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Operation and Maintenance Manual

Trunnion Mounted Ball Valves TT Series

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1. Forewords

Thanks for your selection of VIZA's ball valve. As a type of pressure equipment, valve has potential hazards of pressure and creation of explosive atmosphere resulting from leakage of process fluid. For the safety purpose, user shall read this instruction to know what VIZA has already taken into account in our design and manufacture, and what action shall be taken by user according to essential health and safety requirements of European Directive 97/23/EC (PED) and 94/9/EC (Atex).

2. Essential health & safety requirements of PED/Atex and solution

2.1 What's VIZA design idea:

- Ball valve is designed as standard product, no consideration of each specific service condition since it's too wide.
- Ball valve is designed to API 6D, valve has adequate strength according to ASME B16.34 pressure-temperature rating. The ball valve was EC-type approved by European Notified Body.
- Valve has different sealing materials in accordance with API 6D, which are corrosion/wear resistance to certain type of fluid.
- Valve is designed with anti-static and fire-safety structure. The later one was certified by TUV in accordance with API 607 and API 6FA.
- Valve contains no light metal (such as Mg) and all parts are electricity conductive and connected together to prevent ignite resource.
- Valve is designed with lever, or gear operator or electric actuator according to its size and torque, and operation requirements.

2.2 What action user shall take?

2.2.1 General

2.2.1.1 In any occurrence, first ensure personnel safety.

2.2.1.2 Use the valves in accordance with ASME B16.34 pressure-temperature rating and consider temperature restriction based on non-metal material used on the valve like O-ring and seat inserts.

2.2.1.3 Make sure that the selected valve materials are corrosion/wear resistance to the service fluid.

2.2.1.4 Where the service fluid is flammable/explosive, to limit the working temperature.

2.2.1.5 When performing Repair/maintenance operations, make sure that the valves are always depressurized, vented and drained.

- 2.2.1.6 For actuator operated valves, make sure all supply lines (Electrical, hydraulic, Air) are disconnected before starting any Repair/maintenance operations.
- 2.2.1.7 When performing Repair/maintenance operations, always use appropriate protection e.g. protective clothing, (oxygen) masks, gloves, etc.
- 2.2.1.8 When performing Repair/maintenance operations, do not smoke, do not use any portable no-Ex-proof electrical device in the area and do not use open fire without a valid work permit.
- 2.2.1.9 Valve must be periodically checked on:
- Tightness of bolted connection (body/closure, gland, flange connection).
 - Corrosion/wear damages (crack, pitting, thickness of the valve).
 - Make sure the valves are in fully open/fully closed position.

2.2.2 Specifics

Risk	Preventive Action
Accidental contact with dangerous service fluid* Due to: Gasket or Stem Blow out	1. See 2.2.1 General
	2. Immediately replace Gasket and packing after a Blow-out (use approved/suitable materials only)
	3. Use recommended torque as in Table 1
Accidental contact with dangerous service fluid* during disassembly or maintenance operations	1. See 2.2.1 General
	2. After removal from the production line, open and close valve to guarantee depressurized cavity.
	3. Drain any remainder fluid or substances with suitable devices before disassembly.
Structural yielding of valves body with consequent risk of contact with dangerous service medium*, explosion or fire	1. See 2.2.1 General
	2. Create precautions to avoid additional forces on the valves
	3. Avoid absolutely water hammer: install precaution devices if necessary (e.g. brakes, anti shock devices, etc.)
	4. Avoid submitting excessive vibrations to the valves.
	5. Avoid quick Pressure and/or Temperature change impact.

Accidental contact with High or Low temperature parts	1. See 2.2.1 General
	2. Predispose apposite insulation on the valve.
	3. Alert by means of warning signs about risk of burns.
	4. For Cryogenic service use only valves equipped with Cryogenic Extension.
Fire or explosion in case of service with flammable fluids	1. See 2.2.1 General
	2. Install only Ex-proof electrical devices in the area
	3. While performing maintenance in the area, shut down all electrical devices.
Explosion in case of oxygen service	1. See 2.2.1 General
	2. Install only Ex-proof electrical devices in the area
	3. Install and use only valves completely degreased.
	4. Use valves only made with materials suitable for oxygen service (see EN 1797-1)


* Dangerous service fluid as there are: Toxic, Corrosive, Flammable, High or Low temperature etc. fluid.

3. Application Scope and Technical Parameters

3.1 Application scope

This series valves are widely used in petroleum, gas, chemical, and allied industries which need to be maintained when valves on pipeline.

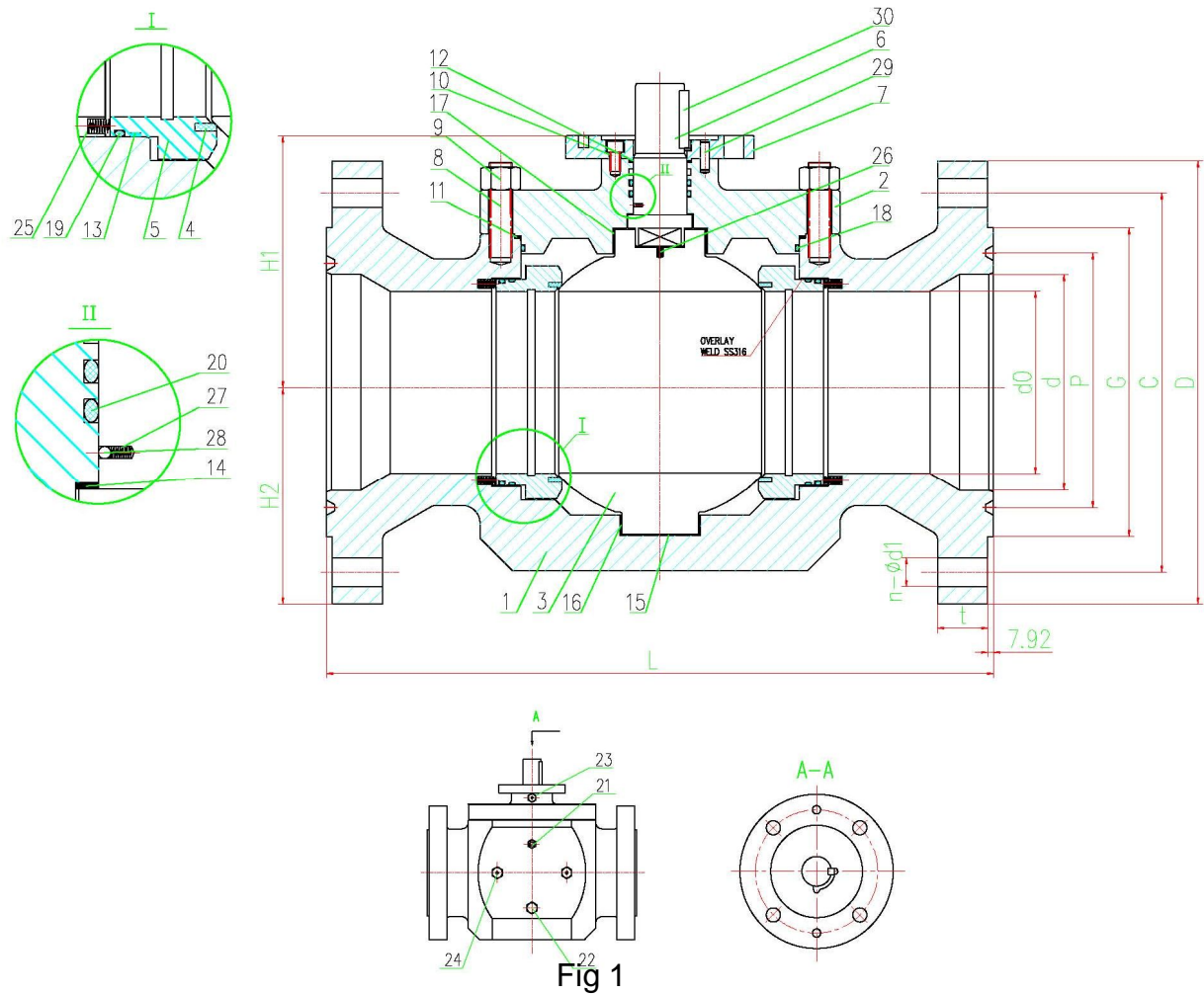
3.2 Technical Parameters:

Nominal pipeline size:	2~24"
Nominal pressure:	150~2500LB
Temperature range:	≤300°F
Fluid:	Water, oil, gas and other kinds of fluid
Body material:	Material as specified in ANSI B16.34
Valve testing::	API 6D
Actuator:	Gear, Lever, motor
Applicable ATEX:	 II 2 GD c

4. Valve Structure

Please refer to Fig 1 and Fig 2 for valve structure.

Drawing for 6" and below (Fig 1)



Drawing for 8" and large (Fig 2)

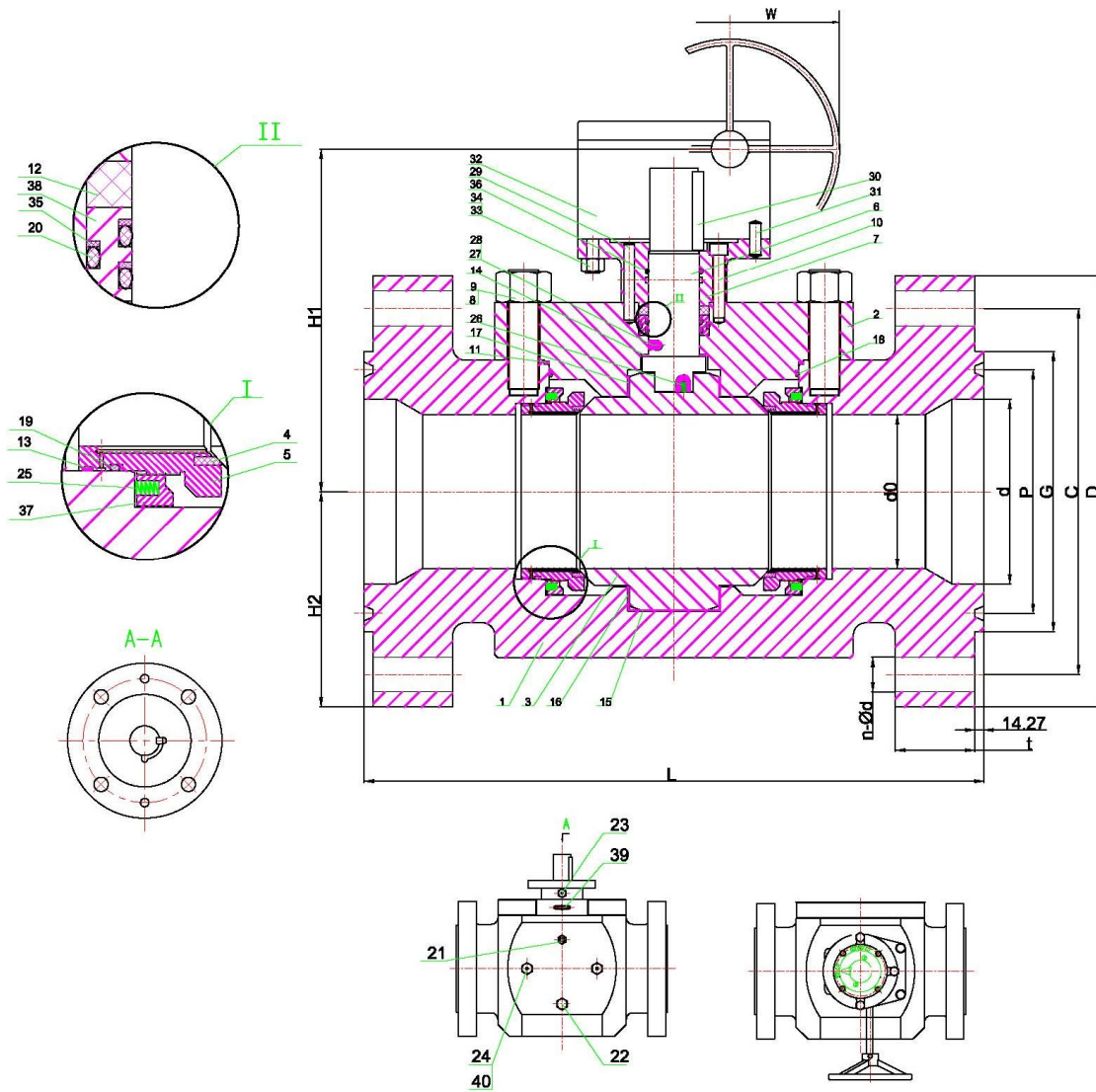


Fig 2

4.1 Main Parts

No.	Parts name		No.	Parts name	
	Fig.1	Fig.2		Fig. 1	Fig. 2
1	Body	Body	22	Drain Plug	Drain Plug
2	Bonnet	Bonnet	23	Stem injection	Stem injection
3	Ball	Ball	24	Maintenance plug	Seat injection
4	Seat insert	Seat insert	25	Seat Spring	Seat Spring
5	Seat ring	Seat ring	26	Antistatic spring	Antistatic spring
6	Stem	Stem	27	Antistatic spring	Antistatic spring
7	Top Flange	Top flange	28	Grounding plunger	Grounding plunger
8	Body bolt	Body bolt	29	Gland pin	Top flange pin
9	Body nut	Body nut	30	Stem key	Stem key
10	Screw	Screw	31		Pin
11	Body fire safe packing	Body gasket	32		Gear box
12	Stem fire safe packing	Stem fire safe packing	33		Gear stud
13	Seat fire safe packing	Seat fire safe packing	34		Gear nut
14	Thrust Washer	Thrust Washer	35		Back up ring (class 1500lb and above)
15	Washer	Washer	36		Stem O-ring
16	Bearing	Bearing	37		Maintenance ring
17	Bearing	Bearing	38		Gland
18	Body O-ring	Body O-ring	39		Lifting eye bolt
19	Seat O-ring	Seat O-ring	40		Inner check
20	Stem O-ring	Gland O-ring	41		
21	Vent Valve	Vent Valve	42		

4.2 Working Principle

The function of the ball valve is to cut off or put through the pipeline. When the ball is driven by the

wrench or other actuator, it rotates and the bore of ball parallelized or perpendicular with the bore of body, the valve opens or closes.

4.3 Structure Description

4.3.1 This series ball valve uses seat insert seal structure. PTFE or NYLON is used as the seat insert material, The “O” ring is used as the stem, body and seat ring seal, and the material is in HNBR or VITON. In the event of fire, when all the soft seals are burned, ball valve has second fire-safe sealing areas such as:

Metal-to metal contact between ball and seat ring;

Graphite seal between seat and body;

Graphite seal between body and bonnet;

Graphite seal between stem and body;

For accidental leakage from and stem sealing area, a sealant injection is provided; leakage can be temporarily prevented by injection of the sealant into this mechanism.

4.3.2 Ball/seats shut off the line fluid independently on the upstream and downstream side of the ball, the valve bore and the body cavity are isolated from each other when the valve is fully opened or closed.

4.3.3 The lower end of the stem is designed with an integral collar to be blowout-proof.

An antistatic feature is provided to ensure electrical continuity between ball, stem and body.

5. Transportation and storage

5.1 Transportation

5.1.1 When carrying the units in unpacked conditions (in a dusty place), put a plastic sheet over them.

5.1.2 Load the units so that no force is placed on the actuator.

5.1.3 Avoid overloading the unit: the cargo may become loose; take care so that the valves do not bounce.

5.1.4 Always handle the valve with care, use lift equipment for the large size valves.

5.2 Storage

5.2.1 When the units are not used for a while after received, store it under conditions where no unnecessary force is applied.

5.2.2 When storing the unit in unpacked conditions, take care so that no dust, dirt or oil-intrudes into the unit.

- 5.2.3 When storing the unit either temporarily or for a long period of time, avoid direct sunlight. Always store the unit indoors at dry place and flange sealing surface protected.
- 5.2.4 Always store valve in open position.
- 5.2.5 Long-time-stored valve shall be re-inspected prior to use. Close attention shall be paid against sealing damage when removal of dirties for the cleanness of sealing surface. If necessary, valve shall be pressure tested once more.

6. Installation

- 6.1 Carefully check valve identification against operation requirements before installation.
- 6.2 Check the inside of bore and the sealing surface before installation, any attached dirty and contamination shall be removed with clean soft cloth.
- 6.3 Check the sensibility of actuator to prevent block before installation.
- 6.4 After the valve is located in the center of the piping, tighten the bolts diagonally.
- 6.5 Never weld the piping flange with the valve installed, never install the valve immediately after welding.
- 6.6 Never operate valve with a wrench or lever applied to the actuator.
- 6.7 Partial tightening of the piping bolt is not allowed.
- 6.8 Avoid forcing the valve between the piping flanges.
- 6.9 Always maintain a space for easy checkup and repair.
- 6.10 When in service, valve must be fully opened or fully closed. It is forbidden to partially open the valve for adjustment of flow rate.
- 6.11 Dust, grease and fluid residual trend to accumulate at the surfaces of body and stem etc, wear and erode the valve, and shall be cleaned frequently.

7 Removal

- 7.1 When removing the valve from the piping, check that: the pressure and fluid do not remain inside the piping.
- 7.2 When removing the valve, lift the valve with soft rope which shall be strong enough to subject the valve weight.

8. Disassembling Procedure

When disassembly of the valve is required (for example for periodical checks or sealing parts replacement), refer to the structural drawing and do the work according to the following procedure.

(valve shall be in fully open position).

8.1 For gear operator or power actuator valve

- a) Remove the bolt fastening the gear or power actuator
- b) Remove the gear operator or power actuator
- c) For subsequent operation, follow the disassembling procedure for the top flange

8.2 For "T" type head operator

- a) Remove the screw fastening the lever pipe
- b) Remove the lever pipe
- c) Remove the screw fastening the T head
- d) For subsequent operation, follow the disassembling procedure for the top flange

8.3 For top flange

- a) Remove the screw fastening the top flange
- b) With a bronze hammer striking lightly the top flange, then lifting off the top flange
- c) Remove the pin on the gland flange

8.4 For gland (10" and above)

- a) Remove the stem packing from stuffing box
- b) Lifting off the gland by properly threaded head tool
- c) Check the O-ring, packing on the gland for any damage
- d) Remove the stem injection(if installed)

8.5 For the bonnet

- a) Remove the bolt fastening the bonnet
- b) Remove the bonnet
- c) Remove the stem from the bonnet
- d) Remove the bearing from the bonnet
- e) Check the O-ring on the bonnet for any damage

8.6 For ball and seat ring

- a) Screw the maintenance pins from maintenance plug hole, to push seat ring to leave away the ball till assure the ball can be lift out without interfere with seats, two maintenance pins for each seat. Lifting the ball from the body with "L" type lifting tool (for size 8" and below)
- b) Use rubber hammer and bronze bar to screw the maintenance ring to pull seat ring to leave away the ball till assure the ball can be lift out without interfere with seats, Lifting the ball from the body with "L" type lifting tool (for size 10" and above).
- c) Remove the bearing from body.

- d) Remove the seat ring from body
 - e) Remove the seat spring from body or maintenance ring.
 - f) Check the O-ring, seat inserts and fire safe packing on the seat ring for any damage
- This completes the disassembly

9. Reassembling Procedure

Reassemble all parts after cleaning, before re-assembling, refer to the structural drawing, and check that all parts are completely prepared, It is recommended that bearing, O-ring, gasket should be replaced even when not damaged.

9.1 For seat ring and ball

- a) Apply silicone grease to the seat spring.
- b) Put the spring in the body (for size 8" and below); install the maintenance ring on the seat ring to the end of threads, and put the spring in the maintenance ring (for size 10" and above).
- c) Apply silicone grease to the O-ring groove of the seat ring, install the O-ring on the seat ring
- d) Put the seat assembly into the body and make sure the seat move freely
- e) Screw the maintenance pins from maintenance plug hole, to push seat ring till assure the ball can be lift in without interfere with seats, two maintenance pins for each seat. (for size 8" and below);
- f) Lifting the ball into the body with "L" type lifting tool
- g) Screw out the maintenance pins, assure the seat ring go against the ball and match well (for size 8" and below)
- h) Use rubber hammer and bronze bar to screw the maintenance ring to pull seat ring to go against the ball till assure the seat ring match the ball properly (for size 10" and above).

9.2 For bonnet

- a) Apply the silicon grease on the O-ring groove
- b) Put the O-ring and gasket in the bonnet
- c) Put the stem in the bonnet.

9.3 For body

- a) Install bolt on the body
- b) Put the bonnet on the body, tightening nuts with the recommended torque as listed in Table 1

Table 1 Recommended torque for flange connection bolting (Bolt material: B7):

Thread size	Torque (N.M)	Thread size	Torque (N.M)
1/2-13UNC	54~60	1-1/4 -8UN	942~1041
9/16-12 UNC	81~89	1-3/8-8 UN	1282~1417

5/8-11 UNC	107~119	1-1/2-8 UN	1659~1833
3/4-10 UNC	197~218	1-5/8-8 UN	2152~2378
7/8-9 UNC	305~337	1-3/4-8 UN	2690~2973
1-8 UNC	466~515	1-7/8-8 UN	3317~3667
1-1/8-8 UN	673~743	2-8 UN	4053~4479

* If more bolting materials tightening torque required, please consult with VIZA VALVES

9.4 For gland (for 10" and above)

- a) Put the O-ring on the gland
- b) Install the gland into the bonnet through the stem

9.5 For top flange

- a) Install stem fire safe packing in the bonnet.
- b) Install top flange and tightening the screws

9.6 For gear operator and power actuator

- a) Install key on the stem
- b) Install gear operator or power actuator on top flange and tightening the bolts

9.7 For "T" type head operator

- a) Install the key on the stem
- b) Install T head on the stem
- c) Install the washer in the T head and tightening the screw
- d) Install lever pipe
- e) tightening the screw to fix the lever pipe

9.8 Install vent valve, drain valve and seat injection (if need)

9.9 This completes the reassembly

10. Valve Operation and Maintenance

10.1 After installation and the pressure test of the pipeline or the system, the ball must be fully opened or fully closed. It is forbidden to partially open the valve for adjustment of flow rate or emergent pressure relief blow-off. VIZA is not responsible for damage, loss or expense arising out of such usage.

10.2 Usually ball valves do not set up heat insulation structure, never touch the surface of valves when the process fluid has a high/low working temperature.

10.3 Dust, grease and medium residual tend to accumulate at the surfaces of body, and moving parts such as stem, gearbox, the guide of yoke etc., wear and erode the valve, and even generate

friction heat that is dangerous in explosive atmosphere, and shall be cleaned frequently according to the working conditions.

- 10.4 The thickness of body and closure must be checked to ensure safety operation at an interval of three months. Where the thickness is less than value in Table10, the valve must be scrapped.
- 10.5 After put into service, valve shall be checked and maintained periodically especially for the situation of sealing surfaces and worn, the age of packing and the corrosion of body. In case of such situation, valve shall be repaired or replaced. It is suggested that inspection and maintenance of valve shall be perform every three months provided the fluid is water or oil, every month or to local law provided the fluid is strong corrosive.

Table 2 Body minimum wall thickness

	20bars 150lb	50bars 300lb	100bars 600lb	150bars 900lb	250bars 1500lb	420bars 2500lb
DN50(2")	5.5	6.0	6.2	7.8	11.8	19.6
DN65(2-1/2")	5.8	6.5	7.2	9.3	14.5	24.7
DN80(3")	6.1	7.0	8.2	10.9	17.3	29.8
DN100(4")	6.5	7.7	9.5	13.0	21.0	36.6
DN150(6")	7.1	9.4	12.9	18.2	30.2	53.7
DN200(8")	8.0	11.0	16.3	23.4	39.4	70.7
DN250(10")	8.8	12.7	19.7	28.7	48.6	87.8
DN300(12")	9.6	14.3	23.0	33.9	57.9	104.8
DN350(14")	10.4	16.0	26.4	39.1	67.1	121.9
DN400(16")	11.2	17.6	29.8	44.3	76.3	138.9
DN450(18")	12.0	19.3	33.2	49.6	85.5	155.9
DN500(20")	12.9	20.9	36.5	54.8	94.8	173.0
DN600(24")	14.5	24.2	43.3	65.2	113.2	207.1

- 10.6 After reparation, valve shall be re-assembled and adjusted using recommended torque as listed in Table 1. After reassembly, valve shall be pressure tested.
- 10.7 When performing Repair/maintenance operations, user shall use valve O-ring, gasket, bolt and nut of the same size and material as the original one. Valve O-ring and gasket may be ordered as spare parts for maintenance and replacement. It is forbidden to open the closure or replace the bolt, nut or O-ring when the valve contains pressure. After replacement of O-ring, gasket, bolt and

nut, valve shall be closure test prior to reuse.

- 10.8 Generally valve trim prefers replacement to reparation. It is better to use provided part as replacement. If part produced by valve manufacturer is not available due to emergency, user shall produce the part to VIZA's technical documentation. VIZA takes no responsibility for loss caused out of part produced other than VIZA.
- 10.9 It is not recommended for reparation of valve pressure-containing part by user. If the pressure-containing part is used for a long time and consequently defection occurs and affect safety use, user shall replace the valve with a new one.
- 10.10 Welding repair on valve online is forbidden.
- 10.11 The online valve shall not be knocked, walked on or used as weight support.

11. Troubleshooting and Repairs

Trouble	Probable Cause	Remedy
Hard to operate	1. Actuator unit 2. Infrequent operation lack of lubrication 3. Ice in operator or valve 4. Stem galling	Remove actuator cover and check screw and linkage for damage. Lubricate seats through the injection and actuator with suitable industrial lubricants Apply heat or inject antifreeze solution. Repair or replace the stem.
Leakage from sealing	1. Dirties between sealing surfaces 2. Sealing surface damaged.	Clean out the dirty. Repair the Sealing surface or change seat insert.
Leakage from stem	1. "O" ring failure due to used-up or improper storage 2. Stem sealing damaged.	Replace with new "O" ring Check the stem when maintain the pipeline, repair or replace the damaged stem.
Leakage between body and bonnet flanges	1. "O" ring failure 2. body/bonnet bolts loose	Replace the "O" ring. Tighten the body/bonnet nuts properly

Leakage between body and seat	1. "O" ring failure	Replace the "O" ring.
Not able to fully close	Improper setting of actuator limit switches or stops in worm gear actuator	Reset limit switches or stops for proper closing
Grease fitting leaking	Inner check not tight or damaged	Tighten or replace inner check, Do not remove inner check fitting while pressure is in-line
Restriction in bore of valve	Ball not properly aligned with bore of seat	Check proper setting of worm gear actuator and/or actuator limit switches.

12 Quality Warrant and Servicing

12.1 Quality Warrant

- 12.1.1 VIZA warrants its valves to the original purchaser for a period of 18 months from and after the date of delivery to the original customer, or 12 months from startup which occurs first, against defects in material and workmanship under proper and normal use and service and not caused of resulting from improper application or usage, improper installations, improper maintenance and repairs, modifications or alterations.
- 12.1.2 Purchaser shall give notice in written to VIZA upon finding of any defect or assuming defect, VIZA has privilege to check the facts of the defect.
- 12.1.3 VIZA sole obligation under this warranty shall be limited to the follows:
- Repair of the material,
 - Replacement of the parts and materials,
 - refund the purchase price and collect the defected products from the original purchaser.
- 12.1.4 VIZA is not responsible to claims caused from unexpected natural disaster such as earthquake, typhoon of any kinds arising out of the defect.
- 12.1.5 The scope and limitation of warranty can be changed on the agreement between VIZA and purchaser.

12.2 Servicing

Where contractually specified, the manufacturer may provide field installation and adjustment.