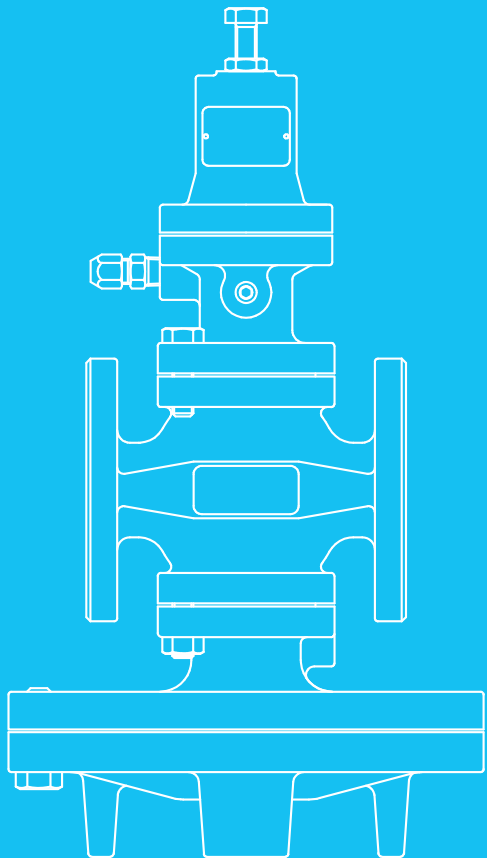


Primary Pressure Regulating Valve  
Pressure Sustaining Valve  
Differential Pressure Regulating Valve

---

# 10



---

## Step 0 Type/Structure/Features

Please refer to this for type, structure and features of each products.

## Step 1 Selection

Search the suitable product from ID-chart by application. Details are on the products page.

## Step 2 Sizing

Check the required Cv value from size selection data on P.10-7, or size selection chart on the product page of each products.

\* Please also check the sizing of P.10-8 for the water fall prevention valve.

## Step 3 Attentions for usage

Please check some guidelines for optimal usage of each products.

## Selection of Primary Pressure Regulating Valve, Pressure Sustaining Valve, and Differential Pressure Regulating Valve

### Primary pressure regulating valve

A primary pressure regulating valve is designed to discharge the fluid according to a variation in primary pressure and thus keep the pressure inside at a constant level.

#### · Applications

To keep the pressure inside of piping constant against the variation in the load applied by air conditioning equipment, heat exchanger, and etc.

### Pressure sustaining valve

A pressure sustaining valve sustains water pressure inside return piping when the pump is not in operation.

#### · Applications

To sustain water pressure in an open circuit of air conditioning equipment in a mid-rise or high-rise building, etc., and to sustain the inside of piping from being a vacuum condition due to a siphon phenomenon.

### Differential pressure regulating valve

A differential pressure regulating valve keeps the pressure difference between the inlet pressure and the outlet pressure constant.

#### · Applications

To regulate the differential pressure between supply and return pipings of a closed circuit in a mid-rise or high-rise building, etc.



GPR-2000



GD-20R



GD-21

## Features of Primary Pressure Regulating Valve &lt;GD-20R&gt;

Step

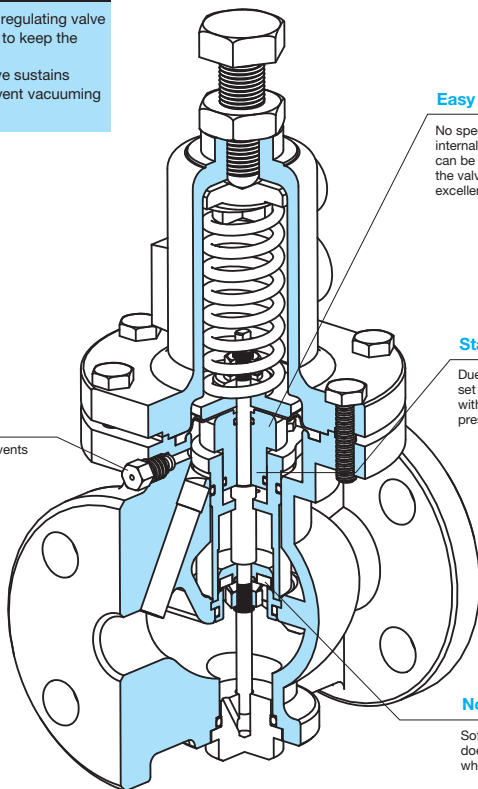
0

## Application

- Install Primary pressure regulating valve at by-pass line, in order to keep the pump pressure stable.
- Pressure sustaining valve sustains water pressure and prevent vacuuming inside the piping.

## Measure against air problems

Manual air vent function prevents air problems.



## Easy maintenance

No special tool is required to replace internal parts. All of the internal parts can be removed from the top of the valve, providing the valve with excellent maintainability.

## Stable operation

Due to a balance structure, the set pressure remains stable without being affected by back pressure.

## No leakage!

Soft seal used for the valve disc does not allow leakage to occur when the valve is closed.



- Adjustable sensitivity  
From 65A~150A a needle valve in the sensing pipe, enabling sensitivity adjustment during operation.
- Pipes can be installed either horizontally or vertically (Horizontal piping only for over 100A).
- Stainless body is available (15-100A).

Direct acting type Primary Pressure Regulating Valve -GD-47R-

Step

0

**Application**

It can be used for protection of waste heat boiler (prevention of pressure drop) and control of exhaust steam volume.

**Quick response**

The response is excellent because the pressure sensing part (bellows) and the valve are direct-acting, which operate directly.

**High performance bellows adopted**

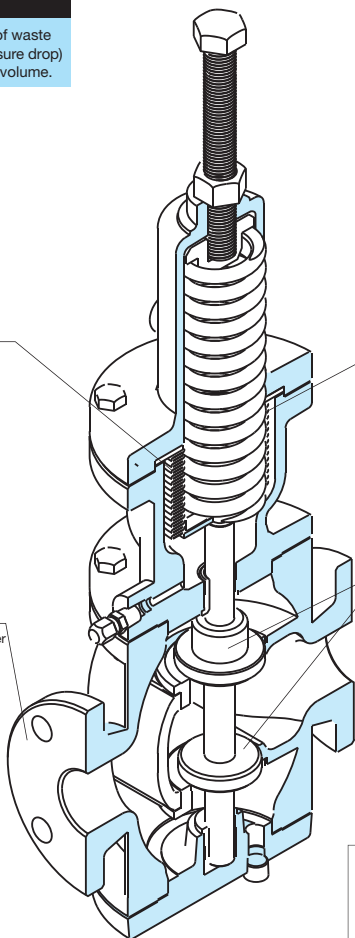
External pressure stainless steel bellows with excellent durability and corrosion resistance are used.

**Precise operation**

By adopting a double valve structure, the operation is not affected by the pressure or absence of back pressure (outlet pressure), allowing a large flow rate.

**Safety**











The body is made of FCD with higher strength to improve safety.



10

Primary Pressure Regulating Valve/Pressure Sustaining Valve/Differential Pressure Regulating Valve

## Primary Pressure Regulating Valve / Pressure Sustaining Valve / Differential Pressure Regulating Valve ID-Charts

	Model	Type	Fluid	Material	Pressure regulating range (MPa)	Fluid temperature (°C)	Connection	Size	Feature	Page
	GPR-2000	Pilot type	Steam	FCD450	0.02-1.4	220°C or less	JIS Rc	15-50A	·High accuracy control ·Primary pressure regulating valve	10-11
					0.02-1.0		JIS 10KFF	15-100A		
					0.02-1.4		JIS 20KRF			
	GD-47R	Direct acting type	Steam	FCD450	0.2-0.9	220°C or less	JIS 10KFF	50A	·For waste heat boiler ·Primary pressure regulating valve	10-14
	GD-20R	Direct acting type	Cold and hot water, Oil, Air	FCD450	0.05-0.7 (0.05-0.5 for 100-150A)	5-80°C	JIS 10KFF	15-150A	·Primary pressure regulating valve ·Pressure sustaining valve	10-16
	GD-20RC							15-150A	·Nylon coating ·Primary pressure regulating valve ·Pressure sustaining valve	10-16
	GD-21	Direct acting type	Cold and hot water	FCD450	0.05-0.7 (0.05-0.5 for 100-150A)	5-80°C	JIS 10KFF	15-150A	·Differential pressure regulating valve	10-17
	GD-4R	Direct acting type	Air	FC200	0.002-0.2	5-80°C	JIS 10KFF	20-150A	·Primary pressure regulating valve ·For slight pressure	10-20
	GD-7R	Direct acting type	Cold and hot water, Oil	FC200	0.05-0.7	5-80°C	JIS 10KFF	20-150A	·Primary pressure regulating valve	10-22
	GP-50R	Pilot type	Cold and hot water	FC200	0.1-0.7	0-70°C	JIS 10KRF	125-300A	·Primary pressure regulating valve ·Large flow capacity	10-24
	GP-50S							125-300A	·Pressure sustaining valve ·Large flow capacity	10-25
	GP-50RD							125-300A	·Differential pressure regulating valve ·Large flow capacity	10-26

Please contact us other than the above fluids.

## Nominal Size Selection for Primary Pressure Regulating Valve

Step  
2

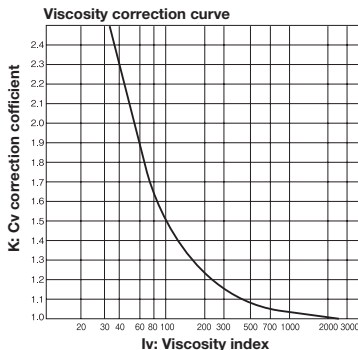
### ■ Calculation formula for Cv value

- (1) For steam  
 When  $P_2 > \frac{P_1}{2}$   $Cv = \frac{Wk}{138 \sqrt{\Delta P(P_1 + P_2)}}$   
 When  $P_2 \leq \frac{P_1}{2}$   $Cv = \frac{Wk}{120P_1}$
- (2) For gas  
 When  $P_2 > \frac{P_1}{2}$   $Cv = \frac{Q}{2940} \frac{\sqrt{(273+t)G}}{\sqrt{\Delta P(P_1 + P_2)}}$   
 When  $P_2 \leq \frac{P_1}{2}$   $Cv = \frac{Q \sqrt{(273+t)G}}{2550P_1}$
- (3) For liquid  
 $Cv = \frac{0.365V \sqrt{G}}{\sqrt{\Delta P}}$

W : Max. steam flow rate [kg/h]  
 P<sub>1</sub> : Inlet pressure [MPa·A]  
 P<sub>2</sub> : Outlet pressure [MPa·A]  
 ΔP : P<sub>1</sub> - P<sub>2</sub> [MPa]  
 k : 1 + 0.0013 x {superheated steam temperature [°C] - saturated steam temperature [°C]}  
 Q : Max. gas flow rate [m<sup>3</sup>/h (standard condition)]  
 G : Specific gravity (relative to air for gas, or relative to water for liquid)  
 t : Fluid temperature [°C]  
 V : Max. liquid flow rate [m<sup>3</sup>/h]  
 Cv : Cv value of each nominal size  
 Iv : Viscosity index  
 Mcst : Viscosity [cSt]

### ■ Formula for correction of viscosity

$$Iv = \frac{72780}{Mcst} \left( \frac{\Delta P}{G} \right)^{\frac{1}{4}} \sqrt{v}$$



### ■ Cv value table

Model \ Nominal size	15A	20A	25A	32A	40A	50A	65A	80A	100A	125A	150A	200A	250A	300A
GPR-2000 screwed	5.0	7.2	10.9	14.3	18.8	32								
GPR-2000 flanged	5.0	7.2	10.9	14.3	18.8	32	54	70	108					
GD-47R						36								
GD-4R		2	3	4	5	8	21	27	42	72	94			
GD-7R		2	3	6	8	15	23	30	40	50	60			
GD-20R, 21	1.5	2.7	4	8.5	11	14	23	32.5	48	75	108			
GP-50R, 50S, 50RD										180	260	470	710	900

## Pressure Sustaining Valve Sizing Check

Selecting a pressure sustaining valve requires a system simulation. Conduct it according to the procedure described below (the procedure is described taking the GD-20R pressure sustaining valve as an example).

**Requirements concerning selection** Check the following items:  
 (Example)

Discharge pressure of pump at specified flow rate (Max. working flow rate)	P <sub>0</sub> [MPa]	0.5
Specified flow rate	V [m <sup>3</sup> /h]	20
Height from pump to top of piping	H <sub>1</sub> (m)	18
Height from pressure sustaining valve to top of piping	H <sub>2</sub> (m)	16
Sum total of piping resistance between pump outlet and pressure sustaining valve inlet and resistance of unit	W [MPa]	0.22

### Table-1 Shut-off pressure drop (Pb)

·GD-20R

H <sub>2</sub> (m)	Pb MPa
5-20	0.02
21-40	0.04
41-70	0.06

·GP-50S

H <sub>2</sub> (m)	Pb MPa
10-20	0.05
21-40	0.07
41-70	0.11

### Table-2 Rated accumulation

·GD-20R

Set pressure P	Accumulation MPa
0.05-0.25	0.05
0.26-0.7	0.105

·GP-50S

Set pressure P	Accumulation MPa
0.1-0.4	0.04
0.4-0.7	0.07

\* Both of Tables 1 and 2 are for selecting pressure sustaining valves.

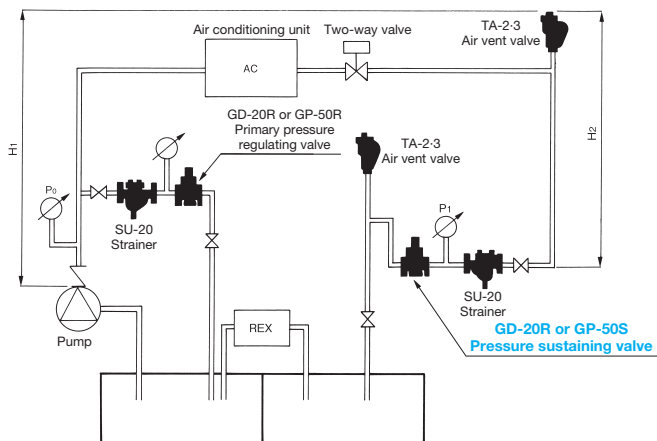
## Nominal Size Selection for Primary Pressure Regulating Valve

Step  
2

Selection calculation Conduct a system simulation according to the procedure described below.

Shut-off pressure drop See Table-1.	Pb MPa	0.02	In a selection calculation, calculate the shut-off pressure drop (Pb (MPa)) based on the height from the pressure sustaining valve to the top of piping (H <sub>2</sub> (m)) according to Table-1 Shut-off pressure drop (Pb). In the example, the distance from the pressure sustaining valve to the top of piping (H <sub>2</sub> (m)) is 16 m, and the shut-off pressure drop is consequently 0.02 MPa.
Minimum set pressure $P = \frac{0.098H_2}{10} + P_b$	P MPa	$\frac{0.098 \times 16}{10} + 0.02 = 0.17$	Calculate the minimum set pressure (P (MPa)). In the example, P = 0.17 MPa.
Nominal size Determine a tentative nominal size at P and V according to the nominal size selection chart.		65A	Select a tentative nominal size at the minimum set pressure P and the specified flow rate V according to the nominal size selection chart. In the example, assuming that P = 0.17 MPa and V = 20 m <sup>3</sup> /h are met, the nominal size of the GD-20R valve is 65A.
Rated flow rate $V_1 = \frac{C_v \sqrt{P}}{0.365 \sqrt{G}}$	V <sub>1</sub> (m <sup>3</sup> /h)	26	Next, calculate the rated flow rate of the 65A GD-20R valve at a set pressure of 0.17 MPa. In the example, it is 26 m <sup>3</sup> /h.
Rated accumulation See Table-2.		0.05	Calculate the rated accumulation (MPa) at the minimum set pressure: P (MPa) according to Table-2 rated accumulation chart. In the example, it is 0.05 MPa.
Accumulation at specified flow rate $P_a = \frac{V}{V_1} \times \text{Rated accumulation}$	P <sub>a</sub> MPa	0.04	Calculate the accumulation (P <sub>a</sub> (MPa)) at the specified flow rate. In the example, it is 0.04 MPa.
Pressure sustaining valve inlet pressure $P_1 = P_0 - \frac{0.098(H_1 - H_2)}{10} - W$	P <sub>1</sub> MPa	0.26	Calculate the pressure sustaining valve inlet pressure P <sub>1</sub> . In the example, it is 0.26 MPa.
Pump allowance $\alpha = P_1 - P - P_a$ · If $\alpha$ is negative, the specifications are not matching. Select a larger nominal size, and recalculate $\alpha$ .	$\alpha$ MPa	0.04	Finally, check the pump allowance $\alpha$ . The accumulation (P <sub>a</sub> ) at the pressure sustaining valve inlet pressure (P <sub>1</sub> ), the minimum set pressure (P), and the specified flow rate is the pump allowance $\alpha$ . If the value of $\alpha$ is negative, select a larger nominal size, and recalculate $\alpha$ . In the example, 0.04 MPa is acceptable.
Selection result Determine the set pressure between P and P + $\alpha$ .	Model Nominal size Set pressure range	GD-20R 65A 0.18-0.22 MPa	As the selection result, determine the set pressure between P and P + $\alpha$ . In the example, the set pressure for the 65A GD-20R valve is between 0.18 MPa and 0.22 MPa.

## Piping example of Pressure sustaining valves GD-20R and GP-50S

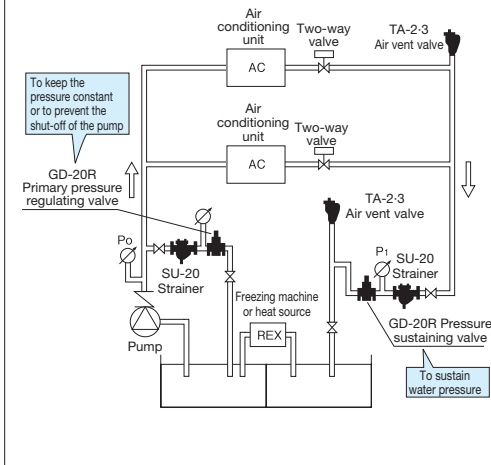




## Application Guide about Pressure Sustaining Valve, Primary Pressure Regulating Valve, and Differential Pressure Regulating Valve

### In the case of an open circuit system

#### Pressure sustaining valve and Primary pressure regulating valve

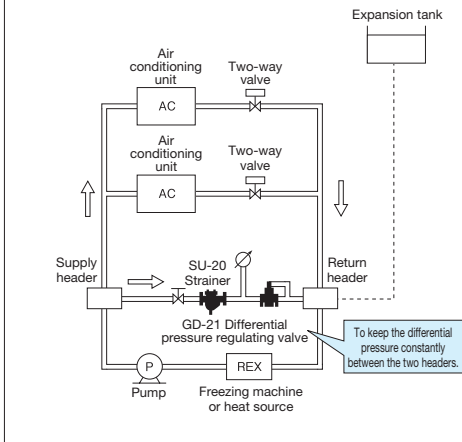


- **Pressure sustaining valve and primary pressure regulating valve are required**  
Falling water by the gravitation of the return piping causes damage to the air conditioning unit or air problems due to a vacuum. It is, therefore, necessary to sustain water pressure in the return piping. In order to do this, use a pressure sustaining valve. Additionally, use a primary pressure regulating valve to ensure stable supply even if the load on the air conditioning unit varies.
- **For what purpose pressure sustaining valve is used**  
To sustain water pressure by gravitation when a pump is at rest by keeping the return piping full of water, as well as problems, such as air lock and noise resulting from the ingress of air into the piping when the flow rate into a load system decreases even if, for example, the pump is in operation.
- **For what purpose primary pressure regulating valve is used**

- 1: To reduce a fluctuation in pump discharge pressure with a change in the flow rate of the unit used (load system) and thereby keep the regulated flow rate stable in the unit (load system).
- 2: To bypass the minimum flow rate required for the operation of the pump before the shut-off of the pump occurs as a result of an extreme decrease in the flow rate into the unit used.

### In the case of a closed circuit system

#### Differential pressure regulating valve



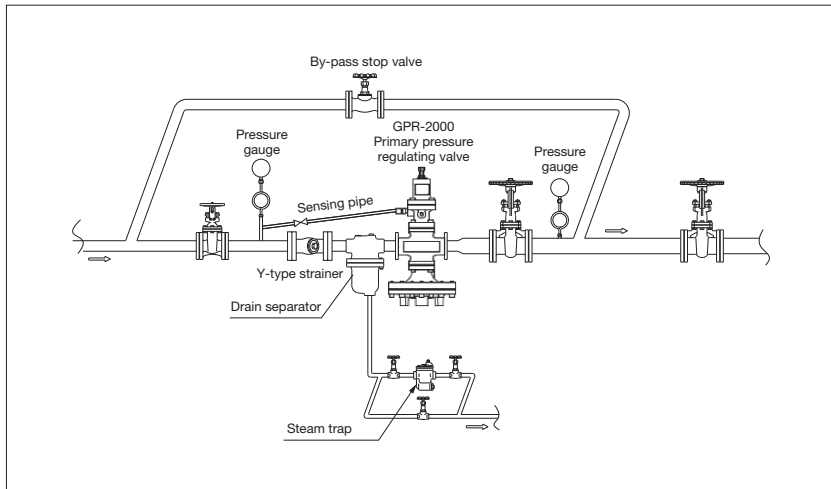
#### Differential pressure regulating valve is required

The supply pressure (flow rate) to the heat source system or pump becomes unstable in response to a variation in the flow rate of the air conditioning unit. This also makes the discharge pressure of the pump unstable and, in the worst case, causes damage to the pump. As a measure to prevent such problems, use a differential pressure regulating valve.

- \* When an expansion tank is used as indicated by the dashed line, a primary pressure regulating valve can be used.
- **For what purpose differential pressure regulating valve is used**

- 1: To regulate the differential pressure between the supply and return headers to a constant level and consequently stabilize the flow rate to the load units by installing a differential pressure regulating valve between them.
- 2: To prevent the shut-off of the pump and also ensure a stable flow rate to the heat source system by bypassing the flow rate from the supply header to the return header when the flow rate to the load units extremely decreases.

## Guidelines for Primary Pressure Regulating Valves for Steam

Step  
3

## Warning and precaution for installation

- Be sure to remove foreign substances and scales from inside of the piping before connecting the product to the piping.
  - \* Foreign substances and scales may prevent the product from functioning properly.
- Be sure to install a strainer (recommendation: 80 mesh) at the inlet side of the product.
  - \* Foreign substances or scales may prevent the product from functioning properly.
- Be sure to install pressure gauges to both the inlet and outlet sides of the product. At the inlet, install a pressure gauge as close to the connection port of external sensing pipe as possible.
  - \* Failure to follow this notice may hamper correct pressure adjustment.
- Provide a trap at the bottom and end of the riser at the inlet and outlet of the product in order to prevent condensate problems. When branching trap piping from the main piping, connect pipes to the lower side of the main piping.
  - \* Failure to follow this notice may cause condensate problems.
- Check the inlet, outlet and posture of the product and then connect the product in horizontal piping.
  - \* Failure to follow this notice may hamper correct pressure adjustment.
- Arrange piping so that the product will not be subjected to excessive load, torque or vibration.
  - \* Failure to follow this notice may result in malfunction or a drastically shortened service life of the product.
- Connect the sensing pipe to the piping with the external sensing pipe ( $\phi$  8-2 m) and external joint ( $\phi$  8-R 1/4) supplied with the product.
  - \* Using other external sensing pipe may prevent the product from functioning properly.
- Avoid placing the external pipe just after valve or elbow; place it in a position with minimum disturbance (recommended length: ten or more times the piping diameter from the joint of the straight piping area).
  - \* Failure to follow this notice may make pressure at the detection unit unstable, resulting in incorrect pressure regulation.
- Use gate valve at the inlet and outlet of the product.
  - \* Valve with high resistance, such as a glove valve, prevents the product from the product from functioning properly.
- When disassembling or inspecting the product, space is required above and beneath the product from the center of the piping. Secure space above and beneath the product when connecting piping to it.
  - \* Failure to follow this notice may hamper correct pressure adjustment.
- In order to prevent freezing, please install stop valve (V1) at the bottom of the product and discharge all condensate after stop operating.
  - \* If condensate remain inside the product, it may break or cannot work properly by freezing.

# GPR-2000

Direct type	<b>Pilot type</b>	<b>Diaphragm</b>	Piston
Bellows	<b>Internal sensing</b>	<b>External sensing</b>	Stainless steel
Nylon	Low pressure	DP regulating	Pressure sustaining

## ■ Features

1. Large capacity and distinguished performance.
2. Excellent sealability ensured by spherical valve.  
Distinguished durability of stainless steel made valve and valve seat.
3. Wide range pressure adjustment.



Screwed type



Flanged type

## ■ Specifications

Application		Steam	
Primary pressure sensing method		External sensing type *1	
Pressure regulating range		0.1-1.1 MPa	0.1-1.0 MPa
		1.0-1.4 MPa	-
Minimum differential pressure		15% of set pressure (gauge pressure) (Minimum value: 0.10 MPa)	
Fluid temperature		220°C or less	
Valve seat leakage		0.01% of rated flow rate	
Material	Body	Ductile cast iron (FCD450)	
	Main valve	Stainless steel	
	Valve seat	Stainless steel	
	Pilot valve	Stainless steel	
	Pilot valve seat	Stainless steel	
	Diaphragm	Stainless steel	
Connection		JIS Rc screwed, JIS 20K RF flanged	JIS 10K FF flanged

\*1 External sensing method is used for the product because of controllability (performance). Available with internal sensing type, but the Cv value is different.

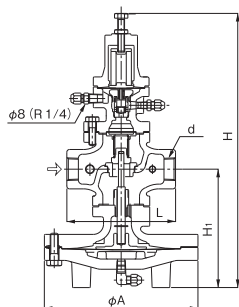
\*2 When the set pressure is between 0.02 MPa and 0.1 MPa, back pressure should not exist.

## ■ Dimensions (mm) and Weights (kg)

### • Screwed type

Nominal size	d	L	H <sub>1</sub>	H	A	Weight
15A	Rc 1/2	150	170	398	200	14.5
20A	Rc 3/4	150	170	398	200	14.5
25A	Rc 1	160	175	404	226	18.8
32A	Rc 1-1/4	180	192	434	226	22.0
40A	Rc 1-1/2	180	192	434	226	22.0
50A	Rc 2	230	216	498	276	33.6

• Available with NPT connection.

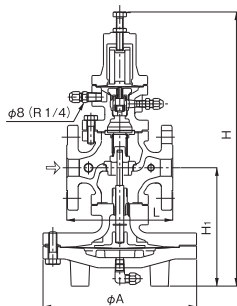


### • Flanged type

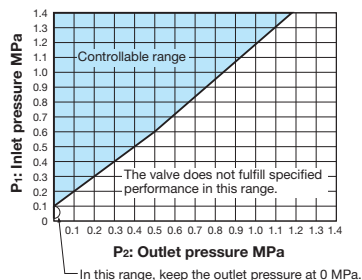
Nominal size	L	H <sub>1</sub>	H	A	Weight
15A	146 (142)	170	398	200	16.0 (15.8)
20A	146 (142)	170	398	200	16.5 (16.3)
25A	156 (152)	175	404	226	21.5 (21.1)
32A	176 (172)	192	434	226	24.5 (24.0)
40A	196 (192)	192	434	226	25.0 (24.6)
50A	222 (218)	216	498	276	36.6 (36.4)
65A	282 (278)	251	552	352	64.9 (64.6)
80A	302 (294)	264	575	352	72.1 (69.9)
100A	342 (330)	321	658	401	111.6 (108.0)

• The values in parentheses are the dimensions and weights of JIS 10K FF flanged.

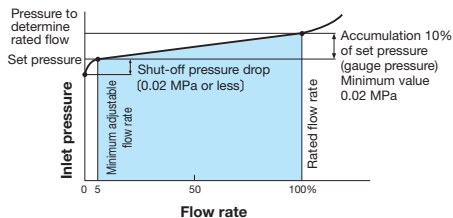
• Please contact us for flanged type other than the above.



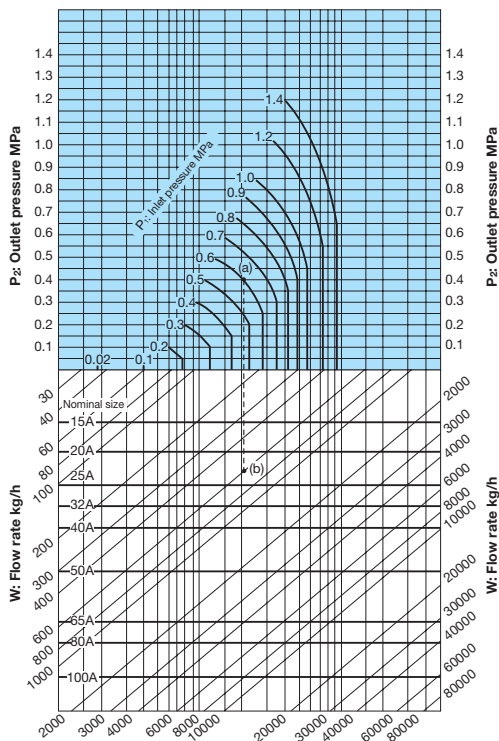
### Specifications Chart



### Flow Rate Characteristics Chart



### ■GPR-2000 Nominal Size Selection Chart (For Steam)



#### [Example]

When selecting the nominal size of a primary pressure regulating valve whose Inlet pressure (P<sub>1</sub>), outlet pressure (P<sub>2</sub>), and flow rate are 0.6 MPa, 0.4 MPa, and 600 kg/h, respectively, first find intersection point (a) of the Inlet pressure of 0.6 MPa and the outlet pressure of 0.4 MPa. Trace down vertically from this intersection point to find intersection point (b) with the flow rate of 600 kg/h. Since intersection point (b) lies between nominal sizes 20A and 25A, select the larger one, 25A.

# GD-47R

Direct type	Pilot type	Diaphragm	Piston
Bellows	Internal sensing	External sensing	Stainless steel
Nylon	Low pressure	DP regulating	Pressure sustaining

## ■Features

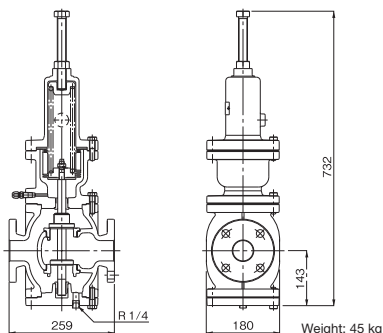
1. Applicable on heavy-duty use for the wide range of flow rate.
2. The application of this model is vast such as waste-heat boiler, air conditioning equipment and factory facilities.

## ■Specifications

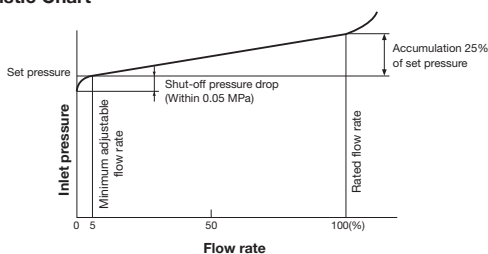
Application	Steam	
Nominal size	50A	
Pressure regulating range	0.2-0.9 MPa	
Minimum differential pressure	0.05 MPa	
Application temperature	220°C or less	
Valve seat leakage	0.5% or less of rated flow rate	
Primary pressure sensing method	External sensing type	
Cv value	36	
Material	Body	Ductile cast iron (FCD450)
	Valve	Stainless steel
	Valve seat	Stainless steel
	Bellows	Stainless steel
Connection	JIS 10K FF flanged	

· An external sensing pipe ( $\phi$  8-2 m) and an external joint ( $\phi$  8-R 1/4) are included with the product.

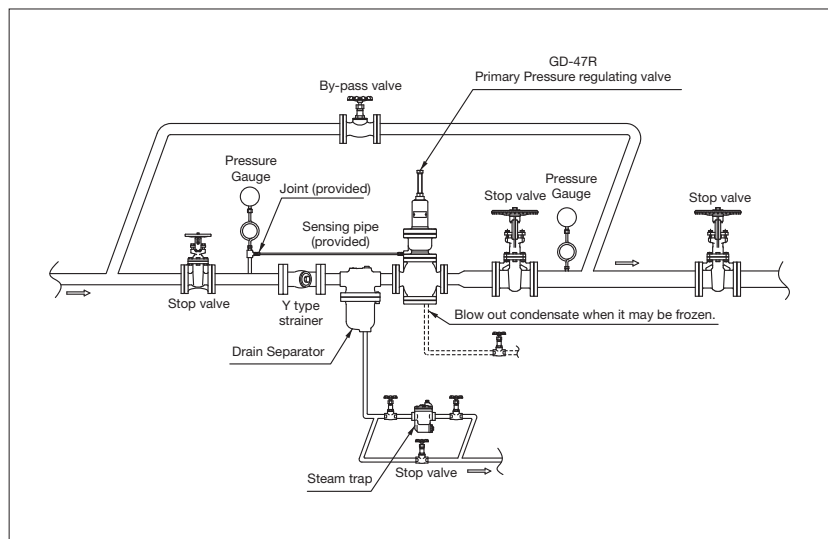
## ■Dimensions (mm) and Weight (kg)



## Flow Characteristic Chart



## Example of Piping



## Sensing pipe connection method

Connect the provided sensing pipe ( $\phi 8-2$  m) and joint ( $\phi 8-R 1/4$ ) as shown in the illustration above.

1. Wind sealing tape around the joint and insert the joint into the pressure sensing side.
2. Fully insert the sensing pipe into the valve and the pressure sensing side joint. Tighten the cap nut until it can no longer be rotated manually, and then turn the cap nut about one and a quarter times with a tool.
3. Sensing pipe should be connected as straight as possible, and should be cut if it is too long.

# GD-20R,20RC

Direct type	Pilot type	Diaphragm	Piston
Bellows	Internal sensing	External sensing	Stainless steel
Nylon	Low pressure	DP regulating	Pressure sustaining

## ■Features

1. No leakage when closed due to single seat valve and valve disc.
2. Large diaphragm ensures reliable response to pressure fluctuations and shutoff.
3. Used as relief valves for pumps, relieves excess pressure caused by load fluctuations, and keeps internal pressure of piping constant during pump operation.
4. Used to sustain water pressure inside piping when the pump of open circuit system for mid-rise or high-rise building equipment is shutdown.
5. For the GD-20RC, the internal and external surfaces of the body are coated with Nylon 11, offering excellent corrosion resistance.



GD-20RC



GD-20R

## ■Specifications

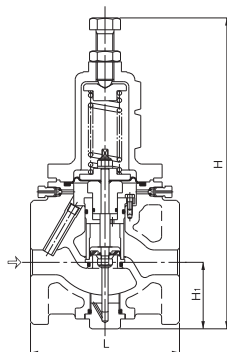
Model	GD-20R	GD-20RC
Application	Cold and hot water, Oil (kerosene-heavy oils A and B), Air, Other non-dangerous fluids	
Pressure regulating range	15A-80A (A) 0.05-0.25 MPa (B) 0.26-0.7 MPa 100A-150A (A) 0.05-0.25 MPa (B) 0.26-0.5 MPa	
Fluid temperature	5-80°C	5-60°C
Fluid viscosity	600 cSt or less	
Material	Body	Ductile cast iron (FCD450)
	Valve seat	Stainless steel or Bronze
	Valve disc	NBR
	Diaphragm	NBR
Connection	JIS 10K FF flanged	
Inside surface treatment of body	15A-100A Electrodeposition coating 125A-150A Tar-based coating (Black) or Electrodeposition coating.	Nylon 11 (inside and outside surfaces of body)

- Available with FKM.
- Available with external sensing type.
- Available with stainless steel made trim parts.
- Available with stainless steel (15A to 100A). Please contact us about availability of 65A to 100A for all stainless steel made.
- Available with drain plug.
- Depending on the additives contained in the oil, the deterioration of rubbers may be accelerated.

## ■Dimensions (mm) and Weights (kg)

Nominal size	L	H	H <sub>1</sub>	Weight
15A	145	309	57	8.2
20A	150	309	57	8.2
25A	150	330	67	10.0
32A	195	395	76	17.3
40A	195	395	76	17.3
50A	195	409	81	19.2
65A	270	555	105	40.0
80A	270	582	120	43.7
100A	308	645	135	70.0
125A	380	849	169	144.0
150A	400	918	194	173.0

\* The weight are for GD-20R



The material shapes are slightly different depending on the nominal size.



# GD-21

Direct type	Pilot type	Diaphragm	Piston
Bellows	Internal sensing	External sensing	Stainless steel
Nylon	Low pressure	DP regulating	Pressure sustaining



## ■Features

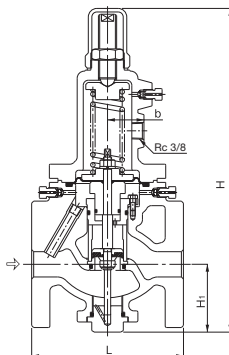
1. Most suitable for relief valve of a pump in closed circuit.
2. No leakage when closed due to single seat valve and valve disc.

## ■Specifications

Application	Cold and hot water	
Regulating differential pressure	15A-80A (A) 0.05-0.25 MPa (B) 0.26-0.7 MPa 100A-150A (A) 0.05-0.25 MPa (B) 0.26-0.5 MPa	
Fluid temperature	5-80°C	
Material	Body	Ductile cast iron
	Valve seat	Stainless steel or bronze
	Valve disc	NBR
	Diaphragm	NBR
Connection	JIS 10K FF flanged	
Inside surface treatment of body	15A-100A: Electrodeposition coating 125A-150A: Tar-based coating (black) or Electrodeposition coating	

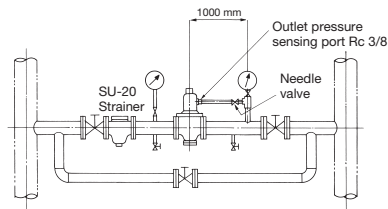
## ■Dimensions (mm) and Weights (kg)

Nominal size	L	H	H <sub>1</sub>	d	Weight
15A	145	298	57	36	8.3
20A	150	298	57	36	8.3
25A	150	320	67	36	10.1
32A	195	400	76	48	17.4
40A	195	400	76	48	17.4
50A	195	414	81	48	19.3
65A	270	572	110	63	40.1
80A	270	597	125	63	43.8
100A	308	665	143	68	70.1
125A	380	874	179	115	144.1
150A	400	929	204	115	173.1



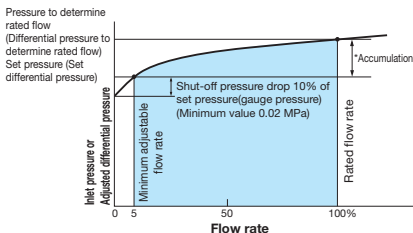
The material shapes are slightly different depending on the nominal size.

## ■ Piping Example



\* Install a needle valve to the outlet side of the product and plumb it to the pressure sensing pipe using copper piping.

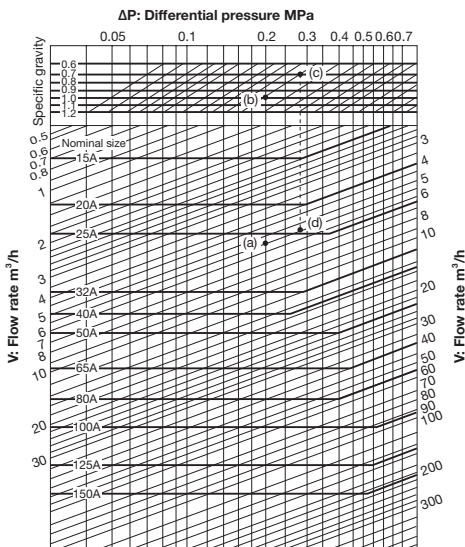
## ■ Flow Characteristic Chart



\* Accumulation

Set range MPa	Accumulation MPa
0.05-0.25	Within 0.05
0.26-0.7	Within 0.105

## ■ GD-20R, GD-21 Nominal Size Selection Chart (For Liquid)



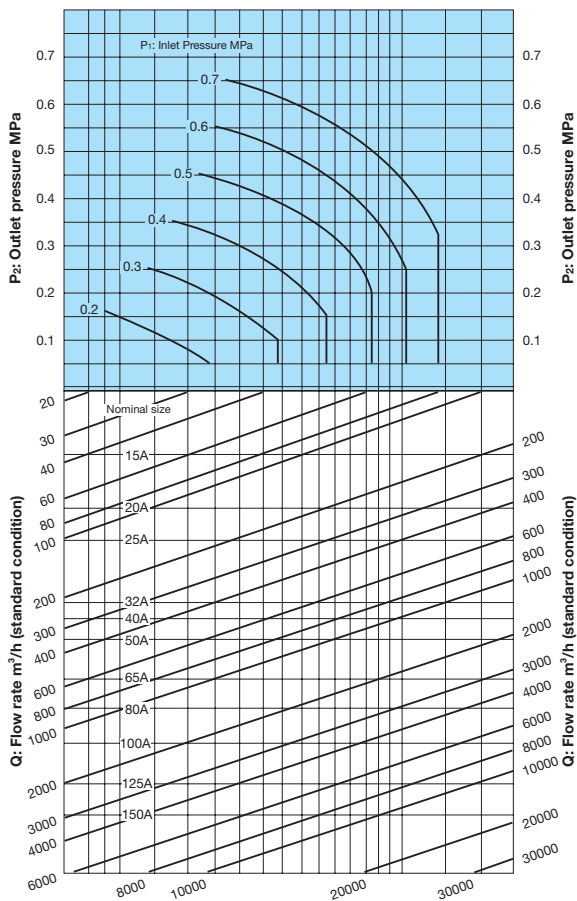
### [Example]

When selecting the nominal size of a differential pressure regulating valve whose differential pressure ( $\Delta P$ ), specific gravity, and flow rate ( $V$ ) are 0.2 MPa, 1 (water), and 5.5  $m^3/h$ , respectively, first trace down vertically from the differential pressure ( $\Delta P$ ) of 0.2 MPa to find intersection point (a) with the flow rate ( $V$ ) of 5.5  $m^3/h$ . Since this intersection point (a) lies between nominal sizes 25A and 32A, select the larger one, 32A.

When the specific gravity is 0.7 under the same conditions, trace down vertically from the differential pressure ( $\Delta P$ ) of 0.2 MPa to find intersection point (b) with the specific gravity 1. Find intersection point (c) with the specific gravity of 0.7 by tracing horizontally to the slant lines from this intersection point (b). Then, find intersection point (d) with the flow rate ( $V$ ) of 5.5  $m^3/h$  by tracing down vertically from intersection point (c). Since this intersection point (d) lies between nominal sizes 20A and 25A, select the larger one, 25A.

\* Select the GD-21 differential pressure regulating valve under a specific gravity of 1.

### GD-20R Nominal Size Selection Chart (For Air)



# GD-4R

Direct type	Pilot type	Diaphragm	Piston
Bellows	Internal sensing	External sensing	Stainless steel
Nylon	Slight pressure	DP regulating	Pressure sustaining



## ■Features

- Used as a safety apparatus for adjusting slight pressure air and gases. Able to use at industrial plant.
- Diaphragm with a large pressure sensing area has high accuracy to set pressure.
- No leakage to outside since there is no gland part.

## ■Specifications

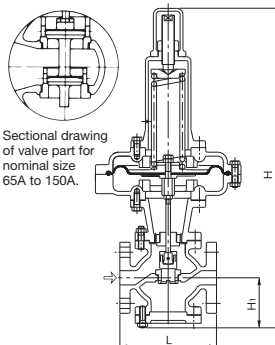
Application	Air, Other non-dangerous fluids					
Nominal size	20-50A			65-150A		
Diaphragm diameter (mm)	φ 400	φ 340	φ 256	φ 400	φ 340	φ 256
Pressure regulating range (kPa)	2-5	5-10	10-25	2-4	10-20	20-50
			25-50	4-6		50-100
			50-100	6-10		100-200
			100-200			
Adjusted reduced pressure	5-80°C					
Valve seat leakage	0.1% or less of rated flow rate			0.5% or less of rated flow rate		
Material	Body			Cast iron		
	Valve			Stainless steel		
	Valve seat, Spindle			Stainless steel		
	Diaphragm			NBR		
Connection	JIS 10K FF flanged					

## ■Dimensions (mm) and Weights (kg)

Nominal size	L	H		H <sub>1</sub>	Weight
		Ha	Hb		
20A	170	565	580	90	27
25A	170	565	580	90	28
32A	180	585	600	100	28
40A	180	585	600	100	29
50A	180	595	610	105	31
65A	215	700	715	125	39
80A	260	715	730	130	48
100A	300	785	800	160	64
125A	360	840	855	190	88
150A	382	895	910	220	123

\* Dimension H will be different depends on diaphragm diameter. (Ha: φ 256  
Hb: φ 340, φ 400)

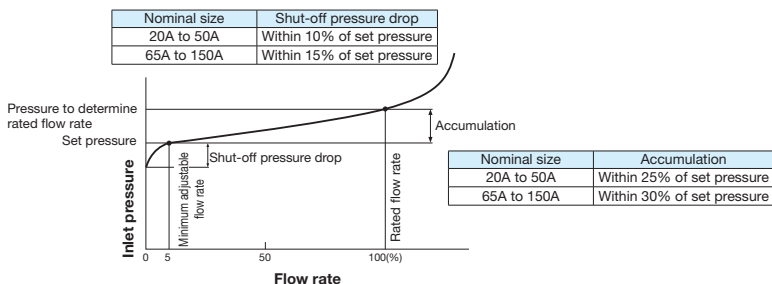
\* The value of product weights are when diaphragm diameter is φ 256. Please add 5 kg for φ 340, and 9 kg for φ 400.



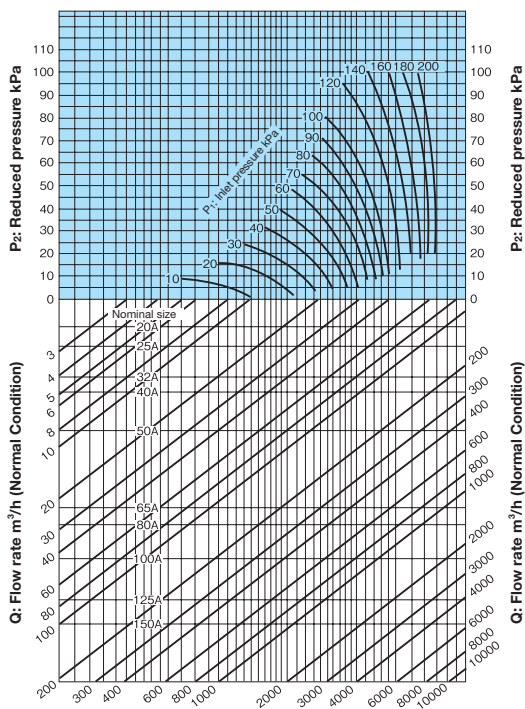
Sectional drawing of valve part for nominal size 65A to 150A.

Structure will be different depends on nominal size and diaphragm diameter.

## GD-4R Flow Characteristic Chart



## GD-4R Nominal Size Selection Chart (For Air)



# GD-7R

Direct type	Pilot type	Diaphragm	Piston
Bellows	Internal sensing	External sensing	Stainless steel
Nylon	Slight pressure	DP regulating	Pressure sustaining

## ■Features

1. Simple in structure, less prone to fail and easy to maintain.
2. Superior performance especially as relief unit for lubricating oil and heavy oil.

## ■Specifications

Application	Cold and hot water, Oil, Other non-dangerous fluids	
Nominal size	20A-50A	65A-150A
Pressure regulating range	0.05-0.25 MPa	0.05-0.2 MPa
	0.25-0.45 MPa	0.2-0.5 MPa
	0.45-0.7 MPa *1	0.5-0.7 MPa *1
Fluid temperature	5-80°C *2	
Valve seat leakage	0.5% or less of rated flow rate	
Fluid viscosity	700 cSt or less	
Material	Body	Cast iron
	Valve disc, valve seat	Phosphor bronze*3
	Piston	Bronze
Connection	JIS 10K FF flanged	

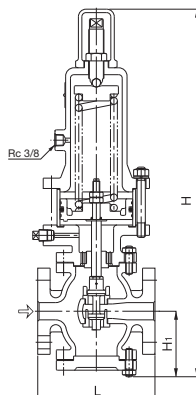
\*1 Available with the GD-7RH, made of cast steel, with pressure regulating range of 0.7 to 1.6 MPa.

\*2 Available with maximum temperature of 120°C.

\*3 Available with stainless steel made valve disc and valve seat.

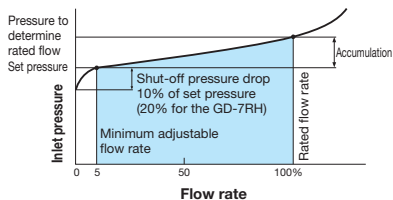
## ■Dimensions (mm) and Weights (kg)

Nominal size	L	H	H <sub>1</sub>	Weight
20A	170	535	95	20
25A	170	535	95	22
32A	180	545	100	23
40A	180	545	100	23
50A	180	565	110	26
65A	215	680	125	41
80A	260	700	135	51
100A	300	750	160	66
125A	360	810	190	90
150A	382	875	220	129



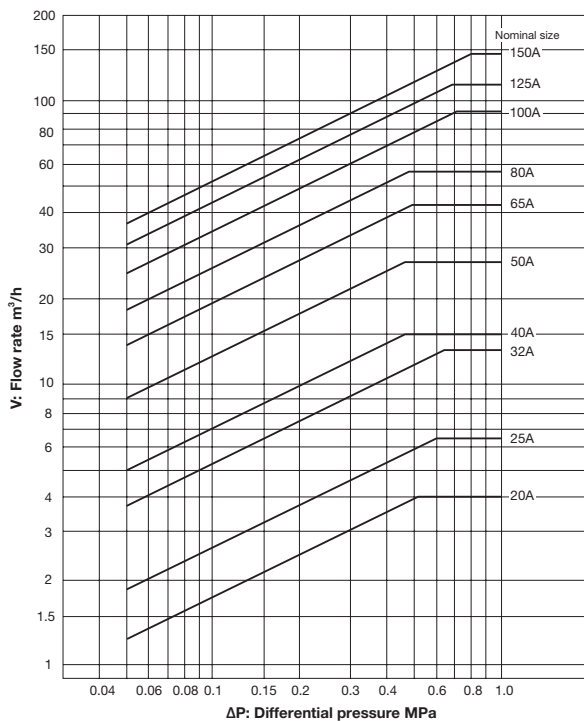
The shapes are slightly different above nominal size 65A.

## Flow Rate Characteristics Chart



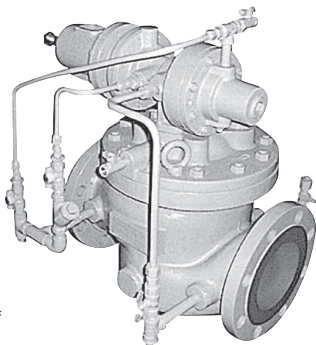
Nominal size	Set range MPa	Accumulation MPa
20A-50A	0.05-0.25	Within 0.04
	0.25-0.45	Within 0.06
	0.45-0.7	Within 0.08
	0.7-1.6	Within 0.23
65A-150A	0.05-0.2	Within 0.1
	0.2-0.5	Within 0.14
	0.5-0.7	Within 0.19
	0.7-1.6	Within 0.32

## GD-7R Nominal Size Selection Chart (For Water)



# GP-50R

Direct type	<b>Pilot type</b>	Diaphragm	Piston
Bellows	<b>Internal sensing</b>	External sensing	Stainless steel
Nylon	Slight pressure	DP regulating	Pressure sustaining



## ■Features

1. Pilot operated type with large flow rate.
2. Suitable for pump by-pass to maintain the internal pressure of piping constant during pump operation.
3. Prevent the pressure change caused by load fluctuations of air conditioner.

## ■Specifications

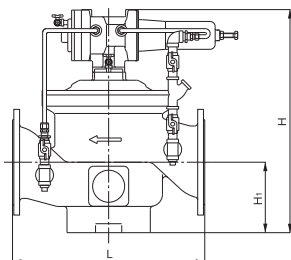
Application	Cold and hot water	
Pressure regulating range	0.1-0.2 MPa	
	0.2-0.4 MPa	
	0.4-0.7 MPa	
Minimum differential pressure	0.1 MPa	
Minimum adjustable flow rate	10% of rated flow rate	
Application temperature	0-70°C	
Material	Body	Cast iron
	Valve	NBR · Bronze
	Valve seat	Bronze
Connection	JIS 10K RF flanged	

## ■Dimensions (mm) and Weights (kg)

Nominal size	L	H	H <sub>1</sub>	Weight
125A	420	585	145	130
150A	450	557	153	170
200A	600	696	220	280
250A	700	765	250	400
300A	800	825	295	520

### · Cv value

Nominal size	125A	150A	200A	250A	300A
Cv value	180	260	470	710	900
Rated flow rate (m <sup>3</sup> /h)	145	204	355	547	800



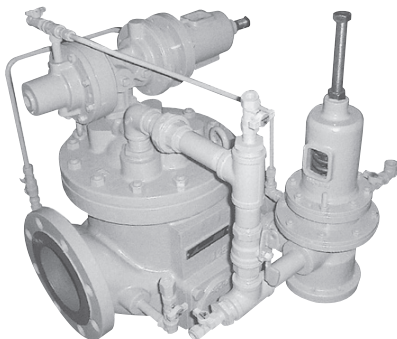


# GP-50S

Direct type	<b>Pilot type</b>	Diaphragm	Piston
Bellows	<b>Internal sensing</b>	External sensing	Stainless steel
Nylon	Slight pressure	DP regulating	<b>Pressure sustaining</b>

## ■ Features

1. Pilot operated type with large flow rate.
2. Used to sustain water pressure inside piping when the pump of open circuit system is shutdown.



## ■ Specifications

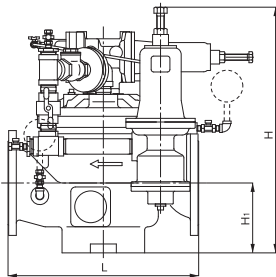
Application		Cold and hot water
Pressure regulating range		0.1-0.2 MPa 0.2-0.4 MPa 0.4-0.7 MPa
Minimum differential pressure		0.1 MPa
Minimum adjustable flow rate		10% of rated flow rate
Application temperature		0-70°C
Material	Body	Cast iron
	Valve	NBR · Bronze
	Valve seat	Bronze
Connection		JIS 10K RF flanged

## ■ Dimensions (mm) and Weights (kg)

Nominal size	L	H	H <sub>1</sub>	Weight
125A	420	735	145	160
150A	450	753	153	210
200A	600	880	220	330
250A	700	1075	250	480
300A	800	1125	295	600

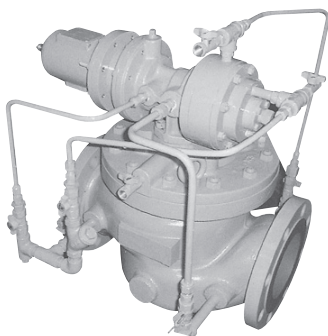
### · Cv value table

Nominal size	125A	150A	200A	250A	300A
Cv value	180	260	470	710	900
Rated flow rate (m <sup>3</sup> /h)	145	204	355	547	800



# GP-50RD

Direct type	<b>Pilot type</b>	Diaphragm	Piston
Bellows	<b>Internal sensing</b>	External sensing	Stainless steel
Nylon	Slight pressure	<b>DP regulating</b>	Pressure sustaining



## ■ Features

1. Pilot operated type with large flow rate.
2. Most suitable for relief valve of a pump in closed circuit.

## ■ Specifications

Application	Cold and hot water	
Differential pressure regulating range	0.1-0.2 MPa	
	0.2-0.4 MPa	
	0.4-0.7 MPa	
Minimum differential pressure	0.1 MPa	
Minimum adjustable flow rate	10% of rated flow rate	
Application temperature	0-70°C	
Material	Body	Cast iron
	Valve	NBR · Bronze
	Valve seat	Bronze
Connection	JIS 10K RF flanged	

## ■ Dimensions (mm) and Weights (kg)

Nominal size	L	H	H <sub>1</sub>	Weight
125A	420	585	145	130
150A	450	623	153	180
200A	600	765	220	280
250A	700	835	250	410
300A	800	895	295	520

## ■ Calculation Formula for Nominal Size Selection

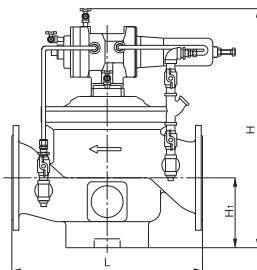
### · Cv value calculation

$$Cv = \frac{0.365V \sqrt{G}}{\sqrt{\Delta P}}$$

$\Delta P$  : P<sub>1</sub> - P<sub>2</sub> (MPa)  
 G : Specific gravity (relative to water)  
 V : Max. liquid flow rate (m<sup>3</sup>/h)  
 Cv : Cv value of each nominal size

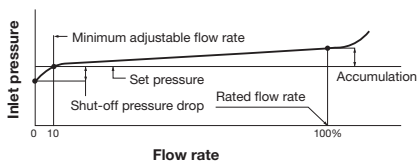
### · Cv value table

Nominal size	125A	150A	200A	250A	300A
Cv value	180	260	470	710	900
Rated flow rate (m <sup>3</sup> /h)	145	204	355	547	800



## ■ GP-50R, GP-50S, GP-50RD Selection Data

## Flow Characteristic Chart



## • GP-50R, GP-50S

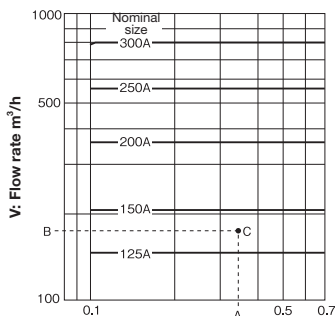
Pressure regulating range	Shut-off pressure drop
0.1 to 0.2 MPa	Within 0.05 MPa
0.2 to 0.4 MPa	Within 0.07 MPa
0.4 to 0.7 MPa	Within 0.11 MPa

## • GP-50RD

Pressure regulating range	Shut-off pressure drop (Differential pressure)
0.1 to 0.2 MPa	Within 0.07 MPa
0.2 to 0.4 MPa	Within 0.09 MPa
0.4 to 0.7 MPa	Within 0.13 MPa

Accumulation | Within 10% of set pressure [Minimum 0.04 MPa]

## ■ Nominal Size Selection Chart



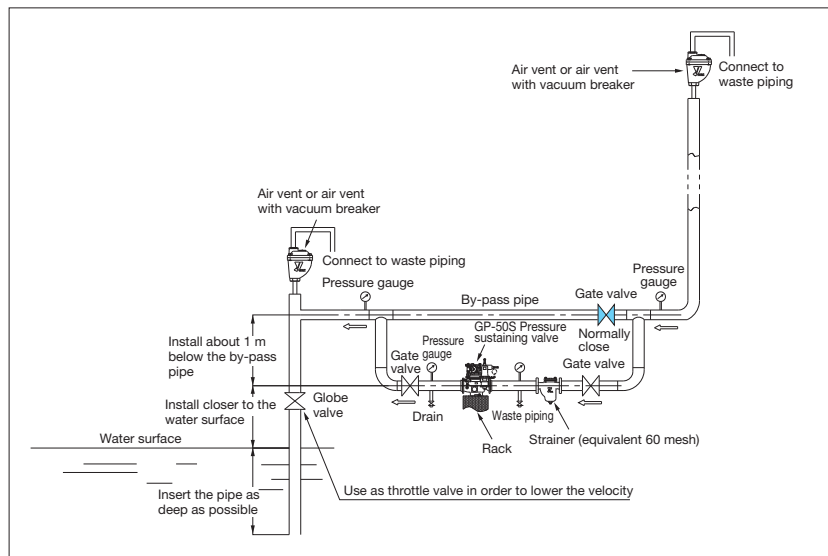
$\Delta\text{P}$ : Differential pressure MPa

## • How to use the chart &amp; example

Find the intersection point (C) of differential pressure (A) and requiring flow rate (B). Select the size above point (C). In this case select 150A.

\* Let the fluid velocity inside pipe be smaller than 3 m/sec.

## ■ Example of Piping (for GP-50S Pressure Sustaining Valve)



---

# Primary Pressure Regulating Valve – Annex

- GPR-2000  
Disassembly and troubleshooting ..... 10-29
- GD-20R  
Disassembly and troubleshooting ..... 10-31
- GD-4R  
Disassembly and troubleshooting ..... 10-32
- GD-7R  
Disassembly and troubleshooting ..... 10-33
- GD-47R  
Disassembly and troubleshooting ..... 10-34

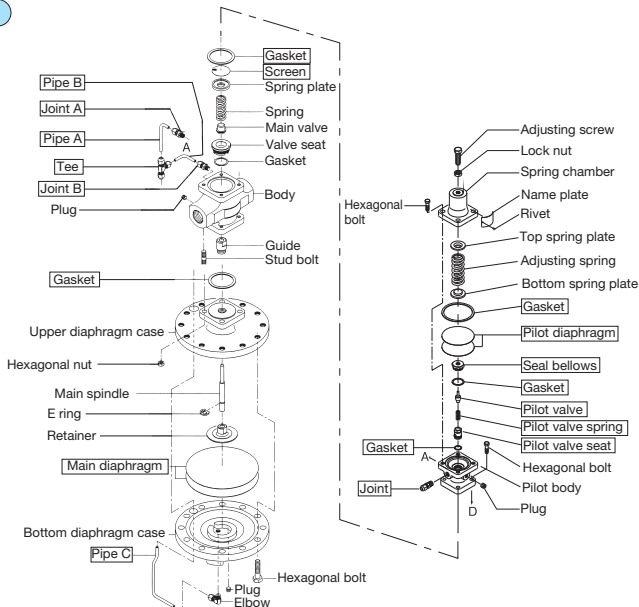
**CAUTION** Please refer to the manual attached to the product for procedures for installation and operation.

## Disassembly and troubleshooting

## GPR-2000 Primary Pressure Regulating Valve

- Most of problems with the primary pressure regulating valve are caused by foreign substances and scale in the piping. Avoid the ingress of dust and dirt to the product with caution.
- A phenomenon similar to valve failure could occur due to the failure of the pressure gauge, clogging of the strainer, and other causes. Check the above possible causes and take a proper remedy and preventive measures.

### GPR-2000



The parts shown in the rectangle boxes  are available as consumable parts.

#### • Disassembly of pilot valve

1. Loosen lock nut and rotate adjusting screw to the left to make adjusting screw free (no compression with spring).
2. Remove hexagonal bolt from spring chamber, and remove spring chamber. Then remove adjusting screw, top spring plate, bottom spring plate, gasket and pilot diaphragm.
3. Remove seal bellows by box wrench or socket wrench (width across flats: 30). Then remove gasket, pilot valve part and pilot valve spring.
4. Remove pilot valve seat by socket wrench (width across flats: 17).

#### • Disassembly of main valve

1. Remove pipe A on joint and tee.
2. For 15 to 40A, remove hexagonal bolt from pilot part, and at the same time of removing pilot part from the body, remove screen, main valve spring plate, main valve spring, main valve. For 50 to 100A, remove hexagonal bolt from spacer, and at the same time of removing spacer from the body, remove main valve spring, main valve assembly (for 50A, main valve spring and main valve).
3. If removing valve seat, specialized tool (our particular size) is needed.

#### • Disassembly of main diaphragm

1. Remove pipe C on elbow or tee.
2. Remove hexagonal bolt from bottom diaphragm case, and at the same time of removing bottom diaphragm case, remove main diaphragm, retainer, spindle (for 65 to 100A, adapter and retainer).

#### • Precaution during reassembly

1. Check that there is no scratch on main valve, valve seat, pilot valve and pilot valve seat. Especially, for seat surface, even small scratch causes leakage.
  2. Check that sliding parts can move smoothly.
  3. Check that retainer and spindle is assembled each other correctly.
  4. Be sure to replace gasket parts with new ones when disassembling the product.
  5. Apply liquid seal agent (recommendation: STT INC. SOLVEST 110) for heat resistance and steam resistance to seal surface between pilot diaphragm and pilot part, and seal part of upper part and bottom part of main diaphragm.
  6. Install slit part of tee to pilot part. Tee is different by size.
- \* Please refer to the manual attached to the product for detailed information.



Completely discharge the internal pressure from the valves before disassembly.



Please refer to the manual attached to the product for procedures for installation and operation.

Trouble	Cause	Remedy
Too much leakage.	<ul style="list-style-type: none"> <li>Foreign substances are stuck between main valve and main valve seat, or either of the parts is damaged.</li> <li>Foreign substances are stuck between pilot valve and pilot valve seat, or either of the parts is damaged.</li> <li>Seal bellows is damaged.</li> </ul>	<ul style="list-style-type: none"> <li>Remove pipe A, and supply fluid at the inlet. If fluid runs out from tee, clean main valve and main valve seat. Lap the parts if scratches are found.</li> <li>When supplying fluid at the same procedures above, if fluid runs out from joint, clean or replace pilot valve and pilot valve seat.</li> <li>Remove joint A (at pilot body), and supply fluid into joint (pressure detection port). If fluid runs out from joint on pilot body, replace seal bellows.</li> </ul>
Cannot be regulated.	<ul style="list-style-type: none"> <li>Main diaphragm is damaged.</li> <li>Orifice of tee is clogged.</li> <li>Screen is clogged.</li> <li>Pressure sensing pipe is clogged.</li> <li>Pressure gauge is out of order.</li> <li>Working pressure is out of controllable range.</li> </ul>	<ul style="list-style-type: none"> <li>When removing pipe C and opening bypass valve, if fluid runs out from elbow, replace main diaphragm.</li> <li>Remove and clean the tee.</li> <li>Remove and clean the screen.</li> <li>Remove and clean the sensing pipe.</li> <li>Replace the pressure gauge.</li> <li>Change working pressure into proper value.</li> </ul>
Inlet pressure rises above set pressure.	<ul style="list-style-type: none"> <li>Nominal size of the product is too small for the specifications of the system.</li> <li>Released steam amount at outlet side of primary pressure regulating valve is too small.</li> <li>Steam passing is stopped at outlet piping of primary pressure regulating valve.</li> <li>Condensate-induced trouble.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the product to proper nominal size</li> <li>Increase released steam amount.</li> <li>Check opening of gate valve, nominal size of piping, etc.</li> <li>Install trap device.</li> </ul>
Accident error is large.	<ul style="list-style-type: none"> <li>Spindle or pilot valve lacks movement.</li> <li>Fluid flow at connection part of sensing pipe is disturbed too much.</li> <li>Condensate-induced trouble.</li> <li>Condensate is in sensing pipe.</li> </ul>	<ul style="list-style-type: none"> <li>Remove and clean spindle or pilot valve or replace.</li> <li>Change the place of connection part to a place without disturbance.</li> <li>Install trap device.</li> <li>Make the sensing pipe in downward slope.</li> </ul>



Completely discharge the internal pressure from the valves before disassembly.

**CAUTION** Please refer to the manual attached to the product for procedures for installation and operation.

## Disassembly and troubleshooting

## Primary Pressure Regulating Valve

- Most of problems with the primary pressure regulating valve are caused by foreign substances and scale in the piping. Avoid the ingress of dust and dirt to the product with caution.
  - A phenomenon similar to valve failure could occur due to the failure of the pressure gauge, clogging of the strainer, and other causes.
- Check the above possible causes and take a proper remedy and preventive measures.

### GD-20R

#### • Disassembly of the body and spring chamber

1. Loosen lock nut and rotate adjusting screw to the left to make adjusting spring free (no compression with spring).
2. Remove hexagonal bolt from spring chamber, and remove spring chamber. Then remove adjusting spring and spring plate.
3. Remove diaphragm by fixing spindle and loosening hexagonal nut.

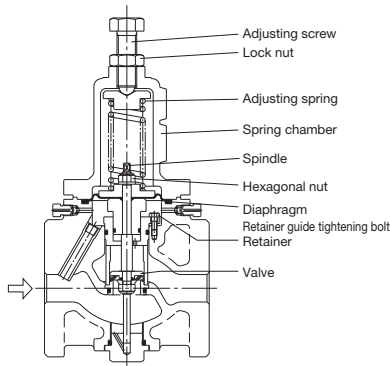
#### • Disassembly of valve

1. By loosening bolt tightening retainer guide and pull up retainer guide, remove retainer.

#### • Precaution during reassembly

1. Check that there is no scratch on diaphragm, valve seat, and valve.
2. After checking there is no scratch on O ring, apply silicon grease, etc to the O ring.
3. After checking that lip of diaphragm is in the body, assemble the spring chamber.

\* The same disassembly procedure and troubleshooting can be applied to GD-21 even its structure is different a little.



### Trouble

### Cause

### Remedy

Cannot be regulated. Too much leakage.

- Foreign substances are stuck between main valve and main valve seat, or either of the parts is damaged. ....Disassemble the product and remove foreign substance. If damage is founded, replace the parts.
- Diaphragm and/or O ring are damaged. ....Replace the diaphragm and/or O ring.
- Nominal size of the product is too small for the specifications of the system. ....Replace the product with one of proper nominal size. (Please refer to Nominal size selection chart.)
- Pressure gauge is out of order. ....Replace the pressure gauge.

Abnormal sound.

- Air induced problem has occurred. ....Install exhaust device (attached with air vent valve).
- Nominal size of the product is too large against the specifications. ....Replace the product to proper nominal size. (Please refer to Nominal size selection chart.)



Completely discharge the internal pressure from the valves before disassembly.

**CAUTION** Please refer to the manual attached to the product for procedures for installation and operation.

**Disassembly and troubleshooting**

**Primary Pressure Regulating Valve**

- Most of problems with the primary pressure regulating valve are caused by foreign substances and scale in the piping. Avoid the ingress of dust and dirt to the product with caution.
  - A phenomenon similar to valve failure could occur due to the failure of the pressure gauge, clogging of the strainer, and other causes.
- Check the above possible causes and take a proper remedy and preventive measures.

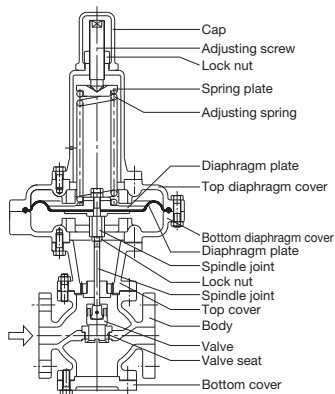
**GD-4R**

**Disassembly of valve and diaphragm**

1. Loosen lock nut and rotate adjusting screw to the left to make adjusting spring free (no compression with spring).
2. Remove bolts from diaphragm cover, and remove diaphragm cover.  
Then remove adjusting spring and spring plate.
3. Remove double lock nut, and remove diaphragm plate and diaphragm.
4. Remove bolts from bottom diaphragm cover, and remove bottom diaphragm cover, loosen lock nut on spindle joint, and remove spindle joint and spindle (before loosening lock nut, it is convenient to mark assembling point by marker, etc).
5. Remove bolts from top cover, and remove diaphragm cover.  
Then pull up spindle and remove valve.

**Precaution during reassembly**

1. Check that there is no scratch on valve seat and valve.
2. Install diaphragm at a predefined position without twisting.



Trouble	Cause	Remedy
Cannot be regulated. Too much leakage	• Foreign substances are stuck between valve and valve seat, or either of the parts is damaged.	Disassemble the product and remove foreign substance. If damage is founded, replace the parts.
	• Diaphragm is damaged.	Replace the diaphragm.
	• Nominal size of the product is too small the specifications.	Replace the product to proper nominal size. (Please refer to Nominal size selection chart.)
	• Pressure gauge is broken.	Replace the pressure gauge.

**+** Completely discharge the internal pressure from the valves before disassembly.



**CAUTION** Please refer to the manual attached to the product for procedures for installation and operation.

## Disassembly and troubleshooting

## Primary Pressure Regulating Valve

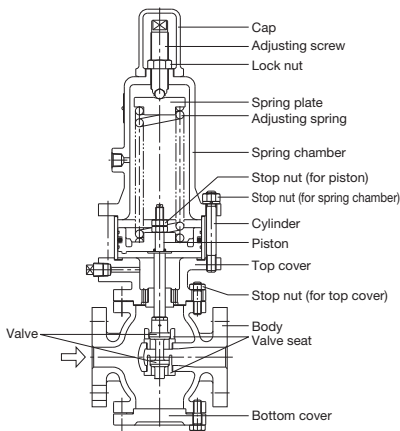
### GD-7R

#### Disassembly of valve and piston

1. Loosen lock nut and rotate adjusting screw to the left to make adjusting spring free (no compression with spring).
2. Remove nuts from spring chamber, and remove spring cover. Then remove adjusting spring and spring plate.
3. Remove nuts from piston, and remove piston and cylinder.
4. Remove nuts from spring chamber. After removing spring chamber, remove valve from upper side.

#### Precaution during reassembly

1. Check that there is no scratch on valve seat and valve.
2. Apply grease to O ring.



10

Trouble	Cause	Remedy
Cannot be regulated. Too much leakage	<ul style="list-style-type: none"> <li>Foreign substances are stuck between valve and valve seat, or either of the parts is damaged.</li> <li>O-ring for piston is damaged</li> <li>Nominal size of the product is too small against specifications.</li> <li>Pressure gauge is out of order.</li> </ul>	<ul style="list-style-type: none"> <li>Disassemble the product and remove foreign substance. If damage is founded, replace the parts.</li> <li>Replace O-ring.</li> <li>Replace the product to proper nominal size (Please refer to Nominal size selection chart.)</li> <li>Replace the pressure gauge.</li> </ul>
Accident error is large.	<ul style="list-style-type: none"> <li>Grease at piston part runs out.</li> </ul>	<ul style="list-style-type: none"> <li>Apply additional grease to sliding part of piston and ditch of O ring.</li> </ul>

**+** Completely discharge the internal pressure from the valves before disassembly.

**CAUTION** Please refer to the manual attached to the product for procedures for installation and operation.

**Disassembly and troubleshooting**

**Primary Pressure Regulating Valve**

**GD-47R**

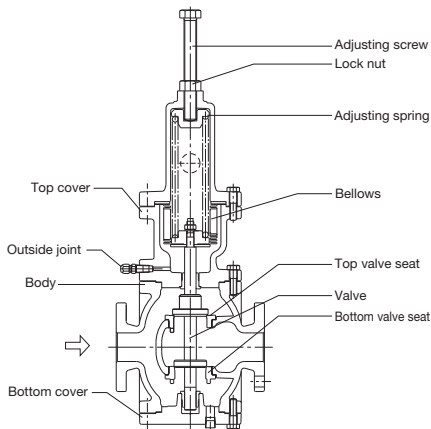
**Disassembly of valve and piston**

Before disassembly, be sure to check that stop valve at inlet and outlet sides of the products are closed. Also, make sure that pressure do not exist inside the product and condensate does not accumulate when disassembling.

1. Loosen lock nut and rotate adjusting screw to the left to make adjusting spring free (no compression with spring).
2. Loosen hexagonal part (width across flats: 14) on external joint and remove external pipe.
3. Remove hexagonal bolts from spring chamber and remove spring chamber, then remove adjusting spring and upper spring plate.
4. Remove hexagonal bolts from top cover. Remove top cover assembly with valve.
5. Remove U nut by socket wrench (width across flats: 19), etc by locking at service hole around center of valve.
6. Remove bottom cover after loosening hexagonal bolt.

**Precaution during reassembly**

1. Check that there is no scratch on valve seat and valve.
2. Be sure to replace gasket parts with new ones when disassembling the product.



Trouble	Cause	Remedy
Cannot be regulated.	<ul style="list-style-type: none"> <li>Pressure sensing pipe is clogged.</li> <li>Pressure gauge is out of order.</li> <li>Working pressure is out of controllable range.</li> </ul>	<ul style="list-style-type: none"> <li>Remove and clean the sensing pipe.</li> <li>Replace the pressure gauge.</li> <li>Change working pressure into proper value.</li> </ul>
Cannot be regulated.	<ul style="list-style-type: none"> <li>Foreign substances are stuck between valve and valve seat, or either of parts is damaged.</li> <li>Bypass stop valve leaks.</li> </ul>	<ul style="list-style-type: none"> <li>Disassemble the product and remove foreign substance. Lap the parts if scratches are found.</li> <li>Repair or replace the bypass valve.</li> </ul>
Inlet pressure rises above set pressure.	<ul style="list-style-type: none"> <li>Released steam amount at outlet side of primary pressure regulating valve is too small.</li> <li>Condensate-induced trouble.</li> <li>Steam passing is stopped at outlet piping of primary pressure regulating valve.</li> <li>Strainer at inlet side of primary pressure reducing valve is clogged.</li> </ul>	<ul style="list-style-type: none"> <li>Increase released steam amount.</li> <li>Install trap device.</li> <li>Check opening of gate valve, nominal size of piping, etc.</li> <li>Clean the strainer.</li> </ul>

**+** Completely discharge the internal pressure from the valves before disassembly.