CKD

SM－206792-A

INSTRUCTION MANUAL

MASTER VALVE

3KA1, 4KA1, 4KB1
M3KA1, M4KA1, M4KB1

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

3rd Edition
CKD Corporation

SAFETY PRECAUTIONS

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

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

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

Observe warnings and precautions to ensure device safety.

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

⚠ WARNING

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

2. Use this product within its specifications.

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

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

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

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

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

ISO4414, JIS B 8370 (pneumatic system rules)

JFPS2008 (principles for pneumatic cylinder selection and use)

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

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

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

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

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

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

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

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

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

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

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

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

Precautions with regard to guarantee

● Guarantee period

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

● Guarantee coverage

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

However, the guarantee excludes following cases:

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

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

● Confirmation of product compatibility

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

UNPACKING (Section 3)

⚠ CAUTION : Bags containing master 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 master valves to fail or malfunction.

INSTALLATION (Section 4)

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

ENVIRONMENT (Section 4.1)

⚠ CAUTION :

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

- The movement of the master valve causes a respiratory action at the master 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 master valve system dry. Take care to avoid direct contact with dripping water or splashes of cutting oil.

- If the cylinder rod is splashed with cutting oil, the oil may penetrate through the cylinder into the secondary side piping of the master valve. This must be prevented to avoid malfunctions. Consult us for preventive measures.

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

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

d) Vibrations and shocks

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

⚠ CAUTION :

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

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

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

INSTALLATION (Section 4.2)

⚠ WARNING :

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

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

PIPING (Section 4.3)

⚠ CAUTION :

a) Observe the recommended tightening torque when connecting pipes.

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

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

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

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

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

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

e) Do not decrease the inside diameter of the piping from any of the master 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.

f) Removal of foreign matter

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

AIR QUALITY (Section 5.2)

⚠ 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.

PERIODIC INSPECTION (Section 6.1)

⚠ WARNING :

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

- The above is required to ensure safety.

⚠ CAUTION :

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

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

DISASSEMBLING AND REASSEMBLING (Section 6.2)

⚠ WARNING :

Before disassembling and reassembling master valves, read the instruction manual carefully and understand the instructions.

- A person who disassembles and reassembles a master valve system needs to have a knowledge for safely performing such operation based on the understanding about the mechanisms and operating principles of master valves.
- Personnel involved in this step must have passed the Pneumatic Pressure Skill Test Class 2 or higher.

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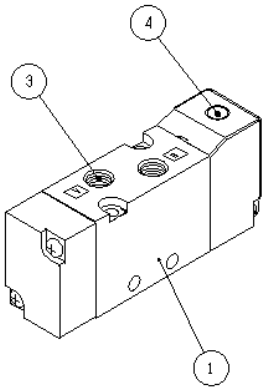
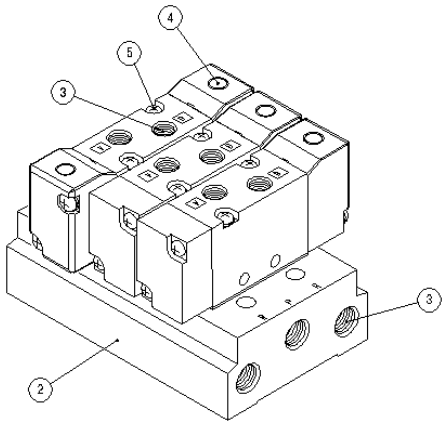
MASTER VALVE

Manual No. SM-206792-A/3

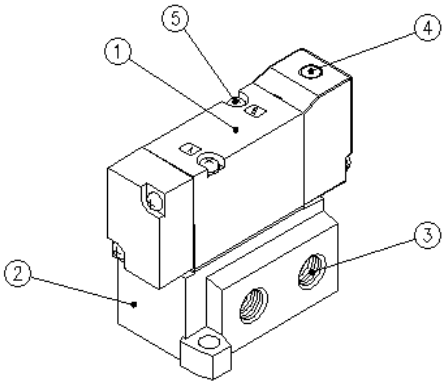
1. PART NAME AND DESCRIPTION



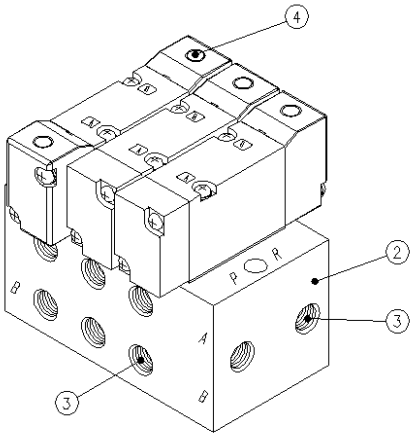
Direct piping unit



Direct piping manifold



Subplate piping unit



Subplate piping manifold

No.	Part Name	explanation
①	Master valve unit	There are direct pipng and subplaate piping
②	Sub plate	It is a block for the piping
③	Piping Port	Port pis the supply port;port R is the exhaust port ; port A and B is the Output port
④	Pilot air piping port	It is pilot air,a supply port.(PA,PB)
⑤	Mounting screw	There are two every individual valve and it fixes the valve unit on the Various base.

2. INTERNATIONAL SYSTEM OF UNITS (SI)

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/cm² → **0.0980665MPa** **1MPa** → 1.01972×10kgf/cm²

- 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/m²	MPa or N/mm²	kgf/mm²	kgf/cm²
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/m², 1MPa=1N/mm²

- Pressure

Pa	kPa	MPa	bar	kgf/cm²	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/m²

3. UNPACKING

⚠ CAUTION : Bags containing master 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 master valves to fail or malfunction.

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

4. INSTALLATION

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

4.1 Environment

⚠ CAUTION :

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

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

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

- If the cylinder rod is splashed with cutting oil, the oil may penetrate through the cylinder into the secondary side piping of the master valve. This must be prevented to avoid malfunctions. Consult us for preventive measures.
hot.

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

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

d) Vibrations and shocks

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

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

⚠ CAUTION :

f) 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 thunder-storms).

- 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 master valve unit, never attempt to hold it in position by means of the pipes connected to it.

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

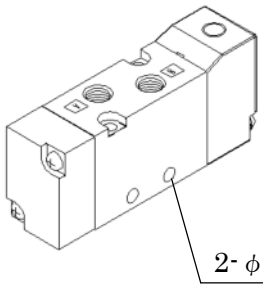
4.2.1 A work space for installation, removal, wiring, and piping operations should be provided around the installed master valve system.

4.2.2 Direct mounting

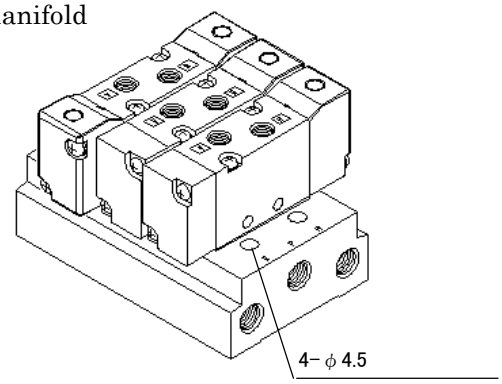
1) Direct piping Type

Use two or four through holes

unit



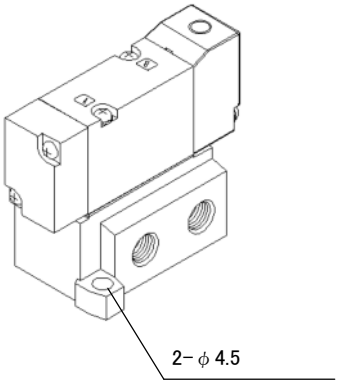
manifold



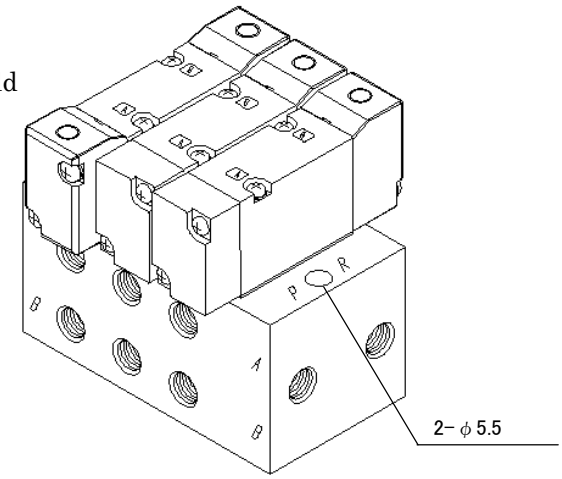
2) Sub plate piping Type

Use two mounting holes

unit



manifold



4.3 Piping

⚠ CAUTION :

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

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

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

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

e) Do not decrease the inside diameter of the piping from any of the master 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 master valves.

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

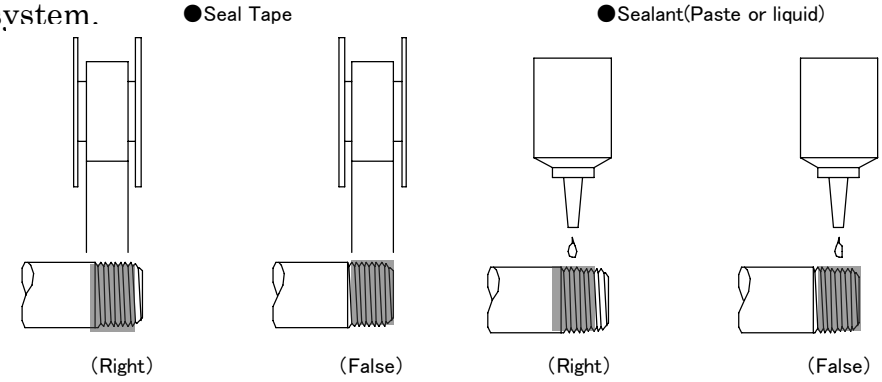
g) Air supply
- Do not restrict the flow of air through the air supply piping. With a manifold system with multiple stations, a drop in the air supply pressure may cause trouble through a delay in the operation timing

Approproate torque

Joint screw	Approproate torque N·m
M5	1 to 1.5
Rc1/8	3 to 5

4.3.1 Sealant

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



When winding the fluororesin seal tape on the screw part, wind the seal tape two or three times where one or two screw threads remain at the top end of the screw, and then push the tape by tip of the nail to make the tape tightly in contact with the screw. When using the liquid sealant, apply a proper amount of sealant where one or two screw threads remain at the top end of the screw.
At this time, do not apply the sealant to the female screw parts of the machine.

4.3.2 Flushing

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

4.3.3 About M5 joint

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

4.3.4 Blow circuit

Do not open the cylinder port circuit to the air because a drop in the air supply pressure may cause a malfunction.

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 master valve.

4.3.6 Pipe connections

(1) Tubes to be used
For use with master 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 master valve with a one-touch joint, select the blank plug specified by us: Blank plug GWP□-B Series

5. OPERATING RECOMMENDATION

5.1 OPERATION

1） 3KA series

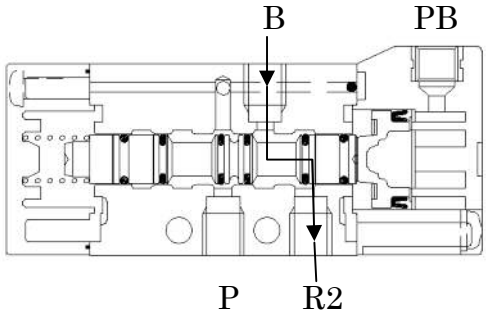
- 3KA111

  When PB no pressurization (See the right figure)

  B → R2 (P port is closed.)

  When PB pressurization

  P → B (R2 port is closed.)



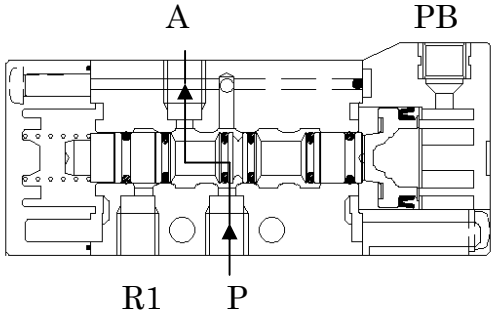
- 3KA1111

  When PB no pressurization (See the right figure)

  P → A (R1 port is closed.)

  When PB pressurization

  A → R1 (P port is closed.)



- 3KA121

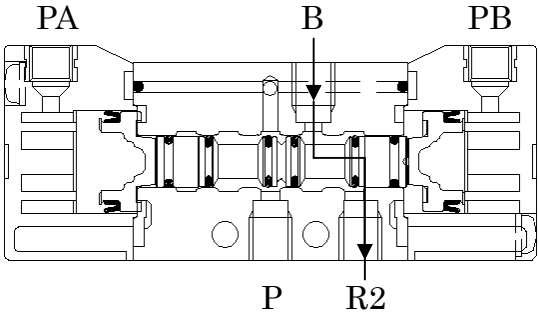
  When PA pressurization (See the right figure)

  B → R2

  When PB pressurization

  P → B

  Even if air is cut off after pressurization,it maintaing the changing by the self



2） 4KA series

- 4 KA111

  When PB no pressurization (See the right figure)

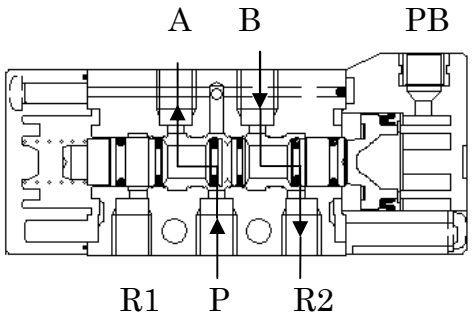
  P → A

  B → R2 (R1 port is closed.)

  When PB pressurization

  P → B

  A → R1 (R2 port is closed.)



- 4KA121

  When PA pressurization (See the right figure)

  P → A

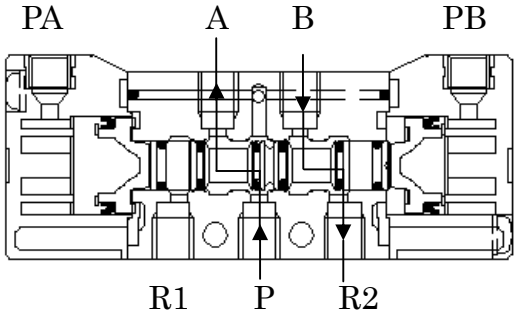
  B → R2 (R1 port is closed.)

  When PB pressurization

  P → B

  A → R1 (R2 port is closed.)

Even if air is cut off after pressurization,it maintaing the changing by the self



- 4KA131, 4KA141, 4KA151

  When 4KA131 is PA,PB no pressurization (See the right figure)

  P・A・B・R1・R2 are closed.

  When 4KA141 is PA,PB no pressurization

  P (Closed.)

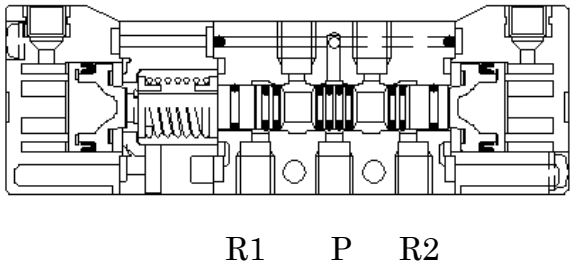
  A → R1

  B → R2

  When 4KA151 is PA,PB no pressurization

  P → A・B

  R1・R2 (Closed)



Refer to the function of 4KA121 concerning the case of PA or PB which is pressurization

2) 4KBseries

● 4KB111

When PB no pressurization (See the right figure)

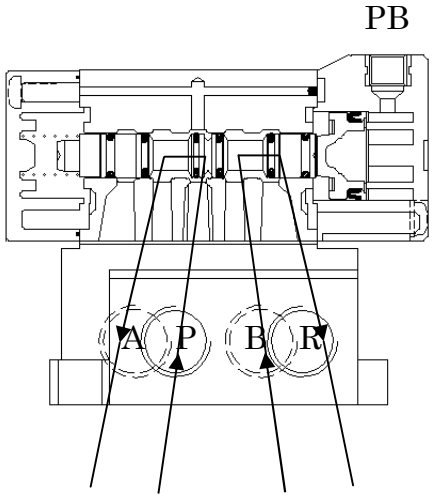
P → A

B → R

When PB pressurization

P → B

A → R



● 4KB121

When PA pressurization (See the right figure)

P → A

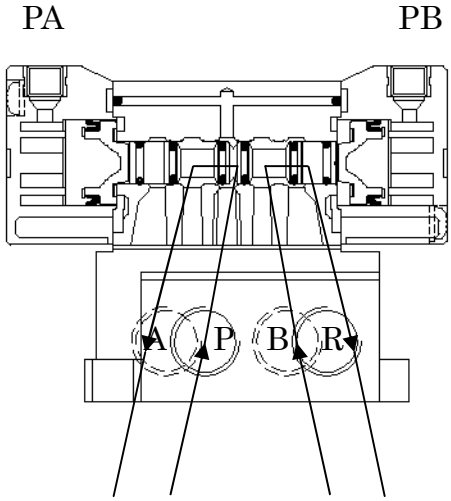
B → R

When PB pressurization

P → B

A → R

Even if air is cut off after pressurization,it maintaing the changing by the self



● 4KB131, 4KB141, 4KB151

When 4KA131 is PA,PB no pressurization (See the right figure)

P・A・B・R are closed.

When 4KA141 is PA,PB no pressurization

P (Closed.)

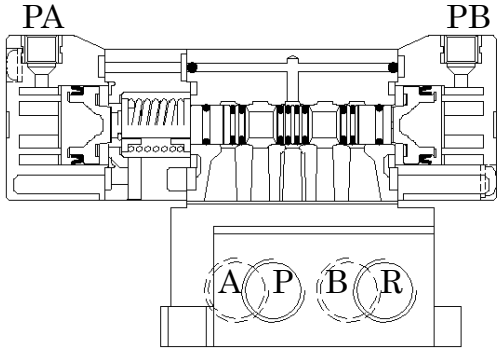
A・B → R

When 4KA151 is PA,PB no pressurization

P → A・B

R (Closed.)

Refer to the function of 4KB121 concerning the caseof PA or PB which is pressurization



5.2 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.

5.2.1 Lubrication

The 4KA1,4KB1 Series master 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.

5.2.2 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.

5.2.3 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.

5.2.4 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.

5.2.5 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.

6. MAINTENANCE

6.1 Periodic Inspection

⚠ WARNING : Before providing a maintenance service, cut 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 master 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 master 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?

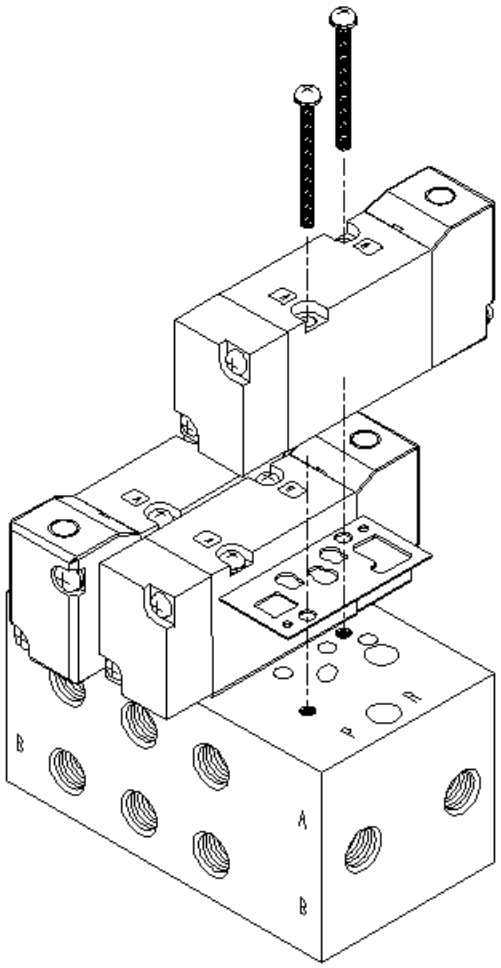
6.2 Disassembling and Reassembling

> **⚠ WARNING :** Before disassembling and reassembling master valves, read the instruction manual carefully and understand the instructions.
>
> - A person who disassembles and reassembles a master valve system needs to have a knowledge for safely performing such operation based on the understanding about the mechanisms and operating principles of master valves.

6.2.1 Master valve mounting and detaching

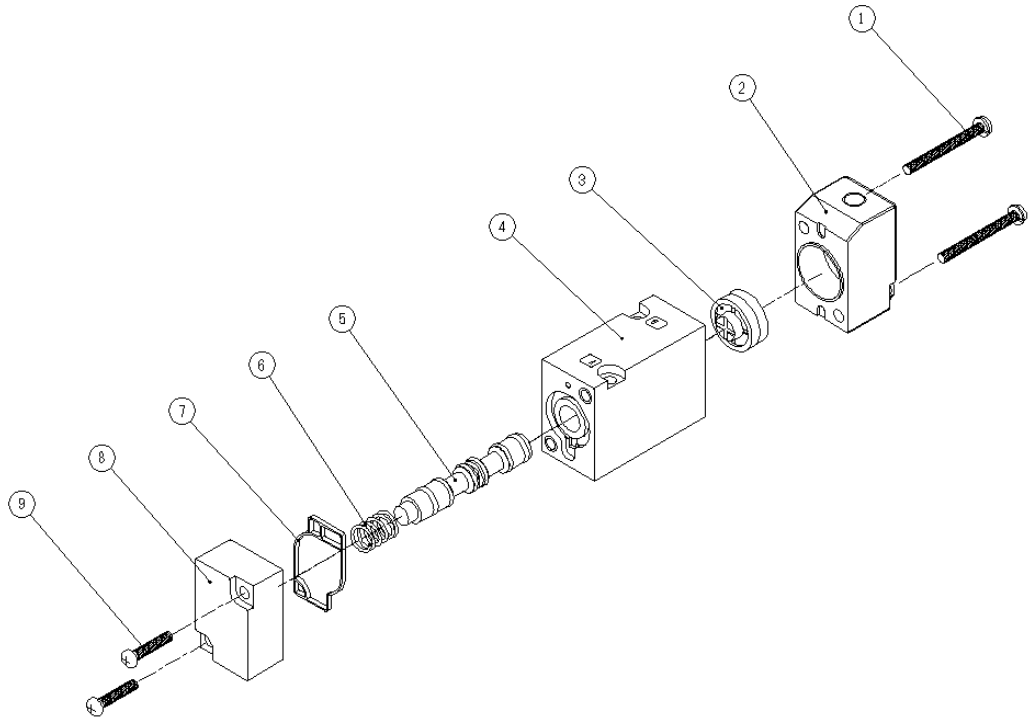
When replacing the master valve, pay special attention so that no gaskets are fallen down. Additionally, carefully check the orientation of the gasket and the master valve.

The proper tightening torque of the master valve mounting screw is 0.8 to 0.9 N·m.



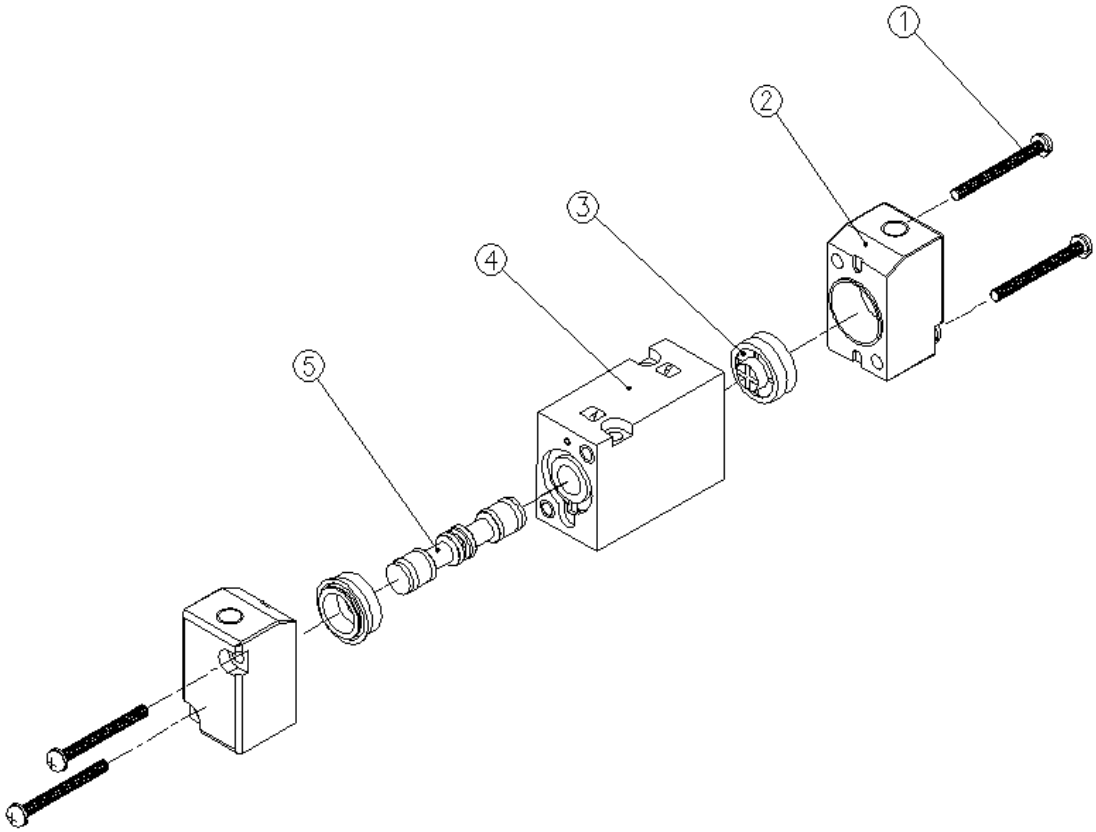
6.2.2 Disassembling drawing and parts list

1) 3KA111･3KA1111
4KA111･4KB111



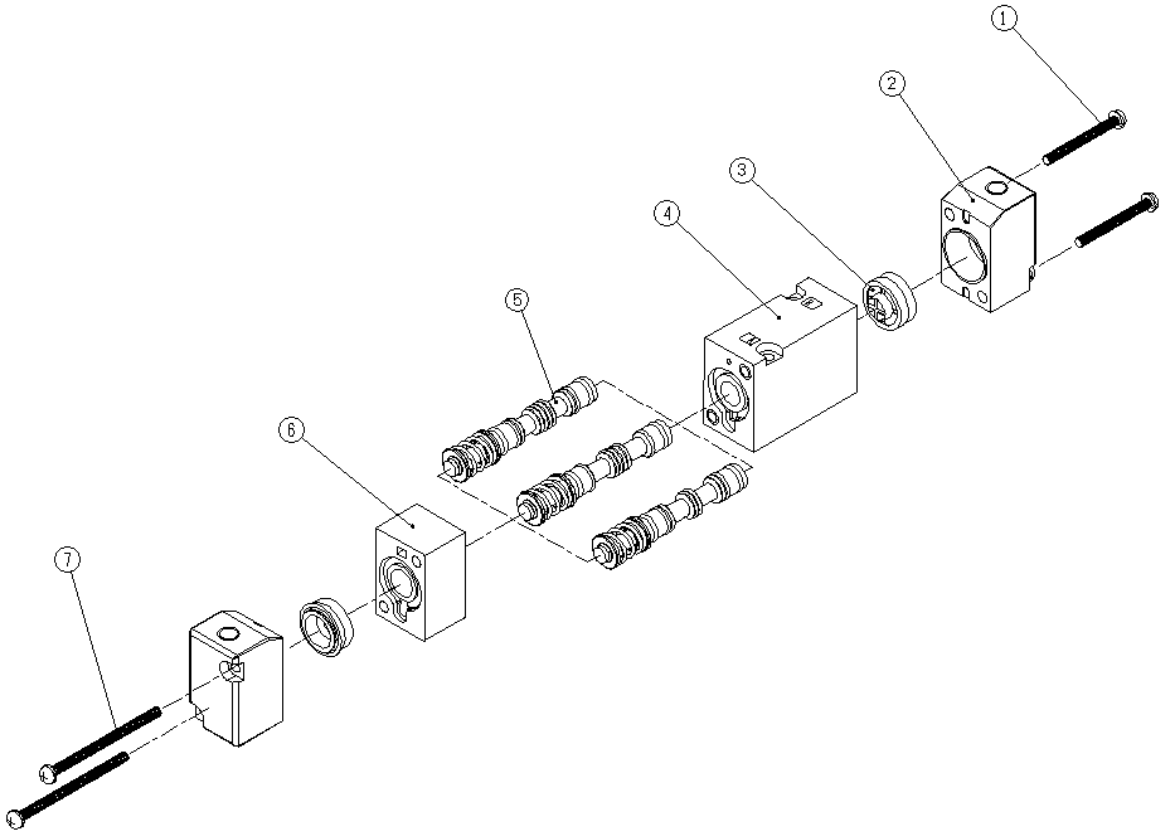
No.	Parts	Material	Qty	Remarks
①	Pilot cap mounting screw	Steel	2	M2.5 × 17(with Spring washer)
②	Pilot cap	Resin	1	
③	Piston ass'y		1	
④	Body	Aluminum alloy die casting	1	
⑤	Spool ass'y		1	
⑥	Spool spring	Stainless steel	1	
⑦	Cap Gasket	Nitrile rubber	1	
⑧	Cap	Resin	1	
⑨	Cap mounting screw	Steel	2	M2.5×12.6(with Spring washer)

2)　　3KA121・4KA121・4KB121



No.	Parts	Material	Qty	Remarks
①	Pilot cap mounting screw	Steel	4	M2.5 × 17(with Spring washer)
②	Pilot cap	Resin	2	
③	Piston ass'y		2	
④	Body	Aluminum alloy die casting	1	
⑤	Spool ass'y		1	

3) 4KA131・4KA141・4KA151
4KB131・4KB141・4KB151



No.	Parts	Material	Qty	Remarks
①	Pilot cap mounting screw	Steel	4	M2.5 × 22(with Spring washer)
②	Pilot cap	Resin	2	
③	Piston ass'y		2	
④	Body	Aluminum alloy die casting	1	
⑤	Spool ass'y		1	
⑥	Body block	Resin	1	
⑦	Pilot cap mounting screw(3pozi)	Steel	2	M2.5 × 30(with Spring washer)

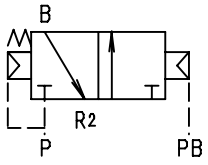
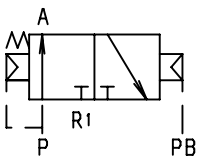
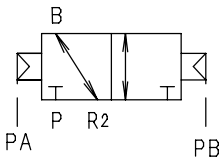
7. TROUBLE SHOOTING

TROUBLE SHOOTING

Motion troubles	Suspected cause	Remedies
Does not actuate	Pilot signal doesn't come	Correction of the air circuit
	Pilot pressure is low	Adjustment of the pilot pressure
Malfunctions	Erroneous shut off pressure source	Turn on the power source
	Insufficient pressure	Reset the pressure reducer valve or install a pressure raising valve
	Insufficient flow of fluid	Rectify the size of pipe or install a surge tank
	Pressure supplied through exhaust port	Change the piping to an external pilot system
	Erroneous piping, erroneous omitting some piping	Rectify the piping system
	Speed control valve completely closed by error	Reset the needle valve
	A port B port is directly released to an open air	Install pipe joints to A and B ports with diameter equal to or smaller than that of to P port joint
	Valve is frozen	Add remedies of avoiding freezing (Heating system or dehumidifying system etc.)
	Clogged-up exhausting port with dust	Install a cover or silencer and clean it regularly
High actuating pressure is required	Bulged or decomposed packings	Check the quality of the lubricant (Turbine oil type1, ISO VG 32 or equivalent) Relocate the valves away from splashing area of cutting coolant Keep organic chemicals away from valves.
	Release of A and / or B port to an open air directly	Check the piping. Apply more grease.
	Foreign particles cut into packing lips	Remove the foreign particle away from the packing
Malfunctions when manifold is used	Adjacent cylinder pops out (3-way, single acting cylinder)	After pressurizing pilot air the master valve in question is actuated prior to others sequentially. Install a locking system to the cylinder

8. PRODUCT SPECIFICATIONS AND HOW TO ORDER

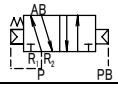
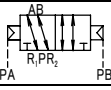
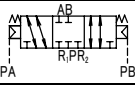
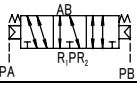
8.1 Product Specifications

Model code			3KA111 2-pos. normal close single	3KA1111 2-pos. normal open single	3KA121 2-pos. double
JIS Symbol Item					
Working fluid			Compressed air		
Valve type and operation			Pilot operated soft spool valve		
Proof pressure		MPa	1.05		
Port size	Supply port	P	M5(option: ϕ 4, ϕ 6 push-in joint)		
	Cylinder ports	A・B			
	Exhaust ports	R1・R2	M5		
	Pilot ports	A・B			
Flow characteristics C(Sonic conductance)		$dm^3/(s \cdot bar)$	0.65		
Ambient temperature (Note 1)		℃	-5 to 50 (No freezing)		
Fluid temperature		℃	5 to 50		
Lubrication			Not required (Use turbine oil type 1, ISO VG32 when required)		
Vibration resistance		m/s^2	50 or less		
Shock resistance		m/s^2	300 or less		
Atmosphere			No corrosive gas should exist		
Working pressure		MPa	0.15to0.7		0to0.7
Pilot pressure		MPa	(0.6×working pressure+0.06) to0.7		0.15to0.7

- Pressure is converted as 1MPa=10.1972kgf/cm^2≒10.2kgf/cm^2

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

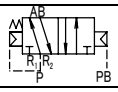
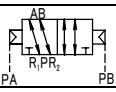
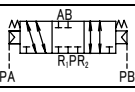
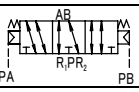
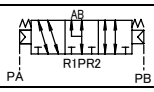
Model code Item			M3KA1
Manifold system			Manifold integrated
Applicable master valve			3KA1 series
Nos. of station			2～20 stations
Manifold type			Common supply, common exhaust
Port size	Supply port	P	Side (Rc1/8)
	Cylinder ports	A・B	Top (M5) (Option : Top ϕ 4, ϕ 6 push-in joint)
	Exhaust ports	R1・R2	Side(Rc1/8)
	Pilot ports	PA・PB	Top (M5)

Model code			4KA111 2-pos. single	4KA121 2-pos. double	4KA131 3pos. all ports blocked	4KA141 3-pos. load ports open to exhaust ports	4KA151 3-pos. load ports open to supply ports
JIS Symbol Item							
Working fluid			Compressed air				
Valve type and operation			Pilot operated soft spool valve				
Proof pressure		MPa	1.05				
Port size	Supply port	P	M5(option: ϕ 4, ϕ 6 push-in joint)				
	Cylinder ports	A・B					
	Exhaust ports	R1・R2	M5				
	Pilot ports	A・B					
Flow characteristics C(Sonic conductance)		$dm^3/(s \cdot bar)$	0.65		0.60	0.68	0.61
Ambient temperature (Note 1)		℃	-5 to 50 (No freezing)				
Fluid temperature		℃	5 to 50				
Lubrication			Not required (Use turbine oil type 1, ISO VG32 when required)				
Vibration resistance		m/s^2	50 or less				
Shock resistance		m/s^2	300 or less				
Atmosphere			No corrosive gas should exist				
Working pressure		MPa	0.15to0.7	0to0.7			
Pilot pressure		MPa	(0.6×working pressure+0.06) to0.7	0.15to0.7	0.2to0.7		

- Pressure is converted as 1MPa=10.1972kgf/cm^2≒10.2kgf/cm^2

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

Model code Item			M4KA1
Manifold structure			Manifold integrated
Applicable master valve			4KA1 series
Nos. of station			2～20 stations
Manifold type			Common supply, common exhaust
Port size	Supply port	P	Side (Rc1/8)
	Cylinder ports	A・B	Top (M5) (Option : Top ϕ 4, ϕ 6 push-in joint)
	Exhaust ports	R1・R2	Side(Rc1/8)
	Pilot ports	PA・PB	Top (M5)

Model code		4KB111 2-pos. single	4KB121 2-pos. double	4KB131 3pos. all ports blocked	4KB141 3-pos. load ports open to exhaust ports	4KB151 3-pos. load ports open to supply ports
JIS Symbol / Item						
Working fluid		Compressed air				
Valve type and operation		Pilot operated soft spool valve				
Proof pressure MPa		1.05				
Port size	Supply por P	Rc1/8				
	Cylinder ports A・B					
	Exhaust ports R1・R2	M5				
	Pilot ports A・B					
Flow characteristics C(Sonic conductance) $dm^3/(s \cdot bar)$		0.89		0.63	1.2	0.75
Ambient temperature (Note 1) ℃		-5 to 50 (No freezing)				
Fluid temperature ℃		5 to 50				
Lubrication		Not required (Use turbine oil type 1, ISO VG32 when required)				
Vibration resistance m/s^2		50 or less				
Shock resistance m/s^2		300 or less				
Atmosphere		No corrosive gas should exist				
Working pressure MPa		0.15 to 0.7	0 to 0.7			
Pilot pressure MPa		0.6×working presure+0.06) to 0.7	0.15 to 0.7	0.2to0.7		

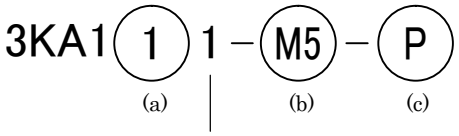
- Pressure is converted as $1MPa=10.1972kgf/cm^2 \fallingdotseq 10.2kgf/cm^2$

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

Model code / Item			M4KB1
Manifold system			Manifold integrated
Applicable master valve			4KB1 series
Nos. of station			2～20 stations
Manifold type			Common supply, common exhaust
Port size	Supply port	P	Side (Rc 1/8)
	Cylinder ports	A・B	Side M5、(Rc1/8) (Option : Side ϕ 6 push-in joint, Rear M5)
	Exhaust ports	R1・R2	Side (Rc 1/8)
	Pilot ports	PA・PB	Top (M5)

8.2 How to Order

1) 3KA1

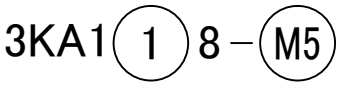


(a) Position/Operator type		(b) Port size				(c) Other option	
Code	Description	Code	P·A·B ports	R1·R2 ports	PA·PB ports	Code	Description
1	2-pos. single normal close	M5	M5	M5	M5	No code	No option
11	2-pos. single normal open	GS4	ϕ 4 push-in joint			P	With mounting plate
2	2-pos. double	GS6	ϕ 6 push-in joint			● Mounting plate is attached with the 3KA111,3KA1111 type only	

GS4 and GS6 are assembled by screwing push-in joints, GWS4-M5-S or GWS6-M5-S to P·A·B ports

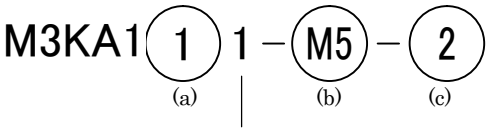
2) M3KA1

※ Master valve for manifold



※ Gasket, mounting screws are attached

Manifold



(a) Position/Operator type		(b) Port size				(c) No. of stations	
Code	Description	Code	P·A·B ports	R1 ·R2 ports	PA·PB ports	Code	Description
1	2-pos. single normal close	M5	M5	Rc1/8	M5	2	2 station
11	2-pos. single normal open	GS4	ϕ 4 push-in joint			≀	≀
2	2-pos. double	GS6	ϕ 6 push-in joint			20	20 station
8	2/3 position mixed manifold	GS4 and GS6 are assembled by screwing push-in joints, GWS4-M5-S or GWS6-M5-S to A·B port					

Example of same model Manifold

M3KA111-M5-7
Indicates 3KA1 manifold, 2-position single normal close B ports M5 top porting, 7 stations,

Example of mixed manifold

- Method of coding the contents of combination :
  Indicate the number of the function-wise master valves (simplex) after the normal Model No. indication when selecting the mixed manifold (code 8 in -).
  After the Model No., clearly indicate the code of the required function (see Table below) and the arrangement no. (carry out numbering up to the specified no. of stations, with the left side station as no. 1) as shown below

Code	Function
S10	2-pos. single normal close
S11	2-pos. single normal open
S20	2-pos. double
MP	Masking plate

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

The method of indicating the manifold combination in the Model No. Indicating method for the above arrangements, with port size M5 top porting

Model example

M3KA181-M5-9- | 5 | 1 | 3 | 0 |

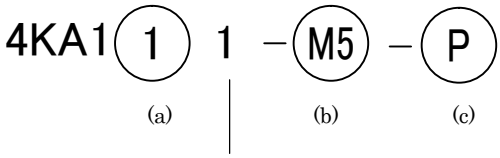
S10 S11 S20 MP

Enter the number.
If not in use, enter zero.
(S10＝1to3,7,8 S20=4to6,S11＝9)

When using more than 10 valves of the same Model No. in the mixed manifold, specify the nos. of valves by using codes (alphabet)

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

3) 4KA1



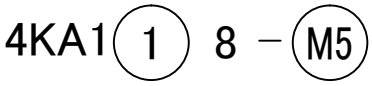
Operator type master valve

(a) Operator type		(b) Port size				(c) Other option	
Code	Description	Code	P・A・B ports	R1・R2 ports	PA・PB ports	Code	Description
1	2-pos. single operator	M5	M5	Rc1/8	M5	No code	No option
2	2-pos. double operator	GS4	ϕ 4 push-in joint			P	With mounting plate
3	3-pos. all ports blocked	GS6	ϕ 6 push-in joint				
4	3-pos. load ports open to exhaust ports	GS4 and GS6 are assembled by screwing push-in joints, GWS4-M5-S or GWS6-M5-S to A・B port					
5	3-pos.load ports open to supply ports						

● Mounting plate is attached with the 4KA111type only

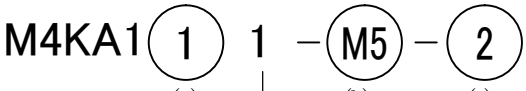
4) M4KA1

※ Master valve for manifold



※ Gasket, mounting screws are attached

Manifold



Operation classification master valve

(a) Operator type		(b) Port size				(c) No. of stations	
Code	Description	Code	A ・B ports	P・R1・R2 ports	PA・PB ports	Code	Description
1	2-pos. single operator	M5	M5	Rc1/8	M5	2	2 station
2	2-pos. double operator	GS4	ϕ 4 push-in joint			≀	≀
3	3-pos. all ports blocked	GS6	ϕ 6 push-in joint			20	20 stations
4	3-pos. load ports open to exhaust ports						
5	3-pos.load ports open to supply ports						
8	2/3 position mixed manifold						

Example of same model Manifold

M4KA111-M5-7
Indicates 4KA1 manifold, 2-position single A・B ports M5 side porting 7 stations,

Example of mixed manifold

- Method of coding the contents of combination :
  Indicate the number of the function-wise master valves (simplex) after the normal Model No. indication when selecting the mixed manifold (code 8 in -).
  After the Model No., clearly indicate the code of the required function (see Table below) and the arrangement no. (carry out numbering up to the specified no. of stations, with the left side station as no. 1) as shown below

Code	Function
S1	2-pos. single operator
S2	2-pos. double operator
S3	3-pos. all ports blocked
S4	3-pos. load ports open to exhaust ports
S5	3-pos. load ports open to supply ports
MP	Masking plate

1	2-position single (S1)
2	2-position double (S2)
3	3-position all ports blocked (S3)
4	3-position all ports blocked (S3)
5	2-position double (S2)
6	2-position single (S1)
7	3-position load ports open to supply ports (S5)

The method of indicating the manifold combination in the Model No. Indicating method for the above arrangements, with port size M5 side porting

Model example

M4KA181-M5-7-

2	2	2	0	1	0
S1	S2	S3	S4	S5	MP

Enter the number.
If not in use, enter zero.
(S1＝1,6 S2=2,5 S3=3,4 S5=7)

When using more than 10 valves of the same Model No. in the mixed manifold, specify the nos. of valves by using codes (alphabet)

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

5) 4KB1

※Without a sub-base

4KB1 (1) 8 − 00 ※Gasket,mounting screws are attached

4KB1 (1) 1 − (06)

(a) (b)

Operator type master valve

(a) Operator type		(b) Port size		
Code	Description	Code	P･A･B ports	PA･PB ports
1	2-pos. single operator	06	Rc1/8	M5
2	2-pos. double operator			
3	3-pos. all ports blocked			
4	3-pos. load ports open to exhaust ports			
5	3-pos.load ports open to supply ports			

6) M4KB1

※Master valve for manifold 4KB1 (1) 8 − 00 ※ Gasket, mounting screws are attached

Manifold M4KB1 (1) 1 − (06) − (2)

(a) (b) (c)

Operation classification master valve

(a) Operator type		(b) Port size				(c) No. of stations	
Code	Description	Code	A ･B ports	P･R1･R2 ports	PA･PB ports	Code	Description
1	2-pos. single operator	06	Rc1/8	Rc1/8	M5	2	2 station
2	2-pos. double operator	M5	M5			≀	≀
3	3-pos. all ports blocked	M5Y	M5 Rear			20	20 stations
4	3-pos. load ports open to exhaust ports	H6	φ6 push-in joint				
5	3-pos.load ports open to supply ports						
8	2/3 position mixed manifold						

Example of same model Manifold

M4KB111-06-7
Indicates 4KB1 manifold, 2-position single　A ・ B ports Rc1/8 side porting 7 stations,

Example of mixed manifold

- Method of coding the contents of combination :
  Indicate the number of the function-wise master valves (simplex) after the normal Model No. indication when selecting the mixed manifold (code 8 in -).
  After the Model No., clearly indicate the code of the required function (see Table below) and the arrangement no. (carry out numbering up to the specified no. of stations, with the left side station as no. 1) as shown below

Code	Function
S1	2-pos. single operator
S2	2-pos. double operator
S3	3-pos. all ports blocked
S4	3-pos. load ports open to exhaust ports
S5	3-pos load ports open to supply ports
MP	Masking plate

1	2-position single (S1)
2	2-position double (S2)
3	3-position all ports blocked (S3)
4	3-position all ports blocked (S3)
5	2-position double (S2)
6	2-position single (S1)
7	3-position load ports open to supply ports (S5)

The method of indicating the manifold combination in the Model No. Indicating method for the above arrangements, with port size Rc1/8 side porting

Model example

M4KB181-M5-7-

2	2	2	0	1	0
S1	S2	S3	S4	S5	MP

Enter the number.
If not in use, enter zero.
(S1＝1,6 S2=2,5 S3=3,4 S5=7)

When using more than 10 valves of the same Model No. in the mixed manifold, specify the nos. of valves by using codes (alphabet)

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

8. 3 Consumable parts

1) Spool assembly

Function	Model example
3KA111	4K9-110
3KA1111	
4KA111	
4KB111	
3KA121	4K9-118
4KA121	
4KB121	
3KA131	4K9-111
4KA131	
4KB131	
4KA141	4K9-112
4KB141	
4KA151	4K9-113
4KB151	

2) Piston assembly

Function	Model example
3KA1※	4K9-151
4KA111, 4KB111	
4KA121, 4KB121	
4KA131, 4KB131	4K9-152
4KA141, 4KB141	
4KA151, 4KB151	

3) Sub plate kit (Individual)

Function	Model example
4KB1	4KB110-06- SUB- BASE- KIT

4) Sub plate kit (Manifold)

Function	Model example
M3KA1	M4KA110-M5-[Nos.of station]- SUB- BASE- KIT
M4KA1	
M4KB1	M4KB110-[Port size]-[Nos.of station]- SUB- BASE- KIT

5) Gasket kit

Function	Model example
M3KA1	M4KA110- GASKET- KIT
M4KA1	
4KB1・M4KB1	M4KB110- GASKET- KIT