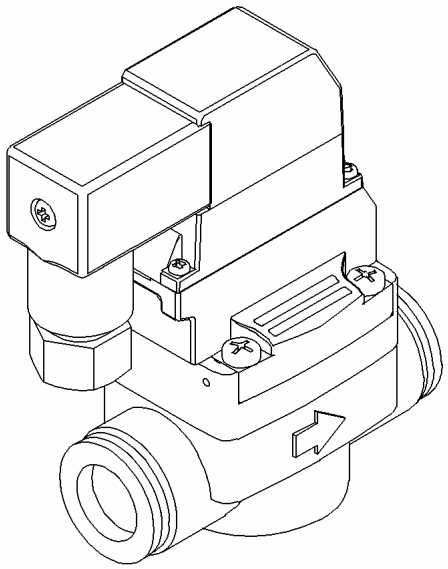
CKD

SM－50737－A

INSTRUCTION MANUAL

Pilot operated 2-port solenoid valve for compressed air EXA Series



- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

Ver.1
CKD Corporation

Safety precautions

When designing and manufacturing a device using CKD products, the manufacturer is obligated to manufacture a safe product by confirming safety of the system comprising the following items:

- Device mechanism
- Pneumatic or water control circuit
- Electric control that controls the above

It is important to select, use, handle, and maintain the product appropriately to ensure that the CKD product is used safely.
Observe warnings and precautions to ensure device safety.
Check that device safety is ensured, and manufacture a safe device.

⚠ WARNING

1. This product is designed and manufactured as a general industrial machine part. It must be handled by someone having sufficient knowledge and experience.

2. Use this product within its specifications.

This product cannot be used beyond its specifications. Additionally, the product must not be modified or machined.
This product is intended for use in general industrial devices and parts. Use beyond such conditions is not considered. Consult with CKD for details when using the product beyond the unique specification range, outdoors, or in the following conditions or environments. In any case, measures for safety shall be provided when the vavle malfunctions.

① Use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.
② Use for applications where life or assets could be adversely affected, and special safety measures are required.

3. Observe corporate standards and regulations, etc., related to the safety of device design and control, etc.

ISO4414, JIS B 8370 (pneumatic system rules)
JFPS2008 (principles for pneumatic cylinder selection and use)
Including High Pressure Gas Maintenance Law, Occupational Safety and Sanitation Laws, other safety rules, standards and regulations, etc.

4. Do not handle, pipe, or remove devices before confirming safety.

① Inspect and service the machine and devices after confirming safety of the entire system related to this product.
② Note that there may be hot or charged sections even after operation is stopped.
③ When inspecting or servicing the device, turn off the energy source (air supply or water supply), and turn off power to the facility. Release any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
④ When starting or restarting a machine or device that incorporates pneumatic components, make sure that system safety, such as pop-out prevention measures, is secured.

5. Observe warnings and cautions on the pages below to prevent accidents.

■**The safety cautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.**

⚠ DANGER :When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, or when there is a high degree of emergency to a warning.

⚠ WARNING :When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries.

⚠ CAUTION :When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. In any case, important information that must be observed is explained.

Precautions with regard to guarantee

● Guarantee period

The guarantee period of our product shall be one (1) year after it is delivered to the place specified by the customer.

● Guarantee coverage

If any failure for which CKD CORPORATION is recognized to be responsible occurs within the above warranty period, a substitute or necessary replacement parts shall be provided free of charge, or the product shall be repaired free of charge at the plant of CKD CORPORATION.

However, the guarantee excludes following cases:

① Defects resulting from operation under conditions beyond those stated in the catalogue or specifications.
② Failure resulting from malfunction of the equipment and/or machine manufactured by other companies.
③ Failure resulting from wrong use of the product.
④ Failure resulting from modification or repairing that CKD CORPORATION is not involved in.
⑤ Failure resulting from causes that could not be foreseen by the technology available at the time of delivery.
⑥ Failure resulting from disaster that CKD is not responsible of.

Guarantee stated here covers only the delivered products. Any other damage resulting from failure of the delivered products is not covered by this guarantee.

● Confirmation of product compatibility

Our customer shall be responsible of confirming compatibility of our product used in our customer's system, machinery or device.

【 Contents 】

1. Unpacking ……4

2. Installation

2. 1 Conditions for installation ……4
2. 2 Installation ……5
2. 3 Piping ……6-7
2. 4 Wiring ……8-10

3. Pre-operation (post-installation) check

3. 1 Appearance check ……11
3. 2 Leakage check ……11
3. 3 Electrical check ……11

4. Instructions for proper use

4. 1 About air quality ……12
4. 2 About surge absorber ……13-14
4. 3 About pressure differential ……14-15
4. 4 Other usage precautions ……16
4. 5 About disassembly ……16

5. Maintenance

5. 1 Maintenance and inspection ……16
5. 2 Parts for maintenance ……16

6. Troubleshooting ……17

7. Product specification and model number display

7. 1 Product specification ……18
7. 2 Model number display ……19

8. Internal construction ……20

9. Operation explained ……21

1. Unpacking

⚠ CAUTION	Do not take off the packing bag until just before piping. Otherwise, foreign matter enters the valve from ports and cause malfunction or bad operation.

(1) Check that the model No. shown on the Label of the product is the same with what you ordered.
(2) Check that the product has no external damages.
(3) When storing the product, keep the product inside the packing box to prevent the intrusion of foreign matter to the valve. Take out the valve when piping.

2. Installation

⚠WARNING	Contact CKD if the product is to be used beyond specifications, or in special applications.

2. 1 Conditions for installation

⚠ CAUTION	a) Do not splash liquid such as water or lubricating oil. Otherwise, liquid splashed on the valve causes electric leakage and coil burn. Protection Rating for the DIN Terminal Box type is equivalent to IPX5. However, we do not guarantee protection against continuous pouring of water. Protective measure shall be taken such as covering, or valve installation inside a panel Protective measure shall be taken against welding spatter. b) The coil generates heat. If the product is to be installed inside a control panel, or if energizing time is long, provide ventilation measures. Temperature around the product will be high. c) The product can not be used in a corrosive or solvent environment. Do not use this product under corrosive gas and corrosive solvent (such as sulfur dioxide) environments. d) Vibration and shock Use this product free from vibration and shock. e) Avoid humid environments, since condensation may occur with change in temperature. f) The product cannot be used in an explosive gas atmosphere. In such atmosphere, use our explosion-proof valve. g) Use the product away from radiant heat.

(1) Provide appropriate measures to prevent the product from freezing at cold places.
(2) The product cannot be used outdoors. Protective measure shall be taken such as covering, or valve installation inside a panel.
(3) Do not wash the product with water or solvents. Do not paint the product. Resin material used in the product may break down.

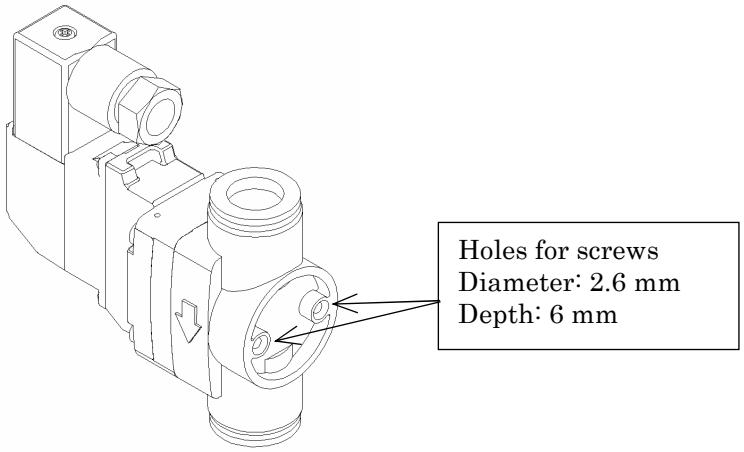
2．2 Installation

⚠ CAUTION	Do not fix the product by the piping (tube). ・Fix the Main Body firmly.

(1) Provide enough space around the product to enable installing, detaching, maintenance, and piping work.
(2) Install the product so that there is no tension to the lead wire and DIN terminal box.
(3) How to fix the product

① For product types without a Fitting Plate

Fix the product by screwing two self-tapping screws (nominal diameter 3 mm) into the two holes (diameter 2.6 mm, depth 6 mm) at the bottom side of the Main Body (refer to below).
Please provide the self-tapping screws.



・Decide the screw length according to the following:

Screw length L (mm) =

Thickness of the plate the valve is fixed on: T(mm) + hole depth: 6 (mm)

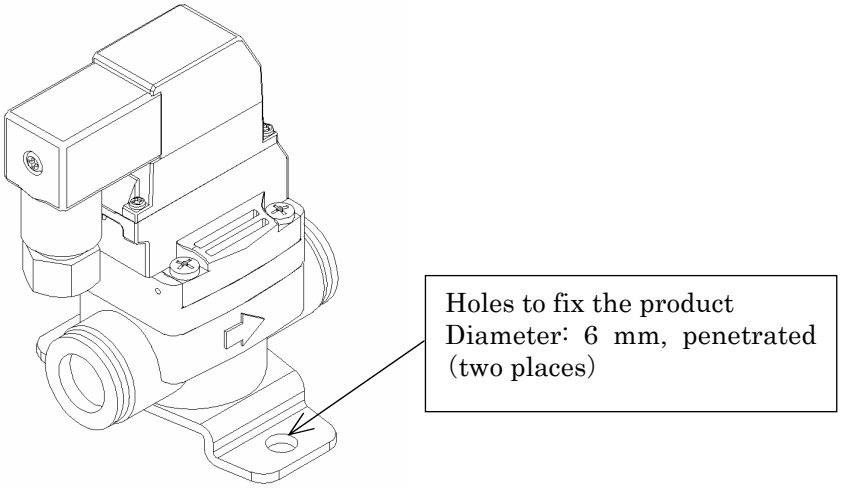
The valve may fail to be fixed firmly if screw length is longer than that calculated by the equation above.

Screw tightening torque varies according to the screw used; decide the appropriate torque for the screw used.

The material used for the Main Body is PBT-G30.

② For product types with a Fitting Plate

Fix the product by making use of the two 6 mm diameter throughholes on the Fitting Plate (refer to below).
Please provide appropriate means to fix the product.



2. 3 Piping

⚠WARNING	Before using the product, confirm that the tubes are inserted firmly into the push-in fitting until they hit the end, and that the tubes do not come off. ・Otherwise, the tube will come off and hop wildly when pressure is applied, resulting in accidents.

⚠ CAUTION	a) Perform piping so that connection at the fitting will not come off when movement, vibration, or tension is applied on that portion. b) When supplying compressed air after piping is finished, be sure to confirm that there are no air leaks at all joint portions. c) When piping is finished and compressed air is to be flown, supply pressure gradually. ・Otherwise, piping connection will come off and tube will hop wildly, resulting in accidents. d) Removal of foreign matter Foreign matter in the fluid causes malfunction and leakage. Attach a filter 5 μm or finer just before the pneumatic circuit. e) Primary side piping Do not restrict flow at the primary side. It may cause malfunction triggered by pressure drop when multiple valves operate at the same time.

(1) Flushing

Before piping, flush the tubes, valves, and related equipments to remove foreign matter.

(2) About piping connection

① Applicable tube

Use our tubes for push-in fitting type solenoid valves.

Soft nylon (F-1500 series)

Urethane (U-9500 series)

② Use fire-resistant tubes where welding spatter flies in all directions.

(3) About commercially available tubes

Note the outer diameter tolerance, thickness, and hardness of the tube if you decide to use commercially available tubes.

Use urethane tube with 93°or more hardness (rubber hardness tester).

Tubes that fail to meet the diameter tolerance and hardness allowed will have poor chucking performance. Tubes may come off or be difficult to insert in that case.

<Tube dimensions>

Outer diameter mm	Inner diameter mm	
	Nylon	Urethane
φ6	φ4	φ4
φ8	φ5.7	φ5
φ10	φ7.2	φ6.5
φ12	φ8.9	φ8

Outer diameter tolerance allowed

Soft or hard nylon ±0.1mm

Urethane φ6 +0.1mm -0.15mm

Urethane φ8, φ10, φ12 +0.1mm -0.2mm

(4) Tube bending radius

Tube bending shall be over the minimum bending radius. Otherwise, tubes may come off or leak.

Tube diameter	Minimum bending radius mm	
	Nylon	Urethane
φ6	20	20
φ8	30	30
φ10	40	40
φ12	55	50

(5) Cutting the tube

Use a tube knife, and cut the tube perpendicular to the tube axis. If the cut surface is slanted, air will leak from the slanted cut surface when it is inserted.

(6) State of tube connection

Provide a linear portion, length more than the tube outer diameter, from the tip of the fitting. Do not bend the tube excessively at the fitting entry.
Do not apply torsion, tension, and moment forces to the fitting and the tube.
Otherwise, tubes may come off, and may break.
Provide measures to prevent tubes from wearing out and being damaged.

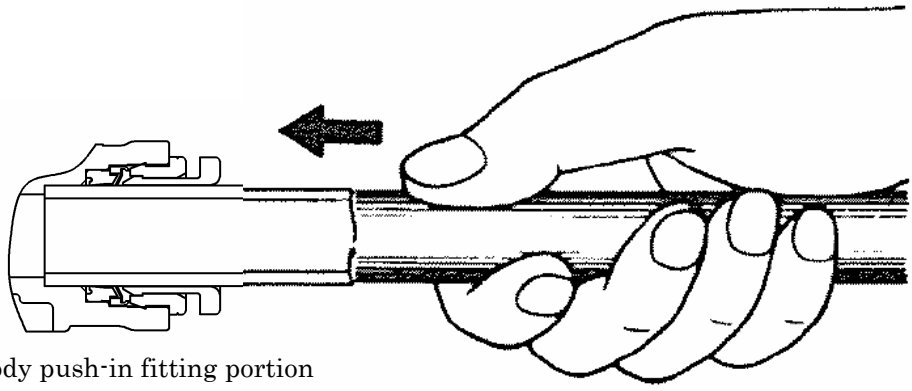
(7) Flow direction

Match the fluid flow direction with the arrow shown on the side of the product.

(8) How to attach and detach the tube

① How to attach

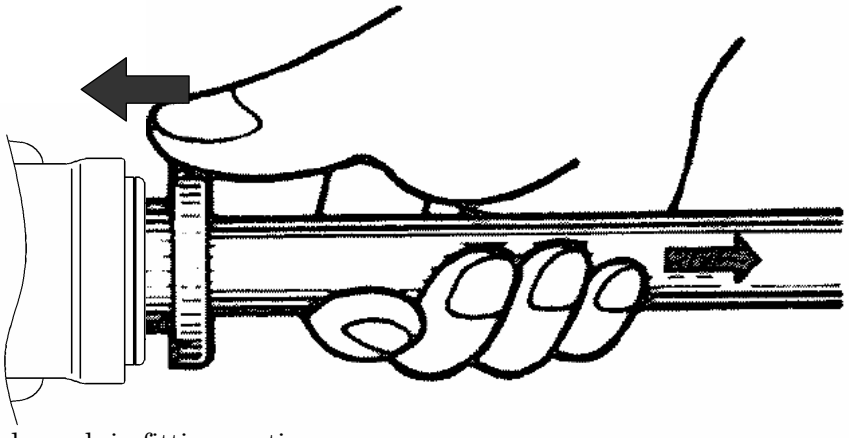
Cut the tube perpendicular to the tube axis.
Insert the tube firmly until it hits the end.
After inserting, pull the tube lightly to check whether the tube is chucked properly.



Body push-in fitting portion

② How to detach

Pull the tube while depressing the push ring to detach the tube.



Body push-in fitting portion

2. 4 Wiring

⚠WARNING

Read this instruction manual thoroughly and understand the contents before wiring the product.
・You need to understand the structure and the operation principle of the solenoid valve. You additionally need knowledge to secure safety.
Be sure to shut off the power before wiring. There is a risk of electric shock.

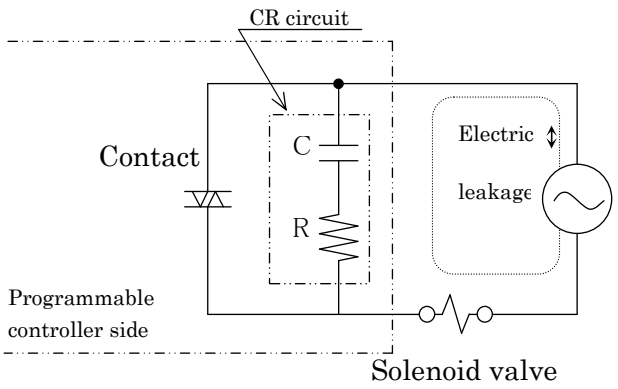
⚠ CAUTION

Confirm the alternating or direct current type of the power source before energizing.

⚠ CAUTION

To prevent unintended operation caused by electric leakage of other control components, confirm electric leakage.
・When using a control circuit such as a programmable controller, the solenoid valve may operate without intention because of the electric leakage from the control components.
When using this product, keep the electric leakage from other components below the value shown in the table below.

Rated voltage	Electric leakage
AC100V	2.0 mA or less
DC12V	1.5 mA or less
DC24V	1.8 mA or less



(1) How to wire the lead wire
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
Blank	Grommet lead wire	AWG#24	Equivalent to 0.22	φ1.42

(2) Wiring the DIN terminal box type

<1> Disassembly

Loosen Screw ①, and pull Cover ② in the direction of Screw ① to detach the DIN terminal box from Coil Assembly ⑫. Pull Screw ① out of Cover ②.

There is a notch ⑨ (beside the GDSN mark) at the bottom side of Gland ③. Inserting and prying a small screwdriver between Cover ② and Gland ③ will detach Gland ③ from Cover ② (refer to figure 1).

Do not apply excessive force when inserting and prying. Otherwise, the Gland may break.

Detach Cable Gland ④ and take off Washer ⑤ and Rubber Packing ⑥.

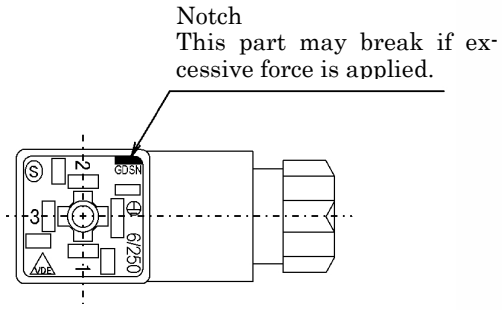


Figure 1 DIN terminal box notch

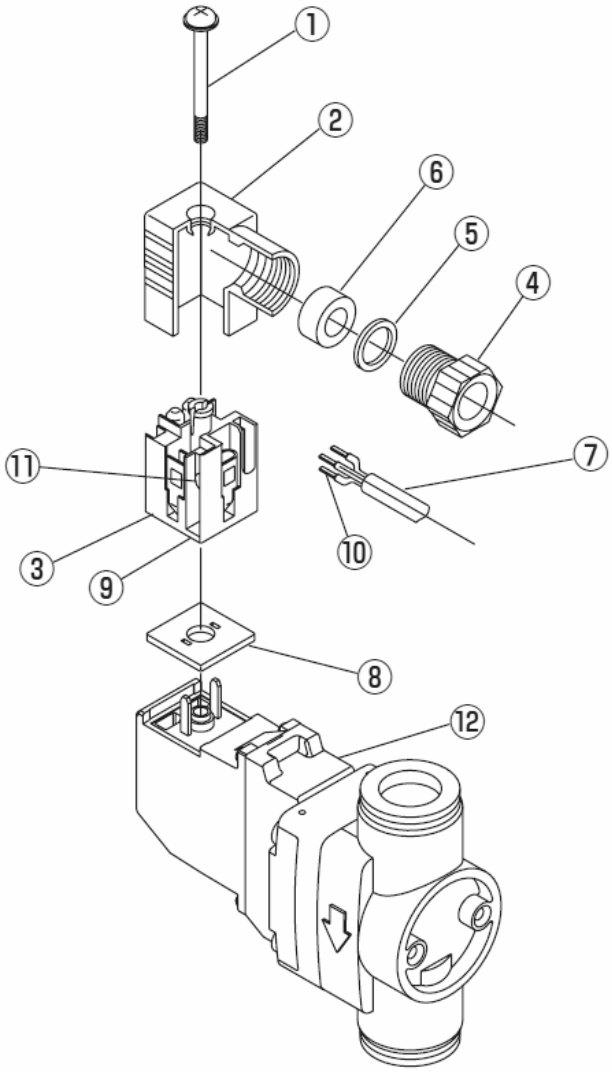


Figure 2 Exploded view of the DIN terminal box

<2> Connection

1) Preparation

・Applicable outer diameter dimension for cable ⑦ is VCTF (two or three cores) (φ3.5 to 7) defined in JIS C3306.
・Cable sheath peeling length is 10 mm.
・Both stranded wire and single wire can be connected.
・Do not connect stranded and soldered wire.
・If you use crimping sleeve ⑩ at the tip of the stranded wire,
use H0.5/6 (0.3～0.5 mm^2) or H0.75/6 (0.75 mm^2) made by Weidmueller Japan Co.,Ltd.
or equivalent. Please provide the crimping sleeve.

2) Connection

・Pass Cable Gland ④, Washer ⑤, and Rubber Packing ⑥ through Cable ⑦. Insert the Cable into Cover ②.
・Connect the wire onto terminal 1 and 2. There is no polarity.
・Recommended tightening torque is 0.2 to 0.25 Nm.

3) Assembly

Set the wire-connected Gland ③ into Cover ② (insert the gland until you hear a snap sound). You can set the gland in four directions (refer to figure 3).
Insert Rubber Packing ⑥ and Washer ⑤ in that order into the cable entrance of Cover ②. Tighten Cable Gland ④ onto Cover ② firmly.

Note: Reference tightening torque of the Cable Gland is 1.0 to 1.5 Nm.
Pull the cable, and confirm that it does not come off.

Insert Gasket ⑧ between the bottom portion of Gland ③ and the plug of Coil Assembly ⑫. Attach the DIN terminal box. Insert Screw ① over Cover ②, and tighten the Screw.

Note: Recommended screw tightening torque is 0.2 to 0.25 Nm.

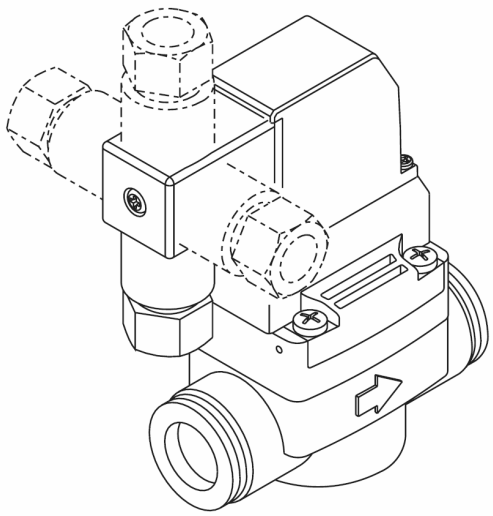


Figure 3 Attaching direction of the DIN terminal box

3. Pre-operation (post-installation) check

3. 1 Appearance check

⚠WARNING	Stop the flow of the fluid（shut the supply）. Discharge the fluid inside the product. Cut off the electricity.

(1) Confirm that the valve is fixed firmly.
(2) Confirm that the piping is done properly.

3. 2 Leakage check

(1) When piping is finished and air is to be flown, supply pressure gradually.
If the piping is improper, the tube will come off and hop wildly when pressure is applied, resulting in accidents.
(2) Confirm leakage at the connection part by applying pressure to the fluid.
We recommend leakage check by the following method:

- Supply compressed air (0.1-0.3MPa)
- Apply soap water to the portion to check for leakage
- Bubbles will appear if there is any leakage.

3. 3 Electrical check

⚠WARNING	Cut off the electricity. Check while taking serious care to avoid electric shock.

(1) Check the supply voltage.
Voltage variation shall be within 10 % of the rated voltage.
Use beyond the allowed variation range will cause malfunction or damage to the coil.
(2) Check insulation resistance
Check the insulation resistance between dead metal parts (such as screws) and uninsulated live parts (such as the tip of the lead wire) that are assembled to the product.
Confirm that insulation resistance is over 10 MΩ at DC500V megger.

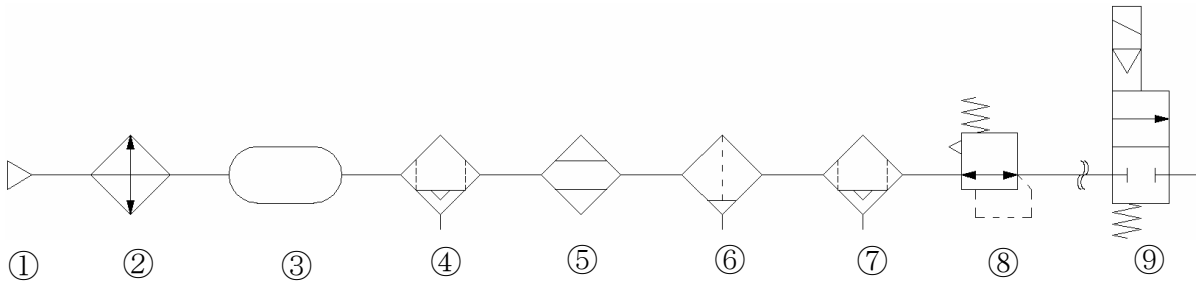
4. Instructions for proper use

4. 1 About air quality

⚠ CAUTION	a) Do not supply fluids other than compressed air. b) Use clean compressed air that is free of corrosive gas. c) Ozone density within the compressed air shall not be greater than 0.1 ppm. Otherwise, the valve may malfunction or leak. d) Compressed air contains large amounts of drain, oxidized oil, tar, foreign matter, and piping rust. They may become the cause of valve failure such as malfunction or short service life.

(1) Required air quality and recommended pneumatic circuit

・ Use this product under air quality described below.
JIS B 8392-1:2003 Compressed air purity class: 2.6.3



① Compressor
② Aftercooler
③ Surge tank
④ Main line filter
⑤ Refrigerated air dryer
⑥ Filter
⑦ Oil mist filter
⑧ Regulator
⑨ This product

(2) 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.

(3) Use dry compressed air that will not generate waterdrops (drain) inside the piping.
Otherwise, drain enters the product air flow path and clogs the flow path for a moment, resulting in malfunction.

(4) 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.

(5) 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.

(6) Install a pneumatic filter just before the solenoid valve.

4．2　About surge absorber

⚠ CAUTION

The surge absorber attached to the solenoid valve protects the output contact by which the solenoid valve is driven.

The surge absorber cannot protect other peripheral equipment; other peripheral equipment may be affected by the surge (break, malfunction). Additionally, the surge absorber may absorb surge caused by other equipment, resulting in breakage such as burnout.

Note the following:

a) A surge absorber suppresses solenoid valve surge voltage, which can reach several hundred volts, to a value that contact outputs can withstand. Depending on the output circuit, however, the performance of the surge absorber may be insufficient to protect other equipment; surge may break or malfunction other equipment.

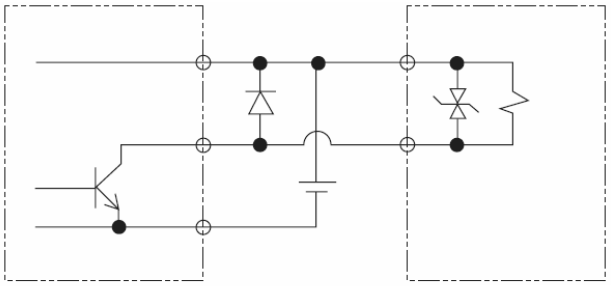
Determine whether the surge suppressor performance meet your needs beforehand; check the clamping voltage of the solenoid valve surge suppressor, withstanding voltage and circuit structure of output equipment, and degree of return time delay.

Provide separate measures against surge if needed. Surge absorber attached to this solenoid valve can suppress the reverse voltage surge at OFF to the following value:

Rated voltage	Reverse voltage surge when OFF
DC12V	Around 27 V
DC24V	Around 47 V

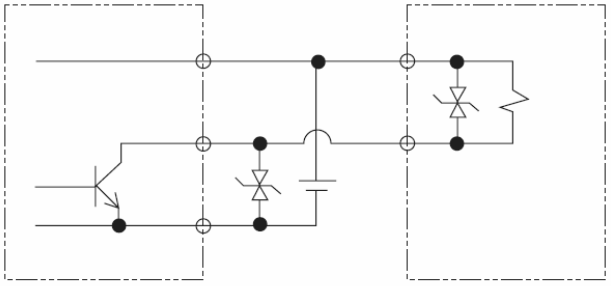
b) When the output unit is NPN type, voltage shown in the table above added to surge voltage from the source voltage may be applied to the output transistor; install a contact protecting circuit in this case.

<Example of output transistor protective circuit installation 1>



Programmable controller side　　Solenoid valve side

<Example of output transistor protective circuit installation 2>



Programmable controller side　　Solenoid valve side

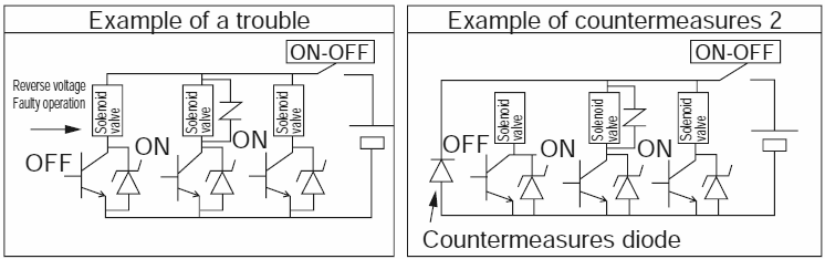
⚠ CAUTION

c) If other solenoid valves or equipment is connected parallel to a solenoid valve, reverse voltage surge generated at OFF is applied to those valves and equipment. Even for a DC24V solenoid valve with a surge absorber, surge voltage will reach several tens of negative volts. This reverse polar voltage may break or malfunction other parallel-connected equipment. Do not parallel connect equipment vulnerable to reverse polar voltage (e.g. LED indicator).

Additionally, if multiple valves that are connected parallel are energized at the same time, surge generated by other valves will be absorbed by the surge absorber attached in a solenoid valve. Depending on the current, the surge may burn the surge absorber. Also, when energizing multiple solenoid valves (each with surge absorber) in parallel, surge current concentrates to the surge absorber having the lowest clamping voltage, similarly burning that surge absorber.

Clamping voltage varies among surge absorbers even for a same solenoid valve model number. So, surge absorbers may burn for the worst conditions.

Avoid parallel connecting solenoid valves, and activating the valves at once.



d) Surge absorbers attached to solenoid valves generally form a short circuit if they are burned due to excessive voltage or excessive current. So, a large amount of current flows when the valve is energized after the surge absorber is burned. In worst cases, that may result in breakage or fire of output circuits and solenoid valves.

Do not continue energizing broken solenoid valves.

Additionally, provide an overcurrent protection circuit in the power supply or driving circuit. Or, use power supply or equipment with overcurrent protection, so that a large current does not flow continuously.

4．3　About pressure differential

⚠ CAUTION

a) Make sure to set pressure differential between the primary and secondary sides at and above 0.01 MPa when the valve is open for the following cases (if pressure differential is below 0.01MPa, the diaphragm vibrates and cause early breakage):

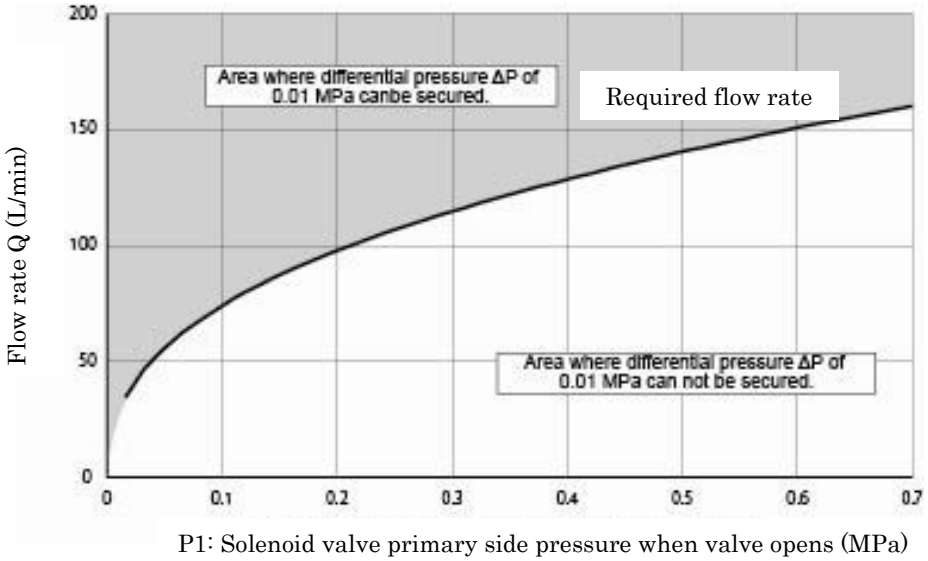
- ・When the secondary side is restricted (e.g. nozzle is attached)
- ・When multiple valves that are piped parallel are opened at the same time (decrease in supply pressure decreases pressure differential between the primary and secondary sides)
- ・If pressure differential between the primary and secondary sides cannot be at and above 0.01 MPa, or if pressure differential cannot be confirmed, we recommend using our pilot air external exhaust type.

(1) If flow is restricted at the supply piping side, shortage in pressure differential at valve operation destabilizes operation. Use proper supply piping size so flow is not restricted.

(2) If a regulator and a solenoid valve are directly connected, they may enter into resonance with each other and cause chattering.

(3) This product is a pilot operated solenoid valve which uses pressure difference between the valve primary and secondary sides to open and close the valve. Therefore, pressure difference (⊿P=P1-P2) not less than 0.01 MPa is needed to keep the valve open for sure. If ⊿P is short, diaphragm in the valve may vibrate and result in early breakage.

Pressure difference ⊿P is determined by valve flow rate Q; the larger the flow rate Q, the larger the pressure difference ⊿P. Figure below shows the reference flow rate value required to keep the pressure difference not less than ⊿P=0.01 MPa when the valve is open. Using the figure below, confirm that there is enough pressure difference ⊿P for your intended usage flow rate.



P1: Solenoid valve primary side pressure when valve opens (MPa)

Notes below lists examples when pressure difference ⊿P and flow rate Q cannot be maintained.

- When flow rate is restricted at the valve primary or secondary side. Such case includes the use of throttles, nozzles, or long piping.
- When air supply capacity is short (including use of regulators with short capacity, use of throttles, or use of long piping).
- When other equipment that share a common air supply (such as from a common regulator) consumes large amounts of air at all time or temporarily.
- When air supply pressure fluctuates, resulting in flow rate change and decrease.
- When multiple valves open at the same time.

If flow rate cannot be maintained to keep the pressure difference not less than 0.01 MPa, or if flow rate cannot be confirmed, we recommend using our pilot air external exhaust type.

4. 4 Other usage precautions

⚠ CAUTION	a) Do not touch the coil portions or AC voltage rectification stack portions when energized or immediately after energizing, since those portions generate heat. b) When carrying the product, hold the main body. ・Do not carry the product by the lead wire, or by the cable attached to the DIN terminal box. Otherwise, the wire may break or have bad continuity. c) Do not apply back pressure（pressurizing from the secondary side）to the product. ・Otherwise, the product may malfunction or break.

(1) About instantaneous leakage
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).
(2) 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.
(3) 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.
(4) If any abnormalities occur, refer to “6. Troubleshooting”.

4. 5 About disassembly

⚠ CAUTION	Do not disassemble the product. Otherwise, valve performance may degrade. ・Disassembled and reassembled products will not be guaranteed(excluding DIN terminal box connection portion).

5. Maintenance

⚠WARNING	Shut off the power supply and release the fluid and pressure before performing maintenance work.

5. 1 Maintenance and inspection

Regularly inspect the product to ensure optimum performance. The product should be inspected every half year.
Refer to “3. Pre-operation check” for contents of inspection.

5. 2 Parts for maintenance

We do not provide maintenance parts.
Please contact CKD or your nearest agent if the product shows abnormalities such as leak or malfunction while use.

6. Troubleshooting

If the product fails to operate as intended, check according to the following table.

State of failure	Cause	Countermeasure
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	Electricity is not shut off.	Check for leak of electricity. Modify the circuit so electricity is completely shut off.
	Applied fluid pressure is beyond the specified range.	Set pressure within specified range.
	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	Diaphragm is damaged or deformed.	Replace the product.
	Gasket is damaged or deformed.	Replace the product.
	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.

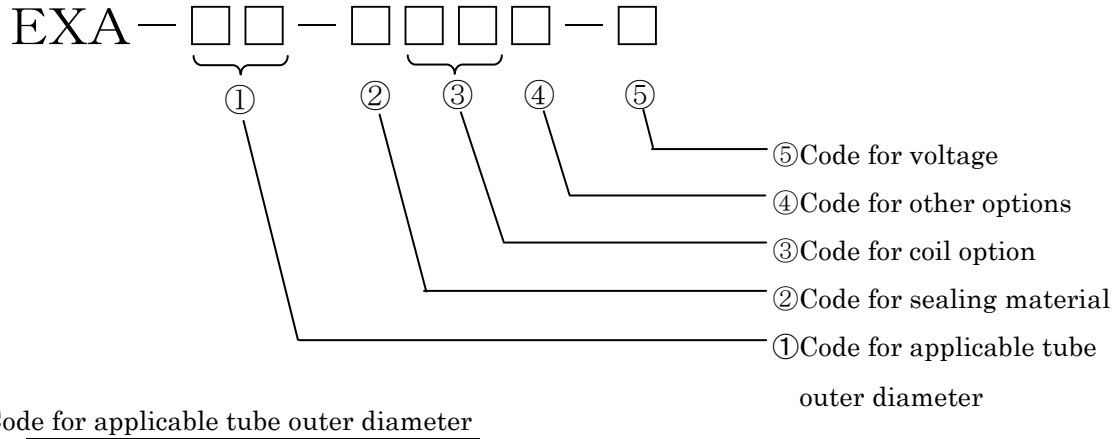
Please contact CKD or your nearest agent for any unclear points.

7. Product specification and model number display

7. 1 Product specification

Model			EXA			
1. Valve structure			Pilot operated 2 port solenoid valve, normally closed			
2. Withstanding pressure (water)			1.05 MPa			
3. Fluid specifications	Fluid		Compressed air (JIS B 8392-1:2003 Compressed air purity class:2.6.3)			
	Fluid temperature		0 to 55 ℃ (no freezing)			
	Max. working pressure		0.7 MPa (external exhaust type: 0.3 MPa)			
	Working pressure differential		0.01 to 0.7 MPa (external exhaust type: 0.01 to 0.3 MPa)			
	Internal leakage		2 cm^3/min or less			
	External leakage		2 cm^3/min or less			
4. Electrical specifications	Duty cycle		Continuous			
	Voltage		DC24V, DC12V, AC100V (voltage variation shall be within ±10 %)			
	Power consumption		0.6 W (DC)			
	Apparent power		1 VA (AC)			
	Insulation resistance		10 MΩ or more at DC500V			
	Withstand voltage		There shall be no abnormality after applying AC1000V (commercial frequency) for 1 minute			
	Insulation		Thermal class B JIS C 4003			
	Increase in coil temperature		50 K or less at rated voltage and at ambient temperature 20 to 30 ℃.			
5. Usage conditions	Ambient temperature		-5 to 55 ℃(no freezing)			
	Ambient humidity		85 % or less			
	Mounting posture		Not restricted			
	Ambient atmosphere		Atmosphere shall not be corrosive nor explosive Places free from liquids such as water, oil, and welding spatter Places free from radiant heat			
6. Shape	Port		φ6 Push-in joint	φ8 Push-in joint	φ10 Push-in joint	φ12 Push-in joint
	C value (dm^3/(s/bar))		1.6	3.0	3.3	3.6
	Mass	Lead wire type	56	57	68	69
		DIN type	76	77	88	89
7. Note	Protection rating		Lead wire type: IPX0 DIN type: IPX5			

7．2　Model number display



①Code for applicable tube outer diameter

Code	Tube outer diameter
C6	φ6
C8	φ8
C10	φ10
C12	φ12

②Code for sealing material

Code	Sealing material
0 (zero)	H-NBR internal exhaust type
H	H-NBR internal exhaust type, oil prohibit type (notes 1)
1	H-NBR external exhaust type (notes 2)

(Notes 2)　"Oil prohibit" is a type that has its parts washed and assembled under the following conditions:

(1-1)　Parts to be washed：Parts that come in contact with the fluid air in the flow path (excluding parts that degrade if washed).

(1-2)　Cleaning solution：Industrial alcohol or fluorine-based cleaning solution

(1-3)　Assembling facility：Normal assembling and inspection facilities

(Notes 3)　Please confirm the pressure specifications.

③ Code for coil option

Code	Coil option
2C	Lead wire (without lamp and surge absorber)
2G	DIN terminal box (Pg 7), without lamp
2GS	DIN terminal box (Pg 7), without lamp, with surge absorber
2H	DIN terminal box (Pg 7), with lamp (built in the terminal box)
2HS	DIN terminal box (Pg 7), with lamp and surge absorber (built in the terminal box)
2KS	DIN terminal box (Pg 7), with lamp and surge absorber (built in the terminal box), with M12 connector cable

④ Code for other options

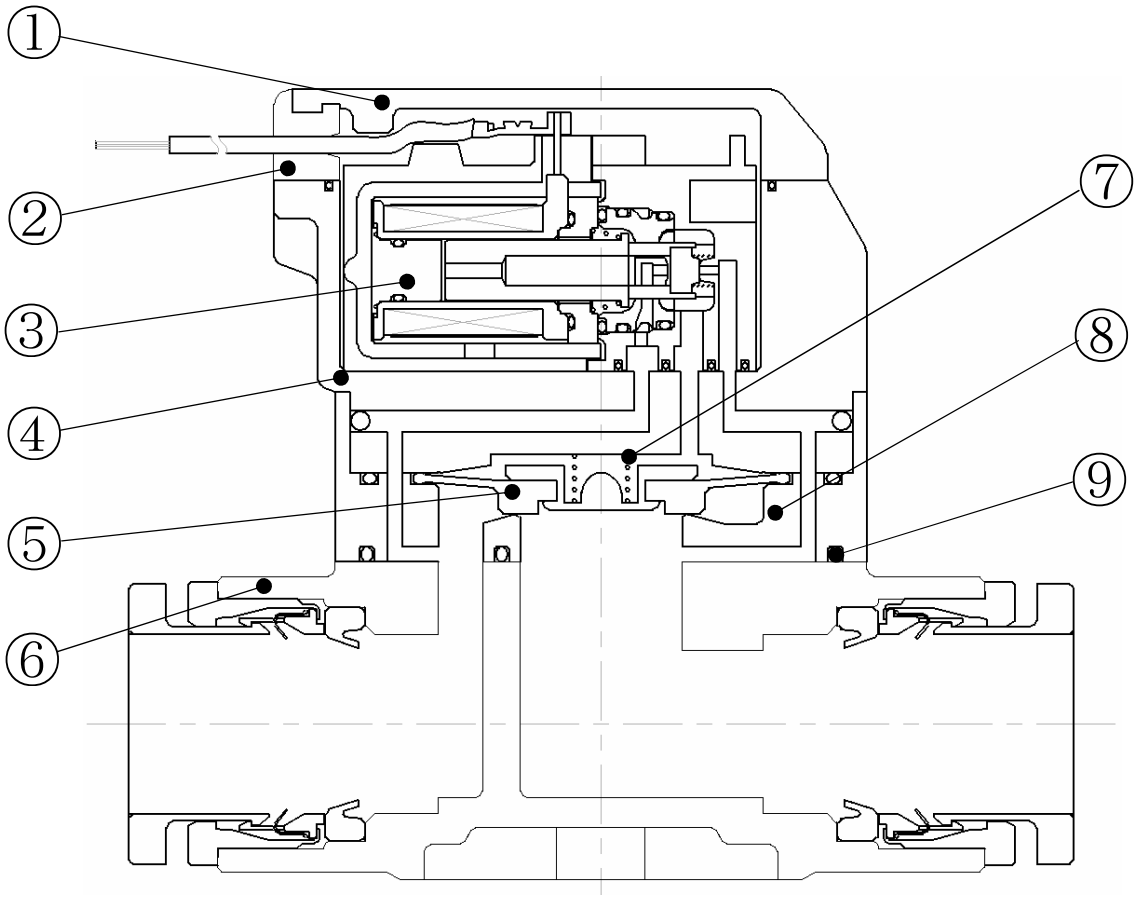
Code	Option
No code	No option
B	With fitting plate

⑤ Code for voltage

Code	Voltage
1	AC100V
3	DC24V
4	DC12V

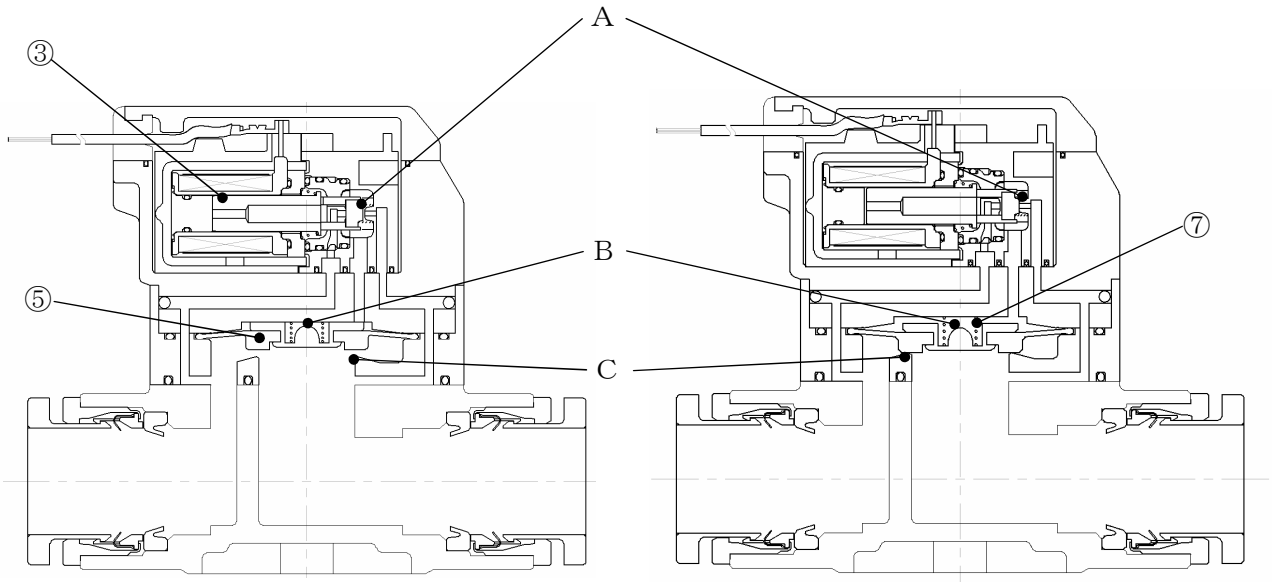
8. Internal construction

(Figure shows the lead wire type)



No.	Part name	Material
1	Lead Wire Cover	PBT
2	Lead Wire Bushing	NBR
3	Pilot Valve Assembly	－
4	Stuffing Assembly	PPS
5	Diaphragm Assembly	HNBR
6	Main Body	PBT
7	Spring	Stainless steel
8	Valve Body	PBT
9	Gasket	HNBR

9. Operation explained



Open　　Closed

(1) Opening operation

Energizing Pilot Valve Assembly ③ switches pilot flow path A in the Pilot Valve Assembly, which flows air inside pilot chamber B through the valve secondary side.

Here, pressure in pilot chamber B becomes lower than pressure in the primary side (pressure below Diaphragm Assembly ⑤). That makes Diaphragm Assembly ⑤ to rise, resulting in flow of air from the primary side to the secondary side through valve seat C.

(2) Closing operation

De-energizing Pilot Valve Assembly ③ switches pilot flow path A in the Pilot Valve Assembly, which flows air into pilot chamber B.

Here, pressure in pilot chamber B becomes the same with pressure in the primary side (pressure below Diaphragm Assembly ⑤). That causes Diaphragm Assembly ⑤ to lower because of force by Spring ⑦, and to close valve seat C and stop flow.