Model GPK-2001,2003

Pressure Reducing Valve

Installation & Operation Manual

Please read this instruction manual thoroughly before using the pressure reducing valve, so that you may do so correctly and safely. Please carefully store this manual 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 (”Caution” may also be used to indicate other unsafe practices or risks of property damage).

Contents

YOSHITAKE

■ PDT-099a ■

1. Features

(1) Enables you to control a larger capacity than piston valves. Less sliding parts lead to excellent durability.
(2) Reliable control even with fluctuations in inlet and system load.
(3) Excellent sealability due to the spherical surface of the main valve.
(4) The remote operated type of this valve enable easy pressure adjustment through a wide pressure setting range.

2. Models

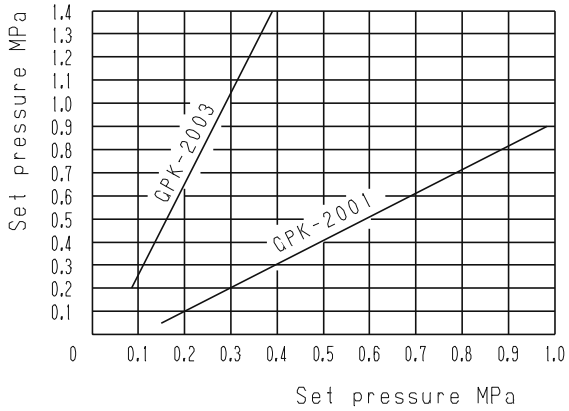
Model	Nominal pressure	Connection	Nominal size	The ratio of control pressure to setting pressure
GPK-2001	2.0 MPa	Screwed	15-50A	1 : 1
	2.0 MPa	Flanged	15-100A	
	1.0 MPa	Flanged	15-100A	
GPK-2003	2.0 MPa	Screwed	15-50A	1 : 3.5
	2.0 MPa	Flanged	15-100A	
	1.0 MPa	Flanged	15-100A	

3. Specifications

Model		GPK-2001	GPK-2003
Connection		JIS Rc (Screwed), JIS 20K RF (Flanged), JIS 10K FF(Flanged)	
Reduced pressure sensing method		External sensing *	
Nominal size		15-50A (Screwed), 15-100A (Flanged)	
Application		Steam	
Inlet pressure	(JIS Rc and JIS 20K RF)	0.1-2.0 MPa	0.25-2.0 MPa
	(JIS 10K FF)	0.1-1.0 MPa	0.25-1.0 MPa
Reduced pressure 85% or less of inlet pressure (gauge pressure)		0.05-0.9 MPa	0. 2-1.4 MPa
System air pressure		Refer to **Standard "Loading pressure - Setting pressure" chart line**. (See the page 2)	
Min. differential pressure		0.05 MPa	
Max. pressure reducing ratio	JIS Rc	20 : 1	10 : 1
	JIS 10K FF	20 : 1	10 : 2
	JIS 20K RF	20 : 1	10 : 1
Max. temperature		220 °C	
Valve seat leakage		0.01% or less of rated flow	
Material		Body : Ductile cast iron Valve, Valve seat(Main and Pilot) : Stainless steel Diaphragm(Main and Pilot) : Stainless steel	
Body hydraulic test		4.0 MPa (JIS Rc and JIS 20K RF) 2.0 MPa (JIS 10K FF)	

* For reduced pressure sensing method, internal sensing method valves will be available upon request.

Standard "Loading Pressure - Setting Pressure" Chart Line



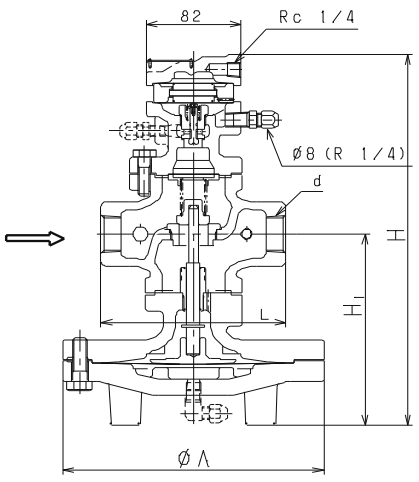
The setting pressure corresponding to the loading pressure are shown left. As slight deviations from the "loading pressure - setting pressure" chart line shown left may occur depending on conditions, such as the length of the air line, etc., a setting pressure which is high enough to cover such deviations should be selected.

4. Dimensions and Weights

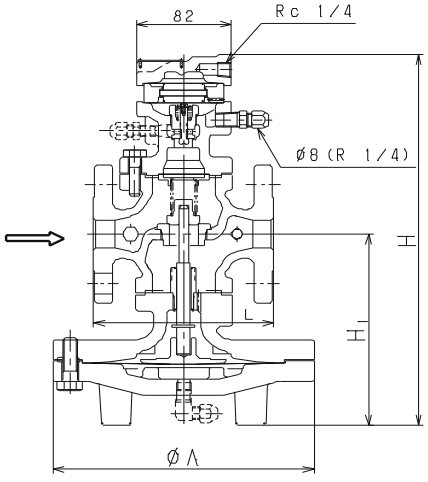
4-1. GPK-2001

• The structure differs for nominal sizes 50A to 100A. (See Fig. 9.1 and 9.2)

Screwed



Flanged



(㎜)

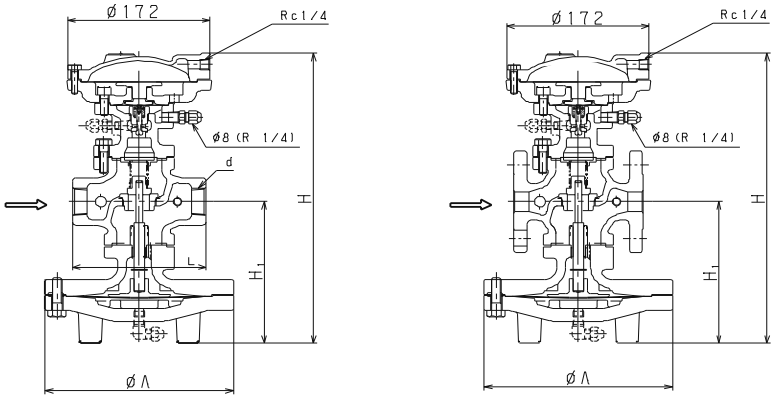
Size	Screwed (JIS Rc)					(kg)	Flanged (JIS 20K RF)					(kg)
	d	L	H1	H	A	Weight	d	L	H1	H	A	Weight
15A	Rc 1/2	150	170	335	200	14.0	15	146	170	335	200	15.5
20A	Rc 3/4	150	170	335	200	14.0	20	146	170	335	200	16.0
25A	Rc 1	160	175	341	226	18.5	25	156	175	341	226	21.0
32A	Rc 1-1/4	180	192	371	226	21.5	32	176	192	371	226	24.0
40A	Rc 1-1/2	180	192	371	226	21.5	40	196	192	371	226	24.5
50A	Rc 2	230	216	435	276	33.0	50	222	216	435	276	36.0
65A	-----	----	----	----	----	-----	65	282	251	489	352	64.5
80A	-----	----	----	----	----	-----	80	302	264	512	352	71.5
100A	-----	----	----	----	----	-----	100	342	321	595	401	111.0

* Different Length(L) and Weight values apply for JIS 10K FF.
* Other standard connection are available upon request.

4-2. GPK-2003

• The structure differs for nominal sizes 50A to 100A (See Fig. 9.1 and 9.2)

Screwed Flanged



(mm)

Size	Screwed (JIS Rc) d	L	H1	H	A	(kg) Weight	Flanged (JIS 20K RF) d	L	H1	H	A	(kg) Weight
15A	Rc 1/2	150	170	353	200	17.5	15	146	170	353	200	19.0
20A	Rc 3/4	150	170	353	200	17.5	20	146	170	353	200	19.5
25A	Rc 1	160	175	359	226	22.0	25	156	175	359	226	24.5
32A	Rc 1-1/4	180	192	389	226	25.0	32	176	192	389	226	27.5
40A	Rc 1-1/2	180	192	389	226	25.0	40	196	192	389	226	28.0
50A	Rc 2	230	216	453	276	36.5	50	222	216	453	276	39.5
65A	-----	----	----	----	----	-----	65	282	251	507	352	68.0
80A	-----	----	----	----	----	-----	80	302	264	530	352	75.0
100A	-----	----	----	----	----	-----	100	342	321	613	401	114.5

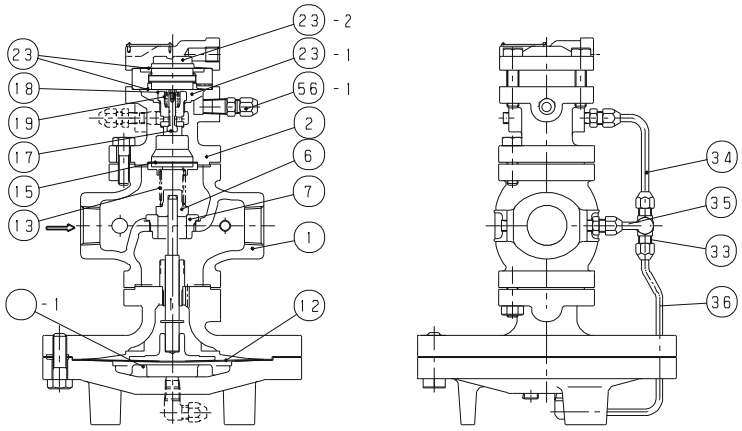
*Different Length(L) and Weight values apply for JIS 10K FF.
*Other standard connections are available upon request.

5. Operation

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, a pressure adjusting air chamber, and a pilot diaphragm, pilot valve, and main diaphragm for pressure sensing and activation.

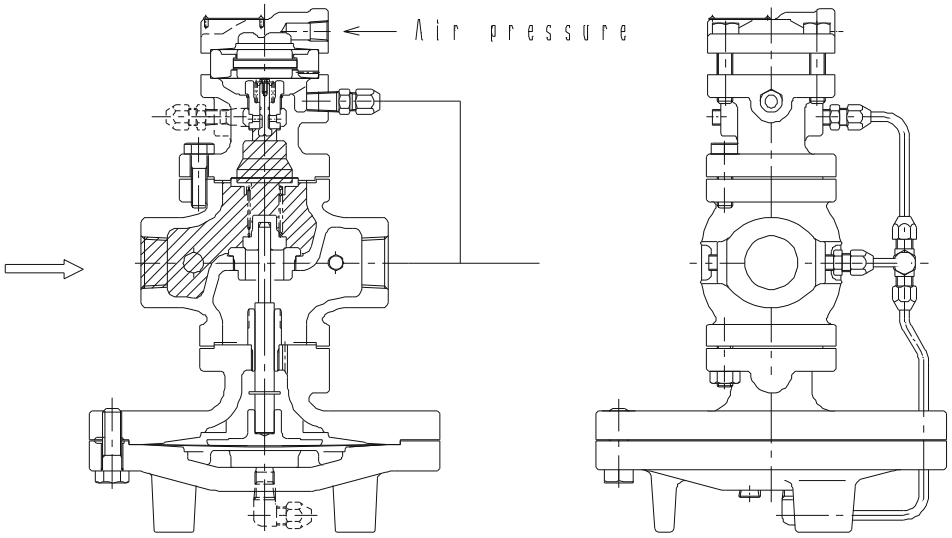
No.	Parts name
1.	Body
2.	Pilot body
6.	Main valve
7.	Main valve seat
12.	Main diaphragm
13.	Main valve spring
15.	Screen
17.	Pilot valve
18.	Pilot valve seat
19.	Pilot valve spring
23.	Pilot diaphragm
23-2	Air press. control space
33	Tee
34.35.36	Pipe
12-1	Main diaphragm chamber
23-1	Pilot diaphragm chamber
56-1	Reduced press. sensing port

Fig.1



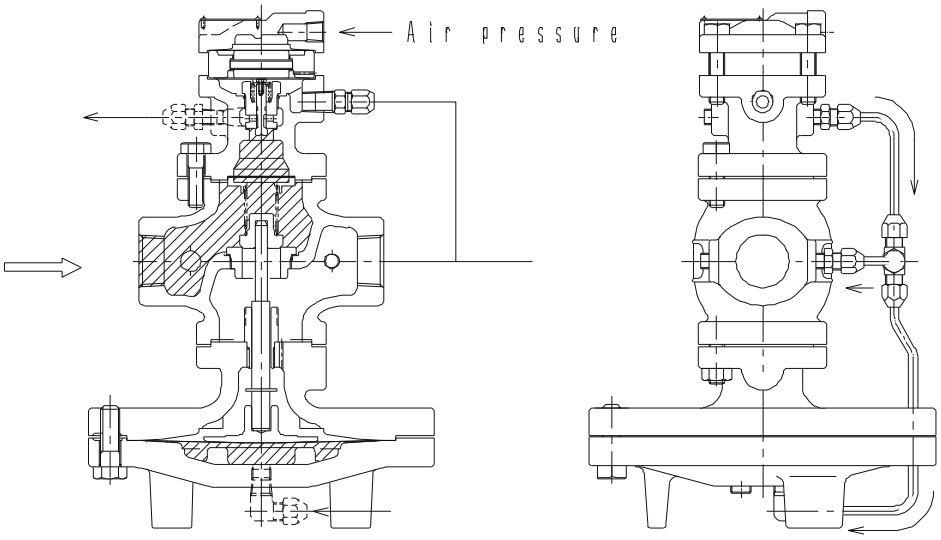
(1) When the pressure reducing valve is mounted correctly, the main valve[6] and pilot valve[17] should be closed by main valve spring[13] and pilot valve spring[19] when air pressure is no-pressure. Slowly open the gate valve and allow the high pressure fluid to flow in. Inlet pressure is applied to the upside of the main valve. High pressure fluid passes through screen[15] to also apply inlet pressure to the downside of the pilot valve. (Fig. 2)

Fig.2



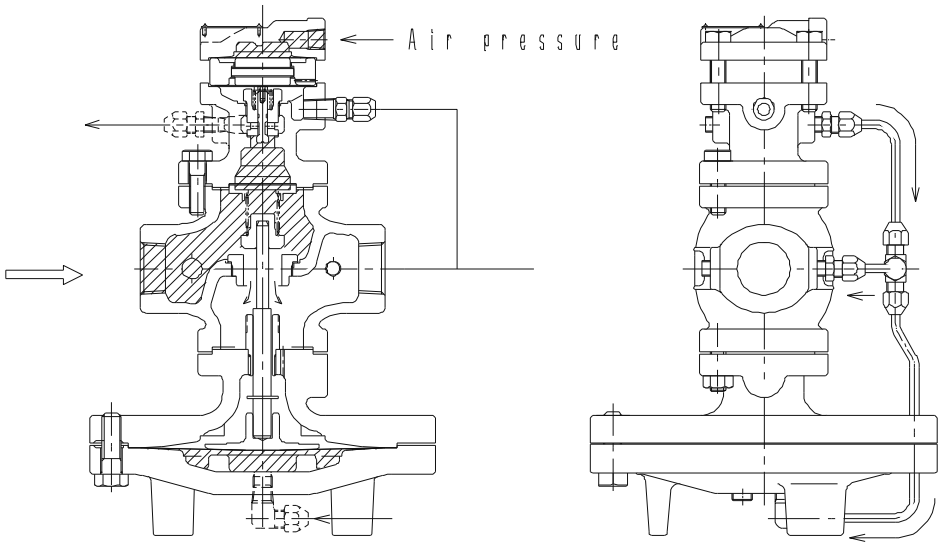
(2) Introducing air pressure into air chamber flexes pilot diaphragm[23] to open the pilot valve. The fluid passing through pilot valve[17] and pilot valve seat[18] enters the main diaphragm chamber [12-1]via pipes [34] and [36]. This fluid also flows to the reduced side of the body[1] through the orifice of tee [33] and pipe [35] that connects to the body. (Fig. 3)

Fig.3



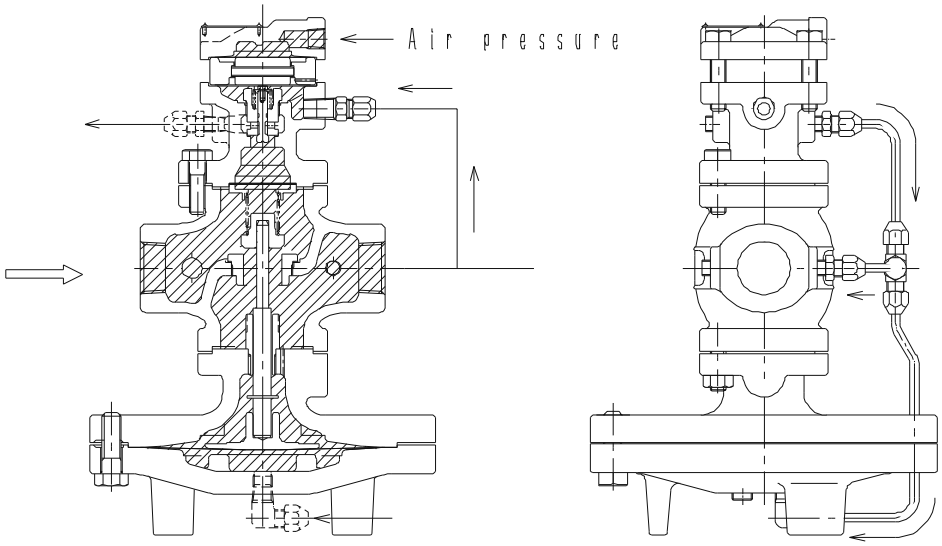
(3) When the flow rate at the pilot valve exceeds the flow rate at the orifice, operating pressure in the main diaphragm chamber raised and overrides the pressure on the upside of the main valve and the load of main valve spring [13] to open the main valve. The fluid then begins to flow from the inlet side. (Fig. 4)

Fig.4



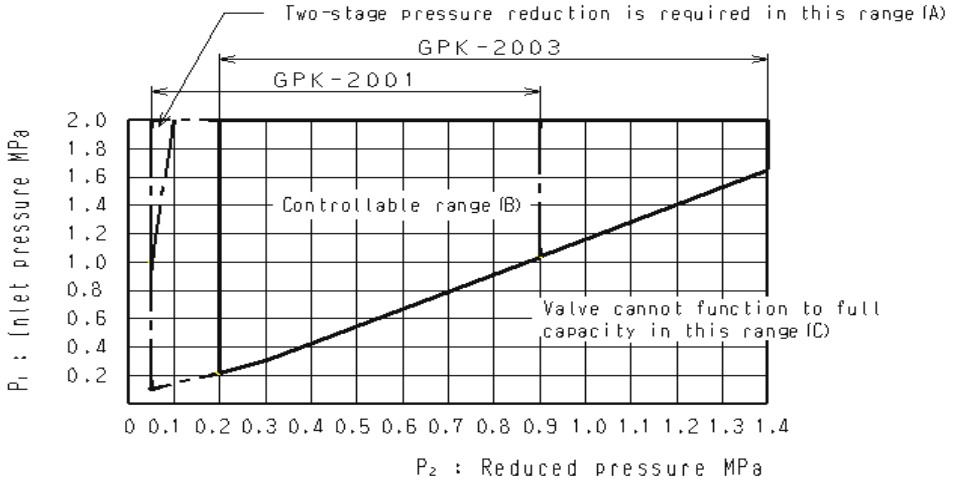
(4) Reduced pressure is led to the pilot diaphragm chamber[56-1] via the sensing pipe and reduced pressure sensing port[23-1]. The pilot diaphragm receives the reduced pressure to be balanced with the air pressure. The pilot valve travel is controlled by the air pressure and pressure applied to the pilot diaphragm due to variations in reduced pressure. This changes the flow rate of fluid to the main diaphragm chamber, which controls the main valve travel to obtain appropriate reduced pressure. (Fig. 5)

Fig.5



6. Selection of Nominal Size

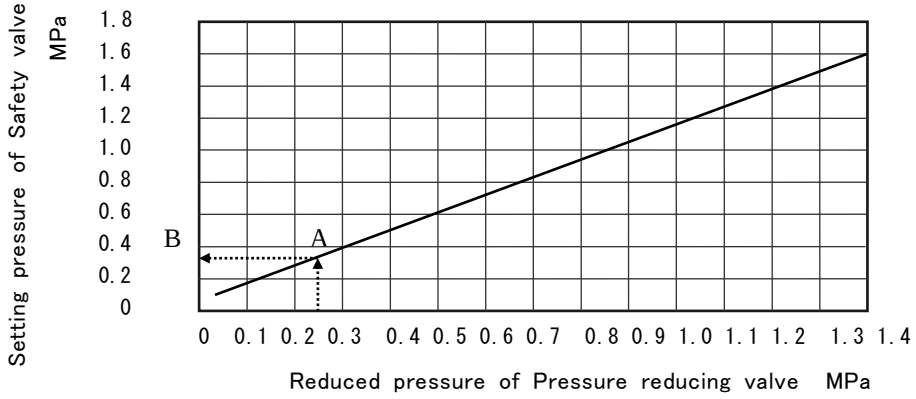
6-1. Specifications selection chart



Refer to the above selection chart to select the most appropriate pressure reducing valve. Find the point of intersection of inlet pressure(P_1) and reduced pressure(P_2). When the point of intersection is within range(A), reduce pressure in two stages. When within range (C), maximum performance cannot be obtained. When reducing pressure in two stages, maximize the distance between the valves (at least 3 m).

6-2. Safety valve setting pressure chart

This chart is for setting the safety valve (for alarms) used for steam pressure reducing valves.



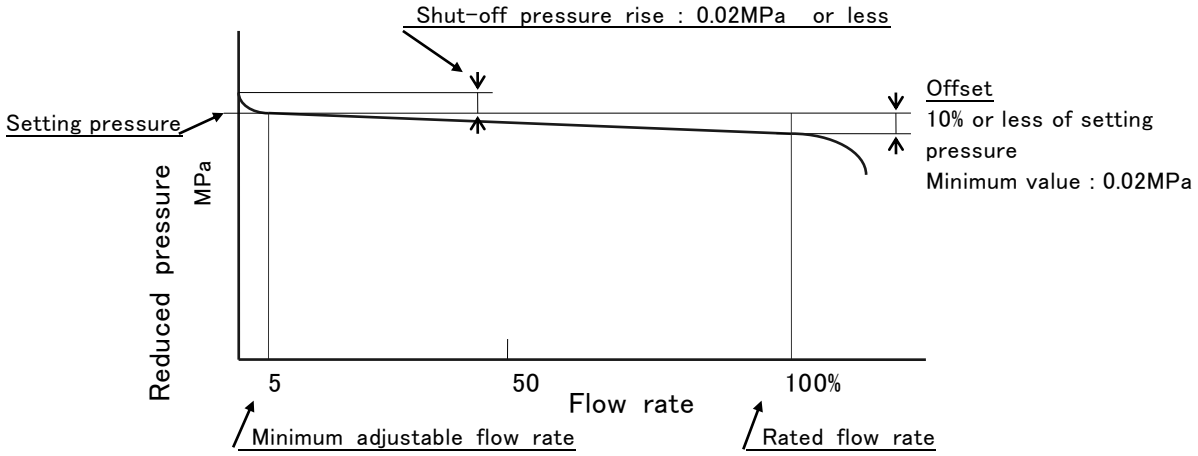
[How to read chart]

Determine the reduced pressure of the pressure reducing valve on the outlet side. Find the intersection with the chart curve (point “A”). Horizontally proceed from point “A” to the left until the Y axis. Regard this point as “B”. “A” value higher than point “B” will be the required setting pressure of the safety valve.

(e.g.) When the reduced pressure of the pressure reducing valve is 0.25 MPa, the setting pressure of the safety valve must be 0.32 MPa or more.

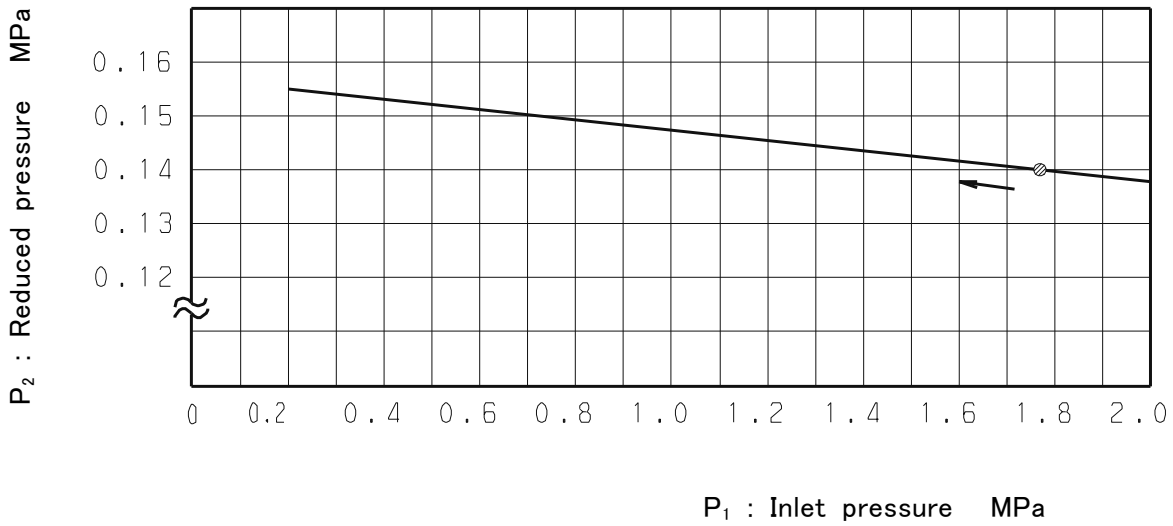
6-3. Characteristics chart

(1) Flow rate characteristics chart



Using the nominal size selection chart, select the nominal size of 80~90% of the flow rate, considering pressure loss and heat loss of the gate valve and the strainer before and after the pressure reducing valve. To fully utilize the flow characteristics of the valve, do not select a small pipe size, considering the effects due to pipe resistance.

(2) Pressure characteristics chart

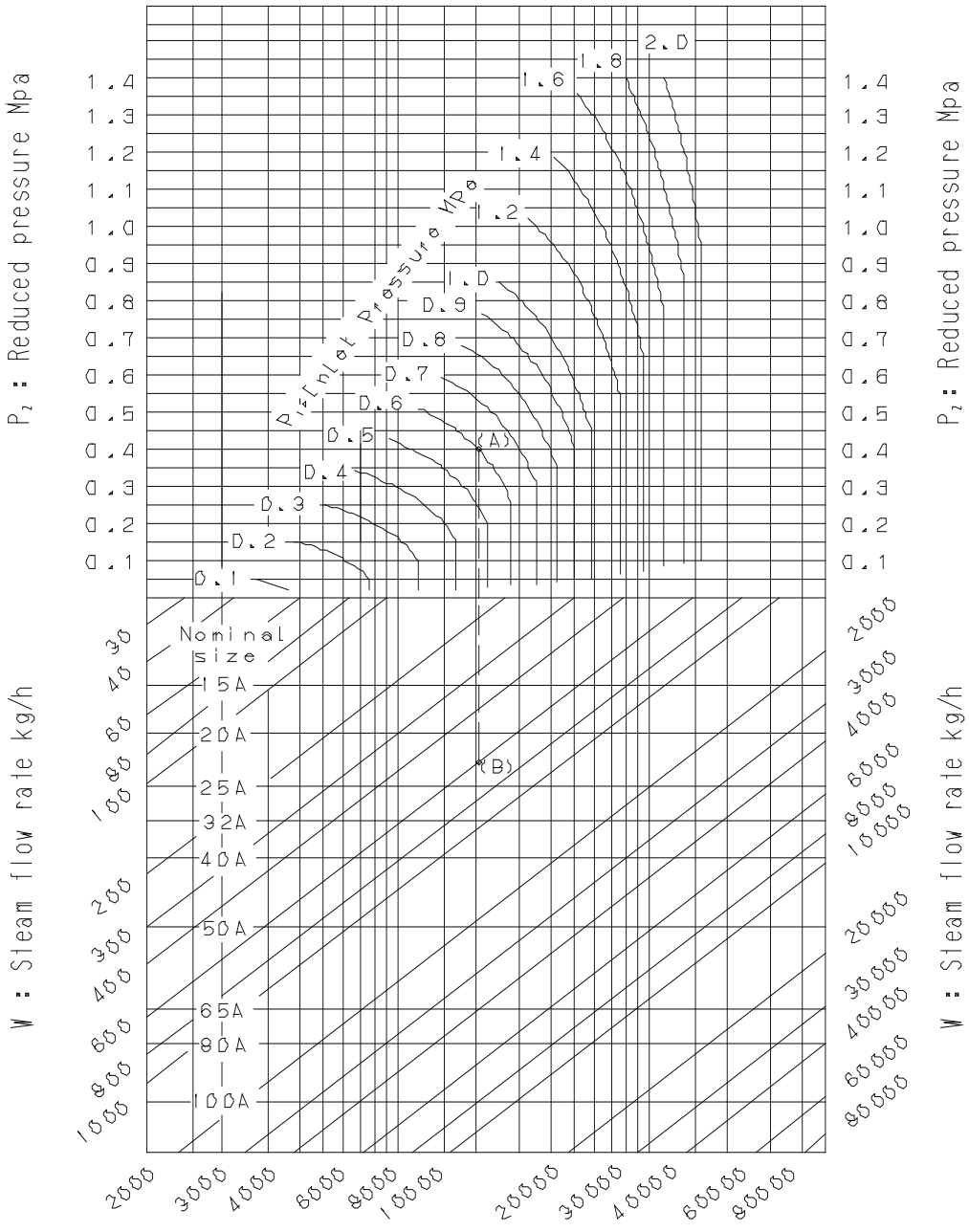


Reduced pressure is set to 0.14 MPa when inlet pressure is 1.75 MPa. The chart indicates a variation in reduced pressure when the inlet pressure is changed within the range of 0.2 to 2.0 MPa.

6-4. Nominal size selection chart (External sensing)

* Please contact us on internal sensing method

For example, take a pressure reducing valve whose inlet pressure(P1) is 0.6 MPa, reduced pressure(P2) 0.4 MPa, flow rate 600 kg/h. When determining the nominal size, find the point of intersection(A) of inlet pressure 0.6 MPa and reduced pressure 0.4 MPa. Vertically proceed from point(A) to come across the flow rate 600 kg/h, and regard this point as (B). Point(B) is between nominal sizes 20A and 25A. Select the larger nominal size (in this example, nominal size 25A).



6-5. Nominal size selection calculation formula

[Cv value calculation]

$$P_2 > \frac{P_1}{2} \qquad Cv = \frac{Wk}{138\sqrt{\Delta P(P_1+P_2)}}$$

$$P_2 \leqq \frac{P_1}{2} \qquad Cv = \frac{Wk}{120P_1}$$

W : Max. steam flow rate [kg/h]
P_1 : Inlet pressure [MPa abs]
P_2 : Reduced pressure [MPa abs]
ΔP : $P_1 - P_2$ [MPa]
k : 1+0.0013 × {super-heated steam temp[℃] – saturated steam temp[℃]}
Cv : Cv value of the nominal size

[Flow rate calculation example of GPK-2001,2003 pressure reducing valve]

The flow rate of the pressure reducing valve is calculated under the following conditions : Nominal size 15A, saturated steam, Inlet pressure of 0.6MPa , Reduced pressure of 0.4MPa.

P_1=0.7 [MPa abs], P_2=0.5 [MPa abs], you can find that Cv value of 15A is 5.0 from the chart. The following formula is established.

$$P_2(=5) > \frac{P_1(=7)}{2} \qquad W = \frac{138Cv\sqrt{\Delta P(P_1+P_2)}}{k}$$

$$W = \frac{138Cv\sqrt{\Delta P(P_1+P_2)}}{k} = \frac{138\times 5.0\times\sqrt{0.2\times(0.7+0.5)}}{1} = 338kg/h$$

■ Secure a safety rate of 80 to 90%

[Cv value chart]

15A	20A	25A	32A	40A	50A	65A	80A	100A
5.0	7.2	10.9	14.3	18.8	32.0	60.0	78.0	120.0

* Please contact your Yoshitake representative for detail regarding valves when an "internal sensing" is used.

7. Precautions before Operation

When installing the pressure reducing valve, refer to Fig.6～8(page 10～12) and observe the precautions below

7-1. When installing the pressure reducing valve

⚠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 do so may prevent the valve from functioning correctly.

(3) **Install the valve so that the arrow on the valve body coincides with the direction of the fluid flow.**
* Failure to do so may prevent the valve from functioning .

(4) **Install the valve perpendicularly to horizontal lines with the diaphragm chamber located at the bottom.**
* Failure to do so may affect the original performance.

(5) **Be extremely careful not to damage the copper pipe .**
* Damage to the copper pipe may prevent the valve from functioning correctly.

(6) **Use the sensing pipe (φ8-2m) and joint (φ8-R1/4) provided.** (See Fig. 6)
* Using other sensing pipes may affect the original performance.

(7) **Do not connect the sensing pipe close to valves and elbows. Choose the position with the least vibration. (Recommended straight length: 10 times the line pipe diameter)**
* Failure to do so may cause inconsistent reduced pressure, which hampers correct pressure control.

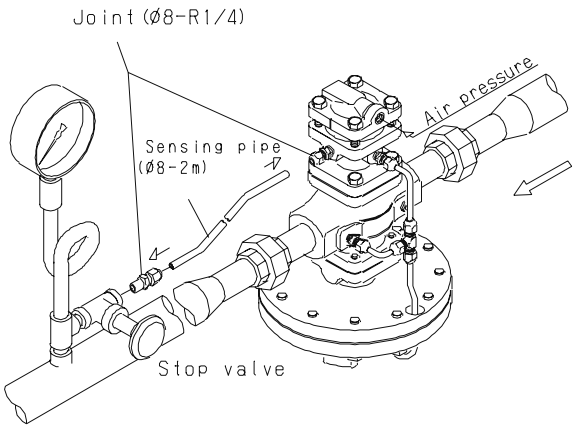
(8) **Do not apply excessive load, torque or vibration to the valve .**
* Doing so may result in drastically shortened service life or operational failure.

7-2. When installing accessories

⚠Warning

(1) **When installing the pressure reducing valve, be sure to connect the provided sensing pipe and joint.**
* Unless the sensing pipe is connected, the valve will not operate. Further, steam may blow off, resulting burns.

< Sensing pipe connection method >



Connect the provided sensing pipe (φ 8-2m) and joint (φ 8-R1/4) as shown in the illustration on the left.

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 quarter times with a tool. Note that the sensing pipe must be connected so that the valve side is higher than the pressure sensing side.

Fig.6

7-3. Piping before and after the pressure reducing valve

⚠Caution

(1) Install a strainer (80-100mesh or equivalent) at the valve inlet side.
*Select a strainer whose nominal size coincides with the valve inlet side piping.
*Failure to do so may hamper correct pressure control, which affects the original performance.

(2) Install a safety valve at the valve outlet sides of alarms.
*Failure to do so prevents problem identification, resulting in equipment damage.

(3) Install a pressure gauge at both the inlet and outlet sides of the valve.
Further, install the gauge at the outlet side as close to the sensing pipe (pressuresensing side) as possible.
*Failure to do so may hamper correct pressure control, which affects the original performance.

(4) Install a trap to the bottom of rising pipes and the end of other pipes connected to the inlet and outlet sides of the valve. When connecting a branch line from the main line, be sure to connect the trap draining drip leg from the bottom of the main line.

*Failure to do so may result in drainage problem, affecting the original performance.

(5) Use the gate valve as a stop valve at the inlet and outlet sides of the pressure reducing valve.

*Using a valve with large resistance, such as a globe valve, may affect the original performance.

(6) When the pressure reducing ratio is large, install a reducer to keep the flow velocity in the pipe below 30 m/s or less.

*An excessively high flow velocity may cause erosion, resulting in drastically shortened service life.

(7) When installing quick open and close valves, such as a solenoid valve, secure at least 3 m from the valve.

*Failure to do so may result in malfunction or drastically shortened service life.

(8) When reducing pressure in two stages, secure at least 3 m between the valves.

*Failure to do so may result in malfunction, affecting the original performance.

(9) Provide space on the top and bottom of the valve and the pipe side so that the valve can be easily disassembled and inspected (See Fig. 7 Space required for disassembly).

(10) Provide a by-pass line.

*The valve can be serviced without stopping operation.

7-4. Space required for disassembly

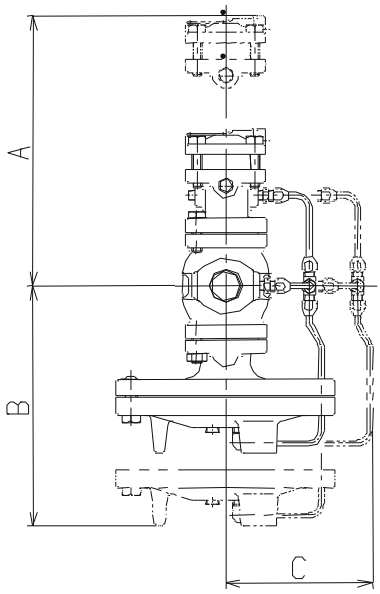


Fig.7

(mm)

Size	A		B	C
	GPK-2001	GPK-2003		
15A	240	260	340	180
20A	240	260	340	180
25A	240	260	350	200
32A	250	270	380	200
40A	250	270	380	200
50A	290	310	430	220
65A	310	330	370	260
80A	320	340	390	260
100A	350	370	470	280

7-5. Examples of piping

With a proper air line configuration, a single remote operated type pressure reducing valve is capable of multistage pressure settings, with automatic control possible using a solenoid valve.

[Standard Line]

With standard pressure reducing valves, air is introduced into the remote operated type pressure reducing valve and the desired pressure is output. Air pressure ON/OFF switching should be executed using a manual 3-way switching valve. As illustrated below, ON/OFF switching can be automated by using a 3-port solenoid valve.

[Combination Line]

Two standard pressure reducing valves with preset air pressure values can be used to create a remote operated type pressure reducing valve system which outputs two air pressure settings. A solenoid valve is used to switch between the pressure reducing valves.

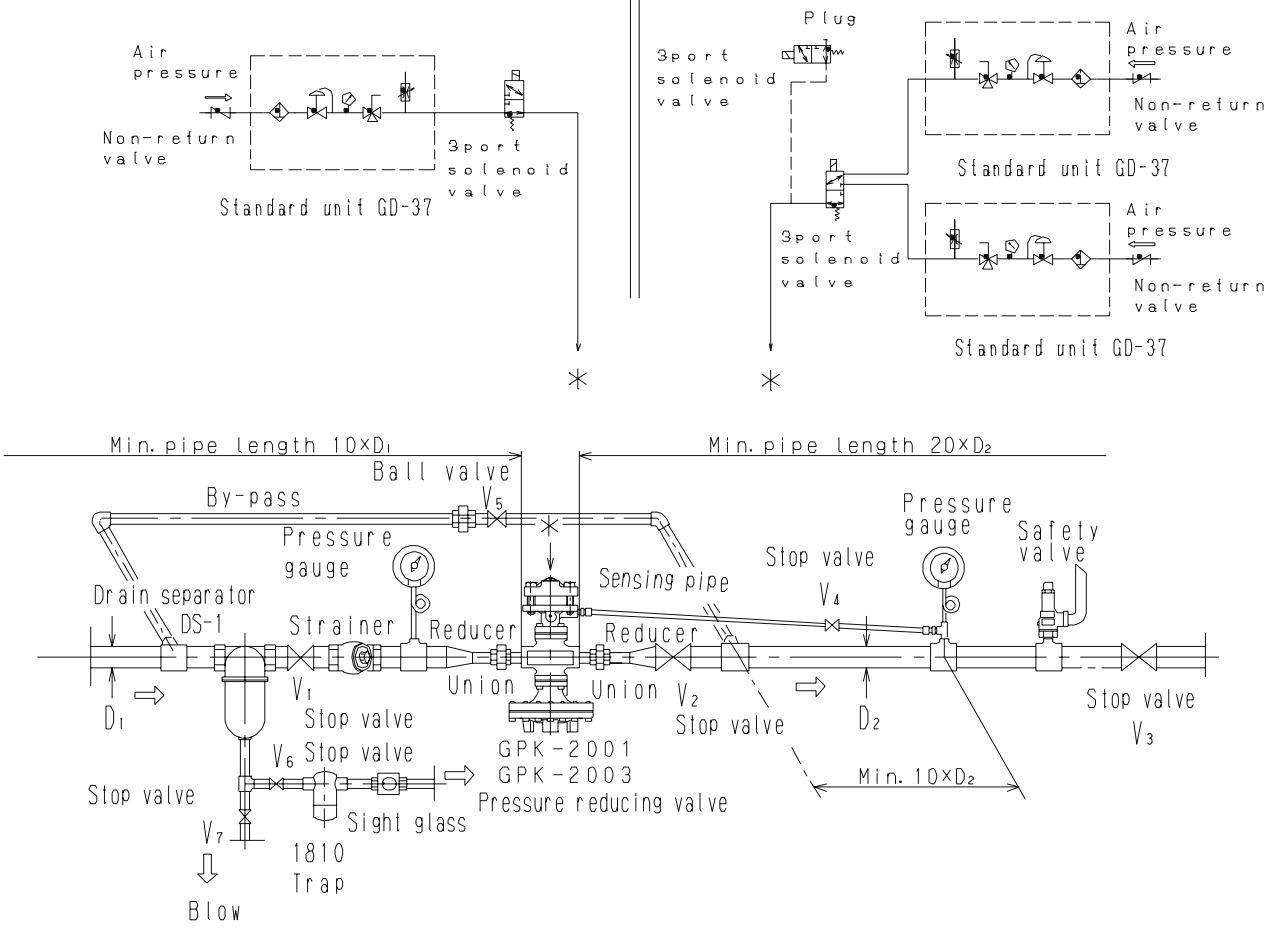


Fig.8

Contact your Yoshtake representative for configurations other than those shown above.

*Notes

- The standard unit's needle valve serves to prevent pressure fluctuations due to volume changes in the operating air pressure chamber, and due to cubical expansion of the upper part of the remote operated type pressure reducing valve from overheating caused by steam.
- In longer system air lines, there may be slight deviations from the standard "loading pressure - setting pressure" chart lines. In such cases, the system pressure should be set high enough to ensure that the required setting pressure is obtained.

8. Precautions for Pressure Reducing Valve Operation

Follow the steps in 8-1 Adjustment, and slowly turn the adjusting screw to control pressure.

* Incorrect adjustment may cause hunting, water hammer, etc., resulting in damage to the valve and other equipment.

⚠Warning

(1) **Do not touch the valve directly with bare hands.**
* Doing so may result in burns.

⚠Caution

(1) **Close the stop valves located at front and rear of the pressure reducing 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) **Remove condensation completely from the line, and close the stop valves located at front and rear of the valve when not using it for long periods of times.**
* Rust generated in the valves and lines may cause malfunction. Incorrect adjustment of the valve may cause problems due to scales, hunting, water hammer, etc., resulting in drastically damaged trim.

8-1. Adjustment

Incorrect adjustment of the pressure reducing valve may cause problems due to scales, hunting, water hammer, etc., resulting in drastically damaged trim. Refer to Fig. 8 and observe the steps below.

(1) Check that all stop valves (V_1 to V_7) are closed.
(2) Open the stop valve (V_6) for the trap installed before the pressure reducing valve.
(3) Open the stop valve (V_3) and adjust the valve travel of the by-pass line glove valve (V_5). Taking sufficient time not to blow the safety valve, blow off the fluid to remove foreign matter. After blowing, close the by-pass line glove valve(V_5).
(4) Set the operating air pressure to “no-pressure”.
(5) Open the sensing pipe stop valve (V_4).
(6) Open the stop valve (V_2) at the outlet side of the pressure reducing valve. Adjust the travel of the stop valve (V_3) so that a little fluid flows.
(7) Confirm that the condensation is discharged from the inside of the pressure reducing valve, and slowly open the stop valve (V_1) on the inlet side.
(8) While watching the outlet pressure gauge, increase the operating air pressure (at standard control unit, etc.), until the desired pressure is reached. At that time, be sure to allow some bleed-off the operating air pressure to the needle valve. (For standard unit needle valves, the valve opening should be turned 1/2 to 1 turn.)
(9) When the entire system has stabilized, conduct fine adjustment as necessary.
(10) When the adjustment is completed, secure the handle of the standard control unit’s pressure reducing valve.
(11) Check for leakage. Conduct re-tightening as necessary.

9. Precautions During Disassembly And Inspection

9-1. Precautions During Disassembly And Inspection

⚠Warning

The pressure reducing valve shall be disassembled and inspected by qualified persons, observing the following.

(1) **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 burns.

(2) **Completely discharge internal pressure from the valves, lines, and equipment before disassembly and inspection.**
* Failure to do so may result in injury or burns due to residual pressure or spillage around the valve.

(3) **Remove condensation before disassembling the diaphragm case at the bottom of the valve.**
* Failure to do so may allow the condensation to splash out, resulting in burns or spillage around the valve.

9-2. Disassembly

When disassembling the pressure reducing valve, refer to Fig. 9.1～9.2 (page 15～16) and observe the precautions below.

(1) **Pilot valve**

1.Set the operating air pressure to “no-pressure”.

2.Remove bolt [60] and cover [57]. For GPK-2001, remove pilot diaphragm [23], diaphragm case [58], diaphragm plate [59] and pilot diaphragm [23]. For GPK-2003, remove diaphragm [62] , bolt [64], top diaphragm plate [63] , diaphragm case [58], bottom diaphragm plate [61] and pilot diaphragm [23]

3.Remove pilot valve seat[18] (hexagonal section of the center of pilot body [2]) using a ring spanner or socket wrench (nominal size 22), and remove the entire pilot valve assembly [17,18,19,20 and 21] .

(2) **Main valve**

1. Remove pipe [34] at joint [30] or tee [33].
2. For nominal sizes 15A to 40A, remove bolt [38] of pilot body [2]. Dismount the pilot body from the body [1]. And remove spring plate [14], screen [15], main valve spring [13], and main valve [6]. For nominal sizes 50A to 100A, remove bolt [44] of spacer [54] and remove the spacer from the main body [1], main valve spring [13], and entire main valve ([6], [9], [50],and [51]) (for nominal sizes 50A,main valve spring [13], and main valve [6]).

    * Do not disassemble the main valve seat [7].

(3) **Main diaphragm**

1.Remove pipe [36] at the tee.

2.Remove bolt [41] of bottom dia. case [5]. Dismount the bottom dia. case, main diaphragm [12], retainer [11], and main spindle [9]. (adapter [52] and retainer [11] for nominal sizes 65A to 100A).

9-3. Disassembly drawing

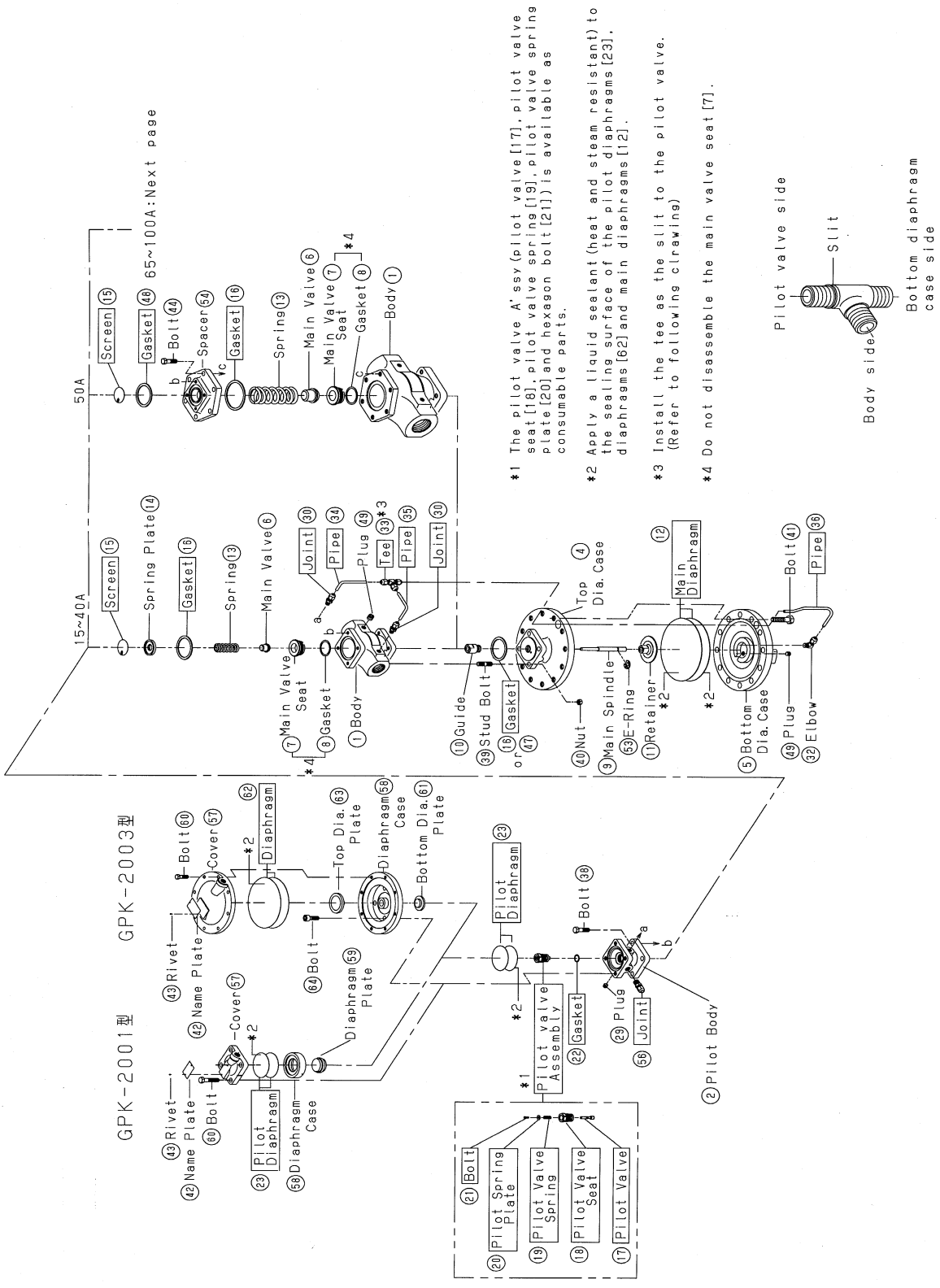


Fig. 9.1

Parts within the frame are consumable. Please contact us for purchase of these consumable parts.

Note(*1): Apply a fluid sealant (heat and steam resistant) to the bottom sealing surface of the top and bottom sealing surfaces of the main diaphragm.

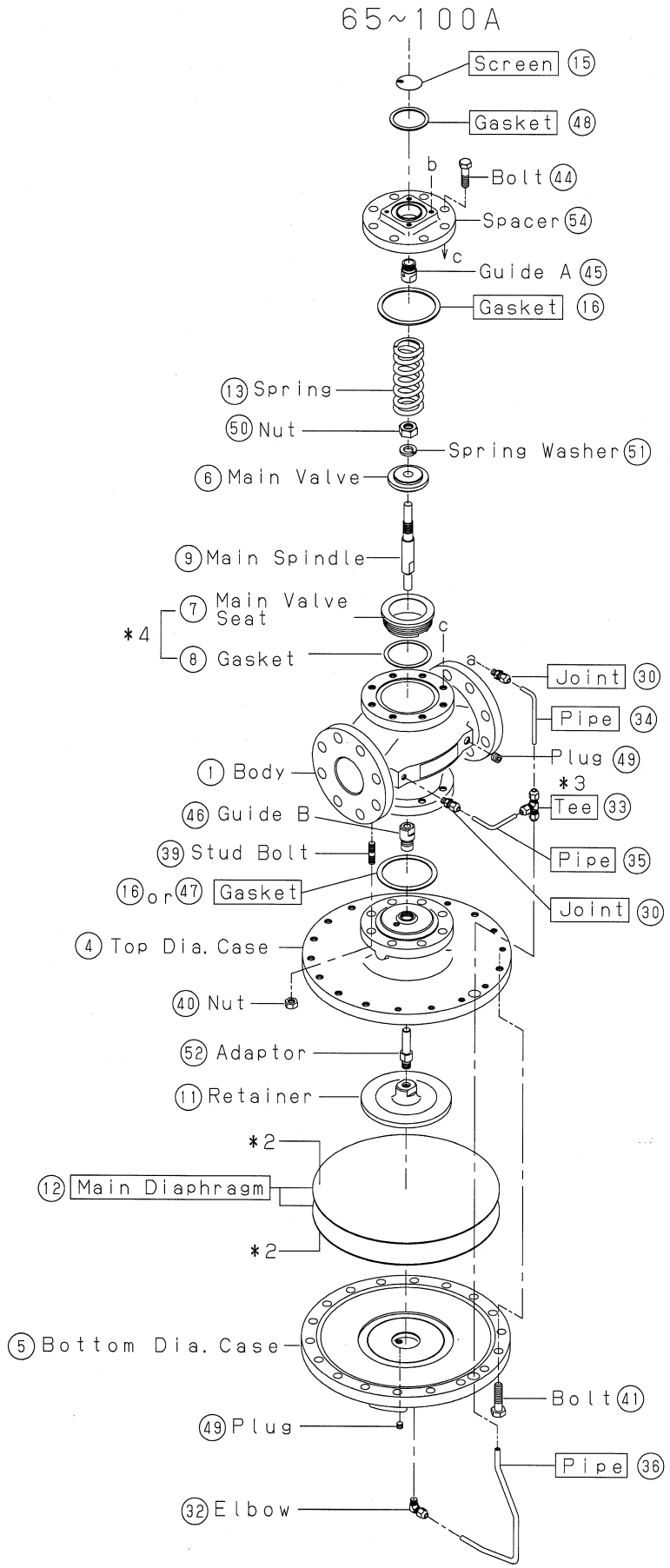

65~100A
Screen (15)
Gasket (48)
b
Bolt (44)
Spacer (54)
c
Guide A (45)
Gasket (16)
(13) Spring
(50) Nut
Spring Washer (51)
(6) Main Valve
(9) Main Spindle
(7) Main Valve Seat
*4
(8) Gasket
c
a
Joint (30)
Pipe (34)
Plug (49)
(1) Body
*3
Tee (33)
(46) Guide B
(39) Stud Bolt
Pipe (35)
(16) or (47) Gasket
Joint (30)
(4) Top Dia. Case
(40) Nut
(52) Adaptor
(11) Retainer
*2
(12) Main Diaphragm
*2
(5) Bottom Dia. Case
Bolt (41)
(49) Plug
Pipe (36)
(32) Elbow

Fig. 9.2

10. Precautions During Assembly And Adjustment

When assembling the pressure reducing valve, refer to Fig. 9.1～9.2 (page 15～16) and observe the precautions below.

10-1. Precautions during assembly

⚠Caution

(1) **Check that there is no damage on the main valve, main valve seat, pilot valve, and pilot valve seat.**
* Any damage on the sealing surfaces of these may cause leakage.

(2) **Move the sliding section (pilot valve, main spindle, etc.) two to three times and confirm they move smoothly.**
* If they do not move smoothly, original performance may be affected.

(3) **After the main valve, spring, and spring plate are assembled correctly, mount the main diaphragm.**
* Incorrect assembly may affect the original performance.

(4) **Replace gaskets with new ones when disassembling.**
* Using old gaskets may cause steam leakage, resulting in burns.

(5) **Tighten the nuts evenly.**
* Tightening insufficiently may cause steam leakage, resulting in burns.

10-2. Assembly

Assemble in the reverse order of "**9-2. Disassembly**". Parts configuration differs depending on the nominal size. Refer to "**9-3. Disassembly drawing**" and assemble the parts correctly.

*1. Further, apply a fluid sealant (heat and steam resistant) to the bottom sealing surface of the pilot diaphragm and the top and bottom sealing surfaces of the main diaphragm.

*2. The hexagon bolt [60] of GPK-2001 should be tighten with specified torque.(3500 N･cm)

10-3. Adjustment

Observe the steps of "**8-1 Adjustment**".

11. Troubleshooting

Problem	Cause	Solution
Pressure does not reach the desired value.	1. Incorrect pressure is being used.	1. Correct the pressure. (Note that the reduced pressure must be 85% or below of the inlet pressure (gauge pressure).
	2. System air pressure is insufficient.	2. Raise the system air pressure to necessary set pressure.
	3. Screen [15] is clogged.	3. Disassemble the valve and clean the screen.
	4. Main diaphragm [12] is damaged.	4. Remove pipe [36] at elbow [32] and open the by-pass valve. If the fluid runs out from elbow , replace the main diaphragm.
	5. Orifice of tee [33] is clogged.	5. Remove the orifice and clean it.
	6. Pilot valve [17] and pilot valve seat [18] are clogged with foreign matter, scales, etc.	6. Disassemble pilot valve assembly [17,18,19,20,21], and clean it.
	7. Sensing pipe is clogged.	7. Disassemble and clean it.
	8. Nominal size is too small for the specifications.	8. Change the nominal size appropriately.
	9. Pressure is not adjusted correctly.	9. Observe the adjustment steps and readjust pressure.
	10.tee [33] lacks orifice.	10. Replace with the correct joint.
	11. Strainer installed before pressure reducing valve is clogged.	11. Disassemble and clean it.
	12. Pressure gauge is faulty.	12. Replace it.
Outlet pressure raises above than the specified value.	1. System air pressure is too high.	1. Lower the system air pressure.
	2. No bleed-off the operating air pressure is allowed.	2. Be sure to allow some bleed-off the operating air pressure to the needle valve (reference the piping examples and the adjustment).
	3. Check for foreign matter stuck to main valve [6] and main valve seat [7], or for scratches on these.	3. Set the operating air pressure to “no-pressure”,remove the joint [30](pilot body side). If fluid runs out from tee [33] when it is supplied from inlet side of the pressure reducing valve, clean the main valve and main valve seat. If any scratches are identified, lap the main valve and main valve seat.
	4. Check for foreign matter stuck to pilot valve [17] and pilot valve seat [18], or for scratches on these.	4. If fluid runs out from joint [30] when it is supplied as 1.above, remove the pilot valve assembly to clean or replace it.
	5. Orifice of tee [33] is clogged.	5. Remove , inspect and clean it.
	6. Reduced pressure is not adjusted correctly.	6. Observe the adjustment steps and readjust pressure.
	7. Foreign matter is stuck to clearance between spindle [9] and guide [10].	7. Remove them for inspection and cleaning.
	8. Trap is not provided for dead end pipe.	8. Install a trap.
	9. Fluid leaks from by-pass valve.	9. Repair or replace it.
Valve operation is not stable.	1. Orifice of the tee is partially clogged.	1. Remove and clean it.
	2. Flow at the connection of the sensing pipe fluctuates excessively.	2. Examine the connecting place and change it.
	3. Condense remains in the sensing pipe.	3. Connect the sensing pipe in upward slope to pressure reducing valve. ※ Refer to Fig.6～8
	4. Sliding movement of the spindle and the guide is poor.	4. Disassemble and clean the valve, or replace the parts.
	5. No bleed-off the operating air pressure is allowed, or excessive bleed-off the operating air pressure is allowed.	5. Observe the adjustment steps and readjust pressure.

12. After Sales Service

1. Warranty application and period

Products delivered to user are manufactured with our high level of engineering techniques under strict quality control. Please observe the descriptions in this instruction manual or precautions on the hazard labels attached to the product. Should the product be faulty due to material or factors in our manufacturing processes, we will repair the product at no charge.

This warranty is valid for one(1)year after delivery to users.

2. Repairs will be charged even during the warranty period in the following cases:

(1) Damage and failure due to user's incorrect operation, repairs and remodeling upon user's discretion.

(2) Damage and failure due to location change of the product after delivery and drop of the product.

(3) Damage and failure due to use under severe conditions beyond design specifications or incorrect operation.

(4) Damage or failure due to natural disasters, such as fire, earthquake, lightening, corrosion due to salt, gas, wind, and water, and abnormal voltage.

(5) Replacement of excessive worn parts.

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