

# Trunnion Mounted Ball Valve

## Features And Benefits

**Dongsan's** Valves business segment is a leading provider of valves, valve automation, and measurement systems to the oil and gas industry.

We provide large-diameter valves for use in natural gas, LNG, crude oil, and refined products transmission lines as well as in many other general industrial applications.

## Applications

**FORCE** split-body side-entry ball valves are manufactured in a wide range of diameters and pressure classes.

In the standard versions, the valves are specified for transmission pipelines, pumping, compression and reinjection units, offshore platforms, onshore terminals, pig traps, measuring stations, and surge-relief skids.

These valves also can be built for speciality applications, such as LNG plants.

Split-body construction allows the use of forged materials in various grades of carbon steel, stainless steel, and high alloys, equipping the valves for some of the most severe service conditions.



## PRODUCT RANGE, FULL & REDUCED PORT, FLANGED ENDS

Size		ASME Class					
DN	NPS	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
50	2	● Lever	● Lever	● Lever	● Lever/Gear	● Lever/Gear	■ Gear
75	3	● Lever	● Lever	● Lever/Gear	● Lever/Gear	● Lever/Gear	■ Gear
100	4	● Lever/Gear	● Lever/Gear	● Lever/Gear	● Gear	● Gear	■ Gear
150	6	● Lever/Gear	● Lever/Gear	● Gear	● Gear	● Gear	■ Gear
200	8	● Gear	● Gear	● Gear	● Gear	● Gear	■ Gear
250	10	● Gear	● Gear	● Gear	● Gear	■ Gear	■ Gear
300	12	● Gear	● Gear	● Gear	■ Gear	■ Gear	■ Gear
350	14	● Gear	● Gear	● Gear	■ Gear	■ Gear	
400	16	● Gear	● Gear	■ Gear	■ Gear	■ Gear	
450	18	● Gear	● Gear	■ Gear	■ Gear	■ Gear	
500	20	■ Gear	■ Gear	■ Gear	■ Gear	■ Gear	
550	22	■ Gear	■ Gear	■ Gear	■ Gear	■ Gear	
600	24	■ Gear	■ Gear	■ Gear	■ Gear	■ Gear	
650	26	■ Gear	■ Gear	■ Gear	■ Gear		
700	28	■ Gear	■ Gear	■ Gear	■ Gear		
750	30	■ Gear	■ Gear	■ Gear	■ Gear		
800	32	■ Gear	■ Gear	■ Gear	■ Gear		
850	34	■ Gear	■ Gear	■ Gear	■ Gear		
900	36	■ Gear	■ Gear	■ Gear	■ Gear		
1000	40	■ Gear	■ Gear	■ Gear			
1050	42	■ Gear	■ Gear	■ Gear			
1100	44	■ Gear	■ Gear	■ Gear			
1200	48	■ Gear	■ Gear	■ Gear			
1400	56	■ Gear	■ Gear				
1500	60	■ Gear	■ Gear				

● : BTS Series

■ : DTS Series

## STANDARD MATERIALS

- Bolted Split Body & Side Entry Design.
- Double Block and Bleed Design.
- Piston action SR (Self-relieving) Seats.
- Spring Energized Seats for Sealing at Low Line-Pressure.
- Original Fire-safe with Soft Seat Inserts.
- O'Ring Stem Seals ; Double-barrier stem seals
- Secondary Upper-stem Sealant Injection (6" and above)
- Secondary Seat Sealant Injection (6" and above)
- Anti-Blow out proof Stem Design
- Anti-Static Device
- Metal-backed, Self-lubricating PTFE sleeve bearing and Thrust washers reduced torque and extend service life.
- Nickel Plating for Trim Parts
- Fire-safe graphite gaskets for protection against external leakage
- **NACE** standard **MR0175**

## OPTIONAL FEATURES

### According to the design impact of the optional features

- PTFE various grades of reinforced gaskets, spring energized, for stem and seat sealing.
- Explosive decompression-resistant seals
- Double sealing barrier in both directions(Double Piston Effect) and body pressure relief valve
- Mechanical Interlock System

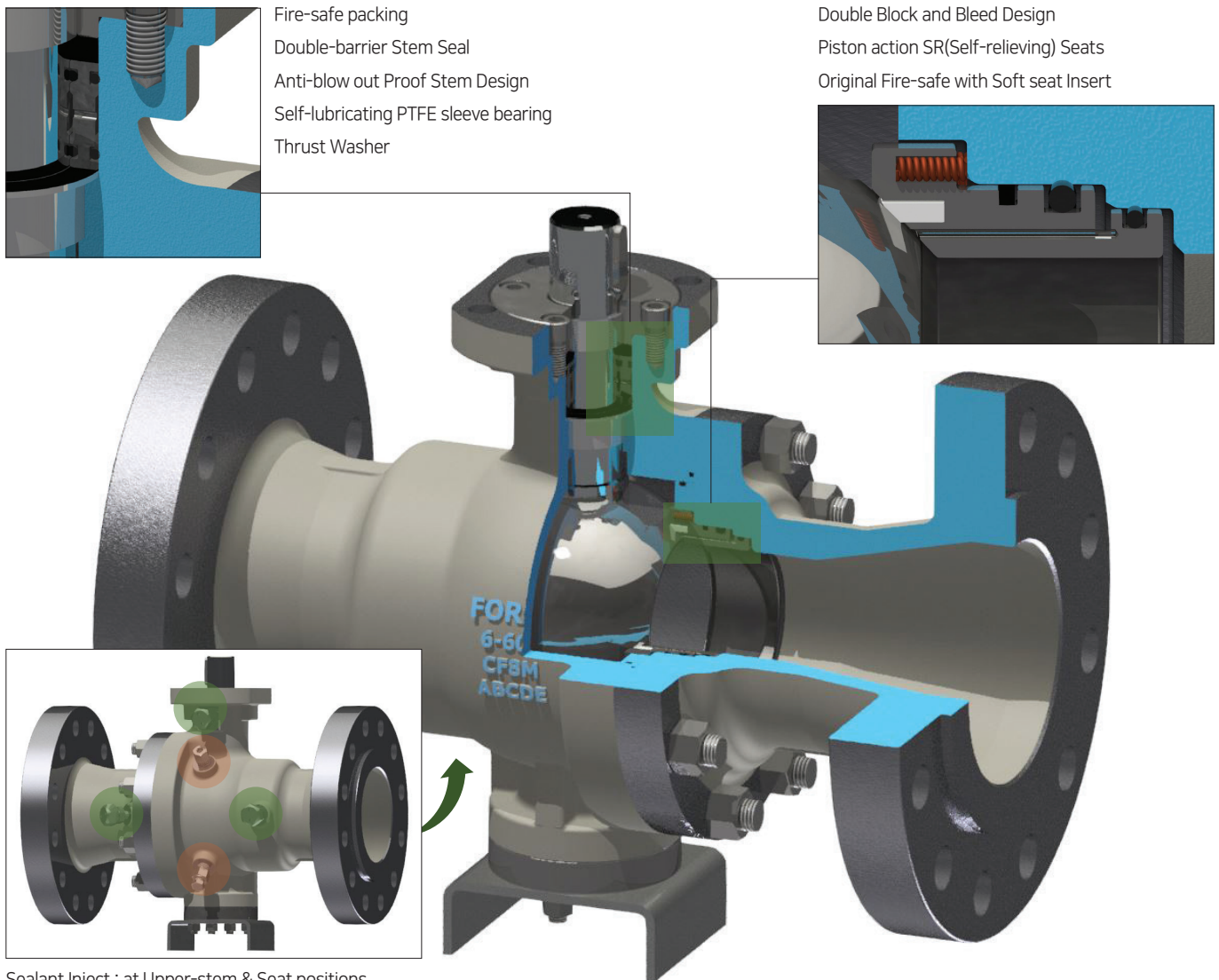
### Metal-to-metal Seats

Series **BTM** and **DTM** design offers metal-to-metal seat sealing ideally suited for the following applications.

- High-temperature and abrasive services
- Severe corrosive mediums
- Coal gasification
- Throttling and control services

The metal seated design has a temperature range of -50°F(-45°C) to 1100°F(600°C) and meets acceptance criteria **per API 6D**.

Sealing surface is critical to metal seated valve performance.



Sealant Inject ; at Upper-stem & Seat positions

Drain & Vent Plug

# Trunnion Mounted Ball Valve

## BODY CONSTRUCTION

The body is made of two casting parts or three forged parts, and the bolted construction allows disassembly in the field for repairs.

The body drain is located in the lowest part of the body cavity and consists of a drain plug with safety plug. Graphite gaskets are provided for compliance with **API 607/ISO 10497, API 6FA** fire-safe standards.

## STEM CONSTRUCTION

The stem function is to transmit torque and to absorb the line pressure thrust together with the trunnion. The stem has an anti-blowout design and incorporates a double-barrier system. The pressure thrust on the stem is supported by a thrust washer in antifriction material.

## SEAT TO BALL SEALING

Soft seats are standard. Seat inserts of synthetic material such as RPTFE, DEVLON, and PEEK are contained within a one piece metal seat ring. With no, or very low, line pressure, sealing between the seats and ball is achieved by the seat springs. As line pressure increases, it begins to work in conjunction with the seat springs to assure the integrity of the seal.

## SEAT FEATURES

Soft seats are standard. Seat inserts of synthetic material such as RPTFE, DEVLON, and PEEK are contained within a one piece metal seat ring. With no, or very low, line pressure, sealing between the seats and ball is achieved by the seat springs. As line pressure increases, it begins to work in conjunction with the seat springs to assure the integrity of the seal.

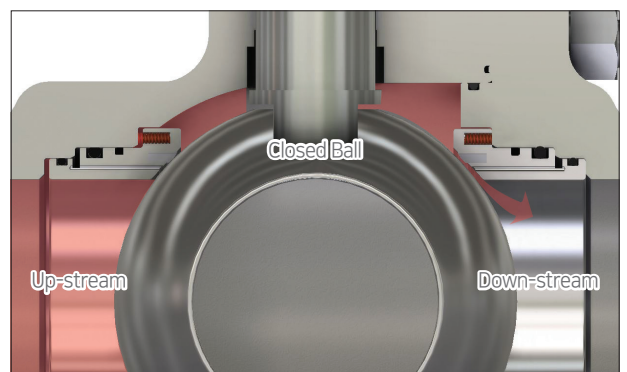
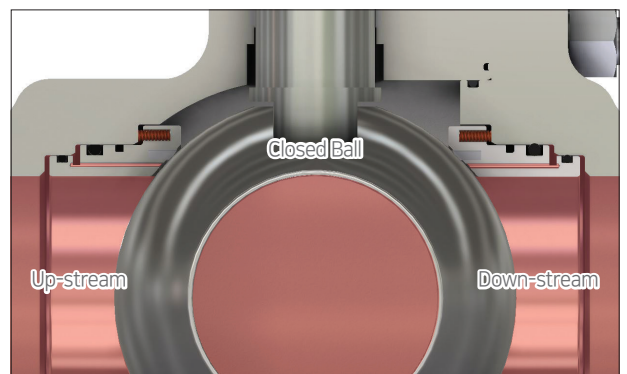
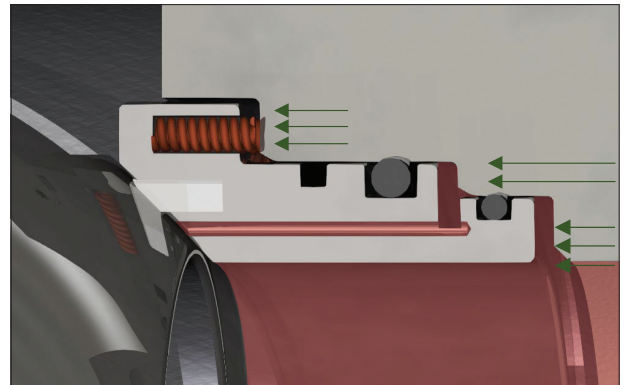
Two different types of seals are used to isolate the line pressure from the body cavity. Primary sealing is accomplished by an elastomeric seal such as **VITON** or **HNBR**, and secondary fire-safe sealing is accomplished by a graphite seal ring.

## DOUBLE BLOCK AND BLEED DESIGN

The trapped cavity pressure can bleed out by vent fitting or drain plug when the valve is in fully open or fully closed position. The fluid is intercepted by seats of up stream and down stream side. So, the stem packing or O'ring may be replaced under working pressure. Each seat works independently assuring tight seal against ball on both upstream and downstream side.

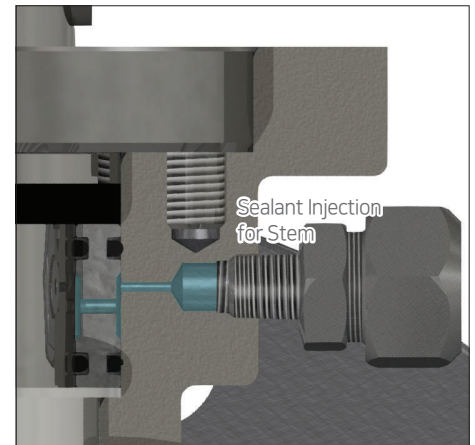
## VALVE CAVITY PRESSURE RELIEF(SELF-RELIEVING SEAT)

The standard feature is designed to prevent excessive pressure buildup within the valve by automatically relieving pressure when body cavity pressure exceeds the spring load on the seats. When a trunnion ball valve is in the closed position, media will be trapped in the body cavity. Unless this media is drained, it will be subjected to thermal expansion and contraction. As the temperature rises, the trapped media desires to expand and the pressure increases in the area body cavity. In order to avoid excessive pressure build-up, the **FORCE** seats are designed to self-relieve, allowing the media in the body to escape to the pipeline. This self-relieving seat design feature is standard on all **FORCE** trunnion ball valves.



## STEM SEALING

The stem is a free member and carries no side thrust. The absence of this side load and friction drag on the stem ensures lower operating torque and long service life. Precision machining of the stem which is rigidly supported between bearings, combined with hardness control between metallic parts and double O'rings backed up by a secondary graphite seal, ensures reliable operation with the highest levels of sealing integrity. All seals can be replaced without the need to remove the stem from the valve or remove the valve from the pipeline. If leakage should ever occur through both stem seals, the outer O'ring can be replaced with the valve in the line, under pressure with the ball in the closed position.

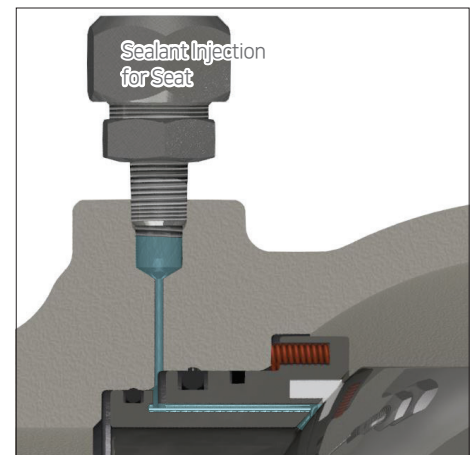


## SEAT & STEM EMERGENCY SEALANT INJECTION

Sealing injection fittings are standard on all **FORCE** Trunnion ball valves.

If the seat ring becomes damaged, this feature provides the user with an easy way to inject an emergency sealant to restore a tight seal. It also allows for the sealing surfaces of the ball and seat to be periodically flushed to clear away debris which may impair sealing.

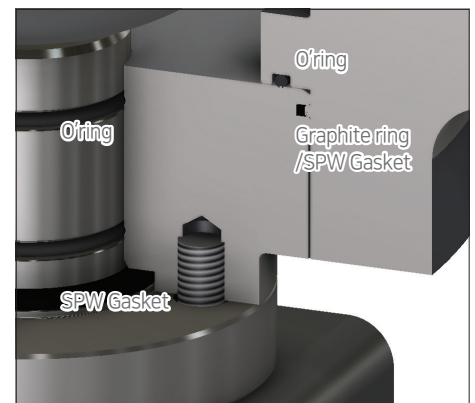
Sealing injection fittings are standard on all **FORCE** trunnion ball valves. If the seat ring becomes damaged, this feature provides the user with an easy way to inject an emergency sealant to restore a tight seal. It also allows for the sealing surfaces of the ball and seat to be periodically flushed to clear away debris which may impair sealing.



## DOUBLE SEALS AT ALL JOINTS

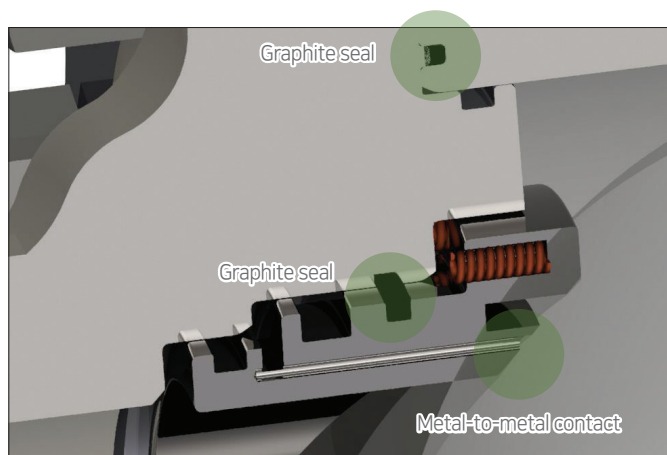
All connecting parts employ a double sealing design incorporating a O'ring and graphite/ spiral wound 316SS-Graphite gasket to ensure positive sealing.

Delta ring is used optionally for Class 1500 and 2500.



## LOW FRICTION STEM/ TRUNNION BEARINGS AND THRUST WASHERS

Heavy duty PTFE lined carbon or stainless steel bearing and thrust washers ensure durable and low torque operation.



## FIRE-SAFE DESIGN API 607/ISO 10497, API 6FA

When the seat inserts are softened and burnt in case of the fire or unusual temperature increase, the seat retainer, under the duty of the spring, will touch with the ball and form a metal-to-metal contact, which can prevent internal leak.

Meanwhile, the middle flange and the upper part and lower part of the stem will form a metal-to-metal contact which can prevent external leak and confirm to **API 607/ISO 10497** or **API 6FA**



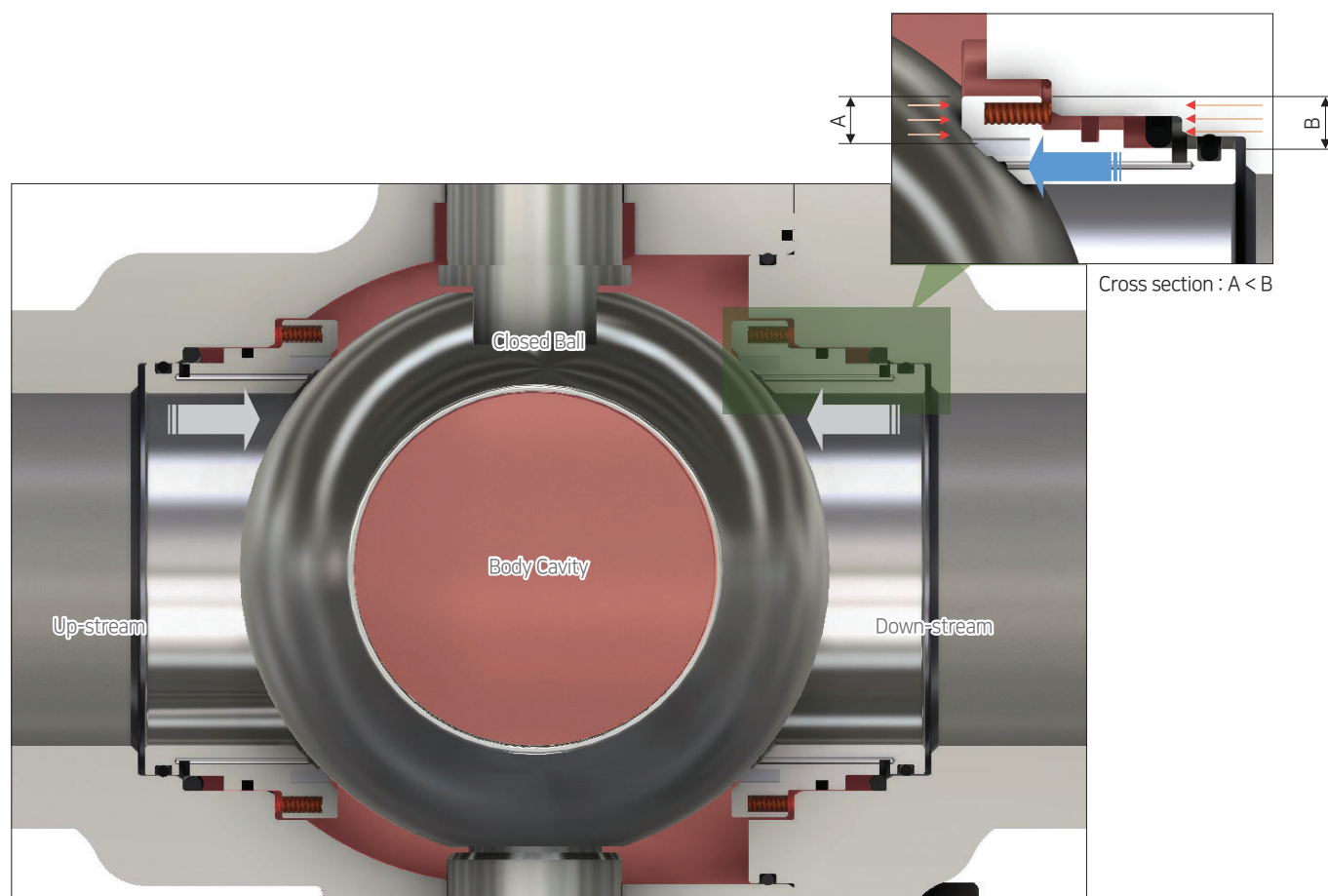
# Trunnion Mounted Ball Valve

## DOUBLE PISTON EFFECT (DPE)

The DPE seat design allows for both seats to seal with pressure acting from the same side of the valve. In the event one seat becomes damaged, the user has the added advantage of the opposite seat sealing. By means of this double barrier, the sealing is ensured regardless of the direction of the flow through the valve. If the upstream seat becomes damaged and leaks, the pressure entering the body cavity acts on the downstream seat, sealing the downstream seat tightly against the ball.

Note:

- \* The DPE feature and the double block-and-bleed feature are not to be confused with one another.
- \* The initial seal, at extremely low pressure differential or vacuum conditions, is obtained with spring-loaded floating seats, which are free to move slightly along the longitudinal axis of the valve.
- \* Line pressure behind the seat ring supplements the seat spring load to force the seat tightly against the ball.



On request, the seat rings design may be modified to perform the "DOUBLE PISTON EFFECT" action.

This feature adds an extra sealing feature to the valve, but to release the possible over pressure developed into the body cavity it may be necessary to use an external safety relief valve.

**STANDARD MATERIAL**

Part Name	Standard Material Grade			
	Carbon Steel	Low Temp. Carbon Steel	Stainless Steel	Duple x Stainless Steel
Body	A216-WCB or A105	A352-LCC or A350-LF2	A351-CF8M or A182-F316	A995-4A or A182-F51
Cap	A216-WCB or A105	A352-LCC or A350-LF2	A351-CF8M or A182-F316	A995-4A or A182-F51
Ball	Body Material (CS/LTCS) +ENP		316SS	UNS S31803
Stem	410SS +ENP or 316SS		316SS	UNS S31803
Stem bush	410SS +ENP		316SS	UNS S31803
Gland Flange	AISI 1020		316SS	UNS S31803
Bottom Cover	Body Material (CS/LTCS) +ENP		316SS	UNS S31803
Trunnion	Body Material (CS/LTCS) +ENP		316SS	UNS S31803
Seat Retainer	Body Material (CS/LTCS) +ENP		316SS	UNS S31803
Seat Ring	Reinforced PTFE or NYLON/DEVLON, PEEK			
Seal	O'Ring (FKM or HNBR)			
Gasket	Graphite or Spiral Wound Gasket (304/316SS +Graphite)			
Bushing	DU-BUSH (Electro Plated Carbon Steel +PTFE Coating)			
Thrust Washer	DDU (Electro Plated Carbon Steel +PTFE Coating)			
Spring	Inconel x-750			
Fitting(Drain/Vent/Injection)	Body Material (CS/LTCS) +ENP		316SS	UNS S31803
Lever Operator	Cast Iron or Carbon Steel			
Gear Operator	Cast Iron Case, Ductile Iron Gear, High Carbon Steel Worm Shaft			
Bolts/ Nuts (for Joint)	A193-B7/ A194-2H A193-B7M/ A194-2HM	A320-L7/ A194-7 A320-L7M/ A194-7M	A193-B8M/ A194-8M (A320-B8M/ A194-8M)	A193-B8M/ A194-8M or UNS S31803

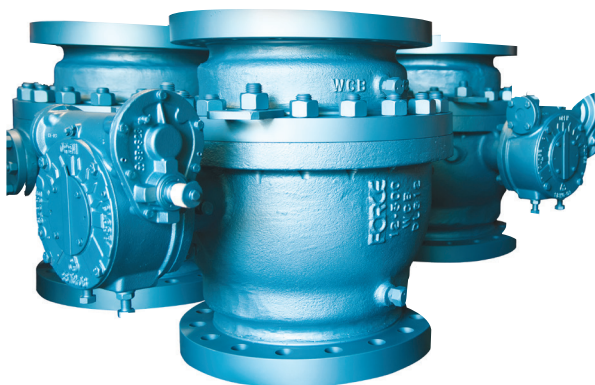
\* Typical materials for standard valves. Alternative materials available on request.

**DESIGN SPECIFICATIONS AVAILABLE**

API Spec. 6D	Specification for Quality Management Systems (design)
ASME B16.34	Valves- Flanged, Threaded, and Welding End (design)
ISO 17292/ BS 5351	Metal Ball Valves for Petroleum, Petrochemical and Allied Industries
API Standard 608	Metal Ball Valves-Flanged, Threaded, and Welding Ends
ASME B16.5/ ASME B16.47	Pipe Flanges and Flanged Fittings
ASME B16.10	Face-to-Face and End-to-End Dimensions of Valves
MSS SP-72	Ball Valves with Flanged or Butt-Welding Ends for General Service
NACE Standard MR0175	Sour gas service application
API Standard 607/ ISO 10497	Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats
API Spec. 6FA	Specification for Fire Test for Valves

# BTS Series

"Split-Body, Trunnion Mounted Ball, Soft Seated & Casting Valves"



## SPECIFICATIONS

### Construction

Split-body, Side entry, Full/Reduced port, Trunnion mounted ball, "Fire-safe" designed to **API 607/ISO 10497** or **API 6FA**, Double seal design, Double block and bleed, Blow out proof stem, Anti-static device, Pressure relieving seats, Locking device.

Valves are designed to **API 6D**, **ASME B16.34** and **ISO 17292/BS 5351** specifications.

Manufactured and conforms to **NACE** standard **MR 0175**.

### Test pressure (psig / CS material)

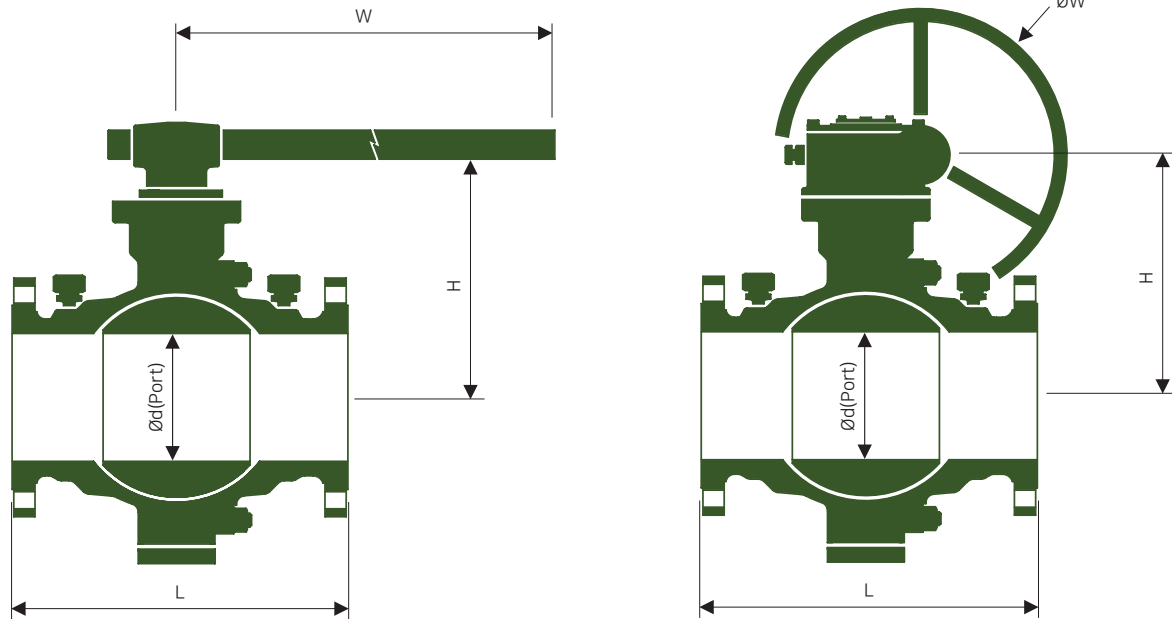
ASME Class	Ma x. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 150	285	450	325 / 80
Class 300	740	1125	825 / 80

## DIMENSIONS

### Class 150

Valve Size	Ød (Ball port)		L		H		W		Approx Weight	
	inch	mm	inch	mm	inch	mm	inch	mm	lb	kg
2" x 1 1/2"	1.50	38.00	7.00	177.80	6.18	157.00	14.96	380.0	26	12
2"	2.01	51.00	7.00	177.80	6.50	165.00	14.96	380.0	35	16
3" x 2"	2.01	51.00	8.00	203.20	6.50	165.00	14.96	380.0	49	22
3"	2.99	76.00	8.00	203.20	7.32	186.00	14.96	380.0	57	26
4" x 3"	2.99	76.00	9.00	228.60	7.32	186.00	14.96	380.0	88	40
4"	4.02	102.00	9.00	228.60	9.33	237.00	17.72	450.0	123	56
6" x 4"	4.02	102.00	15.50	393.70	9.33	237.00	17.72	450.0	265	120
6"	5.98	152.00	15.50	393.70	11.42	290.00	19.69	500.0	276	125
8" x 6"	5.98	152.00	18.00	457.20	11.42	290.00	19.69	500.0	331	150
8"	7.99	203.00	18.00	457.20	13.19	335.00	19.69	500.0	430	195
10" x 8"	7.99	203.00	21.00	533.40	13.19	335.00	19.69	500.0	507	230
10"	10.00	254.00	21.00	533.40	16.42	417.00	27.95	710.0	595	270
12" x 10"	10.00	254.00	24.00	609.60	16.42	417.00	27.95	710.0	653	296
12"	12.01	305.00	24.00	609.60	17.91	455.00	27.95	710.0	1,014	460
14" x 12"	12.01	305.00	27.00	685.80	17.91	455.00	27.95	710.0	1,036	470
14"	13.25	336.50	27.00	685.80	19.13	486.00	27.95	710.0	1,742	790
16" x 14"	13.25	336.50	30.00	762.00	19.13	486.00	27.95	710.0	1,398	634
16"	15.24	387.00	30.00	762.00	20.63	524.00	31.50	800.0	2,271	1,030
18" x 16"	15.24	387.00	34.00	863.60	20.63	524.00	31.50	800.0	2,407	1,092

\* Valve sizes 6" and larger are gear operated.



## DIMENSIONS

**Class 300**

Valve Size	Ød (Ball port)		L		H		W		Approx Weight	
	inch	mm	inch	mm	inch	mm	inch	mm	lb	kg
2" x 1 1/2"	1.50	38.00	8.50	215.90	6.18	157.00	14.96	380.0	40	18
2"	2.01	51.00	8.50	215.90	6.50	165.00	14.96	380.0	79	36
3" x 2"	2.01	51.00	11.12	282.40	6.50	165.00	14.96	380.0	93	42
3"	2.99	76.00	11.12	282.40	7.32	186.00	14.96	380.0	128	58
4" x 3"	2.99	76.00	12.00	304.80	7.32	186.00	14.96	380.0	137	62
4"	4.02	102.00	12.00	304.80	9.33	237.00	17.72	450.0	165	75
6" x 4"	4.02	102.00	15.88	403.35	9.33	237.00	17.72	450.0	298	135
6"	5.98	152.00	15.88	403.35	11.42	290.00	19.69	500.0	335	152
8" x 6"	5.98	152.00	19.75	501.65	11.42	290.00	19.69	500.0	441	200
8"	7.99	203.00	19.75	501.65	13.19	335.00	19.69	500.0	518	235
10" x 8"	7.99	203.00	22.38	568.45	13.19	335.00	19.69	500.0	617	280
10"	10.00	254.00	22.38	568.45	16.42	417.00	27.95	710.0	661	300
12" x 10"	10.00	254.00	25.50	647.70	16.42	417.00	27.95	710.0	860	390
12"	12.01	305.00	25.50	647.70	17.91	455.00	27.95	710.0	1,146	520
14" x 12"	12.01	305.00	30.00	762.00	17.91	455.00	27.95	710.0	1,323	600
14"	13.25	336.50	30.00	762.00	19.13	486.00	27.95	710.0	2,138	970
16" x 14"	13.25	336.50	33.00	838.20	19.13	486.00	27.95	710.0	2,271	1,030
16"	15.24	387.00	33.00	838.20	20.63	524.00	31.50	800.0	2,646	1,200
18" x 16"	15.24	387.00	32.06	814.40	20.63	524.00	31.50	800.0	3,020	1,370

\* Valve sizes 6" and larger are gear operated.



# BTS Series

"Split-Body, Trunnion Mounted Ball, Soft Seated & Casting Valves"



## SPECIFICATIONS

### Construction

Split-body, Side entry, Full/Reduced port, Trunnion mounted ball, "Fire-safe" designed to **API 607/ISO 10497** or **API 6FA**, Double seal design, Double block and bleed, Blow out proof stem, Anti-static device, Pressure relieving seats, Locking device.

Valves are designed to **API 6D**, **ASME B16.34** and **ISO 17292/BS 5351** specifications.

Manufactured and conforms to **NACE** standard **MR 0175**.

### Test pressure (psig/ CS material)

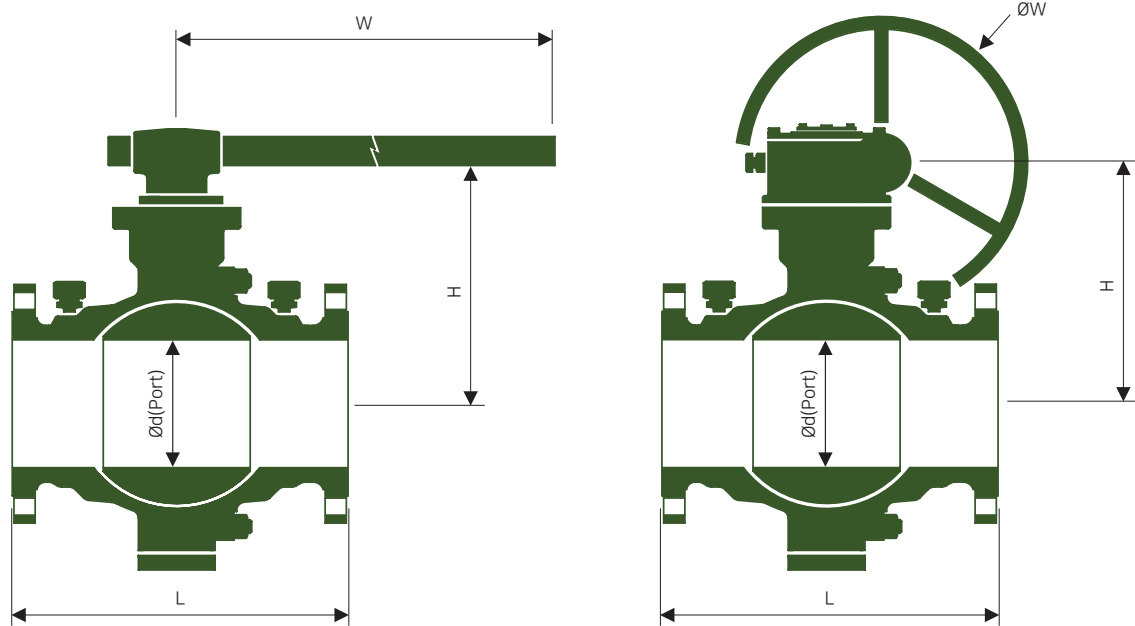
ASME Class	Ma x. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 600	1480	2225	1650 / 80
Class 900	2220	3350	2450 / 80
Class 1500	6170	5575	4100 / 80

## DIMENSIONS

### Class 600

Valve Size	Ød (Ball port)		L				H		W		Approx Weight	
			RF/BW		RTJ							
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	lb	kg
2" x1 1/2"	1.54	39.0	11.50	292.1	11.62	295.2	6.57	167.00	14.96	380.0	84	38
2"	1.97	50.0	11.50	292.1	11.62	295.2	6.77	172.00	14.96	380.0	88	40
3" x 2"	1.97	50.0	14.00	355.6	14.12	358.7	6.77	172.00	14.96	380.0	132	60
3"	2.99	76.0	14.00	355.6	14.12	358.7	8.27	210.00	19.69	500.0	154	70
4" x 3"	2.99	76.0	17.00	431.8	17.12	434.9	8.27	210.00	19.69	500.0	209	95
4"	4.02	102.0	17.00	431.8	17.12	434.9	10.31	262.00	19.69	500.0	243	110
6" x 4"	4.02	102.0	22.00	558.8	22.12	561.9	10.31	262.00	19.69	500.0	342	155
6"	6.02	153.0	22.00	558.8	22.12	561.9	12.48	317.00	27.95	710.0	476	216
8" x 6"	6.02	153.0	26.00	660.4	26.12	663.5	12.48	317.00	27.95	710.0	639	290
8"	7.99	203.0	26.00	660.4	26.12	663.5	14.29	363.00	27.95	710.0	816	370
10" x 8"	7.99	203.0	31.00	787.4	31.12	790.5	14.29	363.00	27.95	710.0	1,080	490
10"	10.00	254.0	31.00	787.4	31.12	790.5	16.85	428.00	31.50	800.0	1,356	615
12" x 10"	10.00	254.0	33.00	838.2	33.12	841.3	16.85	428.00	31.50	800.0	1,781	808
12"	12.01	305.0	33.00	838.2	33.12	841.3	18.29	464.50	31.50	800.0	2,161	980
14" x 12"	12.01	305.0	35.00	889.0	35.13	892.3	18.29	464.50	31.50	800.0	2,619	1,188
14"	13.25	336.5	35.00	889.0	35.13	892.3	20.37	517.50	31.50	800.0	2,707	1,228

\* Valve sizes 3" and larger are gear operated.



## DIMENSIONS

Class 900 & 1500

Valve Size		Ød (Ball port)		L				H		W		Approx Weight	
				RF/BW		RTJ							
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	lb	kg
Class 900	2" x1 1/2"	1.54	39.0	14.50	368.3	14.62	371.4	6.57	167.00	14.96	380.0	121	55
	2"	2.01	51.0	14.50	368.3	14.62	371.4	6.97	177.00	23.62	600.0	154	70
	3" x 2"	2.01	51.0	15.00	381.0	15.12	384.1	6.97	177.00	23.62	600.0	198	90
	3"	2.99	76.0	15.00	381.0	15.12	384.1	8.46	215.00	19.69	500.0	243	110
	4" x 3"	2.99	76.0	18.00	457.2	18.12	460.3	8.46	215.00	19.69	500.0	375	170
	4"	4.02	102.0	18.00	457.2	18.12	460.3	10.35	263.00	27.95	710.0	573	260
	6" x 4"	4.02	102.0	24.00	609.6	24.12	612.7	10.35	263.00	27.95	710.0	683	310
	6"	6.02	153.0	24.00	609.6	24.12	612.7	12.68	322.00	27.95	710.0	794	360
	8" x 6"	6.02	153.0	29.00	736.6	29.12	739.7	12.68	322.00	27.95	710.0	1,168	530
	8"	7.99	203.0	29.00	736.6	29.12	739.7	15.87	403.00	31.50	800.0	1,367	620
	10"x 8"	7.99	203.0	33.00	838.2	33.12	841.3	15.87	403.00	31.50	800.0	1,565	710
	10"	10.00	254.0	33.00	838.2	33.12	841.3	18.11	460.00	31.50	800.0	2,094	950

Valve Size		Ød (Ball port)		L				H		W		Approx Weight	
				RF/BW		RTJ							
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	lb	kg
Class 1500	2" x 1 1/2"	1.54	39.0	14.50	368.3	14.62	371.4	6.57	167.00	14.96	380.0	121	55
	2"	2.01	51.0	14.50	368.3	14.62	371.4	6.97	177.00	23.62	600.0	154	70
	3" x 2"	2.01	51.0	18.50	469.9	18.63	473.2	6.97	177.00	23.62	600.0	198	90
	3"	2.99	76.0	18.50	469.9	18.63	473.2	-	-	19.69	500.0	-	-
	4" x 3"	2.99	76.0	21.50	546.1	21.63	549.4	-	-	19.69	500.0	-	-
	4"	4.02	102.0	21.50	546.1	21.63	549.4	-	-	19.69	500.0	-	-
	6" x 4"	4.02	102.0	27.75	704.9	28.00	711.2	-	-	19.69	500.0	-	-
	6"	5.67	144.0	16.06	704.9	28.00	711.2	-	-	27.95	710.0	-	-

\* Valve sizes 3" and larger are gear operated.