

GD-200 Series

Model:GD-200, 200H

Pressure Reducing Valve

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

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

 **Warning**

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

 **Caution**

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

Contents

1. Specifications & Performance	
1.1 Specifications	1
1.2 Flow Rate Characteristics Chart	2
1.3 Pressure Characteristics Chart	2
2. Structure	3
3. Operation	4
4. Nominal Size Selection Method	
4.1 Nominal Size Selection Chart	5~6
4.2 Selection Formula for Nominal Size	7
5. Installation	
5.1 Example of Piping	8
5.2 Precautions before operation	9~10
6. Operating Procedure	
6.1 Precautions for pressure reducing valve operation	10~11
6.2 Adjustment Procedure	11
7. Maintenance Procedure	
7.1 Troubleshooting	12
7.2 Precautions during disassembly and inspection	13
7.3 Periodic Inspection	13
7.4 Disassembly	13~14
7.5 Assembly	14
8 Exploded drawing	15
After Sales Service	

YOSHITAKE

1. Specifications & Performance
1.1 Specifications

Table 1

Model	GD-200	GD-200H
Application (Fluid)	Hot and cold water, Air, Oil (+) (kerosene, heavy oil A·B) and Other non-dangerous fluids	
Nominal Size	15A ~ 150A	
Inlet Pressure (MPa)	1.0 or less	2.0 or less
Reduced Pressure (MPa)	15A~80A : (A)0.05~0.25 (B)0.26~0.7 100A~150A : (A)0.05~0.25 (B)0.26~0.5	15A~50A : (A)0.05~0.25 (B)0.26~0.7 (C)0.5~1.0 65A、80A : (A)0.05~0.25 (B)0.26~0.7 (C)0.5~0.9 100A~150A : (A)0.05~0.25 (B)0.26~0.5 (C)0.5~0.75
Min. Differential Pressure (MPa)	0.05	
Max. Pressure Reduction Ratio	10:1	
Min. adjustable flow Capacity	Water: 5L/min Air: 10m ³ /h (normal state)	
Application Temperature(°C)	5~80	
Coefficient of viscosity(cSt)	600 or less	
Material	Body	Ductile Cast Iron
	Valve Seat	Stainless Steel
	Valve Disc	NBR
	Diaphragm	NBR
Connection	JIS 10K FF Flanged	JIS 20K RF Flanged
Surface treatment	15~100A : Electrodeposition Paint 125~150A : Tar paint (Black) or Electrodeposition Paint	

* The rubber material FKM type is also available (excluding GD-200H 65~150A).

* We also manufacture products with a pressure gauge (Connection size: R1/4, R3/8).

(+) Deterioration of rubbers may be accelerated depending on the additives contained in the oil used.

 **Caution**

Please collate with attached nameplate and specification of ordered model.

*Please consult factory in case they do not match each other.

1.2 Flow Rate Characteristics Chart

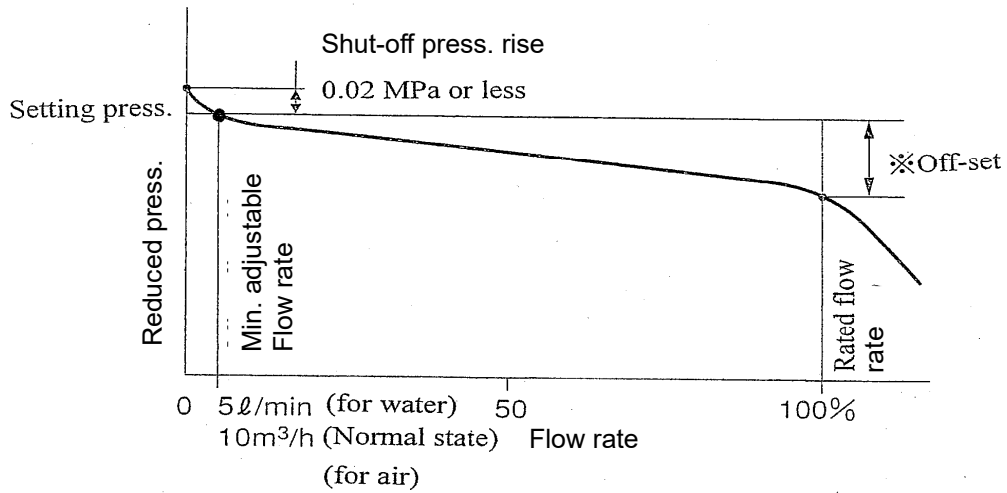


Fig.1 Flow Rate Characteristics Chart

*Off-set

Table 2

Nominal size	Spring division	Off-set	
		Setting range	Within
15A~50A	(A), (B)	Setting range 0.05~0.7MPa	Within 0.05MPa
	(C)	Setting range 0.5~1.0MPa	Within 0.11MPa
65A, 80A	(A), (B)	Setting range 0.05~0.7MPa	Within 0.05MPa
	(C)	Setting range 0.5~0.9MPa	Within 0.11MPa
100A	(A), (B)	Setting range 0.05~0.5MPa	Within 0.05MPa
	(C)	Setting range 0.5~0.75MPa	Within 0.11MPa
125A~150A	(A)	Setting range 0.05~0.25MPa	Within 0.05MPa
	(B)	Setting range 0.26~0.5MPa	Within 0.07MPa
	(C)	Setting range 0.5~0.75MPa	Within 0.11MPa

1.3 Pressure Characteristics Chart

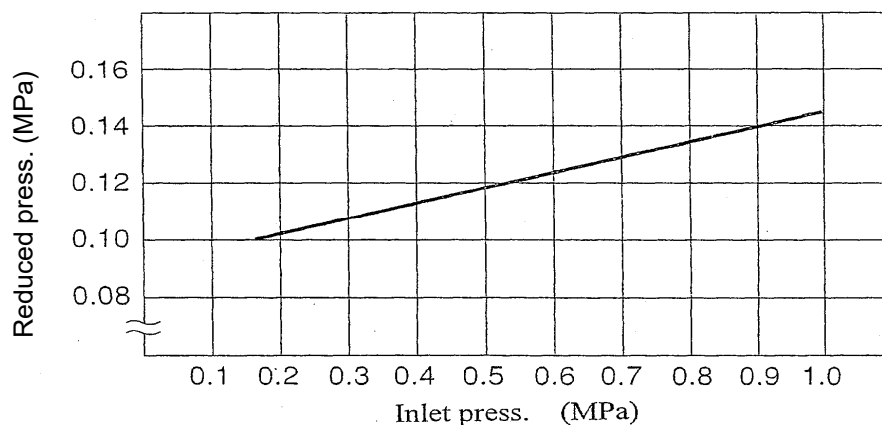


Fig.2 Pressure Characteristics Chart

The above chart shows the change in the reduced pressure when the inlet pressure is changed in the range of 0.15~1.0~0.15 MPa whereas the reduced pressure is set at 0.1 MPa at inlet pressure of 0.15 MPa.

2. Structure

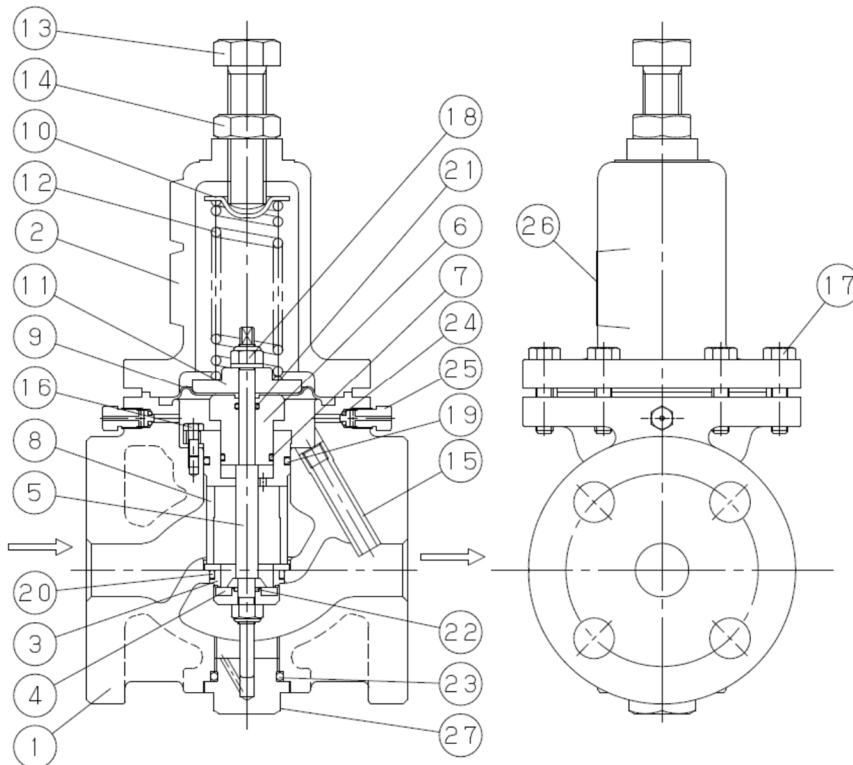


Fig.3

*The parts shape differs according to the nominal size.

Table 3

No.	Parts Name
1	Body
2	Spring Chamber
3	Valve Seat
4	Valve
5	Spindle
6	Retainer
7	O Ring
8	Retainer Guide
9	Diaphragm
10	Spring Plate
11	Spring Plate
12	Spring
13	Adjusting Screw
14	Lock Nut
15	Conductor Pipe
16	Bolt
17	Bolt
18	U Nut
19	O Ring
20	O Ring
21	O Ring
22	O Ring
23	O Ring
24	O Ring
25	Air Vent
26	Name Plate
27	Cap

3. Operation

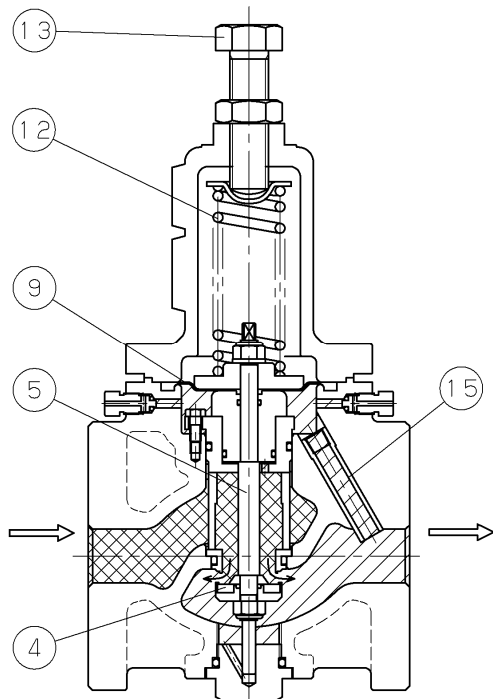


Fig.4

If the adjusting screw [13] is turned right, the diaphragm [9] will be depressed with the spring [12] and valve disc [4] connected with spindle [5] will open. The fluid which flowed in from the inlet side carries out the action which pushes up diaphragm [9] through a sensing pipe [15] at the same time it flows into the outlet side through the valve [4] disc upper part.

Load to diaphragm [9] balances with load of spring [12], and it adjust the opening of main valve [4] to regulate the reducing pressure.

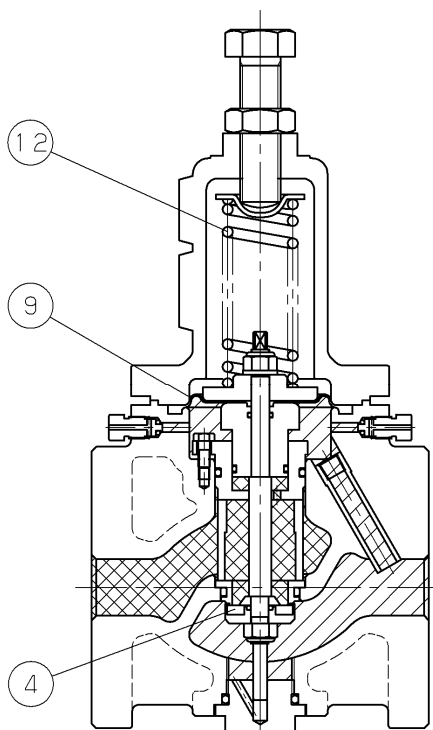


Fig.5

With closing stop valve at the outlet side by little by little, the load to diaphragm [9] will be increased because of increasing in reduced pressure. Increasing load to diaphragm [9] overcomes the load of spring [12], and then closes the main valve [4].

4. Nominal Size Selection Method

When selecting the nominal size, please take piping condition and application into consideration and secure a safety rate of 20% or more for the performance value.

4.1 Nominal Size Selection Chart

< For Water >

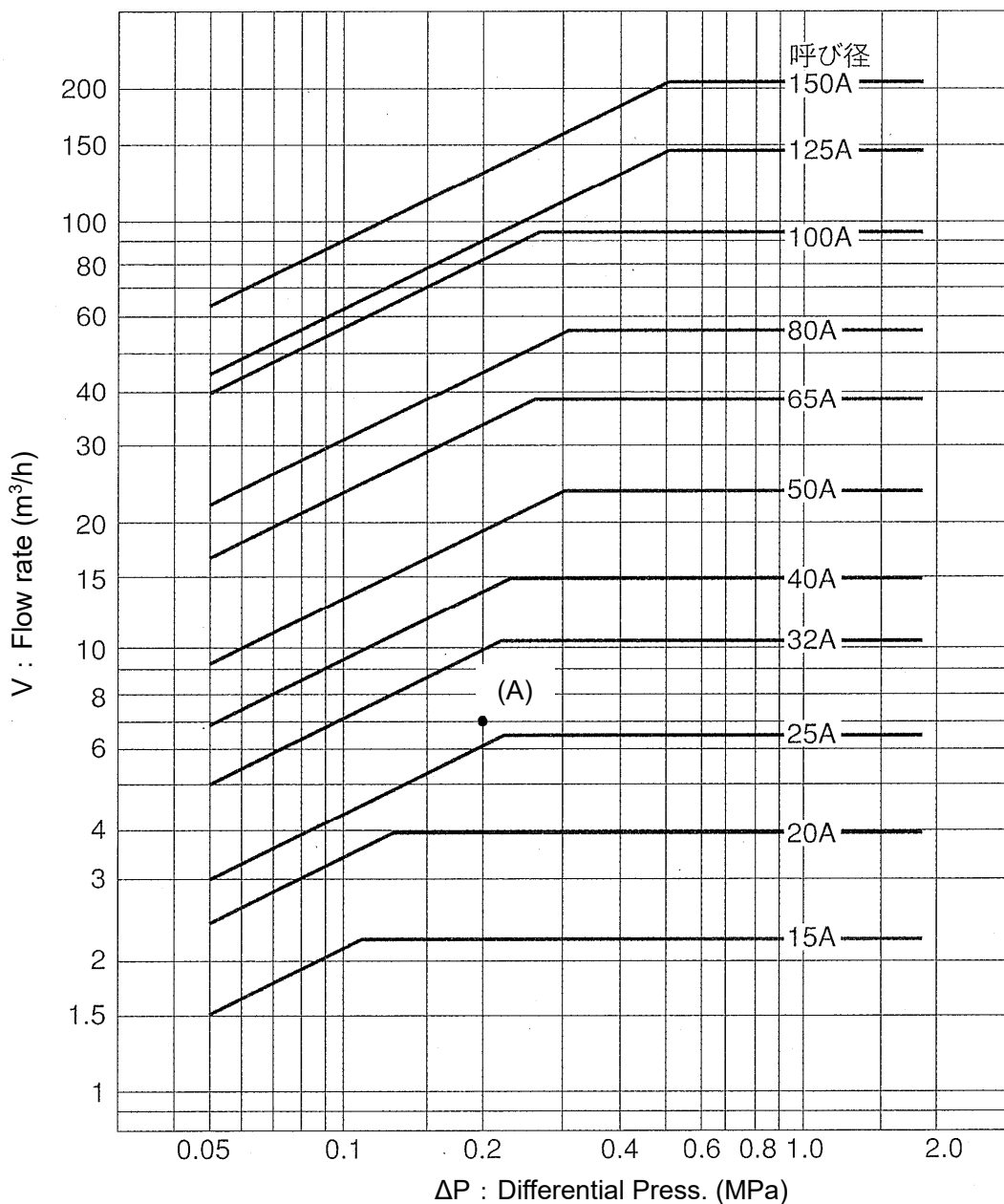


Fig.6

[Example of Selection]

When the inlet pressure (P_1) is 0.5 MPa, the reduced pressure (P_2) is 0.3 MPa and the flow rate is $7\text{ m}^3/\text{h}$, for instance, the size of the pressure reducing valve is selected as follows. Find the intersection point(A) of the differential pressure of 0.2 MPa with the flow rate of $7\text{ m}^3/\text{h}$, the point(A) is between line of size 25A and 32A. Choose larger size 32A for application.

< For Air >

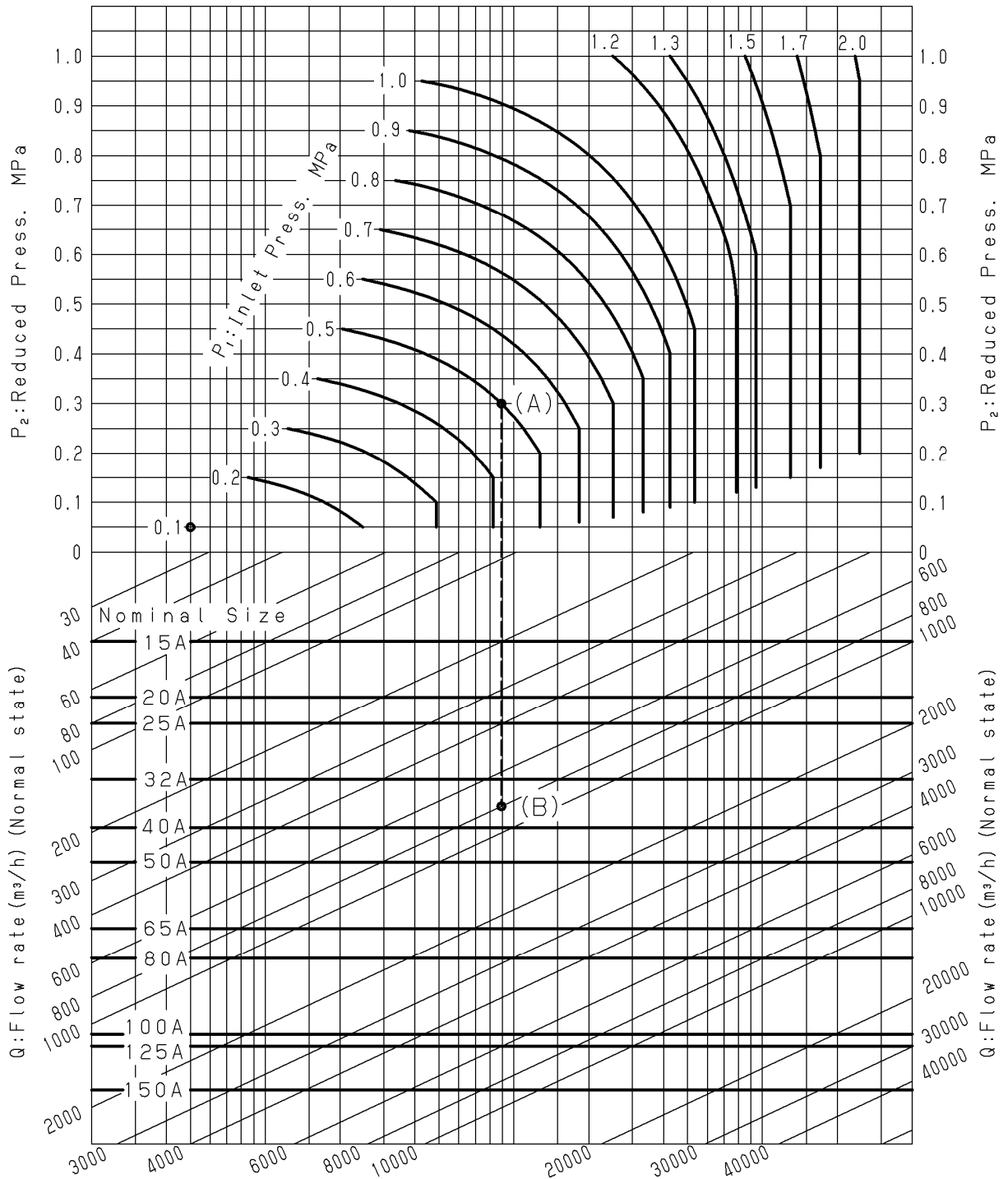


Fig.7

[Example of Selection]

When the inlet pressure (P_1) is 0.5 MPa, the reduced pressure (P_2) is 0.3 MPa and the flow rate is 800Nm³/h, for instance, the size of the pressure reducing valve is selected as follows. Find the intersection point (A) of the inlet pressure (P_1) 0.5 MPa and reduced pressure (P_2) 0.3 MPa and go straight down from the point (A) to find the intersection (B) crossing the flow rate line. The point (B) is between line of 32A and 40A, and choose larger size 40A for application.

4.2 Selection Formula for Nominal Size

When selecting the nominal size by calculation, use a formula to find the required Cv value based on the usage conditions, and then select the nominal size with a Cv value that satisfies that value (see Table 4).

Table 4

Nominal Size	15A	20A	25A	32A	40A	50A	65A	80A	100A	125A	150A
Cv value	2.5	4	5	8	12	16	28	36	68	75	108

[Cv Value Calculation Formula]

< For Gas >

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

$$C_v = \frac{Q}{2940} \sqrt{\frac{(273+t)G}{\Delta P(P_1 + P_2)}} \quad C_v = \frac{Q\sqrt{(273+t)G}}{2550P_1}$$

< For Liquid >

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

*However, the Max. flow rate (V) should be 3 m/s or less (see Table 5).

Table 5 Flow rate at flow velocity 3m/s

Nominal Size	15A	20A	25A	32A	40A	50A	65A	80A	100A	125A	150A
Flow rate (m ³ /h)	2.20	3.96	6.46	10.81	14.67	23.72	39.09	55.21	94.00	145.05	204.21

[Viscosity correction Formula]

For viscous liquids, apply the following viscosity correction formula.

Find the Max. flow rate (V) when the viscosity is ignored. However, the Max flow rate (V) should be 3 m/s or less (see Table 5).

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

And find the viscosity index of lv.

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

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

Compensated Max. flow rate V' = V/K (m³/h)

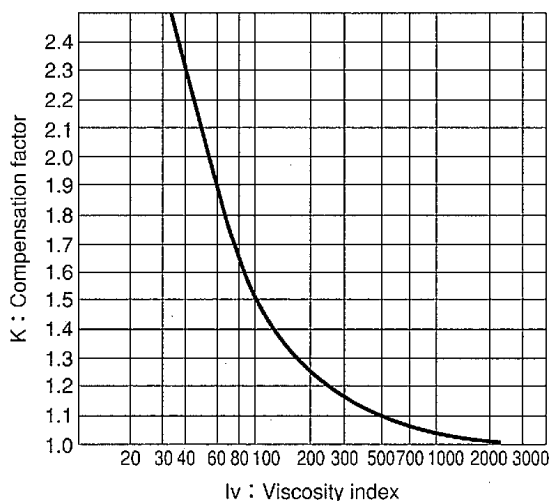


Fig.8

- P₁ : Inlet pressure [MPa·A]
- P₂ : Reduced pressure [MPa·A]
- ΔP : P₁ - P₂ [MPa]
- G : Specific gravity
(Gas : Specific gravity relative to air
Liquid : Specific gravity relative to water)
- V : Max. liquid flow rate [m³/h]
- Q : Max. gas flow rate [m³/h (Normal state)]
- t : Temperature [°C]
- Cv : Cv value of the nominal size
- lv : Viscosity index
- M_{cst} : Viscosity [cSt]

5. Installation

5.1 Example of Piping

[For Water]

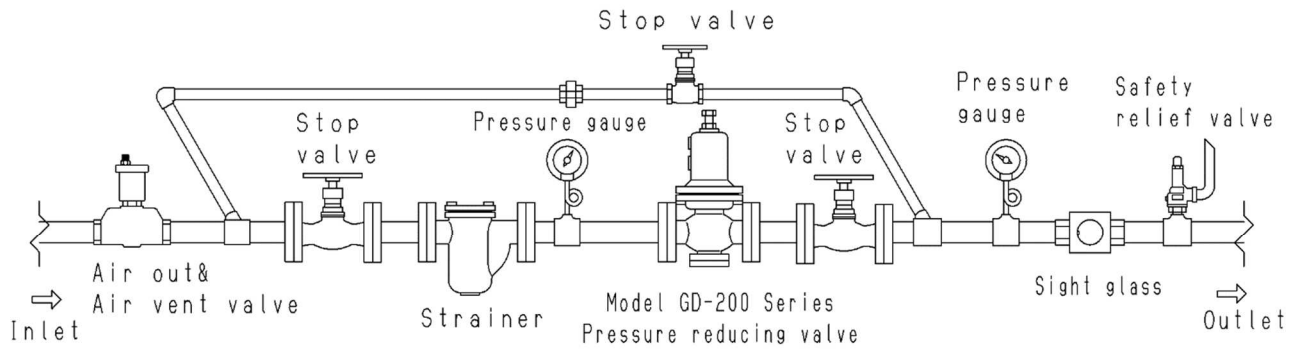


Fig.9

[For Air]

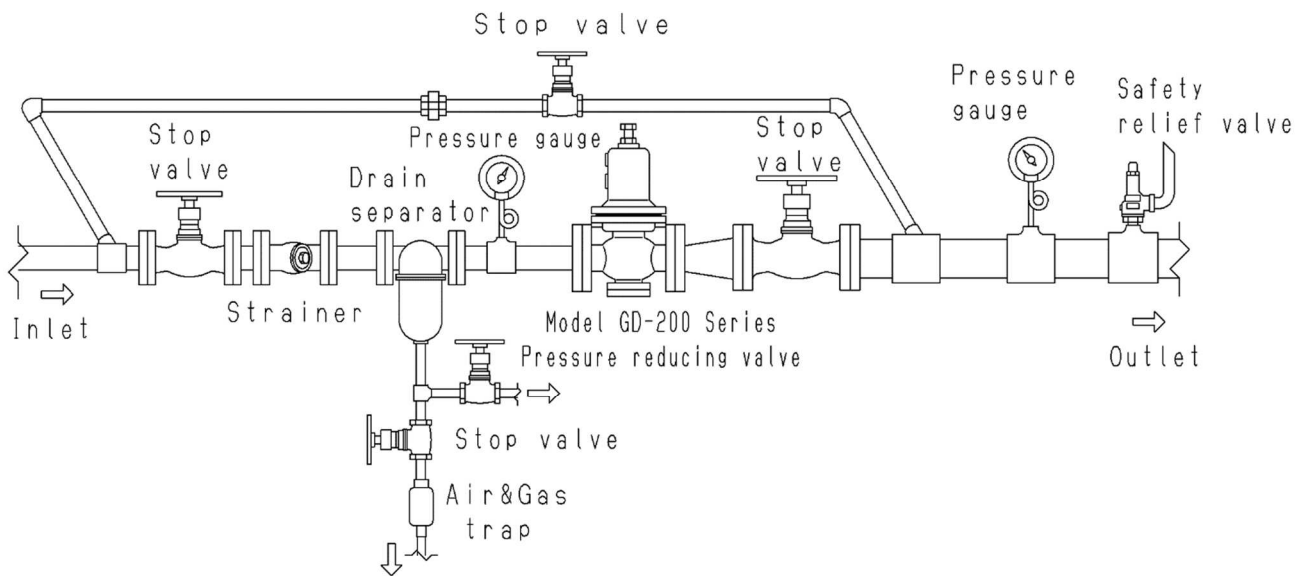


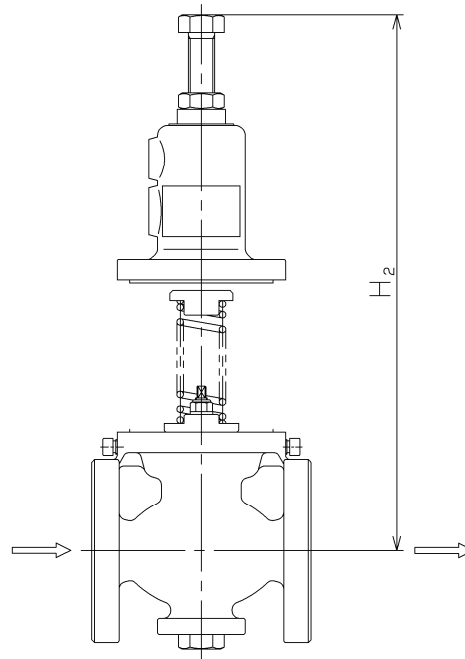
Fig.10

5.2 Precautions before operation

Caution

- (1) Depending on the water quality, brass parts may corrode or be promoted, causing product malfunction. In an environment where corrosion may occur, select a product made of a compatible material such as stainless steel.
- (2) If components having negative influence on internal parts are included in fluid or surroundings, deterioration of rubber parts is accelerated and then outside leakage or functional disorder is caused.
- (3) The product or parts will be damaged if an impact due to sudden pressure fluctuations such as water hammer is applied.
- (4) If the product is in a closed pipe state, the fluid in the pipe will expand in volume due to the rise in fluid temperature, and the product will be damaged.
- (5) Sticky fluids can cause parts to stick together and cause malfunctions.
- (6) Since it is weight thing, this product should use lifting equipment etc., and please support a product certainly and install it in piping.
 - *There is a possibility that it may be injured, by fall of product.
- (7) Do not disassemble the valve unreasonably.
 - *Disassembling the valve at your discretion may affect the original performance.
- (8) Install a bypass line.
 - *The system has to stop operation while inspection and maintenance of the product if the bypass line is not installed.
- (9) Remove foreign matter and scales from the lines before connecting the valve.
 - *Failure to do so may prevent the valve from functioning correctly.
- (10) Install a strainer at the valve inlet side.
 - *Failure to do so may hamper correct pressure control, which affects the original performance.
- (11) Install a safety valve at the valve outlet sides for alarms.
 - *Failure to do so prevents problem identification, resulting in equipment damage.
 - *By sunshine or atmosphere temperature rise, the fluid in piping carries out volume expansion, failure of the valve and the external leak of fluid occur, and there is danger of circumference contamination.
- (12) Install a pressure gauge at both the inlet and outlet sides of the valve.
 - *Failure to do so may hamper correct pressure adjustment.
- (13) For gas application, install a trap to the inlet sides of the valve to prevent drainage problem.
 - *Failure to do so may result in drainage problem, affecting the original performance.
- (14) 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.
- (15) 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.
- (16) Do not apply excessive load, torque or vibration to the valve.
 - *Doing so may result in malfunction or drastically shortened service life.
- (17) Install the valve in proper direction of the fluid flow.
 - *Failure to do so may affect the original performance.
- (18) Do not use dissimilar metal piping that causes a potential difference.
 - * Products and parts will corrode.
- (19) Before performing the water pressure test, close the stop valves upstream and downstream of the product.
 - *The test pressure may damage the product.
- (20) Pipes can be installed either horizontally or vertically except over the size of 100A.
- (21) If the large valve is used for gas, install a reducer to prevent excessive flow speed.
(The flow speed made in piping is appropriate, if it is 15m/s or less.)

(22) Above the center of the pipe line, be sure to reserve enough space larger than H_2 .
Please see the Fig.11.



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

(mm)

Fig.11

6. Operating Procedure

6.1 Precautions for pressure reducing valve operation

⚠ Warning

- (1) When the product is used for hot fluid, do not touch the product with bare hands.
*The product having hot fluid may scald your skin.
- (2) Before leading fluid, make sure that there is no danger even if fluid leads to the piping end.

⚠ Caution

- (1) Before leading fluid into the product, close the stop valves at the inlet and outlet of the product and remove foreign substances and scale from the piping completely by using a bypass line.
*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) To adjust the set pressure, turn the adjusting screw slowly.
*Failure to follow this notice may result in damage to the product and other equipment due to hunting or other cause.
- (3) If closing outlet side of the product and keeping fluid inside the product for an extended period, sliding parts become stuck and it causes malfunction of the product.
*Check if the product operates normally when resuming the product.

- (4) If there is a possibility of freezing or the product is not used for an extended period, completely discharge fluid from the product and pipes, and close the stop valves at the inlet and outlet sides of the product.
- *Failure to follow this notice causes malfunction of the product due to rusting inside the product and the pipes or damaged by freezing.
- (5) If the systems have been out of service for a long time, please perform the following operational checks before restarting the systems.
- Check if the set pressure changes when turning the adjustment screw (see Fig. 12).
 - Check whether the outlet pressure is stable at the adjusted pressure.
 - *If there is any abnormality, please ask a professional to take measures.
- (6) In case of outlet pressure for size 65A to 150A is unstable because of an air obstruction or etc. adjust opening of needle valve at detecting pipe. It is fully opened at the time of shipment.
- (7) The set pressure may be affected by ambient temperature (external temperature) and fluid temperature. Install pipes so that the product may not be exposed to direct sunlight.
- (8) Follow the steps below, and slowly turn the adjusting screw to set pressure. Incorrect adjustment may cause hunting, water hammer, etc., resulting in damage to the valve and other equipment.

6.2 Adjustment Procedure

- (1) Close the stop valves at both sides of the pressure reducing valve, and thoroughly purge the system through the by-pass line, with the by-pass valve opening adjusted so that the safety relief valve is not activated. When completed, be sure to close the by-pass valve.
- (2) Loosen the lock nut [14] and the adjusting screw [13] to unload the spring [12].
- (3) Slowly open the inlet stop valve, then open the outlet stop valve slightly, allowing a trickle to be discharged.
- (4) Slowly turn the adjusting screw [13] (clockwise to increase, counterclockwise to reduce) while observing the pressure gauge on the outlet side.
Refer to Table 6 for the width across flats of the adjustment screw.
- (5) Slowly open the outlet stop valve to its full-open position.
- (6) After the adjustment, tighten the lock nut.
- (7) In case of outlet pressure for size 65A to 150A is unstable because of an air obstruction or etc. adjust opening of needle valve at detecting pipe.

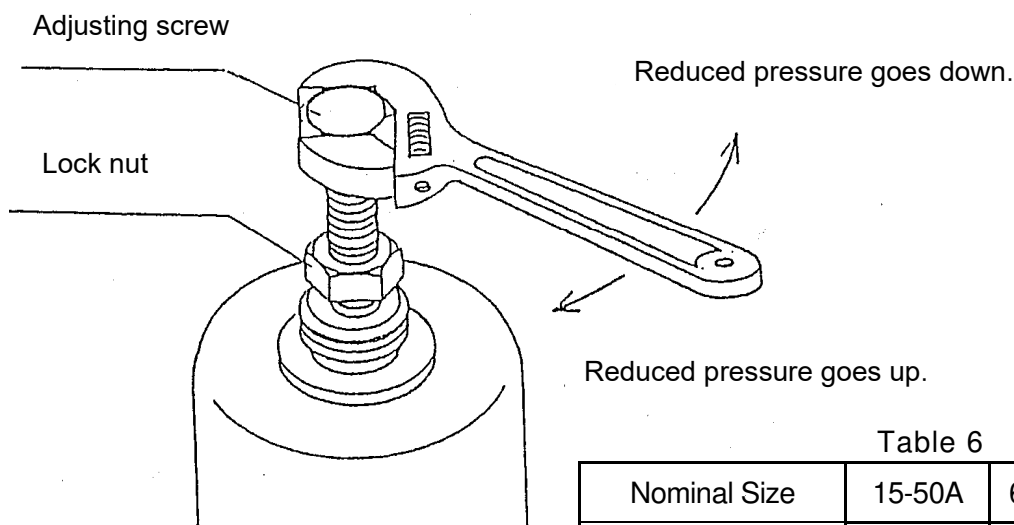


Fig.12

Table 6

Nominal Size	15-50A	65-100A	125-150A
Width across flats	27mm	36mm	50mm

7. Maintenance Procedure
7.1 Troubleshooting

Problem	Causes	Solutions
Pressure does not rise to desired level.	<ol style="list-style-type: none"> 1. Incorrect pressure is being used. 2. Nominal size is too small for these specifications. 3. Incorrect adjustment. 4. Poor sliding of internal parts. 5. Strainer is clogged. 6. Pressure gauge malfunction. 7. The conductor pipe [15] is clogged with foreign matter. 	<ol style="list-style-type: none"> 1. Correct the pressure being used. (Refer to the "1.1 Specifications".) 2. Replace with the correct nominal sized item. (Refer to the "4. Nominal Size Selection Method".) 3. Re-adjust according to the adjustment procedure. (Refer to the "6.2 Adjustment Procedure".) 4. Disassemble and clean. 5. Disassemble and clean. 6. Replace the pressure gauge. 7. Disassemble and clean the conductor pipe.
Reduced pressure exceeds prescribed level.	<ol style="list-style-type: none"> 1. Foreign matter is embedded in the valve [4] and/or valve seat [3], or else scratches exist. 2. By-pass valve is leaking. 3. Incorrect adjustment. 4. Poor sliding of internal parts. 5. Diaphragm [11] or O ring is broken. 	<ol style="list-style-type: none"> 1. Disassemble and clean. If scratches exist, replace them. 2. Repair or replace the valve. 3. Re-adjust according to the adjustment procedure. (Refer to the "6.2 Adjustment Procedure".) 4. Disassemble and clean. 5. Replace the parts.
External leakage	<ol style="list-style-type: none"> 1. Diaphragm [9] is broken. 2. O ring [23] is broken. 	<ol style="list-style-type: none"> 1. Replace Diaphragm [9]. 2. Replace O ring [23].
Abnormal noise is heard.	<ol style="list-style-type: none"> 1. Nominal size is too small for these specifications. 2. Pressure reduction ratio is too large. 3. Air problem is caused. (Liquid use) 4. An abrupt OPEN/CLOSE valve is located too close to the pressure reducing valve. 	<ol style="list-style-type: none"> 1. Replace with the correct nominal sized item. (Refer to the "4. Nominal Size Selection Method".) 2. Use a two-stage reduction. (Refer to the "1.1 Specifications".) 3. Install an air vent. 4. Keep the valves at least 3m apart.

*Foreign matter and scales in pipe may cause most of problems of pressure reducing valve. Be careful sufficiently to foreign matter in pipe.

*Phenomenon alike valve trouble may happen by fault of pressure gauge, fluid leakage from by-pass valve, forgetting to close the by-pass valve, clogging strainer, etc. First, check the said before above troubleshooting.

7.2 Precautions during disassembly and inspection

⚠ Warning

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

⚠ Caution

- (1) Perform periodical inspection to maintain product functions and performance.
*General users shall request countermeasures to installers or maintenance companies.
- (2) Rubber parts and components shown below are consumables. Note that the life expectancy depends on the conditions under which they are used.

Table 7

Serviceable life	Parts name/number
3 years	Valve, O ring, Diaphragm

7.3 Periodic Inspection

Conduct daily and periodic inspections in order to maintain the optimal performance of the product. See "7.1 Troubleshooting" for the remedies if trouble is observed.

• Daily inspection (once a day)

Items	Standards for Inspection
Inlet pressure	There should be maintained at the set pressure.
Outside leakage	There should be no outside leakage.
Abnormal noise	There should be no abnormal noise

• Periodic inspection (once a year)

Items	Standards for Inspection
Valve and valve seat	There should be no scratches, wear, or foreign matters caught on the seat surface.
Retainer sliding part	There should be no scratches, or foreign matters caught on the surface of the part.
O ring	There should be no damage on the O-ring.

7.4 Disassembly

- (1) Release the internal pressure completely, and make sure of zero pressure.
- (2) Slightly loosen the lock nut [14] and turn the adjusting screw [13] counter clockwise to relieve the spring [12] (Unload the spring).
- (3) Remove the hexagon bolt [17] from the spring chamber [2], then remove the spring chamber [2] q, and take out the spring [12] and the spring plate [10].
- (4) To remove the diaphragm [9], fix the spindle [5] and remove the U nut [18].
- (5) To remove the retainer [6], loosen and remove the retainer guide clamping bolt [16] and pull the retainer guide [8]. Remove it by the bellow method (Fig.13, Fig.14) when it is difficult to remove the retainer guide [8].
- (6) To remove the valve seat [3], pull the spindle [5].
- (7) Fix two planar sections at spindle [5] and loosen U nut for spindle to remove it, then the valve can be dismantled.

[Nominal Size: 15A~50A]

To remove the retainer guide [8] easily, install the spring plate [11] and U nut [18] to spindle [5] again and pull the spring plate. (Fig.13)

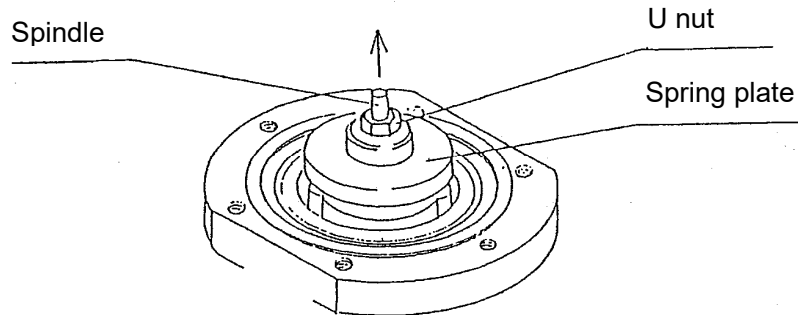


Fig.13

[Nominal Size: 65A~150A]

To remove the retainer guide [8] easily, screw the bolt [16] to retainer guide and pull it. (Fig.14)

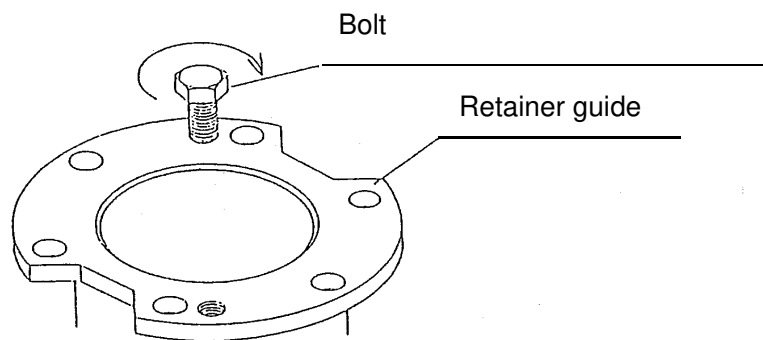


Fig.14

7.5 Assembly

When assembling, follow the steps in the reverse order of disassembly.

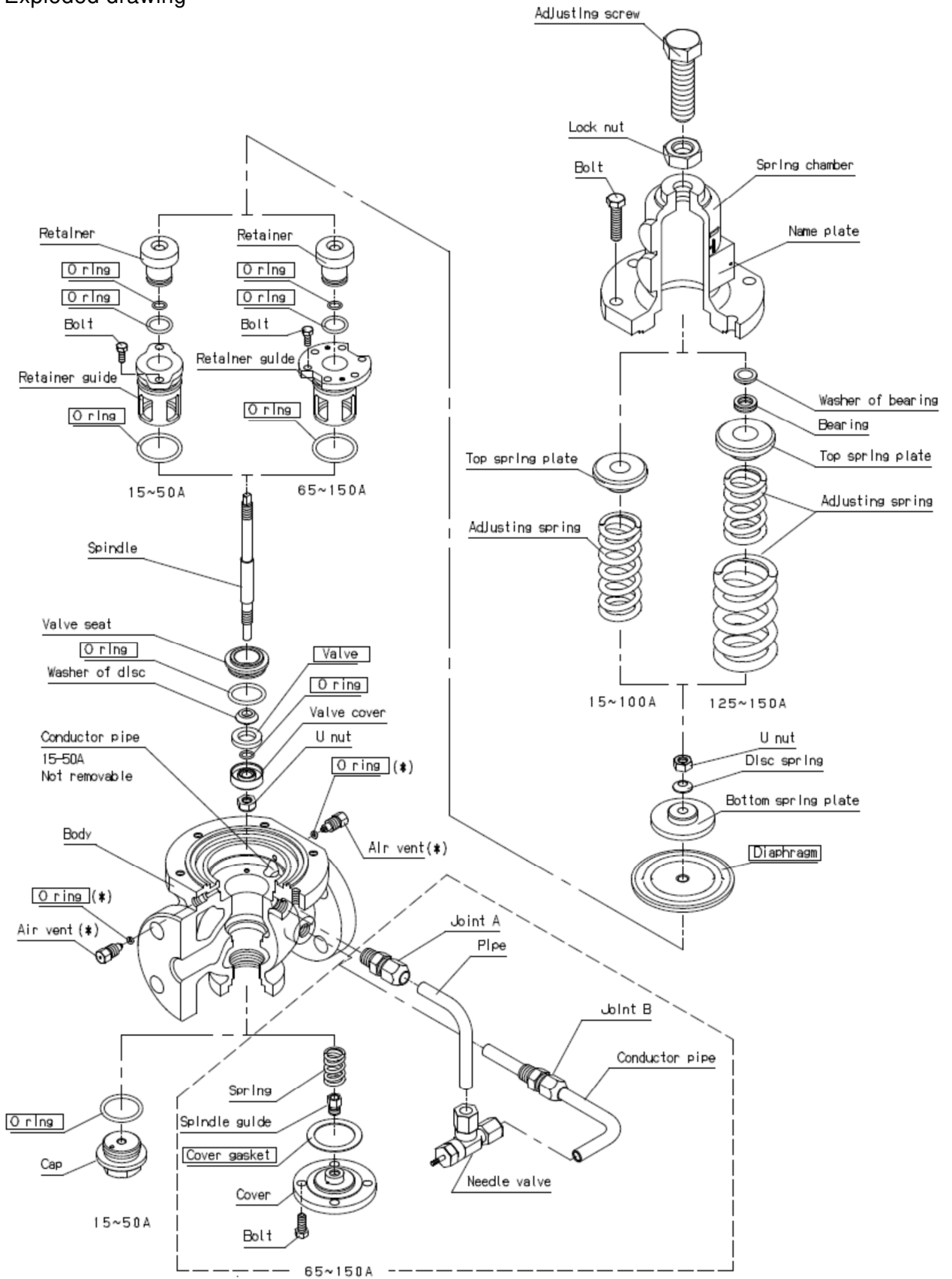
※Precautions during assembly

- (1) Make sure that the diaphragm [9], the valve seat [3], and the valve [4] have no scratches.
- (2) Apply the silicon grease to the O-Ring [7] after confirm whether there is any flaw on the O-Ring.
- (3) It is normal for there to be a gap between the retainer guide [8] and the body [1].
- (4) Install the spring chamber [2] after the confirm whether the border of diaphragm is fitted with the groove of body [1].
- (5) For size 15A to 50A, assemble spring chamber after confirming the outer circumference of diaphragm interlaces with groove at the body.
For size 65A to 150A of GD-200H, confirm the bolt hole of diaphragm fit to bolt hole at body.
Tightening torque of U nut for diaphragm and hexagon bolt for spring chamber are described below.

Table 8

Nominal size	65A, 80A	100A	125A, 150A
Tightening torque of U nut [18] (N-m)	60	60	280
Tightening torque of hexagon bolt [17] (N-m)	20	40	50

8 Exploded drawing



Parts marked with (*) are not available for GD-200H 65-150A.
 Enclosed parts are offered as consumable.

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.