BMT
FLUID COMPONENTS
NORTH AMERICA

CRYOGENIC VALVES

QUALITY, VALUE AND INNOVATION.

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Cryogenic Service Applications

Valves are used with cryogenics from production through transportation and storage which serve many industries with gases such as oxygen, nitrogen, argon and more. At extremely low temperatures of cryogenic liquids, many common materials become brittle and can crack. Many materials also shrink, causing potentially leaks at connections. Therefore, care must be taken when designing equipment and selecting materials to be used with cryogenics. Moisture must not be allowed to contaminate the valve as it will freeze and expand and cause leakage and abrasive damage to the equipment. Some of the common gases used are listed below.

Liquefied Gases	Boiling Point		Liquefied Gases	Boiling Point	
	°C	°F		°C	°F
Ammonia (NH3)	-33.4	-28.1	Oxygen (O2)	-183.3	-298
Propane (C3H8)	-42.2	-44.0	Argon (Ar)	-186.1	-303
Carbon Dioxide (CO2)	-78.5	-109	Air	-194.4	-318
Acetylene (C2H2)	-83.9	-119	Nitrogen (N2)	-195.6	-320
Ethylene (C2H4)	-103.9	-155	Neon (Ne)	-246.1	-411
Methane (CH4)	-161.7	-259	Hydrogen (H2)	-252.8	-423
Natural Gas (LNG)	-167.8	-270	Helium (He)	-268.9	-452

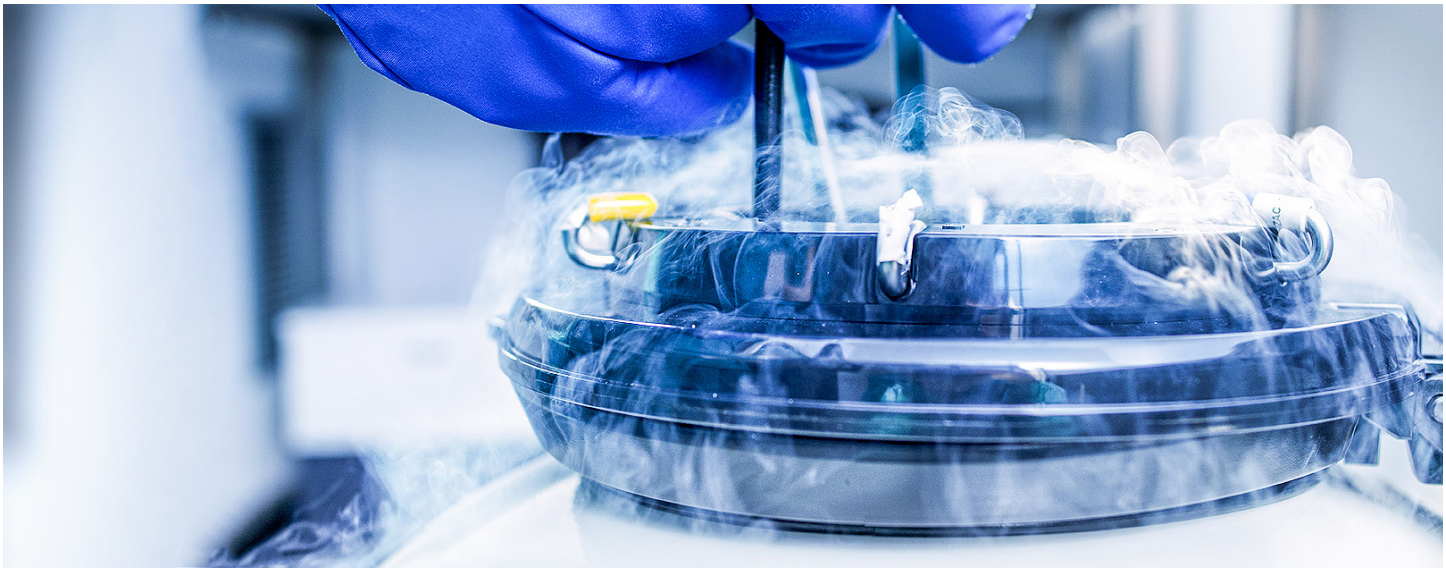
Common Steel will show low temperature brittleness under low temperature. Therefore, it is a key for design and manufacturing to select suitable body materials according to the lowest working temperature of the cryogenic valve. Refer to the following table for the lowest working temperature of body materials. The low temperature materials shall be subjected to low temperature impact test according to standard requirements. For valves with working temperature lower than -100°C, the body, bonnet and stem must be subjected to cryogenic treatment after tough machining.

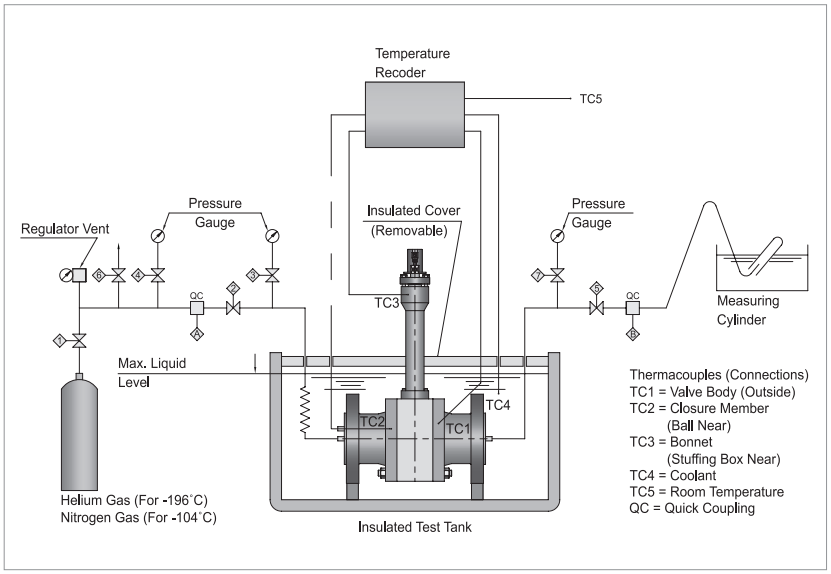
The ball and seat sealing face should be subjected to cryogenic treatment hard alloy spray welding/overlay welding. Then grinding and assembly can be carried out, so as to ensure the adaptability of materials under low temperature. In addition, the pacing, gasket, bolt and nut shall be made of materials suitable for low temperature service condition.

Forging		Casting	
Material	Minimum Temperature	Material	Minimum Temperature
ASTM A350 LF2	-46°C	ASTM A352 LCB ASTM A352 LCC	-46°C -46°C
ASTM A350 LF5	-59°C	ASTM A352 LC1	-59°C
ASTM A350 LF9	-73°C	ASTM A352 LC2	-73°C
ASTM A350 LF3	-101°C	ASTM A352 LC3	-101°C
ASTM A182 F304	-254°C	ASTM A351 CF8	-254°C
ASTM A182 F316	-254°C	ASTM A351 CF8M	-254°C
ASTM A182 F304L	-254°C	ASTM A351 CF3	-254°C
ASTM A182 F316L	-254°C	ASTM A351 CF3M	-254°C

Cryogenic Service Applications

To maintain and enhance the reliability, quality, and functionality of the valves, BMT operates stringent cryogenic testing through the in-house facility. The tests include leakage, torques, and cycling under typical cryogenic conditions. Tests are carried out to recognized international standards such as BS 6364 and ISO 28921 or can be designed to customers specific requirements.





Test Procedure (Standard)

1. **Initial Proving test:**
   Pressure: 1.1 x MDP @ R.T
   Test Fluid: Helium
2. **Operating test with Torque measurement:**
   Open + Close: 20 Cycle
   Torque measurement: at 1st and 20th cycle
3. **Seat Closure Leak test:**
   Pressure: 1.1 x MDP @-196°C
   Test Fluid: Helium
4. **Shell Leak test:**
   Pressure: 1.1 x MDP @-196°C
   Test Fluid: Helium
   Duration: 15 mins
5. **R.T Restoration test:**
   Pressure: 1.1 x MDP @R.T
   Test Fluid: Helium

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Construction - Ball and DBB Valves

Extended Bonnets
Gland packing is located away from cold area in cryogenic and low temperature systems.
Extended stems allow operation through bilk-heads and other obstacles.

Cavity Pressure Relief
In case of an unusually high increase of operating or ambient temperature, liquefied gas or highly volatile liquid trapped within the body cavity may evaporate and cause an excess rise in the cavity pressure. To relieve cavity pressure, the following safety options (or combinations) are available:

- A small relief hole in the ball of the upstream port, which allows the cavity pressure to relieve to the upstream side making the valve unidirectional.
- A hole that is fitted with a relief valve for bidirectional operation.
- Self-relieving seats to relieve the excess of pressure inside the cavity of the valve (for bidirectional flow).

Locking Devices
On manual valves, bolted plates allow all ball valves to be padlocked in the fully open or closed position. On valves with gearboxes, the locking devices are part of the gear. Interlocking systems ensure correct sequencing of any number and combination valves.

Actuated Operation
Electric, pneumatic or hydraulic actuators. Actuated valve packages are functionally tested.

Seat / Sealing materials
From soft materials suitable for temperature down to –196°C (-321°F) to metal seats for aggressive and corrosive process media up to 500°C (932°F) constant temperature.

Construction - Globe, Gate, and Needle Valves

Seat / Sealing Materials
From soft materials suitable for temperature down to -196°C (-321°F) to metal seats for aggressive and corrosive media up to 850°C (1562°F) constant temperature.

Extended Bonnets
Gland packing is located away from cold area in cryogenic and low temperature systems.
Extended stems allow operation through bulkheads and other obstacles.

Cavity Pressure Relief
Not needed.

Locking Devices
A locking device allows all Globe Valves to be padlocked in the fully open or closed position.

Actuated Operation
Electric, pneumatic or hydraulic actuators. Actuated valve packages are functionally tested.

Ball Valves

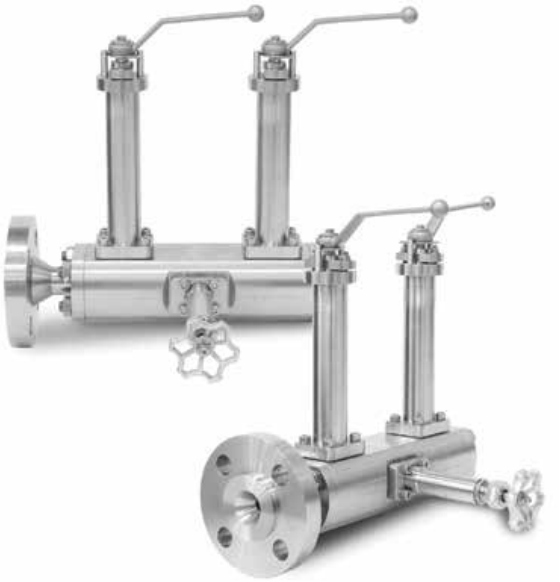
Specifications

- Valve size: Top entry - 1/2” to 14” 2&3-piece ball valves - 1/2” to 14”
- Pressure class: ASME class 150 to class 2500
- End connection: Butt weld, socket weld, threaded, flanged or combinations.
- Temperature: Down to - 196°C
- Bolted extension bonnet
- Anti blow out proof stem
- Fire safety design
- Wall thickness design: ASME B16.34
- Inspection & test: BS6364, API 598, ISO28921
- End flange dimension: ASME B16.5
- Butt weld end dimension: ASME B16.25
- Socket weld end dimension: ASME B 16.11
- Face to face & end to end: ASME B16.10

Block & Bleed Valves

Specifications

- Valve size: 1/2” to 4”
- Pressure class: ASME class 150 to class 2500
- Valve type: Ball-ball-needle, needle-needle-needle
- Bore Size: Full bore, reduced bore
- End Connection: Flanged-threaded, flanged-flanged
- Temperature: Down to -196°C
- Floating & trunnion ball design.
- Bolted extension bonnet.
- Anti blow out proof stem.
- Fire safety design.
- Wall thickness design: ASME B16.34
- Inspection and test: BS 6364, API 598, ISO28921
- End flange dimension: ASME B 16.5
- Face to face & end to end: Manufacture standard



- Components can limit the pressure and temperature ranges of the valve. Please consult BMT sales representative for your specific application.

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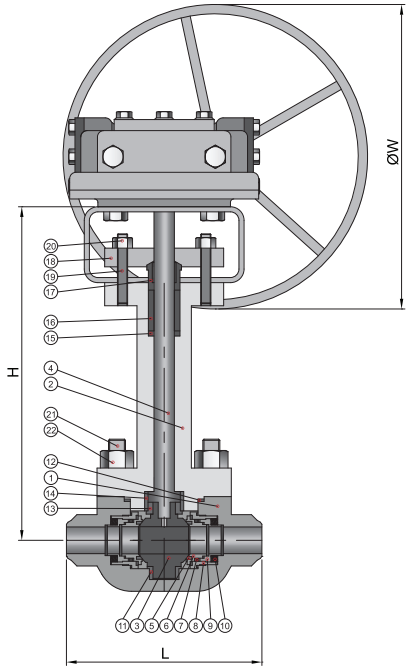
Top Entry Ball Valves



Materials of Construction

NO.	COMPONENT	MATERIAL
1	BODY	ASTM A351-CF8M
2	BONNET	ASTM A351-CF8M
3	BALL	ASTM A351-CF8M
4	STEM	A276-316
5	SEAT	PCTFE
6	SEAT RETAINER	ASTM A276-316
7	U-CUP SEAL VIRGIN	PTFE+SS316
8	SEAT HOLDER	ASTM A276-316
9	BACK UP SEAT RING	ASTM A276-316
10	SPRING INCONEL	X-750
11	BOTTOM THRUST WASHER	PCTFE
12	GASKET	GRAPHITE+SS316
13	UPPER THRUST WASHER	PCTFE
14	TURUST BEARING	PCTFE
15	STEM WASHER	ASTM A276-316
16	PACKING	GRAPHITE
17	GLAND	ASTM A276-316
18	GLAND FLANGE	ASTM A276-316
19	FLANGE BOLT	ASTM A320-B8
20	FLANGE BOLT NUT	ASTM A194-8
21	BONNET BOLT	ASTM A320-B8
22	BONNET BOLT NUT	ASTM A194-8

Table of Dimensions

Class 150

Size		Dimensions				Weight, kg	
DN	NPS	L		H	W	BW	FLG
		BW	FLG				
15	1/2	108	108	300	190	4.3	5.2
20	3/4	117	117	300	190	5.7	7.1
25	1	127	127	352	230	8.6	10.4
40	1-1/2	165	165	400	300	12.9	16
50	2	178	178	434	350	15	20
65	2-1/2	190	190	550	350	20	23
80	3	203	203	561	350	36	45
100	4	229	229	600	350	61	73
150	6	394	394	1073	350	213	249

Class 300

Size		Dimensions				Weight, kg	
DN	NPS	L		H	W	BW	FLG
		BW	FLG				
15	1/2	140	140	300	190	4.3	5.5
20	3/4	152	152	300	190	5.7	8.2
25	1	165	165	352	230	8.6	11.6
40	1-1/2	190	190	400	450	12.9	15.9
50	2	216	216	434	450	16	22
65	2-1/2	241	241	550	450	25	31
80	3	283	283	560	450	43	54
100	4	305	305	612	450	80	100
150	6	403	403	1073	450	227	272

Class 600

Size		Dimensions				Weight, kg	
DN	NPS	L		H	W	BW	FLG
		BW	FLG				
15	1/2	165	165	300	230	6	7.8
20	3/4	191	191	300	230	6	9
25	1	216	216	352	450	12	15.7
40	1-1/2	241	241	400	450	25	32.1
50	2	292	292	434	450	43	54
65	2-1/2	330	330	550	450	55	62
80	3	356	356	600	450	66	82
100	4	432	432	710	450	102	145
150	6	559	559	1163	450	254	318

- *Dimensions and Drawings are for reference only and are subject to change without prior notice.*
- *Unless otherwise specified, all dimensions are in millimeters.*
- *Sizes, pressure classes, and end connections not listed are available upon request.*

2&3-Piece Ball Valves

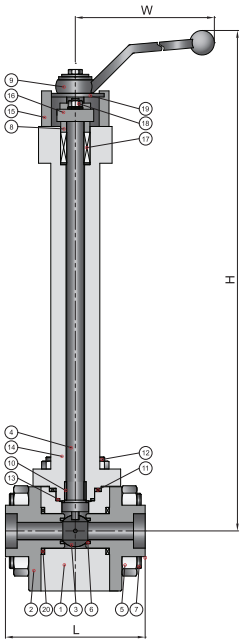


Table of Dimensions

Class 150, 300

Size		Dimensions			Weight, kg
DN	NPS	L SW	H	W	
15	1/2	107	313	190	3.7
20	3/4	107	313	190	3.7
25	1	125	326	230	5.2
32	1-1/4	150	349	260	10.3
40	1-1/2	150	349	260	10.3
50	2	180	370	260	17.1
65	2-1/2	190	477	380	22
80	3	203	487	380	41
100	4	229	534	450	72
150	6	394	657	*400	158
200	8	457	723	*400	245
250	10	533	835	*400	343
300	12	610	897	*500	595
350	14	686	996	*560	720

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- *Sizes, pressure classes, and end connections not listed are available upon request.*

Materials of Construction

NO.	COMPONENT	MATERIAL
1	BODY	ASTM A182-F316
2	BODY CAP	ASTM A182-F316
3	BALL	ASTM A276-316
4	STEM	ASTM A276-316
5	BODY BOLT NUT	ASTM A194-8
6	BALL SEAT	PCTFE
7	BODY BOLT	ASTM A320-B8
8	PACKING GLAND	ASTM A276-316
9	BAR HANDLE	A351 CF8M
10	BUSHING	PCTFE
11	GASKET	GRAPHITE
12	BONNET BOLT / NUT	ASTM A320-B8/A194-8
13	BONNET SEAL	PCTFE
14	BONNET	ASTM A182-F316
15	STOP PIN	SS 316
16	BONNET FLANGE	ASTM A276-316
17	PACKING	GRAPHITE
18	STUD BOLT / NUT	ASTM A320-B8/A194-8
19	LOCKING DEVICE	SS 316
20	GASKET	GRAPHITE

Class 300

Size		Dimensions			Weight, kg
DN	NPS	L SW	H	W	
15	1/2	107	313	190	3.7
20	3/4	107	313	190	3.7
25	1	125	326	230	5.2
32	1-1/4	150	349	260	10.3
40	1-1/2	150	349	260	10.3
50	2	180	370	290	17.1

Class 900

Size		Dimensions			Weight, kg
DN	NPS	L SW	H	W	
15	1/2	167	326	230	7.3
20	3/4	167	326	230	7.3
25	1	185	342	230	10.6
32	1-1/4	210	360	260	19.1
40	1-1/2	210	360	260	19.1

Class 1500

Size		Dimensions			Weight, kg
DN	NPS	L SW	H	W	
15	1/2	167	326	230	7.3
20	3/4	167	326	230	7.3
25	1	185	342	230	10.6
32	1-1/4	210	360	260	19.1
40	1-1/2	210	360	260	19.1

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Globe Valves

Specifications

- Valve size: 1/2” to 14”
- Pressure class: ASME class 150 to class 2500
- End connection: Butt weld, socket weld, threaded, flange or combinations.
- Temperature: -196°C to 850°C (-321°F to 1562°F)
- Standard inclusion of a back seat facility for ease of maintenance.
- Bolted extension bonnet.
- Inside or outside screw stem & fire safety design.
- Non rotating and self aligning stem disc construction.
- Metal seat to bubble tight shut-off design.
- Wall thickness design: ASME B16.34
- Inspection and test: BS6364, API 598, ISO28921
- End flange dimension: ASME B16.5
- Butt weld end dimension: ASME B16.25
- Face to face & end to end: ASME B16.10

Needle Valves

Specifications

- Valve size: 1/2” to 1-1/2”
- Pressure class: ASME class 150
- End connection: Butt weld, socket weld, threaded, flange or combinations.
- Temperature: -196°C to 371°C (-321°F to 700°F)
- Bolted extension bonnet.
- Non rotating and self aligning stem disc construction.
- Metal seat to bubble tight shut-off design.
- Position indicator.
- Fire-safety design.
- Wall thickness design: ASME B16.34
- Inspection and test: BS6364, API 598, ISO28921
- End flange dimension: ASME B16.5
- Butt weld end dimension: ASME B16.25
- Face to face & end to end: Manufacturer’s standard

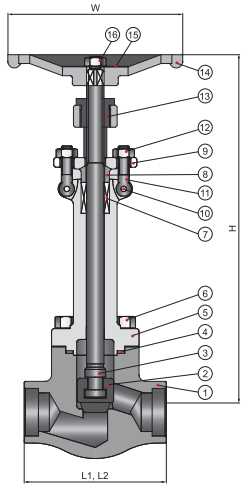
Gate Valves

Specifications

- Valve size: ½” to 24”
- Pressure class: ASME class 150 to class 2500
- End connection: Butt weld(ASME B16.20), flanged (ASME B16.5)
- Temperature range: -196°C to 120°C (-321 to 248°F)
- Standard inclusion of a back seat factory for ease of maintenance.
- Bolted extension bonnet, fire safety design
- Inspection and test: BS6364, API 598
- Design: API 600
- Face to face: ASME B16.10

- Components can limit the pressure and temperature ranges of the valve. Please consult BMT sales representative for your specific application.

Globe Valves (Forged)



Materials of Construction

NO.	COMPONENT	MATERIAL
1	BODY	ASTM A182-F316
2	BODY CAP	ASTM A182-F316
3	BALL	ASTM A276-316
4	STEM	ASTM A276-316
5	BODY BOLT NUT	ASTM A194-8
6	BALL SEAT	PCTFE
7	BODY BOLT	ASTM A320-B8
8	PACKING GLAND	ASTM A276-316
9	BAR HANDLE	A351 CF8M
10	BUSHING	PCTFE
11	GASKET	GRAPHITE
12	BONNET BOLT / NUT	ASTM A320-B8/A194-8
13	BONNET SEAL	PCTFE
14	BONNET	ASTM A182-F316
15	STOP PIN	SS 316
16	GASKET	GRAPHITE

Table of Dimensions

Class 150

Size		Dimensions				Weight, kg	
DN	NPS	L		H	W	SW	FLG
		SW	FLG				
15	1/2	79	108	466	100	4.3	8.7
20	3/4	92	117	466	100	5.7	9.1
25	1	111	127	503	125	8.6	12.3
32	1-1/4	152	165	606	160	12.9	16.2
40	1-1/2	152	165	606	160	12.6	-
50	2	172	203	657	180	21.3	24.4

Class 300

Size		Dimensions				Weight, kg	
DN	NPS	L		H	W	SW	FLG
		SW	FLG				
15	1/2	79	152	466	100	4.3	8.7
20	3/4	92	178	466	100	5.7	9.4
25	1	111	203	503	125	8.6	12.7
32	1-1/4	152	216	606	160	12.9	17.0
40	1-1/2	152	229	606	160	12.6	17.1
50	2	172	267	657	180	21.3	25.5

Class 600

Size		Dimensions				Weight, kg	
DN	NPS	L		H	W	SW	FLG
		SW	FLG				
15	1/2	79	165	466	100	4.3	9.4
20	3/4	92	191	466	100	5.7	10.1
25	1	111	216	503	125	8.6	14.0
32	1-1/4	152	229	606	160	12.9	18.1
40	1-1/2	152	241	606	160	12.6	18.4
50	2	172	292	657	180	21.3	26.6

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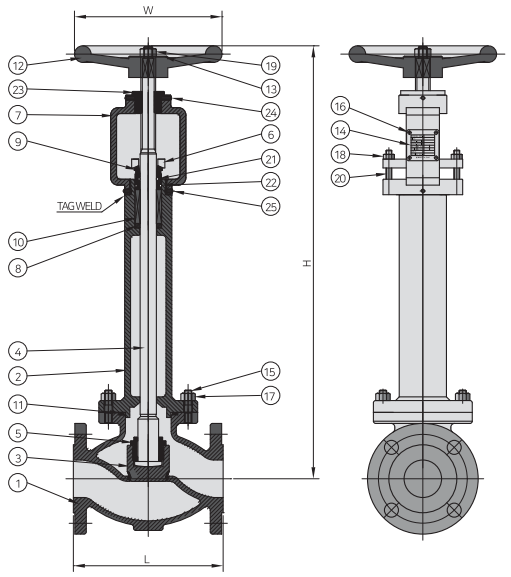

Table of Dimensions

Class 150

Size		Dimensions				Weight, kg	
DN	NPS	L		H	W	BW	FLG/ RTJ
		BW/FLG	RTJ				
65	2-1/2	216	229	660	200	27	32
80	3	241	254	690	200	37	42
100	4	292	305	750	300	50	55
125	5	356	368	850	300	50	55
150	6	406	419	975	300	81	86
200	8	495	508	1040	300	125	130
250	10	622	635	1200	400	175	180
300	12	698	711	1365	500	275	280
350	14	787	800	1940	800	365	380

Class 150

Size		Dimensions				Weight, kg	
DN	NPS	L		H	W	BW	FLG/ RTJ
		BW/FLG	RTJ				
65	2-1/2	292	308	750	200	35	40
80	3	318	333	760	224	65	70
100	4	356	371	810	250	80	85
125	5	400	416	920	280	100	105
150	6	445	460	973	315	200	205

Class 150

Size		Dimensions				Weight, kg	
DN	NPS	L		H	W	BW	FLG/ RTJ
		BW/FLG	RTJ				
65	2-1/2	330	333	800	224	50	55
80	3	356	359	840	250	72	75
100	4	432	435	1010	315	127	132
150	6	559	562	1160	40	295	310

Materials of Construction

NO.	COMPONENT	MATERIAL
1	BODY	A351-CF8M
2	EXTENSION BONNET	A276-316
3	DISC	A276-316
4	EXTENSION STEM	A276-316
5	DISC NUT	A276-316
6	GLAND FLANGE	A240-304
7	YOKE	A351-CF8M
8	STEM WASHER	A276-316
9	PACKING GLAND	A276-316
10	PACKING	GRAPHITE+WIRE
11	SPIRAL WOUND GASKET	GRAPHITE+316SS
12	HANDLE	FC20
13	HANDLE NAME PLATE	STAINLESS STEEL
14	NAME PLATE	STAINLESS STEEL
15	BODY BOLT	A193-B8M-CL.2
16	HEX SOCKET BOLT	BOLT 304 SS
17	HEAVY HEX NUT	A194-8M
18	HEX NUT	304 SS
19	HEX NUT	304 SS
20	PACKING BOLT	304 SS
21	O-RING	NBR
22	O-RING	NBR
23	YOKE BUSHING	BRASS
24	SET SCREW	304 SS
25	SET SCREW	304 SS

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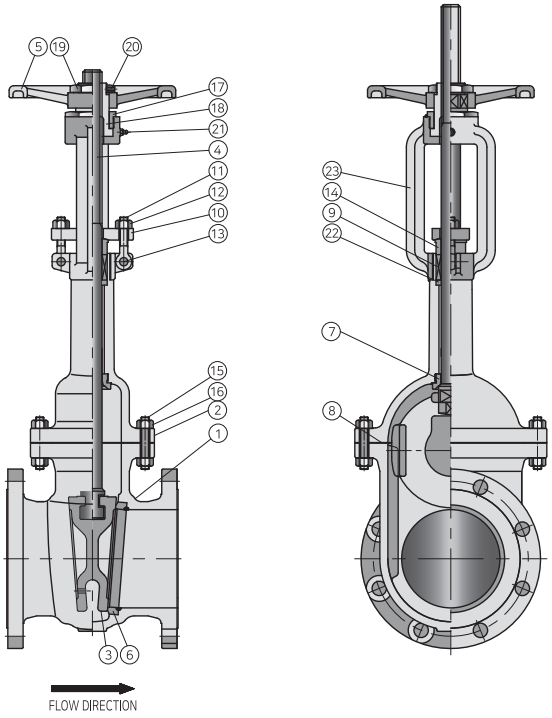
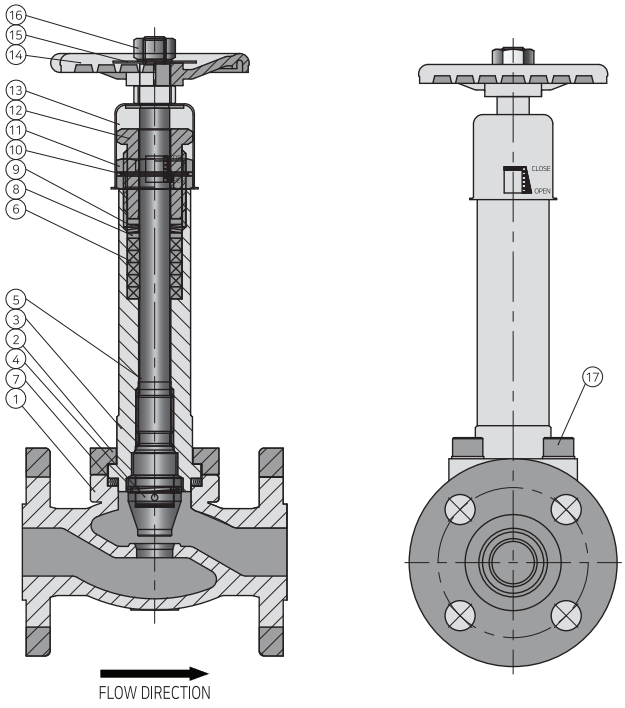
Gate Valves



Materials of Construction

NO.	COMPONENT	MATERIAL
1	BODY	A351-CF8M
2	BONNET	A351-CF8M
3	DISC	A351-CF8M
4	STEM	A276-316
5	HANDWHEEL	FC20
6	BODY SEAT RING	A276-316
7	BACK SEAT RING	A276-316
8	SPRIRAL WOUND GASKET	316SS+GRAPHITE
9	PACKING GRAPHITE	GRAPHITE
10	GLAND FLANGE	A240-304
11	GLAND BOLT	A193-B8
12	NUT	A194-8
13	HINGE PIN	A479-304
14	PACKING GLAND	A479-304
15	BONNET BOLT	A193-B8M
16	NUT	A194-8M
17	YOKE NUT	A576-1020+Zn
18	STEM NUT	A439-D2C
19	HANDLE NUT	A576-1020+Zn
20	SET SCREW	STEEL
21	GREASE NIPPLE	STEEL+Zn
22	STUFFING RING	A479-316
23	YOKE	A351-CF8M

Needle Valves



Materials of Construction

NO.	COMPONENT	MATERIAL
1	BODY	ASTM A351-CF8M
2	BONNET FLAGNE	ASTM A351-CF8M
3	EXTENSION BONNET	ASTM A276-316
4	ROTATING DISC	ASTM A276-316
5	STEM	ASTM A276-316
6	PACKING	GRAPHITE
7	GASKET	GRAPHITE/316SS
8	PACKING GLAND	SS316
9	DISC SPRING	SS316
10	POSITION INDICATOR	PC
11	LOCK NUT	SS316
12	PACKING BOLT	SS316
13	VALVE CAP	SS316
14	HAND WHEEL	ASTM A351 CF8M
15	NAME PLATE	SS316L
16	HEX NUT	SS316
17	HEAVY HEX NUT	A320 B8M CL.2
18	TAG PLATE	SS316
19	GASKET	GRAPHITE / HOOP:316
20	HEX NUT	A194-8M
21	STUD BOLT	A320 B8M CL.2
22	FLANGE ADAPTOR	A182-F316
23	EARTH WIRE	SS316

BMT FLUID COMPONENTS NORTH AMERICA

Ordering Information

Example 1:	FGB3	C	RF	1	-	16	-	G	
	1	3	4	5		6		7	
Example 2:	FCGB	C	C	8S	RF	2	-	16	-	36L
	1	2	3	4	4	5		6		8

1. Valve Type

Ball Valves	Floating	1-piece Top Entry	FCB1
		1-piece Side Entry	FCB1S
		2-piece Side Entry	FCB2
		3-piece Side Entry	FCB3
	Trunnion	1-piece Top Entry	FCBT1
		1-piece Side Entry	FCBT1S
		2-piece Side Entry	FCBT2
		3-piece Side Entry	FCBT3
Globe Valves			FCGB
Gate Valves			FCGT
Needle Valves			FCNV
Block & Bleed Valves			(*)

(*) For Cryogenic Service, add the designator C at the front of the part number of Block & Bleed Valves (please refer to page 338).

2. Metal Forming Process

☐ **(Blank)** = Forging

☐ **C** = Casting

3. Pressure Rating

Class	150	300	600	800	900	1500	2500
Designator	A	B	C	S	D	E	F

4. End Connection

Flange	Raised Face	Ring Joint	Flat Face
Designator	RF	RJ	FF

Butt Weld	Sch10S	Sch20S	Sch40S	Sch80S	Sch160	SchXXS
Designator	1S	2S	4S	8S	16	DS

Type	Socket Weld	Male NPT	Male PT	Female NPT	Female PT
Designator	SW	MN	MR	FN	FR

5. Bore

Bore	Full Bore	Reduced Bore	Double Reduced Bore
Designator	1	2	3

6. Size

Class	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6	8	10	12	14	16
Designator	8	12	16	20	24	32	40	48	64	80	96	128	160	192	224	256

7. Option

Class	Gear Actuator
Designator	G

8. Material

Material	A182-F316 / A351-CF8M	A182-F316L / A351-CF3M	A182-F304 / A351-CF8	A182-F304L / A351-CF3
Designator	(Blank)	36L	34	34L

Notes

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