Discontinue

SM-50586-A

CKD

INSTRUCTION MANUAL

COOLANT VALVE

CV31-10A～25A SERIES

CVS31-10A～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 「CV31, CVS31」.

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.

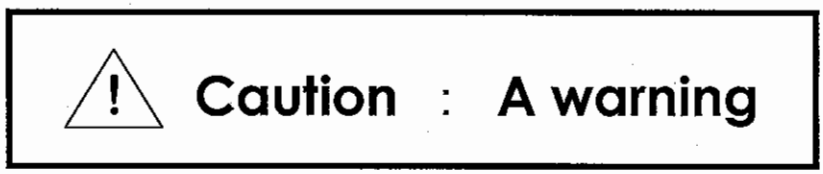
  Thoroughly read this manual before the design and installation in order to assure the safety of the machine or instrument and properly handle the product.

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:



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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

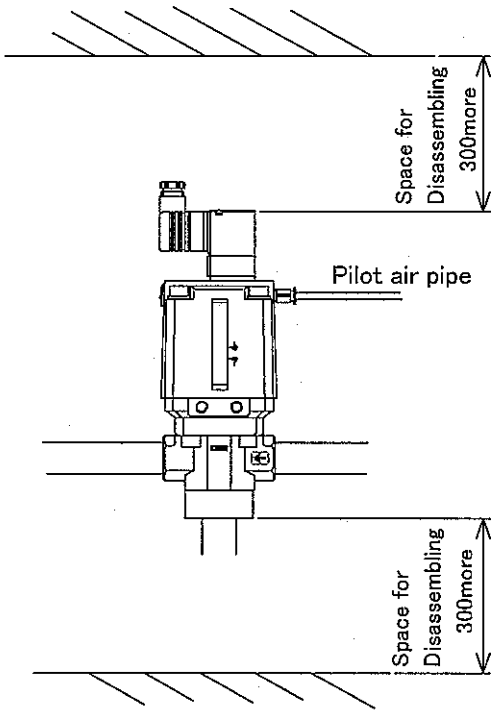
2. 1 Conditions for installation

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

● Dust

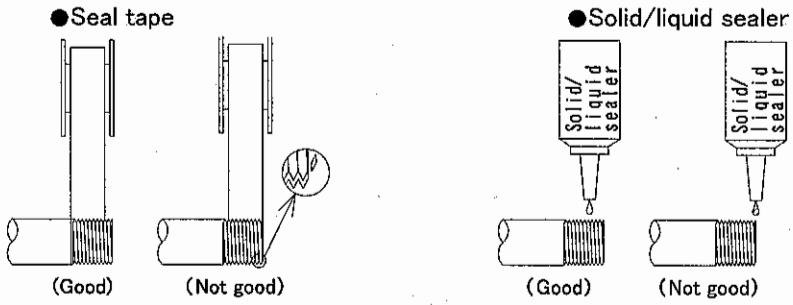
If the valve is used in the atmosphere containing much dust, it will be likely to malfunction or cause a leakage. In this case, a silencer or filter shall be installed at the exhaust or air intake port to prevent the intrusion of dust.

● 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]

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

Do not screw in the pipe to CVS31 model by using the pilot valve portion.

Table 2-2. Main port recommended tuoque

Port size	Torque for tightening pipe
Rc3/8	31~ 33 [N・m]
Rc1/2	41~ 43 [N・m]
Rc3/4	62~ 65 [N・m]
Rc1	83~ 86 [N・m]

● 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 CVS31 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.

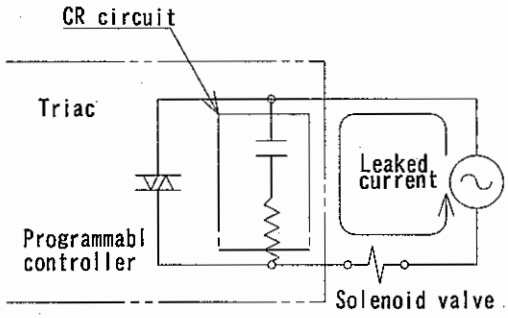
The leaked current may lead to a malfunction, (see Figure 2-3)

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.

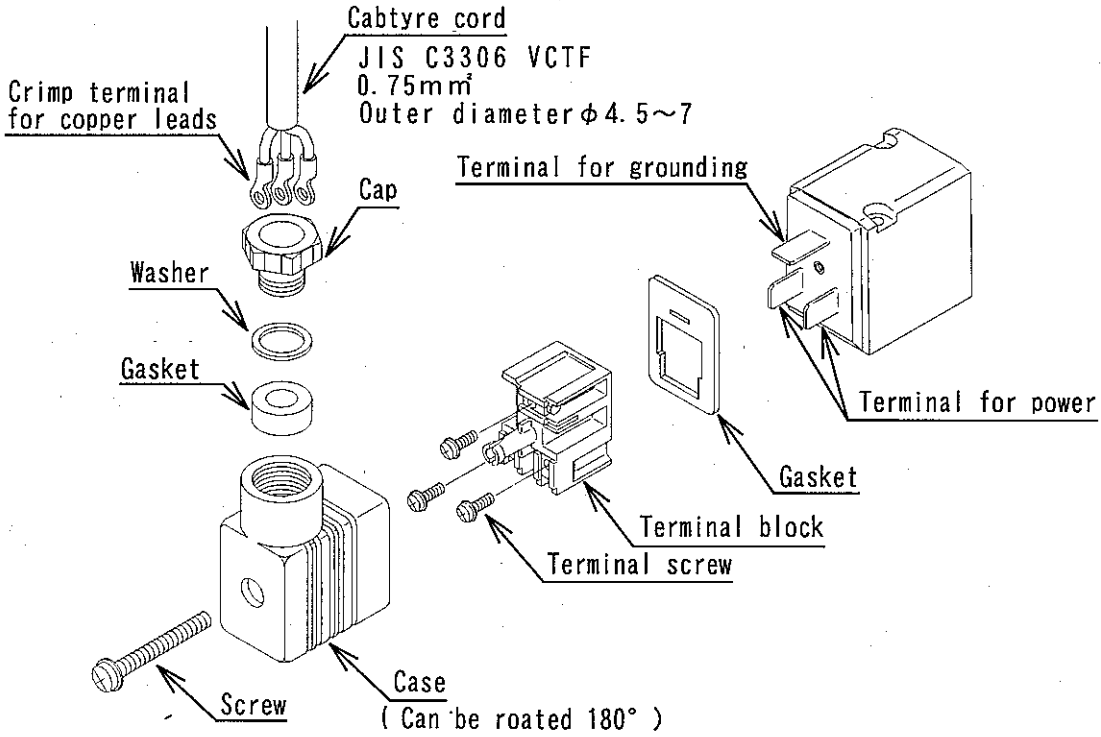
2.3.1 Electric connection of DIN terminal box

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°.

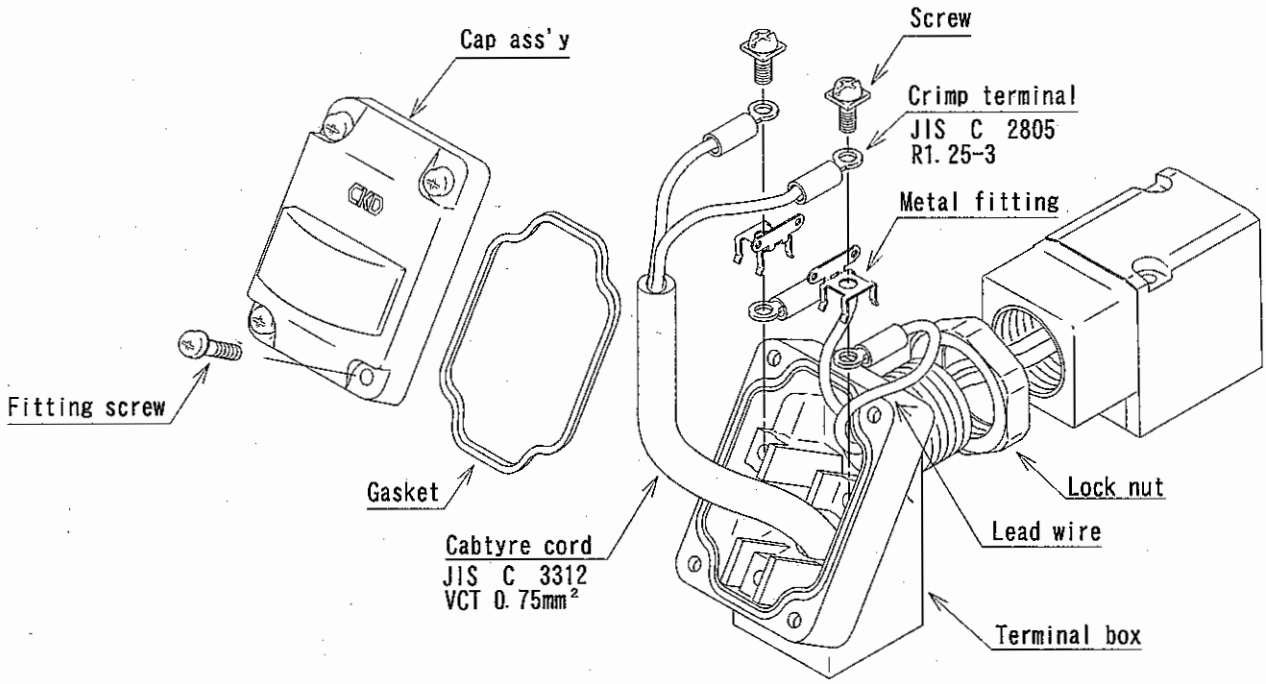


(Figure 2-4) Electric connection of DIN Terminal Box

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 ~1.5mm².
- 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

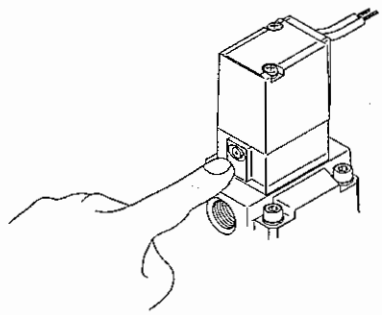
- Compress the fluid to check for leakage at pipe joints.
  It is recommended to check for leakage by supplying a pneumatic pressure of 0.3～0.5MPa with soapy water applied to the joints. Air bubbles will be generated at the leaking joints.

[For CVS31 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 mis-operation or coil burning.
- If the time for which the valve is energized is too short, the valve may not follow the operation of the entire system.
  Check that "operating frequency specified" in section 4 is satisfied.
- When changing a line voltage in the CVS31 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.

- Do not put any object on the valve.
- 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.
- When wanting to make an exhaust sound from the pilot electromagnetism valve quiet in the CVS31 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	For 3.5MPa	For 7MPa
10A	10 cycles/min	10 cycles/min
15A	10 cycles/min	10 cycles/min
20A	10 cycles/min	6 cycles/min
25A	6 cycles/min	6 cycles/min

- 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."

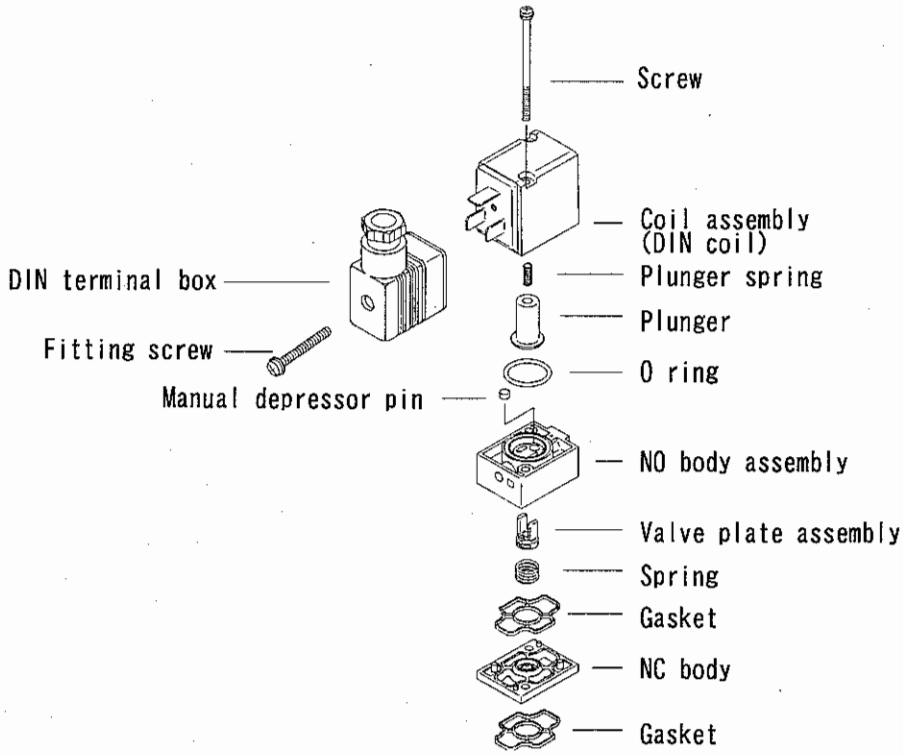
5. Disassembly and assembly

5. 1 Replacement of pilot solenoid valve (For CVS31 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.

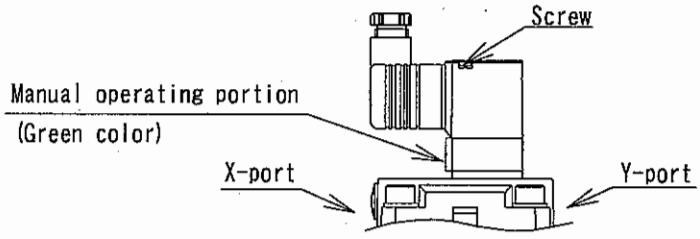


Figure 5-2

5. 2 Replacement of the valve packing

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.
- Loosen 4 pieces of hexagon bolts.
- Pull up and dismount the cylinder cover.
- Loosen the 4 pieces of bolts of NO body and disassemble the NO body.

> **Caution : Spring is incorporated under the piston.**
> **Give your attention to its spring-back action.**

- Insert the screw driver through valve stem through-hole, and fix the turn block. Then, loosen the lock nut to dismount the piston. At this time , the lock nut may scuff the valve stem. The wrench should be kept parallel with the horizontal when rotated. Apply lubricant if available to the threaded portion.
- Push up and dismount the valve stem.

For 3.5MPa

- Adapter can be dismounted.

For 7MPa

- Loosen the 4 pieces of hexagon bolts and dismount the yoke. Adapter can be dismounted.

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.
- Fasten the adapter to the body. For 7MPa, put the yoke on the body and fasten the 4 pieces of bolts evenly referring to Table 5-1.

Table 5-1 Recommended fastening torque

Screw size	Recommended torque
M5	6～ 8 [N・m]
M6	11～13 [N・m]
M8	28～32 [N・m]
M10	55～65 [N・m]

- Insert the valve stem from bottom of body, and fasten the lock nut referring the Table 5-2. At this time , the lock nut may scuff the valve stem. The wrench should be kept parallel with the horizontal when rotated. Apply lubricant if available to the threaded portion.

Table 5-2 Recommended fastening torque

Screw size	Recommended torque
M5	2.7～3.2 [N・m]
M6	4.5～5.5 [N・m]
M8	11.2～13.7 [N・m]
M10	22.5～27.5 [N・m]

- Put the cylinder cover and fasten it by 4 pieces of hexagon bolts referring Table 5-1.
- 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”.

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 5 hundred thousand cycles.

7.Troubleshooting

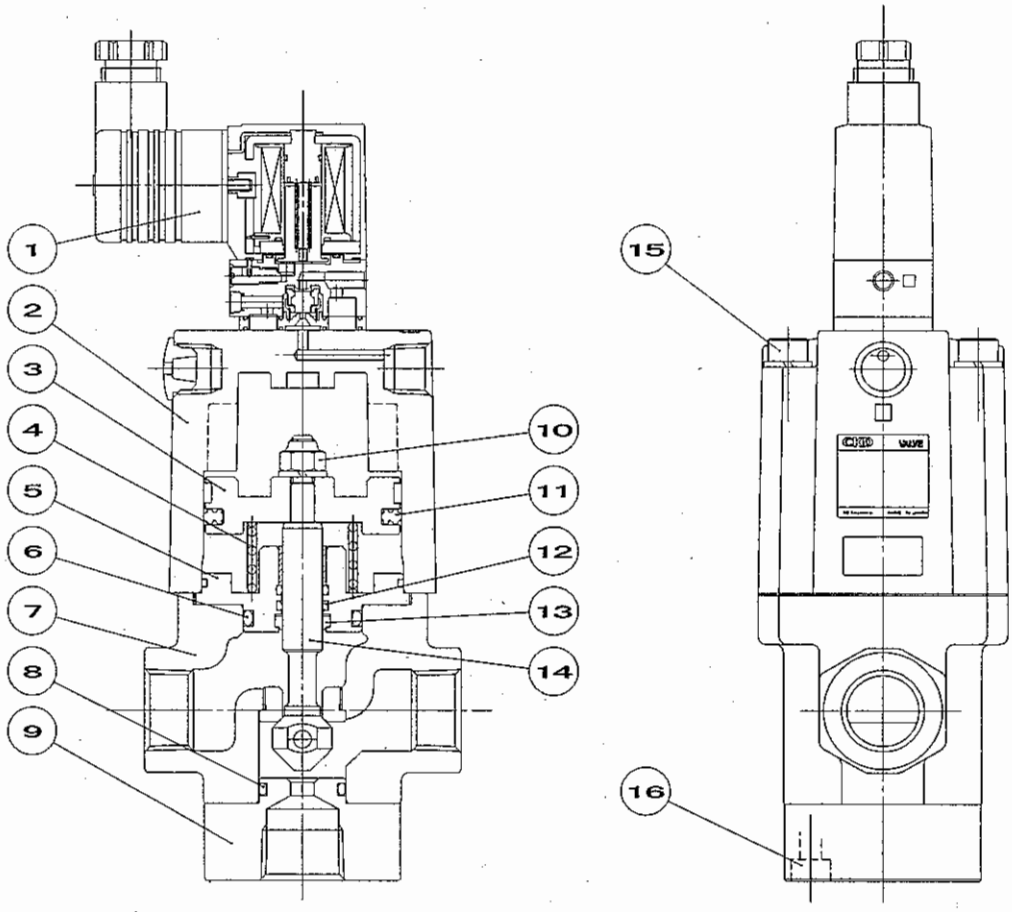
● If the valve does not function as specified, check it according to following Table.

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 valve stem is damaged or worm.	Replace the valve stem with a new one.
	Foreign matter is entangled by the valve stem.	Overhaul the valve and clean the inside of it.

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

8. Internal construction drawing

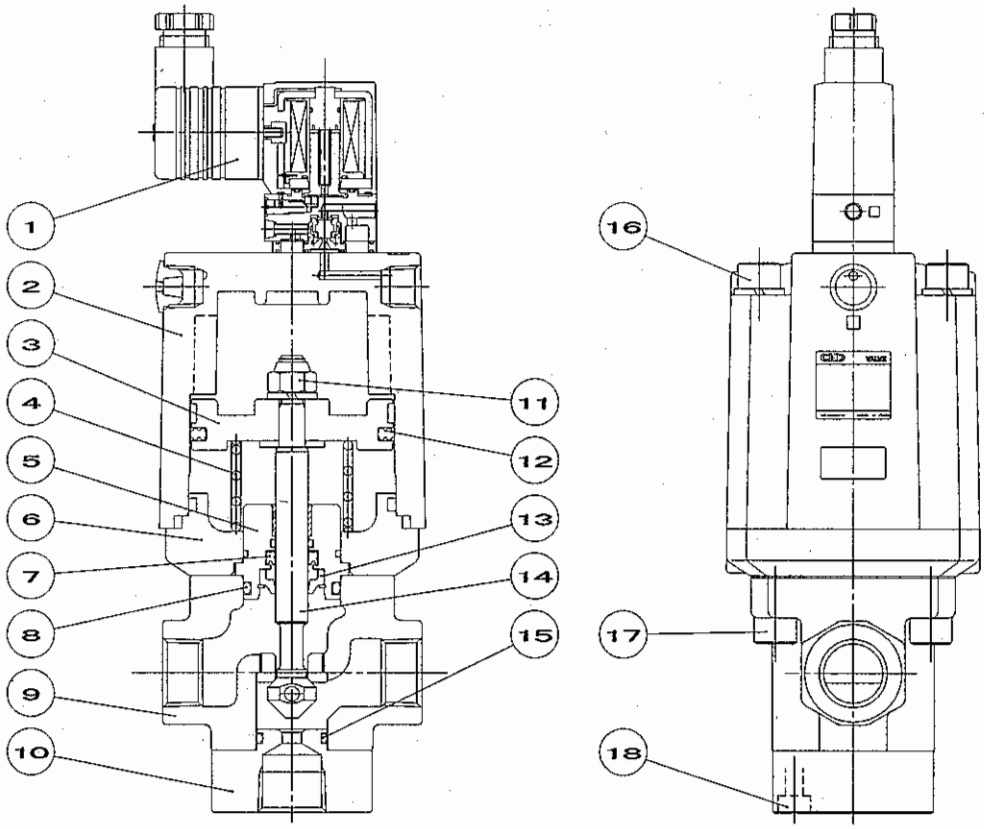
8. 1 For 3.5MPa internal construction drawing



No.	Parts	Q'ty
1	Pilot solenoid valve	1
2	Cylinder cover	1
3	Piston	1
4	Spring	1
5	Adapter	1
6	O-ring	1
7	Body assembly	1
8	O-ring	1
9	NO body	1
10	Lock nut	1
11	PSD packing	1
12	Rod packing	1
13	Scraper	1
14	Valve stem	1
15	Hexagon bolt	4
16	Hexagon bolt	4

The drawing shows CVS31 model.
CV31 model has no pilot solenoid valve.

8. 2 For 7MPa internal construction drawing



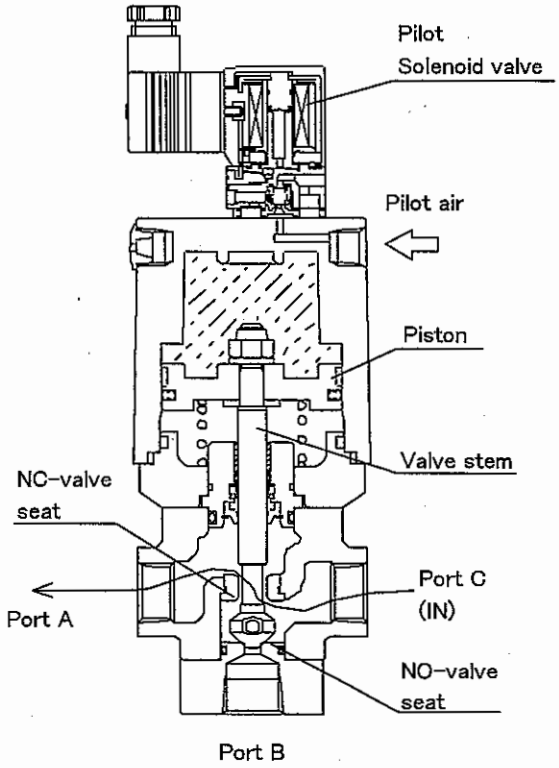
No.	Parts	Q'ty
1	Pilot solenoid valve	1
2	Cylinder cover	1
3	Piston	1
4	Spring	1
5	Adapter	1
6	Yoke	1
7	Lock nut	1
8	O-ring	1
9	Body assembly	1
10	NO body	1
11	Lock nut	1
12	PSD packing	1
13	Scraper	1
14	Valve stem	1
15	O-ring	1
16	Hexagon bolt	4
17	Hexagon bolt	4
18	Hexagon bolt	4

The drawing shows CVS31 model.
CV31 model has no pilot solenoid valve.

9. Operating mechanism

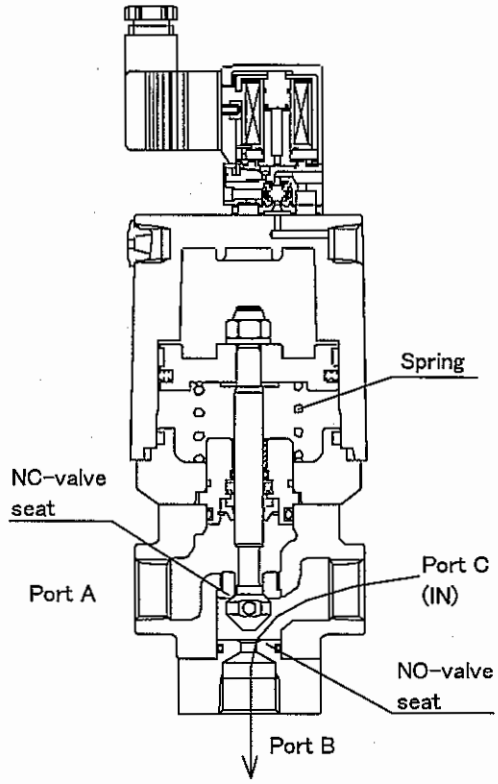
9. 1 Move

- Supply the pilot air to pilot solenoid valve,
- Pilot air passes to piston upper room through.
- Piston descends while the valve stem which is connected with piston descends simultaneously and it closes NO valve seat and NC valve seat opens at the same time.
- Main fluid flows from C to A port.



9. 2 Return

- Non-energize the pilot solenoid valve.
- The piston air in the piston upper room is exhausted through the pilot solenoid valve.
- The piston is pushed up by the spring force , and the valve stem which is connected with piston ascends which leads to NO valve seat open and NC valve seat close.
- Main fluid flows from C to B port.



※ This drawing shows CVS31 model. For the operation of CVS31 model should be done by a separate pilot solenoid valve.

Discontinue

10. Method to specify the model

10. 1 Model number display

CV31－15A－35－0－H C2 3

① ② ③ ④ ⑦ ⑧ ⑨

CVS31－20A－70－B 2H S－D C3 5－1

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① Model name	
Code	Contents
CV31	Air operated type
CVS31	Solenoid valve mounted type

② Connection port size	
Code	Contents
10A	Rc3／8
15A	Rc1／2
20A	Rc3／4
25A	Rc1

③ Operating pressure range	
Code	Contents
35	0～3. 5 MPa
70	0～7 MPa

④ Material combination (body/seal)		
Code	Body	Seal
0	Cast iron	Nitril rubber
B	Cast iron	Fluoro rubber

⑤ Coil options	
Code	Contents
2C	Grommet coil
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

⑥ Other options	
Code	Contents
No Code	No option
S	With surge killer
B	With installing board

⑦ No. of Switches	
Code	Contents
No code	No Switches
X	No Switches, with magnet
H	Detection when valve returned
R	Detection when valve moved
D	With 2 switches

⑧ Switch model	
Code	Contents
	No Switches
C2	No-contact, dual -lead
C3	No-contact, triple-lead

⑨ Switch lead length	
Code	Contents
No Code	No Switches
3	3m
5	5m

⑩ Rated voltage	
Code	Contents
1	AC100V(50/60Hz) ,AC110V(60Hz)
2	AC200V(50/60Hz) ,AC220V(60Hz)
3	DC24V
Other	Other voltage

10. 2 Specifications for the product Model

Model	CV31-※-35 CVS31-※-35	CV31-※-70 CVS31-※-70
Withstand pressure	7MPa	14MPa
Operating pressure range	0～3.5MPa	0～7MPa
Fluid temperature	-10～60℃	
Fluid viscosity	Below 500 mm ^{2}／s	
Ambient temperature	-10～60℃	
Ambient humidity	Below 95%	
Pilot air pressure	0.25～0.5MPa	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 : 4W	

Note: Voltage regulation and Power consumption apply to CVS31 model.