CKD

SM－208676-A

INSTRUCTION MANUAL

SELEX VALVE

3KA1, M3KA1

- 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.

3rd Edition

CKD Corporation

SAFETY PRECAUTIONS

When designing and manufacturing a device using CKD products, the manufacturer is obligated to manufacture a safe product by confirming safety of the system comprising the following items:

- Device mechanism
- Pneumatic or water control circuit
- Electric control that controls the above

It is important to select, use, handle, and maintain the product appropriately to ensure that the CKD product is used safely.

Observe warnings and precautions to ensure device safety.

Check that device safety is ensured, and manufacture a safe device.

⚠ WARNING

1. This product is designed and manufactured as a general industrial machine part. It must be handled by someone having sufficient knowledge and experience.

2. Use this product within its specifications.

This product cannot be used beyond its specifications. Additionally, the product must not be modified or machined.

This product is intended for use in general industrial devices and parts. Use beyond such conditions is not considered. Consult with CKD for details when using the product beyond the unique specification range, outdoors, or in the following conditions or environments. In any case, measures for safety shall be provided when the vavle malfunctions.

① Use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.

② Use for applications where life or assets could be adversely affected, and special safety measures are required.

3. Observe corporate standards and regulations, etc., related to the safety of device design and control, etc.

ISO4414, JIS B 8370 (pneumatic system rules)

JFPS2008 (principles for pneumatic cylinder selection and use)

Including High Pressure Gas Maintenance Law, Occupational Safety and Sanitation Laws, other safety rules, standards and regulations, etc.

4. Do not handle, pipe, or remove devices before confirming safety.

① Inspect and service the machine and devices after confirming safety of the entire system related to this product.

② Note that there may be hot or charged sections even after operation is stopped.

③ When inspecting or servicing the device, turn off the energy source (air supply or water supply), and turn off power to the facility. Release any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.

④ When starting or restarting a machine or device that incorporates pneumatic components, make sure that system safety, such as pop-out prevention measures, is secured.

5. Observe warnings and cautions on the pages below to prevent accidents.

■The safety cautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

⚠ 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.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. In any case, important information that must be observed is explained.

Precautions with regard to guarantee

● Guarantee period

The guarantee period of our product shall be one (1) year after it is delivered to the place specified by the customer.

● Guarantee coverage

If any failure for which CKD CORPORATION is recognized to be responsible occurs within the above warranty period, a substitute or necessary replacement parts shall be provided free of charge, or the product shall be repaired free of charge at the plant of CKD CORPORATION.

However, the guarantee excludes following cases:

① Defects resulting from operation under conditions beyond those stated in the catalogue or specifications.
② Failure resulting from malfunction of the equipment and/or machine manufactured by other companies.
③ Failure resulting from wrong use of the product.
④ Failure resulting from modification or repairing that CKD CORPORATION is not involved in.
⑤ Failure resulting from causes that could not be foreseen by the technology available at the time of delivery.
⑥ Failure resulting from disaster that CKD is not responsible of.

Guarantee stated here covers only the delivered products. Any other damage resulting from failure of the delivered products is not covered by this guarantee.

● Confirmation of product compatibility

Our customer shall be responsible of confirming compatibility of our product used in our customer's system, machinery or device.

UNPACKING (Section 3)

⚠ 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 (Section 4)

⚠ 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 (Section 4.1)

⚠ 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 (Section 4.2)

⚠ 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 (Section 4.3)

⚠ 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 (Section 4.4)

⚠ WARNING : Before wiring, read the instruction manual carefully and understand the instructions.

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

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

MANUAL OVERRIDE (Section 5.2)

⚠ WARNING :

a) Once the manual operation device has been operated, always return it to its origin (initial position), and then start the operation of the device.

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

AIR QUALITY (Section 5.3)

⚠ 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.

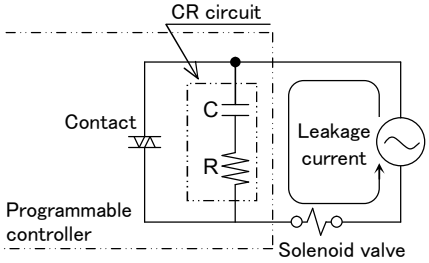
ELECTRIC CIRCUITS (Section 5.4)

⚠ 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 (Section 6.1)

⚠ 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 (Section 6.2)

⚠ 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.
- Personnel involved in this step must have passed the Pneumatic Pressure Skill Test Class 2 or higher.

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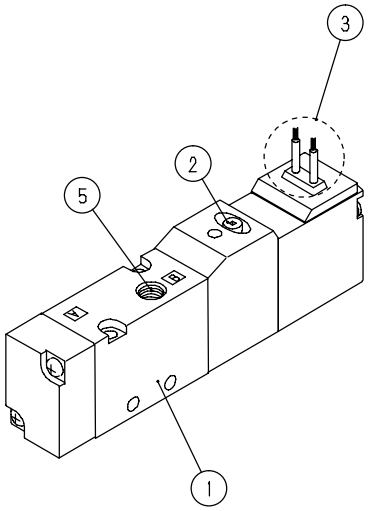
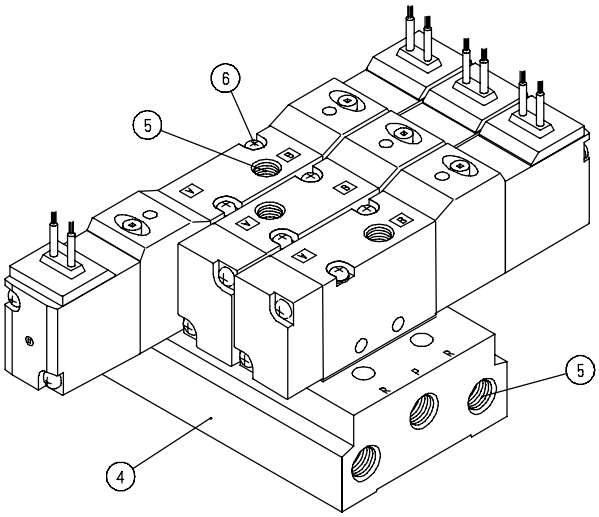
1. PART NAME AND DESCRIPTION



Direct piping unit



Direct piping manifold

No.	Part Name	explanation
①	Valve unit	There are direct piping and sub plate piping
②	Manual Override	It uses case of manual operation. There are a non lock and a lock formula
③	Wire connection	It connections to the electric circuit
④	Sub plate	It is a block for the piping
⑤	Piping Port	Port pis the supply port ; port R is the exhaust port ; port A and B is the Output port
⑥	Mounting screw	There are two every individual valve and it fixes the valve unit on the various base

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.

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⚠ 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.

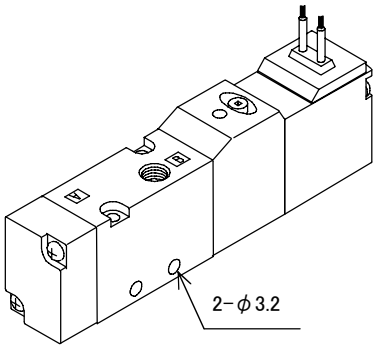
- Mount the solenoid valve by applying the mounting screws and/or mounting plate to the solenoid valve.

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

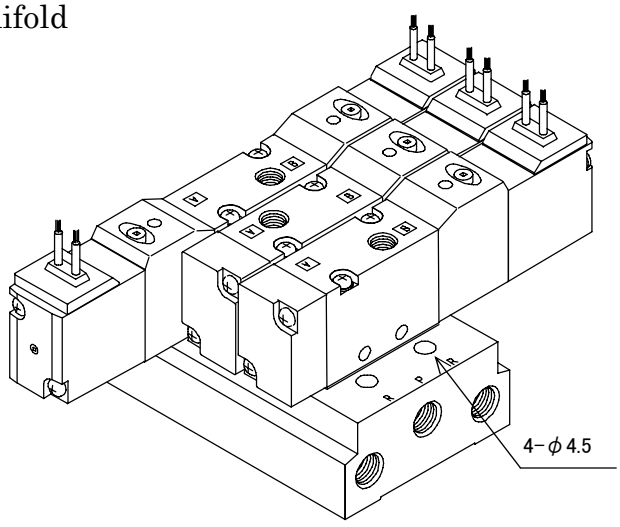
4.2.2 Direct mounting

Use two or four through holes

unit



manifold



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.

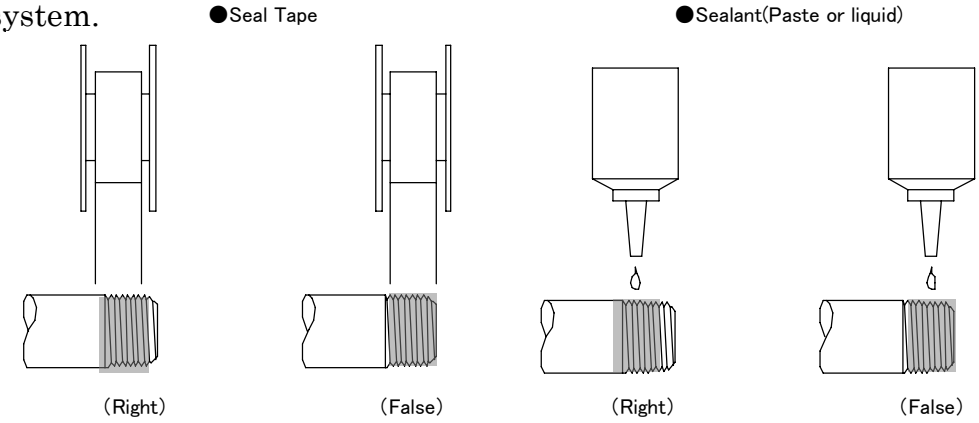
g) Air supply
- Do not restrict the flow of air through the air supply piping. With a manifold system with multiple stations, a drop in the air supply pressure may cause trouble through a delay in the operation timing

Approproate torque

joint screw	Approproate torque N·m
M5	1.0 to 1.5
Rc1/8	3 to 5

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 Blow circuit

Do not open the cylinder port circuit to the air because a drop in the air supply pressure may cause a malfunction. Select the external pilot type design instead of the internal pilot type design. The lowest allowable pressure with the internal pilot type design is 0.2 MPa.

4.3.5 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.

4.3.6 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 : Before wiring, read the instruction manual carefully and understand the instructions.

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

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

1) Caution for wiring

(1) When using the small terminal box and water-proof is required, use cab-tire cords ϕ4 to ϕ6.5 in outer diameter (water-resistance is improved, but not for outdoor use).

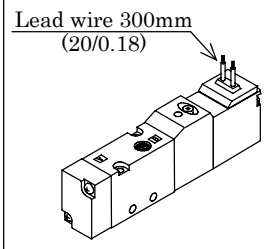
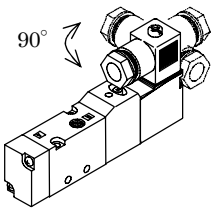
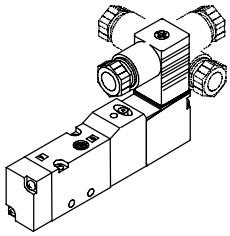
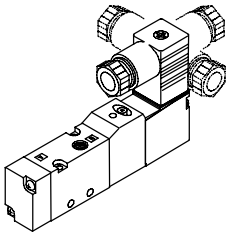
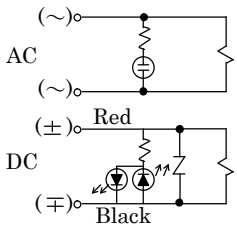
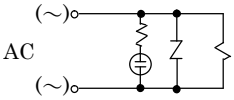
(2) The connector type (C, C1, C2, C3, D, D1, D2, D3) should be used in a place with little dust and not directly exposed to water and oil.

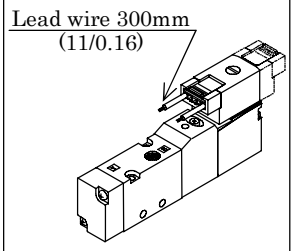
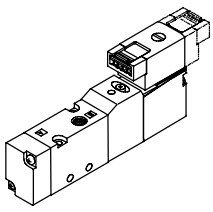
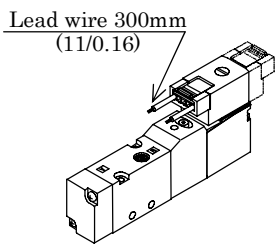
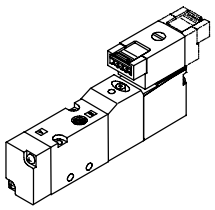
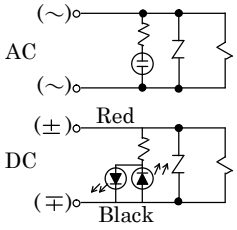
(3) For the electrical circuit, use a switching circuit free of chattering.

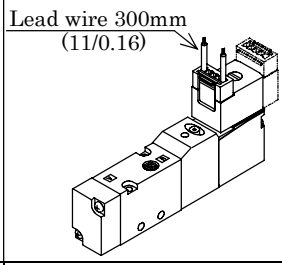
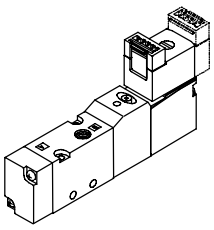
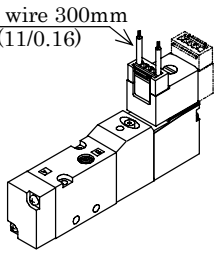
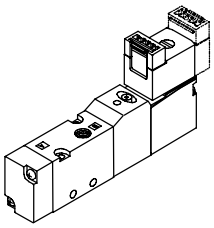
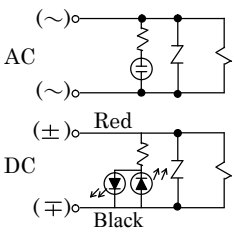
(4) The electrical circuit should have fuses.

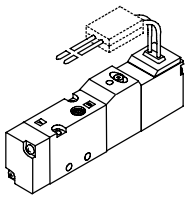
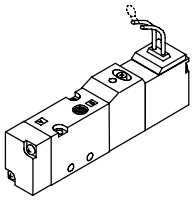
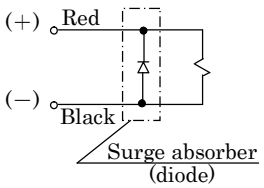
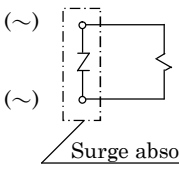
(5) Be sure that the operation voltage is within 10% of the rated voltage.

2) Wire connection

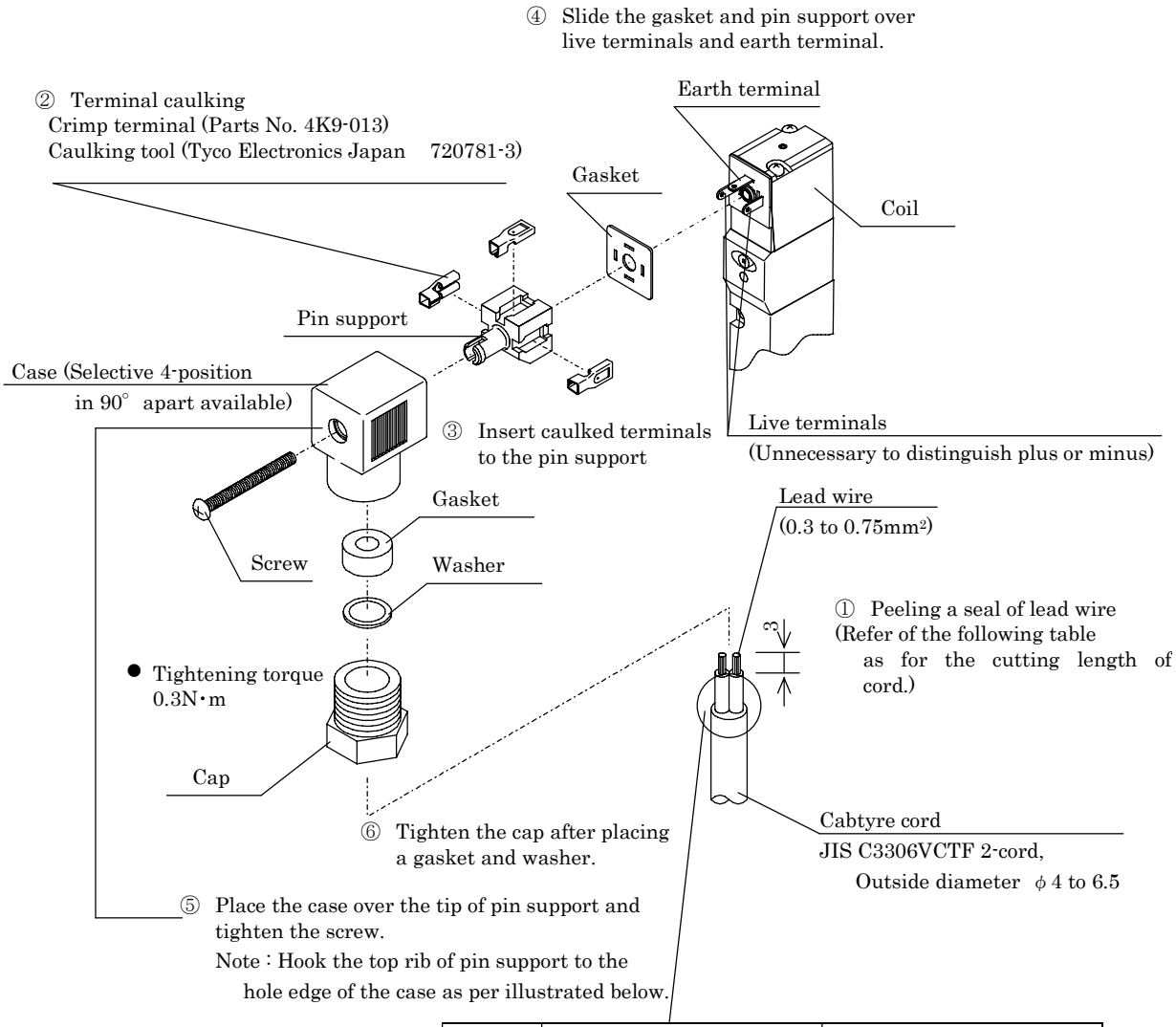
Name	Grommet (standard)	Small terminal box	Small terminal box with lamp	Small terminal box with lamp surge absorber
Option code	No code	B	L	LS
Shape				
Circuit				

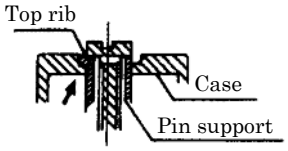
Name	Plug-in connector C type with lead wire	Plug-in connector C type without lead wire	Plug-in connector C type with lead wire, lamp surge absorber	Plug-in connector C type without leadwire, lamp surge absorber
Option code	C	C1	C2	C3
Shape				
Circuit				

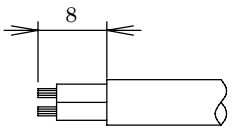
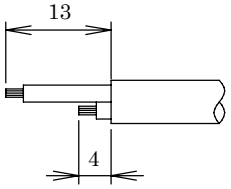
Name	Plug-in connector D type with lead wire	Plug-in connector D type without lead wire	Plug-in connector D type with lead wire, lamp surge absorber	Plug-in connector D type without leadwire, lamp surge absorber
Option code	D	D1	D2	D3
Shape	Lead wire 300mm (11/0.16) 		Lead wire 300mm (11/0.16) 	
Circuit			(～) AC (～) (±) Red DC (∓) Black 	

Name	Surge absorber attached	
Option code	S	
Shape	DC  (suppression type)	AC 
Circuit	The surge absorber has polarity (+) Red (−) Black Surge absorber (diode) 	(～) (～) Surge absorber 

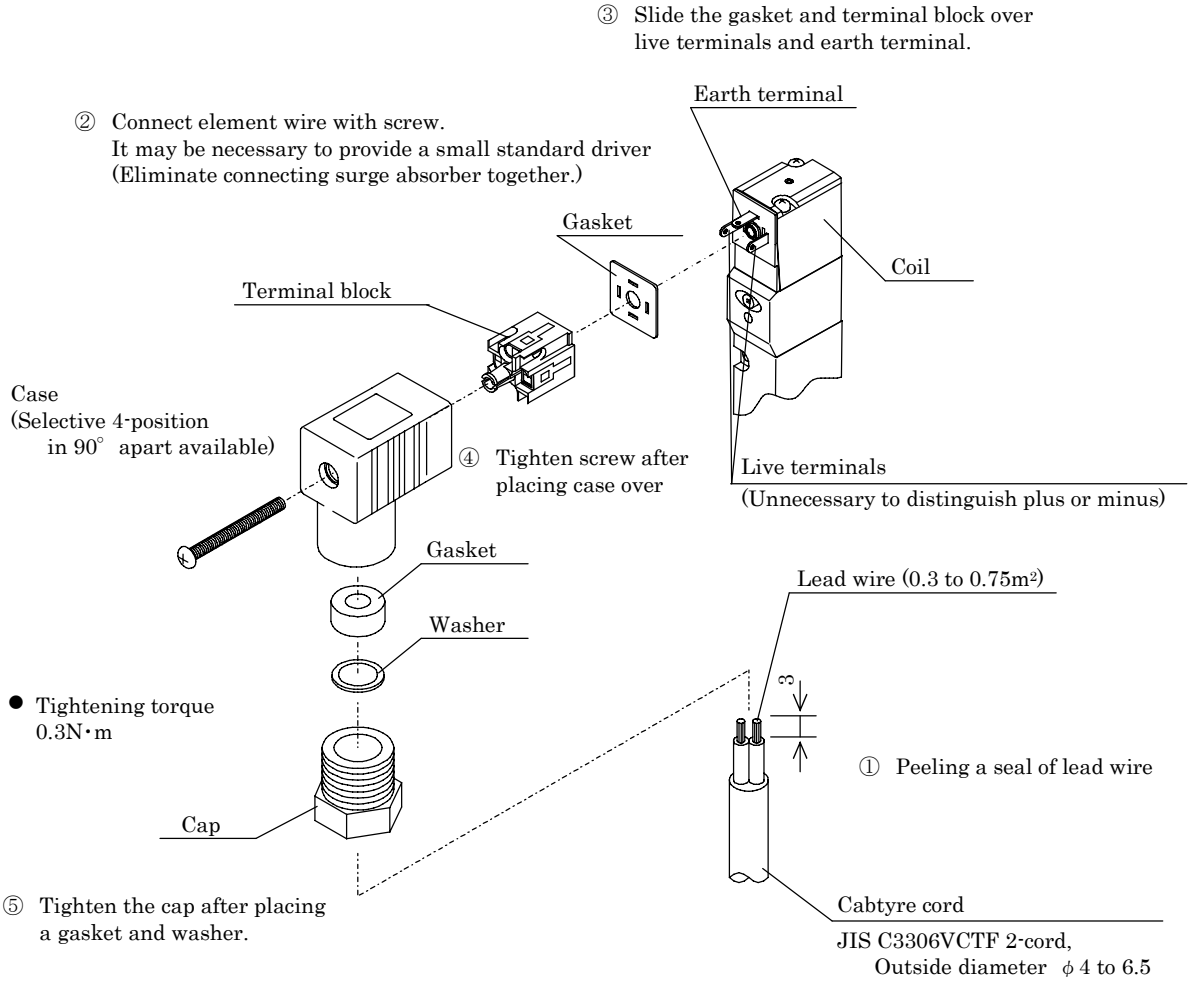
3) Wiring of the small terminal box (B)
Wire the terminal box by following ① to ⑥ in the illustration.



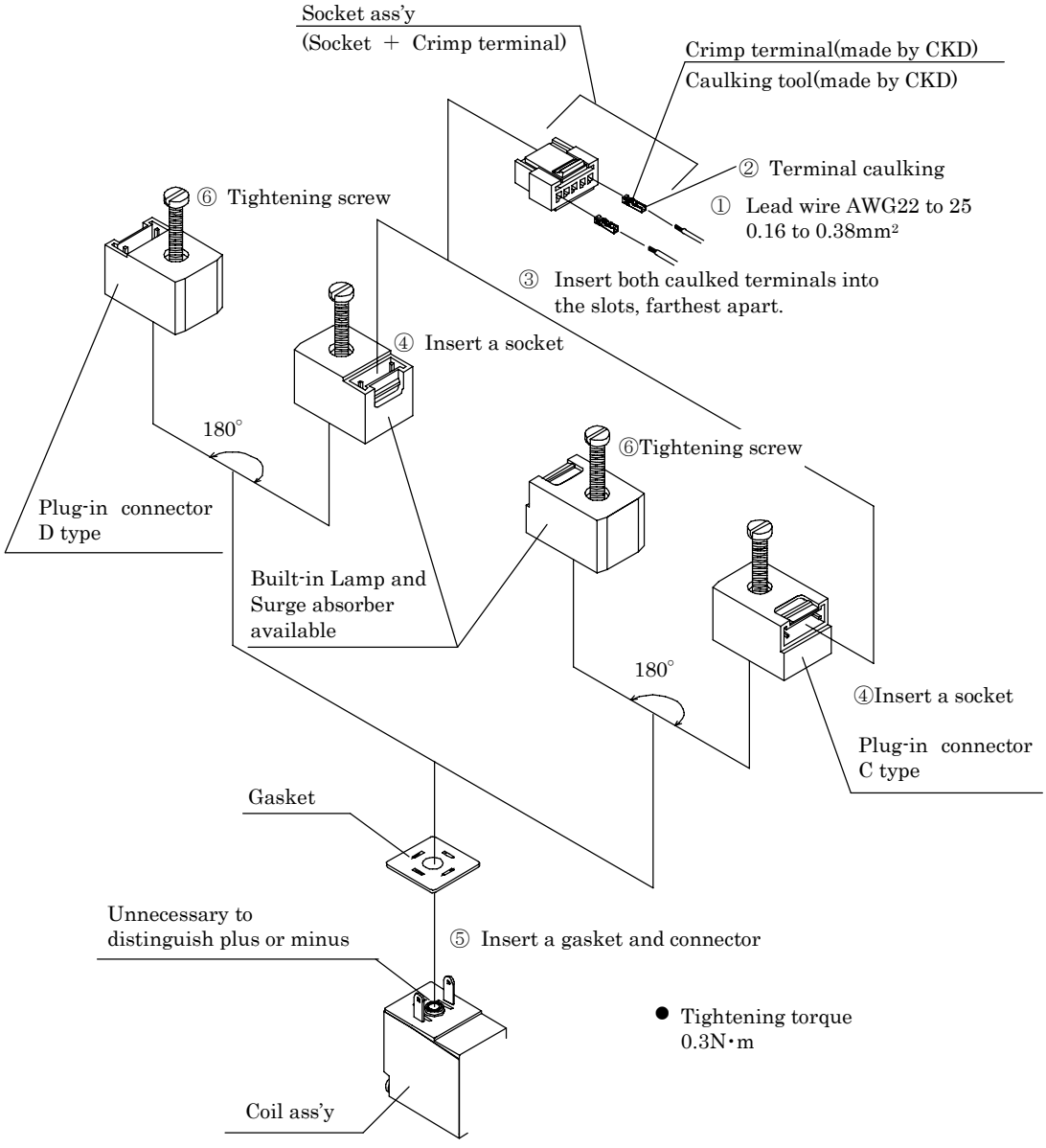


	Direction of the case as per illustrated above or 180° opposite.	Direction of the case 90° to the right or left off per illustrated as above
Length of lead wire		

4) Wiring of the small terminal box with lamp (L・LS)
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.

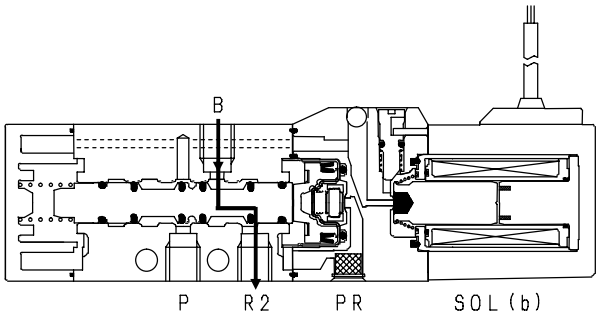


5. OPERATING RECOMMENDATION

5.1 Function

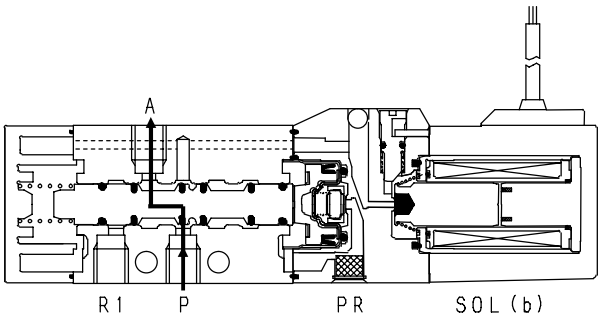
- 3KA110
  No signal current (Illustrated)
  B → R2 (P port is closed.)

  When actuated
  P → B (R2 port is closed.)
  PR is an exhaust port of the pilot pressure line.



- 3KA1110
  No signal current (Illustrated)
  P → A (R1 port is closed.)

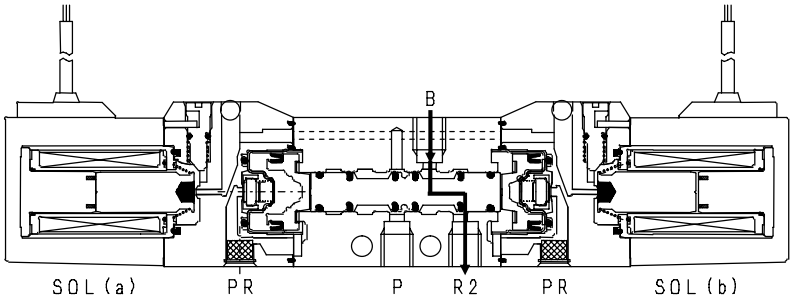
  When actuated
  A → R1 (P port is closed.)
  PR is an exhaust port of the pilot pressure line.



- 3KA120
  When Sol "a" is actuated (Illustrated)
  .B → R2

  When Sol "b" is actuated
  P → B

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

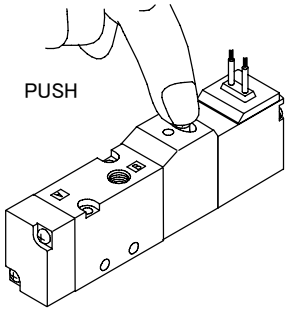
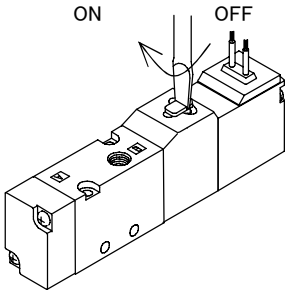


5.2 Manual Override

⚠ WARNING :

a) Once the manual operation device has been operated, always return it to its origin (initial position), and then start the operation of the device.

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

Name	Non-lock type manual override	Lock type manual override
Option code	No code	M1
Shape	 Keeps on activation during the time this button is pushed.	 Activates when set to ON ; normally return to OFF position.

1) Manual override
As this is a pilot solenoid valve, the spool will not be switched by operating the manual override without an air supply to the P port.

2) Non-lock type manual override
Push in the manual axis all the way. With the 3-position single solenoid, the valve is energized while the axis is being pressed and it returns to the original state when released. With the 2-position double solenoid, however, the A (B) side is energized when the manual axis on that side is pushed in ; the spool retains the situation even when the axis is released. To return to the original state, push the manual axis on the B (A) side.

3) Lock type manual override
Turn it 90 degrees (clockwise only) with your finger or a screwdriver, and the valve is energized and locked. Do not turn it further after the valved is locked to prevent damage to the device.
Be sure to unlock it before the regular operation.

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 3KA1 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

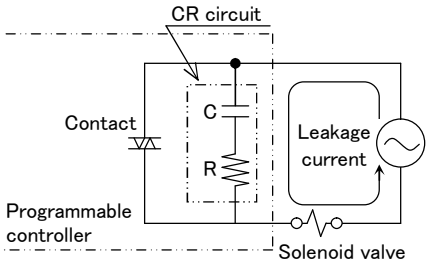
⚠ CAUTION :

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) With a double solenoid type valve system, energize the solenoid for at least 0.1 second even for an instantaneous valve operation. If the target valve can be affected by a back pressure induced by another solenoid valve, it is recommendable to energize the solenoid as long as the cylinder is making an action.

(2) 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

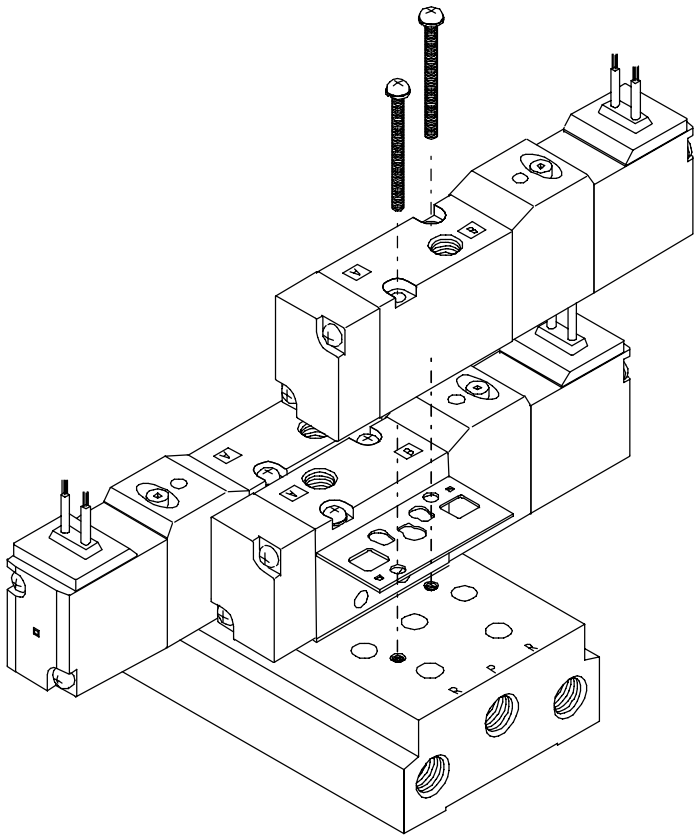
⚠ WARNING : Before disassembling and reassembling solenoid valves, read the instruction manual carefully and understand the instructions.

- 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

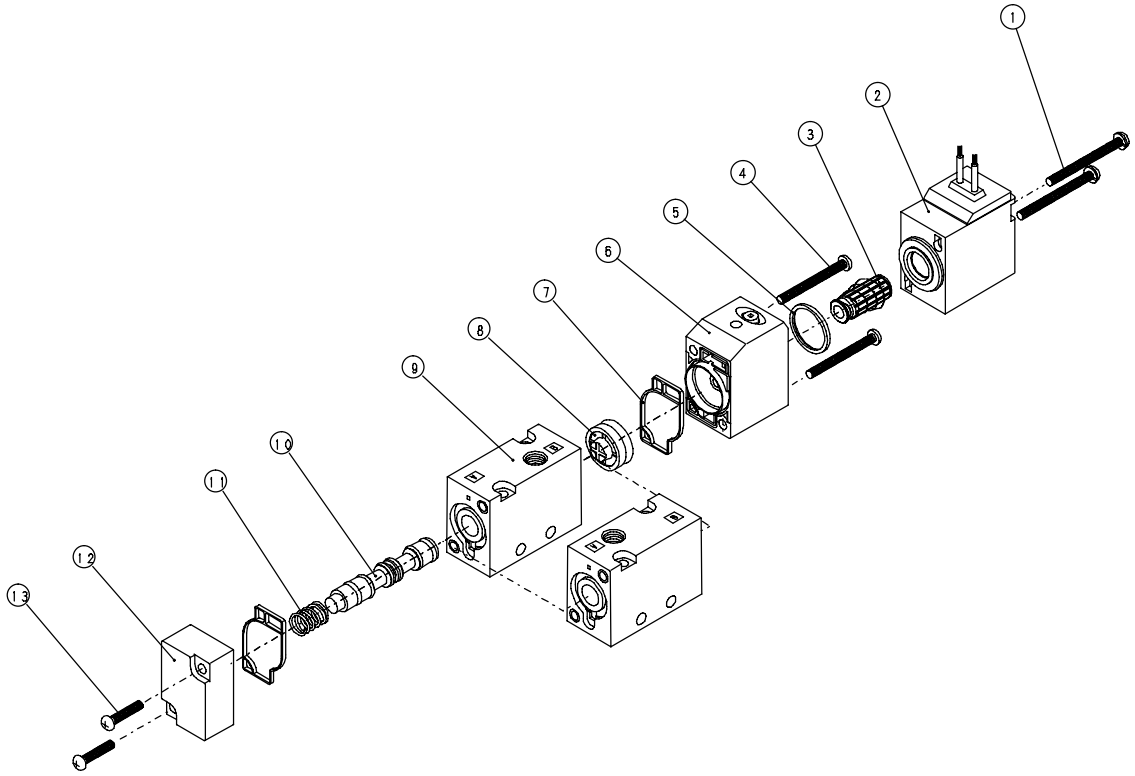
When replacing the solenoid valve, pay special attention so that no gaskets are fallen down. Additionally, carefully check the orientation of the gasket and the solenoid valve.

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



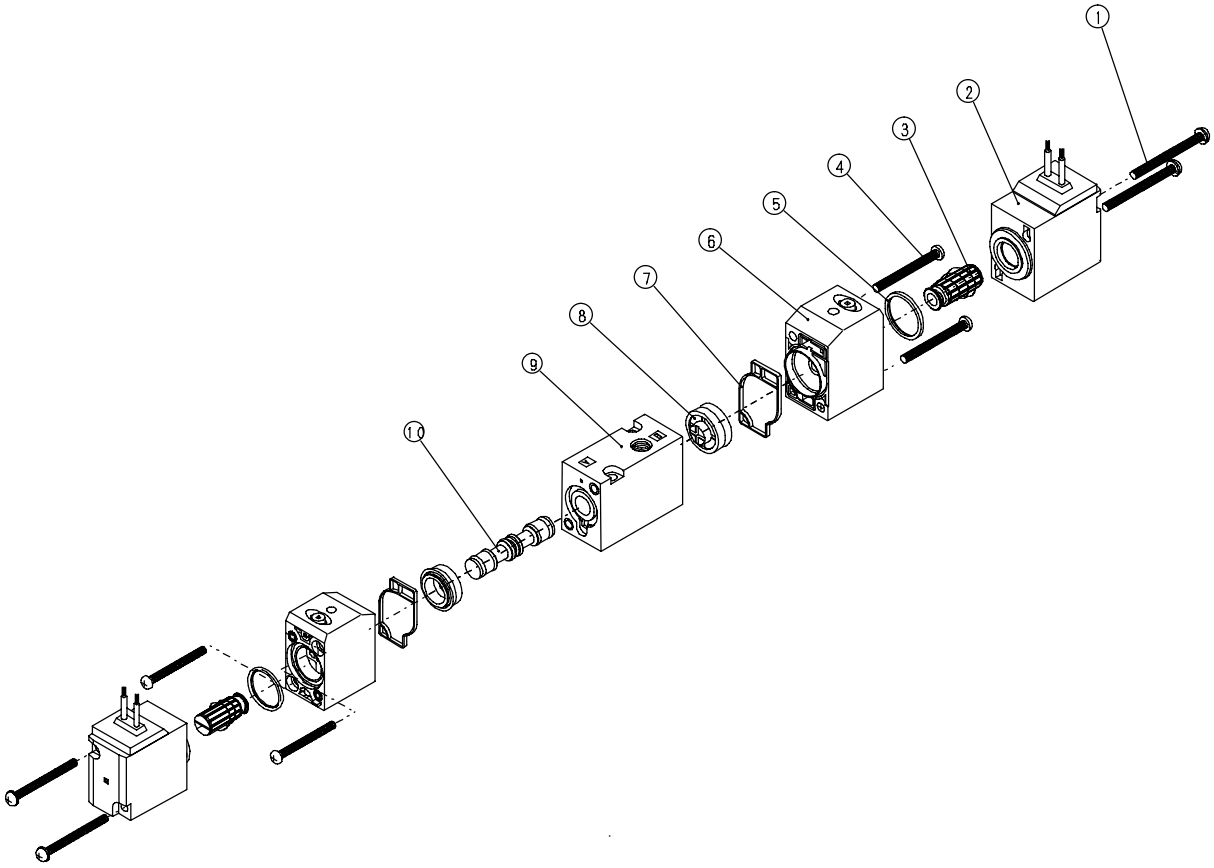
6.2.2 Assembly and Disassembly

1) 3KA110・3KA1110



No.	Parts	Material	Qty	Remarks
①	Coil mounting screw	Steel	2	M2.5 × 26 (with Spring washer)
②	Coil ass'y		1	
③	Plunger ass'y		1	
④	Pilot valve mounting screw	Steel	2	M2.5×22
⑤	Coil Gasket	Fluore rubber	1	
⑥	Pilot valve ass'y		1	
⑦	Pilot valve Gasket	Nitrile rubber	2	
⑧	Piston ass'y		1	
⑨	Body	Aluminum alloy die casting	1	
⑩	Spool ass'y		1	
⑪	Spool spring	Stainless steel	1	
⑫	Cap	Resin	1	
⑬	Cap mounting screw	Steel	2	M2.5×12.6

2) 3KA120



No.	Parts	Material	Qty	Remarks
①	Coil mounting screw	Steel	4	M2.5 × 26 (with Spring washer)
②	Coil ass'y		2	
③	Plunger ass'y		2	
④	Pilot valve mounting screw	Steel	4	M2.5×22
⑤	Coil Gasket	Fluore rubber	2	
⑥	Pilot valve ass'y		2	
⑦	Pilot valve Gasket	Nitrile rubber	2	
⑧	Piston ass'y		2	
⑨	Body	Aluminum alloy die casting	1	
⑩	Spool ass'y		1	

7. TROUBLE SHOOTING

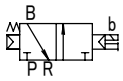
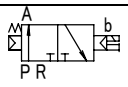
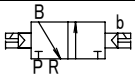
TROUBLE SHOOTING

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
	Pressure supplied through exhaust port	Change the piping to an external pilot system
	Erroneous piping, erroneous omitting some piping	Rectify the piping system
	Speed control valve completely closed by error	Reset the needle valve
	A port 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 far)	Check the quality of the lubricant (Turbine oil type1, 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 type1, 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	Check the piping. Apply more grease.
	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 (3-way, single acting cylinder)	Rewire to have the solenoid valve in question is actuated prior to others sequentially. Install a locking system to the cylinder

8. PRODUCT SPECIFICATIONS AND HOW TO ORDER

8.1 Product Specifications

1) Specifications

Model code			3KA110 2-pos.Single Normal close	3KA1110 2-pos.Single Normal open	3KA120 2-pos Double
JIS Symbol / Item					
Working fluid			Compressed air		
Valve and solenoid type			Pilot operated soft spool valve		
Min. working pressure		MPa	0.15		
Max. working pressure		MPa	0.7		
Proof pressure		MPa	1.05		
Port size	Supply port	P	M5 (Option : ϕ 4, ϕ 6 push-in joint)		
	Cylinder ports	A・B			
	Exhaust ports	R1・R2	M5		
Sonic conductance-C		$dm^3/(s \cdot bar)$	0.65		
Ambient temperature (Note 1)		℃	-5 to 50 (No freezing)		
Fluid temperature		℃	5 to 50		
Response time		ms	30 or less		
Lubrication			Not required (Use turbine oil type 1, ISO VG32 when required)		
Degree of protection			Dust-proof		
Manual operation device			Non-locking type (Option : Locking type)		
Weight		g	70		110

Electrical specifications				
Rated voltage	(V)	AC100V (50 / 60Hz)	AC200V (50 / 60Hz)	DC24V
Starting current	(A)	0.056 / 0.044	0.028 / 0.022	0.075
Holding current	(A)	0.028 / 0.022	0.014 / 0.011	
Power consumption (with lamp)	(W)	1.8 / 1.4 (2.0 / 1.6)		1.8 (2.0)
Temperature rise	(℃)	43		
Voltage fluctuation range		±10%		
Heat proof class		B(molded coil)		
Electrical connections		Grommet with lead wire (Option : Small terminal box, Plug-in connectors)		
Surge absorber		Option		
Indicator		Option (with lamp)		

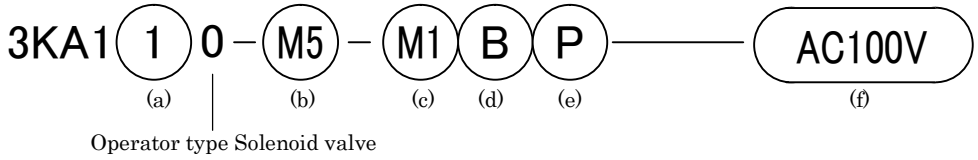
- Above-mentioned response time is the figure on the non-lubricated at 0.5 MPa, and depends on the pressure and quality of lubricant.
- Pressure is converted as $1MPa=10.1972kgf/cm^2 \fallingdotseq 10.2kgf/cm^2$
- In case of use, consult separately of the continous energizing.

Note 1) Ambient temperature applies when stored or sitting, and does not apply to the fluid temperature in operation.

Model code / Item			M3KA1
Manifold structure			Manifold integrated
Applicable solenoid valve			3KA1 series
Nos. of station			2 to 20 stations
Manifold type			Common supply, common exhaust
Electrical connections			Grommet with lead wire (Option : Small terminal box, Plug-in connectors)
Port size	Supply port	P	Side (Rc 1/8)
	Cylinder ports	A・B	Top (M5) (Option : Top ϕ4, ϕ6 push-in joint)
	Exhaust ports	R1・R2	Side (Rc 1/8)

8.2 HOW TO ORDER

1) 3KA1



(a) Position/Operator type		(b) Port size			(c) Manual operation device	
Code	Description	Code	P·A·B ports	R1·R2 ports	Code	Description
1	2-pos single, Normal close	M5	M5	M5	No code	Non-lock type manual override
		GS4	φ4 push-in joint		M1	Lock type manual override
11	2-pos single, Normal open	GS6	φ6 push-in joint			
2	2-pos double	GS4 and GS6 are assembled by screwing push-in joints, GWS4-M5-S or GWS6-M5-S to P·A·B ports.				

(d) Electric connection			(e) Other options	
Code	Description	Lead wire	Code	Description
No code	Grommet with lead wire	300mm	No code	No option
B	Small terminal box	No option	P	With mounting plate
L	Small terminal box, with lamp	No option	S	Surgeabsorber attached
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		

- Mounting plate is attached with the 3KA110 and 3KA1110 type only.

(f) Voltage		
Code	Description	
AC100V	AC100V 50/60Hz	Standard
AC200V	AC200V 50/60Hz	
DC24V	DC24V	
AC110V	AC110V 50/60Hz	Option
AC220V	AC220V 50/60Hz	
DC12V	DC12V	

- The AC100 and 200V coil can be used for AC110V (60Hz) and AC220V (60Hz), respectively.

- The attached surge absorber is supression type (Diode) only for the grommet with lead wire of below DC24V.
- In the item (e), "Other options" enter in the order of PS when specifying both P : with fitting plate and S : with surge absorber.
- If a DC voltage type is selected for (f) ,L will be provided with a builtin surge absorber for DC voltage.

NOTE: Following options are available as a custom order.

・Ozone-proof specifications

Available in ozone-proof specifications by adding -P11 to the end of model number.

Model number: ※※-Voltage-P11

・Coolant proof specifications

Selectable with option symbol A. Model number: ※※-A-Number of stations-Voltage

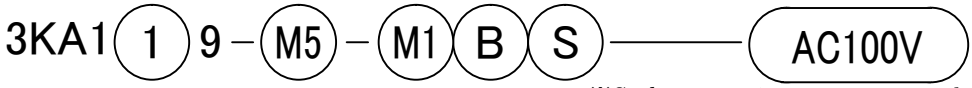
・Copper and PTFE free (Copper and PTFE materials are not used for flow path)

Available in copper and PTFE free by adding -P6 to the end of model number.

Model number: ※※-Voltage-P6

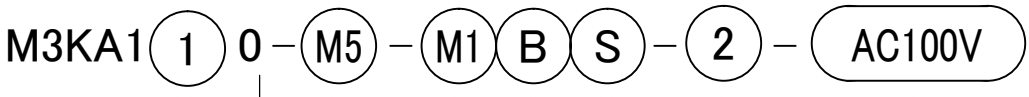
2) M3KA1

※Solenoid valve for manifold



※Gasket, mounting screws are attached

Manifold



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

Operation classification Solenoid valve

(a) Operator type		(b) Port size			(c) Manual override	
Code	Description	Code	A·B ports	P·R1·R2 ports	Code	Description
1	2-pos single, Normal close	M5	M5	Rc1/8	No code	Non-lock type manual override
11	2-pos single, Normal open	GS4	φ4 push-in joint			
2	2-pos double	GS6	φ6 push-in joint		M1	Lock type manual override
8	Mixed manifold (Single/Double)	GS4 and GS6 are assembled by screwing push-in joints,GWS4-M5-S,GWS6-M5-S to P・A・B ports.				

(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	No code	No option	2	2 stations
B	Small terminal box	No option	S	Surge absorber attached	⟆	⟆
L	Small terminal box, with lamp	No option			20	20 stations
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	
AC100V	AC100V 50/60Hz	Standard
AC200V	AC200V 50/60Hz	
DC24V	DC24V	
AC110V	AC110V 50/60Hz	Option
AC220V	AC220V 50/60Hz	
DC12V	DC12V	

- The AC100 and 200V coil can be used for AC110V (60Hz) and AC220V (60Hz), respectively.
- The attached surge absorber is supression type (Diode) only for the grommet with lead wire of below DC 24V.
- If DC voltage type is selected for (G), L will be provided with
- a builtin surge absorber for DC voltage.

NOTE: Following options are available as a custom order.

・Ozone-proof specifications
Available in ozone-proof specifications by adding -P11 to the end of model number. Model number: ※※-Voltage-P11

・Coolant proof specifications
Selectable with option symbol A.
Model number: ※※-A-Number of stations-Voltage

・Copper and PTFE free (Copper and PTFE materials are not used for flow path)
Available in copper and PTFE free by adding -P6 to the end of model number.
Model number: ※※-Voltage-P6

Example of single model Manifold

M3KA110-M5-7-AC100V
Indicates 3KA1 manifold, 2-Position single normal close solenoid, B port M5 top porting, 7 stations, AC100V50/60Hz.

Example of mixed manifold

- Method of entering the contents of combination:

Write the number of the type-wise solenoid valves (simplex) after the normal Model No. indication when selecting the mix, manifold (enter 8 in (a)).

After the Model No., clearly indicate the code of the required function (see Table below) and the arrangement no. (carry out numbering up to the specified no. of stations, with the left side station as no.1) as shown below.

Code	Function
S10	2-position single, normal close
S11	2-position single, normal open
S20	2- position double
MP	Masking plate

1	2-position single normal close (S10)
2	2-position single normal close (S10)
3	2-position single normal close (S10)
4	2-position double (S20)
5	2-position double (S20)
6	2-position double (S20)
7	2-position single normal close (S10)
8	2-position single normal close (S10)
9	2-position single normal close (S11)

When using the manifold (9 stations) of the above combination with the A・B port, M5 and AC100V, describe it as follows.

Model example

M3KA180-M5-9-AC100V- [5][1][3][0]

S10 S11 S20 MP

Enter the number.
If not in use, enter zero.
(S10＝1 to 3, 7 to 8, S20＝4 to 6, S11＝9)

When the mixed manifold uses 10 or more actuators of the same model, indicate their quantity
by alphabet letters.

Number of actuators	10	11	12	13	14	15	16	17	18	19	20
Code (alphabet letters)	A	B	C	D	E	F	G	H	I	J	K

8. 3 Consumable parts

1) Spool assembly

Function	Model example
3KA110	4K9-110
3KA1110	
3KA120	4K9-118

2) Piston assembly

Function	Model example
3KA1※	4K9-151

3) Coil assembly

Function	Model example
All model common	4K1L-[Electrical connection option]-COIL -[Nos.of station]

4) Sub plate kit (Manifold)

Function	Model example
M3KA1	M4KA110- M5-[Nos.of station]- SUB- BASE- KIT

5) Gasket kit

Function	Model example
M3KA1	M4KA110- GASKET- KIT