Pneumatic Equipment

To Use This Product Safely

Be sure to read this before use.

For general cylinder information, see Intro 41, and for cylinder switches, see P. 1026.

Individual Precautions: Round shaped cylinder SCM Series

During Design / Selection

1. Common

⚠ Caution

■ Rubber cushion type and air cushion type are available as cushion mechanisms built into the cylinder. The purpose of the air cushion is to absorb the kinetic energy held by the piston by utilizing the compressibility of air, and to prevent the piston and cover from hitting impulsively at the stroke end. Therefore, the cushion is not for low-speed operation (deceleration operation) of the piston speed from near the stroke end. The table below shows the kinetic energy that can be absorbed by the cushion. If the kinetic energy exceeds this value or if you want to avoid bouncing due to air compressibility, provide a separate shock absorber.

Bore Size (mm)	Rubber Cushion	Air Cushion	
	Allowable Absorbed Energy J	Effective Cushion Length (mm)	Allowable Absorbed Energy J
ø20	0.1	8.1	0.8
ø25	0.2	8.1	1.2
ø32	0.5	8.6	2.5
ø40	0.9	8.6	3.7
ø50	1.6	13.4	8.0
ø63	1.6	13.4	14.4
ø80	3.3	15.4	25.4
ø100	5.8	15.4	45.6

Kinetic Energy (J) =

$$\frac{1}{2} \times \text{Mass (kg)} \times \{\text{Speed (m/s)}\}^2$$

(Note) Regarding calculation of kinetic energy: The average speed of the cylinder is obtained by $Va = \frac{L}{T}$.

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

In contrast, the cylinder speed just before entering the cushion can be found with the following simple formula.

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

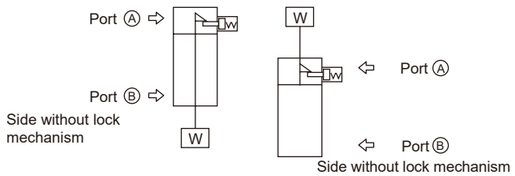
Vm: Stroke end speed (m/s)
ω : Cylinder load factor (%)

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

2. Drop Prevention Type SCM-Q

⚠ Warning

■ In a locked state, if pressure is supplied to the Ⓐ 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

■ Keep the cylinder load factor at 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 be released, so use a single valve or a manifold with individual exhaust.

■ 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 cylinder lock may become impossible to release.

3. Fine Speed Type SCM-F

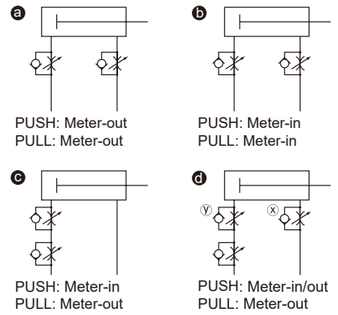
⚠ Caution

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

■ 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.

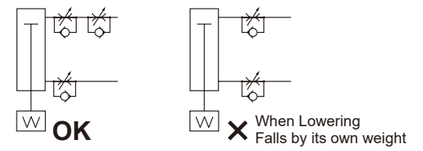
■ Generally, the higher the air pressure and the lower the load factor, the more stable the speed.
Use with a load factor of 50% or less.

■ Speed control with a meter-out circuit provides stability.
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 ⓓ. In addition, the ⓓ circuit is the most stable.

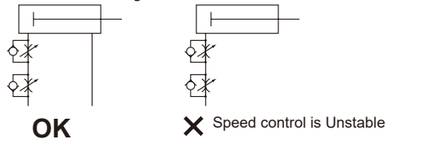


ⓓSpeed adjustment method for PUSH operation of the circuit:
1. Speed setting with x speed controller
2. Throttle with y speed controller until projection stops.
3. Reconfirmation of speed

(*1) Comparing ⓑ ⓒ ⓓ, the ⓓ circuit is the most stable in 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: *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.

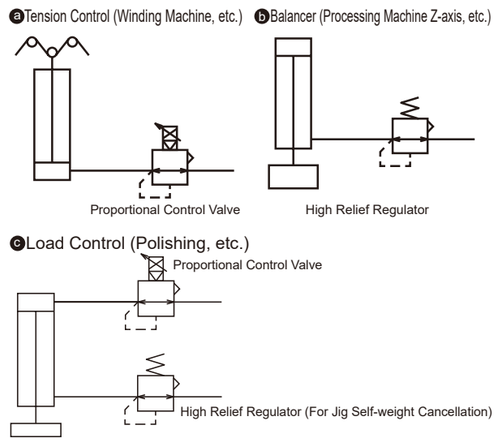
4. Low Friction Type SCM-U

⚠ Warning

■ Durability varies depending on usage conditions and model characteristics.
This cylinder is a cylinder with internal leakage.
For leakage volume, check the specifications (P. 410).

⚠ Caution

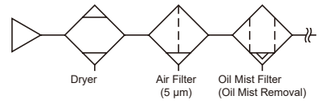
■ Install a speed controller on the cylinder.
Install a speed controller on the cylinder. Use within the operating piston speed range of each cylinder. However, when used with a balancer, etc., it may be better not to attach a speed controller to improve supply/exhaust efficiency. Depending on the application,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



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

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

■ Poor quality air adversely affects characteristics and durability, so use clean air with the following piping.



■ Install the speed controller near the cylinder.
If installed far from the cylinder, adjustment will be 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.

During Use

1. Common

Caution

■ The switch rail is joined with industrial adhesive tape, so do not use it in an atmosphere of inorganic/organic solvents or water vapor, as this may cause the rail to peel off.
Main Inorganic/Organic Solvents
Inorganic/Organic Solvents: Sodium Hydroxide, Hydrochloric Acid, etc. Organic Solvents: Toluene, Ethanol, Hexane, Gasoline, Kerosene, etc.

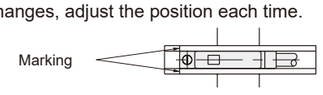
■ When adhering the switch rail, sufficiently remove oil, moisture, dust, etc. from the surface of the main body (tube).
(Adhere by referring to the instruction manual attached to the parts)

■ Precautions for Air Cushion Type
For ø20 and ø25, there are restrictions on usable pipe fittings, so refer to the following and use accordingly.

Item	Port Size	Usable Fittings	Unusable Fittings
ø20	M5	SC3W-M5-4/6 SC3R-M5 GWS4-M5 GWS4-M5-S	GWL6-M5
ø25		GWS6-M5 GWS6-M5-S GWL4-M5 GWL4-M5-45 GWL4-M5-T GWL6-M5-T	GWL6-M5-45

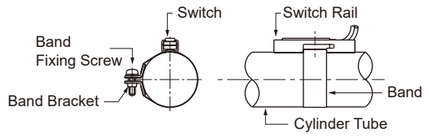
■ Switch Mounting Method: Switch Mounting Method: Precautions for Band Method

● When Moving the Switch Position in the Stroke Direction
The 1-color indicator switch can be finely adjusted by about ±3 mm from the mounting position at the time of shipment. Loosen the switch mounting screw, move the switch along the rail, and tighten at the specified position. If the adjustment range exceeds ±3 mm, or when finely adjusting the position of the 2-color indicator switch, move the band position. For T2, T3, T0, T5, use a flat-blade screwdriver with a grip diameter of 5 to 6 mm, tip shape width of 2.4 mm or less, and thickness of 0.3 mm or less (watchmaker's screwdriver, precision screwdriver, etc.) to tighten the switch fixing screw with a tightening torque of 0.1 to 0.2 N•m. For T2J, T2Y, T3Y, tighten with a tightening torque of 0.5 to 0.7 N•m. The switch rail has a marking 4 mm from the end face of the rail. Use this as a guide for the mounting position when replacing the switch. The marking on the switch rail is set to the switch's highest sensitivity position at the time of factory shipment. If the switch type is changed, the band is moved, or the highest sensitivity position changes, adjust the position each time.



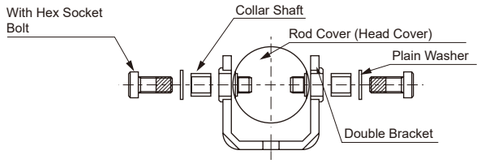
● When Moving the Switch Position in the Circumferential Direction
Loosen the band fixing screw, move the switch rail circumferentially, and tighten it at the specified position. Tightening torque is 0.6 to 0.8 N•m. When loosening or tightening the band fixing screw, hold the band bracket with a tool, etc., keeping the bracket parallel.

● When Moving the Band Position
Loosen the band fixing screw, move the switch rail and band along the cylinder tube, and tighten them at the specified position. Tightening torque is 0.6 to 0.8 N•m. When loosening or tightening the band fixing screw, hold the band bracket with a tool, etc., keeping the bracket parallel.



■ For trunnion mounting style, assemble as shown in the diagram below, and tighten with the tightening torque specified in the table below.

Bore size	Tightening Torque [N•m]
ø20	6
ø25	11
ø32	18
ø40	27
ø50	38
ø63	51



2. Single Acting Type SCM-X/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.

3. Stroke Adjustment Type SCM-R

Caution

■ When adjusting the stroke, strictly follow steps (1) to (5) below. If adjustment is not performed using this method, the seal washer will be damaged after 1 or 2 adjustments.
[Stroke Adjustment Procedure]
(1) First, loosen the lock nut to the state shown in Figure 1.

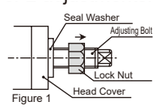


Figure 1

(2) Next, manually detach the seal washer from the adapter to the state shown in Figure 2.

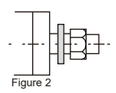


Figure 2

(3) In state (2), turn the adjustment bolt, lock nut, and seal washer together as shown in Figure 3 to adjust the stroke. At this time, be careful not to let the rubber part of the seal washer get caught in the threaded part.

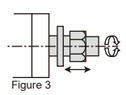


Figure 3

(4) After stroke adjustment, first bring the seal washer close to the adapter by hand as shown in Figure 4.

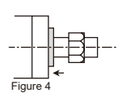


Figure 4

(5) Then, securely tighten with the lock nut as shown in Figure 5. At this time, be careful not to let the rubber part of the seal washer get caught in the threaded part.

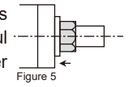


Figure 5

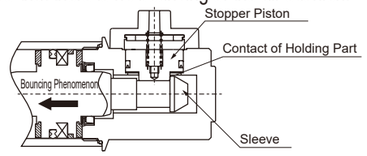
After stroke adjustment, securely tighten the lock nut. If used for a long time, the lock nut may loosen, causing external leakage.

4. Drop Prevention Type SCM-Q

Warning

■ During equipment maintenance, please take separate measures for safety so that the load does not fall due to its own weight.

■ For cylinders with air cushion, if the air cushion needle on the lock mechanism side is tightened too much, the piston will bounce at the stroke end, and the sleeve and stopper piston will make impact contact, leading to damage to the lock mechanism. Also, if the air cushion needle is opened too much, the piston will rebound at the stroke end, similarly leading to damage. Adjust the needle so that there is no bouncing of the air cushion.



When stopping with external shock absorbing equipment (shock absorber, etc.), adjust similarly to prevent bouncing. Also, please perform periodic inspections once or twice a year to check for damage to the holding part due to this phenomenon.

Caution

■ Axial Foot Type (Mounting type: LB), if you try to fix the support bracket to a frame etc. while it is attached to the cylinder, the bolt and stopper cover will interfere, preventing fixation. First, fix the mounting bracket on the drop prevention side to the frame etc., and then install the cylinder.

■ Since the lock mechanism works at the stroke end, if an external stopper is applied mid-stroke, the lock mechanism will not work, and there is a risk of falling. When setting the load, be sure to confirm that the lock mechanism is working before installing.

■ Supply pressure equal to or higher 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, so please be careful. Also, clogging of the silencer attached to the valve's EXH. port will lead to similar results.

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

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

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

■ Always use the side with the lock 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. Fine Speed Type SCM-F

Warning

■ Since fluorine grease is used, if you smoke with it adhered to your hands, toxic gas may be generated, potentially harming the human body, so please be careful.

6. Low Friction Type SCM-U

Caution

■ Avoid use in steam, humid environments, or alkaline atmospheres.

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

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