Safety Precautions

Always read this section before use.
Refer to the main text for detailed precautions for each series and to page 320 for those for the cylinder switch.

Design & selection

⚠WARNING

■ Use the product in the range of conditions specified for the product.
The product in this catalog is designed for use only in a compressed air system. Use with pressure or temperature exceeding the specifications range may result in damage or operation faults. (Refer to specifications) Contact CKD when using fluids other than compressed air and low hydraulic pressure.

■ With the cylinder, there is the risk of the piston rod popping out in cases when a change of force occurs due to disruption of the sliding portions of the machine.
This could cause physical harm, such as pinched hands or feet, or mechanical damage. Adjust the machines so that they operate smoothly and design so that physical harm will be avoided.

■ If there is a risk of bodily injuries, install a protective cover.
If the cylinder's drive section could cause bodily injury, install a protective cover. Design a structure that prevents person(s) from entering the cylinder's operating range or coming into contact with those sections directly.

■ If requiring deceleration circuit and shock absorber.
If the driven object moves at high speeds or is very heavy, it may be difficult to absorb impact with the cylinder cushion alone. Take measures to ease impact by installing a deceleration circuit before the cushion or by using an external shock absorber. The machine's rigidity must also be considered.

■ Consider the possibility that the circuit pressure may be decreased by electrical power failure.
When using a cylinder in clamp mechanisms, blackouts, etc., may cause the circuit pressure to drop, reducing the clamping force and risking falling workpieces. Incorporate a safety device that prevents physical harm or mechanical damage. Suspension mechanisms and lifting devices should also be considered for position locking.

■ Consider the possibility of power source failure.
For devices controlled with power sources such as pneumatics, hydraulics, or electricity, take measures to prevent bodily injury or machine damage if power fails.

■ Design the operating circuit to prevent the piston from popping out.
If one side of the piston is pressurized after the air in the cylinder is released, such as when the cylinder is driven by an exhaust center type directional control valve, or during startup after the residual pressure in the circuit is discharged, the driven object will pop out at high speed. This could cause physical harm, such as pinched hands or feet, or mechanical damage. Design with a circuit to prevent popping out.

■ Consider the operation status at emergency stop.
If the safety device is activated and the machine stops during a system failure such as emergency stop or power outage, design the system so that physical harm or damage to the workpiece/ device/equipment does not occur due to cylinder operation.

■ Consider the operation status when restarting after emergency stop or abnormal stop.
Design the system so that bodily injury or equipment damage will not occur when restarting. If there is a need to reset the cylinder to the starting position, design a safe control device.

■ Intermediate stop
When braking the cylinder's piston with a 3-position closed center directional control valve, air compressibility may make it difficult to stop as accurately as when using low hydraulics. In addition, since valves and cylinders do not guarantee zero air leakage, holding the stop position for long periods may not be possible. Consult with CKD when requiring a stop position to be held for long periods.

■ Use clean dry compressed air.
Do not use the compressed air if it contains chemicals, synthetic oils containing organic solvents, salt, or corrosive gas, as it can cause damage and/or operation failure.

■ Install the product where it will not be exposed to rain, water, direct sunlight, or high temperatures.

■ Do not use this product in a corrosive environment.
Use in such an environment could lead to damage or operation failure. Though piston rods, tie rods, etc. used in the cylinder are plated materials, machining parts (thread surface width, cut surface) are not plated. Implement measures as necessary since rust occurs even in normal environments.

■ If ambient temperature is 5°C or below, moisture in the circuit could freeze and lead to misoperation, etc.

■ Durability differs based on working conditions and model characteristics.

⚠ CAUTION

■ Do not use in a range where the piston could collide with the stroke end and break.
If a piston collides against the cover at the stroke end and stops due to inertia, use within the range of allowable absorbed energy.

■ Mount the speed control valve on the cylinder.
Use each cylinder within the applicable working piston speed range.

■ Provide intermediate support for a cylinder with long stroke.
If the cylinder has a long stroke, provide an intermediate support to prevent rod damage due to rod drooping, tube sag, vibration, or external loads.

■ Use the product within the maximum stroke according to the mounting type.
Refer to "Pneumatic Cylinders ⓘ" (catalog No. CB-29SA)".

■ Install a "pressure switch" and "residual pressure exhaust-valve" on the device's compressed air inlet.
- The pressure switch will disable the operation until the set pressure is reached. The residual pressure release valve will release compressed air left in the pneumatic pressure circuit, and will prevent the residual pressure from accidentally operating pneumatic components.

■ Indicate the maintenance conditions in the device's instruction manual.
- The product's performance may drop too low to maintain an appropriate safety level depending on usage conditions, working environment and maintenance status. With correct maintenance, the product functions can be used to the fullest.

■ Use dry compressed air that does not cause moisture inside the piping.
- Moisture will occur if the temperature drops in the pneumatic piping or pneumatic components.
- If the piping volume is larger than the cylinder volume (atmospheric pressure-converted volume), the compressed air in the cylinder will not be completely exhausted when changing with the solenoid valve. This compressed air will condense, form water drops, and cause drainage.
- Operation faults could occur if moisture enters the air flow path of pneumatic components and temporarily blocks passage.
- Moisture could cause rust, making the pneumatic components fail.
- The drainage will flush the lubricant oil leading to a lubrication failure.

■ Ultra dry air is not suitable for pneumatic components. Use equipments specifically designed for ultra dry air.
- Ultra dry compressed air will shorten the life of pneumatic components.
- Use a solenoid valve for DC voltage drive.

■ Use compressed air that does not contain oxidized oil, tar, carbon, etc., from the air compressor.
- If oil oxides, tar, or carbon enter the pneumatic components and solidify, resistance at the sliding section will increase, leading to operation failure.
- If the supplied lubricant mixes with oil oxides, tar, carbon, etc., the sliding section of the pneumatic component could be worn down.

■ Use compressed air that does not contain solid foreign matter.
- Solid foreign matter in compressed air could enter the pneumatic components and cause wear at the sliding section or hydraulic locking. Install a 5 μm or less air filter.
- Regularly perform compressor maintenance and inspection.

■ Make every effort to avoid using multiple synchronized cylinders.
If not synchronized, the piston rod could twist and lead to malfunctions. If synchronized operation is required, be sure to provide a rigid guide device separately.

■ Precautions for using the pressure relief port
Vacuum treatment with the exhaust treatment (P7, P72)
Exhaust treatment is not possible with the vacuum treatment (P71, P73).
An incorrect combination may cause dispersion of particles or malfunctions. Be sure to choose a correct combination.

Installation & adjustment

⚠WARNING

■ Check load and cylinder installation connection for looseness and other abnormalities before starting operation.

■ Do not use the device until proper operation is confirmed.
After installation, repair, or modification, connect compressed air or electric power and conduct appropriate functional and leakage inspection to confirm that installation is correct.

■ Confirm that there is no machine interference and that the actuation system is normal.

■ Confirm that there is no abnormality in device operation, and gradually raise and set pressure.

■ If operation is started while the exhaust side is at atmospheric pressure, the rod could pop out and cause a dangerous situation. Apply pressure to the cylinder chamber on the exhaust side before starting.

■ When adjusting speed with the speed controller, gradually open the needle from the closed state and adjust.
If speed is adjusted in the opened state, the rod could pop out, creating a hazard.

■ The effect of the cushion with air cushion is adjusted at shipment. However, re-adjust the cushion needle for use in accordance with the size of the load and piston speed.
Gradually open the needle from the closed state and adjust the effect of the cushion. If the cushion needle is loosened too much, the cushion cannot function and may fall off. After making adjustments, tighten the needle nut (hex nut) to fix the unit in place. Use kinetic energy within the allowable value. The product may be damaged if allowable values are exceeded.

■ When the cylinder is in operation, do not enter or put your hand in its operating range.

■ Be sure to tighten very securely in order to prevent the fixed parts or connected sections from loosening.
Always use a secure tightening method when the operating frequency is high or when using the high rotor at places with high levels of vibration.

⚠CAUTION

■ Open the package in a clean room.
- The products are wrapped in an antistatic sheet before packaged in a box. If you install the product in a clean room, we recommend you to take it out of the box outside the clean room before you bring it in and to open the package in the clean room.

■ When connecting pipes, wrap sealing tape clockwise from the inside position to within 2 threads from the pipe end.
- If sealing tape protrudes from the pipe threads, it could be cut when screwing the bolts in. This could cause the tape to enter the valve, causing failures.

■ Check that the piping connected to the cylinder is not dislocated due to vibration, looseness, or tension.
- Cylinder speed cannot be controlled if pneumatic circuit exhaust piping is dislocated.
- When using the chuck holding mechanism, the chuck may be released, creating a hazardous state.

■ Observe the following precautions when using nylon tubes or urethane tubes for piping.
- When using a standard push-in fitting on the spiral tube, secure the base of the tube with a hose clamp. Otherwise, the tube may rotate causing the holding force to be reduced.

■ Use corrosion-proof materials such as galvanized pipes, stainless steel pipes, nylon pipes or rubber pipes for piping material.

■ When supplying compressed air after connecting pipes, do not suddenly apply high pressure.
- The pipe connection could dislocate, causing the pipe tube to fly out, leading to accidents.
- If compressed air is supplied too slowly, sealing pressure may not be generated by the sealing mechanism in the solenoid valve. This can lead to air leaks.
- The cylinder may operate suddenly.

■ Before supplying compressed air after connecting pipes, check that there are no air leaks at any pipe connections.
- Apply a leakage detection agent to pipe connections with a brush and check that there are no air leaks.

■ Use proper torque to tighten the pipes when connecting them.

- The purpose is to prevent air leakage and damage to bolts.
- First tighten the bolts by hand to ensure that the threads are not damaged, then use a tool.

[Reference value] Refer to the instruction manual.

Port thread	Tightening torque (N·m)
M3	0.3 to 0.6
M5	1 to 1.5
Rc1/8	3 to 5
Rc1/4	6 to 8
Rc3/8	13 to 15
Rc1/2	16 to 18
Rc3/4	19 to 40
Rc1	41 to 70

■ Secure sufficient space around the cylinder for installation, removal, wiring, and piping work.

■ Install a pneumatic filter just before the pneumatic component in the circuit.

- To remove moisture in the pipes, attach an air dryer and filter. Install a filter near the directional control valve (primary side) to remove rust, foreign matter and drainage.

■ If the direction that the load moves in is not parallel to the piston rod shaft center, the piston rod and body (tube) could twist and cause the piston rod to pop out. Twisting can cause seizing, damage, etc. Always align the piston rod shaft center and load movement direction.

■ To avoid damaging the screw at the end of the piston rod and to prevent the bushing from getting worn out or seized, connect the end of the piston rod to the load with a floating joint so that twisting never occurs at any position in the stroke.

■ Take measures so that the load does not fall or drop when the cylinder is removed.

■ Use suspension fittings if the cylinder weighs 15 kg or more.

■ Do not hit the cylinder tube and piston rod sliding section with anything or sandwich objects between them, causing scratches or dents.
The bore size is manufactured with precise tolerance, and operation faults could occur with even the slightest deformation. Scratches or dents on the sliding portion of the piston rod will cause damage of the packing, etc., and may lead to air leakage.

■ Be sure to read the instruction manual carefully.
Read carefully and fully understand contents before starting use. Store so as to allow confirmation at any time.

■ When piping, refer to the instruction manual and make sure not to use the wrong connection port.

- This could cause improper operation.

■ The air cushion is factory adjusted.

- When you change the cushion setting according to the load, adjust it with the cushion needle. Cushioning effect will decrease when the needle is loosened (turned counterclockwise).

■ Provide intermediate support for a cylinder with long stroke. If the cylinder has a long stroke, provide an intermediate support to prevent rod damage due to rod drooping, tube sag, vibration, or external loads.

During use & maintenance

⚠WARNING

■ Refer to the instruction manual and conduct careful maintenance and inspection.
Incorrect handling could result in device or system damage or operation faults.

■ Component removal and supply/exhaust of compressed air
Before removing the device, take measures to prevent the driven object from falling or running out of control, and shut OFF air and power. Exhaust all compressed air in the system beforehand. Before restarting, confirm that measures are taken to prevent popping out.

■ Smoking with hands smeared with the fluorine grease of cylinders using fluorine grease (such as heat resistance, low-speed, low friction, P7) could generate harmful gases and cause physical harm.

⚠CAUTION

■ Conduct daily inspections and regular inspections to ensure that maintenance control is done correctly.
● If maintenance is not correctly managed, the product's functions could deteriorate markedly and lead to a shortened service life, faults and accidents.

1. Pressure control of supplied compressed air
● Is the set pressure provided? Does the pressure gauge indicate the set pressure while the equipment is operating?

2. Pneumatic filter control
● Is the drain correctly discharged?
Is the bowl or element clean enough to use?

3. Control of compressed air leaks from piping connections
● Is the state of the connection, especially at movable sections, normal?

4. Control of solenoid valve's operation
● Are operations delayed? Is exhaust normal?

5. Control of pneumatic actuator operation
● Do they work smoothly? Do they stop properly when they reach the ends? Do the joints to the load work properly?

■ Do not use if air leakage rate increases or the device does not operate correctly.
● After repair or modification, connect compressed air and electricity, and conduct functional and leakage inspection to confirm that operation is normal.

■ When restarting after a long period of inactivity, make sure that it works properly before you restart it for operation.

■ Take measures so that the load does not fall or drop when the cylinder is removed.