# To Use This Product Safely

Be sure to read this before use. For general cylinder information, see Opening Section P. 41, and for cylinder switches, see P. 924.

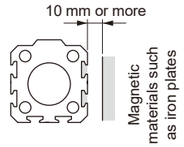
Individual Precautions: Compact Cylinder SSD2 Series

## During Design / Selection

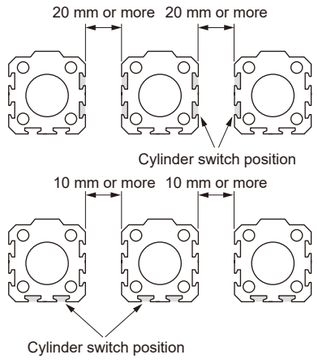
### 1. Common

**Caution**

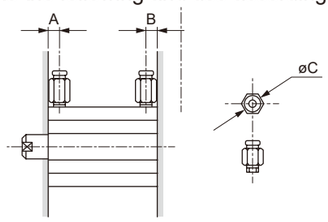
■ If there is a magnetic material such as an iron plate near the cylinder switch, it may cause malfunction. Maintain a distance of 10 mm or more from the cylinder surface.
(Common to all bore sizes)




■ If cylinders are adjacent, it may cause cylinder switch malfunction. Maintain the following distance from the cylinder surface. (Common to all bore sizes)




■ There are restrictions on usable piping fittings. Refer to the following and use accordingly.




| Item / Bore Size (mm) | Port Size | Port position dimension A | Port position dimension B | Usable Fittings | Fitting outer diameter øC | Unusable Fittings |
|---|---|---|---|---|---|---|
| ø12 | M5 | 5.5 | 5.5 | SC3W-M5-4<br>SC3W-M5-6<br>GWS4-M5-S<br>GWS4-M5<br>GWL4-M5<br>GWL6-M5 | ø11 or less | GWS6-M5 |
| ø16 | | | | | | |
| ø20 | | 8 | 5.5 | | | |
| ø25 | | 11 | 6 | | | |
| ø32 | Rc1/8 | 8 | 8 | SC3W-6-4, 6, 8<br>GWS4-6 GWS6-6<br>GWS8-6 GWL4-6<br>GWL6-6 | ø15 or less | GWS10-6<br>GWL8-6<br>GWL10-6 |
| ø40 | | 12 | 8.5 | | | |
| ø50 | Rc1/4 | 10.5 | 10.5 | SC3W-8-6, 8, 10<br>GWS4-8 GWS6-8<br>GWS10-8<br>GWL4 to 12-8 | ø21 or less | GWS12-8 |
| ø63 | | 13 | 11 | | | |
| ø80 | Rc3/8 | 16 | 13 | SC3W-10-6, 8, 10<br>GWS6-10 GWS8-10<br>GWS10-10<br>GWL6 to 12-10 | ø21 or less | - |
| ø100 | | 23 | 15 | | | |

### 2. Single Acting Type SSD2-X, SSD2-Y

**Caution**

■ Do not leave single-acting cylinders pressurized.
If left pressurized, the piston rod may not return by spring load when the pressure is released. If it is necessary to use the product while pressurized, use a double-acting type.

### 3. With Heat Resistant Cylinder Switch SSD2-T1L

**Warning**

■ Cylinder
In an environment with an ambient temperature of 150°C, external leakage will gradually occur after about 500,000 cycles. Please be careful.

■ Heat Resistant Cylinder Switch
The lamp uses an LED. Continuous use at high temperatures will gradually reduce visibility. Even if the LED goes out, the switch output has a separate circuit configuration from the LED, so the switch output will operate normally.

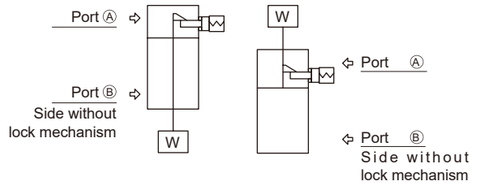




### 4. Fall Prevention Type SSD2-Q

**Warning**

■ In a locked state, if pressure is supplied to a port Ⓐ from a state where both ports are unpressurized, the lock may not release, or the lock may suddenly release and the piston rod may fly out, which is very dangerous. When releasing the lock mechanism, always supply pressure to the Ⓑ port and release it from a state where no load is applied to the lock mechanism.




■ When using a quick exhaust valve to increase the lowering speed, the cylinder body may start moving before the lock pin operates, and normal release may not be possible. Do not use a quick exhaust valve with a drop prevention type cylinder.

■ Do not use 3-position valves.
Do not use in combination with 3-position valves (especially closed-center metal seal type). If pressure is sealed in the port on the side with the lock mechanism, the lock will not engage. Also, even if locked once, air leaking from the valve may enter the cylinder, and the lock may be released over time.

**Caution**

■ The cylinder load factor should be 50% or less.
If the load factor is high, the lock may not be released, or it may lead to damage to the lock part.

■ If back pressure is applied to the lock mechanism side, the lock may disengage. Use a single valve or an individual exhaust type manifold.

■ Do not use multiple cylinders synchronized.
Do not use a method where two or more fall prevention type cylinders are synchronized to move one workpiece. The lock of one of the cylinders may become unremovable.

■ Supply pressure equal to or greater than the minimum operating pressure to the port on the side with the lock mechanism.

■ If the piping on the side with the lock mechanism is thin and long, or if the speed controller is far from the cylinder port, the exhaust speed may be slow, and it may take time for the lock to engage. Please be careful. Also, clogging of the silencer included to the valve's EXH. port will lead to similar results.

■ When using a quick exhaust valve to increase the lowering speed, the cylinder body may start moving before the lock pin operates, and normal release may not be possible. Do not use a quick exhaust valve with a drop prevention type cylinder.

■ Do not use multiple cylinders synchronized.
Do not use a method where two or more fall prevention type cylinders are synchronized to move one workpiece. The lock of one of the cylinders may become unremovable.

■ Use the speed controller with meter-out control.
Lock may not be released with meter-in control.

■ On the side with the lock, always use at the cylinder's stroke end.
If the cylinder piston has not reached the stroke end, the lock may not engage, or it may not be possible to release the lock.

### 5. Creep Speed Type SSD2-F, SSD2-KF

**Caution**

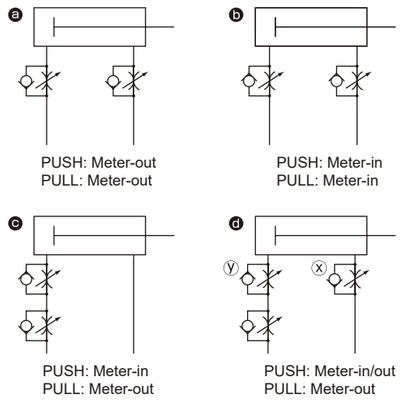
■ Use without lubrication.
Lubrication may change characteristics.

■ Install the speed controller near the cylinder.
If installed far from the cylinder, the speed will become unstable. Use SC-M3/M5, SC3W, SCD-M3/M5, SC3U series speed controllers.

■ Generally, the higher the air pressure and the lower the load factor, the more stable the speed.
Use with a load factor of 50% or less.

## ■ Speed control is stable with a meter-out circuit.

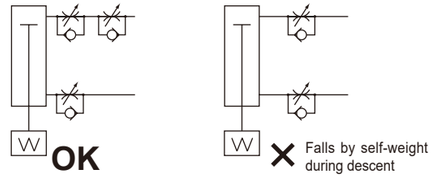
When driving a single-rod cylinder at creep speed in the PUSH direction, if the load resistance is small, a flying-out phenomenon may occur at the start of operation. As countermeasures, use circuits ⓑ, ⓒ, or ⓓ. Circuit ⓓ is the most stable.



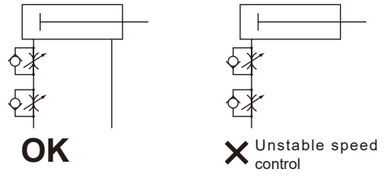

ⓓ Method for adjusting PUSH operation speed of circuit:
1. Speed setting with x speed controller
2. Throttle with y speed controller until projection stops.
3. Reconfirmation of speed

(*1) Comparing ⓑ, ⓒ, and ⓓ, circuit d provides the most stable operation.

(*2) For vertical mounting, it will fall by its own weight in a meter-in circuit, so combine it with a meter-out circuit.




(*3) For series connection of speed controllers, use the circuit shown in the figure below.




(Guideline for lurching occurrence)
Lurching occurs in the following cases:

• Thrust > Resistance

*Resistance: Thrust due to residual pressure on exhaust side (For creep speed type, intake pressure = residual pressure) + [For horizontal use: Frictional force due to load / For vertical use: Dead weight of the load]

## ■ Do not apply lateral load to the cylinder.

Operation becomes unstable when lateral load is applied.

## ■ Avoid use in locations with vibration.

Operation becomes unstable due to the influence of vibration.

## 6. Low Friction Type SSD2-KU

### ⚠ Warning

## ■ Durability varies depending on operating conditions and model characteristics.

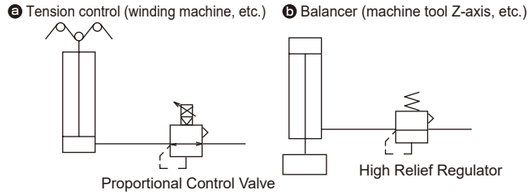
Also, this cylinder has internal leakage. For leakage amount, check the specifications (P. 126).

### ⚠ Caution

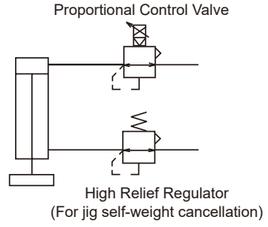
## ■ Install a speed controller on the cylinder.

Install a speed controller on the cylinder. Use within the operating piston speed range of each cylinder. When used with a balancer, etc., it may be better not to install a speed controller to improve supply/exhaust efficiency. Depending on the application, circuits ⓐ to ⓒ below are recommended.

ⓐ Tension control (winding machine, etc.) ⓑ Balancer (machine tool Z-axis, etc.)




ⓒ Load control (polishing, etc.)

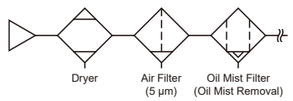



*To improve supply/exhaust characteristics, maximize piping volume as much as possible.

## ■ Do not lubricate. It will cause characteristics to fluctuate.

## ■ Do not apply lateral load to the cylinder. Operation becomes unstable when lateral load is applied.

## ■ Poor quality air adversely affects characteristics and durability. Use clean air with the piping below.




## ■ Install the speed controller near the cylinder.

If installed far from the cylinder, the speed will become unstable.

## ■ Generally, the higher the air pressure and the lower the load factor, the more stable the speed.

Use with a load factor of 50% or less.

## ■ Super compact cylinder high load type has a built-in rubber cushion. The high load type allowable energy value graph below shows the kinetic energy that can be absorbed by the cushion. If the kinetic energy exceeds this value, consider a separate shock absorber.

| Bore Size mm | Allowable Absorption Energy (J) | |
|---|---|---|
| | SSD2-K | SSD2-KU |
| ø12 | 0.04 | - |
| ø16 | 0.09 | - |
| ø20 | 0.16 | |
| ø25 | 0.16 | |
| ø32 | 0.40 | |
| ø40 | 0.63 | |
| ø50 | 0.98 | |
| ø63 | 1.56 | |
| ø80 | 2.51 | |
| ø100 | 3.92 | |

$$\text{Kinetic energy (J)} = \frac{1}{2} \times \text{Weight (kg)} \times [\text{Speed (m/s)}]^2$$

(Note) Regarding the calculation method of kinetic energy

The average speed of the cylinder is calculated by $Va = \frac{L}{T}$.

Va: Average speed (m/s)
L: Cylinder stroke (m)
t: Operating Time (s)

On the other hand, the cylinder speed just before the stroke end is calculated by the following simple formula.

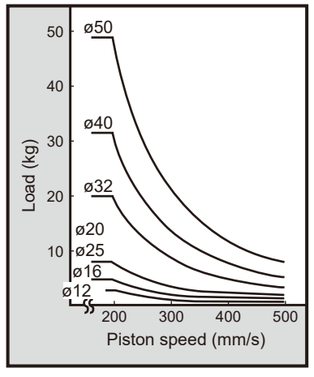
$$Vm = \frac{L}{T} \times (1 + 1.5 \times \frac{\omega}{100})$$

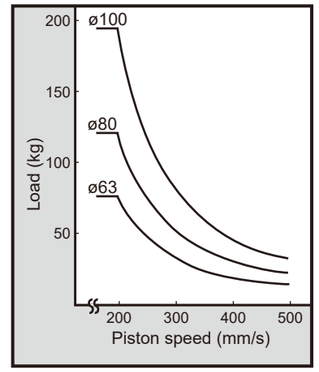
Vm: Speed immediately prior to stroke end (m/s)
ω: Cylinder load factor (%)

For calculating kinetic energy, use this Vm value as the speed.

The following is a graph showing the relationship between piston speed and load for the allowable energy value of the Compact Cylinder High Load Type.

### High Load Type Allowable Energy Value Graph




● Note: The range to the lower left of the curve is usable The upper right range requires an external cushion.

## ■ Avoid use in environments with steam, high humidity, or alkaline atmospheres.

## 7. Non-rotating Type SSD2-M, DM

### ⚠ Caution

## ■ Do not use in a way that applies rotational torque to the piston rod.

The non-rotating bushing will deform and the service life will be significantly reduced.

## ■ Always use with the load on the piston rod applied in the axial direction of the piston rod.

## 8. Cutting Oil Resistant Type SSD2-G2/G3, SSD2-KG2/KG3

### ⚠ Caution

## ■ Do not apply eccentric load to the piston rod. This may reduce the life of scrapers and bearings.

## ■ If there is no splashing of cutting oil or water on the piston rod, use the G or G1 series. Please note that if there is no scattering of cutting oil or water with G2 and G3 series, the lubrication of the piston rod will be cut off and the service life will be reduced.

## ■ Install a speed controller on the cylinder.

● Install a speed controller on the cylinder. Use within the operating piston speed range of each cylinder.

## 9. Spatter Adhesion Prevention Type SSD2-G4 / SSD2-KG4 / SSD2-DG4

### ⚠ Warning

## ■ This cylinder series has improved durability in spatter scattering atmospheres compared to general type cylinders. However, please note that durability may be inferior to general type cylinders when used in other atmospheres.

# During Use

## 1. Common

### Warning

■ Install and remove rod metal using appropriate pliers (C-type retaining ring installation tool).

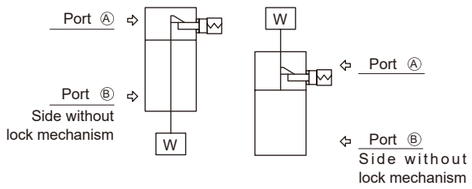
■ Even when using appropriate pliers (C-type retaining ring installation tool), the retaining ring may come off the tip of the pliers (C-type retaining ring installation tool) and fly off, potentially causing injury to personnel and damage to surrounding equipment. Be careful.
Also, when installing, confirm that it is securely in the retaining ring groove before supplying air.

## 2. Fall Prevention Type SSD2-Q

### Warning

■ During equipment maintenance, for safety, please take separate measures to prevent the load from falling due to its own weight.

■ In a locked state, if pressure is supplied to a port Ⓐ from a state where both ports are unpressurized, the lock may not release, or the lock may suddenly release and the piston rod may fly out, which is very dangerous.
When releasing the lock mechanism, always supply pressure to the Ⓑ port and release it from a state where no load is applied to the lock mechanism.




■ When stopping with external shock absorbing equipment (shock absorber, etc.), adjust so that there is no bounce. If there is bounce, the sleeve and stopper piston will make impact contact, leading to damage of the lock mechanism. Also, please perform periodic inspections once or twice a year to check for damage to the holding part due to this phenomenon.

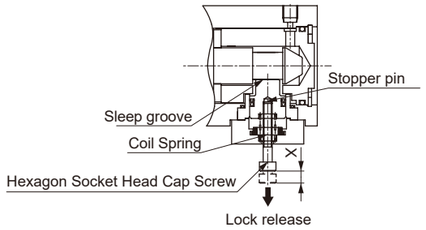
### Caution

■ Since the lock mechanism works at the stroke end, if an external stopper is applied in the middle of the stroke, the lock mechanism will not work and there is a risk of falling. When setting the load, always confirm that the lock mechanism works.

■ After manual operation of the lock mechanism, return the lock mechanism to its original state. Also, do not perform manual operations other than during adjustment, as it is dangerous.

■ Release the lock when mounting or adjusting the cylinder. If installation work, etc. is performed while the lock is engaged, the lock part may be damaged.

■ Manual operation non-locking release method
Screw the hex socket bolt into the stopper piston, and if you pull the bolt with a force of 20 N or more by X mm, the stopper piston will move and the lock will be released. (When mounted horizontally with no load or when the opposite port is pressurized) Also, when you release your hand, the built-in spring returns the stopper piston to its original position, and if it enters the piston rod groove, the piston will be locked.




Hex Socket Bolt Dimensions and Movement Amount Unit: mm

| Bore Size | Dimension | Movement amount X |
|---|---|---|
| ø20 | M3×20 | 3 |
| ø25 | M3×20 | 3 |
| ø32 | M3×20 | 3 |
| ø40 | M3×20 | 3 |
| ø50 | M4×30 | 3 |
| ø63 | M4×30 | 3 |
| ø80 | M4×30 | 3.5 |
| ø100 | M4×30 | 3.5 |

## 3. Creep Speed Type SSD2-F · SSD2-KF

### Caution

■ Adjust alignment, etc., so that no lateral load is applied to the cylinder. Also, adjust and install so that there is no twisting with respect to the sliding guide.
- Fluctuations in load or resistance will make operation unstable.
- Guides with a large difference between static and dynamic friction will have unstable operation.



## 4. Low Friction Type SSD2-KU

### Caution

■ Adjust alignment, etc., so that no lateral load is applied to the cylinder. Also, adjust and install so that there is no twisting with respect to the sliding guide.
- Fluctuations in load or resistance will make operation unstable.
- For long strokes, the speed becomes unstable due to the self-weight of the piston rod. Please install and use a guide.
- Guides with a large difference between static and dynamic friction will have unstable operation.

■ Do not disassemble this product. If disassembled, performance may no longer be maintained. Furthermore, only consumable parts are not provided for this product.

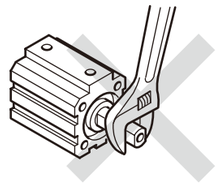
■ Since the U series uses fluorine-based grease, smoking cigarettes, etc. with it adhered to your hands may generate harmful gases and cause harm to the human body. Please be careful.

## 5. Tandem Type SSD2-W

■ Remove the nut included to the tip of the main body's through-bolt (rod side) before mounting.
This nut is for fixing Cylinder 1 and Cylinder 2. It is not for mounting.

## 6. Non-rotating Type SSD2-M, DM

■ When fixing a workpiece to the end of the piston rod, retract the piston rod to the stroke end, place a wrench on the part of the rod parallel section that extends outward, and tighten, taking care that the tightening torque is not applied to the cylinder body.



## 7. Double Rod, Non-rotating Type SSD2-DM

■ Please do not apply torque in opposite directions to the piston rods on both sides of the cylinder. If torque is applied, the fastening parts of internal components may loosen, potentially leading to unforeseen situations. Also, when attaching or detaching a load, fix the flats on the piston rod of the side where the load is included, and ensure that no torque is applied to the non-rotating guide part.

For precautions regarding mounting, installation, adjustment, use, and maintenance, please see "Precautions for Use" in this catalog and the CKD Components Product website (https://www.ckd.co.jp/kiki/en/) -> "Model No." -> Instruction Manual.