CKD

Fine Regulator

PMP002 Series
PMP202 Serise
PMP402 Series

INSTRUCTION MANUAL

SM-50702-A/6

PMP002

PMP202

PMP402

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's **"PMP002 Series/PMP202 Series/PMP402 Series" fine regulator**.
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product, which uses control valves such as solenoid valves, motor valves, and air operated valves, is intended for users who have basic knowledge about materials, fluids, piping, and electricity. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training with respect to control valves.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

Certain products in this product series are subject to the Export Trade Control Order of Japan. When exporting any of these products or devices that contain these products, comply with relevant laws and regulations. Refer to the catalog for whether a product is subject to this Order.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the pneumatic or fluid control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

ISO 4414, JIS B 8370 (the latest edition of each standard), the High Pressure Gas Safety Act, the Industrial Safety and Health Act, other safety rules, organization standards, relevant laws and regulations

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ **DANGER**	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ **WARNING**	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ **CAUTION**	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications. Also, the product must not be modified and additional work on the product must not be performed.

The product is intended for use in devices or parts for general industrial machinery. It is not intended for use outdoors or in the conditions or environment listed below.

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For special applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where life or properties may be adversely affected and special safety measures are required.

(Exception is made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Do not handle the product or remove pipes and devices until confirming safety.

- Inspect and service the machine and devices after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air and fluid from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that incorporates pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

Precautions on Design and Selection

⚠ WARNING

The customer is responsible for checking the specifications of the product and the compatibility with the customer's system when selecting and handling devices.

Incorrect selection and handling of devices may cause problems not only with the product but also with the customer's system.

Install safety equipment if an output pressure above the set pressure of the regulator can cause damage or operation fault on the secondary side device.

Check the compatibility between the materials constituting the product and the working fluid before use. (Refer to "6. REFERENCE INFORMATION".)

- Have a chemical expert check the Checklist on compatibility between product and working fluid in the catalog and the Specifications to determine whether to use the product.
- Working fluid can affect materials constituting the product not only directly but also indirectly through permeated gas and cause problems such as leakage from the product and operation fault.

Do not use the product with the secondary side closed.

The product is a non-relief type. Using the product with the secondary side closed may maintain high pressure caused by a water hammer.

Do not use the product as a shut-off valve.

Make sure that the temperature, pressure, flow rate, and other conditions of use are within the specifications of the product.

Do not use the product in the following environments where problems such as leakage from the product, operation fault, and damage may occur.

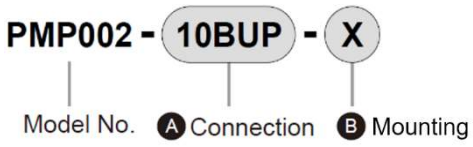
- In a corrosive or explosive atmosphere where chemical liquid can splash onto the product
- Where the product is subject to vibrations or shocks
- Outdoors or around a heat source exceeding the working temperature

CONTENTS

1. PRODUCT OVERVIEW

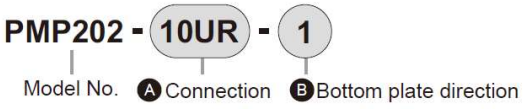
1.1 Model Number Indication

1.1.1 PMP002 Series



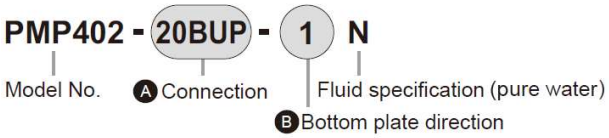
	Description	A Connection			
		6UP	8BUP	10UP	10BUP
		Super 300 Pillar fitting P Series integrated		Super 300 Pillar fitting P Series integrated	
		ø6 x ø4 tube connection	1/4" x 5/32" tube connection	ø10 x ø8 tube connection	3/8" x 1/4" tube connection
Body material		PFA		PFA	
B Mounting					
F	Bottom mounting	●		●	
X	Flange mounting	●		●	

1.1.2 PMP202 Series



Symbol	Description	A Connection							
		6UP	8BUP	6UR	8BUR	10UP	10BUP	10UR	10BUR
		Super 300 Pillar fitting P Series integrated		F-LOCK 60 Series integrated fitting		Super 300 Pillar fitting P Series integrated		F-LOCK 60 Series integrated fitting	
		ø6 x ø4 tube connection	1/4" x 5/32" tube connection	ø6 x ø4 tube connection	1/4" x 5/32" tube connection	ø10 x ø8 tube connection	3/8" x 1/4" tube connection	ø10 x ø8 tube connection	3/8" x 1/4" tube connection
Body material									
PFA molded body or PTFE machined body		PFA		PFA		PFA		PFA	
B Bottom plate direction									
Blank	Vertical	●		●		●		●	
1	Horizontal	●		●		●		●	

1.1.3 PMP402 Series

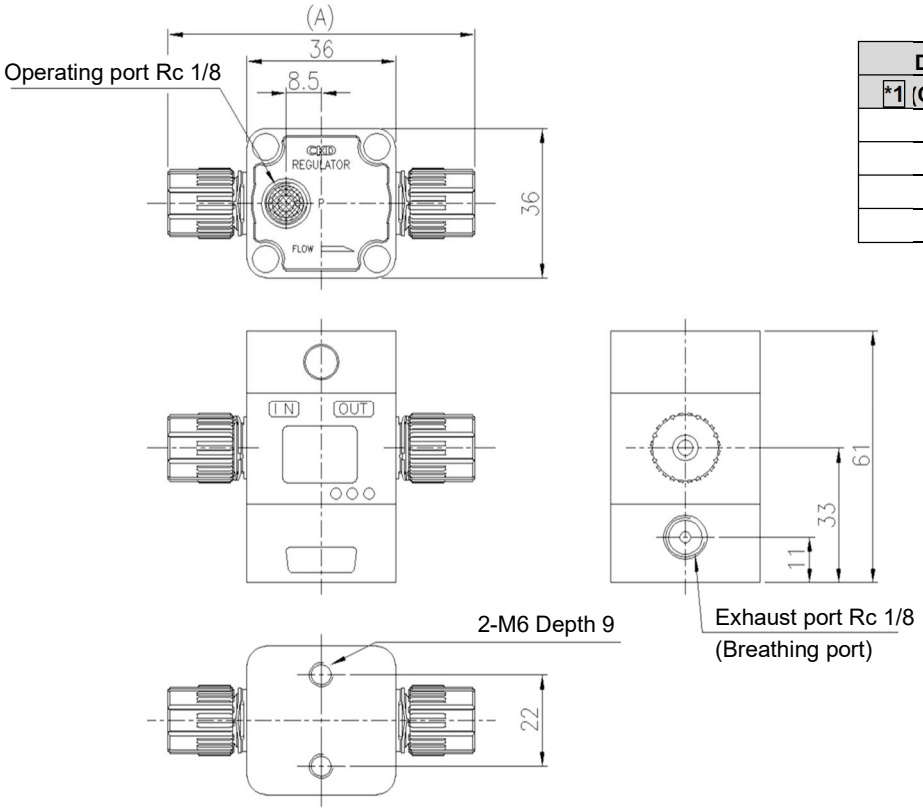


Symbol	Description	A Connection				
		12UP	25UP	15BUP	20BUP	25BUP
		Super 300 Pillar fitting P Series integrated				
		ø12 x ø10 tube connection	ø25 x ø22 tube connection	1/2" x 3/8" tube connection	3/4" x 5/8" tube connection	1" x 7/8" tube connection
Body material						
PFA molded body or PTFE machined body		PTFE	PTFE	PTFE	PTFE	PTFE
B Bottom plate direction						
Blank	Vertical	●	●	●	●	●
1	Horizontal	●	●	●	●	●

1.2 Dimensions

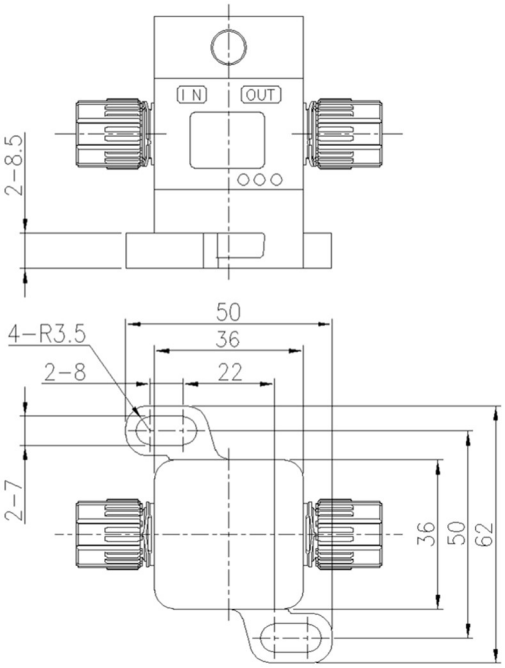
1.2.1 PMP002-*1

Bottom mounting PMP002-*1-X

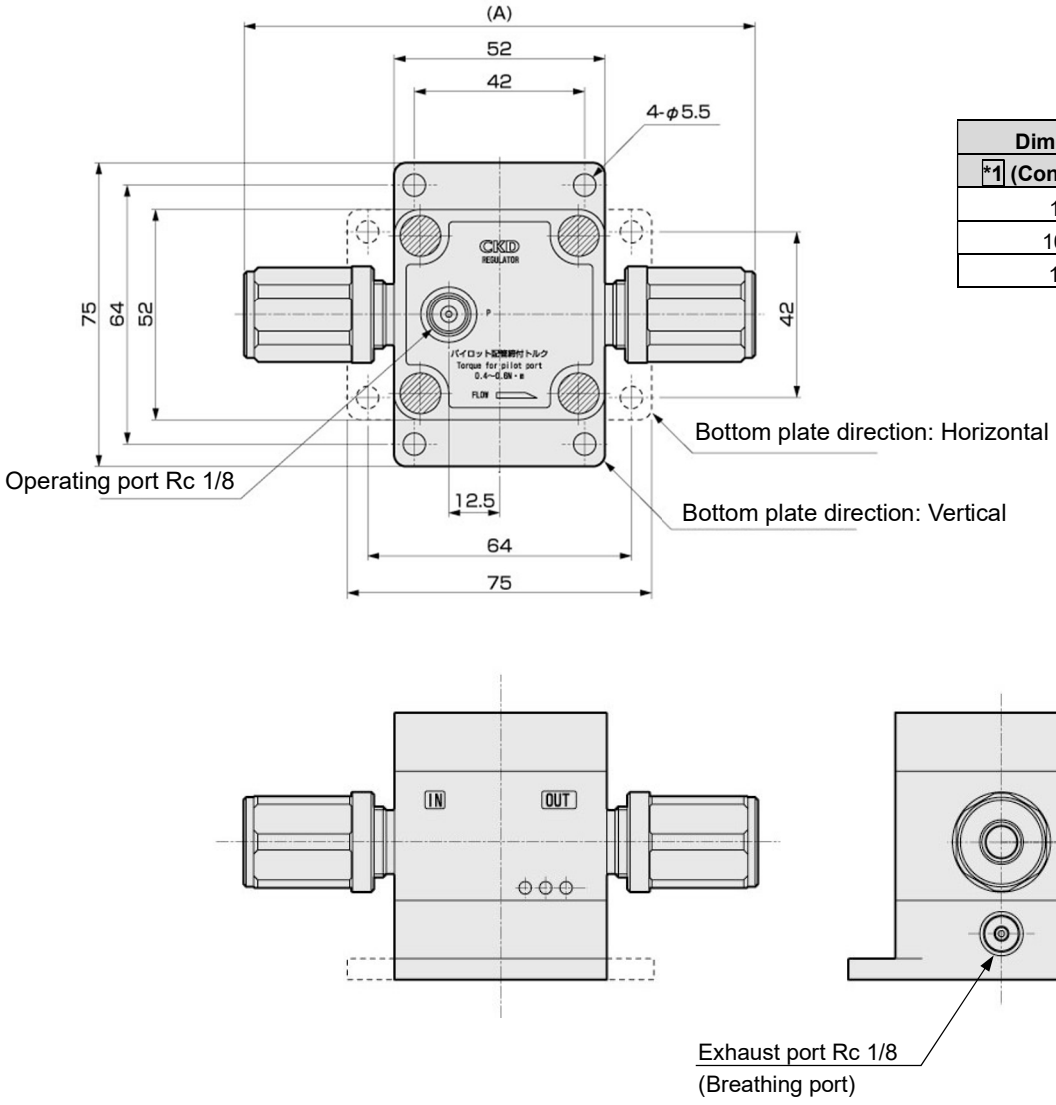


Dimensions *1 (Connection)	A
6UP	74
8BUP	74
10UP	86
10BUP	86

Flange mounting PMP002-*1-F

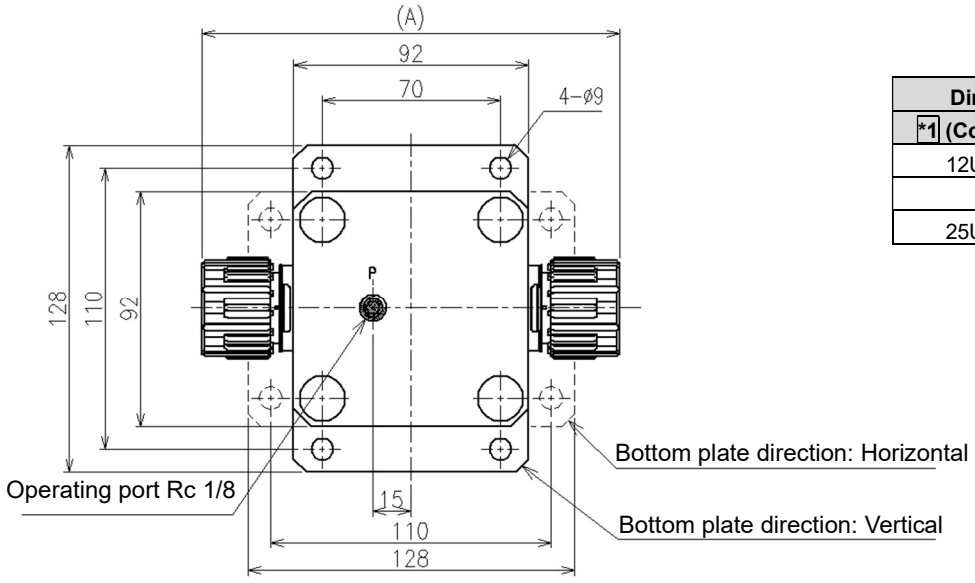


1.2.2 PMP202-*1

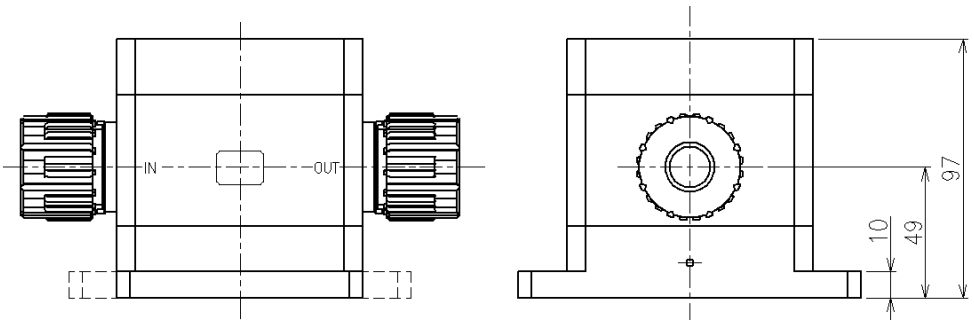


Dimensions *1 (Connection)	A
10UP	102
10BUP	102
10UR	126

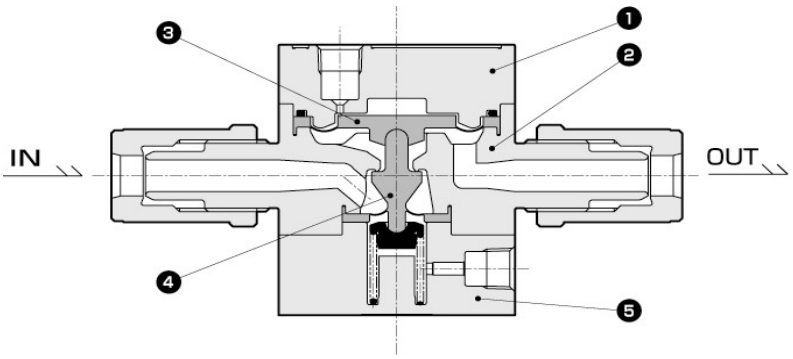
1.2.3 PMP402-*1



Dimensions *1 (Connection)	A
12UP, 15BUP	150
20BUP	164
25UP, 25BUP	178



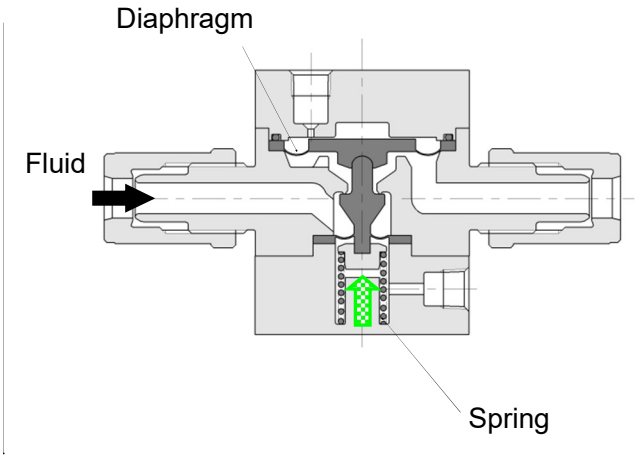
1.3 Internal Structure



No.	Part name	Material
1	Cover	PVDF
2	Body	PFA, PTFE
3	Diaphragm	PTFE
4	Valve diaphragm	PTFE
5	Bottom plate	PVDF

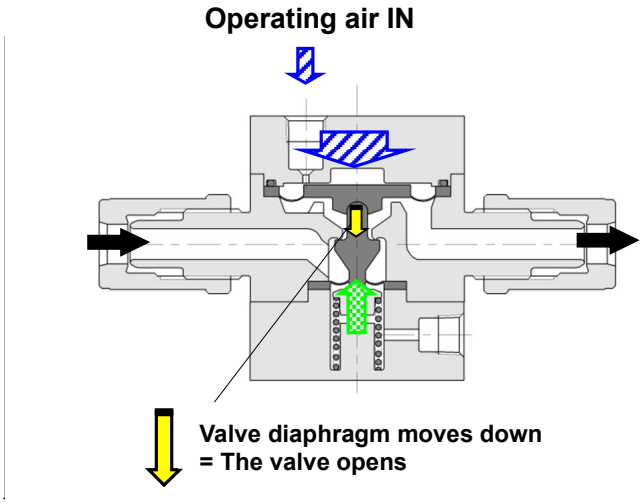
1.4 Description of Operation

■ Closed valve state



When the operating port is not pressurized with air, the force of spring keeps the valve closed.

■ Open valve state



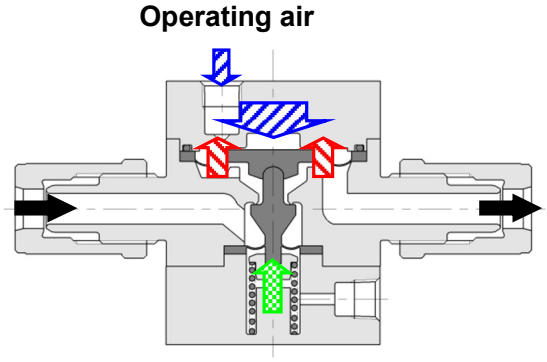
When the operating port is pressurized with air, the valve diaphragm moves down to open the valve and the pressure on the secondary side increases.

Thrust of the operating air

Thrust of the secondary side pressure

Thrust of the spring

■ Balanced state



- Force of operating air to push the diaphragm
- Force of fluid to push the diaphragm
- Force of spring

Balance of these three forces adjusts the pressure on the secondary side.

2. INSTALLATION

⚠ WARNING

Installation and piping must be performed by a qualified person who fully understands the safety precaution of the system, flow characteristics, and compatibility between fluid and related equipment and has read this Instruction Manual thoroughly.

Incorrect installation and piping may cause problems not only with the product but also with the customer's system and may result in death or serious injury to the user.

Handle the product carefully during installation and replacement to prevent chemical liquid from adhering to parts other than the flow path.

Thoroughly replace the chemical liquid with pure water or air before installation or replacement so that it does not affect peripheral devices and people nearby. If the chemical liquid adheres, wash it out immediately.

Refer to the latest instruction manual issued by each fitting manufacturer and follow the instructions when working on fittings.

Do not apply stress such as bending, tension, and compression on the regulator body when piping.

Applying excessive force may cause problems including deformation, damage and decrease in performance of the fitting or body.

Connect the pipes so that the fluid flows in the direction of the arrow indicated on the regulator body.

Secure the bottom plate to the device when mounting the regulator body.

Supporting with only pipes may cause damage to the product body, piping, and fitting.

Use air or inert gas which has come through a filter with a filtration rate of 5 μm or better for the operating air.

Use a resin fitting and tighten with 0.4 N·m to 0.6 N·m for piping to the operating port.

In order to avoid cracking the port or damaging the screw thread, do not tighten with excessive torque or use a metal fitting.

When supplying compressed air for the first time after piping is complete, make sure that there is no air leakage at the joints.

Apply leak detection agent to the joints in the piping using a brush to check for air leakage.

⚠ CAUTION

Use appropriate piping for the working flow rate between the working fluid source and the regulator.

Using a thin piping may cause large pressure loss and the pressure setting may become difficult.

Open the breathing hole on the bottom plate to the atmosphere.

Install a filter on the primary side of the regulator if there is a risk of foreign matter entering the fluid.

Since the regulator operates with a very small opening, fluids contaminated with foreign matter may damage the valve seat and lower the performance.

Prevent dust from adhering to the product.

The product is placed and delivered in a clean packing after undergoing precision cleaning. Unpack and install the product in a cleanroom.

3. USAGE

⚠ DANGER

Make sure that no one comes near the breathing hole during operation.
Due to regulator operation, gas vaporized from chemical liquid that permeated the diaphragm may be released from the breathing hole located on the bottom plate.

⚠ WARNING

Stop the supply pressure on the primary side when leaving the regulator unused for a long period.

⚠ CAUTION

Check the compatibility between the materials constituting the product, the working fluids, and the ambient atmosphere before using the product.
For compatibility between the product and the working fluids, refer to "6. REFERENCE INFORMATION".
Perform periodic inspections and if there is any abnormality, take necessary measures such as replacing the parts.

Supply the operating air using devices with high pressure stability such as a precision regulator.

Set the secondary side pressure so that it is within the specifications.
If the secondary side pressure does not fall within the specified range while flowing a certain flow rate, install an orifice (such as a needle valve) on the secondary side of the product.

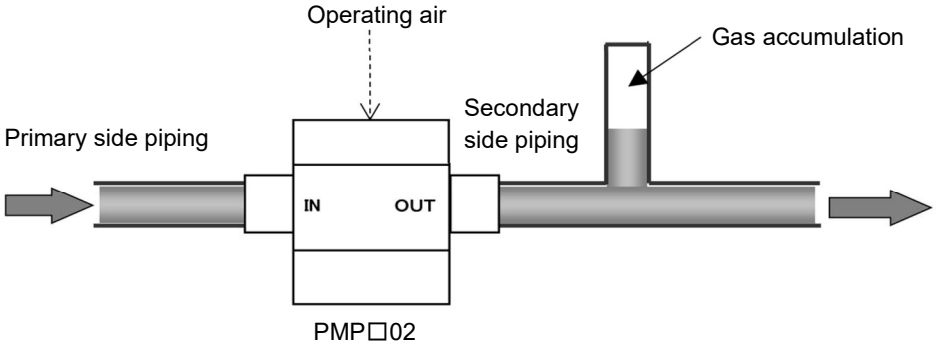
Adjust the open-close speed of the valve on the primary and secondary side to prevent water hammer in the product.

Install a device such as a pressure sensor on the secondary side of the regulator and adjust the set pressure while monitoring the pressure.
Keep a certain flow rate when adjusting the pressure. The product is a non-relief type, so the pressure cannot be lowered with the secondary side circuit completely closed.

Readjust the pressure after changing the fluid pressure since the set pressure may have changed.

Make sure that no vibration occurs with the set pressure and flow rate before using the product.

Be careful that no gas is accumulated inside the pipes when piping.
If gas is accumulated near the product on the secondary side piping, vibrations can occur. Vibrations may shorten the product service life.



If the pilot air is kept pressurized, air may permeate the diaphragm and become bubbles in the flow path.

3.1 Using Products with Custom Order Specifications (Purge Port/Bleed Port)

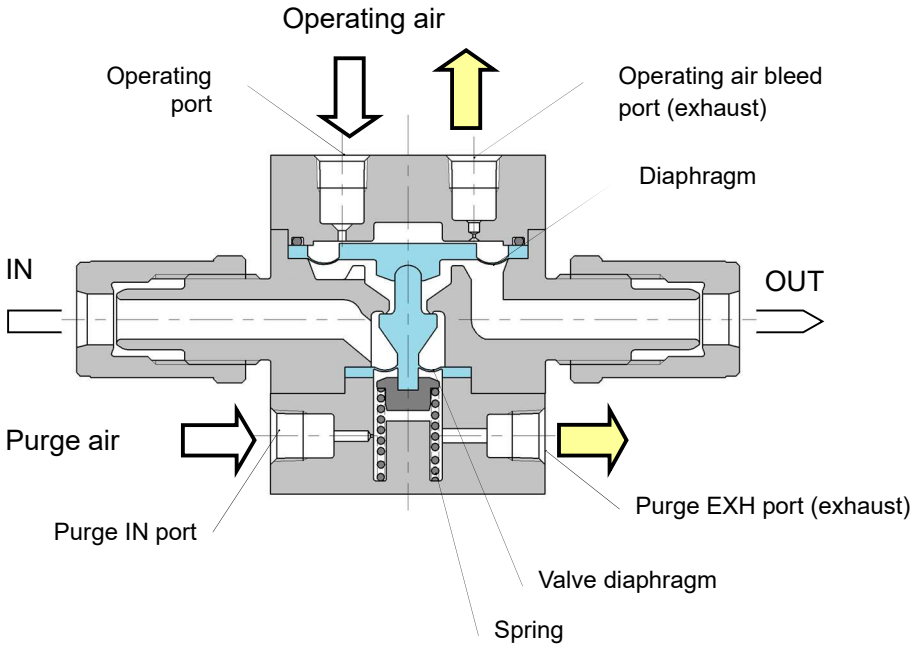
Products with custom order specifications (purge port/bleed port) are available for corrosive chemical liquid and permeable chemical liquid.
Read this section before using products with these specifications.

■ Purge port specification

- Purge before using corrosive chemical liquid. Corrosive gas permeating the valve diaphragm may corrode the spring.
- When air is supplied to the purge IN port, the purge air is exhausted from the purge EXH port. Open the EXH port to the atmosphere when supplying air.
- When piping, pipe so that there is less pressure loss and open the end of the pipe to the atmosphere. For purge supply pressure, observe the instructions in the Specifications.

■ Bleed port specification

- This product always bleeds the operating air to prevent malfunction of the operation devices due to corrosive gas permeating the diaphragm.
- When air is supplied to the operating port, the operating air is exhausted from the operating air bleed port. Open the operating air bleed port to the atmosphere when supplying air.
- When piping, pipe so that there is less pressure loss and open the end of the pipe to the atmosphere. For bleed flow rate, refer to the value in the Specifications.



4. MAINTENANCE AND INSPECTION

⚠ WARNING

Release the operating air and make sure that there is no residual pressure before performing maintenance and inspection.

Do not disassemble or reassemble the product.

- Chemical liquid may leak from the product.
- Disassembling the product will void the warranty.
- If the product needs to be disassembled, contact your nearest CKD sales office or distributor.

⚠ CAUTION

Perform periodic inspections once or twice a year to confirm that the product operates properly.

Secure sufficient space for maintenance and inspection.

Thoroughly read and understand this Instruction Manual before maintenance and inspection.
Release the operating air and fluid before carrying out maintenance and inspection.
When replacing valves, thoroughly replace the remaining chemical liquid with pure water or air so that it does not affect peripheral devices and people nearby.

4.1 Periodic Inspection

In order to use the product under optimum conditions, perform the following periodic inspections once or twice a year.

- Check for external leakage from the product.
- Check for leakage from the fitting.
- Check for abnormalities of component parts such as discoloration, deformation, or corrosion.

5. TROUBLESHOOTING

5.1 Problems, Causes, and Solutions

If the product does not operate as intended, check the table below for a possible solution.

Problem	Cause	Solution
Pressure cannot be set.	Operating air is not supplied.	Supply the operating air.
	Product is not connected in the direction of fluid flow.	Connect the product according to the direction of flow.
	Pressure cannot be lowered since secondary side circuit is completely closed.	Set pressure while fluid flows in the secondary side.
	Primary pressure (supply pressure) is insufficient.	Increase the primary pressure (supply pressure) by 50 kPa to 100 kPa greater than the secondary pressure (set pressure).
Pressure is unstable.	Air pressure from operating device is not stable.	Replace the operating device with a stable one.
	Flow rate fluctuation on secondary side is excessive.	Reduce the flow rate fluctuation.
	Primary pressure (supply pressure) fluctuation is excessive.	Increase the primary pressure (supply pressure) by 50 kPa to 100 kPa greater than the secondary pressure (set pressure) to stabilize pressure.
	Primary pressure (supply pressure) is insufficient.	
Flow rate is low (insufficient).	Piping pressure loss is excessive.	Replace the primary side piping on the regulator with a pipe with less pressure loss and replace the secondary side piping with a pipe with less pressure loss. (Install parts such as an orifice and a needle).
Secondary pressure reaches primary pressure.	Valve seat is damaged by foreign matters or other objects.	Replace the product.
	Product is used as a shut-off valve.	Install another valve to stop the primary pressure completely (supply pressure).
		Install a circuit on the secondary side to release pressure.
Working fluid is leaking from product.	Diaphragm is damaged.	Replace the product.

If you have any other questions or concerns, contact your nearest CKD sales office or distributor.

6. REFERENCE INFORMATION

■ Checklist on compatibility between product and working fluid

- This checklist is created based on previous evaluations and experience but does not guarantee performance.
- Since there are a wide variety of mixed chemical liquids, it is impossible for CKD to comprehend all of their effects. When using a working fluid other than pure water, have a chemical expert check the compatibility between the working fluid and the materials constituting the product to determine whether to use the working fluid with the product.

Fluid		PMP002 PMP202 compatibility	PMP402 compatibility	Note
Pure water		Y	Y	
Oxidizing fluid	Sulfuric acid	Y	△	PMP002,PMP202: Note1: For chemical liquids of high permeability, it is possible that permeated gas may mix with the pilot air and compromise the operating device. Consult CKD if the operating device needs to be protected. Note2: Replace periodically when using amine-based stripping solution at fluid temperature 80℃ or more.Consider min. once a year ad a guideline. PMP402: Products with custom order specifications that include measures against oxidizing fluids and permeated gas are available. Consult CKD.
	Hydrochloric acid	Y(Note1)	△	
	Nitric acid	Y(Note1)	△	
	Hydrofluoric acid	Y(Note1)	△	
	Phosphoric acid	Y	△	
	Ammonium fluoride	△(Note1)	△	
	Hydrogen peroxide	Y	△	
	Ozone water	△	△	
	Sulfuric acid + hydrogen peroxide	Y	△	
	Sulfuric acid + ozone	△	△	
Basic fluid	Sodium hydroxide	Y	△	
	Potassium hydroxide	Y	△	
	Ammonia water	△(Note1)	△	
Organic fluid	Acetone	△	△	
	Butyl acetate	△	△	
	Isopropyl Alcohol	Y	△	
Others/ mixed fluid	Thinner	△	△	
	Resist	Y	△	
	Developer	Y	△	
	Slurry	Y	△	
	Plating solution	Y	△	
	Remover	Y(Note2)	△	
Gas	Air, nitrogen gas	N	N	

* Compatibility is indicated with Y: Compatible, △: Contact CKD, N: Not compatible
* For compatibility of fluid not listed above, contact CKD.
* Do not allow fluid to come into contact with the product body

7. WARRANTY PROVISIONS

7.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

7.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.

7.3 Remarks

As an exception to 7.2 above, the product is warranted for one and a half (1.5) years from the date of delivery to the location specified by the customer.