18	7	21	24	19
M12	1.75	52	19	62	69	55	31	12	37	40	33
M14	2.00	83	31	99	108	88	49	18	58	64	52
M16	2.00	126	47	150	165	134	74	28	88	97	79
M18	2.50	174	65	207	228	185	103	38	123	135	110
M20	2.50	243	91	289	318	258	143	53	143	187	152
M22	2.50	327	122	327	428	348	191	71	191	250	203
M24	3.00	415	155	415	544	441	245	91	200	320	261
M27	3.00	601	224	492	787	639	351	131	287	459	373
M30	3.50	814	303	511	1066	866	477	178	299	625	507
M33	3.50	1097	409	688	1436	1167	639	238	401	836	680
M36	4.00	1410	526	884	1845	1500	824	307	517	1078	876
M39	4.00	1810	675	1135	2370	1925	1052	392	660	1377	1119
M42	4.50	2241	835	1406	2934	2384	1306	487	819	1710	1389
M45	4.50	2780	1036	1744	3639	2957	1613	601	1012	2112	1716
M48	5.00	3348	1248	2100	4383	3561	1948	726	1222	2571	2072
M52	5.00	4298	1602	2696	5626	4572	2488	927	1561	3257	2646
M56	5.50	5343	1991	3352	6995	5683	3098	1155	1943	4056	3295
M60	5.50	6624	2469	4155	8671	7046	3824	1425	2399	5006	4067

KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

FOR IMPERIAL SERIES (Nm)

Thread size (Inch) TPI		Non-coated bolts / nuts					Coated bolts / nuts				
		Low resistance bolt / stud material			High resistance bolt / stud material		Low resistance bolt / stud material grade			High resistance bolt / stud material	
		L7M, B7M	B8M Class 1	B8M Class 2	L7, B7	Gr 660	L7M, B7M	B8M Class 1	B8M Class 2	L7, B7	Gr 660
5/16"	18	15	6	18	20	16	10	4	12	12	11
3/8"	16	26	10	22	34	28	15	6	18	20	16
1/2"	13	61	23	73	80	65	37	14	44	47	39
5/8"	11	118	44	141	155	126	71	26	85	92	76
3/4"	10	206	77	245	270	219	122	45	145	160	130
7/8"	9	328	122	328	429	349	194	72	194	255	206
1"	8	488	182	488	639	519	289	108	289	378	307
1 1/8"	8	706	263	578	925	751	414	154	339	544	440
1 1/4"	8	981	366	803	1285	1043	571	213	467	750	607
1 3/8"	8	1320	492	933	1727	1404	763	284	479	1002	812
1 1/2"	8	1727	644	1083	2261	1837	994	370	624	1305	1057
1 5/8"	8	2211	824	1387	2894	2352	1266	472	794	1527	1347
1 3/4"	8	2777	1035	1742	3636	2954	1585	591	994	2080	1686
1 7/8"	8	3433	1280	2153	4493	3651	1952	728	1224	2563	2076
2"	8	4183	1559	2624	5476	4449	2373	884	1489	3114	2524
2 1/4"	8	5997	2235	3762	7851	6379	3375	1258	2117	4418	3590
2 1/2"	8	8271	3083	5188	10828	8797	4635	1728	2907	6068	4930
2 3/4"	8	11117	4144	6973	14591	11824	6208	2314	3894	8148	6603
3"	8	14481	5397	9084	19007	15403	8064	3006	5058	10583	8577
3 1/4"	8	18462	6881	11581	24232	19637	10256	3823	6433	13461	10909
3 1/2"	8	23114	8615	14499	30336	24585	12812	4775	8037	16817	13627
3 3/4"	8	28485	10617	17868	37388	30298	15762	5875	9887	20688	16765

FOR NPT PLUG THREADS

Plug size	Thread per inch	Approx. torque (Nm)
3/8" NPT	18	61
1/2" NPT	14	68
3/4" NPT	14	75
1" NPT	11 1/2	88

NOTES

1. Torque values given for NPT threads are only for reference, it may change depending upon accuracy of thread profile, sealing requirement, nature of the sealant used etc.
2. As a general guideline, after hand-tight engagement, tighten 1-3 full turns so that you get 'leak proof' joint.

15 SERVICE OF VALVES WITH API MONOGRAM

In case of repair and service of "API monogram" valve, service engineer shall consult Head- QA for any further actions.

16 INFORMATION FOR PED 2014/68/EU COMPLIANT VALVE

The year of manufacture	Refer name plate affixed to the valve
Essential maximum / minimum allowable limits	Refer name plate affixed to the valve
The normal size for piping DN	Refer name plate affixed to the valve
Test pressure applied in bar and date	Refer tag plate affixed to the valve
Tare mass in kg	Refer tag plate affixed to the valve
The fluid group	Refer tag plate affixed to the valve

KTM VIRGO SERIES E & U TOP ENTRY TRUNNION BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

17 WARRANTY

Our liability in respect of any defect in or failure of the goods supplied or for any loss, injury or damage attributable thereto is limited to making good by replacement or repair defects which under proper use appear therein and arise solely from faulty materials and workmanship within a period of 18 calendar months after the original goods shall have been first dispatched or 12 calendar months from the date of commissioning, whichever is earlier provided that such defective parts are returned free to our works for examination. The undertaking shall exclude any and every other obligation.

CAUTION

Emerson does not assume responsibilities for any liabilities/damages arriving out of wrong application of its valve, or imprudent operations carried out by inexperienced operators, or which does not comply with this manual, or instructions provided by Emerson.

The valve shall be appropriately used for the purpose they are built, or applications they are supplied. Use of standard valve for special applications is not recommended unless it has been communicated and agreed to by Emerson. Valve shall be operated and maintained strictly in accordance with the procedures. Operation or maintenance outside these procedures constitutes abuse of the product and voids all warranty and claims.

18 FACTORY ADDRESS FOR CORRESPONDENCE

Emerson Process Management (India) Private Limited

(Manufacturing Regional Sales Office)
277 / 278 Hinjewadi Phase II, Maan (Mulshi)
Pune - 411 057, INDIA
Phone: +91 20 6674 4000
Fax: +91 20 6674 4021
www.emerson.com

Emerson Process Management (India) Private Limited

Plot No. C1
Talegaon Industrial Area
Phase 2, Talegaon MIDC,
Mindewadi,
Taluka - Mawal,
Pune - 410 506, INDIA
Phone: +91 21 1461 1100
www.emerson.com

Emerson Automation Solutions

(Regional Sales Office)
10225 Mula Road, Suite 130
Stafford, TX 77477, USA
Phone: +1 281 933 3100
Fax: +1 281 933 3110
www.emerson.com

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