

# Model GD-20R·20RC

## Primary Pressure Regulating Valve Pressure Sustaining Valve

Please read this bulletin thoroughly before using the primary pressure regulating valve · pressure sustaining valve, so that you may do so correctly and safely. Please carefully store this bulletin in a handy place.

—————The following safety symbols are used in this manual. —————

▪ **Warning**

This symbol indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

▪ **Caution**

This symbol indicates a hazardous situation that, if not avoided, may result in minor or moderate injury.

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This valve is designed primarily for use in air conditioning systems.

Whether it is used in a pump by-pass to prevent pump shut-off, or for maintaining a constant pressure in front of a valve, the GD-20R, 20RC automatically regulates the pressure according to load fluctuations. It is also widely used as a pressure sustaining valve in the open-circuit return pipes of high-rise buildings.

## 1 . Features

- ( 1 ) The use of a disc single-seat valve eliminates leakage when the valve is closed.
- ( 2 ) A sophisticated pressure sensing offers reliable shut-off ability and quick response to pressure changes.
- ( 3 ) When used as a pump relief valve, it discharges excess pressure in response to load changes and maintains a constant line pressure during pump operation.
- ( 4 ) When used in the open circuits of high-rise buildings, it prevents falling water conditions when the pump switches OFF.

## 2 . Specifications & Performance

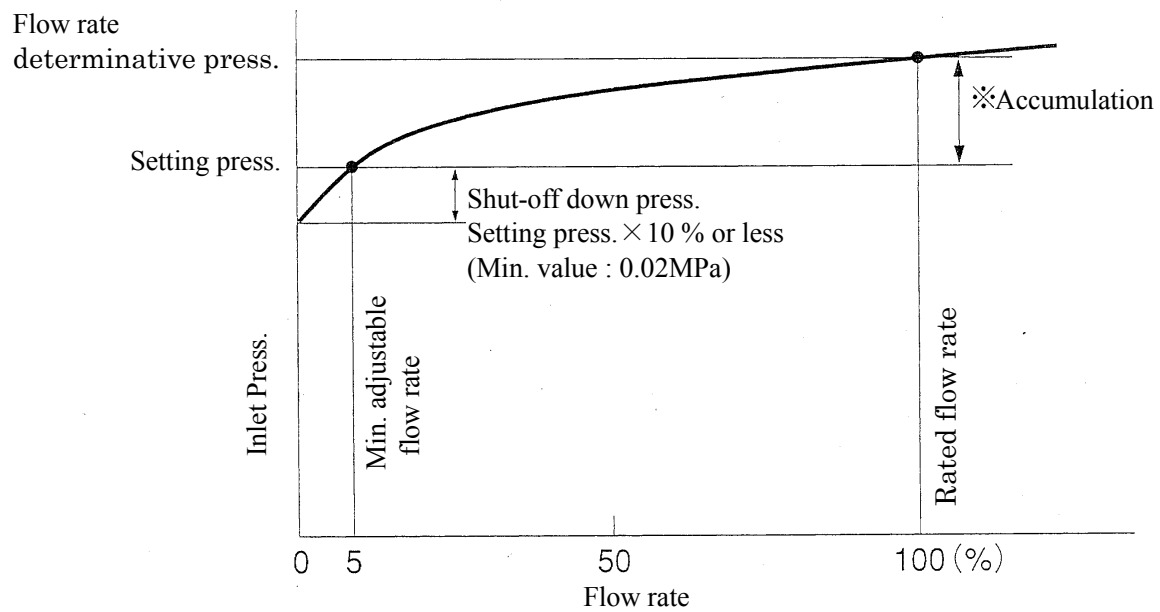
Model		GD-20R		GD-20RC	
Application(Fluid)		Hot or cold water, air, oil(kerosene, heavy oil A・B)			
Nominal Size		15A~80A	100A~150A	15A~80A	100A~150A
Primary press. regulating range(MPa)		0.05 ~0.25 0.26 ~ 0.7	0.05 ~0.25 0.26 ~ 0.5	0.05 ~0.25 0.26 ~ 0.7	0.05 ~0.25 0.26 ~ 0.5
Application Temperature		5~80°C		5~60°C	
Coefficient of viscosity		600 cSt or less			
Materials	Body	Ductile Cast Iron			
	Valve Seat	Stainless Steel or Bronze			
	Valve Disc	NBR			
	Diaphragm	NBR			
Connection		JIS 10K FF Flanged			
Surface treatment		15~100A:Electrodeposition Paint 125~150A:Tar paint(Black) or Electrodeposition Paint		Nylon11 Coating (Both sides)	

- External sensing is also available.
- Model with water drain plug is also available.

## ▪ Caution

Please collate with attached nameplate and specification of ordered model.  
 ※Please consult factory in case they do not match each other.

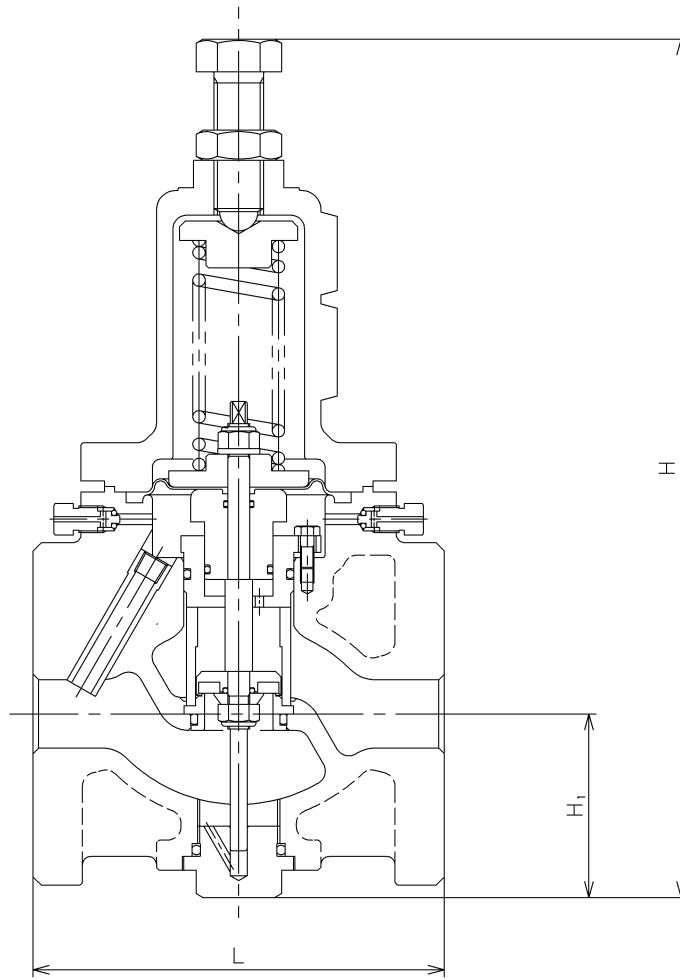
### Flow Rate Characteristics Chart



※Accumulation

Setting range (MPa)	Accumulation (MPa)
0.05~0.25	0.05
0.26~0.7	0.105

3. Dimension & Weight (Size 15A~50A)

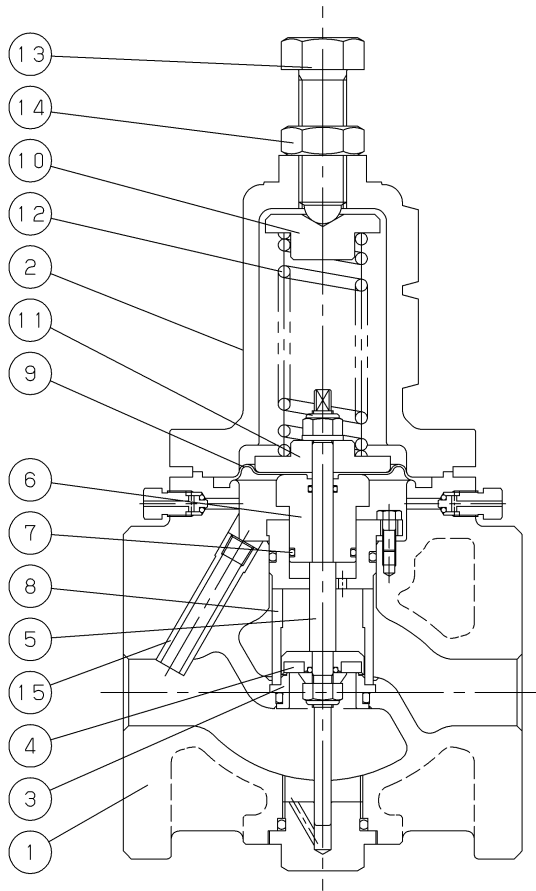


※The parts shape differs according to the nominal size.

Model	GD-20R			GD-20RC			Weight(kg) <sup>(※)</sup>
	L	H	H <sub>1</sub>	L	H	H <sub>1</sub>	
15A	145	309	57	145	296	57	8.2
20A	150	309	57	150	296	57	8.2
25A	150	330	67	150	318	67	10.0
32A	195	395	76	195	398	76	17.3
40A	195	395	76	195	398	76	17.3
50A	195	409	81	195	412	81	19.2
65A	270	553	110	270	573	113	40.0
80A	270	575	125	270	598	128	43.7
100A	308	637	143	308	666	146	70.0
125A	380	835	179	380	875	182	144.0
150A	400	904	204	400	930	207	173.0

(※)Weight in the above table is Model GD-20R.

#### 4 . Operation



No.	Parts Name
1	Body
2	Spring Chamber
3	Valve Seat
4	Valve
5	Spindle
6	Retainer
7	O Ring
8	Retainer Guide
9	Diaphragm
10	Spring Plate
11	Spring Plate
12	Adjusting Spring
13	Adjusting Screw
14	Lock Nut
15	Conductor Pipe

If the adjusting screw<sup>⑬</sup> is turned to the right, load is applied to joins the valve<sup>④</sup> via the spindle<sup>⑤</sup> due to the load of the adjusting spring<sup>⑫</sup>. The load pushes the valve<sup>④</sup> against the valve seat<sup>③</sup>, and a closed valve will be the result.

Fluid passes along a conductor pipe<sup>⑮</sup> and the sensing chamber under the diaphragm<sup>⑨</sup>.

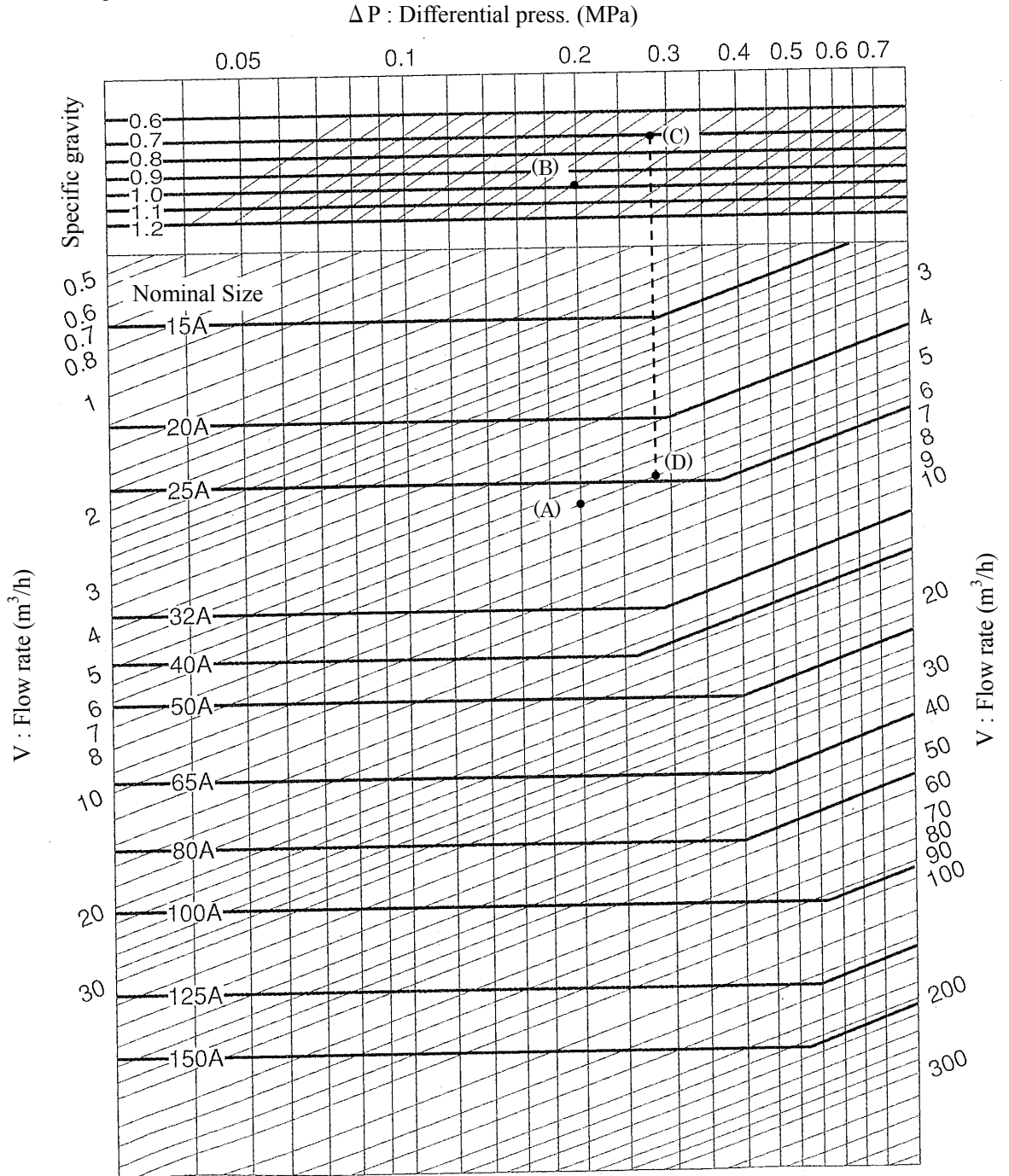
If the pressure of the sensing chamber becomes higher than setting pressure, the load of the diaphragm<sup>⑨</sup> bottom will overcome the load of the adjusting spring<sup>⑫</sup>, will push up the valve<sup>④</sup>, and will relieve excessive pressure.

If the pressure of the sensing chamber falls below setting pressure, the valve<sup>④</sup> will be again closed by the load of the adjusting spring<sup>⑫</sup>.

5 . Nominal Size Selection Method

5 . 1 Nominal Size Selection Chart

< For Liquid >

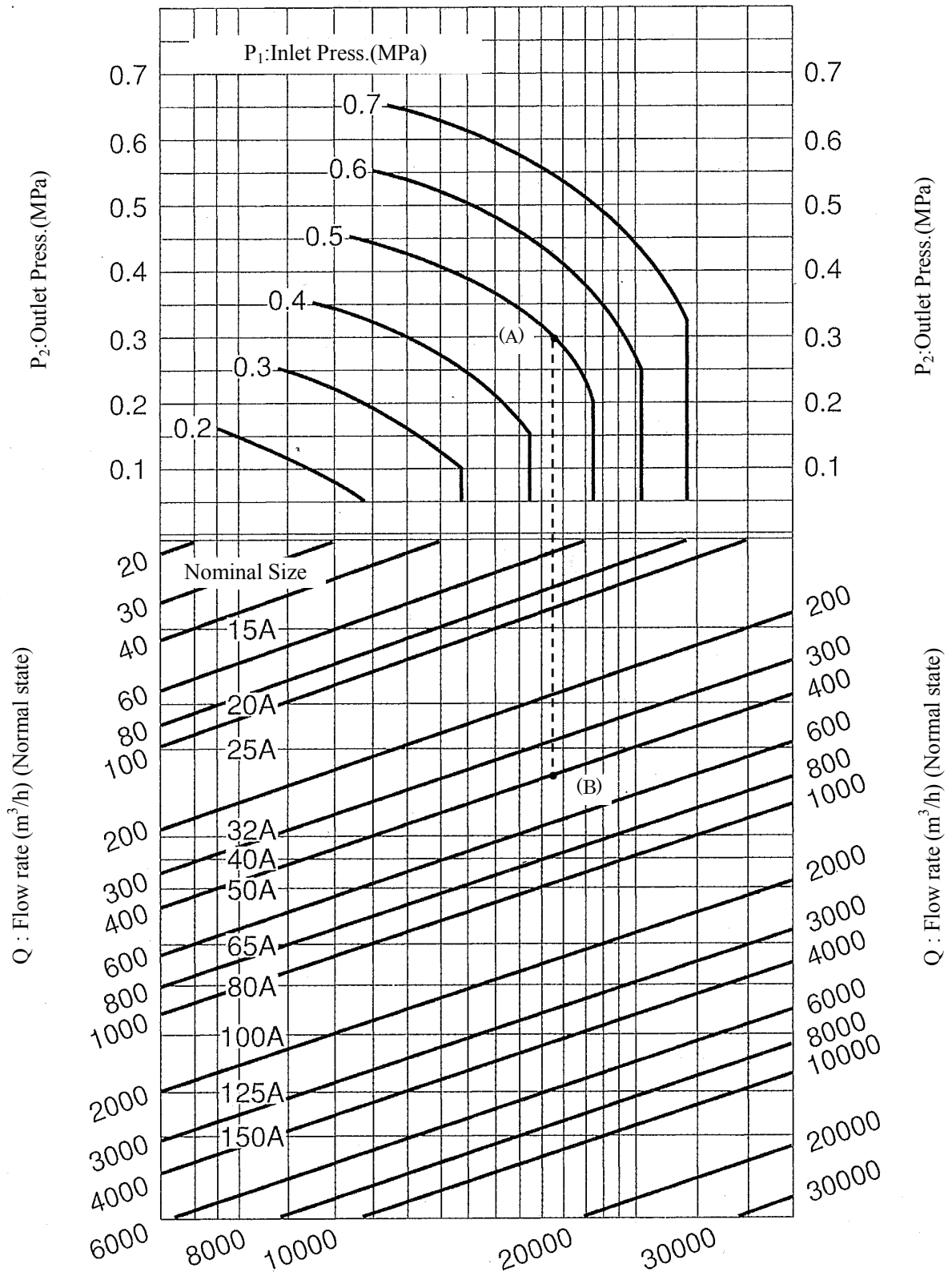


Example of Selection

For example, take a pressure regulating valve whose pressure differential before/after a valve ( $\Delta P$ ) is 0.2MPa, specific gravity is 1(water), flow rate(V) is 5.5m<sup>3</sup>/h. Firstly, vertically proceed on the line of pressure differential 0.2MPa to come across the flow rate 5.5m<sup>3</sup>/h , and regard this point as(A). Point(A) is between nominal size 25A and 32A. Select the lager nominal size 32A.

For example, take a pressure regulating valve whose condition is same as above, but specific gravity is 0.7. Firstly, vertically proceed on the line of pressure differential 0.2MPa to come across the line of specific gravity 1, and regard this point as (B). Move, in parallel to diagonal line, to intersection point (C) with the line of specific gravity 0.7. Vertically proceed from point (D) to come across the flow rate 5.5m<sup>3</sup>/h , and regard this point (E). Point (E) is between nominal size 20A and 25A. Select the lager nominal size 25A.

< For Air >



**Example of Selection**

When the inlet pressure ( $P_1$ ) is 0.5 MPa, the outlet pressure ( $P_2$ ) is 0.3 MPa and the flow rate is 400  $Nm^3/h$ , for instance, the size of the pressure regulating valve is selected as follows. Find the intersection point (A) of the inlet pressure ( $P_1$ ) 0.5 MPa and outlet pressure ( $P_2$ ) 0.3 MPa and go straight down from the point (A) to find the intersection (B) crossing the flow rate line. The point (B) is between line of 25A and 32A, and choose larger size 32A for application.

<Pressure Sustaining Valve Selection>

For selection of Pressure sustaining valve, follow the directions listed below.

Points of be Considered for Selection

Items		Examples
Pump discharge pressure with designated flow rate (Maximum flow rate)	$P_0$ (MPa)	0.5
Designated flow rate	$V$ (m <sup>3</sup> /h)	20
Height from pump to the highest part of piping	$H_1$ (m)	18
Height from pressure sustaining valve to the highest part of piping	$H_2$ (m)	16
The sum total of piping resistance from pump outlet to the inlet of Pressure sustaining valve and resistance of machinery	$W$ (MPa)	0.22

Selection Calculation

Items		Examples
Shut-off down pressure (See table.1)	$P_b$ (MPa)	0.02
Minimum setting pressure $P = \frac{0.098H_2}{10} + P_b$	$P$ (MPa)	0.18
Nominal size Selection temporary nominal size using nominal size selection chart P ( $\Delta P$ on the chart) and V.	—	65A
Rated flow rate $V_1 = \frac{C_v \cdot \sqrt{\Delta P}}{0.365 \cdot \sqrt{G}}$	$V_1$ (m <sup>3</sup> /h)	26
Rated Accumulation (See table.2)	—	0.5
Accumulation with designated flow rate $P_a = \frac{V}{V_1} \times \text{Rated Accumulation}$	$P_a$ (MPa)	0.4
Inlet pressure of Pressure sustaining valve $P_1 = P_0 - \frac{(H_1 - H_2)}{10} - W$	$P_1$ (MPa)	2.6
Pump margin $\alpha = P_1 - P - P_a$ When $\alpha$ is minus, it will not satisfy specifications. Use large nominal size and calculate again.	$\alpha$ (MPa)	0.4
Selection result Decide setting pressure between $P$ and $P + \alpha$	Model	GD-20R
	Nominal size	65A
	Setting press. range	0.18-0.22MPa

Table.1 Shut-off pressure ( $P_b$ )

$H_2$ (m)	$P_b$ (MPa)
5 ~ 20	0.02
21 ~ 40	0.04
41 ~ 70	0.06

Table.2 Rated Accumulation

Setting pressure $P$	Accumulation
0.05 ~ 0.25	0.05 MPa
0.26 ~ 0.7	0.105 MPa

※ Table.1 and 2 are for selection of Pressure sustaining valve.



5 . 2 Selection Formula for Nominal Size

- Cv value

Nominal Size	15A	20A	25A	32A	40A	50A	65A	80A	100A	125A	150A
Cv value	2.5	2.7	4	8.5	11	14	23	32.5	48	75	108

- Cv Value Calculation Formula

< For Gas >

In case of  $p_2 > \frac{p_1}{2}$

$$C_v = \frac{Q}{2940} \sqrt{\frac{(273 + t)G}{\Delta P(P_1 + P_2)}}$$

In case of  $p_2 \leq \frac{p_1}{2}$

$$C_v = \frac{Q\sqrt{(273 + t)G}}{2550P_1}$$

< For Liquid >

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

- Viscosity correction Formula

Find the Max. Flow rate (V) when the viscosity is ignored.

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

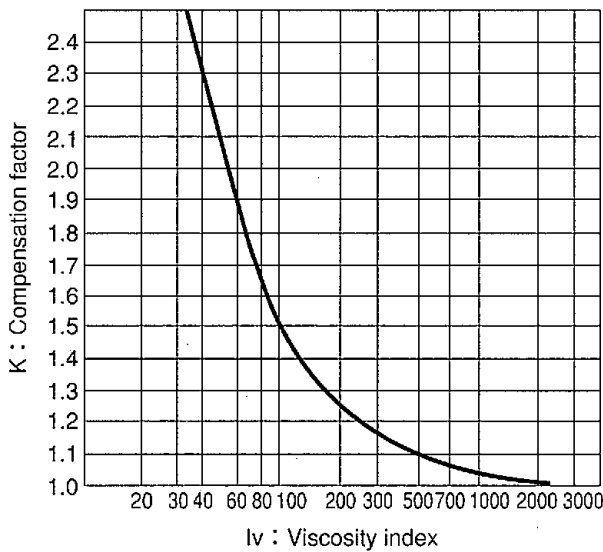
And find the viscosity index of Iv.

$$I_v = \frac{72780}{M_{cst}} \left( \frac{\Delta P}{G} \right)^{\frac{1}{4}} V^{\frac{1}{2}}$$

Find the value of K from the value of Iv, found through the above formula, with the viscosity correction curve. The calculated Max. flow rate divided by the value of K is the corrected value.

Compensated Max. flow rate  $V' = V / K$  (m<sup>3</sup>/h)

Viscosity Correction Curve



- $P_1$ : Inlet pressure [MPa·A]
- $P_2$ : Outlet pressure [MPa·A]
- $\Delta P$ :  $P_1 - P_2$  [MPa]
- G : Specific gravity  
(Gas : Specific gravity relative to air  
Liquid : Specific gravity relative to water)
- V : Max. liquid flow rate [m<sup>3</sup>/h]
- Q : Max. gas flow rate [m<sup>3</sup>/h(Normal state)]
- t : Temperature [°C]
- Cv : Cv value of the nominal size
- I v:Viscosity index
- Mest:Viscosity {cSt}

## 6 . Maintenance & Inspection

### 6 . 1 Precautions before operation

#### ▪ Caution

- (1) As the valve is heavy use lifting equipment etc., and please provide and support in the pipeline.  
※There is a possibility that the valve would be damaged if it falls.
- (2) Do not disassemble the valve .  
※Disassembling the valve at your discretion may affect the original performance.
- (3) Remove foreign matter and scale from the line before connecting the valve.  
※Failure to do so may prevent the valve from functioning correctly.
- (4) Install a strainer at the valve inlet side.  
※Failure to do so may hamper correct pressure control, which affects the original performance.
- (5) Install a pressure gauge at both the inlet and outlet side of the valve.  
※Failure to do so may hamper correct pressure adjustment.
- (6) For gas application, install a trap it the inlet side of the valve to prevent drainage problem.  
※Failure to do so may result in drainage problem, affecting the original performance.
- (7) Do not apply excessive load, torque or vibration to the valve.  
※Doing so may result in malfunction or drastically shortened service life.
- (8) Install the valve in the correct direction of the fluid flow.  
※Failure to do so may affect the original performance.
- (9) Pipes can be installed either horizontally or vertically except over the size of 100A.

6 . 2 Precautions for operation.

▪ **Caution**

- (1) Close the stop valves before and after the valve, and remove all foreign matter and scales via the by-pass line before operation.  
 ※ Failure to do so may prevent the valve from functioning correctly.
- (2) When adjusting pressure, slowly turn the adjusting screw  
 ※ Incorrect adjustment may cause hunting, water hammer, etc., resulting in damage to the valve and other equipment.
- (3) Remove condensate completely from the line, and close the stop valves before and after the valve when not using it for long periods of times.  
 ※ Rust generated in the valves and lines may cause malfunction.

- (1) To maintain easily, install a drainpipe between stop valve and primary pressure regulating valve.
- (2) Above the center of the pipe line, be sure to reserve space larger than  $H_2$ (Fig.1). Please see the following table.

	(mm)										
Nominal Size	15A	20A	25A	32A	40A	50A	65A	80A	100A	125A	150A
$H_2$	500	500	500	650	650	650	800	800	1000	1200	1400

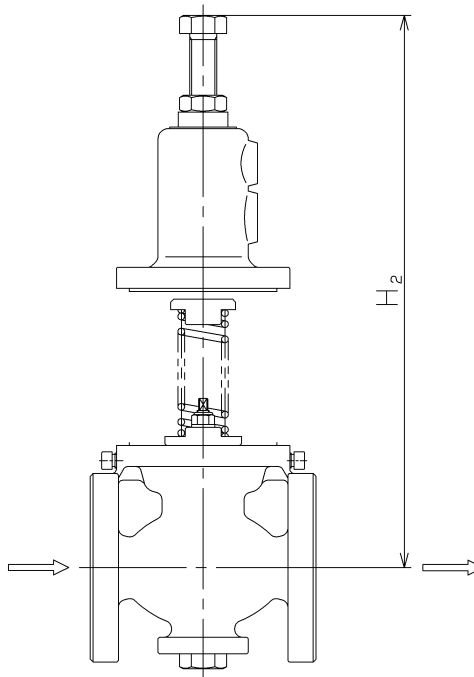
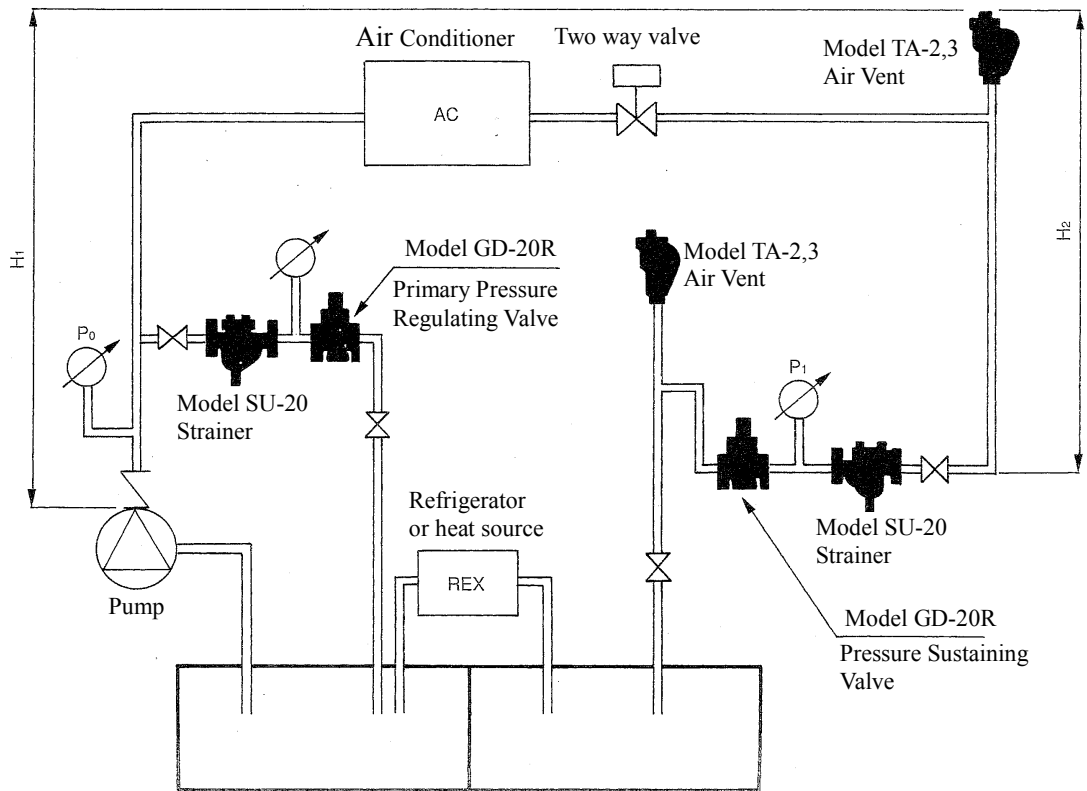


Fig.1

### 6 . 3 Example of Piping



For application to open circuit water fall prevention, install the valve as close as possible to the surface of the water level on the regenerative tank and install the pipe end as deep as possible into the tank water. To secure pressure behind the pressure sustaining valve, stand the pipe at the valve outlet side and install an air vent.

### 6 . 4 Adjustment Procedure

Regulation should be made while the fluid is flowing, To increase the initial blow-off pressure, loosen the lock nut<sup>⑭</sup> and turn the adjusting screw<sup>⑬</sup> clockwise; to decrease the setting pressure, turn the adjusting screw counter-clockwise.

In a case when the secondary pressure for valves size 65A to 150A is unstable due to air obstruction etc., adjust the opening of the needle valve at the conductor pipe.

6 . 5 Troubleshooting

Problem	Causes	Solutions
Adjustment is impossible	1. Foreign matter is embedded in the valve <sup>④</sup> and/or valve seat <sup>③</sup> , or else scratches exist.	1. Disassemble and clean. If scratches exist, replace the damaged parts.
Excessive leakage	2. Diaphragm <sup>⑨</sup> , O-ring <sup>⑦</sup> is broken. 3. Nominal size is too small for these specifications. 4. Pressure gauge malfunction.	2. Replace the Diaphragm <sup>⑨</sup> , O-ring <sup>⑦</sup> . 3. Replace with the correct nominal sized item. (Refer to the "Adjustment Procedure".) 4. Replace the pressure gauge.
Abnormal noise is heard.	1. Air problem is caused.(Liquid use) 2. Nominal size is too large for these specifications.	1. Install a trap. 2. Replace with the correct nominal sized item. (Refer to the "Adjustment Procedure".)

※ Foreign matter and scales in the pipe may cause most of the problems in a primary pressure regulating valve. Take special care to prevent foreign matters from.

※ Phenomenon similar to valve trouble may occur by defective pressure gauge, fluid leakage from by-pass valve, forgetting to close the by-pass valve, clogging strainer, etc. First, check the said particulars before troubleshooting.

## 6. 6 Disassembly

### ▪ Warning

The valve shall be disassembled and inspected by qualified persons.

- (1) Completely discharge internal pressure from the valves, lines, and equipment, and cool the valve down to a level where you can touch it with bare hands before disassembly and inspection.  
※Failure to do so may result in injury or burns due to residual pressure or spillage around the valve.

- (1) Relieve the internal pressure completely, and make sure the pressure is zero.
- (2) Slightly loosen the lock nut<sup>⑩</sup> and turn the adjusting screw<sup>⑮</sup> counter clockwise to relieve the adjusting spring<sup>⑭</sup> (Unload the spring).
- (3) Remove the hexagon bolt from the spring chamber<sup>②</sup>, then remove the spring chamber<sup>②</sup>, and take out the adjusting spring<sup>⑫</sup> and the spring plate<sup>⑬</sup>.
- (4) To remove the diaphragm<sup>⑪</sup>, fix the spindle<sup>⑥</sup> and remove the U nut.
- (5) To remove the retainer<sup>④</sup>, loosen and remove the retainer guide clamping bolt and pull the retainer guide<sup>⑤</sup>. Remove it by the below method (Fig.2, Fig.3) when it is difficult to remove the retainer guide<sup>⑤</sup>.

#### Nominal Size 15A~50A

To remove the retainer guide<sup>⑤</sup> easily, install the spring plate<sup>⑬</sup> and U nut to spindle<sup>⑥</sup> again and pull the spring plate<sup>⑬</sup>. (Fig.2)

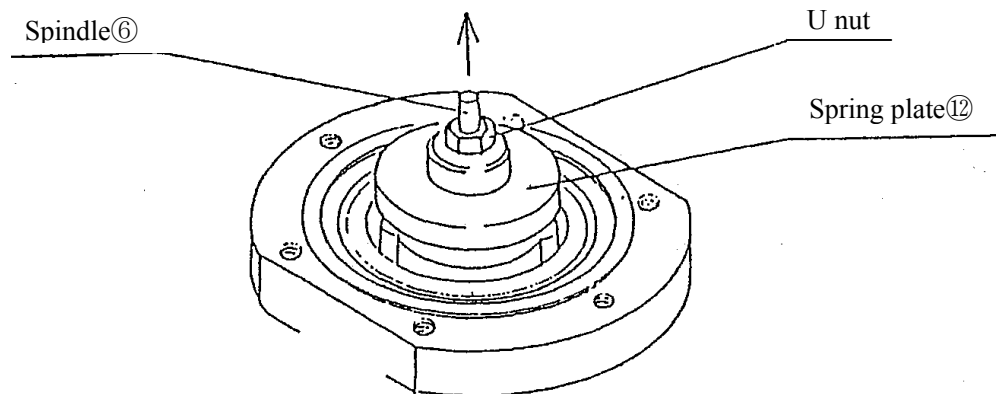


Fig.2

#### Nominal Size 65A~100A

To remove the retainer guide<sup>⑤</sup> easily, screw the retainer guide clamping bolt to retainer guide<sup>⑤</sup> and pull it. (Fig.3)

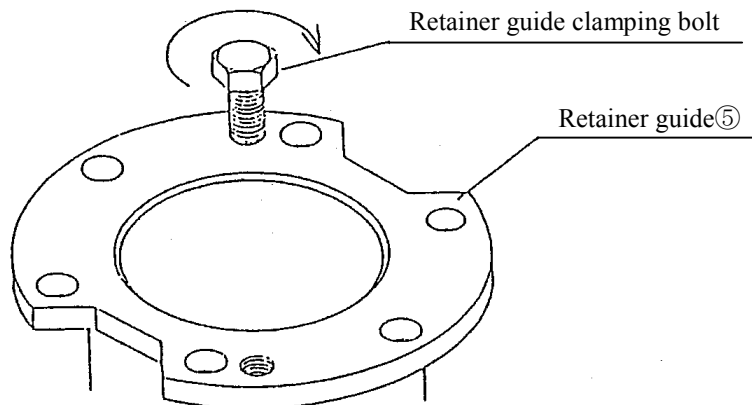
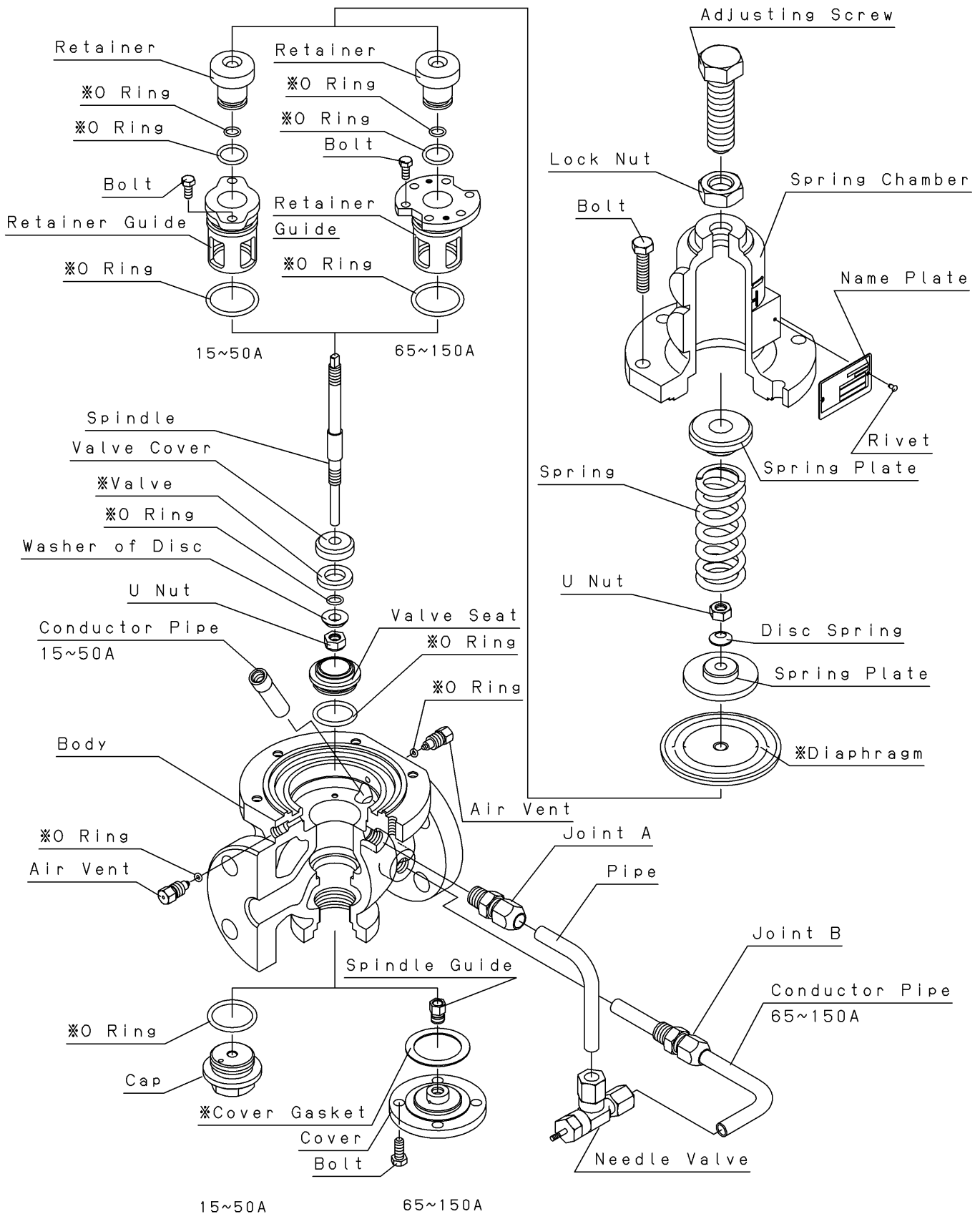


Fig.3

#### 6 . 7 Precautions during disassembly

- (1) Make sure that the diaphragm⑪, the valve seat⑧, and the valve⑨ have no scratches.
- (2) Apply the silicon grease to the O-Ring⑦? after confirm whether there is any flaw on the O-Ring⑦?
- (3) Install the spring chamber② after the confirm whether the border of diaphragm⑪ is fitted with the groove of body①.
- (4) There is a gap between retainer guide⑤ and body① shows these parts positioned correctly. Tighten the bolts evenly and be sure to tighten securely sufficiently.

6. 8 Exploded drawing



• Parts with in the \* are consumable.  
 Please contact us for purchase of these consumable parts.