

IMO-200EN 09/2010

Trunnion mounted forged ball valves Model FF and GG

Installation, Maintenance and Operating Instructions



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READ THESE INSTRUCTIONS FIRST !

These instructions provide information about safe handling and operation of the valve. If you require additional assistance, please contact the manufacturer or manufacturer's representative. Addresses and phone numbers are printed on the back cover.

SAVE THESE INSTRUCTIONS !

I GENERAL INFORMATION

All FF & GG Trunnion mounted Ball valves are bi-directional and may be installed for flow in either direction. FF & GG Ball valves are designed to be mounted either in a horizontal, vertical or any inclined position.

FF & GG Trunnion Ball Valves are designed, manufactured and tested to API-6D specifications. The flanges conform to ASME B16.5 for 24 inches and smaller and ASME B16.47 for greater than 24" series "A" or series "B".

Weld end valves have end connections to ASTM B16.25 specification and are readily field weldable. End preparations are matched with the schedule of mating pipe.

II INSTALLATION

UNPACKING:

All valves should be inspected on receipt for lost or damaged components.

HANDLING:

Handling of the valve crates should be done using appropriate equipment required for valve weight.

The Valve may be lifted by use of slings or integral lifting eyes provided on valve body. (Caution: Two (2) lifting lugs are provided for balance of valve when lifting. Never lift the valve using only one lifting lug).

Located on the body of valve, the nameplate shall provide applicable information including size, pressure class, materials, seals, pressure / temperature ratings and serial number. Reference to serial number will expedite any request or tracking of the valve.

INSTALLATION:

Remove flange covers and thoroughly inspect interior of valve and connections for damage or debris inside of valve.

Check inside the adjacent pipe to ensure that all foreign matter has been removed. Insert the valve and flange gaskets between the mating flanges. Install flange bolts and nuts, and tighten using moderate force. Then cross-tighten each nut to the

proper torque. The valve should remain open during installation.

Welded end valves should be installed using qualified welders and approved weld procedures and performance qualification record. Valve should be welded with ball in the open position.

When preheating, welding or stress relieving, body temperature **must not exceed** 400° F (205° C) at any point beyond 3" (76 mm) from the weld. Use an approved device to monitor temperature.

Prior to operating valve from open position, piping should be flushed to prevent any debris from damaging sealing surfaces.

III OPERATION

NORMAL OPERATION:

FF & GG Ball Valves are designed for full- open to full closed operation 90 degree turn of the valve stem.

Gear operated ball valves have an indicator showing the open and closed position of ball. The hand wheel rotates clockwise to close the valve.

Do not leave the ball in a partially opened position, as it will cause severe damage to the ball and seat resulting in leakage.

BLOCK AND BLEED APPLICATION:

FF & GG Ball Valves provide block and bleed capability in either open or closed position. This feature allows the body cavity pressure to vent to atmosphere while pressure is maintained in pipeline.

This application is to ensure the integrity of the seat inserts and confirm they are not damaged and leaking by.

VALVE IN OPEN POSITION:

With the ball in the full open position, using an Allen wrench open the internal needle valve in the vent plug. This is located on the upper part of the valve body. This will release any pressure in the body cavity. This might take some time depending on the size of the valve and the line pressure. If the pressure bleeds down to nothing then the seats are good. If the pressure does not reduce and continues then there might be damage to either the upstream

or downstream seat. Injecting seat sealant at this time will not help as the sealant will flow down the line with the valve open.

VALVE IN CLOSED POSITION:

With the ball in the full closed position, using an Allen wrench open the internal needle valve in the vent plug. This is located on the upper part of the valve body. This will release any pressure in the body cavity. This might take some time depending on the size of the valve and the line pressure. If the pressure bleeds down to nothing then the seats are good. If the pressure does not reduce and continues then there might be damage to the upstream seat. Emergency seat sealant needs to be injected at this time.

EMERGENCY SEAT SEALANT INJECTION:

Regular routine injection of sealant is not recommended.

FF & GG Trunnion Ball Valves have the provision for emergency seat sealant injection. This feature provides a means for emergency seal of damaged seating/sealing surfaces using sealant. The recommended sealants are Lubechem, Everlast 50-400 or Sealweld #5050.

Injecting sealant in the upstream seat fitting will provide complete sealing in the most downstream leakage situations. Operation of valve after sealant injection usually requires re-injection of sealant.

EMERGENCY SEALANT INJECTION PROCEDURE:

Remove sealant fitting safety cover. Caution: Ensure that fitting body does not rotate/turn as cover is being removed.

Cycle the ball into the closed position. Using approved grease gun and sealant; inject sealant into the upstream sealant fitting while observing for any leakage. (This may be done using the block and bleed feature). Inject enough sealant to eliminate leak.

IV MAINTENANCE

ROUTINE MAINTENANCE:

Routine maintenance in normal services is normally not required other than cycling of the valve. Cycling of the valve under line pressure will remove

any dirt, debris or fluids that may accumulate in the body cavity and help the integrity of the stem seals. In certain corrosive medias it is recommended to inject light synthetic grease into the seats. This helps to keep any corrosives out of the seat seals. **Note:** Never inject grease into the stem seals. Only inject sealant if stem seals are leaking.

V REPAIR

REPLACEMENTS OF STEM SEALS:

CAUTION: Before replacement of stem seals isolate the valve from all line pressure!

Style A: Ensure valve is in closed position

- a. Open drain plug fitting (item 37) and relieve pressure inside the body cavity.
- b. Remove screw (item 41), bolt (item 61), handle lever (item 39) and handle joint (item 38) and lock plate (item 40). Do not discard bolts.
- c. Ensure safe removal of key (item 11) and pin (item 30)
- d. Remove screw (item 33) and adapter plate (item 9). Remove the pin (item 29).
- e. Remove weather seal (item 16) from stem (item 8) and recycle appropriately according to local regulations.
- f. Remove all screws (item 32) from gland (item 7)
- g. Remove gland and stem (items 7 & 8).
- h. Replace bearing (item 19).
- i. Install with new thrust washer (item 17), and gasket (item 14), backup rings (item 53 & 55) and O-rings (items 21 and 22).
- j. Replace stem and gland (items 7 & 8). Tighten screw (item 32) with recommended torque.
- k. Install new weather seal (item 16) onto stem (item 8) ensuring not to damage weather seal.
- l. Install adapter plate (item 9) using screw (item 33). Ensure screws are tightened with recommend torque.
- m. Install lock plate (item 40), handle joint (item 38) using set screw (item 41), replace handle lever (item 39) using bolt (item 61, at top). Ensure set screw (item 41) is tightened properly.
- n. Monitor for leaks through drain opening as valve becomes operational. Close drain plug fitting (item 37) finally.

Style B: Ensure valve is in the closed position

- a. Open drain plug fitting (item 37) and relieve pressure inside the body cavity.
- b. Remove nuts (item 44) from studs of gear operator (item 42). Do not discard nuts.
- c. Remove gear operator (item 42) by lifting vertically until gear operator (item 42) is completely detached from stem (item 8). Ensure safe removal of key, (item 11), pin (item 29 & 30).
- d. Place gear operator (item 42) in a fashion so as not damage mounting studs.
- e. Remove screws (item 33) and adapter plate (item 9) from gland (item 7).
- f. Remove weather seal (item 16) from stem (item 8) and recycle appropriately according to local regulations.
- g. Remove all screws (item 32) from gland (item 7).
- h. Remove gland and stem (items 7 & 8).
- i. Replace bearing (item 19).
- j. Install with new thrust washer (item 17), and gaskets (item 14), backup rings (item 53 & 55) and O-rings (21 and 22).
- k. Replace stem and gland (items 7 & 8). Tighten screw (item 32) with recommended torque.
- l. Install new weather seal (item 16) onto stem (item 8) ensuring not to damage gasket.
- m. Install adapter plate (item 9) using screws (item 33) onto gland (item 7).
- n. Align key way of gear operator (item 42) with key of stem (item 8 and 11) and lower carefully so gear operator is fully engaged and level and parallel with adapter plate (item 9). Replace nuts (item 44) onto studs and tighten properly.
- o. Monitor for leaks through drain opening as valve becomes operational. Close drain plug fitting (item 37) finally.

Style C: Ensure valve is in the closed position

- a. Open drain plug fitting (item 37) and relieve pressure inside the body cavity.
- b. Remove nuts (item 44) from studs of gear operator (item 42). Do not discard nuts.
- c. Remove gear operator (item 42) by lifting vertically until gear operator is fully detached from stem (item 8). Ensure safe removal of screw (item 59) and key (item 11).
- d. Place gear operator (item 42) in a fashion as not to damage mounting studs.
- e. Remove all screws (item 33) and adapter plate (item 9) from gland (item 7).
- f. Remove weather seal gaskets (item 16) and stem and recycle appropriately according to local regulations.
- g. Remove all screws (item 32) from gland (item 7).
- h. Remove gland and stem (items 7 & 8).
- i. Replace bearing (item 19).
- j. Install new thrust washer (item 17), gaskets (item 14), backup rings (item 53 & 55) and O-rings (items 21 and 22).
- k. Install stem and gland (items 7 & 8). Tighten all screws (item 32) with recommended torque.
- l. Place new weather seal (item 16) onto stem (item 8) ensuring not to damage gasket.
- m. Install adapter plate (item 9) using screws (item 33) tightened with recommended torque onto the gland (item 7).
- n. Align key way of gear operator (item 42) with key of stem (item 8 and 11) and lower carefully so gear operator is fully engaged and level and parallel with adapter plate (item 9). Replace nuts (item 44) onto studs and tighten properly.
- o. Monitor for leaks through drain opening as valve becomes operational. Close drain plug fitting (item 37) finally.

VI VALVE DISASSEMBLY

- a. When complete rebuild of valve becomes necessary, replacement of ball, stem, seats, seals, O-rings and backup rings are recommended.
- b. Depressurize and drain pipe line. Cycle valve several times before removing valve from line.
- c. Remove valve from line. After valve is removed cycle valve several times to ensure all pressure is relieved in valve.
- d. Place valve on a flat and clean surface in a vertical position. Ensure that valve is not damaged (i.e. Flange mounting surfaces, stem).

Close valve completely by turning stem clockwise.

- e. Observe the following steps regarding each individual style during disassembly.

FOR STYLE A and B:

- a. Open drain plug fitting (item 37) and drain any remaining media in cavity.
- b. Remove base (item 49) and lifting lug (item 50) by removing the nut (item 28), if available on the valve
- c. Remove the pin (item 30) and key (item 11).
- d. Style A: Remove bolt (item 61), set screw (item 41), bolt (item 61), handle lever (item 39), handle joint (item 38) and locking plate (item 40). Do not discard bolt.
Style B: Remove nuts (item 44) and vertically lift gear operator (item 42) from stem (item 8).
- e. Remove screw (item 33), pin (item 29) and adapter plate (item 9). Do not discard screw.
- f. Remove weather seal (item 16) from stem (item 8) and recycle appropriately according to local regulations.
- g. Remove all fittings (items 34, 35, 36, & 58) from valve body and cap.
- h. Remove the nuts (item 28) from the studs (item 27). Remove end cap (item 2) from body along with body fire proof gasket (item 12), body O-ring (item 23), backup ring (item 52). Place cap assembly on a clean, dry, flat wooden surface with end flange of cap facing down. Remove seat assembly from end cap including seat fire proof gasket, qty 2, (item 13), spring plate (item 5), seat O-rings (item 24 & 56), backup ring (item 51) and seat ring (item 3).
Remove springs (item 26) from end cap (item 2). Ensure no damage occurs to sealing surface.
- i. Remove the ball (item 6) from the body (item 1). Place ball on soft surface to protect ball from being scratched.
- j. Rotate the valve 180 degrees. Ensure mounting studs (item 27) of body (item 1) are not damaged when body, (item 1) is placed on a soft, dry flat area.
- k. Repeat and follow steps defined in f) for second cap removal.
- l. Remove screw (item 32), gland (item 7),

stem (item 8), thrust washer (item 17), gland fire proof gasket, qty 2, (item 14), stem O-ring, qty 2, (item 21), gland O-ring (item 22), stem bearing, (item 19), anti-static spring (item 60) and backup rings (item 53 & 55).

- m. Remove anti-static spring and ball (item 25) from stem (Item 8).
- n. Remove screw (item 31) and trunnion (item 10), trunnion fire proof gasket (item 15), trunnion gasket (item 18), trunnion O-ring (item 20), backup ring (item 54) and trunnion bearing (item 19).

FOR STYLE C:

- a. Open drain plug fitting (item 37) and drain any remaining media in cavity.
- b. Remove nuts (item 44) and vertically lift gear operator, (item 42) from stem (item 8).
- c. Remove the key screw (item 59) and key (item 11).
- d. Remove screws (item 33) and adapter plate (item 9). Do not discard screws.
- e. Remove weather seal (item 16) from stem (item 8) and recycle appropriately according to local regulations.
- f. Remove all fittings (items 34, 35, 36 & 58) from valve.
- g. Remove nuts (item 28) from studs (item 27 & 57) in cap (item 2). Remove base (item 49) and lift lug (item 50) from cap. Do not discard nuts.
- h. Remove screw (item 32) and remove gland (item 7), gland fire proof gasket (item 14), Gland O-ring (item 22), and backup ring (item 53).
- i. Remove, stem thrust washer (item 17), anti-static spring (item 60), and stem O-rings (item 21) from the stem (item 8). Remove backup ring (item 55) from the gland.
- j. Remove cap (item 2) from body along with body fire proof gasket (item 12), body O-ring (item 23), backup ring (item 52). Place cap assembly on a clean, dry, flat wooden surface with end flange of cap facing down. Remove seat assembly from end cap including seat fire proof gasket (item 13), springs, (item 26), spring plate (item 5), seat O-rings (item 24 & 56) and seat ring (item 3). Remove backup rings (item 51). Ensure no damage occurs to sealing surface.

- k. If trunnion (item 10) as in Style B present, remove the all parts (item 31, 10, 15, 18, 20, & 54) as mentioned in VI. Style B (l) above.
- l. Remove the bearing plate (item 45) and the ball (item 6) assembly. Place ball on soft surface to protect ball from being scratched.
- m. Remove bearing (item 19), thrust bearing (item 47), and thrust bearing screw (item 48) if present.
- n. Remove pin (item 46) from the bearing plate (item 45).
- o. Rotate the body 180 degrees. Ensure mounting studs (item 27) of body (item 1) are not damaged when body is placed on a soft, dry flat area.
- p. Repeat the step j to remove another cap (item 2).
- h. Install fire proof gasket (item 15), O-ring (item 20), backup ring (item 54), gasket (item 18) on to the trunnion (item 10) and assemble into body (item 1) and ball (item 6). Ensure ball and body are properly aligned. Use screw (item 31) to secure trunnion to body.
- i. Insert thrust washer (item 17) onto stem (item 8).
- j. Lubricate O-rings before installing and ensure there is no damage or twisting after installation. Install the O-ring (item 21 & 22), backup rings (item 53 & 55) on the gland and install new fire proof gasket (item 14) on the gland.
- k. Assemble the anti-static spring and ball (item 25) on the stem and anti-static spring (item 60), insert into the stem, (item 8), and then insert into the Gland (Item 7). Insert this gland and stem assembly into the body and tighten with the screws (item 32) with recommended torque.

VII VALVE ASSEMBLY

FOR STYLE A and B:

- a. Prior to assembly of valve, inspect that all parts are clean and free from debris and are free from any damage due to removal or wear.
- b. Insert springs (item 26) into spring holes of cap (item 2) or spring plate (item 5) as applicable. Place spring plate, (item 5) into cap and ensure spring plate (item 5) is positioned correctly.
- c. Lubricate all O-rings prior to installation. Place seat fire proof gasket (item 13), backup ring (item 51) and seat O-rings (item 24 & 56) onto seat ring (item 3). Insert entire seat assembly into cap. Ensure that seat assembly is evenly pressed into cap and contacts spring plate fully.
- d. Install body O-ring (item 23), body gasket (item 12) and backup ring (item 52) on to the O-ring groove of cap(item 2).
- e. Mount cap assembly onto body (item 1) using studs (item 27) and nuts (item 28). Tighten the nuts with recommended torque.
- f. Assemble the bearing (item 19) on the ball, each side.
- g. Lift ball (item 6), and place in body (item 1), ensure that ball, seating surface or bore is not damaged. Align Trunnion hole in bottom of ball with Trunnion mounting hole of body, (item 1).
- l. Install the weather seal (item 16) on the gland.
- m. Assemble the adapter plate (item 9) on the gland. Secure with screws (item 33) with recommended torque. Assemble the Pin (item 29).
- n. Mount all fittings (item 34, 35, 36, 37, & 58) into body, cap and gland.
- o. Repeat steps b, c, d & e to mount opposite cap.
- p. Attach key (item 11) and pin (item 30).
- q. Finally mount locking plate (item 40) handle joint (item 38), set screw (item 41), handle lever (item 39) and bolt (item 61) for the Style A valve.
- r. Finally mount the gear operator (item 42) and stud (item 43) on the adapter plate. Secure with nuts (item 44) with recommended torque for Style B valve.
- s. Attach base (item 49) and lifting lug (item 50) with stud (item 57) and nut (item 28), if available.

FOR STYLE C:

- a. Prior to assembly of valve, inspect that all parts are clean and free from debris and are free from any damage due to removal or wear.
- b. Insert springs (item 26), into spring holes of spring plate (item 5). Place spring plate (item 5) into cap and ensure spring plate

- is positioned correctly.
- c. Lubricate all O-rings prior to installation. Place seat fire proof gasket (item 13), backup ring (item 51) and seat O-rings (item 24 & 56) onto seat ring (item 3). Insert entire seat assembly into cap (item 2). Ensure that seat assembly is evenly pressed into cap and contacts spring plate fully.
 - d. Install body O-ring (item 23), body gasket (item 12) and backup ring (item 52) on to the O-ring groove.
 - e. Mount cap assembly onto body (item 1) using studs in body (item 27) and nuts (item 28) with recommended torque.
 - f. Assemble the bearing (item 19) on the bearing plate (item 45), 2 qty.
 - g. Assemble the ball thrust bearing (item 47) on the bearing plate with two screws (item 48), if available.
 - h. Assemble the ball (item 6) between the two bearing plates (item 45).
 - i. Assemble the pins (item 46) on the bearing plate on both sides.
 - j. Insert this assembly in to the body and make sure that the ball is in line with stem axis. Use the small level gauge on the top of the ball and the gland seating surface. These two surfaces must be parallel.
 - k. Repeat the steps b to e for another cap.
 - l. Assemble the base (item 49) to the cap with stud (item 57) and nut (item 28) on both side of cap.
 - m. Assemble the lifting lug (item 50) with stud (item 57) and nut (item 28) on both side of cap.
 - n. Insert thrust washer (item 17) onto stem (item 8).
 - o. Lubricate all O-rings before installing and ensure there is no damage or twisting after installation. Install the O-ring (item 21 & 22), backup ring (item 53 & 55) on the gland and install new fire proof gasket (item 14) on the gland.
 - p. Assemble the anti-static spring and ball (item 25) and anti-static spring (item 60) insert in to the stem, (item 8) and insert into the gland (Item 7). Insert this gland and stem assembly into the body and tighten with the screw (item 32).
 - q. Install the weather seal (item 16) on the gland.
 - r. If trunnion (item 10) as in Style B present, assemble the all parts (item 31, 10, 15, 18, 20, & 54) as in (VII) Style B (h).
 - s. Assemble the adapter plate (item 9) on the gland. Secure with screw (item 33) with recommended torque.
 - t. Mount all fittings (item 34, 35, 36, 37 & 58) into gland, cap and body.
 - u. Attach key (item 11) and screw (item 59).
 - v. Finally mount the gear operator (item 42) and stud (item 43) on the adapter plate. Secure with nuts (item 44).

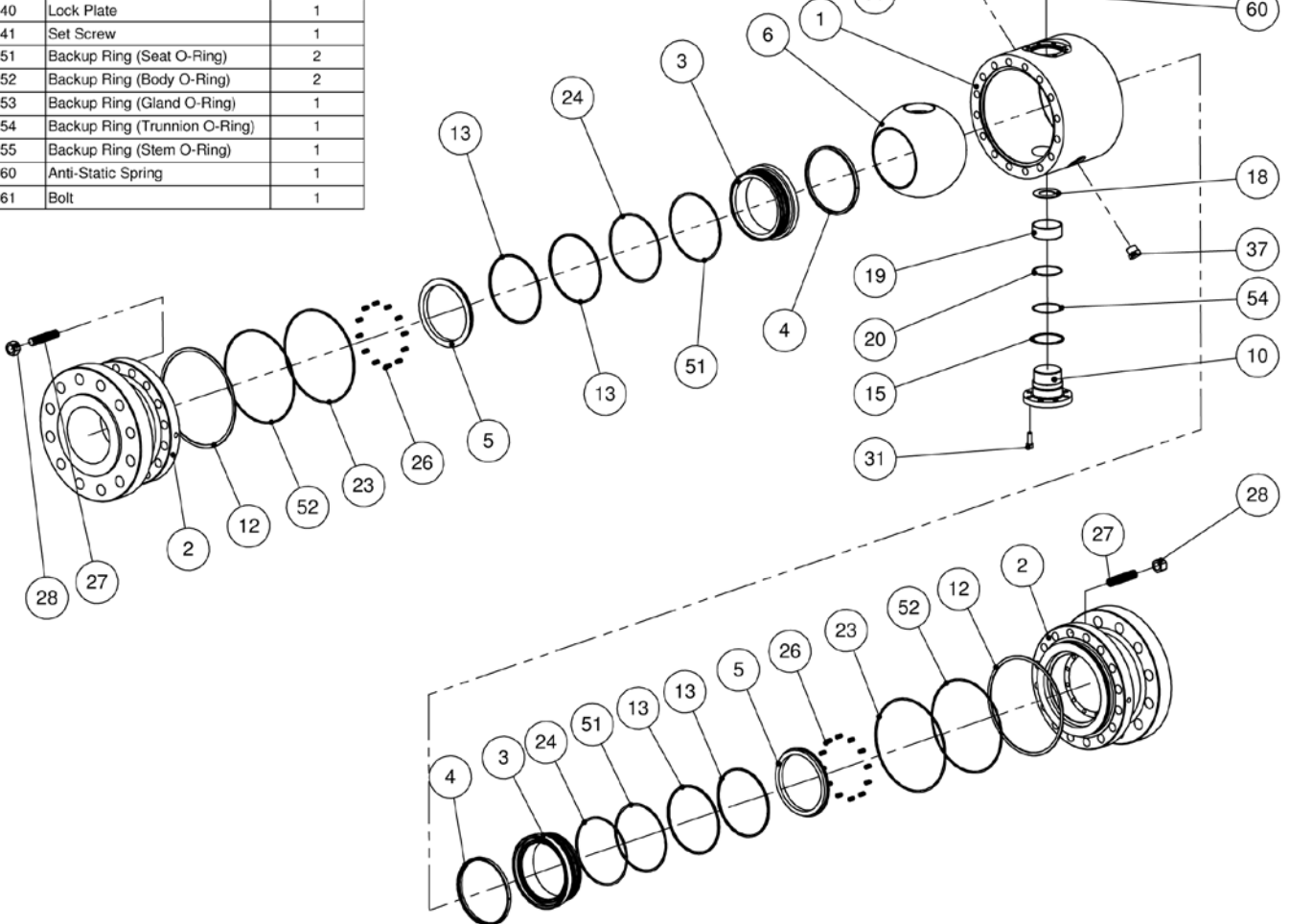
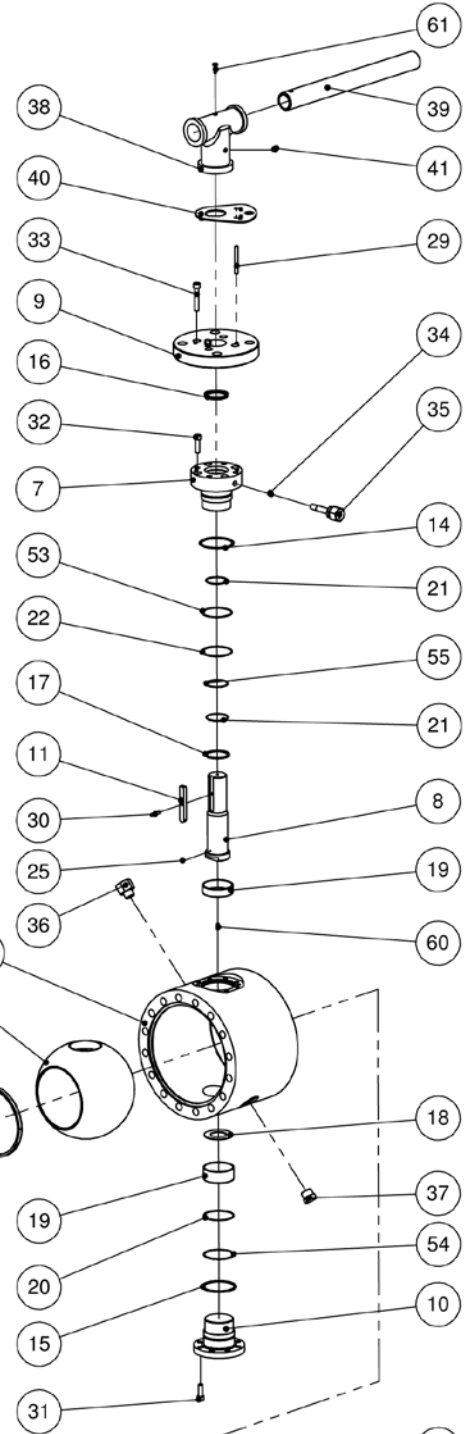
NOTE: Backup rings are available on 1500 and 2500 classes only. If new backup ring is used, the ring must be cut radial 45 Degree, before assembly onto the O-ring groove.

ITEM.NO.	NAME	QUANTITY
1	Body	1
2	Cap	2
3	Seat Ring	2
4	Seat	2
5	Spring Plate	2
6	Ball	1
7	Gland	1
8	Stem	1
9	Adapter Plate	1
10	Trunnion	1
11	Key	1
12	Body Fire-Proof Gasket	2
13	Seat Fire-Proof Gasket	4
14	Gland Fire-Proof Gasket	1
15	Trunnion Fire-Proof Gasket	1
16	Weather Seal	1
17	Thrust Washer	1
18	Trunnion Gasket	1
19	Bearing	2
20	Trunnion O-Ring	1
21	Stem O-Ring	2
22	Gland O-Ring	1
23	Body O-Ring	2
24	Seat O-Ring	2
25	Anti-Static Spring And Ball	2
26	Spring	Varies
27	Stud	Varies
28	Nut	Varies
29	Pin	2
30	Pin	1
31	Screw	Varies
32	Screw	Varies
33	Screw	Varies
34	Burried Check	1
35	Stem Injection	1
36	Vent Valve	1
37	Drain Plug	1
38	Handle Joint	1
39	Handle Lever	1
40	Lock Plate	1
41	Set Screw	1
51	Backup Ring (Seat O-Ring)	2
52	Backup Ring (Body O-Ring)	2
53	Backup Ring (Gland O-Ring)	1
54	Backup Ring (Trunnion O-Ring)	1
55	Backup Ring (Stem O-Ring)	1
60	Anti-Static Spring	1
61	Bolt	1

**Style A . 2" Class 150-2500
3" Class 150-1500
4" Class 150- 600**

NOTES:

- Items 51 thru 55 apply to class 1500 & 2500 only
- Items 3 thru 5, 12 thru 17, 20 thru 24 and 51 thru 55 are required minor repair kit
- Items 3 thru 8, 10 thru 25, 51 thru 55 and 60 are required major repair kit

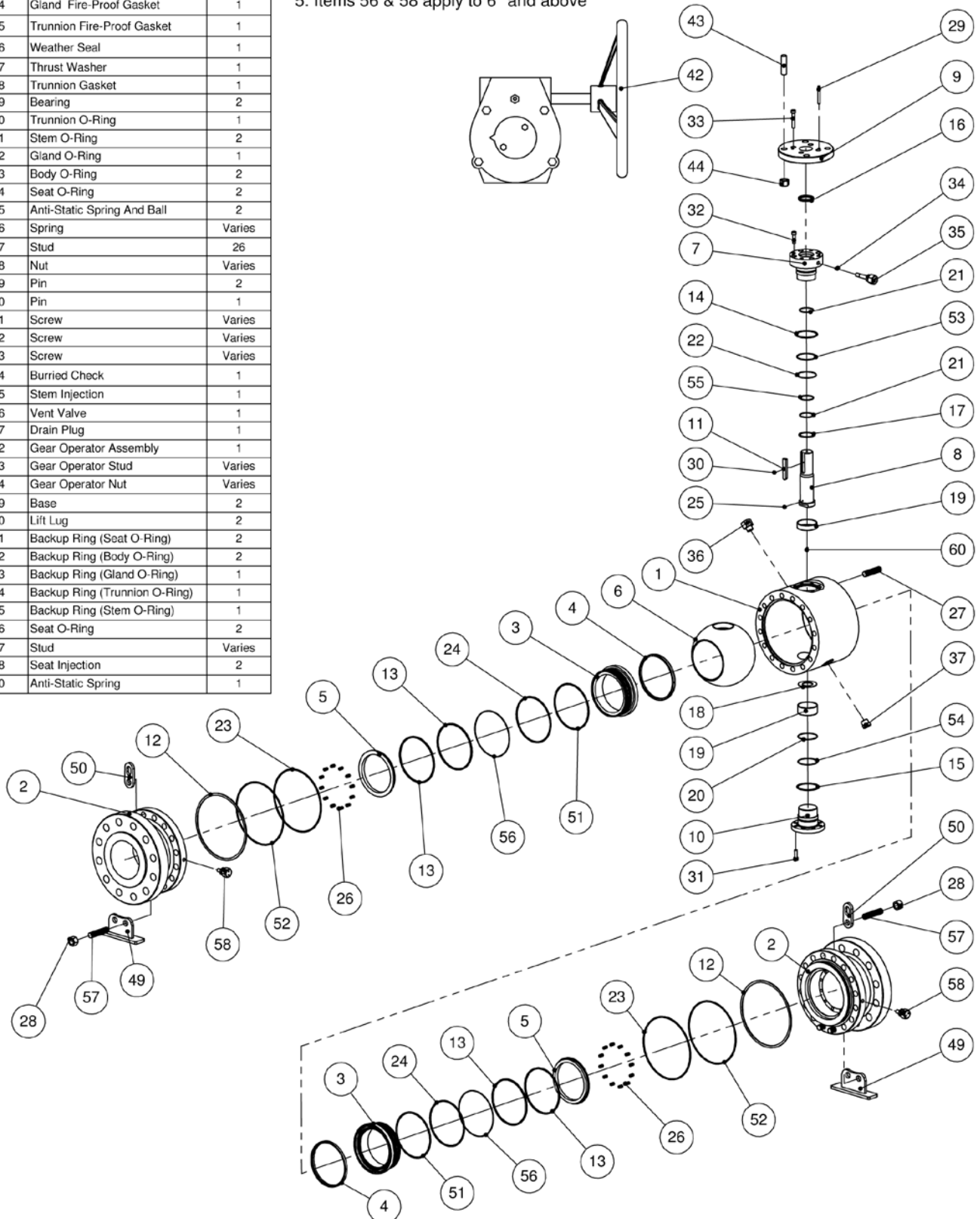


ITEM.NO.	NAME	QUANTITY
1	Body	1
2	Cap	2
3	Seat Ring	2
4	Seat	2
5	Spring Plate	2
6	Ball	1
7	Gland	1
8	Stem	1
9	Adapter Plate	1
10	Trunnion	1
11	Key	1
12	Body Fire-Proof Gasket	2
13	Seat Fire-Proof Gasket	4
14	Gland Fire-Proof Gasket	1
15	Trunnion Fire-Proof Gasket	1
16	Weather Seal	1
17	Thrust Washer	1
18	Trunnion Gasket	1
19	Bearing	2
20	Trunnion O-Ring	1
21	Stem O-Ring	2
22	Gland O-Ring	1
23	Body O-Ring	2
24	Seat O-Ring	2
25	Anti-Static Spring And Ball	2
26	Spring	Varies
27	Stud	26
28	Nut	Varies
29	Pin	2
30	Pin	1
31	Screw	Varies
32	Screw	Varies
33	Screw	Varies
34	Burried Check	1
35	Stem Injection	1
36	Vent Valve	1
37	Drain Plug	1
42	Gear Operator Assembly	1
43	Gear Operator Stud	Varies
44	Gear Operator Nut	Varies
49	Base	2
50	Lift Lug	2
51	Backup Ring (Seat O-Ring)	2
52	Backup Ring (Body O-Ring)	2
53	Backup Ring (Gland O-Ring)	1
54	Backup Ring (Trunnion O-Ring)	1
55	Backup Ring (Stem O-Ring)	1
56	Seat O-Ring	2
57	Stud	Varies
58	Seat Injection	2
60	Anti-Static Spring	1

**Style B . 2" Class 1500-2500
3" & 4" Class 900-2500
6" & Above Class 150-2500**

NOTES:

1. Items 51 thru 55 apply to class 1500 & 2500 only
2. Items 3 thru 5,12 thru 17, 20 thru 24 and 51 thru 56 are required minor repair kit
3. Items 3 thru 8,10 thru 25, 51 thru 56 and 60 are required major repair kit
4. Items 49,50 & 57 apply to 8" and above
5. Items 56 & 58 apply to 6" and above

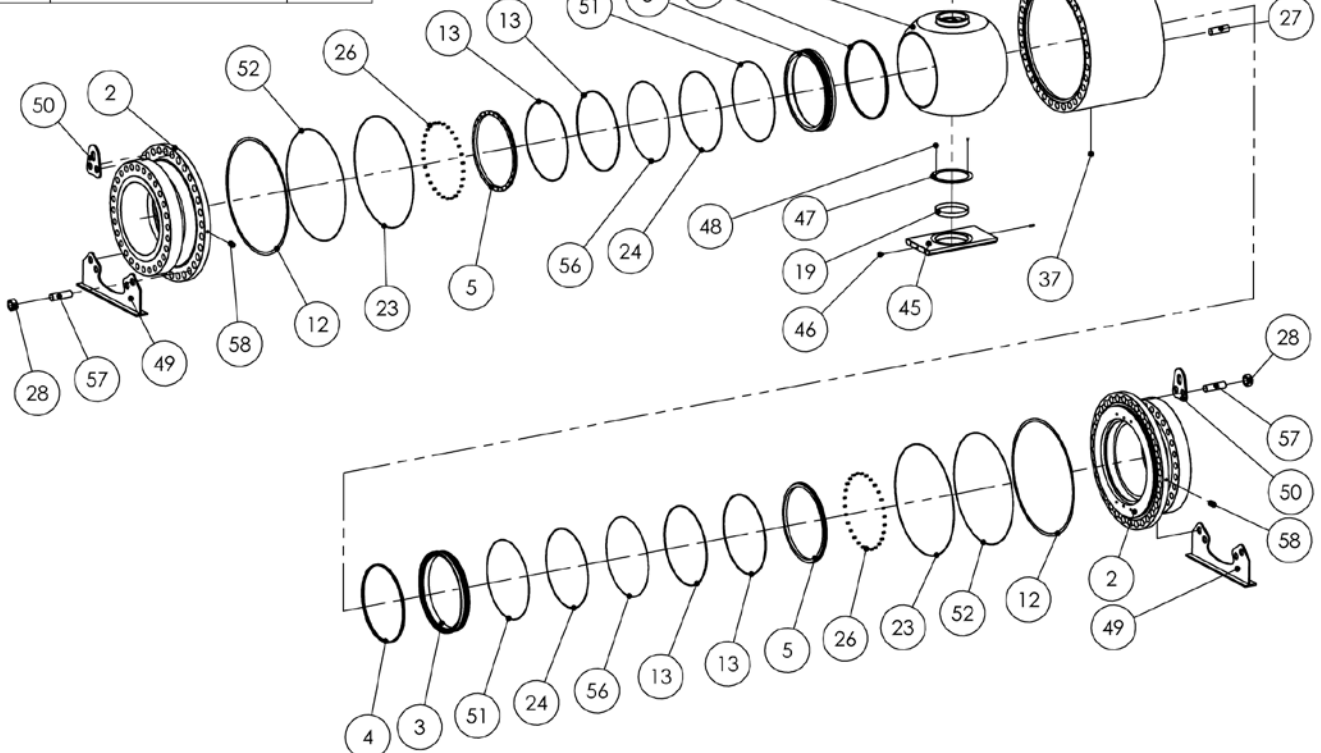
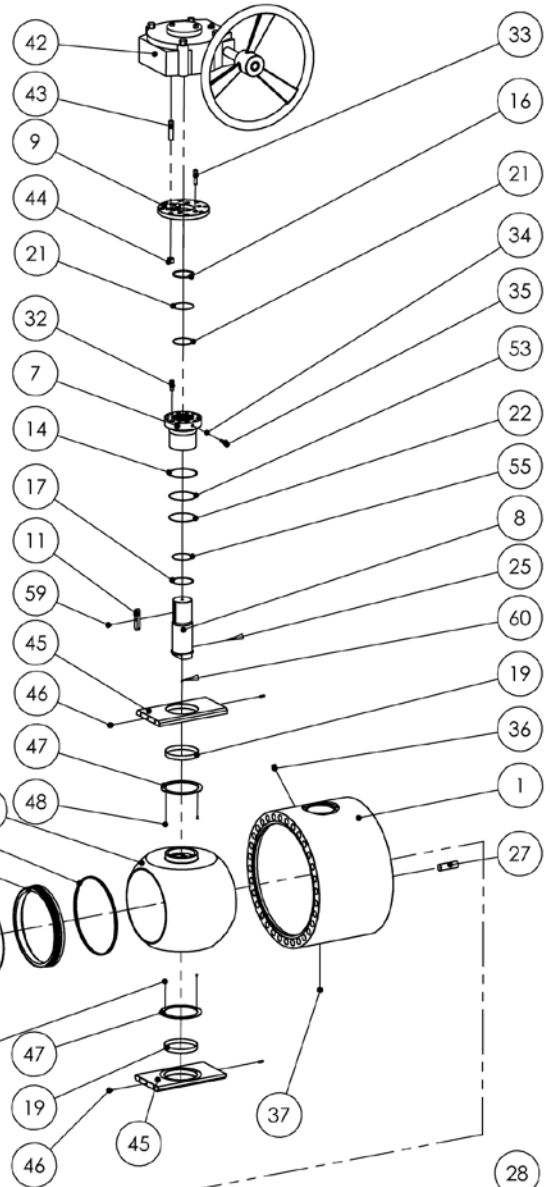


ITEM.NO.	NAME	QUANTITY
1	Body	1
2	Cap	2
3	Seat Ring	2
4	Seat	2
5	Spring Plate	2
6	Ball	1
7	Gland	1
8	Stem	1
9	Adapter Plate	1
11	Key	1
12	Body Fire-Proof Gasket	2
13	Seat Fire-Proof Gasket	4
14	Gland Fire-Proof Gasket	1
16	Weather Seal	1
17	Thrust Washer	1
19	Bearing	2
21	Stem O-Ring	2
22	Gland O-Ring	1
23	Body O-Ring	2
24	Seat O-Ring	2
25	Anti-Static Spring And Ball	2
26	Spring	Varies
27	Stud	Varies
28	Nut	Varies
32	Screw	Varies
33	Screw	Varies
34	Buried Check	3
35	Stem Injection	1
36	Vent Valve	1
37	Drain Plug	1
42	Gear Operator Assembly	1
43	Gear Operator Stud	Varies
44	Gear Operator Nut	Varies
45	Bearing Plate	2
46	Pin	Varies
47	Ball Thrust Bearing	2
48	Bearing Screw	4
49	Base	2
50	Lifting Lug	2
51	Backup Ring (Seat O-Ring)	2
52	Backup Ring (Body O-Ring)	2
53	Backup Ring (Gland O-Ring)	1
55	Backup Ring (Stem O-Ring)	1
56	Seal O-Ring	2
57	Stud	Varies
58	Seat Injection	2
59	Key Screw	1
60	Anti-Static Spring	1

Style C . 6" And Above Class 150-2500

NOTES:

1. Items 51 thru 55 apply to class 1500 & 2500 only
2. Items 3 thru 5, 12 thru 17, 21 thru 24, 47 and 51 thru 56 are required minor repair kit
3. Items 3 thru 8, 11 thru 25, 47, 51 thru 56 and 60 are required major repair kit



Nut Torque Table (Item No. 26 & 28 – Style A, B and C)

Valve Size, Full Bore, NPS	Nut Size (Metric) / Torque, Nm					
	150 CLASS	300 CLASS	600 CLASS	900 CLASS	1500 CLASS	2500 CLASS
2"	M10/50	M12/61	M16/118	M16/118	M16/118	M24/400
3"	M12/61	M14/77	M16/118	M16/118	M24/410	M24/410
4"	M14/77	M14/77	M16/118	M18/150	M27/600	M30/975
6"	M16/118	M16/118	M20/234	M27/600	M36/1550	M42/2250
8"	M20/234	M20/234	M27/600	M36/1550	M36/1550	M42/2250
10"	M27/600	M27/600	M30/975	M39/1870	M52/4200	M52/4200
12"	M24/410	M27/600	M33/1150	M42/2250	M52/4200	M52/4200
14"	M24/410	M27/600	M36/1550	M42/2250	M52/4200	M52/4200
16"	M30/975	M30/975	M42/2250	M42/2250	M52/4200	M52/4200
18"	M30/975	M30/975	M36/1550	M42/2250	M52/4200	M52/4200
20"	M30/975	M30/975	M42/2250	M45/2886	M52/4200	M52/4200
24"	M30/975	M30/975	M45/2886	M45/2886	M52/4200	M52/4200
28"	M30/975	M30/975	M60/7000	M60/6909	M60/6909	M60/6909
30"	M30/975	M36/1550	M60/6909	M60/6909	M60/6909	M60/6909
32"	M30/975	M36/1550	M60/6909	M60/6909	M60/6909	M64/8416
36"	M42/2250	M52/4200	M60/6909	M60/6909	M64/8416	M64/8416
40"	M42/2250	M52/4201	M60/6909	N/A	N/A	N/A
42"	M45/2886	M52/4201	M60/6909	N/A	N/A	N/A
46"	M48/2690	M58/6231	M60/6909	N/A	N/A	N/A
48"	M52/4200	M58/6231	M64/8416	N/A	N/A	N/A

Note: Reduced port for the above sizes of valve available up to 36".

Screw Torque Table (Item No. 31,32 & 33 – Style A, B and C)

Valve Size, Full Bore, NPS	Screw Size (Metric) / Torque, Nm					
	150 CLASS	300 CLASS	600 CLASS	900 CLASS	1500 CLASS	2500 CLASS
2"	M6/30	M8/34	M10/50	M10/50	M12/61	M16/118
3"	M8/34	M8/34	M10/50	M12/61	M16/118	M16/118
4"	M8/34	M8/34	M10/50	M12/61	M20/234	M20/234
6"	M10/50	M10/50	M10/50	M14/77	M10/50	M20/234
8"	M16/118	M10/50	M16/118	M16/118	M20/234	M22/318
10"	M12/61	M12/61	M16/118	M16/118	M24/400	M24/410
12"	M12/61	M12/61	M16/118	M16/118	M24/400	M27/600
14"	M12/61	M12/61	M16/118	M16/118	M24/400	M27/600
16"	M16/118	M16/118	M20/234	M20/234	M24/400	M27/600
18"	M16/118	M16/118	M20/234	M22/318	M24/400	M30/975
20"	M16/118	M16/118	M20/234	M22/318	M24/400	M30/975
24"	M16/118	M20/234	M24/400	M22/318	M24/400	M33/1150
28"	M20/234	M20/234	M24/400	M24/410	M24/400	M33/1150
30"	M20/234	M20/234	M24/400	M24/410	M27/600	M33/1150
32"	M20/234	M20/234	M24/400	M27/600	M27/600	M36/1550
36"	M20/234	M20/234	M24/400	M27/600	M27/600	M36/1550
40"	M20/234	M20/234	M24/400	N/A	N/A	N/A
42"	M24/410	M24/410	M24/400	N/A	N/A	N/A
46"	M24/410	M27/600	M27/600	N/A	N/A	N/A
48"	M24/410	M27/600	M27/600	N/A	N/A	N/A

Note: Reduced port for the above sizes of valve available up to 36".

Subject to change without prior notice.

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