

INSTRUCTION MANUAL

PICOSOL

4SA0, 4SB0, M4SA0, M4SB0

- 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.

For Safety Use

To use this product safely, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, read this instruction manual carefully for proper operation.

Observe the cautions on handling described in this manual, as well as the following instructions :

Precautions

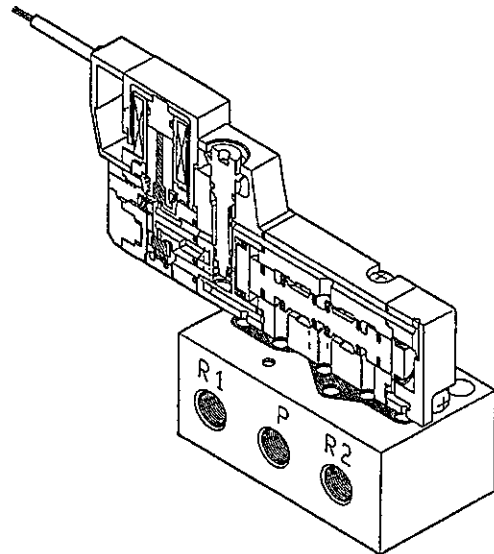
- Do not touch electric wiring connections (exposed live parts) : this will cause an electric shock. During wiring, keep the power off. Also, do not touch these live parts with wet hands.



1. PRODUCTS

1.1 General description and special features.

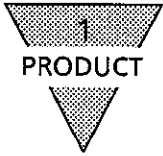
- 1) Compact, width 10mm
It is able to build the total system smaller as this valve is designed compactly.
- 2) Effective sectional area 2mm²
It is the most suitable to drive cylinder of bore up to $\phi 25$.
- 3) Low wattage design (1W)
41.7mA (with lamp) at DC24V. It is capable to be connected directly to electronics controls.
- 4) Broad varieties of connecting cable.
It allows to make a choice of lead cord, series of C type connectors or D type connectors and also combination with lamp and surge killer.



1.2 Specifications

- 1) Common Specifications
 - (1) Fluid specifications

Item	Specification
Media	Pneumatic pressure
Actuation type	Pilot (Soft spool)
Withstanding pressure MPa	1.05
Ambient temperature °C	5~50 (Not to be frozen)
Service fluid temperature °C	5~50
Lubrication	Not required (Use Turbine oil, Class 1, ISO VG32 if lubrication is preferred.)
Protective Structure	Dust prevention
Manual operation device	Non lock type (Standard), Lock type (Optional)



(2) Electrical specification

Item	Specification	
	DC24V	DC24V
Rated voltage (V)	DC24V	DC24V
Holding current (mA)	37.5	75
Power consumption (W) (w/Lamp and surge killer)	0.9 (1.0)	
Temperature raise (°C)	50	
Range of voltage fluctuation	±10%	
Insulation class	Class B	
Wire connecting style	Grommet lead wire, C type connector, D type connector	
Option	w/surge killer, w/lamp indicator	

2) Model code and specifications

(1) 4SA0 series

No. of position and No. of solenoid	Model code	Connecting port dia.	Effective sectional area (mm ²)	Working fluid pressure (MPa)	Response time (ms)	Mass (g)
2-position · Single	4SA010	M3 φ4 Barbed fitting (R ₁ · R ₂ are M3)	2.0	0.15~0.7	30	23
2-position · Double	4SA020			0.1~0.7		35
3-position · All ports block	4SA030		0.9 (T4 spec.)	0.2~0.7	30	39
3-position · ABR connection	4SA040					
3 position · PAB connection	4SA050					

(2) M4SA0 series

Model	M4SA0	
Item	M4SA0	
Type of Manifold	Single Block Manifold	
Applicable Solenoid	4SA0 Series	
Effective Sectional Area	mm ²	0.9
No. of Blocks	2 blocks~20 blocks	
Kind of Manifold	Concentrated Supply Air and Concentrated Exhaust	
Connecting Style of Electric Cord	Grommet Lead Cord (C type or D type connectors)	
Plumbing	P port	Side M5
	A · B port	Top M3 (Top φ4 Barbed fitting : option)
	R port	Side (Rc1/8) Pilot exhaust is released to air.
Manual Operation Device	Non locking type (Stardad), Locking type (Optional)	

(3) 4SB0 series

No. of position and No. of solenoid	Model code	Connecting port dia.	Effective sectional area (mm ²)	Working fluid pressure (MPa)	Response time (ms)	Mass (g)
2-position · Single	4SB010	M5	1.8	0.15~0.7	30	43
2-position · Double	4SB020			0.1~0.7		55
3-position · All ports block	4SB030		1.5	0.2~0.7	30	50
3-position · ABR connection	4SB040					
3 position · PAB connection	4SB050					



(4) M4SB0 series

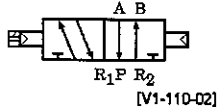
Model		M4SB0
Item		M4SB0
Type of Manifold		Single Block Manifold
Applicable Solenoid		4SB0 Series
Effective Sectional Area	mm ²	1.8 (1.5 : 4SB030, 4SB040, 4SB050)
No. of Blocks		2 blocks~20 blocks
Kind of Manifold		Concentrated Supply Air and Concentrated Exhaust
Connecting Style of Electric Cord		Grommet Lead Cord
Plumbing	P port	Side (M5) (Rc1/8 Option)
	A · B port	Side (M5, φ4 snap join, φ4, φ6 Barbed fitting : option)
	R port	Side (Rc1/8) Pilot exhaust is centralized to R port.
Manual Operation Device		Non locking type (Standard), Locking type (Optional)



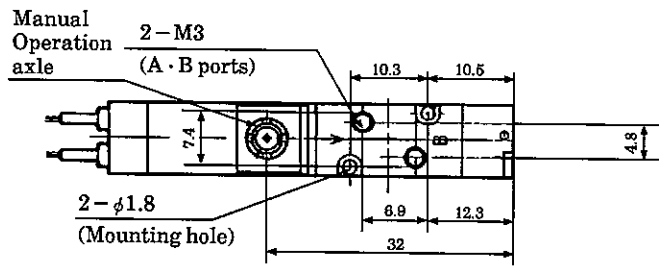
1.3 External dimensions

1) 4SA series

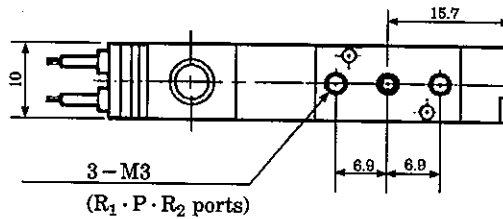
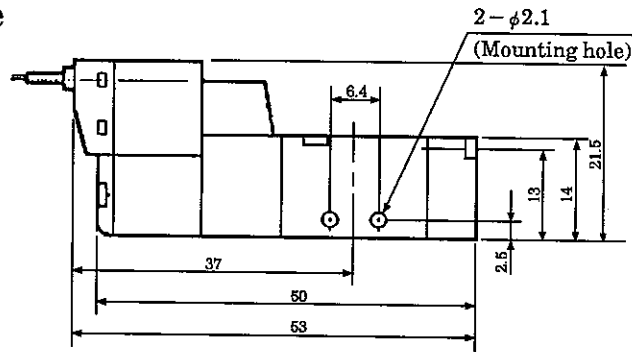
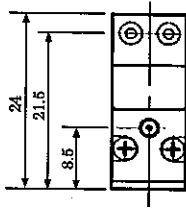
● 4SA010



● 4SA010-M3 (Grommet lead wire)



Manual Operation axle



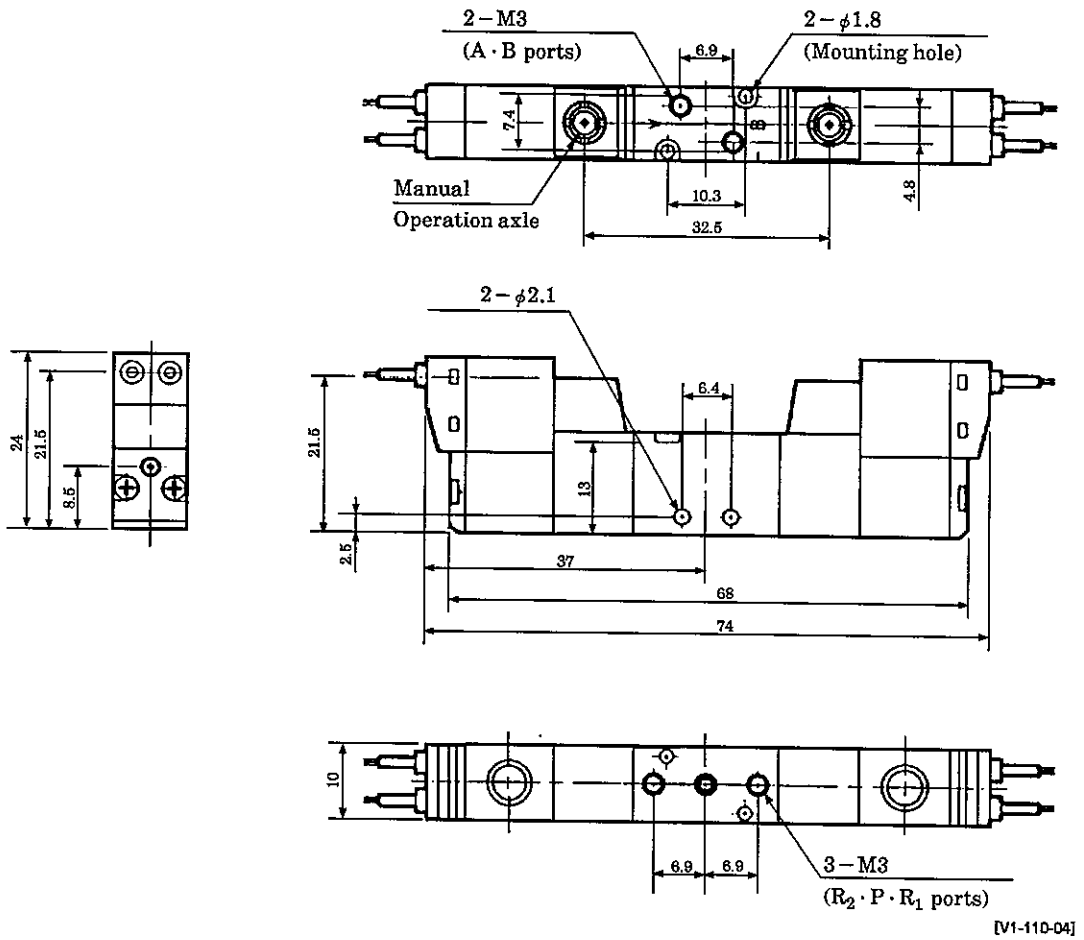
[V1-110-03]



● 4SA020



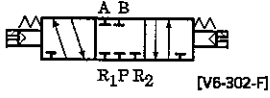
● 4SA020-M3 (Grommet lead wire)



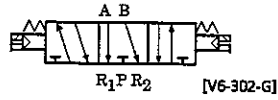
Discontinue



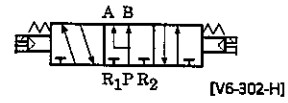
● 4SA030



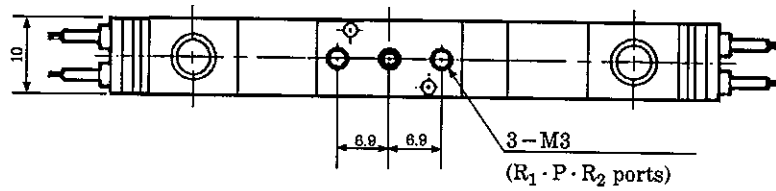
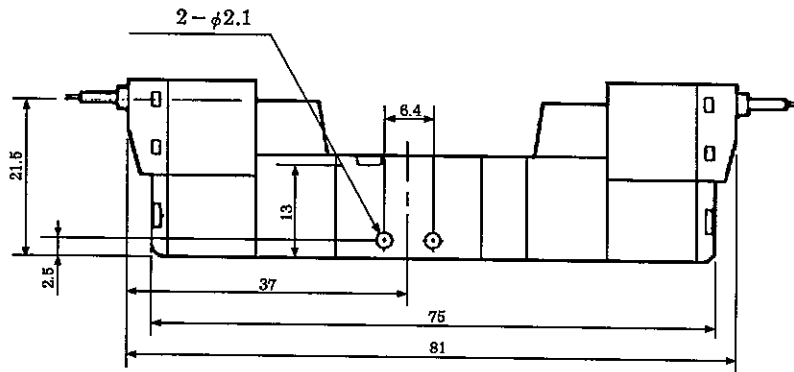
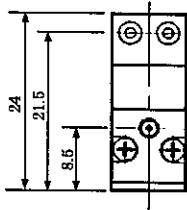
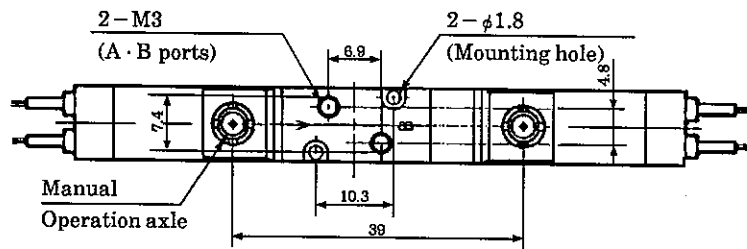
● 4SA040



● 4SA050



● 4SA0340, 040, 050-M3 (Grommet lead wire)



[V1-110-05]

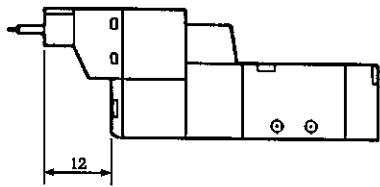
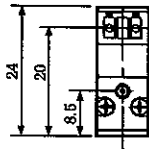
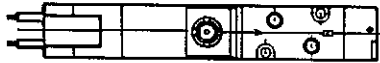


2) 4SA0 series options

- 4SA0

1	┌
2	├
3	└
4	┌
5	└

 0-M3- C, C₁, C₂, C₃ (C type connector)

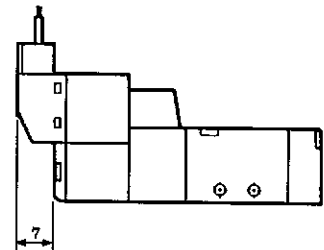
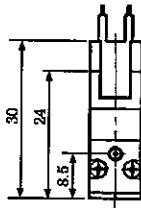


[V1-110-06]

- 4SA0

1	┌
2	├
3	└
4	┌
5	└

 0-M3- D₁, D₂, D₃, D₄ (D type connector)

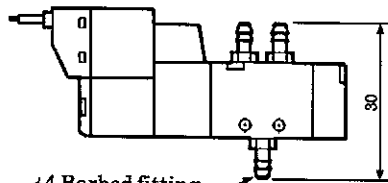


[V1-110-08]

- 4SA0

1	┌
2	├
3	└
4	┌
5	└

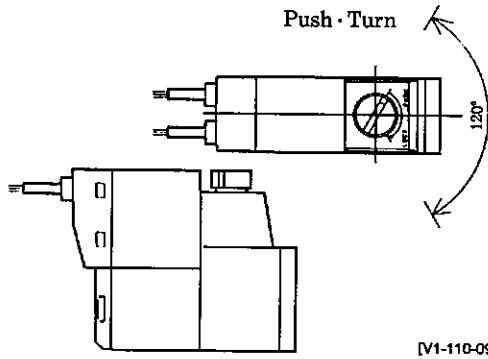
 0-T4



[V1-110-07]



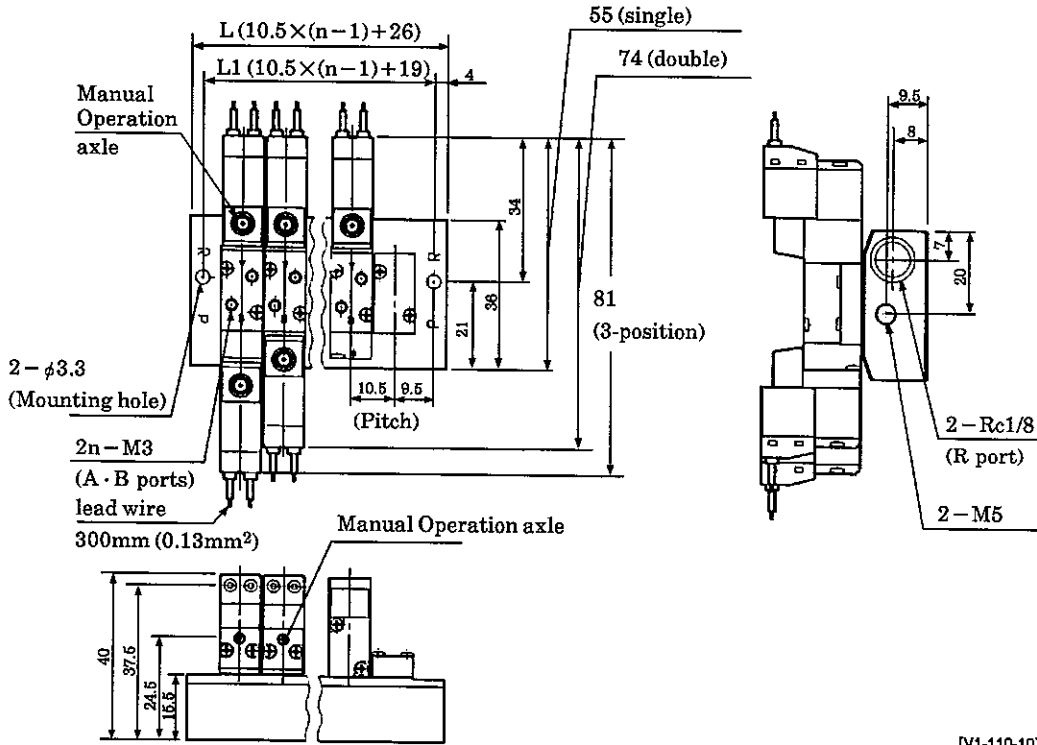
- 4SA0
- | | | |
|---|---|------------------------------------|
| 1 | } | M3-M1 (Lock type manual operation) |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |





3) M4SA series

- M4SA0※0-M3 (Grommet lead wire)

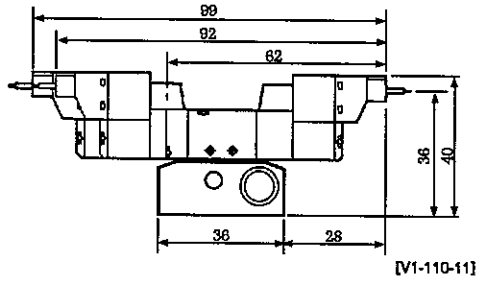


Block No.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Symbol																			
L1	29.5	40	50.5	61	71.5	82	92.5	103	113.5	124	134.5	145	155.5	166	176.5	187	197.5	208	218.5
L	36.5	47	57.5	68	78.5	89	99.5	110	120.5	131	141.5	152	162.5	173	183.5	194	204.5	215	225.5

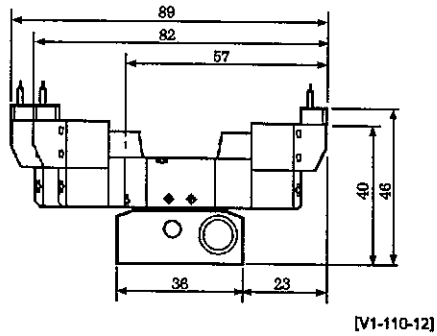


Options

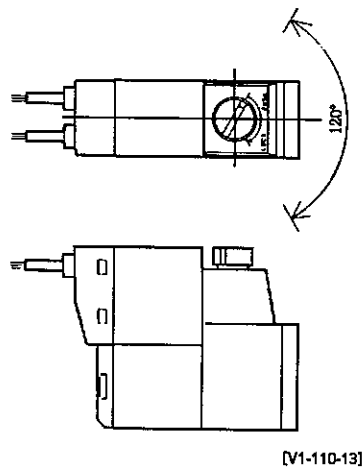
- M4SA0※0-M3- **C, C₁, C₂, C₃** (C type connector)



- M4SA0※0-M3- **D, D₁, D₂, D₃** (D type connector)



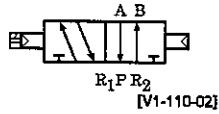
- M4SA0※0-※※-M1 (Lock type manual operation)



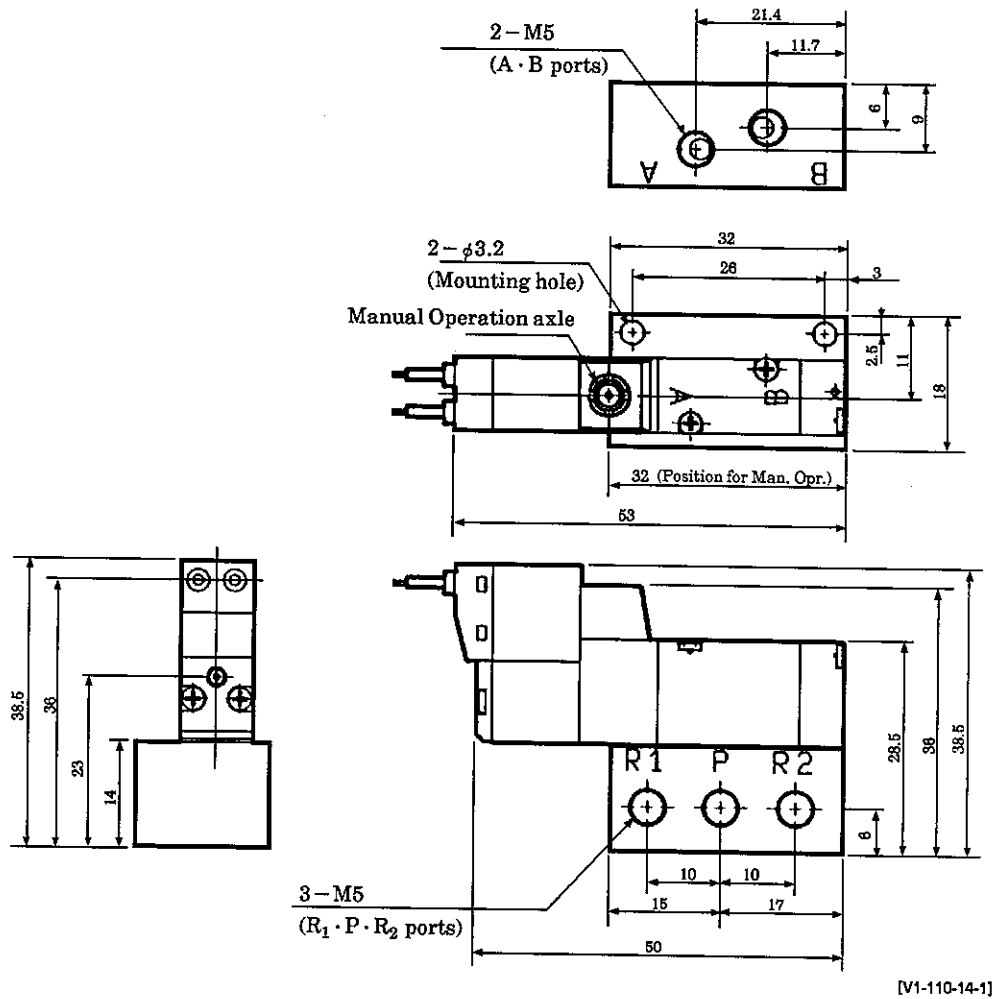


4) 4SB series

- 4SB010

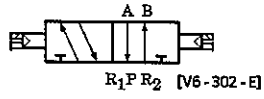


- 4SB010-M5 (Grommet lead wire)

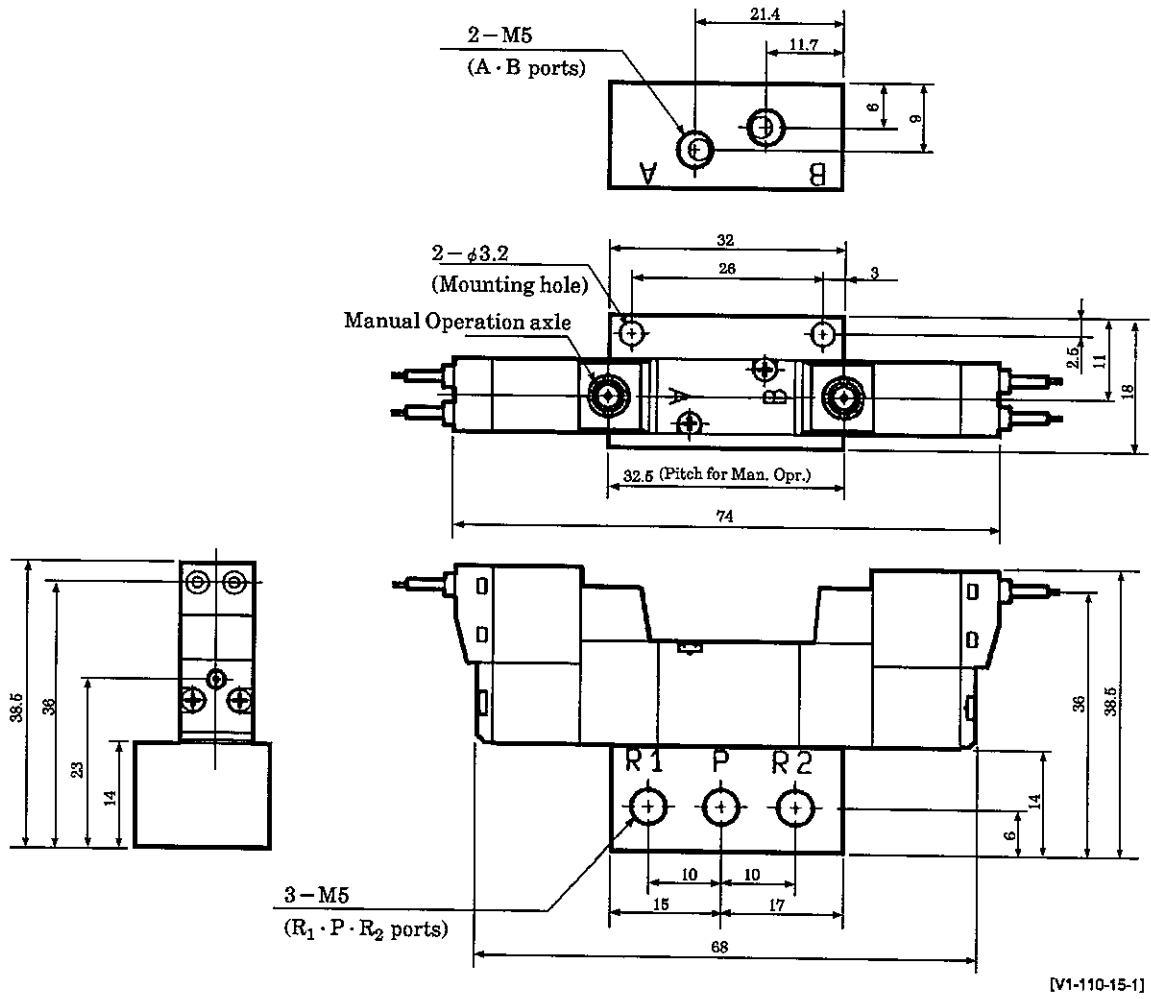




● 4SB020

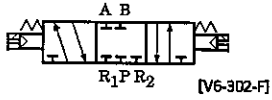


● 4SB020-M5 (Grommet lead wire)

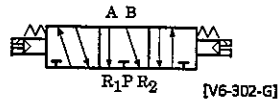




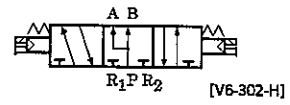
● 4SB030



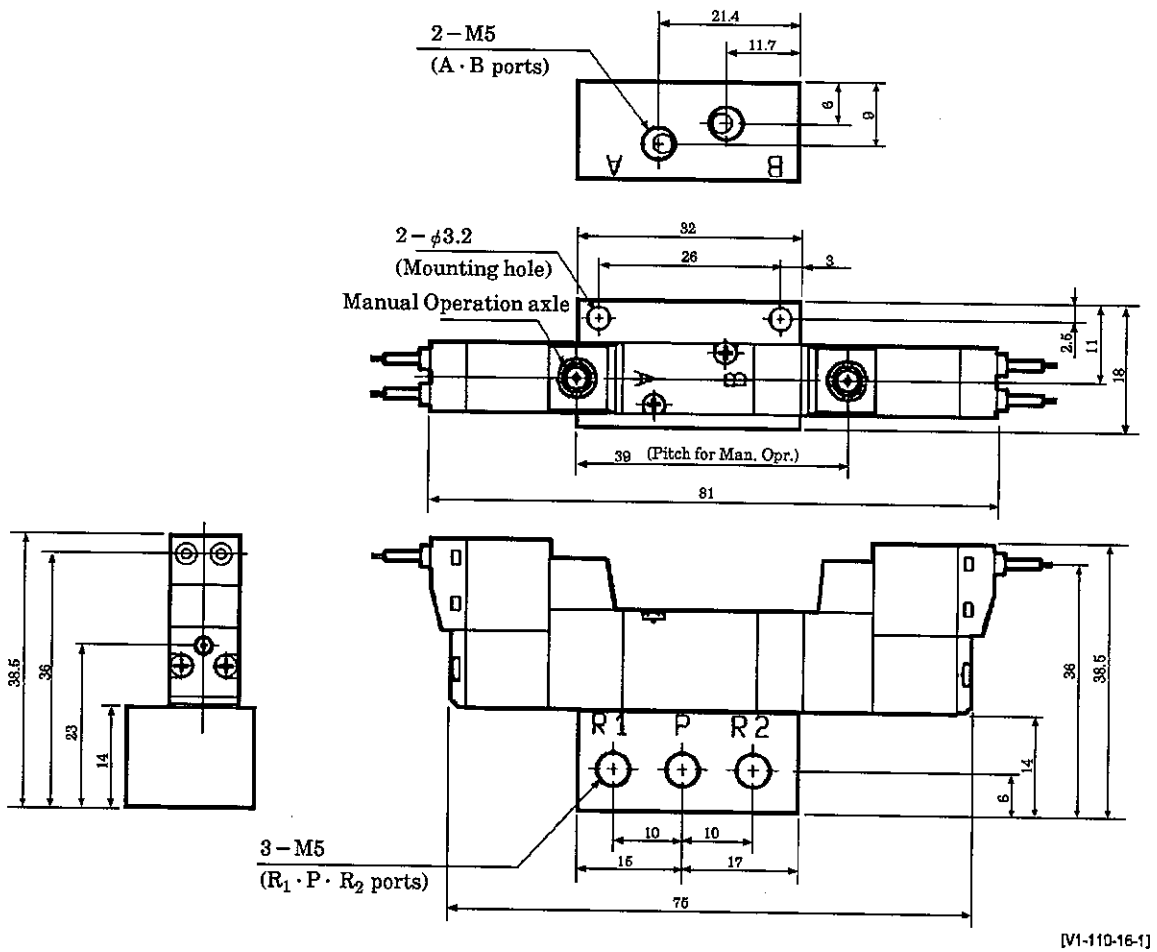
● 4SB040

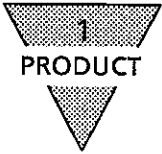


● 4SB050



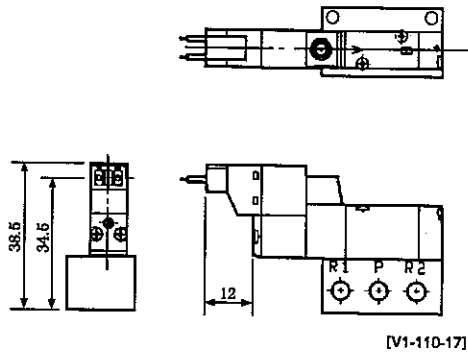
● 4SB030, 040, 050-M5 (Grommet lead wire)



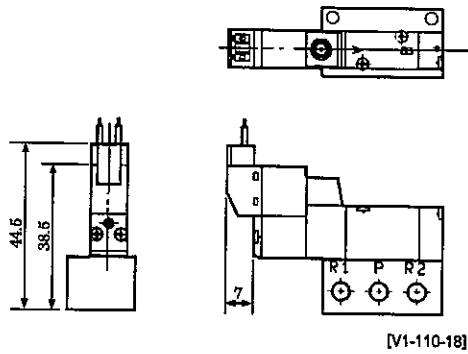


5) 4SB series options

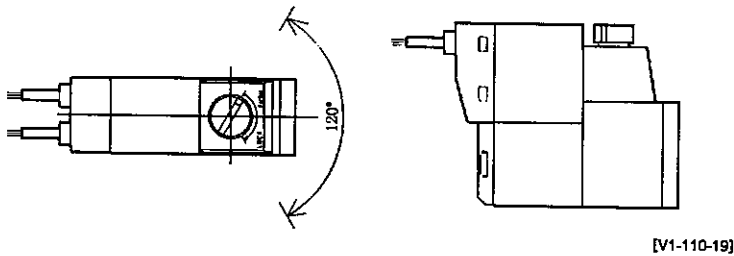
- 4SB0
 - 1
 - 2
 - 3 — 0-M5- C, C1, C2, C3 (C type connector)
 - 4
 - 5



- 4SB0
 - 1
 - 2
 - 3 — 0-M5- D, D1, D2, D3 (D type connector)
 - 4
 - 5



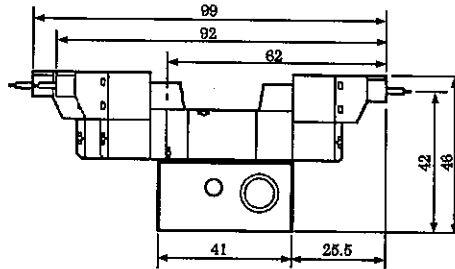
- 4SB0
 - 1
 - 2
 - 3 — 0-M5- M1 (Lock type Manual operation)
 - 4
 - 5





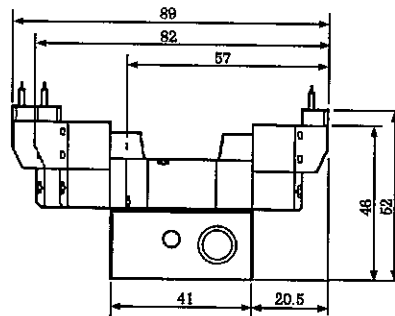
Options

- M4SB0※0-※※- **C, C₁, C₂, C₃** (C type connector)



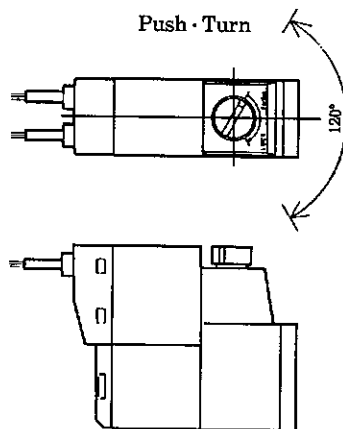
[V1-110-21]

- M4SB0※0-※※- **D, D₁, D₂, D₃** (D type connector)



[V1-110-22]

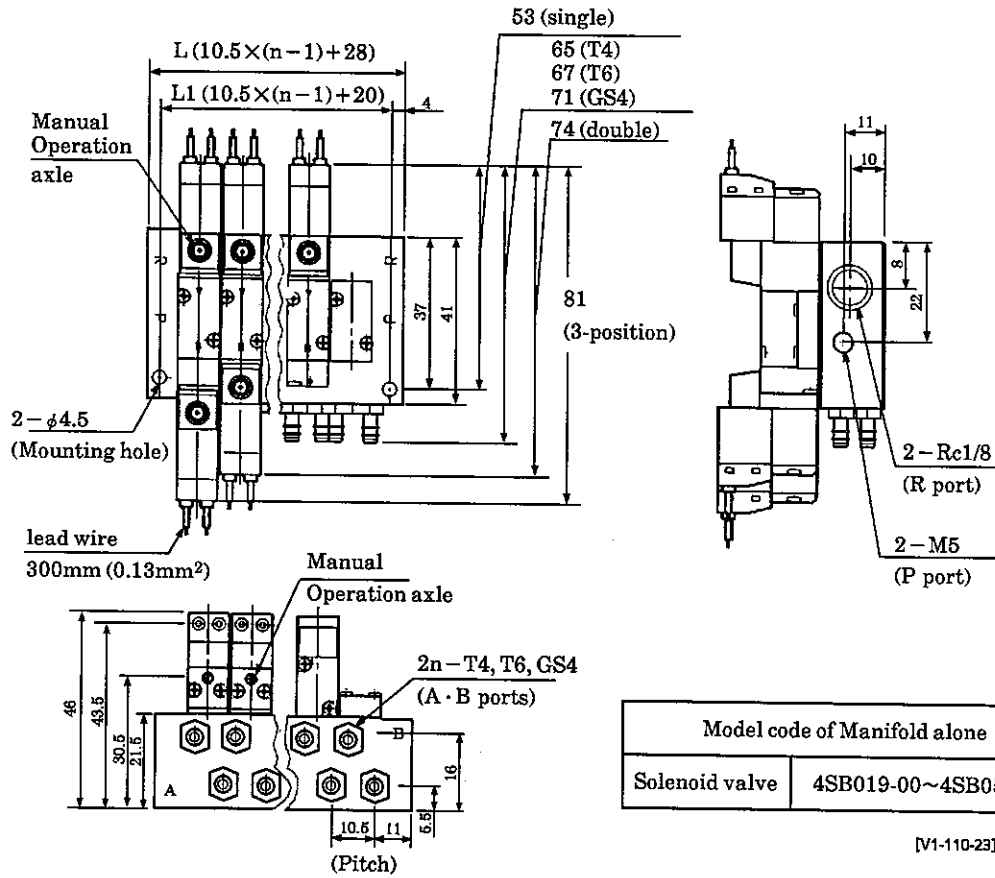
- 4SB0※0-※※-M1 (Lock type manual operation)



[V1-110-13]



● M4SB0×0- GS4, T4, T6 (Grommet lead wire)



Model code of Manifold alone	
Solenoid valve	4SB019-00~4SB059-00

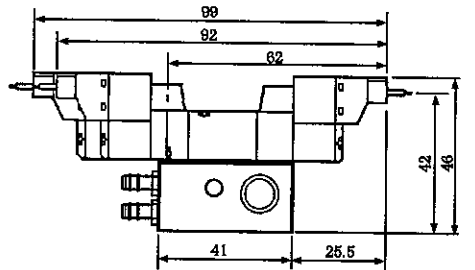
[V1-110-23]

Block No.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Symbol	L1	30.5	41	51.5	62	72.5	83	93.5	104	114.5	125	135.5	146	156.5	167	177.5	188	198.5	209	219.5
	L	38.5	49	59.5	70	80.5	91	101.5	112	122.5	133	143.5	154	164.5	175	185.5	196	206.5	217	227.5



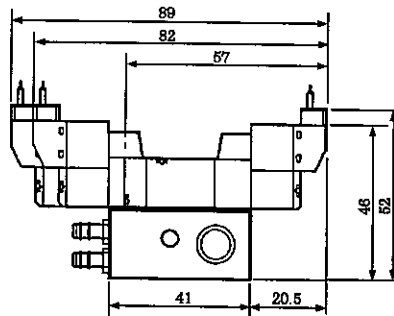
Options

- M4SB0※0-※※※- **C, C₁, C₂, C₃** (C type connector)



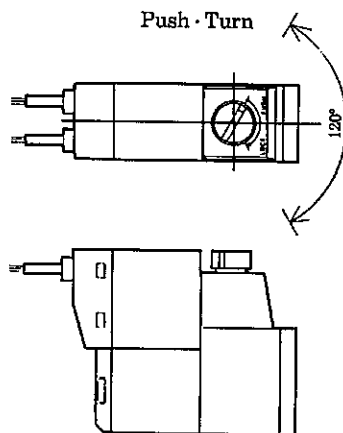
[V1-110-24]

- M4SB0※0-※※※- **D, D₁, D₂, D₃** (C type connector)



[V1-110-25]

- M4SB0※0-※※※-M1 (Lock type manual operation)

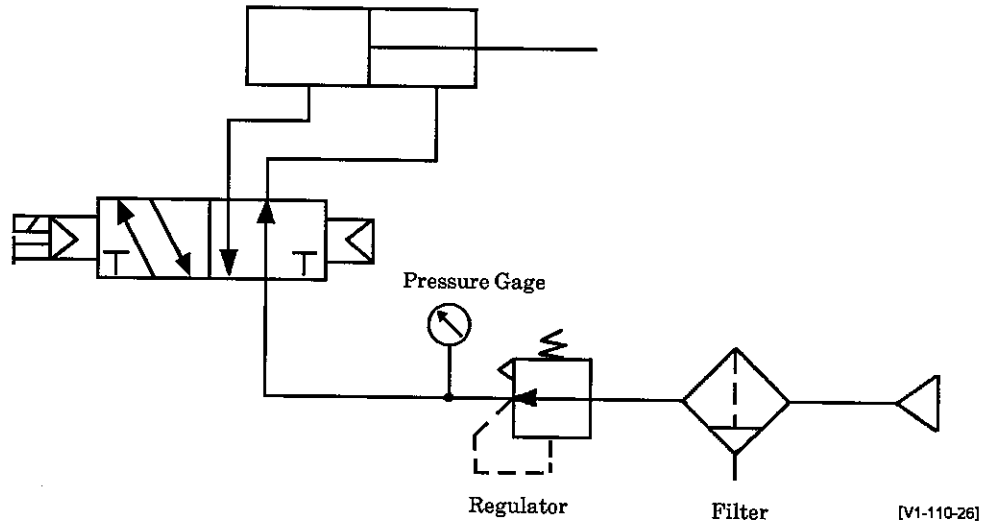


[V1-110-13]

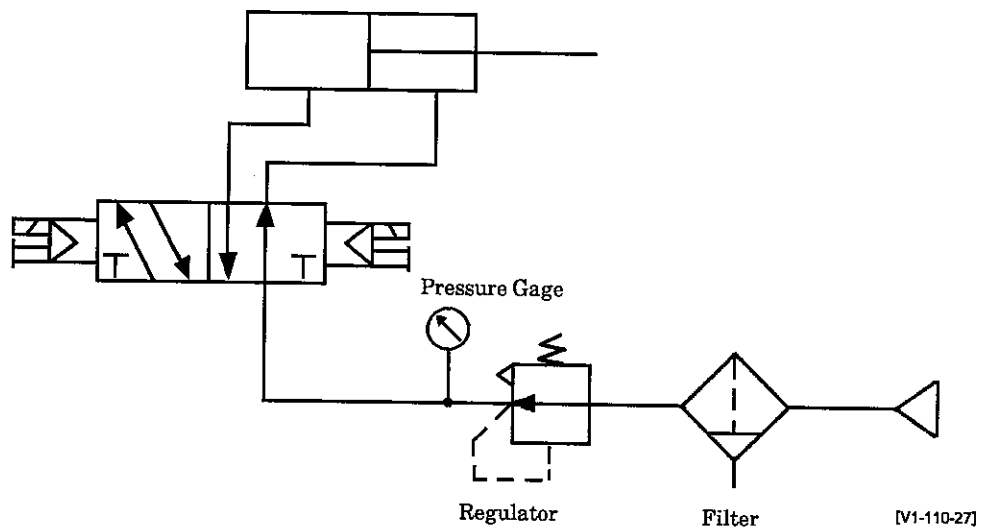


1.4 Fundamental circuit diagrams

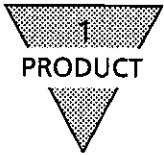
- 1) Single
4SA010, 4SB010



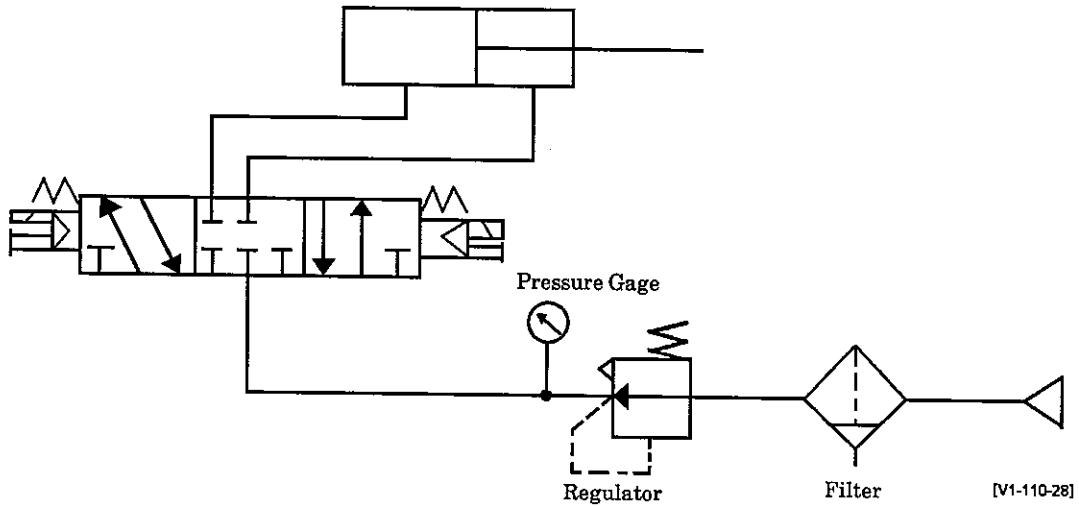
- 2) Double
4SA020, 4SB020



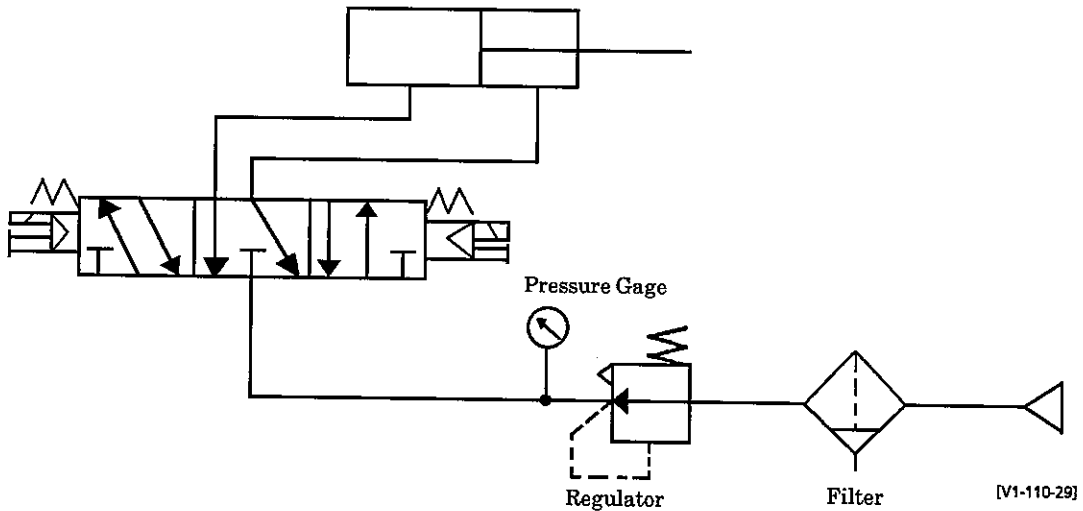
Discontinue



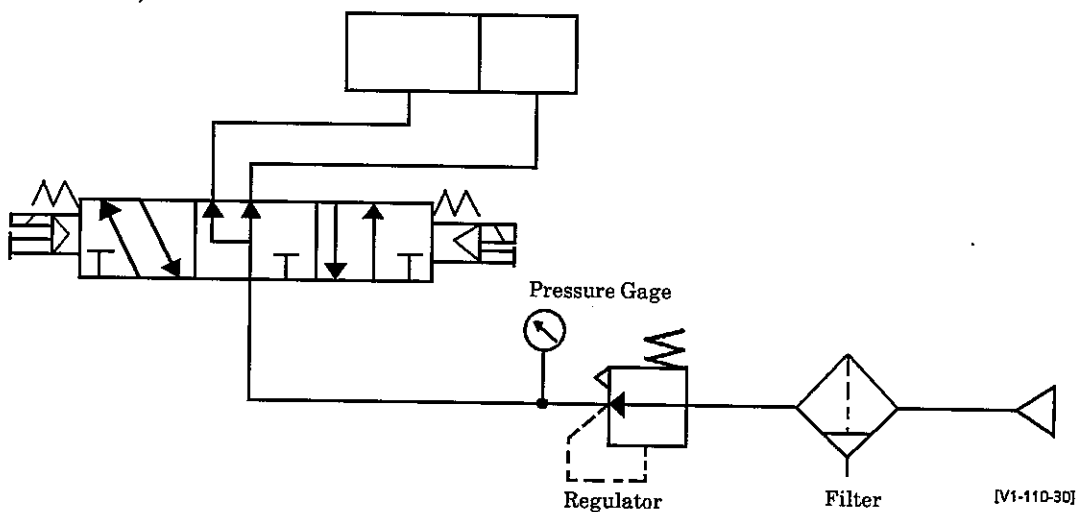
- 3) 3 position (All ports blocked)
4SA030, 4SB030

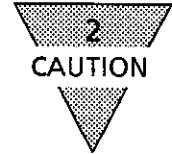


- 4) 3 position (ABR connection)
4SA040, 4SB040



- 5) 3 position (PAB connection)
4SA050, 4SB050





2. CAUTION

2.1 Quality of Compressed air

Much sludge (such as condensed humidity, oxide oil, tarry compound and foreign particles) is apt to be contained within the compressed air which destroys the reliability of pneumatic equipment remarkably. Consider the following remedies of removing such sludge.

Improve the quality of compressed air by dehumidifying using after-cooler dryer.

- 1) How to purge drain (sludge)
 - Dehumidifying the air by means of after-cooler dryer
 - Removal foreign particles and material by means of filter
 - Removal tarcarbide by means of tar-removing filter

2.2 Cautions to build system with manifold

- 1) Direction of flow

Both Compressed air supply (P) ports and Exhaust (R) ports are provided at both end of manifold block. Make use either one of them.

- 2) Number of blocks limitation

When anticipating to operate more than 6 valves simultaneously, connect Air supply lines to P ports on both end of manifold block and lead exhaust to open air at both R ports. Otherwise, it may cause malfunction of valves.

- 3) Connecting pipe diameter

Use the pipe of diameter corresponding to P port size of manifold. Insufficient flow or pressure may cause either malfunction of valve or short propelling force of cylinders.

- 4) Cylinder malfunction

There may be possible malfunction of cylinders when intending to drive double acting cylinders with 3-position ABR connection on manifold or to drive single acting cylinder making use 4-position valve in place of 3-position valve due to the exhaust pressure coming through a round-about route when the other solenoid valve is actuated. Connect an isolated solenoid valve alone to build a cylinder driving circuit as for preventive measure of such trouble.

It is further recommended, however, to contact nearest CKD dealer when intending to use manifold blocks.



2.3 Cautions to mount subplate onto manifold

Tighten 2es. of mounting screws uniformly with tightening torque of 0.25 to 0.3 N · m.

2.4 Manual Operation Devices

1) P port pressure

Even though using the device, main valve will not be shifted unless P port is pressurized, due to its structure of being an Internal pilot type spool valve.

2) Non-lock type manual operation device

Press manual operation axles till it hits the bottom. Valve will be shifted to the same position as if solenoid coil is energized and remain there while the button is pressed as for 3-position type.

As for 2-position double solenoid valve, it will be shifted to the same position as if A side (B side) Solenoid is energized when Manual operation button on A side (B side) is pressed and remain the position even after the button is released. Press opposing button to release its position.

3) Lock type manual operation device

The valve is shifted to the position as if coil is energized when button is pressed with a small screw driver until it hits the bottom and is locked when button is turned about 120° clockwise. Carefully avoid turning it forcibly beyond the limitation to prevent its damage. Make sure to release locking of manual operation device prior to starting normal operation.

2.5 Responding time

1) Supplying pressure

Responding time posted on a catalog is for the case of energizing with Non-lubricat at the pressure of 0.5MPa.

2) Lubrication

There may be a delay of responding time in case of excessive volume of lubrication or low pressure.

2.6 Range of Supply pressure

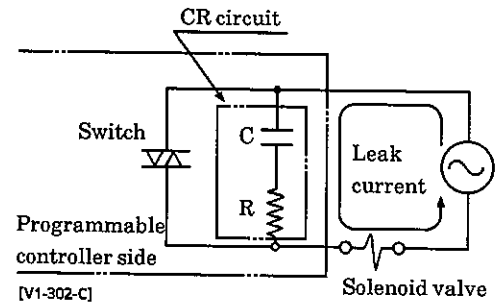
At least lower limited pressure or more is required due to its structure of being Internal pilot type spool valve. Always confirm the line pressure.



2.7 Solenoid valve

1) Limitation of Leak current

Make sure that the leak current of programmable controller output is less than DC24V, 1mA when anticipating to drive solenoid coil valve with programmable controller, etc. Otherwise, it may cause malfunction of coil.



2) Polarity of solenoid coil

There is a polarity of DC solenoid coil with lamp and surge killer. Confirm the electric circuit.

2.8 Ambient Conditions

1) Dust

Mount either silencer or elbow joint to R port keeping its open end downward within the area of much dust or floating foreign particles, to provide protective measurement of keeping those foreign particles from falling into R port.

2) Water drops and cutting coolant

Instead of leaving water or cutting coolant dripping over the solenoid, either provide a cover or install the solenoid within enclosed panel as it may causes short circuit or coil burning. Prevent allowing cutting coolant drip over cylinder rod because it will result malfunction of solenoid valve due to penetrated coolant to secondary piping of solenoid through cylinder. Contact nearest CKD dealer if the case is as such.

3) Continuous charging

When it is installed within enclosed control box or charging time is long, take some measure of ventilation or radiation. Otherwise it may cause rising temperature excessively.

4) Corrosive gas ambient

Prevent installation the valve within the corrosive gas such as sulfurous acid gas. Contact nearest CKD dealer for installation valve in the ambient of sea breeze or splash of sea water.

5) Ambient temperature

Contact nearest CKD dealer for installation valve in the ambient of high temperature higher than 50°C or such lower temperature as below 5°C.

6) Vibration and Shock

Prevent installation of valve within the area of 50m/s² or higher vibration and/or 300m/s² or higher shock.



3. OPERATION

3.1 Function

1) 4SA series

● 4SA010

No signal current

(Illustrated)

$P \rightarrow B$

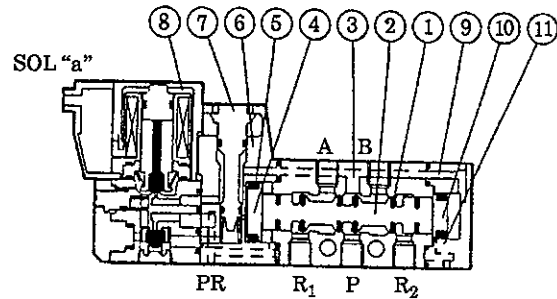
$A \rightarrow R_1$ (R_2 port is closed.)

When actuated

$P \rightarrow A$

$B \rightarrow R_2$ (R_1 port is closed.)

PR is pilot exhaust port.



● 4SA020

When Sol "a" is actuated

$P \rightarrow A$

$B \rightarrow R_2$ (R_1 port is closed.)

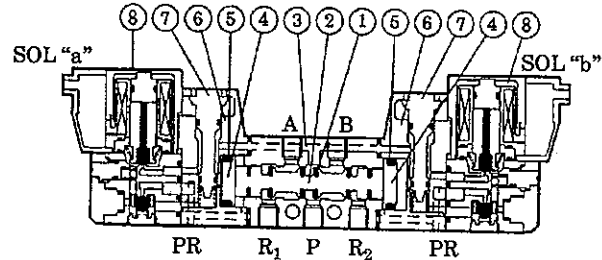
When Sol "b" is actuated

(Illustrated)

$P \rightarrow B$

$A \rightarrow R_1$ (R_2 port is closed.)

New position of the spool is held where it is even after the solenoid is deactuated.



● 4SA030, 4SA040, 4SA050

No signal current to 4SA030

(Illustrated)

$P \cdot A \cdot B \cdot R_1 \cdot R_2$ are closed.

No signal current to 4SA040

P (Closed)

$A \rightarrow R_1$

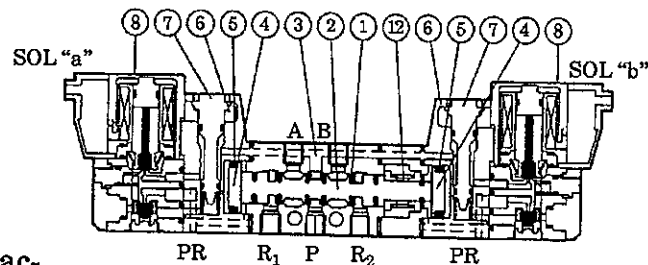
$B \rightarrow R_2$

No signal current to 4SA050

$P \rightarrow A \cdot B$

$R_1 \cdot R_2$ (Closed)

Refer 4SA020 as to the cases actuating Sol "a" or Sol "b".



No.	Parts	Material		Remarks
①	Spool packing	NBR	Nitril rubber	
②	Spool	A6061	Aluminum	
③	Body	ADC12	Die casted aluminum	Painting finish
④	Piston D	POM	Polyacetal	
⑤	Piston packing D	NBR	Nitril rubber	
⑥	Piston chamber	PPS	Polyphenilene sulfide	
⑦	Manual operation axle	POM	Polyacetal	
⑧	Coil ass'y	—	—	
⑨	Cap	PPS	Polyphenilene sulfide	
⑩	Piston S	POM	Polyacetal	
⑪	Piston packing S	NBR	Nitril rubber	
⑫	Spring	SUS304	Stainless steel	

Expendable Parts list

Parts No. · Parts	⑧
Model code	Coil ass'y
4SA010	4S0 - Connecting wire - Coil - Voltage ↑ No marking for Grommet lead wire
4SA020	
4SA030	
4SA040	
4SA050	



2) 4SB series

● 4SB010

No signal current

(Illustrated)

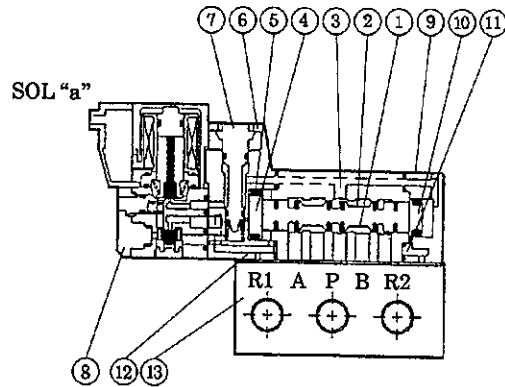
$P \rightarrow B$

$A \rightarrow R_1$ (R_2 port is closed.)

When actuated

$P \rightarrow A$

$B \rightarrow R_2$ (R_1 port is closed.)



● 4SB020

When Sol "a" is actuated

$P \rightarrow A$

$B \rightarrow R_2$ (R_1 port is closed.)

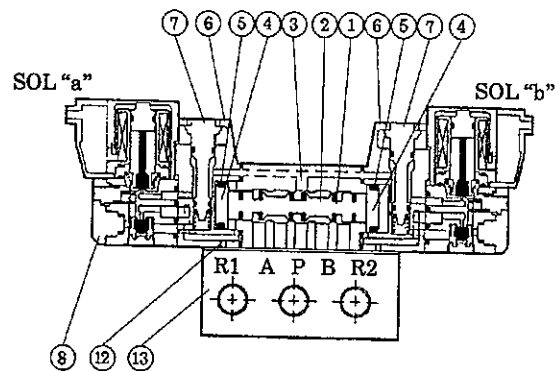
When Sol "b" is actuated

(Illustrated)

$P \rightarrow B$

$A \rightarrow R_1$ (R_2 port is closed.)

New position of the spool is held where it is even after the solenoid is deactivated.



● 4SB030, 4SB040, 4SB050

No signal current to 4SB030

(Illustrated)

$P \cdot A \cdot B \cdot R_1 \cdot R_2$ are closed.

No signal current to 4SB040

P (Closed)

$A \rightarrow R_1$

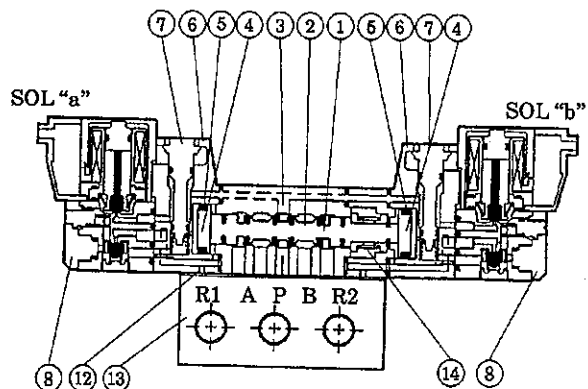
$B \rightarrow R_2$

No signal current to 4SB050

$P \rightarrow A \cdot B$

$R_1 \cdot R_2$ (Closed)

Refer 4SB020 as to the cases actuating Sol "a" or Sol "b".

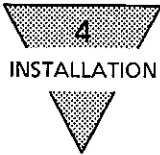




No.	Parts	Material		Remarks
①	Spool packing	NBR	Nitril rubber	
②	Spool	A6061	Aluminum	
③	Body	ADC12	Die casted aluminum	Painting finish
④	Piston D	POM	Polyacetal	
⑤	Piston packing D	NBR	Nitril rubber	
⑥	Piston chamber	PPS	Polyphenilene sulfide	
⑦	Manual operation axle	POM	Polyacetal	
⑧	Coil ass'y	—	—	
⑨	Cap	PPS	Polyphenilene sulfide	
⑩	Piston S	POM	Polyacetal	
⑪	Piston packing S	NBR	Nitril rubber	
⑫	Gasket	NBR	Nitril rubber	
⑬	Subplate	A6063	Aluminum	
⑭	Spring	SUS304	Stainless steel	

Expendable Parts list

Parts No. · Parts	⑧
Model code	Coil ass'y
4SB010	4S0 - Connecting wire - Coil - Voltage ↑ No marking for Grommet lead wire
4SB020	
4SB030	
4SB040	
4SB050	



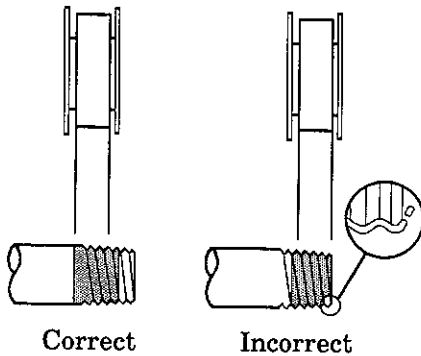
4. INSTALLATION

4.1 Piping

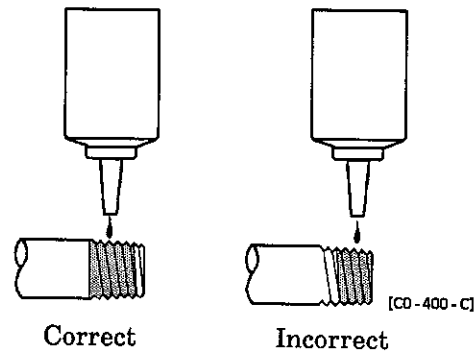
1) Application of sealant

Carefully apply it so as to prevent it from flowing into pipe but sufficient to prevent air leakage.

● Seal Tape



● Sealant (Paste or liquid)



When applying the seal tape of Fluorine resin over threaded pipe, apply it 2~3 layers leaving blank 1 to 2 pitches of thread off the end of pipe and press it with finger nail to make it stick to thread. Leave the same blank of thread when applying sealant sufficiently but not excessive to prevent it from falling into pipe. Never apply sealant to female threaded part.

- 2) Rust scale or dust in pipes cause malfunction of valve seat leakage. Install a filter preferably adjacent upper-stream to solenoid valve for eliminating rust, foreign substance and drain from falling into the system.
- 3) Flush air into the pipes, solenoid valve and peripheral equipment to blow out foreign substances and chips before piping.
- 4) Flow direction

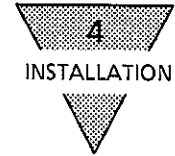
Note arrangement of ports such as A and B, and R₁ and R₂ of 4SO series is in a reverse order with that of 4K series. Carefully confirm flow direction to prevent reversed actuation of valve.

Comparison table of port symbols

	4K series	4SO series
Single solenoid		

5) Mounting posture

There is no restriction as to its mounting posture.



6) Air supply piping

Avoid piping to let A port and B port exhaust to open air. Also prevent chalking P port line as it may cause malfunction of valve. Carefully select pipes of sufficiently large enough diameter particularly when working pressure is low.

7) Piping of 3-position all port block type

Make sure that there is no external leakage from piping between solenoid valve and cylinder when making cylinder stop at an intermediate position while controlling it with 3-position all port block valve. Also select cylinder with no leakage through rod packing and piston packing. Otherwise, cylinder may be unable to make intermediate stop even when shifted to all port block position due to its leakage.

Select cylinder with brake (such as SELTOP cylinder, CKD products) when long holding at its intermediate stop position or stopping accuracy is required.

8) Tightening torque

Apply appropriate torque referring to the following table for the purpose of preventing leakage and damage.

Connecting thread	Appropriate torque N · m
M3	0.3 to 0.6
M5	1.0 to 1.5
Rc1/8	3.0 to 5.0

Gasket (Model code: FGS) is used to seal M3 and M5. Avoid additional tightening while pressure is on. Design and build the system to provide ample room around piping for hand tools at later maintenance work.



4.2 Applicable tubes

1) Appropriate tubes

Select tubes specified by CKD for solenoid valves with fittings.

Soft nylon tube (F-1500 series)

Urethane (U-9500 series)

Carefully examine its Outside Diameter accuracy as well as its wall thickness and hardness when selecting commercially available tubes. As for urethane tube hardness, select 93° or over (Rubber hardness gage).

OD tolerance

Soft-hard nylon	$\pm 0.1\text{mm}$
Urethane $\phi 4, 6$	$+0.1\text{mm}$ -0.15mm

Wall thickness of tube

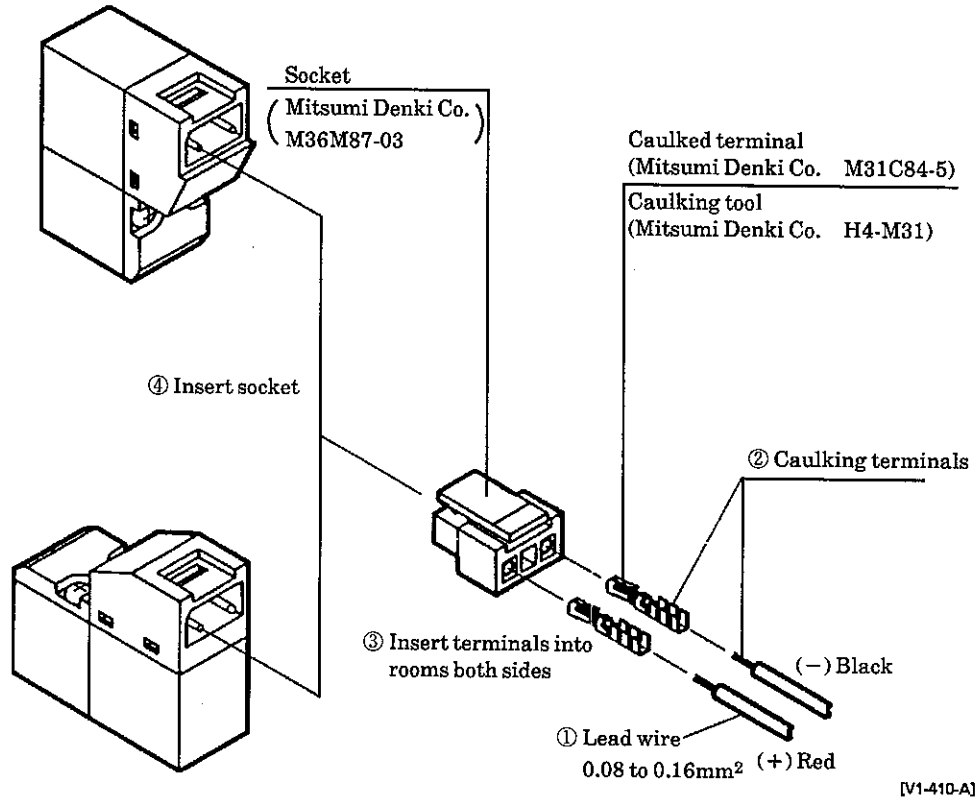
OD mm	ID mm	
	Nylon	Urethane
$\phi 4$	$\phi 2.5$	$\phi 2$
$\phi 6$	$\phi 4$	$\phi 4$

2) Apply tube bending radius more than the least bending radius posted in the table below. Otherwise it may cause slipping off or leakage.

Tube diam.	Least bending radius mm	
	Nylon	Urethane
$\phi 4$	10	10
$\phi 6$	20	20

4.3 Wire connection to C type and D type connectors.

Refer to the following illustration and comply with steps ① to ④.



Note : Confirm the polarity when it is the type with lamp and surge killer.

It results no short circuit but valve does not function.

4.4 Installation of Peripheral equipments

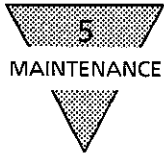
1) Air filter

Select the air filter with a filter element of 5 μ m mesh or smaller.(Refer to CKD's SELEX air filter catalog.) Also, periodically purge drain.

2) Lubricator

Models 4SA, 4SB series are serviceable with no lubrication. It is recommended, if lubrication is preferred due to peripheral equipment, to use Turbine oil, Class 1, ISO VG32 (Additive free) or equivalent, but maintain volume only to the extent of reasonable.

Spindle oil, machine oil are inappropriate because packings will be swollen causing malfunction of equipment.



5. MAINTENANCE

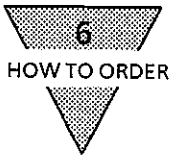
5.1 Trouble Shooting

Motion troubles	Suspected cause	Remedies
Does not actuate	No electric signals	Turn on the power
	Damage to signal wiring system	Repair the control circuit
	Excessive fluctuating range of current or voltage	Reaffirm the power capacity. (within $\pm 10\%$ of voltage pressure fluctuation)
Malfunctions	Excessive leaking current	Correct control circuit and/or set a bleed circuit
	Chattering	Inspect switching system and/or tighten each loosen terminal screw
	Voltage deviates than specified on the name plate	Rectify the voltage to meet the specification
	Damaged or short circuited coil	Replace the coil
	Erroneous shut off pressure source	Turn on the power source
	Insufficient pressure	Reset the pressure reducer valve or install a pressure raising valve
	Insufficient flow of fluid	Rectify the size of pipe or install a surge tank
	Pressure supplied through exhaust port	Rectify the piping system
	Erroneous piping, erroneous omitting some piping	Rectify the piping system
	Speed control valve completely closed by error	Reset the needle valve
	A port or B port is directly released to an open air	Install pipe joints to A and B ports with diameter equal to or smaller than that of to P port joint.
	Valve is frozen	Add remedies of avoiding freezing (Heating system or dehumidifying system etc.)
	Delayed return of a plunger (Excessive oil, existence of tar)	Check the quality of the lubricant. (Turbine oil class 1, ISO VG 32 or equivalent)
	"	Rectify the quantity of lubricant drip
	"	Install a tar removing filter
Clogged-up exhausting port with dust	Install a cover or silencer and clean it regularly	
High actuating pressure is required	Bulged or decomposed packings	Check the quality of the lubricant. (Turbine oil class 1, ISO VG 32 or equivalent)
	"	Relocate the valves away from splashing area of cutting coolant
	"	Keep organic chemicals away from valves.
	Release of A and/or B port to an open air directly	Rectify the piping to an external pilot system. Grease it up
	Foreign particles cut into packing lips	Remove the foreign particle away from the packing
Malfunctions when manifold is used	Delayed response when multiple blocks are used	Install Sup. (P) piping to P ports on both sides of manifold block
	"	Connect Exh. (R) piping to R ports on both sides of manifold block so as to exhaust to an open air through
	Adjacent cylinder pops out (Single-acting cylinder connected with 3-position valve or 3-position ABR connection)	Rewire to have the solenoid valve in question is actuated prior to others sequentially. Install a locking system to the cylinder



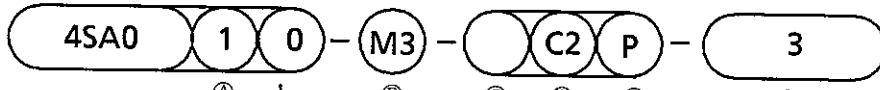
5.2 Disassembly

It is not recommended to disassemble this equipment in field due to its consistency of precision components.



6. HOW TO ORDER

6.1 4SA0

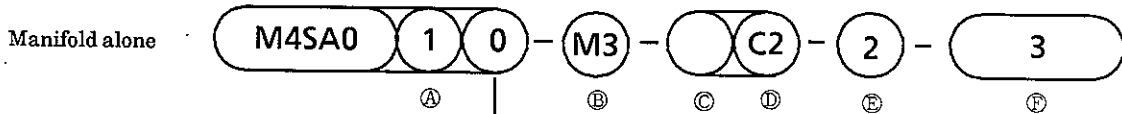
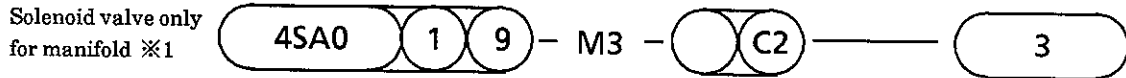


Operational style of Solenoid

Ⓐ Position and status		Ⓑ Connecting port dia.		Ⓒ Manually Operation device	
Marking	Content	Marking	P · A · B port	Marking	Content
1	2-position, single	M3	M3	No mark	Non-locking type manually operating device
2	2-position, Double	T4	φ4 Barbed fitting	M1	Locking type manually operating device
3	3-position, All port block				
4	3-position, ABR connection				
5	3-position, PAB connection				

Ⓓ Wiring type		Ⓔ Other options		Ⓕ Voltage			
Marking	Content	Marking	Content	Marking	Content		
No mark	Grommet lead wire (std)	No mark	w/ mounting plate	3	DC24V	Standard	
C	C type connector, lead wire 300mm	P	with mounting plate	4	DC12V	Option	
C1	C type connector, without lead wire	Mounting plate is available to 4SA010 only.			DC6V		
C2	C type connector, lead wire 300mm w/lamp and surge killer				DC5V		DC5V
C3	C type connector, without lead wire w/lamp and surge killer						
D	D type connector, lead wire 300mm						
D1	D type connector, without lead wire						
D2	D type connector, lead wire 300mm w/lamp and surge killer						
D3	D type connector, without lead wire w/lamp and surge killer						

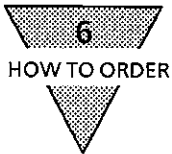
6.2 M4SA0



Operational style of Solenoid

Ⓐ Position and status		Ⓑ Connecting port dia.				Ⓒ Manually Operation device	
Marking	Content	Marking	A · B port	P port	R port	Marking	Content
1	2-position, single	M3	M3	M5	Rc1/8	No marking	Non-locking type manually operating.
2	2-position, Double	T4	φ4 Barbed fitting			M1	Locking type manually
3	3-position, All port block	※ To build T4, barbed fitting FTS4-M3 is screwed into A port as well as B port.					
4	3-position, ABR connection						
5	3-position, PAB connection						

Ⓓ Wiring type		Ⓔ No. of blocks		Ⓕ Voltage		
Marking	Content	Marking	Content	Marking	Content	
No marking	Grommet lead wire (std)	2	2 blocks	3	DC24V	Standard
C	C type connector, lead wire 300mm	5	5	4	DC12V	Option
C1	C type connector, without lead wire	20	20 blocks	DC6V	DC6V	
C2	C type connector, lead wire 300mm w/lamp and surge killer			DC5V	DC5V	
C3	C type connector, without lead wire w/lamp and surge killer					
D	D type connector, lead wire 300mm					
D1	D type connector, without lead wire					
D2	D type connector, lead wire 300mm w/lamp and surge killer					
D3	D type connector, without lead wire w/lamp and surge killer					



When building a system using one kind of manifold

Example of building a series of manifold blocks with same model :
M4SA010-M3-7-3 : It denotes to be a 4SA0 Manifold, 2-position single solenoid, A · B port, M3, 7 blocks, DC 24V.

Mixed Manifold

- Describing procedure of Combination concept

When ordering mixed combined manifold (marking 8 in column of $\text{\textcircled{A}}$), affix the solenoid valve information (type of function, quantity intended and sequential location in combination). An example of coding description depending upon individual function (marking left block No.1) and its sequential location is shown in the last line of this note.

When function list is as follows :

Marking	Function
S1	2-positon, Single
S2	2-position, Double
S3	3-position, All port block
S4	3-position, ABR Connection
S5	3-position, PAB Connection
MP	Masking plate

1	2-pos. Single, (S1)
2	2-pos. Double, (S1)
3	3-pos. All port block, (S3)
4	3-pos. All port block, (S3)
5	2-pos. double, (S2)
6	2-pos. Single, (S1)
7	3-pos. All port block, (S3)

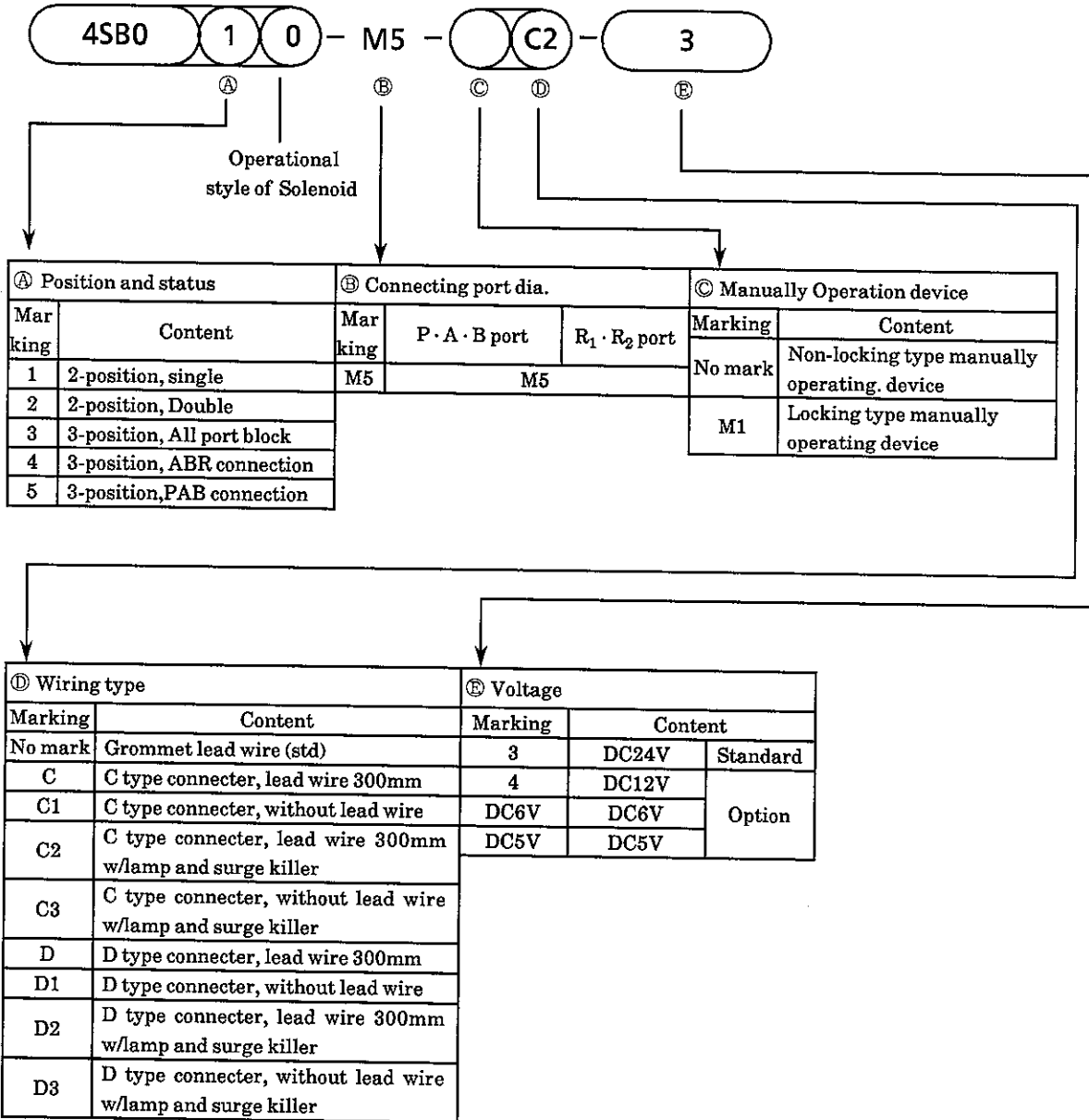
The model coding is as follows when intending to line up 7 blocks of combined blocks of A · B port connection, M3, DC 24V line numbered as above example.

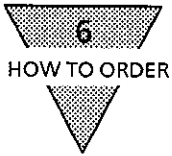
M4SA080-M3-7-3-	2	2	2	0	1	0	Show 0 for blocks not scheduled to use. (S1 = 1.6, S2 = 2.5, S3 = 3.4, S5 = 7)
	S1	S2	S3	S4	S5	MP	

Use alphabetic letters in sequence when anticipating to use more than blocks of same model to build up mix manifolds.

Number of actuators scheduled	10	11	12	13	14	15	16	17	18	19
Alphabetic marking	A	B	C	D	E	F	G	H	I	J

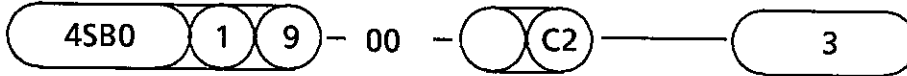
6.3 4SB0



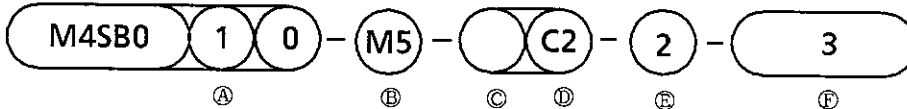


6.4 M4SB0

Solenoid valve only
for manifold ※1



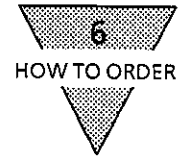
Manifold alone



Ⓐ Position and status		Ⓑ Connecting port dia.				Ⓒ Manually Operation device	
Mar king	Content	Mar king	A · B port	P port	R port	Marking	Content
1	2-position, single	M5	M3	M5	Rc1/8	No marking	Non-locking type manually operating.
2	2-position, Double	GS4	φ4 Snap joint				
3	3-position, All port block	T4	φ4 Barbed fitting				
4	3-position, ABR connection	T6	φ6 Barbed fitting				
5	3-position, PAB connection	PM5	M5	Rc1/8	Rc1/8	M1	Locking type manually
		PGS4	φ4 Snap joint				
		PT4	φ4 Barbed fitting				
		PT6	φ6 Barbed fitting				

- To build GS4, snap joint GMS4-M5-S is screwed into A port as well as B port.
- To build T4 and T6, barbed fitting FTS4-M5 and FTS6-M5 respectively is screwed into A port as well as B port.

Ⓓ Wiring type		Ⓔ No. of blocks		Ⓕ Voltage		
Marking	Content	Marking	Content	Marking	Content	
No marking	Grommet lead wire (std)	2	2 blocks	3	DC24V	Standard
C	C type connector, lead wire 300mm	5	5	4	DC12V	
C1	C type connector, without lead wire	20	20 blocks	DC6V	DC6V	Option
C2	C type connector, lead wire 300mm w/lamp and surge killer			DC5V	DC5V	
C3	C type connector, without lead wire w/lamp and surge killer					
D	D type connector, lead wire 300mm					
D1	D type connector, without lead wire					
D2	D type connector, lead wire 300mm w/lamp and surge killer					
D3	D type connector, without lead wire w/lamp and surge killer					



When building a system using one kind of manifold

Example of building a series of manifold blocks with same model :
M4SB010-M5-7-3 : It denotes to be a 4SB0 Manifold, 2-position single solenoid, A · B port, M5 side piping, 7 blocks, DC 24V.

Mixed Manifold

- Describing procedure of Combination concept

When ordering mixed combined manifold (marking 8 in column \textcircled{A}), specify required function markings (refer to the following tables) and sequential block number starting from left end block (No. 1), beside normal specifications.

When function list is as follows :

Marking	Function
S1	2-positon, Single
S2	2-position, Double
S3	3-position, All port block
S4	3-position, ABR Connection
S5	3-position, PAB Connection
MP	Masking plate

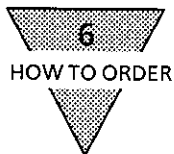
1	2-pos. Single, (S1)
2	2-pos. Double, (S1)
3	3-pos. All port block, (S3)
4	3-pos. All port block, (S3)
5	2-pos. double, (S2)
6	2-pos. Single, (S1)
7	3-pos. All port block, (S3)

The model coding is as follows when intending to line up 7 blocks of combined blocks of A · B port connection, M5 side piping, DC 24V line numbered as above example.

M4SB080-M5-7-3-	2	2	2	0	1	0	Show 0 for blocks not scheduled to use. (S1=1.6, S2=2.5, S3=3.4, S5=7)
	S1	S2	S3	S4	S5	MP	

Use alphabetic letters in sequence when anticipating to use more than blocks of same model to build up mix manifolds.

Number of actuators scheduled	10	11	12	13	14	15	16	17	18	19
Alphabetic marking	A	B	C	D	E	F	G	H	I	J



Additional explanation of Articles © and ④ in Model coding

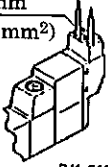
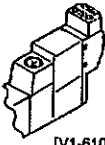
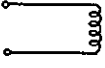
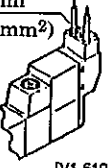
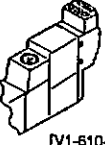
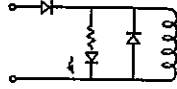
© Manual operation device

Device name	Non-locking type manually operating device	Locking type manually operating device
Option marking	No marking	M1
Shape	 [V1-610-A]	 [V1-610-B]

④ Wiring concept

Device name	Grommet lead wire(Standard)	C type connector, with lead wire	C type connector, without lead wire
Option marking	No marking	C	C1
Shape	<u>Lead wire 300mm</u> (0.13mm ²) [V1-610-A]	<u>Lead wire 300mm</u> (0.13mm ²) [V1-610-C]	 [V1-610-D]
Circuit	 [V6-405-E]		

Device name	C type connector, with lead wire w/surge killer and lamp	C type connector, without lead wire w/surge killer and lamp
Option marking	C2	C3
Shape	<u>Lead wire 300mm</u> (0.13mm ²) [V1-610-C]	 [V1-610-D]
Circuit	 [V1-610-G] Carefully confirm the polarity.	

Device name	D type connector, with lead wire	D type connector, without lead wire
Option marking	D	D1
Shape	Lead wire 300mm (0.13mm ²)  [V1-610-E]	 [V1-610-F]
Circuit	 [V6-405-E]	
Device name	D type connector, with lead wire w/surge killer and lamp	D type connector, without lead wire w/surge killer and lamp
Option marking	D2	D3
Shape	Lead wire 300mm (0.13mm ²)  [V1-610-E]	 [V1-610-F]
Circuit	(+) Red  (-) Black [V1-610-G] Carefully confirm the polarity.	