SM-10499-A

CKD

INSTRUCTION MANUAL

PULSE JET VALVE

PD2 SERIES

PDV2 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.3

CKD Corporation

Introduction

Thank you for choosing the CKD's pulse jet valve "PD2, PDV2".

1. Purpose and use of the valve

This valve is 2-port pilot type air-operated valve to pay and to drop the dust that adheres to the bag filter of the bug type dust collector. It aims at the change of pulse jet mainly, the operation response is improved, and it has the characteristic of about 50 to 1000ms that is appropriate for operation for a short time.
Use it after understanding this characteristic enough when using it for other usages.

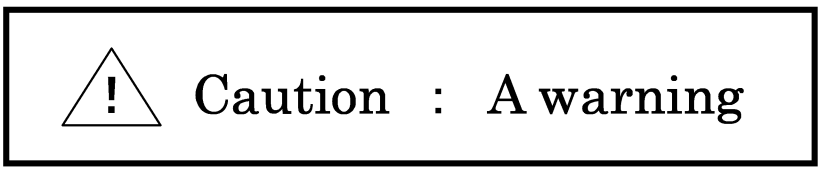
2. General precautions

- This instruction manual describes the basic matters regarding the handling of the product from the unpacking, installation, use, maintenance through withdrawal.
- The instructions for installation given by this manual assume that they will be read by specialist engineers, i.e.mechanics and electricians. Thoroughly read this manual before the design and installation in order to assure the safety of the machine or instrument and properly handle the product.

3. Safety precautions

- To avoid injury, fire and damages to the facilities, the warnings shown on the product shall be strictly observed. Please observe absolutely.
- Each warning has a heading "Danger", "Warning" or "Caution" depending on the rating of the possible risk. As these valves are used as components of a machine or instrument, all the warnings are shown with the heading "Caution."

Example



【 Contents 】

1. Unpacking

Check that the model No. shown on the nameplate of the product matches with that you ordered.

- Check that the rated voltage and frequency meet your specification.
- Check that the product has no external damages.
- When storing the product, attach a seal plug to prevent foreign matter from entering the valve. Remove the seal plug when piping the valve.

2. Installation

2. 1 Conditions for installation

2.1.1 Protection of the product

- Outdoor use

  PD2 type can be used outdoors.

  PDV2 type cannot be used outdoors. Installing the valves in a cover or panel should protect them.
- Use in a cold district

  When using the valve in a cold district, an adequate provision is required to prevent the freezing of the valve.
- Corrosive environment

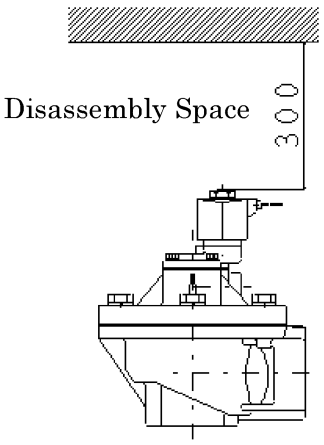
  Do not use in the corrosive gas atmosphere or in the explosive gas atmosphere.

  If the treatment gas of the dust collector contains corrosive gas, care should be taken that the corrosive gas will not flow into valves.

2.1.2 Mounting Style

- The mounting position of the valve is not specified.
- The valve cannot be used in a place where it will be exposed to the vibration larger than 4.3G.

2.1.3 Space for maintenance



(Figure 2－1)

An adequate space shall be provided around the valve to assure the safety during the maintenance / troubleshooting work.

Secure the space for the tool removing loincloth as shown in Figure 2－1 above the valve.

Secure space about other space to do the installation putting up and detaching the valve.

2. 2 Piping work

● Cleaning the pipes

Before piping the valve, check that the pipes are free from foreign matter, cutting chips and burrs. If the pipes need to clean, remove the foreign matter, cutting chips and/or burrs inside the pipes using compressed air with a pressure of 0.3 MPa or more.

● Air filter

Install a 5μm or less air filter before the valve. The rusting of the inside of the pipes may lead to a malfunction or leakage. Select it in consideration of the supply capacity to the header tank though the filter recommends the same caliber as the valve.

● Flowing direction of the fluid

Lay pipes to match the IN side of the direction of the flow of the fluid to the IN port displayed in the product.

● Sealer

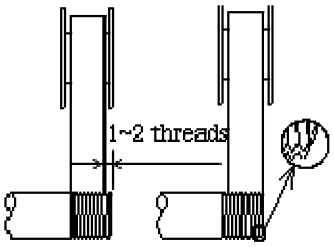
The sealer shall be used with great care to prevent it from entering the pipes or leaking out.

When taping a threaded portion, 1 to 2 threads at the end of the portion shall be exposed. (Figure 2－2)

When using liquid sealer, take care not to apply too much sealer. Similarly to the case of taping, threads at the end of the threaded portion shall be exposed. (Figure 2－3)

Do not apply to the female screw of the apparatus.

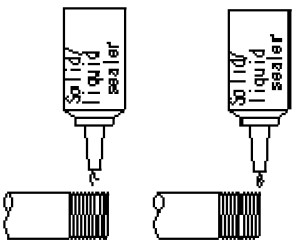
●Seal tape



(Good) (Not good)

(Figure 2－2)

●Solid/liquid sealer



(Good) (Not good)

(Figure 2－3)

● Piping tightening torque

Please refer to Table 2-1 for the tightening torque when pipes is laid.

Table 2－1. Recommended valves of the torques for tightening pipes

Nominal size of pipe	Torque for tightening (recommended)
Rc 1/4	12 ～ 14 [N･m]
Rc 3/8	22 ～ 24 [N･m]
Rc 2	54 ～ 56 [N･m]

● Silencer tightening torque

The tightening torque of the silencer (The optional: our company model number SLW-10A) is about 3.0N･m.

Please confirm the specification of a product concerned about other products.

- Lubricated or non-lubricated operation
  The valve dose not require lubrication. Therefore, no lubricator is needed.
- Minimum differential pressure
  A differential pressure of 0.1 MPa or more is required for the valve to operate.
  If the sectional area of the pipe at the fluid supply port is too small, the valve operation may become instable due to the insufficient differential pressure. For the fluid supply port, use a pipe of the size that fits the inside diameter of the connector port of the valve.
  Moreover, avoid piping with the nipple with a small inside diameter.
  Please select capacity of the header tank enough so that the header tank pressure should not fall on the lowest operation differential pressure in the valve actuation.
- Air supply quantity
  Secure about is two to three times the consumed quantity of air for the supply capacity in the air source.
- Capacity of header tank (When it is used for the payment drop of the bag filter)
  When the header tank is small, enough work cannot be done in the part of the latter half of the pulse because the tank pressure falls in the valve actuation, and the air of the quantity becomes useless. Please set capacity that is larger than Table 2-2.

Table 2－2. Lowest capacity of header tank “recommendation”

Energizing time	100ms		200ms	
Tank pressure	0.3 to 0.5MPa	0.5 to 0.7MPa	0.3 to 0.5MPa	0.5 to 0.7MPa
capacity of tank	170Liter	200Liter	340Liter	400Liter

2. 3 Wiring work (Solenoid valve type : PDV2)

●Continuous power supply

Long continuous electric current will raise surface temperature of coils of solenoid valves. Be careful not to touch directly for rear of a burn.

●Permissible limit of leakage current

When operating the solenoid valve using a programmable controller or equivalent, ensure that the leakage current from the output line of the programmable controller will not exceed the following level.

Table 2－3. Permissible limit of leakage current

Rated voltage	Permissible limit of leakage current
AC100V	6mA or less
AC200V	3mA or less
DC24V	1mA or less
DC12V	2mA or less

●Maintenance of electric installation

Use the breaker such as fuses for the control circuit side to maintain the electric installation.

2. 3. 1 Electric connection of grommet lead wire

This item is applied to the grommet coil products of coil option code “2C” and the open frame products of “3A” and “4A”.

●The lead shall be connected using a crimped terminal or sleeve specially designed for copper leads.

●If there is a possibility of leaked electricity at the electric connection, it shall be adequately insulated.

●There is no polarity for DC coils.

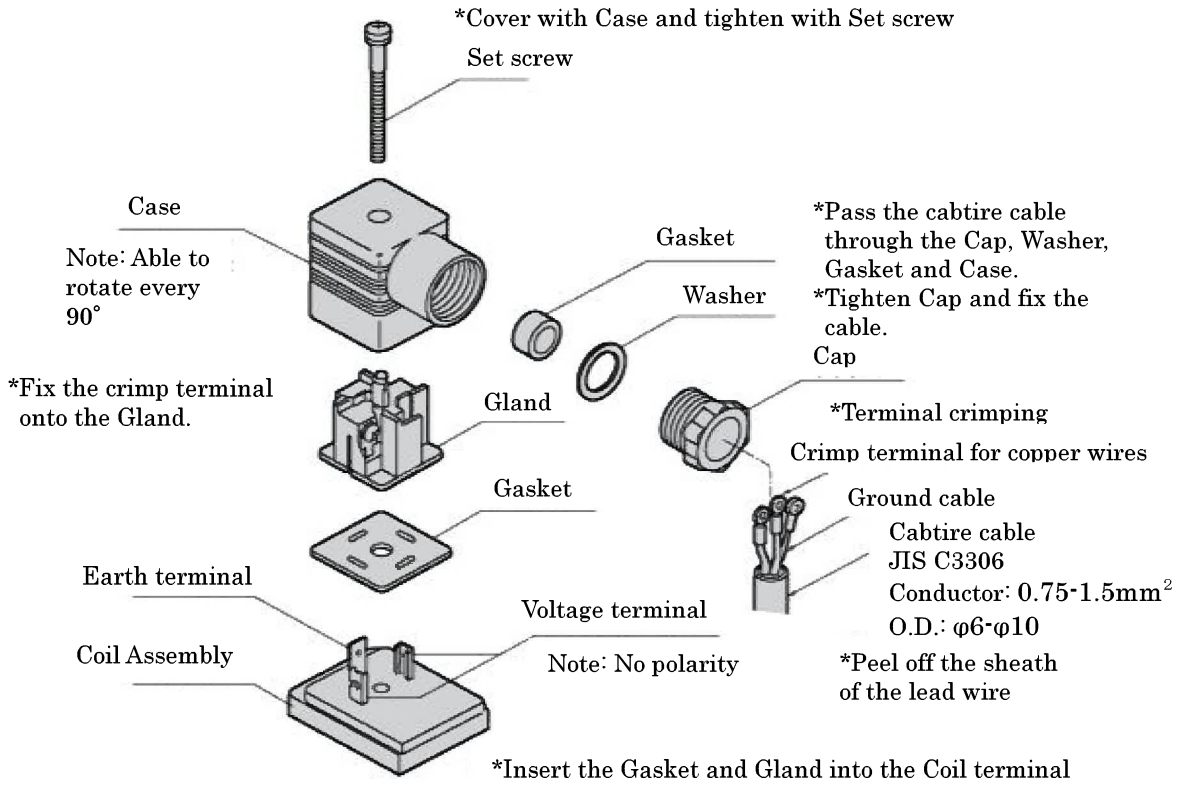
2. 3. 2 Electric connection of DIN terminal box

This subsection applies to the valves with DIN terminal box. This item is applied to optional coil code “2E” “2G” or “2H”.

●For the cabtyre cord, used.
Code outside diameter： ϕ6 to ϕ10
Nominal sectional area：0.75～1.5 mm^2
●Pass a cap, washer, gasket and casing through the cabtyre cord.
●Pass a crimped terminal specially designed for copper leads through the lead of the cabtyre cord and crimp the terminal.
●Fix the crimped terminal on the terminal block.

⚠ Caution	●Take care not to connect the terminal box in a wrong manner. ●The terminals with markings ① and ② on the terminal block are for conductors. ●The terminal with a marking GND on the terminal block is for grounding.

●Enclose the terminal block with the casing.
●Tighten the cap to fix the cabtyre cord so that it will not come off.
●Insert the DIN terminal box to the coil with the grounding terminal of the coil aligned with that on the terminal block. Tighten fitting screw in the terminal box with 0.5N･m.
●To change for the code taking out, the terminal box is put out from the case, it rotates by 180°, and it pushes it into the case.



2. 3. 3 Electric connection of T type terminal box

This subsection applies to the products with HP terminal box.

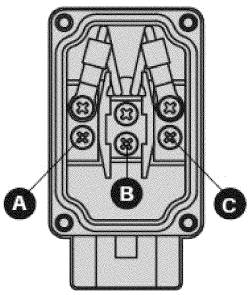
●Use the following cabtire cable.

Nominal sectional area
0.75mm^2

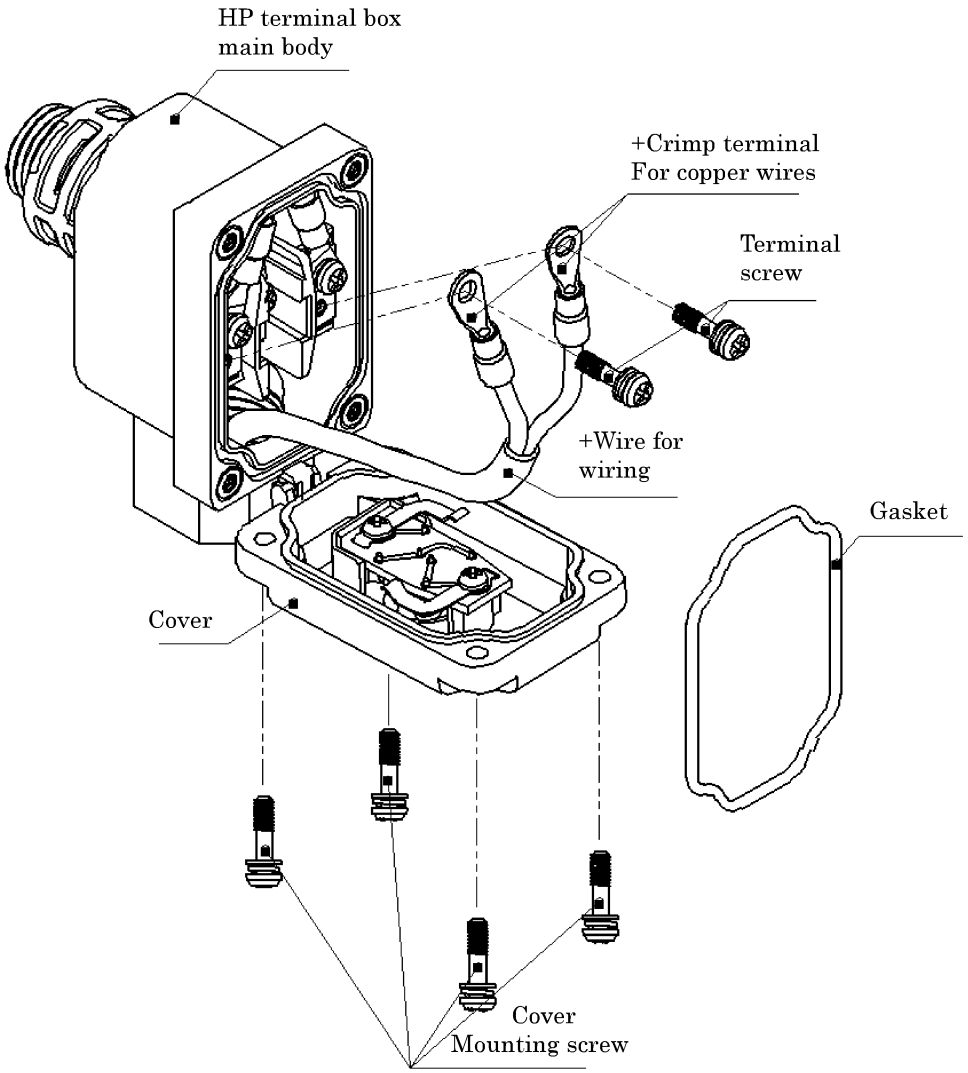
●Crimp the crimp terminal for copper wires to the lead wire of the cabtire cable.
The size of the terminal screw in the DIN terminal box is M3.

●Tighten the screw with torque shown below.

Terminal box mounting set screw	Terminal screw
0.5Nm	0.5Nm



●Wire to A terminal and C terminal on the terminal board.
For DC voltage terminal box with liting.
There is polarity, so wire the "⊖ "pole to the terminal board's A terminal and the "⊕ "pole to the C terminal.



Parts marked with "+" are not included in the product.

3. Pre-operation (post-installation) check

3. 1 Appearance check

 Caution	●Shut off the fluid flow. (The main cock is shut.) ●Exhaust the fluid remaining in the valve(in header tank). ●Turn off the power supply.

●Push the valve with hand to check that the valve has been fixed to the pipe.

●Check that the screw parts securing the valve are not loose.

3. 2 Check for leakage

●Compress the fluid to check for leakage at pipe joints.

It is recommended to check for leakage by supplying compressed air having a pressure of 0.3 to 0.5MPa with soapy water applied to the joints. Air bubbles will be found If a joint is faulty.

3. 3 Electrical check

 Caution	●Turn off the power supply .

●Check the dielectric resistance.

Measure the dielectric resistance using a 1000V DC mega ohmmeter between a metallic part such as screw fixing the valve and the active part of the lead. The measured dielectric resistance shall be 100M ohms or more.

●Check the supply voltage.

The voltage fluctuation shall be within ±10% of the rated voltage.

Usage in a out range of allowable voltage cause a misoperation or coil burning.

4. Instructions for proper use

⚠ Caution	●When the solenoid valve is continuously operated, it will be heated. Do not touch it by hand while it is energized. ●If there is a possibility that the operator may trip on a power cable, it may lead to an accident. Protect the power cable using a conduit or equivalent. ●It isn't possible to use for an urgent blocking-off valve. ●Use it within the range of the specification pressure. ●Install a silencer at the exhaust port of the valve to reduce the noise to be given to the personnel working around the machine.

●Do not put any object that weighs 1 kg or more on the valve.

●The voltage variation shall be within ±10% of the rated voltage.

●The time for applying power shall be determined according to the required specification of the dust collector.

●The response of PD2 series changes in the effective sectional area of solenoid valve for the operation. Moreover, the inside diameter and the length etc. of tube connected with the pilot operation port change. We will recommend that the operation piping condition be made common with each valve so that there is no difference in the payment drop of bag filter and durability. Refer to Table 4-1 for operation piping condition.

Table 4－1. Recommended operation piping condition

Operation piping length	Operation piping inside diameter	Orifice of solenoid valve for operation	Effective sectional area of solenoid valve for operation
1m or less (recommendation)	φ6	φ3 corresponding (※2)	5.8 to 6.2mm²
1m or more (※1)		φ3.5 to 5 corresponding (※2)	8.2 to 15.3mm²

※1:When the operation piping becomes long, open time of solenoid valve for the operation to energizing time tends to shorten, and to fall the pulse pressure.
The payment drop ability can be properly adjusted by lengthening energizing time, and raising tank pressure. Confirm the operation test is executed beforehand when it is longer that the piping length for operation than 1m, and the valve operates normally under real machine condition.

※ 2:Select size with a large orifice diameter when it is long that the piping length for the operation.
There is no problem even if size with a large orifice diameter is selected when the length of piping for operation is short.

●Solenoid valve for operation of PD2 series recommends product of our company in Table 4-2.

Table 4－2. Recommended solenoid valve for operation

Recommended product	Usage
PJVB series	Six valves or more are installed in outdoor.
FAB31 and 41 series GFAB35, 45, and 55 series	Number of valves is little, and valve is installed in room or panel.
AB41E4 series	Resisting pressure explosion-proof type.

●If not used for 7 days or more, perform a test run before starting operation.

●Periodically empty the drain in the air filter. (Regular check recommendation)

●Filter element of the air filter might be stained with tar adhesion so that the filter element should be exchanged at regular intervals. (Regular check recommendation)

●Moreover, it is stopped up of silencer when there is a change in valve action in removing silencer. Please exchange it for a new silencer. (Regular check recommendation)

●If any abnormal condition is found, see section 7 “Troubleshooting.”

●Do not use in the corrosive gas atmosphere or in the explosive gas atmosphere.
If the treatment gas of the dust collector contains corrosive gas, care should be taken that the corrosive gas will not flow into valves.
Moreover, seal material cannot even use product of urethane under the environment that a small amount of corrosive fluid enters.

●When the fluid and the ambient temperature become under the freezing point, damage of valve and clinging of seal of valve are caused by freezing.
Execute pressurizing and driving beforehand after it defrosts with warming.

5. Disassembly and assembly

5. 1 Disassembly procedure (Refer to 5.3 Assembly)

Caution	●Stop the flow of fluid. ●Exhaust the fluid inside the valve (inside heater tank). ●Turn off the power supply.

●Before disassembly, be sure to turn off the power supply, and exhaust fluid /pressure.

●Detaching of coil assembly ⑤

Nut ① are removed. Please note the fall of parts.

●Detaching of plunger assembly ⑩

Core assembly ⑧ is removed. Next, spring ⑨ and O-ring ⑪ are taken out.

●Detaching of pilot diaphragm assembly ⑮

Four hexagon head bolts ⑫ are removed. Please note the fall of parts such as spring.

●Detaching of main diaphragm assembly ⑲

Six hexagon head bolts with spring washer ⑯ are removed. Please note the fall of parts such as spring.

●Clean each part with neutral detergent, ethyl alcohol (Pure water).

Moreover, don't use any organic solvent either, because the rubber and resin products could be swollen/deteriorated by it.

5. 2 Assembly procedure (Refer to 5.3 Assembly)

●When re-assembling, be sure to assemble the parts in the reverse order of the procedure for disassembly.

Notes : Part forgetting, Mistake for assembly, Including a bite of parts

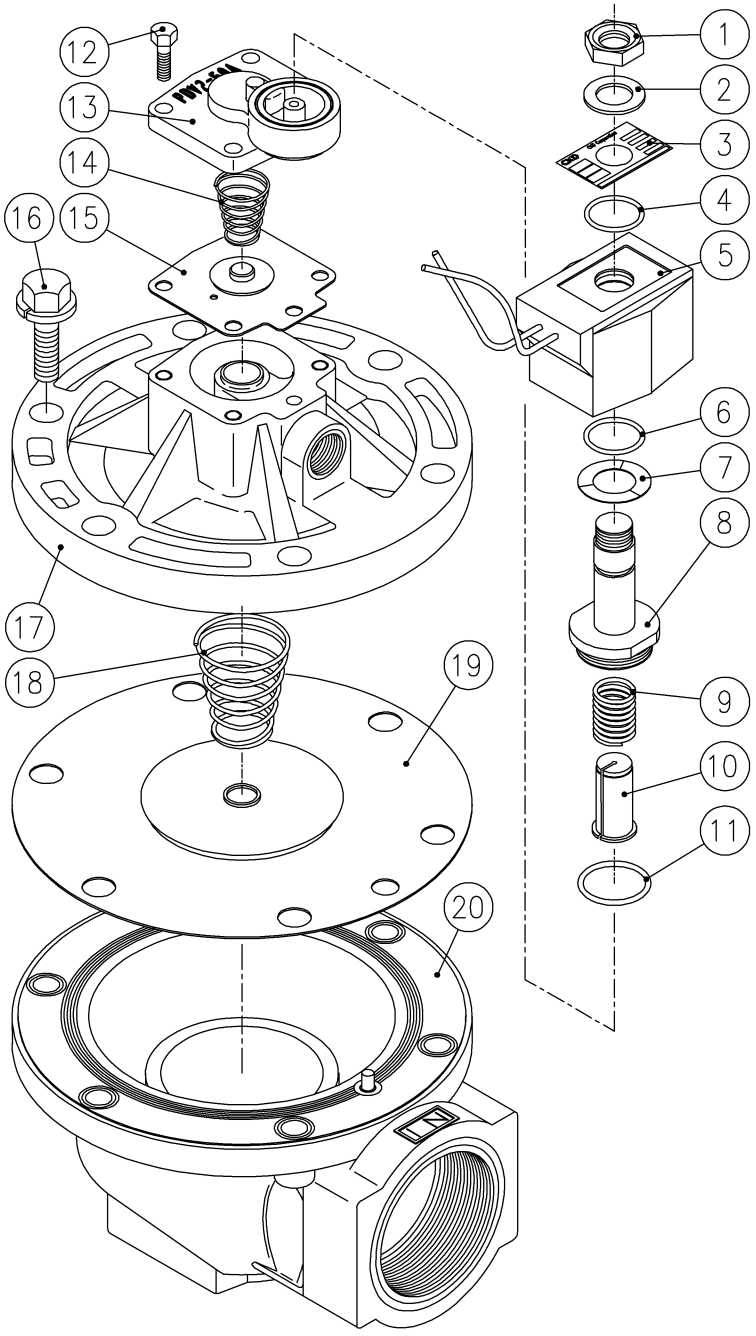
●When the product is reassembled, tighten the threaded parts with torque shown in Table 5-1.

Table 5-1. Recommended value of tightening torque such as screws and bolts

	Parts No.	Screw size	Tightening torque
NUT	①		8～16 [N・m]
CORE ASS'Y	⑧		30～45 [N・m]
HEXAGON BOLT	⑫	M5	2.9～3.2 [N・m]
HEXAGON BOLT	⑯	M10	24.5～36.8 [N・m]

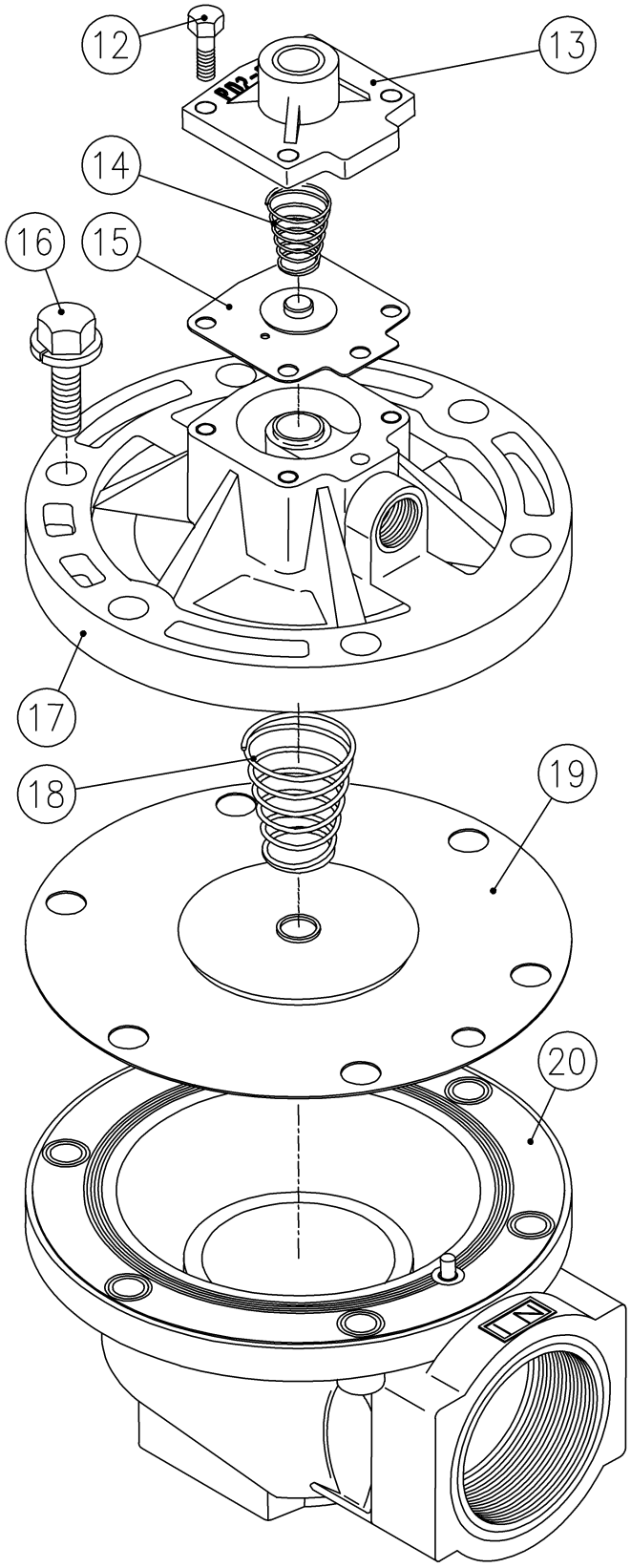
5. 3 Disassembly

5. 3. 1 PDV2−50A Disassembly



No.	PARTS	No.	PARTS
①	NUT	⑪	O−RING
②	SPACER	⑫	HEXAGON BOLT
③	NAME PLATE	⑬	CAP
④	O−RING	⑭	PILOT SPRING
⑤	COIL ASS'Y	⑮	PILOT DIAPHRAGM ASS'Y
⑥	O−RING	⑯	HEXAGON BOLT
⑦	WAVING WASHER	⑰	STUFFING
⑧	CORE ASS'Y	⑱	MAIN SPRING
⑨	SPRING	⑲	MAIN DIAPHRAGM ASS'Y
⑩	PLUNGER ASS'Y	⑳	BODY

5. 3. 2 PD2−50A Disassembly



No.	PARTS
⑫	HEXAGON BOLT
⑬	CAP
⑭	PILOT SPRING
⑮	PILOT DIAPHRAGM ASS'Y
⑯	HEXAGON BOLT
⑰	STUFFING
⑱	MAIN SPRING
⑲	MAIN DIAPHRAGM ASS'Y
⑳	BODY

6. Maintenance

6. 1 Maintenance and inspection

●In order to use this product in the optimal state, please usually perform a scheduled inspection once in half a year.

●Refer to "3. Pre-operation check " for the contents of check.

6. 2 Service parts

●Diaphragm assembly

Exchange diaphragm assembly while using it when it leaks, and delay of operation and abnormality of no opening etc. are found.

・Exchange standard

NBR : Cycles number ・・・ 500,000

FKM : Cycles number ・・・ 300,000

We will recommend three years to be exchanged for the standard even when there is no problem on externals. Parts are common in PD2 and PDV2.

Parts	Seal material (optional sign)	
	NBR(Blank)	FKM(-F)
PILOT DIAPHRAGM ASS'Y	PD2-50A-PD-KIT	PD2-50A-F-PD-KIT
MAIN DIAPHRAGM ASS'Y	PD2-50A-MD-KIT	PD2-50A-F-PD-KIT

※There are four kinds of above-mentioned kits, that is diaphragm assembly, spring, spacer, and O ring.
Please have all parts exchanged together when you exchange it.

●Actuator assembly (Solenoid valve type : PDV2)

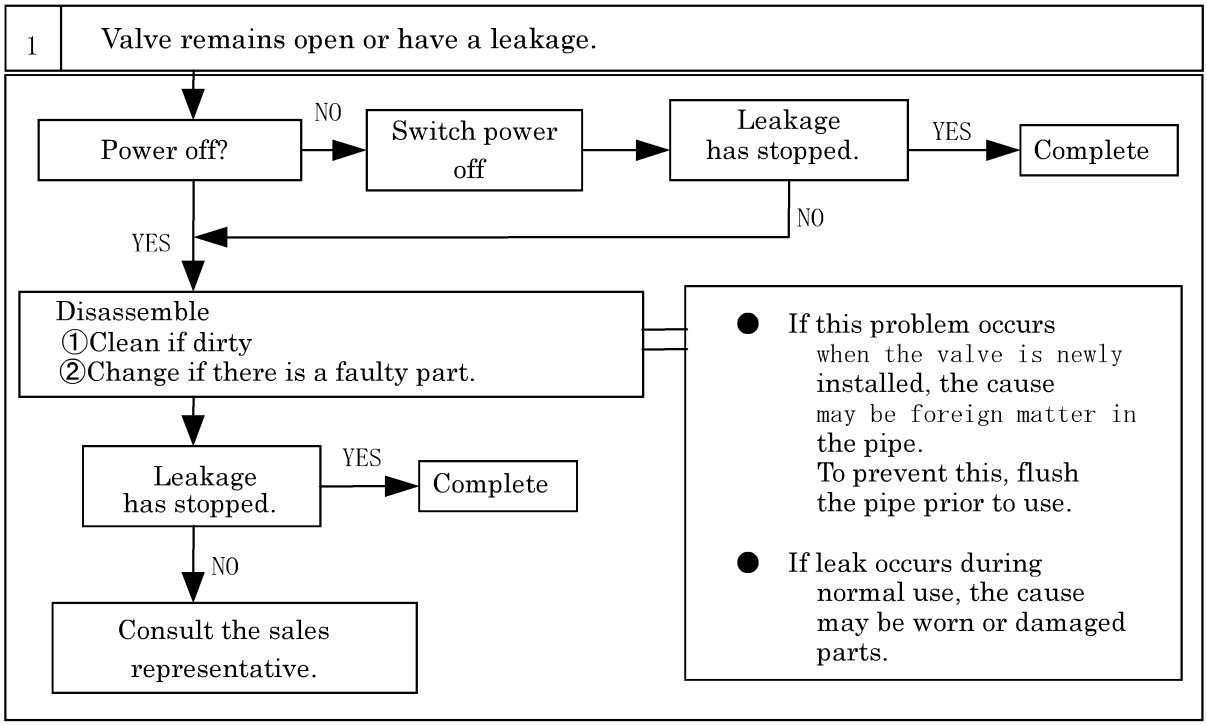
If any electrical failure or fault is detected, replace the actuator. For an earmark, 5 million of operations indicates the time for replacement.

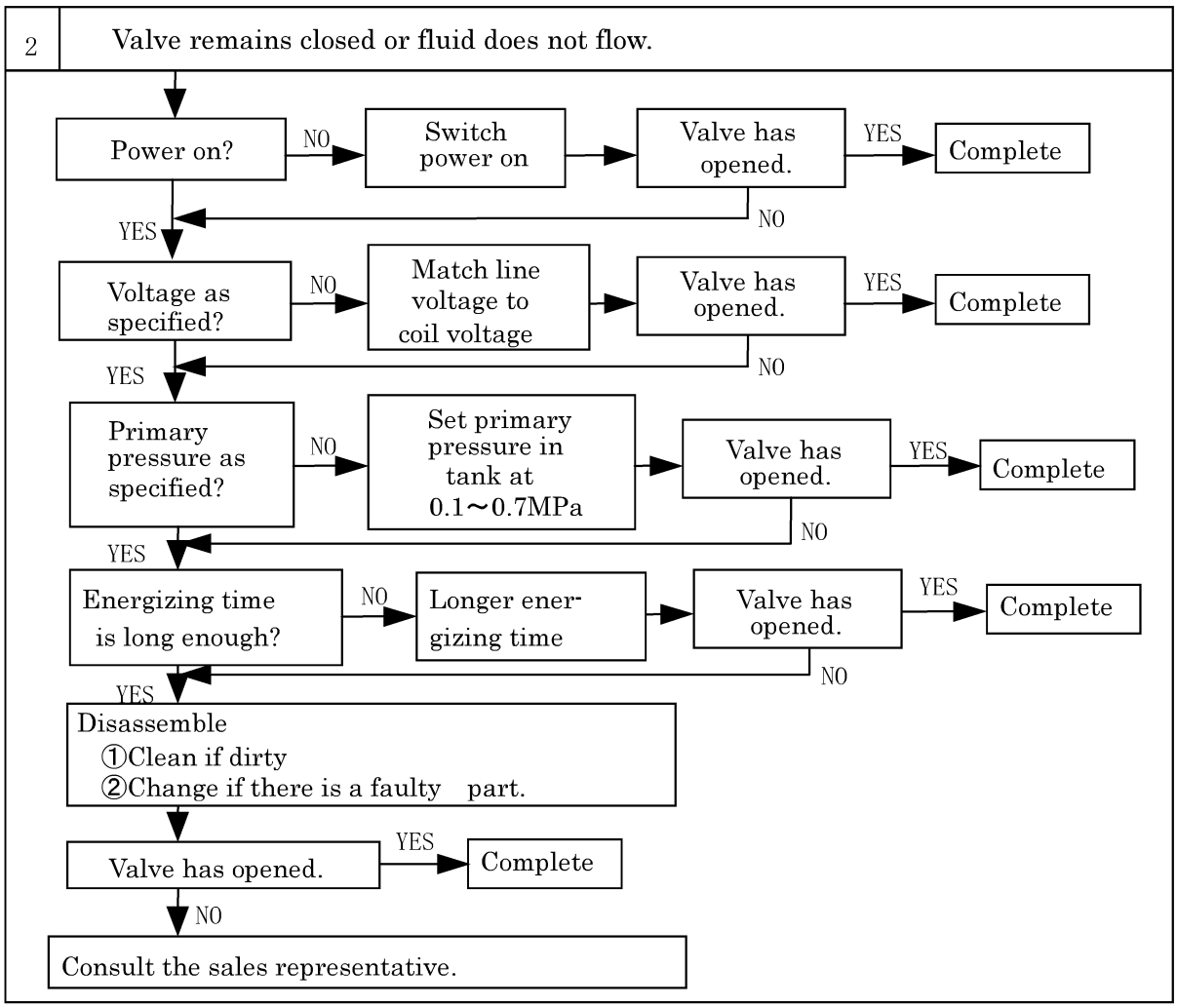
We will recommend three years to be exchanged for the standard even when there is no problem on externals.

Parts model number
PDV2-50A- [Coil option] -A-KIT

7. Troubleshooting

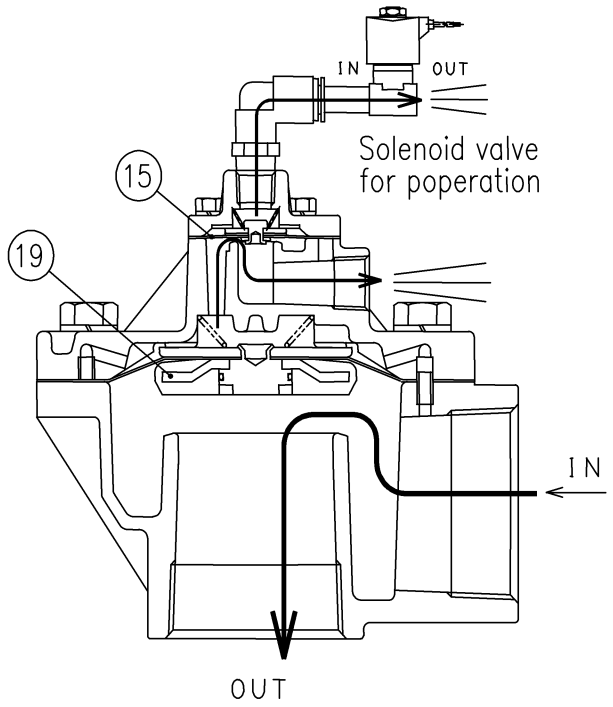
Check according to the following float chart when the valve doesn't operate according to use.



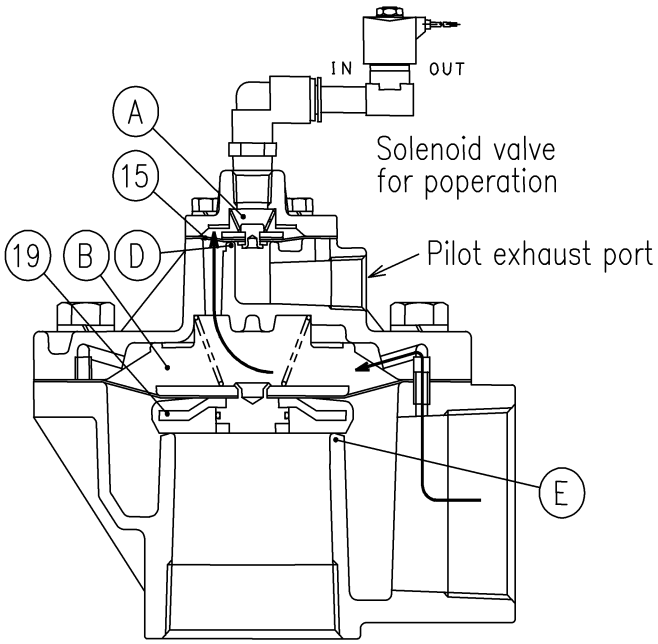


8. Operating mechanism

8. 1 PD2-50A Operating mechanism



OPEN



CLOSE

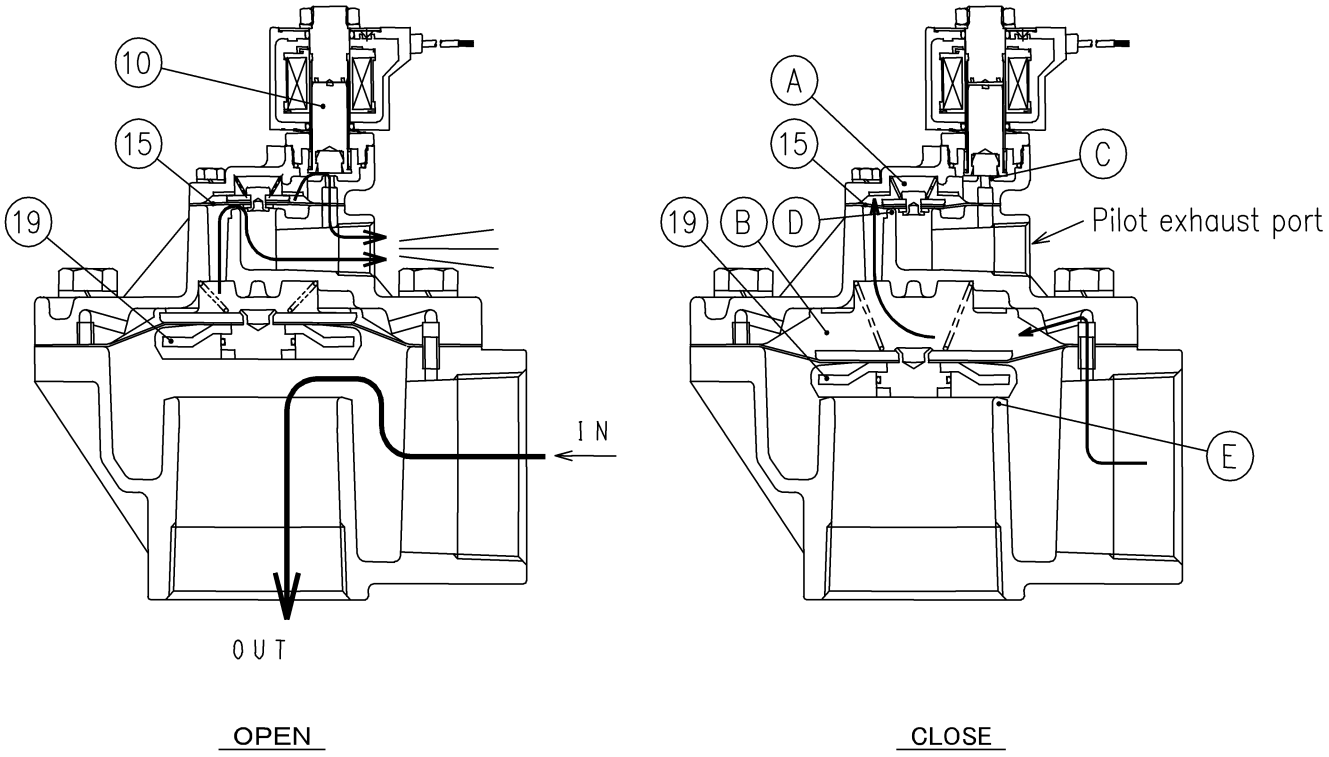
[OPEN]

- When the solenoid valve for operation connected with pilot operation port is energized, room A pilot's fluid is exhausted into atmosphere. Room A pilot's pressure lowers more than room B pilot's pressure, pilot diaphragm assembly ⑮ lifts by this differential pressure.
- Room B pilot's fluid is exhausted into atmosphere from pilot exhaust port. Room B pilot's pressure lowers more than pressure on IN side, main diaphragm assembly⑲ lifts by this differential pressure, and fluid flows to IN→OUT.

[CLOSE]

- When energizing the solenoid valve for operation connected with pilot operation port is stopped, exhaust stops. Fluid is supplied to room A pilot through air orifice of pilot diaphragm assembly. Room A pilot's pressure becomes same pressure as Room B pilot's pressure, valve seat D is shut by descent of pilot diaphragm assembly⑮, and exhaust from pilot exhaust pot stops.
- Fluid is supplied to room B pilot through air orifice of body. Room B pilot's pressure becomes same pressure as IN side, valve seat is shut by descent of main diaphragm assembly⑲, and fluid is stopped.

8. 2 PDV2-50A Operating mechanism



OPEN　　CLOSE

[OPEN]

- When the solenoid valve is energized, room A pilot's fluid is exhausted into atmosphere. Room A pilot's pressure lowers more than room B pilot's pressure, pilot diaphragm assembly ⑮ lifts by this differential pressure.
- Room B pilot's fluid is exhausted into atmosphere from pilot exhaust port. Room B pilot's pressure lowers more than pressure on IN side, main diaphragm assembly⑲ lifts by this differential pressure, and fluid flows to IN→OUT.

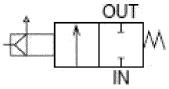
[CLOSE]

- When energizing the solenoid valve is stopped, plunger assembly descends, and valve seat C is shut. The exhaust stops. Fluid is supplied to room A pilot through air orifice of pilot diaphragm assembly. Room A pilot's pressure becomes same pressure as Room B pilot's pressure, valve seat D is shut by descent of pilot diaphragm assembly ⑮, and exhaust from pilot exhaust pot stops.
- Fluid is supplied to room B pilot through air orifice of body. Room B pilot's pressure becomes same pressure as IN side, valve seat is shut by descent of main diaphragm assembly⑲, and fluid is stopped.

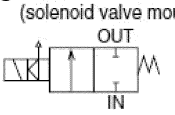
9. Product specification and model number display

JIS symbol

● PD2
(air operated type)



● PDV2
(solenoid valve mounted type)



Specifications

Item	Air operated type	Solenoid valve mounted type
	PD2-50A	PDV2-50A
Working fluid	Air (no corrosive gas)	
Min. working pressure dif. MPa	0.1	
Max. working pressure dif. MPa	0.7	
Max. working pressure MPa	0.7	
Withstanding pressure (water) MPa	1.5	
Fluid temperature ˚C	-10 to 60, -10 to 100 for fluoro rubber seal (no freezing)	
Ambient temperature ˚C	-10 to 60, -10 to 100 for fluoro rubber seal	
Atmosphere	Place free of corrosive gas and explosive gas	
Valve structure	Pilot operated poppet structure	
Port size	Rc2	
Orifice mm	53	
Cv flow factor	62	
Pilot port size	Rc1/4	-
Weight kg	1.9	2.1
Mounting attitude	Free	
Electric specifications	**PDV2**	
Rated voltage	100 VAC (50/60 Hz), 110 VAC (60 Hz); 200 VAC (50/60 Hz), 220 VAC (60 Hz); 12 VDC; 24 VDC, 48 VDC, 100 VDC	
Voltage fluctuation range	-10 to +10% of rated voltage	
Apparent power VA	12 (50 Hz), 10 (60 Hz)	
Power consumption W	11 (DC)	
Heat proof class	B (H when using coil option 4A) JIS C-4003	

*1: For a solenoid valve for driving the air operated type PD2-50A, use FAB31-8-3 (page 26), AB31-02-3 (page 130), AB41E4-02-3-03T (explosion proof, page 360) or PJVB (page 690).
*2: Consult with CKD when using the valve at a garbage incineration plant for smoke treatment, or in a dust collector for combustible gas, etc.
*3: High corrosion resistant types, etc. are also available. Consult with CKD. (Custom order)
*4: The combination of PD2 and PJVB is recommended for outdoors.

● Air operated type

PD2 - 50A - ( ) S

● Solenoid valve mounted type

PDV2 - 50A - ( ) 2E - S - AC100V

Model no.

Port size
Rc2

Ⓐ Sealant
*2

Ⓑ Coil option
*2
*3

Ⓒ Other options
*2

Ⓓ Voltage
*3
*4

Symbol	Descriptions		Model no. PD2	Model no. PDV2
Ⓐ Sealant				
Blank	Nitrile rubber		●	●
F	Fluoro rubber		●	●
Ⓑ Coil option				
Blank	Std.	Grommet lead wire		●
2E	Option	DIN terminal box (G1/2)		●
2G	Option	DIN terminal box (Pg11)		●
2H	Option	DIN terminal box + small light (Pg11)		●
3A	Option	Open frame lead wire		●
3M	Option	Open frame HP terminal box (G1/2)		●
3N	Option	Open frame HP terminal box + light (G1/2)		●
4A	Option	Open frame lead wire (heat proof class H)		●
Ⓒ Other options				
Blank	No options		●	●
S	Silencer (SLW-10A) (enclosed with the product)		●	●
Ⓓ Voltage				
AC100V	100 VAC (50/60 Hz), 110 VAC (60 Hz)			●
AC200V	200 VAC (50/60 Hz), 220 VAC (60 Hz)			●
DC12V	12 VDC			●
DC24V	24 VDC			●
DC48V	48 VDC			●
DC100V	100 VDC			●

*1: The combinations indicated with ● in the above table are available.
*2: When Ⓐ is F (sealant: fluoro rubber), only A4 is available for Ⓑ (coil option), and only blank (no options) is available for Ⓒ (other options).
*3: When Ⓑ (coil option) is blank or 4A, only AC voltage is available.
*4: For voltages other than above, consult with CKD.

<Example of model number>

PDV2-50A-2E-S-AC100V
Model no.: PDV2 (port size Rc2)

Ⓐ Sealant : Nitrile rubber
Ⓑ Coil option : DIN terminal box (G1/2)
Ⓒ Other options : Silencer
Ⓓ Voltage : 100 VAC (50/60 Hz), 110 VAC (60 Hz)