

# 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               |
| Fluid temperature           | 5~60℃                                                                                      | 5~90℃                   |
| Adjustable primary pressure | Size 15~80mm L:0.05~0.35MPa, H:0.3~0.7MPa<br>Size 100~150mm L:0.05~0.35MPa, H:0.3~0.5MPa   |                         |
| End connection              | Flanged JIS 10KRF                                                                          |                         |
| Materials                   | Body(Cast iron), Trim(Cast bronze and Stainless steel), Diaphragm & disc(Synthetic rubber) |                         |
| Painting                    | Interior:Epoxy resin                                                                       | Interior:Rust proof oil |
| Valve body pressure test    | Hydraulic 1.5MPa                                                                           |                         |

\* Refer to Page 109 for size selection for pressure sustaining valve and Page 100 for valve sizing.

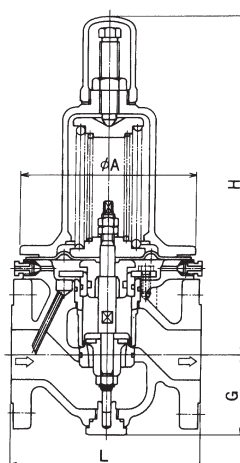
## DIMENSIONS

(mm)

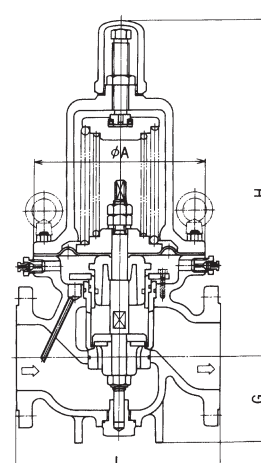
| Size    | L   | A   | G   | H   | Cv value | Mass(kg) |
|---------|-----|-----|-----|-----|----------|----------|
| 15(½")  | 156 | 142 | 65  | 256 | 1        | 10       |
| 20(¾")  | 160 | 142 | 65  | 256 | 2        | 10       |
| 25(1")  | 160 | 142 | 65  | 257 | 3.5      | 10.5     |
| 32(1¼") | 180 | 174 | 76  | 333 | 5.5      | 17       |
| 40(1½") | 180 | 174 | 76  | 332 | 8        | 17.5     |
| 50(2")  | 190 | 174 | 81  | 341 | 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



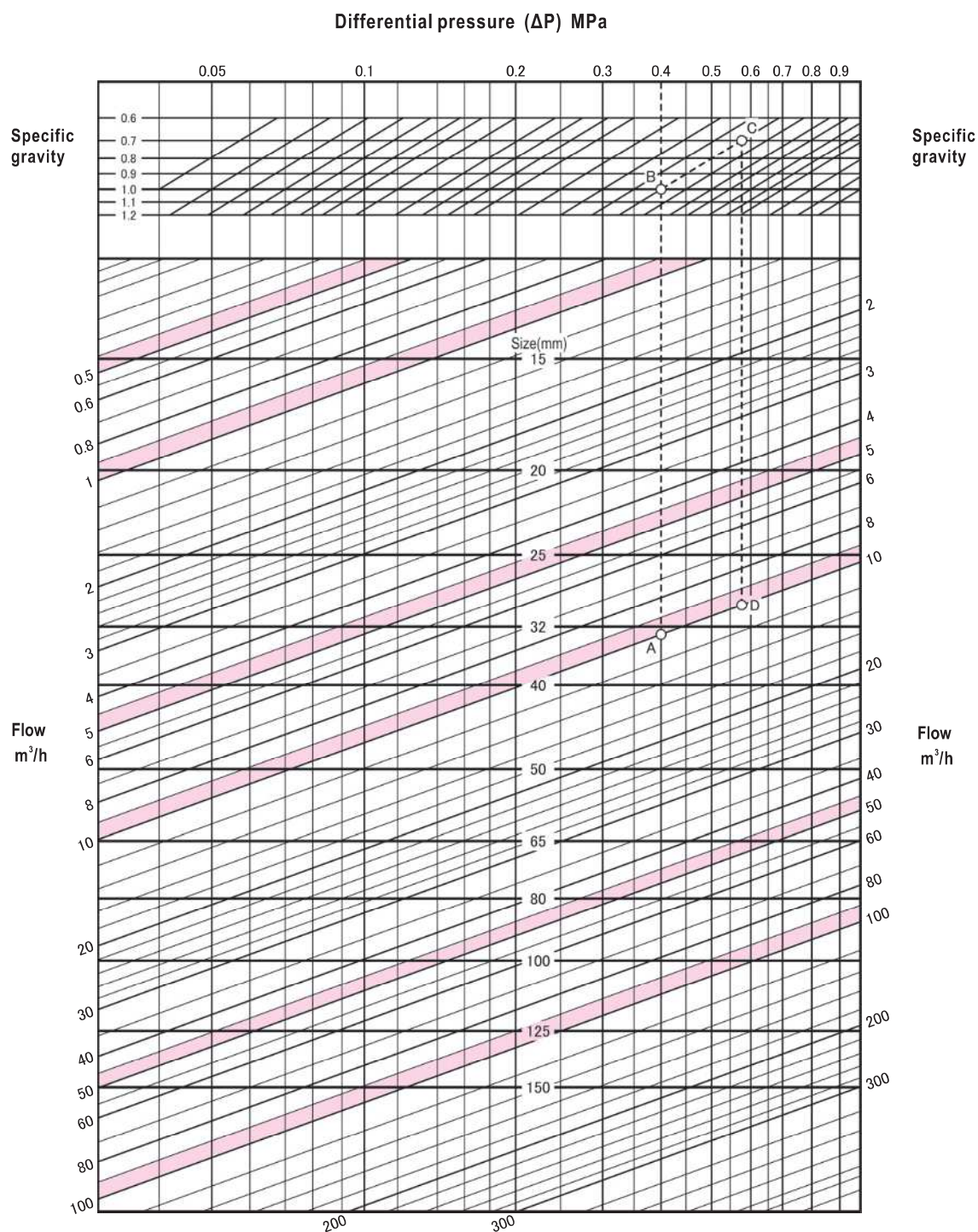
Size 100~150mm

Construction is a bit different depending on sizes.



# 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: 10m<sup>3</sup>/h.  
The differential pressure ( $\Delta P$ ) is 0.5-0.1=0.4MPa  
Find out the intersection point A between the 0.4MPa differential pressure ( $\Delta P$ ) line and the

10m<sup>3</sup>/h flow line.  
Since point A is between the lines nominal diameter size 32mm and 40mm select, choose the larger one, 40mm.  
And here by the same conditions except the specific gravity is 0.7, find out the intersection point B between the 0.4MPa differential pressure ( $\Delta P$ ) 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 10m<sup>3</sup>/h flow line. The intersection point is named D. Since point D is located between the lines nominal diameter size 25mm and 32mm select, choose the larger one, 32mm.

# DATA/Circuit Valve

## Types of Circuit Valve

### OVERVIEW

Circuit valves 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 operated type MD-14 Type)**

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 Type is also available.



**Pressure sustaining valve  
(Direct operated type MD-20 Type)**

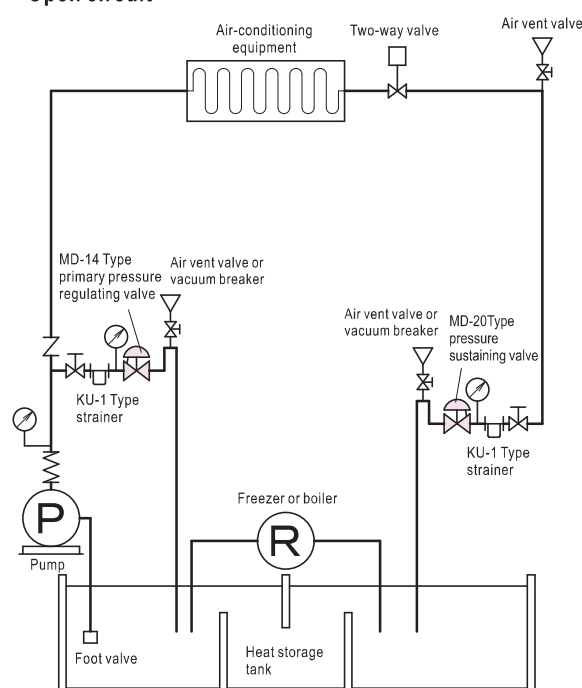
This valve can prevent water from falling in return pipe of open circuit for air conditioning system in high buildings that may occur when pump stops. By installing pressure sustaining valve in return pipe, the valve closes immediately after pump stops. This can prevent decrease of water level and accumulation 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.



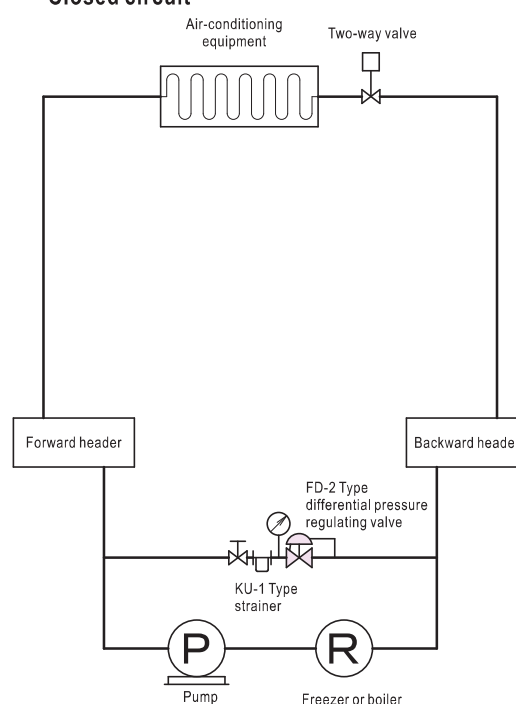
**Differential pressure regulating valve  
(Direct operated type FD-2 Type)**

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

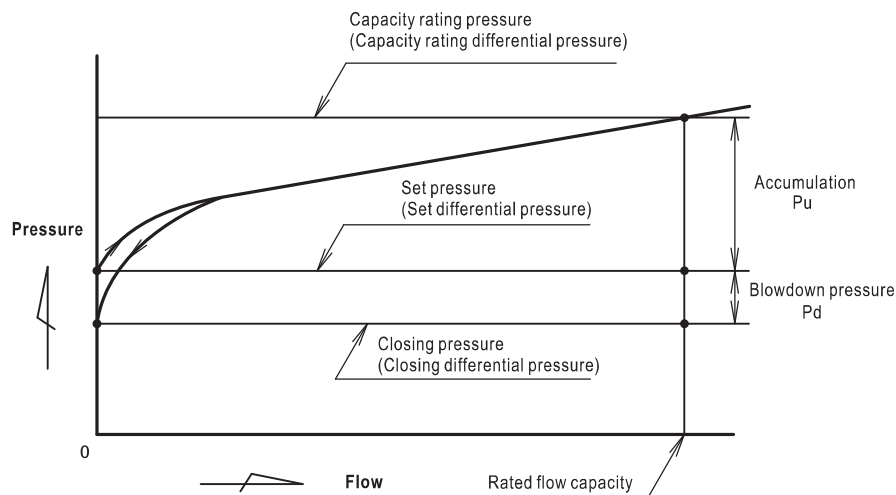


## TERMS

- **Set pressure (set differential pressure):** The pressure at inlet side when primary pressure regulating valve and pressure sustaining 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**



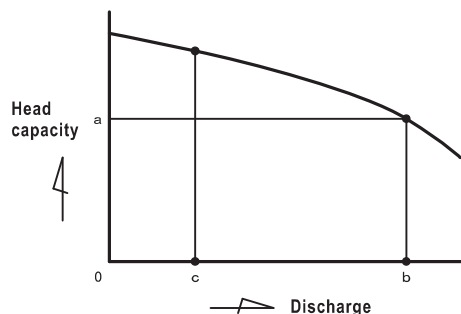
## CHARACTERISTICS

| Operation mode   | Model             | Accumulation $P_u$                                                                                                           | Blowdown pressure $P_d$                                                                                                                                                    |
|------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Direct operating | MD-14W, 14H, 14CN | $\leq$ Max. spring regulating range $\times 15\%$<br>( $\leq 20\%$ , in case of size 100mm or larger and spring for 0.5MPa.) | $\leq$ Set pressure $\times 10\%$<br>(Min. 0.02MPa)                                                                                                                        |
|                  | FD-2W, 2H         |                                                                                                                              |                                                                                                                                                                            |
|                  | MD-35F, 37F       | See Flow Characteristics Chart, Page 103                                                                                     | $\leq 0.04\text{MPa}$                                                                                                                                                      |
|                  | MD-20W, 20H       | See Accumulation Chart, Page 109                                                                                             |                                                                                                                                                                            |
| Pilot operating  | WVM-02            | $\leq$ Set pressure $\times 10\%$<br>(Min. 0.03MPa)                                                                          | Adjusting spring range<br>0.05~0.35 (0.3)MPa;<br>$\leq$ set pressure $\times 20\%$ (Min. 0.03MPa)<br>0.3~1.0 (0.7)MPa and 0.5~1.6MPa;<br>$\leq$ Set pressure $\times 15\%$ |

# DATA/Circuit Valve

## ■ SIZE SELECTION OF PRIMARY PRESSURE REGULATING VALVE

### PUMP CHARACTERISTICS CHART



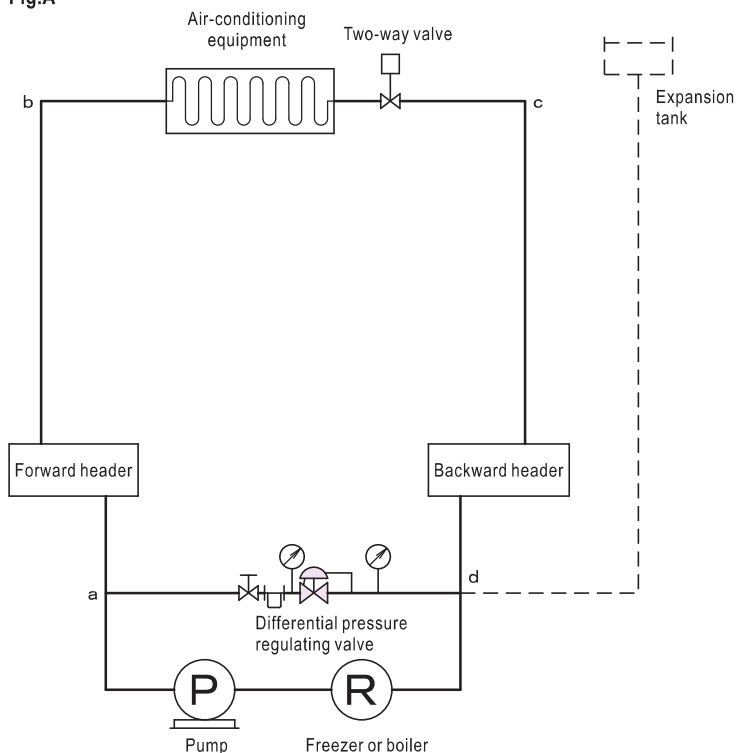
- 1 Use the size selection chart to decide the nominal diameter.
- 2 When primary pressure and back pressure are not constant, but change within a certain range, use the primary pressure and back pressure that allows for minimum difference between these two pressures to decide the size.
- 3 In the case of fluid which viscosity cannot be ignored (e.g. oil), make viscosity correction when deciding size.
- 4 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 (on 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



- 1 Use the size selection chart in Page 100. If water temperature is higher than 60°C, the size should be large enough to allow additional 10~20% flow.
- 2 In Fig.A, the differential pressure before and after valve ( $\Delta P$ ), which is necessary for deciding size, is the total pressure loss between a, b, c, and d.
- 3 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 Type series, see Page 101.



## DATA/Circuit Valve

## ■ 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 <sup>3</sup> /h)                                                                                                                                                                      | 42m <sup>3</sup> /h                       | m <sup>3</sup> /h |
| Height from pump to the highest point of pipe                                                                                                                                            | H <sub>1</sub> (m)                                                                                                                                                                       | 27m                                       | m                 |
| Height from pressure sustaining valve to the highest point of pipe                                                                                                                       | H <sub>2</sub> (m)                                                                                                                                                                       | 26m                                       | m                 |
| Total resistance of pipe between pump outlet and pressure sustaining valve, and machine resistance                                                                                       | W <sub>1</sub> (MPa)                                                                                                                                                                     | 0.2MPa                                    | MPa               |
| Resistance after pressure sustaining valve                                                                                                                                               | W <sub>2</sub> (MPa)                                                                                                                                                                     | 0.01MPa                                   | MPa               |
| Pressure differential before and after valve<br><br>$\Delta P = P - \frac{0.098(H_1 - H_2)}{10} - (W_1 + W_2)$                                                                           | $\Delta P = 0.6 - \frac{0.098(27 - 26)}{10} - (0.2 + 0.01)$<br>$= 0.38$                                                                                                                  | $\Delta P =$<br>$=$                       | MPa<br>MPa        |
| Set pressure (Min)<br><br>$P_s = \frac{0.098H_2}{10} + P_d$ (P <sub>d</sub> : blowdown pressure MPa)<br>See Page 109.<br>Make sure $\Delta P > P_s$                                      | $P_s = \frac{0.098 \times 26}{10} + 0.04$<br>$= 0.29$ $\Delta P > P_s$<br>$0.38 > 0.29$                                                                                                  | $P_s =$<br>$=$<br>$\Delta P > P_s$<br>$>$ | MPa<br>MPa        |
| Use P <sub>s</sub> and size selection chart to determine nominal diameter and rated flow.<br>See the chart in Page 100 .                                                                 | Size: 80<br>Rated flow: 47                                                                                                                                                               | m <sup>3</sup> /h                         | m <sup>3</sup> /h |
| Accumulation P <sub>u</sub><br>Use rated flow % to obtain accumulation (P <sub>u</sub> ).<br><br>$\text{Rated flow}(\%) = \frac{\text{Flow required}}{\text{Rated flow}} \times 100(\%)$ | In case of MD-20 Type<br>Rated flow(%) = $\frac{42}{47} \times 100 = 89\%$<br>Using the accumulation chart,<br>P <sub>u</sub> = 0.065                                                    | MPa                                       | MPa               |
| Checking pump capacity<br>$P \geq \frac{0.098H_1}{10} + W_1 + P_u + P_d$ Surplus pressure of pump<br>$P - (\frac{0.098H_1}{10} + W_1 + P_u + P_d)$                                       | $\frac{0.098 \times 27}{10} + 0.2 + 0.065 + 0.04$<br>$= 0.570$ MPa<br>Since P = 0.6 MPa<br>the requirement is satisfied.<br>The surplus pressure of pump = $0.6 - 0.570$<br>$= 0.03$ MPa | MPa<br>MPa<br>MPa                         | MPa<br>MPa<br>MPa |
| Range of set pressure<br><br>Result of selection                                                                                                                                         | Range of set pressure should be 0.29~0.32MPa<br>Model: MD-20<br>Size: 80 mm<br>Set pressure: 0.32 MPa                                                                                    | MPa<br>mm<br>MPa                          | MPa<br>mm<br>MPa  |

## Key points for installation

### PIPING EXAMPLE

Fig.1 Primary pressure regulating valve/pressure sustaining valve (with bypass pipe)

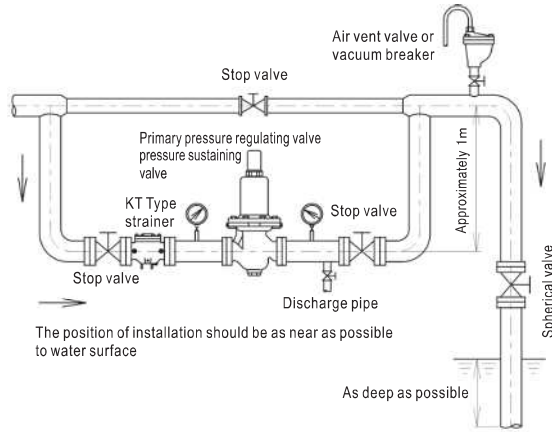


Fig.2 Primary pressure regulating valve/pressure sustaining valve (without bypass pipe)

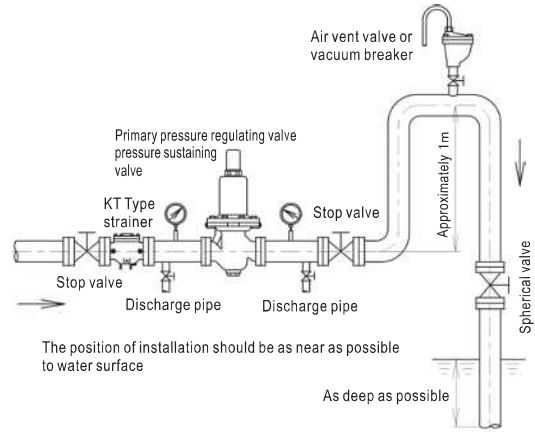


Fig. 3 Differential pressure regulating valve (with bypass pipe)

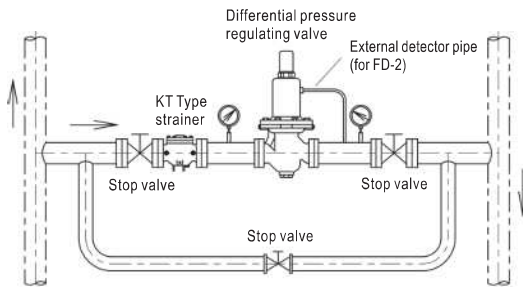
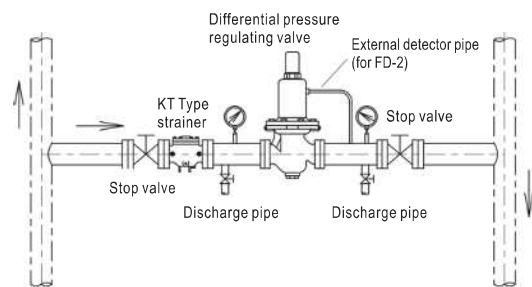


Fig. 4 Differential pressure regulating valve (without bypass pipe)



### KEY POINTS FOR INSTALLATION

1. If not otherwise specified, primary pressure regulating valve should be installed vertically 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 immersed 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 on 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).
7. Leave some space for disassembling 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.

Fig.5 Piping example: Primary pressure regulating valve with external detector

