

Installation, Operating & Maintenance Top Entry Cryogenic Trunnion Ball Valves C52 Valves Series



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WARNINGS & SAFETY INSTRUCTIONS

Habonim cannot anticipate all of the situations user may encounter while installing and using Habonim valves. The user MUST know and follow all applicable industry specifications on the safe installation and use of these valves. Misapplication of the product may result in injuries or property damage. Refer to Habonim product catalogues, product brochures and installation, operating and maintenance manuals for additional product safety information or contact Habonim.

1. Keep hands and objects away from the valve ports at all times. Actuated valves could be accidentally operated, resulting in serious injury or valve damage.
2. Before removing a valve from the line, always make sure the line has been depressurized and drained. Cycle the valve a few times to relieve any pressure that could be trapped in the body cavity.
3. Utmost caution must be taken when handling a valve that has toxic, corrosive, flammable or a contaminant nature media flowing through its pipeline. The following safety precautions are recommended when dismantling valves with hazardous media:
 - 3.1. Wear safety glasses, protective headgear, clothing, gloves and footwear.
 - 3.2. Have available running water.
 - 3.3. Have a suitable fire extinguisher when media is flammable.
4. Do not try to operate a valve that exhibits any sign of leakage. Isolate the valve and either repair or replace it.
5. Do not use or substitute non Habonim components or parts in Habonim valves and assemblies.

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1. General

This Installation, Operating & Maintenance manual represents the instructions required for safe use of Habonim ball valve. The manual relates to reduce and full bore valves.

Before using any of these series valves, read the entire IOM carefully and make sure everything is clear. Where in doubt, please consult with Habonim engineering team.

2. Sil

Under severe operating conditions inspection should be more frequently; detected defects should be repaired promptly. Severe operating conditions can be defined as:

- Application temperature less or above than specified on the valve tag label
- Flow velocity higher than 5 m/sec for liquids, and 200 m/sec for gaseous
- Acidic media PH < 5 or alkaline media PH > 9

Habonim recommend a proof test interval of 12 months; in case of Fail to Open ESD system, a partial stroke is acceptable to confirm that the installation is functioning properly.

For ESD systems with a Fail-To-Close demand, it is necessary to plan a system shut-down; de-energize the system and inspect the valve turning to its fully closed position.

It is essential to log-in the following parameters on site QA records as a proof for preserving SIL capabilities: date, hour, name and signature of the responsible engineer, air pressure on site, time to close the valve, time to open the valve.

Habonim recommend valve full maintenance operation every 500,000 cycles or 4 years, whichever comes first. The combined corrosion and erosion allowance for the valve body wall thickness is 1 mm. When this allowance has been eroded or corroded, mechanically removed or otherwise, the valve should no longer be used. Inspect the valve wall thickness every time the valve is maintained.

The estimated mean time to repair (MTTR) a valve, i.e. time net (line draining or cooling down time excluded from the valve MTTR) of replacing old valve with a new one is 60 minutes. Maintenance team must read and understand the Habonim product IOM before starting the operation. In case of a doubt please consult the Habonim engineering team.

When a valve has been repaired or any maintenance was performed, check the valve for proper function (proof testing). Any failures affecting functional safety should be reported to the Habonim factory.

Client should consult the Habonim factory in order to obtain the product assessment, FMEDA report, and other associated statistical data to satisfy SIL level.

Special condition for safe use

1. When connected to an actuator the maximum rubbing speed of any component within the valve must not exceed 1ms-1.
2. The ambient temperature range for which these valves are suitable depends on the materials used in their construction and the pressure at which they will be used. The maximum withstand temperature is included in the Pressure Equipment Directive (PED) marking. The lower ambient will be specified in the documentation provided with each valve.

3. Limitations

The correct selection of materials of construction, seats and seals, internal valve components and pressure/temperature ratings determines the safe use of the valves and the particular performance requirements for the application. This information can be found on the name plate welded to the valve body. The combined corrosion and erosion allowance for the valve body wall thickness is 1(mm). When this allowance has gone, the valve should no longer be used. Inspect the valve wall thickness every time the valve is maintained. Refer to Habonim Corrosion Data Chart T-614 to determine the corrosion rate for your application.

As the variety of applications these valves can be used in is large, it is impossible to cover all installation and maintenance instructions for servicing the valves. It is the owner's responsibility to use the valves as recommended and in accordance with the pressure and temperature limits as stated in this manual. Where in doubt, please consult with Habonim.

Any unstable fluid or gas should be identified by its manufacturer and must not be used with Habonim valves.

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4. Storage

Prior to storage, inspect the valve for shipping damage. Keep all protective packaging, flange covers and end caps attached to the valves during storage. It is recommended to keep the valves in a clean and dry environment until it is ready for use.

Carbon Steel valves have a "black oxide" and oil dipped finish. This nontoxic process is performed to retard rusting during storage. It is not a substitute for paint or other means of protective coating to be applied to the valve once installed.

Stainless steel valves have their natural finish and do not need any additional protection once installed.

4.1. Long Term Storage

- 4.1.1. It is advisable to store the valves in waterproof conditions. Ball valves should be protected to safeguard against humidity, Moisture, dust, dirt, sand, mud, salt spray, and sea water.
- 4.1.2. Manual ball valves must remain in the open position during the period of storage.
- 4.1.3. Actuated valves (fail to close position) remain in closed position during this time.
- 4.1.4. Valves may be stored as shipped, provided the above storage location and equipment orientation instructions are followed
- 4.1.5. In order to prevent damage, protective covers on valve ends should not be removed until immediately prior to installation.
- 4.1.6. Visual inspection should be performed on a semi-annual basis and results recorded.

5. Installation

The installation procedure for Habonim ball valves is critical to ensuring both long life and satisfying performance. Valves stored on site, awaiting installation, should be kept in their original packing, in dry conditions, where damage will not occur (See Para. 4).

Before carrying out the installation, it is important to follow the basic procedures described below:

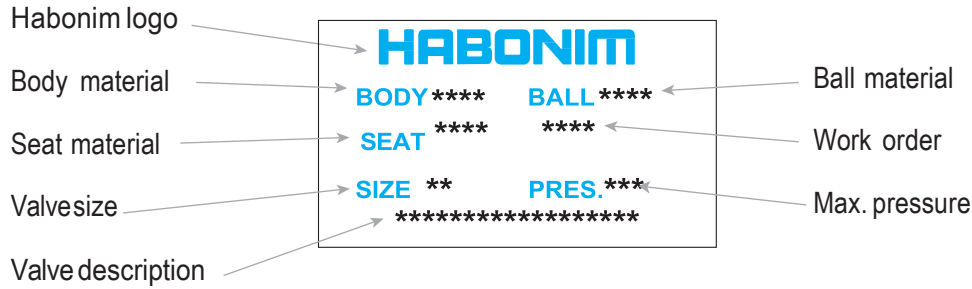
5.1. General

- 5.1.1. It is essential to flush the line prior to assembling any valve on the line.
- 5.1.2. Carefully unpack the valve and check valve nameplate for identification of materials.
- 5.1.3. Remove any special packing materials surrounding the valve.
- 5.1.4. Check the valve for the flow direction indication marks. Appropriate care must be taken, to install the valve for proper flow orientation.
- 5.1.5. Inspect the valve interior through the end ports to determine it is clean and free from foreign matter according to ASME G93-03E1.
- 5.1.6. Cycle the valve and inspect any functionally significant features.
- 5.1.7. Read all the literature and note any special warning tags or plates attached to the valve.
- 5.1.8. Before installation check to insure that the flow line balls are in the fully open position in order to prevent possible damage to the balls and seats. The valve performance depends on its original conditions. At any stage do not leave the valve in the partially open position on either of the lines.

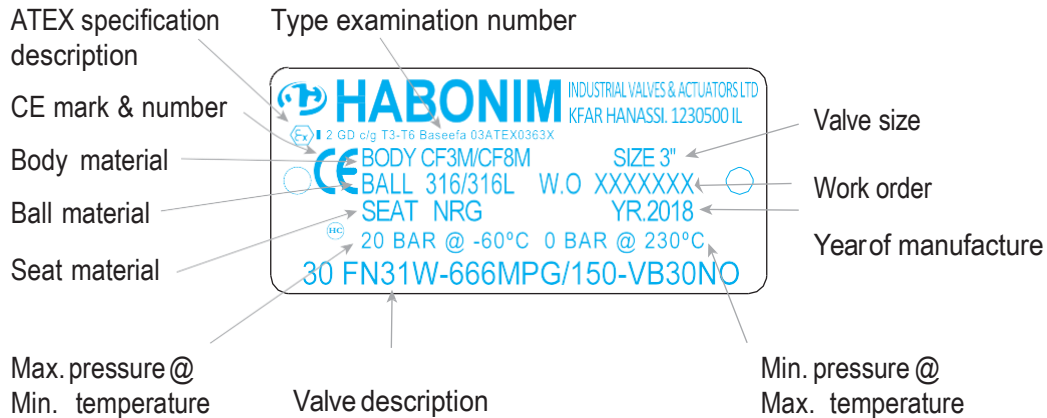
5.2. Valve Marking and Labeling

- 5.2.1. All valves marking is on a nameplate which is spot welded or rivet mounted to the valve body.
- 5.2.2. Valves for the European market and above 1” carry the CE mark with the information required by the PED.
- 5.2.3. The valve markings that are according to API-6D standard are presented in order to provide the user full traceability and information regarding the valve. Unless otherwise requested, nameplates will be secured to the valve body and will be visible to user. The information on the nameplate is as described below:

Standard Habonim Tag



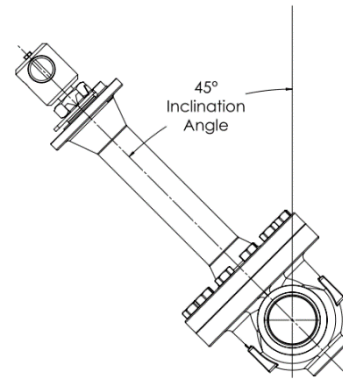
Standard ATEX Tag



5.3. Cryogenic Valves

- 5.3.1. Habonim Top Entry cryogenic valves are fully bidirectional and free of closed cavities, so there is no direction arrow on the valve as well as no preferred installation direction or pressure relief side.
- 5.3.2. **DO NOT** Install Cryogenic valves with the extended bonnet tilted more than 45° from the upright vertical position for the **12"**.
- 5.3.3. **DO NOT** Install Cryogenic valves with the extended bonnet tilted more than 15° from the upright vertical position for the **6"**.

Valve Tilting Limitation



5.4. Weld End Valves in-line - Extended Ends

- 5.4.1. Welding of valves shall be performed by a qualified person according to the ASME Boiler Construction Code Section IX. For valves to be welded within the EEA, refer to the requirements of ESR 3.1.2 of the Pressure Equipment Directive 97/23/EC.
- 5.4.2. Valves that will be welded directly to the line must be in the fully open position to protect the ball and seats from excessive temperatures during the welding procedures.
- 5.4.3. It is recommended to remove the valve wrench during the welding procedure. Protect or remove actuators from weld splatter or arc strikes. Valves in the “Fail Close” position should be cycled to the open position.
- 5.4.4. Use a temperature stick and a wet cloth wrapped around the center section to prevent overheating.

WARNING: DO NOT heat the center section over 150°C (300°F).

- 5.4.5. Align valve to pipe line, ensuring proper fit to minimize pipe load. Tack weld only.
- 5.4.6. Complete welding in small segments. Allow enough time for cooling between each segment.
- 5.4.7. After completing the welds, wait for the valve to cool below 90°C (200°F).
- 5.4.8. Replace the wrench or actuator. It is recommended not to rotate the valve to the closed position before flushing the line.

5.5. Flanged Valves

- 5.5.1. Before installing the valves, make sure the flanges and the pipe are free from grit, dirt or burrs.
- 5.5.2. The flanges must be aligned and parallel with the correct distance to allow the valve face-to-face dimension and gaskets to fit between.
- 5.5.3. Insert the valve between the flanges. If tilting or levering of the flanges is required, avoid harming the sealing surfaces of the flanges.
- 5.5.4. Align the valve and the pipe counter flanges and insert at least 2 bolts at the lowest side of the flange to support the gaskets.
- 5.5.5. Slide the gaskets between the flanges. Insert the remaining bolts and thread the nuts hand tight.
- 5.5.6. Before tightening the bolts, make sure the gaskets are aligned with the raised face of the flanges.
- 5.5.7. Tighten the flange bolts, with a torque values determined by the gasket manufacturer, other variables like gasket type and material, bolt, flange and lubricant affect the tightening torque values.

IMPORTANT: the tightening torque selected must be high enough to ensure adequate strain (stretch) in the bolt, but not so high as to cause the material to be taken beyond yield into the plastic response region. If the initial bolt stress is too low the total amount of strain (stretch in the bolt) is low and under these circumstances any subsequent reduction in thickness of the gasket due to creep will quickly result in loss of bolt strain and subsequent leakage.

- 5.5.8. It is recommended to use ring spanners to tighten and support the bolts and nuts.
- 5.5.9. **Note:** bolts tightening must be uniform in order to create a parallel movement of the two flanges and uniform deformation of the gasket in between them.
- 5.5.10. Before flushing the line, be sure the valves are in the fully open position. Fail-to-close actuated valves should be operated to the open position for flushing.
- 5.5.11. Before pressure testing the valves, bring the valves to the half open position to ensure pressure reaches the stem seals and to avoid unnecessary loading of the seats. Fail-to-close actuated valves should be brought to the half-open position.

6. Operating Instructions

Habonim Valves provide tight shut off when used under normal conditions and in accordance with Habonim's published pressure/temperature chart.

If these valves are used in a partially open (throttled) position, seat life may be reduced. Consult with Habonim for the proper seat material selection.

On manual operated valves, the valve operation is done by turning the valve handle 90° clockwise to open (handle is parallel to flow line), and 90° counter clockwise to close (handle is perpendicular to flow line).

If a shut-off valve is installed for end of line service, it must be ensured that it is closed with a blind end connection and the valve is secured against being opened unintentionally.

WARNING: Never look into the valve bore while the valve is in a flow line. Pressure and fluids could escape from the valve causing harm or injury.

To prevent leakage, malfunctions resulting from internal wear or seal degradation, the user must establish a preventive maintenance and inspection program. This program must include:

1. Inspection of parts to detect loss of wall thickness which may result in decreased pressure capacity (see Para. 3 for acceptable reduction of wall thickness).
2. Routine replacement of seals and inspection for proper operation (See Para. 7 for maintenance instructions).

Valve operating torques, as published in the Habonim literature, are the normal expected maximum break-out torques. These torques have been confirmed by laboratory testing of each valve under controlled conditions. Highly viscous or abrasive media, frequency of operation and temperature fluctuations could cause an increase in valve torque.

7. Maintenance

HABONIM valves have a long and reliable life, and maintenance is seldom required. When maintenance is necessary, valves can be refurbished on site.

To extend valve performance and reduce possible plant problems, the following procedures should be followed:

- 7.1. If leakage around the stem is noticed, check the stem nut torque according to value in Table 1 in the disassembly and assembly manual. If the leak continues, tighten the gland nut about a 1/6-turn as a routine maintenance procedure. This will compensate for any wear or settling of the gland packing.

Caution: Excessive tightening of the stem nut can result in accelerated seal wear and high valve operating torque.

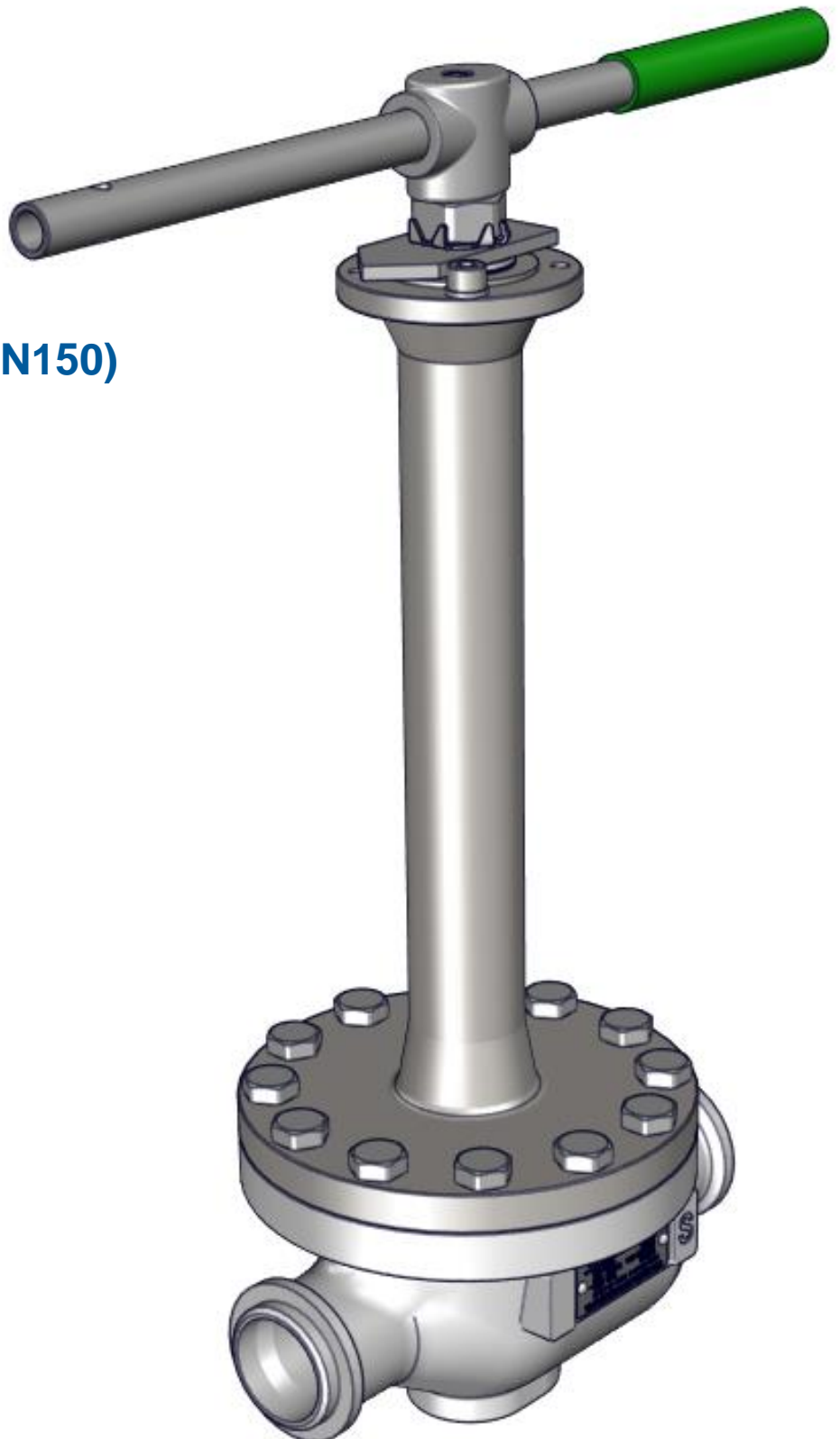
- 7.2. Whether the valve is removed from the line or disassembled in-line, it is recommended to replace all seats and seals using the appropriate Habonim Repair kit. Examine all metallic sealing surfaces such as ball, stem, and the bonnet surfaces that contact the seals for wear, corrosion or damage.
- 7.3. Only Habonim authorized spare parts should be used. Approved/Authorized/Supported Habonim repair kits can be found at "components & materials" in the Habonim catalog.
- 7.4. In addition to repair kits, other spare parts are available from Habonim, such as stem, glands, bolts, screws and nuts.
- 7.5. Should additional parts be required, it is recommended that the complete valve be replaced.
- 7.6. When ordering repair kits, please provide the valve size and full figure number code and series, engraved on the valve ID tag.

Disassembly & Assembly Manual

Top Entry Trunnion Mounted Cryogenic Ball Valves

Series included:
C52 Series

Sizes included:
1/2" - 6" (DN15 – DN150)



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 - 3.1. Wear safety glasses, protective headgear, clothing, gloves and footwear.
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1. General

- Before beginning, it is strongly recommended to review both the disassembly and assembly chapters.
- Both the disassembly and assembly chapters are for bare stem valves.
- General cryogenic service does not allow any lubrication for internal and soft parts such as seals and seats.
- For bolts, studs, nuts and stem seals use Gleitmo 599 grease only.
- An equivalent grease may be applied, when approved by Habonim engineering
- For any discrepancies please contact Habonim

2. Disassembly

The following instructions are for in-line disassembly of valves of all sizes.

IMPORTANT: No need to disassemble the valve from the pipeline, the valve is designed to be maintained in-line.

- 2.1. Refer to the exploded views on page 20 to identify the valve parts and their order.
- 2.2. Cycle the valve with the line pressure fully relieved before attempting disassembly to ensure pressure has also been discharged from the valve cavity.
- 2.3. Cycle the valve to the open position.
- 2.4. For manually operated valves ensure that the handle is positioned parallel to/in line with the pipeline; for automated valves check that the stem flats or the stem groove are parallel to the pipeline.

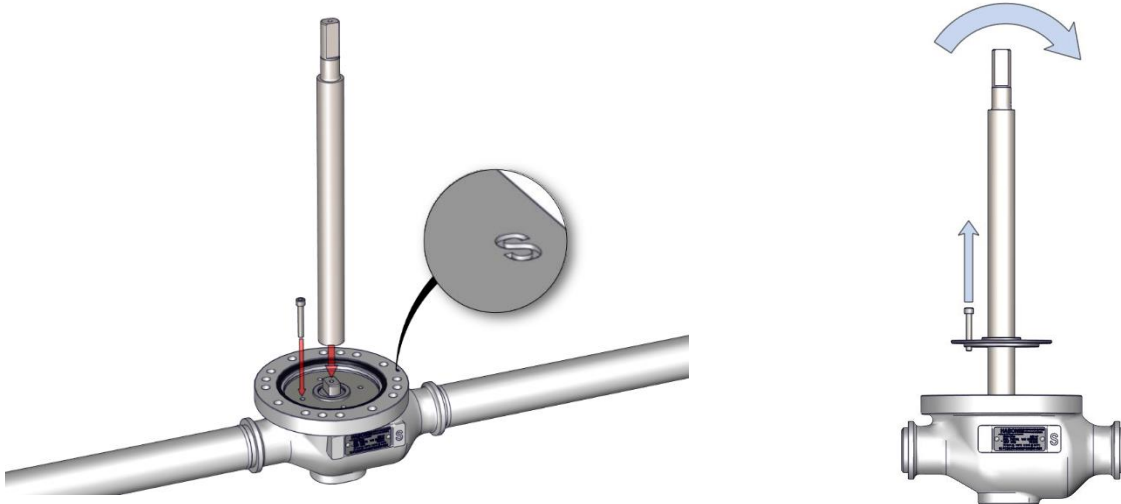
WARNING: Disassembling or assembling the valve with the ball in the closed position may cause damage to parts.

- 2.5. Remove all bonnet bolts.
- 2.6. Remove the bonnet.
- 2.7. Fully disassemble the bonnet.

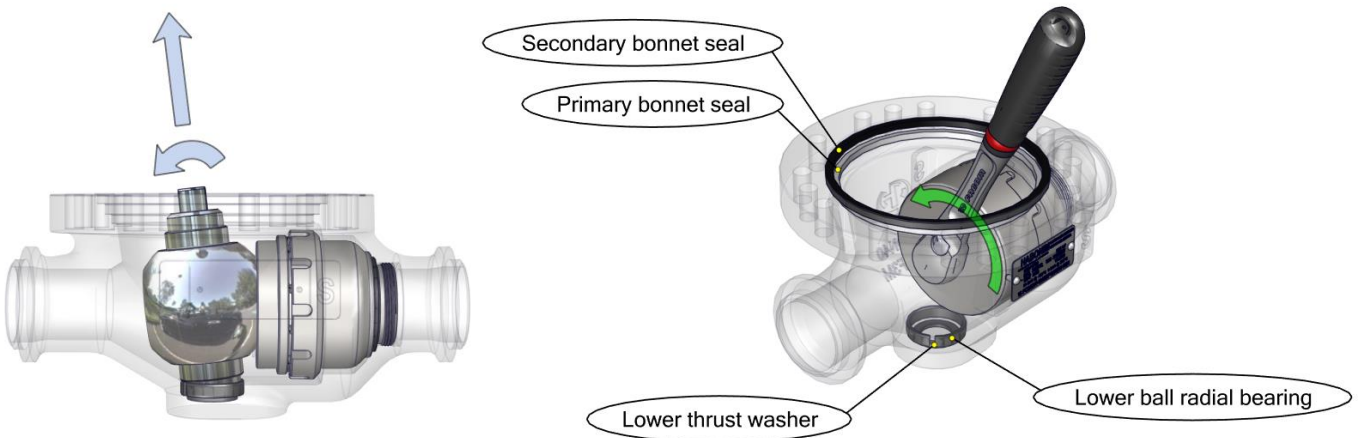
WARNING: Be careful not to damage the sealing surfaces.

- 2.8. Remove the stem nut, locking clip (or tab lock washer), the two disc springs, follower, slide bearing, anti-abrasion ring and the stem seal. Remove the stem, the stem bearing and the stem thrust seal. Place all removed components in a clean secure area.
- 2.9. Discard all repair kit parts: the stem thrust seal, anti-abrasion ring, stem seal, stem bearing and the slide bearing. Take care not to scratch or nick the stem bore area of the bonnet. Clean the stem and the stem bore area.

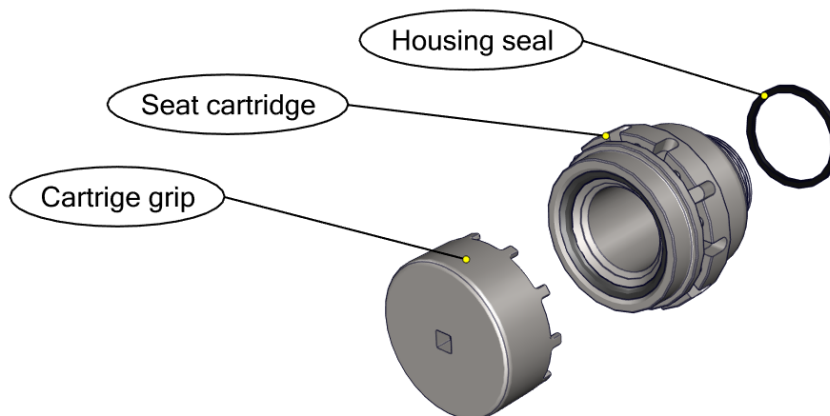
- 2.10. Use the stem (4) to dismantle the centering plate (27A).
- 2.11. Put the stem on the ball and use it to release the plate. Pull the stem towards the seat to energize its springs and at the same time remove the plate. The seat side is marked with the letter "S" on the body flange surface. For easier plate removal, use either a bolt, screwed into one of the two threaded holes or a hook tool (bolt usage is shown on the picture).



- 2.12. Remove and discard the ball radial bearing from the plate.
- 2.13. Slightly tilt the ball away from the seat and remove it from the valve.
- 2.14. Using the cartridge grip provided with the repair kit, release and remove the seat cartridge.



- 2.15. Discard the cartridge. Remove and discard the lower ball radial bearing and the lower thrust washer, primary and secondary bonnet seals and the housing seal from the body.



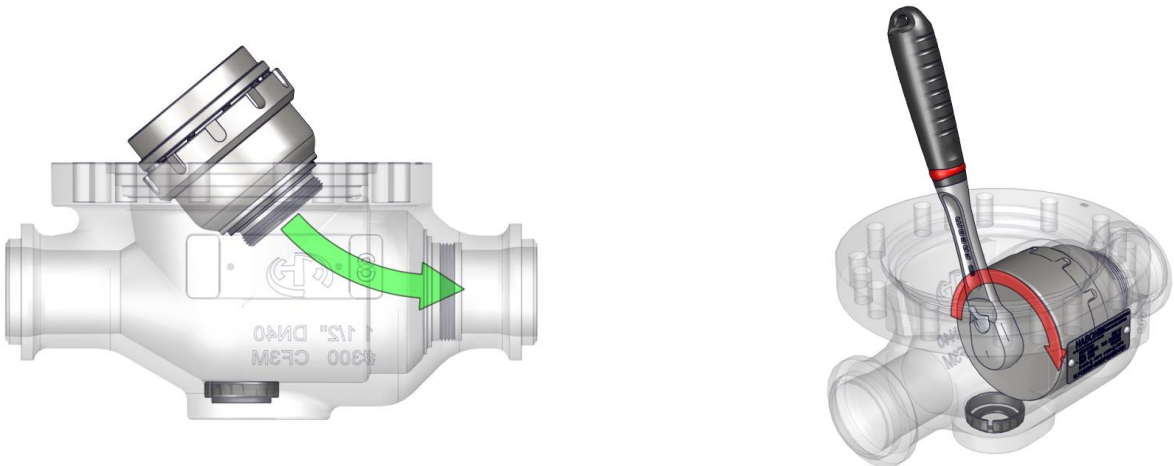
3. Assembly

The following instructions are for in-line assembly of valves of all sizes.

- 3.1. Place the new lower bearing into the body; use a pin punch tool and a hammer to seat it.
- 3.2. Place the thrust washer with its coated side facing up.
- 3.3. Place the new housing seal on the new seat cartridge from the repair kit.



- 3.4. Insert the cartridge into the valve body and hand tighten it.
- 3.5. Using the cartridge grip and a torque wrench, tighten the cartridge according to the torques in **table 1**.



- 3.6. Place new stem bearing into the centering plate.

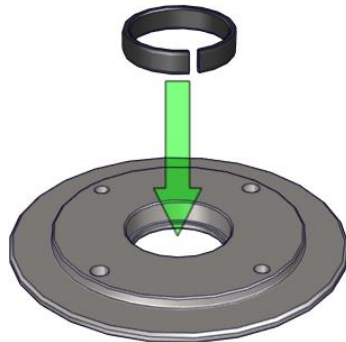
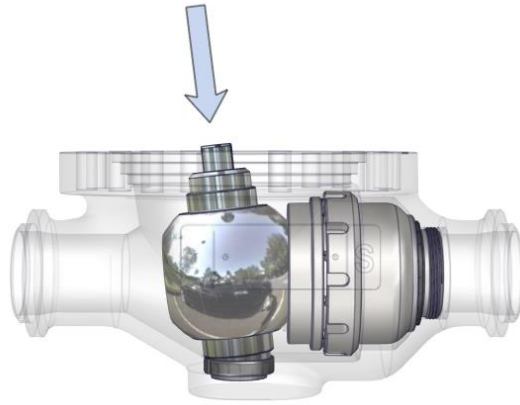


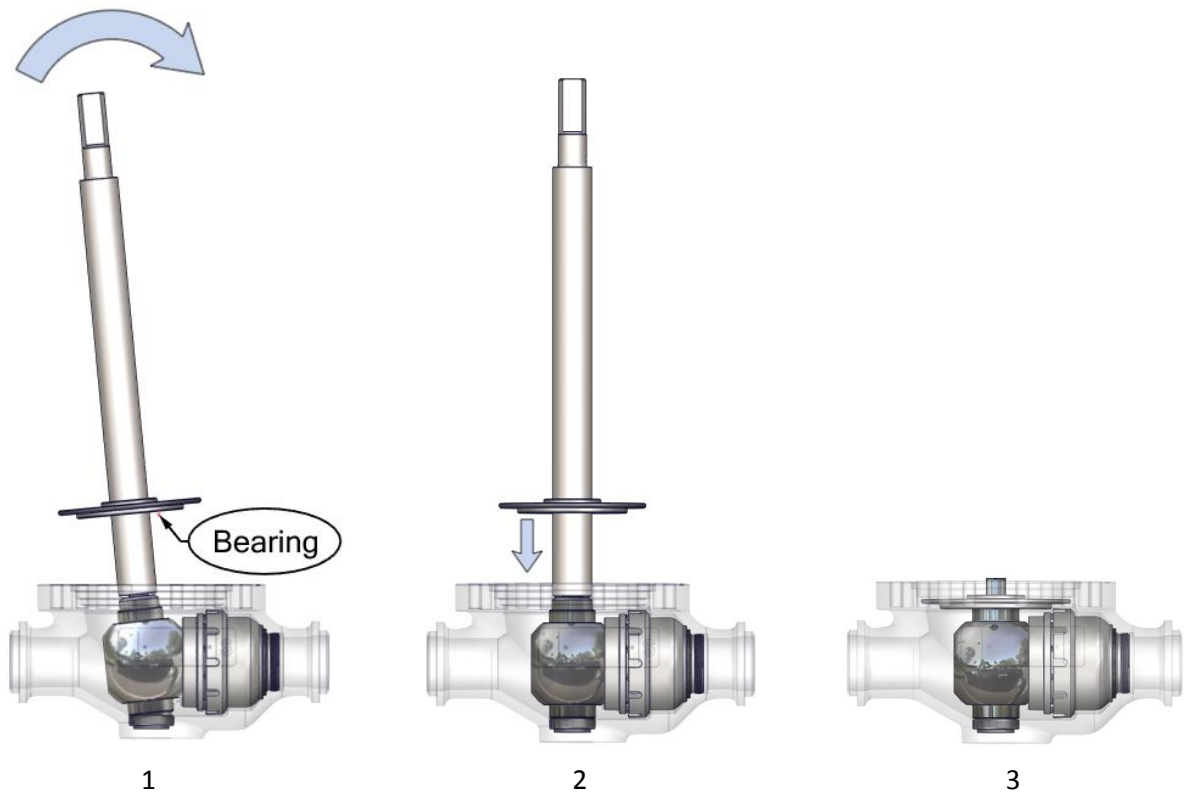
Table 1

Valve Size	Torque Nm
1/2" (DN15)	50
3/4" (DN20)	60
1" (DN25)	75
1 1/2" (DN40)	100
2" (DN50)	150
2 1/2" (DN65)	225
3" (DN80)	300
4" (DN100)	400
6" (DN150)	650

- 3.7. Insert the lower shaft of the ball into the lower radial bearing. Prior to insertion, slightly incline the ball away from the seat to allow it to easily engage with the seat. Ball insertion should be done very carefully, with the ball port in the open orientation. Ensure that the ball is fully seated on the lower bearing. To allow easier insertion, tilt the ball slightly from side to side. Avoid pressing on the seat with the ball during insertion. After insertion, the ball will be slightly inclined.

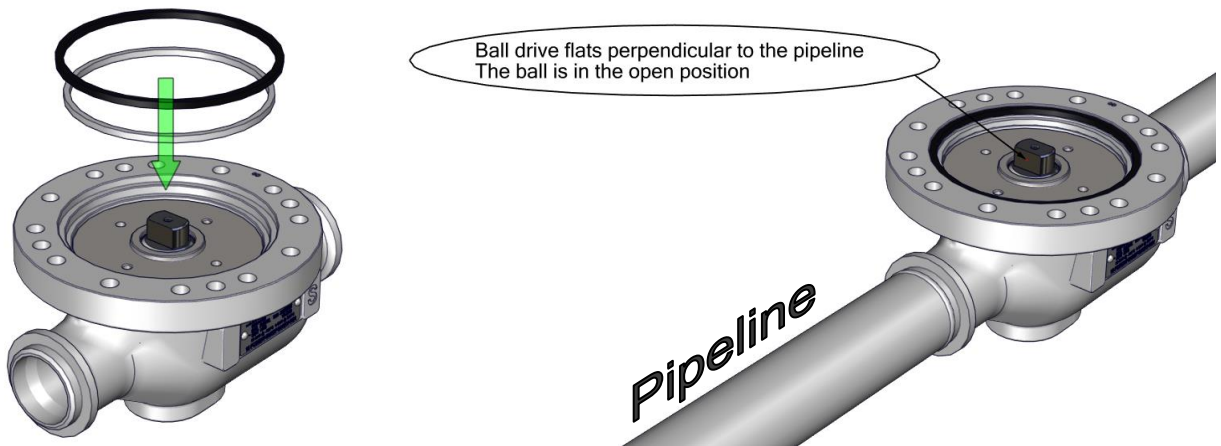


- 3.8. Use the stem to bring the ball into the upright position and to energize the seat springs. Put the centering plate onto the stem with the radial bearing facing down. While holding the plate with one hand, pull the stem toward the seat with the other, energizing the seat spring. While holding the ball in the upright position, place the centering plate down into the body, ensuring that it is thoroughly seated.

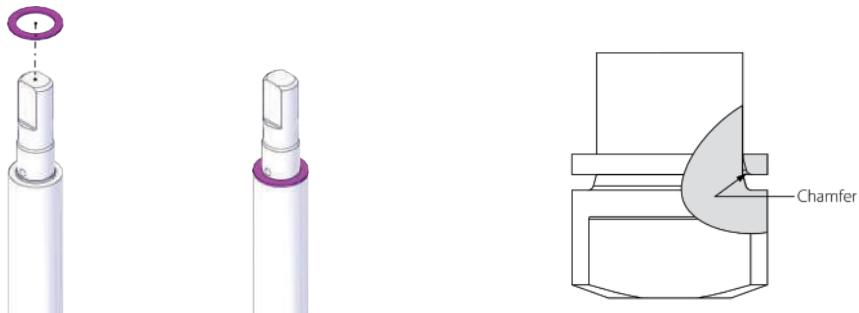


WARNING: Assemble the valve only with the ball in its open position. After assembling the ball, its drive flats shall be perpendicular to the pipeline.

3.9. Place the primary and secondary bonnet seals into the body.



3.10. Place the stem thrust seal on the stem.



WARNING: For valves of size 2" and above verify that the thrust seal chamfer faces down.

3.11. Insert the stem into the bonnet with the threaded side in and carefully guide it up through the stem.

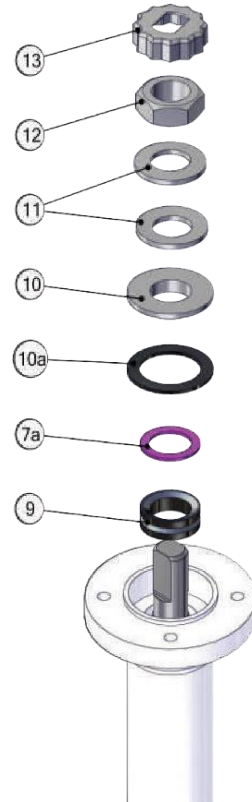


Stem assembly for actuated valves in sizes 1/2"-1" (DN15-DN25).

For manually operated valves stem assembly go to page 19.

- 3.12. Lubricate the stem seal and the anti-abrasion ring with an appropriate lubricant.
- 3.13. While pulling up on the stem, insert the stem seal over the stem and into the stem bore.
- 3.14. Place the anti-abrasion ring, slide bearing, follower, the two disc springs and hand tighten the stem nut onto the stem.

Description	BOMID
Anti-abrasion ring	7a
Stem Seal	9
Follower*	10
Slide bearing**	10a
Disc spring	11
Location ring	11a
Stem nut	12
Locking Clip	13

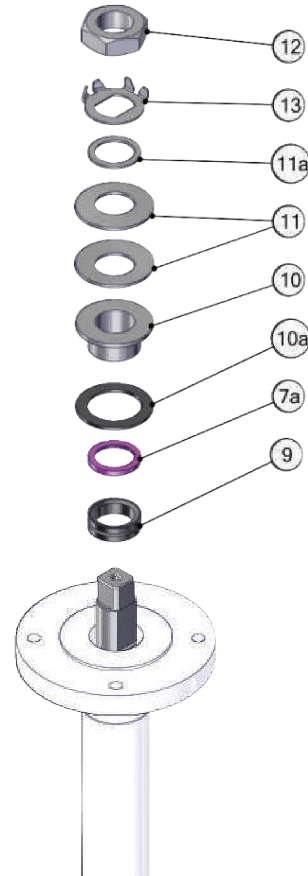


Stem assembly for actuated valves in sizes 1 1/2"-6" (DN40-DN150).

For manually operated valves stem assembly go to page 19.

- 3.15. Lubricate the stem seal and the anti-abrasion ring with an appropriate lubricant.
- 3.16. While pulling up on the stem, insert the stem seal over the stem and into the stem bore.
- 3.17. Place the anti-abrasion ring, slide bearing, follower, the two disc springs, tab lock washer and hand tighten the stem nut onto the stem.

Description	BOMID
Anti-abrasion ring	7a
Stem Seal	9
Follower	10
Slide bearing	10a
Disc spring	11
Location ring	11a
Stem nut	12
Tab lock washer	13



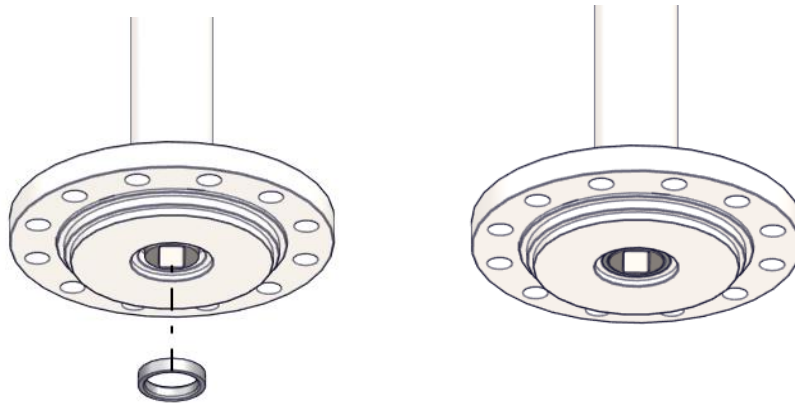
3.18. Tighten the stem nut onto the stem according to **table 2** and lock the locking clip or the tab lock washer.

Table 2:

Valve Size	Stem Size	Stem Thread	HERMETIX	
			Nm	Lb-in
1/2" (DN15)	1"	7/16" - 20 UNF	11	97
3/4"-1" (DN20-DN25)	1 1/2"	9/16" - 18 UNF	15	133
1 1/2" (DN40)	2 1/2"	M20x2.5	30	265
2" (DN50)	3"	1" – 14 UNS	60	530
2 1/2"-3"-4" (DN65-DN80-DN100)	6"	1 1/2" – 12 UNF	120	1060
6" (DN150)	10"	2" – 8 UN	300	2655

Important: An excessively tightened stem nut can cause excessive packing wear and increase stem torque.

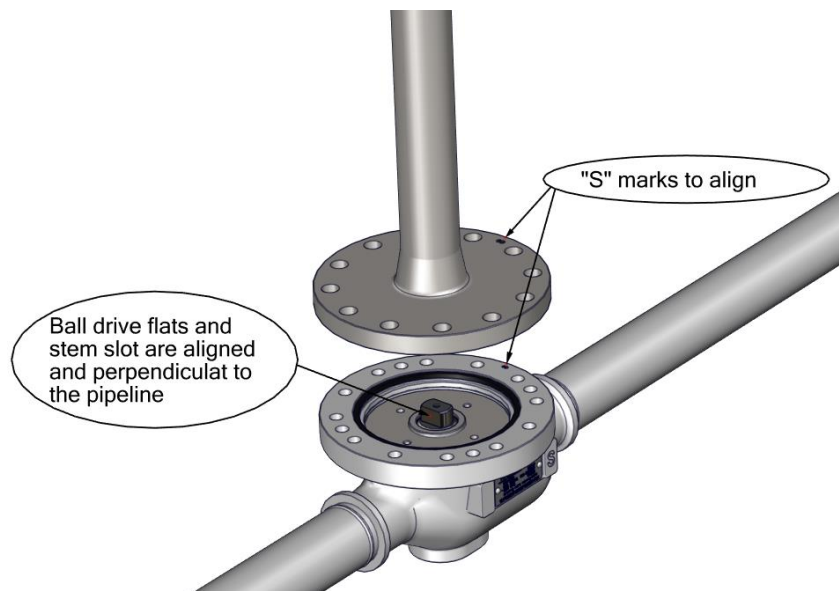
3.19. Insert the stem bearing inside the bottom flange of the bonnet.



3.20. Place the bonnet onto the body, coupling the stem slot with the ball drive and aligning the "S" on the bonnet with the body seat side (also marked with "S").

3.21. Ensure that the bolt holes in the bonnet align with the threads in the body. Slightly push the bonnet down to seat it onto the body, taking care not to score faces or damage seals.

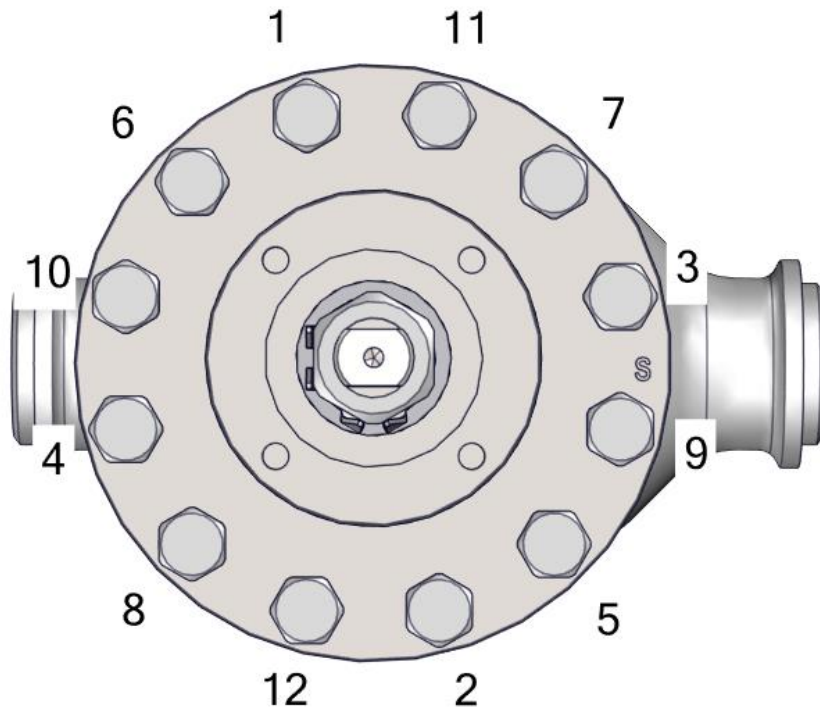
Important: Prior to assembly, determine the correct orientation of the stem slot with respect to the "S" mark on the bonnet.



3.22. Lubricate threads of bolts and nuts with an anti-galling compound to prevent galling.

3.23. Initial tightening of the body bolts should be done according to the tightening sequence illustrated:

Tightening pattern:



3.24. Tighten the body bolts according to **table 3**:

Table 3:

Bolt material	Thread	Valve size	Required torque	
			N-m	Lb-In
Stainless Steel: Grade A2-70	M8	1/2" (DN15)	20	180
	M10	3/4"-1" (DN20-DN25)	40	350
	M12	1 1/2" (DN40)	65	575
	M16	2-2 1/2" (DN50-DN65)	180	1590
	M20	3" (DN80)	350	3100
	M24	4" (DN100)	600	5310
	M30	6" (DN150)	1000	8850

3.25. Close and open the valve several times to ensure its proper operation.

4. Stem disassembly and assembly of manually operated valves

The following instructions cover bent type handles for small valves (sizes from 1/2" to 1") and pipe type handles for large valves (sizes 1-1/2" to 6"). Refer to the exploded views on page 20 to identify each handle type and its corresponding parts. For actuated valve stem assembly refer to page 16.

4.1. Bent type handle disassembly (sizes from 1/2" to 1")

4.1.1. Remove the handle nut, serrated washer, handle, locking clip, stem nut, two disc springs, follower, anti-abrasion ring and the stem seal. Place all removed components in a clean, secure area.

4.2. Bent type handle assembly (sizes from 1/2" to 1")

- 4.2.1. Lubricate the stem seal and the anti-abrasion ring with appropriate lubricant.
- 4.2.2. Holding the stem up insert new stem seal over the stem and into the stem bore. Place the anti-abrasion ring, slide bearing, follower and two disc springs. The slide bearing coated side shall face down. Hand screw the stem nut onto the stem.
- 4.2.3. Tighten the stem nut onto the stem according to **table 2**.
- 4.2.4. Insert the locking clip, handle, serrated washer and the stem bolt.
- 4.2.5. Place and tighten the stop screw.
- 4.2.6. With correct stop-pin installation, the handle will provide quarter clockwise turn from open to closed position.

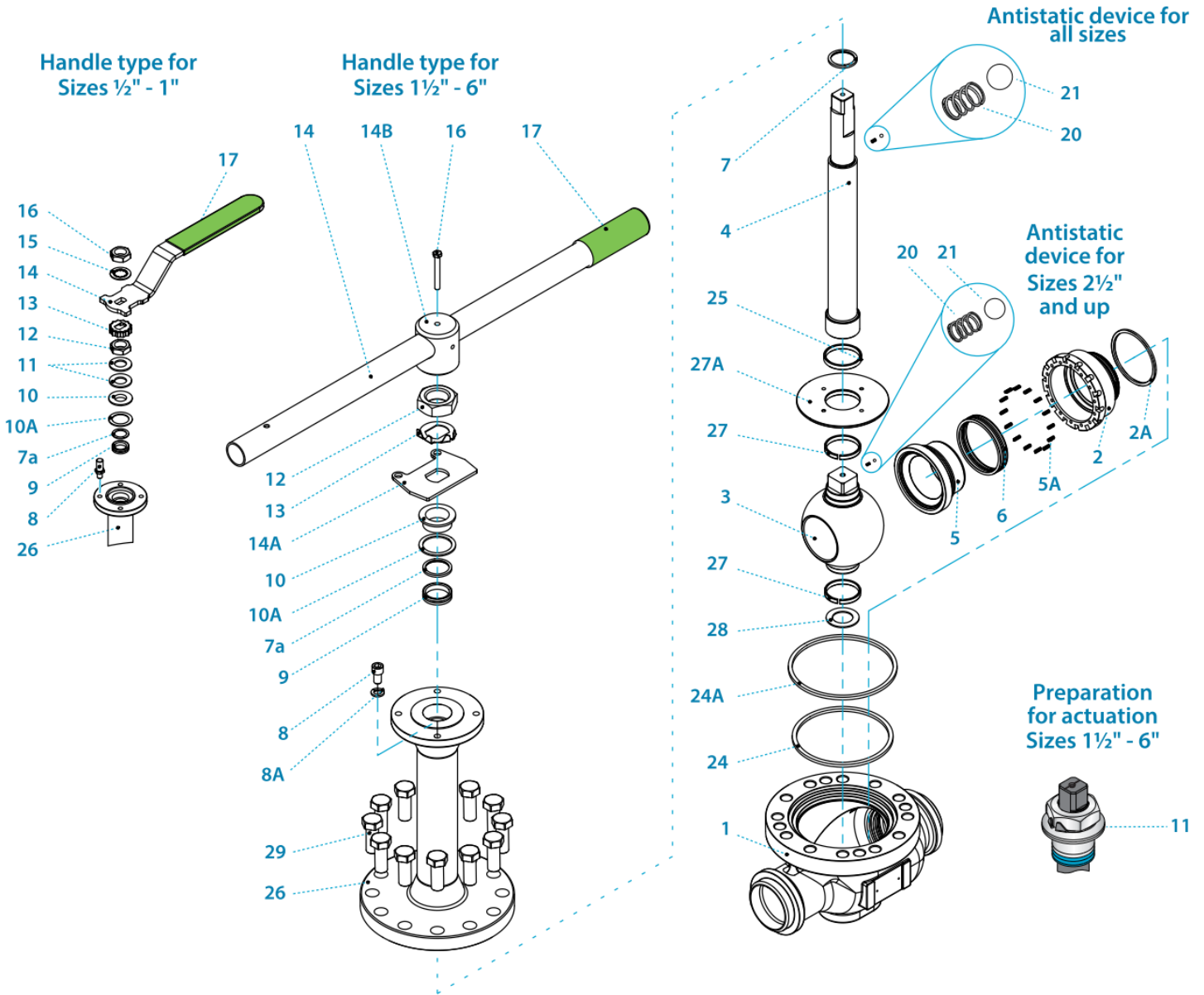
4.3. Pipe type handle disassembly (sizes from 1-1/2" to 6")

4.3.1. Remove the wrench bolt, handle, wrench head, stem nut, tab lock washer, stop plate, follower, slide bearing, anti-abrasion ring and the stem seal. Place all removed components in a clean, secure area.

4.4. Pipe type handle assembly (sizes from 1-1/2" to 6")

- 4.4.1. Lubricate the stem seal and the anti-abrasion ring with appropriate lubricant.
- 4.4.2. While pulling up on the stem, insert the new stem seal over the stem and into the stem bore. Place the anti-abrasion ring, slide bearing, follower, stop plate and the tab lock washer. The coated side of the slide bearing should face down. Hand tighten the stem nut onto the stem.
- 4.4.3. Tighten the stem nut onto the stem according to **table 2** and lock the tab washer ears onto the nut.
- 4.4.4. Place the wrench head on the stem making sure it is parallel to the stem groove to ensure correct handle position with respect to the ball position. The handle is parallel to the line, when the ball is in the open position.
- 4.4.5. Insert the handle through the wrench head and tighten it with the wrench bolt.
- 4.4.6. Place and tighten the stop screw and the spring washer.
- 4.4.7. With correct stop-pin installation, the handle will provide quarter clockwise turn from open to close position.

5. Full exploded view and BOM



Item	Description	Qty.
1	Body	1
2*	Seat Housing	1
2A*	Housing Seal	1
3	Ball	1
4	Stem	1
5*	Hybrid seat	1
5A*	Seat spring	6-18
6*	Lip seal	2
7*	Stem thrust seal	1
7a*	Anti-abrasion ring	1
8	Stop screw	1
8A	Spring washers	1
9*	Stem seal	1
10	Follower	1
10A*	Slide bearing	1
11	Disc spring	2
12	Stem nut	1
13	Locking clip (Tab lock washer**)	1

Item	Description	Qty.
14	Handle	1
14A	Stop plate	1
14B	Wrench head	1
15	Serrated washer	1
16	Handle nut (Wrench bolt**)	1
17	Sleeve	1
20	Anti-static spring	1-2
21	Anti-static plunger	1-2
23	Tag (not shown)	1
24*	Bonnet primary seal	1
24A*	Bonnet secondary seal	1
25*	Stem bearing	1
26	Bonnet	1
27*	Ball radial bearing	2
27A	Centering plate	1
28*	Lower thrust washer	1
29	Bonnet bolt	12

* Repair kit components

** For 1.5" (DN40) and up sizes