





BALL VALVES TABLE OF

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INTRODUCTION

We, "SAMSUNG PRECISION IND. CO., LTD." are specialized in ball valve manufacturing since our foundation year in 1982, with zero-defect, high quality and competitive pricing.

We produce various types of manual ball valves and special valves with state of the art testing equipment and international approval ISO 9001 & API Q1 quality systems.

SAMSUNG, as a specialized valve manufacturer will make the highest quality products and guarantee complete satisfaction for our domestic and overseas customers.

Thank you very much
President S. J. Wi / H. H. Wi

CERTIFICATION & APPROVALS

2



API 6D authentication



Ball Valve for Natural Gas
Certificate of Registration



Certificate of Hygiene and
Safety Standards (KC)



Fire Test



TYPE ACCEPTANCE TEST



CERTIFICATE OF COMPANY-SPECIFIC
APPROVED EXPORTER



CE Certificate



Certificate of designation as a
Company Specializing in Root



SIL2



KS Certificate



ISO9001 Certificate



ISO14001 Certificate



ISO45001 Certificate



Fire Test Certificate



Liquefied Petroleum Gas Product Manufacturing Business



Specific Equipment Manufacturing Registration Certificate



Gas Completion Inspection Certificate 1



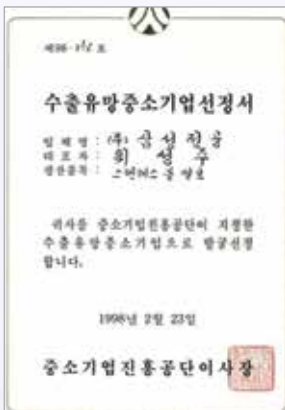
Gas Completion Inspection Certificate 2



Corporate Research Institute Accreditation



Technology Innovation Type (INNO-BIZ) of small and medium-sized businesses



Selected as a Promising Export Small and Medium Enterprise



Patent certificate (swing shutoff valve)



Patent certificate (check valve that can be closed forcibly)

COMPANY HISTORY

1980'S

1982	1985	1987	1989
AUG. Established Samsung Stainless Co., Ltd.	APR. 3-Way Ball Valve Production	SEP. Knife Gate Valve Production	MAR. V-Notch Ball Valve Production OCT. Headquarter moved to 298-5 Gaksan-dong, Dong-gu, Daegu

1990'S

1991	1992	1993	1996
JAN. Pneumatic Cylinder Production(135')	JUL. Legal Entity Conversion to Samsung Precision Ind.Co., Ltd. AUG. Seongseo Factory Breaking Ground(Complex 2, District 2)	JUN. POSCO Vendor Registration JUL. Completion of Seongseo Factory (Land:3,163m ² Building:1,599m ²)	NOV. Acquired Ball Valve KSB 2308 Korea Industrial Standard Marking Certification
1997	1998	1999	
FEB. Expanded Seongseo Factory in Wolam-dong, Dalseo-gu, Daegu from 298-5, Gaksan-dong, Dong-gu, Daegu	FEB. Selected as an Export Promising SME / Registered as a Subcontractor for LG E&C	MAR. Samsung Engineering Vendor Registration MAY. Acquired Gas Appliance Manufacturing Business License JUN. JIS 30K ANSI & 400LB Ball Valve Production	

2000'S

2001	2002	2009
JUN. Acquired API6D Certification	APR. Acquired Fire Safety Certification	SEP. Registered Specific Equipment Manufacturing (Valves for Toxic Gas Piping)/Dalseo-gu Office OCT. Established 2nd Factory (Foundry) in Dalseong 2nd Complex, Guji-myeon, Dalseong-gun, Daegu

2010'S

2010	2011	2012	2013
APR. Recognized by the Korea Industrial Technology Association as a Corporate Research Institute	FEB. Acquired ISO 9001 Quality Certification and selected as INNO-BIZ, a technology innovation SME MAR. Acquired ISO 14001 Quality Management System Certification DEC. Site Agreement at Sungju General Industrial Complex	MAR. Doo San Heavy Industry Vendor Registration DEC. POSCO E&C Vendor Registration	AUG. Expanded & Relocated Guji Factory 2. Land 7,393,60m ² Building area 3,447,30m ² DEC. Expanded and relocated Seongju Headquarter. Land 9,699,20m ² Building 5,516,57m ²
2015	2016	2018	
JUN. Participated in the High Growth Enterprise Export Capacity Build-up Program and designated as a High Growth (Gazelle) Company	MAR. Expanded Seongju Foundry 2nd factory Land 7,393,60m ² Building 560m ² DEC. Awarded the \$1 Million Export Tower at the 53rd Trade Day	MAR. Patented Swing Shutoff Valve APR. Patented Force-Closable Check Valve	

2020'S

2020	2021	2022	2024
SEP. Acquired SIL Cert. /Recognized as a Root Technology Special Company	DEC. Registered as a Major Equipment Manufacturer of Korea Gas Corporation	JAN. Acquired CE Certification APR. Acquired ISO 9001 (for headquarter & foundry)	APR. Expanded the on-site building of the Seongju headquarter Land 9,699,20m ² Building 777,00m ² JUL. KC Certification (Hygiene Safety Standards Certificate)

APPLICATION OF STANDARDS AND SPECIFICATIONS

SAMSUNG ball valves are designed and tested certified and monogrammed in accordance with API SPEC Q1 and SPEC 6D standards. The design standard for sour gas is based on NACE MR0175. Fire tests are performed in accordance with API STD 6FA and 607. In addition to meeting these standards and specifications, the ball valves meet the requirements of a range of other specifications. SAMSUNG is able to apply any other standard specified by the customer.

AMERICAN STANDARDS

ANSI/ASME	B 16.5	Pipe Flanges and Flanged Fittings
	B 16.10	Face-to-Face and End-to-End Dimensions of Valves
	B 16.25	Buttwelding Ends
	B 16.34	Valves-Flanged, Threaded and Welding End
	B 16.47	Large Diameter Steel Flanges
	B 1.20.1	Pipe Threads, General Purpose (Inch)
	B 31.3	Process Piping
	B 31.4	Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
	B 31.8	Gas Transmission and Distribution Piping Systems
ASTM		American Society for Testing and Materials
API	SPEC Q1	Specification for quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry
	SPEC 6D	Specification for Pipeline and Piping Valves
	STD 6FA	Specification for Fire Test for Valves
	STD 607	Fire Test for Soft-Seated Quarter-Turn Valves
	STD 598	Valve Inspection and Testing
	SPEC 5L	Specification for Line Pipe
MSS	SP-6	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
	SP-25	Standard Marking System for Valves, Fittings, Flanges and Unions
	SP-44	Steel Pipeline Flanges
	SP-53	Magnetic Particle Examination Method
	SP-54	Radiographic Examination Method
	SP-55	Visual Method for Evaluation of Surface Irregularities
	SP_61	Pressure Testing of Steel Valves
	SP-72	Ball Valves with Flanged or Butt-Welding Ends for General Service
	SP-82	Valve Pressure Testing Methods
SSPC	SP1~10	Surface Preparation Standards

INTERNATIONAL STANDARDS

ISO	9001	Quality management systems
	5211	Industrial valves-Part-turn actuator attachment
	15848 1&2	Fugitive Emission Test Procedure
	7121	Steel ball valves for general-purpose industrial applications
NACE	MR0175	Metals for Sulfide Stress Cracking and Stress Corrosion Cracking Resistance in Sour Oilfield Environments
	MR0103	Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments

BRITISH STANDARDS

BS	1560	Circular flanges for pipes, valves and fittings
	2080	Face-to-face, centre-to-face, end-to-end and centre-to-end dimensions of valves
	5146	Inspection and tests of valves
	5351	Steel ball valves for the petroleum, petrochemical and allied industries
	6364	Valves for cryogenic service
	6755-2	Testing of valves, Specification for fire type-testing requirements
	EN 10204	Metallic products-Types of inspection documents

HOW TO ORDER

Valve Type

B Ball valve	N Standard
G Gate valve	C Cryogenic
	M Metal Seated
	S Screw
	3L 3-Way L-Port
	3T 3-Way T-Port
	3Y 3-Way Y-Port
	J Jacket
	TB Tank Bottom
	P Spare Part
	R Repair

Rating

15 CLASS 150
30 CLASS 300
60 CLASS 600
80 CLASS 800
90 CLASS 900
50 CLASS 1500
25 CLASS 2500
1 JIS 10K
2 JIS 20K
3 JIS 30K
4 JIS 40K
6 JIS 63K

Seat Material

P PTFE (TFM-1600)
R1 RPTFE (Carbon 25%)
R RPTFE (Glass 15%)
D DEVLON™
K PEEK
C PCTFE
V VITON (FKM)
W CR-PTFE
T Metal + Tungsten Carbide
S Metal + Stellite
E DELRIN™
X RTFM (Carbon 15%, Glass 10%)

OPERATOR

L Lever
G Worm Gear
B Bare Stem
M Motor Actuator
P Pneumatic Actuator
H Hydraulic Actuator
O Gas Over Actuator
W Limits Switch
X Special

BN - **F38** - **60** - **IA** - **DAR** - **6G**

Classification

R1 Reduced Unibody
R2 Reduced Split Body
R3 Reduced Split Body(3P)
F2 Full Split Body
F3 Full Split Body(3P)
G2 Regular Split Body
1 Floating Ball-Graphite Packing
2 Floating Ball-O-Ring Packing
3 Floating Ball-Gland Packing
4 Trunnion Mounted-Graphite Packing
5 Trunnion Mounted-O-Ring Packing
6 Trunnion Mounted-Gland Packing
7 Floating Ball-Graphite + O-Ring Packing (Fire Safe)
8 Trunnion Mounted-O-Ring + Graphite Packing (Fire Safe)

End Connection Size

B Butt Weld	S1 1/2 (15)
F Flat Face	S2 3/4 (20)
R Raised Face	1 1 (25)
H Hub	S3 1 1/4 (32)
J Ring Joint	S4 1 1/2 (40)
S Screw	2 2 (50)
W Socket Weld	S6 2 1/2 (65)
L Large Female	3 3 (80)
M Large Male	4 4 (100)
X Special	5 5 (125)
	6 6 (150)
	8 8 (200)
	10 10 (250)
	12 12 (300)
	14 14 (350)
	16 16 (400)
	18 18 (450)
	20 20 (500)
	22 22 (550)
	24 24 (600)
	26 26 (650)
	28 28 (700)
	30 30 (750)
	32 32 (800)
	34 34 (850)
	36 36 (900)
	40 40 (1000)
	46 46 (1150)

Body & Trim Material

A A351-CF8
B A351-CF8M
C A351-CF3M
F A216-WCB
G A352-LCB
H A352-LCC
I A105N
J A350-LF2
L A182-F304
M A182-F304L
N A182-F316
O A182-F316L
P A182-F51
Q A105N/3MIL ENP

Seal, Gasket, Bushing

A Graphite + HNBR
B Graphite + Viton GLT
C Graphite + FR 58/90 FKM
D Ethylene Propylene EPDM
E Fluorinated Silicon
F Graphite + PTFE
G Graphite + RTFE
H PTFE' Elgiloy Spring
I SW Inconel 718 + Graphite
J PTFE
K SW Inconel 718 + HNBR
L SW Inconel 718 + Viton
M SW Inconel 718 + FR58/90
R1 R-PTFE (Carbon 25%)
R R-PTFE (Glass15%)
X Special
N CS + PTFE
O 316SS + PTFE

For Example

BN-F38-60IA-DAR-6G

6" API 6D Monogrammed NACE MR0175 Compliant, 3-Pc Side Entry Trunnion Mounted Ball Valve, Full Port, Class 600, A105N cs Body, 304 Trim, Devlon Seat, HNBR Seals, RF, Gear

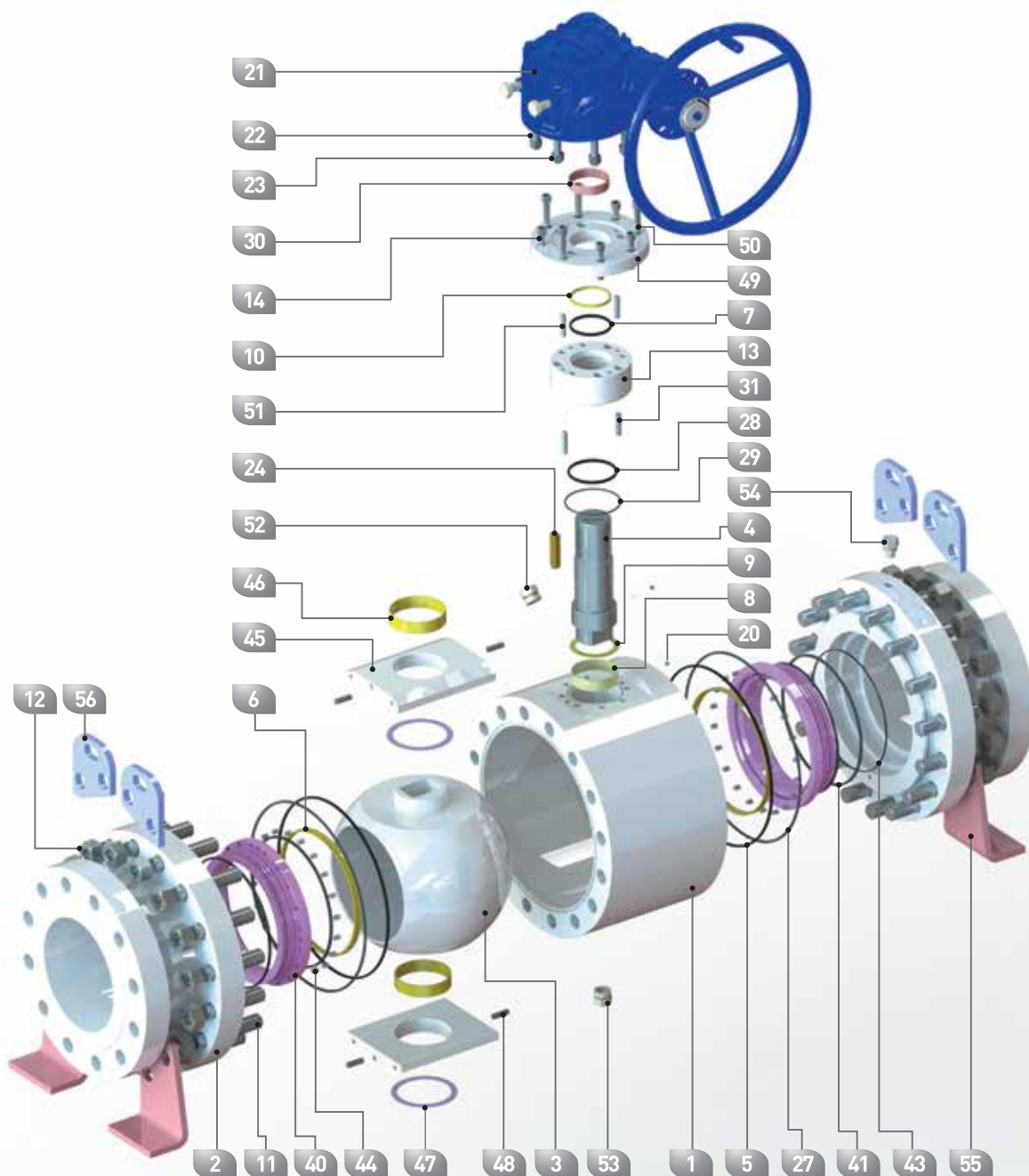
Note : "SW" means "Spiral Wound"

API 6D TRUNNION MOUNTED SIDE ENTRY BALL VALVES

SAMSUNG trunnion mounted side entry ball valves are designed and certified to meet API 6D / ISO 14313 as well as other international valve design standards, when they are used in oil & gas, petroleum, petrochemical and other industrial applications.

DESIGN FEATURES

- 3piece bolted body and end caps
- Standard double Block and bleed
- Standard self-relieving SPE seat design
- Standard fire safe design and certification (option)
- Standard anti static device
- Locking device (for lever and gear operators)
- Blow out proof stem construction
- ISO 5211 Actuator mounting
- Bi-Directional flow
- Secondary seat sealing design
- Stem extension (option)
- Standard seat injection system and (optional) stem injection system
- Double piston effect DPE (option)
- Bypass connection (option)
- NACE MR0175 Certification (option)
- API 607 8th edition certification (optional)



STANDARD BILL OF MATERIAL

Item No.	Description	ASTM A105/304 TRIM	ASTM A105/ENP TRIM	ASTM A350 LF2/316 TRIM	ASTM A182 F316/316 TRIM
1	Body	ASTM A105N	ASTM A105N	ASTM A350 LF2	ASTM A182 F316
2	End Cap	ASTM A105N	ASTM A105N	ASTM A350 LF2	ASTM A182 F316
STANDARD BODY / TRIM CONFIGURATIONS					
3	Ball	ASTM A182 F304/A351 CF8	ASTM A105N/3 MIL ENP	ASTM A182 F316/A351 CF8M	ASTM A182 F316
4	Stem	ASTM A479 304	ASTM A4140/3 MIL ENP	ASTM A479 316	ASTM A479 316
5	Body O-Ring Seal	HNBR	HNBR	HNBR	HNBR
6	Resilient Seat Insert	RTFE/RTFM/DEVLOX	RTFE/RTFM/DEVLOX	RTFE/RTFM/DEVLOX	RTFE/RTFM/DEVLOX
7	Stem O-Ring Seal	HNBR	HNBR	HNBR	HNBR
8	Stem Bushing	CS+PTFE	CS+PTFE	CS+PTFE	316 SS+PTFE
9	Thrust Washer (Back Seat)	RTFE	RTFE	RTFE	RTFE
10	Packing O-Ring Seal	GRAPHITE	GRAPHITE	GRAPHITE	GRAPHITE
11	Body/Cap Stud	ASTM A193 B7/A193 B7M	ASTM A193 B7/A193 B7M	ASTM A320 L7M	ASTM A193 B8M
12	Body/Cap Nut	ASTM A194 2H/A194 2HM	ASTM A194 2H/A194 2HM	ASTM A194 7M	ASTM A194 8M
13	Gland	AISI 1045	ASTM A4140/3 MIL ENP	ASTM A350 LF2	ASTM A182 F316
14	Gland Bolt	A4135+H1150	A4135+H1150	A4135+H1150	ASTM A193 B8M
20	Anti-Static	316L SS	316L SS	316L SS	316L SS
21	Gear Operator Assembly	ASTM A48, Gray Cl	ASTM A48, Gray Cl	ASTM A48, Gray Cl	ASTM A48, Gray Cl
22	Gear Operator Stud	ASTM A193 B7	ASTM A193 B7	ASTM A193 B7	ASTM A193 B7
23	Gear Operator Nut	ASTM A194 2H	ASTM A194 2H	ASTM A194 2H	ASTM A194 2H
24	Stem Key	AISI 1045	AISI 1045	AISI 1045	AISI 1045
27	Body Gasket	GRAPHITE	GRAPHITE	GRAPHITE	GRAPHITE
28	Gland O-Ring Seal	HNBR	HNBR	HNBR	HNBR
29	Gland Gasket	GRAPHITE	GRAPHITE	GRAPHITE	GRAPHITE
30	Gland Bushing	CS+PTFE	CS+PTFE	CS+PTFE	304 SS+PTFE
31	Gland Pin	AISI 1045	AISI 1045	AISI 1045	304 SS
40	Seat Holder	ASTM A351 CF8	ASTM A105N/3 MIL ENP	ASTM A351 CF8M	ASTM A182 F316
41	Seat Holder O-Ring Seal	HNBR	HNBR	HNBR	HNBR
43	Seat Holder Gasket	GRAPHITE	GRAPHITE	GRAPHITE	GRAPHITE
44	Spring	INCONEL X-750	INCONEL X-750	INCONEL X-750	INCONEL X-750
45	Trunnion	AISI 1045	AISI 1045	ASTM A350 LF2	ASTM A182 F316
46	Trunnion Bushing	CS + PTFE	CS + PTFE	CS + PTFE	316 SS+PTFE
47	Trunnion Liner	RTFE	RTFE	RTFE	RTFE
48	Trunnion Pin	AISI 1045	AISI 1045	AISI 1045	304 SS
49	Mounting Plate	AISI 1045	AISI 1045	ASTM A350 LF2	ASTM A182 F316
50	Mounting Plate Bolt	A4135+H1150	A4135+H1150	A4135+H1150	ASTM A193 B8M
51	Mounting Plate Pin	AISI 1045	AISI 1045	AISI 1045	304 SS
52	Vent Plug	AISI 1020+Zn.	AISI 1020+Zn.	AISI 1020+Zn.	316 SS
53	Drain Plug	AISI 1020+Zn.	AISI 1020+Zn.	AISI 1020+Zn.	316 SS
54	Sealant Injection Fitting	AISI 1020+Zn.	AISI 1020+Zn.	AISI 1020+Zn.	316 SS
55	Supporting Leg	CARBON STEEL	CARBON STEEL	CARBON STEEL	CARBON STEEL+Zn.
56	Lifting Lug	CARBON STEEL	CARBON STEEL	CARBON STEEL	CARBON STEEL+Zn.

PRODUCT SPECIFICATIONS

SEAT SEALING FEATURES

Soft seated valves

On standard soft seated ball valves a resilient seat material is inserted into the seat ring to provide a secondary soft seating in addition to the primary metal to metal sealing between the ball and the seat, while the sealing between the seat and the seat housing shoulders is achieved by means of O-rings. For special applications, optional graphite and/or spring energized lip seal O-rings can be used.

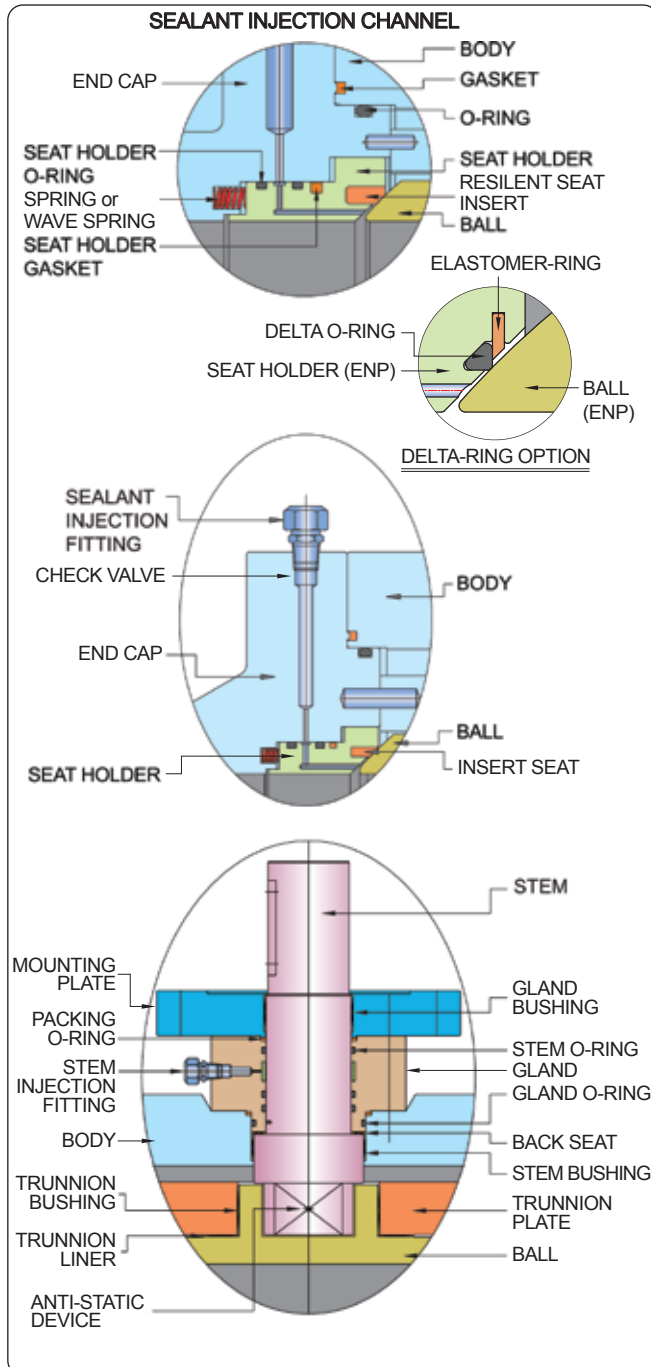
Metal to metal seated valves

Ball Valves designed for abrasive service feature a metal to metal sealing between the ball and seat rings, while the sealing between the seat and the seat housing shoulders is achieved by means of O-rings, graphite gaskets, lip seal O-rings or bellows seals depending on service conditions. The ball and the seat rings are hard-faced using different coatings such as Electroless Nickel, Chrome Carbide, Tungsten Carbide or Stellite depending on fluid to be handled; and then the ball and seats are lapped together to provide tight shutoff. A specially designed seat ring prevents sand or other debris from entering the spring cavity to avoid the inclusion of sand or other debris in the spring recess. Special flushing systems for the seat pocket area are available on request for valves to be used in extremely "dirty" services.

Delta-Ring seated valves

The Delta-Ring seat design provides higher reliability and minimizes leakage in trunnion-mounted ball valves. The Delta-Ring insert assembly is inserted into the seat holder and provides better elasticity than the (harder) primary elastomer seat insert, which allows the Delta-ring to seal across machining imperfections in the ball, thus ensuring zero leakage.

- Good resistance in dirty fluid services (liquids and gases)
- Easy maintenance-on-site service is possible
- Good low-pressure sealing
- Good performance on unlapped ball/seating surfaces and uneven ball surfaces
- An inexpensive solution to a wide range of applications



SEALANT INJECTION SYSTEMS

In clean dry services, Samsung ball valves require little preventive maintenance or lubrication. However, many services contain dirt, scale and other particulates that can damage the soft seat insert material that can allow seat leakage. When such a situation occurs and needs to be quickly rectified, Samsung valves have a standard seat sealant injection system that allows sealant to be injected into the seat area to temporarily eliminate the leak. When the valves are buried or in inaccessible locations, the sealant injection system piping can be extended per customer requirements.

As an Option, a Stem Sealant System can also be installed.

PRODUCT SPECIFICATIONS

ANTI-BLOWOUT STEM DESIGN AND STEM SEAL

A positively retained blowout-proof stem design is standard on the SAMSUNG trunnion mounted ball valve. This feature allows for the top works to be removed from the mounting plate with the valve under pressure. The primary stem seal design utilizes three redundant HNBR O-Ring seals to ensure stem seal integrity. The RTFE backseat thrust washer acts as a secondary stem seal. The Graphite packing O-Ring and Gland Gasket sufficiently seal the stem leakage in the event of a fire. A Stem Injection Fitting is threaded into the gland and is located between the upper and two lower HNBR O-Ring seals. The stem injection fitting can be removed to allow stem seal integrity testing. If necessary and allowed, stem sealant can be injected through the stem injection fitting to temporarily prevent stem leakage until seal replacement can be undertaken.

TRUNNION DESIGN

The SAMSUNG trunnion mounted ball valve design:

- * Utilizes upper and lower trunnion plates that are precisely pinned to the body section and end caps.
- * The Ball is fitted into upper/lower Steel+PTFE bushings and rests upon RTFE Liners to ensure low consistent torque.

DOUBLE BLOCK AND BLEED FEATURE

The SAMSUNG trunnion mounted ball valve is designed to allow for double block and bleed operation. The body cavity can safely be vented by using the vent plug:

- * With the valve in either the Full Open or Full Closed position;
- * With pressure on either or both the upstream and downstream sides of the valve; Once the body cavity is completely depressurized, the drain plug can be removed to allow any liquids to be drain/removed.

FIRE TEST QUALIFICATIONS

The SAMSUNG trunnion mounted ball valve has been designed and tested to comply with DeFacto international fire test standards. This includes fire testing per ISO 10497 / API 607. Copies of Certifications to these standards can be provided when requested.

VALVE BODY OVERPRESSURE PROTECTION

When the SAMSUNG trunnion mounted ball valve is in service, and then closed, flow media is isolated in the body cavity. Depending upon the flow media, if it can expand with increasing temperature inside the body cavity, the expanding fluid media may exceed the allowable pressure rating of the valve. In order to avoid this over pressuring of the body cavity, SAMSUNG trunnion mounted ball valve seat designs meet the requirements of API 6D and will self-relieve the pressure by venting media from the body cavity to either the upstream or downstream side of the valve. SAMSUNG trunnion mounted ball valves also offer an "Optional" double piston effect seat design, which prevents both seats from relieving the body cavity over pressure, and thus, requires installing an overpressure safety device, such as a relief valve, to prevent over pressuring the body cavity. (See the next page for more details on Self-Relieving and Double Piston Effect Seat Designs.

VALVE END CONNECTIONS

The SAMSUNG Ball Valve can be supplied with a variety of end connections including RTJ and Raised Face flanged end, weld end, or flanged by weld end. Standard face to face dimensions are per API 6D. End flanges are supplied to meet ASME B16.5, B16.47 Type A, or MSS-SP44 depending on valve size. SAMSUNG Ball Valves standard weld end connections on carbon steel body valves made from either A216 WCB or ASTM A105 have a specified minimum yield strength (SMYS) of 36,000 psi. This material can be field welded and matches the material of most common flanges. The standard weld preparation is bored to match the specified mating pipe. The bevel thickness is 1.5 times the mating pipe thickness allowing direct welding to mating pipe having a SMYS of 52,000 psi or less. Welding to higher strength pipe may require transition pieces (pups) or a change in specification of the valve end material.

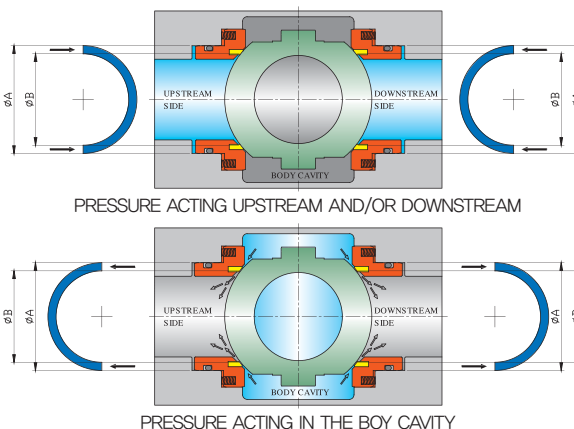
TRUNNION BALL VALVE SEAT DESIGN FEATURES

SELF RELIEVING SEATS (SINGLE PISTON EFFECT)

The single piston effect is the standard design for trunnion mounted ball valves.

Both the upstream and downstream fluid pressure and spring preload pushes the seat rings against the ball and prevents leakage.

However, when the thrust created by the body cavity pressure (due to expansion) exceeds the fluid thrust on the upstream and downstream seats and spring preload (by a pre-determined amount) the seat(s) is/are pushed away from the ball to allow any overpressure in the body cavity to release into either the upstream or downstream piping system.

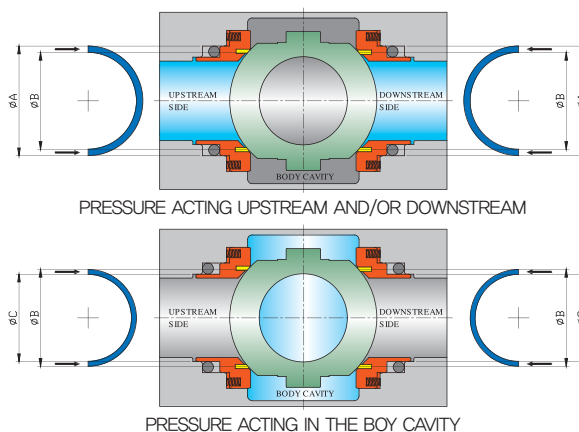


DOUBLE PISTON EFFECT SEATS

Double piston effect seats are pressure energized in both directions. Upstream and downstream pressure create the thrust allowing the seat holder/seat to seal against the ball at all times. So the seat rings are pushed toward the ball at all times.

If the upstream seat fails, the downstream seat still maintains its seat tightness. This feature is attractive to some end users in high integrity applications, downstream pipeline maintenance and during pipeline testing.

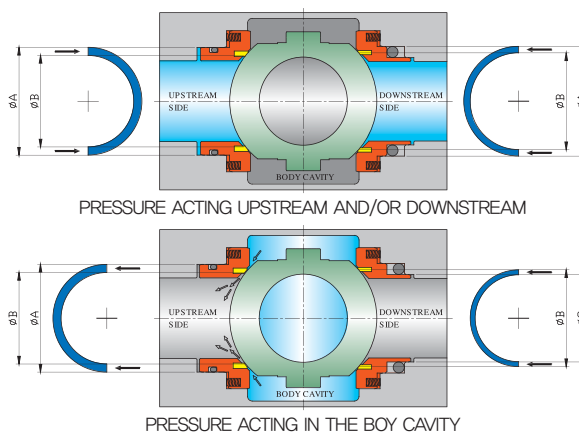
However, since the double piston effect valve seats do not self-relieve and cannot release valve body cavity overpressure, a pressure relief device must be installed to relieve any body cavity overpressure.



SELF RELIEVING UPSTREAM SEAT AND DOUBLE PISTON EFFECT DOWNSTREAM SEAT

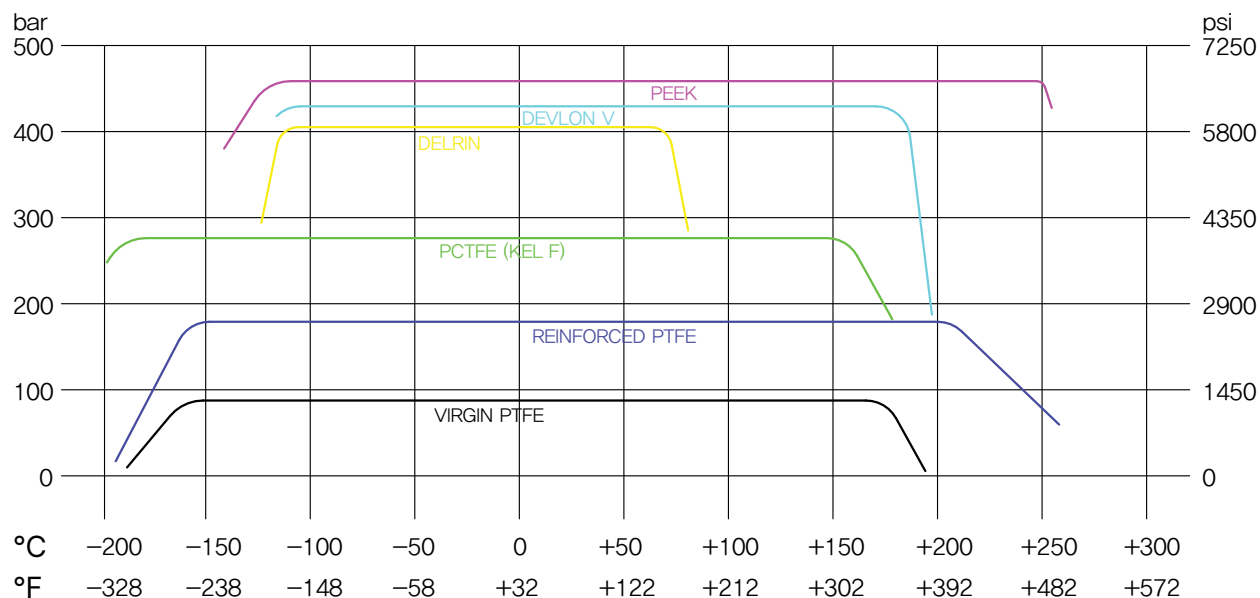
With this seat design configuration, the fluid pushes the double piston effect seat assembly against the ball on the downstream side, and the downstream seat remains pressure energized at all times.

If the upstream seat fails, the downstream seat still maintains sealing integrity. The upstream seat utilizes a single piston effect design and is pressure energized in only one direction.



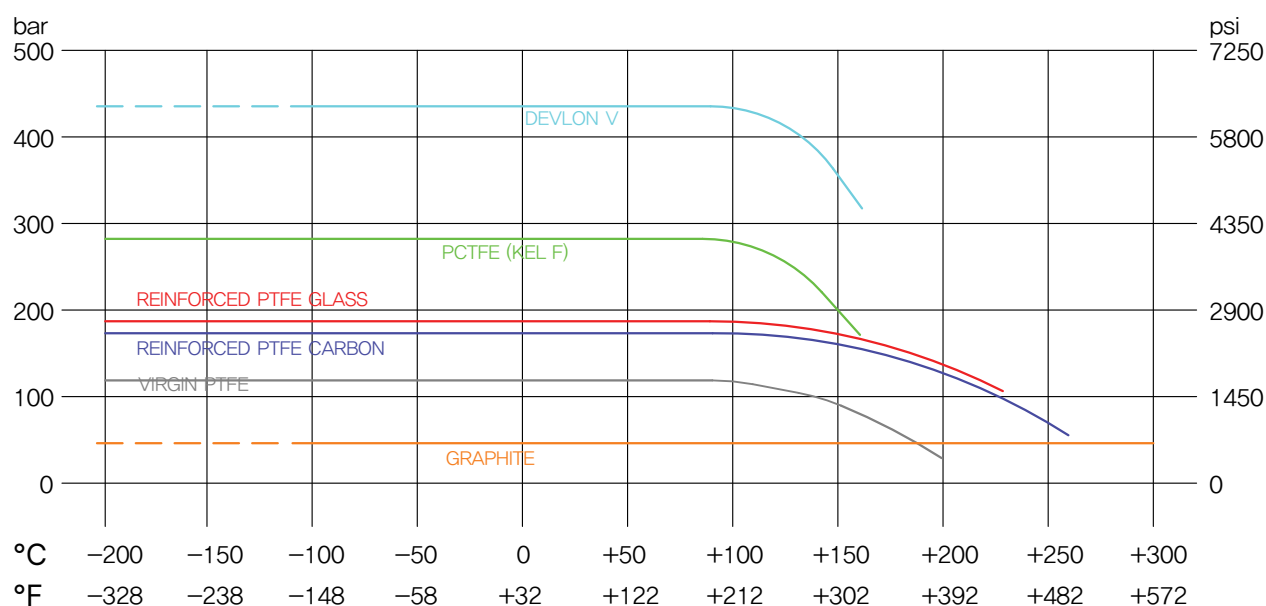
PRESSURE/TEMPERATURE RATING

⑧ PRESSURE / TEMPERATURE LIMITATIONS OF SOFT INSERT SEAT MATERIAL TRUNNION MOUNT



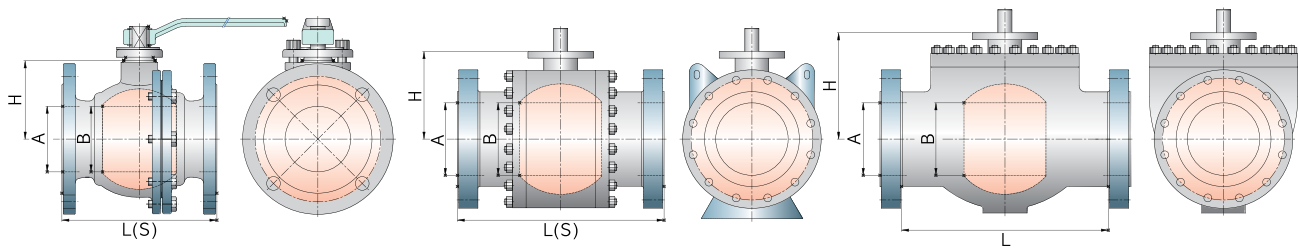
⑧ SEAT PRESSURE / TEMPERATURE RATING – FLOATING

This table express the Seat material resistance as declared by the original manufactures. The values are to be mixed with the other parameters such as other non metallic seals as well as temperature limitations on metals used as per by ASME B16.34.



THE ASME PRESSURE CLASS RATING OF THE VALVE IS NOT TO BE EXCEEDED.

DIMENSION & WEIGHTS



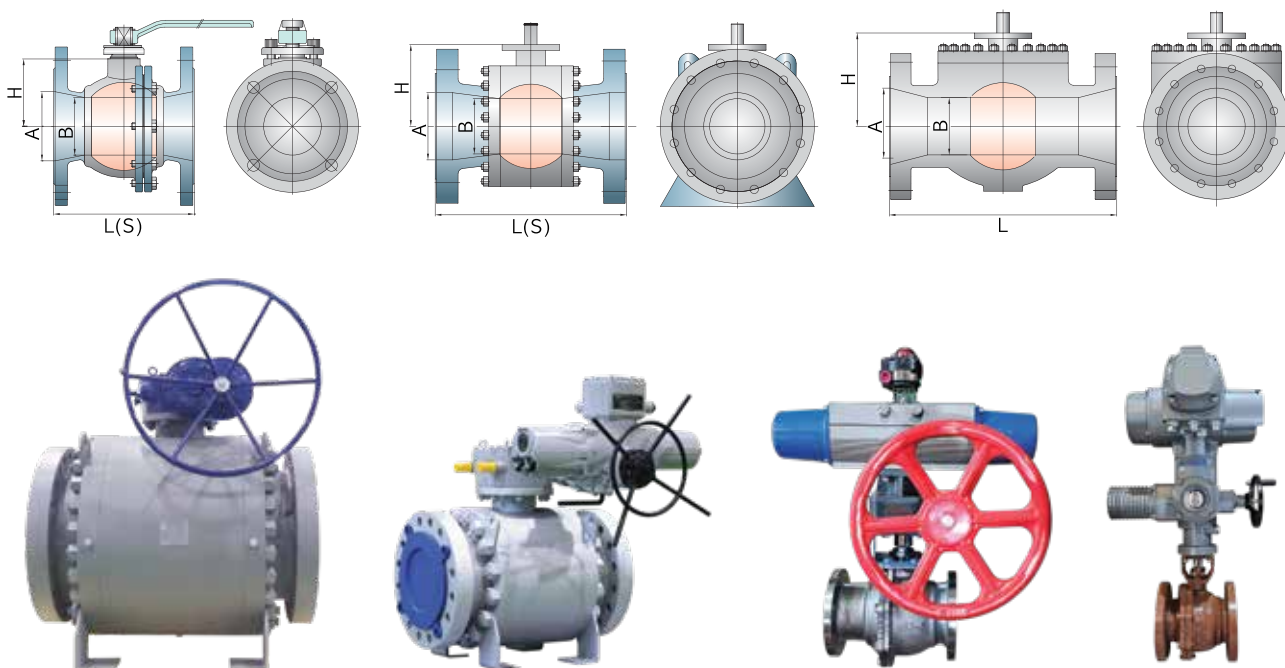
ASME CLASS 150 FULL BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY			
SIZE	A	B	L-RF	L-RTJ	BW	H	WEIGHT	L-RF	L-RTJ	BW	WEIGHT
in/mm							kg				kg
1/2 15	13	15	108		140	77	1.84	108		140	2.7
3/4 20	19	20	117		152	80	2.34	117		152	3.5
1 25	25	25	127	140	165	92	3.4	127	140	165	5.1
1-1/4 32	32	32	140	152	178	95	4.6	140	152	178	6.9
1-1/2 40	38	40	165	178	190.5	113	6.2	165	178	190.5	9.3
2 50	50	50	178	190.5	216	121	8.5	292	304.5	292	30
2-1/2 65	64	65	190	203	241	130	12.5				
3 80	76	76	203	216	283	166	18.2	356	368.5	356	57
4 100	102	100	229	241	305	184	29.3	432	444.5	432	100
5 125	127	125	356	369	356	248	53				
6 150	150	150	394	406	457	270	74	559	571.5	559	215
8 200	203	200	457	470	521	209	123	660	672.5	660	400
10 250	254	250	533	546	559	263	147	787	799.5	787	550
12 300	303	300	610	622	635	304	304	838	850.5	838	700
14 350	337	337	686	699	762	335	450	889	901.5	889	750
16 400	387	387	762	775	838	430	640	991	1003.5	991	1100
18 450	438	438	864	876	914	487	1200	1092	1104.5	1092	1500
20 500	489	489	914	927	991	550	1800	1194	1206.5	1194	1900
22 550	538	538	991	1000	1092	585	2300	1296	1308.5	1296	2700
24 600	589	589	1067	1080	1143	654	3100	1397	1409.5	1397	3200
26 650	633	633	1143		1245	689	3600	1448		1448	3800
28 700	684	684	1244		1347	730	4500	1549		1549	4600
30 750	735	735	1295		1397	752	5200	1651		1651	5600
32 800	779	779	1371		1524	804	6800	1778		1778	7000
34 850	830	830	1473		1626	840	7800	1930		1930	7800
36 900	874	874	1524		1728	882	8800	2083		2083	9100
40 1000	976	976	1753		1956	990	12000	2337		2337	12700

ASME CLASS 300 FULL BORE

ALL TYPE			SIDE-ENTRY					TOP-ENTRY			
SIZE	A	B	L-RF	L-RTJ	BW	H	WEIGHT	L-RF	L-RTJ	BW	WEIGHT
in/mm							kg				kg
1/2 15	13	15	140	152	140	77	2.52	140	152	140	3.8
3/4 20	19	20	152	165	152	80	3.7	152	165	152	5.6
1 25	25	25	165	178	165	92	5	165	178	165	7.5
1-1/4 32	32	32	178	190.5	178	95	6.1	178	190.5	178	9.2
1-1/2 40	38	40	190.5	203	190.5	113	9.5	190.5	203	190.5	14.2
2 50	50	50	216	232	216	121	11.6	292	308	292	30
2-1/2 65	64	65	241	257	241	130	16.8				
3 80	76	76	283	298	283	166	26.1	356	372	356	57
4 100	102	100	305	321	305	184	40.6	432	448	432	100
5 125	127	125	381	397	381	248	75				
6 150	150	150	403	419	457	231	130	559	575	559	215
8 200	201	200	502	518	521	277	200	660	676	660	400
10 250	252	250	568	584	559	310	378	787	803	787	550
12 300	303	300	648	664	635	374	560	838	854	838	700
14 350	337	337	762	778	762	431	1000	889	905	889	750
16 400	387	387	838	854	838	430	1400	991	1007	991	1100
18 450	438	438	914	930	914	487	1590	1092	1108	1092	1500
20 500	489	489	991	1010	991	550	2200	1194	1210	1194	1900
22 550	538	538	1092	1114	1092	585	2700	1296		1296	2750
24 600	589	589	1143	1165	1143	654	3400	1397	1419	1397	3200
26 650	633	633	1245	1270	1245	689	4600	1448	1473	1448	3800
28 700	684	684	1346	1372	1346	730	5700	1549	1574	1549	4600
30 750	735	735	1397	1422	1397	752	6500	1651	1676	1651	5600
32 800	779	779	1524	1553	1524	804	7900	1778	1806.5	1778	7000
34 850	830	830	1626	1654	1626	840	9000	1930	1958.5	1930	7800
36 900	874	874	1727	1756	1727	882	10000	2083	2111.5	2083	9100
40 1000	976	976	1956		1956	990	13700	2337		2337	12700

DIMENSION & WEIGHTS



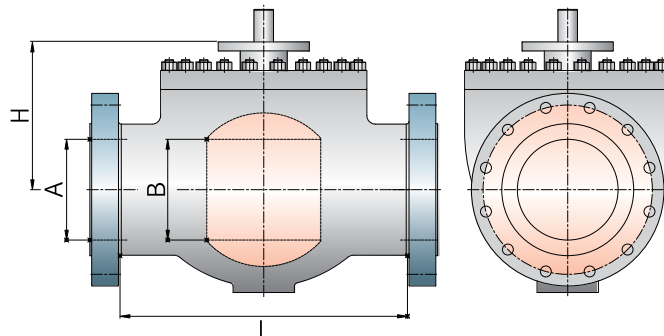
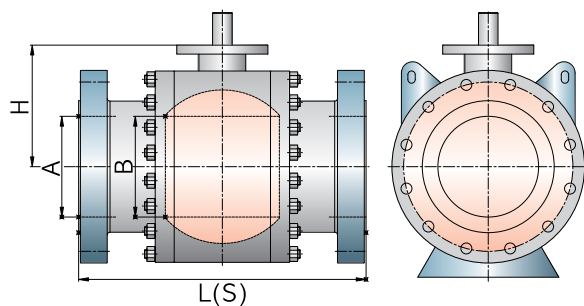
ASME CLASS 150 REDUCED BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY			
SIZE in/mm	A	B	L-RF	L-RTJ	BW	H	WEIGHT kg	L-RF	L-RTJ	BW	WEIGHT kg
2x1-1/2 50x40	51	38	178		216	113	8	292	304.5	292	25
3x2 80x50	76	51	203		283	121	15	356	368.5	356	34
4x3 100x80	102	76	229		305	166	25	432	444.5	432	70
6x4 150x100	150	102	394	267	457	184	60	559	571.5	559	130
6x5 150x125	152	127	394	267	457	248	70	559	571.5	559	160
8x6 200x150	203	152	457	292	521	270	105	660	672.5	660	250
10x8 250x200	254	203	533	330	559	209	130	787	799.5	787	450
12x10 300x250	303	254	610	356	635	263	250	838	850.5	838	480
14x10 350x250	337	254	686		762	263	500	889	901.5	889	660
14x12 350x300	337	303	686		762	304	610	889	901.5	889	790
16x12 400x300	387	303	762		838	304	690	991	1003.5	991	940
16x14 400x350	387	337	762		838	335	820	991	1003.5	991	900
18x16 450x400	438	387	864		914	430	1000	1092	1104.5	1092	1200
20x16 500x400	489	387	914		991	430	1100	1194	1206.5	1194	1500
20x18 500x450	489	438	914		991	487	1200	1194	1206.5	1194	1700
24x20 600x500	589	489	1067		1143	550	1900	1397	1409.5	1397	2300
30x24 750x600	735	589	1295		1397	654	3200	1651		1651	4000
36x30 900x750	874	735	1524		1728	752	6300	2083		2083	7000

ASME CLASS 300 REDUCED BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY			
SIZE in/mm	A	B	L-RF	L-RTJ	BW	H	WEIGHT kg	L-RF	L-RTJ	BW	WEIGHT kg
2x1-1/2 50x40	50	38	216		216	113	10.5	292	308	292	26
3x2 80x50	76	51	283		283	121	20	356	372	356	40
4x3 100x80	100	76	305		305	166	32	432	448	432	80
6x4 150x100	150	100	403		457	184	110	559	575	559	160
6x5 150x125	150	127	403		457	248	120	559	575	559	185
8x6 200x150	201	150	502	419	521	288	180	660	676	660	285
10x8 250x200	252	201	568	457	559	209	290	787	803	787	530
12x10 300x250	303	252	648	502	635	263	580	838	854	838	570
14x10 350x250	337	252	762		762	263	640	889	905	889	780
14x12 350x300	337	303	762		762	304	800	889	905	889	900
16x12 400x300	387	303	838		838	304	950	991	1007	991	1050
16x14 400x350	387	337	838		838	335	1100	991	1007	991	1100
18x16 450x400	438	387	914		914	430	1500	1092	1108	1092	1450
20x16 500x400	489	387	991		991	430	1650	1194	1210	1194	1800
20x18 500x450	489	438	991		991	487	1750	1194	1210	1194	2000
24x20 600x500	589	489	1143		1143	550	2600	1397	1419	1397	2700
30x24 750x600	735	589	1397		1397	654	4400	1651	1676	1651	4600
36x30 900x750	874	735	1727		1727	752	8100	2083	2111.5	2083	8200

DIMENSION & WEIGHTS



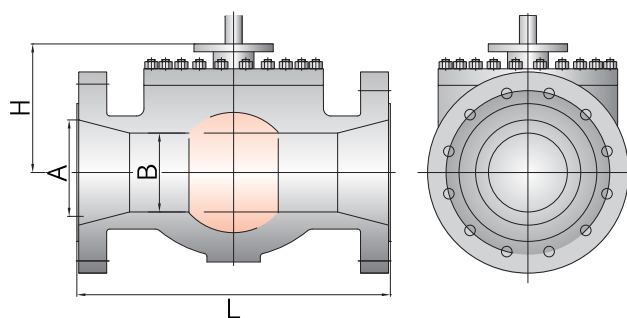
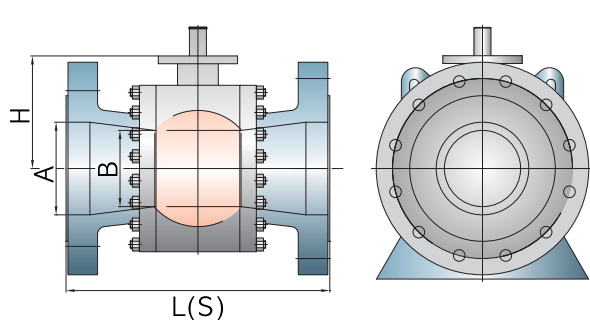
⑧ ASME CLASS 600 FULL BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY			
SIZE	A	B	L-RF	L-RTJ	BW	H	WEIGHT	L-RF	L-RTJ	BW	WEIGHT
in/mm							kg				kg
1/2	13	13	165	163.5	165		4.5	165	163.5	165	5.8
15											
3/4	19	19	190.5	190.5	190.5		6	190.5	190.5	190.5	7.8
20											
1	25	25	216	216	216		10	216	216	216	13
25											
1-1/4	32	32	229	229	229		17	229	229	229	22.1
32											
1-1/2	38	38	241	241	241	75	22	241	241	241	28
40											
2	50	50	292	295	292	110	31	292	295	292	40
50											
2-1/2	62	62	330	333	330	130	42	330	333	330	55
65											
3	74	74	356	359	356	165	60	356	359	356	65
80											
4	100	100	432	435	432	210	110	432	435	432	110
100											
6	150	150	559	562	559	250	250	559	562	559	220
150											
8	201	201	660	664	660	288	480	660	664	660	415
200											
10	252	252	787	791	787	343	750	787	791	787	570
250											
12	303	303	838	841	838	378	1000	838	841	838	720
300											
14	334	334	889	892	889	394	1080	889	892	889	970
350											
16	385	385	991	994	991	440	1500	991	994	991	1100
400											
18	436	436	1092	1095	1092	500	2050	1092	1095	1092	1500
450											
20	487	487	1194	1200	1194	551	2600	1194	1200	1194	1900
500											
22	538	538	1296	1305	1296	600	3700	1296	1305	1296	2700
550											
24	589	589	1397	1406	1397	640	4700	1397	1406	1397	3200
600											
26	633	633	1448	1460	1448	680	5600	1448	1460	1448	3800
650											
28	684	684	1549	1562	1549	700	6700	1549	1562	1549	4600
700											
30	735	735	1651	1664	1651	740	8300	1684	1697	1684	5600
750											
32	779	779	1778	1794	1778	756	9700	1778	1794	1778	7100
800											
34	830	830	1930	1946	1930	782	11000	1930	1946	1930	7800
850											
36	874	874	2083	2098	2083	870	13000	2083	2098	2083	9100
900											
40	976	976	2170	2170	2170	916	18000	2170	2170	2170	12500
1000											

⑧ ASME CLASS 900 FULL BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY			
SIZE	A	B	L-RF	L-RTJ	BW	H	WEIGHT	L-RF	L-RTJ	BW	WEIGHT
in/mm							kg				kg
2	49	49	368	371	368	150	48	368	371	368	52
50											
2-1/2	62	62	419	422	419	175	55	419	422	419	85
65											
3	74	74	381	384	381	188	80	381	384	381	110
80											
4	100	100	457	460	457	230	140	457	460	457	200
100											
6	150	150	610	613	610	250	360	610	613	610	430
150											
8	201	201	737	740	737	300	580	737	740	737	800
200											
10	252	252	838	841	838	362	1000	838	841	838	1000
250											
12	303	303	965	968	965	400	1500	965	968	965	1300
300											
14	322	322	1029	1038	1029	428	1400	1029	1038	1029	1650
350											
16	373	373	1130	1140	1130	455	2100	1130	1140	1130	2500
400											
18	423	423	1219	1232	1219	534	2800	1219	1232	1219	3400
450											
20	471	471	1321	1333	1321	586	4200	1321	1333	1321	4400
500											
24	570	570	1549	1568	1549	690	6800	1549	1568	1549	7200
600											
26	633	633	1651	1673	1651		4600	1651	1673	1651	8500
650											
28	665	665	1753	1775	1753		9900	1753	1775	1753	10400
700											
30	712	712	1880	1902	1880	775	12000	1880	1902	1880	12800
750											
32	760	760	2032	2054	2032		14000	2032	2054	2032	15900
800											
34	808	808	2159	2188	2159		17000	2159	2188	2159	17500
850											
36	855	855	2286	2315	2286		18000	2286	2315	2286	20600
900											

DIMENSION & WEIGHTS



⑧ ASME CLASS 600 REDUCED BORE

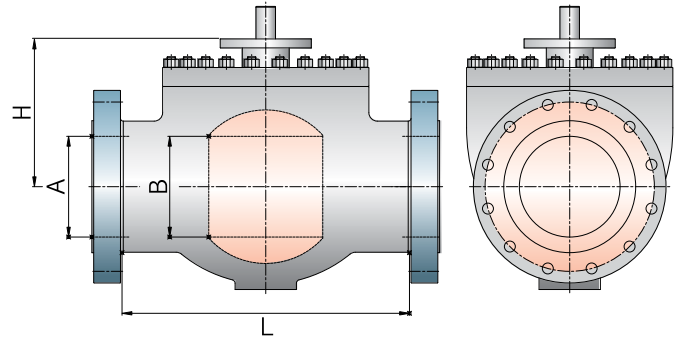
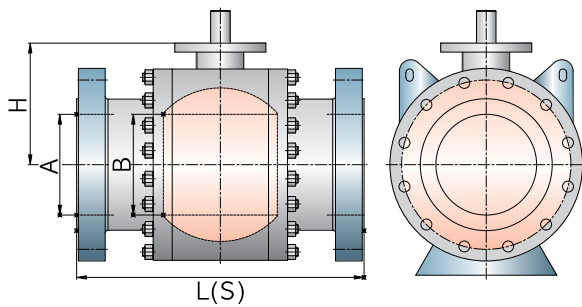
ALL TYPE		SIDE-ENTRY						TOP-ENTRY				
SIZE in/mm	A	B	L-RF	L-RTJ	BW	H	WEIGHT kg	L-RF	L-RTJ	BW	WEIGHT kg	
2X1-1/2 50X40	50	38	292	295	292	75	28	292	295	292	34	
3X2 80X50	74	50	356	359	356	110	39	356	359	356	45	
4X3 100X80	100	74	432	435	432	157	75	432	435	432	90	
6X4 150X100	150	100	559	562	559	180	150	559	562	559	180	
8X6 200X150	201	150	660	664	660	245	290	660	664	660	310	
10X8 250X200	252	201	787	791	787	300	550	787	791	787	600	
12X10 300X250	303	252	838	841	838	355	800	838	841	838	710	
14X10 350X250	334	252	889	892	889	355	910	889	892	889	990	
14X12 350X300	334	303	889	892	889	395	1100	889	892	889	1100	
16X12 400X300	385	303	991	994	991	395	1300	991	994	991	1400	
16X14 400X350	385	334	991	994	991	419	1080	991	994	991	1350	
18X16 450X400	436	385	1092	1095	1092	440	1650	1092	1095	1092	1850	
20X16 500X400	487	385	1194	1200	1194	440	2080	1194	1200	1194	2860	
20X18 500X450	487	436	1194	1200	1194	518	2350	1194	1200	1194	2600	
24X20 600X500	589	487	1397	1406	1397	570	3200	1397	1406	1397	3500	
30X24 750X600	735	589	1651	1664	1651	650	5700	1684	1697	1684	5950	
36X30 900X750	874	735	2083	2098	2083	755	10300	2083	2098	2083	10500	

⑧ ASME CLASS 900 REDUCED BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY				
SIZE in/mm	A	B	L-RF	L-RTJ	BW	H	WEIGHT kg	L-RF	L-RTJ	BW	WEIGHT kg	
2X1-1/2 50X40	49	38	368	371	368	112	40	368	371	368	50	
3X2 80X50	74	49	381	384	381	150	52	381	384	381	75	
4X3 100X80	100	74	457	460	457	188	95	457	460	457	140	
6X4 150X100	150	100	610	613	610	230	205	610	613	610	270	
8X6 200X150	201	150	737	740	737	250	440	737	740	737	540	
10X8 250X200	252	201	838	841	838	300	690	838	841	838	900	
12X10 300X250	303	252	965	968	965	362	1150	965	968	965	1090	
14X10 350X250	322	252	1029	1038	1029	362	1240	1029	1038	1029	1490	
14X12 350X300	322	303	1029	1038	1029	400	1600	1029	1038	1029	1800	
16X12 400X300	373	303	1130	1140	1130	400	1730	1130	1140	1130	2100	
16X14 400X350	373	322	1130	1140	1130	428	1900	1130	1140	1130	2400	
18X16 450X400	423	373	1219	1232	1219	455	2440	1219	1232	1219	2800	
20X16 500X400	471	373	1321	1333	1321	455	2870	1321	1333	1321	3500	
20X18 500X450	471	423	1321	1333	1321	534	3250	1321	1333	1321	3850	
24X20 600X500	570	471	1549	1568	1549	586	5400	1549	1568	1549	5400	
30X24 750X600	712	570	1880	1902	1880	690	8700	1880	1902	1880	9000	
36X30 900X750	855	712	2286	2315	2286	775	15300	2286	2315	2286	15200	



DIMENSION & WEIGHTS



⑧ ASME CLASS 1500 FULL BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY			
SIZE	A	B	L-RF	L-RTJ	BW	H	WEIGHT	L-RF	L-RTJ	BW	WEIGHT
in/mm							kg				kg
2	49	49	368	371	368	150	50	368	371	368	56
50											
3	74	74	470	473	470	188	97	470	473	470	150
80											
4	100	100	546	549	546	235	200	546	549	546	280
100											
6	144	144	705	711	705	260	480	705	711	705	600
150											
8	192	192	832	841	832	314	820	832	841	832	1100
200											
10	239	239	991	1000	991	382	1500	991	1000	991	1400
250											
12	287	287	1130	1146	1130	420	2200	1130	1146	1130	2000
300											
14	315	315	1257	1276	1257	451	2800	1257	1276	1257	2600
350											
16	360	360	1384	1407	1384	480	4100	1384	1407	1384	3900
400											
18	406	406	1537	1559			6200	1537	1559		5100
450											
20	454	454	1664	1686			9100	1664	1686		6600
500											
24	546	546	1950	1972			14000	1950	1972		11500
600											

⑧ ASME CLASS 2500 FULL BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY			
SIZE	A	B	L-RF	L-RTJ	BW	H	WEIGHT	L-RF	L-RTJ	BW	WEIGHT
in/mm							kg				kg
2	42	42	451	454	451	162	90	451	454	451	120
50											
3	62	62	578	584	578	204	190	578	584	578	250
80											
4	87	87	673	683	673	251	380	673	683	673	470
100											
6	131	131	914	927	914	275	770	914	927	914	940
150											
8	179	179	1022	1038	1022	380	1350	1022	1038	1022	1400
200											
10	223	223	1270	1292	1270	451	2100	1270	1292	1270	2600
250											
12	265	265	1422	1445	1422	52	3200	1422	1445	1422	4200
300											

⑧ ASME CLASS 1500 REDUCED BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY			
SIZE	A	B	L-RF	L-RTJ	BW	H	WEIGHT	L-RF	L-RTJ	BW	WEIGHT
in/mm							kg				kg
2X1-1/2	49	38	368	371	368	121	41	368	371	368	50
50X40											
3X2	74	49	470	473	470	150	70	470	473	470	100
80X50											
4X3	100	74	546	549	546	188	120	546	549	546	200
100X80											
6X4	144	100	705	711	705	235	285	705	711	705	380
150X100											
8X6	192	144	832	841	832	260	560	832	841	832	700
200X150											
10X8	239	192	991	1000	991	314	1020	991	1000	991	1270
250X200											
12X10	287	239	1130	1146	1130	382	1750	1130	1146	1130	1530
300X250											
14X10	315	239	1257	1276	1257	382	2100	1257	1276	1257	2100
350X250											
14X12	315	287	1257	1276	1257	451	2500	1257	1276	1257	2700
350X300											
16X12	360	287	1384	1407	1384	451	2800	1384	1407	1384	3200
400X300											
16X14	360	315	1384	1407	1384	480	3200	1384	1407	1384	3600
400X350											
18X16	406	360	1477	1559			4950	1477	1559		4200
450X400											
20X16	454	360	1664	1686			5100	1664	1686		4500
500X400											
20X18	454	406	1664	1686			7500	1664	1686		5900
500X450											
24X20	546	454	1782	1972			10800	1782	1972		9200
600X500											

⑧ ASME CLASS 2500 REDUCED BORE

ALL TYPE		SIDE-ENTRY						TOP-ENTRY			
SIZE	A	B	L-RF	L-RTJ	BW	H	WEIGHT	L-RF	L-RTJ	BW	WEIGHT
in/mm							kg				kg
2X1-1/2	42	38	451	454	451	132	65	451	454	451	80
50X40											
3X2	62	42	578	584	578	162	155	578	584	578	160
80X50											
4X3	87	62	673	683	673	204	265	673	683	673	300
100X80											
6X4	131	87	914	927	914	251	510	914	927	914	670
150X100											
8X6	179	131	1022	1038	1022	275	1090	1022	1038	1022	1150
200X150											
10X8	223	179	1270	1292	1270	380	1660	1270	1292	1270	2100
250X200											
12X10	265	223	1422	1445	1422	541	2550	1422	1445	1422	3300
300X250											

FLOATING BALL VALVES FEATURE

GENERAL DESIGN FEATURES

SAMSUNG Floating Ball Valves offer customers a value-priced alternative to trunnion-mounted ball valves for use in less demanding applications. Properly applied, they provide outstanding service life and low cost ownership.

SAMSUNG offers a wide variety of body and trim materials, and provides quick deliveries on carbon steel and 316 stainless steel body valves. Seat materials include RTFM as standard (along with a wide variety of other optional materials) and seal materials include 80 or 90 durometer peroxide-cured HNBR as standard (along with other optional materials).

All SAMSUNG Floating Ball Valves are monogrammed API 6D, and comply to the NACE MR0175 / ISO 15156 standard, as well as the API 607 Rev. 8 Fire Safe standard.

SAMSUNG has rigorously cycle tested and then re-tested the floating valve design to API 6D requirements—passing the low/high hydrostatic and low/high gas API 6D pressure tests—to insure our valves withstand the tough service conditions required in the field.

REDUNDANT BODY SEALS

The SAMSUNG floating ball valve features an interlocked body design along with an elastomer O-Ring to provide redundant sealing points at the body connection to prevent any external leakage.

FIRE-SAFE CERTIFIED

All SAMSUNG API 6D Monogrammed Floating Ball Valves are certified to and conform to API 607 Rev. 8 and API 6FA standards. If a fire occurs near the valve location, non-metallic soft goods, such as the elastomer seats, seals, bushings, bearings, back seat, packing and gaskets may be incinerated. However, the design of the SAMSUNG floating ball valve provides sufficient metal-to-metal sealing at critical areas in the valve to minimize (per the relevant API code) External or internal leakage. See the three diagrams at the bottom of this page that depict the verbal description in this section.

TRIPLE STEM SEAL DESIGN

SAMSUNG floating ball valves feature PTFE/Graphite packing, elastomer stem seals, and elastomer back seat to provide triple stem sealing.

MOUNTING PAD

SAMSUNG flanged floating ball valves feature a standard ISO 5211 mounting pad that allows easy actuation installation.

LOCKING DEVICE

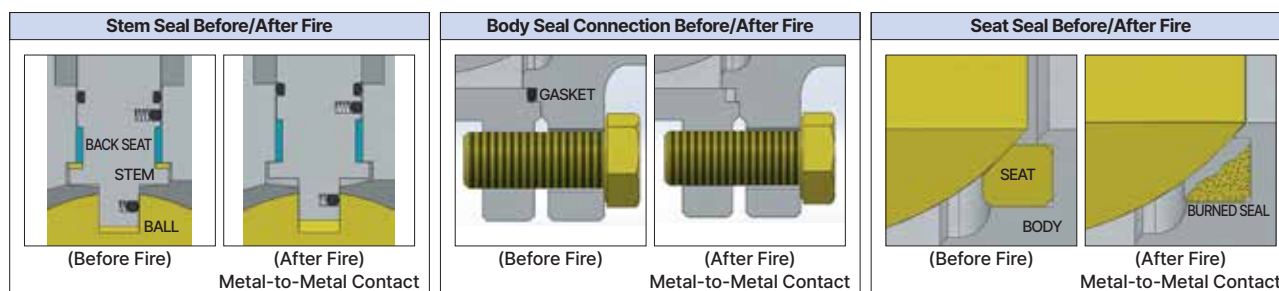
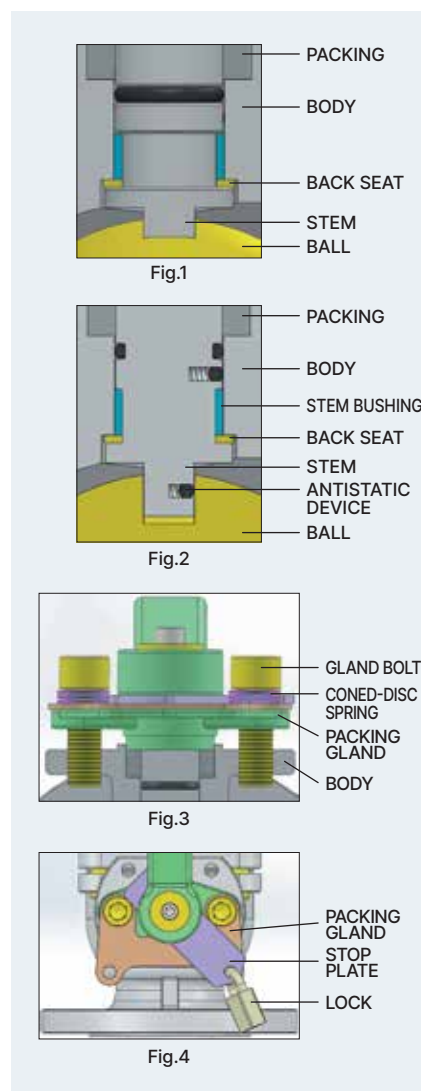
SAMSUNG flanged floating ball valves are equipped with a standard locking device (lever or gear).

ANTI-STATIC DEVICE

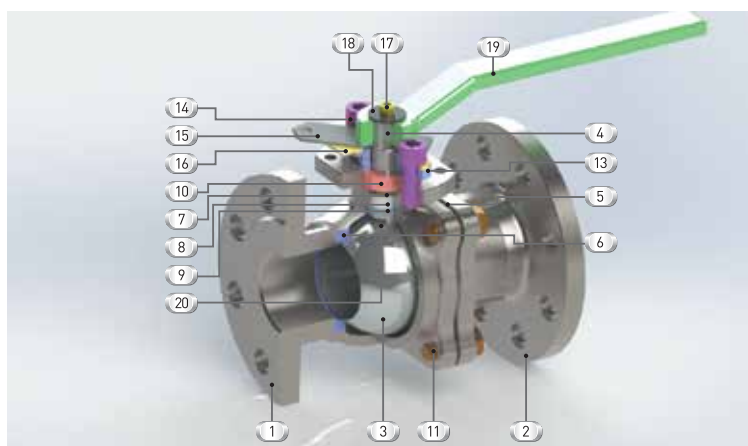
All SAMSUNG flanged floating ball valves feature a standard anti-static device to prevent an electrical discharge into a piping system.

BLOW-OUT PROOF STEM

All SAMSUNG flanged floating ball valves feature an internally installed blow-out proof stem.



FLOATING BALL VALVE OVERVIEW



- Flanged two-piece bolted body.
- Full and regular port offerings
- 1" to 8" sizes, ASME class 150 & 300 pressures
- 1" to 4" sizes, ASME class 600 pressures
- Resilient and fire safe stem seal and body connection
- Fire safe certified to API 607 Rev. 8
- ISO 5211 mounting pad
- API 6D monogrammed, NACE MR0175/ISO15156 Compliant
- Standard locking device (lever)
- Standard anti-static device

⑧ STANDARD BILL OF MATERIAL

Item	Description	Stainless Steel Body/Trim Material	Carbon Steel Body/ENP Trim Material	Low Temp Carbon Steel Body /ENP Trim Material
1	BODY	ASTM A351 CF8M 316SS	A216 WCB CARBON STEEL	A351 LCB CARBON STEEL
2	END CAP	ASTM A351 CF8M 316SS	A216 WCB CARBON STEEL	A351 LCB CARBON STEEL
3	BALL	ASTM A351 CF8M 316SS	ASTM A105N/3-MIL ENP	ASTM A350/3-MIL ENP
4	STEM	ASTM A276 316 SS	ASTM A4140/3-MIL ENP	ASTM A479 316SS
5	BODY O-RING	HNBR	HNBR	VITON
6	SEAT	RTFM	RTFM	RTFM
7	STEM O-RING	HNBR	HNBR	VITON
8	STEM BUSHING	RTFM	RTFM	RTFM
9	BACK SEAT	PTFE / RTFM	PTFE / RTFM	PTFE / RTFM
10	PACKING	PTFE / GRAPHITE	PTFE / GRAPHITE	PTFE / GRAPHITE
11	BODY/END CAP BOLT	ASTM A193-B8	ASTM A320-L7	ASTM A320-L7M
13	PACKING GLAND	ASTM A351 CF8M 316SS	ASTM A351 304SS	ASTM A351 304SS
14	GLAND BOLT	ASTM A276 316 SS	ASTM A4135+H1150 LOW ALLOY STEEL	ASTM A4135+H1150 LOW ALLOY STEEL
15	STOP PLATE	ASTM A240 304SS PLATE	ASTM A36 CS PLATE+Zn COATING	ASTM A36 CS PLATE+Zn COATING
16	CONED-DISC SPRING	HIGH CARBON C-1075	HIGH CARBON C-1075	HIGH CARBON C-1075
17	LEVER BOLT	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
18	LEVER WASHER	ASTM A240 304SS PLATE	ASTM A36 CS PLATE+Zn COATING	ASTM A36 CS PLATE+Zn COATING
19	LEVER	ASTM A536 DUCTILE IRON	ASTM A536 DUCTILE IRON	ASTM A536 DUCTILE IRON
20	ANTI-STATIC DEVICE	316LSS	316LSS	316LSS
27	BODY GASKET	PTFE / 304 SS+GRAPHITE	PTFE / 304 SS+GRAPHITE	PTFE / 304 SS+GRAPHITE

METAL SEATED BALL VALVE



Surface Treatments /Coatings	Process Method	Hardness	Max Temp	Corrosion Resistance
Chromel(Cr3C2)	HVOF Spray	68HRC	815°C/1500°F	Good
Tungsten(WC-Co)	HVOF Spray	72HRC	538°C/1000°F	Excellent
Stellite	PTA(Plasma Thermal Arc)	36HRC	538°C/1000°F	Good
LTPN	Plasma Nitriding	60HRC	350°C/662°F	Excellent

High Velocity Oxygen Fuel(HVOF) coating being carried out on a ball. This advance coating process ensures uniform application, excellent finish and good bonding with the base metal. This results in an abrasion resistant surface that can be mated lapped with the hardened seat.

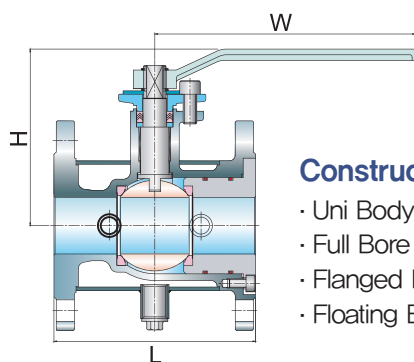
CRYOGENIC BALL VALVE



Type	Boiling Point	Liquid Density	Type	Boiling Point	Liquid Density
Natural Gas(LNG)	-168°C/-270°F	26	Air	-194.4°C/-318°F	57.87
Methane(CH ₄)	-161.5°C/-258°F	26.2	Nitrogen(N ₂)	-195.8°C/-320°F	50.45
Oxygen(O ₂)	-182.9°C/-296°F	71.2	Hydrogen(H ₂)	-252.7°C/-423°F	4.43
Argon(A)	-185.9°C/-303°F	87.4	Helium(He)	-268.9°C/-452°F	7.82
Carbon Dioxide(CO ₂)	-78.5°C/-109°F	50.6	Absolute Zero	-273.2°C/-460°F	

- Bonnet extensions
- Low fugitive emission control
- Lip seal design
- Cavity pressure self relief design
- Stable seat materials provide good low temperature performance
- Seat and Cavity Pressure Design can be adapted to meet actual design conditions

JACKET BALL VALVES



Construction

- Uni Body
- Full Bore
- Flanged Ends
- Floating Ball

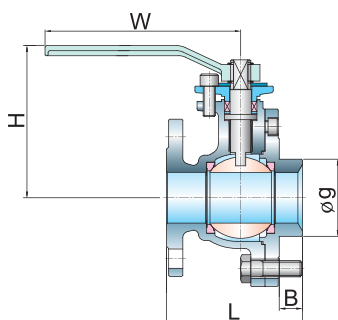
Operator

- Lever
- Gear
- Pneumatic
- Actuator



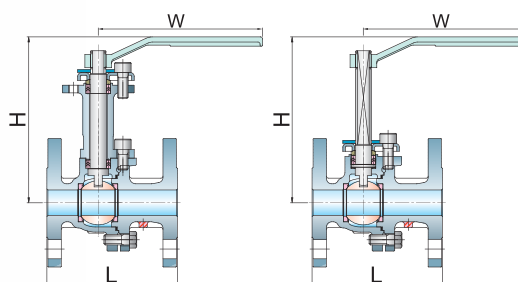
CLASS/SIZE	in	1-1/2×1/2	1-1/2×3/4	2×1	2-1/2×1-1/2	3×2	4×2-1/2	5×3	6×4	8×6	10×8
	mm	40×15	40×20	50×25	65×40	80×50	100×65	125×80	150×100	200×150	250×200
10Kgf/cm ² and CLASS 150	L	108	117	127	165	178	190	203	229	394	457
	H	121	122	132	150	156	167	201	218	272	280
	W	150	150	180	240	240	240	350	350	440	600
20Kgf/cm ² and CLASS 300	L	140	152	165	190	216	241	283	305	403	502
	H	121	122	132	150	156	167	201	218	272	280
	W	150	150	180	240	240	240	350	350	600	600

TANK BOTTOM BALL VALVES



CLASS/SIZE	in	1-1/2×1	2×1-1/2	2-1/2×2	3×2-1/2	4×3	5×3	6×4	8×6	10×8	12×10
	mm	40×25	50×40	65×50	80×65	100×80	125×80	150×100	200×150	250×200	300×250
10Kgf/cm ² and CLASS 150	L	94	125	133	190	179	175	195	255	312	550
	H	117.5	129.5	150	160	173	200	216	271	281	340
	W	180	240	240	240	350	350	350	440	—	—
	B	15	21	23	19	18	25	27	22	20	17
	g	49	60	76	90	110	140	166	200	260	320

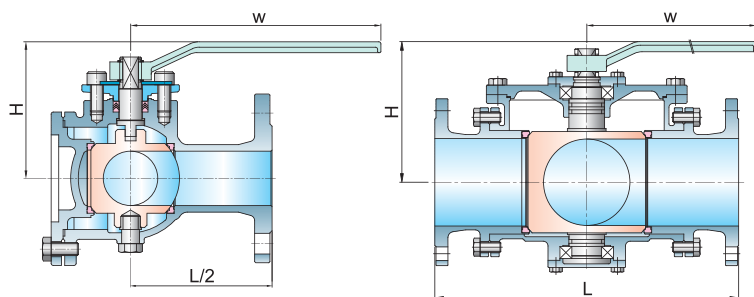
EXTENDED BONNET AND RISING STEM BALL VALVE



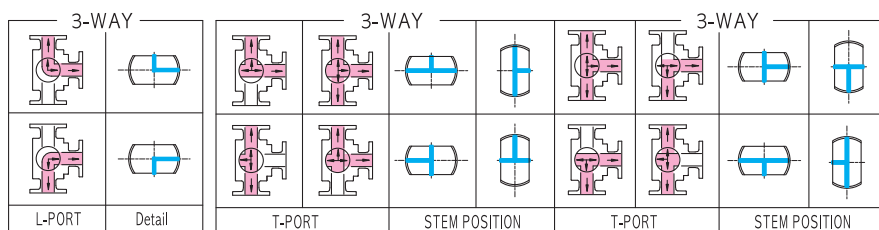
CLASS/SIZE	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
	mm	15	15	15	15	15	15	15	15	15	15	15	15
10Kgf/cm ² and CLASS 150	L	108	117	127	140	165	178	190	203	229	356	394	457
	H	148	151	163	166	188	196	205	240	258	365	387	416
	W	150	150	180	180	240	240	240	350	350	440	440	600

3WAY L&T-TYPE BALL VALVES

- T-Port or L-Port
- Side Entry and Top Entry
- 4-Seat Design
- Face to Face : Man Std.
- Flange End Dimensions : Per ASME B16.5



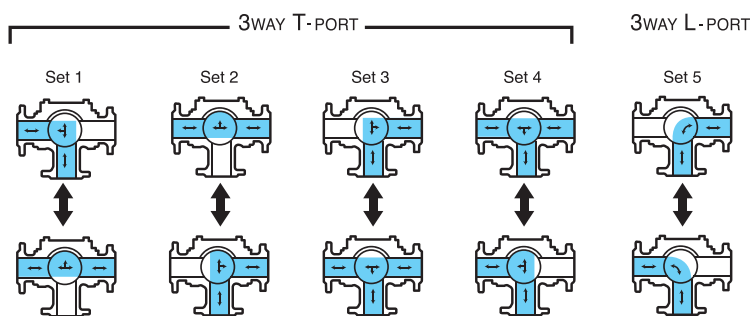
INDICATOR



Flow direction is marked on top stem



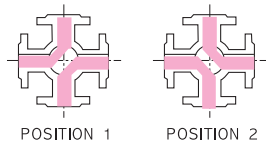
DIRECTION OF FLOW



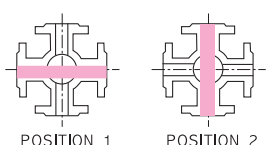
CLASS 150 DIMENSIONS

CLASS/SIZE	in	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6	8	10	12	14
	mm	15	20	25	32	40	50	65	80	100	125	150	200	250	300	350
10Kgt/cm ² and CLASS 150	L	160	160	200	240	240	260	320	360	430	500	510	610	750	840	910
	H	85	85	94.5	117.5	117.5	125.5	140.5	177	192	221	239	277	336	400	400
	W	130	150	180	240	240	240	320	350	350	440	440	600	—	—	—

FLOW PLAN M-4WAY X-PORT 90° TURN



FLOW PLAN O-4WAY 90° TURN



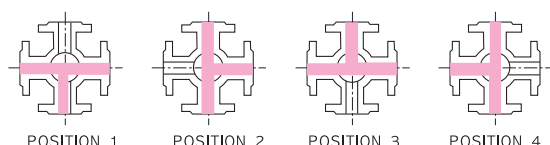
4-WAY VALVES

Directional
Control and
Shut Off
Combined
in One Valve

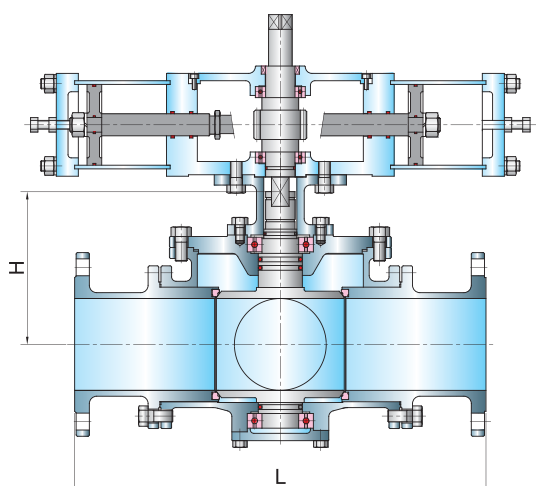
FLOW PLAN N-4WAY L PORT 180° TURN



FLOW PLAN P-4WAY 270° TURN



3WAY Y-TYPE BALL VALVES

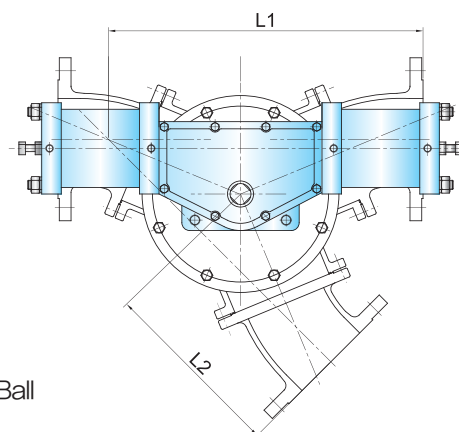


Operator

- Lever
- Gear
- Pneumatic
- Actuator

Specifications

- Split Body
- Full Bore
- Flanged Ends
- Floating & Trunnion Ball

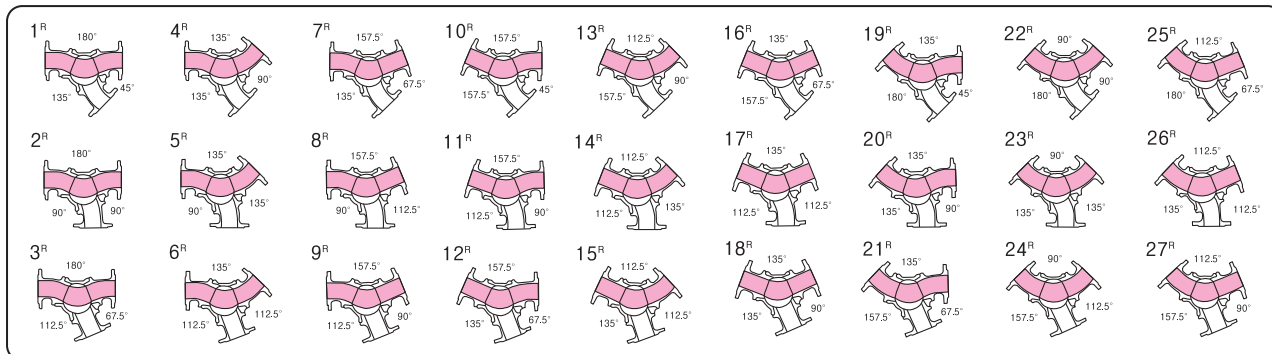


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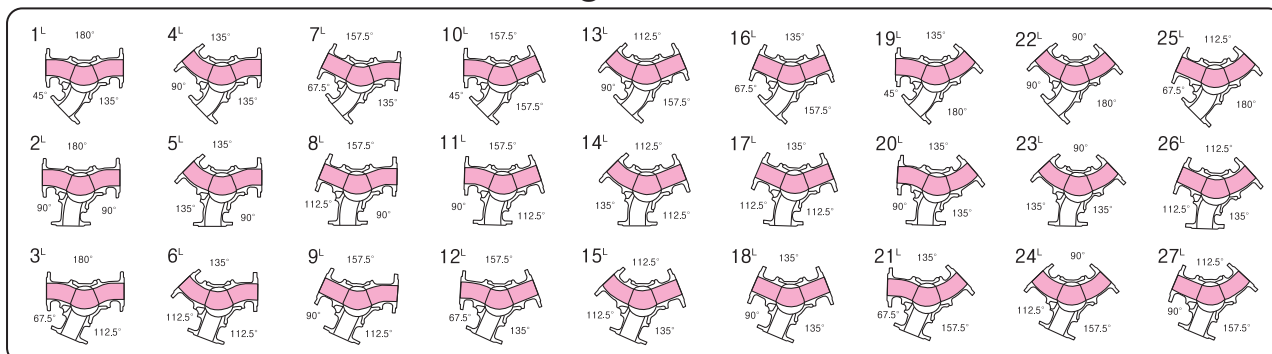
Right → Left

CLASS/SIZE	in	2	2-1/2	3	4	5	6	8	10
	mm	50	65	80	100	125	150	200	250
10Kgt/cm ² and CLASS 150	L	332	340	420	460	554	668	800	884
	L1	284.5	290	366	397	462.5	557	677	738
	L2	166	170	210	230	227	334	400	442
	H	140	141	183	190	208	213	240	277

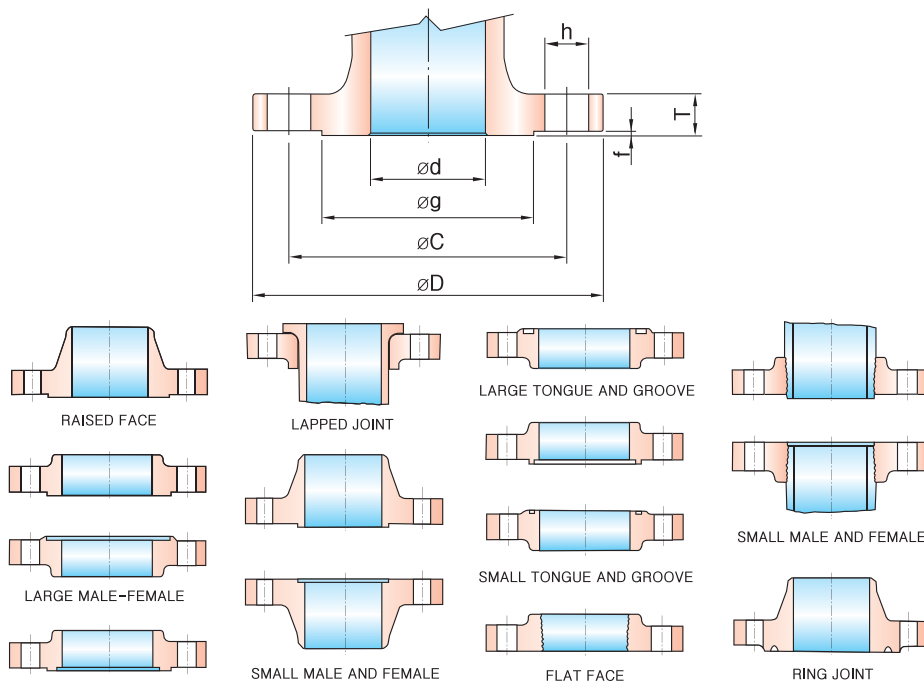
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FLANGE DIMENSION & DRILLING TEMPLATES



10Kgf/cm² STEEL PIPE FLANGE DIMENSIONS

Nominal Pipe Size	ID of Bore	OD of Flange	Raised Face Diam.	Thickness of Flange	Thickness of Raised Face	Diam. of Bolt Circle	Diam. of Bolt Hole	No. of Bolt Holes	Diam. of Bolt
mm	d	D	g	T	f	C	h		
15	15	95	51	12	1	70	15	4	M12
20	20	100	56	14	1	75	15	4	M12
25	25	125	67	14	1	90	19	4	M16
32	32	135	76	16	2	100	19	4	M16
40	40	140	81	16	2	105	19	4	M16
50	50	155	96	16	2	120	19	4	M16
65	65	175	116	18	2	140	19	4	M16
80	80	185	126	18	2	150	19	8	M16
100	100	210	151	18	2	175	19	8	M16
125	125	250	182	20	2	210	23	8	M20
150	150	280	212	22	2	240	23	8	M20
200	200	330	262	22	2	290	23	12	M20
250	250	400	324	24	2	355	25	12	M22
300	300	445	368	24	3	400	25	16	M22
350	337	490	413	26	3	445	25	16	M22
400	387	560	475	28	3	510	27	16	M24
450	438	620	530	30	3	565	27	20	M24
500	489	675	585	30	3	620	27	20	M24
600	589	795	690	32	3	730	33	24	M30

20Kgf/cm² STEEL PIPE FLANGE DIMENSIONS

Nominal Pipe Size	ID of Bore	OD of Flange	Raised Face Diam.	Thickness of Flange	Thickness of Raised Face	Diam. of Bolt Circle	Diam. of Bolt Hole	No. of Bolt Holes	Diam. of Bolt
mm	d	D	g	T	f	C	h		
15	15	95	51	14	1	70	15	4	M12
20	20	100	56	16	1	75	15	4	M12
25	25	125	67	16	1	90	19	4	M16
32	32	135	76	18	2	100	19	4	M16
40	40	140	81	18	2	105	19	4	M16
50	50	155	96	18	2	120	19	8	M16
65	65	175	116	20	2	140	19	8	M16
80	80	200	132	22	2	160	23	8	M20
100	100	225	160	24	2	185	23	8	M20
125	125	270	195	26	2	225	25	8	M22
150	150	305	230	28	2	260	25	12	M22
200	200	350	275	30	2	305	25	12	M22
250	250	430	345	34	2	380	27	12	M24
300	300	480	395	36	3	430	27	16	M24
350	337	540	440	40	3	480	33	16	M30
400	387	605	495	46	3	540	33	16	M30
450	438	675	560	48	3	605	33	20	M30
500	489	730	615	50	3	660	33	20	M30
600	589	845	720	54	3	770	39	24	M36

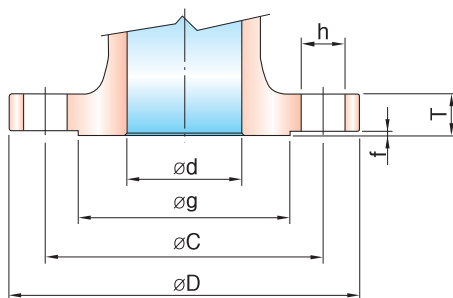
30Kgf/cm² STEEL PIPE FLANGE DIMENSIONS

Nominal Pipe Size	ID of Bore	OD of Flange	Raised Face Diam.	Thickness of Flange	Thickness of Raised Face	Diam. of Bolt Circle	Diam. of Bolt Hole	No. of Bolt Holes	Diam. of Bolt
mm	d	D	g	T	f	C	h		
15	15	115	55	18	1	80	19	4	M16
20	20	120	60	18	1	85	19	4	M16
25	25	130	70	20	1	95	19	4	M16
32	32	140	80	22	2	105	19	4	M16
40	40	160	90	22	2	120	23	4	M20
50	50	165	105	22	2	130	19	8	M16
65	65	200	130	26	2	160	23	8	M20
80	80	210	140	28	2	170	23	8	M20
100	100	240	160	32	2	195	25	8	M22
125	125	275	195	36	2	230	25	8	M22
150	150	325	235	38	2	275	27	12	M24
200	200	370	280	42	2	320	27	12	M24
250	250	450	345	48	2	390	33	12	M30
300	300	515	405	52	3	450	33	16	M30
350	333	560	450	54	3	495	33	16	M30
400	361	630	510	60	3	560	39	16	M36

40Kgf/cm² STEEL PIPE FLANGE DIMENSIONS

Nominal Pipe Size	ID of Bore	OD of Flange	Raised Face Diam.	Thickness of Flange	Thickness of Raised Face	Diam. of Bolt Circle	Diam. of Bolt Hole	No. of Bolt Holes	Diam. of Bolt
mm	d	D	g	T	f	C	h		
15	15	115	55	20	1	80	19	4	M16
20	20	120	60	20	1	85	19	4	M16
25	25	130	70	22	1	95	19	4	M16
32	32	140	80	24	2	105	19	4	M16
40	40	160	90	24	2	120	23	4	M20
50	50	165	105	26	2	130	19	8	M16
65	65	200	130	30	2	160	23	8	M20
80	80	210	140	32	2	170	23	8	M20
100	100	250	165	36	2	205	25	8	M22
125	125	300	200	40	2	250	27	8	M24
150	150	355	240	44	2	295	33	12	M30
200	200	405	290	50	2	345	33	12	M30
250	250	475	355	56	2	410	33	12	M30
300	300	540	410	60	3	470	39	16	M36
350	333	585	455	64	3	515	39	16	M36
400	361	645	515	70	3	570	39	16	M36

FLANGE DIMENSION & DRILLING TEMPLATES



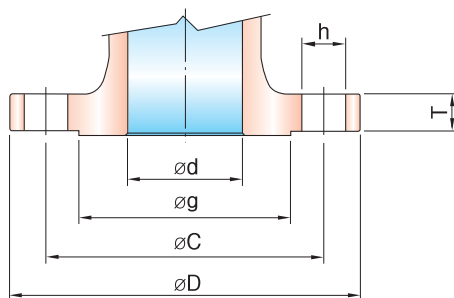
CLASS 150 STEEL PIPE FLANGE DIMENSIONS

Nominal Pipe Size NPS	ID of Bore		OD of Flange		Raised Face Diam.		Thickness of Flange		Diam. of Bolt Circle		Diam. of Bolt Hole		No. of Bolt Holes	Diam. of Bolt
	d		D		g		T		C		h			
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	0.50	13	3.50	89	1.38	35	0.44	11.2	2.38	60.5	0.62	16	4	1/2
3/4	0.75	19	3.88	98	1.69	43	0.50(0.44)	12.7(11.2)	2.75	70	0.62	16	4	1/2
1	1.00	25	4.25	108	2.00	51	0.56(0.44)	14.3(11.2)	3.12	79.5	0.62	16	4	1/2
1 1/4	1.25	32	4.62	117	2.50	63.5	0.62(0.50)	15.9(12.7)	3.50	89	0.62	16	4	1/2
1 1/2	1.50	38	5.00	127	2.88	73	0.69(0.56)	17.5(14.3)	3.88	98.5	0.62	16	4	1/2
2	1.93	50	6.00	152	3.62	92	0.75(0.62)	19.1(15.9)	4.75	120.5	0.75	19	4	5/8
2 1/2	2.50	64	7.00	178	4.12	105	0.88(0.69)	22.3(17.5)	5.50	139.5	0.75	19	4	5/8
3	3.00	76	7.50	190.5	5.00	127	0.94(0.75)	23.9(19.1)	6.00	152.5	0.75	19	4	5/8
4	4.00	102	9.00	229	6.19	157	0.94	23.9	7.50	190.5	0.75	19	8	5/8
5	5.00	127	10.00	254	7.31	186	0.94	23.9	8.50	216.0	0.88	22	8	3/4
6	5.91	150	11.00	279	8.50	216	1.00	25.4	9.50	241.5	0.88	22	8	3/4
8	8.00	201	13.50	343	10.62	270	1.12	28.6	11.75	298.5	0.88	22	8	3/4
10	10.00	254	16.00	406	12.75	324	1.19	30.2	14.25	362	1.00	25	12	7/8
12	12.00	303	19.00	483	15.00	381	1.25	31.8	17.00	432	1.00	25	12	7/8
14	13.27	337	21.00	533	16.26	413	1.38	35.1	18.75	476.5	1.12	29	12	1
16	15.24	387	23.50	597	18.50	470	1.44	36.6	21.25	539.5	1.12	29	16	1
18	17.24	438	25.00	635	21.00	533	1.56	39.6	22.75	578	1.25	32	16	1-1/8
20	19.25	489	27.50	698.5	23.00	584	1.69	42.9	25.00	635	1.25	32	20	1-1/8
24	23.19	589	32.00	813	27.25	692	1.88	47.8	29.50	749.5	1.38	35	20	1-1/4
26	24.92	633	34.25	870	29.50	749	2.69	68.3	31.75	806.5	1.38	35	24	1-1/4
28	26.93	684	36.50	927	31.50	800	2.81	71.4	34.00	863.6	1.38	35	28	1-1/4
30	28.94	735	38.75	984	33.75	857	2.94	74.7	36.00	914.4	1.38	35	28	1-1/4
32	30.67	779	41.75	1060	36.00	914	3.19	81.0	38.50	978	1.62	41	28	1-1/2
34	32.68	830	43.75	1111	38.00	965	3.25	82.6	40.50	1029	1.62	41	32	1-1/2
36	34.41	874	46.00	1168	40.25	1022	3.56	90.4	42.75	1086	1.62	41	32	1-1/2
40	38.43	976	50.75	1289	44.25	1124	3.56	90.4	47.25	1200	1.62	41	36	1-1/2
42	40.16	1020	53.00	1346	47.00	1194	3.81	96.8	49.50	1257	1.62	41	36	1-1/2
44	42.32	1075	55.25	1403	49.00	1245	4.00	101.6	51.75	1314.5	1.62	41	40	1-1/2
48	45.91	1166	59.50	1511	53.50	1359	4.25	108.0	56.00	1422	1.62	41	44	1-1/2
56	53.54	1360	68.75	1746	62.00	1575	4.88	124.0	65	1651	1.88	48	48	1-3/4

CLASS 300 STEEL PIPE FLANGE DIMENSIONS

Nominal Pipe Size NPS	ID of Bore		OD of Flange		Raised Face Diam.		Thickness of Flange		Diam. of Bolt Circle		Diam. of Bolt Hole		No. of Bolt Holes	Diam. of Bolt
	d		D		g		T		C		h			
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	0.50	13	3.75	95	1.38	35	0.56	14.2	2.62	66.5	0.62	16	4	1/2
3/4	0.75	19	4.62	117	1.69	43	0.62	15.8	3.25	82.5	0.75	19	4	5/8
1	1.00	25	4.88	124	2.00	51	0.69	17.5	3.50	89.0	0.75	19	4	5/8
1 1/4	1.25	32	5.25	133	2.50	63.5	0.75	19.1	3.88	98.5	0.75	19	4	5/8
1 1/2	1.50	38	6.12	156	2.88	73	0.81	20.6	4.50	114.5	0.88	22	4	3/4
2	1.93	50	6.50	165	3.62	92	0.88	22.4	5.00	127	0.75	19	8	5/8
2 1/2	2.50	64	7.50	191	4.12	105	1.00	25.4	5.88	149	0.88	22	8	3/4
3	3.00	76	8.25	210	5.00	127	1.12	28.5	6.62	168	0.88	22	8	3/4
4	4.00	102	10.00	254	6.19	157	1.25	31.8	7.88	200	0.88	22	8	3/4
5	5.00	127	11.00	279	7.31	186	1.38	35.1	9.25	235	0.88	22	8	3/4
6	5.91	150	12.50	318	8.50	216	1.44	36.6	10.62	270	0.88	22	12	3/4
8	7.91	201	15.00	381	10.62	270	1.62	41.1	13.00	330	1.00	25	12	7/8
10	9.92	252	17.50	445	12.75	324	1.88	47.8	15.25	387	1.12	28	16	1
12	11.93	303	20.50	521	15.00	381	2.00	50.8	17.75	451	1.25	32	16	1-1/8
14	13.27	337	23.00	584	16.26	413	2.12	53.8	20.25	514.5	1.25	29	20	1-1/8
16	15.24	387	25.50	648	18.50	470	2.25	57.2	22.50	571.5	1.38	35	20	1-1/4
18	17.24	438	28.00	711	21.00	533	2.38	60.5	24.75	628.5	1.38	35	24	1-1/4
20	19.25	489	30.50	775	23.00	584	2.50	63.5	27.00	686	1.38	35	24	1-1/4
24	23.19	589	36.00	914	27.25	692	2.75	69.9	32.00	813	1.62	41	24	1-1/2
26	24.92	633	38.25	972	29.50	749	3.12	79.2	34.50	876	1.75	44.5	28	1-5/8
28	26.93	684	40.75	1035	31.50	800	3.38	85.9	37.00	940	1.75	44.5	28	1-5/8
30	28.94	735	43.00	1092	33.75	857	3.62	91.9	39.25	997	1.88	48	28	1-3/4
32	30.67	779	45.25	1149	36.00	914	3.88	98.6	41.50	1054	2.00	51	28	1-7/8
34	32.68	830	47.5	1207	38.00	965	4.00	101.6	43.50	1105	2.00	51	28	1-7/8
36	34.41	874	50.00	1270	40.25	1022	4.12	104.6	46.00	1168	2.12	54	32	2
40	38.43	976	48.75	1238	42.75	1086	4.50	114.3	45.50	1156	1.75	44.5	32	1-5/8
42	40.16	1020	50.75	1289	44.75	1137	4.69	119.1	47.50	1207	1.75	44.5	32	1-5/8
44	42.32	1075	53.25	1353	47.00	1194	4.88	124.0	49.75	1263.7	1.88	48	32	1-3/4
48	45.91	1166	57.75	1467	51.25	1302	5.25	133.4	54.00	1372	2.00	51	32	1-7/8
56	53.54	1360	67.25	1708	59.75	1518	6.06	153.9	63.00	1600	2.38	60.5	28	2-1/4

FLANGE DIMENSION & DRILLING TEMPLATES



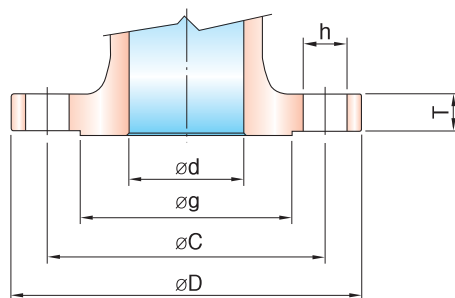
CLASS 600 STEEL PIPE FLANGE DIMENSIONS

Nominal Pipe Size NPS	ID of Bore		OD of Flange		Raised Face Diam.		Thickness of Flange		Diam. of Bolt Circle		Diam. of Bolt Hole		No. of Bolt Holes	Diam. of Bolt
	d		D		g		T		C		h			
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	0.50	12.7	3.75	95	1.38	35	0.56	14.2	2.62	66.7	0.62	16	4	1/2
3/4	0.75	19	4.62	117	1.69	43	0.62	15.7	3.25	82.6	0.75	19	4	5/8
1	0.98	25	4.88	124	2.00	51	0.69	17.5	3.50	88.9	0.75	19	4	5/8
1 1/4	1.26	32	5.25	133	2.50	63.5	0.81	20.6	3.88	98.4	0.75	19	4	5/8
1 1/2	1.50	38	6.12	156	2.88	73	0.88	22.4	4.50	114.3	0.88	22	4	3/4
2	1.93	49	6.50	165	3.62	92	1.00	25.4	5.00	127.0	0.75	19	8	5/8
2 1/2	2.44	62	7.50	191	4.12	105	1.12	28.4	5.88	149.4	0.88	22	8	3/4
3	2.91	74	8.25	210	5.00	127	1.25	31.8	6.62	168.1	0.88	22	8	3/4
4	3.94	100	10.75	273	6.19	157	1.50	38.1	8.50	215.9	1.00	25	8	7/8
5	5.00	125	13.00	330	7.31	186	1.75	44.5	10.50	266.7	1.12	29	8	1
6	5.91	150	14.00	356	8.50	216	1.88	47.8	11.50	292.1	1.12	29	12	1
8	7.91	201	16.50	419	10.62	270	2.19	55.6	13.75	349.3	1.25	32	12	1-1/8
10	9.92	252	20.00	508	12.75	324	2.50	63.5	17.00	431.8	1.38	35	16	1-1/4
12	11.93	303	22.00	559	15.00	381	2.62	66.5	19.25	489.0	1.38	35	20	1-1/4
14	13.15	334	23.75	603	16.26	413	2.75	69.9	20.75	527.1	1.50	38	20	1-3/8
16	15.16	385	27.00	686	18.50	470	3.00	76.2	23.75	603.3	1.62	41	20	1-1/2
18	17.16	436	29.25	743	21.00	533	3.25	82.6	25.75	654.1	1.75	44.5	20	1-5/8
20	19.17	487	32.00	813	23.00	584	3.50	88.9	28.50	723.9	1.75	44.5	24	1-5/8
24	23.19	589	37.00	940	27.25	692	4.00	101.6	33.00	838.2	2.00	51	24	1-7/8
26	24.92	633	40.00	1016	29.50	749	4.25	108.0	36.00	914	2.00	51	28	1-7/8
28	26.93	684	42.25	1073	31.50	800	4.38	111.3	38.00	965	2.12	54	28	2
30	28.94	735	44.50	1130	33.75	857	4.50	114.3	40.25	1022	2.12	54	28	2
32	30.66	779	47.00	1194	36.00	914	4.62	117.3	42.50	1080	2.38	60.5	28	2-1/4
34	32.68	830	49.00	1245	38.00	965	4.75	120.7	44.50	1130	2.38	60.5	28	2-1/4
36	34.41	874	51.75	1314	40.25	1022	4.88	124.0	47.00	1194	2.62	66.5	28	2-1/2
40	38.43	976	52.00	1321	43.75	1111	6.25	158.8	47.75	1213	2.38	60.5	32	2-1/4
42	40.16	1020	55.25	1403	46.00	1168	6.62	168.1	50.50	1283	2.62	66.5	28	2-1/2
44	42.32	1075	57.25	1454	48.25	1226	6.81	173.0	52.50	1333.5	2.62	66.5	32	2-1/2
48	45.9	1166	62.75	1594	52.50	1334	7.44	189.0	57.50	1461	2.88	73	32	2-3/4
56	53.54	1360	73.00	1854	60.75	1543	8.56	217.4	66.75	1695	3.38	86	32	3-1/4

CLASS 900 STEEL PIPE FLANGE DIMENSIONS

Nominal Pipe Size NPS	ID of Bore		OD of Flange		Raised Face Diam.		Thickness of Flange		Diam. of Bolt Circle		Diam. of Bolt Hole		No. of Bolt Holes	Diam. of Bolt
	d		D		g		T		C		h			
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	0.50	12.7	4.75	121	1.38	35	0.88	22.4	3.25	82.6	0.88	22	4	3/4
3/4	0.75	19	5.12	130	1.69	43	1.00	25.4	3.50	88.9	0.88	22	4	3/4
1	0.98	25	5.88	149	2.00	51	1.12	28.4	4.00	101.6	1.00	25	4	7/8
1 1/4	1.25	31.8	6.25	159	2.50	63.5	1.12	28.4	4.38	111.1	1.00	25	4	7/8
1 1/2	1.50	38	7.00	178	2.88	73	1.25	31.8	4.88	124.0	1.12	29	4	1
2	1.93	49	8.50	216	3.62	92	1.50	38.1	6.50	165.1	1.00	25	8	7/8
2 1/2	2.44	62	9.62	244	4.12	105	1.62	41.3	7.50	190.5	1.12	29	8	1
3	2.91	74	9.50	241	5.00	127	1.50	38.1	7.50	190.5	1.00	25	8	7/8
4	3.94	100	11.50	292	6.19	157	1.75	44.5	9.25	235.0	1.25	32	8	1-1/8
6	5.91	150	15.00	381	8.50	216	2.19	55.6	12.50	317.5	1.25	32	12	1-1/8
8	7.91	201	18.50	470	10.62	270	2.50	63.5	15.50	393.7	1.50	38	12	1-3/8
10	9.92	252	21.50	546	12.75	324	2.75	69.9	18.50	469.9	1.50	38	16	1-3/8
12	11.93	303	24.00	610	15.00	381	3.12	79.2	21.00	533.4	1.50	38	20	1-3/8
14	12.67	322	25.25	641	16.26	413	3.38	85.9	22.00	558.8	1.62	41	20	1-1/2
16	14.69	373	27.75	705	18.50	470	3.50	88.9	24.25	616.0	1.75	44.5	20	1-5/8
18	16.65	423	31.00	787	21.00	533	4.00	101.6	27.00	685.8	2.00	51	20	1-7/8
20	18.54	471	33.75	857	23.00	584	4.25	108.0	29.50	749.3	2.12	54	20	2
24	22.44	570	41.00	1041	27.25	692	5.50	139.7	35.50	901.7	2.62	66.5	20	2-1/2
26	24.29	617	42.75	1086	29.50	749	5.5	139.7	37.50	952.5	2.88	73	20	2-3/4
28	26.18	665	46.00	1168	31.50	800	5.62	142.7	40.25	1022.4	3.12	79	20	3
30	28.03	712	48.50	1232	33.75	857	5.88	149.4	42.75	1086	3.12	79	20	3
32	29.92	760	51.75	1314	36.00	914	6.25	158.8	45.50	1156	3.38	86	20	3-1/4
34	31.81	808	55.00	1397	38.00	965	6.50	165.1	48.25	1226	3.62	92	20	3-1/2
36	33.66	855	57.50	1461	40.25	1022	6.75	171.5	50.75	1289	3.62	92	20	3-1/2

FLANGE DIMENSION & DRILLING TEMPLATES



CLASS 1500 STEEL PIPE FLANGE DIMENSIONS

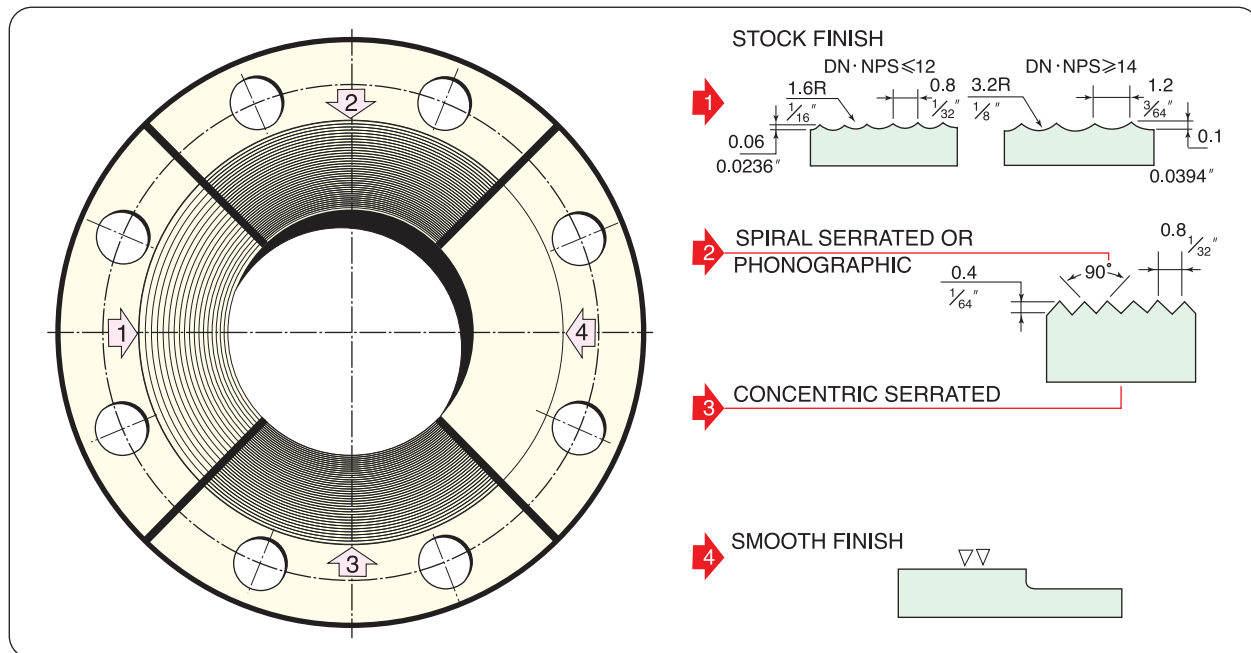
Nominal Pipe Size NPS	ID of Bore		OD of Flange		Raised Face Diam.		Thickness of Flange		Diam. of Bolt Circle		Diam. of Bolt Hole		No. of Bolt Holes	Diam. of Bolt
	d		D		g		T		C		h			
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	0.50	12.7	4.75	121	1.38	35	0.88	22.4	3.25	82.6	0.88	22	4	3/4
3/4	0.75	19	5.12	130	1.69	43	1.00	25.4	3.50	88.9	0.88	22	4	3/4
1	0.98	25	5.88	149	2.00	51	1.12	28.4	4.00	101.6	1.00	25	4	7/8
1 1/4	1.25	31.8	6.25	159	2.50	63.5	1.12	28.4	4.38	111.1	1.00	25	4	7/8
1 1/2	1.50	38	7.00	178	2.88	73	1.25	31.8	4.88	124.0	1.12	29	4	1
2	1.93	49	8.50	216	3.62	92	1.50	38.1	6.50	165.1	1.00	25	8	7/8
2 1/2	2.44	62	9.62	244	4.12	105	1.62	41.1	7.50	190.5	1.12	29	8	1
3	2.91	74	10.50	267	5.00	127	1.88	47.8	8.00	203.2	1.25	32	8	1–1/8
4	3.94	100	12.25	311	6.19	157	2.12	53.8	9.50	241.3	1.38	35	8	1–1/4
6	5.67	144	15.50	394	8.50	216	3.25	82.6	12.50	317.5	1.5	38	12	1–3/8
8	7.55	192	19.00	483	10.62	270	3.62	91.9	15.50	393.7	1.75	44.5	12	1–5/8
10	9.41	239	23.00	584	12.75	324	4.25	108.0	19.00	482.6	2.00	51	12	1–7/8
12	11.30	287	26.50	673	15.00	381	4.88	124.0	22.50	571.5	2.12	54	16	2
14	12.40	315	29.50	749	16.26	413	5.25	133.4	25.00	635.0	2.38	60	16	2–1/4
16	14.17	360	32.50	826	18.50	470	5.75	146.1	27.75	704.9	2.62	66.5	16	2–1/2
18	15.98	406	36.00	914	21.00	533	6.38	162.1	30.50	774.7	2.88	73	16	2–3/4
20	17.87	454	38.75	984	23.00	584	7.00	177.8	32.75	831.9	3.12	79	16	3
24	21.50	546	46.00	1168	27.25	692	8.00	203.2	39.00	990.6	3.62	92	16	3–1/2

CLASS 2500 STEEL PIPE FLANGE DIMENSIONS

Nominal Pipe Size NPS	ID of Bore		OD of Flange		Raised Face Diam.		Thickness of Flange		Diam. of Bolt Circle		Diam. of Bolt Hole		No. of Bolt Holes	Diam. of Bolt
	d		D		g		T		C		h			
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	0.50	12.7	5.25	133	1.38	35	1.19	30.2	3.50	88.9	0.88	22	4	3/4
3/4	0.75	19	5.50	140	1.69	43	1.25	31.8	3.75	95.3	0.88	22	4	3/4
1	0.98	25	6.25	159	2.00	51	1.38	35.1	4.25	108	1.00	25	4	7/8
1 1/4	1.25	31.8	7.25	184	2.50	63.5	1.5	38.1	5.12	130	1.12	29	4	1
1 1/2	1.50	38	8.00	203	2.88	73	1.75	44.5	5.75	146.1	1.25	32	4	1–1/8
2	1.65	42	9.25	235	3.62	92	2.00	50.8	6.75	171.5	1.12	29	8	1
2 1/2	2.05	52	10.50	267	4.12	105	2.25	57.2	7.75	196.9	1.25	32	8	1–1/8
3	2.44	62	12.00	305	5.00	127	2.62	66.5	9.00	228.6	1.38	35	8	1–1/4
4	3.42	87	14.00	356	6.19	157	3.00	76.2	10.75	273.1	1.62	41	8	1–1/2
6	5.16	131.0	19.00	483	8.50	216	4.25	108.0	14.50	368.3	2.12	54	8	2
8	7.04	179	21.75	552	10.62	270	5.00	127.0	17.25	438.2	2.12	54	12	2
10	8.78	223	26.50	673	12.75	324	6.50	165.1	21.25	539.8	2.62	66.5	12	2–1/2
12	10.43	265	30.00	762	15.00	381	7.25	184.2	24.38	619.3	2.88	73	12	2–3/4

FLANGE FACING FINISH

⑧ STANDARD FINISHES for Face of Flange(ASME B16.5)



STOCK FINISH : The most widely used of any gasket finish, because practically, is suitable for all ordinary service conditions. This is a continuous spiral groove. Flanges sizes 12" and smaller are produced with a $1/16"$ round-nosed tool at a feed of $1/32"$ per revolution . For sizes 14" and larger, the finish is made with $1/8"$ round-nosed tool at a feed of $3/64"$ per revolution.

SPIRAL SERRATED OR PHONOGRAPHIC : This finish is produced by using a 90° included angle [V] tool, making a spiral groove $1/64"$ deep with a feed of $1/32"$.

CONCENTRIC SERRATED : This finish is produced by using a 90° included-angle [V] tool, making concentric groove $1/64"$ deep and $1/32"$ apart.

SMOOTH FINISH : This finish is produced by several shapes of tools cutting at speeds and feeds which leave no definite tool marks apparent to the naked eye.

1. RAISED FACE, AND LARGE MALE AND FEMALE

Either a serrated—concentric or serrated—spiral finish having from 30 to 55 grooves per inch is used. The cutting tool employed has an approximate 0.06 in. or larger radius. The resultant surface finish has a 500 microinch ($12.5\mu\text{m}$) approximate roughness.

2. TONGUE AND GROOVE, AND SMALL MALE AND FEMALE

The gasket contact surface does not exceed 125 microinch ($3.2\mu\text{m}$) roughness.

3. RINGJOINT

The inside wall surface of gasket groove does not exceed 63 microinch ($1.6\mu\text{m}$) roughness.

4. BLIND

Blind flanges need not be faced in the center if, when this center part is raised, its diameter is at least 1 in. smaller than the inside diameter of fittings of the corresponding pressure class. When the center part is depressed, its diameter is not greater than the inside diameter of the corresponding pressure class fittings. Machining of the depressed center is not required.

TEST PRESSURE & DURATION

⑧ HYDROSTATIC TEST PRESSURE (ASME B16.34)

CLASS	150LB						300LB					
	DESCRIPTION		CWP		SHELL		SEAT		CWP		SHELL	
	MATERIAL		psi	kgf/cm ²	psi	kgf/cm ²	psi	kgf/cm ²	psi	kgf/cm ²	psi	kgf/cm ²
A216-WCB/A350-LF2			285	452.5	32	313.5	21.1	740	1135	80	814	58
A351-CF3, CF3M, CF8, CF8M			275	437.5	31	302.5	21.3	720	1105	77	792	56

CLASS	600LB						900LB					
	DESCRIPTION		CWP		SHELL		SEAT		CWP		SHELL	
	MATERIAL		psi	kgf/cm ²	psi	kgf/cm ²	psi	kgf/cm ²	psi	kgf/cm ²	psi	kgf/cm ²
A216-WCB/A350-LF2			1480	2245	158	1628	115	2220	3355	236	2442	172
A351-CF3, CF3M, CF8, CF8M			1440	2185	154	1584	112	2160	3265	230	2376	168

* In case of gas closure test at gage pressure not less than 80psi(5.7kgf/cm²)

Valve Size : NPS

12 and Smaller
4 and Smaller

Pressure Class

400 and lower
ALL

⑧ API 6D

1	2	3
Valve Pressure Class	Minimum Test Pressure, psig(kgf/cm ²) Shell Hydrostatic	Seat Hydrostatic
150	425(30.0)	300(21.1)
300	110(7.7.4)	800(56.3)
400	1450(102)	1060(74.6)
600	2175(153.0)	1600(112.5)
900	3250(228.6)	2400(168.8)
1500	5400(379.8)	4000(281.3)
2500	9000(633.0)	6600(464.2)

The test pressure listed are NOT prating pressure rating.

⑧ DURATION OF REQUIRED TEST PRESSURE

SHELL TEST		VALVE CLOSURE TESTS	
Valve size, NPS(inches)	Test Time, Sec	Valve size, NPS(inches)	Test Time, Sec
NPS≤2	15	NPS≤2	15
2½≤NPS≤6	60	2½≤NPS≤8	30
8≤NPS≤12	120	10≤NPS≤18	60
14≤NPS	300	20≤NPS	120

* ASME B16.34

1	2	3
Valve size, NPS(inches)	Shell test Duration(minutes)	Seat test Duration(minutes)
½ ~ 4	2	2
6 ~ 10	5	5
12 ~ 18	15	5
≥20	30	10

* API 6D

⑧ MATERIAL COMPARISON

ASTM, KS AND JIS

MATERIAL CLASSIFICATION	ASTM		ASTM		ASTM	
	ASTM	ASTM	ASTM	ASTM	ASTM	ASTM
Stainless Steel (Casting)	CF8	A 351	SSC 13A	D 4103	SCS 13A	G 5121
	CF8M		SSC 14A		SCS 14A	
	CF3M		SSC 16A		SCS 16A	
	CF3		SSC 19A		SCS 19A	
	CG3M					
Stainless Steel (Bar and Plate)	304	A 276	STS 304	D 3706	SUS 304	G 4303
	316		STS 316		SUS 316	
	316L		STS 316L		SUS 316L	
	304L		STS 317L		SUS 317L	
	403		STS 403		SUS 403	
	410		STS 410		SUS 410	
Cast Steel and Cast Iron	WCB	A 216	SCPH 2	D 4107	SCPH 2	G 5151
	CLB	A 126	GC 20	D 4301	FC 20	G 5501
	GR, 60-40-18	A 536	GCD 40	D 4302	FCD 40	G 5502
	GR, 40-30-5	A 197	BMC 28	D 4303	FCMB 28	G 5702
Copper Alloy	No 865	B 584	HBs C2	D 6007	HBs C2	G 5702
	No 360	B 16	MBs BE2	D 5101	Bs BM2	H 3422
	No 377	B 124	FBs BE2	D 5101	Bs BF2	H 3423

BOLTING MATERIALS

Bolting materials used in Cast Steel Valves are carefully selected and controlled to assure reliability in service. The following describes the more usual bolting materials (studs and nuts) used in the bonnet and cover joints of valves. Steel valves for all temperature services have alloy steel studs. For temperatures up to 875F, chromium-molybdenum steel conforming to ASTM A1 93-B7 is normally used ;and for higher temperatures and/or corrosive services, other suitable ferritic (Usually ASTM A1 93-B1 6) or austenitic grades are selected from ASTM A1 93. Nuts for ferritic alloy studs are normally carbon steel which meets the requirements of ASTM A1 94 Grade 2H. For low temperature applications down to minus 150F, alloy steel studs conforming to ASTM A320-L7 are normally used in conjunction with alloy steel nuts meeting the requirements of ASTM A1 94 Grade 4.

Ferritic requirements: alloy steel Tensile bolting Strength, is heat psi treated to conform to the following 125000 minimum Minimum mechanical.

Property requirement : Tensile Strength, psi ----- 125000 Minimum
 Yield Point, psi ----- 105000 Minimum
 Elongation, percent in 2" ----- 16 Minimum
 Reduction of Area, percent ----- 50 Minimum

In cast iron valves the bonnet, retainer, and cap joints have carbon steel bolting meeting the requirements of ASTM A307 Gr. B. Carbon steel nuts are used.

In corrosion-resistant valves the bonnet and gland bolts and nuts are made of austenitic stainless steel. All bolts are made of Type 304 stainless steel. All nuts are made of gall-resistant austenitic stainless steel of corrosion-resistance equal to or better than Type 303. High strength low alloy bolts, such as ASTM A1 93-B7 with ASTM A194-2H nuts, are used on CLASS 900 and CLASS 1500 valves and for nuclear service.

Body Materials	Temperature Degrees F°	Material Specifications	
		Bolts	Nuts
Cast Iron	- 20 to 410	ASTM A307 Gr B	ASTM A307 Gr Ba
Ductile Iron	- 20 to 650	ASTM A193 Gr B7	ASTM A194 Gr 2H
Carbon Steel (Grade WCB)	- 20 to 800	ASTM A193 Gr B7	ASTM A194 Gr 2H
Carbon Steel (Grade LCB)	- 50 to 650	ASTM 320 Gr L7	ASTM A194 Gr 4
Carbon Moly (Grade WC1)	- 20 to 800	ASTM A193 Gr B7	ASTM A194 Gr 2H
	- 20 to 850	ASTM A193 Gr B16	ASTM A194 Gr 4
1 ½ Cr - ½ Mo (Grade WC6)	- 20 to 800	ASTM A193 Gr B7	ASTM A194 Gr 2H
	- 20 to 1000	ASTM A193 Gr B16	ASTM A194 Gr 4
2 ½ Cr - 1 Mo (Grade WC9)	- 20 to 800	ASTM A193 Gr B7	ASTM A194 Gr 2H
	1001 to 1050	ASTM A193 Gr B16	ASTM A194 Gr 4
5Cr - ½ Mo (Grade C5)	- 20 to 800	ASTM A193 Gr B7	ASTM A194 Gr 2H
	1001 to 1100	ASTM A193 Gr B16	ASTM A194 Gr 4
9 Cr - 1 Mo (Grade C12)	- 20 to 800	ASTM A193 Gr B7	ASTM A194 Gr 2H
	1001 to 1100	ASTM A193 Gr B16	ASTM A194 Gr 4
Type 304 (Grade CF8)	- 425 to 100	ASTM A320 Gr B8	ASTM A194 Gr 8
	100 to 1500	* ASTM A193 Gr B8	* ASTM A194 Gr 8
Type 347 (Grade CF8C)	- 425 to 100	ASTM A320 Gr B8	ASTM A194 Gr 8
	100 to 1500	* ASTM A193 Gr B8	* ASTM A194 Gr 8
Type 316 (Grade CF8M)	- 325 to 100	ASTM A320 Gr B8	ASTM A194 Gr 8
	100 to 1500	* ASTM A193 Gr B8M	* ASTM A194 Gr 8M
3 ½ Ni (Grade LC3)	- 150 to - 50	ASTM A320 Gr L7	ASTM A194 Gr 4
	- 50 to 650	ASTM A193 Gr B7	with Charpy Test or 8M ASTM A194 Gr 2H

* Alloy steel bolting, A193 Gr B7 bolts and A194 Gr 2H nuts can be used at moderate temperatures depending on the permissible differential expansion.

SEALING MATERIALS

MATERIAL FOR SEAL AND SEAT

Material	GENERAL TEMPERATURE RANGE	USE/CHARACTERISTIC	NOT RECOMMENDED	PROPERTIES
FKM (Viton A)	+1.4°F + 400°F (-17°C + 204°C)	Aliphatic hydrocarbons (petroleum oil, mineral oil/grease, fuel oils, butane, propane, natural gas), aromatic hydrocarbons (benzene, toluene), chlorinated hydrocarbons, high vacuum, most acids / chemicals.	Brake fluid with glycol base, ammonia gas amines, alkalis, acetone, skydrol, ethylacetate, superheated steam, polar solvents (ketone, acetone, acetic acid, etc). low molecular esters and ethers.	Excellent resistance for wear, ozone, weather, aging, compression set, permeation.
FKM (Viton GLT)	-22°F + 400°F (-30°C + 204°C)	Extended low temperature service over Viton A, Excellent for water, steam and mineral acids in addition to use of Viton A.	Same as those of Viton A.	Similar to those of Viton A except a little interior compression set and permeability.
NBR (Buna-N, Nitrile)	-35°F + 212°F (-37°C + 100°C)	Aliphatic hydrocarbons (petroleum oil, mineral oil/grease, fuel oils, butane, propane, natural gas) dilute acids, alkalis, and salt solutions at low temperature, water.	Fuels of high aromatic content aromatic hydrocarbons (benzene), chlorinated hydrocarbons, polar solvents (ketone, acetone, acetic acid, ethylene ester), strong acid, glycol based brake fluid, ozone, weather and atmospheric aging.	Good resistance for wear, compression set, permeation.
PTFE	-292°F + 374°F (-180°C + 190°C)	Almost all chemicals and solvents including strong acid and alkali, high and very low temperature service.	High mechanical loading.	Weather resistance, thermal stability, low friction.
Nylon 6+ MOS2	-65°F + 250°F (-54°C + 121°C)	Aliphatic and aromatic hydrocarbons, ketones, acetone, ethers, weak alkalis, and acids, inorganic salt solutions.	Strong acids and alkali, strong ammonia, sodium hydroxide.	Excellent load bearing, strength and rigidity, self lubricating, good abrasion resistance.
PEEK (Polyetheretherketone)	-202°F + 500°F (-130°C + 260°C)	Superb chemical resistance including alcohols, acids, ammonia, esters, halogenated organics, hydrocarbons and inorganics.	Some strong acids - nitric, chromic, sulfuric, benzene sulfonic acids and aqua regia, etc, some inorganic bromine, chlorine and fluorine, etc.	Good high temperature performance, wear resistance, very low smoke and toxic gas emission, good hydrolysis resistance.
Polymite	-65°F + 275°F 185°F, water based fluids (-54°C + 135°C)	Petroleum and water based fluids, phosphate ester fluids, some chlorinated fluids and solvents, ketones, ethylene base glycols.	Strong acid, alcohols, brake fluids, dry chlorine, water over 185°F.	Very high sealability tear strength, abrasion and extrusion resistance.
HNBR	-22°F + 325°F -30°C + 163°C	HNBR is simply hydrogenated NBR. It is typically resistant to mineral oil-based lubricants and greases, hydraulic fluids, hydrocarbons, and water just like MBR. HNBR is more resistant to heat, Ozone, and aging than NBR.		
DEVLON	-148°F + 320°F -100°C + 160°C	DEVLON is a polyamide with additives which allow it to perform at -100°C to +160°C (-148°F to +320°F). This material covers a wide range of applications while having excellent wear properties, low friction, and improved impact strength.		
METAL (STELLITE)	-20°F + 932°F -29°C + 500°C	Metal seats hardfaced with Stellite 6 are recommended for use in high temperature fluid and gas applications. The temperature range of the material allows it to get up to the maximum temperature of the valve body material.		
METAL (Tungsten Carbide)	+ 1000°F + 538°C	Metal seats hardfaced with Tungsten Carbide are recommended for use in high temperature fluid and gas applications. The temperature range of the material allows it to get up to the maximum temperature of the valve body material.		
PCTFE	-400°F + 320°F -240°C + 160°C	Kel-F is a fluorocarbon based polymer offering a unique combination of physical and mechanical characteristics such as non-flamability, chemical resistance, and near zero moisture absorption.		
RTFM	-238°F + 356°F -150°C + 180°C	RTFM (Room Temperature Ferromagnetism), also known as TFM (Tetrafluoroethylene Modified), is a high-density copolymerized material. It offers several advantages over standard PTFE (Polytetrafluoroethylene), including lower deformation under load, better fatigue performance, easier weldability, higher elongation, and higher dielectric strength. RTFM is often used in applications requiring excellent chemical resistance, thermal stability, and low friction. It's suitable for use in the medical field, aerospace, oil and gas, and semiconductor industries.		

MATERIAL FOR SEAL AND SEAT

Forging	Casting	Low Temperature	High Temperature
A105	A216 WCB	-20°F (-29°C)	800°F (426°C)
A350 LF2	A352 LCB, LCC	-50°F (-46°C)	650°F (343°C)
A182 F316	A351 CF8M	-425°F (-254°C)	1500°F (815°C)

MATERIAL FOR SEAL AND SEAT

Type	Material	Low Temperature	High Temperature	Max. Pressure
Spiral wound	316 SS + Graphite	-420°F (-250°C)	1500°F (815°C)	6,250 psi (430bar)
Spiral wound	316 SS + PTFE	-200°F (-129°C)	450°F (232°C)	6,000 psi (415bar)



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