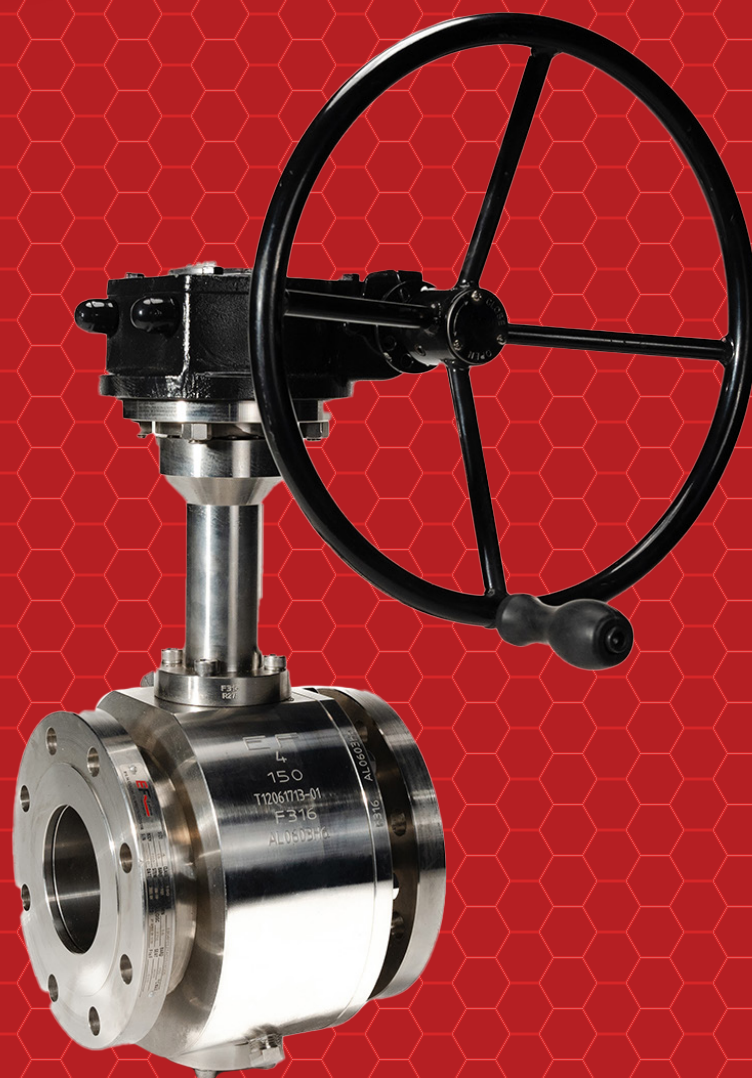




CRYOGENIC VALVES

- Ball Valves
- Gate Valves
- Globe Valves
- Check Valves
- Butterfly Valves
- Forged Gate/Globe & Check Valves



ENFLOW CRYOGENIC VALVES (-196°)

Enflow Industries proudly offers an extensive range of high-quality cryogenic valves, meticulously engineered to meet the unique demands of various projects. Our valves are crafted with precision and technical excellence, ensuring unparalleled reliability and efficiency. Whether you are working in LNG, aerospace, or other fields, our cryogenic valves are designed to perform flawlessly under most extreme conditions.

If you need more information on Enflow valves or have specific requirements, you can visit our website at www.enflow.ca, or contact us directly at sales@enflow.ca or (403) 266-4977

STANDARD, SIZES & CLASS

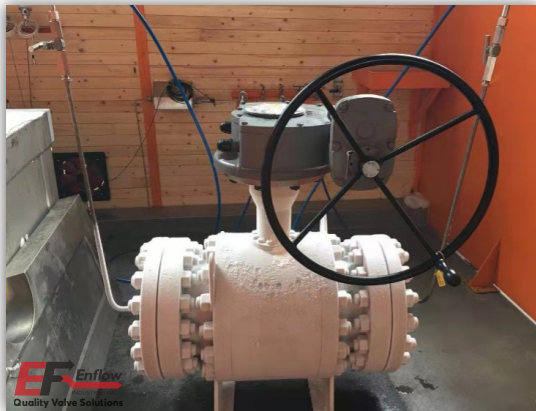
GENERAL	STANDARD	SIZES	CLASS
BALL VALVES	API 6D	½" to 48"	150 to 2500
GATE VALVES	API 600	2" to 42"	150 to 2500
GLOBE VALVES	API 623	2" to 24"	150 to 2500
CHECK VALVES	API 594	2" to 24"	150 to 2500
BUTTERFLY VALVES	API 609	2" to 24"	150 to 2500
FORGED GATE GLOBE CHECK VALVES	API 602	½" to 2"	800 to 2500



Body Cavity Pressure Relief

Double Block and Bleed Ball Valves shall be vented using a pressure relief device/vent valve. DIB-2 utilizes (1) bi-directional DPE seat and (1) uni-directional SR seat and is self-relieving through the SR seat with controlled internal upstream venting.

For valves not provided with a self-relieving seat, a vent hole is drilled through the gate or floating ball to the upstream side.



REFERENCE STANDARDS

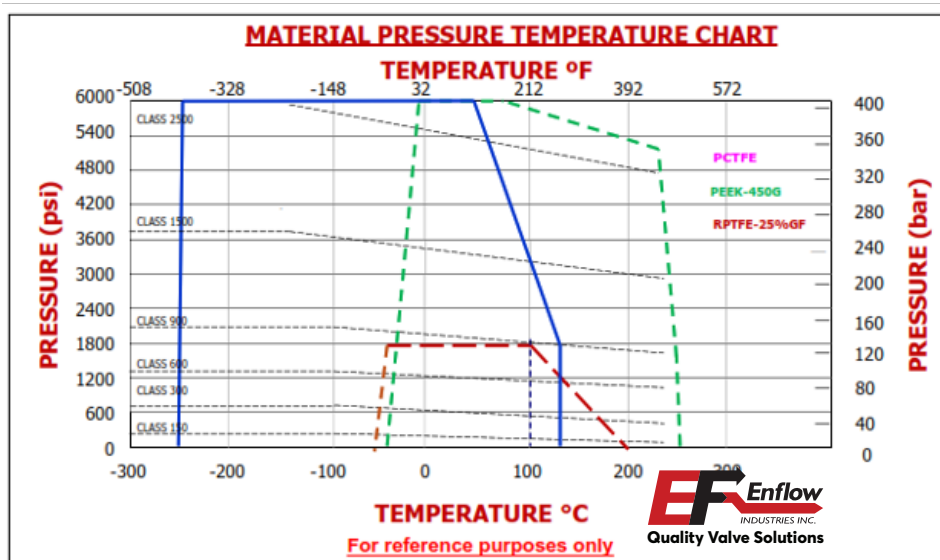
- **MESC SPE 77/200** - Valves in Low Temperature and Cryogenic Services.
- **MSS-SP-134** - Valves for Cryogenic Service, including requirements for body/bonnet extensions.
- **ISO 28921-1** - Industrial valves: Isolating valves for Low-Temperature Applications.
- **ISO 15848-1** - Industrial Valves: Measurement, Test and Qualification Procedure for Fugitive Emissions - Part 1: Classification system and qualification procedure for type testing valves.
- **ASME B16.34** - Valves: Flanged, Threaded, and Welding End.
- **API 6D** - Specification for Valves.
- **Top Works to ISO 5211**

Ball Valve Design Features

- Cryogenic Tested to **-196°C**
- Foged Bodies
- Antistatic
- Blowout Proof Stem
- Fugitive Emissions to **ISO 15848**
- Top Works to **ISO 5211**
- PCTFE and Metal to Metal Seats
- Multiple Packing & Spring Energized Lip Seals

Gate & Globe Valve Design Features

- Cryogenic Tested to **-196°C**
- Antistatic
- Fugitive Emissions to **ISO 15848**
- Top Works to **ISO 5211**
- Metal to Metal Seats
- Low Emission Packing (**API 622**)
- **API 624** Compliant.
- Live Loading Available
- Metal to Metal Seats





EXTENSIONS GENERAL

Extensions are used primarily for temperatures colder than **-73°C**.

For Cold Box Applications, Valves with Extensions shall be capable of operating with stem oriented from **15° to 90°** above the horizontal plane.

Extensions shall meet the requirements of **ASME B16.34** for the applicable pressure class of the valve body.

EXTENSION LENGTH

Enflow Standard offering for Bonnet Extensions are in accordance with the following Cryogenic Standards.

- **MESC SPE 77/200 (Table 1)**
- **MSS-SP-134 (Table 2 & 3)**

*Extensions can also be made to customer specifications.

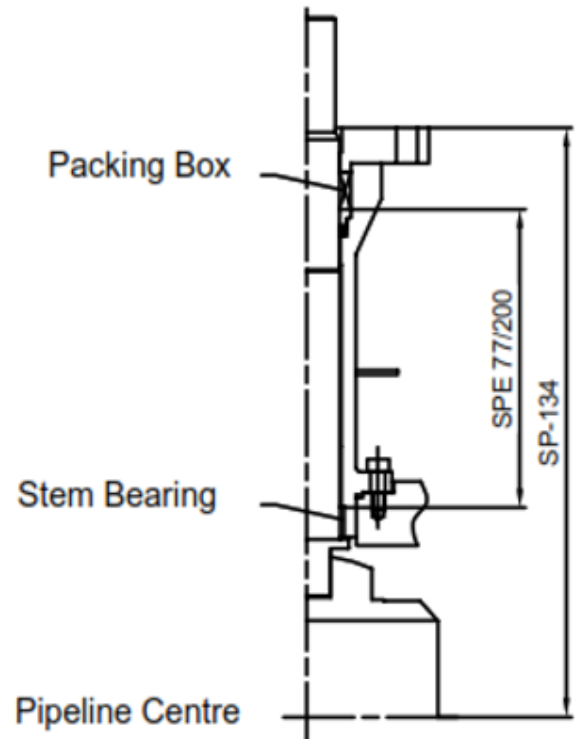


Table 1 - Minimum Vapour Space and Lagging Length (Bonnet Extension)

Minimum Design Temperature Min °C (°F) Max °C (°F)		DN (NPS) Min Max	15 (½)	40 (1½)	80 (3)	150 (6)	250 (10)	350 (14)	450 (18)	700 (28)	900 (36)
			25 (1)	50 (2)	100 (4)	200 (8)	300 (12)	400 (16)	600 (24)	800 (32)	1200 (48)
-196 (-321)	<-110 (-166)	Minimum Vapour Space Length mm (in)	200 (7.9)	250 (9.8)	300 (11.8)	350 (13.8)	400 (15.8)	450 (17.7)	500 (19.7)	550 (21.7)	600 (23.6)
	-110 (-166)		<-50 (-58)	100 (3.9)	125 (4.9)	150 (5.9)	175 (6.9)	200 (7.9)	250 (9.8)	300 (11.8)	350 (13.8)
-50 (-58)	<-20 (-4)	Lagging Extension Length mm (in)	60 (2.4)	80 (3.1)	90 (3.5)	100 (3.9)	100 (3.9)	110 (4.3)	110 (4.3)	110 (4.3)	120 (4.7)

**Table 2 - Body/Bonnet Extension Length - SI (Metric) Units**

Size (DN)	Rising-Stem Valves		Quarter-Turn Valves	
	Cold Box	Non-Cold Box	Cold Box	Non-Cold Box
15	425	300	400	200
20	425	300	400	200
25	425	300	400	200
40	500	350	500	225
50	500	400	500	250
80	600	450	550	300
100	650	550	600	350
150	750	600	600	425
200	900	700	650	450
250	1000	800	700	600
300	1150	900	800	700

Dimensions - Centerline of valve to top of stuffing box.

Table 3 - Body/Bonnet Extension Length - U.S Customary Units (in)

Size (NPS)	Rising-Stem Valves		Quarter-Turn Valves	
	Cold Box	Non-Cold Box	Cold Box	Non-Cold Box
½	17	12	16	7.5
¾	17	12	16	7.5
1	17	12	16	7.5
1 ½	21	14	20	8.5
2	21	16	20	10
3	24	18	22	13
4	26	22	24	14
6	30	24	24	17
8	34	27	26	18
10	40	32	28	25
12	45	36	32	28

Dimensions - Centerline of valve to top of stuffing box.

Definitions

Cryogenic Fluid - A gas that can be changed to a liquid by refrigeration methods to a temperature at **-73°C** or lower.

Cryogenic Temperature - A temperature range of **-73°C to -254°C**.

Cold Box - An enclosure that insulates equipment from the environment without the need for insulation of the individual components inside the cold box.

Cold Box Extension - A valve bonnet extension that removes the operating mechanism of the valve outside the cold box.

Non-Cold Box Extension - A valve bonnet extension that is used for valves that are normally individually insulated.

Gas Column - The portion of the extension that allows for the formation of an insulating column of vapor.

Vapour Space - Rising Stem Valves - Is the distance between the bottom of the packing box and the top of the lower bonnet bushing.

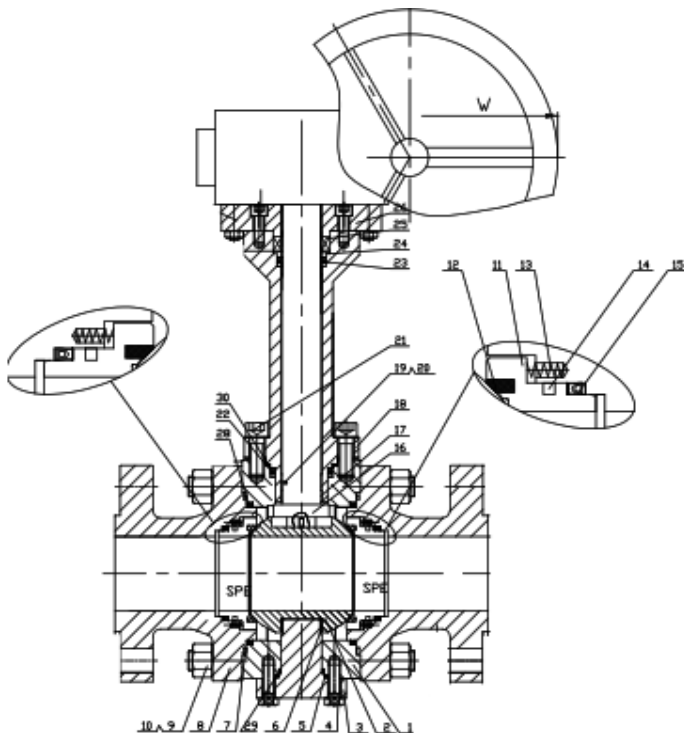
Vapour Space - Quarter Turn Valves - Is the distance between the bottom of the packing box and the top of the lower stem bearing/top of the body.

Typical Cryogenic DIB Ball Valve Materials



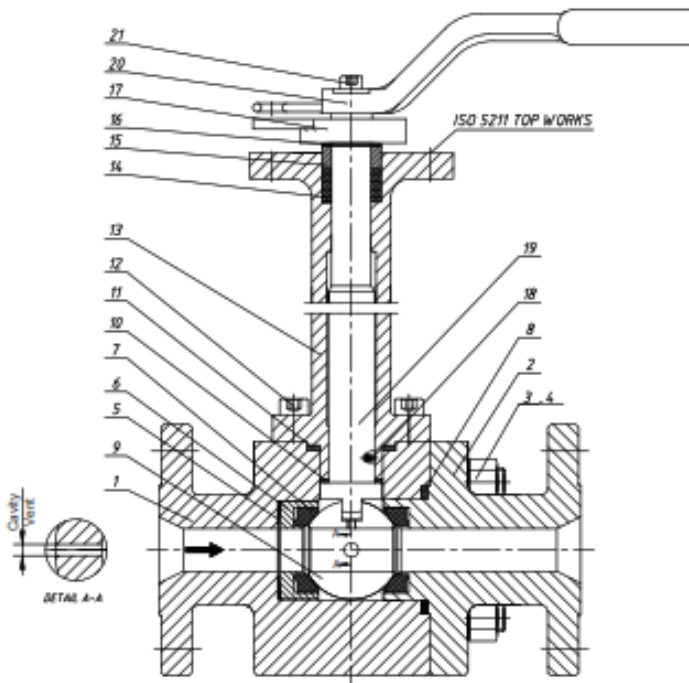
This table outlines the materials used in **Double Isolation and Bleed (DIB) Ball Valves**, detailing key components like the body, ball, and seats. It helps you understand the valve's construction and suitability for various applications, ensuring reliable performance and durability.

No	Description	Material
1	Body	ASTM A182 F316
2	Ball	ASTM A182 F316
3	Trunnion	ASTM A182 F316
4	Screw	ASTM A320 B8M
5	Gasket	Graphite
6	Bearing	SS316 + PTFE
7	Gasket	SS316 + Graphite
8	Adapter / Cap	SS316 + Graphite
9	Body Bolt	ASTM A320 B8M
10	Body Nut	ASTM A194 8M
11	Seat Ring	ASTM A182 F316
12	Seat Insert	PCTFE
13	Spring	Inconel X750
14	Gasket	Graphite
15	Lip Seal	PTFE + ELGILOY
16	Stem	UNS S20910 / XM-19
17	Bearing	SS316 + PTFE
18	Extension	ASTM A182 F316
19	Antistatic Spring	SS316
20	Antistatic Ball	SS316
21	Screw	ASTM A320 B8M
22	Lip Seal	PTFE + ELGILOY
23	Lip Seal	PTFE + ELGILOY
24	Packing Ring	ASTM A276 F316
25	Packing	Flexible Graphite
26	Gand Flange	ASTM A267 F316
27	Lip Seal	PTFE + ELGILOY
28	Lip Seal	PTFE + ELGILOY
29	Gasket	SS316 + Graphite



Other Material Options Available

Typical Cryogenic Floating Ball Valve Materials



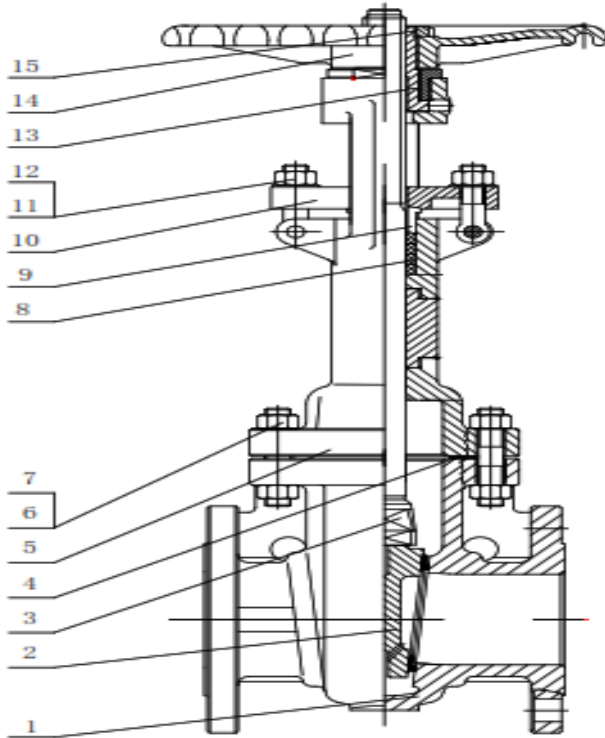
This table lists the materials used in **Floating Ball Valves**, detailing essential components such as the body, ball, and seats. It provides insights into the valve's construction and suitability for different applications, ensuring dependable performance and durability.

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No	Description	Material
1	Body	ASTM A182 F316
2	Adapter / Cap	ASTM A182 F316
3	Body Bolt	ASTM A320 B8M
4	Body Nut	ASTM A194 8M
5	Spring	Inconel X750
6	Spring Retainer	ASTM A182 F316
7	Seat	PCTFE
8	Gasket	SS316 + Graphite
9	Ball	ASTM A182 F316
10	Thrust Collar	PTFE
11	Gasket	SS316 + Gasket
12	Screw	ASTM A320 B8M
13	Extension Bonnet	ASTM A182 F316
14	Packing	Graphite
15	Gland	ATM A276 F316
16	Spring	ASTM A182 F316
17	Gland Flange	ASTM A182 F316
18	Antistatic Device	ASTM A182 F316
19	Stem	UNS S20910 / XM-19
20	Lever	C.S.

Other Material Options Available

Typical Cryogenic Gate Valve Materials

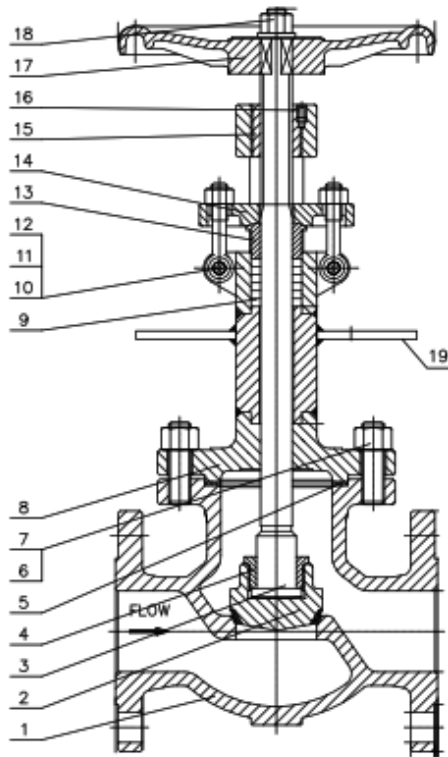


This table lists the materials used in **Gate Valves**, detailing essential components such as the body, ball, and seats. It provides insights into the valve's construction and suitability for different applications, ensuring dependable performance and durability.

No	Description	Material
1	Body	ASTM A351 CF8M + STL
2	Wedge	ASTM A182 F316
3	Stem	ASTM A182 F316
4	Gasket	SS316 + Graphite
5	Bonnet	ASTM A182 F316
6	Bonnet Bolt	ASTM A320 B8M
7	Bonnet Nut	ASTM 194 8M
8	Packing	Flexible Graphite
9	Gland	ASTM A182 F316
10	Gland Flange	ASTM A182 F316
11	Gland Eyebolt	ASTM A320 B8M
12	Gland Nut	ASTM A194 8M
13	Stem Nut	Copper Alloy
14	Hand Wheel	Ductile Iron
15	Lock Nut	AISI 1020

Other Material Options Available

Typical Cryogenic Globe Ball Valve Materials



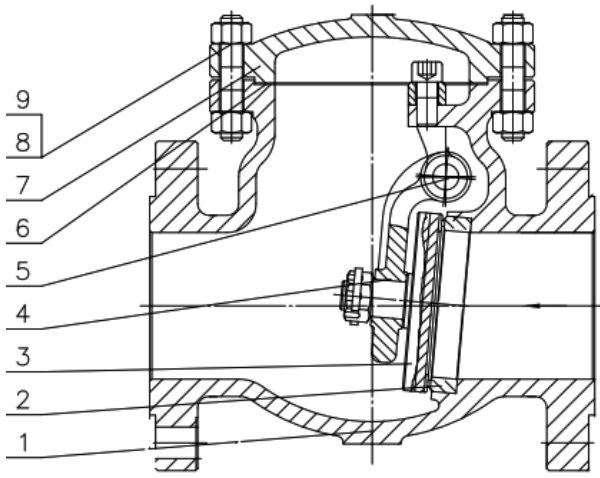
This table lists the materials used in **Globe Valves**, detailing essential components such as the body, ball, and seats. It provides insights into the valve's construction and suitability for different applications, ensuring dependable performance and durability.

No	Description	Material
1	Body	ASTM A351 CF8M+STL
2	Disc	ASTM A182 F316
3	Stem	ASTM A182 F316
4	Disc Bonnet	ASTM A182 F316
5	Gasket	SS316 + Graphite
6	Bonnet Bolt	ASTM A320 B8M
7	Bonnet Nut	ASTM 19 8M
8	Bonnet	ASTM A351 CF8M
9	Packing	Flexible Graphite
10	Gland Eyebolt	ASTM A320 B8M
11	Gland Nut	ASTM A194 8M
12	Pin	ASTM A182 F316
13	Gland	ASTM A182 F316
14	Gland Flange	ASTM A182 F316
15	Stem Nut	Bronze
16	Grub Screw	Carbon Steel
17	Handwheel	Ductile Iron
18	Lock Nut	ASTM A194 8M
19	Drip Plate	ASTM A182 F316

Other Material Options Available

Typical Cryogenic Check Valve Materials

This table lists the materials used in **Check Valves**, detailing essential components such as the body, ball, and seats. It provides insights into the valve's construction and suitability for different applications, ensuring dependable performance and durability.

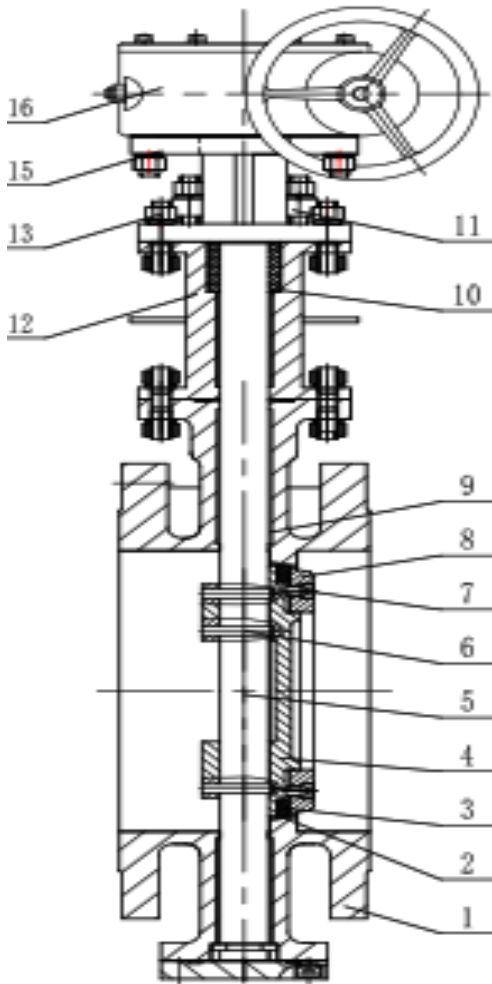


No	Description	Material
1	Body	ASTM A182 CF8M
2	Seat Ring	ASTM A182 CF8M+ STL
3	Disc	ASTM A182 CF8M
4	Hinge	ASTM A182 CF8M
5	Hinge Pin	ASTM A182 F316
6	Gasket	SS316+Graphite
7	Cover	ASTM A182 CF8M
8	Bolt	ASTM A320 B8M
9	Nut	ASTM A194 8M

Other Material Options Available



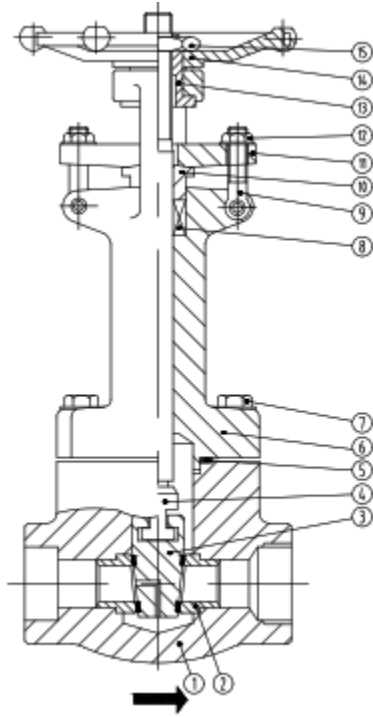
Typical Cryogenic Triple Offset Butterfly Valve Materials



This table lists the materials used in **Triple Offset Butterfly Valves**, detailing essential components such as the body, ball, and seats. It provides insights into the valve's construction and suitability for different applications, ensuring dependable performance and durability.

No	Description	Material
1	Body	ASTM A351 CF8M
2	Overlay	ASTM A351 CF8M+STL
3	Sealing	SS316 + Graphite
4	Disc	ASTM A351 CF8M
5	Stem	UNS S20910 / XM-19
6	Pin	ASTM A182 F316
7	Screw	ASTM A193 B8M
8	Sealing Plate	ASTM A182 F316
9	Bushing	F316+Nitriding
10	Packing	Graphite
11	Packing Gland	ASTM A351 CF8M
12	Extension	ASTM A182 F316
13	Bolt	ASTM A320 B8M
14	Nut	ASTM A194 8M
15	Other Material Options Available	ASTM A351 CF8M
16	Gear	Carbon Steel

Typical Cryogenic Forged Gate Valve Materials

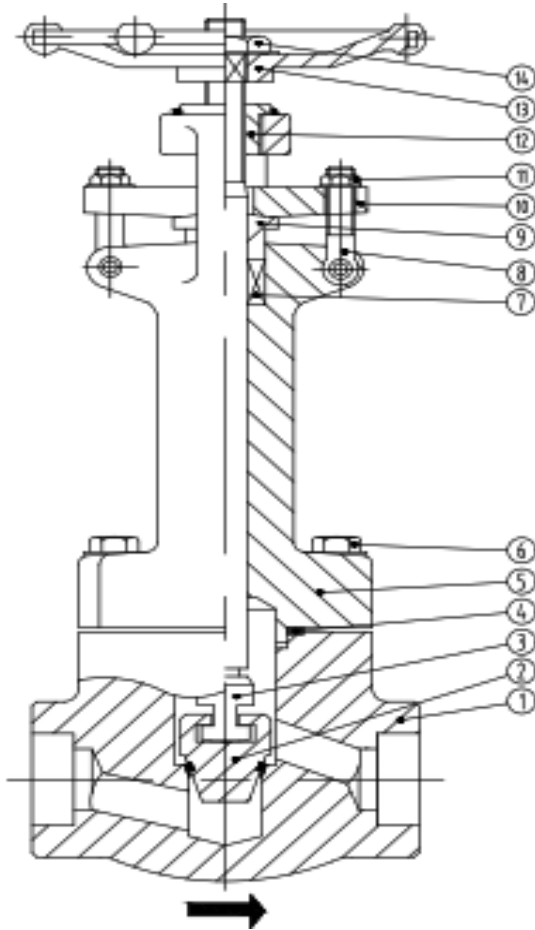


This table lists the materials used in **Forged Gate Valves**, detailing essential components such as the body, ball, and seats. It provides insights into the valve's construction and suitability for different applications, ensuring dependable performance and durability.

No	Description	Material
1	Body	ASTM A182 F316
2	Seat	ASTM A182 F316 + STL
3	Gate	SS316 + Graphite
4	Stem	ASTM A182 F316
5	Gasket	SS316+Graphite
6	Bonnet	ASTM A182 F316
7	Bonnet Bolt	ASTM A320 B8M
8	Packing	Graphite
9	Eye Bolt	ASTM A320 B8M
10	Packing Gland	ASTM A 182 F316
11	Gland Flange	ASTM A351 CF8M
12	Nut	ASTM A 193 8M
13	Stem Nut	13Cr
14	Handwheel	Ductile Iron
15	Lock Nut	Carbon Steel

Other Material Options Available

Typical Cryogenic Forged Globe Valve Materials



This table lists the materials used in **Forged Globe Valves**, detailing essential components such as the body, ball, and seats. It provides insights into the valve's construction and suitability for different applications, ensuring dependable performance and durability.

No	Description	Material
1	Body	ASTM A182 F316+STL
2	Disc	ASTM A182 F316
3	Stem	ASM A182 F316
4	Gasket	SS316+Graphite
5	Bonnet	ASTM A182 F316
6	Bonnet Bolt	ASTM A320 B8M
7	Packing	Graphite
8	Eye Bolt	ASTM A320 B8M
9	Packing Gland	ASTM A 182 F316
10	Gland Flange	ASTM A351 CF8M
11	Nut	ASTM A 193 8M
12	Stem Nut	13Cr
13	Handwheel	Ductile Iron
14	Lock Nut	Carbon Steel

Other Material Options Available

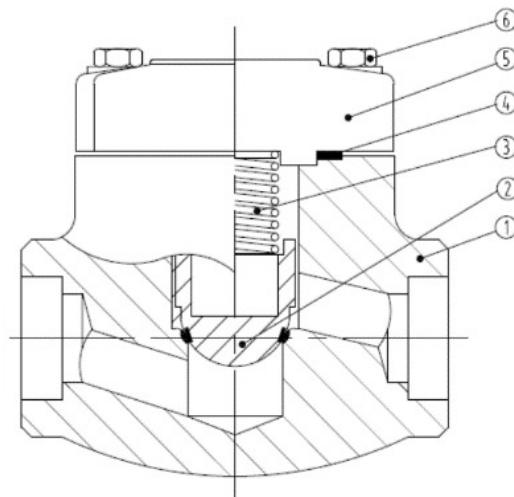
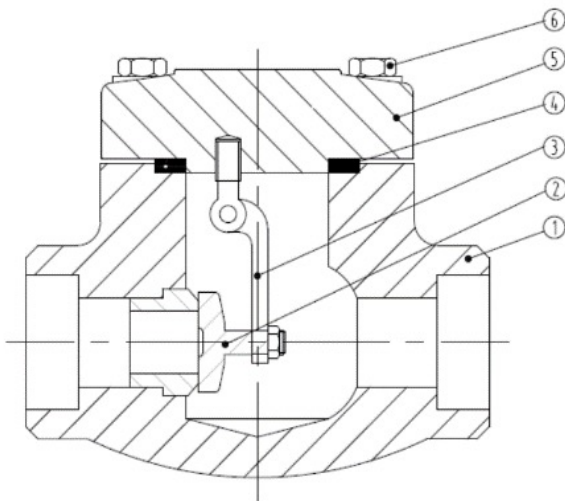
Typical Cryogenic Forged Check Valve Materials

This table lists the materials used in **Forged Check Valves**, detailing essential components such as the body, ball, and seats. It provides insights into the valve's construction and suitability for different applications, ensuring dependable performance and durability.

No	Description	Material
1	Body	ASTM A182 F316 + STL
2	Disc/Clapper	ASTM A182 F316
3	Spring	ASTM A182 F316
4	Gasket	ASTM A182 F316
5	Cover	ASTM A182 F316
6	Screw	ASTM A 320 B8M

No	Description	Material
1	Body	ASTM A182 F316 + STL
2	Disc/Clapper	ASTM A182 F316
3	Spring	ASTM A182 F316
4	Gasket	ASTM A182 F316
5	Cover	ASTM A182 F316
6	Screw	ASTM A 320 B8M

Other Material Options Available





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