HIT
TRUNNION MOUNTED SIDE ENTRY BALL VALVES
TYPE HB-1 – BEARING DESIGN

INSTALLATION, OPERATION
AND MAINTENANCE MANUAL

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CONTENT

1. HEALTH & SAFETY

a. The purpose of this manual is to enable a competent user to safely install, operate and maintain HIT VALVE HB-1 (Bolted Side Entry Series) ball valve with bearing design.

b. No operation, inspection or repair should be undertaken unless it conforms to the procedures given in these instructions. Operation, maintenance or any modification or alteration carried out on the valve outside of these procedures constitutes abuse of the product and voids the warranty of the manufacturer.

c. Only personnel trained and experienced in the appropriate mechanical, electrical and hydraulic aspects required by the operation should be allowed to intervene on the installation and maintenance of the valve. Personnel doing installation and maintenance operations should be familiar with all information contained in this manual.

d. Personnel shall always use safety precautions set forth by the law and regulations required by his employer and in accordance with safety and environmental procedures in force at the particular location.

e. Any servicing not covered by these instructions must be approved by HIT VALVE.

f. Should you require technical assistance and guidance, please contact the factory at the address in the front page. Reference to the serial number will expedite any request regarding HIT valves.

2. NAMEPLATE INFORMATION

a. The nameplate located on the body of the HIT valves provides information about the service conditions the valve has been designed for.

b. The valve's nameplate indicates Maximum Operating Pressures (MOP) at the Maximum Operating Temperature (MOT) and Minimum Operating Temperature (mOT). The valve may be safely operated within this limits.

c. HIT valves are designed, manufactured and tested under a certified quality system. Unless otherwise specified, HIT valves are designed, manufactured and tested in accordance with the relevant design standard.

d. The valve has been designed, manufactured and factory tested based on the Maximum Operating Pressure indicated in the nameplate.

e. Pressure containing components are designed for the Maximum and Minimum Operating Temperature marked on the nameplate.

<table>
<tr><td>SIZE</td><td></td><td>S.N.</td></tr>
<tr><td>PSL/QSL/QL</td><td>PR</td><td>TAG</td></tr>
<tr><td>BODY</td><td>STEM</td><td>M.W.D.</td></tr>
<tr><td>SEAT</td><td>OBTURATOR</td><td>SEAT TEST</td></tr>
<tr><td>MOP/PS</td><td>MOT/TS</td><td>TEMPERATURE CLASS</td></tr>
<tr><td>MOP/PS</td><td>mOT/TS</td><td>MATERIAL CLASS</td></tr>
<tr><td colspan="2">CE Ex II 2 G and D</td><td rowspan="2"></td></tr>
<tr><td colspan="2">HITVALVE MADE IN ITALY
STRADA PER TERZAGO 5 – 20083 GAGGIANO, (MI) ITALY</td></tr>
<tr><td colspan="2"></td><td>F2F/E2E</td></tr>
<tr><td colspan="2"></td><td>DATE</td></tr>
</table>

3. CAUTION

a. Hazards are inherent with the construction, operation and maintenance of high pressure piping systems. The following information and precautions are provided to minimize these hazards.

b. If the valve, in service, is exposed to hazards such as

- wind, earthquake or vibration loading
- excessive piping system reaction forces and moments
- corrosive or abrasive fluids or atmospheric conditions
- operating pressures and temperatures beyond the values marked on the nameplate

contact the factory, if it is necessary, to confirm that the valve design is suitable for the application. The factory requires a complete description of the hazard before making any recommendations.

c. The user is responsible for minimizing other hazards associated with the construction, operation and maintenance of high pressure piping systems such as

- Possibility of decomposition of unstable fluids
- Provisions for the release or blow off of pressure
- Prevention of physical access to system under pressure
- Prevention of physical access to surfaces at extreme temperature
- Provisions for inspection
- Provisions for draining and venting operation
- Provisions for filling operation
- Provision for equipment access
- Prevention of over-pressurization, over-heating and over-filling
- Provision for fault indication

d. The user is responsible for meeting applicable local safety regulations.

4. TECHNICAL INFORMATION

The purpose of this section is to describe the key features of the valve and the function of the main components. In the following, reference is made to general assembly drawing and parts list in Section 15.

4.1. Pressure-containing parts

The pressure-containing parts consist of:

- Body (001)
- Closures (004)
- Body cover (006)
- Stem (012)
- Bolting (301) (302) (303) (343)
- Adapter plate (025)

Sealing between the various components is assured by means of seals as follows:

- Stem to body cover: two to three barriers with seals (207) and graphite gasket (209)
- Body to closure: two barriers with seal (204) and graphite gasket (206)
- Body to body cover: two barriers with seal (210) and graphite gasket (212)

The stem is provided with a collar designed to act as an anti-blow-out device per the applicable standard.

Optional grease injection points can be provided after the secondary seal of the stem and/or on the seats to allow for emergency sealing and/or periodic maintenance operations.

Depending on the valve size, a drain and a vent connections may be provided on the body.

4.2. Pressure-controlling parts

Pressure control is directly achieved by:

- Seat rings (011)
- Ball (008)

The seat rings can be both uni-directional (DBB), both bi-directional (DIB-1) or one seat uni-directional and one seat bi-directional (DIB-2) depending upon Project specific executions. In the latter case, a proper identification plate is present on the body of the valve to indicate the seat rings arrangement.

HIT VALVE ball valves are sized to withstand a differential pressure corresponding to the Maximum Design Pressures indicated on the valve nameplate.

4.3. Seating surfaces

The sealing between the ball and the seat is achieved by means of either a soft or a hard-faced annular surface.

The seat rings are pushed against the ball by the piston force generated by the line pressure. At low pressure, the seat is energized by a set of springs which complement the piston effect of the pressure.

4.4. Drive train

The drive train is comprised of either the “active” and the “passive” components. Among the active components are:

- Stem (012)
- Ball (008)
- Stem to ball connection (tang or pin configuration)
- Stem key (050)

The “passive” components are:

- Reaction pins (046)

Both sets of components are sized to allow a reliable transmission of the operating torque from the operator to the ball.

5. STORAGE

Functional integrity and tightness of a valve is strongly dependent upon a proper handling and storage of the valve itself.

To this aim, HIT valves, after been assembled and tested, are drained and painted (if required).

HIT valves are shipped fully assembled and the end connections are protected by means of plastic or plywood protective covers properly secured to the valve. These covers prevent contaminants from entering the valve cavity and potentially damaging the ball or the seat sealing surfaces during storage. They should be repaired or replaced if damaged and not removed until the valve is to be installed on the line.

All valves are delivered in fully open position, unless they are actuated with fail-to-close actuator. In this case, valves are shipped in fully closed position, unless otherwise agreed. If the valve has an operator, the operator stops are factory adjusted for open and closed position.

Before installation, the valves shall preferably be stored in an enclosed, clean, dry area. Storage in humid and/or dusty conditions shall be avoided.

It is recommended not to expose the valve to the weather or to the sun for a long period if not appropriately packed.

During the storage period, the valves shall be checked for visual damages periodically.

6. TRANSPORTATION AND HANDLING

Lifting and handling of valves packed in crates shall be carried out by fork lifts. Valves packed in cases shall be lifted at the lifting points marked on the cases.

Once unpacked, the valves shall be handled and/or lifted using a lifting equipment sized accordingly to the valve weight indicated in the packing list and/or the delivery notes. Preferably lift a valve by slings wrapped around the flanged ends or by chains hung to the lifting lugs.

Unless specifically indicated on the operator documentation, the valve/gear or valve/actuator assembly shall not be lifted using the lifting points of the gear/actuator.

Pay attention that slings do not damage the gear or actuator.

Lifting must be carried out only by trained personnel. Local regulations about Health & Safety as well as all best safe work practices have to be adhered to when lifting any equipment.

In case of any doubt about the lifting and advice about the center of gravity position of the valve-actuator assembly, please contact the factory.

7. INSTALLATION

7.1. Before installation

a. Upon receipt of the valve, check for any visual damage.

b. Carefully remove the valve from the package and remove the end connections protectors only when the valve is ready to be installed in the line.

c. Before installation, make sure no foreign materials and objects are left within the valve bore.

d. Ensure that grease fittings and sealing surfaces of connection flanges are not damaged.

e. Unless otherwise specified, the valves shall be installed in open position to protect the seal surface of the ball from damage. The line sections, between the valve has to be installed, must be aligned, clean and correctly spaced.

f. Verify the flow direction with respect to the arrow on the valve body or on the plate. Valves without arrow are bi-directional.

g. In case of double-piston-effect seat rings configuration and liquid service, make sure the overpressure relief device is installed.

h. Do not remove the operator from the valve before installation. If strictly necessary, before removing the operator it is strongly recommended to set the valve with the ball in fully open position or in fully closed position (refer to the operator manual).

i. Make sure the drain plug and the vent fitting are properly tightened. Never over tighten the threaded fitting.

j. Verify that the valve-to-operator bolts are tight.

k. Do not change the setting of limit switches and of mechanical stops of the operator.

7.2. Installation of flanged end valves

a. Flanged end valves shall be installed using the appropriate gasket and following usual flanged fitting installation procedures. Nuts and bolts must be tightened according to the appropriate standards and materials characteristics.

b. Unless otherwise specified, use studs, nuts and raised face gasket or ring joints as per size and class conforming to the relevant standard. The end-user must provide gasket and mating flanges of equal ratings to that of the valve for proper installation.

c. Tighten the studs alternately, cross pattern method for even loading, several times, using the torques recommended by ANSI or gasket manufacturer specification.

d. A valve shall never be used to support a pipeline.

e. Leave the valve in the fully open position and never operate the valve before the line has been fully cleaned and flushed.

7.3. Installation of weld end valves

a. Always weld the valve with the ball in open position.

b. The welding has to be carried out by qualified welders using weld procedures appropriate for the valve materials.

c. To avoid damaging the valve seals, when preheating, welding and stress relieving, the temperature of the body shall not exceed 200°C, particularly when the valve is not fitted with a transition piece.

d. After installation and before the valve is operated, the line shall be thoroughly flushed to remove any debris and prevent any damage of the sealing surfaces.

7.4. Field testing

The following procedures for field testing are recommended:

a. Ensure that the test fluid is compatible with the valve and sealing materials

b. Flush the system to remove foreign material that may be in the line as a result from installation procedures, to avoid damages to the ball and seats

c. If performing line shell testing, the valve shall be in half open position. The maximum line pressure can be 1.5 times the valve Maximum Operating Pressure indicated on the valve nameplate. If the valve is tested to a higher pressure, the valve can be permanently damaged

d. If performing seat testing, make sure the valve is fully closed. The maximum pressure for seat testing is the Maximum Operating Pressure indicated on the valve nameplate. If the seats are tested to a higher pressure than Maximum Operating Pressure the seats can be permanently damaged

e. After completion of testing, with the valve in half open position and all test pressure relieved, the valve should be completely drained to purge the test fluid from the valve

f. Stroke the valve open-closed-open to verify operability

g. Check for external leaks at all joints while rising pressure. Always wear safety equipment and adhere to safe work practices when approaching equipment under pressure

8. OPERATION

8.1. General

a. Once installed, the valve shall be kept with the ball in fully open or in fully closed position. These valves work for on/off service only. These valves shall never be operated partially open. Partial opening may cause the damaging of sealing surfaces, preventing tight shut-off.

b. Unless otherwise indicated, the valve is closed by turning 90° clockwise the stem.

c. In case of bare stem valves, the position of the ball is indicated by the stem key. When aligned with the pipe axis, the ball is in open position. On the contrary, when at 90° with the pipe axis, the ball is in closed position.

d. In case of lever, the handle aligns with the valve axis when open and 90° to the valve axis when closed. When viewed from above, the valve stem rotates clockwise to close and counter-clockwise to open.

e. In case of gear and/or motor operated valves, a position indicator fitted onto the gear/actuator provides the open-closed positions.

f. In case of gear/motor operated valves, the end stops have been set in factory to assure the correct rotation from fully open to fully closed position. Do not change their adjustment. If the valve is not correctly reseated at the end of opening or closing the ball and the seats can quickly be damaged when exposed to flow pressure, preventing tight shut-off.

g. In case of handwheel, it rotates clockwise to close the valve. Refer to the appropriate manufacturer's manual for proper operation and maintenance.

8.2. Bleeding/draining

HIT VALVE ball valves are provided with a plugged drain port. If requested, the plug may be substituted with a bleed fitting.

Bleeding is achieved by using the bleed fitting as per the following instructions:

a. Operate the valve in the fully closed position.

b. Slowly unscrew the hex head on the bleed fitting using the appropriate wrench or open the bleed valve (if any) and release body cavity pressure.

c. Dispose of captured fluids in an environmentally responsible manner and be careful as these fluids may be toxic and/or otherwise poisonous, flammable or explosive.

d. Depending on the size of the valve time required to bleed can vary considerably.

Draining is achieved by using the plugged drain port as per following instructions:

a. Operate the valve in the fully closed position.

b. Ensure that no pressure is trapped in the body cavity.

c. Slowly unscrew the plug using the appropriate wrench.

d. Dispose of captured fluids in an environmentally responsible manner and be careful as these fluids may be toxic and/or otherwise poisonous, flammable or explosive.

e. Depending on the size of the valve time required to drain can vary considerably.

8.3. Lubrication procedure

In case of valves equipped with lubricant injection point, the devices are shipped without lubricant, unless otherwise specified. This practice is implemented to avoid the lubricant to become hard if the valve if not installed shortly and operated regularly.

All lubricants break down in the valve if left in place over an extended period, particularly when in gas service or dry fluid. If left long enough without periodic cleaning or the addition of more lubricant, the old lubricant becomes hard and eventually the valve seizes and becomes inoperable. More frequent servicing keeps the lubricant semiliquid inside the valve and makes it easy to operate without serious damage.

8.3.1 Guidelines

The best results are achieved by injecting lubricant while the valve is into the fully open or fully closed position.

In all services, except oxygen, it is recommended to use:

- "Renocal FN 745/94" by Fuchs or equivalent when the operating temperature is up to 100°C;
- "Val-tex 2000" or equivalent when the operating temperature is above 100°C.

Check the product with respect to service conditions.

A reasonable yardstick is to use approximately one ounce of lubricant (or cleaner), per inch of valve size per seat ring and per inch of stem size in case of stem injection. If the valve is buried, it is recommended to add one ounce of lubricant (or cleaner) per inch of riser to be serviced. The most efficient way to gauge how much lubricant (or cleaner) to inject into any valve is to use a pressure gauge on a grease gun.

Do not exceed the valve maximum allowable working pressure.

8.3.2 Routine Maintenance – Top up & Turn

a. Top up the seat sealant system with suitable lubricant. The quantity of lubricant can vary greatly due to frequency of valve operation and service condition. A good practice is described in Paragraph 8.3.1. Keep injection pressures low.

b. Cycle the valve. A full cycle means all the way closed and all the way back open. Repeat 2/3 times to spread the lubricant and to make sure the valve turns easy.

c. Examine the valve for signs of corrosion (rust) or damage to the paint or coating.

d. Routine maintenance is suggested every 6/9 months.

8.3.3 Full Service Maintenance – Clean and re-lubricate

a. Depending on the severity of the service and frequency of stroking, every few years it's a good practice to perform a full service, which consists of purging out the old lubricant with "Sealweld Valve Cleaner Plus" or equivalent. Check the product with respect to service conditions.

b. Inject the full quantity to fill from empty using the indications in paragraph 8.3.1. Cycle the valve repeatedly to spread the cleaner across the seal face. Leave the Valve Cleaner to soak in the valve for up to 2 days maximum.

c. With the ball in the closed position, open the body vent or body drain fitting and depressurize the body cavity. Follow all necessary safety procedures and remove all sources of ignition or spark downwind. Be prepared to capture liquids from the valve body, even in gas service. Dispose of captured liquids in an environmentally responsible manner and be careful as these liquids may be toxic and/or otherwise poisonous, flammable or explosive.

d. Close the body vent, cycle the valve repeatedly.

e. Inject suitable lubricant in all lubricant injections ports.

f. Cycle the valve to ensure ease of operation.

g. Full service maintenance is suggested every 2 years.

9. PERIODIC MAINTENANCE – RECOMMENDATIONS

HIT valves are designed to ensure leak-free performances for a long period of time with low maintenance. It requires no internal lubrication or greasing for normal operations. The implementation of the following preventive maintenance practice could enhance the life of the valve.

a. Visual inspection for checking for any external visible damage or leakage is suggested, depending on the valve accessibility, whenever it's possible.

b. Ball valves should not be immobilized for long periods of time. If possible, the valve should be cycled at periodic intervals to ensure continued reliable operation (e.g. one open/close cycle every year).

c. Drainage of the valve prevents damage caused by debris, deposits or foreign matter accumulated during valve service (refer to Section 8.2 for draining/bleeding procedure). If possible, the valve should be drained every one or two years.

d. If lubricating points are available, a regular lubrication program extends the service life of the valve before carrying out maintenance operation and improves its performance. Lubrication intervals depend on the frequency of operations and the severity of the service (refer to Section 8.3 for lubrication procedure).

10. TROUBLESHOOTING

In the following table a list of possible malfunctions and relative possible causes that can be encountered after valve installation is shown. The action that should be taken for each item is suggested.

The user is strongly recommended to contact HIT VALVE for a proper investigation of the malfunctioning of the device, the determination of the causes and the definition of the best repair program.

Malfunction	Possible cause(s)	Action
Stem seal leakage	Worn or damaged seal	Inject grease (see Emergency sealing section) Replace seal (*)
Body cover to body joint leakage	Worn or damaged seal	Replace seal (*)
	Bolts relaxation	Tighten bolts to specified torque (Table 2)
Body to closure joint leakage	Worn or damaged seal	Replace seal (*)
	Bolts relaxation	Tighten bolts to specified torque (Table 1)
Valve seat leaking thru the line	Valve not fully closed	Check end stops position and in case reset stops (*) Close the valve
	Foreign material between seat and ball	Open the valve Flush to remove debris
	Worn or damaged sealing surfaces	Inject grease (see Emergency sealing section) Disassemble the valve and repair the sealing surfaces (*)
	Worn or damaged seat sealing	Disassemble the valve and replace seat sealing (*)
Valve does not fully open/close	Accumulation of material in the body	Flush to remove debris Disassemble the valve (*)
	Stem/ball sticking	Lubricate the valve Disassemble and repair the valve (*)
	Improper setting of operator stops	Reset operator stops (*)
Hard to operate	Accumulation of material in the body	Flush to remove debris Disassemble the valve (*)
	Stem/ball sticking	Lubricate the valve Disassemble and repair the valve (*)
	Operator not working properly	Check operator (*)

(*) It is suggested to contact HIT VALVE to define the necessary recovery plan.

11. EMERGENCY SEALING

11.1. General

a. HIT valves are provided with emergency sealant injection fittings on stem and (optional) on seats. These are meant to restore sealing for a limited period until the next maintenance service can be performed.

b. Seat grease injection points can be used in the event of slight damage to the seats that causes seat leakage.

c. Stem grease injection points can be used in case of stem leakage.

d. In addition, both seat and stem grease injection points can be used to improve valve operation as soon as an increase of stem torque is noticed.

11.2. Guideline

For this operation it is recommended use of “Sealweld #5050 Sealant” or equivalent. Check the product with respect to service conditions.

Proceed as follow:

a. Place the valve in a fully closed position

b. Connect the grease gun to the grease fitting and inject sealant (one ounce of sealant per inch of valve size for seat injection points, one ounce of sealant per inch of stem diameter for stem injection points)

c. Check for leak. If sealing is not adequate, stroke the valve and repeat sealant injection.

12. VALVE RECONDITIONING

12.1. General

HIT valves can be rebuild if necessary. The reconditioning of the valve require proper lifting equipment and normal maintenance tools.

Spare parts are determined by the individual customer specification. However, the following list is suggested as a minimum for typical maintenance operations:

- Gaskets (O-rings, Lip seals, graphite, etc.)
- Bearings
- Thrust washer

Before proceeding with any maintenance operation described in this section, the valve must first be isolated from system pressure and flow. Drain the valve to make sure there is no residual pressure left in the body, following the procedure described in Section 8.2.

12.2. Stem seals replacement

HIT valve design allows for the in-line replacement of stem seals. Before proceeding with seals replacement, make sure no pressure is in the line.

Sequence of operations is as follows:

a. Operate the valve in the fully closed or fully open position.
b. Bleed pressure in the valve cavity. Keep the bleed fitting open during all sequence.
c. Remove the operator from the adapter flange (025) adhering to the instructions included in the operator manual.
d. Loose the stem key capscrew and remove the stem key (050).
e. Unscrew the operator flange capscrews (343) and remove the adapter plate (025).
f. Remove the spacer ring (021), the graphite gasket (209) and the environmental seal (if any).
g. Pay attention not to damage the sealing surfaces on the stem and on the body cover.
h. Clean all the sealing surfaces and visually check for any damage: if damages are found, they have to be rectified before reassembly.
i. Replace all the seals and gaskets and reassemble all parts backwards.
j. Close the bleed fitting.

12.3. Major overhaul - Disassembly

Any major maintenance operation on the internal components requires the valve is removed from the line.

Sequence of operations is as follows:

a. Ensure no pressure is trapped inside the body cavity.
b. Operate the valve in the fully closed position.
c. Remove the operator following the instructions of the manufacturer.
d. Mark the body/body cover position to allow correct repositioning on assembly.
e. Loose the stem key capscrew and remove the stem key (050).
f. Unscrew the operator flange capscrews (343) and remove the adapter plate (025).

g. Unscrew the body cover capscrews (303).

h. Lift off the valve the body cover (006) together with the stem (012). Pay attention not to drop the stem when lifting the body cover assy.

i. Remove the dowel pins (046), the bushing (107), the body cover seal (210), the possible body cover back-up (211) and the body cover fire safe gasket (212).

j. Turn the stem/body cover assy upside-down and gently push the body cover (006) down to get the stem (012) out of it. Shocking with suitable soft faced hammer is allowed to aid disassembly. Check for the presence of the antistatic device ball and spring without removing it (045).

k. Remove the stem washer (101) and all seals from the body cover.

l. Put the valve with an end flange on the work bench and horizontal stem.

m. Mark the body/closure position to allow correct repositioning on assembly.

n. Loose the body nuts (302) of the upper closure and lift the closure (004) from the body (001).

> **Warning**
> The seat ring (011) is not retained inside the closure (004) by any device but by the friction of the seal (201).
> Failure to smoothly lifting the closure may results in the seat to drop out of the closure.

o. Pull the seat ring (011) out of the closure paying attention not to damage the sealing surfaces of the seat and of the closure.

p. Loose the body nuts (302) of the lower closure (004) and lift the body off the closure.

q. Using a soft sling, lift the ball (008) with the bearing retainers (015) from the lower closure.

r. Remove the other seat ring (011) from the closure (004).

s. Remove the bearing retainers (015) from the ball (008). Do not remove the closure pins (047) from the bearing retainers (015).

t. Check for any damage of the bearings and replace them in case of any trace of wear and/or damage is found.

u. Remove all seals (201), possible back-ups (202) and seat springs (044) from the seat rings (011).

v. Clean and check thoroughly all components. Visually check all sealing surfaces and repair damages. Any repair operation has to be carried out under direct supervision of HIT VALVE or of a Company nominated by HIT VALVE.

12.4. Major overhaul - Reassembly

a. Change all gaskets, seals, bearings and thrust washer as recommended in Par. 12.1.

b. Lubricate seals, bearings and thrust washer with lubricant suitable for the intended service before assembly.
Lubricate all metal surfaces where sliding contact may occur, i.e. seat pockets and stem housing.
Take care that no solid particles are present on the sealing surfaces.

c. Reinstall seat seals (201) and possible backups (202) on the seat rings (011).

d. Fit the seat springs (044) inside the corresponding holes.

e. Lower the seat rings into the closure pockets (004) paying attention the seat springs don't drop to ease the operation is recommended to slightly lubricate the seat ring and the seat seals with light oil.

> **Warning**
> It is mandatory that an even load is applied onto the seat to push it down into the closure: failure to do so may result in damaging either the seal or the seat pocket surface thus impairing the sealing capacity of the assy.

f. Fit the ball thrust ring (102) on the lower trunnion of the ball (008), with the low-friction surface facing the ball (upward).

g. Assemble the bearing retainers (015) on the ball trunnions.

h. Lubricate the sealing surface of the ball (008), then slowly lower it down (complete with the bearing retainers) into the first closure until it is supported by the seat ring.
To ease the closure pins (047) engaging the corresponding holes in the closure, slightly rocking the bearing retainers is recommended.

i. Install body seal (204, possible body back-up (205) and possible body fire safe gasket (206).

j. Lower the body (001) onto the closure (004) making sure that the witness marks on body and closure coincide.

k. Tighten the nuts (302).

l. Install the second set of body seal (204), possible back-up (205) and possible body fire safe gasket (206).

m. Lower the second closure (004) with seat ring (011) onto the body maintaining the relative position as indicated by the marks made on disassembly.
Pay attention that the closure pins (047) correctly engage the corresponding holes the closure. Again, slightly rock the bearing retainers to ease the operation.

n. Tighten all the nuts (302) applying the torque indicated in Table 1 attached.

o. Fit the stem washer (101) onto the stem (012) shoulder so that the anti-friction surface is facing the stem (downward).

p. Install bushing (107), body cover seal (210), possible back-up (211) and possible body cover fire safe gasket (212).

q. Insert the stem (012) into the body cover (006).

r. Install stem seals (207), possible back-up (208), stem fire safe gasket (209) and spacer ring (021) into the body cover (006).

s. Insert the pins (046) into the body (001).

t. Install the stem/body cover assy onto the body (001), fitting the dowel pins (046) into the specific holes. Pay attention to maintain the relative position as indicated by the marks made on disassembly.

u. Tighten the body cover capscrews (303) applying the torque indicated in Table 2 attached.

v. Assemble the adapter plate (025) with the bushing (108) and tighten the operator flange capscrews (343) applying the torque indicated in Table 2 attached.

w. Assemble the stem key (050) on the stem and secure it to the stem by the stem key capscrew.

x. Install the operator and verify smooth operation of the valve. Remember to adjust the end stops of the operator before installing the valve onto the line.

13. DISPOSAL

When dismantling the unit and/or its parts at the end of the service life, address the competent local authority.

Do not throw the package or any other part of the valve in the environment.

14. RECOMMENDED BOLT TORQUE

Table 1 – Imperial threads

	not greased nor PTFE coated			greased and/or PTFE coated		
	A193 B7 A320 L7 A320 L43 N·m (± 5 %)	A193 B7M A320 L7M A453 Gr.660B A182 F55 N·m (± 5 %)	A320 B8 CL.2 A320 B8M CL.2 N·m (± 5 %)	A193 B7 A320 L7 A320 L43 N·m (± 5 %)	A193 B7M A320 L7M A453 Gr.660B A182 F55 N·m (± 5 %)	A320 B8 CL.2 A320 B8M CL.2 N·m (± 5 %)
¼" 20-UNC	14	11	13	9	6	8
5/16" 18-UNC	28	21	25	17	13	15
3/8" 16-UNC	48	36	43	29	22	26
7/16" 14-UNC	75	57	68	45	34	41
½" 13-UNC	112	85	101	67	51	61
9/16" 12-UNC	160	121	144	95	72	86
5/8" 11-UNC	219	166	197	130	99	118
¾" 10-UNC	381	289	344	225	171	203
7/8" 9-UNC	607	461	461	358	272	272
1" 8-UNC	901	683	683	531	403	403
1" 1/8 8-UN	1 304	989	809	762	578	473
1" 1/4 8-UN	1 811	1 374	1 124	1 051	797	652
1" 3/8 8-UN	2 087	1 583	N.A.	1 204	913	N.A.
1" 1/2 8-UN	2 732	2 073	N.A.	1 568	1 189	N.A.
1" 5/8 8-UN	3 497	2 653	N.A.	1 998	1 516	N.A.
1" 3/4 8-UN	4 393	3 333	N.A.	2 500	1 897	N.A.
1" 7/8 8-UN	5 429	4 119	N.A.	3 080	2 336	N.A.
2" 8-UN	6 617	5 020	N.A.	3 742	2 839	N.A.
2" 1/4 8-UN	9 486	7 197	N.A.	5 338	4 050	N.A.
2" 1/2 8-UN	13 083	9 925	N.A.	7 332	5 562	N.A.
2" 3/4 8-UN	15 801	13 268	N.A.	8 825	7 410	N.A.
3" 8-UN	20 587	17 287	N.A.	11 465	9 627	N.A.
3" 1/4 8-UN	26 252	22 044	N.A.	14 585	12 247	N.A.
3" 1/2 8-UN	32 872	27 602	N.A.	18 224	15 302	N.A.
3" 3/4 8-UN	40 518	34 023	N.A.	22 422	18 827	N.A.
4" 8-UN	49 267	41 369	N.A.	27 219	22 855	N.A.

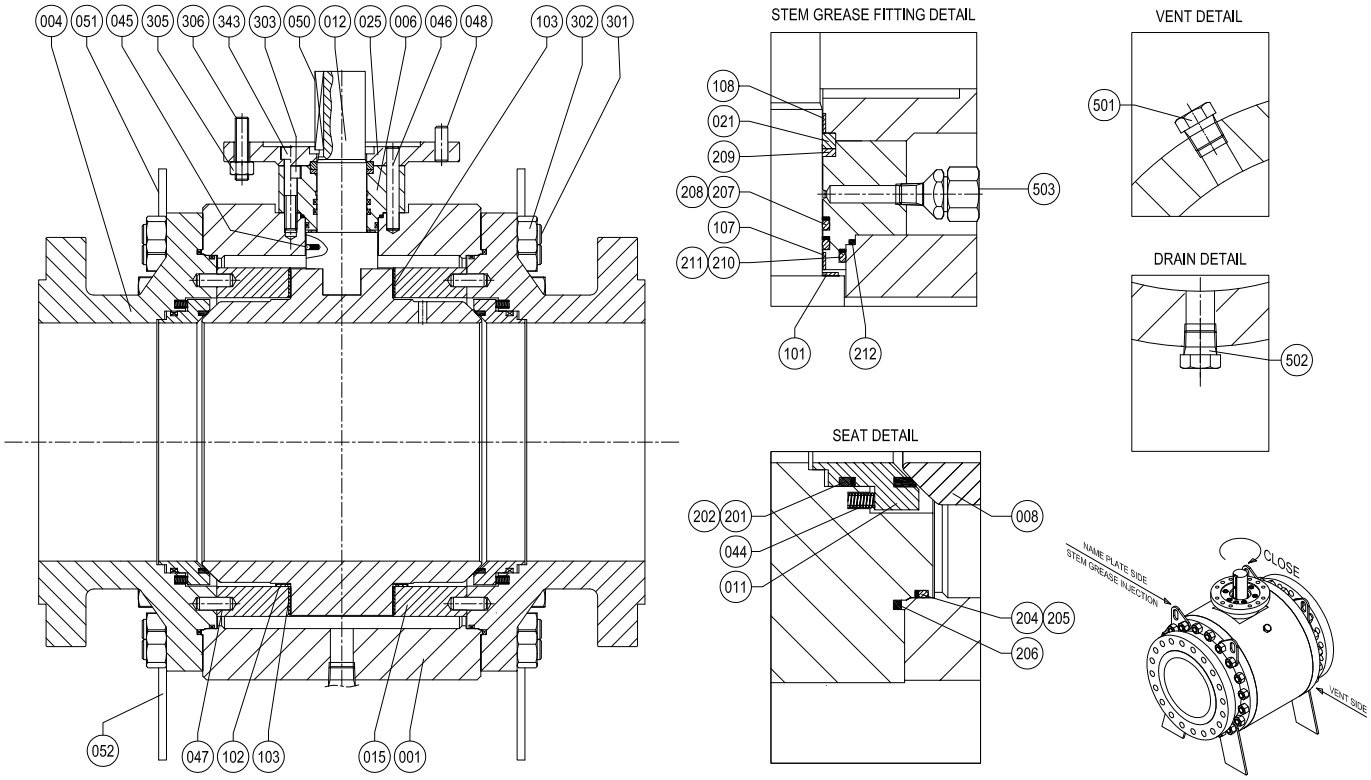
Table 2 – Metric threads

	not greased nor PTFE coated			greased and/or PTFE coated		
	A193 B7 A320 L7 A320 L43	A193 B7M A320 L7M A453 Gr.660B A182 F55	A320 B8 CL.2 A320 B8M CL.2	A193 B7 A320 L7 A320 L43	A193 B7M A320 L7M A453 Gr.660B A182 F55	A320 B8 CL.2 A320 B8M CL.2
	N·m (± 5 %)	N·m (± 5 %)	N·m (± 5 %)	N·m (± 5 %)	N·m (± 5 %)	N·m (± 5 %)
M10	55	42	50	33	25	30
M12	93	71	84	56	42	50
M14	148	112	133	88	67	79
M16	225	171	204	133	101	120
M18	313	237	282	186	141	168
M20	437	331	332	258	196	196
M22	595	451	450	348	264	264
M24	751	570	571	443	336	337
M27	1 092	829	677	639	485	396
M30	1 487	1 128	924	873	662	542
M33	1 714	1 300	N.A.	999	758	N.A.
M36	2 298	1 743	N.A.	1 319	1 001	N.A.
M39	2 949	2 237	N.A.	1 685	1 278	N.A.
M42	3 712	2 816	N.A.	2 113	1 603	N.A.
M45	4 598	3 488	N.A.	2 608	1 978	N.A.
M48	5 613	4 258	N.A.	3 174	2 408	N.A.
M52	7 141	5 417	N.A.	4 025	3 053	N.A.
M56	8 717	6 613	N.A.	4 965	3 766	N.A.
M60	10 744	8 150	N.A.	6 099	4 627	N.A.
M64	13 061	9 908	N.A.	7 393	5 608	N.A.
M68	14 174	11 902	N.A.	8 002	6 719	N.A.
M72	16 846	14 145	N.A.	9 488	7 967	N.A.
M76	19 833	16 654	N.A.	11 147	9 360	N.A.
M80	23 153	19 442	N.A.	12 988	10 906	N.A.
M85	27 716	23 273	N.A.	15 515	13 028	N.A.
M90	33 213	27 889	N.A.	18 550	15 577	N.A.
M95	39 393	33 078	N.A.	21 957	18 437	N.A.
M100	45 830	38 483	N.A.	25 508	21 419	N.A.

15. GA DRAWING AND PARTS LIST

Warning

The valve configuration shown is aimed at illustrating maintenance operations. For this reason some features may differ in minor aspects from those of the actual supply. It is therefore recommended to refer to contractual documentation for all details.



Item	Description
001	Body
008	Ball
015	Bearing retainer
044	Spring
047	Closure pin
051	Lifting lug
102	Ball thrust ring
108	Bushing
204	Body seal
207	Stem seal
210	Body cover seal
301	Body stud
305	Operating mounting nut
501	Vent plug

Item	Description
004	Closure
011	Seat ring
021	Body cover spacer ring
045	Anti-static device
048	Operator flange pin
052	Valve support
103	Ball bearing
201	Seat seal
205	Body back-up
208	Stem back-up
211	Body cover back-up
302	Body nut
306	Operator mounting stud
502	Drain plug

Item	Description
006	Body cover
012	Stem
025	Adapter plate
046	Dowel pin
050	Stem key
101	Stem washer
107	Bushing
202	Seat back-up
206	Body fire safe gasket
209	Stem fire safe gasket
212	Body cover fire safe gasket
303	Body cover bolt
343	Operator flange bolt
503	Stem grease fitting