



登録No. VFS3000-OMH0002

OPERATION MANUAL

PILOT OPERATED 4-WAY SOLENOID VALVES
SERIES VFS3000

SUB-PLATE TYPE

SMC CORPORATION

CORD No.				
SYM	PL	CHANGE	DATE	BY

TABLE OF CONTENTS

	<u>Page</u>
1. SPECIFICATIONS	
1)Standard Specifications	1
2)Model Specifications	2
2. MODEL IDENTIFICATION	
1)VALVE MODEL IDENTIFICATION	3
2)MANIFOLD MODEL IDENTIFICATION	4
3. INDICATOR LIGHT & SURGE SUPPRESSOR	4
4. REPLACEMENT AND REMOVAL	5
5. CONNECTION OF LEAD WIRES	5
6. INSTALLATION	6
7. PIPING	7
8. ENVIRONMENTAL CONDITIONS	8
9. LUBRICANTS	8
10. MAINTENANCE	8
11. TROUBLE AND REMEDY	
1)LOCATION THE SOURCE OF TROUBLE	9
2)TROUBLESHOOTING	10
3)REMEDY	10

1. SPECIFICATIONS

1) Standard Specifications

MEDIA	Air, inert gases			
Max. operating pressure kgf/cm {kpa}	9.9{990}			
Min. operating pressure kgf/cm {kpa}	1.0{100}			
Proof pressure kgf/cm {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	Model	Port size	Eff. Area, mm (Cv Factor)	1) Max. Operating Frequency, CPM	2) Response time ms.	3) Weight, kgf
2-position single solenoid	VFS31**	Rc(PT)1/4 Rc(PT)3/8	32.4 (1.8) 36.0 (2.0)	1200	20 max	0.31
2-position double solenoid	VFS32**	Rc(PT)1/4 Rc(PT)3/8	32.4 (1.8) 36.0 (2.0)	1500	15 max	0.41
3-position closed center	VFS33**	Rc(PT)1/4 Rc(PT)3/8	32.4 (1.8) 36.0 (2.0)	600	40 max	0.43
3-position exhaust center	VFS34**	Rc(PT)1/4 Rc(PT)3/8	32.4 (1.8) 36.0 (2.0)	600	40 max	0.43
3-position pressure center	VFS35**	Rc(PT)1/4 Rc(PT)3/8	32.4 (1.8) 36.0 (2.0)	600	40 max	0.43
3-position perfect	VFS36**	Rc(PT)1/4 Rc(PT)3/8	19.8 (1.1) 21.6 (1.2)	600	50 max	0.91
2-position single reverse pressurized	VFS37**	Rc(PT)1/4 Rc(PT)3/8	32.4 (1.8) 36.0 (2.0)	1200	20 max	0.31
2-position double reverse pressurized	VFS38**	Rc(PT)1/4 Rc(PT)3/8	32.4 (1.8) 36.0 (2.0)	1500	15 max	0.41

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

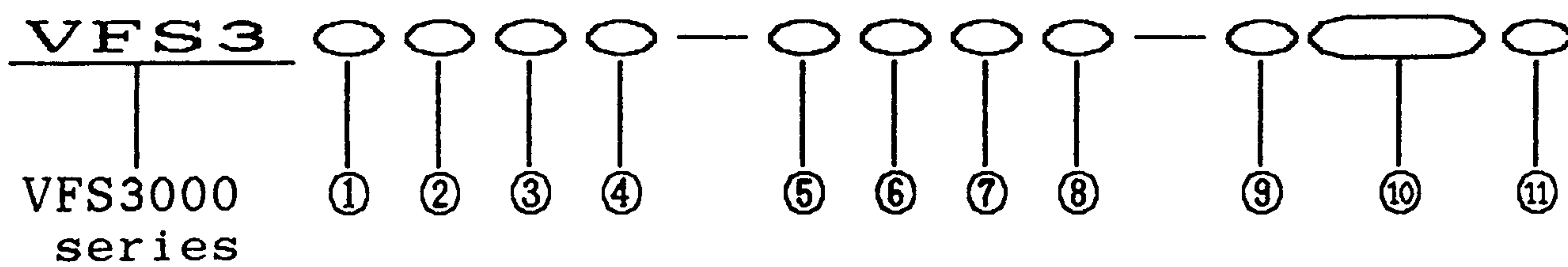
2) Conforming to JIS B8375-1981.

SUP.press. : 5kgf/cm , Solenoid : w/o Surge suppressor.

3) Figures in the list are those without a sub-plate. for models with a plug-in sub-plate 0.30kgf and a non plug-in sub-plate 0.27kgf respectively.

2 . MODEL IDENTIFICATION

1) VALVE MODEL IDENTIFICATION



① Valve functions	
1	2-position single
2	2-position double
3	3-position closed center
4	3-position exhaust center
5	3-position pressure center
6	3-position Perfect
7	2-position single reverse pressurized
8	2-position double reverse pressurized

② Body type	
0	Plug-in sub-plate
1	Non plug-in sub-plate

③ Body option	
0	Standard
1	With direct manual

④ Method of pilot signal	
None	Internal pilot
*R	External pilot
*Semi-standard	

⑤ 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	

⑥ Electrical entry	
F	Conduit terminal
E	Grommet terminal
D	Din type terminal

⑦ Option	
None	Not provided
Z	W/Indicator light & surge suppressor

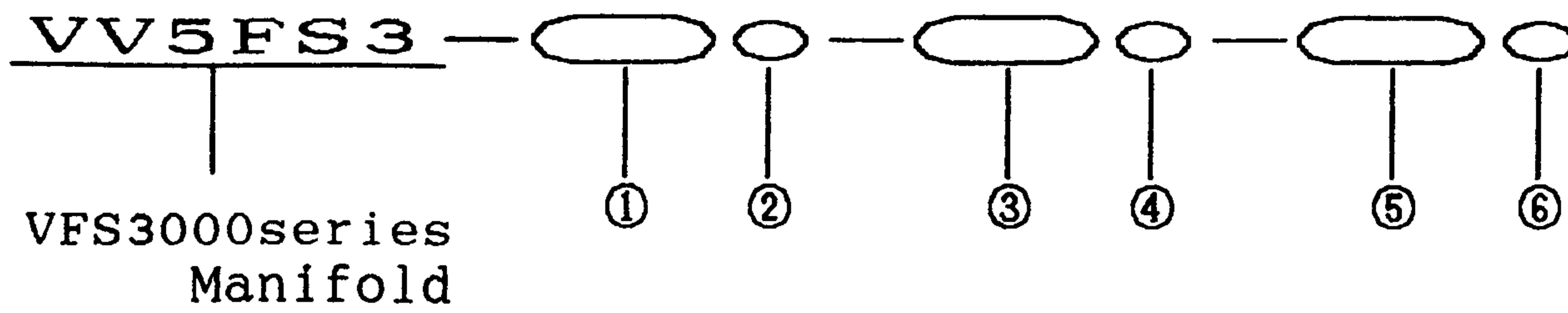
⑧ Type of pilot valve manual operation	
None	Push safety type(flush)
*A	Push type (extended)
*B	Lock tool-requiring type
*C	Lock lever type
*Semi-standard	

⑨ Piping specifications	
None	Side piping, W/O Sub-plate
*B	Rear piping
*Semi-standard	

⑩ Port size	
None	Without sub-plate
02	Rc(PT)1/4
03	Rc(PT)3/8

⑪ Pipe threads	
None	Rc(PT)
*N	NPT
*T	NPTF
*F	G(PF)
*Semi-standard	

2) MANIFOLD MODEL IDENTIFICATION



① Manifold spec. electrical entry

01T	Plug-in terminal
01C	Plug-in malth connector
01F	Plug-in flat cable connector
10	Non plug-in type

② Connector of installed

Mark	Connector	Manifold
None	Not provided	01T, 10
D	D side	01C, 01F
U	U side	

③ Number of stations

02	Two
⋮	⋮
10	Ten

④ Manifold spec.

Mark	Port spec.		Piping spec.
	P	EA, EB	
1	common		Side
*2			Rear

*Semi-standard

⑤ Port size

Mark	P, EA, EB	A, B
02	Rc (PT) 1/2	Rc (PT) 1/4
03		Rc (PT) 3/8
M		Mixing

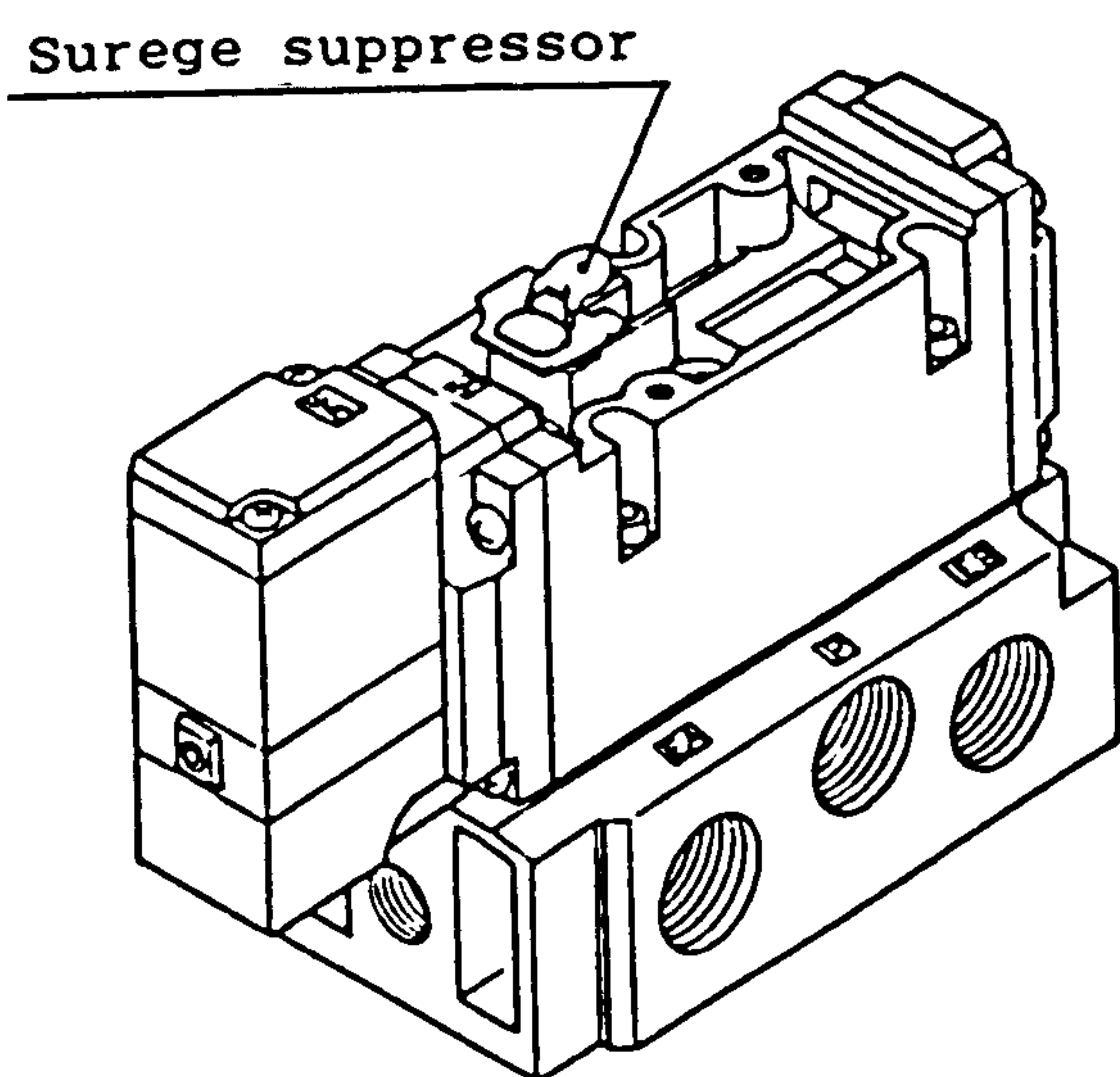
Note: In case of bottom port it is available to use only Rc (PT) 1/4.

⑥ Pipe threads

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

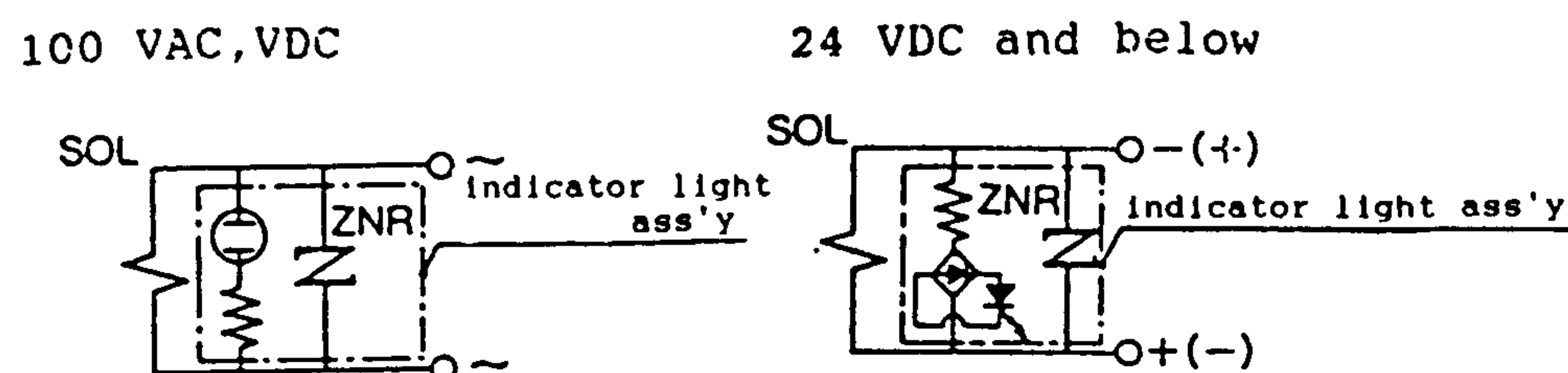
*Semi-standard

3 . INDICATOR LIGHT & SURGE SUPPRESSOR



The indicator light & surge suppressor can easily be mounted by the circuit board assembly (Part No. VFS3000-10A-*) to the pin terminal of the terminal board inside body.

The circuit is as follows:



*Not to be the polarity

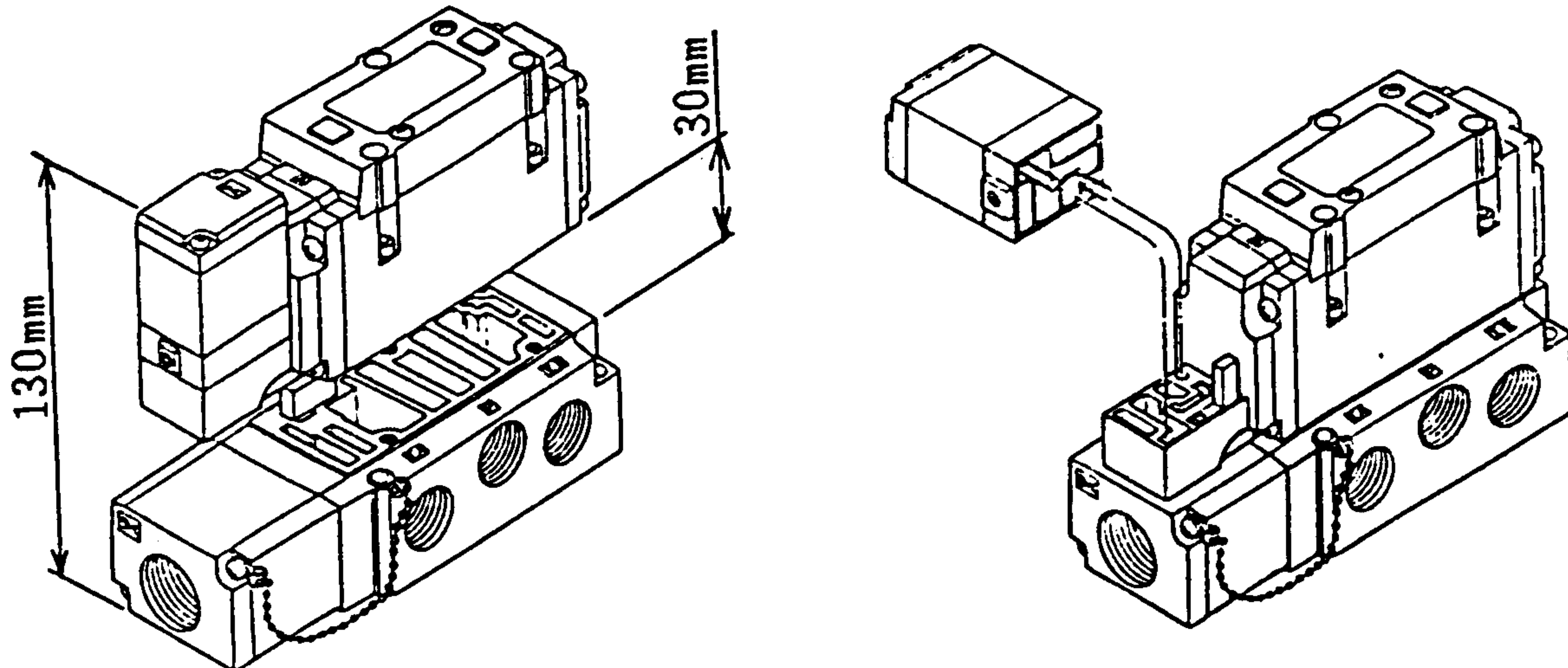
4 . REPLACEMENT AND REMOVAL

Remove the bolts (M3x32 3psc.),and extract straight the solenoid valve body from the sub-plate.

Extract straight to avoid problems.

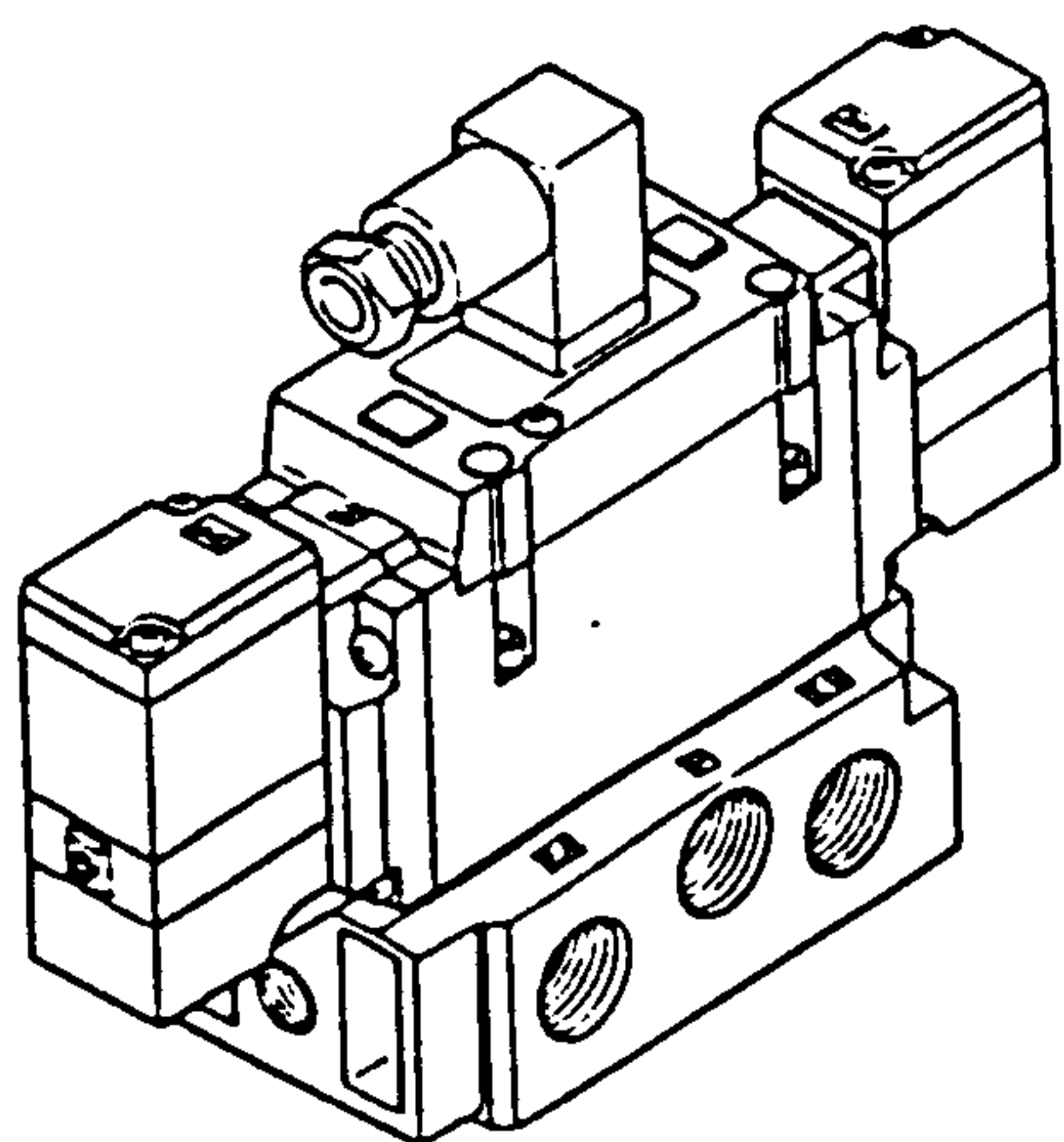
When mounting the solenoid valve body to the base,be sure to insert the pin assembly(male pin side) straight to the receptacle assembly(female pin side).

For either plug-in type or standard type pilot valve, replacement can be performed in the same procedure as that of the solenoid valve body.



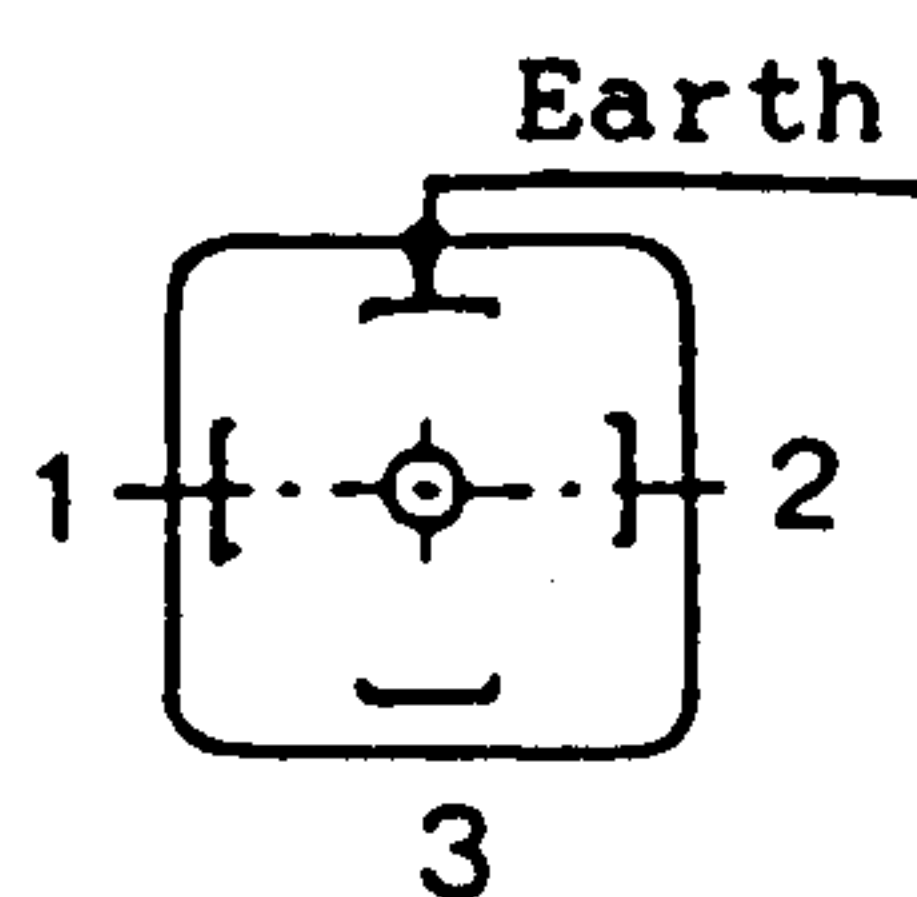
5 . CONNECTION OF LEAD WIRES

1)DIN Terminal Board Type



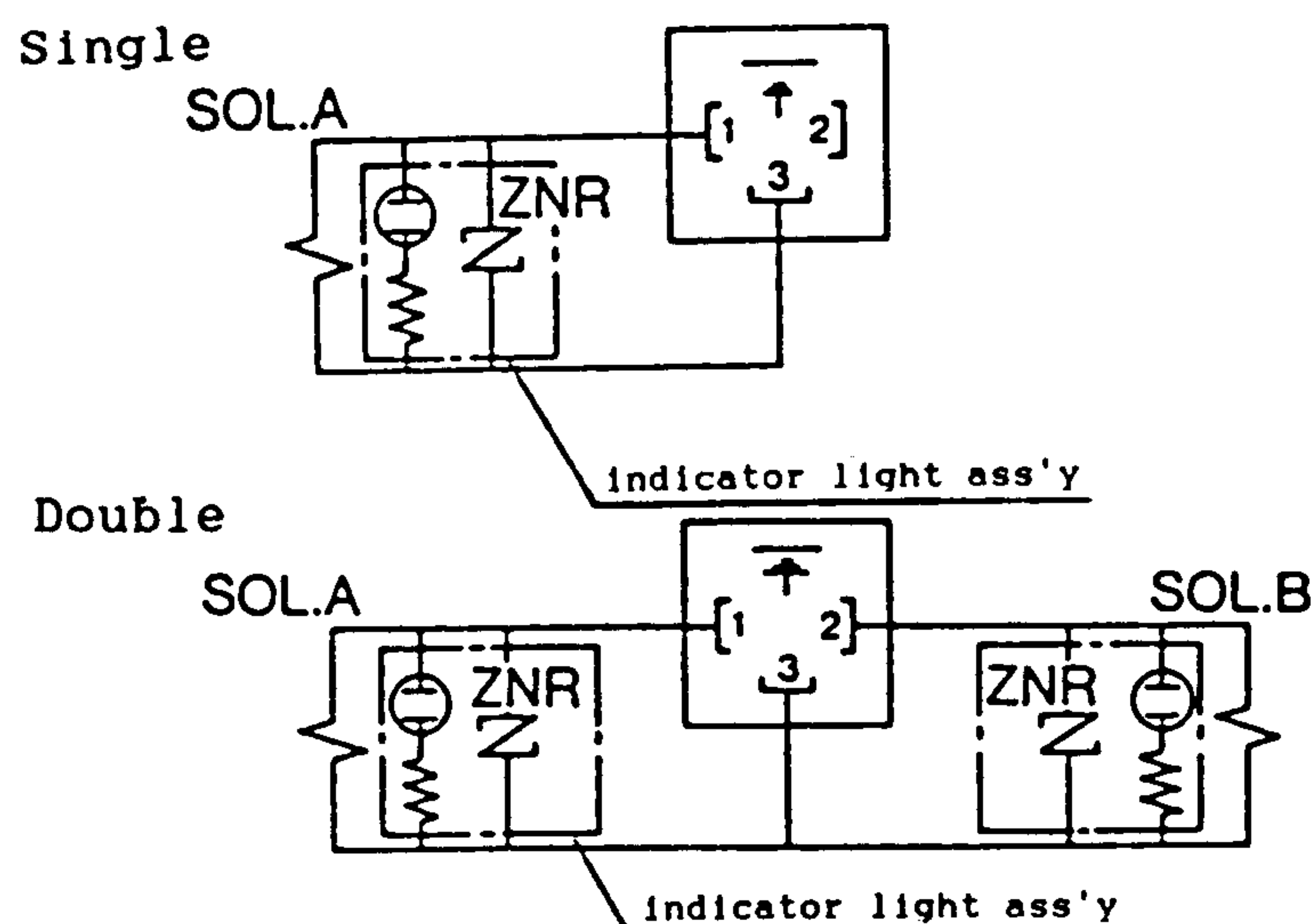
The male pin terminals of the DIN terminal board are internally connected to the solenoid as shown below;connect the lead wires to the respective terminals of the connector.

DIN terminal(Electrical connection)

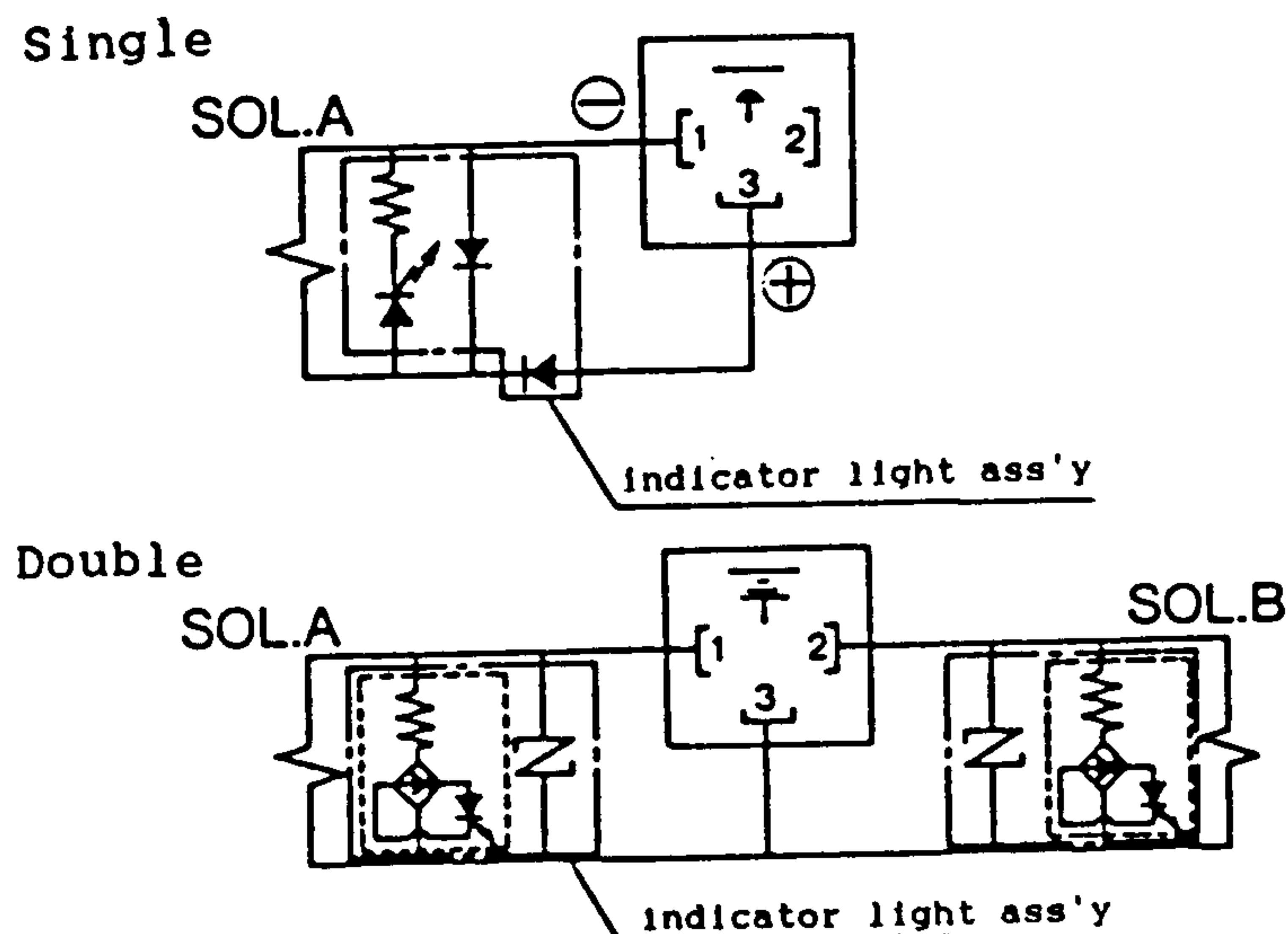


1	A side -
2	B side -
3	COM +
⊕	Earth

100 VAC,VDC



24 VDC and below



Applicable insulated cable : Cables of 6.8 to 11.5mm in diameter
 Applicable solderless terminals : Three types shown below

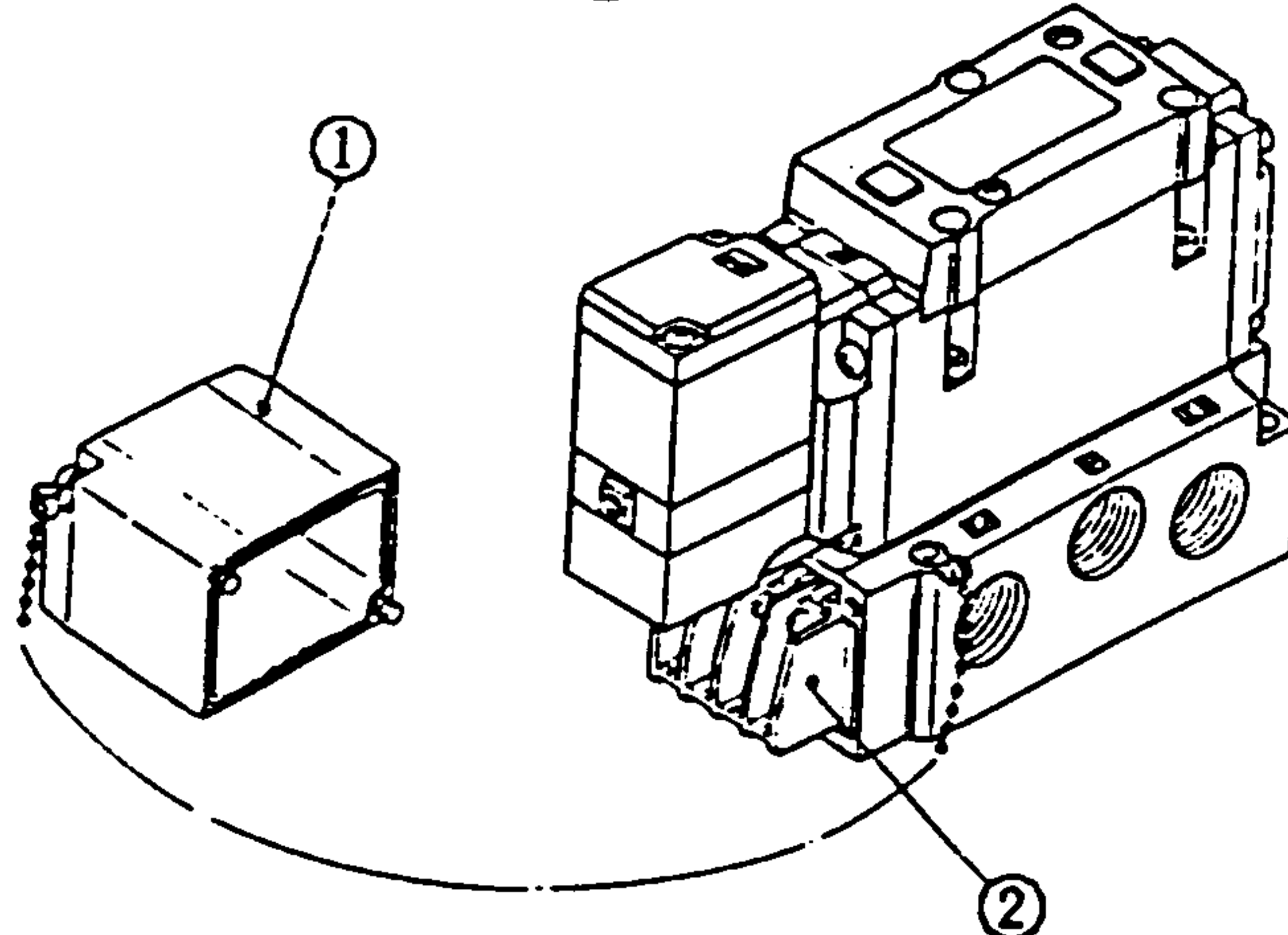
1.25Y-3L, 1.25-3.5S, 1.25-4M

Fastening torque of connector : Clamping screws: 6kgf-cm

Terminal screws: 9kgf-cm

2) Plug-in Type (with terminals)

First remove junction cover ① of the sub-plate, and then pull out the terminal board ② (Part No. NVF2000-27A-1).



On the terminal board are put the following markings; connect them to the power supply side.

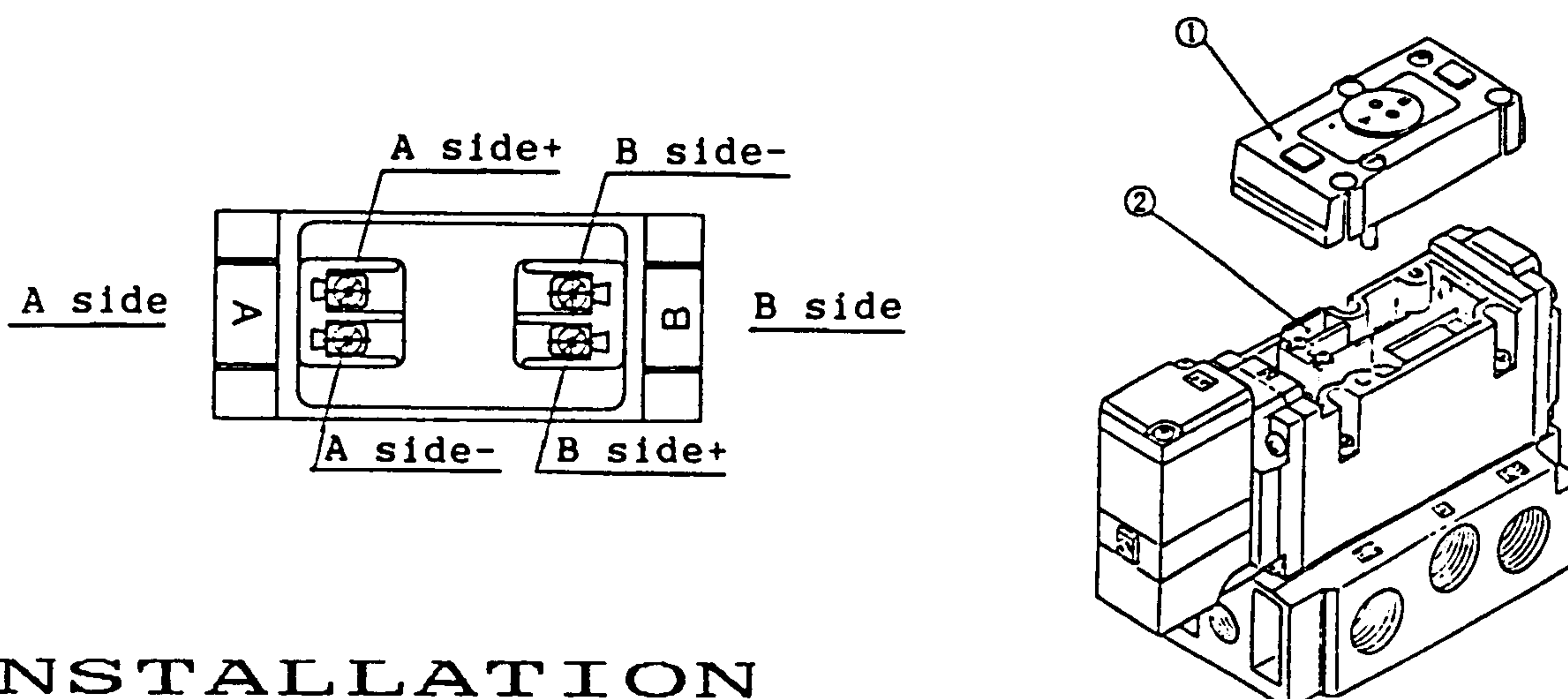
	Solenoid A Side		Solenoid B Side	
Marking on terminal board	+	-	+	-

(+) and (-) indicates the polarities of the DC solenoids with lamp and surge protection circuit.

Contact factory, if you need to use the ground connection or Common connection.

3) Non plug-in Type (with terminals)

Remove cover ①, and then connect the lead wires to terminal board ② (Part No. VFS3000-12A) inside the body.



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.

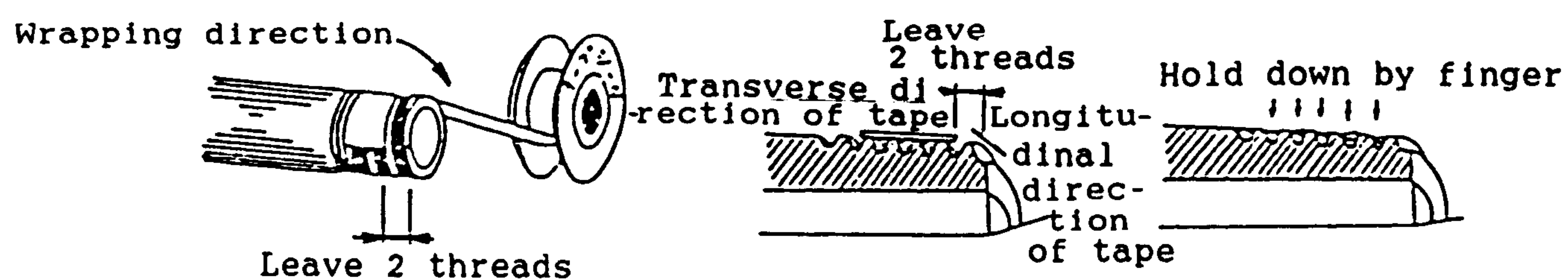
- 3) For the manifold to which the 3-position closed center valve is mounted, check the pipings between the valve and the cylinder and also fittings for possible leakage using a soapy water.

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)	
M5	15- 20	(1.5-2)
Rc (PT) 1/8	70- 90	(7- 9)
Rc (PT) 1/4	120-140	(12-14)
Rc (PT) 3/8	220-240	(22-24)
Rc (PT) 1/2	280-300	(28-30)

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.

11 . TROUBLES AND REMEDY

- 1) Location the source of trouble

Step1 What is the phenomenon of trouble?

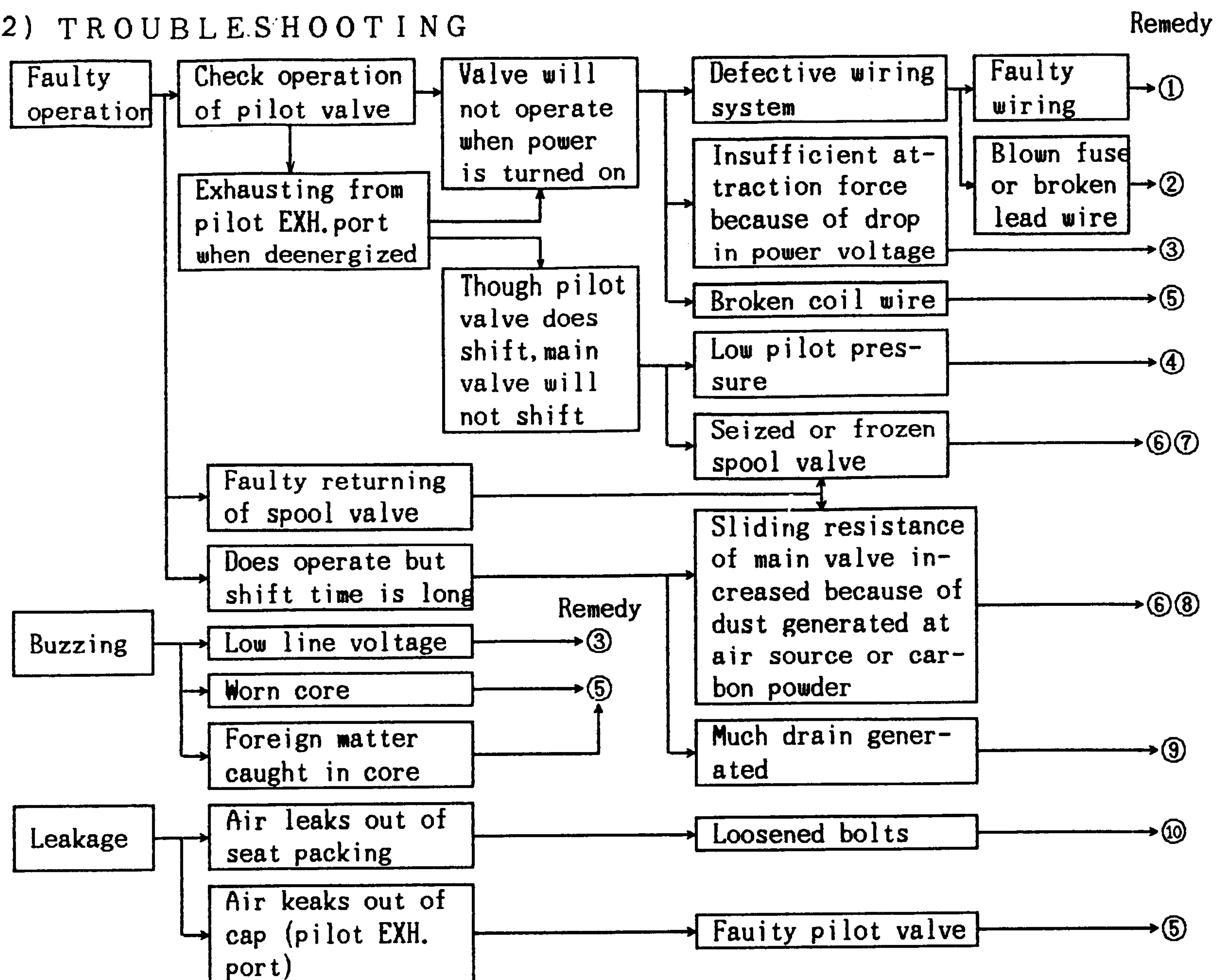
- (1) Faulty operation?
- (2) Buzzing?
- (3) Poor seal?

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.

For replacement of the valve assembly, refer to 4.REPLACEMENT AND REMOVAL.

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.