SM-50622-A

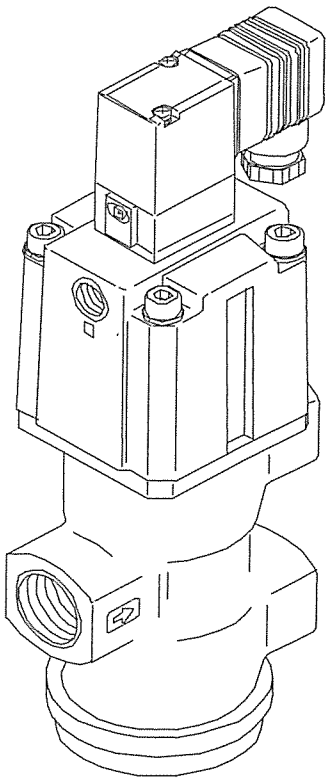
CKD

INSTRUCTION MANUAL

COOLANT VALVE

CV3E-20A·25A SERIES

CVS3E-20A·25A 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.

CKD Corporation

Introduction

Thank you for choosing the CKD's cylinder valve 「CV3E, CVS3E」.

1. Purpose and use of the valves

This valve is an external-pilot, 3-port, selector valve of general industrial machines and instruments.

2. Use of the valve

It is the valve which had a purpose of the changing of the supply and the stop of coolant.

3. 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.

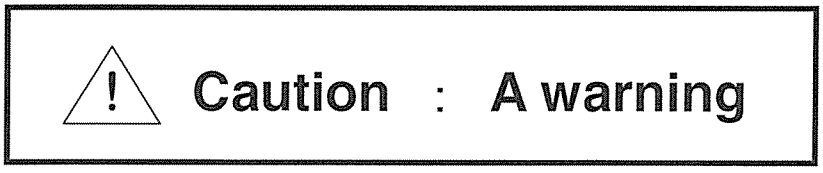
  Thoroughly read this manual before the design and installation in order to assure the safety of the machine or instrument and properly handle the product.

4. Safety precautions

- To avoid injury, fire and damages to the facilities, the warnings shown on the product shall be strictly observed.

- 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 face plate of the product agrees with that you ordered.
- Check that the rated voltage and frequency meet your specification.
- Check that the product has no external damages.
- When keep the product, install a seal plug to prevent the intrusion of foreign matter to the valve. Remove the seal plug when piping the valve.

2. Installation

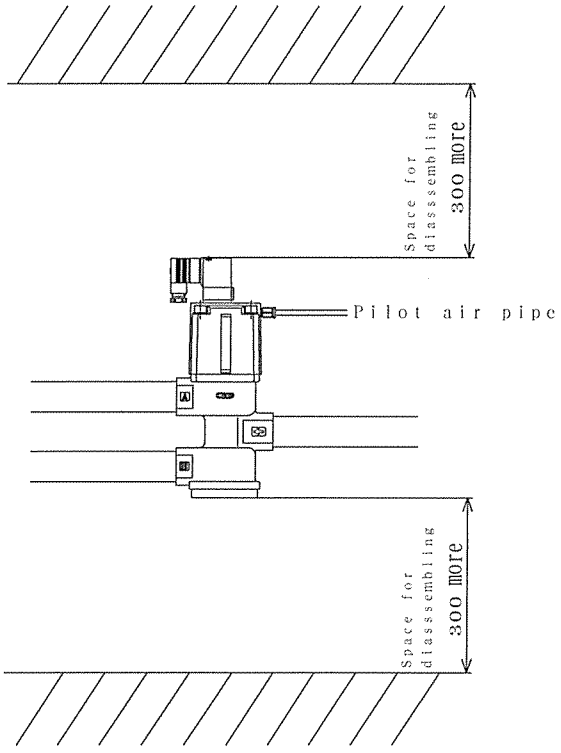
2. 1 Conditions for installation

2.1.1 Orientation

- The mounting posture of the valve is not specified.
- The valve cannot be used in a place where it will be submitted to the vibration larger than 5G.

2.1.2 Space for maintenance

- An adequate space shall be provided around the valve to assure the safety during the maintenance/troubleshooting work (see Figure 2-1).



(Figure 2－1)

2.1.3 Protection of the product

- When using the valve in a cold district, an adequate provision is required to prevent the freezing of the valve.
- Protect the valve against water drips or coolant by enclosing the valve with a cover or panel.
- This valve cannot be used outdoor.
  It shall be protected by enclosing with a cover or panel.

2. 2 Piping work

● Cleaning the pipes

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

● Filtration

Dust or foreign particle in the air may lead to a malfunction and/or leakage.

Install a strainer with 80～100 mesh just in front of the valve, and a filter with 5μm or finer on the pilot air circuit.

● Piping

The valve shall be piped in such a manner that the flowing direction of the fluid will match the direction of the arrow indicated on the valve body. Pilot air to be connected to port X.

Do not remove the exhaust cap on the air intake port side.

● Dust

If the valve is used in the atmosphere containing much dust, it will be likely to malfunction or cause a leakage. In this case, a silencer or filter shall be installed at the exhaust or air intake port to prevent the intrusion of dust.

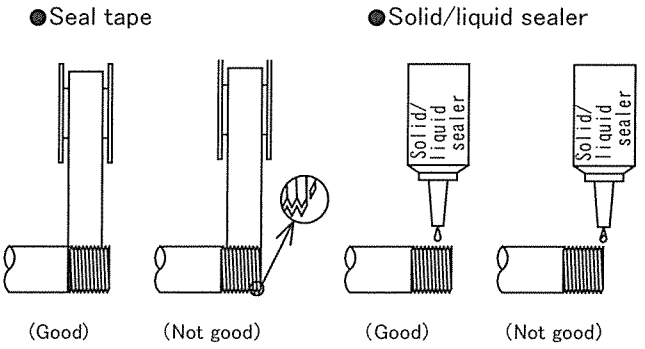
● Sealer

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

When taping a threaded portion, 1～2 threads at the end of the portion shall be exposed (see 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.

Do not apply to the female screw of the apparatus.



(Figure 2-2)

● The torque is required for tightening pipes are shown in Table 2-1, 2-2 for reference.

Table 2-1. Pilot port recommended torque

Port size	Torque for tightening pipe
Rc1/4	12～14 [N・m]

Table 2-2. Main port recommended tuoque

Port size	Torque for tightening pipe
Rc3/4	62～ 65 [N・m]
Rc1	83～ 86 [N・m]

The valve body should be held by a spanner for piping work.

Do not screw in the pipe to CVS3E model by using the pilot valve portion.

● Lubricated or non-lubricated operation

This valve dose not require lubrication. Therefore, no lubricator is needed.

If the valve is to be lubricated, use type 1 turbine oil, ISO VG 32 (no additives).

If stopping refueling on the way, the early stage lubrication pill disappears and there is case which causes to do operation bad.

Therefore, the refueling go always continuously.

● Draining

Improve the quality of pilot air by dehumidify by after-cooler air dryer, elimination of foreign particles by filter, elimination of tar by a filter for tar.

2. 3 Wiring work (For CVS3E model)

● Permissible limit of leaked current

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

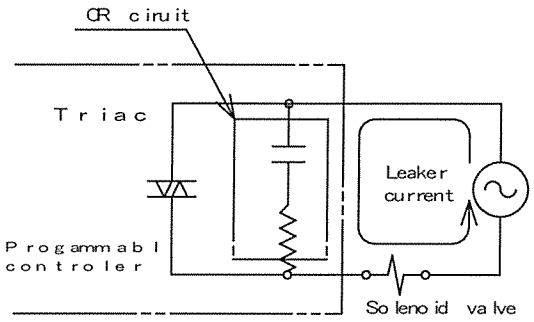
The leaked current may lead to a malfunction, (see Figure 2-3)

Leak current : 3.0(6)mA or less for the rated voltage AC100V

Leak current : 1.5(3)mA or less for the rated voltage AC200V

Leak current : 1.8(3)mA or less for the rated voltage DC24V

The value within parentheses represents the leaked current measured with a surge killer provided.



(Figure2-3)

● Polarity of the solenoid valve

The valve does not have positive and negative terminals although it is designed for use with a direct current.

It will not have polarity even if it is used with a lamp and/or surge killer.

● Continuous power supply

When the solenoid valve is installed on a control panel or energized for an extended period, it will be heated to a temperature of 40-60℃. In this case, a provision is required to discharge heat, i.e. ventilation.

● Orientation of wiring

Coil orientation is within 180° .

Turn the coil when wiring direction is changed

Change of pilot valve direction may lead to malfunction of its operation.

● Surge in the electric circuit.

In case your electric circuits hesitate the surge of solenoid, it is recommended to use our surge killer provided valve or put a surge-absorber in parallel to the solenoid.

● The preservation of the electric facilities

Because of the preservation of the electric facilities, use breakers such as the fuse for the side of the control circuit.

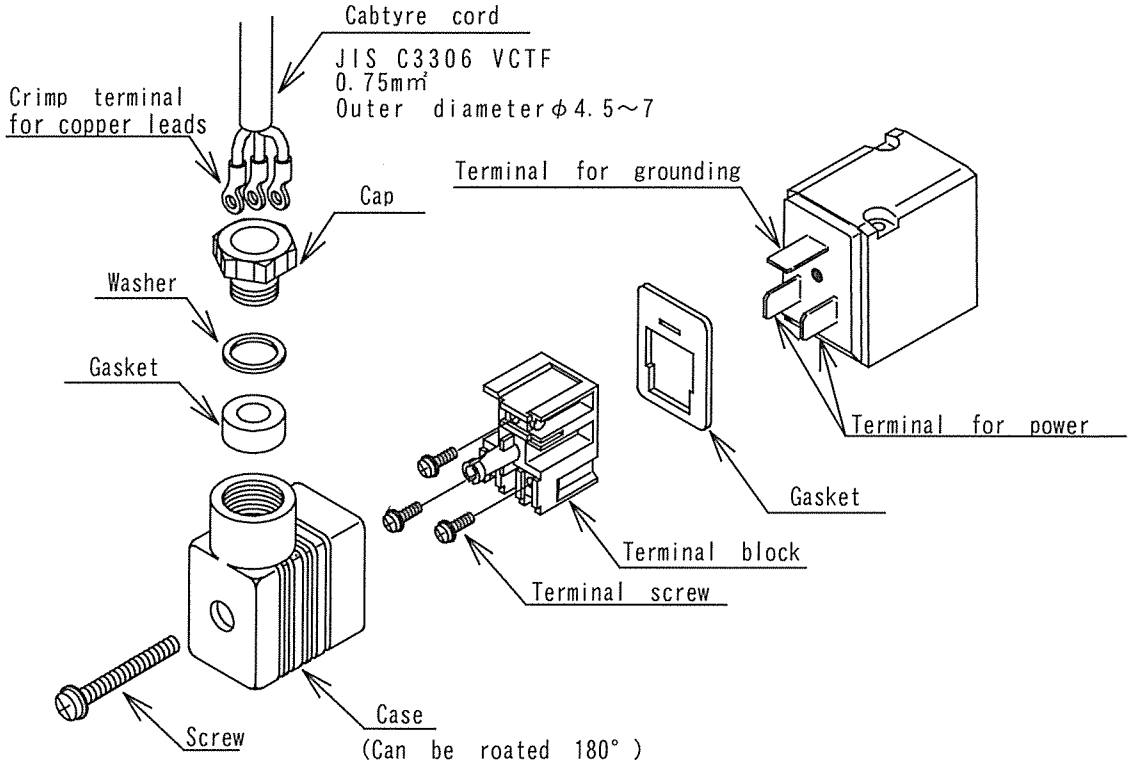
2.3.1 Electric connection of DIN terminal box

This subsection applies to the ones with DIN terminal box (optional coil code "2G" or "2H")

- For the cabtyre cord, use the one whose nominal section area 0.75mm² and outer diameter φ4.5～φ7.
- Pass a cap, washer, gasket and casing through the cabtyre cord.
- Pass a crimp 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, and fasten it with terminal screw by 0.5N・m torque.

Caution :
- **Take care not to connect the terminal box in a wrong manner.**
- **The terminals with markings① and ② on the terminal block are for conductors.**
- **The terminal with a marking ㊥ 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.
- Fix the screw by 0.5N・m torque.
- To change the direction of the code, insert the terminal box turning 180° .

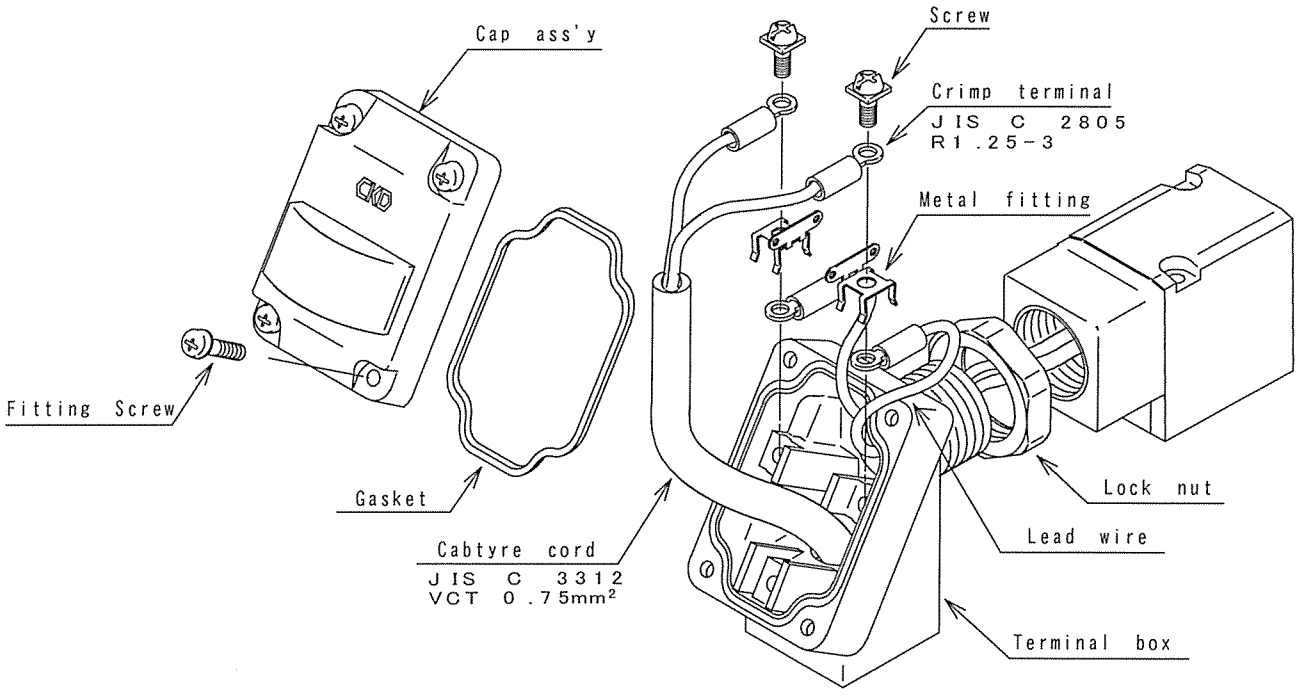


(Figure 2-4) Electric connection of DIN Terminal Box

2.3.2 Electric connection of T-type terminal box

This subsection applies to the with T-type terminal box (optional coil code "3T" or "3R")

- For the cabtyer cord, use the one with a nominal sectional area ranging from 0.75 ~1.5mm^2.
- Pass the cabtyre cord to the terminal box.
- Pass a crimped terminal specially designed for copper leads through the lead of the cabtyre cord and crimp the terminal.
- Tighten the free terminal screw to fix the crimped terminal.
- Install the gasket and cap assembly and fix with screw by 0.5N・m torque.



(Figure 2-5) Electric connection of T-type terminal box.

Changing direction of the T-type terminal box

Follow the following process when change the direction of the T-type terminal box from the position in shipping.

① Put the width (25width) of the T-type terminal box with the tool (wrench), and turn it to the counterclockwise direction, and loosen it.

② Loosen the lock nut.

③ Turn the T-type terminal box to the clockwise direction to about the 15° front of a position to hope.

④ Fasten the lock nut on the coil side until it becomes tight lightly by hand.

⑤ Put the width of the T-type terminal box with the tool, and turn it to a position to hope (about 15°), and fasten it.

Note : Make it less than 1/2 turns when change direction of the T-type terminal box from the position in shipping.

3. Pre-operation (post-installation) check

3. 1 Appearance check

> Caution : ● Shut off the fluid flow. (close the main shut-off valve)
> ● Exhaust the fluid remaining in the valve.
> ● Turn off the power.

- Push the valve with finger to check that the valve has been fixed to the pipe or mounting hole.
- Check that the fasteners including hexagonal socket head cap screws and bolts have not been loosened.

3. 2 Check for leakage

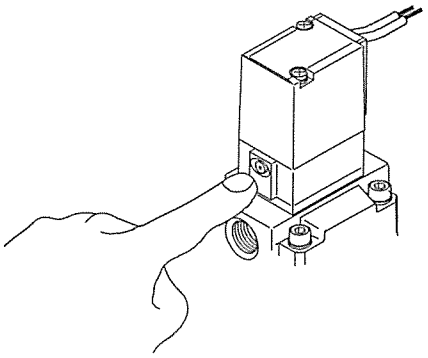
- Compress the fluid to check for leakage at pipe joints.
  It is recommended to check for leakage by supplying a pneumatic pressure of 0. 3～0. 5MPa with soapy water applied to the joints. Air bubbles will be generated at the leaking joints.

[For CVS3E model]

Manual operation (Non-Lock type manual over-ride)

①Supply compressed air (0. 25～0. 5MPa) to the pilot port.

②Push the manual shaft until it bottoms.
The valve will be energized while the manual shaft is pushed.
The valve will return when the manual shaft is released.
(See Figure 3-1)



The valve operates while the shaft is pushed.

(Figure 3-1)

3. 3 Electrical check

> Caution : ● Turn off power.

- Check the dielectric resistance.
  Measure the dielectric resistance using a 100V DC megaohmmeter between a metallic part such as screw fixing the valve and the active part of the lead. The measured dielectric resistance shall be 100Mohms 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.
- When changing a line voltage in the CVS3E series.
  Because the component depends on the AC voltage and the DC voltage, exchange every of the pilot solenoid valve.

4. Instructions for proper use

Caution :
- When the solenoid valve is continuously operated, it will be heated to a temperature of 40～60℃.
  Do not touch it by hand while it is energized.
- Don't touch a hand and a body in the electric wiring part while it is energized.
  There is fear of the electric shock.
- 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 in the allowable pressure range.
- Don't make a mistake in the direction of the pressurization.

- Do not put any object on the valve.
- Don't touch a coil in the hand and the body when the solenoid valve is continuously operated.
  The coil generates heat when is energized. There is case to burn when touching.
- The voltage variation shall be within ±10% of the rated voltage.
- The working pressure range and temperature range of the fluid and ambient temperature range shall be satisfied.
- It isn't possible to use for an urgent block-off valve.
  The CV3E/CVS3E series doesn't become the design of the block-off valve.
  In the case, secure safety in another way.
- When wanting to make an exhaust sound from the pilot electromagnetism valve quiet in the CVS3E series, install silencer in the exhaust port of the pilot electromagnetism valve.
- The operating frequency specified below shall be satisfied.

Table 4-1 Max operating frequency

Port size	Max operating frequency
20A	30 cycles/min
25A	20 cycles/min

- Don't make a mistake in the direction of the pressurization.
  It damages when making a mistake in the direction of the pressurization. Don't make a mistake absolutely.
- If the time for which the valve is energized is too short, the valve may not follow the operation of the entire system.
- If the valve has been out of use for 3 days or longer, the first cycle after the restart of the valve may take approximately a second longer than usual. In this case, a commissioning shall be performed before operating the valve.
- Sealing material may be corroded by a special coolant oil.
  FKM sealer is recommended for a chlorine coolant oil.
- If any abnormal condition is found, see section 7 "Troubleshooting."

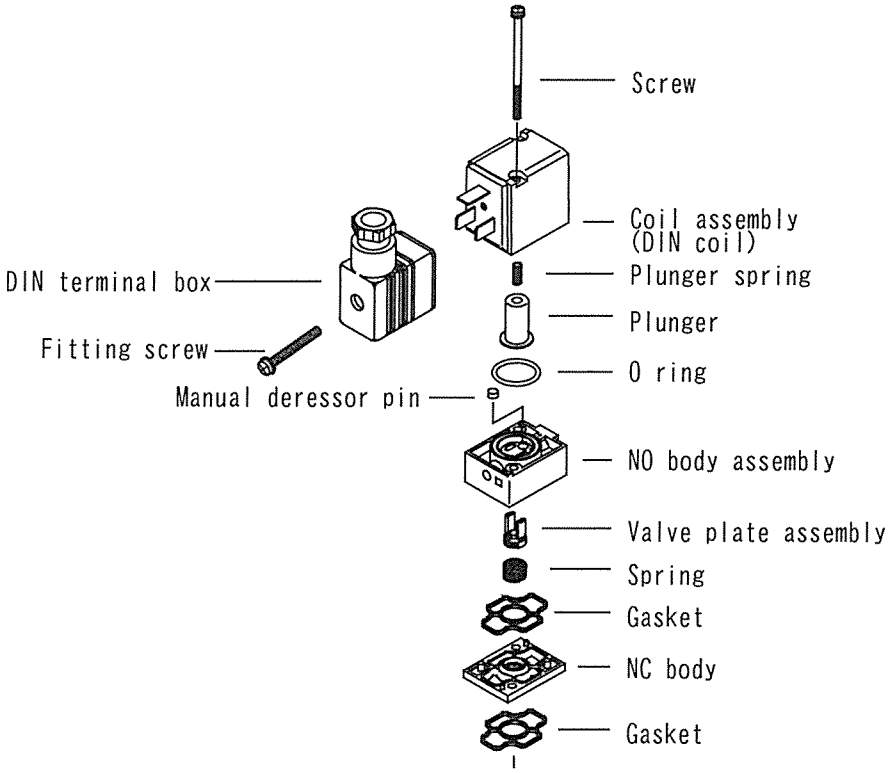
5. Disassembly and assembly

5. 1 Replacement of pilot solenoid valve (For CVS3E model)

5.1.1 Disassembly procedure

> **Caution :** ● Close the main valve.
> ● Exhaust the fluid remaining in the valve.
> ● Turn off the power.

- Remove wires from the solenoid valve.
- Loosen two screws.
- Raise the pilot solenoid valve.



(Figure 5-1) Developed view of the pilot solenoid valve

5.1.2 Assembly procedure

- Install the gasket to the body assembly with care not to install it in the wrong direction.
- Put the pilot solenoid valve manual operation portion (green color) onto the cylinder as directed in Figure 5-2.
- Fasten two screws by 0.46～0.75N ・ m torque.
- Connect electric wires to the valve.
- Turn on the power and activate the fluid circuit.

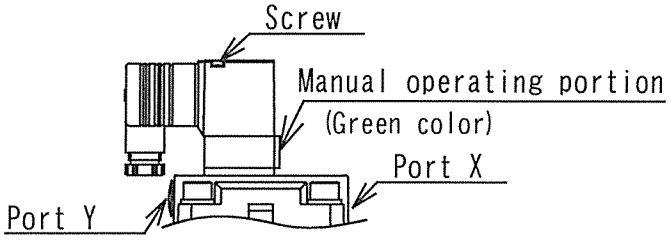
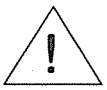


Figure 5-2

5. 2 Replacement of the valve packing and main valve plate

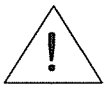
5.2.1 Disassembly procedure



Caution : ● Close the main valve.
● Exhaust the fluid remaining in the valve.
● Turn off the power.

- The disassembly shall be performed with reference to section 8 "Internal construction drawings".
- Disconnect the pilot air piping.

20A



Caution : Spring is incorporated in the cylinder cover.
Give your attention to its spring-back action.

- Loosen the 2 pieces of hexagon socket head cap screw of the bottom cap.
- Insert the wrench through port A, hold the flats part of piston rod on the wrench and fix the turn block. Then, loosen the lock nut, and dismount the main valve plate Ⅱ.
  The wrench should be kept parallel with the horizontal when rotated. Apply lubricant if available to the threaded portion.
- Loosen the 4 pieces of hexagon socket head cap screw of the cylinder cover.
  Then, Give your attention to its spring-back action. Fix the cylinder cover with the hand or some implements.
- Pull up and dismount the cylinder cover.
- Dismount the piston assembly and adapter.
- Pull the main valve plate Ⅰ out of the piston rod after dismounting the retaining ring (E type).
- Pull the adapter out of the piston rod.

25A

Caution : Jumping spring can cause injury.
Don't disassemble the stopper pin.

- Loosen the 2 pieces of hexagon socket head cap screw of the bottom cap.
- Insert the wrench through port A, hold the flats part of piston rod on the wrench and fix the turn block. Then, loosen the lock nut, and dismount the main valve plate Ⅱ.
  The wrench should be kept parallel with the horizontal when rotated. Apply lubricant if available to the threaded portion.
- Loosen the 4 pieces of hexagon socket head cap screw of the cylinder cover.
  Then, Give your attention to its spring-back action. Fix the cylinder cover with the hand or some implements.
- Pull up and dismount the cylinder cover.

- Dismount the piston assembly and adapter.
- Pull the main valve plate Ⅰ out of the piston rod after dismounting the retaining ring (C type).
- Pull the adapter out of the piston rod.
- Don't disassemble the stopper pin.

  Isn't possible to pull the piston assembly out of the cylinder cover because jumping spring is dangerous.

5.2.2 Assembly procedure

- The assembly shall be performed with reference to section 8 "Internal construction drawings".
- Apply grease to packing and O-ring.

  ※For grease, use Lithium alkali base grease.
- Apply grease to the surface on which the packing.
- Install the packing properly to the adapter.
- Insert the piston rod in the adapter and the main valve plate Ⅰ, and fix them on the retaining ring.
- Fasten the adapter to the body. After insert in the main valve plate Ⅱ, insert the wrench through port A, hold the flats part of piston rod on the wrench and fix the turn block. Then, fasten the lock nut referring the Table 5-1.

Table 5-1 Recommended fastening torque

Screw size	Recommended torque
M6	4.5～5.8 [N・m]
M8	11.2～13.7 [N・m]

- Pull the bottom cap in the body and fasten it 2 pieces of hexagon socket head cap screw referring to Table 5-2.
- Put the cylinder cover and fasten it by 4 pieces of hexagon bolts referring Table 5-2.

Table 5-2 Recommended fastening torque

Screw size	Recommended torque
M5	6～ 8 [N・m]
M6	11～13 [N・m]
M8	28～32 [N・m]

- Connect the pilot air piping.
- Supply fluids and check its leakage.
- Turn on the power, and activate the fluid circuit.

6. Maintenance

6. 1 Maintenance and checking

- To keep the product in the good condition, check it once a year as a periodical checking.
- For the content of the inspection, see section 3 "Pre-operation check".
- Use the detergent such as the synthetic detergent where there is little pollution.

6. 2 Service parts

- Pilot solenoid valve

  Replace it with a new one if an electric failure or another abnormal condition is observed with it.

  As a guideline, replace it every 5 million cycles.
- Packing, O-ring and gasket

  Replace them with new ones if fluid leaks or another abnormal condition is observed.

  As s guideline, replace them every 2 million cycles.

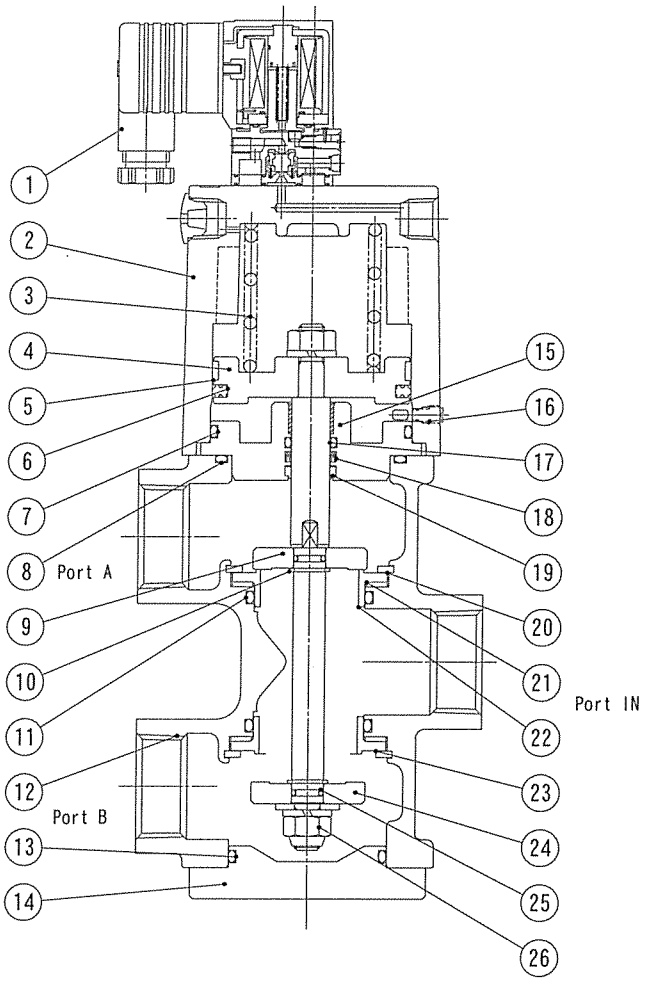
7. Troubleshooting

● If the valve does not function as specified, check it according to following Table.

Symptom	Cause	Action
The valve does not move.	It is not energized.	Check the wiring and fuse and on the power supply.
	The voltage is lower than the rating.	Check the power supply and apply the rated voltage.
	The pilot air pressure is too low.	Adjust the pilot air pressure.
	The pilot solenoid valve does not move.	Replace the pilot solenoid valve with a new one.
	The pilot valve is set inversely.	Refer the section 5.1.2, set the NO body assembly in correct way.
	The fluid pressure is too high.	Adjust the fluid pressure.
	Foreign matter is entangled by the valve stem.	Overhaul the valve and clean the inside of it.
The valve does not return.	It is not de-energized.	Check for leaked current. Modify the circuit to turn off the power supply without fail.
	The pilot solenoid valve does not return.	Replace the pilot solenoid valve with a new one.
	The fluid pressure is too high.	Adjust the fluid pressure.
	Foreign matter is entangled by the valve stem.	Overhaul the valve and clean the inside of it.
	Packing is running short of grease.	Overhaul the valve and clean the inside of it. Apply some grease.
External leakage	The packing or O-ring is damaged or worn.	Disassemble the valve, and replace the packing or O-ring with a new one.
	Screw or bolt is loosen.	Tighten the screw or bolt.
Leakage from the valve seat	The body seal is damaged or worn.	Replace the valve stem with a new one.
	The rubber or sealing surface of the main valve plate is damaged or worm.	Replace the valve stem with a new one.
	Foreign matter is entangled by the main valve plate.	Overhaul the valve and clean the inside of it.

● If further information is required, consult us or the nearest agency.

8. Internal construction drawing



No.	Parts	Q'ty
1	Pilot solenoid valve	1
2	Cylinder cover	1
3	Spring	1
4	Piston assembly	1
5	Wearing	1
6	PSD packing	1
7	O-ring	1
8	O-ring	1
9	Main valve plate Ⅰ	1
10	Retaining ring 20A: E type 25A: C type	2
11	O-ring	2
12	Body	1
13	O-ring	1
14	Bottom cap	1
15	Adapter	1

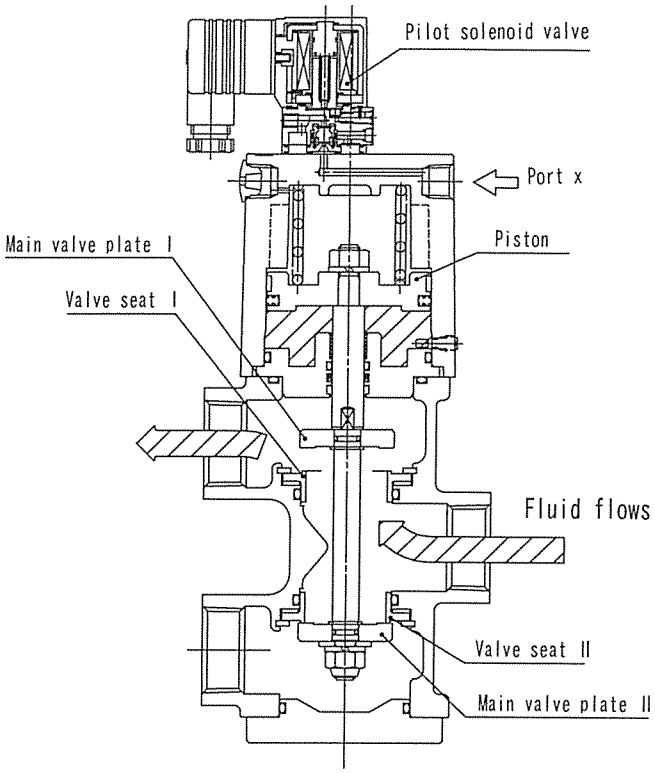
No.	Parts	Q'ty
16	Stopper pin	2
17	O-ring	1
18	MY packing	1
19	Scraper	1
20	Retaining ring (C type)	2
21	Sheet spacer	2
22	Valve seat Ⅰ	1
23	Valve seat Ⅱ	1
24	Main valve plate Ⅱ	1
25	O-ring	2
26	Lock nut	1

Note 1: The drawing shows CVS3E model.
CVS3E model has no pilot solenoid valve.
Note 2: CVS3E-20A has no "⑯Stopper pin"

9. Operating mechanism

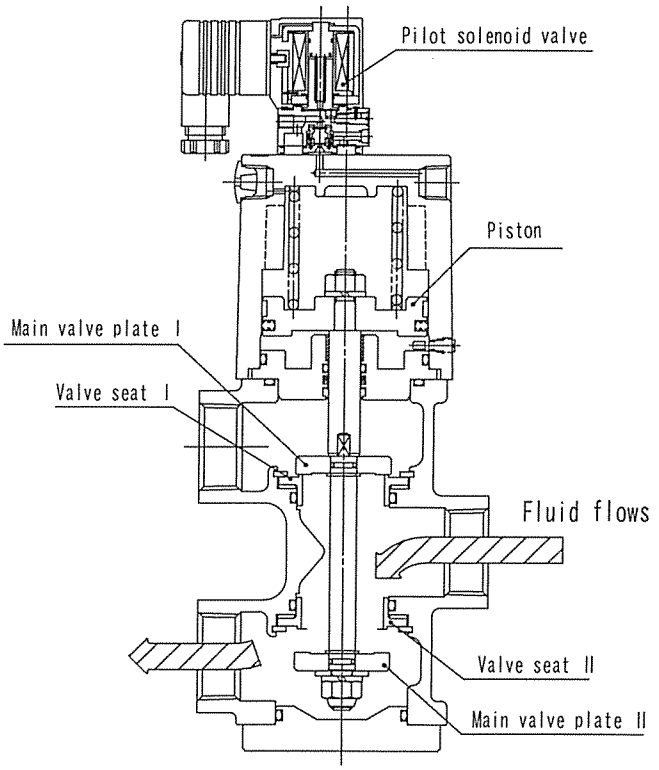
9. 1 Move

- Supply the pilot air to pilot solenoid valve,
- Pilot air passes to piston under room through.
- The piston lifts up the main valve plate Ⅰ and Ⅱ which is connected with pistons. And the valve seat Ⅰ opens and the valve seat Ⅱ closes at the same time.
- The fluid flows from port IN to A .



9. 2 Return

- Non-energize the pilot solenoid valve.
- The piston air in the piston under room is exhausted through the pilot solenoid valve.
- The piston and the main valve plate Ⅰ and Ⅱ which is connected with piston is pushed down by the spring force. And the valve seat Ⅰ closes and the valve seat Ⅱ opens.
- The fluid flows from port IN to B .



※ This drawing shows CVS3E model. For the operation of CVS3E model should be done by a separate pilot solenoid valve.

10. Method to specify the model

10. 1 Model number display

CV3E – 20A– 03 – 0
① ② ③ ④

CVS3E – 25A– 03 – B 2H S – 1
① ② ③ ④ ⑤ ⑥ ⑦

① Model name	
Code	Contents
CV3E	Air operated type
CVS3E	Solenoid valve mounted type

⑤ Coil options	
Code	Contents
2G	With DIN terminal box
2H	With DIN terminal box and lamp
3T	With T type terminal box
3R	With T type terminal box and lamp

② Connection port size	
Code	Contents
20A	Rc3／4
25A	Rc1

⑥ Other options	
Code	Contents
No code	No options
S	With surge killer

③ Operating pressure range	
Code	Contents
03	0～0. 3 MPa

⑦ Rated voltage	
Code	Contents
1	AC100V 50/60Hz, 110V60Hz
2	AC200V 50/60Hz, 220V60Hz
3	DC24V

④ Material combination		
Code	Body	Seal
0	Cast iron	Nitril rubber
B	Cast iron	Fluoro rubber

10. 2 Specifications for the product Model

Model	CV3E-20A-03 CVS3E-20A-03	CV3E-25A-03 CVS3E-25A-03
Withstand pressure	2MPa	
Operating pressure range	0～0.3MPa	
Fluid temperature	-10～60℃	
Fluid viscosity	Below 500 ㎟／s	
Ambient temperature	-10～60℃	
Ambient humidity	Below 95%	
Pilot air pressure	0.25～0.5MPa	
Pilot air temperature	-10～60℃	
Attachment orientation	Free	
Voltage regulation	-10%～+10% of the rated voltage	
Power consumption	AC : 2.0/1.7W(50/60Hz) DC : 2W	

Note: Voltage regulation and Power consumption apply to CVS3E model.