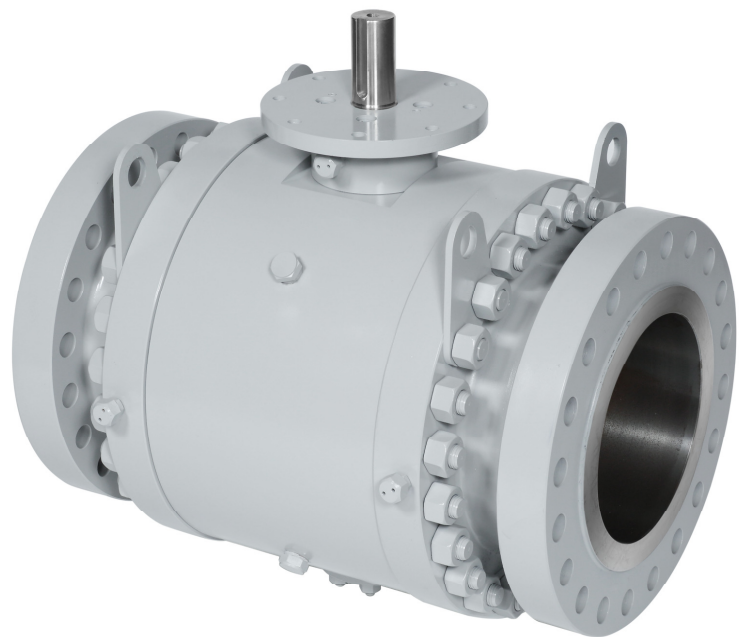


***API 6D  
BALL VALVE  
Series E1 / E2***

***I*NSTALLATION  
*O*PERATION AND  
*M*AINTENANCE  
MANUAL**



## API 6D TRUNNION MOUNTED BALL VALVE

General Instructions	<p>This manual provides installation, operation and maintenance information for StarVal® E1 series and E2 series ball valves. The procedures as indicated in this manual must be carefully followed in order to ensure satisfactory performance of these valves.</p> <p>These instructions are intended for use by personnel who are responsible for installation, operation or maintenance of E1 series and E2 series ball valves. Refer to the identification plate attached to the valve, and also to the product bulletin for information regarding materials of construction and product limitations.</p> <p>Due to the variety of services on which this product can be employed, it is the end user's responsibility to ensure the compatibility of the media with the materials of construction of the products for each specific application (i.e. corrosion and erosion which may affect the integrity of the pressure-containing envelope).</p>
Safety Message	<p>Safety messages in these instructions and on the label(s) on the valve are flagged with one of the words : Caution, Warning or Danger. These message must be carefully read and followed to avoid personnel injury and/or equipment damage.</p> <p>After installation, if a safety label on the valve becomes difficult to see or read, or if a label has been removed, please contact StarVal® for replacement label(s).</p> <p>If the processes or environments that the products are used in are likely to cause temperatures(high or low) that may cause injury to personnel if touched, then adequate insulation/protection must be installed on the valves.</p> <p>If the equipment is to be used on flammable gas duty, ensure that the operational parameters as indicated on the product identification plate cannot be exceeded.</p> <p>Never use a valve on a duty which exceeds its prescribed operating parameters. Refer to StarVal's technical papers for further information.</p> <p>The valves should be protected by pressure relief devices in order to prevent the possibility of over-pressurization. The valves must be installed in a manner that does not add excessive piping stress to the valve.</p>
Environmental instructions	<p>Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified according to ISO 14001.</p> <p>Please help us fulfill this obligation by observing the environmental instructions in this manual: Chapter "Inspection", "Storage", "Disposal"</p>
Inspection	<p>The valves have been packaged to provide ample protection during shipment. However, if the valves are mishandled in transit, the valves could be damaged. Upon arrival at its final destination, the valves should be carefully inspected for damage.</p> <p>If damage exists, a damage claim should be filed immediately with the carrier.</p>
Storage	<p>Units should be stored in a clean, cool and dry location, and should be protected from dirt, paper stock, dust, and other contaminants. If outdoor storage is necessary, the unit should be wrapped in plastic and stored high enough so that it will not be immersed in water or buried in snow.</p> <p>Carbon steel valves are coated in a de-watering oil.</p>

## **API 6D TRUNNION MOUNTED BALL VALVE**

Replacement Parts	<p>Recommended spare parts are listed on the materials of construction. These parts should be stocked to minimize downtime. If four or more valves are in use, it is advisable to stock one complete valve as a spare.</p> <p>Replacement parts may be ordered from the local StarVal® sales representative, or directly from StarVal®, as listed on the back cover.</p>
Disposal	<p>Valves consist of materials which can be recycled by specialized recycling companies. Mark the equipment as scrap and dispose of it according to the legal regulations of your government.</p>
STARVAL Service	<p>Contact a StarVal® sales representative or visit our website at <a href="http://www.starval.net">www.starval.net</a> for more information.</p>

### **WARNING**

**If ball valves are throttled, there could be damage to the seat and/or ball. If throttling is required, please consider the choice of seat and ball**

# API 6D TRUNNION MOUNTED BALL VALVE

## PARTS REFERENCE

ITEM NO.	DESCRIPTIONS	ITEM NO.	DESCRIPTIONS	ITEM NO.	DESCRIPTIONS
100	BODY	104B	THRUST,STEM	140A	STUD,TRUNNION
101	CLOSURE	110	SEAT RETAINER	140B	NUT,TRUNNION
101A	GASKET	111	PACKING	140C	GASKET,TRUNNION
101B	STUD BOLT	120	O-RING,BODY	150	ADAPTOR PLATE
101C	HEAVY HEX NUT	121	O-RING,SEAT RETAINER	150A	CAP SCREW,ADAPTOR PLATE
102	BALL	122	O-RING,GLAND	150C	SPRING PIN
102A	BEARING_BALL	123	O-RING,STEM	181	DRAIN PLUG
102B	THRUST WASHER_BALL	124	O-RING,TRUNNION	183	VENT PLUG
103	INSERT SEAT	130	GLAND	199	KEY
103A	SPRING	130A	SCREW,GLAND	222	FIRE SEAL
104	STEM	130C	GASKET,GLAND	999	GROUND SPRING
104A	BEARING,STEM	140	TRUNNION		

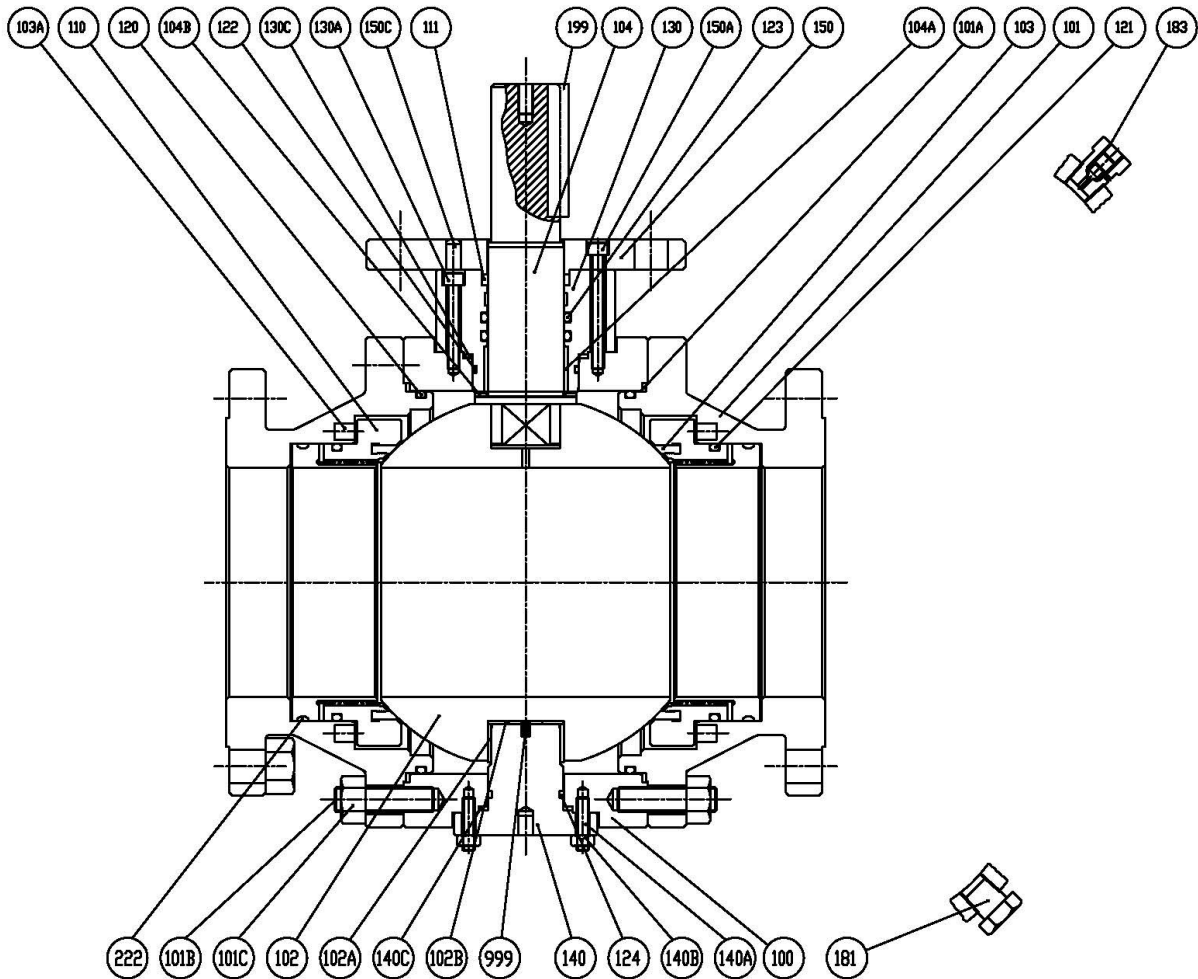


Figure a  
Typical Trunnion Ball Valve ( E1 Model)

# API 6D TRUNNION MOUNTED BALL VALVE

## PARTS REFERENCE

ITEM NO.	DESCRIPTIONS	ITEM NO.	DESCRIPTIONS	ITEM NO.	DESCRIPTIONS
100	BODY	110	SEAT RETAINER	150	ADAPTOR PLATE
101	CLOSURE	111	PACKING	150A	SCREW,A/P
101A	GASKET	115	RETAINER,BALL	150C	ANCHOR,A/P
101B	STUD BOLT	115A	BEARING,RETAINER	180	DRAIN PLUG
101C	HEX NUT	115B	DOWEL,RETAINER	181	VENT PLUG
101D	DOWEL_BODY	115C	SPACER,RETAINER	188	FEET
102	BALL	120	O-RING,BODY	189	LUG
103	INSERT SEAT	121	O-RING,S/R	199	KEY
103A	SPRING	122	O-RING,GLAND	211	SEALANT FITTING
104	STEM	123	O-RING,STEM	212	SEALANT FITTING
104B	THRUST,STEM	130	GLAND	222	FIRE SEAL
104C	BEARING,STEM	130A	SCREW,GLAND	990	GOUND SPRING
104D	ANTISTATIC DEVICE	130C	GASKET,GLAND		

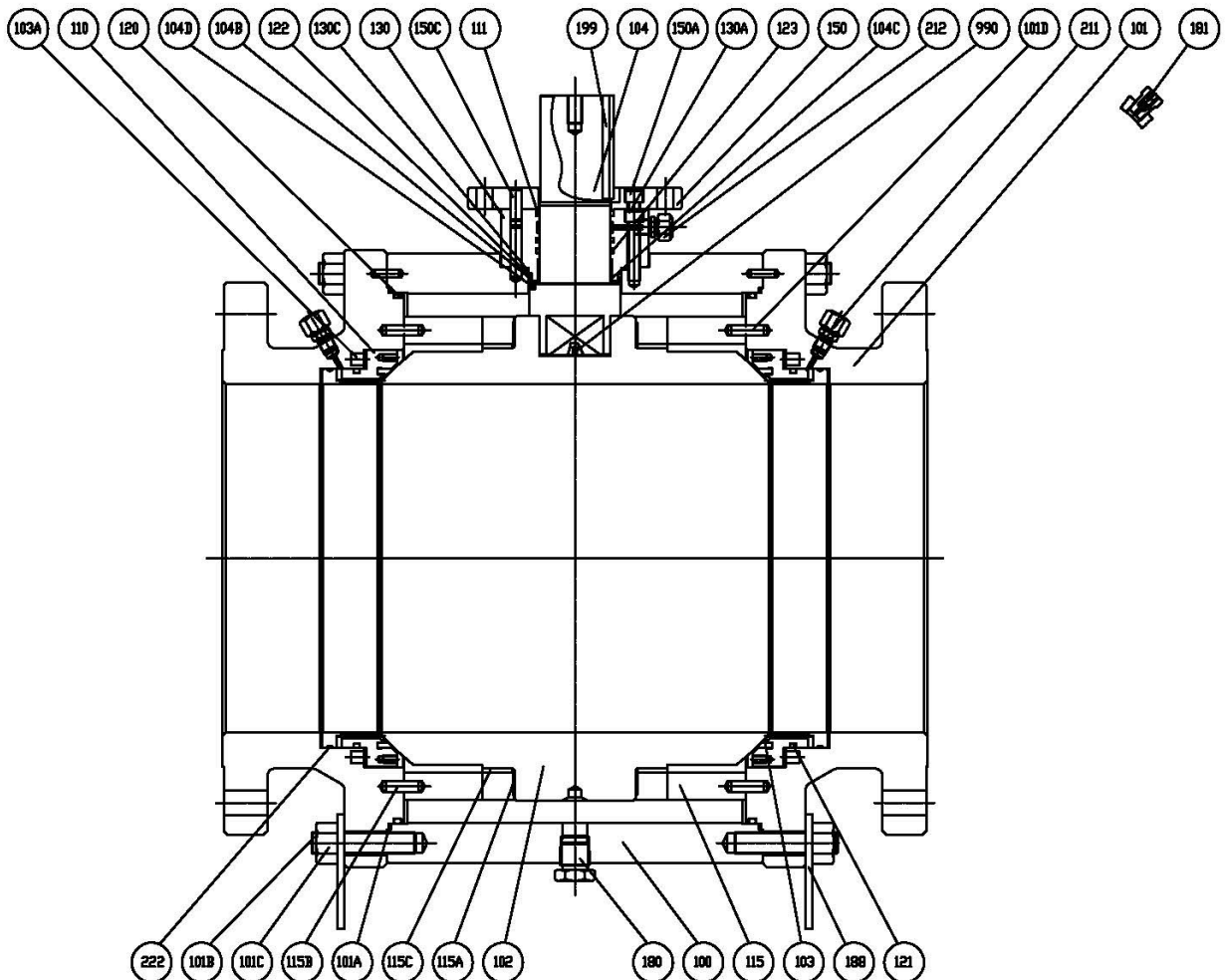


Figure b  
Typical Trunnion Ball Valve ( E2 Model)

## 1. INSTALLATION AND OPERATION

### 1.1 INSTALLATION

1.1.1 Be sure that the valve is in the “OPEN” position.

1.1.2 Remove the flange covers.

1.1.3 Install the valve on the pipework. Strictly avoid any operation of the valve until cleaning of pipework is complete.

1.1.4 Significant problems can arise with any valve installed in an unclean pipeline. Ensure that the pipeline has been flushed free of dirt, weld spatter etc. before installation.

1.1.5 The valve may be installed in any position and offers 1-way or 2-way tightness.

However we do not recommend installing the valve with the stem pointing downward because dirt in the pipeline may then enter the body cavity and damage the gland packing.

The position to be avoided is shown in Fig.1

1.1.6 It may be necessary to firmly support the pipeline in order to protect the valve from excess stress.

Sufficient support will also reduce pipeline vibration and thus ensure proper functioning of the positioner.(see. Fig. 2)

If actuators are mounted to the side of a valve the actuators should be supported in order to reduce side loading on the valve stem

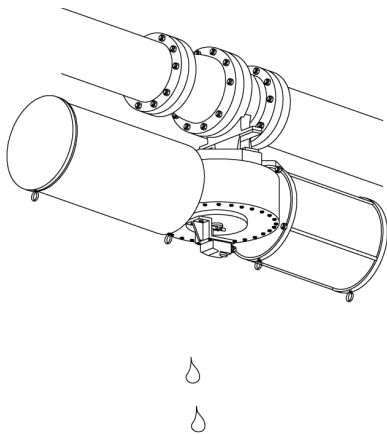


Fig 1. Avoid this mounting position

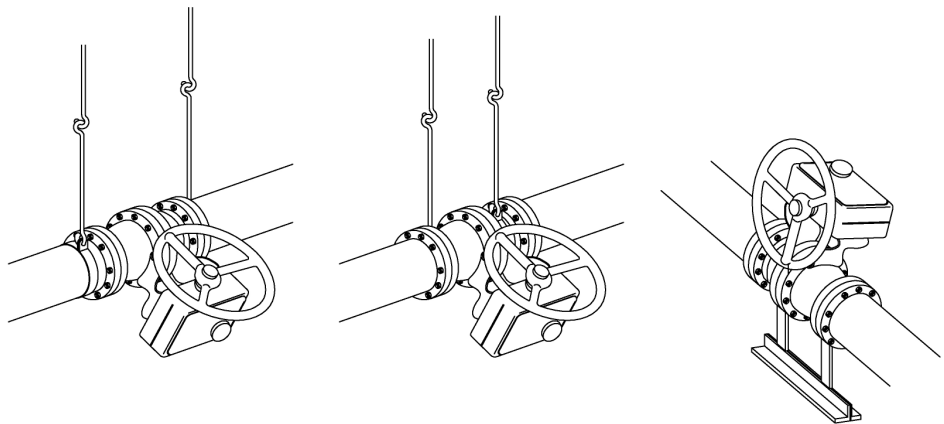


Fig 2. Ways of supporting a ball valve

1.1.7 Automated valve products should only be installed by trained and qualified personnel who have knowledge of how specific pneumatic products are to be piped and electrically connected.

Install automatic valve products only in systems which contain adequate safeguards to prevent injury or damage in the event of product failure.

Insure that the system has provisions for turning air and electrical power off and for exhausting all air trapped within the system.

1.1.8 Automated valve products are designed primarily to be operated with air or other inert gases.

For use with other media, contact our sales division.

When solenoid piloted valves are used for vacuum service, an external pilot supply must be used.

1.1.9 Before installing any pneumatic product, air lines must be blown clean to remove all contamination.

Clean air line filters after purging is completed.

1.1.10 Handling

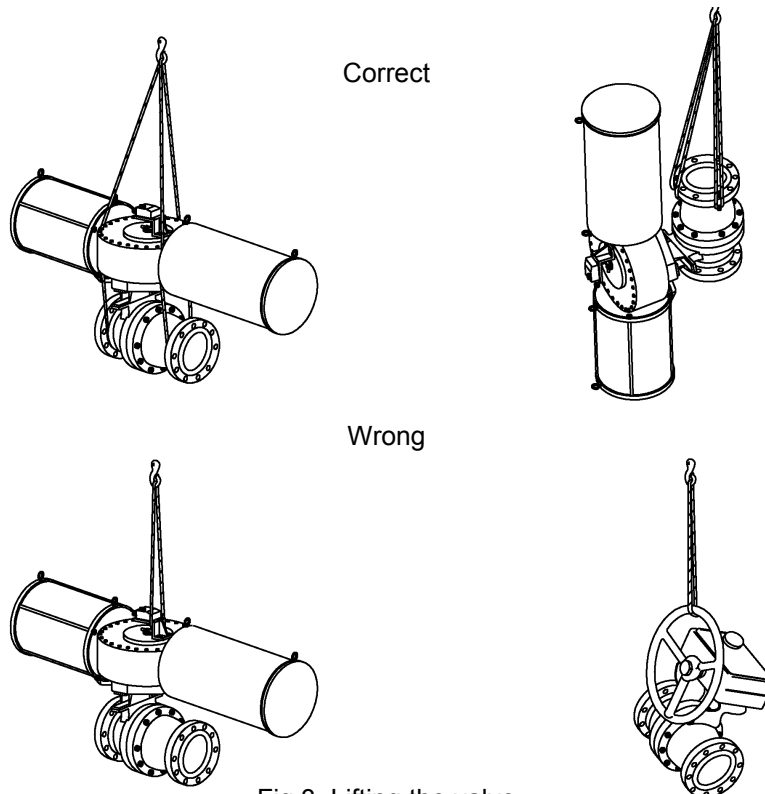


Fig 3. Lifting the valve

1.2 OPERATION

Unless otherwise stated the valve closes by rotating 90° in the clockwise direction

The maximum (human) operator force required to seat or unseat the valve at the maximum specified differential pressure of service condition shall not exceed 360N(80 pounds)at the rim of the hand-wheel or lever.

1.2.1 Lever Operated Valves

The lever of the lever operated valve acts as the position indicator.

- Valve is open when the lever is in the line with the flow.
- Valve is close when lever is perpendicular to the flow.

Unless otherwise stated the valves close by rotating 90° in the clockwise direction.

If requested, valves can be locked in a position by means of a padlock.

1.2.2 Gear Operated Valves

To open /close gear operated valves rotate the handweel.

Unless otherwise stated the valves close by rotating in the clockwise direction.

On the top of gear box there is a position indicator.

If requested, valves can be locked in a position by means of a padlock and can be operated by means of air wrench.



Fig 4. Padlock Shape

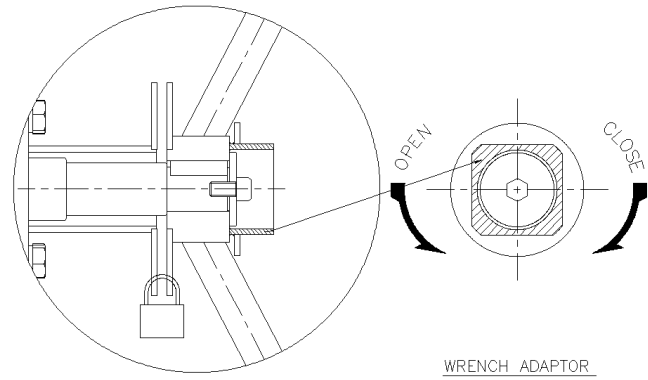


Fig 5. Air Wrench Operation Shape

### 1.2.3 Air Wrench Operation

- Rotate the gear operator handwheel until the valve is in the slightly opened position from the fully closed position.
- Next, connect an air wrench to the wrench adaptor of the gear.
- Rotate the gear operator handwheel using an air wrench until valve is in the fully opened position.

## CAUTION

**Ball Valves must be only used in the fully open or closed position to prevent damage to soft seats.  
Use for any form of flow control is not recommended for valves with soft seats.**

## 2. DISASSEMBLY FOR MAINTENANCE

### 2.1 VALVE REMOVAL FROM THE LINE

- 2.1.1 Isolate the line, rotate the ball to the "OPEN" position and bleed any residual pressure from the vent plug(P# 181) and any residual liquid from the drain plug(P# 180).
- 2.1.2 Remove the valve from the line and position the valve in order to have the stem side accessible.

## WARNING

**Depressurize the line and valve as follows: Open the valve and drain the line. Close and open the valve to relieve any residual pressure that may be in the valve prior to removing the valve from service. Leave the valve in the open position. After removal and prior to any disassembly, drain any remaining media by placing the valve in a vertical position and carefully closing and opening the valve several times.**



### 3. GEAR OPERATOR OR ACTUATOR DISASSEMBLY

3.1. Unscrew the screw connecting the gear operator or the actuator to the Adaptor plate(P# 150).

Remove the gear operator or the actuator, avoiding any damage to the key connecting the gear case operator or the actuator to the stem(P# 104).

3.2 If the valves DN 6" or above are equipped with a wrench, unscrew the screw and remove the wrench.

### 4. BALL VALVE DISASSEMBLY

#### General

During the disassembly operation, the matched items must be marked in order to assure the correct case positioning during the assembly operation.

Mark : Body(P# 100), Closure(P# 101)

#### 4.1 Disassembly of Model E1(Refer to Fig.a)

4.1.1 Rotate the Ball(P# 102) to the closed position.

4.1.2 Remove the Key(P# 199). Unscrew the Cap screw(P# 150A) and remove the Adaptor plate (P# 150).

4.1.3 Unscrew the Cap screw(P# 130A) and remove the Gland(P# 130) from the Body.

4.1.4 Withdraw the Stem(P# 104) from the Gland (P# 130) avoiding to damage the Stem sealing surface. Remove the Thrust washer(P# 104B) from the Stem.

4.1.5 Remove the O-ring/gland(P# 122) from inside the Gland being careful to avoid to damage.

4.1.6 Remove the Gasket(P# 130C) from the Gland and replace it.

4.1.7 Place the assembly on a wooden surface from bottom of the Gland. Remove the Packing (P# 111) and replace it.

4.1.8 Unscrew the Stud and nut(P# 140A and 140B) and separate the Trunnion pin(P# 140) from the body(P# 100).

4.1.9 Remove the O-ring(P# 124) and the gasket(P# 140C) from the Trunnion pin.

4.1.10 Unscrew the closure heavy hex nut(P# 101C) and separate the closure(P# 101) from the body(P# 100). Do the same for both sides.

4.1.11 Remove the Body gasket(P# 101A) and replace it and remove the O-ring(P# 120).

4.1.12 Hook the Ball with a soft belt and remove the Ball from the body. Be careful to not damage the sealing surface of the ball. Place all together on a wooden surface.

4.1.13 Withdraw the Seat retainer(P# 110) from the Closure(P# 101). Do the same for both sides.

4.1.14 Remove the O-ring(P# 121) from the Seat retainer.

4.1.15 Remove the spring(P# 103A) from the Closure. Do the same for both sides.

4.1.16 Verify that the springs(P# 103A) are not crushed or flattened, replace them if necessary.

4.1.17 Check if the Bearing-ball(P# 102A) is damaged or oval and replace it if necessary.

4.2 Disassembly of Model E2(Refer to Fig.b)

- 4.2.1 Rotate the Ball(P# 102) to the closed position.
- 4.2.2 Remove the Key(P# 199). Unscrew the Cap screw(P# 150A) and remove the Adaptor plate (P# 150)
- 4.2.3 Unscrew the Cap screw(P# 130A) and remove the Gland(P# 130) from the Body.
- 4.2.4 Withdraw the Stem(P# 104) from the Gland (P# 130) avoiding damage to the Stem sealing surface. Remove the Thrust washer(P# 104B) from the Stem.
- 4.2.5 Remove the O-ring/gland(P# 122) from inside the Gland avoiding to not damage it.
- 4.2.6 Remove the Gasket(P# 130C) from the Gland and replace it.
- 4.2.7 Place the assembly on a wooden surface from bottom of the Gland. Remove the Packing (P# 111) and replace it.
- 4.2.8 Unscrew the closure heavy hex nut(P# 101C) and separate the closure(P# 101) from the body(P# 100). Do the same for both sides.
- 4.2.9 Remove the Body gasket(P# 101A) and replace it and remove the O-ring(P# 120).
- 4.2.10 Hook the Ball with a soft belt and remove the Ball from the body. Be careful to not damage the sealing surface of the ball. Place all together on a wooden surface.
- 4.2.11 Split the 2-pieces of Trunnion block(P# 115) from the Ball. Check if the Bearings-ball(P# 115A) is damaged or oval and replace it if necessary.
- 4.2.12 Split the Seat retainer(P# 110) from the Closure(P# 101). Do the same for both sides.
- 4.2.14 Remove the O-ring(P# 121) from the Seat retainer.
- 4.2.15 Remove the spring(P# 103A) from the Closure. Do the same for both sides.
- 4.2.16 Verify that the springs(P# 103A) are not crushed or flattened, replace them if necessary.

**CAUTION**

**During this operation, Be careful of doing not damage the sealing surface of the ball and seat insert**

5. ASSEMBLY

FOR VALVE ASSEMBLY FOLLOW THE DISASSEMBLY INSTRUCTION IN THE REVERSE MANNER. NUTS(P# 101C) MUST BE TIGHTENED TO THE TORQUES STATED IN THE TABLE 1.1 OR 1.2.

**CAUTION**

**During these operations, the greatest cleanliness must be ensured**  
**During assembly operations check for:**  
- the marks for the body and closure coincide;  
- correct alignment of the Trunnion block with the ball axis to avoid distortion of the pins(P# 115B) during the assembly of closure.

### 6. MAINTENANCE

#### 6.1 GENERAL

The following checks which should be part of routine maintenance will help extend life further and reduce plant problems :

- 6.1.1 After every 2500 cycles or 3 months, check for any sign of leakage (See sections 2.2, 2.3, 2.4) and that all fasteners (including the gland screw) and joints are tightened to their correct torque value.
- 6.1.2 The valve should not be left standing without operation for more than 1 month. After a period of inactivity, the valve should be operated through three full cycles.
- 6.1.3 After this period the valve should be operated through three full cycles.

#### 6.2 IN-LINE LEAKAGE

In the event that the valve is leaking through the line, check that the valve is fully closed. If leakage still occurs, then it will be necessary to disassemble the valve to examine it for possible damage to the body, ball or seat sealing surface.

#### 6.3 STEM LEAKAGE

Remove the handle assembly, or the actuator, followed by re-tightening of the gland screw to the proper torque.

#### 6.4 BODY/CONNECTOR JOINT LEAKAGE

Check that the body bolting is tightened to the recommended torque values and tighten if necessary. If leakage still occurs it will be necessary to remove the valve body from line to replace the body seal and to establish whether the seal faces of the body and connector have been damaged. If not, it is possible that the piping gaskets needs to be replaced.

#### 6.5 PREVENTIVE MAINTENANCE

- 6.5.1 In order to avoid failure during operation, all valves in a process plant should be periodically inspected thoroughly for wear on the ball, seats, seals, or body. If wear is discovered, StarVal recommends replacing seats, seals, gaskets, and packing with genuine StarVal parts. Check the electrical continuity of the valve and pipeline.
- 6.5.2 The type of process, fluids involved, working conditions, and location of the valve in the process plant, will determine the frequency of the inspection/maintenance.
- 6.5.3 Preventive maintenance is essential as the failure due to lack of maintenance may cause an emergency shutdown of the plant.
- 6.5.4 Before removing the valve from the pipe, it is important to mark the relative position of the valve flange with respect to pipeline flange and the flow direction of the valve.
- 6.5.5 Once a valve is repaired, it should undergo a complete set of tests to make sure that the valve is adequate for the original working conditions. Hydrostatic/pneumatic shell/seat tests should be carried out as per the specifications relevant to the valve.  
Note: Clean the valve carefully of all media. Inform StarVal of any dangerous media involved when sending the product to StarVal for servicing.
- 6.5.6 No special tools are required.
- 6.5.7 Worm gear boxes are supplied with grease. Normally the grease is suitable for -20°C (-4°F) to 80°C (176°F.) For other applications, consult the Factory/Branch office.
- 6.5.8. Grease as necessary.
  - 6.5.8.1 Grease should be changed if operated frequently, after approximately three years.
  - 6.5.8.2. If operated rarely, after approximately five years.
  - 6.5.8.3. The primary reducing spur gear unit attached to main worm gearbox should be re-greased at least annually.

Note: Disassembly of the gear box should be done only by experienced, trained operators and as directed by StarVal.

## API 6D TRUNNION MOUNTED BALL VALVE

### 7. LUBRICATION

- 7.1 Lubricate with high quality grease all the metallic surfaces that are in contact during the ball movement.  
Use MOLY guard PASTA.35 or equivalent.
- 7.2 Lubricate with high quality grease on the “O” rings.  
Use OKS 111 MoS2 spray or equivalent.
- 7.3 Do not lubricate the “DU” bearing(P# 102A, P# 104A) because they are self-lubricating.

### 8. EMERGENCY SEAT SEALANT INJECTION

- 8.1 StarVal Ball valves are designed for long term operation without routine maintenance. Regular injection of Sealant is expressly not recommended.
- 8.2 StarVal Ball valves have the provision(when specified) for emergency seat sealant injection.  
This feature provides a means for emergency seal of a damaged sealing surface using sealant. Injecting sealant in the upstream seat fitting will provide complete sealing in most downstream leakage situations. Operation of the valve after sealant injection usually requires re-injection of sealant.

#### 8.3 Emergency Sealant Injection Procedure

Remove the sealant fitting safety cap (**Caution : Watch the fitting body to insure that it does not turn while turning the cap. Do not attempt removal of the fitting while the valve is subjected to line pressure. A back-up wrench on the fitting body may be required.**)

Using an appropriate grease gun and sealant, inject sealant into both upstream sealant fittings while observing leakage. Inject sealant only sufficient to eliminate leakage. Continued injection is wasteful and contaminates the flow stream.

### 9. ADVISED SPARE PARTS FOR MAINTENANCE

#### COMMON SPARE PARTS:

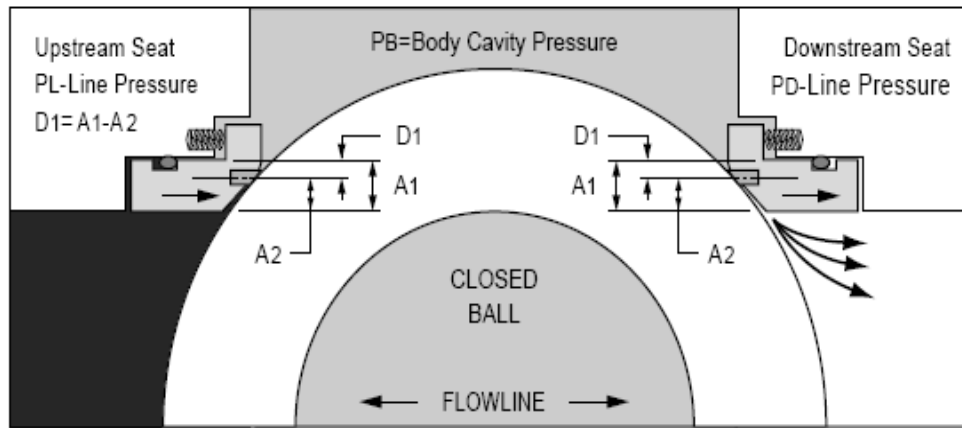
SET O-RING	Closure o-ring	(P# 120)
	Seat seal o-ring	(P# 121)
	Stem o-ring	(P# 122)
	Gland o-ring	(P# 123)
	Trunnion o-ring	(P# 124)
SET GASKET	Body gasket	(P# 101A)
	Gland gasket	(P# 130C)
	Trunnion gasket	(P# 140C)
BEARING	Bearing-ball	(P# 102A)
	Bearing-stem	(P# 104A)
	Bearing-trunnion block	(P# 115A)
SPRING	Seat spring	(P# 103A)

#### FOR VALVE WITH INSERT SEAT ONLY:

SEAT UNIT	Seat retainer	(P# 110)
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## API 6D TRUNNION MOUNTED BALL VALVE

### 10. FIELD TEST PROCEDURE FOR TRUNNION MOUNTED BALL VALVE



10.1 For the single piston trunnion mounted ball valve, the upstream seat must always be activated if the valve is in the closed position. The downstream seat has a self relieving function in the event of overpressure in the body cavity.

#### 10.2 TRUNNION MOUNTED BALL VALVE TEST PROCEDURE

- 10.2.1 Open the ball half (Turn handle to angle 45°).
- 10.2.2 Allow the cavity pressure PB to be equal to that of upstream pressure PL
- 10.2.3 Turn the valve to the closed position so that the cavity retains full line pressure
- 10.2.4 Vent the pressure in the cavity by opening the vent plug (Item 180 or 181)
- 10.2.5 Perform a leak test on the valve using the vent connection of the body

### 11. RECOMMENDED TORQUE TABLE FOR NUTS AND SCREWS ON TRUNNION BALL VALVES

Table 1.1 – Recommended flange bolt torque (API Grease)

Bolt size	L7, L43, B16, B7 or Gr660 material Make-up at 67% of Yield stress				L7, L43, B16, B7 or Gr660 material Make-up at 73% of Yield stress			
	Bolt tension		Make up torque		Bolt tension		Make up torque	
	lbf	kN	ft lbf	Nm	lbf	kN	ft lbf	Nm
1/2 - 13 UNC	(9,983)	44.17	(80)	108	(10,880)	48.38	(87)	118
5/8 - 11 UNC	(15,900)	70.72	(155)	210	(17,320)	77.06	(169)	229
3/4 - 10 UNC	(23,530)	104.66	(270)	366	(25,630)	114.04	(294)	398
7/8 - 9 UNC	(32,480)	144.49	(430)	582	(35,395)	157.43	(467)	634
1 - 8 UN	(42,615)	189.56	(639)	866	(46,430)	206.53	(696)	944
1 1/8 - 8 UN	(55,610)	247.36	(924)	1,252	(60,590)	269.51	(1,006)	1,365
1 1/4 - 8 UN	(70,330)	312.84	(1,283)	1,739	(76,630)	340.86	(1,398)	1,895
1 3/8 - 8 UN	(86,777)	386.00	(1,724)	2,337	(94,548)	420.57	(1,878)	2,547
1 1/2 - 8 UN	(104,950)	466.84	(2,256)	3,059	(114,349)	508.65	(2,458)	3,332
1 5/8 - 8 UN	(124,852)	555.37	(2,887)	3,914	(136,032)	605.11	(3,145)	4,264
1 3/4 - 8 UN	(146,480)	651.57	(3,625)	4,915	(159,560)	709.93	(3,950)	5,355
1 7/8 - 8 UN	(169,833)	755.46	(4,480)	6,074	(185,044)	823.11	(4,880)	6,618
2 - 8 UN	(194,914)	867.02	(5,460)	7,401	(212,370)	944.66	(5,947)	8,063
2 1/4 - 8 UN	(250,256)	1,113.19	(7,823)	10,607	(272,665)	1,212.88	(8,524)	11,557
2 1/2 - 8 UN	(312,504)	1,390.09	(10,787)	14,625	(340,490)	1,514.57	(11,753)	15,935
2 5/8 - 8 UN <sup>1)</sup>	(313,245)	1,393.38	(11,322)	15,351	(341,297)	1,518.16	(12,337)	16,725
2 3/4 - 8 UN <sup>1)</sup>	(345,310)	1,536.02	(13,043)	17,684	(376,234)	1,673.57	(14,211)	19,268

<sup>1)</sup> Calculated based on reduced yield strength of 655 MPa (95,000 psi)

NOTE Metric equivalents for bolt tension and make up torque are listed for convenience, even though inch-size bolts are recommended For use with this part of ISO 13628.

The criteria of bolt torque value is 67 % of Yield stress but allowed by 73% of yield stress.

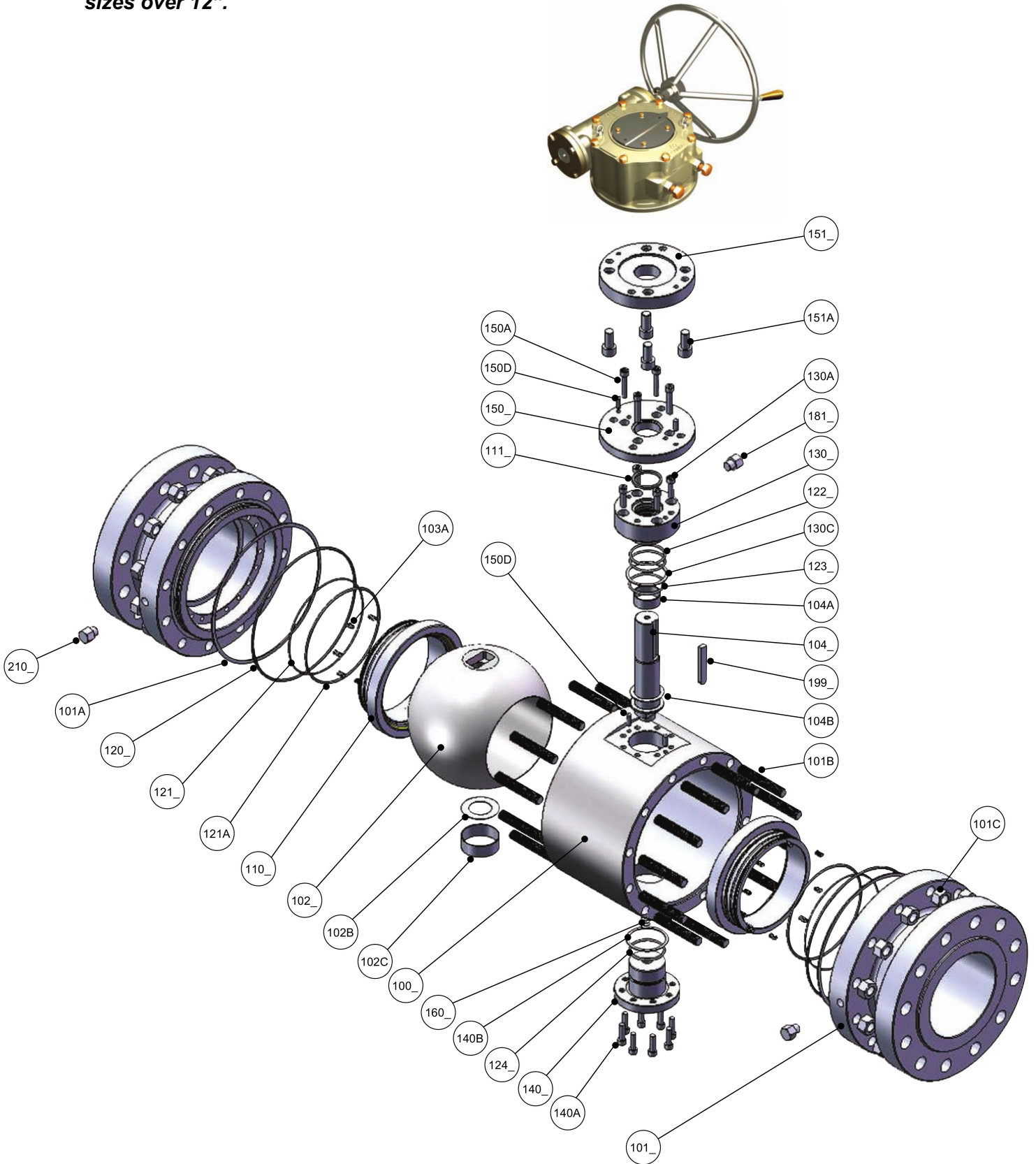
**API 6D TRUNNION MOUNTED BALL VALVE**

Table 1.2 – Recommended flange bolt torque (API Grease)

Bolt size	L7M or B7M material Make-up at 67% of Yield stress				L7M or B7M material Make-up at 73% of Yield stress			
	Bolt tension		Make up torque		Bolt tension		Make up torque	
	lbf	kN	ft lbf	Nm	lbf	kN	ft lbf	Nm
1/2 - 13 UNC	(7606)	33.83	(61)	82	(8,287)	36.86	(67)	89
5/8 - 11 UNC	(12114)	53.88	(118)	160	(13,199)	58.71	(129)	174
3/4 - 10 UNC	(17927)	79.74	(206)	279	(19,533)	86.88	(225)	304
7/8 - 9 UNC	(24750)	110.09	(327)	443	(26,967)	119.95	(356)	483
1 – 8 UN	(32468)	144.42	(487)	660	(35,376)	157.35	(531)	719
1 1/8 – 8 UN	(42368)	188.46	(704)	954	(46,162)	205.34	(767)	1,039
1 ¼ - 8 UN	(53584)	238.35	(977)	1,325	(58,383)	259.70	(1,065)	1,444
1 3/8 – 8 UN	(66116)	294.10	(1,314)	1,781	(72,037)	320.44	(1,432)	1,941
1 ½ - 8 UN	(79963)	355.69	(1,719)	2,330	(87,124)	387.54	(1,873)	2,539
1 5/8 – 8 UN	(95125)	423.14	(2,200)	2,982	(103,644)	461.03	(2,397)	3,249
1 ¾ - 8 UN	(111603)	496.44	(2,762)	3,745	(121,597)	540.90	(3,009)	4,080
1 7/8 – 8 UN	(129397)	575.59	(3,413)	4,628	(140,985)	627.14	(3,719)	5,043
2 – 8 UN	(148506)	660.59	(4,159)	5,639	(161,805)	719.75	(4,532)	6,114
2 ¼ - 8 UN	(190671)	848.15	(5,961)	8,081	(207,746)	924.10	(6,495)	8,805
2 ½ - 8 UN	(238098)	1,059.11	(8,218)	11,143	(259,420)	1,153.96	(8,954)	12,141
2 5/8 – 8 UN <sup>1</sup>	(263785)	1,173.37	(9,534)	12,927	(287,408)	1,278.45	(10,388)	14,085
2 ¾ - 8 UN <sup>1</sup>	(290787)	1,293.49	(10,984)	14,892	(316,828)	1,409.32	(11,968)	16,226

# API 6D TRUNNION MOUNTED BALL VALVE

Valves from 2" through 4" have 2-pieces body. 6" through 12" are in 3-pieces body design. This design is standard in sizes 2" through 12" for all pressure class and available in sizes over 12".



Model E1 – Typical shape

## API 6D TRUNNION MOUNTED BALL VALVE

ITEM NO.	DESCRIPTION	MATERIALS †				REMARKS
		STANDARD	SOUR SERVICE NACE MR0175/ ISO 15156	LOW TEMP. up to -50°F	CORROSIVE SERVICE	
100	BODY	A105		A350 LF2	A182 F316	
101	END CAP	A105		A350 LF2	A182 F316	
101A	GASKET †	S.S316/GRAPHITE				
101B	STUD BOLT	A193 Gr. B7	A193 Gr. B7M	A320 Gr. L7M	A193 Gr. B8M Cl.2	
101C	HEAVY HEX NUT	A194 Gr. 2H	A194 Gr. 2HM	A194 Gr. 7M	A194 Gr. 8M	
102	BALL	A105/ENP		A350 LF2/ENP	A182 F316	
102A	BEARING-BALL	METAL BACK PTFE				
102B	THRUST WASHER	METAL BACK PTFE				
103	SEAT INSERT	PTFE				Note <sup>1)</sup>
103A	SPRING	17-7PH or INCONEL X-750			S.S302 or S.S316	
104	STEM	AISI 1040/ENP		A350 LF2/ENP	A182 F316	
104A	BEARING	METAL BACK PTFE				
104B	THRUST WASHER	METAL BACK PTFE				
110	SEAT RETAINER	A105/ENP		A350 LF2/ENP	A182 F316	
111	PACKING	FLEXIBLE GRAPHITE				
120	O-RING	HNBR or Viton <sup>®</sup>		Viton <sup>®</sup> GLT -50°F	HNBR or Viton <sup>®</sup>	
121	O-RING	HNBR or Viton <sup>®</sup>		Viton <sup>®</sup> GLT -50°F	HNBR or Viton <sup>®</sup>	
121A	O-RING	HNBR or Viton <sup>®</sup>		Viton <sup>®</sup> GLT -50°F	HNBR or Viton <sup>®</sup>	
122	O-RING	HNBR or Viton <sup>®</sup>		Viton <sup>®</sup> GLT -50°F	HNBR or Viton <sup>®</sup>	
123	O-RING	HNBR or Viton <sup>®</sup>		Viton <sup>®</sup> GLT -50°F	HNBR or Viton <sup>®</sup>	
124	O-RING	HNBR or Viton <sup>®</sup>		Viton <sup>®</sup> GLT -50°F	HNBR or Viton <sup>®</sup>	
130	GLAND	C.S or A105		A350 LF2	A182 F316	
130A	SCREW	A193 Gr. B7	A193 Gr. B7M	A320 Gr. L7M	A193 Gr. B8M	
130C	GASKET †	S.S316/GRAPHITE				
140	TRUNNION PIN	C.S or A105		A350 LF2	A182 F316	
140A	SCREW	A193 Gr. B7	A193 Gr. B7M	A320 Gr. L7M	A193 Gr. B8M Cl.2	
140B	GASKET †	S.S316/GRAPHITE				
140C	HEX NUT	A194 Gr. 2H	A194 Gr. 2HM	A194 Gr. L7M	A194 Gr. 8M	
150	ADAPTOR PLATE	C.S			S.S316	
150A	SCREW	A193 Gr. B7	A193 Gr. B7M	A320 Gr. L7M	A193 Gr. B8M Cl.2	
150D	ANCHOR PIN	S.S304				
151	MOUNTING PAD	C.S			S.S304	
151A	SCREW	A193 Gr. B7	A193 Gr. B7M	A320 Gr. L7M	A193 Gr. B8M Cl.2	
160	ANTI-STATIC	S.S316L				
180	DRAIN PLUG	C.S/Zn plated		F316		
181	VENT PLUG	C.S/Zn plated		F316		
199	SQUARE KEY	AISI 4140				
210	SEALANT FITTING	C.S/Zn plated		F316		Note <sup>3)</sup>
211	SEALANT FITTING	C.S/Zn plated		F316		Note <sup>3)</sup>

† Other materials available on request

### Note

<sup>1)</sup> Inserted seat material – Viton(O-ring), Nylon, PEEK, Devlon, others...

<sup>2)</sup> All valves are certified to API 6FA

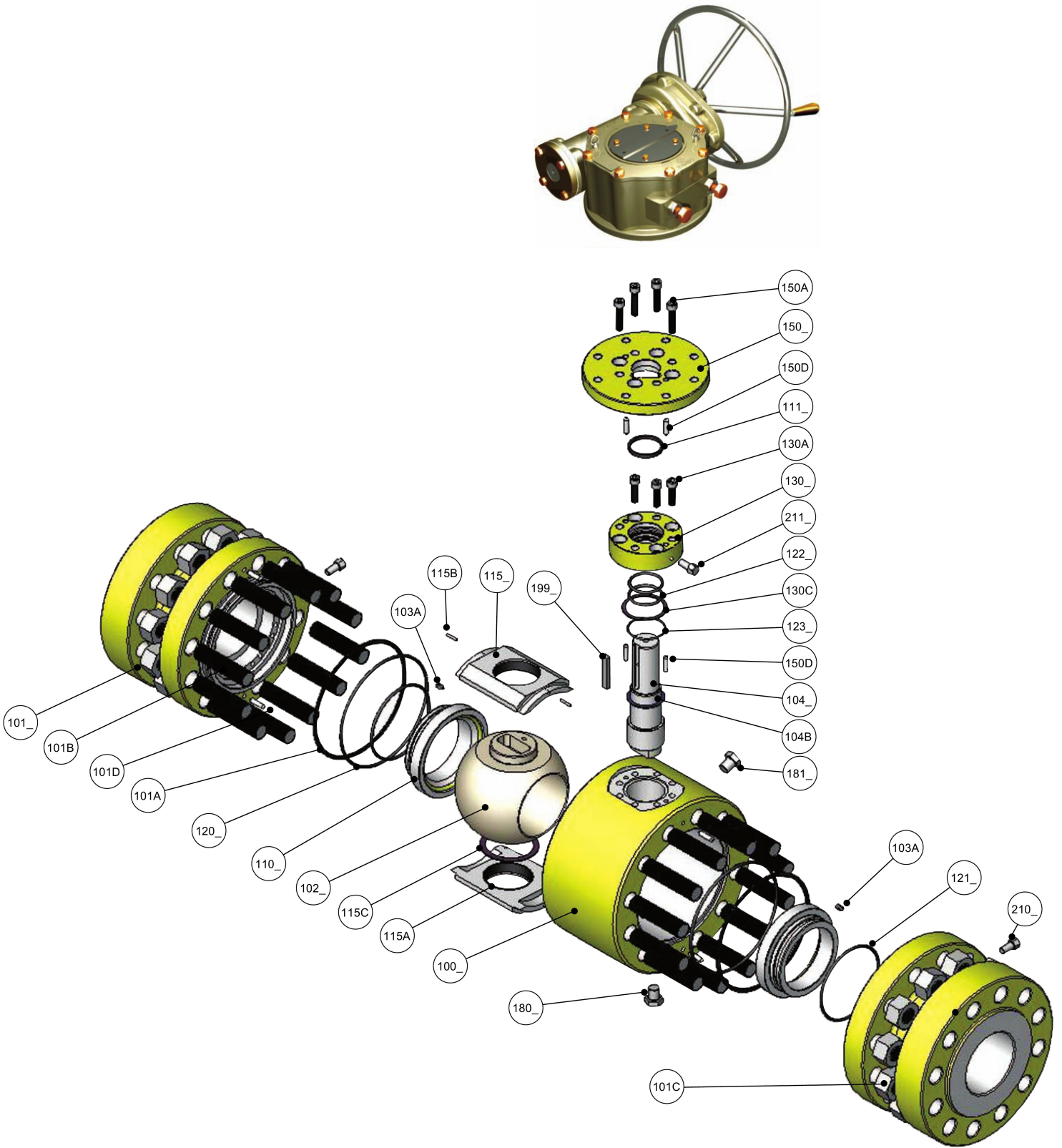
<sup>3)</sup> Available on request.

<sup>4)</sup> For project specific valve details, refer valve drawings.



**API 6D TRUNNION MOUNTED BALL VALVE**

*Model E2 have 3-pieces body design.  
This design is standard in sizes 14" and larger for all pressure class, and available  
In size below 14"*



**Model E2 – Typical shape**

**API 6D TRUNNION MOUNTED BALL VALVE**

ITEM NO.	DESCRIPTION	MATERIALS				REMARKS
		STANDARD	SOUR SERVICE NACE MR01-75/ ISO 15156	LOW TEMP. up to -50°F	CORROSIVE SERVICE	
100	BODY	A105		A350 LF2	A182 F316	
101	END CAP	A105		A350 LF2	A182 F316	
101A	GASKET †	S.S316/GRAPHITE				
101B	STUD BOLT	A193 Gr. B7	A193 Gr. B7M	A320 Gr. L7M	A193 Gr. B8M Cl.2	
101C	HEAVY HEX NUT	A194 Gr. 2H	A194 Gr. 2HM	A194 Gr. 7M	A194 Gr. 8M	
102	BALL	A105/ENP		A350 LF2/ENP	A182 F316	
103	SEAT INSERT	PTFE				Note <sup>1)</sup>
103A	SPRING	17-7PH or INCONEL X-750			S.S302 or S.S316	
104	STEM	AISI 1040/ENP		A350 LF2/ENP	A182 F316	
104B	THRUST WASHER	METAL BACK PTFE				
110	SEAT RETAINER	A105/ENP		A350 LF2/ENP	A182 F316	
115	TRUNNION BLOCK	C.S			S.S316	
115A	BEARING	METAL BACK PTFE				
115B	DOWEL PIN	S.S304			S.S316	
115C	THRUST WASHER	METAL BACK PTFE				
120	O-RING	HNBR or Viton®		Viton® GLT -50°F	HNBR or Viton®	
121	O-RING	HNBR or Viton®		Viton® GLT -50°F	HNBR or Viton®	
121A	O-RING	HNBR or Viton®		Viton® GLT -50°F	HNBR or Viton®	
122	O-RING	HNBR or Viton®		Viton® GLT -50°F	HNBR or Viton®	
123	O-RING	HNBR or Viton®		Viton® GLT -50°F	HNBR or Viton®	
130	GLAND	C.S or A105		A350 LF2	A182 F316	
130A	SCREW	A193 Gr. B7	A193 Gr. B7M	A320 Gr. L7M	A193 Gr. B8M Cl.2	
130C	GASKET †	S.S316/GRAPHITE				
150	ADAPTOR PLATE	C.S			S.S304	
150A	SCREW	A193 Gr. B7	A193 Gr. B7M	A320 Gr. L7M	A193 Gr. B8M Cl.2	
150D	ANCHOR PIN	S.S304				
151	MOUNTING PAD	C.S			S.S304	
151A	SCREW	A193 Gr. B7	A193 Gr. B7M	A320 Gr. L7M	A193 Gr. B8M Cl.2	
180	DRAIN PLUG	C.S/Zn plated		F316		
181	VENT PLUG	C.S/Zn plated		F316		
199	SQUARE KEY	AISI 4140				
210	SEALANT FITTING	C.S/Zn plated		F316		Note <sup>3)</sup>
211	SEALANT FITTING	C.S/Zn plated		F316		Note <sup>3)</sup>

† Other materials available on request

Note

<sup>1)</sup> Inserted seat material – Viton(O-ring), Nylon, PEEK, Devlon, others...

<sup>2)</sup> All valves are certified to API 6FA.

<sup>3)</sup> Available on request.

<sup>4)</sup> For project specific valve details, refer valve drawings.

**TROUBLESHOOTING**

**Fluid will not flow**

Cause	Solution
Blocking	There is an obstruction in the valve or in the pipeline. Remove the valve from the pipe and clear the obstruction.

**Leakage from ball seat**

Cause	Solution
The seat is damaged by foreign object.	Replace seat and re-install after the valve is cleaned
The seat is damaged as it is left in a throttled position (as with soft seated valve)	Replace seat. Consider usage of metal seats
The seat is damaged by thermal expansion inside the cavity of the ball	Replace the seat only after the excessive pressure is relieved from the body cavity
The seat is damaged by excessive system pressure	Please consider process changes
Unidirectional valve is installed in the wrong direction	Re-install in correct direction
Improper selection of seat material	After analysis of process conditions, replace seat with one of the correct material

**Leakage from body gasket**

Cause	Solution
Bolting torque of body bolts are not adequate	Re-set bolting torques after consulting charts for recommended bolting torques
The body bolts are subjected to piping stress	Re-install the valve after eliminating piping stress
The body gasket has been damaged by over-pressurization in the body cavity	Replace body gasket only after pressure from body cavity has been relieved

**Leakage from gland packing**

Cause	Solution
Gland bolts are not adequately tightened	Increase gland bolting torques
The packing has been worn down	Replace packing
Leakage caused by over-pressurization of the cavity	Cavity has been relieved
The gland packing has been damaged by heat cycling	Verify the packing material of the gland packing and replace with packing of correct material.

**Valve can't be operated(Manual On-Off valve)**

Cause	Solution
Foreign object is in valve body.	Replace ball seats, and do the flushing for cleaning.
Seat is worn away	Replace the ball seats. (If necessary, replace the ball also) Consider change to the metal seated ball valve.
Powdery material in the valve	Wash & flush inside body, periodically Replace the ball seats. (If necessary, replace the ball also) Recheck the sizing torque of actuator

**TROUBLESHOOTING****Valve can't be operated(Automated On-Off valve)**

Cause	Solution
Inadequate supply pressure/air volume for operation.	Use adequate supply air (Install air tank according if necessary).
Compressor trouble	Check the compressor.
Clogged and broken air tubing.	Repair the air tubing.
Defective filter regulator.	Discharge the drain.
	Replace the filter regulator.
Speed controller is improperly set	Re-set the speed controller.
Worn piston O-ring of actuator.	Replace the O-ring.
The bypass valve is opened.	Close the bypass valve.
Vent hole of solenoid valve is plugged by dust cap.	Take off the dust cap.
Air tubing is blocked by seal tape.	Repair the air tube.

**Solenoid valve can't be operated correctly**

Cause	Solution
The coil is damaged by excessive over-tightening of the conduit to the solenoid valve.	Replace the solenoid valve
The spool is transformed by too much tightening of the ring joint to the solenoid valve.	Replace the solenoid valve
The electric voltage is incorrect	Check the voltage
	Check the specification of solenoid valve
	Replace the solenoid valve
Incorrectly operated manual switch.	Operate manual switch with correct procedure.
Incorrect wiring or leaking current inside solenoid valve.	Check the wiring and repair it
Breaking of Wire.	Check the wiring and repair it
Incorrectly connected air tubing.	Check the air tubing and repair it
Foreign material (such as seal tape) entered solenoid valve.	Remove the foreign material.
	Replace the solenoid valve
The rainwater entered the solenoid valve.	Use the solenoid valve of weather proof type
	Check the conduit/the piping connection of wiring and repair them.
The pilot port is closed.	Open the pilot port.

**Limit switch can't be operated correctly**

Cause	Solution
Incorrect wiring or leaking current inside limit switch.	Check the wiring and repair it
Breaking of Wire.	Check the wiring and repair it
Limit switch in not calibrated correct.	Re-calibrate the switches

**Proximity sensor can't be operated correctly**

Cause	Solution
Detection distance is incorrect	Re-set the position of proximity switch.
Wiring mistake / breaking of wire.	Check the wiring and repair it.