SM-50668/1-A

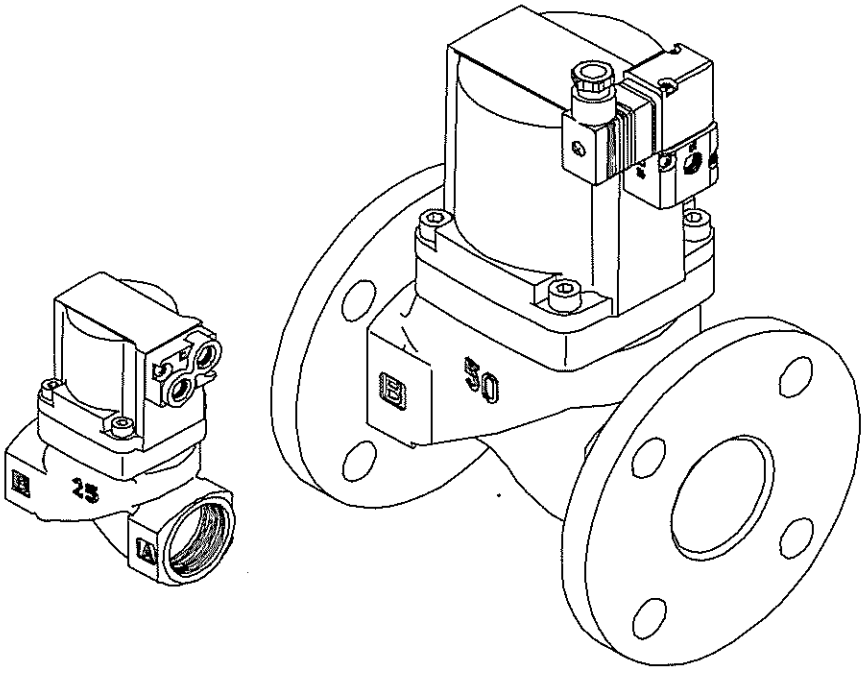
CKD

INSTRUCTION MANUAL

CYLINDER VALVE

SAB※W Series

SVB※W 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 「SAB, SVB」.

1. Purpose and use of the valves

This valve is an external-pilot, 2-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 water, oil, the other liquid.

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

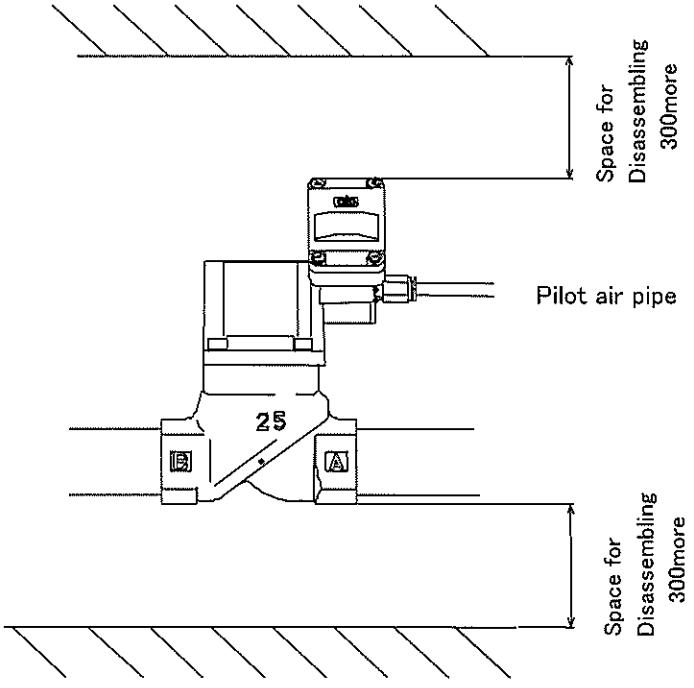
2. 1 Conditions for installation

2.1.1 Orientation

- The mounting posture of the valve is not specified.

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 an approx. 80 to 100 mesh strainer in front of the valve. And, install a filter with 5μm mesh just in front of the valve, and on the pilot air circuit.

● Piping

The piping should be such that the supply ports on the body end and pilot control end are as indicated in the table2-1.

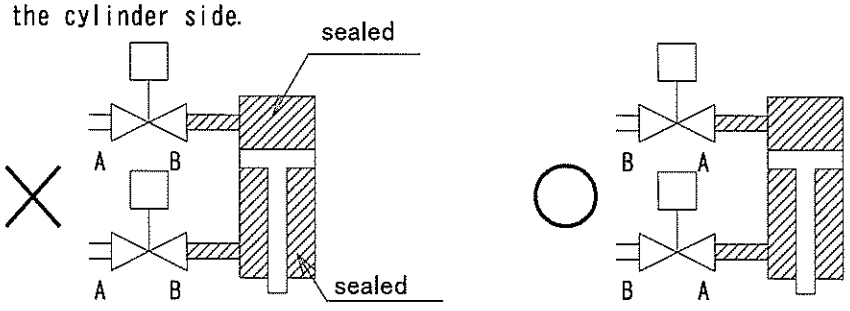
Do not remove the exhaust cap on the air intake port side.

Table 2－1 Supply port

Operation Classification	Body end supply port	Pilot end supply port	
		SAB	SVB
Normally closed type	A	X	P
Normally open type	A	Y	P
Double action type	A	X and Y	

● Hydraulic cylinder control

When moving the hydraulic cylinder, if the valve's B port is piped to the cylinder side, the valve and cylinder fluid will be sealed. The pressure in the pipe will rise and cause an excessive pressure to be applied on the valve body, and could result in damage. Thus, pipe the valve's A port to the cylinder side.



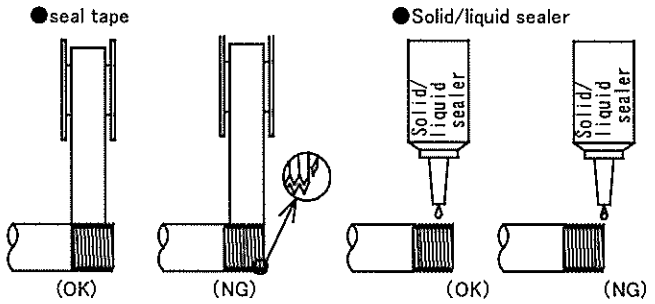
(Figure 2－2)

● 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 2－3)

● The torque is required for tightening pipes are shown in Table 2-2, 2-3 for reference.

Table2－2Pilot port recommend torque

Port size	Torque for tightening pipe
Rc 1／8	7～ 9 [N・m]

Table2－3Main port recommended torque

Port size	Torque for tightening pipe
Rc 1／4	23～ 25 [N・m]
Rc 3／8	31～ 33 [N・m]
Rc 1／2	41～ 43 [N・m]
Rc 3／4	62～ 65 [N・m]
Rc 1	83～ 86 [N・m]
Rc $1^{1}/_{4}$	97～100 [N・m]
Rc $1^{1}/_{2}$	104～108 [N・m]
Rc 2	132～136 [N・m]

The valve body should be held by a spanner for piping work.
Do not screw in the pipe to SVB model by using the pilot valve portion.

● 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.

● 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

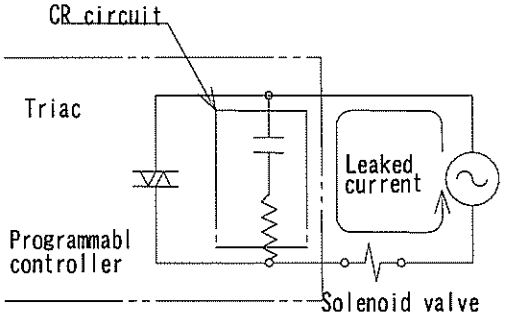
Improve the quality of pilot air by dehumidify by after-cooler air dryer, elimination of foreign particles by filter, elimination of tar by a filter for tar.

2. 3 Wiring work (For SVB 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 mA or less for the rated voltage AC100V
Leak current : 1.5 mA or less for the rated voltage AC200V
Leak current : 1.0 mA or less for the rated voltage DC24V



(Figure 2－4)

● 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.

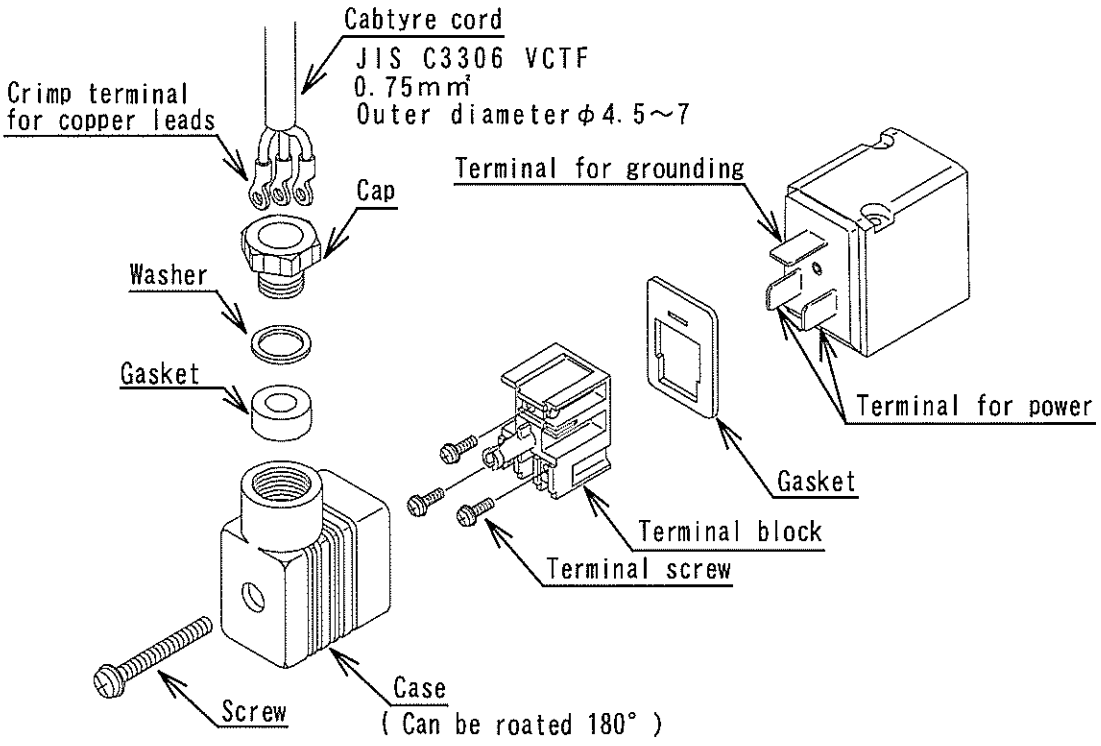
2.3.1 Electric connection of DIN terminal box

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° .

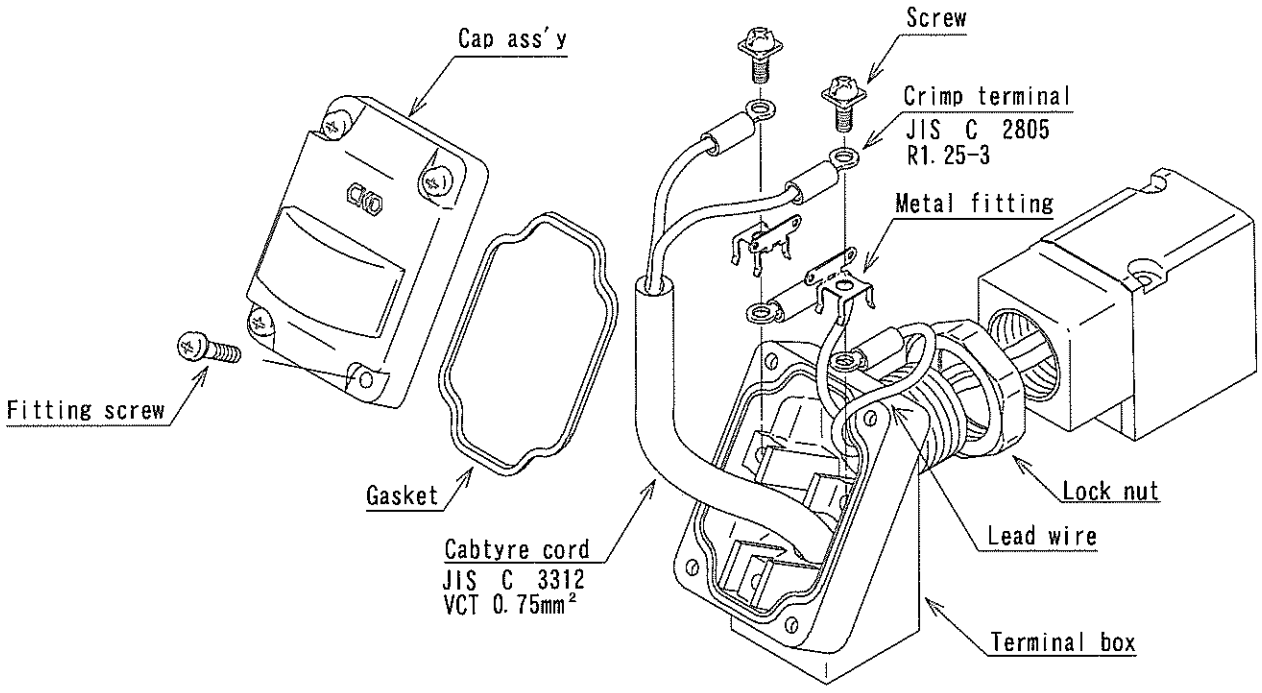


(Figure 2-5) Electric connection of DIN Terminal Box

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 2-6) 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

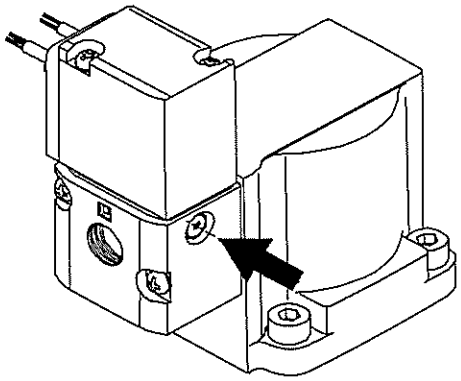
- Compress the fluid to check for leakage at pipe joints.
  It is recommended to check for leakage by supplying a pneumatic pressure of 0.3～0.5MPa with soapy water applied to the joints. Air bubbles will be generated at the leaking joints.

[For SVB 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 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 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 miss 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 SVB series.
  Because the component depends on the AC voltage and the DC voltage, exchange the coil only.

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.
- Set the pilot air pressure range either normally open type or double action type referring the section 10 "Specification for the product model".
- When wanting to make an exhaust sound from the pilot electromagnetism valve quiet in the SVB series, install silencer in the exhaust port of the pilot electromagnetism valve.
- When the fluid temperature is high, please select FKM for seal material.
- The operating frequency specified below shall be satisfied.

Table 4-1 Max operating frequency

Port size	Max operating frequency
8A～25A	30cycles／min
32A (F) , 40A (F)	20cycles／min
50A (F)	15cycles／min
65F	10cycles／min
80F	6cycles／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.
- If any abnormal condition is found, see section 7 "Troubleshooting."

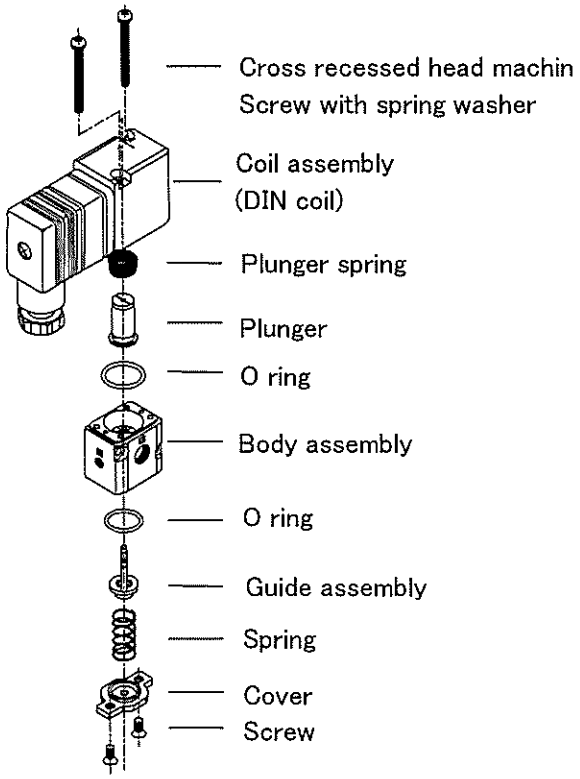
5. Disassembly and assembly

5. 1 Replacement of pilot solenoid valve (For SVB 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.
- 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.

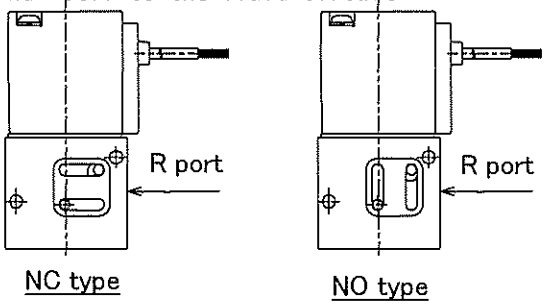


Figure 5-2 direction of gasket installation

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.

Normally closed type

Refer to each corresponding item, because the resolution process is different depending on the port size.

Size:8A~10A

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

- Loosen the 4 pieces of Hex bolt.
  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.
- Please dismount the Lock nut that has fixed the piston.
  When dismounting the Lock nut, please fix the product firmly and turn spanner to the piston rod vertically.
  ※ If you have a lubricant , please apply it on the screw.
- Pull the adapter out of the piston rod.

Size:15A~50A(F)

> ⚠ ⊘ Caution : Jumping spring can cause injury.
> Don't disassemble the C-type snap ring.

- Loosen the 4 pieces of Hex bolt.
- Pull up and dismount the cylinder cover
- Please dismount the Lock nut that has fixed valve main plate.
  When dismounting the Lock nut, please fix the product firmly and turn spanner to the piston rod vertically.
  ※ If you have a lubricant , please apply it on the screw.
- Pull the adapter and valve main plate out of the piston rod.

● Don' t disassemble the C-type snap ring.
Isn' t possible to pull the piston assembly out of the cylinder cover because jumping spring is dangerous.

Size:65F～80F

Caution : The bolt in the center part of the cylinder cover is a resolution prohibition.

Spring might dash out according to the reaction force when resolving it and it

● Loosen the 4 pieces of Hex bolt.
● Pull up and dismount the cylinder cover ass'y
● Please dismount the Lock nut that has fixed valve main plate.
When dismounting the Lock nut, please fix the product firmly and turn spanner to the piston rod vertically.
※ If you have a lubricant , please apply it on the screw.
● Pull the adapter and valve main plate out of the piston rod.
● Don' t disassemble the cylinder cover.
Spring is built into the cylinder cover assembly, and because it is the reaction force in spring and is dangerous to remove the bolt in the center part, it is not possible to do.

Normally open type

● Loosen the 4 pieces of Hex bolt.
● Pull up and dismount the cylinder cover.

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

● Please dismount the Lock nut that has fixed the piston.
When dismounting the Lock nut, please fix the product firmly and turn spanner to the piston rod vertically.
※ If you have a lubricant , please apply it on the screw.
● Pull the adapter and valve main plate out of the piston rod.

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 Silicon base grease.
- Apply grease to the surface on which the packing.
- Install the packing properly to the adapter.
- Fasten the main valve plate by the lock nut referring table 5-1.

Table 5-1 Recommended fastening torque for lock nut

Port size	Screw size	Recommend torque
8A～25A	M4	1．3～1．7 [N・m]
32A	M5	2．7～3．3 [N・m]
40A (F) ～50A (F)	M6	4．6～5．8 [N・m]
65F、80F	M14	61～75 [N・m]

- Fasten the adapter to the body.
- Put the cylinder cover and fasten it by 4 pieces of hexagon bolts referring Table 5-2.

Table 5-2 Recommended fastening torque for hex bolt

Port size	Screw size	Recommended torque
8A, 10A	M3	2．3～2．7 [N・m]
15A, 20A	M4	3～4 [N・m]
25A	M5	6～8 [N・m]
32A	M6	10～14 [N・m]
40A (F) ～50A (F)	M8	26～33 [N・m]
65F、80F	M12	90～110 [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".

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, 8A～25A Replace them every 3 million cycles.
  32A (F) ～50A (F) Replace them every 2 million cycles.
  65F, 80F Replace them every 1 million cycles.

7. Troubleshooting

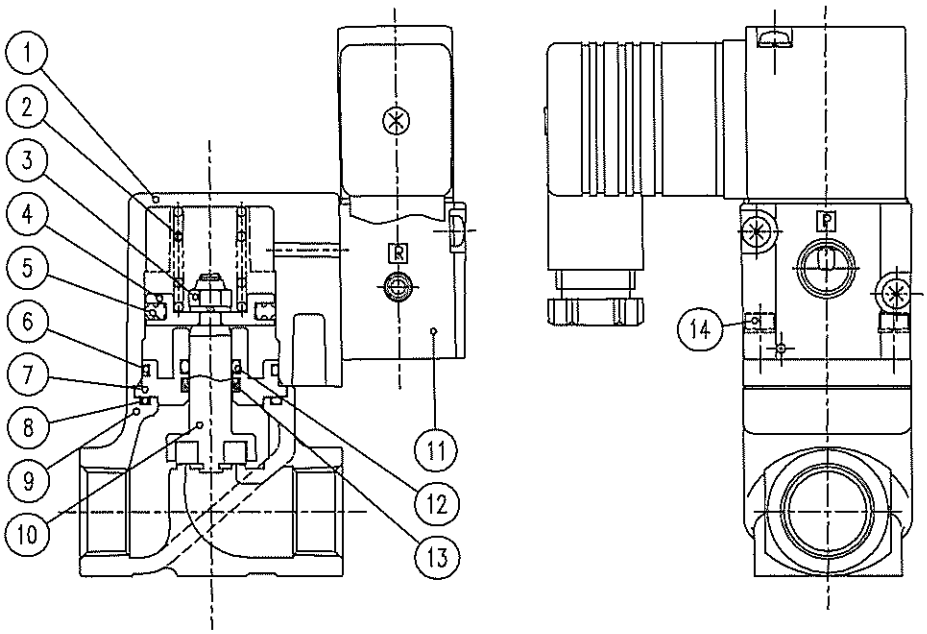
● If the valve does not function as specified, check it according to following Table.

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.
	Foreign matter is entangled by the piston rod.	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 fluid pressure is too high.	Adjust the fluid pressure.
	The pilot solenoid valve does not return.	Replace the pilot solenoid valve with a new one.
	Foreign matter is entangled by the piston rod.	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 piston rod with a new one.
	The rubber or sealing surface of the valve main plate is damaged or worm.	Replace the valve main plate with a new one.
	Foreign matter is entangled by the valve main 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

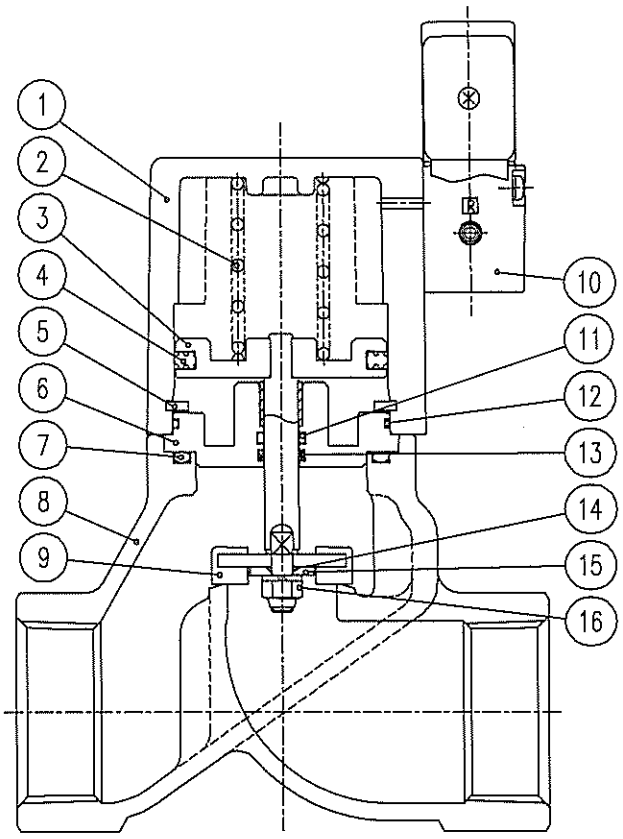
For 8A, 10A internal construction drawing

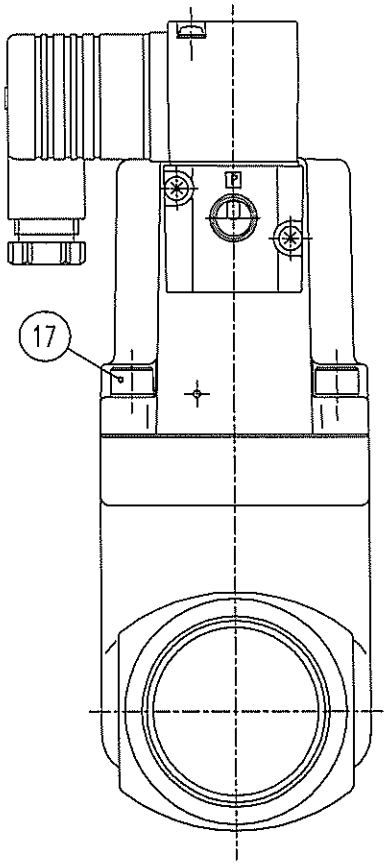


No.	Parts	Q'ty
1	Cylinder cover	1
2	Spring	1
3	Lock nut	1
4	Piston	1
5	PSD packing	1
6	O ring	1
7	Adapter	1
8	O ring	1
9	Body	1
10	Main valve ass'y	1
11	Pilot solenoid valve	1
12	O ring	1
13	MY packing	1
14	Hex. Bolt	4

※1 The drawing shows SVB1W(normally closed type).
Normally open type has the spring below the piston.
※2 SAB model has no pilot solenoid valve.
※3 Double action type has no spring.

For 15A～50A internal construction drawing

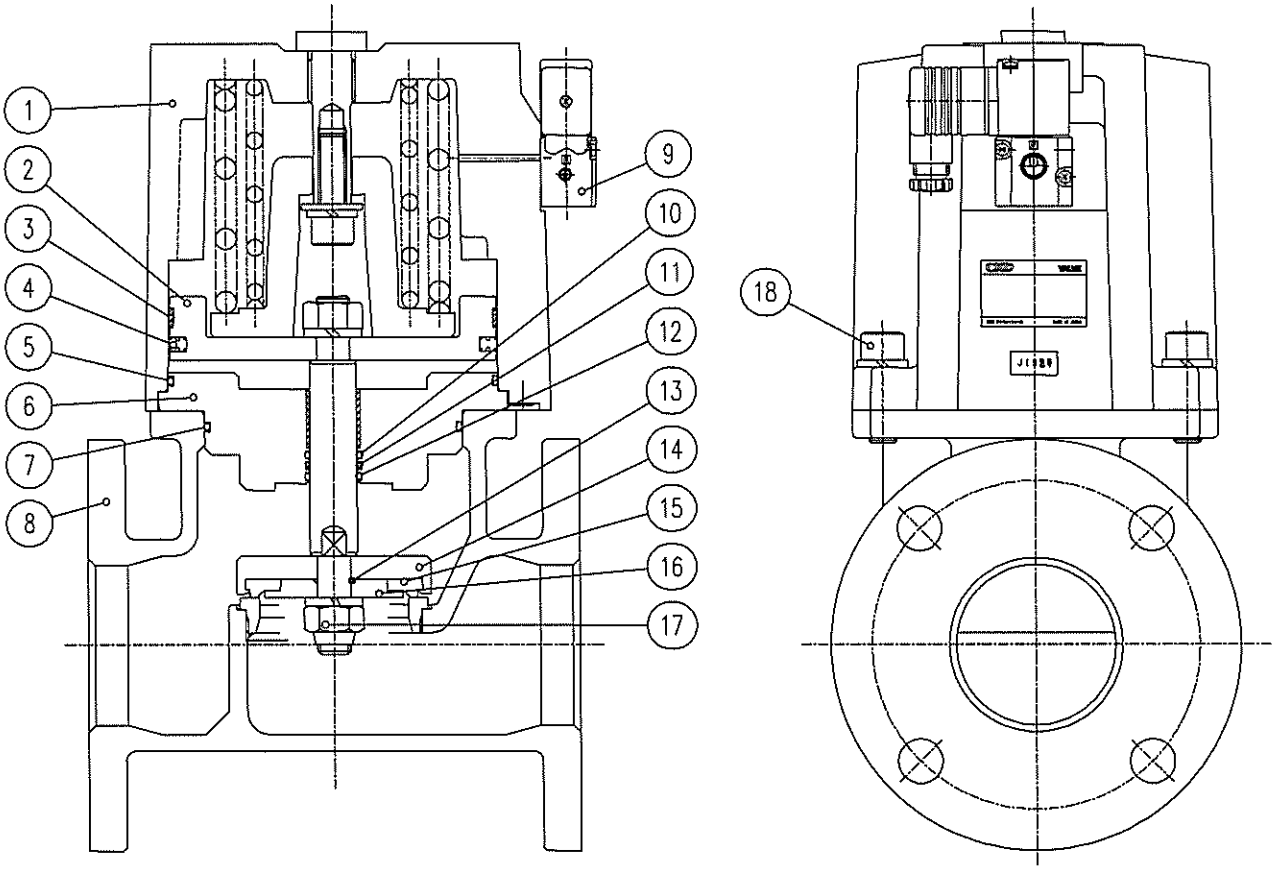




No.	Parts	Q'ty
1	Cylinder cover	1
2	Spring	1
3	Piston ass'y	1
4	PSD packing	1
5	C-type snap ring	1
6	Adapter	1
7	O ring	1
8	Body	1
9	Main valve plate	1
10	Pilot solenoid valve	1
11	O ring	1
12	O ring	1
13	MY packing	1
14	O ring	1
15	Sheet spacer	1
16	Lock nut	1
17	Hex. Bolt	4

※1 The drawing shows SVB1W(normally closed type).
Normally open type has the spring below the piston.
※2 SAB model has no pilot solenoid valve.
※3 Double action type has no spring.
※4 For 40A and 50A,the piston is fixed the piston rod by hex nut.

For 65F, 80F internal construction drawing



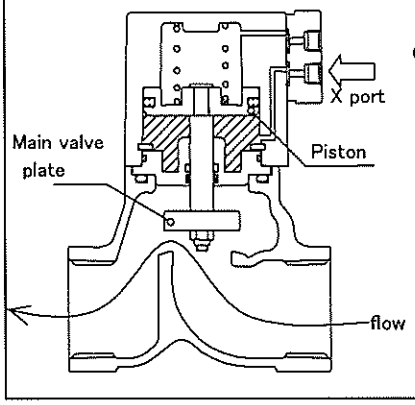
No.	Parts	Q'ty
1	Cylinder cover	1
2	Piston ass'y	1
3	Wear ring	1
4	PSD packing	1
5	O ring	1
6	Adapter	1
7	O ring	1
8	Body ass'y	1
9	Pilot solenoid valve	1
10	O ring	1
11	MY packing	1
12	Scraper	1
13	Valve plate	1
14	O ring	1
15	Main valve plate	1
16	Sheet spacer	1
17	Lock nut	1
18	Hex. Bolt	4

※1 The drawing shows SVB1W(normally closed type).
Normally open type has the spring below the piston.
※2 SAB model has no pilot solenoid valve.
※3 Double action type has no spring.
※4 For 65F and 80F,the piston is fixed the piston rod by hex nut.

9. Operating mechanism

9. 1 Normally closed type

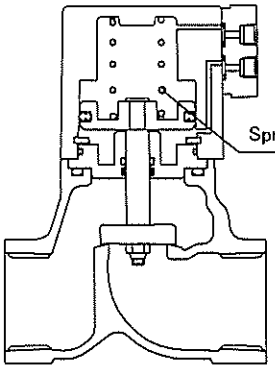
open



- Supply the pilot air for X(P) port.
- Pilot air presses through to the lower piston area.

The main valve plate opens.
The fluid flows through.

closed



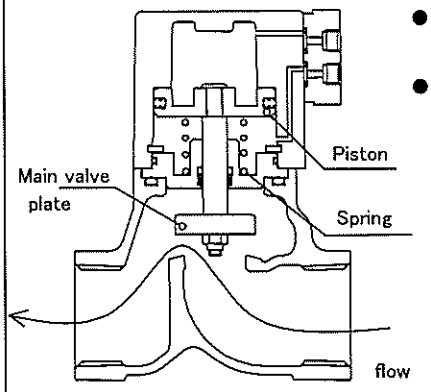
- Pilot air in the lower piston area is exhausted from X(P) port.
- Spring closes the main valve plate.

The fluid stops flowing

() is the case of SVB

9. 2 Normally open type

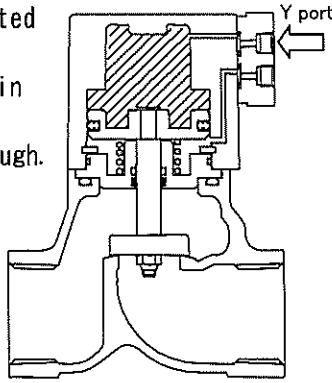
open



- Pilot air is exhausted from Y(R) port.
- Spring opens the main valve plate.

The fluid flows through.

closed



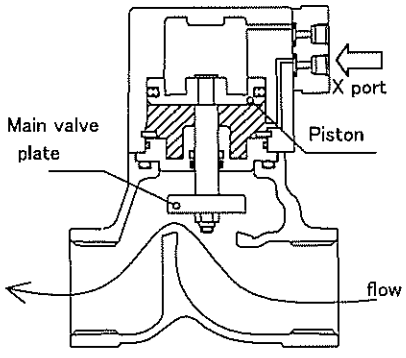
- Supply the pilot air for Y(P) port.
- Pilot air presses through to the upper piston area.

The fluid stops flowing.

() is the case of SVB

9. 3 Double action type

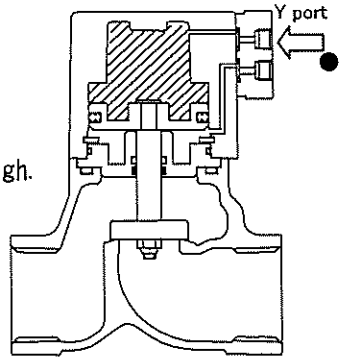
open



- Supply pilot air for X port , and exhaust from Y port.
- Pilot air opens the main valve plate.

The fluid flows through.

closed



- Supply pilot air for Y port , and exhaust from X port.
- Pilot air closes the main valve plate.

The fluid stops flowing.

※ The explanation of above-mentioned shows SAB series.

10.method to specify the model

10. 1 model number display

SAB 1 W−15A− 0 B
① ② ③ ④ ⑤ ⑥

SVB 2 W−20A−B 2H S−AC100V
① ② ③ ④ ⑤ ⑦ ⑥ ⑧

① Model name	
Symbol	
SAB	Air operated type
SVB	Solenoid valve mounted type

② Operation classification	
Symbol	
1	Normally closed type
2	Normally open type
3	Double action type

③ Fluid classification	
Symbol	
W	Water, oil, other liquid

④ Connection port size	
Symbol	
8A	Rc1／4
10A	Rc3／8
15A	Rc1／2
20A	Rc3／4
25A	Rc1
32A	RC1 1／4
32F	Flange 32
40A	RC1 1／2
40F	Flange 40
50A	Rc2
50F	Flange 50
65F	Flange 65
80F	Flange 80

⑤ Body and Seal combination		
Symbol	Body	Seal
0	Bronze	NBR
B	Bronze	FKM
P	Bronze	EPDM
D	Stainless steel	NBR
E	Stainless steel	FKM
R	Stainless steel	EPDM

⑥ Other option	
Symbol	
No symbol	No option
B	Installing board※
S	With surge killer

※for 8A～32A

⑦ Coil option	
Symbol	
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

⑧ Rated voltage	
Symbol	
AC100V	AC100V 50/60Hz,110V 60Hz
AC200V	AC200V 50/60Hz,220V 60Hz
DC24V	DC24V

. Note.1 The Body material of 65F and 80F is FC250.

● Please refer the catalogue for details.

10. 2 Specification for the product model

Model	SAB※W-8A～25A SVB※W-8A～25A	SAB※W-32A(F)～80A(F) SVB※W-32A(F)～80A(F)
Withstand pressure	2MPa	
Fluid pressure	0～0.7MPa ※1	0～0.5MPa ※1
Fluid temperature	-10～60℃ (※when FKM option, -10～90℃)	
Fluid viscosity	Less than 500mm^2／s	
Ambient temperature	-10～60℃	
Ambient humidity	Less than 95%	
Pilot air pressure	0.35～0.7MPa ※2	0.25～0.7MPa ※2
Pilot air temperature	-10～60℃	
Attachment orientation	Free	
Voltage regulation	-10%～+10% of the rated voltage	
Power consumption	AC:1.9/1.5W(50/60Hz) DC:2W	

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

※1

Model	Fluid pressure
SAB1W-8A～25A SVB1W-8A～25A	0～0.7[MPa]
SAB1W-32A(F)～80A(F) SVB1W-32A(F)～80A(F)	0～0.5[MPa]
SAB2W SVB2W SAB3W	0～1[MPa]

※2 Pilot air pressure of normally open type and double action type