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FZV

Joint Venture

3 PIECE FORGED TRUNNION MOUNTED BALL VALVE CATALOGUE

API 6D, ASME CLASS 150 - 2500#
DBB/DIB-1/DIB-2 Ball Valve

API 6D - 1473
API Q1 - 2345
API QR - 2470 (9001)
API 6A - 0842

CHEVRON APPROVED

BP APPROVED

SHELL TAT TAMAP APPROVED

PETRONAS APPROVED

PDO APPROVED

API 607 5th, 6th & 7th Ed.
ISO 10497 Firesafe Certified

ISO 15848-1 & API 641
Fugitive Emission Certified

API 6D - 1473
API Q1 - 2345
API QR - 2470 (9001)
API 6A - 0842

SIL 3

LLOYDS
FZV - CE/PED
2014/68/EU

FANGZHENG VALVE GROUP CO., LTD

Add: NO.1921, Binhai 1st Avenue, Economy & Technology Development Zone,
Wenzhou City, Zhejiang Province, China 325025
Tel: +86-577-6735 6515 Fax: +86-577-6735 8449

E-mail: fzvalve@fzvgroup.com

Distributors/Agents

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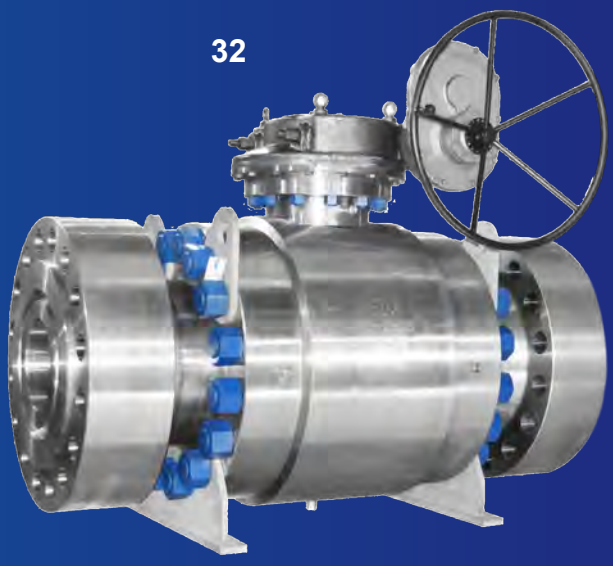
3 PIECE FORGED TRUNNION BALL VALVE CATALOGUE INDEX



Catalogue information is current at time of publication, subject to change without notice

INDUSTRIAL PIPELINE CONTROL EXPERT

FANGZHENG VALVE GROUP

We (FZV) commit ourselves to manufacturing excellent valves and achieving our customer satisfaction based on the principles of quality assurance and continual improvement.

We are specialized in supplying a wide range of APl 6D, API 609, API600, API 602, API 608, API 594, APl 6A products and wellhead equipment.

FZV was formally established in 1992, and so far, FZV has been approved by well-known international and domestic End-users and EPC companies.

FZV has set up three factories based in Shanghai and Wenzhou city with total area 76000 m^2 and maximum production capacity up to 32000 tons.

To enhance engineering designs and manufacture high-end products, FZV has in-house laboratory equipped with various facilities and test equipment to check and verify the product quality. The following tests are conducted in-house:

- Chemical analysis
- Mechanical test, Hardness, and impact test
- Non-destructive examination
- Salt spray test
- Fugitive emission test(ISO 15848-1 & 2)
- Design validation testing (DVT) as per SHELL(MESC SPE 77/300)
- High temperature (Up to 550°C) and Cryogenic test (Up to -196°C)

FZV is certified by ISO 9001, ISO 14001, OHSAS 18001, API6D, API600, API609, API594, API607, API6A, API6A-PR2, API Spec.Q1, ABS, CCS, DNV, ATEX, and CE/PED, etc.

FZV Main Products Range:

Product types: Ball Valve, Gate Valve, Globe Valve, Check Valve, Butterfly Valve, Slab Gate Valve, Pipe Fitting, Cryogenic Valve, API6A Valve, Wellhead Equipment, Manifold & Christmas tree, etc.

Implemented Standards: ISO, API, BS, etc.

Casting material: WCB, LCB, WC6, WC9, C5, C12, CF3, CF3M, CF8, CF8M, C95500, 4A, 5A, Monel 400/500, Inconel 825/625, Titanium Alloy, etc.

Forging material: A105, LF2, F11, F12, F304, F321, F347, F316, 304L, 316L, C61900, F51, F53, F55, Inconel, Titanium Alloy, etc.

Nominal diameter: NPS 1/2"-68"(DN 15-DN 1,700)

Nominal pressure: API600 & API6D: CLASS 150~CLASS 2,500 (PN16~PN420) API 6A: 2,000PSI~15,000PSI

Temperature range: -196°C-550°C

Applications: Onshore oil and gas exploitation and transportation, offshore oil and gas platform and FPSO / FLNG / FSRU, natural gas purification and liquefaction unit, LNG receiving station and vaporization unit, refining, chemical industry and chemistry, coal to gas (oil) and coal chemical industry, air separation, power station, aerospace, military industry and new energy (solar power generation, hydrogen energy, etc.) etc.

Mission: Providing Complete Control Solutions For Industrial Pipelines.

Our Advantages:

1. Strict quality management system to ensure excellent product quality;
2. Excellent production management system to ensure the shortest delivery;
3. Competitive price;
4. Reponsive after-sales service.

The FZV series of forged 3 piece trunnion ball valves have been engineered to meet both general service and heavy duty applications including petroleum, petro-chemical, and industrial. Valves are designed in accordance with API 6D, they are available in a variety of confirgurations and materials to meet your specific operational needs. FZV valves not only meet but exceed industry standards.

FEATURES

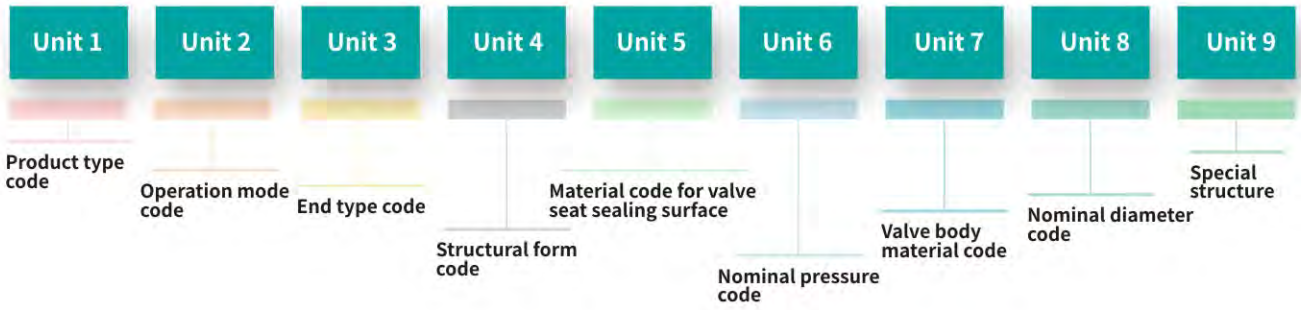
- Valve body, closures, ball and seat carriers are manufactured from forged steel to ensure high strength, dependable service life in high pressure or severe applications.
- Available seat configurations include self-relieving (single piston effect), DIB-1 (double piston effect) and DIB-2 (single piston one side, double piston one side) options.
- DIB-1 valves are provided with drilled, tapped, plugged ports for ease of thermal relief piping as necessary.
- The primary seat design utilises TEFLON, DEVLON, or PEEK as standard dependent on pressure class, the secondary metal seat ring will provide sealing should the primary be eliminated by fire per API 607.
- All seat rings and O-rings include graphite secondary seals to achieve firesafe requirements for API 607.
- All O-rings are anti-explosive decompression style.
- All sizes/ANSI classes are double block and bleed capable in accordance with API 6D.
- The drain valve can be for block and bleed function or to check seat integrity during maintenance.
- All sizes/classes are provided with emergency stem and seat injection capabilities in the event of damage. Valves ≥16" are provided with 2 seat injection ports. Small bore valves ≤4" will be provided with centre body cavity injection due to size constraints.
- The valves are hydro tested excluding the injection fittings as there is a buried check valve installed underneath the fittings in the valve body. Therefore, a damaged fitting can be replaced without the need to re-hydro test the valve shell body (body integrity remains intact).
- Valve stems are anti-blowout, designed in accordance with API 6D to ensure the body cavity pressure cannot eject stem.
- The design incorporates two springs to assure electric continuity between the stem/body/ball to eliminate static build-up.
- The mounting pad provided is standard to ISO 5211 for ease of automation.

ADDITIONAL OPTIONS

- Cryogenic designs and test capabilities are available.
- For severe service (high temperature or abrasive media), metal seated design options can be provided.
- Valves are provided with factory enamel coating, custom coating or colours can be offered based upon specific needs.
- Additional testing or documentation is available and can be offered as required.

IDENTIFICATION NUMBERING SYSTEM FOR BALL VALVE PRODUCTS

A ball valve's identification number consists of 8 units as the following:



Unit 1

Table.1 indicates the number of codes used to categorize Ball valve type.

Unit 2

Table.2 indicates the number of codes used to categorize Ball valve's operation type.

Unit 3

Table.3 indicates the number of codes used to categorize Ball valve's End flange type.

Unit 4

Table.4 & 5 indicates the number of codes used to specify Ball valve's structural design.

Unit 5

Table.6 indicates the number of codes used to specify Ball valve's seat material.

Unit 6

Table.7 indicates the number of codes used to specify Ball valve's nominal pressure.

Unit 7

Table.8 indicates the number of codes used to specify Ball valve's body material.

Unit 8

Table.7 indicates the number of codes used to specify Ball valve's nominal diameter.

Unit 9

The special structure is described in parentheses, and multiple requirements in the description are separated by "/". Examples include (DIB-2), (PTFE), (PTFE/G), (non extension), etc.

BALL VALVE CATEGORY CODE — Table 1

CATEGORY	CODE	CATEGORY	CODE	CATEGORY	CODE
Floating ball valve Shaft type Trunnion mounted ball valve	Q	High temperature ball valve	HQ	Integrated ball valve (side entry)	Qs
Fixed plate structure	Qg	A standard ball valve	MQ	Fully welded ball valve	Qw
Shell 2008 Structure	Qm	Orbit ball valve	QD	Shell standard cavity overlay	Qmn
-46°C low temperature	DQ	Oxygen ball valve	YQ		
-101°C and below	CDQ	Internal cavity welding	Qn		

VALVE OPERATION MODE CODE — Table 2

OPERATION MODE	CODE	OPERATION MODE	CODE	OPERATION MODE	CODE	OPERATION MODE	CODE
Bare shaft	0	Worm gear	3	Pneumatic	6	Motor	9
Lever/Handwheel	N/A	Spur gear	4	Hydraulic/ Gas over oil	7		
Impact type handwheel	2	Bevel gear	5	Chain wheel	8		

Note: (1) For pneumatic or hydraulic valves, 6K and 7K are used for normally open valves, and 6B and 7B are used for normally closed valves.
(2) Explosion proof electric is represented by 9B.

END TYPE CODE — Table 3

END TYPE	CODE	END TYPE	CODE	END TYPE	CODE	END TYPE	CODE
Male Threaded （SD）	1	Raised flange （RF）	4	Wafer （WR）	7	Flat flange （FF）	0
Groove surface （G）	2	Ring type flange （RTJ）	5	Clamp （CP）	8	One side Female threaded /another side Socket weld	1/9
Concave flange （FM）	3	Butt welding （BW）	6	Socket weld （SW）	9		

STRUCTURAL FORM CODE — Table 4

CODE	STRUCTURAL FORM	CODE	STRUCTURAL FORM
0	Tope entry trunnion mounted ball	5	T type floating three way
1	Two pieces floating ball valve	6	Two pieces trunnion mounted ball valve
2	Integral reduce bore floating ball valve	7	Three pieces trunnion mounted ball valve
3	Three pieces floating ball valve	8	L type trunnion mounted three way
4	L type floating three way	9	T type trunnion mounted three way

STRUCTURAL FORM CODE OF ORBIT BALL VALVE — Table 5

CODE	STRUCTURAL FORM	CODE	STRUCTURAL FORM
1	Integral valve stem, closed type valve cover	3	Integral valve stem, OS&Y
		4	Two section valve stem, OS&Y
2	Two section valve stem, sealed type valve cover		

MATERIAL CODE FOR VALVE SEAT SEALING SURFACE — Table 6

SEALING SURFACE MATERIAL	CODE	SEALING SURFACE MATERIAL	CODE	SEALING SURFACE MATERIAL	CODE
Tin based bearing alloy	B	Nylon	N	Lined with fluorine	J
18-8 series stainless steel	P	Mo2Ti series stainless steel	R	Body (integral valve seat)	W
Fluoroplastic	F	Copper alloy	T	Multi lay composite	HF
Cr13 series stainless steel /alloy steel	H	Rubber	X		
Monel	M	Hard faced alloy	Y		

Note: General drawing design: F for soft seat,Y for metal seat.

BALL VALVE PRODUCT PRESSURE - CALIBER RANGE - FIXED BALL VALVE (INCLUDING DIAMETER AND REDUCED DIAMETER)

Table 7

NOMINAL DIAMETER NPS	CL 150	CL 300	CL 600	CL 900	CL 1500	CL 2500
2	●	●	●	●	●	●
3	●	●	●	●	●	●
4	●	●	●	●	●	●
6	●	●	●	●	●	●
8	●	●	●	●	●	●
10	●	●	●	●	●	●
12	●	●	●	●	●	●
14	●	●	●	●	●	●
16	●	●	●	●	●	
18	●	●	●	●	●	
20	●	●	●	●	●	
24	●	●	●	●	●	
28	●	●	●	●		
30	●	●	●	●		
32	●	●	●	●		
36	●	●	●	●		
42	●	●	●	●		
48	●	●	●	●		

BALL VALVE PRODUCT PRESSURE - SIZE RANGE - FLOATING BALL VALVE (INCLUDING FULL BORE AND REDUCE BORE)

NOMINAL DIAMETER NPS	CL 150	CL 300	CL 600	CL 900	CL 1500	CL 2500
1/2	●	●	●	●	●	●
3/4	●	●	●	●	●	●
1	●	●	●	●	●	●
1 1/2	●	●	●	●	●	●
2	●	●	●	●	●	●
3	●	●	●	●	●	
4	●	●	●	●		
6	●	●	●			
8	●	●				
10	●					

VALVE BODY MATERIAL CODE

Table 8

BODY MATERIAL	CODE	BODY MATERIAL	CODE	BODY MATERIAL	CODE	BODY MATERIAL	CODE
WCB	C	Ductile iron	Q	A105	A	F304L	F4
18-8 series stainless steel	P	Mo2Ti series stainless steel	R	LF2/LF1	LF	F316	F6
Chromium molybdenum steel	I	Copper and copper alloys	B	F11	F1	F316L	F7
Malleable iron	K	Chromium molybdenum vanadium steel	V	F22	F2	LCB/LCC	LC
Cr13 series stainless steel	H	Grey cast iron	Z	F304	F3	C5	C5
WC6	C6	WC9	C9	CF3	S3	CF3M	S4
Cf8	S8	CF8M	S9				

Note: (1) For national and German standard valves, when PN ⩽ 1.6MPa uses gray cast iron valve bodies and PN ⩾ 2.5MPa uses carbon cast steel valve bodies, codes Z and C can be omitted.

(2) When using carbon cast steel valve bodies for American and British standard valves, the code C can be omitted.

(3) Universal drawing design, forging valve body uniformly uses A, omitting code for cast steel valves, specific material details are executed according to BOM.

(4) The main types of valve body materials are shown in Table 8.1: Types of main body materials.

TYPE OF MAIN MATERIAL — Table 8.1

ITEM	01	02	03	04	05	06	07
MATERIAL GRADE	A105	WCB	WCA	WCC	WCI	Wc4	Wc5
MATERIAL TYPE	Carbon steel forging				Heat-resistant cast steel		
ITEM	08	09	10	11	12	13	14
MATERIAL GRADE	WC6	WC9	C5	C12	CF3	CF3M	CF8
MATERIAL TYPE	Heat-resistant cast steel				Stainless steel casting		
ITEM	15	16	17	18	19	20	21
MATERIAL GRADE	CF8M	LF1	LF2	LF3	LFA	LCB	LCC
MATERIAL TYPE	Stainless steel casting	Low temperature forged steel			Low temperature cast steel		
ITEM	22	23	24	25	26	27	28
MATERIAL GRADE	LC1	LC2	LC3	F304	F304L	F316	F316L
MATERIAL TYPE	Low temperature cast steel				Stainlesssteel forging		
ITEM	29	30	31	32	33	34	35
MATERIAL GRADE	410	17-4PH	IRON	STEEL	C95800	MONEL	INCONEL625
MATERIAL TYPE	Martensitic stainless steel	Precipitation stainless steel	Soft iron	Cast steel, cold-rolled steel	Copper	Special materials	
ITEM	36	37	38	39	40	41	42
MATERIAL GRADE	20#	Hastelloy B	Hastelloy C	4140	CA15	A105+ENP	WCB+ENP
MATERIAL TYPE	Special materials			Alloy steel	Heat-resistant steel	Surface treatment	
ITEM	43	44	45	46	47	48	49
MATERIAL GRADE	STEELITE	A105N	4A	F51	INCONEL825	LF2+ENP	WCB+DSS
MATERIAL TYPE	Wear resistant material	Surface treatment	Special materials		(CU5MCUC)	Surface treatment	
ITEM	50	51	52	53	54	55	56
MATERIAL GRADE	HT200	F11	F22	A 105N+ENP	54	Organic glass	F12
MATERIAL TYPE	Grey cast iron	High temperature steel		Surface treatment	F44	Special treatment	High temperature steel
ITEM	57	58	59	60	61	62	63
MATERIAL GRADE	WCB+PFA	F55	F91	C95200	61	C61900	
MATERIAL TYPE	Carbon steel lining	Special materials	High temperature steel	Copper alloy	C95500	Copper alloy	
					Copper alloy		

TRIM MATERIAL COMBINATION
TRUNNION MOUNTED BALL VALVE AND WELDED BALL VALVE — Table 9-1

Explanation: The materials in the table can be combined arbitrarily according to the working conditions, and if there are no specified ones, they will be according to the factory standards

ITEM	BALL	SEAT	STEM	SUPPORT PLATE\ LOWER COVER	SEAL RING	BODY FASTENER
1	A105+ENP	A105+ENP	A105+ENP	A105+ENP	PTFE	B7/2H
2	4140+ENP	4140+ENP	4140+ENP	4140+ENP	RPTFE	B7M/2HM
3	F6a(ENP)/410(ENP)	F6a(ENP)/410(ENP)	F6a(ENP)/410(ENP)	F6a(ENP)/410(ENP)	NYLON	B8/8(A)
4	304	304	304	304	NYLON 12	B8M/8M(A)
5	304L	304L	304L	304L	NYLON 66	L7/7
6	316	316	316	316	PEEK	L7M/7M
7	316L	316L	316L	316L	DEVLON V	B8T/8T
8	LF2+ENP	LF2+ENP	LF2+ENP	LF2+ENP	MOLON	L7/4L
9	WCB+ENP	F316+ENP	17-4PH	17-4PH	PARA POLYSTYRENE	B16/4
10	4A/F51	F51	F51	F51	TEFLON	
11	Alloy 825	Alloy 825	Alloy 825	Alloy 825	POM	
12	CF8M	F6a	F6a	F6a	PCTFE	
13	CF8	F55	F56	F57		
14	INCONEL625	INCONEL625	INCONEL625	INCONEL625		
15	MONEL400	MONEL400	MONEL400	MONEL400		
16	MONEL500	MONEL500	MONEL500	MONEL500		
17	Alloy 20	Alloy 20	Alloy 20	Alloy 20		
18	A105N/ENP	A105N/ENP	A105N/ENP	A105N/ENP		
19	F55			ORGANIC GLASS		
20	F44	F44	F44	F44		

Note: The ENP thickness is usually specified as 0.03mm, and can be 0.075mm as needed.

METAL SEAT BALL VALVE

Table 9-2

ITEM	BALL	SEAT	STEM	SUPPORT PLATE \LOWER COVER	BODY FASTENER
1	A105+WC	A105+WC	A 105/ENP	A 105/ENP	B7/2H
2	A105+STL.6	A105+STL.6	4140/ENP	4140/ENP	B7M/2HM
3	F6a/410+WC	F6a/410+WC	F6a/410	F6a/411	B8/8(A)
4	F6a/410+STL.6	F6a/410+STL.6	304	304	B8M/8M
5	WCB+WC	304+STL	304L	304L	L7/7
6	WCB+STL.6	316+STL	316	316	L7M/7M
7	304+WC	304+WC	316L	316L	B8T/8T
8	316+WC	316+WC	LF2+ENP	LF2+ENP	B16/4
9	304+STL		17-4PH	17-4PH	L7/4L
10	316+STL		304+STL	F11	
11	F22+STL	F22+STL	F22+ENP	F22+ENP	
12				F91	

FLOATING BALL VALVE

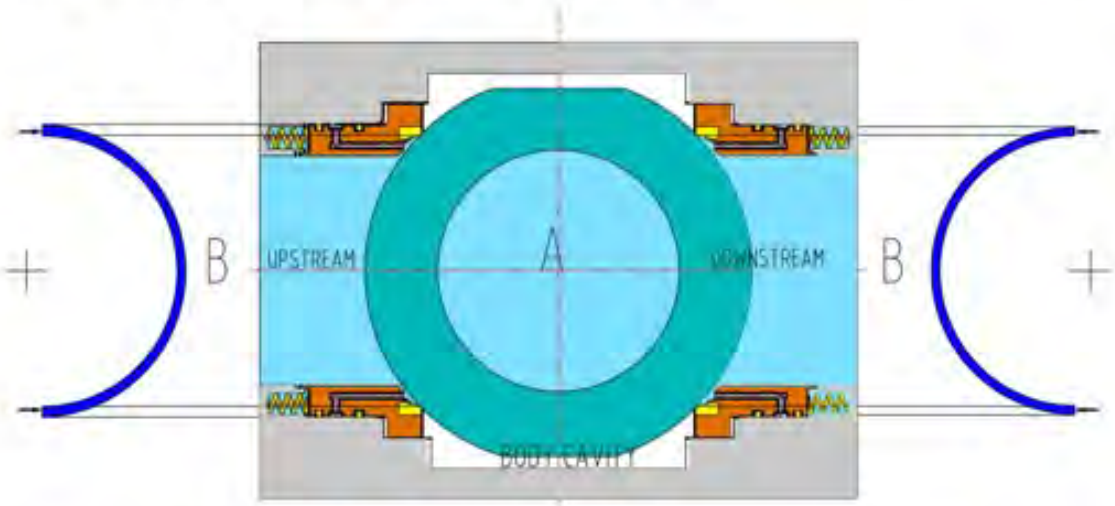
Table 9-3

ITEM	BALL	STEM	STEM PACKING	SEAL RING	BODY FASTENER
1	A105+ENP	A105+ENP	PTFE	PTFE	B7/2H
2	4140+ENP	4140+ENP	RPTFE	RPTFE	B7M/2HM
3	410/F6a	410/F6a	Flexible graphite+304	NYLON	B8/8(A)
4	304/CF8	304	GARLOCK	NYLON 12	B8M/8M(A)
5	304/CF3	304L	O-ring VITON	NYLON 66	L7/7
6	316/CF8M	316	410+VITON	PEEK	L7M/7M
7	316L/CF3M	316L	304+VITON	DEVLON V	B8T/8T
8	LF2+ENP	LF2+ENP	316+VITON	MOLON	L7/4L
9	17-PH	17-4PH		Para polystyrene	B16/4
10	F51	F51		TEFLON	
11	Alloy 825	Alloy 825		POM	
12	C61900	C61900		PCTFE	
13	MONEL	MONEL			
14	A105/ENP	A105+ENP			
15	F55	F55			
16	F44	F44			
17	C63200	C63200			
18	WCB+PFA	WCB+PFA			

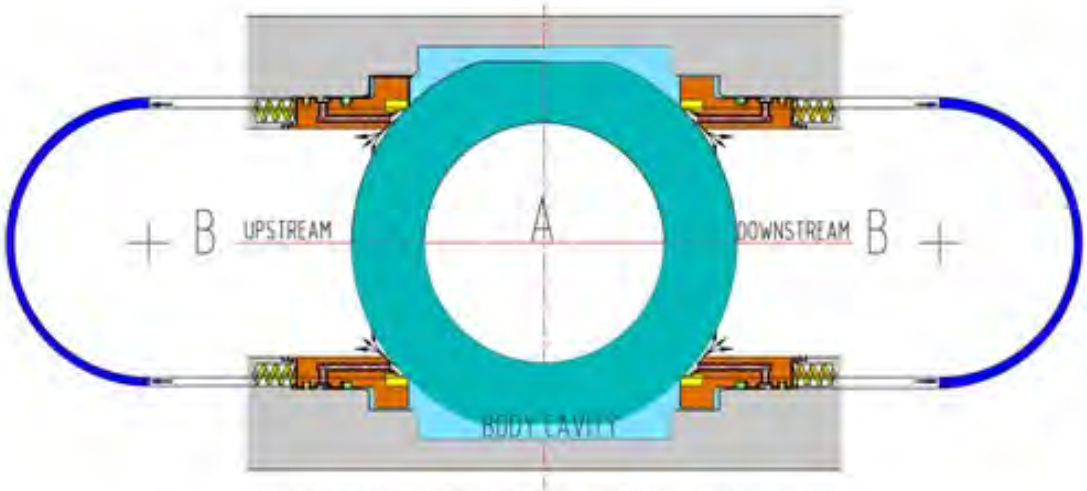
SELF-RELIEVING, DIB-1, AND DIB-2 SEAT DESIGN

SELF-RELIEVING (SINGLE PISTON EFFECT) DOUBLE BLOCK & BLEED

For this design, the seat retains tight contact with the ball in one direction. The line pressures upstream and downstream act upon the back of the seat retainers to force each of the seat rings more tightly against the ball. In the event that the body cavity pressure exceeds either the upstream or downstream line pressure, the body pressure will create a thrust that will push the seat ring away from the ball and allow the pressure to equalize between the cavity and the line. This overpressure release can occur in either the full open or close valve position. This style of valve is fully bi-directional for installation.



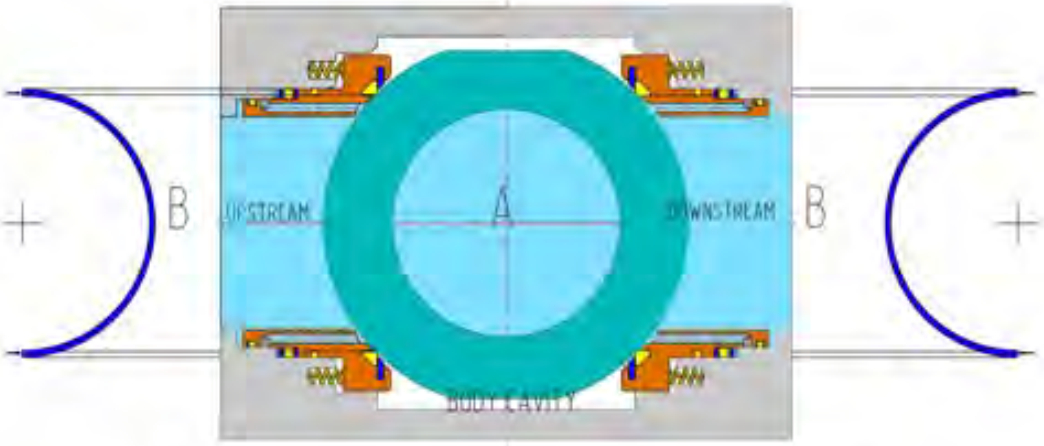
PRESSURE ACTING UPSTREAM AND/OR DOWNSTREAM
PRESSURE B>A
A=BODY CAVITY PRESSURE, B=LINE PRESSURE



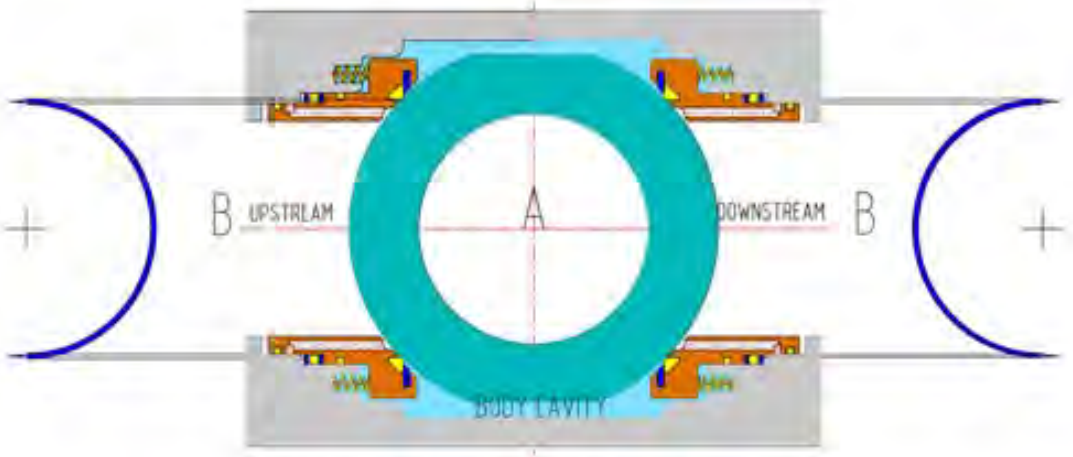
PRESSURE ACTING IN THE BODY CAVITY
PRESSURE A>B
A=BODY CAVITY PRESSURE, B=LINE PRESSURE

DIB-1 (DOUBLE PISTON EFFECT)

In the double piston effect design, the seat remains in tight contact with the ball in both directions. The line pressures upstream, downstream and in the body cavity will all act to increase the thrust forcing the seats into the ball. Therefore in full open or closed positions, the media in the body cavity will always be fully isolated from the line media. Dependent upon the application, this design of valve may require additional pressure relief devices to protect the valve in case of over-pressure of the body cavity. A common example of this requirement would be a liquid service where the media is subject to thermal expansion. This valve is also fully bi-directional for installation purposes, though if provided with cavity pressure relief piped to the flange, the valve would need to be installed so the media pressure release discharges to the upstream or downstream side based upon site requirements.



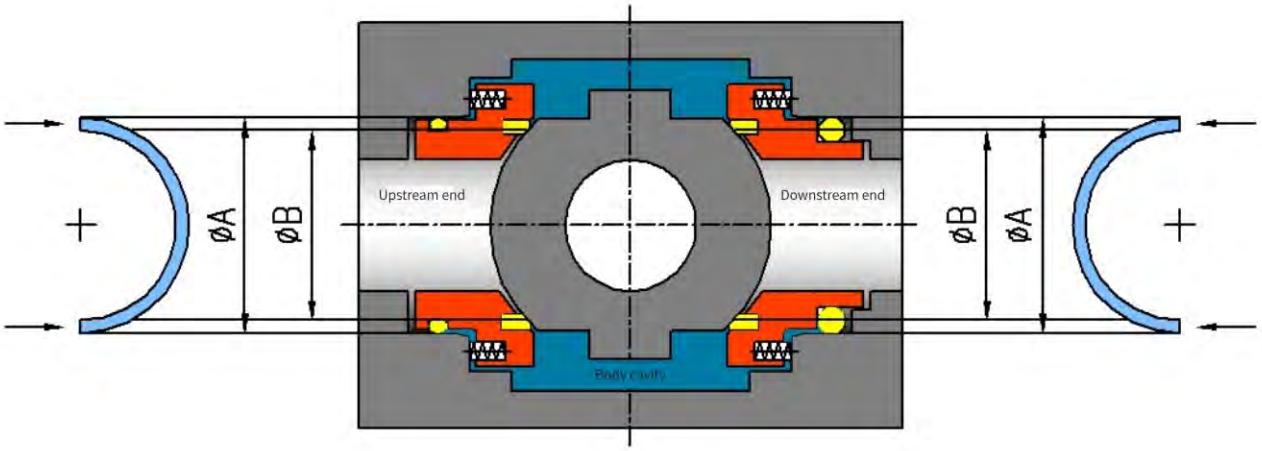
PRESSURE ACTING UPSTREAM AND/OR DOWNSTREAM
PRESSURE B>A
A=BODY CAVITY PRESSURE, B=LINE PRESSURE

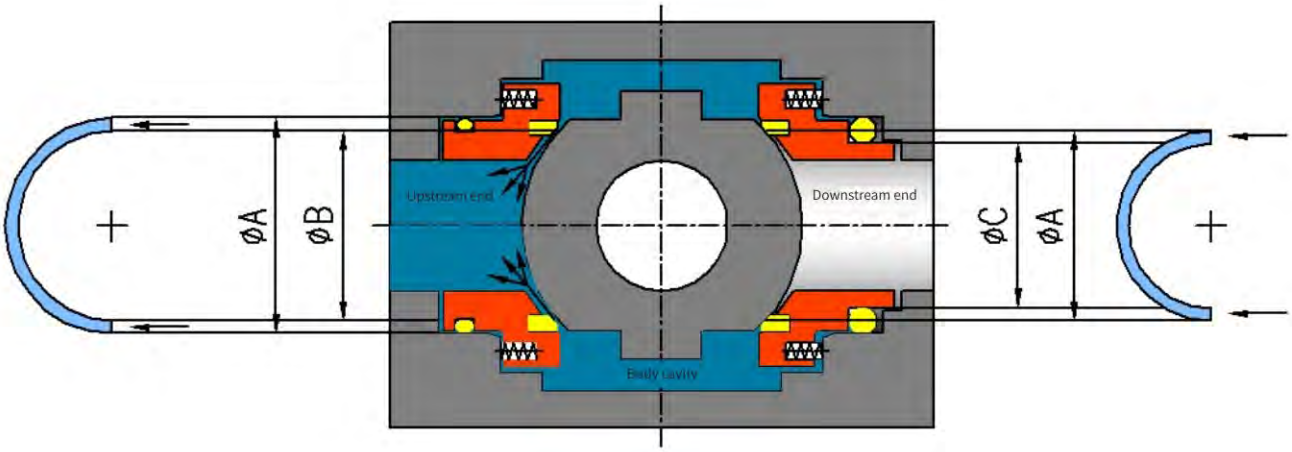


PRESSURE ACTING IN THE BODY CAVITY
PRESSURE A>B
A=BODY CAVITY PRESSURE, B=LINE PRESSURE

DIB-2 (ONE SINGLE PISTON SEAT + ONE DOUBLE PISTON EFFECT SEAT)

The DIB-2 design incorporates one of each seat in the valve construction. This will create a unidirectional valve with the double piston effect seat typically protecting the downstream line. In the case of body cavity pressure exceeding the line pressure, the single piston effect seat will allow for pressure to relieve (typically upstream) and equalise. There is no need to provide for additional pressure relief with this design, as it provides for the relief through the single piston effect seat.





TRUNNION MOUNTED BALL VALVE DESIGN

FLANGED / BW ENDS API 6D

- API 6D
- Flanged & Butt weld ends
- 3P split body, side entry
- Trunnion mounted ball, low operating torque
- Fire safe API 607, ISO 10497
- Anti-static device, BS 5351
- Double block & bleed
- Pressure self relieving seats
- Self lubricating PTFE coated trunnion bearings

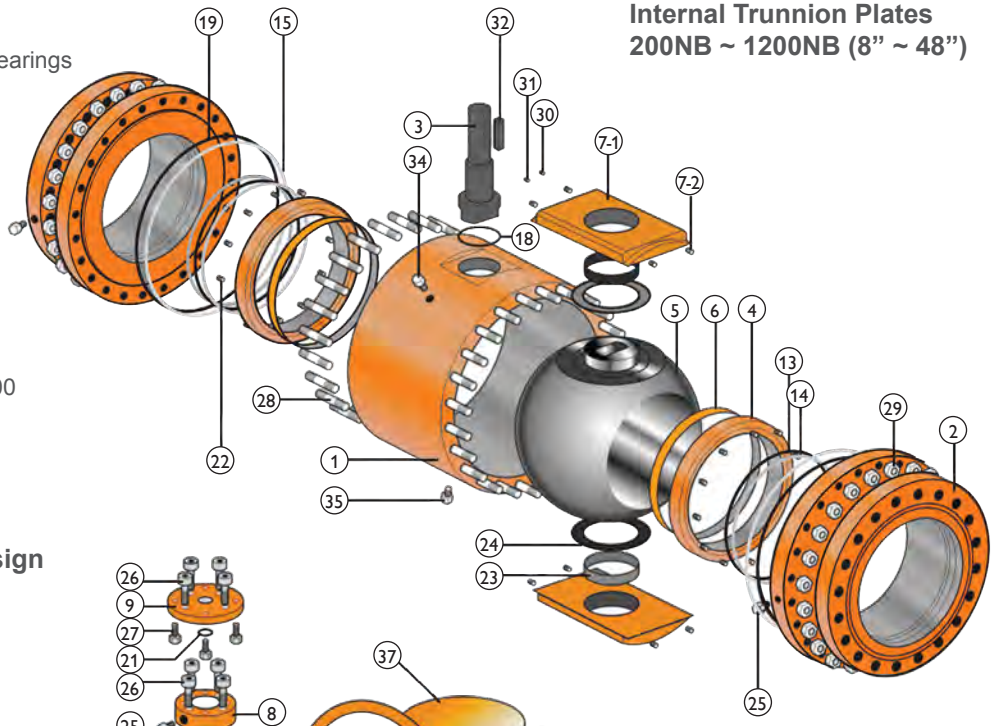
OPERATING CONDITION

Operating Temperature
-29ºC~+185ºC*

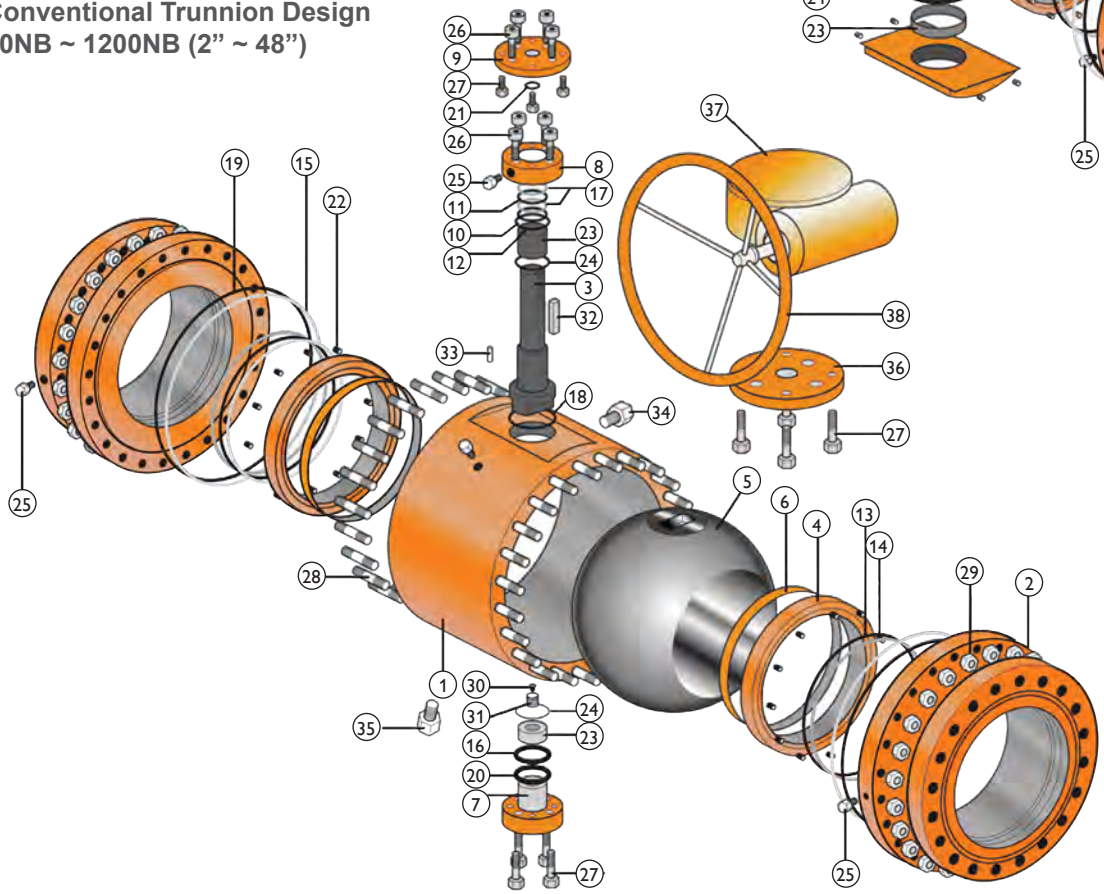
Pressure Rating
PN 20, 50, 64, 100, 150
Class 150, 300, 400, 600, 900, 1500, 2500

* Low and high temperature service also available

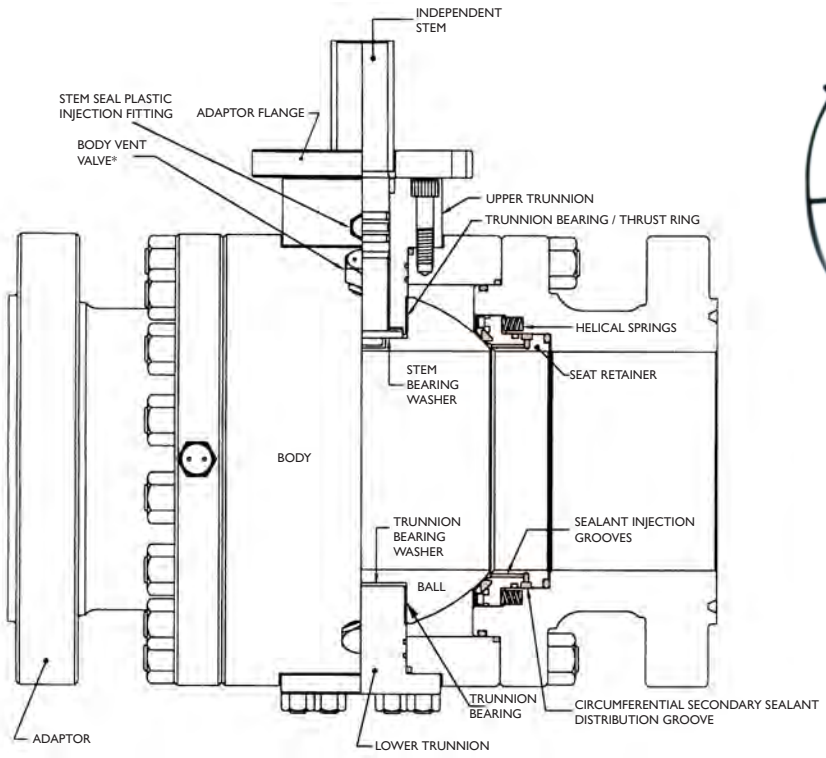
Internal Trunnion Plates
200NB ~ 1200NB (8” ~ 48”)



Conventional Trunnion Design
50NB ~ 1200NB (2” ~ 48”)



TRUNNION MOUNTED BALL MATERIAL SPECIFICATIONS



This drawing is general and for indicative purposes only and may vary according to size and class. (Refer to actual as built drawing if more accurate detail is required.)

BILL OF MATERIALS

No.	Part Name	Material			
		Low Temp	Carbon Steel	Stainless Steel	Duplex Steel
1 & 2	Body & Closure	ASTM A350 LF2	ASTM A105N	ASTM A182 F316	ASTM A182 F51/F53/F55
3 & 4	Stem & Seat Ring	ASTM A350 LF2 + ENP / A182 F6a / F304 / F316 / F51	ASTM A105N + ENP / 4140 + ENP / A182 F6a / F304 / F316 / 17-4PH	ASTM A182 F316/F51	ASTM A182 F51/F53/F55
5	Ball	ASTM A350 LF2 + ENP / A182 F6a / F304 / F316 / F51	ASTM A105N + ENP / A694 F60 + ENP /A182 F6a / F316 / F51	ASTM A182 F316/F51	ASTM A182 F51/F53/F55
6	Seat Insert	PTFE / RPTFE / Nylon / Devlon / PEEK			
7	Trunnion Mounting	LF2 + ENP / F51	ASTM A105 + ENP / 4140 + ENP	ASTM A182 F316/F51	ASTM A182 F51/F53/F55
7-1	Trunnion Block	LF2 + ENP / F51	ASTM A105 + ENP / 4140 + ENP	ASTM A182 F316/F51	ASTM A182 F51/F53/F55
7-2	Trunnion Block Pin	SS410 / SS304 / SS316		SS316	SS316 / S31803 / S32205
8	Stuffing Box	LF2 + ENP	ASTM A105 + ENP	ASTM A182 F316	ASTM A182 F51/F53/F55
9	Connection Plate	LF2 + ENP	ASTM A105 + ENP	ASTM A182 F316	ASTM A182 F51/F53/F55
10 & 11	Stem O-Ring	Viton-B / Viton AED / Viton GLT / Aflas / Elast-o-lion 985®			
12	Gland O-Ring	Viton-B / Viton AED / Viton GLT / Aflas / Elast-o-lion 985®			
13	Seat O-Ring	Viton-B / Viton AED / Viton GLT / Aflas / Elast-o-lion 985®			
14	Seat Subseal	Viton-B / Viton AED / Viton GLT / Aflas / Elast-o-lion 985® / Graphite			
15	Closure O-Ring	Viton-B / Viton AED / Viton GLT / Aflas / Elast-o-lion 985®			
16	Trunnion O-Ring	Viton-B / Viton AED / Viton GLT / Aflas / Elast-o-lion 985®			
17	Backup Ring	PTFE / Nylon / PEEK			
18	Gland Gasket	SS + Graphite / SS + PTFE			
19	Closure Gasket	SS + Graphite / SS + PTFE			
20	Trunnion O-Ring	Viton-B / Viton AED / Viton GLT / Aflas / Elast-o-lion 985®			
21	Stem Packing	PTFE / Graphite			
22	Seat Spring	17-4 / Inconel X 750			
23	Bearing	SS + PTFE / SS + Nitriding			
24	Thrust Washer	PTFE / RPTFE / Devlon / PEEK			
25	Sealant Fitting	Stainless Steel			
26 & 27	Screw	ASTM A320 L7 / L7M + ZP	ASTM A193 B7(M) + ZP	ASTM A193 B8(M) CL 1/2	
28	Stud	ASTM A320 L7 / L7M + ZP	ASTM A193 B7(M) + ZP	ASTM A193 B8(M) CL 1/2	
29	Nut	ASTM A194 7L / 7ML + ZP	ASTM A194 2H(M) + ZP	ASTM A194 8(M) CL 1/2	
30	Grounding Ball	Stainless Steel			Duplex Steel
31	Grounding Spring	Stainless Steel			Duplex Steel
32	Stem Key	AISI 1045			S31803 / S32205
33	Positioning Pin	316 Stainless Steel			Duplex Steel
34 & 35	Vent Plug & Drain Plug	316 Stainless Steel			Duplex Steel
36	Connection Plate	LF2 / ASTM A105N	ASTM A105N	ASTM A182 F316	ASTM A182 F51
37 & 38	Gear & Handwheel	Ductile Iron, Carbon Steel Assembly			

1500LB and 2500LB refer to drawing. O-ring and backing rings specified in larger sizes. The above specifications are general in nature and subject to change without notice.

INTRODUCTION OF TRUNNION MOUNTED BALL VALVE PRODUCTS

A. PURPOSE Trunnion mounted ball valves are essential components to control the flow of fluids or gases in a pipeline, particularly in high-pressure applications, by utilising a fixed ball mounted on trunnions which provide stability and allow for tight sealing with minimal operating torque, making them ideal for demanding industrial settings like oil and gas operations, chemical processing, and power generation plants.

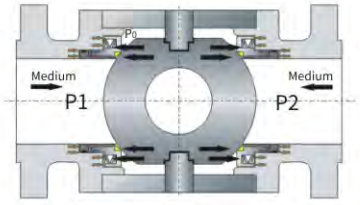
B. CHARACTERISTIC

1. Double block and bleed: A “double block and bleed” (DBB) is a valve configuration used to completely isolate a section of a pipeline or system by employing two isolation valves (“blocks”) with a bleed valve situated between them, allowing for the safe release of any trapped fluid or gas before maintenance or repairs are performed thus enhancing safety during operations by preventing pressure build-up and poetntial leaks.
2. Anti-static structure
3. Firesafe structure
4. The valve seat and stem are equipped with a grease injection system and are fire-resistant.
5. The valve stem has anti blowout function.
6. The ISO 5211 standard top flange design can meet the requirements of changing manual valves to worm gear or motor operation modes.
7. Locking device, manual worm gear operation, can be equipped with a padlock device to prevent operation of the valve.

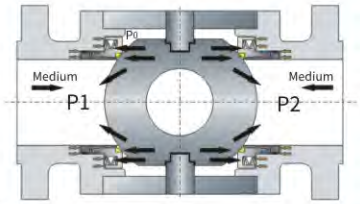
C. DESIGN, MANUFACTURING, AND INSPECTION STANDARDS

Design and manufacturing: API 6D, ASME B16.34, API 608, ISO 17292
End connection dimensions: ASME B16.5, EN1092, GB/T12221, JB/T79, GB/T 9113
Fire safe design: API 6D, JB/T 6899
Inspection and testing: API 6D, ISO 5208, API 598, GB/T 18927, GB/T 9092
Sulfur resistant materials: NACE MR 0175

DOUBLE BLOCK AND BLEED



$Po \leq P_1$ (≤PN)
$Po \leq P_2$ (≤PN)
When the body cavity is open to the atmosphere or emptied of the medium, the flow of the medium at both ends of the valve cavity is blocked.



$Po \leq 1.33PN$ (P_1, $P_2 \leq PN$)
The valve seat automatically retracts under pressure, releaseing the pressure in the cavity.

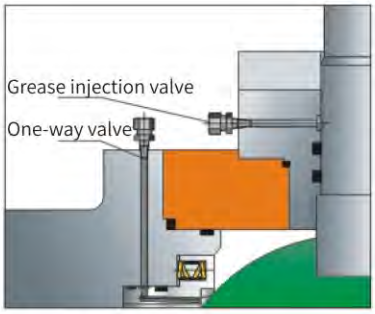
PRODUCT RANGE API 6D FP AND RP

SIZE	ANSI 150	ANSI 300	ANSI 600	ANSI 900	ANSI 1500	ANSI 2500
2	●	●	●	●	●	●
3	●	●	●	●	●	●
4	●	●	●	●	●	●
6	●	●	●	●	●	●
8	●	●	●	●	●	●
10	●	●	●	●	●	●
12	●	●	●	●	●	●
14	●	●	●	●	●	
16	●	●	●	●	●	
18	●	●	●	●	●	
20	●	●	●	●	●	
24	●	●	●	●	●	
28	●	●	●	●		
30	●	●	●	●		
32	●	●	●	●		
34	●	●	●			
36	●	●	●			
40	●	●	●			
42	●	●	●			
48	●	●	●			
56	●	●	●			

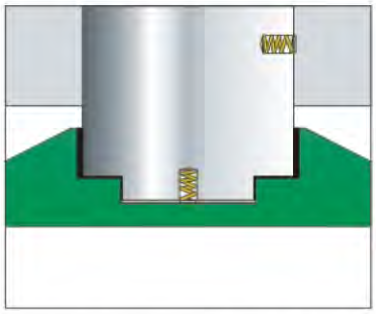
DESIGN AND TEST STANDARDS

DESIGN	API 6D, API 608, ISO 17292, CSA B51
PRESSURE/TEMPERATURE	ASME B16.34
FACE TO FACE	ASME B16.10
END FLANGES	RF/RTJ: ASME B16.5, >24"; B16.47/MSS SP-44, BW:B16.25
FIRESAFE	API 607
SOUR SERVICE	NACE MR0175/ISO 15156
TOP FLANGE	ISO 5211
INSPECTION	API 598
TESTING	API 6D
MARKING	MSS SP-25, API 6D
QUALITY	MSS SP-55
DOCUMENTATION	BS EN 1020403.1

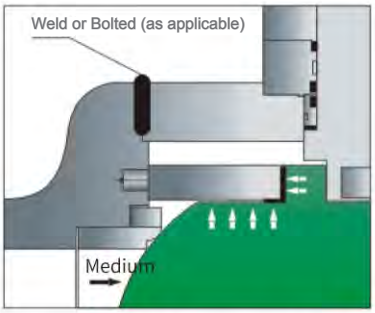
FZV DESIGN



The valve seat and stem are equipped with secondary injection seals, which can be used to urgently injection grease into the body cavity in case of leakage.



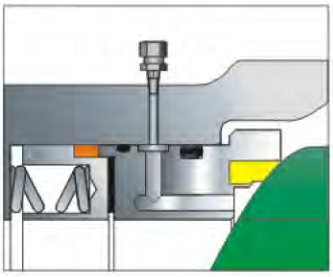
Anti-static devices transmit static electricity through ball, stem, and valve body .



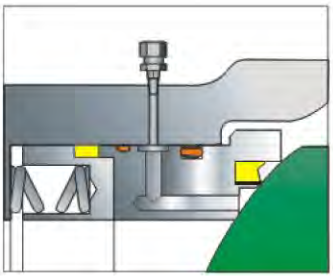
The support plate holds securely the ball and bears the action of the medium. The stem only transmits torque.

FZV TWO TYPES OF VALVE SEAT FIRE SAFE FIG

Type A

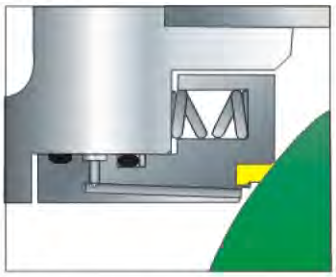


The ball and valve seat are sealed under pressure, the PTFE gasket of the secondary valve seat is tightly pressed, the graphite gasket of the secondary valve seat is loosed , and the valve seat moves well.

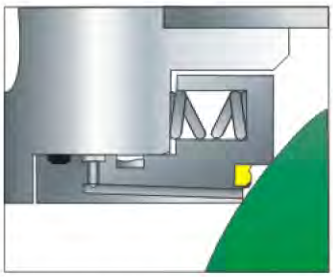


When a fire occurs, soft seat burns out. PTFE gasket as the secondary sealing starts to melt, and the flexible graphite is compressed to reduce the leakage.
A metal to metal seal with the ball reduces the leakage when the seal housing is pushed against the ball, by the line pressure.

Type B



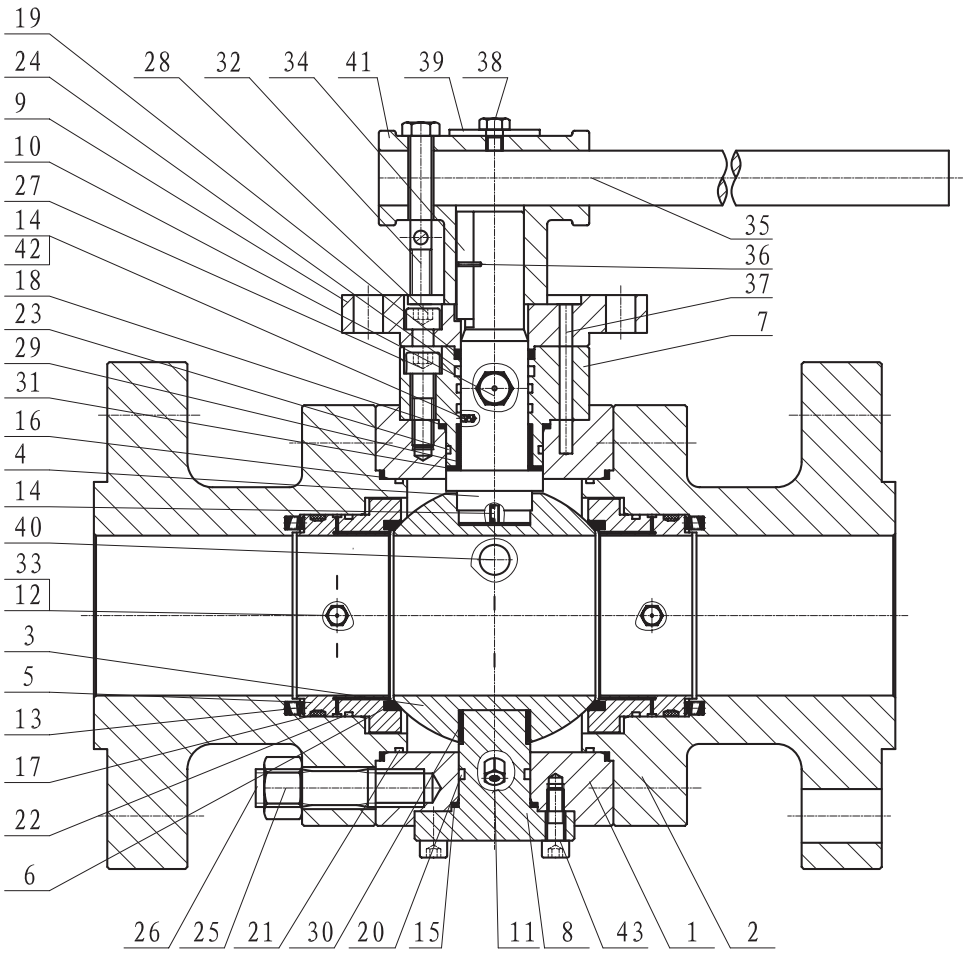
The ball and valve seat are sealed under normal pressure.



When a fire occurs, soft seat and O-ring start to melt. O-ring leakage path has a graphite gasket to restrict the oil / gas flowing to the atmosphere.
A metal to metal seal with the ball reduces the leakage when the seal housing is pushed against the ball, by the line pressure.

3 PIECE FORGED LEVER OPERATED DBB

CROSS SECTIONAL DRAWING

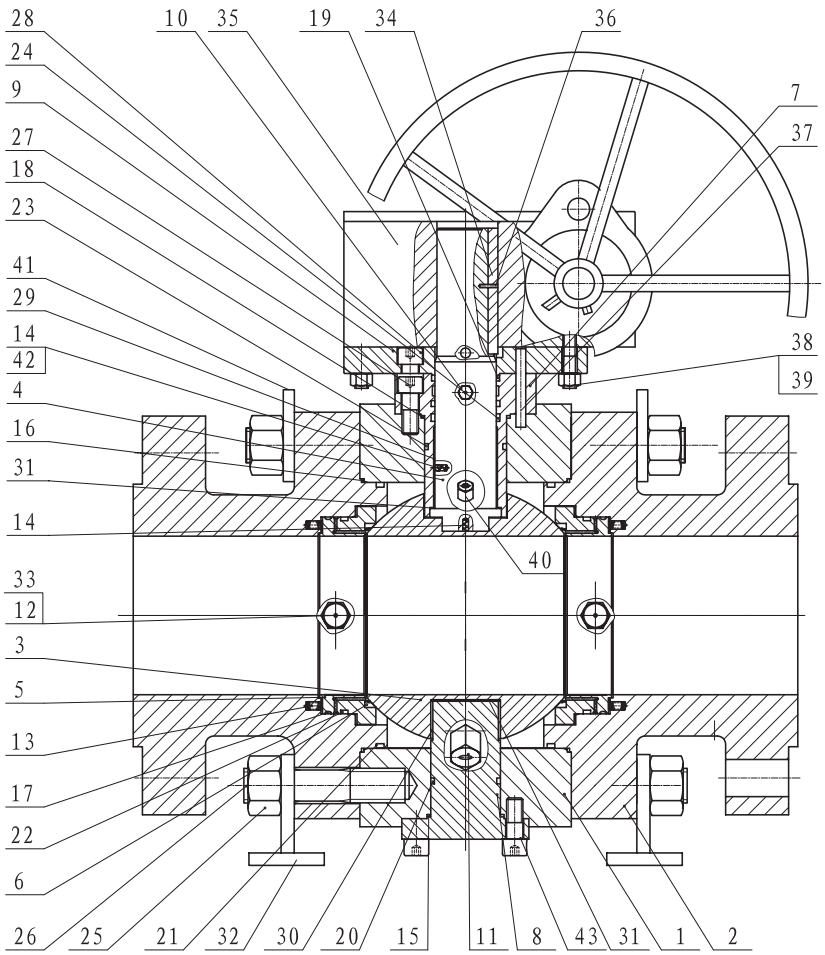


ITEM	DESCRIPTIONS	ITEM	DESCRIPTIONS	ITEM	DESCRIPTIONS
1	BODY	16	FIRE SAFE GASKET	30	BEARING
2	END CAP	17	FIRE SAFE GASKET	31	THRUST WASHER
3	BALL	18	FIRE SAFE GASKET	32	HEX HEAD BOLT
4	STEM	19	FIRE SAFE GASKET	33	CHECK VALVE
5	SEAT	20	TRUNNION SEAL O-RING	34	KEY
6	SEAT RING	21	BODY SEAL O-RING	35	LEVER
7	UPPER CAP	22	SEAT SEAL O-RING	36	PIN
8	TRUNNION	23	UPPER CAP SEAL O-RING	37	PIN
9	LIMIT STOP PLATE	24	STEM SEAL O-RING	38	HEX HEAD BOLT
10	SEALANT INJECTION VALVE	25	STUD	39	INDICATING PLATE
11	DRAIN VALVE	26	NUT	40	VENT VALVE
12	SEALANT INJECTION VALVE	27	ALLEN HEAD BOLT	41	LEVER HEAD
13	SEAT SPRING	28	ALLEN HEAD BOLT	42	ANTISTATIC BALL
14	ANTISTATIC SPRING	29	BEARING	43	ALLEN HEAD BOLT
15	FIRE SAFE GASKET				

NOTE: Drawings are representative.
Space permitting, most valves include seat sealant injection (items 12/33).
Select small valves use body cavity injection due to space constraints.

3 PIECE FORGED GEAR OPERATED DBB

CROSS SECTIONAL DRAWING

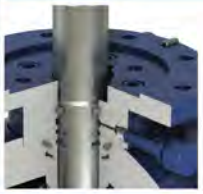


ITEM	DESCRIPTIONS	ITEM	DESCRIPTIONS	ITEM	DESCRIPTIONS
1	BODY	16	FIRE SAFE GASKET	30	BEARING
2	END CAP	17	FIRE SAFE GASKET	31	THRUST WASHER
3	BALL	18	FIRE SAFE GASKET	32	SUPPORT FEET
4	STEM	19	FIRE SAFE GASKET	33	CHECK VALVE
5	SEAT	20	TRUNNION SEAL O-RING	34	KEY
6	SEAT RING	21	BODY SEAL O-RING	35	GEAR OPERATOR
7	UPPER CAP	22	SEAT SEAL O-RING	36	PIN
8	TRUNNION	23	UPPER CAP SEAL O-RING	37	PIN
9	LIMIT STOP PLATE	24	STEM SEAL O-RING	38	STUD
10	SEALANT INJECTION VALVE	25	STUD	39	NUT
11	DRAIN VALVE	26	NUT	40	VENT VALVE
12	SEALANT INJECTION VALVE	27	ALLEN HEAD BOLT	41	LIFTING LUGS
13	SEAT SPRING	28	ALLEN HEAD BOLT	42	ANTISTATIC BALL
14	ANTISTATIC SPRING	29	BEARING	43	ALLEN HEAD BOLT
15	FIRE SAFE GASKET				

NOTE: Drawings are representative.
Support legs and lifting lugs supplied on sizes 6” and larger.
Valve sizes ≥16” use 2 seat sealant injection valves per seat.

DBB/DIB-1/DIB-2 DESIGN

Seats have preloaded springs to ensure a bubble tight seal even at low pressures.



INTEGRAL VALVE STOPS

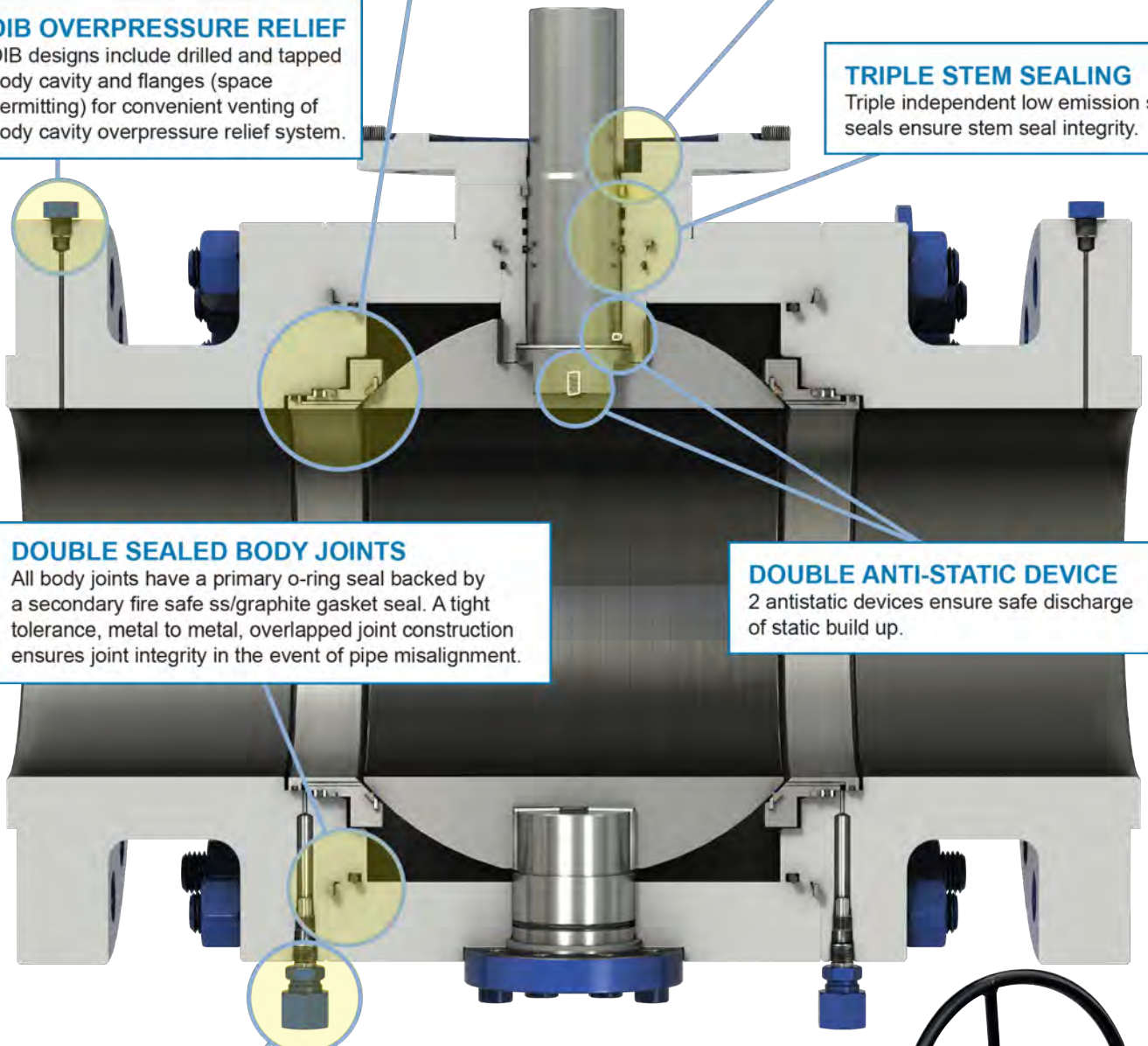
The valve stops are integral facilitating easy correct actuation stop setting when the valve is retrofitted in the field.

DIB OVERPRESSURE RELIEF

DIB designs include drilled and tapped body cavity and flanges (space permitting) for convenient venting of body cavity overpressure relief system.

TRIPLE STEM SEALING

Triple independent low emission stem seals ensure stem seal integrity.



DOUBLE SEALED BODY JOINTS

All body joints have a primary o-ring seal backed by a secondary fire safe ss/graphite gasket seal. A tight tolerance, metal to metal, overlapped joint construction ensures joint integrity in the event of pipe misalignment.

DOUBLE ANTI-STATIC DEVICE

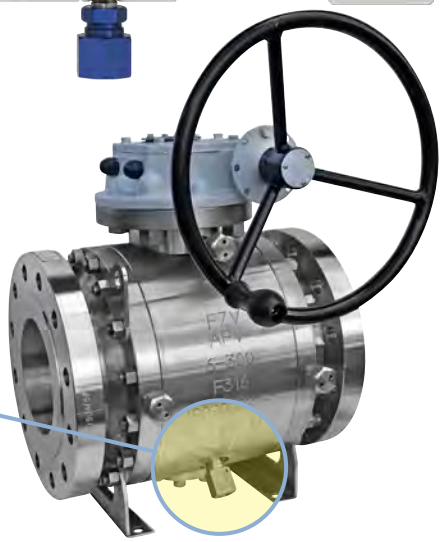
2 antistatic devices ensure safe discharge of static build up.

EMERGENCY STEM & SEAT INJECTION FITTINGS

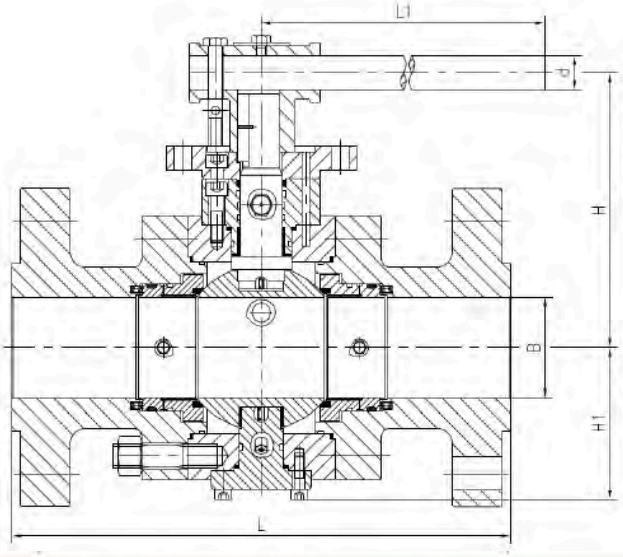
The standard design incorporates both stem and seat injection fittings (smaller sizes use cavity injection).

BODY VENT / DRAIN

For pressure relief prior to servicing and to allow for draining or flushing prior to servicing or removal.



SIZES, DIMENSIONS & WEIGHTS

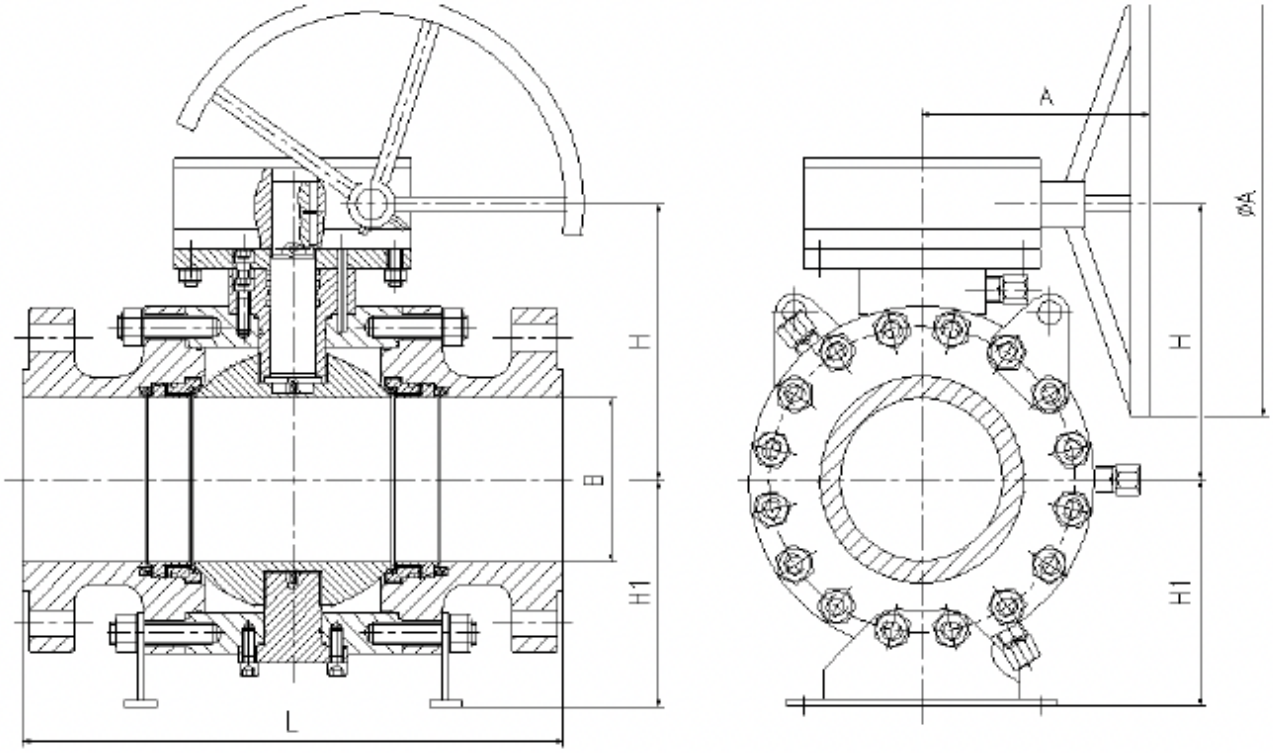


2" TO 6" LEVER OPERATED ASME CLASS 150-2500#

SIZE IN INCHES DIMENSIONS IN MM

ASME	SIZE	B-Port	L-RF	L-RTJ	H	H1	L1	d	WT (kg)
150	2x1-1/2	38	178	191	*	*	*	*	15
150	2	50	178	191	166	90	300	20	17
150	3x2	50	203	216	166	90	300	20	30
150	3	75	203	216	199	111	400	25	37
150	4x3	75	229	241	199	111	400	25	42
150	4	100.1	229	241	222	130	450	25	49
150	6x4	100.1	394	406	222	130	450	25	100
300	2x1-1/2	38	216	232	158	90	300	20	20
300	2	50	216	232	166	90	300	20	22
300	3x2	50	282	298	166	90	300	20	40
300	3	75	282	298	199	111	500	25	45
300	4x3	75	305	321	199	111	500	25	60
300	4	100.1	305	321	221	130	600	25	70
300	6x4	100.1	403	419	221	130	600	25	150
600	2x1-1/2	38	292	295	158	90	404	20	28
600	2	50	292	295	168	95	500	20	32
600	3x2	50	356	359	168	95	500	20	48
600	3	75	356	359	204	115	600	25	56
600	4x3	75	432	435	204	115	600	25	80
600	4	100.1	432	435	225	137	700	25	105
600	6x4	100.1	559	562	225	137	700	25	210
900	2x1-1/2	38	368	371	*	*	*	*	40
900	2	49	368	371	178	101	600	25	48
900	3x2	49	381	384	178	101	600	25	55
900	3	74	381	384	208	114	760	25	83
900	4x3	74	457	460	208	114	760	25	100
1500	2x1-1/2	38	368	371	183	104	500	25	45
1500	2	49	368	371	178	101	600	25	62
1500	3x2	49	470	473	178	101	600	25	110
1500	3	74	470	473	262	147	882	35	135
1500	4x3	74	546	549	262	147	882	35	150
2500	2	42	451	454	237	139	900	35	120
2500	3x2	42	578	584	237	139	900	35	182

Note: envelope dimensions remain the same independent of seat design.
* contact fzv for details.



6" TO 48" GEAR OPERATED ASME CLASS 150#

SIZE IN INCHES DIMENSIONS IN MM

ASME	SIZE	B-PORT	L-RF	L-RTJ	H	H1	A	DIA A	WT (KG)
150	6	151	394	406	266	205	229	465	154
	8x6	151	457	470	266	205	229	465	218
150	8	202	457	470	315	243	360	600	270
	10x8	202	533	546	315	243	360	600	370
150	10	252	533	546	360	300	402	600	462
	12x10	252	610	622	360	300	402	600	535
150	12	303	610	622	393	335	402	600	646
	14x12	303	686	699	393	335	402	600	845
150	14	334	686	699	421	357	402	600	958
	16x14	334	762	775	421	357	402	600	1160
150	16	385	762	775	550	410	520	600	1248
	18x16	385	864	876	550	410	520	600	1350
150	18	436	864	876	640	488	543	750	1440
	20x18	436	914	927	640	488	543	750	1850
150	20	487	914	927	*	*	*	*	1960
	24x20	487	1067	1080	*	*	*	*	2540
150	24	589	1067	1080	661	617	604	750	2810
	30x24	589	1295	*	661	617	604	750	4550
150	30	735	1295	*	*	*	*	*	4850
	36x30	735	1524	*	*	*	*	*	*
150	36	874	1524	*	*	*	*	*	8950
	42x36	874	1655	*	*	*	*	*	*
150	42	1020	1655	*	*	*	*	*	14450
	48x42	1020	2134	*	*	*	*	*	*
150	48	1166	2134	*	*	*	*	*	21750

Note: envelope dimensions remain the same independent of seat design.
* contact fzv for details.

6" TO 48"GEAR OPERATED ASME CLASS 300#

SIZE IN INCHES DIMENSIONS IN MM

ASME	SIZE	B-PORT	L-RF	L-RTJ	H	H1	A	DIA A	WT (KG)
300	6	151	403	419	266	205	229	465	175
	8x6	151	502	518	266	205	229	465	238
300	8	202	502	518	315	243	360	600	327
	10x8	202	568	584	315	243	360	600	382
300	10	252	568	584	360	300	402	600	500
	12x10	252	648	664	360	300	402	600	570
300	12	303	648	664	475	345	520	600	735
	14x12	303	762	778	475	345	520	600	980
300	14	334	762	778	525	388	520	600	1162
	16x14	334	838	854	525	388	520	600	1250
300	16	385	838	854	590	422	543	750	1492
	18x16	385	914	930	590	422	543	750	1620
300	18	436	914	930	639	488	543	750	1752
	20x18	436	991	1010	639	488	543	750	1910
300	20	487	991	1010	*	*	*	*	2695
	24x20	487	1143	1165	*	*	*	*	2860
300	24	589	1143	1165	705	600	642	750	3210
	30x24	589	1397	1422	705	600	642	750	4560
300	30	735	1397	1422	*	*	*	*	5590
	36x30	735	1727	1756	*	*	*	*	7854
300	36	874	1727	1756	*	*	*	*	10280
	42x36	874	2083	*	*	*	*	*	
300	42	1020	2083	*	*	*	*	*	16300
	48x42	1020	2170	*	*	*	*	*	
300	48	1166	2170	*	*	*	*	*	24300

6" TO 48"GEAR OPERATED ASME CLASS 600#

SIZE IN INCHES DIMENSIONS IN MM

ASME	SIZE	B-PORT	L-RF	L-RTJ	H	H1	A	DIA A	WT (KG)
600	6	151	559	562	271	221	360	600	260
	8x6	151	660	664	271	221	360	600	382
600	8	202	660	664	335	280	402	600	465
	10x8	202	787	791	335	280	402	600	591
600	10	252	787	791	448	326	520	600	750
	12x10	252	838	841	448	326	520	600	856
600	12	303	838	841	520	355	543	750	1090
	14x12	303	889	892	520	355	543	750	1150
600	14	334	889	892	546	390	543	750	1335
	16x14	334	991	994	546	390	543	750	1560
600	16	385	991	994	511	420	604	750	1810
	18x16	385	1092	1095	511	420	604	750	2300
600	18	436	1092	1095	*	*	*	*	2500
	20x18	436	1194	1200	*	*	*	*	2750
600	20	487	1194	1200	664	543	660	750	3000
	24x20	487	1397	1407	664	543	660	750	4150
600	24	589	1397	1407	*	*	*	*	5000
	30x24	589	1651	1664	*	*	*	*	6100
600	30	735	1651	1664	*	*	*	*	7570
	36x30	735	2083	2099	*	*	*	*	9266
600	36	874	2083	2099	*	*	*	*	13530
	42x36	874	2437	2437	*	*	*	*	
600	42	1020	2437	2437	*	*	*	*	21590
	48x42	1020	2540	2540	*	*	*	*	
600	48	1166	2540	2540	*	*	*	*	31550

Note: envelope dimensions remain the same independent of seat design.
* contact fzv for details.

4" TO 30"GEAR OPERATED ASME CLASS 900#

SIZE IN INCHES DIMENSIONS IN MM

ASME	SIZE	B-PORT	L-RF	L-RTJ	H	H1	A	DIA A	WT (KG)
900	4	100	457	460	234	200	229	465	127
	6x4	100	610	613	234	200	229	465	240
900	6	150	610	613	283	242	402	600	305
	8x6	150	737	740	283	242	402	600	480
900	8	201	737	740	420	283	520	600	560
	10x8	201	838	841	420	283	520	600	750
900	10	252	838	841	500	320	543	750	858
	12x10	252	965	968	500	320	543	750	1050
900	12	303	965	968	467	355	604	750	1343
	14x12	303	1029	1038	467	355	604	750	1520
900	14	322	1029	1038	*	*	*	*	1610
	16x14	322	1130	1140	*	*	*	*	1850
900	16	373	1130	1140	573	477	643	750	2525
	18x16	373	1219	1232	*	*	*	*	2690
900	18	423	1219	1232	*	*	*	*	2870
	20x18	423	1321	1334	*	*	*	*	2950
900	20	471	1321	1334	*	*	*	*	3480
	24x20	471	1549	1568	*	*	*	*	3600
900	24	570	1549	1568	*	*	*	*	7030
	30x24	570	1880	1902	*	*	*	*	10200
900	30	712	1880	1902	*	*	*	*	12440

4" TO 24"GEAR OPERATED ASME CLASS 1500#

SIZE IN INCHES DIMENSIONS IN MM

ASME	SIZE	B-PORT	L-RF	L-RTJ	L-WE	H	H1	A	DIA A	WT (KG)
1500	4	100	546	549	546	261	209	360	600	195
	6x4	100	705	711	705	261	209	360	600	410
1500	6	144	705	711	705	429	270	520	600	461
	8x6	144	832	841	832	429	270	520	600	560
1500	8	192	832	841	832	509	320	543	750	640
	10x8	192	991	1001	991	509	320	543	750	930
1500	10	239	991	1001	991	481	382	604	750	1210
	12x10	239	1130	1146	1130	481	382	604	750	1356
1500	12	287	1130	1146	1130	*	*	*	*	1592
	14x12	287	1257	1276	1257	*	*	*		1830
1500	14	315	1257	1276	1257	*	*	*	*	2260
	16x14	315	1384	1406	1384	*	*	*	*	2560
1500	16	360	1384	1406	1384	*	*	*	*	3760
	18x16	360	1537	1559	1537	*	*	*	*	5554
1500	18	406	1537	1559	1537	*	*	*	*	6400
	20x18	406	1664	1686	1664	*	*	*	*	7521
1500	20	454	1664	1686	1664	*	*	*	*	8060
	24x20	454	1944	1972	*	*	*	*	*	10922
1500	24	546	1944	1972	*	*	*	*	*	14550

Note: envelope dimensions remain the same independent of seat design.
* contact fzv for details.

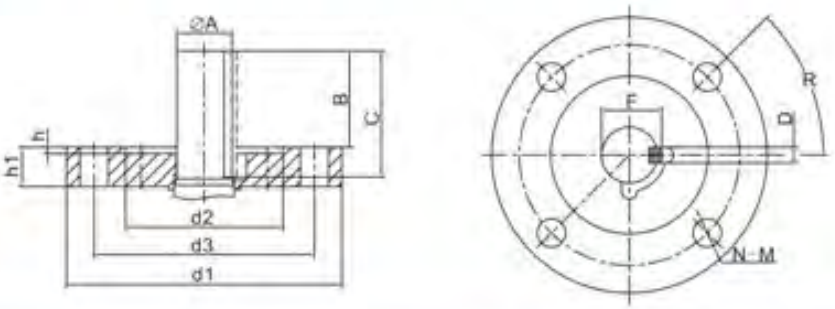
3" TO 12" GEAR OPERATED ASME CLASS 2500#

SIZE IN INCHES DIMENSIONS IN MM

ASME	SIZE	B-PORT	L-RF	L-RTJ	L-WE	H	H1	A	DIA A	WT (KG)
2500	3	62	578	584	578	251	187	360	600	215
	4x3	62	673	683	673	251	187	360	600	275
2500	4	87	673	683	673	288	240	402	600	389
	6x4	87	914	927	914	288	240	402	600	526
2500	6	131	914	927	914	*	*	*	*	1524
	8x6	131	1022	1038	1022	*	*	*	*	1623
2500	8	179	1022	1038	1022	*	*	*	*	1880
	10x8	179	1270	1292	1270	*	*	*	*	2421
2500	10	223	1270	1292	1270	*	*	*	*	3140
	12x10	223	1422	1444	1422	*	*	*	*	3536
2500	12	265	1422	1444	1422	*	*	*	*	4260

Note: envelope dimensions remain the same independent of seat design.
* contact fzv for details.

TOP WORKS DIMENSIONS

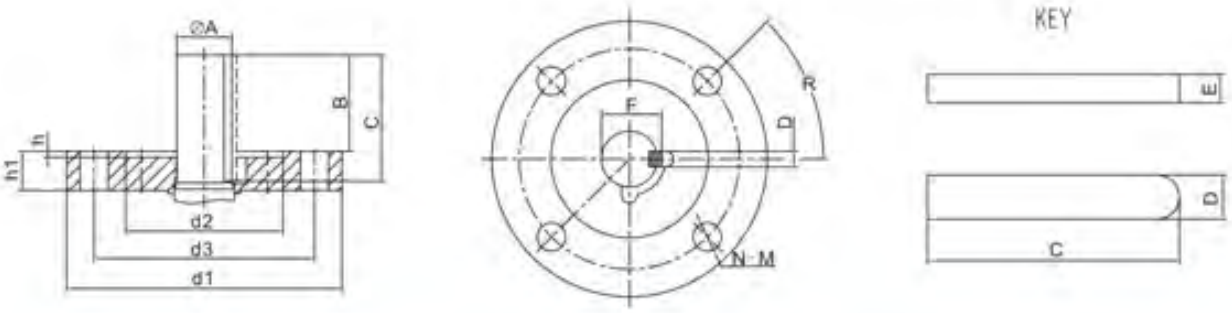


ASME CLASS 150

SIZE IN INCHES, DIMENSIONS IN MM

NPS	A	B	C	D	E	F	ISO	d1	d2	d3	N-M	h	h1	R
2"	26	35	45	8	7	29	F10	125	70	102	4-Φ12	3	14	45°
3"	30	40	50	8	7	33	F12	150	85	125	4-Φ14	3	17	45°
4"	35	41	56	10	8	38	F12	150	85	125	4-Φ14	4	21	45°
6"	47	79	100	14	9	50.5	F16	210	130	165	4-Φ22	6	24.5	45°
8"	52	88	110	16	10	56	F16	210	130	165	4-Φ23	6	24.5	45°
10"	62	85	110	18	11	66	F25	300	200	254	8-Φ18	6	25	22.5°
12"	62	88	110	18	11	66	F25	300	200	254	8-Φ18	6	25.5	22.5°
14"	72	94	120	20	12	76.5	F25	300	200	254	8-Φ18	6	25	22.5°
16"	72	116	140	20	12	76.5	F25	300	200	254	8-Φ18	6	26.5	22.5°
18"	80	120	150	22	14	85	F25	300	200	254	8-Φ18	6	28	22.5°
20"	90	120	150	25	14	95	F25	300	200	254	8-Φ18	6	28	22.5°
24"	105	130	165	28	16	111	F30	350	230	298	8-Φ22	6	25	22.5°
30"	*	*	*	*	*	*	*	*	*	*	*	*	*	
36"	*	*	*	*	*	*	*	*	*	*	*	*	*	
42"	*	*	*	*	*	*	*	*	*	*	*	*	*	
48"	*	*	*	*	*	*	*	*	*	*	*	*	*	

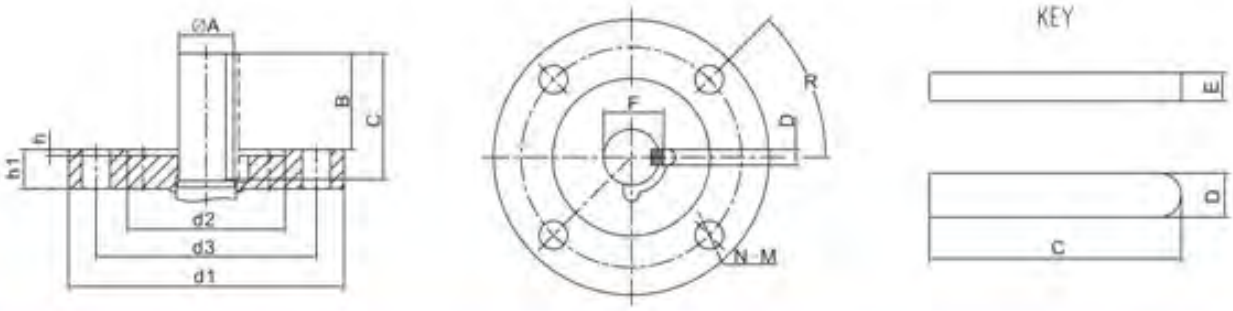
Note: topworks dimensions remain the same independent of seat design.
* contact fzv for details.



ASME CLASS 300														SIZE IN INCHES, DIMENSIONS IN MM
NPS	A	B	C	D	E	F	ISO	d1	d2	d3	N-M	h	h1	R
2x1 1/2"	20	29.5	40	6	6	22.5	F10	125	70	102	4-Φ12	*	14	45°
2"	26	35	45	8	7	29	F10	125	70	102	4-Φ12	3	14	45°
3"	30	40	50	8	7	33	F12	150	85	125	4-Φ14	3	17	45°
4"	35	41	56	10	8	38	F12	150	85	125	4-Φ14	4	20	45°
6"	47	79	100	14	9	50.5	F16	210	130	165	4-Φ22	6	24.5	45°
8"	52	88	110	16	10	56	F16	210	130	165	4-Φ23	6	24.5	45°
10"	62	85	110	18	11	66	F25	300	200	254	8-Φ18	6	25	22.5°
12"	62	88	110	18	11	66	F25	300	200	254	8-Φ18	6	25.5	22.5°
14"	72	100	130	20	12	76.5	F25	300	200	254	8-Φ18	6	30	22.5°
16"	72	116	140	20	12	76.5	F25	300	200	254	8-Φ18		26.5	22.5°
18"	80	110	140	22	14	85	F25	300	200	254	8-Φ18	6	28	22.5°
20"	*	*	*	*	*	*	*	*	*	*	*	*	*	
24"	105	130	165	28	16	111	F35	415	260	356	8-Φ33	6	32	22.5°
30"	*	*	*	*	*	*	*	*	*	*	*	*	*	
36"	*	*	*	*	*	*	*	*	*	*	*	*	*	
42"	*	*	*	*	*	*	*	*	*	*	*	*	*	
48"	*	*	*	*	*	*	*	*	*	*	*	*	*	

ASME CLASS 600														SIZE IN INCHES, DIMENSIONS IN MM
NPS	A	B	C	D	E	F	ISO	d1	d2	d3	N-M	h	h1	R
2"	26	35	45	8	7	29	F10	125	70	102	4-Φ12	3	14	45°
3"	30	40	50	8	7	33	F12	150	85	125	4-Φ14	3	17	45°
4"	35	41	56	10	8	38	F12	150	85	125	4-Φ14	4	20	45°
6"	47	79	100	14	9	50.5	F16	210	130	165	4-Φ22	6	24.5	45°
8"	52	88	110	16	10	56	F25	300	200	254	8-Φ18	6	24.5	22.5°
10"	62	85	110	18	11	66	F25	300	200	254	8-Φ18	6	25	22.5°
12"	72	117	140	20	12	76.5	F25	300	200	254	8-Φ18	6	24.5	22.5°
14"	85	117	140	22	14	90	F30	350	230	298	8-Φ22	6	25	22.5°
16"	92	133	160	25	14	97	F30	350	230	298	8-Φ22	6	24.5	22.5°
18"	*	*	*	*	*	*	*	*	*	*	*	*	*	
20"	110	130	165	28	16	116	F35	415	260	356	8-Φ33	6	45	22.5°
24"	*	*	*	*	*	*	*	*	*	*	*	*	*	
30"	*	*	*	*	*	*	*	*	*	*	*	*	*	
36"	*	*	*	*	*	*	*	*	*	*	*	*	*	
42"	*	*	*	*	*	*	*	*	*	*	*	*	*	
48"	*	*	*	*	*	*	*	*	*	*	*	*	*	

Note: topworks dimensions remain the same independent of seat design.
* contact fzv for details.



ASME CLASS 900												SIZE IN INCHES, DIMENSIONS IN MM		
NPS	A	B	C	D	E	F	ISO	d1	d2	d3	N-M	h	h1	R
2"	26	36	50	8	7	29	F12	150	85	125	4-Φ14	4	23	45°
3"	30	41	55	8	7	33	F12	150	85	125	4-Φ14	4	24	45°
4"	35	61	80	10	8	38	F14	175	100	140	4-Φ18	5	25	45°
6"	47	78	100	14	9	50.5	F25	300	200	254	8-Φ18	6	28	22.5°
8"	72	78	100	20	12	76.5	F25	300	200	254	8-Φ18	6	31	22.5°
10"	72	76	100	20	12	76.5	F25	300	200	254	8-Φ18	6	25	22.5°
12"	90	120	150	25	14	95	F25	300	200	254	8-Φ18	6	25	22.5°
14"	*	*	*	*	*	*	*	*	*	*	*	*	*	
16"	115	170	210	32	18	122	F35	415	260	356	8-Φ33	6	40	22.5°
18"	*	*	*	*	*	*	*	*	*	*	*	*	*	
20"	*	*	*	*	*	*	*	*	*	*	*	*	*	
24"	*	*	*	*	*	*	*	*	*	*	*	*	*	
30"	*	*	*	*	*	*	*	*	*	*	*	*	*	

ASME CLASS 1500												SIZE IN INCHES, DIMENSIONS IN MM		
NPS	A	B	C	D	E	F	ISO	d1	d2	d3	N-M	h	h1	R
2"	26	36	50	8	7	29	F12	150	85	125	4-Φ14	4	23	45°
3"	38	61	75	10	8	41	F16	210	130	165	4-Φ22	*	29	45°
4"	47	79	100	14	9	50.5	F16	210	130	165	4-Φ22	6	31.5	45°
6"	57	83	105	16	10	61	F25	300	200	254	8-Φ18	6	40	22.5°
8"	80	120	149	22	14	85	F25	300	200	254	8-Φ18	6	43.5	22.5°
10"	95	130	160	25	14	100	F30	350	230	298	8-Φ23	6	45.5	22.5°
12"	*	*	*	*	*	*	*	*	*	*	*	*	*	
16"	*	*	*	*	*	*	*	*	*	*	*	*	*	
18"	*	*	*	*	*	*	*	*	*	*	*	*	*	
20"	*	*	*	*	*	*	*	*	*	*	*	*	*	
24"	*	*	*	*	*	*	*	*	*	*	*	*	*	

ASME CLASS 2500												SIZE IN INCHES, DIMENSIONS IN MM	
NPS	A	B	C	D	E	F	ISO	d1	d2	d3	N-M	h	h1
2"	35	43	60	10	8	38	F16	210	130	165	4-Φ22	*	30
3"	42	68	90	12	8	45	F16	210	130	165	4-Φ22	6	31
4"	52	79	100	16	10	56	F25	285	200	254	8-Φ18	6	35
6"	*	*	*	*	*	*	*	*	*	*	*	*	*
8"	*	*	*	*	*	*	*	*	*	*	*	*	*
10"	*	*	*	*	*	*	*	*	*	*	*	*	*
12"	*	*	*	*	*	*	*	*	*	*	*	*	*

Note: topworks dimensions remain the same independent of seat design.
* contact fzv for details.

TORQUE VALUES

SIZE (INCH)	OPEN TORQUE AT MAX. PRESSURE					
	150#	300#	600#	900#	1500#	2500#
1.5"	33	45	86	130	195	259
2"	41	68	135	211	230	446
3"	54	86	222	365	513	802
4"	113	180	393	570	941	1588
6"	325	522	855	1325	2420	4950
8"	612	1197	1845	3078	5215	7798
10"	941	1987	2655	4703	9936	14732
12"	1368	2357	3758	7695	14175	30690
14"	1796	3352	5850	13680		
16"	2820	4752	7952	18383	27000	
18"	3150	5310	9207	22756	29153	
20"	4185	7605	11520	26100	56286	
24"	5901	11200	19121	40500	92250	
28"	10278	19620	30060	52470		
30"	12357	26343	37980	81000		
36"	21780	41094	58662			
42"	32445	68832	111933			
48"	35793	78714	125370			

REMARK:

1. Torque values above are for new valves in clean water service.
2. Torque values are in newton meters, excluding safety factor.
3. Required safety factor is 1.35.
4. For unclean service, additional safety factor of 30% is required.
5. For dry gas service, additional safety factor of 50% is required.
6. Torques reflect valve bore, for RP select appropriate bore size.
7. Torques above are based upon standard seat insert offerings. Class 150 & 300: PTFE; class 600, 900 and 1500: DEVLON; class 2500: PEEK. Consult factory for torques for differing seat materials.

CV VALUES

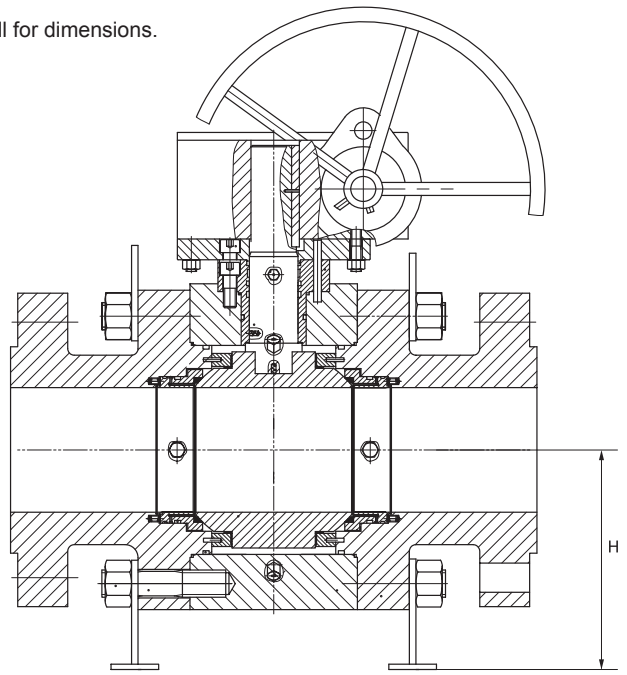
FULL BORE						
SIZE(IN)	150#	300#	600#	900#	1500#	2500#
2	647	647	647	599	582	412
3	2086	2086	2086	1932	1879	1268
4	2694	2694	2694	2494	2426	1766
6	6062	6062	6062	5612	5030	4004
8	10885	10885	10885	10077	8943	7476
10	17109	17109	17109	15840	13857	11603
12	24734	24734	24734	22990	19982	16385
14	30055	30055	30055	25862	24071	
16	39934	39934	39934	34703	31440	
18	51214	51214	51214	44630	39988	
20	63896	63896	63896	53333	50002	
24	96465	96465	96465	81039	72321	
30	145588	145588	145588	129948		
36	211092	211092	211092			
42	280946	280946	280946			
48	383846	383846	383846			

REDUCED BORE						
SIZE(IN)	150#	300#	600#	900#	1500#	2500#
2x1 1/2	306	306	306	306	306	300
3x2	377	377	377	377	377	347
4x3	1043	1043	1043	1043	1043	681
6x4	1587	1587	1587	1587	1353	953
8x6	4364	4364	4364	4364	4065	3197
10x8	7495	7495	7495	7495	6986	6057
12x10	13470	13470	13470	13470	12171	10999
14x12	24702	24702	24702	22276	20780	
16x14	27737	27737	27737	25275	24551	
18x16	34740	34740	34740	32387	31002	
20x18	47739	47739	47739	45666	41158	
24x20	49304	49304	49304	46021	43687	
30x28	96762	96762	96762	94231		
36x30	119199	119199	119199			
42x36	180836	180836	180836			
48x42	267636	267636	267636			

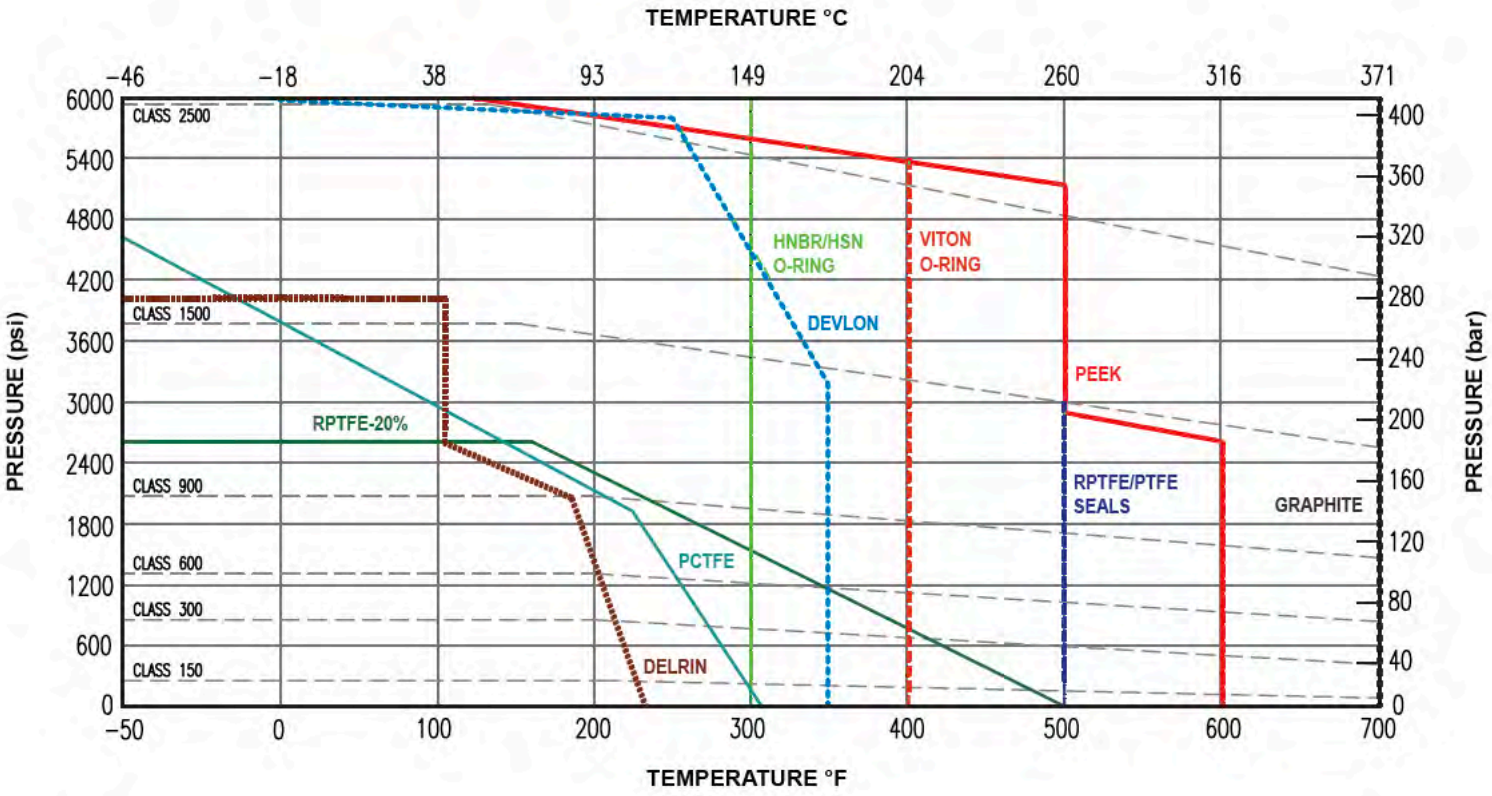
LIFTING LUG AND SUPPORT FEET DATA

	150 ASME			300 ASME			600 ASME			900 ASME			1500 ASME			2500 ASME		
SIZE	Lifting Lugs	Support Feet	H	Lifting Lugs	Support Feet	H	Lifting Lugs	Support Feet	H	Lifting Lugs	Support Feet	H	Lifting Lugs	Support Feet	H	Lifting Lugs	Support Feet	H
in			mm in			mm in			mm in			mm in			mm in			mm in
2x1 1/2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3x2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	YES	YES	187 7.36
4x3"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	YES	YES	187 7.36
4"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	YES	YES	200 7.87	YES	YES	209 8.23	YES	YES	240 9.45
6x4"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	YES	YES	200 7.87	YES	YES	209 8.23	YES	YES	240 9.45
6"	YES	YES	205 8.07	YES	YES	205 8.07	YES	YES	221 8.70	YES	YES	242 9.53	YES	YES	270 10.63			
8x6"	YES	YES	205 8.07	YES	YES	205 8.07	YES	YES	221 8.70	YES	YES	242 9.53	YES	YES	270 10.63			
8"	YES	YES	243 9.57	YES	YES	243 9.57	YES	YES	280 11.02	YES	YES	283 11.14						
10x8"	YES	YES	243 9.57	YES	YES	243 9.57	YES	YES	280 11.02	YES	YES	283 11.14						
10"	YES	YES	300 11.81	YES	YES	300 11.81	YES	YES	326 12.83	YES	YES	320 12.60						
12x10"	YES	YES	300 11.81	YES	YES	300 11.81	YES	YES	326 12.83	YES	YES	320 12.60						
12"	YES	YES	335 13.19	YES	YES	345 13.58	YES	YES	355 13.98									
16"	YES	YES	410 16.14	YES	YES	422 16.61	YES	YES	420 16.54									

NOTE: Valves larger than 16” come standard with support feet - please call for dimensions.



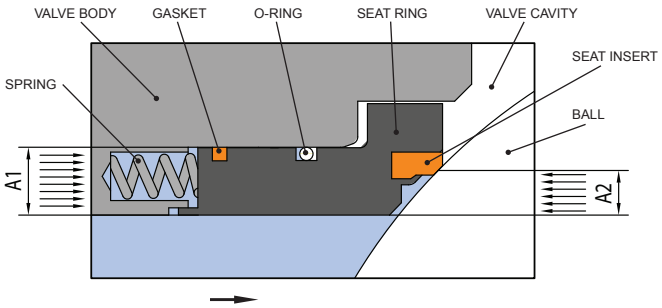
PRESSURE & TEMPERATURE CHART FOR TYPICAL SEAT & SEAL MATERIALS

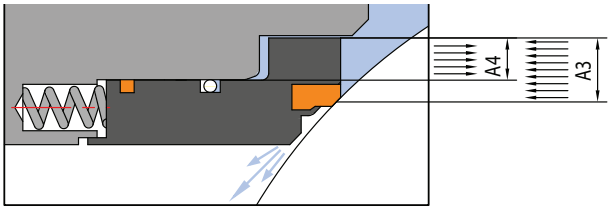


DOUBLE BLOCK AND BLEED VS. DOUBLE ISOLATION AND BLEED

How Do Single Piston Effect Seats Work?

1. During normal operation, upstream or downstream pressure in combination with force created by the seat springs pushes the seat ring against the ball creating positive shutoff (A1>A2).





Pressure acting in the body cavity allows "self relieving" of the seat

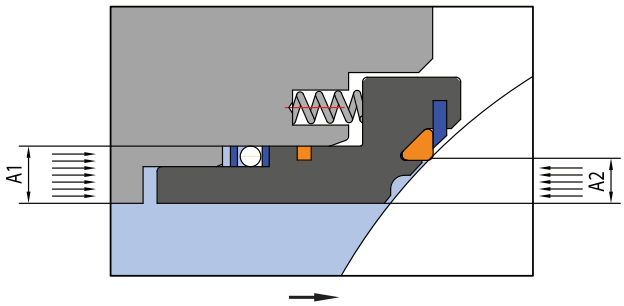
2. With media trapped in the body cavity any increase in media pressure attempts to push the seat ring away from the ball (A3). As pressure in the cavity continues to increase a point is reached where the pressure in the cavity can now overcome the spring force and any other forces (A4).

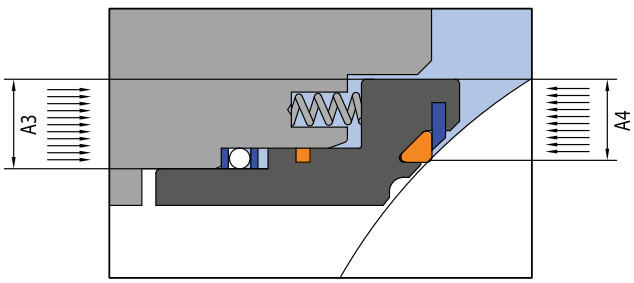
The resultant force pushes the seat assembly away from the ball (A3>A4). Seat assemblies with this feature are referred to as "self relieving".

A valve with two single piston effect seats has a double block and bleed (DBB) design.

How Do Double Piston Effect Seats Work?

1. During normal operation, upstream or downstream pressure in combination with force created by the seat springs pushes the seat ring against the ball creating positive shutoff (A1>A2).





Resultant pressure acting in the body cavity pushes seat against the ball.

2. With media trapped in the body cavity any increase in media pressure acts to push the seat ring against the ball (A3). As a result, regardless of whether the pressure is from upstream, downstream or within the body cavity, the seat ring is always pushed against the ball.

The movement of the seat ring against the ball is created due to differences in the effective pressure influenced area of the upstream and downstream side of the seat assembly (A3>A4). Seat assemblies with this feature are not self relieving.

A valve with two double piston effect seats has a double isolation and bleed (DIB-1) design.

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Contact us: sales@globalsupplyline.com.au

FANGZHENG VALVE GROUP CO., LTD

Add: NO.1921, Binhai 1st Avenue, Economy & Technology Development Zone,
Wenzhou City, Zhejiang Province, China 325025
Tel: +86-577-6735 6515 Fax: +86-577-6735 8449

E-mail: fzvalve@fzvgroup.com