CKD

Manual Valve for Chemical Liquids

MMD□03RN Series

INSTRUCTION MANUAL

SM-50827-A/2

- 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 **"MMD□03RN Series" manual valve for chemical liquids**.
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 water 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, JFPS 2008 (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

Provide other safety measures if functions as safety valves such as emergency shut-off valves are required.

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 a relief valve for a liquid ring circuit.

When the valve opens and closes, the diaphragm moves up and down simultaneously and changes the inner volume of the flow path. Because the fluid is incompressible (a liquid), operating under conditions that seal the fluid in the valve (a liquid ring) will cause abnormal pressures inside the valve. In this case, install a relief valve on the primary or the secondary side of the valve to prevent a liquid ring circuit from being formed.

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 and shocks
- Outdoors or around a heat source exceeding the working temperature

Precautions on Product Disposal

⚠ CAUTION

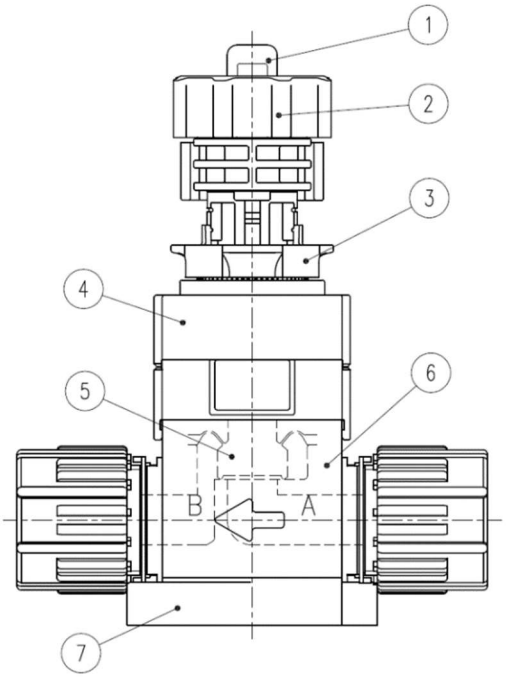
When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

CONTENTS

1. PRODUCT OVERVIEW

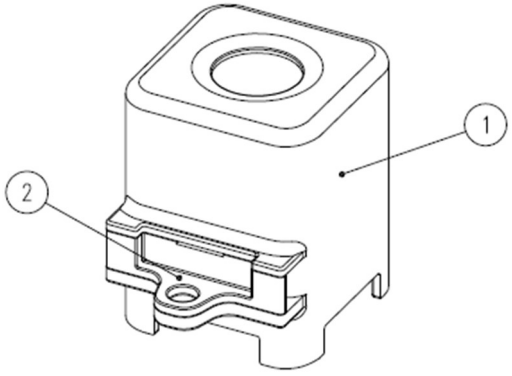
1.1 Part Name

1.1.1 Valve



No.	Part name	Material	Remarks
1	Indicator	PVDF, PP	
2	Knob	PVDF	
3	Lock ring	PVDF	
4	Actuator	PVDF, FEPM, Stainless steel	Stainless steel: fluorinated resin coating
5	Diaphragm	PTFE	Wetted parts
6	Body	PFA	
7	Mounting plate	PVDF	

1.1.2 Accidental operation prevention cover

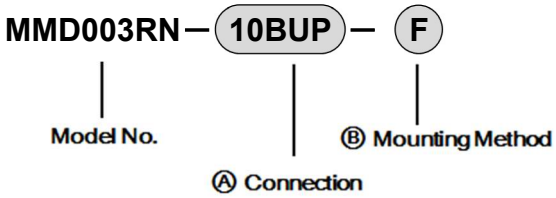


No.	Part name	Material	Remarks
1	Cover	PP	
2	Slide lock	PP	

1.2 Model Number Indication

1.2.1 MMD003RN Series

■ Valve



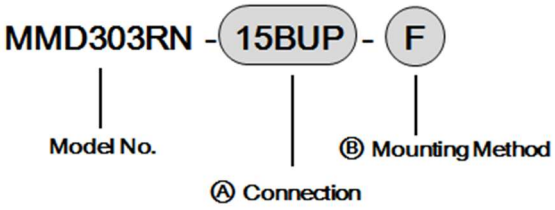
Symbol	Descriptions \ Orifice size	Ⓐ Connection				
		6UP	8BUP	8UP	10UP	10BUP
		Super 300 Pillar fitting P Series integrated				
		ϕ6 × ϕ4 tube conection	1/4″ × 5/32″ tube conection	ϕ8 × ϕ6 tube conection	ϕ10 × ϕ8 tube conection	3/8″ × 1/4″ tube conection
		ϕ4		ϕ6	ϕ8	
Ⓑ	Mounting method					
F	Flange mounting	●	●	●	●	
H	4-point flange mounting	●	●	●	●	
X	Bottom mounting	●	●	●	●	

■ Accidental operation prevention cover

MMD003RN-C

1.2.2 MMD303RN Series

■ Valve



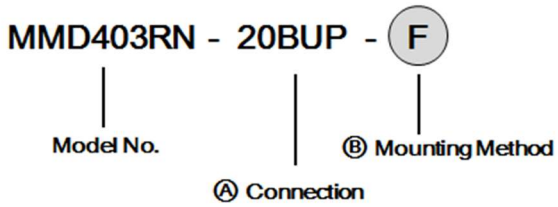
Symbol	Descriptions \ Orifice size	Ⓐ Connection			
		10UP	10BUP	12UP	15BUP
		Super 300 Pillar fitting P Series integrated			
		ϕ10 × ϕ8 tube conection	3/8″ × 1/4″ tube conection	ϕ12 × ϕ10 tube conection	1/2″ × 3/8″ tube conection
		ϕ8		ϕ10	
Ⓑ	Mounting method				
F	Flange mounting	●	●	●	●
H	4-point flange mounting	●	●	●	●
X	Bottom mounting	●	●	●	●

■ Accidental operation prevention cover

MMD303RN-C

1.2.3 MMD403RN Series

■ **Valve**



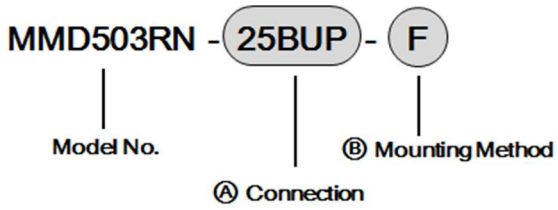
Symbol	Descriptions \ Orifice size	Ⓐ Connection: 20BUP
		Super 300 Pillar fitting P Series integrated
		3/4″×5/8″ tube conection
		ϕ16
Ⓑ	Mounting method	
F	Flange mounting	●
H	4-point flange mounting	●
X	Bottom mounting	●

■ **Accidental operation prevention cover**

MMD403RN-C

1.2.4 MMD503RN Series

■ **Valve**



Symbol	Descriptions \ Orifice size	Ⓐ Connection: 25UP	25BUP
		Super 300 Pillar fitting P Series integrated	
		ϕ25×ϕ22 tube conection	1″×7/8″ tube conection
		ϕ20	
Ⓑ	Mounting method		
F	Flange mounting	●	●
H	4-point flange mounting	●	●
X	Bottom mounting	●	●

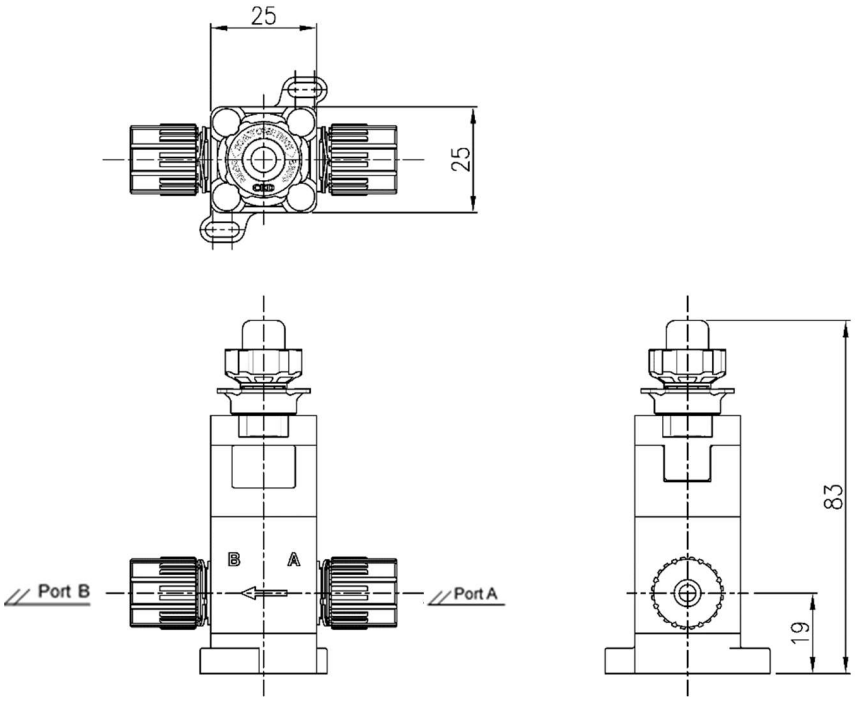
■ **Accidental operation prevention cover**

MMD503RN-C

1.3 Dimensions

1.3.1 MMD003RN Series

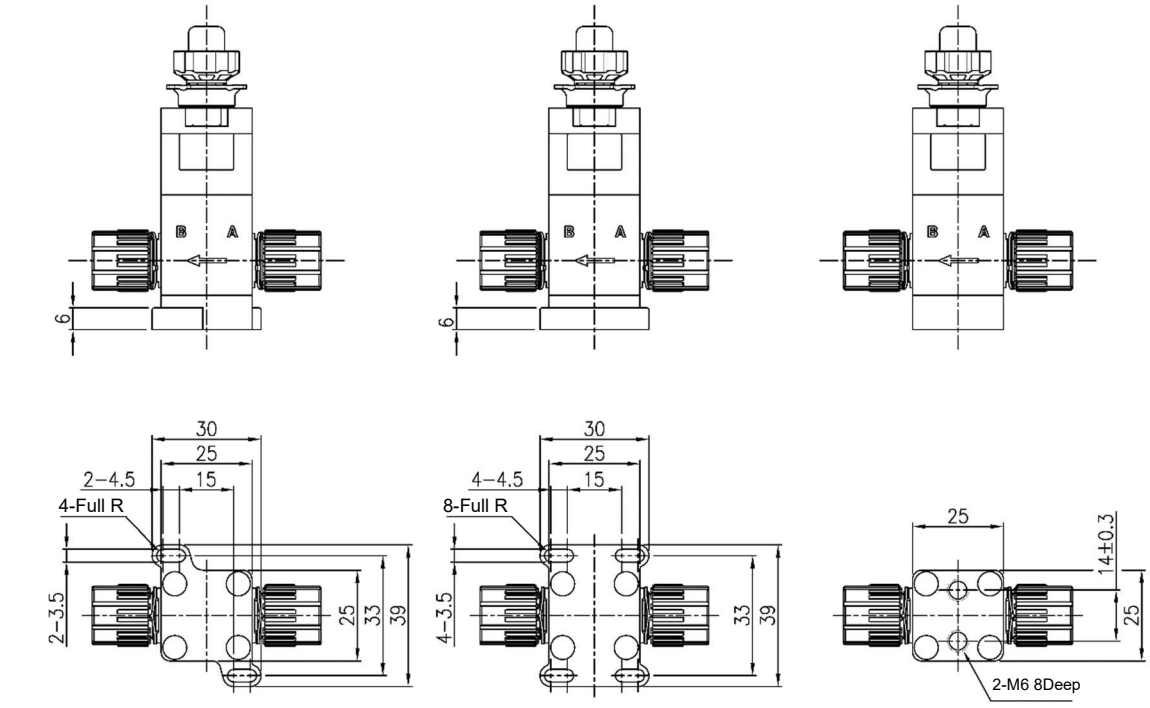
■ Valve



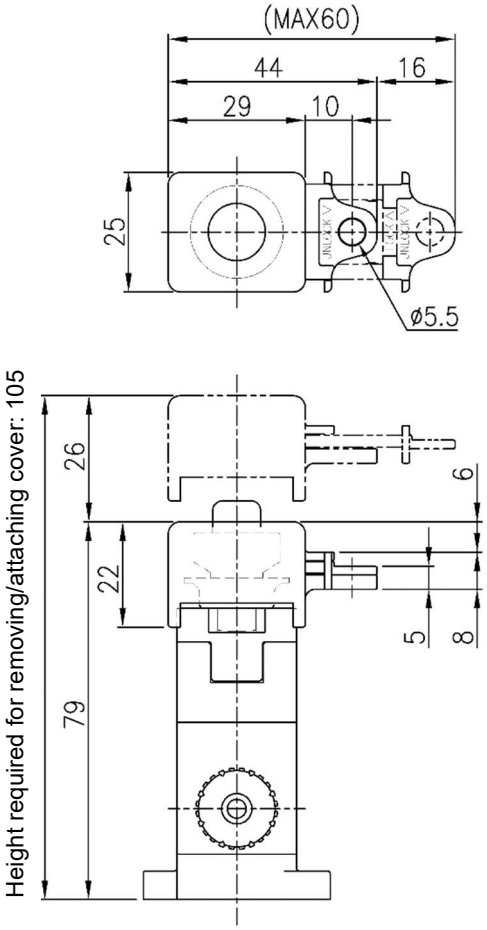
● F Flange mounting
・MMD003RN-☐-F

● H 4-point flange mounting
・MMD003RN-☐-H

● X Bottom mounting
・MMD003RN-☐-X



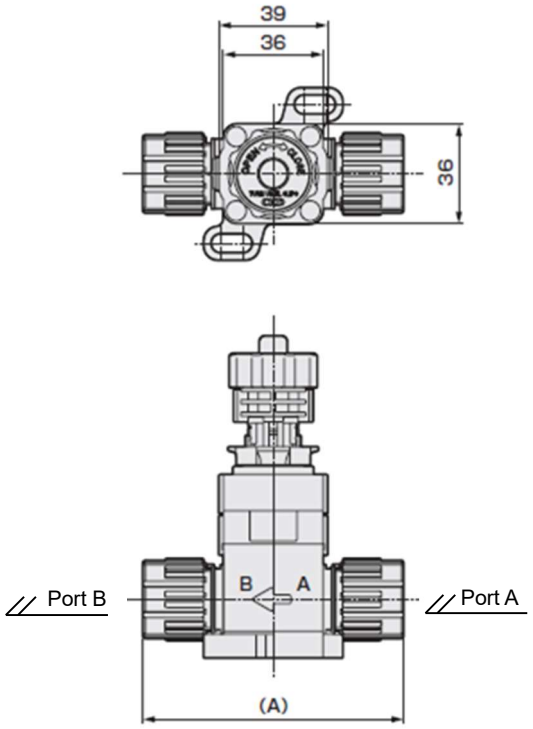
■ Accidental operation prevention cover



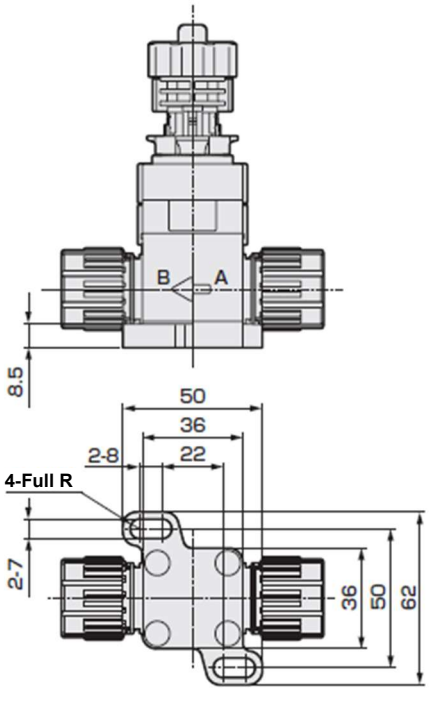
* The accidental operation prevention cover can be attached to the valve in any direction (four directions).

1.3.2 MMD303RN Series

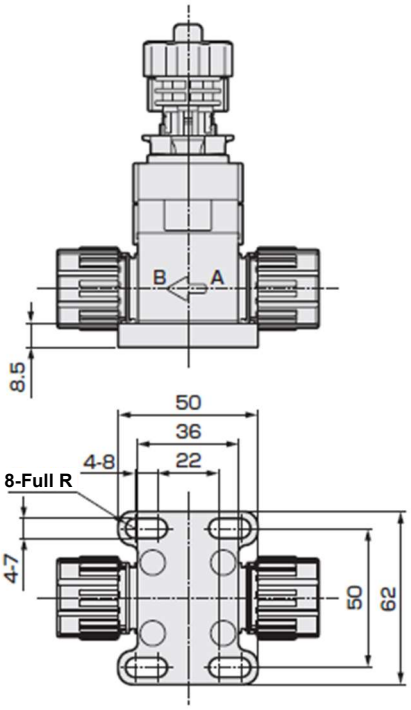
■ Valve



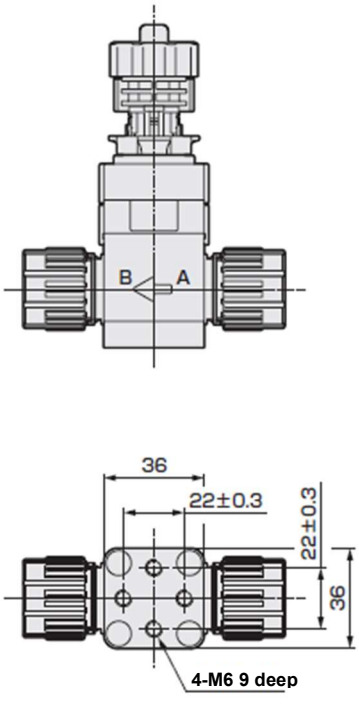
● F Flange mounting
MMD303RN-☐-F



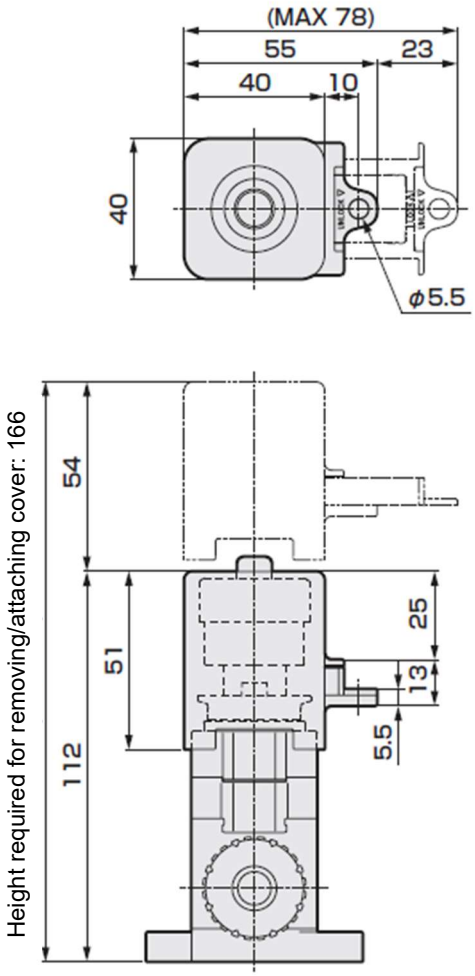
● H 4-point flange mounting
MMD303RN-☐-H



● X Bottom mounting
MMD303RN-☐-X



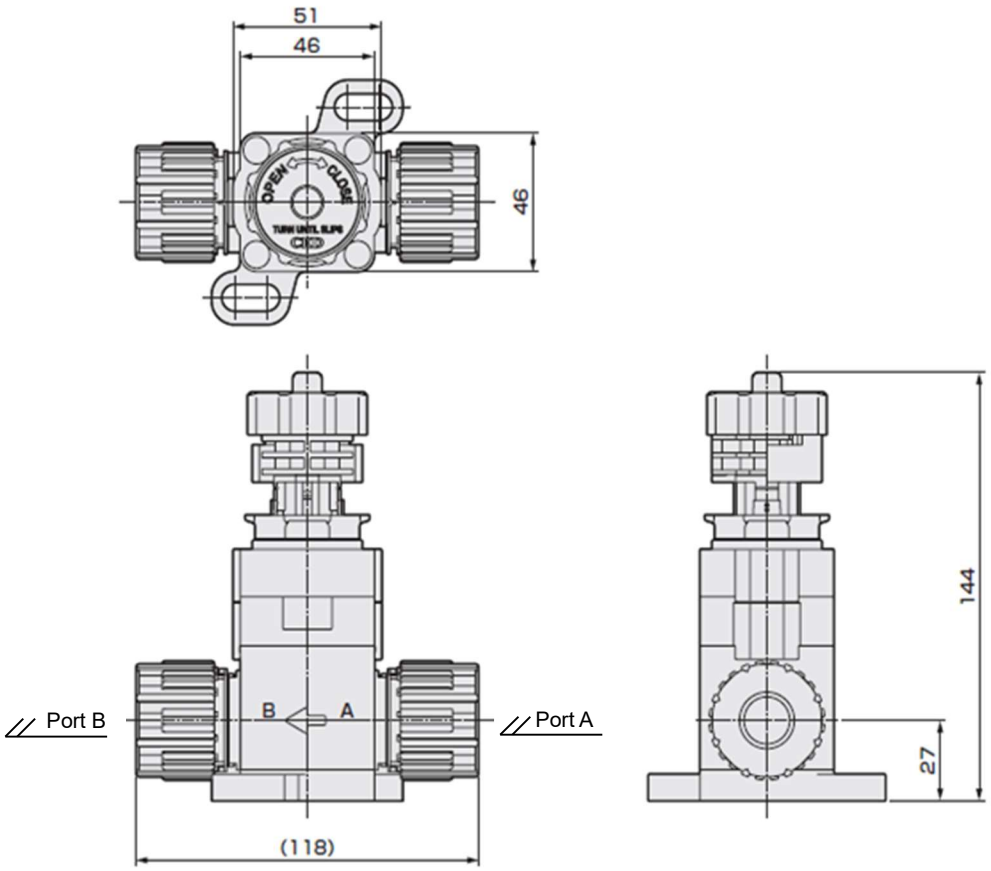
■ Accidental operation prevention cover



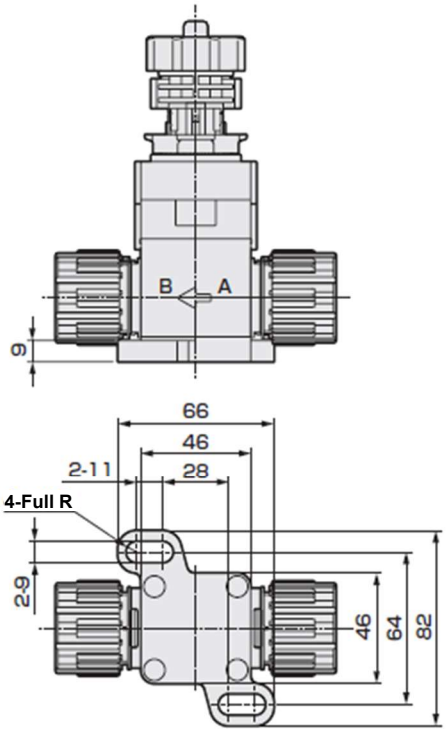
* The accidental operation prevention cover can be attached to the valve in any direction (four directions).

1.3.3 MMD403RN Series

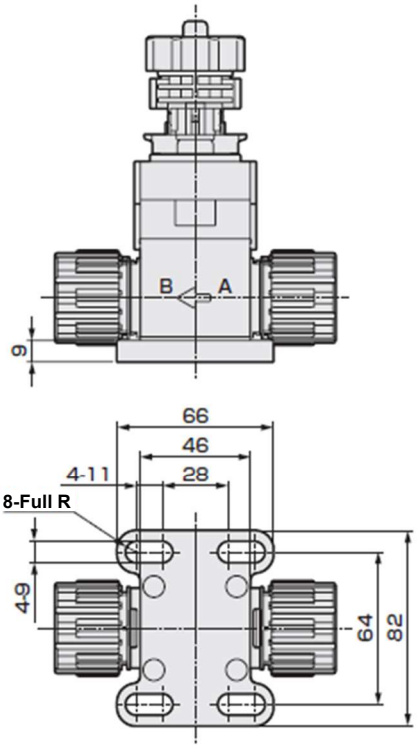
■ Valve



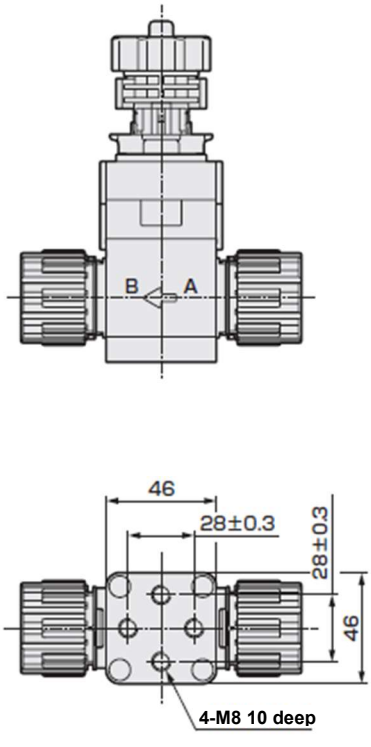
● F Flange mounting
MMD403RN-20BUP-F



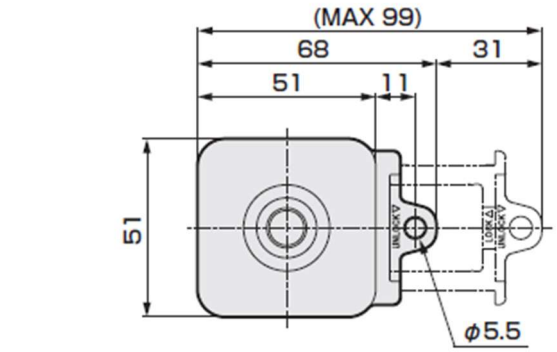
● H 4-point flange mounting
MMD403RN-20BUP-H

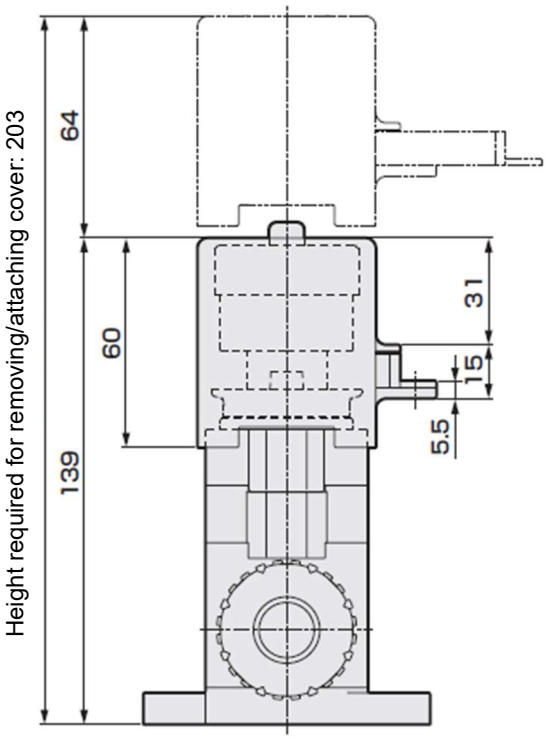


● X Bottom mounting
MMD403RN-20BUP-X



■ Accidental operation prevention cover

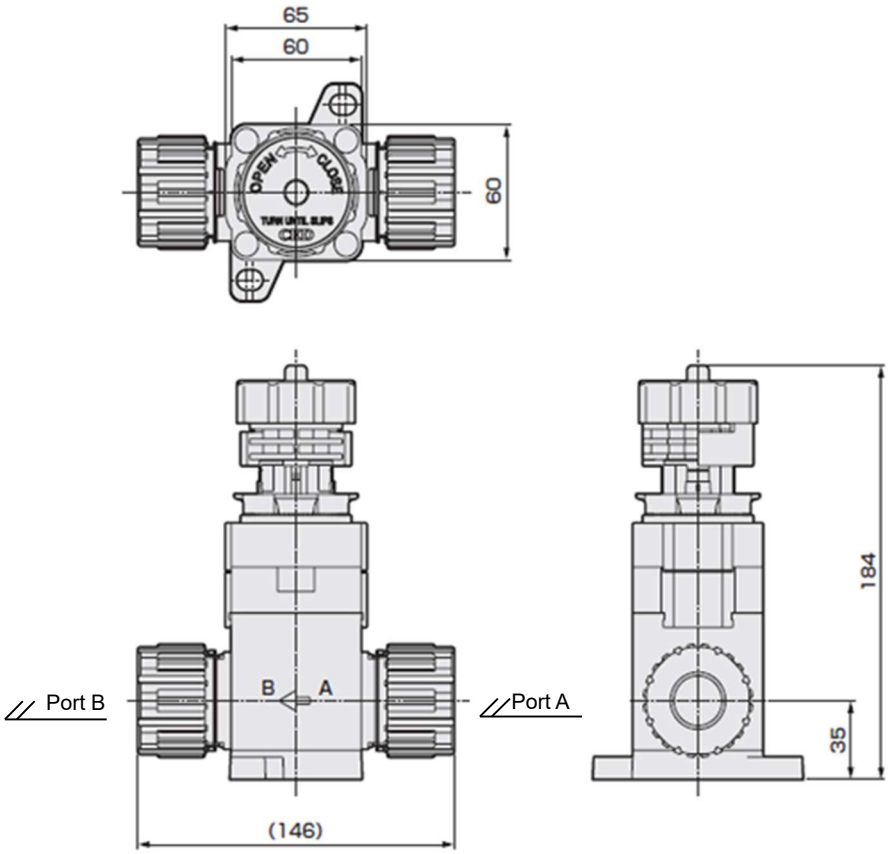




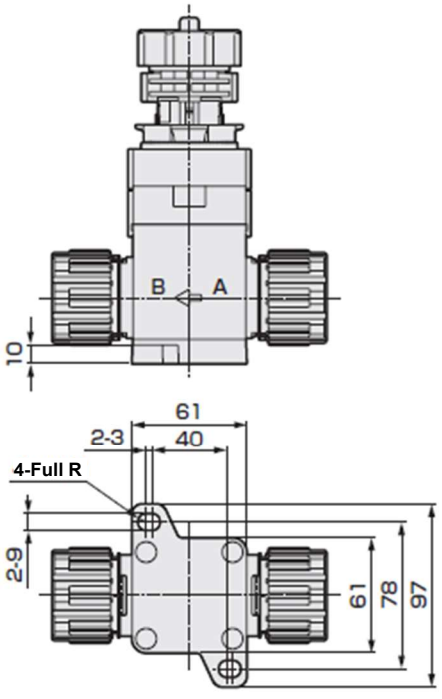
* The accidental operation prevention cover can be attached to the valve in any direction (four directions).

1.3.4 MMD503RN Series

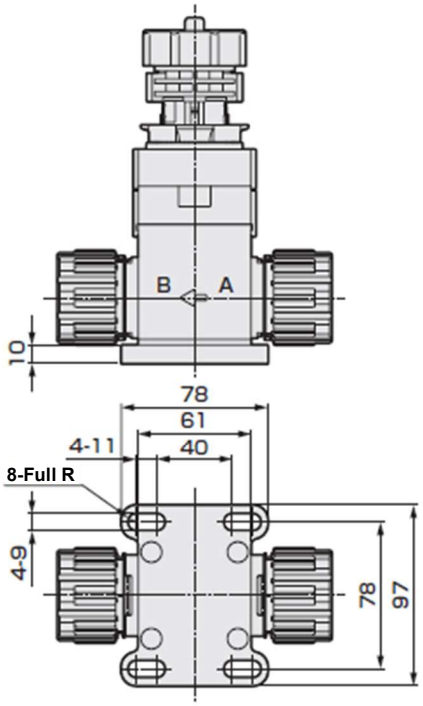
■ Valve



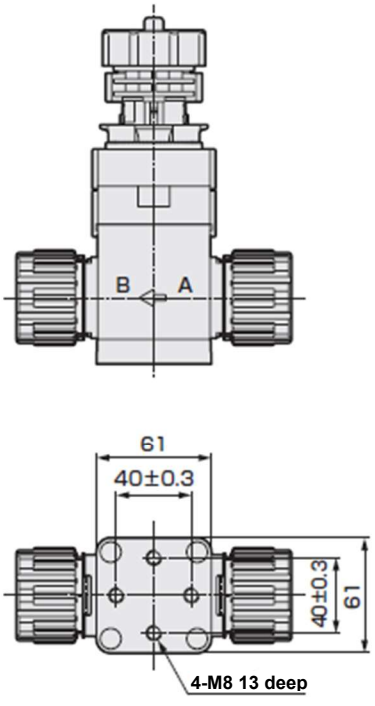
● F Flange mounting
MMD503RN-☐-F



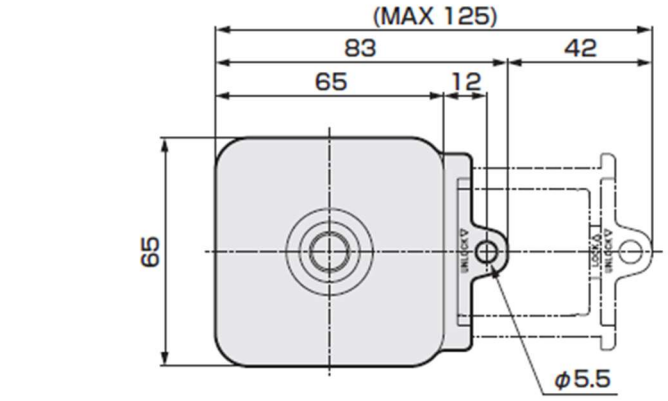
● H 4-point flange mounting
MMD503RN-☐-H

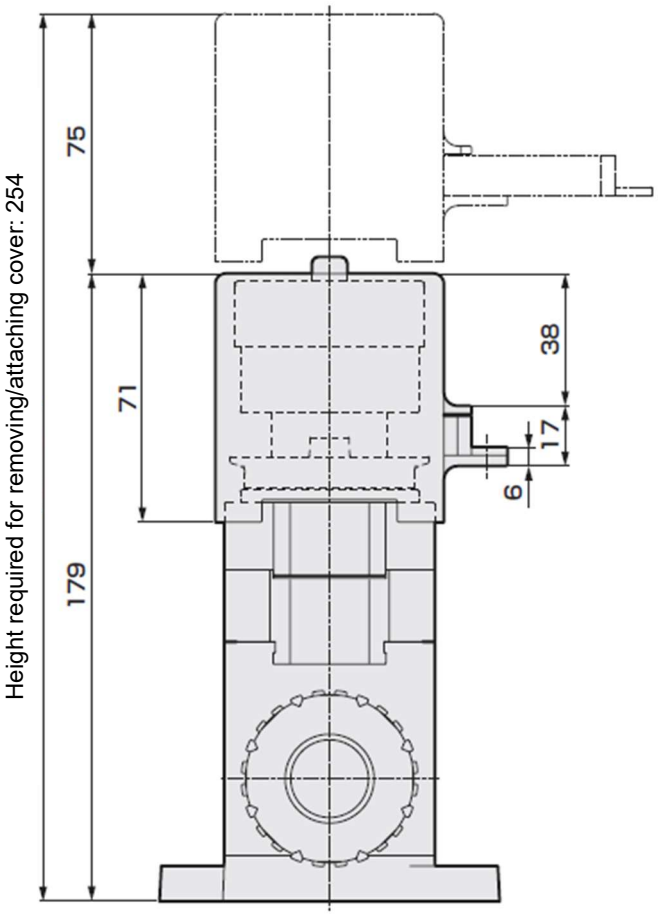


● X Bottom mounting
MMD503RN-☐-X



■ Accidental operation prevention cover



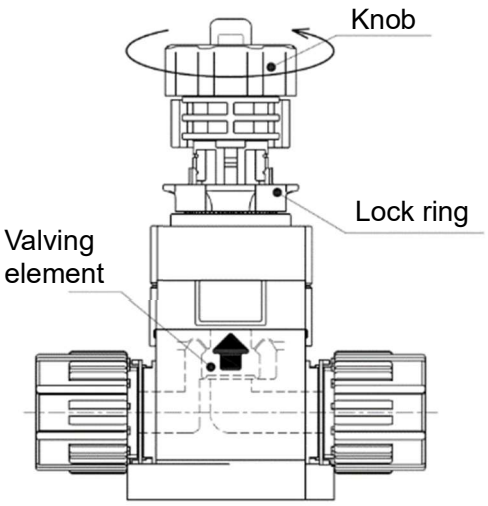


* The accidental operation prevention cover can be attached to the valve in any direction (four directions).

1.4 Description of Operation

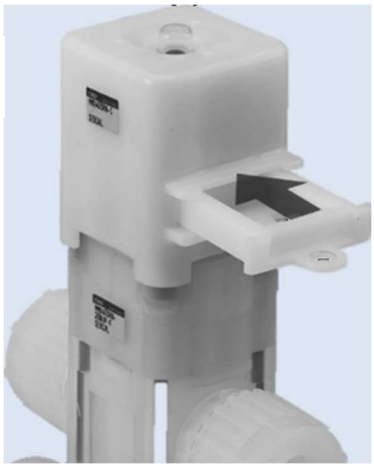
1.4.1 Valve : MMD003RN / MMD303RN / MMD403RN / MMD503RN Series

- Turning the knob in the direction of rotation moves the valving element up and down and controls the fluid.
- The lock ring prevents the valving element from moving even when the knob is operated and prevents accidental operation.



1.4.2 Accidental operation prevention cover : MMD003RN / MMD303RN / MMD403RN / MMD503RN Series

- Covering the operational part prevents accidental operation.
- To secure the cover, pull out the slide lock, put the cover over the knob, and push in the slide lock.
- The cover can be locked while the slide lock is pushed into the cover.



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.

Fully flush and clean the pipes/tubes before use.

Fluid which has been contaminated with dust or foreign matter may prevent the valve from functioning correctly. If there is contamination, install a proper filter on the primary side of the valve in accordance with the circuit.

For products marked with an arrow on its body, connect the pipes/tubes so that the fluid flows in the direction of the arrow.

For NC and NO types, open the port that is not pressurized with operating pressure to the atmosphere.

If directly supplying air into or exhausting air from the valve is undesirable due to surrounding atmosphere and problems such as airborne dirt, remove the exhaust cap and install piping to allow supplying and exhausting of air to take place elsewhere.

Use a solenoid valve appropriate for the product specifications and application when connecting it to the actuator.

⚠ CAUTION

Check for leakage from the pipes/tubes and confirm that the product has been mounted properly after mounting the product.
Refer to the latest instruction manual issued by each fitting manufacturer and follow the instructions to perform necessary work.

Dedicated work jig is required for fitting work. Contact fitting manufacturers for how to purchase and use the jig.

Do not support the valves with only pipes/tubes when mounting. Secure the mounting plate of the valve to the device.

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

To prevent applying load on the valve, consider where and how to support the pipe/tubes before piping.

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

The port may become cracked or the screw thread may become damaged.

2.1 Unpacking

・Check that the model number ordered and the model number indicated on the product are the same.
・Unpack the product in a clean environment.
・Check the exterior and the fitting part of the product for any damage.

3. USAGE

3.1 Safety Instructions

⚠ WARNING

Use the product within the maximum working and operating pressures.

⚠ 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.

Be careful of leakage from the valve seat when using N_2 gas or air.
Leakage up to 1 cm^3/min (at air pressure) from the valve seat may occur.

Be careful of rapid fluid temperature changes.
The valve seat may deform unevenly and cause leakage.

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.

Do not step on the valves or place heavy objects on them.

Carry out a test operation before starting an operation if the product has been left unused for a long period.

When installing a device that is recommended to be used with laminar flow such as a flow rate meter to the secondary side of the valve, keep enough distance between the valve and the device so that the device is not affected by the turbulent flow of the valve.
Turbulent flow occurs on the secondary side of the valve.

Do not allow fluid to come into contact with the product body.

Be careful of the fluid pressure and piping conditions.
Water hammer and vibration may occur under certain fluid pressure and piping conditions. In most cases, this can be resolved by adjusting the open-close speed using a device such as a speed controller. If the problem persists, revise the fluid pressure and the piping conditions.

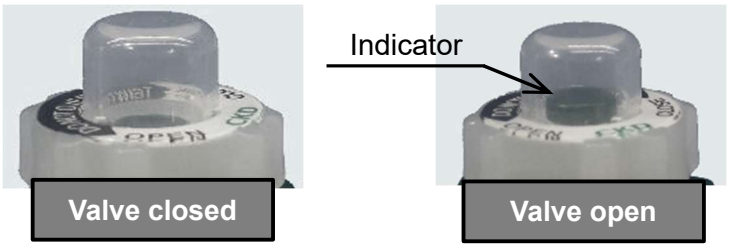
Take measures for removing electricity as necessary to prevent external leakage or ignition caused by static electricity.
Fluorinated resin charges electricity very easily and charges more electricity if gas or fluid flows.

3.2 Operation

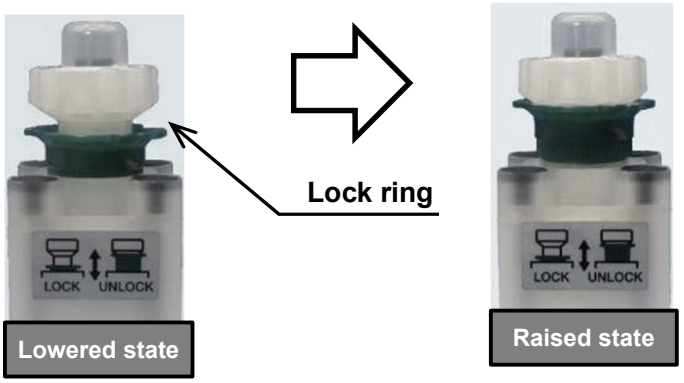
3.2.1 Operation: MMD003RN Series

1 Check the indicator position.

If it is unclear whether the valve is open or closed, check the indicator state before operating the valve.



2 Raise the green lock ring.



3 Turn the knob in the desired direction.

<To open>
When the knob is turned in the OPEN direction, it will rotate smoothly at first but will begin to get tight. Turning the knob further by about one turn until it becomes stiff will cause the valve to become fully open. (*1)
Do not turn the knob any further. Otherwise, it may cause damage.

<To close>
When the knob is turned in the CLOSE direction, it will feel tight at first but will begin to rotate smoothly. Turning the knob further by 3/4 of a turn will cause it to become stiff. (*1)
Do not turn the knob any further. Otherwise, it may cause damage.

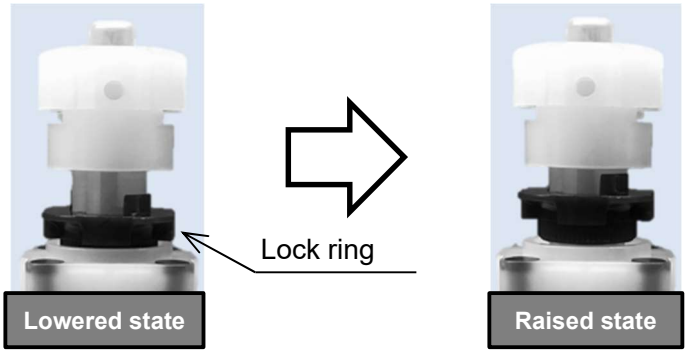
⚠ CAUTION

Do not overtighten; otherwise, it may cause damage.
(MMD003RN does not have the mechanism that makes clicking sounds when the knob rotates freely.)

4 Lower the lock ring after operation.

3.2.2 Operation: MMD303RN / MMD403RN / MMD503RN Series

1 Raise the green lock ring.



2 Turn the knob in the desired direction.

<CLOSE>
To close the valve, turn the knob in the CLOSE direction.

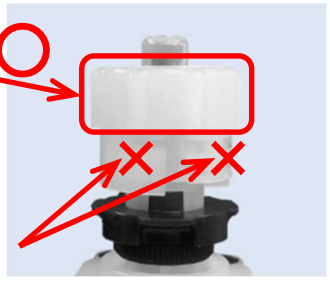
When appropriately tightened, the knob will rotate freely (a click will be heard) and prevents over-tightening.

⚠ CAUTION

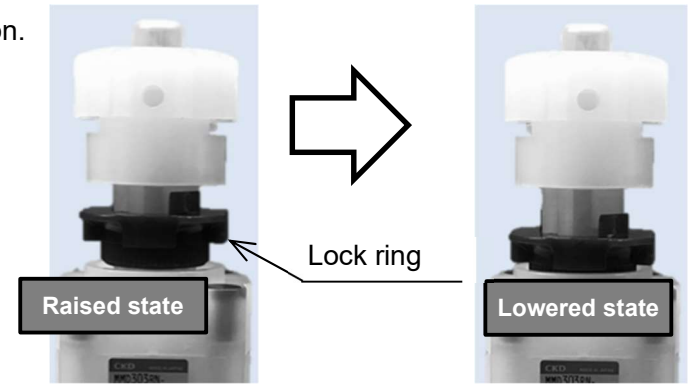
Turn the knob by holding the top of the knob.

Hold here to turn the knob.

Do not hold other parts.



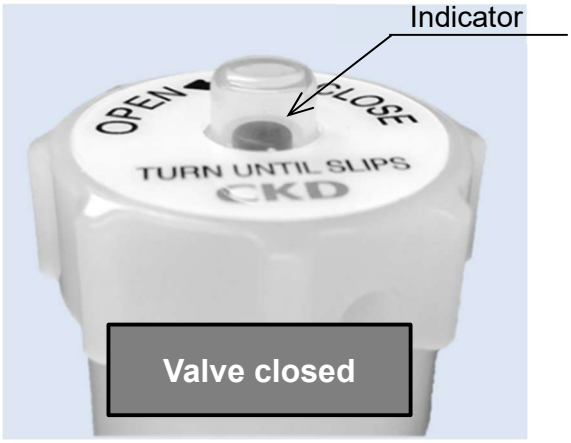
3 Lower the lock ring after operation.



3.3 Valve State Indicator

■ **MMD303RN / MMD403RN / MMD503RN Series**

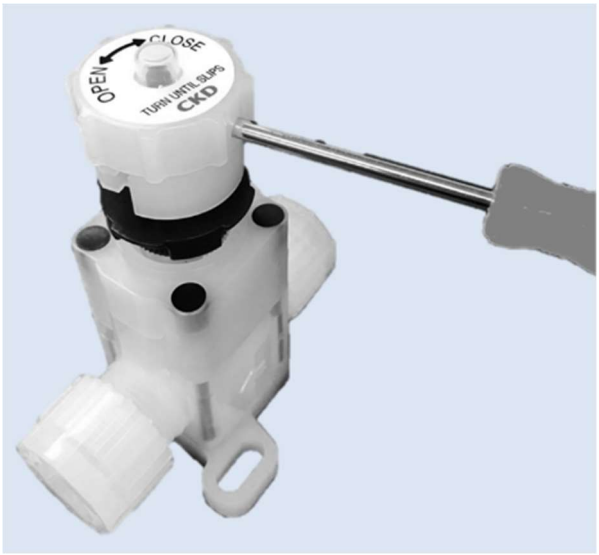
The valve state can be checked with the indicator.



3.4 Forced Operation

■ **MMD303RN / MMD403RN / MMD503RN Series (MMD003RN does not have this function.)**

If the valve does not close or open even when the knob rotates freely, insert a rod-like tool such as a screwdriver into the hole for forced operation on the side of the knob and turn it in the direction of rotation.



If the green indicator is visible through the hole, the forced operation is possible.

If the green indicator is not visible, turn the knob until the green indicator is visible.

⚠ CAUTION

Before carrying out forced operation, make sure that the lock ring is not working (is in raised state).

Once the valve is operated by forced operation, normal operation can be performed. If the valve still cannot be operated, contact CKD.

4. MAINTENANCE AND INSPECTION

⚠ DANGER

Do not disassemble the product.
Valves used with chemical liquids may have chemical-liquid atmosphere remaining between the actuator and the diaphragm. Also, products with high-load springs are very dangerous and must not be disassembled.
If the product needs to be disassembled, contact your nearest CKD sales office or distributor.

⚠ WARNING

Secure sufficient space for maintenance and inspection.

Thoroughly read and understand this Instruction Manual before maintenance and inspection.

Remove operating air and fluid pressure before maintenance.

Thoroughly replace the remaining chemical liquid with pure water or air so that it does not affect peripheral devices and people nearby before replacing the valves.

Make sure that no one comes near the breathing hole during valve operation.
While the upper side of the diaphragm (cylinder side) does not come into contact with the fluid, it is exposed to a chemical-liquid atmosphere due to gas permeation from the thin film part. A small amount of permeated gas is released from the breathing hole located on the side of the cylinder due to valve operation. Crystals may also adhere to the breathing hole or around it.

Wear corrosion-resistant gloves when touching the valve so as not to touch it with bare hands.

4.1 Periodic Inspection

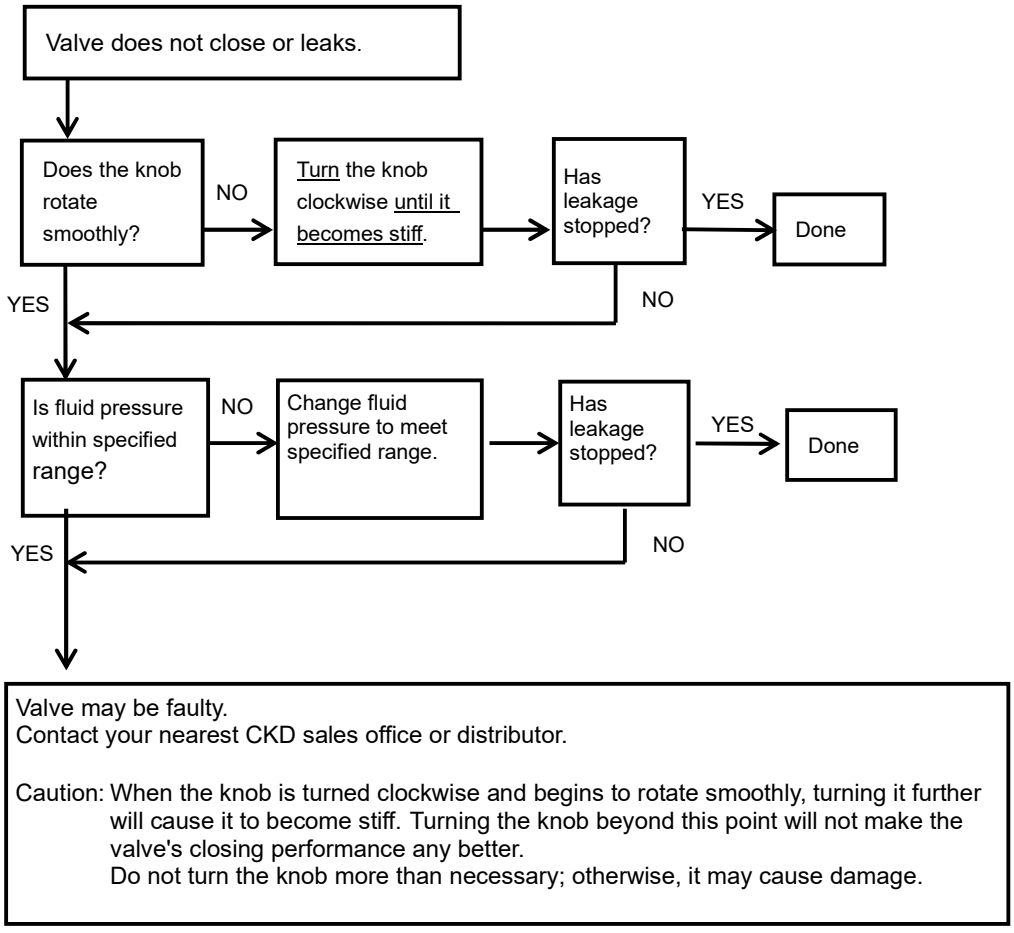
In order to use the product under optimum conditions, perform the following periodic inspections once or twice a year.
- Check for external leakage from the valve.
- Check for leakage from the fitting.
- Check for abnormalities of component parts such as discoloration, deformation, or corrosion.

5. TROUBLESHOOTING

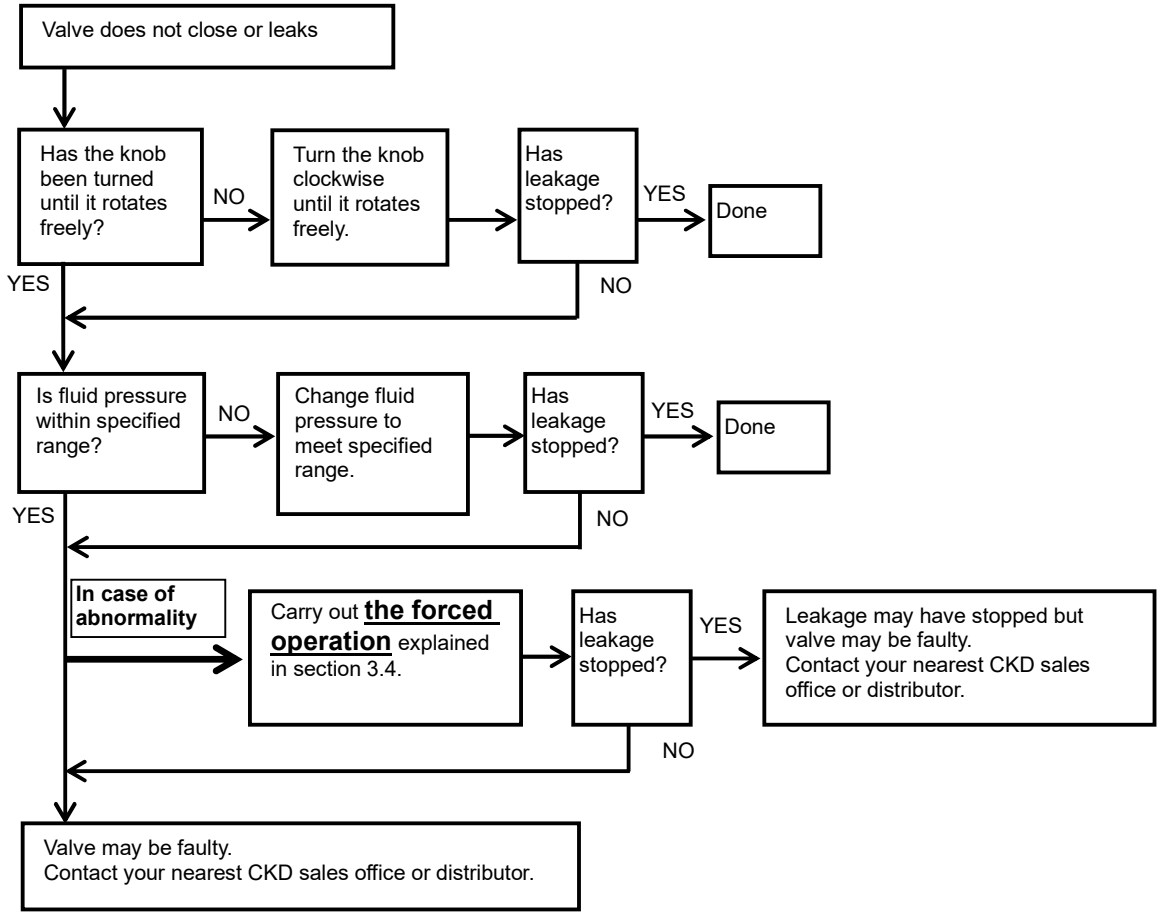
5.1 Problems, Causes, and Solutions

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

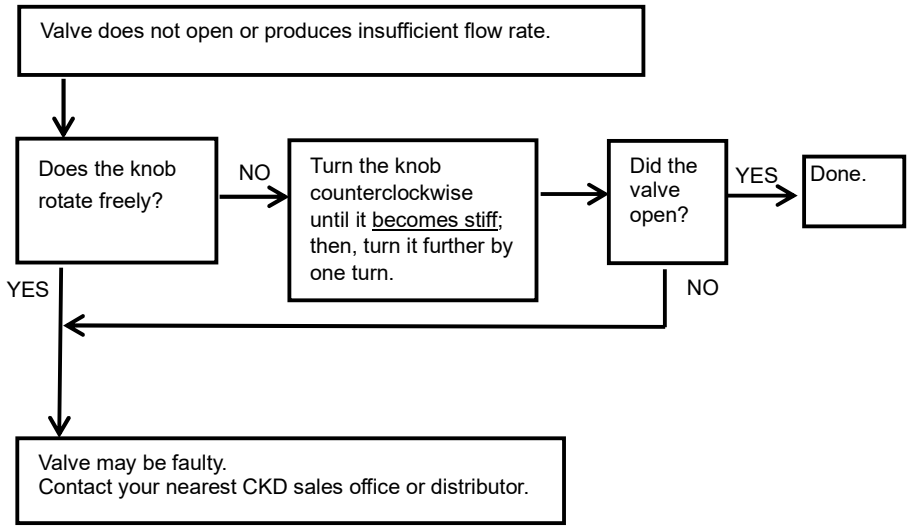
■ Valve does not close or leaks : MMD003RN Series



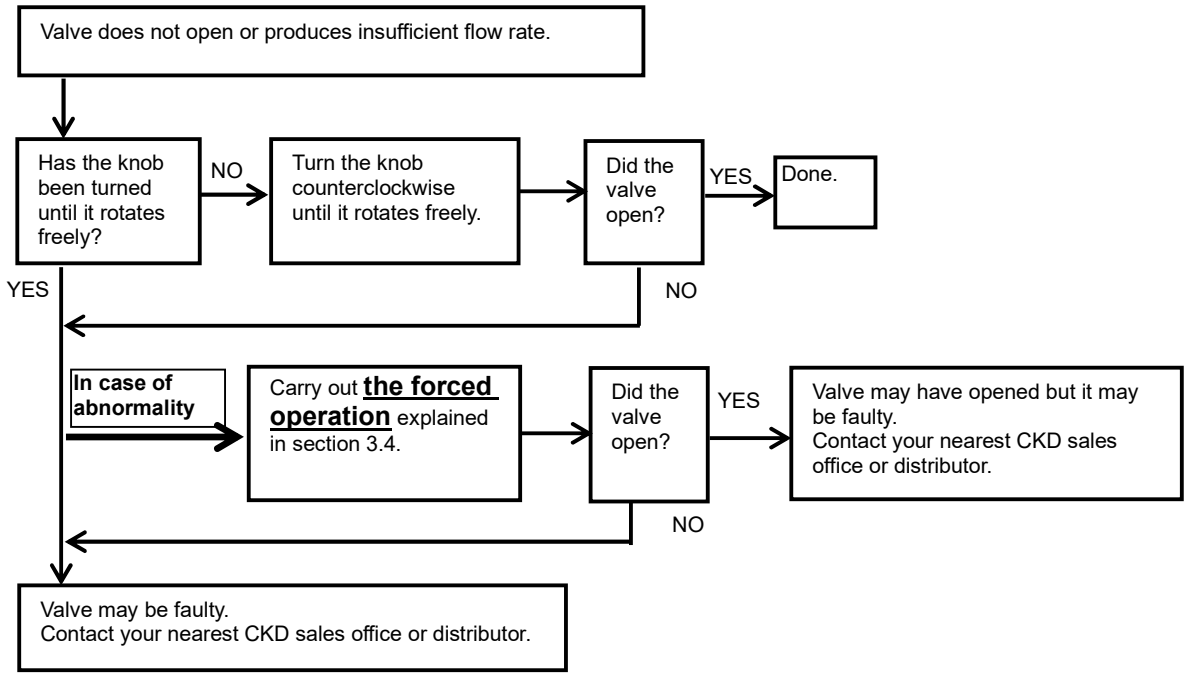
■ Valve does not close or leaks : MMD303RN / MMD403RN / MMD503RN Series



■ Valve does not open or produces insufficient flow rate : MMD003RN Series



■ Valve does not open or produces insufficient flow rate : MMD303RN / MMD403RN / MMD503RN Series



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.
- 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		Compatibility	Note
Pure water		Y	
Oxidizing fluid	Sulfuric acid	Y	
	Hydrochloric acid	Y	
	Nitric acid	Y	
	Hydrofluoric acid	Y	Fluid temperature of hydrofluoric acid and chemical liquids that contain hydrofluoric acid is 5°C to 80°C.
	Phosphoric acid	Y	
	Ammonium fluoride	Y	Fluid temperature of hydrofluoric acid and chemical liquids that contain hydrofluoric acid is 5°C to 80°C.
	Hydrogen peroxide	Y	
	Ozone water	△	
	Sulfuric acid + hydrogen peroxide	Y	Contact CKD before using a sulfuric acid + hydrogen peroxide solution at 100°C or above.
	Sulfuric acid + ozone	△	
Basic fluid	Sodium hydroxide	Y	
	Potassium hydroxide	Y	
	Ammonia water	Y	
Organic fluid	Acetone	N	
	Butyl acetate	N	
	Isopropyl alcohol	Y	
Others/ mixed fluid	Thinner	N	
	Resist	Y	Since there are a wide variety of mixed chemical liquids, it is impossible for CKD to comprehend all of their effects. Make sure to check the compatibility between the materials constituting the product and the working fluid and determine whether to use the fluid.
	Developer	Y	
	Slurry	Y	
	Plating solution	Y	
	Remover	Y	
Gas	Air, nitrogen gas	Y	Gas leakage up to 1 cm^3/min (at air pressure) from the valve seat may occur.

* Compatibility is indicated with Y: Compatible, △: Contact CKD, N: Not compatible
* For compatibility of fluid not list 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 7.2 warranty period specified above, 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.

1) 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 the Instruction Manual.
2) Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts.
3) Failure not caused by the product.
4) Failure caused by use not intended for the product.
5) Failure caused by modifications / alterations or repairs not carried out by CKD.
6) Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
7) 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 specified herein is warranted for one and a half (1.5) years from the date of delivery to the location specified by the customer.