



# ISV Installation, Maintenance and Operation Manual

API-6D Two Piece Trunnion Ball Valve

BT3B Series

IMO

001

Page : 1 of 7

First Issue : 12/17/2010

Prepared By : B. McClure

Approved By : E. Gulgun

Rev. Date : 07/07/2011

Rev. No: 1

## 1. INTRODUCTION

### 1.1. **WARNING**

**Do not install, maintain or operate valves before having carefully read this IMO in order to avoid prospective damages to people and property. Always use the valves within the limit of the working conditions as described in International Standard Valve (ISV) technical documents, and/or nameplate.**

**For your safety and protection, follow essential and best safety practices prior to removing the valve from service and before any disassembly of the valve**

- 1.2. Applicable safety regulations should be followed at all times.
- 1.3. Never loosen or remove any bolting or fittings while valve is under pressure.
- 1.4. Keep hands and objects out of the valve if there is a possibility of unexpected valve actuation in order to prevent serious damage or injury.
- 1.5. For proper handling and disposition, obtain a Material Safety Data Sheet (MSDS) of the media that the valve is exposed to and follow the material handling precautions associated with the media. Immediately contact the proper authority if there is any additional concern.
- 1.6. Wear protective clothing or equipment regularly required when working with the media involved.
- 1.7. Depressurize the line and valve as follows prior to removal of the valve or valve parts:
  - 1.7.1. Drain the line while the valve is in the open position.
  - 1.7.2. Close and open the valve to relieve any pressure that may be trapped in the valve body cavity prior to removal from service. Leave the valve in the open position.
  - 1.7.3. Remove the valve from the line carefully.
  - 1.7.4. Carefully open and close the valve several times while the valve bore is in vertical position to drain any remaining media before disassembly.
- 1.8. ISV assumes no liability for damages, failures, or any other occurrences resulting from unauthorized modification, misuse, or use of non-original manufactured equipment parts.
- 1.9. Any unauthorized repair or modification may void the product warranty; refer to ISV warranty information for details.
- 1.10. ISV withholds the right to revise the valve design. This IMO may not exactly represent your valve's construction. If there are any concerns, please contact the ISV Engineering Department.

## 2. STORAGE

- 2.1. ISV valves are shipped in the full open position with the exception of valves that are equipped with fail-closed actuators. A corrosion inhibitor is applied to all end connections, flanged sealing surfaces and bores (non-stainless steel valves). End protectors are installed to prevent foreign material from entering the body cavity and from scratching and damaging the sealing surfaces of the end connections. This will provide adequate protection for indoor storage.
- 2.2. Do not remove the end protectors except for inspection or installation.



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- 2.3. If valves require outdoor storage, ISV recommends a clean, dry, covered area off of the ground. Special packaging and additional lubrication may be required.
- 2.4. Never store the valve in a partially open position. If the valve is left in a partially open position for an extended period of time, the soft seat can be damaged.

### 3. INSTALLATION

- 3.1. Use proper handling equipment based on the weight of the valve. To avoid damage to the valve or personnel while handling, use a rig or sling if the weight is over 50lbs.
- 3.2. Valve can be installed in line bi-directionally.
- 3.3. With valves that have fittings or extensions, check and tighten before valve is put into service.
- 3.4. Stem or seat grease fittings are for EMERGENCY USE ONLY.
- 3.5. When the valve is ready for installation, remove the end protectors from both ends.
- 3.6. Inspect the valve internals, valve pipe connections and adjoining pipe to make sure they are free of damage, dirt and debris.
- 3.7. Install the valve in open position.
- 3.8. Flanged End Valves:
  - 3.8.1. After confirmation of bolting and gasket material, size and length, align the bolt holes of valve and pipe flanges.
  - 3.8.2. Insert gasket and bolts.
    - 3.8.2.1. To prevent unbalanced tightening and excessive stress on the bolting, the valve-to-pipeline alignment must be accurate.
  - 3.8.3. Follow standard piping practice regarding the bolting of the valve by tightening the bolting uniformly in a crosswise pattern.
    - 3.8.3.1. Uneven compression of the gasket/o-ring can occur if standard tightening sequences are not followed.
    - 3.8.3.2. Deformation of the gasket/o-ring can cause the valve to leak if the bolting is over-torqued.
  - 3.8.4. After installation, check and retighten bolting if necessary.
- 3.9. Weld End Valves:
  - 3.9.1. Verify that the weld area is clean. The weld area should be free of oil, dust, rust, paint or any other contaminants that could inhibit the welding process.
  - 3.9.2. Proper valve to pipe alignment should be verified. If necessary, make corrective adjustments.
  - 3.9.3. Any welding should be done by qualified personnel while using properly certified and approved welding procedures in accordance with all related regional codes and regulations
  - 3.9.4. Any weld process related heat applied to the valve body could damage the seat and seals.
  - 3.9.5. Minimize heat generated by welding to prevent damage to seat and seal.
  - 3.9.6. Perform localized post weld-heat treatment (PWHT) if necessary.
  - 3.9.7. Clean and inspect the weld
  - 3.9.8. After the weld is completed, the pipeline and valves should be flushed to remove any foreign contaminants.



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3.9.8.1. Use Caution during flushing to avoid trapping debris in the valve cavities that could damage or scratch the sealing surfaces.

- 3.10. Check with a piping engineer to assure that the pipeline stress is not concentrated on the valve.
- 3.11. For new construction, valve and line should be flushed to eliminate contaminants and debris prior to cycling the valve.

#### 4. OPERATION

**WARNING: To prolong the life of the seats, ensure that the ball valve is either fully OPEN or fully CLOSED. If the ball is left in the half-open position, damage could be caused to the soft seats.**

- 4.1. Make sure the pipeline is clean.
- 4.2. Verify that the valve bolting is tightened to proper torque.
- 4.3. Make sure that the vent and drain lines are closed (if applicable).
- 4.4. Confirm that the ball is in the OPEN position when doing a pipeline pressure test.
- 4.5. Maximum permitted shell pressure test is 1.5 times working pressure of the valve.
- 4.6. Maximum permitted pipeline shell pressure test is 1.1 times working pressure of the valve while the valve is in closed position.
- 4.7. Directional closing is clockwise for both the lever and gear operated valves.

#### 5. MAINTENANCE

- 5.1. Maintenance intervals should be established and performed by the operational personnel according to service conditions.
- 5.2. Routine maintenance consists of tightening the valve bolting and checking for leakage.
- 5.3. Performance observations should be done periodically to ensure safety and function.
  - 5.3.1. More frequent observation is recommended for valves under extreme conditions.
- 5.4. It is highly recommended to operate the valve at least once a month and generally as often as possible, to avoid torque increase and prevent deposit formations.

#### 6. OVERHAUL MAINTENANCE

- 6.1. Overhaul maintenance consists of replacing the seats and all seals. Replacement of ball and stem may be required. See Warning, Disassembly and Assembly section for part replacement.

#### 7. DISASSEMBLY

**NOTE:** If complete disassembly becomes necessary, replacement of all soft goods such as o-rings, gaskets, and packings is recommended. Prior to disassembly, read the complete IMO including the Warning section.

- 7.1. Verify the valve has been fully drained and depressurized per section 1, and close the valve for disassembly.
- 7.2. Remove the lever or gear and the related hardware.
- 7.3. Stand the valve on the body (1) side flange. Use caution to not damage the flange sealing surfaces.



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- 7.4. Mark the body-end cap connection, the trunnion-body connection, and the gland-body connection with a line of reference for reassembly.
- 7.5. For Lever Operated Valves:
  - 7.5.1. Use caution and remove the retainer ring (35).
  - 7.5.2. Remove the stop plate (24) and locking eyebolt (37).
  - 7.5.3. Remove all the top plate cap-screws (20.1), stop cap-screw (20.3), and top plate (22).
    - 7.5.3.1. Only on the 4"-Class 600 BT3B series valves do the gland-body cap-screws (20.4) need to be removed as well.
- 7.6. For Gear Operated Valves:
  - 7.6.1. Remove the top plate (22).
  - 7.6.2. Remove the gland-body cap-screws (20.4).
- 7.7. Pull the stem sub-assembly outward.
  - 7.7.1. Stem sub-assembly consists of stem (4), packing (21), gland (12), gland o-ring (6.4), thrust washer (19), stem bearing (18.2), stem o-ring (6.2), secondary stem o-ring (6.5), and anti-static devices (15, 16).
  - 7.7.2. To disassemble the stem sub-assembly, push the stem (4) down through the gland (12). Separation of the remaining parts will complete this task.
- 7.8. Remove the trunnion-body cap-screws (20.2).
- 7.9. Remove the trunnion sub-assembly.
  - 7.9.1. Trunnion sub-assembly consists of the trunnion cover (14<sup>(1)</sup>), trunnion (13), and trunnion o-ring (6.4).
  - 7.9.2. ISV BT3B series valves sizes 8-12" Class 600 trunnions are equipped with a support screw (36) and a screw plug (37). See figure 2. Please note that the screw plug (37) is a pressure retaining part.
- 7.10. Remove body-end cap bolting (28, 29).
- 7.11. Carefully lift and remove the end cap (2).
  - 7.11.1. Stand the end cap (2) on the flanged end connection. Use caution to not damage the flange sealing surface
- 7.12. Rotate the ball (3) into the closed position.
- 7.13. Remove the ball sub-assembly and set it on a clean surface.
  - 7.13.1. Ball sub-assembly consists of the ball (3), ball thrust washer (24<sup>(1)</sup>), and trunnion bearing (18.1)
- 7.14. Remove the seat and seat pusher sub-assemblies from the end cap (2) and body (1) seat pockets.
  - 7.14.1. Seat sub-assembly consists of the seat (7), seat insert (5), and the seat o-ring (6.1).
  - 7.14.2. Seat pusher sub-assembly consists of the seat pusher (9), seat springs (10), and seat gasket (8).
- 7.15. Clean all metallic parts with industrial cleaner.
- 7.16. Inspect all parts for scratches and damages on critical surfaces.
- 7.17. Only use OEM replacement parts as needed.

## 8. ASSEMBLY

- 8.1. Prior to assembly, verify all parts are free of scratches, damages, dirt and debris.



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- 8.2. Lubricate all moving parts and threaded connections. PTFE tape should be used on all NPT connections.
- 8.3. Assemble seat and seat pusher sub-assemblies.
- 8.4. Assemble stem, trunnion, and ball sub-assemblies.
- 8.5. Stand the body (1) and end cap (2) onto their end flanges. Use caution to not damage the flange sealing surfaces.
- 8.6. Install the cap gasket (11.1) onto the body.
- 8.7. Install the end cap o-ring (6.3) onto the end cap (2).
- 8.8. Install the seat pusher sub-assemblies into the body (1) and end cap (2) seat pockets with the seat springs (10) facing down.
- 8.9. Install the seat sub-assemblies into the body (1) and end cap (2) seat pockets with the seat insert (5) facing up.
- 8.10. Place the ball sub-assembly onto the seat (5) in the body (1) cavity.
- 8.11. Rotate the ball (3) to the open position.
- 8.12. Center the ball (3) in the valve body (1).
- 8.13. Install the stem and trunnion sub-assemblies through the body (1) into the ball (3).
- 8.14. Install top plate (22) and cap screws (20.1, 20.2).
- 8.15. Install the body-end cap studs (28) into the body.
- 8.16. Place the end cap (2) on top of the body (1), and align the bolt holes according to the line of reference.
- 8.17. Install body-end cap nuts (29) and refer to ISV technical document "IS02-BT3B-1200" for recommended torque values.
- 8.18. For lever actuated valves install stop plate (24), retainer ring (35), spacer (40) and stop cap-screw (20.3).
  - 8.18.1. Verify stop plate (24), spacer (40) and stop cap-screw (20.3) orientation is correct.
- 8.19. Install lever or gear and related hardware.
- 8.20. Verify the fully open and closed stops are set correctly.
- 8.21. After assembly, valve needs to be pressure tested per owner's specifications.
- 8.22. After testing, it is recommended to drain and dry the valve completely. Apply corrosive inhibitors to the machined surface, use protective end cover, and make sure the valve is in the fully open position.
- 8.23. Valve shall be marked as "repaired".

### 9. DISPOSAL

- 9.1. If disposal of the valve is necessary, check with local environment authorities for disposal regulations.
- 9.2. Remove ISV nameplate, logo and markings before disposal to prevent improper usage.



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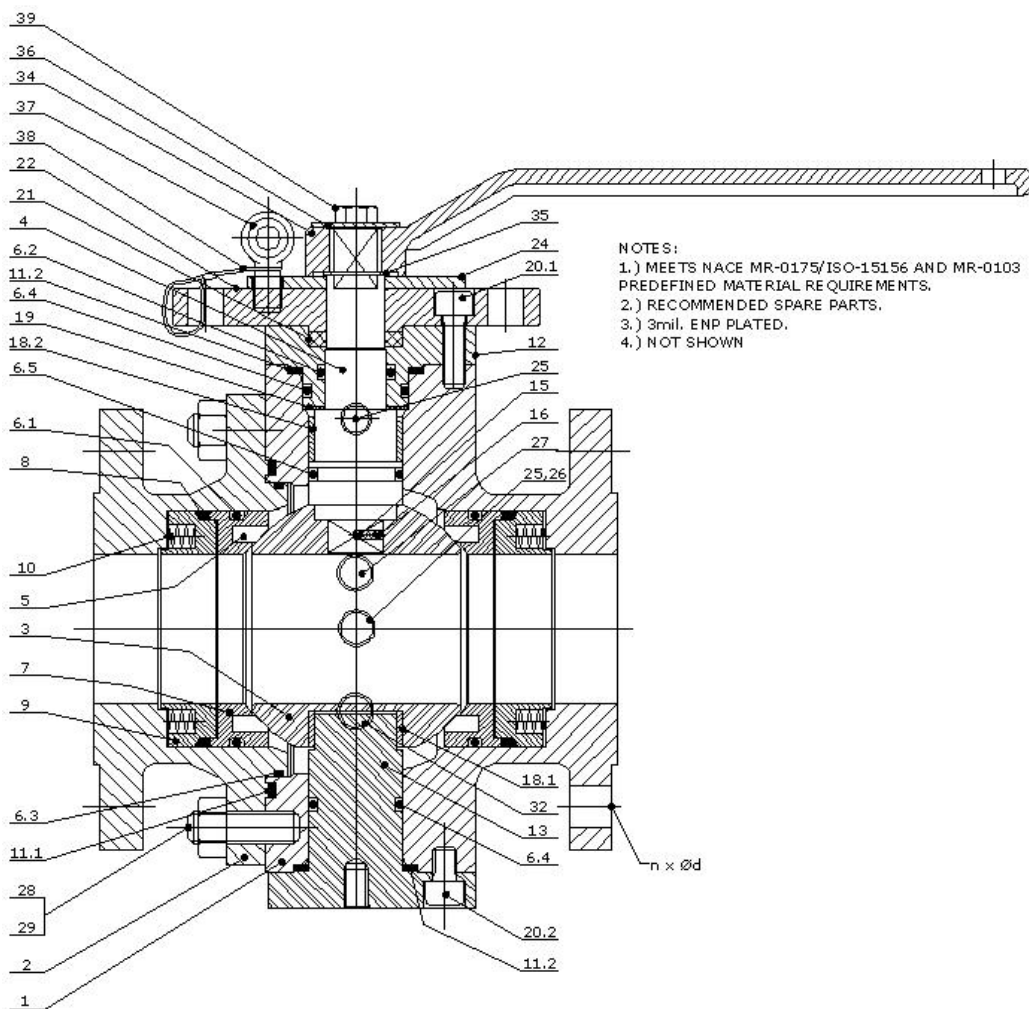
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**FIGURE 1 – LEVER OPERATED ISV BT3B SERIES VALVE**



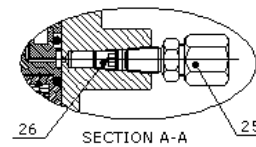
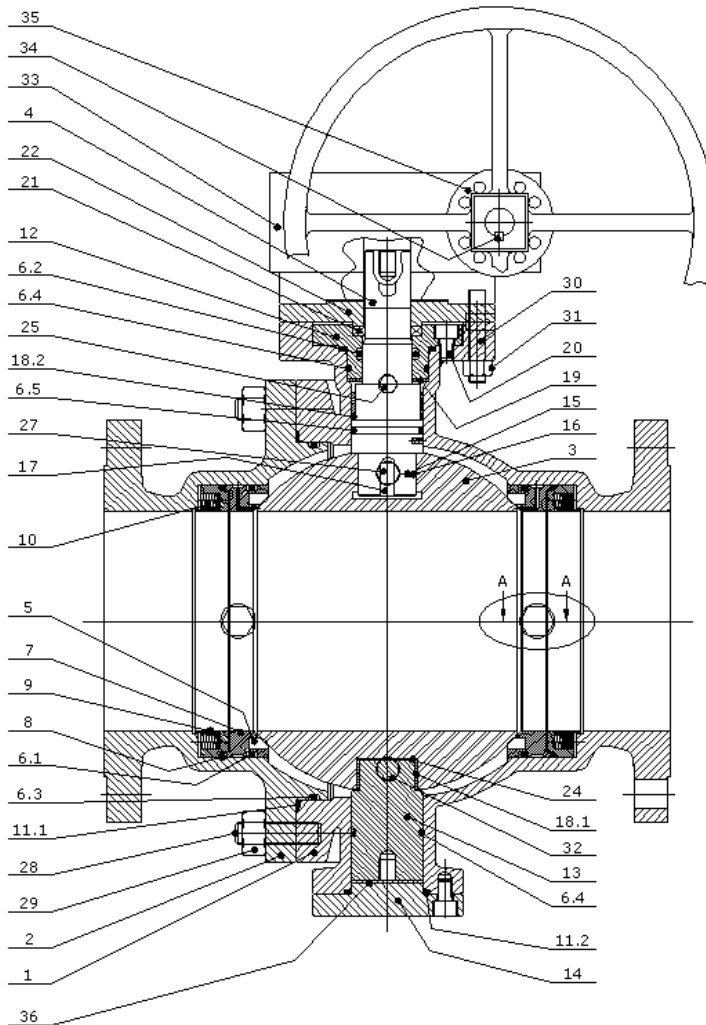
NOTES:  
 1.) MEETS NACE MR-0175/ISO-15156 AND MR-0103 PREDEFINED MATERIAL REQUIREMENTS.  
 2.) RECOMMENDED SPARE PARTS.  
 3.) 3mil. ENP PLATED.  
 4.) NOT SHOWN

1	Body	1
2	End Cap	1
3	Ball	1,3
4	Stem	1,3
5	Seat Insert	2
6.1	Seat O-Ring	2
6.2	Stem O-Ring	2
6.3	End Cap O-Ring	2
6.4	Trunnion/Gland O-Ring	2
6.5	Stem O-Ring (Secondary)	2
7	Seat	1,3
8	Seat Gasket	2
9	Seat Pusher	1,3
10	Seat Spring	1
11.1	Cap Gasket	SPW,2
11.2	Trunnion/Gland Gasket	2
12	Gland	1,3
13	Trunnion	1,3
14		
15	Anti-Static Spring	
16	Anti-Static Ball	
17		
18.1	Trunnion Bearing	
18.2	Stem Bearing	
19	Thrust Washer	
20.1	Top Plate Cap-Screw	2
20.2	Trunnion Cap-Screw	2
20.3	Stop Cap-Screw	2
21	Fire Safe Seal	1
22	Top Plate	2
23		
24	Stop Plate	
25	Grease Injection Fitting	
26	Internal Check Valve	
27	Vent Plug	
28	Body-End Cap Stud	1
29	Body-End Cap Nut	1
30		
31		
32	Drain Valve	
33		
34	Lever	
35	Retainer Ring	
36	Washer	
37	Locking Eyebolt	
38	Metal Wire	
39	Lever Nut	
40	Spacer	4

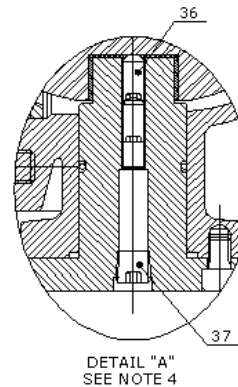
\*This sketch is provided for reference only. For detailed information contact ISV.



**FIGURE 2 – GEAR OPERATED ISV BT3B SERIES VALVE**



NOTES: (SEE REMARKS)  
 1.) MEETS NACE MR-01 75/ISO-15156 & MR-0103  
 PREDEFINED MATERIAL REQUIREMENTS.  
 2.) RECOMMENDED SPARE PARTS.  
 3.) NOT SHOWN.  
 4.) 3mil. ENP PLATED.



1	Body	1
2	End Cap	1
3	Ball	1,3
4	Stem	1,3
5	Seat Insert	2
6.1	Seat O-Ring	2
6.2	Stem O-Ring	2
6.3	End Cap O-Ring	2
6.4	Trunnion/Gland O-Ring	2
6.5	Stem O-Ring (Secondary)	2
7	Seat Ring	1,3
8	Seat Gasket	2
9	Seat Pusher	1,3
10	Seat Spring	1
11.1	Cap Gasket	SPW,2
11.2	Trunnion/Gland Gasket	2
12	Gland	1,3
13	Trunnion	1,3
14	Trunnion Cover	
15	Anti-Static Spring	
16	Anti-Static Ball	
17	Stem Key	
18.1	Trunnion Bearing	
18.2	Stem Bearing	
19	Thrust Washer	
20.1	Top Plate Cap-Screw	2
20.2	Trunnion Cap-Screw	2
20.4	Gland-Body Cap-Screw	2
21	Fire Safe Seal	1
22	Top Plate	2
23	Pin	
24	Ball Thrust Washer	
25	Grease Injection Fitting	
26	Internal Check Valve	
27	Vent Plug	
28	Body-End Cap Stud	1
29	Body-End Cap Nut	1
30	Gear Stud	
31	Gear Nut	
32	Drain Valve	
33	Gear Box	
34	Key	
35	Locking Device	
36	Support Screw	
37	Screw Plug	

\*This sketch is provided for reference only. For detailed information contact ISV.

**NOTES:**

<sup>(1)</sup> – If the valve is equipped with item.