Doc. No.SY3000-OMF0001-B

Operation Manual

PRODUCT NAME

5 Port Air Operated Valve

MODEL/ Series

SYA Series

SMC Corporation

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No.SY3000-OMF0001-B

Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of **"Caution," "Warning"** or **"Danger."** They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)[*1)], and other safety regulations.

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1:Robots
etc.

Danger	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
Warning	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Caution	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not allowed.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, combustion equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

Safety Instructions

⚠ Caution

SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries.
Use in non-manufacturing industries is not allowed.
Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country.
The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

SYA Series
5 Port Air Operated Valve/Safety Instructions①

Read carefully before use.

Design / Selection

⚠Warning

1. Confirm the specifications

Products represented in this instruction manual are designed only for use in compressed air systems (including vacuum).

Do not operate at pressures, temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the specifications.)

We do not guarantee against any damage if the product is used outside of the specification range.

2. Actuator drive

When an actuator, such as a cylinder, is to be driven using a valve, take appropriate measures (such as the installation of a cover or the restricting of access to the product) to prevent potential danger caused by actuator operation.

3. Intermediate stops

For 3-position closed center, it is difficult to make a piston stop at the required position accurately due to the compressibility of air. Furthermore, since valves and cylinders are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time.

4. Effect of back pressure when using a manifold.

Use caution when valves are used on a manifold because actuators may malfunction due to back pressure. For 3-position exhaust center valve of single acting cylinder, take appropriate measures to prevent the malfunction by using it with an individual EXH spacer assembly.

5. Holding pressure (including vacuum).

Since the valve are subject to air leakage, they cannot be used for applications such as holding pressure (including vacuum) in a pressure vessel.

6. Not suitable for use as an emergency shut-off valve, etc.

The valves listed in this instruction manual are not designed for safety applications such as an emergency shutoff valve. If the valves are used for the mentioned applications, additional safety measures should be adopted.

7. Release of residual pressure

For maintenance and inspection purposes install a system for releasing residual pressure. Especially in the case of 3-position closed center valve, ensure that the residual pressure between the valve and the cylinder is released.

⚠Warning

8.Operation in a vacuum condition

When a valve is used for switching a vacuum, take measures to install a suction filter or similar to prevent external dust or other foreign matter from entering inside the valve.

In addition, at the time of vacuum adsorption, be sure to supply a constant supply of vacuum. Failure to do so may result in foreign matter sticking to the adsorption pad or air leakage, causing the workpiece to drop.

9. Regarding a vacuum switch valves and vacuum release valves

If a non-vacuum valve is installed in the middle of a piping system that contains a vacuum, the vacuum condition will not be maintained. Use a valve designed for use under vacuum conditions.

10. Ventilation

Provide ventilation when using a valve in a confined area, such as in a closed control panel. For example, install a ventilation opening, etc. in order to prevent pressure from increasing inside of the confined area and to release the heat generated by the valve.

11. Do not disassemble the product of make any modifications, including additional machining.

Doing so may cause human injury and/or an accident.

12. Resumption after a long period of holding time

When resuming operation after a long period of holding time, there are cases in which, regardless of whether the product is in an ON or OFF state, there is a delay in the initial response time due to adhesion.

Conducting several cycles of running-in operation will solve this problem. Please consider implementing this before resumption.

⚠Caution

1.Operation in a low temperature condition

It is possible to operate a valve in extreme temperature, as low as -10 °C. Take appropriate measures to avoid freezing of drainage, moisture etc. in low temperature.

2.Using with air blow

When single valve is used with air blow, care should be taken since pressure may be dropped by air blow.

3.Mounting orientation

Mounting position is free.

No specific orientation is necessary.

4.Vent

Please don't cover the vent. Attention should be taken so that foreign material including dust and water do not enter.

5.Initial lubrication of main valve

The initial lubricant (Grease) has already been applied to the main valve.

SYA Series
5 Port Air Operated Valve/Safety Instructions②

Read carefully before use.

Mounting

⚠Warning

1.Operation manual

Install the products and operate them only after reading the operation manual carefully and understanding its contents. Also, keep the manual where it can be referred to as necessary.

2.Ensure sufficient space for maintenance activities.

When installing the products, allow access for maintenance and inspection.

3.Tighten threads with the proper tightening torque.

When installing the products, follow the listed torque specifications.

4.If air leakage increases or equipment does not operated properly, stop operation.

Check mounting conditions when air and power supplies are connected. Initial function and leakage tests should be performed after installation.

5.Painting and coating

Warnings or specifications printed or affixed to the product should not be erased, removed or covered up.

Also, applying paint to resinous parts may have an adverse effect due to the solvent in the paint.

Piping

⚠Caution

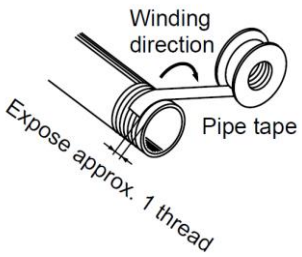
1. Refer to the Fittings and Tubing Precautions for handling one-touch fittings.

2.Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

3.Winding of sealant tape

When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not enter the piping. Also, if sealant tape is used, leave 1 thread ridge exposed at the end of the threads.



4.Closed center

For closed center, check the piping to prevent air leakage from the piping between the valve and the cylinder.

⚠Caution

5. Connection of fittings

When screwing fittings into valves, tighten as follows.

(1) Follow the procedures below when installing an SMC fitting, etc.

- **M5 types**

After tightening the fitting by hand, use a wrench to tighten the fitting an additional approximately 1/6 to 1/4 turn. As a reference value, tightening torque is 1 to 1.5 N·m. Note) If tightened excessively, the thread of the product may break or the gasket may deform. If tightened insufficiently, the thread of the product may become loose. In either case, air leakage can occur.

- **Follow the procedure of the manufacture when fittings other than SMC is used.**

(2) For a fitting with sealant R or NPT, first, tighten it by hand, then use a suitable wrench to tighten the hexagonal portion of the body an additional two or three turns. For the tightening torque, refer to the table below.

Connection thread size	Proper tightening torque (N·m)
1/8	3 to 5
1/4	8 to 12
3/8	15 to 20

(3) If the fitting is tightened with excessive torque, a large amount of sealant will seep out. Remove the excess sealant.

(4) Insufficient tightening may cause seal failure or loosen the threads.

(5) For reuse

(1) Normally, fittings with a sealant can be reused up to 2 to 3 times.

(2) To prevent air leakage through the sealant, remove any loose sealant stuck to the fitting by blowing air over the threaded portion.

(3) If the sealant no longer provides effective sealing, wind sealing tape over the sealant before reusing. Do not use any form of sealant other than the tape type of sealant.

(4) Once the fitting has been tightened, backing it out to its original position often causes the sealant to become defective. Air leakage will occur

SYA Series
5 Port Air operated Valve/Safety Instructions③

Read carefully before use.

Piping

⚠Caution

6. Uni thread fittings

(1) First, tighten the threaded portion by hand, then use a suitable wrench to tighten the hexagonal portion of the body further at wrench tightening angle shown below. For the reference value for the tightening torque, refer to the table below.

Connection Female Thread: Rc, NPT, NPTF

Uni thread size	Wrench tightening angle after tightened by hand (deg)	Tightening torque (N·m)
1/8	30 to 60	3 to 5
1/4	30 to 60	8 to 12
3/8	15 to 45	14 to 16

Connection Female Thread: G

Uni thread size	Wrench tightening angle after tightened by hand (deg)	Tightening torque (N·m)
1/8	30 to 45	3 to 4
1/4	15 to 30	4 to 5
3/8	15 to 30	8 to 9

2) The gasket can be reused up to 6 to 10 times. It can be replaced easily when it has sustained damage. A broken gasket can be removed by holding it and then turning it in the same direction as loosening the thread. If the gasket is difficult to remove, cut it with nippers, etc. In such a case, use caution not to scratch the seat face because the seat face of the fitting's 45° gasket is the sealing face.

7.Piping to products

When piping to a product, avoid mistakes regarding the supply port, etc.

Lubrication

⚠Warning

1.Lubrication

1) The valve has been lubricated for life by the factory and does not require any further.

2) If a lubricant is used in the system, use class 1 (no additives) and class 2 (with additives) ISO VG32 turbine oil. For details about lubricant manufacturers' brands, refer to the SMC website. Once lubricant is utilized within the system, since the original lubricant applied within the product during manufacturing will be washed away, please continue to supply lubrication to the system. Without continued lubrication, malfunctions could occur. If turbine oil is used, refer to the Material Safety Data Sheet (SDS) of the oil.

Air Supply

⚠Warning

1. Type of fluids.

Be sure to use compressed air for the fluid.

2. When there is a large amount of drainage.

Compressed air containing a large amount of drainage can cause malfunction of pneumatic equipment. An air dryer or water separator should be installed upstream from filters.

3. Drain flushing

If condensation in the drain bowl is not emptied on a regular basis, the bowl will overflow and allow the condensation to enter the compressed air lines. It causes malfunction of pneumatic equipment. If the drain bowl is difficult to check and remove, installation of a drain bowl with an auto drain option is recommended. For compressed air quality, refer to SMC's Best Pneumatics catalog.

4. Use clean air

Do not use compressed air that contains chemicals, synthetic oils including organic solvents, salt or corrosive gasses, etc., as it can cause damage or malfunction.

⚠Caution

1. When low dew point air is used as the fluid, degradation of the lubrication properties inside the equipment may occur, resulting in reduced reliability (or reduced service life) of the equipment. Consider using products compatible with low dew points such as those from the 25A- series.

2. Install an air filter.

Install an air filter upstream near the valve. Select an air filter with a filtration size of 5 μm or smaller.

3. Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.

Compressed air that contains a large amount of drainage can cause malfunction of pneumatic equipment such as valves. Therefore, take appropriate measures to ensure air quality, such as by providing an aftercooler, air dryer, or water separator.

4. If excessive carbon powder is seen, install a mist separator on the upstream side of the valve.

If excessive carbon dust is generated by the compressor, it may adhere to the inside of a valve and cause it to malfunction. For compressed air quality, refer to SMC Best Pneumatics No.6 catalog.

SYA Series
5 Port Air operated Valve/Safety Instructions④

Read carefully before use.

Operating Environment

⚠Warning

1. Do not use in an atmosphere having corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these.
2. Products with IP65 enclosures (based on IEC60529) are protected against dust and water, however, these products cannot be used in water.
3. Products compliant to IP65 satisfy the specifications through mounting. Be sure to read the Precautions for each product.
4. Do not use in an environment where flammable gas or explosive gas exists. Usage may cause a fire or explosion. The products do not have an explosion proof construction.
5. Do not use in a place subject to heavy vibration and/or shock.
6. The valve should not be exposed to prolonged sunlight. Use a protective cover.
7. Remove any sources of excessive heat.
8. If it is used in an environment where there is possible contact with oil, weld spatter, etc., exercise preventive measures.
9. When the valve is mounted in a control panel or its energized for a long time, make sure ambient temperatures is within the specification of the valve.

⚠Caution

1. Temperature of ambient environment

Use the valve within the range of the ambient temperature specification of each valve. In addition, pay attention when using the valve in environments where the temperature changes drastically.

2. Humidity of ambient environment

- When using the valve in environments with low humidity, take measures to prevent static.
- If the humidity rises, take measures to prevent the adhesion of water droplets on the valve.

Maintenance

⚠Warning

1. Perform maintenance and inspection ac-Cording to the procedures indicated in the operation manual.

If handled improperly,
human injury and/or malfunction or damage of machinery and equipment may occur.

⚠Warning

2. Removal of equipment, and supply/exhaust of compressed air.

supply/exhaust of compressed air Before components are removed, first confirm that measures are in place to prevent workpieces from dropping, run-away equipment, etc. Then, cut off the supply air and electric power, and exhaust all air pressure from the system using the residual pressure release function. For the 3-position closed center, exhaust the residual pressure between the valve and the cylinder. When the equipment is operated after remounting or replacement, first confirm that measures are in place to prevent the lurching of actuators, etc. Then, confirm that the equipment is operating normally. In particular, when a 2-position double valve is used, releasing residual pressure rapidly may cause the spool valve to malfunction, depending on the piping conditions, or the connected actuator to operate.

3. Low-frequency operation

Valves should be operated at least once every 30 days to prevent malfunction.
(Use caution regarding the air supply.)

4. Manual override

When a manual override is operated, connected Equipment will be actuated.
Operate only after safety is confirmed.

5. If the volume of air leakage increases or the valve does not operate normally, do not use the valve. Perform periodic maintenance on the valve to confirm the operating condition and check for any air leakage

⚠Caution

1.Drain flushing

Remove drainage from the air filters regularly.

2.Lubrication

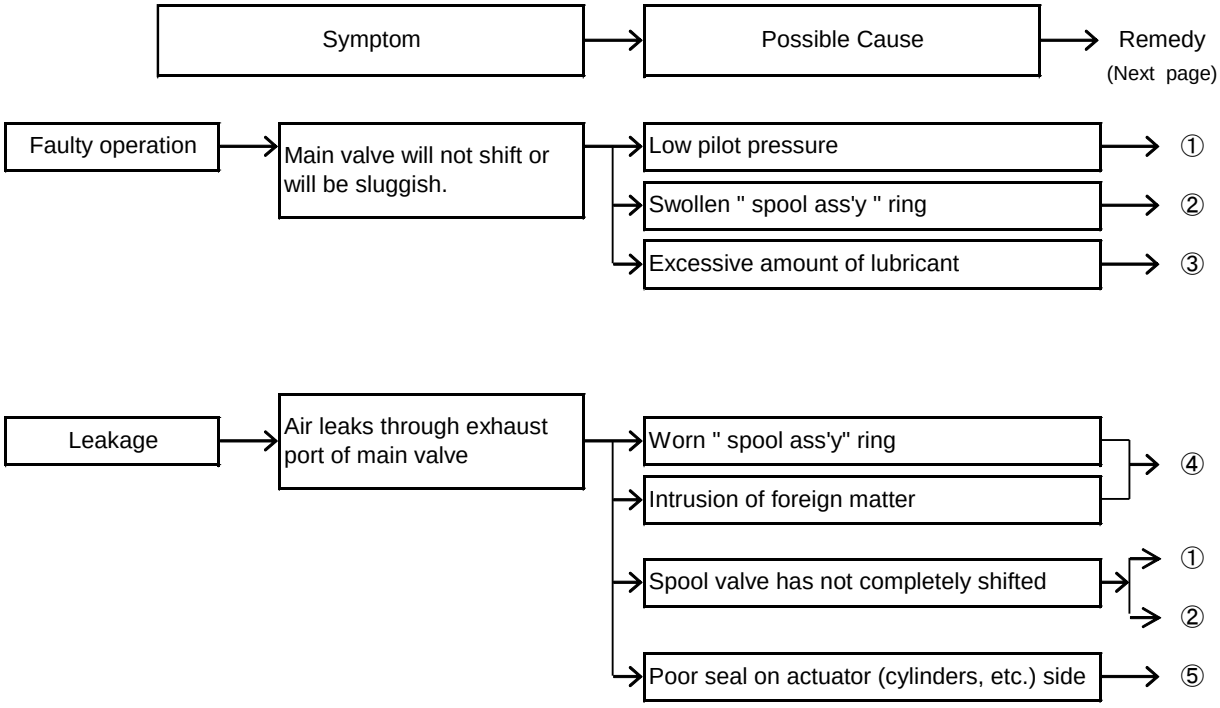
In the case of rubber seals, once lubrication has been started, it must be continued.
Use class 1 (no additives) and class 2 (with additives) ISO VG32 turbine oil. For details about lubricant manufacturers' brands, refer to the SMC website.
If other lubricant oil is used, it may cause a malfunction.

3. Manual override operation

When switching a double valve via the manual override operation, instantaneous operation may cause the malfunction of the cylinder. It is recommended that the manual override be held until the cylinder reaches the stroke end position.

TROUBLESHOOTING

Should any trouble be found during operation, trace the source of the trouble in the following order and take corrective action.



Remedy

No.	Remedy
①	Regulate pressure so that pilot pressure will fall within operating pressure range furing operation.
②	○If wrong oil is used, completely air blow to remove oil, and replace valve. After valve is replaced, use turbine oil class 1 (ISO VG32).
	○In applications where excessive condensate is produed, install either an auto-drain or a dryer.The valve should be replaced.
③	Reduce the amount of lubricant to the degree that no oil splashes out of the air exhaust port.
④	Replace worn spool valve. To remove foreign matter,air blow piping, then replace valve.
⑤	Repair or replace actuators.

If no improvement is achieved in spite of the above countermeasure, inside of the valve may have some failure. In this case, stop using the valve immediately.

If any of followings are carried out, inside of the valve may have some failure. In this case, stop using the valve immediately.

① Oil other than the specified one has been lubricated.

② Lubrication has been stopped intermediately, or lubrication was suspended temporary.

③ Strong impact was given.

④ Alien substance such as drain and particle got into.

⑤ Prohibited way of using the valve which is written at "Precautions" section in this operation manual was carried out excluding above-mentioned.

※In addition, if you rquest us to investigate, please send the valve back to us in its original condition without disassembling it.

Revision history		
A	Safety Instructions	2011.2
B	Precautions for Solenoid Valve	2025.3

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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