KAVAL

KAVAL INDUSTRIES LTD.

Solutions
For Flow Control

Trunnion Mounted Ball Valves

About us

KAVAL is a Canadian valve fabricator, providing customers with floating and trunnion ball valves, as well as gate valves, globe valves, check valves, etc. for oil and gas industry, as well as other industries.

Kaval has production and distribution centers in Calgary, Canada and Nanjing, China, consisting of experienced R&D, QA/QC, Engineering and production teams. We provide customers in the world with soft seated floating and trunnion ball valves, gate valves, globe valves, check valves, etc. for oil and gas industry, as well as other industries. KAVAL is ISO 9000 certified (DNV) and valve designs meet relevant standards such as API 6D, API 600, API 594, ASME B16.34, CSA Z245.15, and tested as per API 598, API 6D, API 607, etc.. Our products meet the most stringent requirement in quality, pricing, delivery and services by our customers.

In the very tough competitive market, KAVAL wins its share by high quality products, quick delivery, excellent service and competitive price. In KAVAL we are proud of our quality control, knowledge of materials, valve design, fabrication, our services, as well as our understanding about requirements in oil and gas industries in North America and the world. Our experienced staff, high standards of excellence, expertise in problem solving and variety of our products will provide our clients with fully satisfaction.

Our international team is composed of experts of valve design, valve manufacture, material production, oil and gas production, EPC, etc. Based on know-how and know-why, we provide our clients with result-oriented flow control solutions for their projects, including selection of materials, specification of valves, etc. rather than only valve products, to meet the client particular applications.

Matching up the market requirement and technology development, we have been dedicating on developing products and services to best meet our client's needs in oil and gas industries. Client's success is our achievement. Our experienced staff, high standards of excellence, expertise in problem solving and variety of our products will provide our clients with fully satisfaction.

The KAVAL Split Body trunnion mounted ball valves have been designed for severe oil and gas applications, including production, upstream processing, transportation and distribution, refining and petrochemical, as well as power plants, water transportation, sea water desalination and chemical applications.

APPLICABLE STANDARD

KAVAL trunnion ball valves are designed to meet the following standards:

Design standard: API 6D

Valve shell pressure-temperature: ASME B16.34

Shell wall thickness: ASME B16.34

Face-to-face dimensions:

API 6D/ASME B16.10

End flange dimensions: ASME B16.5,

MSS SP-44 and ASME B16.47 series A

Top mounting flange: ISO 5211

Fire test: API 607

Pressure / leak test: API 6D

KAVAL trunnion ball valves are also designed to meet EN/ISO standards:

Design standard: ISO 14313

Valve shell pressure-temperature: EN ISO1092-1

Face-to-face dimension: ISO 14313

Fire test: EN ISO 10497

Pressure test: ISO 14313

CSA standards

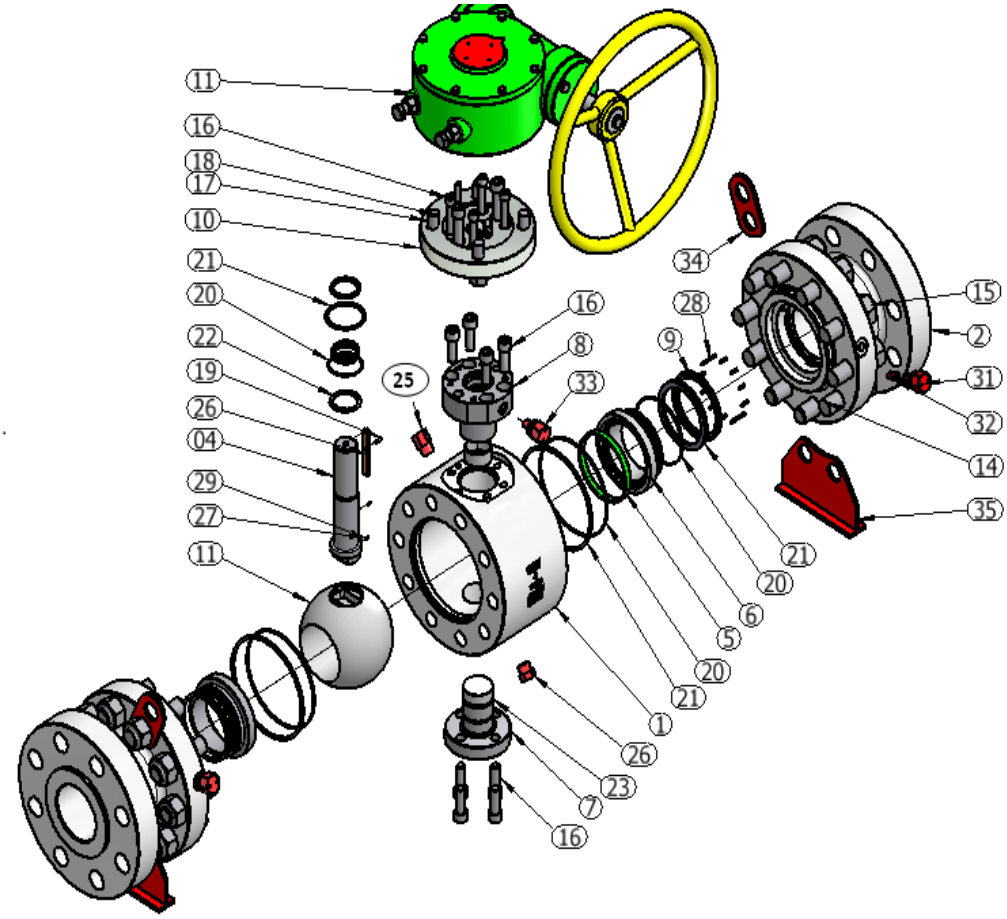
Kaval trunnion valves satisfy CSA Z245.15 (latest edition).

NACE compliance

For easy application and to avoid misuse at site, all materials used by KAVAL are in accordance with NACE MR0175/ISO15156 (latest revision) requirements as pre-qualified materials against H_2S attack, while it is customers' responsibility to determine service conditions of the valves.

PARTS AND MATERIAL SELECTION

Trunnion ball valves can be trunnion supported and bearing-plate mounted design depending on size and class rating. Below are explosive illustrations of KAVAL full port, split body, trunnion ball valve exhibiting the basic design concept. The parts of the valve are numbered and given in bill of material. The regular port is not shown, but design features are the same.



Trunnion (out trunnion) mounted ball valve

Bill of Material (Typical materials of construction[1])

ITEM	PART NAME	MATERIAL [2, 3]		
1	Body	ASTM A105N	ASTM A350 LF2	ASTM A182 F316
2	Adapter	ASTM A105N	ASTM A350 LF2	ASTM A182 F316
3	Ball	316 SS / ASTM A105+ENP	316 SS / ASTM A350 LF2+ENP	ASTM A182 F316
4	Stem [4]	316 SS / ASTM A29 4140+ENP	316 SS / ASTM A29 4140+ENP	ASTM A182 F51
5	Seat [5]	RPTFE / NYLON / DEVLON / PEEK		
6	Seat Ring	ASTM A105N+ENP	ASTM A350 LF2+ENP	ASTM A182 F316
7	Trunnion	ASTM A105N+ENP	ASTM A350 LF2+ENP	ASTM A182 F316
8	Bonnet	ASTM A105N+ENP	ASTM A350 LF2+ENP	ASTM A182 F316
9	Seat Follower	ASTM A105N+ENP	ASTM A350 LF2+ENP	ASTM A182 F316
10	Mounting Plate	ASTM A105	ASTM A350 LF2	ASTM A182 F316
11	Gear	Carbon steel	Carbon steel	Carbon steel
14	Body Stud	ASTM A193 B7M	ASTM A320 L7M	ASTM A193 B8M
15	Body Nut	ASTM A194 2HM	ASTM A194 7M	ASTM A194 8M
16	Screw	ASTM A193 B7M	ASTM A320 L7M	ASTM A193 B8M
17	Stud	ASTM A193 B7M	ASTM A320 L7M	ASTM A193 B8M
18	Nut	ASTM A194 2HM	ASTM A194 7M	ASTM A194 8M
19	Pin	Carbon steel	Carbon steel	ASTM A276 410
20	O Ring	VITON B	HNBR / VITON GLT	VITON B
21	Gasket	Graphite	Graphite	Graphite
22[6]	Thrust Washer	PTFE	PTFE	PTFE
23[6]	Bearing [5]	CS+PTFE	CS+PTFE	SS+PTFE
24	Key	AISI 1045	AISI 1045	AISI 1045
25	Relief Valve	ASTM A105+ENP	ASTM A350 LF2+ENP	ASTM A182 F316
26	Drain Plug	ASTM A105+ENP	ASTM A350 LF2+ENP	ASTM A182 F316
27	Antistatic Spring	SS316	SS316	SS316
28	Spring	INCONEL X750	INCONEL X750	INCONEL X750
29	Antistatic Ball	SS316	SS316	SS316
30	Pin	ASTM A276 410	ASTM A276 410	ASTM A276 410
31	Seat Injection Valve	ASTM A105+ENP	ASTM A350 LF2+ENP	ASTM A182 F316
32	Check Valve	SS316	SS316	SS316
33	Stem Injection Valve	ASTM A105+ENP	ASTM A350 LF2+ENP	ASTM A182 F316
34	Lifting Lug	Carbon steel	Carbon steel	Carbon steel
35	Support Feet	Carbon steel	Carbon steel	Carbon steel

Note:

1. The BOM table lists standard materials which are most commonly used in oil and gas industries. Other materials are available depending on service conditions of the valve and client requirement.
2. A350 LF2 material, unless it is specified otherwise, will be Class 1.
3. The thickness of ENP, unless otherwise specified, will be 3 mil (0.075 mm).
4. Stem material will be determined according to rating/size and service of the valve. Other materials other than listed are available.
5. Flexible seat design provides tight shutoff at high and low pressures, reduce wear and valve torque. A wide range of seat materials are available (see Seat Insert and Sealing Material Selection table).
6. PEEK or other polymer seal is available upon client requirements for particular applications.

Seat Insert and Sealing Material Selection

Material	Temperature ℃		Class Rating		Size	
	Min	Max	Seat Insert	Seal	Seat Insert	Seal
RPTFE	-100	150	300	NA	16”	N/A
NYLON	-60	100	2500	NA	56”	N/A
DEVLON	-60	140	2500	NA	56”	N/A
PEEK	-60	220	2500	NA	24”	N/A
PCTFE	-196	150	2500	NA	24”	N/A
HNBR	-40	140	N/A	2500	N/A	56”
VITON B	-29	180	N/A	900	N/A	56”
VITON AED	-29	180	N/A	2500	N/A	56”
VITON GLT	-30	180	N/A	900	N/A	56”
PTFE+Elgiloy Spring	-196	200	N/A	2500	N/A	24”

Note: The applicable temperature of sealing materials in valves could be lower than the material datasheets for static application.

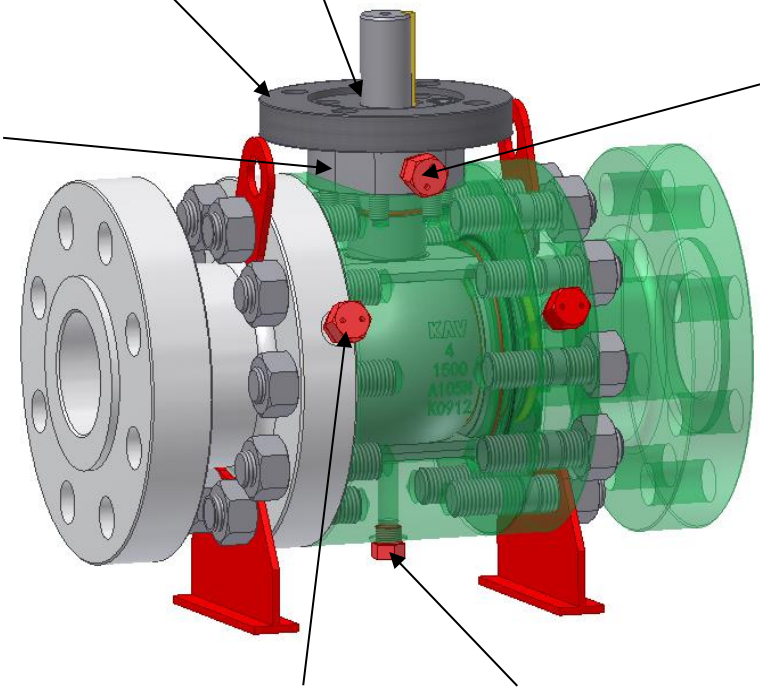
DESIGN FEATURES

In KAVAL trunnion ball vavles, the ball is fixed and the seats are floating, free to move along the valve axis. Side load exerted by the pressure acting on the ball is absorbed by springs behind the seat holder. The springs also provide preload force on the seat to ensure the valve is tight seal at low pressure.

ISO 5211 top flange dimensions are in accordance with ISO5211 and provides unified easy installation of actuators

Internal stop will ensure proper open/close position of the ball and provide pretection fo the stem and ball from over travelling

Blow-out proof stem The stem is of anti-blowout design, separated from the ball and connected to the upper trunnion. The connection between the stem and the actuator is achieved by means of a key.



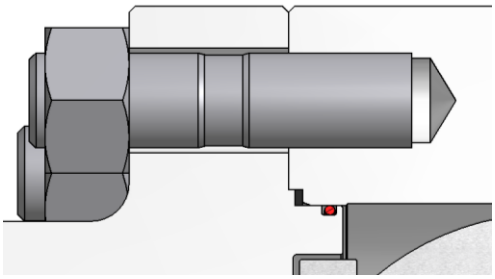
Emergency sealant injection-stem

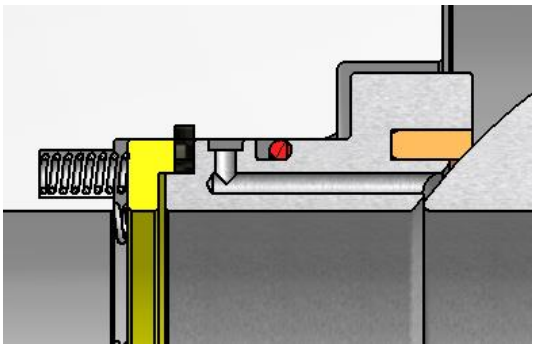
Emergency sealant injection-seat

Drain plug

Body construction

KAVAL standard trunnion ball valves are three piece body design (body + 2 adaptors). The body is made of forged parts and connected together with bolts. The bolted construction allows disassembly on the job site for repairs. The body drain is located in the lowest part of the body cavity and consists of a drain valve with safety plug. Graphite rings are provided to guarantee full compliance with Fire Safe Standards.





Soft seated valves

In a soft seated ball valve a resilient polymer seat is inserted into the seat holder to provide bubble tight seal of the valve. The seat holder also provides a metal to metal sealing with the ball (in case the soft seat fails in fire).

In trunnion ball vavles, the ball is fixed and the seats are floating. The seat with holder is free to move along the valve axis. The seat is self-relieving.

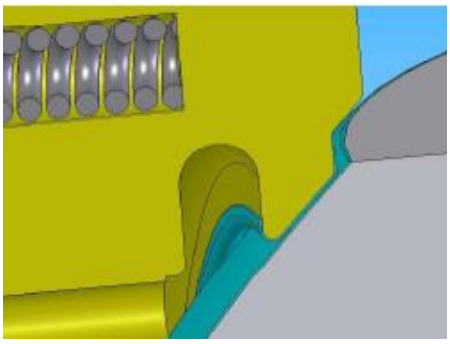
Behind the seat holder are pre-loading springs. The pre-loading springs provide preload force on the seat to ensure the valve is tight seal at low pressure. As pressure increases, the springs absorb load exerted by the fluid pressure and the valve will seal also tight.

An O-ring and a graphite gaskets and/or spring energized lip with the seat holder to ensure sealing between the seat holder and the valve body parts.

Self-relieving seats are supplied as a standard feature. Double piston or combination seats (self-relieving/upstream, double piston/down-stream) can be supplied upon request.

Metal-seated valves

For special applications the contact area between the seats and the ball can be completely metallic. This solution is recommended when the normal soft sealing is not suitable due to the severity of the service conditions, such as high temperature and the presence of solid particles which may damage the soft seats. In metal-to-metal seal design, the ball and the seat contact surfaces are hard faced with tungsten carbide coating or chromium carbide coating to improve resistance to wear and prevent scratching caused by the solid particles contained in the process media.



Stem construction

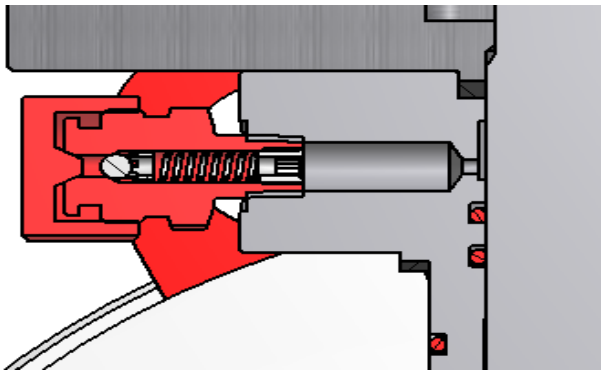
The stem is of anti-blowout design. The stem is separated from the ball and connected to the upper trunnion by means of pins or by a tang-type connection. The connection between the stem and the actuator is achieved by means of a key.

Two O-rings and a graphite gasket ensure sealing low emission of the stem. The graphite gasket is retained by the gland plate.

An emergency sealant injection facility is provided between the upper O-ring and the graphite gasket. The graphite gasket can be replaced with the valve in line and the ball in any position. To replace the graphite gasket, just removing the gland plate and release possible pressure in the space between the upper O-ring and the graphite gasket through the grease injection fitting hole. The stem seals can also be replaced with the valve in line when the ball is in the fully closed or fully open position and the pressure in the body cavity has been completely released.

Special stem sealing systems of lip seals or special gaskets are available upon client request

for different service conditions.



Emergency sealant injection

Each KAVAL valve is supplied with emergency sealant injection feature. The sealant injection fitting is located between the upper O-rings and the graphite gasket.

An emergency sealant injection feature on seats and stem are available for 6" full port and larger, or upon request. Emergency grease injection features are not available on cryogenic and high temperature valves.

Double block and bleed

All KAVAL trunnion mounted ball valves are designed and manufactured to seal off both seats at the same time and allow bleeding of the entrapped cavity pressure (DBB) with the ball in the closed position. Both seats hold their respective pressures independently from the body cavity. The double block and bleed feature provides high reliability of the valve.

Anti-static device

This device is a standard feature of KAVAL ball valves. A spring thrusts a little ball, providing earthed continuity between stem and other metallic components of valve (ball and body) in order to eliminate electric charge accumulation and avoid sparks during operation of the valve and prevent problems in case of use with flammable fluids and gas.

Actuation

KAVAL trunnion mounted ball valves are designed to be operated by manual operators or by any actuator available. The top work flange are designed in accordance with ISO 5211 and fits standard gear box or actuator. Gear operated valves can be easily actuated in service, by removing the gear box and mounting the desired actuator.

Fire safe design

Fire safe is standard design of all KAVAL ball valve. Two o-ring and gland graphite gasket (with graphite packing) prevent leak from the valve stem area. The O-ring and body graphite gasket prevent leakage through the valve body/adaptor connection. In case the O-ring would be destroyed in fire, the graphite gasket and packing will prevent fluid or gas from leakage.

NACE compliance

For easy application and to avoid misuse at site, all materials used by KAVAL are in accordance with NACE MR0175/ISO15156 (latest revision) requirements as pre-qualified materials against H_2S attack, while it is customers' responsibility to determine service conditions of the valves.

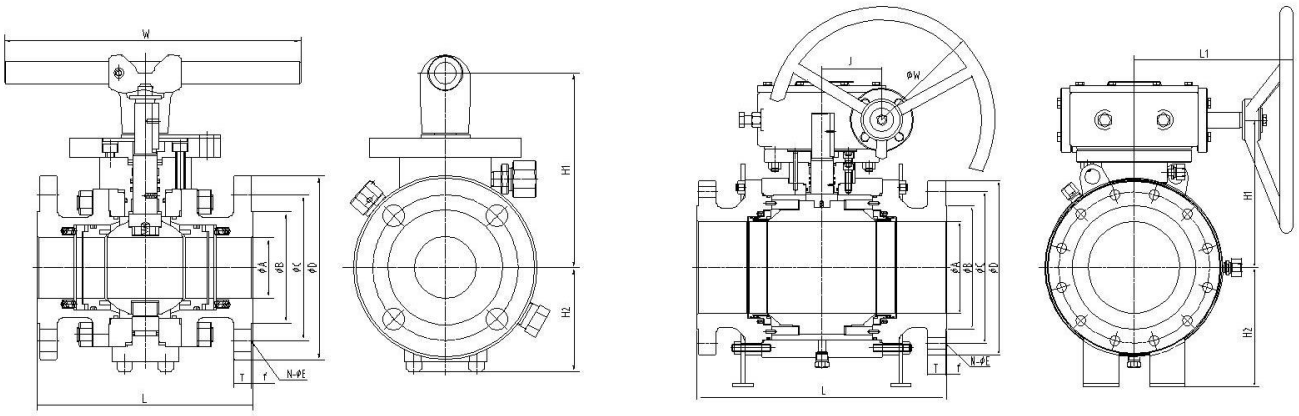
DIMENSION DATA

The dimension data provided are for flange end valves and consistent with the following standards:

Flange dimension: ASME B16.5
Face to face length: ASME B16.10

Dimensions for butt weld valves of KAVAL valves are consistent with ASME B16.10 and end preparation per ASME B16.25.

Valves of other sizes are also available. Please contact KAVAL engineering for information.



ASME Class 150 full port

Valve size	Valve Dimensions (mm)													Weight (kg)
	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
2”	50	92.1	120.7	152	4-19	14.3	2	178	400	163	85	-	-	22
3”	76	127	152.4	190	4-19	17.5	2	203	450	196	110	-	-	37
4”	100	157.2	190.5	230	8-19	22.3	2	229	450	254	133	-	-	50
6”	150	215.9	241.3	280	8-22.5	23.9	2	394	600	270	205	90	360	170
8”	201	270	298.5	345	8-22.5	27	2	457	600	313	260	126	402	255
10”	252	323.8	362	405	12-25.5	28.6	2	533	600	352	280	126	402	390
12”	303	381	431.8	485	12-25.5	30.2	2	610	600	387	347	126	402	600
16”	385	470	539.8	595	16-25.5	35	2	762	600	450	410	126	402	1050
20”	487	584.2	635	700	20-28.5	41.3	2	914	750	515	500	138	544	1900
24”	589	692.2	749.3	815	20-35	46.1	2	1067	750	670	606	138	544	2800
30”	735	857	914.4	985	28-35	73.1	2	1295	750	867	768	205	665	6200
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ASME Class 300 full port

Valve size	Valve Dimensions (mm)													Weight (kg)
	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
2”	50	92.1	127	165	8-19	20.7	2	216	400	163	85	-	-	25
3”	76	127	168.3	210	8-22.5	27	2	283	450	196	110	-	-	50
4”	100	157.2	200	255	8-22.5	30.2	2	305	450	254	133	-	-	75
6”	150	215.9	269.9	320	12-22.5	35	2	403	600	270	205	90	360	172
8”	201	270	330.2	380	12-25.5	39.7	2	502	600	313	260	126	402	300
10”	252	323.8	387.4	445	16-28.5	46.1	2	533	600	352	280	126	402	500
12”	303	381	450.8	520	16-32	49.3	2	648	600	387	347	126	402	740
16”	385	469.9	571.5	650	20-35	55.6	2	838	600	464	420	126	402	1405
20”	487	584.2	685.8	775	24-35	62	2	991	750	595	515	138	544	2100
24”	589	692.2	812.8	915	24-41	68.3	2	1143	750	670	606	138	544	2890
30”	735	857	997	1090	28-48	90.5	2	1397	800	890	770	231	695	5550
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ASME Class 600 full port

Valve size	Valve Dimensions (mm)													Weight (kg)
	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
1 1/2”	38	73	114.3	155	4-22.5	22.3	7	241	450	166.5	85	-	-	25
2”	50	92.1	127	165	8-19	25.4	7	292	450	177	100	-	-	30
3”	74	127	168.3	210	8-22.5	31.8	7	356	550	206	117	-	-	65
4”	100	157.2	215.9	275	8-25.5	38.1	7	432	800	258	145	-	-	120
6”	150	215.9	292	355	12-28.5	48	7	559	600	283	230	126	402	235
8”	201	270	349.2	420	12-32	55.6	7	660	600	313	260	126	402	435
10”	252	323.8	431.8	510	16-35	63.5	7	787	600	372	330	126	402	700
12”	303	381	489	560	20-35	66.7	7	838	600	387	347	126	402	1050
16”	385	469.9	630.2	685	20-41	76.2	7	991	750	506	420	138	544	1550
20”	487	584.2	723.9	815	24-44.5	88.9	7	1194	750	635	570	138	544	2690
24”	589	692.2	838.2	940	24-51	101.6	7	1397	750	740	606.5	138	544	4345
30”	735	857	1022.4	1130	28-54	114.3	7	1651	800	1015	780	230	763	6660
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ASME Class 900 full port

Valve size	Valve Dimensions (mm)													Weight (kg)
	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
1 1/2”	38	73	123.8	180	4-28.5	31.8	7	305	600	176	96	-	-	40
2”	50	92.1	165.1	215	8-25.5	38.1	7	368	700	192	104	-	-	50
3”	74	127	190.5	240	8-25.5	38.1	7	381	700	246	132	-	-	82
4”	100	157.2	235	290	8-32	44.5	7	457	400	260	159	90	360	150
6”	150	215.9	317.5	380	12-32	55.6	7	610	600	288	240	126	402	320
8”	201	270	393.7	470	12-38	63.5	7	737	600	332	295	126	402	580
10”	252	323.8	469.9	545	16-38	69.9	7	838	600	400	350	126	402	920
12”	303	381	533.4	610	20-38	79.4	7	965	700	541	370	138	555	1155
16”	385	469.9	616	705	20-40.5	88.9	7	1130	750	565	450	205	664	2010
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ASME Class 1500 full port

Valve size	Valve Dimensions (mm)													Weight (kg)
	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
1 1/2”	38	73	123.8	180	4-28.5	31.8	7	305	600	176	96	-	-	40
2”	50	92.1	165.1	215	8-25.5	38.1	7	368	700	192	104	-	-	50
3”	74	127	203.2	265	8-32	47.7	7	470	900	253	139	-	-	110
4”	100	157.2	241.3	310	8-35	54	7	546	400	260	206	90	360	200
6”	144	215.9	317.5	395	12-38	82.6	7	705	600	308	260	126	402	490
8”	192	270	393.7	485	12-45	92.1	7	832	600	385	320	126	402	790
10”	239	323.8	482.6	585	12-51	108	7	991	600	420	365	126	402	1200
12”	287	381	571.5	675	16-54	123.9	7	965	700	485	390	138	555	1980
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ASME Class 2500 full port

Valve size	Valve Dimensions (mm)													Weight (kg)
	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
1 1/2”	38	73	146	205	4-32	44.5	7	384	800	235	123	-	-	62
2”	42	92.1	171.4	235	8-28.5	50.9	7	451	800	240	127	-	-	120
3”	62	127	228.6	305	8-35	66.7	7	578	400	260	178	90	360	200
4”	87	157.2	273	355	8-41	76.2	7	673	400	280	230	90	360	380
6”	131	215.9	368.3	485	8-54	108	7	914	600	315	280	126	402	765
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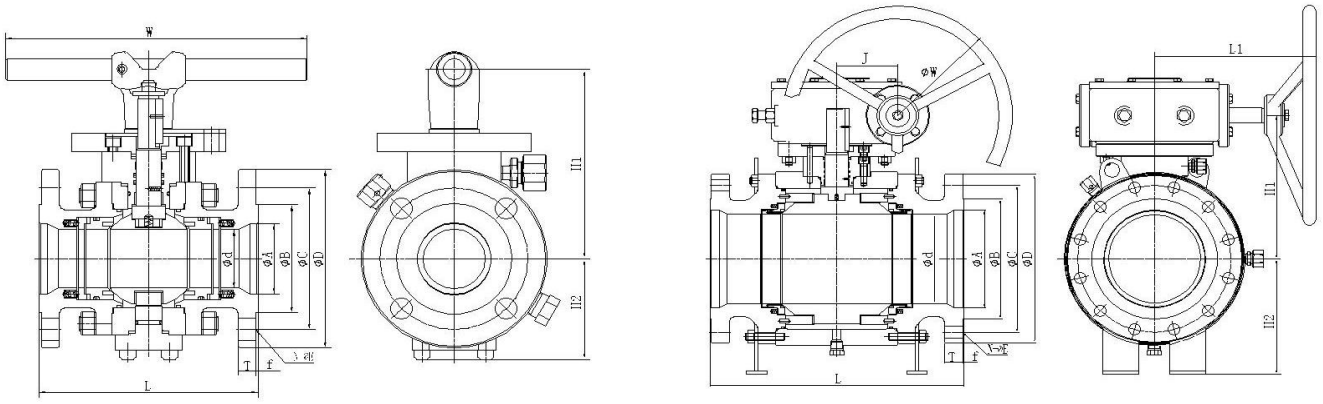

ASME Class 150 regular port

Valve size	Valve Dimensions (mm)														Weight (kg)
	d	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
3”X2”	50	76	127	152.4	190	4-19	17.5	2	203	400	163	85	-	-	22
4”X3”	76	100	157.2	190.5	230	8-19	22.3	2	229	450	196	110	-	-	35
6”X4”	100	150	215.9	241.3	280	8-22.5	23.9	2	394	450	254	133	-	-	72
8”X6”	150	201	270	298.5	345	8-22.5	27	2	457	600	270	205	90	360	159
10”X8”	201	252	323.8	362	405	12-25.5	28.6	2	533	600	313	260	126	402	227
12”X10”	252	303	381	431.8	485	12-25.5	30.2	2	610	600	352	280	126	402	396
16”X12”	303	385	470	539.8	595	16-25.5	35	2	762	600	387	347	126	402	575
20”X16”	385	487	584.2	635	700	20-32	41.3	2	914	600	450	410	126	402	1180
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ASME Class 300 regular port

Valve size	Valve Dimensions (mm)														Weight (kg)
	d	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
3”X2”	50	76	127	168.3	210	8-22.5	27	2	283	400	163	85	-	-	25
4”X3”	76	100	157.2	200	255	8-22.5	30.2	2	305	450	196	110	-	-	50
6”X4”	100	150	215.9	269.9	320	12-22.5	35	2	403	450	254	133	-	-	75
8”X6”	150	201	270	330.2	380	12-25.5	39.7	2	502	600	270	205	90	360	172
10”X8”	201	252	323.8	387.4	445	16-28.5	46.1	2	533	600	313	260	126	402	300
12”X10”	252	303	381	450.8	520	16-32	49.3	2	648	600	352	280	126	402	500
16”X12”	303	385	469.9	571.5	650	20-35	55.6	2	838	600	387	347	126	402	740
20”X16”	385	487	584.2	685.8	775	24-35	62	2	991	600	464	420	126	402	1405
…															

ASME Class 600 regular port

Valve size	Valve Dimensions (mm)														Weight (kg)
	d	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
2”X1 1/2”	38	50	92.1	127	165	8-19	25.4	7	292	450	166.5	85	-	-	25
3”X2”	50	74	127	168.3	210	8-22.5	31.8	7	356	450	177	100	-	-	30
4”X3”	74	100	157.2	215.9	275	8-25.5	38.1	7	432	550	206	117	-	-	65
6”X4”	100	150	215.9	292	355	12-28.5	48	7	559	800	258	145	-	-	120
8”X6”	150	201	270	349.2	420	12-32	55.6	7	660	600	283	230	126	402	235
10”X8”	201	252	323.8	431.8	510	16-35	63.5	7	787	600	313	260	126	402	435
12”X10”	252	303	381	489	560	20-35	66.7	7	838	600	372	330	126	402	700
16”X12”	303	385	469.9	630.2	685	20-41	76.2	7	991	600	387	347	126	402	1050
20”X16”	385	487	584.2	723.9	815	24-44.5	88.9	7	1194	750	506	420	138	544	1550
…															

ASME Class 900 regular port

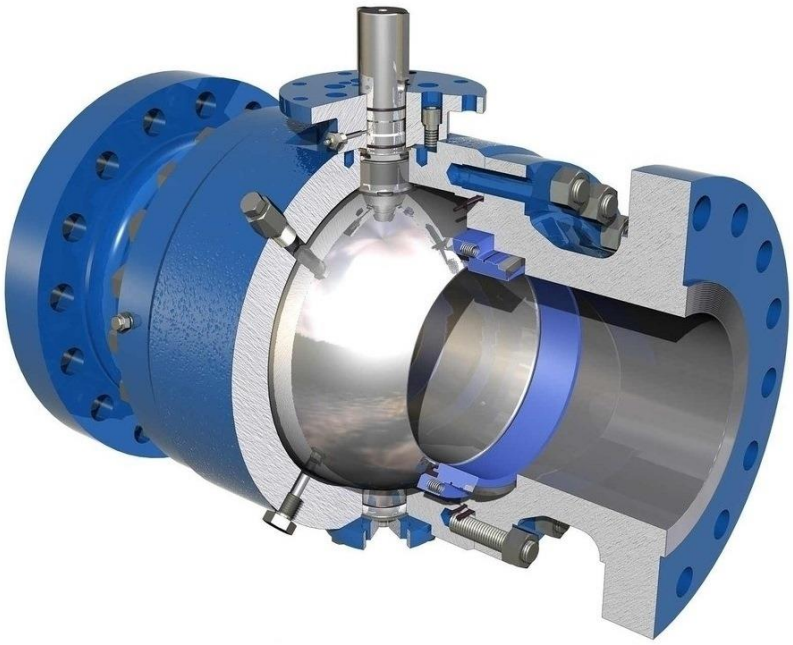
Valve size	Valve Dimensions (mm)														Weight (kg)
	d	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
2”X1 1/2”	38	50	92.1	165.1	215	8-25.5	38.1	7	368	600	176	96	-	-	40
3”X2”	50	74	127	190.5	240	8-25.5	38.1	7	381	700	192	104	-	-	50
4”X3”	74	100	157.2	235	290	8-32	44.5	7	457	700	246	132	-	-	82
6”X4”	100	150	215.9	317.5	380	12-32	55.6	7	610	400	260	159	90	360	150
8”X6”	150	201	270	393.7	470	12-38	63.5	7	737	600	288	240	126	402	320
10”X8”	201	252	323.8	469.9	545	16-38	69.9	7	838	600	332	295	126	402	580
12”X10”	252	303	381	533.4	610	20-38	79.4	7	965	600	400	350	126	402	920
16”X12”	303	385	469.9	616	705	20-40.5	88.9	7	1130	700	541	370	138	555	1155
…															

ASME Class 1500 regular port

Valve size	Valve Dimensions (mm)														Weight (kg)
	d	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
2”X1 1/2”	38	50	92.1	165.1	215	8-25.5	38.1	7	368	600	176	96	-	-	40
3”X2”	50	74	127	203.2	265	8-32	47.7	7	470	700	192	104	-	-	50
4”X3”	74	100	157.2	241.3	310	8-35	54	7	546	900	253	139	-	-	110
6”X4”	100	144	215.9	317.5	395	12-38	82.6	7	705	400	260	206	90	360	200
8”X6”	144	192	270	393.7	485	12-45	92.1	7	832	600	308	260	126	402	490
10”X8”	192	239	323.8	482.6	585	12-51	108	7	991	600	385	320	126	402	790
12”X10”	239	287	381	571.5	675	16-54	123.9	7	965	600	420	365	126	402	1200
…															

ASME Class 2500 regular port

Valve size	Valve Dimensions (mm)														Weight (kg)
	d	A	B	C	D	N-E	T	f	L	W	H1	H2	J	L1	
2”X1 1/2”	38	42	92.1	171.4	235	8-28.5	50.9	7	451	800	235	123	-	-	62
3”X2”	42	62	127	228.6	305	8-35	66.7	7	578	800	240	127	-	-	120
4”X3”	62	87	157.2	273	355	8-41	76.2	7	673	400	260	178	90	360	200
6”X4”	87	131	215.9	368.3	485	8-54	108	7	914	400	280	230	90	360	380
…															



HOW TO ORDER

Type of valve	Size	Port	Class	Model	End connection	Operator	Body material	Trim material	Seat material	Seal
☐☐☐	☐☐	☐	☐☐	☐	☐	☐	☐☐	☐☐	☐	☐

Type of valve:
TBA = Trunnion ball, standard double block and bleed (DBB), outer trunnion
TBE = Trunnion ball, standard double block and bleed (DBB), inner trunnion
TBB = Trunnion ball, DPE × DPE (both sides piston effect seat), outer trunnion
TBC = Trunnion ball, DPE × SPE (one side piston effect seat), outer trunnion
TBF = Trunnion ball, DPE × DPE (both sides piston effect seat), inner trunnion
TBG = Trunnion ball, DPE × SPE (one side piston effect seat), inner trunnion
TBD = Trunnion ball, cryogenic, outer trunnion
TBH = Trunnion ball, cryogenic, inner trunnion
TBS = Other type

Size:

02 = 2"	25 = 2 1/2"	03 = 3"	04 = 4"	06 = 6"	08 = 8"
10 = 10”	12 = 12”	14 = 14”	16 = 16”	18 = 18”	
20 = 20”	22 = 22”	24 = 24”			
30 = 30”	36 = 36”	…			

Port:
R = Regular port F = Full port

Class:
01 = 150 03 = 300 06 = 600 08 = 800 09 = 900 15 = 1500 25 = 2500

Model (of configuration):
S = Bolted body/adaptor connection, side entry
T = Bolted body/adaptor connection, top entry
W = Welded body/adaptor connection, side entry

End connection:
R = Raised face J = RTJ W = Butt Weld

Operator:
G = Manual gear L = Lever B = Bare stem S = Spring lever
E = Electric actuator P = Pneumatic actuator

Body material:
11 = A105N 12 = A182 LF2 13 = A182 F316 (L) 14 = A182 F304 (L)
20 = Other material

Trim material:
E1 = Body material + 1.5 mil ENP
E2 = Body material + 3 mil ENP & 316SS stem
E3 = Body material + 3 mil ENP
E4 = Body material Trim and 4140 Stem + 3mil ENP
S2 = A350 CF8/304SS
S3 = A350 CF8M/316SS
S4 = 410SS
S5 = Duplex 22Cr
S7 = 316SS Trim and F51 Stem
S8 = A182 F51 Ball and Stem +316SS trim
S9 = Other materials

Seat material:
T = MPTFE N = Nylon K = PEEK P = PCTFE D = DEVLON M = Metal
Z = Other material

Seal (Seat seal /Body seal / Stem seal):
A = VITION/VITION/VITION B = HNBR/HNBR/HNBR
C = Graphite/SS+Graphite/Graphite D = Lip Seal/SS+Graphite/Graphite
Z = Other material

FLOW COEFFICIENT

When flow goes through a valve it loses some energy. The pressure drop (ΔP) of the flow across a valve is determined by the flow rate, specific gravity of the flow and the **flow coefficient, K,** of the valve. For liquid,

$$\Delta P = Q^2 \cdot \frac{Sg}{K^2}$$

Where
Q: Flow rate
ΔP: Pressure Drop
Sg: Specific gravity (1 for water)
K: Flow coefficient Kv (SI unit) or Cv (Imperial Unit)

Cv is is defined as the flow rate in US Gallons per minute [gpm] of water at a temperature of 60°F with a pressure drop of 1 psi across a fully open valve.

Kv is the flow coefficient in metric units. It is defined as the flow rate in cubic meters per hour [m3/h] of water at a temperature of 16°C with a pressure drop of 1 bar across a fully open valve.

For gas (compressible flow):

$$\Delta P = \frac{T1 \cdot Gg}{P1} \cdot \left(\frac{q}{1{,}360 \cdot Cv \cdot y}\right)^2$$

where
Cv: Valve flow coefficient, dimensionless
q: Volumetric flow rate, scfh
Gg: Gas specific gravity (ratio of flowing gas to density of air with both at standard conditions, which is equal to the ratio of the molecular weight of gas to the molecular weight of air)
ΔP: Pressure differential, psi
*T*1: Absolute upstream temperatures (in °K)
*P*1: Upstream absolute static pressure, psia
y: Expansion factor, ratio of flow coefficient for a gas to that for a liquid at the same Reynolds Number, dimensionless
(*y* = 0.667 when P2 <= 0.5 times P1 for choked or critical flow, *y* = 1.000 when P2 > 0.5 times P1 for very low pressure differential)

Typical flow coefficient Cv of ball valves:

(full port at full open position)

Size (In)	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
1/2	24	24	24	24	24	24
3/4	53	53	53	53	53	53
1	92	92	92	92	92	92
1 ½	211	211	211	211	211	211
2	381	381	381	381	381	283
3	845	845	845	845	845	600
4	1523	1523	1523	1523	1523	1160
6	3381	3381	3381	3381	3120	2590
8	6031	6031	6031	6031	5508	4795
10	9442	9442	9442	9442	8500	410
12	13614	13614	13614	13614	12223	10433
14	16621	16621	16621	15363	14800	-
16	21920	21920	21920	20581	19178	-
18	28076	28076	28076	26435	24243	-
20	34995	34995	34995	32743	30565	-
22	42676	42676	42676	40184	35860	-
24	51117	51117	51117	47884	41733	-
26	59012	59012	59012	56076	-	-
28	68872	68872	68872	65110	-	-
30	79493	79493	79493	74610	-	-
32	89268	89268	89268	84977	-	-
34	101307	101307	101307	96020	-	-
36	112306	112306	112306	107487	-	-
40	139982	139982	139982	-	-	-

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