



# Safety Precautions

Be sure to read this section before use.

Refer to Intro Page 73 for general information of the cylinder, and to Intro Page 80 for general information of the cylinder switch.

## Product-specific cautions: Compact cylinder SSD2 Series

### Design/selection

#### 1. With heat resistant cylinder switch SSD2-T1L

##### ⚠ WARNING

###### ■ Cylinder

At an ambient temperature of 150°C, external leakage will occur gradually after approximately 500,000 uses.

###### ■ Heat resistant cylinder switch

The lights used are LEDs.

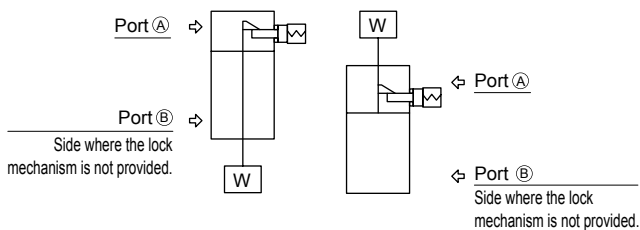
Visibility will gradually decrease with continuous use under high temperatures. As the LED light circuit is separated from the switch output circuit, the switch output works normally even if the LED light goes out.

#### 2. Position locking SSD2-Q

##### ⚠ WARNING

■ If pressure is supplied to port (A) when both ports are not pressurized and the piston is locked, the lock may not be released or the piston rod may suddenly pop out just after the lock is released. This can be extremely hazardous.

To release the locking mechanism, be sure to supply pressure to port (B). Check that a load is not applied to the locking mechanism upon release.



■ For usage where the drop rate is increased using the quick exhaust valve, the lock may not release normally because the cylinder body starts operating before the lock pin. For the position locking cylinder, do not use the quick exhaust valve.

###### ■ Do not use 3-position valves.

Do not use the cylinder in combination with a 3-position (especially, closed center metal seal type) valve. If the port at the side where the lock mechanism is provided is pressurized, the lock cannot be engaged. Even if it is locked once, the air leaked from the valve enters the cylinder, and the lock may be released after a certain period of time.

##### ⚠ CAUTION

###### ■ Cylinder load factor must be 50% or less.

If the load factor is high, the lock may not be released, or the lock section may be damaged.

■ If back pressure is applied to the locking mechanism, the lock may be released. Use a single valve, or an individual exhaust manifold.

###### ■ Do not use multiple synchronized cylinders.

Do not use so that 1 workpiece is moved by synchronizing 2 or more position locking cylinders. Lock release may fail for one of the cylinders.

#### 3. Fine speed SSD2-F, SSD2-KF

##### ⚠ CAUTION

###### ■ Use without lubrication.

Applying lubrication may cause changes in characteristics.

###### ■ Assemble the speed controller near the cylinder.

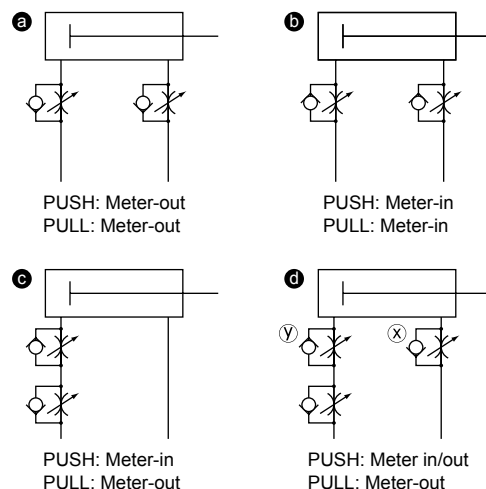
When installed far from the cylinder, the speed becomes unstable. Use the SC-M3/M5, SC3W, SCD-M3/M5 or SC3U Series speed controller.

■ In general, the speed is more stable at higher air pressure and lower load factor.

Use at a 50% or less load factor.

###### ■ The speed control is achieved with a meter-out circuit.

When fine speed activation is performed with operating direction PUSH for the single rod cylinder, the popping out phenomenon occurs when operation starts if the load resistance is low. For countermeasures, use the (b), (c) or (d) circuit. Note that circuit (d) is the most stable.

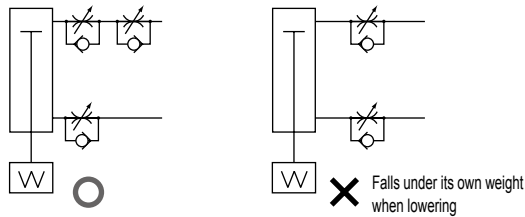


Speed adjustment method for PUSH operation of (d) circuit:

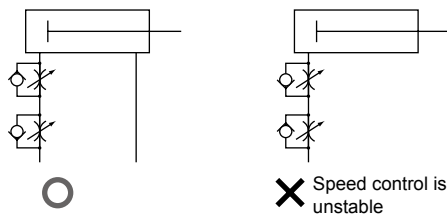
1. Set the speed with the speed controller x.
2. Restrict the speed with the speed controller y until there is no popping out.
3. Check the speed again.

(\*1) When comparing (b), (c), and (d), operation is the most stable with the (d) circuit.

(\*2) For vertical mounting, combine the cylinder with a meter-out circuit, as it will fall under its own weight when a meter-in circuit is used.



(\*3) Use the circuit shown in the figure below for the serial connection of the speed controllers.



(Guidelines for pop-out generation)

Popping out occurs in the following cases.

· Thrust > Resistance

\* Resistance: Thrust caused by residual pressure on the exhaust side (in the fine speed, suction pressure = residual pressure) + { When using horizontally : frictional force caused by load  
When using vertically : load self-weight

■ Do not apply a lateral load to the cylinder.  
With a lateral load, operation will become unstable.

■ Avoid using this product where vibration is present.  
The product will be adversely affected by vibration and operation will become unstable.

### 4. Low friction SSD2-KU

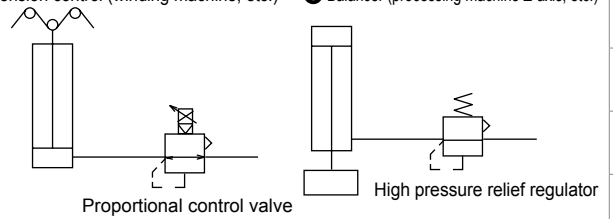
#### ⚠ WARNING

■ Durability differs based on working conditions and model characteristics.  
This cylinder has internal leakage.  
Refer to specifications (page 848) for amount of leakage.

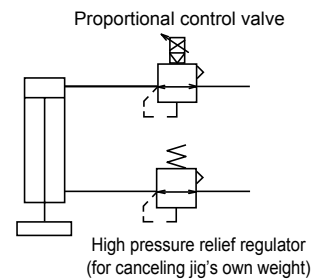
#### ⚠ CAUTION

■ Mount a speed controller on the cylinder.  
Mount the speed controller on the cylinder. Use each cylinder within the applicable working piston speed range. When using the cylinder for a balancer, etc., it may be advisable not to mount a speed controller in order to improve the supply and exhaust efficiency. Depending on the application, circuits a to c below are recommended.

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



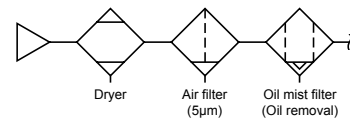
c Load control (grinding, etc.)



\* To improve the supply and exhaust efficiency, make the volume of piping as large as possible.

■ Do not lubricate. The properties fluctuate.

■ Because poor quality air worsens the characteristics and adversely affects the durability, use clean air with the piping below.



■ Assemble the speed controller near the cylinder.  
When installed far from the cylinder, the speed becomes unstable.

■ In general, the speed is more stable at higher air pressure and lower load factor.  
Use at a 50% or less load factor.

■ A rubber cushion is built into the compact cylinder.  
The table below shows the kinetic energy which can be absorbed by the cushion. If kinetic energy exceeds these values, consider using a separate shock absorber.

SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/COVP/N2
<b>SSD2</b>
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/MSDG
FC*
STK
SRL3
SRG3
SRM3
SRT3
MRL2
MRG2
SM-25
ShkAbs
FJ
FK
Spd Contr
Ending

	Bore size (mm)	Allowable absorbed energy (J)	
		SSD2-K	SSD2-KU
SCP*3			
CMK2	φ12	0.04	-
	φ16	0.09	-
CMA2	φ20	0.16	
	φ25	0.16	
SCM	φ32	0.40	
	φ40	0.63	
SCG	φ50	0.98	
	φ63	1.56	
	φ80	2.51	
SCA2	φ100	3.92	

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

(Note) Calculating kinetic energy

Average cylinder speed is obtained with  $V_a = \frac{L}{T}$ .

Va: Average speed (m/s)  
L: Cylinder stroke length (m)  
T: Operation time (s)

With respect to this, the cylinder speed just before the stroke end can be obtained with the following simplified formula.

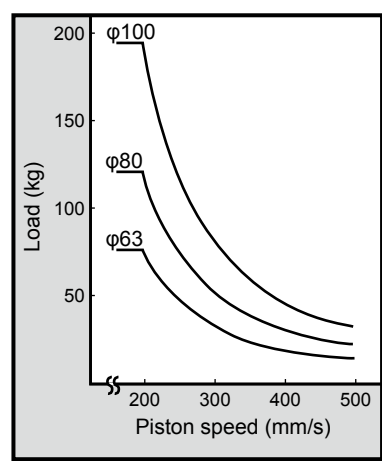
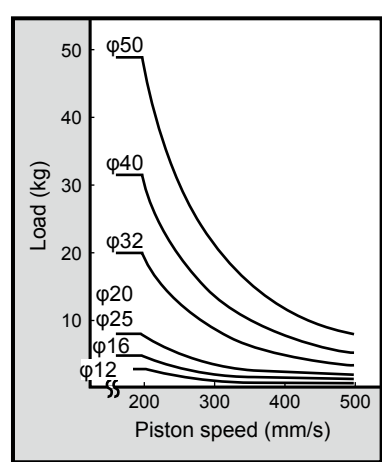
$$V_m = \frac{L}{T} \times (1 + 1.5 \times \frac{\omega}{100})$$

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

Use this Vm value as speed to calculate kinetic energy.

The following is a graph which shows the allowable energy values of the compact cylinder in the form of the relationship between the piston speed and the load.

High load allowable energy value graph



Note: Usable in the range below and to the left of the curve. For the upper right range, an external cushion is required.

## 5. Coolant proof SSD2-G2/G3 / SSD2-KG2/KG3

### CAUTION

- Do not apply an eccentric load to the piston rod. The service life of the scraper or bearing could be shortened.
- If the piston rod is not exposed to splattered cutting oil or water, use the G or G1 Series. In the case that the G2 or G3 Series are not exposed to splattering of cutting oil or water, the lubrication of the piston rod will run out and the service life will be shortened.
- Mount a speed controller on the cylinder.
  - Mount a speed controller on the cylinder. Use each cylinder within the applicable working piston speed range.

## 6. Anti-spatter adherence SSD2-G4/SSD2-KG4/SSD2-DG4

### WARNING

- The durability of this cylinder series is improved in comparison to standard cylinders when used in an atmosphere exposed to spatter. But durability may be shorter than the standard cylinder when used in other atmospheres.

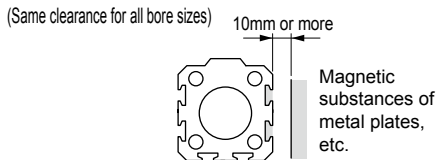
- SCP\*3
- CMK2
- CMA2
- SCM
- SCG
- SCA2
- SCS2
- CKV2
- CAV2/COVPIN2
- SSD2
- SSG
- SSD
- CAT
- MDC2
- MVC
- SMG
- MSD/MSDG
- FC\*
- STK
- SRL3
- SRG3
- SRM3
- SRT3
- MRL2
- MRG2
- SM-25
- ShkAbs
- FJ
- FK
- Spd Contr
- Ending

## Mounting, installation and adjustment

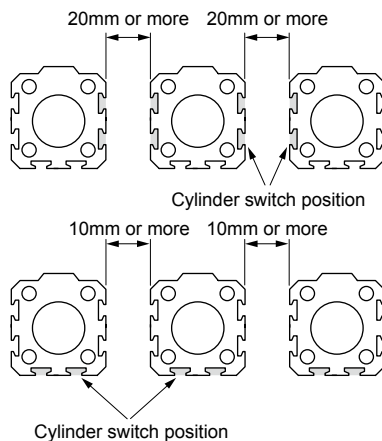
### 1. Common

#### CAUTION

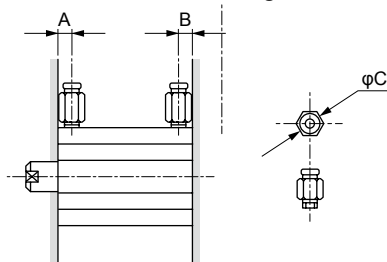
- The cylinder switch may malfunction if there is a magnetic substance such as a metal plate installed adjacently. Confirm that a distance of at least 10 mm is allocated from the surface of the cylinders.



- The cylinder switch may malfunction if cylinders are installed adjacently. Check that the following distances are allocated between cylinders. (Same clearance for all bore sizes)



- As compatible piping fittings are limited, refer to the table below to select the fitting.



Descriptions Bore size (mm)	Port size	Port position		Applicable fittings	Fitting O.D. $\phi C$	Inapplicable fittings
		A	B			
$\phi 12$	M5	5.5	5.5	SC3W-M5-4 SC3W-M5-6	$\phi 11$ or less	GWS6-M5
$\phi 16$			5.5	GWS4-M5-S		
$\phi 20$		8	5.5	GWS4-M5 GWL4-M5		
$\phi 25$		11	6	GWL6-M5		
$\phi 32$	Rc1/8	8	8	SC3W-6-4, 6, 8 GWS4-6 GWS6-6	$\phi 15$ or less	GWS10-6 GWL8-6 GWL10-6
$\phi 40$			12	8.5		
$\phi 50$	Rc1/4	10.5	10.5	SC3W-8-6, 8, 10 GWS4-8 GWS6-8	$\phi 21$ or less	GWS12-8
$\phi 63$			13	11		
$\phi 80$	Rc3/8	16	13	SC3W-10-6, 8, 10 GWS6-10 GWS8-10	$\phi 21$ or less	-
$\phi 100$			23	15		

### 2. Single acting SSD2-X/SSD2-Y

#### CAUTION

- Do not leave the single acting cylinder pressurized. If it is left pressurized for long periods, the piston rod may not return due to spring load when the pressure is released. Use the double acting if the cylinder needs to be left pressurized for long periods.

### 3. Position locking SSD2-Q

#### CAUTION

- The lock mechanism functions at the stroke end, so that if the stopper is engaged during the stroke by the external stopper, the lock mechanism may not work and the piston could fall. When setting a load, make sure to install after checking that the locking mechanism works.
- Supply pressure equal to or higher than the min. working pressure to the port on the lock mechanism side.
- When the piping at the side where the lock mechanism is provided is long and thin, or when the speed controller is far away from the cylinder port, note that it takes time to engage the lock. Clogging in the silencer mounted on the EXH port of the valve may cause the same result.

### 4. Fine speed SSD2-F, SSD2-KF

#### CAUTION

- Perform adjustment such as centering so that a lateral load is not applied to the cylinder. Adjust and install the sliding guide so that it is not twisted.
  - When the load or the resistance fluctuates, operation becomes unstable.
  - With a large difference between static friction and kinematic friction of the guide, operation becomes unstable.

### 5. Low friction SSD2-KU

#### CAUTION

- Do not apply a lateral load to the cylinder. In addition, install the sliding guide so that it is not twisted.
  - When the load or the resistance fluctuates, operation becomes unstable.
  - For the long stroke length type, the piston rod's self-weight causes the speed to become unstable. Install the guide before use.
  - With a large difference between static friction and kinematic friction of the guide, operation becomes unstable.
- Avoid using in environments with water vapor or high humidity or in alkaline atmospheres.

SCP\*3  
CMK2  
CMA2  
SCM  
SCG  
SCA2  
SCS2  
CKV2  
CAV2/  
COVPIN2  
SSD2  
SSG  
SSD  
CAT  
MDC2  
MVC  
SMG  
MSD/  
MSDG  
FC\*  
STK  
SRL3  
SRG3  
SRM3  
SRT3  
MRL2  
MRG2  
SM-25  
ShkAbs  
FJ  
FK  
Spd  
Contr  
Ending

## 6. Rotation-stop SSD2-M, DM

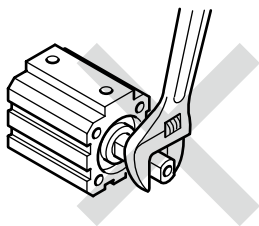
### ⚠ CAUTION

- Do not use the product so as to apply rotation torque to the piston rod.

The bushing for the rotation lock may deform and significantly shorten the service life.

- Use the product so that load on the piston rod is always applied in the rod axial direction.

- When fixing a workpiece onto the tip of the piston rod, retract the piston rod to the stroke end and apply a wrench to the section protruding from the rod's parallel section. Tighten so that torque is not applied to the cylinder body.



## 7. Double rod/rotation-stop SSD2-DM

- Make sure that a reverse torque is not applied to the piston rods at either side of the cylinder. Applying torque can loosen the fastened portions of the internal components and lead to unexpected trouble. In addition, when attaching/removing loads, lock the piston rod using the tang on the end where the load will be attached, and be sure not to apply any torque on the rotation lock guide.

## 8. Two-stage SSD2-W

- Remove the nut mounted on the body through bolt tip (rod side) before mounting. This is a nut for fixing cylinder 1 and cylinder 2. It is not for mounting.

## Use/maintenance

### 1. Common

### ⚠ WARNING

- Use appropriate pliers (C type snap ring mounting tool) to install and remove rod metal.

- Even in cases when appropriate pliers (C type snap ring mounting tool) are used, be careful as the snap ring may pop out at the tip of the pliers (C type snap ring mounting tool) and cause physical or equipment damage.

In addition, when mounting the unit, be sure that the unit fits securely into the snap ring groove before supplying air.

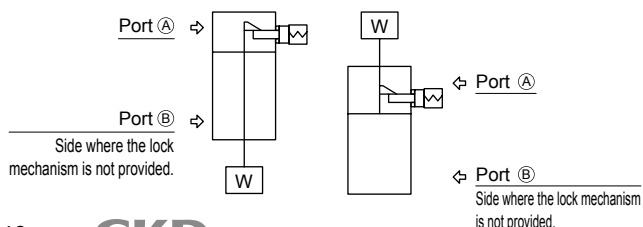
### 2. Position locking SSD2-Q

### ⚠ WARNING

- For safety purposes, prevent the load from falling under its own weight during maintenance.

- If pressure is supplied to port (A) when both ports are not pressurized and the piston is locked, the lock may not be released or the piston rod may suddenly pop out just after the lock is released. This can be extremely hazardous.

To release the locking mechanism, be sure to supply pressure to port (B). Check that a load is not applied to the locking mechanism upon release.



- For usage where the drop rate is increased using the quick exhaust valve, the lock may not release normally because the cylinder body starts operating before the lock pin. For the position locking cylinder, do not use the quick exhaust valve.

- When stopping the piston with an external buffer device (shock absorber, etc.), adjust it so that there is no bound. If the piston bounds at the stroke end, the sleeve and stopper piston will collide strongly and may result in damage of the locking mechanism. Inspect the piston once or twice a year to make sure there is no damage to the retainer caused by this phenomenon.

### ⚠ CAUTION

- After the locking mechanism is manually operated, make sure to return the locking mechanism to the original state before use. Do not perform manual operation except for adjustment, as it is dangerous.

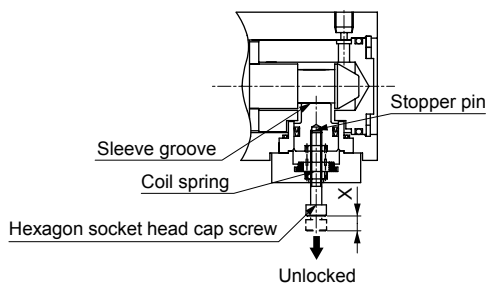
- When mounting or adjusting the cylinder, release the lock. If mounting work, etc., is done while the lock is engaged, the lock part may be damaged.

- Do not use multiple synchronized cylinders. Do not use so that 1 workpiece is moved by synchronizing 2 or more position locking cylinders. Lock release may fail for one of the cylinders.

- Use the speed controller with meter-out. If the meter-in control is used, the lock may not be able to be released.

■ At the side where the lock mechanism is attached, be sure to use the cylinder from the stroke end.  
If the cylinder piston does not reach the stroke end, the lock may not be engaged or the lock may not be able to be released.

■ **Manual override non-locking release method**  
By screwing the hexagon socket head cap screw into the stopper piston and pulling the bolt X mm with force of 20 N or more, the stopper piston moves and the lock is released. (when horizontally installed with no load or with the opposite side port pressurized). When the screw is released, the internal spring causes the stopper piston to return. When it fits into the piston rod groove, the piston is locked.



Hexagon socket head cap screw dimensions and travel distance Unit: mm

Bore size	Dimensions	Travel distance X
φ20	M3×20	3
φ25	M3×20	3
φ32	M3×20	3
φ40	M3×20	3
φ50	M4×30	3
φ63	M4×30	3
φ80	M4×30	3.5
φ100	M4×30	3.5

### 3. Low friction SSD2-U

#### ⚠ CAUTION

- Do not disassemble the product. Once disassembled, the performance may not be retained.  
For this product, ordering just the replacement parts is not possible.
- Smoking with hands smeared with the fluorine grease used for the U Series could generate harmful gases and cause physical harm.

SCP\*3

CMK2

CMA2

SCM

SCG

SCA2

SCS2

CKV2

CAV2/  
COVP/N2**SSD2**

SSG

SSD

CAT

MDC2

MVC

SMG

MSD/  
MSDG

FC\*

STK

SRL3

SRG3

SRM3

SRT3

MRL2

MRG2

SM-25

ShkAbs

FJ

FK

Spd  
Contr

Ending