CKD

SM−9043-A

INSTRUCTION MANUAL

SELEX VALVE

3PA1, 3PB1

M3PA1, M3PB1

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

CKD Corporation

For Safety Use

To use this product safety, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (ISO 4414 *1, JIS B 8370 *2).

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 operation manual carefully for proper operation.**

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

⚠ **DENGER** : Failure to pay attention to DANGER notices may cause a situation that results in a fatality or serious injury and that requires urgent addressing

⚠ **WARNING** : Failure to pay attention to WARNING notices may result in a fatality or serious injury.

⚠ **CAUTION** : Failure to pay attention to WARNING notices may result in injury or damage to equipment or facilities.

*1) ISO 4414 : Pneumatic fluid power ··· Recommendations for the application of equipment to transmission and control systems.

*2) JIS B 8370 : General rule for pneumatic systems

[SM-9043-A]

UNPACKING (Page 10)

⚠ CAUTION : Bags containing solenoid valves should be opened only when you are ready to connect the valves to the pipes immediately afterward.

- If bags are opened before the valves are ready to be connected to the pipes, the entry of foreign matter from the piping ports could cause the solenoid valves to fail or malfunction.

INSTALLATION (Page 11)

⚠ CAUTION : If you have to use the product under conditions that are different from the specified conditions or if you intend to use the product for a special application, be sure to consult us about the product specifications before using the product.

ENVIRONMENT (Page 11, 12)

⚠ CAUTION :

a) In a dusty environment, foreign matter may enter even through the exhaust port.

- The movement of the exhaust valve causes a respiratory action at the exhaust valve, which may cause inhalation of foreign matter near the exhaust port. This potential situation would be worse if the exhaust port is facing upward. Attach a silencer to the exhaust port or have the exhaust port face downward.

b) Keep the solenoid valve system dry. Take care to avoid direct contact with dripping water or splashes of cutting oil.

- If the solenoid valve system is wet by a direct contact with water or cutting oil, an electrical leak or burnt solenoid coils may result. Protect the solenoid valve system by using a cover or by installing it inside a paneled casing. If the cylinder rod is splashed with cutting oil, the oil may penetrate through the cylinder into the secondary side piping of the solenoid valve. This must be prevented to avoid malfunctions. Consult us for preventive measures.

c) The coils will produce heat.

- Particularly if the solenoid valve system is installed in a control board or if the solenoid coils need to be energized for a long time, consider providing sufficient ventilation to release the heat. The coils can get very hot.

d) Do not use the solenoid valve system in an atmosphere that includes a corrosive gas or solvent vapors.

- Do not use the solenoid valve system in an atmosphere that includes a corrosive gas such as the sulfur dioxide gas or in an atmosphere that includes solvent vapors.

e) Vibrations and shocks

- Do not subject the solenoid valve system to vibrations $50m/s^2$ or stronger or shocks $300m/s^2$ or stronger.

⚠ CAUTION :

f) Avoid using the solenoid valve system in a humid environment because the humidity is likely to cause condensation with a change in the temperature.

g) Do not use the normal type solenoid valves for an application that requires conformity with explosion-proof specifications. Choose explosion-proof solenoid valves instead.

h) The packing and gaskets may deteriorate sooner than usual if used in an atmosphere with a higher than normal density of ozone (for example, the atmosphere near a beach or in an area with frequent thunderstorms).

- Consult us for the packing and gaskets to be used in an atmosphere with a higher ozone density.

INSTALLATION (Page 12)

⚠ WARNING : When installing a solenoid valve unit, never attempt to hold it in position by means of the pipes connected to it.

- Mount the solenoid valve by applying the mounting screws and/or mounting plate to the solenoid valve.

PIPING (Page 14)

⚠ CAUTION :

a) Observe the recommended tightening torque when connecting pipes.

- Observing the recommended tightening torque prevents air leakage and damage to the screw threads. To prevent damage to the screw threads, first use your hand to lightly tighten the screw and then use a tool to tighten the screw to the recommended torque.

b) Make sure that the pipes will not be disconnected at the joints by mechanical movements, vibrations or tension.

- If the exhaust piping of the pneumatic circuit is disconnected, the actuator speed control is disabled.
- If the above happens to a chuck holding mechanism, the chuck will open. The inadvertent opening of the chuck may cause a serious accident.

c) When supplying the compressed air for the first time after completing the piping, be sure to check every joint in the piping for air leakage.

d) When supplying the compressed air for the first time after completing the piping, increase the air pressure gradually but never introduce a highly-pressurized air suddenly.

- A sudden introduction of a highly-pressurized air may disconnect pipes at joints and/or cause the tubes to jump around, any of which may cause an injury.

e) Do not decrease the inside diameter of the piping from any of the solenoid valve exhaust ports to a diameter less than the exhaust pipe connecting port size.

- Normal operation of the actuator depends on the smoothness of the exhaust flow. With a manifold system, a restriction to the exhaust flow may prevent normal operation of other solenoid valves.

f) Removal of foreign matter

- Rust and other foreign matter in the pneumatic circuit may cause a malfunction or leakage from the valve seat. Insert a filter (maximum allowable particle size 5 μm or less) immediately upstream of the solenoid valve.

g) Air supply

- Do not restrict the flow of air through the air supply piping. With a manifold system with multiple stations, a drop in the air supply pressure may cause trouble through a delay in the operation timing.

WIRING (Page 18)

⚠ WARNING : An electrical shock hazard exists during wiring, or disassembly or reassembly of the DIN terminal box. Turn OFF the power completely before starting such work.

⚠ CAUTION : Before supplying the power, check the power supply voltage and the current type (AC or DC).

MANUAL OVERRIDE (Page 25)

⚠ WARNING :

a) After using the manual override, be sure to reset the manual override to the original (OFF) position before resuming the operation of the device.
After a non-lock type operation (push and release), be sure to check that the manual override is automatically reset. After a lock-type operation (push and lock), be sure to release the lock to turn the manual override OFF.

b) Before using the manual override, make sure that nobody is present near the cylinder to be activated.

AIR QUALITY (Page 26)

⚠ WARNING :

a) Do not supply anything other than compressed air.

b) Supply clean compressed air without any mixture of corrosive gas.

⚠ CAUTION :

a) Compressed air usually contains a large amount of drain, oxidized oil, tar, foreign matter, and rust from the piping. Filter out those elements in the supplied air because they may cause a malfunction and decrease service life. In addition, clean the exhaust before it is released to the air to minimize pollution.

b) Once you have lubricated a pre-lubricated valve, the valve is no longer capable of running without being lubricated from the outside. Do not leave the valve without lubrication but keep it lubricated.

c) Do not use spindle oil or machine oil. They may induce expansion of the rubber parts, which may cause a malfunction.

ELECTRIC CIRCUITS (Page 28)

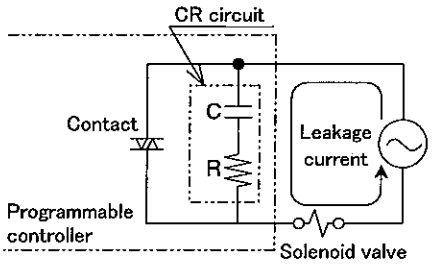
⚠ CAUTION :

a) Check for the presence of any current leak from the external control device because it may cause an erroneous valve operation.

- When a programmable controller or a similar control device is used, a current leak may prevent the normal returning of the valve when the solenoid is de-energized.

b) Restriction on current leak

- When controlling solenoid valves using a programmable controller or a similar control device, make sure that the current leak in the programmable controller output is equal to or less than the level shown in the table below. A current leak larger than the allowable level may cause an erroneous valve operation.



AC100V	3.0 mA or lower
AC200V	1.5 mA or lower
DC24V	1.8 mA or lower

PERIODIC INSPECTION (Page 29)

⚠ WARNING : Before providing a maintenance service, cut the power and the supply of compressed air and confirm the absence of residual pressure.

- The above is required to ensure safety.

⚠ CAUTION : Regularly perform the daily and periodic inspections to correctly maintain product performance.

- If the product is not correctly maintained , product performance may deteriorate dramatically, resulting in a shorter service life, fractures of components, and malfunctions.

DISASSEMBLING AND REASSEMBLING (Page 30)

⚠ WARNING : Before disassembling and reassembling manifold, read the instruction manual carefully and understand the instructions.

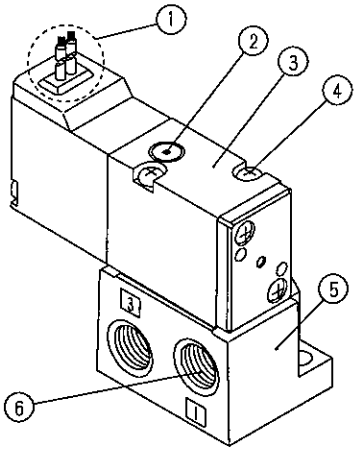
- A person who disassembles and reassembles a solenoid valve system needs to have a knowledge for safely performing such operation based on the understanding about the mechanisms and operating principles of solenoid valves.

INDEX

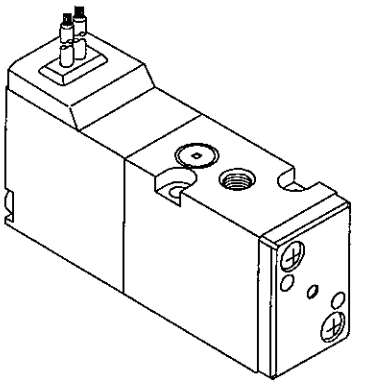
3PA1,3PB1
M3PA1,M3PB1
Manual No. SM-9043-A

Jan. 1991
Revision : Jun. 21. 2002

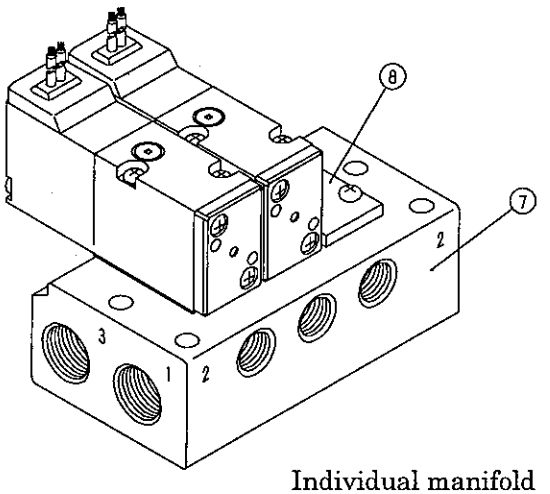
1. PART NAME AND DESCRIPTION



Subplate piping



Direct piping manifold



Individual manifold

No.	Part Name	Description
①	Wire connection	It connections to the electric circuit
②	Manual Override	It uses in case of manual operation. There are a non lock and a lock formula.
③	Valve unit	There are direct piping and sub plate piping.
④	Mounting screw	There are two every individual valve and it fixes the valve unit on the various base
⑤	Sub plate	At the time of the sub plate piping specification, it is possible to grapple and it uses.
⑥	Piping Port	It is possible to pressurize form both 1,2,3 piping ports..
⑦	Manifold base	The common supply or it uses for more than one solenoid valve when exhausting.
⑧	Masking plate	It masks the solenoid valve sky space of the manifold.

2. INTERNATIONAL SYSTEM OF UNITS (SI) AND PORT INDICATION

2.1 Conversion between International System of Units (SI) and Conventional Units

In this manual, values are expressed using the International System of Units (SI). Use the table below to convert them into values expressed in conventional units.

Table of conversion between SI units and conventional units

(The values printed in Bolds fonts are values given in the International System of Units (SI)):

Example (converting a pressure value):

1kgf/cm^2 → **0.980665MPa** **1MPa** → 1.01972×10kgf/cm^2

- Force

N	dyn	kgf
1	1×10^5	1.01972×10^{-1}
1×10^{-5}	1	1.01972×10^{-6}
9.80665	9.80665×10^5	1

- Stress

Pa or N/m^2	Mpa or N/mm^2	kgf/mm^2	kgf/cm^2
1	1×10^{-6}	1.01972×10^{-7}	1.01972×10^{-5}
1×10^6	1	1.01972×10^{-1}	1.01972×10
9.80665×10^6	9.80665	1	1×10^2
9.80665×10^4	9.80665×10^{-2}	1×10^{-2}	1

Note: 1Pa=1N/m^2, 1MPa=1N/mm^2

- Pressure

Pa	kPa	MPa	bar	kgf/cm^2	atm	mmH2O	mmHg or Torr
1	1×10^{-3}	1×10^{-6}	1×10^{-5}	1.01972×10^{-5}	9.86923×10^{-6}	1.01972×10^{-1}	7.50062×10^{-3}
1×10^3	1	1×10^{-3}	1×10^{-2}	1.01972×10^{-2}	9.86923×10^{-3}	1.01972×10^2	7.50062
1×10^6	1×10^3	1	1×10	1.01972×10	9.86923	1.01972×10^5	7.50062×10^3
1×10^5	1×10^2	1×10^{-1}	1	1.01972	9.86923×10^{-1}	1.01972×10^4	7.50062×10^2
9.80665×10^4	9.80665×10	9.80665×10^{-2}	9.80665×10^{-1}	1	9.67841×10^{-1}	1×10^4	7.35559×10^2
1.01325×10^5	1.01325×10^2	1.01325×10^{-1}	1.01325	1.01323	1	1.03323×10^4	7.60000×10^2
9.80665	9.80665×10^{-3}	9.80665×10^{-6}	9.80665×10^{-5}	1×10^{-4}	9.67841×10^{-5}	1	7.35559×10^{-2}
1.33322×10^2	1.33322×10^{-1}	1.33322×10^{-4}	1.33322×10^{-3}	1.35951×10^{-3}	1.31579×10^{-3}	1.35951×10	1

Note: 1Pa=1N/m^2

3. UNPACKING

⚠ CAUTION : Bags containing solenoid valves should be opened only when you are ready to connect the valves to the pipes immediately afterward.

- If bags are opened before the valves are ready to be connected to the pipes, the entry of foreign matter from the piping ports could cause the solenoid valves to fail or malfunction.

a) Check the model number imprinted on the product to make sure that the product you received is exactly the product you ordered.
b) Check the exterior of the product for any damage.
c) Before using the product, read the supplied documentation.

4. INSTALLATION

⚠ CAUTION : If you have to use the product under conditions that are different from the specified conditions or if you intend to use the product for a special application, be sure to consult us about the product specifications before using the product.

4.1 Environment

⚠ CAUTION :

a) In a dusty environment, foreign matter may enter even through the exhaust port.

- The movement of the exhaust valve causes a respiratory action at the exhaust valve, which may cause inhalation of foreign matter near the exhaust port. This potential situation would be worse if the exhaust port is facing upward. Attach a silencer to the exhaust port or have the exhaust port face downward.

b) Keep the solenoid valve system dry. Take care to avoid direct contact with dripping water or splashes of cutting oil.

- If the solenoid valve system is wet by a direct contact with water or cutting oil, an electrical leak or burnt solenoid coils may result. Protect the solenoid valve system by using a cover or by installing it inside a paneled casing. If the cylinder rod is splashed with cutting oil, the oil may penetrate through the cylinder into the secondary side piping of the solenoid valve. This must be prevented to avoid malfunctions. Consult us for preventive measures.

c) The coils will produce heat.

- Particularly if the solenoid valve system is installed in a control board or if the solenoid coils need to be energized for a long time, consider providing sufficient ventilation to release the heat. The coils can get very hot.

d) Do not use the solenoid valve system in an atmosphere that includes a corrosive gas or solvent vapors.

- Do not use the solenoid valve system in an atmosphere that includes a corrosive gas such as the sulfur dioxide gas or in an atmosphere that includes solvent vapors.

e) Vibrations and shocks

- Do not subject the solenoid valve system to vibrations $50m/s^2$ or stronger or shocks $300m/s^2$ or stronger.

f) Avoid using the solenoid valve system in a humid environment because the humidity is likely to cause condensation with a change in the temperature.

⚠ CAUTION :

g) Do not use the normal type solenoid valves for an application that requires conformity with explosion-proof specifications. Choose explosion-proof solenoid valves instead.

h) The packing and gaskets may deteriorate sooner than usual if used in an atmosphere with a higher than normal density of ozone (for example, the atmosphere near a beach or in an area with frequent thunderstorms).

- Consult us for the packing and gaskets to be used in an atmosphere with a higher ozone density.

4.2 Installation

⚠ WARNING : When installing a solenoid valve unit, never attempt to hold it in position by means of the pipes connected to it.

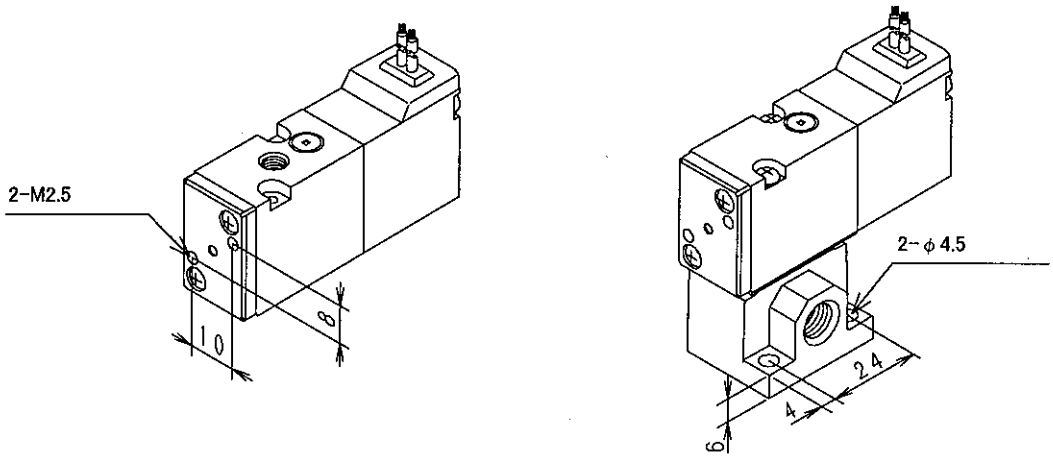
- Mount the solenoid valve by applying the mounting screws and/or mounting plate to the solenoid valve.

4.2.1 A work space for installation, removal, wiring, and piping operations should be provided around the installed solenoid valve system.

4.2.2 Direct mounting

1) Unit sub plate Type

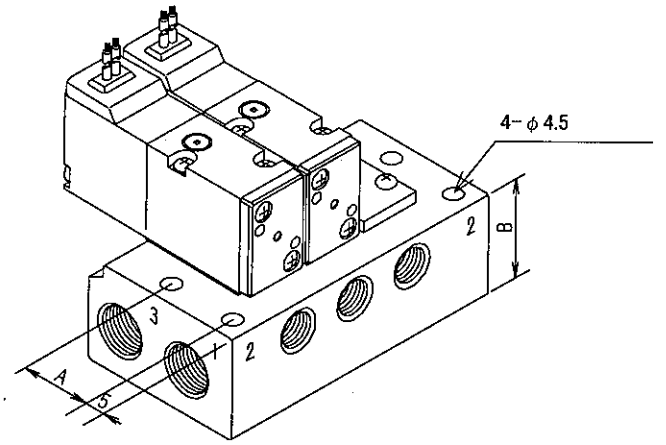
Use two through holes.



2) Manifold Type

Use four mounting holes.

A: Direct piping		: 19
sub plate piping	06, 06Y	: 19
	06A, 06B	: 27
B: Direct piping		: 25
sub plate piping	06, 06Y	: 25
	06A, 06B	: 33



4.3 Piping

⚠ CAUTION :

a) Observe the recommended tightening torque when connecting pipes.
- Observing the recommended tightening torque prevents air leakage and damage to the screw threads. To prevent damage to the screw threads, first use your hand to lightly tighten the screw and then use a tool to tighten the screw to the recommended torque.

b) Make sure that the pipes will not be disconnected at the joints by mechanical movements, vibrations or tension.
- If the exhaust piping of the pneumatic circuit is disconnected, the actuator speed control is disabled.
- If the above happens to a chuck holding mechanism, the chuck will open. The inadvertent opening of the chuck may cause a serious accident.

c) When supplying the compressed air for the first time after completing the piping, be sure to check every joint in the piping for air leakage.

d) When supplying the compressed air for the first time after completing the piping, increase the air pressure gradually but never introduce a highly-pressurized air suddenly.
- A sudden introduction of a highly-pressurized air may disconnect pipes at joints and/or cause the tubes to jump around, any of which may cause an injury.

e) Do not decrease the inside diameter of the piping from any of the solenoid valve exhaust ports to a diameter less than the exhaust pipe connecting port size.
- Normal operation of the actuator depends on the smoothness of the exhaust flow. With a manifold system, a restriction to the exhaust flow may prevent normal operation of other solenoid valves.

f) Removal of foreign matter
- Rust and other foreign matter in the pneumatic circuit may cause a malfunction or leakage from the valve seat. Insert a filter (maximum allowable particle size 5 μm or less) immediately upstream of the solenoid valve.

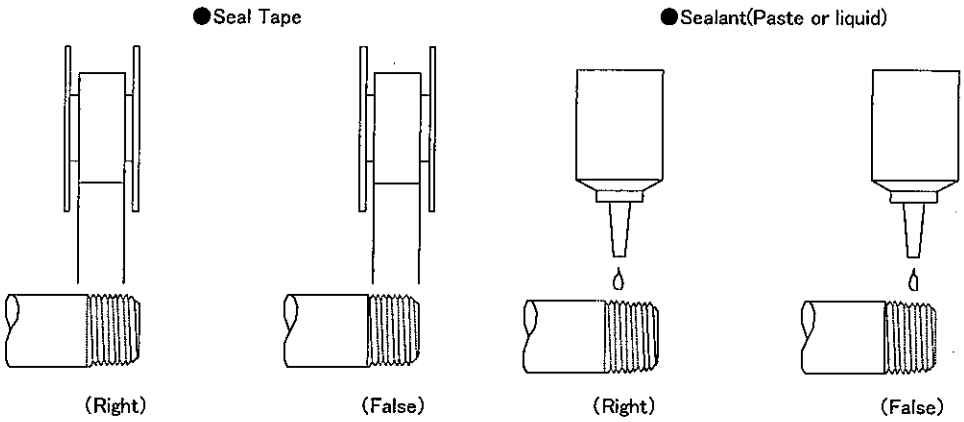
g) Air supply
- Do not restrict the flow of air through the air supply piping. With a manifold system with multiple stations, a drop in the air supply pressure may cause trouble through a delay in the operation timing

Approproate torque

Joint screw	Approproate torque N·m
M5	1.0 to 1.5
Rc1/8	3 to 5
Rc1/4	6 to 8

4.3.1 Sealant

Refrain applying sealant or seal tape approx.two pitches of thread from the tip of pipe to avoid some of the sealing substances from falling into piping system.



4.3.2 Flushing

Before connecting pipes, flush the interiors of the tubes, solenoid valves, and connected devices to remove foreign matter.

4.3.3 About M5 joint

M5 seal it with gasket (model:FGS). Don't tight while increasing Pressure. Consider a trouble of emergency, Design and enforce to be Possible to remore and mount of a valve.

4.3.4 Exhaust port

Minimize the restriction to the flow of the exhaust air because such restriction may cause a delay in the cylinder response. If such a delay happens, the speed needs to be adjusted between the cylinder and solenoid valve.

4.3.5 Pipe connections

(1) Tubes to be used
For use with solenoid valves with one-touch joints, select tubes of the type specified by us:

Soft nylon tubes (F-1500 Series)
Urethane tubes (U-9500 Series)

(2) For installation at a site that has spatters in the air, select incombustible tubes or metal pipes.

(3) For a piping used for both hydraulic and pneumatic controls, select a hydraulic hose.
When combining a spiral tube with a standard one-touch joint, fix the tube origin using a hose band. Otherwise the rotation of the tube will decrease the efficiency of the clamping.
For use in a high-temperature atmosphere, select fastener joints instead of one-touch joints.

(4) When selecting from tubes commercially available, carefully study the accuracy of the outside diameter as well as the wall thickness and the hardness. The hardness of an urethane tube should be 93° C or more (as measured by a rubber hardness meter).
With a tube that does not have a sufficient accuracy of the outside diameter or the specified hardness, a decrease in the chucking force may cause disconnection or difficulty in inserting.

Tube dimensions

Outside diameter mm	Inside diameter mm	
	Nylon	Urethane
φ4	φ2.5	φ2
φ6	φ4	φ4
φ8	φ5.7	φ5
φ10	φ7.2	φ6.5

Outside diameter allowance

Soft or hard nylon	±0.1mm
Urethane φ4, φ6	+0.1mm -0.15mm
Urethane φ8, φ10	+0.1mm -0.2mm

(5) Minimum bending radius of tubes
Observe the minimum bending radius of tubes. Neglecting the minimum bending radius may cause disconnection or leaks.

Tube bore	Minimum bending radius mm	
	Nylon	Urethane
φ4	10	10
φ6	20	20
φ8	30	30
φ10	40	40

(6) Cutting a tube
To cut a tube, use a tube cutter to cut the tube perpendicularly to the length of the tube. Inserting an obliquely cut end of a tube may cause air leakage.

(7) Tube connections
Do not bend a tube immediately at where it is connected to the joint but lead it out straight from the end of the joint for a length equal to or greater than the outside diameter of the tube. The tension applied sideways through the tube should not exceed 40N.

(8) Blank plug to be used
For use with a solenoid valve with a one-touch joint, select the blank plug specified by us:

Blank plug GWP□-B Series

4.4 Wiring

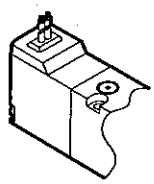
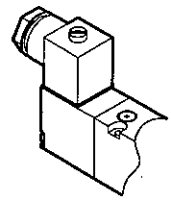
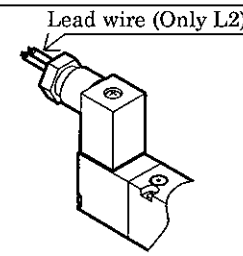
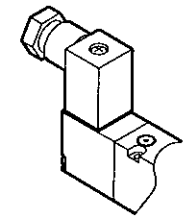
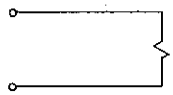
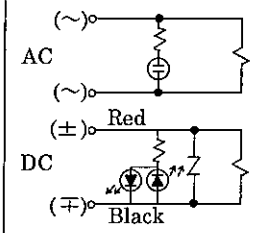
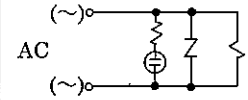
⚠ WARNING : An electrical shock hazard exists during wiring, or disassembly or reassembly of the DIN terminal box. Turn OFF the power completely before starting such work.

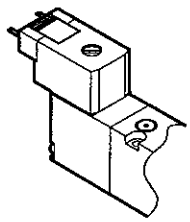
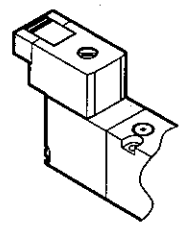
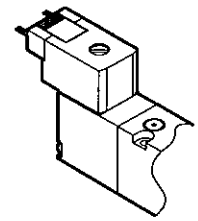
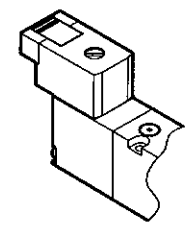
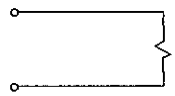
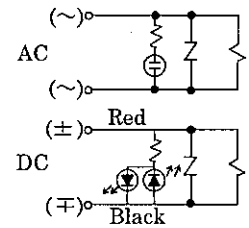
⚠ CAUTION : Before supplying the power, check the power supply voltage and the current type (AC or DC).

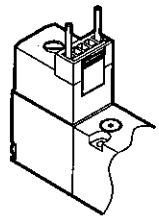
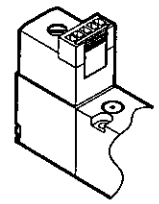
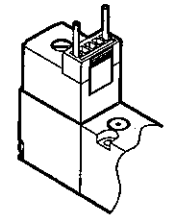
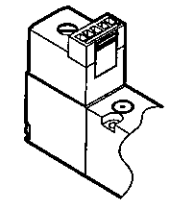
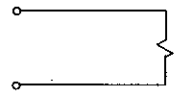
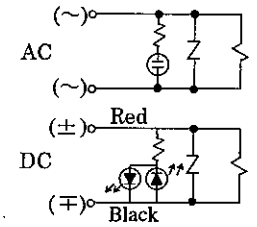
4.4.1 Caution for wiring

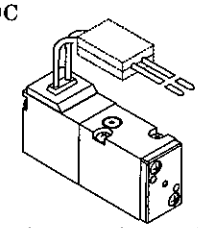
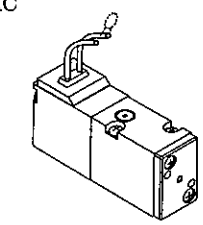
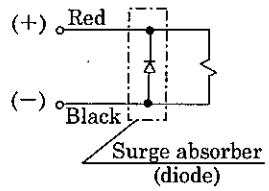
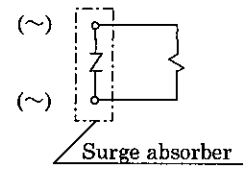
(1) When using the small terminal box and water-proof is required, use cab-tire cords $\phi 4$ to $\phi 6.5$ in outer diameter (water-resistance is improved, but not for outdoor use).
(2) The connector type (C, C1, C2, C3, D, D1, D2, D3) should be used in a place with little dust and not directly exposed to water and oil.
(3) For the electrical circuit, use a switching circuit free of chattering.
(4) The electrical circuit should have fuses.
(5) Be sure that the operation voltage is within 10% of the rated voltage.

4.4.2 Wire connection

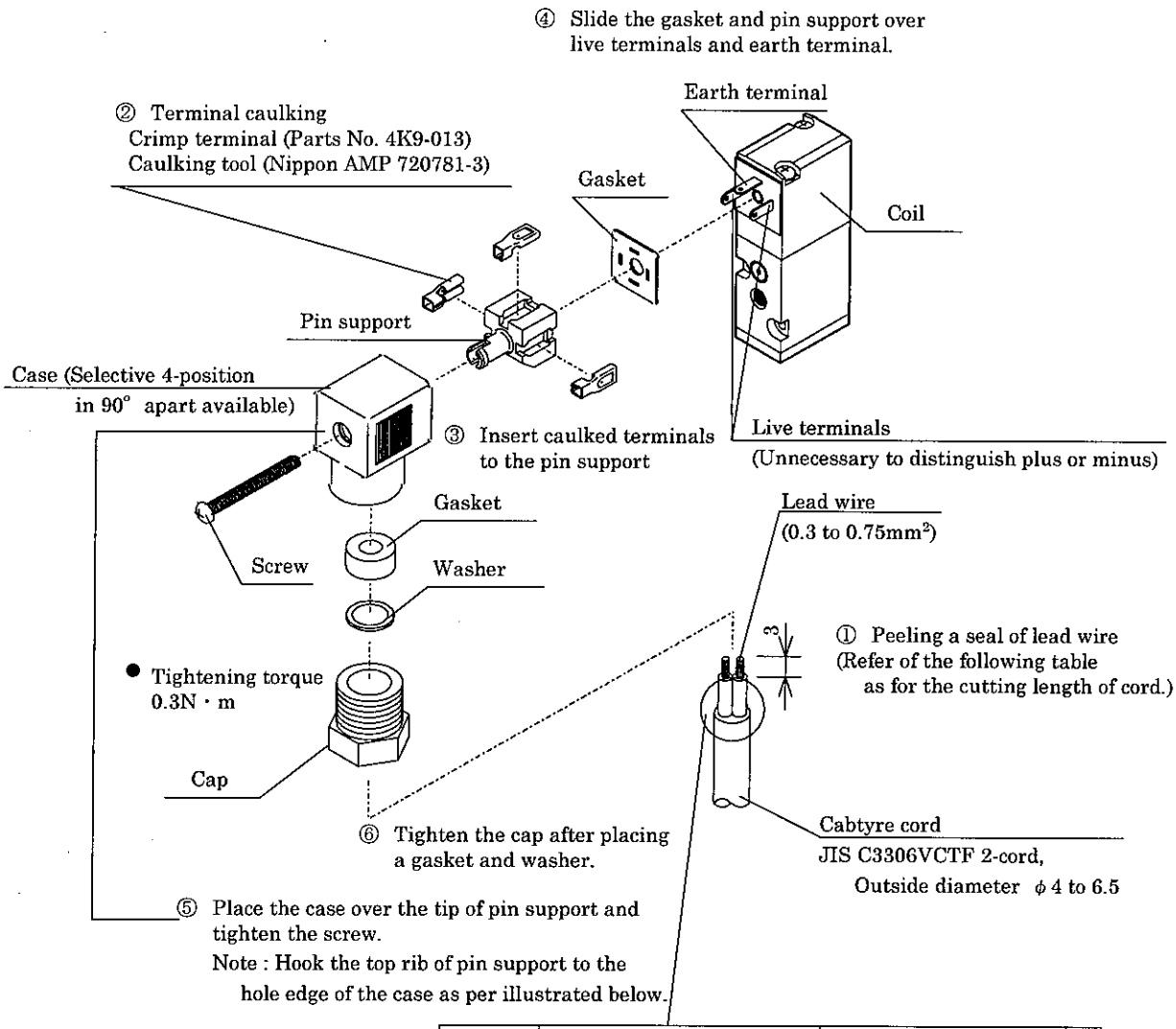
Name	Grommet (standard)	Small terminal box	Small terminal box with lamp	Small terminal box with lamp surge absorber
Option code	No code	B	L (L2)	LS
Shape				
Circuit				

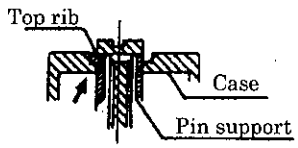
Name	Plug-in connector C type with lead wire	Plug-in connector C type without lead wire	Plug-in connector C type with lead wire, lamp surge absorber	Plug-in connector C type without leadwire, lamp surge absorber
Option code	C	C1	C2	C3
Shape				
Circuit				

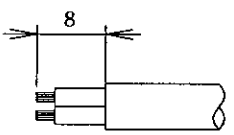
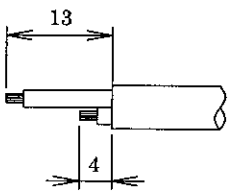
Name	Plug-in connector D type with lead wire	Plug-in connector D type without lead wire	Plug-in connector D type with lead wire, lamp surge absorber	Plug-in connector D type without leadwire, lamp surge absorber
Option code	D	D1	D2	D3
Shape				
Circuit				

Name	Surge absorber attached	
Option code	S	
Shape	DC  (suppression type)	AC 
Circuit	The surge absorber has polarity 	

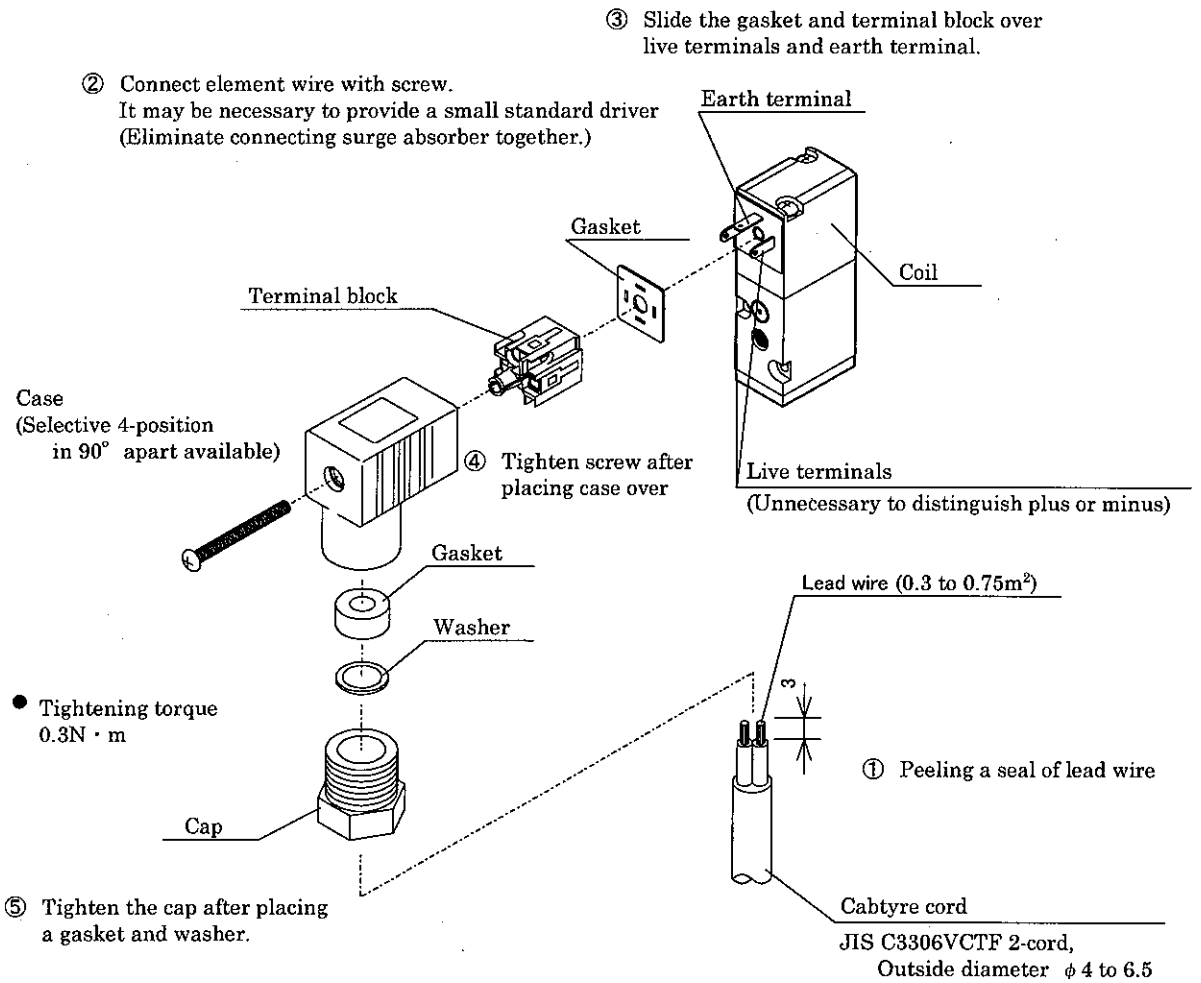
3) Wiring of the small terminal box (B)
Wire the terminal box by following ① to ⑥ in the illustration.



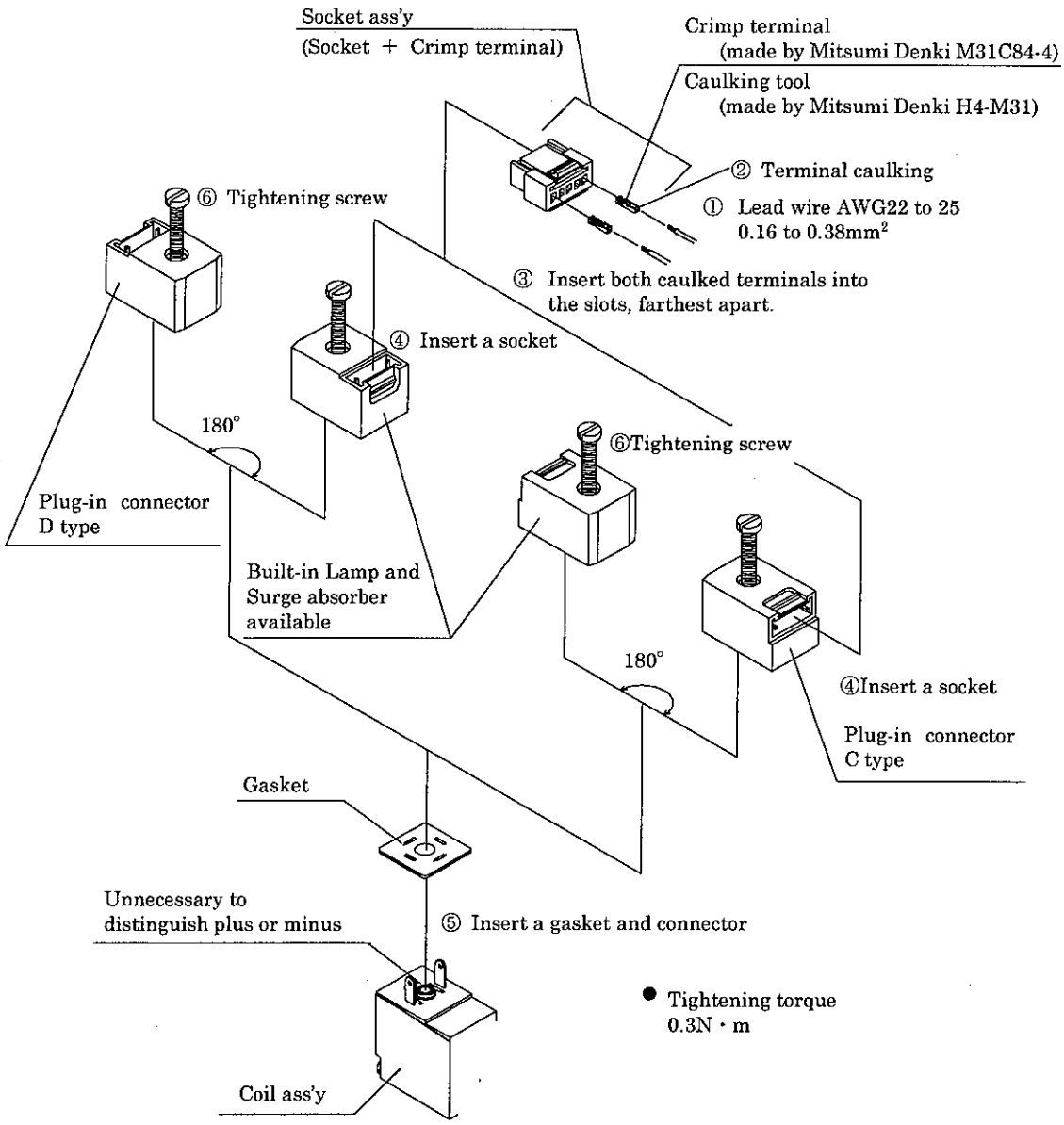


	Direction of the case as per illustrated above or 180° opposite.	Direction of the case 90° to the right or left off per illustrated as above
Length of lead wire		

4) Wiring of the small terminal box with lamp (L・L2)
Wire the terminal box by following ① to ⑤ in the illustration.



5) Wiring of the C-type, D-type connectors
Wire the terminal box by following ① to ⑥ in the illustration.



5. Appropriate way of using

5.1 Operation explanation

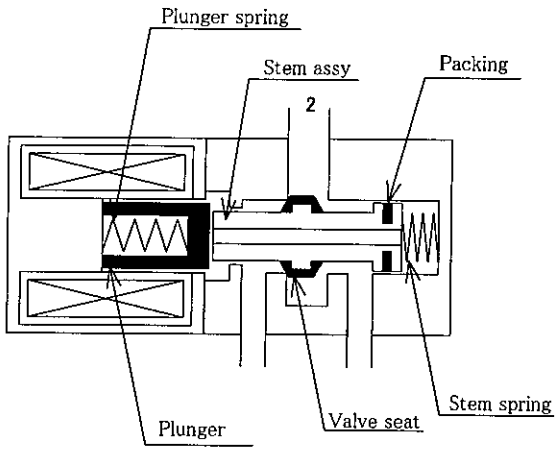
1) Valve operation

The structure of the 3P-series valve is a pressure balance type poppet valve. Use of this structure makes it possible to obtain low-watt large flow rate performance without receiving of any influence of the working pressure.

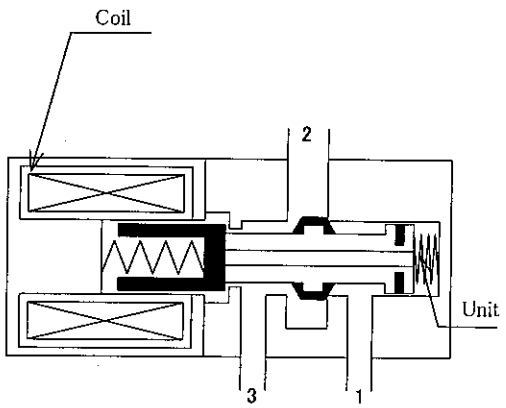
The pressurization can be performed through any connection port of ports 1, 2, and 3.

The diameter of the valve seat of the stem assy is the same as that of the packing seal. Therefore, a pressure difference among the ports is eliminated through the through-hole in the stem assy. This balances the pressure in both the ON and OFF states.

- Operation when not energized:
  The stem assy is pushed on the port 1 side by the plunger spring through the plunger.
  The port 1 is closed by the valve seat and packing of the stem assy, and the ports 2 and 3 are opened.



- Operation when energized:
  As the coil is energized, the plunger is attracted to the coil side and the stem assy is operated by the stem spring. As a result, the ports 1 and 2 are opened, and the port 3 is closed.



5.2 Manual Override

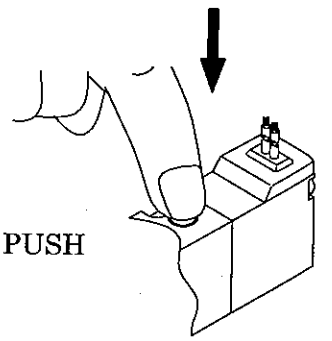
⚠ WARNING :

a) After using the manual override, be sure to reset the manual override to the original (OFF) position before resuming the operation of the device.
After a non-lock type operation (push and release), be sure to check that the manual override is automatically reset. After a lock-type operation (push and lock), be sure to release the lock to turn the manual override OFF.

b) Before using the manual override, make sure that nobody is present near the cylinder to be activated.

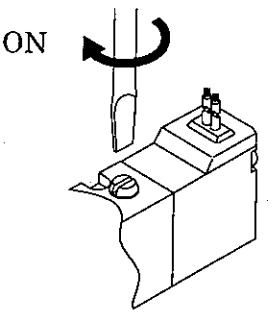
5.2.1 Manual Operation Device.

1) Non-lock type manual operation device
Press manual operation axis till it hits the bottom. Valve will be shifted to the same position as if solenoid coil is energized and returns when axis is released.



Keeps actuating while holding it down .

2) Lock type manual operation device
The valve is shifted to the position as if coil is energized when button is turned approx. 90° and is locked. There is only right turn forcively beyond locked point to eliminate possible damage of valve.
Make sure to release manual operation locking before starting normal operation.



It actuates by setting it ON.
Keep it OFF position normally.

5.3 Air Quality

⚠ WARNING :

a) Do not supply anything other than compressed air.

b) Supply clean compressed air without any mixture of corrosive gas.

⚠ CAUTION :

a) Compressed air usually contains a large amount of drain, oxidized oil, tar, foreign matter, and rust from the piping. Filter out those elements in the supplied air because they may cause a malfunction and decrease service life. In addition, clean the exhaust before it is released to the air to minimize pollution.

b) Once you have lubricated a pre-lubricated valve, the valve is no longer capable of running without being lubricated from the outside. Do not leave the valve without lubrication but keep it lubricated.

c) Do not use spindle oil or machine oil. They may induce expansion of the rubber parts, which may cause a malfunction.

5.3.1 Lubrication

The 3P Series solenoid valve systems use pre-lubricated valves that usually do not require lubrication from the outside. If you have to lubricate a valve, use Type 1 turbine oil (ISO-VG32) without additives.
Excessive lubrication and extremely low pressure may cause a longer response time. The response time in the catalogue assumes no lubrication from the outside and the air supply pressure of 0.5 MPa.

5.3.2 Ultra-dry compressed air

The use of ultra-dry compressed air will cause splashing of the lubrication oil and result in a shorter service life.

5.3.3 Drain

(1) The drain is produced by a drop of temperature in pneumatic piping and devices.
(2) The drain may enter and instantaneously block a passage inside a pneumatic device and cause a malfunction.
(3) The drain accelerates the production of rust, which may cause the failure of pneumatic devices.
(4) The drain may wash away the lubrication oil, causing a malfunction from the lack of lubrication.

5.3.4 Foreign matter in the compressed air

1) Supply clean compressed air that does not include oxidized oil, tar, carbon, or other foreign matter from the air compressor.

(1) If oxidized oil, tar, carbon, or the like enters a pneumatic device and sticks to its components, an increase in the resistance at sliding portions may cause a malfunction.

(2) If oxidized oil, tar, carbon, or the like is mixed with the supplied lubrication oil, wear of the sliding components of the pneumatic device may be accelerated.

2) Supply clean compressed air that does not include solid foreign matter.

(1) Solid foreign matter in the compressed air may cause wear of the sliding components of the pneumatic device or stick to such components and cause hydraulic lock.

5.3.5 Cleaning the supplied air

Compressed air usually contains a large amount of drain (water, oxidized oil, tar, and foreign matter). Remove these elements and clean the supplied air because they may cause a failure of the air compressor. For example, remove the humidity using an after-cooler dryer and remove the tar using a tar filter.

5.4 Electric Circuits

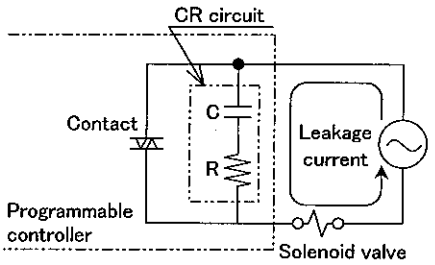
⚠ CAUTION :

a) Check for the presence of any current leak from the external control device because it may cause an erroneous valve operation.

- When a programmable controller or a similar control device is used, a current leak may prevent the normal returning of the valve when the solenoid is de-energized.

b) Restriction on current leak

- When controlling solenoid valves using a programmable controller or a similar control device, make sure that the current leak in the programmable controller output is equal to or less than the level shown in the table below. A current leak larger than the allowable level may cause an erroneous valve operation.



AC100V	3.0 mA or lower
AC200V	1.5 mA or lower
DC24V	1.8 mA or lower

(1) If solenoids are energized for a prolonged period of time, the surface temperature of the manifold will rise. Through this increase in the temperature should not be regarded as abnormal, provide a suitable means of ventilation or heat release.

6. MAINTENANCE

6.1 Periodic Inspection

⚠ WARNING : Before providing a maintenance service, cut the power and the supply of compressed air and confirm the absence of residual pressure.
- The above is required to ensure safety.

⚠ CAUTION : Regularly perform the daily and periodic inspections to correctly maintain product performance.
- If the product is not correctly maintained , product performance may deteriorate dramatically, resulting in a shorter service life, fractures of components, and malfunctions.

1) To use the solenoid valve system under optimum conditions, perform a periodic inspection once or twice a year.

2) Check the screws for loosening and the joints in the piping for integrity of the sealing.
Regularly remove the drain from the air filters.

(1) Checking the compressed air supply pressure:
Is the supply pressure at the specified level?
Does the pressure gauge indicate the specified pressure when the system is operating?

(2) Checking the air filters:
Is the drain normally discharged?
Is the amount of dirt attached to the bowl and element at a normal level?

(3) Checking joints in the piping for the leakage of compressed air:
Are the pipes normally connected at joints, especially at the movable parts?

(4) Checking the operation of solenoid valves:
Is not there any delay in the operation? Is the exhaust flow normal?

(5) Checking the operation of pneumatic actuators:
Is the operation smooth?
Does the actuator stop normally at the end of the stroke?
Is the coupling with the load normal?

(6) Checking the lubricator:
Is the amount of oil adjusted properly?

(7) Checking the lubrication oil:
Is the supplied lubrication oil of the type specified by the manufacturer?

6.2 Disassembling and Reassembling

⚠ WARNING : Before disassembling and reassembling solenoid valves, read the instruction manual carefully and understand the instructions.

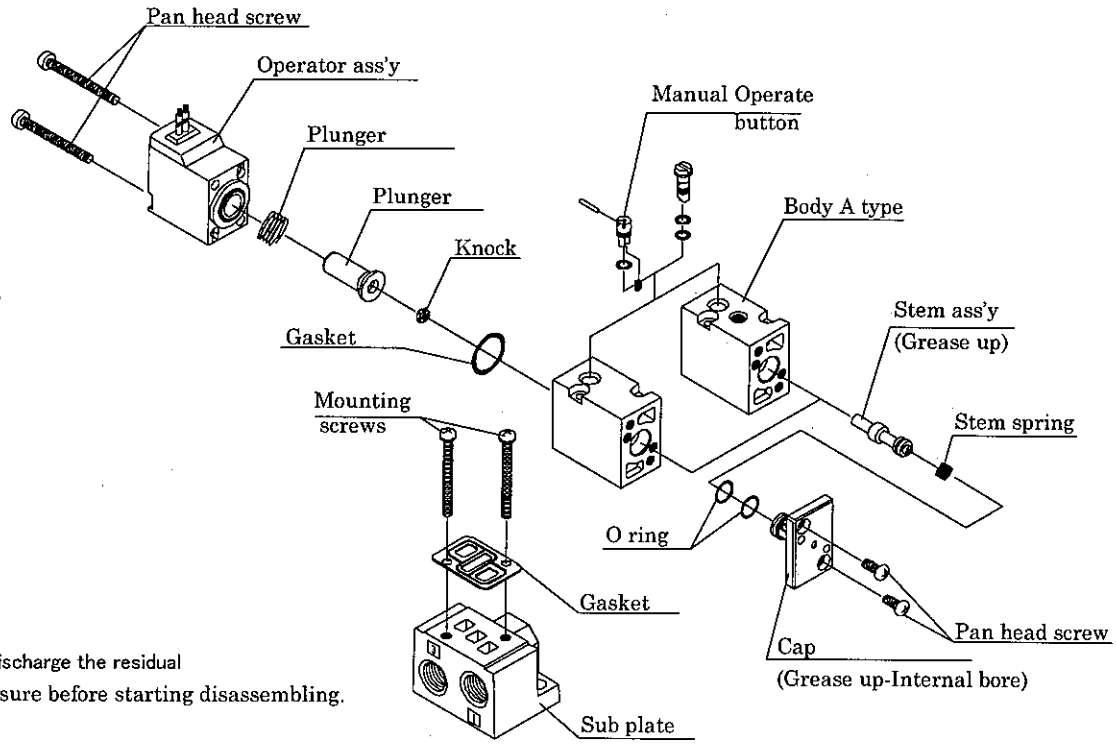
- A person who disassembles and reassembles a solenoid valve system needs to have a knowledge for safely performing such operation based on the understanding about the mechanisms and operating principles of solenoid valves.

6.2.1 Solenoid valve mounting and detaching

When replacing the solenoid valve,play special attention so that no gaskets are fallen down. Additionally,carefully check the orientation of the gasket and the solenoid valve.

(The following figure reference)

The proper tightening torque of the solenoid valve mounting screw is 0.25to 0.30 N·m.



Be sure top discharge the residual Pressure before starting disassembling.

2) Disassembling and assembling Operator ass'y

Operator ass'y can be taken out by removing pan head screws. It is be carried out when Noise at charge is generated, malfunction and/or broken wire.

Wash parts or blow coil inside or replace it with a new one.

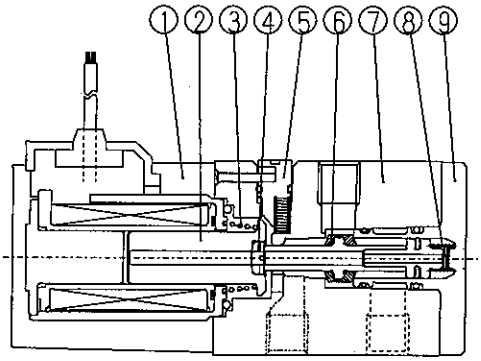
Carefully avoid slipping gasket out and contamination with foreign particles.

3) Disassembling and assembling Poppet valve component

- Poppet component can be taken out by removing pan head screws. It is to be carried out when delayed functioning or leakage taken place.
- Wash parts or blow coil inside or replace it with a new one.
- Carefully avoid giving striking indentation because each part is vitally important component for sealing effect.
- Eliminate of using organic solvent. There is potentiality of deterioration of. rubber parts of malfunction due to swollen rubber parts.
- Take the reversed sequenece of disassembling to assemble it back. Avoid
- minor assembling forgotten, O ring getting out of place or leaving loosen Screws.
- Apply our company specification grease over sliding parts, body guide part and packing of stem ass'y.

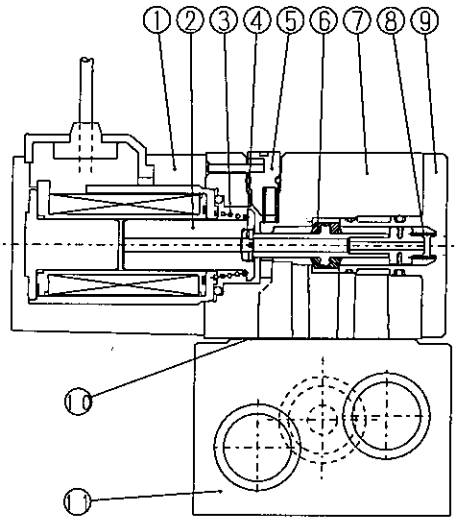
6．3 Internal Structure and Parts List

- 3PA110



No.	Parts	Material	
①	Coil ass'y		
②	Plunger	SUS405	Stainless steel
③	Spring	SUS304	Stainless steel
④	Knock pin	POM	Polyacetal
⑤	Manual operation	POM	Polyacetal
⑥	Stem ass'y		
⑦	Body	ADC12	Die casted aluminum
⑧	Spring	SUS304	Stainless steel
⑨	Cap	PPS	

- 3PB110



No.	Parts	Material	
①	Coil ass'y		
②	Plunger	SUS405	Stainless steel
③	Spring	SUS304	Stainless steel
④	Knock pin	POM	Polyacetal
⑤	Manual operation	POM	Polyacetal
⑥	Stem ass'y		
⑦	Body	ADC12	Die casted aluminum
⑧	Spring	SUS304	Stainless steel
⑨	Cap	PPS	Polyphenilene Sulphate
⑩	Gasket	NBR	Nitril rubber
⑪	Subplate	ADC12	Die casted aluminum

7. 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 ±10% of voltage 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
	Erroneous piping, erroneous omitting some piping	Rectify the piping system
	Speed control valve completely closed by error	Reset the needle valve
	Sticky stem Sticking tarry or liquid jelly substitute	Carry out pipe dressing Operate it periodically
	Valve is frozen	Add remedies of avoiding freezing (Heating system or dehumidifying system etc.)
	Delayed return of a plunger (Excessive oil, existence of far)	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.
Internal leakage	Bulged or decomposed packings Initial Iubricant is washed off or excessive Iubricants	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.
	Initial iubricant is washed off or drain contamination	Change the piping to an external pilot system. Install dryer,Filter or grease up. Grease it up
	Foreign particles cut into packing lips.	Remove the foreign particle away from the packing Install a filter.
Malfunctions when manifold is used	Delayed response when multiple blocks are used. Insufficient air supply flow.	Install Sup. (P) piping to P ports on both sides of manifold block
	Delayed response when multiple blocks are used. Insufficient exhaust air flow.	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. Intrusion of exhaust air.	Rewire to have the solenoid valve in question is actuated prior to others sequentially. Increase exhaust air Change type to individual exhaust

8. PRODUCT SPECIFICATIONS AND HOW TO ORDER

8.1 Product Specifications

1) 3Pseries

(1) Specifications

Model code		3PA1	3PB1
Working fluid		Air	
Type actuation		Direct type, Balanced poppet valve	
Min. Working pressure	kPa	-100	
Max. Working pressure	Mpa	0.7	
Certified withstanding pressure	MPa	1.05	
Connecting port diam.		M5 (ϕ 4· ϕ 6Snap joint : optional)	
Effective sectionai	mm^2	2	
Ambient temperature	℃	-5 to50 (Not to be frozen)	
Working fluid temp.	℃	5 to 50	
Responding	ms	Less than 20	
Lubrication		Not required	
Protective structure		Dust proof	
Manual operation device		Non-lock type, (Lock type optional)	
Mass	g	54	84

(2) Electric Specifications

Rated voltage	(V)	AC100V (50 / 60Hz)	AC200V (50 / 60Hz)	DC24V
Starting current	(A)	0.032 / 0.027	0.016 / 0.014	–
Holding current	(A)	0.028 / 0.022	0.014 / 0.011	0.075
Electricity consumption	(W)	1.8 / 1.4 (2.0 / 1.6)		1.8 (2.0)
Temperature rising	(℃)	30		
Range of voltage fluctuation		±10%		
Class of insulation		Class B		
Wiring type		Grommet lead wire (Terminal box, C type connercter, D type connecter)		
Option		Surge killer · Lamp indicators		

※ Rc is equivalent to PT

※ Responding time is measured in no lubrication operation.
There is a case some times that time is extended depending on lubricant.
Use turbine oil Class 1,ISO VG 32 if lubrication is prefered.

2) M3P series

(1) Specifications

Model / Item		M3PA1	M3PB1
Type of manifold		Consolidated subplate type	
Applicable solenoid valve		3PA119	3PB119
Effective sectional area	mm^2	2	
Number of blocks		2 to 20 blocks	2 to 20 blocks (Individual or concentrated type is up to 10 blocks)
Kind of manifold		Port2 individual, port 1·3 concentrated	Port 2 individual, port 1·3 concentrated (Port 2·3 indiv. Port 1 concentrated Port 1·2 indiv.,Port 3 concentrated)
Wiring type		Grommet lead wire (Terminal box, C type connecter, D type connecter)	
Piping	Port1	Rc 1/4	Concentrated Rc1/4, Indiv. Rc1/8
	Port 2	M5 (ϕ 4· ϕ 6 Snap joint)	Rc1/8 (ϕ 4· ϕ 6Snap joint : optional)
	Port 3	Rc 1/4	Concentrated Rc1/4, Indiv. Rc1/8
Manual operation device		Non-lock type, (Lock type optional)	

※ Rc is equivalent PT.

※ PortNos.1, 2,3 specify as follows, respectively.
Port 1 : P, NC
Port 2 : A, COM
Port 3 : R, NO

8.2 How to Order

8.2.1 3PA1

※ Direct Piping

3PA110-(M5)-( )(C2)(P)-(3)

(a) (b) (c) (d) (e)

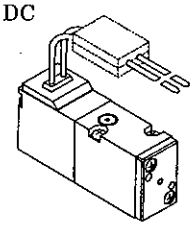
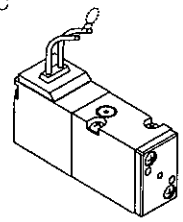
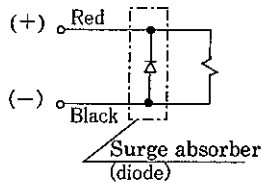
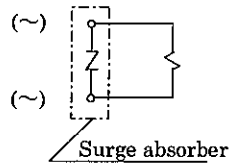
(a) Port size		(b) Manual override		(c) Electric connection		
Code	Ports 1, 2, 3	Code	Description	Code	Description	Lead wire
M5	M5	No code	Non-lock type manual override	No code	mmet with lead wire	300mm
GS4	ϕ 4 push-in joint	M1	Lock type manual override	B	Small terminal box	No option
GS6	ϕ 6 push-in joint			L	Small terminal box, with lamp	No option
				L2		300mm
				LS	Small terminal box, with lamp surge absorber	No option
				C	Plug-in connector C type	300mm
				C00		500mm
				C01		1000mm
				C02		2000mm
				C03		3000mm
				C1		No option
				C2	Plug-in connector C type with lamp surge absorber	300mm
				C20		500mm
				C21		1000mm
				C22		2000mm
				C23		3000mm
				C3		No option
				D	Plug-in connector D type	300mm
				D00		500mm
				D01		1000mm
				D02		2000mm
				D03		3000mm
				D1		No option
				D2	Plug-in connector D type with lamp surge absorber	300mm
				D20		500mm
				D21		1000mm
				D22		2000mm
				D23		3000mm
				D3		No option

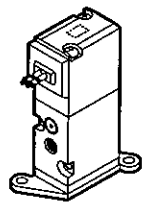
GS4 and GS6 are assembled by screwing push-in joints, GWS4-M5-S or GWS6-M5-S to 1·2·3 ports.

(d) Other options		(e) Voltage		
Code	Description	Code	Description	
No code	Without Mounting board	1	AC100V 50/60Hz	Standard
P	With mounting plate	2	AC200V 50/60Hz	
S	Surge absorber attached	3	DC24V	
		AC110V	AC110V 50/60Hz	Option
		AC220V	AC220V 50/60Hz	
		4	DC12V	

S: Only Surge killer attached to DC grommet lead wire is subression type (diode)

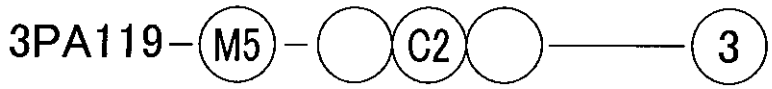
d) Other options

Name	Surge absorber attached	
Options marking	S	
Type	DC  (suppression type)	AC 
Circuit	Polarities exists on surge absorber 	

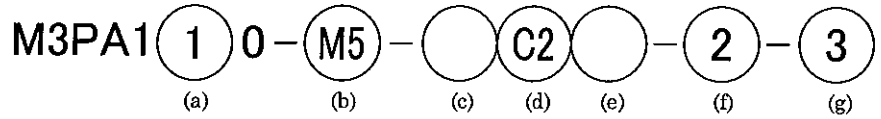
Name	Mounting plate
Options marking	P
Type	

8.2.2 M3PA1

※ Solenoid valve for manifold



Manifold



(a) Operator type		(b) Port size				(c) Manual override	
Code	Description	Code	A·B ports	ports 1	ports 2	Code	Description
1	2-pos single	M5	M5	Rc1/4 concentrated		code No	Non-lock type manual override
8	Mixed manifold	GS4	ϕ 4 push-in joint			M1	Lock type manual override
		GS6	ϕ 6 push-in joint				

GS4 and GS6 are assembled by screwing push-in joints,GWS4-M5-S,GWS6-M5-S to Ports,1,2,3.

(d) Electric connection			(e) Other options		(f) No. of stations	
Code	Description	Lead wire	Code	Description	Code	Description
No code	Grommet with lead wire	300mm	S	Surge absorber attached	2	2 stations
B	Small terminal box	No option	S: Only Surge absorber attached to DC grommet lead wire is subression type (diode)		⟆	⟆
L	Small terminal box, with lamp	No option			20	20 stations
L2		300mm				
LS	Small terminal box, with lamp surge absorber	No option				
C	Plug-in connector C type	300mm				
C00		500mm				
C01		1000mm				
C02		2000mm				
C03		3000mm				
C1		No option				
C2	Plug-in connector C type with lamp surge absorber	300mm				
C20		500mm				
C21		1000mm				
C22		2000mm				
C23		3000mm				
C3		No option				
D	Plug-in connector D type	300mm				
D00		500mm				
D01		1000mm				
D02		2000mm				
D03		3000mm				
D1		No option				
D2	Plug-in connector D type with lamp surge absorber	300mm				
D20		500mm				
D21		1000mm				
D22		2000mm				
D23		3000mm				
D3		No option				

(g) Voltage		
Code	Description	
1	AC100V 50/60Hz	Standard
2	AC200V 50/60Hz	
3	DC24V	
AC110V	AC110V 50/60Hz	Option
AC220V	AC220V 50/60Hz	
4	DC12V	

1) When building a system using one kind of manifold
M3PA110-M5-7-1

It denotes to be a 3PA1 manifold : 2-position, single solenoid, port 2, M5 side piping, 7 blocks, AC100V, 50/60Hz

2) Mixed manifold
Describing procedure of Combination concept
When ordering mixed combined manifold [marking 8 in column of (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:

Code	Function
S1	2-position single
MP	Masking plate

1	2-position single (S1)
2	2-position single (S1)
3	2-position single (S1)
4	2-position single (S1)
5	2-position single (S1)
6	MP
7	MP

Model code indication for connecting port 2 M5, AC100V with lay-out as above table (right) is;

Model example

M3PA180-M5-7-2- [5][2]

S1 MP

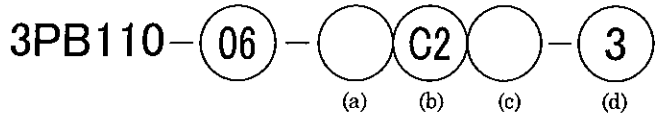
(S1=1 to 5, MP=6 ,7)

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

Number of actuators	10	11	12	13	14	15	16	17	18	19
Code (alphabet letters)	A	B	C	D	E	F	G	H	I	J

8.2.3 3PB1

※ Subplatepiping type



(a) Operator type		(b) Electric connection			(c) Other options	
Code	Description	Code	Description	Lead wire	Code	Description
1	2-pos single	No code	Grommet with lead wire	300mm	S	Surge absorber attached
8	Mixed manifold	B	Small terminal box	No option		
		L	Small terminal box, with lamp	No option		
		L2		300mm		
		LS	Small terminal box, with lamp surge absorber	No option		
		C	Plug-in connector C type	300mm		
		C00		500mm		
		C01		1000mm		
		C02		2000mm		
		C03		3000mm		
		C1		No option		
		C2	Plug-in connector C type with lamp surge absorber	300mm		
		C20		500mm		
		C21		1000mm		
		C22		2000mm		
		C23		3000mm		
		C3		No option		
		D	Plug-in connector D type	300mm		
		D00		500mm		
		D01		1000mm		
		D02		2000mm		
		D03		3000mm		
		D1		No option		
		D2	Plug-in connector D type with lamp surge absorber	300mm		
		D20		500mm		
		D21		1000mm		
		D22		2000mm		
		D23		3000mm		
		D3		No option		

S: Only Surge absorber attached to DC grommet lead wire is subression type (diode)

(d) Voltage		
Code	Description	
1	AC100V 50/60Hz	Standard
2	AC200V 50/60Hz	
3	DC24V	
AC110V	AC110V 50/60Hz	Option
AC220V	AC220V 50/60Hz	
4	DC12V	

8.2.4 M3PB1

※ Solenoid valve for manifold

3PB119- 00 - ( ) C2 ( ) ——— 3

Manifold

M3PB1 (1) 0- (06) - ( ) C2 ( ) - (2) - (3)

(a) (b) (c) (d) (e) (f) (g)

(a) Operator type		(b) Port size				(c) Manual override	
Code	Description	Code	Ports 2 individual	ports 1	ports 2	Code	Description
1	2-pos single	06	Rc1/8	Rc1/4 concentrated		code No	Non-lock type manual override
8	Mixed manifold	GS4	φ4 push-in joint			M1	Lock type manual override
		GS6	φ6 push-in joint				
		06Y	Rc1/8 Rear				
		06A	Rc1/8	Rc1/4 concentrated	Rc1/8 Individual		
		06B	Rc1/8	Rc1/8 Individual	Rc1/4 concentrated		

GS4 and GS6 are assembled by screwing push-in joints, GWS4-M5-S, GWS6-M5-S to Ports, 1, 2, 3.

(d) Electric connection			(e) Other options		(f) No. of stations	
Code	Description	Lead wire	Code	Description	Code	Description
No code	Grommet with lead wire	300mm	S	Surge absorber attached	2	2 stations
B	Small terminal box	No option	S: Only Surge absorber attached to DC grommet lead wire is subression type (diode)		5	5
L	Small terminal box, with lamp	No option			20	20 stations
L2		300mm				
LS	Small terminal box, with lamp surge absorber	No option				
C	Plug-in connector C type	300mm				
C00		500mm				
C01		1000mm				
C02		2000mm				
C03		3000mm				
C1		No option				
C2	Plug-in connector C type with lamp surge absorber	300mm				
C20		500mm				
C21		1000mm				
C22		2000mm				
C23		3000mm				
C3		No option				
D	Plug-in connector D type	300mm				
D00		500mm				
D01		1000mm				
D02		2000mm				
D03		3000mm				
D1		No option				
D2	Plug-in connector D type with lamp surge absorber	300mm				
D20		500mm				
D21		1000mm				
D22		2000mm				
D23		3000mm				
D3		No option				

(g) Voltage		
Code	Description	
1	AC100V 50/60Hz	Standard
2	AC200V 50/60Hz	
3	DC24V	
AC110V	AC110V 50/60Hz	Option
AC220V	AC220V 50/60Hz	
4	DC12V	

1) When building a system using one kind of manifold
M3PB110-M5-7-1

It denotes to be a 3PB1 manifold : 2-position, single solenoid, port 2, M5 side piping, 7 blocks, AC100V, 50/60Hz

2) Mixed manifold
Describing procedure of Combination concept
When ordering mixed combined manifold [marking 8 in column of (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:

Code	Function
S1	2-position single
MP	Masking plate

1	2-position single (S1)
2	2-position single (S1)
3	2-position single (S1)
4	2-position single (S1)
5	2-position single (S1)
6	MP
7	MP

Model code indication for connecting port 2 M5, AC100V with lay-out as above table (right) is;

Model example

M3PB180-M5-7-2- [5][2]

S1 MP

(S1=1 to 5, MP=6 ,7)

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

Number of actuators	10	11	12	13	14	15	16	17	18	19
Code (alphabet letters)	A	B	C	D	E	F	G	H	I	J