Discontinue

CKD

SM-253843-A

INSTRUCTION MANUAL

PILOT TYPE 3, 5 PORTS ELECTRIC-MAGNETIC VALVE

4GA1·4GB1
4GA2·4GB2
4GA3·4GB3

- 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.

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For Safety Use

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

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

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

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

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

⚠ DANGER: 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

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UNPACKING (Page 12)

⚠ 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 13)

⚠ WARNING

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 13)

⚠ 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) Vibration resistance and Shock resistance

- Do not subject the solenoid valve system to vibrations 50m/s² or stronger or shocks 300m/s² 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.

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.

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Installation (Page 14)

⚠ 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.

⚠ CAUTION If you choose to mount the solenoid valve manifold on a DIN rail, make sure that the DIN rail is strong enough.
- If a DIN rail is not strong enough, directly mount the manifold on a manifold base.

Piping (Page 18)

⚠ 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.
- With a female thread type for 4GA2, 4GA3 valve, The parts can deform if the A,B ports is of the excessive torque and be a factor of air leakage.

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 5μm 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.

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Wiring (Page 22)

⚠ 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 41)

⚠ 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.
With the 4G Series solenoid valve system, the lock is released (the manual override turned OFF) if the manual override protection cover is closed.

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

Air Quality (Page 43)

⚠ 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.

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Electric Circuits (Page 45)

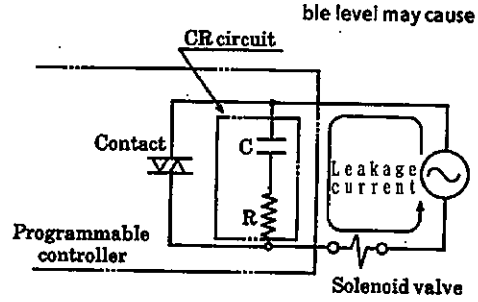
⚠ CAUTION

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.



100 VAC	2.0 mA max.
12 VDC	1.5 mA max.
24 VDC	1.8 mA max.

Periodic Inspection (Page 46)

⚠ 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 47)

⚠ 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.

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4GA1 · 4GB1
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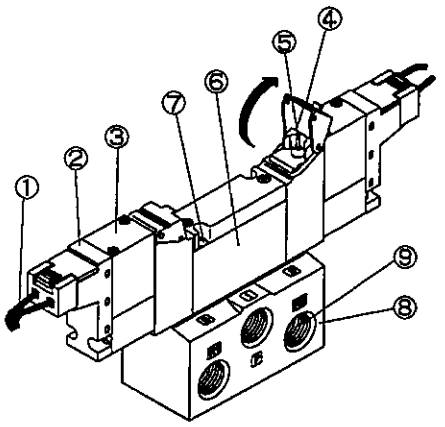
4GA3 · 4GB3
Pilot type 3, 5 ports Electric-magnetic valve
Manual No. SM-253843-A

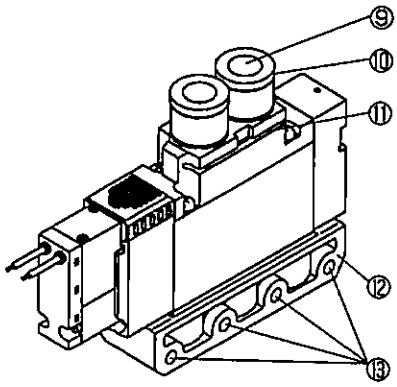
NOTE : Letters & figures enclosed within Gothic style bracket (examples such as [C2-4PP07] · [V2-503-B] etc.) are editorial symbols being unrelated with contents of the book.

Sep.16.1998
Revision : Dec.13.2001

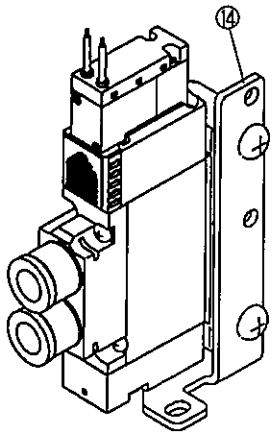
1. PART NAME AND DESCRIPTION



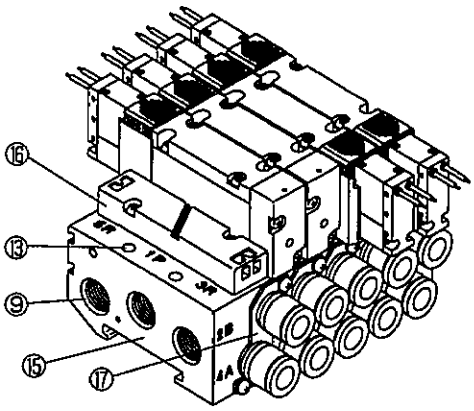
Base piping type valve unit



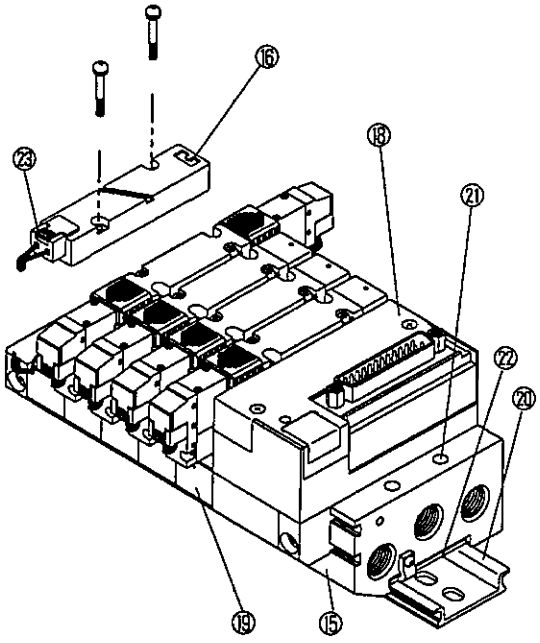
Direct piping type valve unit



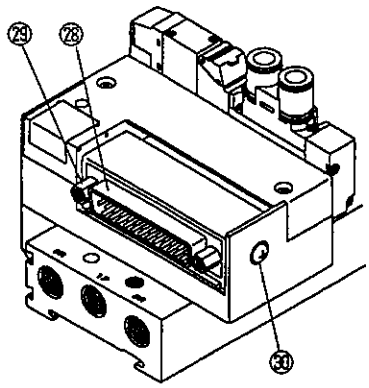
With mounting plate



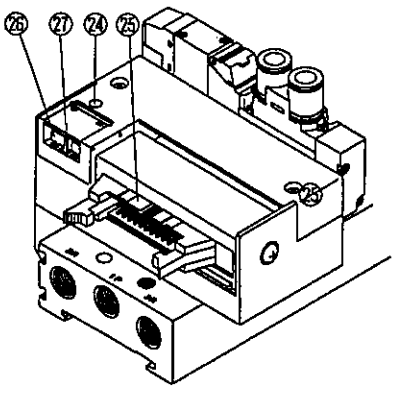
Manifold



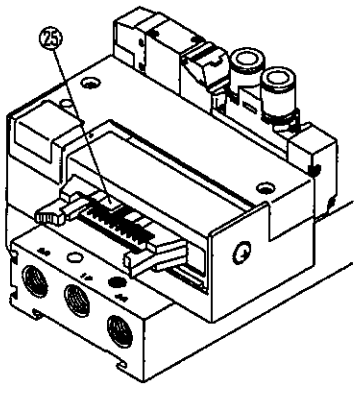
Reduced-wire manifold



D sub-connector type (T30)

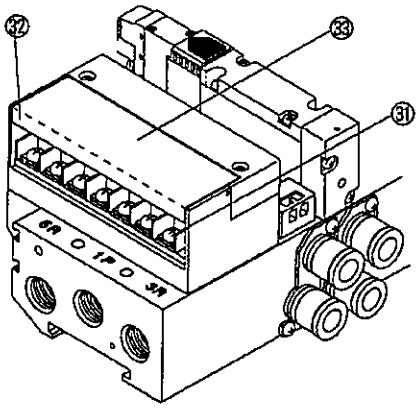


Flat cable type (T50)

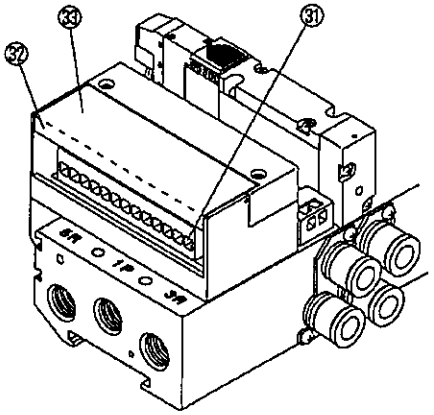


Flat cable type (T51)

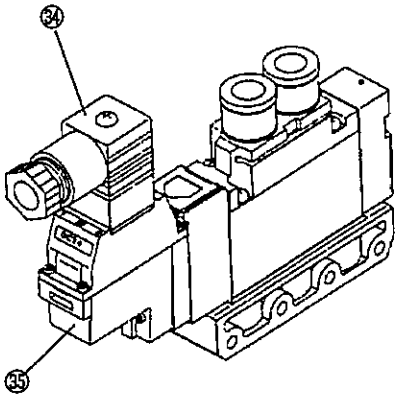
Discontinue



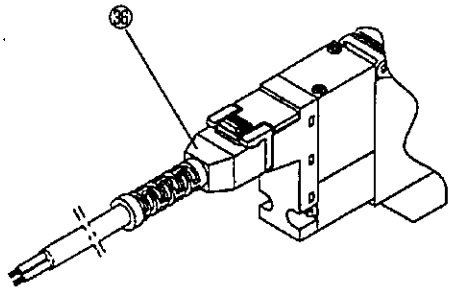
Common terminal
stand block (T10)
Specifications for M3 thread



Common terminal stand
block (T11)
Specifications for push to clamp setting



DINterminal stand bon(B)



Socket with cover (E□J)

No.	Part name	Description
①	Lead wire	No specification about the polarities
②	Electric component cover	The green power indicator light on the top surface is lit when the power is supplied to the coil. (With E-Type and A-Type connectors only.)
③	Coil assembly	
④	Manual override protection cover	The protection cover prevents accidental operation of the manual override. The user must open the cover before operating the manual override.
⑤	Manual override	Allows a non-lock type operation (push and release) as well as a lock type (push and lock) operation.
⑥	Valve unit	
⑦	Valve unit mounting screw	Two mounting screws are provided for each valve unit. They are used for mounting the valve unit to one of the various types of bases.
⑧	Sub plate	Supplied attached to the base piping type valve unit.
⑨	Piping port	Port 1(P) is the supply port; Port 3(R2)/5(R2) is the exhaust port; Port 2(B)/4(A) is the output port.
⑩	Joint	A replaceable cartridge type one-touch joint
⑪	Stopper pin	Secures cartridge type joints or the like.
⑫	Piping adapter	Supplied attached to the direct piping type valve unit.
⑬	Mounting hole	For direct mounting
⑭	Mounting plate	Used for vertical mounting of the direct piping type valve unit.
⑮	Manifold base	
⑯	Masking plate	Removed when an additional valve unit is installed.
⑰	Stopper plate	Secures cartridge type joints or the like.
⑱	Electric component block	Includes and secures a printed circuit board with intermediate connectors.
⑲	Wiring cover	Protects the cables inside. Keep the cover closed when using the valves.
⑳	DIN rail	
㉑	DIN rail mounting screw	One screw (4G1) or two screws (4G2/3) are used at each of the two ends of the base for securing the entire manifold to the DIN rail. Use a flat-end screwdriver to tighten the screws.
㉒	Holder	With 4G2/3 only, one holder is used at each of the two ends of the base. The holders are used together with the DIN rail mounting screws.
㉓	Spare cable	For additional valve installation
㉔	Power indicator light	Lit when the power is supplied with right polarities.
㉕	20-pin connector	Combines the manifold valve control terminals.
㉖	Power terminal block	Used when an external power supply is required.
㉗	Power polarity marking	
㉘	D-sub 25-pin connector	Combines the manifold valve control terminals.
㉙	Connector lock screw	Locks the mating connector. (M2.6)
㉚	Lock screw	Loosened to allow changing the direction for leading out the connected cable; tightened to lock the direction.
㉛	Common terminal stand (14 poles)	A common stand for the control terminals of the manifold electromagnetic valve.
㉜	Cover	Keep closed while in use to prevent an electric shock.
㉝	Indicates the layout of the terminal stand.	Terminal stand layout drawing Indicates the layout of the terminal stand. Paper can be removed for use as a TAG for taking notes.
㉞	DIN terminal stand bon	A green power indicator lamp is lit while the solenoid is energized.
㉟	Coil assembly	This coil assembly is for the DIN terminal box type only; not interchangeable with the coil assembly ③.
㊱	Socket with cover	Comes with a covered cabtyre type lead wire; can be used with the E type

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

2.1 Port Indication

Each piping port is marked with ISO and JIS conformable piping port indication codes like 1P and 4A.

Application	ISO	JIS
Supply port	1	P
Output port	4	A
Output port	2	B
Exhaust port	5	R1
Exhaust port	3	R2

- There are no rules applicable to the solenoid valve mounting attitude. Between our 4G Series and 4K Series models, the positions of Ports 4(A) and 2(B), and also the positions of Ports 5(R1) and 3(R2), are reversed. Check the port indication codes carefully before connecting the pipes to prevent reversed operation of the cylinder and other components.

2.2 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):
$1kgf/cm^2 \rightarrow 0.980665MPa$, $1MPa \rightarrow 1.01972 \times 10 kgf/cm^2$

- 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	1.013323	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

⚠ WARNING 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) Vibration resistance and Shock resistance
- Do not subject the solenoid valve system to vibrations 50m/s² or stronger or shocks 300m/s² 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.

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.

⚠ CAUTION If you choose to mount the solenoid valve manifold on a DIN rail, make sure that the DIN rail is strong enough.
- If a DIN rail is not strong enough, directly mount the manifold on a manifold base.

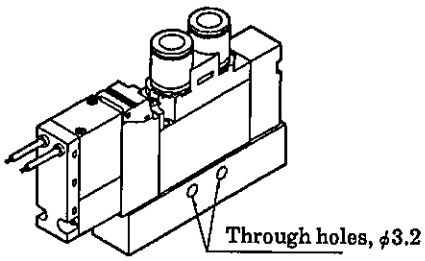
4.2.1 A work space for installation, removal, wiring, and piping operations should be provided around the installed solenoid valve system.

4.2.2 Direct mounting

The 4GA2 and 4GA3 Series direct piping type valve units can be installed with (a) through holes or (b) female-threaded screw holes. If you choose to install the valve unit using the female-threaded screw holes, observe the specified tightening torque.

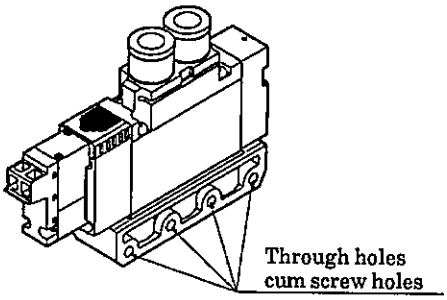
4GA1 Series

(a) Two through holes



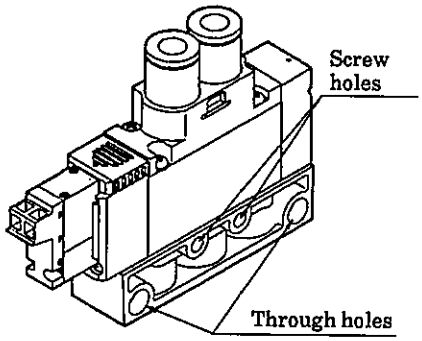
4GA2 Series

Four through holes (a) cum screw holes (b)



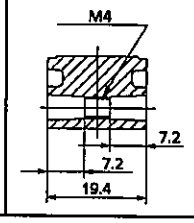
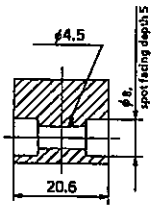
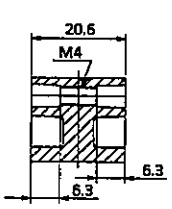
4GA3 Series

(a) Two through holes; (b) Two screw holes (different holes)



Tightening torque 0.7 to 1.2 N·m

Mounting hole dimensions

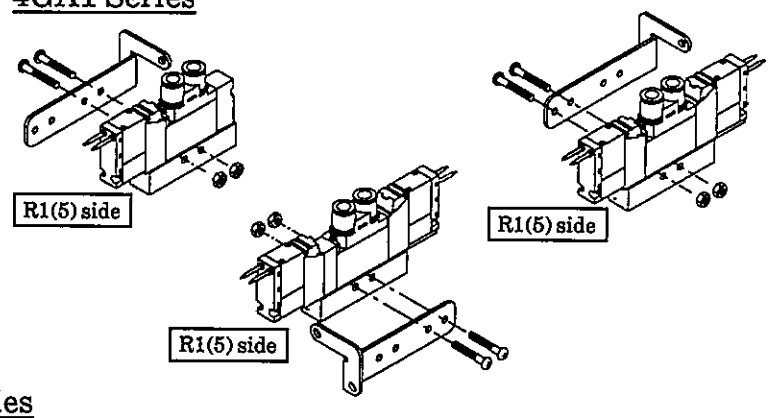
	4GA2	4GA3	
	(a) cum (b)	(a) Through hole	(b) Screw hole
Mounting hole profile			

4.2.3 Installation using the mounting plate (P)

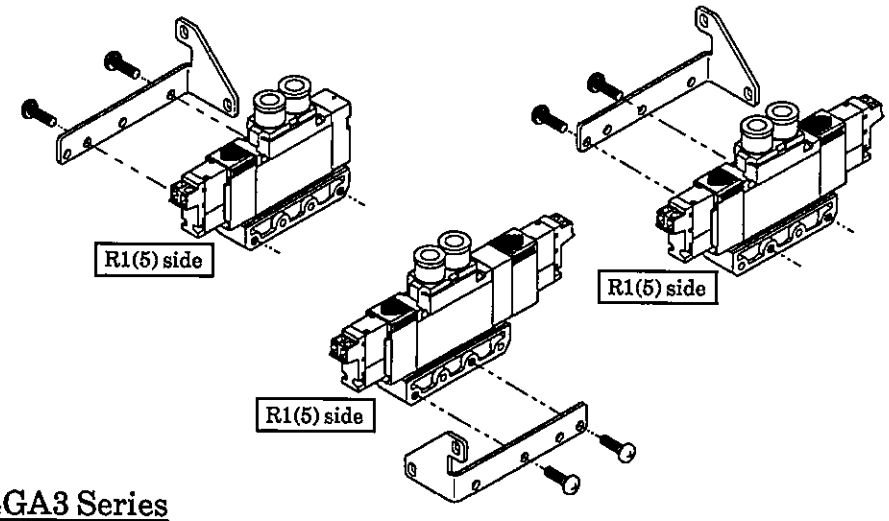
The way to attach the mounting plate (P) to a direct piping type valve unit differs among the single type, double type, and three-position valves. Pay careful attention to the screw holes and the orientation of the attached mounting plate. The improper attachment of the mounting plate may result in a fracture.

● Installation using a mounting plate

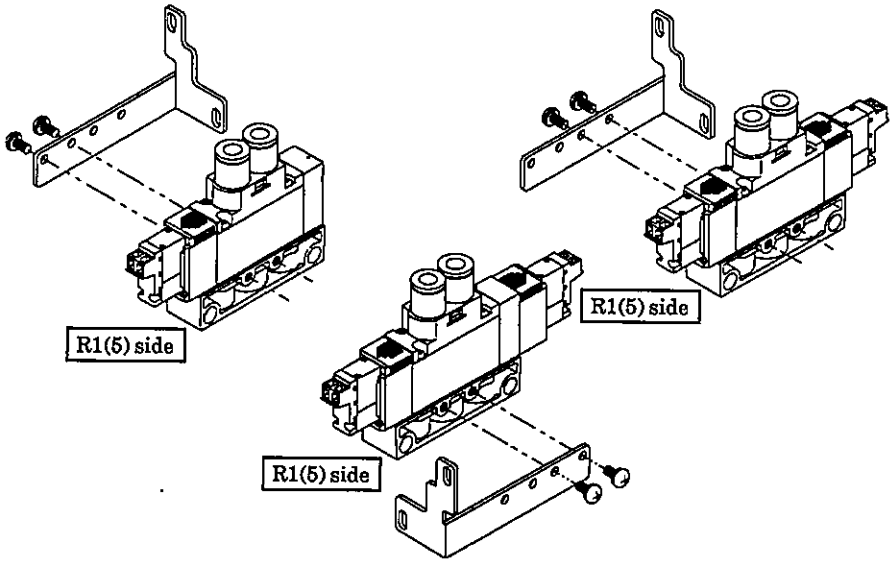
4GA1 Series



4GA2 Series



4GA3 Series

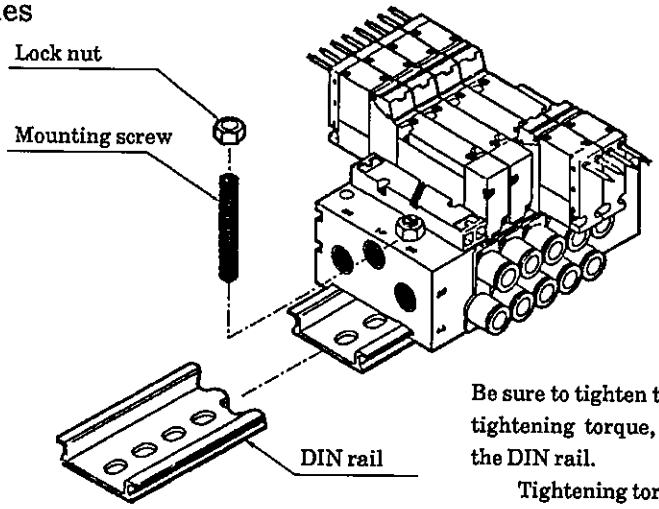


4.2.4 Installation using a DIN rail

With the M4G Series solenoid valve systems, you can replace the direct mounting type manifold with the DIN rail mounting type manifold. Note, however, that if the system is not properly mounted to the DIN rail it may fall and break the manifold. If the manifold is to be used in an environment where it can be subjected to vibrations and shocks, secure the DIN rail to the mounting surface by applying screws at intervals of 50 mm, and check that it is securely mounted before using the manifold.

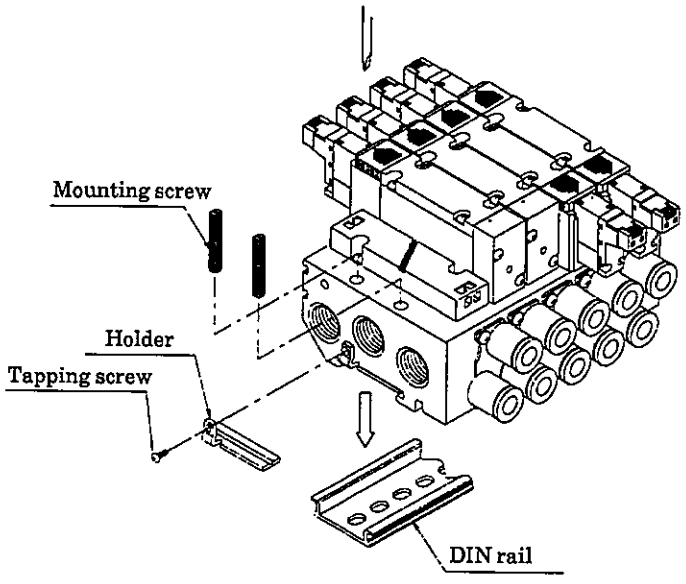
- Installation using a DIN rail

M4G1 Series

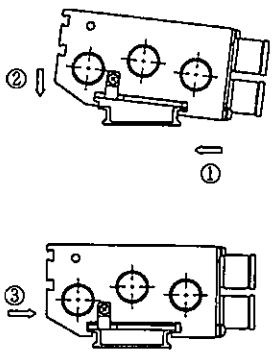


Be sure to tighten the lock nut. An excessive tightening torque, however, may disfigure the DIN rail.
Tightening torque: 0.3 to 0.5 N·m

M4G2 Series
M4G3 Series



1. Install the holder.
   (And apply a tapping screw to keep it at the position.)
2. Lightly tighten the mounting screws.
3. Engage the jaws (first ① and then ②) with the DIN rail.
4. Press in the direction ③.
5. Tighten the mounting screws to the specified tightening torque.
   Tightening torque: 0.7 to 1.0 N·m



4.2.5 Direct mounting

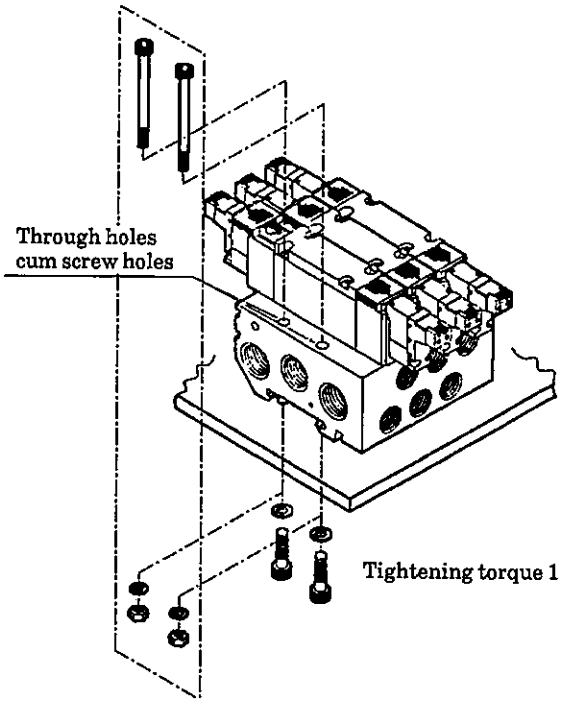
With the M4G2/3 Series solenoid valve systems, two ways of mounting are available. One way is to apply through bolts through the bolt holes that have openings at both sides of the top surface of the manifold base.

Another way is to apply bolts to the bolt holes that have openings on the bottom surface of the manifold base.

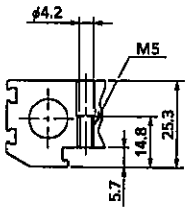
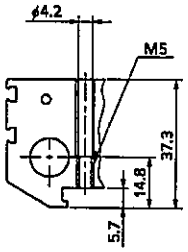
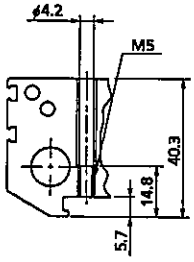
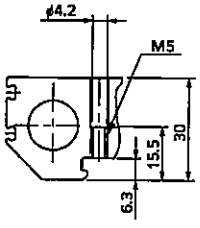
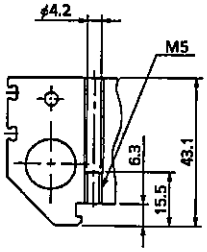
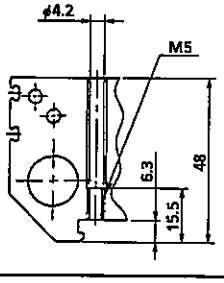
If you choose to use the female-threaded bolt holes shown below, check the depth of the bolt holes and choose mounting bolts that can be screwed in for 10 threads or more. Be sure to observe the tightening torque. Improper mounting may fracture the bolts.

● Mounting method

M4G2 · 3 Series



Mounting hole diameters (profile)

	Standard manifold (Internal pilot)		External pilot
	M4GA (Direct piping)	M4GB (Base piping)	M4G-K
M4G2			
M4G3			

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.
- With a female thread type for 4GA2, 4GA3 valve, The parts can deform if the A,B ports is of the excessive torque and be a factor of air leakage.

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 5μm 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.

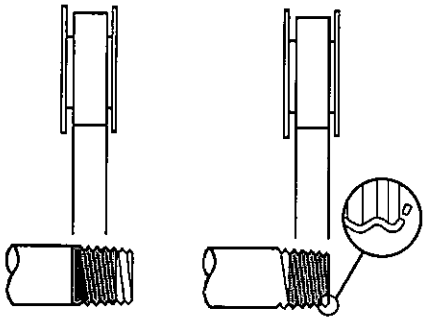
Tightening torque

Joint screw	Tightening torque N·m
M3	0.3 - 0.6
M5	0.5 - 1.0
Rc1/8	3 - 5
Rc1/4	6 - 8
Rc3/8	13 - 15

4.3.1 Seal material

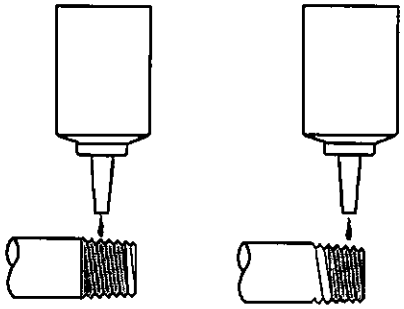
When using seal material, take care to avoid getting it in the pipes or overflowing on the exterior surface of the pipes.

● Seal Tape



(Right) (False)

● Sealant (Paste or liquid)



(Right) (False)

When applying fluororesin sealing tape to the screw threads, wind the tape two or three times around the threads but leave the one or two threads at the pipe end uncovered. Firmly press the tape against the threads using the tip of your fingernail. When applying liquid type seal material, apply the material to all the threads except one or two threads at the pipe end and take care not to apply too much of it.

Never apply the seal material to the female threads in the device side piping port.

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 M5 joint

An M5 joint is sealed using a gasket (Model No. for the gasket only: FGS). Do not retighten the joint screw when pressure is generated in the pneumatic circuit. Design and construct the piping system in such a way that the valves may be removed and reinstalled if a trouble should happen.

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
ϕ12	ϕ8.9	ϕ8

Outside diameter allowance

Soft or hard nylon	±0.1mm
Urethane ϕ4、6	+0.1mm −0.15mm
ϕ8、10、12	+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
ϕ12	55	50

(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

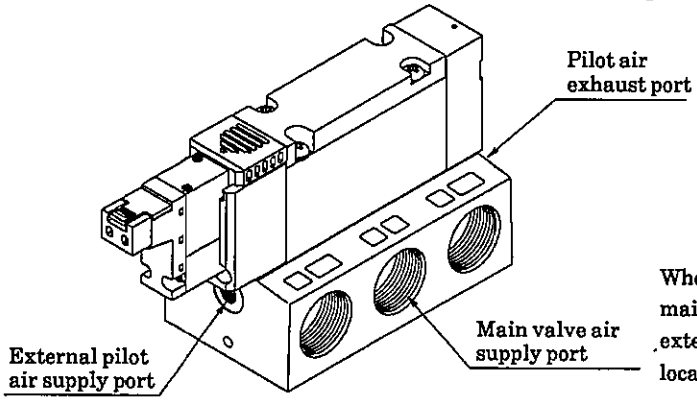
4.3.7 External pilot (K) type piping port

With the external pilot (K) type solenoid valve system, a port is dedicated for use as the pilot air exhaust port. Each of the pilot air supply and exhaust ports is a port with M5 screw threads. Be careful not to make a mistake in connecting pipes to the ports. Such a mistake will cause a malfunction.

Port indication:

Application		Indication (ISO conformable)
Pilot air	Supply port	12/14
	Exhaust port	82/84

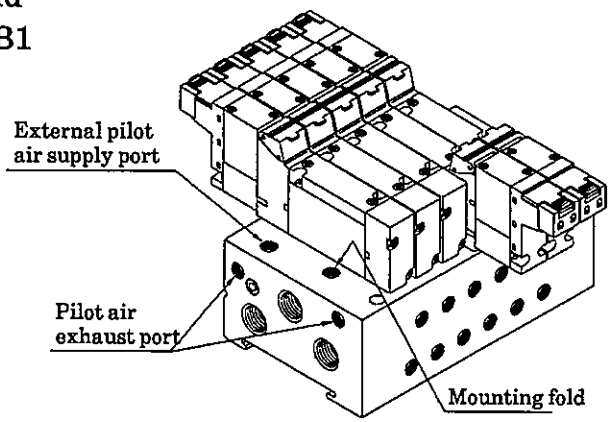
- Base piping type valve unit (common to 4GB1 through 4GB3)



When you are facing toward the main valve air supply port, the external pilot air supply port is located to the left.

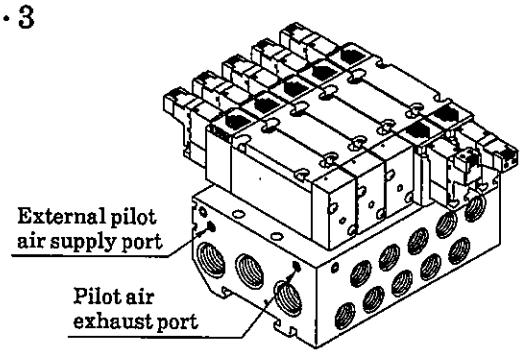
- Manifold

M4GB1



Each of the two external pilot air supply ports has an opening on the upper surface of the manifold. One is located at one side of the manifold; one at another side.

M4GB2 · 3



Each of the two external pilot air supply ports has an opening on a side of the manifold far from the A and B ports. One is located at one end face of the manifold; one at another end face.

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).

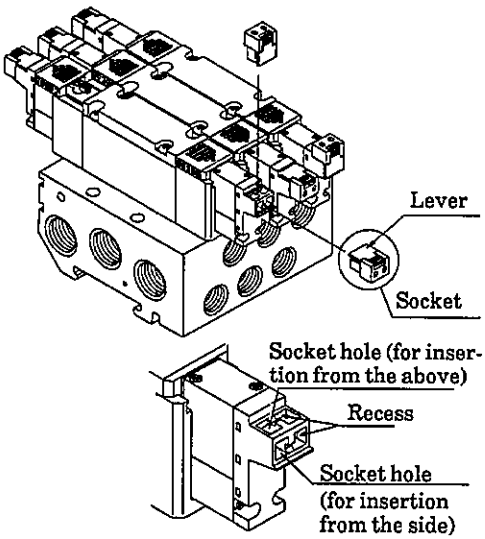
4.4.1 Using E-type connectors

The E-type connectors allow the insertion of sockets from above or from the side. The connectors are already installed to the sockets when the product is delivered. The user, however, may change the socket insertion direction to suit the chosen method of installation.

1) Installing and removing the sockets

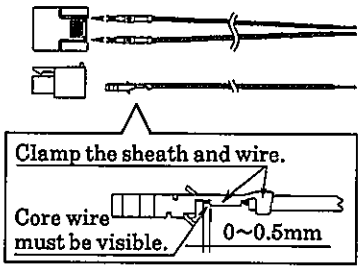
(1) To install a socket, hold the lever and socket unit using your fingers and insert them straight into the socket hole in the connector unit. Then engage the jaws of the lever with the recesses on the connector unit to lock the socket at its position. If you are inserting the socket from the above, the lever should face toward you as you insert the socket. If you are inserting the socket from the side, the lever should face upward as you insert the socket.

(2) To remove a socket, press its lever downward, disengage the jaws from the recesses, and pull it straight out from the socket hole.



2) Connecting lead wire

(1) Remove the sheath of the lead wire for about 3 mm at the end. Prepare the ends of the core wires, insert them into the contact terminals, and clamp them using a caulking tool. At this time, make sure that you clamp both the sheath and core wire and that the bare end of the core wire is visible (0.5 mm max.).

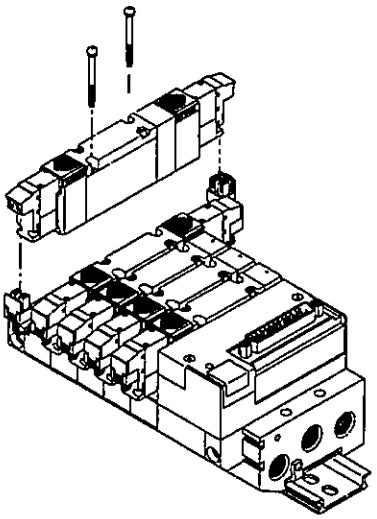


Caulking tool (Mitsumi Denki H4-M31)

(2) After clamping the lead wire, orient the contact terminals as shown in the figure to the right and insert them into the socket until they are locked in position. Then lightly pull the wire to check if the terminals are properly locked.

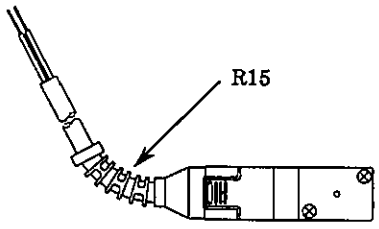
4.4.2 Using A-type connectors

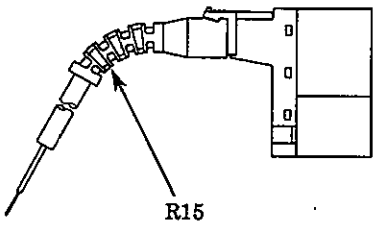
The A-type connectors are designed specially for use with a reduced-wiring type manifold. They allow the insertion of sockets from below. The instructions and precautions given above for the installation and removal of sockets to and from the E-type connectors apply to the A-type connectors as well.



4.4.3 Using E(J-type (socket type with cover) connectors

When bending the lead wires, the dimensions shown in the Figure below must be observed as bending limits.





4.4.4 Using the DIN terminal box

1) Disassembly

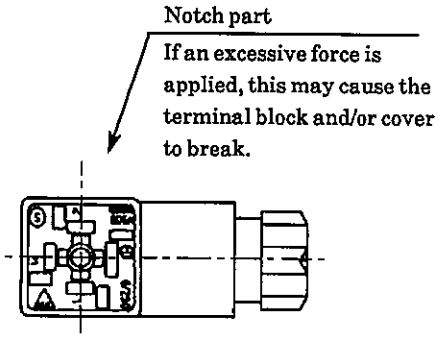
(1) Loosen the screw ①and pull the cover ② in the direction of the screw ①to disconnect the connectors from the coil assembly ⑫.

(2) Pull out the screw ①from the cover ②.

(3) The notch part ⑨ (next to the GDSN mark) is provided on the bottom of the terminal block ③. Insert a small standard screwdriver into the gap between the housing ② and terminal block ③, and then pry it. The terminal block ③ is then removed from the cover ②. (See Figure 1.)

At this time, do not apply an excessive force to remove the terminal block. Doing so may cause the terminal block and/or cover to break.

(4) Remove the cable gland ④, and then take out the washer ⑤ and rubber packing ⑥.



<Figure 1>

2) Wiring

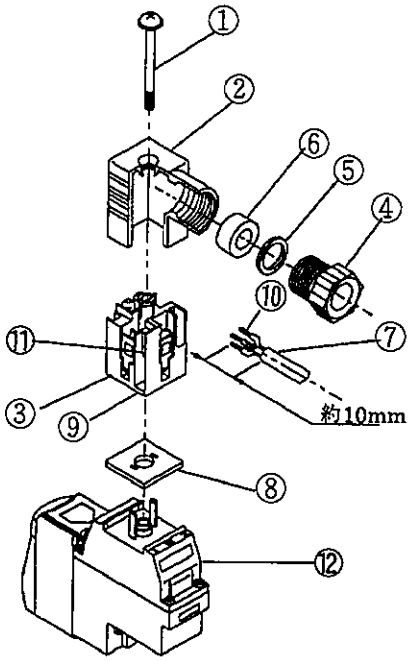
(1) Crimp the lead wires (stranded wires) of the cable ⑦ on the bar terminal ⑩. (The crimping terminals must be prepared by the customer. If the cable wire is a type of solid wire, the bar terminals are not necessary. Additionally, even if the stranded wires are bare wires, the wiring can also be performed.)

Note 1: Do not perform the wiring of the stranded wires, the ends of which are solder-finished.

Note 2: Connect the cable wires to terminals 1 and 2. Note that there are no polarities.

(2) Pass the cable gland ④, washer ⑤, and rubber packing ⑥through the cable ⑦ in that order and insert the cable into the cover ②.

(3) Loosen the screw ⑪on the terminal block ③ and insert the terminal ⑩. Retighten the screw ⑪.



<Exploded view>

Remarks:

a. The recommended tightening torque is 0.2 to 0.25 N·m.

b. The applicable outside dimension of the cable ⑦ conforms to VCTF2 (3) core wire (ϕ3.5 - 7) specified in JIS C 3306.

c. The stripping length of the lead wire sheath of the cable ⑦is approximately 10 mm.

d. For the crimping terminal, H0.5/6 (0.3 to 0.5 mm^2) or H0.75/6 (0.75 mm^2) made by Weidmuller, or its equivalent terminal can be used.

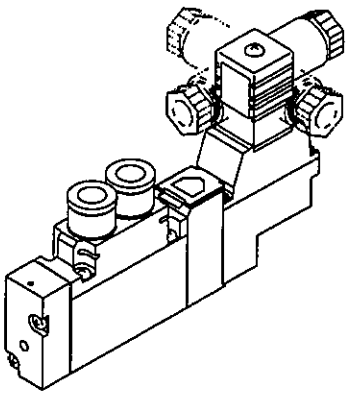
3) Assembly

(1) Set the terminal block ③, to which the cable wires are connected, on the cover ②. (Press-fit the terminal block until a click sounds.)

● It is possible to set the terminal block in any of four directions.

(2) Put the rubber packing ⑥ and washer ⑤ in the cable lead-in port of the cover ② in that order. Additionally, tighten the cable gland ④ firmly.

Remarks:The reference tightening torque of the cable gland is 10. to 1.5 N·m.



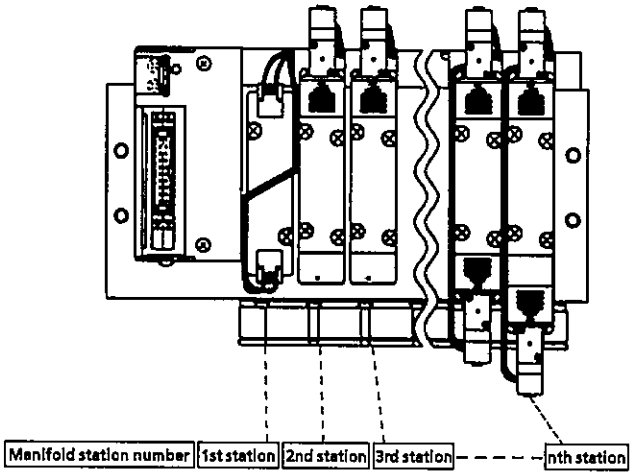
<Figure2>

(3) Put the gasket ⑧in the part between the bottom of the terminal block ③and the plug of the coil assembly ⑫, and insert the connector. Put the screw ① from the top of the cover ② and tighten it.

4.4.5 Flat cable type : The connector for the T50

(1)Flat cable connector

The connector used in the T50 complies with the MIL standard (MIL-C-83503).Its flat-cable press-connection design makes wiring work easy. Pin numbers may differ from one PLC manufacturer to another, but their functions are the same. Use the connector and the reversed triangle mark in the drawing below as a reference point for arrangement. The triangle mark serves as a reference point for both the plug and the socket. The manifold stations are set one by one from left to right with the piping port in the front.



(2) Cautions regarding the connector type (T50)

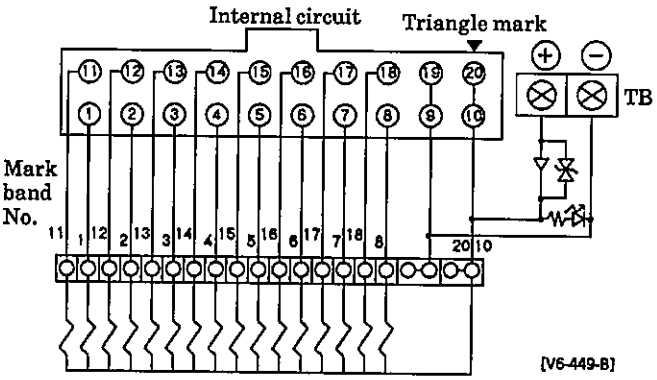
① It is necessary to match the signal arrangement of the PLC output unit and that of the valve side. Since direct connection with the PLC is limited, use cables specified by the PLC manufacturer.

② The operation power is DC24V or DC12V.

③ When driving the T50 by an ordinary output unit, use the + terminals (20, 10) of the 20-P connector as the + side common and use an NPN transistor output open collector type as the drive circuit.

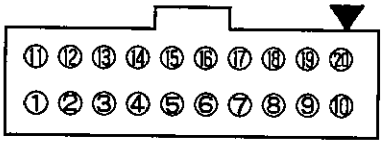
④ Make sure to connect the manifold to the output unit. Never connect it to the input unit as a problem will involve not only this unit, but also other related equipment as well, seriously aggravating the situation.

⑤ Voltage drops will occur depending on cable lengths or at the time of simultaneous power supply. Make sure that a voltage drop for the solenoid is within 10% of the rated voltage.



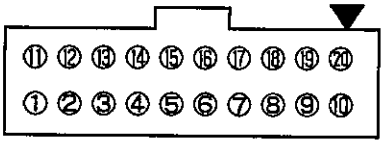
(3) Wiring method

● Single solenoid valve (up to 16 manifold stations).



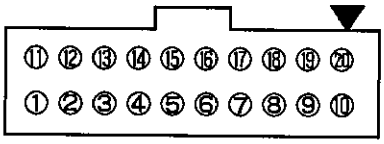
Pin No.	11	12	13	14	15	16	17	18	19	20
Valve No.	9a	10a	11a	12a	13a	14a	15a	16a	− Power	+ Power
Pin No.	1	2	3	4	5	6	7	8	9	10
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	− Power	+ Power

- Double solenoid valve (up to 8 manifold stations).



Pin No.	11	12	13	14	15	16	17	18	19	20
Valve No.	5a	5b	6a	6b	7a	7b	8a	8b	− Power	+ Power
Pin No.	1	2	3	4	5	6	7	8	9	10
Valve No.	1a	1b	2a	2b	3a	3b	4a	4b	− Power	+ Power

- Mixed (single,double) solenoid valve (up to 16 solenoids).



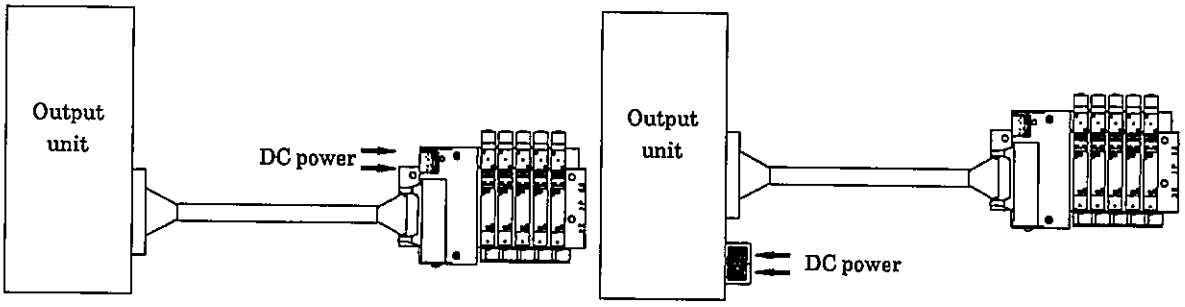
Pin No.	11	12	13	14	15	16	17	18	19	20
Valve No.	7a	7b	8a	9a	10a	10b	11a	11b	− Power	+ Power
Pin No.	1	2	3	4	5	6	7	8	9	10
Valve No.	1a	2a	3a	3b	4a	4b	5a	6a	− Power	+ Power

Note : The numbers in valve No. 1a, 2a, 2b...indicate the station No.1, station No.2 and so on, while the alphabets a and b mean, respectively, the solenoid on the side a and the solenoid on the side b.

(4) Power supply

The terminal stand is designed to accept power supplied from an external source when such outside power supply is needed. Supply the power to the wiring block or the input/output unit in the manner as shown in the following drawings. The power indicator lamp comes on after the connection has been made correctly. For wiring, check the polarity marks on the cover. Wiring errors cause malfunctions.

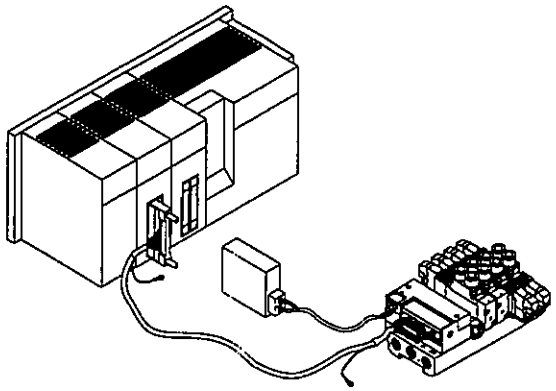
M3×6 screws are used for the terminal stand. Use M3 screws 6.4 or less in width to fasten the crimp terminals at the tightening torque of 0.3 to 0.5 N · m.



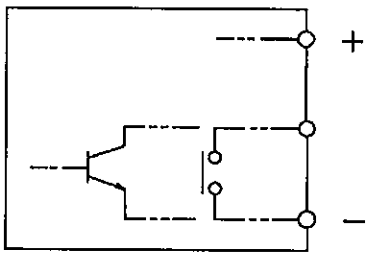
(5) Connection to PLC

ⓐ The units described below can be directly connected to the output unit by the designated cable. Make sure to have the combinations right, as combination errors may cause serious problems. Use cables designated by the manufacturer.

Manufacturer	PLC model	Connecting cable model
OMRON Corporation	Model C200H-0D215 Model C500-0D415CN	Model G79-□C
	Model C500-0D213	Model G79-0□DC-□
Matsushita Electric Works, Ltd.	AFP33484	AY15133~7
	AFP53487	AY15223~7
Idec Izumi Corporation	PF3S-T32K	The same specifications as OMRON's



ⓑ When making a connection to units other than the PLC mentioned above, make sure that the signal line and power line are wired correctly. Even if the connectors have the same shape, their pin arrangements may not be the same with different manufacturers or unit types. Check the pint arrangement before the wiring. For the output unit, use one with a contact between the minus side of the power source and the output point, or one with an NPN transistor open collector output.



[V1-407-0]

4.4.6 Flat cable connector type : The connector for the T51

(1) Cautions regarding the connector type (T51)

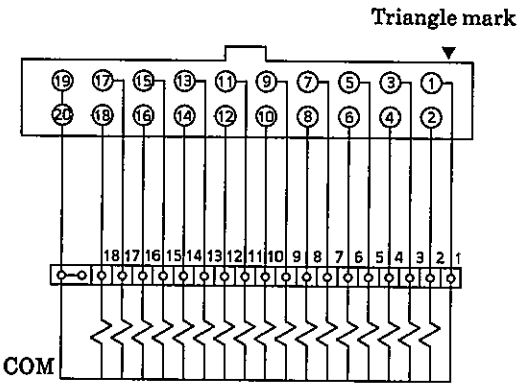
① The order of signals in the PLC output unit should match the order of signals in the solenoid valve system.

② The operation power is DC24V or DC12V.

③ With the T51 type wiring, a general output unit should be used to drive the manifold.

④ Make sure to connect the manifold to the output unit. Never connect it to the input unit as a problem will involve not only this unit, but also other related equipment as well, seriously aggravating the situation.

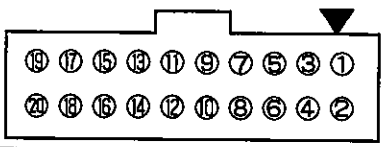
⑤ Voltage drops will occur depending on cable lengths or at the time of simultaneous power supply. Make sure that a voltage drop for the solenoid is within 10% of the rated voltage.



(2) Wiring method

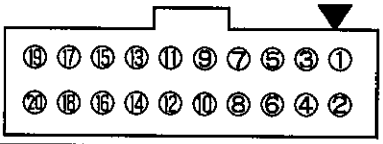
※ :The numbers in valve No. 1a, 2a, 2b...·indicate the station No.1, station No.2 and so on, while the alphabets a and b mean, respectively, the solenoid on the side a and the solenoid on the side b.
The maximum number of stations on the manifold differs among the models. Refer to the specifications of the model you purchased.

● Single solenoid valve (up to 18 manifold stations).



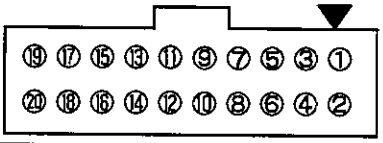
Pin No.	19	17	15	13	11	9	7	5	3	1
Valve No.	COM	17a	15a	13a	11a	9a	7a	5a	3a	1a
Pin No.	20	18	16	14	12	10	8	6	4	2
Valve No.	COM	18a	16a	14a	12a	10a	8a	6a	4a	2a

- Double solenoid valve



Pin No.	19	17	15	13	11	9	7	5	3	1
Valve No.	COM	9a	8a	7a	6a	5a	4a	3a	2a	1a
Pin No.	20	18	16	14	12	10	8	6	4	2
Valve No.	COM	9b	8b	7b	6b	5b	4b	3b	2b	1b

- Mixed (single,double) solenoid valve
(The maximum number of solenoids is 18 but restricted by the maximum number of stations on the manifold.)



Pin No.	19	17	15	13	11	9	7	5	3	1
Valve No.	COM	12a	11a	10a	8a	7a	5a	4a	3a	1a
Pin No.	20	18	16	14	12	10	8	6	4	2
Valve No.	COM	13a	11b	10b	9a	7b	6b	4b	3b	2b

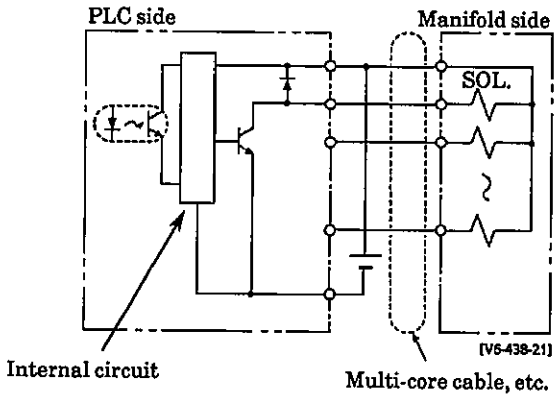
(3) Connection to PLC

The common wiring has been internally done on the manifold side.

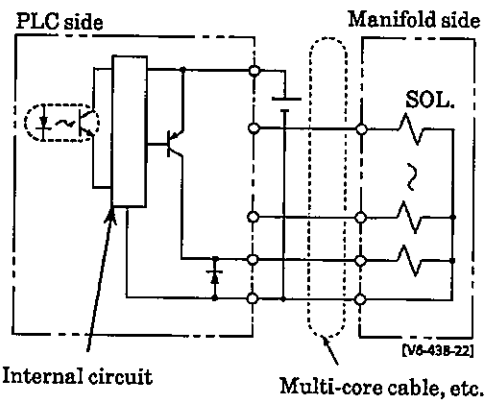
Since the electromagnetic valve has no polarity, it can be connected to either the NPN output or PNP output of the DC output unit of the PLC.

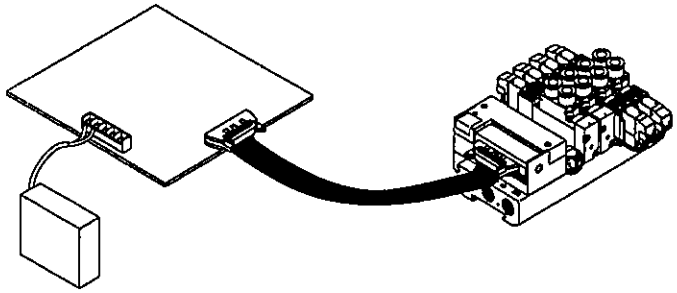
Wire each unit in the following manner.

DC output unit (NPN output)



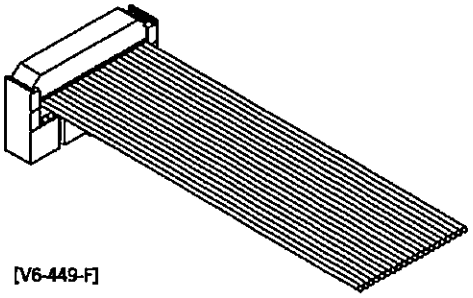
DC output unit (PNP output)





(4) Cable production

To produce a connecting cable, we recommend the following equipment for the valve side. Make a correct selection and connection of the cable according to the catalog data sheet. The equipment shown here all complies with the MIL standard (MIL-C-83503); thus, there are many others that can be also used for connection, but their locking mechanism may not be suitable.



[V6-449-F]

If so, secure the lock lever with a band.

- Socket XG4M-2030 (OMRON Corporation)
  Strain relief XG4T-2004
- Loose wire press-connect connector XG5M-2032 (OMRON Corporation)
- Loose wire press-connect connector XG5M-2035 (OMRON Corporation)

(5) Cable

The system uses flat cables or slender multi-conductor cables.

As these cables have fine core wires, it should be checked that they have enough mechanical strength and electric capacity.

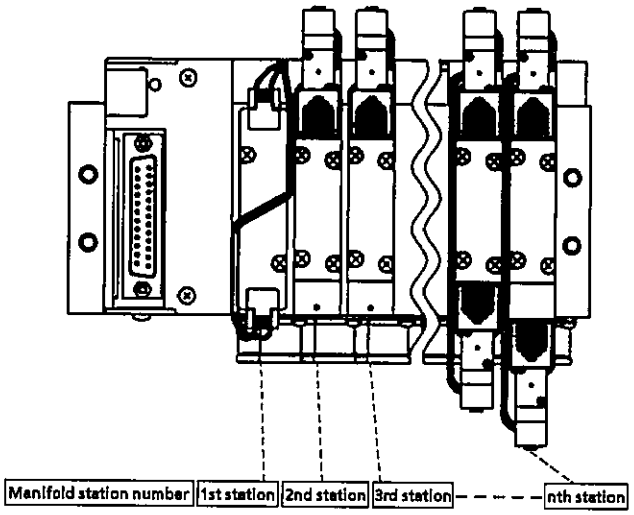
- Make sure to make a rounded corner (R) when bending the flat cable.
- The cable has large electric resistance (AWG28, approx. 0.22 ohm/m). Pay special attention to voltage drop along the cable.

4.4.7 D sub-connector type : The connector for the T30

(1) T30 connector

The connector for the T30, which is usually called the D sub-connector, is widely used in FA and OA equipment. The 25P type, in particular, is the connector specified in the RS232C standard for use in personal computer communication.

Manifold stations are arranged from left to right with the piping port in the front.



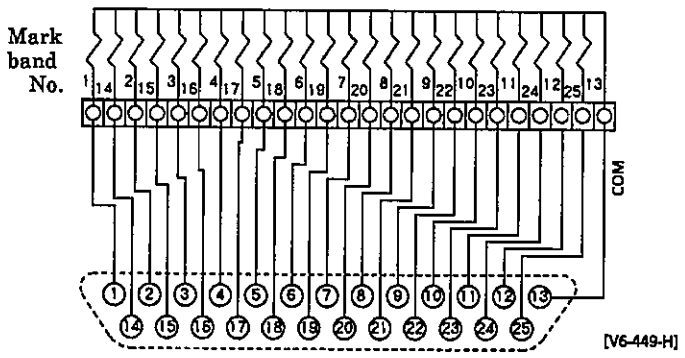
(2) Cautions regarding the connector type (T30)

① It is necessary to match the signal arrangement of the PLC output unit and that on the valve side.

② The operation power is DC24V or DC12V.

③ Voltage drops will occur depending on cable lengths or at the time of simultaneous power supply. Make sure that a voltage drop for the solenoid is within 10% of the rated voltage.

Internal circuit



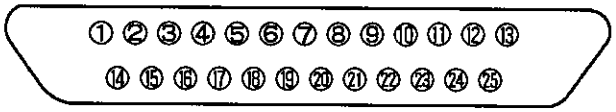
(3) Wiring method

The maximum number of stations on the manifold differs among the models. Refer to the specifications of the model you purchased.

- Single solenoid valve

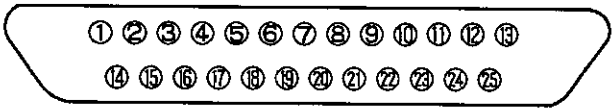
Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Valve No.	1a	3a	5a	7a	9a	11a	13a	15a	17a	19a			COM
Pin No.	14	15	16	17	18	19	20	21	22	23	24	25	
Valve No.	2a	4a	6a	8a	10a	12a	14a	16a	18a	20a			

- Double solenoid valve (up to 12 manifold stations).



Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	COM
Pin No.	14	15	16	17	18	19	20	21	22	23	24	25	
Valve No.	1b	2b	3b	4b	5b	6b	7b	8b	9b	10b	11b	12b	

- Mixed (single, double) solenoid valve (up to 24 solenoids).



Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Valve No.	1a	3a	4a	5a	7a	8a	10a	11b	12b	14a	16a	18a	COM
Pin No.	14	15	16	17	18	19	20	21	22	23	24	25	
Valve No.	2a	3b	4b	6a	7b	9a	11a	12a	13a	15a	17a	18b	

Note : The numbers in valve No. 1a, 2a, 2b... indicate the station No.1, station No.2 and so on, while the alphabets a and b mean, respectively, the solenoid on the side a and the solenoid on the side b.

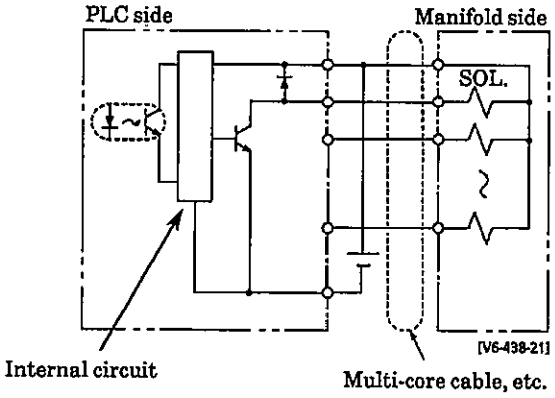
(4) Connection to PLC

The common wiring has been internally done on the manifold side.

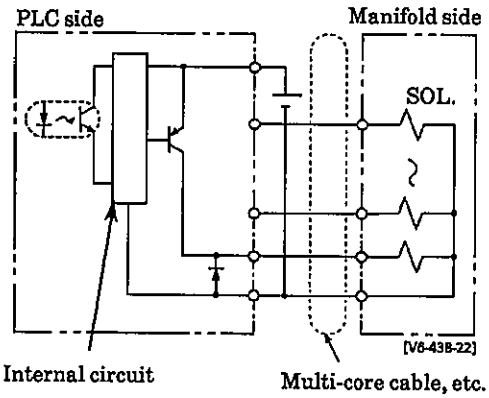
Since the electromagnetic valve has no polarity, it can be connected to either the NPN output or PNP output of the DC output unit of the PLC.

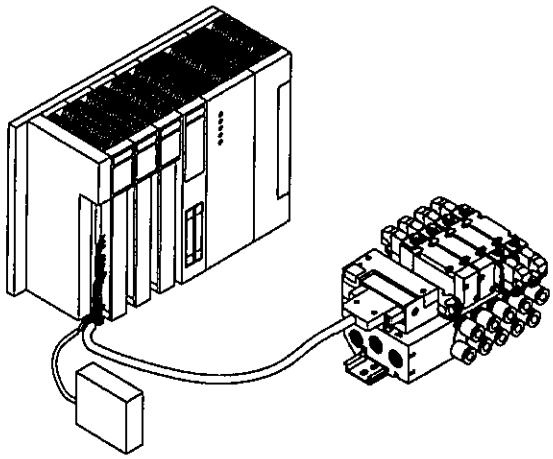
Wire each unit in the following manner.

DC output unit (NPN output)



DC output unit (PNP output)





(5) Cable production

We recommend the following for the valve side in the production of the connection cable.

Name	Model	Manufacturer
D sub-connector socket solder type	HDBB-25S	Hirose Electric Co., Ltd.
D sub-connector socket solder type	JAZ-25S	Nippon Atchaku Tanshi
D sub-connector socket crimp type	CDB-25S	Hirose Electric Co., Ltd.
D sub-connector socket crimp type	JAC-25S	Nippon Atchaku Tanshi
Plug case (for the solder type) (with M2.6 screw)	HDB-CTF	Hirose Electric Co., Ltd.
Plastic cover with M2.6 screw	JCB-25M	Nippon Atchaku Tanshi

Avoid the use of the press-connect type as much as possible as it has small electric capacity and the fine core wire of the able causes large voltage drop.

Discontinue

(6) CKD cable specifications

(CKD cables of the following models can be used)

Model

N4T – Cable – D 0 [※1] – [※2]

※1 Connecting method on the user side

0	Cutting only
1	With round crimp terminal for M3.5 screws

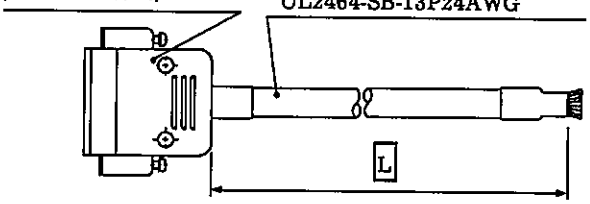
※2 Cable length

1	1m
3	3m
5	5m

○ N4T cable D00- [L]

HDBB-25S (Hirose Electric)

UL2464-SB-13P24AWG



[V6-438-23]

D sub-connector terminal numbers and core wires

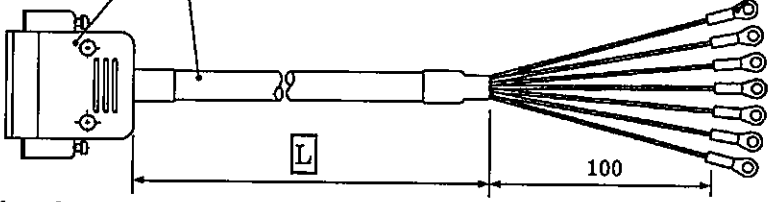
D sub-connector terminal No.		1	2	3	4	5	6	7	8	9	10	11	12	13
Wire end identification	Color of insulator	Orange	Orange	Yellow	Yellow	Green	Green	Gray	Gray	White	White	Orange	Orange	Yellow
	Kind of markings	1-dot									2-dots			
	Color of marking	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black

D sub-connector terminal No.		14	15	16	17	18	19	20	21	22	23	24	25
Wire end identification	Color of insulator	Yellow	Green	Green	Gray	Gray	White	White	Orange	Orange	Yellow	Yellow	Green
	Kind of markings	2-dots							3-dots				
	Color of marking	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black

○ N4T cable D01- [L]

HDBB-25S (Hirose Electric) Multi-core cable (UL2464-SB-13P24AWG)

Round crimp terminal (M3.5 screw)



[V6-438-24]

D sub-connector terminal numbers and core wires

D sub-connector terminal No.		1	2	3	4	5	6	7	8	9	10	11	12	13
Wire end identification	Color of insulator	Orange	Orange	Yellow	Yellow	Green	Green	Gray	Gray	White	White	Orange	Orange	Yellow
	Kind of markings	1-dot										2-dot		
	Color of marking	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black
Marked tube No.		1	2	3	4	5	6	7	8	9	10	Cut off	Cut off	13

D sub-connector terminal No.		14	15	16	17	18	19	20	21	22	23	24	25
Wire end identification	Color of insulator	Yellow	Green	Green	Gray	Gray	White	White	Orange	Orange	Yellow	Yellow	Green
	Kind of markings	2-dot							3-dot				
	Color of marking	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black
Marked tube No.		14	15	16	17	18	19	20	21	22	23	Cut off	Cut off

Use the D00 type described above for 20 or more points.

4.4.8 Common terminal stand type (T10, 11)

(1) Caution with the common terminal stand type (T10, 11)

① Centralize the manifold power as the common wiring has been internally processed for the common terminal stand type. With an independent contact PLC output unit, carry out contact common wiring.

② Check the manifold stations and corresponding solenoids. Make sure that there is no error in wiring (see the table below).

③ The system is not functional if the number of solenoids exceeds 14 (T10) or 24 (T11).

④ Manifold stations are arranged one by one from left to right with the piping port in the front.

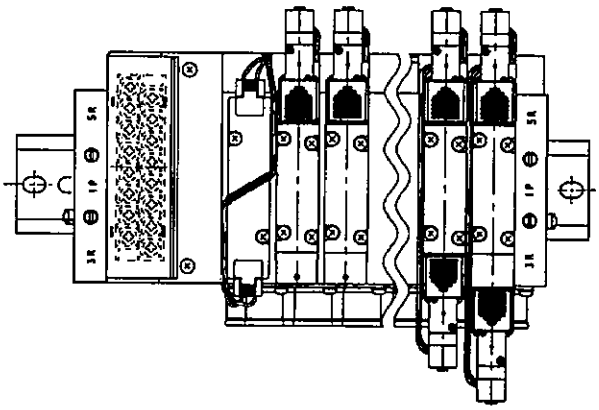
⑤ Voltage drops will occur depending on cable lengths or at the time of simultaneous power supply. Make sure that a voltage drop for the solenoid is within 10% of the rated voltage.

⑥ Either a round terminal or an Y terminal can be used for the wiring method T10.

⑦ Proper tightening torque of the wiring screw is as shown below.

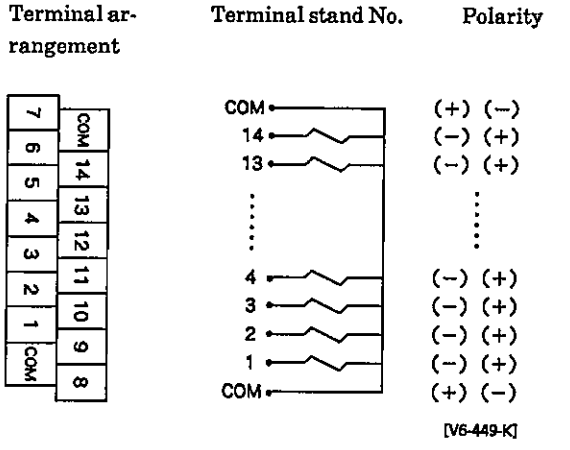
(N·m)

Wiring mode	Tightening torque
T10	0.6
T11	0.3

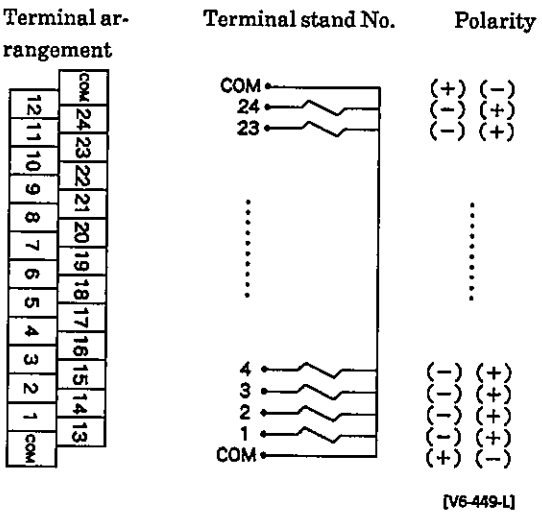


(2) Wiring method

T10 internal wiring (up to 14 solenoids)



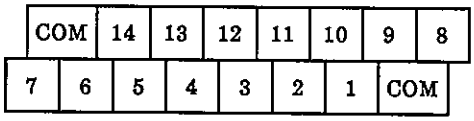
T11 internal wiring (up to 24 solenoids)



(3) Wiring method T10

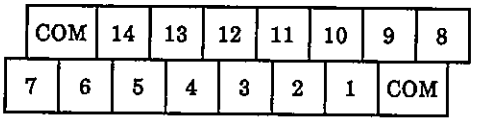
The maximum number of stations on the manifold differs among the models. Refer to the specifications of the model you purchased.

- Single solenoid valve



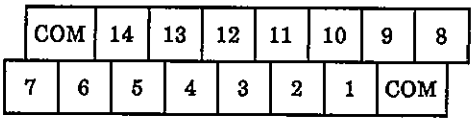
Terminal stand No.	1	2	3	4	5	6	7
Valve No.	1a	2a	3a	4a	5a	6a	7a
Terminal stand No.	8	9	10	11	12	13	14
Valve No.	8a	9a	10a	11a	12a	13a	14a

- Double solenoid valve (up to 7 manifold stations).



Terminal stand No.	1	2	3	4	5	6	7
Valve No.	1a	1b	2a	2b	3a	3b	4a
Terminal stand No.	8	9	10	11	12	13	14
Valve No.	4b	5a	5b	6a	6b	7a	7b

● Mixed (single, double) solenoid valve (up to 14 solenoids).



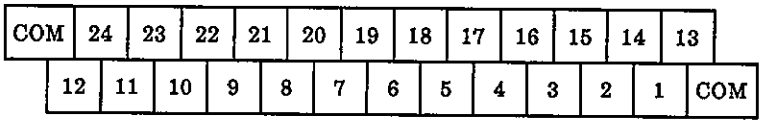
Terminal stand No.	1	2	3	4	5	6	7
Valve No.	1a	2a	3a	3b	4a	4b	5a
Terminal stand No.	8	9	10	11	12	13	14
Valve No.	6a	7a	7b	8a	9a	10a	11a

Note : The numbers in valve No. 1a, 2a, 2b... indicate the station No.1, station No.2 and so on, while the alphabets a and b mean, respectively, the solenoid on the side a and the solenoid on the side b.

(4) Wiring method T11

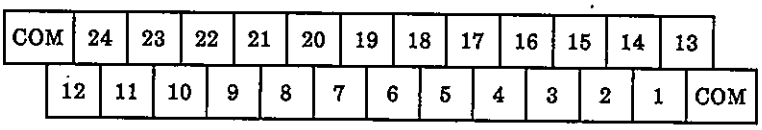
The maximum number of stations on the manifold differs among the models. Refer to the specifications of the model you purchased.

● Single solenoid valve



Terminal stand No.	1	2	3	4	5	6	7	8	9	10	11	12
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a
Terminal stand No.	13	14	15	16	17	18	19	20	21	22	23	24
Valve No.	13a	14a	15a	16a	17a	18a	19a	20a				

● Double solenoid valve (up to 12 manifold stations).



Terminal stand No.	1	2	3	4	5	6	7	8	9	10	11	12
Valve No.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b
Terminal stand No.	13	14	15	16	17	18	19	20	21	22	23	24
Valve No.	7a	7b	8a	8b	9a	9b	10a	10b	11a	11b	12a	12b

- Mixed (single, double) solenoid valve (up to 24 solenoids).

COM	24	23	22	21	20	19	18	17	16	15	14	13
12	11	10	9	8	7	6	5	4	3	2	1	COM

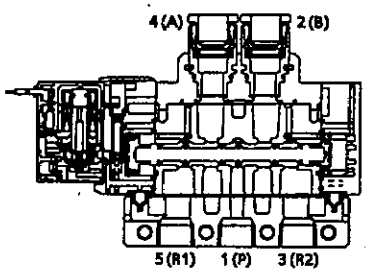
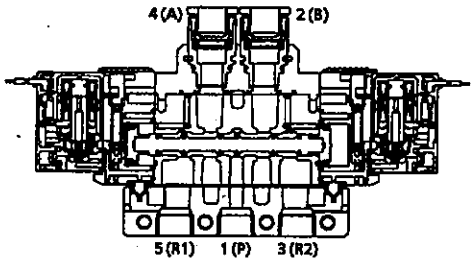
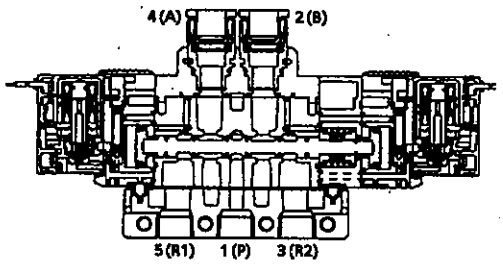
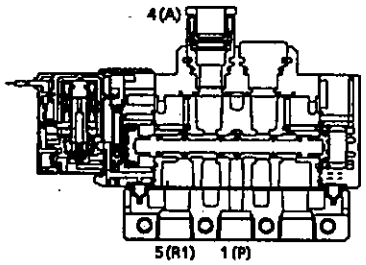
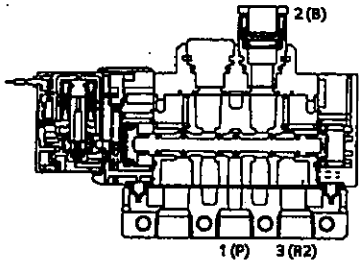
Terminal stand No.	1	2	3	4	5	6	7	8	9	10	11	12
Valve No.	1a	2a	3a	3b	4a	4b	5a	6a	7a	7b	8a	9a
Terminal stand No.	13	14	15	16	17	18	19	20	21	22	23	24
Valve No.	10a	11a	11b	12a	12b	13a	14a	15a	16a	17a	18a	18b

Note : The numbers in valve No. 1a, 2a, 2b... indicate the station No.1, station No.2 and so on, while the alphabets a and b mean, respectively, the solenoid on the side a and the solenoid on the side b.

5. OPERATING RECOMMENDATION

5.1 Operation

1) Valve operation

	Operating drawing	Operation
4G※10 Single		Power off (illustrated) 1 (P) → 2 (B) 4 (A) → 5 (R1) Power on 1 (P) → 4 (A) 2 (B) → 3 (R2)
4G※20 Double		Solenoid a energized 1 (P) → 4 (A) 2 (B) → 3 (R2) Solenoid b energized (illustrated) 1 (P) → 2 (B) 4 (A) → 5 (R1) The solenoids retain their switching position even after the power is turned off.
4G※30 4G※40 4G※50 3-position		Power off, 1 (P), 4 (A), 2 (B), 5 (R1) and 3 (R2) closed ※1 Power off, 1 (P) is closed, 4 (A), 2 (B) → 5 (R1), 3 (R2) ※1 Power off, 1 (P) → 4 (A), 2 (B) 5 (R1) and 3 (R2) is closed
3G※10 Normal close		
3G※110 Normal open		

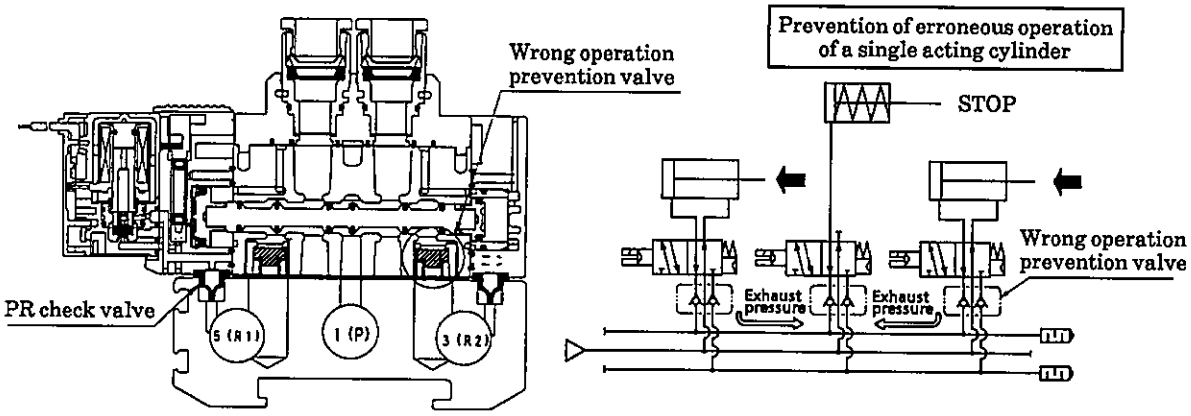
※1 Refer to the N4S010 for the operation of each solenoid when the power is on.

2) Manifold operation

With a standard model of the internal pilot design, the main exhaust (R) and the pilot exhaust (PR) are combined inside the manifold base before they are released from the exhaust port. With a model of the external pilot design, the main exhaust (R) and the pilot exhaust (PR) are released separately from different ports.

3) Prevention of erroneous operation

The 4G Series manifold is equipped with a wrong operation prevention valve and a PR check valve. They prevent the erroneous operation of another cylinder in the system by the exhaust and the erroneous operation of a solenoid valve by the pilot air back pressure.



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.
With the 4G Series solenoid valve system, the lock is released (the manual override turned OFF) if the manual override protection cover is closed.

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

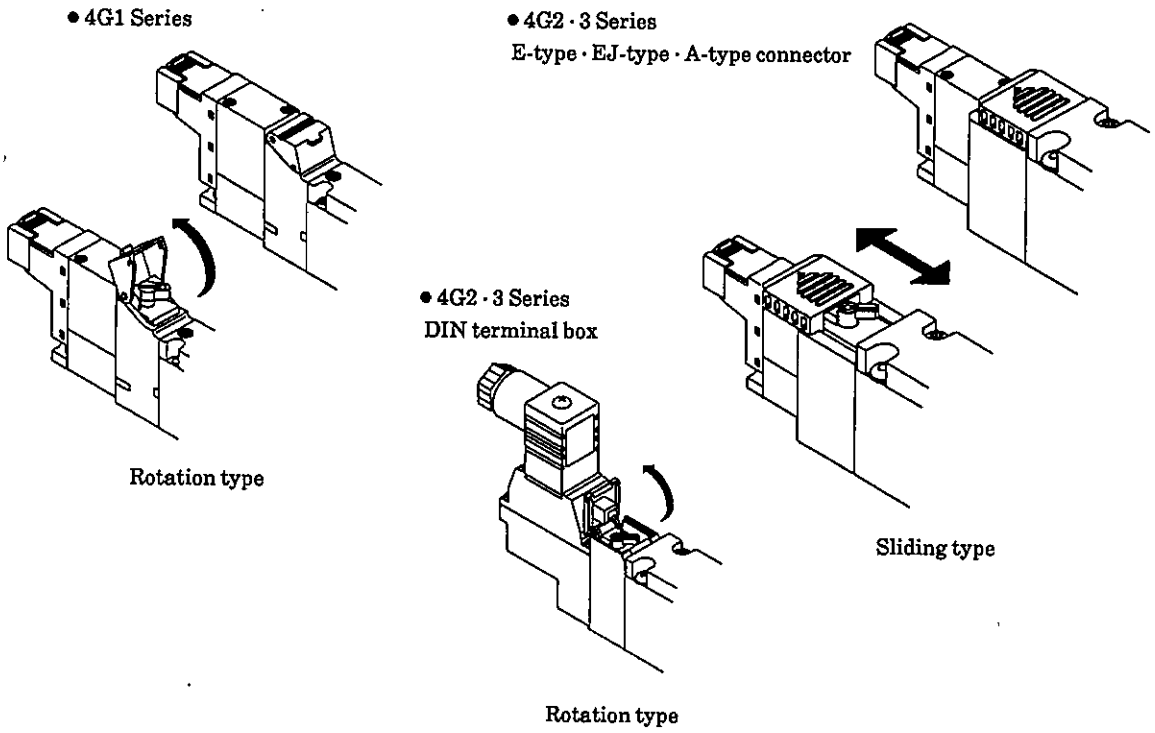
(1) The 4G Series solenoid valve systems use pilot type solenoid valves. Unless the air is supplied to the P port, the main valve position will not change even when you operate the manual override.

(2) The manual override protection cover is provided as a part of the standard specifications. When the product is delivered, the protection cover is closed and the manual override is not visible. To use the manual override, open the protection cover first.
Note that the protection cover cannot be closed if the manual override is locked (ON).

(3) The manual override allows a non-lock type (push and release) operation as well as a lock type operation (push and lock). The push and lock operation consists of pressing and then turning the manual override knob. Be sure to press the knob before turning it. An attempt to turn the knob without pressing it may damage the manual override or cause air leakage.

5.2.1 Opening and closing the manual override protection cover

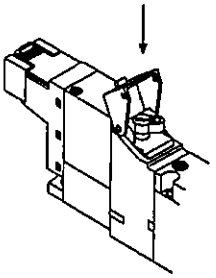
When opening and closing the manual override protection cover, do not use an excessive force. Excessive force may cause a failure. (The force applied should be less than 5N.)



5.2.2 Operating the manual override

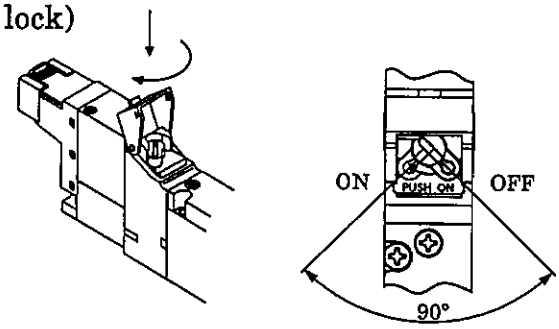
(1) Non-lock type operation (push and release)

Press the manual override knob in the direction of the arrow until it hits the stopper. The manual override is turned OFF as you let go of the knob.



(2) Lock type operation (push and lock)

Press and then turn the manual override knob in the direction of the arrow. The manual override remains turned ON even when you let go of the knob.



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 4G 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

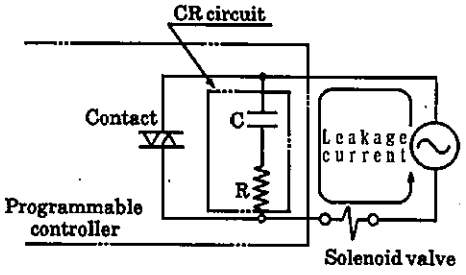
⚠ CAUTION

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.



100 VAC	2.0 mA max.
12 VDC	1.5 mA max.
24 VDC	1.8 mA max.

(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.

Note on 100 VAC models:

The 100 VAC type models are equipped with a full-wave rectifier circuit. The use of a certain type of solid-state relay (SSR) for turning a solenoid valve ON and OFF may prevent normal returning of the solenoid valve when the solenoid is de-energized.
Carefully choose the type of the SSR to be used.

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 Replacing solenoid valve

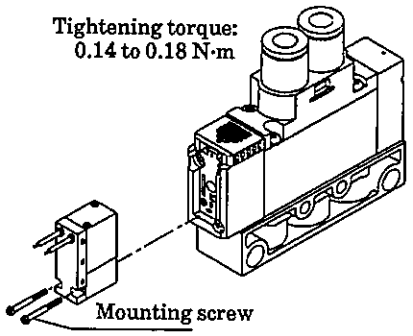
When replacing a solenoid valve, take care not to install the new solenoid valve without the gasket and pilot check valve.

	Screw size	Tightening torque (N · m)
4G1	M1.7	0.18 - 0.22
4G2	M2.5	0.25 - 0.30
4G3	M3	0.6 - 0.7

6.2.2 Replacing coil

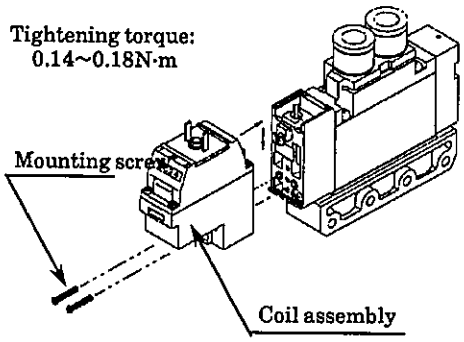
1) Grommet with lead wire and E-type connector coil assembly

To replace a coil, remove the mounting screws shown in the figure to the right. Never remove a different screw because it may disable the operation. When installing a new coil, make sure that a coil side gasket is fitted and observe the tightening torque. Improper installation of the coil may cause air leakage or malfunction.



2) DIN terminal box coil assembly

To replace a coil, remove the mounting screws shown in the figure to the right. Never remove a different screw because it may disable the operation.Note that the coil assembly having the grommet with lead wire and E-type connector specifications cannot be replaced with that having the DIN terminal box specifications, vice versa.

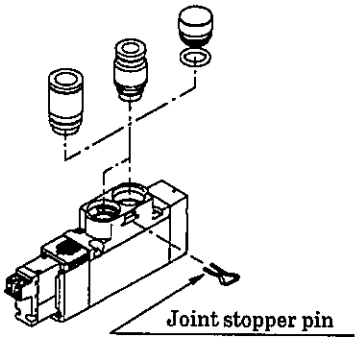


6.2.3 Replacing cartridge joint

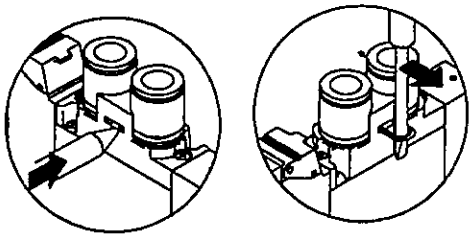
If you wish to use one-touch joints of a different size, replace the joint after studying the procedure. Improper installation of the joints or the lack of mounting screw tightening torque may cause air leakage and other troubles.

1) Direct piping (A) type

① Use a screwdriver to remove the stopper pin.
② Remove the joints.
③ Insert new joints vertically until it hits the end.
④ Insert the stopper pin.
Pull the joints to check that the joints are locked at their positions.

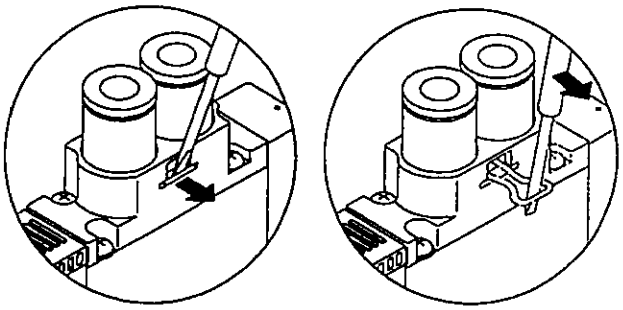


4GA1



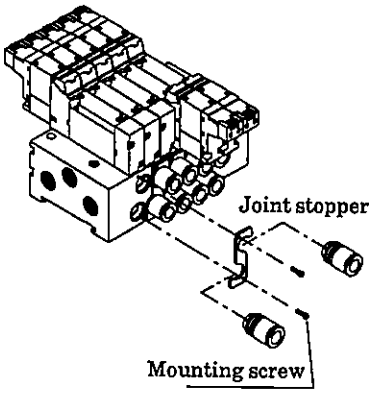
Remove the stopper pin by pushing it out from behind.

4GA2/3



2) Base piping (B) type

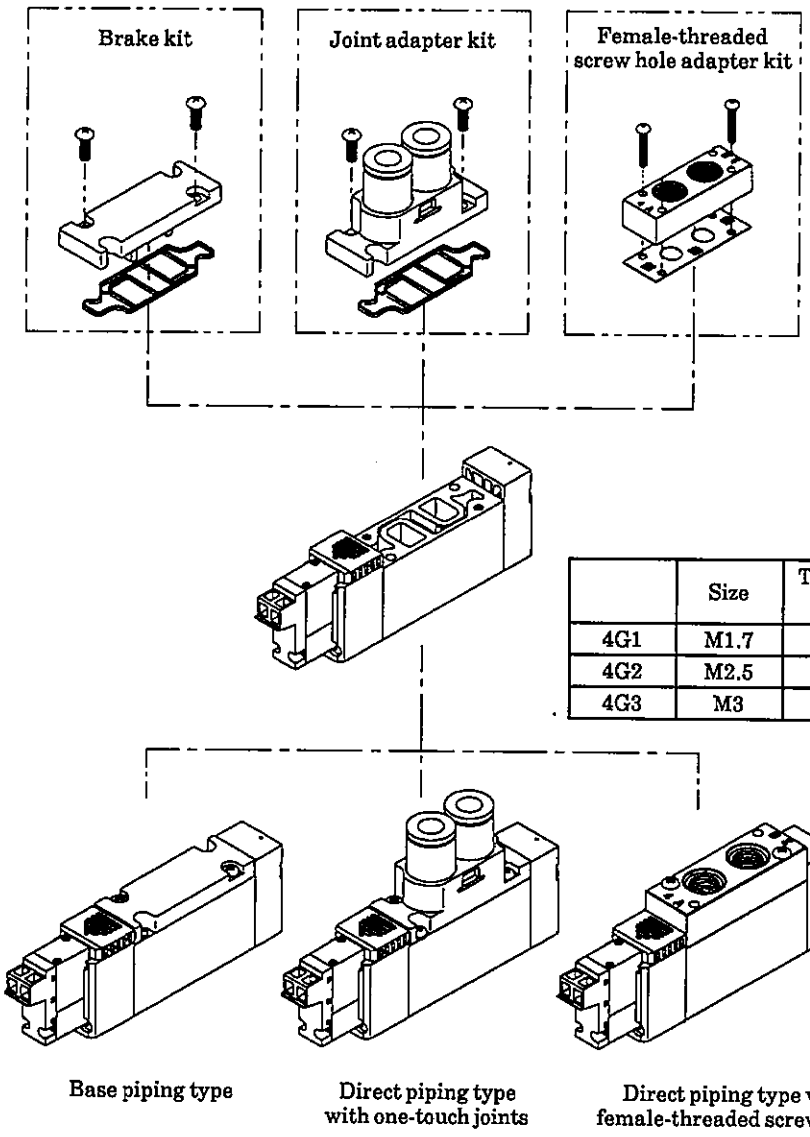
① Remove the mounting screws.
② Remove the stopper plate and joints at the same time.
③ Pre-assemble the stopper plate and new joints after aligning the stopper plate to the grooves of the joints.
④ Install the stopper plate together with the joints and tighten the mounting screws. Pull the joints to check that the joints are locked at their positions.



	Size	Tightening torque(N·m)
4G1	M1.7	0.18 - 0.22
4G2	M2.5	0.25 - 0.30
4G3	M3	0.6 - 0.7

6.2.4 Changing the piping specifications

By replacing the plate or joint adapter installed to the body, the user may remodel a direct piping type unit into a base piping type unit, or vise versa. Similarly, the user may remodel a direct piping one-touch joint type unit into a direct piping female-threaded screw hole type unit, or vise versa. When doing such replacement, carefully observe the tightening torque for the mounting screws. A lack of tightening torque may cause air leakage and other troubles.



	Size	Tightening touque (N · m)
4G1	M1.7	0.18 - 0.22
4G2	M2.5	0.25 - 0.30
4G3	M3	0.6 - 0.7

6.3 Additional Installation of a Valve Unit to a Reduced-Wiring Manifold

6.3.1 Additional installation at a location provided with spare wiring

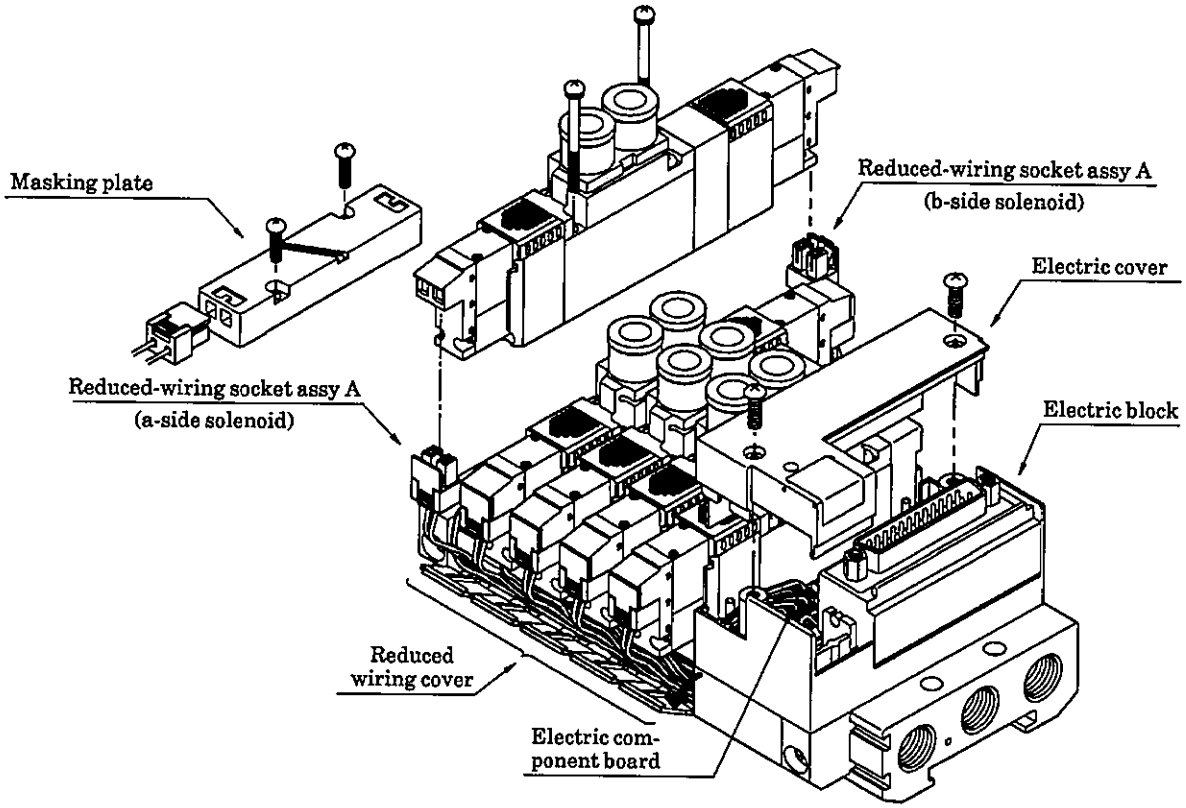
The masking plate at a location on the manifold reserved for additional installation of a valve unit is already provided with spare wiring. To install an additional valve unit using the spare wiring, follow the procedure below:

① Disconnect the spare wiring socket from the masking plate.
② Remove the masking plate from the base.
③ Install the additional valve unit to the base and connect the valve unit with the spare wiring socket.

6.3.2 Additional installation at a location not provided with spare wiring

When a single type valve unit is replaced with a double type valve unit, additional internal wiring must be provided for the b-side solenoid that is added. With the installation of an additional valve in a case like this when no spare wiring is available, follow the procedure below:

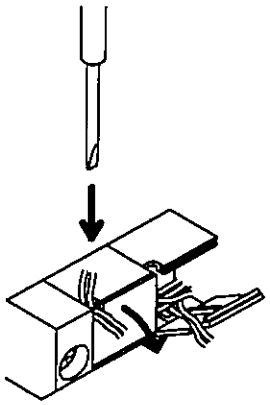
① Remove the electric component cover and open the reduced wiring covers.
② Replace the valve to be changed. Reconnect the socket for the a-side solenoid.
③ Install the socket for the b-side solenoid. (This socket needs to be purchased anew.) Route the cable between the valves to the a-side.
④ Route the cable into the electric component block and insert the connector into its mating connector on the electric component board.
⑤ Store the cable behind the reduced wiring covers. Then close the reduced wiring covers and refit the electric component cover.



6.3.3 Opening and Closing Reduced Wiring Covers

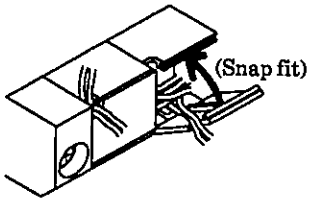
1) Opening a reduced wiring cover

Apply a precision screwdriver or similar tool to the cable hole in the reduced wiring cover to open the cover. Do not use a sharp object to open the cover because it may scar the cable.



2) Closing a reduced wiring cover

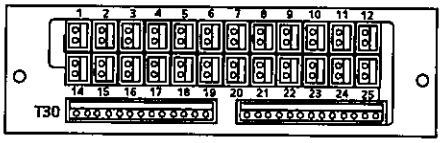
Lead the cable through the cable hole in the reduced wiring cover and then close the cover taking care not to entangle the cable. Close the cover firmly until it snaps.

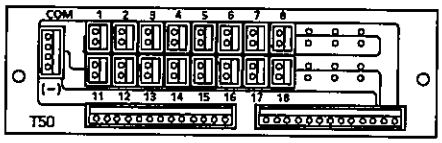
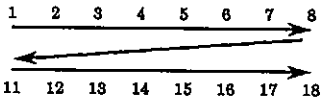
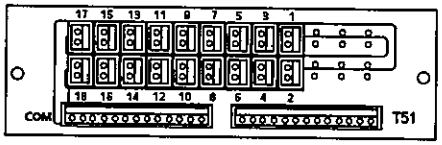
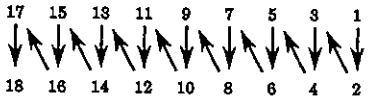


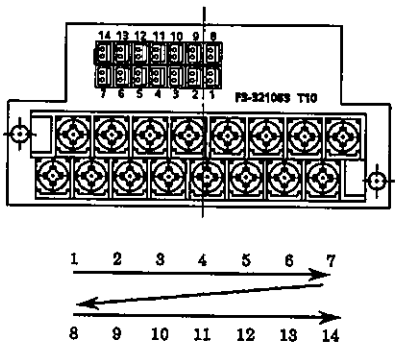
6.3.4 Connecting cables to connectors on electric component board

The relationship between the connectors on the electric component board and the valves on the manifold differs among different specifications of the reduced-wiring systems (T30, T50, T51, and T6 ※). When connecting cables to these connectors, refer to the connector numbers printed on the electric component board.

The connector numbers correspond to the pin numbers of a D-sub connector or a flat cable connector.

	Electric component board assy The arrows indicate the order in which cables should be connected.	Relationship with valves The arrows indicate the order in which cables should be connected.
T30	 	<Table 1> Order of connector numbers (with T30) 1) Single solenoid type Connector No. 1 2 3 4 5 6 7 8 9 10 11 12 Valve No. 1a 3a 5a 7a 9a 11a 13a 15a 17a 19a Connector No. 14 15 16 17 18 19 20 21 22 23 24 25 Valve No. 2a 4a 6a 8a 10a 12a 14a 16a 18a 20a 2) Double solenoid type (Maximum number of stations on manifold: 12) Connector No. 1 2 3 4 5 6 7 8 9 10 11 12 Valve No. 1a 2a 3a 4a 5a 6a 7a 8a 9a 10a 11a 12a Connector No. 14 15 16 17 18 19 20 21 22 23 24 25 Valve No. 1b 2b 3b 4b 5b 6b 7b 8b 9b 10b 11b 12b 3) Mixture of single and double types (Maximum number of solenoids: 24) Connector No. 1 2 3 4 5 6 7 8 9 10 11 12 Valve No. 1a 3a 4b 5b 7a NC NC NC NC NC NC NC Connector No. 14 15 16 17 18 19 20 21 22 23 24 25 Valve No. 2a 4a 5a 6a 7b NC NC NC NC NC NC NC ※ Wiring rule:  The arrows indicate the order in which cables should be connected.

	Electric component board assy The arrows indicate the order in which cables should be connected.	Relationship with valves The arrows indicate the order in which cables should be connected.
T50 T6※	  	<Table 1> Order of connector numbers (with T50) 1) Single solenoid type (Maximum number of stations on manifold: 16) Connector No. 1 2 3 4 5 6 7 8 Valve No. 1a 2a 3a 4a 5a 6a 7a 8a Connector No. 11 12 13 14 15 16 17 18 Valve No. 9a 10a 11a 12a 13a 14a 15a 16a 2) Double solenoid type (Maximum number of stations on manifold: 8) Connector No. 1 2 3 4 5 6 7 8 Valve No. 1a 1b 2a 2b 3a 3b 4a 4b Connector No. 11 12 13 14 15 16 17 18 Valve No. 5a 5b 6a 6b 7a 7b 8a 8b 3) Mixture of single and double types (Maximum number of solenoids: 16) Connector No. 1 2 3 4 5 6 7 8 Valve No. 1a 2a 3a 4a 4b 5a 5b 6a Connector No. 11 12 13 14 15 16 17 18 Valve No. 7a 7b NC NC NC NC NC NC ※ Wiring rule : Connect cables in the order of connector numbers.
T51	  	<Table 1> Order of connector numbers (with T51) 1) Single solenoid type (Maximum number of stations on manifold: 18) Connector No. 17 15 13 11 9 7 5 3 1 Valve No. 17a 15a 13a 11a 9a 7a 5a 3a 1a Connector No. 18 16 14 12 10 8 6 4 2 Valve No. 18a 16a 14a 12a 10a 8a 6a 4a 2a 2) Double solenoid type (Maximum number of stations on manifold: 8) Connector No. 17 15 13 11 9 7 5 3 1 Valve No. 9a 8a 7a 6a 5a 4a 3a 2a 1a Connector No. 18 16 14 12 10 8 6 4 2 Valve No. 9b 8b 7b 6b 5b 4b 3b 2b 1b 3) Mixture of single and double types (Maximum number of solenoids: 18) Connector No. 17 15 13 11 9 7 5 3 1 Valve No. NC NC NC NC 7a 5b 4b 3a 1a Connector No. 18 16 14 12 10 8 6 4 2 Valve No. NC NC NC NC 7b 6a 5a 4a 2a ※ Wiring rule:  The arrows indicate the order in which cables should be connected. (order of connector numbers.)

<table>
<tr><th></th><th>Electric component board assy
The arrows indicate the order in which cables should be connected.</th><th>Relationship with valves
The arrows indicate the order in which cables should be connected.</th></tr>
<tr><td>T10</td><td> 
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<Table 1> Order of connector numbers (with T10)
1) Single solenoid type
(Maximum number of stations on manifold: 14)
<table>
<tr><td>Connector No.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Valve No.</td><td>1a</td><td>2a</td><td>3a</td><td>4a</td><td>5a</td><td>6a</td><td>7a</td></tr>
<tr><td>Connector No.</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr>
<tr><td>Valve No.</td><td>8a</td><td>9a</td><td>10a</td><td>11a</td><td>12a</td><td>13a</td><td>14a</td></tr>
</table>
2) Double solenoid type
(Maximum number of stations on manifold: 7)
<table>
<tr><td>Connector No.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Valve No.</td><td>1a</td><td>1b</td><td>2a</td><td>2b</td><td>3a</td><td>3b</td><td>4a</td></tr>
<tr><td>Connector No.</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr>
<tr><td>Valve No.</td><td>4b</td><td>5a</td><td>5b</td><td>6a</td><td>6b</td><td>7a</td><td>7b</td></tr>
</table>
3) Mixture of single and double types
(Maximum number of solenoids: 14)
<table>
<tr><td>Connector No.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Valve No.</td><td>(1a)</td><td>(2a)</td><td>2a</td><td>3a</td><td>NC</td><td>NC</td><td>NC</td></tr>
<tr><td>Connector No.</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr>
<tr><td>Valve No.</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>na</td><td>nb</td></tr>
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※ Wiring rule : Connect cables in the order of connector numbers.
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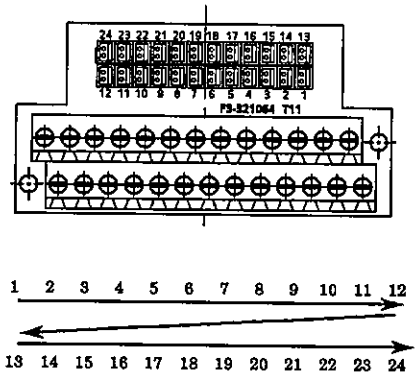
<tr><td>T11</td><td> 
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<Table 1> Order of connector numbers (with T11)
1) Single solenoid type
(Maximum number of stations on manifold: 20)
<table>
<tr><td>Connector No.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td>Valve No.</td><td>1a</td><td>2a</td><td>3a</td><td>4a</td><td>5a</td><td>6a</td><td>7a</td><td>8a</td><td>9a</td><td>10a</td><td>11a</td><td>12a</td></tr>
<tr><td>Connector No.</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td></tr>
<tr><td>Valve No.</td><td>13a</td><td>14a</td><td>15a</td><td>16a</td><td>17a</td><td>18a</td><td>19a</td><td>20a</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td></tr>
</table>
2) Double solenoid type
(Maximum number of stations on manifold: 12)
<table>
<tr><td>Connector No.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td>Valve No.</td><td>1a</td><td>1b</td><td>2a</td><td>2b</td><td>3a</td><td>3b</td><td>4a</td><td>4b</td><td>5a</td><td>5b</td><td>6a</td><td>6b</td></tr>
<tr><td>Connector No.</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td></tr>
<tr><td>Valve No.</td><td>7a</td><td>7b</td><td>8a</td><td>8b</td><td>9a</td><td>9b</td><td>10a</td><td>10b</td><td>11a</td><td>11b</td><td>12a</td><td>12b</td></tr>
</table>
3) Mixture of single and double types
(Maximum number of solenoids: 24)
<table>
<tr><td>Connector No.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td>Valve No.</td><td>(1a)</td><td>(2a)</td><td>3a</td><td>4a</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td></tr>
<tr><td>Connector No.</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td></tr>
<tr><td>Valve No.</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>NC</td><td>na</td><td>nb</td></tr>
</table>
※ Wiring rule : Connect cables in the order of connector numbers.
</td></tr>
</table>

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 leakage 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 or B port is directly released to an open air	Install pipe joints to A and B ports with diameter equal to or smaller than that of to P port joint
	Valve is frozen	Add remedies of avoiding freezing (Heating system or dehumidifying system etc.)
	Delayed return of a plunger (Excessive oil, existence of tar)	Check the quality of the lubricant (Turbine oil type 1, ISO VG 32 or equivalent) Rectify the quantity of lubricant drip Install a tar removing filter
	Clogged-up exhausting port with dust	Install a cover or silencer and clean it regularly
High actuating pressure is required	Bulged or decomposed packings	Check the quality of the lubricant. (Turbine oil type 1, ISO VG32 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

Discontinue

8. PRODUCT SPECIFICATIONS & HOW TO ORDER

8.1 Product specifications

1) Common specifications

Model number / Item		4G1·4G2·4G3
Working fluid		Compressed air
Actuation		Pilot operated type
Valve structure		Soft spool valve
Min. working pressure MPa		0.2
Max. working pressure	MPa	0.7
Proof pressure	MPa	1.05
Ambient temperature	℃	-5~55 (No freezing)
Fluid temperature	℃	5~55
Manual override		Locked / Non-locked common type
Pilot exhaust method	Internal pilot	Main valve / pilot operated valve common exhaust
Lubrication	[Note 1]	Not required
Degree of protection	[Note 2]	Dust-proof/Jet-proof (equivalent to IP65 enclosure)
Vibration resistance	m/s^2	50 or less
Shock resistance	m/s^2	300 or less
Atmosphere		Must not used in any corrosive gas environment

Note 1 : If the user chooses to lubricate, Type 1 turbine oil (ISO VG32) should be used. Excessive or intermittent lubrication may cause instability in operation.

Note 2 : The protection structure is dust-proof but not drip-proof. Protect the unit from the drips or splashes of water and oil. The protection class of the product having the DIN terminal box specifications is IP65. Therefore, it is absolutely necessary to properly secure the cable wire terminal box. Since the product is not applicable to continuous water injection, it needs to be protected using the cover box.

Reference: The pressure is indicated in MPa. The unit conversion is that 1 MPa equals 10.1972 kgf/cm^2.

2) Electrical specifications

Model Coding / Item		4G1 · 4G2 · 4G3
Rated voltage V	DC	12, 24
	AC	100
Allowable fluctuation from rated voltage		±10%
Holding current A (Note 3)	DC24V	0.023 (0.025)
	DC12V	0.046 (0.050)
	AC100V	0.010 (0.012)
Power consumption (Note 3) W	DC24V	0.55 (0.6)
	DC12V	0.55 (0.6)
Apparent powerVA	AC100V	1.0 (1.2)
Thermal class		Class B
Temperature rise	℃	50
Surge absorber	(Note 4)	Option
Indicator		indicator light (option)

Note 3 : The values in ( ) include the light.

Note 4 : The DIN terminal type incorporates the lamp and surge killer as standard accessories. The specification values for the DIN terminal type are shown in ( ).

3) Specifications for different models

Item			4G1		4G2		4G3	
			ON	OFF	ON	OFF	ON	OFF
Response time ms	2-position	Single	12	12	19	19	25	28
		Double	9	—	18	—	24	—
	3-position	ABR port connection	8	15	17	30	23	45

Each of the values listed above is the response time with a unit equipped with a thump surge killer. The following are assumed: supply pressure 0.5 MPa; 20°C; and no lubrication by the user. The response time differs with the supply pressure and the lubrication oil quality.

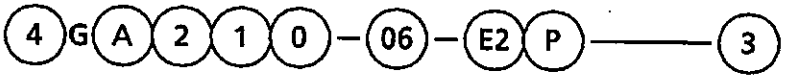
Item	Series		Operator type		4G1		4G2		4G3	
					P→A/B	A/B→R	P→A/B	A/B→R	P→A/B	A/B→R
Effective sectional area mm²	Individual	4GA Series	2-position		3.8	4.5	11	10	18	19
			3-position	CC	3.8	4.5	10	12	17	17
				ABR connection	3.8	4.5	10	10	17	19
				PAB connection	4.0	4.5	13	12	19	17
		4GB Series	2-position		6.0	6.0	13	13	23	22
			3-position	CC	6.0	6.0	11	11	19	19
				ABR connection	6.0	6.5	11	13	19	22
				PAB connection	7.0	6.0	15	11	24	19
	Manifold	M4GA Series	2-position		5.0	4.0	11	9.0	18	16
			3-position	CC	5.0	5.5	10	10	17	17
				ABR connection	5.0	4.0	10	9.0	17	16
				PAB connection	6.0	5.5	13	10	19	17
		M4GB Series	2-position		4.5	4.0	11	9.0	18	16
			3-position	CC	4.5	4.5	10	10	17	17
				ABR connection	4.5	4.0	10	9.0	17	16
				PAB connection	5.5	4.5	13	10	20	17

The values of effective sectional area shown for the 2-position and ABR-connection valves on a manifold are determined assuming that the valves include a wrong operation prevention valve.

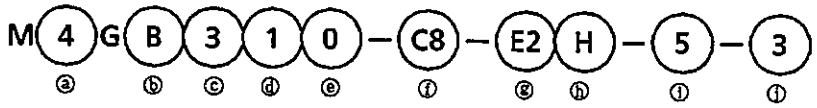
Discontinue

8.2 HOW TO ORDER

• Solenoid valve



• Manifold



ⓐ No. of port		ⓑ Piping direction		ⓒ Series model		ⓓ Operator type	
Code	Discription	Code	Discription	Code	Discription	Code	Discription
3	3-port valve	A	Top porting (Direct piping)	1	4G1	1	2-position single
4	5-port valve			2	4G2	2	2-position double
		B	Side porting (Base piping)	3	4G3	3	3-position CC
						4	3-position ABR connection
						5	3-position PAB connection
						1	Normal close NC (3GA)
						11	Normal open NO (3GA)
						8	Mix

ⓔ Operator type		ⓕ Port size		ⓖ Electrical connection	ⓗ Option
Code	Discription	Code	Discription	See Table 2	
0	Solenoid valve	00	Solenoid valve for manifold		
9	Without a sub-base	CX	Mix		
		See Table 1			

ⓘ No. of stations		ⓙ Rated voltage	
Code	Discription	Code	Discription
2~	No. of stations	1	AC100V
		3	DC24V
		4	DC12V

Table 1 ⓕ Port size

	Code	Port size	4GA1	4GB1	M4G*1	4GA2	4GB2	M4G*2	4GA3	4GB3	M4G*3
A/B port	C4	Push-in joint ϕ4	●		●	●		●			
	C6	Push-in joint ϕ6	●		●	●		●	●		●
	C8	Push-in joint ϕ8				●		●	●		●
	C10	Push-in joint ϕ10							●		●
	M5	M5	●		●						
	06	Rc1/8		●		●		●			
	08	Rc1/4					●		●	●	●
	10	Rc3/8								●	
P/R port			M5	Rc1/8	Rc1/8	Rc1/8	Rc1/4	Rc1/4	Rc1/4	Rc1/4 Rc3/8 ※1	Rc3/8

※1 Same as A/B port size selected

Discontinue

Table 2 Wiring type ⓖ and other options ⓗ

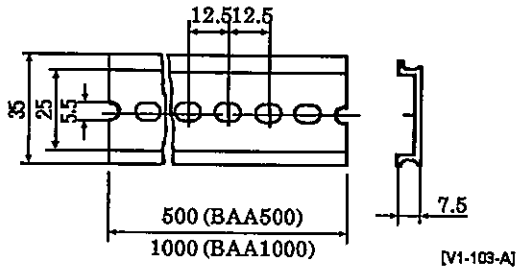
ⓖ Wiring type				ⓗ
Valve units and individual wiring type manifolds		Reduced-wiring manifolds		Other options
No code Grommet and lead wire • Lead wire length 300mm 500mm 1000mm 2000mm	E3 E-type connector; with socket terminal ※1	T30 D-sub connector type (left side model)	T6□0 Serial transmission type 8 points	K External pilot
E0 E-type connector	A2N A-type connector facing down; without socket	T30□ D-sub connector type (right side model)	T6□1 Serial transmission type 16 points	P Mounting plate (For direct piping type only)
E0N E-type connector; without socket	• Domination "A" of 100VAC model is 3.5 mm longer than that of 12/24DCV model	T50 Flat cable; with power terminal (left side model)		D DIN rail mount
E1 E-type connector; with socket terminal		T5□P Flat cable; with power terminal (right side model)		A Ozone and cutting oil resistant model • Recommended as a way to resist cutting oil or ozone in the supplied air.
E2 E-type connector ※2	B DIN terminal box ※1	T51 Flat cable; without power terminal	T10 T11 Common terminal stand type (left side model)	H Wrong operation prevention valve The one for the pilot exhaust is a part of standard specifications.
E2N E-type connector; without socket ※1	EOJ Socket with cover	T51□ Flat cable; without power terminal (right side model)	T10P T11P Common terminal stand type (right side model)	F Built-in AB port filters Filter

※1 : with surge absorber and lamp. ※2 : sith lead wire, surge absorber and lamp.

Discontinue

8.3 Accessories

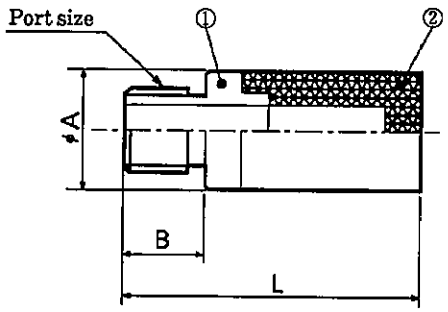
1) Mounting rail (BAA)



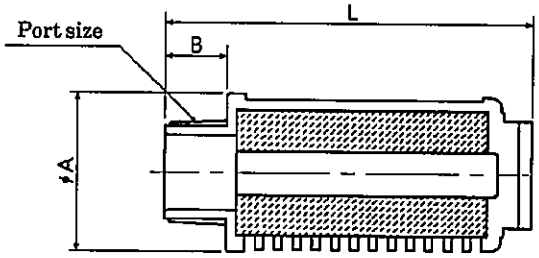
Model	L
BAA500	500
BAA1000	1000

2) Silencer

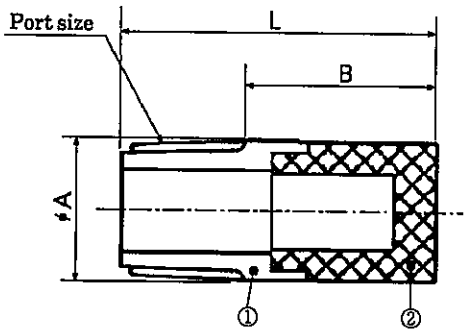
- SLM-M5



- SLW-6A · 8A · 10A · 8L · 10L

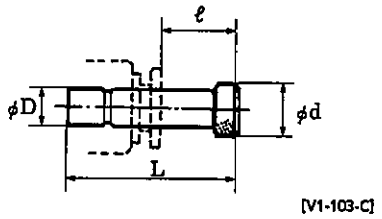


- SLW-6S · 8S



Model	L	B	φA	Port size	Effective sectional area mm²
SLM-M5	16.5	4.5	φ7	M5	5
SLW-6A	34.5	6.5	φ16.5	R1/8	10
SLW-8A	44.5	8.5	φ20	R1/4	20
SLW-10A	58.5	10	φ25.5	R3/8	30
SLW-8L	57.4	8.9	φ25.5	R1/4	30
SLW-10L	69	10	φ28	R3/8	60
SLW-6S	22	13.3	φ10.5	R1/8	12
SLW-8S	28	19	φ15.4	R1/4	30

3) Blank plug



Model	D	L	ℓ	d
GWP4-B	φ4	27	12	6
GWP6-B	φ6	29	12.5	8
GWP8-B	φ8	33	12.5	10
GWP10-B	φ10	40	17	14

8.4 Consumable Parts

1) Consumable parts

Item No.	Part name	Material
1	Coil assy	4G - [Wiring type] - □ - Coil -- [Voltage] □: None : Standard type A : Ozone-resistant Wiring type: None : Grommet and lead wire E□ : E-type connector A2N: A-type connector B : DIN terminal box
—	E-type connector socket assy	4G - Socket assy type [Wiring type] - [Voltage] Wiring type E 01 21J, E 02 22J, E 03 23J is the socket with cover
	DIN terminal box	4G-Terminal-Voltage

2) Cartridge type one-touch joint

Model	Part name	Model No.
4G1	φ4 straight type	4G1-Joint-C4
	φ6 straight type	4G1-Joint-C4
	Plug cartridge	4G1-Joint-CPG
4G2	φ6 straight type	4G2-Joint-C6
	φ8 straight type	4G2-Joint-C8
	Plug cartridge	4G2-Joint-CPG
4G3	φ8 straight type	4G3-Joint-C8
	φ10 straight type	4G3-Joint-C10
	Plug cartridge	4G3-Joint-CPG

3) Female-threaded screw adapter kit

Model	Kit No.	Items in kit
4G1	4G1-Female-threaded screw adapter kit	Female-threaded screw adapter, gasket, mounting screw (x 2)
4G2	4G2-Female-threaded screw adapter kit	Female-threaded screw adapter, gasket, mounting screw (x 2)
4G3	4G3-Female-threaded screw adapter kit	Female-threaded screw adapter, gasket, mounting screw (x 2), body mounting screw (x 2)

Discontinue

4) Joint adapter kit

Model	Part name		Kit No.	Items in kit
4G1	ϕ4 joint adapter kit	For NC	4G1-Joint adapter kit-C4NC	Piping adapter One-touch joint x 2 (NC, NO: x 1) (NC, NO: Plug cartridge x 1) Gasket Stopper pin
		For NO	4G1-Joint adapter kit-C4NO	
			4G1-Joint adapter kit-C4	
	ϕ6 joint adapter kit	For NC	4G1-Joint adapter kit-C6NC	
		For NO	4G1-Joint adapter kit-C6NO	
			4G1-Joint adapter kit-C6	
4G2	ϕ6 joint adapter kit	For NC	4G2-Joint adapter kit-C6NC	Piping adapter One-touch joint x 2 (NC, NO: x 1) (NC, NO: Plug cartridge x 1) Gasket Stopper pin
		For NO	4G2-Joint adapter kit-C6NO	
			4G2-Joint adapter kit-C6	
	ϕ8 joint adapter kit	For NC	4G2-Joint adapter kit-C8NC	
		For NO	4G2-Joint adapter kit-C8NO	
			4G2-Joint adapter kit-C8	
4G3	ϕ8 joint adapter kit	For NC	4G3-Joint adapter kit-C8NC	Piping adapter One-touch joint x 2 (NC, NO: x 1) (NC, NO: Plug cartridge x 1) Gasket Stopper pin
		For NO	4G3-Joint adapter kit-C8NO	
			4G3-Joint adapter kit-C8	
	ϕ10 joint adapter kit	For NC	4G3-Joint adapter kit-C10NC	
		For NO	4G3-Joint adapter kit-C10NO	
			4G3-Joint adapter kit-C10	

5) Plate kit

Model	Kit No.	Items in kit
4G1	4G1-Plate kit	Plate, gasket, mounting screw (x 2)
4G2	4G2-Plate kit	Plate, gasket, mounting screw (x 2)
4G3	4G3-Plate kit	Plate, gasket, mounting screw (x 2)

6) Mounting plate (P) kit

Model	Kit No.	Items in kit
4GA1	4G1-Mounting plate kit	Mounting plate, mounting screws, nut
4GA2	4G2-Mounting plate kit	Mounting plate, mounting screws
4GA3	4G3-Mounting plate kit	Mounting plate, mounting screws

7) DIN rail kit

Model	Model No.	Discription
M4G1	4G1-BAA Length -D	DIN rail, mounting screw (x 2)
M4G2	4G2-BAA Length -D	DIN rail, holder (x 2), tapping screw (x 2), mounting screw (x 4)
M4G3	4G3-BAA Length -D	

If the DIN rail is not required, specify "0" as the "Length".

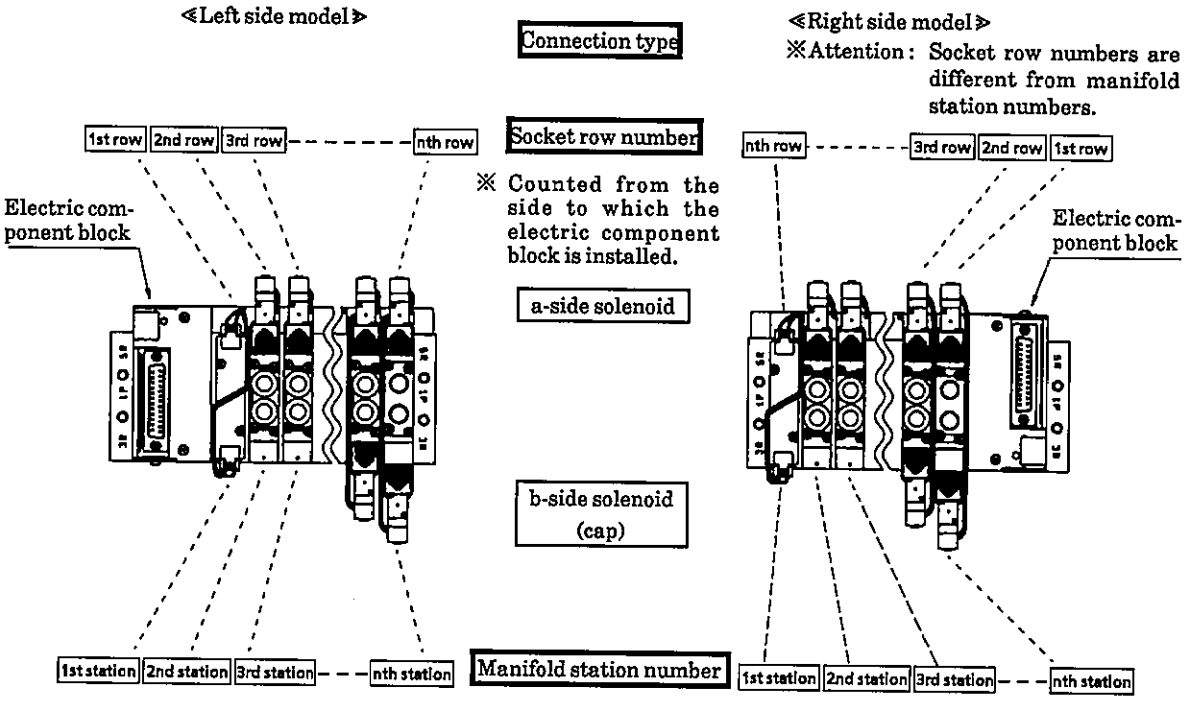
8) Masking plate kit

Masking plate	4G1	4G1-MP	Masking plate, gasket, mounting screws
	4G2	4G2-MP	
	4G3	4G3-MP	

9) Determination of the model number of the socket assy required for a valve unit additionally installed

For a valve unit additionally installed to a manifold, select a socket assembly that includes a cable of the length suitable for the position of the valve unit. Otherwise the disconnection or entanglement of the cable may occur.

The last digit in the socket assy model number indicates the position of the valve unit on a manifold by the number of rows counted from the side to which the electric component block is installed. With the valve station number, which is also used for specifying a position of a valve unit on a manifold, you count the valve units from left to right when the b-side solenoids are facing toward you. Do not confuse these two different ways of counting.



※ The order of connections is from left to right when the b-side solenoids (caps) are facing toward you.

Note 1: The same applies to T50 and T51 as well.

Reduced-wiring socket assy A

Model number of a socket assy for a valve unit additionally installed:

4G[※1] - Socket assy A [※2] [※3]- [※4]

※1 : Series		※2 : Connection type		※3 : Solenoid position		※4 : Socket row number	
1	4G1	None	Left side	a	a-side	2	2nd row
2	4G2	R	Right side	b	b-side	⟨	⟨
3	4G3					24	24th row