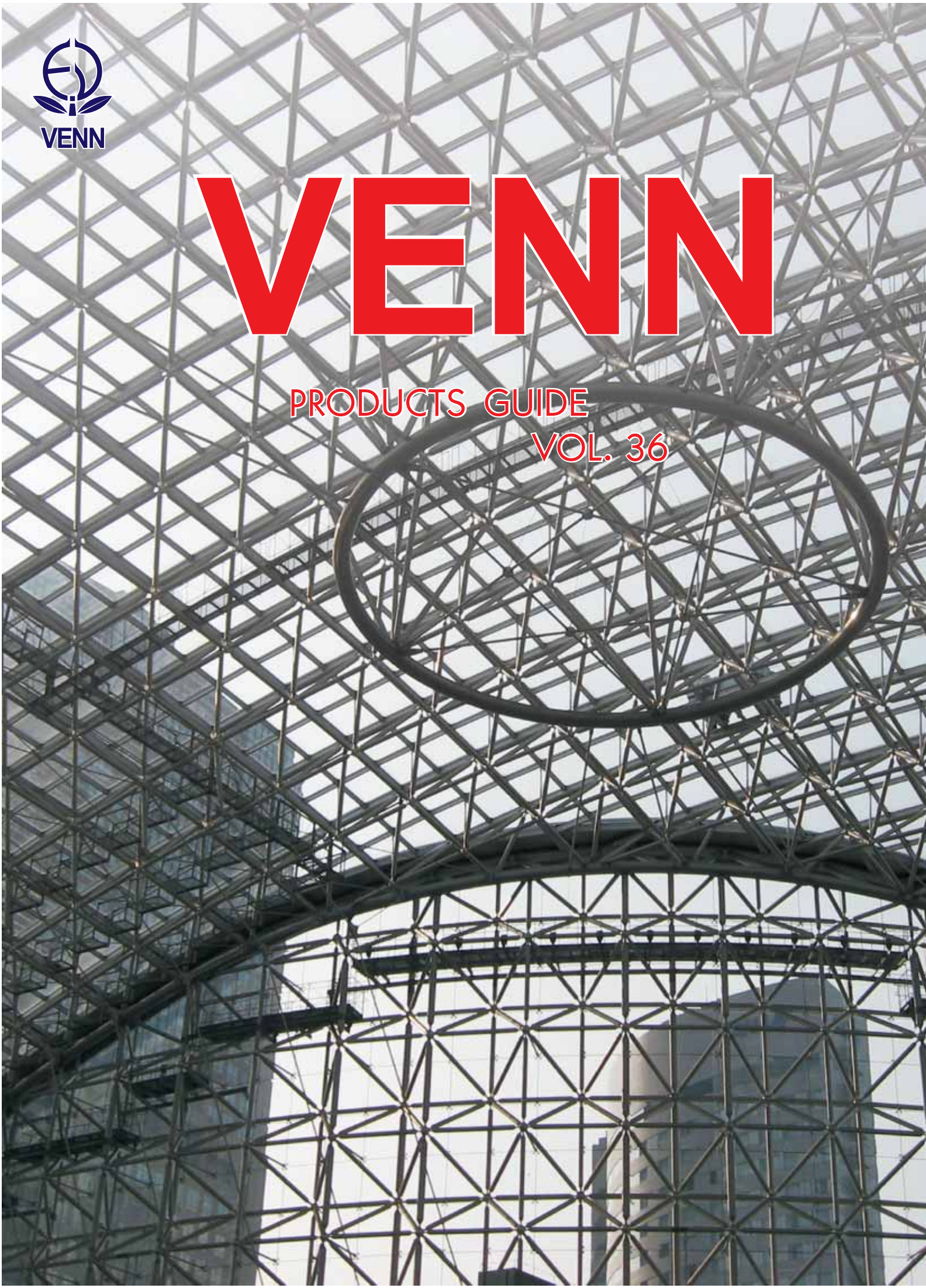
VENN

VENN

PRODUCTS GUIDE

VOL. 36



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★ CODE NAME

The code name includes the following:

Product code			
Type	— (Hyphen)	Material code	Spec. Code

For example:

				Model	Spec. Code
RP6	—	B	⇦	RP-6	(B)
WS12	—	F	⇦	WS-12	(F)

- "Type" is basically the same as "Model" code, except that the hyphen in "Model" code is truncated.
- "Material code" represents the material used in making the main body and main parts of the product. This code can be found in the following table.
- "Spec. code" represents structure, pressure type, fluid, inventory identification etc.
  Some products do not have Spec. Code.

☆ For details, see page 281.

Material code	Material of main body	Material of essential parts	Material of valve disc	Material code	Material of main body	Material of essential parts	Material of valve disc
F	Cast bronze	Cast bronze		M	Ductile cast iron	Stainless steel	
J	Cast bronze	Stainless steel		C	Cast steel	Stainless steel	
W	Cast bronze	Stainless steel		T	Cast steel	Stainless steel	Teflon
B	Cast iron	Cast bronze	Teflon	D	Stainless steel (SCS13)	Stainless steel	
R	Cast iron	Cast bronze	Teflon	V	Stainless steel (SCS13)	Stainless steel	Teflon
H	Cast iron	Cast bronze	Synthetic rubber	K	Stainless steel (SCS14)	Stainless steel (SUS316)	
G	Cast iron	Stainless steel		E	Stainless steel (SCS14)	Stainless steel (SUS316)	Teflon
S	Cast iron	Stainless steel	Teflon	N	Carbon steel	Stainless steel	
L	Ductile cast iron	Cast bronze		P	Resin	Resin	

VENN CO., LTD.

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PRODUCTS GUIDE

VOL. 36

The Beauty of Flow

Everlasting challenge to the beauty of flow, Venn Co., Ltd. provides superior fluid control valves, contributing to society through its "CUSTOMER FIRST" philosophy and powerful integrated skills.

Iwaki Technical Center, with unlimited potential. . .

Venn Co., Ltd. Provides the optimum environment for analyzing fluid control technology, conducting research and development as well as offering various customer services such as training, information, technical support, etc.

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Iwaki Technical Center

Iwate Works

TO THE USERS OF THIS GENERAL CATALOG, "VENN PRODUCTS GUIDE"

MODELS:

In this overall catalog of VENN products, This catalog is designed to help you select the most suitable product type and size. Plase contace us if you have queries regarding the contents of this catalog.

INDEX:

VENN products described in this catalog are roughly classified into 15 groups by type. For detailed information on a desired type, look for it on the overall index page or the table of contents by referring to the number on the back cover. The table of contents describes the major specifications for each product. Therefore, first select a product type frorn the table of contents, then refer to the page which describes that product type. If you have any idea of the desired product type, look for the corresponding page which describes it by referring to the corresponding page which describes it by referring to the overall index(in alphabetical order).

SELECTION:

If the most appropriate product type and size are not selected, the equipment using the product may not function satisfactorily. When selecting a product type and size, thoroughly check whether the conditions under which the product wil be used conform to those described for each product, such as the fluid type, pressure, temperature, viscosity, product materials, etc. If you have any queries, please contact us.

⚠ CAUTION

- Select the most suitable product for the application. Otherwise, an accident may result.
- Before operating the product, carefully read the instruction manual. Incorrect product operation may cause failure or accident.
- The contents of this catalog are subject to change without prior notice.

Sagamihara Works

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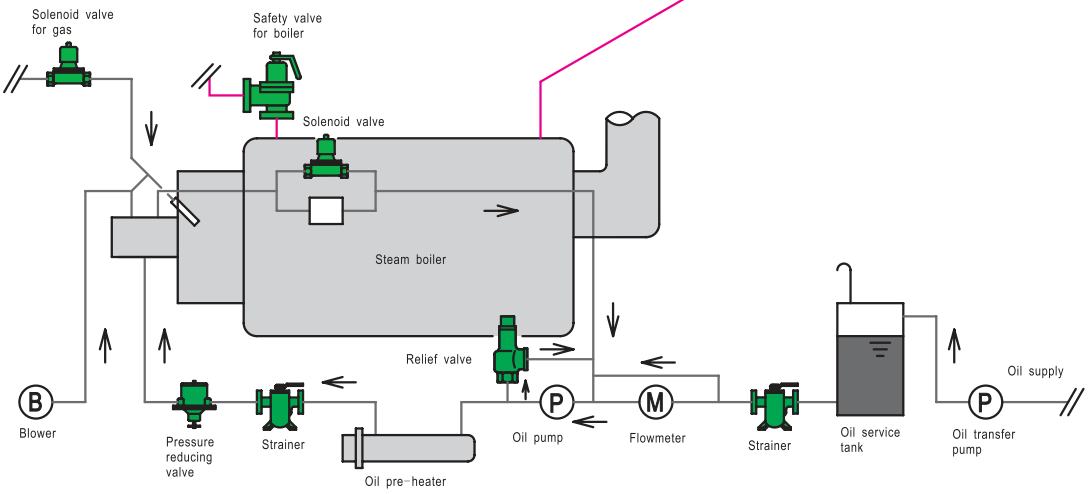
Latest technology for meeting the needs of the time

Buildings, Housings and Factories. . . etc.

Boiler Equipment
Heat exchanger Equipment

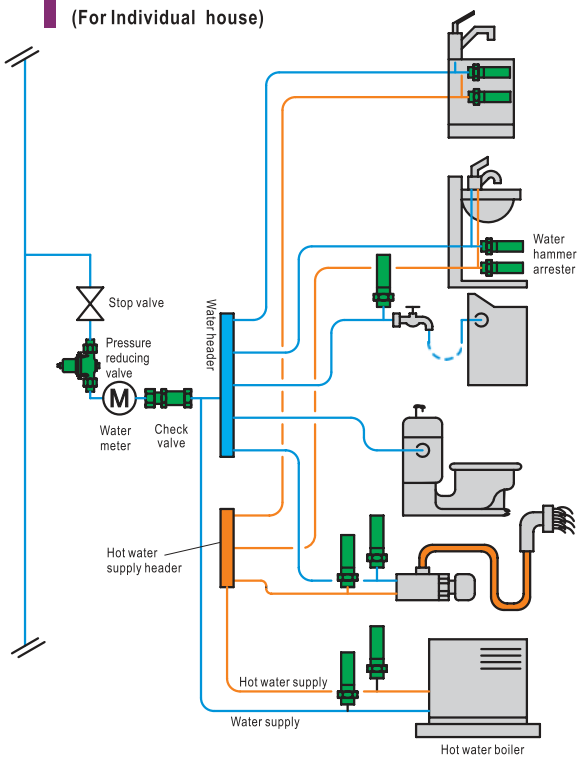
Steam boiler



Pressure reducing valve for oil

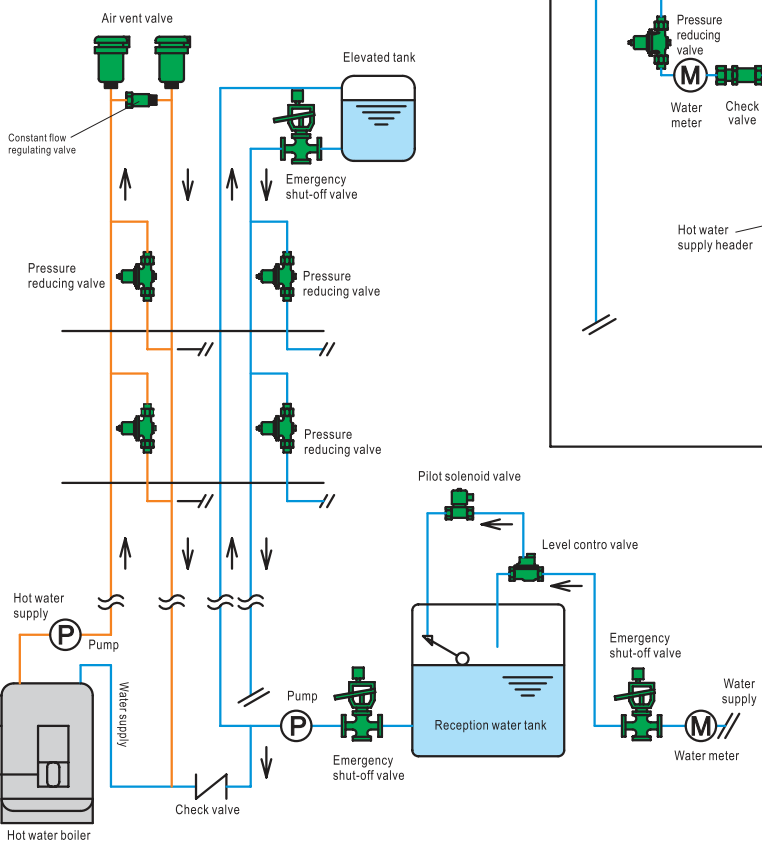
Pressure reducing valve for steam

Water supply Equipment
Hot water supply Equipment
(For Individual house)



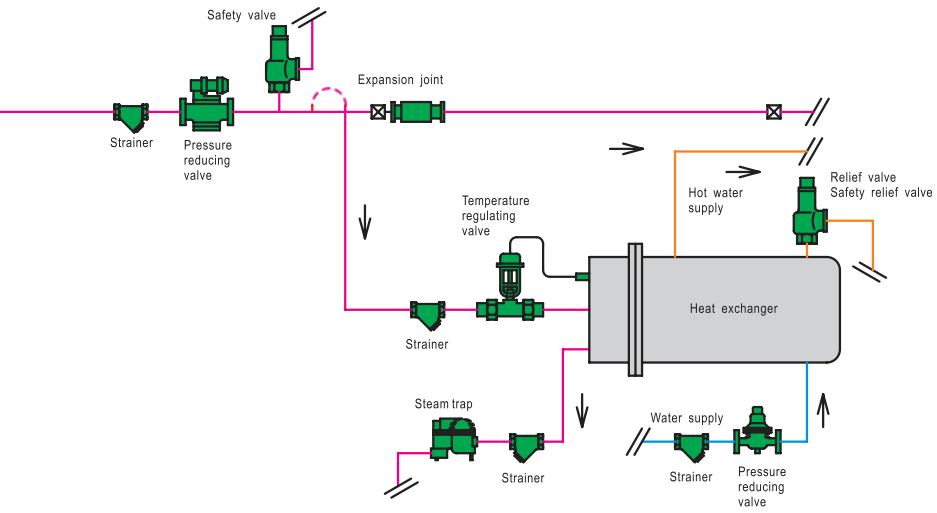
Air vent valve

Water supply Equipment
Hot water supply Equipment
(For Apartment houses)



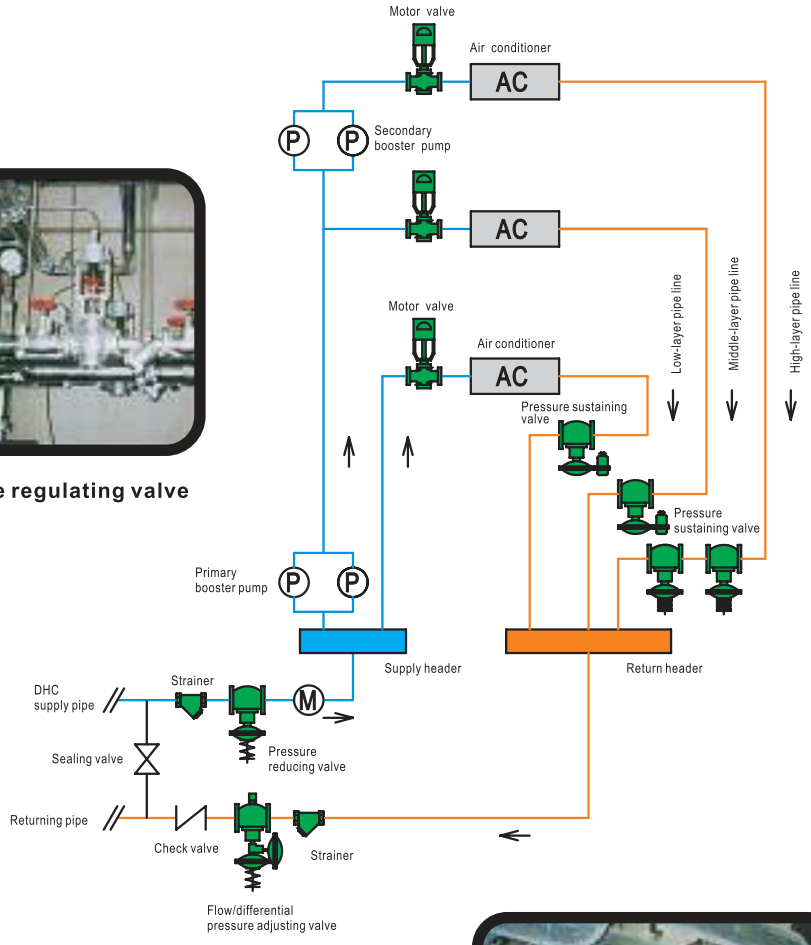
Pressure reducing valve for water

Emergency shut-off valve

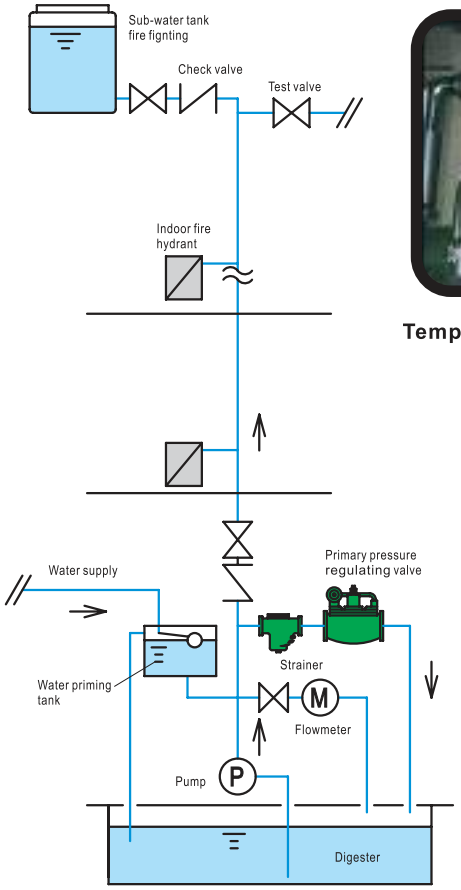


Heat exchanger

Air conditioning Equipment



Indoor fire hydrant Equipment
Sprinkler Equipment



Temperature regulating valve

Pressure sustaining valve

Primary pressure regulating valve

Supply or return header

1

PRESSURE REDUCING VALVES [FOR STEAM OR GASES]

VENN pressure reducing valves are manufactured based on our years of experience in this industry and advanced technology. The extensive lineup of our products can meet the needs of liquid or pressure applications in construction, factory, and a variety of other areas. Please consider the conditions of use and select a most suitable model.

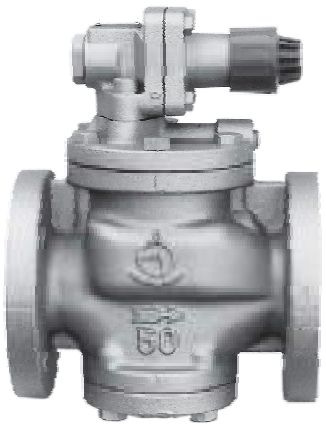
Model name	Size	Applicable fluid	Applicable pressure(MPa)		Materials		Page
			Primary side	Secondary side	Body	Disc & seat	
RP-6	15~200 (½″~8″)	Steam	Max. 1.0	0.03~0.8	Cast iron	Stainless steel	12
RP-1H	100~200 (4″~8″)	Steam	Max. 1.0	0.03~0.8	Cast iron	Stainless steel	13
RP-8	32~80 (1¼″~3″)	Steam	Max. 1.0	0.03~0.8	Stainless steel	Stainless steel	14
RP-6BD	15~50 (½″~2″)	Steam	Max. 1.0	0.03~0.8	Cast iron	Stainless steel	15
RP-2H	15~40 (½″~1½″)	Steam	Max. 1.6	0.035~0.8	Ductile Cast iron	Stainless steel	17
	50~150 (2″~6″)				Cast iron		
	15~150 (½″~6″)		Max. 2.0		Cast steel		
RP-6A	15~80 (½″~3″)	Air or gases	Max. 1.0	0.03~0.8	Cast iron	Brass or Stainless steel	20
RP-8A	32~80 (1¼″~3″)	Air or gases	Max. 1.0	0.03~0.8	Stainless steel	Stainless steel	21
RP-1HA	100~200 (4″~8″)	Air or gases	Max. 1.0	0.035~0.8	Cast iron	Stainless steel	23
RP-2HA	15~40 (½″~1½″)	Air or gases	Max. 1.6	0.035~0.8	Ductile Cast iron	Brass or Stainless steel	24
	50~150 (2″~6″)				Cast iron		
	15~150 (½″~6″)		Max. 2.0		Cast steel	Stainless steel	
RP-7	15~25 (½″~1″)	Steam	Max. 1.6	0.03~0.8	Cast bronze	Stainless steel	30
RD-30	15~40 (½″~1½″)	Steam	Max. 1.0	0.02~0.4	Cast iron	Stainless steel	33
RD-29A	15~50 (½″~2″)	Air or N_2 gas	Max. 0.3	1~3kPa	Cast iron	Stainless steel	36
RD-29B		Coke oven gas					

RP-6 Type Pressure Reducing Valve (for Steam)

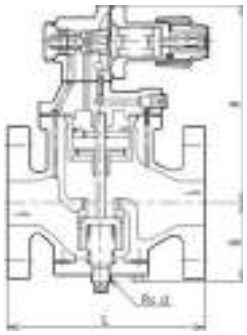
for Building facilities Industrial facilities etc.,Multipurpose Pilot operated type(High capacity)

This is a Pilot operated pressure reducing valve. It is suitable to install in the steam lines with the high capacity of flow, such as industrial production facility and building facility. This model is designed to ensure the perfect performance in various different conditions of the facility, with your easy handling and installation by the light weighted, compact valve body.

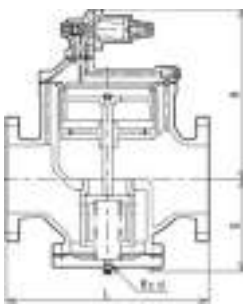
Refer to page 16 for valve size selection chart.



■ CONSTRUCTION



Size 15~80mm



Size 100~200mm

■ FEATURES

- It is performed and controlled constantly by adopting piston guide construction and specia seal ring.
- Possible to install in a line for wide range of pressure and capacity.
- Easy pressure adjustment by manual handle with automatic lock mechanism. (Size 15~80mm)
- Compact design.

■ SPECIFICATIONS

Model name		RP-6	
Code name		RP6-B	RP6-G
Applicable fluid		Steam	
Applicable primary pressure		Max. 1.0MPa	
Adjustable secondary pressure		0.03~0.8MPa	
Maximum reducing rate		20 : 1	
Minimum pressure differential across the disc		Size 15~80mm : 0.05MPa Size 100~200mm : 0.07MPa	
Lock up pressure		Max. 0.02MPa	
Offset pressure	Size 15 ~ 80mm	Within 0.02MPa (Adjustable secondary pressure 0.03~0.035MPa) Within 0.03MPa (Adjustable secondary pressure 0.035~0.07MPa) Within 0.05MPa (Adjustable secondary pressure 0.07~0.8MPa)	
	Size 100 ~ 200mm	0.05MPa	
Leakage allowance		Less than 0.05% of rated flow	
Applicable temperature		Max. 184℃*	
End connection		Flanged JIS 10KFF	
Materials	Body	Cast iron	
	Disc & seat	Stainless steel	
	Piston & cylinder	Cast bronze	Stainless steel
Valve body pressure test		Hydraulic 1.5MPa	

*Applicable temperature Max. 220℃ is available upon your request.

■ DIMENSIONS

(mm)

Size	L	G	H	d	Cv value	Mass (kg)
15(½″)	140	62	155	¼″	1	7.5
20(¾″)	140	62	155	¼″	2.5	7.5
25(1″)	150	67	160	¼″	4	9
32(1¼″)	180	73	182	⅜″	6.5	12
40(1½″)	180	73	182	⅜″	9	12.5
50(2″)	200	86	187	⅜″	16	15.5
65(2½″)	230	94	202	⅜″	25	20.5
80(3″)	260	110	221	⅜″	36	26.5
100(4″)	320	139	285	⅜″	64	52
125(5″)	380	187	320	⅜″	100	82
150(6″)	420	206	368	⅜″	144	110
200(8″)	540	255	425	⅜″	256	176

Flange code JIS 10KFF

■ REFERENCE

When the existing RP-1H Type pressure reducing valve is replaced with the RP-6 due to changes in operating conditions, the same face-to-face dimension can be attained by the use of face-to-face dimension adjustment spacers.(Size 15~80mm)

For more details, please contact our agent in your area.

RP-1H Type Pressure Reducing Valve (for Steam)

Large diameter, pilot type pressure reducing valve, with the valve disc and seat made of durable stainless steel.

SPECIFICATIONS

Model name		RP-1H	
Code name		RP1H-B□	RP1H-G□
		※ L(low press.)or H(high press.)for adjustable secondary pressure is required in □.	
Applicable fluid		Steam	
Applicable primary pressure		Max. 1.0MPa	
Adjustable secondary pressure		L:0.03~0.4MPa, H:0.3~0.8MPa	
Maximum reducing rate		20:1	
Minimum pressure differential across the disc		0.07MPa	
Lock up pressure		Max. 0.02MPa	
Offset pressure		Within 0.05MPa	
Minimum adjustable flow		5% of rated flow	
Leakage allowance		Less than 0.05% of rated flow	
Applicable temperature		Max. 184℃*1.	
End connection		Flanged JIS 10KRF	
Materials	Body	Cast iron	
	Disc& seat	Stainless steel	
	Piston&cylinder	Cast bronze	Stainless steel
Valve body pressure test		Hydraulic 1.5MPa	

*1. Applicable temperature Max. 220℃ is available upon your request.
*2. For size 15~80mm, select RP-6 or RP-7 Type(Size 15~25mm).

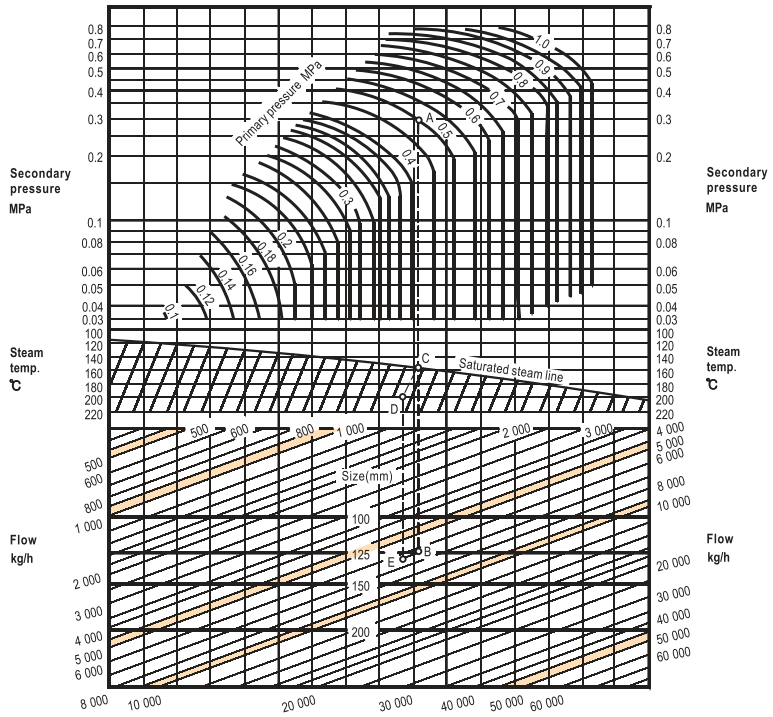
DIMENSIONS

(mm)

Size	L	G	H	d	Cv value	Mass (kg)
100(4″)	320	146	337	3/8″	64	66
125(5″)	380	178	409	3/8″	100	104
150(6″)	420	206	471	3/8″	144	147
200(8″)	540	262	539	3/8″	256	275

Flange code JIS 10KRF

NOMINAL DIAMETER SELECTION CHART (for Steam)



Example:
Primary pressure: 0.5MPa (saturated steam)
Secondary pressure:0.3MPa Flow: 6000 kg/h
At the above conditions,
the nominal diameter should be size 125mm.

Example:
Primary pressure: 0.5MPa (200℃)
Secondary pressure:0.3MPa
Flow: 6000 kg/h
At the above conditions, the nominal diameter should be size 150mm.

CONSTRUCTION

RP-8 Type Pressure Reducing Valve (for Steam)

for Food processing Manufacturing Sterilizing equipments etc., General purpose (large capacity) pilot valve

The body and disc & seat of RP-8 Type Pressure Reducing Valve are made of stainless steel. This ensures clean supply of fluid, thus is ideal for application on food processing, sterilizing equipments. In addition, the corrosion resistance and durability of stainless steel also allow extensive applications in other areas.

For selecting the appropriate nominal diameter, see the table in page 16.

FEATURES

- Piston guide and special seal ring allow stable control.
- Wide range of pressure and flow for a variety of applications.
- Easy pressure adjustment by manual handle with automatic lock mechanism.
- Compact design.

SPECIFICATIONS

Model name	RP-8
Code name	RP8-D
Applicable fluid	Steam
Applicable primary pressure	Max. 1.0MPa
Adjustable secondary pressure	0.03~0.8MPa
Maximum reducing rate	20 : 1
Minimum pressure differential across the disc	0.05MPa
Lock up pressure	Max. 0.02 MPa
Offset pressure	Within 0.02MPa (Adjustable secondary pressure 0.03~0.035MPa) Within 0.03MPa (Adjustable secondary pressure 0.035~0.07MPa) Within 0.05MPa (Adjustable secondary pressure 0.07~0.8MPa)
Leakage allowance	Less than 0.05% of rated flow
Applicable temperature	Max. 200℃
End connection	Flanged JIS 10KFF
Materials	Body(Stainless steel), Disc & seat(Stainless steel), Diaphragm(Stainless steel)
Valve body pressure test	Hydraulic 1.5MPa

*For size 15~25mm, select RD-40 or RD-41F Type. For size 100~150mm and for pressure 1.6M or 2.0MPa, select RP-2H Type.

DIMENSIONS

(mm)

Size	L	G	H	d	Cv value	Mass (kg)
32(1¼″)	180	90	182	¼″	6.5	12.5
40(1½″)	180	90	182	¼″	9	12.5
50(2″)	200	100	187	¼″	16	16
65(2½″)	230	110	202	⅜″	25	22
80(3″)	260	118	221	⅜″	36	27.5

Flange code JIS 10KFF

CONSTRUCTION

RP-6BD Type Steam Trap with Pressure Reducing Valve (for Steam)

for Construction Factory equipments etc., General purpose valve(Large capacity)

RP-6 Type with steam trap embedded. It is an ideal product for preventing drain flowing after the valve and application in locations such as vertical piping where drain can be easily accumulated.

For selecting the appropriate nominal diameter, see the table in page 16.

FEATURES

- The position of the drain hole can be changed at an interval of 90°, thus allows appropriate piping suiting locations.
- Piston guide and special seal ring allow stable control.
- Wide range of pressure and flow for a variety of applications.
- Easy pressure adjustment by manual handle with automatic lock mechanism.
- Compact design.

SPECIFICATIONS

Model name		RP-6BD	
Code name		RP6BD-B	RP6BD-G
Applicable fluid		Steam	
Applicable primary pressure		Max. 1.0MPa	
Adjustable secondary pressure		0.03~0.8MPa	
Maximum reducing rate		20:1	
Minimum pressure differential across the disc		0.05MPa	
Lock up pressure		Max.0.02MPa	
Offset pressure		Within 0.02MPa(Adjustable secondary pressure 0.03~0.035MPa) Within 0.03MPa(Adjustable secondary pressure 0.035~0.07MPa) Within 0.05MPa(Adjustable secondary pressure 0.07~0.8MPa)	
Leakage allowance		Less than 0.05% of rated flow	
Applicable temperature		Max. 184℃*	
Allowed back pressure trap part		within 70% of pressure on inlet side	
End connection		Flanged JIS 10KFF	
Materials	Body	Cast iron	
	Disc& seat	Stainless steel	
	Piston& cylinder	Cast bronze	Stainless steel
Valve body pressure test		Hydraulic 1.5MPa	

*Applicable temperature Max. 220℃ is available upon your request.

DIMENSIONS

(mm)

Size	L	G	H	H_1	d	Cv value	Mass (kg)
15(½″)	140	134	155	72	½″	1	10
20(¾″)	140	134	155	72	½″	2.5	10
25(1″)	150	139	160	77	½″	4	11.5
32(1¼″)	180	145	182	88	¾″	6.5	14.5
40(1½″)	180	145	182	88	¾″	9	15
50(2″)	200	166	187	98	¾″	16	18.5

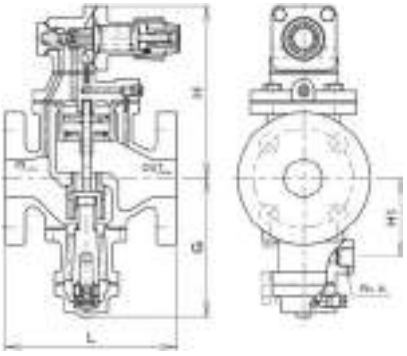
Flange code JIS 10KFF

DRAIN DISCCHARGE AMOUNT (MAX. CONTINUAL DISCHARGE AMOUNT)

(l/h)

Pressure differentail (MPa)	0.05	0.1	0.2	0.3	0.4	0.6	0.8	1.0
Discharge amount	100	160	260	340	400	500	550	590

CONSTRUCTION

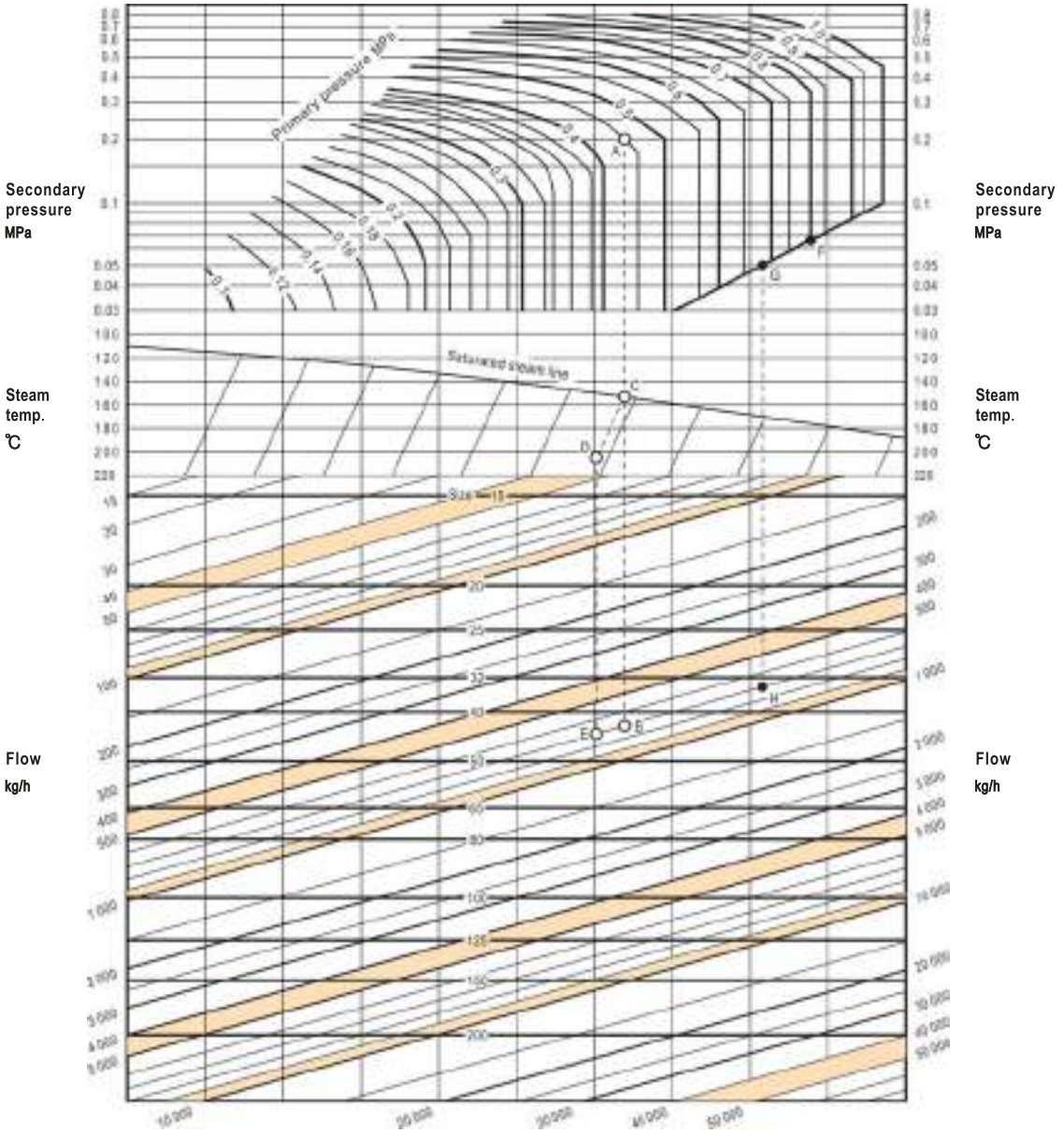


REFERENCE

1. We also provide spacers for adjustment of face to face dimension. Such spacers are useful when replacing VENN RP-6BD with RP-1H valve, such as in the case of modification ofequipment. Please contact us for details.
2. It is also possible that you attach trap (BD-2) to RP-6 valve that is in use. For more details,please contact our agent in your area.

DATA/RP-6, 6K, 6BD, 8 Type Pressure Reducing Valve (for Steam)

NOMINAL DIAMETER SELECTION CHART (for Steam)



● HOW TO USE THE CHART

Example1:

This example shows you how to decide nominal diameter of valve at the following conditions: primary pressure 0.45MPa, secondary pressure 0.2MPa, flow of saturated steam 700 kg/h.

First, find out the intersection point A of primary pressure curve 0.45MPa and secondary pressure curve 0.2MPa.

Draw a vertical line from point A. This line intersects with flow curve 700kg/h. The intersection point is B. Since B is located between a nominal diameter range of size 40mm~50mm. The larger value, which is size 50mm is taken as the nominal diameter that we are looking for.

Now let's find out the nominal diameter at an additional condition: the temperature is 205℃. Draw a vertical from point A until it intersects with the saturated steam curve. The intersection point is named C. Now move from point C to temperature curve 205℃ paraallelly and we can stop at point D. Draw a vertical line from point D until it intersects with flow curve 700kg/h.The intersection point is named E. Since point E is located between a nominal diameter range of size 40mm~50mm. The larger value, which is size 50mm is taken as the nominal diameter that we are looking for.

Example 2:

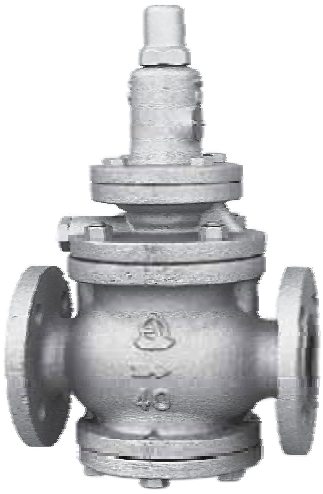
Now let's try to find out the nominal diameter at the following conditions: primary pressure 0.8MPa; secondary pressure 0.05MPa; and flow of saturated steam 700kg/h.

First, we should find out the intersection point F between primary pressure curve 0.8MPa and oblique line. Next, move on the oblique line and find it the intersection point G on the secondary pressure curve 0.05MPa. Draw a vertical line from point G until it intersects with flow curve 700kg/h. the intersection point is named H.

Since point H is located between a nominal diameter range of size 32mm~40mm. The larger value, which is size 40mm in this case, is taken as the nominal diameter that we are looking for.

RP-2H Type Pressure Reducing Valve (for Steam)

Pilot operated valve for reducing pressure of high-pressure steam.
RP-2H Type has larger Cv value than RP-6,1H Type , and allows large flow.



SPECIFICATIONS

Model name		RP-2H		
Body material		Cast iron		Cast steel
Code name		Size15~40mm:RP2H-L Size50~150mm:RP2H-B	Size 15~40mm:RP2H-M Size 50~150mm:RP2H-G	RP2H-C1
Applicable fluid		Steam		
Applicable primary pressure		Max. 1.6MPa		Max. 2.0MPa*2
Adjustable secondary pressure		Size 15~40mm : 0.035~1.2MPa Size 50~100mm : 0.035~1.0MPa Size 125・150mm : 0.035~0.8MPa		
Maximum reducing rate		10 : 1		
Minimum pressure differential across the disc		0.07MPa		
Lock up pressure		Max. 0.02MPa		
Offset pressure		Within 0.05MPa		
Minimum adjustable flow		5% of rated flow		
Leakage allowance		Less than 0.05% of rated flow		
Applicable temperature		Max. 220℃		Max. 250℃
End connection		Flanged JIS 16KRF		Flanged JIS 20KRF*3
Materials	Body	Size 15~40mm (Ductile cast iron), Size 50~150mm (Cast iron)		Cast steel
	Disc&seat	Stainless steel	Stainless steel	Stainless steel
	Piston&cylinder	Cast bronze	Stainless steel	Stainless steel
Valve body pressure test		Twice as much pressure of flange rated pressure		

*1. Valve body with stainless is also available upon your request.
*2. Applicable primary pressure Max. 3.0MPa is available upon your request.
*3. Flanged JIS 10, 16, 30K are also available upon your request.
*4. Applicable temperature Max. 350℃ is available as RP-2HT Type, and adjustable secondary pressure 1.2~2.0MPa is available as RP-2HN Type.

DIMENSIONS (CAST IRON)

(mm)

Size	L	G	H	d	Cv value	Mass(kg)
15(½″)	170	65	255	¼″	1.5	10.5
20(¾″)	170	65	255	¼″	3.5	11
25(1″)	210	75	265	¼″	6	16
32(1¼″)	210	75	265	¼″	9.5	16
40(1½″)	220	80	270	¼″	3.5	19
50(2″)	250	101	290	⅜″	24	28.5
65(2½″)	290	119	305	⅜″	37.5	39
80(3″)	350	134	323	⅜″	54	54
100(4″)	384	175	390	⅜″	96	98
125(5″)	434	218	480	⅜″	150	147
150(6″)	544	259	528	⅜″	216	296

Flange code JIS 16KRF

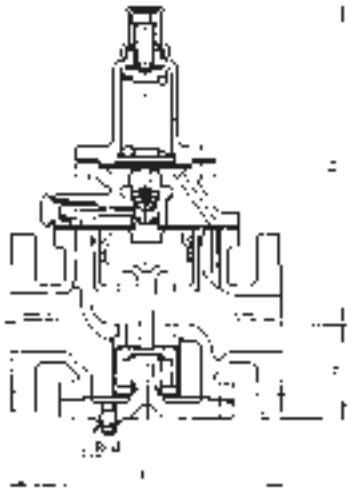
DIMENSIONS (CAST STEEL)

(mm)

Size	L		G	H	d	Cv value	Mass(kg)
	Flange code JIS						
	20K	30K					
15(½″)	190	198	73	255	¼″	1.5	12.5
20(¾″)	194	198	73	255	¼″	3.5	13
25(1″)	220	228	85	265	¼″	6	17
32(1¼″)	224	232	85	265	¼″	9.5	18
40(1½″)	240	248	94	270	¼″	13.5	20
50(2″)	272	280	109	290	⅜″	24	30.5
65(2½″)	276	288	109	290	⅜″	28	33
80(3″)	354	366	148	320	⅜″	54	69
100(4″)	410	426	177	390	⅜″	96	115
125(5″)	434	454	223	472	⅜″	150	180
150(6″)	544	564	264	504	⅜″	216	298

Weights listed are for those with flange code JIS 20KRF

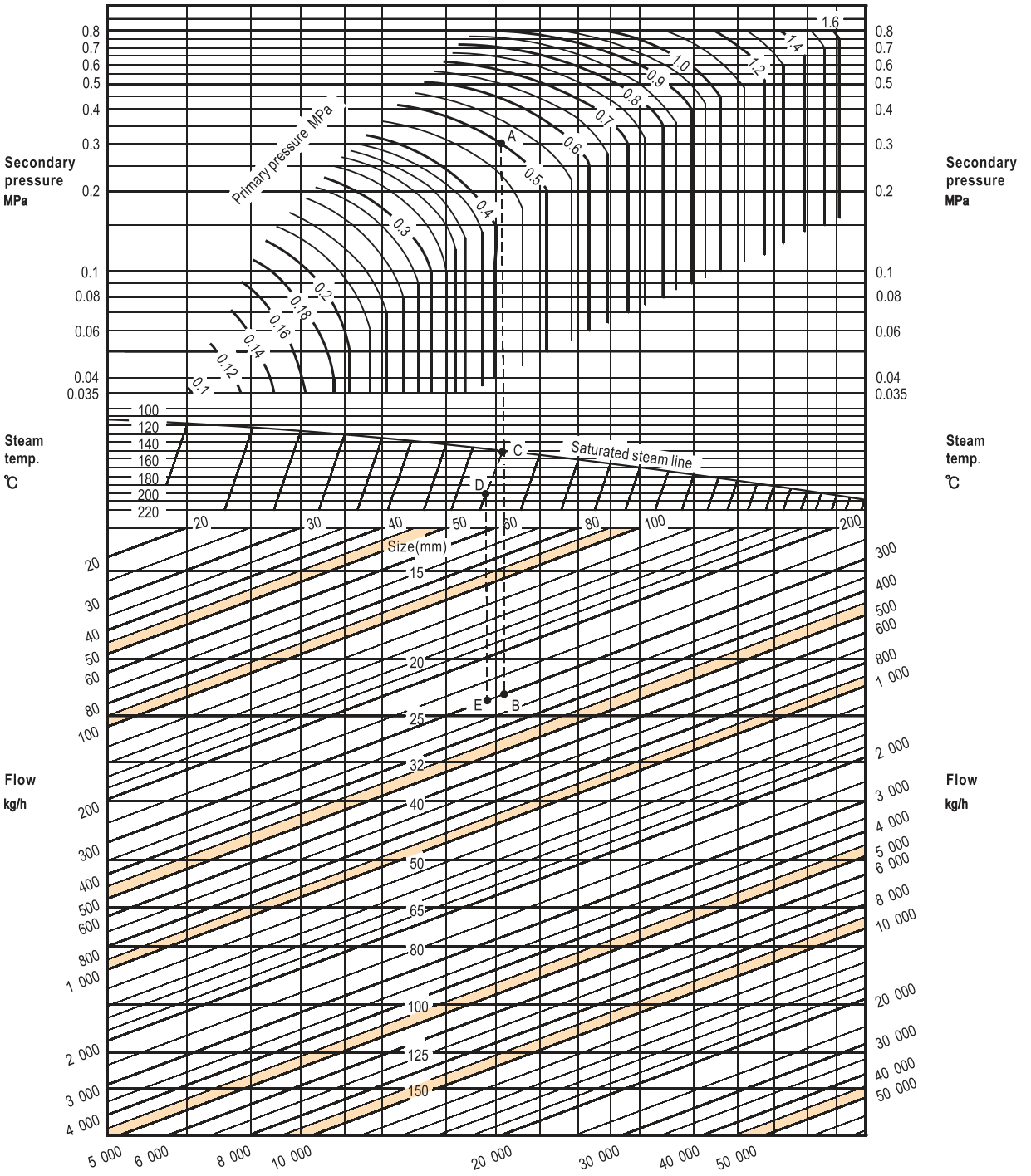
CONSTRUCTION



The structure may vary depending on material and nominal diameter.

DATA/RP-2H Type Pressure Reducing Valve (for Steam)

NOMINAL DIAMETER SELECTION CHART (for Steam) [Body : Cast iron]



● HOW TO USE THE CHART

This example shows you how to decide nomina l diameter of valve at the following conditions: primary pressure 0.5MPa, secondary pressure 0.3MPa, flow of saturated steam 300 kg/h.

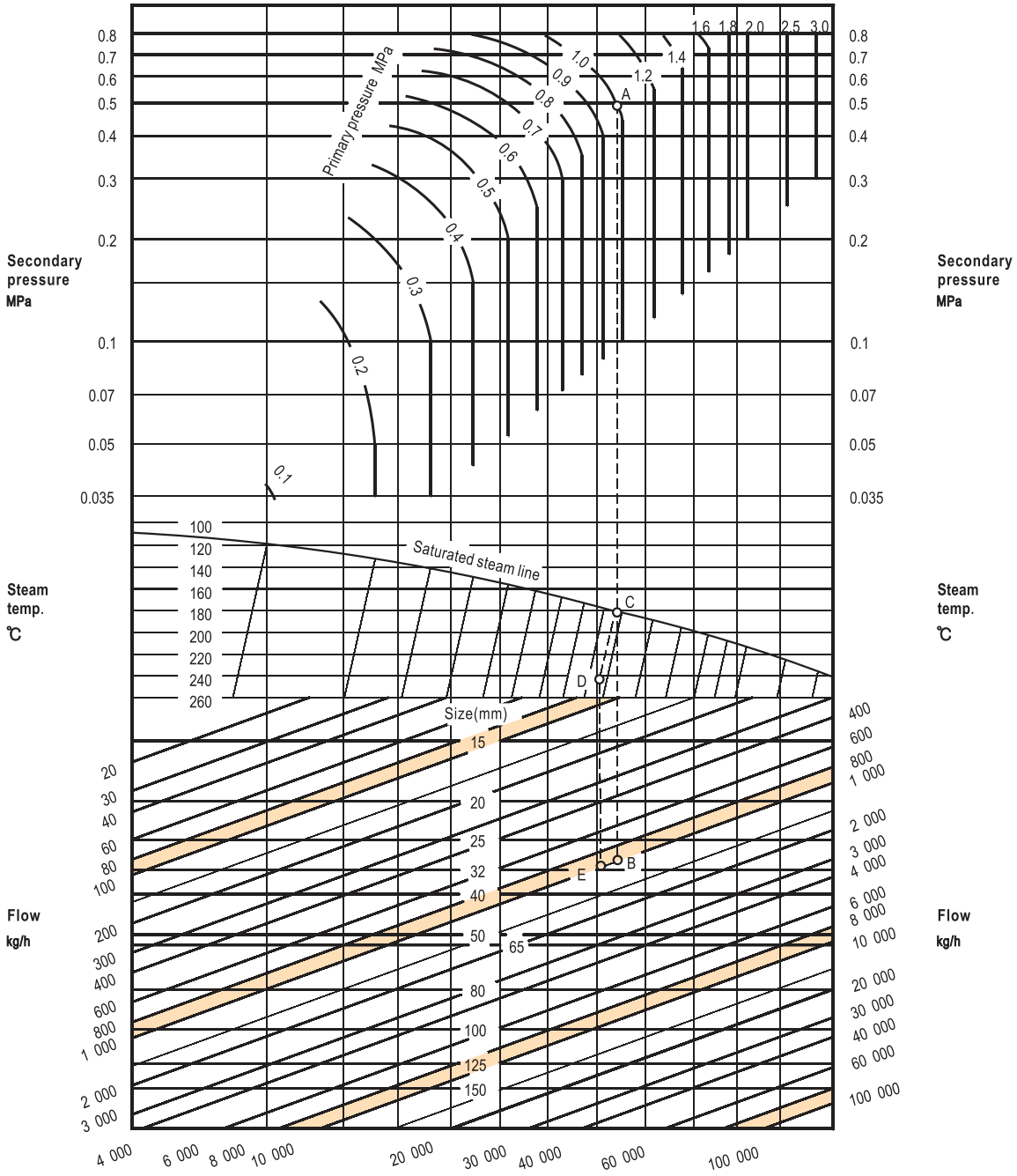
First, find out the intersection point A of primary pressure curve 0.5MPa and secondary pressure curve 0.3MPa .

Draw a vertical line from point A. This line intersects with flow curve 300kg/h. The intersection point is B. Since B is located between a nominal diameter range of size 20mm~25mm. The larger value, which is size 25mm is taken as the nominal diameter that we are looking for. Now let's find out the nominal diameter at an additional.

Condition: the temperature is 200℃. Draw a vertical from point A until it intersects with the saturated steam curve. The intersection point is named C. Now move from point C to temperature curve 200℃ paraallelly and we can stop at point D. Draw a vertical line from point D until it intersects with flow curve 300kg/h. the intersection point is named E. Since point E is located between a nomina diameter range of size 20mm~25mm. The larger value, which is size 25 mm is taken as the nominal diameter that we are looking for.

DATA/RP-2H Type Pressure Reducing Valve (for Steam)

NOMINAL DIAMETER SELECTION CHART (for Steam) [Body : Cast steel]



● HOW TO USE THE CHART

This example shows you how to decide nominal diameter of valve at the following conditions: primary pressure 1.0MPa, secondary pressure 0.5MPa, flow of saturated steam 1000 kg/h.

First, find out the intersection point A of primary pressure curve 1.0MPa and secondary pressure curve 0.5MPa.

Draw a vertical line from point A. This line intersects with flow curve 1000kg/h. The intersection point is B. Since B is located between a nominal diameter range of size 25mm~32mm. The larger value, which is size 32mm is taken as the nominal diameter that we are looking for.

Now let's find out the nominal diameter at an additional.

Condition: the temperature is 240℃. Draw a vertical from point A until it intersects with the saturated steam curve. The intersection point is named C. Now move from point C to temperature curve 240℃ paraallelly and we can stop at point D. Draw a vertical line from point D until it intersects with flow curve 1000kg/h. the intersection point is named E. Since point E is located between a nominal diameter range of size 25mm~32mm. The larger value, which is size 32 mm is taken as the nominal diameter that we are looking for.

RP-6A Type Pressure Reducing Valve (for Air or Gases)

for Factory equipments Variety of devices etc., General-purpose pilot operated valve(Large capacity)

A companion to RP-6 Type especially designed for air and gases.
For selecting nominal diameter,see the chart in page 22.

FEATURESPECIFICATIONS

- Piston guide and diaphragm allow stable control.
- Wide range of pressure and flow for a variety of applications.
- Easy pressure adjustment by manual handle with automatic lock mechanism.
- Compact design.

SPECIFICATIONS

Model name		RP-6A	
Code name		RP6A-B	RP6A-G
Applicable fluid		Air & gases	
Applicable primary pressure		Max. 1.0MPa	
Adjustable secondary pressure		0.03~0.8MPa	
Maximum reducing rate		10:1	
Minimum pressure differential across the disc		0.07MPa	
Lock up pressure		Max. 0.02MPa	
Offset pressure		Within 0.02MPa (Adjustable secondary pressure 0.03~0.035MPa) Within 0.03MPa (Adjustable secondary pressure 0.035~0.07MPa) Within 0.05MPa (Adjustable secondary pressure 0.07~0.8MPa)	
Minimum adjustable flow		5% of rated flow	
Leakage allowance		Nil (Confirm at pressure Gauge)	
Applicable temperature		5~80℃	
End connection		Flanged JIS 10KFF	
Materials	Body	Cast iron	
	Disc & seat	Disc (Brass), Seat (Stainless steel)	Disc & seat (Stainless steel)
	Piston & cylinder	Brass	Stainless steel
Valve body pressure test		Hydraulic 1.5MPa	

*For size100~200mm, select RP-1HA Type.

DIMENSIONS

(mm)

Size	L	G	H	d	Cv value	Mass(kg)
15(½″)	140	62	155	¼″	1	7.5
20(¾″)	140	62	155	¼″	2.5	7.5
25(1″)	150	67	160	¼″	4	9
32(1¼″)	180	73	182	⅜″	6.5	12
40(1½″)	180	73	182	⅜″	9	12.5
50(2″)	200	86	187	⅜″	16	15.5
65(2½″)	230	94	202	⅜″	25	20.5
80(3″)	260	110	221	⅜″	36	26.5

Flange code JIS 10KFF

CONSTRUCTION

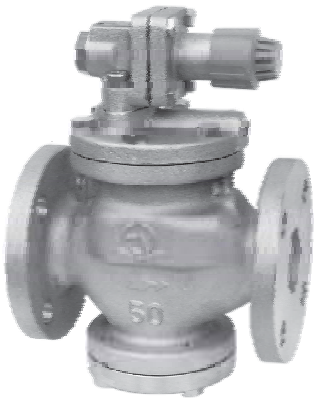
REFERENCE

We also provide spacers for adjustment of face to face dimension. Such spacers are useful when replacing RP-6A Type with RP-1HA Type valve, such as in the case of modification of equipment. For more details, please contact our agent in your area.

RP-8A Type Pressure Reducing Valve (for Air or Gases)

for Factory equipments Variety of devices etc., General-purpose pilot operated valve(Large capacity)

With the body and main parts made of stainless steel, RP-8A Type is ideal for applications with clean fluid. In addition, the durability and corrosion resistance of stainless steel also make RP-8A Type useful in a variety of other applications.



FEATURESPECIFICATIONS

- Piston guide and diaphragm allow stable control.
- Wide range of pressure and flow for a variety of applications.
- Easy pressure adjustment by manual handle with automatic lock mechanism.
- Compact design.

SPECIFICATIONS

Model name	RP-8A
Code name	RP8A-D
Applicable fluid	Air & gases
Applicable primary pressure	Max. 1.0MPa
Adjustable secondary pressure	0.03~0.8MPa
Maximum reducing rate	10:1
Minimum pressure differential across the disc	0.07MPa
Lock up pressure	Max. 0.02MPa
Offset pressure	Within 0.02MPa (Adjustable secondary pressure 0.03~0.035MPa) Within 0.03MPa (Adjustable secondary pressure 0.035~0.07MPa) Within 0.05MPa (Adjustable secondary pressure 0.07~0.8MPa)
Minimum adjustable flow	5% of rated flow
Leakage allowance	Nil (Confirm at pressure Gauge)
Applicable temperature	5~80℃
End connection	Flanged JIS 10KFF
Materials	Body (Stainless steel) ,Diaphragm (Stainless steel) , Disc & seat (Stainless steel) Disc tip & pilot disc (Synthetic rubber)
Valve body pressure test	Hydraulic 1.5MPa

*For size15~25mm, select RD-20, 20F Type, and for size 100mm, select RP-2HA Type.

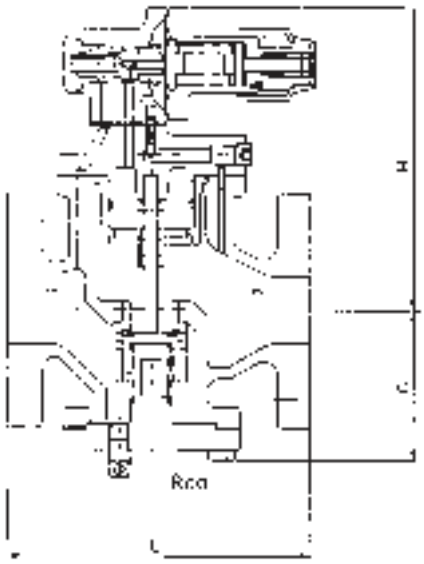
DIMENSIONS

(mm)

Size	L	G	H	d	Cv value	Mass (kg)
32(1¼″)	180	90	182	¼″	6.5	12.5
40(1½″)	180	90	182	¼″	9	12.5
50(2″)	200	100	187	¼″	16	16
65(2½″)	230	110	202	⅜″	25	22
80(3″)	260	118	221	⅜″	36	27.5

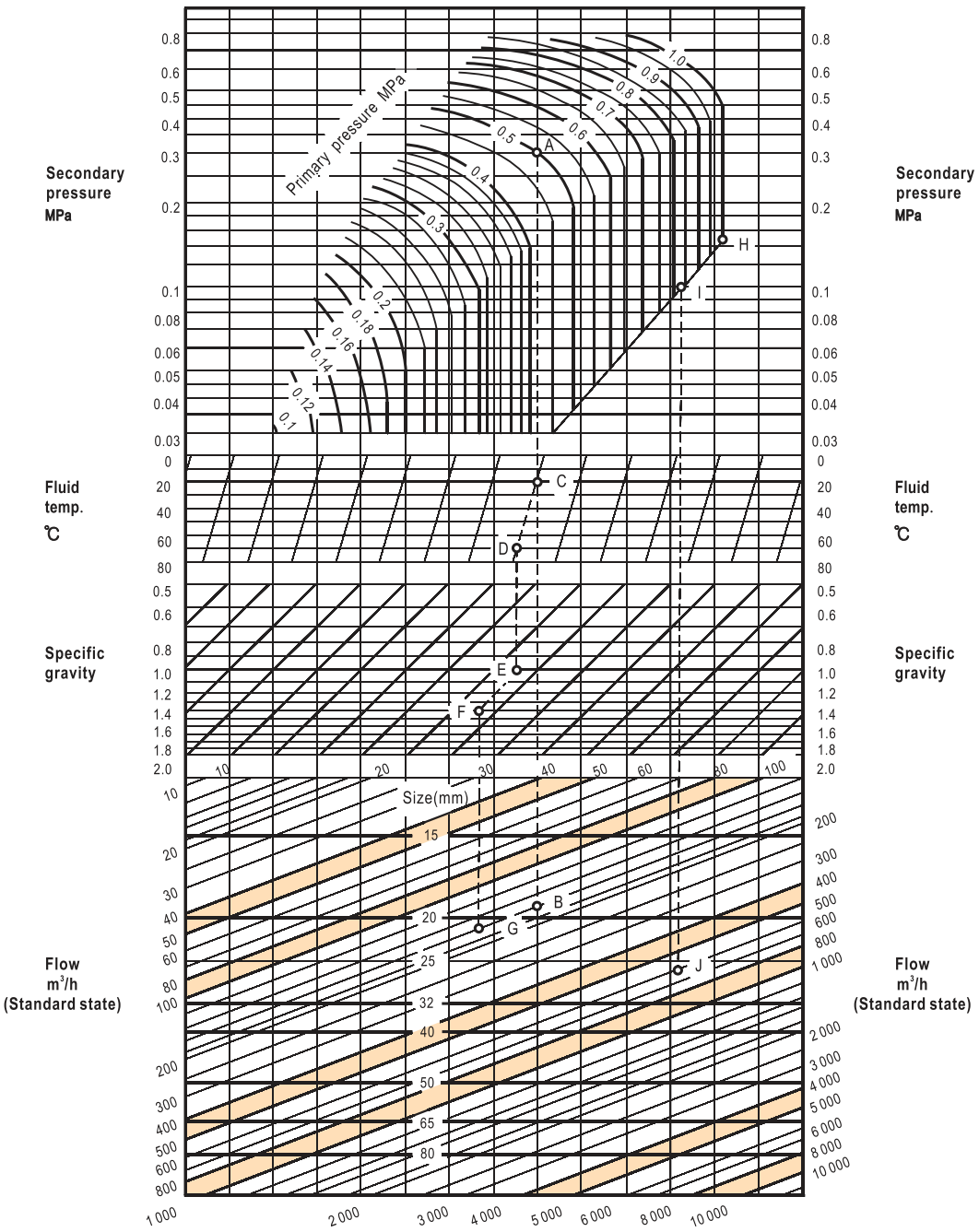
Flange code JIS 10KFF

CONSTRUCTION



DATA/RP-6A, 8A Type Pressure Reducing Valve (for Air or Gases)

NOMINAL DIAMETER SELECTION CHART (for Air or Gases)



● HOW TO USE THE CHART

This example shows you how to decide nominal diameter of valve at the following conditions: primary pressure 0.5 MPa; secondary pressure 0.3 MPa; temperature 20℃; specific gravity 1(air); and flow 160m³/h (standard state).

First, find out the intersection point A of primary pressure curve 0.5MPa and secondary pressure curve 0.3MPa.

Draw a vertical line from point A. This line intersects with flow curve 160kg/h. The intersection point is B. Since B is located between a nominal diameter range of size 15mm~20mm. The larger value, which is size 20mm is taken as the nominal diameter that we are looking for.

Now let's find out the nominal diameter when some conditions are changed. The other conditions are the same, but the temperature is 70℃, and the specific gravity is 1.4. Draw a vertical from point A until it intersects with the temperature curve 20℃. The intersection point is named C. Now move from point C to temperature curve 70℃ parallelly and we can stop at point D. Draw a vertical line from point D until it intersects with specific gravity curve 1.4. The intersection point is named E.

Now move from point E parallelly to point F. Draw a vertical line from point F until it intersects with flow curve (160m³/h). The intersection point is named G. Since point G is located between a nominal diameter range of 20mm~25mm. The larger value, which is 25mm, is taken as the nominal diameter that we are looking for.

RP-1HA Type Pressure Reducing Valve (for Air or Gases)

RP-1HA Type is a large-diameter pilot operated type pressure reducing valve for air and gases,and a companion to RP-1H Type pressure reducing valve for steam.

SPECIFICATIONS

Model name		RP-1HA	
Code name		RP1HA-B	RP1HA-G
Applicable fluid		Air & gases	
Applicable primary pressure		Max. 1.0MPa	
Adjustable secondary pressure		0.035~0.8MPa	
Maximum reducing rate		10:1	
Minimum pressure differential across the disc		0.07MPa	
Lock up pressure		Max. 0.02MPa	
Offset pressure		Within 0.05MPa	
Minimum adjustable flow		5% of rated flow	
Leakage allowance		Less than 0.01% of rated flow	
Applicable temperature		5~80℃	
End connection		Flanged JIS 10KRF	
Materials	Body	Cast iron	
	Disc&seat	Stainless steel	
	Piston&cylinder	Cast bronze	Stainless steel
Valve body pressure test		Hydraulic 1.5MPa	

∗For size15~80mm, select RP-6A Type.

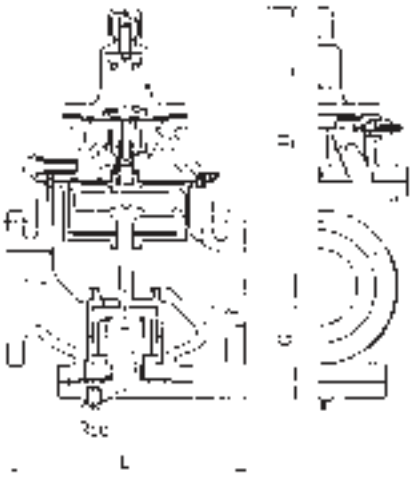
DIMENSIONS

(mm)

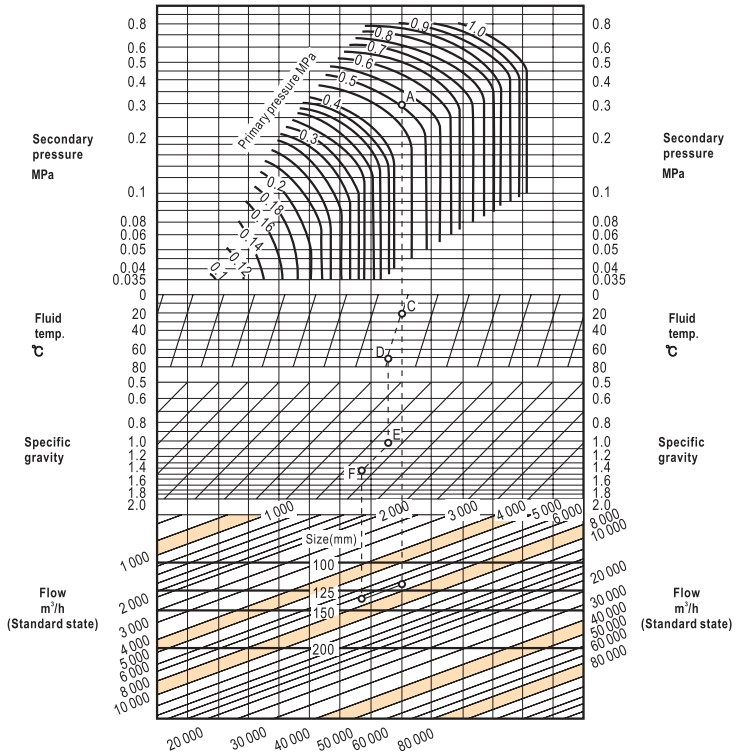
Size	L	G	H	d	Cv value	Mass (kg)
100(4″)	320	146	337	3/8″	64	66
125(5″)	380	178	409	3/8″	100	104
150(6″)	420	206	471	3/8″	144	147
200(8″)	540	262	539	3/8″	256	275

Flange code JIS 10KRF

CONSTRUCTION



NOMINAL DIAMETER SELECTION CHART (for Gases)

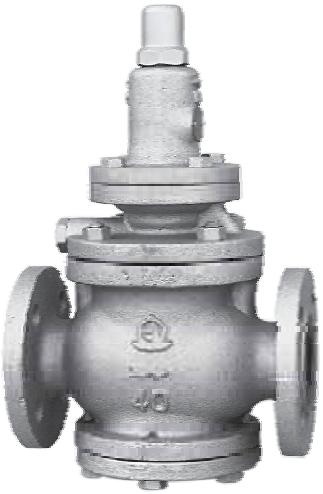


Example 1:
Primary pressure: 0.5MPa (20℃)
Secondary pressure: 0.3MPa
Specific gravity: 1 (air)
Flow: 7000 m³/h (standard state)
The nominal diameter should be size 125mm.

Example 2:
Primary pressure: 0.5MPa (70℃)
Secondary pressure: 0.3MPa
Specific gravity: 1.4
Flow: 7000 m³/h (standard state)
The nominal diameter should be size 150mm.

RP-2HA Type Pressure Reducing Valve (for Air or Gases)

RP-2HA Type is a large-diameter pilot operated type pressure reducing valve for air and gases,and a companion to RP-2H Type pressure reducing valve for steam.
RP-2HA Type has larger Cv value than RP-6A, 1HA Type , and allows large flow.



SPECIFICATIONS

Model name		RP-2HA		
Body material		Cast iron		Cast steel
Code name		Size 15~40mm:RP2HA-L Size 50~150mm:RP2HA-B	Size 15~40mm:RP2HA-M Size 50~150mm:RP2HA-G	RP2HA-C □ ※L or H for adjustable secondary pressure is required in □.
Applicable fluid		Air & gases		
Applicable primary pressure		Max. 1.6MPa		Max. 1.0,1.6,2.0,3.0MPa
Adjustable secondary pressure		Size 15~40mm:0.035~1.2MPa Size 50~100mm:0.035~1.0MPa Size 125·150mm:0.035~0.8MPa		L:0.035~0.4MPa H:0.3~1.2MPa
Maximum reducing rate		10:1		
Minimum pressure differential across the disc		0.07MPa		
Lock up pressure		Max. 0.02MPa		
Offset pressure		Within 0.05MPa		
Minimum adjustable flow		5% of rated flow		
Leakage allowance		Less then 0.01% of rated flow (Cast iron,Size 65mm or smaller: Nil(Confirm at pressure Gauge))		
Applicable temperature		5~80℃		
End connection		Flanged JIS 16KRF		Flanged JIS10,16,20 & 30KRF
Materials	Body	Size 15~40mm(Ductile cast iron), Size 50~150mm(Cast iron)		Cast steel
	Disc & seat	Size15~65mm(Brass) Size50~150mm(Stainless steel)	Stainless steel	Stainless steel
	Piston&cylinder	Cast bronze	Stainless steel	Stainless steel
Valve body pressure test		Twice as much pressure of flange rated pressure		

*For sizes 15~100mm, valve bodies with Stainless steel are also available upon your request.

DIMENSIONS (CAST IRON)

(mm)

Size	L	G	H	d	Cv value*	Mass(kg)
15(½″)	170	65	255	¼″	1.5	10.5
20(¾″)	170	65	255	¼″	3.5	11
25(1″)	210	75	265	¼″	6	16
32(1¼″)	210	75	265	¼″	9.5	16
40(1½″)	220	80	270	¼″	13.5	19
50(2″)	250	101	290	⅜″	24	28.5
65(2½″)	290	119	305	⅜″	37.5	39
80(3″)	350	134	323	⅜″	54	54
100(4″)	384	175	390	⅜″	96	98
125(5″)	434	218	480	⅜″	150	147
150(6″)	544	259	528	⅜″	216	296

*The Cv valves require correction depending on pressure conditions.

Flange code JIS 16KRF

DIMENSIONS (CAST STEEL)

(mm)

Size	L		G	H	d	Cv value*	Mass(kg)
	Flange code JIS						
	20K	30K					
15(½″)	190	198	73	255	¼″	1.5	12.5
20(¾″)	194	198	73	255	¼″	3.5	13
25(1″)	220	228	85	265	¼″	6	17
32(1¼″)	224	232	85	265	¼″	9.5	18
40(1½″)	240	248	94	270	¼″	13.5	20
50(2″)	272	280	109	290	⅜″	24	30.5
65(2½″)	276	288	109	290	⅜″	28	33
80(3″)	354	366	148	320	⅜″	54	69
100(4″)	410	426	177	390	⅜″	96	115
125(5″)	434	454	223	472	⅜″	150	180
150(6″)	544	564	264	504	⅜″	216	298

*The Cv valves require correction depending on pressure conditions.

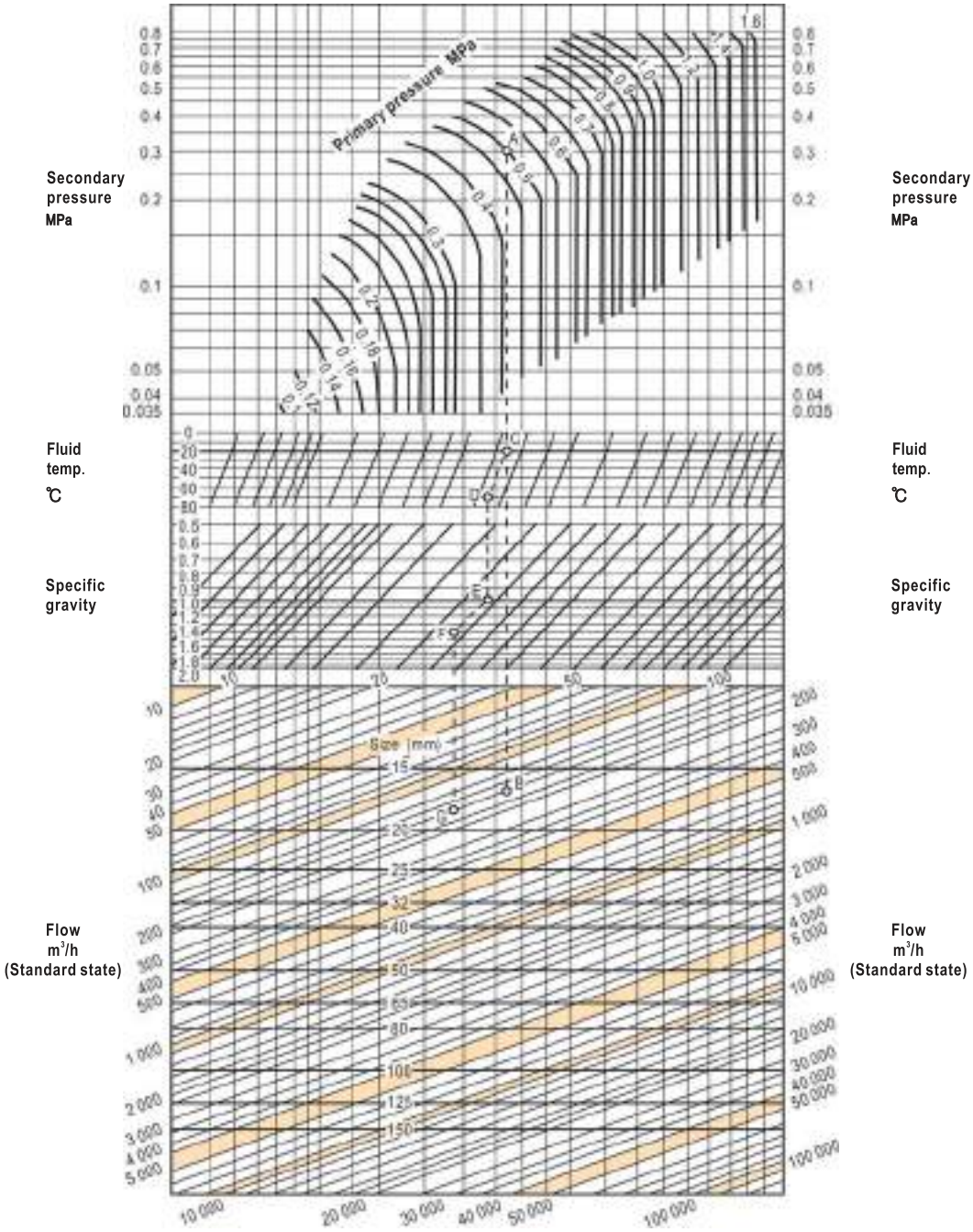
Weights listed are for those with flange code JIS 20KRF

CONSTRUCTION

The structure may vary depending on material and nominal diameter.

DATA/RP-2HA Type Pressure Reducing Valve (for Air or Gases)

NOMINAL DIAMETER SELECTION CHART (for Air or Gases) [Body : Cast iron]



● HOW TO USE THE CHART

This example shows you how to decide nominal diameter of valve at the following conditions: primary pressure 0.5MPa; secondary pressure 0.3MPa; temperature 20℃ ; specific gravity 1(air);and flow 160m³/h (standard state).

First, find out the intersection point A of primary pressure curve 0.5MPa and secondary pressure curve 0.3MPa.

Draw a vertical line from point A. This line intersects with flow curve 160m³/h. The intersection point is B. Since B is located between a nominal diameter Range of size 15mm~20mm. The larger value, which is size 20mm is taken as the nominal diameter that we are looking for.

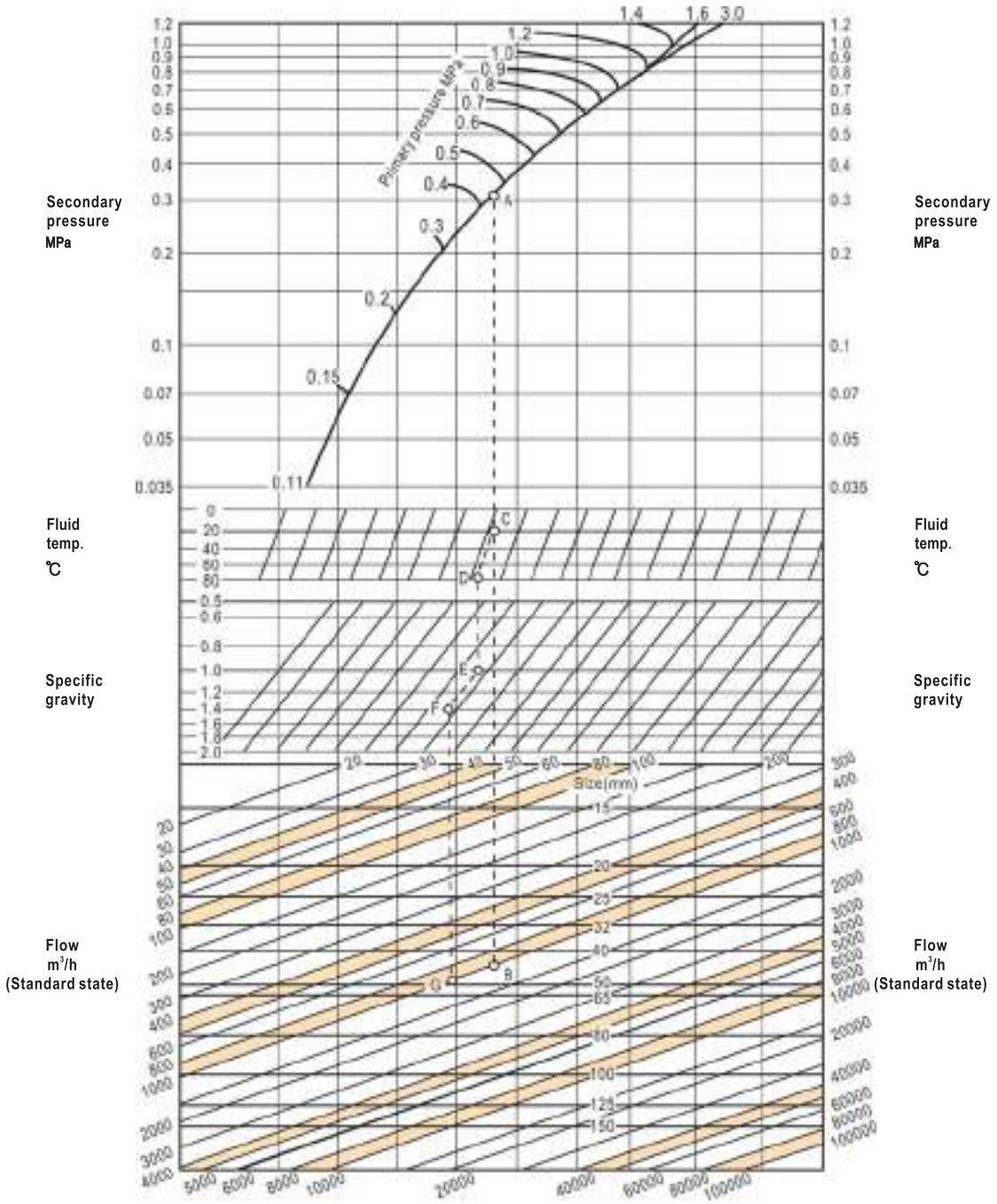
Now let's find out the nominal diameter when some conditions are the same, but the temperature is 70℃, and the specific gravity is 1.4. Draw a vertical from point A until it intersects with the temperature curve 20℃.

The intersection point is named C. Now move from point C to temperature curve 70℃ parallelly and we can stop at point D. Draw a vertical line from point D until it intersects with specific gravity curve 1.4. The intersection point is named E.

Now move from point E parallelly to point F. Draw a vertical line from point F until it intersects with flow curve 160m³/h. The intersection point is named G. Since point G is located between a nominal diameter range of size 15mm~20mm. The larger value, which is size 20mm,is taken as the nominal diameter that we are looking for.

DATA/RP-2HA Type Pressure Reducing Valve (for Air or Gases)

NOMINAL DIAMETER SELECTION CHART (for Air or Gases) [Body : Cast steel]



● HOW TO USE THE CHART

This example shows you how to decide nominal diameter of valve at the following conditions: primary pressure 1.0MPa; secondary pressure 0.3MPa; temperature 20℃ ; specific gravity 1(air); and flow 1000m³/h (standard state).

First, find out the intersection point A of primary pressure curve 1.0MPa and secondary pressure curve 0.3MPa.

Draw a vertical line from point A. This line intersects with flow curve 1000kg/h. The intersection point is B. Since B is located between a nominal diameter range of size 40mm~50mm. The larger value, which is size 20mm is taken as the nominal diameter that we are looking for.

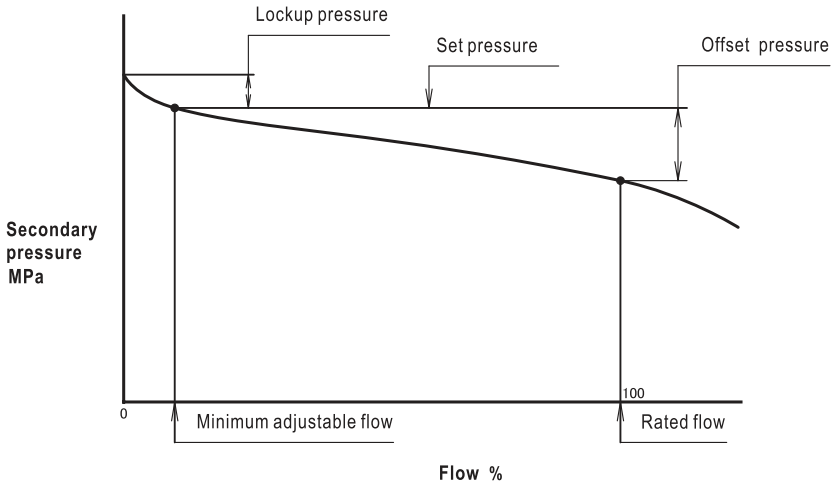
Now let's find out the nominal diameter when some conditions are changed. The other conditions are the same, but the temperature is 80℃, and the specific gravity is 1.4. Draw a vertical from point A until it intersects with the temperature curve 20℃.

The intersection point is named C.Now move from point C to temperature curve 80℃ parallelly and we can stop at point D. Draw a vertical line from point D until it intersects with specific gravity curve 1.4 . The intersection point is named E. Now move from point E parallelly to point F. Draw a vertical line from point F until it intersects with flow curve 1000m³/h. The intersection point is named G. Since point G is located between a nominal diameter range of size 40mm~50mm. The larger value, which is size 50mm,is taken as the nominal diameter that we are looking for.

Note: When secondary pressure (MPa·A)/primary pressure (MPa·A) is less than 0.745, it will be necessery for flow (Cv) correction.

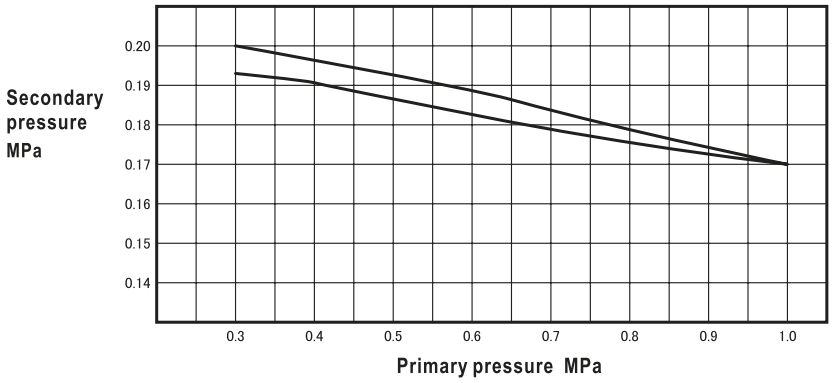
DATA/RP-Type Pressure Reducing Valve (RP-6, 8, 1H, 2H Type Series) (for Steam or Gases)

FLOW CHARACTERISTICS



PRESSURE CHARACTERISTICS

Example: RP-6 Type



The secondary pressure is set at 0.2 MPa when primary pressure is 0.3 MPa. The chart shows the change of secondary pressure when primary pressure changes between 0.3~1.0~0.3 MPa.

TERMS

- Primary pressure: The inlet pressure of pressure reducing valve or the inlet pressure of piping that is near to pressure reducing valve.
- Secondary pressure: The outlet pressure of pressure reducing valve or the outlet pressure of piping that is near to pressure reducing valve.
- Set pressure: secondary pressure at minimum adjustable flow.
- Offset pressure: The difference between secondary pressure and set pressure when primary pressure is kept at a constant level but flow increases gradually from minimal adjustable flow to the rated flow of pressure reducing valve.
- Lockup pressure: The increased pressure above set pressure when the secondary valve of pressure reducing valve is locked up.
- Minimum adjustable flow: The minimum flow of pressure reducing valve for maintaining stable flow.
- Rated flow: The maximum flow at the specified offset pressure when primary pressure is kept at a constant level.

TIPS: HOW TO SELECT AN APPROPRIATE NOMINAL DIAMETER?

❶ When you select the size, use nominal diameter selection chart. Considering pressure loss and thermal loss, the flow amount for selecting the nominal diameter should be larger by 10-20% than designed flow amount, particularly in case of the pressure reducing ratio is large or the set pressure is lower than 0.1MPa.

❷ The secondary pressure of a pressure reducing valve changes when primary pressure or flow changes. Therefore, when selecting nominal diameter, it is necessary to consider lockup pressure and offset.

(See flow characteristics and pressure characteristics.)

❸ In the case when primary and secondary pressure are not constant but change within a certain range, the nominal diameter can be determined using the primary and secondary pressures that produce the smallest differential pressure.

❹ In the case the pressure reduction ratio exceeds its maximum value, it is required to perform two-step pressure reduction by using 2 pressure reducing valves. Although the flow at step 1 and step 2 are the same, the nominal diameter of the valve at step 1 should be different from that at step 2, because primary pressure is different from secondary pressure. Therefore, it is necessary to select two nominal diameters for the valves to be used.

❺ It is easy to understand that an extremely small valve allows only a tiny flow. However, this does not mean a large valve is better than small valve. In fact, an extremely large valve may cause the occurrence of “hunting” , which canlead to abnormal wearing. Another thing to be noted is the minimum adjustable flow, which is about 5% of the rated flow. You should not select a valve which may be used when the flow is lower than the minimum adjustable flow. In winter or summer, flow may change extremely. It is recommended that you install two pressure reducing valves, a large one and a smaller one, and switch between them according to change of flow.

DATA/Pressure Reducing Valve (for Steam or Gases)

INSTALLATION EXAMPLE

Fig.1 With bypass piping

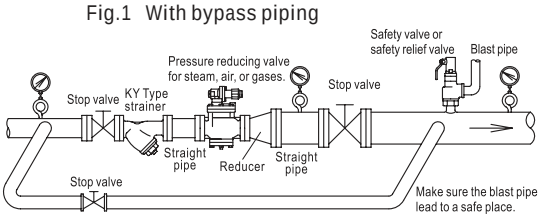
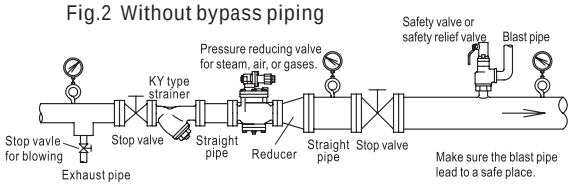


Fig.2 Without bypass piping



POINTS FOR INSTALLATION

- Installation of pressure reducing valve and piping.

1. Pressure reducing valve should be vertical to horizontal piping
2. Install safety valve or safety relief valve on the secondary side of pressure reducing valve.

※1. Equipment may be damaged due to increase of secondary pressure at the time of failure of pressure reducing valve.

※2. See Table 1 for set pressure of safety valve and safety relief valve.

※3. In the case safety valve or safety relief valve is used as an alarm, its nominal diameter should be big enough to allow discharge of 10% maximum flow of pressure reducing valve, which is about the leakage of pressure reducing valve. In very few cases, safety valve or safety relief valve may allow discharge of maximum flow of pressure reducing valve.(reference value: see Table 2 and Table 3).

TABLE1. SET PRESSURE FOR SAFETY RELIEF VALVE (MPa)

Set pressure of Pressure reducing valve	Set pressure of Safety valve
0.1 or less	+ 0.05
Over 0.1 and below 0.4	+ 0.08
0.4 or more and below 0.6	+ 0.12
0.6 or more and below 0.8	+ 0.15
0.8 or more and below 1.0	+ 0.19
1.0 or more and 1.2 or less	+ 0.23

Add the above valve to set pressure of the Pressure Reducing Valve.

TABLE2. FLOW FOR SAFETY RELIEF VALVE (Saturated steam)
SL-37~SL-40 TYPE (kg/h)

Set pressure (MPa)	Size(mm)					
	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
0.05	13.4	22.9	33.3	61.8	96.7	157
0.1	17.4	29.7	43.1	80	125	203
0.2	25.3	43.2	62.8	116	182	296
0.3	34.1	58	84.3	156	244	397
0.4	41.9	71.4	103	192	301	489
0.5	50.5	86	125	231	362	589
0.6	59	100	146	271	424	689
0.7	67.6	115	167	310	485	788
0.8	76.1	129	188	349	546	886
0.9	84.7	144	209	388	608	988
1.0	93.2	158	230	428	669	1080

TABLE3. FLOW FOR SAFETY RELIEF VALVE (Air)
SL-37~SL-40 TYPE (kg/h)

Set pressure (MPa)	Size(mm)					
	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
0.05	21.8	37.1	53.9	100	156	254
0.1	28.2	48	69.8	129	202	329
0.2	41	69.9	101	188	294	479
0.3	55.1	93.9	136	253	396	643
0.4	69.3	118	171	318	497	808
0.5	83.4	142	206	382	598	972
0.6	97.5	166	241	447	700	1130
0.7	111	190	276	512	801	1300
0.8	125	214	311	577	902	1460
0.9	139	238	346	641	1000	1630
1.0	154	262	381	706	1100	1790

3. Install strainer at the primary side of pressure reducing valve.

4. For devices that cannot be stopped, install bypass piping (with stop valve) from the primary side to the secondary side of pressure reducing valve. If bypass piping is not suitable, then install blowing stop valve, which is derived from the main pipe before the primary side of pressure reducing valve, so as to make flushing possible.

5. Install straight piping, stop valve, and pressure gauge before and after pressure reducing valve.
If end connection of pressure reducing valve is realized using screw, then use union joint to make it easy to fix and remove.

※ The diameter of piping before and after pressure reducing valve should be determined based on the standard velocity of flow of fluid.
Generally, since the nominal diameter of secondary piping of pressure reducing valve for steam and gasses is larger than the diameter of pressure reducing valve, it is necessary to use reducer.

6. If you install solenoid valve (on/off operation) or control valve at the secondary side of pressure reducing valve, there should be an interval (L) between such solenoid valve or control valve and pressure reducing valve. The interval (L) should be larger than 2m in the case of solenoid valve.As for control valve, the interval should be larger than 1m if nominal diameter is less than 100mm, and larger than 1.5m if nominal diameter is larger than 125mm(see Fig.3).

7. In the case of 2-step pressure reduction, the interval between 2 valves should be 1~2m (see Fig.4).

Fig.3 INTERVAL BETWEEN PRESSURE REDUCING VALVE AND CONTROL VALVE

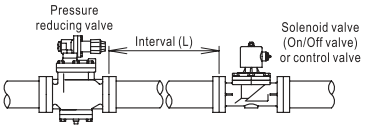
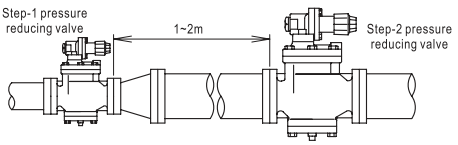


Fig.4 INTERVAL BETWEEN VALVES (2-STEP PRESSURE REDUCTION)



DATA/Pressure Reducing Valve (for Steam or Gases)

8. For pressure reducing valve for steam, “hunting” or vibration may occur if drain accumulates.
   To prevent hunting and vibration, it is necessary to prevent drain from entering into the piping or install stem trap at the primary side.
   In addition, since pressure reducing valve cannot be closed completely, it is necessary to install steam trap at the secondary side if the amount of steam used is near zero.

Fig.5: Proper installation

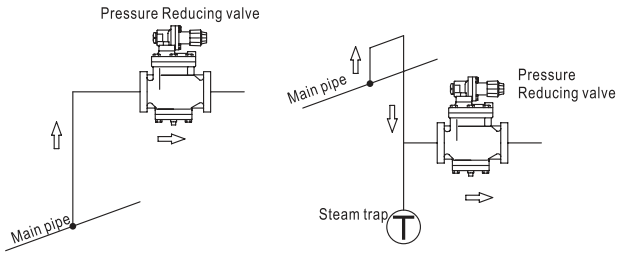
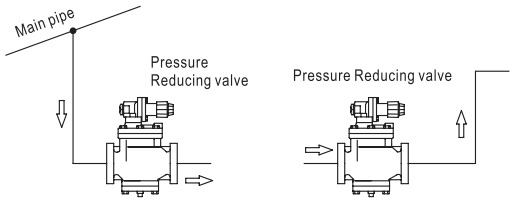


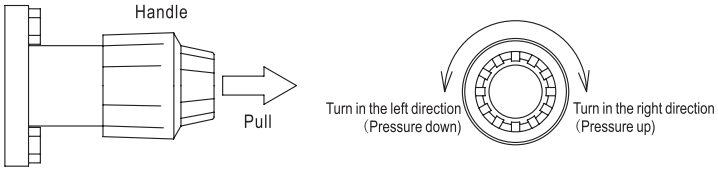
Fig.6:Inproper installation



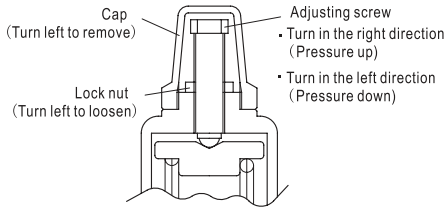
9. Make sure sufficient space is left for maintenance.
10. Apply appropriate support to pressure reducing valve to make sure it does not bear the weight of piping, bending force, or vibration directly.
11. If you think there is possibility of freezing, insulate or discharge the drain.
12. The secondary pressure of the valve is not adjusted at delivery. Therefore, you should adjust the secondary pressure to the desired pressure before use.
    ※ The secondary pressure of a non-adjusted valve is near to zero.
    ※ How to adjust the secondary pressure:
    ① Close the stop valves at primary and secondary sides.
    ② Open the blowing stop valve or stop valve in bypass and remove any content inside. Such operation is called flushing and should be carried out sufficiently by spending sufficient time on it.Take care not to make the secondary pressure rise excessively.
    ③ Close the stop valve in by pass or blowing stop valve completely.
    ④ Make sure there is not any spring load caused by adjusting screw.
    ⑤ Open the stop valve at primary side gradually.
    ⑥ Make sure you have adjusted the secondary pressure. Open the stop valve at the secondary side slightly to allow small flow.
    ⑦ Apply a small spring load using handle or adjusting screw.
    Once the fluid start flowing, open the stop valve at the secondary side gradually.
    ⑧ Read the pressure gauge and apply more spring load to make the pressure reaching the set pressure. The pressure rises if you turn the handle or adjusting screw in the right direction and falls if you turn them in the left direction.
    ⑨ Once the desired pressure is reached, use the lock nut to lock the adjusting screw.
    After the screw is locked, the spring load will not change.

• ADJUSTING SECONDARY PRESSURE

For RP-6 series and RD-40 series.



• OTHER PRESSURE REDUCING VALVES



■ DIAMETER OF PIPING BEFORE AND AFTER PRESSURE REDUCING VALVE

The nominal diameter of pressure reducing valve can be determined using relevant graphs made for such purpose. The diameter of piping before and after pressure reducing valve must be determined base on the standard velocity of fluid.
Extremely small diameter or large velocity of fluid may cause large loss of pressure inside the piping and wearing, vibration of the piping. Therefore, it is necessary to consider the standard velocity of fluid when determining the diameter of piping.

● Table of velocity of Steam as standard condition.

Item	For steam	Standard velocity (m/s)
Pipage	Saturated steam (0.2~0.5MPa)	15~20
	Saturated steam (0.5~1.5MPa)	20~30
(Steam engine)	Saturated steam	20~30
	Super heated steam	30~40

● Table of velocity of Air as standard condition.

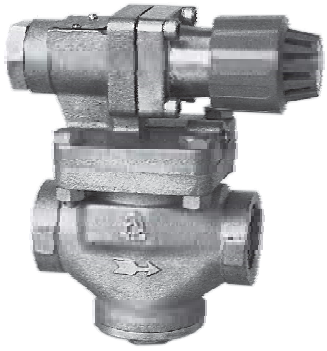
Item	For air	Standard velocity(m/s)
Pipage	(0.1~0.2MPa)	8~15
	(20~30MPa)	5~7
(Compressor)	Saturated line	10~20
	Low pressure supplyline	20~30
	High pressure supply line	10~15

RP-7 Type Pressure Reducing Valve (for Steam)

Used in Food processing Sterilizing Cleaning equipments for clean steam

RP-7 Type is a compact, pilot operated-type pressure reducing valve for application on equipments or devices with comparatively small flow.

It is small, light-duty (MAX.50% according to our data) and can be installed as a part of a machine.



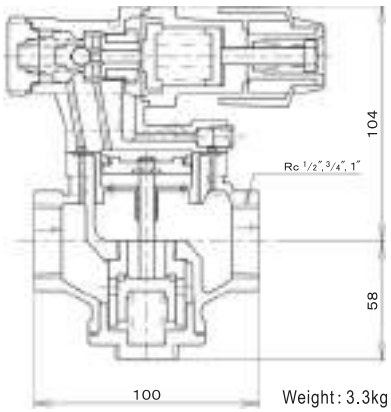
FEATURES

- Features
  Piston guide and special seal ring allow stable control over small flow and rated flow of fluid.
- Easy pressure adjustment by manual handle with automatic lock mechanism.
- Compact design.

SPECIFICATIONS

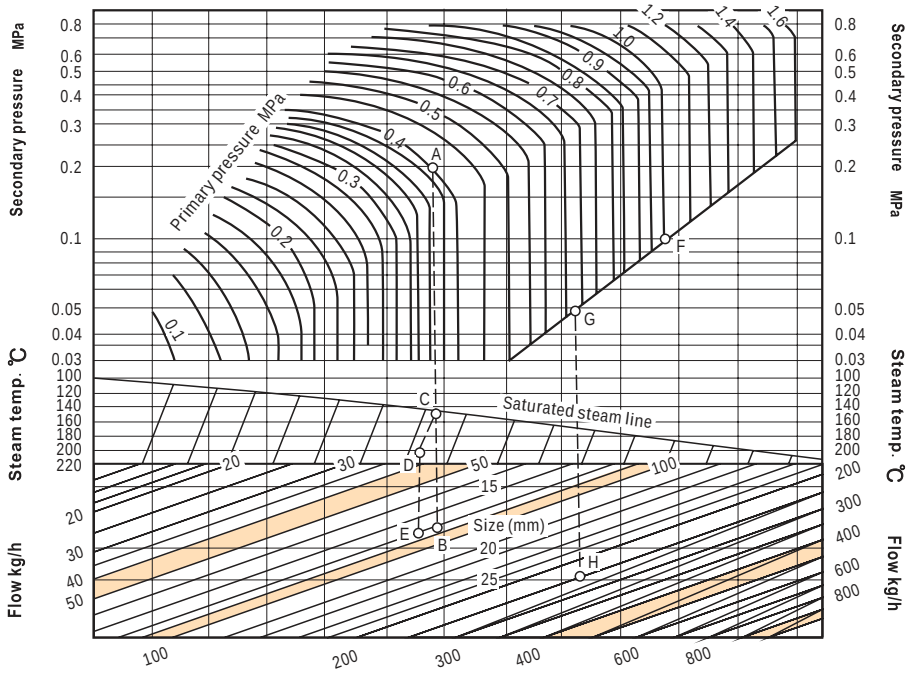
Model name		RP-7	
Code name		RP7-F□	RP7-J□
		※ L(low press.) or H (high press.) For adjustable secondary pressure is required in □.	
Size		15・20・25(½″・¾″・1″)	
Applicable fluid		Steam	
Applicable primary pressure		Max. 1.6MPa	
Adjustable secondary pressure		L:0.03~0.4MPa, H:0.3~0.8MPa	
Maximum reducing rate		20:1	
Minimum pressure differential across the disc		0.05MPa	
Lock up pressure		Max. 0.02MPa	
Offset pressure		Within 0.02MPa(Adjustable secondary pressure 0.03~0.035MPa) Within 0.03MPa(Adjustable secondary pressure 0.035~0.07MPa) Within 0.05MPa(Adjustable secondary pressure 0.07~0.8MPa)	
Leakage allowance		Less than 0.05% of rated flow	
Cv value		Size 15mm:1, Size 20mm:2, Size 25mm:3	
Applicable temperature		Max. 220℃	
End connection		Screwed JIS Rc	
Materials	Body	Cast bronze	
	Disc & seat	Stainless steel	
	Piston & cylinder	Cast bronze	Stainless steel
Valve body pressure test		Twice as much pressure of flange rated pressure	

CONSTRUCTION



Weight: 3.3kg

NOMINAL DIAMETER SELECTION CHART (for Steam)



Example 1:
Primary pressure: 0.4MPa (saturated steam)
Secondary pressure: 0.2MPa
Flow: 80 kg/h
At the above conditions, the nominal diameter should be size 20 mm.
At the same conditions and at 200℃, the nominal diameter is also size 20 mm.

Example 2:
Primary pressure: 1.0MPa (saturated steam)
Secondary pressure: 0.05MPa
Flow: 250 kg/h
At the above conditions, the nominal diameter should be size 25 mm.

RD-40, 41, 41F Type Pressure Reducing Valve (for Steam)

for Food processing, Medical Devices, Laundry Machines and other Steam Equipments/Devices

Compact, light-duty, direct operated pressure reducing valve, ideal for integration into a variety of equipments for precise steam control.

Most suitable for food processing equipments, kitchen equipments, medical devices, laundry machines, air-conditioning (humidifying) equipments, and other equipments /devices that are required to be rust free.

For high-grade steam lines, a valve with stainless steel body is most suitable.

RD-40, 41 Type

RD-41F Type

FEATURES

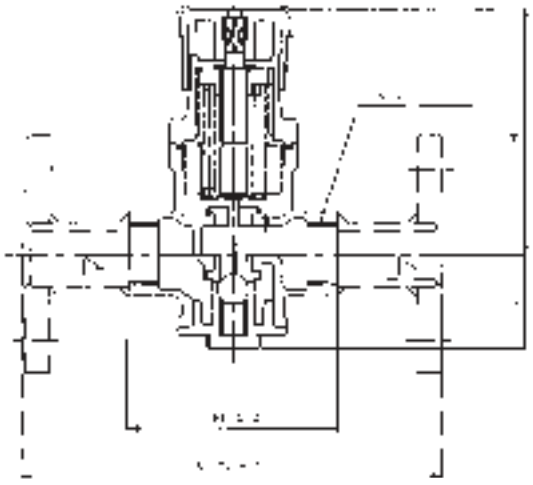
- Ensure large flow (heat) necessary for starting up machines.
- The stainless steel/bronze body and stainless steel disc & seat ensure supply of clean steam.
- Precise adjustment of secondary pressure with manual handle with automatic lock mechanism.
- Stainless steel bellows and embedded strainer (80 mesh) allow high durability.

SPECIFICATIONS

Body material		Cast bronze, Screwed	Stainless steel, Screwed	Stainless steel, Flanged
Model name		RD-40 L/M/H	RD-41 L/M/H	RD-41F L/M/H
Code name		RD40-J ☐	RD41-D ☐	RD41F-D ☐
		※L, M or H for adjustable secondary pressure is required in ☐.		
Applicable fluid		Steam		
Applicable primary pressure		Max. 1.0MPa*		
Adjustable secondary pressure (Color of name plate and spring)		L:0.02~0.25MPa (Green) M:0.2~0.4MPa (Blue) H:0.35~0.8MPa (Red)		
Maximum reducing rate		20:1		
Minimum pressure differential across the disc		0.02MPa		
Lock up pressure		Max.0.02MPa		
Offset pressure at rated flow		Within set pressure 0.5 (Adjustable secondary pressure: Max. 0.13MPa) Within 0.07MPa (Adjustable secondary pressure: 0.13MPa~0.4MPa) Within 0.12MPa (Adjustable secondary pressure: 0.4MPa~0.8MPa)		
Leakage allowance		Less than 0.05% of rated flow		
Applicable temperature		Max. 220 ℃		
End connection		Screwed JIS Rc		Flanged JIS 10KRF
Materials	Body	Cast bronze	Stainless steel	Stainless steel
	Trim	Disc & seat (Stainless steel), Bellow (Stainless steel)		
Valve body pressure test		Hydraulic 1.5MPa		

*Applicable primary pressure 1.6MPa is also available upon your request.

CONSTRUCTION



The structure of the flange-type of welded part may be different from what is shown in the drawing.

DIMENSIONS (mm)

Size	d	L_1	L_2	G	H
15(½″)	½″	83	186	55	128
20(¾″)	¾″	96	190	55	128
25(1″)	1″	108	190	55	128

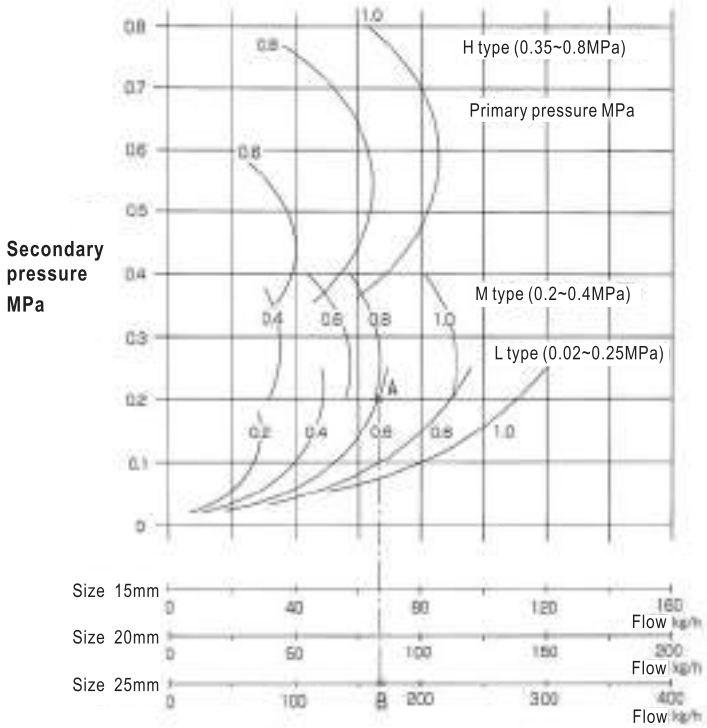
MASS (kg)

Size	RD-40 Type	RD-41 Type	RD-41F Type
15(½″)	1.7	2	3.8
20(¾″)	1.7	2	4
25(1″)	1.9	2.4	5.5

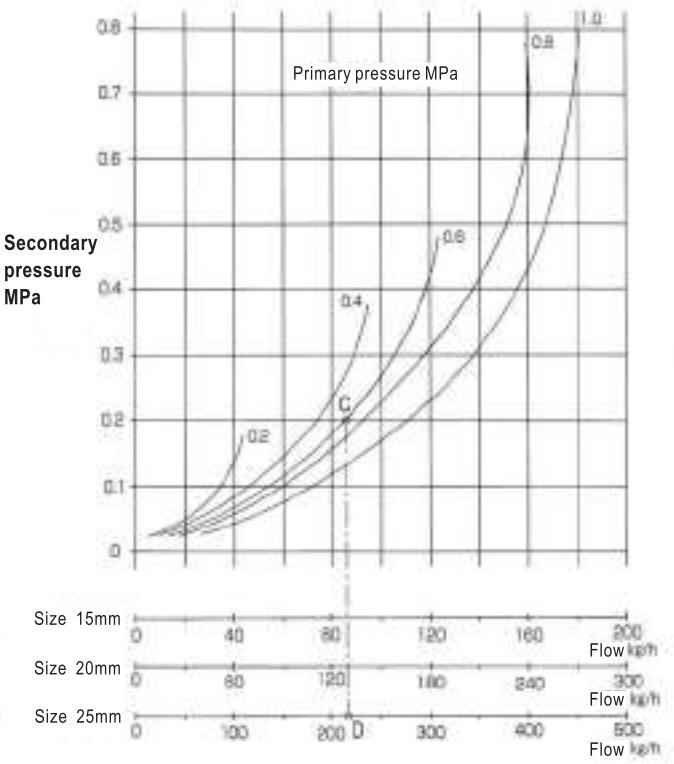
DATA/RD-40, 41, 41F Type Pressure Reducing Valve (for Steam)

NOMINAL DIAMETER SELECTION CHART (For saturated steam)

[Rate Flow Chart]



[Open Flow Chart]



● Offset pressure of rated flow (MPa)

Set pressure	Offset pressure
0.13 or less	Set pressure within 0.5
Over 0.13~0.4	Within 0.07
Over 0.4~0.8	Within 0.12

Opening flow

Opening flow is the full opening flow of the stop valve at the secondary side when the diameter of the secondary piping is the same as that of pressure reducing valve.

Note: At opening flow, the secondary pressure reduces significantly.

HOW TO USE THE CHART

Example (conditions):
Primary pressure:0.6MPa
Secondary pressure:0.2MPa
Saturated steam: 100kg/h

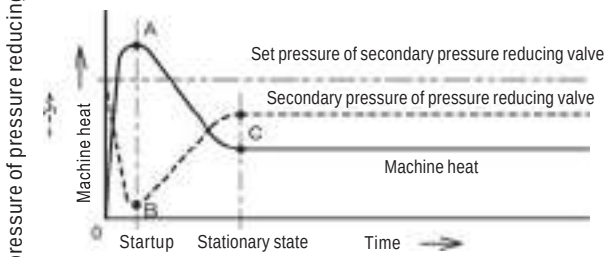
Generally, the nominal diameter can be decided using the Rated Flow Chart.

- Find out the intersection point A between primary pressure 0.6MPa and secondary pressure 0.2MPa.
- Draw a vertical line from point A. The line intersects with the flow 100kg/h line. From the intersection pint B, we can find the desired nominal diameter, or size, i.e. 25mm.

To decide the flow necessary for starting up a machine, use the Open Flow Chart.

- Under the same pressure condition above mentioned, the open flow of size 25mm valve can be determined using intersection points C and D. In this case, the open flow is 215kg/h.

Machine heat and the secondary pressure of pressure reducing valve



A: Maximum heat at startup (the point of flow when pressure reducing valve opens)
B: Minimum secondary pressure of pressure reducing valve (the time when pressure reducing valve opens)
C: The point when machine heat and the secondary pressure of pressure reducing valve become stable.

RD-30 Type Pressure Reducing Valve (for Steam)

for Building Equipments, Factory Equipments etc. General-purpose direct acting valves (small/medium capacity)

Direct operated pressure reducing valve with diaphragm made of special synthesized rubber. Suitable for a variety of applications from small to large flow for piping lines, steam equipments etc.

FEATURES

- Stable operation in small flow applications, which are not controllable using pilot-operated type, and large flow applications.
- Structure which is not influenced by foreign materials easily and easy maintenance.

SPECIFICATIONS

Model name	RD-30	
Code name	RD30-GL	RD30-GH
Applicable fluid	Steam	
Applicable primary pressure	Max. 1.0MPa	
Adjustable secondary pressure	0.02~0.2MPa	0.15~0.4MPa
Maximum reducing rate	20:1	
Minimum pressure differential across the disc	0.02MPa	
Lock up pressure	Max. 0.02MPa	
Offset pressure	Within 0.045MPa However in cass of Set pressure at 0.08MPa or less: Set pressure 0.5 or less	Within 0.06MPa
Minimum adjustable flow	2~5kg/h	
Leakage allowance	Less than 0.05% of rated flow	
Applicable temperature	Max. 184℃	
End connection	Screwed JIS Rc	
Materials	Body (Cast iron),Disc & seat (Stainless steel), Diaphragm (Synthetic rubber)	
Valve body pressure test	Hydraulic 1.5MPa	

DIMENSIONS

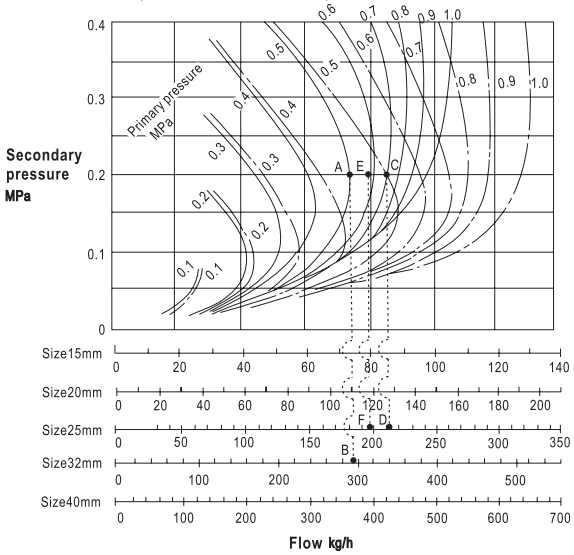
(mm)

Size	d	L	G	H	Mass (kg)
15(½″)	½″	110	57	207	5.5
20(¾″)	¾″	110	57	207	5.5
25(1″)	1″	120	63	223	7
32(1¼″)	1¼″	150	78	278	14
40(1½″)	1½″	150	78	278	14

CONSTRUCTION

NOMINAL DIAMETER SELECTION CHART (For saturated steam)

Example (conditions):
- Primary pressure: 0.5MPa
- Secondary pressure: 0.2MPa
- Saturated steam: 205kg/h



How to use the chart

The flow increases when selecting a larger diameter for the secondary piping.

❶ Secondary piping diameter

Types of primary pressure line

Solid line (————): The secondary piping diameter is the same as that of pressure reducing valve.

Dashed line (— · —): The secondary piping diameter is 2 sizes larger than that of pressure reducing valve.

❷ The secondary piping diameter is the same as that of pressure reducing valve

① Find out the intersection point A between primary pressure 0.5MPa line (solid line) and secondary pressure 0.2MPa line.

② Draw a vertical line from point A until the line intersects with the flow 205kg/h line. From the intersection point B, it is able to determine the nominal diameter, which is size 32mm in this case.

❸ The secondary piping diameter is 2 sizes larger than that of pressure reducing valve

① Find out the intersection point C between primary pressure 0.5MPa line (dash line) and secondary pressure 0.2MPa line.

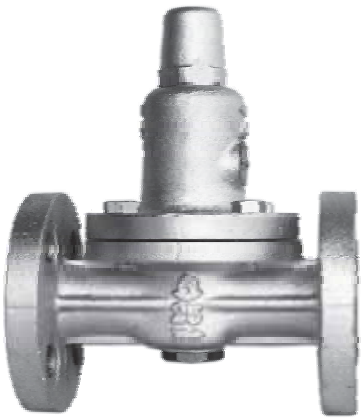
② Draw a vertical line from point C until the line intersects with the flow 205kg/h line. From the intersection point D, it is able to determine the nominal diameter, which is size 25mm (size 40mm for the secondary piping diameter).

- In the above example, the flow at point D is 213kg/h, which is larger than the necessary flow (205kg/h). It is necessary to check whether the necessary flow can be satisfied when the secondary piping diameter is 1 size larger. When the secondary piping diameter is 1 size larger, draw a vertical line from point E (the median point between points A and C) until it intersects with the nominal diameter size 25mm line. From the intersection point F, it is able to find out the flow 196kg/h, which is insufficient in this case.

RD-3H Type Series Pressure Reducing Valve (for Steam or Gases, Liquids)

Direct operated pressure reducing valves with good pressure control, wide range of pressure adjustment, and disc & seat Stainless steel (for steam). Suitable for small flow applications that are not controllable using pilot-operating valves. RD-3H and RD-3HF are for steam use. RD-3HA and RD-3HAF are for air and gases.

RD-3H, 3HA Type



RD-3HF, 3HAF Type

SPECIFICATIONS

Model name		RD-3H	RD-3HF	RD-3HA	RD-3HAF
Code name		RD3H-GH	RD3HF-GH	RD3HA-BH	RD3HAF-BH
End connection		Screwed JIS Rc	Flanged JIS 10KRF	Screwed JIS Rc	Flanged JIS 10KRF
Applicable fluid		Steam		Air, gases & liquids	
Applicable primary pressure		Max. 1.0MPa			
Adjustable secondary pressure		0.035~0.5MPa*1.			
Maximum reducing rate		15:1			
Minimum pressure differential across the disc		0.02MPa			
Lock up pressure		Max. 0.02MPa			
Leakage allowance		Less then 0.05% of rated flow		Nil(Confirm at Pressure Gauge)	
Fluid viscosity		—		Max. 150cSt	
Applicable temperature		Max. 184℃*2		5~80℃	
Materials	Body & seat ring	Body(Cast iron),Seat ring(Stainless steel)			
	Disc	Stainless steel		Brass with Synthetic rubber heat treatment*3	
Valve body pressure test		Hydraulic 1.5MPa			

*1. Adjustable secondary pressure 0.02~0.1MPa is available upon request.
*2. Applicable temperature Max. 220℃ is available upon your request.
*3. Disc with Stainless steel・Synthetic rubber by heat treatment is also avaiable upon you request.

DIMENSIONS

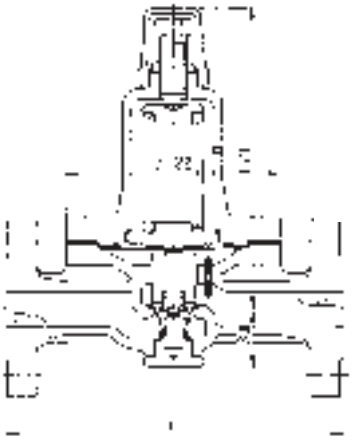
(mm)

Size	Cv value	RD-3H, 3HA Type		RD-3HF, 3HAF Type	
		d	Mass(kg)	L	Mass(kg)
15(½″)	0.8	½″	4.1	186	5.7
20(¾″)	0.8	¾″	4.1	190	6.1
25(1″)	1	1″	4.2	190	7.2

CONSTRUCTION

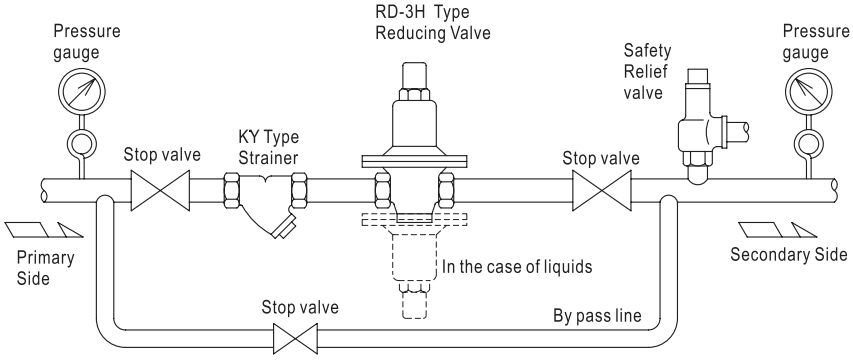
RD-3H Type

RD-3HF Type



RD-3HA Type
RD-3HAF Type

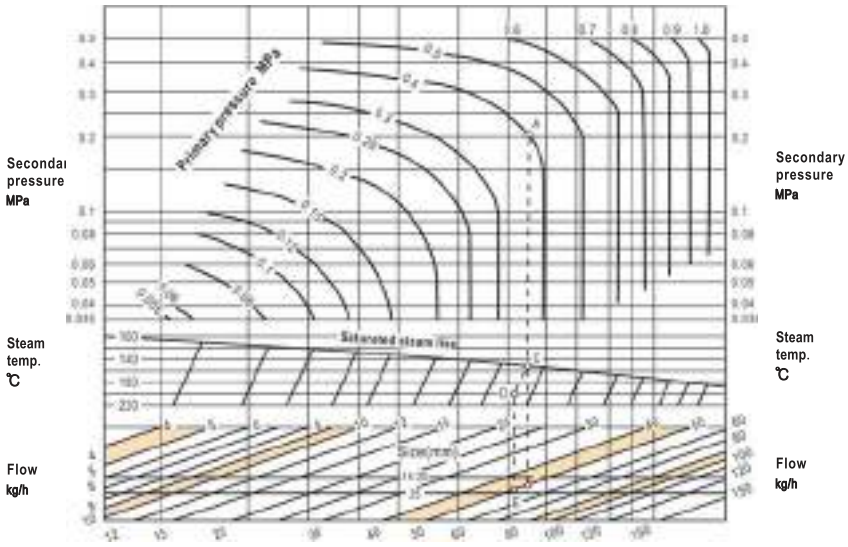
PIPING EXAMPLE



※In the case of liquid, turn upside down.

DATA/RD-3H Type Series Pressure Reducing Valve (for Steam or Gases, Liquids)

RD-3H, 3HF TYPE NOMINAL DIAMETER SELECTION CHART (for Steam)



● HOW TO USE THE CHART

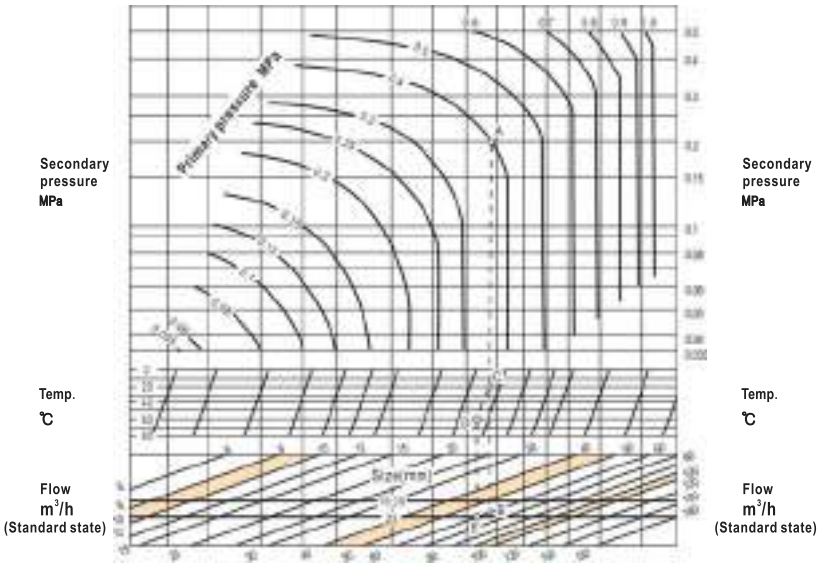
This example shows you how to decide nominal diameter of valve at the following conditions: primary pressure 0.4MPa, secondary pressure 0.2MPa, flow of saturated steam 50 kg/h.

First, find out the intersection point A of primary pressure curve 0.4MPa and secondary pressure curve 0.2MPa.

Draw a vertical line from point A. This line intersects with flow curve 50kg/h. The intersection point is B. Since B is located between a nominal diameter range of 15/20mm and 25mm. The larger value, which is 25mm is taken as the nominal diameter that we are looking for.Now let's find out the nominal diameter at an additional.

Condition: the temperature is 200℃. Draw a vertical from point A until it intersects with the saturated steam curve. The intersection point is named C. Now move from point C to temperature curve 200℃ paraallelly and we can stop at point D. Draw a vertical line from point D until it intersects with flow curve 50kg/h. the intersection point is named E. Since point E is located between a nominal diameter range of 15/20mm and 25mm. The larger value, which is 25mm is taken as the nominal diameter that we are looking for.

RD-3HA, 3HAF TYPE NOMINAL DIAMETER SELECTION CHART (for Air)



● HOW TO USE THE CHART

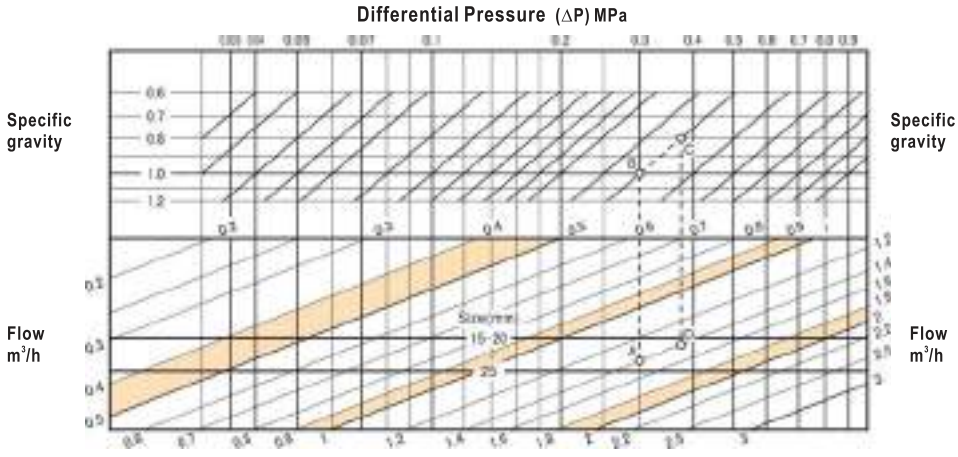
Example: Find out the nominal diameter meeting the following conditions: Primary pressure: 0.4MPa, Secondary pressure: 0.2MPa, Temperature: 20℃, Flow: 60m³/h

First, find out the intersection point A of primary pressure curve 0.4MPa and secondary pressure curve 0.2MPa.

Draw a vertical line from point A. This line intersects with flow curve 60m³/h. The intersection point is B. Since B is located between a nominal diameter range of 15/20mm and 25mm. The larger value, which is 25mm is taken as the nominal diameter that we are looking for. Now let's find out the nominal diameter at an additional.

Condition: the temperature is 60℃. Draw a vertical from point A until it intersects with the saturated steam curve. The intersection point is named C. Now move from point C to temperature curve 20℃ paraallelly and we can stop at point D. Draw a vertical line from point D until it intersects with flow curve 60m³/h. the intersection point is named E. Since point E is located between a nominal diameter range of 15/20mm and 25mm. The larger value, which is 25mm is taken as the nominal diameter that we are looking for.(Note: the flow is standard flow)

RD-3HA, 3HAF TYPE NOMINAL DIAMETER SELECTION CHART (for Liquids)



● HOW TO USE THE CHART

Example: Find out the nominal diameter meeting the following conditions: Primary pressure: 0.5MPa, Secondary pressure: 0.2MPa, Specific gravity: 1 (water), Flow: 1.4m³/h, Differential pressure (ΔP): 0.5−0.2=0.3MPa

Find out the intersection point A between the 0.3MPa differential pressure (ΔP) line and the 1.4m³/h flow line. Since point A is between the lines representing nominal diameter 15/20mm and 25mm, the nominal diameter should be the larger one, i.e. 25mm.

In the case other conditions remain the same but the specific gravity is 0.8, find out the intersection point B between the 0.3MPa differential pressure (ΔP) line and the 1.0 specific gravity line. Move from point B on the 0.8 specific gravity line parallelly to reach point C. Now draw a vertical line from point C until it intersects with the 1.4m³/h flow line. The intersection point is named D. since point D is located between the lines representing nominal diameter 15/20mm and 25mm, the nominal diameter should be the larger one, i.e. 25mm.

RD-29A, 29B Type Pressure Reducing Valve (for Low Pressure Gases)

Direct operated pressure reducing valves for low pressure applications in chemical and steel plants. With embedded dual detecting devices, it is not necessary to install detecting pipes. In addition, these valves allow small pressure control with different differential pressures.

FEATURES

- Maximum reducing rate 300:1. (e.g. reduce pressure from 300kPa to 1kPa)
- No leakage through disc and seat ring due to single seat valve.
- Most suitable pressure balance construction must be selected depending on fluid.

SPECIFICATIONS

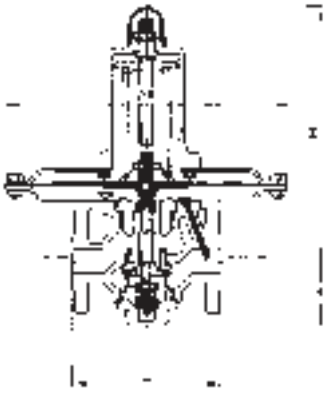
Model name	RD-29A	RD-29B
Code name	RD29A-G☐	RD29B-G☐
	※L,M or H for adjustable secondary pressure isrequiredin ☐.	
Applicable fluid	Air, N_2 gas & non-corrosive gases	Coke oven gas & containing tar
Applicable primary pressure	Max. 300kPa	
Adjustable secondary pressure	L:1~3kPa (Offset, Within 0.9kPa), M:3~10kPa (Offset, Within 1.5kPa), H:10~30kPa (Offset, Within 4.5kPa)	
Maximum reducing rate	300:1	
Minimum pressure differential across the disc	2kPa	
Lock up pressure	Max. 2kPa	
Applicable temperature	5~60℃	
Minimum adjustable flow	2~5m^3/h (Standard condition)	
Leakage allowance	Nil (Confirm at Pressure Gauge)	
End connection	Flanged JIS 10KRF	
Materials	Body (Cast iron),Disc & seat ring(Stainless steel), Diaphragm & disc tip(Synthetic rubber)	
Valve body pressure test	Hydraulic 1.5MPa(Excluding actuator)	
Airtight test	Primary side:300kPa Secondary side:	

Adjustable secondary pressure range	Airtight test
L:1-3kPa	5kPa
M:3-10kPa	12kPa
H:10-30kPa	32kPa

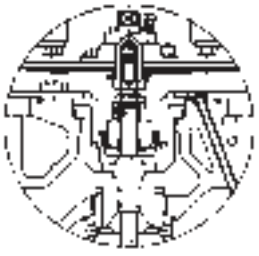
*Adding of pressure exceeding hydraulic test and airtight test pressure may damage the pressure reducing valve.

CONSTRUCTION

RD-29A Type — O-ring sealed pressure balance construction



RD-29B Type — Bellophragm seal pressure balance construction



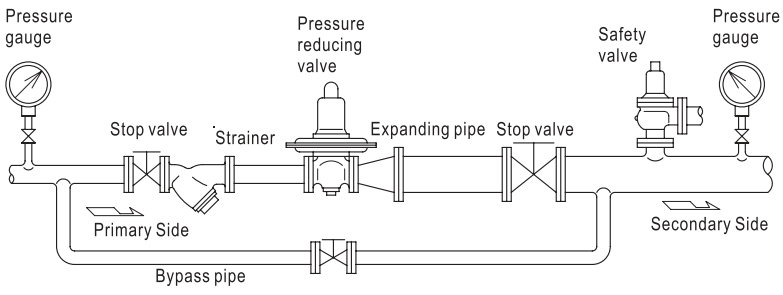
DIMENSIONS

(mm)

Size	L	A	G	H	Mass (kg)
15(½″)	170	360	75	323	21
20(¾″)	170	360	75	323	22
25(1″)	170	360	75	323	22
32(1¼″)	190	360	85	333	27
40(1½″)	190	360	85	333	27
50(2″)	240	360	95	343	32

Flange code JIS 10KRF

PIPING EXAMPLE



DATA/RD-29A, 29B Type Pressure Reducing Valve (for Low Pressure Gases)

NOMINAL DIAMETER SELECTION CHART (for Air)

This nominal diameter selecting chart is based on air (20℃).
For other gases, convert them into air.

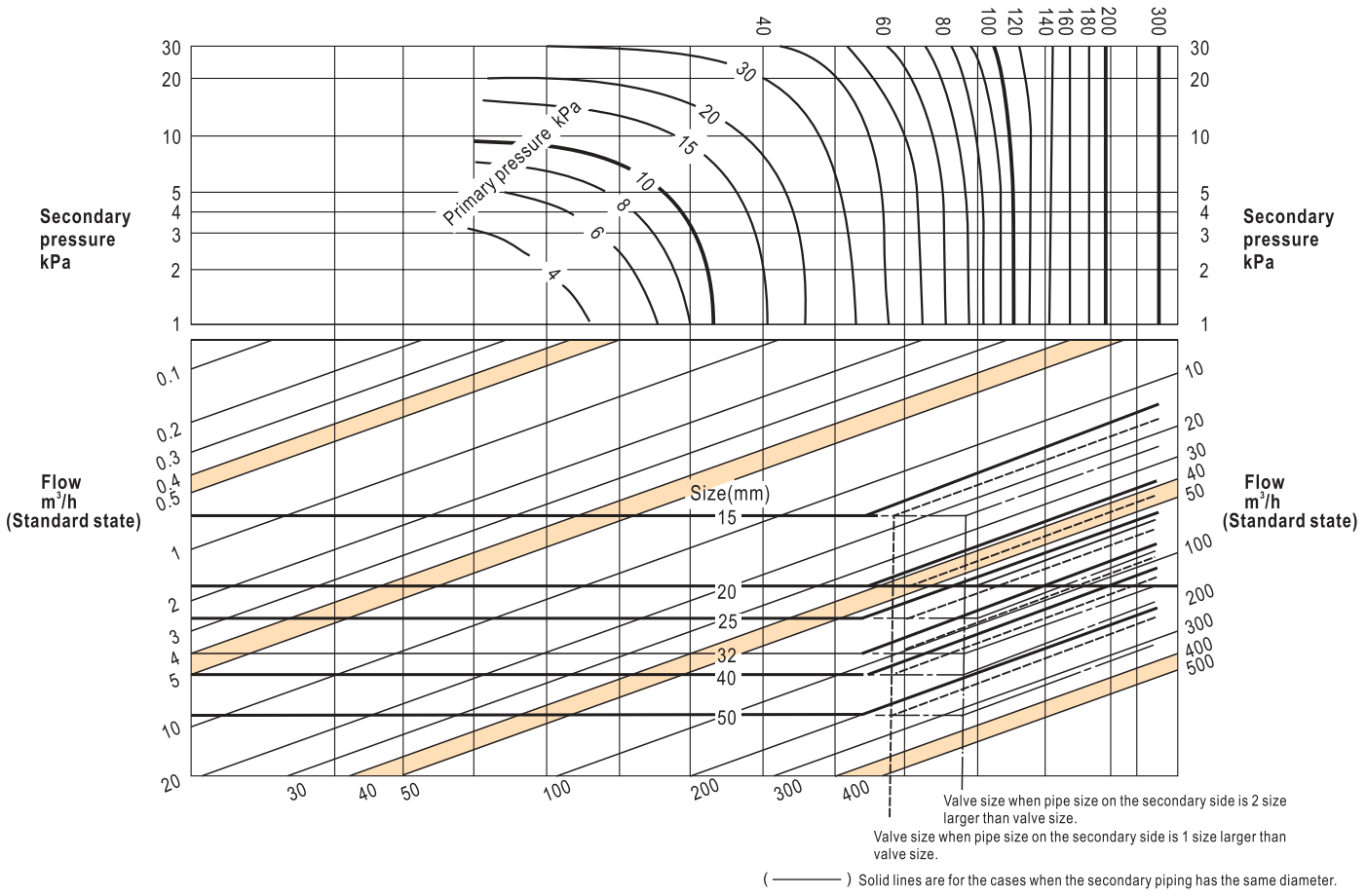
Gases other than air →Convert into air
Flow of gas ×Conversion factor = Flow of air

■ CONVERSION FACTOR

(Temperature : 5 to 60℃)

Fluid name	Gas constant R(J/kg·K)	Conversion
Dry air	287.03	1.000
Nitrogen gas	296.80	0.983
Methane	518.27	0.744
City gas (13A)	437.67	0.810
Coke oven gas	813.60	0.587

*In the above table, conversion factors are obtained from gas constants. Therefore, for coke oven and city gases,pay attention that their components, and gas constants vary in districts.



● How to use the chart

Example: find out the nominal diameter meeting the following conditions.
Fluid: air
Primary pressure: 200kPa
Secondary pressure: 2kPa
Temperature: 20℃
Flow: 120m³/h (standard state)

1) First, find out the intersection point A of primary pressure curve 200kPa and secondary pressure curve 2kPa.
2) Draw a vertical line from point A. This line intersects with flow curve 120m³/h. The intersection point is B.
3) When the secondary piping diameter is the same as that of pressure reducing valve, the nominal diameter line is a solid line (———). Since point B is between size 40mm and size 50mm lines, the larger one, which is size 50mm, is selected.
4) When the secondary piping diameter is 1 size larger than the diameter of pressure reducing valve, the nominal diameter line is a dashed line(- - - - - -). Since point B is between size 32mm and size 40mm lines, the larger one, which is size 40mm, is selected as the nominal diameter. The secondary piping diameter, which is 1 size larger than the diameter of pressure reducing valve, is thus size 50mm.
5) When the secondary piping diameter is 1 size larger than the diameter of pressure reducing valve, the nominal diameter line is a dotted and dashed line (—— · ——).Since point B is between size 25mm and size 32mm lines, the larger one, which is size 32mm, is selected as the nominal diameter. The secondary piping diameter, which is 2 size larger than the diameter of pressure reducing valve, is thus size 50mm.

● The rated flow of pressure reducing valve depends on pressure condition. In this chart, the flows at the intersection points of nominal diameter lines are the rated flows of pressure reducing valve at relevant pressure conditions.
The flow of gases other than air can be calculated by converting air flow.
Air flow/Conversion factor = Flow of gas

2 PRESSURE REDUCING VALVES [FOR WATER OR LIQUIDS]

VENN pressure reducing valves are manufactured based on our years of experience in this industry and advanced technology. The extensive lineup of our products can meet the needs of liquid or pressure applications in construction, factory, and a variety of other areas.

You can select the most suitable valve model, considering the various conditions of the application to use.

Model name	Size	Applicable fluid	Applicable pressure (MPa)		Materials		Page
			Primary side	Secondary side	Body	Disc & seat	
RD-31N	15~50 (½″~2″)	Water or hot water	Max. 1.0	0.05~0.7	Cast bronze	Cast bronze & Synthetic rubber	40
RD-31FN	25~50 (1″~2″)						
RD-33FN	65~150 (2½″~6″)						
RD-32N	15~50 (½″~2″)	Water or hot water	Max. 1.6	0.05~0.7	Cast bronze	Cast bronze & Synthetic rubber	41
RD-32FN	25~50 (1″~2″)						
RD-34FN	65~100 (2½″~4″)						
RD-35	25~40 (1″~1½″)	Water & liquids	Max. 1.0	0.05~0.7	Stainless steel	Stainless steel & Synthetic rubber	42
RD-35F	25~100 (1″~4″)						
RD-36	25~40 (1″~1½″)		Max. 1.6				
RD-36F	25~100 (1″~4″)						
RD-37	25~40 (1″~1½″)	Water & liquids	Max. 1.0	0.05~0.7	Stainless steel	Stainless steel & Synthetic rubber	43
RD-37F	25~50 (1″~2″)						
RD-38	25~40 (1″~1½″)		Max. 1.6				
RD-38F	25~50 (1″~2″)						
RD-44N	20 (¾″)	Water or hot water	Max. 1.0	0.05~0.3	Cast bronze	Synthetic rubber	47
RD-43N	15 20 (½″ ¾″)	Water or hot water	Max. 1.0	0.05~0.3			48
RD-47N	25 (1″)	Water or hot water	Max. 1.0	0.05~0.35			49
RD-14W	15~150 (½″~6″)	Water, hot water or air	Max. 1.0	0.05~0.7	Cast iron	Cast bronze & Synthetic rubber	50
RD-14H							
RD-14CN							
WVR-02	40~400 (1½″~16″)	Water	Max. 1.0 (Max. 1.6)	0.05~1.0	Cast iron or Ductile Cast iron	Cast bronze & Synthetic rubber	54
WVR-02CN	80~200 (3″~8″)						
RD-16	20~50 (¾″~2″)	Water & liquids	Max. 2.7	0.05~0.7	Cast steel	Stainless steel & Synthetic rubber	57
RD-17	20~150 (¾″~6″)	Water & liquids	Max. 3.0	0.7~1.4	Cast steel	Stainless steel & Synthetic rubber	58
RD-17A			Max. 2.7	0.2~0.7			
RD-7	10 15(⅜″ ½″)	Fuel oil	Max. 1.0	0.01~0.2	Cast iron	Brass & Viton O ring	60
RD-20	15~25 (½″~1″)	Liquids or air	Max. 2.0	0.02~0.5	Stainless steel	Stainless steel & Synthetic rubber	61
RD-20F							

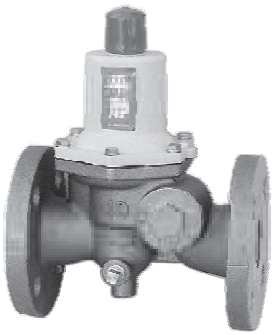
RD-31N, 31FN, 33FN Type Pressure Reducing Valve (for Water, Hot Water or Air)

for Building and Factory Equipments etc. Direct operation, general-purpose valves

(bronze body, medium capacity)

Bronze valves meeting the demand of the time.
Designed based on our technology for making quality pressure reducing valves, which are highly evaluated by our customers, these valves are more reliable, easier to control and use, and particularly, they do not allow rust in the entire piping line, including pipe joints. Using these pipes, you do not need to worry about the occurrence of the red water (rusty water). Ideal for applications in building, house, factory, and boiler and water supply equipments.

Screw Type



Flange Type

FEATURES

- Bronze body prevents occurrence of rusty water.
- Low noise design.
- 50% smaller, lighter than traditional cast iron products.
- No water leakage even if the diaphragm is broken.
- Flexible installation (except that the strainer cap face upwardly).
- Strainer embedded (40 meshes for nominal diameter less than size 50mm).

SPECIFICATIONS

Model name	RD-31N L/H	RD-31FN L/H	RD-33FN L/H
Code name	**RD31N-F□**	**RD31FN-F□**	**RD33FN-F□**
	※L (low press.) or H (high press.) for adjustable secondary pressure is required in □.		
Size	15~50(½″~2″)	25~50(1″~2″)	65~150(2½″~6″)
End connection	Screwed JIS Rc	Flanged JIS 10KFF	
Applicable primary pressure	Max. 1.0MPa		
Applicable fluid	Water, hot water, air*2 & non-corrosive gases*2		
Applicable temperature	5~90℃		
Adjustable secondary pressure	Size 15~100mm L:0.05~0.35MPa, H:0.3~0.7MPa Size 125~150mm L:0.05~0.35MPa, H:0.3~0.5MPa		
Maximum reducing rate	10:1		
Minimum pressure differential across the disc	0.05MPa		
Leakage allowance	Nil(Confirm at pressure Gauge)		
Valve body pressure test	Hydraulic 1.75MPa		
Materials	Body(Cast bronze), Trim(Cast bronze), Diaphragm & disc(Synthetic rubber) Spring case(Size 25~50mm:Cast zinc, Size 65~150mm:Cast iron)		

*1. Valves with pressure gauge is also available upon your request.(Secondary side)
*2. Size 100mm or smaller can be used in non-corrosive gases line.

DIMENSIONS (RD-31N Type)

(mm)

Size	d	L	G	H	A	Mass (kg)
15(½″)	½″	125	41	140	100	2.2
20(¾″)	¾″	130	41	140	100	2.3
25(1″)	1″	145	41	141	100	2.6
32(1¼″)	1¼″	175	50	187	116	4.9
40(1½″)	1½″	180	50	187	116	5.1
50(2″)	2″	205	50	206	142	7.5

DIMENSIONS (RD-31FN, 33FN Type)

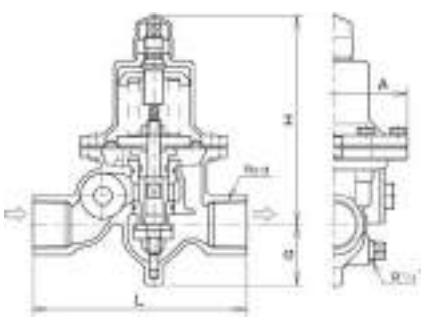
(mm)

Size	L	G	H	A	Mass(kg)
25(1″)	170	41	141	100	5.3
32(1¼″)	190	50	187	116	8.3
40(1½″)	190	50	187	116	8.6
50(2″)	215	50	206	142	12
65(2½″)	215	70	280	162	22
80(3″)	230	70	285	162	22
100(4″)	260	78	345	201	35
125(5″)	330	105	490	250	63.5
150(6″)	400	130	660	340	126

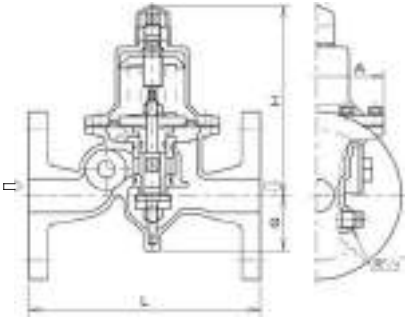
Flange code JIS 10KFF

CONSTRUCTION

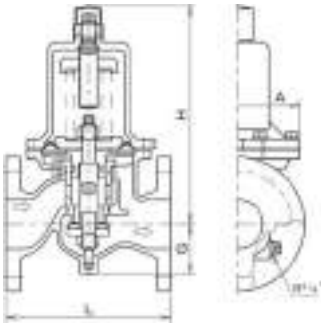
RD-31N Type



RD-31FN Type



RD-33FN Type



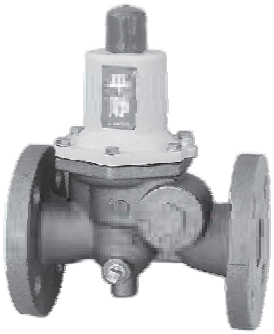
RD-32N, 32FN, 34FN Type Pressure Reducing Valve (for Water or Hot Water)

for Building and Factory Equipments etc. Direct operation, general-purpose valves

(bronze body, medium capacity)

Bronze valves meeting the demand of the time.
Designed based on our technology for making quality pressure reducing valves, which are highly evaluated by our customers, these valves are more reliable, easier to control and use, and particularly, they do not allow rust in the entire piping line, including pipe joints. Using these pipes, you do not need to worry about the occurrence of the red water (rusty water). Ideal for applications in building, house, factory, and boiler and water supply equipments.

Screw Type



Flange Type

FEATURES

- Bronze body prevents occurrence of rusty water.
- Low noise design.
- 50% smaller, lighter than traditional cast iron products.
- No water leakage even if the diaphragm is broken.
- Flexible installation (except that the strainer cap face upwardly).
- Strainer embedded (40 meshes for nominal diameter less than size 50mm).

SPECIFICATIONS

Model name	RD-32N L/H	RD-32FN L/H	RD-34FN L/H
Code name	**RD32N-F☐**	**RD32FN-F☐**	**RD34FN-F☐**
	※L (low press.) or H (high press.) for adjustable secondary pressure is required in ☐.		
Size	15~50(½″~2″)	25~50(1″~2″)	65~100(2½″~4″)
End connection	Screwed JIS Rc	Flanged JIS 16KFF	
Applicable primary pressure	Max. 1.6MPa		
Applicable fluid	Water & hot water		
Applicable temperature	5~90℃		
Adjustable secondary pressure	**L:0.05~0.35MPa, H:0.3~0.7MPa**		
Maximum reducing rate	10:1		
Minimum pressure differential across the disc	0.05MPa		
Leakage allowance	Nil(Confirm at pressure Gauge)		
Valve body pressure test	Hydraulic 2.4MPa		
Materials	Body(Cast bronze), Trim(Cast bronze), Diaphragm & disc(Synthetic rubber) Spring case(Size 25~50mm:Cast zinc, Size 65~100mm:Cast iron)		

* Valves with pressure gauge are also available upon your request.

DIMENSIONS(RD-32N Type)

(mm)

Size	D	L	G	H	A	Mass(kg)
15(½″)	½″	125	41	140	100	2.2
20(¾″)	¾″	130	41	140	100	2.3
25(1″)	1″	145	41	141	100	2.6
32(1¼″)	1¼″	175	50	187	116	4.9
40(1½″)	1½″	180	50	187	116	5.1
50(2″)	2″	205	50	206	142	7.5

DIMENSIONS(RD-32FN,34FN Type)

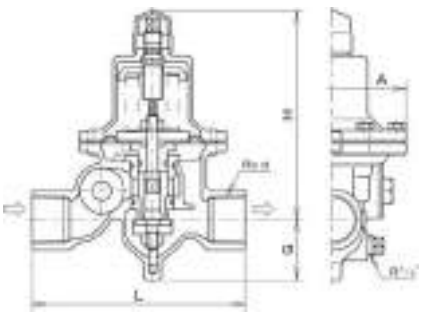
(mm)

Size	L	G	H	A	Mass(kg)
25(1″)	170	41	141	100	5.3
32(1¼″)	190	50	187	116	8.3
40(1½″)	190	50	187	116	8.6
50(2″)	230	50	206	142	12
65(2½″)	215	70	280	162	22
80(3″)	260	70	285	162	28.5
100(4″)	300	78	345	201	39

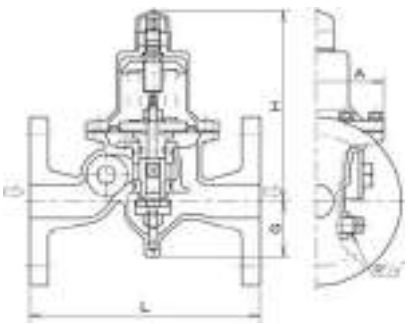
Flange code JIS 16KFF

CONSTRUCTION

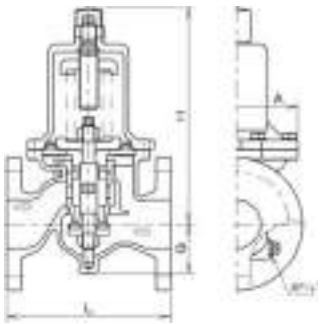
RD-32N Type



RD-32FN Type



RD-34FN Type

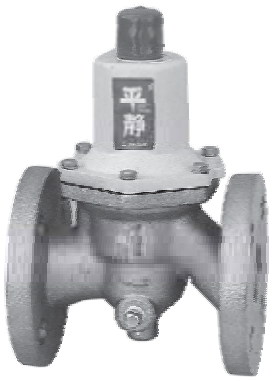


RD-35 ~ 36F Type Pressure Reducing Valve (for Water, Hot Water or Air)

Pressure reducing valves for water, with bronze body and disc & seat made of stainless steel.

High controllability, reliability, corrosion resistance. Suitable for applications in plants.

Screw Type



Flange Type

FEATURES

- The stainless steel valve body repels rusty water, and suitable for the usage in the stainless steel pipeline.
- Low noise design.
- 50% smaller, lighter than traditional cast iron.
- No water leakage even if the diaphragm is broken.
- Flexible installation.
- Allows direct installation of pressure gauge on the body (only for the secondary side).

SPECIFICATIONS

Type	For pressure of less than 1.0MPa		For pressure of less than 1.6MPa	
Model name	RD-35 L/H	RD-35F L/H	RD-36 L/H	RD-36F L/H
Code name	**RD35-D ☐**	**R35F-D ☐**	**RD36-D ☐**	**RD36F-D ☐**
	※ L (low press.) or H (high press.) for adjustable secondary pressure is required in ☐.			
Size	25~40(1″~1½″)	25~100(1″~4″)	25~40(1″~1½″)	25~100(1″~4″)
End connection	Screwed JIS Rc	Flanged JIS10KFF	Screwed JIS Rc	Flanged JIS16KFF
Applicable primary pressure	Max. 1.0MPa		Max. 1.6MPa	
Applicable fluid	Water, hot water, air & non-corrosive gases		Water & hot water	
Applicable temperature	5~90℃			
Adjustable secondary pressure	**L:0.05~0.35MPa, H:0.3~0.7MPa**			
Maximum reducing rate	10:1			
Minimum pressure differential across the disc	0.05MPa			
Leakage allowance	Nil (Confirm at Pressure Gauge)			
Valve body pressure test	Hydraulic 1.75MPa		Hydraulic 2.4MPa	
Materials	Body(Stainless steel), Trim(Stainless steel), Diaphragm & disc(Synthetic rubber) Spring case(Size 25~50mm:Cast zinc, Size 65~100mm:Cast iron)			

∗1. Valves with pressure gauge are also available.(Secondary side)
∗2. RD-35 and 35F Type with Max. 130℃ for cleaning steam in temporary use at beverage industry,etc. are available upon your request.

DIMENSIONS(RD-35, 36 Type)

(mm)

Size	d	L	G	H	A	Mass(kg)
25(1″)	1″	130	41	141	100	2.6
32(1¼″)	1¼″	150	50	187	116	4.8
40(1½″)	1½″	150	50	187	116	4.8

DIMENSIONS(RD-35F, 36F Type)

(mm)

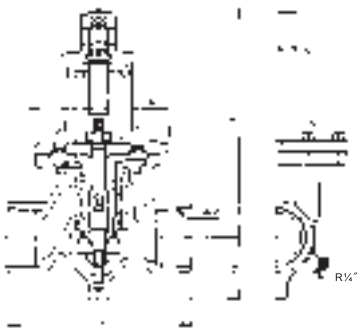
Size	d	L	G	H	A	Mass(kg)
25(1″)	¼″	160	41	141	100	5.1
32(1¼″)	¼″	160	50	187	116	7.2
40(1½″)	¼″	160	50	187	116	7.8
50(2″)	¼″	210	50	206	142	12
65(2½″)	⅜″	215	70	280	162	20
80(3″)	⅜″	260(264)	70	285	162	23(25)
100(4″)	⅜″	300(308)	78	345	201	36(40)

∗ Figures in ( ) are for RD-36F Type. Other Figures are common to all types.

Flange code JIS 10(16)KFF

CONSTRUCTION

RD-35, 36 Type



RD-35F, 36F Type

※ The structure of the valve may be different depending on sizes.

RD-37 ~38F Type Pressure Reducing Valve (for Water, Hot Water, Air or Medical Fluid)

Pressure reducing valves for water, with bronze body and disc & seat made of stainless steel.

High controllability, reliability, corrosion resistance. Suitable for applications in plants.

Screw type

Flange type

FEATURES

- Stainless steel spring and spring case. Suitable for medicinal solution.
- Low noise design.
- No water leakage even if the diaphragm is broken.
- Flexible installation.
- Allows direct installation of pressure gauge on the body (only for the secondary side).

SPECIFICATIONS

Type	For pressure of less than 1.0MPa		For pressure of less than 1.6MPa	
Model name	RD-37 L/H	RD-37F L/H	RD-38 L/H	RD-38F L/H
Code name	**RD37-D ☐**	**RD37F-D ☐**	**RD38-D ☐**	**RD38F-D ☐**
	※ L (low press.) or H (high press.) for adjustable secondary pressure is required in ☐.			
Size	25~40(1″~1½″)	25~50(1″~2″)	25~40(1″~1½″)	25~50(1″~2″)
End connection	Screwed JIS Rc	Flanged JIS10KFF	Screwed JIS Rc	Flanged JIS16KFF
Applicable primary pressure	Max. 1.0MPa		Max. 1.6MPa	
Applicable fluid	Water, hot water, air, non-corrosive gases & medical fluid		Water, hot water & medical fluid	
Applicable temperature	5~90℃			
Adjustable secondary pressure	**L:0.05~0.35MPa, H:0.3~0.7MPa**			
Maximum reducing rate	10:1			
Minimum pressure differential across the disc	0.05MPa			
Leakage allowance	Nil (Confirm at Pressure Gauge)			
Valve body pressure test	Hydraulic 1.75MPa		Hydraulic 2.4MPa	
Materials	Body(Stainless steel), Trims(Stainless steel) Diaphragm(Synthetic rubber), Spring case(Stainless steel)			

∗1. Valves with pressure gauge are also available upon your request.
∗2. RD-37 and 37F Type with Max. 130℃ for cleaning steam in temporary use at beverage industry, etc. are available upon your request.

DIMENSIONS (RD-37, 38 Type)

(mm)

Size	d	L	G	H	A	Mass(kg)
25(1″)	1″	130	41	195	100	3.7
32(1¼″)	1¼″	150	50	245	116	6.4
40(1½″)	1½″	150	50	245	116	6.4

DIMENSIONS(RD-37F, 38F Type)

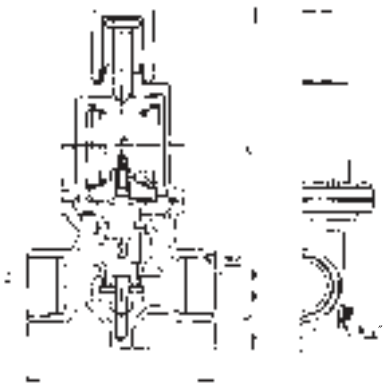
(mm)

Size	L	G	H	A	Mass(kg)
25(1″)	160	41	195	100	6.1
32(1¼″)	160	50	245	116	9.2
40(1½″)	160	50	245	116	9.4
50(2″)	210	50	320	142	15

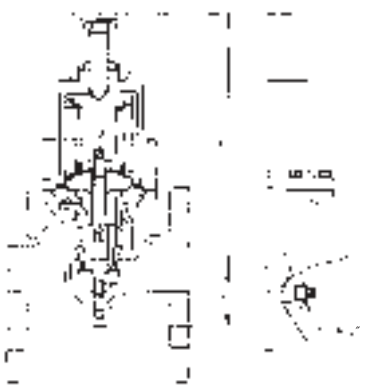
Flange code JIS 10(16)KFF

CONSTRUCTION

RD-37, 38 Type



RD-37F, 38F Type



※ The structure of the valve may be different depending on sizes.

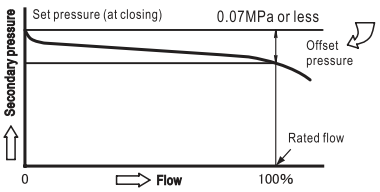
DATA/RD-31N ~ 38F Type Pressure Reducing Valve (for Water, Hot Water, Air or Liquids)

OFFSET PRESSURE CHARACTERISTIC

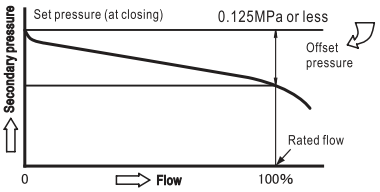
Offset pressure: The difference between secondary pressure and set pressure when flow increases from zero to rated flow but the primary pressure maintains the same.

(For details, see Flow Characteristics)

Spring range L : 0.05~0.35MPa



Spring range H:Size <100mm: 0.3~0.7MPa
Size 125mm, 150mm: 0.3~0.5MPa



RATED FLOW (Water and Liquids)

Pressure differential across the disc: More than 0.15MPa

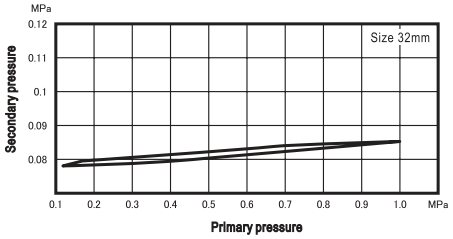
Size(mm)	15	20	25	32	40	50	65	80	100	125	150
Rated flow(l/min)	20	40	60	100	150	240	300	440	700	1200	1800

In case of pressure difference is less than 0.15MPa,the Rated flow will be calculated by 「 RatedFlow$\times\sqrt{\frac{\Delta P}{0.15}}$ 」

PRESSURE CHARACTERISTIC

Pressure characteristic shows the change of the secondary pressure when flow remains the same but the primary pressure changes. In the figure in the right, the secondary pressure is set to be 0.1MPa when flow is 0 and the primary pressure is 0.6MPa. It shows the change of the secondary pressure when the flow is 10% rated flow and the primary pressure changes from 0.6~0.15~1.0~0.6MPa.

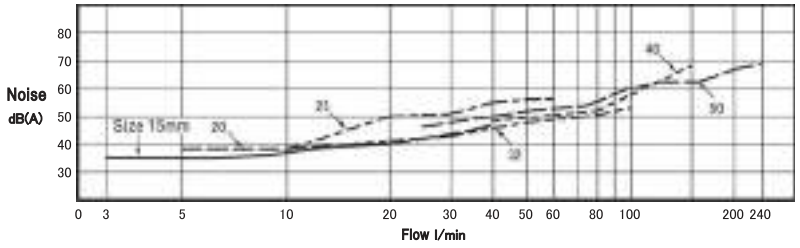
Change of the Secondary pressure = Set pressure×10% or less (minimum 0.02MPa)



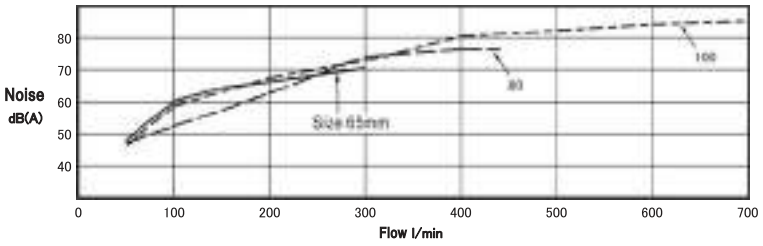
NOISE CHARACTERISTIC

Noise characteristic shows the noise at each different flow when the secondary pressure is set and the primary pressure maintains the same.

Size 15~50mm: Primary pressure 0.6MPa
Secondary pressure 0.2MPa



Size 65~100mm: Primary pressure 0.6MPa
Secondary pressure 0.2MPa



POINTS FOR INSTALLATION

- Install use bypass line.
- Use a globe valve for the stop valve on the bypass line.
- Install straight pipe before and after pressure reducing valve.
  The length of straight pipe depends on the state of pipe before and after valve. The length should be at least 10~20 times of nominal diameter (Minimum 500mm).
- Install pressure gauge at both the primary and secondary sides.
- Install safety relief valve at the secondary side.
  ① If not otherwise specified, the diameter of the safety relief valve should allow to blow out about 10% of the rated flow of pressure reducing valve.
  ② Set pressure table for safety relief valve is as follows.

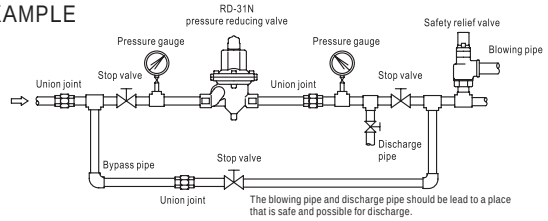
SET PRESSURE FOR TABLE SAFETY RELIEF VALVE

(MPa)

Set pressure of pressure reducing valve	Set pressure of safety valve
0.1or less	+0.05
0.1 or more and below 0.4	+0.08
0.4 or more and below 0.6	+0.12
0.6 or more and below 0.8	+0.15

Add the above value to set pressure of Pressure Reducing Valve.

PIPING EXAMPLE



Note: In the case of RD-33FN~38F type series pressure reducing valve without embedded strainer, it is necessary to install strainer at the primary side.

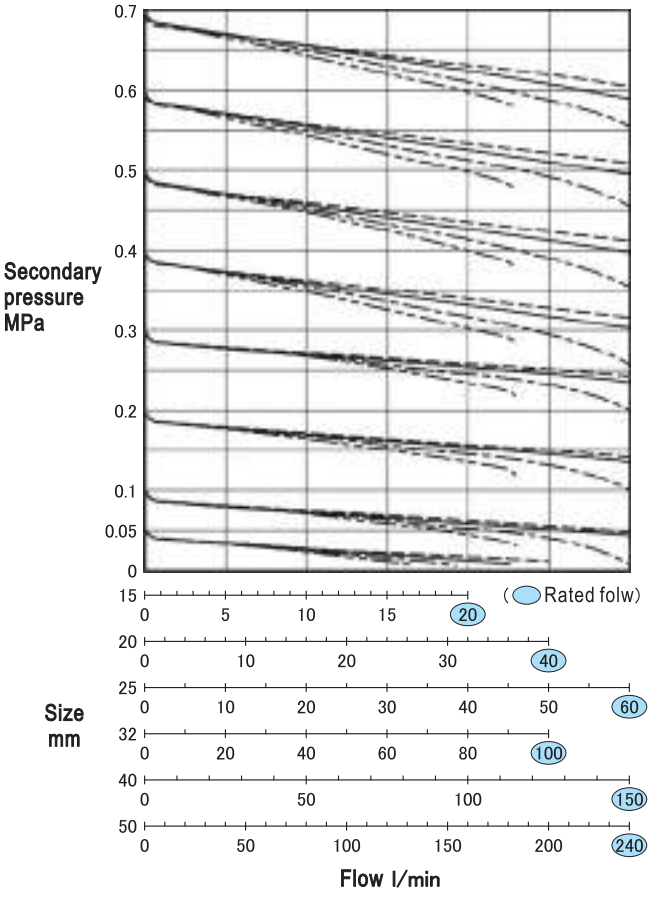
DATA/RD-31N ~ 38F Type Pressure Reducing Valve (for Water, Hot Water, or Liquids)

■ FLOW CHARACTERISTIC (for Liquids)

● Size 15~50mm

Primary pressure (P_1) MPa

- - - - - - - - - P_1=1.0~1.6MPa
(0.5MPa if the set pressure is 0.05MPa)
———— P_1= P_2+0.2MPa
——— - ——— P_1= P_2+0.1MPa
——— - - ——— P_1= P_2+0.05MPa
P_2: secondary set pressure (MPa)

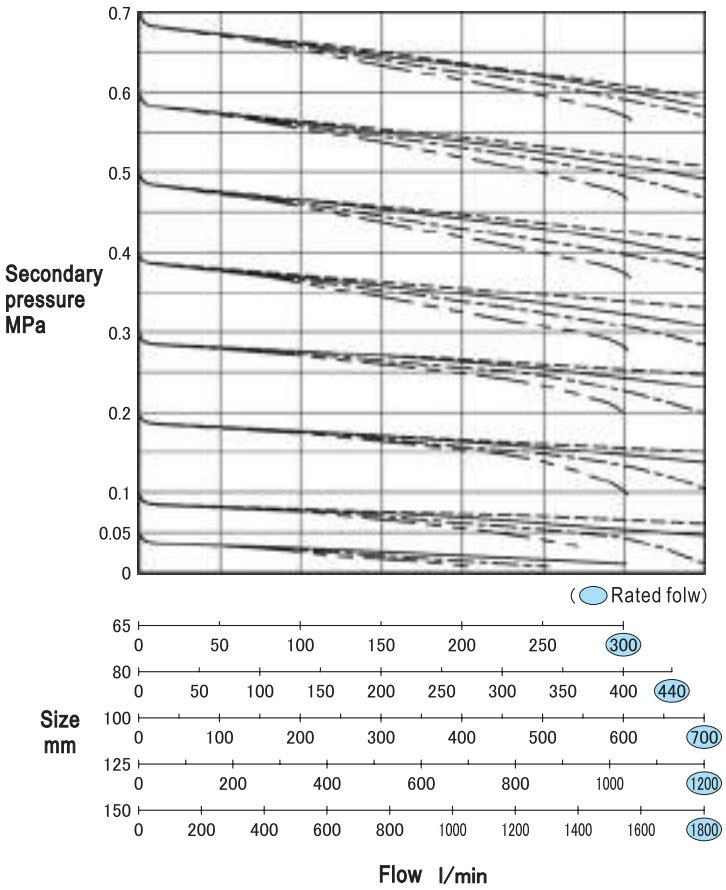


● Size 65~150mm

Primary pressure (P_1) MPa

- - - - - - - - - P_1=1.0~1.6MPa
(0.5MPa if the set pressure is 0.05MPa)
———— P_1= P_2+0.2MPa
——— - ——— P_1= P_2+0.1MPa
——— - - ——— P_1= P_2+0.05MPa
P_2: secondary set pressure (MPa)

Note: In the case of nominal diameter 125mm, 150mm, the secondary set pressure is Max. 0.5MPa.

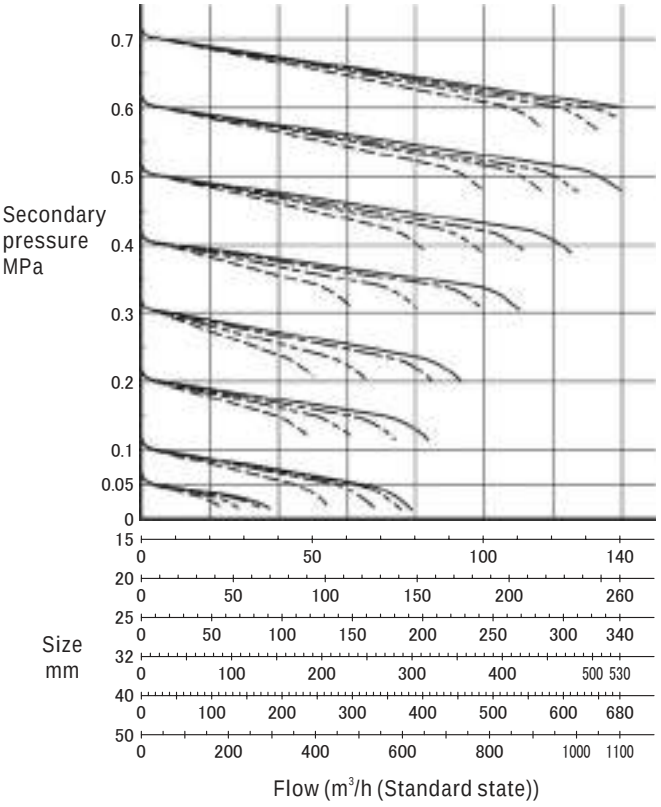


DATA/RD-31N ~ 38F Type Pressure Reducing Valve (for Water, Hot Water, Air or Liquids)

■ FLOW CHARACTERISTIC (for air and non-corrosive gasses)

Primary pressure

——————— set pressure plus 0.3MPa or lager
——— · ——— set pressure plus 0.2MPa
——— - - ——— set pressure plus 0.1MPa
- - - - - - - - - set pressure plus 0.05MPa



- This flow characteristic is based on air (standard state).
- For gas with specific gravity G, convert the flow into the flow of air.

Converted flow = flow of gas $\sqrt{G}$

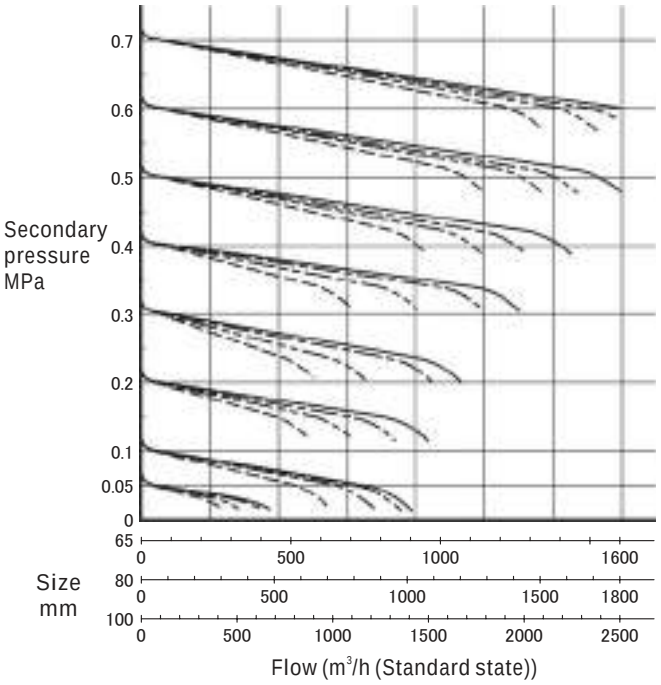
= flow of gas $\sqrt{\frac{M}{28.96}}$

G: specific gravity (air=1)
M: molecular weight of gas .

(M: See page 264 for molecular weight of gas)

Primary pressure

——————— set pressure plus 0.3MPa or lager
——— · ——— set pressure plus 0.2MPa
——— - - ——— set pressure plus 0.1MPa
- - - - - - - - - set pressure plus 0.05MPa



RD-44N Type Pressure Reducing Valve (for Water or Hot Water)

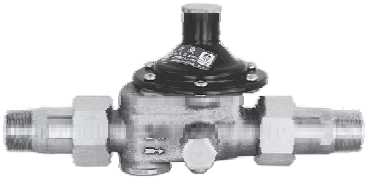
for Apartments, Hotels, Office Buildings, etc. Direct operation, general-purpose valve

(low noise type)

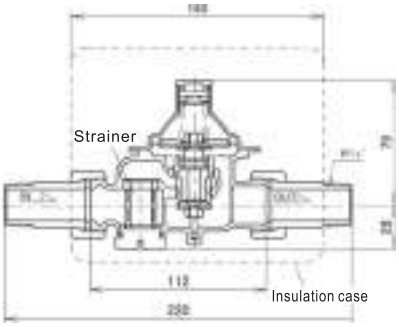
RD-44N type has the basic pressure reducing function of the combination pressure reducing valve series for separate house water supply. It can help improving construction and test efficiency.

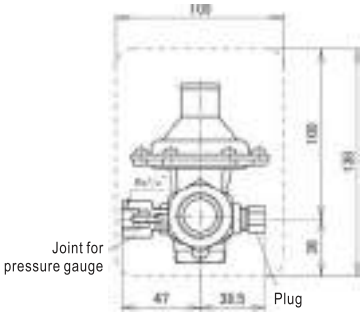
Benefits of pressure reducing valve for separate house water supply:

1. Reduce noise of water flow.
2. By installing pressure reducing valve on each floor, it is able to eliminate the difference of water pressure between the floors.
3. Appropriate pressure reduces water jump and water hammer.
4. No influence to other rooms when water supply is cut off for maintenance purpose.
5. Stable mixing temperature and improved housing conditions.



CONSTRUCTION





Weight:1.4kg

FEATURES

- Chlorine water resistant rubber for permanent reliability.
- Hygiene structure allows no “dead water”.
- Reliable performance at low or high differential pressure conditions.
- Reliable installation, not necessary to dissemble pressure reducing valve.
- Allows water pressure test with valves installed.
- New “test gag” for easy testing.

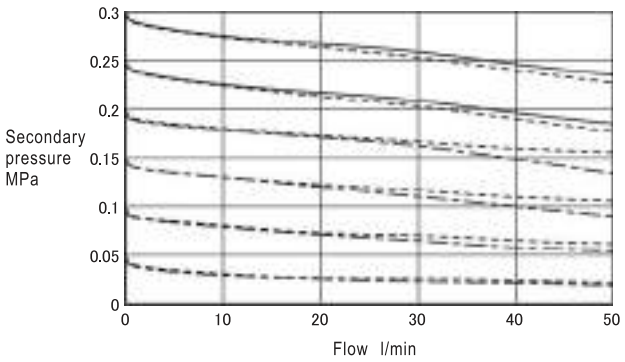
SPECIFICATIONS

Model name	RD-44NLP	RD-44NMP	RD-44NHP
Code name	RD44N-FLPL1	RD44N-FMPL2	RD44N-FHPL3
Applicable fluid	Water & hot water		
Applicable temperature	5~90℃		
Applicable primary pressure	Max. 1.0MPa		
Adjustable secondary pressure	**0.05~0.12MPa (Set at 0.08MPa)**	**0.11~0.23MPa (Set at 0.20MPa)**	**0.22~0.30MPa (Set at 0.25MPa)**
Maximum reducing rate	10:1		
Minimum pressure differential across the disc	0.02MPa		
Rated flow	50 l/min when pressure differential exceeds 0.1MPa		
End connection	Screwed JIS R¾″ union pipe		
Materials	Body(Cast bronze), Diaphragm & disc(Synthetic rubber)		
Valve body pressure test	Hydraulic 1.75MPa*1.		
Installation	In vertical and horizontal pipe line		
Accessory	Union pipe(pipe, nut, gasket), Foam polyethylene case for heat insulation, Test gag(For water pressure test) *1., Fitting for pressure gauge (It is already installed in the body for secondary side.)		
Strainer	60Mesh		

*1. Use test gag within 1.75MPa at water pressure test.
*2. Pressure gauge is optional item.

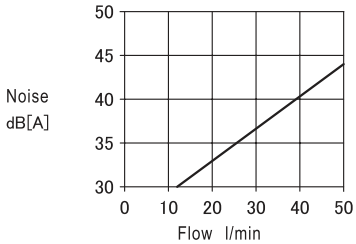
FLOW CHARACTERISITC

Primary pressure
——— 1.0MPa
- - - - - - - - 0.5MPa
——— - ——— 0.3MPa



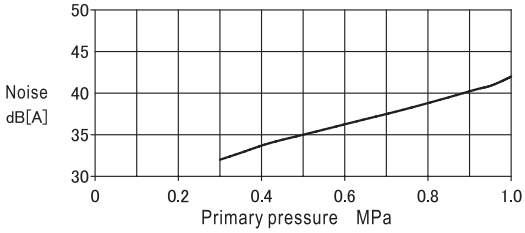
NOISE CHARACTERISTIC

- Noise characteristic when flow changes



Primary pressure	0.6MPa
Secondary set pressure	0.2MPa
Background noise	30dB(A)
Microphone distance	15cm

- Noise characteristic when primary pressure changes



Secondary set pressure	0.2MPa
Flow	30 l/min
Microphone distance	15cm
Background noise	30dB(A)

RD-43N Type Pressure Reducing Valve (for Water or Hot Water)

for One-Room Apartment etc.

RD-43N type is a pressure reducing valve for separate house water supply. It is ideal for small or medium capacity water/hot water supply system in one-room apartment etc.
For water supply in common apartments or large capacity water supply, use RD-44N type.

FEATURES

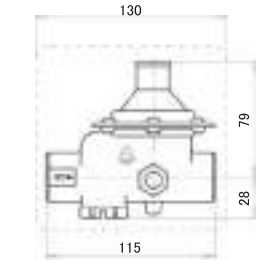
- Chlorine water resistant rubber for permanent reliability.
- Hygiene structure allows no “dead water”.
- Reliable performance at low or high differential pressure conditions.
- Reliable installation, not necessary to dissemble pressure reducing valve.
- Allows water pressure test with valves installed.
- New “test gag” for easy testing.

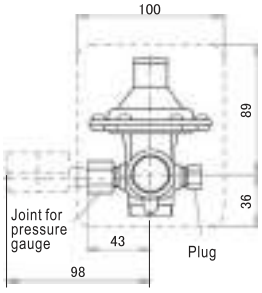
SPECIFICATIONS

Model name	RD-43NL	RD-43NM	RD-43NH
Code name	RD43N-FLL1	RD43N-FML2	RD43N-FHL3
Size	15 20(½″ ¾″)		
Applicable fluid	Water & hot water		
Applicable temperature	5~90℃		
Applicable primary pressure	Max. 1.0MPa		
Adjustable secondary pressure	**0.05~0.12MPa (Set at 0.08MPa)**	**0.11~0.23MPa (Set at 0.20MPa)**	**0.22~0.30MPa (Set at 0.25MPa)**
Maximum reducing rate	10:1		
Minimum pressure differential across the disc	0.02MPa		
Rated flow	Size 15mm:30l/min, Size 20mm:35l/min (Pressure differential 0.1MPa and more)		
End connection	Screwed JIS Rc		
Materials	Body(Cast bronze), Diaphragm & disc(Synthetic rubber)		
Valve body pressure test	Hydraulic 1.75MPa*1.		
Installation	In vertical and horizontal pipe line		
Accessory	Foam polyethylene case for heat insulation, Test gag(For water pressure test) *1., Fitting for pressure gauge (It is already installed in the body for secondary side.)		
Strainer	60Mesh		

*1. Use test gag within 1.75MPa at water pressure test.
*2. Pressure gauge is optional item.

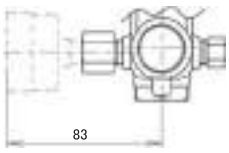
CONSTRUCTION





With type A pressure gauge

In the case of valve with type D pressure gauge

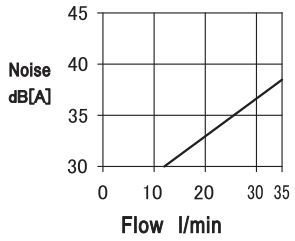


With type D pressure gauge

Mass
Size 15mm:0.9kg
Size 20mm:1.0kg

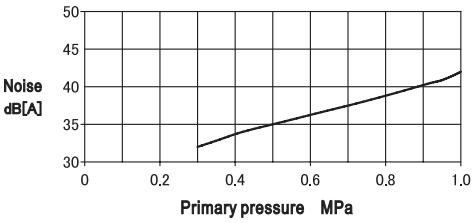
NOISE CHARACTERISTIC

Noise characteristic when flow changes



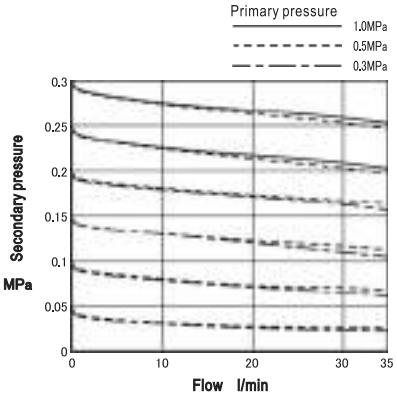
Primary pressure	0.6MPa
Secondary set pressure	0.2MPa
Background noise	30dB(A)
Microphone distance	15cm

Noise characteristic when primary pressure changes

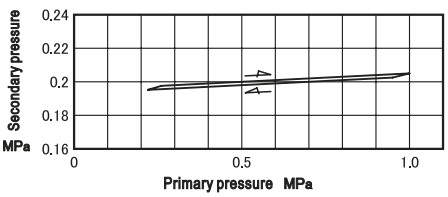


Secondary set pressure	0.2MPa
Flow	30 l/min
Microphone distance	15cm
Background noise	30dB(A)

FLOW CHARACTERISITC



PRESSURE CHARACTERISTIC



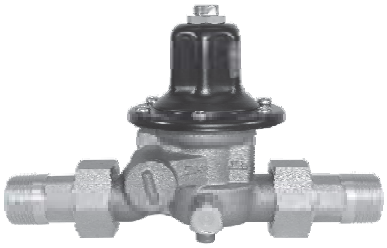
This figure shows the change of the secondary pressure when the primary pressure is 0.5MPa, secondary set pressure is 0.2MPa, and the primary pressure changes from 0.5~1MPa to 0.22~0.5MPa.

RD-47N Type Pressure Reducing Valve (for Water or Hot Water)

for Large Houses etc.

RD-47N type is suitable for water/hot water supply in apartments and tall buildings etc.

1. Reduce noise of water flow.
2. Eliminate the difference of water pressure between the floors.
3. Appropriate pressure allows no water jumping phenomenon.
4. No influence to other rooms when water supply is cut off for maintenance purpose.
5. Stable mixing temperature and improved housing conditions.



FEATURES

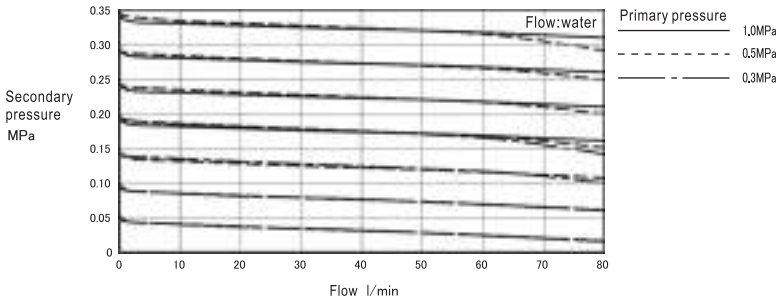
- Chlorine water resistant rubber for permanent reliability.
- Hygiene structure allows no “dead water”.
- Reliable performance at low or high differential pressure conditions.
- Reliable installation, not necessary to dissemble pressure reducing valve.
- Allows water pressure test with valves installed.
- New “test gag” for easy testing.
- Cassette method allows easy maintenance.
- No caulking or welding. All parts can be recycled or dissembled.

SPECIFICATIONS

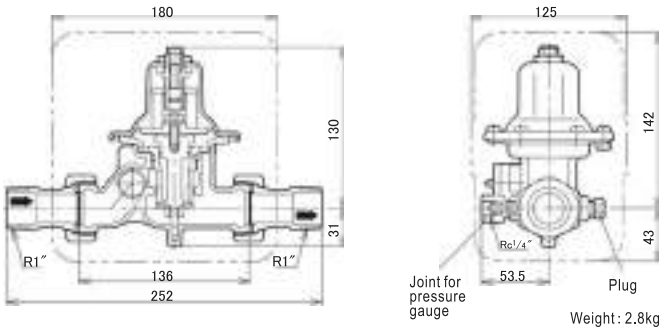
Model name	RD-47NL	RD-47NH
Code name	RD47N-FLPL1	RD47N-FHPL2
Applicable fluid	Water & hot water	
Applicable temperature	5~90℃	
Applicable primary pressure	Max. 1.0MPa	
Adjustable secondary pressure	0.05~0.13MPa(Set at 0.08MPa)	0.12~0.35MPa(Set at 0.20MPa)
Maximum reducing rate	10:1	
Minimum pressure differential across the disc	0.02MPa	
Rated flow	80 l/min when pressure differential exceeds 0.1MPa	
End connection	Screwed JIS R1″ (Union pipe)	
Materials	Body(Cast bronze), Diaphragm & disc(Synthetic rubber)	
Valve body pressure test	Hydraulic 1.75MPa*1.	
Installation	In vertical and horizontal pipe line	
Accessory	Union pipe(pipe, nut, gasket), Foam polyethylene case for heat insulation, Test gag(For water pressure test) *1., Fitting for pressure gauge (It is already installed in the body for secondary side.)	
Strainer	60Mesh	

*1. Use test gag within 1.75MPa at water pressure test.
*2. Pressure gauge is optional item.

FLOW CHARACTERISITC



CONSTRUCTION



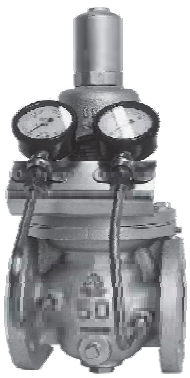
RD-14 Type Series Pressure Reducing Valve (for Water, Hot Water, Air or Oil)

Direct acting pressure reducing valve for water, liquids, or air with small or large flow and small range of pressure change.

Ideal for pressure control of roof water tank, water pumping system, or boiler direct linking water supply system for tall/medium height buildings, or in industrial applications, for controlling pressure of fuel, lubricants, and air.

RD-14W,14H Type

RD-14CN Type



Special order product
(With 2 pressure gauges)

FEATURES

- Pressure balanced structure with small change of set pressure.
- One-way (upper side) dissembling allows easy maintenance.
- RD-14CN Type has nylon coating, which can prevent occurrence of rusty water.

SPECIFICATIONS

Type	Standard	Hot water & oil	Nylon coating
Model name	RD-14W	RD-14H	RD-14CN
Code name	**RD14W-B ☐**	**RD14H-B ☐**	**RD14CN-B ☐**
	※ L, M or H for adjustable secondary pressure is required in ☐.		
Applicable fluid	Water, hot water & air	Oils not corrosive,kerosene,lubricant, Heavy oil A & B, & hot water	Water & hot water
Applicable primary pressure	Max. 1.0MPa		
Adjustable secondary pressure	Size 15~80mm L:0.05~0.35MPa, M(For RD-14CN Type is H):0.3~0.7MPa Size 100~150mm L:0.05~0.35MPa, M(For RD-14 CN Type is H):0.3~0.5MPa		
Maximum reducing rate	10:1		
Minimum pressure differential across the disc	0.05MPa		
Minimum adjustable flow	Water:2~5 l/min Air:5~10m³/h(Standard state)	2~5 l/min	
Fluid viscosity	—	Max. 800cSt	—
Applicable temperature	5~60℃	5~90℃	5~60℃
Leakage allowance	Nil (Confirm at pressure gauge)		
Valve body pressure test	Hydraulic 1.75MPa		
End connection	Flanged JIS 10KRF		
Materials	Body(Cast iron), Trim(Cast bronze), Diaphragm & disc(Synthetic rubber)		
Painting or coating for Body	Interior:Epoxy resin Exterior:Metallic blue	Interior:Rust proof oil Exterior:Metallic blue	Nylon coating

∗1. Valve with connecting thread (Screwed JIS Rc¼″) for pressure gauge on the side of body and with pressure gauges mounted are available upon request.
∗2. Valves with adjustable secondary pressure in 0.65~0.95MPa for size 80mm or smaller and 0.45~0.8MPa for size 100mm or bigger are available upon your request.

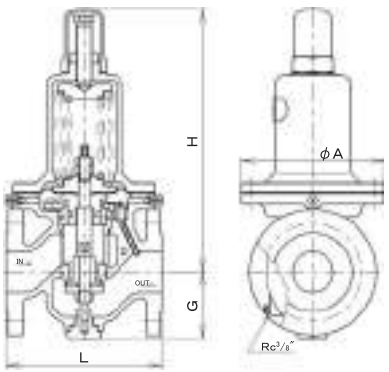
DIMENSIONS

(mm)

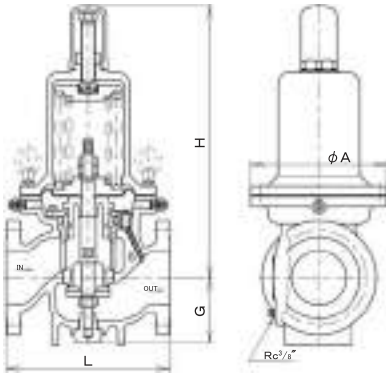
Size	A	L	G	H	Cv value	Mass(kg)
15(½″)	156	142	65	252	1	10
20(¾″)	160	142	65	252	2	10
25(1″)	160	142	65	252	3.5	10.5
32(1¼″)	180	174	76	332	5.5	17
40(1½″)	180	174	76	333	8	17.5
50(2″)	190	174	81	340	14	19
65(2½″)	230	218	95	428	22	37
80(3″)	250	218	100	433	32	40
100(4″)	300	250	125	493	48	67
125(5″)	370	340	150	641	75	112
150(6″)	400	340	165	656	108	150

Flange code JIS 10KRF

CONSTRUCTION



Size:15~18mm

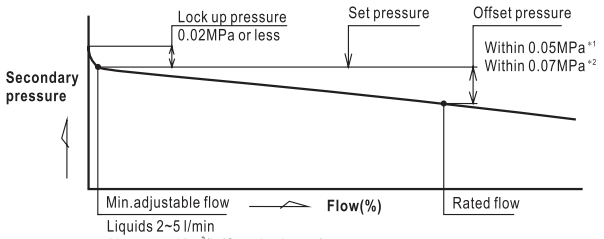


Size:100~150mm

Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

DATA/RD-14 Type Series Pressure Reducing Valve (for Water, Hot Water, Air or Oil)

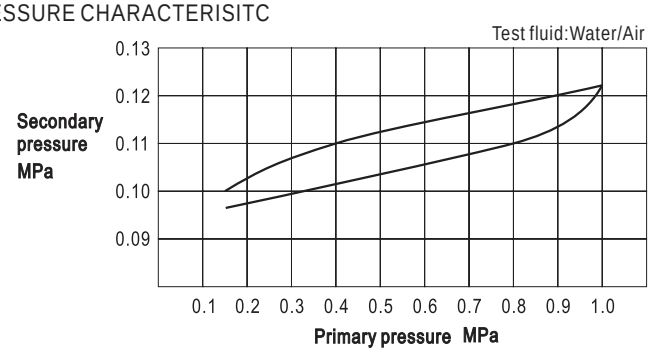
FLOW CHARACTERISITC



Liquids 2~5 l/min
Air 5~10m³/h (Standard state)

*1.At spring range 0.05~0.35MPa
*2.At spring range 0.3~0.7MPa or 0.3~0.5MPa

PESSURE CHARACTERISITC



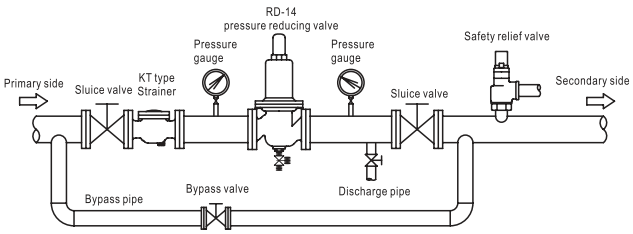
The above chart shows the change of secondary pressure when primary pressure was changed to 0.15MPa, 1.0MPa and 0.15MPa at primary pressure being 0.15MPa and secondary pressure being set at 0.1MPa.

TERMS

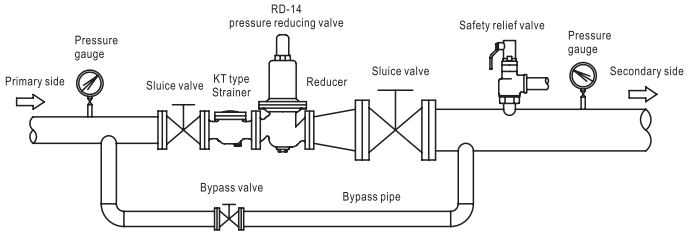
- Primary pressure: The inlet pressure of pressure reducing valve or the inlet pressure of piping that is near to pressure reducing valve.
- Secondary pressure: The outlet pressure of pressure reducing valve or the outlet pressure of piping that is near to pressure reducing valve.
- Set pressure: secondary pressure at minimum adjustable flow.
- Offset pressure: The difference between secondary pressure and setup pressure when primary pressure is kept at a constant level but flow increases gradually from minimal adjustable flow to the rated flow of pressure reducing valve.
- Lockup pressure: The increased pressure above setup pressure when the secondary valve of pressure reducing valve is locked up.
- Minimum adjustable flow: The minimum flow of pressure reducing valve for maintaining stable flow.
- Rated flow: The maximum flow at the specified offset pressure when primary pressure is kept at a constant level.

PIPING EXAMPLE

PIPING ILLUSTRATION (for Liquids)



PIPING ILLUSTRATION (for Air)



POINTS FOR INSTALLATION

❶ There should be some space for dissembling and maintenance. Leave some space, which height should be h (see the following table) above the center of piping.

TABLE FOR SPACE (mm)

Size (mm)	15	20	25	32	40	50	65	80	100	125	150
h	500	500	500	600	600	600	700	700	800	1000	1000

❷ In the case of liquid application, install straight pipe before and after pressure reducing valve.
The length of straight pipe depends on the piping condition before and after the valve. Basically, it should be 10~20 times of the nominal diameter (min. 500mm).

❸ Install strainer at the primary side of pressure reducing valve.

❹ Considering the pressure rise at failure, safety relief valve is installed at the secondary side of pressure reducing valve. Generally, the capacity of the safety relief valve should be about 10% of the maximum flow of pressure reducing valve. See the following table for the approximate set pressure of safety relief valve.

SET PRESSURE FOR SAFETY RELIEF VALVE (MPa)

Set pressure of pressure reducing valve	Set pressure of safety valve
0.1 or less	+0.05
0.1 or more and below 0.4	+0.08
0.4 or more and below 0.6	+0.12
0.6 or more and below 0.8	+0.15
0.8 or more and below 1.0	+0.19
1.0 or more and 1.2 or less	+0.23

Add above value to set pressure of Pressure Reducing Valve.

❺ In the case of gas application, since the volume may expand after pressure reducing valve, use reducer to enlarge the piping of the secondary side.

❻ In the case of liquid application, install sluice valve at the secondary side (see Piping illustration for liquids) to allow easy maintenance. Particularly in the case of installation in shaft in tall/medium height buildings, a discharge pipe is necessary if wires, electric devices are installed in the same shaft. The discharge pipe can be installed directly on the body of pressure reducing valve.

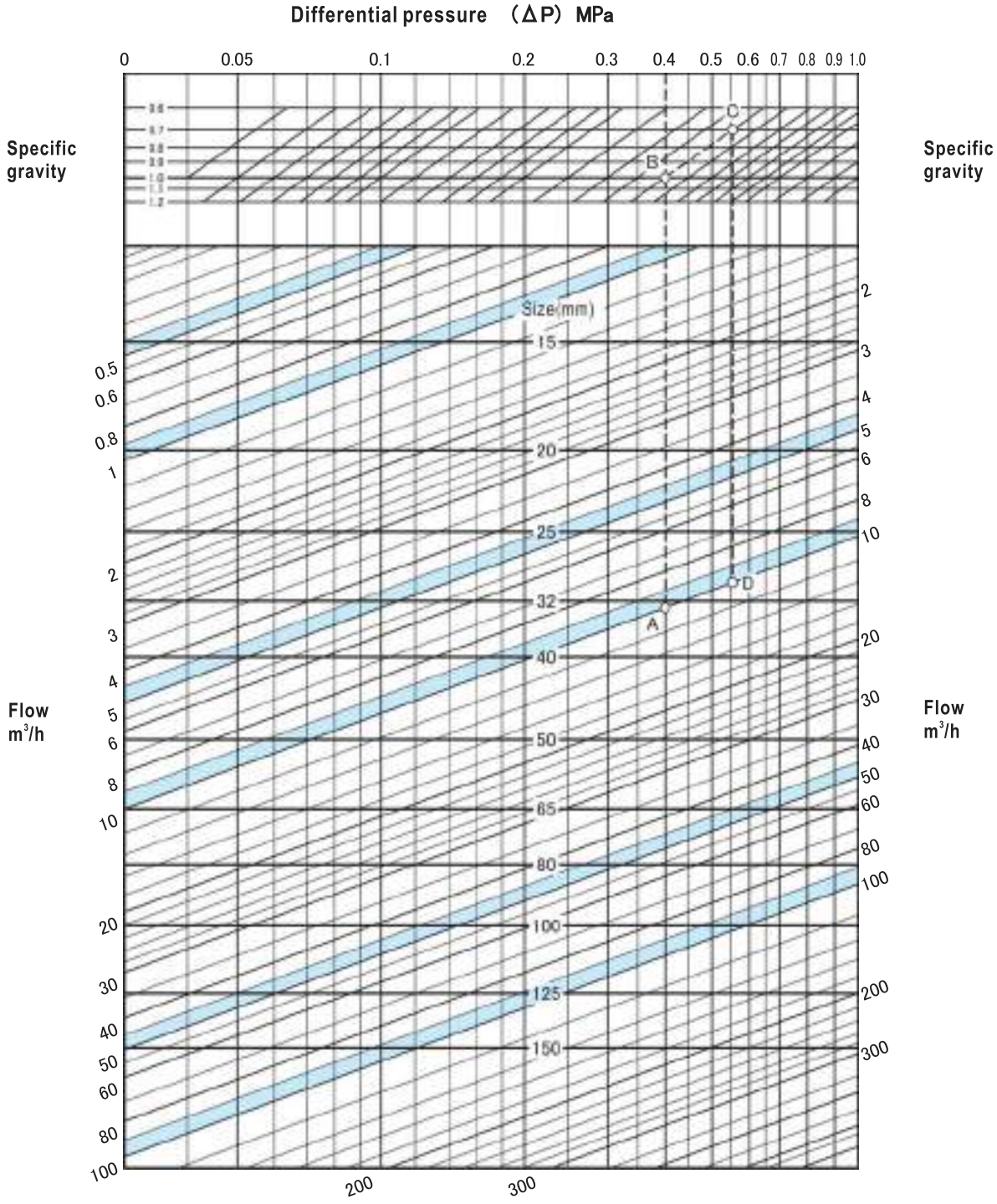
❼ Before installing pressure reducing valve, clean in the piping and remove contaminations such as welding residuals. Most claims related to pressure reducing valve in new piping are caused by contaminations in piping.

❽ For RD-14CN and 14PN type, thermo-insulation is necessary if the difference of temperature between the valve and ambient air is larger than 40℃.

Note: Also see Points for Installation of Pressure Reducing Valve. (Page 63~64)

RD-14 Type Series Pressure Reducing Valve (for Water)

NOMINAL DIAMETER SELECTION CHART (for Liquids)



● HOW TO USE THE CHART

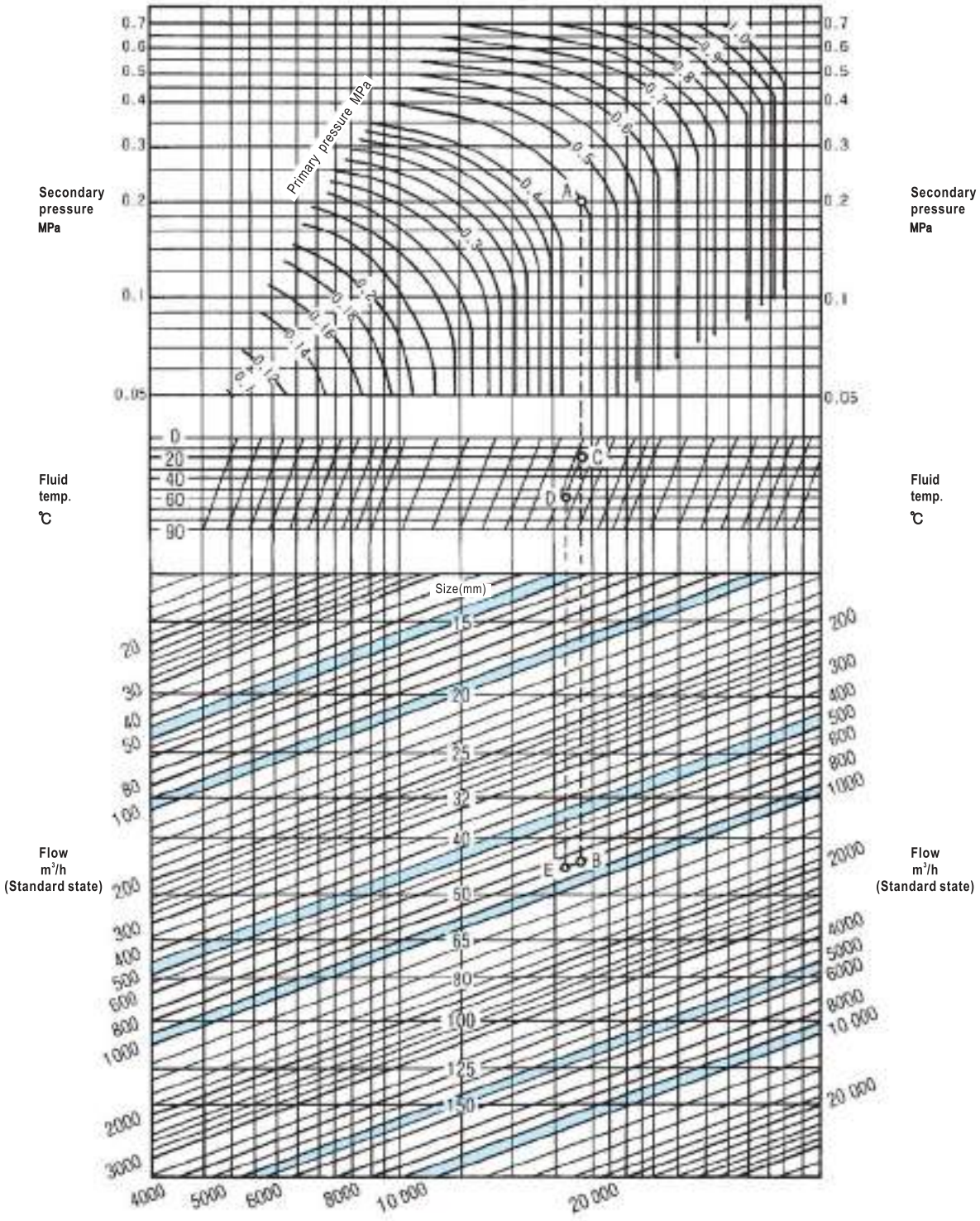
Example: Find out the nominal diameter meeting the following conditions:
Primary pressure: 0.5MPa
Secondary pressure: 0.1MPa
Specific gravity: 1 (water)
Flow: 10m³/h
Differential pressure(ΔP): 0.5−0.1=0.4MPa

Find out the intersection point A between the 0.4MPa differential pressure (ΔP) line and the 10m³/h flow line. Since point A is between the lines representing nominal diameter size 32mm and 40mm, the nominal diameter should be the larger one, i.e. size 40mm.

In the case other conditions remain the same but the specific gravity is 0.7, find out the intersection point B between the 0.4MPa differential pressure (ΔP) line and the 1.0 specific gravity line. Move from point B on the 0.7 specific gravity line parallelly to reach point C. Now draw a vertical line from point C until it intersects with the 10m³/h flow line. The intersection point is named D. Since point D is located between the lines representing nominal diameter size 25mm and 32mm, the nominal diameter should be the larger one, i.e. size 32mm.

DATA/RD-14 Type Series Pressure Reducing Valve (for Air)

NOMINAL DIAMETER SELECTION CHART (for Air)



● HOW TO USE THE CHART

Determine the nominal diameter under the following conditions:
Primary pressure: 0.45MPa
Secondary pressure: 0.2MPa
Temperature: 20℃
Flow (standard state): 800m³/h
Obtain the crossing point A of the curves representing 0.45MPa primary pressure and 0.2MPa secondary pressure.

Draw a vertical line from point A until it intersects with the 800m³/h flow line. The crossing point is named B. Since point B is located between lines representing size 40mm and 50mm, the larger one, which is 50mm, is selected.
Here is another example showing how to determine the nominal diameter when other conditions remain the same but the temperature is 60℃. Draw a vertical line from point A until the line intersects with the 20℃ temperature line. The crossing point is named C. Move the line parallelly until it intersects with the 60℃ temperature line. The crossing point is named D. Draw a vertical line from point D until it intersects with the 800m³/h flow line. The crossing point is named E. Since point E is located between lines representing size 40mm and 50mm, the larger one, which is 50mm, is selected.

WVR-02 Type Series Pressure Reducing Valve (for Water)

for Builiing facilities Industrial facilities etc.,Multipurpose Pilot type (High capacity)

Large capacity pressure reducing valve for water supply line of air conditioning, sanitary accommodations, fire extinguishing, and farm irrigating equipments. Pilot operated valve has pressure balancing structure, thus can regulate secondary pressure without being influenced by the change of primary pressure.

FEATURES

- Sensitive needle valve opening adjustment according to state of use, allow easy and reliable operation.
- The base and pilot-operated part can be dissembled easily, thus make it easy to adjust, repair, or replace parts.
- Lift limiting device limits overflow.
- The base and pilot-operated part can be installed on vertical or horizontal pipes*, thus allow piping according to space.

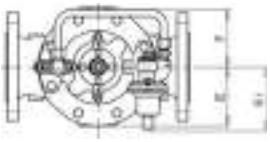
*: The pilot piping should be at the upper side in the case of horizontal piping.

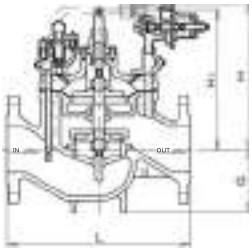
SPECIFICATIONS

Usage		Standard		Nylon coating	
Model name		WVR-02		WVR-02CN	
Code name		WVR02-B☐	WVR02-L☐	WVR02CN-B☐	WVR02CN-L☐
		※ L (low press.) or H (high press.) for adjustable secondary pressure is required in ☐.			
Size		50~400(2″~16″)	40~200(1½″~8″)	80~200(3″~8″)	
Applicable fluid		Water & hot water			
Applicable temperature		5~60℃			
Applicable primary pressure		Max. 1.0MPa*1.			
Adjustable secondary pressure		Size 40~200mm L:0.05~0.35, H:0.3~0.95MPa Size 250~400mm L:0.05~0.35, H:0.3~0.7MPa			
Maximum reducing rate		10:1			
Minimum pressure differential across the disc		0.05MPa			
Offset pressure		Adjustable secondary pressure 0.05~0.35MPa:Within 0.08MPa*1. Adjustable secondary pressure 0.3~0.95(0.7)MPa:Within 0.1MPa*1.			
End connection		Flanged JIS 10KRF*1.			
Valve body pressure test		Hydraulic 1.75MPa			
Materials	Body	Cast iron	Ductile cast iron	Cast iron	Ductile cast iron
	Trim	Diaphragm & disc(Synthetic rubber), Seat ring(Cast bronze)			
Painting or coating for Body		Interior:Epoxy resin Exterior:Metallic blue		Nylon coating	
Installation		In vertical and horizontal pipe line However, 250mm and bigger are allowed to install in horizontal pipe line erect position			

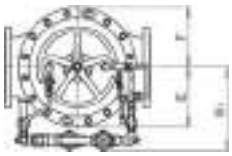
*1. Size 200mm and smaller with Flanged JIS 16K are available upon your request.
(Offset pressure with Flanged JIS 16KRF, Adjustable secondary pressure for 0.05~0.35MPa is below 0.09MPa, for 0.3~1.0MPa is below 0.14MPa)
*2. The valve with 2 pressure gauges is also available upon your request.
*3. Refer to page 55 of value size selection chart for WV Types.

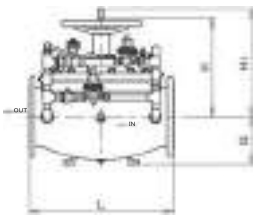
CONSTRUCTION





Size 40~200mm





Size 250~400mm

DIMENSIONS (Body materials: Cast iron)

(mm)

Size	L		G	H	H_1	E	E_1	F	Cv value	Mass(kg)
	JIS 10K	JIS 16K								
40(1½″)	260	260	80	285	230	93	136	136	18	21.5
50(2″)	270	270	85	285	230	93	136	136	32	24.5
65(2½″)	340	340	100	295	261	117	136	136	38	43
80(3″)	350	354	110	298	261	117	136	145	54	43
100(4″)	400	404	130	324	300	130	136	145	96	60
125(5″)	440	444	140	354	371	145	136	145	150	70
150(6″)	500	504	165	387	416	173	136	160	216	125
200(8″)	600	608	200	438	522	218	136	195	384	200
250(10″)	720	—	240	490	560	295	420	295	600	470
300(12″)	820	—	280	540	620	328	430	328	864	524
400(16″)	1040	—	370	690	800	440	520	440	1536	1400

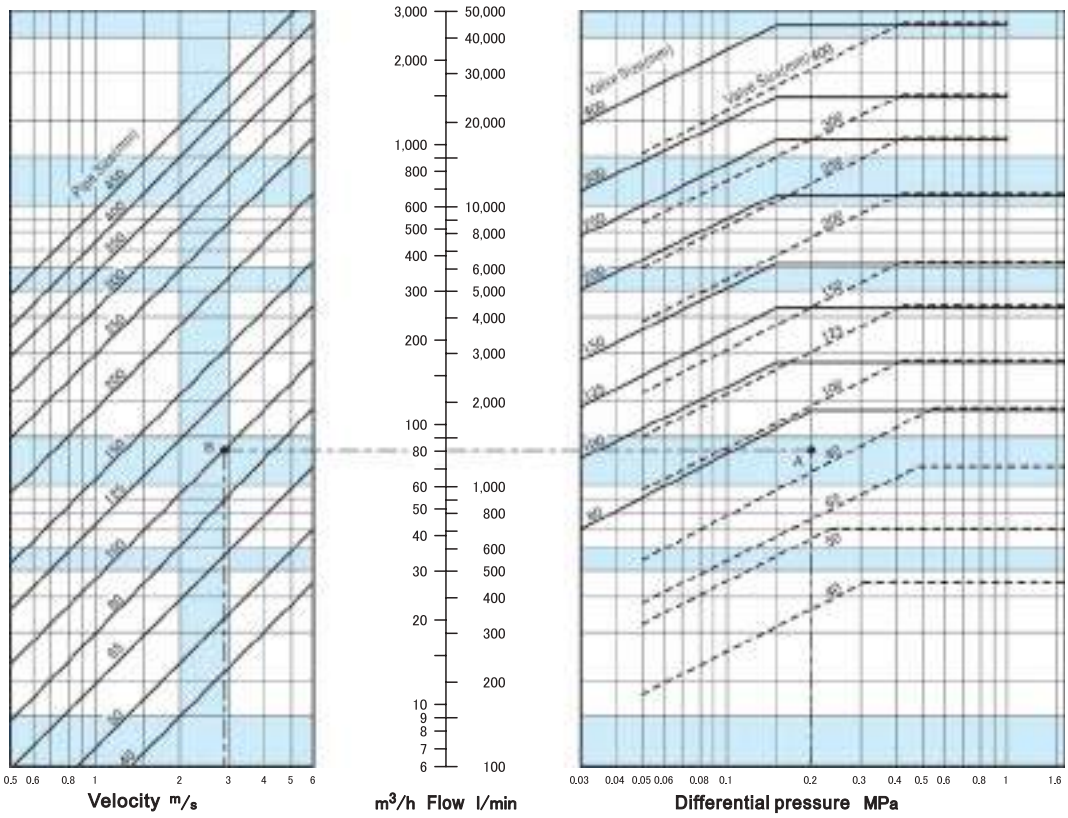
*1. JIS10K:Flanged code JIS 10KRF
JIS16K:Flanged code JIS 16KRF
*2. Please contact our local agent about figures for valve body with Ductile cast iron.
*3. Size 40mm of material is Ductile cast iron.

DATA/WV Type Regulating Valve (for Water or Hot Water)

SIZE SELECTION CHART (for Water)

■ VELOCITY RATE LINE CHART

■ SIZE SELECTION CHART



● PRODUCTS WHICH SIZES CAN BE DETERMINED
- - - - - - (dashed line) in the size selection chart
Pressure reducing valve WVR-02, Primary pressure regulating valve WVM-02.

● VALVES APPLICABLE TO
——— (solid line) in size selection chart
Solenoid valve WVE-02, Level control valve WVL-02

Note 1: In the size selection chart, the horizontal position of the valve size line represents the maximum flow.
Note 2: Use velocity line of less than 3m/s in velocity line chart with obtained pipe size, if not any special case.
Note 3: Size 40~65mm is for WVR and WVM types only.
Note 4: For sizes 40,50mm, in case of the larger differential pressure,please contact our local agent in your area.

● HOW TO USE THE CHART

Example: Select the size of valve for the following conditions:
Primary pressure: 0.5MPa; Secondary pressure: 0.3MPa; Flow: 80m³/h
1.Calculate differential pressure between inlet and outlet of valve: 0.5−0.3=0.2MPa
2.Follow the 80m³/h flow line horizontally until it intersects with the 0.2MPa differential pressure line. The intersection point is named A.
3.Since point A is between the lines representing size 80mm and 100mm, select the larger size, which is size 100mm, is selected.

● CONFIRMING PIPE FLOW RATE

1. Assume the pipe and valve are of the same diameter. Follow the 80m³/h flow line horizontally until it intersects with the 100mm size line to obtain cross point B.
2. Draw a vertical line from point B and find out the pipe flow rate 2.8m/s.
3. Since the flow rate is less than 3m/s, the pipe size should be size 100mm. If flow rate is larger than 3m/s, select a larger size to make the flow rate less than 3m/s.

● REFERENCE

■To select the size for pressure reducing valve or primary pressure regulating valve with considering dynamic water pressure:
For pressure reducing valve, add the largest offset pressure to the secondary pressure. For primary pressure regulating valve, deduct the minimum accumulation from the primary pressure. The size can be determined using the differential pressure between primary and secondary of valve.

●Pressure reducing valve
Find out the maximum offset pressure 0.1MPa from the specifications. The differential pressure is 0.5−(0.3+0.1)=0.1MPa. Use the method described in the example in “How to use the chart” to select the size.

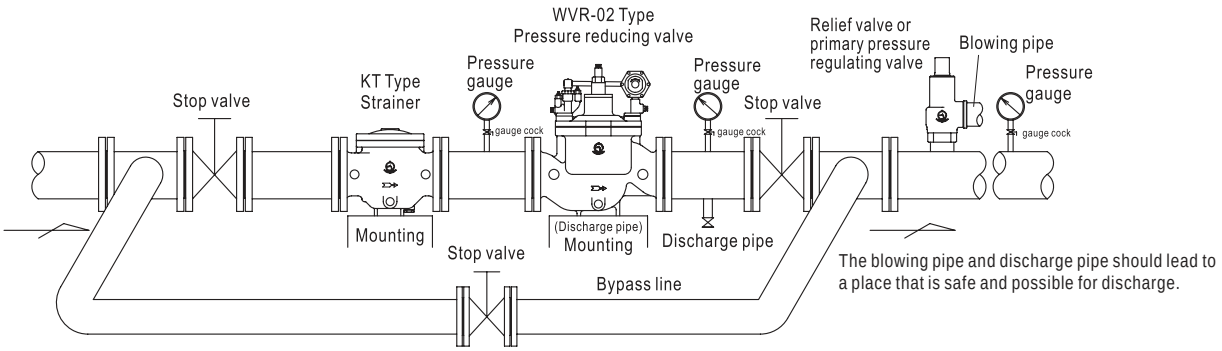
●Primary pressure regulating valve
Find out the minimum accumulation 0.03MPa from specifications. The differential pressure is (0.5−0.03)−0.3=0.17MPa. Use the method described in the example in “How to use the chart” to select the size.

DATA/WV Type Regulating Valve (for Water or Hot water)

PIPING EXAMPLE (horizontal piping with the size of WVR-02 pressure reducing valve is 200mm or small)

Water supply system using roof tank in tall/medium height buildings

Install water hammer preventing device closely at the primary side of pressure reducing valve if the pressure is reduced by one and more steps.



POINTS FOR INSTALLATION AND USE

BYPASS LINE

It is necessary to install a bypass pipe with stop valve, as shown in the figure above, for test before filling water, air purging, cleaning the inside of pipes, or maintenance.

STRAIGHT PIPE

To ensure stable operation of the valve, install straight pipe before and after the valve. The length of the straight pipe depends on the state before and after piping. However, the length should be approximately 10~20 times the nominal diameter (Minimum 500mm).

PIPING SUPPORT

Install piping support to avoid undesired mechanical impact due to the weight of the piping, weight of fluid, or continuous vibration, stress, or bending force.

STRAINER

Install strainer at the primary side of the valve.

SAFETY DEVICE

Considering the rise of secondary pressure, in some cases, it is necessary to install relief valve or primary pressure regulating valve at the secondary side.

See the following table for the approximate set pressure for the relief valve or primary pressure regulating valve. The outlet of the relief valve or primary pressure regulating valve should lead to a drainage that can accept the discharge of the valve.

■ TABLE OF SET PRESSURE FOR SAFETY RELIEF VALVE AND PRIMARY PRESSURE REGULATING VALVE (MPa)

Set pressure of pressure reducing valve	Set pressure of safety valve
0.1or less	+0.05
0.1 or more and below 0.4	+0.08
0.4 or more and below 0.6	+0.12
0.6 or more and below 0.8	+0.15
0.8 or more and 1.0 or less	+0.19

Add above value to set pressure of Pressure Reducing Valve.

THERMO-INSULATION

Cover the valve with insulating material if there is possibility of condensation or freezing. However, no thermo-insulation is to be applied on the coil of pilot-operated solenoid valve.

Note 1: The figure shows an example of WVR-02. The piping for other types of valve are the same. However, for WVM-02, there should be a rising part at the outlet piping. (See the piping example in page 109)

Note 2: In the case of vertical piping, the piping should be the same as shown in the piping illustration. In addition, the weight of the piping should not be applied on valves, and there should be some space for maintenance purpose.

PRESSURE GAUGE

Install pressure gauge at the primary and secondary sides of the valve, and at locations that can be easily accessed after piping.

LIMITATION ON INSTALLATION LOCATION

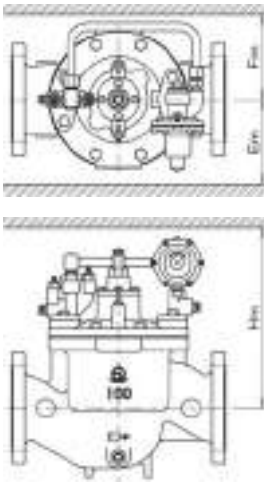
In the case solenoid valve, the valve should not be installed at locations where corrosive or explosive gas may accumulate.

DISCHARGE PIPE

To allow easy maintenance, install discharge pipe before the stop valve at the secondary side. In the case of installation inside buildings, discharge pipe is particularly necessary for locations where there are also wires or electric devices installed. The discharge pipe should be leading to a drainage that can accommodate the content of stop valves before and after the drainage.

MAINTENANCE SPACE

Leave some space surrounding the valve for maintenance (see the figures below).



The figure shows an example for WVR-02.
The maintenance space for other types of valves is the same.

■ TABLE FOR MAINTENANCE SPACE (mm)

Size	Hm	Em	Fm
40(1½″)	550	600	600
50(2″)	550	600	600
65(2½″)	600	600	600
80(3″)	600	600	600
100(4″)	800	680	680
125(5″)	1000	780	780
150(6″)	1200	910	910
200(8″)	1400	1060	1060
250(10″)	1500	1200	1200
300(12″)	1600	1300	1300
400(16″)	1800	1400	1400

RD-16 Type Pressure Reducing Valve (for Water or Liquids)

Pressure reducing valve with diaphragm at pressure sensing part. Ideal for high-pressure liquids and for installation at places where there is large differential pressure before and after the valve.
With a pressure balancing structure, the valve ensures only tiny change of secondary pressure when primary pressure changes.

CONSTRUCTION

Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

SPECIFICATIONS

Model name	RD-16	
Code name	RD16-CL	RD16-CH
Applicable fluid	Water & liquids	
Applicable primary pressure	Max. 2.7MPa	
Adjustable secondary pressure	0.05~0.35MPa	0.3~0.7MPa
	Refer to the applicable pressure selection chart below.	
Minimum pressure differential across the disc	0.05MPa	
Lock up pressure	Max. 0.035MPa	
Offset pressure	Within 0.07MPa	Within 0.1MPa
Applicable temperature	5~80℃	
Fluid viscosity	Max. 700cSt	
Leakage allowance	Nil (Confirm at pressure gauge)	
End connection	Flanged JIS 10,16,20,30KRF	
Materials	Body(Cast steel), Seat(Stainless steel) Diaphragm & disc(Synthetic rubber), Spring case(Cast iron)	
Valve body pressure test	1.5 times of flange rated pressure. (Hydraulic)	

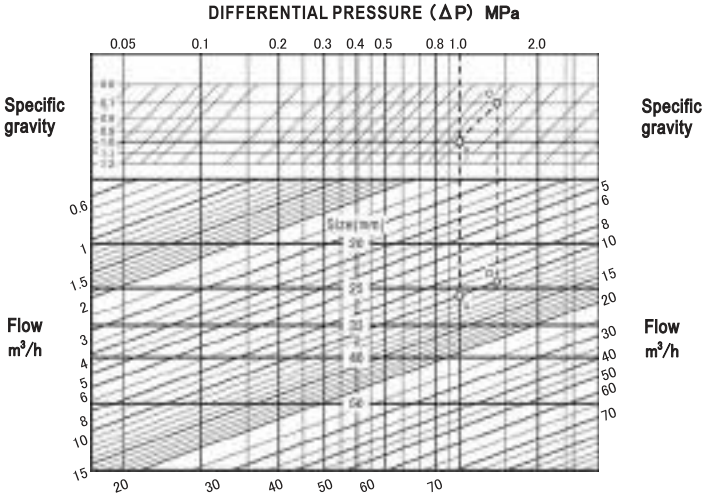
DIMENSIONS

(mm)

Size	L	L_1	G	H	A	Cv value	Mass(kg)
20(¾″)	186	88	110	365	174	2	23
25(1″)	190	90	110	365	174	3.5	24
32(1¼″)	220	110	115	445	218	5.5	36
40(1½″)	220	110	115	445	218	8	37
50(2″)	250	115	165	485	218	14	47

Flange code JIS 30KRF

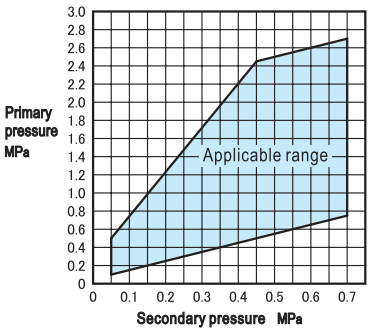
SIZE SELECTION CHART



HOW TO USE THE CHART

Example: Find out the nominal diameter meeting the following conditions:
Primary pressure: 1.5MPa
Secondary pressure: 0.5MPa
Specific gravity: 1 (water)
Flow: 10m³/h.
Differential pressure(ΔP): 1.5−0.5=1.0MPa
Find out the intersection point A between the 1.0MPa differential pressure (ΔP) line and the 10m³/h flow line. Since point A is between the lines representing nominal diameter size 25mm and 32mm, the nominal diameter should be the larger one, i.e. 32mm.
In the case other conditions remain the same but the specific gravity is 0.7, find out the intersection point B between the 1.0MPa differential pressure (ΔP) line and the 1.0 specific gravity line. Move from point B on the 0.7 specific gravity line parallelly to reach point C. Now draw a vertical line from point C until it intersects with the 10m³/h flow line. The intersection point is named D. Since point D is located between the lines representing nominal diameter size 20mm and 25mm, the nominal diameter should be the larger one, i.e. 25mm.

APPLICABLE PRESSURE SELECTION CHART



In the case pressure is not within the applicable range of pressure, perform 2-stage pressure reduction or use other type of valve.

RD-17, 17A Type Pressure Reducing Valve (for Water or Liquids)

Pressure reducing valve with piston-structured pressure sensing part. Ideal for high-pressure liquids and for installation at places where there is large differential pressure before and after the valve.
With a pressure balancing structure, the valve ensures only tiny change of secondary pressure when primary pressure changes.

SPECIFICATIONS

Model name	RD-17	RD-17A
Code name	**RD17-C ☐**	**RD17A-C ☐**
	※ L (low press.) or H (high press.) for adjustable secondary pressure is required in ☐.	
Applicable fluid	Water & liquids	
Applicable primary pressure	Max. 3.0MPa	Max. 2.7MPa
Adjustable secondary pressure	L:0.7~1.05MPa, H:1.0~1.4MPa	L:0.2~0.35MPa, H:0.3~0.7MPa
	Refer to the applicable pressure selection chart below.	
Minimum pressure differential across the disc	0.05MPa	
Lock up pressure	Max. 0.05MPa	
Offset pressure	Spring range 0.7~1.05MPa: Within 0.15MPa Spring range 1.0~1.4MPa: Within 0.2MPa	Spring range 0.2~0.35MPa: Within 0.15MPa Spring range 0.3~0.7MPa: Within 0.2MPa
Applicable temperature	5~80℃ (Size 50mm and smaller with applicable temperature 5~100℃ are available upon your request.)	
Fluid viscosity	Max. 700cSt	
Leakage allowance	Nil (Confirm at pressure gauge)	
End connection	Flanged JIS 10,16,20,30KRF	
Materials	Body(Cast steel), Seat(Stainless steel) Diaphragm & disc(Synthetic rubber), Spring case(Carbon steel or Carbon steel pipe)	
Valve body pressure test	1.5 times of flange rated pressure (Hydraulic)	

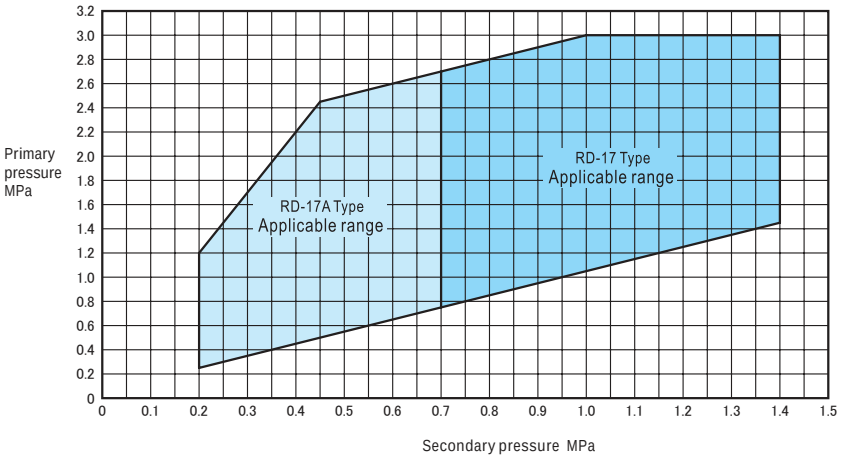
DIMENSIONS

(mm)

Size	L	L_1	G	H	Cv value		Mass(kg)
					RD-17 Type	RD-17A Type	
20(¾″)	186	88	110	355	2	1	15
25(1″)	190	90	110	355	3	1.5	16
32(1¼″)	220	110	115	390	5	2.5	22
40(1½″)	220	110	115	390	6	3	23
50(2″)	250	115	165	445	10	5	30
65(2½″)	290	140	165	500	15	7.5	55
80(3″)	325	145	210	593	18	9	85
100(4″)	355	160	225	705	32	16	133
125(5″)	445	200	291	880	50	25	218
150(6″)	485	220	290	959	72	36	338

Flange code JIS 30KRF

APPLICABLE PRESSURE SELECTION CHART



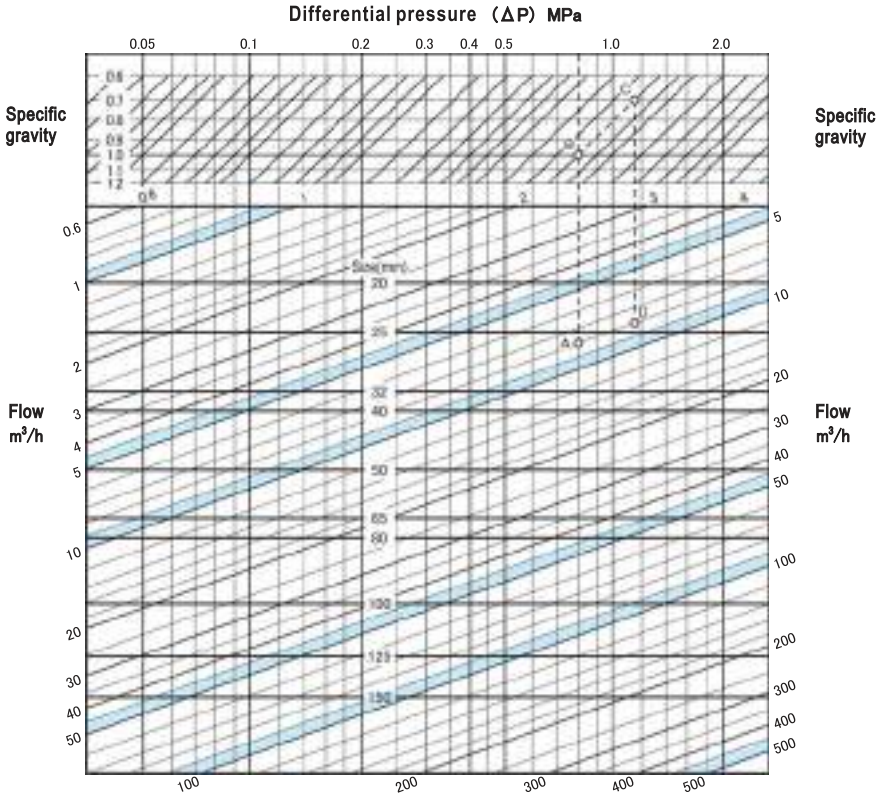
In the case pressure is not within the applicable range of pressure, perform 2-stage pressure reduction or use other type of valve.

CONSTRUCTION

Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

DATA/RD-17,17A Type Pressure Reducing Valve (for Water or Liquids)

RD-17 TYPE DIAMETER SELECTION CHART(for Liquids)



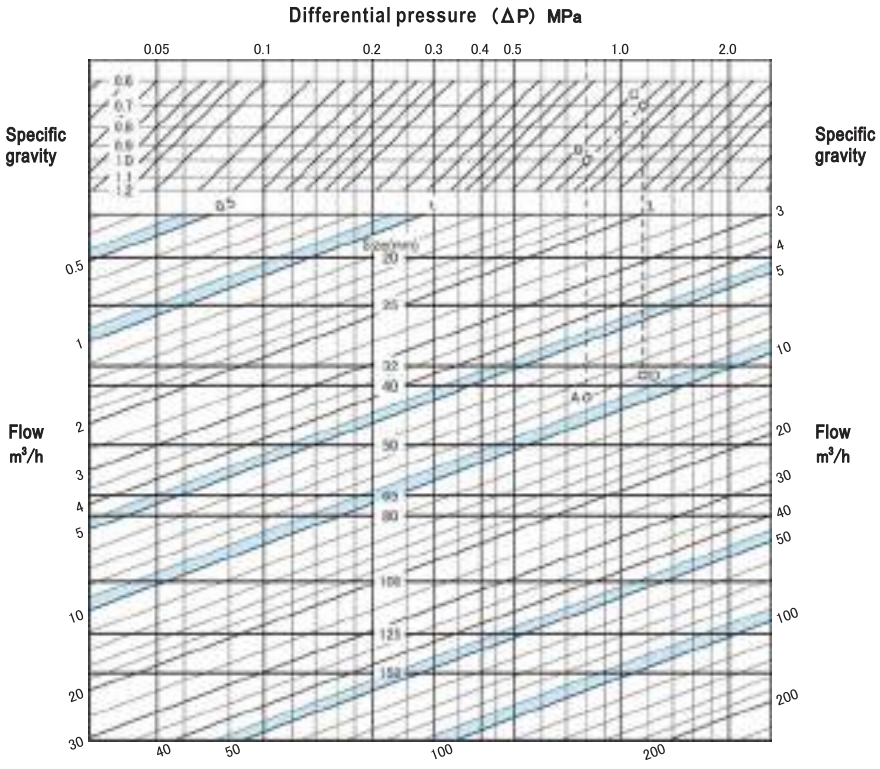
● HOW TO USE THE CHART

Example: Find out the nominal diameter meeting the following conditions:
Primary pressure: 1.6MPa
Secondary pressure: 0.8MPa
Specific gravity: 1 (water)
Flow: 8m³/h

Differential pressure(ΔP): 1.6−0.8=0.8MPa
Find out the intersection point A between the 0.8MPa differential pressure (ΔP) line and the 8m³/h flow line. Since point A is between the lines representing nominal diameter size 25mm and 32mm, the nominal diameter should be the larger one, i.e. 32mm.

In the case other conditions remain the same but the specific gravity is 0.7, find out the intersection point B between the 0.8MPa differential pressure (ΔP) line and the 1.0 specific gravity line. Move from point B on the 0.7 specific gravity line parallelly to reach point C. Now draw a vertical line from point C until it intersects with the 8m³/h flow line. The intersection point is named D. Since point D is located between the lines representing nominal diameter size 20mm and 25mm, the nominal diameter should be the larger one, i.e. 25mm.

RD-17A TYPE DIAMETER SELECTION CHART(for Liquids)



● HOW TO USE THE CHART

Example: Find out the nominal diameter meeting the following conditions:
Primary pressure: 1.1MPa
Secondary pressure: 0.3MPa
Specific gravity: 1 (water)
Flow: 8m³/h

Differential pressure(ΔP): 1.1−0.3=0.8MPa
Find out the intersection point A between the 0.8MPa differential pressure (ΔP) line and the 8m³/h flow line. Since point A is between the lines representing nominal diameter size 40mm and 50mm, the nominal diameter should be the larger one, i.e. 50mm.

In the case other conditions remain the same but the specific gravity is 0.7, find out the intersection point B between the 1.0MPa differential pressure (ΔP) line and the 1.0 specific gravity line. Move from point B on the 0.7 specific gravity line parallelly to reach point C. Now draw a vertical line from point C until it intersects with the 8m³/h flow line. The intersection point is named D. Since point D is located between the lines representing nominal diameter size 32mm and 40mm, the nominal diameter should be the larger one, i.e. 40mm.

RD-7 Type Pressure Reducing Valve (for Oil)

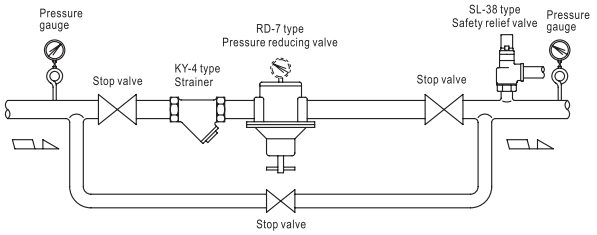
RD-7 is a pressure reducing valve for kerosene, heavy oil and for burner of industrial boiler.

With good controllability, RD-7 allows only tiny change of pressure when the oil level of burner changes.

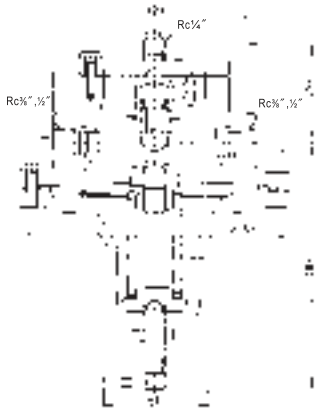
SPECIFICATIONS

Model name	RD-7		
Code name	RD7-BL	RD7-BM	RD7-BH
Size	10 15(⅜″ ½″)		
Applicable fluid	Fuel oils		
Applicable primary pressure	Max. 1.0MPa		
Adjustable secondary pressure	0.01~0.08MPa	0.08~0.2MPa	0.2~0.3MPa
Maximum reducing rate	20:1		
Minimum pressure differential across the disc	0.05MPa		
Lock up pressure	Max. 0.01MPa		
Applicable temperature	5~120℃		
Fluid viscosity	Max. 700cSt		
Leakage allowance	Nil (Confirm at pressure gauge)		
End connection	Screwed JIS Rc		
Materials	Body(Cast iron), Disc & seat ring(Brass), Disc tip(O-ring (Viton))		
Valve body pressure test	Hydraulic 1.5MPa		
Mass	6kg		

PIPING EXAMPLE

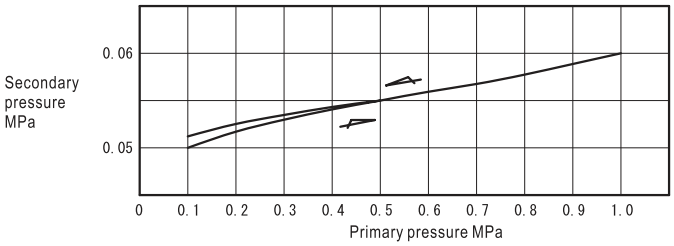


CONSTRUCTION



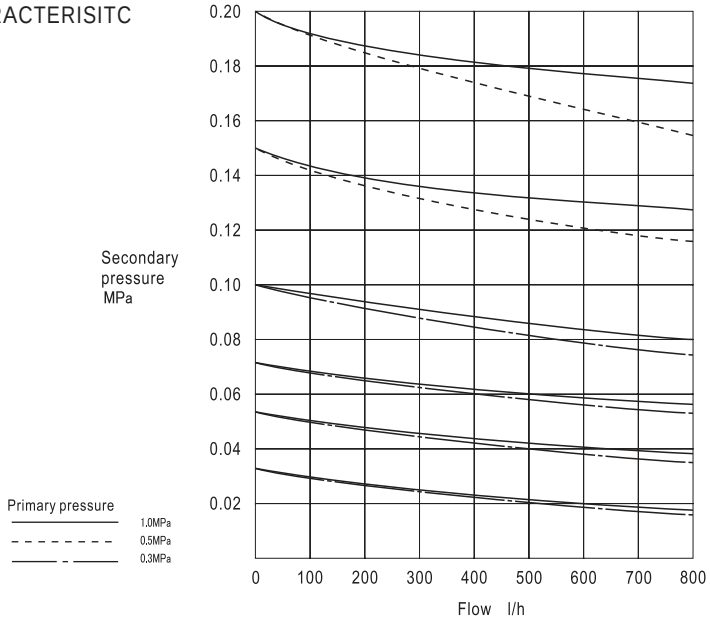
Follow the direction shown in the figure for installation.

PESSURE CHARACTERISITC



The secondary pressure is set at 0.1 MPa when primary pressure is 0.05 MPa.
The graph shows the change of secondary pressure when primary pressure changes between 0.1~1.0~0.1 MPa.

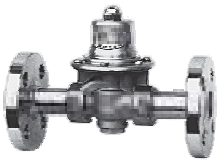
FLOW CHARACTERISITC



RD-20, 20F Type Pressure Reducing Valve (for Water, Liquids, Air or Gases)

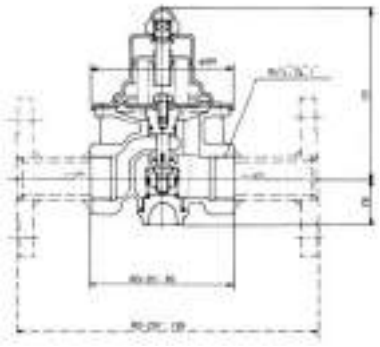
Small-sized stainless steel valve for liquids and gasses. Ideal for applications where rust is great concern and bronze material cannot be used. In addition, it can also be used in stainless steel piping for appartment water supply system.

RD-20 Type



RD-20F Type

CONSTRUCTION



Weight
RD-20 :0.7kg
RD-20F :Size 15mm 2kg
:Size 20mm 2.3kg
:Size 25mm 3.3kg

FEATURES

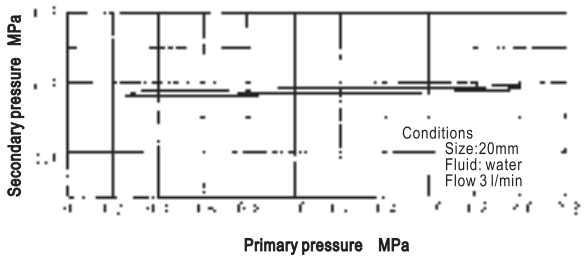
- High corrosion resistance: The parts contacting liquid and the spring case are made of stainless steel and synthesized rubber.
- Compact, light weight, as result of redesigned flow route and adoption of rectangular spring etc.
- Flexible installation.
- Easy maintenance.
- For both liquids and gasses, with primary pressure 2.0MPa.

SPECIFICATIONS

Model name	RD-20 Type L/M/H	RD-20F Type L/M/H
Code name	**RD20-D ☐**	**RD20F-D ☐**
	※ L, M or H for adjustable secondary pressure is required in ☐.	
Size	15 20 25(½″ ¾″ 1″)	
Applicable fluid	Water, liquids, air or gases(non-corrosive)	
Applicable temperature	5~60℃*1.	
Fluid viscosity	Liquids:Max. 800cSt	
Applicable primary pressure	Max. 2.0MPa	
Adjustable secondary pressure	L:0.02~0.12MPa, M:0.1~0.3MPa, H:0.25~0.5MPa	
Minimum pressure differential across the disc	0.05MPa	
Maximum reducing rate	Water, liquids:10:1*1, Air, gases:20:1	
Leakage allowance	Nil (Confirm at pressure gauge)	
End connection	Screwed JIS Rc	Flanged JIS 10,16,20KRF
Valve body pressure test	Hydraulic 3.0MPa	1.5 times of flange rated pressure (Hydraulic)
Materials	Body(Stainless steel), Diaphragm & disc(Synthetic rubber)	

*1. Please contact our local agent in case of Applicable temperature 60~90℃.
*2. Applicable temperature Max. 130℃ in temporary cleaning steam use at beverage industry, etc. are available upon your request.
(Applicable primary pressure Max. 1.0MPa, Maximum reducing rate 10:1)

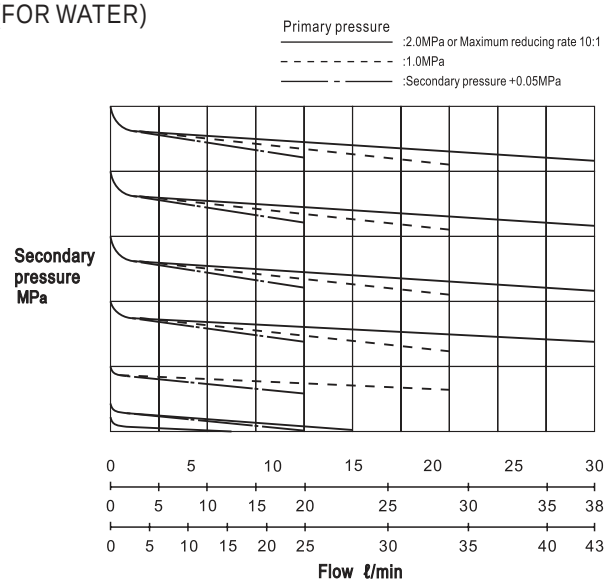
PESSURE CHARACTERISITC



In the figure in the left, the primary pressure is set to be 1.0MPa when flow is 0 and the secondary pressure is 0.2MPa. It shows the change of the secondary pressure when the flow is 10% rated flow and the primary pressure changes from 1.0~0.25 to 2.0~1.0MPa. The range of change of Secondary pressure
= less than set pressure 10% (minimum 0.02MPa)

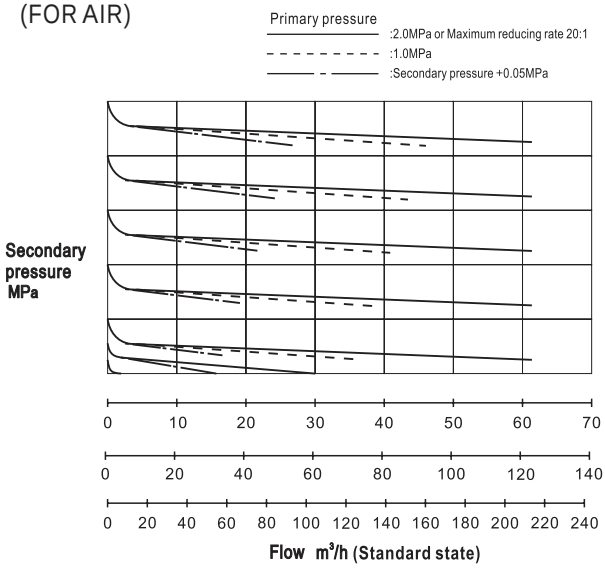
FLOW CHARACTERISITC

(FOR WATER)



The flow of liquids other than water should be converted into flow of water.
Converted flow = Liquid flow $\sqrt{G}$
G: specific gravity (See page 264)

(FOR AIR)



The flow of gasses other than air should be converted into flow of air.
Converted flow = gas flow $\sqrt{G}$ = gas flow $\sqrt{\frac{M}{28.96}}$
M: molecular weight of gas (See page 264)

DATA/Pressure Reducing Valve (for Water or Liquids)

■ PIPING EXAMPLE

Fig 1. With bypass line

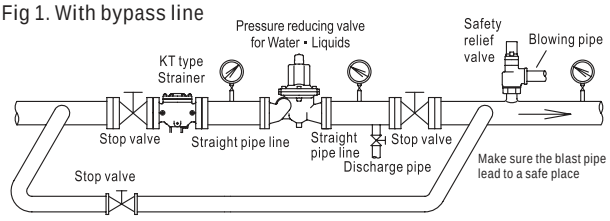


Fig 2. Without bypass line

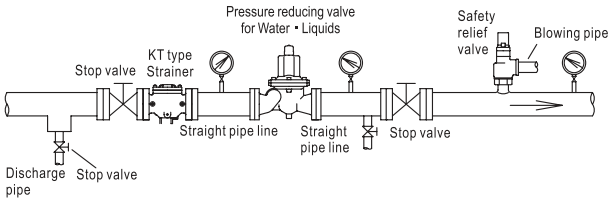
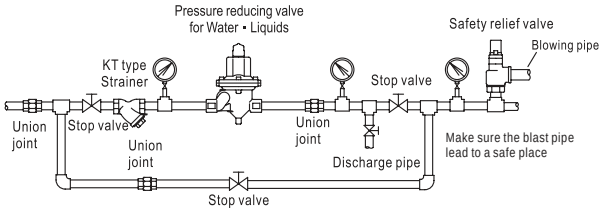


Fig 3. Screwed type connection with bypass line



Note: See Fig.2 for piping with screw type end connection and without bypass pipe.

■ POINTS FOR INSTALLATION

○ Installation of pressure reducing valve and piping

1. If not otherwise specified, the pressure reducing valve should be vertical to horizontal pipe.
   Install safety valve or safety relief valve at secondary side.
   ※ 1. In the case of failure of pressure reducing valve, expansion of fluid due to rise of ambient temperature, or water hammer, the secondary pressure may rise and equipment may be damaged.
   ※ 2. See Tab.1 for set pressure of safety valve or safety relief valve.
   ※ 3. In the case safety valve or safety relief valve is used as an alarm, its nominal diameter should be big enough to allow discharge of 10% maximum flow of pressure reducing valve, which is about the leakage of pressure reducing valve. In very few cases, nominal diameter is selected by discharging amount of maximum flow for pressure reducing valve.(reference value: see Table 2 and Table 3)

■ TABLE1. SET PRESSURE FOR SAFETY RELIEF VALVE (MPa)

Set pressure of pressure reducing valve	Set pressure of safety valve
0.1or less	+0.05
0.1 or more and below 0.4	+0.08
0.4 or more and below 0.6	+0.12
0.6 or more and below 0.8	+0.15
0.8 or more and below 1.0	+0.19
1.0 or more and 1.2 or less	+0.23

Add above value to set pressure of Pressure Reducing Valve.

■ TABLE2. FLOW FOR SAFETY VALVE (Water) (kg/h)

Set pressure (MPa)	Size					
	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
0.05	375	640	930	1720	2690	4380
0.1	531	905	1310	2430	3810	6200
0.2	742	1260	1830	3400	5320	8650
0.3	875	1490	2160	4010	6280	10200
0.4	976	1660	2410	4480	7000	11300
0.5	1070	1820	2650	4910	7690	12400
0.6	1150	1970	2860	5310	8310	13500
0.7	1230	2110	3060	5680	8890	14400
0.8	1310	2240	3250	6030	9440	15300
0.9	1380	2360	3430	6360	9950	16100
1.0	1450	2470	3600	6680	10400	16900

■ TABLE3. FLOW FOR SAFETY VALVE (Air) (kg/h)

Set pressure (MPa)	Size					
	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
0.05	21.8	37.1	53.9	100	156	254
0.1	28.2	48	69.8	129	202	329
0.2	41	69.9	101	188	294	479
0.3	55.1	93.9	136	253	396	643
0.4	69.3	118	171	318	497	808
0.5	83.4	142	206	382	598	972
0.6	97.5	166	241	447	700	1130
0.7	111	190	276	512	801	1300
0.8	125	214	311	577	902	1460
0.9	139	238	346	641	1000	1630
1.0	154	262	381	706	1100	1790

3. Install strainer at the primary side of pressure reducing valve.
4. For devices that cannot be stopped, install bypass piping (with stop valve) from the primary side to the secondary side of pressure reducing valve (see Fig.1). If bypass piping is not suitable, then install blowing check valve which is derived from the main pipe before the primary side of pressure reducing valve, so as to make flushing possible(see Fig.2).
5. Install straight piping, stop valve, and pressure gauge before and after pressure reducing valve. In case of screwed type end connections, use union joint for easy maintenance and repair.(see Fig. 3).
6. In the case a solenoid valve (ON/OFF operation) is installed at the secondary side of pressure reducing valve, the solenoid valve should 1~2m away from pressure reducing valve.

There should also be a 1~2m distance between pressure reducing valves in the case of 2-step pressure reduction. (See Fig.4, Fig.5)

DATA/Pressure Reducing Valve (for Water or Liquids)

Fig.4 Solenoid valve (on/off operation) installation

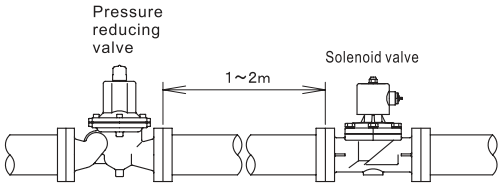
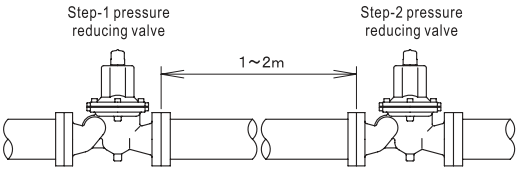


Fig.5 2-Step pressure reduction



7. In water supply system with roof tank in tall/medium height buildings, water hammer may occur if one stop or 2 more steps of pressure reducing valves are installed. In such case, install a water hammer preventing device at the primary side of pressure reducing valve. (See Fig.6)
8. Leave some space for dissembling and maintenance.
9. Apply appropriate support to pressure reducing valve to protect from the weight of piping itself, bending force, or vibration.
10. If it is possibility of freezing, perform thermal insulation or discharge the drain.
11. In the case of buried piping, install pressure reducing valve in pit (box).
    The pit should have drainage system to prevent accumulation of rain etc., and thermo-insulation or drainage may be necessary if there is possibility of freezing. (See Fig. 7)

Fig.6 Roof tank in tall/medium height building

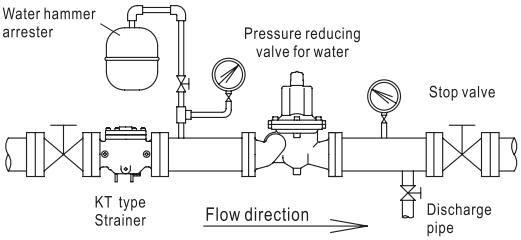
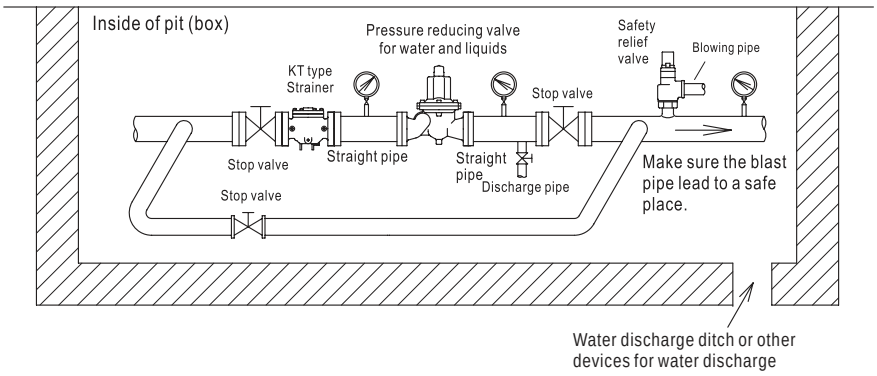


Fig.7 BURIED PIPING



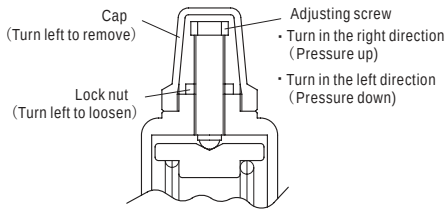
12. In most cases, the secondary pressure is not adjusted when product is delivered.
    Therefore, adjust the secondary pressure to a desired pressure.

※ The secondary pressure of a non-adjusted valve is near to zero.To adjust the secondary pressure, follow the following steps.

※ How to adjust the secondary pressure:

① Close the stop valves at primary and secondary sides.
② Open the blowing stop valve or stop valve in bypass and remove any content inside.Such operation is called flushing and should be carried out sufficiently by spending sufficient time on it. take care not to make the secondary pressure rise excessively.
Take care not to make the secondary pressure rise excessively.
③ Close the blowing stop valve or stop valve of bypass pipe.
④ Make sure there is not any spring load caused by adjusting screw.
⑤ Open the stop valve at primary side gradually.
⑥ Make sure you have adjusted the secondary pressure. Open the stop valve at the secondary side slightly to allow small flow.
⑦ Use the adjusting screw and apply a tiny spring load. Open the secondary stop valve gradually once fluid starts to flow.
⑧ Read the pressure gauge and apply more spring load to make the pressure reaching the set pressure. The secondary pressure rises if you turn the adjusting screw clockwise, and the pressure drops if you turn the screw counterclockwise.
⑨ Once the desired pressure is reached, use the lock nut to lock the adjusting screw. After the screw is locked, the spring load will not change.

Fig.8 A TYPICAL ADJUSTING METHOD



SAFETY VALVES
RELIEF VALVES

3

Safety relief valve has both function of Safety valve and relief valve,also can cover wide range of application.
Lift type and full bore type safety valves can prevent accidents caused by abnormal pressure of pressure vessel, boilers, device, and pipes.
Relief valve can be used on cold/hot water equipments, devices, and pumps.
Please select suitable model matching with condition of use.

■ SAFETY RELIEF VALVES (LIFT TYPE)

Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
SL-37,38	Screwed	15~50(½″~2″)	0.05~1.0	Steam,air,gases or liquids	Stainless steel (Cast bronze)	Stainless steel	66
SL-37V,38V	Screwed	15~50(½″~2″)	0.05~1.0	Air,gases or liquids	Stainless steel (Cast bronze)	Stainless steel & Synthetic rubber	66
SL-39,40	Screwed	15~50(½″~2″)	0.05~1.0	Steam,air,gases or liquids	Stainless steel	Stainless steel	67
SL-39V,40V	Screwed	15~50(½″~2″)	0.05~1.0	Air,gases or liquids	Stainless steel	Stainless steel & Synthetic rubber	67
SL-39F,40F	Flanged	15~50(½″~2″)	0.05~1.0	Steam,air,gases or liquids	Stainless steel	Stainless steel	68
SL-39FV,40FV	Flanged	15~50(½″~2″)	0.05~1.0	Air,gases or liquids	Stainless steel	Stainless steel & Synthetic rubber	68

■ SAFETY VALVES (LIFT TYPE)

Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
SL-23H,24H	Flanged	15~65(½″~2½″)	0.035~1.0	Steam,air,gases or liquids	Cast iron	Stainless steel or Cast bronze	70
SL-5,6	Flanged	15~40(½″~1½″)	0.035~1.0	Steam,air,gases or liquids	Cast iron	Stainless steel	71
		50~100(2″~4″)	0.035~1.6				
		40~100(1½″~4″)	0.035~2.0				
SL-7,8	Screwed	15~32(½″~1¼″)	0.035~3.0	Steam,air,gases or liquids	Forged steel or Stainless steel	Stainless steel	72
SL-9,10	Flanged	15~32(½″~1¼″)	0.035~3.0	Steam,air,gases or liquids	Forged steel or Stainless steel	Stainless steel	73
SL-11,12	Flanged	15~25(½″~1″)	0.035~3.0	Steam,air,gases or liquids	Cast steel	Stainless steel	74
		125 150(5″~6″)					
		40~100(1½″~4″)	2.0~3.0				

■ RELIEF VALVES

Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
SL-38E	Screwed	15~50(½″~2″)	0.035~1.0	Water,oil or liquids	Stainless steel (Cast bronze)	Stainless steel	75
SL-40E					Stainless steel		
SL-40EF	Flanged	15~50(½″~2″)	0.035~1.0	Water,oil or liquids	Stainless steel	Stainless steel	
SL-24E	Flanged	15~80(½″~3″)			Cast iron	Brass or Stainless steel	
SL-8ED	Screwed	15~32(½″~1¼″)	0.035~3.0	Water,oil or liquids	Forged steel or Stainless steel	Stainless steel	76
SL-10ED	Flanged						
SL-6ED	Flanged	40~75(1½″~3″)	0.035~2.0	Water,oil or liquids	Cast iron or Cast steel	Stainless steel	

■ SAFETY VALVES (FULL BORE TYPE)

Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
SF-1H,2H	Screwed	20~50(¾″~2″)	0.1~2.0	Steam or air	Ductile cast iron stellited	Stainless steel	79
SF-13,13L SF-14,14L	Flanged	25~150(1″~6″)	0.1~1.0	Refer to specifications	Cast iron	Stainless steel	80
SF-15,15L SF-16,16L	Flanged	40~150(1½″~6″)	0.1~1.0		Cast steel	Stainless steel	81
SF-17,17L SF-18,18L	Flanged	40~150(1½″~6″)	1.0~2.0		Cast steel	Stainless steel	82
SF-19,19L	Flanged	15~25(½″~1″)	0.1~3.0		Cast steel	Stainless steel	83
SF-20,20L		40~150(1½″~6″)	2.0~3.0				

SL-37, 38 Type Series Safety Relief Valve (Lift Type)

for Pressure Vessels, Hot Water Boilers, Heat Exchangers, Secondary Side of Pressure Reducing Valves etc.

Safety relief valve is a category of valves with functions between those of safety valves, which are mainly for steam and gases, and those of relief valves, which are mainly for liquids.

Safety relief valve can be used for fluid, steam, gas, and liquid. The metal-sheet type safety relief valve has simple structure, high corrosion resistance, and is made of high-grade materials. It is widely used as safety device for pressure vessels, machines/equipments, Hot water boilers, water/hot water supply systems, air conditioning systems, and pressure reducing valves.

The soft-sheet type safety relief valve is featured of high airtightness. It is suitable for gases and applications where leakage of valve is not allowed.

SL-37 Type Series

SL-38 Type Series

PRESSURE DIVISION (MPa)

Code No.	Pressure division
1	0.05~0.1
2	Over 0.1~0.2
3	Over 0.2~0.5
4	Over 0.5~1.0

FEATURES

- Bronze spring case, Stainless steel seat and disc, Stainless steel spring. A sealed type safety relief valve with high corrosion resistance.
- Suitable for three fluids, including steam, gas, and liquid (metal-sheet type).
- 1~2 sizes smaller and lighter than prior products of the same type.

SPECIFICATIONS

Type		Standard item(Metal seated type)		Soft seat type	
Model name		SL-37	SL-38	SL-37V	SL-38V
Code name		**SL37-D ☐**	**SL38-D ☐**	**SL37V-D ☐**	**SL38V-D ☐**
		※ Code No. of pressure division is required in ☐.			
Cap type(Closed type)		With lever*1.	Without lever	With lever	Without lever
Applicable fluid		Steam, air, gases & liquids*2.		Air, gases & liquids*2.	
Set pressure range		**0.05~1.0MPa**			
Applicable temperature		Max. 150℃(Max. 225℃*1.)	Max. 225℃	Max. 120℃	
End connection		Screwed JIS Rc			
Materials	Body	Stainless steel(Spring case:Cast bronze)			
	Disc	Stainless steel		Stainless steel(Disc tip:Synthetic rubber)	
Valve body pressure test		Hydraulic 2.0MPa			

*1. For steam, the valve is provided with a release lever and can be used at steam temperature up to 225℃.
*2. Contact our local agent for gasoline, kerosene and solvent medium use.

DIMENSIONS (mm)

Size	Seat opening dia. D	Effective area (mm²) π Dℓ	Lift ℓ	Face to Face L1	Face to Face L2	Height H SL-37,37V Type	Height H SL-38,38V Type	End connection d	Mass(kg) SL-37,37V Type	Mass(kg) SL-38,38V Type
15(½″)	14(13)	17.5	0.4(0.43)	30	36	94	84	½″	0.6	0.5
20(¾″)	19(18.6)	29.8	0.5(0.51)	35	40	99	89	¾″	0.7	0.6
25(1″)	23(21.9)	43.3	0.6(0.63)	40	46	102	92	1″	0.9	0.8
32(1¼″)	32(29.4)	80.3	0.8(0.87)	50	54	124	114	1¼″	1.4	1.3
40(1½″)	40(36.7)	125.6	1.0(1.09)	55	60	130	120	1½″	1.9	1.8
50(2″)	50(47.1)	204.1	1.3(1.38)	65	73	165	151	2″	3.6	3.4

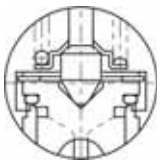
* Figures in ( ) are for SL-37V, 38V Type.

CONSTRUCTION

SL-37 Type

SL-38 Type

Size 50mm



Soft-sheet type

Note: See page 69 for relieving capacity.

SL-39, 40 Type Series Safety Relief Valve (Lift Type)

for Stainless Steel Lines of Pressure Vessels, Hot Water Boilers, Heat Exchangers, Secondary Side of Pressure Reducing Valves etc.

Safety relief valve is a category of valves with functions between those of safety valves, which are mainly for steam and gases, and those of relief valves, which are mainly for liquids.

Safety relief valve has simple structure, high corrosion resistance, and is made of high-grade materials. It is widely used as safety device for pressure vessels, machines/equipments, hot water boilers, water/hot water supply systems, air conditioning systems, and pressure reducing valves.

The soft-sheet type safety relief valve is featured of high airtightness. It is suitable for gases and applications where leakage of valve is not allowed.

SL-39 Type Series

SL-40 Type Series

PRESSURE DIVISION (MPa)

Code No.	Pressure division
1	0.05~0.1
2	Over 0.1~0.2
3	Over 0.2~0.5
4	Over 0.5~1.0

FEATURES

- A sealed type safety relief valve with high corrosion resistant Stainless steel spring case, seat and disc, and Stainless steel spring.
- 1~2 sizes smaller and lighter than prior products of the same type.

SPECIFICATIONS

Type		Standard item(Metal seated type)		Soft seat type	
Model name		SL-39	SL-40	SL-39V	SL-40V
Code name		**SL39-D ☐**	**SL40-D ☐**	**SL39V-D ☐**	**SL40V-D ☐**
		※ Code No. of pressure division is required in ☐.			
Cap type(Closed type)		With lever*1.	Without lever	With lever	Without lever
Applicable fluid		Steam, air, gases & liquids*2.		Air, gases & liquids*2.	
Set pressure range		**0.05~1.0MPa**			
Applicable temperature		Max. 150℃(Max. 235℃*1)	Max. 235℃	Max. 120℃	
End connection		Screwed JIS Rc			
Materials	Body	Stainless steel(Spring case:Stainless steel)			
	Disc	Stainless steel		Stainless steel(Disc tip:Synthetic rubber)	
Valve body pressure test		Hydraulic 2.0MPa			

*1. For steam, the valve is provided with a release lever and can be used at steam temperature up to 235℃.
*2. Contact our local agent for gasoline, kerosene and as open type solvent medium use.

DIMENSIONS (mm)

Size	Seat opening dia. D	Effective area (mm^2) $\pi D\ell$	Lift ℓ	Face to Face L_1	Face to Face L_2	Height H SL-39,39V Type	Height H SL-40,40V Type	End connection d	Mass(kg) SL-39,39V Type	Mass(kg) SL-40,40V Type
15(½″)	14(13)	17.5	0.4(0.43)	30	36	96	85	½″	0.6	0.5
20(¾″)	19(18.6)	29.8	0.5(0.51)	35	40	100	89	¾″	0.7	0.6
25(1″)	23(21.9)	43.3	0.6(0.63)	40	46	104	93	1″	0.9	0.8
32(1¼″)	32(29.4)	80.3	0.8(0.87)	50	54	126	115	1¼″	1.5	1.4
40(1½″)	40(36.7)	125.6	1.0(1.09)	55	60	131	120	1½″	2	1.9
50(2″)	50(47.1)	204.1	1.3(1.38)	65	73	166	152	2″	3.4	3.2

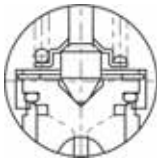
* Figures in ( ) are for SL-39V, 40V Type.

CONSTRUCTION

SL-39 Type

SL-40 Type

Size 50mm



Soft-sheet type

Note: See page 69 for relieving capacity.

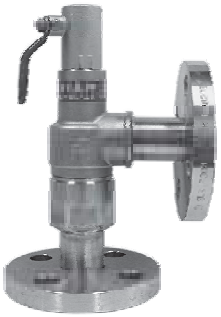
SL-39F, 40F Type Series Safety Relief Valve (Lift Type)

for Stainless Steel Lines of Pressure Vessels, Hot Water Boilers, Heat Exchangers, Secondary Side of Pressure Reducing Valves etc.

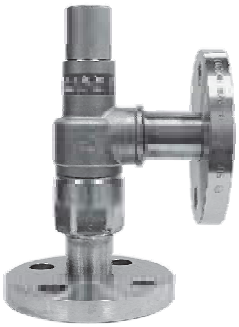
Safety relief valve is a category of valves with functions between those of safety valves, which are mainly for steam and gases, and those of relief valves, which are mainly for liquids.

Safety relief valve has simple structure, high corrosion resistance, and is made of high-grade materials. It is widely used as safety device for pressure vessels, machines/equipments, hot water boilers, water/hot water supply systems, air conditioning systems, and pressure reducing valves.

The soft-sheet type safety relief valve is featured of high airtightness. It is suitable for gases and applications where leakage of valve is not allowed.



SL-39 Type Series



SL-40 Type Series

PRESSURE DIVISION (MPa)

Code No.	Pressure division
1	0.05~0.1
2	Over 0.1~0.2
3	Over 0.2~0.5
4	Over 0.5~1.0

FEATURES

- A sealed type safety relief valve with high corrosion resistant Stainless steel spring case, seat and disc, and Stainless steel spring.
- 1~2 sizes smaller and lighter than prior products of the same type.

SPECIFICATIONS

Type		Standard item(Metal seated type)		Soft seat type	
Model name		SL-39F	SL-40F	SL-39FV	SL-40FV
Code name		**SL39F-D □**	**SL40F-D □**	**SL39FV-D □**	**SL40FV-D □**
		※ Code No. of pressure division is required in □.			
Cap type(Closed type)		With lever*1.	Without lever	With lever	Without lever
Applicable fluid		Steam, air, gases & liquids*2.		Air, gases & liquids*2.	
Set pressure range		**0.05~1.0MPa**			
Applicable temperature		Max. 150℃(Max. 235℃*1.)	Max. 235℃	Max. 120℃	
End connection		Flanged JIS 10K(Loose type)			
Materials	Body	Stainless steel(Spring case:Stainless steel)			
	Disc	Stainless steel		Stainless steel(Disc tip:Synthetic rubber)	
Valve body pressure test		Hydraulic 2.0MPa			

*1. For steam, the valve is provided with a release lever and can be used at steam temperature up to 235℃.
*2. Contact our local agent for gasoline, kerosene and solvent medium use.

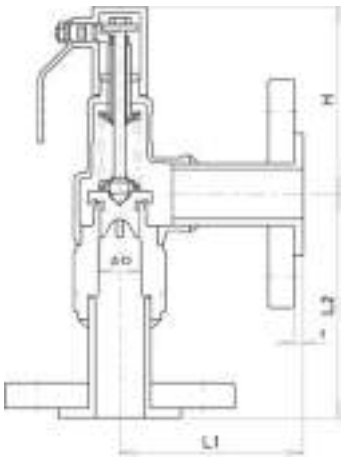
DIMENSIONS (mm)

Size	Seat opening dia. D	Effective area (mm^2) $\pi D\ell$	Lift ℓ	Face to Face		Height H		f	Mass(kg)	
				L_1	L_2	SL-39F,39FV Type	SL-40F,40FV Type		SL-39F,39FV Type	SL-40F,40FV Type
15(½″)	14(13)	17.5	0.4(0.43)	90	110	96	85	5	2.2	2.1
20(¾″)	19(18.6)	29.8	0.5(0.51)	95	115	100	89	5	2.6	2.5
25(1″)	23(21.9)	43.3	0.6(0.63)	100	124	104	93	5	4.1	4
32(1¼″)	32(29.4)	80.3	0.8(0.87)	110	138	126	115	5	5.6	5.5
40(1½″)	40(36.7)	125.6	1.0(1.09)	125	154	131	120	5	6.6	6.5
50(2″)	50(47.1)	204.1	1.3(1.38)	135	164	166	152	5	9.9	9

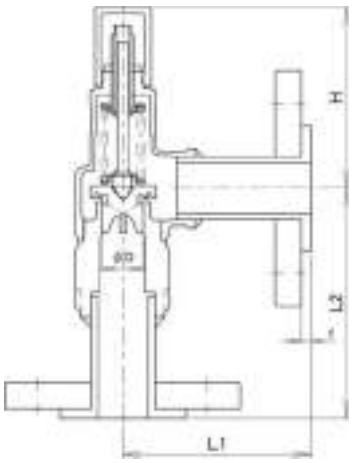
* Figures in ( ) are for SL-39FV, 40FV Type.

CONSTRUCTION

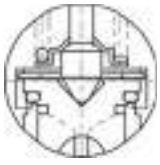
SL-39 Type



SL-40 Type



Size 50mm



Soft-sheet type

Note: See page 69 for relieving capacity.

Discharge Capacity

1. RELIEVING CAPACITY FOR STEAM
(Pressure Vessel Construction Code)

(kg/h)

Size	Set pressure(MPa)										
	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15(½″)	13.4	17.4	25.3	34.1	41.9	50.5	59	67.6	76.1	84.7	93.2
20(¾″)	22.9	29.7	43.2	58	71.4	86	100	115	129	144	158
25(1″)	33.3	43.1	62.8	84.3	103	125	146	167	188	209	230
32(1¼″)	61.8	80	116	156	192	231	271	310	349	388	428
40(1½″)	96.7	125	182	244	301	362	424	485	546	608	669
50(2″)	157	203	296	397	489	589	689	788	888	988	1080

※ House data

Calculating formula:

$Qm=5.246CKd'A(P+0.1)\quad 0.9$

Qm: Relieving discharge capacity kg/h
C: 0.98 (An coefficient depending on the nature of steam.
C=1 when set pressure is less than 0.4MPa and at saturation temperature)

Kd': 0.96 (Relieving coefficient)
A: Seat opening area mm^2
P: Relieving pressure MPa
(set pressure +0.02) or (set pressure 1.1) whichever larger.

2. RELIEVING CAPACITY FOR AIR
(Pressure Vessel Construction Code)

(kg/h)

Size	Set pressure(MPa)										
	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15(½″)	21.8	28.2	41	55.1	69.3	83.4	97.5	111	125	139	154
20(¾″)	37.1	48	69.9	93.9	118	142	166	190	214	238	262
25(1″)	53.9	69.8	101	136	171	206	241	276	311	346	381
32(1¼″)	100	129	188	253	318	382	447	512	577	641	706
40(1½″)	156	202	294	396	497	598	700	801	902	1000	1100
50(2″)	254	329	479	643	808	972	1130	1300	1460	1630	1790

※ House data

Calculating formula:

$Qm=C'K_d'A\,P_1\sqrt{\frac{M}{ZT}}\quad 0.9$

Qm: Relieving discharge capacity kg/h
C': 27.0 (Coefficient)
Kd': 0.96* (Relieving coefficient)
A: Seat opening area mm^2
M: 28.96 (Molecular weight of air)
Z: 1 (Compression coefficient)

T: 293 (Absolute temperature K)
P_1: Relieving pressure MPa
(set pressure 1.1+0.1) or (set pressure +0.02+0.1) whichever larger.

■Converting kg/h to m^3/h (standard state) (for reference only)

$$m^3/h(\text{Standard state})=\frac{\text{Value in the table above (kg/h)}}{1.226kg/m^3}$$

3. RELIEVING CAPACITY FOR WATER AND HOT WATER
(Pressure Vessel Construction Code)

(kg/h)

Size	Set pressure(MPa)										
	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15(½″)	375	531	742	875	976	1070	1150	1230	1310	1380	1450
20(¾″)	640	905	1260	1490	1660	1820	1970	2110	2240	2360	2470
25(1″)	930	1310	1830	2160	2410	2650	2860	3060	3250	3430	3600
32(1¼″)	1720	2430	3400	4010	4480	4910	5310	5680	6030	6360	6680
40(1½″)	2690	3810	5320	6280	7000	7690	8310	8890	9440	9950	10400
50(2″)	4380	6200	8650	10200	11300	12400	13500	14400	15300	16100	16900

Calculation formula:

$W=87.7S\sqrt{(P_1+0.1)\,\kappa\,\gamma_1}$

$\left(S=\frac{W}{87.7\sqrt{(P_1+0.1)\,\kappa\,\gamma_1}}\right)$

(If $(P_1+0.1)\,\kappa > (P_1-P_2)$, replace $(P_1+0.1)\,\kappa$ with (P_1-P_2))

W: Relieving capacity kg/h
S: Seat opening area mm^2
P_1: Relieving pressure MPa
Set pressure 1.2: 0.05MPa≦set pressure<0.17MPa
Set pressure+0.034: 0.17MPa≦set pressure<0.34MPa
Set pressure 1.1: 0.34MPa≦set pressure

P_2: Outlet pressure MPa
κ : Coefficient of correction (see Fig.2 in page 89)
Δt: difference between saturation temperature at P_1 (Relieving pressure) and the temperature of water/hot water at inlet side of valve℃
γ_1: Density of water/hot water at inlet side of valve kg/l (water(15 ℃)=1)

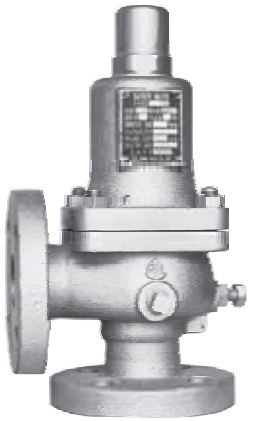
■Converting kg/h to l/min (Standard state) (for reference only)

Weight of 1 liter water (l)≒ 1kg,

$$l/min=\frac{\text{Value in the table above (kg/h=l/h)}}{60}$$

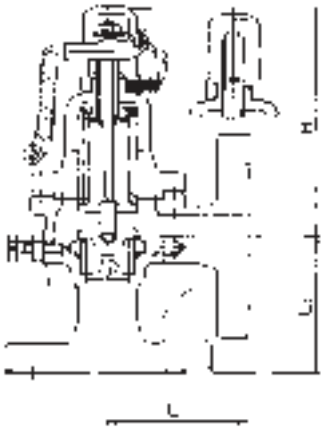
SL-23H, 24H Type Safety Valve (Lift Type)

SL-23H Type



SL-24H Type

CONSTRUCTION



Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

SPECIFICATIONS

Model name		SL-23H	SL-23	SL-24H	SL-24
Code name		**SL23H-G ☐**	**SL23-B ☐**	**SL24HB-G ☐**[*1.]	**SL24-B ☐**
		※ Code No. of pressure division is required in ☐.			
Cap type		With lever		Without lever	
Size		15~65(½″~2½″)	80~150(3″~6″)	15~65(½″~2½″)	80~150(3″~6″)
Applicable fluid		Steam & air		Steam, air, gases & (liquids[*1.])	
Set pressure range		**0.035~1.0MPa**			
Applicable temperature		−5~230℃		−5~184℃[*3.]	
End connection		Flanged JIS 10KFF[*2.]			
Valve body pressure test		Hydraulic 1.5MPa			
Materials	Body	Cast iron			
	Disc	Stainless steel	Cast bronze	Stainless steel	Cast bronze
	Seat ring	Size 15~100mm:Stainless steel, Size 125~150mm:Cast bronze			

∗1. For liquids, size 15~65mm, use code name SL24HW-G☐.
∗2. RF flange for outlet side is available upon your request.
∗3. Applicable temperature Max. 230℃ is available upon your request.

DIMENSIONS

(mm)

Size d	Seat opening dia. D	Effective area (mm²) π Dℓ	Lift ℓ	Face to Face		Height H	Mass(kg)	
				L_1	L_2		SL-23H,23 Type	SL-24H,24 Type
15(½″)	15	18.8	0.4	70	70	116	3.2	3.1
20(¾″)	20	31.4	0.5	75	75	120	4.1	4
25(1″)	25	54.9	0.7	85	85	129	6	5.9
40(1½″)	40	125.6	1.0	100	95	226	13	12
50(2″)	50	204.1	1.3	110	105	255	16	15
65(2½″)	65	346.9	1.7	135	115	291	23	22
80(3″)	78.4	492.3	2.0	145	125	371	33	30
100(4″)	99.4	780.2	2.5	160	150	435	52	46
125(5″)	130 (125)	1347.0 (1256.0)	3.3 (3.2)	182	182	674	120	114
150(6″)	160 (150)	2009.6 (1789.8)	4.0 (3.8)	219	208	727	151	145

∗ Figures in ( ):Size 125 and 150mm for Cast iron body with Stainless steel disc and seat ring. Flange code JIS 10KFF

PRESSURE DIVISION

(MPa)

Code No.	SL23H-G ☐,SL24HB-G ☐	SL24HW-G ☐	SL24HW-G ☐	SL23-B ☐, SL24-B ☐	
	Size 15~65mm	Size 15~25mm	Size 40~65mm	Size 80~100mm	Size 125~150mm
1	0.035~0.15		0.035~0.07	0.035~0.15	0.035~0.07
2	Over 0.15~0.6		Over 0.07~0.15	Over 0.15~0.4	Over 0.07~0.1
3	Over 0.6~1.0		Over 0.15~0.3	Over 0.4~0.7	Over 0.1~0.3
4			Over 0.3~0.6	Over 0.7~1.0	Over 0.3~0.5
5			Over 0.6~1.0		Over 0.5~0.7
6					Over 0.7~0.85
7					Over 0.85~1.0

∗Code No. of pressure division is required in ☐.

SL-5, 6 Type Safety Valve (Lift Type)

SL-5 Type

SL-6 Type

CONSTRUCTION

Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

SPECIFICATIONS

Type	Cast iron		Cast steel	
Model name	SL-5	SL-6	SL-5	SL-6
Code name	**SL5-G ☐**	**SL6-G ☐**	**SL5-C ☐**	**SL6-C ☐**
	※ Code No. of pressure division is required in ☐.			
Cap type	With lever	Without lever	With lever	Without lever
Applicable fluid	Steam & air	Steam, air, gases & liquids	Steam & air	Steam, air, gases & liquids
Size	15~100(½″~4″)		40~100(1½″~4″)	
Set pressure range	0.035~1.6MPa*3.		0.035~2.0MPa	
Applicable temperature	−5~230℃		−5~250℃	
End connection	Flanged JIS 10, 16KFF*4.		Flanged JIS 10, 16, 20KFF*4.	
Materials	Body(Cast iron) Disc & Seat ring(Stainless steel)		Body(Cast steel) Disc & Seat ring(Stainless steel)	
Valve body pressure test	1.5 times of flange rated pressure. (Hydraulic)		2 times of flange rated pressure. (Hydraulic)	

＊1. Flange codes ANSI Class 150 and 300 with cast steel valve body are available upon your request.
＊2. Stainless steel body valve is available for size 40mm or bigger.
＊3. Size 15~40mm cast iron body valves are available only with Flange code JIS 10KFF flanges.
＊4. RF flange on outlet side is available upon your request.

DIMENSIONS

(mm)

Size d	Seat opening dia. D	Effective area (mm^2) $\pi D\ell$	Lift ℓ	Face to Face L_1	Face to Face L_2	Height H	Mass(kg) Cast iron SL-5 Type	Mass(kg) Cast iron SL-6 Type	Mass(kg) Cast steel SL-5 Type	Mass(kg) Cast steel SL-6 Type
15(½″)	15	18.8	0.4	(75)	(65)	(174)	4.3	4.2		
20(¾″)	20	31.4	0.5	(80)	(75)	(198)	4.9	4.8		
25(1″)	25	54.9	0.7	(95)	(90)	(244.5)	9	8.7		
40(1½″)	40	125.6	1.0	110(108)	100 (98)	253(253)	13	13	15	14.7
50(2″)	50	204.1	1.3	120(118)	110(108)	297(297)	20.5	20	22.5	22
65(2½″)	65	346.9	1.7	130(128)	120(118)	369(369)	28	28	30	28
75(3″)	75	447.4	1.9	145(143)	135(133)	407(407)	46	44	37	35
100(4″)	100	785.0	2.5	170(168)	155(153)	557(557)	74	70	72	68

＊1. Figures of face to face and height are for Flanged JIS 20K.
＊2. Figures in ( ):Size 15~40mm with cast iron body are for Flanged JIS 10K. Figures of 50~100mm are of Flanged JIS 16K.
Size 15~40mm cast iron body with JIS 10K are only available.
＊3. The end connection Flange of 75mm is same as JIS Flange code of 80mm.

PRESSURE DIVISION (Cast iron)

(MPa)

Code No.	Size 15~25mm	Size 40mm	Size 50mm	Size 65mm	Size 75mm	Size 100mm
1	0.035~0.07	0.035~0.07	0.035~0.07	0.035~0.07	0.035~0.07	0.035~0.07
2	Over 0.07~0.1	Over 0.07~0.1	Over 0.07~0.1	Over 0.07~0.1	Over 0.07~0.1	Over 0.07~0.1
3	Over 0.1~0.35	Over 0.1~0.35	Over 0.1~0.35	Over 0.1~0.35	Over 0.1~0.35	Over 0.1~0.35
4	Over 0.35~0.5	Over 0.35~0.5	Over 0.35~0.5	Over 0.35~0.5	Over 0.35~0.5	Over 0.35~0.5
5	Over 0.5~0.7	Over 0.5~0.85	Over 0.5~0.7	Over 0.5~0.85	Over 0.5~0.7	Over 0.5~0.7
6	Over 0.7~0.85	Over 0.85~1.0	Over 0.7~1.0	Over 0.85~1.0	Over 0.7~0.85	Over 0.7~0.85
7	Over 0.85~1.0		Over 1.0~1.3	Over 1.0~1.3	Over 0.85~1.0	Over 0.85~1.0
8			Over 1.3~1.6	Over 1.3~1.6	Over 1.0~1.6	Over 1.0~1.3
9						Over 1.3~1.6

PRESSURE DIVISION (Cast steel)

(MPa)

Code No.	Size 40mm	Size 50mm	Size 65mm	Size 75mm	Size 100mm
1	0.035~0.07	0.035~0.07	0.035~0.07	0.035~0.07	0.035~0.07
2	Over 0.07~0.1	Over 0.07~0.1	Over 0.07~0.1	Over 0.07~0.1	Over 0.07~0.1
3	Over 0.1~0.35	Over 0.1~0.35	Over 0.1~0.35	Over 0.1~0.35	Over 0.1~0.35
4	Over 0.35~0.5	Over 0.35~0.5	Over 0.35~0.5	Over 0.35~0.5	Over 0.35~0.5
5	Over 0.5~0.85	Over 0.5~0.7	Over 0.5~0.85	Over 0.5~0.7	Over 0.5~0.7
6	Over 0.85~1.3	Over 0.7~1.0	Over 0.85~1.0	Over 0.7~0.85	Over 0.7~0.85
7	Over 1.3~1.6	Over 1.0~1.3	Over 1.0~1.3	Over 0.85~1.0	Over 0.85~1.0
8	Over 1.6~2.0	Over 1.3~1.6	Over 1.3~1.6	Over 1.0~1.6	Over 1.0~1.3
9		Over 1.6~2.0	Over 1.6~2.0	Over 1.6~2.0	Over 1.3~1.6
A					Over 1.6~2.0

SL-7, 8 Type Safety Valve (Lift Type)

SL-7 Type

SL-8 Type

CONSTRUCTION

Depending on models, the structure may be different from what is shown in the above figure.

SPECIFICATIONS

Model name		SL-7		SL-8	
Code name		SL7-N☐	SL7-D☐	SL8-N☐	SL8-D☐
		※ Code No. of pressure division is required in ☐.			
Cap type		With lever		Without lever	
Applicable fluid		Steam & air		Steam, air, gases & liquids	
Set pressure range		0.035~3.0MPa			
Applicable temperature		−5~250℃			
End connection		Screwed JIS Rc			
Materials	Body	Forged steel	Stainless steel	Forged steel	Stainless steel
	Disc	Stainless steel			
	Seat ring	Stainless steel			
Valve body pressure test		Set pressure 0.035MPa~1.0MPa:Hydraulic 2.0MPa Set pressure1.0MPa~2.0MPa:Hydraulic 4.0MPa Set pressure2.0MPa~3.0MPa:Hydraulic 6.0MPa			

* For those exceeding 2.0MPa as the pressure division, the satellite deposition (welding) shall be executed on the disc and the seat ring.

DIMENSIONS

(mm)

Size d	Seat opening dia. D	Effective area (mm^2) π Dℓ	Lift ℓ	Face to Face		Height H	End connection d	Mass(kg)	
				L_1	L_2			SL-7 Type	SL-8 Type
15(½″)	15	18.8	0.4	50	45	207	½″	2.7	2.5
20(¾″)	20	31.4	0.5	50	45	207	¾″	2.7	2.5
25(1″)	25	54.9	0.7	70	55	254	1″	6.5	6.2
32(1¼″)	32	80.3	0.8	70	55	254	1¼″	7.3	7

PRESSURE DIVISION (Forged steel)

(MPa)

Code No.	Size 15mm	Size 20mm	Size 25mm	Size 32mm
1	0.035~0.15	0.035~0.1	0.035~0.2	0.035~0.1
2	Over 0.15~0.4	Over 0.1~0.25	Over 0.2~0.3	Over 0.1~0.2
3	Over 0.4~0.8	Over 0.25~0.5	Over 0.3~0.7	Over 0.2~0.4
4	Over 0.8~1.5	Over 0.5~1.0	Over 0.7~1.5	Over 0.4~0.7
5	Over 1.5~2.5	Over 1.0~1.5	Over 1.5~2.0	Over 0.7~1.0
6	Over 2.5~3.0	Over 1.5~3.0	Over 2.0~3.0	Over 1.0~1.5
7				Over 1.5~2.0
8				Over 2.0~2.5
9				Over 2.5~3.0

PRESSURE DIVISION (Stainless steel)

(MPa)

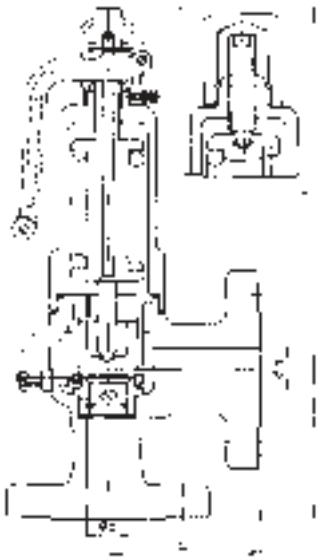
Code No.	Size 15mm	Size 20mm	Size 25mm	Size 32mm
1	0.035~0.15	0.035~0.1	0.035~0.2	0.035~0.1
2	Over 0.15~0.4	Over 0.1~0.25	Over 0.2~0.3	Over 0.1~0.2
3	Over 0.4~0.8	Over 0.25~0.5	Over 0.3~0.7	Over 0.2~0.4
4	Over 0.8~1.5	Over 0.5~1.0	Over 0.7~1.5	Over 0.4~0.7
5	Over 1.5~2.5	Over 1.0~1.5	Over 1.5~2.0	Over 0.7~1.0
6	Over 2.5~3.0	Over 1.5~3.0	Over 2.0~3.0	Over 1.0~1.5
7				Over 1.5~2.0
8				Over 2.0~3.0

SL-9, 10 Type Safety Valve (Lift Type)

SL-9 Type

SL-10 Type

CONSTRUCTION



Depending on models, the structure may be different from what is shown in the above figure.

SPECIFICATIONS

Model name		SL-9		SL-10	
Code name		SL9-N ☐	SL9-D ☐	SL10-N ☐	SL10-D ☐
		※ Code No. of pressure division is required in ☐.			
Cap type		With lever		Without lever	
Applicable fluid		Steam & air		Steam, air, gases & liquids	
Set pressure range		0.035~2.0MPa*1.			
Applicable temperature		−5~250℃			
End connection		Flanged JIS 10, 20, 30KRF*2.			
Materials	Body	Forged steel	Stainless steel	Forged steel	Stainless steel
	Disc	Stainless steel			
	Seat ring	Stainless steel			
Valve body pressure test		2 times of flange rated pressure. (Hydraulic)			

*1. Set pressure Max. 3.0MPa is available upon your request.
*2. Flange codes ANSI Class 150 and 300 are available.
*3. For those exceeding 2.0MPa as the pressure division, the satellite deposition (welding) shall be executed on the disc and the seat ring.

DIMENSIONS

(mm)

Size d	Seat opening dia. D	Effective area (mm^2) $\pi D\ell$	Lift ℓ	Face to Face		Height H	Mass(kg)	
				L_1	L_2		SL-9 Type	SL-10 Type
15(½″)	15	18.8	0.4	86	86	207	4	3.8
20(¾″)	20	31.4	0.5	88	88	207	4.4	4.2
25(1″)	25	54.9	0.7	96	96	254	9	8.7
32(1¼″)	32	80.3	0.8	102	102	254	9.8	9.5

Flange code JIS 20K

PRESSURE DIVISION (Forged steel)

(MPa)

Code No.	Size 15mm	Size 20mm	Size 25mm	Size 32mm
1	0.035~0.15	0.035~0.1	0.035~0.2	0.035~0.1
2	Over 0.15~0.4	Over 0.1~0.25	Over 0.2~0.3	Over 0.1~0.2
3	Over 0.4~0.8	Over 0.25~0.5	Over 0.3~0.7	Over 0.2~0.4
4	Over 0.8~1.5	Over 0.5~1.0	Over 0.7~1.5	Over 0.4~0.7
5	Over 1.5~2.5	Over 1.0~1.5	Over 1.5~2.0	Over 0.7~1.0
6	Over 2.5~3.0	Over 1.5~3.0	Over 2.0~3.0	Over 1.0~1.5
7				Over 1.5~2.0
8				Over 2.0~2.5
9				Over 2.5~3.0

PRESSURE DIVISION (Stainless steel)

(MPa)

Code No.	Size 15mm	Size 20mm	Size 25mm	Size 32mm
1	0.035~0.15	0.035~0.1	0.035~0.2	0.035~0.1
2	Over 0.15~0.4	Over 0.1~0.25	Over 0.2~0.3	Over 0.1~0.2
3	Over 0.4~0.8	Over 0.25~0.5	Over 0.3~0.7	Over 0.2~0.4
4	Over 0.8~1.5	Over 0.5~1.0	Over 0.7~1.5	Over 0.4~0.7
5	Over 1.5~2.5	Over 1.0~1.5	Over 1.5~2.0	Over 0.7~1.0
6	Over 2.5~3.0	Over 1.5~3.0	Over 2.0~3.0	Over 1.0~1.5
7				Over 1.5~2.0
8				Over 2.0~3.0

SL-11, 12 Type Safety Valve (Lift Type)

for Pressure Vessels, Steam Boilers etc.

SL-11 Type

SL-12 Type

CONSTRUCTION

Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

SPECIFICATIONS

Model name	SL-11	SL-12
Code name	**SL11-C ☐**	**SL12-C ☐**
	※ Code No. of pressure division is required in ☐.	
Cap type	With lever	Without lever
Applicable fluid	Steam & air	Steam, air, gases & liquids
Size	15~150(½″~6″)	
Set pressure range	Size 15~25mm:0.035~3.0MPa Size 40~100mm:2.0~3 0MPa*1. Size 125~150mm:0.035~3.0MPa	
Applicable temperature	−5~250℃	
End connection	Flanged JIS 10, 20, 30KRF*2.	
Materials	Body (Cast steel)*3, Disc & Seat ring(Stainless steel)	
	Disc & Seat ring (Stellite deposition)	
Valve body pressure test	2 times of flange rated pressure. (Hydraulic)	

∗1. Set pressure 2.0MPa or less is available for size 40~100mm upon your request.
∗2. Flange codes ANSI Class 150 and 300 are available; ANSI Class 150 excludes Size 15mm.
∗3. Stainless steel body valve is available. (Applicable pressure is different for each size)

DIMENSIONS

(mm)

Size d	Seat opening dia. D	Effective area (mm^2) $\pi D\ell$	Lift ℓ	Face to Face		Height H	Mass(kg)	
				L_1	L_2		SL-11 Type	SL-12 Type
15(½″)	15	18.8	0.4	85	80	197	6.6	6.4
20(¾″)	20	31.4	0.5	90	90	201	8.2	8
25(1″)	25	54.9	0.7	95	100	253	12	11
40(1 ½″)	40	125.6	1.0	130	105	304	22	21
50(2″)	50	204.1	1.3	135	110	368	31	29
65(2 ½″)	65	346.9	1.7	155	135	431	48	47
80(3″)	75	447.4	1.9	170	140	474	70	69
100(4″)	100	785.0	2.5	210	165	670	139	137
125(5″)	125	1256.0	3.2	235	190	760	193	190
150(6″)	150	1789.8	3.8	265	215	863	280	277

∗The end connection Flange of 75mm is same as JIS Flange code of 80mm. Flange code JIS 30K

PRESSURE DIVISION

(MPa)

Code No.	Size 15~25mm	Size 40~100mm	Size 125~150mm
1	0.035~0.07	2.0~2.5	0.035~0.07
2	Over 0.07~0.12	Over 2.5~3.0	Over 0.07~0.1
3	Over 0.12~0.2		Over 0.1~0.35
4	Over 0.2~0.3		Over 0.35~0.5
5	Over 0.3~0.5		Over 0.5~0.7
6	Over 0.5~0.8		Over 0.7~0.85
7	Over 0.8~1.3		Over 0.85~1.0
8	Over 1.3~2.0		Over 1.0~1.3
9	Over 2.0~3.0		Over 1.3~1.6
A			Over 1.6~2.0
B			Over 2.0~2.5
C			Over 2.5~3.0

E Type Series Relief Valve (for Pump Relief)

for Pump Only

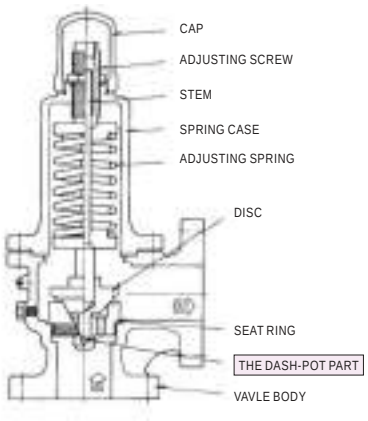
E Type series pump relief valves are specially designed for pump. Their construction prevent hunting or water hammer even in the case of continuous relief.

SL-38E,40E Type

SL-40EF Type

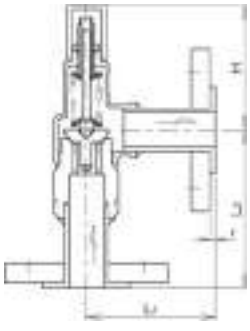
SL-24E Type

■ THE DASH-POT PART CONSTRUCTION



■ CONSTRUCTION

SL-38E,40E Type



SL-40EF Type

SL-24E Type

【 DASH-POT TYPE 】

■ FEATURES

- The dash-pot structure of the disc can inhibit drastic movement of the disc caused by pulsating pressure or fluctuating of pressure.
- It maintains the discharge pressure of pump constantly to relieve increased by change of load of the pump.

SCREWED TYPE

■ SPECIFICATIONS

Model name		SL-38E		SL-40E	
Code name		**SL38E-D ☐**		**SL40E-D ☐**	
		※ Code No. of pressure division is required in ☐.(Refer to page 77)			
Applicable fluid		Water, oil & liquids*			
Size		15~50(½″~2″)	15~25(½″~1″)	15~50(½″~2″)	15~25(½″~1″)
Set pressure range		**0.035~1.0MPa**	**1.0~1.6MPa**	**0.035~1.0MPa**	**1.0~1.6MPa**
Applicable temperature		5~80℃(Available up to 150℃ upon request)			
End connection		Screwed JIS Rc			
Materials	Body	Stainless steel(Spring case:Cast bronze)		Stainless steel(Spring case:Stainless steel)	
	Disc & seat ring	Stainless steel			
Valve body pressure test		2 times of rated pressure. (Hydraulic)			

*Contact our local agent for gasoline, kerosene and solvent medium use.

FLANGE TYPE

■ SPECIFICATIONS

Model name		SL-40EF	SL-24E	
Code name		**SL40EF-D ☐**	**SL24E-B ☐**	**SL24E-G ☐**
		※ Code No. of pressure division is required in ☐. (Refer to page 77)		
Applicable fluid		Water, oil & liquids*	Water, oil & liquids	
Set pressure range		0.035~1.0MPa		
Applicable temperature		5~80℃(Available up to 150℃ upon request)		
End connection		Flanged JIS 10K(Loose type)	Flanged JIS 10KFF	
Materials	Body	Stainless steel(Spring case:Stainless steel)	Cast iron	
	Disc & seat ring	Stainless steel	Brass	Stainless steel
Valve body pressure test		2 times of rated pressure. (Hydraulic)	1.5 times of rated pressure. (Hydraulic)	

*Contact our local agent for gasoline, kerosene and solvent medium use.

■ DIMENSIONS

●SL-38E, 40E TYPE (Screwed Type) (mm)

Size	d	L1	L2	H	Mass(kg)
15(½″)	½″	30	36	85	0.5
20(¾″)	¾″	35	40	89	0.6
25(1″)	1″	40	46	93	0.8
32(1¼″)	1¼″	50	54	115	1.4
40(1½″)	1½″	55	60	120	1.9
50(2″)	2″	65	73	152	3.4

●SL-40EF TYPE (Flange Type) (mm)

Size	L1	L2	H	f	Mass(kg)
15(½″)	90	110	85	5	2.1
20(¾″)	95	115	89	5	2.5
25(1″)	100	124	93	5	4
32(1¼″)	110	138	115	5	5.5
40(1½″)	125	154	120	5	6.5
50(2″)	135	164	152	5	9

Flange code JIS 10K

●SL-24E TYPE (Flange Type) (mm)

Size	L1	L2	H	Mass(kg)
15(½″)	70	70	116	3
20(¾″)	75	75	120	4
25(1″)	85	85	129	5.6
40(1½″)	100	95	226	12
50(2″)	110	105	255	15
65(2½″)	135	115	291	22
80(3″)	145	125	371	30

Flange code JIS 10KFF

ED Type Series Relief Valve(for Pump Relief)

for Pump and Thermo-relief etc. 【 DAMPER TYPE 】

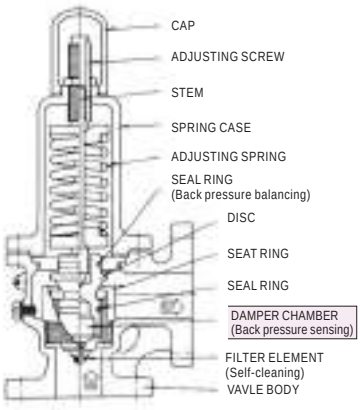
ED Type series pump relief valves are specially designed for regulating pressure of pump. Damper device with back pressure balancing structure, which is not influenced by back pressure,senses pressure for regulating pressure. These valves can also be used on positive displacement pump such as plunger pump.

SL-6ED Type

SL-8ED Type

SL-10ED Type

■ DAMPER CONSTRUCTION



■ CONSTRUCTION

SL-6ED Type

SL-8ED Type

SL-10ED Type

■ FEATURES

- The damper in valve disc can inhibit drastic movement of the disc caused by high pulsating pressure and change of pressure.
- The back pressure balancing structure eliminates the influence of back pressure caused by piping at the outlet of relief valve.

Max. 3.0MPa

■ SPECIFICATIONS

Model name		SL-8ED		SL-10ED	
Code name		**SL8ED-N ☐**	**SL8ED-D ☐**	**SL10ED-N ☐**	**SL10ED-D ☐**
		※ Code No. of pressure division is required in ☐.(Refer to page 77)			
Applicable fluid		Water, oil & liquids			
Set pressure range		**0.035~3.0MPa**			
Applicable temperature		5~80℃(Available up to 150℃ upon request)			
Maximum allowed back pressure		1.0MPa			
End connection		Screwed JIS Rc		Flanged JIS 20KRF*	
Materials	Body	**Forged steel**	**Stainless steel**	**Forged steel**	**Stainless steel**
	Disc & seat ring	Stainless steel			
Valve body pressure test		2 times of rated pressure. (Hydraulic)			

*Flanged JIS 10, 16 and 30K are available upon your request.

Max. 2.0MPa

■ SPECIFICATIONS

Model name		SL-6ED	
Code name		**SL6ED-G ☐**	**SL6ED-C ☐**
		※ Code No. of pressure division is required in ☐.(Refer to page 77)	
Applicable fluid		Water, oil & liquids	
Set pressure range		Size 40mm:0.035~1.0MPa Size 50~75mm:0.035~1.6MPa	**0.035~2.0MPa**
Applicable temperature		5~80℃(Available up to 150℃ upon request)	
Maximum allowed back pressure		1.0MPa	
End connection		Size 40mm:Flanged JIS 10KFF Size 50~75mm:Flanged JIS 16KFF*2.	Flanged JIS 20KFF*3.
Materials	Body	**Cast iron**	**Cast steel*4.**
	Disc & seat ring	Stainless steel	
Valve body pressure test		1.5 times of flange rated pressure. (Hydraulic)	2 times of flange rated pressure. (Hydraulic)

*1. The end connection Flange of 75mm is same as JIS Flange code of 80mm.
*2. Size 50mm or bigger with Flanged JIS 10K are available upon your request.
*3. JIS 10K and 16K are available upon your request.
*4. Stainless steel body valve is available upon your request.

■ DIMENSIONS

●SL-8ED TYPE (Screwed Type) (mm)

Size	d	L_1	L_2	H	Mass(kg)
15(½″)	½″	50	45	192	2.4
20(¾″)	¾″	50	45	192	2.4
25(1″)	1″	70	55	244	6.2
32(1¼″)	1¼″	70	55	244	7

●SL-10ED TYPE (Flange Type) (mm)

Size	L_1	L_2	H	Mass(kg)
15(½″)	86	86	192	4
20(¾″)	88	88	192	4.2
25(1″)	96	96	244	8.7
32(1¼″)	102	102	244	11

Flange code JIS 20KRF

●SL-6ED TYPE (Flange Type) (mm)

Size	L_1	L_2	H	Mass(kg)
40(1½″)	110	100	251	13.3
50(2″)	120	110	296	22.5
65(2½″)	130	120	365	27.1
75(3″)*	145	135	403	36.6

Flange code JIS 20KFF(Cast steel)

*The end connection Flange of 75mm is same as JIS Flange code of 80mm.

DATA/E, ED Type Series Relief Valve (for Pump Relief)

PRESSURE CLASSIFICATION TABLE

●E TYPE SERIES RELIEF VALVE

【DASH POT TYPE】 for PUMP

SL-38E, 40E TYPES (Screwed Type)

(MPa)

Code No.	SL38E-D ☐, SL40E-D ☐
1	0.035~0.2
2	Over 0.2~0.5
3	Over 0.5~1.0
4	Over 1.0~1.6

＊Code No. of pressure division is required in ☐.

SL-40EF TYPE (Flange Type)

(MPa)

Code No.	SL40EF-D ☐
1	0.035~0.2
2	Over 0.2~0.5
3	Over 0.5~1.0

＊Code No. of pressure division is required in ☐.

SL-24E TYPE (Flange Type)

(MPa)

Code No.	SL24E-B ☐, SL24E-G ☐	
	Size 15~65mm	Size 80mm
1	0.035~0.2	0.035~0.2
2	Over 0.2~0.7	Over 0.2~0.5
3	Over 0.7~1.0	Over 0.5~0.8
4		Over 0.8~1.0

＊Code No. of pressure division is required in ☐.

●ED TYPE SERIES RELIEF VALVE

【DAMPER TYPE】 for PUMP AND THERMAL RELIEF PURPOSE

SL-8ED TYPE (Screwed Type)
SL-10ED TYPE (Flange Type) (Max. 3.0MPa)

■FORGED STEEL

(MPa)

Code No.	SL8ED-N ☐, SL10ED-N ☐		
	Size 15~20mm	Size 25mm	Size 32mm
1	0.035~0.15	0.035~0.3	0.035~0.15
2	Over 0.15~0.4	Over 0.3~0.5	Over 0.15~0.3
3	Over 0.4~0.8	Over 0.5~1.0	Over 0.3~0.6
4	Over 0.8~1.5	Over 1.0~2.0	Over 0.6~1.1
5	Over 1.5~2.5	Over 2.0~3.0	Over 1.1~1.6
6	Over 2.5~3.0		Over 1.6~2.4
7			Over 2.4~3.0

＊Code No. of pressure division is required in ☐.

■STAINLESS STEEL

(MPa)

Code No.	SL8ED-D ☐, SL10ED-D ☐		
	Size 15~20mm	Size 25mm	Size 32mm
1	0.035~0.15	0.035~0.3	0.035~0.15
2	Over 0.15~0.4	Over 0.3~0.45	Over 0.15~0.3
3	Over 0.4~0.8	Over 0.45~1.0	Over 0.3~0.6
4	Over 0.8~1.5	Over 1.0~2.0	Over 0.6~1.0
5	Over 1.5~2.5	Over 2.0~3.0	Over 1.0~1.5
6			Over 1.5~2.0
7			Over 2.0~3.0

＊Code No. of pressure division is required in ☐.

SL-6ED TYPE (Flange Type) (Max. 2.0MPa)

(MPa)

Code No.	SL6ED-G ☐, SL6ED-C ☐
1	0.035~0.1
2	Over 0.1~0.2
3	Over 0.2~0.4
4	Over 0.4~0.6
5	Over 0.6~0.85
6	Over 0.85~1.5
7	Over 1.5~2.0

＊Code No. of pressure division is required in ☐.

DATA/E, ED Type Series Relief Valve

Fig 1. FLOW CHARACTERISTICS CHART

Applicable models:

SL-38E, SL-40E
SL-40EF, SL-24E
SL-6ED, SL-8ED, SL-10ED

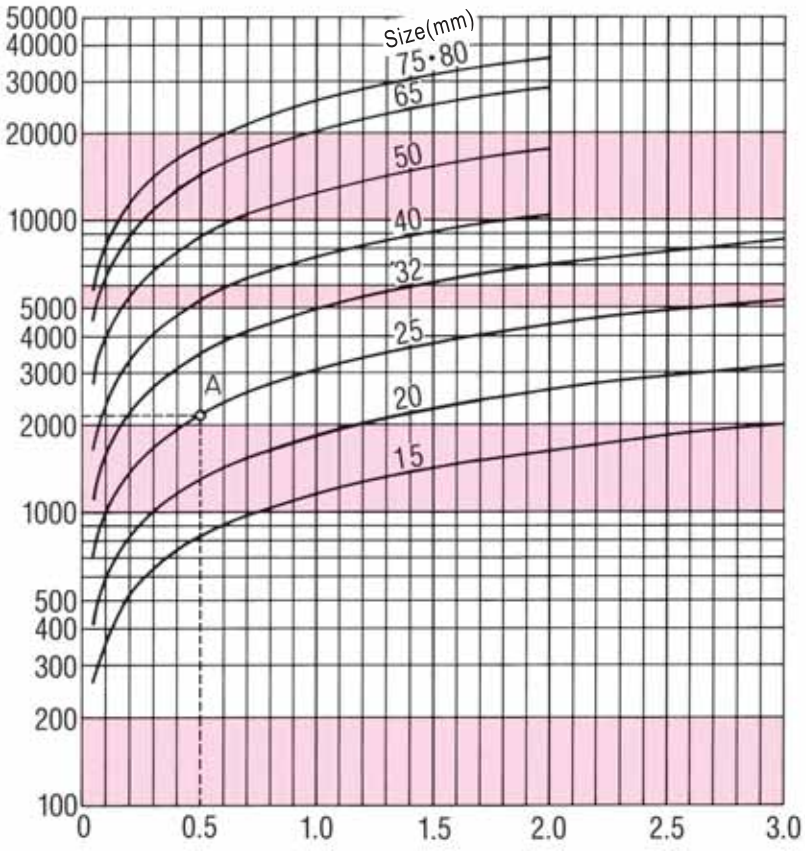
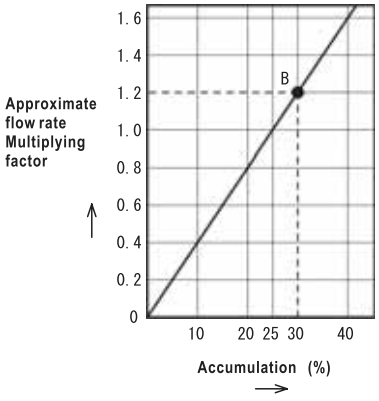
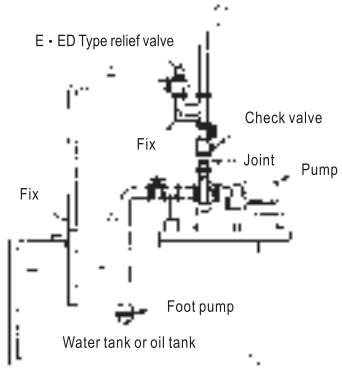


Fig 2. APPROXIMATE FLOW RATE



■ PIPING EXAMPLE



● HOW TO USE THE CHART

1. Use Fig.1 when accumulation is 25%.
2. Use Fig.1 and Fig.2 when accumulation is not 25%.

● EXAMPLE

1. Conditions: size 25mm, relieving pressure 0.5MPa, accumulation 25%. From point A (the point where 0.5MPa relieving pressure line intersects with size 25mm curve) in Fig.1, the flow will be 2189kg/h.
2. When accumulation is 30% and other conditions are the same as above, since the approximate flow rate multiplying factor is 1.2, which can be acquired using point B in Fig.2, the flow will be 2180kg 1.2=2616kg/h.

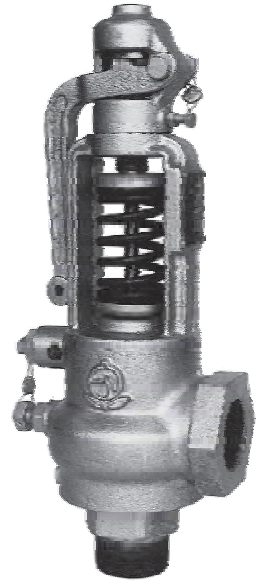
● kg/h→l/min conversion (for reference only)

Since the weight of 1l water is about 1kg

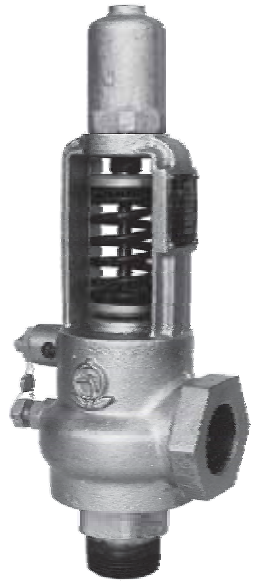
$$l/min = \frac{\text{value in the above chart (kg/h=l/h)}}{60}$$

SF-1H, 2H Type Safety Valve (Full Bore Type)

for Pressure Vessels, Steam Boiler etc. (2.0MPa)



SF-1H Type



SF-2H Type

SPECIFICATIONS

Model name	SF-1H	SF-2H
Code name	**SF1H-M☐**	**SF2H-M☐**
	※ Code No. of pressure division is required in ☐.	
Cap type	With lever	Without lever
Applicable fluid	Steam & air	
Set pressure range	**0.1~2.0MPa**	
Applicable temperature	−5~230℃	
End connection	inlet JIS R, outlet JIS Rc	
Materials	Body(Ductile cast iron), Disc(Stainless steel), Seat ring(Stainless steel stellited)	
Valve body pressure test	Set pressure 0.1MPa~1.0MPa: Hydraulic 1.5MPa Set pressure 1.0MPa~2.0MPa: Hydraulic 3.0MPa	

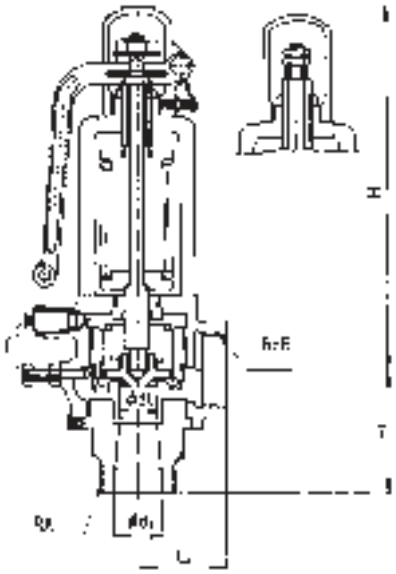
* Size (di) and thread size of End connection are different. Thread size of End connection have to be one size bigger.

DIMENSIONS

(mm)

Size	End connection		Seat opening dia.	Throat dia.	Throat area	Lift	Face to Face		Height	Mass(kg)	
di	A	B	D	dt	a(mm²)	ℓ	L_1	L_2	H	SF-1H Type	SF-2H Type
20(¾″)	1″	1″	18	15	176.6	3.8	50	75	207	3.3	3.2
25(1″)	1½″	1½″	22	19	283.3	5.0	60	85	232	5.2	5
40(1½″)	2″	2″	35	30	706.5	7.5	70	100	300	9.6	9.2
50(2″)	2½″	2½″	45	38	1133.5	9.5	85	115	329	16	16

CONSTRUCTION



Note:

Different products have different nominal diameter and jointing screw.

The size of jointing screw is one size larger than the size of valve.

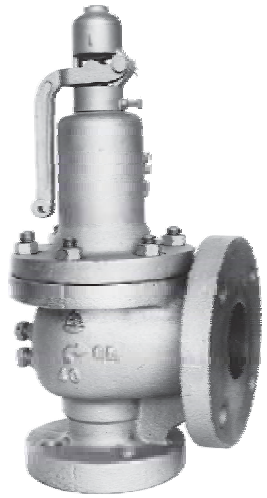
PRESSURE DIVISION

(MPa)

Code No.	Pressure division
1	0.1~0.12
2	Over 0.12~0.2
3	Over 0.2~0.3
4	Over 0.3~0.5
5	Over 0.5~0.75
6	Over 0.75~1.0
7	Over 1.0~1.3
8	Over 1.3~1.6
9	Over 1.6~2.0

SF-13, 13L, 14, 14L Type Safety Valve (Full Bore Type)

for Pressure Vessels, Steam Boiler etc. (1.0MPa)



SF-13 Type

SF-14 Type

SPECIFICATIONS

Model name	SF-13	SF-13L	SF-14	SF-14L
Code name	SF13-G ☐	SF13L-G ☐	SF14-G ☐	SF14L-G ☐
	※ Code No. of pressure division is required in ☐.			
Cap type	With lever		Without lever	
Applicable fluid	Air	Steam	Air, gases & liquids	Steam
Size	25~150(1″~6″)			
Set pressure range	0.1~1.0MPa			
Applicable temperature	−5~230℃		−5~184℃*1.	
End connection	Inlet:Flanged JIS10KFF (Thickness is based on table of DIMENSIONS)*2. Outlet:Flanged JIS10KFF			
Materials	Body(Cast iron), Disc & Seat ring(Stainless steel)			
Valve body pressure test	Hydraulic 1.5MPa			

*1. Applicable temperature Max. 230℃ is available upon your request.
*2. Flange codes JIS B8210 for inlet is also available upon your request.

DIMENSIONS

(mm)

Size	Seat opening dia.	Throat dia.	Throat area	Lift	Face to Face		Height	Thickness of flange	Mass(kg)	
Inlet×Throat dia.×Outlet									SF-13 SF-13L Type	SF-14 SF-14L Type
di×dt×do	D	dt	a(mm²)	ℓ	L1	L2	H	t		
25(1″)×19×40(1½″)	22	19	283.3	5.0	105	95	227	22	11	11
40(1½″)×25×65(2½″)	35	25	490.6	6.5	125	120	291	24	20	19
		30	706.5	7.5						
50(2″)×34×80(3″)	45	34	907.4	8.5	135	125	342	26	26	26
		38	1133.5	9.5						
65(2½″)×43×100(4″)	58	43	1451.4	11.0	155	140	397	28	41	40
		49	1884.7	12.5						
80(3″)×55×125(5″)	71	55	2374.6	14.0	175	160	481	30	61	58
		61	2920.9	15.5						
100(4″)×69×150(6″)	88	69	3737.3	17.5	205	180	554	32	91	91
		76	4534.1	19.0						
125(5″)×86×200(8″)	111	86	5805.8	21.5	225	210	687	34	147	145
		95	7084.6	24.0						
150(6″)×105×200(8″)	134	105	8654.6	26.5	255	220	815	36	226	220
		115	10381.6	29.0						

Flange code JIS 10K

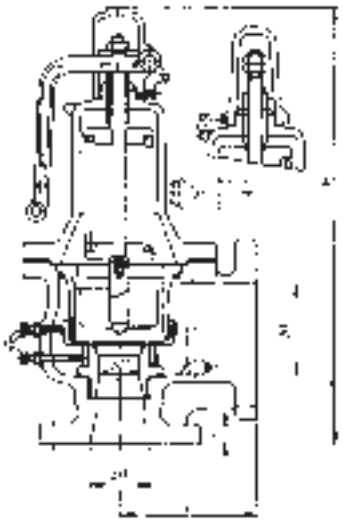
PRESSURE DIVISION

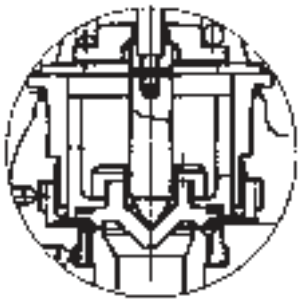
(MPa)

Code No.	Pressure division
1	0.1
2	Over 0.1~0.12
3	Over 0.12~0.15
4	Over 0.15~0.18
5	Over 0.18~0.21
6	Over 0.21~0.25
7	Over 0.25~0.3
8	Over 0.3~0.36
9	Over 0.36~0.43
A	Over 0.43~0.5
B	Over 0.5~0.65
C	Over 0.65~0.8
D	Over 0.8~1.0

CONSTRUCTION

● CONSTRUCTION OF SF-13L, 14L VALVE PART





Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

SF-15, 15L, 16, 16L Type Safety Valve (Full Bore Type)

for Pressure Vessels, Steam Boiler etc. (1.0MPa)

SF-15 Type

SF-16 Type

SPECIFICATIONS

Model name	SF-15	SF-15L	SF-16	SF-16L
Code name	**SF15-C ☐**	**SF15L-C ☐**	**SF16-C ☐**	**SF16L-C ☐**
	※ Code No. of pressure division is required in ☐.			
Cap type	With lever		Without lever	
Applicable fluid	Air	Steam	Air, gases & liquids	Steam
Size	40~150(1½″~6″)			
Set pressure range	**0.1~1.0MPa**			
Applicable temperature	−5~250℃			
End connection	Inlet:Flanged JIS 10KRF(Thickness is based on table of DIMENSIONS)*1. Outlet:Flanged JIS 10KFF*1. *2.			
Materials	Body(Cast steel)*3, Disc & Seat ring(Stainless steel)			
Valve body pressure test	Hydraulic 2.0MPa			

*1. Flange codes JIS B8210 10K(Inlet) JIS B2220 10K(Outlet) and ANSI Class 150 150 are also available upon your request.
*2. RF flange for outlet side is also available upon your request.
*3. Stainless steel body is available. (Applicable pressure is different for each size)

DIMENSIONS

(mm)

Size Inlet×Throat dia.×Outlet	Seat opening dia.	Throat dia.	Throat area	Lift	Face to Face		Height	Thickness of flange		Mass(kg)	
										SF-15 SF-15L Type	SF-16 SF-16L Type
di×dt×do	D	dt	a(mm²)	ℓ	L1	L2	H	t	f		
40(1½″)× 25/30 ×65(2½″)	35	25	490.6	6.5	127	125	291	24	6	21	21
		30	706.5	7.5							
50(2″)× 34/38 ×80(3″)	45	34	907.4	8.5	136	135	342	26	6	27	26
		38	1133.5	9.5							
65(2½″)× 43/49 ×100(4″)	58	43	1451.4	11.0	156	160	397	28	8	45	44
		49	1884.7	12.5							
80(3″)× 55/61 ×125(5″)	71	55	2374.6	14.0	176	180	481	30	8	63	61
		61	2920.9	15.5							
100(4″)× 69/76 ×150(6″)	88	69	3737.3	17.5	206	205	554	32	10	97	95
		76	4534.1	19.0							
125(5″)× 86/95 ×200(8″)	111	86	5805.8	21.5	225	240	687	34	10	160	158
		95	7084.6	24.0							
150(6″)× 105/115 ×200(8″)	134	105	8654.6	26.5	255	250	815	36	12	242	236
		115	10381.6	29.0							

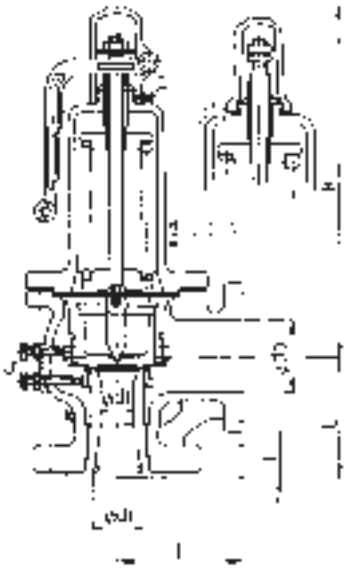
Flange code inlet JIS 10KRF
Outlet JIS 10K

PRESSURE DIVISION

(MPa)

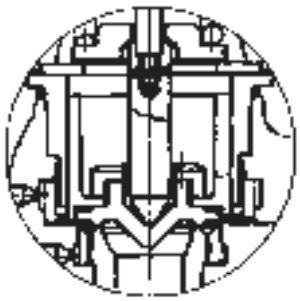
Code No.	Pressure division
1	0.1
2	Over 0.1~0.12
3	Over 0.12~0.15
4	Over 0.15~0.18
5	Over 0.18~0.21
6	Over 0.21~0.25
7	Over 0.25~0.3
8	Over 0.3~0.36
9	Over 0.36~0.43
A	Over 0.43~0.5
B	Over 0.5~0.65
C	Over 0.65~0.8
D	Over 0.8~1.0

CONSTRUCTION



Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

● CONSTRUCTION OF SF-15L, 16L VALVE PART



SF-17, 17L, 18, 18L Type Safety Valve (Full Bore Type)

for Pressure Vessels, Steam Boiler etc. (2.0MPa)

SF-17 Type

SF-18 Type

PRESSURE DIVISION

(MPa)

Code No.	Pressure division
1	1.0~1.3
2	Over 1.3~1.6
3	Over 1.6~2.0

SPECIFICATIONS

Model name	SF-17	SF-17L	SF-18	SF-18L
Code name	**SF17-C☐**	**SF17L-C☐**	**SF18-C☐**	**SF18L-C☐**
	※ Code No. of pressure division is required in ☐.			
Cap type	With lever		Without lever	
Applicable fluid	Air	Steam	Air, gases & liquids	Steam
Size	40~150(1½″~6″)			
Set pressure range	**1.0~2.0MPa**			
Applicable temperature	−5~250℃			
End connection	Inlet:Flanged JIS 16K, 20KRF(Thickness is based on table of DIMENSIONS)*1. Outlet:Flanged JIS 10KFF*1. *2.			
Materials	Body(Cast steel)*3., Disc & Seat ring(Stainless steel)			
	Disc & Seat ring:Stellited			
Valve body pressure test	2 times of flange rated pressure. (Hydraulic)			

∗1. Flange codes JIS B8210(inlet) JIS B2220(outlet) and ANSI Class 150 150 are also available upon your request.
∗2. RF flange for outlet side is also available upon your request.
∗3. Stainless steel body is available upon your reguest. (Applicable pressure is different for each size)

DIMENSIONS

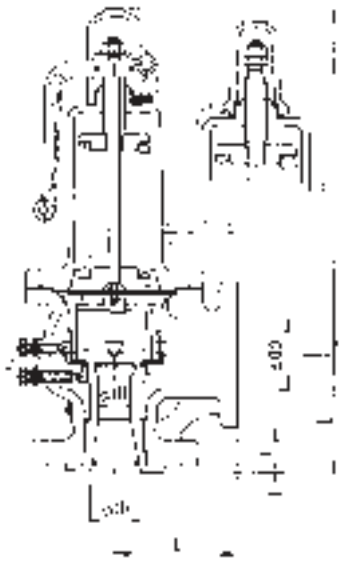
(mm)

Size Inlet×Throat dia.×Outlet	Seat opening dia.	Throat dia.	Throat area	Lift	Face to Face		Height	Thickness of flange		Mass(kg)	
										SF-17 SF-17L Type	SF-18 SF-18L Type
di×dt×do	D	dt	a(mm²)	ℓ	L1	L2	H	t	f		
40(1½″)× 25/30 ×65(2½″)	35	25	490.6	6.5	127	125	291	24	6	22	22
		30	706.5	7.5							
50(2″)× 34/38 ×80(3″)	45	34	907.4	8.5	136	135	375	26	6	30	29
		38	1133.5	9.5							
65(2½″)× 43/49 ×100(4″)	58	43	1451.4	11.0	156	160	471	28	8	52	51
		49	1884.7	12.5							
80(3″)× 55/61 ×125(5″)	71	55	2374.6	14.0	176	180	529	30	8	80	79
		61	2920.9	15.5							
100(4″)× 69/76 ×150(6″)	88	69	3737.3	17.5	206	205	657	32	10	140	138
		76	4534.1	19.0							
125(5″)× 86/95 ×200(8″)	111	86	5805.8	21.5	225	240	811	34	10	197	194
		95	7084.6	24.0							
150(6″)× 105/115 ×200(8″)	134	105	8654.6	26.5	255	250	902	36	12	281	278
		115	10381.6	29.0							

Note: The weight is that of JIS 20K inlet flange.

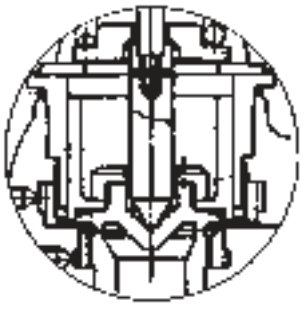
Flange code inlet JIS 16,20KRF
Outlet JIS 10K

CONSTRUCTION



Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

● CONSTRUCTION OF SF-17L, 18L VALVE PART



SF-19, 19L, 20, 20L Type Safety Valve (Full Bore Type)

for Pressure Vessels, Steam Boiler etc. (3.0MPa)

SF-19 Type

SF-20 Type

PRESSURE DIVISION (MPa)

Code No.	Size 15~25mm	Size 40~150mm
1	0.1	2.0~2.5
2	Over 0.1~0.12	Over 2.5~3.0
3	Over 0.12~0.15	
4	Over 0.15~0.18	
5	Over 0.18~0.21	
6	Over 0.21~0.25	
7	Over 0.25~0.3	
8	Over 0.3~0.36	
9	Over 0.36~0.43	
A	Over 0.43~0.5	
B	Over 0.5~0.65	
C	Over 0.65~0.8	
D	Over 0.8~1.0	
E	Over 1.0~1.3	
F	Over 1.3~1.6	
G	Over 1.6~2.0	
H	Over 2.0~2.5	
J	Over 2.5~3.0	

SPECIFICATIONS

Model name	SF-19	SF-19L	SF-20	SF-20L
Code name	**SF19-C ☐**	**SF19L-C ☐**	**SF20-C ☐**	**SF20L-C ☐**
	※ Code No. of pressure division is required in ☐.			
Cap type	With lever		Without lever	
Applicable fluid	Air	Steam	Air, gases & liquids	Steam
Size	15~150(½″~6″)			
Set pressure range	Size 15~25mm:0.1~3.0MPa Size 40~150mm:2.0~3.0MPa			
Applicable temperature	−5~250℃			
End connection	Inlet:Flanged JIS (10*1), 20, 30KRF(Thickness is based on table of DIMENSIONS)*2. Outlet:Flanged JIS 10KFF*2. *3.			
Materials	Body(Cast steel)*4, Disc & Seat ring(Stainless steel)			
	Disc & Seat ring:Stellited			
Valve body pressure test	2 times of flange rated pressure. (Hydraulic)			

*1. Flange codes JIS B8210 20K or 30K(inlet) JIS B2220(outlet) and ANSI Class 300 or 400 150 are available except Size 40mm.
*2. RF flange for outlet side is also available upon your request.
*3. Stainless steel body is available. (Applicable pressure is different for each size)

DIMENSIONS (mm)

Size Inlet×Throat dia.×Outlet	Seat opening dia.	Throat dia.	Throat area	Lift	Face to Face		Height	Thickness of flange		Mass(kg)	
										SF-19 SF-19L Type	SF-20 SF-20L Type
di×dt×do	D	dt	a(mm²)	ℓ	L1	L2	H	t	f		
15(½″)×11×25(1″)	13	11	94.9	2.8	100	80	204	18	1	8.2	8
20(¾″)×15×40(1½″)	18	15	176.6	3.8	105	95	210	18	1	9.7	9.5
25(1″)×19×40(1½″)	22	19	283.3	5.0	115	110	258	20	1	13	12
40(1½″)×25/30×65(2½″)	35	25	490.6	6.5	125	125	333	28	6	24	24
		30	706.5	7.5							
50(2″)×34/38×80(3″)	45	34	907.4	8.5	135	135	377	30	6	34	33
		38	1133.5	9.5							
65(2½″)×43/49×100(4″)	58	43	1451.4	11.0	155	160	473	34	8	57	56
		49	1884.7	12.5							
80(3″)×55/61×125(5″)	71	55	2374.6	14.0	175	180	529	36	8	77	76
		61	2920.9	15.5							
100(4″)×69/76×150(6″)	88	69	3737.3	17.5	205	205	659	40	10	131	129
		76	4534.1	19.0							
125(5″)×86/95×200(8″)	111	86	5805.8	21.5	225	240	813	44	10	270	267
		95	7084.6	24.0							
150(6″)×105/115×200(8″)	134	105	8654.6	26.5	255	250	904	48	12	316	310
		115	10381.6	29.0							

Note: The weight is that of JIS 30K inlet flange.

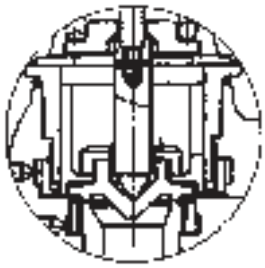
Flange code inlet JIS (10), 20, 30KRF
Outlet JIS 10K

CONSTRUCTION

Size 15~25mm

Size 40~150mm

● CONSTRUCTION OF SF-15L, 16L VALVE PART



Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

Extract from JIS B8210-1994 Spring Safety Valve for Steam and Gases

■ Allowed deviation of discharge-starting pressure

(1) For steam

There is no provision on the relief pressure of safety valve for steam.

(2) For gasses

For valve for gasses, the allowed deviation of start to discharge pressure is set pressure ±5% (minimum pressure: ±0.025MPa). In case of allowed deviation, which is not allowed to exceed set pressure,add the "+" side to "−" side.

Note: For valves for gasses, the set pressure is generally the start to discharge pressure.

■ Allowed deviation of opening pressure (popping pressure)

(1) For steam

See Table 1 for the deviation of opening pressure. In case of allowed deviation, which is not allowed to exceed set pressure, add the "+" side to "−" side.

(2) For gasses

For safety valves for gasses, the allowed deviation of discharge-starting pressure is less then1.1 times of star to discharge pressure. However, in the case of setting opening pressure, the deviation should be ±3% set pressure (minimum±0.014MPa).

■ BLOWDOWN

(1) For steam

See Table 2 for the blowdown pressure of safety valves for steam. For valves for steam used with through flow boilers, re-heater, and piping, which opening pressure exceeds 0.3MPa, the blowdown pressure should be less than 10% of set pressure.

(2) For gasses

See Table 3 for blowdown pressure of safety valves for gasses.

TABLE1. TOLERANCE OF OPENING PRESSURE OF SAFETY VALVES FOR STEAM

(MPa)

Set pressure	Tolerance
Below 0.5	±0.014 or less
0.5 or more and below 2.3	±(3% of set pressure)
2.3 or more and below 7.0	±0.07
7.0 or more	±(1% of set pressure)

∗1. For steam, generally the set pressure is assumed to be the opening pressure.

∗2. The tolerance of the opening pressure of the safety valves for steam used other than in boilers can be ±3% of the set pressure (minimum value ±0.014MPa).

TABLE2. BLOWDOWN PRESSURE OF SAFETY VALVES FOR STEAM

(MPa)

Set pressure	Blowdown
0.4 or less	0.03
Over 0.4	7%(4%) or less of set pressure

∗1. Generally, the blowdown pressure for steam shall be the difference between the popping pressure and the reseating pressure.

∗2. The figures in ( ) can be determinated in accordance with the agreement between the parties concerned.

TABLE3. BLOWDOWN PRESSURE OF SAFETY VALVES FOR GAS

(MPa)

Set pressure	Blowdown	
	Metal seated type	Soft seat type
0.2 or less	0.03 or less	0.05 or less
Over 0.2	15% or less of set pressure	25% or less of set pressure

∗1. Generally, the blowdown pressure for gases shall be the difference between the start to discharge pressure and the reseating pressure.
However, when set by the opening pressure, it shall be the difference between the opening pressure and the reseating pressure.

∗2. The definition of the soft seat and metal seated types shall be in accordance with JIS B 0100.

Note. The blowdown pressure defined by Venn shall be in accordance with the Venn standard unless otherwise specified by JIS B8210.

Applicable Laws/Regulations and Formulas for Calculating Relieving Capacity

Coefficients assigned to equations may be those specified in applicable laws/regulations or in-house data. ※In-house data

1. PRESSURE VESSEL CONSTRUCTION CODE (from JIS B8210-1994)

(1) For steam

$Qm=5.246CK_d'A(P+0.1)\quad 0.9$

Qm: Nominal Relieving capacity (kg/h)
A: Seat opening area (mm^2)
Lift type: $A=\pi D\ell$
Full bore type: $A=\frac{\pi d^2}{4}$
D: Seat opening diameter (mm)
ℓ: Lift (mm)
d: Throat diameter (mm)

P: Relieving pressure (MPa)
(Select the larger one of set pressure 1.1 or set pressure +0.02)
C: Coefficient determined according the nature of steam (see Tab. 1 in page 87)
1: Set pressure is less than 0.4MPa, at saturated pressure
0.98: Set pressure is larger than 0.4MPa, at saturated pressure
In the case of super heated steam, see Tab.1, page 87.
K_d': Relieving coefficient
Lift type:0.96※
Full bore type:0.864

(2) For gasses

$Qm=C'K_d'AP_1\sqrt{\frac{M}{ZT}}\quad 0.9$

Qm: Nominal Relieving capacity (kg/h)
A: Seat opening area (mm^2)
Lift type: $A=\pi D\ell$
Full bore type: $A=\frac{\pi d^2}{4}$
D: Seat opening diameter (mm)
ℓ: Lift (mm)
d: Throat diameter (mm)
Z: Compression coefficient: 1※ (see Fig.1 in page 89)
T: Absolute temperature (K) of gasses at relieving pressure

C': Coefficient according to κ and P_2/P_1 (See Fig.3, page 89)
κ : Adiabatic exponent (Cρ/Cυ) (See Tab.2, page 87).
The value is considered 1 if it is not clear.
P_2: Back pressure (MPa·A)
K_d': Relieving coefficient
Lift type:0.96※
Full bore type:0.864
M: Molecular weight of gas (see Tab.2, page 87)
P_1: Relieving pressure (MPa·A)
(Select the larger absolute pressure of set pressure 1.1 or absolute pressure of set pressure +0.02)

■ Calculating maximum flow-in gas using the following formula:

$G=0.0028\,\upsilon\,\rho\,d^2$

G: Flow in gas (kg/h)
υ : Velocity of gas (m/sec)
(More than 20 for saturated steam, more than 30 for super-heated steam, or move than 10 for common gas)

ρ: Density of gas (kg/m^2)
d: Internal diameter of pipe (mm)

(3) For water/hot water (also applicable for hot water with temperature higher than 120℃)

(1) In case of searching from relieving capacity:

$$S=\frac{W}{87.7\sqrt{(P_1+0.1)\,\kappa\,\gamma_1}}$$

(2)In case of searching from thermal input of pressure vessel or thermal out put of hot water boiler:

$$S=\frac{Q\varepsilon}{87.7C\sqrt{(P_1+0.1)\,\kappa\,\gamma_1}}$$

(If $(P_1+0.1)\kappa > (P_1-P_2)$ in equations (1) and (2), replace (P_1-P_2) with $(P_1+0.1)\kappa$)

S: Seat opening area (mm^2)
W: Relieving capacity of valve (kg/h)

P_1: Relieving pressure (MPa) (see Note)
Lift type: set pressure 1.1
For SL-37~40, see page 69.
Full bore type: select the larger one of set pressure 1.15 or set pressure +0.034
Relief valve (type E・ED): select the larger one of set pressure 1.25 or set pressure +0.034
P_2: Outlet pressure (MPa)
κ : Correction coefficient (see Fig.2 in page 89)
Δt: Difference between the saturated temperature of relieving pressure P_1 and the temperature of hot water at inlet. (℃)
γ_1: Density hot water at inlet (kg/l) (see Tab.3 in page 88)
Q: Thermal input of pressure vessel or thermal output of hot water boiler (kJ/h)
ε : Coefficient of volumetrical expansion for water (l/℃) (see Tab.4 in page 88)
C : Specific heat of water at constant pressure (kJ/kg℃) (see Tab.4 in page 88)
Note: In the case of full bore type safety valve or relief valve, make sure the pressure does not exceed 1.1 times maximum working pressure of pressure vessel or hot water boiler (or maximum working pressure +0.034).

Applicable Laws/Regulations and Formulas for Calculating Relieving Capacity

Coefficients assigned to equations may be those specified in applicable laws/regulations or in-house data.

※In-house data

2. BOILER CONSTRUCTION CODE (from JIS B8210-1994)

(1) For steam

$Qm=5.246CK_d'A(P+0.1)\quad 0.9$

Qm: Nominal Relieving capacity (kg/h)

A: Seat opening area (mm^2)

Lift type: $A=\pi D\ell$

Full bore type: $A=\frac{\pi d^2}{4}$

D: Seat opening diameter (mm)

ℓ: Lift (mm)

d: Throat diameter (mm)

(2) For hot water **(Applicable when temperature is less than 120℃. If temperature is higher than 120 ℃, then use the formula described in (1))**

(1) In case of searching from relieving capacity:

$$S=\frac{W}{87.7C\sqrt{(P_1+0.1)\kappa\gamma_1}}$$

(2)In case of searching from thermal input of pressure vessel or thermal out put of hot water boiler:

$$S=\frac{Q\varepsilon}{87.7C\sqrt{(P_1+0.1)\kappa\gamma_1}}$$

(If $(P_1+0.1)^{\kappa}>(P_1-P_2)$ in equations (1) and (2), replace (P_1-P_2) with $(P_1+0.1)^{\kappa}$)

S: Seat opening area (mm^2)

W: Relieving capacity of valve (kg/h)

P:Relieving pressure (MPa)

(Select the larger one of set pressure 1.1 or set pressure +0.02)

C: Coefficient according the nature of steam (see Tab.1 in page 87)

1: set pressure is less than 0.4MPa, at saturated pressure

0.98: set pressure is larger than 0.4MPa, at saturated pressure

In the case of overheated steam, see Tab.1, page 87.

K_d': Relieving coefficient

Lift type:0.96※

Full bore type:0.864

P_1: Relieving pressure (MPa) (see Note)

Lift type: set pressure 1.1

For SL-37~40, see page 69.

Full bore type: select the larger one of set pressure 1.15 or set pressure +0.034

Relief valve (type E・ED): select the larger one of set pressure 1.25 or set pressure+0.034

P_2: Outlet pressure (MPa)

κ : Correction coefficient (see Fig.2 in page 89)

Δt: Difference between the saturated temperature of relieving pressure P_1 and the temperature of hot water at inlet. (℃)

γ_1: Density hot water at inlet (kg/l) (see Tab.3 in page 88)

Q: Thermal input of pressure vessel or thermal output of hot water boiler (kJ/h)

ε : Coefficient of volumetrical expansion for water (l/℃) (see Tab.4 in page 88)

C: Specific heat of water at constant pressure (kJ/kg℃) (see Tab.4 in page 88)

■ NOTE

It is necessary installing safety valve when water temperature exceeds 120℃. The formula is as the following:

$Qm=5.246CK_d'A(P+0.1)\quad 0.9$

In this case, the required relieving capacity (kg/h) of safety valve can be calculated using the following formula:

$$W=\frac{Q}{h_1-h_2}$$

W: Relieving capacity (kg/h)

Q: Thermal output of hot water boiler (kJ/h)

h_1: Enthalpy of saturated steam that is equivalent to the maximum working pressure of boiler (kJ/kg).

h_2: Enthalpy of water supply (kJ/kg)

$$W=\frac{Q\varepsilon}{C}$$

ε : Coefficient of volumetrical expansion for water (l/℃) (see Tab.4 in page 88)

C: Specific heat of water at constant pressure (kJ/kg℃) (see Tab.4 in page 88)

(3) For Dowtherm boiler

$$Qm=C'K_d'AP_1\sqrt{\frac{M}{ZT}}\quad 0.9$$

Qm: Nominal relieving capacity (kg/h)

A: Seat opening area (mm^2)

Lift type: $A=\pi D\ell$

Full bore type: $A=\frac{\pi d^2}{4}$

D: Seat opening diameter (mm)

ℓ : Lift (mm)

d : Throat diameter (mm)

Z: Compression coefficient: 1※ (see Fig.1 in page 89)

T: Absolute temperature (K) of gasses at relieving pressure

C': Coefficient according to κ and P_2/P_1 (See Fig.3, page 89)

κ : Adiabatic exponent (C_P/C_V) (See Tab.2, page 87). The value is considered 1 if it is not clear.

P_2: Back pressure (MPa A)

K_d': Relieving coefficient

Lift type:0.96※

Full bore type:0.864

M: Molecular weight of gas (see Tab.2, page 87)

P_1: Relieving pressure (MPa A)

(Select the larger absolute pressure of set pressure 1.1 or absolute pressure of set pressure +0.02)

Applicable Laws/Regulations and Formulas for Calculating Relieving Capacity

Coefficients assigned to equations may be those specified in applicable laws/regulations or in-house data.

※In-house data

3. IN-HOUSE STANDARDS (for liquids other than water and hot water)

$$W=161\ AK\sqrt{PG}$$

W: Relieving capacity (kg/h)
A: Seat opening area (mm^2)
Lift type: $A=\pi D\ell$
Full bore type: $A=0.785d^2$
D: Seat opening diameter (mm)
ℓ: Lift (mm)
d: Throat diameter (mm)

G: Specific gravity
P: Relieving pressure (MPa)
K: Flow coefficient
Lift type: 0.55 for upper guide type
0.45 for blade type [The value may be different depending on type and accumulation]
Full bore type: 0.60

TABLE1. COEFFICIENT ACCORDING TO PROPERTY OF STEAM

Absolute pressure Mpa \ Temp. ℃	Saturated temperature	200	220	240	260	280	300	320	340	360	380	400	420	440	460
0.5	1.005	0.996	0.972	0.951	0.931	0.913	0.896	0.879	0.864	0.894	0.835	0.822			
1.0	0.987	0.981	0.983	0.960	0.938	0.919	0.901	0.884	0.868	0.853	0.838	0.825			
1.5	0.977	0.976	0.970	0.972	0.947	0.925	0.906	0.888	0.872	0.856	0.841	0.828			
2.0	0.972		0.967	0.964	0.955	0.932	0.912	0.893	0.876	0.860	0.845	0.830	0.817	0.804	0.792
2.5	0.969			0.961	0.961	0.937	0.918	0.898	0.880	0.863	0.848	0.833	0.819	0.806	0.793
3.0	0.967			0.962	0.957	0.949	0.924	0.903	0.885	0.867	0.851	0.836	0.822	0.808	0.795
4.0	0.965				0.958	0.954	0.934	0.915	0.894	0.875	0.857	0.841	0.826	0.813	0.799
5.0	0.966					0.955	0.953	0.927	0.904	0.884	0.865	0.848	0.832	0.817	0.803
6.0	0.968					0.962	0.953	0.941	0.911	0.891	0.872	0.854	0.838	0.822	0.808
7.0	0.971						0.958	0.954	0.924	0.901	0.881	0.861	0.844	0.827	0.812
8.0	0.975						0.967	0.956	0.937	0.912	0.888	0.868	0.850	0.833	0.817
9.0	0.980							0.962	0.957	0.926	0.897	0.876	0.856	0.838	0.822
10.0	0.986							0.971	0.961	0.936	0.909	0.883	0.863	0.844	0.827
12.0	0.999								0.975	0.964	0.926	0.903	0.876	0.857	0.838
14.0	1.016								1.002	0.980	0.956	0.920	0.893	0.868	0.846
16.0	1.036									1.000	0.988	0.942	0.907	0.883	0.858
18.0	1.063									1.038	1.004	0.972	0.929	0.895	0.873
20.0	1.094										1.028	1.006	0.953	0.914	0.885

＊Intermediate values of pressure and temperature in this table are calculated by proportional method. However, In case of Absolute pressure less than 0.5MPa refer at absolute pressure 0.5MPa.
Example. Incase of Absolute pressure:1.2MPa, Temperature:230℃, C=0.960

TABLE2. GAS PROPERTY

Name \ Physical property	Chemical symbol	Molecular weight	Adiabatic index Cp/Cv κ	Critical temp. Tc K	Critical pressure Pc MPa
Acetylene	C_2H_2	26.04	1.28	308.5	6.25
Air		28.96	1.40	—	—
Ammonia	NH_3	17.03	1.31	405.6	11.46
Argon	Ar	39.94	1.67	150.8	4.94
Benzene	C_6H_6	78.11	1.12	562.8	4.96
Isobutane	iso-C_4H_{10}	58.12	1.10	408.2	3.70
Normal butane	n-C_4H_{10}	58.12	1.09	425.5	3.75
Carbon disulfide	CS_2	76.14	1.21	549.2	7.65
Carbon dioxide	CO_2	44.01	1.29	304.2	7.63
Carbon monoxide	CO	28.01	1.40	133.0	3.62
Chlorine	Cl_2	70.90	1.36	417.2	7.83
Cyclohexane	C_6H_{12}	84.16	1.09	481.6	4.06
Normal decane	n-$C_{10}H_{22}$	142.29	1.03	618.4	2.13
Ethane	C_2H_6	30.07	1.19	305.4	4.89
Ethyl alcohol	C_2H_5OH	46.07	—	516.2	6.38
Ethylene	C_2H_4	28.05	1.24	282.7	5.09
Helium	He	4.00	1.66	5.3	0.24
Normal heptane	n-$CH_3(CH_2)_5CH_3$	100.21	1.05	540.2	2.73
Normal hexane	n-C_6H_{14}	86.18	1.06	507.7	3.03
Hydrogen chloride	HCl	36.46	1.41	324.7	8.43
Hydrogen	H_2	2.16	1.41	33.2	1.32
Hydrogen sulfide	H_2S	34.08	1.32	373.6	9.16
Methane	CH_4	16.04	1.31	190.9	4.71
Methyl alcohol	CH_3OH	32.04	1.20	512.6	8.02
Methyl chloride	CH_3Cl	50.49	1.20	416.3	6.75
Nitrogen	N_2	28.01	1.40	126.3	3.44
Nitrogen suboxide	N_2O	44.01	1.30	309.3	7.39
Normal nonane	n-$CH_3(CH_2)_7CH_3$	128.26	1.04	594.7	2.30
Oxygen	O_2	32.00	1.40	154.7	5.12
Normal pentane	n-$CH_3(CH_2)_3CH_3$	72.15	1.07	470.1	3.35
Normal propane	n-$CH_3CH_2CH_3$	44.11	1.13	370.0	4.27
Steam	H_2O	18.02	1.33	647.1	22.12
Sulfur dioxide	SO_2	64.06	1.29	593.6	4.23
Toluene	$C_6H_5CH_3$	92.14	1.09	593.6	4.23
Propylene	CH_3CHCH_2	42.08	1.15	365.1	4.60
Octane	C_8H_{18}	114.23	1.05	—	—

＊1. For air, Tc=132.45(K) and Pc=3.769(MPa･A)
＊2. When obtaining the compression factor Z of hydrogen and helium, add 8 to both Tc and add 0.8 to both Pc.

Applicable Laws/Regulations and Formulas for Calculating Relieving Capacity

TABLE3. HOT WATER SPECIFIC GRAVITY γ_1(kg/ℓ)

Pressure MPa A / Temp.℃	0.1	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.5
40	0.992	0.992	0.992	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993
50	0.998	0.988	0.988	0.988	0.988	0.988	0.989	0.989	0.989	0.989	0.989	0.989	0.989
60	0.983	0.983	0.983	0.983	0.983	0.984	0.984	0.984	0.984	0.984	0.984	0.984	0.984
70	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.979	0.979	0.979
80	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.973	0.973	0.973
90	0.965	0.965	0.965	0.965	0.965	0.966	0.966	0.966	0.966	0.966	0.966	0.966	0.966
100		0.958	0.958	0.958	0.958	0.959	0.959	0.959	0.959	0.959	0.959	0.959	0.959
110		0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.952	0.952	0.952
120		0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.944	0.944	0.944	0.944	0.944
130			0.935	0.935	0.935	0.935	0.935	0.935	0.935	0.935	0.935	0.936	0.936
140			0.926	0.926	0.926	0.926	0.926	0.926	0.927	0.927	0.927	0.927	0.927
150				0.917	0.917	0.917	0.917	0.917	0.917	0.918	0.918	0.918	0.918
160					0.907	0.908	0.908	0.908	0.908	0.908	0.908	0.908	0.908
170					0.897	0.897	0.898	0.898	0.898	0.898	0.898	0.898	0.898
180							0.887	0.887	0.887	0.887	0.888	0.888	0.888
190								0.876	0.876	0.876	0.877	0.877	0.877
200									0.865	0.865	0.865	0.865	0.865
210											0.853	0.853	0.853
220													0.841

Remarks:Intermediate values in this table are calculated by proportional method.
* In case of below 40℃:1

TABLE4. COEFFICIENT OF VOLUMETRICAL EXPANSION FOR WATER

Temp.℃	Specific heat C kJ/kg℃	Expansion coefficient ε ℓ/℃
Below 40℃	4.150	0.00039
40	4.179	0.00039
50	4.181	0.00046
60	4.185	0.00053
70	4.190	0.00060
80	4.197	0.00066
90	4.205	0.00072
100	4.216	0.00079
110	4.229	0.00085
120	4.245	0.00090
130	4.263	0.00097
140	4.285	0.00103
150	4.310	0.00110
160	4.339	0.00118
170	4.317	0.00126
180	4.408	0.00134
190	4.449	0.00145
200	4.497	0.00155
210	4.551	0.00165
220	4.613	0.00179

Remarks:Intermediate values in this table are calculated by proportional method.

TABLE5. Value C against κ

κ	C	P_2/P_1	κ	C	P_2/P_1	κ	C	P_2/P_1	κ	C	P_2/P_1
1.00	2380	0.606	1.20	2550	0.563	1.40	2700	0.528	1.60	2820	0.496
1.02	2410	0.602	1.22	2570	0.559	1.42	2710	0.525	1.62	2830	0.493
1.04	2420	0.597	1.24	2590	0.556	1.44	2720	0.522	1.64	2850	0.490
1.06	2440	0.593	1.26	2600	0.552	1.46	2730	0.518	1.66	2860	0.488
1.08	2460	0.588	1.28	2620	0.549	1.48	2750	0.515	1.68	2870	0.485
1.10	2480	0.584	1.30	2630	0.545	1.50	2760	0.512	1.70	2880	0.482
1.12	2490	0.580	1.32	2650	0.542	1.52	2770	0.509	1.80	2940	0.468
1.14	2500	0.576	1.34	2660	0.538	1.54	2790	0.505	1.90	2980	0.456
1.16	2520	0.571	1.36	2680	0.535	1.56	2800	0.502	2.00	3030	0.444
1.18	2540	0.567	1.38	2690	0.531	1.58	2810	0.499	2.20	3130	0.422

* In case κ takes middle value. Obtain P_2/P_1 with interpolation and disregard below 4 places to decimals, and disregard below decimal point for C.

Fig.1 Coefficient of compressibility Z

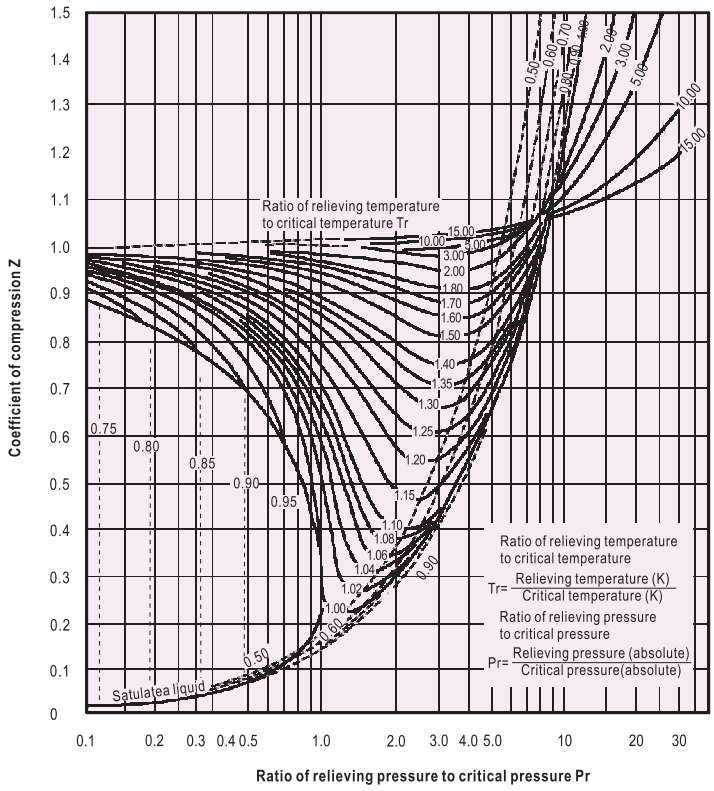


Fig.2 Δt℃ correction coefficient κ

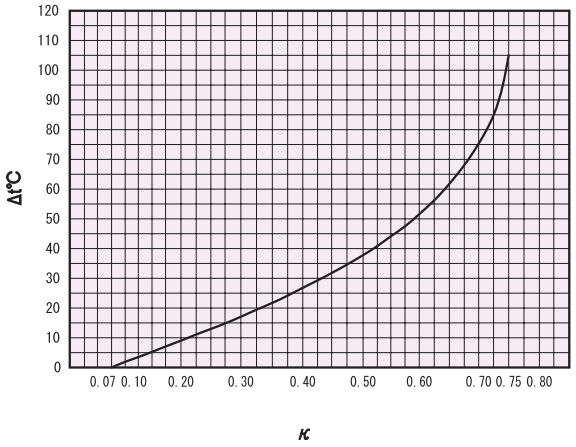
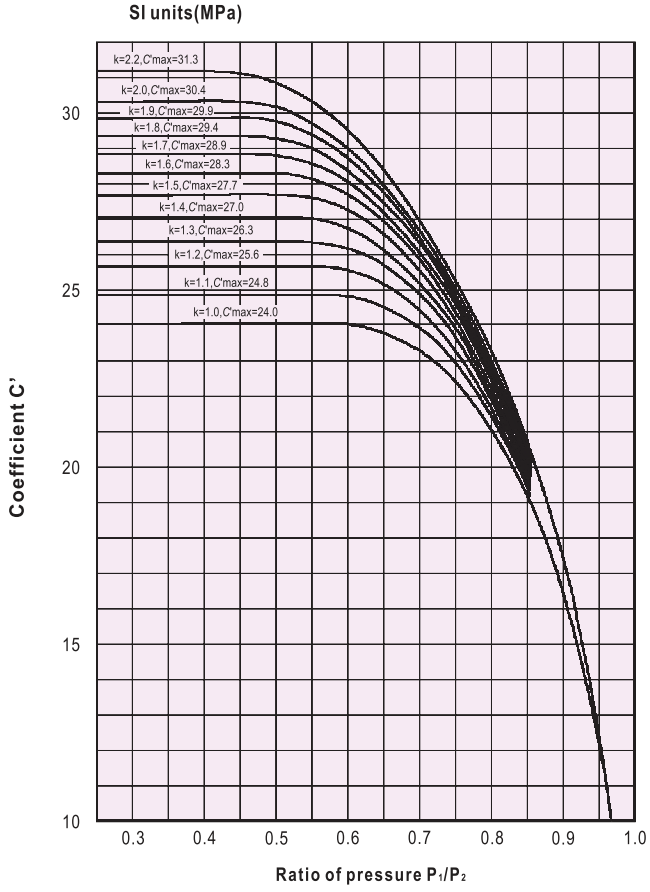


Fig.3 Coefficient (C') based on κ and P_2/P_1



Key Points for Installation of Safety Valve and Relief Valve

1. Installation

❶ Safety valve should be vertical to pipe. Before installation, remove scale and dust and clean the surfaces that contact with gasket.

❷ The diameter of the installation pipe should be larger than the diameter of valve. To reduce pressure loss to minimum degree, the stand pipe should be as short as possible.

❸ The stand pipe should be rigid and hard enough to bear the compression force, shearing force, bending stress or other counterforce caused by relieving of safety valve.

❹ Compared with the diameter of the outlet of safety valve, the diameter of the discharge pipe should be as large as possible. The discharge pipe should be as short as possible, without any bending, lead to outside of the door or other safe place, and be properly supported to avoid the occurrence of undesired stress (including thermal stress).

When deciding the place that the outlet of the discharge pipe faces, pay attention to the following issues.

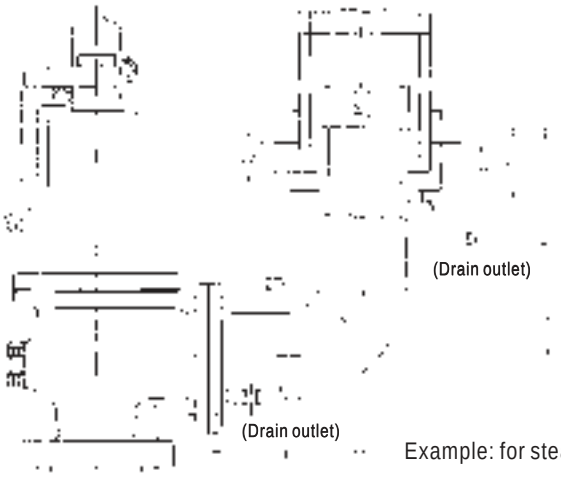
- To avoid installation place where is influenced by explosive sound and blast.
- Avoid damage to electrical equipments, machines, tools etc. in the case the fluid is steam or water.
- Avoid corrosion, poisoning, anoxia etc. in the case the fluid is harmful gas.
- In the case of screwed type safety valve or relief valve, install union joint at the discharge pipe of the outlet side to allow easy dismounting (see Fig.1 in next page).

❺ At parts of the discharge pipe where drain or rain may accumulate, install the drain outlet, which is possible to discharge drain completely,and connect to dike.

❻ In the case of full bore type safety valve for liquids or harmful gasses and have faucet for adjusting back pressure, install the valve on the outlet discharge pipe (see Fig.3 in next page).

❼ To avoid adverse impact on safety valve that is caused by thermal expansion of devices or discharge pipe, install proper expansion joint at the outlet of valve and install a discharge pipe at the end (see the figure below). To limit counterforce, the distance between the axes of the valve and the center of discharge pipe should be as short as possible, and the radius of the elbow pipe should be at least 2D (D: the internal diameter of the elbow). below figure also shows the standard dimensions of the discharge pipe of safety valve.

❽ Cares should be paid on installation of valves with lever (open type). It may effuse fluid from upper cap when such valves are operating (see Fig.5 in the next page).



Example: for steam

■ REFERENCE DIMENSION FOR EXHAUST PIPE (mm)

Outlet size	D	**d**	(A)	B	C	E	L	H	N
40(1½″)	40	65	130	60	80	30	130	220	Rc⅜″
50(2″)	50	80	150	60	90	40	150	230	Rc½″
65(2½″)	65	100	200	60	100	40	180	270	Rc½″
80(3″)	80	125	200	70	120	50	200	310	Rc½″
100(4″)	100	150	250	70	140	60	250	370	Rc¾″
125(5″)	125	200	300	80	160	70	300	430	Rc1″
150(6″)	150	200	300	80	180	70	350	500	Rc1″
200(8″)	200	250	380	100	220	80	450	610	Rc1″

2. Maintenance and operating instructions

❶ At the installation of safety valves avoid the place where there is possibility to obstruct their functions by vibration or corrosion and do not give impact from outside.

❷ After installation, make sure the pressure of the device has reached at least 75% discharge pressure of the valve before using the test lever to start the valve.

❸ Normal working pressure of the equipment shall not exceed 90% of the blowdown pressure of the valve and 80 to 85% when pulsation is expected.

❹ If possible, remove safety valve before making water pressure test. To make water pressure test without removing safety valve, pay attention to the following below (see Fig.4 in the next page).

ⓐ To prevent valve from being damaged due to improper load, when the pressure of the device reaches 80~90% of discharge pressure, install test gag* and press lightly on the end of valve shaft. The test gag must be rotated using hand. If you rotate it using spanner or other tools, there may have excessively large pressing force, the seat may be damaged, the shaft may be bended, and the valve may not function normally.

ⓑ After water pressure test and the pressure reduces to 80~90% relieving pressure,remove test gag immediately.

※ The test gag is optional item.

Key Points for Installation of Safety Valve and Relief Valve

■ PIPING EXAMPLE

Fig.1 Example: Pressure tank installation

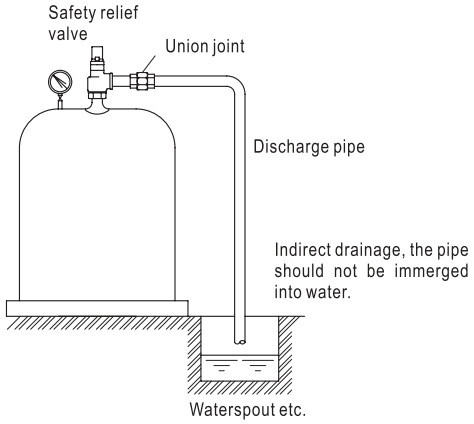


Fig.2 Example: Installation of the secondary side of pressure reducing valve

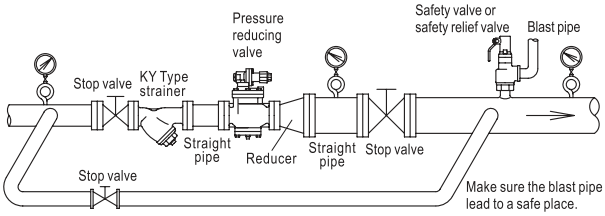


Fig.3 Example connection of(back pressure adjusting cock)

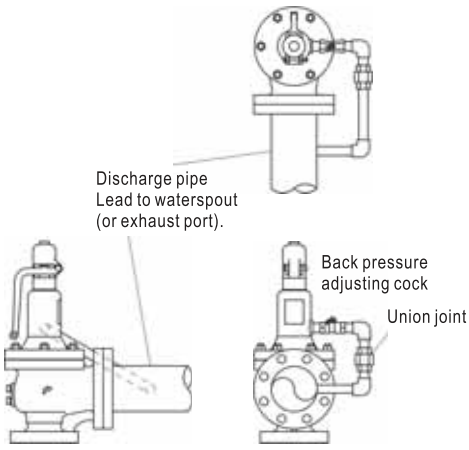


Fig.4 Installation of test gag

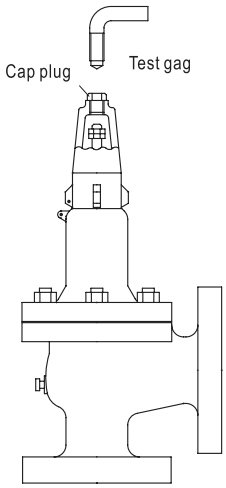
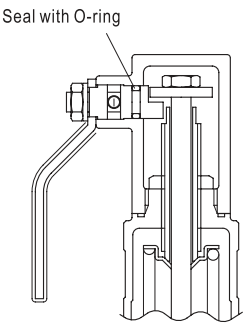
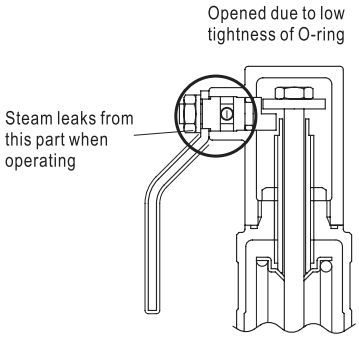


Fig.5 Lever structure

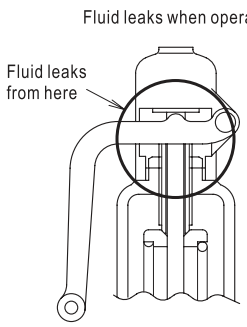
Lever structure of SL-37, 39, 39F Type
For air, gas, or liquid



For steam



Open type lever structure



E070436A

■ FULL BORE TYPE

Qm=5.246CKd'A(P+0.1) 0.9 ····· { C=0.98(C=1 if set pressure<0.4MPa), Kd'=0.864 / P is the larger one of (set pressure +0.02) or (set pressure 1.1) }

(kg/h)

Model name	Size mm	dt	A	Set pressure MPa 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
SF-1H, 2H	20	15	176.6	158	230	309	381	458	536	614	691	769	847	924	100	1080	1150	1230	1310	1390	1460	1540	1620										
	25	19	283.3	254	369	496	611	736	860	985	1100	1230	1350	1480	1600	1730	1850	1980	2100	2230	2350	2480	2600										
	40	30	706.5	634	922	1230	1520	1830	2140	2450	2760	3070	3380	3690	4010	4320	4630	4640	5250	5560	5870	6180	6490										
	50	38	1133.5	1010	1470	1980	2440	2940	3440	3940	4440	4930	5430	5930	6430	6930	7430	7920	8420	8920	9420	9920	10400										
SF-19L, 20L	15	11	94.9	85.1	123	166	204	246	288	330	371	413	455	496	538	580	622	663	705	747	789	830	872	914	956	997	1030	1080	1120	1160	1200	1240	1280
	20	15	176.6	158	230	309	381	458	536	614	691	769	847	924	1000	1080	1150	1230	1310	1390	1460	1540	162	1700	1770	1850	1930	2010	2080	2160	2240	2320	2400
	25	19	283.3	254	369	496	611	736	860	985	1100	1230	1350	1480	1600	1730	185	1980	2100	2230	2350	2480	2600	2720	2850	2970	3100	3220	3350	3470	3600	3720	3850
SF-13L, 14L	25	19	283.3	254	369	496	611	736	860	985	1100	1230	1350																				
SF-13L SF-16L (0.1~1MPa) SF-17L SF-18L (1~2MPa) SF-19L SF-20L (2~3MPa)	40	25	490.6	440	640	860	1050	1270	1490	1700	1920	2130	2350	2560	2780	3000	3210	3430	3640	3860	4070	4290	5410	4720	4940	5150	5370	5580	5800	6020	6230	6450	6660
		30	706.5	634	922	1230	1520	1830	2140	2450	2760	3070	3380	3690	4010	4320	4630	4940	5250	5560	5870	6180	6490	6800	7110	7420	7730	8040	8360	8670	8980	9290	9600
	50	34	907.4	814	1180	1590	1950	2350	2750	3150	3550	3950	4350	4750	5150	5550	5940	6340	6740	7140	7540	7940	8340	8740	9140	9540	9930	10300	10700	11100	11500	11900	12300
		38	1133.5	1010	1470	1980	2440	2940	3440	3940	4440	4930	5430	5930	6430	6930	7430	7920	8420	8920	9420	9920	10400	10900	11400	11900	12400	12900	13400	13900	14400	14900	15400
	65	43	1451.4	1300	1890	2540	3130	3770	4400	5040	5680	6320	6960	7600	8230	8870	9510	10100	10700	11400	12000	12700	13300	13900	14600	15200	15800	16500	17100	17800	18400	19000	19700
		49	1884.7	1690	2460	3300	4060	4890	5720	6550	7380	8210	9040	9870	10600	11500	12300	13100	14000	14800	15600	16500	17300	18100	18900	19800	20600	21400	22300	23100	23900	24700	25600
	80	55	2374.6	2130	3090	4160	5120	6170	7210	8250	9300	10300	11300	12400	13400	14500	15500	16600	17600	18700	19700	20700	21800	22800	23900	24900	26000	27000	28000	29100	30100	31200	32200
		61	2920.9	2620	3810	5120	6300	7580	8870	10100	11400	12700	14000	15200	16500	17800	19100	20400	21700	23000	24200	25500	26800	28100	29400	30700	31900	33200	34500	35800	37100	38400	39700
	100	69	3737.3	3350	4870	6550	8060	9710	11300	12900	14600	16200	17900	19500	21200	22800	24500	26100	27700	29400	31000	32700	34300	36000	37600	39200	40900	42500	44200	45800	47500	49100	50700
		76	4534.1	4060	5910	7950	9780	11700	13700	15700	17700	19700	21700	23700	25700	27700	29700	31700	33700	35700	37700	39600	41600	43600	45600	47600	49600	51600	53600	55600	57600	59600	61600
	125	86	5805.8	5210	7570	10100	12500	15000	17600	20100	22700	25200	27800	30400	32900	35500	38000	40600	43100	45700	48200	50800	53300	55900	58400	61000	63500	66100	68700	71200	73800	76300	78900
		95	7084.6	6350	9240	12400	15200	18400	21500	24600	27700	30800	33900	37100	40200	43300	46400	49500	52600	55700	58900	62000	65100	68200	71300	74400	77600	80700	83800	86900	90000	93100	96200
	150	105	8654.6	7760	11200	15100	18600	22400	26200	30100	33900	37700	41500	45300	49100	52900	56700	60500	64300	68100	71900	75700	79500	83300	87100	90900	94700	98600	102000	106000	110000	113000	117000
		115	10381.6	9310	13500	18200	22400	26900	31500	36100	40600	45200	49800	54300	58900	63400	68000	72600	77100	81700	86300	90800	95400	100000	104000	109000	113000	118000	122000	127000	131000	136000	141000

dt:Throat dia.(mm), A:Seat opening area(mm^2)

■ LIFT TYPE

Qm=5.246CKd'A(P+0.1) 0.9 ····· { C=0.98(C=1 if set pressure<0.4MPa), Kd'=0.96 / P is the larger one of (set pressure +0.02) or (set pressure 1.1) }

(kg/h)

Size mm	D	A	Set pressure MPa 0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
15	15	18.8	14.4	18.7	27.2	36.6	45	54.2	63.4	72.6	81.8	91	100	109	118	127	136	146	155	164	173	182	192	201	210	219	228	237	247	256	265	274	283
20	20	31.4	24.1	31.3	45.5	61.1	75.3	90.6	106	121	163	152	167	182	198	213	228	244	259	274	290	305	320	336	351	366	382	397	412	428	443	458	474
25	25	54.9	42.3	54.7	79.6	106	131	158	185	212	238	265	292	319	346	373	399	426	453	480	507	534	560	587	614	641	668	695	721	748	775	802	829
32	32	80.3	61.8	80	116	156	192	231	271	310	349	388	428	467	506	545	548	624	663	702	741	781	820	859	898	938	977	1010	1050	1090	1130	1170	1210
40	40	125.6	96.7	125	182	244	301	362	424	485	546	608	669	730	792	853	914	976	1030	1090	1160	1220	1280	1340	1400	1460	1520	1590	1650	1710	1770	1830	1890
50	50	204.1	157	203	296	397	489	589	689	788	888	988	1080	1180	1280	1380	1480	1580	1680	1780	1880	1980	2080	2180	2280	2380	2480	2580	2680	2780	2880	2980	3080
65	65	346.9	267	345	503	676	832	1000	1170	1340	1510	1670	1840	2010	2180	2350	2520	2690	2860	3030	3200	3370	3540	3710	3880	4050	4220	4390	4560	4730	4900	5060	5230
75	75	447.4	344	446	648	871	1070	1290	1510	1720	1940	2160	2380	2600	2820	3040	3250	3470	3690	3910	4130	4350	4570	4780	5000	5220	5440	5660	5880	6100	6310	6530	6750
80	78.4	492.3	379	490	714	959	1180	1420	1660	1900	2140	2380	2620																				
100	100	785.0	604	782	1130	1520	1880	2260	2650	3030	3410	3800	4180	4560	4950	5330	5710	6100	6480	6860	7250	7630	8010	8400	8780	9170	9550	9330	10300	10700	11000	11400	11800
	99.4	780.2	601	777	1130	1520	1870	2250	2630	3010	3390	3770	4150																				
125	125	1256.0	976	1250	1820	2440	3010	3620	4240	4850	5460	6080	6690	7300	7920	8530	9140	9760	10300	10900	11600	12200	12800	13400	14000	14600	15200	15900	16500	17100	17700	18300	18900
	130	1347.0	1030	1340	1950	2620	3230	3880	4540	5200	5860	6520	7170																				
150	150	1789.8	1370	1780	2590	3480	4290	5160	6040	6910	7790	8660	9540	10400	11200	12100	13000	13900	14700	15600	16500	17400	18200	19100	20000	20900	21700	22600	23500	24400	25200	26100	27000
	160	2009.6	1540	2000	2910	3910	4820	5800	6780	7760	8740	9720	10700																				

D:Seat opening dia.(mm), A:Seat opening area(mm^2) * Refer to page 69 for safety relief valves (SL-37~40F Type).

■ FULL BORE TYPE

$Qm = C' K_d' A P_1 \sqrt{\frac{M}{ZT}}$ 0.9 ····· { C'=27.0, P_1 is the larger one of (set pressure +0.02+0.1) or (set pressure 1.1+0.1); K_d'=0.864, M=28.96, Z=1, T=293 }

(kg/h)

Model name	Size mm	dt	A	Set pressure MPa 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
SF-1H, 2H	20	15	176.6	256	373	501	629	757	885	1010	1140	1270	1390	1520	1650	1780	1910	2030	2160	2290	2420	2550	2680										
	25	19	283.3	411	598	804	1000	1210	1420	1620	1830	2030	2240	2440	2650	2860	3060	3270	3470	3680	3880	4090	4300										
	40	30	706.5	1020	1490	2000	2510	3030	3540	4050	4570	5080	5590	6100	6620	7130	7640	8160	8670	9180	9690	10200	10700										
	50	38	1133.5	1640	2390	3210	4040	4860	5680	6500	7330	8150	8970	9800	10600	11400	12200	13000	13900	14700	15500	16300	17200										
SF-19L, 20L	15	11	94.9	137	200	269	338	407	476	544	613	682	751	820	889	958	1020	1090	1160	1230	1300	1370	1440	1500	1570	1640	1710	1780	1850	1920	1990	2060	2120
	20	15	176.6	256	373	501	629	757	885	1010	1140	1270	1390	1520	1650	1780	1910	2030	2160	2290	2420	2550	2680	2800	2930	3060	3190	3320	3450	3570	3700	3830	3960
	25	19	283.3	411	598	804	1000	1210	1420	1620	1830	2030	2240	2440	2650	2860	3060	3270	3470	3680	3880	4090	4300	4500	4710	4910	5120	5320	5530	5740	5940	6150	6350
SF-13L, 14L	25	19	283.3	411	598	804	1000	1210	1420	1620	1830	2030	2240																				
SF-13L SF-16L (0.1~1MPa) SF-17L SF-18L (1~2MPa) SF-19L SF-20L (2~3MPa)	40	25	490.6	712	1030	1390	1740	2100	2460	2810	3170	3520	3880	4240	4590	4950	5310	5660	6020	6370	6730	7090	7440	7800	8160	8510	8870	9220	9580	9940	10200	10600	11000
		30	706.5	1020	1490	2000	2510	3030	3540	4050	4570	5080	5590	6100	6620	7130	7640	8160	8670	9180	6990	10200	10700	11200	11700	12200	12700	13200	13800	14300	14800	15300	15800
	50	34	907.4	1310	1910	2570	3230	3890	4550	5210	5860	6520	7180	7840	8500	9160	9820	10400	11100	11700	12400	13100	13700	14400	15000	15700	16400	17000	17700	18300	19000	19700	20300
		38	1133.5	1640	2390	3210	4040	4860	5680	6500	7330	8150	8970	9800	10600	11400	12200	13000	13900	14700	15500	16300	17200	18000	18800	19600	20500	21300	22100	22900	23700	24600	25400
	65	43	1451.4	2100	3060	4110	5170	6220	7280	8330	9380	10400	11400	12500	13600	14600	15700	16700	17800	18800	19900	20900	22000	23000	24100	25100	26200	27300	28300	29400	30400	31500	32500
		49	1884.7	2730	3980	5340	6710	8080	9450	10800	12100	13500	14900	16200	17600	19000	20400	21700	23100	24500	25800	27200	28600	29900	31300	32700	34000	35400	36800	38100	39500	40900	42200
	80	55	2374.6	3440	5010	6730	8460	10100	11900	13600	15300	17000	18800	20500	22200	23900	25700	27400	29100	30800	32600	34300	36000	37700	39400	41200	42900	44600	46300	48100	49800	51500	53200
		61	2920.9	4240	6160	8290	10400	12500	14600	16700	18800	21000	23100	25200	27300	29400	31600	33700	35800	37900	40100	42200	44300	46400	48500	50700	52800	54900	57000	59100	61300	63400	65500
	100	69	3737.3	5420	7890	10600	13300	16000	18700	21400	24100	26800	29600	32300	35000	37700	40400	43100	45800	48500	51300	54000	56700	59400	62100	64800	67500	70300	73000	75700	78400	81100	83800
		76	4534.1	6580	9570	12800	16100	19400	22700	26000	29300	32600	35900	39200	42400	45700	49000	52800	55600	58900	62200	65500	68800	72100	75400	78700	82000	85200	88500	91800	95100	98400	101000
	125	86	5805.8	8430	12200	16400	20600	24900	29100	33300	37500	41700	45900	50200	54400	58600	62800	67000	71200	75400	79700	83900	88100	92300	96500	100000	105000	109000	113000	117000	121000	126000	130000
		95	7084.6	10200	14900	20100	25200	30300	35500	40600	45800	50900	56100	61200	66400	71500	76600	81800	86900	92100	97200	102000	107000	112000	117000	122000	128000	133000	138000	143000	148000	153000	158000
	150	105	8654.6	12500	18200	24500	30800	37100	43400	49600	55900	62200	68500	74800	81100	87400	93600	99900	106000	112000	118000	125000	131000	137000	143000	150000	156000	162000	169000	175000	181000	187000	194000
		115	10381.6	15000	21900	29400	37000	44500	52000	59600	67100	74600	82200	89700	97300	104000	112000	199000	127000	134000	142000	150000	157000	165000	172000	180000	187000	195000	202000	210000	217000	225000	232000

dt:Throat dia.(mm), A:Seat opening area(mm^2)

■ LIFT TYPE

$Qm = C' K_d' A P_1 \sqrt{\frac{M}{ZT}}$ 0.9 ····· { C'=27.0, P_1 is the larger one of (set pressure +0.02+0.1) or (set pressure 1.1+0.1); K_d'=0.96, M=28.96, Z=1, T=293 }

(kg/h)

Size mm	D	A	Set pressure MPa 0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
15	15	18.8	23.4	30.3	44.1	59.2	74.4	89.6	104	119	135	150	165	180	195	210	226	241	256	271	286	301	317	332	347	362	377	392	408	423	438	453	468
20	20	31.4	39.1	50.6	73.6	99	124	149	175	200	225	251	276	301	327	352	377	403	428	453	479	504	529	554	580	605	630	656	681	706	732	757	782
25	25	54.9	68.4	88.5	128	173	217	261	306	350	394	438	483	527	517	616	660	704	748	793	837	881	926	970	1010	1050	1100	1140	1190	1230	1280	1320	1360
32	32	80.3	100	129	188	253	318	382	447	512	577	641	706	771	836	901	965	1030	1090	1160	1220	1280	1350	1410	1480	1540	1610	1670	1740	1800	1870	1930	2000
40	40	125.6	156	202	294	396	497	598	700	801	902	1000	1100	1200	1300	1400	1510	1610	1710	1810	1910	2010	2110	2210	2320	2420	2520	2620	2720	2820	2920	3030	3130
50	50	204.1	254	329	479	643	808	972	1130	1300	1460	1630	1790	1960	2120	2290	2450	2610	2780	2940	3110	3270	3440	3600	3770	3930	4100	4260	4430	4590	4760	4920	5080
65	65	346.9	432	559	814	1090	1370	1650	1930	2210	2490	2770	3050	3330	3610	3890	4170	4450	4730	5010	5290	5570	5850	6130	6410	6690	6970	7250	7530	7810	8090	8370	8650
75	75	447.4	557	721	1040	1410	1770	2130	2490	2850	3210	3570	3930	4290	4650	5020	5380	5740	6100	6460	6820	7180	7540	7900	8260	8620	8990	9350	9710	10000	10400	10700	11100
80	78.4	492.3	613	794	1150	1550	1940	2340	2740	3140	3530	3930	4330																				
100	100	785.0	978	1260	1840	2470	3100	3740	4370	5000	5640	6270	6900	7540	8170	8800	9440	10000	10700	11300	11900	12600	13200	13800	14500	15100	15700	16400	17000	17600	18300	18900	19500
	99.4	780.2	972	1250	1830	2460	3080	3710	4340	4970	5600	6230	6860																				
125	125	1256.0	1560	2020	2940	3960	4970	5980	7000	8010	9020	10000	11000	12000	13000	14000	15100	16100	17100	18100	19100	20100	21100	22100	23200	24200	25200	26200	27200	28200	29200	30300	31300
	130	1347.0	1670	2170	3160	4240	5330	6420	7500	8590	9680	10700	11800																				
150	150	1789.8	2230	2880	4200	5640	7080	8530	9970	11400	12800	14300	15700	17100	18600	20000	21500	22900	24400	25800	27300	28700	30100	31600	33000	34500	35900	37400	38800	40200	41700	43100	44600
	160	2009.6	2500	3240	4710	6330	7950	9580	11200	12800	14400	16000	17600																				

D:Seat opening dia.(mm), A:Seat opening area(mm^2) * Refer to page 69 for safety relief valves (SL-37~40F Type).

E070436A

RELIEVING CAPACITY (BOILER CONSTRUCTION CODE)

■ FULL BORE TYPE

Qm=5.246CK$_d$'A (P+0.1) 0.9 ····· { C=0.98(C=1 if set pressure<0.4MPa), K$_d$'=0.864 ; P=set pressure 1.03 (In case of set pressure<0.1MPa,P=set pressure +0.02MPa) }

(kg/h)

Model name	Size mm	dt	A	Set pressure MPa 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
SF-1H, 2H	20	15	176.6	158	220	294	361	434	506	579	652	725	797	9870	943	1010	1080	1160	1230	1300	1370	1450	1520										
	25	19	283.3	254	353	472	579	696	813	929	1040	1160	1270	1390	1510	1620	1740	1860	1970	2090	2210	2320	2440										
	40	30	706.5	634	881	1170	1440	1730	2020	2310	2600	2900	3190	3480	3770	4060	4350	4640	4930	5220	5510	5800	6100										
	50	38	1133.5	1010	1410	1890	2320	2780	3250	3720	4180	4650	5120	5580	6050	6520	6980	7450	7920	8380	8850	9320	9780										
SF-19L, 20L	15	11	94.9	85.1	118	158	194	233	272	311	350	389	428	467	506	545	585	624	663	702	741	780	819	858	897	936	975	1010	1050	1090	1130	1170	1210
	20	15	176.6	158	220	294	361	434	506	579	652	725	797	870	943	1010	1080	1160	1230	1300	1370	1540	1520	1590	1670	1740	1810	1880	1960	2030	2100	2170	2250
	25	19	283.3	254	353	472	579	696	813	929	1040	1160	1270	1390	1510	1620	1740	1860	1970	2090	2210	2320	2440	2560	2670	2790	2910	3020	3140	3260	3370	3490	3610
SF-13L, 14L	25	19	283.3	254	353	472	579	696	813	929	1040	1160	1270																				
SF-13L SF-16L (0.1~1MPa) SF-17L SF-18L (1~2MPa) SF-19L SF-20L (2~3MPa)	40	25	490.6	440	612	818	1000	1200	1400	1610	1810	2010	2210	2410	2620	2820	3020	3220	3420	3630	3830	4030	4230	4430	4640	4840	5040	5240	5440	5650	5850	6050	6250
		30	706.5	634	881	1170	1440	1730	2020	2310	2600	2900	3190	3480	3770	4060	4350	4640	4930	5220	5510	5800	6100	6390	6680	6970	7260	7550	7840	8130	8420	8710	9000
	50	34	907.4	814	1130	1510	1850	2230	2600	2970	3350	3720	4090	4470	4840	5210	5590	5960	6340	6710	7080	7460	7830	8200	8580	8950	9320	9700	10000	10400	10800	11100	11500
		38	1133.5	1010	1410	1890	2320	2780	3250	3720	4180	4650	5120	5580	6050	6520	6980	7450	7920	8380	8850	9320	9780	10200	10700	11100	11600	12100	12500	13000	13500	13900	14400
	65	43	1451.4	1300	1810	2420	2970	3560	4160	4760	5360	5950	6550	7150	7750	8340	8940	9540	10100	10700	11300	11900	12500	13100	13700	14300	14900	15500	16100	16700	17300	17900	18500
		49	1884.7	1690	2350	3140	3850	4630	5400	6180	6960	7730	8510	9290	10000	10800	11600	12300	13100	13900	14700	15400	16200	17000	17800	18600	19300	20100	20900	21700	22400	23200	24000
	80	55	2374.6	2130	2960	3960	4860	5830	6810	7790	8770	9740	10700	11700	12600	13600	14600	15600	16500	17500	18500	19500	20500	21400	22400	23400	24400	25300	26300	27300	28300	29300	30200
		61	2920.9	2620	3640	4870	5970	7180	8380	9580	10700	11900	13100	14300	15600	16800	18000	19200	20400	21600	22800	24000	25200	24600	27600	28800	30000	31200	32400	33600	34800	36000	37200
	100	69	3737.3	3350	4660	6230	7640	9180	10700	12200	13800	15300	16800	18400	19900	21400	23000	24500	26100	27600	29100	30700	32200	33800	35300	36800	38400	39900	41500	43000	44500	46100	47600
		76	4534.1	4060	5650	7560	9280	11100	13000	14800	16700	18600	20400	22300	24200	26000	27900	29800	31600	33500	35400	37200	39100	41000	42800	44700	46600	48400	50300	52200	54000	55900	57800
	125	86	5805.8	5210	7240	9680	11800	14200	16600	19000	21400	23800	26200	28600	31000	33300	35700	38100	40500	42900	45300	47700	50100	52500	54900	57300	59600	62000	64400	66800	69200	71600	74000
		95	7084.6	6350	8840	11800	14500	17400	20300	23200	26100	29000	32000	34900	37800	40700	43600	46500	49500	52400	55300	58200	61100	64000	67000	69900	72800	57500	78600	81500	84500	87400	90300
	150	105	8654.6	7760	10800	14400	17700	21200	24800	28400	31900	35500	39000	42600	46200	49700	53300	56900	60400	64000	67600	71100	74700	78200	81800	85400	88900	92500	96100	99600	103000	106000	110000
		115	10381.6	9310	12900	17300	21200	25500	29700	34000	38300	42600	46800	51100	55400	59700	63900	68200	72500	76800	81000	85300	89600	93900	98100	102000	106000	111000	115000	119000	123000	128000	132000

dt:Throat dia.(mm), A:Seat opening area(mm^2)

■ LIFT TYPE

Qm=5.246CK$_d$'A (P+0.1) 0.9 ····· { C=0.98(C=1 if set pressure<0.4MPa), K$_d$'=0.96 ; P=set pressure 1.03 (In case of set pressure<0.1MPa,P=set pressure +0.02MPa) }

(kg/h)

Size mm	D	A	Set pressure MPa 0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
15	15	18.8	14.4	18.7	26	34.8	42.7	51.3	59.9	68.5	77.1	85.7	94.3	102	111	120	128	137	145	154	163	171	180	188	197	206	214	223	231	240	249	257	266
20	20	31.4	24.1	31.3	43.5	58.2	71.4	85.7	100	114	128	143	157	171	186	200	215	229	243	258	272	286	301	315	329	344	358	373	387	401	416	430	444
25	25	54.9	42.3	54.7	76.1	101	124	149	175	200	225	250	275	300	325	350	376	401	426	541	476	501	526	551	576	620	627	652	677	702	727	752	777
32	32	80.3	61.8	80	111	148	182	219	256	292	329	366	403	439	476	513	550	586	623	660	696	733	770	807	843	880	917	945	990	1020	1060	1100	1130
40	40	125.6	96.7	125	174	232	285	343	400	458	515	572	630	687	745	802	860	917	975	1030	1090	1140	1200	1260	1310	1370	1430	1490	1540	1600	1660	1720	1770
50	50	204.1	157	203	283	378	464	557	650	744	837	931	1020	1110	1210	1300	1390	1490	1580	1670	1770	1860	1950	2050	2140	2230	2330	2420	2510	2610	2700	2790	2890
65	65	346.9	267	345	481	643	788	947	1100	1260	1420	1580	1740	1890	2050	2210	2370	2530	2690	2850	3010	3160	3320	3480	3640	3800	3960	4120	4280	4430	4590	4750	4910
75	75	447.4	344	446	620	829	1010	1220	1420	1630	1830	2040	2240	2450	2650	2850	3060	3260	3470	3670	3880	4080	4290	4490	4700	4900	5110	5310	5520	5720	5930	1630	6330
80	78.4	492.3	379	490	682	912	1110	1340	1570	1790	2020	2240	2470																				
100	100	785.0	604	782	1080	1450	1780	2140	2500	2860	3220	3580	3940	4290	4650	5010	5370	5730	6090	6540	6810	7170	7530	7890	8240	8600	8960	9320	9680	10000	10400	10700	11100
	99.4	780.2	601	777	1080	1440	1770	2130	2480	2840	3200	3550	3910																				
125	125	1256.0	976	1250	1740	2320	2850	3430	4000	4580	5150	5720	6300	6870	7450	8020	8600	9170	9750	10300	10900	11400	12000	12600	13100	13700	14300	14900	15400	16000	16600	17200	17700
	130	1347.0	1030	1340	1860	2490	3060	3670	4290	4910	5520	6140	6760																				
150	150	1789.8	1370	1780	2480	3310	4070	4880	5700	6520	7340	8160	8980	9800	10600	11400	12200	13000	13800	14700	15500	16300	17100	17900	18800	19600	20400	21200	22000	22900	23700	24500	25300
	160	2009.6	1540	2000	2780	3720	4570	5480	6400	7320	8240	9160	10000																				

D:Seat opening dia.(mm), A:Seat opening area(mm^2)

RELIEVING CAPACITY (VENN STANDARD)

<Liquids>
(Except Hot water and water)

■ FULL BORE TYPE

W=161 $AK\sqrt{PG}$ (K=0.6, G=1, Accumulation 15% $A=0.785dt^2$)

(10^3kg/h)

Size mm		Set pressure MPa	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
SF-20	15	11	3.10	4.39	5.38	6.21	6.95	7.61	8.22	8.79	9.32	9.83	10.3	10.7	11.2	11.6	12.0	12.4	12.8	13.1	13.5	13.9	14.2	14.5	14.9	15.2	15.5	15.8	16.1	16.4	16.7	17.0
	20	15	5.78	8.18	10.0	11.5	12.9	14.1	15.3	16.3	17.3	18.2	19.1	20.0	20.8	21.6	22.4	23.1	23.8	24.5	25.2	25.8	26.5	27.1	27.7	28.3	28.9	29.4	30.3	30.6	31.1	31.6
	25	19	9.28	13.1	16.0	18.5	20.7	22.7	24.5	26.2	27.8	29.3	30.7	32.1	33.4	34.7	35.9	37.1	38.2	39.3	40.4	41.5	42.5	43.5	44.5	45.4	46.4	47.3	48.2	49.1	49.9	50.8
SF-14	25	19	9.28	13.1	16.0	18.5	20.7	22.7	24.5	26.2	27.8	29.3																				
SF-14 SF-16 (0.1~1MPa) SF-18 (1~2MPa) SF-20 (2~3MPa)	40	25	16.0	22.7	27.8	32.1	35.9	39.3	42.5	45.4	48.2	50.8	53.3	55.6	57.9	60.1	62.2	64.2	66.2	68.1	70.0	71.8	73.6	75.3	77.0	78.7	80.3	81.9	83.5	85.0	86.5	88.0
		30	23.1	32.7	40.0	46.2	51.7	56.6	61.2	65.4	69.4	73.1	76.7	80.1	83.4	86.5	89.6	92.5	95.4	98.1	100	103	106	108	110	113	115	118	120	122	124	126
	50	34	29.7	42.0	51.4	59.4	66.4	72.8	78.6	84.0	89.1	93.9	98.5	102	107	111	115	118	122	126	129	132	136	139	142	145	148	151	154	157	160	162
		38	37.1	52.5	64.3	74.2	83.0	90.9	98.2	105	111	117	123	128	133	138	143	148	153	157	161	166	170	174	178	181	185	189	192	196	199	203
	65	43	47.5	67.2	82.3	95.0	106	116	125	134	142	150	157	164	171	177	184	190	196	201	207	212	217	223	228	232	273	242	247	251	256	260
		49	61.7	87.3	107	123	138	151	163	174	185	195	204	213	222	231	239	246	254	261	269	276	282	289	296	302	308	314	320	326	332	338
	80	55	77.7	110	135	156	174	190	205	220	233	245	257	269	280	291	301	311	320	330	33.9	347	356	364	373	381	388	396	404	411	418	426
		61	95.6	135	166	191	214	234	253	270	287	302	317	331	344	358	370	382	394	405	417	427	438	448	458	468	478	487	497	506	515	524
	100	69	122	173	212	245	274	299	323	346	367	387	406	424	441	458	474	489	504	519	533	547	561	574	587	599	612	624	636	647	659	670
		76	149	210	257	297	332	363	392	420	445	469	490	514	535	555	575	594	612	630	647	664	680	696	712	727	742	757	771	785	799	813
	125	86	190	269	329	380	425	465	503	537	570	601	630	658	685	711	736	760	784	806	829	850	871	892	912	931	950	969	988	1000	1020	1040
		95	232	328	402	464	519	568	614	656	696	733	769	803	836	868	898	928	956	984	1010	1030	1060	1080	1110	1130	1160	1180	1200	1220	1240	1270
	150	105	284	401	491	567	634	694	750	801	850	896	940	982	1020	1060	1090	1130	1160	1200	1230	1260	1290	1320	1350	1380	1410	1440	1470	1500	1520	1550
		115	340	481	589	680	760	833	899	961	1020	1070	1120	1170	1220	1270	1310	1360	1400	1440	1480	1520	1550	1590	1630	1660	1700	1730	1760	1790	1830	1860

P:Relieving pressure(MPa), dt:Throat dia.(mm)

∗1. Coefficient K and Accumulation are different according to types.
∗2. P (MPa), which is for actual calculation to decide discharge amount, is (P)+(Accumulation)−(Back pressure)

■ LIFT TYPE

W=161 $AK\sqrt{PG}$ (K=0.55, G=1, Accumulation 10% $A=\pi D\ell$)

(10^3kg/h)

Size mm	D	Set pressure MPa	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
15	15		0.552	0.780	0.956	1.10	1.23	1.35	1.46	1.56	1.65	1.74	1.83	1.91	1.99	2.06	2.13	2.20	2.27	2.34	240	2.46	2.53	2.58	2.64	2.70	2.76	2.81	2.86	2.92	2.97	3.02
20	20		0.922	1.30	1.59	1.84	2.06	2.25	2.43	2.60	2.76	2.91	3.05	3.19	3.32	3.45	3.57	3.68	3.80	3.91	4.01	4.12	4.22	4.32	4.42	4.51	4.61	4.70	4.79	4.87	4.96	5.05
25	25		1.61	2.28	2.79	3.22	3.60	3.94	4.26	4.56	4.83	5.09	5.34	5.58	5.18	6.03	6.24	6.44	6.64	6.84	7.02	7.21	7.38	7.56	7.73	7.89	8.06	8.22	8.37	8.53	8.68	8.83
32	32		2.35	3.33	4.08	4.71	5.27	5.77	6.23	6.67	7.07	7.45	7.82	8.16	8.50	8.82	9.13	9.43	9.72	10.0	10.2	10.5	10.8	11.0	11.3	11.5	11.7	12.0	12.2	12.4	12.6	12.9
40	40		3.68	5.21	6.38	7.37	8.24	9.03	9.75	10.4	11.0	11.6	12.5	12.7	13.2	13.8	14.2	14.7	15.2	15.6	16.0	16.4	16.9	17.3	17.6	18.0	18.4	18.8	19.1	19.5	19.8	20.2
50	50		5.99	8.47	10.3	11.9	13.4	14.6	15.8	16.9	17.9	18.9	19.8	20.7	21.6	22.4	23.2	23.9	24.7	25.4	26.1	26.8	27.4	28.1	28.7	29.3	29.9	30.5	31.1	31.7	32.2	32.8
65	65		10.1	14.4	17.6	20.3	22.7	24.9	26.9	28.8	30.5	32.2	33.7	35.2	36.7	38.1	39.4	40.7	42.0	43.2	44.4	45.5	46.6	47.7	48.8	49.9	50.9	51.9	52.9	53.9	54.8	55.8
75	75		13.1	18.5	22.7	26.2	29.3	32.1	34.7	37.1	39.4	41.5	43.5	45.5	74.3	49.1	50.8	52.5	54.1	55.7	57.2	58.7	60.2	61.6	63.0	64.3	65.6	66.9	68.2	69.5	70.7	71.9
80	78.4		14.4	20.4	25.0	28.9	32.3	35.4	38.2	40.8	43.3	45.7	47.9	50.0	52.1	54.0	55.9	57.8	59.6	61.3	63.0	64.6	66.2	67.8	69.3	70.8	72.2	73.7	75.1	76.5	77.8	79.1
100	100		22.9	32.4	39.6	45.8	51.2	56.1	60.6	64.8	68.7	72.4	75.9	79.3	82.6	85.7	88.7	91.6	94.4	97.2	99.8	102	105	107	109	112	114	116	119	121	123	125
	99.4		23.0	32.6	39.9	46.1	51.5	56.4	60.9	65.2	69.1	72.9	76.4	79.8	83.1	86.2	89.2	92.2	95.0	97.8	100	103	105	108	110	112	115	117	119	121	124	126
125	125		36.8	52.1	63.8	73.7	82.4	90.3	97.5	104	110	116	122	127	132	138	142	147	152	156	160	164	169	173	176	180	184	188	191	195	198	202
	130		39.5	55.9	68.5	79.1	88.4	69.9	104	111	118	125	131	137	142	148	153	158	163	167	172	176	181	185	189	193	197	201	205	209	213	216
150	150		52.5	74.3	91.0	105	117	128	139	148	157	166	174	182	189	196	203	210	216	223	229	235	240	246	252	257	262	268	273	278	283	287
	160		59.0	83.4	102	118	131	144	156	166	177	186	195	204	212	220	228	236	243	250	257	263	270	276	283	289	295	300	306	312	317	323

P:Relieving pressure (MPa), D:Seat opening dia.(mm), R:Lift(A)

∗1. Coefficient K, Accumulation and Lift are different according to types.
∗2. Refer to page 69 for safety relief valves (SL-37~40F Type).
∗3. P (MPa), which is for actual calculation to decide discharge amount, is (P)+(Accumulation)−(Back pressure)

CIRCUIT VALVES PRIMARY PRESSURE REGULATING VALVES

4

Circuit valve is of pressure regulating valve used for air conditioning system in high/medium height buildings.

Primary pressure regulating valve is used as pump relief that can maintain the discharge pressure of pump at a constant level.

Pressure sustaining valve can prevent water from falling in return pipe in open circuit.

Differential pressure regulating valve can be used as pump bypass valve (pump relief) in closed circuit.

■ PRIMARY PRESSURE REGULATING VALVES

Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
MD-14W,14H	Flanged	15~80(½″~3″)	0.05~0.7	Water, hot water or oils	Cast iron	Cast bronze & Synthetic rubber	98
		100~150(4″~6″)	0.05~0.5				
MD-14CN		20~80(¾″~3″)	0.05~0.7				
		100~150(4″~6″)	0.05~0.5				
WVM-02	Flanged	40~50(1½″~2″)	0.5~1.0	Water or hot water	Ductile cast iron	Cast bronze & Synthetic rubber	99
		50~200(2″~8″)	0.05~1.0		Cast iron or ductile cast iron		
		250~400(10″~16″)	0.05~0.7		Cast iron		
WVM-02CN		80~200(3″~8″)	0.05~1.0		Cast iron		
MD-1A	Flanged	15~50(½″~2″)	0.5~3.0	Oils or liquids	Carbon steel or Stainless steel	Stainless steel	110
MD-2P	Flanged	20~150(¾″~6″)	0.05~0.7	Oils or liquids	Cast iron	Cast bronze	111
					Cast steel	Stainless steel	
MD-22	Flanged	20~50(¾″~2″)	0.05~0.7	Fuel oils or oils	Ductile cast iron	Synthetic rubber	113

■ PRESSURE SUSTAINING VALVES

Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
MD-20W, 20H	Flanged	15~80(½″~3″)	0.05~0.7	Water or hot water	Cast iron	Cast bronze & Synthetic rubber	102
		100~150(4″~6″)	0.05~0.5				

■ DIFFERENTIAL PRESSURE REGULATING VALVES

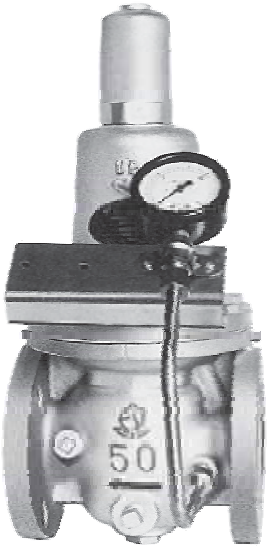
Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
FD-2W, 2H	Flanged	15~80(½″~3″)	0.05~0.7	Water or hot water	Cast iron	Cast bronze & Synthetic rubber	103
		100~150(4″~6″)	0.05~0.5				

MD-14 Type Series Primary Pressure Regulating Valve (for Water Air or Oil)

Pump Relief, Pressure Tank/Piping etc.

High-performance relief valve that can respond to load change, relieve excessive pressure, and maintain the pressure of machines or piping at a constant level. For example, in the case of continuously operating pump, the discharge pressure will change when load changes, but by installing MD-14 type primary pressure regulating valve in bypass circuit, the valve can relieve excessive pressure and regulate discharge pressure at a certain level. It can also be used as the relief valve for pressure tank or piping.

MD-14W,14H Type



Special order item
(with pressure gauge)

FEATURES

- Can be used as pump relief valve. The structure is designed with considerations paid on hunting and vibration, thus allows for stable operation.
- Suitable for being used as the relief valve for pressure tank or piping.
- Piston-type balancing structure, with little change of discharge pressure when outlet pressure changes.
- The valve can be dismantled from upper side, thus allows easy maintenance.
- MD-14CN Type with nylon coating is highly corrosion resistant.

SPECIFICATIONS

Type	Standard	Hot water & oil	Nylon coating
Model name	MD-14W	MD-14H	MD-14CN
Code name	**MD14W-B ☐**	**MD14H-B ☐**	**MD14CN-B ☐**
	※ L, M or H for adjustable primary pressure is required in ☐.		
Size	15~150(½″~6″)		20~150(¾″~6″)
Applicable fluid	Water & air	Oils not corrosive, kerosene, lubricant, Heavy oil A & B, & hot water	Water & Hot water
Adjustable primary pressure	Size 15~80mm L:0.05~0.35MPa, M(H for MD-14CN):0.3~0.7MPa Size 100~150mm L:0.05~0.35MPa, M(H for MD-14CN):0.3~0.5MPa		
Fluid viscosity	—	Max. 800cSt	—
Applicable temperature	5~60℃	5~90℃	5~60℃
End connection	Flanged JIS 10KRF		
Materials	Body(Cast iron), Trim(Cast bronze), Disc & diaphragm(Synthetic rubber)		
Valve body pressure test	Hydraulic 1.5MPa		
Painting or coating for Body	Interior:Epoxy resin Exterior:Metallic blue	Interior:Rust proof oil Exterior:Metallic blue	Nylon coating

∗1. The valve with a pressure gauge connection hole (screwed JIS Rc¼″) drilled in the valve body or with a pressure gauge installed in this hole is available upon your request.
∗2. The valve with a primary pressure regulating range of 0.65~1.0MPa for available size of 80mm or smaller or a primary pressure regulating range of 0.45~0.8MPa for a valve size of 100mm or bigger is also available upon your request.

DIMENSIONS

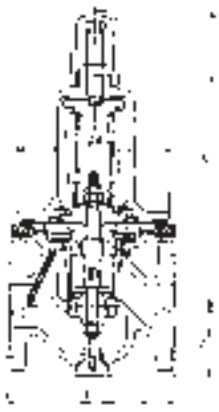
(mm)

Size	L	A	G	H	Cv value	Mass(kg)
15(½″)	156	142	65	252	1	10
20(¾″)	160	142	65	252	2	10
25(1″)	160	142	65	253	3.5	10.5
32(1¼″)	180	174	76	332	5.5	17
40(1½″)	180	174	76	333	8	17.5
50(2″)	190	174	81	340	14	19
65(2½″)	230	218	95	428	22	37
80(3″)	250	218	100	433	32	40
100(4″)	300	250	125	493	48	67
125(5″)	370	340	150	641	75	112
150(6″)	400	340	165	656	108	150

Flange code JIS 10KRF

CONSTRUCTION

Size 15~80mm



Size 100~150mm

Construction is a bit different according to sizes.

WVM-02 Type Series Primary Pressure Regulating Valve (for Water)

for Pump Relief, Pressure Tank/Piping etc. Pilot Type (large capacity)

Large capacity primary pressure regulating valve that can respond to change of load and relieve excessive pressure in air-conditioner, hygiene equipment, fire protection devices, and maintain primary pressure at a certain level.

FEATURES

- Needle valve opening (sensing adjustment) can respond to state of operation and allow for easy, stable operation.
- Disc, seat, and pilot operating part can be easily dismantled, thus allows easy adjustment, repair, and replacement of parts.
- Lift limitation device limits overflow.
- Disc, seat, and pilot operating part can be installed vertical or horizontal to piping (see Note), thus allow for piping according to available space.

  Note: In the case of horizontal piping, the pilot piping should be at the upper side.

SPECIFICATIONS

Type		Order item		Nylon coating
Model name		WVM-02		WVM-02CN
Code name		WVM02-B☐	WVM02-L☐	WVM02CN-B☐
		※ L(low press.) or M (high press.) for adjustable primary pressure is required in ☐.		
Size		50~400(2″~16″)	40~200(1½″~8″)	80~200(3″~8″)
Applicable fluid		Water & hot water		
Applicable temperature		5~60℃		
Adjustable primary pressure		Max.1.0MPa*1.		Max.1.0MPa
Adjustable primary pressure		Size 40~200mm L:0.05~0.35MPa, M:0.3~1.0MPa*2. Size 250~400mm L:0.05~0.35MPa, M:0.3~0.7MPa		
Blowdown pressure		Set pressure adjustable range 0.05~0.35MPa:Set pressure 20% or less(min. within 0.03MPa) Set pressure adjustable range 0.3~0.7, 0.3~1.0, 0.3~1.6MPa:Set pressure 15% or less		
Accumulation		Set pressure 10% or less(min. within 0.03MPa)		
End connection		Flanged JIS 10KRF*1		Flanged JIS 10KRF
Valve body pressure test		1.5MPa		1.75MPa
Materials	Trim	Cast iron	Ductile cast iron	Cast iron
	Body	Disc & diaphragm(Synthetic rubber), Seat ring(Cast bronze)		
Painting or coating for Body		Interior:Epoxy resin Exterior:Metallic blue		Nylon coating
Installation		Vertical and horizontal(For size 250mm and bigger:Install valve vertical on the horizontal piping)		

∗1. Adjustable primary pressure Max. 1.6MPa(0.5~1.6MPa) with Flanged JIS 16KRF for sizes 200mm or smaller are available upon your request.
∗2. For size 40 and 50mm, Adjustable primary pressure range is 0.5~1.0MPa. Code name:WVM02-B(Cast iron body), WVM02-L(Ductile cast iron body)
∗3.The valve model WVM-02PN with epoxy resin painted inside and outside of the valve body(Cast iron body material, sizes 80~200mm)is available upon your reguest.
∗4. Valve with pressure gage is also available upon your request.
∗5. Refer to page 101 for value sizing and page 109 for example of installation in a pipe line.

DIMENSIONS

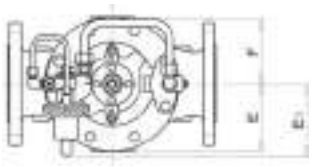
(mm)

Size	L		G	H	H_1	E	E_1	F	Cv value	Mass(kg)
	JIS 10K	JIS 16K								
40(1½″)	260	260	80	345	230	93	115	216	18	23.5
50(2″)	270	270	85	345	230	93	115	216	32	26.5
65(2½″)	340	340	100	346	261	117	216	145	38	43
80(3″)	350	354	110	346	261	117	136	145	54	43
100(4″)	400	404	130	372	300	130	136	145	96	60
125(5″)	440	444	140	403	371	145	136	145	150	70
150(6″)	500	504	165	436	416	173	136	160	216	125
200(8″)	600	608	200	487	522	218	136	195	384	200
250(10″)	720	—	240	490	560	295	420	295	600	470
300(12″)	820	—	280	540	620	328	430	328	864	524
400(16″)	1040	—	370	690	800	440	520	440	1536	1400

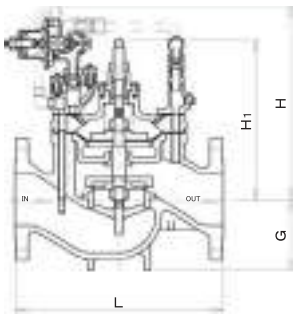
∗1. JIS10K:Flanged code JIS 10KRF
JIS16K:Flanged code JIS 16KRF
∗2. Please contact our local agent for the dimensions of the main valve of Ductile cast iron.
∗3. Valve body material of size 40mm is Ductile cast iron only.

CONSTRUCTION

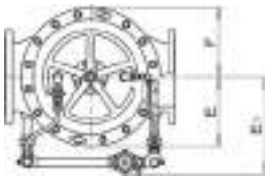
Size 80~200mm

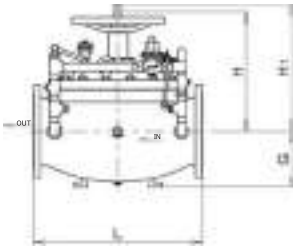


Note: The direction of size 40 50 pilot valve is different from the direction shown in the figure.



Size 250~400mm

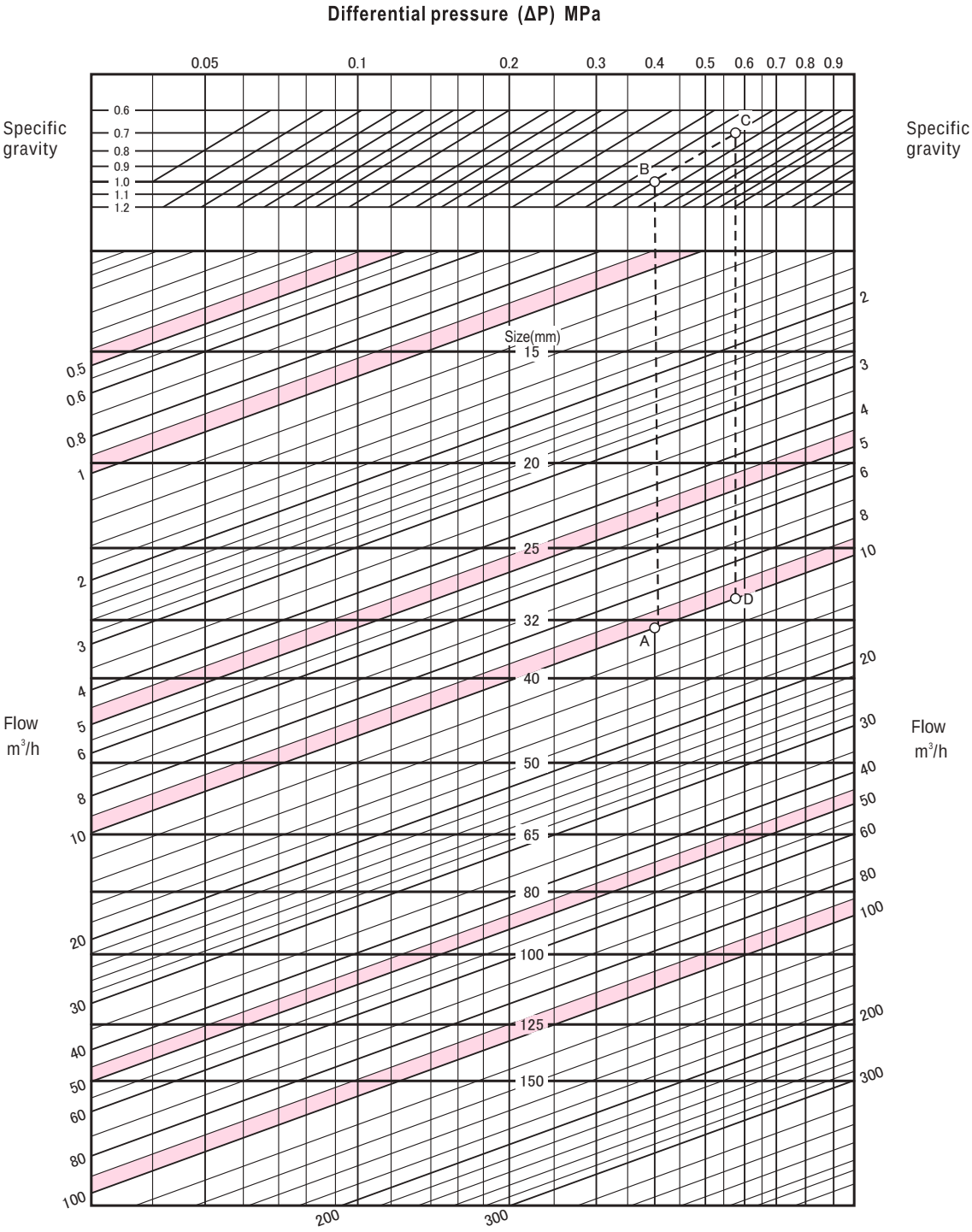




Construction is a bit different for applicable primary pressure 1.6MPa. Size 40・50mm.

DATA/MD-14, 20, FD-2 Type Series Circuit Valve

SIZE SELECTION CHART (for Liquids)



● HOW TO USE THE CHART

Where,
Primary set pressure: 0.5MPa
Back pressure: 0.1MPa
Specific gravity: 1 (water)
Flow rate: 10m³/h.
The differential pressure (ΔP) is 0.5−0.1=0.4MPa

Find out the intersection point A between the 0. 4MPa differential pressure (ΔP) line and the 10m³/h flow line.

Since point A is between the lines nominal diameter size 32mm and 40mm select, the larger one, 40mm.

And where same conditions except the specific gravity is 0.7, find out the intersection point B between the 0.4MPa differential pressure (ΔP) line and the 1.0 specific gravity line.

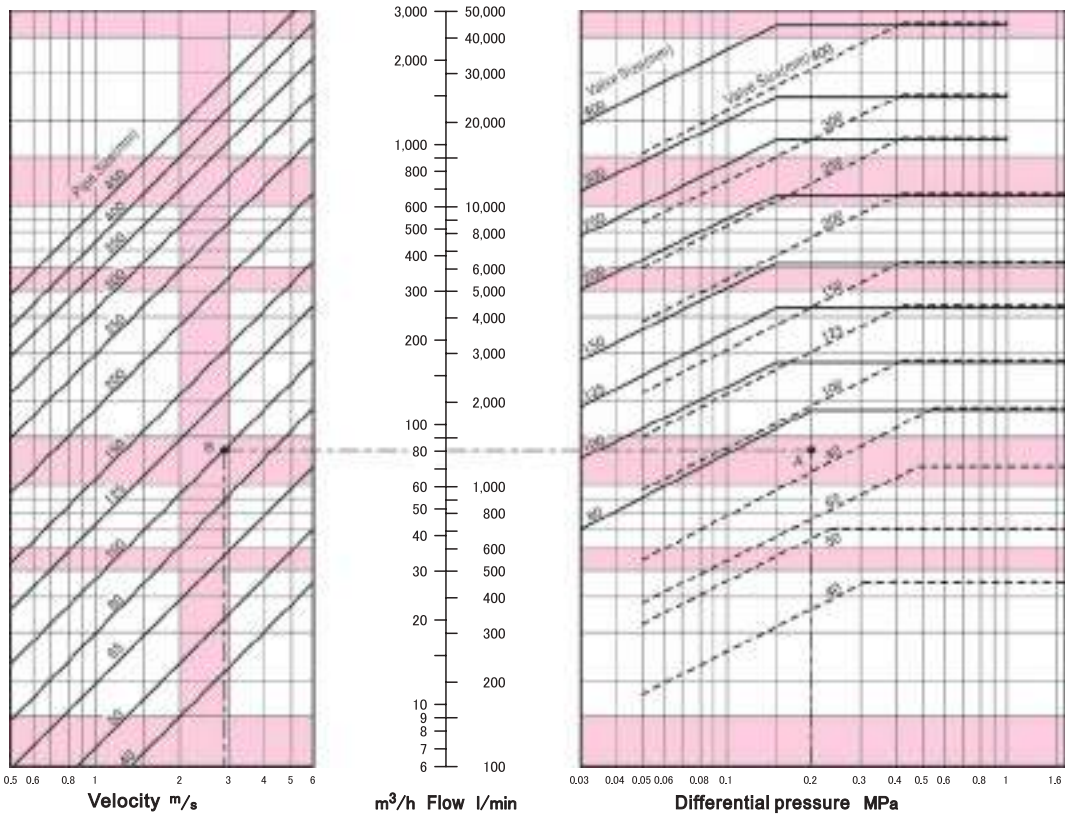
Move from point B on the 0.7 specific gravity line parallelly to reach point C. Now draw a vertical line from point C until it intersects with the 10m³/h flow line. The intersection point is named D. Since point D is located between the lines nominal diameter size 25mm and 32mm select, the larger one, 32mm.

DATA/WV Type Regulating Valve (for Water or Hot Water)

SIZE SELECTION CHART (for Water)

■ VELOCITY RATE LINE CHART

■ SIZE SELECTION CHART



● PRODUCTS WHICH SIZES CAN BE DETERMINED
- - - - - - (dashed line) in the size selection chart
Pressure reducing valve WVR-02, Primary pressure regulating valve WVM-02.

● VALVES APPLICABLE TO
——— (solid line) in size selection chart
Solenoid valve WVE-02, Level control valve WVL-02

Note 1: In the size selection chart, the horizontal position of the valve size line represents the maximum flow.
Note 2: Use velocity line of less than 3m/s in velocity line chart with obtained pipe size, if not any special case.
Note 3: Size 40~65mm is for WVR and WVM types only.
Note 4: For sizes 40,50mm, in case of the larger differential pressure,please contact our local agent in your area.

● HOW TO USE THE CHART

Example: Select the size of valve for the following conditions:
Primary pressure: 0.5MPa; Secondary pressure: 0.3MPa; Flow: 80m³/h
1.Calculate differential pressure between inlet and outlet of valve: 0.5−0.3=0.2MPa
2.Follow the 80m³/h flow line horizontally until it intersects with the 0.2MPa differential pressure line. The intersection point is named A.
3.Since point A is between the lines representing size 80mm and 100mm, select the larger size, which is size 100mm, is selected.

● CONFIRMING PIPE FLOW RATE

1. Assume the pipe and valve are of the same diameter. Follow the 80m³/h flow line horizontally until it intersects with the 100mm size lineto obtain cross point B.
2. Draw a vertical line from point B and find out the pipe flow rate 2.8m/s.
3. Since the flow rate is less than 3m/s, the pipe size should be size 100mm. If flow rate is larger than 3m/s, select a larger size to make the flow rate less than 3m/s.

● REFERENCE

■To select the size for pressure reducing valve or primary pressure regulating valve with considering dynamic water pressure:
For pressure reducing valve, add the largest offset pressure to the secondary pressure. For primary pressure regulating valve, deduct the minimum accumulation from the primary pressure. The size can be determined using the differential pressure between primary and secondary of valve.

●Pressure reducing valve
Find out the maximum offset pressure 0.1MPa from the specifications. The differential pressure is 0.5−(0.3+0.1)=0.1MPa. Use the method described in the example in “How to use the chart” to select the size.

●Primary pressure regulating valve
Find out the minimum accumulation 0.03MPa from specifications. The differential pressure is (0.5−0.03)−0.3=0.17MPa. Use the method described in the example in “How to use the chart” to select the size.

MD-20W, 20H Type Pressure Sustaining Valve (for Water or Hot water)

for Air Conditioner, Air Conditioning Equipment etc.

Use the valve to prevent water from falling in return pipe in open circuit for air conditioner or air conditioning equipments in high buildings.

When pump stops

The valve disc closes rapidly to prevent water level in from falling return pipe.

When pump starts

With no accumulation of air. Prevent the occurrence of noise and vibration.

When pump is working

Maintain proper pressure in pipe.

FEATURES

- Good response to change of pressure. The valve closes rapidly when pump stops.

SPECIFICATIONS

Model name	MD-20W	MD-20H
Code name	**MD20W-B ☐**	**MD20H-B ☐**
	※ L(low press.) or H (high press.) for adjustable primary pressure is required in ☐.	
Applicable fluid	Water	Hot water
Adjustable primary pressure	Size 15~80mm L:0.05~0.35MPa, H:0.3~0.7MPa Size 100~150mm L:0.05~0.35MPa, H:0.3~0.5MPa	
Applicable temperature	5~60℃	5~90℃
End connection	Flanged JIS 10KRF	
Materials	Body(Cast iron), Trim(Cast bronze), Diaphragm & disc(Synthetic rubber)	
Valve body pressure test	Hydraulic 1.5MPa	
Painting	Interior:Epoxy resin Exterior:Metallic blue	Interior:Rust proof oil Exterior:Metallic blue

* For valve size selection, refer to the VALVE SIZE SELECTION CHART on page 100.

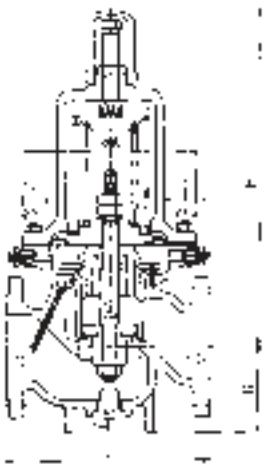
DIMENSIONS

(mm)

Size	L	A	G	H	Cv value	Mass(kg)
15(½″)	156	142	65	256	1	10
20(¾″)	160	142	65	256	2	10
25(1″)	160	142	65	256	3.5	10.5
32(1¼″)	180	174	76	332	5.5	17
40(1½″)	180	174	76	332	8	17.5
50(2″)	190	174	81	340	14	19
65(2½″)	230	218	95	434	22	37
80(3″)	250	218	100	439	32	40
100(4″)	300	250	125	490	48	67
125(5″)	370	340	150	640	75	112
150(6″)	400	340	165	655	108	150

Flange code JIS 10KRF

CONSTRUCTION



Size 15~80mm

Size 100~150mm

Construction is a bit different depending on sizes.

FD-2W, 2H Type Differential Pressure Regulating Valve (for Water or Hot water)

for Air Conditioner, Air Conditioning Equipment etc.

These products can be used as pump relief valve in closed circuit of air conditioning equipments in high buildings.
In open circuit, primary pressure regulating valve is used for the relief valve of pump. In closed circuit, however, since it is required to maintain operating at a constant flow for the pump, no matter how load changes, Differential pressure regulating valve should be used.

FEATURES

- Can be used as pump relief valve in closed circuit.

SPECIFICATIONS

Model name	FD-2W	FD-2H
Code name	**FD2W-B ☐**	**FD2H-B ☐**
	※ L(low press.) or H (high press.) for adjustable primary pressure is required in ☐.	
Applicable fluid	Water	Hot water
Adjustable primary pressure	Size 15~80mm L:0.05~0.35MPa, H:0.3~0.7MPa Size 100~150mm L:0.05~0.35MPa, H:0.3~0.5MPa	
Applicable temperature	5~60℃	5~90℃
End connection	Flanged JIS 10KRF	
Materials	Body(Cast iron), Trim(Cast bronze), Diaphragm & disc(Synthetic rubber)	
Valve body pressure test	Hydraulic 1.5MPa	
Painting	Interior:Epoxy resin Exterior:Metallic blue	Interior:Rust proof oil Exterior:Metallic blue

* For valve size selection, refer to the VALVE SIZE SELECTION CHART on page 100.

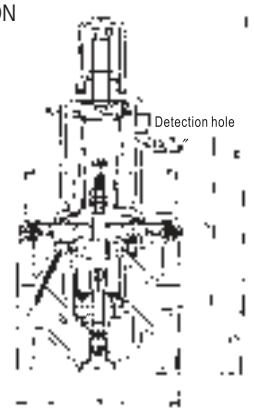
DIMENSIONS

(mm)

Size	L	A	G	H	a	b	Cv value	Mass(kg)
15(½″)	156	142	65	252	137	40	1	10
20(¾″)	160	142	65	252	137	40	2	10
25(1″)	160	142	65	253	137	40	3.5	10.5
32(1¼″)	180	174	76	332	170	50	5.5	17
40(1½″)	180	174	76	333	170	50	8	17.5
50(2″)	190	174	81	340	177	50	14	19
65(2½″)	230	218	95	428	214	64	22	37
80(3″)	250	218	100	433	219	64	32	40
100(4″)	300	250	125	493	281	78	48	67
125(5″)	370	340	150	641	356	104	75	112
150(6″)	400	340	165	656	371	104	108	150

Flange code JIS 10KRF

CONSTRUCTION



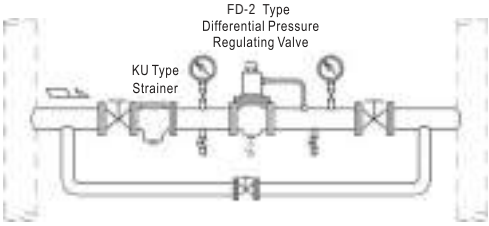
Size 15~80mm

Size 100~150mm

Construction is a bit different depending on sizes.

Note: The detection hole (JIS Rc⅜″) should be pipe connected to the detection part of the outlet side.

PIPING EXAMPLE



Note: It is recommended to use a 40-mesh strainer.

Types of Circuit Valve

OVERVIEW

Circuit valve can be divided into three types: Primary pressure regulating valve, Pressure sustaining valve, and Differential pressure regulating valve. These valves are used as pressure regulating valves in air conditioning equipments in high buildings.

Primary pressure regulating valve (direct acting type MD-14)

Used as bypass valve for pump (pump relief valve), Primary pressure regulating valve can respond to change of pump load and discharge excessive pressure and maintain a constant discharge pressure. Large capacity type WVM-02 is also available.

Pressure sustaining valve (direct acting type MD-20)

This valve can prevent water from falling in return pipe of open circuit for air conditioning system in high buildings that may occur when pump stops.

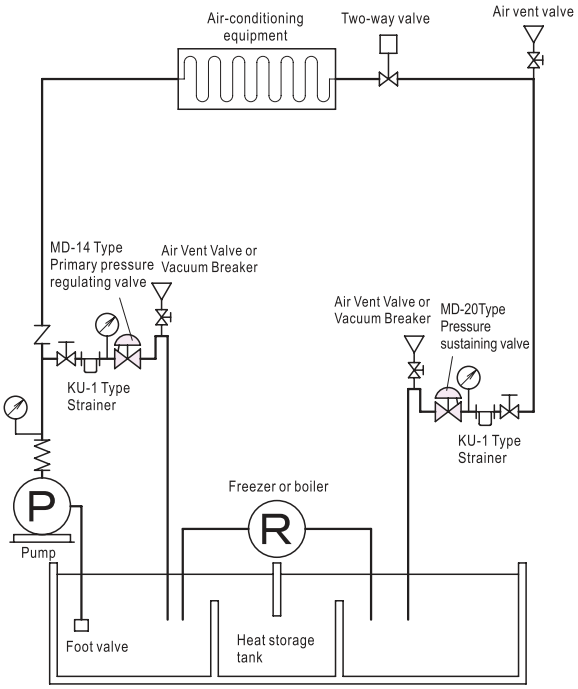
By installing Pressure sustaining valve in return pipe, the valve closes immediately after pump stops. This can prevent decrease of water level and accumulation of air, thus can prevent the occurrence of noise and vibration. In addition, the valve can maintain the primary pressure at a constant level and provide stable pressure condition for normal operation of equipments.

Differential pressure regulating valve (direct acting type FD-2)

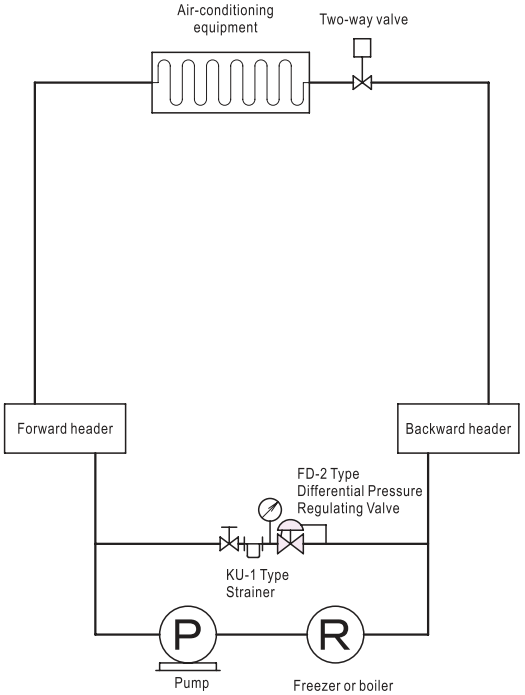
This valve can be used as Pump relief valve in closed circuit of air conditioning system in high buildings.

In open circuit, Primary pressure regulating valve is used as the Relief valve of pump. In closed circuit, however, since it is required to maintain operating at a constant flow, no matter how load changes, Differential pressure regulating valve should be used.

Open circuit



Closed circuit



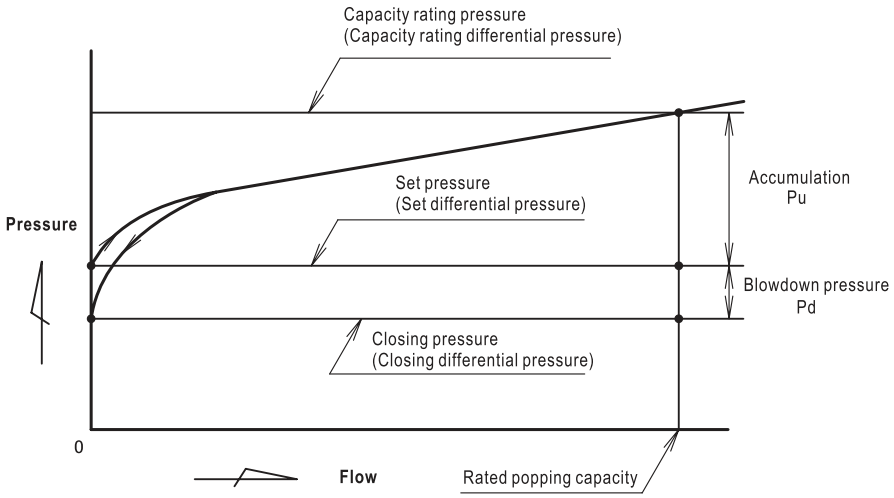
DATA/Circuit Valve

TERMS

- Set pressure (set differential pressure): The pressure at inlet side when primary pressure regulating valve and pressure sustaining valve start (differential pressure regulating valve) start to operate and fluid starts to flow (difference of pressure before and after valve).
- Closing pressure (closing differential pressure): The inlet pressure when primary pressure regulating valve and pressure sustaining valve close (differential pressure regulating valve) and fluid stops (difference of pressure before and after valve).
- Blowdown pressure: Difference of set pressure (set differential pressure) and closing pressure (closing differential pressure).
- Accumulation: The pressure exceeding set pressure (set differential pressure) for acquiring desired discharge (in percentage or pressure unit).
- Capacity rating pressure (capacity rating differential pressure): Standard pressure for deciding rated capacity, which is the pressure at inlet side when pressure reaches a required level, higher than set pressure (set differential pressure), and the fluid keeps on flowing (difference of pressure before and after valve).
- Rated discharge capacity: The maximum flow at capacity rating pressure (capacity rating differential pressure).

Note: The words in parenthesis are applicable to Differential pressure regulating valve.

PRESSURE-FLOW CHARACTERISTICS CHART

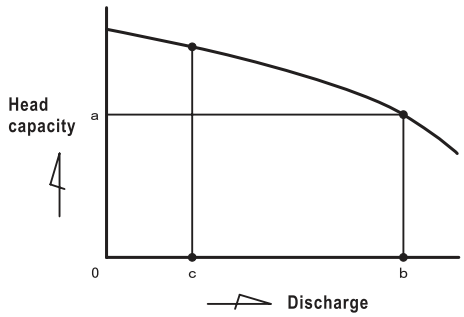


CHARACTERISTIC

Operation mode	Model	Accumulation Pu	Blowdown pressure Pd
Direct operating	MD-14W	<Max. spring regulating range 15% (<20% for size 100 mm above, 0.5MPa spring)	<Set pressure 10% (Min. 0.02MPa)
	FD-2W, 2H		
	MD-20W, 20H	See Accumulation Chart, page 107	<0.04MPa
Pilot operating	WVM-02	<Set pressure 10% (Min. 0.03MPa)	Range of regulating spring 0.05~0.35 (0.3)MPa; <Set pressure 20% (Min. 0.03MPa) 0.3~1.0(0.7)MPa and 0.5~1.6MPa; <Set pressure 15%

■ SIZE SELECTION OF PRIMARY PRESSURE REGULATING VALVE

PUMP CHARACTERISTICS CHART



❶ Use the size selection chart to decide the nominal diameter.

❷ When primary pressure and back pressure are not constant, but change within a certain range, use the primary pressure and back pressure that allows for minimum difference between these two pressures to decide the size.

❸ In the case of fluid which viscosity cannot be ignored (e.g. oil), make viscosity correction when deciding size.

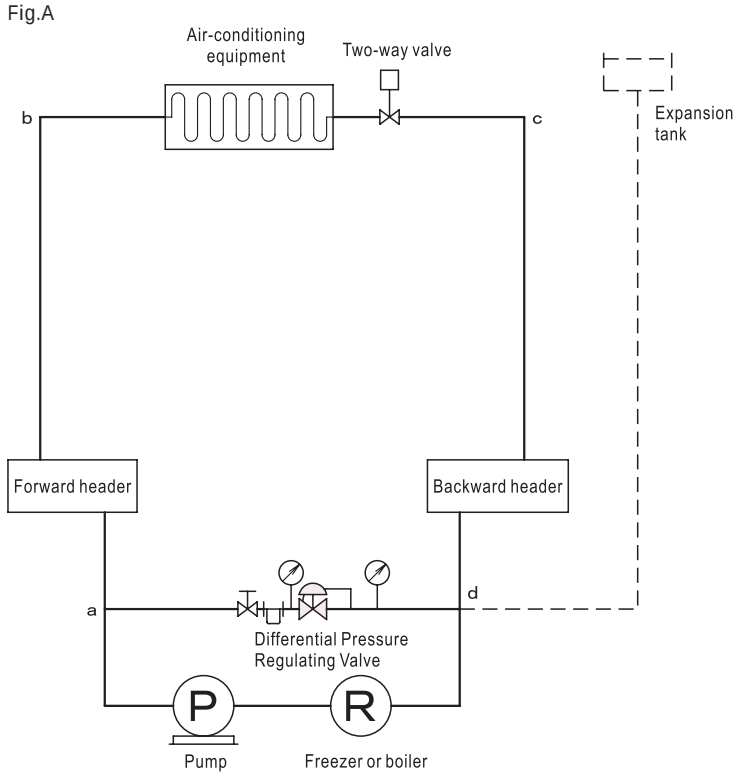
❹ If Primary pressure regulating valve is used as pump relief valve, the relief volume can be decided using the following method

The discharge side of the pump is completely closed: in the pump characteristics chart (in the left), find out the relief volume (b) of head capacity (a) that is equivalent to regulating pressure. In this case, b is the relief volume of Primary pressure regulating valve.

The discharge side of the pump is not completely closed: The relief volume of Primary pressure regulating valve is the difference of(b-c),as c is the minimum flow at normal operation.

■ SIZE SELECTION OF DIFFERENTIAL PRESSURE REGULATING VALVE

Fig.A



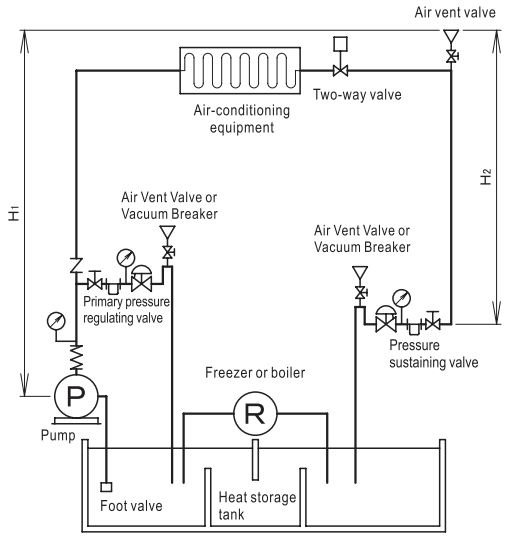
❶ Use the size selection chart in page 100. If water temperature is higher than 60℃, the size should be large enough to allow additional 10~20% flow.

❷ In Fig.A, the Differential pressure before and after valve (ΔP), which is necessary for deciding size, is the total pressure loss between a, b, c, and d.

❸ In stead of Differential pressure regulating valve, Primary pressure regulating valve can be used if there is expansion tank as shown by dash line in Fig. A. However, the set pressure of spring is different.

For WV series, see page 101.

SIZE SELECTION FOR PRESSURE SUSTAINING VALVE



Differential pressure before and after valve: ΔP(MPa)
Pump output pressure at max. flow: P(MPa)
Height from pump to the highest point of piping: H_1 (m)
Height from Pressure sustaining valve to the highest point of piping: H_2 (m)
Piping between pump outlet to Pressure sustaining valve
Total resistance and machine resistance: W_1(MPa)
Resistance after Pressure sustaining valve: W_2(MPa)
Set pressure of Pressure sustaining valve: Ps(MPa)
Accumulation of Pressure sustaining valve: Pu(MPa)
Blowdown pressure of Pressure sustaining valve: Pd(MPa)

CALCULATING METHOD

(see the pressure sustaining valve calculation form in the next page)

Step 1: calculate the differential pressure (ΔP) before and after the valve.

$$\Delta P = P - \frac{0.98(H_1 - H_2)}{10} - (W_1 + W_2)$$

Step 2: calculate set pressure (min.) Ps.

$$Ps = \frac{0.98H_2}{10} + Pd$$

Now check if ΔP is larger than Ps (ΔP >Ps). If not, that means the pump does not have sufficient capacity.

Step 3:Use set pressure (min.) Ps and the size selection chart to decide size and obtain rated flow.

Step 4: Calculate accumulation Pu.
In the case of MD-20:

$$\text{Rated flow \%} = \frac{\text{Required flow}}{\text{Rated flow}} \quad 100\%$$

Then calculate accumulation Pu using the accumulation chart.

Step 5: Make sure pump capacity meets the following:

$$P \geqq \frac{0.098H_1}{10} + W_1 + Pu + Pd$$

If not, select a larger size and calculate again. Since the surplus pressure of pump is:

$$P - \left(\frac{0.098H_1}{10} + W_1 + Pu + Pd\right)$$

The actual set pressure should be in the range between the min.set pressure (Ps) to (Ps+surplus pressure of pump).

Note: If water temperature is higher than 60℃, the size should be large enough to allow additional 10~20% flow.

Accumulation Chart for MD-20 Pressure Sustaining Valve

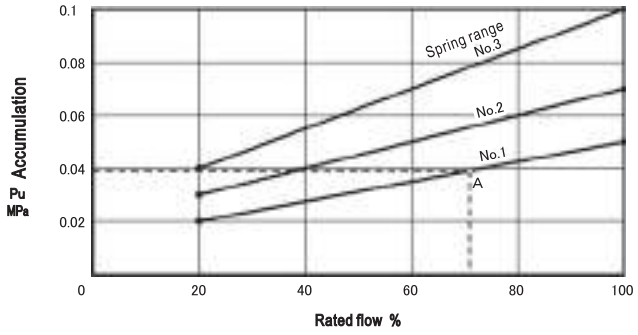


Table of spring range No. for MD-20 TYPE.

No.	Size(mm)	Spring range(MPa)
1	15~50	0.05~0.35
2	15~40	0.3~0.7
	65~150	0.05~0.35
3	50~80	0.3~0.7
	100~150	0.3~0.5

HOW TO USE THE ACCUMULATION CHART

Example: calculation accumulation (Pu) under the following conditions:
Size: 40mm
Pressure differential: 0.1MPa
Flow: 5m^3/h
Since the rated flow is 7m^3/h, as shown in the size selection chart.

$$\text{RatedFlow(\%)} = \frac{5(m^3/h)}{7(m^3/h)} \quad 100(\%) = 71\%$$

From point A on No.1 spring range line, accumulation (Pu) is 0.038MPa.

■ MD-20TYPE CALCULATION SHEET: PRESSURE SUSTAINING VALVE

Customer			
Valve spec.		(Example)	
Discharge pressure of pump at Max. Flow	P(MPa)	0.6MPa	MPa
Flow required	(m^3/h)	42m^3/h	m^3/h
Height from pump to the highest point of pipe	H_1(m)	27m	m
Height from pressure sustaining valve to the highest point of pipe	H_2(m)	26m	m
Total resistance of pipe between pump outlet and pressure sustaining valve, and machine resistance	W_1(MPa)	0.2MPa	MPa
Resistance after pressure sustaining valve	W_2(MPa)	0.01MPa	MPa
Pressure differential before and after valve $\Delta P=P-\frac{0.098(H_1-H_2)}{10}-(W_1+W_2)$	ΔP(MPa)	$\Delta P=0.6-\frac{0.098(27-26)}{10}-(0.2+0.1)$ =0.38 MPa	ΔP= = MPa
Set pressure (Min) $Ps=\frac{0.098H_2}{10}+Pd$ (Pd: blowdown pressure MPa) See page 107. Make sure ΔP>Ps	Ps(MPa)	$Ps=\frac{0.098\times26}{10}+0.04$ =0.29 MPa ΔP>Ps 0.38>0.29	Ps= = MPa
Use Ps and size selection chart to determine nominal diameter and rated flow. See the chart in page 100 .		Size: 80 RatedFlow: 47 m^3/h	Size: RatedFlow: m^3/h
Accumulation Pu Use rated flow % to obtain accumulation (Pu). $RatedFlow(\%)=\frac{Flow\ required}{Rated\ flow}\times100(\%)$		$RatedFlow(\%)=\frac{42}{47}\times100=89\%$ Using the accumulation chart, Pu=0.065 MPa	RatedFlow(%)= Using the accumulation chart, Pu= MPa
Checking pump capacity $P\geqq\frac{0.098H_1}{10}+W_1+Pu+Pd$ Surplus pressure of pump $P-(\frac{0.098H_1}{10}+W_1+Pu+Pd)$		$\frac{0.098\times27}{10}+0.2+0.065+0.04$ = 0.570 MPa Since P= 0.6 MPa the requirement is satisfied. The surplus pressure of pump =0.6−0.570 = 0.03 MPa	= MPa Since P= pa, the requirement is satisfied. The surplus pressure of pump = MPa
Range of set pressure Result of selection		Range of set pressure should be 0.29~0.32MPa Model: MD-20 Size: 80 mm Set pressure: 0.32 MPa	Range of set pressure should be ~ MPa Model: Size: mm Set pressure: MPa

Key points for installation

■ PIPING EXAMPLE

Fig.1 Primary pressure regulating valve/pressure sustaining valve (with bypass pipe)

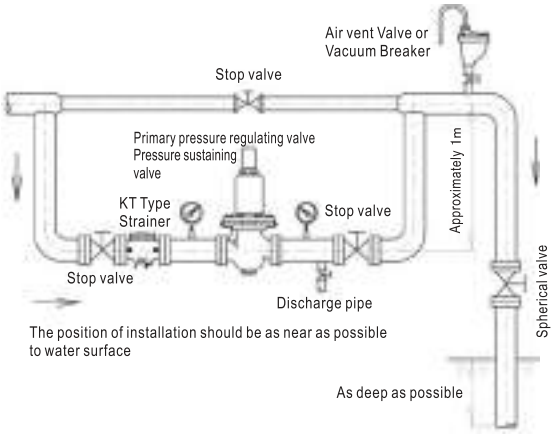


Fig.2 Primary pressure regulating valve/pressure sustaining valve (without bypass pipe)

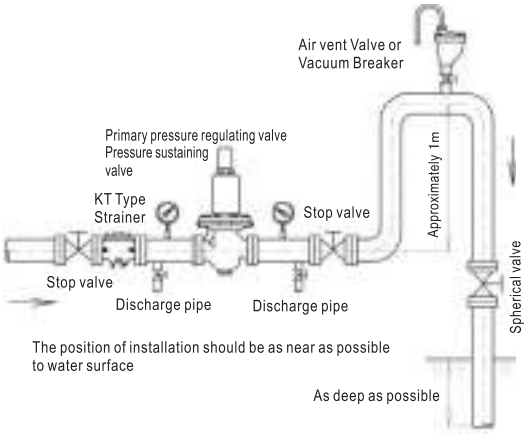


Fig. 3 Differential pressure regulating valve (with bypass pipe)

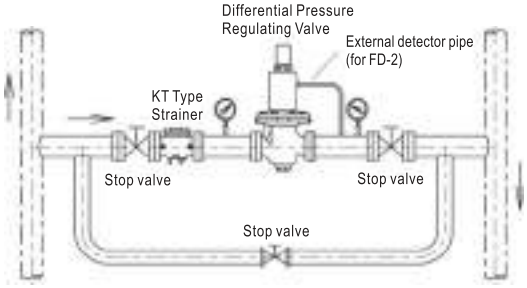
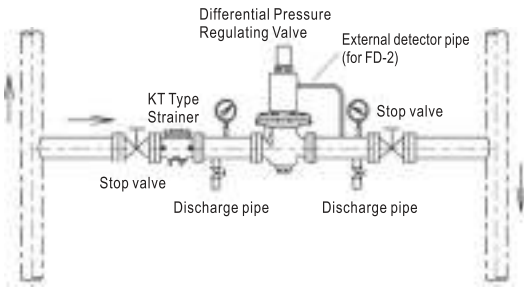


Fig. 4 Differential pressure regulating valve (without bypass pipe)



■ KEY POINTS FOR INSTALLATION

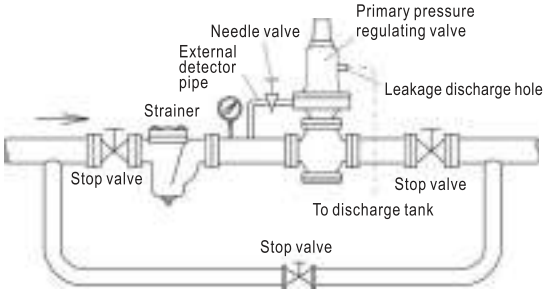
1. If not otherwise specified, Primary pressure regulating valve should be installed verticaly on the horizontal piping.
2. Install strainer at the primary side of the valve.
3. For equipments which operation cannot be stopped, install bypass piping (with stop valve) between primary and secondary sides (see Fig. 1 and 3). If bypass piping is not installed, install blowing stop valve, which is branched from the main pipe and located immediately before the primary side of the product, to allow flushing (see Fig. 2 and 4).
4. In the case of Primary pressure regulating valve and Pressure sustaining valve that discharge to open tank, the outlet piping of the valve should have a 1m ascending part and then a descending part and be immerged into water. In addition, the top of the ascending pipe should have Air vent valve or Vacuum breaker.

   ※By installing ascending pipe, Air vent valve or Vacuum breaker at the outlet side of the valve, it is able to maintain a stable flow and normal functioning of valve (see Fig. 1 and 2).
5. Install stop valve and pressure gauge.

   The pressure gauge should be installed at the primary side in the case of Primary pressure regulating valve and Pressure sustaining valve, or primary/secondary side in the case of Differential pressure regulating valve (see Fig. 1~4).
6. Depending on model of Primary pressure regulating valve, there may be external detector (which can detect pressure using a pipe branched from piping). For such model, connect pressure detecting hole and piping with a pipe and install a needle valve on the pipe (to make it possible to adjust the sensibility of primary pressure regulating valve based on the opening degree of needle valve).

   If there is leakage outlet on spring case, install a pipe that leads to liquid discharge tank (see Fig. 5).

Fig.5 Piping example: Primary pressure regulating valve with external detector



7. Leave some space for dissembling and maintenance.
8. Apply appropriate support to product to make sure it does not bear the weight of piping, bending force, or vibration directly.
9. If you think there is possibility of freezing, insulate or discharge the drain.

MD-1A Type Primary Pressure Regulating Valve (for Oil or Liquids)

Although developed for regulating high pressure oil, MD-1A Type can also be used as Primary pressure regulator for other liquids (mainly be used as pump relief valve).

CONSTRUCTION

VALVE LEAKAGE ALLOWANCE

Size	Valve leakage allowance
15~25mm	150ml/min or less
32~50mm	200ml/min or less

SPECIFICATIONS

Model name		MD-1A	
Code name		MD1A-N☐	MD1A-D☐
		※ L, M or H for adjustable primary pressure is required in ☐.	
Applicable fluid		Oil & liquids	
Adjustable primary pressure		L:0.5~1.0MPa, M:1.0~1.5MPa, H:1.5~2.5MPa, S:2.5~3.0MPa	
Blowdown pressure		Set pressure 10% or less	
Applicable temperature		5~80℃	
Fluid viscosity		Max. 700cSt	
Valve body pressure test		1.5 times of flange rated pressure	
End connection		Flanged JIS 30KRF*	
Materials	Body	Carbon steel	Stainless steel
	Trim	Stainless steel	

*Flanged JIS 10K, 16K and 20KRF are available upon your request.

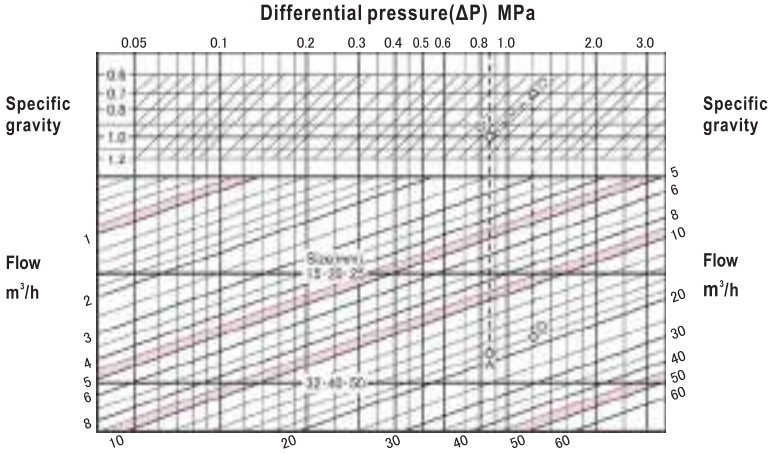
DIMENSIONS

(mm)

Size	L	G	H	Cv value	Mass(kg)
15(½″)	260	90	385	3	28
20(¾″)	260	90	385	3	28
25(1″)	260	90	385	3	28
32(1¼″)	310	115	428	10	57
40(1½″)	310	115	428	10	57
50(2″)	310	115	428	10	57

Flange code JIS 30KRF

SIZE SELECTION CHART

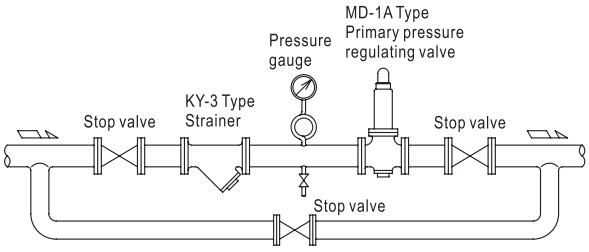


HOW TO USE THE CHART

Example: Select the size of valve meeting following requirements.
Set pressure: 0.9MPa
Back pressure: 0.05MPa
Specific gravity: 1 (water)
Flow: 18m³/h
The differential pressure (ΔP) is 0.9−0.05=0.85MPa
Find out the intersection point A between the 0.85MPa differential pressure (ΔP) line and the 18m³/h flow line. Since point A is between the lines representing nominal diameter size15・20・25mm and 32・40・50mm, the nominal diameter should be the larger one, i.e. 32・40・50mm.

In the case other conditions remain the same but the specific gravity is 0.7, find out the intersection point B between the 0.85MPa differential pressure (ΔP) line and the 0.1 specific gravity line. Move from point B on the 0.7 specific gravity line parallelly to reach point C. Now draw a vertical line from point C until it intersects with the 18m³/h flow line. The intersection point is named D. Since point D is located between the lines representing nominal diameter size 15・20・25mm and 32・40・50mm, the nominal diameter should be the larger one, i.e. 32・40・50mm.

PIPING EXAMPLE



MD-2P Type Primary Pressure Regulating Valve (for Oil or Liquids)

MD-2P Type can be used as oil pressure regulating valve.
In the case of water or hot water, select MD-14 Type series.

SPECIFICATIONS

Model name	MD-2P	
Code name	**MD2P-B ☐**	**MD2P-C ☐**
	※ L, M or H for adjustable primary pressure is required in ☐.	
Applicable fluid	Oil & liquids	
Adjustable primary pressure	Size 20~50mm L:0.05~0.25MPa, M:0.25~0.45MPa, H:0.45~0.7MPa Size 65~150mm L:0.05~0.2MPa, M:0.2~0.5MPa, H:0.5~0.7MPa	
Blowdown pressure	Set pressure 10% or less (min. within 0.03MPa)	
Applicable temperature	5~80℃*2.	
Fluid viscosity	Max. 700cSt	
Valve body pressure test	Hydraulic 1.5MPa	
End connection	Flanged JIS10KFF*3.	
Materials	Body(Cast iron), Disc & seat(Cast bronze)*4.	Body(Cast steel), Disc & seat(Stainless steel)

*1. The inlet pressure can be checked by the external detector.But the internal detector is also available upon request.
*2. For high applicable temperature 5~150℃ is also available upon your request.
*3. Valve body with Flanged JIS 10KRF is also available upon your request.
*4. Disc and seat with Stainless steel are also available upon your request.
*5. In case of fuel oil use, select MD-22 Type. Refer to page 113.

DIMENSIONS

(mm)

Size	L	G	H	A	B	Cv value	Cast iron Mass(kg)	Cast steel Mass(kg)
20(¾″)	170	93	440	77	110.5	2	21	28
25(1″)	170	93	440	77	110.5	3	22	29
32(1¼″)	180	98	445	77	115.5	5	23	31
40(1½″)	180	98	445	77	115.5	6	24	31
50(2″)	180	108	450	77	125.5	15	26	33
65(2½″)	215	123	555	100	153.5	23	41	56
80(3″)	260	133	565	100	162.5	30	48	70
100(4″)	300	160	590	100	189.5	40	67	86
125(5″)	360	189	620	100	218.5	50	90	115
150(6″)	382	219	655	100	250.5	60	126	177

Flange code JIS 10KFF

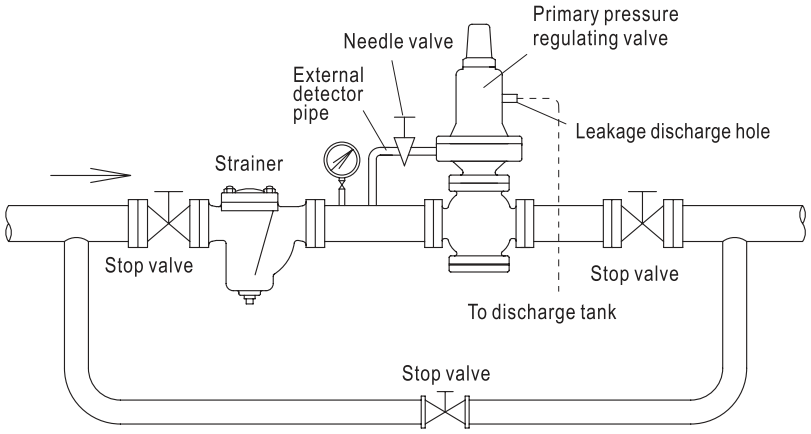
VALVE LEAKAGE ALLOWANCE

Size	Valve leakage allowance
20~32mm	0.3 l/min or less
40~65mm	0.8 l/min or less
80~100mm	1.4 l/min or less
125~150mm	2.2 l/min or less

CONSTRUCTION

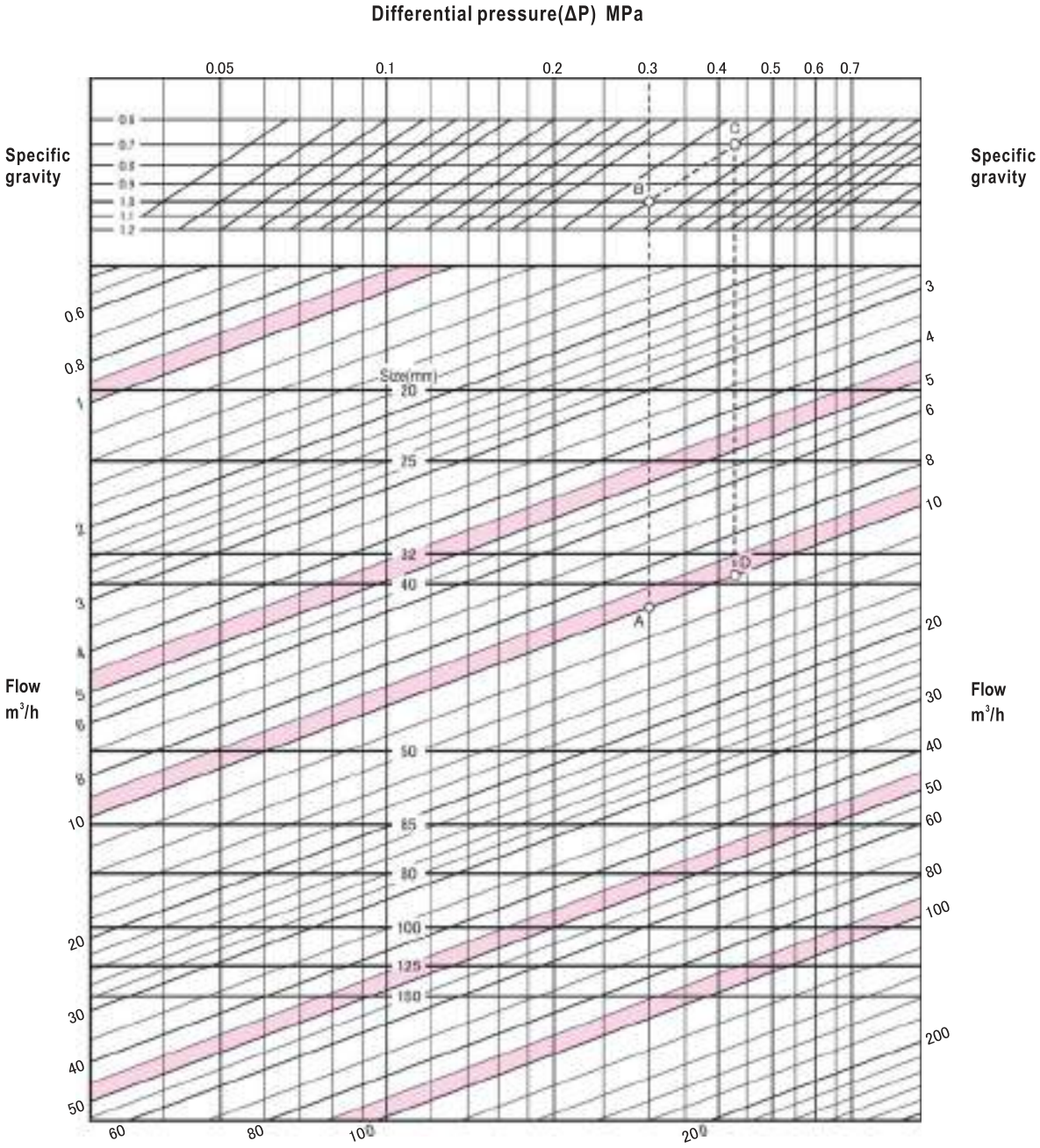
Valves with different size may have different structure.
C: leakage discharge hole (JIS Rc⅜″)

PIPING EXAMPLE



MD-2P Type Primary Pressure Regulating Valve (for Oil or Liquids)

SIZE SELECTION CHART (for Liquids)

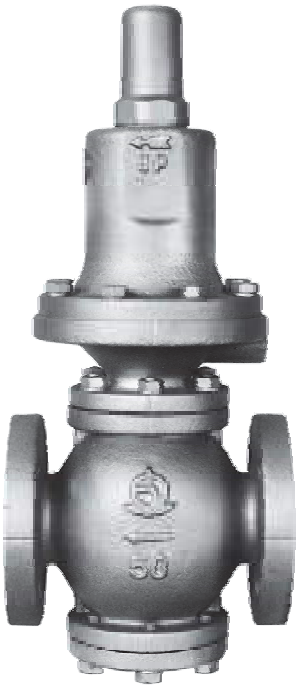


● HOW TO USE THE CHART

Where,
Set pressure: 0.4MPa
Back pressure: 0.1MPa
Specific gravity: 1 (water)
Flow rate: 10m³/h.
The differential pressure (ΔP) is 0.4−0.1=0.3MPa
Find out the intersection point A between the 0.3MPa differential pressure (ΔP) line and the 10m³/h flow line. Since point A is between the lines representing nominal diameter 40mm and 50mm, the select the larger one, 50mm.
In the case other conditions remain the same but the specific gravity is 0.7, move vertically on pressure differential line ΔP=0.3MPa and find out the intersection point B between this line and the specific gravity line 1.0. Move parallelly from point B on the specific gravity line 0.7 and find out point C. Now draw a vertical line from point C until it intersects with the 10m³/h flow curve. The intersection point is named D. Since point D is between the lines representing size 32mm and 40mm, the larger one, which is 40mm, is selected.

MD-22 Type Primary Pressure Regulating Valve (for Oil)

The diaphragm structure of pressure detecting part allows for stable operation, and the piston backup seal and leakage discharge hole make the valve operation safer.



FEATURES

- Heat resistant rubber makes the valve suitable for high-temperature application.
- The diaphragm of pressure detecting part contacts with liquid. This allows for higher wearing resistance.

SPECIFICATIONS

Model name	MD-22		
Code name	MD22-ML	MD22-MM	MD22-MH
Applicable fluid	Fuel oils(A B C heavy), oils		
Adjustable primary pressure	0.05~0.25MPa	0.2~0.45MPa	0.4~0.7MPa
Blowdown pressure	Set pressure 10% or less (min. within 0.03MPa)		
Applicable temperature	Max. 150℃		
Fluid viscosity	Max. 700cSt		
Leakage allowance	Size 20~32mm:0.09 l/min or less, Size 40, 50mm:0.24 l/min or less		
End connection	Flanged JIS 10KFF		
Materials	Body(Ductile cast iron), Diaphragm(Synthetic rubber +Teflon)		
Valve body pressure test	Hydraulic 1.5MPa		

* The inlet pressure can be checked by the external detector.

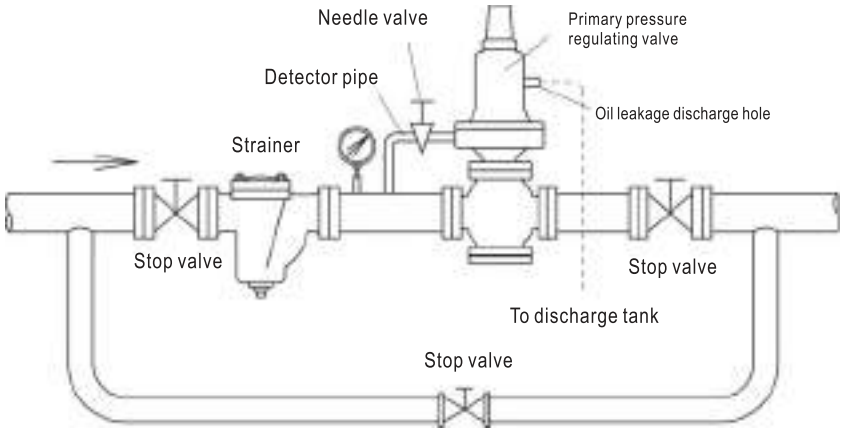
DIMENSIONS

(mm)

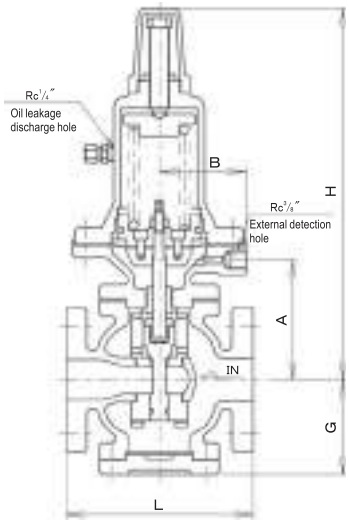
Size	L	G	H	A	B	Cv value	Mass(kg)
20(¾″)	170	85	365	121	85	0.8	22
25(1″)	170	85	365	121	85	1	23
32(1¼″)	180	90	370	126	85	1.5	24
40(1½″)	180	90	370	126	85	2	25
50(2″)	200	100	380	136	85	4	28

Flange code JIS 10KFF

PIPING EXAMPLE

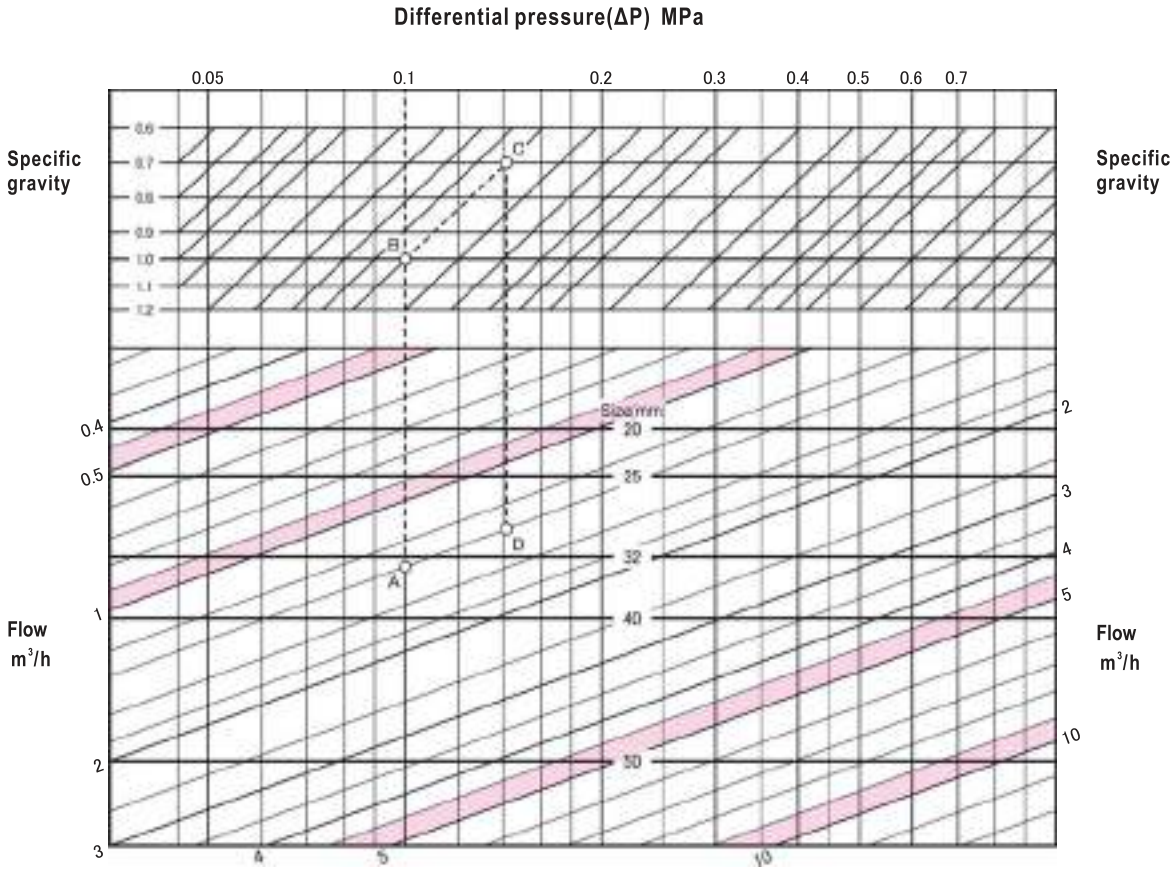


CONSTRUCTION



MD-22 Type Primary Pressure Regulating Valve (for Oil)

SIZE SELECTION CHART (for Liquids)



● HOW TO USE THE CHART

Example: where,
Set pressure: 0.5MPa
Back pressure: 0.4MPa
Specific gravity: 1 (liquid)
Flow: 1.4m³/h
The differential pressure (ΔP) is 0.5−0.4=0.1MPa

Find out the intersection point A between the 0. 1MPa differential pressure (ΔP) line and the 1.4m³/h flow line.
Since point A is located between the size 32mm and 40mm size lines, select the larger size, 40mm.
In the case other conditions remain the same but the specific gravity is 0.7, find out the intersection point B between the 0.1MPa differential pressure (ΔP) line and the 1.0 specific gravity line. Move from point B on the 0.7 specific gravity line parallelly to reach point C. Now draw a vertical line from point C until it intersects with the 1.4m³/h flow line. The intersection point is named D. Since point D is located between the size 25mm and 32mm size lines, select the larger size, 32mm.

LEVEL CONTROL VALVES
VACUUM BREAKER

5

Level control valves can automatically control and maintain the water level of tanks such as a water receiving tank. There are many types of level control valves, such as straight type, angular type. They have a variety of functions and their structures are designed to prevent water hammer and vibration.
In addition to level control valves, we also provide related products that are necessary to operate level control valve for water receiving tank.
Vacuum breaker can introduce air into piping rapidly when there is negative pressure in water supply pipeline. It can be used to prevent backflow of contaminated water due to back siphonage phenomenon.

■ LEVEL CONTROL VALVES

Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
LP-8N	Screwed	25~50(1″~2″)	0.03~0.75	Water	Cast bronze	Brass & Synthetic rubber	116
	Flanged	65~100(2½″~4″)	0.035~0.75	Water	Cast iron		
LP-9N					Cast bronze		
LP-8HN	Screwed	20~50(¾″~2″)	0.03~0.75	Water	Cast bronze	Brass & Synthetic rubber	117
	Flanged	65~100(2½″~4″)	0.035~0.75	Water	Cast iron		
LP-9HN					Cast bronze		
LP-8RN	Screwed	20~50(¾″~2″)	0.03~0.75	Water	Cast bronze	Brass & Synthetic rubber	118
	Flanged	65~100(2½″~4″)	0.035~0.75	Water	Cast iron		
LP-9RN					Cast bronze		
LP-8AN	Screwed	25~50(1″~2″)	0.03~0.75	Water	Cast bronze	Brass & Synthetic rubber	119
LP-8AHN		20~50(¾″~2″)					
LP-8ARN							
WVL-02	Flanged	80~200(3″~8″)	0.03~0.75	Water	Cast iron or Ductile cast iron	Cast bronze & Synthetic rubber	121
		250~400(10″~16″)	0.05~0.75				
WVL-02CN		80~200(3″~8″)	0.03~0.75		Cast iron		

■ LEVEL CONTROL VALVE RELATED ITEMS

Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
DS-11N	Screwed	20(¾″)	0~0.75	Water	Cast bronze	Stainless steel	123
WS-12	Screwed	20~25(¾″~1″)	0~1.0	Water	Cast bronze	Stainless steel	
WS-12C							
LB-2N	Screwed	20(¾″)	0~0.75	Water	Cast bronze	Polyethylene	124
VD-2N	Screwed	15~25(½″~1″)	Refer to specifications	Water	Brass or cast bronze	Synthetic rubber	

■ VACUUM BREAKER

Model name	End connection	Size	Applicable pressure(MPa)	Applicable fluid	Materials		Page
					Body	Trim	
VD-2N	Screwed	15~25(½″~1″)	Refer to specifications	Water	Brass or cast bronze	Synthetic rubber	124
VD-5N	Screwed	20(¾″)	Max. 1.0	Water or hot water	Cast bronze	Synthetic rubber	125

LP-8N, 9N Type Level Control Valve (for Water)

General purpose level control valve for water receiving tank. It is made of cast of cast bronze for body to prevent rust water. And no adjustable part, compact,easy to installation.

FEATURES

- Since the passage to the pilot piping is through of bypass line, intermittent water feeding by the ball tap which caused by water wave, does not influence to water supply quiet and stable water supply is ensured.
- Compact, simple structured, easy to handle.
- Strainer embedded.

SPECIFICATIONS

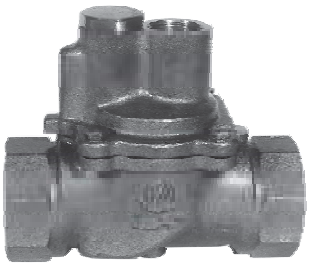
Model name	LP-8N		LP-9N
Code name	LP8N-F	LP8N-B	LP9N-F
Size	25~50(1″~2″)	65~100(2½″~4″)	
End connection	Screwed JIS Rc	Flanged JIS 10KFF	
Applicable fluid	Water		
Applicable temperature	5~60℃		
Applicable pressure	0.03~0.75MPa	0.035~0.75MPa	
Materials	Body(Cast bronze) Disc & seat (Brass and Synthetic rubber)	Body(Cast iron) Disc & seat (Brass and Synthetic rubber)	Body(Cast bronze) Disc & seat (Brass and Synthetic rubber)
Valve body pressure test	Hydraulic 1.75MPa		
Painting	—	Body inside:Epoxy resin	—
Accessories	Ball tap(Size 20mm), male and female bushing	Ball tap(Size 20mm)	Ball tap(Size 20mm), male and female bushing

DIMENSIONS

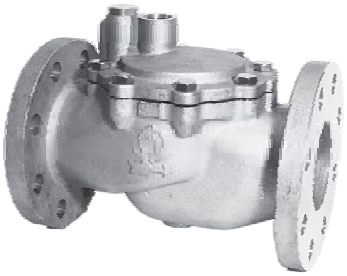
(mm)

Size	d	L	G		H	H_1	A	Cv value	Mass(kg)	
			LP-8N Type	LP-9N Type					LP-8N Type	LP-9N Type
25(1″)	1″	120	21	—	77	84	15	8	1.5	—
32(1¼″)	1¼″	135	25	—	82	89	10	11	2.1	—
40(1½″)	1½″	145	29	—	89	96	9	16	2.7	—
50(2″)	2″	170	36	—	97	104	3	22	3.9	—
65(2½″)	—	270	75	75	123	130	26	60	21	19
80(3″)	—	270	79	79	123	130	26	70	21	21
100(4″)	—	290	92	89	135	142	39	100	29	28

* Size 65~100mm: Flange code JIS 10KFF

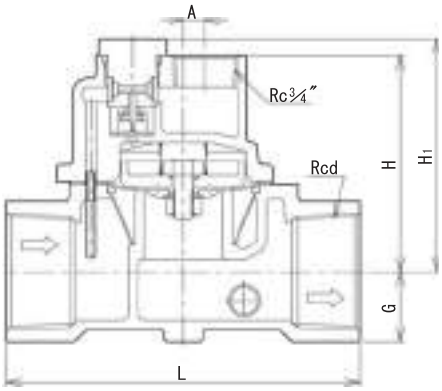


Size 25~50mm
(LP-8N Type)

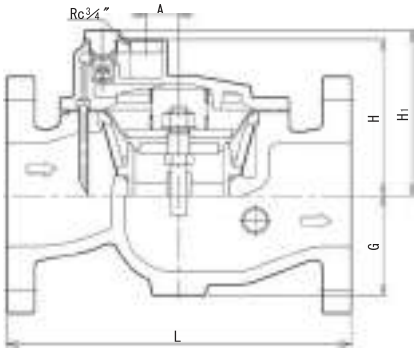


Size 65~100mm
(LP-8N, 9N Type)

CONSTRUCTION



Size 25~50mm (LP-8N Type)



Size 65~100mm (LP-8N, 9N Type)

LP-8HN, 9HN Type Level Control Valve (for Water)

General purpose level control valve with adjustor. Body with cast bronze prevents rust water.

FEATURES

- Flow adjustor and needle for adjusting valve closing time.
- Since the passage to the pilot piping is through of bypass line, intermittent water feeding by the ball tap which caused by water wave, does not influence to water supply quiet and stable water supply is ensured.
- Strainer embedded.

SPECIFICATIONS

Model name	LP-8HN		LP-9HN
Code name	LP8HN-F	LP8HN-B	LP9HN-F
Size	20~50(¾″~2″)	65~100(2½″~4″)	
End connection	Screwed JIS Rc	Flanged JIS 10KFF	
Applicable fluid	Water		
Applicable temperature	5~60℃		
Applicable pressure	0.03~0.75MPa	0.035~0.75MPa	
Materials	Body(Cast bronze) Disc & seat (Brass and Synthetic rubber)	Body(Cast iron) Disc & seat (Brass and Synthetic rubber)	Body(Cast bronze) Disc & seat (Brass and Synthetic rubber)
Valve body pressure test	Hydraulic 1.75MPa		
Flow adjusting mechanism	Equipped		
Needle valve for adjusting the valve close time	Equipped		
Painting	—	Body inside:Epoxy resin	—
Accessories	Ball tap(Size 20mm), male and female bushing	Ball tap(Size 20mm)	Ball tap(Size 20mm), male and female bushing

* The accessory for the valve size 20mm is a ball trap only.

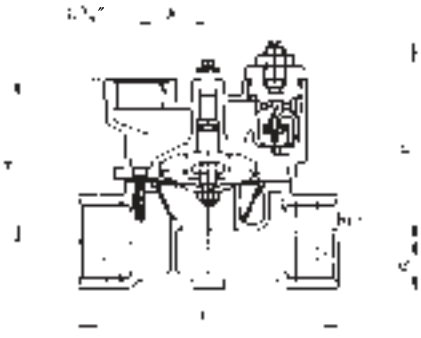
DIMENSIONS

(mm)

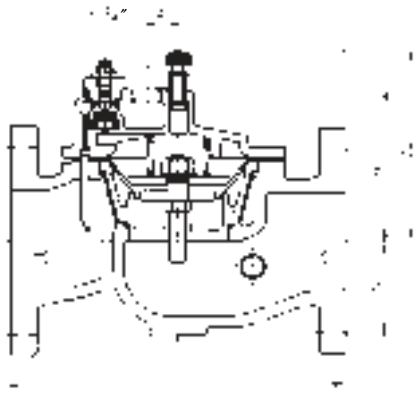
Size	d	L	G		H	H1	A	Cv value	Mass(kg)	
			LP-8HN Type	LP-9HN Type					LP-8HN Type	LP-9HN Type
20(¾″)	¾″	110	16	—	75	97	30	5	1.4	—
25(1″)	1″	120	21	—	80	102	30	8	1.7	—
32(1¼″)	1¼″	135	25	—	85	107	35	11	2.3	—
40(1½″)	1½″	145	29	—	90	113	31	16	2.8	—
50(2″)	2″	170	36	—	98	121	39	22	4.1	—
65(2½″)	—	270	75	75	125	155	26	60	21	19
80(3″)	—	270	79	79	125	155	26	70	21	21
100(4″)	—	290	92	89	137	167	39	100	29	28

* Size 65~100mm: Flange code JIS 10KFF

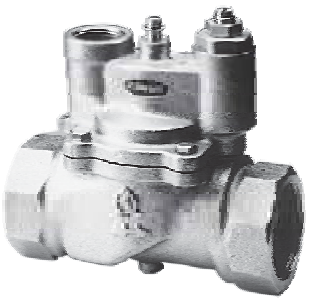
CONSTRUCTION



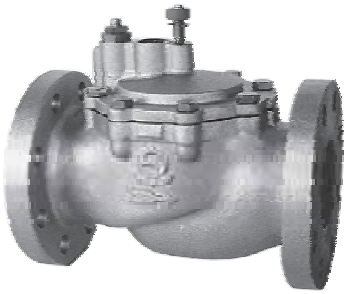
Size 25~50mm (LP-8HN Type)



Size 65~100mm (LP-8HN, 9HN Type)



Size 25~50mm
(LP-8HN Type)



Size 65~100mm
(LP-8HN, 9HN Type)

LP-8RN, 9RN Type Level Control Valve (for Water)

Level control valve with draining and flow adjusting functions for applications in cold disteict. Body with cast bronze prevents rust water.

FEATURES

- Suitable for applications in cold area.
- With draining and flow adjusting functions.
- Since the passage to the pilot piping is through of bypass line, intermittent water feeding by the ball tap which caused by water wave, does not influence to water supply quiet and stable water supply is ensured.
- Strainer embedded.

SPECIFICATIONS

Model name	LP-8RN		LP-9RN
Code name	LP8RN-F	LP8RN-B	LP9RN-F
Size	20~50(¾″~2″)	65~100(2½″~4″)	
End connection	Screwed JIS Rc	Flanged JIS 10KFF	
Applicable fluid	Water		
Applicable temperature	1~60℃		
Ambient temperature	−20~60℃		
Applicable pressure	0.03~0.75MPa	0.035~0.75MPa	
Materials	Body(Cast bronze) Disc & seat (Brass and Synthetic rubber)	Body(Cast iron) Disc & seat (Brass and Synthetic rubber)	Body(Cast bronze) Disc & seat (Brass and Synthetic rubber)
Valve body pressure test	Hydraulic 1.75MPa		
Flow adjusting mechanism	Equipped		
Drain valve	Equipped		
Painting	—	Body inside:Epoxy resin	—
Accessories	Ball tap(Size 20mm), male and female bushing	Ball tap(Size 20mm)	Ball tap(Size 20mm), male and female bushing

∗1. Ball tap is designed for cold district use.
∗2. The accessory for the valve size 20mm is a ball trap only.

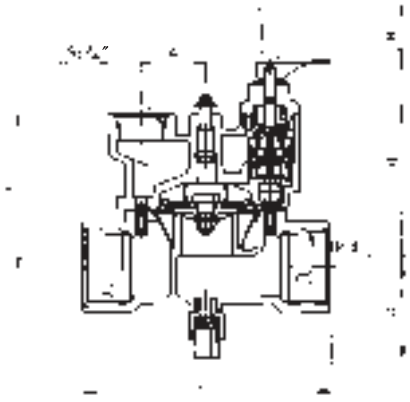
DIMENSIONS

(mm)

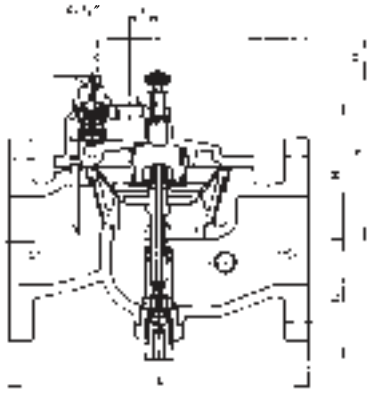
Size	d	L	G		H	H_1	H_2	A	Cv value	Mass(kg)	
			LP-8RN Type	LP-9RN Type						LP-8RN Type	LP-9RN Type
20(¾″)	¾″	110	44	—	75	103	30	30	5	1.4	—
25(1″)	1″	120	49	—	80	108	30	30	8	1.7	—
32(1¼″)	1¼″	135	54	—	85	113	30	35	11	2.3	—
40(1½″)	1½″	145	58	—	90	118	30	31	16	2.8	—
50(2″)	2″	170	63	—	98	126	30	39	22	4.1	—
65(2½″)	—	270	102	102	125	155	25	26	60	21	19
80(3″)	—	270	106	106	125	155	25	26	70	21	21
100(4″)	—	290	119	116	137	167	25	39	100	29	28

∗ Size 65~100mm: Flange code JIS 10KFF

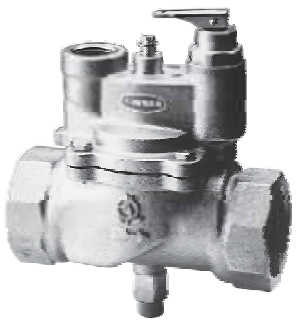
CONSTRUCTION



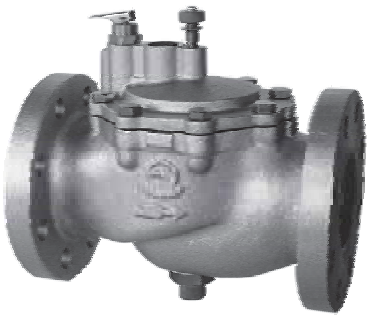
Size 20~50mm (LP-8RN Type)



Size 65~100mm (LP-8RN, 9RN Type)



Size 20~50mm
(LP-8RN Type)



Size 65~100mm
(LP-8RN, 9RN Type)

LP-8AN, 8AHN, 8ARN Type Level Control Valve (for Water)

Angular Type level control valve with bronze body prevents occurrence of rusty water.

For valve with flow adjusting function, needle valve is used to adjust valve closing time and screw is used to adjust water flow.

For valve for applications in cold district, Residual water in the valve does not accumulate even at advance draining,and allow smooth water supply at times of recharging.

LP-8AN Type

LP-8AHN Type

LP-8ARN Type

FEATURES

- Bronze body, rust free.
- Different series (flow adjusting function type, valve for applications in cold district type) are available for meeting your demand.
- Strainer embedded.

SPECIFICATIONS

Usage	Standard	Standard with flow control construction	For cold district
Model name	LP-8AN	LP-8AHN	LP-8ARN
Code name	LP8AN-F	LP8AHN-B	LP8ARN-F
Size	25~50(1″~2″)	20~50(¾″~2″)	
End connection	Screwed JIS R		
Applicable fluid	Water		
Applicable temperature	5~60℃		1~60℃
Ambient temperature	5~60℃		−20~60℃
Applicable pressure	0.03~0.75MPa		
Materials	Body(Cast bronze),Disc & seat(Brass and Synthetic rubber)		
Valve body pressure test	Hydraulic 1.75MPa		
Flow adjusting mechanism	—	Equipped	Equipped
Needle valve for adjusting the valve close time	—	Equipped	—
Drain valve	—	—	Equipped
Accessories	Ball tap (Size 20mm)		Ball tap for cold district as Size 20mm

DIMENSIONS LP-8AN Type (Standard)

(mm)

Size	d	L	L_1	H	H_1	A	Cv value	Mass(kg)
25(1″)	1″	71	40	70	77	15	8	1.3
32(1¼″)	1¼″	88	50	75	82	10	11	1.9
40(1½″)	1½″	95	53	81	88	9	16	2.4
50(2″)	2″	101	57	87	94	3	22	3.4

DIMENSIONS

LP-8AHN Type (Standard with flow control construction), LP-8ARN Type (Cold district)

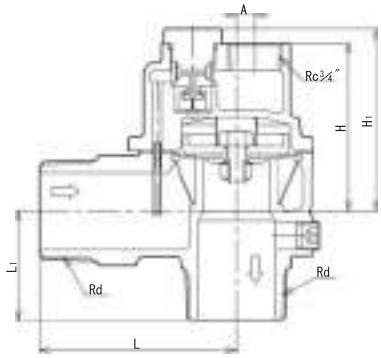
(mm)

Size	d	L	L_1	H	H_1	A	(H_2)	Cv value	Mass(kg)
20(¾″)	¾″	65	40	70	90(98)	30	30	5	1.3
25(1″)	1″	71	40	72	100	30	30	8	1.5
32(1¼″)	1¼″	88	50	77	105	35	30	11	2.2
40(1½″)	1½″	95	53	81	109	31	30	16	2.6
50(2″)	2″	101	57	87	115	39	30	22	3.6

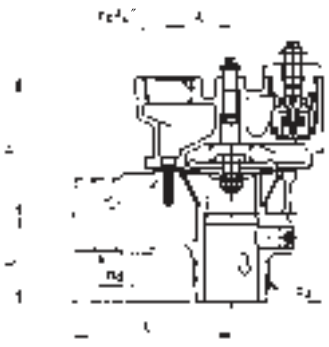
∗ Figures in ( ) are for LP-8ARN Type.

CONSTRUCTION

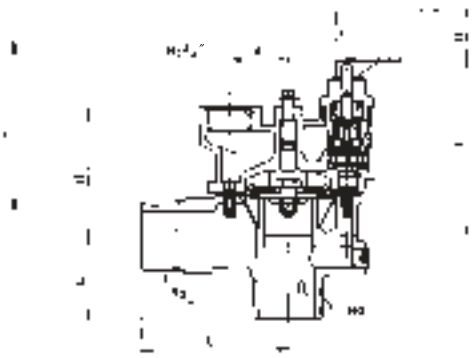
LP-8AN Type



LP-8AHN Type



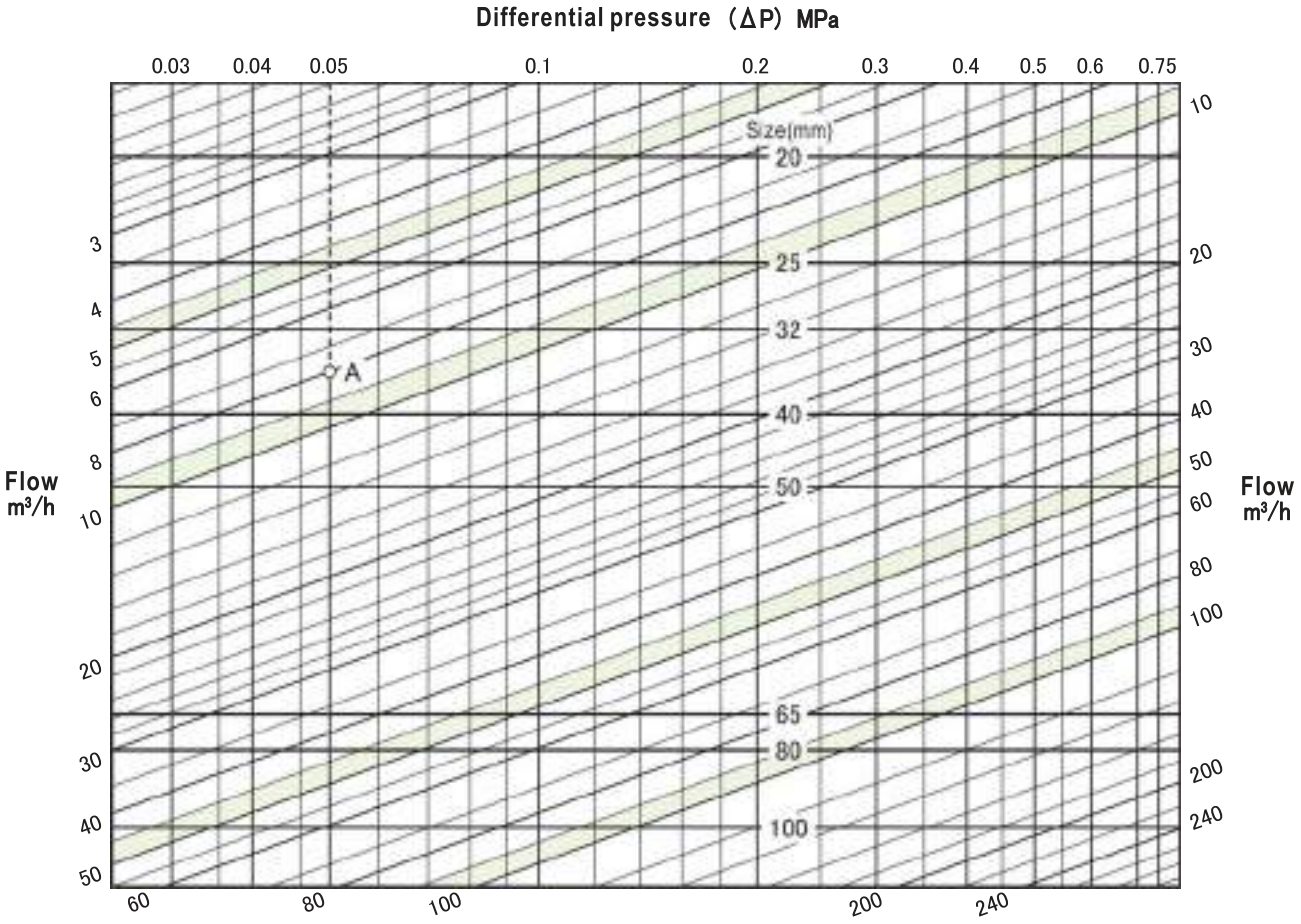
LP-8ARN Type



DATA/LP-8N, 9N Type Series Level Control Valve (for Water)

SIZE SELECTION CHART (for Water)

SUITABLE TYPES: LP-8N,9N
LP-8HN,9HN
LP-8RN,9RN
LP-8AN,8AHN,8ARN



● HOW TO USE THE CHART

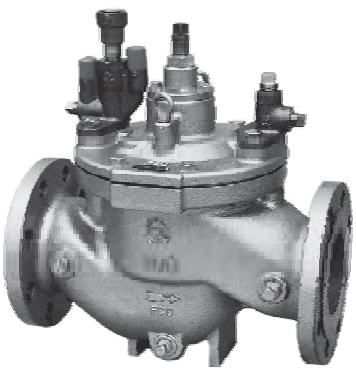
Example: determine size for meeting the following conditions.
Water supply pressure: 0.05MPa
Back pressure: 0MPa
Flow: 8m³/h

Differential pressure (ΔP) is 0.05MPa.
The 0.05MPa pressure differential line intersects with the 8m³/h flow curve at point A.

Since point A is between the 32mm and 40mm size lines, the larger one, which is 40mm, is selected.

WVL-02, 02CN Type Level Control Valve (for Water)

Large capacity level control valve for water receiving tank of water supply pipeline, water receiving tank of farm-land irrigation pipeline, and pressure reducing tank etc.



SPECIFICATIONS

Type		Basic type		Nylon coating
Model name		WVL-02		WVL-02CN
Code name		WVL02-B	WVL02-L	WVL02CN-B
Size		80~400(3″~16″)	80~200(3″~8″)	80~200(3″~8″)
Applicable fluid		Water		
Applicable temperature		5~60℃		
Applicable pressure		Size 80~200mm:0.03~0.75MPa, Size 250~400mm:0.05~0.75MPa		
Min. press differential across the disc		Size 80~200mm:0.03MPa, Size 250~400mm:0.05MPa		
End connection		Flanged JIS 10KRF		
Valve body pressure test		Hydraulic 1.75MPa		
Materials	Body	Cast iron	Ductile cast iron	Cast iron
	Trim	Diaphragm & disc(Synthetic rubber), Seat ring(Cast bronze)		
Painting or coating for Body		Interior:Epoxy resin, Exterior:Metallic blue		Nylon coating
Installation		In vertical and horizontal pipe line erect position		
Accessories ball tap		Body Size 80~200mm:Size 20mm(Polyethylene ball) Body Size 250~400mm:Size 25mm(Polyethylene ball)		

＊ Refer to page 101 for value size selecting chart.

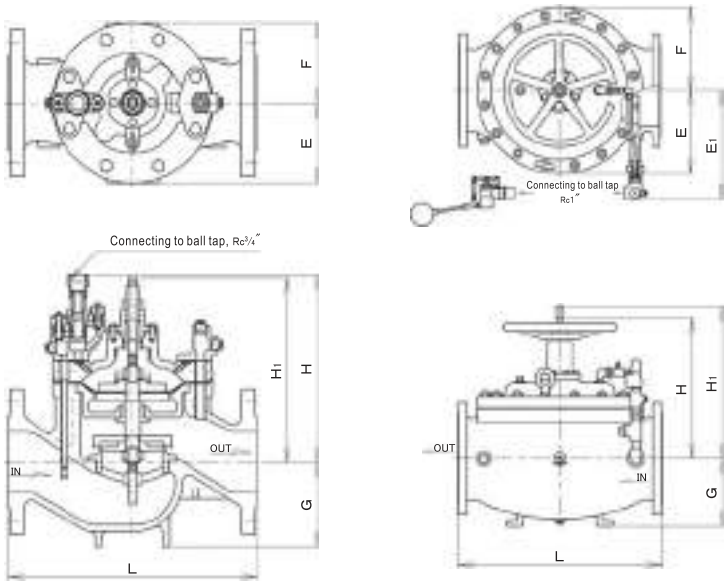
DIMENSIONS

(mm)

Size	L	G	H	H_1	E	E_1	F	Cv value	Mass(kg)
80(3″)	350	110	277	261	117	—	117	90	43
100(4″)	400	130	303	300	130	—	130	160	60
125(5″)	440	140	334	371	145	—	145	250	70
150(6″)	500	165	367	416	173	—	173	360	125
200(8″)	600	200	418	522	218	—	218	640	200
250(10″)	720	240	490	560	295	390	295	1000	470
300(12″)	820	280	540	620	328	400	328	1440	524
400(16″)	1040	370	690	800	440	490	440	2560	1400

＊Please contact our local agent for the dimensions of the main valve whose body is made of ductile cast iron. Flanged code JIS 10KRF

CONSTRUCTION



Size 80~200mm　　Size 250~400mm

DATA/Level Control Valve (FV Valve)

LEVEL CONTROL VALVE ADJUSTMENT (LP series)

■ VALVE CLOSING TIME

LP-8HN, 8AHN, 9HN

Although valve closing time has been adjusted at factory before delivery, it needs to be adjusted when there is an abnormal situation.

- **Delaying valve closing time**

  Water hammer may occur if the interval between closing of ball tap and closing of level control valve is too short. To delay valve closing, loosen the lock nut and turn the needle valve in right (clockwise) to reduce the opening degree of needle valve.

- **Shortening valve closing time**

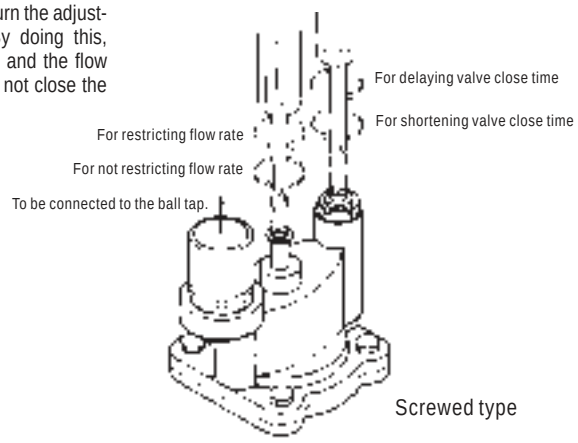
  The closing water level may be too high or overflow may occur if the interval between closing of ball tap and closing of level control valve is too long. To solve such problems, loosen the lock nut and turn the needle valve in the left (counterclockwise) to increase the opening degree of needle valve.

■ FLOW ADJUSTMENT

LP-8HN, 8AHN, 9HN
LP-8RN, 8ARN, 9RN

The flow of water will be extremely large and there will be excessive vibration and noise if the water pressure or the head drop of pressure is excessively large. To solve such problems, turn the adjustment screw in right (clockwise). By doing this, the stroke of the valve is shortened and the flow amoumt and velocity are limited (do not close the screw completely).

Adjustment of valve close time and flow



Screwed type

WATER DRAINING AND RE-FEEDING FOR LEVEL CONTROL VALVE FOR APPLICATIONS IN COLD DISTRICT

■ DRAINING

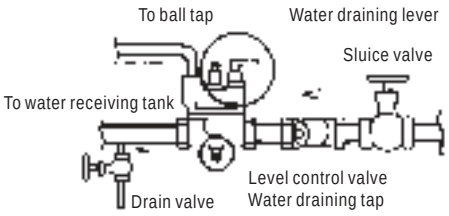
① Close the valve controlling water supply to reduce water level of water receiving tank, and then open the ball tap.

② Raise the lever of level control valve (and the drain tap in the case of straight type valve) to drain water. Close the tap after water is drained completely.

■ RE-FEEDING (resuming water supply)

Open the water supply valve and start water supply. After 2~3 minutes, check if water is supplied by secondary valve and level control valve, and then pull down the water draining lever to allow normal water supply.

Water draining and re-feeding (resuming water supply)



CAUTIONS RELATED TO USAGE OF LEVEL CONTROL VALVE

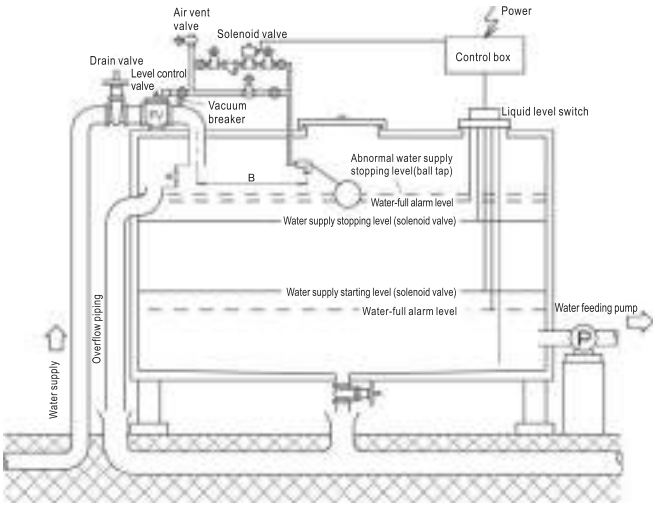
Depending on the location of water receiving tank, the sound of water flowing in the outlet piping of level control valve may cause claim from people living nearby.

Therefore, considerations on how to reduce the sound of flowing water have to be paid if the water receiving tank is located at a place where people are living in the vicinity.

■ EXAMPLE

To control water level, use the level switch to detect water level and open/close the master valve by operating the pilot-operating solenoid valve.

In case of water level in the tank raised up by some happen such as solenoid valve of unoperated,the ball tap will close as safety device, then level control valve stops to supply water.



■ CAUTIONS ON PIPING

- Interval A should be at least 1.7 times plus 5mm of pipe diameter (adjust based on the area of water receiving tank).
- Interval B should be as large as possible (>1m) or equipped with fluctuation preventing device to prevent the fluctuation of the floater of ball tap.
- Install a strainer at the primary side of level control valve.
- If the secondary piping of level control valve is very long or there are many bending parts on the piping also spout is possibly under water level, install a vacuum breaker right after the secondary side of the valve.
- Before installing level control valve, carry out sufficient flushing to clean the pipe. The valve should be vertical to horizontal pipe.
- Use union joint or flanged joint for piping of size 20~50mm valve.
- To make maintenance easier, install union joint next to the level control valve of pilot piping and install stop valve between union joint and ball tap.
- The diameter of pilot piping must not be smaller than the diameter of the pipe for connecting level control valve.
- The ball tap should be installed nearing the manhole for easy checking and maintenance.
- For applications in cold district, perform sufficient thermal insulation to protect damage of level control valve from freezing.

PILOT-OPERATING SOLENOID VALVE (to be ordered separately)

During water feeding to tank, pilot type solenoid valve in pilot piping line is possibly uncontrollable due to pressure drops, so that select the corrent direct type solenoid valve according to table of suitable solenoid valve.

■ TABLE OF SUITABLE SOLENOID VALVES

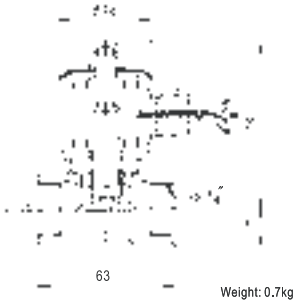
○:Good ×:Bad

Level control valve		DS-11N (Normally closed)	WS-12 (Normally closed)	WS-12C (Normally open)
Model name	Size			
LP-8N LP-8HN	20~50mm	○	○	○
	65~100mm	×	○	○
LP-8AN, 8AHN	20~50mm	○	○	○
LP-9N, 9HN	65~100mm	×	○	○
WVL-02	80~400mm	×	○	○
Other level control valves		×	○	○

＊For WVL-02 Type Size 250mm and bigger, use WS-12, 12C Type Size 25mm.
For cold district use, select LP-8ARN Type and WS Type solenoid valve.
To protect from freeze, wrap the body with thermal insulation, except coil part.

DS-11N Type Solenoid Valve (Normally closed)

■ CONSTRUCTION



Weight: 0.7kg

Note: The size and weight are those of size 20mm valve.

■ SPECIFICATIONS

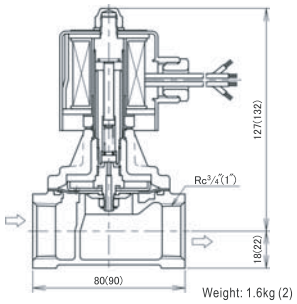
Type	Common use	
Model	DS-11N	
Code name	DS11N-J1	DS11N-J2
Size	20 or 15mm (¾″ or ½″)	
Applicable pressure	0~0.75MPa	
Materials	Body(Cast bronze), Disc & seat(Stainless steel)	
Rated voltage	AC100V 50/60Hz	AC200V 50/60Hz
Rated current	0.19A	0.10A
Starting current	0.57A	0.29A
Protection	Dust & drip proof	
Cv value	0.45	

＊For outdoor use, use the TB-03 Type Series terminal box.

WS-12 Type Solenoid Valve (Normally closed)

■ CONSTRUCTION

Special voltage are also available.



Weight: 1.6kg (2)

Note: The number in () is for size 25mm valve.

■ SPECIFICATIONS

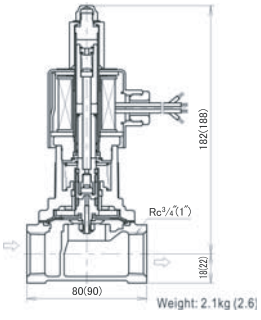
Model	WS-12	
Code name	WS12-F	
Size	20(¾″)	25(1″)
Applicable pressure	0~1.0MPa	
Materials	Body(Cast bronze), Disc & seat(Stainless steel and Synthetic rubber)	
Rated voltage	Common use:AC100V 50/60Hz or AC200V 50/60Hz	
Rated current	AC100V:0.28A AC200V:0.14A	
Starting current	AC100V:1.0A AC200V:0.5A	
Protection	Dust & drip proof	
Cv value	7	10

＊For outdoor use, use the TB-03 Series terminal box.

WS-12C Type Solenoid Valve (Normally open)

■ CONSTRUCTION

Special voltage are also available.



Weight: 2.1kg (2.6)

Note: The number in () is for size 25mm valve.

■ SPECIFICATIONS

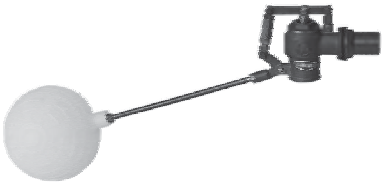
Model	WS-12C	
Code name	WS12C-F	
Size	20(¾″)	25(1″)
Applicable pressure	0~1.0MPa	
Materials	Body(Cast bronze), Disc & seat(Stainless steel and Synthetic rubber)	
Rated voltage	Common use:AC100V 50/60Hz or AC200V 50/60Hz	
Rated current	AC100V:0.30A AC200V:0.15A	
Starting current	AC100V:1.30A AC200V:0.70A	
Protection	Dust & drip proof	
Cv value	7	10

＊For outdoor use, use the TB-03 Series terminal box.

LB-2N Type Pilot Ball tap (Standard accessories)

Standard accessory for level control valve. Pilot ball tap works with level control valve and maintain a fixed level of water tank.

※ If level control valve is replaced, the ball tap should also be replaced.



SPECIFICATIONS

Model name	LB-2N
Code name	LB2N-F
Applicable fluid	Water
Applicable pressure	0~0.75MPa
Applicable temperature	5~60℃
Materials	Body(Cast bronze), Float(Polyethylene)
Valve body pressure test	Hydraulic 1.75MPa

DIMENSIONS

(mm)

Size	d	A	B	C	D	E	F	Mass(kg)
20(¾″)	G ¾″	450	35	75	115	42	60(110)	0.75(1)

Figures in ( ) are for cold district and level control valve with Size 65mm or bigger.

CONSTRUCTION

VD-2N Type Vacuum Breaker (Optional item) for outlet side of Level control valve

The operation of level control valve may become unstable if the outlet side piping is too long or the piping is a vertical piping. To maintain stable operation of the valve, install vacuum breaker on the pipe right after the outlet side of level control valve.

Note: Select VD-5N (see page 125) for indoor piping of water supply or air conditioning system.

SPECIFICATIONS

Model name	VD-2N
Code name	VD2N-F
Opening operation	Negative pressure −0.003MPa or more
Closing operation	Positive pressure 0.01MPa or more
Materials	Body(Brass or Cast bronze), Disc(Synthetic rubber), Ball(Polyethylene), Strainer(Stainless steel)

DIMENSIONS

(mm)

Size	A	D	H	Mass(kg)	Applicable size of level control valve
15(½″)	½″	25.5	63	0.1	20~32mm
20(¾″)	¾″	32.5	87	0.16	40~50mm
25(1″)	1″	40	99	0.29	65mm or bigger

CAPACITY (Air)

(kg/h)

Size	−0.003MPa	−0.006MPa	−0.01MPa
15(½″)	0.94	1.30	1.65
20(¾″)	1.40	1.95	2.50
25(1″)	1.95	2.70	3.40

● Convert kg/h → m^3/h (Standard state) (for reference only)
Density of air is 1.226kg/m^3 (15℃, 1atm)

$$m^3/h\ (\text{Standard state}) = \frac{\text{Value in above table (kg/h)}}{1.226\ (kg/m^3)}$$

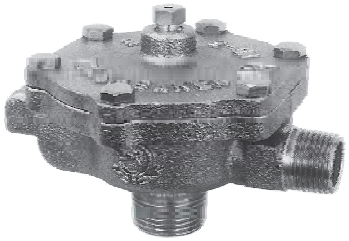
CONSTRUCTION

VD-5N Type Vacuum Breaker (for Water or Hot Water)

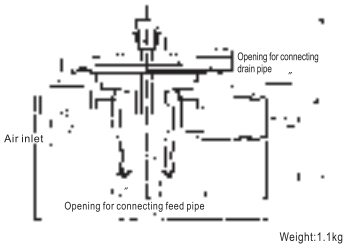
for Water Supply Equipments, Air Conditioning Equipments, and Kitchen instrument etc.prevent backflow caused by back siphonage

This product can rapidly introduce air into feed pipe when there is negative pressure in the pipe and prevent backflow due to back siphonage.

It is suitable to install at unprepared space of air gap and vacuum breaking for back siphonage.



CONSTRUCTION



Weight:1.1kg

FEATURES

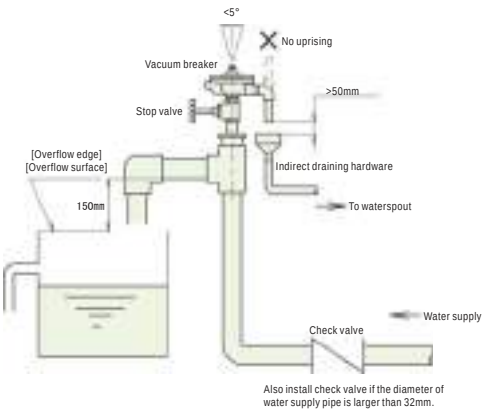
- It can be used at indoor without being around dirty by leaking from disc during operation due to built in connection of discharge piping.
- Strainers embedded at the feed pipe side and air inlet side, prevent entry of dust etc.

SPECIFICATIONS

Model name	VD-5N
Code name	VD5N-F
Size	20(¾″)
Applicable fluid	Water and hot water
Applicable temperature	5~90℃
Applicable pressure	Max. 1.0MPa
Amount of air vacuuming (Standard state)	17m³/h and more at −1.5kPa
Valve body pressure test	Hydraulic 1.75MPa
End connection	Inlet:Screwed JIS R ¾″, Outlet:Screwed JIS R½″
Materials	Body(Cast bronze), Disc(Synthetic rubber)

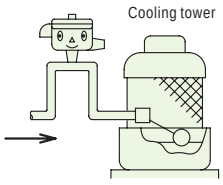
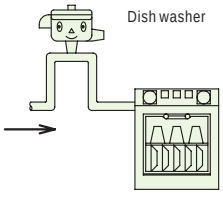
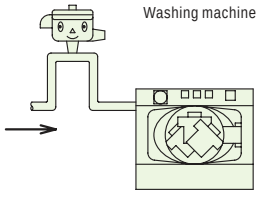
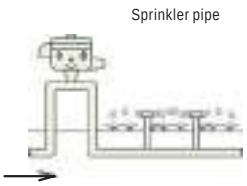
POINTS OF INSTALLATION AND OPERATION

- The installation position should be at least 150mm above the overflow edge or overflow surface of water receiving container.
- To ensure safer water supply, install check valve at the water supply pipe side.
- Keep the product vertical to pipe, with deviation of verticality less than 5°.
- Carry out sufficient flushing of pipe before installation.
- In the case of indoor piping, install indirect draining hardware and lead it to draining tank to drain water that may leak from the opening of connecting drain pipe.
  In addition, the piping from the opening of connecting drain pipe should not run upwardly and be supported or fixed properly.
- Consider thermal insulation if there is risk of freezing.
  Otherwise,do not block vacuuming hole by thermal insulation.
- Install stop valve (sluice valve/full bore ball valve) in water supply pipe to make maintenance easier.
- Do not connect directly to stop valve or joint which embedded pipe end core.



Also install check valve if the diameter of water supply pipe is larger than 32mm.

EXAMPLES OF APPLICATION

Air conditioning equipment	Kitchen utensils	Cleaning machines	Others
			
For water tanks, liquid tanks etc.	For bottler washer, rice washer etc.	For cleaning machines	For pool, medical/research equipments etc.

TEMPERATURE REGULATING VALVES

6

TD type are self-operating temperature regulating valves,which automatically carry out temperature control for water tank or heat exchanger,without using any power supply.

Model name	Seat type	End connection	Size	Applicable pressure	Applicable fluid	Materials		Page
						Body	Disc & seat	
TD-8	Single-seated	Screwed	15~40(½″~1½″)	Refer to respective specifications of each model	Steam	Cast bronze	Stainless steel	128
TD-8A					Water	Cast bronze & Brass		
TD-2	Double-seated	Flanged	15~150(½″~6″)		Steam or hot water	Cast iron	Cast bronze	129
TD-2L			15~100(½″~4″)					
TD-2A			15~150(½″~6″)		Water or cold medium			
TD-2AL			15~100(½″~4″)					
TD-4, 4L	Single-seated	Flanged	15~25(½″~1″)		Steam or hot water	Cast iron	Stainless steel	132
			32·40(1¼″·1½″)					

TD-8, 8A Type Temperature Regulating Valve

for Hot Water Tank, Heat Exchanger, Heavy Oil Heater etc.

High-performance single seat valve with pressure balancing structure and advantages of both single and double seat valves.

FEATURES

- Compact structure, large capacity.
- Single seat valve with less leakage.

SPECIFICATIONS

Utility		Heating		Cooling	
Model name		TD-8		TD-8A	
Type		Liquids	Gases	Liquids	Gases
Code name		TD8W-J☐	TD8G-J	TD8AW-F	TD8AG-F
		※ 1, 2 or 3 for adjustment temperature range is required in ☐.			
Adjustment temperature range		1:40~60℃ 2:60~80℃ *1.*2. 3:80~100℃	Adjustment temperature range is 20℃ in breath between 40 and 100℃*2.		
Applicable ambient temperature		Setting temperature −10℃ or below			
Applicable fluid		Steam		Water	
Fluid to be heated or cooled		Water, oil & liquids	Gases	Water, oil & liquids	Gases
Seat type		Pressure balance type single seated			
Leakage allowance		0.05% or less than the rated flow			
End connection		Screwed JIS Rc (Union)			
Applicable temperature		Max. 184℃		Max. 60℃	
Length of capillary tube		2m(Available up to 5m)			
Materials	Body	Cast bronze			
	Disc & Seat	Stainless steel		Disc(Cast bronze), Seat(Brass)	
	Bellows	Phosphor bronze			
	Thermo bulb	Copper tube, Chrome plated	Copper tube, Copper with fin	Copper tube, Chrome plated	Copper tube, Copper with fin
Applicable pressure for thermo bulb		Max. 1.0MPa			
Valve body pressure test		Hydraulic 1.5MPa			
Pressure limit at inlet		0.7MPa			

＊1. Other than the above adjustment temperature range are available upon your request. Refer to page 130.
＊2. In case of liquid use, adjustable temperature range 100~120℃.(Withstanding temperature 130℃) is available upon your request.
＊3. Refer to page 130 for adjustable temperature range.
＊4. In case of liquid use, Thermo bulb with Stainless steel Max.3.0MPa is available upon your request.
＊5. In case of liquid use, the protection cap for Thermo bulb, with non-standard(R1½″ x L440,etc.), And the Teflon protection cap are available upon your request.

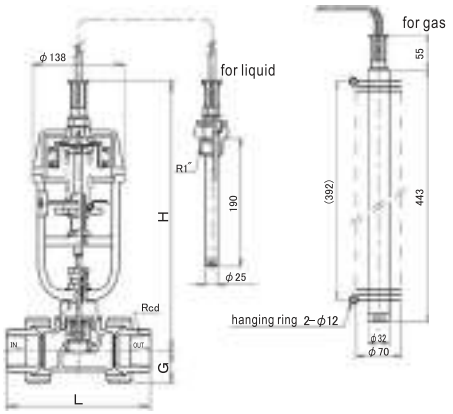
DIMENSIONS

(mm)

Size	L	G	H	d	Cv value	Mass(kg)
15(½″)	136	30	378	½″	3	7
20(¾″)	136	30	378	¾″	3	7
25(1″)	142	33	378	1″	4	7
32(1¼″)	184	40	391	1¼″	6.5	8.5
40(1½″)	202	42	395	1½″	8	9

＊Mass are for TD-8 Type

CONSTRUCTION

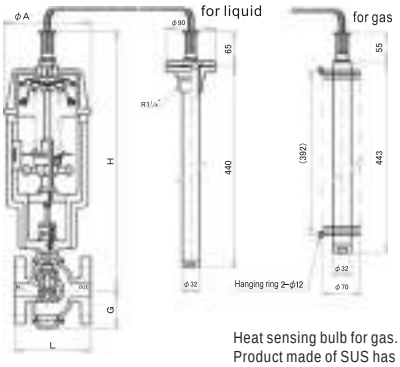


TD-2 Type Series Temperature Regulating Valve

General purpose, flanged temperature regulating valves for heating of water tank, heat exchanger, heavy oil heater etc. The series also include valves using water or coolant for cooling purpose. And we have a suitable models applicable in place where ambient temperature is higher than set temperature or applicable for the lower temperature of 40℃ or below.

CONSTRUCTION

TD-2 Type



Heat sensing bulb for gas. Product made of SUS has different dimensions.

Depending on size, the structure may vary. The bellows of TD-2L and TD-2AL have different structure.

TD-2A,2AL Type

LEAKAGE ALLOWANCE

(g/min or ml/min)

Size(mm)	15	20	25	32	40	50
TD-2 Type TD-2A Type	20	20	20	26	32	40
TD-2L Type TD-2AL Type	40	40	40	52	64	80

Size(mm)	65	80	100	125	150
TD-2 Type TD-2A Type	52	64	80	100	120
TD-2L Type TD-2AL Type	104	128	160	—	—

＊Reading in g/min for testing fluid STEAM.
＊Reading in ml/min for testing fluid WATER.

SPECIFICATIONS (Common use)

Utility		Heating	Low temp Heating	Cooling	Low temp Cooling
Model name		TD-2	TD-2L	TD-2A	TD-2AL
Size		15~150(½″~6″)	15~100(½″~4″)	15~150(½″~6″)	15~100(½″~4″)
Applicable fluid		Steam & hot water		Water & cold medium	
Seat type		Double seated			
Leakage allowance		Refer to Table of leakage allowance			
End connection		Flanged JIS 10KFF			
Applicable temperature		Max. 184℃			
Materials		Body(Cast iron), Disc & Seat(Cast bronze*), Bellows(Phosphor bronze)			
Valve body pressure test		Hydraulic 1.5MPa			
Pressure limit at inlet	Size(mm)	15~40	50~65	80	100	125	150
	Limit(MPa)	1.0	0.7	0.5	0.4	0.35	0.2

＊Disc and seat with Stainless steel are available upon your request.

SPECIFICATIONS TD-2 Type (Heating)、TD-2A Type (Cooling)

Model name	TD-2(Heating)		TD-2A(Cooling)	
Utility	Liquids	Gases	Liquids	Gases
Code name	**TD2W-B □*1.**	**TD2G-B**	**TD2AW-B**	**TD2AG-B**
	※ 1, 2 or 3 for adjustment temperature range is required in □.			
Adjustment temperature range	**1:40~60℃ 2:60~80℃*2.*3. 3:80~100℃**	Adjustment temperature range is 20℃ ,between 40 and 100℃*3.		
Applicable ambient temperature	Setting temperature −10℃ or below			
Fluid to be heated or cooled	Water, oil & liquids	Gases	Water, oil & liquids	Gases
Length of capillary tube	Size 15~100mm:2m*5., Size 125~150mm:4m*5.			
Thermo bulb materials	Copper tube, Chrome plated	Copper tube, Copper with fin	Copper tube, Chrome plated	Copper tube, Copper with fin
Applicable pressure for thermo bulb	Max. 1.0MPa			

SPECIFICATIONS TD-2L Type (Low temp Heating),TD-2AL Type (Low temp Cooling)

Model name	TD-2L(Low temp heating)		TD-2AL(Low temp cooling)	
Utility	Liquids	Gases	Liquids	Gases
Code name	TD2LW-B	TD2LG-B	TD2ALW-B	TD2ALG-B
Adjustment temperature range	Adjustment temperature range is 20℃, between 15 and 55℃*3.			
Applicable ambient temperature	Setting temperature +20℃ or below			
Fluid to be heated or cooled	Water, oil & liquids	Gases	Water, oil & liquids	Gases
Length of capillary tube	Size 15~100mm:2m*5., Size 125~150mm:4m*5.			
Thermo bulb materials	Copper tube, Chrome plated	Copper tube, Copper with fin	Copper tube, Chrome plated	Copper tube, Copper with fin
Applicable pressure for thermo bulb	Max. 1.0MPa			

＊1. In case of size 100mm or bigger, code name is TD2W-B.
＊2. Other than the above adjustment temperature range are available upon your request. Refer to page 130.
＊3. In case of liquid use, adjustable temperature range 100~120℃.(With standing temperature 130℃) is available upon your request.
＊4. Refer to page 130 for adjustable temperature range.
＊5. Length of capillary tube up to 5m is available upon your request.
＊6. In case of liquid use, Thermo bulb with Stainless steel Max.3.0MPa is available upon your request.
＊7. In case of liquid use, for sizes 15~65mm (½″~2½″),the protection cap for Thermo bulb, with non-standard (R1½″x L440,etc.)and the Teflon protection are available upon your request.

DIMENSIONS

(mm)

Size	L	G	H	A	Cv value	Mass(kg)
15(½″)	126	60	475	160	3	12.1
20(¾″)	130	60	475	160	3	12.4
25(1″)	140	70	485	160	4	13.5
32(1¼″)	150	75	490	160	6.5	15
40(1½″)	160	75	490	160	8	15.5
50(2″)	180	100	525	160	12.5	22.5
65(2½″)	215	115	535	160	18	29.2
80(3″)	260	125	580	180	25	38
100(4″)	300	150	605	180	40	57.5
125(5″)	360	180	745	220	70	75.6
150(6″)	382	205	770	220	110	125

Flange code JIS 10KFF

Key Points for Installation

■ PIPING EXAMPLE

Fig.1 Piping for liquids

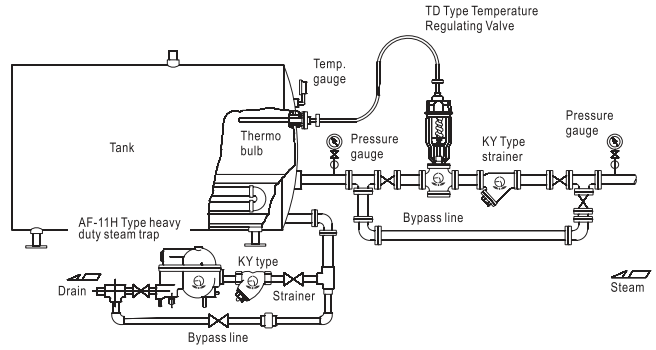
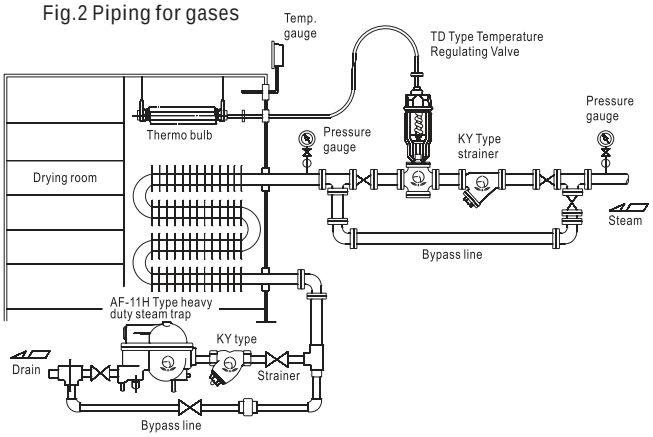


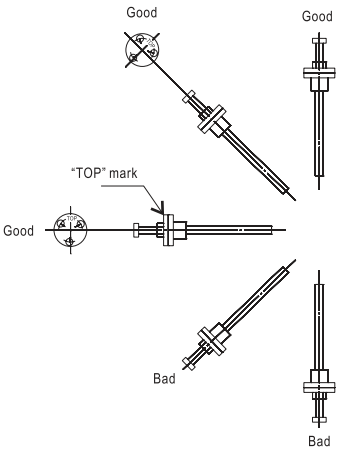
Fig.2 Piping for gases



■ KEY POINTS FOR SELECTION AND INSTALLATION

1. Temperature regulating may not be possible if ambient temperature is very high due to direct sunlight or heat accumulated in the place where the valve is installed. The following is the allowed ambient temperature for different types of valves.
   ※Allowed ambient temperature:
   TD- □(for heating), TD- □A(for cooling): −10℃ or below.
   TD-□L (for low temperature heating), TD-□AL(low temperature cooling): +20℃ or below.
2. Generally, for the purpose of selecting size of valve, the differential pressure before and after valve should be 0.05MPa. In addition, the inlet pressure of temperature regulating valve should be 0.2~0.3MPa. Such a pressure can help ensuring stable temperature regulating performance and expanding the service life of the valve.
3. For ideal controllability, take the median of the temperature regulating range as set temperature.
4. For applications with low capacity and risk of leakage, select single seat TD-8 or TD-4 series that have less leakage.
5. Install strainer at the primary side of temperature regulating valve.
6. For equipments which operation cannot be stopped, install bypass piping (with stop valve) between the primary and secondary sides of temperature regulating valve (see Fig.1, 2). If such a bypass piping is not installed, install blowing stop valve, which is branched from the main pipe, right before the primary stop valve of temperature regulating valve to make flushing possible.
7. The temperature may exceed set temperature due to leakage of temperature regulating valve. To avoid such increase of temperature, install electric valve or other blocking devices at the outlet side of temperature regulating valve.
8. Make sure the direction of flow of fluid is the same as the direction marked on the product and install temperature regulating valve vertically to horizontal pipes.
9. Install stop valve and pressure gauge before and after temperature regulating valve (see Fig.1, 2).
10. The thermo bulb should be installed in a manner so that the head faces horizontally or slightly downwardly (but not upwardly).
    In addition, the "TOP" mark must face upwardly (see Fig.3).
11. The thermo bulb must have at least 3/4 of its total length submerged into the flowing fluid. The thermometer must be installed nearing and at the same height of the thermo bulb.
12. Do not bend the capillary tube in an acute angle.
13. If the fluid is steam, install steam trap for discharging drain generated by heat exchanger.
14. Leave sufficient space for dismantling and maintenance purpose.
15. Temperature regulating valve should be supported and fixed properly to avoid impact due to the weight of piping, bending force, or vibration.
16. In case of any freezing possibility, insulate or drain out.
17. Deviation of temperature setting and range of temperature regulating are as below:

Fig.3 Direction for installation of thermo bulb



■ TEMPERATURE SET ERROR

Length of capillary tube	Heating& cooling		Low temp Heating & cooling
	A	B	
2m	±2℃	±3℃	±3.5℃ 2m or longer add ±0.5℃ per 1m
2~3.5m	±2.5℃	±3.5℃	
3.5~5m	±3℃	±4℃	

＊1. A:In case of Max. 100℃ or less for adjustable temperature range.
B:In case of exceeding 100℃ in all or part of adjustable temperature range.
＊2. In case of Gases service,±1℃ is added.

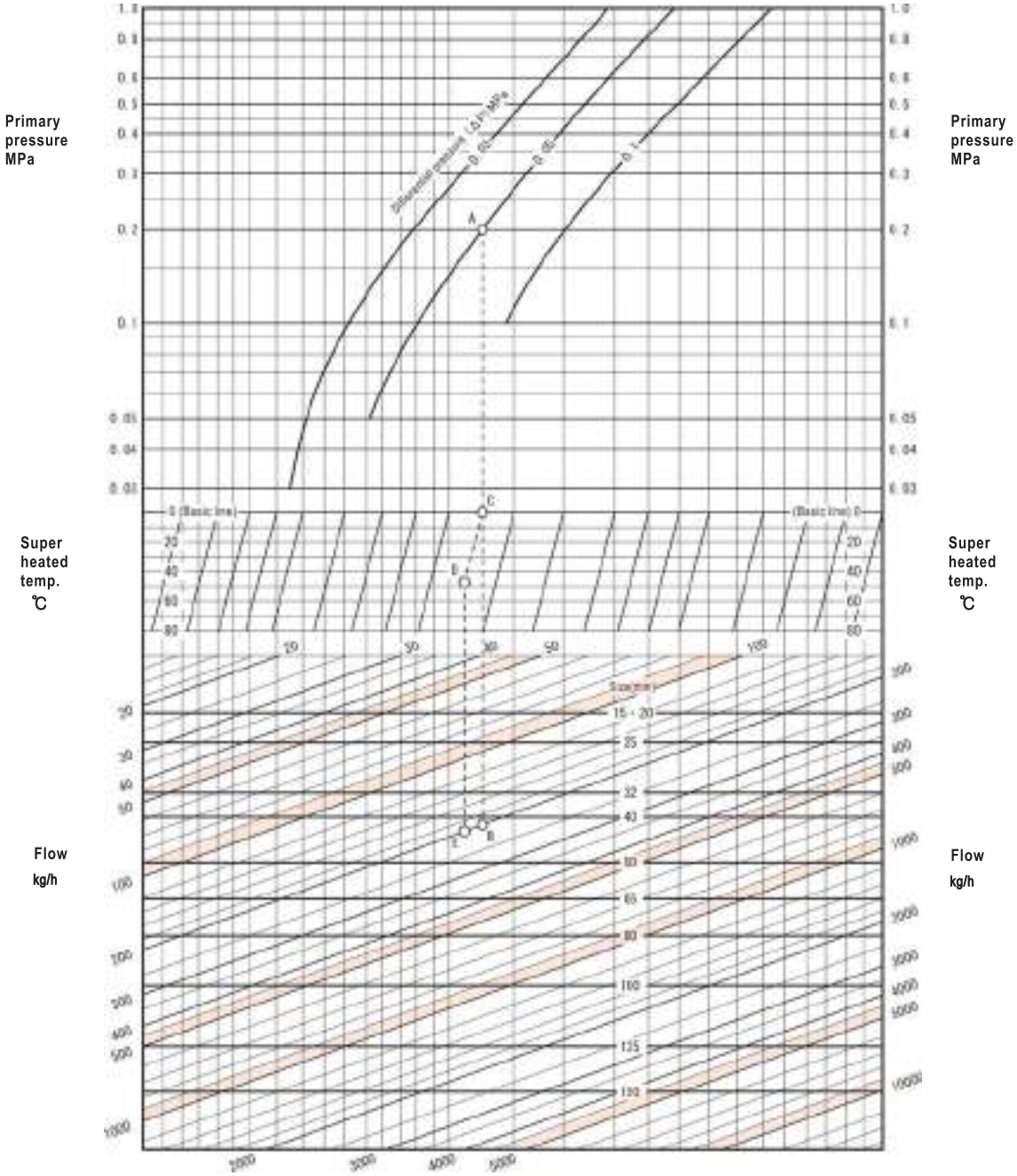
■ ADJUSTABLE TEMPERATURE RANGE

Heating& cooling			Low temp Heating& cooling	
Code No.	Adjustable temp. Range	Withstanding temperature	Adjustable temp. Range	Withstanding temperature
1	40~60℃	70℃	15~35℃	50℃
	50~70℃	80℃	20~40℃	
2	60~80℃	90℃	35~55℃	70℃
	70~90℃	100℃		
3	80~100℃	110℃		

＊Other than the above temperature range items are available upon your request.

DATA/TD Type Temperature Regulating Valve (TD-2, 8 Type Series)

SIZE SELECTION CHART (for Steam)



● HOW TO USE THE CHART

Select a valve with proper size for meeting the following requirements.
Primary pressure: 0.2MPa
Flow of saturated steam: 200kg/h
Differential pressure: 0.05MPa

First, find out the point (A) where the primary pressure line (0.2MPa) intersects with the differential line (0.05MPa). Draw a vertical line from point A. This line intersects with flow curve (200kg/h). The intersection point is B. Since B is located between a nominal diameter range of 40mm~50mm. The larger value, which is 50mm is taken as the nominal diameter that we are looking for.

If the steam temperature is 180℃, the first thing is to calculate the degree of superheat.

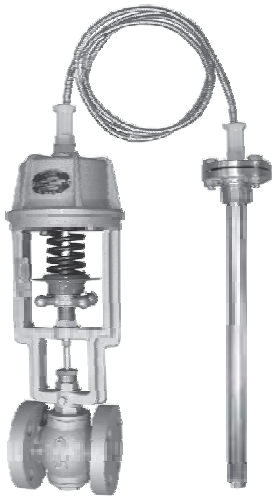
Since degree of superheat = temperature of superheat steam temperature of saturated steam, Degree of superheat: 180℃−132.9℃=47.1℃. Draw a vertical line from point A until it intersects with the benchmark line. The intersection point is named C. Move from point C parallel along the superheat line (47.1℃) to decide point D.

Draw a vertical line from point D until it intersects with flow curve (200kg/h). the intersection point is named E. Since point E is located between a nominal diameter range of 40mm~50mm. The larger value, which is 50mm is taken as the nominal diameter that we are looking for.

See page 263 for temperature of saturated steam.

TD-4, 4L Type Temperature Regulating Valve

Small capacity, flanged, single seat temperature regulating valve with less leakage. Suitable for installation at places where leakage is not permitted and on small capacity machines.



SPECIFICATIONS

Utility		Heating	Low temp Heating
Model name		TD-4	TD-4L
Code name		TD4-G	TD4L-G
Adjustment temperature range		40~100℃*1.*2.	15~55℃*1.*2.
Applicable ambient temperature		Setting temperature −10℃ or below	Setting temperature +20℃ or below
Applicable fluid		Steam & Hot water	
Fluid to be heated or cooled		Water, oil & liquids	
Seat type		single seated	
Leakage allowance		Refer to Table of leakage allowance	
End connection		Size 15~25mm:Flanged JIS 10KFF Size 32~40mm:Flanged JIS 5KFF	
Applicable temperature		Hydrauric,Max. 220℃	
Length of capillary tube		2m(Available up to 5m)	
Materials		Body(Cast iron), Disc & seat(Stainless steel), Bellows(Phosphor bronze) Thermo bulb (Copper tube, Chrome plated) Thermo bulb with Stainless steel is available upon your request	
Applicable pressure for thermo bulb		Max. 1.0MPa	
Valve body pressure test		Hydraulic,1.5 times of flange rated pressure.	
Pressure limit at inlet	Size	15~20(½″~¾″)	25(1″)	32~40(1¼″~1½″)
	(MPa)	1.0	0.7	0.5

*1. Refer to below Table of adjustable temperature range.
*2. For liquid service, adjustable temperature range 120℃(with standing temperature:130℃) is available upon your request.
*3. In case of liquid use,for sizes 15~65mm (½″~2½″),the protection cap for Thermo bulb, with non-standard (R1½″x L440,etc.)and the Teflon protection are available upon your request.

CONSTRUCTION

DIMENSIONS

(mm)

Size	L	G	H	Cv value	Mass(kg)
15(½″)	126	55	470	1.5	13
20(¾″)	130	55	470	1.5	13
25(1″)	130	60	475	3	15
32(1¼″)	180	85	510	4	21
40(1½″)	180	85	510	4	22

Size 15~25mm:Flange code JIS 10KFF
Size 32~40mm:Flange code JIS 5KFF

ADJUSTABLE TEMPERATURE RANGE

Heating		Low temp Heating	
Adjustable temp. Range	Withstanding temperature	Adjustable temp. Range	Withstanding temperature
40~60℃	70℃	15~35℃	50℃
50~70℃	80℃	20~40℃	
60~80℃	90℃	35~55℃	70℃
70~90℃	100℃		
80~100℃	110℃		

*Other than the above temperature range items are available upon your request.

TEMPERATURE SET ERROR

(In case of 2m of length of capillary tube)

Heating		Low temp Heating
A	B	
±2℃	±3℃	±3.5℃

In case of Max. 100℃ or less for adjustable temperature range.
In case of exceeding 100℃ in all or part of adjustable temperature range.

LEAKAGE ALLOWANCE

(g/min or ml/min)

Size(mm)	15	20	25	32	40
TD-4 Type	2	2	2	3	4
TD-4L Type	4	4	4	6	8

*Reading in g/min for testing fluid STEAM.
Reading in ml/min for testing fluid WATER.

HOW TO USE THE CHART

Under the following conditions:
Primary pressure: 0.2MPa
Flow of saturated steam: 50kg/h
Differential pressure: 0.05MPa

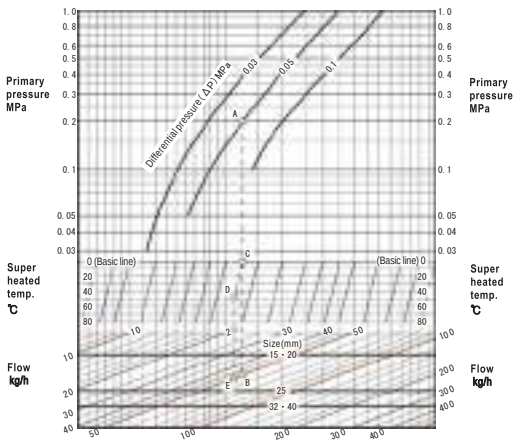
Obtain point A (where the 0.2MPa primary pressure line intersects with the 0.05MPa differential pressure line) and point B (intersection point acquired using 50kg/h flow line). Since point B is located between lines size 15/20mm and size 25mm, the size 25mm is selected.

If the steam temperature is 180℃, the first thing is to find the degree of superheat.

Since degree of superheat = temperature of superheat steam temperature of saturated steam, Degree of superheat : 180℃−132.9℃=47.1℃. Draw a vertical line from point A until it intersects with the benchmark line. The intersection point is named C. Move from point C parallely along the superheat line (47.1℃) to decide point D. Using point D, it is able to decide point E, where the line intersects with flow line (50kg/h). Since point C is located between lines size 15/20mm and size 25mm, the larger one, 25mm, is selected.

See page 263 for temperature of saturated steam.

SIZE SELECTION CHART (for Steam)



7

NOISELESS HEATERS
VACUUM BREAKER

Noiseless heaters reduce noise and vibration that occur when steam is blown into water for making hot water.

Vacuum breaker can introduce air into pipes or devices to prevent formation of vacuum when there may occur negative pressure.

■ NOISELESS HEATERS

Model name	End connection	Size	Applicable pressure (MPa)	Applicable fluid	Materials	Warning sound temperature limit (℃)	Page
QH-1	Screwed	15~80(½″~3″)	Max. 0.7	Steam	Cast bronze or Stainless steel	66	134
QH-2	Screwed	15~80(½″~3″)	Max. 0.7	Steam	Cast bronze or Stainless steel	95	135
QH-3	Screwed	15~50(½″~2″)	Max. 0.7	Steam	Stainless steel	95	136

■ VACUUM BREAKERS

Model name	End connection	Size	Applicable pressure (MPa)	Applicable fluid	Materials	Setpressure	Page
VD-1H	Screwed	15~50(½″~2″)	Max. 1.0	Steam or air	Brass(Cast bronze) or Stainless steel	Refer to specifications	137

QH-1 Type Noiseless Heater

This product can be used to reduce noise and vibration that occur when steam is blown into water for making hot water. It can also be used for heating bathtub or other open type hot water tank (66℃ or below).

SPECIFICATIONS

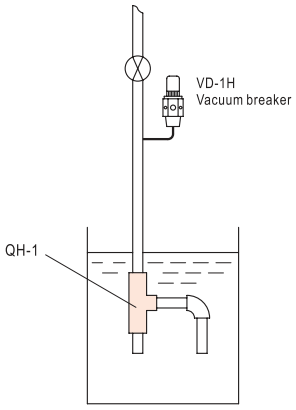
Model name	QH-1	
Code name	QH1-F	QH1-D
Applicable pressure	Max. 0.7MPa	
Warning sound temperature limit	66℃	
End connection	Screwed JIS Rc	
Materials	Cast bronze	Stainless steel

DIMENSIONS

(mm)

Size	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)
A	54	62	75	93	110	140	155	180
B	54	63	75	91	109	130	154	170
C	25	31	37	45	50	65	85	88
d	½″	¾″	1″	1¼″	1½″	2″	2½″	3″
Mass(kg)	0.36	0.55	0.86	1.8	2.4	4	11	14

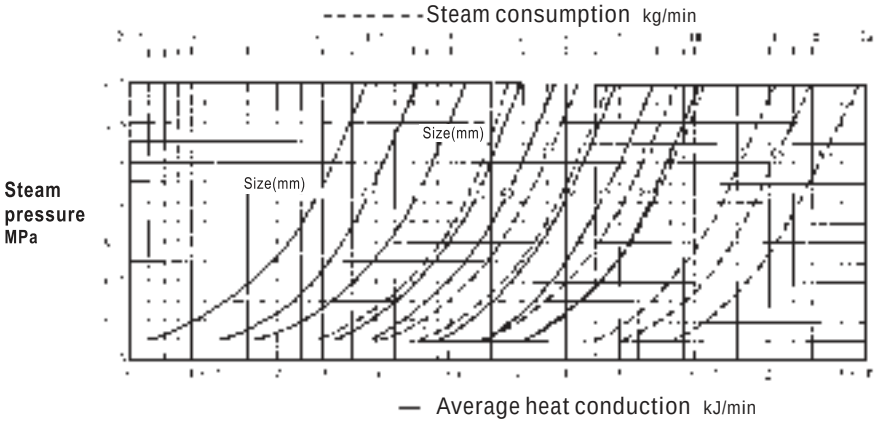
PIPING EXAMPLE



Note: 1.Submerge the Noiseless heaters into water. If this is not possible, place it as near as possible to the surface of water.

2.Install VD-1H Type vacuum breaker for preventing backflow of water that may occur when steam supply is stopped.

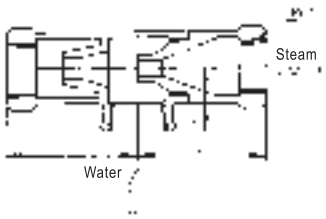
CAPACITY CHART



● HOW TO USE THE CHART

The dashed line (– – –) stands for steam consumption.
The solid line (——) stands for average heat conduction.

CONSTRUCTION



Depending on the size and material of valve, the structure may vary.

QH-2 Type Noiseless Heater

This product can be used to reduce noise and vibration that occur when steam is blown into water for making hot water. It can also be used for heating bathtub or other open type hot water tank (95℃ or below).

SPECIFICATIONS

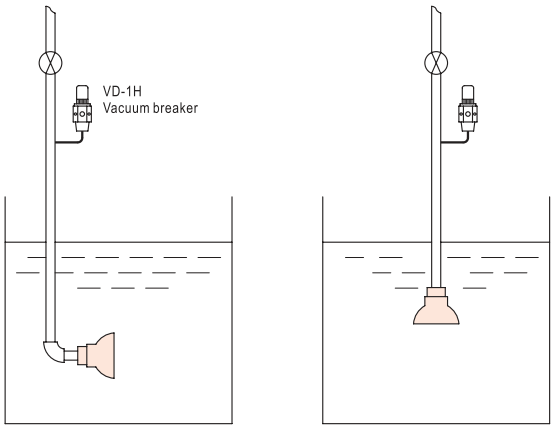
Model name	QH-2	
Code name	QH2-F	QH2-D
Applicable pressure	Max. 0.7MPa	
Warning sound temperature limit	95℃	
End connection	Screwed JIS Rc	
Materials	Cast bronze	Stainless steel

DIMENSIONS

(mm)

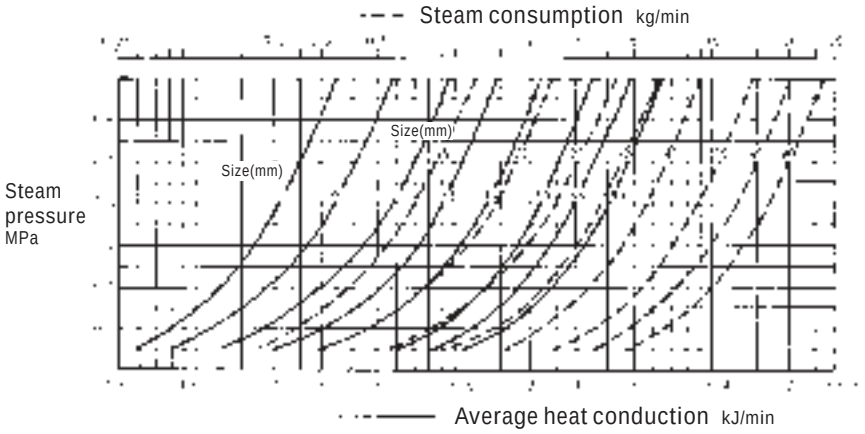
Size	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)
A	70	94	133	175	204	229	260	280
B	57	72	195	113	137	156	180	200
d	½″	¾″	1″	1¼″	1½″	2″	2½″	3″
Mass(kg)	0.36	0.77	1.8	3.2	4.3	7.4	11.2	14

PIPING EXAMPLE



Note: 1.Install noiseless heater at least 300mm away from the wall or bottom of the tank.
2.Install VD-1H Type vacuum breaker valve for preventing backflow of water that may occur when steam supply is stopped.

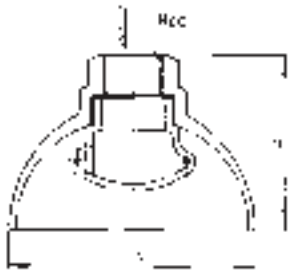
CAPACITY CHART



HOW TO USE THE CHART

The dashed line (– – –) stands for steam consumption.
The solid line (——) stands for average heat conduction.

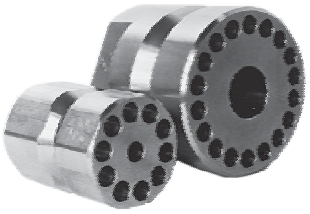
CONSTRUCTION



Depending on the size and material of valve, the structure may vary.

QH-3 Type Noiseless Heater

This product can be used to reduce noise and vibration that occur when steam is blown into water for making hot water. It can also be used for heating bathtub or other open type hot water tank (95℃ or below). It is compact and has large heat conduction with sectional plane similar to that of lotus root.



SPECIFICATIONS

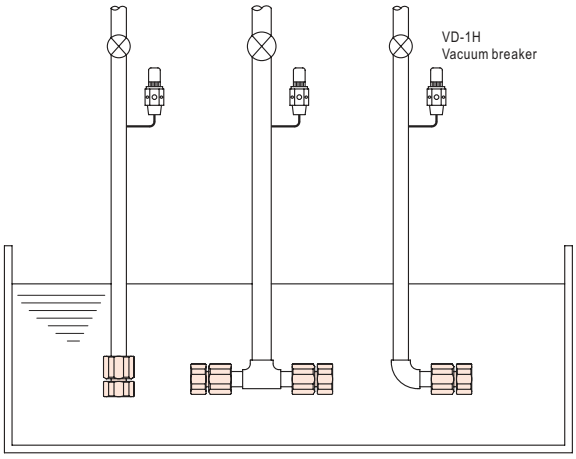
Model name	QH-3
Code name	QH3-D
Size	15~50(½″~2″)
Applicable pressure	Max. 0.7MPa
Warning sound temperature limit	95℃
End connection	Screwed JIS Rc
Materials	Stainless steel

DIMENSIONS

(mm)

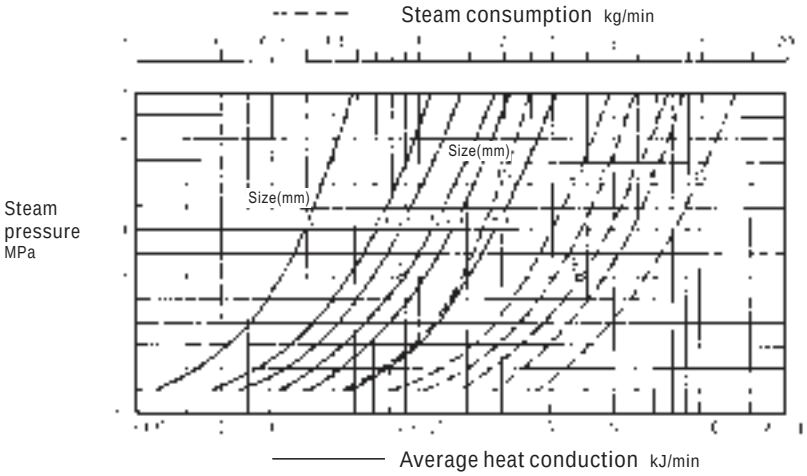
Size	d	A	B	C	Mass(kg)
15(½″)	½″	50	34	32	0.21
20(¾″)	¾″	53	40	38	0.28
25(1″)	1″	60	48	46	0.5
32(1¼″)	1¼″	63	65	55	1
40(1½″)	1½″	65	75	63	1.4
50(2″)	2″	70	110	95	3.4

PIPING EXAMPLE



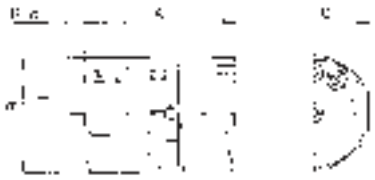
Note:
1. Install noiseless heater at least 300mm away from the wall or bottom of the tank.
2. Install VD-1H Type vacuum breaker valve for preventing backflow of water that may occur when steam supply is stopped.

CAPACITY CHART



CONSTRUCTION

Size 15~25mm



Size 32~50mm

Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

HOW TO USE THE CHART

Where, size is 32mm and steam pressure 0.3MPa, the average heat conduction (solid line ———), as shown by point A, is 8820kJ/min, and steam consumption (dashed line – – –), as shown by point B, is 3.8kg/min.
The time to heat 700ℓ water from 20℃ to 80℃ will be:

$$\frac{4.2 \quad (80-20) \quad 700}{8820} = 20(\text{minutes})$$

The steam consumption will be: 3.8 20=76 kg

VD-1H Type Vacuum Breaker

When the pressure gets down to the negative pressure below the set-press., the Vacuum breaker will open to absorb air and prevent formation of vacuum in pipe or device.Installation of this item in steam pipeline with Noiseless heater will prevent absorption of water that may occur when steam supply is stopped.

SPECIFICATIONS

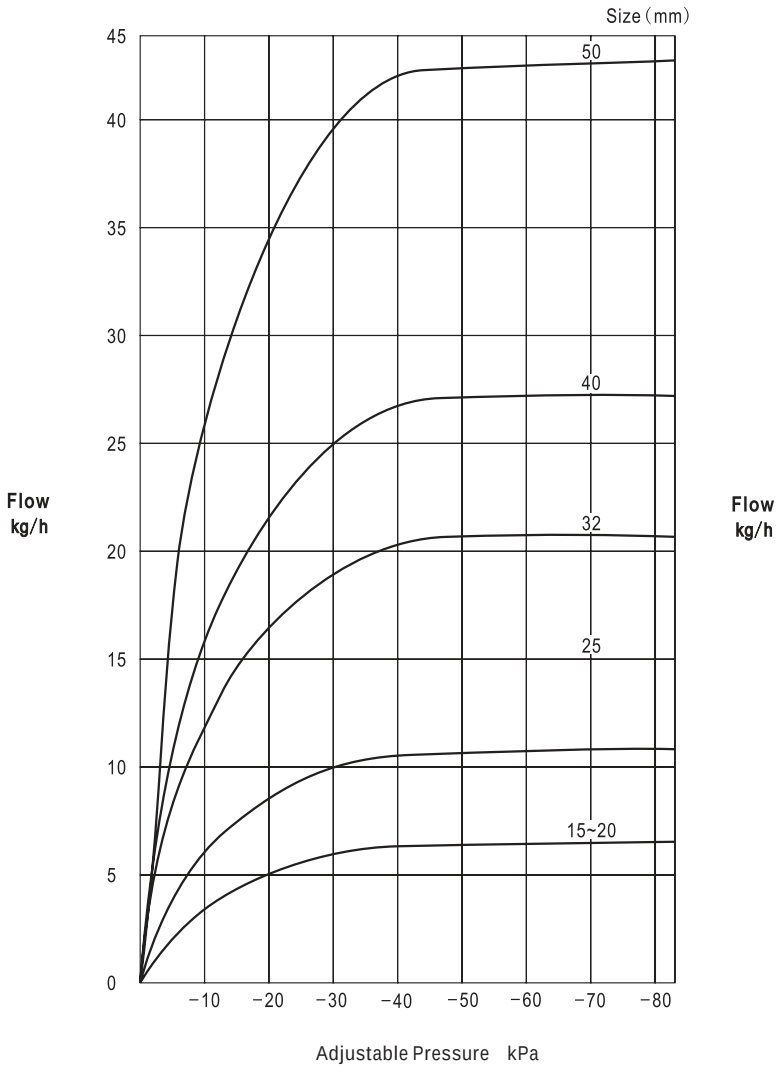
Model name	VD-1H	
Code name	VD1H-F☐	VD1H-D☐
	※ 1, 2, 3 or 4 for adjustable pressure range No. is required in ☐.	
Applicable fluid	Steam and air	
Applicable pressure	Max. 1.0MPa	
Adjustable pressure range	**1:−0.5~−22kPa, 2:−22~−49kPa, 3:−49~−76kPa, 4:−76~−82kPa**	
Fluid temperature	Max. 200℃	
End connection	Screwed JIS R	
Materials	Brass or Cast bronze	Stainless steel

DIMENSIONS

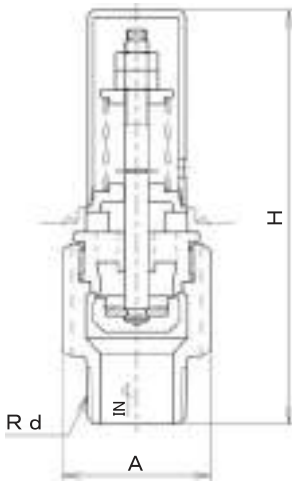
(mm)

Size	d	A	H	Mass(kg)
15(½″)	½″	Hexa. 34 39.3	110	0.4
20(¾″)	¾″	Hexa. 34 39.3	110	0.4
25(1″)	1″	Hexa. 34 39.3	110	0.6
32(1¼″)	1¼″	Hexa. 50 57.7	107	0.8
40(1½″)	1½″	Hexa. 55 63.5	122	1.1
50(2″)	2″	Hexa. 68 78.5	153	1.9

FLOW CHART



CONSTRUCTION



Depending on nominal diameter, the structure of the valve may be different from what is shown in the drawing.

8 STEAM TRAPS

Steam traps can retain steam in steam pipeline or machine and discharge unnecessary drain. In doing so, they can prevent decrease of heat exchange and the occurrence of problems such as water hammer etc.

To select the most suitable steam trap, considerations must be paid on the actual conditions.

■ THERMOSTATIC TYPE

Model name	End connection	Size	Applicable pressure(MPa)	Materials		Page
				Body	Trim	
AT-1A,1S	Screwed	15~25(½″~1″)	Max. 100kPa	Cast bronze	Brass	140
AT-4A,4S	Screwed	15·20(½″·¾″)	Max. 0.35	Cast bronze	Stainless steel	141
ATB-5	Screwed	15~25(½″~1″)	Max. 1.0	Cast iron	Stainless steel	142
ATB-5F	Flanged	15~50(½″~2″)				
AT-6	Screwed	15~25(½″~1″)	Max. 1.0	Mild steel or Stainless steel	Stainless steel	144
AT-6F	Flanged					
AT-6FB	Flanged	15~25(½″~1″)	0.07~1.0	Mild steel or Stainless steel	Stainless steel	145

■ DISC TYPE

Model name	End connection	Size	Applicable pressure(MPa)	Materials		Page
				Body	Trim	
AD-17	Screwed	15~25(½″~1″)	0.03~1.6	Stainless steel	Stainless steel	146
AD-17F	Flanged					

■ INVERTED BUCKET TYPE

Model name	End connection	Size	Applicable pressure(MPa)	Materials		Page
				Body	Trim	
AK-1H	Screwed	15~25(½″~1″)	0.035~0.7	Cast iron	Stainless steel	147
			0.035~1.0			
AK-2H	Screwed	32~80(1¼″~3″)	0.02~0.7	Cast iron	Stainless steel	148
		32~50(1¼″~2″)	0.02~1.0			
AK-5	Screwed	15~25(½″~1″)	0.01~1.6	Cast iron	Stainless steel	149
AK-5F	Flanged					
AK-16	Screwed	15~25(½″~1″)	0.01~1.6	Stainless steel	Stainless steel	150

■ FLOAT TYPE

Model name	End connection	Size	Applicable pressure(MPa)	Materials		Page
				Body	Trim	
AF-12	Screwed	15~25(½″~1″)	Max. 0.4	Cast iron	Stainless steel	151
AF-15F	Flanged	20~50(¾″~2″)	Max. 0.9	Cast iron	Stainless steel	152
AF-16F	Flanged	50(2″)	Max. 0.9	Cast iron	Stainless steel	153
AF-11H	Screwed	15~50(½″~2″)	Max. 0.5	Cast iron	Stainless steel & Cast bronze	154
AF-11HF	Flanged	65·80(2½″·3″)	Max. 0.35	Cast iron	Cast bronze	155

■ STEAM TRAP SILENCERS(FOR OUTLET SIDE OF STEAM TRAP)

Model name	End connection	Size	Applicable pressure(MPa)	Materials	Page
BH-1	Screwed	15~25(½″-1″)	Max. 1.6	Mild steel or Stainless steel	145

AT-1A, 1S Type Radiator Trap

Bellows type Max. 100kPa
Trap for heater radiator

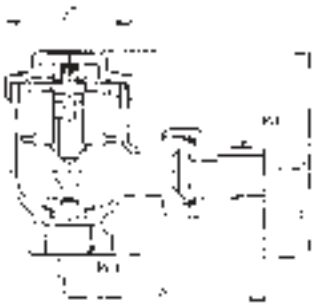
Bellows type radiator trap for max. 100kPa heater radiator. Also can be used as the pipe end trap for low pressure pipeline.

AT-1A Type

AT-1S Type

CONSTRUCTION

AT-1A Type



AT-1S Type

FEATURES

- Protects from freezing by the construction for no accumlation of drain.
- Rapidly discharge drain and air that occur when beginning of operation.

SPECIFICATIONS

Model name	AT-1A	AT-1S
Code name	AT1A-F	AT1S-F
Shape	Angle Type	Straight Type
Applicable pressure	Max. 100kPa	
End connection	Inlet:Screwed JIS R(Union joint), Outlet:Screwed JIS Rc	
Fluid temperature	Max. 120℃	
Materials	Body(Cast bronze chrome plated), Disc & seat(Brass), Bellows(Phosphor bronze)	
Valve body pressure test	Hydraulic 200kPa(Bellows:Hydraulic 120kPa)	

DIMENSIONS AT-1A Type (Angle type)

(mm)

Size	d	A	B	C	D	Mass(kg)
15(½″)	½″	80	35	46	52	0.55
20(¾″)	¾″	87	41	52.5	57	0.72
25(1″)	1″	105	52	61.5	57	1.32

DIMENSIONS AT-1S Type (Straight type)

(mm)

Size	d	A	B	C	D	E	Mass(kg)
15(½″)	½″	80	28	48	52	43	0.66
20(¾″)	¾″	87	34	52.5	57	48	0.94
25(1″)	1″	105	40	64.5	57	60	1.56

FLOW CHART

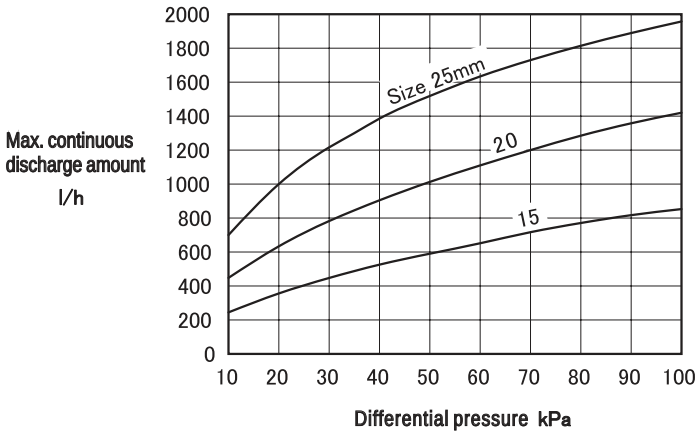


TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

Size \ Differential pressure (kPa)	10	35	50	70	100
15(½″)	240	470	570	690	840
20(¾″)	430	830	1000	1190	1390
25(1″)	700	1300	1500	1740	1930

POINTS FOR SIZE SELECTION

Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge volume.

In the case there is back pressure at the outlet side of trap, use the differential pressure between inlet and outlet sides to select the size of valve.

CAUTIONS ON INSTALLATION

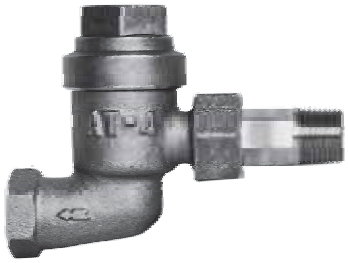
- Confirm the direction of flow before installation.
- If union nipple is used, take cares not to damage the sealing surface between the product and the main body.
- Drain may accumulate in the valve if the outlet side piping is an ascending type. To prevent freezing in such case, install drain hole.

AT-4A, 4S Type Radiator Trap

Thermal wax type
MAX. 0.35MPa

Thermal wax type radiator trap for heater radiator max. 0.35MPa. Also can be used as pipe end trap.

AT-4A Type



AT-4S Type

FEATURES

- Designed to prevent accumulation of drain in positive gradient piping, thus can prevent corrosion of pipe and freezing.
- Rapidly discharge drain and air when air supply starts.
- Rapidly close after drain is discharged.
- Hexagonal union pipe at inlet, allows easy installation.

SPECIFICATIONS

Model name	AT-4A	AT-4S
Code name	AT4A-J	AT4S-J
Shape	Angle Type	Straight Type
Applicable pressure	Max. 0.35MPa	
End connection	Inlet:Screwed JIS R(Union joint), Outlet:Screwed JIS Rc	
Fluid temperature	Max. 150℃	
Materials	Body(Cast bronze), Disc & seat(Stainless steel)	
Valve body pressure test	Hydraulic 0.53MPa	

DIMENSIONS AT-4A Type (Angle type)

(mm)

Size	d	A	B	C	Mass(kg)
15(½″)	½″	80	35	49	0.53
20(¾″)	¾″	87	41	47	0.57

DIMENSIONS AT-4S Type (Straight type)

(mm)

Size	d	A	B	C	E	Mass(kg)
15(½″)	½″	80	28	49	43	0.6
20(¾″)	¾″	87	34	47	48	0.67

FLOW CHART

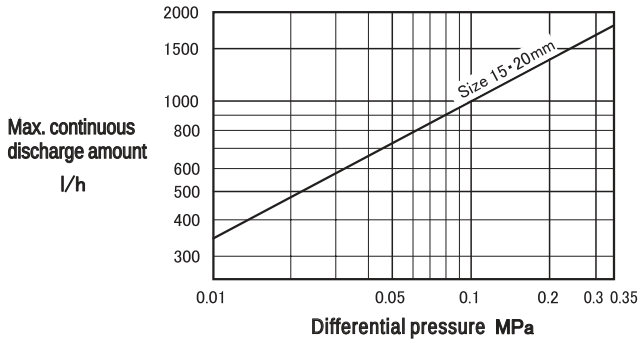


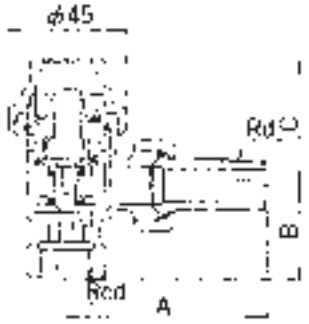
TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

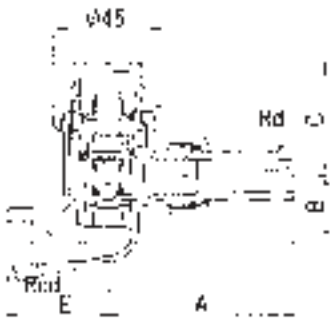
Differential pressure (MPa)	0.01	0.035	0.05	0.07	0.1	0.2	0.3	0.35
Discharge amount	350	620	730	850	1000	1370	1650	1800

CONSTRUCTION

AT-4A Type



AT-4S Type



POINTS FOR SIZE SELECTION

Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge volume.

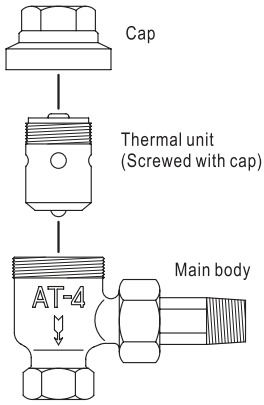
In the case there is back pressure at the outlet side of trap, use the differential pressure between inlet and outlet sides to select the size of valve.

CAUTIONS ON INSTALLATION

- Confirm the direction of flow before installation.
- If union nipple is used, take cares not to damage the sealing surface between the product and the main body.
- Drain may accumulate in the valve if the outlet side piping is an ascending type. To prevent freezing in such case, install drain hole.

REPLACING THERMAL UNIT

Remove the cap and replace thermal unit.

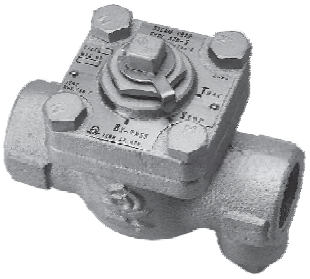


ATB-5, 5F Type Steam Trap

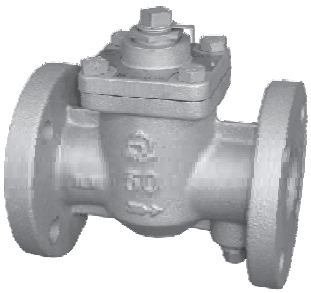
for (Pipeline), (Header) etc.

Thermal static

Thermstatic trap ATB-5 is compact structure with triple functions, including trap, bypass, and stop valve functions, for effective utilization of space and cost reduction.



ATB-5 Type



ATB-5F Type

FEATURES

- Large discharge amount, suitable for pipe end or large equipment.
- Free installation in vertical, horizontal, or lateral style [1].
- Operate at 10℃[2] below the temperature of saturated steam, prevent discharge of steam and idle operation of valve, and contribute to energy saving.
- Size 32~50mm valves have removable disc and are highly air tight and durable.
- Test valve can be installed on trap directly.

Note:
1) Size 32~50mm valves must be installed vertical to horizontal pipe.
2) Size 32~50mm valves start to operate at 15℃ below temperature of saturated steam.

SPECIFICATIONS

Model name	ATB-5	ATB-5F
Code name	ATB5-G	ATB5F-G
Type	Thermostatic	
Size	15 20 25(½″ ¾″ 1″)	15~50(½″~2″)
Applicable pressure	Max. 1.0MPa	
Applicable fluid	Saturated steam*	
Fluid temperature	Max. 184℃	
End connection	Screwed JIS Rc	Flanged JIS 10KFF
Materials	Body(Cast iron), Disc & Seat(Stainless steel), Cock(Cast bronze), Thermo element (Stainless steel)	
Allowed back pressure	Within 50% of pressure on inlet side(Minimum pressure difference:0.03MPa)	
Pressure tightness	Steam:1.5MPa, Water:0.5MPa	

* The valve can not be used for super heated steam line.

TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

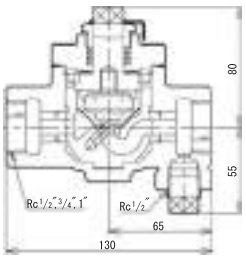
Size	Differential pressure(MPa)	0.03	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
15~25 (½″~1″)	Water	650	900	1350	1900	2400	2800	3150	3400	3700	3900	4150	4300
	Hot water of saturated steam temperature−20℃	600	800	1150	1700	2100	2400	2700	2950	3150	3300	3450	3550
32~50 (1¼″~2″)	Water	1450	1870	2650	3750	4600	5310	5940	6510	7030	7510	7970	8400
	Hot water of saturated steam temperature−25℃	1340	1650	2250	3150	3830	4360	4800	5160	5470	5750	6000	6250

MASS (ATB-5F Type)

Size	Mass(kg)
15(½″)	4.2
20(¾″)	4.5
25(1″)	5.8
32(1¼″)	10
40(1½″)	11
50(2″)	12

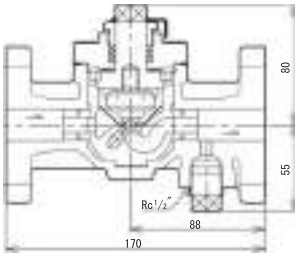
CONSTRUCTION

ATB-5 Type

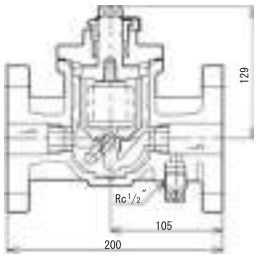


Weight:3.1kg

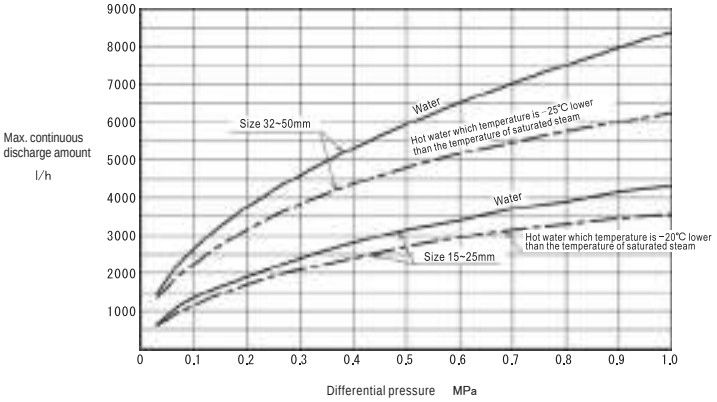
ATB-5F Type (Size 15~25mm)



ATB-5F Type(Size 32~50mm)



FLOW CHART



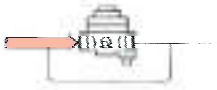
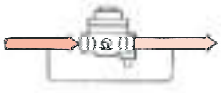
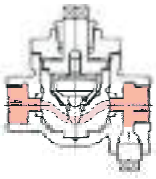
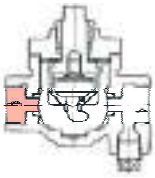
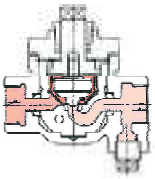
POINTS FOR SELECTION

1. Generally, hot water which temperature is 20℃ lower than the temperature of saturated steam (for size 15~25mm valves) and hot water which temperature is 25℃ lower than the temperature of saturated steam (for size 32~50mm valves) are used to decide the discharge amount of steam trap.
2. Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge amount.
3. In the case there is back pressure at the outlet side of trap, use the differential pressure between inlet and outlet sides to select the size of valve. The allowed back pressure is up to 50% of the pressure of inlet side.
4. If the discharge amount of one valve is not enough, use multiple valves or select other type of valve.

DATA/ATB-5, 5F Type Steam Trap

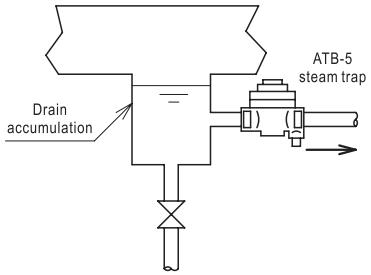
STEAM TRAP

⊕ Stop valve
⊕ Bypass
Triple functions

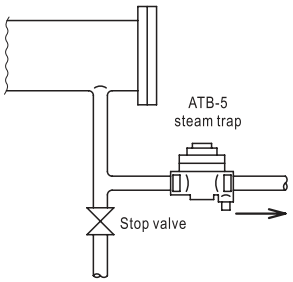
	BY-PASS	STOP	TRAP
Function			
Handle position (Top view)			
Passage within trap (Front view)			

PIPING EXAMPLE

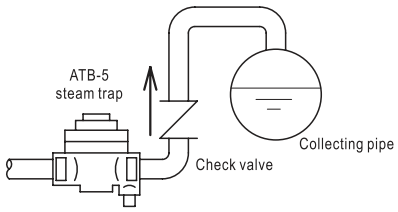
〈 Installation on main pipe 〉



〈 Installation at pipe end 〉



〈 Ascending piping 〉



POINTS FOR INSTALLATION

① The arrow mark must match with the direction of drain flow. The position of the trap should be as low as possible to allow drain flow into the trap. Make sure the handle is at the STOP position.

② The inlet pipe should be naked pipe that is at least 1m in length. The trap should not be wrapped with any insulation material.

③ When installing trap on the main steam pipe, install a separator (for drain accumulation) with the same diameter as of the main pipe on main pipe.

④ In the event the outlet piping is ascending type, install check valve at the outlet side, and make sure discharge the drain into pipe or device from top.

⑤ When making the initial aeration, switch the handle to BY-PASS position and blow off dirt or scale in the pipe. Then switch the handle to TRAP (steam trap) position and start normal operation.

⑥ If test valve is necessary for conforming operation or freezing prevention, install the test valve at the plug (Rc½″ screw). In the event there is risk of freezing or the valve has not been used for a long time, discharge drain after test is completed.

⑦ Leave sufficient space for maintenance or disassembly. When disassemble switch the handle to STOP position. Make sure there is not steam pressure and the surface temperature is below 80℃ before disassemble. Do not turn the handle (cock) when disassemble.

⑧ When installing multiple steam traps at the same position, the height of the inlet side of each trap should be the same.

⑨ Steam trap should not be installed at a place where temperature is higher than the temperature of drain discharged.

⑩ There must be strainer at the inlet side of steam trap.

⑪ Close the valve if the thermal element of steam trap is damaged.

⑫ If the discharge side of steam trap faces open air, cares should be taken to avoid any danger that may occur in such case. In addition, install BH-1 silencer to reduce noise.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

AT-6, 6F Type Steam Trap

for Pipeline, Header etc.

Thermal static

AT-6 series of thermostatic type that can rapidly discharge air and drain during initial aeration. Allow effective utilization of steam and save energy instead of Disc trap.

FEATURES

- Stainless steel thermal element, highly corrosion resistant and durable.
- Free installation, vertically, horizontally, or laterally.
- Operate at a temperature 10℃ lower than the temperature of saturated steam. No discharge of raw steam or idle running of valve disc. Energy saving.

SPECIFICATIONS

Model name		AT-6		AT-6F	
Code name		AT6-N	AT6-D	AT6F-N	AT6F-D
End connection		Screwed JIS Rc		Flanged JIS 10KFF*1.	
Type		Thermostatic			
Size		15 20 25(½″ ¾″ 1″)			
Applicable pressure		Max. 1.0MPa			
Applicable fluid		Saturated steam*2.			
Fluid temperature		Max. 184℃			
Materials	Body	Mild steel	Stainless steel	Mild steel	Stainless steel
	Trim	Disc & Seat(Stainless steel), Thermo element(Stainless steel)			
Allowed back pressure		Within 50% of pressure on inlet side(Minimum pressure difference:0.03MPa)			
Pressure tightness		Steam:1.5MPa, Water:0.5MPa			

*1. Stainless steel body with Flanged JIS 10KRF is available.
*2. The valve can not be used for super heated steam line.

CONSTRUCTION

Unit: (mm)

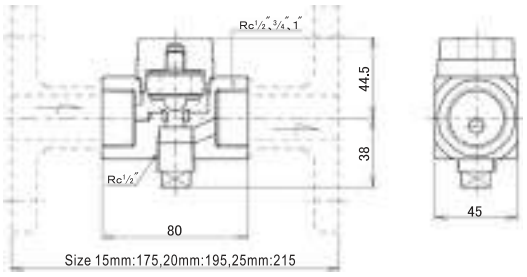


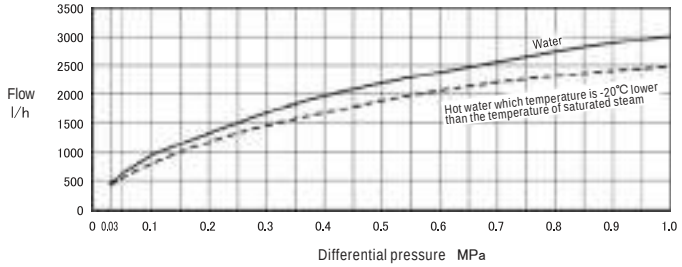
TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

Differential pressure (MPa)		0.03	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Discharge amount	Water	450	630	940	1330	1680	1960	2200	2380	2590	2730	2900	3010
	Hot water of saturated steam temperature−20℃	420	560	800	1190	1470	1680	1890	2060	2200	2310	2410	2480

* At the sizing , take into consideration of safety factor to select the size to have 3 times as much or more capacity of required capacity, discharging from the steam trap at a hot water temperature of saturated steam temperature −20℃.

FLOW CHART(Size 15~25mm)

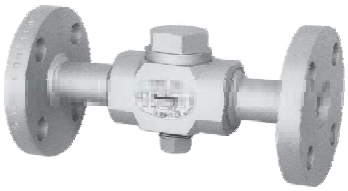


POINTS FOR INSTALLATION

1. The arrow mark on the name plate must match with the direction of drain flow.
2. Do not apply any thermal insulation on steam trap.
3. Do not install steam trap on inlet side of any machine that is equipped with solenoid valve allowing fast opening/closing.
4. To discharge drain generated during operation test or after the machine is stopped, install test valve at Rc½″ plug, which is at the lower part of steam trap.
5. In cold area with risk of freezing, install proper piping to prevent drain from accumulating.
6. Close valve if thermal element of steam trap is damaged.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

AT-6 Type



AT-6F Type

MASS

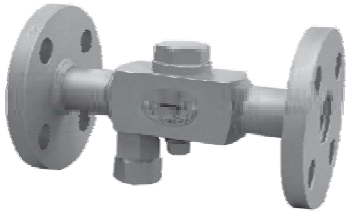
(kg)

Size / Model name	15(½″)	20(¾″)	25(1″)
AT-6	1.4	1.3	1.2
AT-6F	2.7	3	3.9

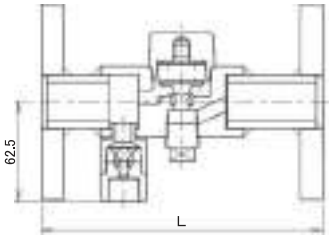
AT-6FB Type Steam Trap for non-freeze

for Pipeline, Header etc.

AT-6F Type steam strap with non-freezing valve embedded at inlet side. Suitable for applications in cold area.



CONSTRUCTION



DIMENSIONS (mm)

Size	L
15(½″)	175
20(¾″)	195
25(1″)	215

Refer to page 144 for Table of capacity and Installation sample of AT-6,6F Type.

FEATURES

- Large initial aeration, rapidly discharge drain and air.
- Mild steel or Stainless steel bodies available.
- Pressure type, non-freezing valve embedded at inlet side.

SPECIFICATIONS

Model name		AT-6FB	
Code name		AT6FB-N	AT6FB-D
Type		Thermostatic	
Size		15 20 25(½″ ¾″ 1″)	
Applicable pressure		0.07~1.0MPa	
Applicable fluid		Saturated steam*1.	
Fluid temperature		Max. 184℃	
Allowed back pressure		Within 50% of pressure on inlet side(Minimum pressure difference:0.03MPa)	
Materials	Body	Mild steel	Stainless steel
	Trim	Disc & Seat(Stainless steel), Thermo element(Stainless steel)	
End connection		Flanged JIS 10KFF*2·*3(Non-freeze valve at outlet side:Screwed JIS Rc ½″)	
Non-freeze valve opening pressure		0.04MPa	
Non-freeze valve close pressure		0.05MPa	

*1. The valve can not be used for super heated steam line.
*2. Stainless steel body with Flanged JIS 10KRF is available upon your request.
*3. AT-6B Type of screwed type is available upon your request.

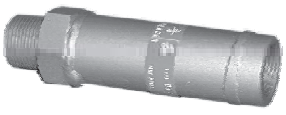
POINTS FOR INSTALLATION

1. The arrow mark on the name plate must match with the direction of drain flow.
2. Do not apply any thermal insulation on steam trap.
3. Do not install steam trap on inlet side of any machine that is equipped with solenoid valve allowing fast opening/closing.
4. To discharge drain generated during operation test or after the machine is stopped, install test valve at Rc½″ plug, which is at the lower part of steam trap.
5. Close valve if thermal element of steam trap is damaged.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

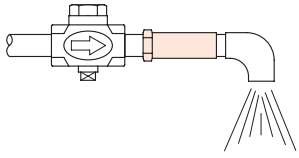
BH-1H Type Steam Trap Silencers

BH-1 Type steam trap silencers can reduce noise that occurs when drain is discharged.

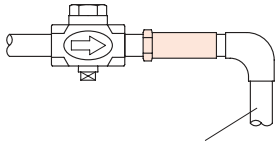


PIPING EXAMPLE

● Direct discharge



● Indirect discharge



The pipe should lead to a safe place.
(Note: Do not allow back pressure on pipe)

FEATURES

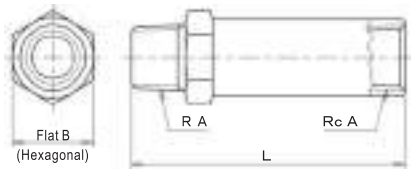
- Can be connected to the outlet side of steam trap and discharge drain to safe place.
- Exclusive acoustic material developed by VENN, less pressure on steam trap and outstanding silencing effect.

SPECIFICATIONS

Model name		BH-1	
Code name		BH1-N	BH1-D
Type		Outlet side of steam Trap	
Applicable fluid		Drain(Water again)	
Size		15 20 25(½″ ¾″ 1″)*	
Applicable pressure		Max. 1.6MPa	
Materials	Body	Mild steel	Stainless steel
	Silencing effect	Stainless steel	
End connection		Screwed JIS R or Screwed JIS Rc	

*The other sizes are available upon your request.

DIMENSIONS



Without limitation of the direction of flow

DIMENSIONS (mm)

Size	15(½″)	20(¾″)	25(1″)
L	133	133	133
d	½″	¾″	1″
B	35	35	41
Mass(kg)	0.42	0.42	0.6

AD-17, 17F Type Steam Trap

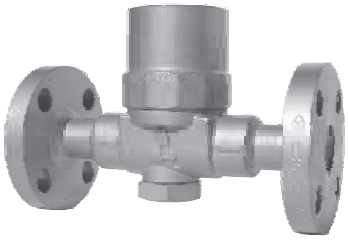
for Pipeline, Header etc.

Disc type

Rapidly discharge air and drain during initial aeration. Short startup time.

The chamber of drain retention and evaporation in the trap ensures stable performance.

AD-17 Type



AD-17F Type

FEATURES

- Stainless body and disc.
- Free installation, horizontally, vertically (outlet facing downwardly), or laterally.
- Wide range of applicable pressures for a variety of applications.

SPECIFICATIONS

Model name	AD-17	AD-17F
Code name	AD17-D	AD17F-N
End connection	Screwed JIS Rc	Flanged JIS 10 16KFF (common use)
Type	Thermo-dynamic type	
Applicable pressure	0.03~1.6MPa	
Fluid temperature	Max. 220℃	
Materials	Body(Stainless steel), Cap(Ductile cast iron) Disc(Stainless steel)	Body(Stainless steel), Cap(Ductile cast iron) Disc(Stainless steel), Flange(Carbon steel)
Allowed back pressure	Within 50% of pressure on inlet side(Minimum pressure difference: 0.03MPa)	
Installation	Vertical line(Flowing from top down) and horizontal line	
Valve body pressure test	Hydraulic 2.4MPa	

∗1. Strainer with 60 mesh is installed.
∗2. Valve body with non-freeze type is available for AD-17B, 17FB Type upon your request.

DIMENSIONS AD-17 Type

(mm)

Size	d	L	G	H	A	Mass(kg)
15(½″)	½″	98	32	80	70	1.8
20(¾″)	¾″	104	36	84	70	2
25(1″)	1″	112	39	87	70	2.1

DIMENSIONS AD-17F Type

(mm)

Size	L	G	H	A	Mass(kg)
15(½″)	175	32	80	70	3.1
20(¾″)	195	36	84	70	3.7
25(1″)	215	39	87	70	4.8

Flange code JIS 10K•16K FF

TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

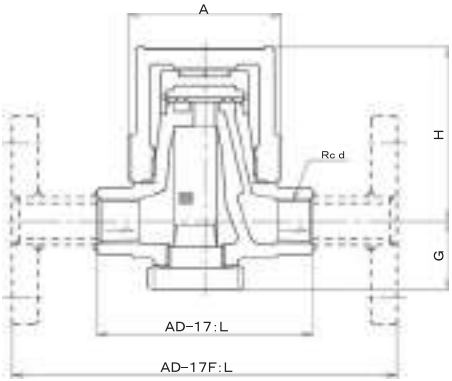
Differential pressure(MPa)	0.03	0.05	0.1	0.2	0.3	0.4	0.5	0.6
Discharge amount	40	100	180	320	430	500	550	650
Differential pressure(MPa)	0.7	0.8	0.9	1.0	1.2	1.4	1.6	
Discharge amount	700	750	780	800	850	880	900	

POINTS FOR INSTALLATION

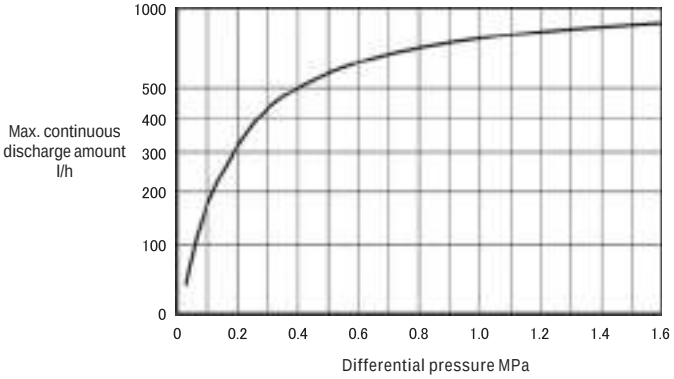
Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge amount.
Do not apply any thermal insulation on steam trap.
The differential pressure is the difference of pressure between inlet and outlet sides.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

CONSTRUCTION



FLOW CHART (Size 15~25mm)

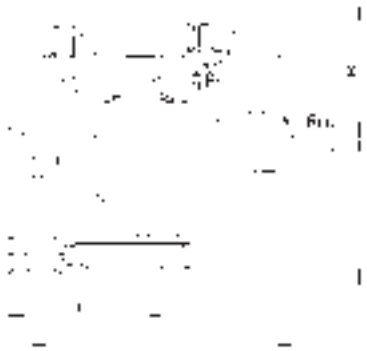


AK-1H Type Steam Trap

Bucket type

General purpose trap that can be used as drain discharge trap for pipeline, header etc. All functions set in the top cover, so that allow easy maintenance.

CONSTRUCTION



FEATURES

- Simple internal structure makes maintenance works easier.
- With strainer embedded.

SPECIFICATIONS

Model name	AK-1H	
Type	0.7MPa	1.0MPa
Code name	AK1H-GL	AK1H-GH
Applicable pressure	0.035~0.7MPa	0.035~1.0MPa
Fluid temperature	Max. 184℃	
End connection	Screwed JIS Rc	
Materials	Body(Cast iron), Disc & Seat(Stainless steel), Bucket(Brass)	
Valve body pressure test	Hydraulic 1.5MPa	

* In case of pressure being less than 0.035MPa or less than 0.1MPa with very small capacity, select the other type (AT-1, AT-4 or AF-12 Type).

DIMENSIONS

(mm)

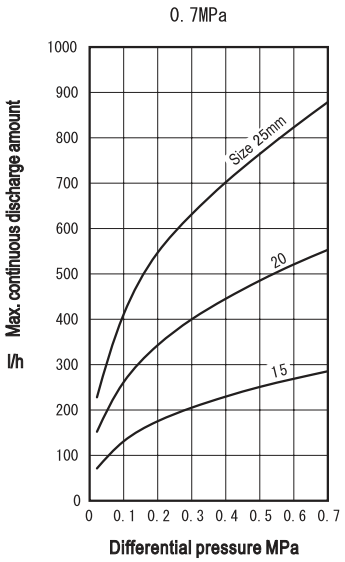
Size	d	L_1	L_2	G	H	Mass(kg)
15(½″)	½″	130	76	72.5	68.5	2.7
20(¾″)	¾″	148	87	88	74	4.4
25(1″)	1″	184	94	98	81	5.8

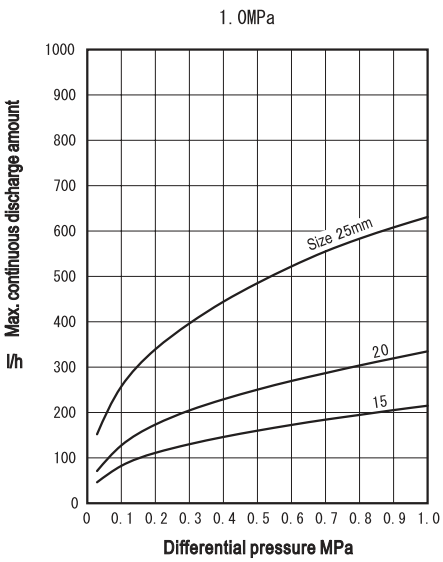
TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

Type	Size \ Differential pressure MPa	0.035	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.7MPa	15(½″)	80	130	175	205	230	252	270	287	—	—	—
	20(¾″)	175	260	340	398	444	485	522	555	—	—	—
	25(1″)	255	412	548	634	703	767	825	880	—	—	—
1.0MPa	15(½″)	50	84	110	130	146	160	173	180	195	205	214
	20(¾″)	80	130	175	205	230	252	270	287	305	320	335
	25(1″)	175	260	340	398	444	485	522	555	582	608	630

FLOW CHART





POINTS FOR SIZE SELECTION

Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge volume.

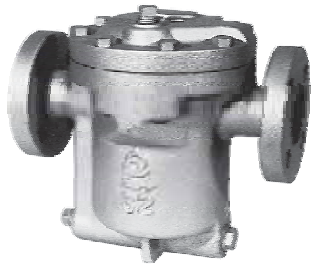
In the case there is back pressure at the outlet side of trap, use the differential pressure between inlet and outlet sides to select the size of valve.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

AK-2H Type Steam Trap

Bucket type
With SSR device

General purpose trap that can be used as drain discharge trap for pipeline, header etc. All functions set in the top cover, so that allow easy maintenance.



Size 32~50mm

Size 65・80mm

FEATURES(Size 32~50mm)

- The SSR (Shockless Self Return) device eliminates impact that may occur when valve is closed. The valve disc can close by itself, but not influenced by the buoyancy of the bucket, so that can be used from low pressure.
- With strainer embedded, for size 32~50mm.

SPECIFICATIONS

Model name	AK-2H		
Type	0.7MPa		1.0MPa
Code name	AK2H-GL		AK2H-GH
Size	32 40 50(1¼″ 1½″・2″)	65 80(2½″ 3″)	32 40 50(1¼″ 1½″・2″)
Applicable pressure	0.02~0.7MPa		0.02~1.0MPa
Fluid temperature	Max. 184℃*		
End connection	Flanged JIS 10KFF		
Materials	Body(Cast iron) Disc & seat(Stainless steel) Bucket(Stainless steel)	Body(Cast iron) Disc & seat(Stainless steel) Bucket(Brass)	Body(Cast iron) Disc & seat(Stainless steel) Bucket(Stainless steel)
Valve body pressure test	Hydraulic 1.5MPa		

* The valve for fluid temperature Max. 220℃ is available upon your request.

DIMENSIONS

(mm)

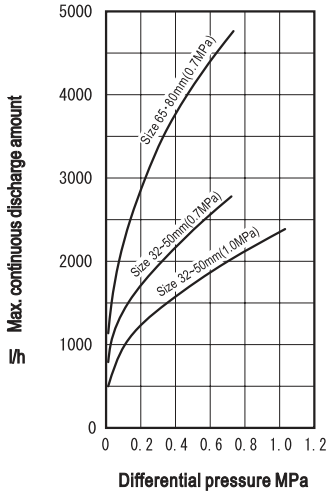
Size	L	G	H	Mass(kg)
32(1¼″)	280	161	88	21
40(1½″)	290	161	88	22
50(2″)	290	161	88	23
65(2½″)	480	340	160	87
80(3″)	480	340	160	90

TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

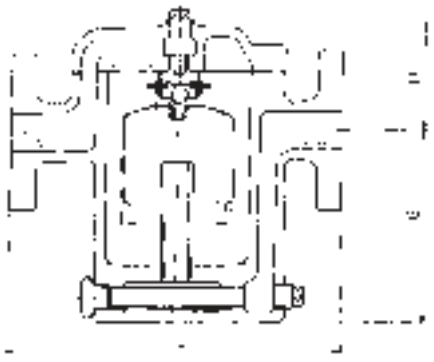
Type	Size \ Differential pressure MPa	0.02	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.7MPa	32 40 50(1¼″ 1½″・2″)	800	1100	1370	1700	1940	2170	2380	2570	2750	—	—	—
	65 80(2½″ 3″)	1120	1600	2150	3850	3400	3800	4130	4430	4700	—	—	—
1.0MPa	32 40 50(1¼″ 1½″・2″)	500	750	950	1200	1400	1570	1740	1870	2000	2120	2240	2350

FLOW CHART

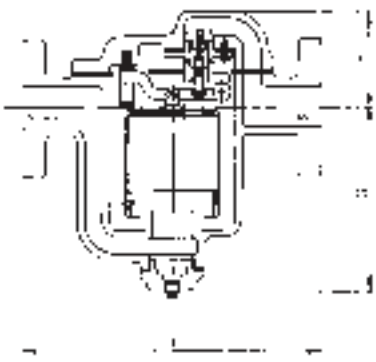


CONSTRUCTION

Size 32~50mm



Size 65・80mm



POINTS FOR SIZE SELECTION

Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge volume.

In the case there is back pressure at the outlet side of trap, use the differential pressure between inlet and outlet sides to select the size of valve.

POINTS FOR INSTALLATION

- In the event the trap is to be left unused for a long period or there is risk of freezing in winter, operate the plug at the lower part of the main body and discharge drain.
- If the piping at the outlet side is an ascending type (which means there is back pressure), install check valve at the discharge side of steam trap.
- Leave sufficient space for maintenance purpose.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

AK-5, 5F Type Steam Trap

for Small Machines・Equipments, High-pressure Steam Line etc.

Small bucket type
0.01~1.6MPa
SSR device

Max.1.6MPa, small capacity bucket type steam trap for laundry machines, heating equipments, food processing equipments, and medical devices.

AK-5 Type

AK-5F Type

FEATURES

- The SSR (Shockless Self Return) device eliminates impact that may occur when valve is closed. The valve disc can close by itself, but not influenced by the buoyancy of the bucket. So that can be used wide pressure range.
- Compact body allows installation in narrow space.
- With strainer embedded.

SPECIFICATIONS

Type		0.3MPa Type	0.7MPa Type	1.0MPa Type	1.6MPa Type
Model name	Screwed	AK-5			
	Flanged	AK-5F			
Code name	Screwed	AK5-GL	AK5-GM	AK5-GH	AK5-GS
	Flanged	AK5F-GL	AK5F-GM	AK5F-GH	AK5F-GS
End connection		AK-5:Screwed JIS Rc, AK-5F:Flanged JIS 10K 20KFF(common use)			
Size		15 20 25(½″ ¾″ 1″)			
Applicable pressure		0.01~0.3MPa	0.01~0.7MPa	0.01~1.0MPa	0.01~1.6MPa
Fluid temperature		Max. 184℃			Max. 220℃
Materials		Body(Cast iron), Disc & seat(Stainless steel), Bucket(Stainless steel)			
Valve body pressure test		Hydraulic 1.5MPa for 0.3~1.0MPa Type, Hydraulic 2.4MPa for 1.6MPa Type			

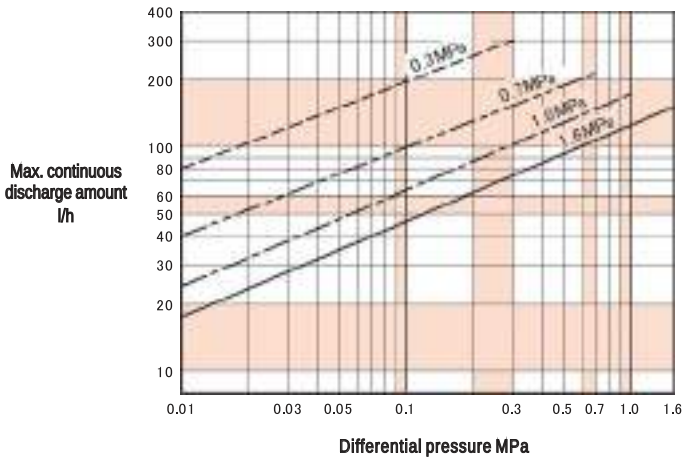
TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

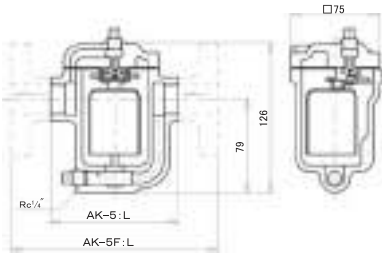
Differential pressure(MPa)		0.01	0.05	0.1	0.2	0.3	0.4	0.5	0.6
Discharge amount	0.3MPa Type	80	155	200	280	300	—	—	—
	0.7MPa Type	42	80	110	145	170	190	200	210
	1.0MPa Type	24	42	62	82	100	120	120	140
	1.6MPa Type	18	37	49	65	78	82	95	100

Differential pressure(MPa)		0.7	0.8	0.9	1.0	1.2	1.4	1.6
Discharge amount	0.7MPa Type	220	—	—	—	—	—	—
	1.0MPa Type	148	152	160	175	—	—	—
	1.6MPa Type	110	120	125	130	140	150	160

FLOW CHART (Size 15~25mm)



CONSTRUCTION



DIMENSIONS

Model name \ Size		15(½″)	20(¾″)	25(1″)
AK-5	L(mm)	100	100	105
	W(kg)	2	2	2
AK-5F	L(mm)	175	195	215
	W(kg)	2.7	3	3.9

POINTS FOR SELECTION

1. Use the safety factor, which is 3 times of planned discharge amount, for selecting a proper size of steam trap.
2. The differential pressure is the difference of pressure between inlet and outlet sides.

POINTS FOR INSTALLATION/OPERATION

- The arrow mark on the main body must match with the direction of drain flow. The trap must be installed vertically to horizontal pipe.
- In the event the trap is to be left unused for a long period or there is risk of freezing in winter, operate the plug (Rc¼″) at the lower part of the main body and discharge drain.
- If the piping at the outlet side is an ascending type (which means there is back pressure), install check valve at the discharge side of steam trap.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

AK-16 Type Steam Trap

for Small Machines・Equipments, High-pressure Steam Line etc.

Small bucket type
0.01~1.6MPa
SSR device

Steam trap that is highly corrosion resistant, durable, and elegant

Max. 1.6MPa small capacity bucket type steam trap made of stainless steel. Ideal for laundry machines, heating equipments, food processing machines, and medical devices.

FEATURES

- The SSR (Shockless Self Return) device eliminates impact that may occur when valve is closed. The valve disc can close by itself, but not influenced by the buoyancy of the bucket. So that can be used wide pressure range.
- Compact body allows installation in narrow space.
- With strainer embedded.

SPECIFICATIONS

Model name	AK-16			
Type	0.3MPa Type	0.7MPa Type	1.0MPa Type	1.6MPa Type
Code name	AK16-DL	AK16-DM	AK16-DH	AK16-DS
Size	15 20 25(½″ ¾″ 1″)			
Applicable pressure	0.01~0.3MPa	0.01~0.7MPa	0.01~1.0MPa	0.01~1.6MPa
Fluid temperature	Max. 220℃			
End connection	Screwed JIS Rc			
Materials	Body(Stainless steel), Disc & seat(Stainless steel), Bucket(Stainless steel)			
Valve body pressure test	Hydraulic 1.5MPa for 0.3~1.0Pa Type, Hydraulic 2.4MPa for 1.6MPa Type			

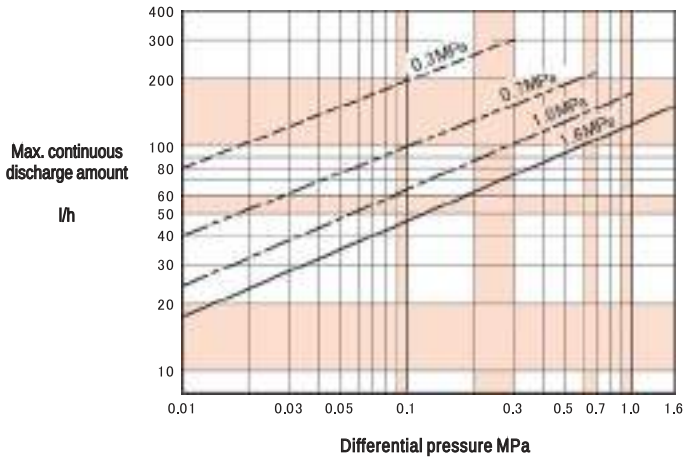
TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

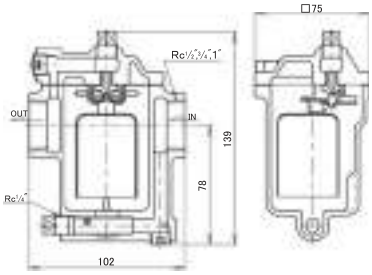
Differential pressure (MPa)		0.01	0.05	0.1	0.2	0.3	0.4	0.5	0.6
Discharge amount	0.3MPa Type	80	155	200	280	300	—	—	—
	0.7MPa Type	42	80	110	145	170	190	200	210
	1.0MPa Type	24	42	62	82	100	125	125	140
	1.6MPa Type	18	37	49	65	78	82	95	100

Differential pressure (MPa)		0.7	0.8	0.9	1.0	1.2	1.4	1.6
Discharge amount	0.7MPa Type	220	—	—	—	—	—	—
	1.0MPa Type	148	152	160	175	—	—	—
	1.6MPa Type	110	120	125	130	140	150	160

FLOW CHART (Size 15~25mm)



CONSTRUCTION (Unit: mm)



POINTS FOR SELECTION

1. Use the safety factor, which is 3 times of planned discharge amount, for selecting a proper size of steam trap.
2. The differential pressure is the difference of pressure between inlet and outlet sides.

POINTS FOR INSTALLATION/OPERATION

- The arrow mark on the main body must match with the direction of drain flow. The trap must be installed vertically to horizontal pipe.
- In the event the trap is to be left unused for a long period or there is risk of freezing in winter, operate the plug (Rc¼″) at the lower part of the main body and discharge drain.
- If the piping at the outlet side is an ascending type (which means there is back pressure), install check valve at the discharge side of steam trap.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

AF-12 Type Steam Trap

Small float type
Max. 0.4MPa

Float type steam trap for pipe end, low-pressure steam header, and small heat exchanger etc.

FEATURES

- With wax type air vent valve, for shorter warm-up time and prevention of air problem.
- The direction of flow can be selected, which allows easier installation.
- Hanging hardware for piping support, allows easy installation.
- Stable performance, no matter how much drain is generated.

SPECIFICATIONS

Model name	AF-12
Code name	AF12-G
Applicable pressure	Max. 0.4MPa
Fluid temperature	Max. 150℃
End connection	Screwed JIS Rc
Materials	Body(Cast iron), Disc & seat(Stainless steel), Float(Stainless steel)
Valve body pressure test	Hydraulic 0.6MPa

DIMENSIONS

(mm)

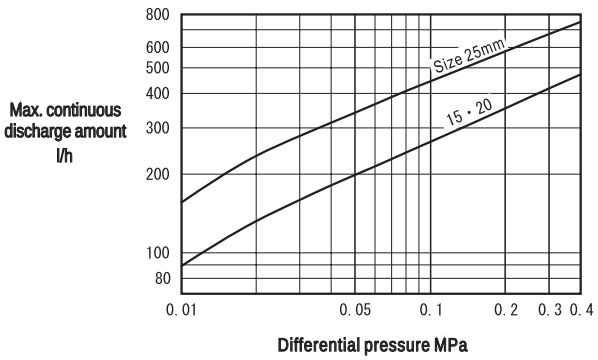
Size	d	L_1	L_2	H_1	H_2	H_3	W_1	W_2	Mass(kg)
15(½″)	½″	110	144	19.5	90	129	86	167	4.5
20(¾″)	¾″	110	147	19.5	90	129	86	167	4.5
25(1″)	1″	120	161	22.5	100	145	94	184	5.5

TABLE FOR CAPACITY (Max. continual discharge amount)

(l/h)

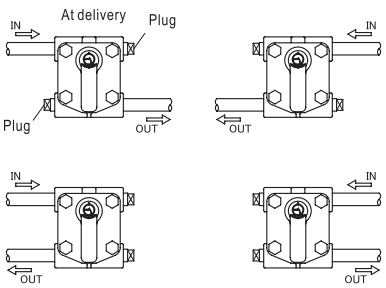
Size \ Differential pressure MPa	0.01	0.03	0.05	0.07	0.1	0.2	0.3	0.4
15 20(½″ ¾″)	88	160	200	230	265	360	420	470
25(1″)	155	280	345	385	435	590	690	750

FLOW CHART



CONSTRUCTION

DIRECTION OF FLOW



POINTS FOR SIZE SELECTION

Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge volume.

In the event there is back pressure at the outlet side of steam trap, use the pressure differential between inlet and outlet sides for selecting the proper size of steam trap.

POINTS FOR INSTALLATION

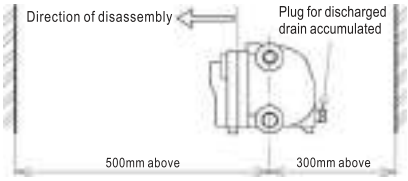
- In the even the trap is to be left unused for a long period or there is risk of freezing in water, use the plug (Rc⅜″) at the lower part of the main body to discharge drain.
- Foreign matters are the cause of most claims related to steam traps in new pipelines. To reduce such claims, install KY strainer and valve that can blow off dirt.

※ It is recommended to use 80-mesh strainer.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

- If the piping at the outlet side is an ascending type (which means there is back pressure), install check valve at the discharge side of steam trap.
- Leave sufficient space for maintenance purpose.

Maintenance space

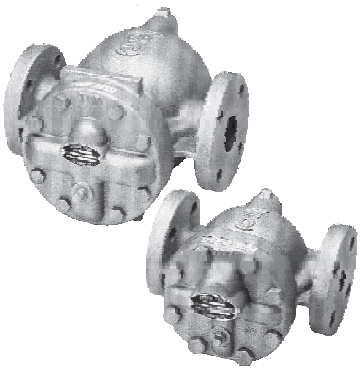


AF-15F Type Heavy Duty Trap

Float type

for (Pipeline), (Header) etc.

Ideal for heat control equipment or equipments/machines with large amount of drain generated.



FEATURES

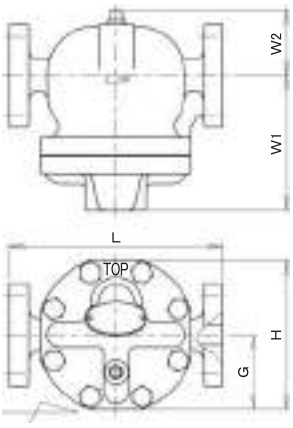
- Thermal air vent valve for reduced warm-up time and preventing air problem.
- Wide range of applicable pressures for a variety of applications.
- Stable performance, no matter how much drain is generated.
- By changing the position of cover, this product can also be used on vertical piping (up to bottom).

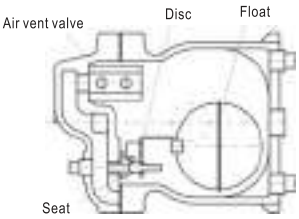
SPECIFICATIONS

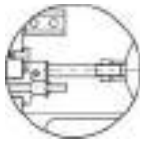
Model name	AF-15F	
Type	0.4MPa Type	0.9MPa Type
Code name	AF15FR-GL	AF15FR-GH
Applicable pressure	Max. 0.4MPa	Max. 0.9MPa
Fluid temperature	Max. 180℃	
Allowed back pressure	Within 90% of pressure on inlet side	
End connection	Flanged JIS 10KFF	
Materials	Body(Cast iron), Disc & seat(Stainless steel), Float(Stainless steel)	
Installation	Vertical line (flowing from top down) and horizontal line by changing cover position*	
Valve body pressure test	Hydraulic 1.5MPa	

* It is possible by changing the cover position. Refer to "Installation example at vertical line and horizontal line" below.

CONSTRUCTION







In the case of size 40, 50mm

DIMENSIONS

(mm)

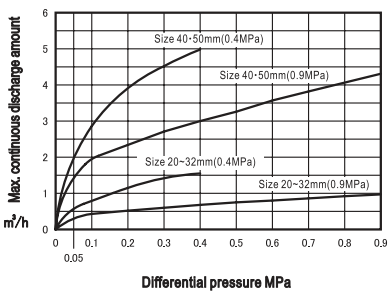
Size	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
L	205	215	245	280	290
G	72	72	72	102	102
W_1	135	135	135	170	170
W_2	65	65	65	160	160
Mass(kg)	8.3	10	11	21	23

TABLE FOR CAPACITY (Max. continual discharge amount)

(m^3/h)

Type	Size \ Differential pressure MPa	0.05	0.1	0.2	0.4	0.5	0.6	0.7	0.8	0.9
0.4MPa	20 25 32(¾″ 1″ 1¼″)	0.57	0.8	1.15	1.55	—	—	—	—	—
	40 50(1½″ 2″)	1.97	2.86	3.91	5.0	—	—	—	—	—
0.9MPa	20 25 32(¾″ 1″ 1¼″)	—	0.43	0.52	0.68	0.75	0.8	0.86	0.92	0.97
	40 50(1½″ 2″)	—	1.97	2.34	3.0	3.26	3.57	3.82	4.1	4.31

FLOW CHART

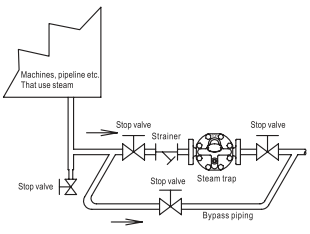


POINTS FOR SIZE SELECTION

The size should be selected with considerations paid on safety factor and a capacity that is 3 times of planned discharge amount (which is the amount of drain generated in the case of supply pipe, or steam consumption of machine in the case of process).

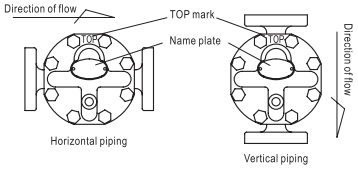
Note: Read Points for Installation of Steam Trap carefully (see page 157).

PIPING EXAMPLE



Installation on vertical・horizontal piping

The name plate and the TOP mark should face upwardly

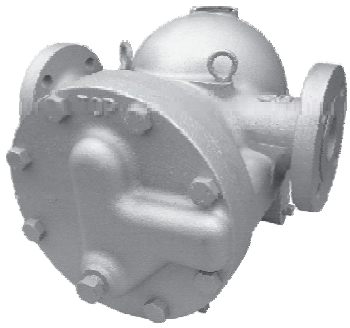


AF-16F Type Heavy Duty Trap

for Pipeline, Header etc.

Float type

Ideal for heat control equipment or equipments/machines with large amount of drain generated.



FEATURES

- Thermal air vent valve for reduced warm-up time and preventing air problem.
- Wide range of applicable pressures for a variety of applications.
- Stable performance, no matter how much drain is generated.

SPECIFICATIONS

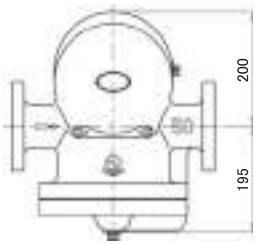
Model name	AF-16F
Code name	AF16F-G
Size	50(2″)
Applicable pressure	Max. 0.9MPa
Fluid temperature	Max. 180℃
Allowed back pressure	Within 90% of pressure on inlet side
End connection	Flanged JIS 10KFF
Materials	Body(Cast iron), Disc & seat(Stainless steel), Float(Stainless steel)
Valve body pressure test	Hydraulic 1.5MPa

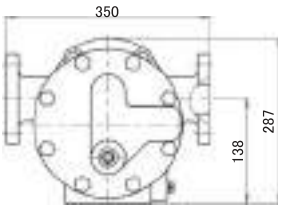
TABLE FOR CAPACITY (Max. continual discharge amount)

(m^3/h)

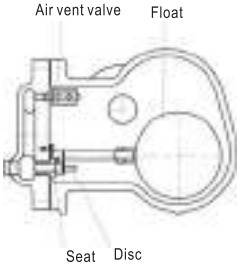
Differential pressure(MPa)	0.05	0.1	0.2	0.4	0.5	0.6	0.7	0.8	0.9
Discharge amount	1.87	2.65	3.75	5.3	5.92	6.49	7.0	7.5	7.95

CONSTRUCTION

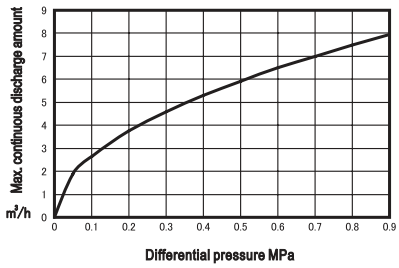




Weight: 47kg



FLOW CHART

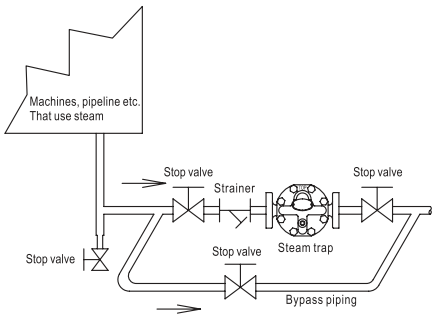


POINTS FOR SIZE SELECTION

The size should be selected with considerations paid on safety factor and a capacity that is 3 times of planned discharge amount (which is the amount of drain generated in the case of supply pipe, or steam consumption of machine in the case of process).

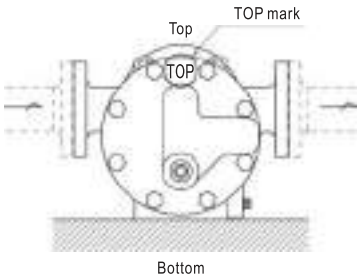
Note: Read Points for Installation of Steam Trap carefully (see page 157).

PIPING EXAMPLE



INSTALLATION STATE

The name plate and the TOP mark should face upwardly



Bottom

AF-11H Type Heavy Duty Trap

Float type

Ideal for heat exchanger, drying machine, header etc. with large amount of drain generated.

Simple structured, lever float type heavy duty trap with balancing structure of valve disc. Small in size but large in discharge capacity.

FEATURES

- Simple, durable structure.
- Balancing structure allows large discharge capacity.
- Easy disassembly and maintenance.
- Wax type air vent valve prevents air problem.
- Continuous discharge of drain.

SPECIFICATIONS

Model name	AF-11H
Code name	AF11H-B
Applicable pressure	Max. 0.5MPa
Fluid temperature	Max. 160℃
End connection	Screwed JIS Rc
Materials	Body(Cast iron), Disc & seat(Stainless steel & Cast bronze), Float(Stainless steel)
Valve body pressure test	Hydraulic 0.75MPa

* Contact surface of disc and seat are stainless steel.

DIMENSIONS

(mm)

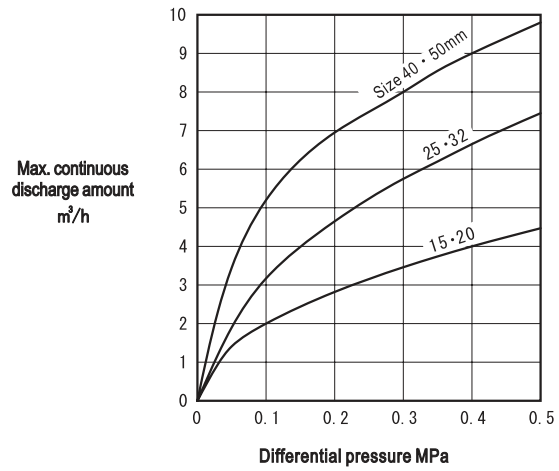
Size	d	L	H_1	H_2	H_3	D	W	Mass(kg)
15(½″)	½″	285	62	137	252	115	216	14
20(¾″)	¾″	285	62	137	252	115	216	14
25(1″)	1″	290	63	133	261	115	216	15
32(1¼″)	1¼″	290	63	133	261	115	216	15
40(1½″)	1½″	370	69	189	336	125	248	29
50(2″)	2″	370	69	189	336	125	248	29

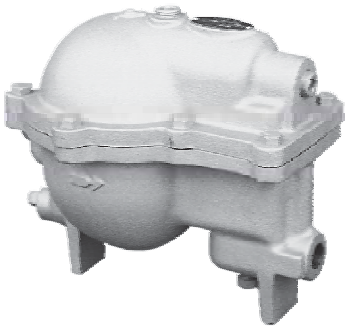
TABLE FOR CAPACITY (Max. continual discharge amount)

(m^3/h)

Size \ Differential pressure MPa	0.03	0.05	0.1	0.2	0.3	0.35	0.4	0.5
15 20(½″ ¾″)	0.95	1.41	2.00	2.82	3.46	3.74	4.00	4.47
25 32(1″ 1¼″)	1.20	1.90	3.17	4.65	5.75	6.20	6.65	7.45
40 50(1½″ 2″)	2.32	3.45	5.20	6.95	8.00	8.55	9.00	9.80

FLOW CHART





CONSTRUCTION

POINTS FOR SIZE SELECTION

Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge volume.

In the case there is back pressure at the outlet side of trap, use the differential pressure between inlet and outlet sides to select the size of valve.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

AF-11HF Type Heavy Duty Trap

Float type

Ideal for heat exchanger, drying machine, header etc. with large amount of drain generated.
A heavy duty, lever float type trap developed with simple structure.

FEATURES

- Simple, durable structure.
- Easy disassembly and maintenance.
- Wax type air vent valve prevents air problem.
- Continuous discharge of drain.

SPECIFICATIONS

Model name	AF-11HF
Code name	AF11HF-B
Size	65 80(2½″ 3″)
Applicable pressure	Max. 0.35MPa
Fluid temperature	Max. 150℃
End connection	Flanged JIS 5KFF*
Materials	Body(Cast iron), Disc & seat(Cast bronze), Float (Brass)
Valve body pressure test	Hydraulic 0.53MPa

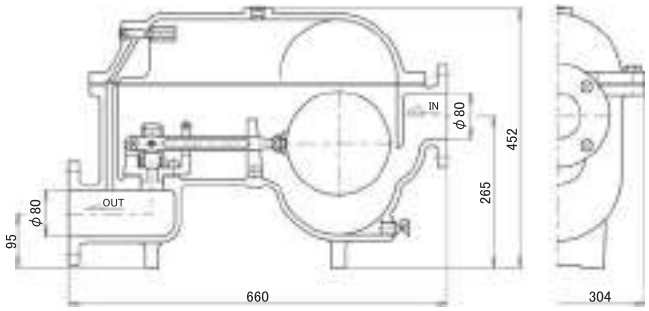
*Including companion flanges, bolts, nuts and gaskets.

TABLE FOR CAPACITY (Max. continual discharge amount)

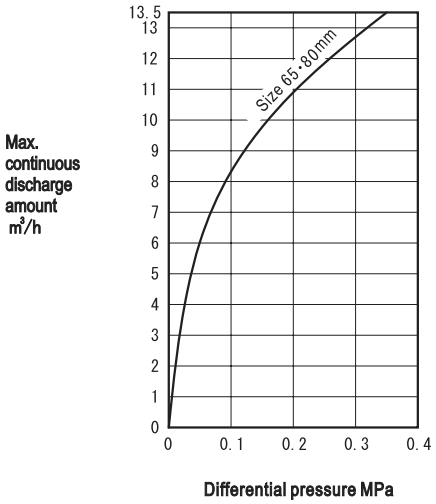
(m^3/h)

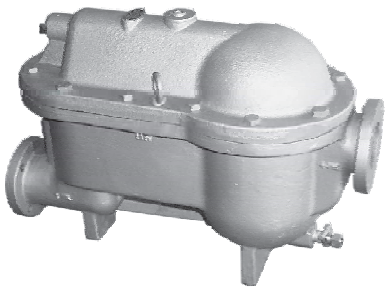
Differential pressure(MPa)	0.03	0.05	0.1	0.2	0.3	0.35
Discharge amount	4.45	6.03	8.32	10.90	12.70	13.50

CONSTRUCTION



FLOW CHART





POINTS FOR SIZE SELECTION

Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge volume.

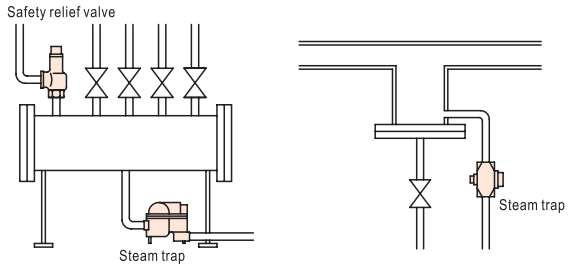
In the case there is back pressure at the outlet side of trap, use the differential pressure between inlet and outlet sides to select the size of valve.

Note: Read Points for Installation of Steam Trap carefully (see page 157).

DATA/Steam Trap

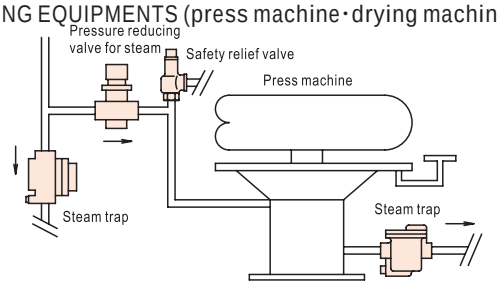
EXAMPLE: APPLICATION OF STEAM TRAP

STEAM SUPPLY PIPELINE (main pipe・branch pipe・header etc.)



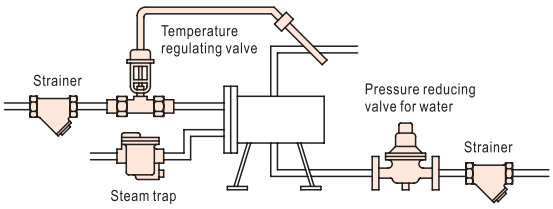
- Points for selection:
  There is a large difference between the amount of drain generated at normal operation state and that generated at start up. Large amount of air and drain generated at start up may obstruct the supply of steam.
- Applicable model:
  ATB-5, 5F/AT-6, 6F (thermal element type)
  AD-17, 17F (disc type)
  AK series (bucket type), AF series (float type)

CLEANING EQUIPMENTS (press machine・drying machine etc.)



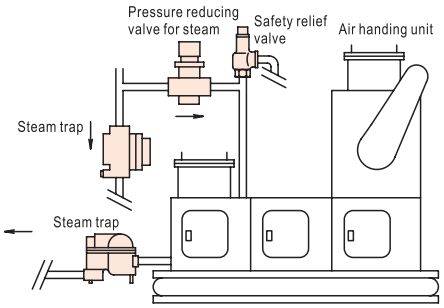
- Points for selection:
  Pay attention to selection of the size of steam trap, because the load changes drastically.
- Applicable model:
  AD-17, 17F (disc type)
  AK series (bucket type)
  AF series (float type)

AIR CONDITIONING・MANUFACTURING EQUIPMENTS (heat exchanger etc.)



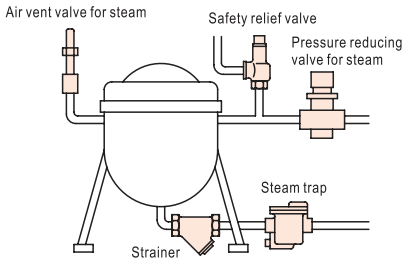
- Points for selection:
  Large amount of drain is generated for maximal utilization of the heat of steam. There is a large difference between the amount of drain generated at normal operation state and that generated at start up.
- Applicable model:
  AF series (float type)
  AK series (bucket type)

(Air handling unit)



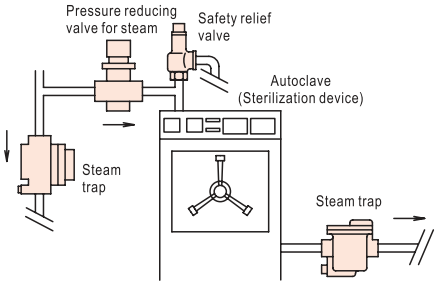
- Points for selection:
  Large amount of drain is generated for maximal utilization of the heat of steam. In addition, the amount and temperature of air feed also affect the amount of drain generated.
- Applicable model:
  AF series (float type)
  AK series (bucket type)

FOOD PROCESSING EQUIPMENTS・KITCHEN UTENSILS (stew pot・heating pot etc.)



- Points for selection:
  Large amount of drain is generated for maximal utilization of the heat of steam. With the passing by of heating time, the amount of drain reduces.
- Applicable model:
  AF series (float type)
  AK series (bucket type)

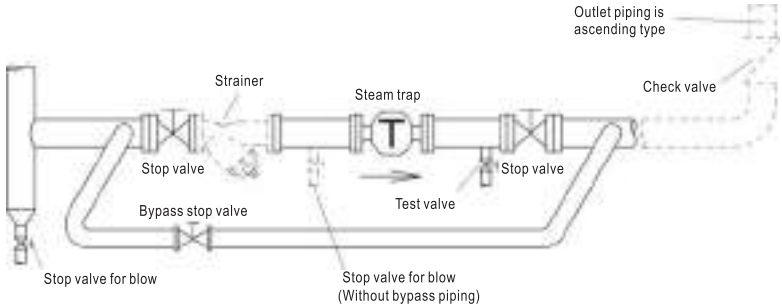
MEDICAL・PHARMACEUTICAL・FOOD PROCESSING EQUIPMENTS (autoclave・sterilizer etc.)



- Points for selection:
  To rapidly increase the internal temperature, large amount of drain is generated during initial operation period. The amount of drain decreases after temperature becomes stable.
- Applicable model:
  ATB-5, 5F/AT-6, 6F (thermal element type)
  AD-17, 17F (disc type)
  AK series (bucket type)

■ PIPING EXAMPLE

Fig. 1 Piping example



■ POINTS FOR SIZE SELECTION AND INSTALLATION

(Steam trap is hereinafter referred to as “trap”.)

1. Select a proper size that can meet the requirement on safety factor and allow at least 3 times of planned discharge volume.
2. AT and ATB Type can detect drain temperature and open/close valve based on the temperature detected. When selecting size, pay attention to following issues:
   ※1. Before the temperature of saturated steam drops to the temperature for valve opening, drain accumulates at the primary side of trap. Do not install trap on machines or equipments which functions may be affected by accumulation of drain.
   ※2. Avoid installing trap on machines or equipments using solenoid valve control for frequent feeding or stop feeding of steam. Such action may cause pressure changes drastically and reduce the durability of bellows and thermal element. (Applicable model: AT-6, 6F, 6FB, ATB-5, 5F)
   ※3. The pipe at the inlet side of trap should be naked pipe that is more than 1m in length. Do not apply thermal insulation on trap. (Applicable model: AT-6, 6F, 6FB, ATB-5, 5F)
3. Install strainer at the primary side of trap.
   ※ It may not be necessary to install strainer in the case of steam trap with strainer embedded. However, for ensuring stable operation, it is recommended installing strainer.
4. For devices which operation cannot be stopped, install a bypass pipe (with stop valve) between the primary and secondary sides of steam trap (see Fig.1). If you choose not to install bypass pipe, install stop valve for blowing, which is branched from the main pipe, right before the stop valve at the primary side of steam trap, to make flushing possible.
5. The position of steam trap should be as low as possible to allow drain flow by its weight.
6. In the event trap is installed at the midway of main pipe, install a separator with the same diameter as of the main pipe (see Fig.2).
7. To install trap at pipe end, install a dirt pocket (which diameter is the same as that of main pipe) at pipe end, and install trap at the pipe where is branched from dirt pocket(see Fig.3).
8. When the discharge side of trap is piped to drain tank or waterspout, make sure such pipe does not submerge into water. In addition, install check valve to prevent back flow (see Fig. 4, 5).
9. When the discharge side of trap is piped to drain collecting pipe or other system, make sure the discharge pipe enters into such drain collecting pipe or system from the upper side, and install check valve if there is back pressure (see Fig.4).
10. In the event the discharge side of trap opens to atmosphere, make sure such outlet piping does not cause any danger. In addition, install BH-1 silencer to reduce noise that occurs when drain is discharged (see Fig.6).
11. In general, one trap is necessary for one unit of machine (see Fig.7).
12. The arrow mark on steam trap should match with the direction of the flow of fluid. Except for some models, steam trap should be installed vertical to horizontal pipe.
13. Leave some space for diassembling and maintenance.
14. Fix or support steam trap properly to avoid damage of steam trap due to the weight of pipe, stress, bending force, or vibration.
15. Discharge drain if there is risk of freezing.
16. The secondary piping of AD-17B, 17FB (for cold area) should not be ascending type.

Fig.2 Installation at midway of pipe

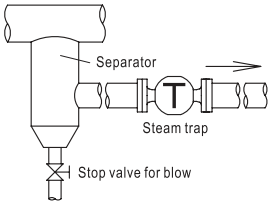


Fig.3 Pipe end installation

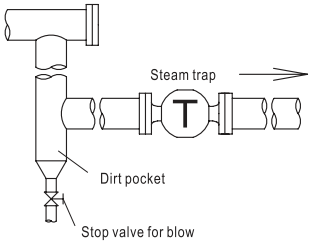


Fig.4 Drain tank piping

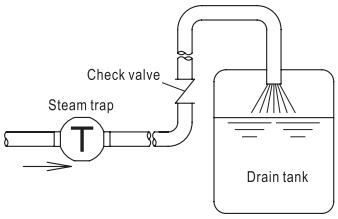


Fig.5 Waterspout Piping Example

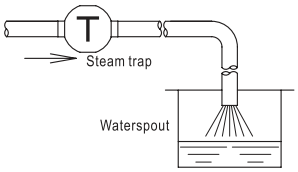


Fig.6 Discharge to atmosphere

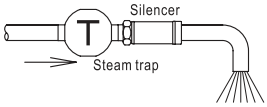
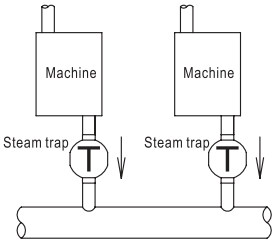


Fig. 7 Installation on machine



AIR VENT VALVES

9

The most popular use of an air vent valve is to eliminate air troubles and prevent corrosion in pipe line by automatically discharging air accumulated in the piping for airconditioning, water supply or hot water supply of buildings or cold/hot water supply piping or tanks in factories.

On the other hand, when discharging liquid in the piping or tanks, the air vent valve automatically absorbs air and prevents vacuum condition for easy discharge.

Model name	End connection	Size	Applicable fluid	Applicable pressure(MPa)	Materials		Page
					Body	Trim	
AF-4S	Screwed	15~32(½″~1¼″)	Water, hot water or oil	Max. 1.0	Cast iron	Brass or Stainless steel	160
AF-4CN			Water or hot water				
AF-4M			Water, hot water or oil				
AF-5N	Screwed	15~25(½″~1″)	Water, hot water or oil	Max. 1.0	Cast bronze	Stainless steel	161
AF-6N	Screwed	15~25(½″~1″)	Water or hot water	Max. 1.0	Brass	Cast bronze & synthetic rubber	162
AF-17N	Screwed	15~25(½″~1″)	Water or hot water	Max. 1.0	Cast bronze	Cast bronze & synthetic rubber	163
AF-9, 9H	Screwed	15~25(½″~1″)	Water or hot water	Max. 1.0	Stainless steel	Stainless stee & synthetic rubberl	164
AF-9L, 9HL				Max. 0.3			
AF-10, 10H	Screwed	15~25(½″~1″)	Water, hot water or oil	Max. 1.0	Stainless steel	Stainless stee & synthetic rubberl	

AF-4 Type Series Air Vent Valve

for Building Equipments, Factory Equipments etc.

FC, 1.0MPa

Air vent valve for liquids. Automatically discharge air accumulated in piping and sealed tank, and smoothen the flow of fluid.

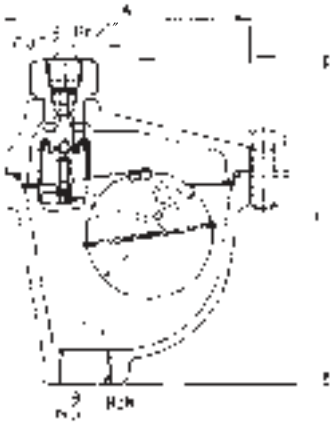
When there is negative pressure and internal liquid level decreases, air vent valve will open to absorb air.

AF-4S Type

AF-4CN Type

CONSTRUCTION (AF-4S, 4CN Type)

The structure of AF-4M is slightly different from the structure shown in the figure.



FEATURES

- Head swinging valve disc for better air tightness.
- Comparatively larger discharge amount.
- Simple structure allowing easy maintenance.
- Nylon coating of AF-4CN, highly rust resistant.

SPECIFICATIONS

Type	Standard item	Nylon coating	Hot water
Model name	AF-4S	AF-4CN	AF-4M
Code name	AF4S-G	AF4CN-G	AF4M-G
Applicable fluid	Water, hot water & oil (S.G.:0.9 or over)	Water & hot water	Water, hot water & oil (S.G.:0.9 or over)
Fluid temperature	5~90℃	5~60℃	5~150℃
Applicable pressure	Max. 1.0MPa		
End connection	Screwed JIS Rc		
Materials	Body(Cast iron), Disc & Float(Stainless steel), Seat(Brass)		Body(Cast iron) Disc, Float & Seat (Stainless steel)
Valve body pressure test	Hydraulic 1.75MPa		
Painting or coating for Body	Inside:Rust proof oil Outside:Metallic blue	Body & Cover:Nylon coating	Inside:Rust proof oil Outside:Heat-resistant silver paint

* In case of avoiding the rust, select AF-4CN, AF-5N, 10 and 17N Type Air vent valve.

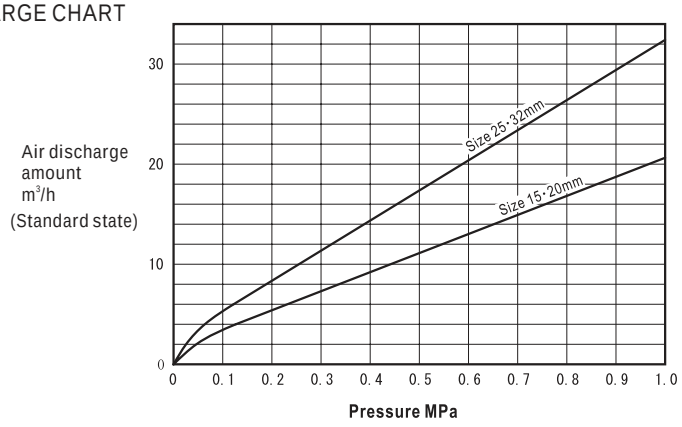
DIMENSIONS

(mm)

Size	A	H	C	d	Mass(kg)
15(½″)	114	154(150)	60	½″	3(2.8)
20(¾″)	114	154(150)	60	¾″	
25(1″)	130	169(165)	70	1″	4(3.8)
32(1¼″)	130	169(165)	70	1¼″	

* Figures in ( ) are for AF-4M Type.

AIR DISCHARGE CHART



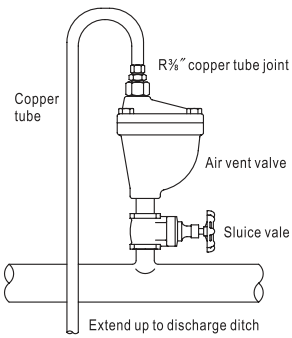
POINTS FOR INSTALLATION

- Install the product vertically to pipe (deviation of verticality: 5°).
- Before installation, remove all foreign matters in pipe and equipment.
- Install stop valve at the inlet side to allow water supply to be stopped before maintenance works. Use sluice valve or ball valve that can be switched between water and air.
- The outlet side should be piped to waterspout as a countermeasure for possible water leakage. The end of the piping for discharge should not be submerged into water.
- Apply thermal insulation on air vent valve if:

① There is risk of freezing.

② For AF-4CN, there is a temperature difference of 40℃ or more between the valve and ambient temperature.

PIPING EXAMPLE



AF-5N Type Air Vent Valve

Bronze, 1.6MPa

Air vent valve with bronze body for high-pressure liquid. Filter (muffler) embedded to reduce noise that occurs when high-pressure air is discharged. Besides venting air, AF-5N can also absorb air when there is negative pressure.

FEATURES

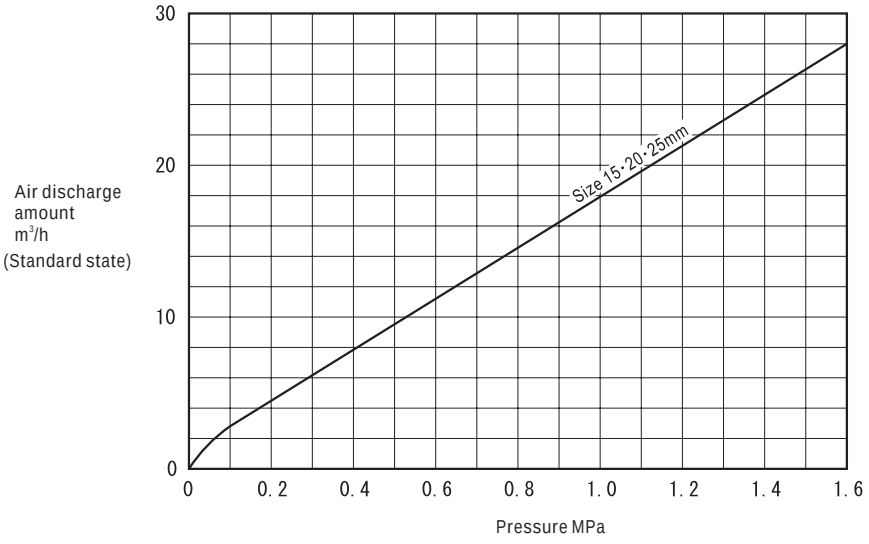
- Bronze body, large discharge amount, applicable pressure Max.1.6MPa.
- Head swinging valve disc for air tightness.
- Filter (muffler) embedded at outlet side reduces noise that occurs when air is discharged.

SPECIFICATIONS

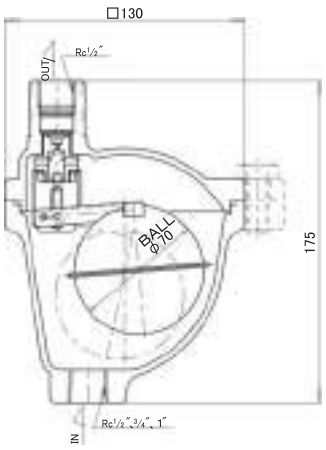
Model name	AF-5N
Code name	AF5N-J
Size	15 20 25(½″ ¾″ 1″)
Applicable fluid	Water, hot water & oil
Fluid specific gravity	0.85 or more
Fluid temperature	5~90℃*
Applicable pressure	Max. 1.6MPa
End connection	Screwed JIS Rc
Materials	Body(Cast bronze), Disc & Seat(Stainless steel), Float(Stainless steel)
Valve body pressure test	Hydraulic 2.4MPa

* Applicable temperature Max. 150℃ is available upon your request.

AIR DISCHARGE CHART



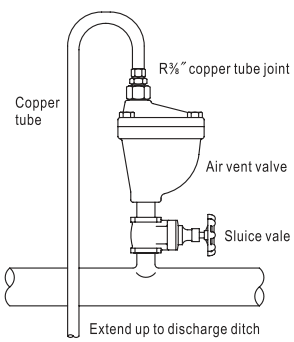
CONSTRUCTION



POINTS FOR INSTALLATION

- Install the product vertically to pipe (deviation of verticality: 5°).
- Before installation, remove all foreign matters in pipe and equipment.
- Install stop valve at the inlet side to allow water supply to be stopped before maintenance works. Use sluice valve or ball valve that can be switched between water and air, or a ball valve.
- The outlet side should be piped to waterspout as a countermeasure for possible water leakage. The end of the piping for discharge should not be submerged into water.
- Apply thermal insulation on air vent valve if there is risk of freezing.

PIPING EXAMPLE



AF-6N Type Air Vent Valve

for Building Equipments, Apartments, Hot Water Boiler etc.

Made of cast copper, 1.0MPa

Small air vent valve for pipeline, hot water boiler, fan coil, small to medium pressure tank, solar system etc.

Besides venting air, the valve can also absorb air when there is negative pressure.

Dispersing method allows stable operation and prevents air venting with water.

The air discharge side is in a shape suitable for tube joint.

FEATURES

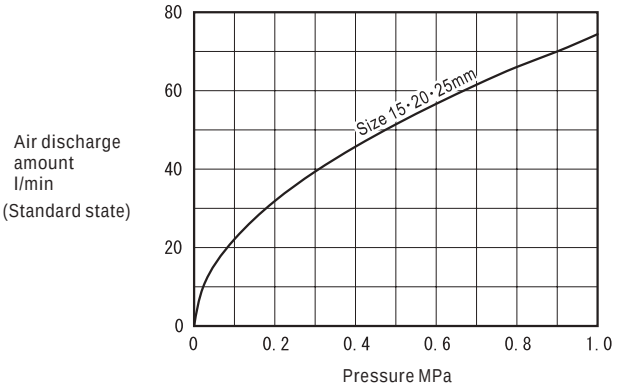
- Small valve, applicable pressure up to 1.0MPa.
- With manual stopping device.

SPECIFICATIONS

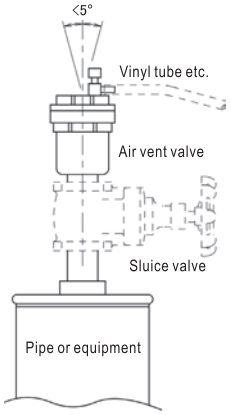
Model name	AF-6N
Code name	AF6N-F
Size	15 20 25(½″ ¾″ 1″)
Applicable fluid	Water & hot water
Fluid temperature	5~100℃
Applicable pressure	Max. 1.0MPa
End connection	Screwed JIS R
Materials	Body(Brass, Nickel-chrome plated), Disc(Synthetic rubber), Float(Polypropylene)
Valve body pressure test	Hydraulic 1.75MPa

CONSTRUCTION

AIR DISCHARGE CHART



PIPING EXAMPLE



POINTS FOR INSTALLATION

- Install the product vertically to pipe (deviation of verticality: 5°).
- Before installation, remove all foreign matters in pipe and equipment.
- Install stop valve at the inlet side to allow water supply to be stopped before maintenance works. Use sluice valve or ball valve that can be switched between water and air.
- In the case of indoor installation, extend the valve with vinyl tube or pipe to drain ditch. The end of such tube or pipe for discharge should not be submerged into water.
- Turn the switch to stop water leakage.
- Apply thermal insulation on air vent valve if there is risk of freezing.

AF-17N Type Air Vent Valve

for Building Equipments, Apartments, Hot Water Boiler etc.

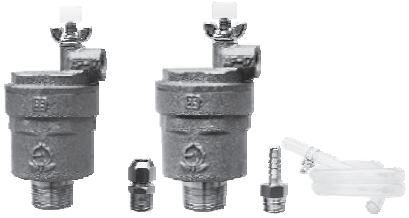
Made of bronze, 1.0MPa

Small air vent valve for pipeline, hot water boiler, fan coil, small to medium pressure tank, solar system etc.

Besides venting air, the valve can also absorb air when there is negative pressure.

Dispersing method allows stable operation and prevents air venting with water.

Air vent valve with bronze body.The outlet is in a shape of female screw, or with union joint or tube joint.



w/union joint w/tube joint

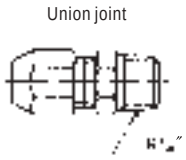
FEATURES

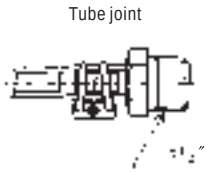
- Compact design applicable pressure up to 1.0MPa.
- With manual stopping device.

SPECIFICATIONS

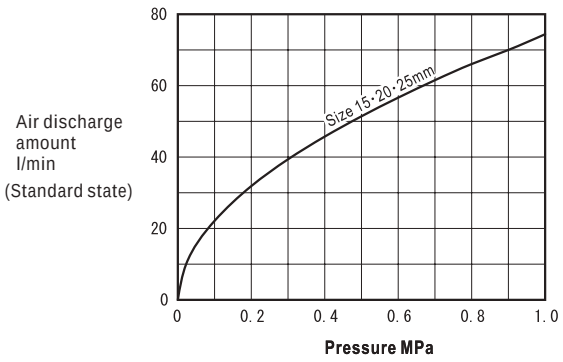
Model name	AF-17N		
Code name	AF17N-FU	AF17N-FT	AF17N-FS
Outlet connection type	With union joint	With tube joint	Screwed JIS Rc¼″
Size	15 20 25(½″ ¾″ 1″)		
Applicable fluid	Water & hot water		
Fluid temperature	5~100℃		
Applicable pressure	Max. 1.0MPa		
End connection	Screwed JIS R		
Materials	Body(Cast bronze), Disc(Synthetic rubber), Float(Polypropylene)		
Valve body pressure test	Hydraulic 1.75MPa		
Accessories	Union joint Outside diameter Φ8 for copper tube	Tube joint, Hose band Vinyl tube(500mm)	—

CONSTRUCTION

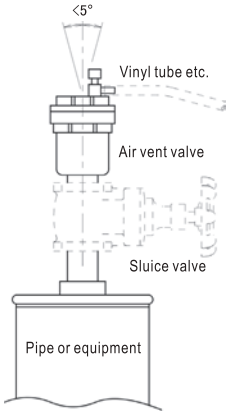




AIR DISCHARGE CHART



PIPING EXAMPLE



POINTS FOR INSTALLATION

- Install the product vertically to pipe (deviation of verticality: 5°).
- Before installation, remove all foreign matters in pipe and equipment.
- Install stop valve at the inlet side to allow water supply to be stopped before maintenance works. Use sluice valve or ball valve that can be switched between water and air.
- In the case of indoor installation, extend the valve with vinyl tube or pipe to drain ditch. The end of such tube or pipe for discharge should not be submerged into water.
- Turn the switch to stop water leakage.
- Apply thermal insulation on air vent valve if there is risk of freezing.

AF-9, 10 Type Series Air Vent Valve

Made of stainless steel, 0.3, 1.0MPa

for Building Equipments, Factory Equipments, Absorption Side of Pump or Sealed Circuit (AF-9) etc.

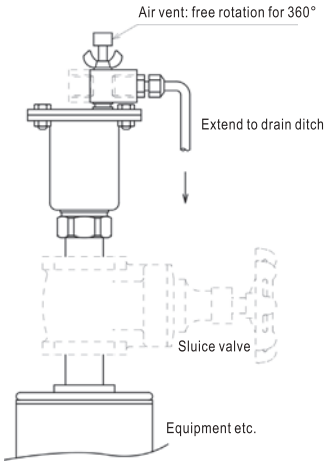
Corrosion resistant with stainless steel body and strainer embedded, AF-10 series are durable air vent valves that can absorb and vent air.

AF-9 series have check valve embedded and are designed to prevent air from being absorbed into the valve even when there is negative pressure at the inlet side of air vent valve. There fore, they are ideal for applications at air absorbing side of pump or sealed circuit of ventilation system where only ventilation is requied, but not air absorption.

AF-9 Type

AF-10 Type

PIPING EXAMPLE



FEATURES

- Embedded strainer allows easy design and installation.
- Corrosion resistant, durable body made of stainless steel.
- The air vent can rotate for 360°, allows easy installation.
- With manual stopping device.
- Does not absorb air even when there is negative pressure; suitable for the air absorbing side of pump (AF-9 series)

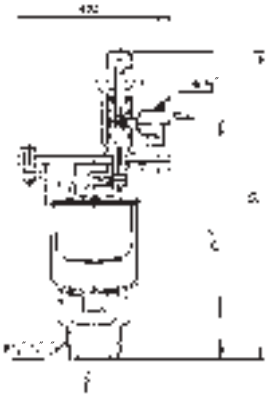
SPECIFICATIONS

Type	With no-air suction device					
Model name	AF-9	AF-9H	AF-9L	AF-9HL	AF-10	AF-10H
Code name	AF9-D	AF9H-D	AF9-DL	AF9H-DL	AF10-D	AF10H-D
Size	15 20 25(½″ ¾″ 1″)					
Applicable pressure	Max. 1.0MPa		Max. 0.3MPa		Max. 1.0MPa	
Fluid temperature	5~90℃	5~150℃	5~90℃	5~150℃	5~90℃	5~150℃
Applicable fluid	Water & hot water				Water, hot water & oil(S.G.:0.8 or over)	
Valve body pressure test	Hydraulic 1.75MPa					
End connection	Inlet:Screwed JIS R, Outlet:Screwed JIS Rc⅜″					
Materials	Body(Stainless steel), Disc(Synthetic rubber), Float(Stainless steel)					
Accessories	Manual shut off knob, Strainer, Check valve				Manual shut off knob, Strainer	

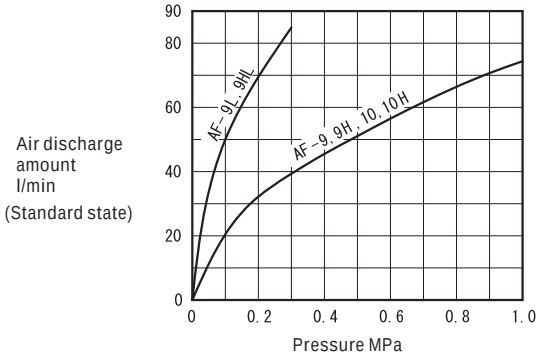
CONSTRUCTION

AF-9 Type

AF-10 Type



AIR DISCHARGE CHART(Size 15~25mm)



Points for installation

- Install the product vertically to pipe (deviation of verticality: 5°).
- Before installation, remove all foreign matters in pipe and equipment.
- Install stop valve at the inlet side to allow water supply to be stopped before maintenance works. Use sluice valve or ball valve that can be switched between water and air, or a ball valve.
- In the case of indoor installation, extend the valve with pipe to drain ditch. The end of such pipe for discharge should not be submerged into water.
- When water leakage occurs, loosen the nut and rotate the switch. The leakage will be stopped.
- Apply thermal insulation on air vent valve if there is risk of freezing.

BELLOWS EXPANSION JOINTS SLEEVE EXPANSION JOINTS & BALL JOINTS

10

Expansion Joints or Ball Joints absorb expansion, contraction, deflection, twisting, distorsion, etc. of the piping caused by the change of temperature, ground sinking, earthquake, etc.
Select most suitable item for the purpose from the under listed.

■ BELLOWS EXPANSION JOINTS

Model name	End connection	Size	Applicable pressure(MPa)	Expansion amount		Page
				Expansion	Contraction	
JB-13	Flanged	20~300(¾″~12″)	Max. 1.0	10	25	166
JB-14				20	50	
JB-21	Flanged	20~300(¾″~12″)	Max. 1.0	10	25	167
JB-22				20	50	
JB-15	Socket brazing	20~32(¾″~1¼″)	Max. 1.0	10	30	168
		40~100(1½″~4″)			35	
JB-16		20~32(¾″~1¼″)		20	60	
		40~100(1½″~4″)			70	
JB-23	Flanged	20~300(¾″~12″)	Max. 2.0	10	25	169
JB-24				20	50	
JB-17	Flanged	20~250(¾″~10″)	Max. 1.6, 2.0	10	35	170
JB-18				20	70	

■ SLEEVE EXPANSION JOINTS

Model name	End connection	Size	Applicable pressure(MPa)	Expansion amount		Page
				Expansion	Contraction	
JS-5HF	Flanged	20~300(¾″~12″)	Max. 1.0	20	80	174
JS-6HF			Max. 2.0			
JS-7HF			Max. 1.0	40	160	
JS-8HF			Max. 2.0			
JS-5HW	Butt-weld	20~300(¾″~12″)	Max. 1.0	20	80	175
JS-6HW			Max. 2.0			
JS-7HW			Max. 1.0	40	160	
JS-8HW			Max. 2.0			

■ BALL JOINTS

Model name	End connection	Size	Applicable pressure(MPa)	Max. displacement angle	Page
JU-1	Screwed	25~50(1″~2″)	Max. 1.0	30°	178
JU-3F	Flanged	50~300(2″~12″)	Max. 1.0	Size 50~100mm : 20° Size 125~300mm : 15°	179
JU-3W	Butt-weld				
JU-4F	Flanged		Max. 2.0		
JU-4W	Butt-weld				

JB-13, 14 Type Bellows Expansion Joint

for (Building・Air Conditioning Equipments), (Factory Equipments) etc.

JIS certified

JIS B 2352 Bellows Type Expansion Joint (mainly for piping of air conditioning and sanitary systems).

Absorb expansion or contraction by temperature changes in the axial direction of pipe.

JB-13 Type

JB-14 Type

CONSTRUCTION

JB-13 Type

JB-14 Type

Note:
1.Depending on size, the structure may vary.
2.The size for 400mm (see the following table for max. working pressure and test pressure).

(MPa)

Size	Applicable pressure	Pressure test
350(12″)	1.0	1.5
400(16″)	0.8	1.2

FEATURES

- Stainless steel bellows with internal pipe manufactured using exclusive formation and fixing method; highly durable and corrosion resistant.
- 20~40% lighter than prior products.

SPECIFICATIONS

Model name(Type)	JB-13(Single)	JB-14(Double)
Code name	JB13-N	JB14-N
Applicable fluid	Steam, air, gases, water & oils	
Applicable pressure	Max. 1.0MPa	
Fluid temperature	Max. 220℃	
End connection	Flanged JIS 10KRF(ANSI Class150 with is available upon request)	
Materials	Flange(Mild steel), External sleeve(Carbon steel or Mild steel), Internal sleeve & Bellows(Stainless steel)	
Pressure test	Hydraulic 1.5MPa	
Expansion amount	35mm	70mm

DIMENSIONS JB-13 Type (Single Type)

(mm)

Size	L	Expansion amount		Mass(kg)
		Expansion	Contraction	
20(¾″)	365	10	25	4
25(1″)	365	10	25	4
32(1¼″)	365	10	25	5.5
40(1½″)	365	10	25	5.5
50(2″)	365	10	25	7.5
65(2½″)	415	10	25	10.5
80(3″)	415	10	25	12
100(4″)	415	10	25	16
125(5″)	440	10	25	22
150(6″)	440	10	25	29
200(8″)	440	10	25	49
250(10″)	465	10	25	59
300(12″)	465	10	25	95

Flange code JIS 10KRF

DIMENSIONS JB-14 Type (Double Type)

(mm)

Size	L	Expansion amount		H	A	B	T	h	Mass(kg)
		Expansion	Contraction						
20(¾″)	680	20	50	100	100	60	3.2	12	6
25(1″)	680	20	50	100	100	60	3.2	12	6
32(1¼″)	680	20	50	120	100	70	3.2	12	9
40(1½″)	680	20	50	120	100	70	3.2	12	9
50(2″)	680	20	50	130	100	80	3.2	15	12
65(2½″)	780	20	50	140	120	100	3.2	15	17
80(3″)	780	20	50	150	120	110	4.5	15	20
100(4″)	880	20	50	170	120	130	4.5	19	30
125(5″)	880	20	50	200	120	150	4.5	19	35
150(6″)	930	20	50	220	160	180	6.0	23	62
200(8″)	930	20	50	250	160	220	6.0	25	91
250(10″)	980	20	50	300	180	280	6.0	27	103
300(12″)	980	20	50	350	200	300	19	28	198

Flange code JIS 10KRF

POINTS FOR INSTALLATION

- The arrow mark on the main body should match with the flow of fluid.
- Make sure no torsional stress is applied on bellows.
- Remove nut for fixing faces and washers after piping is completed.

AXIAL DIRECTION LOAD ON MAIN FIXING POINT

Items \ Size(mm)		20	25	32	40	50	65	80	100	125	150	200	250	300
Bellows' effective area	Ae(mm²)	880	880	1960	1960	3130	4950	6570	11100	17700	24400	42900	62700	92100
Spring constant	K(N/mm)	28	28	54	54	68	90	91	185	255	372	590	648	1240
Load by max. Working pressure at 1.0MPa	Fp(N)	880	880	1960	1960	3130	4950	6570	11100	17700	24400	42900	62700	92100
Load by max. contraction at 25mm	Fe(N)	700	700	1350	1350	1700	2250	2280	4630	6380	9300	14750	16200	31000
Total load t max. working pressure	Fm=Fp+Fe(N)	1580	1580	3310	3310	4830	7200	8850	15730	24080	33700	57650	78900	123100
Load by hydraulic test pressure at 1.5MPa	(N)	1320	1320	2940	2940	4700	7430	9860	16650	26550	36600	64350	94050	138150

JB-21, 22 Type Bellows Expansion Joint

for Building・Air Conditioning Equipments, Factory Equipments etc.

JIS certified
Double-layer Bellows

JIS B 2352 Bellows Type Expansion Joint (mainly for piping of air conditioning and sanitary systems).

Absorb expansion or contraction by temperature changes in the axial direction of pipe.

JB-21 Type

JB-22 Type

FEATURES

- Double-layer bellows with improved durability.
- Except for flange, all parts included bellows are made of stainless steel, and the part contacting with fluid is made of Stainless steel.
- Loose flange for end connection; preventing shifting in the circumferential direction of bolt hole.
- Duplex joint allows adjustment (inching adjustment on height and in forward and backward directions) of the position of installation foot and easier installation (JB-22, size <150mm).

SPECIFICATIONS

Model name(Type)	JB-21(Single)	JB-22(Double)
Code name	JB21-N	JB22-N
Applicable fluid	Steam, air, gases, water & oils	
Applicable pressure	Max. 1.0MPa	
Fluid temperature	Max. 220℃	
End connection	Flanged JIS 10K(Loose type)	
Materials	Flange(Mild steel*), External sleeve(Stainless steel), Internal sleeve & Bellows(Stainless steel)	
Pressure test	Hydraulic 1.5MPa	
Expansion amount	35mm	70mm

* JB-21 and JB-22 Type with Stainless steel flange are available upon your request. (Code name:JB21-K , JB22-K Type)

DIMENSIONS JB-21 Type (Single Type)

(mm)

Size	L	Expansion amount		Mass(kg)
		Expansion	Contraction	
20(¾″)	365	10	25	2.5
25(1″)	365	10	25	3.5
32(1¼″)	365	10	25	4.5
40(1½″)	365	10	25	5
50(2″)	365	10	25	6
65(2½″)	415	10	25	8.5
80(3″)	415	10	25	10
100(4″)	415	10	25	12.5
125(5″)	440	10	25	18.5
150(6″)	440	10	25	21
200(8″)	440	10	25	33
250(10″)	465	10	25	47
300(12″)	465	10	25	100

DIMENSIONS JB-22 Type (Double Type)

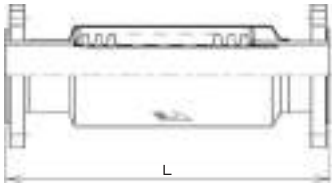
Flange code JIS 10K
(mm)

Size	L	Expansion amount		H	J	K	h_1	Mass(kg)
		Expansion	Contraction					
20(¾″)	680	20	50	100	100	60	12	4
25(1″)	680	20	50	100	100	60	12	5.5
32(1¼″)	680	20	50	120	100	70	12	7
40(1½″)	680	20	50	120	100	70	12	7.5
50(2″)	680	20	50	130	100	80	15	9.5
65(2½″)	780	20	50	140	120	100	15	13
80(3″)	780	20	50	150	120	110	15	17
100(4″)	880	20	50	170	120	130	19	22
125(5″)	880	20	50	200	120	150	19	30.5
150(6″)	930	20	50	220	160	180	23	39
200(8″)	930	20	50	250	160	220	25	60
250(10″)	980	20	50	300	180	280	27	82
300(12″)	980	20	50	350	200	300	27	170

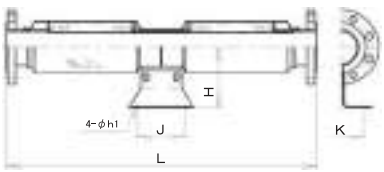
Flange code JIS 10K

CONSTRUCTION

JB-21 Type



JB-22 Type



Note:
1.Depending on size, the structure may vary.
2.The size is up to 350mm (for details, please contact us).

POINTS FOR INSTALLATION

- The arrow mark on the main body should match with the flow of fluid.
- Make sure no torsional stress is applied on bellows.
- Remove set bolt for fixing faces after piping is completed.

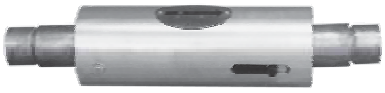
AXIAL DIRECTION LOAD ON MAIN FIXING POINT

Items \ Size(mm)		20	25	32	40	50	65	80	100	125	150	200	250	300
Bellows' effective area	Ae(mm^2)	650	830	1440	1770	2990	4460	6840	11930	18610	25790	42940	62640	98000
Spring constant	K(N/mm)	50	52	53	53	80	87	155	185	210	290	490	540	700
Load by max. Working pressure at 1.0MPa	Fp(N)	650	830	1440	1770	2990	4460	6840	11930	18610	25790	42940	62640	98000
Load by max. contraction at 25mm	Fe(N)	1250	1300	1325	1325	2000	2175	3875	4625	5250	7250	12250	13500	17500
Total load t max. working pressure	Fm=Fp+Fe(N)	1900	2130	2765	3095	4990	6635	10715	16555	23860	33040	55190	76140	115500
Load by hydraulic test pressure at 1.5MPa	(N)	975	1245	2160	2655	4485	6690	10260	17895	27915	38685	64410	93960	147000

JB-15, 16 Type Bellows Expansion Joint

For copper pipe

Absorb expansion and contraction of cooper pipes due to change of temperature in air conditioning and sanitary systems.



JB-15 Type

JB-16 Type

FEATURES

- Absorb expansion and contraction by thermal changes in the axial direction of cooper pipe.
- With internal pipe inserted, the pressure loss of fluid is reduced and the flow is smooth. In addition, since the buckling of bellows is prevented, the bellows has a longer service life.
- Made of Stainless steel, solid and corrosion resistant.
- Longer joint allows easy installation. In the case bellows is damaged, the parts around bellows can be replaced without replacing the brazed parts.

SPECIFICATIONS

Model name(Type)	JB-15(Single)	JB-16(Double)
Code name	JB15-J	JB16-J
Applicable fluid	Cold or hot water, air, oils & others	
Applicable pressure	Max. 1.0MPa	
Fluid temperature	Max. 100℃	
End connection	Brazed socket type	
Materials	End part(Copper tube), External sleeve(Carbon steel or Steel gas pipe), Internal sleeve & Bellows(Stainless steel)	
Pressure test	Hydraulic 1.5MPa	
Expansion amount	Size 20~32mm:40mm, Size 40~100mm:45mm	Size 20~32mm:80mm, Size 40~100mm:90mm

DIMENSIONS JB-15 Type (Single Type)

(mm)

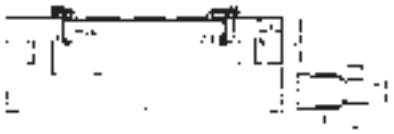
Size	L	Expansion amount		d	ℓ	Mass(kg)
		Expansion	Contraction			
20(¾″)	400	10	30	22.4	17	2.5
25(1″)	345	10	30	28.8	19	2.5
32(1¼″)	355	10	30	35.1	21	2.7
40(1½″)	385	10	35	41.5	24	3.1
50(2″)	405	10	35	54.2	30	4.7
65(2½″)	425	10	35	67.0	33	6
80(3″)	445	10	35	79.7	37	8.7
100(4″)	500	10	35	105.1	47	13.4

DIMENSIONS JB-16 Type (Double Type)

Size	L	Expansion amount		d	ℓ	H	A	B	T	h	Mass (kg)
		Exp.	Cont.								
20(¾″)	520	20	60	22.4	17	80	90	45	3.2	12	4
25(1″)	465	20	60	28.8	19	80	90	45	3.2	12	4
32(1¼″)	495	20	60	35.1	21	80	90	45	3.2	12	4.3
40(1½″)	525	20	70	41.5	24	89	100	60	3.2	12	5.4
50(2″)	575	20	70	54.2	30	95	100	60	3.2	12	7.4
65(2½″)	605	20	70	67.0	33	127	100	70	4.5	19	10.1
80(3″)	620	20	70	79.7	37	127	100	70	4.5	19	14
100(4″)	700	20	70	105.1	47	152	135	95	4.5	19	21.5

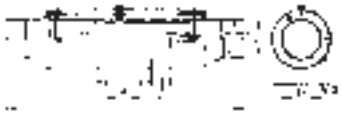
CONSTRUCTION

JB-15 Type



Size 20mm,Drawing of connection part

JB-16 Type



POINTS FOR INSTALLATION

- The arrow mark on the main body should match with the flow of fluid.
- Make sure no torsional stress is applied on bellows.
- When performing brazing, protect the joint of copper pipe using wet cloth.

AXIAL DIRECTION LOAD ON MAIN FIXING POINT

Items \ Size(mm)		20	25	32	40	50	65	80	100
Bellows' effective area	Ae(mm²)	892	892	1380	1960	3170	5150	7080	11100
Spring constant	K(N/mm)	19	19	40	40	41	48	85	90
Load by max. Working pressure at 1.0MPa	Fp(N)	892	892	1380	1960	3170	5150	7080	11100
Load by max. contraction at 25mm	Fe(N)	570	570	1200	1400	1435	1680	2975	3150
Total load t max. working pressure	Fm=Fp+Fe(N)	1462	1462	2580	3360	4605	6830	10055	14250
Load by hydraulic test pressure at 1.5MPa	(N)	1338	1338	2070	2940	4755	7725	10620	16650

JB-23, 24 Type Bellows Expansion Joint

for Building・Air Conditioning Equipments, Factory Equipments etc.

For high pressure application Max. 2.0MPa
Double-layer Bellows

Corrosion resistant, durable Stainless steel bellows expansion joint, suitable for pressure up to 2.0MPa. The face-to-face dimensions are the same as those for JIS certified JB-21, 22.

JB-23 Type

JB-24 Type

FEATURES

- Double-layer bellows with improved durability.
- Except for flange, all parts of bellows are made of stainless steel, and the part contacting with fluid is made of Stainless steel.
- Loose flange for end connection; preventing shifting in the circumferential direction of bolt hole.
- Duplex joint allows adjustment (inching adjustment on height and in forward and backward directions) of the position of installation foot and easier installation (JB-24, size up to 150mm).

SPECIFICATIONS

Model name(Type)	JB-23(Single)	JB-24(Double)
Code name	JB23-N	JB24-N
Applicable fluid	Steam, air, gases, water & oils	
Applicable pressure	Max. 2.0MPa	
Fluid temperature	Max. 250℃	
End connection	Flanged JIS 20K (Loose type)	
Materials	Flange(Mild steel*), External sleeve(Stainless steel), Internal sleeve & Bellows(Stainless steel)	
Pressure test	Hydraulic 3.0MPa	
Expansion amount	35mm	70mm

* JB-23 and JB-24 Type with Stainless steel flange are available upon your request. (Code name:JB23-K, JB24-K Type)

DIMENSIONS JB-23 Type (Single Type)

(mm)

Size	L	Expansion amount		Mass(kg)
		Expansion	Contraction	
20(¾″)	365	10	25	3
25(1″)	365	10	25	4
32(1¼″)	365	10	25	5
40(1½″)	365	10	25	5.5
50(2″)	365	10	25	6.5
65(2½″)	415	10	25	9
80(3″)	415	10	25	12.5
100(4″)	415	10	25	16
125(5″)	440	10	25	24.5
150(6″)	440	10	25	28.5
200(8″)	440	10	25	43
250(10″)	465	10	25	67
300(12″)	465	10	25	130

Flange code JIS 20K

DIMENSIONS JB-24 Type (Double Type)

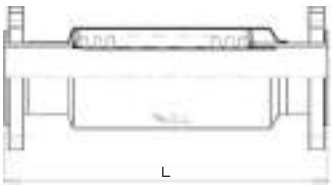
(mm)

Size	L	Expansion amount		H	J	K	h_1	Mass(kg)
		Expansion	Contraction					
20(¾″)	680	20	50	100	100	60	12	4.5
25(1″)	680	20	50	100	100	60	12	6
32(1¼″)	680	20	50	120	100	70	12	7.5
40(1½″)	680	20	50	120	100	70	12	8
50(2″)	680	20	50	130	100	80	15	10
65(2½″)	780	20	50	140	120	100	15	13.5
80(3″)	780	20	50	150	120	110	15	19.5
100(4″)	880	20	50	170	120	130	19	25.5
125(5″)	880	20	50	200	120	150	19	36.5
150(6″)	930	20	50	220	160	180	23	46.5
200(8″)	930	20	50	250	160	220	25	70
250(10″)	980	20	50	300	180	280	27	102
300(12″)	980	20	50	350	200	300	27	200

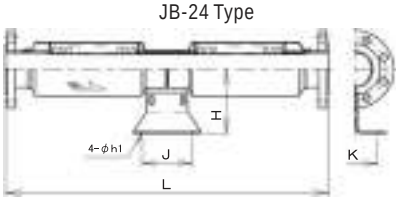
Flange code JIS 20K

CONSTRUCTION

JB-23 Type



JB-24 Type



Note:
1.Depending on size, the structure may vary.
2.Size 350mm or larger is availabe upon your request (for details, please contact our local agent).

POINTS FOR INSTALLATION

- The arrow mark on the main body should match with the flow of fluid.
- Make sure no torsional stress is applied on bellows.
- Remove set bolt for fixing faces after piping is completed.

AXIAL DIRECTION LOAD ON MAIN FIXING POINT

Items \ Size(mm)		20	25	32	40	50	65	80	100	125	150	200	250	300
Bellows' effective area	Ae(mm²)	650	830	1440	1770	2990	4460	6840	11930	18610	25790	42940	62640	98000
Spring constant	K(N/mm)	50	52	53	53	80	87	155	185	210	290	490	540	700
Load by max. Working pressure at 2.0MPa	Fp(N)	1300	1660	2880	3540	5980	8920	13680	23860	37200	51580	85800	125280	19600
Load by max. contraction at 25mm	Fe(N)	1250	1300	1325	1325	2000	2175	3875	4625	5250	7250	12250	13500	17500
Total load t max. working pressure	Fm=Fp+Fe(N)	2550	2960	4205	4865	7980	11095	17555	28485	42470	58830	98130	138780	213500
Load by hydraulic test pressure at 3.0MPa	(N)	1950	2490	4320	5310	8970	13380	20520	35790	55830	77370	128820	187920	294000

JB-17, 18 Type Bellows Expansion Joint

1.6, 2.0MPa

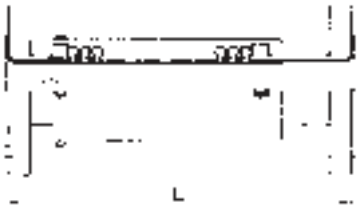
Durable, corrosion resistant 2.0MPa expansion joint with Stainless steel bellows. The face-to-face dimensions are the same as those of JIS certified JB-13, 14.

JB-17 Type

JB-18 Type

CONSTRUCTION

JB-17 Type



JB-18 Type

Depending on size, the structure may vary.

FEATURES

- The part contacting with fluid is made of durable and corrosion-resistant Stainless steel.
- Absorb expansion and contraction of pipe by thermal changes in the axial direction .

SPECIFICATIONS

Model name(Type)	JB-17(Single)	JB-18(Double)
Code name	JB17-N	JB18-N
Applicable fluid	Steam, air, gases, water & oils	
Applicable pressure	Max. 1.6, 2.0MPa	
Fluid temperature	Max. 250℃	
End connection	Flanged JIS 16, 20KRF (ANSI Class150, 300 with mild steel flange is available upon request.)	
Materials	Flanged(Carbon steel), External sleeve(Carbon steel or Steel gas pipe), Internal sleeve & Bellows(Stainless steel)	
Pressure test	1.5 times of flange rated pressure. (Hydraulic)	
Expansion amount	45mm	90mm

DIMENSIONS JB-17 Type (Single Type)

(mm)

Size	L	Expansion amount		Mass(kg)
		Expansion	Contraction	
20(¾″)	365	10	35	7
25(1″)	365	10	35	8
32(1¼″)	365	10	35	10
40(1½″)	365	10	35	10
50(2″)	365	10	35	12
65(2½″)	415	10	35	17
80(3″)	415	10	35	19
100(4″)	415	10	35	24
125(5″)	440	10	35	41
150(6″)	440	10	35	53
200(8″)	440	10	35	63
250(10″)	465	10	35	81

Flange code JIS 20KRF

DIMENSIONS JB-18 Type (Double Type)

(mm)

Size	L	Expansion amount		H	A	B	T	h	Mass(kg)
		Expansion	Contraction						
20(¾″)	680	20	70	100	100	60	9	12	12
25(1″)	680	20	70	100	100	60	9	12	13
32(1¼″)	680	20	70	120	100	70	9	12	17
40(1½″)	680	20	70	120	100	70	9	12	18
50(2″)	680	20	70	130	100	80	12	15	18
65(2½″)	780	20	70	140	120	100	12	15	26
80(3″)	780	20	70	150	120	110	12	15	32
100(4″)	880	20	70	170	120	130	16	19	45
125(5″)	880	20	70	200	120	150	16	19	67
150(6″)	930	20	70	220	160	180	16	23	92
200(8″)	930	20	70	250	160	220	16	25	125
250(10″)	980	20	70	300	180	280	16	27	173

Flange code JIS 20KRF

POINTS FOR INSTALLATION

- The arrow mark on the main body should match with the flow of fluid.
- Make sure no torsional stress is applied on bellows.
- Remove nuts and washers for fixing faces after piping is completed.

AXIAL DIRECTION LOAD ON MAIN FIXING POINT

Items \ Size(mm)		20	25	32	40	50	65	80	100	125	150	200	250
Bellows' effective area	Ae(mm²)	920	920	2020	2020	3130	5020	6640	11400	17700	24400	43400	62700
Spring constant	K(N/mm)	20	20	38	38	58	89	120	200	310	360	630	880
Load by max. Working pressure at 2.0MPa	Fp(N)	1840	1840	4040	4040	6260	10004	13280	22800	35400	48800	86800	125400
Load by max. contraction at 35mm	Fe(N)	700	700	1330	1330	2030	3120	4200	7000	10850	12600	22050	30800
Total load t max. working pressure	Fm=Fp+Fe(N)	2540	2540	5370	5370	8290	13160	17480	29800	46250	61400	108850	156200
Load by hydraulic test pressure at 3.0MPa	(N)	2760	2760	6060	6060	9390	15060	19920	34200	53100	73200	130200	188100

DATA/JB Type Bellows Expansion Joint

■ ABOUT BELLOWS MATERIAL SUS316L (Stainless steel)

The JIS B 2352 Bellows Type Expansion Joint recommends SUS304, SUS304L, SUS316, SUS 316L, and others for making bellows. To ensure durability and corrosion resistance, which are extremely important parameters for high grade bellows, we selected SUS316L for making bellows and all parts that contact with fluid. With higher performance than SUS304, SUS316L is considered having the same or even higher characteristics than SUS304L. See the following table for characteristics of SUS316L and SUS304L.

■ COMPARISON BETWEEN SUS316L AND SUS304L

TABLE1. CHEMICAL COMPOSITION (%)

Type	Carbon C	Silicon Si	Manganese Mn	Phosphor P	Sulfur S	Nickel Ni	Chrome Cr	Molybdenum Mo
SUS316L	0.030 or less	1.00 or less	2.00 or less	0.045 or less	0.030 or less	12.00~15.00	16.00~18.00	2.00~3.00
SUS304L	0.030 or less	1.00 or less	2.00 or less	0.045 or less	0.030 or less	9.00~13.00	18.00~20.00	—

TABLE2. MECHANICAL PROPERTY

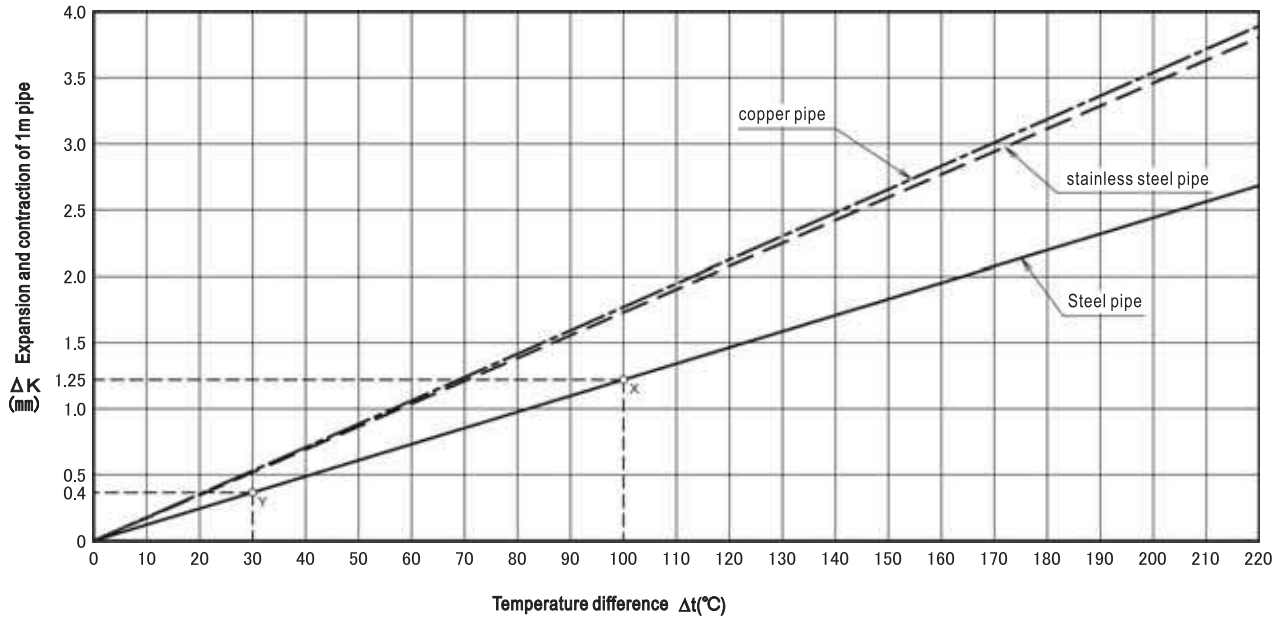
Type	Tensile test			Hardness test		
	Yield Strength N/mm^2	Tensile N/mm^2	Elongation %	HB	HRB	HV
SUS316L	175 or more	480 or more	40 or more	187 or less	90 or less	200 or less
SUS304L	175 or more	480 or more	40 or more	187 or less	90 or less	200 or less

TABLE3. ANTICORROSION

Type	All surface corrosion	Intercrystalline corrosion	Stress corrosion crack	Porous corrosion	Gap corrosion
SUS316L	○	○	◎	◎	◎
SUS304L	○	○	○	○	○

＊○:Superior ◎:Much superior

■ FIG.1 EXPANSION AND CONTRACTION OF 1m PIPE



■ SELECTING EXPANSION JOINT

Determine the type and number of expansion joints based on the material of pipe and change of temperature, which are factors affecting expansion/ contraction of pipe.

● Calculation $n = \frac{\Delta \ell}{\delta}$

$$\Delta \ell = \beta \quad \Delta t \quad \ell$$

n	: number of joints	
δ	: max. expansion/contraction of joint	(mm)
Δℓ	: expansion/contraction of pipe	(mm)
β	: linear expansion coefficient of pipe	(mm/m/℃)
	Steel pipe	(12.2×10^{-3})
	Copper pipe	(17.7×10^{-3})
	Stainless steel pipe	(17.3×10^{-3})
Δt	: temperature difference	(℃)
ℓ	: length of pipe	(m)

● Example

Under the following conditions:
Length of pipe (ℓ): 35m
Max. working temperature (t_1): 120℃
Min. ambient temperature (t_2): −10℃
Ambient temperature at the time of installation (t_3): 20℃
Determine the type and number of expansion joints.
The pipe is steel pipe and the joint is to be determined based on standard face-to-face dimensions.

DATA/JB Type Bellows Expansion Joint

Step 1: Calculate expansion/contraction of pipe

Temperature difference at the expansion side of pipe:

$\Delta t_1 = t_1 - t_3 = 120 - 20 = 100℃$

Temperature difference at the contraction side of pipe:

$\Delta t_2 = t_3 - t_2 = 20 - (-10) = 30℃$

According to point X in Fig.1,

Expansion of 1m pipe $\Delta k_1 = 1.25$mm

According to point Y in Fig.1,

Contraction of 1m pipe $\Delta k_2 = 0.40$mm

Therefore,

The expansion of 35m pipe is:

$\Delta \ell_1 = k_1 \quad \ell$

$= 1.25 \quad 35 = 43.75$mm

The contraction is:

$\Delta \ell_2 = k_2 \quad \ell$

$= 0.40 \quad 35 = 14.0$mm

Step 2: Determine type and number of joints

For selecting JIS certified JB-13, 21 (single type),

The expansion side of pipe (δ=25mm): $n = \frac{\Delta \ell_1}{\delta} = \frac{43.75}{25} = 1.75$

The contraction side of pipe (δ=10mm): $n = \frac{\Delta \ell_2}{\delta} = \frac{14.0}{10} = 1.40$

The number of joints should be the larger one, i.e. 2.

For selecting JIS certified JB-14, 22 (duplex),

The expansion side of pipe (δ=50mm): $n = \frac{\Delta \ell_1}{\delta} = \frac{43.75}{50} = 0.875$

The contraction side of pipe (δ=20mm): $n = \frac{\Delta \ell_2}{\delta} = \frac{14.0}{20} = 0.70$

The number of joints should be the larger one, i.e. 1.

To select other types of joints, follow the same steps above mentioned.

POINTS FOR INSTALLATION

- The arrow mark on the main body should match with the flow of fluid.
- Make sure no torsional stress is applied on bellows.
- The following parts are for fixing faces and need to be removed after piping is completed.

  JB-13~18: nut and washer

  JB-21~24: set bolt

POINTS FOR HANDLING

1. Fixing point

Fixing point with sufficient strength are necessary for installing expansion joint. The position and type of fixing point are the following.

① Main fixing point

- The end of straight pipe where closing plate is installed;
- Bending pipe where the direction of flow changes;
- Between two expansion joints, where reducer is used to change the diameter of pipe;
- Pipe between two expansion joints, where valve is installed;
- The inlet of branch pipe where free expansion joint is installed.

② Intermediate fixing point

- In the middle of two expansion joints between main fixing point;
- Anchor base (installation position) of double type expansion joint.

2. Guide and pipe support

① Guide

To ensure correct expansion and contraction of expansion joint, the axes of expansion joint and pipe must match with each other. In addition, it is necessary to use guides to transmit the force for the movement in axial direction to fixing points. The guides need to be installed according to the following intervals.

The deviation of pipe axes is ±2mm for size 125mm or smaller pipe, and ±3mm for size 150mm or larger pipe. The deviation of degree of parallelization of pipe should be ±2°.

L_1: The interval between expansion joint and No.1 guide.

L_2: The interval between No.1 guide and No.2 guide.

L_3: The interval between No.2 guide and middle guide.

Load on main fixing point of main straight pipe Fm (N)

$Fm = Fp + Fe$

$Fp = Ae \quad P$

$Fe = K \quad S$

Load on main fixing of bending pipe Fb (N)

$Fb = 2Fm \sin\frac{\theta}{2} + Fc$

$Fc = \left(\frac{2A\rho V^2}{g} \sin\frac{\theta}{2} \right) \quad 98.0665$

Load on intermediate fixing Fi (N)

$Fi = Fe$

Fp: Load in axial direction due to internal pressure	(N)
Fe: Load due to specified contraction	(N)
Ae: Effective area of bellows	(mm^2)
P : Working pressure	(MPa)
K : Bellows spring constant	(N/mm)
S : expansion/contraction	(mm)
θ : Bending angle of pipe (see Fig.5 Piping example)	
Fc: Load due to centrifugal force of fluid	(N)
A : cross sectional area of pipe	(cm^2)
ρ : Density of fluid	(g/cm^3)
V : Velocity of flow	(m/s)
g : Acceleration of gravity	($980cm/s^2$)

Fig.2-1 Interval of guides

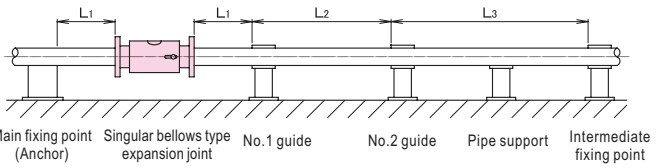
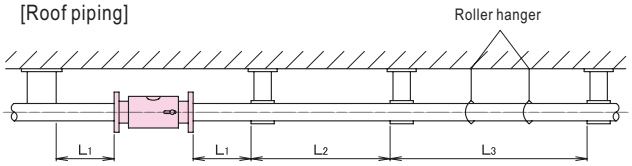


Fig.2-2 Example of Roof piping

[Roof piping]



Note: The pipe may buckle if only roller hanger is used. In this case, guides are necessary.

DATA/JB Type Bellows Expansion Joint

The maximum interval between guides can be calculated using the following formula.
The interval (max.) between intermediate guides (L_3) can be determined using Fig.3.

$L_1 \leqq 4D$

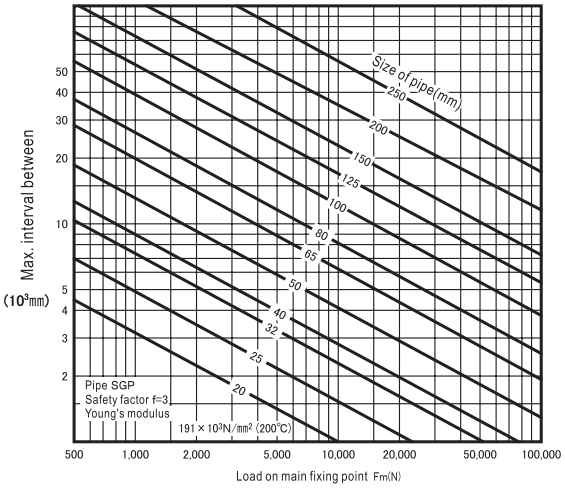
$L_2 \leqq 14D$

$L_3 \leqq \sqrt{\frac{\pi^2 EI}{fFm}}$ $\quad L=\frac{\pi}{64}(D^4-d^4)$

L_1, L_2, L_3: Interval between guides (max.)		(mm)
D: External diameter of pipe		(mm)
d: Internal diameter of pipe		(mm)
E: Young's modulus at the designed temperature of pipe material		(N/mm^2)
Steel pipe 200℃:	191	$10^3 N/mm^2$
Stainless steel pipe 200℃:	183	$10^3 N/mm^2$
Copper pipe 200℃:	116	$10^3 N/mm^2$
I: Secondary moment of the cross section of pipe		(mm^4)
f: Safety factor		(>3)
Fm: Load on main fixing point		(N)

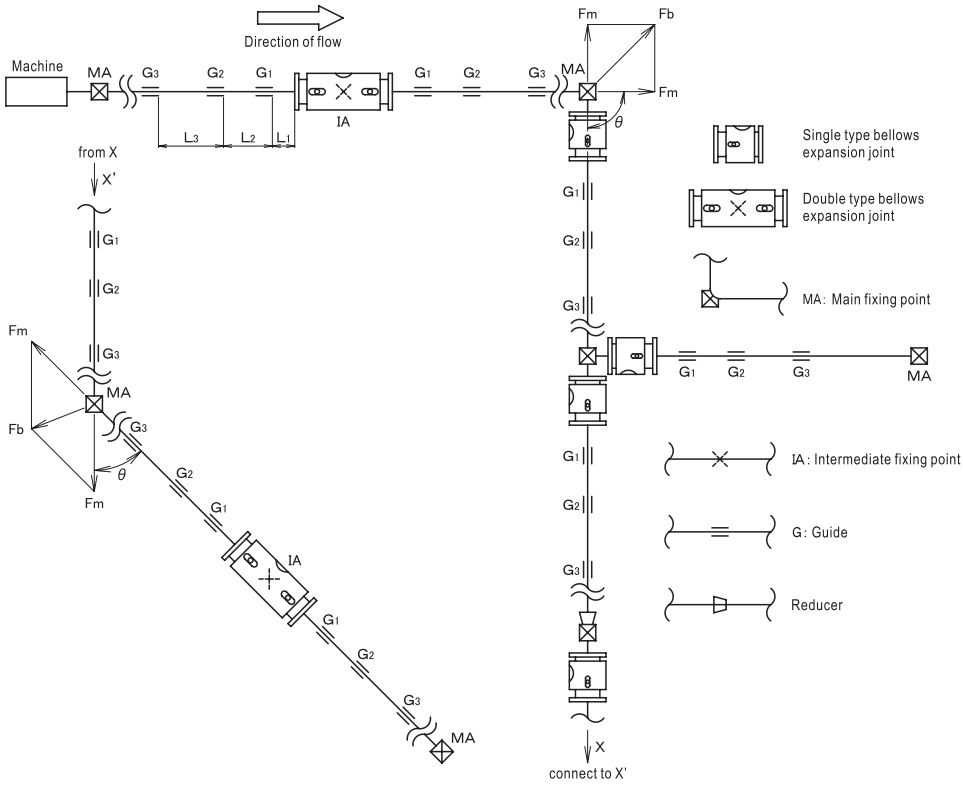
② Pipe supporting
Install roller support or roller hanger guide to prevent pipe from bending due the weight of pipe or fluid.

Fig.3 Max. interval between intermediate guides



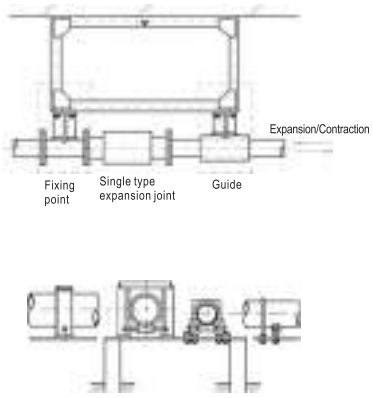
Note: See page 177 for STPG pipe.

Fig. 5 Piping example



Note: Carry out axes matching before installing expansion joint.

Fig.4 Fixing point and guide (example)



JS Type Sleeve Expansion Joint

for Building・Air Conditioning Equipments, Factory Equipments etc.

Flanged

Solutions for Pipe Expansion/Contraction, Ground Sinkage

Sleeve expansion joint absorbing expansion/contraction of pipe in axial direction due to change of temperature.
Suitable for main pipeline in high buildings, area conditioning, plants, factories, hospitals. Also serve as countermeasure for ground sinkage and earthquake.

FEATURES

- Supper packing for high sealing performance.
- Safe structure.
- Large expansion/contraction.
- No need for lubrication.
- All Stainless steel products are also suitable for water supply.

SPECIFICATIONS

Model name	JS-5HF	JS-6HF	JS-7HF	JS-8HF
Code name	**JS5HF-N**	**JS6HF-N**	**JS7HF-N**	**JS8HF-N**
Applicable fluid	Steam, air, gases, water & oils			
Applicable pressure	Max. 1.0MPa		Max. 2.0MPa	
End connection	Flanged JIS 10KFF		Flanged JIS 20KRF	
Fluid temperature	Max. 220℃			
Materials	Sleeve(Stainless steel), External sleeve(Carbon steel), Flange(Mild steel), Packing(Graphite compound)			
Pressure test	Hydraulic 1.5MPa		Hydraulic 3.0MPa	
Expansion amount	100mm	200mm	100mm	200mm
Expansion	20mm	40mm	20mm	40mm
Contraction	80mm	160mm	80mm	160mm

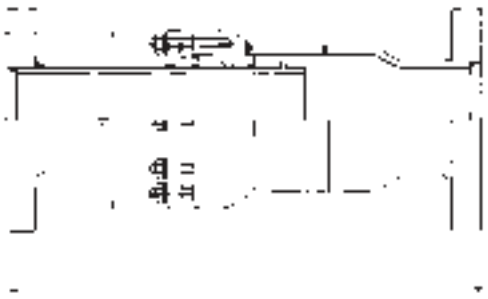
＊All stainless steel material available upon request.

DIMENSIONS

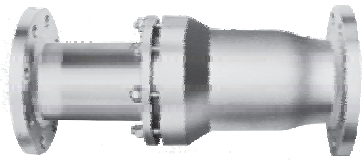
DIMENSIONS	L(mm)		D(mm)	Pressure receiving area of sleeve Ae(mm^2)	Friction resistance of sleeve μ(N)	Load on main fixing point (N)	
Model Name / Size	JS-5HF,7HF (Max. exp. 100mm)	JS-6HF,8HF (Max. exp. 200mm)				JS-5HF,6HF (at 1.0MPa)	JS-7HF,8HF (at 2.0MPa)
20(¾″)	380	560	83	530	1300	1900	2400
25(1″)	380	560	90	860	1600	2500	3400
32(1¼″)	380	560	100	1320	2000	3400	4700
40(1½″)	380	560	105	1730	2300	4100	5800
50(2″)	380	560	120	2460	2700	5200	7700
65(2½″)	430	600	135	4300	3600	8000	13000
80(3″)	430	600	145	5810	4200	11000	16000
100(4″)	430	640	185	9850	5400	16000	26000
125(5″)	500	640	210	14700	6600	22000	37000
150(6″)	500	690	235	20600	7800	29000	49000
200(8″)	500	690	300	35600	10300	46000	82000
250(10″)	580	740	350	54700	12700	68000	123000
300(12″)	580	740	415	77900	15200	94000	172000

Flange code JIS 10KFF, JIS 20KRF

CONSTRUCTION



Depending on size, the structure may vary.



JS Type Sleeve Expansion Joint

Welded

Sleeve expansion joint absorbing Expansion/Contraction of pipe in axial direction due to change of temperature.

Suitable for main pipeline in high buildings, area conditioning, plants, factories, hospitals. Also serve as countermeasure for ground sinkage and earthquake.

FEATURES

- Supper packing for high sealing performance.
- Safe structure.
- Large expansion/contraction.
- No need for lubrication.
- ALL Stainless steel products are also suitable for water supply.

SPECIFICATIONS

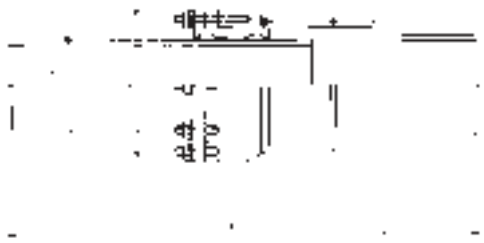
Model name	JS-5HW	JS-6HW	JS-7HW	JS-8HW
Code name	**JS5HW-N**	**JS6HW-N**	**JS7HW-N**	**JS8HW-N**
Applicable fluid	Steam, air, gases, water & oils			
Applicable pressure	Max. 1.0MPa		Max. 2.0MPa	
End connection	Butt-weld			
Fluid temperature	Max. 220℃			
Materials	Sleeve(Stainless steel), External sleeve(Carbon steel), Packing(Graphite compound)			
Pressure test	Hydraulic 1.5MPa		Hydraulic 3.0MPa	
Expansion amount	100mm	200mm	100mm	200mm
Expansion	20mm	40mm	20mm	40mm
Contraction	80mm	160mm	80mm	160mm

* All stainless steel material available upon request.

DIMENSIONS

DIMENSIONS	L(mm)		D(mm)	Pressure receiving area of sleeve Ae(mm^2)	Friction resistance of sleeve μ(N)	Load on main fixing point (N)	
Model Name / Size	JS-5HW,7HW (Max. exp. 100mm)	JS-6HW,8HW (Max. exp. 200mm)				JS-5HW,6HW (at 1.0MPa)	JS-7HW,8HW (at 2.0MPa)
20(¾″)	410	590	83	530	1300	1900	2400
25(1″)	410	590	90	860	1600	2500	3400
32(1¼″)	410	590	100	1320	2000	3400	4700
40(1½″)	410	590	105	1730	2300	4100	5800
50(2″)	410	590	120	2460	2700	5200	7700
65(2½″)	460	630	135	4300	3600	8000	13000
80(3″)	470	640	145	5810	4200	11000	16000
100(4″)	470	680	185	9850	5400	16000	26000
125(5″)	540	680	210	14700	6600	22000	37000
150(6″)	540	730	235	20600	7800	29000	49000
200(8″)	540	730	300	35600	10300	46000	82000
250(10″)	620	780	350	54700	12700	68000	123000
300(12″)	620	780	415	77900	15200	94000	172000

CONSTRUCTION



Depending on size, the structure may vary.

DATA/JS Type Sleeve Expansion Joint

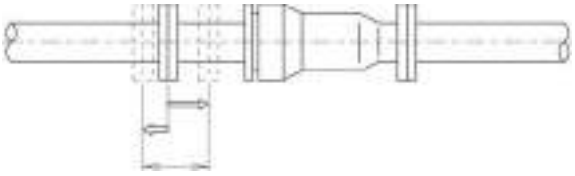
■ ABOUT SUPER PACKING

Super packing is packing material made of flexible graphite and a certain type of inorganic substance in specific proportion. It has a high sealing performance and reliable service life.

In addition, it can resist −200~450℃ temperature and shows great corrosion resistance against acid, alkaline, and organic solvents.

■ EXAMPLE OF APPLICATION

Fig.1 Absorption of thermal expansion



Extension and Compression

Fig.2 Ground sinkage prevention

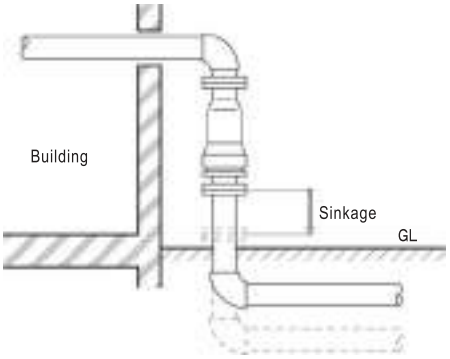
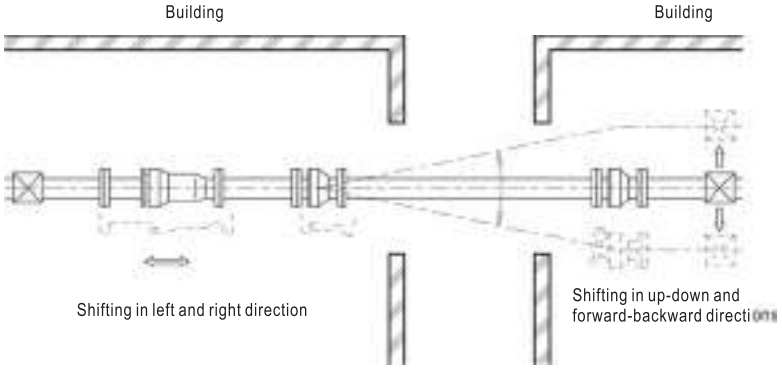


Fig.3 Earthquake-proof building and ground sinkage prevention



■ CALCULATING EXPANSION/CONTRACTION OF PIPE

$\Delta \ell = \beta \quad \Delta t \quad \ell$

$\Delta \ell$: Expansion/Contraction of pipe (mm)

β: Linear expansion coefficient of pipe

12.2 10^{-3}mm/m/℃ (steel pipe)

Δt: Temperature difference (℃)

ℓ: Length of pipe (m)

Note: The extension/compression of 1m pipe can also be calculated using Fig.1 in page 171.

■ FIXING POINT INSTALLATION

Fixing point with sufficient strength are necessary for installing expansion joint. The position of fixing point is the following.

① Main fixing point

- The end of straight pipe where closing plate is installed.
- Bending pipe where the direction of flow changes;
- Between two expansion joints, where reducer is used to change the diameter of pipe;
- Pipe between two expansion joints, where valve is installed;
- The inlet of main pipe of branch pipe with free expansion joint.

② Intermediate fixing point

In the middle of two expansion joints between main fixing point.

■ LOAD ON FIXING POINT

Load on main fixing point of straight pipe Fm (N)

Fm=Ae P+μ

Load on intermediate fixing point Fi (N)

Fi=μ

Ae: Pressure receiving area of sleeve (mm^2)

P: Pressure of fluid (MPa)

μ: Friction resistance of sleeve (N)

DATA/JS Type Sleeve Expansion Joint

■ GUIDE AND PIPE SUPPORT

① Guide

To ensure correct expansion and contraction of expansion joint, the axes of expansion joint and pipe must match with each other. In addition, it is necessary to use guides to transmit the force for the movement in axial direction to fixing point. The guides need to be installed according to the following intervals.

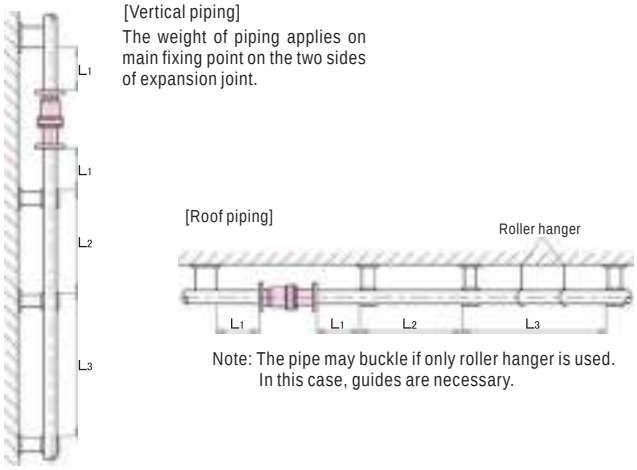
The deviation of pipe axes is ±2mm for size 125mm or smaller pipe, and ±3mm for size 150mm or larger pipe. The deviation of degree of parallelization of pipe should be ±0.5°.

L_1: The interval between expansion joint and No.1 guide.

L_2: The interval between No.1 guide and No.2 guide.

L_3: The interval between No.2 guide and middle guide.

Fig. 4-2 Vertical piping and Roof piping



The max. interval of guides can be calculated using the following formula. The max. interval of intermediate guide (L_3) can be determined using Fig.5. (For STPG Sch40)

$L_1 \leqq 4D$

$L_2 \leqq 14D$

$L_3 \leqq \sqrt{\frac{\pi^2 EI}{fFm}}$ $\qquad L=\frac{\pi}{64}(D^4-d^4)$

L_1, L_2, L_3: Interval between guides (max.)		(mm)
D: External diameter of pipe		(mm)
d: Internal diameter of pipe		(mm)
E: Young's modulus at the designed temperature of pipe material		(N/mm^2)
Steel pipe 200℃:	191	$10^3 N/mm^2$
Stainless steel pipe 200℃:	183	$10^3 N/mm^2$
I: Secondary moment of the cross section of pipe		(mm^4)
f: Safety factor		(>3)
Fm: Load on main fixing point		(N)

② Pipe supporting

Install roller support or roller hanger guide to prevent pipe from bending due the weight of pipe or fluid.

Fig.5 Max. interval between intermediate guides

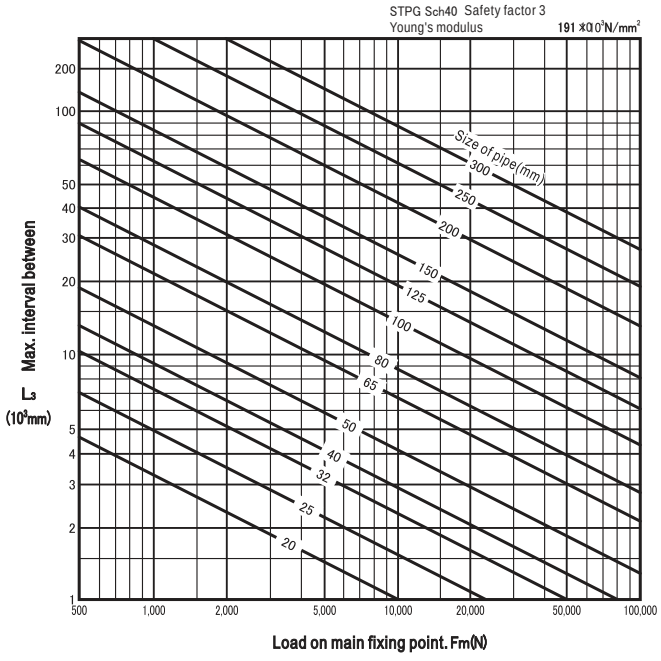


Fig.4-1 Interval between guides

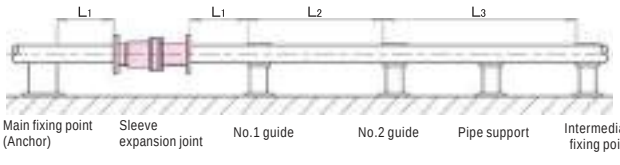
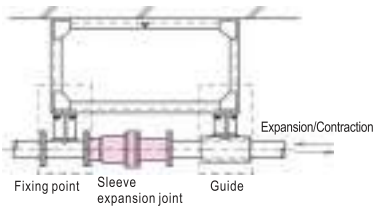
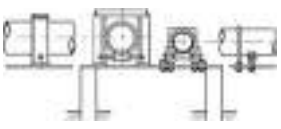


Fig.6 Fixing point and Guide (example)



Other guide (example)



JU-1 Type Ball Joint

Screwed

Complicated displacement of pipeline occurs due to expansion, contraction, shifting of axes, bending, twisting caused by change of temperature, ground sinkage, earthquake, and other factors. Ball joint can absorb such displacement. It is sold, durable, and can simplify piping works.

SPECIFICATIONS

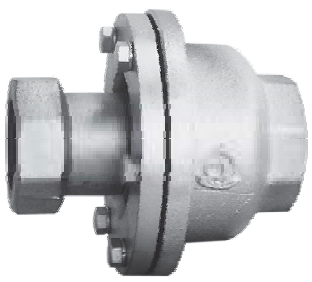
Model name	JU-1
Code name	JU1-M
Applicable fluid	Steam, air, gases, water & oils
Applicable pressure	Max. 1.0MPa
Fluid temperature	Max. 220℃
Max. displacement angle	30°
Rotation angle	360°
Pressure test	Hydraulic 1.5MPa
End connection	Screwed JIS Rc
Materials	Body(Ductile cast iron), Ball(Ductile cast iron chrome plated), Packing(Teflon)

DIMENSIONS

(mm)

Size	L	H	A	d	Mass(kg)	Torque(N m)
25(1″)	150	90	118	1″	3.3	100
32(1¼″)	160	100	134	1¼″	4.6	130
40(1½″)	170	105	148	1½″	6.3	150
50(2″)	185	115	170	2″	8.5	220

CONSTRUCTION



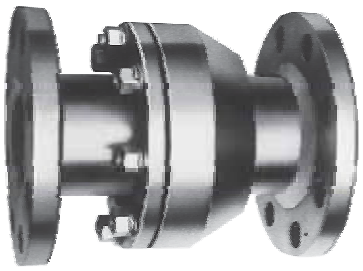
JU Type Ball Joint

Flanged・Welded

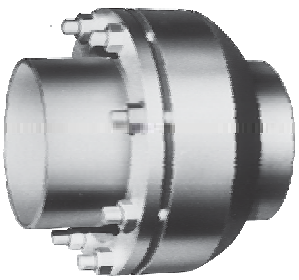
for Building・Air-conditioning Equipments, Factory Equipments, and Earthquake-proof Buildings etc.

Solutions for Preventing Expansion and Contraction of Pipelines, Earthquake-proof, and Ground Sinkage

Absorb expansion and contraction in axial direction of pipeline, shifting of axes, bending, twisting, and other displacement of pipeline due to ground sinkage or earthquake. Ideal for high buildings, area conditioning, plants, storage tanks, and factories.



JU-3F, 4F Type



JU-3W, 4W Type

FEATURES

- Super Packing allows high sealing performance.
- Large displacement in limited space.
- Low load on fixing point, allows utilization of small fixing point.
- Absorb thermal expansion of pipeline and the movement of pipeline due to ground sinkage.

SPECIFICATIONS

Model name	JU-3F	JU-3W	JU-4F	JU-4W
Code name	**JU3F-N**	**JU3W-N**	**JU4F-N**	**JU4W-N**
Applicable fluid	Steam, air, gases, water & oils			
Applicable pressure	Max. 1.0MPa		Max. 2.0MPa	
End connection	Flanged JIS 10KFF	Butt-weld	Flanged JIS 20KRF	Butt-weld
Fluid temperature	Max. 220℃			
Materials	Ball(Stainless steel), End pipe(Carbon steel), Flange(Mild steel), Packing(Graphite compound)			
Pressure test	Hydraulic 1.5MPa		Hydraulic 3.0MPa	

＊All stainless materials are available upon request.

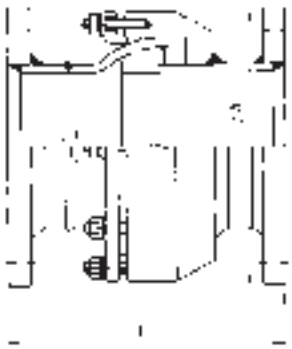
DIMENSIONS

DIMENSIONS / Models / Size	L(mm) JU-3F JU-4F	L(mm) JU-3W JU-4W	A(mm)	Max. displacement angle(θ)	Torque(N m) JU-3F JU-3W	Torque(N m) JU-4F JU-4W
50(2″)	220	210	125	20	200	200
65(2½″)	240	230	145	20	300	300
80(3″)	270	260	160	20	400	500
100(4″)	295	280	195	20	700	800
125(5″)	315	300	220	15	900	1100
150(6″)	325	310	255	15	1300	1600
200(8″)	375	360	335	15	2400	3100
250(10″)	390	430	395	15	4000	5200
300(12″)	430	480	465	15	6000	8200

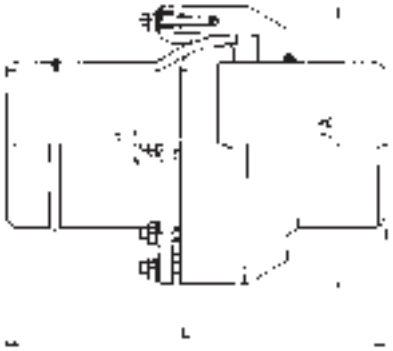
＊Flange type: Flange code JIS 10KFF, JIS 20KRF

CONSTRUCTION

JU-3F, 4F Type



JU-3W, 4W Type



DATA/JU Type Ball Joint

■ CALCULATING EXTENSION / COMPRESSION OF PIPELINE

$\delta = \beta \quad \Delta t \quad L$

δ: Expansion and contraction of pipe (mm)
β: Linear expansion coefficient of pipe
12.2×10^{-3}mm/m/℃ (steel pipe)
Δt: Temperature difference (℃)
L: Length of pipe (m)

The expansion/contraction of 1m pipe can be calculated using Fig.1 in page 171.

In the case of earthquake-proof buildings and solutions for preventing ground sinkage and absorption of displacement between buildings, the expansion/contraction should be added with displacement.

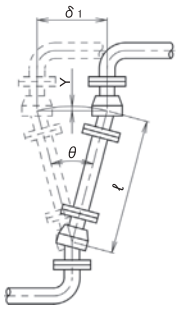
■ POSITIONS FOR INSTALLING BALL JOINT

Generally, ball joint can be installed at any position, provided it can absorb the expansion or contraction of pipe. However, in the case of absorption of displacement in axial direction, installing ball joint at the bending part or ascending/descending part of pipe can help saving space.

■ INSTALLING 2 BALL JOINTS
(Determining interval between ball joints)

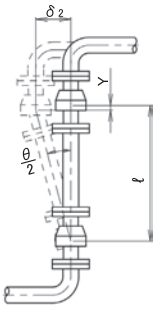
The interval between ball joints can be calculated using the following formula, where the interval is ℓ, expansion/contraction of pipe is δ, the displacement angle is θ, and safety factor is 1.5.

Fig.1



$$\ell \geqq \frac{\frac{\delta_1}{2}\ 1.5}{\sin\frac{\theta}{2}}$$

Fig.2



$$\ell \geqq \frac{\delta_2\ 1.5}{\sin\frac{\theta}{2}}$$

■ CALCULATING DEFLECTION OF PIPE

When two ball joints are used, deflection may occur when pipe expands. The deflection can be calculated using the following formula.

In Fig.1,

$$Y=\ell-\sqrt{\ell^2-\left(\frac{\delta_1}{2}\right)^2}$$

In Fig.2,

$$Y=\ell-\sqrt{\ell^2-\delta_2^{\ 2}}$$

ℓ : Interval between ball joints (mm)
δ_1 : Expansion/Contraction of pipe (in the case of Fig.1) (mm)
δ_2 : Expansion/Contraction of pipe (in the case of Fig.2) (mm)
Y : Deflection of pipe (mm)
θ : Displacement angle of ball joint

The results of calculations are shown in Tab.1.

■ TABLE1. DEFLECTION OF PIPE "Y"

(mm)

Expansion of piping		40	60	80	100	150	200	300	400
Expansion of piping		20	30	40	50	75	100	150	200
The distance "ℓ" between ball joints	800	0.25	0.56	1.0	1.6	3.5	6.3	14.2	25.4
	1000	0.20	0.45	0.8	1.3	2.8	5.0	11.3	20.2
	1500	0.13	0.30	0.53	0.83	1.9	3.3	7.5	13.4
	2000	0.10	0.23	0.40	0.63	1.4	2.5	5.6	10.0
	2500	0.08	0.18	0.32	0.50	1.2	2.0	4.5	8.0
	3000	0.07	0.15	0.27	0.42	0.94	1.7	3.8	6.7
	4000	0.05	0.12	0.20	0.32	0.70	1.3	2.8	5.0
	5000	0.04	0.09	0.16	0.25	0.56	1.0	2.3	4.0

Deflection of pipe causes bending moment on pipe. Therefore, the distance to the first guide should be longer than the distance calculated using the following formula.

$$X=f\sqrt{\frac{3EYD}{2\sigma}}$$

X: Min. distance to the first guide (mm)
f: Safety factor (>2)
E: Young's modulus (N/mm^2)
Y: Deflection of pipe (mm)
D: External diameter of pipe (mm)
σ: Allowable stress of pipe (N/mm^2)

In the case of steel pipes, the minimum distance "X" to the first guide is shown in TABLE 2. taking Safety factor "f"=2
$E=191\times10^3 N/mm^2$,
"σ"=70N/mm^2 ※: 200℃

■ TABLE2. MINIMUM DISTANCE "X" TO THE FIRST GUIDE

(mm)

Y / Size	Deflection "Y" of pipe							
	1	2	4	6	8	10	12	14
25(1″)	800	1100	1600	1900	2200	2400	2700	2900
32(1¼″)	900	1200	1700	2100	2400	2700	3000	3200
40(1½″)	1000	1300	1900	2300	2600	2900	3200	3400
50(2″)	1100	1500	2000	2500	2900	3200	3500	3800
65(2½″)	1200	1700	2300	2800	3300	3600	4000	4300
80(3″)	1300	1800	2500	3000	3500	3900	4300	4600
100(4″)	1400	2000	2800	3400	4000	4400	4800	5200
125(5″)	1600	2100	3100	3800	4400	4900	5400	5800
150(6″)	1700	2400	3400	4100	4800	5300	5800	6300
200(8″)	2000	2700	3900	4700	5400	6100	6700	7200
250(10″)	2200	3000	4300	5200	6000	6800	7400	8000
300(12″)	2400	3300	4700	5700	6600	7400	8100	8700

∗ In case of using 3 ball joints, there will be no deflection. So, the first guide should be installed at the nearest point of the ball joint.

■ THE DISTANCE "ℓ" BETWEEN BALL JOINTS

Max. Displacement angle of joint	Fig.1	Fig.2
θ=30° (JU-1 Type)	$\ell \geqq 3\delta_1$	$\ell \geqq 6\delta_2$
θ=20° (JU-3~4 Type Size 100mm and below)	$\ell \geqq 4.5\delta_1$	$\ell \geqq 9\delta_2$
θ=15° (JU-3~4 Type Size 125mm above)	$\ell \geqq 6\delta_1$	$\ell \geqq 12\delta_2$

DATA/JU Type Ball Joint

■ USING 3 BALL JOINTS

① One-way expansion

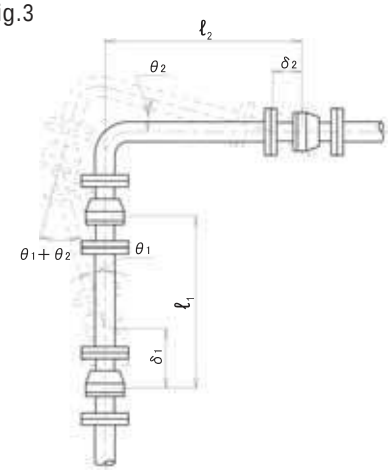
By using a combination of 3 ball joints, it is able to absorb deflection and bending stress that occur in the case of using 2 ball joints.

The interval can be calculated using the same formulas as those utilized in the case of using 2 ball joints.

② Two-way expansion

Using 3 ball joints can also absorb expansion of pipe in two directions. The interval (ℓ) can be calculated using the longer one of δ_1 and δ_2 and $\ell_1=\ell_2$. The total of θ_1 and θ_2 should not exceed allowable displacement angle($\frac{\theta}{2}$).

Fig.3



■ INSTALLING FIXING AND THE FIRST GUIDE

ⓐ Fixing point should be installed at the two ends and points that equally divide the extension of pipe.

ⓑ The first guide should be installed at a position as near as possible to ball joint. In the case 2 ball joints are used, see Tab.2 in page 180.

ⓒ The load of fixing point and the guide can be calculated using the following formulas. Fixing point and the guide must be strong enough to bear this load.

$$F_1=\frac{2T}{\ell}\quad 1000$$

$$F_2=\frac{3EIY}{X^3}$$

$$F_T=\sqrt{F_1^2+F_2^2}$$

$$F_Z=\sqrt{F_A^2+F_B^2-2F_AF_B\cos\alpha}$$

$$F_Z=\sqrt{F_A^2+F_B^2}\quad(\alpha=90°)$$

F_1: The load of the first guide when fixing points and 3 ball joints are used (N)
See Tab.3 in page 183.

F_2: The load of the first guide when fixing points and 2 ball joints are used (N)
See Tab.4 in page 183.

F_T, F_Z: Combined load of fixing points (N)

F_A: Axial load of pipe A (N)
See Fig.8.

F_B: Axial load of pipe B (N)
See Fig.8.

α : Angle between pipe A and B (°)
ℓ : Interval between ball joints (mm)
T : Torque of ball joint (N m)
See dimension table in page 178, 179.
I : Inertia moment (mm^4)

$$I=\frac{\pi}{64}(D^4-d^4)$$

D : External diameter of pipe
d : Internal diameter of pipe
E : Young's modulus
Steel pipe (200℃): 191 $10^3N/mm^2$
X : Distance to the first guide (mm)
Y : Deflection of pipe (mm)

■ PIPING EXAMPLE

Fig.4

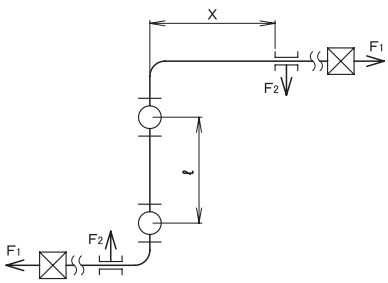


Fig.5

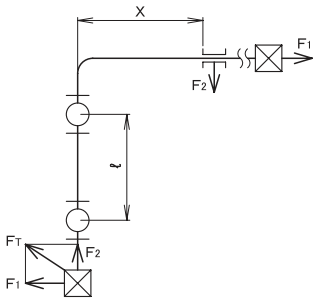


Fig.6

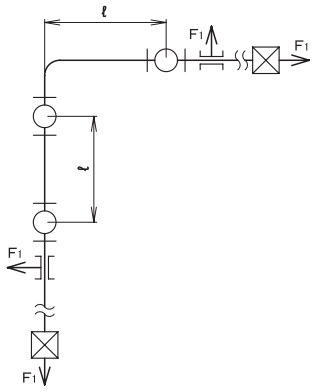


Fig.7

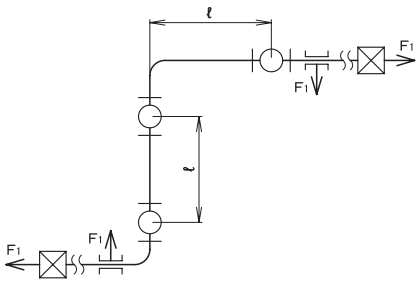
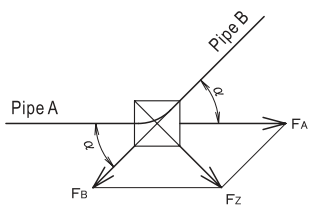


Fig.8

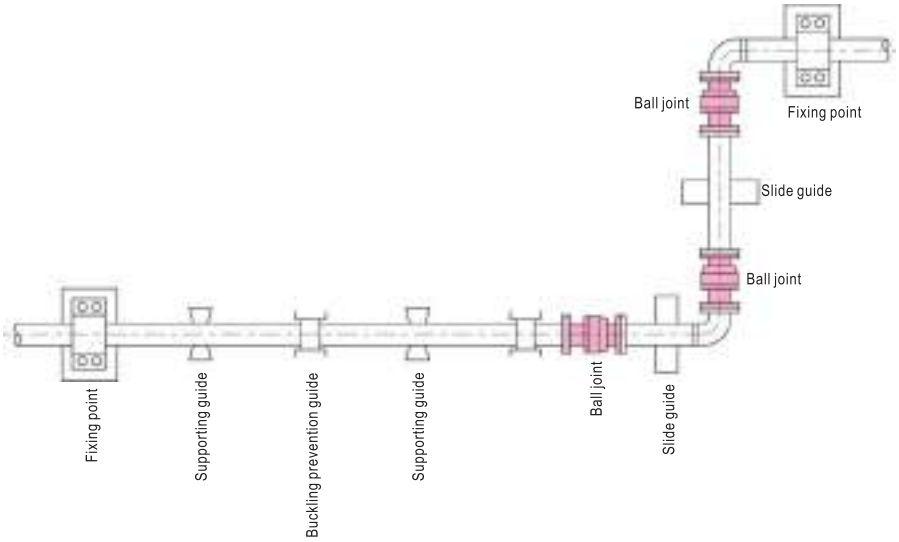


Ball joint
Anchor
The first guide

DATA/JU Type Ball Joint

■ PIPING EXAMPLE

● Horizontal piping



■ GUIDE

ⓐ Buckling prevention guide

To allow correct expansion of pipe, it is necessary to install guides for supporting pipe and preventing buckling. The interval between buckling prevention can be calculated using the following formula.

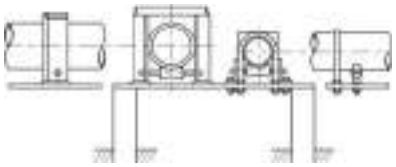
$$L=\sqrt{\frac{\pi^2 EI}{fF}}$$

L: Interval between guides	(mm)
F: Axial load of pipe	(N)
E: Young's modulus	(N/mm^2)
I: Secondary moment of cross section of pipe	(mm^4)
f: Safety factor	(>3)

ⓑ Pipe supporting

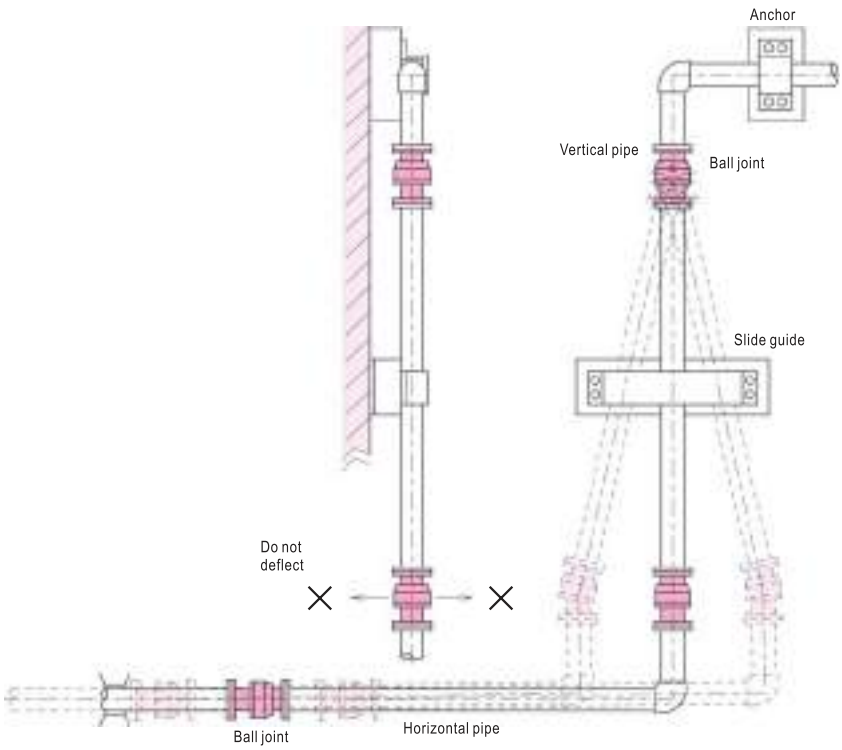
Pipe may bend due to its weight and the weight of fluid. To prevent pipe from bending, it is necessary to install roller, hanger, and other guides. In addition, since the pipe between ball joints move in horizontal direction, it is also necessary to install slide joint on this section of pipe.

● An example of buckling prevention guide



● Vertical piping

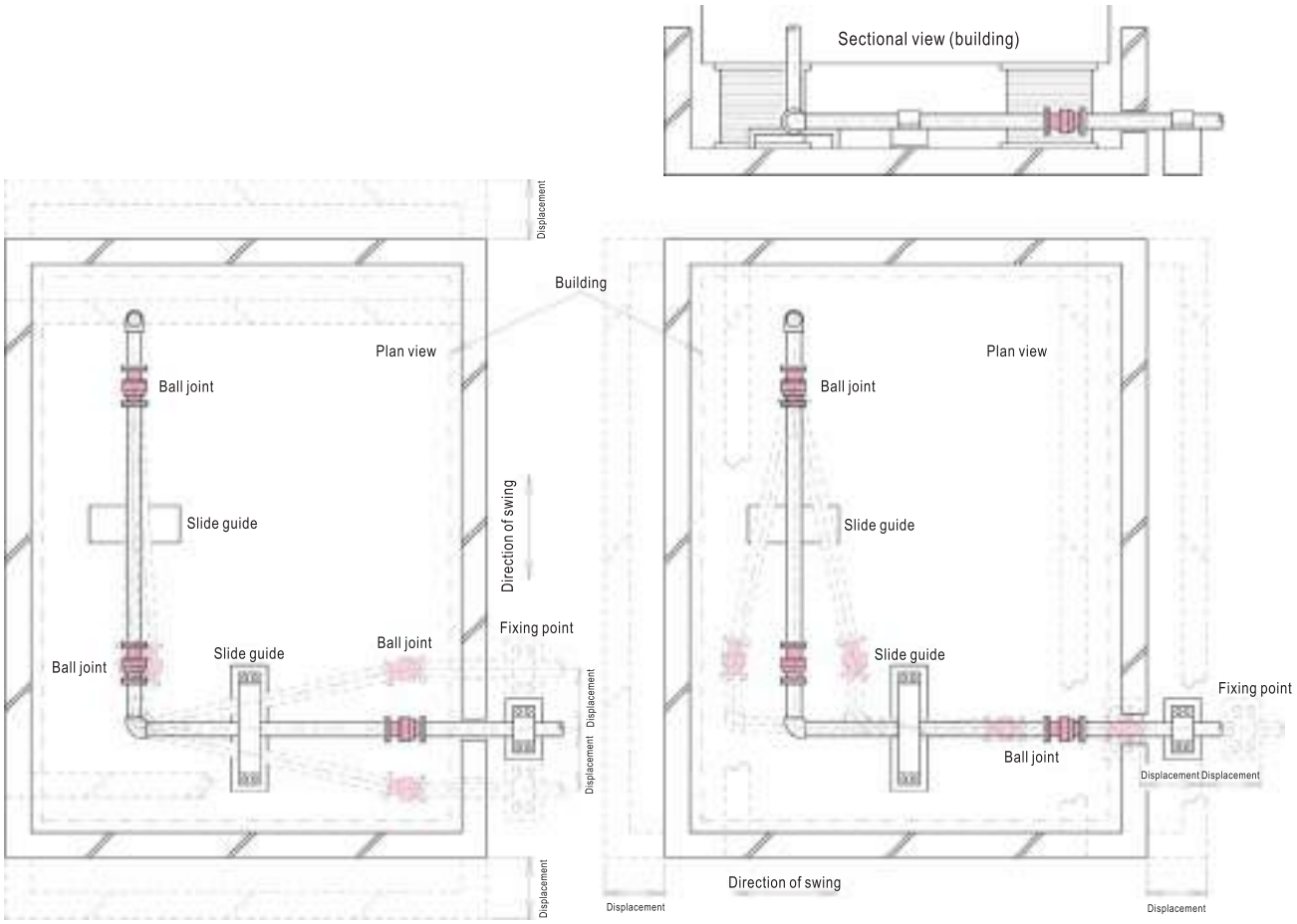
Make sure the ball joint in the middle does not deflect from the direction of sliding and clamps the pipe from both sides. Install slide guide on vertical pipe (as shown in the figure) or horizontal pipe.



DATA/JU Type Ball Joint

■ USING BALL JOINT IN EARTHQUAKE-PROOF BUILDING

Example (using 3 ball joints)



■ TABLE 3. F_1 at Pressure 1.0MPa

(N)

Size	Distance between Ball joints ℓ (mm)					
	1000	1500	2000	2500	3000	4000
50(2″)	400	270				
65(2½″)	600	400				
80(3″)	800	540	400			
100(4″)	1400	940	700			
125(5″)		1200	900	720		
150(6″)		1740	1300	1040		
200(8″)		3200	2400	1920	1600	
250(10″)			4000	3200	2670	2000
300(12″)			6000	4800	4000	3000

∗ This table is for Types JU-3F & JU-3W.

■ TABLE 4. F_2 at deflection Y=1mm

(N)

Size	Distance to First guide X (mm)						
	1000	2000	3000	4000	5000	6000	7000
50(2″)	170	21	6.1	2.6			
65(2½″)	430	54	16	6.8			
80(3″)	740	93	28	12			
100(4″)		220	65	28	14		
125(5″)		450	140	56	29		
150(6″)		810	240	110	52	30	
200(8″)			630	270	140	79	50
250(10″)			1360	580	300	170	110
300(12″)			2560	1080	560	320	210

(STPG Sch40)

∗ 1. Required load can be figured out by multiplying the actual distance mm with the above figures.
∗ 2. This table is for Types JU-3F, 4F & JU-3W, 4W.

STRAINERS

11

■ Y TYPE

Model name	End connection	Size	Applicable pressure(MPa)	Body Materials	Page
KY-4	Screwed	15~65(½″~2½″)	Max. 1.0	Cast iron	186
KY-4N		15~50(½″~2″)		Cast bronze	
KY-7	Screwed	15~50(½″~2″)	Max. 1.0	Stainless steel	187
KY-6	Flanged	15~250(½″~10″)	Max. 1.0	Cast iron	188
KY-6CN		15~150(½″~6″)			
KY-8	Flanged	15~150(½″~6″)	Max. 1.0	Stainless steel	189
KY-3	Flanged	15~250(½″~10″)	Max. 3.0	Cast steel	190
KY-9	Flanged	150~600(6″~24″)	Max. 1.0	Carbon steel	191
KY-10				Stainless steel	

■ T TYPE

Model name	End connection	Size	Applicable pressure(MPa)	Body Materials	Page
KT-1	Flanged	50~300(2″~12″)	Max. 1.0	Cast iron	192
			Max. 1.6	Ductile cast iron	
KY-1G	Flanged	50~100(2″~4″)	Max. 1.0	Cast iron	
		125(5″)	Max. 0.75		
		150(6″)	Max. 0.5		
KY-1D	Flanged	250~300(10″~12″)	Max. 1.0	Cast iron	
KT-1PN	Flanged	50~300(2″~12″)	Max. 1.0	Cast iron	194
KT-1CN					
KT-3	Flanged	50~300(2″~12″)	Max. 1.0	Stainless steel	195
KT-3G	Flanged	50~100(2″~4″)	Max. 1.0	Stainless steel	
		125(5″)	Max. 0.75		
		150(6″)	Max. 0.5		

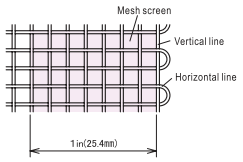
■ U TYPE

Model name	End connection	Size	Applicable pressure(MPa)	Body Materials	Page
KU-1	Flanged	25~250(1″~10″)	Max. 1.0	Cast iron	196
KU-1CN		25~125(1″~5″)			
KU-2	Flanged	15~100(½″~4″)	Max. 1.0	Stainless steel	197
KU-2G		15~80(½″~3″)			
KU-3	Flanged	125~600(5″~24″)	Max. 1.0	Carbon steel	198
KU-4		125~450(5″~18″)		Stainless steel	

■ W TYPE

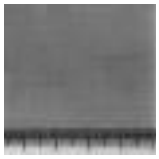
Model name	End connection	Size	Applicable pressure(MPa)	Body Materials	Page
KW-1	Flanged	20~65(¾″~2½″)	Max. 1.0	Cast iron	199
KW-2	Flanged	15~100(½″~4″)	Max. 0.7	Cast iron	200

[Reference: Mesh for strainer]



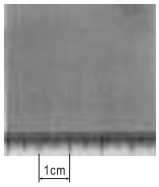
40-mesh
(mesh screen: 0.44mm)

60-mesh
(mesh screen: 0.27mm)



80-mesh
(mesh screen: 0.19mm)

100-mesh
(mesh screen: 0.15mm)



■ What is mesh?

Mesh is the unit to describe the mesh screen count used in the Strainer net. It shows the number of mesh screen in 1 inch (25.4mm)distance in the net.

● The larger the mesh number, the narrower the mesh screen.

■ Reference

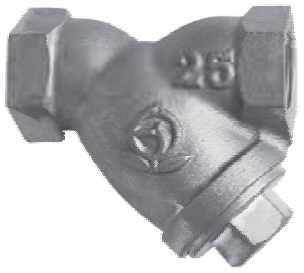
Φ1.3 P2.5 punch hole (punch plate):equivalent to 11-mesh

Φ2.5 P4 punch hole (punch plate):equivalent to 7-mesh

KY-4, 4N Type Strainer

Cast iron·Cast bronze Screwed

Y-shaped, screwed strainer made of cast iron or bronze, with compact body, large filtering area, is ideal to use in the pipeline where automatic valves are installed.



KY-4 Type

SPECIFICATIONS

Body material	Cast iron		Cast bronze	
Model name	KY-4		KY-4N	
Code name	KY4-G2	KY4-G ☐	KY4N-J2	KY4N-J ☐
	※ 1, 3 or 4 for mesh is required in ☐.			
Size	15~65(½″~2½″)		15~50(½″~2″)	
Applicable fluid	Steam, gases & liquids			
Applicable pressure	Max. 1.0MPa			
Applicable temperature	Max. 184℃*1.			
End connection	Screwed JIS Rc			
Materials	Body(Cast iron), Net(Stainless steel) Cover(Forged brass or cast iron)		Body, Cover(Cast bronze) Net(Stainless steel)	
Mesh	60 Mesh	※ 1:40 Mesh 3:80 Mesh 4:100 Mesh	60 Mesh	※ 1:40 Mesh 3:80 Mesh 4:100 Mesh
Pressure test	Hydraulic 1.5MPa		Hydraulic 1.75MPa	

＊1. Applicable temperature Max. 220℃ is available upon your request.
＊2. Punched plate without lining is available.(Size 15~40mm: ϕ1.3 P2.5. And size 50 and 65mm: ϕ2.5 P4)

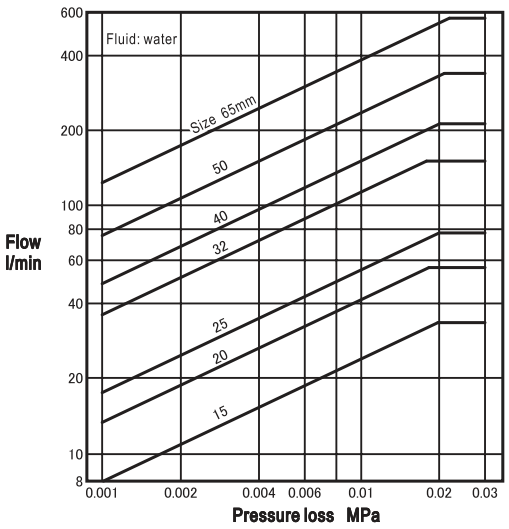
DIMENSIONS

(mm)

Size	L	H	d	Mass(kg)
15(½″)	75	55(53)	½″	0.6(0.4)
20(¾″)	90	67(64)	¾″	0.9(0.6)
25(1″)	110	78(77)	1″	1.4(1)
32(1¼″)	135	97(95)	1¼″	2.3(1.7)
40(1½″)	150	112(109)	1½″	3.5(2.5)
50(2″)	170	125(123)	2″	4.7(3.7)
65(2½″)	200	145	2½″	7.3

Figures in ( ) are for KY-4N Type.

PRESSURE LOSS CHART (punch hole (punch plate))



Note: The pressure loss for each mesh number can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed below.

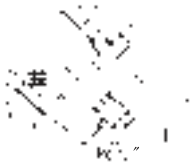
MULTIPLIER LIST

Mesh	Multiplier
40	1.08
60	1.12
80	1.16
100	1.20

＊Refer to page 185 for mesh data.

CONSTRUCTION (KY-4 Type)

The structure of KY-4N is slightly different.



Size 50mm & 65mm

KY-7 Type Strainer

Stainless steel, screwed

Y-shaped, screwed type strainer made of stainless steel, especially suitable for pipeline or clean fluid lines with high requirements on corrosion resistance.

SPECIFICATIONS

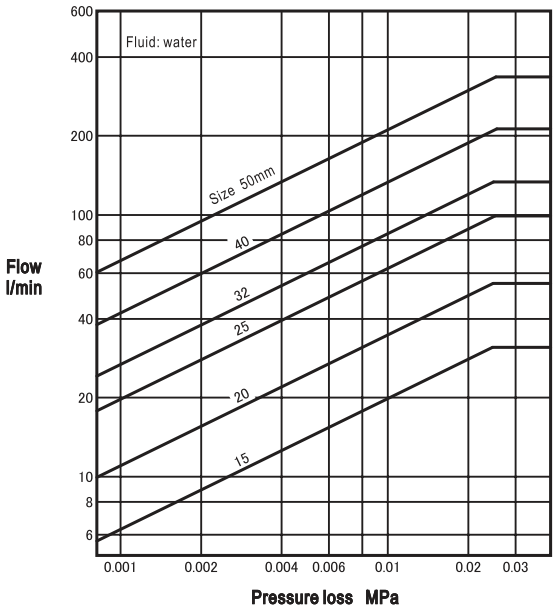
Model name	KY-7	
Code name	KY7-D2	KY7-D
Applicable fluid	Steam, Gases & liquids	
Applicable pressure	Max. 1.0MPa	
Applicable temperature	Max. 220℃	
End connection	Screwed JIS Rc	
Materials	Body, Net(Stainless steel)	
Available mesh	60 Mesh	40, 80 or 100 Mesh
Pressure test	Hydraulic 1.5MPa	

DIMENSIONS

(mm)

Size	d	L	H	Mass(kg)
15(½″)	½″	78	50.5	0.35
20(¾″)	¾″	93	60.5	0.5
25(1″)	1″	108	71	0.85
32(1¼″)	1¼″	128	82	1.1
40(1½″)	1½″	143	93	1.5
50(2″)	2″	173	119	2.6

PRESSURE LOSS CHART (40-mesh)



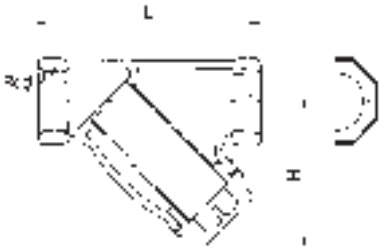
Note: The pressure loss for each mesh number can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed below.

MULTIPLIER LIST

Mesh	Multiplier
60	1.04
80	1.07
100	1.11

∗ Refer to page 185 for mesh data.

CONSTRUCTION



KY-6, 6CN Type Strainer

Stainless steel, flanged

Y-shaped, flanged strainer made of cast iron, with compact body, large filtering area, is ideal to use in the pipeline where automatic valves are installed KY-6CN Type has nylon coating for improved corrosion resistance.

SPECIFICATIONS

Type	Multipurpose type		Nylon coating	
Model name	KY-6		KY-6CN	
Code name	KY6-G2	KY6-G □*1.	KY6CN-G2	KY6CN-G
	※ 1, 3 or 4 for mesh is required in □.			
Size	15~250(½″~10″)		15~150(½″~6″)	
Applicable fluid	Steam, gases & liquids Water			
Applicable pressure	Max. 1.0MPa			
Applicable temperature	Max. 184℃*2.		5~60℃	
End connection	Flanged JIS 10KRF			
Materials	Body(Cast iron), Net(Stainless steel) Cover(Size 15~40mm:brass, Size 50~250mm:Cast iron)		Body(Cast iron), Net(Stainless steel) Cover(Size 15~40mm:Cast bonze, Size 50・65mm:Brass, Size 80~150mm:Cast iron)	
Mesh	60 Mesh	※ 1:40 Mesh 3:80 Mesh 4:100 Mesh	60 Mesh	※ 1:40 Mesh 3:80 Mesh 4:100 Mesh
Pressure test	Hydraulic 1.5MPa		Hydraulic 1.75MPa	
Painting or coating	For Body Interior:Rust proof oil, Exterior:Silver		Body and cover:Nylon 11 coating	

*1. Size 100mm and bigger, code name is KY6-G Type.
*2. Applicable temperature Max. 220℃ is available upon your request.
*3. Punched plate without lining is available upon your request. (Size 15~40mm: φ1.3 P2.5. And size 50~250mm: φ2.5 P4)

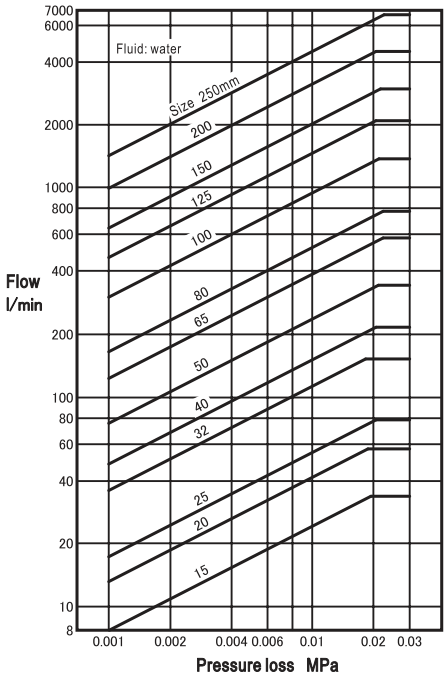
DIMENSIONS

(mm)

Size	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)	100(4″)	125(5″)	150(6″)	200(8″)	250(10″)
L	125	140	160	180	190	220	270	315	370	450	510	620	760
H	55	67	78	97	112	125	155	200	245	300	340	450	550
Mass(kg)	2	3	4	5.5	6.5	9	13	20	32	55	75	130	220

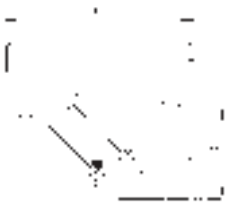
Flange code JIS 10KRF

PRESSURE LOSS CHART (punch hole (punch plate))



Note: The pressure loss for each mesh number can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed.

CONSTRUCTION



Size 15~40mm

Size 50~65mm

Size 80~250mm

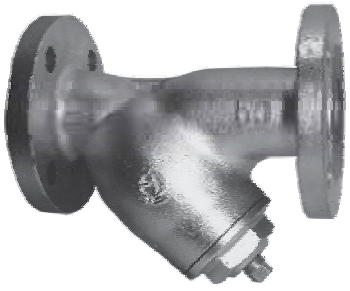
MULTIPLIER LIST

Mesh	Multiplier
40	1.08
60	1.12
80	1.16
100	1.20

*Refer to page 185 for mesh date.

CAUTIONS ON INSTALLATION AND HANDLING

Apply thermal insulation on KY-6CN Type if the temperature difference between the product and the ambient environment is larger than 40℃.



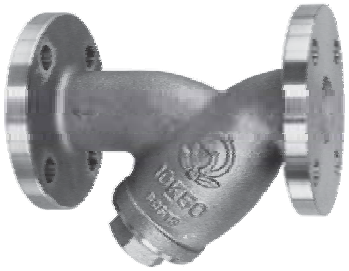
KY-6 Type

KY-6CN Type

KY-8 Type Strainer

Stainless steel
Flanged

Y-shaped, flanged strainer made of stainless steel, The compact body, large filtering area are suitable is ideal to use for corrosive fluid and clean fluid to use in the pipeline where automatic valves are installed.



SPECIFICATIONS

Model name	KY-8	
Code name	KY8-D2	KY8-D
Applicable fluid	Steam, gases & liquids	
Applicable pressure	Max. 1.0MPa	
Applicable temperature	temperature Max. 200℃	
End connection	Flanged JIS 10KFF	
Materials	Body, Cover, Net(Stainless steel)	
Mesh	60 Mesh	40, 80 or 100 Mesh
Pressure test	Hydraulic 1.5MPa	

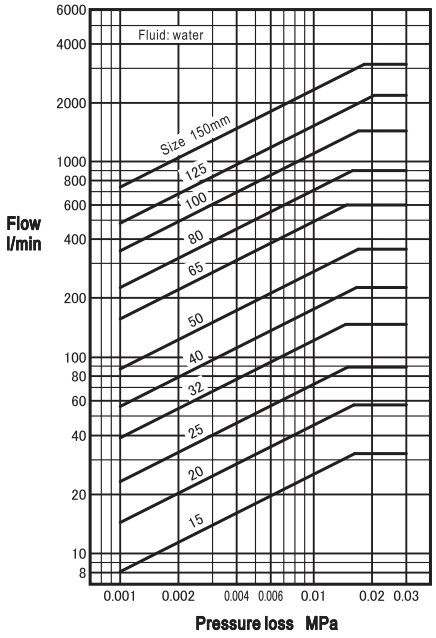
DIMENSIONS

(mm)

Size	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)	100(4″)	125(5″)	150(6″)
L	120	130	150	170	190	220	270	290	350	390	440
H	57	65	76	92	105	122	162	195	228	260	310
Mass(kg)	2	2.5	3.5	5	5.5	7.5	13	16	24	37	50

Flange code JIS 10KFF

PRESSURE LOSS CHART (40-mesh)



Note: The pressure loss for 60~100-mesh can be calculated by multiplying pressure loss determined using the chart and a multiplier listed below.

MULTIPLIER LIST

Mesh	Multiplier
60	1.04
80	1.07
100	1.11

* Refer to page 185 for mesh data.

CONSTRUCTION

Size 15~50mm

Size 65~150mm

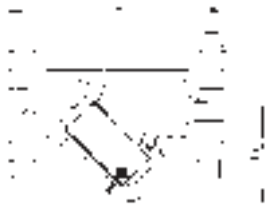
KY-3 Type Strainer

Cast iron, Flanged

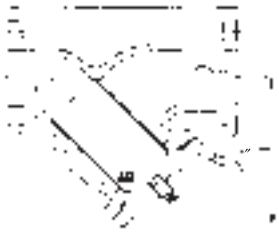
Y-shaped, high pressure strainer made of cast iron, with 10, 16, 20, 30K flanges, compact body, large filtering area, is ideal to use in for pipelines where automatic valves are installed.

CONSTRUCTION

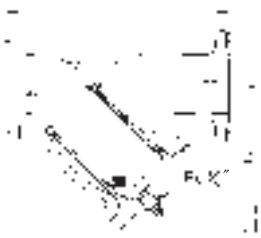
Size 15~20mm



Size 25~40mm



Size 50~80mm



Size 100~250mm

SPECIFICATIONS

Model name	KY-3
Code name	KY3-C
Applicable fluid	Steam, gases & liquids
Applicable pressure	Max. 1.0, 1.6, 2.0 & 3.0MPa
Applicable temperature	Max. 300℃
End connection	Flanged JIS 10, 16, 20 & 30KRF
Materials	Body(Cast steel), Net(Stainless steel), Cover(Mild steel or Cast steel)
Mesh	40, 60, 80 or 100 Mesh
Pressure test	Hydrauric 1.5 times of rated pressure

＊Punched plate without lining is available upon your request. (Size 15~40mm: ϕ1.3 P2.5. And size 50~250mm: ϕ2.5 P4)

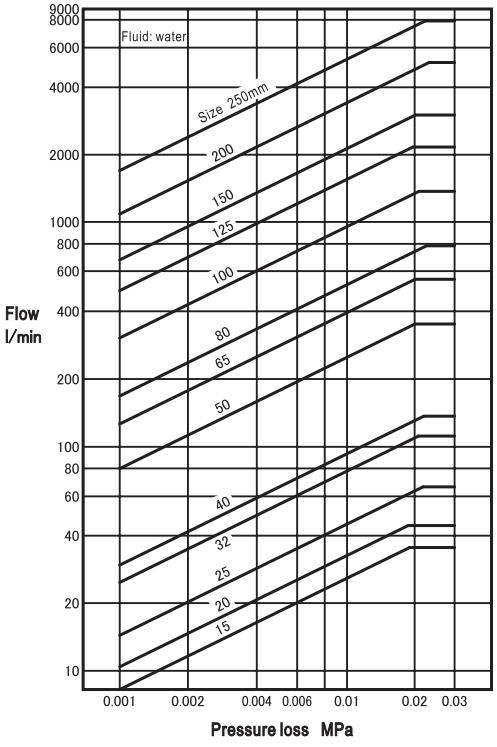
DIMENSIONS

(mm)

Size		15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)	100(4″)	125(5″)	150(6″)	200(8″)	250(10″)
L	10K	142	146	168	192	198	248	294	340	402	458	528	630	900
	16K	142	146	168	192	198	252	298	348	410	462	532	638	908
	20K	142	146	168	192	198	252	298	348	414	470	540	646	920
	30K	150	150	176	200	206	260	310	360	430	490	560	670	948
H		76	76	80	115	115	170	200	230	270	330	380	480	600
Mass(kg)		4	4	6	9	10	14	27	31	51	79	115	192	365

＊Mass for CAST STEEL is with JIS 30K.

PRESSURE LOSS CHART (punch hole (punch plate))



Note: The pressure loss for each mesh number can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed below.

MULTIPLIER LIST

Mesh	Multiplier
40	1.08
60	1.12
80	1.16
100	1.20

＊Refer to page 185 for mesh data.

KY-9, 10 Type Strainer

Carbon steel/Stainless steel
Flanged

Large diameter, Y-shaped strainer made of carbon steel or stainless steel, with compact body, large filtering area, is ideal to use in for pipelines where automatic valves are used.

SPECIFICATIONS

Body material	Cast steel	Stainless steel
Model name	KY-9	KY-10
Code name	KY9-N	KY10-D
Applicable fluid	Steam, gases & liquids	
Applicable pressure	Max. 1.0MPa	
Applicable temperature	Max. 184℃*2.	
End connection	Flanged JIS 10KFF	
Materials	Body(300mm & smaller:STPG, 400mm & larger is STPY), Cover(Mild steel) Net(Stainless steel)	Body, Net(Stainless steel)
Available mesh	5, 10, 20, 30, 40, 50 or 60 Mesh	
Pressure test	Hydraulic 1.5MPa	
Painting	Interior:Rust proof oil, Exterior:Red rust prevention	—

∗1. Punched plate without lining (φ10×P12.5) is available upon your request.
∗2. Applicable temperature Max. 350℃ is available upon your request.

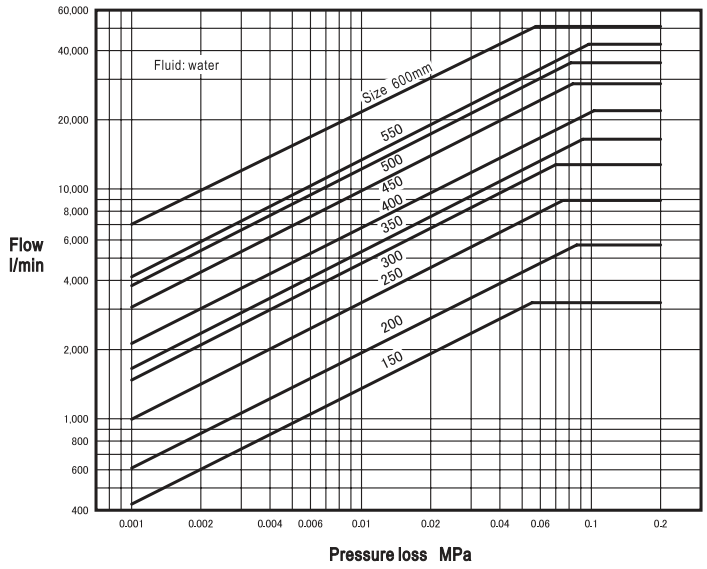
DIMENSIONS

(mm)

Size		150(6″)	200(8″)	250(10″)	300(12″)	350(14″)	400(16″)	450(18″)	500(20″)	550(22″)	600(24″)
L		480	580	680	800	900	1000	1100	1200	1400	1500
H		430	520	620	690	780	860	940	1010	1150	1270
d		¾″	1″	1″	1″	1″	1″	1″	1″	1″	1″
Mass (kg)	KY-9 Type	62	94	154	209	281	314	434	516	788	913
	KY-10 Type	49	70	131	166	236	315	400	516	675	783

Flange code JIS 10KFF

PRESSURE LOSS CHART (40-mesh)



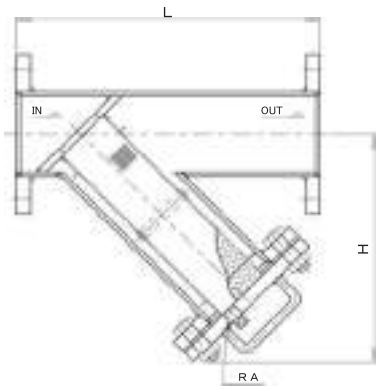
Note: The pressure loss for 60-mesh can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed below.

MULTIPLIER LIST

Mesh	Multiplier
60	1.04

∗ Refer to page 185 for mesh data.

CONSTRUCTION



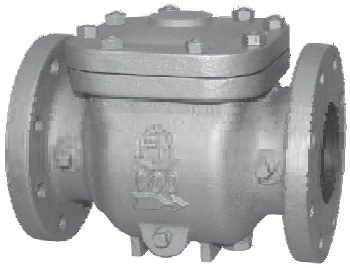
KT-1, 1A, 1D Type Strainer

A new-concept (T-shaped) strainer that is completely different from the conventinal products.

Allow easy maintenance, installation, and reduced pressure loss.

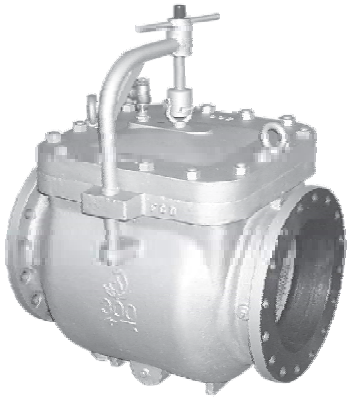
KT-1A Type can be easily cleaned with just one bolt and is ideal for installation at places where frequent cleaning is necessary.

KT-1D Type is a davit type strainer, which cap can be removed easily.



KT-1 Type

KT-1A Type



KT-1D Type

■ SPECIFICATIONS

Type		Multipurpose type		One touch type	Davit type
Model name		KT-1		KT-1A	KT-1D
Code name		KT1-G	KT1-M	KT1A-G	KT1D-G
Size		50~300(2″~12″)		50~150(2″~6″)	250~300(10″~12″)
Applicable fluid		Steam, gases & liquids		Gases & liquids	Steam, gases & liquids
Applicable pressure		Max. 1.0MPa	Max. 1.6MPa	Refer to the table of applicable pressure below.	Max. 1.0MPa
Applicable temperature		Max. 184℃*2.	Max. 220℃	5~90℃	Max. 184℃*2.
End connection		Flanged JIS 10KFF	Flanged JIS 16KRF	Flanged JIS 10KFF	
Materials	Body, Cover	Cast iron	Ductile cast iron	Cast iron	
	Net	Stainless steel			
Mesh		40, 60, 80 or 100 Mesh			
Pressure test		Hydraulic 1.75MPa	Hydraulic 2.4MPa	Refer to the table of pressure tightness below.	Hydraulic 1.75MPa

*1. Punched plate without lining is available upon your request. (Size 50~200mm: φ3 P4. And size 250~300mm: φ4 P6)
*2. Applicable temperature Max. 220℃ is available upon your request.
*3. For size 350~450mm of KT-2, 2D Type are available upon your request.
*4. Applicable pressure Max. 2.0MPa for KT-4 Type with size 50~300mm is available upon your request.

■ DIMENSIONS

(mm)

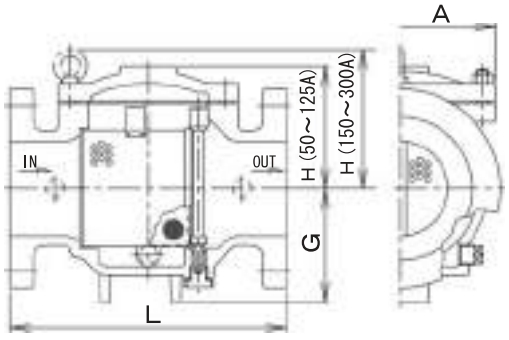
Size	L	G	KT-1 Type			KT-1A Type			KT-1D Type		
			H	A	Mass(kg)	H	A	Mass(kg)	H	A	Mass(kg)
50(2″)	200	—	64	110	7.5	145	100	10.5	—	—	—
65(2½″)	240	—	89	158	13	170	115	17.5	—	—	—
80(3″)	265	—	103	170	18.5	205	140	23.5	—	—	—
100(4″)	290	130	128	200	30.5	228	150	35	—	—	—
125(5″)	340	140	155	252	47	266	185	50	—	—	—
150(6″)	380	165	171	282	66	280	190	74	—	—	—
200(8″)	450	200	223	368	118	—	—	—	—	—	—
250(10″)	560	240	273	545	200	—	—	—	530	273	207
300(12″)	680	280	321	595	290	—	—	—	580	298	297

Flange code JIS 10KFF

■ APPLICABLE PRESSURE AND PRESSURE TIGHTNESS FOR KT-1A Type

Size	Applicable pressure	Pressure tightness(Hydraulic)
50~100mm	Max. 1.0MPa	1.5MPa
125mm	Max. 0.75MPa	1.13MPa
150mm	Max. 0.5MPa	0.75MPa

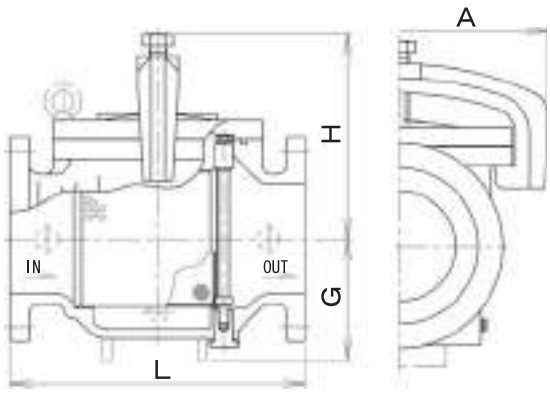
■ CONSTRUCTION



KT-1 Type

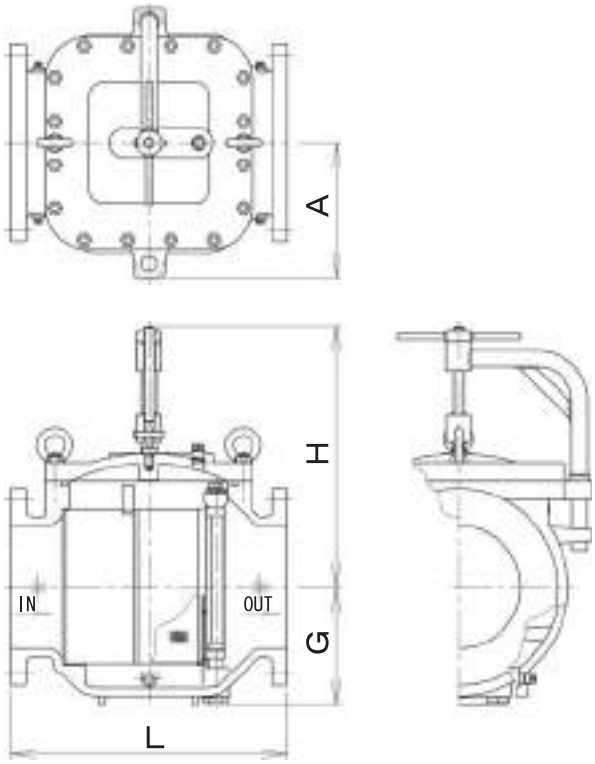
DATA/KT Type Series Strainer

■ CONSTRUCTION



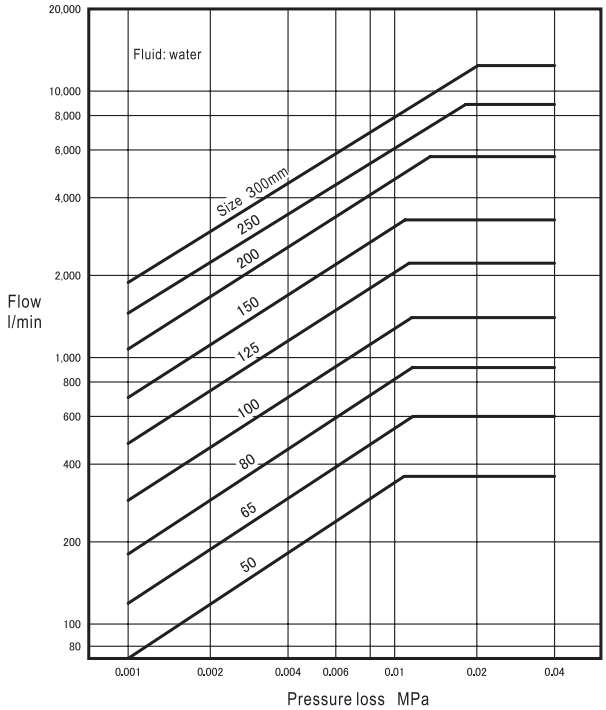
KT-1A Type

Depending on size, the structure may vary.



KT-1D Type

■ PRESSURE LOSS CHART (60-mesh)



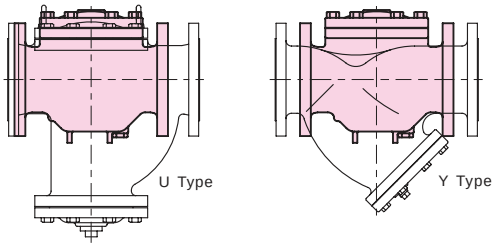
Note: The pressure loss for each mesh number can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed.

■ MULTIPLIER LIST

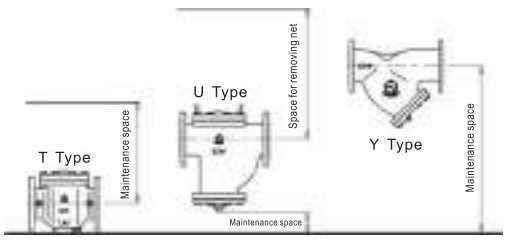
Mesh	Multiplier
60	0.95
80	1.05
100	1.10

* Refer to page 185 for mesh date.

■ SIZE COMPARISON WITH CONVENTINAL STRAINER



■ COMPARISON OF MAINTENANCE SPACE



KT-1PN, 1CN Type Strainer

A new-concept (T-Type) strainer that is completely different from the conventinal products.

Allow easy maintenance, installation, and reduced pressure loss.

KT-1PN Type has epoxy resin coating and is ideal for water supply pipes.
KT-1CN Type has nylon coating.

SPECIFICATIONS

Type	Epoxy resin coating	Nylon coating
Model name	KT-1PN	KT-1CN
Code name	KT1PN-G	KT1CN-G
Applicable fluid	Water & Hot water	
Applicable pressure	Max. 1.0MPa	
Applicable temperature	5~60℃	
End connection	Flanged JIS 10KFF	
Materials	Body and Cover(Cast iron) *2, Net(Stainless steel)	
Mesh	40, 60, 80 or 100 Mesh	
Pressure test	Hydraulic 1.75MPa	
Painting or coating for Body	Body and Cover:Epoxy resin coating inside and outside value	Body and cover:Nylon coating

* 1. Punched plate without lining is available upon your request. (Size 50~200mm: ϕ3 P4. And size 250~300mm: ϕ4 P6)
* 2. Applicable pressure Max. 1.6MPa with ductile cast iron body is available upon your request.

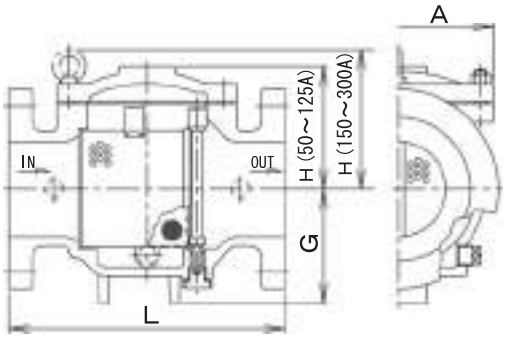
DIMENSIONS

(mm)

Size	L	G	H	A	Mass(kg)
50(2″)	200	—	64	110	7.5
65(2 ½″)	240	—	89	158	13
80(3″)	265	—	103	170	18.5
100(4″)	290	130	128	200	30.5
125(5″)	340	140	155	252	47
150(6″)	380	165	171	282	66
200(8″)	450	200	223	368	118
250(10″)	560	240	273	545	200
300(12″)	680	280	321	595	290

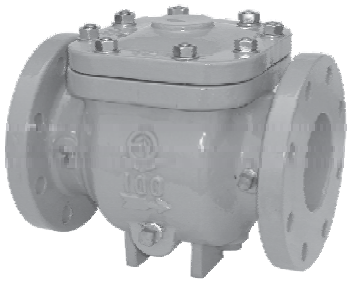
Flange code JIS 10KFF

CONSTRUCTION



CAUTIONS FOR INSTALLATION AND HANDLING

Apply thermal insulation if the temperature difference between the product and the ambient environment is larger than 40℃.



KT-1PN Type

KT-1PN Type

Note: See page 193 for pressure loss.

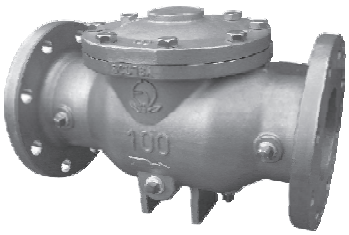
KT-3, 3A Type Strainer

A new-concept (T-Type) strainer that is completely different from the conventinal products.

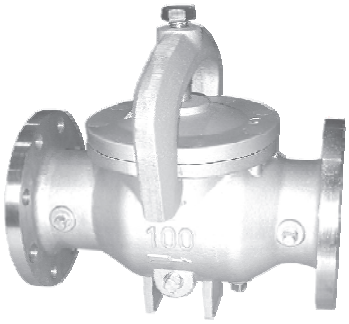
Allow easy maintenance, installation, and reduced pressure loss.

Stainless steel strainer suitable for clean fluid.

KT-3A Type can be easily cleaned with just one bolt and is ideal for installation at places where frequent cleaning is necessary.



KT-3 Type



KT-3A Type

SPECIFICATIONS

Type		Multipurpose type	One touch type
Model name		KT-3	KT-3A
Code name		KT3-D	KT3A-D
Size		50~300(2″~12″)	50~150(2″~6″)
Applicable fluid		Steam, gases & liquids	Gases & liquids
Applicable pressure		Max. 1.0MPa	Refer to the table of applicable pressure below.
Applicable temperature		Max. 150℃*2.	5~90℃
End connection		Flanged JIS 10KFF	
Materials	Body, Cover	Stainless steel	Stainless steel, Cover holder(Ductile cast iron)
	Net	Stainless steel	
Mesh		40, 60, 80 or 100 Mesh	
Pressure test		Hydraulic 1.5MPa	Refer to the table of pressure tightness below.

＊1. Punched plate without lining is available upon your request. (φ3　P4)
＊2. Applicable temperature Max. 220℃ is available upon your request.

DIMENSIONS

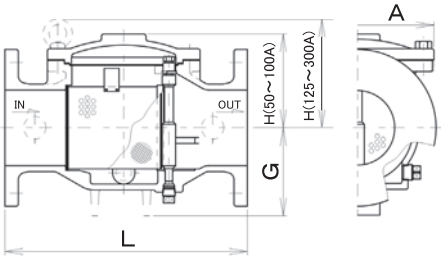
(mm)

Size	L	G	KT-3 Type			KT-3A Type		
			H	A	Mass(kg)	H	A	Mass(kg)
50(2″)	220	—	67	107	8.5	140	200	10
65(2½″)	270	—	89	158	13.5	170	230	15.5
80(3″)	290	—	103	200	16.5	200	280	20.5
100(4″)	350	130	126	202	23.7	235	300	29
125(5″)	390	140	146	256	42	255	370	49
150(6″)	440	165	162	280	56	270	380	64.5
200(8″)	540	180	216	358	93	—	—	—
250(10″)	680	240	266	458	184	—	—	—
300(12″)	840	280	303	526	268	—	—	—

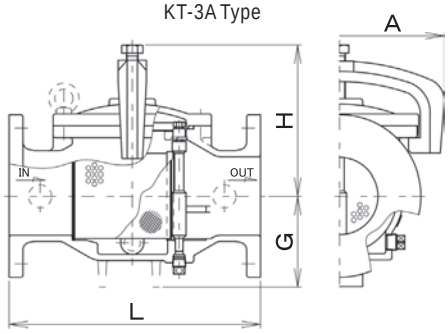
Flange code JIS 10KFF

CONSTRUCTION

KT-3 Type



KT-3A Type



Depending on size, the structure may vary.

APPLICABLE PRESSURE AND PRESSURE TIGHTNESS FOR KT-3A Type

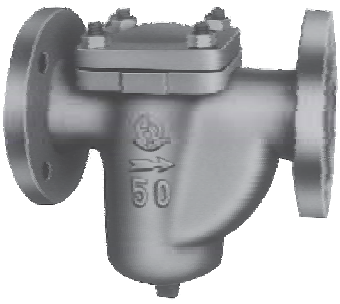
Size	Applicable pressure	Pressure tightness(Hydraulic)
50~100mm	Max. 1.0MPa	1.5MPa
125mm	Max. 0.75MPa	1.13MPa
150mm	Max. 0.5MPa	0.75MPa

Note: See page 193 for pressure loss.

KU-1, 1CN Type Strainer

Cast iron, flanged

U-Type strainer mainly for liquids. Since the mesh can be removed from the top, there will be no overflowing of liquid when dismantling. Ideal to use for automatic valve for liquids. KU-1CN Type has rust-free nylon coating.



KU-1 Type

KU-1CN Type

SPECIFICATIONS

Type	Multipurpose type		Nylon coating	
Model name	KU-1		KU-1CN	
Code name	KU1-G2	KU1-G	KU1CN-G2	KU1CN-G
Size	25~250(1″~10″)		25~125(1″~5″)	
Applicable fluid	Water, oils, air & steam		Water	
Applicable pressure	Max. 1.0MPa			
Applicable temperature	Max. 184℃*2.		5~60℃	
End connection	Flanged JIS 10KRF			
Materials	Body & Cover(Cast iron), Net(Stainless steel), Net case(Cast bronze)			
Mesh	60 Mesh	40, 80 or 100 Mesh	60 Mesh	40, 80 or 100 Mesh
Pressure test	Hydraulic 1.75MPa			
Painting or coating for Body	Interior:Rust proof oil, Exterior:Metallic blue		Body and cover:Nylon coating	

* 1. Punched plate without lining is available upon your request. (Size 25~40mm: φ1.3 P2.5. And size 50~250mm: φ2.5 P4)
* 2. Applicable temperature Max. 220℃ is available upon your request.
* 3. KU-1PN(50~125mm) body interior & exterior with Epoxy resin paint is available upon your request.

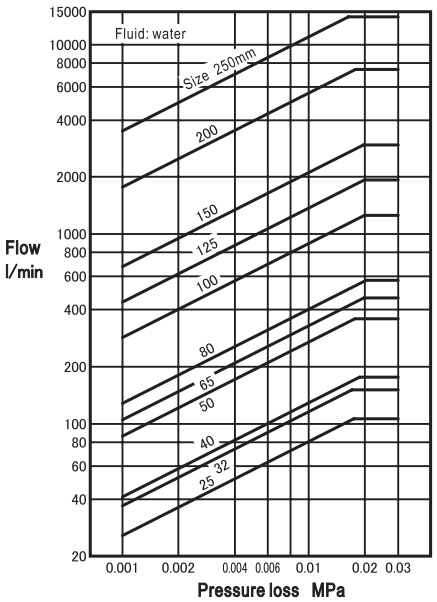
DIMENSIONS

(mm)

Size	L	A	B	d	Mass(kg)
25(1″)	185	110	55	½″	6.5
32(1¼″)	210	119	58	½″	9.5
40(1½″)	210	119	58	½″	10
50(2″)	230	140	68	½″	12
65(2½″)	270	160	87	1″	20
80(3″)	300	197	92	1″	24
100(4″)	385	245	110	1″	50
125(5″)	425	325	128	1½″	75
150(6″)	520	385	152	1½″	97
200(8″)	696	555	204	2″	292
250(10″)	850	786	238	3″	540

Flange code JIS 10KRF

PRESSURE LOSS CHART (punch hole (punch plate))



Note: The pressure loss for each mesh number can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed below.

MULTIPLIER LIST

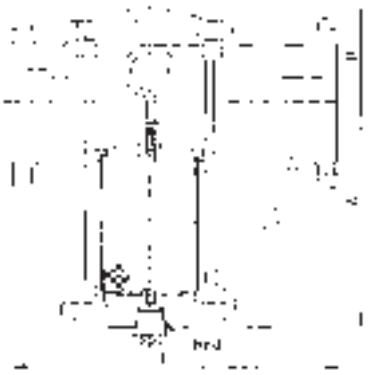
Mesh	Multiplier
40	1.08
60	1.12
80	1.16
100	1.20

* Refer to page 185 for mesh data.

Cautions for Installation and Handling

Apply thermal insulation on KU-1CN Type if the temperature difference between the product and the ambient environment is larger than 40℃.

CONSTRUCTION



Depending on size, the structure may vary.

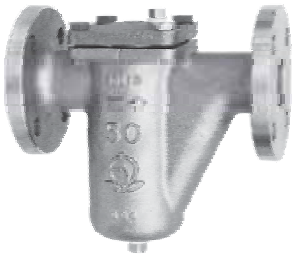
KU-2, 2A Type Strainer

Carbon steel, flanged

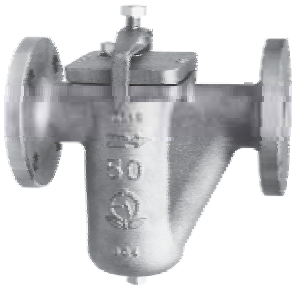
U-Type strainer made of stainless steel, suitable for clean fluid.

Since the net can be removed from the top, there will be no overflowing of liquid when dismantling.

KU-2A Type can be easily cleaned with just one bolt and is ideal for installation at places where frequent cleaning is necessary.



KU-2 Type



KU-2A Type

SPECIFICATIONS

Type	Multipurpose type		One touch type
Model name	KU-2		KU-2A
Code name	KU2-D2	KU2-D	KU2A-D
Applicable fluid	Water & oils		
Applicable pressure	Max. 1.0MPa		
Applicable temperature	Max. 150℃		Max. 80℃
End connection	Flanged JIS 10KFF		
Materials	Body, Cover and Net(Stainless steel)		
Available mesh	60 Mesh	40, 80 or 100 Mesh	40, 60, 80 or 100 Mesh
Pressure test	Hydraulic 1.5MPa		

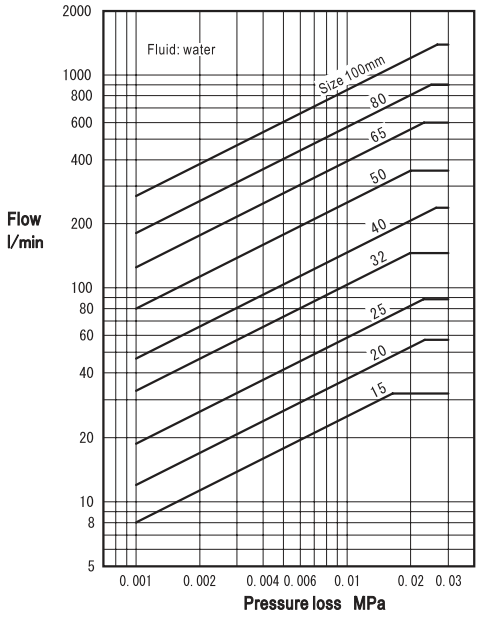
DIMENSIONS

(mm)

Size	L	A	d	KU-2 Type			KU-2A Type		
				B	W	Mass(kg)	B	W	Mass(kg)
15(½″)	156	116	⅜″	41	70	3.5	82	114	4
20(¾″)	160	116	⅜″	41	70	3.5	82	114	4
25(1″)	180	129	⅜″	52	85	5.5	90	114	5.5
32(1¼″)	230	164	⅜″	62	106	8.5	100	144	9
40(1½″)	230	164	⅜″	62	106	8.5	100	144	9
50(2″)	260	183	½″	73	113	11	110	144	11.5
65(2½″)	300	229	½″	83	131	17	132	162	18
80(3″)	350	253	¾″	103	194	23	151	246	24.5
100(4″)	400	274	¾″	116	240	37	—	—	—

Flange code JIS 10KFF

PRESSURE LOSS CHART (40-mesh)



CONSTRUCTION

KU-2 Type

KU-2A Type

Note:
The pressure loss for 60~100 mesh can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed.

MULTIPLIER LIST

Mesh	Multiplier
60	1.04
80	1.07
100	1.11

* Refer to page 185 for mesh data.

KU-3, 4 Type Strainer

Carbon steel・stainless steel

Large diameter, U-Type strainer made of carbon steel or stainless steel.

The mesh can be removed from the top; there will be no overflowing of liquid when dismantling.

SPECIFICATIONS

Body material	Carbon steel	Stainless steel
Model name	KU-3	KU-4
Code name	KU3-N	KU4-D
Size	125~600(5″~24″)	125~450(5″~18″)
Applicable fluid	Steam, gases & liquids	
Applicable pressure	Max. 1.0MPa	
Applicable temperature	Max. 184℃*2.	
End connection	Flanged JIS 10KFF	
Materials	Body(Carbon steel pipe), Cover(Mild steel) Net(Stainless steel)	Body & Net(Stainless steel)
Mesh	5, 10, 20, 30, 40, 50 or 60 Mesh	
Pressure test	Hydraulic 1.5MPa	
Painting	Interior:Rust proof oil, Exterior:Red rust prevention	—

＊1. Punched plate without lining (φ10×P12.5) is available upon your request.
＊2. Applicable temperature Max. 350℃ is available upon your request.

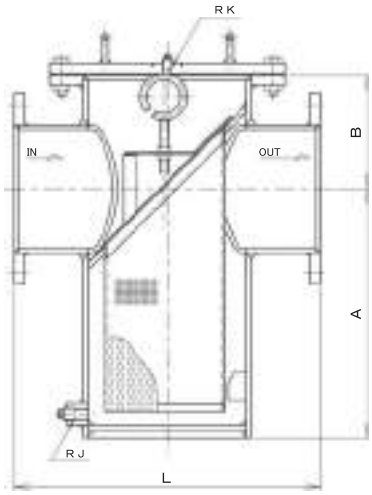
DIMENSIONS

(mm)

Size	L	A	B	d_1	d_2	Mass(kg)	
						KU-3 Type	KU-4 Type
125(5″)	420	295	175	¾″	½″	67	55
150(6″)	490	345	200	¾″	½″	105	84
200(8″)	570	415	215	¾″	½″	144	114
250(10″)	640	525	235	¾″	½″	204	173
300(12″)	710	665	275	¾″	½″	295	235
350(14″)	770	755	310	¾″	½″	401	307
400(16″)	840	865	335	1″	½″	503	411
450(18″)	920	975	375	1″	½″	600	527
500(20″)	1000	1000	435	1″	¾″	711	—
550(22″)	1050	1100	480	1″	¾″	854	—
600(24″)	1080	1250	500	1″	¾″	995	—

Flange code JIS 10KFF

CONSTRUCTION



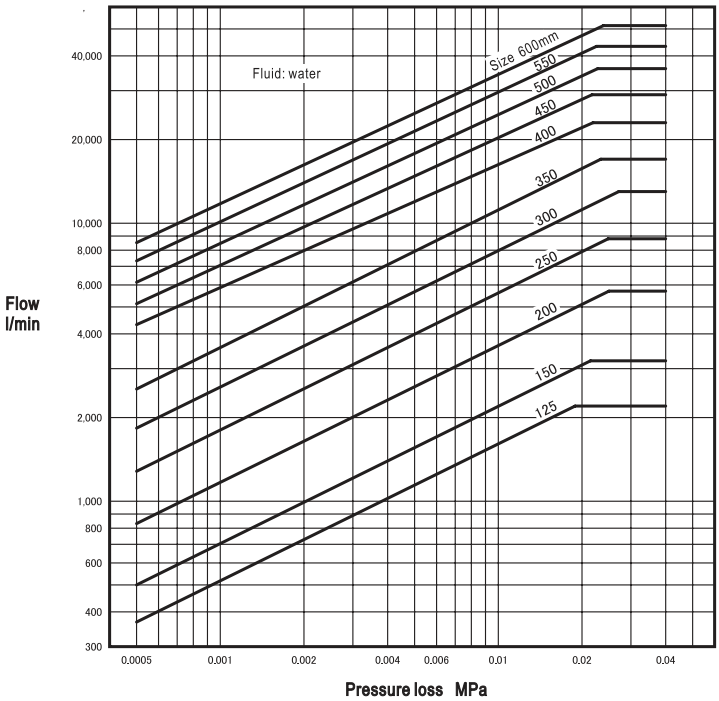
Depending on size, the structure may vary.

MULTIPLIER LIST

Mesh	Multiplier
60	1.04

＊Refer to page 185 for mesh data.

PRESSURE LOSS CHART (40-mesh)



Note: The pressure loss for 60-mesh can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed.

KW-1 Type Strainer

Cast iron, Flanged

Duplex strainer designed for oil, with filtering cartridge in the left and right of switching cock, allows continuous operation even when one filtering cartridge is being cleaned.

SPECIFICATIONS

Model name	KW-1	
Code name	KW1-G2	KW1-G
Applicable fluid	Oil	
Applicable pressure	Max. 1.0MPa	
Applicable temperature	Max. 90℃	
End connection	Flanged JIS 10KFF	
Materials	Body(Cast iron), Net(Stainless steel)	
Mesh	60 Mesh	20, 40, 80, 100, 125, 150 or 200 Mesh
Pressure test	Hydraulic 1.5MPa	

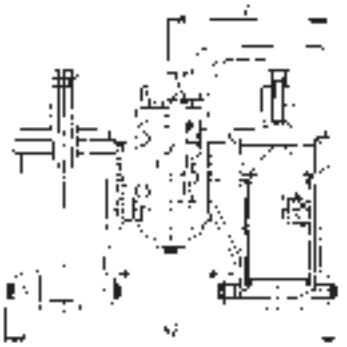
DIMENSIONS

(mm)

Size	L	H_1	H_2	ℓ	A_1	A_2	B	h	T	Mass(kg)
20(¾″)	190	145	116	150	215	344	120	11	10	17
25(1″)	190	145	116	150	215	344	120	11	10	18
32(1¼″)	218	195	156	215	249	399	120	15	13	27
40(1½″)	250	220	161	215	265	421	130	15	13	36
50(2″)	285	200	165	150	300	449	150	15	16	44
65(2½″)	285	200	165	150	300	449	150	15	16	45

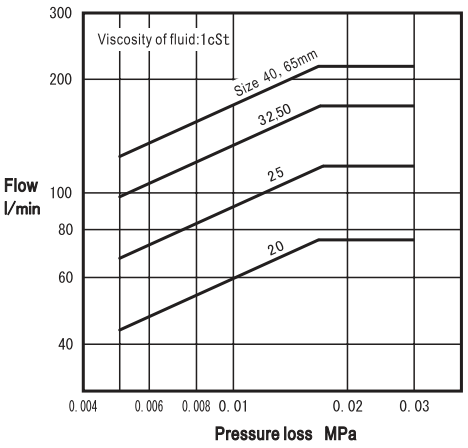
Flange code JIS 10KFF

CONSTRUCTION



Depending on size, the structure may vary.

PRESSURE LOSS CHART (60-mesh)



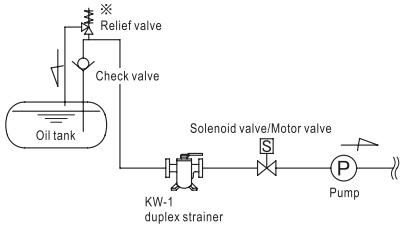
Note:
The pressure loss for 40,80,100-mesh can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed.

MULTIPLIER LIST

Mesh	Multiplier
40	0.96
80	1.03
100	1.07

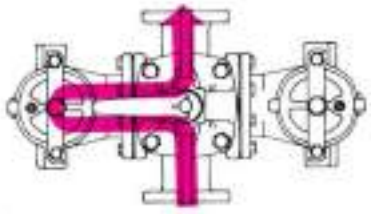
＊Refer to page 185 for mesh data.

PIPING EXAMPLE

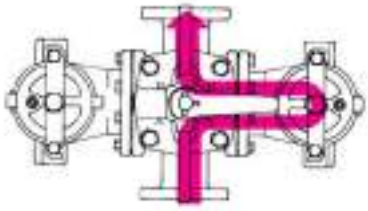


SWITCHING FILTERING CARTRIDGE

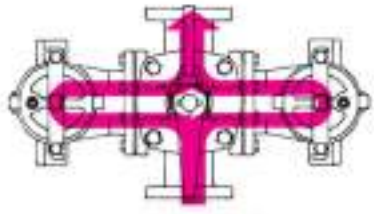
Left filtering cartridge
Switch the handle to the left side to allow fluid flow in the left case only.



Right filtering cartridge
Switch the handle to the right side to allow fluid flow in the right case only.



Double filtering cartridge
Switch the handle to the center of flange at inlet to allow fluid flow in both cases.



※For the piping shown in the left figure or there is water hammer or thermal expansion of fluid due to ambient temperature is anticipated, install relief valve.

※There is no plug in the inner side of filtering cartridge for size 20, 25mm strainers.

KW-2 Type Strainer

Cast iron, Flanged

Duplex strainer for water and oil, with filtering cartridge in the left and right of switching cock, allows continuous operation even when one filtering cartridge is being cleaned.

SPECIFICATIONS

Model name	KW-2	
Code name	KW2-G2	KW2-G
Applicable fluid	Water & oil	
Applicable pressure	Max. 0.7MPa	
Applicable temperature	Max. 110℃	
End connection	Flanged JIS 10KFF	
Materials	Body(Cast iron), Net(Stainless steel)	
Mesh	60 Mesh	Size 15~50mm:20~200 mesh Punched plate Size 65~100mm:5~200 mesh Punched plate
Pressure test	Hydraulic 1.1MPa	

＊Punched plate without lining is available upon your request.(Size 15~25mm: φ3　P4. And size 32~100mm: φ6　P7.5)

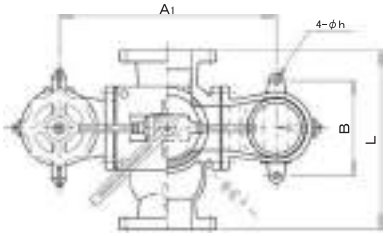
DIMENSIONS

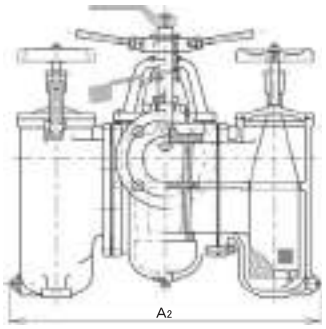
(mm)

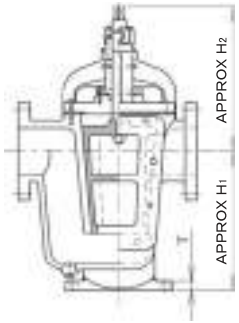
Size	L	H_1	H_2	A_1	A_2	B	h	T	Mass(kg)
15(½″)	170	120	94	190	290	95	12	15	14
20(¾″)	170	120	94	190	290	95	12	15	14
25(1″)	170	120	94	190	290	95	12	15	15
32(1¼″)	220	150	120	250	365	116	12	14	25
40(1½″)	220	150	120	250	365	116	12	14	26
50(2″)	240	180	249	280	410	130	12	14	37
65(2½″)	330	255	325	420	590	175	15	20	90
80(3″)	330	255	325	420	590	175	15	20	90
100(4″)	380	305	341	480	675	200	15	20	135

Flange code JIS 10KFF

CONSTRUCTION

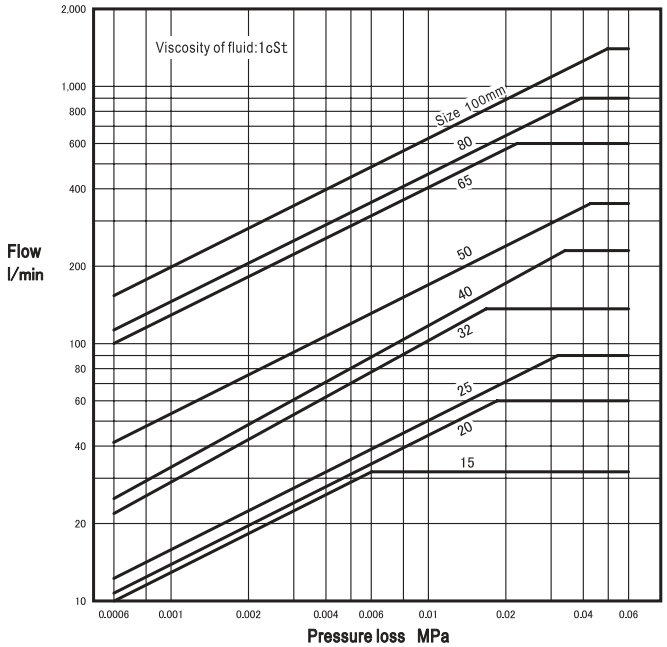






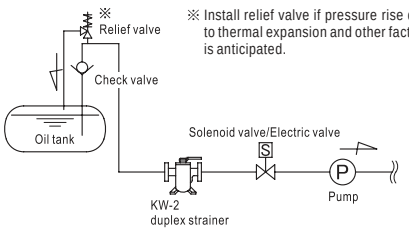
Depending on size, the structure may vary.

PRESSURE LOSS CHART (60-mesh)



Note:
The pressure loss for 40,80,100-mesh can be calculated by multiplying pressure loss determined using the above chart and a multiplier listed.

PIPING EXAMPLE



※ Install relief valve if pressure rise due to thermal expansion and other factors is anticipated.

MULTIPLIER LIST

Mesh	Multiplier
40	0.96
80	1.03
100	1.07

＊Refer to page 185 for mesh data.

SOLENOID VALVES

12

There are many solenoid valves in different types. The solenoid valves listed herein are recommended with confidence for these are the results of our long researches and technical experiences.

Model name		End connection	Size	Applicable fluid	Applicable pressure(MPa)	Materials	Page
Energized open	Energized close						
WS-12	WS-12C	Screwed	10~65(⅜″~2½″)	Water, air, inert gas or oils	0~1.0	Body:Cast bronze Diaphragm:Synthetic rubber	202
WF-12	WF-12C	Flanged	15~65(½″~2½″)				203
WS-13	WS-13C	Screwed	15~50(½″~2″)	Water, air, inert gas or oils	0~1.0	Body:Cast bronze Diaphragm:Synthetic rubber	204
WS-15	WS-15C	Screwed	10~50(⅜″~2″)	Water, air, inert gas or oils	0~1.0	Body:Stainless steel Diaphragm:Synthetic rubber	206
WF-15	WF-15C	Flanged	15~50(½″~2″)				
PS-12	PS-12C	Screwed	10~65(⅜″~2½″)	Steam, water, air or gas	0~1.0	Body:Cast bronze Disc:Stainless steel with Teflon tip	208
PF-12	PF-12C	Flanged	15~80(½″~3″)				209
PS-13	PS-13C	Screwed	15~50(½″~2″)	Steam, water, air or gas	0~1.0	Body:Cast bronze Disc:Stainless steel with Teflon tip	210
PS-15	PS-15C	Screwed	10~50(⅜″~2″)	Steam, water, air or gas	0~1.0	Body:Stainless steel Disc:Stainless steel with Teflon tip	212
PF-15	PF-15C	Flanged	15~50(½″~2″)				
PS-16	—	Screwed	10~50(⅜″~2″)	Water	0.05~2.0	Body:Stainless steel Disc:Stainless steel with Teflon tip	215
PF-16	—	Flanged	15~50(½″~2″)				
PS-17	—	Screwed	10~50(⅜″~2″)	Steam	0.05~1.6		
PF-17	—	Flanged	15~50(½″~2″)				
WS-12K	WS-12CK	Screwed	10~50(⅜″~2″)	Water, air, or inert gas	0~1.0	Body:Cast bronze Diaphragm:Synthetic rubber	217
PS-12K	PS-12CK	Screwed		Water or air		Body:Cast bronze Disc:Stainless steel with Teflon tip	
VF-11	VF-11C	Flanged	80~100(3″~4″)	Water, air or oils	0.03~1.0	Body:Cast iron Trim:Brass & Synthetic rubber	218
VF-12	VF-12C					Body:Cast bronze Trim:Brass & Synthetic rubber	
WVE-02	—	Flanged	80~200(3″~8″)	Water or hot water	0.03~1.0	Body:Cast iron or ductile cast iron Trim:Cast bronze & Synthetic rubber	220
WVE-02CN	—					Body:Cast iron Trim:Cast bronze & Synthetic rubber	
DS-10	—	Screwed	10~20(⅜″~¾″)	Water, air or oils	0~0.8	Body:Cast bronze Trim:Stainless steel & Synthetic rubber	221
DS-10H	—	Screwed	10~20(⅜″~¾″)	Steam or hot water		Body:Cast bronze Trim:Stainless steel with Teflon tip	
DS-12	—	Screwed	10~20(⅜″~¾″)	Steam, water, air or oils	0~1.0		
ED-S	—	Screwed	10~50(⅜″~2″)	Water, air or oils	0~0.7	Body:Cast bronze Disc:Stainless steel with Teflon tip	223
ED-F	—	Flanged	15~50(½″~2″)				
			65~80(2½″~3″)			Body:Cast iron Disc:Cast bronze with Teflon tip	
WSE-18	—	Screwed	15~50(½″~2″)	Water, air or gas	0.02~1.0	Body:Cast bronze Diaphragm:Synthetic rubber	226
WSE-18A	—						
PSE-18	—	Screwed	15~50(½″~2″)	Oils, gas, air or water	0.02~1.0	Body:Stainless steel Disc:Stainless steel & Synthetic rubber	227
PSE-18A	—						
TPS-12	—	Screwed	10~50(⅜″~2″)	Steam or hot water	0~0.7	Body:Cast bronze Disc:Stainless steel with Teflon tip	229
TPF-12	—	Flanged	15~50(½″~2″)				

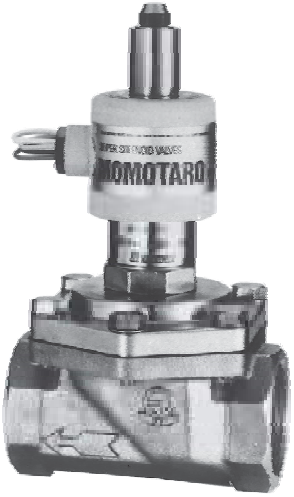
WS-12, 12C Type Solenoid Valve (for Liquids or Gases)

for Manufacturing and Building Equipments etc. Diaphragm Type

Diaphragm type, screwed

WS series are diaphragm type, screwed solenoid valves, with water hammer relaxation mechanism for energized open or energized close operation.

WS-12 Type



WS-12C Type

FEATURES

- For liquids or gasses.
- Wide range of working pressure: 0~1.0MPa.
- Water hammer relaxation mechanism.
- Free installation in vertical or horizontal direction (size 10~50mm).
- Energized open or energized close operation.

SPECIFICATIONS

Operation	Energized open	Energized close
Model name	WS-12	WS-12C
Code name	WS12-F	WS12C-F
Applicable fluid	Water, air, inert gas & oil(Kerosene, light oil level)	
Applicable pressure	0~1.0MPa	
Min. pressure differential across the disc	0MPa (0.03MPa for coil installed horizontally.)	
Fluid temperature	5~60℃	
Fluid viscosity	20cSt or less	
Leakage allowance	Nil (Confirm at pressure gauge. For gas, when 0.02~1.0MPa)	
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*2.	
Insulation	Class B (Silicone mold)	
Ambient temperature	5~60℃	
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)	
End connection	Screwed JIS Rc	
Materials	Body(Cast bronze), Diaphragm(Synthetic rubber)	
Installation	Size 50mm or smaller:Can be installed on both horizontal and vertical piping at any angle between the vertical (when the coil part is placed above) and horizontal. Size 65mm:Install the valve vertically in horizontal piping placing coil part above.	
Valve body pressure	Hydraulic 2.0MPa	

* 1. Refer to page 231 for Method of Wiring.
* 2. Special voltage items other than the above specified are available upon your request.
* 3. We also provide WS-12S type (size up to 50mm), which can reduce the click sound of electromagnet.
* 4. Select WS-12Y, 12CY types if humidity is higher than 85%.

DIMENSIONS AND CURRENT VALUES

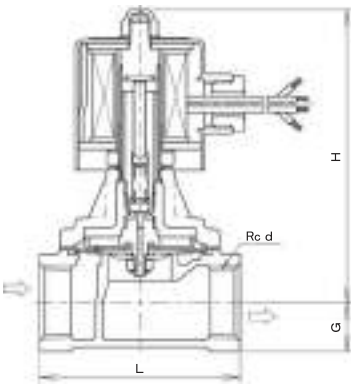
(mm)

Size			10(⅜″)	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)
d			⅜″	½″	¾″	1″	1¼″	1½″	2″	2½″
L			63	63	80	90	106	118	140	160
G			15	15	18	22	27	30	37	45
H			116(174)	116(174)	127(182)	132(188)	148(201)	151(204)	163(215)	201(252)
Port size			18	18	23	28	32	40	48	60
Cv value			3	3	7	10	17	20	30	50
Mass(kg)			1.2(1.8)	1.2(1.7)	1.6(2.1)	2(2.6)	2.8(3.3)	3.6(4.1)	5.3(5.8)	8.2(8.6)
Current (A)	AC100V	Rated	0.20(0.30)		0.25(0.30)		0.35(0.40)			0.60(0.60)
		Starting	0.60(1.30)		0.90(1.30)		1.30(1.70)			2.50(2.50)
	AC200V	Rated	0.10(0.15)		0.13(0.15)		0.18(0.20)			0.30(0.30)
		Starting	0.30(0.70)		0.45(0.70)		0.65(0.85)			1.25(1.25)

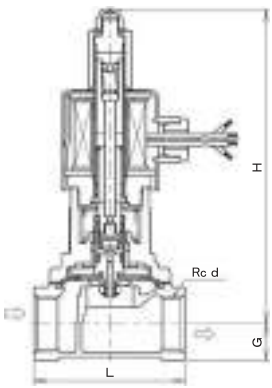
Figures in ( ) are for WS-12C Type

CONSTRUCTION

WS-12 Type



WS-12C Type



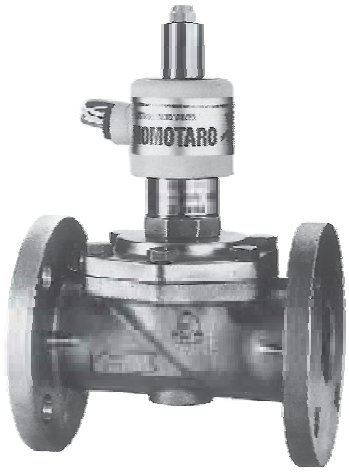
Note: Depending on size, the structure may vary.

WF-12, 12C Type Solenoid Valve (for Liquids or Gases)

Diaphragm type, flanged

WF series are diaphragm type, flanged solenoid valves, with water hammer relaxation mechanism for energized open or energized close operation.

WF-12 Type



WF-12C Type

FEATURES

- For liquids or gasses.
- Wide range of working pressure: 0~1.0MPa
- Water hammer relaxation mechanism.
- Free installation in vertical or horizontal direction (size 15~50mm).
- Energized open or energized close operation.

SPECIFICATIONS

Operation	Energized open	Energized close
Model name	WF-12	WF-12C
Code name	WF12-F	WF12C-F
Applicable fluid	Water, air, inert gas & oil(Kerosene, light oil level)	
Applicable pressure	0~1.0MPa	
Min. pressure differential across the disc	0MPa (0.03MPa for coil installed horizontally.)	
Fluid temperature	5~60℃	
Fluid viscosity	20cSt or less	
Leakage allowance	Nil (Confirm at pressure gauge. For gas, when 0.02~1.0MPa)	
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*2.	
Insulation	Class B (Silicone mold)	
Ambient temperature	5~60℃	
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)	
End connection	Flanged JIS 10KFF	
Materials	Body(Cast bronze), Diaphragm(Synthetic rubber)	
Installation	Size 50mm or smaller:Can be installed on both horizontal and vertical piping at any angle between the vertical (when the coil part is placed above) and horizontal. Size 65mm:Install the valve vertically in horizontal piping placing coil part above.	
Valve body pressure	Hydraulic 2.0MPa	

＊1. Refer to page 231 for Method of Wiring.
＊2. Special voltage items other than the above specified are available upon your request.
＊3. We also provide WS-12S type (size up to 50mm), which can reduce the click sound of electromagnet.
＊4. Select WS-12Y, 12CY types if humidity is higher than 85%.

DIMENSIONS AND CURRENT VALUES

(mm)

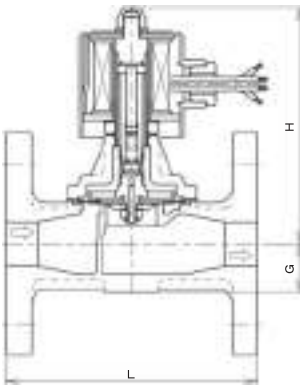
Size			15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)
L			112	118	140	150	160	190	212
G			21	24	27	32	35	41	50
H			116(174)	127(182)	132(188)	148(202)	151(205)	163(217)	201(252)
Port size			18	23	28	32	40	48	60
Cv value			4	7	10	17	20	30	50
Mass(kg)			2.7(3.3)	3.6(4.1)	5.2(5.8)	6.7(7.2)	7.9(8.4)	10.5(11)	15.2(15.6)
Current (A)	AC100V	Rated	0.20(0.30)	0.25(0.30)		0.35(0.40)			0.60(0.60)
		Starting	0.60(1.30)	0.90(1.30)		1.30(1.70)			2.50(2.50)
	AC200V	Rated	0.10(0.15)	0.13(0.15)		0.18(0.20)			0.30(0.30)
		Starting	0.30(0.70)	0.45(0.70)		0.65(0.85)			1.25(1.25)

Figures in ( ) are for WF-12C Type.

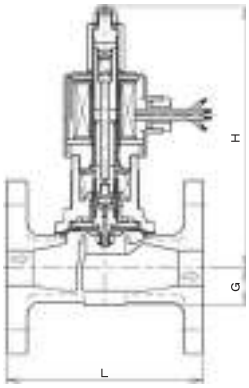
Flanged code JIS 10KFF

CONSTRUCTION

WF-12 Type



WF-12C Type

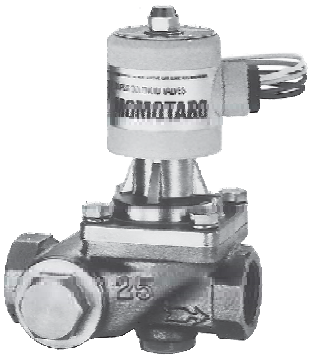


Note: Depending on size, the structure may vary.

WS-13, 13C Type Solenoid Valve (for Liquids or Gases)

Diaphragm type, screwed

Diaphragm type solenoid valve with strainer embedded at the inlet side, allows easy cleaning. A sister product to WS series.



WS-13 Type

WS-13C Type

FEATURES

- Except for strainer, the other parts and their functions are exactly the same as those in WS-12, WS-12C.
- No need to install strainer, contribute to space saving and reduction of installation cost.
- The plug for strainer can be removed using common tools. Easy cleaning.
- Strainer: 60-mesh*, internal lining.

Note: Internal lining, mesh-40, 80, 100 strainers are also available.

SPECIFICATIONS

Operation	Energized open	Energized close
Model name	WS-13	WS-13C
Code name	WS13-F	WS13C-F
Applicable fluid	Water, air, inert gas & oil(Kerosene, light oil level)	
Applicable pressure	0~1.0MPa	
Min. pressure differential across the disc	0MPa (0.03MPa for coil installed horizontally.)	
Fluid temperature	5~60℃	
Fluid viscosity	20cSt or less	
Leakage allowance	Nil (Confirm at pressure gauge. For gas, when 0.02~1.0MPa)	
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*2.	
Insulation	Class B (Silicone mold)	
Ambient temperature	5~60℃	
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)	
End connection	Screwed JIS Rc	
Materials	Body(Cast bronze), Diaphragm(Synthetic rubber)	
Installation	Can be installed on both horizontal and vertical piping at any angle between the vertical (when the coil part is placed above) and horizontal.	
Valve body pressure	Hydraulic 2.0MPa	

* 1. Refer to page 231 for Method of Wiring.
* 2. Special voltage items other than the above specified are available upon your request.
* 3. Select WS-13Y, 13CY types if humidity is higher than 85%.

DIMENSIONS AND CURRENT VALUES

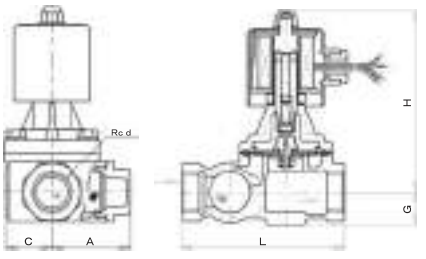
(mm)

Size			15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
d			½″	¾″	1″	1¼″	1½″	2″
L			95	110	125	150	175	205
G			18	21	25	32	35	41
H			119(177)	133(188)	138(194)	154(208)	159(213)	170(224)
A			50	55	60	75	83	94
C			29	30	36	40	49	57
Port size			18	23	28	32	40	48
Cv value			4	7	10	15	20	27
Mass(kg)			1.4(2)	2(2.5)	2.7(3.2)	4.1(4.6)	5.4(5.9)	8(8.5)
Current (A)	AC100V	Rated	0.20(0.30)	0.25(0.30)		0.35(0.40)		
		Starting	0.60(1.30)	0.90(1.30)		1.30(1.70)		
	AC200V	Rated	0.10(0.15)	0.13(0.15)		0.18(0.20)		
		Starting	0.30(0.70)	0.45(0.70)		0.65(0.85)		

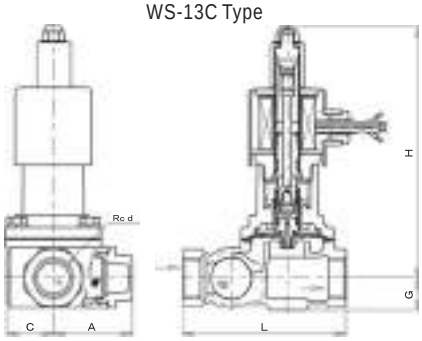
Figures in ( ) are for WS-13C Type

CONSTRUCTION

WS-13 Type



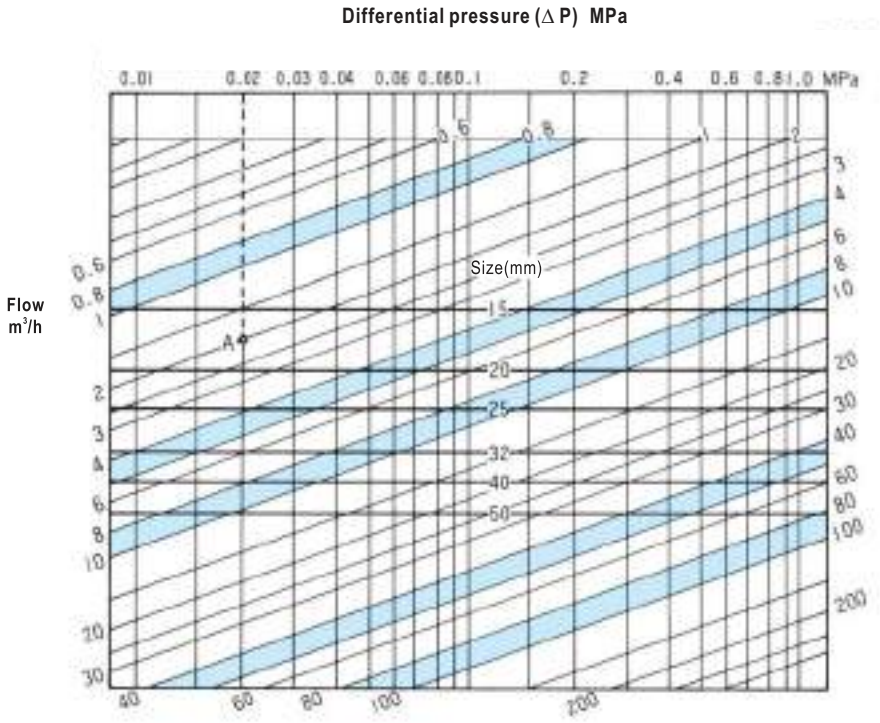
WS-13C Type



Note: Depending on size, the structure may vary.

DATA/WS-13, 13C Type Solenoid Valve (for Liquids or Gases)

SOLENOID VALVE SIZE SELECTION CHART (for Water)



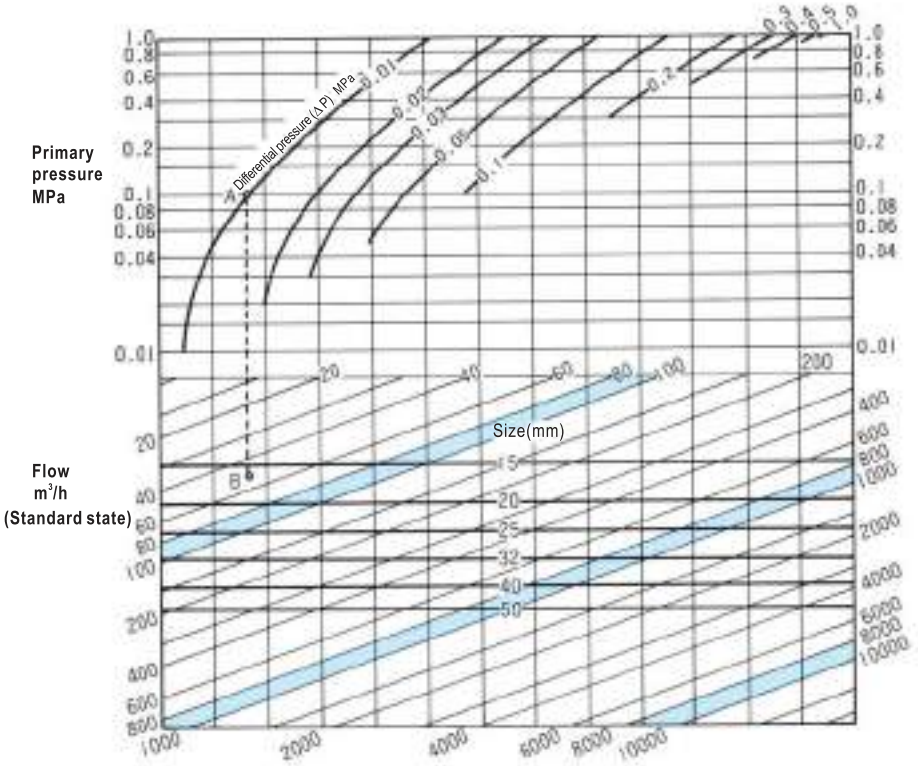
● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:

Primary pressure: 0.3MPa
Secondary pressure: 0.28MPa
Flow of water: 2m³/h

Differential pressure (Δ P) : 0.3−0.28=0.02MPa. Find out the intersection point A between the 0.02MPa differential pressure (ΔP) line and the 2m³/h flow line. Since point A is between the lines representing nominal diameter 15mm and 20mm, the nominal diameter should be the larger one, i.e. 20mm.

SOLENOID VALVE SIZE SELECTION CHART (for Air)



● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:

Primary pressure: 0.1MPa
Secondary pressure: 0.09MPa
Flow of air (at 20℃): 50m³/h (standard state)

Differential Pressure (ΔP) is: 0.1−0.09=0.01MPa. Identify intersection point (A) of the 0.1MPa primary pressure line and the 0.01MPa differential pressure curve. Draw a vertical line from point A until it intersects with the 50m³/h flow line. The intersection point is named B. Since point B is between the 15mm and 20mm size lines, the larger size, which is 20mm, is selected.

WS-15, 15C, WF-15, 15C Type Solenoid Valve (for Liquids or Gases)

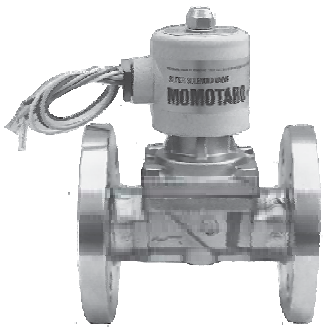
Diaphragm type

These series valves are basically the same as WS series,except that they are made of stainless steel.

Although the electromagnet of the part contacting with liquid is made of stainless steel with special steel, cares should be paid in applications requiring high corrosion resistance.

WS-15 Type

WS-15C Type



WF-15 Type

WF-15C Type

FEATURES

- Suitable for stainless steel piping and equipment.
- Wide range of working pressure: 0~1.0MPa
- Water hammer relaxation mechanism.
- Free installation in vertical or horizontal direction.
- Energized open or energized close operation.

SPECIFICATIONS

Model name	WS-15	WF-15	WS-15C	WF-15C
Code name	**WS15-D**	**WF15-D**	**WS15C-D**	**WF15C-D**
Size	10~50(⅜″~2″)	15~50(½″~2″)	10~50(⅜″~2″)	15~50(½″~2″)
End connection	Screwed JIS Rc	Flanged JIS 10KFF	Screwed JIS Rc	Flanged JIS 10KFF
Operation	Energized open		Energized close	
Applicable fluid	Water, air, inert gas & oil(Kerosene, light oil level)			
Applicable pressure	0~1.0MPa			
Min. pressure differential across the disc	0MPa (0.03MPa for coil installed horizontally.)			
Fluid temperature	5~60℃			
Fluid viscosity	20cSt or less			
Leakage allowance	Nil (Confirm at pressure gauge. For gas, when 0.02~1.0MPa)			
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*2.			
Insulation	Class B (Silicone mold)			
Ambient temperature	5~60℃			
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)			
Materials	Body(Stainless steel), Diaphragm(Synthetic rubber)			
Installation	Can be installed on both horizontal and vertical piping at any angle between the vertical (when the coil part is placed above) and horizontal.			
Valve body pressure	Hydraulic 2.0MPa			

＊1. Refer to page 231 for Method of Wiring.
＊2. Special voltage items other than the above specified are available upon your request.
＊3. Please contact our local agant if the fluid is pure water.
＊4. Select WS,WF-15Y,15CY types if humidity is higher than 85%.

DIMENSIONS AND CURRENT VALUES

(mm)

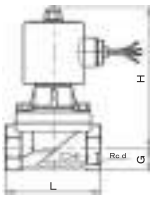
Size				10(⅜″)	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
Screwed	WS-15 WS-15C Type	d		⅜″	½″	¾″	1″	1¼″	1½″	2″
		L		63	63	80	90	106	118	140
		G		15	15	18	22	27	30	37
		H		120(181)	120(181)	131(190)	135(194)	151(208)	154(211)	166(223)
		Port size		18	18	23	28	32	40	48
		Cv value		3	4	7	10	17	20	30
		Mass(kg)		1.3(1.9)	1.3(1.9)	1.8(2.2)	2.2(2.6)	2.9(3.3)	3.7(4.1)	5.6(5.8)
Flanged	WF-15 WF-15C Type	L		—	112	118	140	150	160	190
		G		—	15	18	22	27	30	37
		H		—	120(181)	131(190)	135(194)	151(208)	154(211)	166(223)
		Port size		—	18	23	28	32	40	48
		Cv value		—	4	7	10	17	20	30
		Mass(kg)		—	2.6(3.2)	3.6(4)	4.9(5.3)	6.2(6.6)	7.3(7)	9.8(10)
Current (A)		AC100V	Rated	0.25(0.35)	0.25(0.35)	0.30(0.35)	0.30(0.35)	0.40(0.45)	0.40(0.45)	0.40(0.45)
			Starting	0.60(1.30)	0.60(1.30)	0.90(1.30)	0.90(1.30)	1.30(1.70)	1.30(1.70)	1.30(1.70)
		AC200V	Rated	0.13(0.18)	0.13(0.18)	0.15(0.18)	0.15(0.18)	0.20(0.23)	0.20(0.23)	0.20(0.23)
			Starting	0.30(0.70)	0.30(0.70)	0.45(0.70)	0.45(0.70)	0.65(0.85)	0.65(0.85)	0.65(0.85)

Figures in ( ) are for WS-15C or WF-15C.

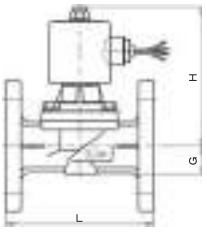
Flange code JIS 10KFF

FIGURATION DRAWING

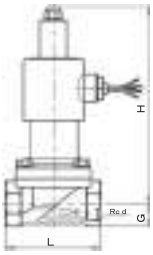
WS-15 Type



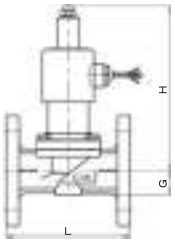
WF-15 Type



WS-15C Type



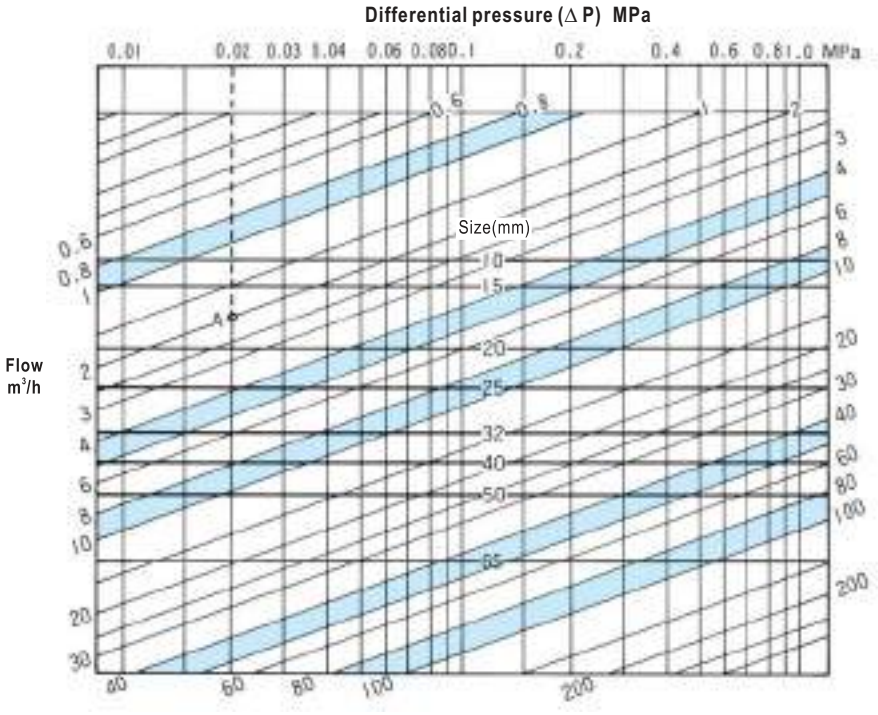
WF-15C Type



DATA/WS, WF Type Solenoid Valve (for Liquids or Gases)

SIZE SELECTION CHART (for Water)

Applicable models: WS-12, 12C, 12K, 12CK
WF-12, 12C, 12K, 12CK
WS-15, 15C
WF-15, 15C



HOW TO USE THE CHART

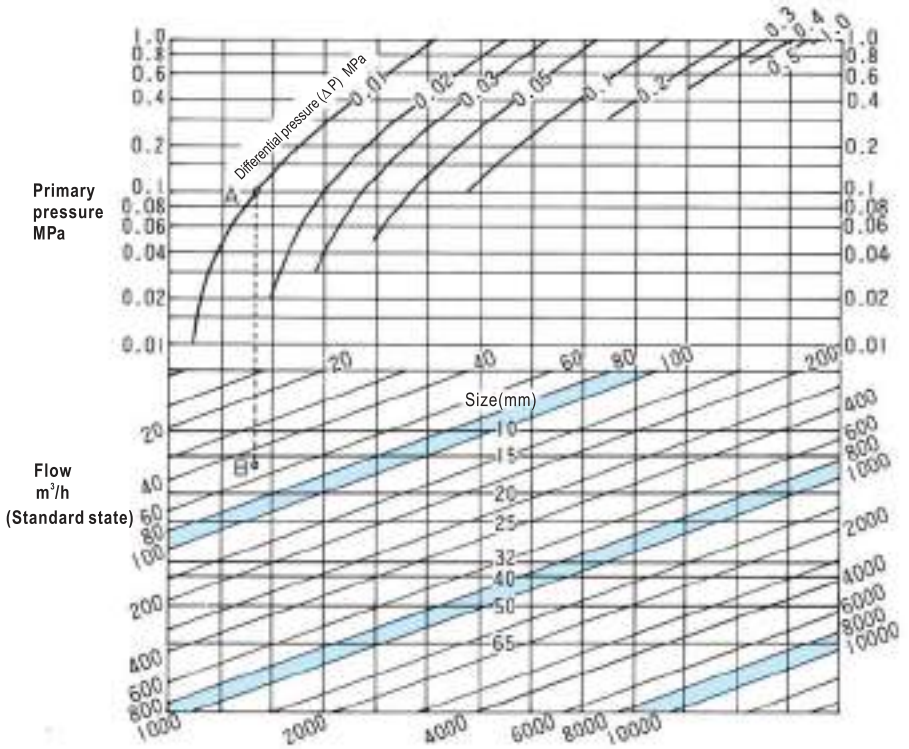
Example: Determine the size of valve meeting the following conditions:

Primary pressure: 0.3MPa
Secondary pressure: 0.28MPa
Flow of water: 2m³/h

Differential pressure (Δ P) : 0.3−0.28=0.02MPa. Find out the intersection point A between the 0.02MPa differential pressure (ΔP) line and the 2m³/h flow line. Since point A is between the lines representing nominal diameter 15mm and 20mm, the nominal diameter should be the larger one, i.e. 20mm.

SIZE SELECTION CHART (for Air)

Applicable models: WS-12, 12C, 12K, 12CK
WF-12, 12C, 12K, 12CK
WS-15, 15C
WF-15, 15C



HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:

Primary pressure: 0.1MPa
Secondary pressure: 0.09MPa
Flow of air (at 20℃): 50m³/h (standard state)

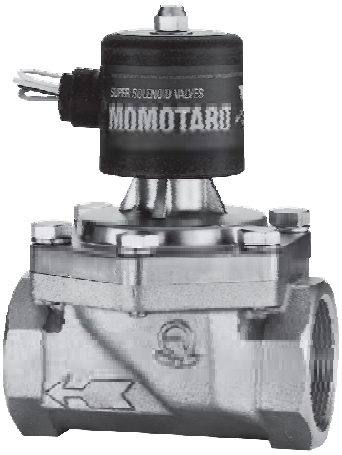
Differential pressure (ΔP) is: 0.1−0.09=0.01MPa. Identify intersection point (A) of the 0.1MPa primary pressure line and the 0.01MPa Differential pressure curve. Draw a vertical line from point A until it intersects with the 50m³/h flow line. The intersection point is named B. Since point B is between the 15mm and 20mm size lines, the larger size, which is 20mm, is selected.

PS-12, 12C Type Solenoid Valve (for Steam, Liquids or Air)

for Manufacturing and Building Equipments etc. Piston-type solenoid valve

Piston type, screwed

PS series piston-type screwed solenoid valves for energized open and energized close operation.



PS-12 Type

PS-12C Type

FEATURES

- For steam, water, air, and oil.
- Wide range of working pressure: 0~1.0MPa
- Free installation in vertical or horizontal direction (size 10~50mm).
- Energized open or energized close operation.

SPECIFICATIONS

Operation	Energized open	Energized close
Model name	PS-12	PS-12C
Code name	PS12-W	PS12C-W
Applicable fluid	Steam, water, air & oils(Kerosene, light oil, gasoline level)	
Applicable pressure	0~1.0MPa	
Min. pressure differential across the disc	0MPa (0.03MPa for coil installed horizontally.)	
Fluid temperature	5~180℃ (For hot water:Max. 100℃)	
Fluid viscosity	20cSt or less	
Leakage allowance	Steam, water & oils:Nil (Confirm at pressure gauge) Air:50ml/min(standard state) or less (when 0.05~1.0MPa)	
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*3.	
Insulation	Class H (Silicone mold)	
Ambient temperature	5~60℃	
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)	
End connection	Screwed JIS Rc	
Materials	Body(Cast bronze), Disc(Stainless steel with Teflon tip)	
Installation	Size 50mm or smaller:Can be installed on both horizontal and vertical piping at any angle between the vertical (when the coil part is placed above) and horizontal. Size 65mm:Install the valve vertically in horizontal piping placing coil part above.	
Valve body pressure	Hydraulic 2.0MPa	

* 1. Refer to page 231 for Method of Wiring.
* 2. In case complete of shut off is required for air service, or the valve is used for well water, select WS or WF series.
* 3. Special voltage items other than the above specified are available upon your request.
* 4. We also provide PS-12Z type, which size is smaller than 25mm and is suitable for applications requiring highly frequent opening/closing.
* 5. Select PS-12Y, 12CY types if humidity is higher than 85%.
* 6. We also provide PS-12R type that is suitable for oil or other fluid with viscosity up to 100cSt (the specifications may vary slightly for sizes smaller than 50mm) .

DIMENSIONS AND CURRENT VALUES

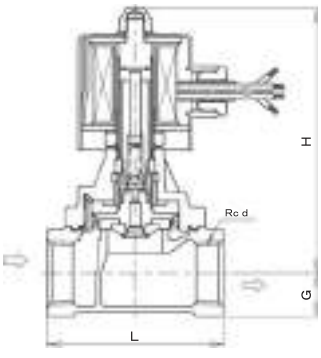
(mm)

Size			10(⅜″)	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)
d			⅜″	½″	¾″	1″	1¼″	1½″	2″	2½″
L			63	63	80	90	106	118	140	160
G			15	15	18	22	27	30	37	45
H			118(177)	118(177)	130(186)	136(191)	147(201)	150(204)	162(216)	200(252)
Port size			18	18	23	28	32	40	48	60
Cv value			3	4.5	7.5	12	18	23	35	50
Mass(kg)			1.2(1.8)	1.1(1.7)	1.6(2.1)	2.1(2.6)	2.8(3.3)	3.6(4.1)	5.3(5.8)	8.1(8.5)
Current (A)	AC100V	Rated	0.20(0.30)		0.25(0.30)		0.35(0.40)			0.60(0.60)
		Starting	0.60(1.30)		0.90(1.30)		1.30(1.70)			2.50(2.50)
	AC200V	Rated	0.10(0.15)		0.13(0.15)		0.18(0.20)			0.30(0.30)
		Starting	0.30(0.70)		0.45(0.70)		0.65(0.85)			1.25(1.25)

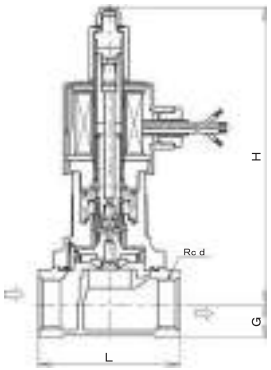
Figures in ( ) are for PS-12C Type

CONSTRUCTION

PS-12 Type



PS-12C Type



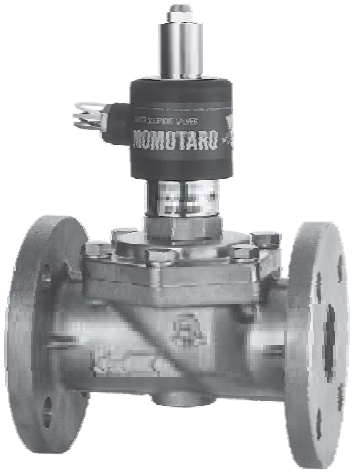
Note: Depending on size, the structure may vary.

PF-12, 12C Type Solenoid Valve (for Steam, Liquids or Air)

Piston type, flanged

PF series piston-type flanged solenoid valves for energized open and energized close operation applications.

PF-12 Type



PF-12C Type

FEATURES

- For steam, water, air, and oil.
- Wide range of working pressure: 0~1.0MPa.
- Free installation in vertical or horizontal direction (size 15~50mm).
- Energized open or energized close operation.

SPECIFICATIONS

Operation	Energized open	Energized close
Model name	PF-12	PF-12C
Code name	**PF12-W*1**	**PF12C-W*1**
Applicable fluid	Steam, water, air & oils(Kerosene, light oil, gasoline*5 level)	
Applicable pressure	0~1.0MPa(0.05~1.0MPa for size 80mm.)	
Min. pressure differential across the disc	0MPa (0.03MPa for coil installed horizontally. 0.05MPa for size 80mm.)	
Fluid temperature	5~180℃ (For hot water:Max. 100℃)	
Fluid viscosity	20cSt or less	
Leakage allowance	Steam, water & oils:Nil (Confirm at pressure gauge) Air:50ml/min(standard state) or less (when 0.05~1.0MPa)	
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*4	
Insulation	Class H (Silicone mold)	
Ambient temperature	5~60℃	
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)	
End connection	Flanged JIS 10KFF	
Materials	Body(Cast bronze, Size 80mm:Cast iron), Disc(Stainless steel with Teflon tip)	
Installation	Size 50mm or smaller:Can be installed on both horizontal and vertical piping at any angle between the vertical (when the coil part is placed above) and horizontal. Size 65 80mm:Install the valve vertically in horizontal piping placing coil part above.	
Valve body pressure	Hydraulic 2.0MPa	

* 1. Code name for size 80mm are PF12-S and PF12C-S.
* 2. Refer to page 231 for Method of Wiring.
* 3. In case complete of shut off is required for air service, or the valve is used for well water, select WS or WF series.
* 4. Special voltage items other than the above specified are available upon your request
* 5. We also provide PF-12Z type, which size is less than 25mm and is suitable for applications requiring highly frequent opening/closing.
* 6. Select PF-12Y, 12CY types if humidity is higher than 85%.
* 7. We also provide PF-12R type that is suitable for oil or other fluid with viscosity up to 100cSt (the specifications may vary slightly for sizes less than 50mm).
* 8. In case of Gasoline use, size 15~65mm only are available.

DIMENSIONS AND CURRENT VALUES

(mm)

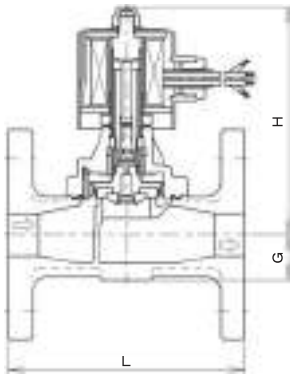
Size			15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)
L			112	118	140	150	160	190	212	290
G			21	24	27	32	35	41	50	50
H			118(177)	130(186)	136(191)	147(201)	150(204)	162(216)	200(252)	220(272)
Port size			18	23	28	32	40	48	60	73
Cv value			4.5	7.5	12	18	23	35	50	70
Mass(kg)			2.7(3.3)	3.6(4.1)	5.3(5.8)	6.7(7.2)	7.9(8.4)	10.5(11)	15.1(15.5)	26.5(27)
Current (A)	AC100V	Rated	0.20(0.30)	0.25(0.30)		0.35(0.40)			0.60(0.60)	
		Starting	0.60(1.30)	0.90(1.30)		1.30(1.70)			2.50(2.50)	
	AC200V	Rated	0.10(0.15)	0.13(0.15)		0.18(0.20)			0.30(0.30)	
		Starting	0.30(0.70)	0.45(0.70)		0.65(0.85)			1.25(1.25)	

Figures in ( ) are for PF-12C Type

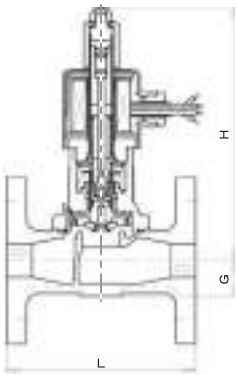
Flange code JIS 10KFF

CONSTRUCTION

PF-12 Type



PF-12C Type



Note: Depending on size, the structure may vary.

PS-13, 13C Type Solenoid Valve (for Steam, Liquids or Air)

Piston type, screwed

Piston type solenoid valve with strainer embedded at the inlet side, allows easy cleaning. A sister product to PS series valves.

FEATURES

- Except for strainer, the other parts and their functions are exactly the same as those in PS-12, 12C.
- No need to install strainer, contribute to space saving and reduction of installation cost.
- The plug for strainer can be removed using common tools. Easy cleaning.
- Strainer: 60-mesh*, internal lining.

Note: Internal lining, mesh-40, 80, 100 strainers are also available.

SPECIFICATIONS

Operation	Energized open	Energized close
Model name	PS-13	PS-13C
Code name	PS13-W	PS13C-W
Applicable fluid	Steam, water, air & oils(Kerosene, light oil, gasoline level)	
Applicable pressure	0~1.0MPa	
Min. pressure differential across the disc	0MPa (0.03MPa for coil installed horizontally.)	
Fluid temperature	5~180℃ (For hot water:Max. 100℃)	
Fluid viscosity	20cSt or less	
Leakage allowance	Steam, water & oils:Nil (Confirm at pressure gauge) Air:50ml/min(standard state) or less (when 0.05~1.0MPa)	
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*3.	
Insulation	Class H (Silicone mold)	
Ambient temperature	5~60℃	
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)	
End connection	Screwed JIS Rc	
Materials	Body(Cast bronze), Disc(Stainless steel with Teflon tip)	
Installation	Can be installed on both horizontal and vertical piping at any angle between the vertical (when the coil part is placed above) and horizontal.	
Valve body pressure	Hydraulic 2.0MPa	

* 1. Refer to page 231 for Method of Wiring.
* 2. In case complete of shut off is required for air service, or the valve is used for well water, select WS or WF series.
* 3. Special voltage items other than the above specified are available upon your request.
* 4. We also provide PS-13Z type, which size is smaller than 25mm and is suitable for applications requiring highly frequent opening/closing.
* 5. Select PS-13YY, 13CY types if humidity is higher than 85%.

PS-13 Type

PS-13C Type

DIMENSIONS AND CURRENT VALUES

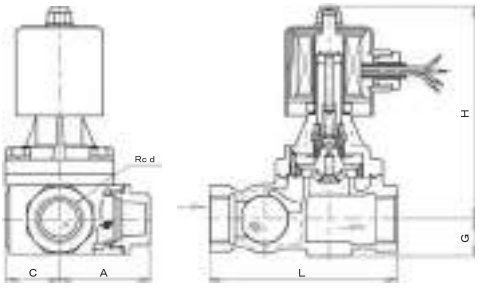
(mm)

Size			15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
d			½″	¾″	1″	1¼″	1½″	2″
L			95	110	125	150	175	205
G			18	21	25	32	35	41
H			121(180)	136(192)	142(197)	153(207)	158(212)	169(223)
A			50	55	60	75	83	94
C			28	30	35	40	47	56
Port size			18	23	28	32	40	48
Cv value			4.5	7.5	12	16	22	34
Mass(kg)			1.4(2)	2(2.5)	2.7(3.2)	4.1(4.6)	5.4(5.9)	8(8.5)
Current (A)	AC100V	Rated	0.20(0.30)	0.25(0.30)		0.35(0.40)		
		Starting	0.60(1.30)	0.90(1.30)		1.30(1.70)		
	AC200V	Rated	0.10(0.15)	0.13(0.15)		0.18(0.20)		
		Starting	0.30(0.70)	0.45(0.70)		0.65(0.85)		

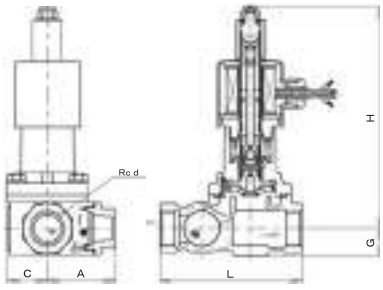
Figures in ( ) are for PS-13C Type

CONSTRUCTION

PS-13 Type



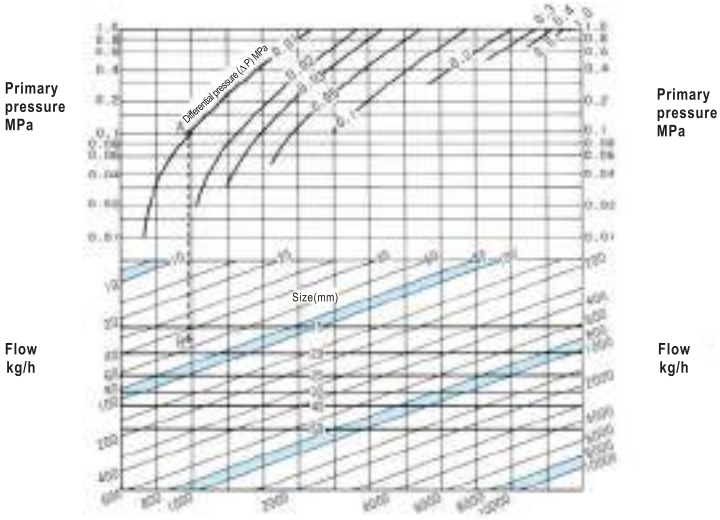
PS-13C Type



Note: Depending on size, the structure may vary.

DATA/PS-13, 13C Type Solenoid Valve (for Steam, Liquids or Air)

SIZE SELECTION CHART (for Steam)



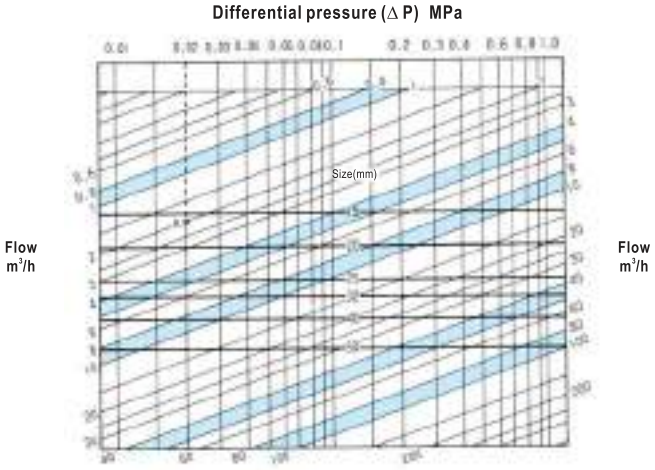
● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:

Primary pressure: 0.1MPa
Secondary pressure: 0.09MPa
Flow of steam (saturated): 50kg/h

Differential pressure (ΔP) is: 0.1−0.09=0.01MPa. Identify intersection point (A) of the 0.1MPa primary pressure line and the 0.01MPa differential pressure curve. Draw a vertical line from point A until it intersects with the 50m^3/h flow line. The intersection point is named B. Since point B is between the 15mm and 20mm size lines, the larger size, which is 20mm, is selected.

SIZE SELECTION CHART (for Water)



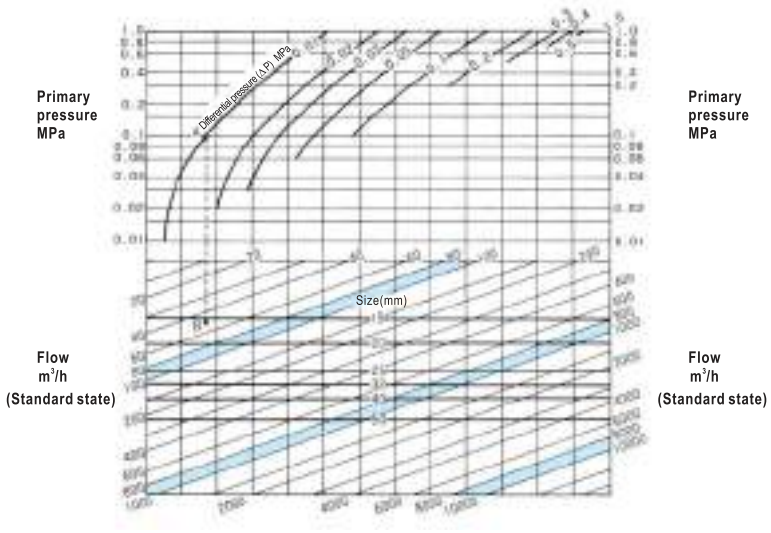
● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:

Primary pressure: 0.3MPa
Secondary pressure: 0.28MPa
Flow of water: 2m^3/h

Differential pressure (ΔP) : 0.3−0.28=0.02MPa. Find out the intersection point A between the 0.02MPa differential pressure (ΔP) line and the 2m^3/h flow line. Since point A is between the lines representing nominal diameter 15mm and 20mm, the nominal diameter should be the larger one, i.e. 20mm.

SIZE SELECTION CHART (for Air)



● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:

Primary pressure: 0.1MPa
Secondary pressure: 0.09MPa
Flow of air (at 20℃): 50m^3/h (standard state)

Differential pressure (ΔP) is: 0.1−0.09=0.01MPa. Identify intersection point (A) of the 0.1MPa primary pressure line and the 0.01MPa differential pressure curve. Draw a vertical line from point A until it intersects with the 50m^3/h flow line. The intersection point is named B. Since point B is between the 15mm and 20mm size lines, the larger size, which is 20mm, is selected.

PS-15, 15C, PF-15, 15C Type Solenoid Valve (for Steam, Liquids or Air)

Piston type

These series valves are basically the same as PS series, except that they are made of stainless steel.

Although the electromagnet of the part contacting with liquid is made of stainless steel with special steel, cares should be paid in applications requiring high corrosion resistance.

PS-15 Type

PS-15C Type

PF-15 Type

PF-15C Type

FEATURES

- Suitable for stainless steel piping and equipment.
- Wide range of working pressure: 0~1.0MPa
- Free installation in vertical or horizontal direction.
- Energized open or energized close.

SPECIFICATIONS

Model name	PS-15	PF-15	PS-15C	PF-15C
Code name	PS15-V	PF15-V	PS15C-V	PF15C-V
Size	10~50(⅜″~2″)	15~50(½″~2″)	10~50(⅜″~2″)	15~50(½″~2″)
End connection	Screwed JIS Rc	Flanged JIS 10KFF	Screwed JIS Rc	Flanged JIS 10KFF
Operation	Energized open		Energized close	
Applicable fluid	Steam, water, air & oils(Kerosene, light oil, gasoline level)			
Applicable pressure	0~1.0MPa			
Min. pressure differential across the disc	0MPa (0.03MPa for coil installed horizontally.)			
Fluid temperature	5~180℃(For hot water:Max.100℃)			
Fluid viscosity	20cSt or less			
Leakage allowance	Steam, water & oils:Nil (Confirm at pressure gauge), Air:50ml/min(standard state) or less (when 0.05~1.0MPa)			
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*2.			
Insulation	Class H (Silicone mold)			
Ambient temperature	5~60℃			
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)			
Materials	Body(Stainless steel), Disc(Stainless steel with Teflon tip)			
Installation	Can be installed on both horizontal and vertical piping at any angle between the vertical (when the coil part is placed above) and horizontal.			
Valve body pressure	Hydraulic 2.0MPa			

＊1. Refer to page 231 for Method of Wiring.
＊2. In case complete of shut off is required for air service, or the valve is used for well water, select WS or WF series.
＊3. Special voltage items other than the above specified are available upon your request.
＊4. We also provide PS-15Z and PF-15Z types, which size is smaller than 25mm and are suitable for applications requiring highly frequent opening/closing.
＊5. Select PS, PF-15Y, or 15CY types if humidity is higher than 85%.

DIMENSIONS AND CURRENT VALUES

(mm)

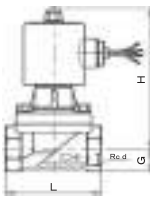
Size				10(⅜″)	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
Screwed	PS-15 PS-15C Type	d		⅜″	½″	¾″	1″	1¼″	1½″	2″
		L		63	63	80	90	106	118	140
		G		15	15	18	22	27	30	37
		H		122(183)	122(183)	135(193)	139(197)	150(207)	153(210)	165(222)
		Port size		18	18	23	28	32	40	48
		Cv value		3	4.5	7.5	12	18	23	35
		Mass(kg)		1.3(1.9)	1.3(1.9)	1.8(2.2)	2.2(2.6)	2.9(3.3)	3.7(4.1)	5.6(5.8)
Flanged	PF-15 PF-15C Type	L		—	112	118	140	150	160	190
		G		—	15	18	22	27	30	37
		H		—	122(183)	135(193)	139(197)	150(207)	153(210)	165(222)
		Port size		—	18	23	28	32	40	48
		Cv value		—	4.5	7.5	12	18	23	35
		Mass(kg)		—	2.6(3.2)	3.6(4)	4.9(5.3)	6.2(6.6)	7.3(7)	9.8(10)
Current (A)		AC100V	Rated	0.25(0.35)	0.25(0.35)	0.30(0.35)	0.30(0.35)	0.40(0.45)	0.40(0.45)	0.40(0.45)
			Starting	0.60(1.30)	0.60(1.30)	0.90(1.30)	0.90(1.30)	1.30(1.70)	1.30(1.70)	1.30(1.70)
		AC200V	Rated	0.13(0.18)	0.13(0.18)	0.15(0.18)	0.15(0.18)	0.20(0.23)	0.20(0.23)	0.20(0.23)
			Starting	0.30(0.70)	0.30(0.70)	0.45(0.70)	0.45(0.70)	0.65(0.85)	0.65(0.85)	0.65(0.85)

Figures in ( ) are for PS-15C or PF-15C.

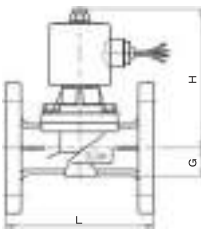
Flange code JIS 10KFF

FIGURATION DRAWING

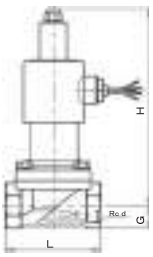
PS-15 Type



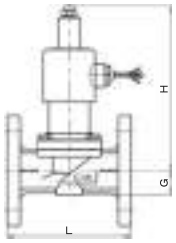
PF-15 Type



PS-15C Type



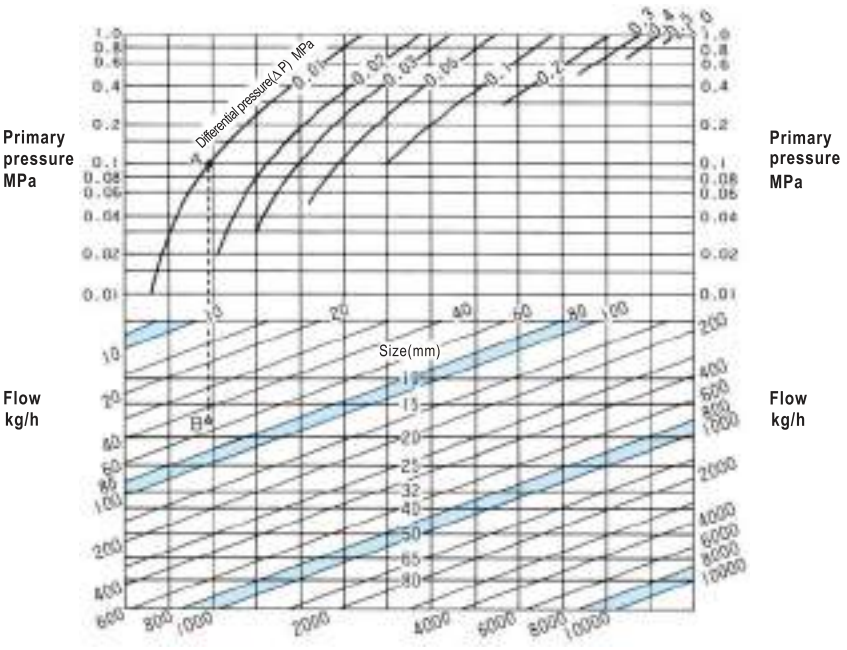
PF-15C Type



DATA/PS, PF Type Solenoid Valve (for Steam or Water)

SIZE SELECTION CHART (for Steam)

Applicable models: PS-12, 12C
PF-12, 12C
PS-15, 15C
PF-15, 15C



● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:

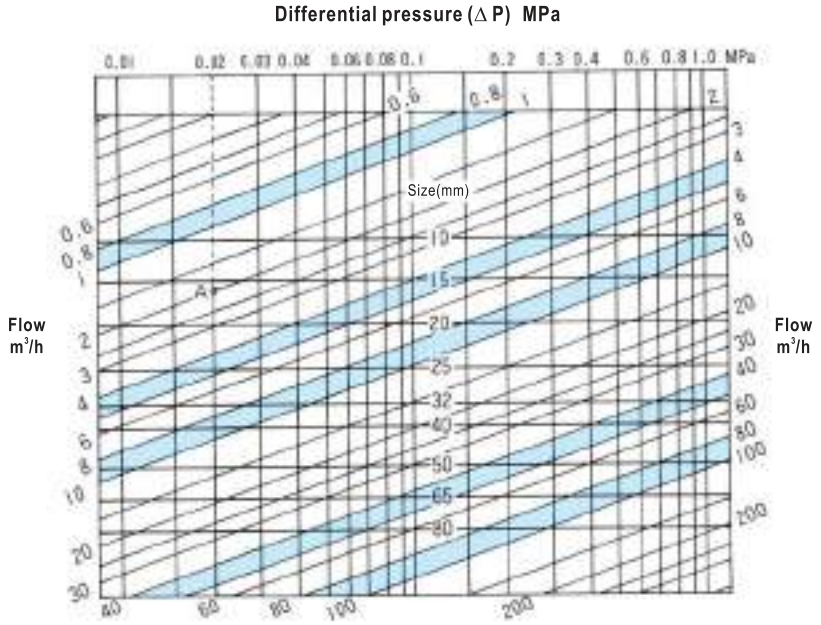
Primary pressure: 0.1MPa
Secondary pressure: 0.09MPa
Flow of steam (saturated): 50kg/h

Differential pressure(Δ P) is:
0.1−0.09=0.01MPa.

Identify intersection point (A) of the 0.1MPa primary pressure line and the 0.01MPa differential pressure differential curve. Draw a vertical line from point A until it intersects with the 50kg/h flow line. The intersection point is named B. Since point B is between the 15mm and 20mm size lines, the larger size, which is 20mm, is selected.

SIZE SELECTION CHART (for Water)

Applicable models: PS-12, 12C, 12K, 12CK
PF-12, 12C
PS-15, 15C
PF-15, 15C



● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:

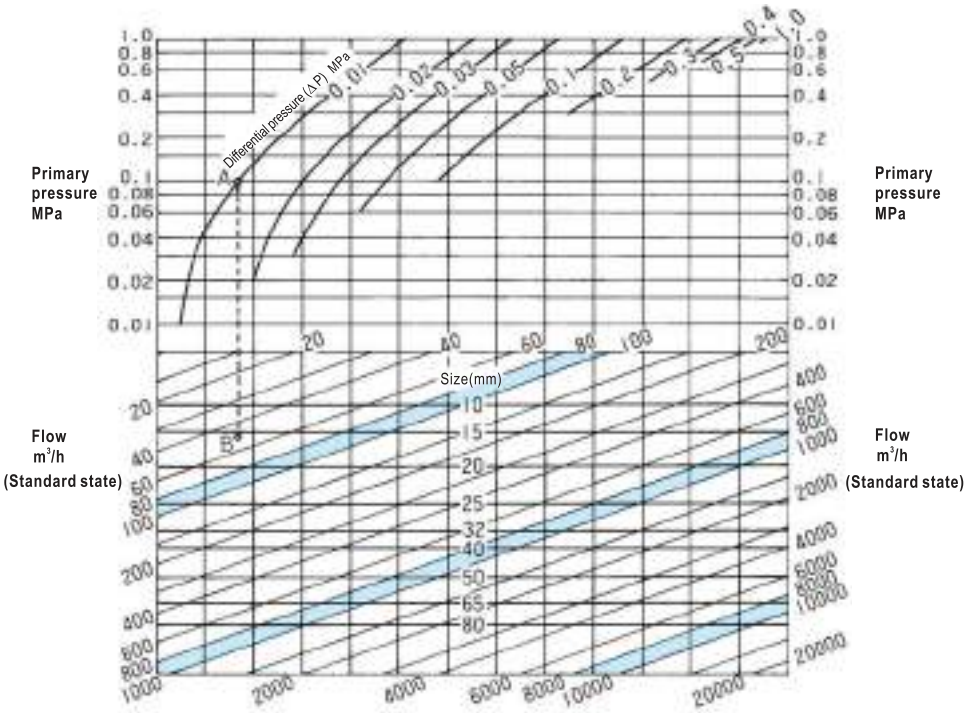
Primary pressure: 0.3MPa
Secondary pressure: 0.28MPa
Flow of water: 2m³/h

Differential pressure (Δ P) : 0.3−0.28=0.02MPa. Find out the intersection point A between the 0.02MPa differential pressure (ΔP) line and the 2m³/h flow line. Since point A is between the lines representing nominal diameter 15mm and 20mm, the nominal diameter should be the larger one, i.e. 20mm.

DATA/PS, PF Type Solenoid Valve (for Air)

SIZE SELECTION CHART (for Air)

Applicable models: PS-12, 12C, 12K, 12CK
PF-12, 12C
PS-15, 15C
PF-15, 15C



● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:

Primary pressure: 0.1MPa
Secondary pressure: 0.09MPa
Flow of air (at 20℃): 50m³/h (standard state)

Differential pressure (ΔP) is: 0.1−0.09=0.01MPa. Identify intersection point (A) of the 0.1MPa primary pressure line and the 0.01MPa differential pressure curve. Draw a vertical line from point A until it intersects with the 50m³/h flow line. The intersection point is named B. Since point B is between the 15mm and 20mm size lines, the larger size, which is 20mm, is selected.

PS-16, PF-16 (for Water), PS-17, PF-17 (for Steam) Type Solenoid Valve

[Stainless steel] Piston type, for high pressure

A sister product to series bronze solenoid valves for high pressure application.
Although the electromagnet of the part contacting with liquid is made of stainless steel with special steel, cares should be paid in applications requiring high corrosion resistance.

FEATURES

- Suitable for high pressure fluid.
- Stainless steel body, also suitable for high pressure water or steam.

SPECIFICATIONS

Model name	PS-16	PF-16	PS-17	PF-17
Code name	PS16-V	PF16-V	PS17-V	PF17-V
Size	10~50(⅜″~2″)	15~50(½″~2″)	10~50(⅜″~2″)	15~50(½″~2″)
Applicable fluid	Water		Steam	
Applicable pressure	0.05~2.0MPa		0.05~1.6MPa	
Min. pressure differential across the disc	0.05MPa			
Fluid temperature	5~100℃		5~200℃	
Fluid viscosity	20cSt or less		—	
Leakage allowance	2ml/min or less		3g/min or less	
Operation	Energized open			
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*1.			
Insulation Class	Class H (Silicone mold)			
Ambient temperature	5~60℃		5~40℃	
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)			
End connection	Screwed JIS Rc	Flanged JIS 16KFF	Screwed JIS Rc	Flanged JIS 16KFF
Materials	Body(Stainless steel), Disc(Stainless steel with Teflon tip)			
Installation	Install the valve vertically in horizontal piping placing coil part above.			
Valve body pressure test	Hydraulic 4.0MPa		Hydraulic 3.2MPa	

* 1. Special voltage items other than the above specified are available upon your request.
* 2. Refer to page 231 for Method of Wiring.
* 3. Please contact our local agent if the fluid is pure water.

DIMENSIONS AND CURRENT VALUES

(mm)

Size				10(⅜″)	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)
Screwed	PS-16 PS-17 Type	d		⅜″	½″	¾″	1″	1¼″	1½″	2″
		L		63	63	80	90	106	118	140
		G		15	15	18	22	27	30	37
		H		129	129	136	140	163	166	178
		Port size		18	18	23	28	32	40	48
		Cv value		3	4.5	7.5	12	18	23	35
		Mass(kg)		1.5	1.5	2.2	2.6	3.6	4.5	6.4
Flanged	PF-16 PF-17 Type	L		—	112	118	140	150	160	190
		G		—	15	18	22	27	30	37
		H		—	129	136	140	163	166	178
		Port size		—	18	23	28	32	40	48
		Cv value		—	4.5	7.5	12	18	23	35
		Mass(kg)		—	2.8	4	5.3	6.9	8.1	10.6
Current (A)		AC100V	Rated	0.3	0.3	0.4	0.4	0.6	0.6	0.6
			Starting	0.9	0.9	1.3	1.3	2.50	2.50	2.50
		AC200V	Rated	0.15	0.15	0.20	0.20	0.30	0.30	0.30
			Starting	0.45	0.45	0.65	0.65	1.25	1.25	1.25

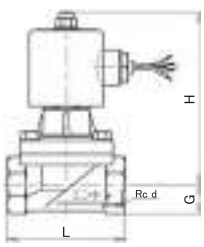
Flange code JIS 16KFF

PS-16, PS-17 Type

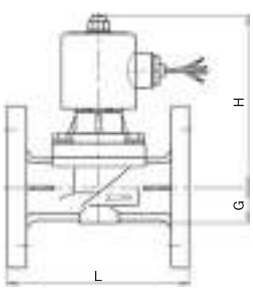
PF-16, PF-17 Type

FIGURATION DRAWING

PS-16, PS-17 Type

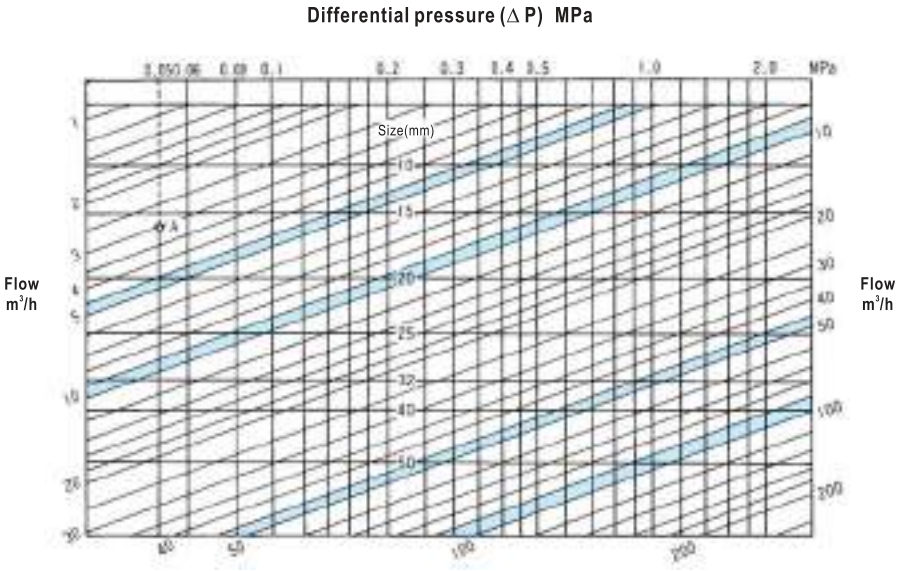


PF-16, PF-17 Type



DATA/PS-16, PF-16 (for Water), PS-17, PF-17 (for Steam) Type Solenoid Valve

PS-16, PF-16 TYPE SIZE SELECTION CHART (for Water)

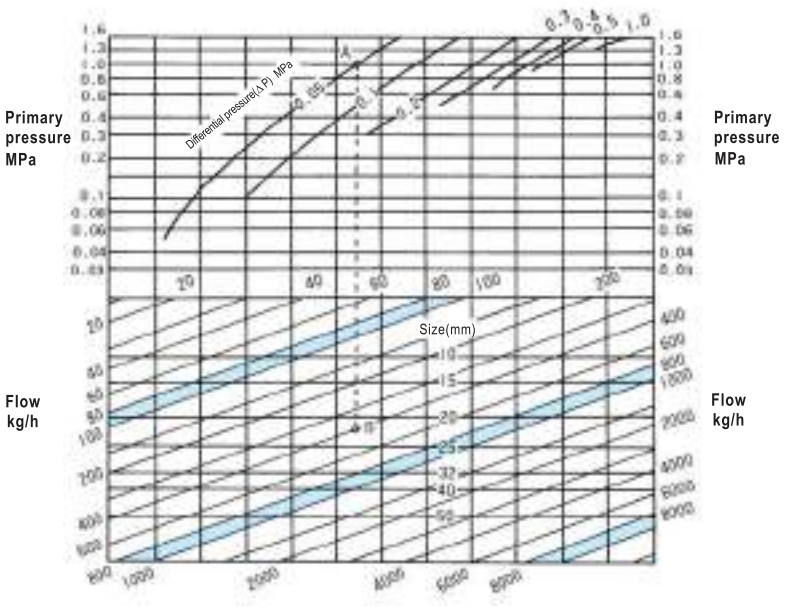


● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:
Primary pressure: 1.0MPa
Secondary pressure: 0.95MPa
Flow of water: 2m³/h

Differential pressure (Δ P): 1.0−0.95=0.05MPa. Find out the intersection point A between the 0.05MPa Differential pressure (Δ P) line and the 3m³/h flow line. Since point A is between the lines representing nominal diameter 15mm and 20mm, the nominal diameter should be the larger one, i.e. 20mm.

PS-17, PF-17 TYPE SIZE SELECTION CHART (for Steam)



● HOW TO USE THE CHART

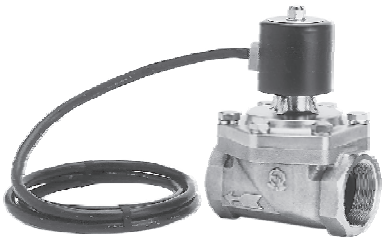
Example: Determine the size of valve meeting the following conditions:
Primary pressure: 1.0MPa
Secondary pressure: 0.95MPa
Flow of steam (saturated): 400kg/h

Differential pressure (ΔP) is: 1.0−0.95=0.05MPa. Identify intersection point (A) of the 1.0MPa primary pressure line and the 0.05MPa differential pressure curve. Draw a vertical line from point A until it intersects with the 400kg/h flow line. The intersection point is named B. Since point B is between the 20mm and 25mm size lines, the larger size, which is 25mm, is selected.

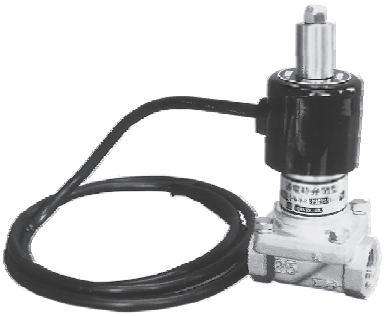
K Type Series Solenoid Valve for Fountain

Underwater series
Diaphragm type/Piston type
Screwed

K series solenoid valves for fountain or underwater applications or places where there is risk of submerging. Of course, they can also be used for places where there is not such risk.



WS-12K, PS-12K Type



WS-12CK, PS-12CK Type

FEATURES

- Solenoid valves for underwater applications (depth up to 1.5m).
- A solution for fountain, pit, or waste water treatment tank.
- Working pressure up to 1.0MPa.
- Free installation in vertical or horizontal direction.

SPECIFICATIONS

Operation	Energized open	Energized close	Energized open	Energized close
Model name	WS-12K	WS-12CK	PS-12K	PS-12CK
Code name	**WS12K-F □**	**WS12CK-F**	**PS12K-W □**	**PS12CK-W**
	※ 1 or 2 for rated voltage is required in □			
Applicable fluid	Water, air & inert gas		Water & air	
Applicable pressure	0~1.0MPa			
Min. pressure differential across the disc	0MPa (0.03MPa for coil installed horizontally.)			
Fluid temperature	5~60℃		5~80℃	
Leakage allowance	Nil (Confirm at pressure gauge. For gas, when 0.02~1.0MPa)		Water:Nil (Confirm at pressure gauge,) Air:50ml/min(standard state) or less (When 0.05~1.0MPa)	
Coil	Epoxy mold coil (Case:Cation painting)			
Ambient temperature	5~40℃			
Rated voltage	Refer to table of rated voltage			
Insulation	Class B			
Protection	Underwater application			
Lead wire	1.25mm² 2m, 2-core 2PNCT			
Applicable water depth	Max. 1.5m			
End connection	Screwed JIS Rc			
Body Materials	Cast bronze			
Installation	Can be installed on both horizontal and vertical piping at any angle between the vertical (When the coil part is placed above) and horizontal.			
Valve body pressure test	Hydraulic 2.0MPa			

＊1. For the construction, see pages 202 to 214 "Standard type."
＊2. The solenoid valves with a built-in strainer made of Stainless steel or a valve size of 65~100mm is also available upon your request.
＊3. Lead length of up to 20m is also available upon you request.

FIGURATION DRAWING

WS-12K, PS-12K Type

WS-12CK, PS-12CK Type

RATED VOLTAGE

Operation	Energized open		Energized close	
Model name	WS-12K	PS-12K	WS-12CK	PS-12CK
Rated voltage	1:AC100V 50/60Hz 110V60Hz 2:AC200V 50/60Hz 220V60Hz		AC100V 50/60Hz 110V60Hz or AC200V 50/60Hz 220V60Hz	

＊Rated voltage of AC24V is also available.

CURRENT VALUES

(A)

Voltage \ Model		WS-12K PS-12K	WS-12CK PS-12CK
AC100V	Rated(Starting)	0.35(1.30)	0.40(1.70)
AC200V	Rated(Starting)	0.18(0.65)	0.20(0.85)

DIMENSIONS

(mm)

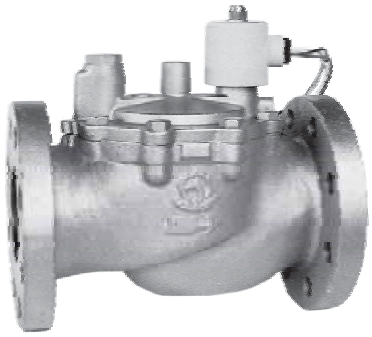
Size	d	L	G	H		Port size	Cv value		Mass(kg)	
				WS-12K Type	PS-12K Type		WS-12K Type	PS-12K Type	WS-12K Type	PS-12K Type
10(⅜″)	⅜″	63	15	124 (175)	126 (178)	18	3	3	1.8(2.2)	1.8(2.2)
15(½″)	½″	63	15	124 (175)	126 (178)	18	4	4.5	1.8(2.2)	1.8(2.2)
20(¾″)	¾″	80	18	129 (183)	132 (186)	23	7	7.5	2 (2.5)	2 (2.5)
25(1″)	1″	90	22	135 (189)	138 (192)	28	10	12	2.4(3)	2.5(3)
32(1¼″)	1¼″	106	27	149 (201)	148 (200)	32	17	18	3 (3.5)	3 (3.5)
40(1½″)	1½″	118	30	152 (204)	151 (203)	40	20	23	3.8(4.3)	3.8(4. 3)
50(2″)	2″	140	37	164 (215)	163 (214)	48	30	35	5.5(6)	5.5 (6)

Figures in ( ) are for WS-12CK and PS-12CK Type.

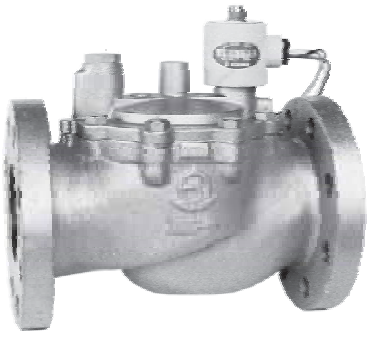
VF-11, 11C, 12, 12C Type Solenoid Valve (for Liquids or Gases)

Large diameter, flanged solenoid valve with simple structure and compact body for liquids or gases, automatically adjusts valve opening time, prevents water hammer that may occur when the flow of liquid is extremely large.

VF-11, 11C has cast iron body, while VF-12, 12C has bronze body.



VF-11, 12 Type



VF-11C, 12C Type

FEATURES

- With diaphragm in driving unit, bronze cap (including pilot-operating valve), and strainer embedded in flow channel, the valve is highly dirt proof and rust proof.
- Water hammer relaxation mechaism.
- Light-weight, compact, low power consumption, energy saving.
- VF-12, 12C is made of bronze and rustproof material.

SPECIFICATIONS

Operation	Energized open		Energized close	
Model name	VF-11	VF-12	VF-11C	VF-12C
Code name	VF11-B	VF12-F	VF11C-B	VF12C-F
Materials	Body(Cast iron)	Body(Cast bronze)	Body(Cast iron)	Body(Cast bronze)
	Trim(Brass and Synthetic rubber), Upper cover(Cast bronze)			
Applicable fluid	Water, air & oils			
Applicable pressure	0.03~1.0MPa			
Min. pressure differential across the disc	0.03MPa			
Fluid temperature	5~60℃			
Fluid viscosity	50cSt or less			
Leakage allowance	Nil (Confirm at pressure gauge.)			
Rated voltage	Common use:AC100/200V 50/60Hz or AC110/220V 60Hz*2.			
Rated current	AC100V 50/60Hz:0.18/0.16A, AC200V 50/60Hz:0.09/0.08A			
Starting current	AC100V 50/60Hz:0.5/0.45A, AC200V 50/60Hz:0.25/0.23A			
Insulation	Class B			
Ambient temperature	5~60℃			
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)			
End connection	Flanged JIS 10KFF			
Installation	Install the valve vertically in horizontal piping placing coil part above.			
Valve body pressure test	Hydraulic 2.0MPa			
Interior painting	Epoxy resin	—	Epoxy resin	—

* 1. Refer to page 231 for method of wiring.
* 2. Special voltage items other than the above specified are available upon your request.
* 3. K series for foundation or underwater, with size 65~100mm, are also available.

DIMENSIONS (VF-11,11C Type)

(mm)

Size	L	G	H	Port size	Cv value	Mass(kg)
80(3″)	270	70	168(179)	70	70	23
100(4″)	290	80	180(191)	90	100	32

* Figures in ( ) are for VF-11C Type. Other dimensions are common.

Flange code JIS 10KFF

DIMENSIONS (VF-12,12C Type)

(mm)

Size	L	G	H	Port size	Cv value	Mass(kg)
80(3″)	270	75	168(179)	70	70	22
100(4″)	290	85	180(191)	90	100	30

* Figures in ( ) are for VF-12C Type. Other dimensions are common.

Flange code JIS 10KFF

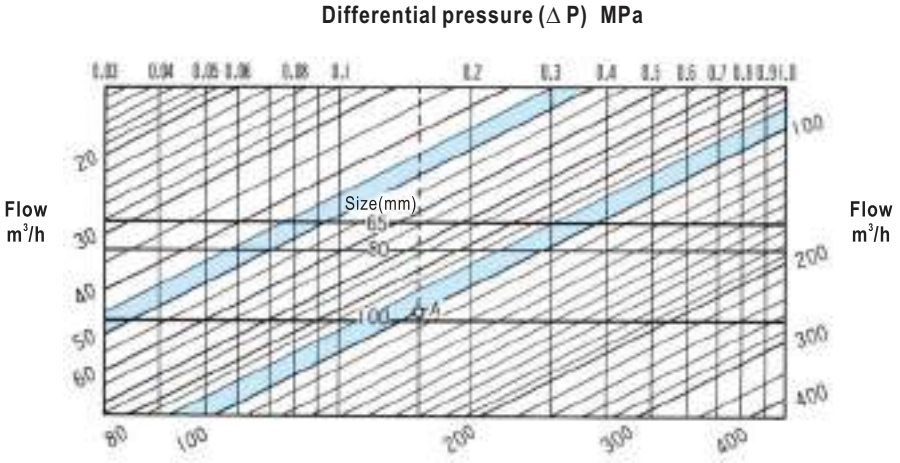
CONSTRUCTION

VF-11, 12 Type

VF-11C, 12C Type

DATA/VF-11, 11C, 12, 12C Type Solenoid Valve (for Liquids or Gases)

SIZE SELECTION CHART (for Water)

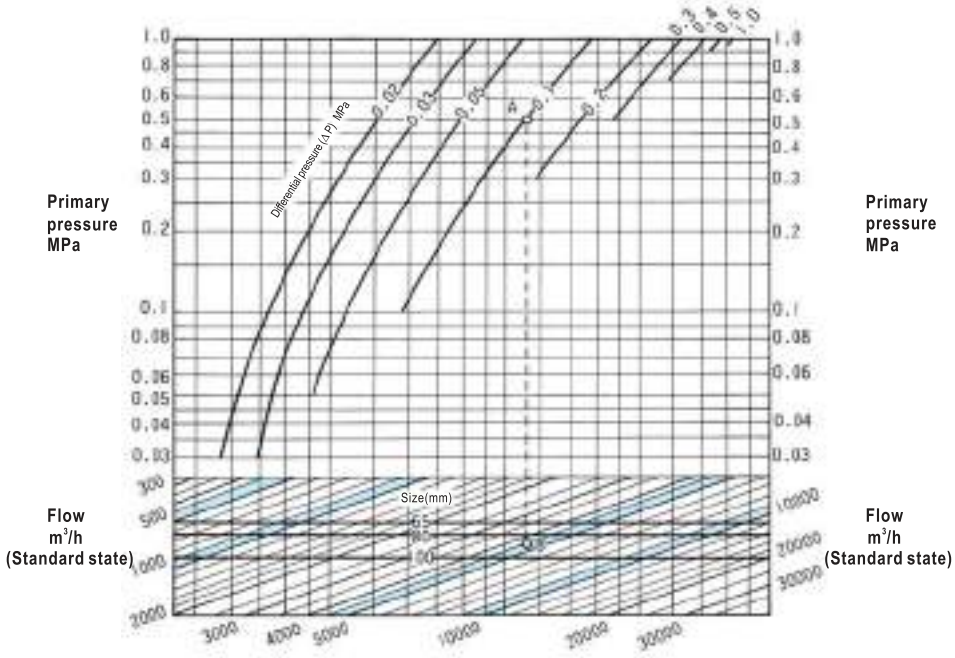


● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:
Primary pressure: 0.4MPa
Secondary pressure: 0.25MPa
Flow of water: 100m³/h
Differential pressure (Δ P): 0.4−0.25=0.15MPa.
Find out the intersection point A between the 0.15MPa Differential pressure (Δ P) line and the 100m³/h flow line. Since point A is between the lines representing nominal diameter 80mm and 100mm, the nominal diameter should be the larger one, i.e. 100mm.

Note: Size 65mm valve is applicable to K series for fountain.

SIZE SELECTION CHART (for Air)



● HOW TO USE THE CHART

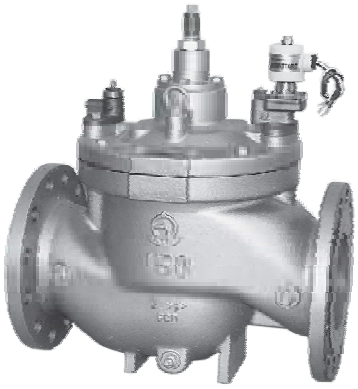
Example: Determine the size of valve meeting the following conditions:
Primary pressure: 0.5MPa
Differential pressure (ΔP): 0.1MPa
Air: 20℃
Flow of water (standard state): 4500m³/h
Identify intersection point (A) of the 0.5MPa primary pressure line and the 0.1MPa Differential pressure curve. Draw a vertical line from point A until it intersects with the 4500m³/h flow line. The intersection point is named B. Since point B is between the 80mm and 100mm size lines, the larger size, which is 100mm, is selected.

Note: Size 65mm valve is applicable to K series for fountain.

WVE-02, 02CN Type Solenoid Valve (for Water)

WVE-02 solenoid valve can be used with sensors and timers for automatic control or remote control of sprinkling or cooling equipments.

By adjusting valve opening/closing time, the valve can be used to reduce water hammer.



FEATURES

- The detection range and valve opening/closing time can be adjusted by changing the opening degree of needle according to actual conditions.
- Easy maintenance: The disc, seat, and pilot-operating unit can be dismantled, adjusted, repaired, or displaced easily.

SPECIFICATIONS

Model name		WVE-02		WVE-02CN
Code name		WVE02-B	WVE02-L	WVE02CN-B
Applicable fluid		Water & hot water		
Fluid temperature		5~60℃		
Applicable pressure		0.03~1.0MPa		
Min. pressure differential across the disc		0.03MPa		
Operation		Energized open		
Rated voltage		Common use:AC100/200V 50/60Hz, AC110/220V 60Hz*1.		
Rated current		AC100/110V Rated:0.2A, Starting:0.6A AC200/220V Rated:0 .1A, Starting:0.3A		
Insulation		Class B (Silicone mold)		
Protection		Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)		
Ambient temperature		5~60℃		
End connection		Flanged JIS 10KRF		
Valve body pressure test		Hydraulic 2.0MPa		Hydraulic 1.75MPa
Materials	Body	Cast iron	Ductile cast	Cast iron
	Trim	Disc & Diaphragm(Synthetic rubber), Seat(Cast bronze)		
Main valve painting		Interior:Epoxy resin Exterior:Metallic blue		Body and cover:Nylon coating
Installation		Install the valve vertically in horizontal piping placing coil part above.		

* 1. Special voltage items other than the above specified are also available upon your request. Refer to page 231 for method of wiring.
* 2. For valve size selection, use on page 101.

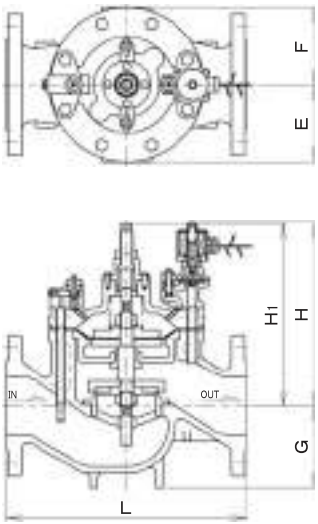
DIMENSIONS(Body: Cast iron)

(mm)

Size	L	G	H	H_1	E	F	Cv value	Mass(kg)
80(3″)	350	110	286	261	117	117	90	43
100(4″)	400	130	312	300	130	130	160	60
125(5″)	440	140	343	371	145	145	250	70
150(6″)	500	165	376	416	173	173	360	125
200(8″)	600	200	427	522	218	218	640	200

* Contact our local agent for the dimensions of the main valve whose body is made of Ductile cast iron.

CONSTRUCTION

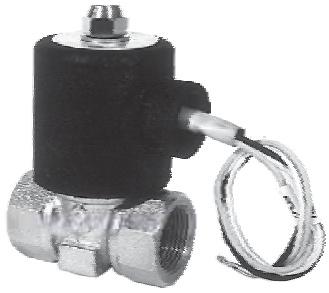


DS-10, 10H, 12 Type Solenoid Valve

Direct acting, small capacity solenoid valves with compact body, simple structure, and orifices designed for a variety of applications.

Depending on orifice diameter, the applicable pressure and flow of this series product are different from those of general purpose solenoid valve.

DS-10,10H Type



DS-12 Type

FEATURES

- Compact, light weight.
- A variety of models available.
- Simple structure allows easy maintenance works.

SPECIFICATIONS

Operation	Energized open			
Model name	DS-10		DS-10H	DS-12
Code name	DS10-J □1	DS10-J □2	DS10H-W □	DS12-W □
	※ S, H, M or L for orifice is required in □.			
Applicable fluid	Water, air & oils		Steam & hot water*1.	Water, steam, air & oils
Materials	Body(Cast bronze) Trim(Stainless steel & Synthetic rubber)		Body(Cast bronze) Trim(Stainless steel with Teflon tip)	Body(Cast bronze) Trim(Stainless steel with Teflon tip)
Fluid temperature	5~80℃		5~175℃*1.	5~180℃
Orifice Applicable pressure	Orifice		S:4mm	H:5.5mm	M:7mm	L:10mm
	Applicable pressure(MPa)	DS-10,10H Type	0.8 or less	0.4 or less	0.25 or less	0.1 or less
		DS-12 Type	1.0 or less	0.55 or less	0.3 or less	0.13 or less
Fluid viscosity	50cSt or less			
Leakage allowance	Nil (Confirm at pressure gauge.)			Steam, water & oils: Nil (Confirm at pressure gauge) Air:25ml/min (standard state) or less
Rated voltage	AC100V 50/60Hz	AC200V 50/60Hz	AC100V 50/60Hz or AC200V 50/60Hz*3.	
Insulation	Class B		Class H	
Ambient temperature	5~50℃			
Protection	Dust & drip proof (When used outdoors, also use TB-03 Type terminal box, as rain proof type)			
End connection	Screwed JIS Rc			
Installation	Can be installed on both horizontal and vertical piping at any angle between the vertical (When the coil part is placed above) and horizontal.			
Valve body pressure test	Hydraulic 2.0MPa			

* 1. For hot water:Max.100℃.
* 2. Refer to page 231 for method of wiring.
* 3. For DS-12 Type, special voltage items other than the above specified are upon your request.

DIMENSIONS

(mm)

Size	d	L	G	H		Cv value				Mass (kg)
				DS-10 Type DS-10H Type	DS-12 Type	Orifice				
						4	5.5	7	10	
10(⅜″)	⅜″	50	14	77	83	0.45	0.75	1.1	2	0.6(0.8)
15(½″)	½″	56	14	77	83	0.45	0.85	1.3	2.4	0.6(0.8)
20(¾″)	¾″	63	17	78	84	0.45	0.85	1.3	2.4	0.7(0.9)

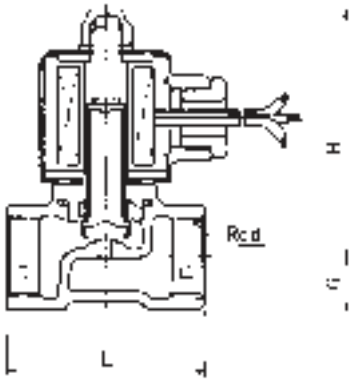
*Figures in ( ) are for DS-12 Type.

RATED CURRENT

(A)

Voltage \ Model		DS-10 DS-10H	DS-12
AC100V	Rated	0.19	0.25
	Starting	0.57	0.60
AC200V	Rated	0.10	0.13
	Starting	0.29	0.30

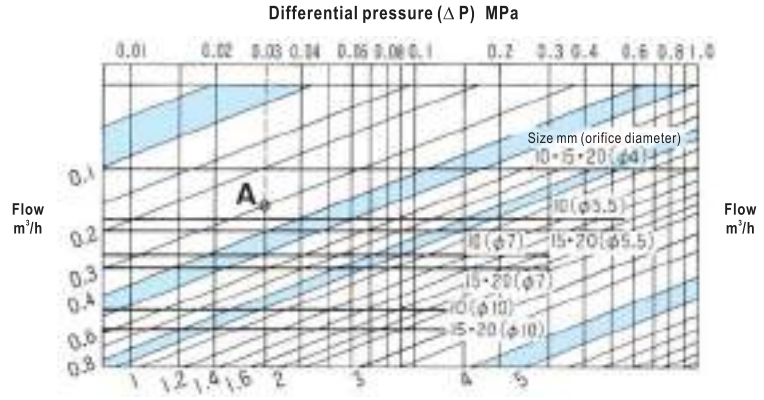
CONSTRUCTION



Depending on model, the structure may vary.

DATA/DS-10, 10H, 12 Type Solenoid Valve (for Water, Air, or Steam)

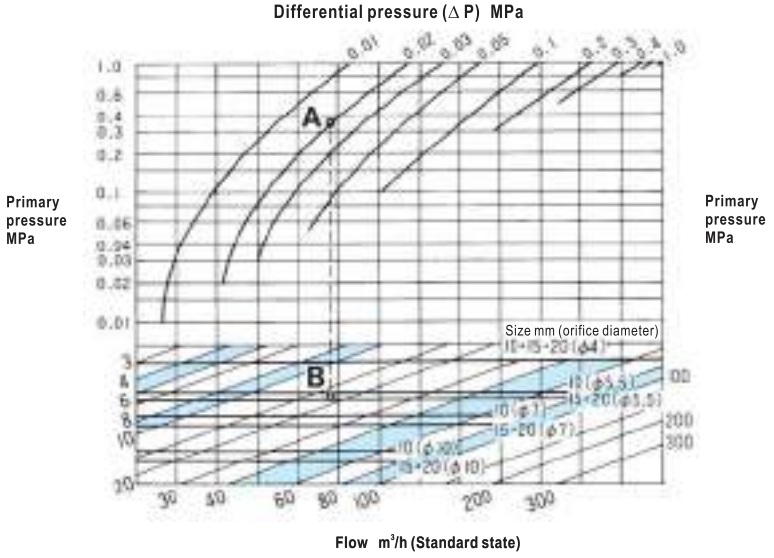
SIZE (ORIFICE SIZE) SELECTION CHART (for Water)



HOW TO USE THE CHART

Example: Determine the size (orifice diameter) of valve meeting the following conditions:
Primary pressure: 0.1MPa
Secondary pressure: 0.07MPa
Flow of water: 0.3m³/h
Differential pressure (ΔP) is: 0.1−0.07=0.03MPa. Identify intersection point (A) of the 0.03MPa differential pressure line and the 0.3m³/h flow line. Since point A is between the 10/15/20mm (orifice diameter Φ4) and 10mm (orifice diameter Φ5.5) size lines, the larger size, which is 10mm (orifice diameter Φ5.5), is selected.

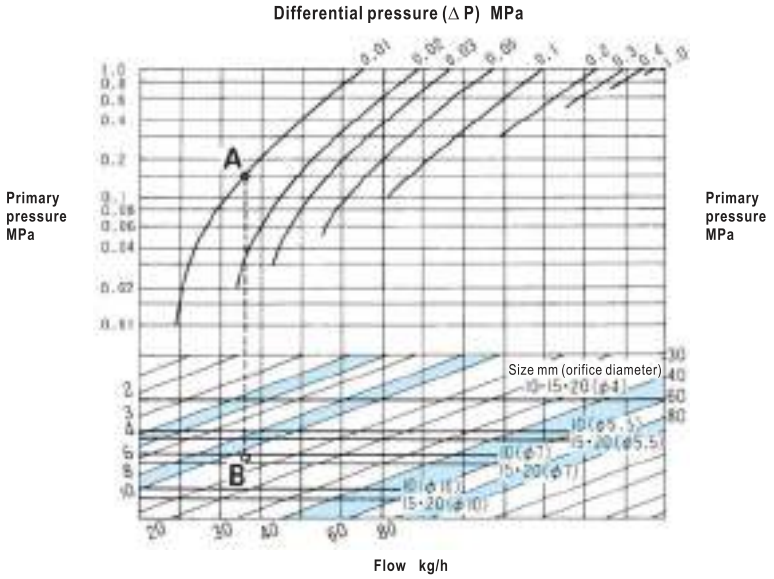
SIZE (ORIFICE SIZE) SELECTION CHART (for Air)



HOW TO USE THE CHART

Example: Determine the size (orifice diameter) of valve meeting the following conditions:
Primary pressure: 0.35MPa
Secondary pressure: 0.33MPa
Flow of air (20℃): 18m³/h (standard state)
Differential pressure (ΔP) is: 0.35−0.33=0.02MPa. Identify the intersection point (A) of the 0.35MPa primary pressure line and the 0.02MPa differential pressure curve. Draw a vertical from point A until it intersects with 18m³/h flow line. The intersection point is named B. Since point B is between the 10mm (orifice diameter Φ5.5) and 15/20mm (orifice diameter Φ5.5) size lines, the larger size, which is 15mm (orifice diameter Φ5.5) or 20mm (orifice diameter Φ5.5), is selected.

SIZE (ORIFICE SIZE) SELECTION CHART (for Steam)

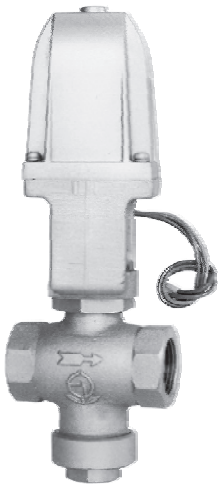


HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:
Primary pressure: 0.15MPa
Secondary pressure: 0.14MPa
Flow of steam (saturated): 11.5kg/h
Differential pressure (ΔP) is: 0.15−0.14=0.01MPa. Identify the intersection point (A) of the 0.15MPa primary pressure line and the 0.01MPa differential pressure curve. Draw a vertical from point A until it intersects with 11.5kg/h flow line. The intersection point is named B. Since point B is between the 10mm (orifice diameter Φ7) and 15/20mm (orifice diameter Φ7) size lines, the larger size, which is 15mm (orifice diameter Φ7) or 20mm (orifice diameter Φ7), is selected.

ED-S, F Type Solenoid Valve (for Liquids or Gases)

ED-S screw connection and ED-F flange connection valves use powerful 2-way electromagnet to open or close valve. They are semi-direct acting valves suitable for fluid with high viscosity or low pressure.



ED-S Type

ED-F Type

CURRENT VALUES (A)

Voltage		50Hz	60Hz
AC100V	Rated	0.68	0.78
	Starting	8.00	9.20
AC200V	Rated	0.34	0.39
	Starting	4.00	4.60

SPECIFICATIONS

Model name		ED-S		ED-F			
Type		Metal disc	With Teflon-disc	Metal disc	With Teflon-disc	Metal disc	With Teflon-disc
Code name		EDS-J	EDS-W	EDF-J	EDF-W	EDF-B	EDF-R
Size		10~50(⅜″~2″)		15~50(½″~2″)		65•80(2½″ 3″)	
Applicable fluid		Metal disc:Water & oils*2., With Teflon-disc:Light oil, kerosene, gasoline*4. & gases					
Applicable pressure		0~0.7MPa					
Min. pressure differential across the disc		0MPa					
Fluid temperature		5~100℃					
Fluid viscosity		100cSt or less*4.					
Leakage allowance		Water & oils:3g/min or less, Air(With Teflon-disc):50ml/min(Standard state) or less					
Operation		Energized open					
Rated voltage		AC100V 50/60Hz or AC200V 50/60Hz*5.					
Insulation		Class B					
Ambient temperature		5~40℃					
Protection		Dust & drip proof (When using the solenoid valve outdoors, protect it with a cover, etc.)					
End connection		Screwed JIS Rc		Flanged JIS 10KFF			
Materials	Body	Cast bronze				Cast iron	
	Trim	Disc:Stainless steel or With Teflon tip				Disc:Cast bronze or With Teflon tip	
Valve body pressure test		Hydraulic 2.0MPa					

* 1. Refer to page 231 for method of wiring.
* 2. For steam, stainless steel valve body and cast steel valve body of ED-F Type are available upon your request.
* 3. In case of light oil and gasoline use, select cast steel valve body.
* 4. Fluid viscosity Max. 300cSt is also available upon your request.
* 5. Special voltage items other than the above specified are available upon your request.

DIMENSIONS(ED-S Type) (mm)

Size	d	L	G	H	Port size	Cv value	Mass(kg)
10(⅜″)	⅜″	63	63	193	13	1.5	2.4
15(½″)	½″	63	63	193	13	3	2.4
20(¾″)	¾″	80	60	198	18	5	2.6
25(1″)	1″	90	65	202	23	8.5	2.9
32(1¼″)	1¼″	106	85	209	27	12.5	3.6
40(1½″)	1½″	118	97	215	34	20	4.7
50(2″)	2″	140	109	225	44	30	6.9

DIMENSIONS(ED-F Type) (mm)

Size	L	G	H	Port size	Cv value	Mass(kg)
15(½″)	100	63	193	13	3	4.2
20(¾″)	106	60	198	18	5	4.9
25(1″)	112	65	202	23	8.5	6.3
32(1¼″)	150	85	209	27	12.5	7.9
40(1½″)	160	97	215	34	20	9.3
50(2″)	170	109	225	44	30	12.5
65(2½″)	270	120	289	65	36	35
80(3″)	290	143	308	80	43	48

Flange code JIS 10KFF

CONSTRUCTION (AC power)

ED-S Type

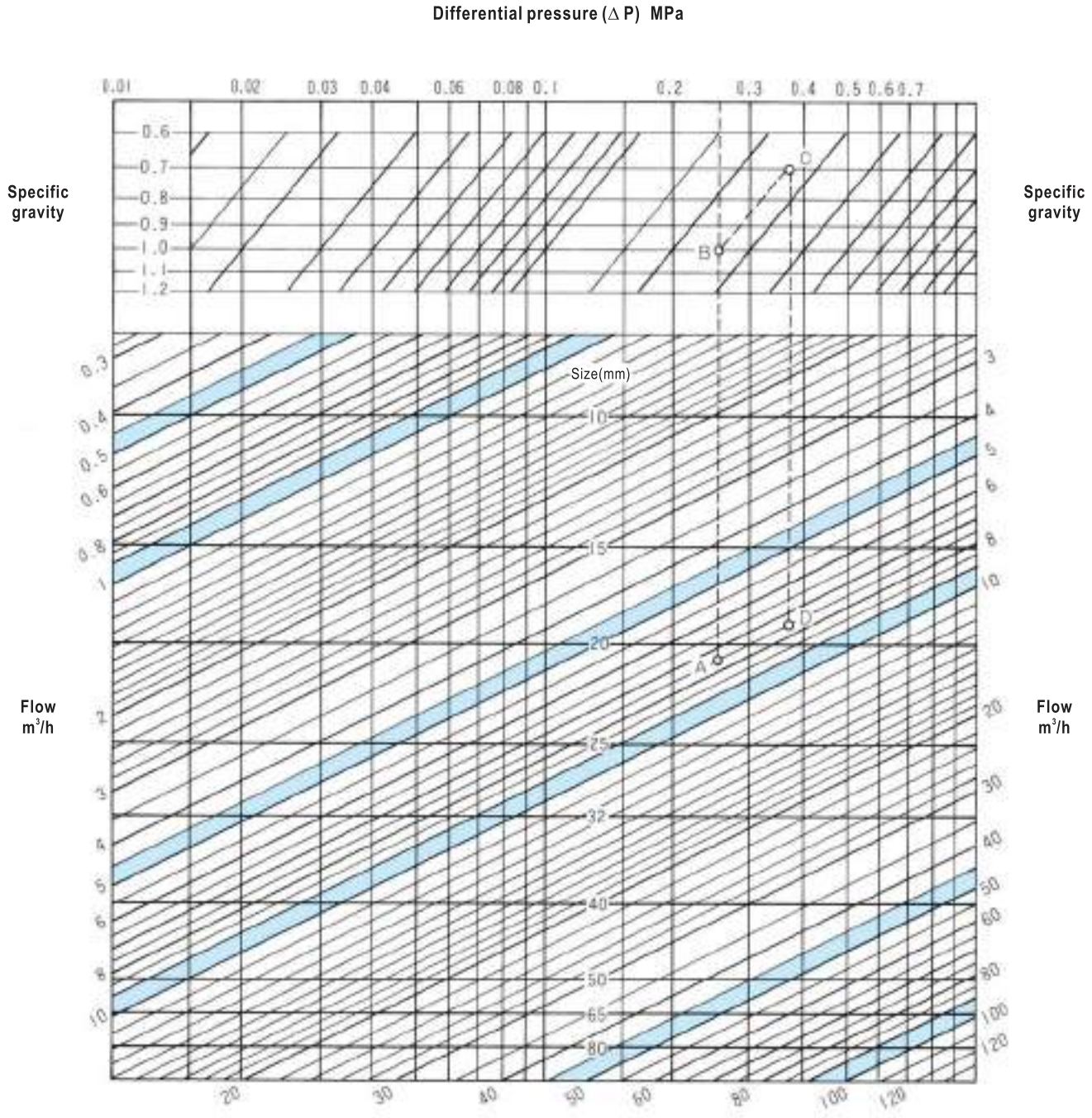
Teflon disc structure

ED-F Type

Depending on size, the structure may vary.

DATA/ED-S, F Type Solenoid Valve (for Liquids)

SIZE SELECTION CHART (for Liquids)



● HOW TO USE THE CHART

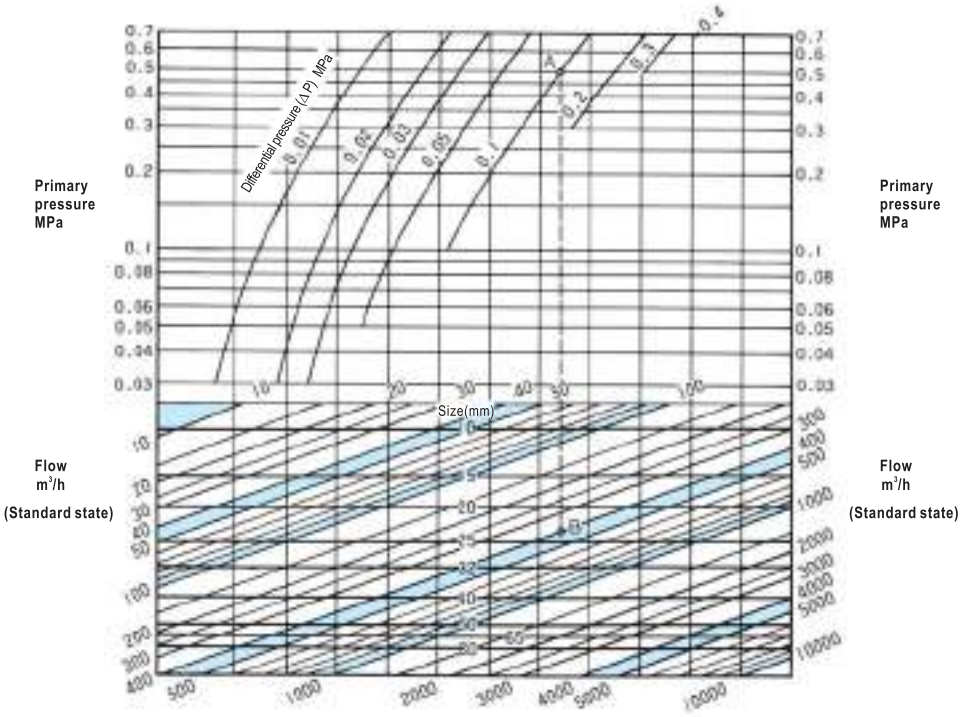
Example: Find out the nominal diameter meeting the following conditions: Primary pressure: 0.5MPa, Secondary pressure: 0.25MPa, Specific gravity: 1 (water), Flow: 7.5m³/h.

Differential pressure (ΔP) MPa: 0.5−0.25=0.25MPa. Find out the intersection point A between the 0.25MPa differential pressure (ΔP) line and the 7.5m³/h flow line.

Since point A is between the lines representing nominal diameter 20mm and 25mm, the nominal diameter should be the larger one, i.e. 25mm.
In the case other conditions remain the same but the specific gravity is 0.7, find out the intersection point B between the 0.25MPa differential pressure (ΔP) line and the 1.0 specific gravity line. Move from point B on the 0.7 specific gravity line parallelly to reach point c. Now draw a vertical line from point C until it intersects with the 7.5m³/h flow line. The intersection point is named D. since point D is located between the lines representing nominal diameter 15mm and 20mm, the nominal diameter should be the larger one, i.e. 20mm.

DATA/ED-S, F Type Solenoid Valve (for Air)

SIZE SELECTION CHART (for Air)



● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:
Primary pressure: 0.5MPa
Differential pressure (ΔP): 0.1MPa
Flow of air (20℃): 400m³/h (standard state)
Identify the intersection point (A) of the 0.5MPa primary pressure line and the 0.1MPa differential pressure curve. Draw a vertical from point A until it intersects with 400m³/h flow line. The intersection point is named B. Since point B is between the 20mm and 25mm size lines, the larger size, which is 25mm, is selected.

WSE-18, 18A Type Pressure Resistance and Explosion Proof Solenoid Valve

d2G4 pressure resistant and explosion proof structure
Diaphragm type

With water hammer relaxation mechanism unit and diaphragm, WSE-18, 18A is suitable for water lines or gas lines where there is risk of explosion due to explosive gas.

FEATURES

- Suitable for dangerous place with risk of explosion.
- Manual operating unit allows test run and manual operation at times of power failure.
- Easy installation and wiring by changing the direction of screw for cable tube.

SPECIFICATIONS

Operation	Energized open		
Type	Straight		Angle
Model name	WSE-18		WSE-18A
Code name	WSE18-F1	WSE18-F2	WSE18A-F
Applicable fluid	Water, air & gases		
Applicable pressure	0.02~1.0MPa		
Min. pressure differential across the disc	0.02MPa		
Fluid temperature	5~60℃		
Leakage allowance	Nil (Confirm at pressure gauge)		
Rated voltage	AC100/110V 50/60Hz	AC200/220V 50/60Hz	AC100/110V 50/60Hz or AC200/220V 50/60Hz
Insulation	Class B (Epoxy mold)		
Ambient temperature	5~50℃		
Protection	Pressure resistance and explosion proof d2G4		
End connection	Screwed JIS Rc		Screwed JIS R
Materials	Body(Cast bronze), Diaphragm(Synthetic rubber)		
Installation	Install the valve vertically in horizontal piping placing coil part above.		
Valve body pressure test	Hydraulic 2.0MPa		

CURRENT VALUES

(A)

Voltage		AC100V		AC110V		AC200V		AC220V	
		50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
Current value	Rated	0.16	0.13	0.19	0.15	0.08	0.07	0.08	0.08
	Starting	0.27	0.25	0.30	0.25	0.14	0.13	0.15	0.13

DIMENSIONS(WSE-18 Type)

(mm)

Size	d	L	H	G	A	B	Port size	Cv value	Mass(kg)
15(½″)	½″	110	147	16	27	106	18	4.5	2
20(¾″)	¾″	110	147	16	27	106	18	5	2
25(1″)	1″	120	152	21	30	111	23	9	2.2
32(1¼″)	1¼″	135	157	25	35	116	28	11	2.9
40(1½″)	1½″	145	164	29	38	123	32	17	3.2
50(2″)	2″	170	172	35	46	131	40	23	4.1

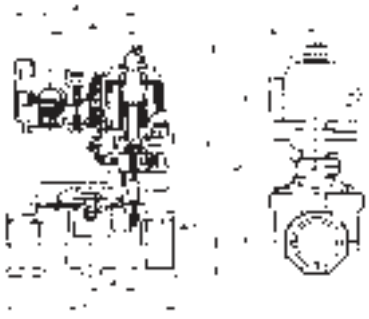
DIMENSIONS(WSE-18A Type)

(mm)

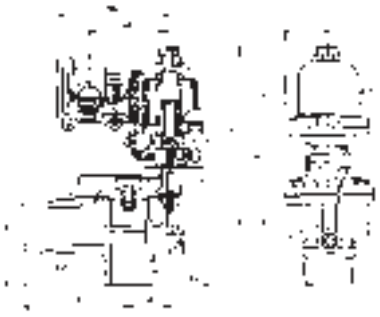
Size	d	L	L_1	H	A	B	Port size	Cv value	Mass(kg)
15(½″)	½″	65	40	142	27	101	18	4.5	1.9
20(¾″)	¾″	65	40	142	27	101	18	5	1.9
25(1″)	1″	71	40	145	30	104	23	9	2.1
32(1¼″)	1¼″	88	50	150	35	109	28	11	2.8
40(1½″)	1½″	95	53	156	38	115	32	17	3.2
50(2″)	2″	101	57	162	46	121	40	23	4.1

CONSTRUCTION

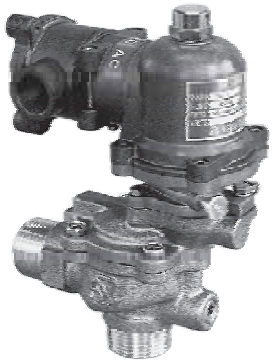
WSE-18 Type



WSE-18A Type



WSE-18 Type



WSE-18A Type

PSE-18, 18A Type Pressure Resistance and Explosion Proof Solenoid Valve

d2G4 pressure resistant and explosion proof structure
Piston type

PSE-18,18A is suitable where there is risk of explosion due to explosive gas.

Pilot-operating, durable, piston type solenoid valve suitable for oil.

PSE-18

PSE-18A

FEATURES

- Suitable for dangerous place with risk of explosion.
- Manual operating unit allows test run and manual operation at times of power failure.
- Easy installation and wiring by changing the direction of screw for cable tube.

SPECIFICATIONS

Operation	Energized open		
Type	Straight		Angle
Model name	PSE-18		PSE-18A
Code name	PSE18-J1	WSE18-J2	PSE18A-J
Applicable fluid	Oils(Kerosene, light oil, A class heavy oil & gasoline), gases, air & water		
Applicable pressure	0.02~1.0MPa		
Min. pressure differential across the disc	0.02MPa		
Fluid temperature	5~60℃		
Fluid viscosity	50cSt or less		
Leakage allowance	Nil (Confirm at pressure gauge)		
Rated voltage	AC100/110V 50/60Hz	AC200/220V 50/60Hz	AC100/110V 50/60Hz or AC200/220V 50/60Hz
Insulation	Class H (Epoxy mold)		
Ambient temperature	5~50℃		
Protection	Pressure resistance and explosion proof d2G4		
End connection	Screwed JIS Rc		Screwed JIS R
Materials	Body(Cast bronze), Disc(Stainless steel with Teflon)		
Installation	Install the valve vertically in horizontal piping placing coil part above.		
Valve body pressure test	Hydraulic 2.0MPa		

CURRENT VALUES

(A)

Voltage		AC100V		AC110V		AC200V		AC220V	
		50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
Current value	Rated	0.16	0.13	0.19	0.15	0.08	0.07	0.08	0.08
	Starting	0.27	0.25	0.30	0.25	0.14	0.13	0.15	0.13

DIMENSIONS (PSE-18 Type)

(mm)

Size	d	L	H	G	A	B	Port size	Cv value	Mass(kg)
15(½″)	½″	110	166	16	27	125	18	5	2.2
20(¾″)	¾″	110	166	16	27	125	18	6	2.2
25(1″)	1″	120	171	21	30	130	23	11	2.4
32(1¼″)	1¼″	135	180	25	35	139	28	15	3.3
40(1½″)	1½″	145	187	29	38	146	32	20	3.9
50(2″)	2″	170	199	35	46	158	40	27	5.4

DIMENSIONS (PSE-18A Type)

(mm)

Size	d	L	L_1	H	A	B	Port size	Cv value	Mass(kg)
15(½″)	½″	65	40	161	27	120	18	5	2.1
20(¾″)	¾″	65	40	161	27	120	18	6	2.1
25(1″)	1″	71	40	164	30	123	23	11	2.3
32(1¼″)	1¼″	88	50	173	35	132	28	15	3.2
40(1½″)	1½″	95	53	179	38	138	32	20	3.8
50(2″)	2″	101	57	189	46	148	40	27	5

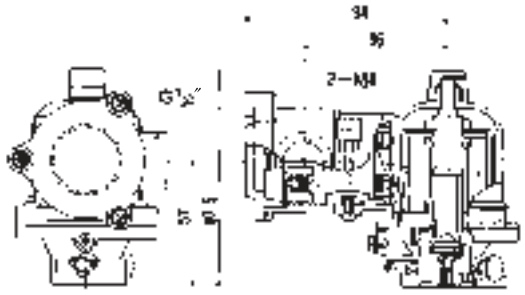
CONSTRUCTION

PSE-18 Type

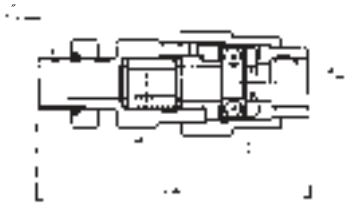
PSE-18A Type

DATA/WSE, PSE Type Pressure Resistance and Explosion Proof Solenoid Valve

PRESSURE RESISTANT AND EXPLOSION PROOF SOLENOID PART



PRESSURE RESISTANT GLAND PACKING (TG type optional item)



DIMENSIONS

(mm)

Compellation	Size	d	D_1	D_2	Diameter of outside conductor
TG type P2	16 16	G½″	10.5	13	9-10.5
TG type P3	16 22	G¾″	11	14	10-11
TG type P5	16 22	G¾″	13	14	11-12

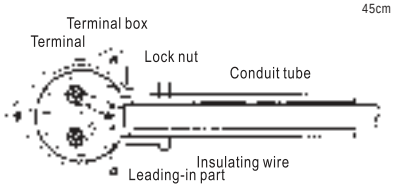
CONNECTING EXTERNAL LEAD AND TERMINAL BOX

1. Conduit tube pressure resistant screw connection

Fix the conduit tube using screw at the leading-in part of the wire. The wire should be insulating wire.

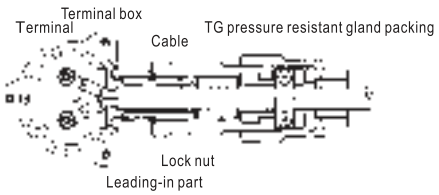
As for the connection between conduit tube and terminal box, use parallel screw for conduit as specified in JIS B0202, and screw in effective part of the screw for at least 5 threads, then fix the conduit tube as tightly as possible using lock nut.

Note: Install sealing fitting for the part 45cm from the leading-in part.



2. Pressure resistant packing connection

Apply packing on the leading-in part of external wire and cable on the wire. Put TG pressure resistant gland packing on the leading-in part of wire, screw in the effective part of the screw for at least 5 threads, fix as tightly as possible using a lock nut, and then tighten the pressure resistant packing to fix the cable.



REFERENCE: ABOUT EXPLOSION PREVENTION

The Occupational Health and Safety Law and relevant regulations in Japan require utilization of electric equipments/tools that are explosion proof in places where there is risk of explosion.

EXPLOSION PROOF MARK OF WSE, PSE SERIES SOLENOID VALVE

d 2 G4

Ignition temperature: G4
Explosion degree: 2
Type of explosion proof structure:
d=pressure resistant and explosion proof structure

Pressure resistant and explosion proof structure:

A fully airtight structure that can bear the pressure generated by explosion of gas inside the structure and cannot be ignited by explosive gas from outside of the structure.

TABLE FOR EXAMPLE OF CLASSIFICATION FOR EXPLOSION CLASS, IGNITION LEVEL AND FUEL GASES.

Explosion class / Ignition level		G1	G2	G3	G4	G5	G6
A / B		**Over 450℃**	**300~450℃**	**200~300℃**	**135~200℃**	100~135℃	85~100℃
1	Over 0.6mm	Acetone, Ammonia, Carbon monoxide, Ethane, Acetic acid, Ethyl acetate, Toluene, Propane, Benzene, Methanol, Methane	Ethanol Isopentyl acetate 1-Butanol Butane Acetic anhydride	Gasoline Hexane	Acetaldehyde Ethyl ether		
2	0.4~0.6mm	Coal gas	Ethylene Ethylene oxide				
3	0.4mm or less	Water gas, Hydrogen	Acetylene			Carbon disulfide	

A: Ignition temperature B: Minimum spacing (at depth 25) allowing transmission of flame ☐: The range of application of WSE, PSE series

HAZARDOUS AREA CLASSIFICATION AND LOCATIONS FOR UTILIZATION OF PRESSURE RESISTANT AND EXPLOSION PROOF SOLENOID VALVE

Hazardous area: An area, such as a factory workshop, where large amount of explosive gas is mixed with air and forms a hazardous atmosphere and there is risk of explosion. According to the period and frequency of existence of hazardous atmosphere, hazardous area can be divided into three categories:

Category 0 area: Under normal conditions, hazardous atmosphere exists continuously or a long period.

Category 1 area: Under normal conditions, there is risk of formation of hazardous atmosphere.

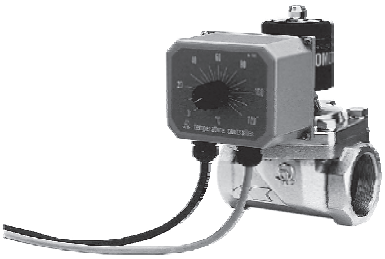
Category 2 area: Under abnormal conditions, there is risk of formation of hazardous atmosphere.

Pressure resistance and explosion proof solenoid valve is suitable for applications in category 1 area and 2 area dangerous places.

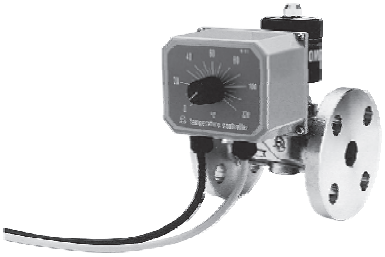
TPS-12, TPF-12 Type Temperature Regulating Solenoid Valve (for Steam or Hot Water)

For on/off control

A combination of electric temperature regulator and solenoid valve, with no need for selecting temperature regulator and connecting solenoid valve. For temperature regulating, connect the temperature sensor, which is attached to the valve, and switch the knob to set temperature.

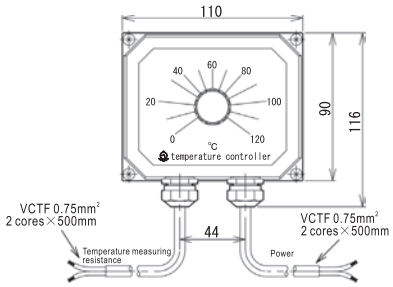


TPS-12 Type

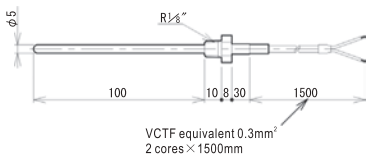


TPF-12 Type

[Temperature regulating unit]



[Temperature measuring resistance (sensor)]



FEATURES

- A combination of electric temperature regulator and solenoid valve, with no need for selecting temperature regulator and valve.
- Temperature regulating knob.
- Compact, saving space.

SPECIFICATIONS

Solenoid valve body	Use	Heating*1.	
	Operation	ON/OFF(Energized open)	
	Model name	TPS-12	TPF-12
	Code name	TPS12-W	TPF12-W
	Size	10~50(⅜″~2″)	15~50(½″~2″)
	Applicable fluid	Steam & hot water	
	Applicable pressure	0~0.7MPa	
	Min. pressure differential across the disc	0MPa	
	Fluid temperature	5~170℃(For hot water:Max. 100℃)	
	Leakage allowance	Nil (Confirm at pressure gauge)	
	Rated voltage	AC100V 50/60Hz, AC110V 60Hz or AC200V 50/60Hz, AC220V 60Hz	
	Insulation	Class H	
	Ambient temperature	5~55℃	
	Protection	Dust proof	
	End connection	Screwed JIS Rc	Flanged JIS 10KFF
	Materials	Body(Cast bronze), Disc(Stainless steel with Teflon tip)	
	Installation	Install the valve vertically in horizontal piping placing coil part above.	
	Valve body pressure test	Hydraulic 2.0MPa	
Temperature controller	Input	Resistance temperature detector (RTD):Pt 500 (With leads of 1.5m for indoor use)	
	Control type	Two-position	
	Temperature setting range	0~120℃	
	Setting accuracy	±2.4℃	
	Control sensitivity	Set to 3℃ prior to shipment	
	Rated electric capacity	2VA	

*1. The solenoid valve for cooling (applicable fluid: Water) is also available upon your request. (Code name: TPS12-WA, TPF12-WA)
*2. The length of leads connected to the RTD can be extended up to 10m using commercially available.
*3. The RTD is for indoor applications. Please contact our local agent for other types of RTD.

CURRENT VALUES

(A)

Size(mm)	10	15	20	25	32	40	50
AC100V Rated(Starting)	0.22(0.62)		0.27(0.92)		0.37(1.32)		
AC200V Rated(Starting)	0.11(0.31)		0.14(0.46)		0.19(0.66)		

DIMENSIONS (TPS-12 Type)

(mm)

Size	d	L	G	H	C	Port size	Cv value	Mass(kg)
10(⅜″)	⅜″	63	15	118	164	18	3	2.1
15(½″)	½″	63	15	118	164	18	4	2
20(¾″)	¾″	80	18	130	167	23	6	2.5
25(1″)	1″	90	22	136	167	28	10	3
32(1¼″)	1¼″	106	27	147	171	32	18	3.7
40(1½″)	1½″	118	30	150	171	40	23	4.5
50(2″)	2″	140	37	162	171	48	35	6.2

DIMENSIONS (TPF-12 Type)

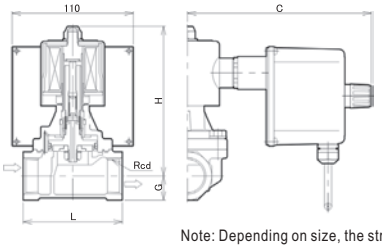
(mm)

Size	L	G	H	C	Port size	Cv value	Mass(kg)
15(½″)	112	21	118	164	18	4	3.6
20(¾″)	118	24	130	167	23	6	4.5
25(1″)	140	27	136	167	28	10	6.2
32(1¼″)	150	32	147	171	32	18	7.6
40(1½″)	160	35	150	171	40	23	8.8
50(2″)	190	41	162	171	48	35	11.4

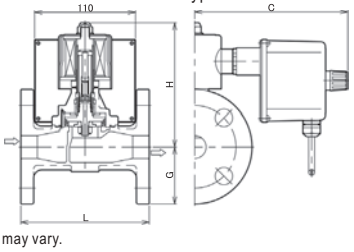
Flange code JIS 10KFF

CONSTRUCTION

TPS-12 Type



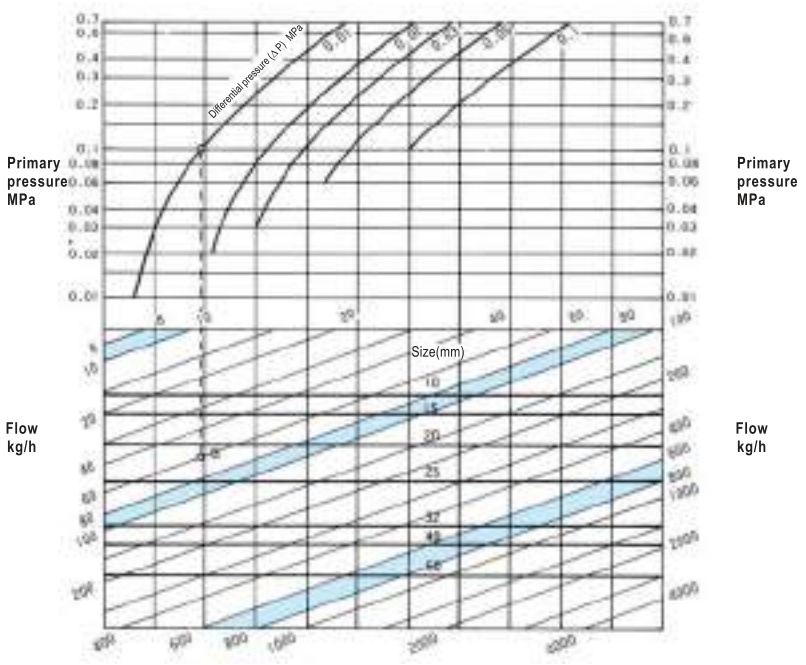
TPF-12 Type



Note: Depending on size, the structure may vary.

DATA/TPS-12, TPF-12 Type Temperature Regulating Solenoid Valve (for Steam or Hot Water)

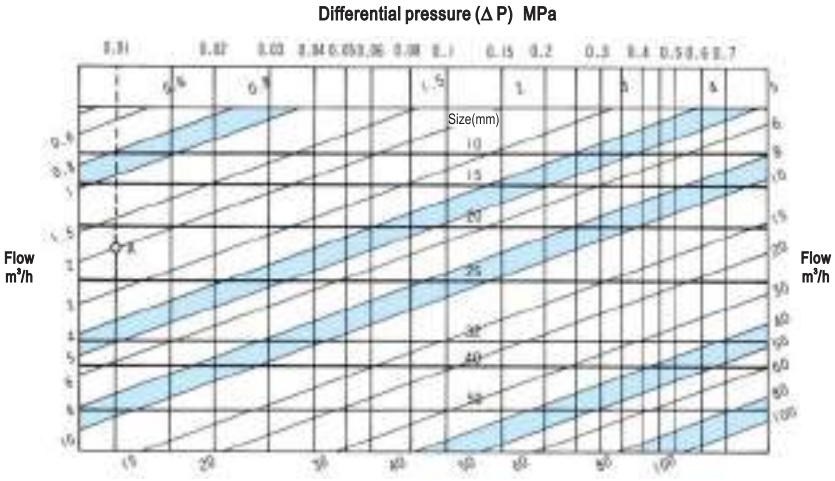
SIZE SELECTION CHART (for Steam)



● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:
Primary pressure:0.1 MPa
Differential pressure: 0.01MPa
Flow of steam (saturated): 60kg/h
Identify intersection point (A) of the 0.1MPa primary pressure line and the 0.01MPa differential pressure curve.
Draw a vertical line from point A until it intersects with the 60kg/h flow line. The intersection point is named B. Since point B is between the 20mm and 25mm size lines, the larger size, which is 25mm, is selected.

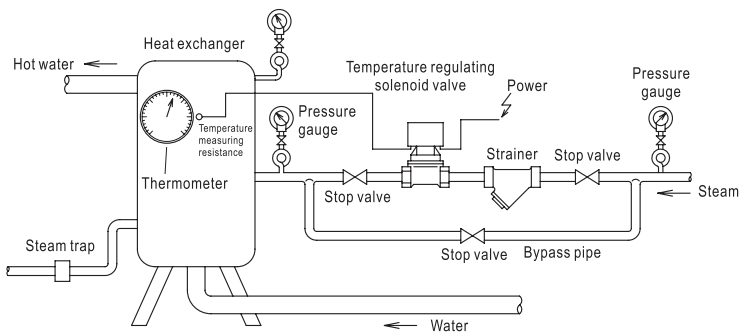
SIZE SELECTION CHART (for Hot water)



● HOW TO USE THE CHART

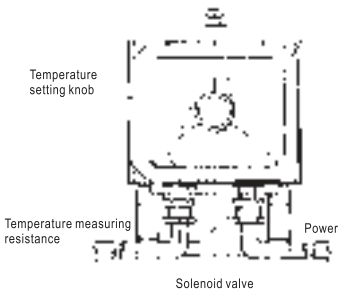
Example: Determine the size of valve meeting the following conditions:
Primary pressure: 0.3MPa
Secondary pressure: 0.29MPa
Flow of water: 2m^3/h
Differential pressure (ΔP):0.3−0.29=0.01MPa. Find out the intersection point A between the 0.01MPa differential pressure (ΔP) line and the 2m^3/h flow line.
Since point A is between the lines representing nominal diameter 20mm and 25mm, the nominal diameter should be the larger one, i.e. 25mm.

■ PIPING EXAMPLE



Note:Install a safety valve if there is risk of temperature increase due to thermal expansion for heat exchanger.

■ TEMPERATURE SETTING



Adjust the knob to desired temperature.

DATA/Solenoid Valve

METHOD FOR CONNECTION OF COIL

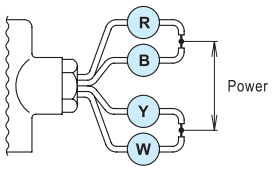
As shown in relevant specification table, different models of solenoid valve have different rated voltage.
When connecting to power, make sure the voltage does not exceed the rated voltage of solenoid valve.

<Common voltage coil>
- Connect the 4 lead wires (in different color) to power source.

<Exclusive/Special voltage coil>
- Connect 2 lead wires to power source.

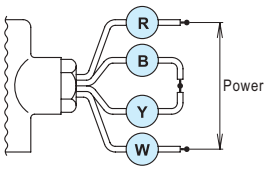
<Frequency selecting coil>
- There are 3 lead wires on coil. Read the connection method shown on product before connecting to power source.
  The lead wire that left unused should be insulated using insulating tape.

AC100/110V



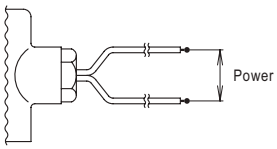
Connect R and B wires, then Y and W wires, before connecting them to power source.

AC200/220V



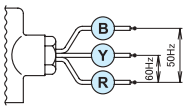
Connect and then insulate Y and B wires. Connect the R and W wires to power source.

W : White
Y : Yellow
B : Black
R : Red

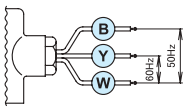


DS-10, 10H, 12 Type

AC 100V

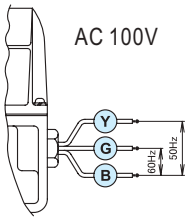


AC200V

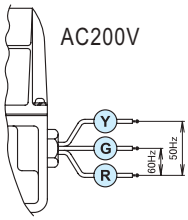


ED-S, F Type

AC 100V



AC200V



W : White
Y : Yellow
B : Black
R : Red
G:Grey

REFERENCE: ABOUT EXPLOSION PREVENTION

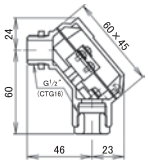
Terminal box specially designed for solenoid valve. Can be screwed in with lead wire of solenoid valve and protect power cable and lead wire from being exposed to rain or dust.
TB-03 series are for outdoor cable and conduit.

An example of TB-03 installation

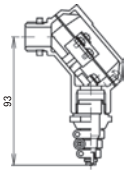
TB-03 TYPE SERIES (for indoor/outdoor, metal body, rainproof)

(Without indication lamp) Rated power: 250V 15A

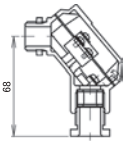
- TB-03 Type(standard model)
  With gland nut



- TB-03C Type
  With cap cone

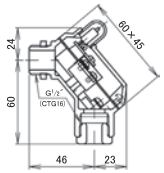


- TB-03F Type
  With ship-class gland

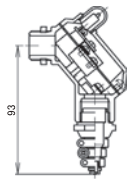


(With indication lamp) Rate power: AC100V or AC200V
Please specify voltage when ordering.

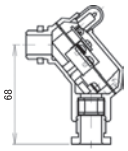
- TB-03L Type
  With indication lamp



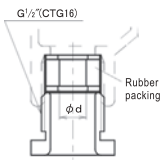
- TB-03LC Type
  Lamp + cap cone



- TB-03LF Type
  Lamp + ship-class gland

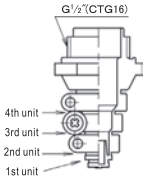


SPECIFICATIONS OF GLAND (TB-03F, 03LF Type)



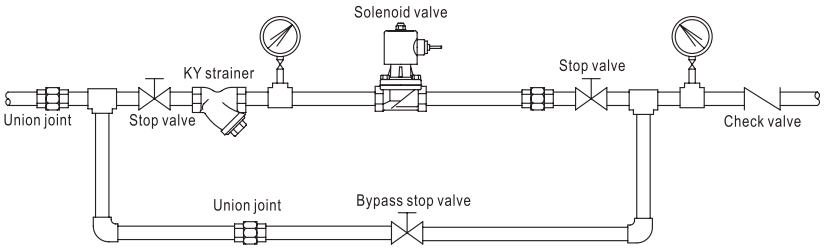
Gland size	d (mm)	Size of applicable conduit		
		Hard steel conduit	Flexible metal conduit	
			Class 1	Class 2
15a	9	16	13	10 12
15b	10			
15c	11		15	15 17

SPECIFICATIONS OF CAPCONE PLUG (TB-03C, 03LC Type)



Cut position	Applicable cable diameter(mm)
4th unit	10~12
3rd unit	8~10
2nd unit	6~8
1st unit	4~6

■ Fig.1 Piping example



■ SELECTION AND INSTALLATION

1. Install strainer on the primary side of solenoid valve (see Fig.1).
2. Install a bypass pipe (with stop valve) between the primary and secondary sides of solenoid valve if the operation of equipment cannot be stopped (see Fig.1).
   If you do not intend to install bypass pipe, install blowing stop valve, which is branched from the main pipe, right before the stop valve on the primary side of solenoid valve, to allow flushing.
3. The coil should stand upright above horizontal pipe (see Fig.1, 2).
   For size 50mm (and below) valve of WS, PS series, the coil can be upright above or at the same level of (and perpendicular to) horizontal pipe. In this case, make sure the pressure differential before and after the valve is larger than 0.03MPa (see Fig.2).
4. Back flow may occur when the secondary pressure is larger than the primary pressure. To prevent back flow, install check valve on the secondary side (see Fig. 1).
5. If the valve is used for steam and the secondary pressure is negative pressure when the valve is closed, install vacuum regulating valve (vacuum breaker) on the secondary side of solenoid valve (see Fig.3).
6. Install steam trap on piping if the valve is used for steam.
7. When used for liquid, the pressure inside the piping may increase due to water hammer occurred when valve is closed or ambient temperature. In this case, it is recommended to install relief valve to protect machine (see Fig.4).
8. Connect coil properly using 0.75mm^2 above wire. Install fuse to protect electric circuit.
9. Repeated power-on and power-off for a long period may make the surface temperature rises up to about 70℃. Cares should be paid to avoid burning. (Depending on conditions and model, the temperature rise varies.)
10. Make sure the arrow mark on solenoid valve match with the direction of flow of fluid.
11. Leave some space for dissembling and maintenance.
12. Fix and support piping properly to prevent solenoid valve from being damaged due to weight of piping, excessively large stress, bending force, or vibration.
13. Discharge drain or apply thermal insulation if there is risk of freezing.
    However, the coil should not be applied with any thermal insulation.

Fig.2 Installation position

Upright to horizontal pipe

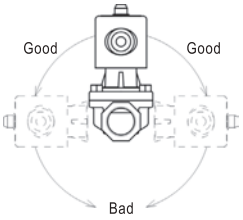


Fig.3 Steam line application

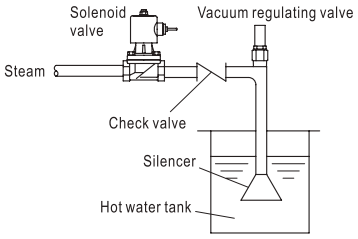
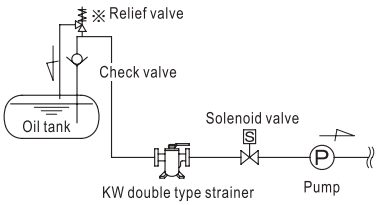


Fig.4 Relief valve installation



※ Install relief valve if pressure rise due to thermal expansion or other factors is anticipated.

EMERGENCY SHUT-OFF VALVES

13

Getting more sophisticated and gigantic, the industrial plants nowadays are obliged to strengthen the systems for security and prevention of casualty.

Restrictive laws are quite severe now.

EBS/ECS, EBF/ECF, EI-FS and EI-FP Types have been developed as safeguards for those equipments and piping systems and play quite important roles as Emergency Shut-Off Valves in case of emergency.

At the operation, the valves close instantly and surely and resuming of operation can only be made manually after safety has been confirmed.

Model name		End connection	Size	Applicable fluid	Applicable pressure(MPa)	Materials	Page
Energized open	Energized close						
EBS-1W	ECS-1W	Screwed	10~50(⅜″~2″)	Water,fuel gases or air	0~1.0	Body:Cast bronze Diaphragm:Synthetic rubber	234
EBF-1W	ECS-1W	Flanged	15~50(½″~2″)				
EBS-1P	ECS-1P	Screwed	10~50(⅜″~2″)	Fuel oils or other oils	0~1.0	Body:Cast bronze Disc:Stainless steel with Teflon tip	235
EBF-1P	ECF-1P	Flanged	15~50(½″~2″)				
EI-FS		Flanged	15~200(½″~8″)	Water,steam,oils, gases or air	Max. 1.0	Body:Cast iron Disc & seat:Cast bronze	236
EI-EP			32~200(1¼″~8″)	Water,oils, Fuel gases or air			
EIE-FS		Flanged	15~200(½″~8″)	Water,steam,oils, gases or air	Max. 1.0	Body:Cast iron Disc & seat:Cast bronze	237
EIE-FP			32~200(1¼″~8″)	Water,oils, Fuel gases or air			

EBS/ECS-1W Type, EBF/ECF-1W Type Emergency Shut off Solenoid Valve

Diaphragm type

Rapidly close and shut off fluid using electrical signal when emergency occurs. To restart, the operator must confirm safety first and then operate the lever manually. This allows safer operation.

EBS/ECS-1W, EBF/ECF-1W series are diaphragm type emergency shut off valves with different shape, operation, connection method and are made of different material.

FEATURES

- Compact, light weight.
- Wide range of working pressure.
- A variety of models available for meeting different demands.

SPECIFICATIONS

Model name	EBS-1W	ECS-1W	EBF-1W	ECF-1W
Code name	EBS1W-F	ECS1W-F	EBF1W-F	ECF1W-F
Size	10~50(⅜″~2″)		15~50(½″~2″)	
End connection	Screwed JIS Rc		Flanged JIS 10KFF	
Operation	Reenergized close	Energized close	Reenergized close	Energized close
Applicable fluid	Water, air & inert gases			
Fluid temperature	5~60℃			
Applicable pressure	0~1.0MPa			
Fluid viscosity	50cSt or less			
Rated voltage	Exclusive use:AC100V 50/60Hz or AC200V 50/60Hz			
Rated Current	AC100V:0.3A, AC200V:0.15A			
Starting Current	AC100V:1.0A, AC200V:0.5A			
Ambient temperature	5~40℃			
Protection	Dust proof (Insulated in the E class)			
Materials	Body(Cast bronze*1), Diaphragm(Synthetic rubber)			
Valve body pressure test	Hydraulic 1.5MPa			

* 1. Stainless steel body valve is available upon your request.
* 2. For outdoor use, protect the valve with a cover.

DIMENSIONS(EBS-1W, ECS-1W Type)

(mm)

Size	d	Ls	Gs	H	S	Cv value	Mass(kg)
10(⅜″)	⅜″	63	15	176	70	3	2.6
15(½″)	½″	63	15	176	70	4	2.6
20(¾″)	¾″	80	18	178	70	7	2.7
25(1″)	1″	90	22	183	70	9	3.1
32(1¼″)	1¼″	106	27	190	70	15	3.7
40(1½″)	1½″	118	30	193	70	18	4.7
50(2″)	2″	140	37	207	70	25	6.3

DIMENSIONS(EBF-1W, ECF-1W Type)

(mm)

Size	Lf	Gf	H	S	Cv value	Mass(kg)
15(½″)	112	21	176	70	4	4.1
20(¾″)	118	24	178	70	7	4.7
25(1″)	140	27	183	70	9	6.3
32(1¼″)	150	32	190	70	15	7.6
40(1½″)	160	35	193	70	18	9
50(2″)	190	41	207	70	25	11.5

Flange code JIS 10KFF

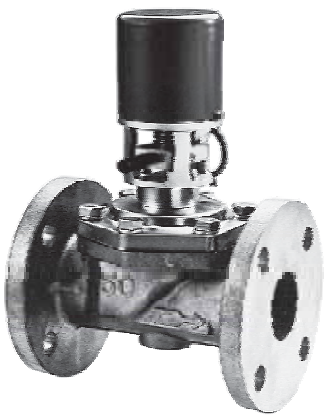
CONSTRUCTION

EBS-1W, EBF-1W Type

ECS-1W, ECF-1W Type

Upper part (lever)

EBS-1W Type
ECS-1W Type



EBF-1W Type
ECF-1W Type

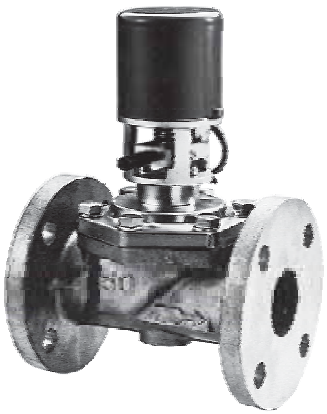
EBS/ECS-1P Type, EBF/ECF-1P Type Emergency Shut off Solenoid Valve

Piston type

Rapidly close and shut off fluid using electrical signal when emergency occurs. To restart, the operator must confirm safety first and then operate the lever manually. This allows safer operation.

EBS/ECS-1P, EBF/ECF-1P series are piston type emergency shut off valves with different shape, operation, connection method and are made of different material.

EBS-1P Type
ECS-1P Type



EBF-1P Type
ECF-1P Type

FEATURES

- Compact, light weight.
- Wide range of working pressure.
- A variety of models available for meeting different demands.

SPECIFICATIONS

Model name	EBS-1P	ECS-1P	EBF-1P	ECF-1P
Code name	EBS1P-W	ECS1P-W	EBF1P-W	ECF1P-W
Size	10~50(⅜″~2″)		15~50(½″~2″)	
End connection	Screwed JIS Rc		Flanged JIS 10KFF	
Operation	Reenergized close	Energized close	Reenergized close	Energized close
Applicable fluid	Fuel oils (such as kerosene, light oil & A class heavy oil) & other oil			
Fluid temperature	5~100℃			
Applicable pressure	0~1.0MPa			
Fluid viscosity	50cSt or less			
Rated voltage	Exclusive use:AC100V 50/60Hz or AC200V 50/60Hz			
Rated Current	AC100V:0.3A, AC200V:0.15A			
Starting Current	AC100V:1.0A, AC200V:0.5A			
Ambient temperature	5~40℃			
Protection	Dust proof (Insulated in the E class)			
Materials	Body(Cast bronze*1), Disc(Stainless steel with Teflon tip)			
Valve body pressure test	Hydraulic 1.5MPa			

*1. Stainless steel body valve is available upon your request.
*2. For outdoor use, protect the valve with a cover.

DIMENSIONS (EBS-1P, ECS-1P Type)

(mm)

Size	d	Ls	Gs	H	S	Cv value	Mass(kg)
10(⅜″)	⅜″	63	15	173	70	3	2.6
15(½″)	½″	63	15	173	70	4.5	2.6
20(¾″)	¾″	80	18	177	70	7.5	2.7
25(1″)	1″	90	22	182	70	11	3.1
32(1¼″)	1¼″	106	27	188	70	16	3.7
40(1½″)	1½″	118	30	191	70	20	4.7
50(2″)	2″	140	37	205	70	30	6.3

DIMENSIONS (EBF-1P, ECF-1P Type)

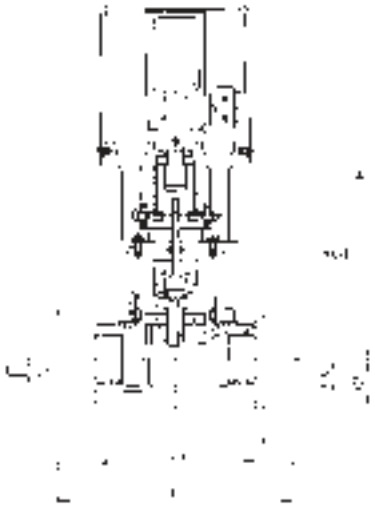
(mm)

Size	Lf	Gf	H	S	Cv value	Mass(kg)
15(½″)	112	21	173	70	4.5	4.1
20(¾″)	118	24	177	70	7.5	4.7
25(1″)	140	27	182	70	11	6.3
32(1¼″)	150	32	188	70	16	7.6
40(1½″)	160	35	191	70	20	9
50(2″)	190	41	205	70	30	11.5

Flange code JIS 10KFF

CONSTRUCTION

EBS-1P, EBF-1P Type



ECS-1P, ECF-1P Type

Upper part (lever)

EI-FS, FP Type Emergency Shut off Solenoid Valve

for Fuel Supply Line, Storage Tanks, etc.

When being installed on machines or equipments using fuel or gas, this valve is close by electrical signal when emergency occurs, shut off the supply line and prevent fire, explosion, and secondary disasters.

Manual restarting requires operator to confirm safety and resume electrical signal before operating the restart lever. For size 100mm (and below) valves, it is easy to switch between power-off closing and power-on closing by changing the position of stopper hole.

SPECIFICATIONS

Model name		EI-FS			EI-FP
Code name		EIFS-RB	EIFS-HB	EIFS-BB	EIFP-RB
Use		Liquids	Gases	Steam	High differential pressure
Size		15~200(½″~8″)			32~200(1¼″~8″)
Applicable fluid		Fuel oil*2., water & oils*2.	Fuel gases, air	Steam	Fuel oil*2., fuel gases, air,water & oils*2.
Rated Pressure		1.0MPa	1.0MPa*3.	1.0MPa	1.0MPa*3.
Applicable press. differential limit		According to table for applicable press. differential limit			
Fluid temperature		5~100℃	5~60℃	Max. 180℃	5~100℃
Fluid viscosity		900cSt or less	—	—	900cSt or less
Leakage allowance		Nil (Confirm at Pressure gauge.)		0.01% or less of rated flow	Nil (Confirm at Pressure gauge.)
Operation		Energized close type, reset manually or de-energized close type, reset manually*4.			
Rated voltage		AC100V 50Hz, AC100V 60Hz, AC200V 50Hz, AC200V 60Hz			
Rated Current		AC100V:0.44A, AC200V:0.22A			
Starting Current		AC100V:1.76A, AC200V:0.88A			
Ambient temperature		−10~40℃			
Protection		Dust proof (Insulated in the B class)			
End connection		Flanged JIS 10KFF			
Materials	Body	Body(Cast iron*5.), Disc & seat(Cast bronze)			
	Disc	Teflon	Synthetic rubber	—	Teflon
Valve body pressure test		Hydraulic 1.5MPa			

* 1. For outdoor use, protect the valve with a cover.
* 2. In case of fuel oil, gasoline and light oil, use cast steel valve body.
* 3. In case of fuel gases use, rated pressure is up to 0.2MPa. Rated pressure 1.0MPa with cast steel valve body is available upon your request.
* 4. Energized open type is available upon your request.
* 5. Valve body with Cast bronze(Size 50~100mm)、Cast steel and Stainless steel are available upon your request.
* 6. With an explosion proof limit switch to confirm operation type is available upon your request.
* 7. Refer to page 231 for method of Wiring.

DIMENSIONS

(mm)

Size	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)	100(4″)	125(5″)	150(6″)	200(8″)
L	112	125	140	160	180	200	270	290	350	360	410	500
G	52	57	62	67	72	82	120	141	160	190	214	240
H	353	355	360	363	381	391	410	430	499	583	607	633
S(Reference)	233	233	233	233	363	363	363	363	363	530	530	530
Cv value	3.6	6.4	10	16	25	40	67	102	160	250	360	640
Mass(kg)	8	8.5	10.3	11.6	13.2	16.4	32.4	37.1	58.1	105	130	190

Flange code JIS 10KFF

APPLICABLE PRESS. DIFFERENTIAL LIMIT

(MPa)

Size	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)	100(4″)	125(5″)	150(6″)	200(8″)
EI-FS Type	1.0	1.0	1.0	0.7	0.7 (0.4)	0.5 (0.3)	0.3 (0.15)	0.2 (0.1)	0.1 (0.05)	0.06	0.04	0.02
EI-FP Type	—	—	—	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5

* Figures in ( ) are in case of 233mm for S in dimension table.

CONSTRUCTION

EI-FS Type
(AC power source)

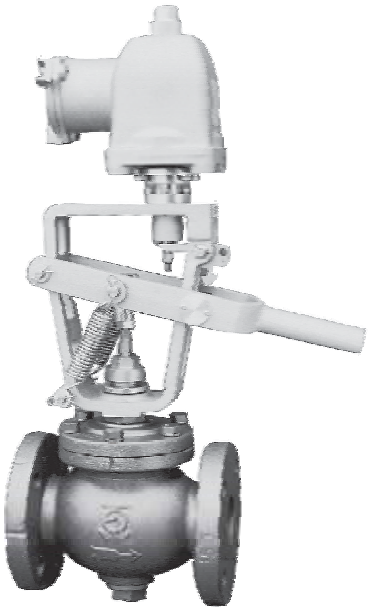
EI-FP Type disc structure

Depending on size, the structure may vary.

EIE-FS, FP Type Pressure Resistance and Explosion Proof Emergency Shut off Solenoid Valve

d2G4 pressure resistant and explosion proof structure

Pressure resistant and explosion proof solenoid valve is ideal for piping of fuel storage tank system and other important lines. It can close and shut off fluid flow by electric signal (such as one sent out by vibration sensor) when earthquake, fire, or other accident occurs, and prevent secondary disasters. Manual restarting requires operator to confirm safety and resume electric signal before operating the restart lever. For size 100mm (and below) valves, it is easy to switch between power-off closing and power-on closing by changing the position of stopper hole.



SPECIFICATIONS

Model name		EIE-FS			EIE-FP
Code name		EIEFS-RB	EIEFS-HB	EIEFS-BB	EIEFP-RB
Use		Liquids	Gases	Steam	High differential pressure
Size		15~200(½″~8″)			32~200(1¼″~8″)
Applicable fluid		Fuel oil*2., water & oils*2.	Fuel gases, air	Steam	Fuel oil*2., fuel gases, air,water & oils*2.
Rated Pressure		1.0MPa	1.0MPa*3.	1.0MPa	1.0MPa*3.
Applicable press. differential limit		According to table for applicable press. differential limit			
Fluid temperature		5~100℃	5~60℃	Max. 180℃	5~100℃
Fluid viscosity		900cSt or less	—	—	900cSt or less
Leakage allowance		Nil (Confirm at Pressure gauge.)		0.01% or less of rated flow	Nil (Confirm at Pressure gauge.)
Operation		Energized close type, reset manually or de-energized close type, reset manually*4.			
Rated voltage		AC100V 50Hz, AC100V 60Hz, AC200V 50Hz, AC200V 60Hz			
Ambient temperature		−10~40℃			
Protection		Pressure resistance and explosion proof d2G4			
End connection		Flanged JIS 10KFF			
Materials	Body	Body(Cast iron*5.), Disc & seat(Cast bronze)			
	Disc	Teflon	Synthetic rubber	—	Teflon
Valve body pressure test		Hydraulic 1.5MPa			

＊1. For outdoor use, protect the valve with a cover.
＊2. In case of fuel oil, gasoline and light oil, use cast steel valve body.
＊3. In case of fuel gases use, rated pressure is up to 0.2MPa. Rated pressure 1.0MPa with cast steel valve body is available upon your request.
＊4. Energized open type is available upon your request.
＊5. Valve body with Cast bronze(Size 50~100mm)、Cast steel and Stainless steel are available upon your request.
＊6. With an explosion proof limit switch to confirm operation type is available upon your request.

CURRENT VALUVES

(A)

Voltage division		AC100V 50Hz	AC100V 60Hz	AC200V 50Hz	AC200V 60Hz
Current value	Rated	0.65	0.65	0.3	0.3
	Starting	5.7	6.2	2.7	3.1

DIMENSIONS

(mm)

Size	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)	100(4″)	125(5″)	150(6″)	200(8″)
L	112	125	140	160	180	200	270	290	350	360	410	500
G	52	57	62	67	72	82	120	141	160	190	214	240
H	458	460	465	468	486	496	515	535	554	681	705	731
S(Reference)	233	233	233	233	363	363	363	363	363	530	530	530
Cv value	3.6	6.4	10	16	25	40	67	102	160	250	360	640
Mass(kg)	10.2	10.7	12.5	13.8	15.4	18.6	34.6	39.3	60.3	107	132	192

Flange code JIS 10KFF

APPLICABLE PRESS. DIFFERENTIAL LIMIT

(MPa)

Size	15(½″)	20(¾″)	25(1″)	32(1¼″)	40(1½″)	50(2″)	65(2½″)	80(3″)	100(4″)	125(5″)	150(6″)	200(8″)
EI-FS Type	1.0	1.0	1.0	0.7	0.7 (0.4)	0.5 (0.3)	0.3 (0.15)	0.2 (0.1)	0.1 (0.05)	0.06	0.04	0.02
EI-FP Type	—	—	—	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5

＊Figures in ( ) are in case of 233mm for S in dimension table.

CONSTRUCTION

EIE-FS Type

Disc structure of EIE-FP Type

Depending on size, the structure may vary.

DATA/Installation of Emergency Shut off Valve

Fig.1 Piping example

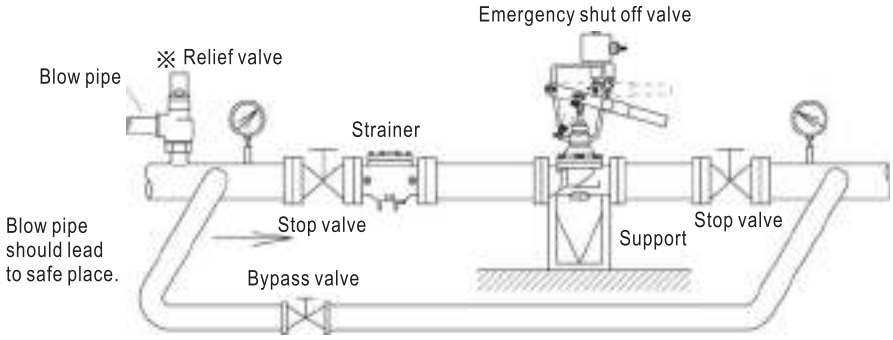
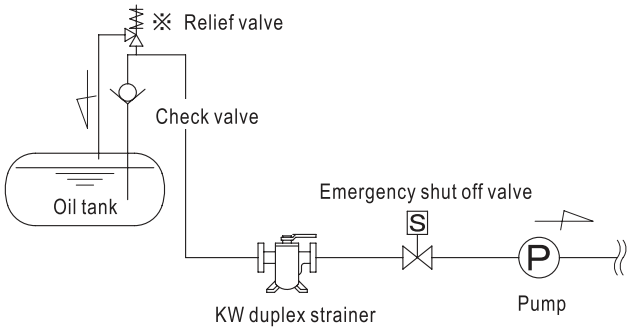


Fig.2 Piping example



※ In the case of liquid application, install relief valve if water hammer or thermal expansion of fluid due to change of ambient temperature is anticipated.

■ SELECTION AND INSTALLATION

1. In general, strainer should be installed on the primary side of emergency shut off valve (see Fig.1).
2. Install a bypass pipe (with stop valve) between the primary and secondary sides of emergency shut off valve if the operation of equipment cannot be stopped (see Fig.1).
3. The drive unit of the valve should stand upright above horizontal pipe (see Fig.1).
4. Back flow may occur when the secondary pressure is larger than the primary pressure. To prevent back flow, install check valve on the secondary side.
5. When used for liquid, the pressure inside the piping may increase due to water hammer occurred when valve is closed or increase of ambient temperature. In this case, it is recommended to install relief valve to protect machine (see Fig.1, 2).
6. The valve cannot open or close when pressure exceeds rated pressure. The valve cannot operate under vacuum pressure.
7. Use explosion proof model if there is explosive gas accumulated in the atmosphere.
8. See specifications of product for suitable ambient temperature.
9. For outdoor installation, cover the valve to avoid exposure to rain or direct sunlight.
10. Connect coil properly using 0.75mm^2 or above wire. Install fuse to protect electric circuit.
11. To avoid malfunction caused by vibration, install shock absorber for places with excessive vibration.
12. Make sure the arrow mark on emergency shut off valve match with the direction of flow of fluid.
13. Leave sufficient space for maintenance purpose.
14. Fix and support piping properly to prevent the valve from being damaged due to weight of piping, excessively large stress, bending force, or vibration.
15. Discharge drain or apply thermal insulation if there is risk of freezing.
    However, the coil should not be applied with any thermal insulation.

MOTOR VALVES 14

ML Types are motor valves consisting of the actuating parts to alter the rotation of the motor shaft to the piston movement with linkage system and the main valve part to regulate the flow. With electric or electronic controller, two position regulation or proportional regulation is conductedto adjust the flow of various fluid and regulate the temperature, pressure, capacity, etc. BM Types are small sized compact motor valves to be used for two position regulation.

Model name	End connection	Size	Applicable fluid	Type	Materials		Page
					Body	Disc & Seat	
BM-12S	Screwed	10~25(⅜″~1″)	Water,oils,air or gases	Ball type	Cast bronze	Stainless steel	240
BM-13S		15~25(½″~1″)					
BM-14S					Stainless steel		
BM-12SR	Screwed	10~25(⅜″~1″)	Water,oils,air or gases	Ball type	Cast bronze	Stainless steel	241
BM-13SR		15~25(½″~1″)					
BM-14SR					Stainless steel		
BM-12CR	Screwed	10~25(⅜″~1″)	Water,oils,air or gases	Ball type	Cast bronze	Stainless steel	242
BM-13CR		15~25(½″~1″)					
BM-14CR					Stainless steel		
BM-8S	Screwed	32~50(1¼″~2″)	Water,oils,air or gases	Ball type	Brass	Brass,chrome plated	243
BM-9S		15~25(½″~1″)	Steam or hot water				
BM-7S	Screwed	10~50(⅜″~2″)	Water,air or gases	Ball type	Brass	Brass,chrome plated	244
BM-1S	Screwed	10~50(⅜″~2″)	Water,air or gases	Ball type	Stainless steel	Stainless steel	245
3BM-1S	Screwed	15~50(½″~2″)	Water,air or gases	Ball type	Brass	Brass	246
ML-FD	Flanged	32~150(1¼″~6″)	Steam,water,hot water, oils or air	Double seated	Cast iron	Cast bronze	247
ML-TS	Screwed	15~50(½″~2″)	Water,hot water, oils or gases	Single seats	Cast bronze	Cast bronze	248
ML-FS	Flanged	15~100(½″~4″)			Cast iron		
ML-FW	Flanged	32~150(1¼″~6″)	Water,hot water, oils or gases	Balance type Single seated	Cast iron	Cast bronze	249
TBM-8S	Screwed	10~50(⅜″~2″)	Hot water	Ball type	Brass	Brass,chrome plated	252

BM-12S, 13S, 14S Type Ball Valve Type Motor Valve

Two-way valve for on/off control

Compact, light weight, general purpose ball type motor valve with rated voltage AC100/200, wide range of applicable pressure, and can be handled as easily as solenoid valve.

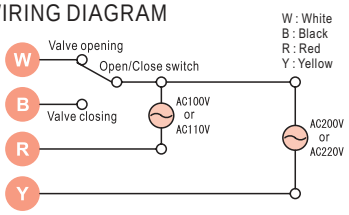
BM-12S is general purpose valve, BM-13S has long neck, and BM-14S has stainless steel body. Both are for on/off control.

BM-12S Type

BM-13S Type

BM-14S Type

WIRING DIAGRAM



Unused wire (red or yellow) must be insulated.

Note: Install space heater if condensation is anticipated.

FEATURES

- Rated voltage AC100/200.
- Compact, light weight, easy to handle.
- Wide range of applicable pressure for a variety of applications.
- No limitation on flow direction and installation direction (in the case of indoor application).
- Durable stainless steel ball.

SPECIFICATIONS

Model name		BM-12S	BM-13S	BM-14S
Code name		BM12S-J	BM13S-J	BM14S-D
Type		Standard neck	Long neck	Standard neck
Size		10~25(⅜″~1″)	15~25(½″~1″)	
Applicable fluid		Water, oils, air & non-corrosive fluids		
Fluid temperature		−10~80℃(Freezing is not allowed.)		
Applicable pressure		0~1.0MPa		
Ambient temperature		−10~50℃		
Operation		ON/OFF control		
Leakage allowance		Water & oils:Nil(Confirm at pressure gauge), Air & gases:50ml/min(Standard state) or less		
End connection		Screwed JIS Rc		
Valve body pressure test		Hydraulic 1.75MPa		
Materials	Body	Cast bronze		Stainless steel
	Ball	Stainless steel		
Rated voltage		Common use AC100/110/200/220V (50/60Hz)*1.		
Allowable voltage fluctuation range		Rated voltage ±5%		
Rated capacity		AC110V:13VA, AC220V:26VA		
Rated current		0.12A		
Starting current		0.12A		
Open/close time		4.6/3.8sec (50/60Hz)		
Insulation		Class E		
Time rating		20min		
Withstanding voltage test		1500V/min		
Insulation resistance		50MΩ or more		
Overload protection		Thermal protector is built in		
Protection		Dust & rain proof (IP-53 corresponding)		
Manual control device		Equipped		

* 1. Rated voltage of AC 24V, DC 12V or DC24V is available upon your request.
* 2. Actuator with space heater to prevent from rust by dew condensation, etc. is available upon your request.
* 3. Actuator with relay circuit is available upon your request.

DIMENSIONS

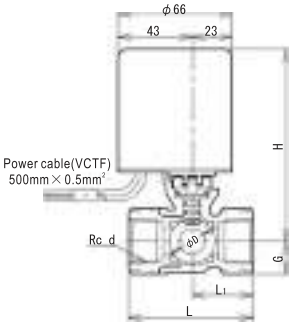
(mm)

Size	d	D	L	L_1	G	Cv value	BM-12S Type		BM-13S Type		BM-14S Type	
							H	Mass(kg)	H	Mass(kg)	H	Mass(kg)
10(⅜″)	⅜″	12.5	62	31	16	4.5	107	1.3	—	—	—	—
15(½″)	½″	12.5	62	31	16	7	107	1.3	138	1.3	107	1.2
20(¾″)	¾″	15	72	35(33)	19	10	111	1.4	140	1.5	111	1.4
25(1″)	1″	21	81	40.5	23	20	115	1.6	145	1.7	115	1.5

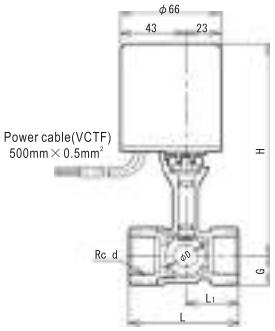
* Figures in ( ) are for BM-14S Type

CONSTRUCTION

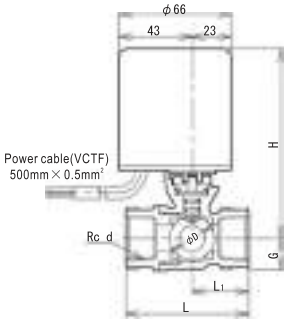
BM-12S Type



BM-13S Type



BM-14S Type



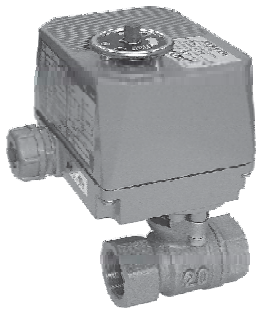
BM-12SR, 13SR, 14SR Type Ball Valve Type Spring Return Motor Valve

Two-way valve for on/off control

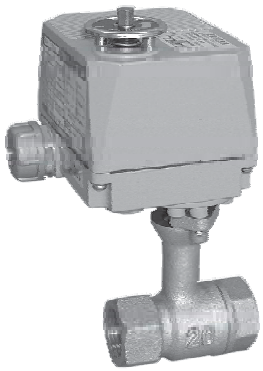
Ball type spring return motor valve can maintain opening or closing state with extremely light current. To switch between opening and closing state, turn on or turn off power.

This product combines the characteristics of motor valve (no limitation on flow direction) and solenoid valve (2-wire control).

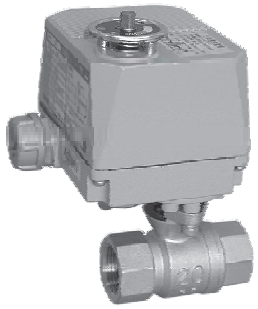
BM-12SR is general purpose valve, BM-13SR has long neck, and BM-14SR has stainless steel body. Both are for on/off control.



BM-12SR Type

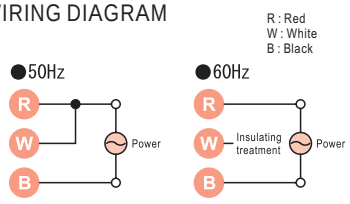


BM-13SR Type



BM-14SR Type

WIRING DIAGRAM



Unused wire (white wire in the case of 60Hz) must be insulated.

FEATURES

- 2-wire type that can handled like solenoid valve.
- Durable stainless steel ball.
- No limitation on flow direction and installation direction (in the case of indoor application).

SPECIFICATIONS

Model name		BM-12SR	BM-13SR	BM-14SR
Code name		BM12SR-J	BM13SR-J	BM14SR-D
Type		Standard neck	Long neck	Standard neck
Size		10~25(⅜″~1″)	15~25(½″~1″)	
Applicable fluid		Water, oils, air & non-corrosive fluids		
Fluid temperature		−10~80℃(Freezing is not allowed.)		
Applicable pressure		0~1.0MPa		
Ambient temperature		−10~45℃		
Operation		Reenergized close, Energized close*1.		
Leakage allowance		Water & oils:Nil(Confirm at pressure gauge), Air & gases:50ml/min(Standard condition) or less		
End connection		Screwed JIS Rc		
Valve body pressure test		Hydraulic 1.75MPa		
Materials	Body	Cast bronze		Stainless steel
	Ball	Stainless steel		
Rated voltage		AC100V(50/60Hz) or AC200V(50/60Hz)		
Allowable voltage fluctuation range		Rated voltage ±10%		
Rated capacity		10VA(AC100/200V)		
Rated current		AC100V:0.1A, 200V:0.05A		
Starting current		AC100V:0.15A, 200V:0.08A		
Open/close time		Open time:36/29 sec or less(50/60Hz), Close time:4~36sec*2.		
Insulation		Class E		
Time rating		Continuous duty		
Withstanding voltage test		DC500V		
Insulation resistance		100MΩ or more		
Overload protection		Impedance protector		
Protection		Splash-proof type(IP-54 corresponding)		
Manual control device		Equipped(on the actuator)		

＊1. Energized close and De-energized open Type for BM- 12SRC, 13SRC and 14SRC are available upon your request.
＊2. Disc close time period is changed by continuous energization time period. Over 30min. continuous energization time period: Close time period 4~10sec.
Within 30min. continuous energization time period: Close time period within 36sec.

DIMENSIONS

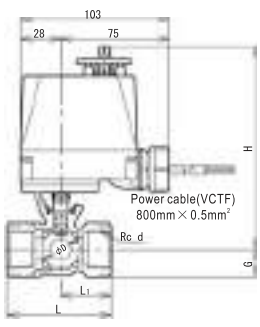
(mm)

Size	d	D	L	L1	G	Cv value	BM-12SR Type		BM-13SR Type		BM-14SR Type	
							H	Mass(kg)	H	Mass(kg)	H	Mass(kg)
10(⅜″)	⅜″	12.5	62	31	16	4.5	137	1.6	—	—	—	—
15(½″)	½″	12.5	62	31	16	7	137	1.6	168	1.6	137	1.5
20(¾″)	¾″	15	72	35(33)	19	10	141	1.7	170	1.8	141	1.7
25(1″)	1″	21	81	40.5	23	20	145	1.9	175	2	145	1.8

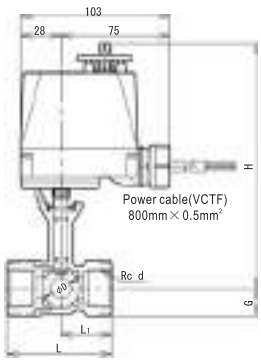
＊Figures in ( ) are for BM-14SR Type

CONSTRUCTION

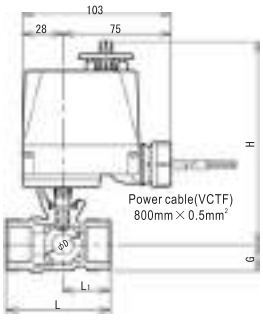
BM-12SR Type



BM-13SR Type



BM-14SR Type



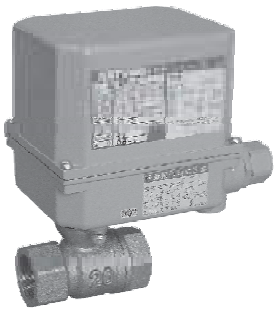
BM-12CR, 13CR, 14CR Type Ball Valve Type Capacitor Return Motor Valve

Two-way valve for on/off control

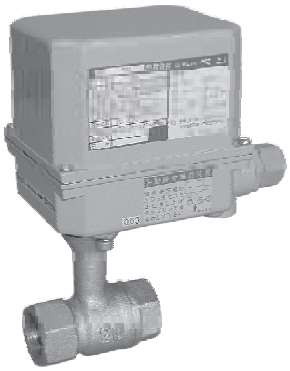
Ball type capacitor return motor valve uses capacitor to store electricity and opens or closes using such electricity stored when power is off.

This product combines the characteristics of motor valve (no limitation on flow direction) and solenoid valve (2-wire control).

BM-12CR is general purpose valve, BM-13CR has long neck, and BM-14CR has stainless steel body. Both are for on/off control.



BM-12CR Type



BM-13CR Type

BM-14CR Type

FEATURES

- Rated voltage AC100/200.
- 2-wire type that can handled like solenoid valve.
- Low rated current, energy saving.
- Durable stainless steel ball.
- No limitation on flow direction and installation direction (in the case of indoor application).

SPECIFICATIONS

Model name		BM-12CR	BM-13CR	BM-14CR
Code name		BM12CR-J	BM13CR-J	BM14CR-D
Type		Standard neck	Long neck	Standard neck
Size		10~25(⅜″~1″)	15~25(½″~1″)	
Applicable fluid		Water, oils, air & non-corrosive fluids		
Fluid temperature		−10~80℃(Freezing is not allowed.)		
Applicable pressure		0~1.0MPa		
Ambient temperature		−10~50℃		
Operation		De-energized close, Energized open*1.		
Leakage allowance		Water & oils:Nil(Confirm at pressure gauge), Air & gases:50ml/min(Standard condition) or less		
End connection		Screwed JIS Rc		
Valve body pressure test		Hydraulic 1.75MPa		
Materials	Body	Cast bronze		Stainless steel
	Ball	Stainless steel		
Rated voltage		Common use AC100/200V (50/60Hz)		
Allowable voltage fluctuation range		Rated voltage ±10%		
Rated capacity		3VA*3. (20VA*2.)		
Rated current		AC100V:0.03A*3., AC200V:0.015A*3.		
Starting current		AC100V:0.2A*2., AC200V:0.1A*2.		
Open/close time		Around 6sec*3. *4.		
Insulation		Class A		
Time rating		Continuous duty		
Withstanding voltage test		AC1500V/min		
Insulation resistance		20MΩ or more		
Protection		Water jet prevention type(IP-55 corresponding)		
Manual control device		Equipped		

* 1. Energized close and De-energized open Type for BM-12SRC, 13SRC and 14SRC are available upon your request.
* 2. At the beginning of power charges in capacitor.
* 3 At the full power charge in capacitor.
* 4. At the first operation, it is required to charge power for 2 min. before operation. Also in case of first operation and re-start after long time no-use without any power supply for actuator, it takes about 20 seconds to start operation and 30 seconds more for the full-open.

DIMENSIONS

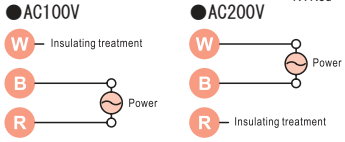
(mm)

Size	d	D	L	L_1	G	Cv value	BM-12CR Type		BM-13CR Type		BM-14CR Type	
							H	Mass(kg)	H	Mass(kg)	H	Mass(kg)
10(⅜″)	⅜″	12.5	62	31	16	4.5	139	2	—	—	—	—
15(½″)	½″	12.5	62	31	16	7	139	2	170	2	139	1.9
20(¾″)	¾″	15	72	35(33)	19	10	143	2.1	172	2.2	143	2.1
25(1″)	1″	21	81	40.5	23	20	147	2.3	177	2.4	147	2.2

* Figures in ( ) are for BM-14CR Type

WIRING DIAGRAM

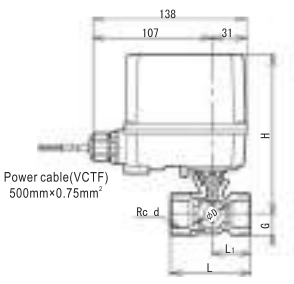
W : White
B : Black
R : Red



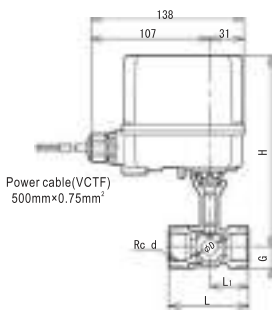
Unused wire (white or red) must be insulated.

CONSTRUCTION

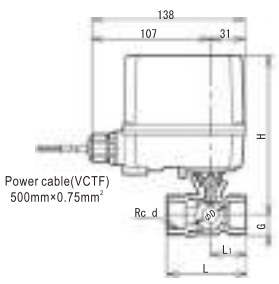
BM-12CR Type



BM-13CR Type



BM-14CR Type

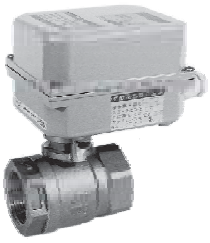


BM-8S, 9S Type Ball Valve Type Motor Valve

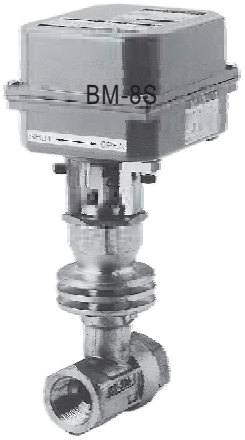
Two-way valve for on/off control

Compact, light weight, general purpose ball type motor valve with rated voltage AC100/200, wide range of applicable pressure, and can be handled as easily as solenoid valve.

BM-8S is general purpose valve and BM-9S is for steam or hot water. Both are for on/off control.



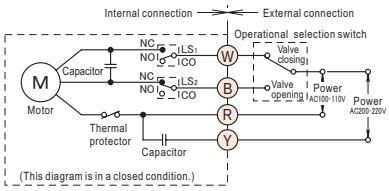
BM-8S Type



BM-9S Type

CIRCUIT DIAGRAM OF ACTUATOR (Standard)

W : White
B : Black
R : Red
Y : Yellow



Unused wire must be insulated.

FEATURES

- Rated voltage AC100/200.
- Compact, light weight, easy to handle.
- Wide range of applicable pressure for a variety of applications.
- No limitation on flow direction and installation direction (in the case of indoor application).

SPECIFICATIONS

Model name	BM-8S	BM-9S
Code name	BM8S-F	BM9S-F
Applicable fluid	Water, oils, air & gases	Steam & hot water
Fluid temperature	−10~80℃(Freezing is not allowed.)	180℃ or less(For hot water: Max. 100℃)
Size	32~50(1¼″~2″)	15~25(½″~1″)
Applicable pressure	0~1.0MPa	
Ambient temperature	−10~50℃	
Operation	ON/OFF control	
Leakage allowance	Water & oils:Nil(Confirm at pressure gauge), Air & gases:50ml/min(Standard condition) or less	Nil(Confirm at pressure gauge)
End connection	Screwed JIS Rc	
Valve body pressure test	Hydraulic 1.75MPa	Hydraulic 1.5MPa
Materials	Body(Brass), Ball(Brass, Chrome plated)	
Rated voltage	Common use:AC100/110/200/220V 50/60Hz	
Allowable voltage fluctuation range	Rated voltage ±5%	
Rated capacity	AC110V:20VA, AC220V:40VA	
Rated current	0.18A	
Starting current	0.18A	
Open/close time	10/8.5sec (50/60Hz)	
Insulation	Class E	
Time rating	10min	
Withstanding voltage test	1500V/min	
Insulation resistance	50MΩ or more	
Overload protection	Thermal protector is built in	
Protection	Dust & rain proof	
Manual control device	Equipped	

＊1. Rated voltage AC24V, DC12V andDC24V are available upon your request.
＊2. Actuator with space heater to prevent from rust by dew condensation, etc. is available upon your request.

DIMENSIONS

(mm)

Size	d	D	L	L_1	G	H	Cv value	Mass(kg)
15(½″)	½″	11.5	62	31	20	203	6	2.3
20(¾″)	¾″	15	75	37.5	23	207	10	2.5
25(1″)	1″	20	85	42.5	26	211	18	2.8
32(1¼″)	1¼″	24	82	41	29	128	24	2.3
40(1½″)	1½″	32	96	45	34	134	45	2.7
50(2″)	2″	38	120	57	41	140	63	3.7

＊Above figures are for Size 15~25mm of BM-9S Type and Size 32~50mm of BM-8S Type.

CONSTRUCTION

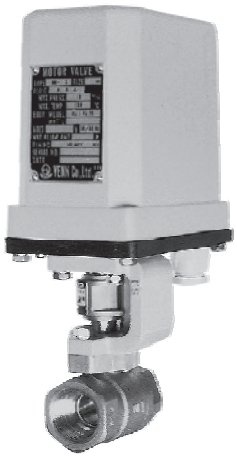
BM-8S Type

BM-9S Type

BM-7S Type Ball Valve Type Motor Valve (for Liquids, Air or Gases)

Two-way valve for on/off control

High grade motor valve for on/off control, with characteristics of ball type vale, simple structure, and sufficient rotating torque.



FEATURES

- Compact, light weight.
- Large operating power.
- The state of valve can be checked from outside.
- Manual open/close available.
- No limitation on flow direction and installation direction.
- The signal for valve open/close can be drawn out.
- Embedded thermal protector (for size 32mm above).
- Rainproof, suitable for outdoor application.

SPECIFICATIONS

Model name	BM-7S	
Code name	BM7S-F1	BM7S-F2
Type	Full bore	
Applicable fluid	Liquids, air & gases	
Fluid temperature	−10~100℃(Freezing is not allowed.)	
Applicable pressure	Max. 1.0MPa	
Ambient temperature	−10~50℃	
Operation	ON/OFF control	
Leakage allowance	Nil(Confirm at pressure gauge)	
End connection	Screwed JIS Rc	
Valve body pressure test	Hydraulic 1.5MPa	
Materials	Body(Brass), Ball(Brass, Chrome plated), Cover(Cast aluminum)	
Rated voltage	AC100/110V 50/60Hz	AC200/220V50/60Hz
Allowable voltage fluctuation range	Rated voltage ±5%	
Insulation	Class E	
Time rating	30min	
Withstanding voltage test	1500V/min	
Insulation resistance	50MΩ or more	
Overload protection	Thermal protector is built in (Size 32~50mm)	
Protection	Rain proof (with cabtyre cable)	
Open/close check contact	Provided (voltage) Contact capacity:AC125, 250V, 10A(Equivalent to JIS C4505 V3)	
Manual control device	Equipped	

RATED CAPACITY, CURRENT VALUES, OPEN/CLOSE TIME

Size	10~25(⅜″~1″)	32~50(1¼″~2″)
Rated capacity	22VA	50VA
Rated current	AC100V:0.22A, AC200V:0.11A	AC100V:0.50A, AC200V:0.25A
Starting current	AC100V:0.30A, AC200V:0.15A	AC100V:0.90A, AC200V:0.45A
Open/close	Approx. 3sec	Approx. 6sec

DIMENSIONS

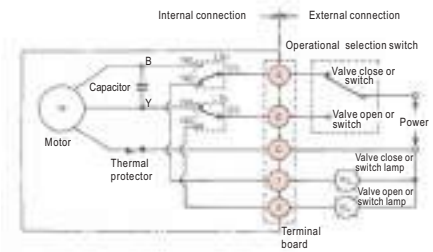
(mm)

Size	d	A	B	L	G	H	Port size	Cv value	Mass(kg)
10(⅜″)	⅜″	139	89	50	16	232	10	4.5	3.3
15(½″)	½″	139	89	65	20	236	15	10	3.5
20(¾″)	¾″	139	89	75	24	242	20	18	3.7
25(1″)	1″	139	89	85	29	247	25	27	3.9
32(1¼″)	1¼″	159	109	100	34	282	32	45	6.2
40(1½″)	1½″	159	109	109	41	291	40	70	7.1
50(2″)	2″	159	109	132	49	299	50	110	8.6

OPERATION

CO power-on opening
CS power-on closing

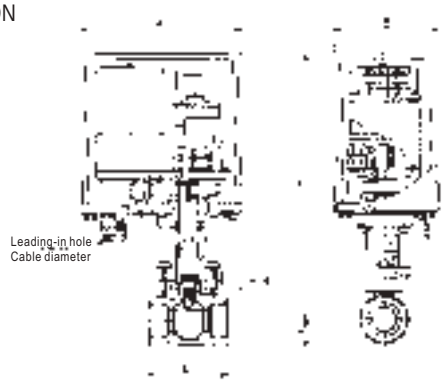
CIRCUIT DIAGRAM OF ACTUATOR



B : Black
Y : Yellow

(The figure shows all-closing state)
Note: Size 10~25mm product has thermal protector embedded.

CONSTRUCTION



BM-1S Type Ball Valve Type Motor Valve (for Liquids, Air or Gases)

Two-way valve for on/off control

BM-1S is a motor on/off valve with characteristics of ball valve and stainless body.

FEATURES

- Compact, light weight.
- Large operating power.
- The state of valve can be checked from outside.
- Manual open/close.
- No limitation on flow direction and installation direction.
- The signal for valve open/close can be drawn out.
- Embedded thermal protector (for size 32~50mm above)
- Rainproof, suitable for outdoor application.

SPECIFICATIONS

Model name	BM-1S	
Code name	BM1S-D	
Applicable fluid	Liquids, air & gases	
Fluid temperature	−10~100℃(Freezing is not allowed.)	
Applicable pressure	Max. 1.0MPa	
Ambient temperature	−10~50℃	
Operation	ON/OFF control	
Leakage allowance	Nil(Confirm at pressure gauge)	
End connection	Screwed JIS Rc	
Valve body pressure test	Hydraulic 1.5MPa	
Materials e	Body(Stainless steel), Ball(Stainless steel), Cover(Cast aluminum)	
Rated voltage	AC100/110V 50/60Hz or AC200/220V 50/60Hz	
Allowable voltage fluctuation range	Rated voltage ±5%	
Size	10~25(⅜″~1″)	32~50(1¼″~2″)
Rated capacity	22VA	50VA
Rated current	AC100V:0.22A, AC200V:0.11A	AC100V: 0.50A, AC200V:0.25A
Starting current	AC100V:0.30A, AC200V:0.15A	AC100V: 0.90A, AC200V:0.45A
Open/close time	Approx. 2sec	Approx. 4sec
Insulation	Class E	
Time rating	30min	
Withstanding voltage test	1500V/min	
Insulation resistance	50MΩ or more	
Overload protection	Thermal protector is built in (Size 32~50mm)	
Protection	Rain proof (with cabtyre cable)	
Manual control device	Provided (voltage) Contact capacity: Ac125, 250V, 10A(Equivalent to JIS C4505 V3)	
Open/close time	Equipped	

DIMENSIONS

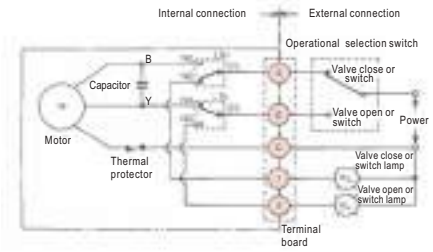
(mm)

Size	d	L	G	H	A	B	W	Port size	Cv value	Mass(kg)
10(⅜″)	⅜″	45	15	219	139	89	44	7.5	2.5	3.1
15(½″)	½″	55	17	222	139	89	50	9	3.5	3.2
20(¾″)	¾″	61	20	225	139	89	56	12.5	7	3.3
25(1″)	1″	75	26	229	139	89	65	16	11	3.6
32(1¼″)	1¼″	78	30	265	159	109	80	21	20	5.7
40(1½″)	1½″	82	34	267	159	109	84	24	25	6
50(2″)	2″	100	41	275	159	109	102	32	45	7

OPERATION

CO power-on opening
CS power-on closing

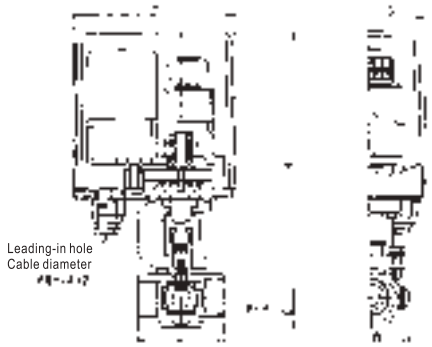
CIRCUIT DIAGRAM OF ACTUATOR



B : Black
Y : Yellow

(The figure shows all-closing state)
Note: Size 10~25mm product has thermal protector embedded.

CONSTRUCTION



3BM-1S Type Ball Valve Type Motor Valve (for Liquids, Air or Gases)

Three-way valve for on/off control

3BM-1S is a compact motor valve with characteristics of ball valve and a 3-way, 2-port (L) structure.

FEATURES

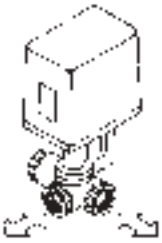
- Compact, light weight.
- Large operating power.
- The signal for valve switching can be drawn out.
- The state of valve can be checked from outside.
- No limitation on flow direction and installation direction.
- Manual valve switching possible.
- Embedded thermal protector (for size 32~50mm above)
- Rainproof, suitable for outdoor application.

SPECIFICATIONS

Model name	3BM-1S	
Code name	3BM1S-D	
Applicable fluid	Liquids, air & gases	
Fluid temperature	−10~100℃(Freezing is not allowed.)	
Applicable pressure	Max. 1.0MPa	
Ambient temperature	−10~50℃	
Operation	ON/OFF control	
Leakage allowance	Nil(Confirm at pressure gauge)	
End connection	Screwed JIS Rc	
Valve body pressure test	Hydraulic 1.5MPa	
Materials e	Body(Stainless steel), Ball(Stainless steel), Cover(Cast aluminum)	
Rated voltage	AC100/110V 50/60Hz or AC200/220V 50/60Hz	
Allowable voltage fluctuation range	Rated voltage ±5%	
Size	15~25(½″~1″)	32~50(1¼″~2″)
Rated capacity	22VA	50VA
Rated current	AC100V:0.22A, AC200V:0.11A	AC100V:0.50A, AC200V:0.25A
Starting current	AC100V:0.30A, AC200V:0.15A	AC100V:0.90A, AC200V:0.45A
Switch off time	Size 10~25mm Approx. 2sec, Size 32~50mm Approx. 4sec	
Insulation	Class E	
Time rating	30min	
Withstanding voltage test	1500V/min	
Insulation resistance	50MΩ or more	
Overload protection	Thermal protector is built in (Size 32~50mm)	
Protection	Rain proof (with cabtyre cable)	
Manual control device	Provided (voltage) Contact capacity:Ac125, 250V, 10A(Equivalent to JIS C4505 V3)	
Open/close time	Equipped	

OPERATION

CO power-on



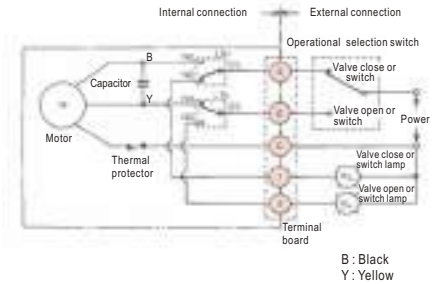
CS power-on

DIMENSIONS

(mm)

Size	d	L	L₁	G	H	A	B	Port size	Cv value	Mass(kg)
15(½″)	½″	67	33.5	16	234	139	89	10	2.8	3.4
20(¾″)	¾″	68	34	21	238	139	89	15	7.5	3.5
25(1″)	1″	78.5	39.5	24	242	139	89	20	12	3.8
32(1¼″)	1¼″	89	44.5	25	281	159	109	25	18.5	5.9
40(1½″)	1½″	100	50	33	283	159	109	32	30	6.2
50(2″)	2″	115	57.5	39	290	159	109	40	45	7.2

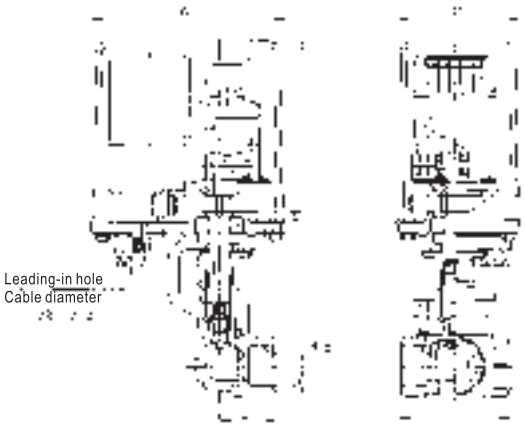
CIRCUIT DIAGRAM OF ACTUATOR



B : Black
Y : Yellow

(the state that switching is completed when CS is on)
Note: Size 10~25mm product has thermal protector embedded.

CONSTRUCTION



DIRECTION OF FLOW

CS power on

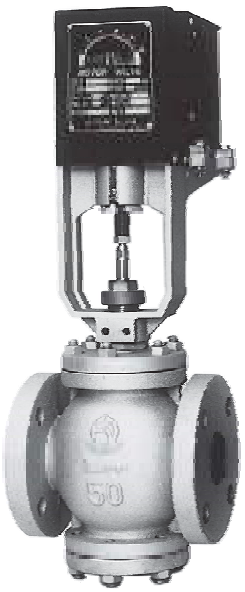
CO power on

ML-FD Type Motor Valve

Dual seat two-way valve

ML-FD double seat two-way valve is designed for flow control of cold/hot water, oil, steam, and gases.

The ON-OFF characteristic is for two-position control, while the linear characteristic is for proportion control. Since the valve is a double seat valve that allows certain leakage, it is not suitable for applications where complete closing is required.



FEATURES

- Large flow, suitable for large pressure differential.
- Less water hammer when opening/closing valve.

SPECIFICATIONS

Model name	ML-FD	
Code name	MLFD-BD	MLFD-BS
Applicable fluid	Water, hot water, oils & air	Steam
Rated pressure	1.0MPa	
Fluid temperature	Max. 100℃	Max. 180℃
Ambient temperature	−10~60℃	
Plug characteristics	ON-OFF*1.	
Leakage allowance	Less than 0.5% of rated flow	
End connection	Flanged JIS 10KFF	
Materials	Body(Cast iron), Trim(Cast bronze)	
Valve body pressure test	Hydraulic 1.5MPa	

*1. Proportional control circuit with linear is available upon your request.
*2. Refer to page 250 and 251 for specifications and circuit, etc.

DIMENSIONS

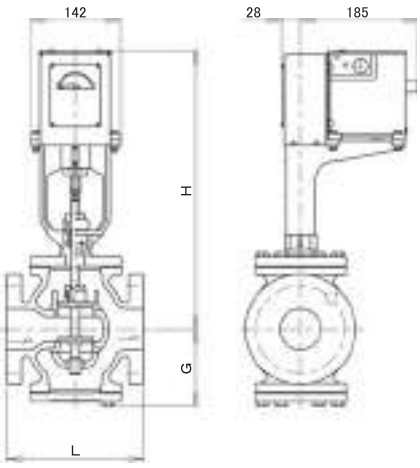
(mm)

Size	L	G	H	Mass(kg)
32(1¼″)	180	100	421(460)	19
40(1½″)	180	100	421(460)	20
50(2″)	180	110	431(470)	21.5
65(2½″)	215	125	448(487)	27.5
80(3″)	260	136	451(490)	34.5
100(4″)	300	163	484(523)	54.5
125(5″)	360	194	514(553)	76
150(6″)	382	224	538(577)	112

TABLE OF Cv VALUE AND APPLICABLE DIFFERENTAL PRESSURE LIMIT

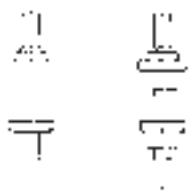
Size	Cv value	Differential pressure limit (MPa)
32(1¼″)	20	1.0
40(1½″)	30	1.0
50(2″)	50	1.0
65(2½″)	75	1.0
80(3″)	105	1.0
100(4″)	170	1.0
125(5″)	250	0.5
150(6″)	360	0.35

CONSTRUCTION



Valve shape

ON-OFF plug Linear plug



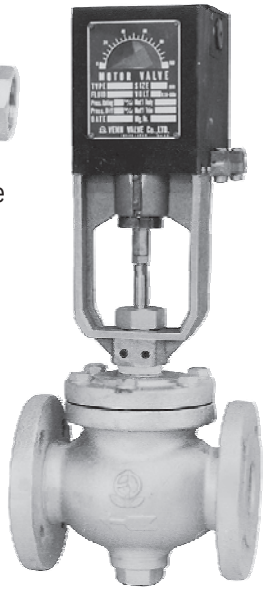
ML-TS, FS Type Motor Valve

Single seat two-way valve

ML-TS (screwed) and ML-FS (flanged) motor valves are designed for flow control of cold/hot water, oil, steam, and gases.

The ON-OFF characteristic is for two-position control, while the linear characteristic is for proportion control. Since the valve has single seat, the leakage is small. Nonetheless, it is not suitable for applications where high pressure differential is required.

ML-TS Type



ML-FS Type

FEATURES

- Single seat valve with small leakage.
- Less water hammer when opening/closing valve.

SPECIFICATIONS

Model name	ML-TS	ML-FS
Code name	MLTS-FD	MLFS-BD
Applicable fluid	Water, hot water, oils & air*1.	
Rated pressure	1.0MPa	
Fluid temperature	Max. 100℃*1.	
Ambient temperature	−10~60℃	
Plug characteristics	ON-OFF and Linear	
Leakage allowance	Less than 0.01% of rated flow	
End connection	Screwed JIS Rc	Flanged JIS 10KFF
Materials	Body(Cast bronze), Trim(Cast bronze*2)	Body(Cast iron*3), Trim(Cast bronze*2)
Valve body pressure test	Test Hydraulic 1.5MPa	

*1. Applicable temperature Max. 180℃ for steam is available upon your request.
*2. Disc with Teflon is available upon your request.
*3. Valve body with Cast iron or Stainless steel are also available upon your request.
*4. Refer to page 250 and 251 for specifications and circuit, etc.

DIMENSIONS (ML-TS Type)

(mm)

Size	d	L	G	H	Mass(kg)
15(½″)	½″	63	17	359(398)	7.4
20(¾″)	¾″	80	20	367(406)	7.6
25(1″)	1″	90	25	372(411)	8
32(1¼″)	1¼″	106	32	397(436)	9
40(1½″)	1½″	118	38	409(448)	9.7
50(2″)	2″	140	47	428(467)	12

* Figures in ( ) are for Proportional control type. Flange code JIS 10KFF

DIMENSIONS (ML-FS Type)

(mm)

Size	L	G	H	Mass(kg)
15(½″)	112	51	386(425)	11.1
20(¾″)	125	56	390(429)	11.6
25(1″)	140	61	395(434)	13.4
32(1¼″)	160	67	398(437)	14.7
40(1½″)	180	72	417(456)	16.3
50(2″)	200	82	426(465)	19.9
65(2½″)	270	120	443(482)	35.5
80(3″)	290	141	463(502)	40.5
100(4″)	350	160	483(522)	61.5

* Figures in ( ) are for Proportional control type. Flange code JIS 10KFF

TABLE OF Cv VALUE AND APPLICABLE DIFFERENTAL PRESSURE LIMIT

Size	Cv value	Differential pressure limit (MPa)
15(½″)	3.6	1.0
20(¾″)	6.4	1.0
25(1″)	10	1.0
32(1¼″)	16	0.75
40(1½″)	25	0.45
50(2″)	40	0.3
65(2½″)	67	0.18
80(3″)	102	0.12
100(4″)	160	0.06

* Size 65mm or bigger are only ML-FS Type.

CONSTRUCTION

ML-TS Type

Valve shape

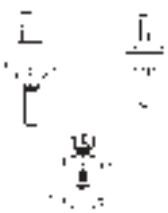
Linear plug ON-OFF plug

Size 15~25mm

ML-FS Type

Valve shape

ON-OFF plug Linear plug



Size 65~100mm

ML-FW Type Motor Valve

Single seat two-way valve

ML-FW motor valve is a single seat, two-way valve with pressure balancing structure for applications requiring high pressure differential and small leakage.

FEATURES

- Pressure balancing structure for high pressure differential.
- Less water hammer when opening/closing valve.

SPECIFICATIONS

Model name	ML-FW
Code name	MLFW-BD
Applicable fluid	Water, hot water, oils & air*2.
Rated pressure	1.0MPa
Fluid temperature	Max. 80℃*2.
Ambient temperature	−10~60℃
Plug characteristics	ON-OFF and Linear
Leakage allowance	Less than 0.01% of rated flow
End connection	Flanged JIS 10KFF
Materials	Body(Cast iron), Trim(Cast bronze*1.)
Valve body pressure test	Hydraulic 1.5MPa

* 1. Stainless steel body and with Teflon disc is available upon your request.
* 2. Applicable temperature Max. 180℃ for steam is available upon your request.
* 3. Refer to page 250 and 251 for specifications and circuit, etc.

DIMENSIONS

(mm)

Size	L	G	H	Mass(kg)
32(1¼″)	160	67	398(437)	16
40(1½″)	180	72	417(456)	18
50(2″)	200	82	426(465)	21
65(2½″)	270	117	432(471)	36
80(3″)	290	140	454(493)	42
100(4″)	350	159	473(512)	65
125(5″)	360	190	504(543)	95
150(6″)	410	214	557(596)	120

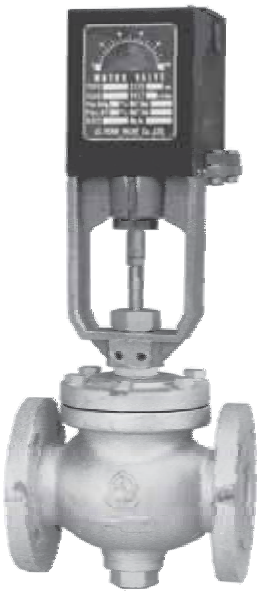
* Figures in ( ) are for Proportional control type.

Flange code JIS 10KFF

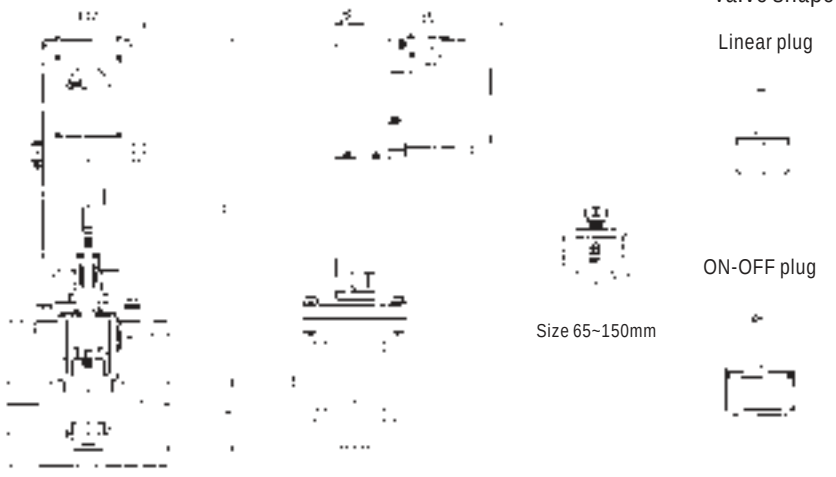
TABLE OF Cv VALUE AND APPLICABLE DIFFERENTAL PRESSURE LIMIT

Size	Cv value	Differential pressure limit(MPa)
32(1¼″)	16	1.0 (1.0)
40(1½″)	25	1.0 (1.0)
50(2″)	40	1.0 (1.0)
65(2½″)	67	1.0 (0.7)
80(3″)	102	1.0 (0.5)
100(4″)	160	1.0 (0.5)
125(5″)	250	0.5 (0.25)
150(6″)	360	0.35(0.15)

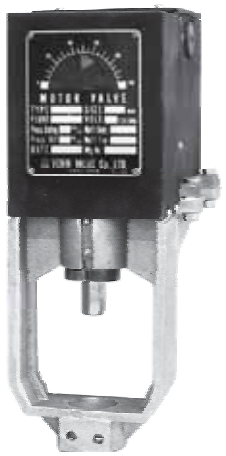
* Figures in ( ) are for those with Teflon disc.



CONSTRUCTION



DATA/ML Type Motor Valve



【MOTOR】

FEATURES

- Four types of motor available for meeting requirements of different input methods.
- Low power consumption, energy saving.
- Buffer in drive unit protect motor and disc from excessive stress.
- Needle and scale plate allow easy reading of valve opening degree.

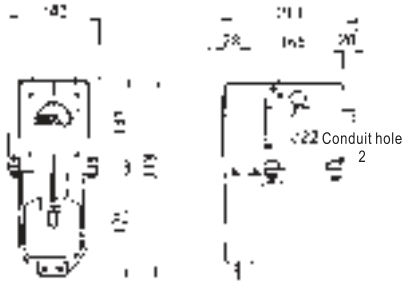
SPECIFICATIONS

Control type	ON-OFF type	Proportional control type		
		A motor	B motor	C motor
Input signal	Relay contact	Potentiometer(135Ω)	Relay contact	4~20mA DC
Rated voltage	AC24V 50/60Hz			
Rated capacity	17W	9VA	17W	14W
Timing (at non-load)	50Hz:40sec, 60Hz:36sec	50Hz:72sec, 60Hz:60sec	50Hz:40sec, 60Hz:36sec	50Hz:72sec, 60Hz:60sec
Withstanding voltage test	1000V/min	500V/min	1000V/min	500V/min
Insulation resistance	10MΩ or more	5MΩ or more	10MΩ or more	5MΩ or more
Ambient temperature	−10~60℃			
Protection	Dust proof type (For outdoor use, use drip proof)			
Note	—	—	Potentiometer (135Ω、2 Equipped)	—

＊AC 100V or 200V for ON-OFF or B motor are available upon your request.

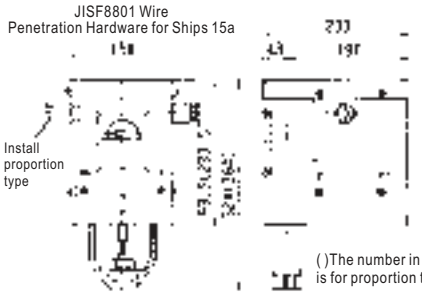
FIGURATION

2-position type (ON-OFF type)

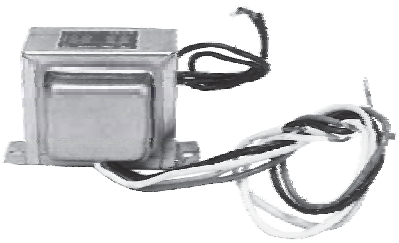


Proportion B motor

With rain cover (2-position/proportion type)



( )The number in squares is for proportion type.



Transformer

【TRANSFORMER】 (accessory, not embedded)

The rated voltage of motor of ML motor valve is AC24V. Use the accessorial transformer to reduce general commercial voltage to rated voltage.

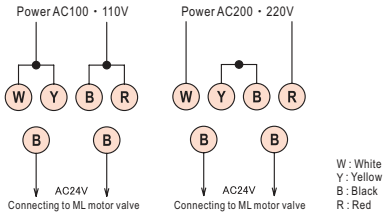
FIGURATION

SPECIFICATIONS

Primary side voltage	AC100/200V 50/60Hz, AC110/220V 60Hz Common use by method for wire connection
Secondary side voltage	25V(at non-load)
Apparent power	25VA
Withstanding voltage test	1500V/min
Insulation resistance	Min. 100MΩ
Coil connection	Coil connection Lead wires at both sides
Mounting	Mount on a panel board, etc. with screws or nuts.
Mass	0.95kg

＊Other voltages for primary side are available.

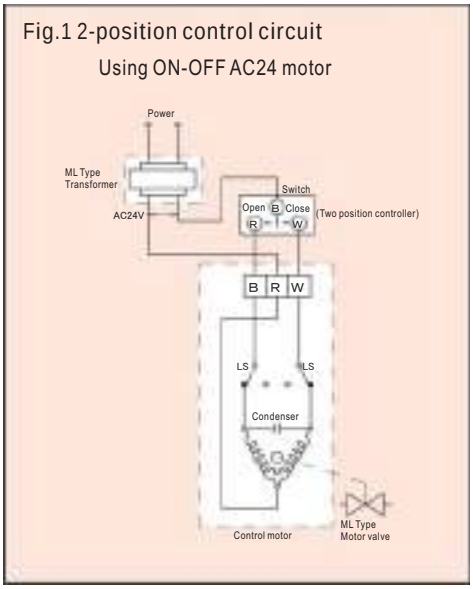
FIGURATION



CONTROL SCHEME

■ 2-POSITION (ON-OFF) CONTROL

Fig.1 2-position control circuit
Using ON-OFF AC24 motor



Equipped with 2-position regulator with single pole double-throw (SPDT) switch, the valve is capable for 2-position control.

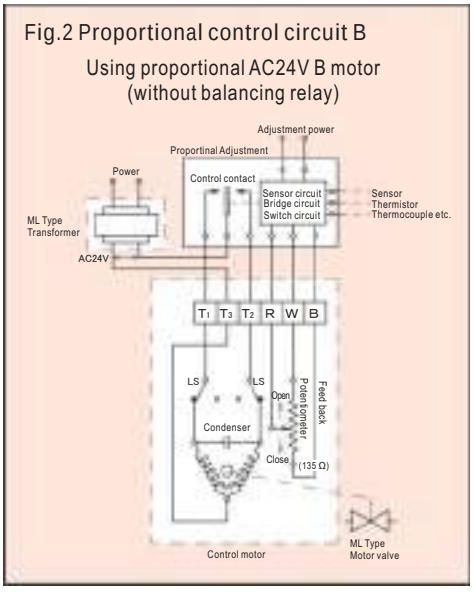
As shown in Fig.1, when the connecting point of 2-position regulator is switched and power AC24V is applied between motor terminals BR or RW, the valve is opened or closed.

When the valve is fully opened or closed, the limiter switch LS_1 or LS_2 turns off the power of motor, and when motor is stopped, the brake starts to work and maintains the position.

When power is turned off when motor is running, the brake maintains the opening degree of valve at the time when motor is stopped.

■ PROPORTIONAL CONTROL

Fig.2 Proportional control circuit B
Using proportional AC24V B motor
(without balancing relay)



Note: Proportional AC24V B motor does not have balancing relay consisting of bridge circuit and switch circuit. Therefore, it is necessary to check the compatibility of the motor with regulator that is used.

Proportional control is controlled through combination of various proportional regulators and by changing signals of such regulators.

As shown in Fig.2, a proportional AC24V B motor is used, and the proportional regulator outside of control motor has bridge circuit and switch circuit embedded. After receiving signal from measuring device, the balance of bridge circuit is unbalanced position, the contact of switch circuit closes, and the power of motor is turned on and motor starts to run.

When motor is running, the wiper of feedback potential meter, which is linked to main shaft, starts to rotate in opening or closing direction according to certain proportion to balance the bridge circuit. When the bridge circuit is balanced, the contact of balancing relay is open, and the embedded brake in motor maintains the position.

When motor is running before valve is fully opened or closed, the limiting switch turns off the power and makes motor stopped, and the brake maintains the position.

In the case of 135Ω resistance output type proportional regulator without bridge circuit and switch circuit, use proportional AC24V A motor .

In the case of proportional control, use C motor when the signal of proportional regulator is DC4~20mA instrumentation standardized signal.

■ SPECIAL SPECIFICATIONS

1. Limiting switch: valves with separated signal-extracting switch at full open/full close position are also available.
2. AC100, 200V motor: Motors that can directly connected to commercial power source AC100V or AC200V without transformer are available (also,proportional B motor is available).
3. Potential meter with special resistance: In addition to motors with standard 135Ω potential meter, we also provide motors with 1kΩ, 2kΩ potential meters.
4. 2 potential meter set: Motors with 2 potential meter set are available.

   Remote opening degree indicator: A transmitter is equipped on potential meter to allow remote reading of opening degree.

TBM-8S Type Temperature Regulating Ball Valve Type Motor Valve (for Hot water)

Two-way valve for ON/OFF control

TBM-8S is a temperature regulating valve combining electric temperature regulator and motor valve. It can help saving time and efforts for selecting temperature regulator and connecting motor valve.

To regulate temperature, just connect the temperature sensor (attached to the valve) to power and switch the knob to set temperature position.

FEATURES

- A combination of electric temperature regulator and motor valve; does not need the troublesome selection work.
- To regulate temperature, just switch the knob to set temperature position.
- Vertical or horizontal installation.
- Compact, space saving.

SPECIFICATIONS

Model name		TBM-8S
Code name		TBM8S-F
Motor operated valve body	Use	Heating*1.
	Applicable fluid	Hot water
	Fluid temperature	−10~80℃(Freezing is not allowed.)
	Applicable pressure	0~1.0MPa
	Ambient temperature	5~50℃
	Operation	ON/OFF control
	Leakage allowance	Nil(Confirm at pressure gauge)
	End connection	Screwed JIS Rc
	Valve body pressure test	Hydraulic 1.5MPa
	Materials	Body(Brass), Ball(Brass chrome plated)
	Rated voltage	AC100V 50/60Hz, AC110V 60Hz or AC200V 50/60Hz, AC220V 60Hz
	Allowable voltage fluctuation range	Rated voltage ±5%
	Rated capacity	AC100V:19VA, AC200V:40VA
	Rated current	AC100V:0.18A, AC200V:0.18A
	Starting current	AC100V:0.18A, AC200V:0.18A
	Open/close time	50Hz:10sec, 60Hz:8.5sec
	Insulation	Class E
	Time rating	10min
	Allowed open/close time/min	1cycle/min
	Withstanding voltage test	1000V/min
	Insulation resistance	20MΩ or more
	Overload protection	Thermal protector
	Protection	Drip proof (Indoor use)
	Manual control device	Equipped
Temperature controller	Input	Resistance temperature detector:Pt500Ω (With leads of 1.5m for indoor use)
	Control type	Two-position control
	Temperature setting range	range 0~80℃
	Setting accuracy	±1.6℃
	Control sensitivity	Set to 3℃ prior to shipment (Can be set between 1 and 5℃)
	Rated electric capacity	2VA

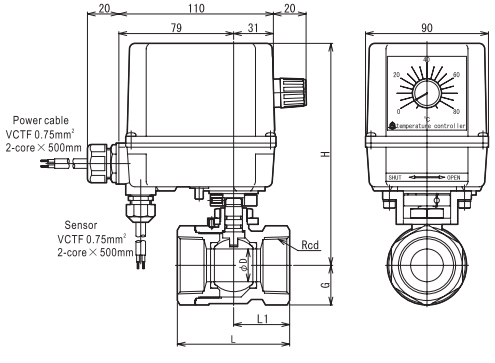
＊1. The motor-operated valve for cooling (applicable fluid:water) is available upon your request.
＊2. The length of leads connected to the RTD can be extended up to 10m using commercially available leads.

DIMENSIONS

(mm)

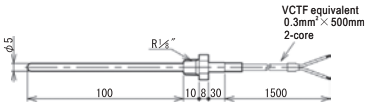
Size	d	D	L	L1	G	H	Cv value	Mass(kg)
10(⅜″)	⅜″	9	46	21	13	147	6	1.7
15(½″)	½″	12.5	62	28	14	150	13	1.9
20(¾″)	¾″	16	72	32	19	155	22	2
25(1″)	1″	21	72	36	23	159	34	2.2
32(1¼″)	1¼″	24	82	41	29	158	45	2.7
40(1½″)	1½″	32	96	45	34	164	80	3.1
50(2″)	2″	38	120	57	41	170	100	4.1

CONSTRUCTION



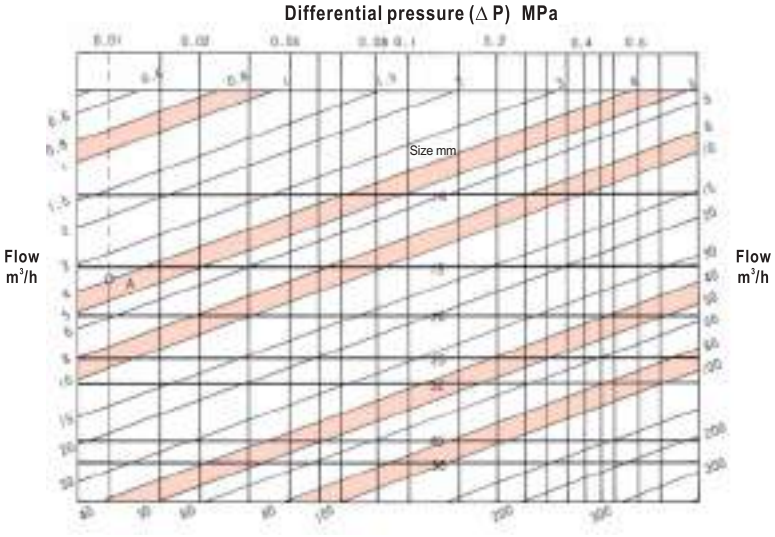
Note: depending on structure, the size may vary.

Cable for temperature (measuring resistance)



DATA/TBM-8S Temperature Regulating Ball Valve Type Motor Valve (for Hot Water)

SIZE SELECTION CHART (for Water)

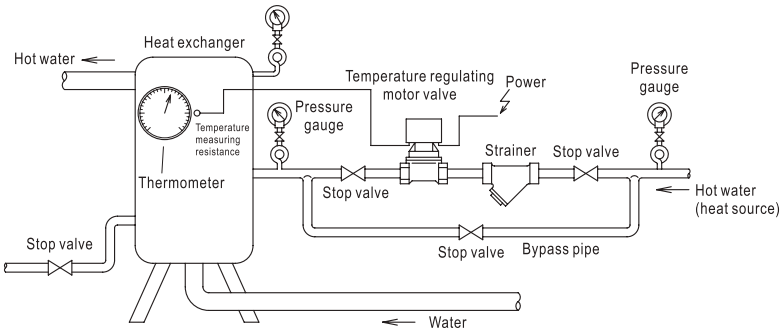


● HOW TO USE THE CHART

Example: Determine the size of valve meeting the following conditions:
Primary pressure: 0.3MPa
Secondary pressure: 0.29MPa
Flow of water: 4m³/h

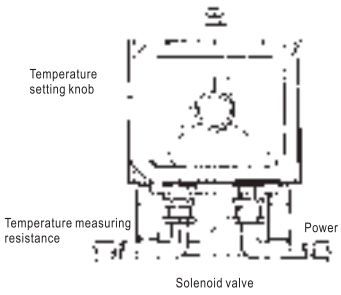
Differential pressure (ΔP): 0.3−0.29=0.01MPa. Find out the intersection point A between the 0.01MPa differential pressure (ΔP) line and the 4m³/h flow line.
Since point A is between the lines representing nominal diameter 15mm and 20mm, the nominal diameter should be the larger one, i.e. 20mm.

■ PIPING EXAMPLE



Note:Install heat exchanger if there is risk of temperature increase due to thermal expansion.

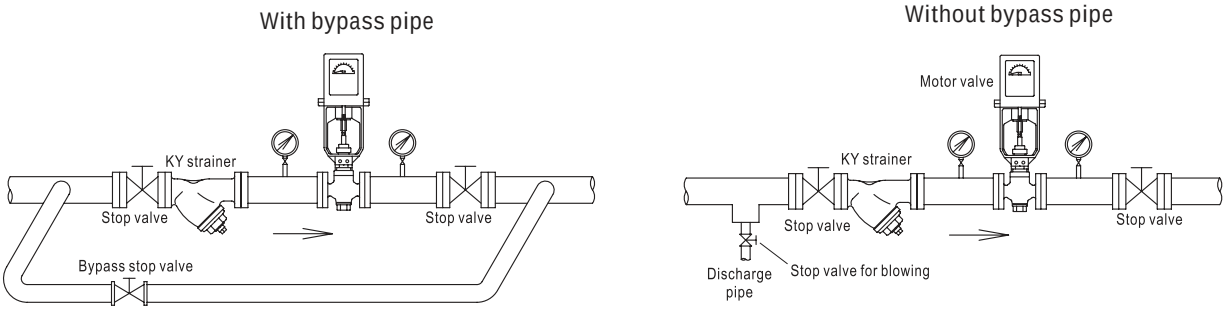
■ TEMPERATURE SETTING



Switch the knob to desired temperature.

DATA/ Motor Valve Installation

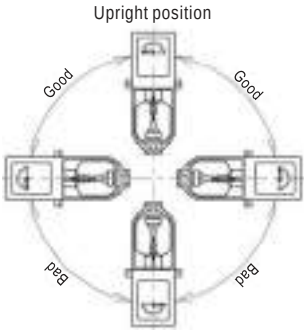
Fig.1 Piping example



■ Selection and Installation

1. Install strainer on the primary side of motor valve (see Fig.1).
2. Install a bypass pipe (with stop valve) between the primary and secondary sides of motor valve if the operation of equipment cannot be stopped (see Fig.1).
   If you do not intend to install bypass pipe, install blowing stop valve, which is branched from the main pipe, right before the stop valve on the primary side of motor valve, to allow flushing.
3. Install the valve upright to horizontal pipe or on vertical pipe (see Fig.2). For installation on vertical pipe and when the size is 80mm above, leave sufficient space for maintenance purpose.
4. Operation switch: in the case 2 or more motor valves are connected through parallel connection, install external relay and the operation should be performed through the contact of relay.
5. The ambient temperature should be within the range of applicable temperature described in specifications. In addition, avoid using motor valve in environment where there is excessive humidity, dust, corrosive gas or explosive gas.
6. Install steam trap on piping if the valve is used for steam.
7. When the fluid is liquid, the pressure in pipe may increase due to thermal expansion caused by ambient temperature when valve is closed. In such cases, it is recommended to install relief vale to protect machine (see Fig. 3).
8. Make sure the arrow mark on solenoid valve match with the direction of flow of fluid.
9. Leave some space for dissembling and maintenance.
10. Fix and support piping properly to prevent solenoid valve from being damaged due to weight of piping, excessively large stress, bending force, or vibration.
11. Discharge drain or apply thermal insulation if there is risk of freezing.

Fig.2 Direction of installation of ML motor valve



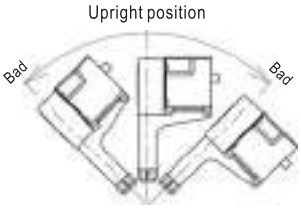
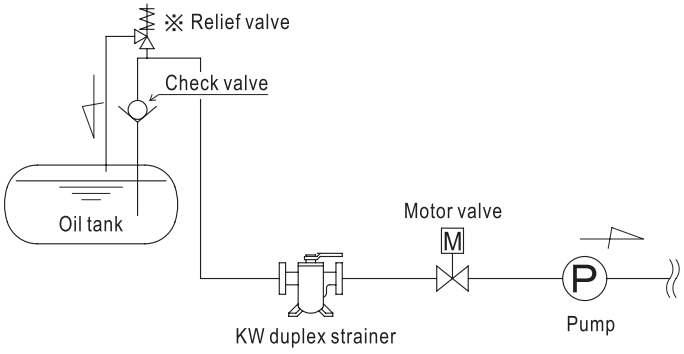


Fig.3 Relief valve installation



※Install relief valve if pressure rise due to thermal expansion or other factors is anticipated.

CYLINDER VALVES

15

Venn's Cylinder Valves are self-operated valves to open and close the discs by remote and automatic control using 3-way solenoid switch off valve as pilot valve and supplying air pressure to the actuating part of the cylinder valves.

These valves mainly feature:

- Compact and light to handle easily
- Simple constructions
- Easy maintenance
- Durable even for frequent operations
- No need for lubrication.

Model name	End connection	Size	Applicable pressure(MPa)	Actuating air pressure(MPa)	Materials		Page
					Body	Disc & Seat	
COS-1,1H	Screwed	10~65(⅜″~2½″)	0~1.0	0.3~0.7	Cast bronze or Stainless steel	Stainless steel with Teflon tip	256
CCS-1,1H							
COF-1,1H	Flanged	15~65(⅜″~2½″)	0~1.0	0.3~0.7	Cast bronze or Stainless steel	Stainless steel with Teflon tip	257
CCF-1,1H							
CP53-FS	Flanged	15~25(½″~1″)	Max. 1.0	0.3~0.7	Cast iron	Cast bronze	258
CP85-FS		32~50(1¼″~2″)					
CP125-FS		65~100(2½″~4″)					

COS/CCS-1,1H Type Cylinder Valve

Piston type

Cylinder valves that open or close by switching operation pressure of air, suitable for applications requiring frequent operation or environment with explosive atmosphere where electricity needs to be avoided.

COS, CCS series are cylinder valves with a variety of models that are different in operation, connecting method, and material.

FEATURES

- Compact, light weight.
- Wide range of applicable pressure.
- A variety of models for different conditions.

SPECIFICATIONS

Model name			COS-1		CCS-1		COS-1H		CCS-1H	
Code name			COS1-W	COS1-V	CCS1-W	CCS1-V	COS1H-W	COS1H-V	CCS1H-W	CCS1H-V
Body part	Operation		Air to open		Air to close		Air to open		Air to close	
	Size(mm)		10~65	10~50	10~65	10~50	10~65	10~50	10~65	10~50
	Applicable fluid		Hot water, water, air & oil(Kerosene, light oil & A class heavy oil, etc.)				Steam, Hot water & oils			
	Fluid temperature		5~100℃				Max. 180℃(For hot water:Max. 100℃)			
	Fluid viscosity		Max. 50cSt				—			
	Applicable pressure		0~1.0MPa							
	Materials	Body	Cast bronze	Stainless steel	Cast bronze	Stainless steel	Cast bronze	Stainless steel	Cast bronze	Stainless steel
		Trim	Stainless steel with Teflon tip							
	End connection		Screwed JIS Rc							
	Valve body pressure test		Hydraulic 1.5MPa							
Actuating par	Type		Single action type(Spring-return)							
	Materials		Cast aluminum							
	Actuating air pressure		0.3~0.7MPa							
	Air tight test		0.9MPa(By air pressure)							

DIMENSIONS(Body materials Cast bronze)

(mm)

Size	d	L	G	COS-1		CCS-1		COS-1H		CCS-1H		Cv value	Mass (kg)
				H	Ha	H	Hb	H	Ha	H	Hb		
10(⅜″)	⅜″	63	15	171	89	167	139	242	160	238	210	3	2
15(½″)	½″	63	15	171	89	167	139	242	160	238	210	4.5	2
20(¾″)	¾″	80	18	176	93	172	143	247	164	243	214	7.5	2
25(1″)	1″	90	22	183	99	179	149	255	171	250	221	11	2.5
32(1¼″)	1¼″	106	27	190	105	186	155	261	176	257	226	17	3
40(1½″)	1½″	118	30	193	108	189	158	264	176	260	229	23	4
50(2″)	2″	140	37	208	122	204	172	280	194	275	244	35	5.5
65(2½″)	2½″	160	45	238	140	226	190	309	211	297	261	50	8

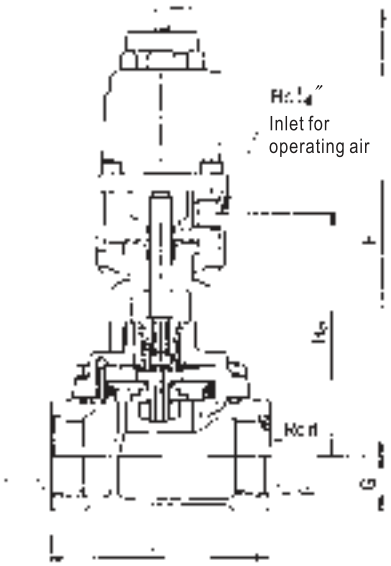
* Contact our local agent for dimension of valve body with Stainless steel.

COS-1,CCS-1 Type

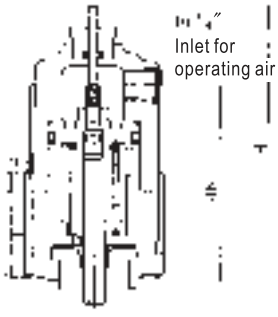
COS-1H, CCS-1H Type

CONSTRUCTION

COS-1 Type



Drive unit of CCS-1, CCS-1H Type



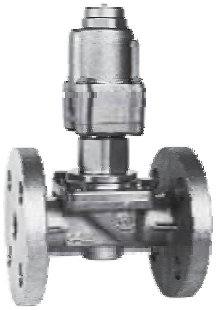
Gland of COS/CCS-1H Type

COF/CCF-1,1H Type Cylinder Valve

Piston type

Flange type cylinder valves that open or close by switching operation pressure of air, suitable for applications requiring frequent operation or environment with explosive atmosphere where electricity needs to be avoided.

COF, CCF series are cylinder valves with a variety of models that are different in operation, connecting method, and material.



COF-1,CCF-1 Type

COF-1H, CCF-1H Type

FEATURES

- Compact, light weight.
- Wide range of applicable pressure.
- A variety of models for different conditions.

SPECIFICATIONS

Model name			COF-1		CCF-1		COF-1H		CCF-1H	
Code name			COF1-W	COF1-V	CCF1-W	CCF1-V	COF1H-W	COF1H-V	CCF1H-W	CCF1H-V
Body part	Operation		Air to open		Air to close		Air to open		Air to close	
	Size(mm)		15~65	15~50	15~65	15~50	15~65	15~50	15~65	15~50
	Applicable fluid		Hot water, water, air & oil(Kerosene, light oil & A class heavy oil, etc.)				Steam, Hot water & oils			
	Fluid temperature		5~100℃				Max. 180℃(For hot water:Max. 100℃)			
	Fluid viscosity		Max. 50cSt				—			
	Applicable pressure		0~1.0MPa							
	Materials	Body	Cast bronze	Stainless steel	Cast bronze	Stainless steel	Cast bronze	Stainless steel	Cast bronze	Stainless steel
		Trim	Stainless steel with Teflon tip							
	End connection		Flanged JIS 10KFF							
	Valve body pressure test		Hydraulic 1.5MPa							
Actuating par	Type		Single action type(Spring-return)							
	Materials		Cast aluminum							
	Actuating air pressure		0.3~0.7MPa							
	Air tight test		0.9MPa(By air pressure)							

DIMENSIONS(Body materials Cast bronze)

(mm)

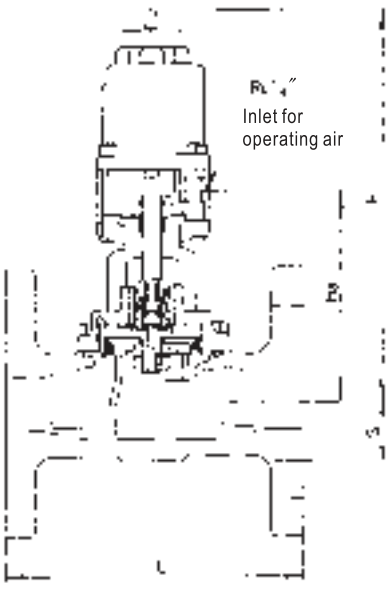
Size	L	G	COF-1		CCF-1		COF-1H		CCF-1H		Cv value	Mass (kg)
			H	Ha	H	Hb	H	Ha	H	Hb		
15(½″)	112	21	171	89	167	139	242	160	238	210	4.5	3.5
20(¾″)	118	24	176	93	172	143	247	164	243	214	7.5	4
25(1″)	140	27	183	99	179	149	255	171	250	221	11	6
32(1¼″)	150	32	190	105	186	155	261	176	257	226	17	7
40(1½″)	160	35	193	108	189	158	264	179	260	229	23	8
50(2″)	190	41	208	122	204	172	280	194	275	244	35	9
65(2½″)	212	50	238	140	226	190	309	211	297	261	50	15

* Contact our local agent for dimension of valve body with Stainless steel.

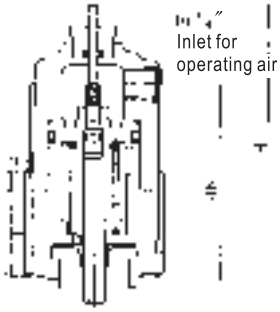
Flange code JIS 10KFF

CONSTRUCTION

COF-1 Type



Drive unit of CCF-1, 1H Type

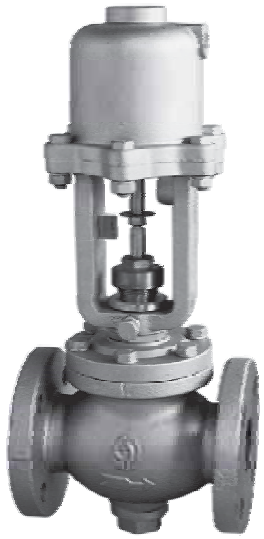


Gland of COF/CCF-1H Type

CP-FS Type Cylinder Valve

Single-seat, 2-way valve

ON-OFF valve that can open or close by switching operational air pressure through 3-way solenoid valve and then supplying pressure to cylinder valve or discharge air. The drive unit of standard model is single action type, while other models have double action that is opeated by 4-way or 5-way air pressure.

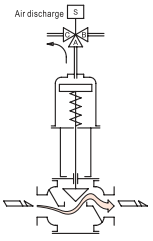
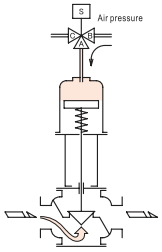
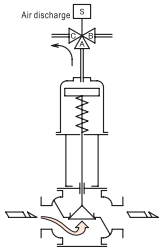
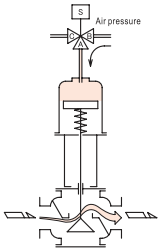


SPECIFICATIONS

Model name		CP53-FS		CP85-FS		CP125-FS	
Code name		CP53FS-BD	CP53FS-BS	CP85FS-BD	CP85FS-BS	CP125FS-BD	CP125FS-BS
Size		15~25(½″~1″)		32~50(1¼″~2″)		65~100(2½″~4″)	
Applicable fluid		Hot water, water, air & oil	Steam	Hot water, water, air & oil	Steam	Hot water, water, air & oil	Steam
Fluid temperature		100℃ or less	180℃ or less	100℃ or less	180℃ or less	100℃ or less	180℃ or less
Ambient temperature		−10~60℃					
Body part	Rated pressure	1.0MPa					
	Disc type	Two-way single seated valve					
	Leakage allowance	Less than 0.01% of rated flow					
	Operation	Air to close(Direct plug), Air to open(Reverse plug)					
	Materials	Body(Cast iron), Trim(Cast bronze)					
	End connection	Flanged JIS 10KFF					
	Pressure test	Hydraulic 1.5MPa					
Actuating part	Type	Single action type (Spring-return)*3.					
	Materials	Cast aluminum					
	Actuating air pressure	0.3~0.7MPa					
	Air tight test	1.5 times of actuating air pressure. By air pressure					

* 1. Trim with Stainless steel is available upon your request.
* 2. Disc with Teflon is also available upon your request.
* 3. Double action is available upon your request.

OPERATION & FLOW DIRECTION

Type	Direct acting Direct plug		Direct acting Reverse plug	
	At discharge-Open	At pressurized-Closed	At discharge-Closed	At pressurized-Open
Operation				

CONSTRUCTION

CP85-FS Type(negative valve)

The structure of CP125-FS Type is slightly different from the drawing.

(positive valve)

DIMENSIONS AND

(mm)

Model name	Size	Dimensions L	Direct acting G	Direct acting H	Reverse acting G	Reverse acting H	Mass (kg)	Cylinder capacity(ℓ) Direct acting	Cylinder capacity(ℓ) Reverse acting	Cv value
CP53-FS	15(½″)	112	51	318	62	288	5	0.09	0.10	3.6
	20(¾″)	125	56	320	64	293	5.5	0.09	0.10	6.4
	25(1″)	140	61	325	69	298	7	0.09	0.10	10
CP85-FS	32(1¼″)	160	67	380	75	355	11.5	0.26	0.29	16
	40(1½″)	180	72	398	96	360	13.5	0.28	0.29	25
	50(2″)	200	82	408	100	370	17.5	0.28	0.29	40
CP125-FS	65(2½″)	270	120	516	120	516	42	0.71	0.74	67
	80(3″)	290	141	535	141	535	50	0.79	0.82	102
	100(4″)	350	160	555	160	555	63	0.87	0.82	160

Flange code JIS10KFF

ACTUATING AIR PRESSURE AND DIFFERENTIAL PRESSURE LIMIT

(MPa)

Model name	Size	Actuating air pressure 0.3 Direct acting	0.3 Reverse acting	0.4 Direct acting	0.4 Reverse acting	0.5 Direct acting	0.5 Reverse acting	0.6 Direct acting	0.6 Reverse acting	0.7 Direct acting	0.7 Reverse acting
CP53-FS	15(½″)	0.45	0.90	0.90	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	20(¾″)	0.30	0.60	0.65	1.0	0.95	1.0	1.0	1.0	1.0	1.0
	25(1″)	0.25	0.50	0.55	0.90	0.80	1.0	1.0	1.0	1.0	1.0
CP85-FS	32(1¼″)	0.60	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	40(1½″)	0.45	0.70	0.75	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	50(2″)	0.30	0.45	0.55	0.75	0.75	1.0	1.0	1.0	1.0	1.0
CP125-FS	65(2½″)	0.40	0.60	0.70	0.95	0.95	1.0	1.0	1.0	1.0	1.0
	80(3″)	0.30	0.40	0.50	0.65	0.70	0.90	0.85	1.0	1.0	1.0
	100(4″)	0.20	0.25	0.30	0.40	0.45	0.60	0.60	0.75	0.70	0.90

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Units Conversion Table

LENGTH

cm	m	km	in	ft
1	0.01	0.0_41	0.3937	0.0328
100	1	0.001	39.371	3.2809
100,000	1,000	1	39,371	3,280.9
2.54	0.02540	0.0_4254	1	0.08333
30.48	0.3048	0.0_33048	12	1
30.30	0.30303	0.0_33030	11.9303	0.9942

AREA

cm^2	m^2	in^2	ft^2
1	0.0_31	0.1550	0.001076
1 10^4	1	1,550.1	10.7643
6.4514	0.0_36451	1	0.006944
929	0.0929	144	1
918.27	0.09183	142.34	0.9885

VOLUME

dm^3 or ℓ	m^3 or kℓ	ft^3	UK gal	US gal
1	0.001	0.03532	0.220	0.2642
1,000	1	35.317	219.95	264.19
28.315	0.02832	1	6.2279	7.4806
4.5465	0.0_24547	0.1606	1	1.2011
3.7852	0.0_23785	0.1337	0.8325	1
180.39	0.18039	6.3707	39.676	47.656
27.826	0.02783	0.9827	6.1203	7.3514

MASS

g	kg	t(tonne)(F)	lb	UK ton	US ton
1	0.001	0.0_51	0.002205	0.0_60984	0.0_51102
1,000	1	0.001	2.2046	0.0_30984	0.0_21102
1 10^6	1,000	1	2,204.6	0.9842	1.1023
453.6	0.4536	0.0_34536	1	0.0_3446	0.0_251
1,016,047	1,016.05	1.01605	2,240	1	1.12
907,185	907.185	0.90719	2,000	0.89286	1
3,750	3.75	0.00375	8.2673	0.0_23691	0.0_24134
600	0.6	0.0_36	1.3228	0.0_35905	0.0_36613

VISCOSITY

Poise=g/cm.s(CGS Unit)	centipoise.cP	kg/m·s	kg/m·h	lb/ft·s
1	100	0.1	360	0.0672
0.01	1	0.001	3.6	0.000672
10	1,000	1	3,600	0.672
0.00278	0.278	0.0_3278	1	0.000187
14.88	1,488	1.488	5,356.8	1

VELOCITY

m/s	m/h	km/h	ft/s	ft/min	mile/h
1	3,600	3.6	3.281	196.85	2.2370
0.0_32778	1	0.001	0.0_39114	0.05468	0.0_56214
0.2778	1,000	1	0.9114	54.682	0.6214
0.3048	1,097.25	1.0973	1	60	0.68182
0.0_25080	18.287	0.01829	0.1667	1	0.01136
0.4470	1,609.31	1.6093	1.4667	88	1

FLOW

ℓ/s	ℓ/min	m^3/min	m^3/h	m^3/s	UK gal/min	US gal/min
1	60	0.06	3.6	0.001	13.197	15.8514
0.01667	1	0.001	0.06	0.0_41667	0.2200	0.2642
16.67	1,000	1	60	0.01667	219.95	264.19
0.2778	16.67	0.01667	1	0.0_32778	3.6658	4.4032
1000	60,000	60	3,600	1	13,197	15,851.4
0.07578	4.546	0.0_24546	0.2728	0.0_47578	1	1.2011
0.06309	3.785	0.0_23785	0.2271	0.0_46309	0.8325	1

PRESSURE

lb/in^2 or PSI	Pa	kPa	MPa	kgf/cm^2	bar	atm	mmHg or Torr	mmH_2O
1	6,894.8	6.8948	0.0_26895	0.07031	0.068678	0.06804	51.714	702.99
0.0_314504	1	0.0_21	0.0_51	0.0_410197	0.0_41	0.0_39869	0.0_27501	0.10197
0.14504	1,000	1	0.001	0.010197	0.01	0.0_29869	7.501	101.97
145.03	1,000,000	1,000	1	10.1970	10.000	9.8690	7,501	101,970
14.223	98,068	98.068	0.098068	1	0.98068	0.96783	735.61	10,000
14.561	100,000	100	0.10000	1.01970	1	0.98690	750.10	10,197
14.697	101,303	101.33	0.10133	1.0332	1.0133	1	760.06	10,332
0.019337	133.32	0.13332	0.0_313332	0.0_213594	0.0_213332	0.0_213157	1	13.594
0.0_214225	9.8068	0.0_298068	0.0_398068	0.0_31	0.0_49869	0.0_469783	0.073561	1

Units Conversion Table

STRESS

Pa	MPa or N/mm^2	kg/mm^2	kgf/cm^2
1	0.000001	$0.0_6$101972	$0.0_4$101972
1,000,000	1	0.101972	10.1972
9,806,650	9.80665	1	100
98,066.5	0.0980665	0.01	1

POWER

N	dyn	kgf	lbf
1	100,000	0.101972	0.22480894
0.00001	1	$0.0_5$101972	$0.0_5$22480894
9.80665	980,665	1	2.2046226
4.4482216	444,822.16	0.45359237	1

WORK ENERGY CALORIE

J	kw·h	kgf·m	kcal
1	$0.0_6$277778	0.101972	0.000238889
3,600,000	1	367,098	860
9.80665	$0.0_5$272407	1	0.00234270
4,186.05	0.00116279	426.858	1

TEMPERATURE

From ℃ to °F	From °F to ℃
9/5 ℃+32°	5/9 (°F−32°)

■ COMPARISON BETWEEN SI UNIT AND GRAVITAIONAL SYSTEM OF UNITS

Physical quantity	SI units	Unit which can be used together with SI units	Gravitational system of units	Factor for converting to SI units	Remarks
Plane angle	rad	° ′ ″		— 1.74533 10^{-2} rad 2.90888 10^{-4} rad 4.84814 10^{-6} rad	1°=(π/180)rad 1′=(1/60)° 1″=(1/60)′
Mass	kg	t		— 1 10^3kg	
Density	kg/m^3	kg/ℓ t/m^3		— 1 10^{-3}kg/m^3 1 10^3kg/m^3	
Force	N		dyn kgf	— 1 10^{-5} N 9.80665N	
Pressure	Pa	bar	mmAq,mmH_2O mAq,mH_2O kgf/cm^2 mmHg atm	— 1 10^5Pa 9.80665Pa 9.80665 10^3Pa 9.80665 10^4Pa 1.3322 10^2Pa 1.0135 10^5Pa	To be used for fluid pressure
Viscosity	Pa·s	P		1 10^{-1}Pa·S	
Kinematic viscosity	m^2/s	St		1 10^{-4} m^2/S	
Energy Work Heating value Electric energy	J		kcal kgf·m kW·h	— 4.18605kJ 9.80665J 3.6MJ	IT, calorific value shown in "Weight and Measure Act": 1kcalIT=4.18689kJ (according to International Steam Table)
Temperature	K ℃				Thermodynamic temperature, Celsius scale T[K]=273.15+t [℃]
Temperature difference	K ℃				Previously described as "deg"
Specific heat Specific entropy	J/(kg·K)		kcal/kg· ℃	— 4.18605kJ/(kg·K)	
Specific enthalpy Specific latent heat	J/kg		kcal/kg	— 4.18605kJ/kg	
Stress	Pa N/ m^2		kgf/ m^2	9.80665Pa	

SI Unit Conversion Table (Actual Number)

"SI" is the abbreviation of International System of Units (or Le Systeme International d'Unites) agreed upon at the general meeting of International Committee of Weights and Measures held in 1960. In Japan, according to the new Weights and Measures Act established in 1992 and enacted in 1992, weight and measure units used for business and certification have been standardized to SI.

■ UNITS TRANSITED TO SI UNITS

Item	Transited unit (symbol)	SI unit (symbol)	Conversion (see Note 1)
Pressure	Weight (kg)/m^2 (kgw/m^2, kgf/m^2, kg/m^2) Mercury column (m) (mHg) (see Note 2) Water column (m) (mH_2O, mAq) Torr (see Note 3)	Pascal (Pa)	1kgf/m^2≒9.8Pa 1mHg≒133kPa 1mH_2O≒9.8kPa 1Torr≒133Pa
Power	Weight (kg) (kgw, kgf)	Newton (N)	1kgf≒9.8N
Moment	weight (kg)/m (kgw·m, kgf·m, kg·m)	Newton (N·m)	1kgfm≒9.8N·m
Stress	Weight (kg)/m^2 ($kgf·m^2$)	Pascal (Pa)	1kgf/m^2≒9.8Pa
Calorie	Calorie (cal) (Note 4)	Joule (J)	1cal≒4.2J
Length	Micron (μ)	Meter (m)	1μ=1μm

Note:
1.Coefficient for unit conversion: 9.8→9.80665, 133→133.322, 4.2→4.18605.
2.Can be used for measuring blood pressure.
3.Can be used for medical purpose.
4.Can be used for measuring nutrition content.

■ MAIN PREFIXES REPRESENTING INTEGRAL POWERS OF 10

Power	Prefix	Symbol	Power	Prefix	Symbol
10^6	Mega	M	10^{-2}	Centi	c
10^3	Kilo	k	10^{-3}	Mili	m
10^2	Hecto	h	10^{-6}	Micro	μ

■ CONVERSION TABLE FOR PRESSURE UNIT (SI UNI→ PRIOR UNIT)

Use 1.0kPa=0.0101972kgf/cm^2 and 1.0MPa=10.1972kgf/cm^2 for conversion. The value in kgf/cm^2 should be rounded and the effective digit should be the same as that of MPa value.

Note: The conversion table is just for simple conversion. It cannot be used for converting the unit of set pressure of safety valve and relief valve.

NEGATIVE PRESSURE

SI unit kPa	Converted value Kgf/cm^2
−0.50	−0.0051
−1.5	−0.015
−22.0	−0.224
−49.0	−0.500
−76	−0.775
−82	−0.836
−3.0	−0.031
−6.0	−0.061
−10.0	−0.102
−55.0	−0.561
Absolute pressure: kPa·A	**kgf/cm^2 abs**
3.40	0.0347

POSITIVE PRESSURE

SI unit kPa	Converted value Kgf/cm^2
1.0	0.010
2.0	0.020
3.0	0.031
4.0	0.041
5.0	0.051
6.0	0.061
7.0	0.071
8.0	0.082
9.0	0.092

SI unit MPa	Converted value Kgf/cm^2
0.10	1.0
0.20	2.0
0.30	3.1
0.40	4.1
0.50	5.1
0.60	6.1
0.70	7.1
0.80	8.2
0.90	9.2
1.00	10.2

Note: The table shows the negative pressures of some products.

Saturated Steam Table

Absolute pressure (MPa·A)	Steam temperature (℃)	Volume of 1kg water before evaporation (ℓ)	Volume of 1kg steam (m^3)	Weight of $1m^3$ steam (kg)	Calorie of 1kg steam (kJ)		
					Calorie of water h	Latent heat L	Total H=h+L
0.010	45.83	1.0102	14.67	0.0681	191.8	2392.9	2584.8
0.015	54.00	1.0140	10.03	0.0998	226.0	2373.2	2599.2
0.020	60.09	1.0172	7.65	0.1307	251.5	2358.4	2609.9
0.025	64.99	1.0199	6.20	0.1612	272.0	2346.4	2618.4
0.030	69.12	1.0223	5.23	0.1912	289.3	2336.1	2625.4
0.035	72.71	1.0245	4.53	0.2210	304.3	2327.2	2631.5
0.040	75.89	1.0265	3.99	0.2504	317.7	2319.2	2636.9
0.045	78.74	1.0284	3.58	0.2796	329.6	2312.0	2641.7
0.050	81.35	1.0301	3.24	0.3086	340.6	2305.4	2646.0
0.060	85.95	1.0333	2.73	0.3661	359.9	2293.6	2653.6
0.070	89.96	1.0361	2.36	0.4229	376.8	2283.3	2660.1
0.080	93.51	1.0387	2.09	0.4792	391.7	2274.0	2665.8
0.090	96.71	1.0412	1.87	0.5350	405.2	2265.6	2670.9
0.100	99.63	1.0434	1.69	0.5904	417.5	2257.9	2675.4
0.120	104.81	1.0476	1.43	0.7002	439.4	2244.1	2683.4
0.140	109.32	1.0521	1.24	0.8089	458.4	2231.9	2690.3
0.160	113.32	1.0547	1.09	0.9165	475.4	2220.9	2696.2
0.180	116.93	1.0579	0.98	1.0233	490.7	2210.8	2701.5
0.200	120.23	1.0608	0.89	1.1294	504.7	2201.6	2706.3
0.220	123.27	1.0636	0.81	1.2348	517.6	2193.0	2710.6
0.240	126.09	1.0663	0.75	1.3397	529.6	2184.9	2714.5
0.260	128.73	1.0688	0.69	1.4440	540.9	2177.3	2718.2
0.280	131.20	1.0712	0.65	1.5479	551.4	2170.1	2721.5
0.300	133.54	1.0735	0.61	1.6514	561.4	2163.2	2724.7
0.320	135.75	1.0757	0.57	1.7544	570.9	2156.7	2727.6
0.340	137.86	1.0779	0.54	1.8572	579.9	2150.4	2730.3
0.360	139.86	1.0799	0.51	1.9595	588.5	2144.4	2732.9
0.380	141.78	1.0819	0.49	2.0616	596.8	2138.6	2735.3
0.400	143.62	1.0839	0.46	2.1635	604.7	2133.0	2737.6
0.420	145.39	1.0858	0.44	2.2650	612.3	2127.5	2739.8
0.440	147.09	1.0876	0.42	2.3663	619.6	2122.3	2741.9
0.460	148.73	1.0894	0.41	2.4674	626.7	2117.2	2743.9
0.480	150.31	1.0911	0.39	2.5683	633.5	2112.2	2745.7
0.500	151.84	1.0928	0.37	2.6690	640.1	2107.0	2747.5
0.520	153.33	1.0945	0.36	2.7695	646.5	2102.7	2749.3
0.540	154.76	1.0961	0.35	2.8698	652.8	2098.1	2750.9
0.560	156.16	1.0978	0.34	2.9700	658.8	2093.7	2752.5
0.580	157.52	1.0993	0.33	3.0700	664.7	2089.3	2754.0
0.600	158.84	1.1009	0.32	3.1698	670.4	2085.0	2755.4
0.620	160.12	1.1024	0.31	3.2696	676.0	2080.9	2756.9
0.640	161.38	1.1039	0.30	3.3692	681.5	2076.8	2758.2
0.660	162.60	1.1053	0.29	3.4687	686.8	2072.7	2759.5
0.680	163.79	1.1068	0.28	3.5680	692.0	2068.8	2760.8
0.700	164.96	1.1082	0.27	3.6673	697.1	2064.9	2762.0
0.720	166.10	1.1096	0.27	3.7665	702.0	2061.1	2763.1

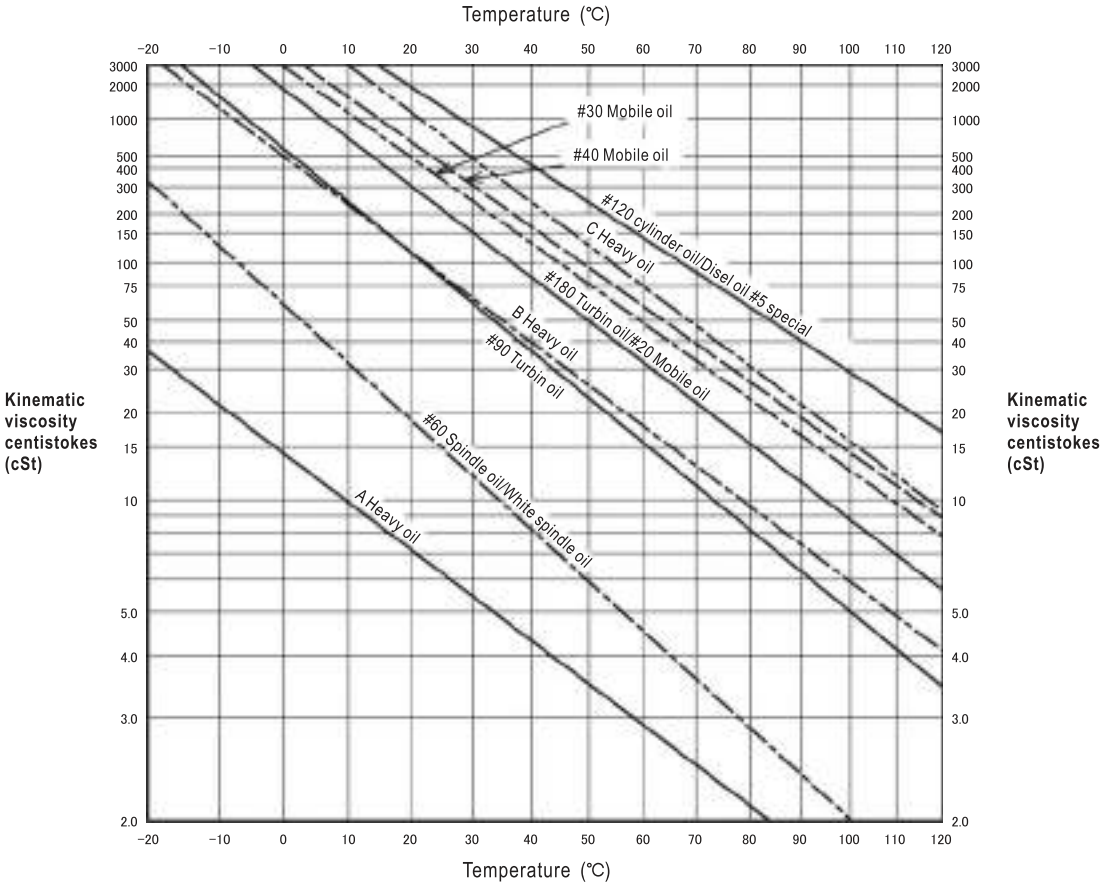
Absolute pressure (MPa·A)	Steam temperature (℃)	Volume of 1kg water before evaporation (ℓ)	Volume of 1kg steam (m^3)	Weight of $1m^3$ steam (kg)	Calorie of 1kg steam (kJ)		
					Calorie of water h	Latent heat L	Total H=h+L
0.740	167.21	1.1110	0.26	3.8655	706.9	2057.4	2764.3
0.760	168.30	1.1123	0.25	3.9645	711.7	2053.7	2765.4
0.780	169.37	1.1137	0.25	4.0634	716.4	2050.1	2766.4
0.80	170.41	1.1150	0.24	4.1622	720.9	2046.5	2767.5
0.85	172.95	1.1182	0.23	4.4089	732.0	2037.9	2769.9
0.90	175.36	1.1214	0.22	4.6552	742.6	2029.5	2772.1
0.95	177.67	1.1244	0.20	4.9012	752.8	2021.4	2774.2
1.00	179.88	1.1274	0.19	5.1469	762.6	2013.6	2776.2
1.05	182.02	1.1303	0.19	5.3923	772.0	2006.0	2778.0
1.10	184.07	1.1331	0.18	5.6375	781.1	1998.5	2779.7
1.15	186.05	1.1359	0.17	5.8825	789.9	1991.4	2781.3
1.20	187.96	1.1386	0.16	6.1274	798.4	1984.3	2782.7
1.25	189.82	1.1412	0.16	6.3723	806.7	1977.5	2784.2
1.30	191.61	1.1439	0.15	6.6170	814.7	1970.7	2785.4
1.35	193.35	1.1464	0.15	6.8616	822.5	1964.2	2786.7
1.40	195.04	1.1489	0.14	7.1063	830.1	1957.7	2787.8
1.45	196.69	1.1514	0.14	7.3509	837.5	1951.5	2788.9
1.5	198.29	1.1539	0.13	7.5955	844.7	1945.2	2789.9
1.6	201.37	1.1586	0.12	8.0850	858.6	1933.2	2791.7
1.7	204.31	1.1633	0.12	8.5747	871.8	1921.5	2793.4
1.8	207.11	1.1678	0.11	9.0648	884.6	1910.3	2794.8
1.9	209.80	1.1723	0.11	9.5554	896.8	1899.3	2796.1
2.0	212.37	1.1766	0.10	10.047	908.6	1888.6	2797.2
2.1	214.85	1.1809	0.09	10.539	920.0	1878.2	2798.2
2.2	217.24	1.1850	0.09	11.031	931.0	1868.1	2799.1
2.3	219.55	1.1892	0.09	11.525	941.6	1858.2	2799.8
2.4	221.78	1.1932	0.08	12.019	951.9	1848.5	2800.4
2.5	223.94	1.1972	0.08	12.515	962.0	1839.0	2800.9
2.6	226.04	1.2011	0.08	13.011	971.7	1829.6	2801.4
2.7	228.07	1.2050	0.07	13.509	981.2	1820.5	2801.7
2.8	230.05	1.2088	0.07	14.008	990.5	1811.5	2802.0
2.9	231.97	1.2126	0.07	14.508	999.5	1802.6	2802.2
3.0	233.84	1.2163	0.07	15.009	1008.4	1793.9	2802.3
3.2	237.45	1.2237	0.06	16.016	1025.4	1776.9	2802.3
3.5	242.54	1.2345	0.06	17.536	1049.8	1752.2	2802.0
4.0	250.33	1.2521	0.05	20.101	1087.4	1712.9	2800.3
4.5	257.41	1.2691	0.04	22.708	1122.1	1675.6	2797.7
5	263.91	1.2858	0.04	25.362	1154.5	1639.7	2794.2
6	275.55	1.3187	0.03	30.828	1213.7	1571.3	2785.0
7	285.79	1.3513	0.03	36.532	1267.4	1506.0	2773.5
8	294.97	1.3842	0.02	42.507	1317.1	1442.8	2759.9
9	303.31	1.4179	0.02	48.792	1363.7	1380.9	2744.6
10	310.96	1.4526	0.02	55.428	1408.0	1319.7	2727.7
15	342.13	1.6579	0.01	96.710	1611.0	1004.0	2615.0
20	365.70	2.0370	0.01	170.17	1826.5	591.9	2418.4
22.12	374.15	3.1700	0.003	315.46	2107.4	0.0	2107.4

Physical Property of Gases and Liquids

Material name	Chemical formula	Molecular weight	Gas			Liquid		
			Adiabatic index (Cp/Cv=*k*)	Density kg/m³ 0℃ 1atm	Specific gravity (air=1)	Specific gravity (water=1)	Specific gravity at ℃	Boiling point
Acrylonitrile	Ch_2=CHCN	53.06			1.832	0.8060	20	77.7
Acetylene	HC≡CH	26.04	1.26	1.173	0.907			−83.8
Acetaldehyde	CH_3CHO	44.05	1.14		1.519	0.783	17.8	−18.9
Acetone	CH_3COCH_3	58.08				0.791	18.9	56.5
Aniline	$C_6H_5NH_2$	93.13			3.216	1.0217	20.7	184.6
Argon	Ar	39.94	1.67	1.784	1.380	1.65	−232.8	−185.0
Ammonia	NH_3	17.03	1.31	0.771	0.587	0.590	−78.9	−33.5
Isobutane	$(CH_3)_3CH$	58.12	1.10	2.595	2.007	0.557	20	−11.7
Carbon monoxide	CO	28.01	1.40	1.250	0.967	0.814	−194.4	−191.6
Nitrous oxide	N_2O	44.00	1.30	1.978	1.530	1.226	−88.9	−88.57
Ethane	C_2H_6	30.07	1.19	1.356	1.05	0.546	−87.8	−88.6
Ethyl alcohol	C_2H_5OH	46.07	1.13		1.59	0.789	20	−78.3
Ethyl benzene	$C_6H_5C_2H_5$	106.17			3.666	0.8672	20	136.15
Ethylene	CH_2=CH_2	28.05	1.24	1.263	0.974	0.566	−102.2	−103.9
Ethylene glycol	$HOCH_2CH_2OH$	62.07			2.143	1.1131	20	197.7
Ethyl chloride	$C_2H_5Cℓ$	64.51	1.19		2.22	0.903	10	12.2
Methyl chloride	$CH_3Cℓ$	50.49	1.20		1.742	0.952	0	−23.9
Hydrogen chloride	Hℓ	36.46	1.41	1.639	1.27			−85.1
Chloride	$Cℓ_2$	70.90	1.36	3.214	2.49	1.56	−33.9	−34.0
Octane	$CH_3(CH_2)_6CH_3$	114.23	1.05		3.94	0.707	20	125.6
Sea water						1.01~1.05	20	
Gasoline						0.75	20	30~210
Air		28.96	1.40	1.293	1			100
Chloroethyl	$C_2H_5OCHCℓCH_3$	108.57			3.749	0.9655	20	98.5
Chloromethyl	$C_2H_5OCH_2Cℓ$	94.54	1.28		3.26	1.0127	20	82.4
Chloroform	$CHCℓ_3$	119.38			4.122	1.4985	15	61.2
Acetic acid	CH_3CO_2H	60.05	1.15		2.071	1.049	20	117.9
Oxygen	O_2	32.0	1.40	1.429	1.105	1.426	−252.2	−182.9
Ethylene oxide	$(C_2H_4)O$	44.05	1.01		1.521	0.8896	6	10.73
Nitric oxide	NO	30.0	1.40	1.340	1.036	1.269	−150.6	−151.8
Nitric acid	HNO_3					1.502	15.6	83.8
Water vapor (100℃)	H_2O	18.02	1.324	0.598	0.463	1.0	3.9	100
Hydrogen	H_2	2.016	1.41	0.0899	0.070	0.0709	−252.8	−252.8
Dowtherm A		165	1.046		5.696	0.997	100	257.8
Nitrogen	N_2	28.01	1.40	1.250	0.967	1.026	−252.2	−195.8
Kerosene						0.80~0.83	15	150~320
Toluene	$C_6H_5CH_3$	92.14	1.09		3.18	0.866	20	111.1
Carbon dioxide	CO_2	44.01	1.29	1.977	1.53	1.101	−37.2	Sublimation
Sulfur dioxide	SO_2	64.06	1.29	2.926	2.264	1.434	0	−10.1
Carbon bisulfide	CS_2	76.14	1.21		2.628	1.263	20	46.7
Fuel oil(Navy heavy)						1.014	15.6	
Fuel oil(No.3)						0.899	15.6	
Fuel oil(No.5 &6)						0.993	15.6	
Butadiene	CH_2=CHCH=CH_2	54.09	1.12	2.485	1.922	0.621	20	−4.4
Butane	C_4H_{10}	58.12	1.10	2.595	2.007	0.579	20	−0.6
Freon 11		137.37	1.14	6.131	4.742	1.494	17.2	23.9
Freon 12		120.92	1.14	5.397	4.174	1.486	−30.0	−29.4
Freon 22		86.48	1.18	3.860	2.985	1.419	−41.1	−40.6
Freon 114		170.93	1.09	1.989	5.90	1.538	−1.1	3.3
Propane	$CH_3CH_2CH_3$	44.09	1.13	2.02	1.56	0.585	−45.0	−42.1
Propylene	CH_3CH=CH_2	42.08	1.15	1.908	1.476	0.609	−47.2	−47.8
Hexane	$CH_3(CH_2)_4CH_3$	86.18	1.06	3.840	2.97	0.659	20	68.9
Helium	He	4.00	1.66	0.1785	0.138			−269
Benzene	C_6H_6	78.11	1.12		2.89	0.879	20	80.0
Methane	CH_4	16.04	1.31	0.717	0.55	0.415	−163.9	−161.5
Methyl alcohol	CH_3OH	32.04	1.20		1.11	0.792	20	64.6
Methylic butane	$(CH_3)_2CHC_2H_5$	72.15	1.08		2.49	0.625	15.6	27.8
Methylic ether	CH_3OCH_3	46.07			1.591	2.091	15.6	
Hydrogen sulfide	H_2S	34.08	1.32	1.539	1.19			−60.1
Sulphuric acid	H_2SO_4					1.834	15.6	340.0

Viscosity of Liquids

■ TEMPERATURE AND VISCOSITY CURVES FOR OIL



Centi-stokes cSt	Saybolt time, sec. SSU	Redwood No.1 time, R″ sec.	Engler degree E	Centi-stokes cSt	Saybolt time, sec. SSU	Redwood No.1 time, R″ sec.	Engler degree E
2.7	35	32.2	1.18	103	475	419	13.5
4.3	40	36.2	1.32	108	500	441	14.2
5.9	45	40.6	1.46	119	550	485	15.6
7.4	50	44.9	1.60	130	600	529	17.0
8.9	55	49.1	1.75	141	650	573	18.5
10.4	60	53.5	1.88	152	700	617	19.9
11.8	65	57.9	2.02	163	750	661	21.3
13.1	70	62.3	2.15	173	800	705	22.7
14.5	75	67.6	2.31	184	850	749	24.2
15.8	80	71.0	2.42	195	900	793	25.6
17.0	85	75.1	2.55	206	950	837	27.0
18.2	90	79.6	2.68	217	1000	882	28.4
19.4	95	84.2	2.81	260	1200	1058	34.1
20.6	100	88.4	2.95	302	1400	1234	39.8
23.0	110	97.1	3.21	347	1600	1411	45.5
25.0	120	105.9	3.49	390	1800	1587	51
27.5	130	114.8	3.77	433	2000	1763	57
29.8	140	123.6	4.04	542	2500	2204	71
32.1	150	132.4	4.32	650	3000	2646	85
34.3	160	141.1	4.59	758	3500	3087	99
36.5	170	150.0	4.88	867	4000	3526	114
38.8	180	158.8	5.15	974	4500	3967	128
41.0	190	167.5	5.44	1082	5000	4408	142
43.2	200	176.4	5.72	1150	5500	4849	156
47.5	220	194.0	6.28	1300	6000	5290	160
51.9	240	212	6.85	1400	6500	5730	185
56.5	260	229	7.38	1510	7000	6171	199
60.5	280	247	7.95	1630	7500	6612	213
64.9	300	265	8.51	1740	8000	7053	227
70.3	325	287	9.24	1850	8500	7494	242
75.8	350	309	9.95	1960	9000	7934	256
81.2	375	331	10.7	2070	9500	8375	270
86.8	400	353	11.4	2200	10000	8816	284
92.0	425	375	12.1				
97.4	450	397	12.8				

Above figures are converted from kinematic viscosity(cSt) measured at 37.8℃.

Conversion

v: Kinematic viscosity (stokes: St, centistokes: cSt)
μ: absolute viscosity (Poise: P, centipoises: cP)
ρ: Density (g/cm^3)
1 Poise = 100 centipoise
1 Stokes=100 centistokes

SI Conversion Table (SI unit is marked by heavy line)

	Pa·S	cP	P
Viscosity	1	1 10^3	1 10
	1 10^{-3}	1	1 10^{-2}
	1 10^{-1}	1 10^2	1

Note: 1cP=1mPa·S

	m^2/S	cSt	St
Kinematic viscosity	1	1 10^6	1 10^4
	1 10^{-6}	1	1 10^{-2}
	1 10^{-4}	1 10^2	1

Note:1St=1cm^2/S,1cSt=1mm^2/S

Pressure Rating for Ferrous Material Pipe Flanges

Extracted from JIS B2220-2004

This standard provides specifications on steel flanges (hereinafter referred to as "flanges") for connecting steel pipes, valves, and accessories for stainless piping of common pipes, pressure pipes, high pressure pipes, high-temperature pipes, and steel alloy pipes for steam, air, gas, water, and oil.

See Tab.1 "Pressure-Temperature Standard" and Tab. 2 "Symbols of Material Group" for the relationship between temperature and maximum working pressure of fluids. The classification (Ⅰ~Ⅲ) in Appendix 1 depends on the class of flange and material group (refer to JIS B2220-2004).

Tab.1 Pressure-Temperature Standard

Nominal pressure	Symbol of material group material specified	Max. working pressure											
		Temperature of fluid											
	Classification	T꜀~120			220			300			350		
		Ⅰ	Ⅱ	Ⅲ	Ⅰ	Ⅱ	Ⅲ	Ⅰ	Ⅱ	Ⅲ	Ⅰ	Ⅱ	Ⅲ
5k	001,002,003a	0.7	0.5	0.5	0.6	0.5	—	0.5	0.5	—	—	—	—
	021a,021b,022a,022b	0.7	0.5	0.5	0.6	0.5	—	0.5	0.5	—	—	—	—
	023a,023b	0.7	0.5	0.5	0.6	0.5	—	0.5	0.5	—	—	—	—
10k	001,002,003a	1.4	1.0	1.0	1.2	1.0	—	1.0	1.0	—	—	—	—
	021a,021b,022a,022b	1.4	1.0	1.0	1.2	1.0	—	1.0	1.0	—	—	—	—
	023a,023b	1.4	1.0	1.0	1.2	0.9	—	1.0	0.8	—	—	—	—
16k	002,003a	2.7	1.6	1.6	2.5	1.6	—	2.3	1.6	—	2.1		—
	021a,021b,022a,022b	2.7	1.6	1.6	2.5	1.6	—	2.3	1.6	—	2.1	1.6	—
	023a,023b	2.7	1.6	1.6	2.5	1.6	—	2.3	1.5	—	2.1	1.4	—
20k	002,003a	3.4	2.0	2.0	3.1	2.0	—	2.9	2.0	—	2.6	—	—
	021a,021b,022a,022b	3.4	2.0	2.0	3.1	2.0	—	2.9	2.0	—	2.6	2.0	—
	023a,023b	3.4	2.0	2.0	3.1	2.0	—	2.9	1.9	—	2.6	1.7	—
30k	002,003a	5.1	3.9		4.6	3.9		4.3	3.9		3.9	—	
	013a	5.1	3.9		4.6	3.9		4.3	3.9		3.9	3.9	
	015a	5.1	3.9		4.6	3.9		4.3	3.9		3.9	3.9	
	021a,021b,022a,022b	5.1	3.9	3.9	4.6	3.6	—	4.3	3.4	—	3.9	3.0	—
	023a,023b	5.1	3.5	3.5	4.6	3.0	—	4.3	2.9	—	3.9	2.6	—

Tab.2 Material Group

Type of material	Rolled material		Forged material		Forged material		Symbol of material group
	Standard No.	Standard material	Standard No.	Standard material	Standard No.	Standard material	
Carbon steel	JIS G 3101 JIS G 4051	SS400 S20C	JIS G 3201 JIS G 3202	SF390A SFVC 1	JIS G 5101 JIS G 5151	SC410 SCPH1	001
	JIS G 4051	S25C	JIS G 3201	SF440A	JIS G 5101	SC480	002
	—	—	JIS G 3202	SFVC 2A	JIS G 5151	SCPH2	003a
Low-alloy steel	—	—	JIS G 3203	SFVA F1	JIS G 5151	SCPH11	013a
	—	—	JIS G 3203	SFVA F11A	JIS G 5151	SCPH21	015a
Stainless steel	JIS G 4304 JIS G 4305	SUS304 SUS304	JIS G 3214	SUS F304	JIS G 5121	SCS13A	021a
	—	—	—	—	JIS G 5121	SCS19A	021b
	JIS G 4304 JIS G 4305	SUS316 SUS316	JIS G 3214	SUS F316	JIS G 5121	SCS14A	022a
	—	—	—	—	JIS G 5121	SCS16A	022b
	JIS G 4304 JIS G 4305	SUS304L SUS304L	JIS G 3214	SUS F304L			023a
	JIS G 4304 JIS G 4305	SUS316L SUS316L	JIS G 3214	SUS F316L			023b

Note: 1.SS400 (JIS G 3101) and SF390A and SF440A (JIS G 3201) are for materials with carbon content less than 0.33%.
2.S20C and S25C (JIS G 4051) should be tested according to JIS G 0303. The tensile strength of S20C should be larger than 400N/mm^2, and for S25C, the tensile strength of should be larger than 440N/mm^2.

Pressure Rating of Cast Iron Flange for Piping (JIS B2239-2004)

This standard provides specifications on cast iron flanges for cast iron pipes, fitting, valves etc. for steam, air, gas, water, oil, and other fluids.

See Tab.1 "Pressure-Temperature Standard" and Tab. 2 "Symbols of Material Group" for the relationship between temperature and maximum working pressure of fluids.

Tab.1 Pressure-Temperature Standard

Nominal pressure	Symbol of material group	Max. working pressure			
		Temperature of fluid			
		−10~120	220	300	350
5K	G2,G3	0.7	0.5	—	—
	D1,M1,M2	0.7	0.6	0.5	—
10K	G2,G3	1.4	1.0	—	—
	D1,M1,M2	1.4	1.2	1.0	—
10K thin type	G2,D1,M1,M2	0.7	—	—	—
16K	G2,G3	2.2	1.6	—	—
	D1,M1,M2	2.2	2.0	1.8	1.6
20K	G3,M1	2.8	2.0	—	—
	D1,M2	2.8	2.5	2.3	2.0

Note:1. Use proportional interpolation method to determine maximum working pressure for applications with temperature between the temperatures shown in the table.

Tab.2 Material Group

Material		Mechanical property			Material spec.	
Type	Symbol of material group	Min. tensile strength	Min. Extension	0.2% min. Durability	Standard No.	Material symbol
Cast iron	G1 (2)	(145)	—	—	—	—
	G2	200	—	—	JIS G 5501	FC200
		214	—	—	—	—
	G3	250	—	—	JIS G 5501	FC250
Ductile cast iron	D1	415	18	276	JIS G 8270	FCD-S (1)
		350	22	220	JIS G 5502	FCD350
		400	15	250	JIS G 5502	FCD400
		450	10	280	JIS G 5502	FCD450
	D2(2)	(400)	(5)	(300)	—	—
		(600)	(3)	(370)	—	—
Forged steel	M1	270	5	165	JIS G 5705	FCBM27-05
		300	6	190	—	—
	M2	340	10	220	—	—
		350	10	200	JIS G 5705	FCMB35-10 FCMB35-10S(1)

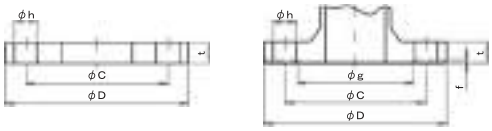
Note: 1.Generally, it is not necessary to consider the impact of material, except that applicable laws or regulations require.
2.The symbols (G1 and D2) of material group are for reference purpose. They represent the structure of material group. The numbers in squares, which show the mechanical properties of materials, come from relevant standards.

Basic Dimensions of Pipe Flanges

Basic Dimensions of Pipe Flanges

Extracted from JIS B2220-2004 (Steel Pipe Flange)
JIS B2239-2004 (Cast Iron Pipe Flange)

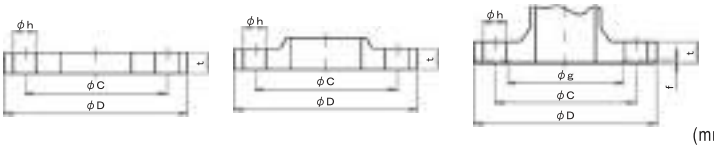
■ BASIC DIMENSIONS OF FLANGE WITH NOMINAL PRESSURE 5K



(mm)

Size	Outside dia. of steel pipe applicable to	Connection dimensions					Plane seat		Thickness of flange t	
		Outside dia. of flange D	Bolt hole				Diameter g	Height f	Other than grey cast iron/ steel	Grey cast iron
			dia. of pitch circle C	Diameter h	Number	Nominal size of screw				
10	17.3	75	55	12	4	M10	39	1	9	12
15	21.7	80	60	12	4	M10	44	1	9	12
20	27.2	85	65	12	4	M10	49	1	10	14
25	34.0	95	75	12	4	M10	59	1	10	14
32	42.7	115	90	15	4	M12	70	2	12	16
40	48.6	120	95	15	4	M12	75	2	12	16
50	60.5	130	105	15	4	M12	85	2	14	16
65	76.3	155	130	15	4	M12	110	2	14	18
80	89.1	180	145	19	4	M16	121	2	14	18
(90)	101.6	190	155	19	4	M16	131	2	14	—
100	114.3	200	165	19	8	M16	141	2	16	20
125	139.8	235	200	19	8	M16	176	2	16	20
150	165.2	265	230	19	8	M16	206	2	18	22
(175)	190.7	300	260	23	8	M20	232	2	18	—
200	216.3	320	280	23	8	M20	252	2	20	24
(225)	241.8	345	305	23	12	M20	277	2	20	—
250	267.4	385	345	23	12	M20	317	2	22	26
300	318.5	430	390	23	12	M20	360	3	22	28
350	355.6	480	435	25	12	M22	403	3	24	30
400	406.4	540	495	25	16	M22	463	3	24	30

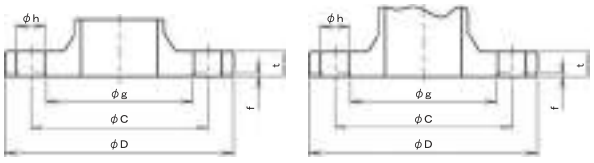
■ BASIC DIMENSIONS OF FLANGE WITH NOMINAL PRESSURE 10K



(mm)

Size	Outside dia. of steel pipe applicable to	Connection dimensions							Plane seat		Thickness of flange t			
		Outside dia. of flange D	Bolt hole						Diameter g	Height f	Other than grey cast iron/steel		Grey cast iron	
			dia. of pitch circle C	Diameter h		Number	Nominal size of screw							
				Parallel type	Thin type		Parallel type	Thin type			Parallel type	Thin type	Parallel type	Thin type
10	17.3	90	65	15	12	4	M12	M10	46	1	12	9	14	12
15	21.7	95	70	15	12	4	M12	M10	51	1	12	9	16	12
20	27.2	100	75	15	12	4	M12	M10	56	1	14	10	18	14
25	34.0	125	90	19	15	4	M16	M12	67	1	14	12	18	16
32	42.7	135	100	19	15	4	M16	M12	76	2	16	12	20	18
40	48.6	140	105	19	15	4	M16	M12	81	2	16	12	20	18
50	60.5	155	120	19	15	4	M16	M12	96	2	16	14	20	18
65	76.3	175	140	19	15	4	M16	M12	116	2	18	14	22	18
80	89.1	185	150	19	15	8	M16	M12	126	2	18	14	22	18
(90)	101.6	195	160	19	15	8	M16	M12	136	2	18	14	—	—
100	114.3	210	175	19	15	8	M16	M12	151	2	18	16	24	20
125	139.8	250	210	23	19	8	M20	M16	182	2	20	18	24	22
150	165.2	280	240	23	19	8	M20	M16	212	2	22	18	26	22
(175)	190.7	305	265	23	19	12	M20	M16	237	2	22	20	—	—
200	216.3	330	290	23	19	12	M20	M16	262	2	22	20	26	24
(225)	241.8	350	310	23	19	12	M20	M16	282	2	22	20	—	—
250	267.4	400	355	25	23	12	M22	M20	324	2	24	22	30	26
300	318.5	445	400	25	23	16	M22	M20	368	3	24	22	32	28
350	355.6	490	445	25	23	16	M22	M20	413	3	26	24	34	28
400	406.4	560	510	27	25	16	M24	M22	475	3	28	24	36	30

■ BASIC DIMENSIONS OF FLANGE WITH NOMINAL PRESSURE 16K

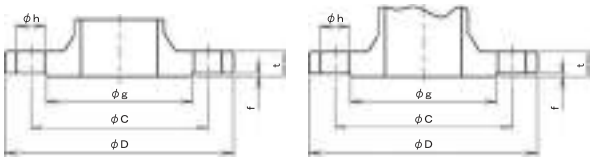


(mm)

Size	Outside dia. of steel pipe applicable to	Connection dimensions					Plane seat		Thickness of flange t	
		Outside dia. of flange D	Bolt hole				Diameter g	Height f	Other than grey cast iron/ steel	Grey cast iron
			dia. of pitch circle C	Diameter h	Number	Nominal size of screw				
10	17.3	90	65	15	4	M12	46	1	12	14
15	21.7	95	70	15	4	M12	51	1	12	16
20	27.2	100	75	15	4	M12	56	1	14	18
25	34.0	125	90	19	4	M16	67	1	14	18
32	42.7	135	100	19	4	M16	76	2	16	20
40	48.6	140	105	19	4	M16	81	2	16	20
50	60.5	155	120	19	8	M16	96	2	16	20
65	76.3	175	140	19	8	M16	116	2	18	22
80	89.1	200	160	23	8	M20	132	2	20	24
(90)	101.6	210	170	23	8	M20	145	2	20	—
100	114.3	225	185	23	8	M20	160	2	22	26
125	139.8	270	225	25	8	M22	195	2	22	26
150	165.2	305	260	25	12	M22	230	2	24	28
200	216.3	350	305	25	12	M22	275	2	26	30
250	267.4	430	380	27	12	M24	345	2	28	34
300	318.5	480	430	27	16	M24	395	3	30	36
350	355.6	540	480	33	16	M30	440	3	34	38
400	406.4	605	540	33	16	M30	495	3	38	42

(1) The "t" dimension of M1 material group of cast iron pipe flange is the same as that for grey cast iron.

■ BASIC DIMENSIONS OF FLANGE WITH NOMINAL PRESSURE 20K



(mm)

Size	Outside dia. of steel pipe applicable to	Connection dimensions					Plane seat		Thickness of flange t	
		Outside dia. of flange D	Bolt hole				Diameter g	Height f	Other than grey cast iron/ steel	Grey cast iron
			dia. of pitch circle C	Diameter h	Number	Nominal size of screw				
10	17.3	90	65	15	4	M12	46	1	14	16
15	21.7	95	70	15	4	M12	51	1	14	16
20	27.2	100	75	15	4	M12	56	1	16	18
25	34.0	125	90	19	4	M16	67	1	16	20
32	42.7	135	100	19	4	M16	76	2	18	20
40	48.6	140	105	19	4	M16	81	2	18	22
50	60.5	155	120	19	8	M16	96	2	18	22
65	76.3	175	140	19	8	M16	116	2	20	24
80	89.1	200	160	23	8	M20	132	2	22	26
(90)	101.6	210	170	23	8	M20	145	2	24	—
100	114.3	225	185	23	8	M20	160	2	24	28
125	139.8	270	225	25	8	M22	195	2	26	30
150	165.2	305	260	25	12	M22	230	2	28	32
200	216.3	350	305	25	12	M22	275	2	30	34
250	267.4	430	380	27	12	M24	345	2	34	38
300	318.5	480	430	27	16	M24	395	3	36	40
350	355.6	540	480	33	16	M30	440	3	40	44
400	406.4	605	540	33	16	M30	495	3	46	50

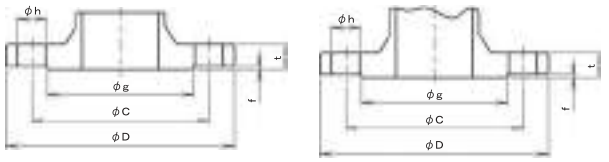
(1) The "t" dimension of M1 material group of cast iron pipe flange is the same as that for grey cast iron.

Basic Dimensions of Pipe Flanges

Basic Dimensions of Pipe Flanges

Extracted from JIS B2220-2004 (Steel Pipe Flange)
JIS B8210-1994 (Spring Safety Valve for Steam and Gas)

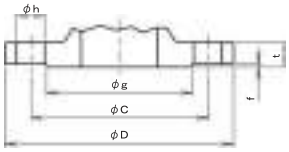
■ BASIC DIMENSIONS OF FLANGE WITH NOMINAL PRESSURE 30K



(mm)

Size	Outside dia. of steel pipe applicable to	Connection dimensions					Plane seat		Thickness of flange t
		Outside dia. of flange D	Bolt hole				Diameter g	Height f	
			Bolt hole	Diameter h	Number	Nominal size of screw			
10	17.3	110	75	19	4	M16	52	1	16
15	21.7	115	80	19	4	M16	55	1	18
20	27.2	120	85	19	4	M16	60	1	18
25	34.0	130	95	19	4	M16	70	1	20
32	42.7	140	105	19	4	M16	80	2	22
40	48.6	160	120	23	4	M20	90	2	22
50	60.5	165	130	19	8	M16	105	2	22
65	76.3	200	160	23	8	M20	130	2	26
80	89.1	210	170	23	8	M20	140	2	28
(90)	101.6	230	185	25	8	M22	150	2	30
100	114.3	240	195	25	8	M22	160	2	32
125	139.8	275	230	25	8	M22	195	2	36
150	165.2	325	275	27	12	M24	235	2	38
200	216.3	370	320	27	12	M24	280	2	42
250	267.4	450	390	33	12	M30	345	2	48
300	318.5	515	450	33	16	M30	405	3	52
350	355.6	560	495	33	16	M30	450	3	54
400	406.4	630	560	39	16	M36	510	3	60

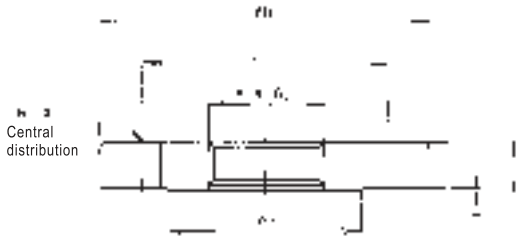
■ BASIC DIMENSIONS OF FLANGE WITH NOMINAL PRESSURE 40K



(mm)

Size	Outside dia. of steel pipe applicable to	Connection dimensions					Plane seat		Thickness of flange t
		Outside dia. of flange D	Bolt hole				Diameter g	Height f	
			Bolt hole	Diameter h	Number	Nominal size of screw			
10	17.3	110	75	19	4	M16	52	1	18
15	21.7	115	80	19	4	M16	55	1	20
20	27.2	120	85	19	4	M16	60	1	20
25	34.0	130	95	19	4	M16	70	1	22
32	42.7	140	105	19	4	M16	80	2	24
40	48.6	160	120	23	4	M20	90	2	24
50	60.5	165	130	19	8	M16	105	2	26
65	76.3	200	160	23	8	M20	130	2	30
80	89.1	210	170	23	8	M20	140	2	32
(90)	101.6	230	185	25	8	M22	150	2	34
100	114.3	250	205	25	8	M22	165	2	36
125	139.8	300	250	27	8	M24	200	2	40
150	165.2	355	295	33	12	M30	240	2	44
200	216.3	405	345	33	12	M30	290	2	50
250	267.4	475	410	33	12	M30	355	2	56
300	318.5	540	470	39	16	M36	410	3	60
350	355.6	585	515	39	16	M36	455	3	64
400	406.4	645	570	39	16	M36	515	3	70

■ DIMENSIONS OF FLANGE FOR INSTALLATION OF FULL-BORE SAFETY VALVE (JIS B8210, 1994)



■ DIMENSION (1994)

(mm)

Nominal pressure of flange	Size	Nominal dia. Of screw for installation	Flange				Bolt hole			Nominal dia. of bolt screw
		A(JIS Rc)	D	t	f	g	C	N	h	
10K	20	1	125	18	1	67	90	4	19	M16
	25	1¼	135	20	2	76	100	4	19	M16
	40	2	155	20	2	96	120	8	19	M16
	50	2½	175	22	2	116	140	8	19	M16
20K	20	1	130	20	1	70	95	4	19	M16
	25	1¼	140	22	2	80	105	4	19	M16
	40	2	165	22	2	105	130	8	19	M16
	50	2½	200	26	2	130	160	8	23	M20

Pressure Rating for Cooper Alloy Material Pipe Flanges

Pressure Rating for Cooper Alloy Material Pipe Flanges(Extracted from JIS B2240-2006)

This standard provides specifications on copper alloy flanges (hereinafter referred to as "flanges") for connecting pipes, valves, and other accessories in common piping for steam, air, gas, water, and oil.

See Tab.1 "Pressure-Temperature Standard" and Tab. 2 "Symbols of Material Group" for the relationship between temperature and maximum working pressure of fluids.

Tab.1 Pressure-Temperature Standard

Nominal pressure	Symbol of material group	Max. working pressure				
		Classification	Temperature of fluid(℃)			
			T_A~120	185	205	220
10K	C11,C21	Ⅰ	1.4	1.2	1.1	—
		Ⅱ	1.0	1.0	1.0	—
	C12,C22	Ⅰ	1.4	1.2	1.1	1.0
		Ⅱ	1.0	1.0	1.0	1.0
16K	C11,C21	Ⅰ	2.2	1.9	1.7	—
		Ⅱ	1.6	1.6	1.6	—
	C12,C22	Ⅰ	2.2	1.9	1.7	1.6
		Ⅱ	1.6	1.6	1.6	1.6

Note: 1.Category Ⅰ is applicable to applications using flat gasket and flat flange for connection. Category Ⅱ is applicable to other applications (e.g. ring gasket)
2.T_A stands for normal temperature.
3.Use proportional interpolation method to determine maximum working pressure for applications with temperature between the temperatures shown in the table.

Tab.2 Material

Type of flange	Symbol of material group	Standard material		
		Standard No.	Material symbol	Special remark
Slip-on welded flange (SO)	C11	JIS H5120	CAC202	Pb≦1%
	C12	JIS H5120	CAC407	Sn 5~6% Pb≦1%
Integral flange (IT)	C21	JIS H5120	CAC406	—
	C22	JIS H5120	CAC402	—
			CAC407	—

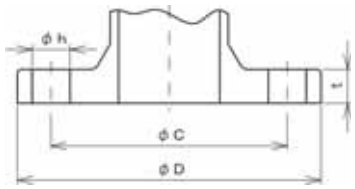
■ BASIC DIMENSIONS OF COPPER ALLOY PIPE FLANGE

Nominal pressure 10K flange (mm)

Size	Flange		Bolt hole			Nominal size of bolt screw
	External dia. D	Thickness t	dia. of pitch circle	Number	Size h	
10	90	12	65	4	15	M12
15	95	12	70	4	15	M12
20	100	14	75	4	15	M12
25	125	14	90	4	19	M16
32	135	16	100	4	19	M16
40	140	16	105	4	19	M16
50	155	16	120	4	19	M16
65	175	18	140	4	19	M16
80	185	18	150	8	19	M16
100	210	18	175	8	19	M16
125	250	20	210	8	23	M20
150	280	22	240	8	23	M20

Nominal pressure 16K flange (mm)

Size	Flange		Bolt hole			Nominal size of bolt screw
	External dia. D	Thickness t	dia. of pitch circle	Number	Size h	
10	90	12	65	4	15	M12
15	95	12	70	4	15	M12
20	100	14	75	4	15	M12
25	125	14	90	4	19	M16
32	135	16	100	4	19	M16
40	140	16	105	4	19	M16
50	155	16	120	8	19	M16
65	175	18	140	8	19	M16
80	200	20	160	8	23	M20
100	225	22	185	8	23	M20
125	270	22	225	8	25	M22
150	305	24	260	12	25	M22



Integral flange (IT)

Data for Sizing

Cv Calculation

Cv is the flow of clear water expressed in US gal/min unit under the conditions of 60°F (15.6℃), full open of valve, and differential pressure 1psi.

■ CALCULATION STEPS

Based on given specifications of fluid and nominal diameter calculated, Cv can be calculated according to the following steps.

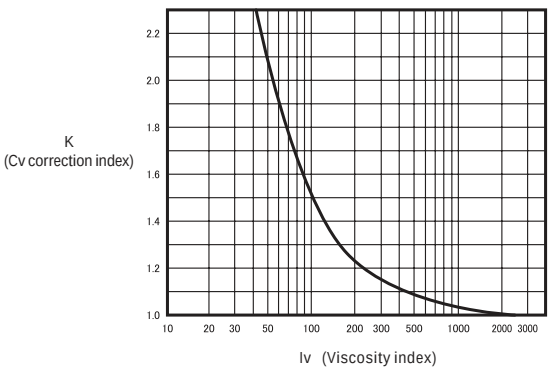
❶ In most cases, the nominal diameter of valve can be calculated using Cv methods. In this method, the Cv values at maximum, normal, and minimum flows and differential pressure are calculated. The Cv value at the maximum flow and minimum differential pressure is the maximum Cv, while the Cv value at the minimum flow and the maximum differential pressure is the minimum Cv.

❷ Generally, the nominal diameter of valve can be determined using the flow 10~20% larger than obtained maximum Cv by calculation. However, depending on the type of regulating valve (some have specified minimum adjustable flow or rangeablity and max. controllable flow divided by min. controllable flow), it may be necessary to consider minimum Cv.

■ FORMULAS FOR CALCULATING Cv

Type		Pressure: MPa	Pressure: kPa
For steam		$Cv=\frac{WK}{139\sqrt{\Delta P(P_1+P_2)}}$	$Cv=\frac{WK}{0.139\sqrt{\Delta P(P_1+P_2)}}$
		$Cv=\frac{WK}{121P_1}$	$Cv=\frac{WK}{0.121P_1}$
	Unit	P_1=primary pressure MPa·A P_2=secondary pressure MPa·A	P_1=primary pressure kPa·A P_2=secondary pressure kPa·A
		W:max. Flow kg/h $\Delta P=P_1-P_2$ K=1+(0.0013 superheating degree℃)	
For air		$Cv=\frac{Q}{2920}\sqrt{\frac{G(273+t)}{\Delta P(P_1+P_2)}}$	$Cv=\frac{Q}{2.92}\sqrt{\frac{G(273+t)}{\Delta P(P_1+P_2)}}$
		$Cv=\frac{Q\sqrt{G(273+t)}}{2530P_1}$	$Cv=\frac{Q\sqrt{G(273+t)}}{2.53P_1}$
	Unit	P_1=primary pressure MPa·A P_2=secondary pressure MPa·A $\Delta P=P_1-P_2$ MPa	P_1=primary pressure kPa·A P_2=secondary pressure kPa·A $\Delta P=P_1-P_2$ kPa
		Q=max. flow (m^3/h) (standard state) (15℃, 0.1013MPa·A), G: specific gravity (air=1), t: temperature (℃)	
For Liquids	Formula	$Cv=\frac{0.365V\sqrt{G}}{\sqrt{P_1-P_2}}$	$Cv=\frac{11.5V\sqrt{G}}{\sqrt{P_1-P_2}}$
	Unit	P_1=primary pressure MPa·A P_2=secondary pressure MPa·A	P_1=primary pressure kPa·A P_2=secondary pressure kPa·A
		V: max. flow (m^3/h), G: specific gravity (water:1)	
	■ Viscosity correction: For fluid with viscosity larger than 20cSt, use viscosity index (Iv) and viscosity correction coefficient (K) from the viscosity correction coefficient chart to calculate correction flow V'		
	Correction formula	$Iv=\frac{72780}{Mc}(\frac{\Delta P}{G})^{\frac{1}{4}}V^{\frac{1}{2}}$	$Iv=\frac{12940}{Mc}(\frac{\Delta P}{G})^{\frac{1}{4}}V^{\frac{1}{2}}$
	Unit	ΔP: differential pressure MPa	ΔP: differential pressure kPa
		V: max. flow (before viscosity correction, m^3/h), Mc: viscosity (cSt, see Note), G: specific gravity (water:1)	

Cv correction index chart



Correction flow v', m^3/h (the max. flow after viscosity correction) can be calculated using the following formula:

$$V'=\frac{V}{K}$$

To calculate Cv after viscosity correction, replace the max. flow V (m^3/h) in the following formula with correction flow V' (m^3/h).

V'=V K

Note: See page 265 for conversion from SI unit.

■ FLOW PER Cv (saturated steam)

(kg/h)

P_2 \ P_1	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0
0.035	20.59	29.34	36.45	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
0.05	18.45	27.89	36.21	42.50	48.55																											
0.10		20.91	31.16	40.01	48.25	54.60	60.65																									
0.15			23.10	34.12	43.48	52.10	60.29	66.70	72.75																							
0.20				25.10	36.84	46.70	55.69	64.17	72.33	78.80	84.85																					
0.25					26.96	39.37	49.70	59.05	67.83	76.23	84.36	90.90	96.95																			
0.30						28.69	41.76	52.54	62.24	71.30	79.94	88.28	96.40	103.0	109.0																	
0.35							30.33	44.01	55.23	66.27	74.61	83.49	92.03	100.3	108.4	115.1	121.1															
0.40								31.88	46.15	57.79	68.16	77.78	86.89	95.63	104.1	112.3	120.4	127.2	133.2													
0.45									33.36	48.20	60.25	70.94	80.82	90.16	99.11	107.7	116.1	124.4	132.5	145.3												
0.50										34.78	50.16	62.61	73.62	83.76	93.32	102.4	111.2	119.8	128.2	144.5	157.4											
0.55											36.14	52.05	64.88	76.19	86.59	96.38	105.7	114.7	123.4	140.3	156.5	169.5										
0.60												37.46	53.88	67.07	78.69	89.34	99.34	108.8	118.0	135.5	152.3	168.6	181.6									
0.65													38.72	55.64	69.20	81.11	92.00	102.2	111.9	130.2	147.6	164.4	180.6	193.7								
0.70														39.95	57.35	71.26	83.46	94.59	105.0	124.4	142.5	159.7	176.4	192.7	205.8							
0.75															41.14	59.01	73.27	85.74	97.11	117.8	136.8	154.7	171.8	188.5	204.7							
0.80																42.30	60.63	75.22	87.96	110.3	130.4	149.1	166.8	183.9	200.5	230.0						
0.85																	43.43	62.20	77.12	101.9	123.4	143.0	161.4	179.0	196.0	228.8						
0.90																		44.52	63.73	92.25	115.5	136.2	155.4	173.6	191.1	224.6	254.2					
0.95																			45.60	80.79	106.6	128.7	148.9	167.8	185.9	220.2	252.8					
1.0																				66.69	96.35	120.4	141.8	161.5	180.2	215.4	248.7	278.4				
1.1																					69.53	100.2	125.1	147.1	167.4	204.8	239.6	272.8	302.6			
1.2																						72.26	104.0	129.7	152.3	192.6	229.3	263.8	296.9	326.8	351.0	375.2

P_2 \ P_1	0.04	0.06	0.08
0.02	10.07	14.77	18.72
0.04	—	10.81	15.78

* P_1=Primary pressure (MPa)
P_2=Secondary pressure (MPa)

■ Cv VALUE TABLE

Type \ Model	Size	10 (⅜″)	15 (½″)	20 (¾″)	25 (1″)	32 (1¼″)	40 (1½″)	50 (2″)	65 (2½″)	80 (3″)	100 (4″)	125 (5″)	150 (6″)	200 (8″)	250 (10″)
Pressure reducing valve	RD-3H/3HA		0.8	0.8	1										
Temperature regulating valve	TD-8		3	3	4	6.5	8								
	TD-2/2L		3	3	4	6.5	8	12.5	18	25	40	70	110		
	TD-4/4L		1.5	1.5	3	4	4								

Size selection method

1. $(Cv)=\frac{(\text{max.flow speified})}{\text{flow/Cv}}$ (Possible flow)=(flow/Cv) (Cv)

2. Correction using superheated steam

(Unit flow for correction)= $\frac{\text{flow/Cv}}{K}$ K=1+(0.0013 (overheating degree,))

Type \ Model	Size	10 (⅜″)	15 (½″)	20 (¾″)	25 (1″)	32 (1¼″)	40 (1½″)	50 (2″)	65 (2½″)	80 (3″)	100 (4″)	125 (5″)	150 (6″)	200 (8″)	250 (10″)
Motor valve	BM-9S			10	20	32									
	ML-FD					20	30	50	75	105	170	250	360		
	ML-TS/FS		3.6	6.4	10	16	25	40	67	102	160				
Cylinder valve	COS/COS-1H	3	4.5	7.5	11	17	23	35	50						
	COF/CCF-1H		4.5	7.5	11	17	23	35	50						
	CP-FS		3.6	6.4	10	16	25	40	67	102	160				

Note: 1.The flow/Cv is the flow per Cv under relevant pressure condition.
2.Depending on model, the range of pressure and offset vary.
3.For models not mentioned in the Cv table, see relevant Size Selection Chart and Flow Chart.

■ FLOW PER Cv (Air)

(m^3/h(standard state))

P_2 \ P_1	0.01	0.02	0.04	0.06	0.08	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.70	0.80	0.90	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.5	4.0	4.5	5.0
0(atm.)	7.865	11.38	16.80	21.41	25.64	29.67																												
0.001	7.479	11.11	16.62	21.27	25.53	29.57																												
0.005	5.629	9.967	15.88	20.69	25.05	29.16																												
0.010		8.227	14.84	19.91	24.41	28.61																												
0.020			12.36	18.13	22.98	27.40	37.14																											
0.035			8.358	14.71	20.39	25.27	36.01	44.53																										
0.05				12.24	17.04	22.65	34.22	44.44	51.92	59.31																								
0.10							25.66	38.24	49.11	59.22	66.70	74.09																						
0.15								28.35	41.87	53.37	63.94	73.99	81.48	88.87																				
0.20									30.81	45.21	57.31	68.34	78.75	88.76	96.26	103.6																
0.25										33.09	48.32	61.00	72.47	83.24	93.55	103.5	118.4															
0.30											35.22	51.25	64.48	76.38	87.50	98.11	118.3	133.2	147.9														
0.40													39.13	56.64	70.93	83.66	106.6	127.7	147.8	162.7													
0.50															42.69	61.56	90.35	114.5	136.5	157.3	192.3												
0.60																	66.12	96.57	121.9	144.8	186.9	221.8											
0.70																		70.38	102.4	128.8	174.9	216.5	251.4										
0.80																			74.40	107.9	160.1	204.8	246.1	281.0									
0.90																				78.22	141.7	190.8	234.6	275.7	310.5								
1.0																					118.2	174.0	221.2	264.3	305.2	340.1	369.7						
1.2																					127.7		186.9	236.4	281.4	323.7	364.4	399.2	428.8				
1.4																							136.5	199.0	250.8	297.5	341.2	383.0	423.5	458.3			
1.6																								144.8	210.3	264.3	312.7	357.9	400.9	442.3	532.2	606.1	
2.0																										160.0	231.4	289.5	341.2	389.0	498.9	600.8	680.0	753.9
2.5																												124.2	219.1	288.0	424.8	540.8	647.4	748.5
3.0																															312.2	457.8	579.8	690.9

* P_1=Primary pressure (MPa) P_2=Secondary pressure (MPa)

■ Cv VALUE TABLE

Product \ Model \ Size	10 (⅜″)	15 (½″)	20 (¾″)	25 (1″)	32 (1¼″)	40 (1½″)	50 (2″)	65 (2½″)	80 (3″)	100 (4″)	125 (5″)	150 (6″)	200 (8″)	250 (10″)
Reducing/ Primary pressure regulating valve	**RD-3HA/3HAF**		0.8	0.8	1									
	RD-14		1	2	3.5	5.5	8	14	22	32	48	75	108		
	MD-14		1	2	3.5	5.5	8	14	22	32	48	75	108		

Size selection method

1. $(Cv)=\frac{(\text{max.flow speified})}{\text{flow/Cv}}$ (Possible flow)=(flow/Cv) (Cv)

2. Correction for gases

(Unit flow for correction)=(Flow/Cv) $\sqrt{\frac{29}{M}}$ M: molecular weight

Product \ Model \ Size	10 (⅜″)	15 (½″)	20 (¾″)	25 (1″)	32 (1¼″)	40 (1½″)	50 (2″)	65 (2½″)	80 (3″)	100 (4″)	125 (5″)	150 (6″)	200 (8″)	250 (10″)
Motor valve	**BM-8S**				45	80	100							
	BM-7S	10	18	40	60	85	120	200						
	BM-1S	2.75	4.2	8.5	15	25	35	63						
	3BM-1S		2.8	7.5	12	18.5	30	45						
	ML-FD					20	30	50	75	105	170	250	360	
	ML-TS/FS		3.6	6.4	10	16	25	40	67	102	160			
Cylinder valve	**COS/CCS-1**	3	4.5	7.5	11	17	23	35	50					
	COF/CCF-1		4.5	7.5	11	17	23	35	50					
	CP-FS		3.6	6.4	10	16	25	40	67	102	160			

Note: 1.The flow/Cv is the flow per Cv under relevant pressure condition.
2.Depending on model, the range of pressure and offset vary.
3.For models not mentioned in the Cv table, see relevant Size Selection Chart and Flow Chart.

■ FLOW PER Cv (Water)

Differential pressure ΔP (MPa)	0.001	0.002	0.003	0.004	0.005	0.006	0.008	0.01	0.02	0.03	0.04	0.05	0.07	0.10
Flow per Cv (m^3/h)	0.0866	0.1225	0.1500	0.1732	0.1937	0.2122	0.2450	0.2739	0.3874	0.4745	0.5479	0.6126	0.7248	0.8663

Differential pressure ΔP (MPa)	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.70	0.80	0.90	1.0	1.1
Flow per Cv (m^3/h)	1.225	1.369	1.500	1.620	1.732	1.837	1.937	2.031	2.122	2.292	2.450	2.599	2.739	2.873

Differential pressure ΔP (MPa)	1.2	1.3	1.4	1.5	1.6	1.8	2.0	2.2	2.3	2.4	2.6	2.8	3.0
Flow per Cv (m^3/h)	3.001	3.123	3.241	3.355	3.465	3.675	3.874	4.063	4.155	4.244	4.417	4.584	4.745

■ Cv VALUE TABLE

Product \ Model \ Size	10 (3/8″)	15 (1/2″)	20 (3/4″)	25 (1″)	32 (1 1/4″)	40 (1 1/2″)	50 (2″)	65 (2 1/2″)	80 (3″)	100 (4″)	125 (5″)	150 (6″)	200 (8″)	250 (10″)	300 (12″)	400 (16″)
Pressure reducing valve	**RD-14**		1	2	3.5	5.5	8	14	22	32	48	75	108				
	RD-17			2	3	5	6	10	15	18	32	50	72				
	RD-17A			1	1.5	2.5	3	5	7.5	9	16	25	36				
	RD-3HA/3HAF		0.8	0.8	1												
Primary pressure regulating valve	**MD-14**		1	2	3.5	5.5	8	14	22	32	48	75	108				
	MD-2P			2	3	5	6	15	23	30	40	50	60				
	MD-1A		3	3	3	10	10	10									

Product \ Model \ Size	10 (3/8″)	15 (1/2″)	20 (3/4″)	25 (1″)	32 (1 1/4″)	40 (1 1/2″)	50 (2″)	65 (2 1/2″)	80 (3″)	100 (4″)	125 (5″)	150 (6″)	200 (8″)	250 (10″)	300 (12″)
Motor valve	**BM-8S**					45	80	100								
	BM-9S		10	20	32											
	BM-7S	10	18	40	60	85	120	200								
	BM-1S	2.75	4.2	8.5	15	25	35	63								
	3BM-1S		2.8	7.5	12	18.5	30	45								
	TBM-8S	6	13	22	34	45	80	100								
	ML-FD					20	30	50	75	105	170	250	360			
	ML-FW					16	25	40	67	102	160					
	ML-TS/FS		3.6	6.4	10	16	25	40	67	102	160					
Cylinder valve	**COS/CCS-1/1H**	3	4.5	7.5	11	17	23	35	50							
	COF/CCF-1/1H		4.5	7.5	11	17	23	35	50							
	CP-FS		3.6	6.4	10	16	25	40	67	102	160					

Size selection method

1. $(Cv) = \frac{(\text{max.flow speified})}{\text{flow/Cv}}$ (Possible flow)=(flow/Cv) (Cv)

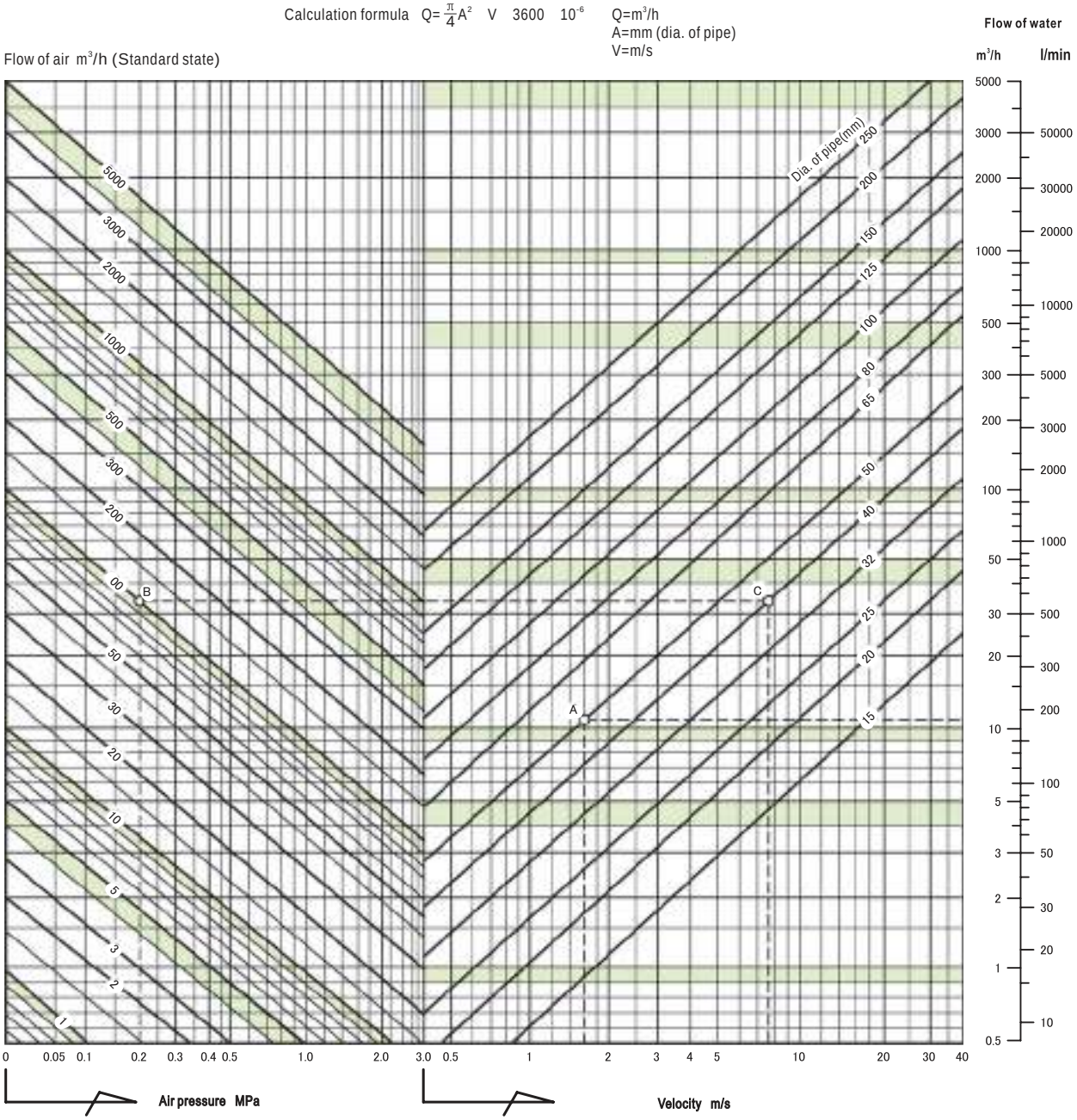
2. Correction using specific gravity (G)
(flow for correction per Cv)=(flow/Cv) $\sqrt{\frac{1}{G}}$

Note: 1.Depending on model, the range of pressure and offset vary.
2.For models not mentioned in the Cv table, see relevant Size Selection Chart and Flow Chart.

Velocity in Pipes (for Water and Air)

WATER/AIR VELOCITY CHART

Calculation formula $Q=\frac{\pi}{4}A^2 \quad V \quad 3600 \quad 10^{-6}$ $Q=m^3/h$
A=mm (dia. of pipe)
V=m/s



HOW TO USE THE CHART

Example 1: Calculate velocity under the following conditions:
Flow of water: 11m³/h
Pipe diameter: 50mm
Trace horizontally along the 11m³/h flow line until it intersects with the line representing 50mm pipe size. The intersection point is named A.
Draw a vertical line from point A to read the velocity, which is 1.6m/s.

Example 2: Calculate velocity under the following conditions:
Flow of air: 100m³/h (standard state)
Pressure: 0.2MPa
Pipe diameter: 40mm
Find the intersection point (B) of 100m³/h flow line and 0.2MPa pressure line.
Trace horizontally from point B until it intersects with 40mm pipe size line. The intersection point is named C. Draw a vertical line from point C and read the velocity, which is 7.5m/s.

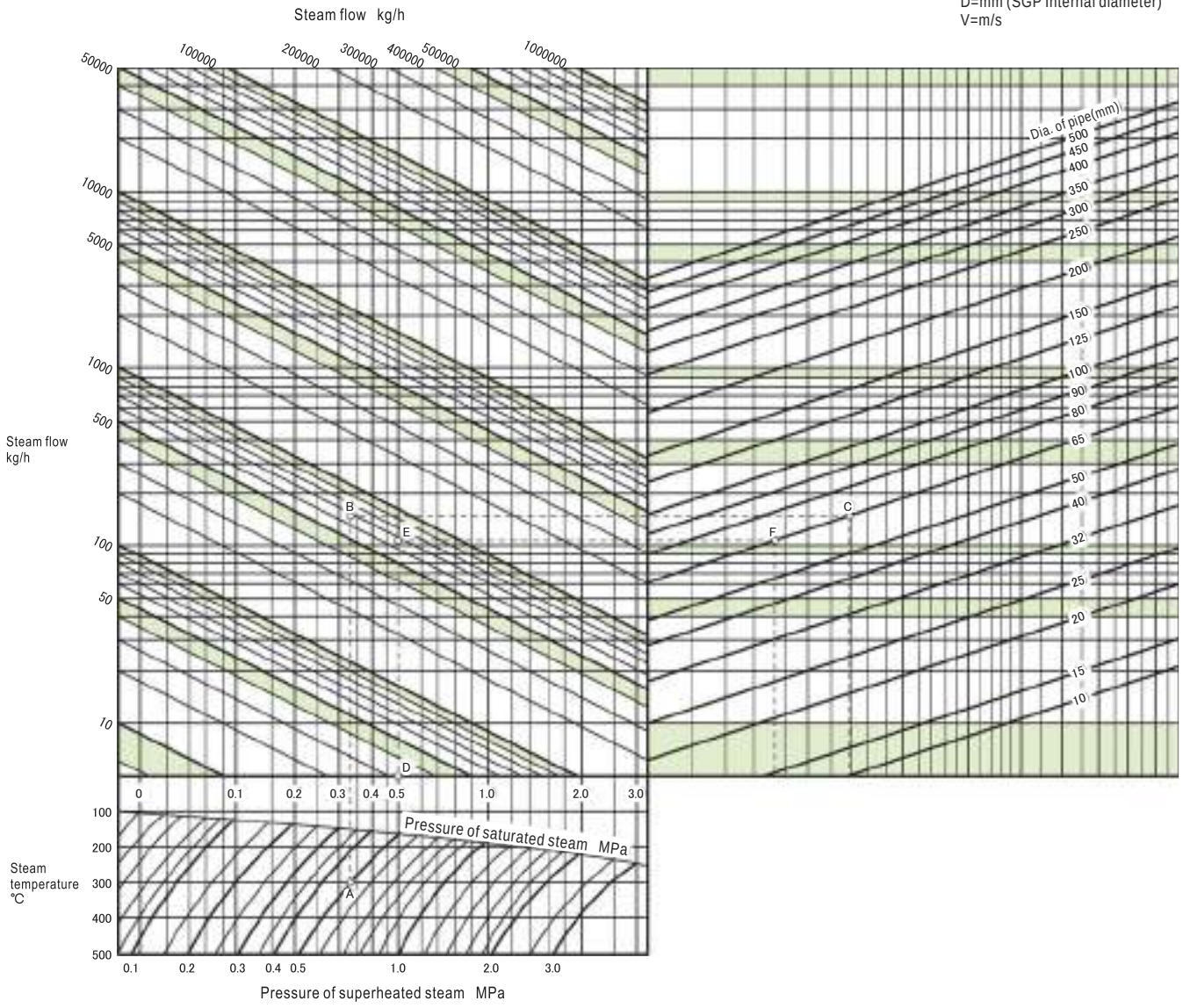
STANDARD VELOCITY

❶ Volute pump	
Suction pipe	2.0~2.5m/s
Lowe pressure discharge pipe	2.5~3.0 m/s
High pressure discharge pipe	3.0~3.5 m/s
❷ Inside liquid transport pipe	
Water etc. with pressure 0.1~1.0MPa	1.5~3 m/s
Water etc. with pressure 20~30MPa	3~4 m/s
Others such as oil, fluid with high viscosity	0.5~2 m/s
❸ Compressor	
Suction pipe	10~20m/s
Lowe pressure discharge pipe	20~30 m/s
High pressure discharge pipe	10~15 m/s
❹ Inside compressed gas transport pipe	
0.1~0.2 MPa	8~15 m/s
20~30MPa	5~7 m/s

Velocity in Pipes (Steam)

WATER/AIR VELOCITY CHART

Calculation formula $Q=\frac{\pi}{4}D^2 \quad V \quad 3600 \quad 10^{-6}$ $Q=m^3/h$
D=mm (SGP Internal diameter)
V=m/s



HOW TO USE THE CHART

Example: Calculate velocity under the following conditions:
Steam pressure: 0.5MPa
Temperature of superheated steam: 300℃
Flow: 700kg/h
Pipe diameter: 65mm

Determine the intersection point (A) of 0.5MPa pressure line and the 300℃ temperature line. Draw a vertical line from point A until it intersects with 700kg/h flow line. The intersection point is named B. Draw a horizontal line from point B until it intersects with the 65mm pipe diameter line. The intersection point is named C. Move from point C vertically to read the velocity, which is 23.7 m/s.

For saturated steam under the same conditions, determine the intersection point (D) on saturated steam line and points E and F, then read the velocity, which is 17.3 m/s.

STANDARD VELOCITY

❶ Steam engine

Saturated steam	20~30m/s
Superheated steam	30~45m/s

❷ Inside steam transport pipe

Saturated steam with pressure 0.2~0.5MPa	15~20m/s
Saturated steam with pressure 0.5~1.5MPa	20~30m/s

Water Head Loss of Pipeline

EQUIVALENT PIPE LENGTH OF JOINT AND VALVE ETC.

Equivalent length of pressure loss of steel pipe with hard PVC lining for water supply(source: Handbook for Air-conditioning and Hygiene Engineering)

Size	Corresponding pipe length (m)							
	90°Elbow	45°Elbow	90°T (Separate flow)	90°T (Straight flow)	Sluice valve	Glove valve	Angle valve Foot valve	Check valve (Swing type)
15(½″)	3.0*1	2.3*1	3.8*1	1.2*1	3.5*2	4.5	2.4	5.5*2
20(¾″)	3.1*1	2.2*1	3.8*1	1.6*1	2.3*2	6.0	3.6	2.7*2
25(1″)	3.2*1	1.8*1	3.3*1	1.2*1	1.7*2	7.5	4.5	2.9*2
32(1¼″)	3.6*1	2.3*1	4.0*1	1.4*1	1.3*2	10.5	5.4	3.2*2
40(1½″)	3.3*1	1.9*1	3.6*1	0.9*1	1.7*2	13.5	6.6	2.6*2
50(2″)	3.3*1	1.9*1	3.5*1	0.9*1	1.9*2	16.5	8.4	3.7*2
65(2½″)	4.4*1	2.4*1	4.4*1	1.1*1	0.48	19.5	10.2	4.6
80(3″)	4.6*1	2.4*1	4.9*1	1.3*1	0.63	24.0	12.0	5.7
100(4″)	4.7*1, 4.2	2.7*1, 2.4	6.6*1, 6.3	1.5*1, 1.2	0.81	37.5	16.5	7.6
125(5″)	5.1	3.0	7.5	1.5	0.99	42.0	21.0	10.0
150(6″)	6.0	3.6	9.0	1.8	1.20	49.5	24.0	12.0
200(8″)	6.5	3.7	14.0	4.0	1.40	70.0	33.0	15.0
250(10″)	8.0	4.2	20.0	5.0	1.70	90.0	43.0	19.0

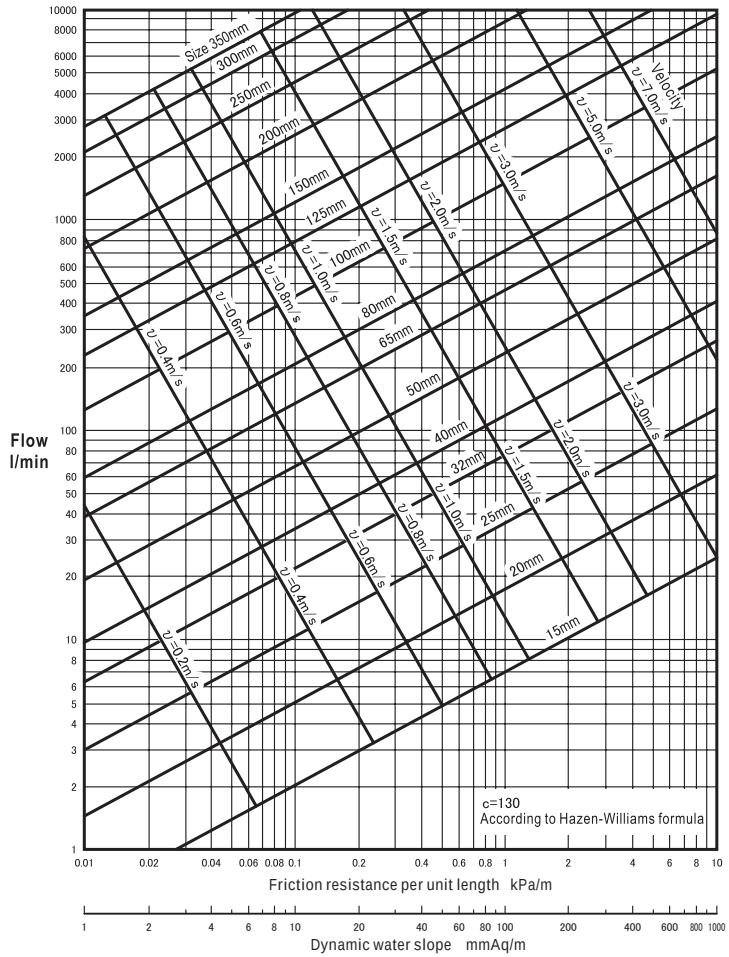
Note: 1. Pipe end corrosion proof type. Data from materials published by Steel Joint Association. Also used as poly powder lining steel pipe.
2. Pipe end corrosion proof type. Data from materials published by makers. Also used as poly powder lining steel pipe.
Data without asterisk mark is for steel pipe.

FRICTION LOSS OF PIPING

Calculation formula (Hazen-Williams formula) $Q=4.87cd^{2.63}R^{0.54}$ 10^3 {$Q=1.67cd^{2.63}i^{0.54}$ 10^4}

Q : Flow (l/min)
c : Flow coefficient (130 for new steel pipe and new cast iron pipe)
d : Internal dia. of pipe (m)
R : Friction resistance per unit length
i : Dynamic water slope

Flow chart for steel pipe with hard PVC lining for water supply
(Source: Handbook for Air-conditioning and Hygiene Engineering)



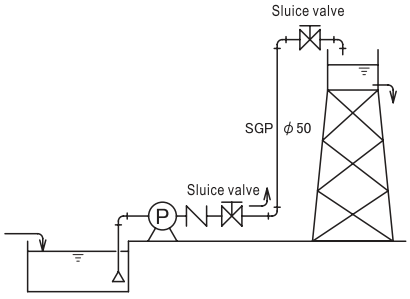
CALCULATION EXAMPLE

To calculate total water head loss and required total head of pump when pumping up water from one tank to other tank (actual head 200kPa (20m)) in size 50mm steel pipe (length 36m) with hard PVC lining and at a pumping speed of 150l/min.

❶ Calculate equivalent pipe length of joins and valves etc.
Foot valve (1): 8.4 1=8.4
Check valve (1): 3.7 1=3.7
Sluice valve (2): 1.9 2=3.8
Elbow (4): 3.3 4=13.2
Total: 29.1m

❷ Converted pipe length:
36+29.1=65.1m

❸ From the chart, the friction resistance at size 50mm, flow 150l/min is 0.40kPa/m
Therefore,
The total head loss is:
65.1 0.40=26.04≈26kPa (2.6m)
The required head of pump is:
200+26=226kPa (20+2.6=22.6m)



Drain Accumulated in Steam Pipeline

Tab.1 Drain generated at initial flow and of bare pipe

Upper: initial flow kg/m
Lower: bare pipe kg/mh

Dia. of pipe / Pressure(MPa)	15 (½″)	20 (¾″)	25 (1″)	32 (1¼″)	40 (1½″)	50 (2″)	65 (2½″)	80 (3″)	100 (4″)	125 (5″)	150 (6″)	200 (8″)	250 (10″)	300 (12″)
0.05	0.04	0.05	0.07	0.09	0.10	0.14	0.23	0.28	0.39	0.53	0.68	1.03	1.45	1.91
(111.6℃)	0.09	0.11	0.13	0.16	0.19	0.23	0.29	0.34	0.43	0.52	0.62	0.81	1.00	1.20
0.1	0.04	0.05	0.07	0.10	0.11	0.15	0.25	0.31	0.43	0.58	0.74	1.12	1.58	2.08
(120.4℃)	0.10	0.12	0.15	0.19	0.21	0.26	0.33	0.38	0.49	0.60	0.70	0.92	1.14	1.35
0.2	0.04	0.06	0.08	0.11	0.13	0.17	0.28	0.34	0.49	0.66	0.84	1.27	1.78	2.36
(133.7℃)	0.12	0.14	0.18	0.22	0.25	0.31	0.39	0.46	0.59	0.72	0.85	1.11	1.37	1.63
0.3	0.05	0.06	0.09	0.12	0.14	0.18	0.30	0.37	0.53	0.71	0.91	1.38	1.94	2.57
(143.7℃)	0.13	0.16	0.20	0.25	0.29	0.36	0.45	0.53	0.67	0.82	0.97	1.27	1.57	1.87
0.4	0.05	0.07	0.09	0.13	0.15	0.20	0.32	0.40	0.57	0.76	0.97	1.48	2.08	2.75
(151.9℃)	0.15	0.18	0.23	0.28	0.32	0.40	0.50	0.58	0.75	0.91	1.08	1.41	1.74	2.08
0.5	0.05	0.07	0.10	0.13	0.16	0.21	0.34	0.42	0.60	0.81	1.03	1.56	2.20	2.90
(158.9℃)	0.16	0.20	0.25	0.31	0.35	0.44	0.55	0.64	0.82	1.00	1.18	1.54	1.91	2.27
0.6	0.06	0.07	0.10	0.14	0.16	0.22	0.36	0.44	0.63	0.85	1.08	1.64	2.30	3.04
(165℃)	0.17	0.21	0.27	0.33	0.38	0.47	0.59	0.69	0.88	1.08	1.27	1.66	2.06	2.45
0.7	0.06	0.07	0.11	0.14	0.17	0.22	0.37	0.46	0.65	0.88	1.12	1.69	2.38	3.14
(170.5℃)	0.18	0.23	0.28	0.35	0.40	0.50	0.63	0.73	0.93	1.14	1.35	1.76	2.18	2.59
0.8	0.06	0.08	0.11	0.15	0.18	0.23	0.39	0.48	0.68	0.92	1.17	1.77	2.49	3.29
(175.4℃)	0.19	0.24	0.30	0.38	0.43	0.53	0.67	0.78	1.00	1.22	1.44	1.89	2.33	2.78
0.9	0.06	0.08	0.12	0.16	0.18	0.24	0.40	0.50	0.70	0.95	1.21	1.83	2.57	3.40
(179.9℃)	0.20	0.25	0.32	0.40	0.45	0.56	0.71	0.82	1.06	1.29	1.52	1.99	2.46	2.93
1.0	0.06	0.08	0.12	0.16	0.19	0.25	0.41	0.51	0.72	0.98	1.24	1.89	2.65	3.51
(184.1℃)	0.21	0.27	0.33	0.42	0.47	0.59	0.74	0.87	1.11	1.36	1.60	2.09	2.59	3.08
1.5	0.07	0.09	0.14	0.18	0.21	0.28	0.47	0.58	0.81	1.10	1.41	2.13	3.00	3.97
(201.4℃)	0.26	0.33	0.41	0.51	0.58	0.72	0.91	1.06	1.36	1.66	1.96	2.56	3.17	3.77
2.0	0.08	0.10	0.15	0.20	0.23	0.31	0.51	0.63	0.89	1.21	1.54	2.34	3.29	4.35
(214.8℃)	0.30	0.38	0.47	0.59	0.67	0.84	1.06	1.23	1.58	1.93	2.28	2.98	3.69	4.39
3.0	0.09	0.12	0.17	0.23	0.27	0.35	0.59	0.73	1.03	1.40	1.78	2.70	3.80	5.02
(235.6℃)	0.38	0.48	0.60	0.75	0.85	1.06	1.33	1.56	2.00	2.44	2.88	3.77	4.66	5.55

STPG Sch #40 Ambient Temperature 0℃
Thermo insulation: JIS A 9501-1995 Standards for Thermo Insulation Works
(Thermo insulating material: Glass wool tube)

Tab.2 Drain generated in insulated pipe

Temp. (℃)	Dia. of pipe	15 (½″)	20 (¾″)	25 (1″)	32 (1¼″)	40 (1½″)	50 (2″)	65 (2½″)	80 (3″)	100 (4″)	125 (5″)	150 (6″)	200 (8″)	250 (10″)	300 (12″)
100	**mm**	25	25	25	30	30	35	35	35	40	40	40	45	45	45
	kg/mh	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.06	0.07	0.08	0.09	0.11	0.12
150	**mm**	30	30	35	35	40	40	45	45	50	50	55	55	60	60
	kg/mh	0.05	0.05	0.06	0.06	0.07	0.07	0.08	0.09	0.10	0.11	0.12	0.15	0.16	0.19
200	**mm**	35	40	40	45	45	50	55	55	60	65	65	70	70	75
	kg/mh	0.07	0.08	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.16	0.18	0.22	0.25	0.27
250	**mm**	40	40	45	50	50	55	60	65	70	70	75	80	80	85
	kg/mh	0.11	0.12	0.13	0.14	0.15	0.16	0.18	0.19	0.21	0.24	0.26	0.31	0.36	0.40
300	**mm**	45	50	55	60	60	65	70	75	75	80	85	90	95	95
	kg/mh	0.17	0.18	0.20	0.21	0.23	0.25	0.27	0.29	0.34	0.37	0.40	0.47	0.53	0.61

Calculation formula: $\text{Amount of drain(kg/h)} = \frac{\text{(Diffused calorific value,W/m)} \quad \text{3.6kJ/h}}{\text{Latent heat(kJ/h)}}$, where 1W=3.6kJ/h

Reference: In the case drain is discharged using steam trap, select type and number of steam traps satisfying the following condition:
Amount of drain discharged from trap (kg/h)>amount of drain generated (kg/m) Length of pipe (m) (60/discharge time (min)) Safety factor (about 3)

Carbon Steel Pipes for Ordinary Piping and Pressure Service

JIS G3452 and JIS G3454 provide the following requirements for carbon steel pipe for piping purpose.
Use carbon steel pipe for piping (SGP) for relatively low pressure steam, water, oil, gas, and air. Use carbon steel pipe for pressure piping (STPG) for applications with temperature lower than 350℃.

Size		External diameter (mm)	Carbon steel pipe for piping (SGP) JIS G 3452		Carbon steel pipe for pressure piping (STPG) JIS G 3454					
					Nominal thickness					
					Schedule 40		Schedule 60		Schedule 80	
(A)	(B)		Thickness (mm)	Unit mass excluding socket (kg/m)	Thickness (mm)	Unit mass (kg/m)	Thickness (mm)	Unit mass (kg/m)	Thickness (mm)	Unit mass (kg/m)
6	1/8″	10.5	2.0	0.419	1.7	0.369	2.2	0.450	2.4	0.479
8	1/4″	13.8	2.3	0.652	2.2	0.629	2.4	0.675	3.0	0.799
10	3/8″	17.3	2.3	0.851	2.3	0.851	2.8	1.00	3.2	1.11
15	1/2″	21.7	2.8	1.31	2.8	1.31	3.2	1.46	3.7	1.64
20	3/4″	27.2	2.8	1.68	2.9	1.74	3.4	2.00	3.9	2.24
25	1″	34.0	3.2	2.43	3.4	2.57	3.9	2.89	4.5	3.27
32	1 1/4″	42.7	3.5	3.38	3.6	3.47	4.5	4.24	4.9	4.57
40	1 1/2″	48.6	3.5	3.89	3.7	4.10	4.5	4.89	5.1	5.47
50	2″	60.5	3.8	5.31	3.9	5.44	4.9	6.72	5.5	7.46
65	2 1/2″	76.3	4.2	7.47	5.2	9.12	6.0	10.4	7.0	12.0
80	3″	89.1	4.2	8.79	5.5	11.3	6.6	13.4	7.6	15.3
90	3 1/2″	101.6	4.2	10.1	5.7	13.5	7.0	16.3	8.1	18.7
100	4″	114.3	4.5	12.2	6.0	16.0	7.1	18.8	8.6	22.4
125	5″	139.8	4.5	15.0	6.6	21.7	8.1	26.3	9.5	30.5
150	6″	165.2	5.0	19.8	7.1	27.1	9.3	35.8	11.0	41.8
200	8″	216.3	5.8	30.1	8.2	42.1	10.3	52.3	12.7	63.8
250	10″	267.4	6.6	42.4	9.3	59.2	12.7	79.8	15.1	93.9
300	12″	318.5	6.9	53.0	10.3	78.3	14.3	107	17.4	129
350	14″	355.6	7.9	67.7	11.1	94.3	15.1	127	19.0	158
400	16″	406.4	7.9	77.6	12.7	123	16.7	160	21.4	203

Pressure for hydraulic test (for carbon steel pipe for pressure piping) (MPa)

Schedule No. Sch	10	20	30	40	60	80
Hydraulic test	2.0	3.5	5.0	6.0	9.0	12

Anti-Corrosion Material List

The following table is used for selecting valve material. Please consider conditions of application when selecting valve material.
Rank of corrosion resistance:
A: Excellent B: Good C: Normal (lack of corrosion resistance) D: Bad

Fluid	Stainless 304	Stainless 316	Copper	Bronze	Cast iron and Steel	Neo-plane	NBR	Viton	Teflon
Acethylene	A	A	D	B	A	C	A	A	A
Acetone	B	B	A	A	B	C	D	D	A
Aniline 3%	A	A	B	C	B	C	D	C	A
Amine	A	A	B	A	A	D	—	D	A
Benzoic acid	B	B	B	B	D	D	D	A	A
Ammonia (dense)	A	A	D	D	B	C	D	D	A
Ether	A	A	A	B	A	C	C	A	A
Ethyl alcohol	B	B	B	B	B	A	A	A	A
Ethylene glycol	A	A	B	B	A	A	A	A	A
Zinc chloride 5%	C	B	D	D	D	C	C	A	A
Aluminum chloride	D	C	D	B	D	B	B	A	A
Ammonia chloride	C	C	D	D	C	A	D	A	A
Sulfur chloride	C	B	D	—	D	B	B	—	A
Kalium chloride 1~5%	C	B	C	—	D	A	A	A	A
Calcium chloride	C	C	D	B	C	A	A	A	A
Argentic chloride	D	D	—	—	C	D	—	—	—
Hydrogen chloride (dry)	C	B	D	—	C	C	—	—	—
Hydrogen chloride (wet)	D	C	D	—	D	D	—	—	—
Iron chloride 1%	D	C	D	—	C	D	A	A	A
Iron chloride 5%	D	D	D	—	A	D	A	A	A
Sodium chloride 5%	B	B	B	B	C	A	A	A	A
Sodium chloride 20%	B	B	B	B	C	A	A	A	A
Nickel chloride	C	B	D	D	D	A	A	—	A
Barium chloride 5%	B	B	C	B	C	A	A	A	A
Benzene chloride	A	A	A	—	A	—	—	—	—
Magnesium chloride 5%	B	B	C	B	D	A	A	A	A
Chloromethane gas	B	B	B	—	D	C	C	—	A
Hydrochloric acid	D	D	D	—	D	C	B	—	A
Hydrochloric acid 1%	D	C	D	D	D	B	A	—	A
Hydrochloric acid 5%	D	D	D	—	D	—	—	—	—
Chlorine gas (dry)	D	C	C	C	B	B	B	B	A
Chlorine gas (wet, 100°C)	D	D	D	—	D	C	C	—	A
Chloric acid	D	D	D	—	D	—	—	—	A
Potassium chlorate	B	B	B	B	B	A	A	A	A
Sodium chlorate 10%	B	B	—	B	—	B	A	A	A
Chlorine water	D	C	D	—	D	—	—	—	A
Sea water	B	B	C	B	D	B	A	A	A
Hydrogen peroxide	A	A	C	D	D	D	D	—	A
Potassium permanganate 5%	A	A	A	B	B	B	A	A	A
Gasoline (rough)	A	A	D	B	C	D	C	A	A
Gasoline (refined)	A	A	A	A	A	D	B	A	A
Citric acid	A	A	C	—	D	A	B	—	A

Fluid	Stainless 304	Stainless 316	Copper	Bronze	Cast iron and Steel	Neo-plane	NBR	Viton	Teflon
Creosote (hot)	B	B	C	B	B	B	A	A	A
Chromic acid 5%	C	C	C	—	B	D	D	C	A
Glycerin	A	A	B	B	A	A	A	A	A
Sodium silicate	B	B	B	B	B	A	A	A	A
Acetic acid 5~10%	A	A	D	D	D	D	D	D	A
Acetic acid 20%	A	A	D	D	D	D	D	D	A
Acetic acid 50%	A	A	D	D	D	D	D	D	A
Acetic acid 80%	A	A	D	D	D	D	D	D	A
Allyl acetate	B	B	C	C	B	D	D	—	A
Lead acetate	B	B	—	C	D	A	A	A	A
Sodium acetate (wet)	B	B	B	B	C	B	B	A	A
Butyl acetate	B	B	—	—	D	D	—	—	A
Salicylic acid	B	B	D	C	B	A	A	A	A
Oxygen (cold)	A	A	—	A	B	A	C	A	A
Sodium tripolyphosphate	B	B	D	—	D	—	—	—	—
Kalium cyanide	B	B	D	D	B	A	A	A	A
Sodium cyanide	B	B	D	D	B	A	A	A	A
Carbon tetrachloride (boiled)	C	B	C	D	C	—	—	—	—
Silver bromide	C	B	—	—	D	—	—	—	—
Bromine	D	D	D	B	D	C	C	B	A
Potassium bromate	C	B	B	—	D	—	—	—	—
Tartaric acid 10%	A	A	C	A	D	C	C	A	A
Nitric acid 1%	A	A	D	D	D	—	—	—	—
Nitric acid 5%	A	A	D	D	D	B	C	A	A
Nitric acid 20%	A	A	D	D	D	C	C	A	A
Nitric acid 50%	A	A	D	D	D	D	D	B	A
Nitric acid 85%	B	B	D	D	B	D	D	B	A
Potassium nitrate	B	B	B	B	B	B	A	A	A
Silver nitrate	B	B	—	D	D	C	C	A	A
Sodium nitrate	B	B	B	B	B	C	C	A	A
Potassium hypochlorite	D	C	D	—	D	—	—	—	—
Calcium hypochlorite	C	C	D	—	D	C	C	—	A
Sodium hypochlorite 5%	D	C	D	D	D	C	C	A	A
Sodium hyposulfite	B	B	D	—	D	—	—	—	—
Sodium bicarbonate	B	B	B	B	C	B	A	A	A
Vinegar	A	A	C	B	D	D	D	D	A
Mercury 50°C	C	C	C	D	B	A	A	A	A
Potassium hydrate 5%	B	B	D	D	B	C	C	A	A
Calcium hydrate 5%	B	B	C	A	B	A	A	A	A
Sodium hydrate 5%	B	B	C	A	B	C	C	C	A
Magnesium hydrate	B	B	B	—	B	A	A	—	A
Hydrocyanic acid	B	B	D	D	C	B	—	—	A

Anti-corrosion Materials List/Materials for Critical Parts

Anti-corrosion Materials List/Materials for Critical Parts

Fluid	Stainless 304	Stainless 316	Copper	Bronze	Cast iron and Steel	Neo-plane	NBR	Viton	Teflon
Carbonic acid	B	B	C	D	D	A	A	A	A
Ammonium carbonate	B	B	C	B	B	B	D	B	A
Potassium carbonate	B	B	B	C	B	B	A	A	A
Calcium carbonate	B	B	B	C	B	A	A	A	A
Sodium carbonate 5%	B	B	B	B	B	A	A	A	A
Magnesium carbonate	B	B	—	—	—	—	—	—	—
Dowtherm A (hot)	A	A	D	A	A	D	D	—	A
Turpentine	B	B	B	B	A	B	B	A	A
Kerosene	A	A	A	A	A	B	A	A	A
Naphtha	B	B	B	—	B	—	—	—	—
Sulfur dioxide (wet)	C	B	D	—	D	—	—	—	—
Lactic acid 5%	B	A	D	D	D	C	C	—	A
Lactic acid 10%	B	A	D	D	D	C	C	—	—
Calcium bisulfide	C	B	D	—	D	—	—	—	A
Carbon bisulfide	B	B	D	C	B	B	C	A	A
Picric acid	B	B	D	A	B	C	C	B	A
Hydrogen fluoride (dense)	B	B	D	B	C	A	A	—	A
Sodium fluoride 5%	D	D	D	—	D	D	D	A	A
Fluoric acid	B	B	B	C	—	A	A	—	A
Freon (dry)	B	B	C	D	D	C	—	C	—
Freon (wet)	A	A	A	B	B	B	B	—	A
	C	C	B	—	C	—	—	—	—

Fluid	Stainless 304	Stainless 316	Copper	Bronze	Cast iron and Steel	Neo-plane	NBR	Viton	Teflon
Butane	B	B	—	A	B	B	B	A	A
Propane	B	B	—	A	B	B	A	A	A
Benzene (benzenol)	B	B	B	B	B	D	D	B	A
Alum	B	B	D	C	D	A	A	A	A
Methyl alcohol	B	B	B	B	B	A	A	D	A
Lacquer (hot)	B	B	B	A	D	D	D	A	A
Sulfuric acid 1%	D	D	D	C	D	A	B	A	A
Sulfuric acid 5%	D	D	C	C	D	A	B	A	A
Zinc sulfate 5%	B	B	B	B	C	A	A	A	A
Aluminum sulphate	C	B	D	C	D	A	A	A	A
Ammonia sulfate	C	B	D	B	C	A	A	A	A
Potassium sulfate 1~5%	B	B	B	—	B	A	A	—	A
Calcium sulfate	B	B	B	C	B	A	A	A	A
Copper sulfate 5%	B	B	D	D	D	A	A	A	A
Sodium sulfate	B	B	C	B	D	A	A	A	A
Nickel sulfate (hot)	C	B	D	—	D	A	A	—	A
Barium sulfate	B	B	B	C	B	A	A	A	A
Manganese sulfate	B	B	B	—	B	A	A	—	A
Phosphoric acid 1%	B	B	B	C	C	C	C	A	A
Phosphoric acid 5%	B	B	C	D	D	A	B	A	A
Varnish	A	A	B	A	C	A	C	—	A

Materials for Critical Parts

Material	Abbreviation	Example	Parts	Characteristics
Grey cast iron	FC	FC200	Body	The name comes from the grey-colored sectional plane. Applicable for 10K and temperature lower than 230℃.
Spherical graphite cast iron	FCD	FCD450	Body	With spherical graphite, with higher strength and heat resistance than grey cast iron.
Cast iron for high temperature and high pressure	SCPH	SCPH2	Body	For high temperature and high pressure. With high strength and heat resistance.
Carbon steel/forged iron	SF	SF440A	Body	Dense structure, high strength and heat resistance.
Stainless steel/cast steel	SCS	SCS13	Body, Critical parts	Resistant to stain and corrosion. High corrosion resistance, strength, and heat resistance. Ni: 8.0~11.0%, Cr: 18.0~21.0%, C: <0.8%
Stainless steel (Bar, Strip)	SUS	SUS304	Critical parts	Anti-corrosion, high strength, heat resistant. Ni: 8.0~11.0%, Cr: 18.0~20.0%, C:<0.08%
	CAC400	SUS316L	Bellows	Ideal for making bellows. Ni: 12.0~15.0%, Cr: 16.0~18.0%, Mo: 2.0~3.0%, C:<0.03%
Cast bronze	CAC500	CAC406	Body, Critical parts	Also called “gun metal”. Has long been used as material for making valve cock. Highly corrosion resistant and pressure proof. Cu: 83.0~87.05, Sn: 4.0~6.0%, Zn: 4.0~6.0%, Pb: 4.0~6.0%
Phosphor bronze cast		CAC502	Critical parts	Corrosion resistant, durable. Cu: 87.0~91.0%, Sn: 9.0~12.0%, P: 0.05~0.2%
Phosphor bronze plate		C5212P	Bellows	Ductible, durable, corrosion resistant. Sn: 7.0~0.9%, P: 0.03~0.35%, Cu+Sn+P: >99.5%
Copper for forging		C3771	Body	Corrosion resistant, pressure proof. Cu: 57.0~61.0%, Pb: 1.8~3.7%, Fe: <0.5, Fe+Sn: 1.2%, remnant: Zn
Free-cutting copper		C3604	Critical parts	Good cutability, wearing resistant. Cu: 57.0~61.0%, Pb: 1.8~3.7%, Fe: <0.5, Fe+Sn: 1.2%, remnant: Zn
Chloroprene rubber (Synthesized rubber)	CR	——	Disc, etc.	A product of Showa Neoplane.
Nitrile rubber (Synthesized rubber)	NBR	——	Disc, etc.	Nitrile rubber is its general name.
Fluorine-contained rubber (Synthesized rubber)	FKM	——	Disc, etc.	A product of DuPont.
Polytetrafluoroethylene (Synthesized resin)	PTFE	——	Disc, etc.	A product of DuPont.
Remark	Critical parts: disc, seat, etc. main parts of valve. Fe (iron: main ingredient of cast iron and cast steel), C(carbon), Ni (Nickle), Cr (chromium), Mo (molybdenum), Cu (copper), Sn (tin), Zn (zink), Pb (plumbum), P (phosphor)			

Code Name

■ ABOUT NEW CODE NAME

We have been using combinations of alphabets and numbers as the model names of our products. To differentiate products with the same model name but are made of different materials, we have introduced 3-digit specification code to demonstrate material and important specifications. However, this code was proved not effective enough for differentiation purpose. This is why we have introduced a new code name system recently.

This new product code system is developed to comply with the recent trend of computerized coding system. According to this system, each product is expressed using a 31-digit code.

The first 17 digits of the code are called the product code, which demonstrates model, material, and important specifications. The other digits include size code and selection code for options (there are blank digits in the code).

Using product code, it is possible to differentiate most products that are made of different materials and with different specifications.
Please use product when ordering products.

■ ABOUT NEW CODE NAME

The new product code includes the following:

(For example) RP6-B	Model classification	Model No.	Hyphen	Spec. Code
	RP	6	—	B

The Model Classification and Model No. are basically the same as those in the old coding system.
The Spec. Code includes material, structure, shape, spring type, fluid, set value, inventory mark etc.
Examples: pressure reducing valve (material, spring type etc.), safety valve (shape, material, spring type etc.), temperature regulating valve (material, fluid for heating etc.), solenoid valve (material, action etc.)

Digits of product code: Maximum 17 digits. In the case the number of digits is less than 17, it will be truncated.

Material code: 1 alphabet in product code.

Material code	Body material	Material for critical parts	Valve disc material
F	CAC	CAC	
J	CAC	SUS	
W	CAC	SUS	PTFE
B	FC	CAC	
R	FC	CAC	PTFE
H	FC	CAC	
G	FC	SUS	
S	FC	SUS	PTFE
L	FCD	CAC	
M	FCD	SUS	
C	SCPH	SUS	

Material code	Body material	Material for critical parts	Valve disc material
T	SCPH	SUS	PTFE
D	SCS13	SUS	
V	SCS13	SUS	PTFE
K	SCS14	SUS316	
E	SCS14	SUS316	PTFE
N		SUS	
P			
A			
X			
Q			

FC: Cast iron, FCD: Ductile cast iron, SCPH: Cast steel /Carbon steel, Mild steel: other carbon steel
SUS: stainless steel, SCS13/SCS14: stainless cast steel, CAC: cast bronze, PTFC: polytetrafluoroethylene (Teflon)

※ 1.Exceptions can be seen in some products.
※ 2.The code for "material of body + critical parts" also include material of other group.

History of VENN

CORPORATE HISTORY

Nov.1950
Established Fushinan Valve Seisakusho in Iwate-Pref. ro start production and sales of Automatic Control Valves to use for Steam, Air, Water and etc.

Aug. 1952
Established Tokyo Testing Works in Yaguchi, Tokyo.

Aug. 1958
Authorized by JIS to indicate the certificate No.JIS B8402

Dec.1960
Established Fuji Denso Works for production of Solenoid Valves.

May.1963
Corporate name changed to K.K.Fushiman Valve.

Jun.1970
Corporate name changed to Venn Co.,Ltd.

Apr.1973
Established Technical Center in Yokohama.

Jun.1980
Authorized by JIS to indicate the certificate No.JIS B8410.

Apr.1983
Authorized by JIS to indicate the certificate No.JIS B8414.

Apr.1990
Represented sales of German IWK and French COMAP products.

Oct.1990
Technical Center moved to Iwaki, Fukushima, and re-named as ITC(Iwaki Technical Center)

Feb.1996
Increased the capital to 384 mil.yen.

Apr.1997
Merged Fuji Denso Works, and increased the capital to 449 mil.yen.

Oct.1999
Iwate Works acquired the certificate of ISO 9001.

Apr. 2003
Represented sales of STUDOR products(Air admittance valves).

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