valves and flow control specialist

FLOATING BALL VALVE

INSTALLATION, OPERATION AND MAINTENANCE

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1 - SAFETY INFORMATION

The following general safety information should be taken into account in addition to the specific warnings and cautions specified in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered in this I.O.M.

To avoid injury, never attempt disassembly while there are pressures either upstream or downstream. Even when replacing gaskets, caution is necessary to avoid possible injury. Disassemble with caution in the event all pressures are not relieved.

To prevent valve bending, damage, inefficient operation, or early maintenance problems, support piping on each side of the valve.

- A valve is a pressurized mechanism containing fluids under pressure and consequently should be handled with appropriate care.
- Valve surface temperature may be dangerously too hot or too cold for skin contact.
- Upon disassembly, attention should be paid to the possibility of releasing dangerous and or ignitable accumulated fluids.
- Ensure adequate ventilation is available for service.

This manual provides instructions for storing, general servicing, installation and removal of valves. Trust Valves refuses any liability for damage to people, property or plant as well as loss of production and loss of income under any circumstances but especially if caused by incorrect installation or utilization of the valve or if the valve installed is not fit for intended purpose. It is the sole responsibility of the user to ensure the valve type and materials are correctly specified.
DURING OPERATION, TAKE INTO ACCOUNT THE FOLLOWING WARNINGS:

- Graphite/Graphoil packing and body gasket is very brittle, any impacting, twisting or bending should be avoided.
- The valve's internal parts such as ball, stem, seals, seats, gaskets shall be handled with care avoiding scratches or surface damage.
- All tools and equipment for handling internal critical sealing parts shall be soft coated.
- Valves can be fitted with gaskets or seals in PTFE, Buna, Viton, etc., hence high temperatures will damage sealing components.
- Never part open valve; valve must be full open or full closed to avoid seal damage.

For all operations, refer to position number on part list of the applicable drawing.

2 - INSTALLATION

Piping should be properly aligned and supported to reduce mechanical loading on end connections. Never use the lever (wrench) to hold the valve during transport, handling or assembly.

The following procedure is required to be followed for correct installation:

- Before installation confirm the marking (rating, size and material) on the valve body and nameplate. Ensure the valve is suitable for the service which it is being used.
- Body bolts and nuts on valve shall be checked and retightened if necessary in case loosened during installation.
- Remove valve end protectors and ensure gasket faces are free from damage. Tighten all bolts between mating flanges and valve equally paying careful attention to properly tighten bolts. Follow tightening procedure (opposing bolts sequentially) gradually increasing torque. Refer to Appendix Table 3 for tightening sequence.
- Prior to installation of valve, ensure the line is completely flushed to remove any debris as soft seated ball valves are easily damageable. Filters or strainers should be installed upstream to protect soft seated valves.
- Valves will operate at any angle horizontally or vertically, although it is recommended to install valves in a vertical position with stem pointing upwards for ease of operation, inspection and accessibility.

2.1 - INSTALLATION POSITIONS

Ball valves are usually bi-directional, and therefore may be installed in either direction. In some cases, ball valves such as 'metal to metal' seated and low temperature valves may be unidirectional, in which case the direction of flow will be indicated on the valve body.

2.2 - PREPARATION FOR INSTALLATION

- Remove protective end caps or plugs and inspect valve ends for damage to threads, weld ends or flange faces.
- Thoroughly clean adjacent piping system to remove any foreign material that could cause damage to seating surfaces during valve operation.
- Verify that the space available for installation is adequate to allow the valve to be installed and to be operated.

2.3 - END CONNECTIONS

Threaded Ends

Check condition of threads on mating pipe. Apply joint compound to the male end of joint only. This will prevent compound from entering the valve flow path.

Flanged Ends

Check to see that mating flanges are dimensionally compatible with the flanges on the valve body ensure sealing surfaces are free of debris. Install the correct studs and nuts for the application and place the gasket between the flange facings.

Stud nuts should be tightened in an opposite crisscross pattern in equal increments to ensure even gasket compression.

Socket weld Ends

Remove all debris, grease, oil, paint, etc., from the pipe that is to be welded into the valve and from the valve end connections.

Insert the pipe into the valve end connection until it bottoms out in the socket weld bore. Withdraw the pipe 1/16" so that a gap remains between the pipe and the bottom of the socket weld bore to prevent cracks (ASME B16.11). Tack the pipe into the valve and complete the fillet weld.

WELDING INSTRUCIONS

- Local welding regulations and specification must be complied with when carrying out welding work.
- Remove any paint and rust around the weld area on the pipe and welded end of the ball valve.
- Check that the ball valve is correctly positioned and aligned with the pipeline.
- Where weld connection is dose to seat area, due to short length of the welded ends there is a risk that the soft inserts may be destroyed during the welding work. Hence the following procedure is advised:

Use temperature measuring strips to check that the temperature does not rise beyond the permissible limits (160°C). The strips must be fitted to the connection near the soft inserts. These temperature measurements strips are designed so that, when a type dependent temperature is reached, the color irreversibly changes from white to black. The temperature measurement strip must be monitored constantly throughout the welding work. If any change of color is noticed, the welding work must be interrupted immediately and the weld allowed to cool.

Buttweld End Valves

Clean the weld ends as necessary and weld into the line using an approved weld procedure. Make sure the pipe and valve body material given on the valve body or nameplate is compatible with the welding procedure. Soft seats can be damaged during welding, take steps to ensure valve is not over heated, especially smaller size valves (see above caution note).

2.4 - VALVE INSTALLATION BY WELDING

Leave valves in full open position during installation, welding and post-weld heat treatment. This will reduce temperature transmission to soft seats. After welding completion, open the valve and flush line to clean out any foreign matter. Valves aver DN 65 (2.1/2") have minimal risk of temperature damage to seats.

Far valves up to DN 80 (3") the welding temperature can adversely affect the PTFE and elastomer components. Follow the welding instructions above and use temperature measuring strips to monitor temperature. It will be the responsibility of the operator to ensure valves are kept cool during welding and then post-weld testing of the valve should be performed.

Larger size valves aver DN 80 (3") are less likely to transmit heat to seat and stem packing during welding but still care should be taken. Depending on class, valves under DN 50 (2") should have pup ends fitted to avoid seat damage. If not fitted ensure valve body temperature is kept cool. Temperatures aver 180°C can damage seats & seals.

3 – OPERATIONS

3.1 - MANUAL OPERATION

Valve adjustment is by clockwise turning of stem. Lever operated and gear operated valves have a position indicator to indicate open or closed (see figure 1 & 2). Ball Valves must not be used for throttling. Do not leave part open, or seats will be damaged. Valve must be full open or full closed.

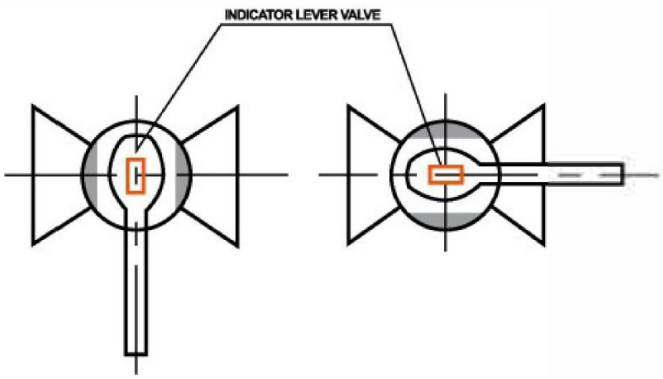


FIG. 1

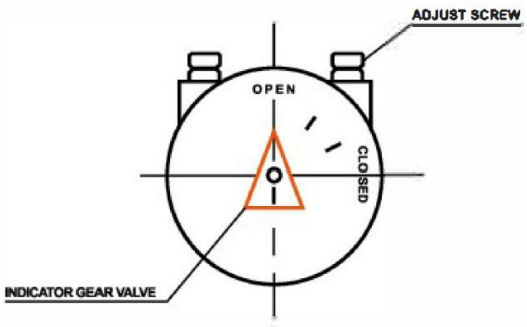


FIG. 2

3.2 - LOCK DEVICE

Where provided (optional) the valve has a locking lug that allows valve to be locked in full open or full closed position.

4 – MAINTENANCE

Valves should be periodically checked at least once every 3 months, but depending on service, criticality and frequency of use, more regular checking may be required.

Packing leakage could result in personal injury. Valve packing is tightened prior to shipping but may require adjustment to meet specific service conditions.
If valve does not fully close, damage to the seat and body will result due to the Venturi effect resulting in high-pressure erosion. Flush or remove the valve at next opportunity.

A good program of inspection and maintenance cannot be overstressed. It is recommended that the valve be periodically and at least partially stroked/function tested to ensure the valve functions and prevent seizure/sticking of any mating surfaces. Duration depends on service, criticality etc. However, it also must be factored in that if there are impurities or particulates in the line each operation could reduce seat life proportionately. Periodic inspection of critical leak-path areas such as body/bonnet joint, end connections, seating surfaces, and around the stem packing should be a requirement.
The most common area for leakage is around the stem packing, this is usually due to wear and can normally be stopped by adjusting the packing.

This procedure is performed by turning gland bolts or nut (8) 1/2 turn at a time until leakage stops. Once leakage stops, continue tightening gland plate nuts an additional 1/2 turn. If leakage cannot be halted by adjusting packing, repacking of the valve is indicated. (Refer to field repair).

4.1 - GLAND PACKING

In case of slight leakage from the gland, gland packing bolts can be lightly tightened up without effecting torque. (See 4.0) See Figure 3 and 4 and table 2 in the Appendix.

Do not attempt to repack or replace stem while the valve is in service! Only graphite packing is to be used for firesafe service, PTFE is not firesafe.

4.1.1 - STEM LEAKAGE - STEM PACKING REPLACEMENT

The most common point for leakage is around the stem and packing this leakage can normally be stopped by adjustment of the packing gland. If this does not stop the valve leakage, the valve will have to be repacked. The system and valve MUST be depressurized before attempting any repair work. After removing all pressure from the valve and draining the system, the following procedure should be used to repack the valve:

1. Remove nuts or screw from the lever. Remove the lever and lock plate. Remove the gland plate bolts and remove the gland plate and gland. If the gland retainer is a double nut type then remove both nuts and anti-vibration washer.
2. Remove old packing, taking care not to scratch or damage the stem or stuffing box. Note: the stem design is anti-blow out so the stem cannot be removed up through the top of the valve.
3. Clean and inspect stem, stuffing box, and gland. If any scratches, nicks, or corrosion is found, the parts should be replaced.
4. Slide each packing ring over the stem and into packing chamber. Carefully tap each ring into place and continue installing rings until the recommended number of rings have been installed. A thin smear of molybdenum sulfide anti-seize grease may be used on the stem and packing chamber wall for packing lubrication.
5. Replace gland, gland plate, and gland plate bolts. Tighten nuts alternately in 1/2 turn increments until a reasonable torque (refer table 2 in the Appendix) is applied to lightly compress packing. Lubricate stem and cycle valve through a couple of complete cycles.
6. If slight stem leakage occurs after system is pressurized, continue tightening gland plate bolts in alternating 1/2 turn increments until leakage stops. Once leakage stops, continue tightening gland plate nuts and additional 1/2 turn. There is also a PTFE seal ring/bearing and larger sizes/higher classes have an elastomer O-ring. However, these parts can only be replaced during complete disassembly of the valve. If a PTFE stem O-ring is fitted, it can be replaced with an elastomer O-ring suitable for the service medium and temperature. PTFE O-rings require pre softening in hot water prior to fitting. Should replacement of packing fail to prevent the leakage, complete reconditioning of the valve may be required.

Personal injury may result from sudden release of any process pressure. Trust Valves recommends the use of protective clothing, gloves and eyewear when performing any installation or maintenance. Isolate the valve from the system and relieve pressure prior to performing maintenance. Disconnect any operating lines providing air pressure, control signals or electrical power to actuators.

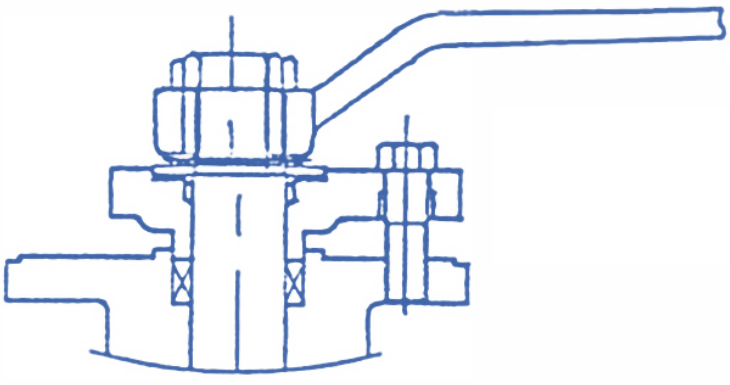


FIG. 3

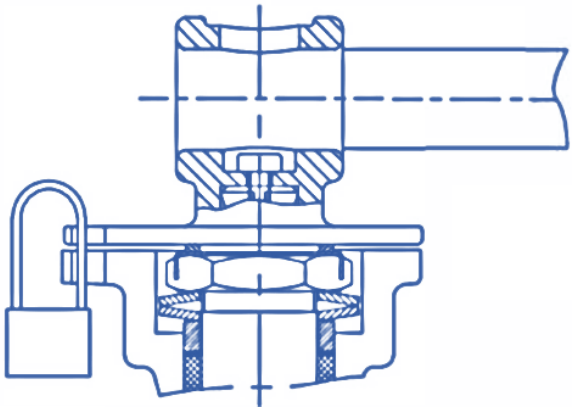


FIG. 3.1

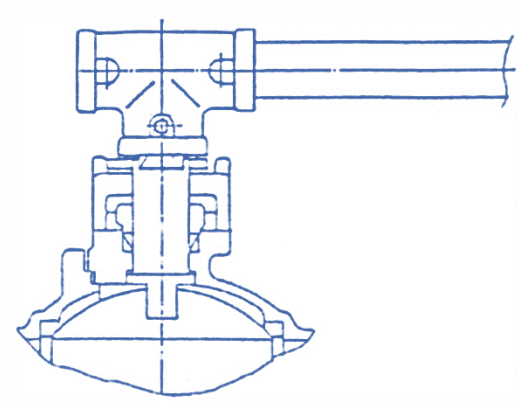


FIG. 4

4.2 - BODY SEAL

Sealing between two body segments is provided with a gasket (Teflon, spiral wound or graphite) and both valve segment surfaces also provide metal to metal sealing. In case of slight leakage, the fastening bolts can be lightly tightened up.

If a gasket seal is disturbed while removing or adjusting gasketed parts, Trust Valves recommends installing a new gasket while reassembling. A proper seal is required to ensure optimum operation.

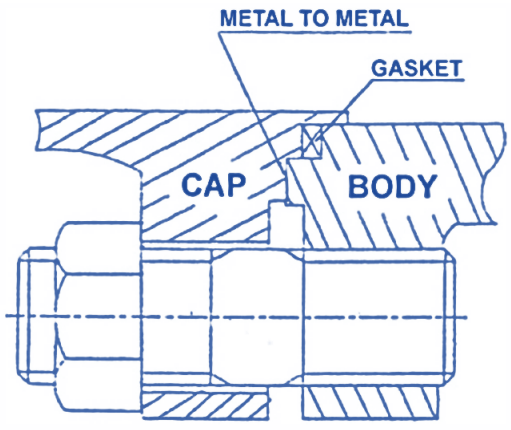


FIG. 5

4.2.1 - BODY GASKET TIGHTENING

Should leakage occur at the body/bonnet joint, tighten bonnet bolts to the values shown in Table 1 (refer Appendix). If after tightening body bolts, leakage continues, replacement of gasket is recommended. A new gasket is recommended anytime the valve is disassembled. The following procedure shown in 4.3 is recommended for the replacement of the gasket and other trim components.

4.3 - INSPECTION AND REPLACEMENT OF TRIM COMPONENTS

Disassembly:

1. Place the valve in the half open position and remove all pressure and drain the system. Make sure that leakage of any residual material is caught in an appropriate container and disposed of properly.
2. For gear operator or power actuator operated: remove the bolt fastening the gearbox or power actuator. Remove the gear operator or power actuator. Remove the bolt fastening the yoke or yoke nut (depending on size/class).
3. For lever operated: remove the screw or circlip fastening the lever. Remove the lever. Remove the retainer/lock washer and the stop plate.
4. Follow disassembly procedure 4.4 below.
5. Remove the ball from the body. Check the ball far any damage. Remove the seat from the body. Check the seat for any damage.
6. Remove the stem and thrust plate from the body. Remove the thrust plate from the stem. Check the stem for any damage.
7. Clean and inspect body and retainer gasket surfaces. Check for erosion, corrosion, or damage, especially near point where leakage occurred. If damage is found, those surfaces must be repaired before continuing.
8. Replace or repair all damaged parts.

Reassembly:

1. Installation of new seats, packing and seals is recommended, and then follow reassembly procedure 4.5 below.
2. For gear operator or power actuator operated: install the yoke and tighten the screws.
   2a. Install key on the stem.
   2b. Install gear operator on top flange and tighten the bolts.
3. For lever operated: install stop plate.
   3a. Install retainer /thrust washer.
   3b. Install lever.
   3c. Install washer and tighten the screw or fit circlip.

This completes the reassembly.

4.4 - DISASSEMBLY PROCEDURE

Before removing valve from line ensure valve is in the closed position and line is fully closed off and drained. Client should observe all industry & regulatory procedures in this process. To disassemble first remove the operator (4.3.2) then the following steps should be followed with reassembly in reverse order:

1. Drain & clean valve including contents in cavity.
2. Remove (13) CAP BOLT and (14) NUT from (1) BODY and (2) CAP.
3. Take off (2) CAP from (1) BODY and remove (12) GASKET.
4. Carefully remove (3) BALL. Avoid scratching BALL surface.
5. Remove (5) SEATS from BODY and CAP.
6. Remove (16) SNAP RING (or retainer bolt), (15) STOPPER, (8) GLAND BOLT and (7) GLAND FLANGE (or GLAND NUT) on larger sizes YOKE must also be removed.
7. Remove (4) STEM by pulling from inside BODY cavity.
8. Remove (9) THRUST WASHER.
9. Remove (11) GLAND PACKING and (10) STEM SEAL where fitted.

4.5 - REASSEMBLY PROCEDURE

1. For reassembly of the disassembled valves, follow the above disassembling procedure in the reverse order.
2. After cleaning the disassembled parts, reset each part in the original position properly. The threaded parts should be cleaned thoroughly and applied with lubricating paste.
3. The stuffing box and base of gasket should be thoroughly cleaned with care.

Check the packing box for pressurized process fluids even after the valve has been removed from the pipeline, particularly when removing packing hardware or packing rings, or removing packing box pipe plug.

4. The gland packing and gasket should be replaced preferably each time the valve is disassembled.
5. To reassemble body and cap, each bolt and nut shall be pre-greased and then tightened in accordance with applicable Torque as per Table 1 (see Appendix).

Nylon and Devlon are hard and more scratch resistant compared to Teflon®, and PEEK is harder still. However, Teflon® is more resilient and has better 'memory' in terms of resistance to permanent indentations. All soft seated valves are only suited to clean service applications.

6. After installation of new parts:
   Reassemble using reverse order of steps outlined above. Operate valve several times to be assured of smooth operation before reinstalling.

5 - CONSTRUCTION

Following is a typical explosion view of a floating 2 pieces ball valve. The number of parts will slightly vary in each size & class, but the principal components are as per figure 6 below. Refer to as-built drawing for actual bill of material.

NO	DESCRIPTION
1	Body
2	Closure / Cap
3	Ball
4	Stem
5	Seat Ring
6	Stem O-ring
7	Gland
8	Gland Nut
9	Thrust Seal
10	Stem Bush / Seal
11	Gland Packing
12	Gasket
13	Stud Bolt
14	Nut
15	Stopper
16	Snap Ring
17	Lever / Wrench
18	Antistatic Device

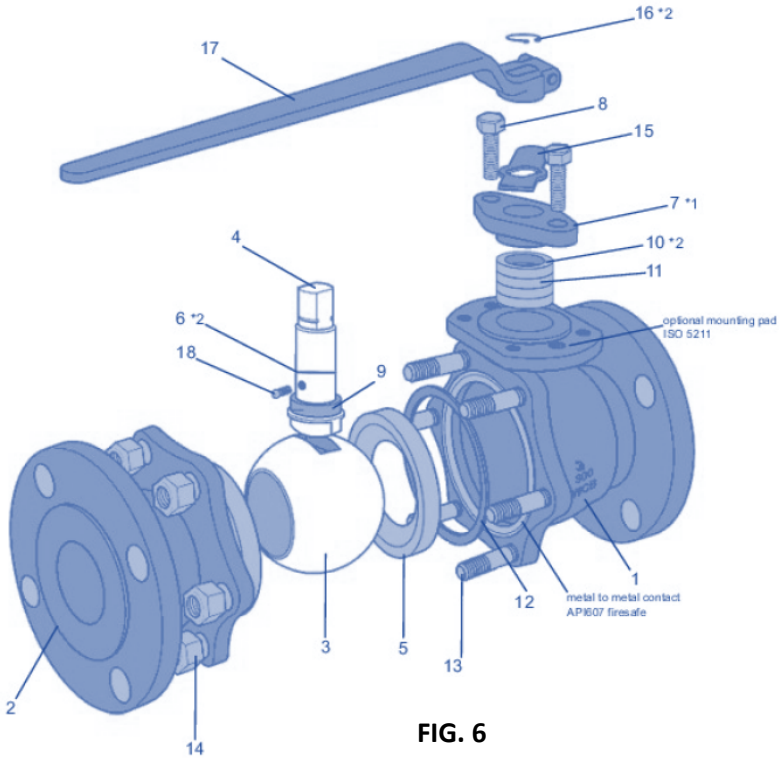
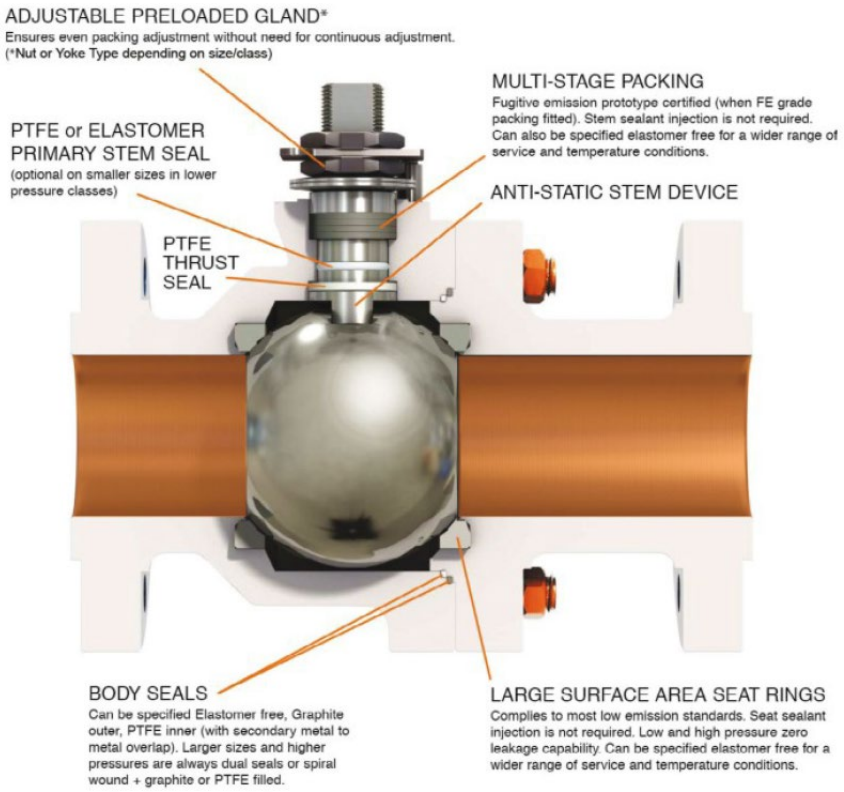


FIG. 6



6 – APPENDIX

Indicative Bonnet Bolting (Bolted Bonnet) Torque ft·lb (N·m)

Stud Size	Bolting Material			
	B7M / L7M	B7 / B16 / L7	B8 / B8M CL.1	B8 / B8M CL.2
3/8 – 16 UNC	15 (20)	20 (27)	15 (20)	20 (27)
7/16 – 14 UNC	25 (34)	30 (41)	22 (30)	25 (34)
1/2 – 13 UNC	40 (54)	50 (68)	35 (47)	45 (61)
9/16 – 12 UNC	55 (75)	70 (95)	55 (75)	65 (88)
5/8 – 11 UNC	75 (102)	100 (136)	70 (95)	85 (115)
3/4 – 10 UNC	135 (183)	170 (231)	125 (170)	150 (203)
7/8 – 9 UNC	200 (271)	270 (366)	170 (230)	200 (271)
1 – 8 UNC	350 (475)	400 (542)	219 (298)	350 (475)
1 1/8 – 8 UN	500 (678)	520 (705)	256 (398)	450 (610)
1 1/4 – 8 UN	675 (915)	850 (915)	321 (498)	650 (881)

Note:

(1) Torques shown are for A193 B7/B16/B7M/B8/B8M and A320 l7/l7M/B8/B8M.
(2) Torque tolerance ±10%.
(3) For temperatures above 750°F (400°C) use 75% of the torque values.
(4) Above torque values are with the bolts lubricated.
(5) Values above are based on 30,000 psi (206.85 Mpa) bolting stress and lubricated with heavy graphite and oil mixture or a copper based anti-seize grease.
(6) Do not exceed by more than 25% of values stated when emergency torqueing is required.
(7) All bolts shall be torqued in the pat tern as shown in Figure 6 over page to ensure uniform gasket loading
(8) Optimum torque can vary depending on type of body gasket but do not increase torque more than 10% above those shown.
(9) Consult Trust Valves for other bolt material.
(10) Most B8M and B8 bolts are class 1 so do not assume class 2 unless you are sure.

For any technical request or assistance, feel free to contact Trust Valves Quality Department at:
quality@trust-valves.com – +39 02 9675 4324

Gland Packing Torque in▪lb (N▪m)

Stud Diameter	Torque Value in/lb (Nm)	
Thread Pitch in (mm)	Gland Torque	Never Exceed
5/16-18(8)	48 (5.4)	60 (6.8)
5/16-18(8)	48 (5.4)	60 (6.8)
3/8-16(10)	84 (9.5)	105 (11.9)
3/8-16(10)	84 (9.5)	105 (11.9)
3/8 -16 (10)	84 (9.5)	105 (11.9)
7/16 -14 (11)	132 (14.9)	165 (18.7)
1/2-13(13)	204 (23.1)	225 (25.5)
1/2-13(13)	204 (23.1)	225 (25.5)
9/16 -12 (14)	252 (28.5)	315 (35.6)
5/8 -11 (16)	396 (44.8)	495 (56.0)

STUD LUBRICATION

• Re-tightening of body bolts (with system de-pressurized) and gland packing bolting is permissible, if leakage occurs in these areas.

• Required Torque values are given in Tables 1 & 2.

• The use of copper-based Anti-seize grease for body and packing stud lubrication and molybdenum disulfide anti-seize grease for stem packing lubrication is recommended.

• Bolt tension should be decreased by 25% from values shown in Tables 1 & 2 when other or no lubrication is used.

TABLE 3
Bolt Tightening Sequence