



Safety Precautions

The purpose of precautions in this document is to instruct you to use this product safely and prevent risk and damage to you and other people. These precautions are categorized into the following three risk/damage levels: CAUTION, WARNING and DANGER in order to indicate the seriousness of a risk/damage and the level of emergency. Be sure to follow them in addition to ISO4414 * 1), JIS B 8370 * 2) and other safety regulations since all of them are about safety.

 CAUTION	Indicates a hazardous situation which could result in minor or moderate injury or property damage if the product is used improperly.
 WARNING	Indicates a potentially hazardous situation which will result in death or serious injury if the product is used improperly.
 DANGER	Indicates an imminently hazardous situation which will result in death or serious injury if the product is used improperly.

※ 1) ISO 4414 : Pneumatic fluid power-Recommendations for the application of equipment to transmission and control systems.
 ※ 2) JIS B 8370 : General Rule for Pneumatic Systems

WARNING

① The compatibility of a pneumatic pressure system shall be judged by the pneumatic pressure system designer or any person who determines its specifications.

Products described in this document have various use conditions. Therefore, the compatibility of each product to the system shall be determined by the pneumatic pressure system designer or any person who determines its specifications after conducting analysis and/or tests as needed. The person who determined the compatibility of the system is responsible for the initial performance of the system and assurance of safety. From now on also, you are requested to construct a system after examining all contents of the specifications and considering the possibility of equipment failures based on the latest product catalogues and materials.

② Only personnel with sufficient knowledge and experience are allowed to handle this product.

Compressed air is dangerous if it is handled wrongly. Only personnel with sufficient knowledge and experience are allowed to assemble, operate or maintain machines and systems that use an air compressor.

③ Do not handle machines and systems or remove equipment until safety is confirmed.

1. Before checking or maintaining machines or systems, make sure that driven object fall prevention measures and runaway prevention measures have been taken.
2. Before removing equipment, make sure that the safety measures described above have been taken, shut off the supply air (energy source), turn off the power of the corresponding equipment and exhaust compressed air from the system.
3. Before re-starting machines and systems, make sure that jumping prevention measures have been taken and do it carefully.

④ If the product is used under the following conditions and environment, pay attention to safety measures and consult us.

1. Use in the conditions and environment not specified in this document or outdoor.
2. Use for nuclear, railroad, aircraft, vehicle, medical equipment, equipment in contact with drink and food, entertainment equipment, emergency shutoff circuits, clutch brake circuits for press, safety equipment, etc.
3. Use for the applications that are expected to have a large influence on people and properties and especially requiring safety.



Actuator Precaution ①

Please read the following instructions before use.

Design

WARNING

◆ Abnormal action

Actuators may cause a kind of impact when force change occurs due to rattle in the sliding part of a machine. In this case, actuators may result in bodily damage (e.g. hands or legs being caught) or machine damage. Therefore, adjust actuators for smooth mechanical movement and design them to prevent bodily damage.

◆ Protection cover

When there is a risk that a system or a product is harmful to human body during operation, install a protection cover.

◆ Impact relaxation

When the driven object moves at a high speed or its mass is large, it is difficult to absorb impact using the cushion of the cylinder only. Therefore, install a circuit to reduce the speed before going to the cushion to release impact. In this case, consider the rigidity of the mechanical system fully.

◆ Power source failures and supply pressure drop

If the power source (e.g. electric, pneumatic pressure, hydraulic source) has a failure or the air pressure drops due to troubles, cylinder power will drop, thus leading to load decrease. Take measures to prevent damage to human bodies and equipment.

◆ Jumping prevention circuit

When the cylinder is driven by the exhaust center type directional control valve or one side of the piston is pressed under the condition that air has been exhausted from the cylinder (such as when starting after the residual pressure has been exhausted from the circuit), driven objects will jump out at a high speed. Such situation may be harmful to the human body (e.g. hands or legs getting caught) or machine damage. Therefore, select equipment and design circuits to prevent driven objects from jumping.

◆ Emergency stop, abnormal stop

Design actuators so that their motions do not damage human bodies or equipment even in case of emergency/abnormal stop of the system or when the system is re-started after stop.

Selection

WARNING

◆ Working pressure range

If the system is used with the maximum working pressure or above, each part will be worn or damaged, thus resulting in breakage or operation failures. If the system is used with the minimum working pressure or less, the specified thrust force cannot be generated, thus causing malfunctions such as failure to move smoothly. Therefore, use products within the specified working pressure range. (See the specifications.)

◆ Intermediate stop

When the 3-position closed center type directional control valve is used to stop the cylinder piston in the intermediate position, it cannot stop it correctly and accurately because it uses not hydraulic pressure but compressed air. Also, it is not assured that valves and cylinders leak no air. Therefore, pistons may not be able to stop for a long time. Consult us if you need to realize long time stop position retainment.

Mounting

WARNING

◆ Locking in mounting

Product fixing bolts and attachment/jig mounting bolts must have a locking. Mount bases must have a structure to prevent deformation and breakage due to thrust force or inertia force at stopping.

CAUTION

◆ Precautions in operating

Do not use the product until it is confirmed that equipment operate properly.

After mounting, repair or modification, connect compressed air and power and conduct appropriate functional tests and leak inspection to check if the mounting is appropriate.

◆ Equipment operation check

After mounting the product to the system, do not start the system immediately but check if the product has been properly mounted for safety.

◆ Product handling

Dropping or hitting the product or pinching the product with a tool will result in product deformation, thus causing accuracy deterioration and operational failure.

◆ Speed adjustment

Adjust the cylinder drive speed gradually to the specified speed with a speed controller from the low speed side.

◆ Precautions in magnetic products

Bringing magnetic products such as a magnetic disk, a magnetic guard and a magnetic tape close to the built-in switch sensing magnet type may result in data erase. Also, do not bring them close to any equipment that may cause malfunction due to magnetism.

Piping

CAUTION

◆ Treatment before piping

Before piping, blow air (flush) or clean pipes sufficiently to remove chips, cutting oil and dust from the pipes.



Actuator Precaution ②

Please read the following instructions before use.

New-Era

Piping

CAUTION

◆ Seal tape winding

When you screw in pipes and joints, be careful not to make piping screw chips and sealing materials enter into the inside of the pipes. When you use a seal tape, wind a screw with the tape so that 1.5 to 2 turns of the screw head is not wound.

Fueling

CAUTION

◆ Fueling to compressed air

Do not fuel the product since it is initially lubricated.

◆ Use in the lubrication circuit

If the system needs fueling, use additive-free turbine oil class 1 ISO VG32 or ISO VG46. Do not use machine oil and spindle oil because they will damage packings, thus causing operation failures. Do not stop fueling in the middle of fueling because doing so will cause flowout of lubrication grease, thus accelerating damage of packings and other parts, resulting in operation failures.

Air source

CAUTION

◆ Quality of compressed air

Compressed air containing drain (e.g. dust, water, salt, degraded compressor oil, oil carbon particles) and corrosive gas will damage packings and other parts, thus causing operation failures and damages. Therefore, use clean compressed air.

◆ Drain removal measure

Compressed air containing a large amount of drain not only causes operation failures of the air compressor but also causes environmental contamination. Install equipment such as an after-cooler, an air dryer and an air filter (nominal filtration rating: 50µm or less). The air cleaning system to drive actuators is recommended in JPAS005 "Guidelines for Use and Selection of Pneumatic Cylinders".

◆ Temperature of compressed air

Hot compressed air will accelerate damage of packings and other parts. Even when the environmental temperature is within the specified range, heat may transmit through jigs connected to the actuator and driven objects. When the environmental temperature is low, drain and moisture will become solidified or frozen, thus resulting in damaged packings and parts and operation failures. Therefore, measures to prevent freezing must be taken.

Usage environment

WARNING

◆ Outdoor use

Do not use the product in places where the product is directly or indirectly exposed to wind and rain, is exposed to direct sunlight, or any outdoor place where the product is influenced by temperature or any other factors because this product is not resistant to weather.

◆ Use in the corrosive environment

Do not use the product in water or places where the product is exposed to salt water, acid, alkaline fluid splash, iron powder or in their gases or moisture vapors.

◆ Cover installation

Attachment of dust, water, oil, chips, iron powder, or spatter to the rod and the sliding parts will result in damaged shafts and packings, thus causing air leak and operation failures. Install a cover to prevent them from attaching.

◆ Operating temperature range

Use with a temperature exceeding the maximum operating temperature will result in deterioration acceleration such as hardening of packings, thus causing operation failures. Even when the environmental temperature is within the specified range, heat may transmit through jigs and driven objects. When the product is working at a high speed, its sliding surfaces will locally overheat, thus causing similar problems, freezing due to adiabatic expansion or surface dew condensation. When the temperature is lower than the minimum operating temperature, drain and moisture will become solidified or frozen, thus resulting in damaged packings and operation failures. Therefore, measures to prevent freezing must be taken.

Maintenance and check

WARNING

◆ Removing equipment, and supplying and exhausting compressed air

Before removing equipment, make sure that driven object fall prevention measures and runaway prevention measures have been taken, cut off supply air, turn off the power of the equipment and exhaust compressed air from the system. Before re-starting the equipment, make sure that the jumping prevention measures have been taken and do it carefully.

CAUTION

◆ Draining air filter

Operating the equipment without maintaining or draining the air dryer and the air filter will result in life shortening or equipment failures. Drain tends to increase in summer in particular, so drain them frequently in summer. Use of a type with an auto drain function is recommended.



Switch Precaution ①

Please read the following instructions before use.

Design and selection

WARNING

◆ Specification check

Please read the specifications carefully because use of a load current, voltage, temperature or impact outside of the specified range will result in equipment breakage or operation failures.

◆ Contact protection circuit (measure against surge voltage)

When an induction load such as a relay or a solenoid is connected, surge voltage is generated. In this case, therefore, install a contact protection circuit. See "Switch Connection Method" for details.

◆ Actuator installation interval

Switches are operated by a magnet built in the actuator. Therefore, if two products get close to each other, their magnets may interfere with each other, thus causing malfunction.

◆ Leak current

<Solid State>

For the 2 wire system solid state auto switch, currents (leak currents) flow to the load to activate the internal circuit even when they are OFF. When the leak current is lower than the load operation current (input off current of the controller), restoration failure occurs (ON state remains). If such switch cannot meet the specification, use a 3 wire system switch. When switches (n switches) are connected in parallel, the magnitude of the current flown to the load will be n times.

◆ Serial connection

When switches with an indicator are connected in series, voltage drop occurs due to the internal resistance of light-emitting diodes, etc. (When n switches are connected, the voltage drop is n times.) In this case, the load may not operate even when the switches are normally operated.

◆ Switch wiring length

When the switch wiring is long, excessive current flows into the contact due to the incoming current when the switch is turned ON. Thus, the switch may remain ON. When the wire length is longer than 10 m, install a cable surge absorbing circuit. See "Switch Connection Method" for details.

◆ Detection in the middle of a stroke

Note that when a switch is provided in the middle of a stroke, the switch operates when the piston speed is too high but the load may not be operated. In this case, decrease the speed or install an electric hold circuit.

◆ Interlock

When a switch is used for systems such as an interlock, design it in consideration of failures and malfunctions.

◆ Securing the maintenance space

Secure the space for operations such as switch adjustment and indicator check.

Mounting and adjustment

WARNING

◆ Switch handling

Impact to a switch such as by falling may result in breakage of the inside of the switch.

◆ Lead wire handling

Excess tensile force on a lead wire may result in lead wire breakage in the cable or breakage of the inside of a switch.

◆ Switch fixing tightening torque

Tightening the switch fixing screw or mounting bracket with a torque larger than the specified torque may result in switch breakage. Insufficient torque may result in out of mounting position in use. Follow the specified tightening torque for each switch.

◆ Switch setting position

Adjust the switch mounting position so that the piston stops in the center of the operation range (ON range). (The mounting position specified in the catalogue shows the optimal position in the stroke end.) When it is set in the end of the operation range (around the ON/OFF border line), operation may be unstable.

Wiring

WARNING

◆ Lead wire wiring

To install a switch in the movable area, take some wiring measures such as allowing extra cable length and replaceable cables. When wire is bundled with air pipes by a spiral tube, unreasonable force may be applied to the wires. Therefore, allow extra length of wires in this case.

◆ Load connection

Operating a 2 wire system switch while connecting it directly to the power without connecting any load such as a relay and a sequence controller may result in instant overcurrent, thus resulting in switch breakage.

◆ Short-circuit of load

Operating a switch with a short-circuited load will cause the flow of overcurrent, thus resulting in switch breakage.

◆ Polarity

In case of DC, wires have polarity. Brown lead wires are (+) and blue lead wires are (-). When wires are connected reversely in the contact switch, the switch operates but the light-emitting diode does not illuminate. When wires are connected reversely in the solid state switch, the switch does not operate and the internal circuit may be broken. When the power wire (brown) and the output wire (black) are connected reversely in the 3 wire system switch, the switch will be broken.



Switch Precaution ②

Please read the following instructions before use.

Usage environment

DANGER

◆ Use in the hazardous atmosphere

Do not use switches in the explosive gas atmosphere. Switches do not have an explosion-proof structure. Do not use them in the explosive gas atmosphere because doing so may result in explosion.

CAUTION

◆ Use in a powerful magnetic field

Use of a switch in a powerful magnetic field will result in switch operation failure and malfunctions because the internal magnetic force and the magnetic field distribution change.

◆ Adjacent of magnetic body

Note that when there is a large amount of iron power (e.g. chips, welding spatters) accumulated around the switch cylinder or magnetic bodies (attracted to the magnet) are adjacent to the switch cylinder, the magnetic force inside the cylinder is deprived so the switch may not operate.

◆ Usage environment

The water proof property of the switch is applicable to the IEC Standard IP66 (JIS C0920 Water Proof Type). However, if they are constantly exposed to water, insulation failure may occur. When they are exposed to oil (e.g. cutting oil) or chemical or in such atmosphere, lead wire hardening or insulation failure may occur.

◆ Impact

If excessive impact is applied to a contact switch in use, the contact may cause malfunction. Such failures will be reduced by using no-contact switches, but you must check the impact-resistant values in the specifications before doing so.

◆ Serge generating places <Solid State>

When there is a large serge generating system (e.g. electromagnetic lifter, high-frequency induction furnace, motor) in the periphery of the cylinder with a no-contact switch, circuit elements inside the switch may deteriorate or break. Therefore, take measures against the serge (source of generation) and pay attention to confusion with other lines.

◆ Temperature change

Even when switches are used within the specified use temperature, extreme environmental temperature changes may have a bad influence on the parts inside the switch.

Maintenance and check

DANGER

◆ Screw and hardware looseness check

Looseness of a switch mounting screw and hardware will result in switch displacement, thus causing unstable operation and malfunction. After setting the position again, tighten them with a specified torque.

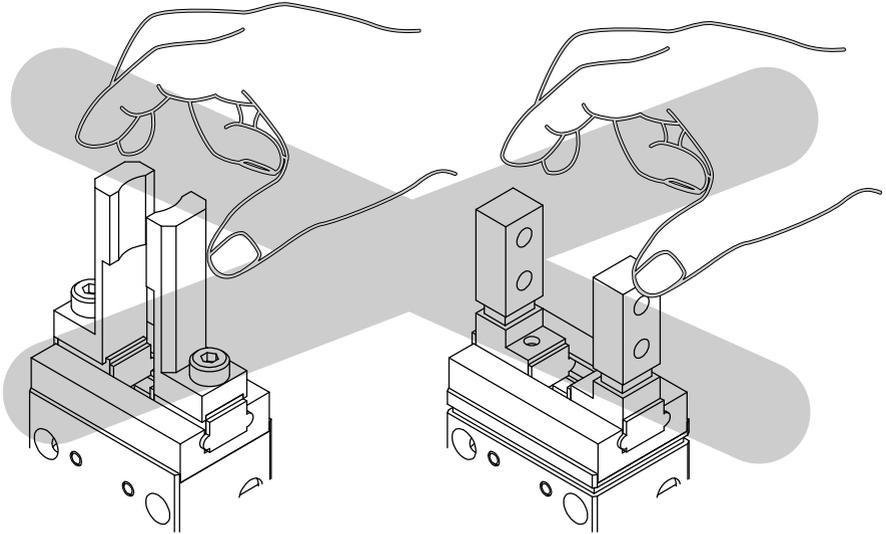
◆ Lead wire breakage check

Damaged lead wire coating may result in insulation failure or breakage. Replace the switch or repair the lead wire immediately.

CAUTION

Do not open and close the levers successively by hand without pressurized air into the air ports to avoid being possibility of malfunction of opening and closing levers.

If malfunction is found with levers, follow “Recovery Procedure”



● “Recovery Procedure”

First pump air(0.5 ~ 0.7MPa)into the air ports which do not work.

Or move the both levers by hand at the base in operation range.

For example,if not opened fully,air(0.5 ~ 0.7MPa)shall be pumped into “Open” port.

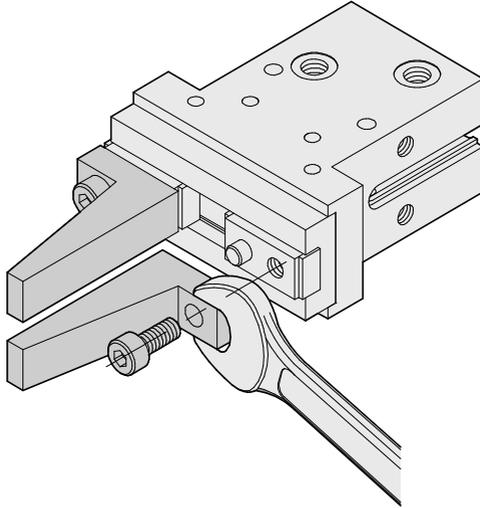
Do not lean the levers too much,excessive force and moment to the levers cause a damage of internal construction.

Extreme caution should be exercised as several “Recovery Procedure” repeated may lower the bearing performance or damage itself.

CAUTION

When installing the finger in the lever, use a wrench etc., to hold it so that lever doesn't get twisted.

Tighten the mounting bolts to the tightening torques shown in the table below.



Bolt	Maximum tightening torque N·m [in·lbf]
M1.6 × 0.35	0.156 [1.38]
M2 × 0.4	0.315 [2.79]
M2.5 × 0.45	0.65 [5.75]
M3 × 0.5	1.14 [10.1]
M4 × 0.7	2.7 [23.9]
M5 × 0.8	5.4 [47.8]
M6 × 1.0	9.2 [81.4]