



登録No. VFS2000-OMH0004

OPERATION MANUAL

PILOT OPERATED 4-WAY SOLENOID VALVES  
SERIES VFS2000

BODY PORTED TYPE

CORD No.

SMC CORPORATION

SYM	PL	CHANGE	DATE	BY

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# 1. SPECIFICATIONS

## 1) Standard Specifications

MEDIA	Air, inert gases			
Max. operating pressure kgf/cm <sup>2</sup> {kpa}	9.9 {990}			
Min. operating pressure kgf/cm <sup>2</sup> {kpa}	1.0 {100}			
Proof pressure kgf/cm <sup>2</sup> {kpa}	15 {1500}			
Ambient and operating fluid temperature, °C	(Note 1) -10 to +60			
Lubrication	(Note 2) Unnecessary			
Protection	Dust-proof			
Pilot valve manual operation	Non-lock push type (Flush type)			
Rated voltage of coil	100VAC, 200VAC, 50/60Hz 24VDC			
Allowable voltage fluctuation, %	-15 to +10 (at rated voltage)			
Classification of coil insulation	class B or equivalent (130 °C)			
Apparent power, VA (Power consumption, W)	AC	Inrush	50Hz	5.6
			60Hz	5.0
		Holding	50Hz	3.4 (2.1)
			60Hz	2.3 (1.5)
	DC	1.8		

Note 1) In low temperature applications, use dry air.

2) When supplying oil, use turbine oil Class 1  
(ISO VG32 or equivalent).

## 2) Model specifications

Valve Functions	2-position single sol.		2-position double sol.		3-position closed center		3-position exhaust center		3-position pressure center	
Model	VFS21 <sup>2</sup> <sub>3</sub> 0		VFS22 <sup>2</sup> <sub>3</sub> 0		VFS23 <sup>2</sup> <sub>3</sub> 0		VFS24 <sup>2</sup> <sub>3</sub> 0		VFS25 <sup>2</sup> <sub>3</sub> 0	
Port size	Rc1/8	Rc1/4	Rc1/8	Rc1/4	Rc1/8	Rc1/4	Rc1/8	Rc1/4	Rc1/8	Rc1/4
Eff. Area, mm <sup>2</sup> (Cv Factor)	16.2 (0.9)	18.0 (1.0)	16.2 (0.9)	18.0 (1.0)	16.2 (0.9)	18.0 (1.0)	16.2 (0.9)	18.0 (1.0)	16.2 (0.9)	18.0 (1.0)
Note 1) Max. Operating Frequency, CPM	1200		1200		600		600		600	
Note 2) Response Time, ms.	22 max		13 max		40 max		40 max		40 max	
Note 3) Weight, kgf	0.26		0.35		0.42		0.42		0.42	

Note 1) Conforming to JIS B8375-1981. (once a month)

2) Conforming to JIS B8375-1981.

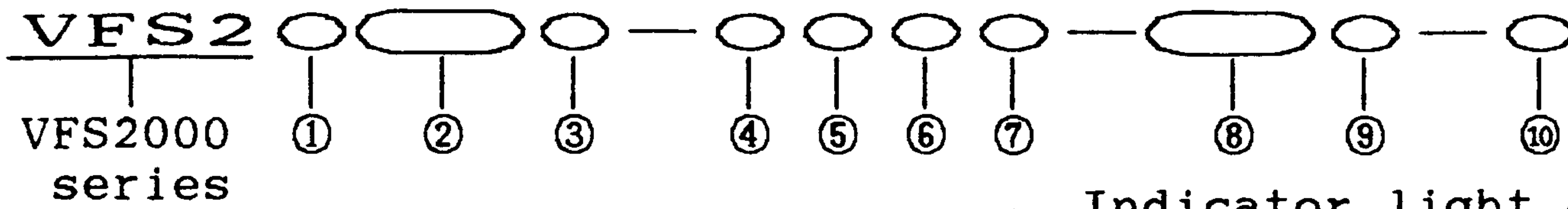
SUP. press: 5kgf/cm<sup>2</sup>, Solenoid: w/o Surge suppressor.

3) These value is Grommet type.



## 2. MODEL IDENTIFICATION

### 1) VALVE MODEL IDENTIFICATION



#### ① Number of solenoids

1	2-position single
2	2-position double
3	3-position closed center
4	3-position exhaust center
5	3-position pressure center

#### ② Body type

20	Individual pilot exh.
30	Common pilot exh.

#### ③ Method of Pilot signal

None	Internal pilot
*R	External pilot

\*Semi-standard

#### ④ Power source

1	100	VAC, 50/60 Hz
2	200	VAC, 50/60 Hz
*3	110~120	VAC, 50/60 Hz
*4	220	VAC, 50/60 Hz
5	24	VDC
*6	12	VDC
*7	240	VAC, 50/60 Hz
*9	others	

\*Semi-standard

#### ⑤ Electrical entry

G	Grommet
E	Grommet terminal
T	Conduit terminal
D	DIN type terminal

#### ⑥ Indicator light & Surge suppressor

None	Not provided
Z	W/Indicator lightnal & Surge suppressor
*S	W/Surge suppressor

\*Available to use only Grommet type.

#### ⑦ Type of pilot valve manual operation

None	Push safety type(flush)
*A	Push type (extended)
*B	Lock tool-requiring type

\*Semi-standard

#### ⑧ Port size

01	Rc(PT)1/8
02	Rc(PT)1/4

#### ⑨ Pipe threads

None	Rc(PT)
*N	NPT
*T	NPTF
*F	G(PF)

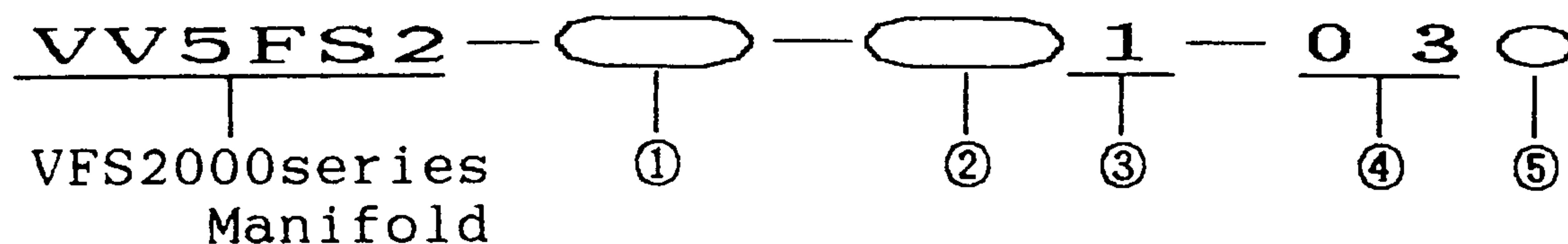
\*Semi-standard

#### ⑩ Option

F	Foot type Bracket
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Note:Using only VFS2120 series.

### 2) MANIFOLD MODEL IDENTIFICATION



#### ① Base type

20	Individual pilot exh.
30	Common pilot exh.

#### ② Number of stations

02	Two
:	:
15	Fifteen

#### ③ Manifold spec.

Mark	Port spec.	Piping spec.
	P, EA, EB	A, B
1	common	Body end
	Rc(PT)1/8	Rc(PT)1/8, 1/4

#### ④ P,EA,EB Port size

03	Rc(PT)3/8
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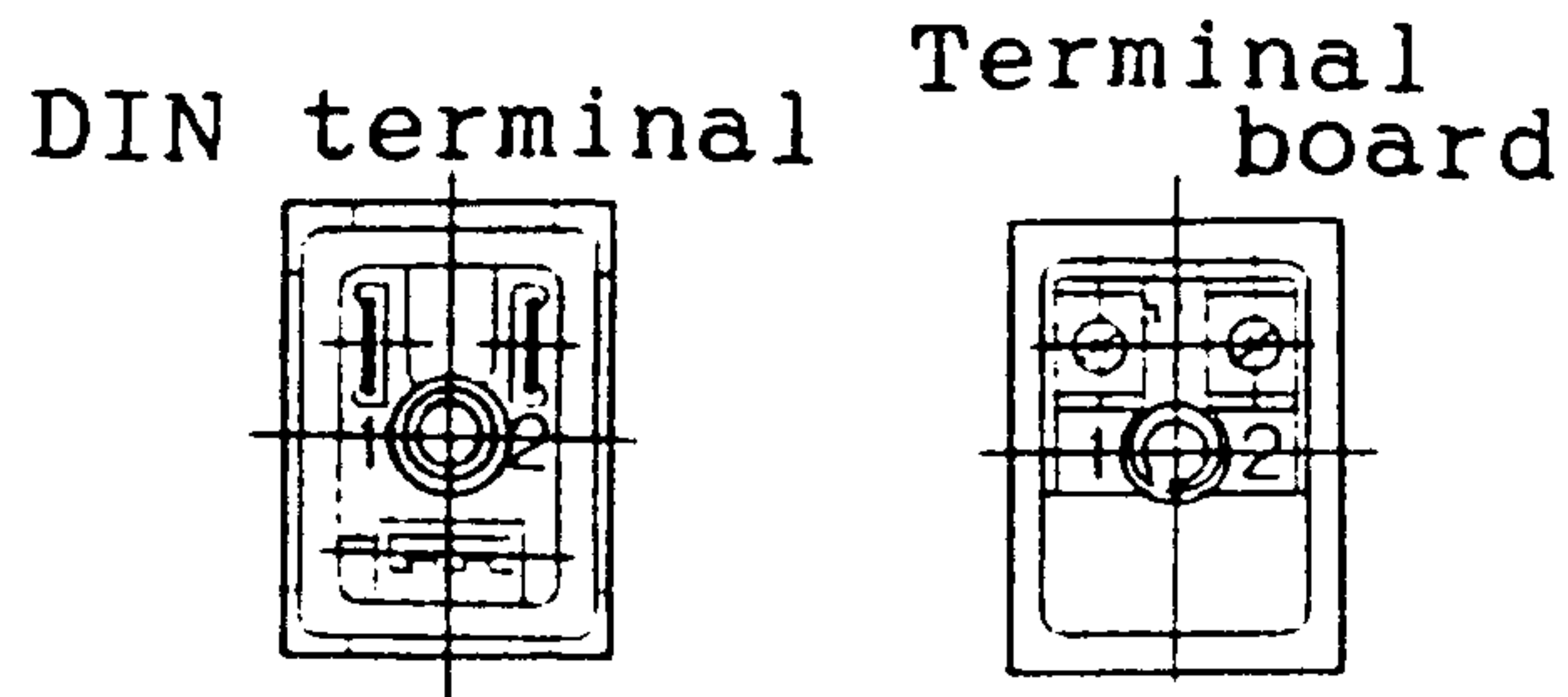
#### ⑤ Pipe threads

None	Rc(PT)
*N	NPT
*T	NPTF
*F	G(PF)

\*Semi-standard

### 3. Installation of leads wire

· Connect leads wire from solenoid housing to the power source end.  
The units with DIN terminal and terminalboard (with voltage suppressor) are so internally wired as shown below; connect them to the power source end.



Terminal No.	1	2
Terminal board	+(-)	-(+)
DIN terminal	+(-)	-(+)

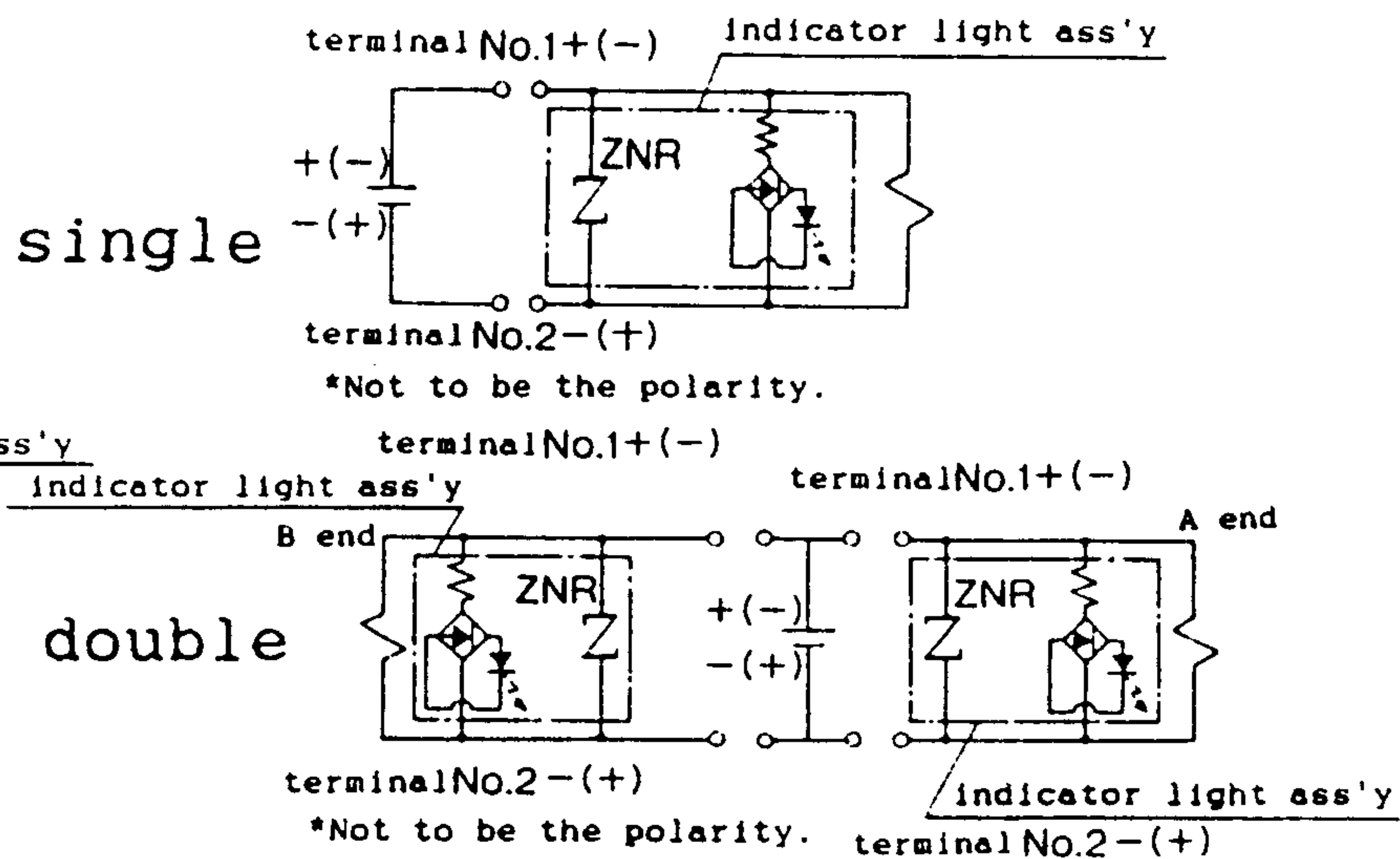
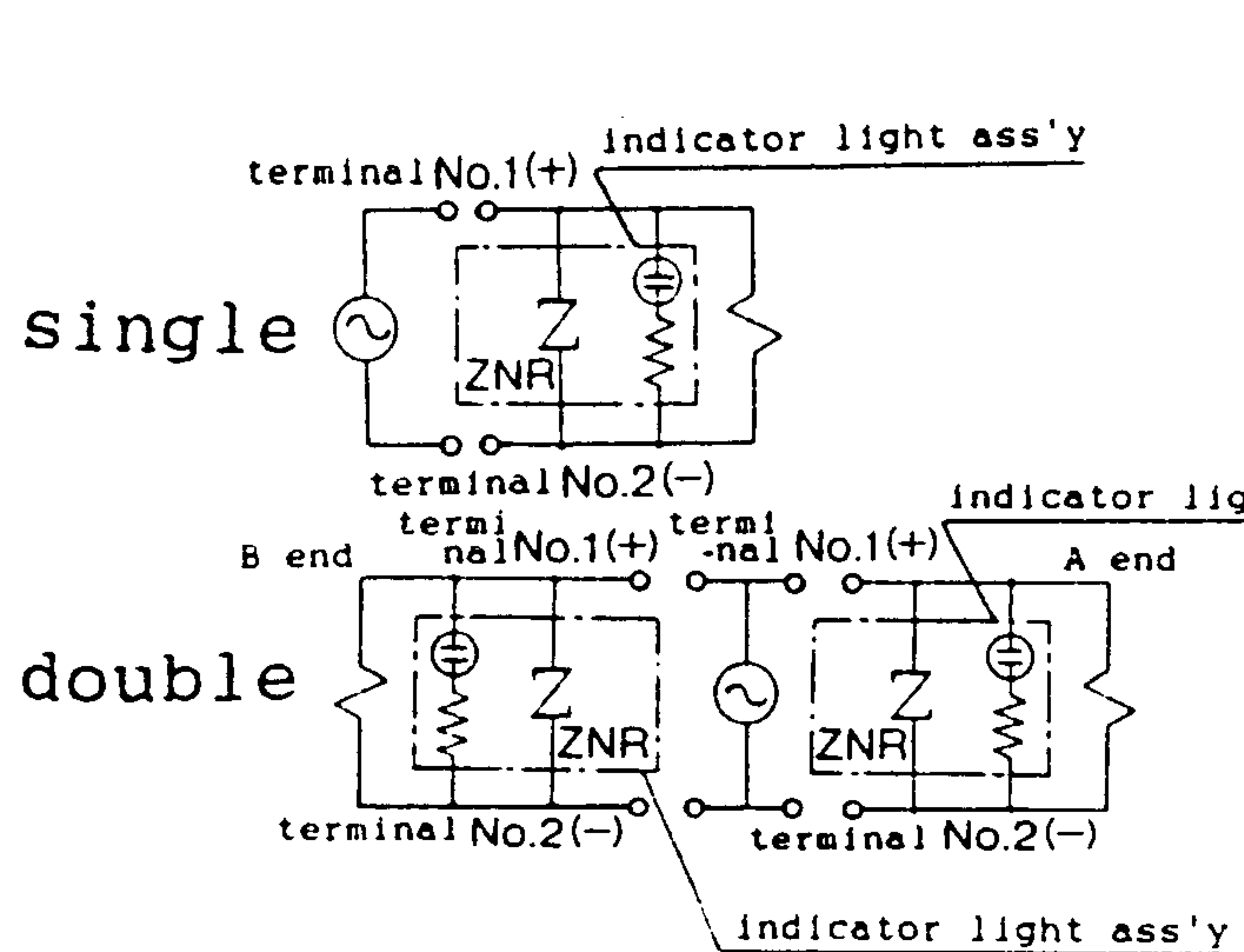
\*Not to be the polarity.

### 4. Indicator light & Surge suppressor

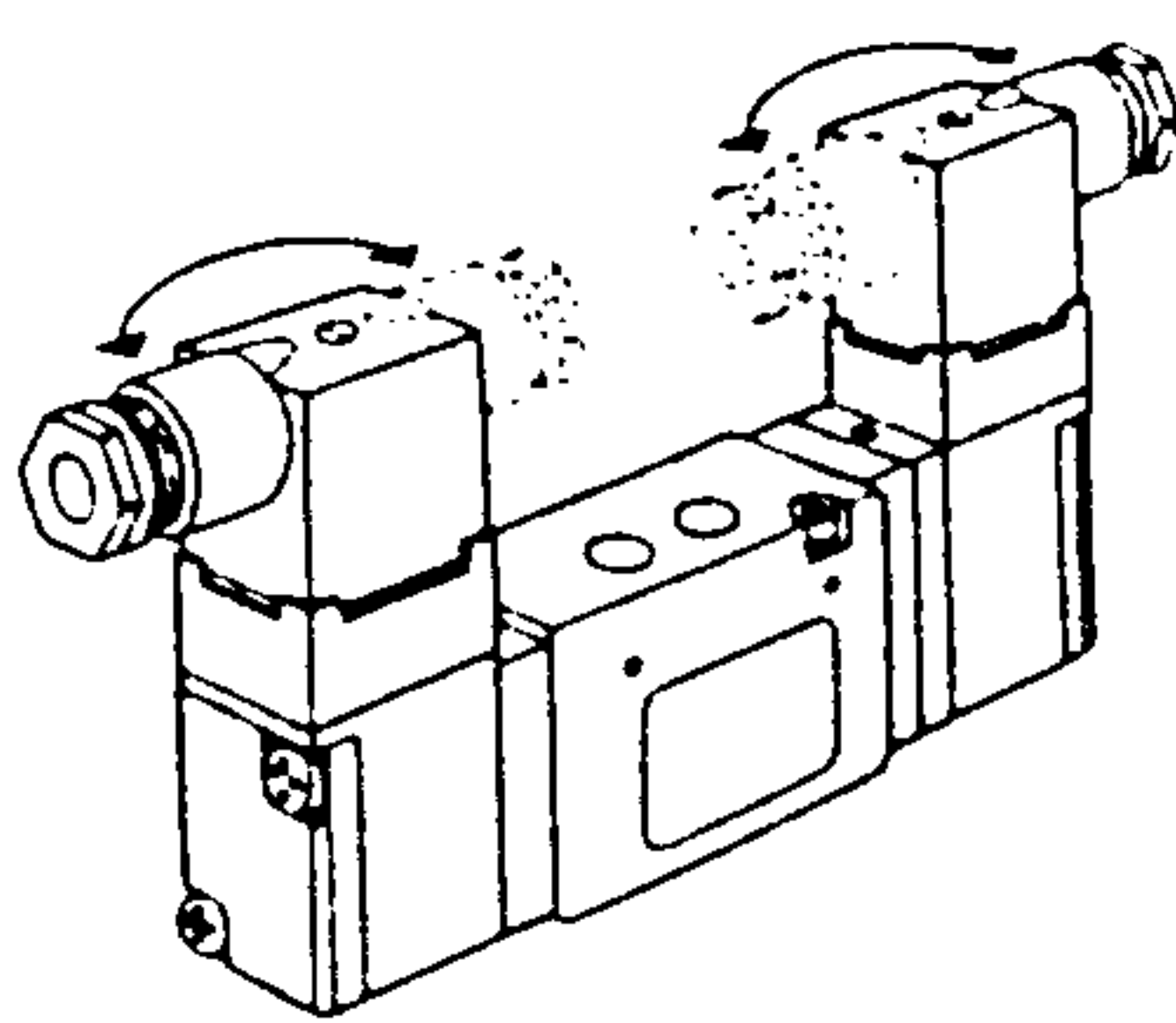
· Indicator light & Surge suppressor: This is installed the surge suppressor "ZNR".

· AC, DC 100V

· 48VDC or less



### 5. Change of DIN terminal / Cable outlet



· The change of the direction is possible by removing the DIN terminal from the cover and inserting it again into the cover with 180° rotation.

Applicable cable Dia. 6 to 8.



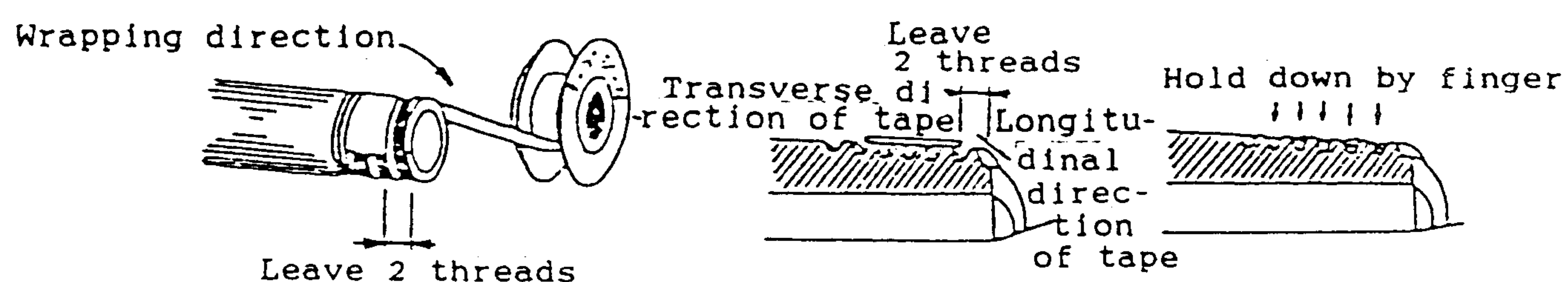
## 6 . INSTALLATION

- 1) The unit can be installed in almost any position. For double solenoid and 3-position models, however, be careful so that the spool valve is parallel to the ground.

In applications where vibration is unavoidable, install the unit so that the spool valve is perpendicular to the direction of vibration. (Do not use this unit in a place where vibration of more than 5G is expected.)

## 7 . PIPING

- 1) Use a pipe of inside diameter equal to or larger than the nominal diameter.
- 2) Before piping, thoroughly flush both primary (supply pressure side) and secondary (final controlling element side) pipes to completely clear away dust, scale, and other foreign matters generated during piping job.
- 3) For the manifold to which the 3-position closed center valve is mounted, check the pipings between the valve and the cylinder and also fittings for possible leakage using a soapy water. If any leakage is present, take corrective action to stop the leakage. Also check the packings of the cylinder rod and piston for leakage. The presence of any leakage will cause the cylinder not to stop at the neutral position when the valve is turned off but to move. When wrapping the threads with a teflon sealing tape, leave one to two threads exposed at the tip of the thread and press the tape onto the thread by a finger nail to tightly adhere. When using a liquid sealing agent, also leave one to two threads and be careful not apply too much agent on the threads. In no case should the female threads be applied with the agent.



Fastening torque	
Thread	Proper fastening torque, kgf-cm (N-m)
Rc (PT) 1/8	70-90 (7-9)
Rc (PT) 1/4	120-140 (12-14)
Rc (PT) 3/8	220-240 (22-24)

Pay utmost attention to design and performance of piping to facilitate removal and installation of the unit in the event trouble.

## 8 . ENVIRONMENTAL CONDITIONS

- 1) When the unit is used in dusty location, protect the rod of the cylinder to prevent dust from entering the secondary side through the rod.

On the EXH.port, provision should be made to prevent dust from entering the unit either by installing a silencer to the EXH.port or installing an elbow with its open end pointing downward.

- 2) In applications where installation of the unit in a place exposed to corrosive gas, chemical solution or its vapor, seawater, etc. or where high temperatures more than 60°C is expected is unavoidable, consult with the manufacturer.

## 9 . LUBRICANTS

- 1) The unit does not require lubrication. If however, lubrication is required for any reason such as the use of a lubrication-requiring cylinder, install a lubricator (oiler) in the primary side piping to supply atomized oil. Use turbine oil Class 1 (ISO VG32) as a lubricant. Never use spindle oil or machine oil. In low temperature applications, use low temperature lubricant.

Example : Idemitsu Kosan, lubricant for low temperatures,  
Daphne Super Hydro 32WR -20 to +60°C

Turbine oil is higher in viscosity at low temperatures below 0°C, causing valve trouble.

## 10 . MAINTENANCE

- 1) This solenoid valve does not require any particular maintenance. If, however, any trouble should occur during operation, refer to the troubleshooting list.

- 2) The carbon powder generated from an air pressure source (mainly a compressor) and oil contaminants will adhere to the spool, increasing the sliding resistance of the spool and eventually resulting in faulty operation of the valve.

In the worst case, the spool may completely seize, pay particular attention to the quality of air.

In applications where the air with poor quality is used, if the unit is left with the SUP. pressure applied to the unit for a long period of time, the carbon powder contained in the



air or oil contaminant will build up between the spool and sleeve, causing the spool to seize. In such a case, check the type of compressor lubricant, and use compressor oil with better quality which forms less oxidized substances.

Installation of a mist-separator with finer filtration (AM-series) after a normal filter (AF series) will prevent fine particles from entering the inside of the valve.

Commercially available compressor lubricants are :

Nippon Oil : Farecaol A-80

Idemitsu Kosan : Daphne CSS55, CS49

- 3) When the spool and the sleeve seize because of the foreign matter generated at an air pressure source, remove the adapter plate and end plate (in which the return spring is housed), extract the spool and sleeve from the valve body, and then clean them in a solution such as trichloroethylene or tetrachloride.

In so doing, do not immerse the "O" ring attached to the sleeve in cleaning solution.

- 4) When assembling the disassembled parts, be sure to replace all the parts in place. Tighten all the bolts evenly so that the gaskets do not slip.

## 1 1 . TROUBLES AND REMEDY

- 1) Location the source of trouble

Step1 What is the phenomenon of trouble?

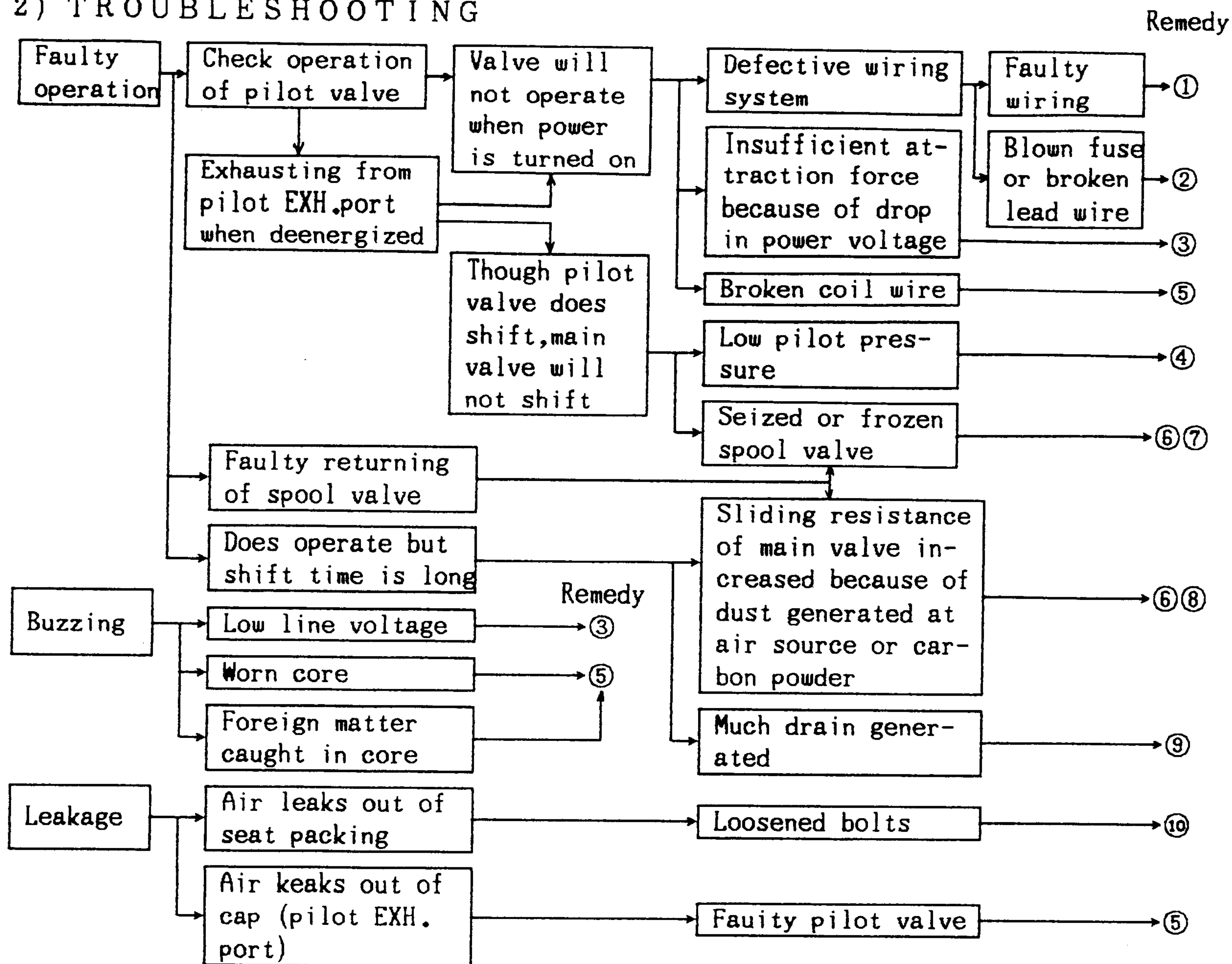
- (1) Faulty operation?
- (2) Buzzing?
- (3) Poor seal?

Step2 Check the possible sources of trouble in the order of their higher probability judging the actual phenomenon.

Step3 Once the real source of trouble is located, take a corrective action based on the chart in "2) TROUBLE-SHOOTING".



## 2) TROUBLESHOOTING



## 3) REMEDY

No.	Remedy
①	Re-wire correctly.
②	Replace parts and correct wiring.
③	Regulate power voltage.
④	Regulate pressure so as to fall in operating pressure range.
⑤	Replace pilot valve ass'y.
⑥	Disassemble main valve spool and sleeve valve and eliminate dust.
⑦	Take countermeasure against freezing.
⑧	Take countermeasure against contamination of air source.
⑨	Take countermeasure against removing drain.
⑩	Fasten mounting bolts.

To users :

If the above remedies do not work , please send the unit back to the supplier for repair or replacement.