CKD

Thin Pilot 2-Port Solenoid Valve for Compressed Air

SP Series

INSTRUCTION MANUAL

SM-A37651-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 **"SP Series" Thin Pilot 2-Port Solenoid Valve**.
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.

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 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.

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

Do not use the product as a valve for ensuring safety such as an emergency shut-off valve.
The product is not designed to be used as a valve for ensuring safety such as an emergency shut-off valve. If using the product for such a system, take appropriate measures in advance to secure safety.

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.

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.

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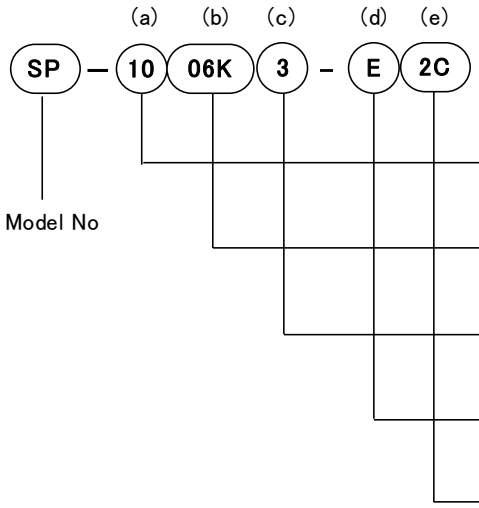
1. PRODUCT OVERVIEW

1.1 Model Number Indication



Symbol	Description
(a) Product width	
10	10mm
13	13mm
(b) Port size	
ACT	Actuator
06K	φ6 push-in fitting ※1
(c) Voltage	
3	24VDC
4	12VDC
(d) Pilot operated combination	
E	External exhaust
R	Internal exhaust ※2
(e) Coil option	
2C	Lead wire (without lamp/surge suppressor)

※1 φ6 push-in fitting can be selected only with product width 10 mm.
※2 Internal exhaust can be selected only with product width 13 mm.
The internal exhaust type does not exhaust the exhaust from the pilot chamber to the outside.
It is discharged to the OUT side flow path.

1.2 Specifications

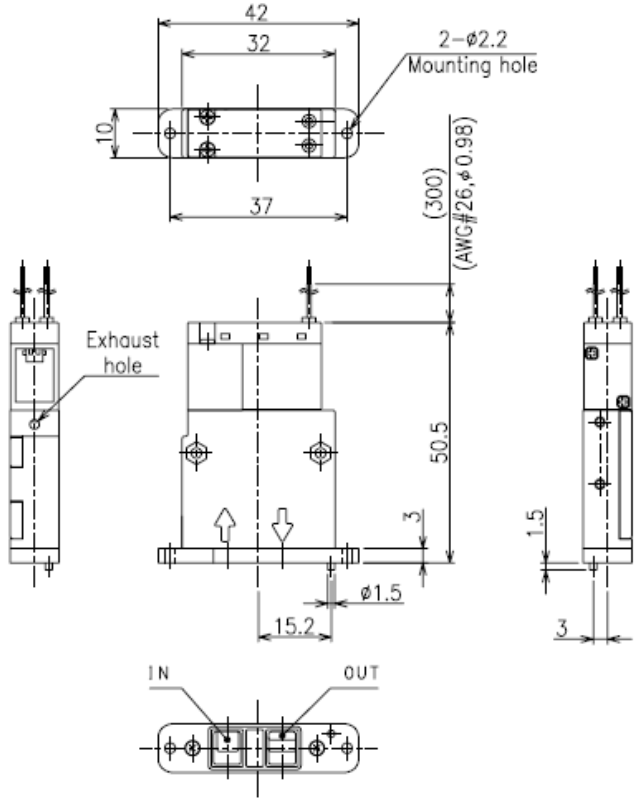
Descriptions		SP-10	SP-13
Working fluid		Compressed air	
Working pressure differenti	MPa	0.02 to 0.2	
Max. working pressure	MPa	0.2	
Proof pressure	MPa	0.3	
Fluid temperature	℃	0 to 70 (no freezing)	
Ambient temperature	℃	0 to 60	
Atmosphere		Place free of corrosive gas/explosive gas and not exposed to water	
Valve structure		Pilot-operated diaphragm drive	
Internal leakage	cm^3/min	2or less	
External leakage	cm^3/min	2or less	
Mounting orientation		Unrestricted	
Flow	C [$dm^3/(s \cdot bar)$]	1.0	1.4
Electrical specifications			
Rated voltage		24VDC, 12VDC	
Voltage fluctuation range		±10%	
Power consumption	W	0.6	
Coil rating		Intermittent rating(50%duty.Energizing time 10 sec. or less)※3	
Thermal class		Class 130 (B)	

※3:Continuous energization is possible when fluid temperature and ambient temperature are below 55℃

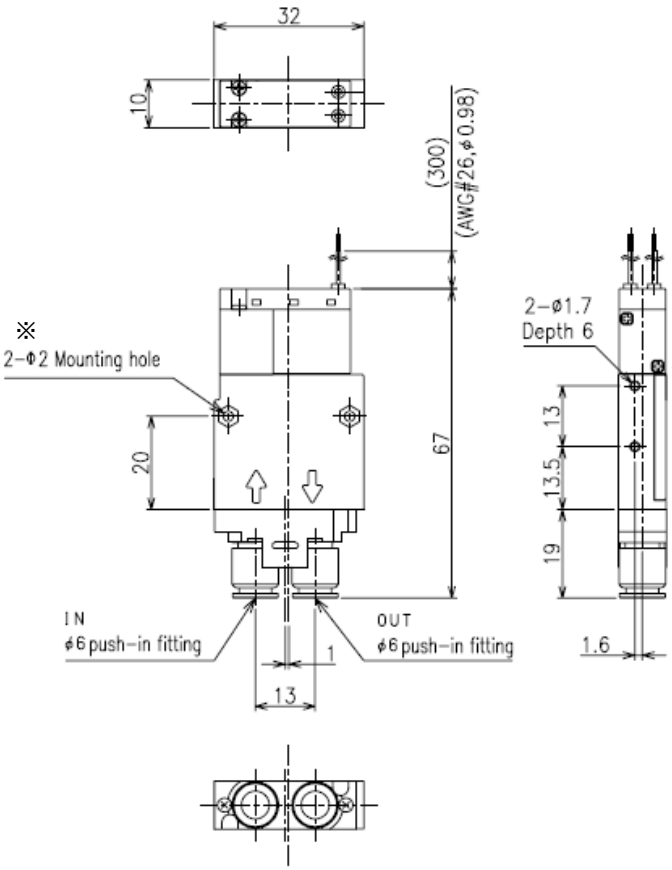
1.3 Dimensions

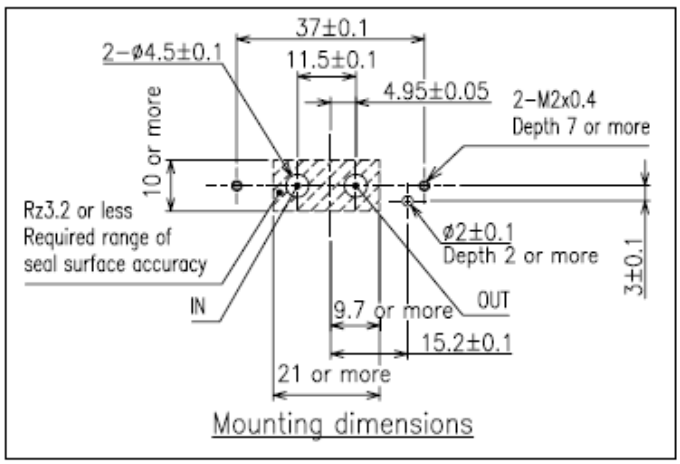
●SP－10

Actuator type



ϕ6 push-in fitting type

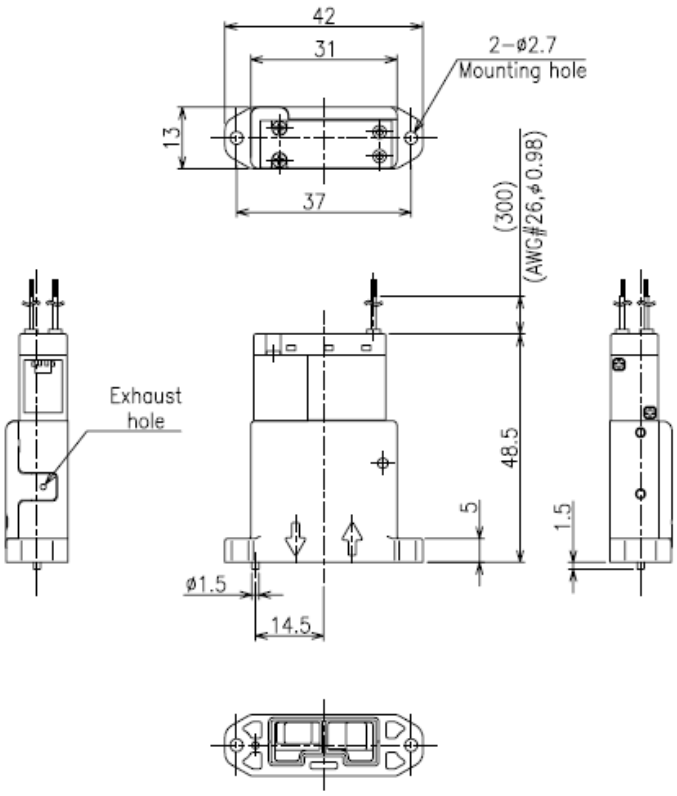


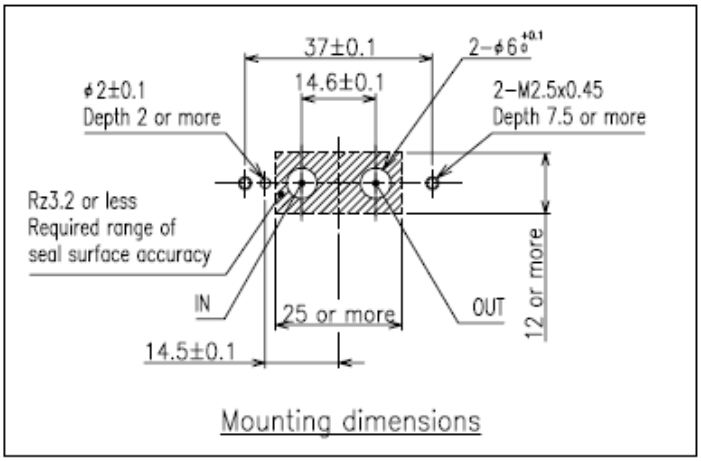


※1 This is for mounting M2 screws.
It can also be installed with M2 nuts.

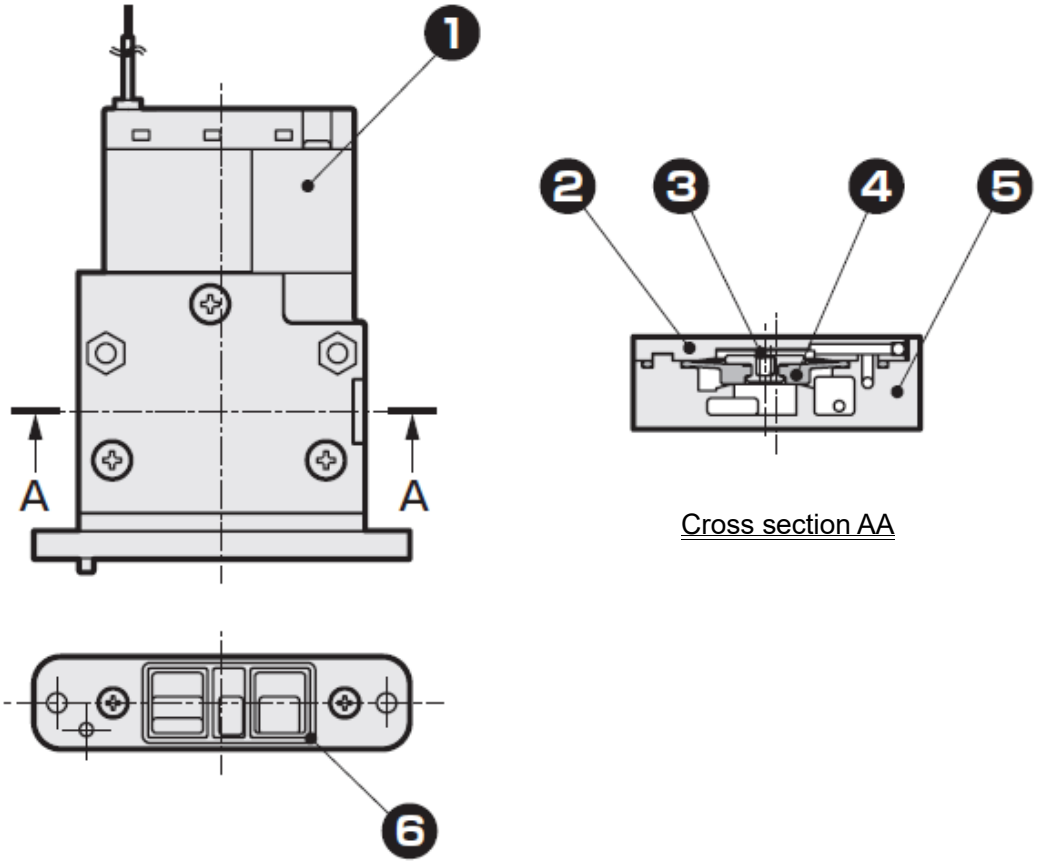
※2 This is a hole for the nominal 2 self-tapping screw.

●SP－13


42
31
2-ø2.7
Mounting hole
13
37
(300)
(AWG#26,ø0.98)
Exhaust
hole
48.5
5
1.5
ø1.5
14.5


37±0.1
2-ø6 +0.1 0
ø2±0.1
Depth 2 or more
14.6±0.1
2-M2.5x0.45
Depth 7.5 or more
Rz3.2 or less
Required range of
seal surface accuracy
IN
25 or more
OUT
12 or more
14.5±0.1
Mounting dimensions

1.4 Internal Structure

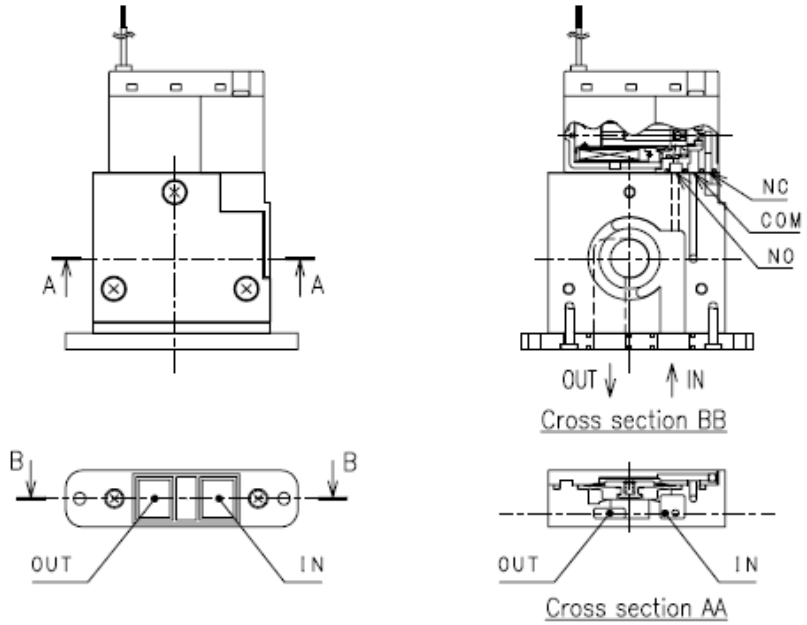


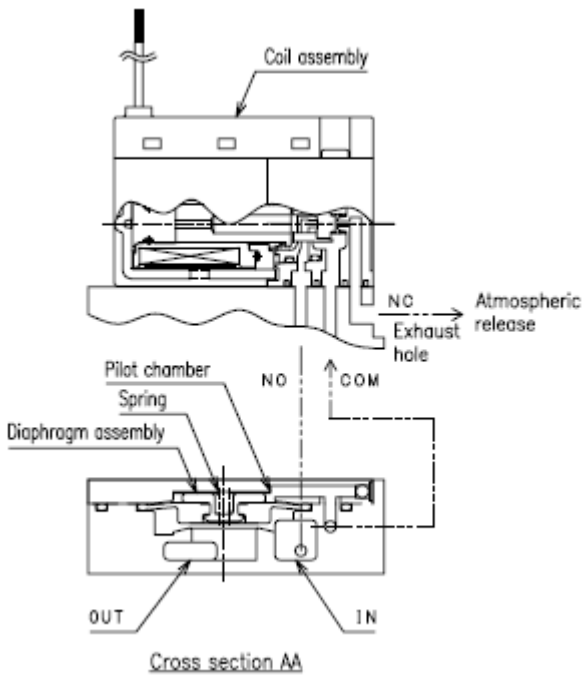
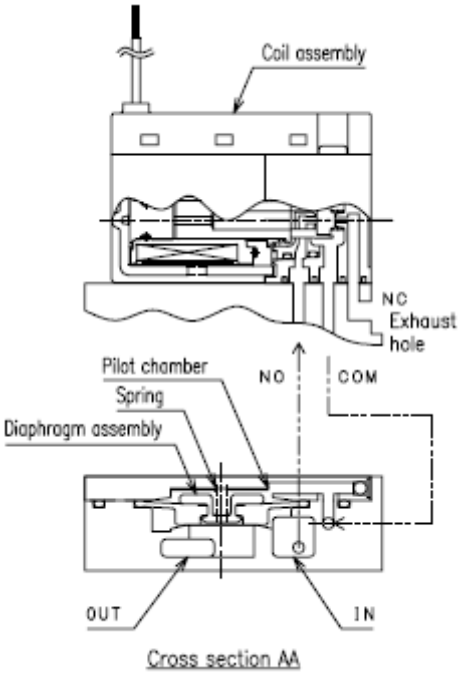
Cross section AA

No	Part name	Material
1	Coil assembly	—
2	Stuffing	PPS
3	Spring	SUS
4	Diaphragm Assembly	H-NBR/PPS
5	Body	PPS
6	Gasket	H-NBR

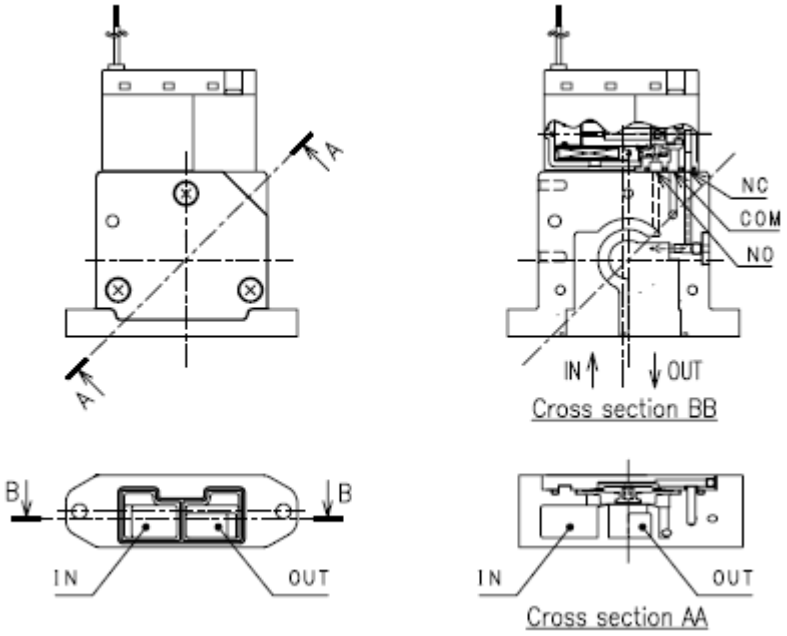
1.5 Description of Operation

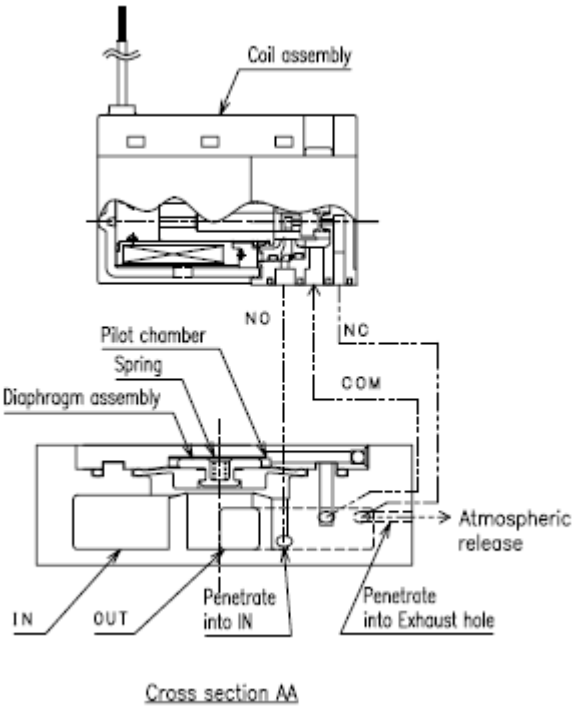
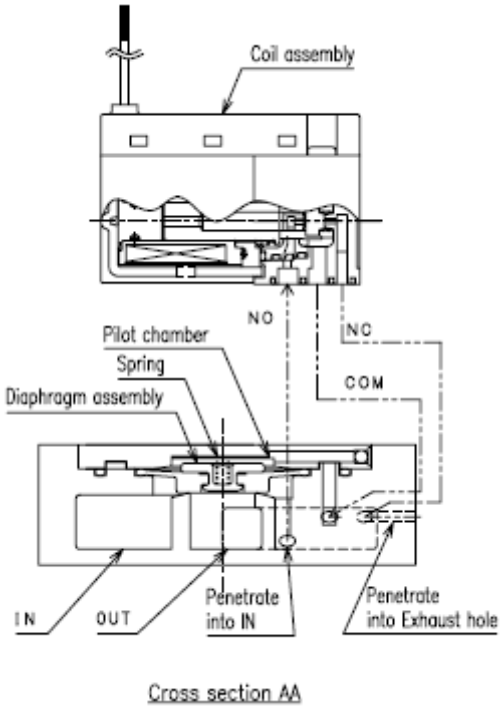
SP－10



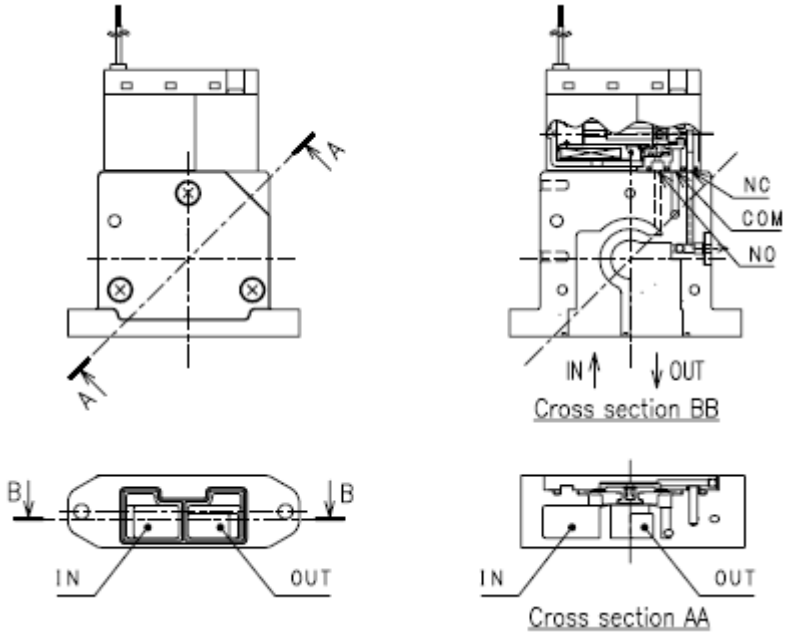
Opening operation	Closing operation
	
When energized, the flow path switches from COM to NC in the coil assembly, and the fluid in the pilot chamber is exhausted from NC to the atmosphere. At this time, the pressure in the pilot chamber becomes lower than the pressure on the IN side, so the diaphragm assembly rises and the fluid flows to the OUT side.	When the power supply is stopped, the flow path changes from NO to COM in the coil assembly, and the fluid on the IN side flows into the pilot chamber. At this time, the pressure in the pilot chamber becomes the same as the IN side pressure, so the diaphragm assembly is lowered by the force of the spring and the fluid is stopped.

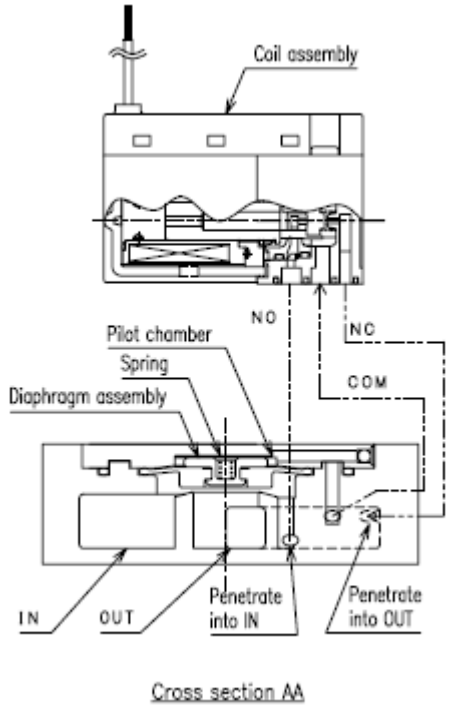
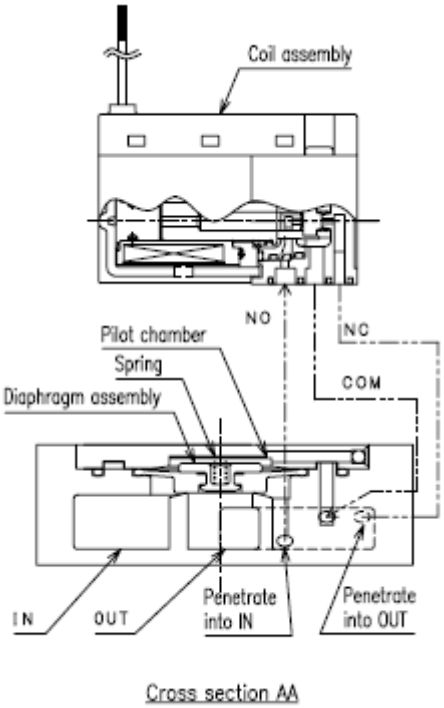
SP－13 （Extarnal exhaust type）



Opening operation	Closing operation
	
When energized, the flow path switches from COM to NC in the coil assembly, and the fluid in the pilot chamber is exhausted from NC to the atmosphere. At this time, the pressure in the pilot chamber becomes lower than the pressure on the IN side, so the diaphragm assembly rises and the fluid flows to the OUT side.	When the power supply is stopped, the flow path changes from NO to COM in the coil assembly, and the fluid on the IN side flows into the pilot chamber. At this time, the pressure in the pilot chamber becomes the same as the IN side pressure, so the diaphragm assembly is lowered by the force of the spring and the fluid is stopped.

SP－13 （Internal exhaust type）



Opening operation	Closing operation
	
When energized, the flow path switches from COM to NC in the coil assembly, and the fluid in the pilot chamber flows from NC to the OUT side. At this time, the pressure in the pilot chamber becomes lower than the pressure on the IN side, so the diaphragm assembly rises and the fluid flows to the OUT side.	When the power supply is stopped, the flow path changes from NO to COM in the coil assembly, and the fluid on the IN side flows into the pilot chamber. At this time, the pressure in the pilot chamber becomes the same as the IN side pressure, so the diaphragm assembly is lowered by the force of the spring and the fluid is stopped.

2. INSTALLATION

2.1 Environment

⚠ WARNING

Do not use the product in an application where water or cutting oil can splash onto the valve directly.

- In an environment where water and cutting oil can splash onto the valve, protect it by installing it under a cover or inside a paneled casing.
- If cutting oil splashes onto the cylinder rod, the oil may enter into the secondary side piping of the solenoid valve through the cylinder, causing a malfunction. Consult CKD before using the product in such an environment.

Observe the following precautions since coils produce heat.

- Appropriate ventilation or heat dissipation measures must be considered if the product is installed in a control board or if the solenoid coil needs to be energized for a long period.
- Be careful when touching the valve since the coil temperature may rise depending on the surrounding temperature and energization time.

Do not use the product in the presence of corrosive gas or solvents.

Do not use the product in an environment where corrosive gases such as sulfur dioxide gas or solvents are present.

Do not use the product in a humid environment.

Condensation may occur due to a change in the temperature.

Do not use the product in an explosive gas environment.

For use in an explosive gas environment, select an explosion-proof solenoid valve.

⚠ CAUTION

Take measures to prevent foreign matters from entering the exhaust port in a dusty environment.

Foreign matters may enter the exhaust port of a solenoid valve when the valve is operated to supply or exhaust air or if the exhaust port is facing up. Install a silencer to prevent foreign matters from entering the exhaust port or mount the valve so that the exhaust port faces down.

Do not use the product where it is subject to vibrations or shocks.

Do not subject the product to vibrations exceeding 50 m/s^2 or shocks exceeding 300 m/s^2.

Use extreme care to avoid deterioration of packings and gaskets when using the product in a place with high ozone concentration (for example, near a beach or in an area with frequent thunderstorms).

Packing and gaskets may deteriorate sooner than usual.

Use the product in an environment where it is not subject to radiant heat.

2.2 Unpacking

⚠ CAUTION

Do not remove the solenoid valves from their packaging bag until just before piping.
If bags are opened before the valves are ready to be piped, foreign matters may enter inside the solenoid valves from the piping ports and may 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.
- When any cautionary documents are provided with the product, read them, as well as this Instruction Manual, before use.
- Secure sufficient space around the solenoid valve for installation, removal, wiring, and piping.

2.3 Mounting

⚠ CAUTION

Be sure to hold the product body when handling and installing the product.
Avoid holding the lead wire and hanging it. It may cause disconnection or conduction failure .

Do not use a method of mounting that relies on support from the piping when mounting the solenoid valve.
Mount and secure the solenoid valve body.

Tighten the screws with the appropriate tightening torque.
If assembly or tightening is not properly done, it may result in air leakage, product falling off, damage to the threads, or deformation of DIN rails.

When using them side by side, install them with a space of 1 mm or more between the products.

2.4 Piping

⚠ WARNING

Insert the tube into the fitting until it firmly rests on the tube end and make sure that the tube does not come off before use.

⚠ CAUTION

Piping so that the solenoid valve is not dropped or excessive force is applied.

Make sure that the pipes/tubes will not be disconnected at the joints by mechanical movements, vibrations or tension.

When the piping connection is completed and compressed air is supplied, make sure that there are no air leaks in all parts of the piping connection.

Do not apply high pressure suddenly when supplying compressed air for the first time after connecting the pipes/tubes.
Sudden introduction of highly-pressurized air may cause the tubes to become disconnected and jump around and an accident may occur.

Do not decrease the inside diameter of the piping from any of the solenoid valve exhaust ports to a diameter less than the piping port size.
Smooth exhaust flow is important for normal operation of the actuator. With a manifold, a restriction to the exhaust flow may prevent normal operation of other solenoid valves.

Remove foreign matter.
Rust and other foreign matters in the piping may cause a malfunction or valve seat leakage.
Insert a filter (which removes particles exceeding 5 μm) immediately upstream of the solenoid valve.

Do not restrict the flow of air through the supply piping.
A delay in operation may occur due to a drop in the supply pressure when multiple valves are operated.

2.4.1 Pipe cleaning

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

2.4.2 Flushing

Before piping, flush the pipes/tubes, solenoid valves, and connected devices to remove foreign matters.

2.4.3 Piping connection

■ Appropriate tube

For solenoid valves provided with push-in fitting, use tubes specified by CKD.
- Soft nylon tubes (F-1500 Series)
- Urethane tubes (U-9500 Series)
- When using commercially available tubes, check the outside diameter accuracy, wall thickness, and hardness of such tubes. The hardness of a urethane tube should be 93° or more (as measured by a rubber hardness meter).
- Using a tube with insufficient diameter accuracy and hardness will cause the chucking force to drop, which makes the tube come off easily or difficult to insert.

- Tube dimensions

Tube Type	Outside diameter (mm)		Inside diameter (mm)	
	Nylon	Urethane	Nylon	Urethane
ø6	ø6±0.1	ø6 $^{+0.1}_{-0.15}$	ø4	ø4

■ Minimum allowable bending radius of tubes

Observe the minimum allowable bending radius of tubes. Neglecting the minimum allowable bending radius may cause disconnection or leakage.

Tube Type	Minimum allowable bending radius (mm)	
	Nylon	Urethane
ø6	20	20

■ Tube cutting

To cut a tube, use a tube cutter to cut the tube perpendicularly to the length of the tube. Inserting an obliquely cut end of a tube may cause air leakage.

■ Tube connections

From the end of the fitting, secure a straight section as long as the outside diameter of the tube and do not bend the tube abruptly at the fitting connection point. The tension applied sideways through the tube should not exceed 40 N.

2.5 Wiring

⚠ WARNING

Turn off the power before wiring.
An electric shock may occur.

Do not touch live parts with bare hands.
An electric shock may occur.

Thoroughly read and understand this Instruction Manual before working on electrical wiring.
The product must be handled by a person who understands the structure and operation principle of solenoid valve and has knowledge to secure the safety.

⚠ CAUTION

Check the power supply voltage and the type of current (AC or DC) before supplying power.

Do not apply stress to the lead wires.
Make sure that the lead wires are slack and connect them so that they are not pulled.
Undue stress may cause such problems as disconnection of the lead wires or the contact terminals.

Make sure that the voltage drop on the solenoid does not exceed 10% of the rated voltage.
Voltage drop occurs when energizing solenoids at the same time or depending on the cable length.

2.5.1 How to wire the lead wire Flushing

This product uses lead wires as shown in the table below.
When pressure bonding (crimping), crimp under proper crimping conditions, and insulate properly.

Electric connection symbol	Contents	Conductor size	Condutor cross-sectional area	Insulator outer diameter
2C	Grommet lead wire	AWG♯26	Equivalent to 0.13 mm^2	φ0.98mm

3. USAGE

⚠ WARNING

Do not use any fluid other than those listed in the specifications column.

Do not use beyond the maximum working pressure stated in the specifications column.

Do not touch the coil and the actuator while the product is energized.

A burn injury may occur.

Do not touch electrical wiring connections (bare live parts) while the product is energized.

An electric shock may occur.

Consult CKD about the specifications before using the product for special applications.

⚠ CAUTION

Use within the operating pressure difference range described in the specification column.

In the following cases, be careful to set the pressure so that the pressure difference in the valve open state does not fall below 0.02MPa. The diaphragm may vibrate and break prematurely.

·When there is a diaphragm on the primary or secondary side of the solenoid valve

·When opening multiple solenoid valves at the same time with multiple solenoid valves connected in parallel

(Due to the decrease in solenoid valve main pressure, the differential pressure between the primary side and the secondary side is less likely to occur.)

Do not apply back pressure（pressurizing from the secondary side）to the product.

If the secondary pressure becomes higher than the primary pressure, backflow will occur.

Otherwise, the product may malfunction or break**.**

For products with external exhaust specifications, pay attention to the exhaust air in the pilot chamber.

For products with external exhaust specifications, a small amount of pilot chamber exhaust air is released to the outside of the product when the solenoid valve is opened, so be sure to consider the effect of the fluid exhausted to the outside on the surroundings.

When the solenoid valve is opened, the exhaust noise of the pilot chamber exhaust air emitted to the outside of the product is generated.

3.1 Checks to Make Before Use (Checks Made After Mounting)

⚠ WARNING

Close the main cock and discharge the fluid in the valve before performing an appearance check.

Turn off the power before checking the power and insulation resistance.
Be careful not to get an electric shock while checking.

■ Appearance check

- Check that the valve is securely fixed to the piping by pressing it by hand.
- Check that the threaded parts such as bolts, nuts, and screws are not loose.

■ Leakage check

- Pressurize the fluid and check that there are no leaks in the pipe connections.

■ Electricity check

- Check the power supply voltage.
  Keep the voltage fluctuations within ± 10% of the rated voltage range.
  If the product is used beyond the voltage fluctuation range, an operation fault or damage to the coil may occur.

- Check the insulation resistance.
  Measure the insulation resistance between a non-live metal part mounted to the solenoid valve and a bare live part such as a lead wire.
  Check that the insulation resistance is 100 MΩ or more with 500 VDC megger.

■ Operation check

- Apply the rated voltage and pressurize the working fluid to check if the solenoid valve performs opening and closing movement properly.
  If the solenoid valve has a short energizing time, the solenoid valve opening / closing operation may not be able to follow.

3.2 Safety Instructions

3.2.1 Air quality

⚠ WARNING

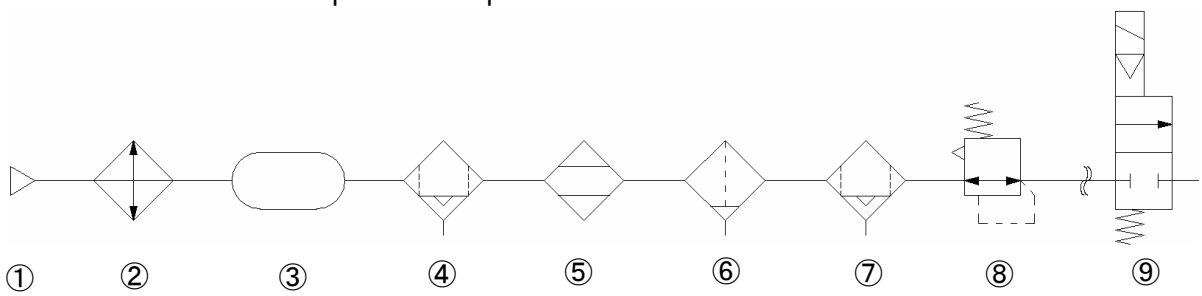
Do not supply anything other than compressed air.
Use clean compressed air that does not contain corrosive gases.

⚠ CAUTION

Make the air quality appropriate.
Compressed air usually contains a large amount of drainage, oxidized oil, tar, foreign matters, and rust from the piping, which may cause malfunction such as an operation fault and short service life. In addition, the exhaust causes pollution.

■ Air quality used / recommended air pressure circuit

Required air quality and recommended pneumatic circuit.
Compressed air purity class: JIS B 8392-1:2003 2.6.3
It is recommended to use this product in a pneumatic circuit.



① Air compressor
② After cooler
③ Tank
④ Main line filter
⑤ Refrigeration air dryer
⑥ Filter
⑦ Oil mist filter
⑧ Regulator
⑨ This product

■ Drainage

- Use dry compressed air that will not generate waterdrops (drain) inside the piping.
- Compressed air contains large amounts of drain (water, oxidized oil, tar, foreign matter).
- Drain causes malfunction to pneumatic equipments. Improve air quality by the following methods: Dehumidify using an aftercoolor or a dryer; Remove foreign matter using an air filter; Remove tar using an air filter for tar removal.
- Otherwise, drain enters the product air flow path and clogs the flow path for a moment, resulting in malfunction.

■ Contamination

- Install a pneumatic filter just before the solenoid valve.
- Use compressed air that is free of contaminants such as compresser oil, tar, and carbon. Otherwise, contaminants such as compressor oil, tar, and carbon enters the product and cause malfunction.
- Use compressed air that is free of solid foreign matter.
- Otherwise, solid foreign matter in the compressed air enters the product and cause malfunction and leakage.

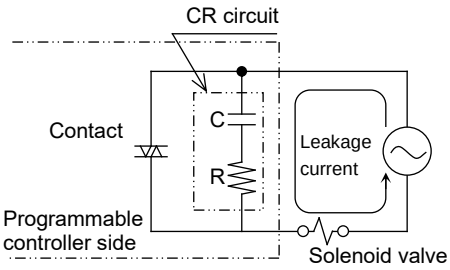
3.2.2 Electric circuit

⚠ CAUTION

Check for leakage currents from external control devices to prevent a malfunction.

When a programmable controller or a similar control device is used, a leakage current may prevent the valve from operating correctly even if the solenoid valve is de-energized.

When controlling solenoid valves using a programmable controller or a similar control device, make sure that the leakage current from the programmable controller output is as specified in the table below.



For 12 VDC	1.8 mA or less
For 24 VDC	1.2 mA or less

Take protective measures such as surge suppressor on the circuit side to protect against surge from the solenoid valve.

The surge suppressor limits the surge voltage generating from the solenoid valve, which can reach several hundred volts, to a low voltage level bearable for output contacts. However, this function may be insufficient for some output circuits and the voltage may cause breakage or malfunction of the product. Check the surge voltage limitation level of the solenoid valve to be used, the withstand voltage and circuit configuration of the output devices, and the reset delay time to determine serviceability.

For 12 VDC	Approx. 27 V
For 24 VDC	Approx. 47 V

3.2.3 Other usage precautions

- **Note that pilot operated 2 port valves may open and leak instantaneously at closed position when pressure is suddenly applied (e.g. when compressor starts).**
- **Depending on your usage, valve operation may become unstable if the valve is left abandoned for around a month. Be sure to use the product after trial run.**
- **If energizing time length is short, ON-OFF operation may fail to follow. Be sure to use the product after perform trial run under work conditions.**
- **If the regulator and solenoid valve are directly connected, they may vibrate each other, causing resonance and chattering.**

4. MAINTENANCE AND INSPECTION

⚠ DANGER

Do not disassemble the product.
Disassembling the product will void the warranty.

Do not clean the product with water or solvent.
The resin parts can become damaged and this may lead to a failure or malfunction.

4.1 Periodic Inspection

⚠ WARNING

Turn off the power, stop the supply of compressed air, and make sure that there is no residual pressure before maintenance.
Observe the condition to ensure safety.

⚠ CAUTION

Plan and perform daily and periodic inspections so that maintenance can be managed properly.
If maintenance is not properly managed, the product's functions may deteriorate significantly and this may lead to faults (such as short service life, damage, and malfunction) or accidents.

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

■ Pressure of supplied compressed air

- Is the set pressure supplied?
- Does the pressure gauge indicate the set pressure during operation of the device?

■ Pneumatic filter

- Is drainage correctly discharged?
- Are the bowl and element clean enough to use?

■ Leakage of compressed air from piping connections

- Are all connections, especially at movable sections, correctly connected?

■ Operation of solenoid valves

- Is there any delay in operation?
- Are the valves exhausting properly?

■ Screws

- Are there any loose screws?

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
Valve does not open	Valve is not energized	Confirm wiring and fuse, then energize the valve.
	Voltage applied is lower than the allowable voltage range.	Confirm the power supply, and apply rated voltage.
	Applied fluid pressure is beyond the specified range.	Set pressure within specified range.
	Foreign matter clogs the flow path.	Replace the product.
	Foreign matter is clogged at the actuator portion.	Replace the product.
	Diaphragm is damaged.	Replace the product.
Valve does not close	Pressurizing port of body is mounted in reverse direction.	Refer to this Instruction Manual to correct the pressurizing port.
	Applied fluid pressure is beyond the specified range.	Set pressure within specified range.
	Electricity is not shut off.	Check for leak of electricity. Modify the circuit so electricity is completely shut off.
	Foreign matter is stuck on the valve seat.	Replace the product.
	Foreign matter is clogged at the actuator portion.	Replace the product.
	Diaphragm is damaged.	Replace the product.
External leakage	Applied fluid pressure is beyond the specified range.	Set pressure within specified range.
	Diaphragm is damaged or deformed.	Replace the product.
	Gasket is damaged or deformed.	Replace the product.
	Screws are loose.	Tighten the screws.
	Tube is not inserted properly. Wrong tube size.	Insert the tube properly. Insert tube that matches the valve port.
Internal leakage	Applied fluid pressure is beyond the specified range.	Set pressure within specified range.
	Valve seat on the body is worn out or has flaw.	Replace the product.
	Sealing side of the Diaphragm is worn out or has flaw.	Replace the product.
	Foreign matter is stuck on the valve seat.	Replace the product.

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.