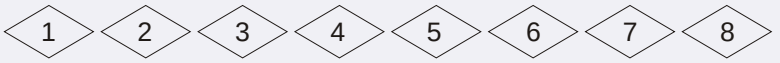
KOFLOW

BALL VALVES

Ball Valve Model Schedule Illustration



① Codes of Nominal Diameter

British series indicated by A××in value, and metric series indicated by G××mm value.

② Codes of Driving Modes (For handle or lever drive, this code can be omitted.)

3—Manual Operator; 6—Pneumatic; 6S—Pneumatic Spring Return; 6A—Pneumatic Control; 5—Gear Drive; 7—Hydraulic; 8—Airdraulic; 8H—Airdraulic with Emergency Cutoff; 9—Electric

③ Codes of Valve Types

FB-Float Ball Valve; TB-Fixed Ball Valve

④ Codes of Nominal Pressure Class

1—PN1.6 class150 ; 2—PN2.5; 3—class300; 4—PN4.0 class400 ; 6—PN6.4 class600

9—class900; 10—PN10.0; 15—class1500; 16—PN16.0; 20—PN20.0; 25—class2500;

⑤ Codes of Connecting Modes

RF—Raised Face Flange; FF—Fully Flat Face Flange; MFM—Male and Female Flange; TG—Tongued and Grooved Flange; RJ—Ring Junction Flange; BW—Butt Welding; SW—Socket Welding; NPT—Threaded Connection

⑥Codes of Structural Modes

1—Full Bore Straightway; 2—Reducing Straightway; 3T—T-shaped Three-Way; 3L—L-shaped Three-way; 4—Four-way; 5—Overall Top Installed (Full Bore); 5A—Overall Top Installed (Reducing); 6—Track Ball Valve (Full Bore); 6A—Track Ball Valve (Reducing); 7H—Eccentric Half Ball; 7F—Eccentric Full Ball; 8—All Welded (Full Bore); 8A—All Welded (Reducing)

⑦ Codes of Shell Materials

C—WCB; C5—C5; C6—WC6; C9—WC9; BL—LCB; CL—LCC

8—CF8; 8M—CF8M; 3—CF3; 3M—CF3M; ML—MONEL

⑧ Codes of Ball Materials

1—WCB; 2—CF8; 3—CF8M; 4—CF3; 5—CF3M

1F—A105or25 2F—304; 3F—316; 4F—304L; 5F—316L

⑨ Codes of Seat Materials

F—PTFE; N—Nylon; G—Carbon Fiber; P—PPL; E—PEEK; M—MOLON

Note:* The letters of " K " 、 " E " 、 " O " and " J " are placed in front of the codes of valve types, respectively representing hydrogen sulphide resistant, extension bar, oxygen, and jacketed ball valve.

Example: A8 " TB3RF1C2F means API 8 " worm gear drive, fixed ball valve, 300Lb, raised face flange, full bore, body material WCB, ball material CF8, and seat of F4.

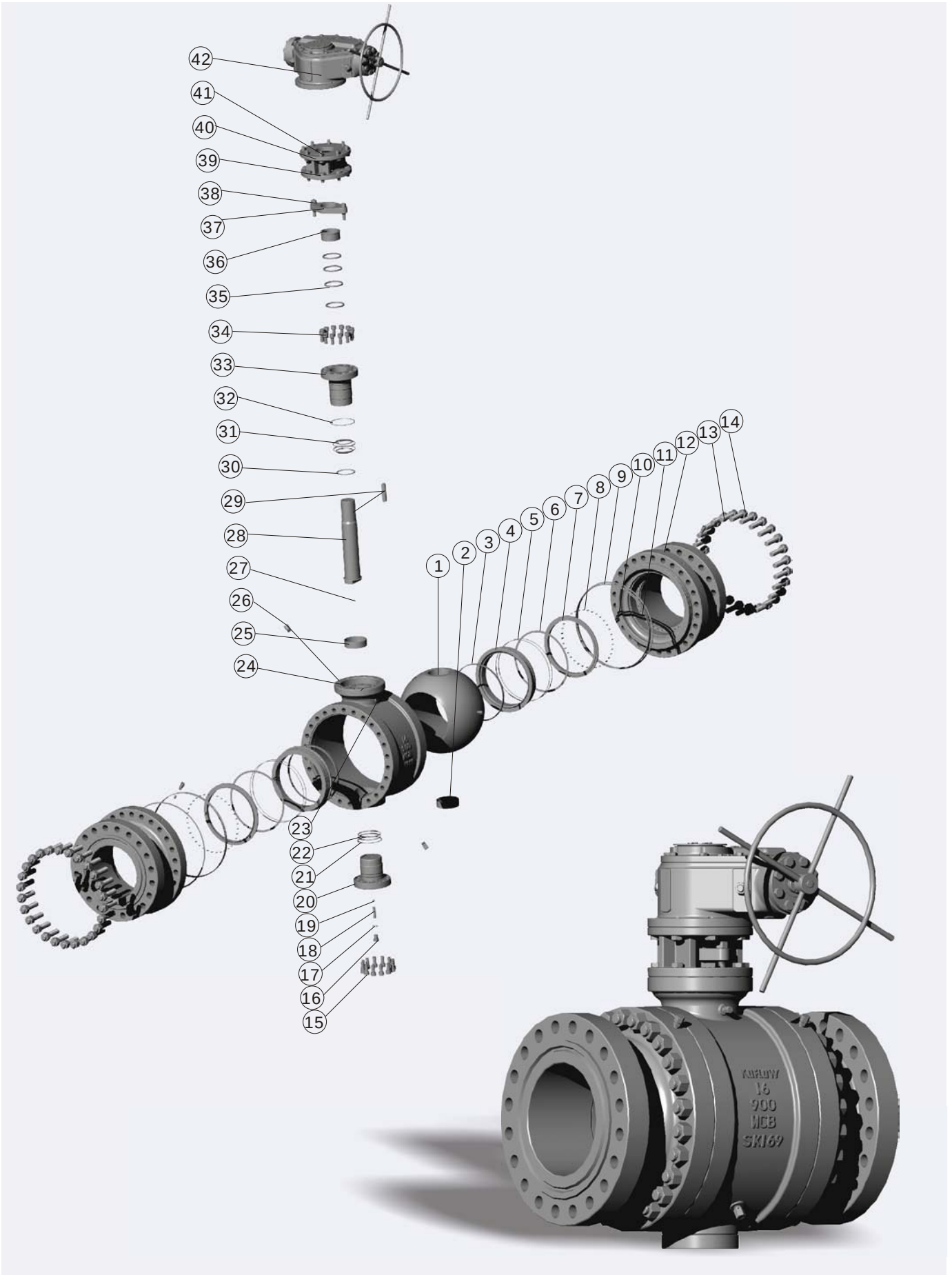
*** The figures mentioned hereunder don't have the codes of caliber and valve material, they are to be specified by users.**

Technical Specifications of Ball Valve

Technical Specifications	API Series	GB Series
Design Specifications	API6D、API608、BS5351	GB/T12237、JB/T7745
Pressure and Temperature Class	ASME B16.34	GB/T9124
Face-to-face	ASME B16.10	GB/T12221、GB/T15188.1
Flange Type and Dimensions	ASME B16.5 、ASME B16.47	GB/T9113 、JB/T79
Butt Welded	ASME B16.25	GB/T12224
Socket Welded	ASME B16.11	/
Threaded	ASME B16.1.20	/
Inspection and Test	API598 、API6D	JB/T9092、GB/T13927
Fireproofing Test	API6FA 、API607	JB/T6899-1993
Quality Inspection of Cast Steel Body	MSS -SP-55	JB/T9092-1999

TRUNNION MOIWTED BALL VALVE

Valve Structural Diagram (Cast Steel)



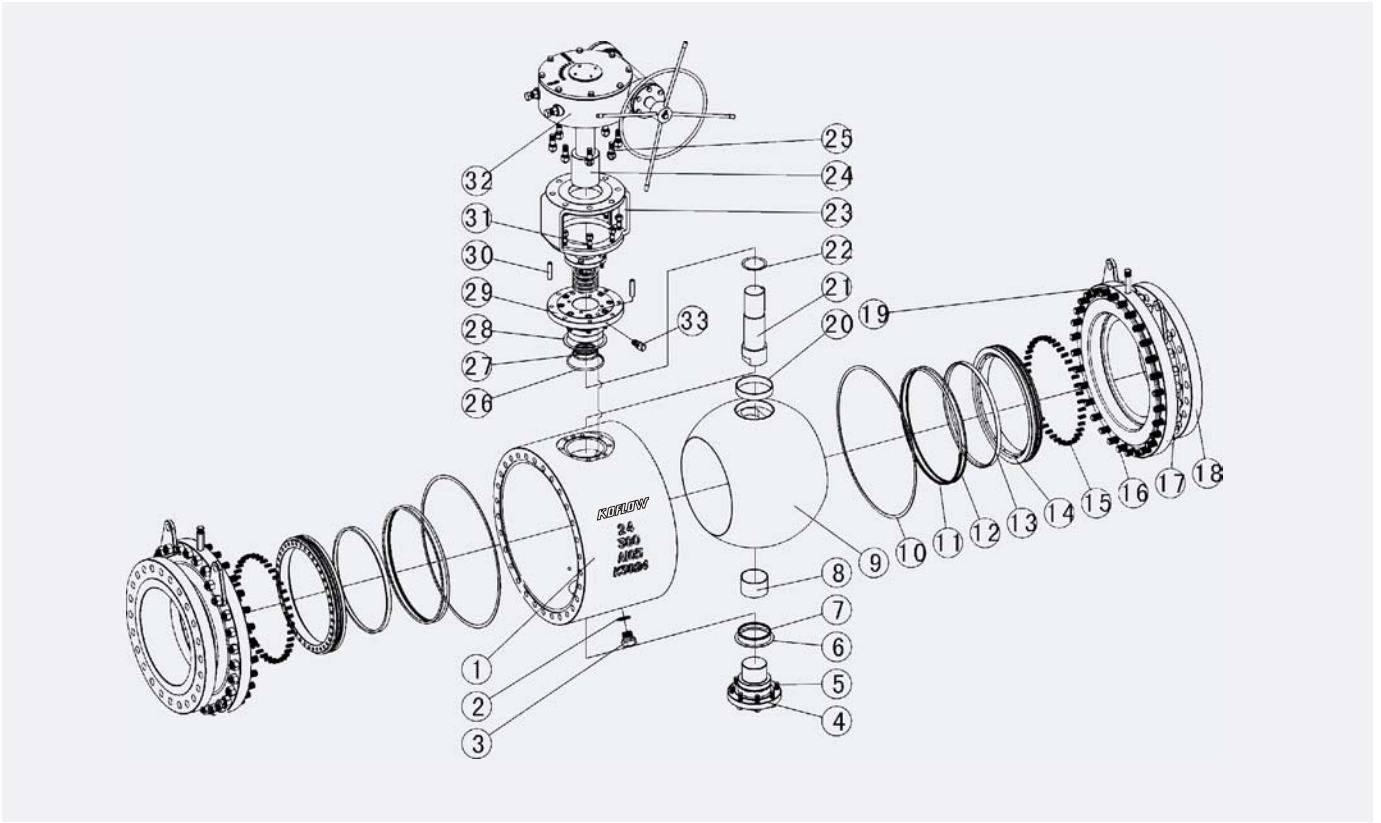
TRUNNION MOUNTINED BALL VALVE

Materials of Main Parts

No.	Part Name	Conventional Carbon Steel Series	Stainless Steel Series	Low Temperature Steel Series	Anti-sulfur Series	
					GB Standard	NACE Standard
1	Ball	A105+ HCr/ENP	A351 CF8、CF8M、CF3、CF3M	A352 LCB、LCC+ENP	A105+ HCr/ENP	A351 CF8M+ENP
2	Bushing	Metal with PTFE lining; sintered carbon fibre				
3	Sealing Ring	PTFE, RPTFE, sintered carbon fibre, high molecular polymer, NYLON, MOLON, DELRIN or PEEK				
4	Valve Seat	A105+ HCr/ENP	A182 、F304、316	A182 、F6a	A105+ HCr/ENP	A182、 F316
5	O-ring	VITON				
6	Fireproofing Seat	Flexible Graphite + Stainless Steel				
7	Bracing Ring	A105+ HCr/ENP	A182 F304、316	A182、 F6a	A105+ HCr/ENP	A182 、F316
8	Spring	INCONEL 750				
9	O-ring	VITON				
10	Greasing Valve	Same shell material (seat greasing)				
11	Gasket	Flexible Graphite + Stainless Steel				
12	Bonnet	A216 WCB	A351 CF8、CF8M、CF3、CF3M	A352 LCB、LCC	A216 WCB	A351 CF8M
13	Stud	A193 B7	A193 B8、B8M	A320 L7	A193 B7M	A193 B7M
14	Nut	A194 2H	A194 8M	A194 4	A194 2HM	A194 2HM
15	Bolt	A193 B7	A193 B8、B8M	A320 L7	A193 B7M	A193 B7M
16	Plug Screw	A105+ HCr/ENP	A182 F304、316	A182 F6a	A105+ HCr/ENP	A182 F316
17	Gasket	Gasket	RPTFE		Red Copper	RPTFE
18	Bolt	A193 B7	A193 B8、B8M	A320 L7	A193 B7M	A193 B7M
19	Ball	A182 F304				
20	Bottom Cover	A105+ HCr/ENP	A182 F304、316	A182 F6a	A105+A182 F316 HCr/ENP	
21	Gasket	Flexible Graphite + Stainless Steel				
22	O-ring	VITON				
23	Greasing Valve	Same shell material (seat greasing)				
24	Valve Body	A216 WCB	A351-CF8、CF8M、CF3、CF3M	A352 LCB、LCC	GB/T12229 A216 WCB	A351 CF8M
25	Bushing	Metal with PTFE lining; sintered carbon fibre				
26	Discharge Valve	Same shell material				
27	Spring	A182 F304				
28	Valve Stem	A182 F6a	A182 F304、316	A182 F6a	A182 F304	A182 F304
29	Key	GB/T699 45				
30	Thrust Bearing	Metal with PTFE lining; sintered carbon fibre				
31	O-ring	VITON				
32	Gasket	Flexible Graphite + Stainless Steel				
33	Upper Stem Seat	A105+ HCr/ENP	A182 F304、316	A182 F6a	A105+ HCr/ENP	A182 F316
34	Bolt	A193 B7	A193 B8、B8M	A320 L7	A193 B7M	A193 B7M
35	Packing	Flexible Graphite、PTFE				
36	Packing Gland	A182 F6	A182 F304,316	A182 F304	A182 F6	A182 F316
37	Pressure Plate	A216 WCB	A351 CF8、CF8M	A351 Cf8	A216 WCB	A351 CF8M
38	Bolt	A193 B7	A193 B8、B8M	A320 L7	A193 B7M	A193 B7M
39	Bolt	A193 B7	A193 B8、B8M	A320 L7	A320 L7	A193 B7M
40	Yoke	A216 WCB	A351 Cf8	A352 LCB	A216 WCB	A351 Cf8
41	Bolt	A193 B7	A193 B8、B8M	A320 L7	A193 B7M	A193 B7M
42	Actuating Mechanism	Worm and gear, electric, pneumatic, electric-hydraulic, pneumatic-hydraulic				

TRUNNION MOUNTINED BALL VALVE

Valve Structural Diagram (Forged Steel)



Materials of Main Parts

No.	Part Name	Materials			No.	Part Name	Materials		
		Carbon Steel	Stainless Steel	Low Temperature Steel			Carbon Steel	Stainless Steel	Low Temperature Steel
1	Valve Body	ASTM A105	A182 F304	A350 LF2	19	Greasing Valve	ASTM A105	A182 F304	A350 LF2
2	Gasket	Flexible graphite+SS			20	Upper Bushing	PTFE+CS	PTFE+SS	PTFE+SS
3	Discharge Valve	ASTM A105	A182 F304	A350 LF2	21	Valve Stem	A182 F6a	A182 F304	A182 F304
4	Bottom Cover	ASTM A105	A182 F304	A350 LF2	22	Flat Bushing	PTFE+CS	PTFE+SS	PTFE+SS
5	Stud	A193 B7	A193 B8	A320 L7	23	Yoke	A216 WCB		
6	Gasket	Flexible graphite+SS			24	Joint Sleeve	ANSI 1025		
7	O-ring	VITON			25	Bolt	A193 B7		
8	Lower Bushing	PTFE+CS	PTFE+SS	PTFE+SS	26	O-ring	VITON		
9	Ball	ASTM A105+ENP	A182 F304	A182 F304	27	O-ring	VITON		
10	Middle Flange Gasket	Flexible graphite+SS			28	Gasket	Flexible graphite+SS		
11	O-ring	VITON			29	Upper Stem Seat	ASTM A105	A182 F304	A350 LF2
12	Fire Protection Ring	Flexible graphite			30	Locating Pin	A182 F6a		
13	Sealing Ring	PTFE、NYLON、PEEK、MOLON、PCTFE			31	Bolt	A193 B7		
14	Valve Seat	ASTM A105+ENP	A182 F304	A182 F304	32	Worm Gear Device	/		
15	Spring	INCONEL600			33	Stem Greasing Valve	ASTM A105	A182 F304	A350 LF2
16	Stud	A193 B7	A193 B8	A320 L7					
17	Nut	A194 2H	A194 8	A194 7					
18	Bonnet	ASTM A105	A182 F304	A350 LF2					

Note: 1. Sealing ring of different materials to be used according to the temperature and pressure of medium and different working conditions.
2. Besides the materials listed, we offer others according to customers' requests.

TRUNNION MOUNTINED BALL VALVE

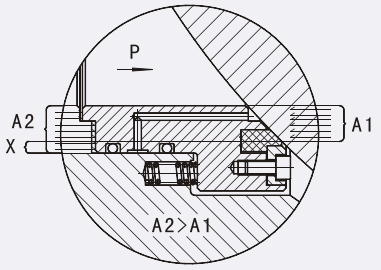
Structural Features of Fixed Ball Valve

Fixed ball valves are mainly used in the industries of natural gas, oil products, chemicals, metallurgy, urban construction, environmental protection, pharmaceuticals, foodstuff and etc. Among them, the sulfur-resisting series products are applicable for seriously corrosive natural gas pipeline containing hydrogen sulphide mediums and impurities.

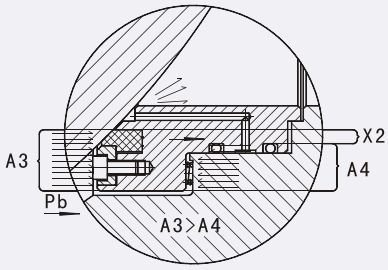
Structural Features of Fixed Ball Valve Series:

1) DISTINCTIVE SEALING STRUCTURE According to the extent of pressure, medium properties and sealing requirements, fixed ball valves may be made to front seal structure, back seal structure, or front-back dual seal structure.

▲FRONT SEAL STRUCTURE The front seal structure of valve seat gives the functions of two way seal and self-relieving function at middle cavity. As shown in the figure, the sealing socket inlaid with appropriate polymeric material (high molecular material of NYLON, MOLON, DELRIN or PEEK) is float. With spring loaded, when closed, the sealing face remains always in close contact with the ball, thus to ensure leak-tightness under whatever high or low differential pressure. Upstream: valve seat moves axially along with the valve, the upstream (inlet) pressure P applied to A2 produces a directional force on A1. As A2 is larger than A1, A2-A1=X, so the pressure on X will push the valve seat toward the ball to actualize close seal at upstream. Downstream: in case the pressure inside valve cavity Pb rises, the force acted upon A3 will be greater than that upon A4, A3-A4=X2. The differential pressure formed up on X2 will overcome the spring force and make valve seat separated from ball, and then, the valve seat will be closed to the ball again under spring action.



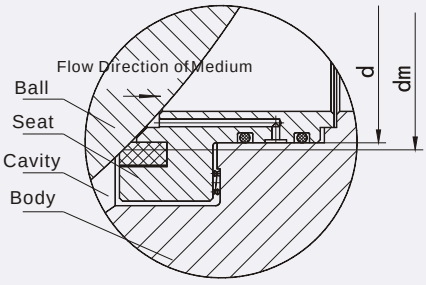
Inlet Side



Outlet Side

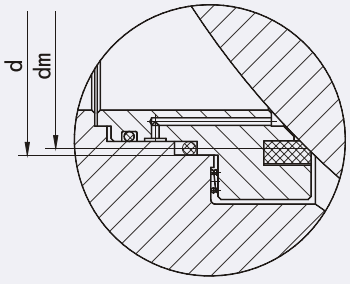
Front Seal Structure

▲ BACK SEAL STRUCTURE The piston effect at valve seat produced by the area difference between 'd' and 'dm' (see figure on the right) will make seating seal ring and ball closely contacted and sealed under the medium action at the middle cavity of valve body.

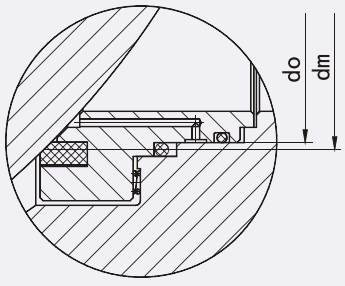


Outlet Side

▲FRONT-BACK SEAL STRUCTURE At the inlet inside, the piston effect at valve seat produced by the area difference between 'd' and 'dm' will make seating seal ring and ball closely contacted and sealed under the medium action at upstream. At the outlet side, the piston effect produced by the area difference between 'do' and 'dm' will make seating seal ring and ball closely contacted and sealed under the action of medium pressure at the middle cavity of valve body.



Inlet Side



Outlet Side

Back Seal Structure

TRUNNION MOUNTINED BALL VALVE

Structural Features of Fixed Ball Valve

2) SELF-RELIEVING STRUCTURE In case of abnormal rise of pressure at middle cavity, ball valve of single seal structure is provided with self-relieving function, while ball valve of dual seal structure uses the auxiliary pressure relief device on valve body to carry out pressure relief.

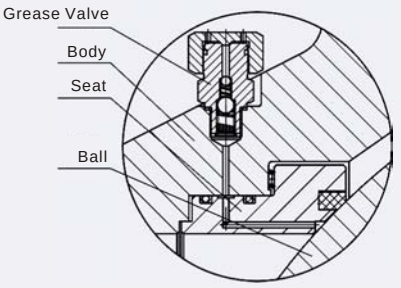
3) FIRST AID OF SEAL The valve is designed with an auxiliary seating emergency seal system, as shown in the figure. In case of soft seal damaged, or failure of seal in an emergency circumstances, emergency seal may be effected by injecting in sealant through auxiliary sealing system. If needed, emergency seal assembly can be used to rinse and lubricate the seating area. Plus, valve stem can also be designed with an auxiliary emergency sealing system.

4) FIRE PROTECTION STRUCTURE If requested by working conditions and users,ball valve may be designed to fireproof. The fireproofing design of ball valve is to the standards of API 607 and JB/T6899. In case of soft seal ring burnt in fire, the fire protection structure of ball valve functions to prevent mediums from mass leakage, thus to avoid fire spreading.

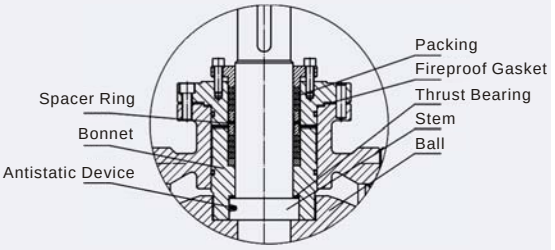
5) ANTISTATIC STRUCTURE When operating the valve, the friction between the ball and seat will produce electrostatic charge that can be accumulated on the ball. To prevent static spark, an antistatic device is placed on the valve to derive the electric charge accumulated on the ball (as shown in the figure).

6) LOCKING DEVICE To prevent misoperation and the unexpected open or close caused by the unpredicted circuit vibration, a locking device is designed at the fully opened and closed positions of hand operated ball valve. This design is proven especially good and effective in the production line of inflammable mediums of petroleum and chemicals, or when valves are mounted outdoors.

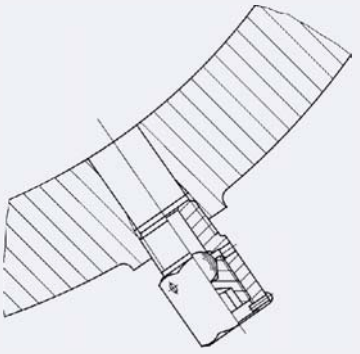
7) FULL AND REDUCED BORE STRUCTURE To meet the different requirements of users, we have full and reduced bore ball valves series (as shown in the figure). The inside diameter of full-bore ball valve is in conformity with that of the pipe for the convenience of cleaning, while reduced-bore series ball valve is comparatively lighter in weight, but its fluid resistance is only 1/7 of that of globe valve of the same caliber. So, reduced-bore ball valves boast of broader prospects.



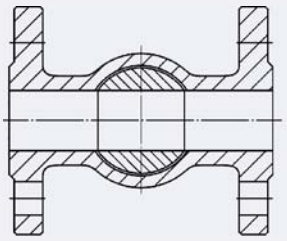
Seating Auxiliary Seal



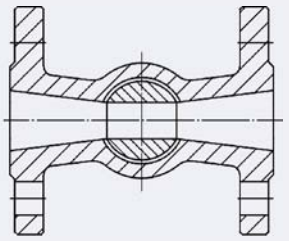
Stem Anti-flyout Structure
Stem Antistatic Device
Bonnet Leak-tight Structure



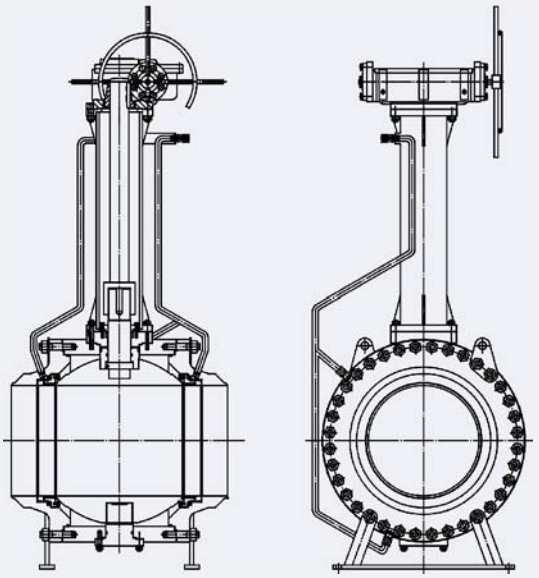
Discharge Device



Full-bore Channel Type



Reduced-bore Channel Type



Extension bar device

8) DISCHARGE DEVICE ON VALVE BODY If requested by users or by the system, discharge valve may be mounted on the body of ball valve. In case the two ends of valve have been sealed, the pressure in valve will be released through the discharge valve on the body. Besides the function of DBB, this discharge valve also functions to rinse and blow out the deposits inside valve body.

9) CORROSION RESISTANCE Corrosion allowance is left for the design of body thickness, the stem, fixed shaft, ball, seat and bottom cover of carbon steel valve are all chemical plated in surface to ASTM B733 and B656. Use of paint from international co. to deal with all kinds of conditions.

10) SULFIDE STRESS CRACKING RESISTANCE The materials exposed to fluid of our sulfur resisting ball valves, including fastening components, are all selected to NACE MR0175. Rigorous quality control and inspection is implemented in the manufacturing process to make our products conformed to the standard and suitable for vulcanizing conditions.

11) EXTENSION BAR DEVICE Extension bar device may be provided for buried ball valves, which include the extension of valve stem, greasing valve and discharge valve. As shown in the figure on the left, users shall specify the requirements and length to be extended (The length is generally the distance from the center of valve channel to the center of operating device).

TRUNNION MOUNTINED BALL VALVE

Product Line

Nominal Diameter		Nominal Pressure					Class						
DN	in	1.6	2.5	4.0	6.3	10.0	150	300	400	600	900	1500	2500
50	2	●/△					●/△					☆/△	
65	2 1/2	●/△					●/△					☆/△	
80×50	3×2	●/△					●/△					☆/△	
80	3	●/△					☆/△					☆/△	
100×80	4×3	●/△					●/△					☆/△	
100	4	●/△					●/△				☆/△		
125	5	●/△			●/☆/△	△	●/△		●/☆/△	△	/		
150×100	6×4	●/△					●/△				☆/△		
150	6	●/☆/△/★				☆/△/★	●/☆/△/★			☆/△/★	☆/△/★		
200×150	8×6	☆/△/★			●/☆/△/★		☆/△/★		●/☆/△/★		☆/△/★		
200	8	☆/△/★					☆/△/★						
250×200	10×8	☆/△/★					☆/△/★						
250	10	☆/△/★					☆/△/★						
300×250	12×10	☆/△/★					☆/△/★						
300	12	☆/△/★					☆/△/★						
350×300	14×12	☆/△/★					☆/△/★						
350	14	☆/△/★					☆/△/★						
400×300	16×12	☆/△/★					☆/△/★						
400	16	☆/△/★					☆/△/★						
450	18	☆/△/★					☆/△/★						
500×400	20×16	☆/△/★					☆/△/★						
500	20	☆/△/★					☆/△/★						
600×500	24×20	☆/△/★					☆/△/★						
600	24	☆/△/★					☆/△/★						☆/★
650	26	☆/△/★					☆/△/★					☆/★	/
700	28	☆/△/★					☆/△/★					☆/★	/
750×600	30×24	☆/△/★					☆/△/★						/
750	30	☆/△/★				☆/★	☆/△/★			☆/★			/
800	32	☆/△/★				☆/★	☆/△/★			☆/★			/
850	34	☆/★					☆/★						/
900×750	36×30	☆/△/★					☆/△/★				☆/★		/
900	36	☆/★					☆/★						/
1000	40	☆/★			/	☆/★	☆/★		/	☆/★		/	
1050	42	☆/★			/	☆/★	☆/★		/	☆/★		/	
1200	48	☆/★			/	☆/★	☆/★		/	☆/★		/	
1350	54	/				☆/★	/			☆/★		/	
1400	56	☆/★			/	☆/★	☆/★		/	☆/★		/	
1500	60	☆/★			/	☆/★	☆/★		/	☆/★		/	

Note: ● stands for handle operated valves; ☆ stands for gearbox operated valves;
△stands for air operated valves; ★ stands for electrically operated valves;
/ stands for no option of this.
Those not covered in the table can be custom made to users' requirements.

Product Performance Specifications

Performance Specifications		Nominal Pressure (Mpa)					Class						
		1.6	2.5	4.0	6.4	10.0	150	300	400	600	900	1500	2500
Test Pressure	Strength Test	2.4	3.75	6.0	9.6	15.0	2.93	7.58	10.0	15.0	22.5	37.5	63.0
	Seal Test	1.76	2.75	4.4	7.04	11.0	2.07	5.52	7.31	11.03	16.5	27.5	46.2
	Air Pressure Test	0.6 MPa											
Suitable Temperature		-196 ℃~550℃ (Note: different materials to be used to deal with different ambient temperature.											
Suitable Medium	Conventional Type	Water, steam, petroleum, LPG, natural gas and etc.											
	Anti-sulfur Type	Natural gas and petroleum containing H2S or co,and petroleum etc.											

TRUNNION MOUNTINED BALL VALVE

Table of Torque of Fixed Ball Valve

The torque ratings listed below are for the reference to choose a drive device. The properties of medium, trims and valve open frequency shall be considered as extra factors. For instance, valves with corrosion-resistant trims to deal with clean lubricating mediums, their torque may be lowered by 20%. However, to deal with stringent mediums like slurry, granular medium and oxygen, the torque may be increased by 50%. The operating torque of drawing-down valves is subject to the corresponding diameter to their neckings.

Diameter		Pressure					CLASS						
DN	in	1.6	2.5	4.0	6.4	10.0	150	300	400	600	900	1500	2500
50	2	25	30	50	100	190	57	99	/	168	228	390	589
65	2 1/2	50	60	100	200	360	/	/	/	/	/	/	/
80	3	65	80	150	300	460	122	212	/	360	512	831	1577
100	4	125	140	250	400	770	192	335	467	572	946	1524	1965
125	5	250	300	450	650	1050	/	/	/	/	/	/	/
150	6	340	400	585	890	1980	274	544	650	912	1784	2934	5501
200	8	485	680	996	1500	3280	832	1250	1806	2177	4116	7215	11786
250	10	810	1140	1690	2560	5250	1105	1736	2638	3093	5910	11128	13222
300	12	1310	1870	2800	4290	7200	1502	2388	2929	4282	10137	16103	20075
350	14	1910	2740	4110	6320	9860	1946	3224	3971	7458	14141	24518	/
400	16	2860	4150	6300	9750	14500	3164	5139	6307	9310	18866	29630	/
450	18	4500	6500	8900	13500	16900	3793	6194	7609	14639	22400	34392	/
500	20	5860	7800	12000	18660	19000	4769	7826	9623	20011	28544	40918	/
550	22	/	/	/	/	/	5695	9454	11651	24785	42427	/	/
600	24	8920	13210	20380	31820	42500	7529	12958	15900	31226	43276	65351	/
650	26	/	/	/	/	/	8693	14394	17727	35184	47580	/	/
700	28	13320	19380	30670	48020	58000	9832	15620	20182	38987	52486	/	/
750	30	/	/	/	/	/	11172	18703	23086	41832	56210	/	/
800	32	24000	35420	55200	68830	82000	12494	21030	25985	45199	60849	/	/
850	34	/	/	/	/	/	21148	31558	33000	48401	65244	/	/
900	36	34960	52870	82700	134000	/	22987	34170	36045	52262	70355	/	/
1000	40	43420	66700	102820	162210	/	26059	39115	43990	60197	/	/	/
1050	42	/	/	/	/	/	28149	42414	50300	65496	/	/	/
1200	48	/	/	/	/	/	42776	71868	80302	118938	/	/	/
1350	54	/	/	/	/	/	70276	91238	116000	144342	/	/	/
1400	56	/	/	/	/	/	85654	108550	129900	169230	/	/	/
1500	60	/		/		/	116000	122820	178200	216270	/	/	/

TRUNNION MOUNTINED BALL VALVE

Table of Options for Valve Pneumatic Actuators

SIZE		PN1.6、150Lb	PN2.5、PN4.0、300Lb	PN6.4、400Lb	PN10.0、600Lb	PN15.0、900Lb	1500Lb	2500Lb
DN	NPS							
50	2	AG09	AG19	AG19	AG19	AG19	AW13	AW13
65	2 1/2	AG13	AG13	AG13	AW13	AG13	AW13	AW17
80 × 50	3 × 2	AG09	AG13	AG13	AG13	AG13	AW13	AW13
80	3	AG13	AW13	AW13	AW13	AW13	AW17	AW20
100 × 80	4 × 3	AG13	AW13	AW13	AW13	AW13	AW17	AW20
100	4	AW13	AW13	AW13	AW13	AW17	AW20	AW20
125	5	AW13	AW17	AW17	AW17	/	/	AW28
150 × 100	6 × 4	AW13	AW13	AW13	AW13	AW17	AW20	AW20
150	6	AW17	AW17	AW17	AW17	AW20	AW20	C1-355
200 × 150	8 × 6	AW17	AW17	AW17	AW17	AW20	AW20	AW28
200	8	AW17	AW17	AW20	AW20	AW20	AW28	C1-355
250 × 200	10 × 8	AW17	AW17	AW20	AW17	AW20	AW28	C1-355
250	10	AW17	AW20	AW20	AW20	AW28	C1-355	C2-490
300 × 250	12 × 10	AW17	AW20	AW20	AW20	AW28	C1-355	C1-355
300	12	AW20	AW20	AW28	AW28	C1-355	C1-355	C1-355
350 × 300	14 × 12	AW20	AW20	AW28	AW20	C1-355	C1-355	C2-490
350	14	AW20	AW28	AW28	C1-355	C1-355	C2-490	C2-490
400 × 350	16 × 14	AW20	AW20	AW28	AW20	C1-355	C1-355	C2-490
400	16	AW28	AW28	C1-355	C1-355	C2-490	C2-490	C3-600
450 × 400	18 × 16	AW28	AW28	C1-355	C1-355	C2-490	C2-490	C2-490
450	18	AW28	C1-355	C1-355	C2-490	C2-490	C2-490	C3-600
500 × 450	20 × 18	AW28	AW28	C1-355	C1-355	C2-490	C2-490	C2-490
500	20	AW28	C1-355	C1-355	C2-490	C2-490	C3-600	/
600 × 500	24 × 20	AW28	C1-355	C1-355	C2-490	C2-490	C3-600	C3-600
600	24	C1-355	C2-490	C2-490	C2-490	C3-600	C3-600	/
650	26	C1-355	C2-490	C2-490	C3-600	C3-600	/	/
700	28	C2-490	C2-490	C2-490	C3-600	C3-600	/	/
750 × 600	30 × 20	C1-355	C1-490	C2-490	C2-490	C3-600	C3-600	/
750	30	C2-490	C3-600	C3-600	/	/	/	/
800	32	C3-600	C3-600	C3-600	/	/	/	/
850	34	/	/	/	/	/	/	/
900 × 750	36 × 30	C2-490	C1-600	C3-600	C3-600	/	/	/
900	36	/	/	/	/	/	/	/
1000	40	/	/	/	/	/	/	/
1050	42	/	/	/	/	/	/	/
1200	48	/	/	/	/	/	/	/
1350	54	/	/	/	/	/	/	/
1400	56	/	/	/	/	/	/	/
1500	60	/	/	/	/	/	/	/

Note: 1. The output torque of the types in the table is subject to the data specified in the manufacturer's product manual.
2. The pneumatic actuator in the table is manufactured by Alpha.

TRUNNION MOUNTINED BALL VALVE

Table of Options for Valve Electric Actuators

SIZE		PN1.6、150Lb	PN2.5、PN4.0、300Lb	PN6.4、400Lb	PN10.0、600Lb	PN15.0、900Lb	1500Lb	2500Lb
DN	NPS							
50	2	/	/	/	/	/	/	/
65	2 1/2	/	/	/	/	/	/	/
80 × 50	3 × 2	/	/	/	/	/	/	/
80	3	/	/	/	/	/	/	/
100 × 80	4 × 3	/	/	/	/	/	/	/
100	4	/	/	/	/	/	/	/
125	5	/	/	/	/	/	/	/
150 × 100	6 × 4	/	/	/	/	/	/	/
150	6	SMC-04/H0BC	SMC-04/H0BC	SMC-04/H1BC	SMC-04/H1BC	SMC-03/H1BC	SMC-03/H2BC	SMC-00/H3BC
200 × 150	8 × 6	SMC-04/H0BC	SMC-04/H0BC	SMC-04/H0BC	SMC-04/H1BC	SMC-03/H1BC	SMC-03/H2BC	SMC-00/H3BC
200	8	SMC-04/H0BC	SMC-04/H1BC	SMC-04/H1BC	SMC-03/H1BC	SMC-03/H2BC	SMC-00/H3BC	SMC-0/H4BC
250 × 200	10 × 8	SMC-04/H0BC	SMC-04/H1BC	SMC-04/H1BC	SMC-03/H1BC	SMC-03/H2BC	SMC-00/H3BC	SMC-0/H4BC
250	10	SMC-04/H0BC	SMC-04/H1BC	SMC-03/H2BC	SMC-03/H2BC	SMC-00/H3BC	SMC-0/H4BC	SMC-0/H4BC
300 × 250	12 × 10	SMC-04/H0BC	SMC-04/H1BC	SMC-04/H1BC	SMC-03/H2BC	SMC-00/H3BC	SMC-0/H4BC	SMC-0/H4BC
300	12	SMC-04/H0BC	SMC-03/H2BC	SMC-03/H2BC	SMC-00/H3BC	SMC-0/H4BC	SMC-0/H4BC	SMC-1/H5BC
350 × 300	14 × 12	SMC-04/H0BC	SMC-04/H1BC	SMC-04/H1BC	SMC-00/H3BC	SMC-0/H4BC	SMC-0/H4BC	SMC-1/H5BC
350	14	SMC-03/H1BC	SMC-00/H3BC	SMC-00/H3BC	SMC-00/H3BC	SMC-0/H4BC	SMC-1/H5BC	SMC-2/H6BC
400 × 350	16 × 14	SMC-04/H1BC	SMC-04/H1BC	SMC-04/H1BC	SMC-00/H3BC	SMC-0/H4BC	SMC-0/H4BC	SMC-1/H5BC
400	16	SMC-03/H2BC	SMC-00/H3BC	SMC-00/H3BC	SMC-0/H4BC	SMC-1/H5BC	SMC-2/H6BC	SMC-2/H6BC
450 × 400	18 × 16	SMC-03/H2BC	SMC-00/H3BC	SMC-00/H3BC	SMC-0/H4BC	SMC-1/H5BC	SMC-2/H6BC	SMC-2/H6BC
450	18	SMC-00/H3BC	SMC-00/H3BC	SMC-00/H3BC	SMC-0/H4BC	SMC-1/H5BC	SMC-2/H6BC	SMC-3/H6BC
500 × 450	20 × 18	SMC-03/H2BC	SMC-00/H3BC	SMC-00/H3BC	SMC-0/H4BC	SMC-1/H5BC	SMC-2/H6BC	SMC-2/H6BC
500	20	SMC-00/H3BC	SMC-0/H4BC	SMC-0/H4BC	SMC-1/H5BC	SMC-2/H6BC	SMC-3/H6BC	SMC-3/H6BC
600 × 500	24 × 20	SMC-00/H3BC	SMC-0/H4BC	SMC-0/H4BC	SMC-1/H5BC	SMC-2/H6BC	SMC-3/H6BC	SMC-3/H6BC
600	24	SMC-0/H4BC	SMC-0/H4BC	SMC-1/H5BC	SMC-2/H6BC	SMC-3/H6BC	SMC-3/H6BC	SMC-3/H7BC
650	26	SMC-0/H4BC	SMC-1/H5BC	SMC-1/H5BC	SMC-2/H6BC	SMC-3/H6BC	SMC-3/H7BC	/
700	28	SMC-1/H5BC	SMC-1/H5BC	SMC-1/H5BC	SMC-2/H6BC	SMC-3/H6BC	SMC-3/H7BC	/
750 × 600	30 × 20	SMC-0/H4BC	SMC-0/H4BC	SMC-0/H4BC	SMC-2/H6BC	SMC-3/H6BC	SMC-3/H6BC	/
750	30	SMC-1/H5BC	SMC-1/H5BC	SMC-1/H5BC	SMC-3/H6BC	SMC-3/H6BC	SMC-3/H10BC	/
800	32	SMC-2/H6BC	SMC-2/H6BC	SMC-2/H6BC	SMC-3/H6BC	SMC-3/H6BC	SMC-3/H10BC	/
850	34	SMC-2/H6BC	SMC-2/H6BC	SMC-2/H6BC	SMC-3/H6BC	SMC-3/H7BC	SMC-3/H12BC	/
900 × 750	36 × 30	SMC-1/H5BC	SMC-1/H5BC	SMC-1/H5BC	SMC-3/H6BC	SMC-3/H7BC	SMC-3/H10BC	/
900	36	SMC-2/H6BC	SMC-3/H6BC	SMC-3/H6BC	SMC-3/H6BC	SMC-3/H6BC	SMC-3/H12BC	/
1000	40	SMC-2/H6BC	SMC-3/H6BC	/	SMC-3/H6BC	/	/	/
1050	42	SMC-3/H6BC	SMC-3/H6BC	/	SMC-3/H7BC	/	/	/
1200	48	SMC-3/H6BC	SMC-3/H7BC	/	SMC-3/H7BC	/	/	/
1350	54	SMC-3/H6BC	SMC-3/H7BC	/	/	/	/	/
1400	56	SMC-3/H7BC	SMC-3/H7BC	/	SMC-3/H10BC	/	/	/
1500	60	SMC-3/H7BC	SMC-3/H10BC	/	SMC-3/H10BC	/	/	/

Note: 1. The output torque of the types in the table is subject to the data specified in the manufacturer's product manual.
2. The electric actuator in the table is made by Tianjin Ertong.

TRUNNION MOUNTINED BALL VALVE

Datasheet of Flow Coefficient of Fixed Ball Valve

Flow coefficient is an index to measure the flow capacity of a valve. A higher value of flow coefficient means less pressure loss when fluid passing through the valve. The value of flow coefficient varies according to the dimensions, type and structure of valve. Valves of different types and specifications shall be tested separately to make sure of their values of flow coefficient. Regarding valves of the same structure, flow coefficient varies according to the flow direction of fluid through the valve. Generally, these differences are caused by different pressure recoveries.

The table below is the flow coefficient of fixed ball valve. 'Cv' stands for the American gallons flowing through the valve per minute under 1pound/inch2 (0.006894757MPa) pressure drop + 60℉ (+16℃) water.

Cv

Diameter		2” FB	3” RB	3” FB	4” RB	4” FB	6” RB	6” FB	8” RB
		50	80×50	80	100×80	100	150×100	150	200×150
Class	150	500	180	1350	545	2500	790	5300	1945
	300	500	195	1350	535	2500	765	5300	1945
	600	500	180	1350	550	2500	745	5300	2220
	900	500	187	1350	512	2500	740	5300	2035
	1500	330	187	1350	510	2500	742	4167	2033
	2500	301	180	743	505	1460	735	2603	1502
Diameter		8” FB	10” RB	10” FB	12” RB	12” FB	14” RB	14” FB	16” RB
		200	250×200	250	300×250	300	350×300	350	400×300
Class	150	10500	4050	17500	6900	26300	13100	31850	14600
	300	10500	4040	17500	7100	26300	13200	30050	14580
	600	10500	4065	17500	7150	26300	14350	28400	14350
	900	10500	4061	17500	7136	26300	14290	26803	14313
	1500	8013	4051	13309	7117	17073	14180	24276	14247
	2500	5370	3198	8631	5767	12503	/	/	/
Diameter		16” FB	18” RB	18” FB	20” RB	20” FB	22” FB	24” RB	24” FB
		400	450×400	450	500×400	500	550	600×500	600
Class	150	43300	/	57300	27750	74500	89700	44700	112300
	300	41700	/	55370	28050	72300	85350	44650	109150
	600	38150	/	50950	29500	65600	77600	48900	98150
	900	36705	/	48703	29443	62504	/	48713	86252
	1500	33215	/	43402	29253	55931	/	/	/
Diameter		26” FB	28” FB	30” RB	30” FB	32” FB	34” FB	36” RB	36” FB
		550	700	750×600	750	800	850	900×750	900
Class	150	128300	151750	76000	179300	199750	225000	123000	258300
	300	123050	146050	75900	171200	187700	214900	121550	243500
	600	114050	136500	73850	158900	175000	196500	118300	226300
	900	102940	121201	71500	140093	159420	181137	103083	226033
Diameter		40” FB	42” FB	48” FB	54” FB	56” FB	60” FB	/	/
		1000	1050	1200	1350	1400	1500	/	/
Class	150	323000	343000	480500	/	/	/	/	/
	300	309000	340000	460300	/	/	/	/	/
	600	28500	309000	438500	/	/	/	/	/
	900	/	/	/	/	/	/	/	/

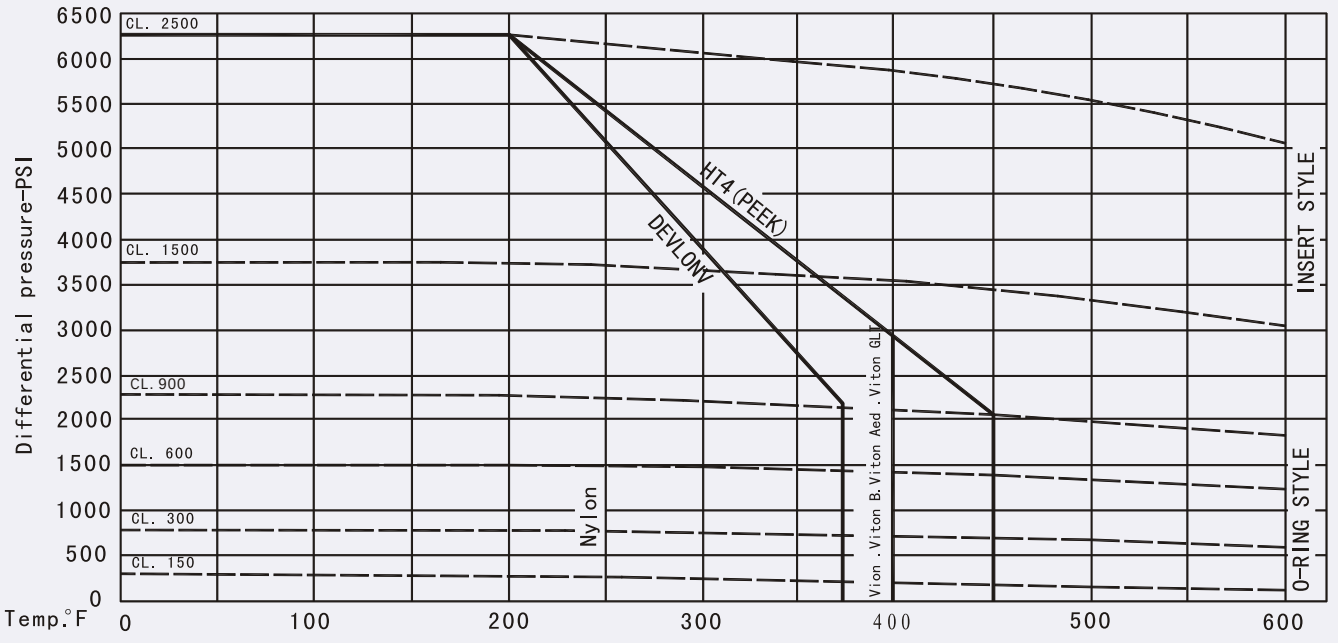
Note: FB ---- Full Bore, RB ---- Reduced Bore

TRUNNION MOUNTINED BALL VALVE

Performance Datasheet of Sealing Seat Material

Test Standard	Test Item	Unit	PEEK	MOLON	DEVLON	PPL	PTFE	PTFE + Graphite	PTFE + Fiberglass	NYLON66
D638	Tensile Strength 23℃/-40℃	MPa	93.08	75/100	79.92/ 109.52	72	24.82	25	24.2	60/80
D638	Elongation at Break 23℃	%	50	10/30	5.37	6/8	300	150	105	60
D785	Hardness	D	/	78	78/80	80	56	58	65	78
		R	120	110/120	114	/	/	/	/	118
D790	Bending Strength	MPa	166.71	140	121.55	176	/	/	23.7	117
D621	Deformation by Load 24hours	%	~0	1.2	1.0/2.0	0.78	14/28	8.8	5.5	1.4
E831	Coefficient of Linear Expansion	1/K	0.48×10^{-4}	0.6×10^{-4}	1.1×10^{-4}	0.43×10^{-4}	1.2×10^{-4}	1×10^{-4}	1×10^{-4}	0.7×10^{-4}
D648	Heat Distortion Temperature 1.82MPa/0.46MPa	℃	160	150/190	93	163	55	63	78	90
			/	/	209	/	132	/	/	235
D792	Density	G/cm3	1.34~1.36	1.15	1.14	1.48	2.20	2.22	2.1	1.12
D570	24 Hours Water Absorption	%	0.13	0.7	0.1	0.2	0.01	0.015	0.015	1.2
D695	Tensile Strength	MPa	142	140	140	117	35	45	52	/
D695	Compressive Yield Strength	MPa	/	120	88.9	/	11.7	/	/	75.8

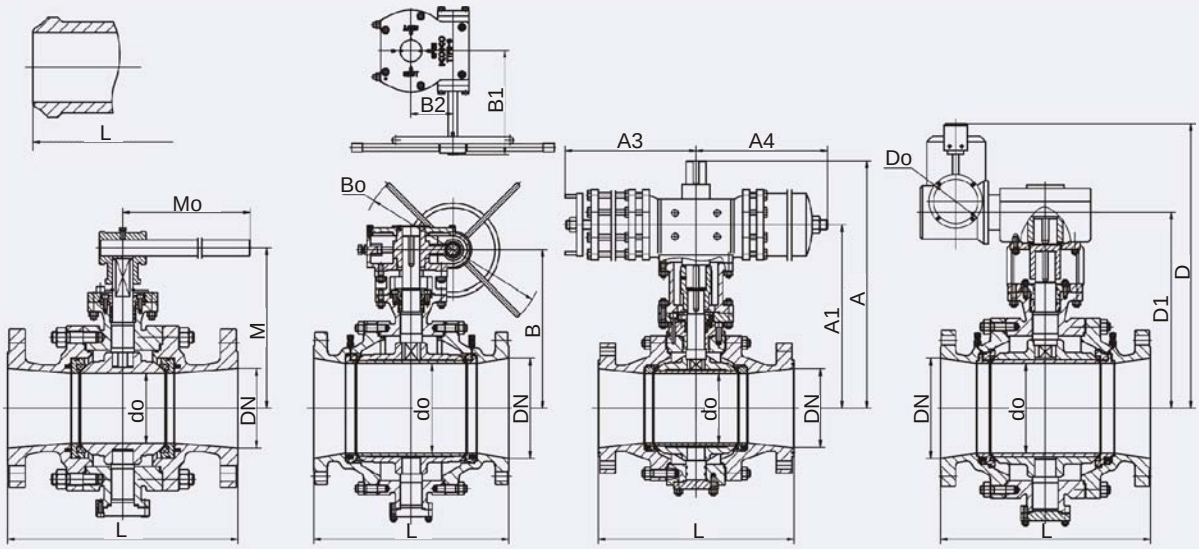
Pressure-Temperature Characteristic Value of Sealing Seat



Above table gives the temperature and pressure ratings of nylon, devlonv, PEEK, viton and etc., and the temperature and pressure ratings of 150Lb, 300Lb and 600Lb equally apply to seat design with O-ring.

REDUCED BORE TRUNNION MOUNTINED BALL VALVE

PN1.6~10.0MPa CLASS 150~2500



Handle operation | worm gear operation | pneumatic operation | electric operation

Figure No.

A(G)TB(1~9)(2~25)RF2	A(G)3TB(1~9)(2~25)RF2	A(G)6TB(1~9)(2~25)RF2	A(G)9TB(1~9)(2~25)RF2
A(G)TB1(1~9)(2~25)BW2	A(G)3TB(1~9)(2~25)BW2	A(G)6TB(1~9)(2~25)BW2	A(G)9TB(1~9)(2~25)BW2

Main Dimensions

PN1.6MPa CLASS 150 mm

Dimensions		L			do	Manual		Worm Gear Drive				Pneumatic				Electric			Weight	
DN	NPS	RF	WE	RJ		M	Mo	B	Bo	B1	B2	A	A1	A3	A4	D	D1	Do	RF	WE
80	3×2	203	283	216	49	107	230	/	/	/	/	217	174	89	181	/	/	/	19	15
100	4×3	229	305	241	74	152	400	/	/	/	/	318	258	148	257	/	/	/	32	24
150	6×4	394	457	406	100	178	650	/	/	/	/	407	322	287	287	/	/	/	55	48
200	8×6	457	521	470	150	272	1050	378	400	200	106	562	457	378	378	554	337	508	73	69
250	10×8	533	559	546	201	/	/	421	400	200	108	700	595	378	378	606	421	508	122	110
300	12×10	610	635	622	252	/	/	482	400	200	108	735	630	378	378	667	482	508	310	297
350	14×12	686	762	699	303	/	/	549	600	330	144	858	728	530	530	734	549	508	470	430
400	16×14	762	838	775	336	/	/	607	600	330	144	888	758	530	530	774	589	508	590	540
450	18×16	864	914	876	385	/	/	687	800	370	220	1319	1154	680	680	889	687	508	830	760
500	20×18	914	991	927	435	/	/	713	800	370	220	1354	1180	680	680	909	708	508	1040	940
600	24×20	1067	1143	1080	487	/	/	772	800	370	220	1459	1294	680	680	1023	772	305	1650	1110
750	30×24	1295	1397	/	589	/	/	995	800	515	279	1060	915	1455	1455	1268	995	305	4100	3170
900	36×30	1524	1727	/	735	/	/	1153	800	515	279	1195	1035	1665	1665	1515	1211	305	6450	4820

PN2.5、 4.0 MPa CLASS300 mm

Dimensions		L			do	Manual		Worm Gear Drive				Pneumatic				Electric			Weight	
DN	NPS	RF	WE	RJ		M	Mo	B	Bo	B1	B2	A	A1	A3	A4	D	D1	Do	RF	WE
80	3×2	283	283	298	49	107	230	/	/	/	/	234	174	148	257	/	/	/	28	20
100	4×3	305	305	321	74	152	400	/	/	/	/	343	258	287	287	/	/	/	38	28
150	6×4	403	457	419	100	178	650	/	/	/	/	407	322	287	287	/	/	/	67	54
200	8×6	502	521	517	150	272	1050	378	400	200	106	562	457	378	378	522	337	508	95	83
250	10×8	568	559	584	201	/	/	421	400	200	108	700	595	378	378	606	421	508	144	125
300	12×10	648	635	664	252	/	/	482	400	200	108	760	630	530	530	667	482	508	380	340
350	14×12	762	762	778	303	/	/	549	600	330	144	858	728	530	530	751	549	508	580	540
400	16×14	838	838	854	336	/	/	607	700	330	144	909	758	530	530	774	589	508	780	680
450	18×16	914	914	930	385	/	/	687	800	370	220	1319	1154	680	680	938	687	305	1190	1050
500	20×18	991	991	1010	435	/	/	713	800	370	220	1354	1180	680	680	909	708	508	1880	1690
600	24×20	1143	1143	1165	487	/	/	772	800	370	220	1459	1294	1455	1455	1045	772	305	2750	2180
750	30×24	1397	1397	1422	589	/	/	995	800	515	279	1075	915	1665	1665	1268	995	305	4810	3820
900	36×30	1727	1727	1756	735	/	/	1153	800	515	279	1195	1035	1960	1960	1515	1211	305	8440	6840

REDUCED BORE TRUNNION MOUNTINED BALL VALVE

Main Dimensions PN6.4MPa CLASS 400 mm

Dimensions		L			do	Manual		Worm Gear Drive				Pneumatic				Electric			Weight	
DN	NPS	RF	WE	RJ		M	Mo	B	Bo	B1	B2	A	A1	A3	A4	D	D1	Do	RF	WE
80	3×2	356	356	359	49	107	400	/	/	/	/	234	174	148	257	/	/	/	37	26
100	4×3	406	406	410	74	152	650	/	/	/	/	343	258	287	287	/	/	/	66	47
150	6×4	495	495	498	100	178	650	/	/	/	/	407	322	287	287	/	/	/	128	81
200	8×6	597	597	600	150	272	1050	383	400	200	108	562	457	378	378	522	337	508	296	252
250	10×8	673	673	676	201	/	/	447	600	330	144	725	595	530	530	606	421	508	456	384
300	12×10	762	762	765	252	/	/	480	600	330	144	760	630	530	530	667	482	508	648	544
350	14×12	826	826	829	303	/	/	517	800	370	220	943	728	680	680	751	549	508	950	795
400	16×12	902	902	905	303	/	/	517	800	370	220	943	728	680	680	751	549	508	1053	882
450	18×16	978	978	981	385	/	/	639	800	370	220	1299	1154	1455	1455	938	687	305	1512	1265
500	20×16	1054	1054	1060	385	/	/	639	800	370	220	1299	1154	1455	1455	938	687	305	1925	1605
600	24×20	1232	1232	1241	487	/	/	744	800	515	279	1459	1294	1455	1455	1045	772	305	3125	2610
750	30×24	1524	1524	1537	589	/	/	869	800	515	279	1075	915	1665	1665	1268	995	305	5385	4490
900	36×30	1880	1880	1895	735	/	/	1013	800	570	368	1195	1035	1960	1960	1515	1211	305	8960	7470

PN10.0MPa CLASS600 mm

Dimensions		L			do	Manual		Worm Gear Drive				Pneumatic				Electric			Weight	
DN	NPS	RF	WE	RJ		M	Mo	B	Bo	B1	B2	A	A1	A3	A4	D	D1	Do	RF	WE
80	3×2	356	356	359	49	107	400	/	/	/	/	234	174	148	257	/	/	/	44	34
100	4×3	432	432	435	74	152	650	/	/	/	/	343	258	287	287	/	/	/	89	65
150	6×4	559	559	562	100	178	1050	/	/	/	/	407	322	287	287	/	/	/	160	110
200	8×6	660	660	664	150	/	/	389	400	200	108	500	395	378	378	522	337	508	310	240
250	10×8	787	787	791	201	/	/	449	600	330	144	562	457	378	378	606	421	508	570	500
300	12×10	838	838	841	252	/	/	497	600	330	144	725	595	530	530	684	482	508	850	680
350	14×12	889	889	892	303	/	/	550	800	370	220	760	630	530	530	751	549	508	1180	970
400	16×12	991	991	994	303	/	/	550	800	370	220	760	630	530	530	751	549	508	1390	1140
450	18×16	1092	1092	1095	385	/	/	687	800	370	220	1319	1154	1455	1455	960	687	305	1765	1415
500	20×16	1194	1194	1200	385	/	/	687	800	370	220	1319	1154	1455	1455	960	687	305	2170	1690
600	24×20	1397	1397	1407	487	/	/	780	800	515	279	1459	1294	1665	1665	1045	772	305	3390	2540
750	30×24	1651	1651	1664	589	/	/	995	800	515	279	1075	915	1665	1665	1328	995	305	5910	4470
900	36×30	2083	2083	2099	735	/	/	1157	800	570	368	1195	1035	1960	1960	1661	1211	305	10560	8460

REDUCED BORE TRUNNION MOUNTINED BALL VALVE

Main Dimensions

CLASS 900 mm

Dimensions		L			do	Manual		Worm Gear Drive				Pneumatic				Electric			Weight	
DN	NPS	RF	WE	RJ		M	Mo	B	Bo	B1	B2	A	A1	A3	A4	D	D1	Do	RF	WE
80	3×2	381	381	384	49	123	650	/	/	/	/	234	174	148	257	/	/	/	58	48
100	4×3	457	457	460	74	/	/	185	400	200	106	343	258	287	287	/	/	/	105	90
150	6×4	610	610	613	100	/	/	225	400	200	108	427	322	378	378	/	/	/	230	162
200	8×6	737	737	740	150	/	/	389	600	330	144	587	457	530	530	522	337	508	470	370
250	10×8	838	838	841	201	/	/	449	600	330	144	725	595	530	530	606	421	508	530	410
300	12×10	965	965	968	252	/	/	497	800	370	220	795	630	680	680	684	482	508	1200	1030
350	14×12	1029	1029	1038	303	/	/	550	800	370	220	837	728	1455	1455	822	549	508	1695	1440
400	16×12	1130	1130	1140	303	/	/	550	800	370	220	837	728	1455	1455	822	549	508	1790	1480
450	18×16	1219	1219	1232	373	/	/	687	800	515	279	1314	1154	1665	1665	991	687	305	2520	2100
500	20×16	1321	1321	1334	373	/	/	687	800	515	279	1314	1154	1665	1665	991	687	305	2970	2430
600	24×20	1549	1549	1568	471	/	/	780	800	515	279	1459	1294	1665	1665	1105	772	305	5580	4520
750	30×24	1880	1880	1902	570	/	/	995	800	515	279	1075	915	1960	1960	1445	995	305	8980	7907
900	36×30	2286	2286	2315	712	/	/	1157	800	570	368	/	/	/	/	1661	1211	305	15650	13910

CLASS1500 mm

Dimensions		L			do	Worm Gear Drive				Pneumatic				Electric			Weight	
DN	NPS	RF	WE	RJ		B	Bo	B1	B2	A	A1	A3	A4	D	D1	Do	RF	WE
80	3×2	470	470	473	49	154	400	200	106	259	174	287	287	/	/	/	75	49
100	4×3	546	546	549	74	187	600	330	144	363	258	378	378	/	/	/	130	73
150	6×4	705	705	711	100	217	600	330	144	452	322	530	530	/	/	/	300	181
200	8×6	832	832	841	144	346	800	370	220	587	457	530	530	522	337	508	615	491
250	10×8	991	991	1000	192	384	800	370	220	760	595	680	680	623	421	508	1085	879
300	12×10	1130	1130	1146	239	452	800	370	220	739	630	1455	1455	755	482	508	1850	1547
350	14×12	1257	1257	1276	287	512	800	515	279	837	728	1455	1455	822	549	508	2620	2214
400	16×12	1384	1384	1407	287	512	800	515	279	837	728	1455	1455	822	549	508	2890	2365
450	18×16	1537	1537	1559	360	601	800	515	279	1314	1154	1665	1665	1020	687	305	3856	3156
500	20×16	1664	1664	1686	360	601	800	515	279	1314	1154	1665	1665	1020	687	305	5005	4105
600	24×20	1943	1943	1972	416	727	800	570	368	1459	1294	1960	1960	1272	772	305	11377	9980
750	30×24	2251	2251	2281	498	803	800	570	368	1075	915	1960	1960	1445	995	305	17914	14660
900	36×30	2556	2556	2590	625	1070	960	575	220	/	/	/	/	1661	1211	305	32976	27743

CLASS2500 mm

Dimensions		L			do	Worm Gear Drive				Pneumatic				Electric			Weight	
DN	NPS	RF	WE	RJ		B	Bo	B1	B2	A	A1	A3	A4	D	D1	Do	RF	WE
80	3×2	578	578	584	42	174	600	330	144	259	174	287	287	/	/	/	165	111
100	4×3	673	673	683	62	224	800	370	220	388	258	530	530	/	/	/	280	166
150	6×4	914	914	927	87	268	800	370	220	452	322	530	530	/	/	/	540	302
200	8×6	1022	1022	1038	131	371	800	370	220	622	457	680	680	539	337	508	990	860
250	10×8	1270	1270	1292	179	420	800	515	279	704	595	1455	1455	694	421	508	1750	1270
300	12×10	1422	1422	1445	223	540	800	515	279	739	630	1455	1455	755	482	508	2650	1920
350	14×12	1540	1540	1569	265	638	800	515	279	888	728	1665	1665	853	549	305	4610	3855
400	16×12	1567	1567	1596	265	638	800	515	279	888	728	1665	1665	853	549	305	5145	4295
450	18×16	1825	1825	1854	276	764	800	570	368	1314	1154	1665	1665	1020	687	305	7395	6170
500	20×16	1875	1875	1904	276	764	800	570	368	1314	1154	1665	1665	1020	687	305	8900	7430
600	24×20	2257	2257	2286	343	867	800	570	368	1459	1294	1960	1960	1272	772	305	12190	10440