CKD

SM－P00126-A

INSTRUCTION MANUAL

SELEX VALVE

3QB1,
M3QB1

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

CKD Corporation

Safety precautions

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

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

It is important to select, use, handle, and maintain the product appropriately to ensure that the CKD product is used safely.
Observe warnings and precautions to ensure device safety.
Check that device safety is ensured, and manufacture a safe device.

⚠ WARNING

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

2. Use this product within its specifications.

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

① Use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.
② Use for applications where life or assets could be adversely affected, and special safety measures are required.

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

ISO4414, JIS B 8370 (pneumatic system rules)
JFPS2008 (principles for pneumatic cylinder selection and use)
Including High Pressure Gas Maintenance Law, Occupational Safety and Sanitation Laws, other safety rules, standards and regulations, etc.

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

① Inspect and service the machine and devices after confirming safety of the entire system related to this product.
② Note that there may be hot or charged sections even after operation is stopped.
③ When inspecting or servicing the device, turn off the energy source (air supply or water supply), and turn off power to the facility. Release any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
④ When starting or restarting a machine or device that incorporates pneumatic components, make sure that system safety, such as pop-out prevention measures, is secured.

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

[SM-P00126-A]

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

⚠ DANGER :When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, or when there is a high degree of emergency to a warning.

⚠ WARNING :When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries.

⚠ CAUTION :When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

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

Precautions with regard to guarantee

● Guarantee period

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

● Guarantee coverage

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

However, the guarantee excludes following cases:

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

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

● Confirmation of product compatibility

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

UNPACKING (Page 13)

⚠ 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 14)

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

ENVIRONMENT (Page 14)

⚠ 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.

⚠ CAUTION :

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

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

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) When touching the valve, be careful of it. The coil may get very hot by ambient temperature or by energization.
- Valve perfomance deterioration may be accelerated if valves are continuously energiving for long periods of time.

i) 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.

j) There is no resistance to surges caused by overvoltage from switching and lightning transients(CE Marking :IEC61000-4-5). Please take measures against surges on the equipment side.

INSTALLATION (Page 16)

⚠ WARNING : When installing a solenoid valve unit, never attempt to hold it in position by means of the pipes connected to it.
- Mount the solenoid valve by applying the mounting screws and/or mounting plate to the solenoid valve.

PIPING (Page 17)

⚠ CAUTION :

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

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

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

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

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

f) Removal of foreign matter
- Install the vacuum filter between the pad nozzle and the valve, if it is used under the vacuum condition.

g) Do not use the product as emergency cutout solenoid valve.
- Starting response time can be late, when leaving under elevated pressure for a long time.

WIRING (Page 21)

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

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

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

AIR QUALITY (Page 23)

⚠ WARNING :

a) Do not supply anything other than compressed air or low vacuum.

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.

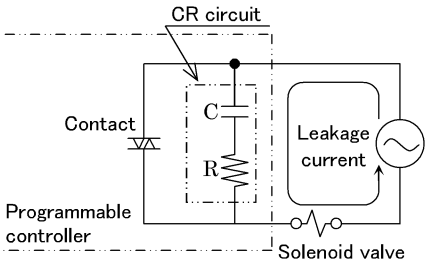
b) Do not lubricate. Doing so will cause slow response or malfunction.

⚠ 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.

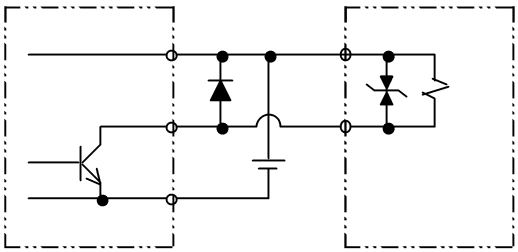


DC24V	1.8 mA or lower
DC12V	1.5 mA or lower

⚠ CAUTION : ■ The surge killer is installed in the solenoid valve to protect the output contact for functioning the solenoid valve. The effect of the protection to the peripheral devices besides it cannot be expected. Therefore the effect of the surge (breakage or malfunction) may be given to the peripheral devices. In addition, the surge killer absorbs the surge occurred by external devices, happening the accident of breakage, for example burning breakage, etc. Verify the following units.

a) When the output unit is a NPN type, a surge voltage of "voltage stated in above table" + "power voltage" may be applied to the output transistor. To avoid this trouble, it may be required to separately install a contact protection circuit.

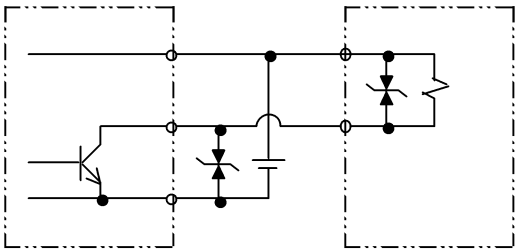
< Example 1 Separate installation of output transistor protection circuit >



Programmable controller side

Solenoid valve side

< Example 2 Separate installation of output transistor protection circuit >



Programmable controller side

Solenoid valve side

b) If another devices or solenoid valves are connected to the solenoid valve in parallel, the reverse surge voltage occurred while the power of the solenoid valve is OFF is applied to those devices. When the solenoid valve with the surge killer for DC24V is used, the surge voltage reaches minus several tens V due to the type, and another device connected in parallel may be broken or be malfunctioned by this voltage of reverse polarity. Do not connect in parallel the solenoid valve and another devices, which are weak of the voltage of reverse polarity (for example LED lamp).
When a few solenoid valves are functioned in parallel, the surge of another solenoid valve is flowed to surge killer of one solenoid valve with it, and therefore it may make burning breakage the surge killer due to current value.
When a few solenoid valves with the surge killer are functioned in parallel, the surge current converges on the surge killer of the most low limiting voltage, and it may make burning breakage similarly. If the solenoid valves are same model number, the surge killer may make burning breakage at worst because their limiting voltages vary widely. Do not function in parallel a few solenoid valves.

c) When the surge killer installed in the solenoid valve is broken by the over voltage or the over current from besides the solenoid valve, it short-circuits in many cases. Therefore, after broken it, a large current is flowed while the output is ON, and the output circuit or the solenoid valve may be broken or get a fire at worst. Do not keep a continuous energizing while the solenoid valve is broken. In addition, install the protection circuit of the over current at the power source or the functioning circuit, or use the power source with the protection of over current not to continue flowing a large current.

PERIODIC INSPECTION (Page 28)

⚠ 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.

REPLACING OF THE SOLENOID VALVE (Page 28)

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

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

INDEX

3QB1,
M3QB1

SELEX VALVE

Manual No. SM-P00126-A

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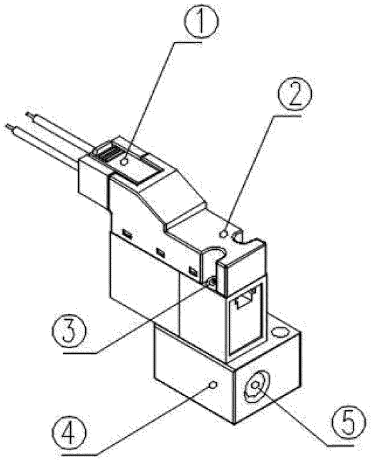
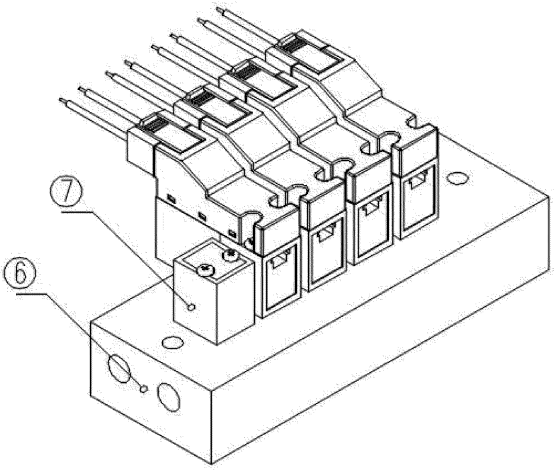
1. PART NAME AND DESCRIPTION



3QB1 Sub plate piping



M3QB1 Individual wiring and manifold

No.	Part Name	Explanation
①	Wire connection	It connections to the electric circuit.
②	Valve unit	This is sub plate piping.
③	Mounting screw	Two screws are provided for each individual valve so as to fix the valve unit to various bases.
④	Sub plate	This sub plate is assembled to use it in the sub plate piping specifications.
⑤	Piping port	Piping port is M5.
⑥	Manifold base	It uses in case of performing common supply or common exhaust to several valve units.
⑦	Masking plate	It masks the clear space of valve unit in the manifold.

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

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

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

Table of conversion between SI units and conventional units
(The values printed in Bolds fonts are values given in the International System of Units (SI)):

Example (converting a pressure value):

1kgf/cm^2 → **0.0980665Mpa** **1MPa** → 1.01972×10kgf/cm^2

- Force

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

- Stress

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

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

- Pressure

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

Note: 1Pa=1N/m^2

3. UNPACKING

> ⚠ **CAUTION :** Bags containing solenoid valves should be opened only when you are ready to connect the valves to the pipes immediately afterward.
>
> - If bags are opened before the valves are ready to be connected to the pipes, the entry of foreign matter from the piping ports could cause the solenoid valves to fail or malfunction.

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

4. INSTALLATION

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

4. 1 Environment

⚠ CAUTION :

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

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

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

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

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

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

⚠ CAUTION :

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

h) When touching the valve, be careful of it. The coil may get very hot by ambient temperature or by welding time.

- Valve perfomance deterioration may be accelerated if valves are continuously energiving for long periods of time.

i) 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.

j) There is no resistance to surges caused by overvoltage from switching and lightning transients(CE Marking :IEC61000-4-5). Please take measures against surges on the equipment side.

4. 2 Installation

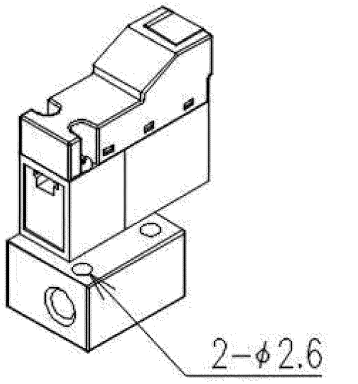
> **⚠ WARNING :** When installing a solenoid valve unit, never attempt to hold it in position by means of the pipes connected to it.
> - Mount the solenoid valve by applying the mounting screws and/or mounting plate to the solenoid valve.

4. 2. 1 A work space for installation, removal, wiring, and piping operations should be provided around the installed solenoid valve system.

4. 2. 2 Direct mounting

1) Unit Sub plate Type

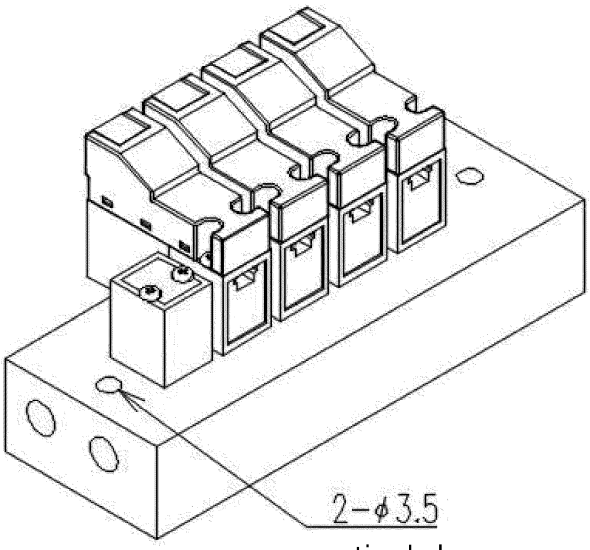
Use two through holes



mounting holes

2) Manifold Type

Use two mounting holes



mounting holes

4. 3 Piping

⚠ CAUTION :

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

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

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

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

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

f) Removal of foreign matter
- Install the vacuum filter between the pad nozzle and the valve, if it is used under the vacuum condition.

g) Do not use the product as emergency cutout solenoid valve.
- Starting response time can be late, when leaving under elevated pressure for a long time.

Appropriate tightening torque

Connecting screw	Tightening torque N·m
M5	1.0～1.5

4. 3. 1 Flushing

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

4. 3. 2 About M5 joint

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

4. 3. 3 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. 4 Pipe connections

(1) Tubes to be used

For use with solenoid valves with one-touch joints, select tubes of the type specified by us:

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

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

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

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

Tube dimensions

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

Outside diameter allowance

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

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

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

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

(7) Tube connections

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

(8) Blank plug to be used

For use with a solenoid valve with a one-touch joint, select the blank plug specified by us.

Blank plug （GWP□-B Series）

4. 4 Wiring

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

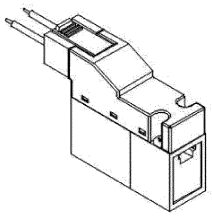
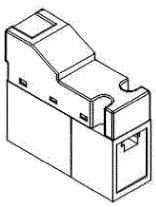
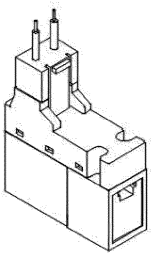
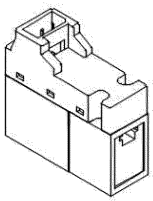
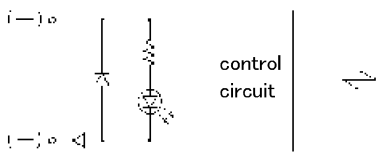
- A person who wires needs to have knowledge for safely performing such operation based on the understanding about the mechanisms and operating principles of solenoid valves.

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

4. 4. 1 Caution for wiring

(1) Use it under low dust or under avoiding direct contact with dripping water or splashing of cutting oil.
(2) For the electrical circuit, use a switching circuit free of chattering.
(3) The electrical circuit should have fuses.
(4) Be sure that the operation voltage is within 10% of the rated voltage.
(5) 3QB has the control circuit of current, therefore the current value is reduced when the coil holds suctioned. Verify that only plus common has polarity.
(6) Install the valve so that wiring connections are not subject to any force(such as that caused by a device movement)

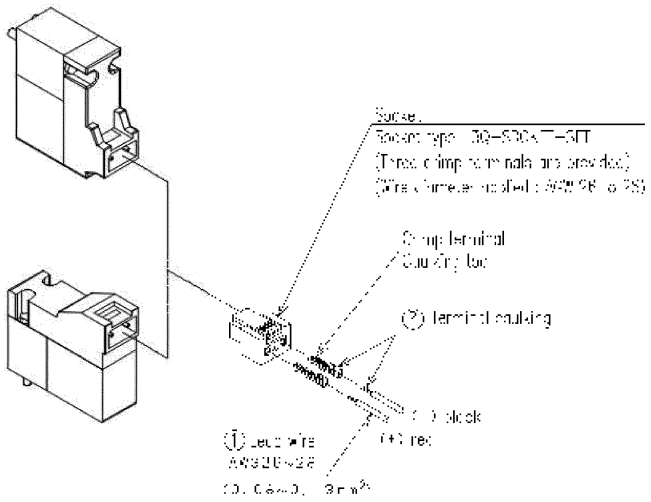
4. 4. 2 Wire connection

Name	Plug-in connector C type with lead wire	Plug-in connector C type without lead wire	Plug-in connector D type with lead wire	Plug-in connector D type without lead wire
Option code	C2, 20, 21, 22	C3	D2, 20, 21, 22	D3
Shape				
Circuit				

4) Wiring of the C-type, D-type connectors

Wire the terminal box by following ① to ④ in the illustration.

① Peel off 2 to 3 mm of insulation on the lead wire end.
② Caulk the lead wire to the crimp terminal by caulking tool.
③ Insert the terminals into either side holes at the socket.
④ Insert the socket into the connecter of the solenoid valve.



Note
Please be careful not to reverse thepolarity.
If mistaking it, the circuit does not short. But the solenoid valve cannot be operated.
Please contact CKD for details on the crimp terminal and caulking tool

5. APPROPRIATE WAY OF USING

5. 1 Air Quality

⚠ WARNING :

a) Do not supply anything other than compressed air or low vacuum.

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) Do not lubricate. Doing so will deteriorate rubber parts, and will cause malfunction.

5. 1. 1 Lubrication

The 3QB series solenoid valve systems do not require lubrication from the outside. Do not lubricate to the solenoid valve. Doing so will cause slow response or malfunction.

5. 1. 2 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 grease, causing a malfunction from the lack of lubrication.

5. 1. 3 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.

3) Install the vacuum filter between the pad nozzle and the valve, if it is used under the vacuum condition.

5. 1. 4 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.

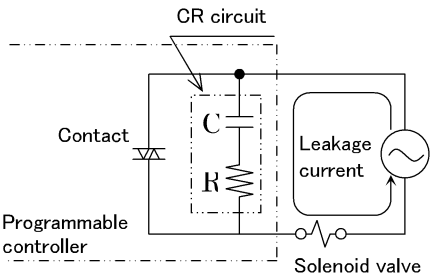
5. 2 Electric Circuits

⚠ 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.

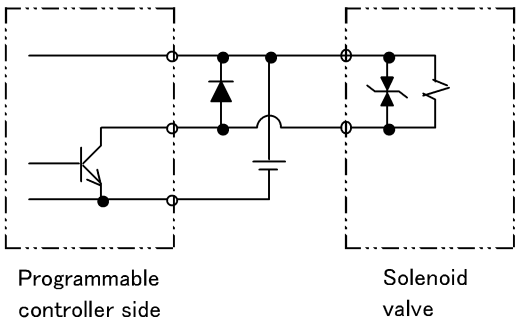


DC24V	1.8 mA or lower
DC12V	1.5 mA or lower

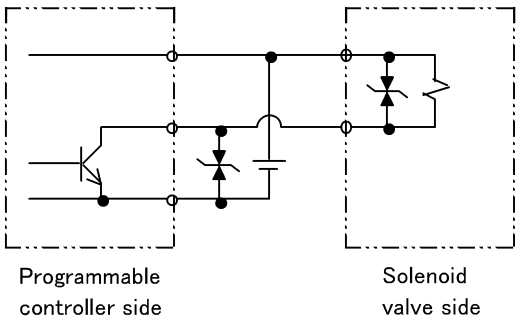
⚠ CAUTION : ■ The surge killer is installed in the solenoid valve to protect the output contact for functioning the solenoid valve. The effect of the protection to the peripheral devices besides it cannot be expected. Therefore the effect of the surge (breakage or malfunction) may be given to the peripheral devices. In addition, the surge killer absorbs the surge occurred by external devices, happening the accident of breakage, for example burning breakage, etc. Verify the following units.

a) When the output unit is a NPN type, a surge voltage of "voltage stated in above table" + "power voltage" may be applied to the output transistor. To avoid this trouble, it may be required to separately install a contact protection circuit.

< Example 1 Separate installation of output transistor protection circuit >



< Example 2 Separate installation of output transistor protection circuit >



b) If another devices or solenoid valves are connected to the solenoid valve in parallel, the reverse surge voltage occurred while the power of the solenoid valve is OFF is applied to those devices. When the solenoid valve with the surge killer for DC24V is used, the surge voltage reaches minus several tens V due to the type, and an-

⚠ CAUTION :

other device connected in parallel may be broken or be malfunctioned by this voltage of reverse polarity. Do not connect in parallel the solenoid valve and another devices, which are weak of the voltage of reverse polarity (for example LED lamp).
When a few solenoid valves are functioned in parallel, the surge of another solenoid valve is flowed to surge killer of one solenoid valve with it, and therefore it may make burning breakage the surge killer due to current value.

When a few solenoid valves with the surge killer are functioned in parallel, the surge current converges on the surge killer of the most low limiting voltage, and it may make burning breakage similarly. If the solenoid valves are same model number, the surge killer may make burning breakage at worst because their limiting voltages vary widely. Do not function in parallel a few solenoid valves.

c) When the surge killer installed in the solenoid valve is broken by the over voltage or the over current from besides the solenoid valve, it short-circuits in many cases. Therefore, after broken it, a large current is flowed while the output is ON, and the output circuit or the solenoid valve may be broken or get a fire at worst. Do not keep a continuous energizing while the solenoid valve is broken. In addition, install the protection circuit of the over current at the power source or the functioning circuit, or use the power source with the protection of over current not to continue flowing a large current.

⚠ CAUTION :

■Continuous energizing

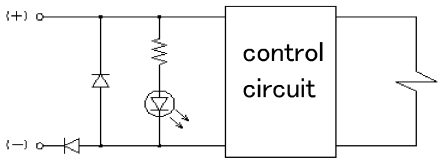
(1) When touching the valve, be careful of it. The coil may get very hot by ambient temperature or by welding time.

(2) Valve perfomance deterioration may be accelerated if valves are continuously energiving for long periods of time.

5. 2. 1 the control circuit of current

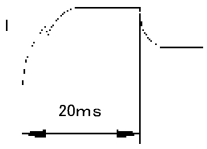
Do not use the solenoid valve when the vibration or the shock beyond the range of specification is applied to it. Doing so will cause malfunction.

3QB1 series has the control circuit of current, therefore the current value is reduced when the coil holds suctioned. Verify that only plus common has polarity.



Electric circuit diagram

Voltage wave



Current wave

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?

6. 2 Replacing Of The Solenoid Valve

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

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

⚠ CAUTION : Screws must be tightened with a correct torque. Otherwise, the product will be damaged.

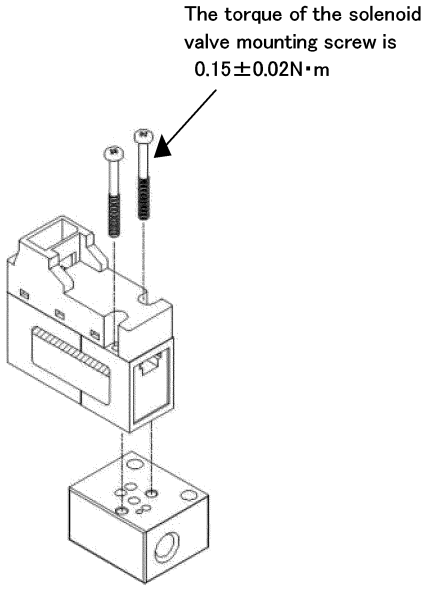
6. 2. 1 Solenoid valve mounting and detaching

When replacing the solenoid valve, play special attention so that no gaskets are fallen down.

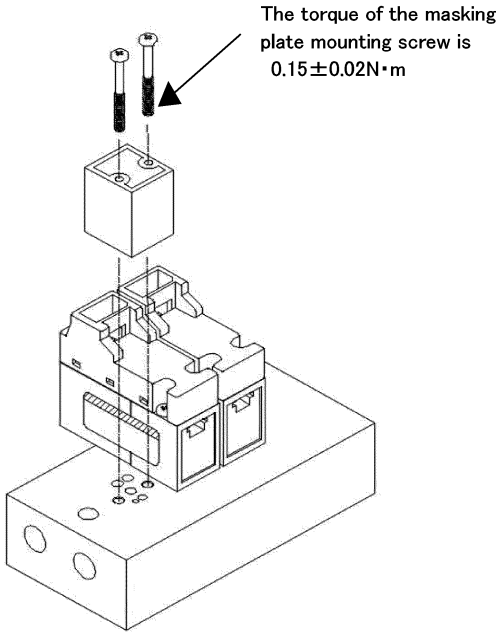
(The following figure reference)

The proper tightening torque of the solenoid valve mounting screw is 0.15±0.02 N·m

The proper tightening torque of the masking plate mounting screw is 0.15±0.02 N·m



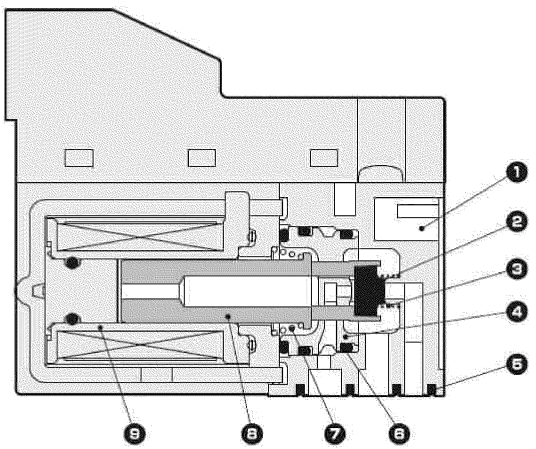
Case of Unit



Case of MF

Before replacing, be sure to turn off power supply and discharge the residual pressure.

6. 3 Internal Structure And Parts List



No.	Parts	Material
1	Body	Resin
2	Valve sheet	Nitrile rubber
3	Valve spring	Stainless steel
4	Plug	Resin
5	Body Gasket	Fluorine rubber
6	O ring	Fluorine rubber
7	Plunger spring	Stainless steel
8	Plunger	Stainless steel
9	Coil ass'y	—

7. TROUBLE SHOOTING

Motion troubles	Suspected cause	Remedies
Does not actuate	No electric signals	Turn on the power
	Damage to signal wiring system	Repair the control circuit
	Excessive fluctuating range of current or voltage	Reaffirm the power capacity (within ±10% of voltage fluctuation)
Malfunctions	Excessive leaking current	Correct control circuit and / or set a bleed circuit
	Chattering	Inspect switching system and / or tighten each loosen terminal screw
	Voltage deviates than specified on the name plate	Rectify the voltage to meet the specification
	Damaged or short circuited coil	Replace the solenoid valve
	Erroneous shut off pressure source	Turn on the power source
	Insufficient pressure	Reset the pressure reducer valve or install a pressure raising valve
	Insufficient flow of fluid	Rectify the size of pipe or install a surge tank
	Erroneous piping, erroneous omitting some piping	Rectify the piping system
	Speed control valve completely closed by error	Reset the needle valve
	Sticky stem Sticking tarry or liquid jelly substitute	Carry out pipe dressing Operate it periodically
	Valve is frozen	Add remedies of avoiding freezing (Heating system or dehumidifying system etc.)
	Delayed return of a plunger (Incorporation of oil, existence of tar)	Install a oil mist filter Install a tar removing filter
	Clogged-up exhausting port with dust	Install a cover or silencer and clean it regularly
Internal leakage	Bulged or decomposed packings (Incorporation of oil)	Install a oil mist filter and keep organic chemicals away from valves
	Bulged or decomposed packings Incorporation of drain Initial lubricant is washed off Incorporation of oil	Change the piping to an external pilot system Install dryer or filter
	Foreign particles cut into packing lips	Remove the foreign particle away from the packing Install a filter
Malfunctions when manifold is used	Delayed response when multiple blocks are used	Install Sup. (P) piping to 1 ports on both sides of manifold block
	Delayed response when multiple blocks are used	Connect Exh. (R) piping to 2 ports on both sides of manifold block so as to exhaust to an open air through
	Adjacent cylinder pops out. Intrusion of exhaust air	Rewire to have the solenoid valve in question is actuated prior to others sequentially Increase exhaust air Change type to individual exhaust

8. PRODUCT SPECIFICATIONS AND HOW TO ORDER

8. 1 Product Specifications

1) 3QB1 series

(1) Specifications

Model code / Item	3QB11※－H	3QB11※－HP	3QB11※－HV
Type of valve	2 position single solenoid valve(NC type)		
Working fluid	Compressed air or low vacuum	Compressed air	Low vacuum
Type actuation	Direct type poppet valve		
Min. Working pressure MPa	−0.1	0.1	Low vacuum：-100kPa
Max. Working pressure MPa	0.3 ※1	0.65	0
Certified withstanding pressure MPa	0.6	0.98	-101kPa
minimum working pressure differential MPa	0.4	0.55	0.1
Flow rate C [dm3/(s･bur)]	1→2：0.11、2→3：0.11		2→1：0.18、3→2：0.11
Piping	M5		
Ambient temperature ℃	0～50 (Not to be frozen)		
Working fluid temp. ℃	5～50		
Responding time (ON/OFF) ms	5 or less ※2		
Lubrication	It is not allowed to lubricate ※3		
Protective structure	Dust proof		
Working atmosphere	It is not allowed to use this product in corrosive gas atmosphere		
Mass g	12.5(discrete solenoid valve)		

(2) Electric specifications

Specification	3QB1 series	
Rated voltage (V)	DC12V	DC24V
Starting current (A)	0.183	0.092
Holding current (A)	0.050	0.025
Electricity consumption (with lamp) (W)	0.6 ※4	
Range of voltage fluctuation	±10%	
Class of insulation	B	
Wiring type	C type connecter, D type connecter	
Indicator	Surge killer ・ LED	

※1. When using only positive pressure, it can be used in the pressure range of 0 to 0.4 MPa

※2. Responding time is based on continuous operation at 20° C with supply pressure of 0.5 MPa.

※3. Lubrication will deteriorate performance.

※4. Electricity consumption is 2.2W from starting until 20ms.

2) M3QB1 series

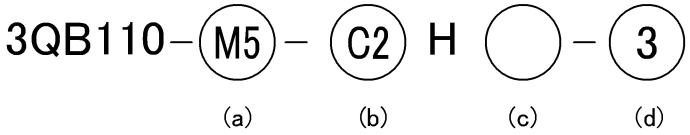
(1) Specifications

Model / Item	M3QB110－H	M3QB110－HP	M3QB110－HV
Type of manifold	Consolidated sub plate type		
Applicable solenoid valve	3QB119－H	3QB119－HP	3QB119－HV
Number of blocks	2 to 20 blocks		
Kind of manifold	Port 2(A) individual, port 1(P)･3(R) concentrated		Port 2(A) individual, port 1(V)･3(R) concentrated
Wiring type	C type connecter, D type connecter		
Piping	M5		

8. 2 How To Order

8. 2. 1 3QB1 series

※ Direct piping type

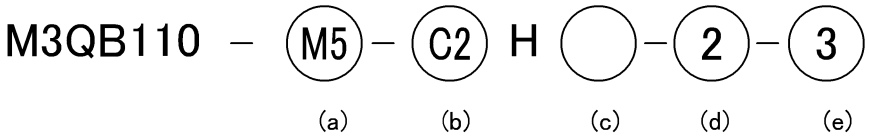


(a) Port size		(b) Electric connection		(c) Option		(d) Voltage	
Code	Ports 1, 2, 3	Code	Description	Code	Description	Code	Description
M5	M5	C2	Plug-in connector C type (300mm)	No code	positive or negative pressure	4	DC12V
		C20	Plug-in connector C type (500mm)	P	positive pressure	3	DC24V
		C21	Plug-in connector C type (1000mm)	V	negative pressure		
		C22	Plug-in connector C type (2000mm)				
		C3	Plug-in connector C type, without lead wire				
		D2	Plug-in connector D type (300mm)				
		D20	Plug-in connector D type (500mm)				
		D21	Plug-in connector D type (1000mm)				
		D22	Plug-in connector D type (2000mm)				
		D3	Plug-in connector D type, without lead wire				

8. 2. 2 M3QB1 series

※ Solenoid valve for manifold

Manifold



(a) Port size		(b) Electric connection		(c) Option		(d) No. of stations	
Code	Ports 1, 2, 3	Code	Description	Code	Description	Code	Description
00	No piping	C2	Plug-in connector C type (300mm)	No code	positive or negative pressure	2	2 stations
M5	M5	C20	Plug-in connector C type (500mm)	P	positive pressure type	20	20 stations
		C21	Plug-in connector C type (1000mm)	V	negative pressure type		
		C22	Plug-in connector C type (2000mm)				
		C3	Plug-in connector C type, without lead wire				
		D2	Plug-in connector D type (300mm)				
		D20	Plug-in connector D type (500mm)				
		D21	Plug-in connector D type (1000mm)				
		D22	Plug-in connector D type (2000mm)				
		D3	Plug-in connector D type, without lead wire				

(e) Voltage	
Code	Description
4	DC12V
3	DC24V

8. 2. 3 Masking plate kit

Masking plate kit　3QB1-MP-KIT

Negative pressure type(V) Masking plate kit　3QB1-MP-KIT-V

8. 2. 4 Socket assembly

Socket assembly　3Q-SOCKET-ASSY-300
(a)

(a) Electric connection	
Code	Description
300	wire length 300mm
500	wire length 500mm
1000	wire length 1000mm
2000	wire length 2000mm

Socket set　3Q-SOCKET-SET