SM-50578-A

CKD

INSTRUCTION MANUAL

PLOT OPERATED 2 PORT SOLENOID VALVE

RSV- 20 A -210K (Normally closed series)
25 F
32
40
50
65
80

- Prior to using the Product, it is essential to read this INSTRUCTION MANUAL, especially the description of safety-use issue.
- For quick reference whenever necessary, keep this INSTRUCTION MANUAL in a good manner.

CKD Corporation

Introduction

Thank you for purchasing the CKD solenoid valve for water "RSV Series".
The power consumption of this solenoid valve is low at 3W for the DC coil and 2.5W for the AC coil. (Note that this is limited to the standard voltage on page 22.) Thus, the voltage drop caused by the cable's wire resistance is low, and remote control is possible.
This solenoid valve has the following features.

1. Outstanding waterproofness. (Protection class: Equivalent to IP67, brief submersion in water possible. (Excluding valve with terminal box.))
2. Low water hammer (Water hammer is eased by lengthening the valve close time.)
3. The flow control and manual operations are possible.
4. A surge suppressor is built-in, providing measures against indirect lightning. (Note that this is limited to the standard voltage.)

1. Description and Intended use

This solenoid valve is used to supply and stop water by turning electric signals ON and OFF. This valve can be used with agricultural water or industrial water, etc.

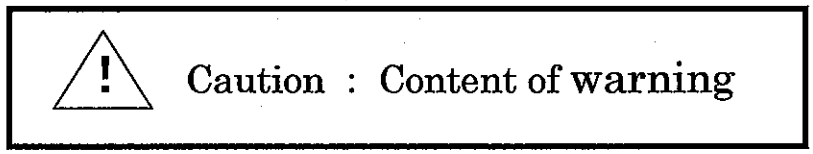
2. General precautions

- This operation manual describes the basic matters concerning the handling of the product, including unpacking, installation, use, and maintenance.
- The description about the installation in this manual is intended for qualified mechanicians and electricians. This should be thoroughly read before designing and installation to ensure the safety of the machine or tool and the proper handling of this product.

3. Safety precautions

- Warnings are shown in this manual as required to avoid injury, fire, and damage to your properties. They must be strictly observed.
- Warnings should be shown under different headings, i.e. Danger, Warning, and Caution, according to the degree of risk. However, they are all shown under the heading of Caution in this manual because this product is used as a component of a machine or tool.

Example of warning



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1. Unpacking

(1) Check that the product model and nameplate are the same as those ordered.

(2) Check that the rated voltage and frequency are the same as those ordered.

(3) Check the appearance for damage.

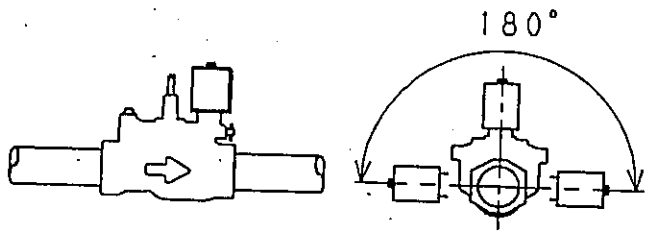
(4) To store the valve, do not unpack the valve to protect it from foreign matter entering its inside. It is recommended to unpack the valve immediately before starting piping work.

2. Installation

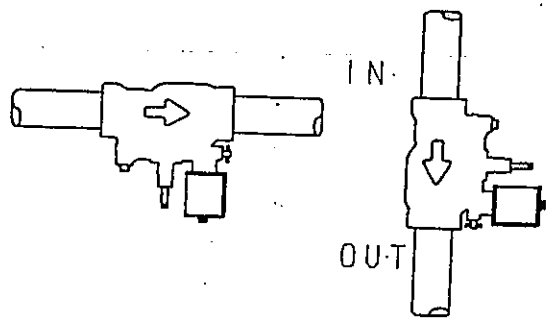
2.1 Installation requirements

(1) Install the solenoid valve on a horizontal piping with the coil section facing upward. If the solenoid valve must be piped vertically, pipe so that the IN port faces downward and the OUT port faces upward. (Refer to Fig. 1.)
If air enters the piping or solenoid valve, phenomenon such as cavitation or chattering could occur. Make sure that air does not enter.
If a phenomenon such as cavitation occurs, repeatedly open and close the solenoid valve to gradually bleed the air accumulated in the valve. Note that if the problem occurs frequently, an air bleeding valve should be installed at the highest point in the piping between the water pressure source and solenoid valve.

good installation attitude



poor installation attitude



Installation attitude when inevitable

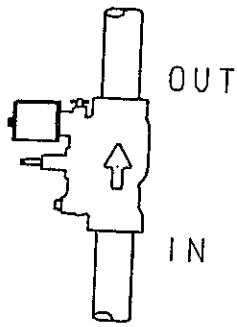


Fig. 1.

2.2 Maintenance space

(1) By taking safe maintenance and troubleshooting work into consideration, keep adequate spaces around the valve. (Fig. 2)
If the solenoid valve installation position is deeper than the Earth's surface, secure space in which a worker can enter and work.

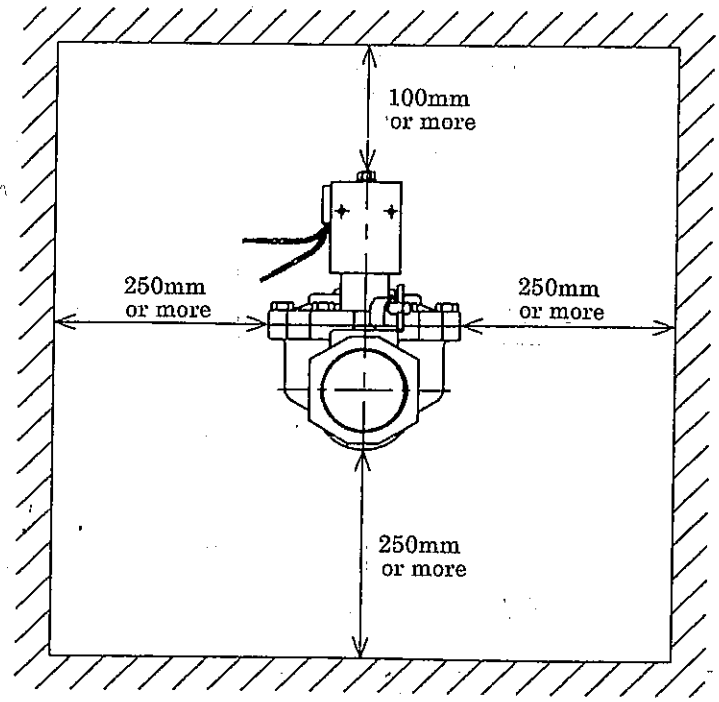


Fig. 2

2.3 Protection measures

(1) When using this solenoid valve in cold district, or if the solenoid valve could freeze during the winter, take appropriate anti-freezing measures such as protecting the valve with heat insulating material.

> Caution : Do no place heat insulating material, etc., on the coil section.
> There is a risk of fire when the coil heats up.

(2) When using the solenoid valve outdoors, make sure that water is drained well around the solenoid valve.
The solenoid valve can withstand brief submersion in water. However, to prevent corrosion and a deterioration in insulation, avoid submerging the valve in water for longer than one month. (Note that the solenoid valve with terminal box must not be used outdoors.)

2.4 Piping work

(1) When possible, use a piping diameter with the same port size as the solenoid valve. When using a screw-in type, use the piping taper screw specified in the JIS Standards. When using a flange type, use a 10K flange specified in the JIS Standards.

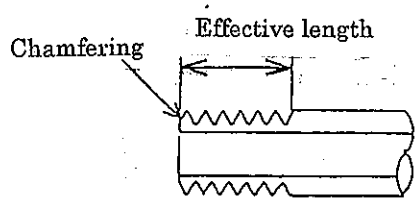


Fig. 3

(2) Keep the length of the threads in the piping to an effective thread length. Also, the end of the threaded part should be finished by chamfering to a half pitch. (Fig. 3)

(3) Air-flush the pipe to remove any foreign matter or chippings inside the pipe before piping.(Fig. 4)

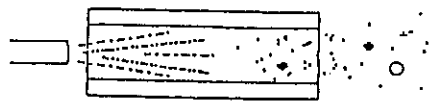


Fig. 4

(4) If the piping is connected to any other articles, try not to get any seal material or sealing tape inside the piping.
Pay attention to the amount of seal material and the position of application or the position where the sealing tape is wound around the pipe. (Do not place the seal material within 1.5 to 2 threads from the end of the pipe.) (Fig. 5)

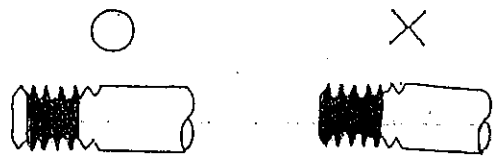


Fig. 5

(5) Align the fluid flow direction and the direction of the arrow indicated on the solenoid valve when piping.
When using the screw-in type, refer to the tightening torque for piping in the following table.

Port size	Tightening torque of piping
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
Rc 2 $^{1}/_{2}$	146 ~ 150 N・m
Rc 3	148 ~ 152 N・m

(6) Take care not to strain the valve when piping. Especially take care not to apply external force on the coil section.

(7) Make sure that foreign matter such as sand does not enter the piping during the piping work.
Provide a relief valve (mud drainage valve, etc.) at the required section in the pipe path or at the end of the pipe so that the pipe can be flushed.

(8) When the drainage of water from inside the tank is controlled, if the pipe is placed at the bottom of the tank, accumulated foreign matter may flow into the pipe, causing operational defects in the solenoid valve. The pipe should be placed slightly above the bottom of the tank. (Fig. 6)

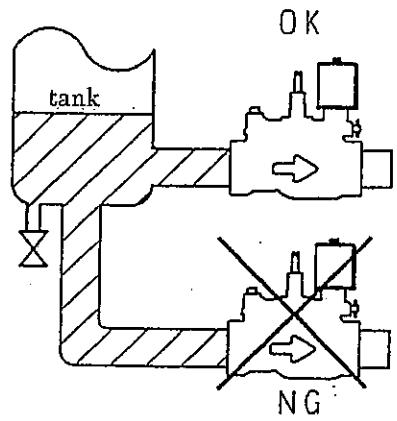


Fig. 6

(9) Dirt or foreign matter in the water will interfere with the normal operation of the solenoid valve. Install a 40 to 80 mesh strainer on the IN side of the solenoid valve according to the water quality. (Fig. 7.)

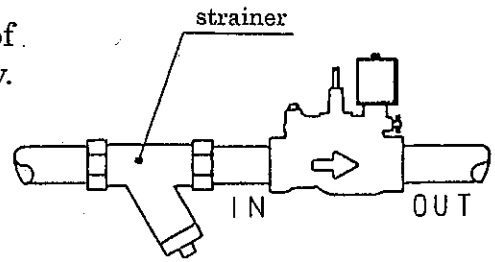


Fig. 7.

2.5 Wiring work

(1) When operating the solenoid valve using a programmable controller, confirm that the leak current level of the output from the programmable controller is within the specified values shown in the following. Failure to observe this could cause malfunctions.

Rated voltage	AC24V	AC100V	AC200V	DC24V
Leak current	6mA or less	1.9mA or less	0.7mA or less	4mA or less

(2) Use a snap action switch or relay for the switches when possible.

(3) Use a breaker such as a fuse or ground-fault circuit breaker on the control circuit side to protect the electric equipment.

(4) For the wiring, use electrical wires with a nominal cross-sectional area of $0.75mm^2$ or larger. Make sure that excessive force is not applied on the lead wires.

(5) The AC and DC coils do not have polarity. (The AC coil has a built-in rectifier (half wave), and drives the DC coils.) The lead wire and terminal box connections are shown in Fig. 8. to Fig. 10. Connect according to each type.
The solenoid valve with terminal box is not suitable for outdoor use. When the solenoid valve must be used outdoors, use the lead wire type.

(a) Lead wire type
Use a crimp sleeve at the lead wire joint section, and accurately insulate with a waterproof insulation pad (ex.: Sumitomo 3M EMS-9091FR).

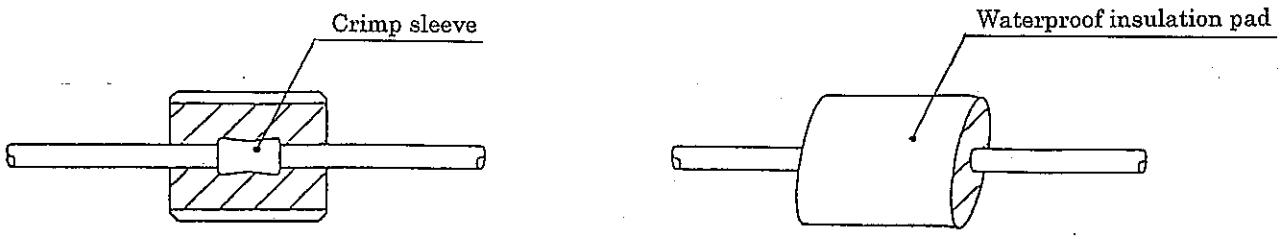
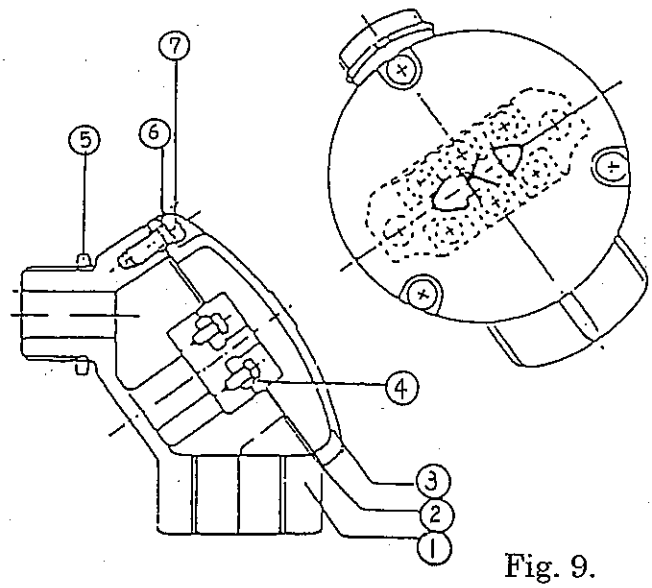


Fig. 8.

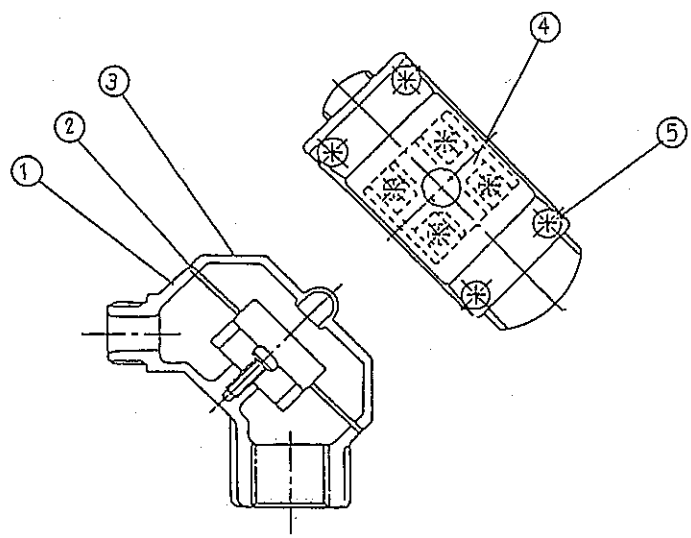
(b) Round terminal box type (option)
The coil does not have polarity. Loosen the ⑦ pan head small screw, remove the ③ cap, and connect to the ④ harmonica terminal.



No.	Parts name
7	Pan head small screw
6	Spring washer
5	Lock nut
4	Terminal
3	Cap
2	Packing seal
1	Main body

Fig. 9.

(c) Square terminal box type (option)
The coil does not have polarity. Loosen the ⑤ cap installation screw, remove the ③ cap, and connect to the terminals on the ④ terminal block.



No.	Parts name
5	Cap set screw
4	Gland
3	Cap
2	Packing seal
1	Main body

Fig. 10.

(6) The solenoid valve can be used in the continuous power ON state. If the power is turned ON for a long time, the coil surface temperature will rise to approx. 30°C, and will become very hot. Make sure that combustible matters do not come in contact, and provide sufficient heat dissipation with ventilation, etc.

3. Check items before starting operation (Check items after installation)

3.1 Appearance check

Caution : Turn OFF the power.
: Stop the fluid flow.
(Turn the water off at the main.)

(1) Press the piping connection by hand to check that solenoid valve is correctly secured to the piping.

(2) Check that all the bolts and screws are securely tightened.

3.2 Leak check

(1) Confirm that the liquid does not leak from the connection section or to the solenoid valve's OUT side when applied within the working pressure range. (If there is air in the piping or solenoid valve, water will flow temporarily to the solenoid valve's OUT side immediately after the pressure is applied. This is not a leak.)

3.3 Electrical check

Caution : Turn OFF the power.

(1) Measure the insulation resistance between the metal section, such as the solenoid valve's body or screw parts, and the charged section, such as the lead wire. The state is correct if the resistance is 10MΩ or more.

(2) Power supply voltage check
The power supply voltage variation shall be in a range of −10～+10% of the rated voltage.

4. Proper operating procedure

Caution : When using the solenoid valve is used in the continuous power ON state, the coil surface temperature will rise to approx. 30°C, and will become very hot.
Do not touch the coil with bare hands while the power is ON or immediately after turning the power OFF.

: Do not touch the electrical wiring connection sections (bare exposed sections) while the solenoid valve is energized with hands or body parts. (Note that if the solenoid valve is submerged in water, this includes the water and solenoid valve.) There is a risk of electric shock.

: If electric cables are loose and directly placed on the work place floor, this may cause stumbling hazards.
Protect the electric cables with appropriate measures, such as wire conduits.

: Do not use in an atmosphere that contains corrosive or flammable gases. There is a risk of accidents.

(1) Use this solenoid valve for agricultural water or industrial water. This valve can be used with water containing liquid manure or diluted agricultural chemicals. However, the performance of the solenoid valve could be inhibited depending on the liquid.

(2) Always stay within the specified range for the temperature of the ambient air and the water that passes through the valve.

(3) Use within the specified pressure range. Note that the IN and OUT valve pressure difference must be 0.03MPa (bore 50 or less) or 0.05MPa (bore 65 or more) when the valve is open. (Refer to Fig. 11.)

Differential pressure $\Delta P = P_1 - P_2 >$ 0.03MPa (Port size 2 or less)
0.05MPa (Port size $1\,{}^{1}/_{2}$ or more)

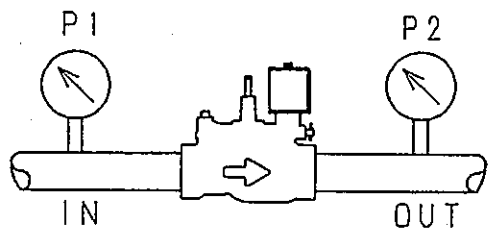


Fig. 11.

(4) When the solenoid valve has not been used for six months or more, operation faults or leakage faults could occur due to changes in the water quality. Disassemble and clean the valve in this case.

Refer to the "5. Disassembly, Cleaning, assembly"

(5) Strictly follow the valve activation frequency.

Activation frequency [activations/min]
1 or less

5. Disassembly, Cleaning, Assembly

For details on disassembly and assembly, refer to the disassembly figures in Fig. 14 to 16 according to the solenoid valve bore and presence of the terminal box.

5.1 Disassembly procedure

Caution : Turn the water off at the main.
: Discharge the fluid in the solenoid valve.
: Turn OFF the power.

(1) Remove the Hexagon nut ㉖ and than remove the parts in the order of ㉕㉔㉓㉒㉑. [In case of terminal box type, remove the parts in the order of ㉕㉔㉚(㉛㉜)㉙㉒㉑.]

(2) Remove the cross-recessed head screw ⑳ and than remove the parts in the order of ⑲⑱(⑰)⑯(⑮)⑭⑬ . [In case of terminal box type, remove the parts in the order of ㉘⑱(⑰)⑯(⑮)⑭⑬ .]

(3) Remove the Hexagon head bolt ⑨ and than remove the parts in the order of ⑥ (⑤④) ③②① (⑦⑧).

(4) The manual operation needle ⑪ (⑩) can be removed by turning it counterclockwise.

(5) The filter assembly ⑧ (⑦) can be removed by turning it counterclockwise.

5. 2 Cleaning

(1) Wash the disassembled parts with water or a neutral detergent.
Note that contamination on the coil should be wiped off, and the coil must not be washed.
Do not use organic solvent as it could cause the rubber parts to expand.

(2) Periodically wash the filter assembly ⑧ according to the water quality as it will greatly affect the solenoid valves opening/closing operation. Clean the metal mesh section of the filter assembly with a brush, etc.
Clean the bleed holes in the following manner. 1. If the hole is 0.5mm or less in size, pass a wire through the hole. 2. Blow air compressed to approx. 0.3MPa. 3. Clean with pressurized water, etc. (Refer to Fig. 12.)

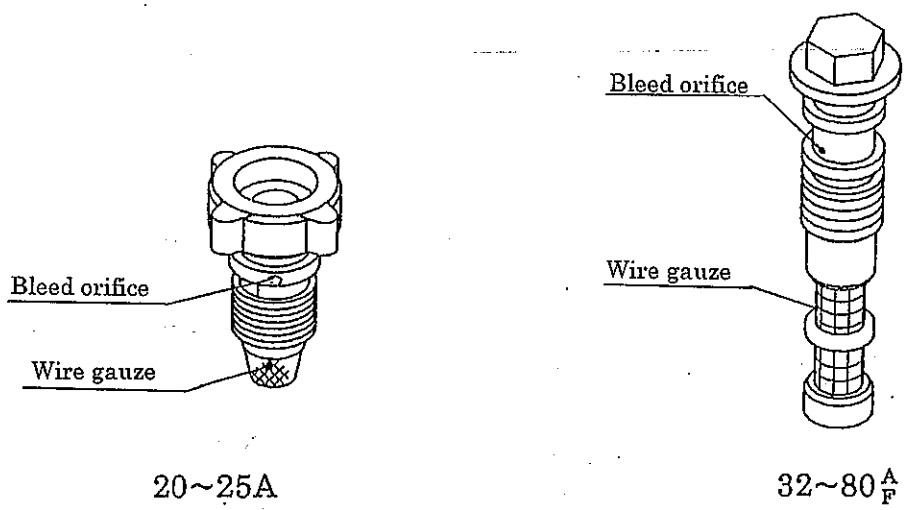


Fig. 12.

5. 3 Assembly procedure

(1) To re-assembly, follow the instructions for "5.1 disassembly" in reverse order, and make sure not to forget any of the parts.

(2) Take care to the installation direction of the diaphragm assembly ②. (For the 65 and 80 port size, the installation direction will be determined when the positioning eyelet ㉗ is mounted on the diaphragm assembly body ① hole.)

(3) Assembly the spring ③ so that it is not tilted.

(4) Accurately mount each O-ring onto the slot of each installation part.

(5) Accurately mount the plunger spring ⑮ onto the plunger ⑯.

(6) Assemble the core A ⑲ edge so that it accurately contacts the inner surface of core B ㉓ , and securely tighten it with the hexagon nut ㉖. (Refer to Fig. 13.)

(7) Tighten the hexagon head bolt ⑨ at a torque of 12 to 18N.m for the 20 to 50A port size, and at 24 to 36N.m for the 65 to 80 port size.

(8) The filter assembly ⑧ is a resin part, so lightly tighten it by hand. The reference tightening torque is 0.8 to 1.2N.cm. The assembly will be damaged if tightened too far.
(The assembly can also be damaged after long use due to creeping rupture.)

(9) Apply the fluid pressure and check that no leak occurs.

(10) Power on the system to make the fluid circuit ready for use.

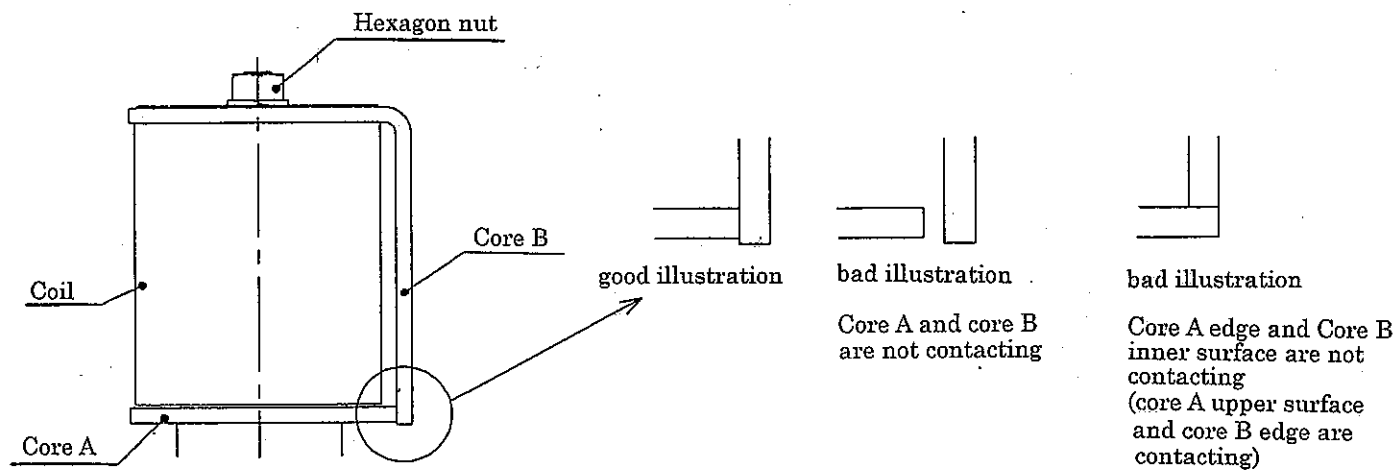


Fig. 13.

6. Maintenance

6. 1 Maintenance and inspection

(1) Periodically inspect the valve once 6 months to keep its optimal operating status.

(2) Refer to section "5.1 Disassembly procedures", disassemble the part and inspect.

(a) Check that there is no foreign matter such as contaminant in the valve or rust in the piping, and check that no highly viscous matter is adhered. If any abnormality is found, disassemble and clean the part.

(b) Check that no foreign matter is adhered on the filter assembly's metal mesh section or bleed hole. Clean if any abnormality is found. (Refer to section 5.2 Cleaning (2).)

(c) Check that the plunger is not abnormally worn or corroded, and that the diaphragm assembly is not damaged or abnormally worn. Replace the part if any abnormality is found.

(d) Check the filter assembly and molded coil for damage and cracks, etc. Replace the part if any abnormality is found.

6. 2 Spare parts

(1) The following maintenance parts are available as a kit. If any abnormality is found in the parts, replace the part immediately. (Refer to the disassembly drawings in Fig. 14 to 16.)

Kit name	Parts	Number in disassembly drawing	Remark
Diaphragm ass'y kit (D ass'y)	Diaphragm ass'y	②	Repair parts
Filter ass'y kit (F kit)	Filter ass'y O-ring	⑧ ⑦	Repair parts
Manual operated needle kit (N kit)	Manual operated needle O-ring	⑪ ⑩	Repair parts
Core ass'y kit	Core ass'y O-ring	⑱ ⑰	Repair parts
Core AB	Core A Core B Flat headed cross cut screw	⑲ ㉓ ⑳	
Pilot valve seat kit (P seat kit)	Pilot valve seat O-ring	⑭ ⑬	Repair parts
Plunger ass'y kit (P kit)	Plunger Plunger spring	⑯ ⑮	Repair parts
Bonnet ass'y kit (B kit)	Bonnet ass'y Bonnet piece	㉚ ㉙	
Actuator ass'y kit (A kit)	O-ring Pilot valve seat Plunger spring Plunger O-ring Core ass'y Core A Flat headed cross cut screw Insulator Mould coil Core B Spring washer Hexagon nut	⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉕ ㉖	Core ass'y kit, Core AB, Pilot valve seat kit, Plunger ass'y kit, Select when replacing the coil, etc., as a set

Disassembly drawing

RSV−$^{20}_{25}$A−210K

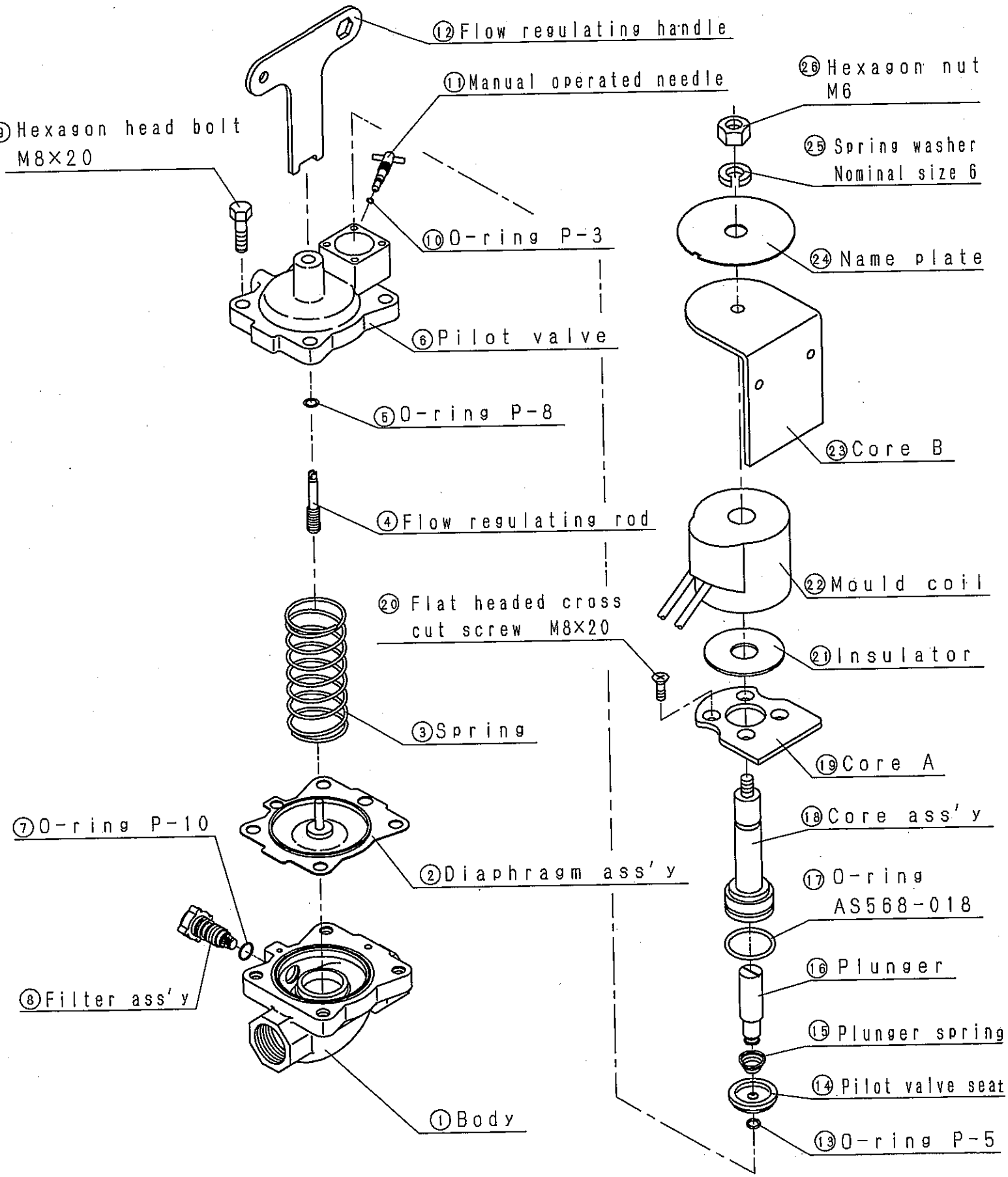


Fig. 14.

Disassembly drawing

RSV− 32, 40, 50, 60, 80A / 40, 50, 65, 80F −210K

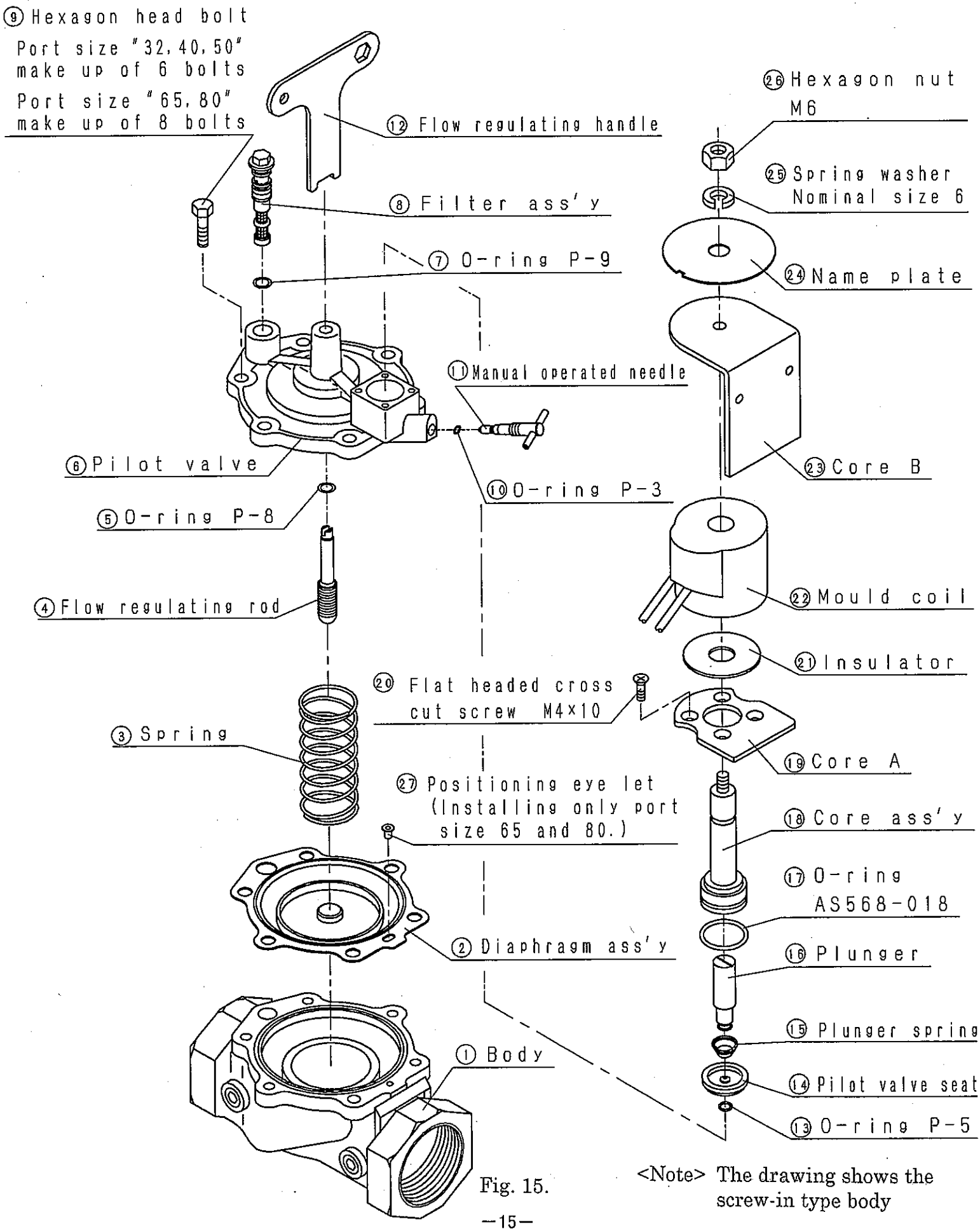
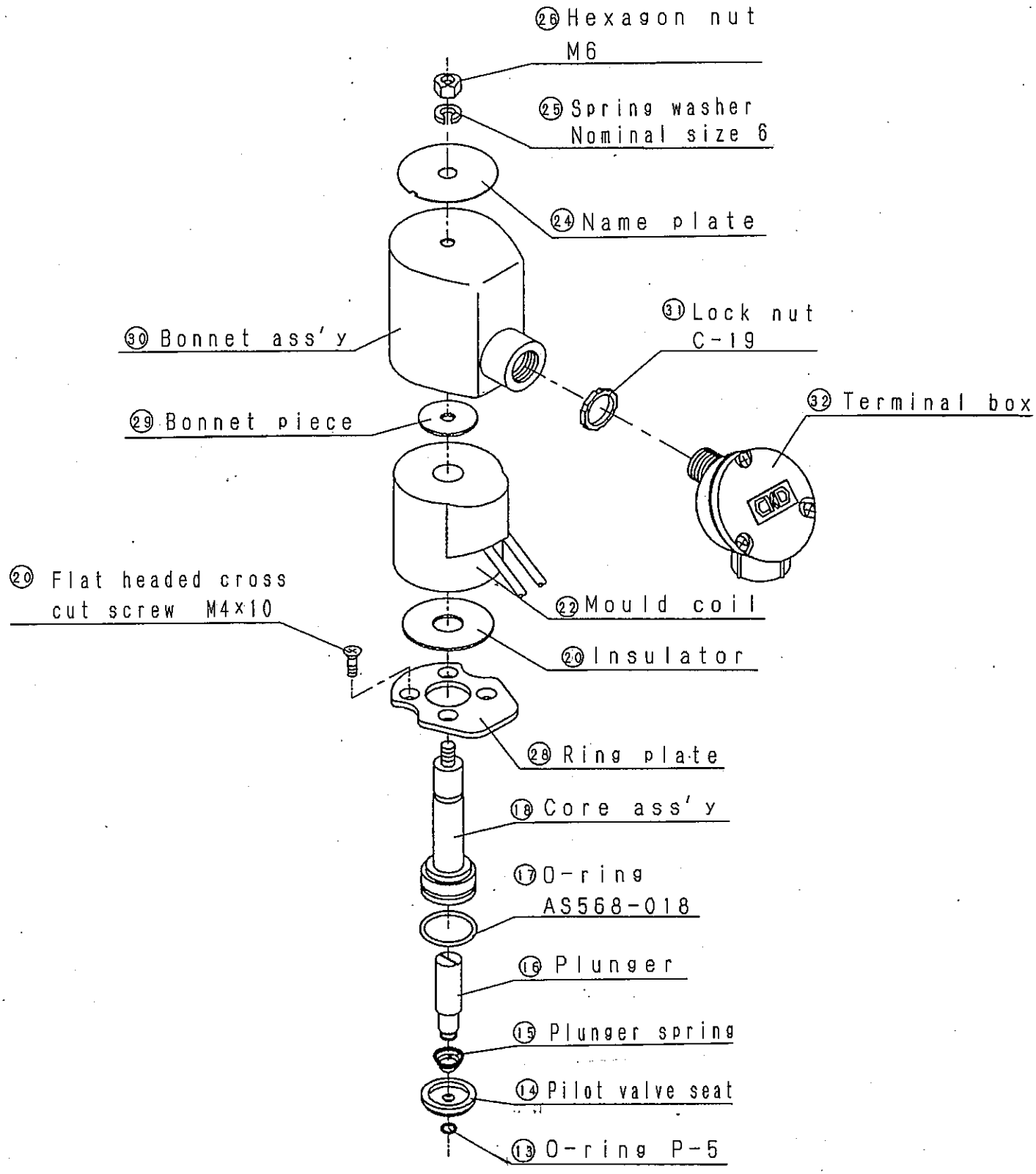


Fig. 15.

<Note> The drawing shows the screw-in type body

Disassembly drawing of the solenoid valve with terminal box



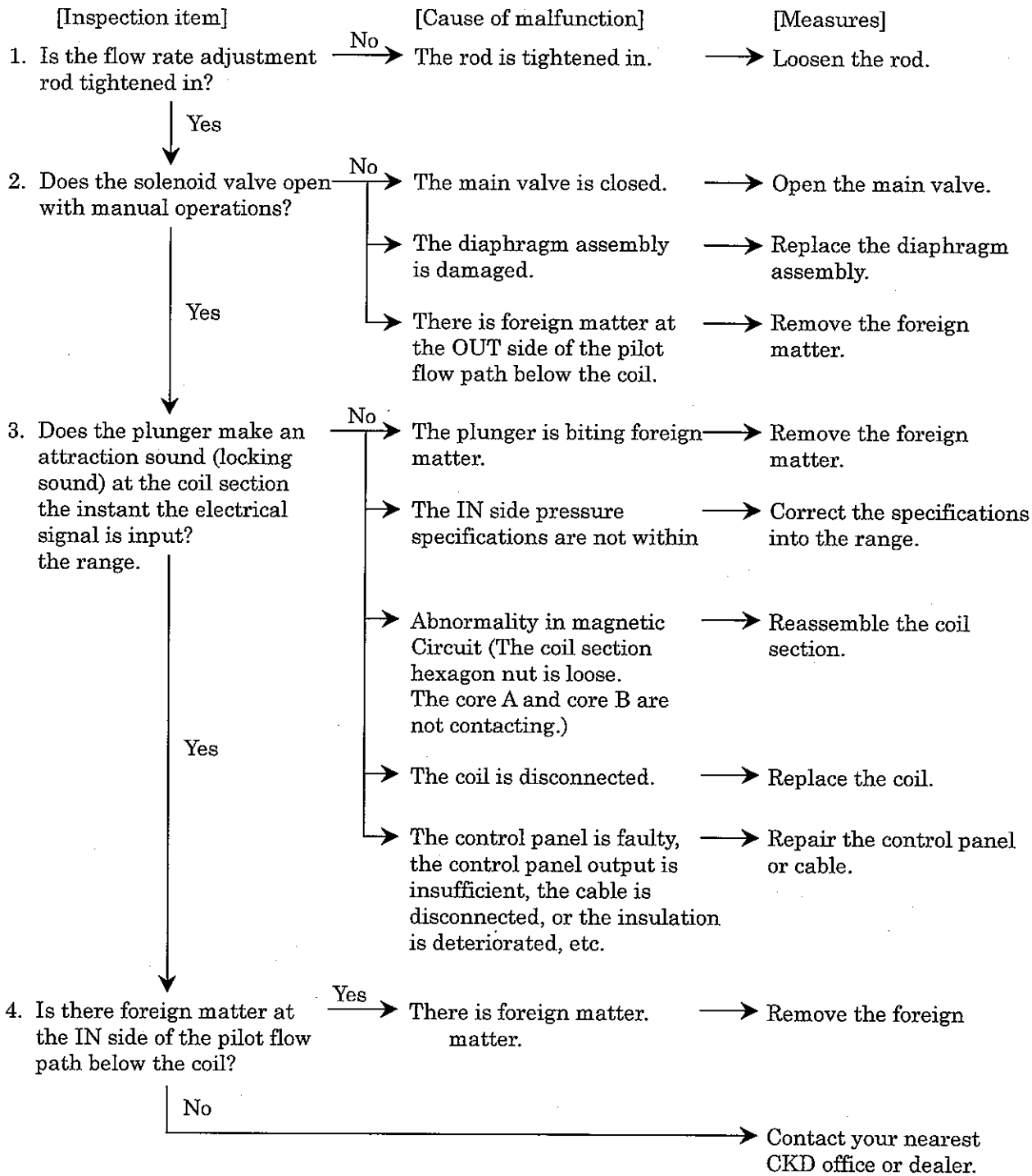
(Note) In respect to the standard part disassembly drawing (Fig. 14 and 15), only the actuator section is replaced as shown above. The drawing shows the round terminal box.

Fig. 16.

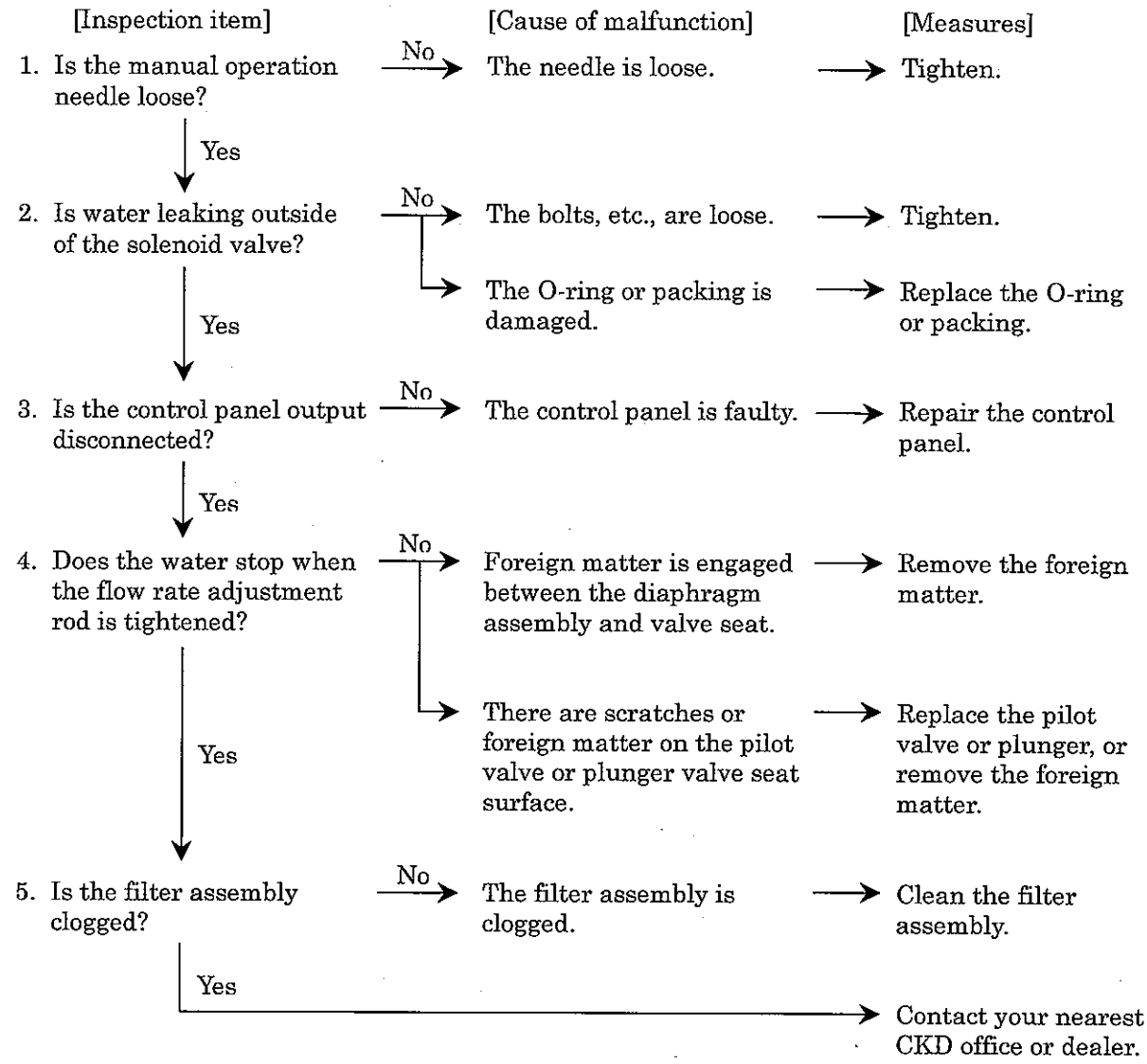
7. Troubleshooting

(1) If the solenoid valve does not operate as intended, refer to the following table and inspect.

(a) When solenoid valve does not open



(b) When solenoid valve does not close



8. Internal structure drawing

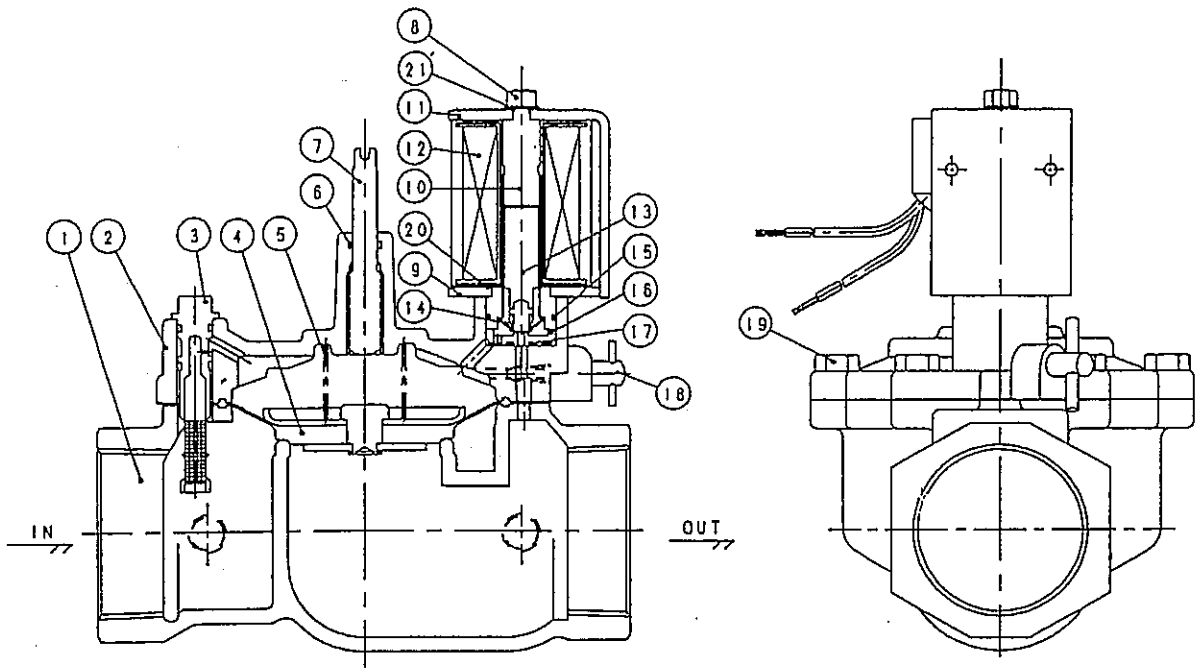


Fig. 17.

Part No.	Part name	Q'ty	Part No.	Part name	Q'ty
1	Body	1	12	Mold coil	1
2	Pilot valve	1	13	Plunger	1
3	Filter ass'y	1	14	Plunger spring	1
4	Diaphragm ass'y	1	15	O-ring (AS568-018)	1
5	Spring	1	16	Pilot valve seat	1
6	O-ring (P-8)	1	17	O-ring (P-5)	1
7	Flow regulating rod	1	18	Manual operated needle	1
8	Hexagon nut (M6)	1	19	Hexagon head bolt (M8×20)	6
9	Core A	1	20	Insulator	1
10	Core ass'y	1	21	Spring washer (Nominal size 6)	1
11	Core B	1			

Note

(1) Figure 18 shows the structure drawing of the RSV-32, 40, 50A-210K (standard part).

9. Activation description

9.1 Open activation

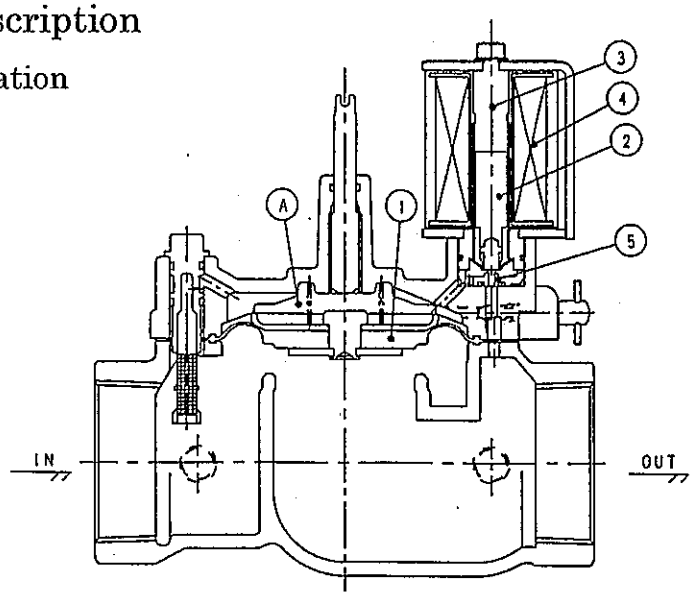


Fig. 18.

When the coil ④ is energized, the plunger ② is attracted to the core assembly ③ . The liquid in the upper Ⓐ chamber of the diaphragm assembly passes through the pilot valve seat ⑤ , and flows to the OUT side. At this moment, the Ⓐ chamber pressure drops below the IN side pressure, creating a pressure difference. The diaphragm assembly ① rises with this pressure difference, and allows the water to pass. (Refer to Fig. 18.)

9.2 Close activation

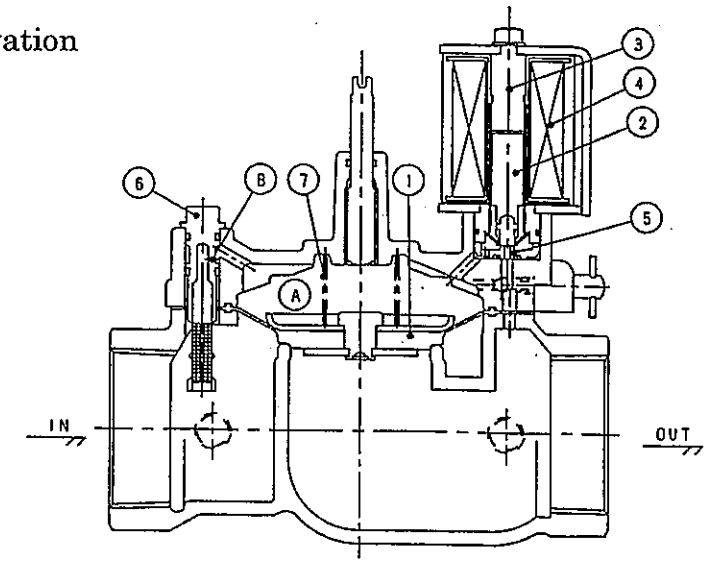


Fig. 19.

When the power to the coil ④ is stopped, the plunger ② separates from the core assembly ③ by the spring force, and the pilot valve seat ⑤ closes. The fluid pressure is applied on the upper Ⓐ chamber of the diaphragm assembly via the bleed orifice Ⓑ in the filter assembly ⑥ . The diaphragm assembly lowers due to the pressure difference at the top and bottom of the diaphragm assembly and the force of spring ⑦, and maintains the water stopping state. (Refer to Fig. 19)
By reducing the bleed orifice Ⓑ 's diameter, this solenoid valve lengthens the valve close time, and reduces water hammering that occurs when the valve is closed.

9.3 Opening/closing with manual operations

> Caution : When opening the valve, if the manual operation needle is turned too far, the water will spray externally. Turn the manual operation needle by 0.5 to 1 turns.Turn OFF the power.

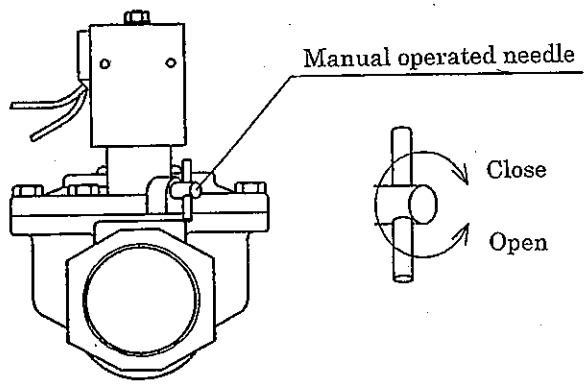


Fig. 20.

The manual operation is a mechanism to open and close the solenoid valve when the power to the coil is stopped. (Refer to Fig. 20)
The solenoid valve will open when the manual operation needle is turned 0.5 to 1 turn clockwise.
To close the solenoid valve, turn the manual operation needle clockwise and tighten the manual operation needle.

9.4 Flow rate adjustment methods

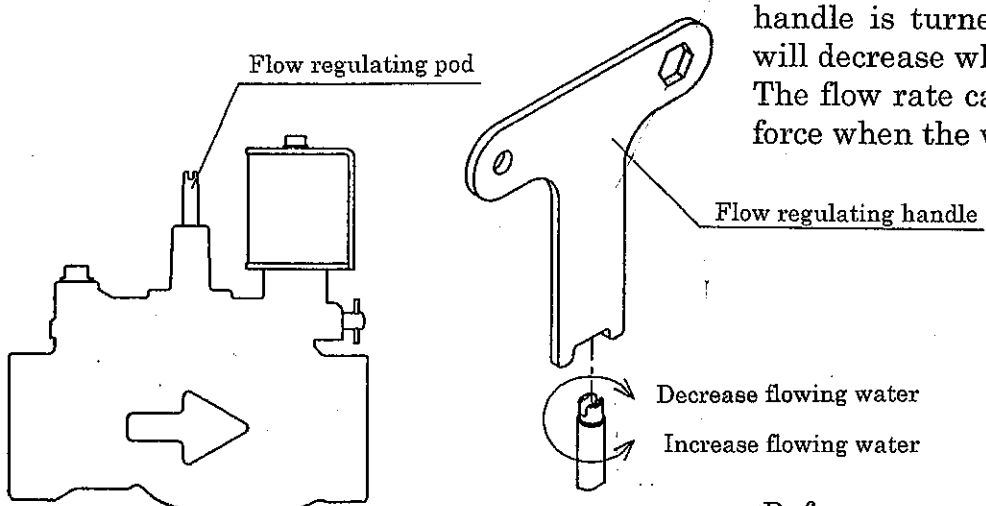


Fig. 21.

Adjust the flow rate by contacting the end of the flow rate adjustment handle, enclosed with the product, against the end of the flow rate adjustment bar, and turning the handle clockwise or counterclockwise. (Refer to Fig. 21.)
The flow rate will increase when the handle is turned counterclockwise, and will decrease when turned clockwise.
The flow rate can be adjusted with little force when the valve is closed.

<Reference>
Use the hexagon hole on the flow rate adjustment handle when mounting or removing the coil's upper hexagon nut and a 32 port size or larger filter assembly.

10. Product specification

10. 1 Product number explanation

RSV－50A－210K－B－Voltage

①　②③　④

①Piping size			
mark	Screw type	mark	Flange type (JIS 10K)
20A	Rc3/4	40F	1 1/2
25A	Rc1	50F	2
32A	Rc1 1/4	65F	2 1/2
40A	Rc1 1/2	80F	3
50A	Rc2		
65A	Rc2 1/2		
80A	Rc3		

②Body material	
mark	content
K	CAC406(Blonze)
No mark	FC200(Cast iron) 40F, 50F only

③Terminal box(option)	
mark	Content[thread size of exiting lead wire]
No mark	Not attached terminal box(standard model)
B	Round type terminal box[G1/2]
B1	Round type terminal box[G3/4]
B3	Square type terminal box[G1/2]
L	Round type terminal box with indicator light[G1/2]
L1	Round type terminal box with indicator light[G3/4]
L3	Square type terminal box with indicator light[G1/2]

④Voltage
AC24V
AC100V
AC200V
DC24V

10.2 Product specifications

	RSV-20A-210K	RSV-25A-210K	RSV-32A-210K	RSV-40A-210K	RSV-40F-210	RSV-40F-210K	RSV-50A-210K	RSV-50F-210	RSV-50F-210K	RSV-65A-210K	RSV-65F-210K	RSV-80A-210K	RSV-80F-210K
Flluid	Agicultial water industrial water												
Working pressure MPa	3				1.75	3		1.75	3				
MAX.Working Pressure(At water) MPa	0.03～1									0.05～1			
Fluid Temp. ℃	5～60												
Ambient Temp. ℃	0～60												
Protection class	Equivalent to IP67 (Equivalent to IP21 in case of terminal box type)												
Leakage cm^3/min	0.1 or less(at water)												
Frequency activations/min	1 or less												
Voltage	AC24V, AC100V, AC200V, DC24V												
Voltage fluctuation range	Within −10% and +10% range from the rated voltage												
Electric power W	2.5W												
Coil temprise K	Below 30												
Insulation class	Type B												
Piping form	Rc				Flange (JIS 10k)	Rc	Flange (JIS 10k)		Rc	Flange (JIS 10k)		Rc	Flange (JIS 10k)
Piping size	3/4	1	1 1/4	1 1/2	1 1/2	2	2		2 1/2	2 1/2		3	3
Valve of CV	13	14	29	35		46.5			82			97	