CKD

Vacuum Regulator
VRA2000 Series

INSTRUCTION MANUAL

SM-286516-A/2

Vacuum Regulator: VRA2000 Series

- 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 **" VRA2000 Series" Vacuum 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 is intended for users who have basic knowledge about materials, piping, electricity, and mechanisms of pneumatic components. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training.
- 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.

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.

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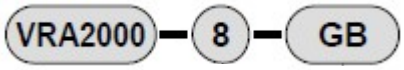
1. PRODUCT OVERVIEW

1.1 Model Number Indication



(a) (b)

(a) Port size	
8	Rc1/4
10	Rc3/8
8G	G1/4
10G	G3/8
8N	NPT1/4
10N	NPT3/8

(b) Option	
Blank	None
G	Pressure gauge
P	Pressure switch
B	C type bracket
B3	L type bracket
B4	B type bracket
R2	Digital pressure sensor

Please refer to the catalog for precautions when selecting the model number.

1.2 Specifications

1.2.1 Product specifications

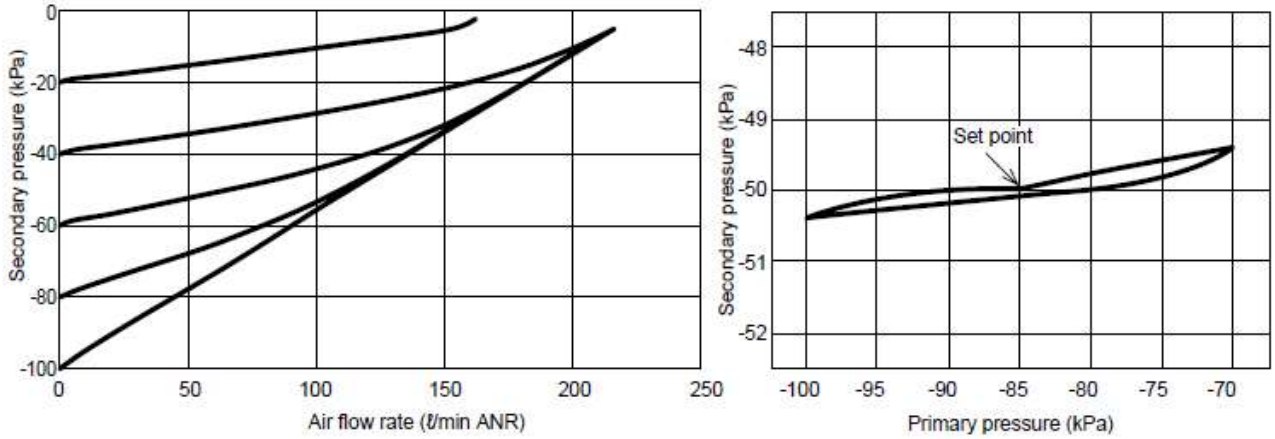
1 MPa = 10 bar

Model No.		VRA2000-8	VRA2000-10
Set pressure kPa		-100 (≈-15 psi) to -1 (≈-0.2 psi)	
Ambient / fluid temperatures °C		5 (41°F) to 50 (122°F)	
Balance leak flow rate ℓ/min(ANR)		1 *2	
Max. flow rate ℓ/min(ANR)		200 *1	
Port size	IN/OUT	1/4	3/8
	Gauge	1/8	
Weight kg		0.29	

*1: The max. flow rate is the flow rate when the secondary side is completely closed and the primary pressure is at -101.3 kPa, and then after adjusting the secondary pressure to -100kPa, the secondary side is fully opened.

*2: Flow rate when primary pressure is set to -95 kPa or less and secondary pressure to -45 kPa while closed.

1.2.2 Characteristic curve



*1: The primary side vacuum pump is measured with using discharge rate 500 ℓ/min.

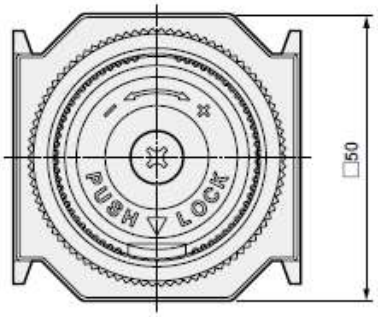
1.2.3 Related kit

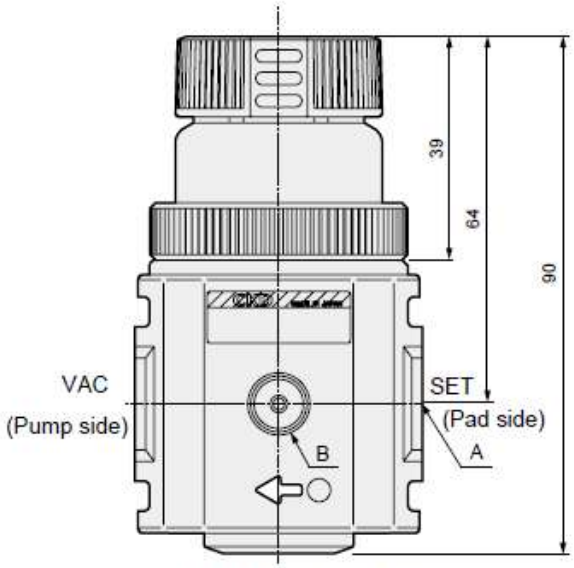
■ **Repair parts kit**
< Diaphragm kit>
VRA2000-D

■ **Valve kit**
VRA2000-V

1.3 Dimensions

● VRA2000-8/VRA2000-10

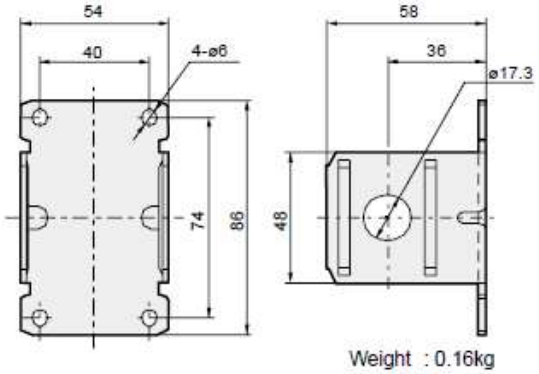




Hole dimension for panel mount: ø38.5

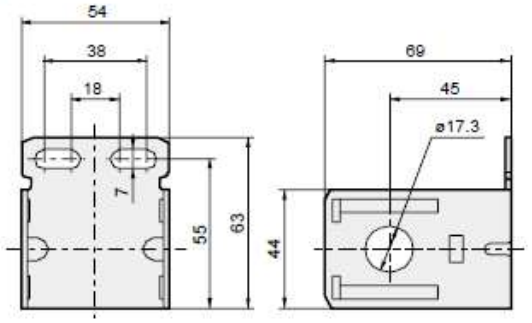
Model No.	A	B
VRA2000-8	Rc1/4	Rc1/8
VRA2000-10	Rc3/8	Rc1/8

● B type bracket (B4)
B240



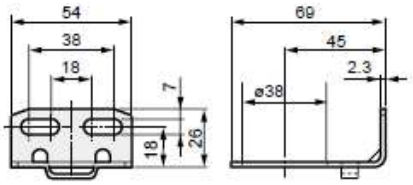
Weight : 0.16kg
Material : Steel
Zinc plated

● C type bracket (B)
B220



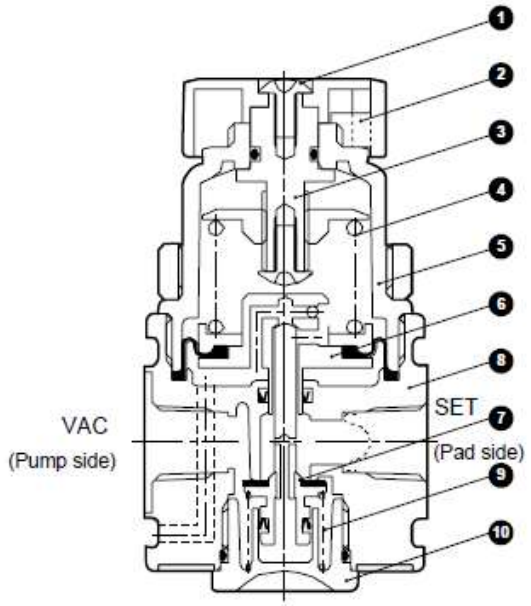
Weight : 0.15kg
Material : Steel
Zinc plated

● L type bracket (B3)
B230



Weight : 60g
Material : Steel
Zinc plated

1.4 Internal Structure



Parts list

No.	Part name	Material
1	Cross-recessed truss machine screw	Steel
2	Knob assembly	Polybutylene terephthalate
3	Adjusting screw assembly	Copper alloy/steel/nitrile rubber
4	Adjusting spring	Stainless steel
5	Cover assembly	Aluminum alloy/PBT
6	Diaphragm assembly	Aluminum alloy/steel/nitrile rubber
7	Valve assembly	Aluminum alloy/copper alloy/hydrogenated nitrile rubber
8	Body assembly	Aluminum alloy/stainless steel/nitrile rubber
9	Bottom spring	Stainless steel
10	Bottom plug assembly	Polybutylene terephthalate/nitrile rubber

2. INSTALLATION

2.1 Environment

⚠ WARNING

Do not use the product in an atmosphere where synthetic oil, organic solvent, chemicals, cutting oil, screw lock agent, leak detection agent, hot water, or other hazardous factors are present or in a place where they may adhere to the product.

⚠ CAUTION

Observe the following precautions regarding the ambient environment.

- Do not use the product where there is direct irradiation of ultraviolet rays.
- Avoid installing the product where it is exposed to direct sunlight.
- Avoid installing the product where it is subject to vibrations and shocks.
- This vacuum regulator always sucks in the atmosphere, so use it in a dust-free place.

Do not use the product in an environment where:

- Ambient temperature is outside the range of 5°C to 60°C
- Air can freeze
- Water drop or cutting oil can splash onto the product
- Condensation may occur due to high humidity and temperature change
- Sea breeze or seawater can splash onto the product
- Atmosphere contains corrosive gas, fluids, or chemicals
- Atmosphere contains a lot of dust
- Atmosphere contains spatter
- It is exposed to direct sunlight, rain, wind, or water
- There is a heat source in the surrounding area and heat is radiated
- Ozone is produced

2.2 Unpacking

⚠ CAUTION

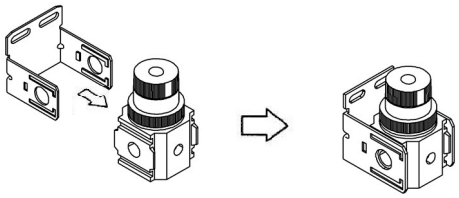
Do not open the packing of the product until just before piping.
Foreign matters may enter the product and cause a failure or malfunction.

- Check that the model number ordered and the model number indicated on the product are the same.
- Check the exterior of the product for any damage.

2.3 Mounting

■ C-type and B-type bracket (if selected in the model number)

Attach the C-type and B-type bracket to the product as shown in the figure below before piping.

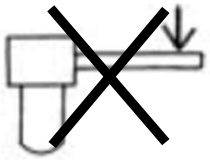


Align the convex portion of the C-type and B-type bracket with the concave portion of the product and push in.

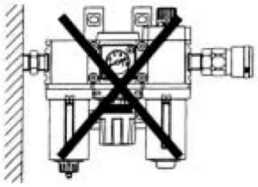
2.4 Piping

⚠ WARNING

Do not apply pipe loads or torque to the body and the pipes.



Do not support the product at only one end as illustrated in the figure below since this may apply excessive force and lead to damage.



<Piping load torque>

Series	VRA2000
Max. torque (N·m)	50

⚠ CAUTION

Fully flush and clean the pipes before use.
Residual dust or foreign matter in a pipe may cause operation fault.

Connect the pipes correctly according to the direction of flow by checking the direction of the arrow.

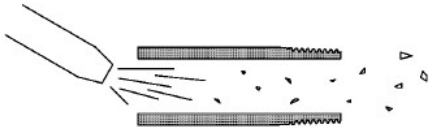
Prevent foreign matters from entering the pipes while piping and connecting the fitting.
Be careful not to allow cutting chips from the piping screw and seal material from entering the pipes while piping and connecting the fitting.
Residual dust or foreign matter in a pipe may cause lower performance of the product.

Tighten the pipes with the appropriate tightening torque.

Do not subject the body and the pipes to a bending moment that is due to pipe loads.

■ Pipe cleaning

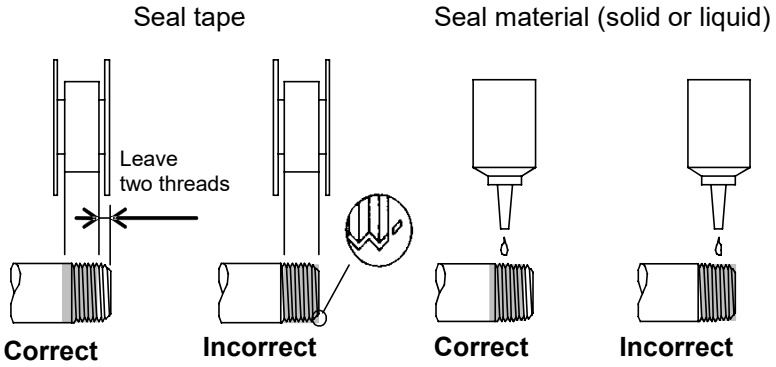
Before piping, blow air into the pipes to clean the interior and to remove cutting chips and foreign matters.



■ Seal material

Apply a seal tape or seal material to the screw threads leaving two or more threads at the pipe end uncovered or uncoated. If the pipe end is fully covered or coated, a shred of seal tape or residue of seal material may enter inside of the pipes or device and cause a failure.

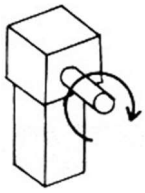
When using a seal tape, wind it around the screw threads in the direction opposite from the screw threads and press it down with your fingers to attach it firmly.
When using a liquid seal material, be careful not to apply it to resin parts. The resin parts can become damaged and this may lead to a failure or malfunction.
Also, do not apply seal material to the internal threads.



■ Pipe screwing torque

Do not apply excessive torque to the body and the pipes when piping.

Port thread	Rc1/4	Rc3/8
Tightening torque (N·m)	6 to 8	13 to 15



3. USAGE

⚠ WARNING

Use the product within the specifications.

Do not use the product for medical purposes or in any equipment or circuit that concerns human life.

The product is designed for industrial use.

⚠ CAUTION

Check the working circuit and the working fluid.

If fluids containing solids or fluids not in the specifications flow into the product, operation faults may occur. Attach a filter to the primary side of the product to prevent solids from entering.
Pulsation may occur depending on the conditions of use or the piping conditions.

Do not pressurize because of vacuum regulator.

This product is for vacuum, so it cannot be used for pressurization.

If pulsation occurs in the regulator, change the usage conditions and piping conditions, such as lowering the pressure on the primary side.

It may pulsate depending on the usage conditions and piping conditions.

To use the product correctly:

- Check the pressure on the pump side carefully before setting the regulator pressure. Lock the knob after setting.
- Check the arrow indicating the air flow to connect. Reverse connection may cause malfunction or failure.
- Install the vacuum regulator vertically with it facing up or down.

3.1 Method of operation

⚠ CAUTION

When setting the pressure of the regulator, pull the pressure control knob to release the lock before operating.
If you operate it forcibly without unlocking it, it may be damaged.

■ Secondary pressure setting

1 Check that the piping connection of the vacuum regulator matches the flow direction.

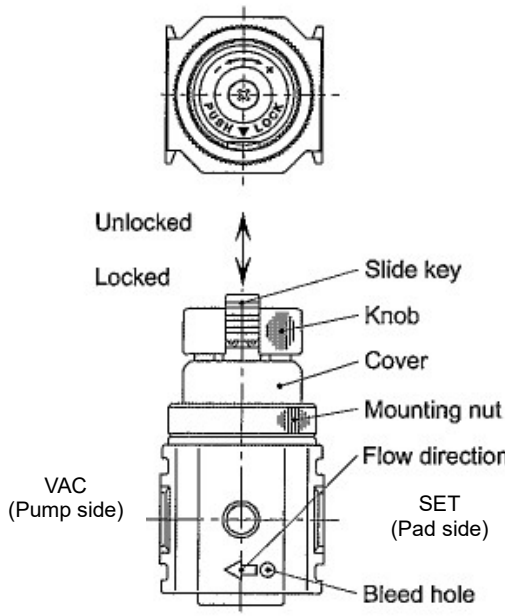
2 Check the pressure on the pump side.

3 Press up the slide key to unlock the knob.

4 Turn the knob to adjust the pressure on the pad side.
(Right rotation: increase in pressure, left rotation: decompression)
At this time, gradually reduce the pressure from the atmospheric pressure side to adjust.

5 Check the pressure on the pad side by turning the valve on the pad side ON / OFF.
If the pressure on the pad side changes at this time, make fine adjustments.

6 Press down on the slide key to lock the knob.



■ How to change from lock type to non-lock type

1 Rotate the knob 3 times counterclockwise to fix the internal parts.
If you neglect to rotate the knob counterclockwise, the adjusting screw will sink into the product when you remove the knob, making it difficult to connect the knob.

2 Loosen the truss machine screw and remove the knob.

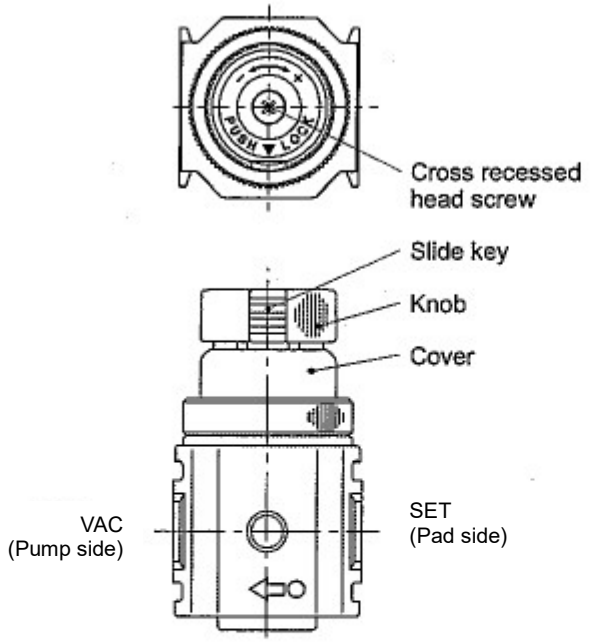
3 Remove the slide key from the knob.

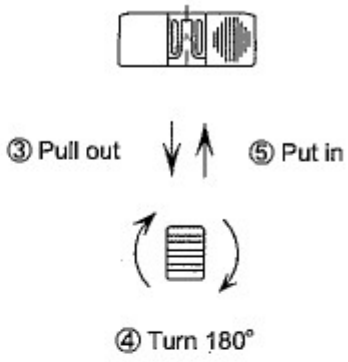
4 Rotate the slide key 180 °.

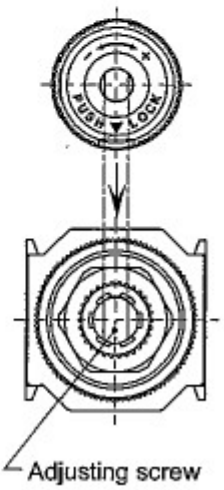
5 Insert the slide key into the knob.

6 Insert the knob into the adjusting screw and attach it with a machine screw.
When inserting the knob into the adjusting screw, align the knob with the shape of the adjusting screw and then tighten the machine screw.

The non-lock type omits the complicated lock function in case the secondary pressure setting is changed frequently, so please recombination it if necessary.







4. MAINTENANCE AND INSPECTION

⚠ WARNING

Maintenance should be performed after stopping the vacuum pump and confirming that the piping and vacuum regulator have returned to the atmosphere.

⚠ CAUTION

Thoroughly read and understand the Instruction Manual supplied with the product before use and maintenance.

4.1 Daily Inspection

- Thoroughly read and understand this Instruction Manual before maintenance and inspection.
- Check that the product operates properly before starting use.

4.2 Periodic Inspection

- In order to use this product in the optimum condition, perform the following periodic inspections once or twice every six months.
  (1) Check for loose mounting screws
  (2) Checking the amount of suction from the balance leak port
  If there is a leak of 2ℓ / min or more, disassemble and inspect it, and replace parts if necessary.
  (3) Check the set pressure
  If abnormal set pressure fluctuation occurs, disassemble or inspect it, and if necessary, grease it up and replace parts.
- It is recommended to check for leaks from the piping.

4.3 Maintenance method

Before disassembling, stop the vacuum pump and check that the piping and vacuum regulator have returned to atmospheric pressure.

Please prepare + screwdriver # 2, monkey wrench, and coin as tools.

■ Replacing the valve assembly (Refer to Fig.1)

1 Remove the bottom plug with a coin and pull out the bottom spring and valve assembly.

2 Apply new grease to the new MYN packing and assemble it into a new valve assembly.

3 Wipe off the dirty grease on the bottom plug, apply new grease to the inner diameter of the bottom plug, and assemble in the reverse order of disassembly.

■ Replacement of diaphragm assembly (Refer to Fig.1)

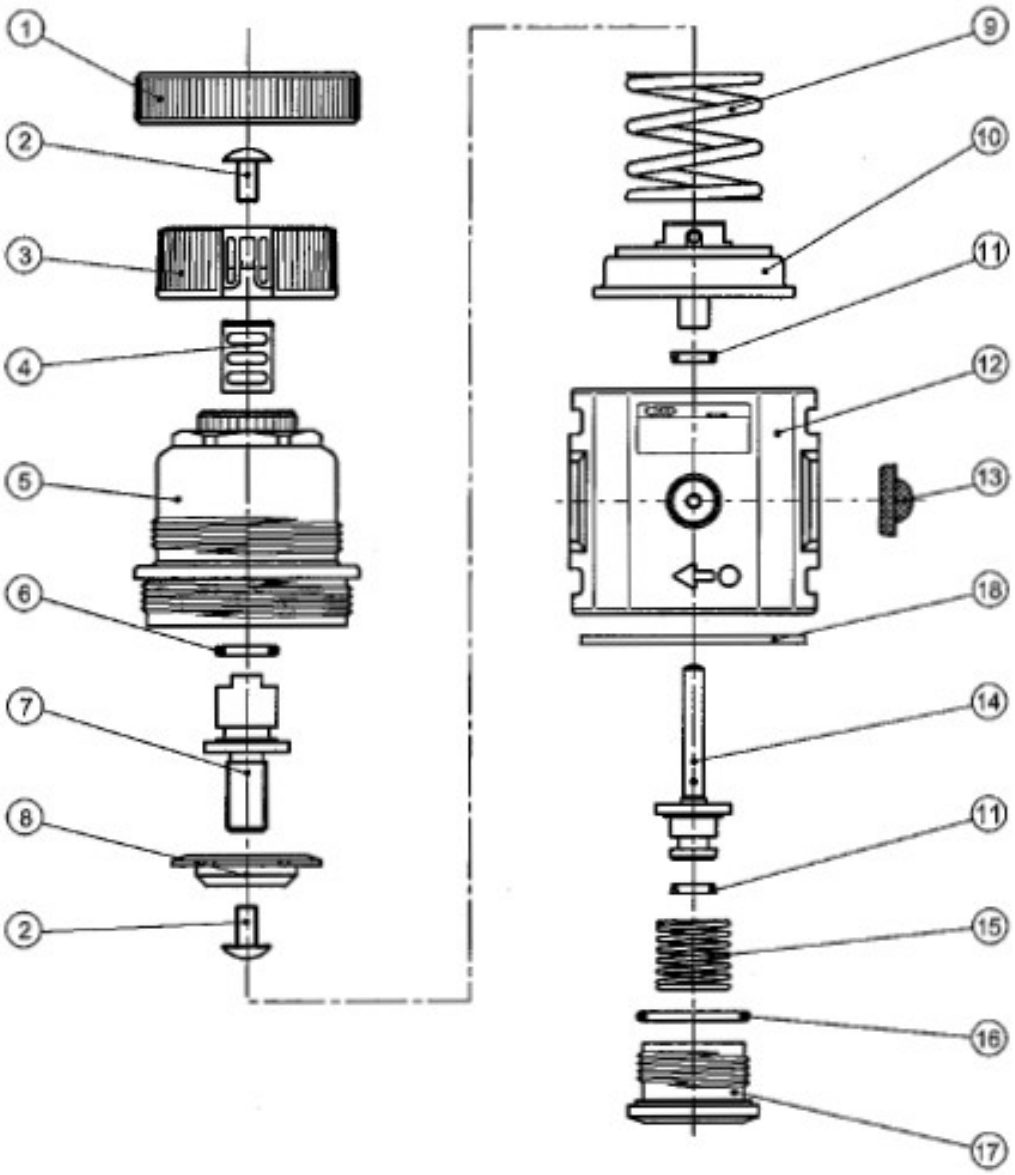
1 Return the knob to the + side, rotate it 3 times to the-side, and loosen the machine screw with + driver # 2 to remove it.

2 Remove the cover with a monkey wrench and pull out the diaphragm assembly and MYN packing from the body.

3 Wipe off the dirty grease on the body, apply new grease to the new packing, and assemble the body.

4 Apply new grease to the outer circumference of the pipe for new diaphragm assembly and assemble in the reverse order of disassembly.

Fig.1 Assembly drawing



Product number	Parts name	Quantity	Remarks	Product number	Parts name	Quantity	Remarks
1	Mounting nut	1	-	**10**	Diaphragm assembly	1	Consumable parts
2	Truss machine screw with cross hole	2	-	**11**	MYN packing	2	Consumable parts
3	Knob	1	-	**12**	Body	1	-
4	Slide key	1	-	**13**	Mesh filter	1	-
5	Cover	1	-	**14**	Valve assembly	1	Consumable parts
6	O-ring	1	-	**15**	Bottom spring	1	-
7	Adjusting screw	1	-	**16**	O-ring	1	-
8	Spring disc	1	-	**17**	Bottom plug	1	-
9	Adjusting spring	1	-	**18**	Plate cover	1	-

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.	Insufficient pressure on the pump side.	Check the pressure on the pump side.
	Pump side piping is long or squeezed.	Shorten the pump side piping or increase the piping diameter
	The needle of the pressure gauge does not move.	Replace the pressure gauge with a new one as the pressure gauge may be defective.
	Back pressure is applied to the regulator.	Consider if there is a problem with the system.
	The diaphragm is damaged.	Clean or replace parts.
	Bowl is damaged.	Stop supplying the compressed air, remove the bowl assembly, and replace the bowl assembly.

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

6. WARRANTY PROVISIONS

6.1 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.

6.2 Warranty Period

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