

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

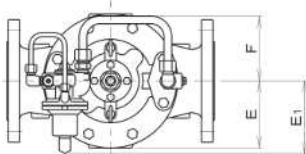
for (Pump Relief), (Pressure Tank/Piping), etc. Pilot Type (large capacity)

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

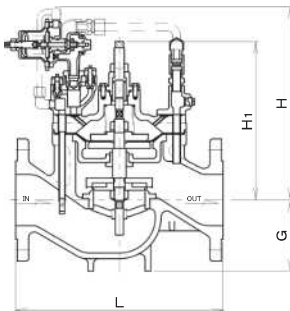


CONSTRUCTION

Size 80~200mm



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



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

FEATURES

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

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

SPECIFICATIONS

Type	Standard		Nylon coating
Model name	WVM-02		WVM-02CN
Code name	WVM02-B □	WVM02-L □	WVM02CN-B □
	※ L (low press.) or M (high press.) for adjustable primary pressure is required in □.		
Size	50~400(2"~16")	40~200(1½"~8")	80~200(3"~8")
Applicable fluid	Water & hot water		
Fluid temperature	5~60℃		
Adjustable primary pressure	Max. 1.0MPa* ¹		Max. 1.0MPa
Adjustable primary pressure	Size 40~200mm L: 0.05~0.35MPa, M: 0.3~1.0MPa* ² . Size 250~400mm L: 0.05~0.35MPa, M: 0.3~0.7MPa		
Blowdown pressure	Set pressure adjustable range 0.05~0.35MPa: Set pressure × 20% or less (min. within 0.03MPa) Set pressure adjustable range 0.3~0.7, 0.3~1.0, 0.3~1.6MPa: Set pressure × 15% or less		
Accumulation	Set pressure × 10% or less (min. within 0.03MPa)		
End connection	Flanged JIS 10KRF* ¹		Flanged JIS 10KRF
Materials	Body	Cast iron	Ductile cast iron
	Trim	Disc & diaphragm (Synthetic rubber), Seat ring (Cast bronze)	
Painting or coating for Body	Interior: Epoxy resin		Nylon 11 coating
Valve body pressure test	Hydraulic 1.5MPa		Hydraulic 1.75MPa
Installation	Vertical and horizontal (For size 250mm and bigger: Install valve vertically on the horizontal piping)		

*1. Adjustable primary pressure Max. 1.6MPa (0.5~1.6MPa) with Flanged JIS 16KRF for sizes 200mm or smaller are available upon your request.

*2. For size 40 and 50mm, adjustable primary pressure range is 0.5~1.0MPa. Code name: WVM02-B (Cast iron body), WVM02-L (Ductile cast iron body)

*3. The valve model WVM-02PN Type with epoxy resin painted inside and outside of the valve body (Cast iron body material, sizes 80~200mm) is available upon your request.

*4. Valve with pressure gauge is also available upon your request.

*5. Refer to Page 101 for valve sizing and Page 111 for example of installation in a pipe line.

DIMENSIONS (Body: Cast iron)

(mm)

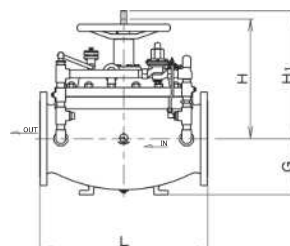
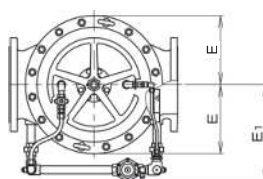
Size	L	G	H	H ₁	E	E ₁	F	Cv value	Mass(kg)
40(1½")	260	80	345	230	93	115	216	18	23.5
50(2")	270	85	345	230	93	115	216	32	26.5
65(2½")	340	100	346	261	117	136	145	38	43
80(3")	350	110	346	261	117	136	145	54	43
100(4")	400	130	372	300	130	136	145	96	60
125(5")	440	140	403	371	145	136	145	150	70
150(6")	500	165	436	416	173	136	145	216	125
200(8")	600	200	487	522	218	136	145	384	200
250(10")	720	240	490	560	295	420	—	600	470
300(12")	820	280	540	620	328	430	—	864	524
400(16")	1040	370	690	800	440	520	—	1536	1400

*1. JIS 10K: Flanged code JIS 10KRF

*2. Please contact our local agent for the dimensions of the main valve of Ductile cast iron or Flanged JIS 16K.

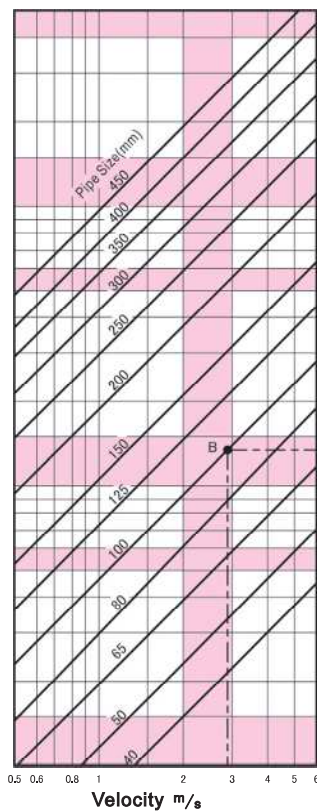
*3. Valve body material of size 40mm is Ductile cast iron only.

Size 250~400mm

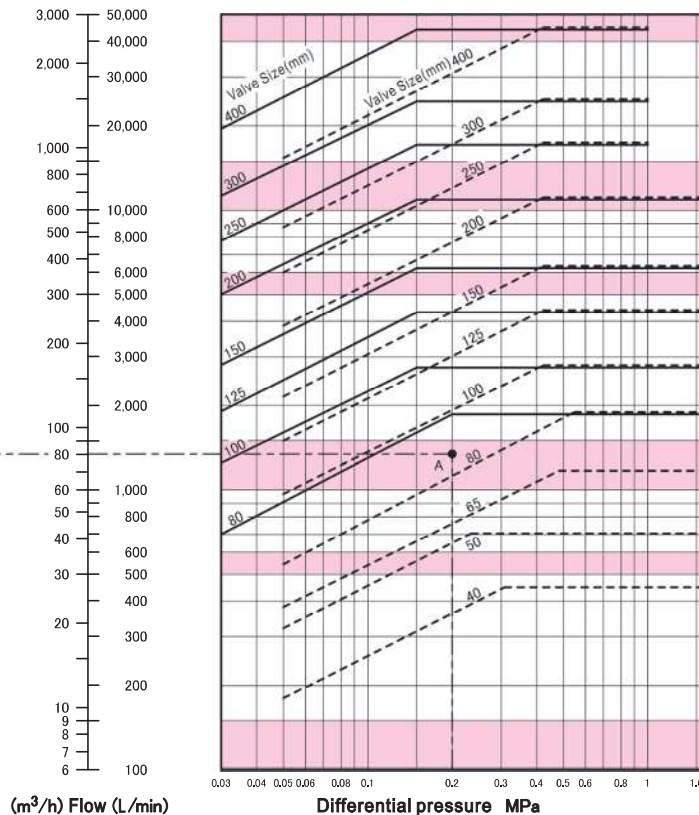


SIZE SELECTION CHART (for Water)

■ VELOCITY RATE LINE CHART



■ SIZE SELECTION CHART



● PRODUCTS WHOSE SIZES CAN BE DETERMINED

----- (dashed line) in the size selection chart

Pressure reducing valve WVR-02 Type, Primary pressure regulating valve WVM-02 Type.

● VALVES APPLICABLE TO

———— (solid line) in size selection chart

Solenoid valve WVE-02 Type, Level control valve WVL-02 Type.

Note 1: In the size selection chart, the horizontal position of the valve size line represents the maximum flow.

Note 2: Use velocity line of less than 3m/s in velocity line chart with obtained pipe size, if not any special case.

Note 3: Size 40~65mm are for WVR and WVM types only.

Note 4: For sizes 40, 50mm, in case of the larger differential pressure, please contact our local agent in your area.

● HOW TO USE THE CHART

Example: Select the size of valve for the following conditions:

Primary pressure: 0.5MPa; Secondary pressure: 0.3MPa; Flow: 80m³/h

1. Calculate differential pressure between inlet and outlet of valve: $0.5 - 0.3 = 0.2\text{MPa}$

2. Follow the 80m³/h flow line horizontally until it intersects with the 0.2MPa differential pressure line. The intersection point is named A.

3. Since point A is between the lines representing size 80mm and 100mm, select the larger size, which is size 100mm.

● CONFIRMING PIPE FLOW RATE

1. Assume the pipe and valve are of the same diameter. Follow the 80m³/h flow line horizontally until it intersects with the 100mm size line to obtain cross point B.

2. Draw a vertical line from point B and find out the pipe flow rate 2.8m/s.

3. Since the flow rate is less than 3m/s, the pipe size should be size 100mm. If flow rate is larger than 3m/s, select a larger size to make the flow rate less than 3m/s.

● REFERENCE

■ To select the size for pressure reducing valve or primary pressure regulating valve with considering dynamic water pressure:

For pressure reducing valve, add the largest offset pressure to the secondary pressure. For primary pressure regulating valve, deduct the minimum accumulation from the primary pressure. The size can be determined using the differential pressure between primary and secondary of valve.

● Pressure reducing valve

Find out the maximum offset pressure 0.1MPa from the specifications. The differential pressure is $0.5 - (0.3 + 0.1) = 0.1\text{MPa}$. Use the method described in the example in "HOW TO USE THE CHART" to select the size.

● Primary pressure regulating valve

Find out the minimum accumulation 0.03MPa from specifications. The differential pressure is $(0.5 - 0.03) - 0.3 = 0.17\text{MPa}$. Use the method described in the example in "HOW TO USE THE CHART" to select the size.

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)**

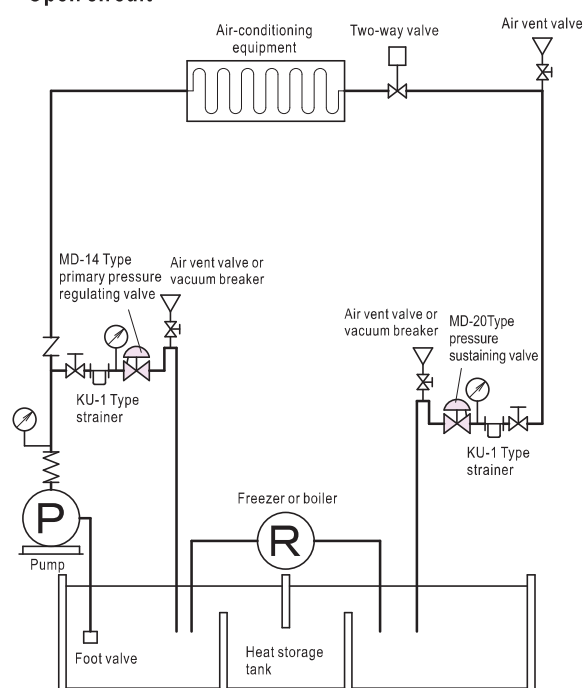
This valve can prevent water from falling in return pipe of open circuit for air conditioning system in high buildings that may occur when pump stops. By installing pressure sustaining valve in return pipe, the valve closes immediately after pump stops. This can prevent decrease of water level and accumulation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



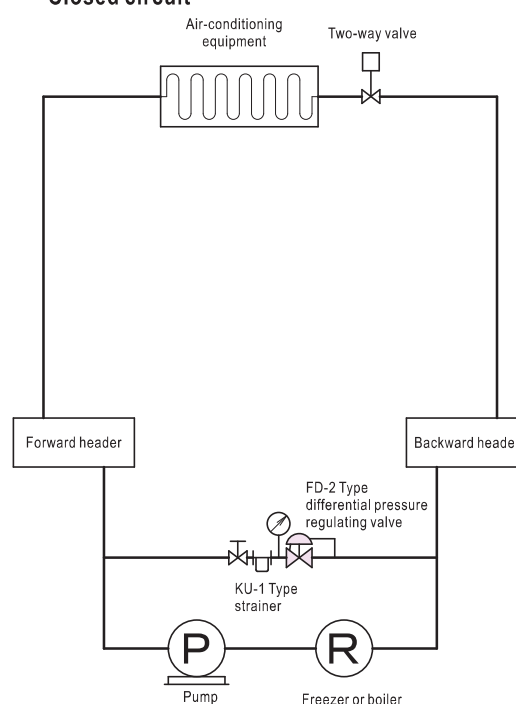
**Differential pressure regulating valve
(Direct operated type FD-2 Type)**

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

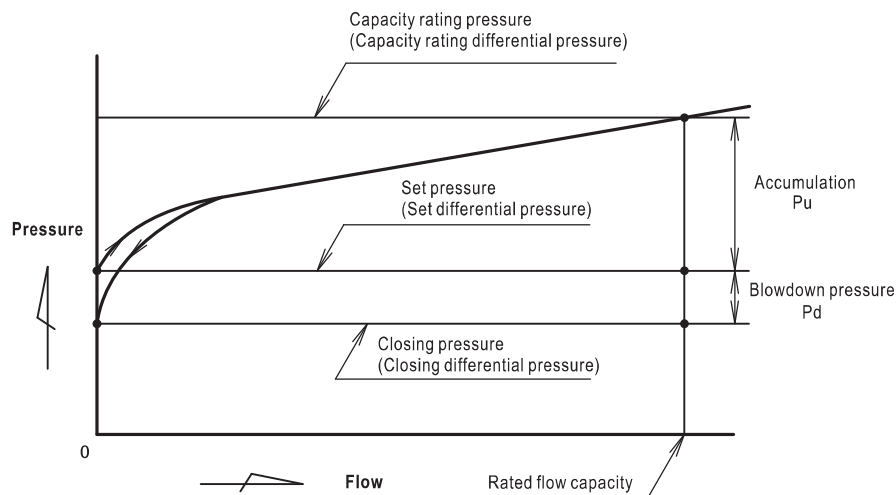


TERMS

- **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



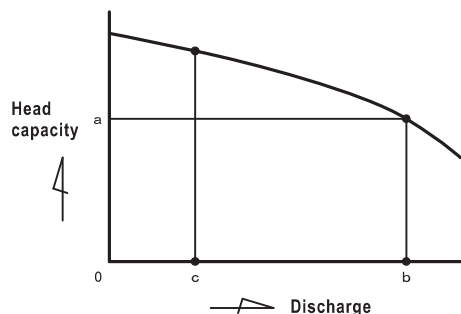
CHARACTERISTICS

Operation mode	Model	Accumulation P_u	Blowdown pressure P_d
Direct operating	MD-14W, 14H, 14CN	$\leq$ Max. spring regulating range $\times 15\%$ ($\leq 20\%$, in case of size 100mm or larger and spring for 0.5MPa.)	$\leq$ Set pressure $\times 10\%$ (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 $\times 10\%$ (Min. 0.03MPa)	Adjusting spring range 0.05~0.35 (0.3)MPa; $\leq$ set pressure $\times 20\%$ (Min. 0.03MPa) 0.3~1.0(0.7)MPa and 0.5~1.6MPa; $\leq$ Set pressure $\times 15\%$

DATA/Circuit Valve

SIZE SELECTION OF PRIMARY PRESSURE REGULATING VALVE

PUMP CHARACTERISTICS CHART



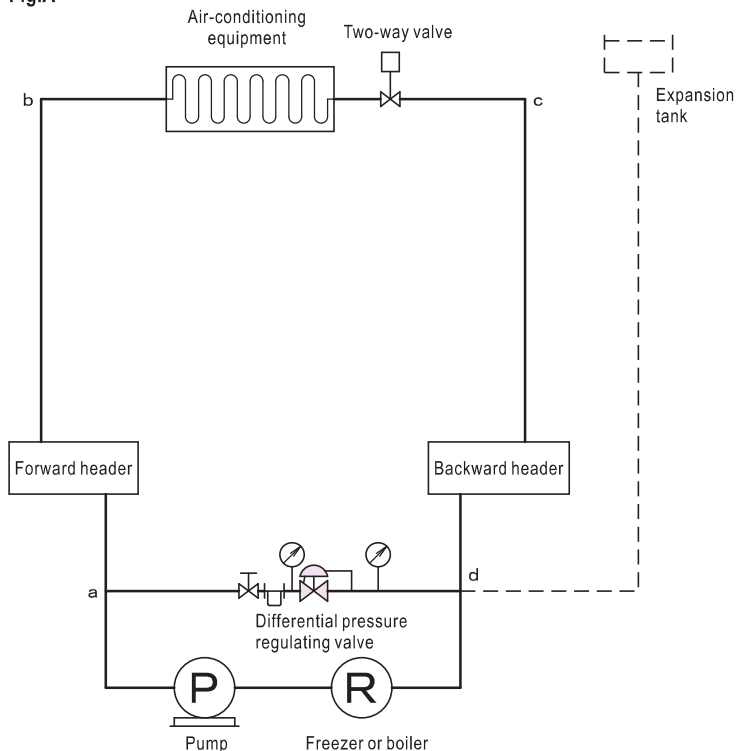
- 1 Use the size selection chart to decide the nominal diameter.
- 2 When primary pressure and back pressure are not constant, but change within a certain range, use the primary pressure and back pressure that allows for minimum difference between these two pressures to decide the size.
- 3 In the case 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 (ΔP), 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.

Key points for installation

PIPING EXAMPLE

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

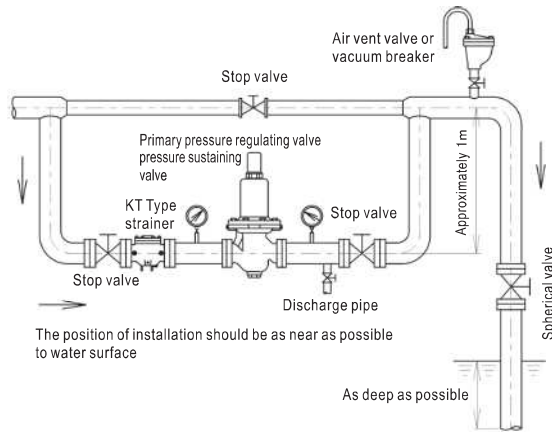


Fig.2 Primary pressure regulating valve/pressure sustaining valve (without bypass pipe)

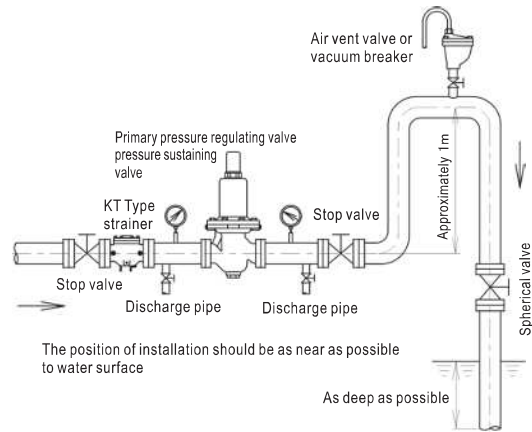


Fig. 3 Differential pressure regulating valve (with bypass pipe)

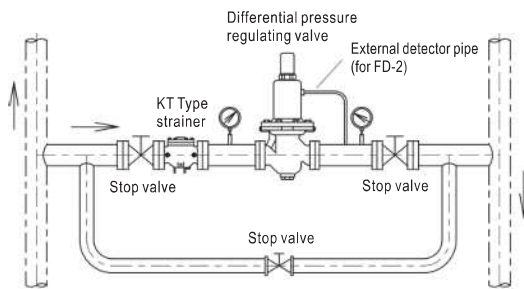
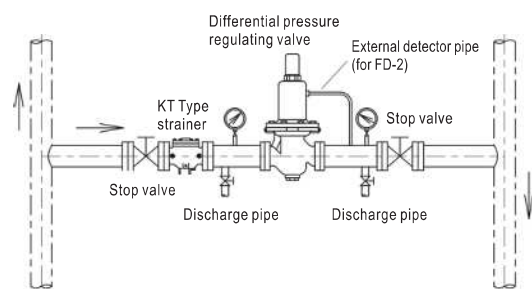


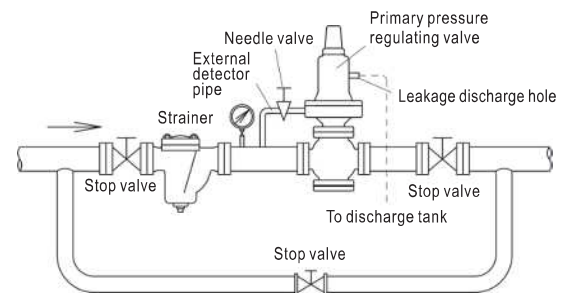
Fig. 4 Differential pressure regulating valve (without bypass pipe)



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

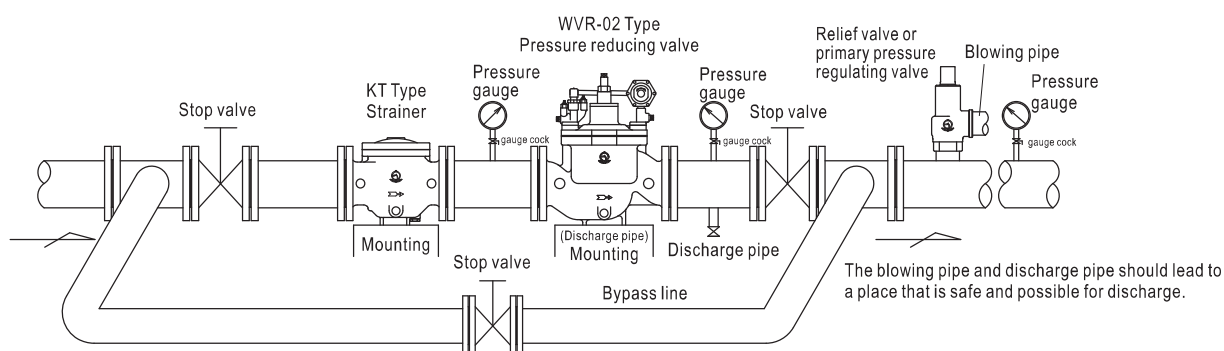


DATA/WV Type Regulating Valve (for Water or Hot water)

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

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

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



POINTS FOR INSTALLATION AND USE

BYPASS LINE

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

STRAIGHT PIPE

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

PIPING SUPPORT

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

STRAINER

Install strainer at the primary side of the valve.

SAFETY DEVICE

Considering the rise of secondary pressure, in some cases, it is necessary to install relief valve or primary pressure regulating valve at the secondary side. See the following table for the approximate set pressure for the relief valve or primary pressure regulating valve. The outlet of the relief valve or primary pressure regulating valve should lead to a drainage that can accept the discharge of the valve.

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

Set pressure of pressure reducing valve	Set pressure of safety valve ※2.
0.1 or less	+0.05 (+0.08)
over 0.1 and less than 0.4	+0.08 (+0.14)
0.4 or more and less than 0.6	+0.12 (+0.2)
0.6 or more and less than 0.8	+0.15 (+0.28)
0.8 or more and 1.0 or less	+0.19

Add above value to set pressure of pressure reducing valve.

※1. The above value is added to the set pressure of pressure-reducing valve.

※2. The values in parentheses are applicable to soft-seated safety relief valve.

THERMO-INSULATION

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

Note 1: The figure shows an example of WVR-02 Type. The piping for other types of valves are the same. However, for WVM-02 Type, there should be a rising part at the outlet piping. (See the piping example in Page 111)

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

PRESSURE GAUGE

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

LIMITATION ON INSTALLATION LOCATION

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

DISCHARGE PIPE

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

MAINTENANCE SPACE

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

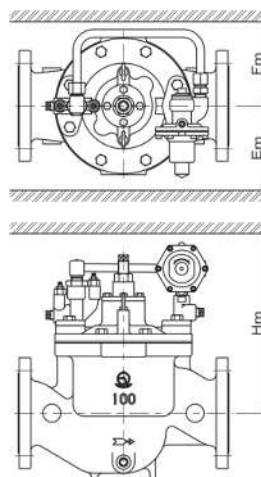


TABLE FOR MAINTENANCE SPACE (mm)

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

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