



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.

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

Product-specific cautions: Round shaped cylinder SCM Series

Design/selection

1. Common

CAUTION

As a cushion mechanism integrated in the cylinder, the rubber cushion and the air cushion are available. The purpose of the air cushion is to absorb the piston's kinetic energy by using air compressibility, avoiding collisions of piston and cover at the stroke end. Thus, the cushion is not used to decelerate the piston speed (deceleration action) near the stroke end. The following table shows the kinetic energy that can be absorbed by the cushion. If the kinetic energy exceeds these values, or if bounding caused by the air compressibility is to be avoided, use a separate buffer.

Bore size (mm)	Rubber cushion		Air cushion	
	Allowable absorbed energy	Effective cushion length (mm)	Allowable absorbed energy	
	J		J	
φ20	0.1	8.1	0.8	
φ25	0.2	8.1	1.2	
φ32	0.5	8.6	2.5	
φ40	0.9	8.6	3.7	
φ50	1.6	13.4	8.0	
φ63	1.6	13.4	14.4	
φ80	3.3	15.4	25.4	
φ100	5.8	15.4	45.6	

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 $V_a = \frac{L}{T}$.

- V_a : Average speed (m/s)
- L : Cylinder stroke length (m)
- T : Operating time (s)

With respect to this, the cylinder speed just before rushing into the cushion can be obtained with the following simple formula.

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

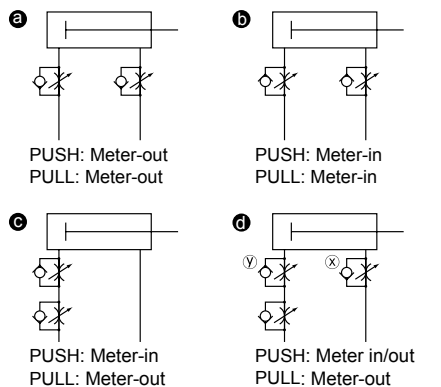
- V_m : Stroke end speed (m/s)
- ω : Cylinder load factor (%)

Use this V_m value as speed to calculate kinetic energy.

2. Fine speed SCM-F

CAUTION

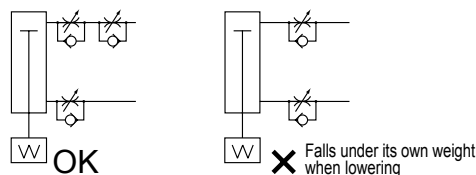
- Use without lubrication.
Applying lubrication may cause changes in characteristics.
- Assemble the speed controller near the cylinder.
When installed far from the cylinder, the speed becomes unstable. Use the SC-M3/M5, SC3W, SCD-M3/M5 or SC3U Series speed controller.
- In general, the speed is stabler at higher air pressure and lower load factor.
Use at a 50% or less load factor.
- Stable 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 the **d** circuit is the most stable.



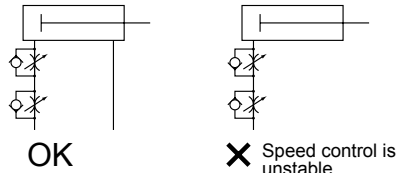
Speed adjustment method for PUSH operation of **d** circuit:
1. Set the speed with the speed controller x.
2. Restrict the speed with the speed controller y until there is no popping out.
3. Check the speed again.

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

(*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.



Design/selection

(Guidelines for pop-out generation)

Popping out occurs in the following cases.

· Thrust > Resistance

* Resistance: Thrust caused by residual pressure + $\left\{ \begin{array}{l} \text{When using horizontally: frictional} \\ \text{on the exhaust side (in the fine speed, suction +} \\ \text{pressure = residual pressure)} \end{array} \right.$ 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.

3. Low friction SCM-U

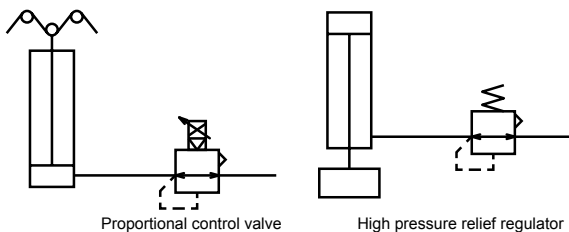
⚠ WARNING

■ Durability differs based on working conditions and model characteristics.
 This cylinder is a cylinder that has internal leakage.
 Refer to specifications (page 286) for amount of leakage.

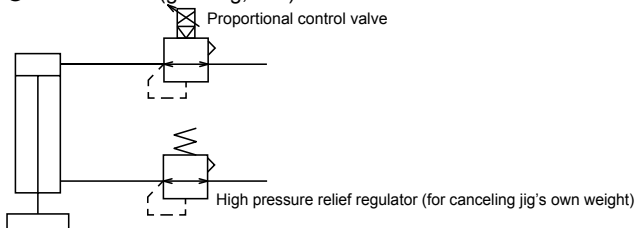
⚠ CAUTION

■ Mount a speed controller on the cylinder.
 Mount the speed controller on the cylinder.
 Use each cylinder within the applicable working piston speed range.
 However, 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 applications, circuits **a** to **c** below are recommended.

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



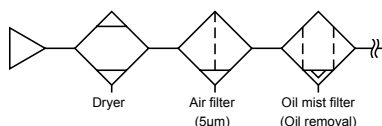
c Load control (grinding, etc.)



* 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.



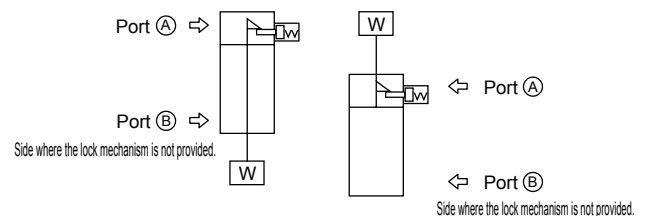
■ Assemble the speed controller near the cylinder.
 When installed at a distant place from the cylinder, the adjustment becomes unstable.

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

4. Position locking SCM-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 by combining with the 3-position (especially, closed center metal seal) valves. 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. Cylinder lock release may fail.

SCP*3

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Ending

Mounting, installation and adjustment

1. Common

CAUTION

Switch rails are adhered with industrial adhesive tape. If used in an atmosphere containing inorganic or organic solvents or water vapor, rails may become loose.

Main inorganic solvent/organic solvent

Inorganic solvents: Sodium hydroxide, hydrochloric acid, etc.

Organic solvents: Toluene, ethanol, hexane, gasoline, kerosene, etc.

Remove all oil, moisture, dust, etc., from the body (tube) in order to adhere the switch rail.
(Perform adhesion by referring to instructions attached to the part.)

Caution for type with air cushion

For $\phi 20$ and $\phi 25$, compatible fittings are limited, so see the following table to select the fitting.

Descriptions	Port size	Applicable fittings	Inapplicable fittings
$\phi 20$	M5	SC3W-M5-4/6	GWL6-M5
		SC3R-M5	
GWS4-M5 GWS4-M5-S		GWL6-M5-45	
GWS6-M5 GWS6-M5-S			
$\phi 25$	GWL4-M5 GWL4-M5-45	GWL6-M5-45	
	GWL4-M5-T GWL6-M5-T		

Switch mounting: Caution for band

When moving the switch position to the stroke length direction

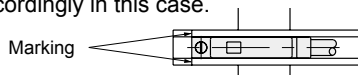
The 1-color display switch can be fine-tuned by ± 3 mm from the default. Loosen the switch fixing screw, shift the switch along the rail, then tighten at the specified position. If the adjusting range exceeds ± 3 mm, or when fine-tuning the 2-color display switch, move the band position. When using T2, T3, T0, or T5, use a flathead screwdriver (clockwork screwdriver, precision screwdriver, etc.) with a grip diameter of 5 to 6 mm, a 2.4 mm or smaller tip, and a thickness of 0.3 mm or less to tighten the screws with a tightening torque of 0.1 to 0.2 N·m.

When using T2J, T2Y, or T3Y, tighten the screw with a tightening torque of 0.5 to 0.7 N·m.

The switch bracket rail has a marking 4 mm from the rail end. Use as a guide to the mounting position when replacing the switch.

Switch rail markings are set to the default switch max. sensitivity position.

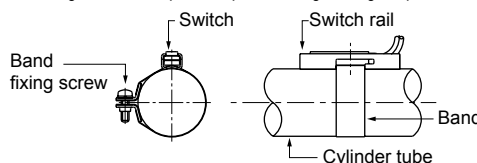
The max. sensitivity position will change when the switch is changed or when the band is shifted. Adjust the position accordingly in this case.



If moving the switch position in the circumferential direction, loosen the band fixing screw, shift the switch rail in the circumferential direction, then tighten at the specified position. Tightening torque is 0.6 to 0.8 N·m.

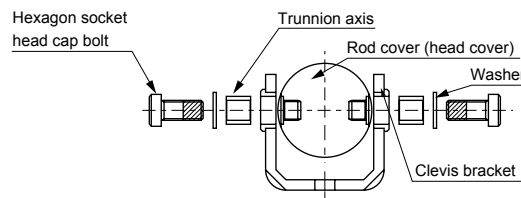
Shifting the band position

Loosen the band fixing screw, shift the switch rail and band along the cylinder tube, and tighten at the specified position. Tightening torque is 0.6 to 0.8 N·m.



When the mounting style is the trunnion, preassemble it as shown in the figure below and tighten the bolt using the tightening torque with reference to the table below.

Bore size	Tightening torque [N·m]
$\phi 20$	6
$\phi 25$	11
$\phi 32$	18
$\phi 40$	27
$\phi 50$	38
$\phi 63$	51



2. Stroke adjustable SCM-R

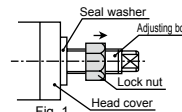
CAUTION

Securely lock the adjustable stroke stopper with the lock nut.

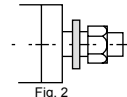
Observe steps (1) to (5) when adjusting the stroke. If adjustments are not made this way, the seal washer will be damaged after one or two adjustments

[Adjustable stroke procedure]

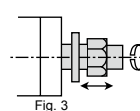
(1) First loosen the lock nut as shown in Fig. 1.



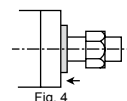
(2) Second, remove the seal washer from the adaptor by hand, and make a state as shown in Fig. 2.



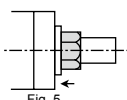
(3) Turn the angle adjustment bolt, lock nut, and seal washer together in the (2) state as shown in Fig. 3, and adjust the stroke length. Check that the rubber section of the seal washer does not bite into the thread part.



(4) After adjusting the stroke, move the seal washer near the adaptor by hand as shown in Fig. 4.



(5) Tighten securely with the lock nut as shown in Fig. 5. Check that the rubber section of the seal washer does not bite into the thread part.



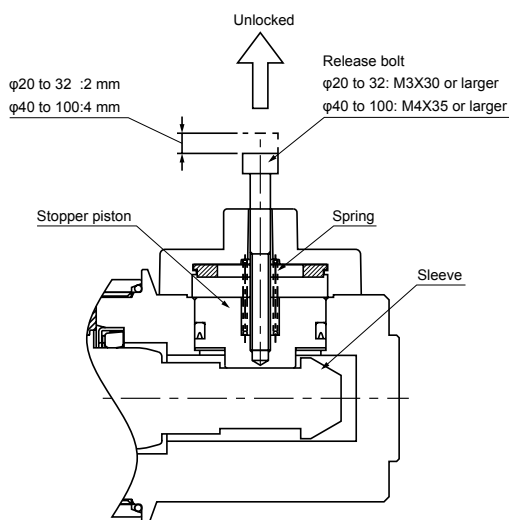
Securely tighten the lock nut after adjusting the stroke. The lock nut could be loosened in the course of usage, and this may result in external leakage.

- Because a seal washer is used for sealing the adjustment bolt, the sealing cannot withstand frequent adjustment.
- If the stroke is adjusted, the cushion cannot function at all.
- 2 types of 25 mm and 50 mm are available for adjustment stroke length.
- When the mounting style is the axial foot, the axial pitch dimension is the same as the standard.

3. Position locking SCM-Q

⚠ CAUTION

- For the axial foot (mounting style: LB), when trying to fix the cylinder to a support, etc., with the state that the mounting bracket is attached to the cylinder, the cylinder cannot be fixed because the bolt and the stopper cover will interfere with each other. Fix the mounting bracket at the position locking side to the support, etc., first, and then mount the cylinder.
- 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 check that the lock mechanism functions before installing the product.
- 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.
- Manual operation unlocking method
By screwing the bolt (φ20 to 32: M3X30 and over, φ40 to 100: M4X35 and over) into the stopper piston and pulling the bolt 2 mm (φ20 to 32) or 4 mm (φ40 to 100) with force of 20 N or more, the stopper piston is moved and the lock is released.
When released, the stopper piston is returned to the original position by the built-in spring and engaged in the sleeve groove, and the cylinder is locked.



4. Fine speed SCM-F

⚠ 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 cylinder SCM-U

⚠ CAUTION

- Do not apply a lateral load to the cylinder. 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, 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 this product where vibration is present.
 - The product will be adversely affected by vibration and operation will be unstable.
- Avoid using in environments with water vapor or high humidity or in alkaline atmospheres.

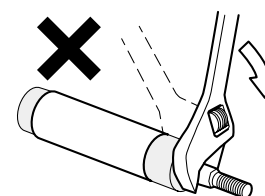
6. Rotation-stop SCM-M

⚠ 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.
When inevitable, use within the allowable torque range.

Allowable torque	φ20	φ25	φ32	φ40	φ50	φ63
N·m	0.2	0.25	0.25	0.45	0.45	0.45

- Do not apply rotation torque with impact, or with instantaneous changes in torque load 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 protruding tang. Tighten so that torque is not applied to the cylinder body.



SCP*3

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Spd
Contr

Ending

Use/maintenance

SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/
COVPIN2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/
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SRT3
MRL2
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ShkAbs
FJ
FK
Spd
Contr
Ending

1. Common

⚠ CAUTION

- When disassembling the cylinder, grip the tang portion of either of the head cover or the rod cover with a vice, etc., apply a wrench or an adjustable wrench to the tang portion of the other cover and loosen it to remove the cover. When tightening it again, retighten from the position set before disassembly.
- A larger torque is required for disassembling and assembling the $\phi 80$ and $\phi 100$ cylinders. Contact your nearest CKD sales office for details, which are described in the instructions for assembling and disassembling.

2. Single acting SCM-X/Y

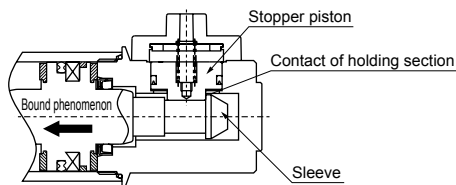
⚠ CAUTION

- 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.

3. Position locking SCM-Q

⚠ WARNING

- For safety purposes, prevent the load from falling under its own weight during maintenance.
- In the case of the cylinder with air cushion, if the air cushion needle at the lock mechanism side is tightened excessively, the piston bounds at the stroke end and the sleeve and stopper piston collide strongly, which may result in damage to the locking mechanism. Also, if the air cushion needle is opened too much, the piston bounces off at the stroke end, which may similarly damage the mechanism. Adjust the needle of the air cushion so that there is no bound.



When stopping the piston with an external buffer device (shock absorber, etc.), adjust it similarly so that there is no bound. 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 lock mechanism is manually operated, make sure to return the lock 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.
- 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.

4. Fine speed SCM-F

⚠ WARNING

- Smoking with hands smeared with the fluorine grease used could generate harmful gases and cause physical harm.

5. Low friction SCM-U

⚠ CAUTION

- Do not disassemble the product. Once disassembled, the performance may not be retained. For this product, just the repair parts are not available.