

MODEL GP-27

PRESSURE REDUCING VALVE

PRODUCT MANUAL

Thank you very much for choosing the Yoshitake's product. To ensure the correct and safe use of the product, please read this manual before use. This manual shall be kept with care for future references.

The symbols used in this manual have the following meanings.

	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 or may result in only property damage.

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YOSHITAKE

1. Specifications

Model	GP-27	
Connection	JIS 10K FF Flanged	
Application	Steam	
Inlet pressure	0.1-1.0 MPa	
Reduced pressure	0.03-0.8 MPa	
	80% or less of Inlet pressure (gauge pressure)	
Min. differential pressure	0.07 MPa	
Max. pressure reducing ratio	10:1	
Max. temperature	220 °C	
Valve seat leakage	0.05% or less of rated flow	
Material	Body	Ductile Cast Iron
	Valve, Valve seat	Stainless Steel
	Pilot valve, pilot valve seat	Stainless Steel
	Piston, Cylinder	Bronze
	Diaphragm	Stainless Steel

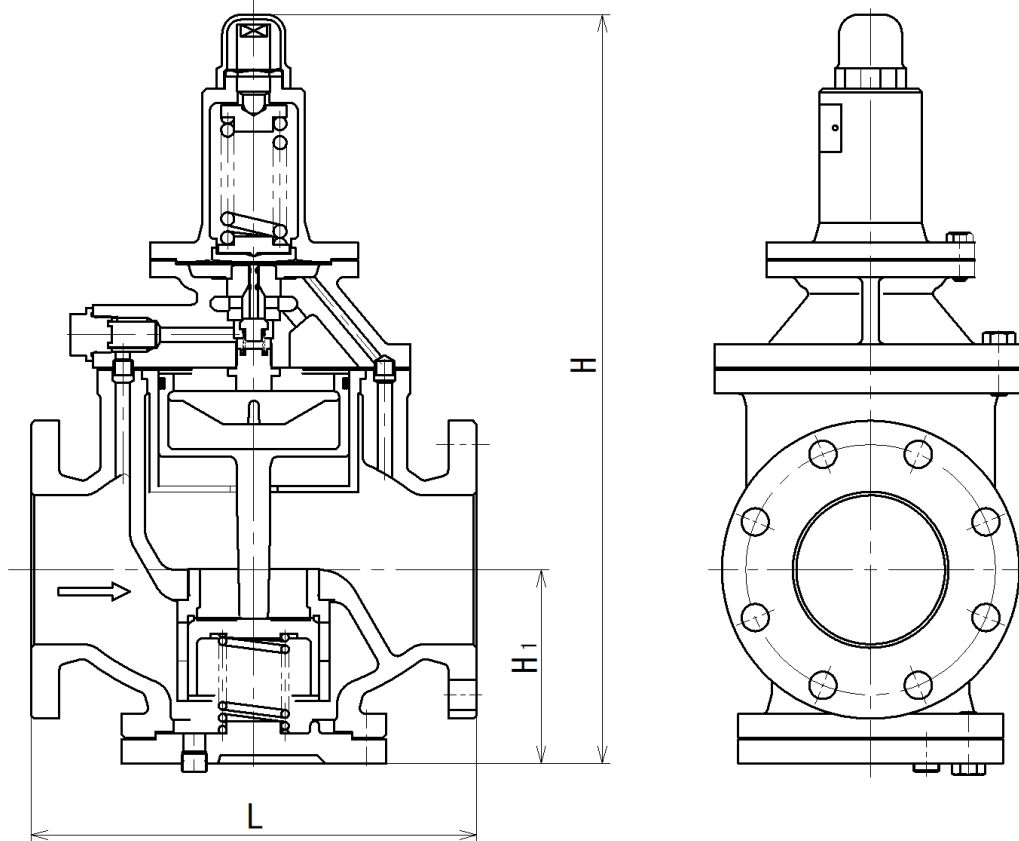


Caution

Please confirm that the indications on the product correspond with the specifications of the ordered product model before use.

* If they are different, please contact us without using the product.

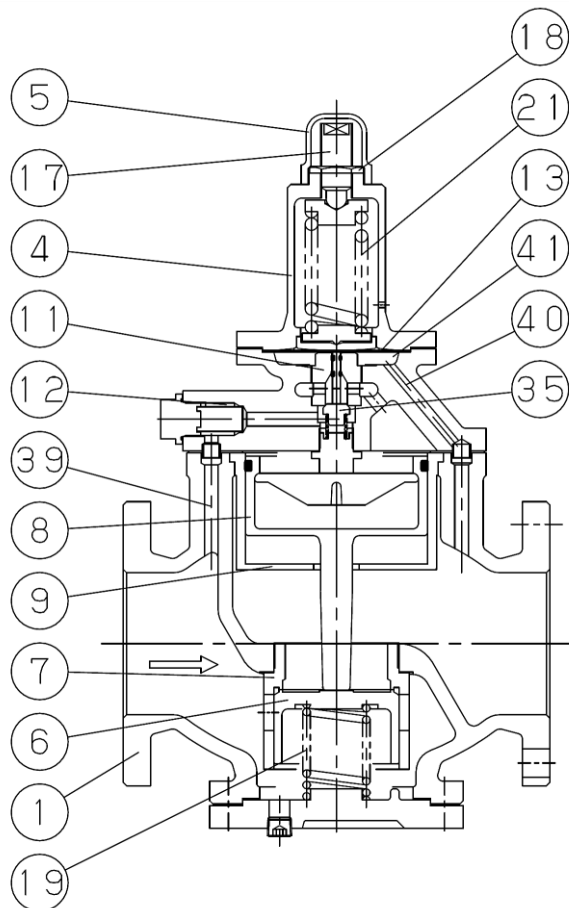
2. Dimensions and Weights



(mm)

Nominal Size	L	H	H ₁	Weight(kg)
125A	375	627	162	90
150A	420	686	190	135
200A	490	765	220	204

3. Operation



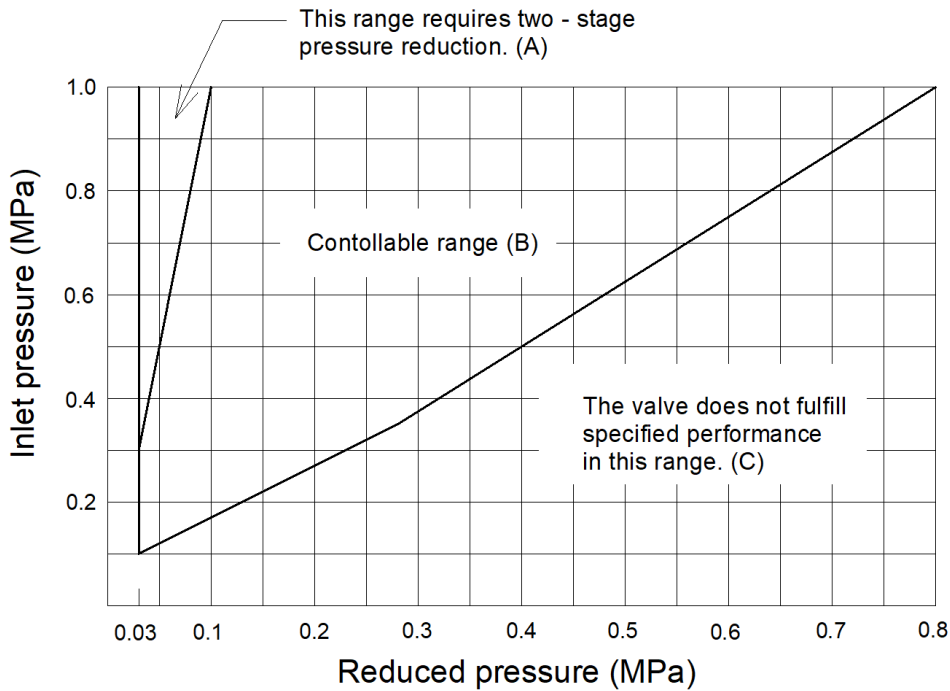
No.	Parts name
1	Body
4	Spring Chamber
5	Cap
6	Main valve
7	Main valve seat
8	Piston
9	Cylinder
11	Pilot valve seat
12	Strainer
13	Diaphragm
17	Adjusting screw
18	Lock nut
19	Main valve spring
21	Adjusting spring
35	Pilot valve
39	Inlet press. passage
40	Reduced press. sensing port
41	Diaphragm chamber

The pressure-reducing valve reduces pressure by the throttling the valve. The valve is composed of the main valve and main valve seat for throttling, and adjusting spring, diaphragm, pilot valve, and piston for pressure sensing and activation.

- (1) When the pressure-reducing valve is mounted correctly, releasing the compression of adjusting spring [21] allows the spring to close main valve [6] and pilot valve [35]. Slowly open the gate valve and allow the high-pressure fluid to flow in. Inlet pressure is applied to the downside of the main valve. High-pressure fluid passes through strainer [12] via inlet pressure passage [39] to also apply inlet pressure to the downside of the pilot valve.
- (2) Turning adjusting screw [17] in the direction of the casted arrow with “H” on spring chamber [4] compresses spring [21] and flexes diaphragm [13], and thus opens pilot valve [35].
- (3) Inlet pressure via inlet pressure passage and pilot valve enters the upside of the piston. The pressure overrides the pressure on the downside of the main valve and the load of main valve spring [7], to open the main valve. The fluid then begins to flow from the inlet side.
- (4) Reduced pressure is led to diaphragm chamber [41] via reduced pressure sensing port [40]. The diaphragm receives the reduced pressure to be balanced with the adjusting spring load, and control the pilot valve travel.
- (5) The change of pilot valve travel changes the flow rate of fluid to the upside of the piston, and controls the main valve travel to obtain appropriate reduced pressure.

4. Nominal size selection method

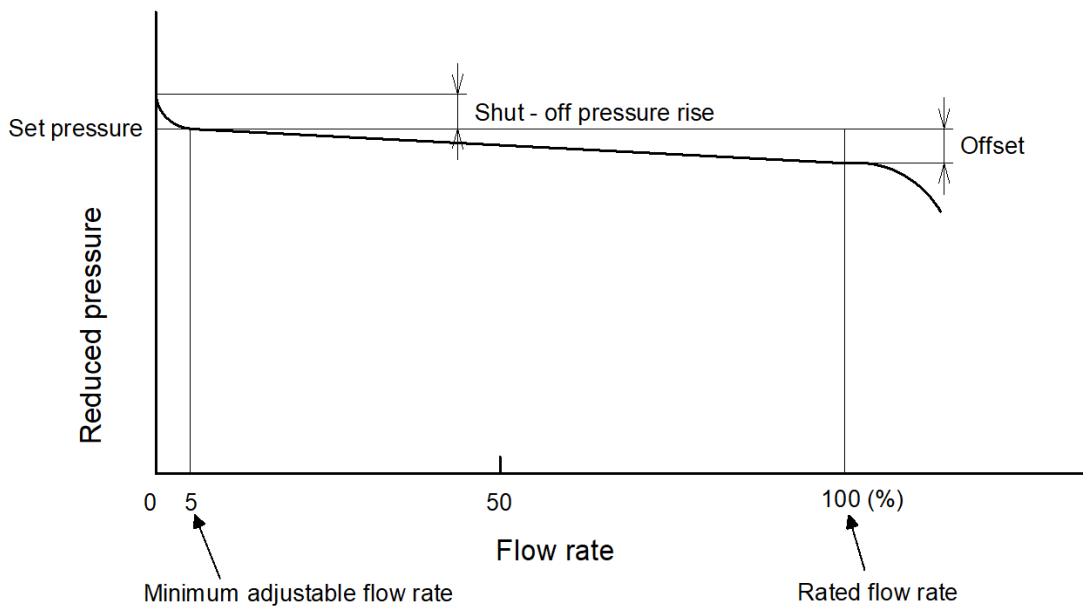
4.1 Pressure reducing valve specification selection chart



Based on the selection chart, select a pressure reducing valve in the optimum manner. On the selection chart, first find the intersection point of the inlet pressure and the reduced pressure. Two-stage pressure reduction is required if the intersection point lies in range (A), or the pressures are controllable with a single pressure reducing valve if the intersection point is within range (B). The valve does not fulfill specified performance in range (C). To adopt two-stage pressure reduction, separate two pressure reducing valves as far away from each other as possible (at least 3m).

4.2 Characteristic chart

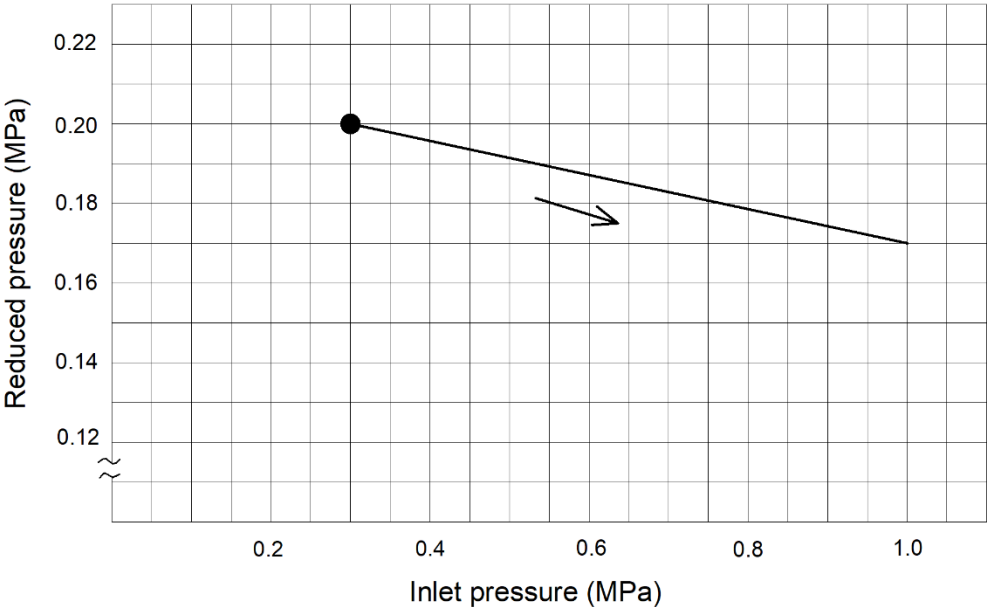
(1) Flow rate characteristics chart



* Shut-off pressure rise: 0.02 MPa or less

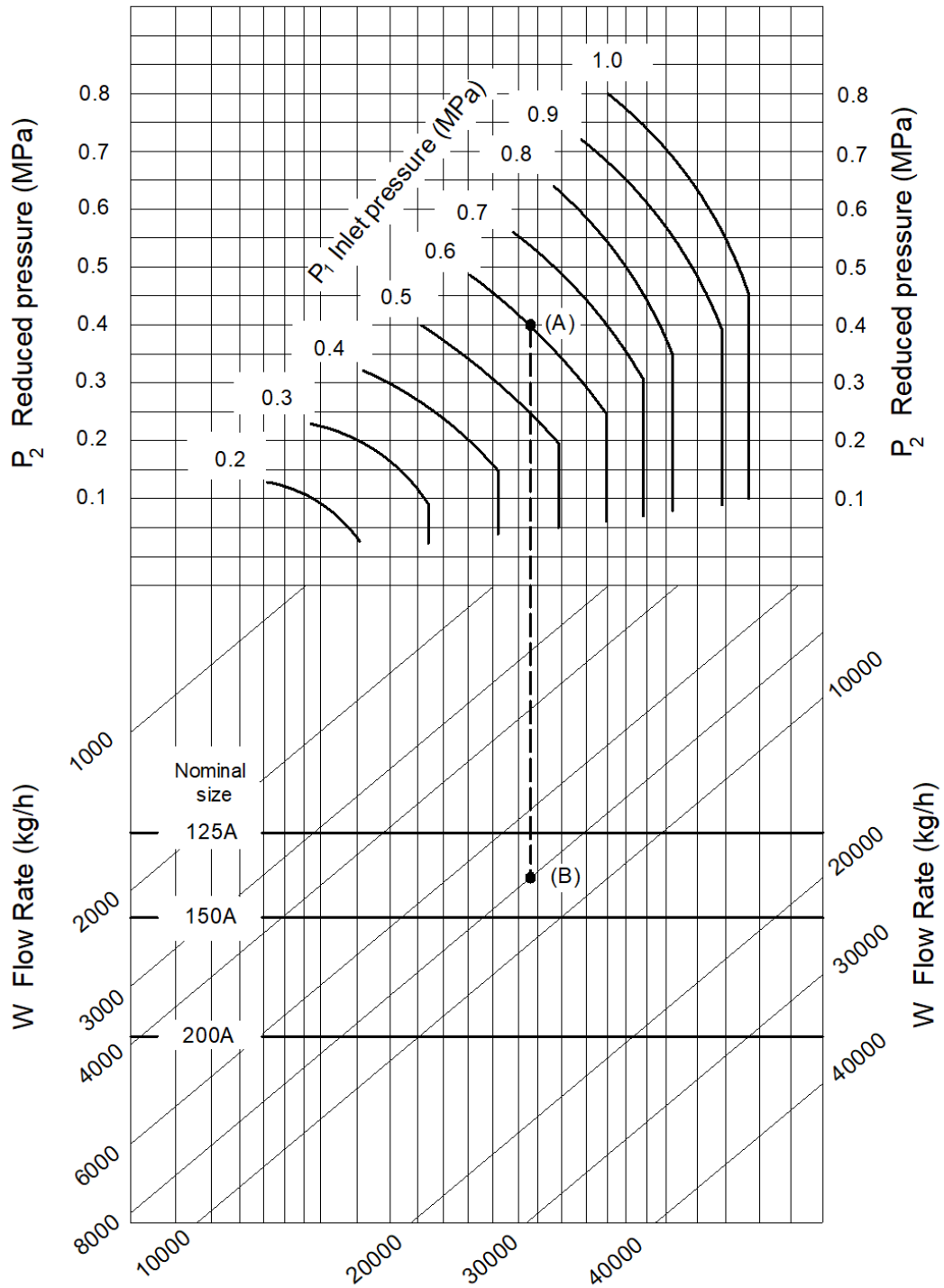
* Offset: 0.05 MPa or less

(2) Pressure characteristics chart



This chart shows variation in reduced pressure when the inlet pressure of 0.3 MPa is changed between 0.3 MPa and 1.0 MPa while the reduced pressure is set at 0.2 MPa.

4.3 Nominal size selection chart



[Example]

When selecting the nominal size of a pressure reducing valve with its inlet pressure (P_1) is 0.6 MPa, its reduced pressure (P_2) 0.4 MPa and its steam flow rate 8000 kg/h, first find the intersection point (A) of inlet pressure 0.6 MPa and reduced pressure 0.4 MPa. Trace down vertically from this intersection point (A) to find intersection point (B) with the flow rate of 8000 kg/h. Since the intersection point (B) is between nominal sizes 125A and 150A, select the larger one, 150A.

4.4 Nominal size selection calculation formula

An appropriate nominal size can be calculated by obtaining Cv value for the operating conditions in question, as shown below.

- Calculation formula for Cv value

$$P_2 > \frac{P_1}{2}$$

$$C_v = \frac{Wk}{138\sqrt{\Delta P(P_1 + P_2)}}$$

$$P_2 \leq \frac{P_1}{2}$$

$$C_v = \frac{Wk}{120P_1}$$

W: Max. steam flow rate [kg/h]

P₁: Inlet pressure [MPa·A]

P₂: Reduced pressure [MPa·A]

ΔP: P₁ - P₂ [MPa]

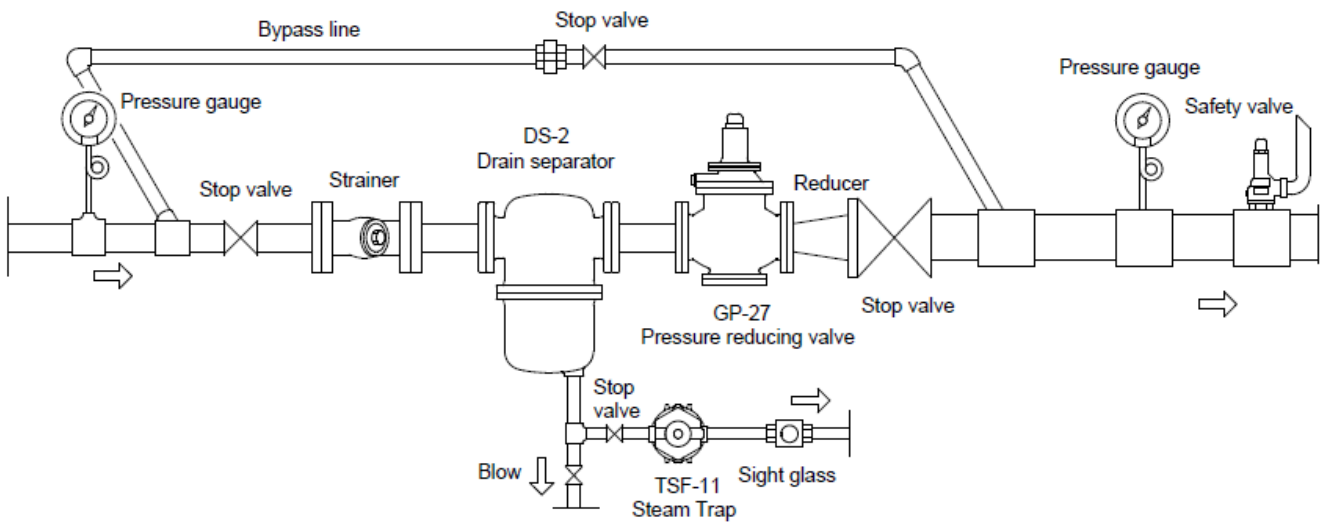
k: 1+0.0013 × {super-heated steam temp. [°C] - saturated steam temp. [°C]}

- Rated Cv value table

Nominal size	125A	150A	200A
Cv value	100	144	230

5. Installation

5.1 Piping example



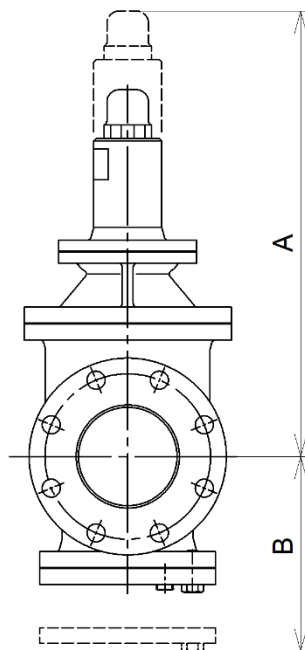
5.2 Precaution for installation

⚠ Warning

1. Because of heavy weight, hold the valve with lifting equipment while piping. Refer to "3. Dimensions and weights" table for the valve weight.
* Failure to follow this notice may result in injury due to dropping the valve.
2. In case installing safety valve as safety device at outlet side, joint relief pipe at outlet of safety valve and guide it to safety place where steam can relief out.
* Failure to follow this notice may result in injury and scalds in case of fluid blow out.

⚠ Caution

1. Do not disassemble the valve unreasonably.
* Disassembling the valve at your discretion may affect the original performance.
2. Remove foreign matter and scales from the lines before connecting the valve.
* Failure to follow this notice may prevent the valve from functioning correctly.
* Repairs caused by foreign substances or scales will be charged even during the warranty period.
3. Install a strainer (80 mesh) at the valve inlet side.
* Failure to follow this notice may hamper correct pressure control, which affects the original performance.
4. Install a safety valve at the valve outlet sides as safety device for equipment.
* Failure to follow this notice may prevents problem identification, resulting in equipment damage.
5. Install a pressure gauge at both the inlet and outlet sides of the valve.
* Failure to follow this notice may hamper correct pressure adjustment.
6. Install a steam trap to the inlet sides of the valve to prevent drainage problems.
* Failure to follow this notice may result in drainage problem, affecting the original performance.
7. When installing quick open and close valves, such as a solenoid valve, install it at inlet side as much as possible, and secure at least 3 m from the valve.
* Failure to follow this notice may result in malfunction or drastically shortened service life.
8. When pressure reducing in two stages, secure at least 3 m between the valves.
* Failure to follow this notice may result in malfunction, affecting the original performance.
9. When installing a control valve, etc. at the outlet side of the valve, secure at least 1m from the valve.
10. Install the valve in proper direction of the fluid flow.
* Failure to follow this notice may affect the original performance.
11. Do not apply excessive load, torque or vibration to the valve.
* Doing so may result in malfunction or drastically shortened service life.
12. Install the valve perpendicularly to horizontal lines.
13. Provide the by-pass line. (See 5.1 Example of piping)
14. When the pressure-reducing ratio is large, install a reducer to keep the flow velocity in the pipe below 30 m/s or less.
15. Provide space on the top and bottom of the valve so that the valve can be easily disassembled and inspected. (See Fig.1)



Nominal size	(mm)	
	A	B
125A	690	370
150A	725	435
200A	780	495

Fig. 1

6. Operation procedure

6.1 Precaution for operation

Warning

1. Do not touch the product with bare hands directly.
* Failure to follow this notice may result in scalds.
2. Before applying steam to the product, confirm that there is no risk when steam flows into the piping end and that piping joints are securely connected.
* Failure to follow this notice may result in scalds in case of steam blow out.

Caution

1. Close the stop valves before and after the pressure reducing valve, and remove all foreign matter and scales via the by-pass line before operation. And, open each stop valve slowly.
* Failure to follow this notice may prevent the product from functioning properly due to the ingress of foreign substances and scale into the product.
2. Secondary pressure at by-pass line must be lower than set pressure.
* Safety valve blows in case secondary pressure at by-pass line becomes higher than set pressure.
3. 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.
4. To adjust the set pressure, turn the adjusting screw slowly.
* Failure to follow this notice may result in outside leakage or damage of the product due to hunting or water hammer, etc.
5. Before stopping operation of the product for an extended period, completely discharge fluid from the product and close the stop valves at the inlet and outlet sides of the product.
* Failure to follow this notice may cause malfunction due to rusting inside the product and the pipes.

6.2 Adjusting procedure

(Please refer to the drawing in “4. Operation” or “8.5 Exploded drawing” for each part name.)

Taking a wrong adjusting procedure may cause hunting, scale problems or water hammer, and can heavily damage the main parts of the valve. Be sure to follow the procedure below

1. Close the stop valve at inlet and outlet side of the pressure reducing valve, and taking enough time not to blow the safety valve, blow off the fluid to remove foreign matter via the by-pass line. After blowing, close the by-pass line stop valve.
2. Remove the cap [5], loosen the locknut [18] and the adjusting screw [17], and release the spring [21] (no compression).
3. Slowly open the stop valve at the inlet side of the pressure reducing valve, and adjust the travel of the stop valve at the outlet side of the pressure reducing valve so that a little fluid flow.
4. To adjust the reduced pressure, slowly turn the adjusting screw [17] in the direction of the casted arrow with “H” on spring chamber [4] while observing the pressure gauge on the outlet side. The pressure increases when turning the adjusting screw [17] along the arrow, and decreases when turning it to the opposite direction.
5. Slowly open the stop valve at the outlet of the pressure reducing valve, and readjust the desired pressure.
6. After adjustment, tighten the lock nut [18] and attach the cap [5].

7. Troubleshooting

7.1 Troubleshooting

Trouble	Cause	Remedy
Reduced pressure of desired level is not obtained.	1. Working pressure is improper.	1. Correct the working pressure.
	2. The strainer [12] is clogged.	2. Disassemble and clean.
	3. Foreign matter exists between piston [8] and cylinder [9].	3. Disassemble and remove the foreign matter. When any scratches are identified, polish them away using a paper. Change the parts if scratches still exist after polishing.
	4. Nominal size is too small for the specification.	4. Change the nominal size appropriately.
	5. Pressure is not adjusted correctly	5. Observe the adjustment procedures and readjust pressure.
	6. Strainer installed before pressure reducing valve is clogged.	6. Disassemble and clean.
	7. Pressure gauge is faulty	7. Replace it.
Abnormal pressure rises at the outlet.	1. Foreign substances stuck between the main valve [6] and the main valve seat [7], or scratches on them.	1. Disassemble the product and remove the foreign substances. Conduct lapping if scratches are found. If the scratches still exist, please contact us.
	2. Foreign substances stuck between the pilot valve [35] and the pilot valve seat [11], or scratches on them.	2. Disassemble the product and remove the foreign substances. Conduct lapping if scratches are found. If the scratches still exist, replace the parts.
	3. Foreign matter exists between piston [8] and cylinder [9].	3. Disassemble and remove the foreign matter. When any scratches are identified, polish them away using a paper. Change the parts if scratches still exist after polishing.
	4. Trap is not provided for dead-end line.	4. Install a trap device.
	5. By-pass valve is leaking.	5. Repair or replace.
Abnormal sound. Unstable operation.	1. Nominal size is too large for the specification.	1. Change the nominal size appropriately.
	2. Pressure reducing ratio is too large.	2. Reduce pressure in two stages.
	3. Drainage problem is caused.	3. Install a trap device.
	4. An abrupt OPEN/CLOSE valve is located too close to the pressure reducing valve.	4. Allow as much as possible between the valves.

- Refer to “7.6 Exploded view” for the above parts name.
- Most of problems at pressure reducing valve is caused by foreign matter and scales in the piping. Be careful sufficiently.
- Phenomenon like valve trouble happens by pressure gauge failure, by-pass valve leakage, forgetting to close by-pass valve or strainer clog. Check the above troubleshooting and take a proper remedy or prevention.
- Please contact us if you cannot judge whether damaged parts need to be replaced or not.

7.2 Precaution for maintenance and inspection

Warning

1. Completely discharge the pressure inside of the product, piping and equipment prior to disassembly and inspection. When fluid is hot, cool down the product to the condition that it can be touched with bare hands. Avoid touching the product with bare hands till it is cooled down enough.
* Failure to follow this notice may result in scalds, injury or contamination on the surroundings due to the residual pressure.

Caution

1. Conduct daily and periodic inspection to maintain optimum performance of the product.
* For general users, request to specialized dealer or manufacture.
2. Disassembly and maintenance must be conducted by professional.
* In the event of product failure, ask a professional to take measures.
3. When disassembling, put a container under the product to collect condensate flowing out from it. Disassemble the product after condensate is completely discharged from the product.
* Failure to follow this notice may result in making the surroundings dirty.
4. Before applying steam to the product, close the stop valves at the inlet and outlet sides of the product and remove foreign substances and scale from the piping completely.
* Failure to follow this notice may prevent the product from functioning properly due to the ingress of foreign substances and scale into the product.
5. When adjusting pressure, slowly turn the adjusting screw.
* Failure to follow this notice may cause hunting or water hammer, which leads to damage of the product or equipment
6. After stopping operation of the product for an extended period, conduct operational check of the product
* In the event of product failure, ask a professional to take measures.

•Perform the operation test according to “6.2 Adjustment procedures” .

7.3 Disassembly

(Please refer to the drawing in “4. Operation” or “8.5 Exploded drawing” for each part name.)

Be sure that the stop valves at inlet and outlet side of pressure reducing valve is closed and all internal pressure and condensate have discharged before disassembling the valve.

(1) Disassembly of the pilot valve

1. Remove the cap [5], slightly loosen the lock nut [18], turn the adjusting screw [17] in the opposite direction to the casted arrow with “H” on the spring chamber [4] to release the spring [21] (no compression).
2. Remove the bolts [23] and the spring chamber [4], and take out the spring [21], spring plates [15], [16], spring plate follower [14], and diaphragm [13]. When removing the diaphragm [13], apply a pointed tool to the straight part of the diaphragm’s edge.
3. Remove the pilot valve seat [11] (the hexagonal part on the center of the top cover [3]) by using a ring wrench or a socket wrench, and take out the pilot valve [35] and spring [20].

(2) Disassembly of the piston

1. Remove the bolt [23] of the top cover [3] and the top cover. Pick up the piston [8] and the cylinder [9].

(3) Disassembly of the main valve

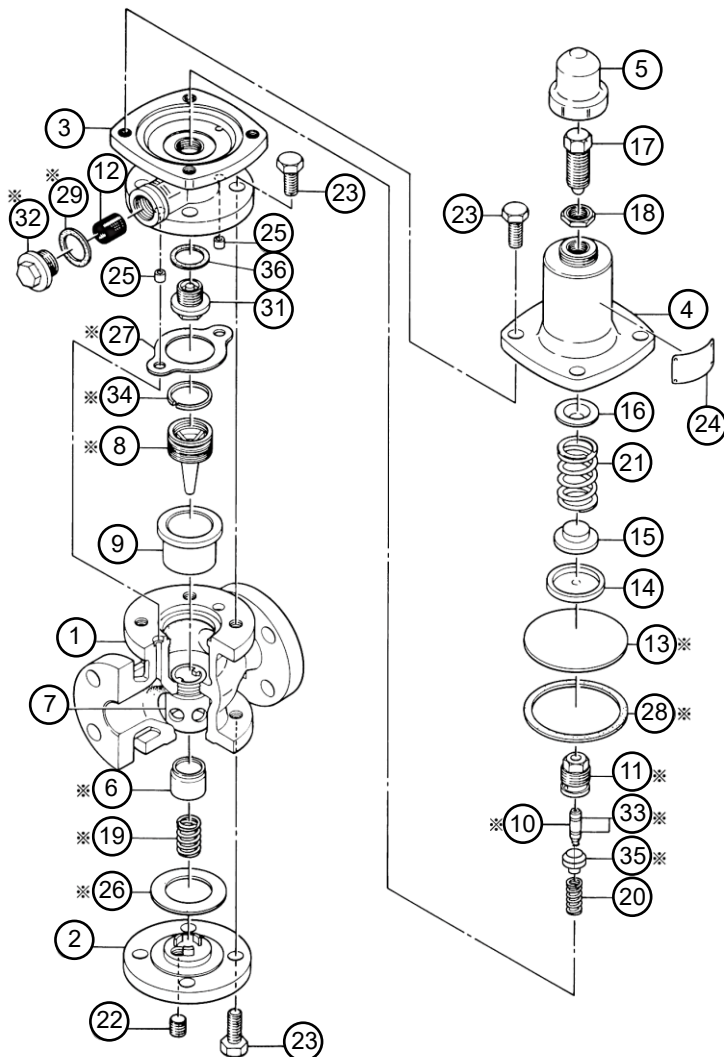
1. Remove the bolt [23] of the bottom cover [2]. Remove the bottom cover, spring [19], and main valve [6].

7.5 Precautions for reassembly

Caution

1. Check that there is no damage or scratch on the main valve, main valve seat, pilot valve, and pilot valve seat. When there is damage or scratch on the main valve and main valve seat, lap them. If the damage or scratch still exists even after lapping, then replace the part. In case the main valve seat needs replacement, the whole product should be replaced because the main valve seat cannot be replaced. If the pilot valve or pilot valve seat has damage or scratch, replace the pilot valve assembly.
* Any damage or scratch on the sealing surface may increase the reduced pressure.
2. Confirm that the sliding parts (the pilot valve, spindle, etc) moves smoothly.
* If the sliding parts do not move smoothly, it may cause failure problems.
3. Replace gaskets with new ones when reassembling.
* If the old gasket is used again, it may cause steam leakage problem.
4. Assemble the parts in reverse order from disassembly. Tighten the bolts uniformly.
* Wrong order keeps the product from being assembled correctly. If the hexagon bolts are not tightened uniformly, it may cause steam leakage problem.

7.6 Exploded view



No.	Parts name	No.	Parts name
1	Body	19	Spring
2	Bottom Cover	20	Spring
3	Top Cover	21	Spring
4	Spring Chamber	22	Plug
5	Cap	23	Bolt
6	Main Valve	24	Name Plate
7	Main Valve Seat	25	Guide Pipe
8	Piston	26	Gasket
9	Cylinder	27	Gasket
10	Pilot Valve Spindle	28	Gasket
11	Pilot Valve Seat	29	Gasket
12	Strainer	31	Pilot Valve Cap
13	Diaphragm	32	Strainer Cap
14	Spring Plate Follower	33	Pilot Valve Ring
15	Spring Plate	34	Piston Ring
16	Spring Plate	35	Pilot Valve
17	Adjusting Screw	36	Gasket
18	Lock Nut		

No.	Parts name	Recommended replacement year
10, 11, 33, 35	Pilot Valve Set	5 years
12	Strainer	5 years
13	Diaphragm	2 years
26, 27, 29	Gasket	2 years
34	Piston Ring	3 years

The parts name remarked “※” are available as consumable supply.

* Apply lubricant agent for heat/steam resistance (recommendation: SOLVEST No.110 paste, STT Inc.) to the bottom seal area of the diaphragm.

Warranty Information

1. Limited warranty

This product has been manufactured using highly-advanced techniques and subjected to strict quality control. Please be sure to use the product in accordance with instructions on the manual and the label attached to it.

Yoshitake warrants the product to be free from any defects in material and workmanship under normal usage for a period of one year from the date of receipt by the original user, but no longer than 24 months from the date of shipment from Yoshitake's factory.

2. Parts supply after product discontinuation

This product may be subject to discontinuation or change for improvement without any prior notice. After the discontinuation of the product, Yoshitake supplies the repair parts for 5 years otherwise individually agreed.

3. This warranty does not cover the damage due to any of below:

- (1) Valve seat leakage or malfunction caused by foreign substances inside piping.
- (2) Improper handling or misuse.
- (3) Improper supply conditions such as abnormal water pressure/quality.
- (4) Water scale or freezing.
- (5) Trouble with power/air supply.
- (6) Any alteration made by other than Yoshitake.
- (7) Use under severe conditions deviating from the design specifications (e.g. in case of corrosion due to outdoor use).
- (8) Fire, flood, earthquake, thunder and other natural disasters.
- (9) Consumable parts such as O-ring, gasket, diaphragm and etc.

Yoshitake is not liable for any damage or loss caused by malfunction or defect of the product.