OKANO
The Spirit of Manufacturing

VALVE

CATALOG

General high-temperature and high-pressure valves for thermal power plants

Gate valve / Globe valve / Check valve

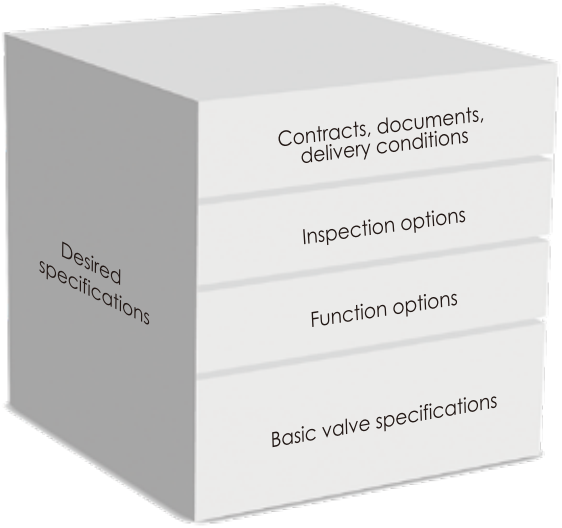
OKANO VALVE MFG. CO. LTD.

INDEX

CONCEPT

With the valve order system of OKANO VALVE MFG. CO. LTD. you are now able to clearly see custom-made valve costs (by specificatiion) which was not possible up to now. Therefore, we are able to provide products with optimum functions and quality at optimum price and delivery periods.

Please utilize our unique order system and experience the quality of our products that have been used in major areas of thermal power plants for many years.



Contacts, documents, delivery conditions

Indicates ordering conditions mainly generated by order units that are not related to specifications of products themselves. Especially, easing the contract conditions enables the macroscopic product procurement costs to be optimized.

Inspection options

Indicates special inspection contents that are not included in standard requirements and our standards. Product procurement costs can be optimized by avoiding excessive inspection.

Function options

Indicates additional product functions for improving operating efficiency of thermal powr plants , maintaining long-term performance under high-temperature and high-pressure environments, and meeting any other requirements.

Basic valve specifications

Indicates basic specifications as products for important lines in power generation plants. According to our delivery records, at least 70% of our products for thermal power plants are basic spec products that satisfy required specifications.

ORDER FLOW

1. Disclosure of specifications

Please provide specification instructions or customer's specifications based on our order system.

2. Approximate estimate

A written approximate estimate is submitted based on specification conditions. Uncertain/undetermined specification conditions are assumed based on our standards and past records, and managed as pending matters. The written approximate estimate can be used as a document for budget estimate or specification adjustment.

3. Specification adjustment / Adjusted estimate

Specifications are adjusted and pending matters are resolved from comprehensive viewpoints including functions and costs, and a written estimate of adjustment to which the contents have been reflected is submitted. If pending matters occur at the time of order placement, the customer is requested to specify temporary conditions. Specifications will be adjusted until the customer is happy and product manufacturing is ready to be undertaken.

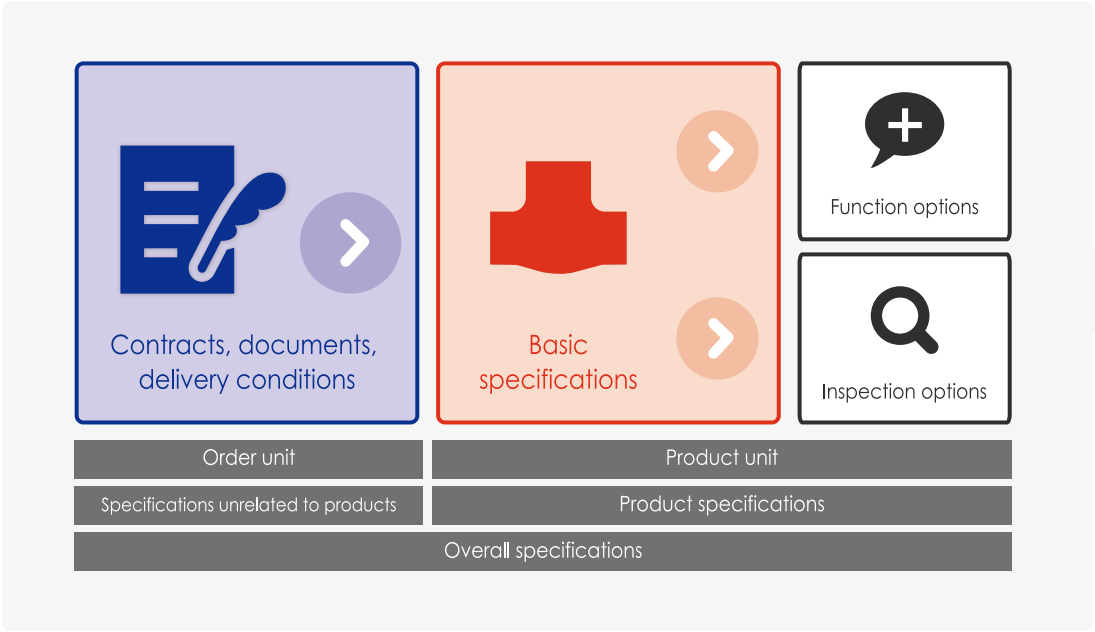
4. Final estimate/Order placement

After completion of specification adjustments and customer's temporary pending matters specified, a final written estimate is submitted. If order is placed, product manufacturing will commence based on the determined specifications and temporary conditions.

5. Specification change after ordering / Settlement estimate

Specification change after order placement is also dealt with flexibly. The customer is asked to approve the settlement estimate based on the specification change after order placement, and product manufacturing commence (continued) based on the changed specifications.

Flow of specification determination



Contracts, documents, delivery conditions

Ordering conditions mainly generated by order units that are not related to product specifications themselves are determined. Especially, easing the contract conditions enables the macroscopic product procurement costs to be optimized.

List of items in contracts, documents, and delivery conditions

	Item	OKANO's standard	Option
Contract	Guarantee period	• 30 months after delivery to plant • 24 months after commencement of commercial operation of plant whichever is shorter	Extension/shortening of guarantee period
	Delivery period	Cast steel valve 6 months Forged valve 4 months * It shows the expected production period and therefore transportation period is not included.	Extension/shortening of delivery period
Documents		Product specifications (Delivery specifications)	Requirements of various documents including Inspection Procedure, Coating Procedure, On-site Construction Procedure, and Instruction Manual
Delivery	Packing for shipment	Wood base packing Corrugated cardboard * It shows packing to the customer specified port.(export packing supplier)	Designating packing method for shipment including export packing
	Transportation method	Truck transportation (consolidated shipment) * It shows the transportation method to the customer specified port.	Designating transportation methods including chartered truck delivery and special delivery car.
	Delivery destination	In accordance with customer's instruction	–

Basic specifications

Basic specifications are determined as products for important lines in thermal power plants. According to our delivery records, at least 70% of our products for thermal power plants are basic spec products that satisfy required specifications.

List of basic specification items

Item		Option						
Standards	Valve standards	ASME B16.34	JEAC3706	Ship's class	Other			
	Material standards	ASTM	ASME	JIS	Other			
Valve type		Globe valve	Y-globe valve	Angle-globe valve	Gate valve	Swing check valve	Lift check valve	Other
Valve size【DN】		15	20	25	40	50	65	80
		100	125	150	200	250	300	350
		400	450	500	550	600	Other	
Body material		Carbon steel	0.5Mo steel	1Cr-0.5Mo steel	2.5 Cr-1Mo steel	Carbon steel for low temperature	18Cr-8Ni steel	18Cr-9Ni-2Mo steel
		9Cr-1Mo-V steel	Other					
Pressure and temperature criteria	Pressure class	150	300	600	900	1500	2000	2500
		3500	4500	Other				
	Classification	Standard class	Special class					
Operation		HO	MO	Other				
Connection form		BW	SW	FL	Other			

Standards

Valve standards

When manufacturing valves, it is necessary to select standards and regulations to be applied, and materials, manufacturing, tests, inspection, etc. prescribed by them.

Standard/regulation	Remarks
ASME B16.34	• Standard by American Society of Mechanical Engineers: VALVES-FLANGED, THREADED, WELDING END • The standard is mainly applied to valves for overseas plants.
JEAC 3706	• Regulations on electrical technology for thermal power generation, regulations on pressure piping and valves • The standard is mainly applied to valves for domestic plants
Ship's class standard	• Classes NK, LR, DNV, BV, AB, etc. • The standard is mainly applied to valves for ships.
Other	• Other standards and regulations such as the High Pressure Gas Safety Act are applicable.

Material standards

With regard to industrial materials, chemical components and mechanical properties are prescribed by respective material standards. Standard materials prescribed by applicable valve standards are used for pressure-resistant components and important parts of valves.

Standard/regulation	Remarks
ASTM	• Standard by American Society of Testing Materials
ASME	• Standard by American Society of Mechanical Engineers (for materials)
JIS	• Japanese Industrial Standard (for materials)
Other	• Other material standards are also applicable.

Basic specifications

Valve types

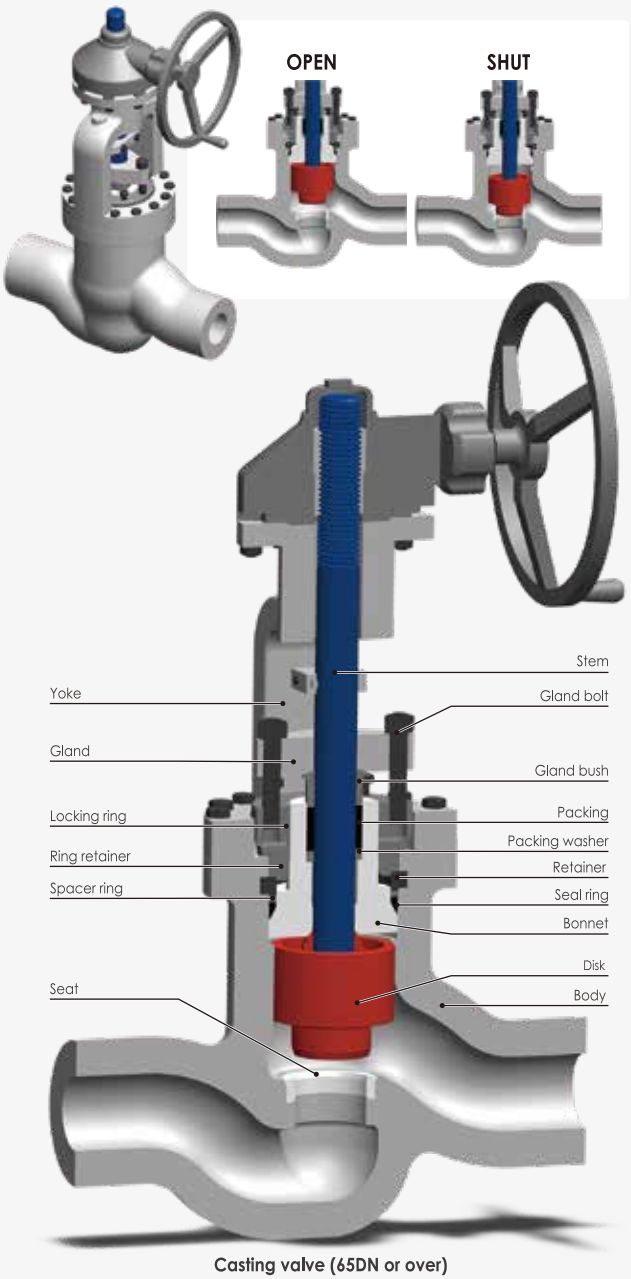
Six basic valve types are presented and selected according to intended use.

Globe valve

It is called globe valve because the body shape looks like a globe. The disk operates vertically against the seat to shut off fluid. It is a shut-off valve and can also be used as a flow regulating valve by adjusting the opening degree.

Characteristics

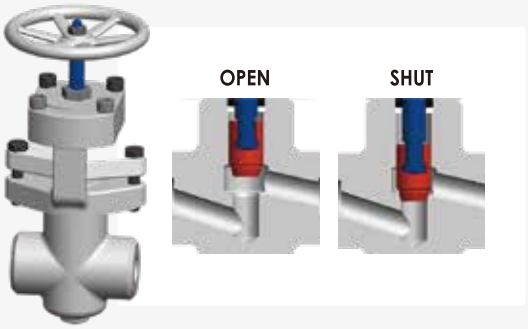
- Due to the structure, it is relatively easy to shut off fluids.
- It can be used as a flow regulating valve.
- It causes large pressure loss.
- It requires large operating force and is not suitable for large size valves.

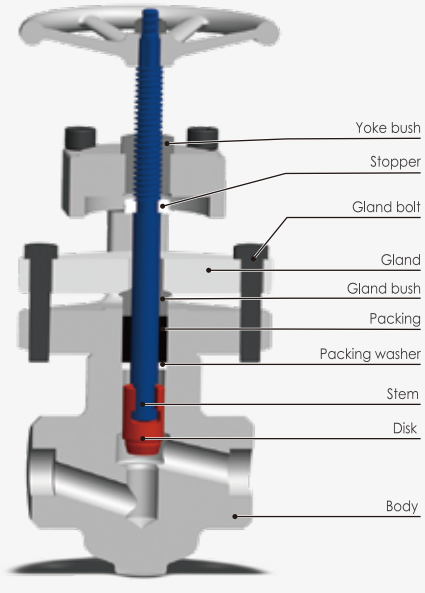


Casting valve (65DN or over)

(Standard) Globe valve

The central axis of the inlet is identical with that of the outlet. As for the basic structure, the upper mechanism is perpendicular to the central axis and the flow channel is S-shaped. Due to the S-shaped flow channel, pressure loss is relatively large.

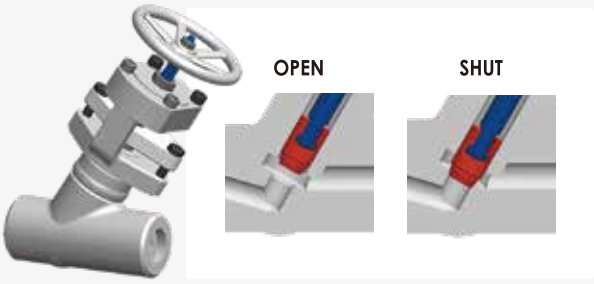


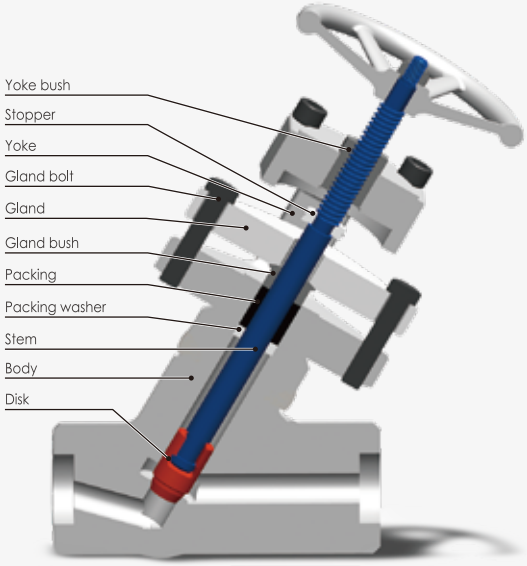


Forged valve (50DN or under)

Y- globe valve

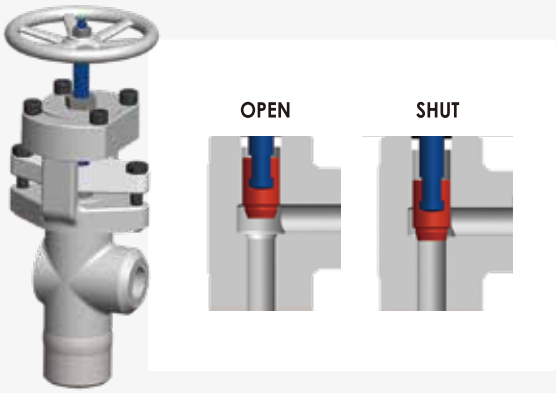
It is called Y- globe valve because it looks like the alphabetic character Y. It has a structure of the upper mechanism being tilted. Because the flow channel is gentler than that of the (standard) globe valve, pressure loss can be reduced.

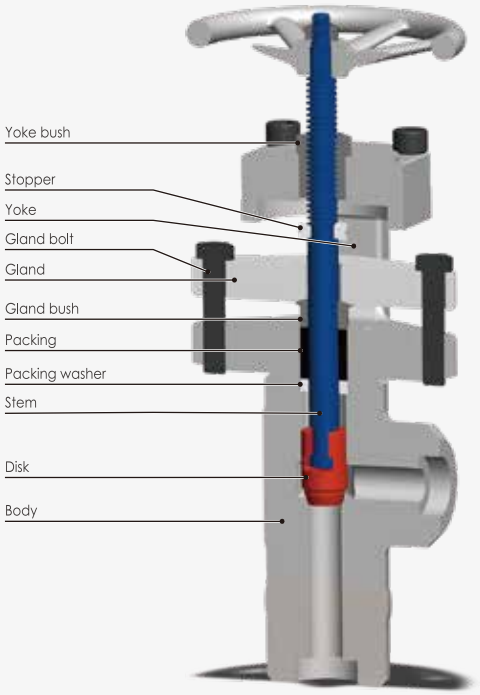




Angle-globe valve

Because it has a structure of the central axes of the flow channel inlet and outlet crossing at right angles, it is called angle-globe valve. Among globe valves, it has a structure that can reduce pressure loss the most. It is used for right-angled piping or as a drain valve.





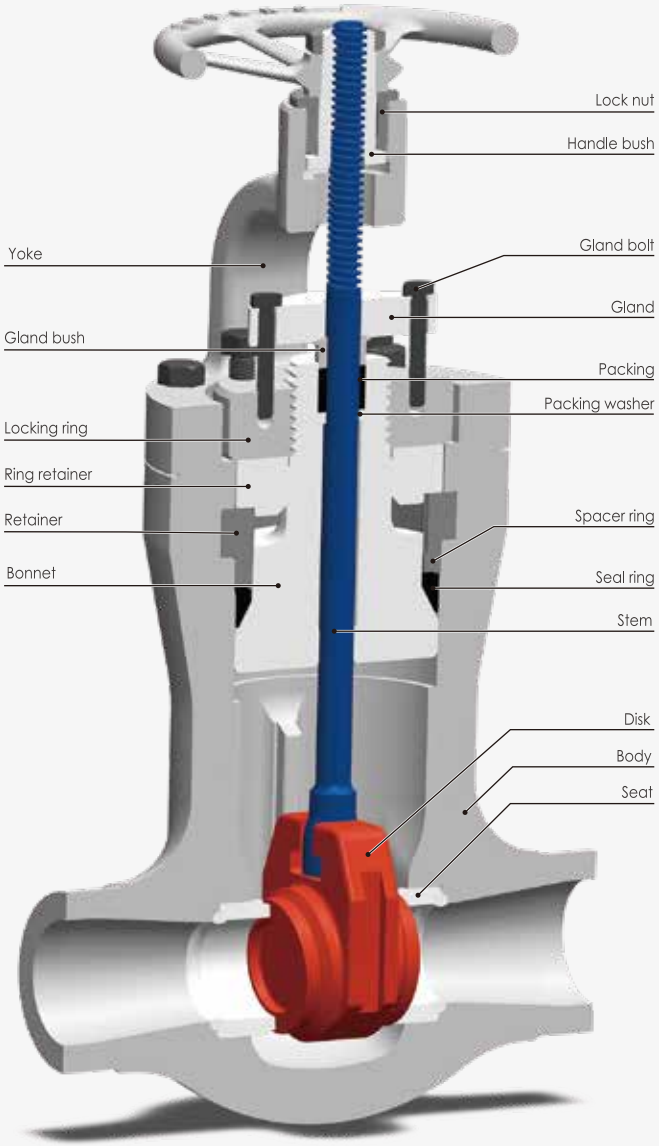
Valve types

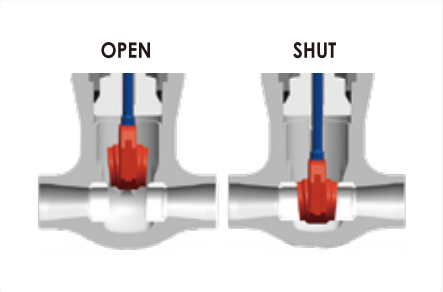
Gate valve

It is called gate valve because the disk partitions the flow channel like a gate. The disk operates horizontally against the seat, and fluid is shut off when the disk, perpendicularly inserted in the flow channel, is pushed against the outlet side seat by fluid pressure. It is a shut-off valve with little pressure loss.

Characteristics

- Pressure loss is small.
- It requires small operating force and is suitable for large size valves.
- It is not suitable for use as a flow regulating valve.





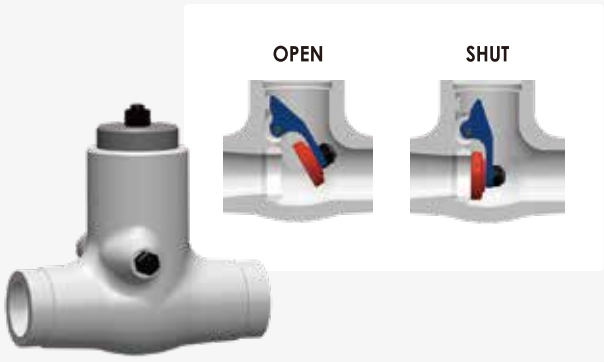
Check valve

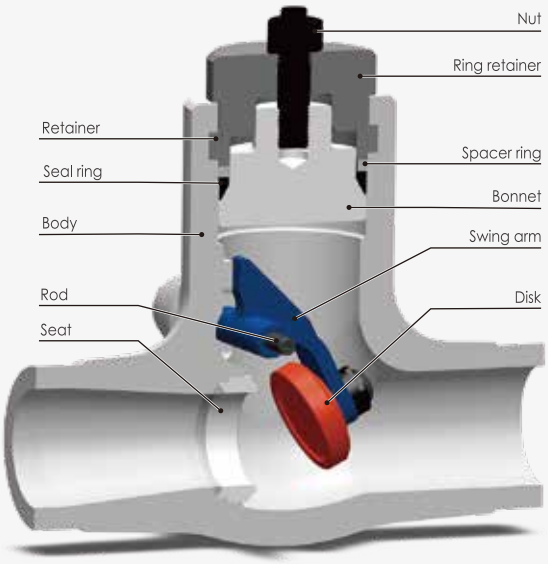
Because it prevents (checks) backward flow of a fluid, it is called check valve. The disk is automatically opened/closed by fluid pressure. The check valve shuts off only backward flow of a fluid.

Characteristics
- It shuts off only backward flow of a fluid.

Swing check valve

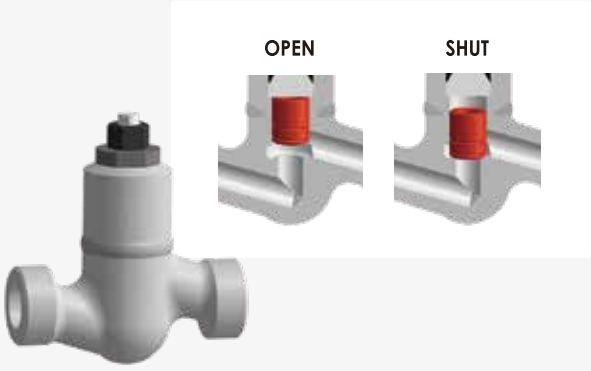
Because the disk is moved in arch form (swing) by a fluid, it is called swing check valve. Because of the straight flow channel structure, pressure loss can be reduced. However, fluid pressure above a certain level is required to open the disk. It is mainly used for large size valves.

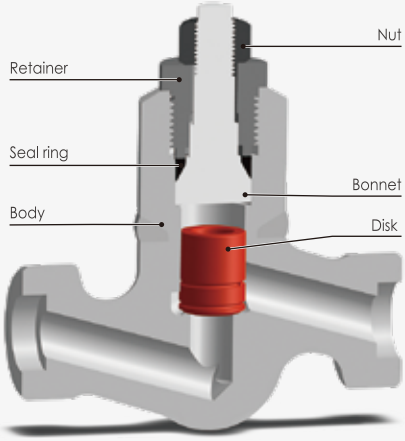




Lift check valve

Because the disk is moved up/down (lifted) by a fluid, it is called lift check valve. The disk can be opened by low fluid pressure. However, because the flow channel is S-shaped, pressure loss is greater. It is mainly used for small size valves.





Basic specifications

Valve size

Valve size is also called “nominal diameter,” which indicates basic valve size. The valve size of a valve is basically selected in accordance with the size of piping to be connected. There are two dimension systems for valve size: millimeter system (DN) and inch system (NPS).

Outside valve size of pipe [mm]	21.3	26.7	33.4	48.3	60.3	73.0	88.9	114.3	141.3	168.3	219.1	273.0	323.8	355.6	406.4	457	508	559	610
Valve size [DN]	15	20	25	40	50	65	80	100	125	150	200	250	300	350	400	450	500	550	600
Valve size [NPS]	½	¾	1	1½	2	2½	3	4	5	6	8	10	12	14	16	18	20	22	24

Body materials

Body materials shown below are core components of valves. Due to the valve characteristic of the body material being connected to piping, body materials to be selected are basically identical to piping materials. From a productivity viewpoint, we basically select forged steel materials for valves with 50A or less in valve size, and cast steel materials for valves with 65A or more in valve size.

Material group	Piping material			Cast steel	Forged steel product, steel rod
Carbon steel	ASTM A672 C70	ASTM A672 C65	ASTM A672 C60	ASTM SA216 WCB	ASTM A105
	ASTM A672 B70	ASTM A672 B65	ASTM A672 B60	ASTM SA216 WCC	ASME SA105
	ASTM A106 C	ASTM A106 B		ASME SA216 WCB	
				ASME SA216 WCC	
0.5 Mo steel	ASTM A691 CM-70			ASTM A217 WC1	ASTM A182 F1
				ASME SA217 WC1	ASME SA182 F1
1Cr-0.5 Mo steel	ASTM A691 ½CR	ASTM A691 CM-75	ASTM A691 1¼CR	ASTM A217 WC6	ASTM A182 F11
	ASTM A691 2¼CR	ASTM A691 5CR		ASME SA217 WC6	ASME SA182 F11
2.5Cr-1 Mo steel	ASTM A335 P22	ASTM A369 FP22		ASTM A217 WC9	ASTM A182 F22
				ASME SA217 WC9	ASME SA182 F22
Carbon steel for low temperature	ASTM A672 B65	ASTM A672 C65		ASTM A352 LCB	
				ASME SA352 LCB	
18Cr-8 Ni steel	ASTM A312 TP304	ASTM A312 TP304H	ASTM A358 FP304	ASTM A351 CF8	ASTM A182 F304
	ASTM A376 TP304	ASTM A376 TP304H	ASTM A430 FP304	ASME SA351 CF8	ASME SA182 F304
	ASTM A430 FP304H				
18Cr-9 Ni-2 Mo steel	ASTM A312 TP316	ASTM A312 TP316H	ASTM A358	ASTM A351 CF8M	ASTM A182 F316
	ASTM A376 TP316	ASTM A376 TP316H	ASTM A430 TP316	ASME SA351 CF8M	ASME SA182 F316
	ASTM A430 TP316H				
9Cr-Mo-V steel	ASTM A335 P91	Fire STP A28		ASTM A217 C12A	ASTM A182 F91
				ASME SA217 C12A	ASME SA182 F91

Pressure and temperature criteria (pressure class, classification)

Pressure and temperature criteria prescribe the relationship between fluid temperature and the maximum working pressure of valves at that temperature for each material group, which indicates the basic valve strength against pressure and temperature. Pressure and temperature criteria consist of pressure class and classification. To select them, it is necessary to obtain information on body materials, design pressure, design temperature, and so on.

Selection of pressure class and classification

Pressure class

Pressure class is an indication prescribed to express the pressure classification of valves. As the pressure class is higher, resistance to pressure and temperature increases, making the valve thickness as a pressure vessel large, thereby increasing the mass.

Classification

* For differences in inspection items depending on connection methods and classification, refer to "Connection" in page 14 and "Inspection options" in page 40.

Classification consists of standard class and special class. standard class was originally set up as criteria for flanged connection valves and special class for welded connection valves. Therefore, at present, standard class is applied to not only flanged connection valves but also welded connection valves. Compared to flanged connection valves, welded connection valves have a lower risk of leakage from piping connected area. Thus, even if the pressure class and temperature are the same, higher pressure can be applied to special class compared to standard class. For special class, there are more nondestructive inspection items than those required for standard class, and guarantee of body material quality for special class is greater compared to standard class which makes for higher cost and longer delivery period.

Example

Body material	:	A182 F22
Design pressure	:	220.0bar
Design temperature	:	450℃
Connection	:	Welded connection
Standard	:	ASME B16.34

1. Check the rating table of 2.5Cr-1Mo steel for the material group to which A182 F22 is applicable.
2. Check the temperature column for 450°C.
3. In the standard class table, pressure class 2500 (to 281.8bar) or higher exceeds the design pressure, and in the special class table, pressure class 1500 (to 235.8bar) or higher exceeds the design pressure (220.0bar). Therefore, for pressure class and classification, either pressure class 2500, standard class or pressure class 1500, special class is selected.
4. In general, to reduce the valve mass even if more cost and longer delivery period is required, select standard class, and to reduce cost and delivery period even if valve mass increases, select special class.

Rating table of 2.5Cr-1Mo steel

Standard class — REFERENCE : ASME B16.34-2013 Table 2-1.10

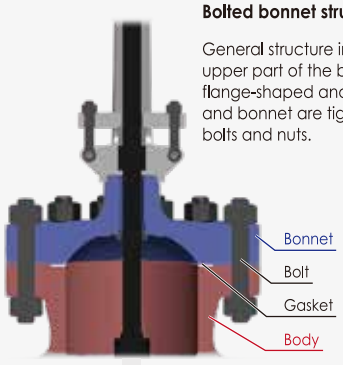
Temperature ℃	Working Pressures by class bar						
	150	300	600	900	1500	2500	4500
425	5.5	35.2	70.0	105.1	175.1	291.6	524.7
450	4.6	33.7	67.7	101.4	169.0	281.8	507.0
475	3.7	31.7	63.4	95.1	158.2	263.9	474.8
500	2.8	28.2	56.5	84.7	140.9	235.0	423.0

Special class — REFERENCE : ASME B16.34-2013 Table 2-1.10

Temperature ℃	Working Pressures by class bar						
	150	300	600	900	1500	2500	4500
425	18.7	48.8	97.5	146.3	243.8	406.3	731.3
450	18.1	47.3	94.4	141.4	235.8	393.1	707.6
475	16.4	42.8	85.5	128.2	213.7	356.3	641.3
500	13.7	35.6	71.5	107.1	178.6	297.5	535.4

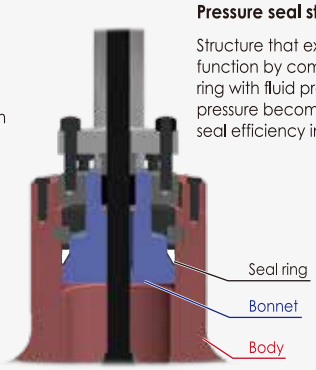
Seal structure of the body and bonnet joint part

The joint part between the body and bonnet is one of the parts with a high risk of external leakage. We ensure the sealing of the joint part between the body and bonnet by adopting a bolted bonnet structure for pressure class below 900 and a pressure seal structure for pressure class 900 or higher as standard.



Bolted bonnet structure

General structure in which the upper part of the body is flange-shaped and the body and bonnet are tightened with bolts and nuts.



Pressure seal structure

Structure that exhibits a sealing function by compressing the seal ring with fluid pressure. As the pressure becomes higher, the seal efficiency increases.

Basic specifications

Rating table

Carbon steel

Standard class

REFERENCE : ASME B16.34-2013 Table 2-1.1

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	19.6	51.1	102.1	153.2	255.3	425.5	765.9
50	19.2	50.1	100.2	150.4	250.6	417.7	751.9
100	17.7	46.6	93.2	139.8	233.0	388.3	699.0
150	15.8	45.1	90.2	135.2	225.4	375.6	676.1
200	13.8	43.8	87.6	131.4	219.0	365.0	657.0
250	12.1	41.9	83.9	125.8	209.7	349.5	629.1
300	10.2	39.8	79.6	119.5	199.1	331.8	597.3
325	9.3	38.7	77.4	116.1	193.6	322.6	580.7
350	8.4	37.6	75.1	112.7	187.8	313.0	563.5
375	7.4	36.4	72.7	109.1	181.8	303.1	545.5
400	6.5	34.7	69.4	104.2	173.6	289.3	520.8
425	5.5	28.8	57.5	86.3	143.8	239.7	431.5
450	4.6	23.0	46.0	69.0	115.0	191.7	345.1
475	3.7	17.4	34.9	52.3	87.2	145.3	261.5
500	2.8	11.8	23.5	35.3	58.8	97.9	176.3
538	1.4	5.9	11.8	17.7	29.5	49.2	88.6

Special class

REFERENCE : ASME B16.34-2013 Table 2-1.1

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	19.8	51.7	103.4	155.1	258.6	430.9	775.7
50	19.8	51.7	103.4	155.1	258.6	430.9	775.7
100	19.8	51.6	103.3	154.9	258.2	430.3	774.5
150	19.6	51.0	102.1	153.1	255.2	425.3	765.5
200	19.4	50.6	101.1	151.7	252.9	421.4	758.6
250	19.4	50.5	101.1	151.6	252.6	421.1	757.9
300	19.4	50.5	101.1	151.6	252.6	421.1	757.9
325	19.2	50.1	100.2	150.3	250.6	417.6	751.7
350	18.7	48.9	97.8	146.7	244.6	407.6	733.7
375	18.1	47.1	94.2	141.3	235.5	392.5	706.5
400	16.6	43.4	86.8	130.2	217.0	361.7	651.0
425	13.8	36.0	71.9	107.9	179.8	299.6	539.3
450	11.0	28.8	57.5	86.3	143.8	239.6	431.4
475	8.4	21.8	43.6	65.4	109.0	181.6	326.9
500	5.6	14.7	29.4	44.1	73.5	122.4	220.4
538	2.8	7.4	14.8	22.2	36.9	61.6	110.8

0.5 Mo steel

Standard class

REFERENCE : ASME B16.34-2013 Table 2-1.3

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	18.4	48.0	96.0	144.1	240.1	400.1	720.3
50	18.2	47.5	94.9	142.4	237.3	395.6	712.0
100	17.4	45.3	90.7	136.0	226.7	377.8	680.1
150	15.8	43.9	87.9	131.8	219.7	366.1	659.1
200	13.8	42.5	85.1	127.6	212.7	354.4	638.0
250	12.1	40.8	81.6	122.3	203.9	339.8	611.7
300	10.2	38.7	77.4	116.1	193.4	322.4	580.3
325	9.3	37.6	75.2	112.7	187.9	313.1	563.7
350	8.4	36.4	72.8	109.2	182.0	303.3	545.9
375	7.4	35.0	69.9	104.9	174.9	291.4	524.6
400	6.5	32.6	65.2	97.9	163.1	271.9	489.3
425	5.5	27.3	54.6	81.9	136.5	227.5	409.5
450	4.6	21.6	43.2	64.8	107.9	179.9	323.8
475	3.7	15.7	31.3	47.0	78.3	130.6	235.0
500	2.8	11.1	22.1	33.2	55.4	92.3	166.1
538	1.4	5.9	11.8	17.7	29.5	49.2	88.6

Special class

REFERENCE : ASME B16.34-2013 Table 2-1.3

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	20.0	48.0	96.0	144.1	240.1	400.1	720.3
50	20.0	48.0	96.0	144.1	240.1	400.1	720.3
100	20.0	48.0	96.0	144.1	240.1	400.1	720.3
150	20.0	48.0	96.0	144.1	240.1	400.1	720.3
200	20.0	48.0	96.0	144.1	240.1	400.1	720.3
250	20.0	48.0	96.0	144.1	240.1	400.1	720.3
300	20.0	48.0	96.0	144.1	240.1	400.1	720.3
325	20.0	48.0	95.9	143.9	239.8	399.6	719.3
350	19.8	47.3	94.6	141.9	236.5	394.1	709.4
375	19.3	44.9	89.9	134.8	224.7	374.6	674.2
400	19.3	40.8	81.6	122.3	203.9	339.8	611.7
425	17.1	34.1	68.3	102.4	170.6	284.4	511.9
450	13.5	27.0	54.0	81.0	134.9	224.9	404.8
475	9.8	19.6	39.2	58.8	97.9	163.2	293.8
500	6.9	13.8	27.7	41.5	69.2	115.3	207.6
538	3.7	7.4	14.8	22.2	36.9	61.6	110.8

Standard class

REFERENCE : ASME B16.34-2013 Table 2-1.5

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	18.4	48.0	96.0	144.1	240.1	400.1	720.3
50	18.4	48.0	96.0	144.1	240.1	400.1	720.3
100	17.7	47.9	95.9	143.8	239.7	399.5	719.1
150	15.8	47.3	94.7	142.0	236.7	394.5	710.1
200	13.8	45.8	91.6	137.4	229.0	381.7	687.1
250	12.1	44.5	89.0	133.5	222.5	370.9	667.6
300	10.2	42.9	85.7	128.6	214.4	357.1	642.6
325	9.3	41.4	82.6	124.0	206.6	344.3	619.6
350	8.4	40.3	80.4	120.7	201.1	335.3	603.3
375	7.4	38.9	77.6	116.5	194.1	323.2	581.8
400	6.5	36.5	73.3	109.8	183.1	304.9	548.5
425	5.5	35.2	70.0	105.1	175.1	291.6	524.7
450	4.6	33.7	67.7	101.4	169.0	281.8	507.0
475	3.7	31.7	63.4	95.1	158.2	263.9	474.8
500	2.8	24.1	48.1	72.2	120.3	200.5	361.0
538	1.4	11.3	22.7	34.0	56.7	94.6	170.2

Special class

REFERENCE : ASME B16.34-2013 Table 2-1.5

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	18.4	48.0	96.0	144.1	240.1	400.1	720.3
50	18.4	48.0	96.0	144.1	240.1	400.1	720.3
100	18.4	48.0	96.0	144.1	240.1	400.1	720.3
150	18.4	48.0	96.0	144.1	240.1	400.1	720.3
200	18.4	48.0	96.0	144.1	240.1	400.1	720.3
250	18.4	48.0	96.0	144.1	240.1	400.1	720.3
300	18.4	48.0	96.0	144.1	240.1	400.1	720.3
325	18.4	48.0	96.0	144.1	240.1	400.1	720.3
350	18.4	48.0	96.0	144.1	240.1	400.1	720.3
375	18.4	48.0	96.0	144.1	240.1	400.1	720.3
400	18.4	48.0	96.0	144.1	240.1	400.1	720.3
425	18.4	48.0	96.0	144.1	240.1	400.1	720.3
450	18.1	47.3	94.4	141.4	235.8	393.1	707.6
475	16.4	42.8	85.5	128.2	213.7	356.3	641.3
500	11.5	30.1	60.2	90.2	150.4	250.7	451.2
538	5.4	14.2	28.4	42.6	70.9	118.2	212.8

1Cr-0.5 Mo steel

Standard class

REFERENCE : ASME B16.34-2013 Table 2-1.9

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	19.8	51.7	103.4	155.1	258.6	430.9	775.7
50	19.5	51.7	103.4	155.1	258.6	430.9	775.7
100	17.7	51.5	103.0	154.4	257.4	429.0	772.2
150	15.8	49.7	99.5	149.2	248.7	414.5	746.2
200	13.8	48.0	95.9	143.9	239.8	399.6	719.4
250	12.1	46.3	92.7	139.0	231.8	386.2	694.8
300	10.2	42.9	85.7	128.6	214.4	357.1	642.6
325	9.3	41.4	82.6	124.0	206.6	344.3	619.6
350	8.4	40.3	80.4	120.7	201.1	335.3	603.3
375	7.4	38.9	77.6	116.5	194.1	323.2	581.8
400	6.5	36.5	73.3	109.8	183.1	304.9	548.5
425	5.5	35.2	70.0	105.1	175.1	291.6	524.7
450	4.6	33.7	67.7	101.4	169.0	281.8	507.0
475	3.7	31.7	63.4	95.1	158.2	263.9	474.8
500	2.8	25.7	51.5	77.2	128.6	214.4	385.9
538	1.4	14.9	29.8	44.7	74.5	124.1	223.4
550	1.4(5)	12.7	25.4	38.1	63.5	105.9	190.6
575	1.4(5)	8.8	17.6	26.4	44.0	73.4	132.0
600	1.4(5)	6.1	12.2	18.3	30.5	50.9	91.6
625	1.4(5)	4.3	8.5	12.8	21.3	35.5	63.9
650	1.1(5)	2.8	5.7	8.5	14.2	23.6	42.6

Special class

REFERENCE : ASME B16.34-2013 Table 2-1.9

Temperature, ℃	Working Pressure by class bar						
	150	300	600	900	1500	2500	4500
-29~38	19.8	51.7	103.4	155.1	258.6	430.9	775.7
50	19.8	51.7	103.4	155.1	258.6	430.9	775.7
100	19.8	51.7	103.4	155.1	258.6	430.9	775.7
150	19.8	51.7	103.4	155.1	258.6	430.9	775.7
200	19.8	51.7	103.4	155.1	258.6	430.9	775.7
250	19.8	51.7	103.4	155.1	258.6	430.9	775.7
300	19.8	51.7	103.4	155.1	258.6	430.9	775.7
325	19.8	51.7	103.4	155.1	258.6	430.9	775.7
350	19.8	51.5	102.8	154.3	257.1	428.6	771.4
375	19.3	50.6	101.0	151.5	252.5	420.9	757.4
400	19.3	50.3	100.6	150.6	251.2	418.3	753.2
425	19.0	49.6	99.3	148.9	248.2	413.7	744.6
450	18.1	47.3	94.4	141.4	235.8	393.1	707.6
475	16.4	42.8	85.5	128.2	213.7	356.3	641.3
500	12.3	32.2	64.3	96.5	160.8	268.0	482.4
538	7.1	18.6	37.2	55.8	93.1	155.1	279.2
550	6.1	15.9	31.8	47.7	79.4	132.4	238.3
575	4.2	11.0	22.0	33.0	55.0	91.7	165.1
600	2.9	7.6	15.3	22.9	38.2	63.6	114.5
625	2.0	5.3	10.6	16.0	26.6	44.4	79.9
650	1.4	3.5	7.1	10.6	17.7	29.5	53.2

2.5Cr-1 Mo steel

Standard class

REFERENCE : ASME B16.34-2013 Table 2-1.10

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	19.8	51.7	103.4	155.1	258.6	430.9	775.7
50	19.5	51.7	103.4	155.1	258.6	430.9	775.7
100	17.7	51.5	103.0	154.6	257.6	429.4	773.0
150	15.8	50.3	100.3	150.6	250.8	418.2	752.8
200	13.8	48.6	97.2	145.8	243.4	405.4	729.8
250	12.1	46.3	92.7	139.0	231.8	386.2	694.8
300	10.2	42.9	85.7	128.6	214.4	357.1	642.6
325	9.3	41.4	82.6	124.0	206.6	344.3	619.6
350	8.4	40.3	80.4	120.7	201.1	335.3	603.3
375	7.4	38.9	77.6	116.5	194.1	323.2	581.8
400	6.5	36.5	73.3	109.8	183.1	304.9	548.5
425	5.5	35.2	70.0	105.1	175.1	291.6	524.7
450	4.6	33.7	67.7	101.4	169.0	281.8	507.0
475	3.7	31.7	63.4	95.1	158.2	263.9	474.8
500	2.8	28.2	56.5	84.7	140.9	235.0	423.0
538	1.4	18.4	36.9	55.3	92.2	153.7	276.6
550	1.4(5)	15.6	31.3	46.9	78.2	130.3	234.5
575	1.4(5)	10.5	21.1	31.6	52.6	87.7	157.9
600	1.4(5)	6.9	13.8	20.7	34.4	57.4	103.3
625	1.4(5)	4.5	8.9	13.4	22.3	37.2	66.9
650	1.1(5)	2.8	5.7	8.5	14.2	23.6	42.6

Special class

REFERENCE : ASME B16.34-2013 Table 2-1.10

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	19.8	51.7	103.4	155.1	258.6	430.9	775.7
50	19.8	51.7	103.4	155.1	258.6	430.9	775.7
100	19.8	51.6	103.2	154.9	258.1	430.2	774.3
150	19.5	51.0	101.9	152.9	254.8	424.6	764.3
200	19.3	50.2	100.4	150.7	251.1	418.5	753.4
250	19.2	50.0	100.0	149.9	249.9	416.5	749.7
300	19.1	49.8	99.6	149.3	248.9	414.8	746.7
325	19.0	49.6	99.2	148.8	248.0	413.3	743.9
350	18.9	49.2	98.4	147.6	246.0	410.0	738.1
375	18.7	48.8	97.5	146.3	243.8	406.3	731.3
400	18.7	48.8	97.5	146.3	243.8	406.3	731.3
425	18.7	48.8	97.5	146.3	243.8	406.3	731.3
450	18.1	47.3	94.4	141.4	235.8	393.1	707.6
475	16.4	42.8	85.5	128.2	213.7	356.3	641.3
500	13.7	35.6	71.5	107.1	178.6	297.5	535.4
538	8.8	23.0	46.1	69.1	115.2	192.1	345.7
550	7.5	19.5	39.1	58.6	97.7	162.8	293.1
575	5.0	13.2	26.3	39.5	65.8	109.7	197.4
600	3.3	8.6	17.2	25.8	43.0	71.7	129.1
625	2.1	5.6	11.2	16.7	27.9	46.5	83.7
650	1.4	3.5	7.1	10.6	17.7	29.5	53.2

Basic specifications

Rating table

Carbon steel for low temperature

Standard class

REFERENCE : ASME B16.34-2013 Table 2-1.3

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	18.4	48.0	96.0	144.1	240.1	400.1	720.3
50	18.2	47.5	94.9	142.4	237.3	395.6	712.0
100	17.4	45.3	90.7	136.0	226.7	377.8	680.1
150	15.8	43.9	87.9	131.8	219.7	366.1	659.1
200	13.8	42.5	85.1	127.6	212.7	354.4	638.0
250	12.1	40.8	81.6	122.3	203.9	339.8	611.7
300	10.2	38.7	77.4	116.1	193.4	322.4	580.3
325	9.3	37.6	75.2	112.7	187.9	313.1	563.7
350	8.4	36.4	72.8	109.2	182.0	303.3	545.9
375	7.4	35.0	69.9	104.9	174.9	291.4	524.6
400	6.5	32.6	65.2	97.9	163.1	271.9	489.3
425	5.5	27.3	54.6	81.9	136.5	227.5	409.5
450	4.6	21.6	43.2	64.8	107.9	179.9	323.8
475	3.7	15.7	31.3	47.0	78.3	130.6	235.0
500	2.8	11.1	22.1	33.2	55.4	92.3	166.1
538	1.4	5.9	11.8	17.7	29.5	49.2	88.6

Special class

REFERENCE : ASME B16.34-2013 Table 2-1.3

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	20.0	48.0	96.0	144.1	240.1	400.1	720.3
50	20.0	48.0	96.0	144.1	240.1	400.1	720.3
100	20.0	48.0	96.0	144.1	240.1	400.1	720.3
150	20.0	48.0	96.0	144.1	240.1	400.1	720.3
200	20.0	48.0	96.0	144.1	240.1	400.1	720.3
250	20.0	48.0	96.0	144.1	240.1	400.1	720.3
300	20.0	48.0	96.0	144.1	240.1	400.1	720.3
325	20.0	48.0	95.9	143.9	239.8	399.6	719.3
350	19.8	47.3	94.6	141.9	236.5	394.1	709.4
375	19.3	44.9	89.9	134.8	224.7	374.6	674.2
400	19.3	40.8	81.6	122.3	203.9	339.8	611.7
425	17.1	34.1	68.3	102.4	170.6	284.4	511.9
450	13.5	27.0	54.0	81.0	134.9	224.9	404.8
475	9.8	19.6	39.2	58.8	97.9	163.2	293.8
500	6.9	13.8	27.7	41.5	69.2	115.3	207.6
538	3.7	7.4	14.8	22.2	36.9	61.6	110.8

18Cr-8Ni steel

Standard class

REFERENCE : ASME B16.34-2013 Table 2-2.1

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	19.0	49.6	99.3	148.9	248.2	413.7	744.6
50	18.3	47.8	95.6	143.5	239.1	398.5	717.3
100	15.7	40.9	81.7	122.6	204.3	340.4	612.8
150	14.2	37.0	74.0	111.0	185.0	308.4	555.1
200	13.2	34.5	69.0	103.4	172.4	287.3	517.2
250	12.1	32.5	65.0	97.5	162.4	270.7	487.3
300	10.2	30.9	61.8	92.7	154.6	257.6	463.7
325	9.3	30.2	60.4	90.7	151.1	251.9	453.3
350	8.4	29.6	59.3	88.9	148.1	246.9	444.4
375	7.4	29.0	58.1	87.1	145.2	241.9	435.5
400	6.5	28.4	56.9	85.3	142.2	237.0	426.6
425	5.5	28.0	56.0	84.0	140.0	233.3	419.9
450	4.6	27.4	54.8	82.2	137.0	228.4	411.1
475	3.7	26.9	53.9	80.8	134.7	224.5	404.0
500	2.8	26.5	53.0	79.5	132.4	220.7	397.3
538	1.4	24.4	48.9	73.3	122.1	203.6	366.4
550	1.4(3)	23.6	47.1	70.7	117.8	196.3	353.4
575	1.4(3)	20.8	41.7	62.5	104.2	173.7	312.7
600	1.4(3)	16.9	33.8	50.6	84.4	140.7	253.2
625	1.4(3)	13.8	27.6	41.4	68.9	114.9	206.8
650	1.4(3)	11.3	22.5	33.8	56.3	93.8	168.9
675	1.4(3)	9.3	18.7	28.0	46.7	77.9	140.2
700	1.4(3)	8.0	16.1	24.1	40.1	66.9	120.4
725	1.4(3)	6.8	13.5	20.3	33.8	56.3	101.3
750	1.4(3)	5.8	11.6	17.3	28.9	48.1	86.7
775	1.4(3)	4.6	9.0	13.7	22.8	38.0	68.4
800	1.2(3)	3.5	7.0	10.5	17.4	29.2	52.6
816	1.0(3)	2.8	5.9	8.6	14.1	23.8	42.7

Special class

REFERENCE : ASME B16.34-2013 Table 2-2.1

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	19.8	51.7	103.4	155.1	258.6	430.9	775.7
50	19.4	50.5	101.0	151.5	252.5	420.8	757.4
100	17.5	45.6	91.2	136.8	228.0	380.0	683.9
150	15.8	41.3	82.6	123.9	206.5	344.2	619.6
200	14.8	38.5	77.0	115.4	192.4	320.7	577.2
250	13.9	36.3	72.5	108.8	181.3	302.2	543.9
300	13.2	34.5	69.0	103.5	172.5	287.5	517.5
325	12.9	33.7	67.5	101.2	168.7	281.1	506.0
350	12.7	33.1	66.1	99.2	165.3	275.5	496.0
375	12.4	32.4	64.8	97.2	162.0	270.0	486.0
400	12.2	31.7	63.5	95.2	158.7	264.5	476.1
425	12.0	31.2	62.5	93.7	156.2	260.4	468.7
450	11.7	30.6	61.2	91.8	153.0	254.9	458.9
475	11.5	30.1	60.1	90.2	150.3	250.5	450.9
500	11.3	29.6	59.1	88.7	147.8	246.4	443.5
538	11.0	28.6	57.3	85.9	143.1	238.5	429.4
550	10.9	28.4	56.8	85.1	141.9	236.5	425.7
575	10.0	26.1	52.1	78.2	130.3	217.2	390.9
600	8.1	21.1	42.2	63.3	105.5	175.8	316.5
625	6.6	17.2	34.5	51.7	86.2	143.6	258.5
650	5.4	14.1	28.2	42.2	70.4	117.3	211.2
675	4.5	11.7	23.4	35.1	58.4	97.4	175.3
700	4.1	10.7	21.3	32.0	53.3	88.9	160.0
725	3.5	9.2	18.5	27.7	46.2	77.0	138.6
750	2.8	7.4	14.8	22.1	36.7	61.2	110.3
775	2.2	5.8	11.4	17.2	28.5	47.6	85.6
800	1.8	4.4	8.8	13.2	22.0	36.6	65.6
816	1.4	3.4	7.2	10.7	17.9	29.6	53.1

18Cr-9Ni-2Mo steel

Standard class

REFERENCE : ASME B16.34-2013 Table 2-2.2

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	19.0	49.6	99.3	148.9	248.2	413.7	744.6
50	18.4	48.1	96.2	144.3	240.6	400.9	721.7
100	16.2	42.2	84.4	126.6	211.0	351.6	632.9
150	14.8	38.5	77.0	115.5	192.5	320.8	577.4
200	13.7	35.7	71.3	107.0	178.3	297.2	534.9
250	12.1	33.4	66.8	100.1	166.9	278.1	500.6
300	10.2	31.6	63.2	94.9	158.1	263.5	474.3
325	9.3	30.9	61.8	92.7	154.4	257.4	463.3
350	8.4	30.3	60.7	91.0	151.6	252.7	454.9
375	7.4	29.9	59.8	89.6	149.4	249.0	448.2
400	6.5	29.4	58.9	88.3	147.2	245.3	441.6
425	5.5	29.1	58.3	87.4	145.7	242.9	437.1
450	4.6	28.8	57.7	86.5	144.2	240.4	432.7
475	3.7	28.7	57.3	86.0	143.4	238.9	430.1
500	2.8	28.2	56.5	84.7	140.9	235.0	423.0
538	1.4	25.2	50.0	75.2	125.5	208.9	375.8
550	1.4(5)	25.0	49.8	74.8	124.9	208.0	374.2
575	1.4(5)	24.0	47.9	71.8	119.7	199.5	359.1
600	1.4(5)	19.9	39.8	59.7	99.5	165.9	298.6
625	1.4(5)	15.8	31.6	47.4	79.1	131.8	237.2
650	1.4(5)	12.7	25.3	38.0	63.3	105.5	189.9
675	1.4(5)	10.3	20.6	31.0	51.6	86.0	154.8
700	1.4(5)	8.4	16.8	25.1	41.9	69.8	125.7
725	1.4(5)	7.0	14.0	21.0	34.9	58.2	104.8
750	1.4(5)	5.9	11.7	17.6	29.3	48.9	87.9
775	1.4(5)	4.6	9.0	13.7	22.8	38.0	68.4
800	1.2(5)	3.5	7.0	10.5	17.4	29.2	52.6
816	1.0(5)	2.8	5.9	8.6	14.1	23.8	42.7

Special class

REFERENCE : ASME B16.34-2013 Table 2-2.2

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	19.8	51.7	103.4	155.1	258.6	430.9	775.7
50	19.5	50.8	101.6	152.5	254.1	423.5	762.3
100	18.1	47.1	94.2	141.3	235.5	392.4	706.4
150	16.5	43.0	85.9	128.9	214.8	358.0	644.4
200	15.3	39.8	79.6	119.4	199.0	331.7	597.0
250	14.3	37.3	74.5	111.8	186.3	310.4	558.8
300	13.5	35.3	70.6	105.9	176.4	294.1	529.3
325	13.2	34.5	68.9	103.4	172.3	287.2	517.0
350	13.0	33.8	67.7	101.5	169.2	282.1	507.7
375	12.8	33.3	66.7	100.0	166.7	277.9	500.2
400	12.6	32.9	65.7	98.6	164.3	273.8	492.9
425	12.5	32.5	65.1	97.6	162.6	271.1	487.9
450	12.3	32.2	64.4	96.6	161.0	268.3	482.9
475	12.3	32.0	64.0	96.0	160.0	266.6	480.0
500	12.2	31.7	63.4	95.1	158.6	264.3	475.7
538	11.0	29.0	57.9	86.9	145.1	241.7	435.1
550	11.0	29.0	57.9	86.9	145.1	241.7	435.1
575	10.9	28.6	57.1	85.7	143.0	238.3	428.8
600	9.5	24.9	49.8	74.6	124.4	207.3	373.2
625	7.6	19.8	39.5	59.3	98.8	164.7	296.5
650	6.1	15.8	31.7	47.5	79.1	131.9	237.4
675	4.9	12.9	25.8	38.7	64.5	107.5	193.5
700	4.4	11.4	22.8	34.3	57.1	95.2	171.3
725	3.7	9.5	19.1	28.6	47.7	79.5	143.0
750	2.8	7.4	14.8	22.1	36.7	61.2	110.3
775	2.2	5.8	11.4	17.2	28.5	47.6	85.6
800	1.8	4.4	8.8	13.2	22.0	36.6	65.6
816	1.4	3.4	7.2	10.7	17.9	29.6	53.1

9Cr-1Mo-V steel

Standard class

REFERENCE : ASME B16.34-2013 Table 2-1.15

Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	20.0	51.7	103.4	155.1	258.6	430.9	775.7
50	19.5	51.7	103.4	155.1	258.6	430.9	775.7
100	17.7	51.5	103.0	154.6	257.6	429.4	773.0
150	15.8	50.3	100.3	150.6	250.8	418.2	752.8
200	13.8	48.6	97.2	145.8	243.4	405.4	729.8
250	12.1	46.3	92.7	139.0	231.8	386.2	694.8
300	10.2	42.9	85.7	128.6	214.4	357.1	642.6
325	9.3	41.4	82.6	124.0	206.6	344.3	619.6
350	8.4	40.3	80.4	120.7	201.1	335.3	603.3
375	7.4	38.9	77.6	116.5	194.1	323.2	581.8
400	6.5	36.5	73.3	109.8	183.1	304.9	548.5
425	5.5	35.2	70.0	105.1	175.1	291.6	524.7
450	4.6	33.7	67.7	101.4	169.0	281.8	507.0
475	3.7	31.7	63.4	95.1	158.2	263.9	474.8
500	2.8	28.2	56.5	84.7	140.9	235.0	423.0
538	1.4	25.2	50.0	75.2	125.5	208.9	375.8
550	1.4(2)	25.0	49.8	74.8	124.9	208.0	374.2
575	1.4(2)	24.0	47.9	71.8	119.7	199.5	359.1
600	1.4(2)	19.5	39.0	58.5	97.5	162.5	292.5
625	1.4(2)	14.6	29.2	43.8	73.0	121.7	219.1
650	1.4(2)	9.9	19.9	29.8	49.6	82.7	148.9

Special class

REFERENCE : ASME B16.34-2013 Table 2-1.15

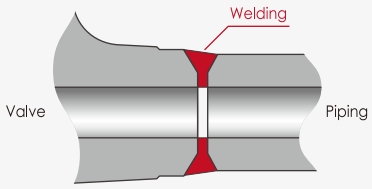
Temperature, ℃	Working Pressure by class, bar						
	150	300	600	900	1500	2500	4500
-29~38	20.0	51.7	103.4	155.1	258.6	430.9	775.7
50	20.0	51.7	103.4	155.1	258.6	430.9	775.7
100	20.0	51.7	103.4	155.1	258.6	430.9	775.7
150	20.0	51.7	103.4	155.1	258.6	430.9	775.7
200	20.0	51.7	103.4	155.1	258.6	430.9	775.7
250	20.0	51.7	103.4	155.1	258.6	430.9	775.7
300	20.0	51.7	103.4	155.1	258.6	430.9	775.7
325	20.0	51.7	103.4	155.1	258.6	430.9	775.7
350	19.8	51.5	102.8	154.3	257.1	428.6	771.4
375	19.3	50.6	101.0	151.5	252.5	420.9	757.4
400	19.3	50.3	100.6	150.6	251.2	418.3	753.2
425	19.0	49.6	99.3	148.9	248.2	413.7	744.6
450	18.1	47.3	94.4	141.4	235.8	393.1	707.6
475	16.4	42.8	85.5	128.2	213.7	356.3	641.3
500	13.7	35.6	71.5	107.1	178.6	297.5	535.4
538	11.0	29.0	57.9	86.9	145.1	241.7	435.1
550	11.0	29.0	57.9	86.9	145.1	241.7	435.1
575	10.9	28.6	57.1	85.7	143.0	238.3	428.8
600	9.3	24.4	48.7	73.1	121.9	203.1	365.6
625	7.0	18.3	36.5	54.8	91.3	152.1	273.8
650	4.8	12.4	24.8	37.2	62.1	103.4	186.2

Basic specifications

Connection

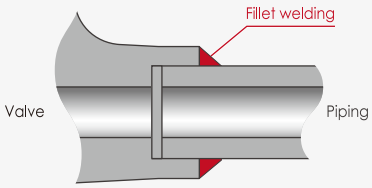
Methods for connecting valves with piping are described. Since the connection part inevitably has a higher risk of fluid leakage, select optimum connection methods in accordance with valve operating conditions such as a fluid, pressure, and temperature will be selected.

BW
(Butt Welding-end)



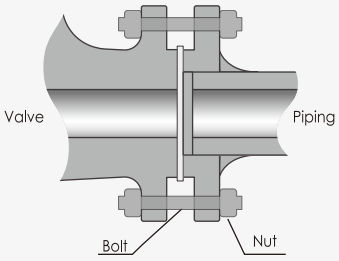
With this connection method, grooves are provided for the valve and piping, and the end surfaces are butted and welded. This connection method is excellent in reliability and durability against leakage. However, it requires advanced welding technique and the cost is high, and once they are connected, it is not easily detached. This connection method is mainly selected for high-temperature and high-pressure valves.

SW
(Socket Welding-end)



With this connection method, the valve end surface is made socket form and the end surface of piping is inserted and welded. This method does not reguire advanced welding technique compared to BW. However, because the valve end surface becomes large, this method is not appropriate for large size valves. It is selected for small size valves.

FL
(Flange-end)



With this connection method, flanges are provided for end surfaces of the valve and piping and they are connected using bolts and nuts. Because of the balance between reliability against leakage and attachment/detachment performance, generally this method is most widely used. However, as the temperature and pressure of piping increase, the flange size expands therefore measures against weight are required.

Operation

The operation methods for opening/closing valves are described. An optimum operation method is selected depending on the operating force required for valve opening/closing, opening/closing frequency, installation environment, and so on.

HO

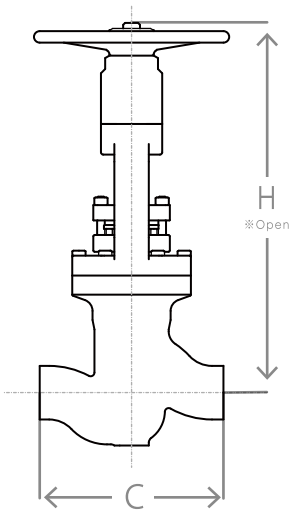
With the hand operated method, the handle is operated manually. This method is selected when operating force for valve opening/closing is small, when opening/closing frequency is low, when it is easy to access the valve, and so on.

MO

With the motor operated method, a valve is operated using motor operation by an electric controller. This method is selected when operating force for valve opening/closing is large, when opening/closing frequency is high, when it is difficult to access the valve, and so on.

Major specifications

Globe valve



Pressure class 1500

Valve size		Dimension[mm]		Cv value	Mass[kg]
DN	NPS	C: Face to Face	H: Height		
15	½	128	300	2.9	13
20	¾	128	300	4.9	13
25	1	128	300	5.7	13
40	1½	216	430	15.4	34
50	2	216	540	25.5	68

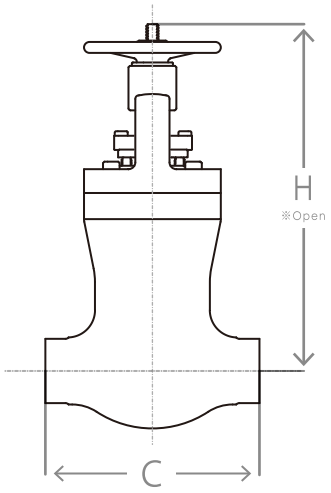
Pressure class 2500

Valve size		Dimension[mm]		Cv value	Mass[kg]
DN	NPS	C: Face to Face	H: Height		
15	½	128	250	2.3	13
20	¾	128	300	4.2	13
25	1	128	340	5.7	13
40	1½	216	510	15.4	34
50	2	216	620	22.1	68

Pressure class 4500

Valve size		Dimension[mm]		Cv value	Mass[kg]
DN	NPS	C: Face to Face	H: Height		
15	½	178	270	1.2	21
20	¾	178	280	1.9	21
25	1	178	330	3.8	21
40	1½	216	510	11.1	48
50	2	216	620	17.4	75

Gate valve



Pressure class 900

Valve size		Dimension[mm]		Cv value	Mass[kg]
DN	NPS	C: Face to Face	H: Height		
65	2½	254	560	172	60
80	3	305	600	284	70
100	4	406	660	547	120
125	5	483	740	915	140
150	6	559	830	1399	230
200	8	711	980	2108	330
250	10	864	1250	3434	550
300	12	991	1350	4660	800
350	14	1067	1600	5564	1100
400	16	1194	1800	7507	1400
450	18	1346	2000	9349	2050

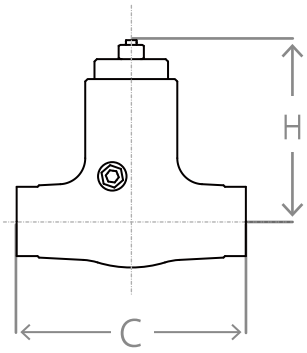
Pressure class 1500

Valve size		Dimension[mm]		Cv value	Mass[kg]
DN	NPS	C: Face to Face	H: Height		
65	2½	254	550	172	60
80	3	305	600	300	70
100	4	406	660	478	120
125	5	483	790	781	160
150	6	559	850	1152	260
200	8	711	1050	1813	380
250	10	864	1400	3020	750
300	12	991	1500	4043	1050
350	14	1067	1650	4747	1350
400	16	1194	1850	6422	1750
450	18	1346	2000	7854	2400

Pressure class 2500

Valve size		Dimension[mm]		Cv value	Mass[kg]
DN	NPS	C: Face to Face	H: Height		
65	2½	330	580	118	70
80	3	368	630	205	90
100	4	457	710	276	150
125	5	533	750	468	230
150	6	610	920	781	340
200	8	762	1100	1167	700
250	10	914	1350	1948	1100
300	12	1041	1550	2723	1450
350	14	1118	1600	3269	1800
400	16	1245	1800	4392	2650
450	18	1397	1950	5461	3600

Swing check valve



Pressure class 900

Valve size		Dimension[mm]		Cv value	Mass[kg]
DN	NPS	C: Face to Face	H: Height		
65	2½	254	250	63	45
80	3	305	300	101	55
100	4	406	350	184	100
125	5	483	370	298	120
150	6	559	390	548	190
200	8	711	430	854	230
250	10	864	470	1366	370
300	12	991	490	1865	550
350	14	1067	530	2255	850
400	16	1194	570	3002	1050
450	18	1346	610	3751	1450

Pressure class 1500

Valve size		Dimension[mm]		Cv value	Mass[kg]
DN	NPS	C: Face to Face	H: Height		
65	2½	254	250	63	45
80	3	305	300	101	55
100	4	406	350	164	100
125	5	483	390	259	140
150	6	559	410	461	220
200	8	711	460	744	270
250	10	864	500	1197	430
300	12	991	540	1632	650
350	14	1067	590	1959	950
400	16	1194	630	2615	1200
450	18	1346	670	3218	1700

Pressure class 2500

Valve size		Dimension[mm]		Cv value	Mass[kg]
DN	NPS	C: Face to Face	H: Height		
65	2½	330	270	43	50
80	3	368	320	69	70
100	4	457	370	101	110
125	5	533	410	164	150
150	6	610	440	318	230
200	8	762	490	499	380
250	10	914	530	804	750
300	12	1041	540	1123	1150
350	14	1118	590	1366	1500
400	16	1245	630	1810	1750
450	18	1397	670	2255	2700

* Because it is recommended to adopt an operating force instruction option, values when a speed reducer is installed are indicated.

Function options

Additional product functions are determined in detail to improve operating efficiency of thermal power plants, maintain long-term performance under high-temperature and high-pressure environments.

List of optional function items

○: Availabilit

Item		Globe valve	Y-globe valve	Angle-globe valve	Gate valve	Swing check valve	Lift check valve	Remarks
Countermeasures against pressure loss		○	○	○	○	○	○	To be adopted for forged valves as standard.
Countermeasures against high-temperature and thermal impact		○	○	○	○	○	○	
Countermeasures against erosion		○	○	○	○	○	○	
Countermeasures against vibrations		○	○	○	○	○	—	
Countermeasures against external leakage		○	○	○	○	○	—	
Countermeasures against negative pressure		○	○	○	○	—	—	
Countermeasures against differential pressure and warming		○	○	○	○	—	—	
Countermeasures for draining		○	○	○	○	○	○	
Operation options	Instructions on the number of operations (frequency)	○	○	○	○	○	○	
	Instructions on opening/ closing time (speed)	○	○	○	○	—	—	Exclusive option for MO valves
	Instructions on operating power	○	○	○	○	—	—	Exclusive option for HO valves
Exclusive options for globe valve	Instructions on flow rate	○	○	○	—	—	—	
Exclusive options for gate valve	Countermeasures against high-speed operation	—	—	—	○	—	—	
	Countermeasures against abnormal pressure rising	—	—	—	○	—	—	
Exclusive options for check valve	Countermeasures against impact	—	—	—	—	○	—	
	Countermeasures against chattering	—	—	—	—	○	—	
	Countermeasures against water hammer	—	—	—	—	○	—	
Countermeasures against salt damage (rust prevention)		○	○	○	○	○	○	
Dust proofing measures		○	○	○	○	○	○	
Measures for seating characteristics		—	—	—	○	—	○	
Simple options	Opening degree display	○	○	○	○	○	—	
	Metal fittings for support	○	○	○	○	○	○	
	Metal fittings for transportation	○	○	○	○	○	○	
	Metal fittings for preventing misoperation	○	○	○	○	—	—	
	Disk stopper	—	—	—	○	—	—	To be adopted as standard.
	Name plate	○	○	○	○	○	○	

* We may recommend the addition of function options based on the presented specifications and contents of specification adjustment, or the customer may be asked to determine the addition directly.
* For function options named as "Countermeasures against ***," please determine whether to adopt them.
* For function options named as "Instructions on ***," the customer is requested to present detailed conditions.

Explanation of function option pages

Option name

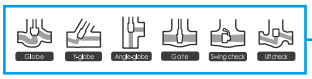
Explanation of phenomenon

Describes the phenomenon that requires countermeasures by adding the option.

Function options

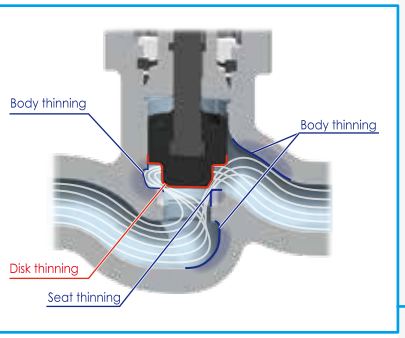
Countermeasures against erosion

Erosion is a phenomenon in which the inner wall of a valve becomes thin due to fluid collision. It easily occurs in globe valves with particularly complicated flow channel shapes. Erosion can cause serious problems such as loss of valve sealing function and external leakage.



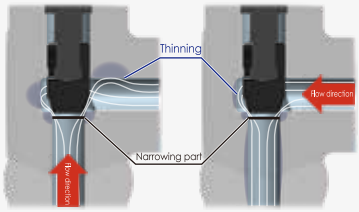
Indication of valve types to which the option is applicable

Indicates whether the option is available depending on valve types. Note that options may not be available for some valve types. For detailed option contents, please contact us.



Example of optional application

FLOW-TO-CLOSE



Fluid collision is minimized and erosion risks are reduced by selecting an angle valve and providing measures against backward flow.

Explanation of phenomenon

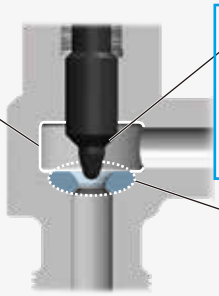
Illustrates the phenomenon that requires countermeasures by adopting an option.

Enlarged bosom structure

By enlarging the bosom part of the body, fluid flow is made uniform to reduce erosion risks.

Standard specification

Enlarged bosom area

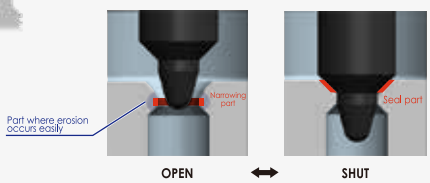


Metalizing the entire Stellite surface

Erosion risks of the disk are reduced by expanding the Stellite build-up part having high wear resistance.

Separate seat structure

By separating the seal part from the narrowing part, the soundness of the seal part is maintained even if erosion occurs in the narrowing part.



Detailed explanation

Components to be added or changed when the option is selected are explained in detail.
* The explanations are just an example. Note that they may change depending on factors such as a valve type, valve size, and pressure class.

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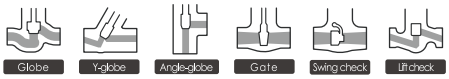
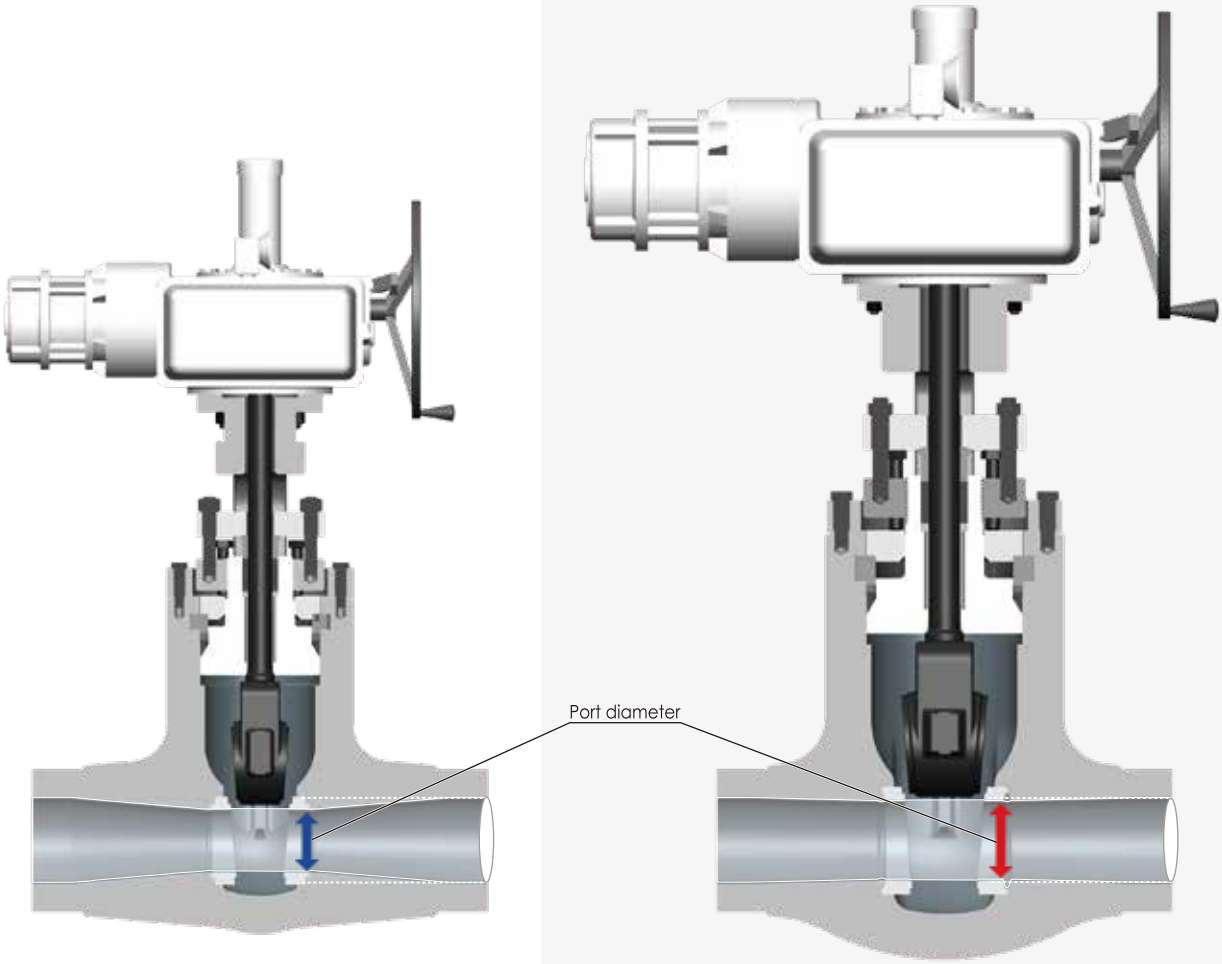
Function options

Countermeasures against pressure loss

The fluid that flows through piping can be controlled by a valve. However, installation of a valve inevitably causes pressure loss of the fluid. Pressure loss can be a limiting factor in plant operating efficiency.





Reduced port VP SERIES

We adopt a reduced port type as standard whose port diameter is made smaller than the inside diameter of piping at a fixed ratio, from the comprehensive viewpoints such as allowable pressure loss or functionality and economic efficiency of the valve.

Full port HP SERIES

We also have in our lineup a full port type whose port diameter is made as close as possible to the inside diameter of the piping in order to place importance on minimization of pressure loss rather than economic efficiency of a valve. This type is recommended for application to valves installed in a main steam system or a water supply system.

Gate valve

Reduced port VP SERIES

Pressure class	Valve size		Dimension[mm]		Cv value	Mass [kg]
	DN	NPS	Face to Face	Height		
900	65	2½	254	560	172	60
	80	3	305	600	284	70
	100	4	406	660	547	120
	125	5	483	740	915	140
	150	6	559	830	1399	230
	200	8	7 11	980	2108	330
	250	10	864	1250	3434	550
	300	12	991	1350	4660	800
	350	14	1067	1600	5564	1100
	400	16	1194	1800	7507	1400
	450	18	1346	2000	9349	2050
1500	65	2½	254	550	172	60
	80	3	305	600	300	70
	100	4	406	660	478	120
	125	5	483	790	781	160
	150	6	559	850	1152	260
	200	8	711	1050	1813	380
	250	10	864	1400	3020	750
	300	12	991	1500	4043	1050
	350	14	1067	1650	4747	1350
	400	16	1194	1850	6422	1750
	450	18	1346	2000	7854	2400
2500	65	2½	330	580	118	70
	80	3	368	630	205	90
	100	4	457	710	276	150
	125	5	533	750	468	230
	150	6	610	920	781	340
	200	8	762	1100	1167	700
	250	10	914	1350	1948	1100
	300	12	1041	1550	2723	1450
	350	14	1118	1600	3269	1800
	400	16	1245	1800	4392	2650
	450	18	1397	1950	5461	3600

Full port HP SERIES

Pressure class	Valve size		Dimension [mm]		Cv value	Mass [kg]
	DN	NPS	Face to Face	Height		
900	65	2½	254	600	350	60
	80	3	305	660	693	80
	100	4	406	740	1124	120
	125	5	483	830	1680	160
	150	6	559	980	2718	270
	200	8	711	1250	4265	450
	250	10	864	1600	7284	900
	300	12	991	1800	9515	1200
	350	14	1067	2000	11934	1550
	400	16	1194	2200	14974	2150
	450	18	1346	2300	19001	2850
1500	65	2½	254	600	350	60
	80	3	305	660	614	80
	100	4	406	790	952	120
	125	5	483	850	1367	170
	150	6	559	1050	2379	290
	200	8	711	1400	3694	600
	250	10	864	1650	6327	1100
	300	12	991	1850	8203	1350
	350	14	1067	2000	9993	1750
	400	16	1194	2200	12608	2600
	450	18	1346	2400	16048	3400
2500	65	2½	330	630	238	80
	80	3	368	710	363	110
	100	4	457	750	566	160
	125	5	533	920	931	290
	150	6	610	1100	1537	550
	200	8	762	1350	2386	900
	250	10	914	1600	4311	1450
	300	12	1041	1800	5567	2050
	350	14	1118	1950	6934	2350
	400	16	1245	2100	8735	3600
	450	18	1397	2300	11226	4500

Check valve

Reduced port VP SERIES

Pressure class	Valve size		Dimension [mm]		Cv value	Mass [kg]
	DN	NPS	Face to Face	Height		
900	65	2½	254	250	63	45
	80	3	305	300	101	55
	100	4	406	350	184	100
	125	5	483	370	298	120
	150	6	559	390	548	190
	200	8	711	430	854	230
	250	10	864	470	1366	370
	300	12	991	490	1865	550
	350	14	1067	530	2255	850
	400	16	1194	570	3002	1050
	450	18	1346	610	3751	1450
1500	65	2½	254	250	63	45
	80	3	305	300	101	55
	100	4	406	350	164	100
	125	5	483	390	259	140
	150	6	559	410	461	220
	200	8	711	460	744	270
	250	10	864	500	1197	430
	300	12	991	540	1632	650
	350	14	1067	590	1959	950
	400	16	1194	630	2615	1200
	450	18	1346	670	3218	1700
2500	65	2½	330	270	43	50
	80	3	368	320	69	70
	100	4	457	370	101	110
	125	5	533	410	164	150
	150	6	610	440	318	230
	200	8	762	490	499	380
	250	10	914	530	804	750
	300	12	1041	540	1123	1150
	350	14	1118	590	1366	1500
	400	16	1245	630	1810	1750
	450	18	1397	670	2255	2700

Full port HP SERIES

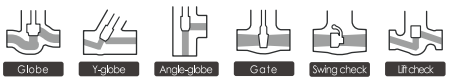
Pressure class	Valve size		Dimension [mm]		Cv value	Mass [kg]
	DN	NPS	Face to Face	Height		
900	65	2½	254	300	101	50
	80	3	305	350	184	70
	100	4	406	370	298	110
	125	5	483	390	548	140
	150	6	559	430	854	230
	200	8	711	470	1366	390
	250	10	864	530	2255	600
	300	12	991	570	3002	900
	350	14	1067	610	3751	1050
	400	16	1194	650	4758	1550
	450	18	1346	700	6018	2300
1500	65	2½	254	300	101	50
	80	3	305	350	164	70
	100	4	406	390	259	110
	125	5	483	410	461	150
	150	6	559	460	744	250
	200	8	711	500	1197	430
	250	10	864	590	1959	650
	300	12	991	630	2615	950
	350	14	1067	670	3218	1150
	400	16	1194	720	4104	1400
	450	18	1346	770	5182	1900
2500	65	2½	330	320	69	50
	80	3	368	370	101	80
	100	4	457	410	164	120
	125	5	533	440	318	150
	150	6	610	490	499	260
	200	8	762	530	804	440
	250	10	914	590	1366	950
	300	12	1041	630	1810	1300
	350	14	1118	670	2255	1550
	400	16	1254	720	2863	1950
	450	18	1397	770	3646	2800

* The Cv values used in the table are the values when the valve is fully open. The Cv value is one of capacity coefficients.
It is a numeric value that expresses the flow rate of water at 60°F (approx. 15.5°C) that flows through the valve when the differential force is 1 lbf/in2 [6.895 KPa] at a specific opening degree. It is expressed by US gal/min (1US gal = 3.785 L)

Function options

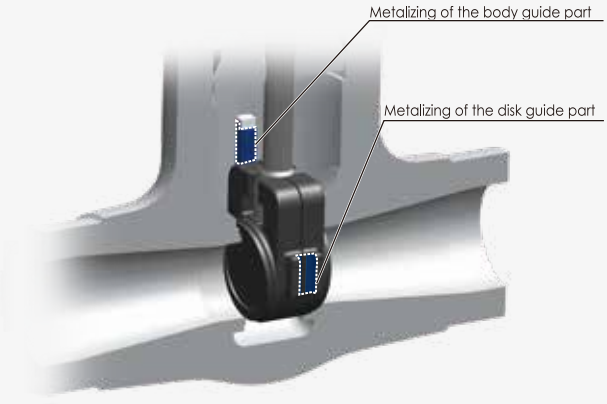
Countermeasures against high-temperature and thermal impact

Under high-temperature environment, inoperability or leakage may occur due to thermal deformation. For valves used in such environment, we recommend the application of countermeasures against high-temperature and thermal impact.



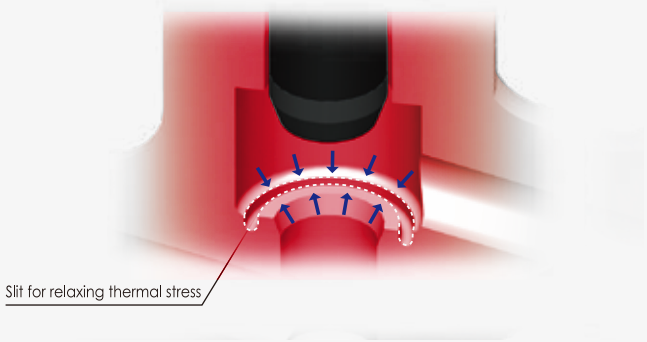
Example of optional application

Metalizing of the guide part



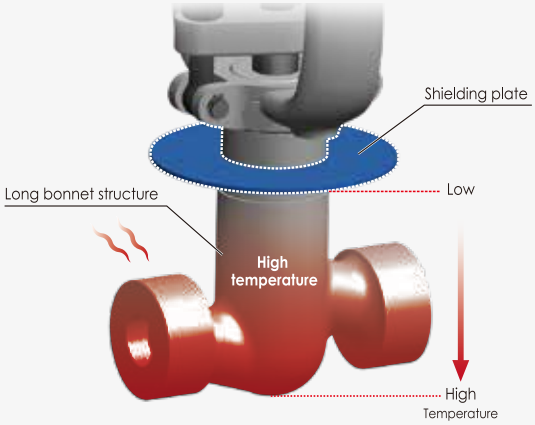
Metalizing is performed for the sliding part of the valve to reduce the risk of burn-in at the sliding part.

Slit for relaxing thermal stress



A slit is provided on the outside of the seat to relax thermal stress, which reduces seat cracking risks due to thermal stress.

Protection of the upper mechanism of the valve



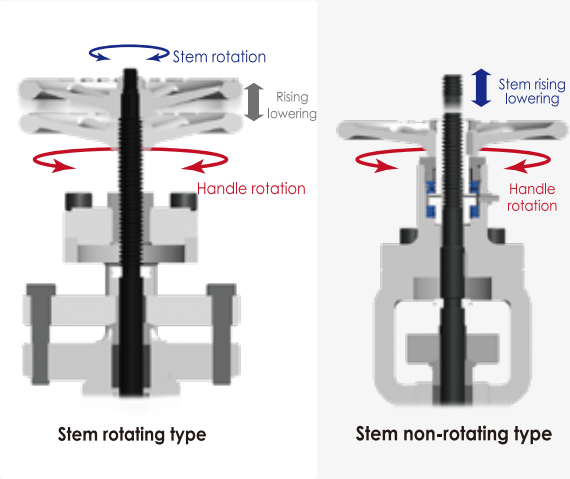
Long bonnet structure

Thermal influence on the upper mechanism of the valve is alleviated by extending the upper part of the body.

Shielding plate

By providing a metal plate for the upper part of the body, thermal radiation from piping is cut off and heat of the body is diffused.

Stem non-rotating type



Stem rotating type

Stem non-rotating type

By using a valve opening/closing mechanism without stem rotation (stem rising/lowering mechanism), risk of stem burn-in is reduced. The stem non-rotating type is generally adopted for globe valves (65DN or over), gate valves, and MO valves.

High-performance sealing materials

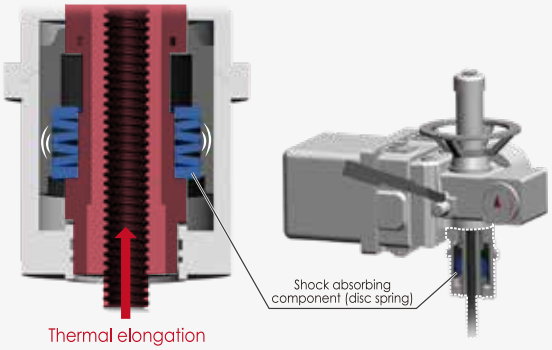
Delta seal ring

Sealing can be enhanced by making the seal ring a delta shape having more seal points.

Graphite seal ring

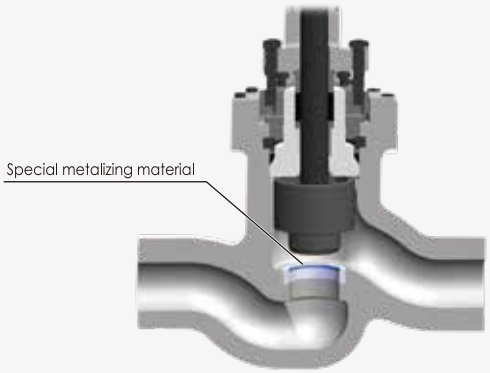
By using expanded graphite excellent in follow-up performance and adhesiveness as a seal ring material, sealing can be achieved without being affected by pressure and temperature.

Drive part for high temperature



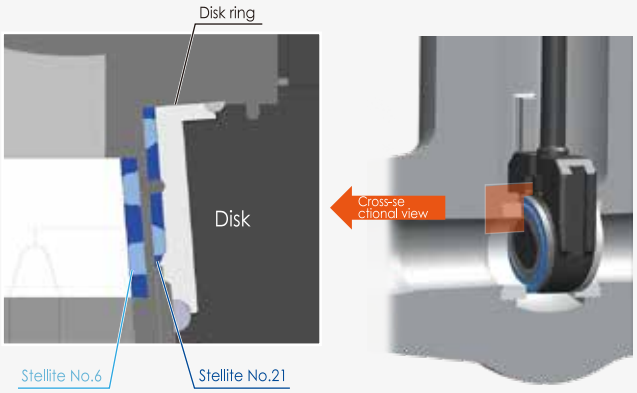
By installing an electric controller with shock absorbing components (disc springs), load on the controller is reduced when thermal expansion of the stem occurs under high temperature.

Special metalizing



Stellite No. 21

By using Stellite No. 21 with lower hardness as a metalizing material, risk of crack occurrence at the seal part is reduced.



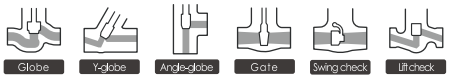
Combination of stellites

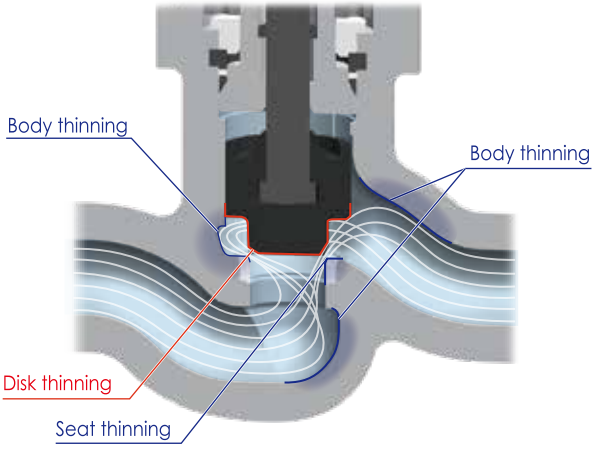
By making a structure with Stellite No. 6 and Stellite No. 21 combined, risks of crack occurrence and crack expansion at the seal part are reduced.

Function options

Countermeasures against erosion

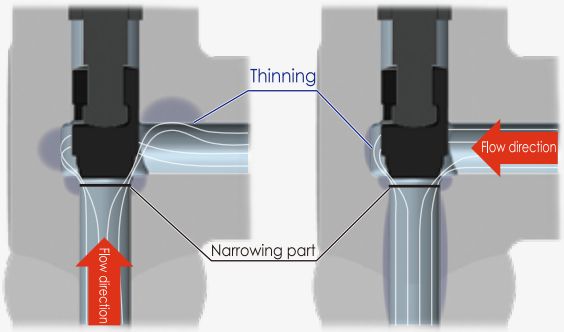
Erosion is a phenomenon in which the inner wall of a valve becomes thin due to fluid collision. It easily occurs in globe valves with particularly complicated flow channel shapes. Erosion can cause serious problems such as loss of valve sealing function and external leakage.





Example of optional application

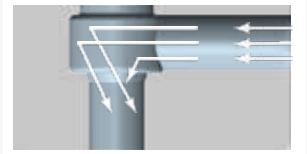
FLOW-TO-CLOSE



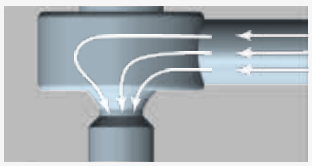
Fluid collision is minimized and erosion risks are reduced by selecting an angle valve and providing measures against backward flow.

Enlarged bosom structure

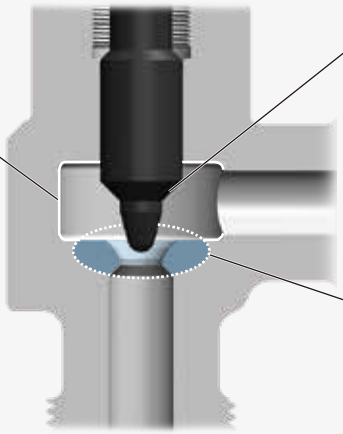
By enlarging the bosom part of the body, fluid flow is made uniform to reduce erosion risks.



Standard specification

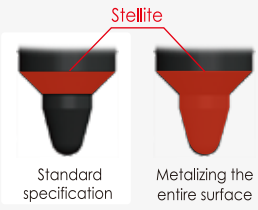


Enlarged bosom area



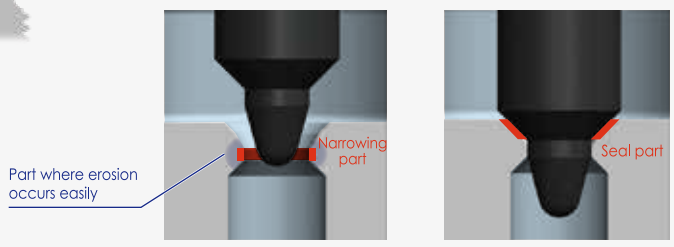
Metalizing the entire Stellite surface

Erosion risks of the disk are reduced by expanding the metalized Stellite part having high wear resistance.

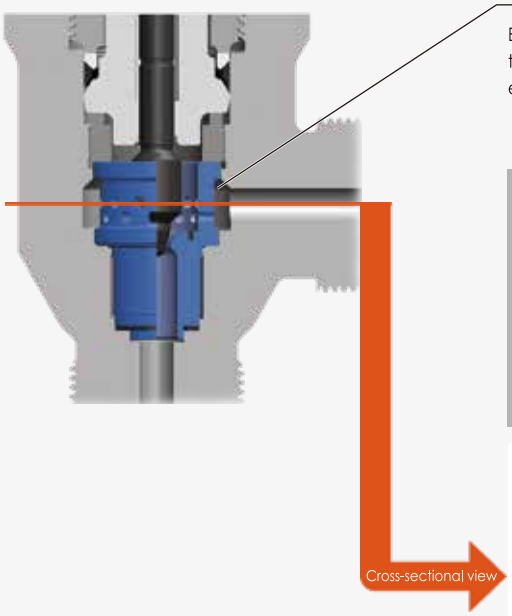


Separate seat structure

By separating the seal part from the narrowing part, the soundness of the seal part is maintained even if erosion occurs in the narrowing part

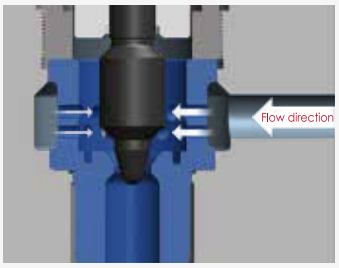


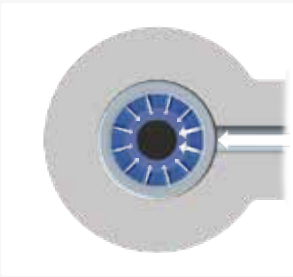
Structure with cage



Cage for rectification

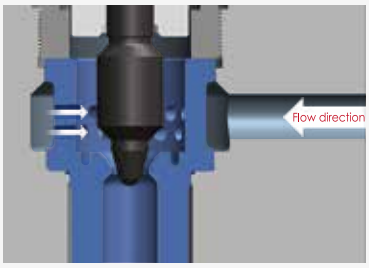
By passing a fluid through the cage hole, the flow is made uniform to reduce erosion risks.





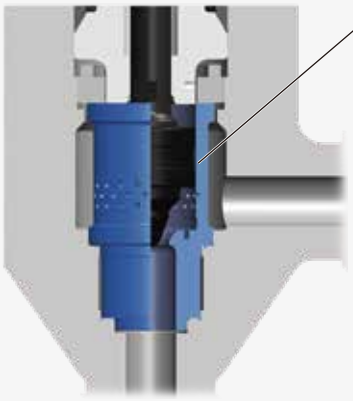
Change of cage hole position

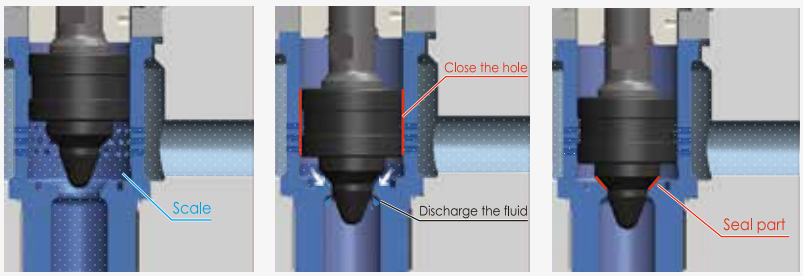
By not having a cage hole at the inlet side, fluid flow is dispersed to the periphery of the cage so that erosion risk due to small particle scale is reduced.



Cage guide structure

By closing the cage hole before closing of the valve and discharging the fluid from the seal part, no scale is left at the seal part when the valve is closed. Erosion risks due to biting of scale is reduced.



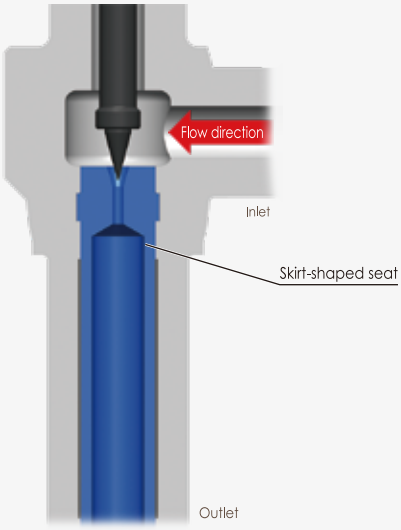


Function options

Countermeasures against erosion

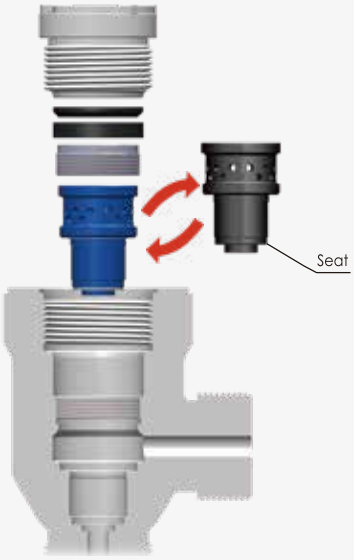
Example of optional application

Skirt-shaped seat



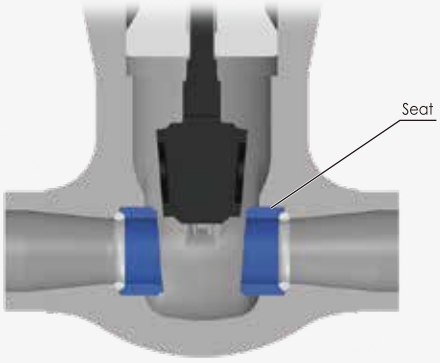
In an environment where flushing or cavitation occurs at the seat part, erosion risks of the body are reduced by protecting up to the outlet flow channel.

Seat replacing type



By providing a structure in which the seat can be replaced easily, early restoration is achieved in the event of seat erosion.

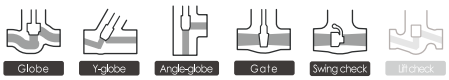
Special seat material

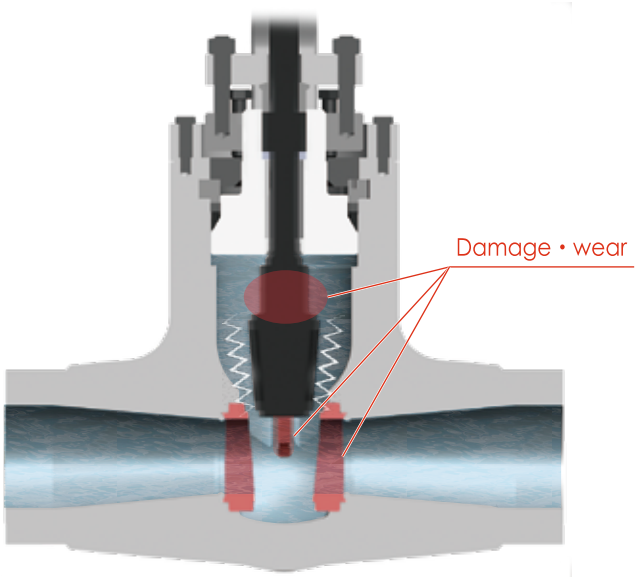


By changing the seat material to a material with excellent abrasion resistance, resistance to erosion at the seat part is enhanced.

Countermeasures against vibrations

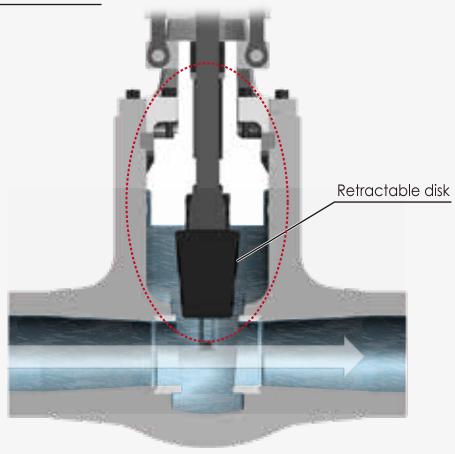
If piping is vibrated by a high-speed fluid or pump, the valve may become damaged or worn.





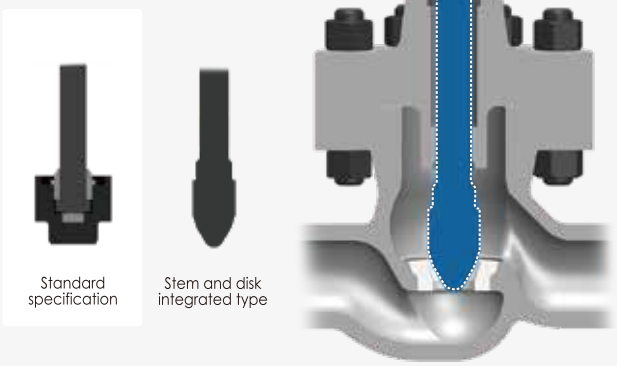
Example of optional application

Retractable disk



By fixing the disk when fully opened to the bonnet, the joint of the stem and disk is prevented from being damaged and worn due to vibrations.

Stem and disk integrated type

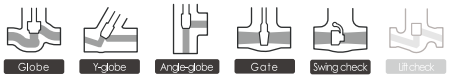


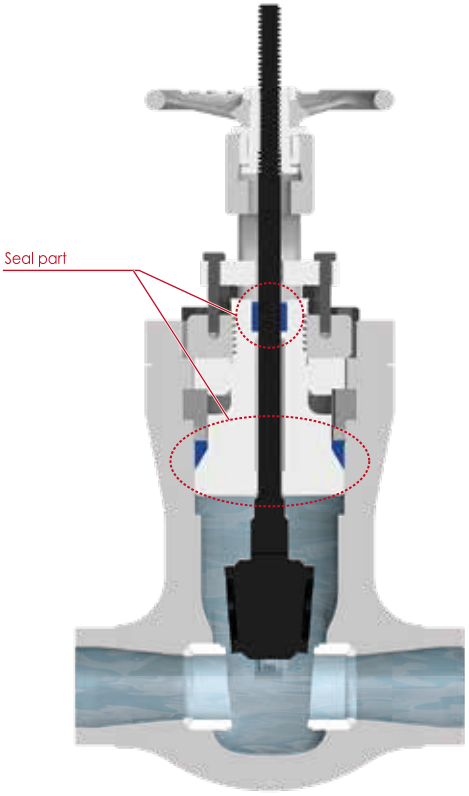
By changing the stem and disk structure to an integrated type, damaged and worn parts due to vibrations are eliminated.

Function options

Countermeasures against external leakage

External leakage is a phenomenon in which a fluid leaks into the air. Due to its mechanism, valves always have risk of external leakage. Occurrence of external leakage may not only decrease plant operating efficiency but also cause serious injuries.





Example of optional application

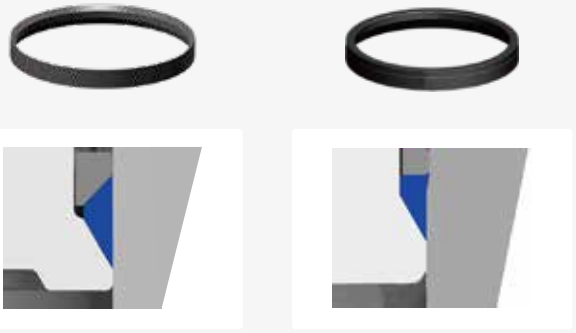
High-performance sealing material

Delta seal ring

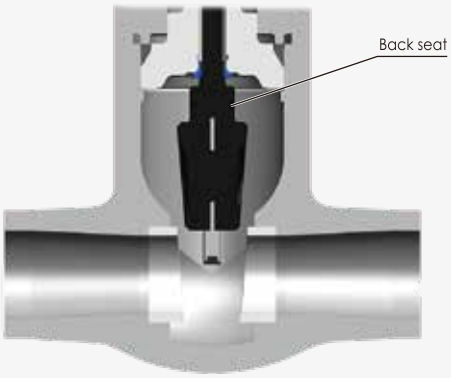
Sealing can be enhanced by making the seal ring a delta shape having more seal points.

Graphite seal ring

By using expanded graphite excellent in follow-up performance and adhesiveness as a seal ring material, sealing can be achieved without being affected by pressure and temperature.

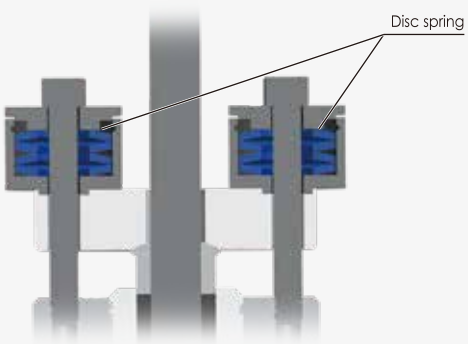


Back seat

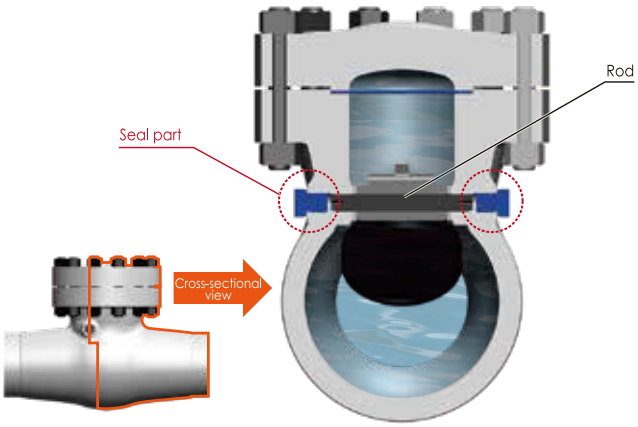


By providing back seats at the lower part of the bonnet and pushing the stem against the back seats, external leakage from the stem sliding part is prevented.

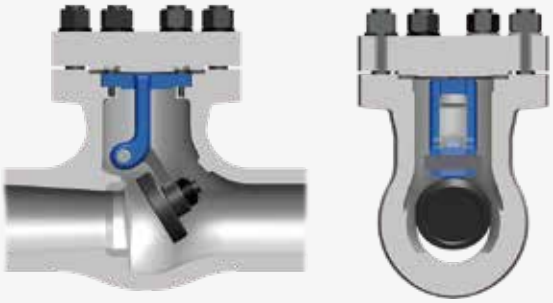
Disc spring for gland



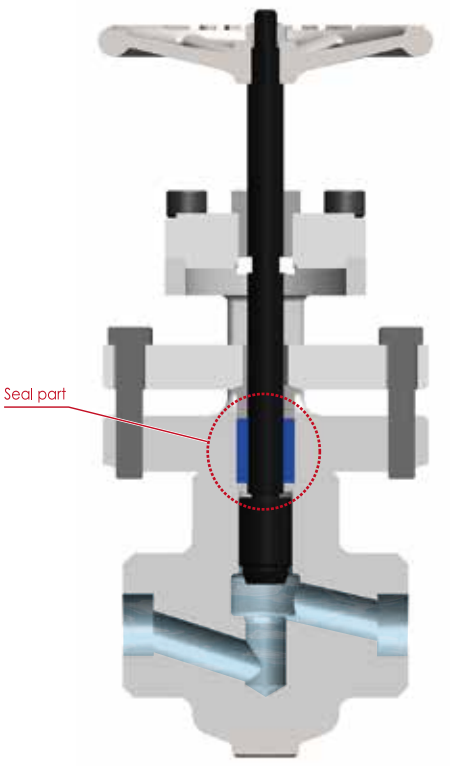
By providing disc springs for the gland bolts, risk of packing tightening force decreasing is reduced.



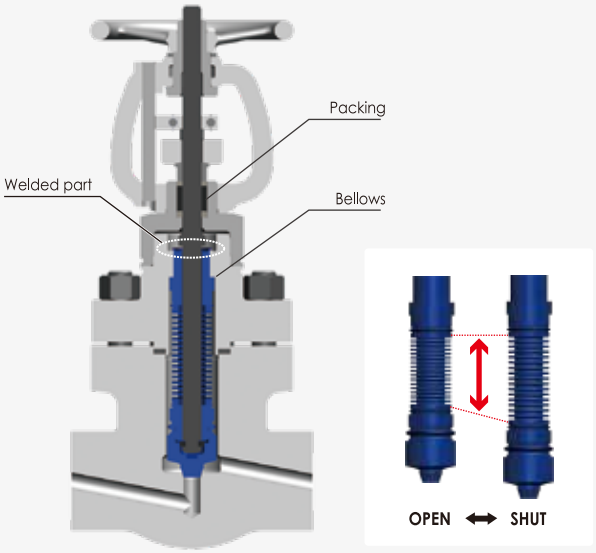
Internal suspended structure



By providing a structure in which the rod is not supported by the body, the seal part itself is eliminated and the risk of leakage to outside is reduced.



Bellows seal structure

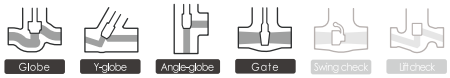


A double seal mechanism is provided by incorporating bellows. Contraction of bellows enables the valve to be opened/closed with airtightness maintained.

Function options

Countermeasures against negative pressure

If the internal pressure of the valve becomes lower than the atmospheric pressure (negatively pressurized state), outside air may be sucked into the valve.



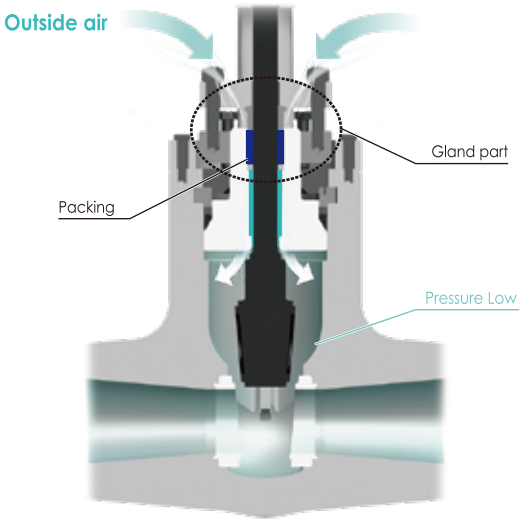
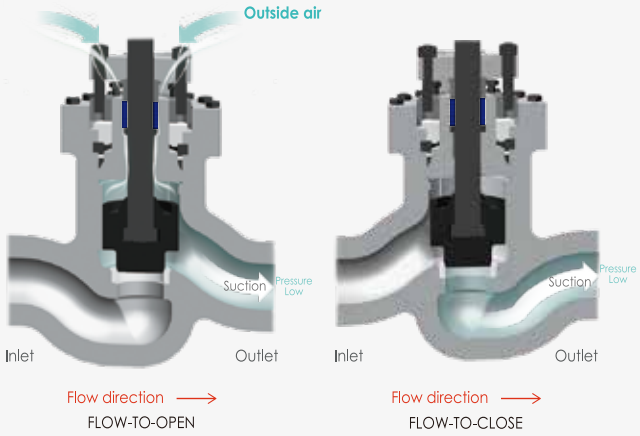


Image of negative pressure generation

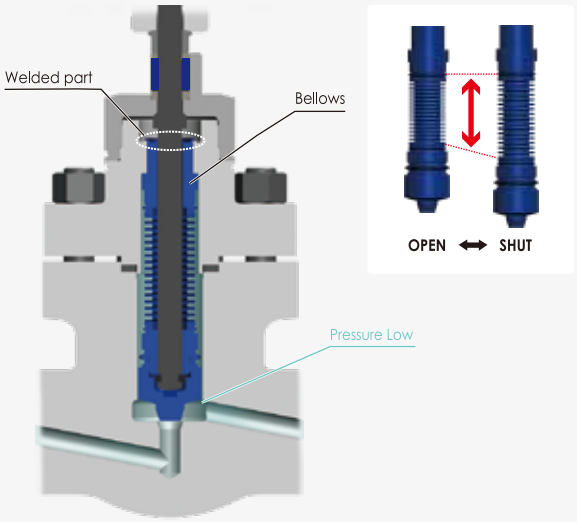
Example of optional application

FLOW-TO-CLOSE



When the valve closes, if the out let pressure drops and becomes negatively pressurized, risks of outside air entry can be reduced by performing reverse installation.

Bellows seal structure



Risks of outside air entry can be reduced by incorporating bellows. Contraction of bellows enables the valve to be opened/closed with airtightness maintained.

Structure with water-seal valve

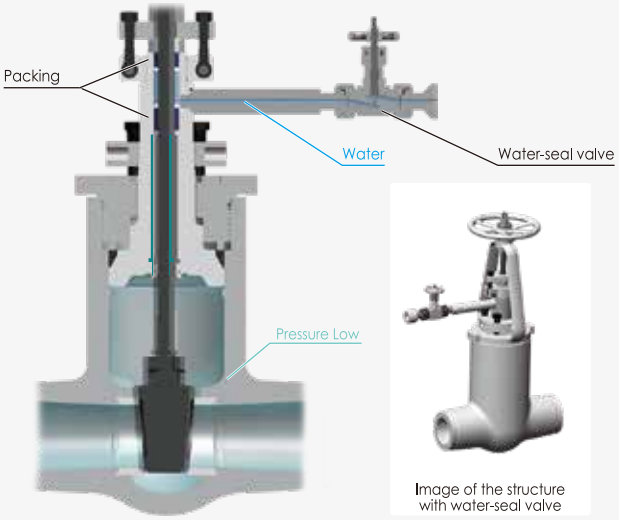
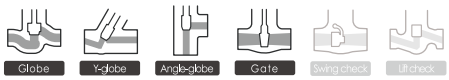


Image of the structure with water-seal valve

By dividing the packing part into two and filling water in the clearance, risk of outside air entry can be reduced. Because installation of external piping is reguired for injecting water, it is necessary to secure a certain amount of space.

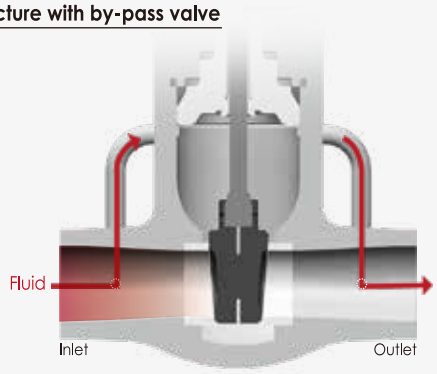
Countermeasures against differential pressure and warming

If the difference in pressure is large between the primary side and the secondary side, the amount of operating force required for valve opening operation increases. In addition, if the valve opening operation is performed with a temperature difference between the primary side and the secondary side, abrupt temperature variation may cause the seal part to be damaged.



Example of optional application

Structure with by-pass valve

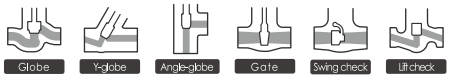


By opening the by-pass valve with the valve fully closed, the differential pressure is reduced. As a result, the amount of operating force required for valve opening operation is reduced and the risk of damage to the seal part of the valve due to outlet warming is reduced.

Image of the structure with by-pass valve

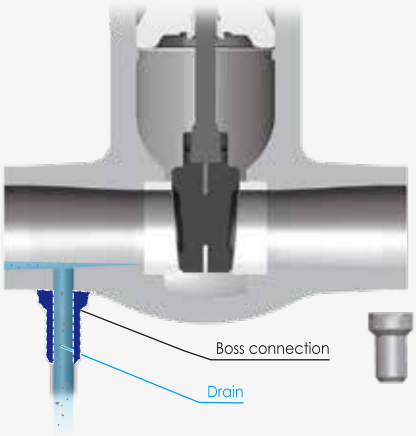
Countermeasures for draining

Water (drain) accumulated due to steam condensation can cause degradation of plant operating efficiency or damage to the piping and the valve.



Example of optional application

Boss connection



The valve is provided with a drain discharge mechanism to reduce risk of damage to the piping and the valve.

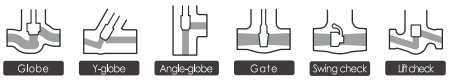
Image of the structure with drain piping

Function options

Operation options

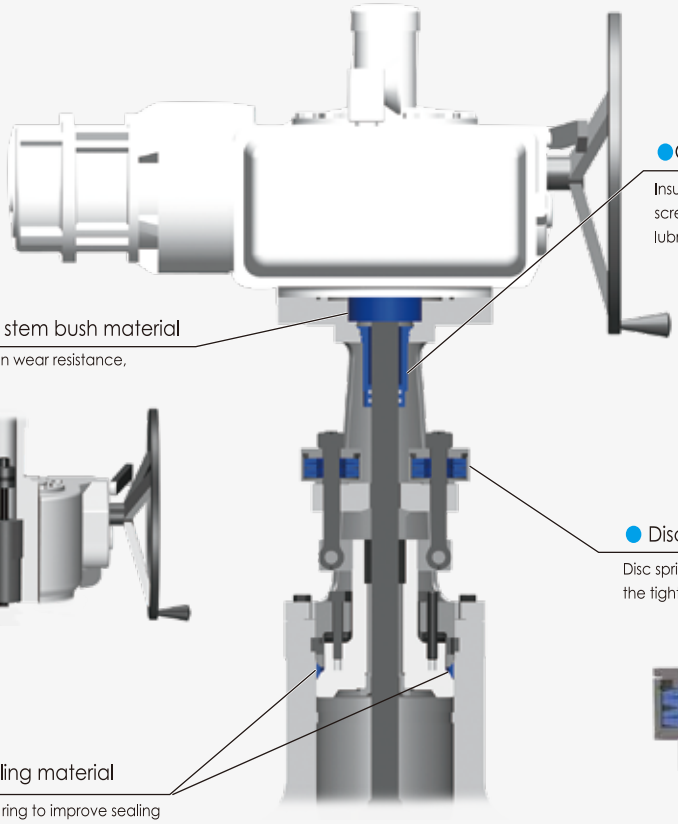
Instructions on the number of operations(frequency)

If instructions are given on frequency of MO valve operation, countermeasures can be taken against degradation of functions and components hastened by frequent opening/closing of the valve.



Example of optional application

- Opening/closing operation: 500 times/year or more
- DDS operation (opening/closing operation: once/day or more)



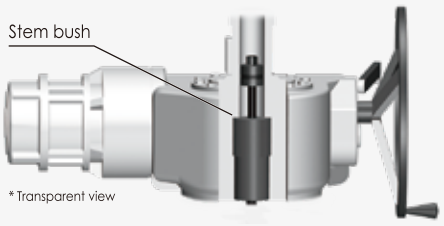
Grease stock structure

Insufficient lubrication at the stem screw part is prevented by retaining lubricating oil.

Change of the special stem bush material

By changing to a material excellent in wear resistance, wear of the sliding part is reduced.

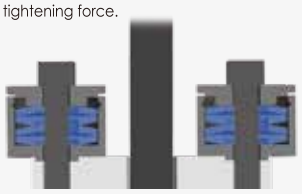
Stem bush



*Transparent view

Disc spring for gland

Disc springs are added to the gland part to enhance the tightening force.



High-performance sealing material

Change to a high-performance seal ring to improve sealing

Delta seal ring

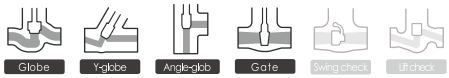
Sealing can be enhanced by making the seal ring a delta shape having more seal points.

Graphite seal ring

By using expanded graphite excellent in follow-up performance and adhesiveness as a seal ring material, sealing can be achieved without being affected by pressure and temperature.

Instructions on opening/closing time (speed)

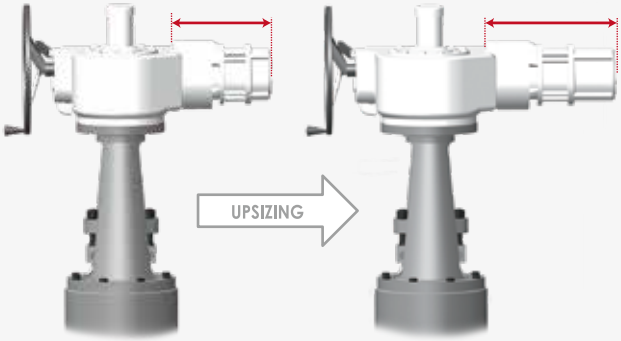
If instructions are given on the time of opening/closing the MO valve, nonstandard specifications can be dealt with.



Example of optional application

Upsizing of the drive part

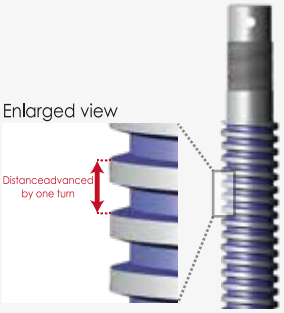
By upsizing the drive part to increase drive capability, the time of MO valve operation can be reduced.



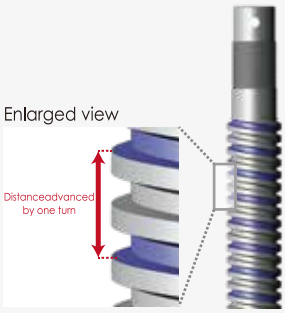
Standard specification　　Upsizing of the drive part

Double-threaded screw

By changing the screw for the stem to a double-threaded screw, the time of MO valve operation can be reduced.



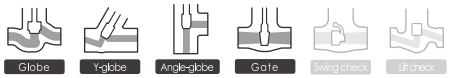
Single-threaded screw



Double-threaded screw

Instructions on operating power

If instructions are given on the amount of operating force for an HO valve, nonstandard specifications can be dealt with.



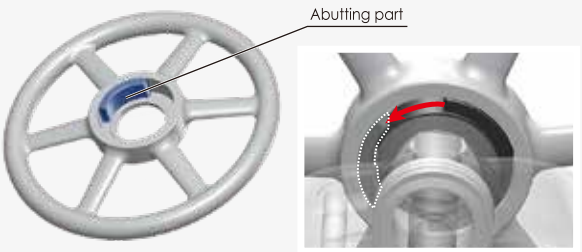
Example of optional application

Manual speed reducer

Operating force is reduced by installing a speed reducer with gears on the upper part of the valve. Because operating force is reduced by the gears, the handle rotation speed during opening/closing operation increases.

※For the recommended installation range, refer to page 15.

Hammer blow handle



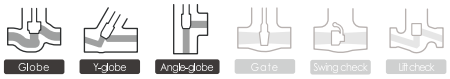
This is a manual handle that makes valve opening/closing easy using the impact force created by the play of the handle rotation.

Function options

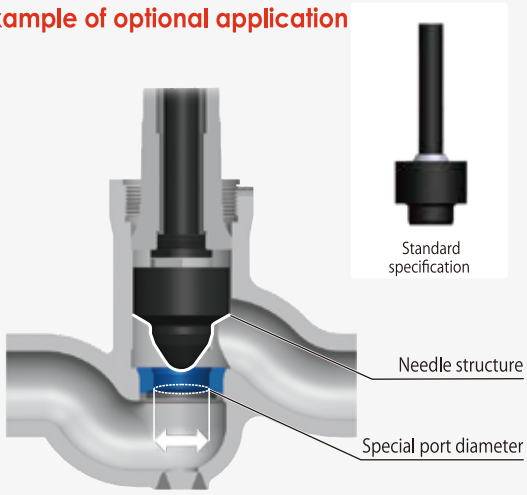
Exclusive options for globe valve

Flow rate instructions

If instructions are given on flow rate requirements, globe valves (including angle-globe valve and Y-globe valve) can be used as flow regulating valves.

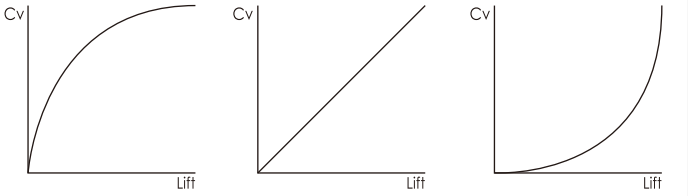


Example of optional application



Example of Cv-lift charts

Individual specifications can be supported.



ON-OFF specification (standard specification)

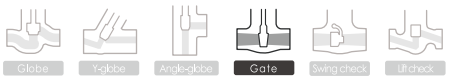
Linear specification

Parabolic specification

Exclusive options for gate valve

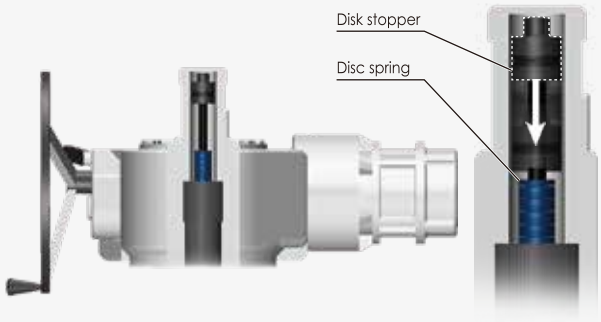
Countermeasures against high-speed operation

Friction and inertial force accompanied by high-speed opening/closing of the MO valve can cause the valve to malfunction.



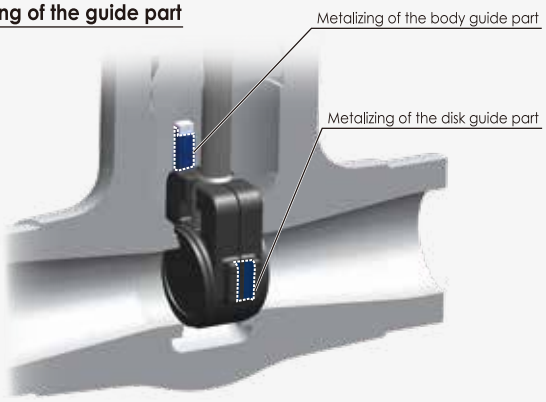
Example of optional application

Disc spring at the lower part of the stopper



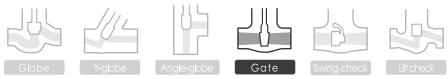
By mounting a disc spring to the lower part of the disk stopper, risk of disk bumping during high-speed opening/closing are reduced.

Metalizing of the guide part

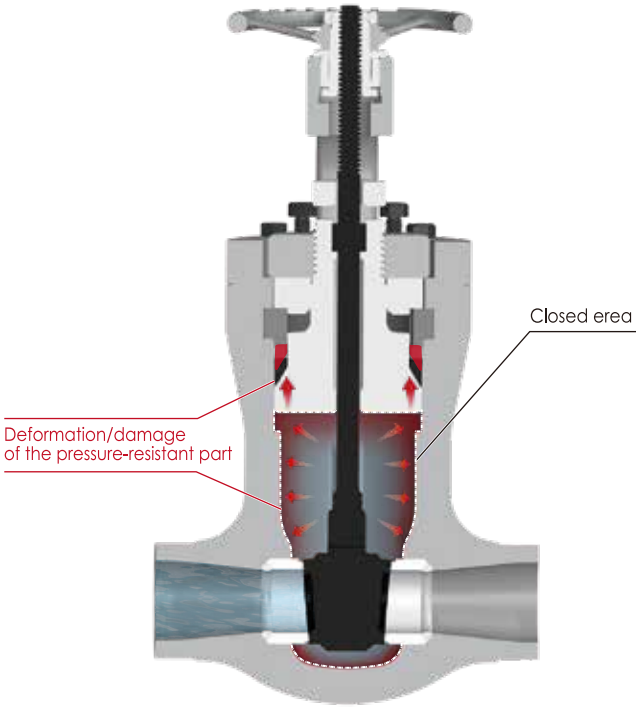


Metalizing is performed for the sliding part of the valve to reduce the risk of burn-in at the sliding part.

Countermeasures against abnormal pressure rising

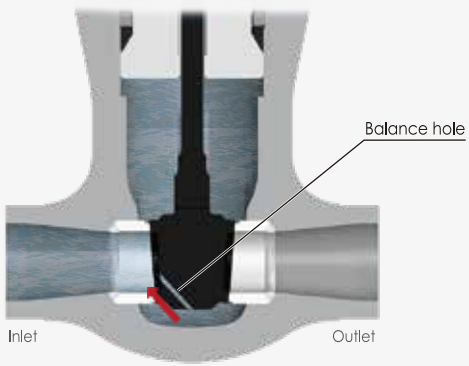


Abnormal pressure rising is a phenomenon peculiar to gate valves in which a fluid is sealed in the bosom part of the body and heated under that state, causing the fluid to expand and the internal pressure of the bosom part of the body to increase significantly. Occurrence of abnormal pressure rising can cause problems such as deformation or damage of pressure-resistant components including the body and opening operation to be inoperative.



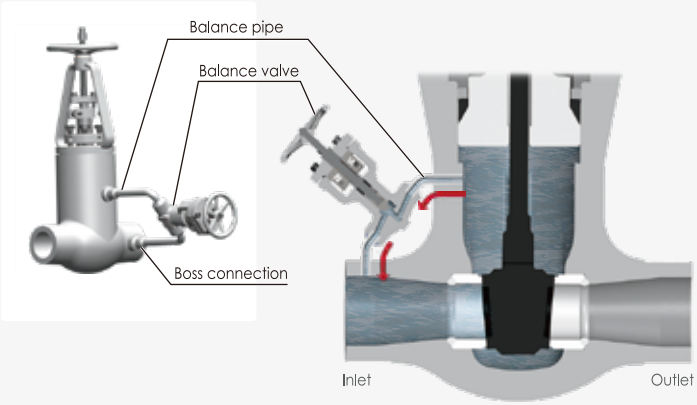
Example of optional application

Balance hole



The inlet of the disk is provided with a balance hole to equalize the body bosom part pressure and the flow channel pressure. Because a fluid at the time of backward flow leaks out of the balance hole, this cannot be applied when a sealing function is required at the time of backward flow.

Structure with balance valve



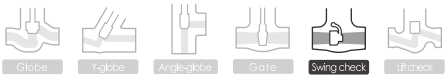
External piping with balance valve is installed from the body bosom part to the flow channel. By providing a balance valve for external piping, sealing can be achieved for both direct flow and backward flow. Because installation of external piping is reguired, it is necessary to secure a certain amount of space.

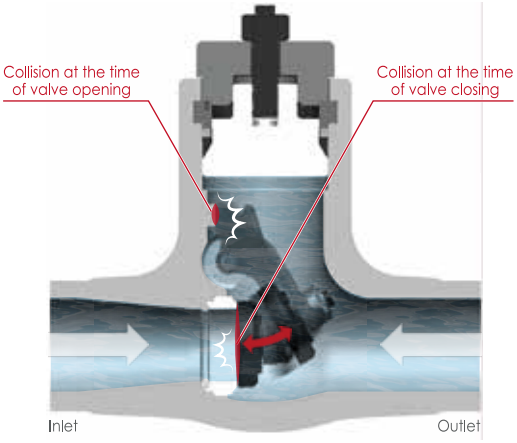
Function options

Exclusive options for check valve

Countermeasures against impact

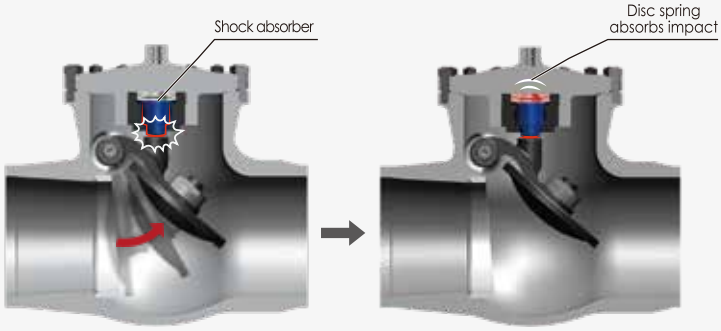
A swing check valve is opened/closed using the pressure difference between the in let and the out let. Thus, if the water pressure rises/lowers abruptly, impact due to disk opening/closing operation may cause the internal part of the body or seal part to be damaged.





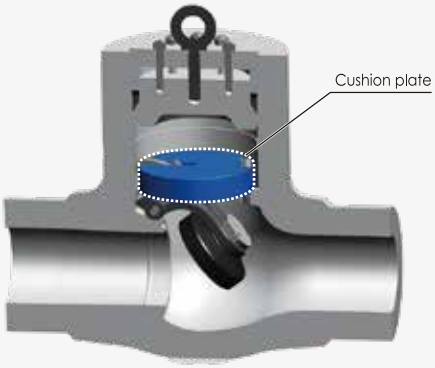
Example of optional application

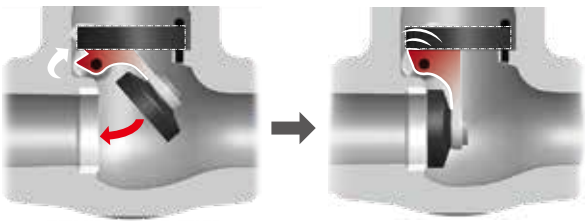
Shock absorber



The shock absorber is incorporated in the lower part of the bonnet together with a disc spring. It absorbs impact at the time of valve opening to reduce risk of damage to components.

Cushion plate

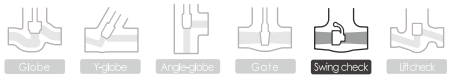


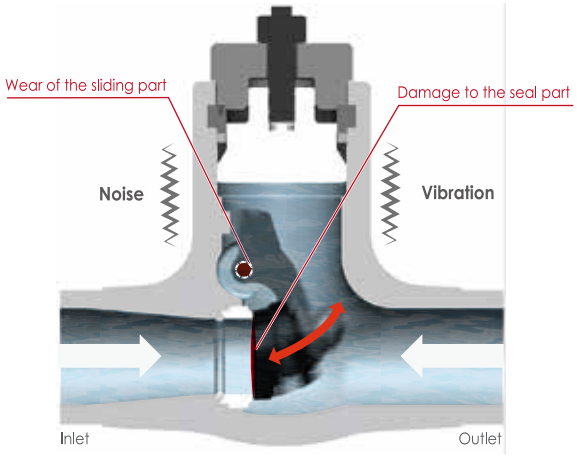


The cushion plate is incorporated in the upper part of the swing arm. It absorbs impact at the time of valve closing to reduce risk of damage to the seal part.

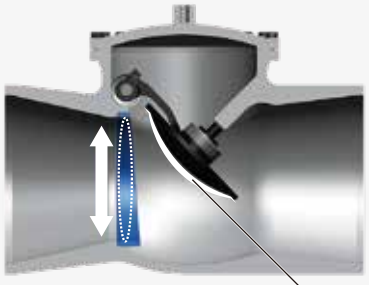
Countermeasures against chattering

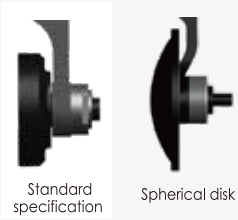
Chattering is a phenomenon that a valve opens and closes at short cycles under an environment of frequent pressure variation or low-load . Chattering generates mechanical vibrations and noise, causing the seal part to be damaged and the sliding part to wear.





Example of optional application





Special port size

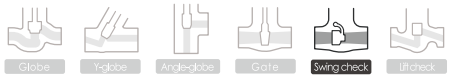
The opening moment by a fluid is increased by reducing the seat size to prevent chattering.

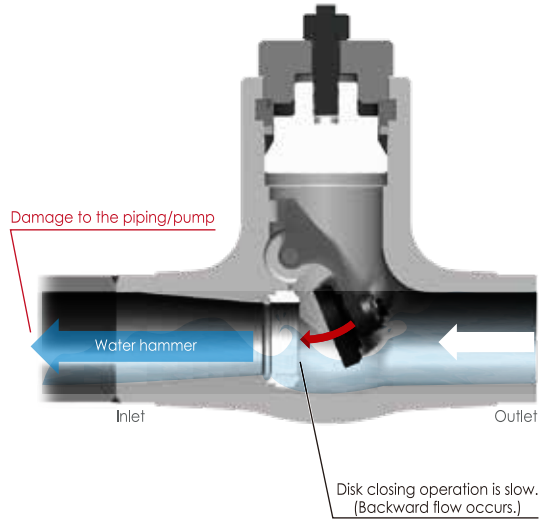
Spherical disk

By changing the disk shape to spherical, the closing moment by the self-weight of the valve body is reduced. Chattering is prevented by making it easy to open the valve.

Countermeasures against water hammer

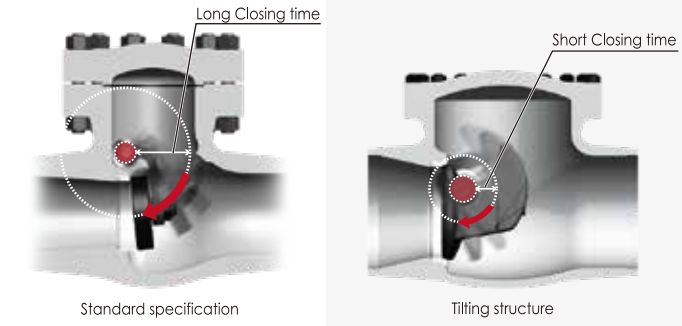
Water hammer is a phenomenon that fluid flow changes due to valve opening/closing or pump stoppage, causing abrupt pressure variation or impact in the piping. It may give damage to the piping, valve, pump, and so on.





Example of optional application

Tilting structure

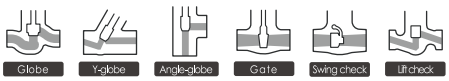


In the tilting structure, the arm rotating shaft is located near the center of the flow channel, so the valve opening/closing time can be shortened. The structure reduces the risk of damage to the piping and pump caused by backward flow due to water hammer.

Function options

Countermeasures against salt damage (rust prevention)/Dust proofing measures

For valves installed outdoors, not only rust and corrosion due to rain and sea breeze but also deterioration and malfunction due to adhesion of dust may occur.



Example of optional application

● Effective as countermeasures against salt damage
● Effective as dust proofing measures

●● Long cap

It protects the stem screw part exposed to the outside.

● Plating handle

Anti-rust coating is applied to the handle part.

●● Dust-proof/anti-rust cover

It protects the stem screw part exposed to the outside.

● Adoption of materials with high corrosion resistance

Component materials are changed to those with high anti-rust characteristics outside.

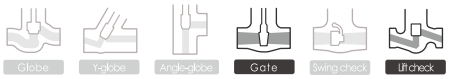
● Designated coating

Anti-rust coating is added in accordance with the customer' s request.

Deterioration and malfunction are prevented by protecting and strengthening the valve part exposed to the outside.

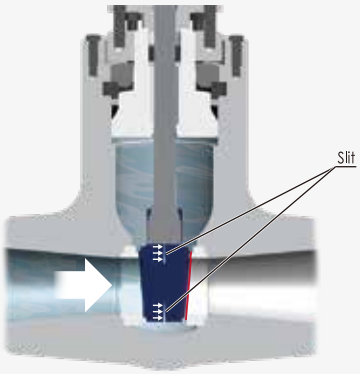
Measures for seating characteristics

Risks occur in the seating characteristics of the disk under special conditions. In such cases, sufficient sealing may not be secured.



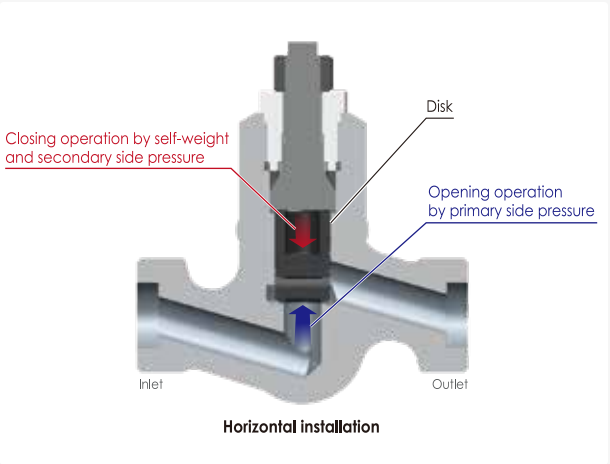
Example of optional application

Flexible disk

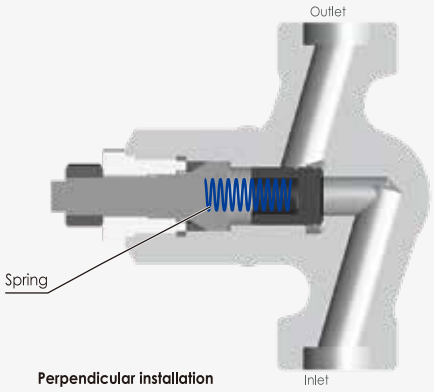


The disk is provided with flexibility by placing a slit on the center of the disk to improve the seating characteristics of the disk and seat. It is more effective as the fluid pressure becomes higher.

Built-in spring structure



Horizontal installation



Perpendicular installation

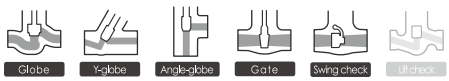
If the lift check valve that is closed by the self-weight of the disk and out let pressure is installed at any location other than horizontal piping, it is necessary to provide a spring for supporting seating.

Function options

Simple options

Opening degree display

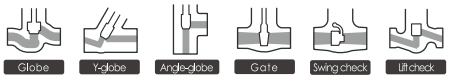
The valve opening/closing state can be checked visually from a distance.



Example of optional application

Metal fittings for support

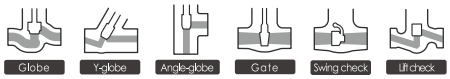
An area to connect fixed metal fittings is provided for the valve.



Example of optional application

Metal fittings for transportation

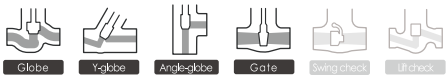
Metal fittings for valve installation and transportation are mounted.



Example of optional application

Metal fittings for preventing misoperation

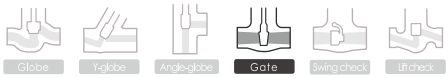
The manual operation function of the valve is physically restricted to prevent misoperation.



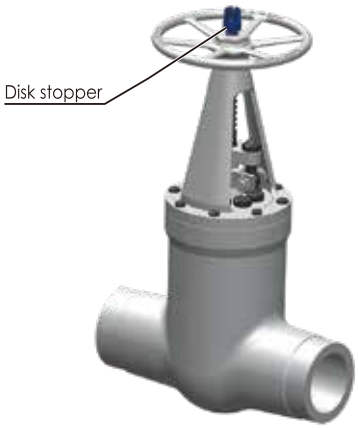
Example of optional application

Disk stopper

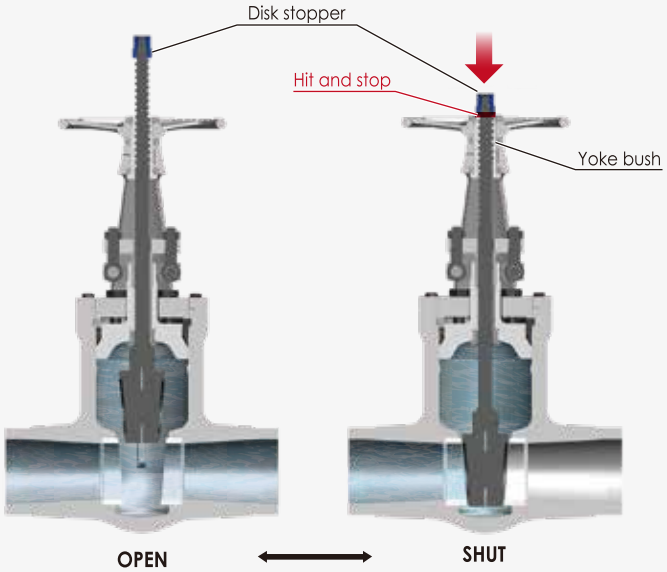
It provides support so that the disk position is appropriate when the gate valve is fully closed.



Example of optional application



Appearance of disk stopper



Inspection options

Inspection options

Products (components) are inspected based on the standards and OKANO' s standard. If there is any special request, it is handled as an option. By avoiding excessive inspection, product procurement costs can be optimized.

List of standard inspection items

◎ : Test/inspection performed in accordance with requirements of standards
◎: Test/inspection performed as OKANO' s standard

	Item		Target component	Target part	Implementation period	Overseas plant [ASME B16.34 is applied.]	
						Standard	Special
A	Material inspection	Chemical analysis test	Pressure-resistant component	—	During casting	◎	◎
		Analysis test for controlled minor components		—	During casting		
		Product analysis test		—	After heat treatment		
		Mechanical test		—	After heat treatment	◎	◎
B	Heat treatment		Pressure-resistant component	—	After casting, after welding	◎	◎
C	Nondestructive inspection	Volumetric inspection (RT or UT)	Pressure-resistant component	Critical part	After heat treatment		◎RT
				Entire volume			◎UT
				Pressure-resistant welding part	After welding		◎RT
				Repair welding part	After repair welding		
			Body	Groove part of inlet/outlet butt welding	After heat treatment		
		Surface inspection (MT or PT)	Pressure-resistant component	External surface	After heat treatment		◎
				Entire surface			◎
				Pressure-resistant welding part	After welding		◎
				Mechanical processing surface	After machining		
				Repair welding part	After defect removal		
					After repair welding		
			Body	Groove part of inlet/outlet butt welding	After machining		
D	Welding work inspection		Pressure-resistant component	Welding part	After welding	◎	◎
E	Dimension inspection	Component	Pressure-resistant component	—	After completion of materials	◎	◎
				—	After completion of components	◎	◎
			Body	Groove part of inlet/outlet butt welding	After machining	◎	◎
		Valve	A set of valves	—	After valve assembly	○	○
F	Appearance inspection	Component	Pressure-resistant component	—	After completion of materials	◎	◎
				—	After completion of components	○	○
		Valve	A set of valves	—	After valve assembly	○	○
G	Material verification inspection		Pressure-resistant component	—	At the time of material acceptance	○	○
H	Assembly inspection		A set of valves	—	After valve assembly	○	○
I	Pressure resistance inspection	Component	Pressure-resistant component	—	After completion of components	◎	◎
		Valve	A set of valves	—	After valve assembly	◎	◎
J	Leakage inspection	Valve seat leak inspection, water pressure test	A set of valves	—	After valve assembly	◎	◎
		Valve seat leak inspection, pneumatic test	A set of valves	—	After valve assembly		
		Back seat leak inspection, water pressure test	A set of valves	—	After valve assembly		
		Back seat leak inspection, pneumatic test	A set of valves	—	After valve assembly		
K	Steam inspection		A set of valves	—	After valve assembly		
L	Operation inspection	Valve	A set of valves	—	After valve assembly	○	○
		Electrical product test	Auxiliary (electrical item)	—	At the time of acceptance	○	○
M	Shipping inspection	Inspection before shipment	A set of valves	—	After completion of valve	○	○
		Coating inspection	A set of valves	—	After coating	○	○
		Packing inspection	A set of valves	—	After packing	○	○

Outline of test and inspection

	Test and inspection item			Description
A	Material inspection	Chemical analysis test		Perform molten steel analysis and check whether components contained in the material and the fixed quantity satisfy the standard for the corresponding material. [Target] Refer to the next page
		Analysis test for controlled minor components		Perform special material tests including restriction of the target element content, minor component analysis, and gas analysis.
		Product analysis test		Perform chemical analysis for the analysis sample extracted from part of the product, and check whether the components contained in the material and the fixed quantity satisfy the standard for the corresponding material.
		Mechanical test		Extract a specimen from the material and perform tests for measuring mechanical characteristics (tensile test, impact test, hardness test, bending test, etc.). Check whether the standard for the corresponding material is satisfied. [Target] Refer to the next page.
B	Heat treatment			Check that heat treatment is performed as prescribed in the standard. [Target] Heat treatment type, heat treatment temperature, retention time, cooling method, heating/cooling speed
C	Nondestructive inspection	Volumetric inspection	RT (Radiographic test)	Irradiate the specimen with radiation rays, and check the presence or absence of internal defects and the defect state from the strength of the transmitted radiation rays. The test should be mainly performed for cast steel products. [Target] Refer to the next page.
			UT (Ultrasonic test)	Transmit ultrasonic waves to the specimen, and check the presence or absence of internal defects and the defect state using the acoustic characteristics of ultrasonic waves. The test should be mainly performed for forged steel products. [Target] Refer to the next page.
		Surface inspection	MT (Magnetic particle test)	Magnetize the steel material that is a ferromagnet to generate a stray magnetic field at the defective part near the specimen surface. Check the presence or absence of surface defects and the defect state using magnetic powder. [Target] Refer to the next page
			PT (Penetrant test)	Penetrate a penetrant into the specimen surface, and check the presence or absence of flaws and the flaw state from the patterns that oozed on the surface. [Target] Refer to the next page.
D	Welding work inspection			Check that the welder authorized in accordance with a public institution or internal rules has carried out welding using the prescribed welding method.[Target] Working instruction number, base material specifications, welding method, welding material, core diameter, welding conditions (number of paths, current, voltage, speed, gas amount, gas pressure, etc.), person who performs welding
E	Dimension inspection	Pressure-resistant component		Check that the product was manufactured within tolerance of the design plan dimensions. [Target] Material dimensions (quality record), component dimensions (quality record), dimensions of inlet/outlet butt welding groove of the valve box (measurement record)
		A set of valves		Check that the product was manufactured within tolerance of the design plan dimensions. [Target] Interface dimensions (measurement record), height dimension (measurement record), discrepant dimensions (quality record)
F	Appearance inspection	Pressure-resistant component		Visually check whether there are not any appearance abnormalities such as a flaw. [Target] Flaws and corner finishing of material/machining surface/seat surface
		A set of valves		Visually check whether there are not any appearance abnormalities such as a flaw. [Target] Flaw on the valve surface, finishing of the flow channel, flaw on the display and welded parts, presence or absence of foreign matter
G	Material verification inspection			Check that the material test results satisfy the designated standard and requirements and that the control number described in the test results corresponds with the indications on the product. [Target] ASME: Body, bonnet
H	Assembly inspection			Check whether the finished valve assembly satisfies the valve functions. [Target] Handle operation, operability, opening degree, body and seat position, packing and gasket insertion state, state of screw part of boltsand nuts, bolt tightening state
I	Pressure resistance inspection	Pressure-resistant component		If the implementation after completion of assembly is not appropriate, apply the prescribed test pressure (water pressure) to the single body of the pressure-resistant component, and check that no fluid leaks from the pressure-resistant part and that the pressure-resistant component is not deformed.
		A set of valves		Apply the prescribed test pressure (water pressure) to the inside of the valve in a set state, and check that no fluid leaks from the valve box and the pressure seal part and that the pressure-resistant component is not deformed.
J	Leak inspection	Valve seat leak inspection, water pressure test		To check the sealing function of the valve seat surface, apply the prescribed pressure from the one side of the inlet and outlet with the valve fully closed. Check the valve seat surface for leakage.
		Valve seat leak inspection, pneumatic test		
		Back seat leak inspection, water pressure test		To check the sealing function of the back seat part (gland part), apply the prescribed pressure to the inside of the valve in the fully opened state. Check the back seat part for leakage.
		Back seat leak inspection, pneumatic test		
K	Steam test			If new materials or materials that have no results on burn-in are used for important parts, perform the test to check the adaptability.
L	Operation inspection	Valve		Fill the inside of the valve with water, and perform valve opening/closing operation in unloaded condition to check operability. For motor operation, also perform valve opening/closing operation in loaded condition to check operability. [Test items] The following shall be checked: Manual valve: Operability in unloaded condition Motor operated valve: Operability in unloaded and loaded conditions, opening degree, operating time, operating current, start current, and accessory setup state
		Electrical item test		Check the product and manufacturer's record.
M	Shipment inspection	Inspection before shipment		Check whether the final state of the product, test/inspection implementation situation, and submitted documents are appropriate.
		Coating inspection		Check whether the coating specifications, coating surface state, and film thickness are appropriate.
		Packing inspection		Check whether anti-rust measures, tightening state, and indicated matters are appropriate.

Inspection options

List of targets for material inspection

Chemical Analysis Test

ASTM (ASME)

Chemical component whose content must be checked : ○

Material group	Material classification	Chemical component							
		C	Si	Mn	P	S	Cr	Mo	Ni
Carbon steel	Cast steel	○	○	○	○	○	—	—	—
	Forged steel product/steel rod								
0.5Mo steel	Cast steel	○	○	○	○	○	—	○	—
	Forged steel product/steel rod								
1Cr-0.5Mo steel	Cast steel	○	○	○	○	○	○	○	—
	Forged steel product/steel rod								
2.5 Cr-1Mo steel	Cast steel	○	○	○	○	○	○	○	—
	Forged steel product/steel rod								
Carbon steel for low temperature	Cast steel	○	○	○	○	○	—	—	—
18Cr-8Ni steel	Cast steel	○	○	○	○	○	○	○	○
	Forged steel product/steel rod	○	○	○	○	○	○	—	○
18Cr-9Ni-2Mo steel	Cast steel	○	○	○	○	○	○	○	○
	Forged steel product/steel rod								
9Cr-1Mo-V steel	Cast steel	○	○	○	○	○	○	○	○
	Forged steel product/steel rod								

Chemical component of impurity whose content must be checked : ○

Material group	Material classification	Chemical component of impurity											
		Cu	Ni	Cr	Mo	V	W	N	Cb	Al	Ti	Zr	Total amount
Carbon steel	Cast steel	○	○	○	○	○	—	—	—	—	—	—	○
	Forged steel product/steel rod												
0.5Mo steel	Cast steel	○	○	○	—	—	○	—	—	—	—	—	○
	Forged steel product/steel rod	—	—	—	—	—	—	—	—	—	—	—	—
1Cr-0.5Mo steel	Cast steel	○	○	—	—	—	○	—	—	—	—	—	○
	Forged steel product/steel rod	—	—	—	—	—	—	—	—	—	—	—	—
2.5 Cr-1Mo steel	Cast steel	○	○	—	—	—	○	—	—	—	—	—	○
	Forged steel product/steel rod	—	—	—	—	—	—	—	—	—	—	—	—
Carbon steel for low temperature	Cast steel	○	○	○	○	○	—	—	—	—	—	—	○
18Cr-8Ni steel	Cast steel	—	—	—	—	—	—	—	—	—	—	—	—
	Forged steel product/steel rod	—	—	—	—	—	—	○	—	—	—	—	—
18Cr-9Ni-2Mo steel	Cast steel	—	—	—	—	—	—	—	—	—	—	—	—
	Forged steel product/steel rod	—	—	—	—	—	—	○	—	—	—	—	—
9Cr-1Mo-V steel	Cast steel	—	—	—	—	○	—	○	○	○	○	○	—
	Forged steel product/steel rod												

Mechanical test

ASTM (ASME)

Inspection item : ○

Material group	Material classification	Mechanical characteristics					
		Yield point or yield strength	Tensile strength	Elongation	Reduction of area	Charpy absorbed energy	Hardness
Carbon steel	Cast steel	○	○	○	○	—	—
	Forged steel product/steel rod	○	○	○	○	—	○
0.5Mo steel	Cast steel	○	○	○	○	—	—
	Forged steel product/steel rod	○	○	○	○	—	○
1Cr-0.5Mo steel	Cast steel	○	○	○	○	—	—
	Forged steel product/steel rod	○	○	○	○	—	○
2.5 Cr-1Mo steel	Cast steel	○	○	○	○	—	—
	Forged steel product/steel rod	○	○	○	○	—	○
Carbon steel for low temperature	Cast steel	○	○	○	○	○	—
18Cr-8Ni steel	Cast steel	○	○	○	—	—	—
	Forged steel product/steel rod	○	○	○	○	—	—
18Cr-9Ni-2Mo steel	Cast steel	○	○	○	—	—	—
	Forged steel product/steel rod	○	○	○	○	—	—
9Cr-1Mo-V steel	Cast steel	○	○	○	○	—	—
	Forged steel product/steel rod	○	○	○	○	—	○

List of targets for nondestructive inspection

Inspection item \ Standard / Classification		Overseas plant [ASME B16.34 is applied.]	
		Standard	Special
Volumetric inspection	RT (Radiographic test)	There is no standard for mandatory implementation.	[Pressure-resistant area] Perform 100% inspection for the critical area. (Critical area: Refer to ASME B16.34.) [Pressure-resistant welded area] Perform 100% inspection.
	UT (Ultrasonic test)	There is no standard for mandatory implementation.	[Pressure-resistant area] Perform 100% inspection for the entire volume that meets the following: [1] Flow channel end of the body and the cylindrical part of the neck. [2] Ring-shaped parts excluding he stuffing box part and yoke arm part of the bonnet [3] area near the joint between the saucer-shaped cover with 3 tm or 70 mm in width, whichever is larger, and the flange area. (For details, refer to ASME B16.34.) [Pressure-resistant welded area] Perform 100% inspection.
Surface inspection	MT (Magnetic particle test)	There is no standard for mandatory implementation.	[Groove area of inlet/outlet butt welding] Perform 100% inspection. [Pressure-resistant area] Perform 100% inspection for all outside surfaces and the inner surfaces that can be tested. [Pressure-resistant welded area] Perform 100% inspection.
	PT (Penetrant test)	There is no standard for mandatory implementation.	[Groove area of inlet/outlet butt welding] Perform 100% inspection. [Pressure-resistant area] Perform 100% inspection for all outside surfaces and the inner surfaces that can be tested. [Pressure-resistant welded area] Perform 100% inspection.

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