

Technical Innovation

Design Standards

API 6D
API 607
API 6F
API 598

BS 5351
BS 6755

ANSI B16.34
ANSI B16.10
ANSI B16.5

MSS SP-25
MSS SP-55

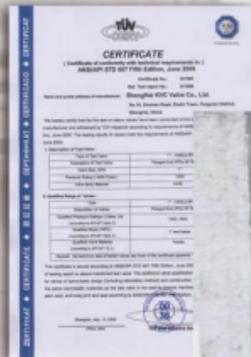
NACE std

SHELL MESL

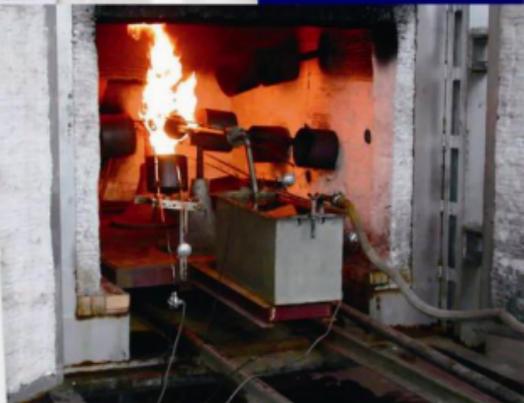
SHK technical research center utilizes the most advanced computer technology to improve the existing products and develop the new lines, this includes a highly educated and trained engineering team and a comprehensive internal computer network which links the entire operations of design, manufacturing and administration.

SHK design philosophy is to develop a safety and cost-efficient valve, we introduced the latest AUTO CAD and I-DEAS software for all our new product design research which include the advanced finite element analysis to virtually verify the new design prior to production, this has resulted in dramatically reducing the new product design time and ensure a safety and cost efficient final product.

SHK technical personnel are always ready to offer on line or on site technical training and support for all of its distributors, agents and end users.



Fire Safe Test



Fire safe is standard design of all **SHK** ball valve. **SHK** soft seat ball valve fire safe test was witnessed and certified by Lloyd's Register. Our in-house computer controlled fire test facility is capable of testing and certifying of **SHK** floating and trunnion mounted ball valves per API 6FA and API 607.

Advanced Manufacturing

The latest computer technology are also widely applied in **SHK** for valve manufacturing, this include a large number of numeric control machines (Machining center, CNC horizontal and vertical lathe, CNC drilling machine) and ERP management system which significantly improve our machining quality and process control. **SHK** also employs a number of conventional lathe with capacity up to machine 4B ball valve. **SHK** manufacturing philosophy is to ensure stable quality and just in time delivery.



Quality Control

SHK developed an extensive and advanced inspection and test facilities to control the quality from rough castings or forgings to final products. These facilities enable us to do Radio graphic test, Ultrasonic test, Dye-penetrant test, Magnetic test, Positive Material Identifier (PMI), Impact test, Tensile test, Hardness test, Fire safe test, Cryogenic test, Vacuum test, Low fugitive emission test and Hydro-static test.

SHK Quality Assurance is dedicated to the pursuit of a zero defect valve, and this has resulted in the company having more quality qualifications and end user approval than most of our competitors.

SHK is certified by ISO 9001 (certificate under DNV) and API 6D (registered no. 6D-0285) and our off-shore platform valves are type approved by ABS. Moreover, **SHK** is the first valve manufacturer in China to be certified to CE/ PED (category IV, mode B+D, certificate under B.V.), All of **SHK** soft seated ball valves are fire safe tested and certified by Lloyd's Register.



● How to Order

Example:

8 BT 1 R A 12666 - G

SHK figure numbers are designed to cover essential features. When ordering, please show figure numbers to avoid misunderstanding of your requirements. However a detailed description must accompany any special orders.

1 2 3 4 5 6 7

Following descriptions provide a basic guideline in valve specification:

1 Valve Size

2 Symbol for Ball Valve Type

Symbol	Type	Symbol	Type
B	2-pcs Floating type in casting	BT	2-pcs side entry Trunnion Mounted type
BA	1-pc Floating type	BS	3-pcs side entry Trunnion Mounted type
BB	2-pcs Floating type in forging	BE	Top Entry Trunnion Mounted type
BC	3-pcs Floating type	BM	Metal Seated Floating type

3 ANSI Class

Code Class (LB)	1	3	6	8	9	15	25
	150	300	600	800	900	1500	2500

4 End Connection

Symbol	End	Symbol	End
R	Raised face flanged end	W	Walter
J	RTJ flanged end	S	Socket welding end
B	Butt-welding end	N	Screwed end

6 Trim Code

Seat Insert		O-ring		Stem		Ball		Seat	
Code	Material	Code	Material	Code	Material	Code	Material	Code	Material
1	PTFE	1	NBR	1	F6a	1	F6a	1	F6a
2	NYLON	2	VITON	2	F304	2	F304	2	F304
3	PEEK	3	VITON AED	3	A105/ENP	3	A105/ENP	3	A105/ENP
		4	VITON B	4	17-4PH	4	17-4PH	4	17-4PH
		5	HSN	5	AISI 4140	5	AISI 4140	5	AISI 4140
				6	F316	6	F316	6	F316
				7	F304L	7	F304L	7	F304L
				8	F316L	8	F316L	8	F316L
				9	LF2/ENP	9	LF2/ENP	9	LF2/ENP

5 Shell Material

● How to Order

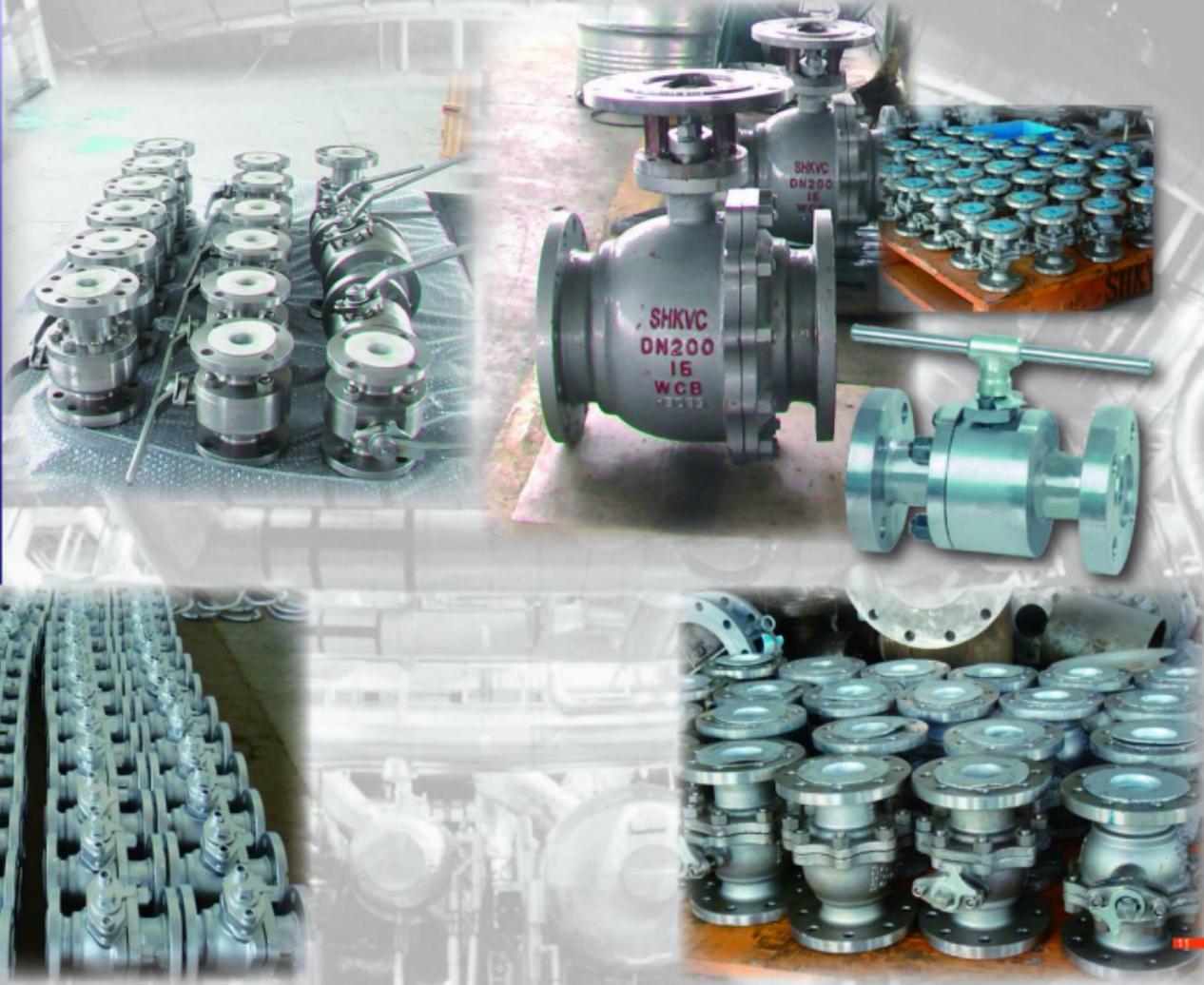
Material	Symbol	Classification Steel	ASTM Ref.	Recommended Temperature Limits		Application
				°C	°F	
WCB (A105)	A	Carbon	A216 Grade WCB	-29 to 425	-20 to 800	Steam, water oil, oil vapour, gas and general service
LCB (LF2)	B	Carbon	A352 Grade LCB	-46 to 350	-50 to 650	Low temperature
LCC	C	Carbon	A352 Grade LCC	-46 to 350	-50 to 650	
WC 6 (F11)	D	Chromium Moly 1.25%Cr,0.5% Mo	A217 Grade WC 6	-29 to 590	-20 to 1100	Steam, water oil, oil vapour, gas and general service
WC 9 (F22)	E	Chromium Moly 2.25%Cr,1% Mo	A217 Grade WC 9	-29 to 590	-20 to 1100	
C 5	F	Chromium Moly 5%Cr,0.5% Mo	A217 Grade C 5	-29 to 650	-20 to 1200	Corrosive/ erosive oil refinery service
CF8M (316)	G	Stainless 18%Cr,9% Ni 2%Mo	A351 Grade CF8M	-196 to 815	-320 to 1500	High and low temperature corrosion resistance
CF 8 (304)	H	Stainless 18%Cr,8% Ni	A351 Grade CF 8	-196 to 815	-320 to 1500	
CF3M (316L)	I	Low Carbon Stainless 18%Cr,9% Ni 2%Mo	A351 Grade CF3M	-196 to 815	-320 to 1500	Cryogenic service is also available upon request
CF 3 (304L)	J	Low Carbon Stainless 18%Cr,8% Ni	A351 Grade CF 3	-196 to 815	-320 to 1500	
CF7M Alloy 20	P	Stainless 19%Cr,29% Ni	A351 Grade CF7M	-196 to 425	-320 to 800	Corrosion resistance

7 Others

Symbol	Description	Symbol	Description
G	Lever handle	EB	Extended bonnet
R	Gear operator	ES	Extended spindle
M	Reduce bore	I	Indicator
P	Electric actuator	NC	NACE MR0175 requirements
	Pneumatic actuator	GL	Seat and stem injection

Floating Ball Valve

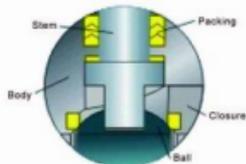
SHK floating ball valve contains 3 main series: BA series for one-piece uni-body design, B series for two-piece, split body design and BB series for forged steel split body design, all designed conform to BS 5351 and fire safe test are satisfied to BS 6755 and API 607. Wide range of body and trim material is available for service working temperature from -196°C to 200°C, size from 1/2" to 12" and pressure rating from ANSI class 150 to 2500 or for sour service to NACE MR0175 is also available upon request.



● Floating Ball Valve Design Feature

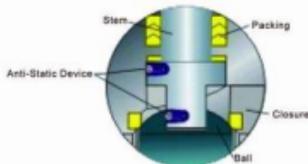
Blow-out Proof Stem

Stem lower end is integral T shaped designed to be blow-out proof. It is internally inserted and functions as the backseat for assured stem sealing at all pressures.



Anti-Static Device

When static are generated and concentrated on the ball, the spring-loaded pins installed on ball, stem are provided to ensure electrical continuity throughout the valve.

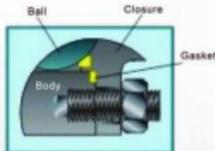
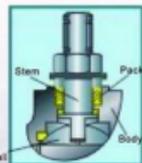


Fire Safe Seat Sealing

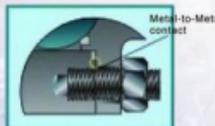
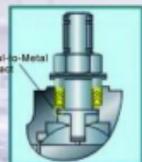
When non-metal sealing material are decomposed or deteriorated by a plant fire, the upstream line pressure pull the ball into contact with the metal seat lip beneath the soft seat to shut off the line fluid to minimize the internal leakage.

Additionally, the fire safe metal seat can prevent the line pressure erosion on soft seat and minimize soft seat creep deformation. All SHK floating valves fire safe is designed and test certified in accordance with API 607.

Before Fire



After Fire



● Low Emission Control

Design Feature:

Live Loaded Gland Flange

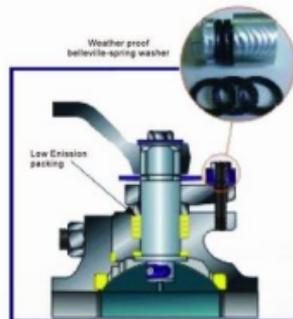
Live loading is designed to provide gland load retention, compensating for expected in-service consolidation of the packing. A set of Belleville-Spring Washers are used on each gland stud to help exert a continuous compressive force on the gland follower flange and therefore reduce fugitive emissions from the stem packing. SHK standard Belleville-Spring Washers are protected by a weatherproof cap to keep them free from environmental contamination, resulting in a long stable life.

Low Emission Packing

The packing set is a combination of parallel and vertical layer sealing elements, which are made of expanding graphite in die-formed rings and have features of heat resistance, less stress relaxation and low creep. With this special structure, it allows for a low-friction on rotary & rising stem valves, therefore providing the stabilized seal performance for long cycle life.

For the elimination of air pollution, it is essential to control the fugitive emissions leakage of various chemicals from valves in your chemical plant.

SHK low emissions ball valves installed with our emissions defense packing have been designed and tested to meet the 100 PPM maximum emission level (acceptance test per Shell SPE 77/312). This is SHK standard specification for all series BA, B and BB flanged floating ball valve.



For medium and low temperature service, the standard V shape PTFE packing rings are installed for low emission control.

Controlled Stem & Stuffing Box Finish

The stem surface finish is controlled between Ra0.4 and Ra0.8 which will ensure the graphite to fill and migrate into the stems micro scratches, and function as a lubricant to reduce stem leakage. The stuffing box surface is controlled to a maximum of Ra3.2, a reasonably rougher surface finish to allow for better holding of the packing ring and results in a better sealing performance.



SHK Series BA Ball Valve

Regular port, uni-body, end entry design

Featuring a uni-body and screwed-in adapter with flanged end floating ball, **SHK** BA series ball valve is available in size from 1/2" to 10" offers ANSI class rating 150 to 300 and temperature ratings of -46°C to 200°C, and meets the fire safe requirements of BS 6755 and API 607.

The standard design includes: blow-out-proof stem, anti-static device and locking device. Low emission packing with live loaded gland flange design can be available upon request. Manual handle operation is standard, but fully machined mounting pad can also easily be installed with gear, motor or pneumatic operator.

Double "D" Stem Head
Provides mounting of the lever handle always in parallel to the flow passage

Secure Line Flow
Equipped with an integral locking device to secure the line flow

Blow-out Proof Stem
Internally inserted and functions as the backseat for assured stem sealing at all pressures

Emission-free Graphite
primary gasket

Metal-to-Metal Sealing
When non-metal sealing is deteriorated by fire ball floats to shut off line fluid

This is a typical **SHK** series BA floating ball valve illustrated cross-section drawing which is only for demonstrating of basic design features. The actual product design may be slightly different from this sample drawing due to its size and pressure class.

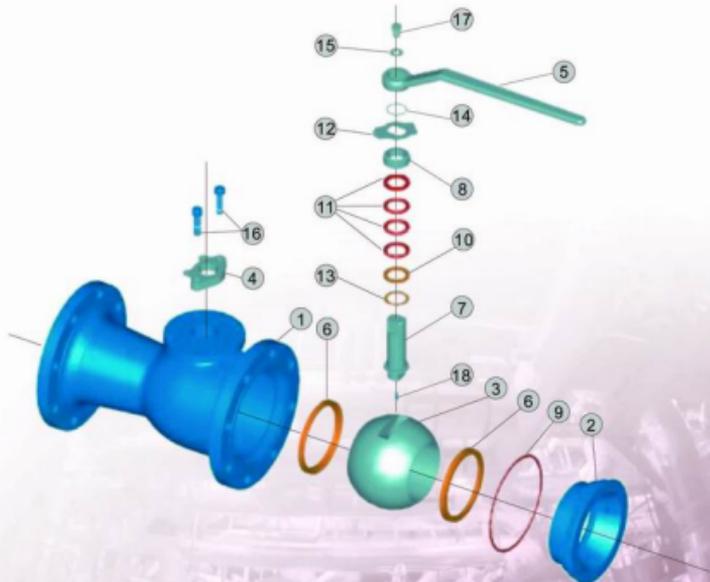
Integrated solutions for industrial valves.

SHK

● Series BA Ball Valve

Index no	Part
1	Body
2	Closure
3	Ball
4	Gland Flange
5	Lever
6	Seat Ring
7	Stem
8	Gland
9	Gasket

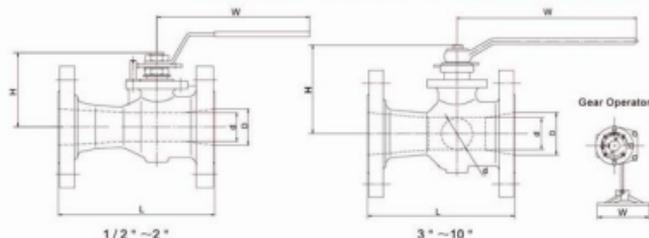
Index no	Part
10	Grounding Washer
11	Packing Set
12	Stop Plate
13	Thrust Washer
14	Retainer
15	Washer
16	Bolt
17	Rotating
18	Spring



● Series BA material specifications

No.	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A352-LCB
2	Closure	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A352-LCB
3	Ball	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A182-F316
4	Gland Flange	ASTM A216-WCB	ASTM A351-CF8	ASTM A216-WCB	ASTM A352-LCB
5	Lever	Ductile Iron	Ductile Iron	Ductile Iron	Ductile Iron
6	Seal Ring	PTFE	PTFE	PTFE	PTFE
7	Stem	ASTM A182-F6a	ASTM A182-F316	ASTM A182-F6a	ASTM A182-F316
8	Gland	ASTM A276-420	ASTM A182-F316	ASTM A276-420	ASTM A182-F316
9	Gasket	Graphite	316 + Graphite	Graphite	316 + Graphite
10	Grounding Washer	Graphite	Graphite	Graphite	Graphite
11	Packing Set	PTFE	PTFE	PTFE	PTFE
12	Stop Plate	Carbon Steel	S.S.	Carbon Steel	S.S.
13	Thrust Washer	PTFE	PTFE	PTFE	PTFE
14	Retainer	Carbon Steel	S.S.	Carbon Steel	S.S.
15	Washer	S.S.	S.S.	S.S.	S.S.
16	Bolt	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
17	Retaining	Carbon Steel	S.S.	Carbon Steel	S.S.
18	Spring	Carbon Steel	S.S.	Carbon Steel	S.S.

● Regular port, uni-body, cast steel, end entry design



Dimensions

	Size in	d mm	D mm	L mm	H mm	W mm	Weight Kg
Class 150LB	1 / 2	9.5	12.7	108	54	120	1.7
	3 / 4	12.7	19	117	59	140	2.7
	1	19	25.4	127	64	140	3.8
	1-1/2	30	38	165	90	160	6.7
	2	38	51	178	102	265	8.8
	2-1/2	51	64	191	112	265	12.4
	3	64	76	203	121	265	15.4
	4	76	102	229	166	300	29
	6	114	152	267	208	400	54
	8	144	203	292	246	300 *	80
Class 300LB	10	187	254	330	303	400 *	150
	1 / 2	9.5	12.7	140	54	120	2.8
	3 / 4	12.7	19	152	59	140	3.6
	1	19	25.4	165	64	140	4.8
	1-1/2	30	38	190	90	160	9.6
	2	38	51	216	102	265	11
	2-1/2	51	64	241	112	265	15.1
	3	64	76	263	121	265	22.5
	4	76	102	305	166	300	40
	6	114	152	403	208	300 *	81.5
8	144	203	419	246	400 *	125	
10	187	254	457	303	400 *	206	

* Gear Operator

SHK Series B Ball Valve

Two-piece, split body, cast steel, side entry design

This series ball valves are featured with two-piece bolted carbon steel with flanged end body and floating ball. BA series ball valve is available in size from 1/2" to 12" full port or regular port and offers ANSI class rating 150 to 300 and temperature ratings of -46°C to 200°C. All valves meet the requirements of BS5351, 6755 and API 607. Fire safe tests have been witnessed and certified by Lloyd's Register.

NACE standard MR0175 requirement can be satisfied for Sour Gas service application. A wide selection of soft seat material: Teflon, PEEK, Delrin, Polyphenylene are available for different working pressure and temperature rating.

Blowout-proof stem, anti-static device and locking device are standard design. Low emission packing with live loaded gland flange design can be available upon request. Manual handle operation is basic standard, but fully machined mounting pad can also easily install with gear, motor or pneumatic operator.

This series ball valve also has cryogenic and super metal seated design for servicing in working temperature down to -196°C or above 400°C, details please refer to page 54-57.

Double "D" Stem Head
Provides mounting of the lever handle always in parallel to the flow passage

Blow-out Proof Stem
Internally inserted and functions as the backseat for assured stem sealing at all pressures

Metal-to-Metal Sealing
When non-metal sealing is deteriorated by fire, ball floats to shut off the line fluid

ISO 5210 mounting yoke
easily for installation of gear, motor or pneumatic actuator

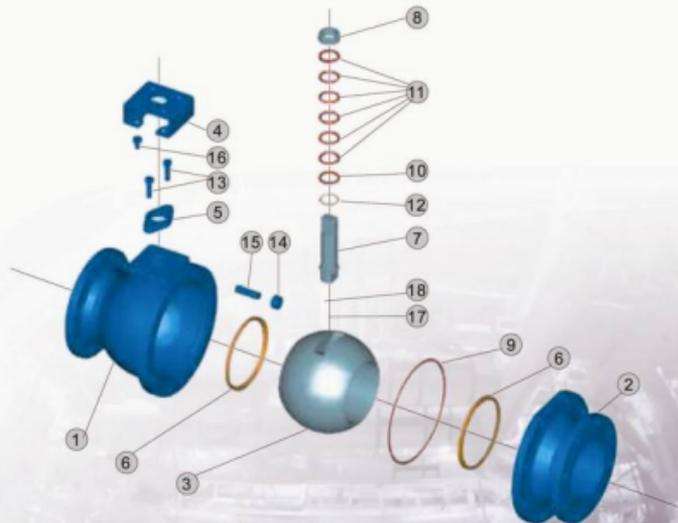
Emission-free Graphite primary gasket

This is a typical SHK series B floating ball valve illustrated cross-section drawing which is only for demonstrating of basic design features. The actual product design may be slightly different from this sample drawing due to its size and pressure class.

● Series B Ball Valve

Index no	Part
1	Body
2	Closure
3	Ball
4	Yoke
5	Gland Flange
6	Seat Ring
7	Stem
8	Gland
9	Gasket

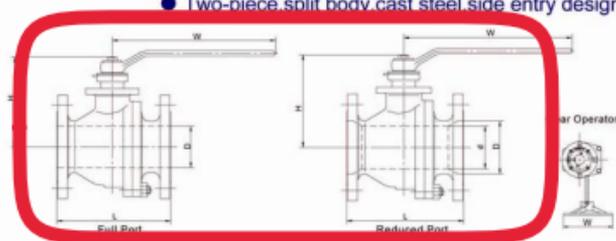
Index no	Part
10	Grounding Washer
11	Packing Set
12	Thrust Washer
13	Stud
14	Nut
15	Bolt
16	Bolt
17	Spring
18	Steel Ball



● Series B material specifications

No.	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A352-LCB
2	Closure	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A352-LCB
3	Ball	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A182-F316
4	Yoke	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A216-WCB
5	Gland Flange	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A216-WCB
6	Seat Ring	PTFE	PTFE	PTFE	PTFE
7	Stem	ASTM A182-F6a	ASTM A182-F316	ASTM A182-F6a	ASTM A182-F316
8	Gland	ASTM A276-420	ASTM A182-F316	ASTM A276-420	ASTM A182-F316
9	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
10	Grounding Washer	Graphite	Graphite	Graphite	Graphite
11	Packing Set	PTFE	PTFE	PTFE	PTFE
12	Thrust Washer	PTFE	PTFE	PTFE	PTFE
13	Stud	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
14	Nut	ASTM A194-2H	ASTM A194-B	ASTM A194-2HM	ASTM A194-7M
15	Bolt	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
16	Bolt	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
17	Spring	S.S.	S.S.	S.S.	S.S.
18	Steel Ball	S.S.	S.S.	S.S.	S.S.

● Two-piece split body cast steel side entry design



Dimensions

Size in	Full Port					Weight Kg	Reduced Port						Weight Kg
	D mm	L mm	H mm	W mm	Size in		d mm	D mm	L mm	H mm	W mm		
1/2	13	108	59	130	2.3	3/4"102/34	13	19	117	82	130	3.0	
3/4	19	117	63	130	3.0	1"34"1	19	25	127	85	130	4.5	
1	25	127	76	160	4.5	1-1/2"152	25	38	165	100	160	7.0	
1-1/2	38	165	97	230	7.0	2"152/2	38	51	178	115	230	9.5	
2	51	178	107	230	9.5								
2-1/2	64	191	142	400	15.0	2 1/2"192/3	64	76	203	153	400	19.0	
3	76	203	152	400	19.0								
4	102	229	178	700	33.0	4"178	102	152	394	191	460	58.0	
5	125	356	252	1100	58.0	5"178	152	203	457	290	300 *	93.0	
6	152	394	272	300 *	93.0	6"178	203	254	530	340	300 *	160.0	
8	203	457	342	300 *	160.0	8"178/10	254	305	610	442	400 *	230.0	
10	254	533	345	400 *	200.0								
12	305	610	479	600 *	346.0								
1 1/2	13	140	59	130	2.5	3/4"102/34	13	19	152	82	130	3.5	
3/4	19	152	63	130	3.5	1"34"1	19	25	165	85	130	5.5	
1	25	165	75	160	5.5	1-1/2"152	25	38	190	100	160	10.0	
1-1/2	38	190	97	230	10.0	2"152/2	38	51	216	115	230	14.5	
2	51	216	107	230	15.0	2-1/2"192/3	51	64	241	120	230	23.5	
2-1/2	64	241	142	400	26.0	2 1/2"192/3	64	76	283	153	400	30.0	
3	76	283	152	400	35.0	3"192/3	76	102	305	162	400	55.0	
4	102	305	178	700	56.0	4"192/3	102	152	403	191	460	81.0	
5	125	381	252	1100	93.0	5"192/3	152	203	502	290	300 *	118.0	
6	152	403	272	300 *	116.0	6"192/3	203	254	568	340	400 *	200.0	
8	203	502	342	400 *	233.0								
10	254	568	345	400 *	433.0								

* Gear Operator

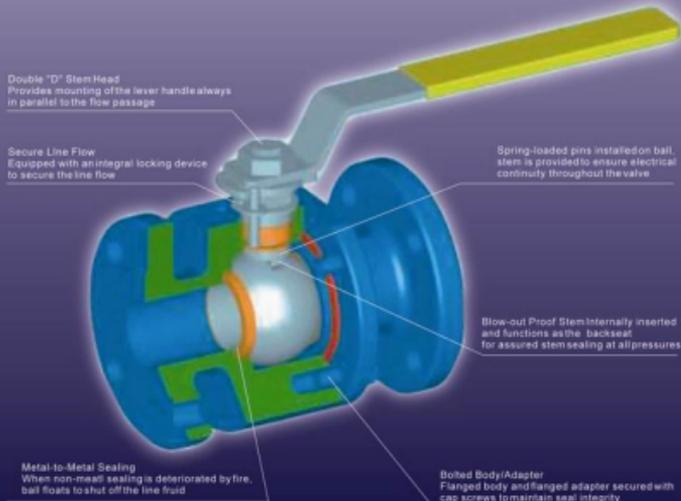
SHK Series BB Ball Valve

Two-piece, split body, forged steel, side entry design

This series ball valves are featured with two-piece bolted with flanged end body and floating ball. Body and closure are fully forged steel made which eliminate the inevitable casting defects and is ideal for high pressure service. BB series ball valves are available in size from 1/2" to 4" and offers ANSI class rating 600 to 2500, all meet the fire safe requirements of BS 6755 and API 607.

Blowout-proof stem, anti-static device and locking device are standard design, low emission packing with live loaded gland flange design can be available upon request. Manual handle operation is basic standard, but fully machined mounting pad can also easily install with gear, motor or pneumatic operator.

ANSI Class 150 to 300 and Three-piece design can be supplied upon request.

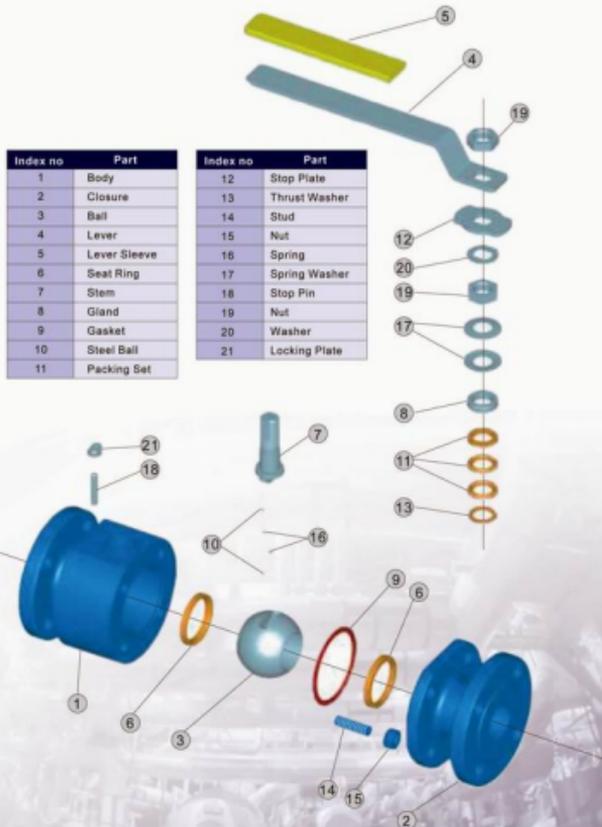


This is a typical SHK series BB floating ball valve illustrated cross-section drawing which is only for demonstrating of basic design features. The actual product design may be slightly different from this sample drawing due to its size and pressure class.

Integrated solutions for industrial valves.

SHK

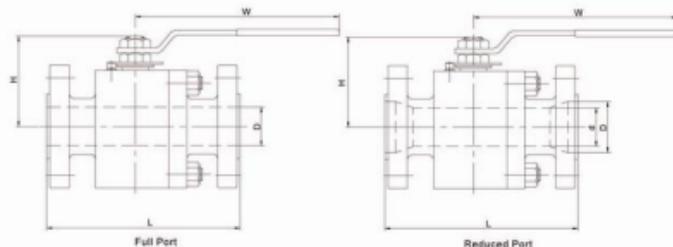
● Series BB Ball Valve



● Series BB material specifications

No.	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
2	Closure	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
3	Ball	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A182-F316
4	Lever	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel
5	Lever Sleeve	Polyethylene	Polyethylene	Polyethylene	Polyethylene
6	Seat Ring	PTFE	PTFE	PTFE	PTFE
7	Stem	ASTM A182-F6a	ASTM A182-F316	ASTM A182-F6a	ASTM A182-F316
8	Gland	ASTM A276-420	ASTM A182-F316	ASTM A276-420	ASTM A182-F316
9	Gasket	Graphite	Graphite	Graphite	316 + Graphite
10	Steel Ball	S.S.	S.S.	S.S.	S.S.
11	Packing Set	PTFE	PTFE	PTFE	PTFE
12	Stop Plate	Carbon Steel	S.S.	Carbon Steel	S.S.
13	Thrust Washer	PTFE	PTFE	PTFE	PTFE
14	Stud	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
15	Nut	ASTM A194-2H	ASTM A194-8	ASTM A194-2HM	ASTM A194-7M
16	Spring	S.S.	S.S.	S.S.	S.S.
17	Spring Washer	Alloy Steel	Alloy Steel	Alloy Steel	Alloy Steel
18	Stop Pin	Carbon Steel	S.S.	Carbon Steel	S.S.
19	Nut	Carbon Steel	S.S.	Carbon Steel	S.S.
20	Washer	Carbon Steel	S.S.	Carbon Steel	S.S.
21	Locking Plate	Carbon Steel	S.S.	Carbon Steel	S.S.

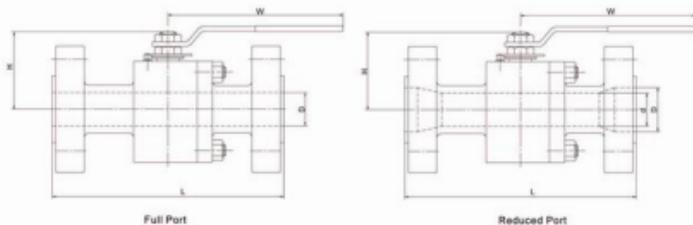
● Two-piece, split body, forged steel, side entry design



Dimensions

Size in	Full Port					Weight Kg		Reduced Port					Weight Kg	
	D mm	L mm	H mm	W mm				d mm	D mm	L mm	H mm	W mm		
1/2	13	165	86	160	3.5	600LB	1/2"114"12	7	13	165	43	130	2.9	
3/4	19	191	88	170	5.1		3/4"112"34	13	19	191	66	180	3.8	
1	25	216	90	170	6.5		1"94"1	19	25	216	88	170	5.3	
1-1/2	38	241	120	280	13.2		1-1/2"111-12	25	38	241	90	170	10.6	
2	51	292	135	300	16.7		2"1-5/2"2	38	51	292	120	280	13	
3	76	356	180	450	34.0		3"2"3	51	76	356	135	300	29.7	
4	102	432	224	500	48.8		4"3"4	76	102	432	180	450	43	
1/2	13	216	83	170	8.5		900LB	1/2"114"12	7	13	216	70	140	7.5
3/4	19	229	112	170	11.0			3/4"112"34	13	19	229	83	170	10.0
1	25	254	123	130	16.0			1"94"1	19	25	254	112	170	15.0
1-1/2	38	305	143	300	30.0	1-1/2"1-5/2"1-5/2		25	38	305	123	230	28.0	
2	51	368	177	350	45.0	2"1-5/2"2		38	51	368	143	300	40.0	
3	76	381	200	450	85.0	3"2-1/2"3		51	76	381	177	350	77.0	

- Two-piece, split body, forged steel, side entry design



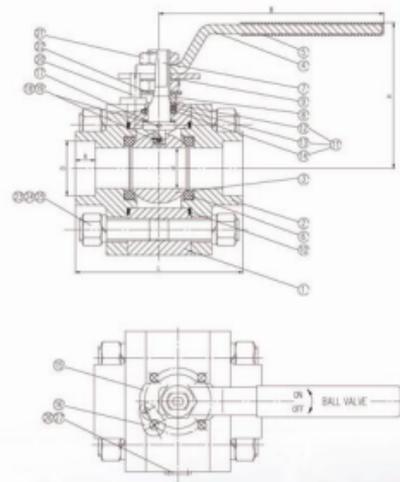
Dimensions

		Full Port					Reduced Port						
Size in	D mm	L mm	H mm	W mm	Weight Kg	Size in	d mm	D mm	L mm	H mm	W mm	Weight Kg	
1/2	13	216	83	230	8.5	1500LB	5/2"14"12	7	13	216	70	170	7.5
3/4	19	229	112	230	11.0		3/4"12"34	13	19	229	83	230	10.0
1	25	254	123	300	16.0		1"3/8"1	19	25	254	112	230	15.0
1-1/2	38	305	143	400	30.0		1-1/2"1-1/2	25	38	305	123	300	28.0
2	51	368	177	450	45.0		2"1-1/2"2	38	51	368	143	400	40.0
3	76	470	200	700	90.0		3"2"3	51	76	470	177	450	82.0
1/2	13	264	88	230	9.0	2500LB	5/2"14"12	7	13	264	75	170	8.0
3/4	19	273	117	230	15.0		3/4"12"34	13	19	273	88	230	14.0
1	25	308	128	300	17.5		1"3/8"1	19	25	308	117	230	16.0
1-1/2	38	368	148	400	34.0		1-1/2"1-1/2	25	38	368	128	300	32.0
2	51	451	183	450	55.0		2"1-1/2"2	38	51	451	148	400	52.0
3	76	578	205	700	110.0		3"2"3	51	76	578	183	450	102.0

- Three-piece, split body, forged steel, side entry design

Part List

No.	Part
1	Body
2	Closure
3	Ball
4	Lever
5	Lever Sleeve
6	Seat Ring
7	Stem
8	Gland
9	Stop Washer
10	Gasket
11	Packing Assembly
12	Top Packing
13	Middle Packing
14	Bottom Packing
15	Stop Plate
16	Lock Plate
17	Thrust Washer
18	Steel Ball
19	Spring
20	Stop Pin
21	Nut
22	Dish Spring
23	Stud
24	Spring Washer
25	Nut
26	Rivet
27	Name Plate



Dimension of 800LB/1500LB (full port)

DN	d	D	H	A	L	B
1/2"	12.7	22	73	9.5	80	150
3/4"	19	27.4	78	12.5	95	170
1"	25.4	34	95	12.5	110	170
1-1/2"	38	48.8	114	12.5	140	250
2"	51	61.2	140	16	165	300

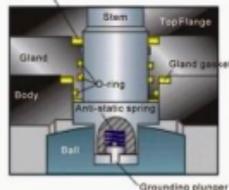
Trunnion Mounted Ball Valve

SHK trunnion mounted ball valve contains 3 main series: BT series for cast steel two-piece design, BS series for forged steel three-piece design and BE series for top entry uni-body design, all designed conform to API 6D and fire safe test are satisfied to BS 6755 and API 6FA. They are available in size from 2" to 48" Wide range of body and trim material is available for service temperature from -46°C to 200°C and pressure rating from ANSI class 150 to 1500 or for sour service to NACE MR0175.



● Trunnion Mounted Ball Valve Design Feature

Stem fire safe packing



Anti Blow-out Stem

The stem is made separately from the ball. The lower end of the stem is designed with an integral collar to be blow-out-proof.

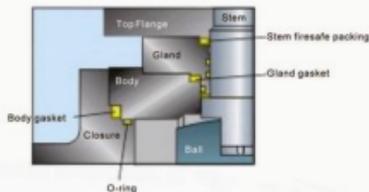
Anti-static Device

Anti-static device is a standard feature of ball valve. A spring-loaded pin assures the electrical continuity between ball stem and body, so as to avoid sparks during turning of the stem to open and close the valve, which could be dangerous in case of hazardous area installation.

Super Fire safe design

External leakage prevention

Leakage from the valve stem area is prevented by double sealing with 2 O-rings and gland gasket. Leakage through the valve body joint is also blocked by double sealing with O-ring and body gasket. After a fire has deteriorated O-rings, gland gasket, body gasket and stem fire safe packing are the measure that prevents external fluid leakage.

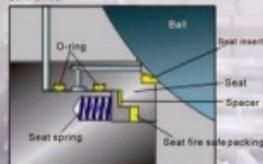


Internal leakage prevention

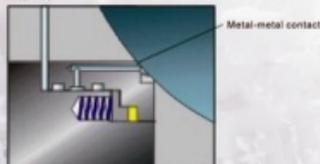
When non-metal materials such as O-ring, seat insert and spacer are decomposed or deteriorated by fire, the edge of the metal seat preloaded by the seat spring comes into contact with the

Ball to shut off the line fluid to minimize internal leakage through the valve bore. Also the fire safe flexible graphite seat packing will be compressed by the seat spring to prevent fluid leakage between the valve body and the seat.

Before Fire



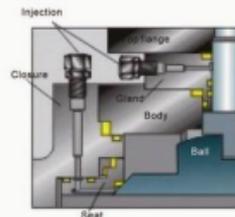
After Fire



● Trunnion Mounted Ball Valve Design Feature

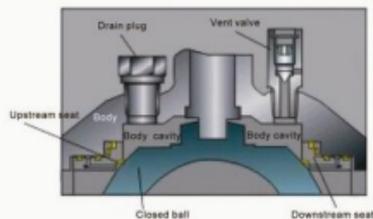
Emergency sealant injection system

For 6 inch and larger Trunnion mounted ball valves will be installed with a sealant injection fittings on both stem and seats. When the sealing materials (seat sealing or stem o-ring) are damaged or decomposed by fire or other accidental causes, leakage from the seat and stem can be prevented by injection of sealant into these fittings. Fitting is also internally installed a second check valve to provides backup sealing.

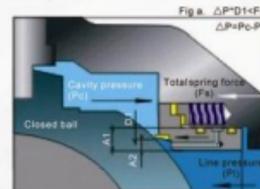


Double block and bleed

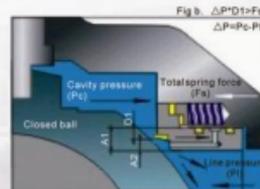
Each ball seats shut off the line fluid independently on the upstream and downstream side, allowing double block operation. When the pressure is simultaneously applied to both sides of the ball in closed position, the valve bore and the body cavity will be isolated from each other, and the residue within the body cavity can be released through the drain plug.



Cavity Pressure Relief



When cavity pressure (P_c) is lower than seat spring and line pressure (P_l), i.e. $\Delta P^*D1 < F_s$, then contact between ball and seat ring is assured to provide a tight seal.



When cavity pressure (P_c) is higher than seat spring and line pressure, i.e. $\Delta P^*D1 > F_s$, the self relieving action allows that valve seat will move slightly away from the ball surface, therefore any over pressure acting in the body cavity is discharged into the line to restore the body balance between the body cavity and line (either upstream or downstream).

SHK Series BT Ball Valve

Two-piece, split body, cast steel, trunnion mounted design

This series ball valves are trunnion mounted supported which provide excellent tightness over an extensive range of temperatures and pressures. They are available in size from 2" to 24" and offers ANSI class rating 150 to 1500, temperature ratings from -46°C to 200°C.

Valves are designed and manufactured in conformance with specification of API 6D, fire safe tested to BS 6755 and API 6FA have been witnessed and certified by Lloyd's Register that qualify this series of valves for virtually all oil and gas services.

All BT series ball valves are featured with trunnion mounted ball and unique spring loaded seats which provides bubble-tight shut off and low operating torques even at low different pressure. A large trunnion design ensures central positioning under the highest working pressure.

Detailed design features are exhibited in page 30, 31.



This is a typical SHK Series BT trunnion mounted ball valve illustrated cross-section drawing which is only for demonstrating of basic design features. The actual product design may be slightly different from this sample drawing due to its size and pressure class.

Integrated solutions for industrial valves.

SHK

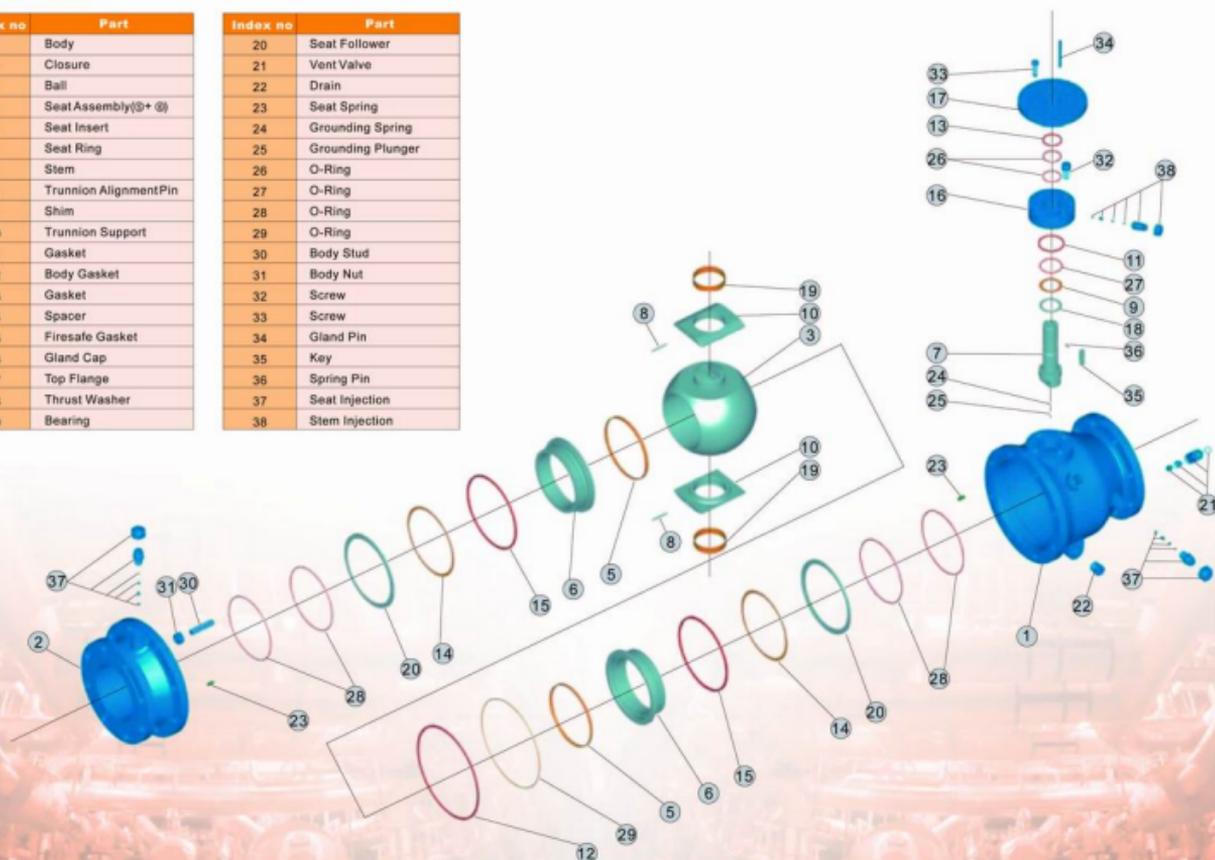
● Series BT material specifications

No.	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A352-LCB
2	Closure	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A352-LCB
3	Ball	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
4	Seat Assembly	Assembled By No.586	Assembled By No.586	Assembled By No.586	Assembled By No.586
5	Seat Insert	25% Glass-filled PTFE	25% Glass-filled PTFE	25% Glass-filled PTFE	25% Glass-filled PTFE
6	Seat Ring	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
7	Stem	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
8	Trunnion Alignment Pin	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
9	Shims	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
10	Trunnion Support	ASTM A216-WCB/ENP	ASTM A351-CF8M	ASTM A216-WCB/ENP	ASTM A352-LCB/ENP
11	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
12	Body Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
13	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
14	Spacer	PTFE	PTFE	PTFE	PTFE
15	Fire-safe Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
16	Gland Cap	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
17	Top Flange	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
18	Thrust Washer	316 + PTFE + MoS2			
19	Bearing	316 + PTFE + MoS2			
20	Seat Follower	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
21	Vent Valve Assembly	Assembly	Assembly	Assembly	Assembly
22	Drain	S.S.	S.S.	S.S.	S.S.
23	Seat Spring	Inconel X-750	Inconel X-750	Inconel X-750	Inconel X-750
24	Grounding Spring	S.S.	S.S.	S.S.	S.S.
25	Grounding Plunger	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
26	O-Ring	NBR	NBR	NBR	NBR
27	O-Ring	NBR	NBR	NBR	NBR
28	O-Ring	NBR	NBR	NBR	NBR
29	O-Ring	NBR	NBR	NBR	NBR
30	Body Stud	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
31	Body Nut	ASTM A194-2H	ASTM A194-8	ASTM A194-2HM	ASTM A194-7M
32	Screw	Carbon Steel	S.S.	Carbon Steel	ASTM A320-L7M
33	Screw	Carbon Steel	S.S.	Carbon Steel	ASTM A320-L7M
34	Gland Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
35	Key	Carbon Steel	S.S.	Carbon Steel	ASTM A182-F304
36	Spring Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
37	Seat Injection Assembly	Assembly	Assembly	Assembly	Assembly
38	Stem Injection Assembly	Assembly	Assembly	Assembly	Assembly

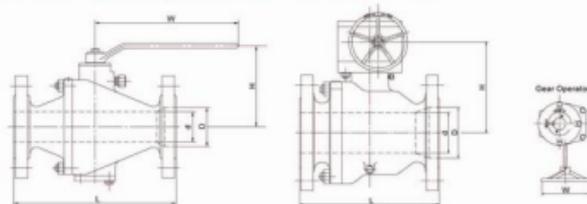
● Series BT Ball Valve

Index no	Part
1	Body
2	Closure
3	Ball
4	Seat Assembly(⊕+ ⊗)
5	Seat Insert
6	Seat Ring
7	Stem
8	Trunnion Alignment Pin
9	Shim
10	Trunnion Support
11	Gasket
12	Body Gasket
13	Gasket
14	Spacer
15	Firesafe Gasket
16	Gland Cap
17	Top Flange
18	Thrust Washer
19	Bearing

Index no	Part
20	Seat Follower
21	Vent Valve
22	Drain
23	Seat Spring
24	Grounding Spring
25	Grounding Plunger
26	O-Ring
27	O-Ring
28	O-Ring
29	O-Ring
30	Body Stud
31	Body Nut
32	Screw
33	Screw
34	Gland Pin
35	Key
36	Spring Pin
37	Seat Injection
38	Stem Injection



- Two-piece, split body, cast steel, side entry design

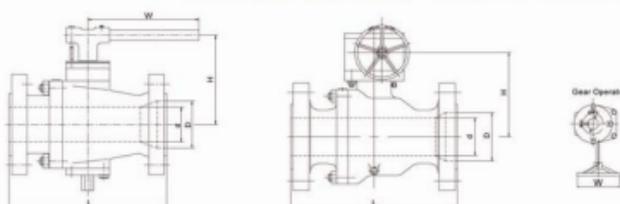


Dimensions

Size	Full Port					Weight Kg	Size	Reduced Port					Weight Kg
	d mm	L mm	H mm	W mm	D mm			L mm	H mm	W mm	D mm		
2	51	178	165	230	17	150LB	2"2"3	51	76	203	165	230	30
3	76	203	193	400	33		4"2"4	76	102	229	193	400	47
4	102	229	231	460	50		6"4"6	102	152	394	231	400	90
6	152	394	329	1000	93		8"6"8	152	203	457	329	460	161
8	203	457	393	*500	166		10"8"10	203	254	533	393	1000	268
10	254	533	401	*500	273		12"10"12	254	305	610	393	*500	467
12	305	610	441	*500	475		14"12"14	305	337	686	441	*500	580
14	337	686	481	*500	570		16"14"16	337	367	762	481	*500	766
16	387	762	598	*500	778		18"16"18	387	438	864	598	*500	902
18	438	864	643	*500	935		20"18"20	438	489	914	643	*500	1130
20	489	914	708	*500	1190		22"20"22	438	540	1018	643	*500	1300
22	540	1018	798	*500	1346		24"22"24	489	591	1067	708	*500	1520
24	591	1067	863	*500	1579								
2	51	216	165	230	18	300LB	2"2"3	51	76	283	165	230	38
3	76	283	193	400	40		4"2"4	76	102	305	193	400	60
4	102	305	231	750	83		6"4"6	102	152	403	231	750	147
6	152	403	329	1000	150		8"6"8	152	203	502	329	1000	234
8	203	502	393	1500	240		10"8"10	203	254	568	393	1500	295
10	254	568	401	*500	305		12"10"12	254	305	648	393	*500	488
12	305	648	441	*500	507		14"12"14	305	337	762	441	*500	570
14	337	762	481	*500	602		16"14"16	337	367	838	481	*500	910
16	387	838	598	*500	1000		18"16"18	387	438	914	598	*500	1020
18	438	914	643	*500	1160		20"18"20	438	489	991	643	*500	1280
20	489	991	708	*500	1320		22"20"22	438	540	1092	643	*500	1390
22	540	1092	798	*500	1540		24"22"24	489	591	1143	708	*500	1670
24	591	1143	863	*500	1874								

* Gear Operator

- Two-piece, split body, cast steel, side entry design

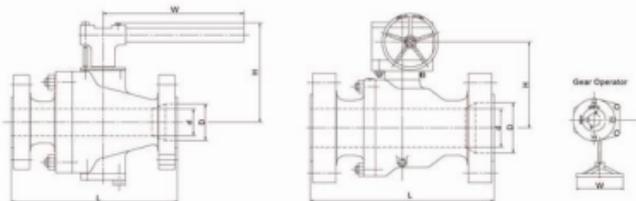


Dimensions

Size	Full Port					Weight Kg	Size	Reduced Port					Weight Kg
	d mm	L mm	H mm	W mm	D mm			L mm	H mm	W mm	D mm		
2	51	292	176	400	27	600LB	2"2"3	51	76	356	176	400	41
3	76	356	247	750	50		4"2"4	76	102	432	247	750	70
4	102	432	276	1000	80		6"4"6	102	152	559	276	1000	122
6	152	559	363	1500	220		8"6"8	152	203	660	363	1500	255
8	203	660	363	*500	350		10"8"10	203	254	787	363	*500	440
10	254	787	426	*500	600		12"10"12	254	305	838	426	*500	6620
12	305	838	548	*500	820		14"12"14	305	337	889	548	*500	1060
14	337	889	598	*500	1130		16"14"16	337	367	991	598	*500	1440
16	387	991	648	*500	1550		18"16"18	387	438	1092	648	*500	1890
18	438	1092	740	*500	2100		20"18"20	438	489	1194	740	*500	2400
20	489	1194	810	*500	2800		24"20"24	489	591	1397	810	*500	3240
24	591	1397	920	*500	3626								
2	51	368	192	460	52	900LB	2"2"3	51	76	381	192	460	83
3	76	381	279	1000	97		4"2"4	76	102	457	279	1000	103
4	102	457	315	1500	138		6"4"6	102	152	610	315	1500	201
6	152	610	323	*500	288		8"6"8	152	203	737	323	*500	348
8	203	737	381	*500	448		10"8"10	203	254	838	381	*500	598
10	254	838	518	*500	748		12"10"12	254	305	965	518	*500	788
12	305	965	568	*500	1018		14"12"14	305	324	1029	568	*500	1100
14	324	1029	665	*500	1398		16"14"16	324	375	1130	665	*500	1420
16	375	1130	730	*500	1828		18"16"18	375	426	1219	730	*500	1928
18	426	1219	795	*500	2328		20"18"20	426	473	1321	795	*500	2428
20	473	1321	825	*610	2928		24"20"24	473	572	1549	825	*610	3578
24	572	1549	973	*610	4178								

* Gear Operator

● Two-piece, split body, cast steel, side entry design



Dimensions

Size in	Full Port					Weight Kg	1500LB	Size in	Reduced Port					Weight Kg
	D mm	L mm	H mm	W mm					d mm	D mm	L mm	H mm	W mm	
2	51	368	252	750	86		2 1/2	51	76	470	252	750	98	
3	76	470	300	1500	136		3	76	102	546	300	1500	138	
4	102	546	272	*500	221		4	102	146	705	272	*500	288	
6	146	705	341	*500	388		6	146	194	832	341	*500	448	
8	194	832	493	*500	580		8	194	241	991	493	*500	748	
10	241	991	565	*500	948		10	241	289	1130	565	*500	1020	
12	289	1130	700	*500	1338		12	289	318	1257	700	*500	1400	
14	318	1257	747	*500	1748		14	318	362	1384	747	*500	1820	
16	362	1384	795	*610	2228		16	362	410	1537	795	*610	2328	
18	410	1537	877	*610	2850		18	410	454	1664	877	*610	4150	
20	454	1664	985	*610	4860									

* Gear Operator

SHK Series BS Ball Valve

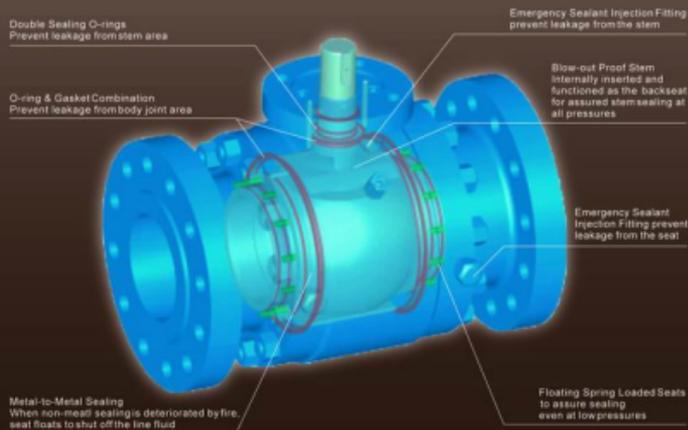
Three-piece, split body, forged steel, trunnion mounted design

SHK series BS ball valves are trunnion mounted supported and available in size 2" to 48", ANSI class rating 150 to 1500 and temperature ratings of -46°C to 200°C. All meet the fire safe requirements of BS 6755 and API 6FA.

Fully forged steel body and closure eliminates the inevitable defects of casting and assures the through structure of the valve at full rated working pressure. It also has advantage of quick delivery time, thus more popular in modern oil and gas industry.

All BS series ball valves are featured with trunnion mounted ball and independent floating spring loaded seats which provides bubble-tight shut off and low operating torques even at low different pressure. Double sealing O-rings or a combination of an O-ring and gasket in stem making this series of ball valve suitable for both above ground or under-ground service.

Detailed design features are exhibited in page 30, 31.

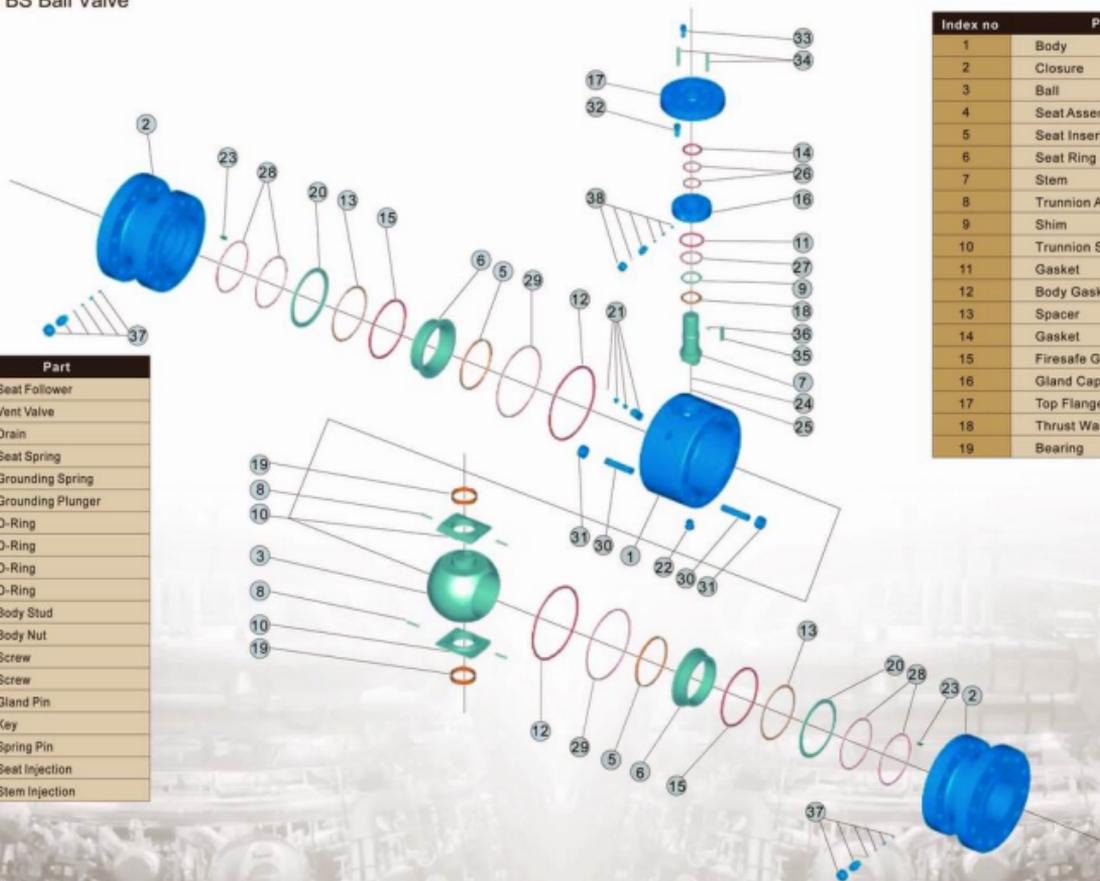


This is a typical SHK series BS trunnion mounted ball valve illustrated cross-section drawing which is only for demonstrating of basic design features. The actual product design may be slightly different from this sample drawing due to its size and pressure class.

● SHK Series BS Ball Valve

Index no	Part
20	Seat Follower
21	Vent Valve
22	Drain
23	Seat Spring
24	Grounding Spring
25	Grounding Plunger
26	O-Ring
27	O-Ring
28	O-Ring
29	O-Ring
30	Body Stud
31	Body Nut
32	Screw
33	Screw
34	Gland Pin
35	Key
36	Spring Pin
37	Seat Injection
38	Stem Injection

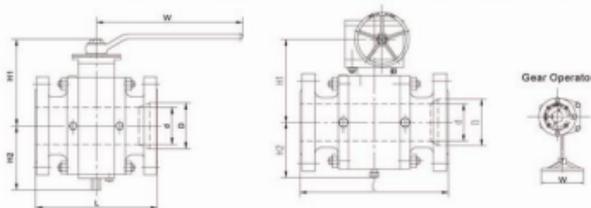
Index no	Part
1	Body
2	Closure
3	Ball
4	Seat Assembly(⊕+ ⊕)
5	Seat Insert
6	Seat Ring
7	Stem
8	Trunnion Alignment Pin
9	Shim
10	Trunnion Support
11	Gasket
12	Body Gasket
13	Spacer
14	Gasket
15	Firesafe Gasket
16	Gland Cap
17	Top Flange
18	Thrust Washer
19	Bearing



● Series BS material specifications

No.	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
2	Closure	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
3	Ball	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
4	Seat Assembly	Assembled By No.586	Assembled By No.586	Assembled By No.586	Assembled By No.586
5	Seat Insert	25% Glass-filled PTFE	25% Glass-filled PTFE	25% Glass-filled PTFE	25% Glass-filled PTFE
6	Seat Ring	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
7	Stem	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
8	Trunnion Alignment Pin	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
9	Shim	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
10	Trunnion Support	ASTM A216-WCB/ENP	ASTM A351-CF8M	ASTM A216-WCB/ENP	ASTM A352-LCB/ENP
11	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
12	Body Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
13	Spacer	PTFE	PTFE	PTFE	PTFE
14	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
15	Flareless Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
16	Gland Cap	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
17	Top Plug	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
18	Thrust Washer	316 + PTFE + MoS2			
19	Bearing	316 + PTFE + MoS2			
20	Seat Follower	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
21	Vent Valve	Assembly	Assembly	Assembly	Assembly
22	Drain	S.S.	S.S.	S.S.	S.S.
23	Seat Spring	Inconel X-750	Inconel X-750	Inconel X-750	Inconel X-750
24	Grounding Spring	S.S.	S.S.	S.S.	S.S.
25	Grounding Plunger	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
26	O-Ring	NBR	NBR	NBR	NBR
27	O-Ring	NBR	NBR	NBR	NBR
28	O-Ring	NBR	NBR	NBR	NBR
29	O-Ring	NBR	NBR	NBR	NBR
30	Body Stud	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
31	Body Nut	ASTM A194-2H	ASTM A194-8	ASTM A194-2HM	ASTM A194-7M
32	Screw	Carbon Steel	S.S.	Carbon Steel	ASTM A320-L7M
33	Screw	Carbon Steel	S.S.	Carbon Steel	ASTM A320-L7M
34	Gland Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
35	Key	Carbon Steel	S.S.	Carbon Steel	ASTM A192-F304
36	Spring Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
37	Seat Injection	Assembly	Assembly	Assembly	Assembly
38	Stem Injection	Assembly	Assembly	Assembly	Assembly

● Three-piece, split body, forged steel, side entry design

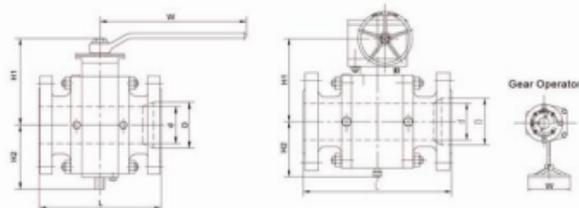


Dimensions

Size in	Class 150LB Full Port						Weight Kg	Size in	Class 150LB Reduced port						Weight Kg
	D mm	L mm	H1 mm	H2 mm	W mm				d mm	D mm	L mm	H1 mm	H2 mm	W mm	
2	51	178	200	110	265	30	3"	3	51	76	203	200	110	265	34
3	76	203	300	126	285	90	4"	4	76	102	229	300	126	285	62
4	102	229	315	165	285	92	6"	6	102	152	394	315	165	285	102
6	152	394	335	165	*300	190	8"	8	152	203	457	335	170	*300	225
8	203	457	405	200	*300	345	10"	10	203	254	534	405	200	*300	373
10	254	534	427	220	*300	495	12"	12	254	305	610	427	220	*300	533
12	305	610	465	262	*500	705	14"	14	305	337	686	465	262	*500	730
14	337	686	506	293	*600	859	16"	16	337	387	762	506	293	*600	790
16	388	762	622	341	*600	1020	18"	18	388	438	864	622	341	*600	1095
18	438	864	666	92	*600	1440	20"	20	438	489	914	666	392	*600	1152
20	489	914	730	435	*600	1918	22"	22	489	540	991	666	392	*600	2343
22	540	991	833	480	*600	2352	24"	24	540	591	1067	730	435	*600	2060
24	591	1067	895	518	*800	2803	26"	26	591	635	1143	833	480	*600	2215
26	635	1143	900	535	*800	3200	28"	28	635	686	1245	895	518	*800	2700
28	686	1245	935	542	*800	4045	30"	30	686	737	1295	895	518	*800	2918
30	737	1295	1010	605	*800	4820	34"	34	737	833	1372	900	535	*800	4005
32	781	1372	1060	650	*800	5490	36"	36	781	884	1473	935	542	*800	4445
34	832	1473	1077	650	*800	6704	38"	38	832	938	1524	1010	605	*800	4995
36	876	1524	1115	700	*800	7615	40"	40	876	989	1575	1077	650	*800	5200
40	978	1727	1400	865	*800	11027	42"	42	978	1040	1655	1115	700	*800	10871
42	1022	1855	1598	900	*800	12210	44"	44	1022	1091	1727	1168	730	*800	13520
48	1168	2134	1722	1042	*800	18360									

* Gear Operator

- Three-piece, split body, forged steel, side entry design

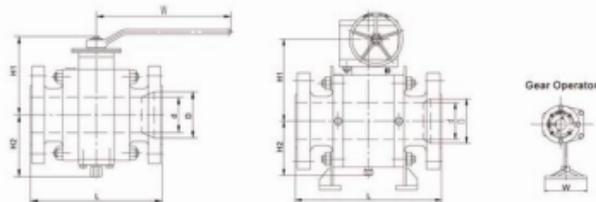


Dimensions

Class 300LB Full Port						Weight Kg	Class 300LB Reduced Port						Weight Kg	
Size in	D mm	L mm	H1 mm	H2 mm	W mm		Size in	d mm	D mm	L mm	H1 mm	H2 mm		W mm
2	51	216	206	113	265	31	3"2"3	51	76	283	206	113	265	37
3	76	283	315	129	400	69	4"3"4	76	102	305	315	129	400	74
4	102	305	330	169	750	11	6"4"6	102	152	404	330	169	750	142
6	152	404	345	148	*300	211	8"6"8	152	203	502	345	148	*300	235
8	203	502	415	185	*300	376	10"8"10	203	254	569	415	185	*300	410
10	254	569	427	226	*400	540	12"10"12	254	305	648	427	226	*500	580
12	305	648	465	269	*500	763	14"12"14	305	337	762	465	269	*600	830
14	337	762	519	300	*600	900	16"14"16	337	387	839	519	300	*600	970
16	388	839	638	350	*600	1300	18"16"18	387	438	914	638	350	*600	1530
18	438	914	683	402	*600	1715	20"18"20	438	489	991	683	402	*600	1830
20	489	991	748	446	*600	2090	22"18"22	438	540	1093	683	402	*600	2010
22	540	1093	854	492	*600	2220	24"20"24	489	591	1143	748	446	*600	2220
24	591	1143	917	531	*800	2690	28"24"28	591	686	1347	917	531	*800	3200
28	686	1347	958	556	*800	4575	30"24"30	591	737	1397	917	531	*800	3200
30	737	1397	1035	620	*800	5590	34"28"34	686	832	1628	958	556	*800	4845
32	787	1524	1087	666	*800	6240	36"30"36	737	876	1728	1035	620	*800	6100
34	832	1628	1104	666	*800	7370	40"34"40	832	978	1930	1104	666	*800	8200
36	876	1728	1143	718	*800	8435	42"36"42	876	1022	2032	1143	718	*800	9200
40	978	1930	1435	887	*800	11200	48"40"48	978	1168	2692	1435	887	*800	15000
42	1022	2032	1638	923	*800	13050								
48	1168	2692	1765	1068	*800	19000								

* Gear Operator

- Three-piece, split body, forged steel, side entry design

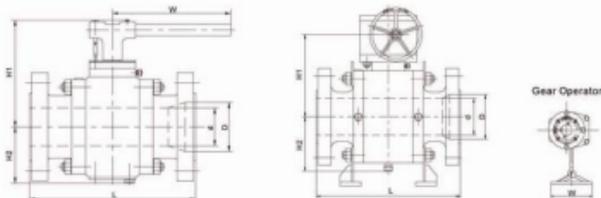


Dimensions

Class 600LB Full Port						Weight Kg	Class 600 LB Reduced Port						Weight Kg	
Size in	D mm	L mm	H1 mm	H2 mm	W mm		Size in	d mm	D mm	L mm	H1 mm	H2 mm		W mm
2	51	292	206	113	400	45	3"2"3	51	76	356	206	113	400	54
3	76	356	315	129	750	80	4"3"4	76	102	432	315	129	750	99
4	102	432	330	169	1000	150	6"4"6	102	152	559	330	169	1000	212
6	152	559	345	148	*300	248	8"6"8	152	203	660	345	148	*300	304
8	203	660	415	185	*300	438	10"8"10	203	254	787	415	185	*300	510
10	254	787	427	226	*500	701	12"10"12	254	305	838	427	226	*500	902
12	305	838	465	269	*600	825	14"12"14	305	337	869	465	269	*600	1090
14	337	889	519	300	*600	1230	16"14"16	337	387	991	519	300	*600	1310
16	388	991	638	350	*600	1535	18"16"18	387	438	1092	638	350	*600	1640
18	438	1092	683	402	*600	2135	20"18"20	438	489	1194	683	402	*600	2270
20	489	1194	748	446	*600	2640	22"18"22	438	540	1295	683	402	*600	2430
22	540	1295	854	492	*800	3370	24"20"24	489	591	1397	748	446	*600	3440
24	591	1397	917	531	*800	3960	28"24"30	591	686	1649	917	531	*800	4250
28	686	1649	958	556	*800	6000	30"24"30	591	737	1651	917	531	*800	4730
30	737	1651	1035	620	*800	6690	34"28"34	686	832	1930	958	556	*800	7200
32	787	1778	1087	666	*800	7825	36"30"36	737	876	2083	1035	620	*800	8600
34	832	1930	1104	666	*800	8460	40"34"40	832	978	2337	1104	666	*800	10020
36	876	2083	1143	718	*800	10650	42"36"42	876	1022	2438	1143	718	*800	11100
40	978	2337	1435	887	*800	14700	48"40"48	978	1168	2845	1435	887	*800	17200
42	1022	2438	1638	923	*800	16410								
48	1168	2845	1765	1068	*800	24200								

* Gear Operator

- Three-piece, split body, forged steel, side entry design



Dimensions

Size in	Full Port						Weight Kg		Reduced Port						Weight Kg	
	D mm	L mm	H1 mm	H2 mm	W mm				Size in	d mm	D mm	L mm	H1 mm	H2 mm		W mm
2	51	368	217	119	460	52		3"2"3	51	76	381	217	119	460	56	
3	76	381	327	133	1000	87		4"3"4	76	102	457	327	133	1000	94	
4	102	457	343	176	1500	160		6"4"6	102	152	610	343	176	1500	228	
6	152	610	358	153	*300	385		8"6"8	152	203	737	358	153	*300	480	
8	203	737	431	193	*400	560		10"8"10	203	254	838	431	193	*400	650	
10	254	838	443	235	*500	820		12"10"12	254	305	965	443	235	*500	888	
12	305	965	484	260	*600	1125		14"12"14	305	337	1029	484	260	*600	1310	
14	324	1029	540	312	*600	1610		16"14"16	324	375	1130	540	312	*600	1830	
16	375	1130	660	365	*600	2010	900LB	18"16"18	375	425	1219	660	365	*600	2205	
18	425	1219	700	414	*600	2810		20"18"20	425	473	1321	700	414	*600	3140	
20	473	1321	770	459	*600	3460		22"18"22	425	524	1422	700	414	*600	3288	
22	524	1422	880	507	*600	4410		24"20"24	473	572	1549	770	459	*600	3810	
24	572	1549	945	547	*600	5497		28"24"30	572	667	1753	945	547	*600	7580	
28	667	1753	987	573	*600	10202		30"24"30	572	714	1880	945	547	*600	7981	
30	714	1880	1066	638	*600	11442		34"28"34	667	810	2159	987	573	*600	11202	
32	762	2032	1120	686	*600	12102		36"30"36	714	857	2286	1066	638	*600	15653	
34	810	2159	1137	688	*600	17482										
36	857	2286	1177	739	*600	20154										
2	51	368	221	130	750	60		3"2"3	51	76	470	221	130	460	82	
3	76	470	297	152	1500	115		4"3"4	76	102	546	297	152	1000	150	
4	102	546	345	166	*300	194		6"4"6	102	146	705	345	166	1500	295	
6	146	705	365	192	*400	580		8"6"8	146	194	832	365	192	*300	690	
8	194	832	423	238	*500	752		10"8"10	194	241	991	423	238	*400	930	
10	241	991	560	274	*600	1195		12"10"12	241	289	1130	560	274	*600	1340	
12	289	1130	608	318	*600	2170		14"12"14	289	318	1257	608	318	*600	2070	
14	318	1257	662	483	*600	2250		16"14"16	318	362	1384	662	485	*600	2470	
16	362	1384	796	534	*600	2780		18"16"18	362	406	1537	796	534	*600	2950	
18	406	1537	849	606	*600	3646		20"18"20	406	451	1664	849	606	*600	3350	
20	451	1664	964	686	*600	4497		22"18"22	406	495	1816	849	303	*600	3600	
22	495	1816	1025	731	*600	5731		24"20"24	451	533	2045	964	686	*600	5850	
24	533	2045	1085	775	*600	7151										

* Gear Operator

SHK Series BE Ball Valve

Top entry, cast steel, trunnion mounted design

SHK series BE top entry ball valves are available in size 2"–24", ANSI class rating 600 to 1500 and temperature ratings of -46°C to 200°C. All meet the fire safe requirement of BS 6755 and API 6FA.

The top entry trunnion supported design and unique seat retraction technique gives the convenience of in-line repair or replace valve internal components without dismantling it from pipe line.

Because each ball seat shuts off the line fluid independently on the upstream and downstream side, so this series ball valves are suitable for double block and bleed application. Secondary sealant injection system for stem and seat is provided for emergency stop of accidental seat or stem leakage.

Detailed design features are exhibited in page 30, 31

Double Sealing Springs
Prevent leakage from both ends

Backseat Proof Stem
Internally inserted and functions as the backseat for assured stem sealing at all pressures

O-ring & Gasket Combination
Prevent leakage from both joint ends

Flushing Spring Loaded Seats
To assure sealing even at low pressures

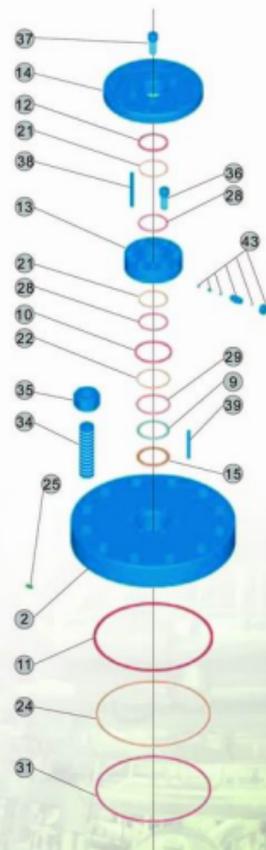
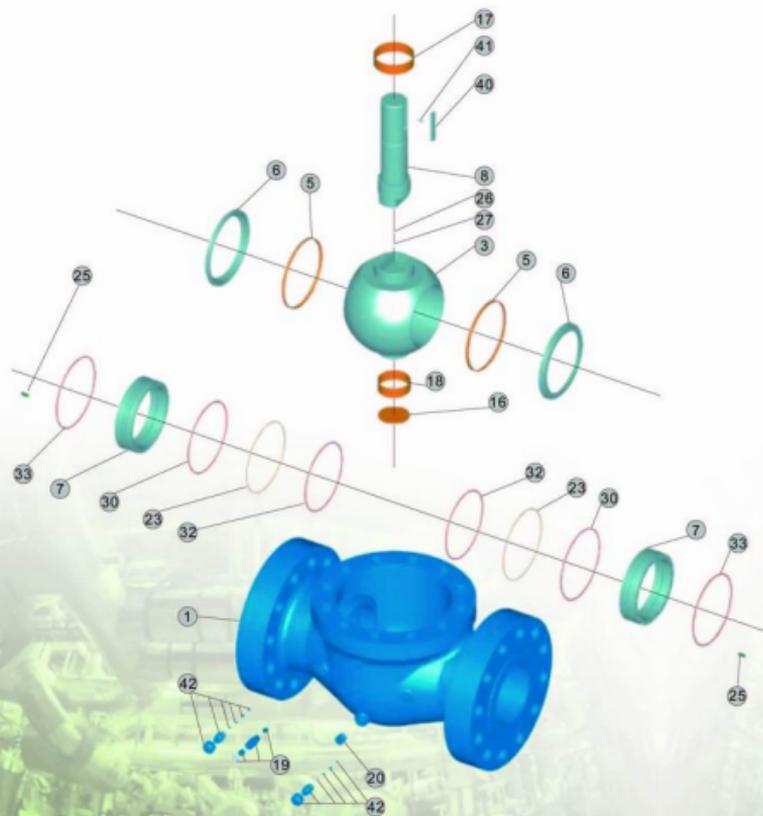
Metal-to-Metal Seating
When non-metal seating is discontinued by the seat seats lockout off the line fluid

One-piece Body
Rigid as the pipe itself

Emergency Sealant Injection Fitting
Prevent leakage from the seat

This is a typical SHK series BE trunnion mounted ball valve (disassembled cross-section drawing) which is only for demonstrating of basic design features. The actual product design may be slightly different from this sample drawing due to its size and pressure class.

● Series BE Ball Valve

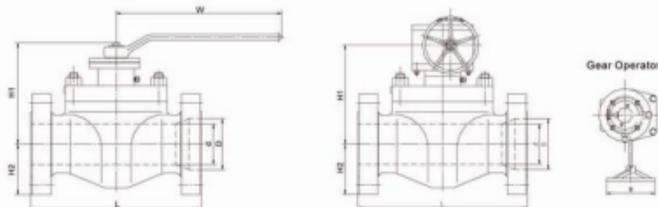


1	Body
2	Closure
3	Ball
4	Seat Assembly(①+②)
5	Seat Insert
6	Seat Ring
7	Spring Seat
8	Stem
9	Shim
10	Gasket
11	Gasket
12	Gasket
13	Gland Cap
14	Top Flange
15	Thrust Washer
16	Shim
17	Bearing
18	Bearing
19	Vent Valve
20	Drain
21	Retainer Ring
22	Retainer Ring
23	Retainer Ring
24	Retainer Ring
25	Seat Spring
26	Grounding Spring
27	Grounding Plunger
28	O-Ring
29	O-Ring
30	O-Ring
31	O-Ring
32	O-Ring
33	O-Ring
34	Body Stud
35	Body Nut
36	Screw
37	Screw
38	Gland Pin
39	Gland Pin
40	Key
41	Spring Pin
42	Seat Injection
43	Stem Injection

Series BE material specifications

No.	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A352-LCB
2	Closure	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
3	Ball	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
4	Seat Assembly	Assembled By No. 5&6			
5	Seat Insert	Nylon 1010 + 5% MoS2			
6	Seat Ring	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
7	Spring Seat	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
8	Stem	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
9	Shim	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
10	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
11	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
12	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
13	Gland Cap	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
14	Top Flange	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
15	Thrust Washer	316 + PTFE + MoS2			
16	Shim	316 + PTFE + MoS2			
17	Bearing	316 + PTFE + MoS2			
18	Bearing	316 + PTFE + MoS2			
19	Vent Valve	Assembly	Assembly	Assembly	Assembly
20	Drain	S.S.	S.S.	S.S.	S.S.
21	Retainer Ring	PTFE	PTFE	PTFE	PTFE
22	Retainer Ring	PTFE	PTFE	PTFE	PTFE
23	Retainer Ring	PTFE	PTFE	PTFE	PTFE
24	Retainer Ring	PTFE	PTFE	PTFE	PTFE
25	Seat Spring	Inconel X-750	Inconel X-750	Inconel X-750	Inconel X-750
26	Grounding Spring	S.S.	S.S.	S.S.	S.S.
27	Grounding Plunger	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
28	O-Ring	NBR	NBR	NBR	NBR
29	O-Ring	NBR	NBR	NBR	NBR
30	O-Ring	NBR	NBR	NBR	NBR
31	O-Ring	NBR	NBR	NBR	NBR
32	O-Ring	NBR	NBR	NBR	NBR
33	O-Ring	NBR	NBR	NBR	NBR
34	Body Stud	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
35	Body Nut	ASTM A194-2H	ASTM A194-8	ASTM A194-2HM	ASTM A194-7M
36	Screw	Carbon Steel	S.S.	Carbon Steel	ASTM A320-L7M
37	Screw	Carbon Steel	S.S.	Carbon Steel	ASTM A320-L7M
38	Gland Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
39	Gland Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
40	Key	Carbon Steel	S.S.	Carbon Steel	ASTM A182-F304
41	Spring Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
42	Seat Injection	Assembly	Assembly	Assembly	Assembly
43	Stem Injection	Assembly	Assembly	Assembly	Assembly

Top entry, trunnion mounted design

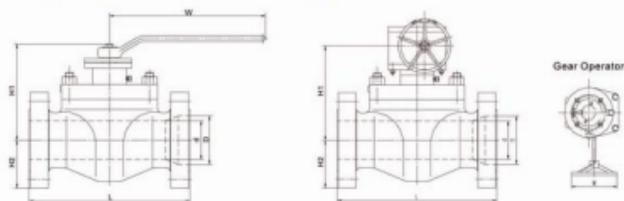


Dimensions

Class 600LB Full Port							Class 600LB Reduced Port							
Size in	D mm	L mm	H1 mm	H2 mm	W mm	Weight Kg	Size in	d mm	D mm	L mm	H1 mm	H2 mm	W mm	Weight Kg
1-1/2	38	241	209	70	400	30	2 1/2-1/2	38	51	292	209	70	400	40
2	51	292	195	110	400	45	2 1/2-3	51	76	356	195	110	400	54
3	76	356	240	110	750	80	3-3/4	76	102	432	240	110	750	99
4	102	432	280	175	1000	150	4-1/2	102	152	559	280	175	1000	212
6	152	559	305	195	*300	248	6-1/2	152	203	660	305	195	*300	304
8	203	660	400	280	*300	438	8-1/2	203	254	787	400	280	*300	510
10	254	787	435	285	*500	601	10-1/2-12	254	305	838	435	285	*500	902
12	305	838	440	320	*600	625	12-1/2-14	305	337	889	440	320	*600	1090
14	337	889	505	340	*600	1230	14-1/2-16	337	387	891	505	340	*600	1310
16	389	991	590	410	*600	1535	16-1/2-18	387	438	1092	590	410	*600	1640
18	438	1092	700	445	*600	2135	18-1/2-20	438	489	1194	700	445	*600	2430
20	489	1194	775	510	*600	2640	20-20-24	489	591	1397	775	510	*600	3440
24	591	1397	840	640	*600	3960								

* Gear Operator

- Top entry, trunnion mounted design



Dimensions

Full Port							Reduced Port							
Size	D	L	H1	H2	W	Weight	Size	d	D	L	H1	H2	W	Weight
in	mm	mm	mm	mm	mm	Kg	in	mm	mm	mm	mm	mm	mm	Kg
1-1/2	38	305	215	80	400	40	2-1/2	38	51	369	215	80	400	44
2	51	369	200	120	750	52	2-1/2	51	76	381	200	120	750	56
3	76	381	240	130	1000	87	3	76	102	458	240	130	1000	94
4	102	458	280	175	1500	160	4	102	152	610	280	175	1500	226
6	152	610	350	220	*300	385	6	152	203	737	350	220	*300	480
8	203	737	390	260	*400	560	8	203	254	839	390	260	*400	850
10	254	839	480	310	*600	820	10	254	305	966	480	310	*600	868
12	305	966	538	410	*600	1125	12	305	356	1092	538	410	*600	1160
1.5	38	305	220	90	400	40	2-1/2	38	51	369	220	90	400	44
2	51	368	205	120	750	60	2-1/2	51	76	356	205	120	750	82
3	76	470	210	125	1000	115	3	76	102	432	210	125	100	150
4	102	546	245	160	*300	194	4	102	152	559	245	160	*300	295
6	152	705	335	255	*400	580	6	152	203	660	335	255	*400	690
8	203	832	427	340	*500	752	8	203	254	787	427	340	*500	930
10	254	991	502	381	*600	1195	10	254	305	838	502	381	*600	1340
12	305	1131	533	438	*600	2170	12	305	356	966	533	438	*600	2170

* Gear Operator

Cryogenic & High Performance Ball Valve

For ambient working temperature: down to -196°C or up to 450°C

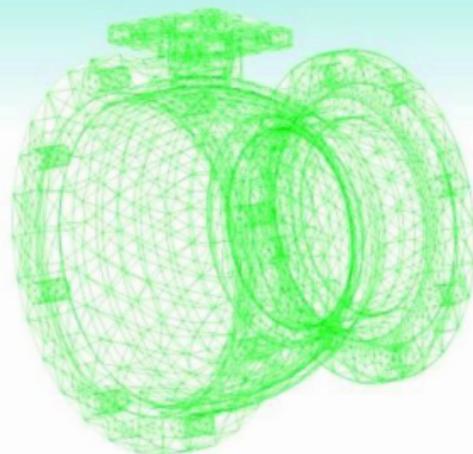
Two-piece, splitbody, cast steel, side entry design

Design and test conform to:

- BS6364
- API 598, BS6755
- Shell Spe 77/306

Product range:

- Class rating: ANSI 150 & 300
- Size: 1/2" to 10"



● Cryogenic Service Ball Valve



SHK cryogenic ball valves have been developed to satisfy the rapid increasing of world LNG and other low temperature industry demand. All **SHKVC** cryogenic ball valves are designed and tested as per BS6384 and Shell MESC Spe 77/306. **SHKVC** standard cryogenic ball valves are anti-static, fire-safe and low emission designed. **SHKVC** in-house laboratory uses the latest computer aid technologies and is capable of certifying valves upto size 24" and temperature range from -46°C ~ -196°C.

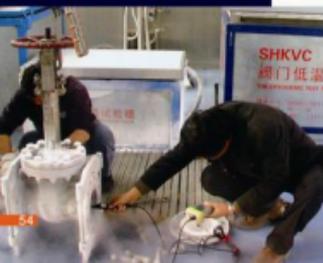


Cryogenic Design Feature

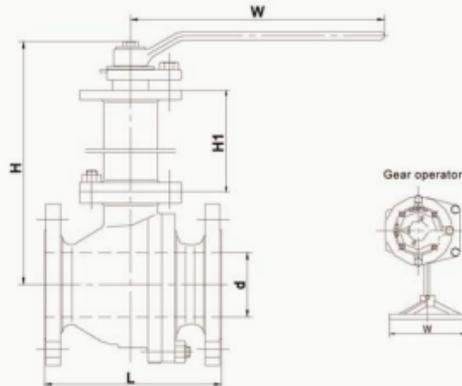
- Safety long extended bonnet give sufficient vapour space for freezing prevention.
- Vent hole on ball functioned as pressure release device to up stream to prevent dangerous cavity thermal expansion.
- Special designed cryogenic PTFE seat & packing for assured stem seal and lower operating torque.

Cryogenic Test

- All components receive cryogenic (-196°C) treatment prior to assembling.
- Valve is disassembled for degreasing after hydrostatic and air test per API598.
- Valve is re-assembled and was sunked in liquid nitrogen (-196°C) and tested with pure helium gas to detected the seat leakage.
- Valve operability and torque are tested and recorded.



● Cryogenic floating ball valve Two piece, cast steel, side entry design



Dimensions

Class 150LB Full Port							Weight Kg
DN in	D mm	L mm	W mm	H1 mm	H mm		
1/2	12.7	108	130	200	259	3.1	
3/4	19	117	130	200	263	3.9	
1	25.4	127	160	200	276	5.8	
1-1/2	38	165	230	250	347	8.4	
2	51	178	230	250	357	11.2	
2-1/2	64	191	400	300	442	17	
3	76	203	400	300	452	21.5	
4	102	229	700	300	478	36	
5	125	356	1100	350	602	62	
6	152	394	*	350	622	98	
8	203	457	*	350	692	168	
10	254	533	*	400	820	310	

Class 300LB Full Port							Weight Kg
DN in	D mm	L mm	W mm	H1 mm	H mm		
1/2	12.7	140	130	200	259	3.5	
3/4	19	152	130	200	263	4.8	
1	25.4	165	160	200	276	7.0	
1-1/2	38	190	230	250	347	12	
2	51	216	230	250	357	18	
2-1/2	64	241	400	300	442	30	
3	76	283	400	300	452	39	
4	102	305	700	300	478	60	
5	125	381	1100	350	602	100	
6	152	403	*	350	622	122	
8	203	502	*	350	692	242	
10	254	568	*	400	820	400	

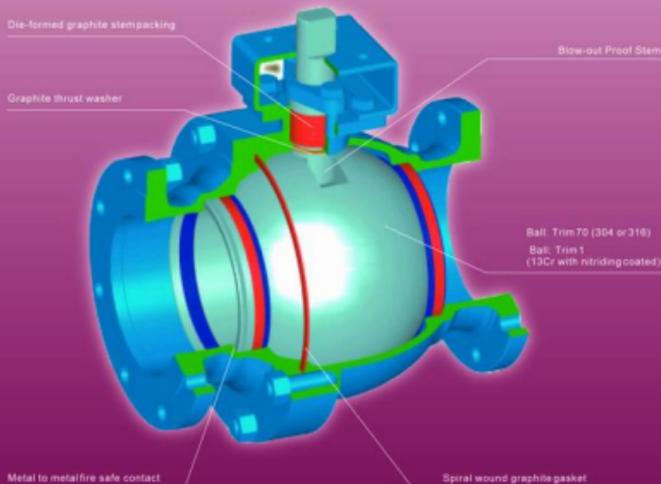
* Gear Operator

High Performance Ball Valve

Two-piece, split body, side entry design

SHK high performance ball valve has 2 series: trim 70 (polyphenylene seats with stainless steel retainer rings) and trim 1 (nitriding coated metal seat and ball), operating temperature rating up to 450°C and size range from 1/2" to 10", ANSI class rating 150 to 300.

Because sealing materials are made from heat resistant materials, these valves are ideal for heated abrasive service which can not be performed by conventional soft seated ball valve due to the its limitation of heat resistance and mechanical properties.



This is a typical **SHK** high performance ball valve illustrated cross-section drawing which is only for demonstrating of basic design features. The actual product design may be slightly different from this sample drawing due to its size and pressure class.

● Design Feature

Seating Material

Trim 70: polyphenylene seats with stainless steel retainer rings & flexible graphite gasket.

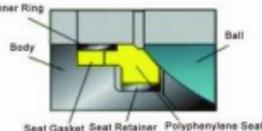
Maximum working temperature: 300°C

Recommended for low abrasive service

Not recommended for throttling service

Non-directional installation

See page 58 for detailed chemical and mechanical property.

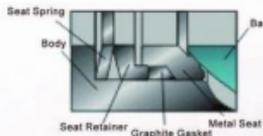


Trim 1: 13Cr seats with nitriding coated and 17-7 PH Seat spring

Maximum working temperature: 450°C

Rigid construction and fully metallic contact between ball and seat. Ideal for high abrasive and throttling service.

Uni-directional installation (arrow mark on body flange)



High temperature service

Conventional soft seated material is limited up to temperature 200°C as it may soften, degrade or melt in high temperature while high performance valve provides a greatly extended range of temperature up to 450°C.

Unconditional fire safe provision

SHK high performance ball valve sealing components (seats, ball, gasket and packing) are all hard faced metal or graphite made which is extremely heat resistant, so that it is unconditional fire safe design. Also conventional anti-static device is not required because of inter-component electric conductivity.

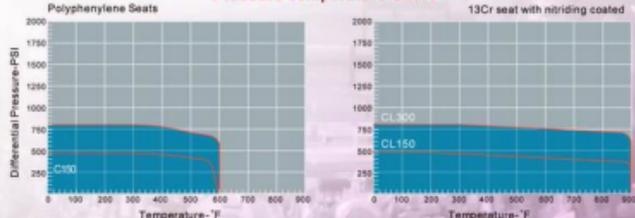
Sealing and Torque Performance

SHK high performance ball valve can meet soft seated leakage criteria for fluid service. Advanced seat design offers low operation torque at full pressure rating. It is suitable for high temperature steam or gas service.

Design Review

SHK engineers employ latest computer technology (I-DEAS soft ware) to carry out finite element analysis to study the metal & soft sealing material performance in high temperature condition.

Pressure Temperature Chart



● Soft Seat Material

Seat

Properties		Nylon	Teflon (unfilled)	PEEK	Delrin	Polyphaniene
Temperature Range °F		-30~200	-100~425	-60~500	-50~180	-50~750
Pressure Rating		900~1500	150~600	150~1500	150~1500	150~300
Mechanical Property	Hardness	D75	D58	D85	R-120	D80
	Tensile Strength (psi)	8700 (min)	2100~2400	11000(min)	6600~7500 (min)	2000~2350 (min)
	Elongation (%)	250~290	250	30 (min)	220	275~310
Physical Property	Specific Gravity	1.04	2.2	1.3	1.41	1.9~2.1
	Water Absorption (%)	0.2	<0.01	0.18	0.15	0.1~0.2
	Radiation	5*10 ⁶ RAD	10 ⁶ RAD	10 ⁶ RAD	10 ⁶ RAD	9*10 ⁶ RAD
Service Application		High pressure & Low temperature service	Chemical & Cryogenic service	High pressure & temperature service with steam in radiation environment	High pressure & Low temperature service	High temperature & High Corrosion service

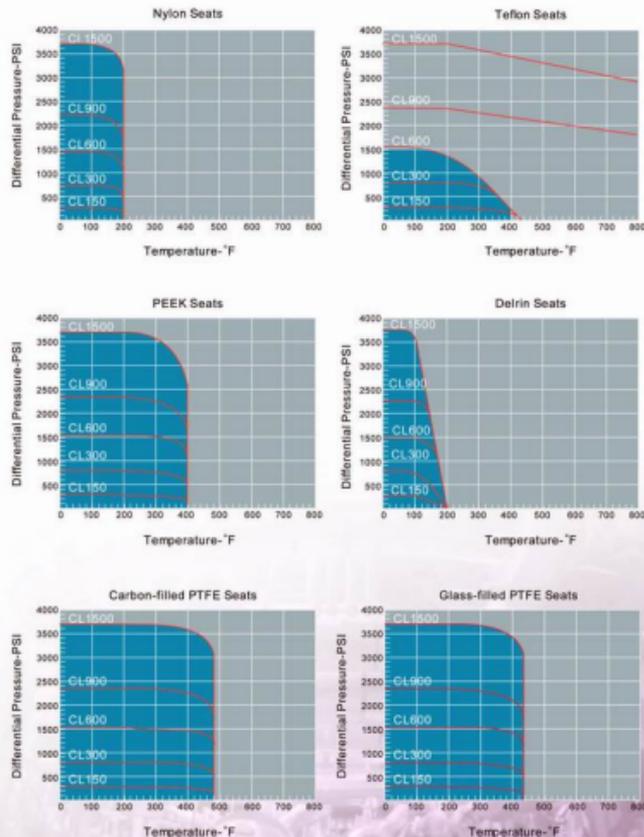
Sealing

Type	Viton	EPDM	25% Glass Filled PTFE	NBR	Buna N
Temperature range °F	-20~400	-60~500	-328~500	-50~300	-30~250
Specific Gravity	1.85	---	2.24	1.2	1.31
Hardness	D75	D90	D65	D50	D90

Gasket

Type	Flexible Graphite	Spiral Wound 316+Graphite	Spiral Wound 316+PTFE
Temperature range °F	-328~500	-328~500	-328~500
Service Application	100% Fire-safe	100% Fire-safe	Cryogenic High Corrosion
Hardness	0~14	0~14	0~14

● Pressure Temperature Chart



SHK Floating Ball Valve Design Operating Torque

Size (inch)	Design Operating Torque (N.M)				
	150LB	300LB	600LB	900LB	1500LB
1/2	6	9	16	20	32
3/4	7	12	20	35	45
1	15	20	42	70	115
1-1/2	40	60	90	140	171
2	50	70	130	200	296
2-1/2	80	90	150	320	440
3	90	120	200	431	590
4	130	230	370		
6	560	930			
8	980	2197			
10	2000	4500			
12	3500				

Notes:

- Torque is calculated based on normal temperature, with RPTFE seat for 150LB-300LB and NYLON seat for 600LB-1500LB.
- For cryogenic service, torque shall be increased about 2-2.5 times.
- Torque shown in this table is to be used as a guide for actuator selection. A safety factor of 1.3-1.5 is recommended for actuator sizing.
- Torque may be changed according to different fluid and trim material.

SHK Trunnion Mounted Ball Valve Design Operating Torque

SIZE (inch)	ANSI (class)	Torque Expression	Stem Torque (ft.lbf.)	SIZE (inch)	ANSI (class)	Torque Expression	Stem Torque (ft.lbf.)
2	150	19.2+0.06P	36.30	49	6	150	128.1+0.366P
2	300	19.2+0.06P	63.60	86	6	300	128.1+0.366P
2	600	19.2+0.06P	108.00	146	6	600	128.1+0.366P
2	900	19.2+0.06P	152.40	207	6	900	128.1+0.366P
2	1500	19.2+0.06P	241.50	327	6	1500	128.1+0.366P
3	150	21.4+0.08P	44.20	80	8	150	480+0.95P
3	300	21.4+0.08P	80.60	109	8	300	480+0.95P
3	600	21.4+0.08P	139.80	190	8	600	480+0.95P
3	900	21.4+0.08P	199.00	270	8	900	480+0.95P
3	1500	21.4+0.08P	317.80	431	8	1500	480+0.95P
4	150	56.95+0.19P	111.10	151	10	150	453.7+1.21P
4	300	56.95+0.19P	197.55	268	10	300	453.7+1.21P
4	600	56.95+0.19P	338.15	459	10	600	453.7+1.21P
4	900	56.95+0.19P	478.75	649	10	900	453.7+1.21P
4	1500	56.95+0.19P	760.90	1032	10	1500	453.7+1.21P

(Continue)

SIZE (inch)	ANSI (class)	Torque Expression	Stem Torque (ft.lbf.)	Stem Torque (n.m)	SIZE (inch)	ANSI (class)	Torque Expression	Stem Torque (ft.lbf.)	Stem Torque (n.m)
12	150	667.9+1.69P	1149.55	1559	26	150	4936.4+13.60P	8812.40	11950
12	300	667.9+1.69P	1918.50	2601	26	300	4936.4+13.60P	15000.40	20341
12	600	667.9+1.69P	3169.10	4297	26	600	4936.4+13.60P	25064.40	33987
12	900	667.9+1.69P	4419.70	5993	26	900	4936.4+13.60P	35128.40	47634
12	1500	667.9+1.69P	6929.35	9398	26	1500	4936.4+13.60P	51072.40	68513
14	150	945.89+2.95P	1786.64	2423	28	300	8730.6+23.50P	18487.50	25069
14	300	945.89+2.95P	3128.89	4243	28	600	8730.6+23.50P	31148.90	42238
14	600	945.89+2.95P	5311.89	7203	28	900	8730.6+23.50P	43810.30	59407
14	900	945.89+2.95P	7494.89	10163	30	150	6962.8+22.11P	13264.15	17986
14	1500	945.89+2.95P	11875.64	16103	30	300	6962.8+22.11P	23324.20	31628
16	150	1146.8+3.781P	2224.10	3016	30	600	6962.8+22.11P	39685.60	53814
16	300	1146.8+3.781P	3944.00	5348	30	900	6962.8+22.11P	56047.00	76000
16	600	1146.8+3.781P	6741.20	9141	32	150	8263.8+26.24P	15742.20	21346
16	900	1146.8+3.781P	9538.40	12934	32	300	8263.8+26.24P	27681.40	37536
16	1500	1146.8+3.781P	15151.70	20546	32	600	8263.8+26.24P	47099.00	63866
18	150	1800.3+5.51P	3370.65	4571	32	900	8263.8+26.24P	66516.60	90197
18	300	1800.3+5.51P	5877.70	7970	34	150	10548.3+28.61P	18702.15	25360
18	600	1800.3+5.51P	9955.10	13499	34	300	10548.3+28.61P	31719.70	43012
18	900	1800.3+5.51P	14032.50	19028	34	600	10548.3+28.61P	52891.10	71720
18	1500	1800.3+5.51P	22214.85	30123	34	900	10548.3+28.61P	74062.50	100429
20	150	2326.5+7.39P	4432.65	6011	36	150	13766+37.54P	24464.90	33174
20	300	2326.5+7.39P	7795.10	10570	36	300	13766+37.54P	41545.60	56336
20	600	2326.5+7.39P	13263.70	17986	36	600	13766+37.54P	69325.20	94005
20	900	2326.5+7.39P	18732.30	25401	36	900	13766+37.54P	97104.80	131674
20	1500	2326.5+7.39P	29706.45	40282	40	150	17772.2+48.68P	31646.00	42912
22	150	2707.7+8.44P	5113.10	6933	40	300	17772.2+48.68P	53795.40	72947
22	300	2707.7+8.44P	8953.30	12141	40	600	17772.2+48.68P	89818.60	121794
22	600	2707.7+8.44P	15198.90	20610	42	150	20958.6+57.80P	37431.60	50757
22	900	2707.7+8.44P	21444.50	29079	42	300	20958.6+57.80P	63730.60	86419
22	1500	2707.7+8.44P	33977.90	46074	42	600	20958.6+57.80P	106502.60	144418
24	150	3685.4+12.20P	7162.40	9712	48	150	27647.5+76.19P	49361.65	66934
24	300	3685.4+12.20P	12713.40	17239	48	300	27647.5+76.19P	84028.10	113942
24	600	3685.4+12.20P	21741.40	29481	48	600	27647.5+76.19P	140408.70	190394
24	900	3685.4+12.20P	30769.40	41723					
24	1500	3685.4+12.20P	48886.40	66290					

Notes:

- Torque is calculated based on normal temperature, with RPTFE seat for 150LB-600LB and NYLON seat for 900LB-1500LB.
- Torque shown in this table is to be used as a guide for actuator selection. A safety factor of 1.3-1.5 is recommended for actuator sizing.
- Torque may be changed according to different fluid and trim material.

● SHK Ball Valve Flow Coefficient (Cv value) Specification

Size (inch)	150LB	300LB	600LB	900LB	1500LB
1/2	25	25	20	16	16
3/4	56	56	48	34	34
1	95	95	64	55	55
1-1/2	308	308	308	165	165
2	500	430	370	320	320
3	1360	1100	1020	920	820
4	2500	2000	1850	1760	1600
6	5300	5250	4400	4300	4150
8	10750	10100	8450	8475	8010
10	17500	16820	14250	14160	13220
12	26750	25950	22550	21200	18800
14	31850	30900	28500	26700	24180
16	44000	42600	38150	36600	33710
18	58000	55870	51150	49000	45703
20	75500	72500	68500	64600	60750
22	91770	86850	80150		
24	113400	109340	98860		

Notes:

- All the valves are in full port.
- Pressure Ratings are according to API 6D.

Method of Calculating Flow

The Flow Coefficient (Cv) of a valve is the flow rate of water (gallons/minute) through a fully open valve, with a pressure drop of 1 psi across the valve. To find the flow of liquid through the valve from the Cv, use the following formulas:

Flow Coefficient:

$$Cv = Q \sqrt{P/g}$$

Q = Flow rate of liquid (gal./min.)

P = differential pressure across the valve

G = specific gravity of liquid (for water, G=1)

Gas Flow:

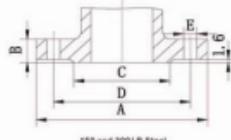
$$Q_g = 81Cv \sqrt{P/g}$$

(For non-critical flow, P/P < 1.0)

Q_w = Flow rate of gas (CFH at STP)

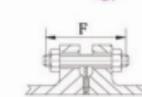
P_w = outlet pressure (psia)

g = specific gravity of gas (for air, g=1.0)

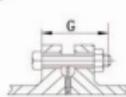


150 and 300 LB Steel

2" to 24" ANSI B16.5
BS 1560
MSS SP-44



Length of Stud Bolt



1/16-inch Raised Face Joint

Nominal Size	A	B *	C	D	E	Bolt	F	G
in	mm	in	mm	in	mm	in	mm	in

CLASS 150 RF

2	50	6.0	152.4	0.75	19.1	3.62	91.8	4.75	120.7	0.75	19.1	4	5/8	3.25	82.6	2.75	69.9
2 1/2	65	7.0	177.8	0.80	20.4	4.12	104.6	5.50	139.7	0.75	19.1	4	5/8	3.50	88.9	3.00	76.2
3	80	7.5	191.5	0.84	21.3	4.50	114.3	6.00	152.4	0.75	19.1	4	5/8	3.75	95.3	3.25	82.6
4	100	8.0	203.2	0.84	21.3	4.89	124.2	6.19	157.2	0.75	19.1	4	5/8	3.50	88.9	3.00	76.2
5	125	10.0	254.0	0.84	21.3	7.31	185.7	6.50	215.9	0.88	22.4	4	3/4	3.75	95.3	3.25	82.6
6	150	11.0	279.4	1.00	25.4	8.50	215.9	8.50	215.9	0.88	22.4	4	3/4	3.75	95.3	3.25	82.6
8	200	13.0	342.9	1.12	28.5	10.62	269.7	11.25	286.5	0.88	22.4	4	3/4	4.25	108.0	3.50	88.9
10	250	15.0	406.4	1.19	30.3	12.75	323.9	14.25	362.0	1.00	25.4	12	7/8	4.50	114.3	4.00	101.6
12	300	18.0	488.8	1.25	31.8	15.00	381.0	17.50	431.8	1.00	25.4	12	7/8	4.75	120.7	4.00	101.6
14	350	21.0	533.4	1.30	33.1	16.25	412.9	18.75	476.3	1.12	28.4	12	1	5.25	133.4	4.00	101.6
16	400	23.0	586.9	1.44	36.8	18.50	469.9	21.25	539.8	1.12	28.4	16	1	5.25	133.4	4.50	114.3
18	450	25.0	639.5	1.56	39.7	21.00	533.2	23.75	603.2	1.25	31.8	16	1 1/8	5.75	146.1	4.50	114.3
20	500	27.0	692.0	1.60	40.3	23.00	584.2	25.00	653.0	1.25	31.8	20	1 1/8	6.25	158.8	5.00	127.0
22	550	28.0	743.3	1.81	46.0	25.25	641.4	27.25	692.2	1.38	35.1	20	1 1/4	6.75	171.5	5.00	127.0
24	600	30.0	791.8	1.88	47.8	27.25	692.2	29.50	749.3	1.38	35.1	20	1 1/4	6.75	171.5	5.00	127.0
30	750	34.0	891.0	2.09	60.3	29.50	749.3	31.75	806.5	1.38	35.1	24	1 1/2	7.50	190.5	5.00	127.0
36	900	36.0	927.1	2.81	71.4	31.50	800.1	34.00	863.8	1.38	35.1	28	1 1/2	7.50	190.5	5.00	127.0
40	1000	38.0	984.3	2.84	74.7	33.75	857.5	36.00	914.4	1.38	35.1	28	1 1/2	7.50	190.5	5.00	127.0
42	1050	41.0	1050.5	3.11	68.8	36.00	914.4	38.00	971.8	1.62	41.1	32	1 1/2	8.25	209.5	5.00	127.0
44	1100	45.0	1143.0	3.25	82.8	38.00	965.2	40.00	1028.7	1.62	41.1	32	1 1/2	8.25	209.5	5.00	127.0
46	1150	46.0	1168.4	3.95	99.5	40.25	1023.4	42.75	1085.9	1.62	41.1	32	1 1/2	8.25	209.5	5.00	127.0
48	1200	50.0	1269.1	3.50	89.4	44.50	1139.4	47.25	1200.2	1.62	41.1	36	1 1/2	8.25	209.5	5.00	127.0
48	1200	50.0	1269.1	3.81	96.8	47.00	1193.8	48.80	1257.3	1.62	41.1	36	1 1/2	8.25	209.5	5.00	127.0
48	1190	50.25	1403.4	4.00	101.6	49.00	1244.6	51.75	1314.5	1.62	41.1	40	1 1/2	8.25	209.5	5.00	127.0
48	1200	50.0	1513.1	4.25	108.3	53.50	1368.9	55.00	1423.4	1.62	41.1	44	1 1/2	8.25	209.5	5.00	127.0

CLASS 300 RF

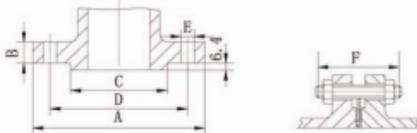
2	50	6.00	152.4	0.88	22.4	3.62	91.8	5.00	127.0	0.75	19.1	4	5/8	3.50	88.9	3.00	76.2
2 1/2	65	7.00	177.8	1.00	25.4	4.12	104.6	5.50	139.7	0.88	22.4	4	3/4	4.00	101.6	3.25	82.6
3	80	8.25	209.6	1.12	28.5	5.00	127.0	6.62	168.1	0.88	22.4	4	3/4	4.25	108.0	3.50	88.9
4	100	9.00	234.8	1.25	31.8	6.19	157.2	7.88	200.2	0.88	22.4	4	3/4	4.50	114.3	3.75	95.3
5	125	11.00	279.4	1.38	35.1	7.31	185.7	9.35	238.0	1.00	25.4	4	3/4	4.75	120.7	4.00	101.6
6	150	12.00	304.8	1.44	36.8	8.50	215.9	10.62	269.7	0.88	22.4	12	3/4	4.50	114.3	4.25	108.0
8	200	15.00	381.0	1.62	41.2	10.62	269.7	13.00	330.2	1.00	25.4	12	7/8	5.00	127.0	4.50	114.3
10	250	17.00	441.5	1.88	47.8	12.75	323.9	15.25	387.4	1.12	28.4	16	1	5.50	139.7	4.50	114.3
12	300	20.00	508.0	2.00	50.8	15.00	381.0	17.50	431.8	1.25	31.8	16	1 1/8	6.00	152.4	4.50	114.3
14	350	23.00	584.2	2.12	53.9	16.25	412.9	19.25	476.3	1.25	31.8	20	1 1/8	6.25	158.8	4.75	120.7
16	400	25.00	641.7	2.25	57.2	18.50	469.9	21.50	531.5	1.38	35.1	20	1 1/4	6.75	171.5	4.50	114.3
18	450	28.00	714.2	2.38	60.3	21.00	533.2	24.75	603.2	1.38	35.1	24	1 1/4	7.00	177.8	4.50	114.3
20	500	30.00	774.2	2.50	63.5	23.00	584.2	27.00	689.8	1.38	35.1	24	1 1/4	7.00	177.8	4.50	114.3
22	550	33.00	856.2	2.62	66.5	25.25	641.4	29.25	743.0	1.62	41.1	24	1 1/2	7.50	190.5	4.50	114.3
24	600	36.00	914.4	2.75	69.9	27.25	692.2	32.00	812.8	1.62	41.1	24	1 1/2	7.50	190.5	4.50	114.3
26	650	38.00	974.2	3.12	79.2	28.50	749.3	34.50	879.3	1.75	44.5	28	1 1/2	8.00	203.2	4.75	120.7
28	700	40.75	1038.3	3.28	83.8	30.50	800.1	37.00	939.9	1.75	44.5	28	1 1/2	8.00	203.2	4.75	120.7
30	750	43.00	1098.2	3.62	91.9	33.75	857.5	39.50	1001.8	1.75	44.5	28	1 1/2	8.00	203.2	4.75	120.7
32	800	45.25	1168.4	3.88	98.6	36.00	914.4	41.00	1054.1	2.00	50.8	28	1 1/2	8.25	209.5	4.75	120.7
34	850	47.00	1204.0	4.00	101.6	38.00	965.2	43.50	1109.9	2.00	50.8	28	1 1/2	8.25	209.5	4.75	120.7
36	900	50.00	1269.1	4.12	104.6	40.25	1023.4	46.00	1168.4	2.12	53.9	32	1 1/2	8.25	209.5	4.75	120.7
40	1000	55.00	1412.5	4.50	114.3	47.75	1085.9	51.75	1314.5	2.12	53.9	32	1 1/2	8.25	209.5	4.75	120.7
42	1050	56.75	1449.4	4.89	124.1	44.75	1139.4	47.25	1200.2	2.12	53.9	32	1 1/2	8.25	209.5	4.75	120.7
44	1100	59.00	1498.0	5.15	130.7	47.25	1193.8	50.00	1267.3	2.12	53.9	32	1 1/2	8.25	209.5	4.75	120.7
48	1200	67.50	1727.5	5.25	133.4	51.25	1314.5	54.00	1378.0	2.00	50.8	32	1 1/2	8.00	203.2	4.75	120.7

(1) The regular 1/16 inch (1.6mm) raised face 150 and 300 lb flanges is included in the minimum flange thickness given above, but other raised faces must be added thereto.

(2) Flanges for Nominal Pipe Size above 24 inches are available to BS 3293, API 605 and MSS-SP 44.

* For Flange valve of class 150, the dimension "B" is 0.62 for 2", 0.69 for 2 1/2" and 0.75 for 3".

Class 600/900 Steel Pipe Flange



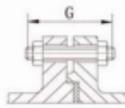
600LB and 900LB Steel

Length of Stud Bolt
Male to Male

1/4-inch Raised Face Flanged Joint

2" to 24" ANSI B16.5

BS 1560

Length of Stud Bolt
Male to Female

Flanged Joint

Nominal Size	A		B		C		D		E		F		G	
	in	mm												

CLASS 600 RF

2	50	5.50	165.1	1.00	29.4	3.62	91.9	5.90	127.0	0.75	19.1	8	50	4.25	108.0	4	151.6
2 1/2	65	5.50	190.5	1.12	28.5	4.12	134.6	5.88	148.4	0.88	22.4	8	3/4	4.75	120.7	4	114
3	80	8.25	209.6	1.28	31.8	5.00	127.0	6.92	166.1	0.96	24.4	8	3/4	5.00	127.0	4	114
4	100	10.75	271.1	1.50	38.1	5.19	157.2	8.50	216.0	1.00	25.4	8	7/8	5.75	146.1	5	128
5	125	13.00	330.2	1.76	44.6	7.31	185.7	10.90	266.7	1.12	28.4	8	1	6.50	165.1	6	152.8
6	150	14.00	355.6	1.88	47.8	8.50	215.9	11.90	292.1	1.12	28.4	12	1	6.75	171.5	6	152
8	200	16.00	411.8	2.19	56.7	10.62	289.7	13.78	349.3	1.28	31.8	12	1 1/8	7.50	190.5	11	284.2
10	250	20.00	508.0	2.50	63.5	12.75	323.9	17.00	431.8	1.36	35.1	16	1 1/4	8.50	215.9	14	354.8
12	300	22.00	568.8	2.62	66.6	15.00	381.0	19.25	489.0	1.36	35.1	20	1 1/4	9.75	231.3	16	375.9
14	350	23.75	603.2	2.76	69.9	16.25	412.9	20.75	527.1	1.50	38.1	20	1 3/8	9.25	235.0	9	228.6
16	400	27.00	665.8	3.00	76.2	18.50	469.9	23.75	603.3	1.62	41.1	20	1 1/2	10.00	254.0	9	234.7
18	450	29.25	743.0	3.25	82.6	21.00	533.4	25.75	654.1	1.75	44.5	20	1 5/8	10.75	273.1	10	252
20	500	32.00	812.8	3.50	88.9	23.00	584.2	28.50	723.9	1.75	44.5	24	1 5/8	11.25	285.8	11	278.4
22	560	34.25	870.9	3.75	95.3	25.25	641.4	29.00	738.0	1.88	47.8	24	1 5/8	12.25	311.2	12	304.8
24	600	37.00	939.8	4.00	101.6	27.25	692.2	33.00	838.0	2.00	50.8	24	1 7/8	13.00	330.2	12	314
26	650	40.00	1016.0	4.25	108.0	29.50	749.3	34.00	878.2	2.00	50.8	28	1 5/8	13.50	342.9	13	325.8
28	700	42.25	1073.2	4.38	111.3	31.50	800.1	37.00	939.6	2.12	53.8	28	1 5/8	14.00	355.6	14	350.9
32	800	47.00	1193.8	4.82	117.3	36.00	914.4	41.50	1064.1	2.26	58.0	28	1 3/8	15.00	381.0	16	406.4
34	850	49.00	1246.6	4.75	120.7	38.00	965.2	43.50	1092.2	2.38	60.3	28	1 3/8	15.25	387.4	15	381.0
36	900	51.75	1314.5	4.88	124.0	40.25	1028.4	46.00	1168.4	2.62	66.5	28	1	16.00	406.4	15	400.1
40	1000	52.00	1320.8	6.25	158.8	43.75	1111.3	46.25	1174.8	2.38	60.3	32	1 5/8	16.75	426.3	16	409.9
42	1050	55.25	1403.8	6.62	168.1	46.00	1168.4	48.25	1226.0	2.62	66.5	28	1 5/8	18.25	460.0	18	452.0
44	1100	57.25	1454.2	6.81	173.0	48.25	1225.8	50.50	1287.7	2.62	66.5	32	1 3/4	18.75	477.9	18	457.9
48	1200	62.75	1583.9	7.44	189.0	52.50	1333.5	55.25	1403.4	2.88	73.2	32	1 7/8	21.50	546.1	21	538.8

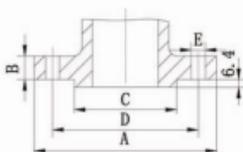
CLASS 900 RF

2	50	8.50	215.9	1.50	38.1	3.62	91.9	6.50	165.1	1.00	25.4	8	7/8	5.75	146.1	5	128
2 1/2	65	8.62	244.3	1.62	41.2	4.12	104.8	7.50	190.5	1.12	28.4	8	1	6.25	158.8	6	152.4
3	80	9.50	241.3	1.50	38.1	3.61	107.0	8.50	196.5	1.00	25.4	8	7/8	5.75	146.1	5	128
4	100	11.50	292.1	1.75	44.5	4.45	127.0	9.25	230.0	1.28	31.8	8	1	5.75	146.1	5	128
5	125	13.75	343.0	2.00	50.8	5.08	155.7	11.00	279.4	1.36	35.1	8	1 1/4	7.50	190.5	7	174
6	150	16.00	381.0	2.19	56.7	5.67	215.9	12.50	317.8	1.28	31.8	12	1 1/8	7.50	190.5	7	174
8	200	18.00	457.0	2.50	63.5	6.35	266.7	15.00	381.0	1.36	35.1	12	1 1/8	8.75	221.3	8	203.2
10	250	21.00	540.1	2.75	69.9	6.99	323.9	16.50	420.9	1.50	38.1	16	1 3/8	9.25	235.0	9	228.6
12	300	24.00	609.6	3.12	79.3	7.93	361.0	21.00	533.4	1.50	38.1	20	1 3/8	10.00	254.0	9	234.7
14	350	25.25	641.4	3.38	85.9	8.59	412.8	22.00	568.8	1.62	41.1	20	1 1/2	10.75	273.1	10	252
16	400	27.25	704.9	3.50	88.9	8.89	466.0	24.25	616.0	1.75	44.5	20	1 5/8	11.25	285.8	11	278.4
18	450	29.25	743.0	4.00	101.6	10.16	533.4	27.00	688.4	1.88	47.8	24	1 5/8	12.25	311.2	12	304.8
20	500	33.75	857.3	4.25	108.0	10.80	584.2	29.50	749.3	2.12	53.8	20	1	13.75	340.3	13	325.8
24	600	41.00	1041.4	5.50	139.7	13.97	692.2	35.50	901.7	2.62	66.5	20	2	17.25	438.2	17	431.8
26	650	46.00	1168.4	5.62	142.7	14.27	749.3	36.00	965.2	1.32	33.8	20	1	18.50	469.9	18	452.0
28	700	48.75	1246.6	6.25	158.8	16.00	814.4	40.50	1039.5	1.36	35.1	20	1	19.25	491.4	20	508.0
30	750	51.50	1306.5	6.75	171.5	17.15	862.8	42.00	1066.8	1.50	38.1	20	1	20.25	514.4	20	508.0

(1) The regular 1/4 inch (6.4 mm) raised face of 800,900,1500 and 2500 lb flanges is not included in the minimum flange thickness given above. The addition of any facing is beyond outside edge of the flange.

(2) Stud bolts length "G" also applies for tongue to groove flanged joint.

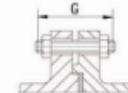
Class 1500/2500 Steel Pipe Flange



1500LB and 2500LB Steel

Length of Stud Bolt
Male to Male

1/4-inch Raised Face Flanged Joint

Length of Stud Bolt
Male to Female

Flanged Joint

Nominal Size	A		B		C		D		E		F		G	
	in	mm												

CLASS 1500 RF

2	50	8.50	215.9	1.50	38.1	3.62	91.9	6.50	165.1	1.00	25.4	8	7/8	5.75	146.1	5	128
2 1/2	65	9.62	244.3	1.62	41.2	4.12	104.8	7.50	190.5	1.12	28.4	8	1	6.25	158.8	6	152.4
3	80	10.50	266.7	1.58	40.7	3.62	107.0	8.50	215.9	1.25	31.8	8	1	6.50	165.1	6	152.4
4	100	12.25	311.2	2.12	53.8	6.19	157.2	9.92	241.3	1.58	38.1	8	1 1/4	7.75	196.9	7	174
5	125	14.50	367.7	2.88	73.2	7.31	185.7	11.50	292.1	1.62	41.1	8	1 1/2	9.25	247.7	9	228.6
6	150	15.50	397.7	3.25	82.6	8.50	215.9	12.00	317.5	1.50	38.1	12	1 3/8	10.00	254.0	10	254.0
8	200	19.00	482.6	3.62	91.9	10.62	269.7	15.00	381.0	1.75	44.5	12	1 3/8	11.25	285.8	11	278.4
10	250	23.00	584.2	4.25	108.0	12.75	323.9	19.00	482.0	2.00	50.8	12	1 5/8	13.00	330.2	12	304.8
12	300	26.50	671.1	4.88	124.0	15.00	381.0	22.00	571.5	2.12	53.8	16	2	14.75	374.7	14	354.8
14	350	29.50	749.3	5.25	133.4	16.25	412.8	25.00	635.0	2.38	60.3	16	2	15.4	394.0	14	354.8
16	400	32.50	835.5	5.75	146.1	18.50	469.9	27.75	704.9	2.62	66.5	16	2	16.75	426.4	16	406.4
18	450	36.00	914.4	6.38	162.1	21.00	533.4	30.50	774.7	2.88	73.2	16	2	18.00	457.3	18	452.0
20	500	38.75	984.3	7.00	177.8	23.00	584.2	32.75	831.9	3.12	79.2	16	3	21.25	538.8	21	533.4
24	600	46.00	1168.4	8.00	203.2	27.25	692.2	39.00	990.6	3.62	91.9	16	3 1/2	24.25	616.0	24	609.2

CLASS 2500 RF

2	50	9.25	235.0	2.00	50.8	3.62	91.9	6.75	171.5	1.12	28.4	8	7/8
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