CKD

SM－227268－A

INSTRUCTION MANUAL

SUPER MICRO CYLINDER

CLEAN ROOM SPECIFICATION

SCM-(Q)-P7 Series

SCM-(Q)-P5 Series (custom order)

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

CKD Corporation
The 7th edition

For Safety Use

To use this product safety, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules). We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.
Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your applications, requirements, and how to use it.
This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, **read this operation manual carefully for proper operation**.
Observe the cautions on handling described in this manual, as well as the following instructions:

⚠ CAUTION :

- Before performing an overhaul inspection on the actuator, deactivate residual pressure completely.
- While the actuator is operating, do not step into or place hands in the driving mechanism.
- To prevent an electric shock, do not touch the electric wiring connections (exposed live parts) of the actuator equipped with a solenoid valve or switch. Perform an overhaul inspection with the power off. Also, do not touch these live parts with wet hands.
- The P7 series uses fluorine-based grease. Avoid exposure to open flame to prevent generation of possibly injurious toxic gases.
  Smoking with a hand with the grease may generate toxic gas, so this is harmful to the health.

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SCM
Super micro cylinder
Clean Room Specification
Manual No. SM-227268-A

1. UNPACKING

1) Open the package in a clean room. The product is packaged in a clean room, and should be opened just before piping it in the clean room.

2) Make sure that the type No. on the nameplate of the delivered Super Micro Cylinder matches the type No. you ordered.

3) Check the appearance for any damage.

4) Stop up the piping port with a sealing plug to prevent the entry of foreign substances into the cylinder. Remove the sealing plug before piping.

2. INSTALLATION

2.1 Installation

1) The ambient temperature for this cylinder is -10 to 60℃.

2) Consult CKD, when the cylinder is used in the dusty atmosphere, because there may be a case that foreign substances go inside through breathing hole of locking mechanism and cause malfunction.

3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.

4) When using the axial foot type (mounting style: LB), fixing the mounting bracket on the frame, etc., while mounted on the cylinder will cause the bolt and stopper cover to interfere and prevent fixing. Fix the position locking mounting bracket on the frame, etc., before mounting the cylinder.

5) The locking mechanism functions at stroke limit, so if the stopper is applied with the external stopper in the middle of a stroke, the locking mechanism will not function and the load may drop. Check that the locking mechanism functions before setting the load.

6) Supply pressure higher than the minimum working pressure to the port with a locking mechanism.

7) If piping on the side with the locking mechanism is long and thin, or if the flow control valve is separated from the cylinder port, exhaust speed may drop and it may take longer for the lock to be applied. This may also occur if the silencer on the valve's EXH. port is clogged.

8) For mounting style 00 type, front direct mount can not be installed.

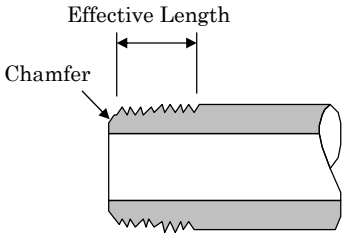
2.2 Piping

1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc. If the operating ambient temperature exceeds 60℃, use copper pipes.

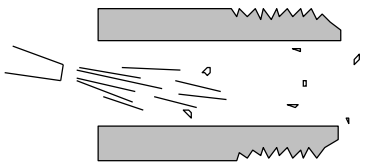
2) See to it that the pipe connecting cylinder and solenoid valve has effective cross-sectional area which is needed for the cylinder to drive at the specified speed.

3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust, foreign substance in the drain of the pipe.

4) Be sure to observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.

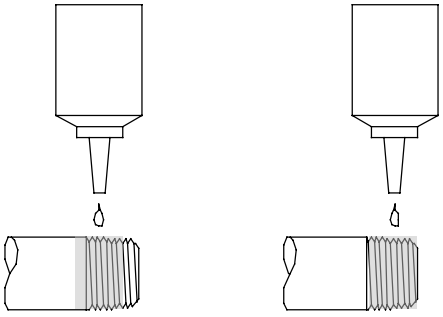


5) Flush air into the pipe to blow out foreign substances and chips before piping.



6) Refrain from applying sealant approx. the tip of pipe to avoid to residual substances from falling into piping systems.

●Sealant (Paste or liquid)



(Correct) (Incorrect)

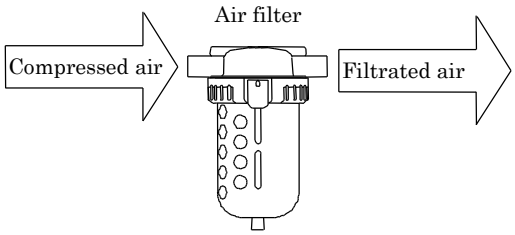
7) Precautions for product with air cushion

Piping joints used with ϕ 20 and ϕ 25 types are limited. Refer to the following table when selecting joints:

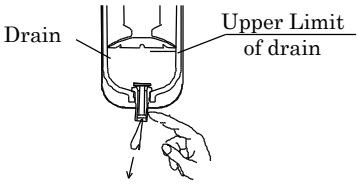
Item	Port size	Compatible joints	Incompatible joints
ϕ 20	M5	SC3W-M5-4/6 SC3R-M5 GWS4-M5 GWS4-M5-S GWS6-M5 GWS6-M5-S GWL4-M5 GWL4-M5-45 GWL4-M5-T GWL6-M5-T	GWL6-M5 GWL6-M5-45
ϕ 25			

2.3 Fluid

1) It is necessary to use dehumidified air that has been filtered from compressed air. Carefully select an adequate filter that has an adequate filtration rate (preferably 5 μ m or less), flow rate and its mounting location (as nearest to the directional control valve as possible).



2) Be sure to drain out the accumulation in the filter periodically.



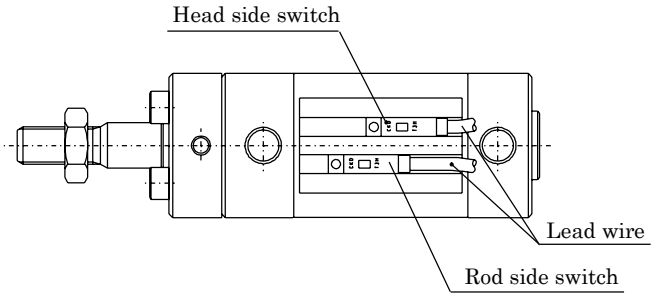
3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

2.4 Location of mounting Switches on a Cylinder

1) Switch rails are glued with industrial adhesive tape. If used in an atmosphere containing inorganic or organic solvents or water vapor, rails may peel off.
   Main inorganic/organic solvents
   Inorganic solvent: Sodium hydroxide, hydrochloric acid, etc.
   Organic solvent: Toluene, ethanol, hexane, gasoline, kerosene, etc.

2) Remove all oil, water, and dust from the main unit (tube) before laying adhesive tape for switch rails.
   (Refer to precautions enclosed with the product before starting.)

3) Location of mounting switches on a cylinder. (Common items)



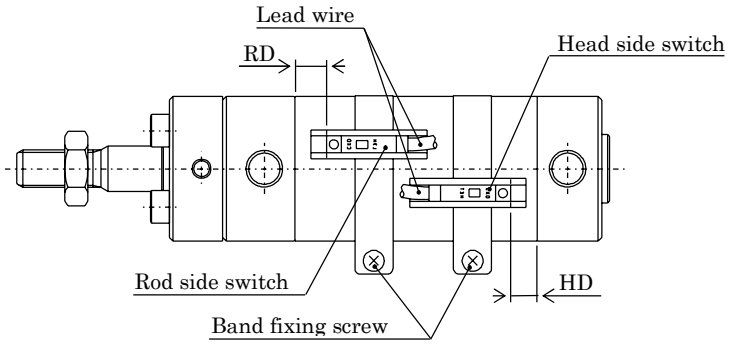
(1) At the stroke end
Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the maximum sensitive position.
(Refer to Tables 1 and 2.)

(2) Intermediate of stroke
Move the piston where it is anticipated to stop and fix it tentatively Slide a switch carefully along the side of cylinder over the piston to find out the spot where switch turns on. This type spot should be located on both side of piston. The intermediate spot between those posits is of the maximum sensitive position and where the switch is supposed to be installed.

(3) Relocation of switch
Slide switch body along cylinder tube after loosening mounting screws and tighten screws when located the maximum sensitive position. (Apply tightening torque of 0.1 to 0.2N・m)

(4) Replacing switch
Take out switch out of groove after loosening mounting screws. Slide new replacing switch into groove and tighten screws upon placing the switch at the maximum sensitive position. (Apply tightening torque of 0.1 to 0.2N・m)

4) Switch mounting position (Band method)

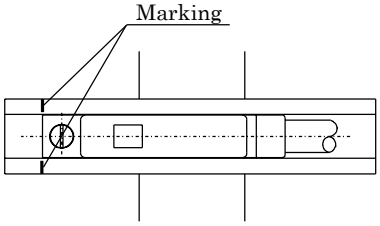


(1) Fine adjustment of switch mounting position

When the switch is mounted by means of the band method, the one-color indication switch is finely adjusted about ±3 mm back and forth from the mounting position, which has been set before shipment.

If the adjustment range exceeds ±3 mm or the fine adjustment of the two-color indication switch is performed, move the band.

(2) Replacement of switch



A marking is provided at a position where is 4 mm far from the end face of the switch rail. When replacing the switch, this marking is used as reference mounting position. Additionally, the marking of the switch rail has been set at the maximum switch sensitivity position before shipment from the factory.

As the switch type is changed or the band is moved, the maximum sensitivity position is changed. If this happens, adjust the mounting position appropriately.

(3) Movement of switch (Circumference direction)

Loosen the band fixing screws and move the switch rail in the circumference direction. Secure the rail at the specified position by tightening the fixing screws. At this time, the tightening torque is 0.6 to 0.8 N·m.

(4) Movement of band

Loosen the band fixing screws and move the switch rail and band along with the cylinder tube. Secure the rail and band at the specified position by tightening the fixing screws. At this time, the tightening torque is 0.6 to 0.8 N·m.

5) Operating range

The switch turns on first and turns off as the piston moves along its stroke. Precise operating range deviate slightly depending upon the direction of piston movement as shown right.

The center of the range is the mostly sensitive position. Setting switch at this point eliminates majority of external disturbance and provides the most stabile actuation of switch.

6) Hysteresis

(1) Precise operating range deviate slightly depending upon the direction of piston movement as shown right.

(2) Switch is apt to be disturbed its accuracy by external effect when piston stops within this range. Carefully avoid designing stopping location of piston.

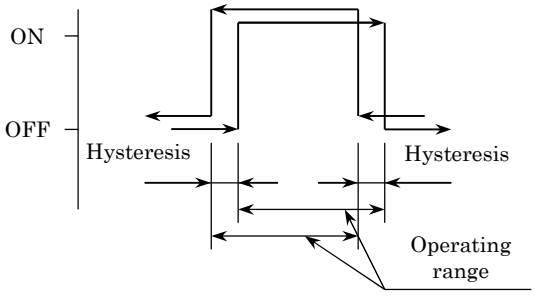


Table 1 (Rail method) (mm)

Bore size (mm)	Solid state switch (T2H/T2V, T3H/T3V)				Reed switch (T0H/T0V, T5H/T5V)			
	Maximum sensitive position		Operating range	Hysteresis	Maximum sensitive position		Operating range	Hysteresis
	RD	HD			RD	HD		
ϕ 20	7.5	7.0	3 to 8	1.5 or less	7.0	4.0	6 to 14	3 or less
ϕ 25	8.5	6.0	3 to 9		8.0	3.0	5 to 14	
ϕ 32	9.5	7.0	3 to 8		9.0	4.0	5 to 12	
ϕ 40	11.5	9.0	3 to 9		11.0	6.0	6 to 14	
ϕ 50	13.0	11.5			12.0	8.0		
ϕ 63							7 to 15	
ϕ 80	20.0	13.0	4 to 10		19.0	10.5		
ϕ 100	19.5	13.5			18.5	11.0	9 to 15	

Table 2 (Band method) (mm)

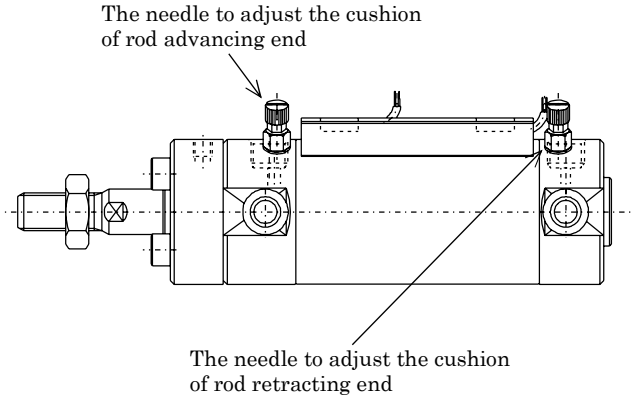
Bore size (mm)	Solid state switch (T2H/T2V, T3H/T3V)				Reed switch (T0H/T0V, T5H/T5V)			
	Maximum sensitive position		Operating range	Hysteresis	Maximum sensitive position		Operating range	Hysteresis
	RD	HD			RD	HD		
ϕ 20	7.5	6.5	3 to 8	1.5 or less	7.5	6.5	6 to 14	3 or less
ϕ 25	8.5	5.5	3 to 9		8.5	5.5	5 to 14	
ϕ 32	9.5	6.5	3 to 8		9.5	6.5	5 to 12	
ϕ 40	11.5	8.5	3 to 9		11.5	8.5	6 to 14	
ϕ 50	13.0	11.0			13.0	11.0		
ϕ 63							7 to 15	
ϕ 80	20.0	13.0	4 to 10		20.0	13.0		
ϕ 100	19.5	13.5			19.5	13.5	9 to 15	

3. OPERATION

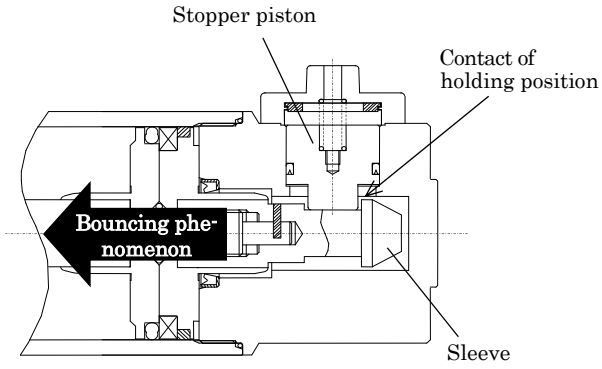
3.1 Operating the Cylinder

1) The working pressure for this type of cylinder is specified in "Product Specifications". Operate the system within this range.
Let the load factor of the cylinder be 50 % or less.

2) Though the cushion has been adjusted at no load when delivered, adjust the cushion needle when the change of cushion effect is required.
Tightening the needle (clockwise) makes cushion more effective. Tighten the needle lock nut all the way after adjustment.
However, if kinetic energy such as load is heavy or speed is too fast, exceeding the values given in Table 3, consider of providing a shock absorber.



If the cushion adjusting needle on the locking mechanism side is fastened too tight, the piston bounces on the stroke end to bring the sleeve and the stopper piston into contact with a bump, thereby resulting in damage in the locking mechanism. On the other hand, if the cushion adjusting needle is opened too much, the piston bounces on the end of stroke, it also causes damage to the mechanism. Make adjustments of the needles for the cushion so as not to allow bouncing of the piston.



When an external cushion dumper (such as a shock absorber) is used to stop the piston, it is also needed to make adjustments so as not to allow bouncing of the piston.
Conduct periodic inspections once or two times a year to check for damage on the holding portion by this phenomenon.

Table 3 Table of cushion characteristics

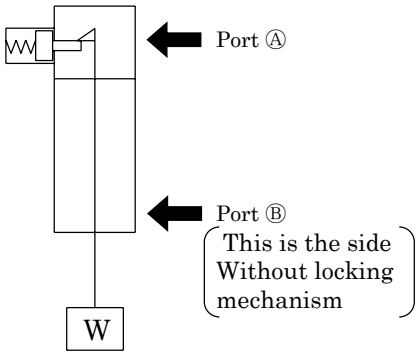
Bore size (mm)	Rubber cushion	Air cushion	
	Allowable energy absorption (J)	Effective air cushion length (mm)	Allowable energy absorption (J)
ϕ 20	0.1	8.1	0.8
ϕ 25	0.2		1.2
ϕ 32	0.5	8.6	2.5
ϕ 40	0.9		3.7
ϕ 50	1.6	13.4	8.0
ϕ 63			14.4
ϕ 80	3.3	15.4	25.4
ϕ 100	5.8		45.6

3) Adjust the working piston speed with the speed controller mounted.

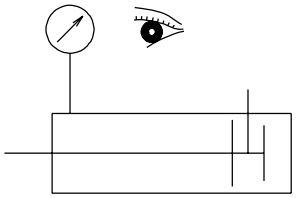
3.2 For use up precautions (position locking type)

1) To release the locking, be sure to remove the load to locking mechanism by supplying pressure to the port B first where no locking mechanism is installed.

It is quite dangerous to supply pressure to the A direct while piston is being locked after both ports A and B are exhausted because the piston rod is apt to pop out all the sudden due to the load on the tip of piston rod. When the port A is pressurized, at the same moment, pilot line releases the locking mechanism.

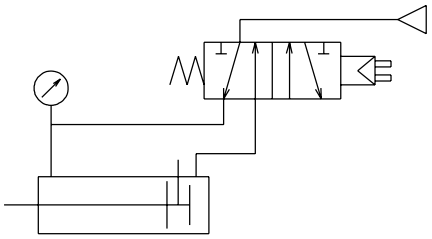


2) Confirm by an air gage, before starting daily operation, that the cylinder chamber where no locking device mounted (port B) is adequately pressurized.

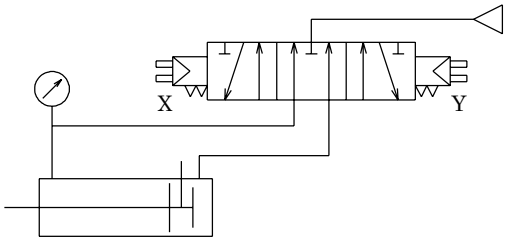


3) During the design of circuit layout, make sure the pressure delivery just before starting daily operation is so arranged as shown on the illustration.

(A) A satisfactory layout



(B) A sample of layout, which requires a particular consideration to start a system



Piston rod is apt to pop out when Y solenoid is energized first. Design the circuit which energizes X solenoid first then dose Y solenoid.

4) If backpressure is applied to the locking mechanism, the lock may be released. Use a discrete valve, or use an individual exhaust type manifold.

5) There is a tendency that it takes some lengthy time before locking when the exhausting air speed is excessively slow from the chamber of locking mechanism side. (For instance, speed control is set at low speed while piping is long and small diameter.)

6) When using the cylinder with an air cushion, if the end cushion needle on the locking mechanism side is tightened too much, the piston may bounce at stroke limit and damage the locking mechanism.
Adjust the needle so the piston does not bounce.

7) If the locking mechanism is operated manually, check and return the manual override to the original position. Do not operate this product manually other than during adjustment, because this may be very hazardous.

8) Release the lock when installing or adjusting the cylinder.
The lock may be damaged if the cylinder is installed while the lock is applied.

9) Do not use multiple cylinders together.
Do not move one work piece using more than one end lock cylinder. It may not be possible to release one of the cylinder's locks.

10) Use the flow control valve with meter-out control.
It may not be possible to release locks used with meter-in control.

11) Use the side with the lock with a cylinder stroke limit.
If the cylinder's position does not reach stroke limit, the lock may not be applied or released.

12) There is approx. 1mm play along piston rod axis under locking status.

13) Do not perform vacuum treatment on the relief port of the position locking part. Otherwise, the position locking mechanism will not work and it can be very dangerous.

3.3 Principle of Mechanical Motion

1) Locking Motion

(a) Stopper piston ④ is pushed up by the slant of sleeve tip ② as the piston ① of cylinder approaches to its stroke end. (Fig. 1)
The stopper piston, however, is held up by the pressure when the pressure within the chamber Ⓐ is Min. working pressure or higher.

(b) When the piston of cylinder further comes closer to its stroke end and the groove Ⓑ of sleeve matches to the tail of stopper piston, the stopper piston drops back to the groove Ⓑ due to expansion force of spring ③, generating an effect of locking the piston of cylinder. (Fig. 2)

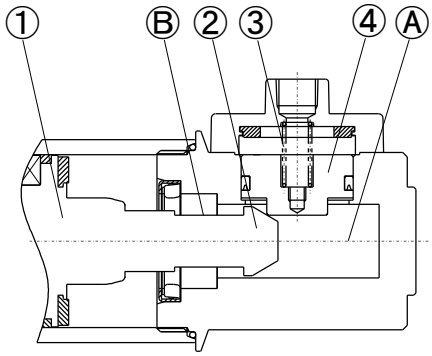


Fig.1

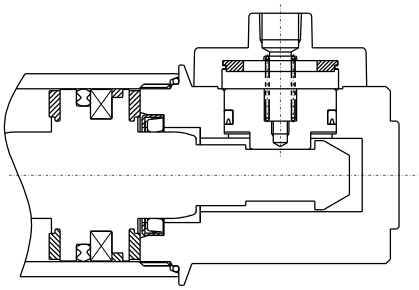


Fig.2

2) Unlocking Motion

The stopper piston, when compressed air is supplied through the port, floats up against the force of the spring ③ and comes off the groove Ⓑ of sleeve, generating an effect of unlocking the piston of cylinder. (Fig. 3)

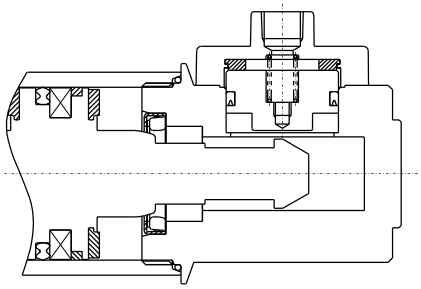
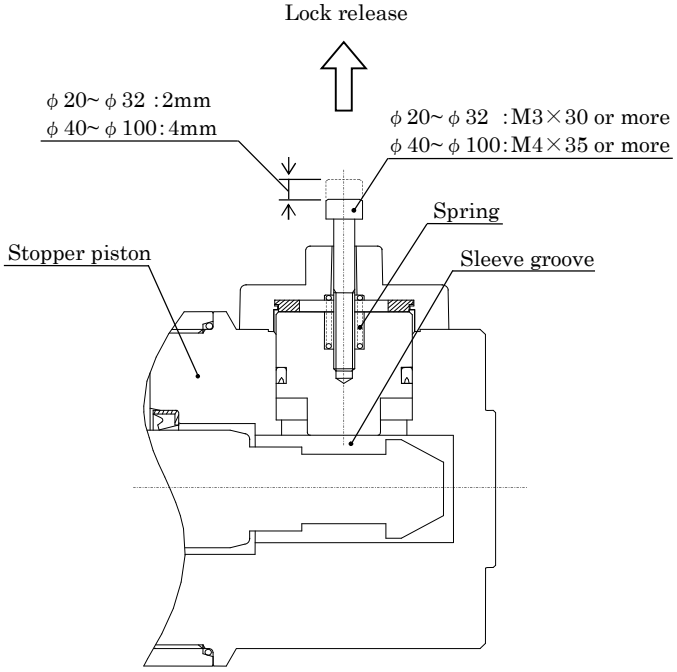


Fig.3

3) Unlocking Procedures by Manual control

Screw a hexagon socket head cap screw (φ20 to φ32 : M3 ×30 or more, φ40 to φ100 : M4 ×35 or more) into the stopper piston, and pull the bolt up φ20 to φ32 : 2mm, φ40 to φ100 : 4mm with a force of 2 kgf or more. The stopper piston moves and the lock is released.

When the hand is released, if the stopper piston is returned by the internal spring and enters the piston rod groove, the piston locks.



3.4 How to use the Switches

3.4.1 Common items

1) Magnetic environment

Do not operate this product in a place where a strong magnetic field or large current (large magnet or spot welder, etc.) exists. If a cylinder with the switch is installed in parallel to this product or the magnetic substance moves near the cylinder, the mutual interference may occur and affect the detection accuracy.

2) Protection of lead wire

Pay consideration to eliminate repeating bending stress or stretching of lead wire while laying the wire.

To the moving portion, use such cord of flexibility as for building a robot.

3) Operating temperature

Do not operate the product at a high temperature (60℃)

Always avoid operation of the product in a hot place due to temperature characteristics of magnetic and electronics parts.

4) Intermediate position detection

When activating the switch halfway of the stroke, the relay may not respond if the working piston speed is too fast.

5) Impact

Do not apply a large vibration or impact to the product when transporting the cylinder, or mounting or adjusting the switch.

6) Changing switch lead wire colors

The colors of the switch lead wires have been changed, as shown in the following table, in response to the revision of the JIS standard and the subsequent revision of the NECA (Nippon Electric Controllers Association) standard.

		Before change	After change
M, S, R, A, T, K, V, H Series	2-wire type	White (+)	Brown (+)
		Black (−)	Blue (−)
	3-wire type	Red (+)	Brown (+)
		White (output)	Black (output)
		Black (−)	Blue (−)
T, K Series (Equipped with preventive maintenance output)	3-wire type	White (+)	Brown (+)
		Yellow (preventive maintenance output)	Orange (preventive maintenance output)
		Black (−)	Blue (−)
	4-wire type	Red (+)	Brown (+)
		White (regular output)	Black (regular output)
		Yellow (preventive maintenance output)	Orange (preventive maintenance output)
		Black (−)	Blue (−)

3.4.2 Operational Cautions, Solid state switch (T1, T2, T3)

1) Connection of lead cord

Comply with the color coding specified on the illustrations. Be sure to turn the power off before starting connecting work.

An erroneous wiring or short circuiting of load causes damage to not only switches, but also load side circuit. Wiring work without shutting electricity off may cause damage to the load side circuit.

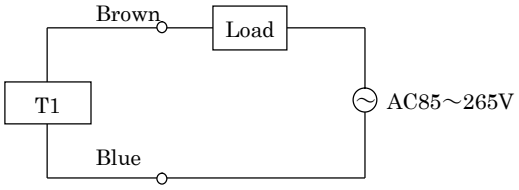


Fig.1 Fundamental circuit Example of T1

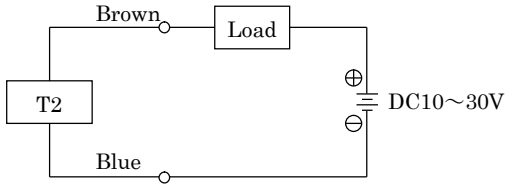


Fig.2 Fundamental circuit Example of T2

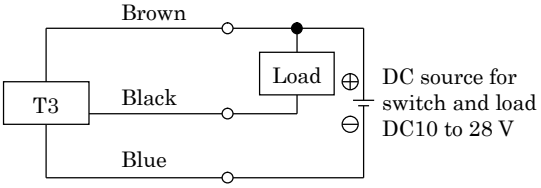


Fig.3 Fundamental circuit Example of T3 (1)
(In case the same source of power is used.)

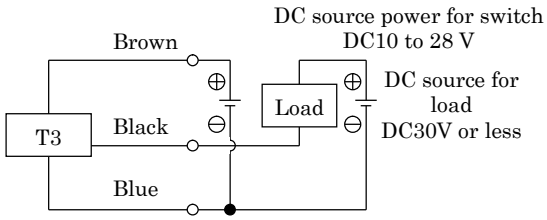


Fig.4 Fundamental circuit Example of T3 (2)
(In case individual sources of power are used.)

2) Protection of output circuit

Install some protective circuit as illustrated in Fig. 5 or 6 when inducing type load (Relay or solenoid valve) are to be used because those types apt to generate surge current switch off.

Install some protective circuit as illustrated in Fig. 7 when capacitor type load (Capacitor type) are to be used, because these types apt to generate a dash current when turning the switch ON.

Install some protective circuit as illustrated in Fig. 8 or 9 (in case of model T2) and Fig 10 (in case of model T3).

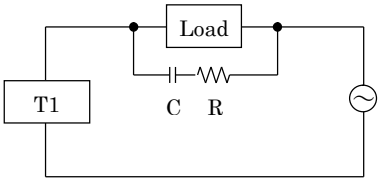


Fig. 5 An example of protective circuit at CR circuit
Capacitor volume : 0.03 to 0.1Mf
Resister : 1 to 3kΩ

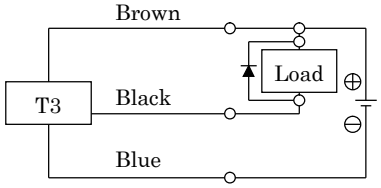
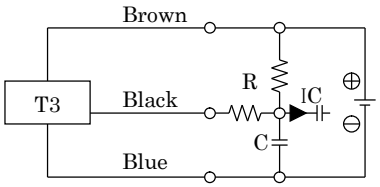


Fig.6 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



Flg.7 An example of using capacitor type load together with current regulating resister R. Comply with the following formula to figure out required R.

$$\frac{V}{0.05} = R(\Omega)$$

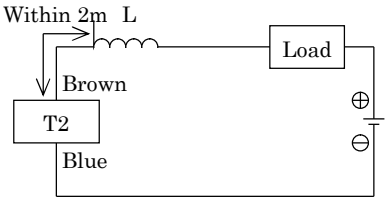


Fig.8 ・Choke coil
L= a couple hundred μH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

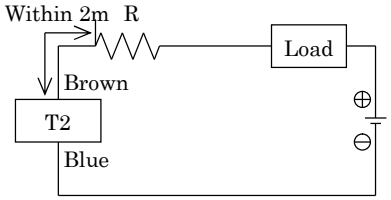


Fig.9 ・Dash current restriction resister.
R= As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

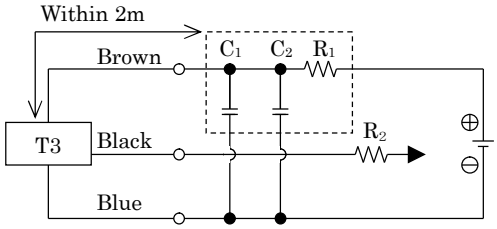


Fig10・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor
(Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30Ω
・Dash current restriction resister.
R_2=As much large resister as the load circuit can afford.
・Install it nearby the switch(Within 2m)

3) Connection to a programmable controller (Sequencer).
Type of connection varies depending upon the model of the programmable controller. Refer to the following Fig. 11 to 15 respectively.

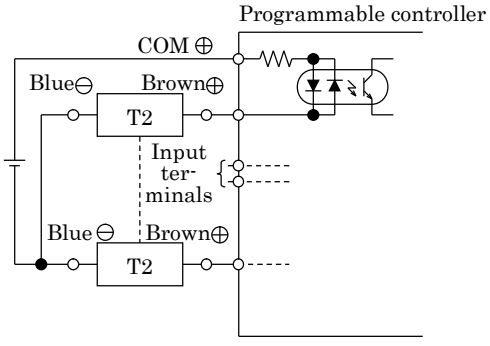


Fig.11 An example of T2 connection to source input type (an external power source)

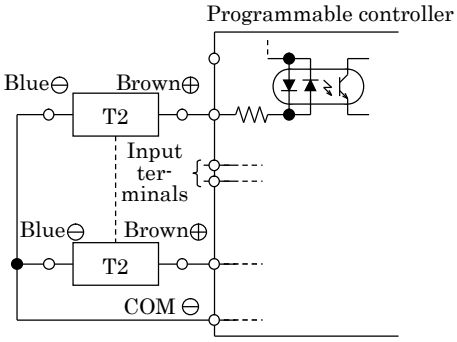


Fig.12 An example of T2 connection to source input type (an internal power source)

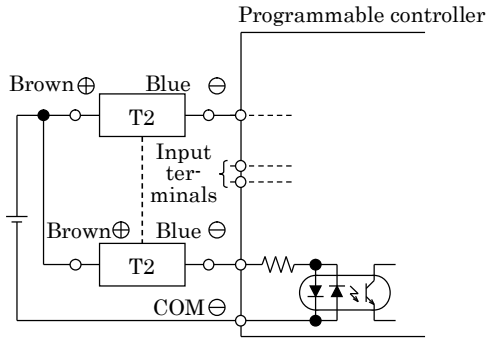


Fig.13 An example of T2 connection to source input type (an external power source)

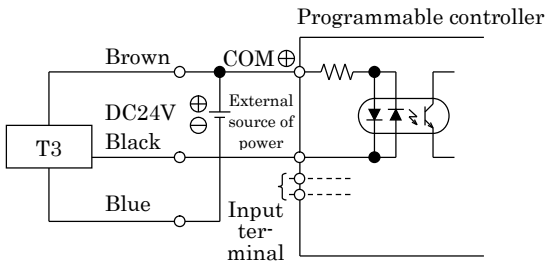


Fig.14 An example of T3 connection to source input type (an internal power source)

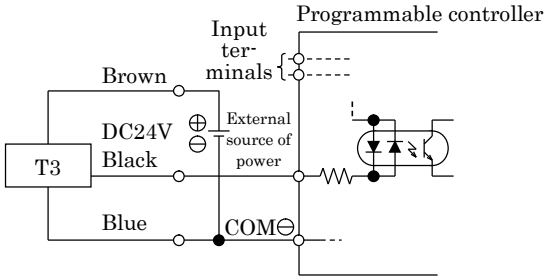


Fig.15 An example of T3 connection to source input type (an internal power source)

4) Series connection

The total voltage will decrease when the T2 switches connections have a leak. Therefore, confirm the input specifications for the programmable controllers, which are the connecting load. However, dimming or total failure of the indicator light may exist.

T3 switches hardly ever leak. When less than 10 μA, then leakage may occur. Usually dimming and failure of the indicator light do not occur.

3.4.3 Reed switch (T0, T5, T8)

1) Lead wire connections

Do not connect the lead wires of the switch to the power supply directly. Always connect the loads in series. For T0 switch, carefully check following items Ⓐ, Ⓑ.

Ⓐ When using the switch for DC power supply, connect the brown and blue lines to the positive and negative sides, respectively. If these lines are connected reversely, the switch is activated, but the indicator light is not lit.

Ⓑ When the switch is connected to an AC relay or a programmable controller input, the indicator light on the switch is not lit if the half-wave rectification is performed in the connected circuit. If this occurs, reverse the polarities of the switch lead wire connection. The indicator light may then be lit.

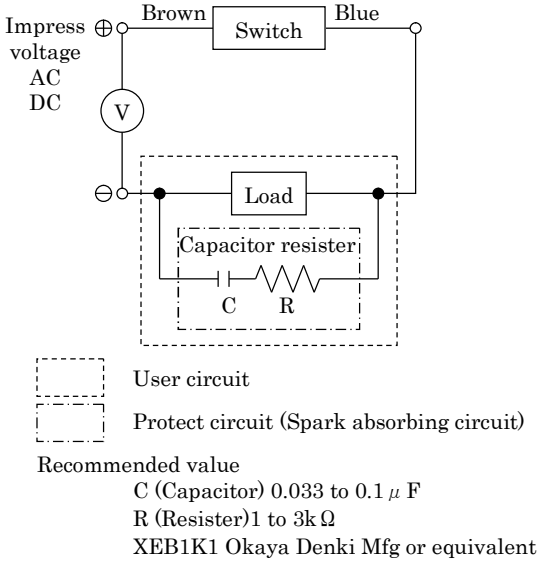
2) Contact protective measures

When an inductive load, such as relay is used or the wire length exceeds that stated in Table 4, always install a contact protective circuit.

Table 4

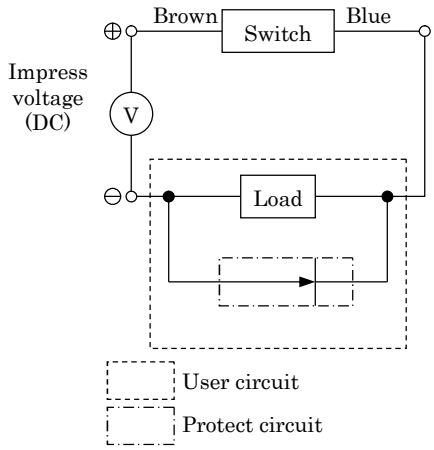
Electric power	Wiring length
DC	50m
AC	10m

(1) Protective circuit when connecting an inductive type load.



Recommended value
C (Capacitor) 0.033 to 0.1 μ F
R (Resister)1 to 3k Ω
XEB1K1 Okaya Denki Mfg or equivalent

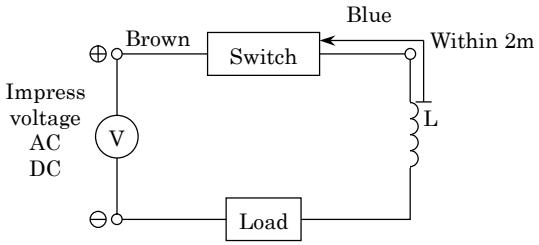
Fig.1 When capacitor resister is used.



Rectifying diode, general use
Hitachi Mfg. product V06C or equivalent

Fig.2 When diode is used.

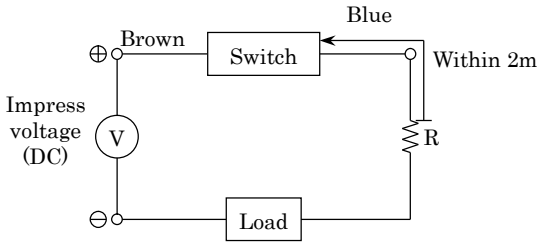
(2) Protective circuit when the wire length exceeds that stated Table 1



・ Choke coil
L=a couple hundred μH to a couple mH
surpassing high frequency characteristic

・ Install it near by a switch (within 2m).

Fig.3



・ Dash current restriction resister
R=As much large resister as the load circuit can afford.

・ Install it near by a switch (within 2m).

Fig.4

3) Contact capacity

Do not use a load exceeding the maximum contact capacity of the switch. Additionally, if the current is lower than the rated current value, the indicator light may not be lit.

4) Relay

Always use the relays listed below.

Omron Corporation ……MY type
Fuji Electric Co., Ltd. ……HH5 type
Panasonic, Ltd. ……HC type

5) Serial connection

Total voltage loss, when connected T0 switches in series, equals to the sum of respective voltage loss of each switch.

The total voltage loss becomes equivalent to one T0 (approx. 2.4V) when connecting the combination of one T0 for actuation confirming and rest of T5 switches. Indicator light is lit only when all switches turn on.

6) Parallel connection

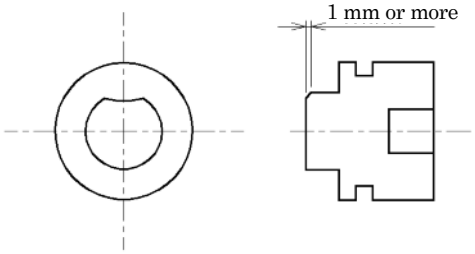
There is no restriction in parallel connection number of switches of these types. Multi number connection of model T0 and T8 sometimes, cause a dimmed indicator light or complete indicator light failure.

4. MAINTENANCE

4.1 Periodical Inspection

1) In order to upkeep the cylinder in optimum condition, carry out periodic inspection once or twice a year.
Before starting an inspection, take appropriate measures separately to prevent a load from falling down under its own weight.

2) Inspection items
(1) Check the bolts and nuts fitting the piston rod end brackets and mounting brackets for slackening.
(2) Check to see that the cylinder operates smoothly.
(3) Check any change of the working piston speed and cycle time.
(4) Check for internal and/or external leakage.
(5) Check the piston rod for flaw (scratch) and deformation.
(6) Check the stroke for abnormality.
(7) Check if the position locking mechanism is securely locked.
(8) Check for scratches, wear and tear on the position locking mechanism (sleeve, stopper piston, stopper packing, coil spring, etc.)
When a permanent deformation of 1 mm or more is observed on the stopper piston, the stopper piston needs to be replaced.
Since this may be caused by a permanent deformation of the sleeve, the sleeve also needs to be checked in this case.



See “5 Trouble shooting”, should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.
Since the position locking mechanism is a safety mechanism, disassemble it and check for scratches, wear and tear on it without fail.

5. TROUBLE SHOOTING

1) Cylinder

Trouble	Causes	Remedies
Does not operate.	No pressure or inadequate pressure.	Provide an adequate pressure source.
	Signal is not transmitted to direction control valve.	Correct the control circuit.
	Improper or misalignment of installation.	Correct the installation state and/or change the mounting style.
	Broken piston packing	Replace the cylinder.
Does not function smoothly.	Speed is below the low speed limit	Limit the load variation.
	Improper or misalignment of installation.	Correct the installation state and/or change the mounting style.
	Exertion of transverse (lateral) load.	Install a guide. Revise the installation state and/or change the mounting style.
	Excessive load.	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of “Meter in” circuit.	Change the meter-out circuit of the speed control valve.
Breakage and / or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load and/or install a mechanism with more secured cushion effect (e.g.external cushion mechanism).
	Exertion of transverse load.	Install a guide. Reverse the installation state and/or change the mounting style.

2) Cylinder position locking mechanism

Trouble	Causes	Remedies
No locking.	No operation up to the stroke end.	Operate the cylinder up to the stroke end.
	Residual pressure is present inside the cylinder room on the locking mechanism side.	Reduce the residual pressure to zero.
No lock is released	The external force is applied to the stopper piston.	After pressurizing the cylinder side on the side without position locking unit, actuate the cylinder.
	No pressure: the pressure is insufficient.	Maintain the pressure source.
Does not operate.	No pressure: the pressure is insufficient.	Maintain the pressure source.
	Signal is not transmitted to direction control valve.	Correct the control circuit.
	Broken stopper packing.	Replace the cylinder.
Does not function smoothly.	Excessive load.	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of “Meter in” circuit.	Change the meter-out circuit of the speed control valve.
	Grease shortage.	Grease is spread.
Breakage and / or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load and/or install a mechanism with more secured cushion effect (e.g.external cushion mechanism).
	Excessive load.	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of “Meter in” circuit.	Change the meter-out circuit of the speed control valve.
	Bounce on the end of stroke.	Eliminate a bounce on the end of stroke.

3) Switch

Troubles	Causes	Remedies
Indicator light is not lit.	Deposited contact point	Replace the switch.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
	Damaged indicator light	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.
Switch does not function right.	Broken circuit	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.
	Improper voltage	Correct voltage to specified.
	Incorrect location of switch	Correct its location.
	Aberrant position of switch	Set it back to original position and tighten the mounting device.
	Incorrect direction of switch mounting	Correct the direction of the switch mounting.
	Relay is unable to respond properly	Turn the speed down. Replace the relay with a recommended one.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
Switch does not return.	Piston is not moving	Make the piston move.
	Deposited contact point	Replace the switch
	Excessive load (relay) than rated capacity	Replace the relay with a recommended one or replace the switch.
	The ambient temperature is out of the specification range	Adjust the ambient temperature within the range of -10 to 60℃
	Existence of a foreign magnetic field	Shield the magnetic field.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.

6. HOW TO ORDER

6.1 Product Number Coding

● Without switch

SCM - LB - 40 B - 100 ——— Q P7

● With switch

SCM - LB - 40 B - 100 - T2H - D - Z Q P7

(a) (b) (c) (d) (e) (f) (g) (h) (i)

Super micro cylinder
Standard type, equipped

(a) Mounting style (Note1)		(b) Bore size (mm)		(c) Cushion	
00	Basic type	20	ϕ 20	B	With air cushion at both ends
LB	Foot mount type, along axis	25	ϕ 25	R	With air cushion at rod side
FA	Rod side flange type	32	ϕ 32	H	With air cushion at head side
FB	Head side flange type	40	ϕ 40	D	With rubber cushion at both ends
		50	ϕ 50		
		63	ϕ 63		
		80	ϕ 80		
		100	ϕ 100		

(d) Stroke (mm)			(e) Switch model (Note2)					(f) Switch Q'ty. (Note3, 4)	
Standard stroke	Maximum stroke		Axial lead wire	Radial lead wire	Switch type	Indicator light	Lead wire	R	1 on rod side
	Bore size	Stroke						H	1 on head side
25	20							D	2
50	25	1000	T0H※	T0V※	Reed	1 color indicator		T	3
75	32		T5H※	T5V※		Without indicator light		4	4
100	40		T8H※	T8V※		1 color indicator	2 wire		
125	50		T1H※	T1V※	Solid state	1 color indicator		※ Lead wire length	
150	63	1500	T2H※	T2V※				Blank	1m(standard)
200	80		T3H※	T3V※			3 wire	3	3m(option)
250	100		T2YH※	T2YV※		2 color indicator	2 wire	5	5m(option)
300			T3YH※	T3YV※			3 wire		
			T2JH※	T2JV※		Off delay type	2 wire		

※ mark indicates the length of lead wire.

(g) Switch installation type		(h) Option		(i) Clean room specifications			
Blank	Rail method	Q	Switch rail attached at delivery		Structure	Material restriction	
Z	Band method			P7	Exhaust treatment	—	
				P71	Vacuum treatment	—	
				P5	Exhaust treatment	Copper, silicon, halogen-based (fluorine, chlorine, oxalic) unacceptable.	(Custom order)
				P51	Vacuum treatment	Copper, silicon, halogen-based (fluorine, chlorine, oxalic) unacceptable.	(Custom order)

Note1: Mounting bracket is attached to the product at shipment.
Note2: T3PH, T3PV type is also available. (Custom order)
Note3: Specify the number of switches if four or more switches are to be used.
Note4: For details of switch model coding, see the page 34.

6 HOW TO ORDER

● Without switch

SCM-Q - LB - 40 B - 100 - R ——————— Q P7

● With switch

SCM-Q - LB - 40 B - 100 - R - T2H - D - Z Q P7

(a) (b) (c) (d) (e) (f) (g) (h) (i) (j)

Super micro cylinder
Position locking type, equipped

(a) Mounting style (Note1)		(b) Bore size (mm)		(c) Cushion	
00	Basic type	20	φ 20	B	With air cushion at both ends
LB	Foot mount type, along axis	25	φ 25	R	With air cushion at rod side
FA	Rod side flange type	32	φ 32	H	With air cushion at head side
FB	Head side flange type	40	φ 40		
		50	φ 50		
		63	φ 63		
		80	φ 80		
		100	φ 100		

(d) Stroke (mm)			(e) Position locking mechanism	
Standard stroke	Maximum stroke		R	Rod side position locking
	Bore size	Stroke	H	Head side position locking
25	20	1000		
50	25			
75	32			
100	40	1500		
125	50			
150	63			
200	80			
250	100			
300				

(f) Switch model (Note2)				
Axial lead wire	Radial lead wire	Switch type	Indicator light	Lead wire
T0H※	T0V※	Reed	1 color indicator	2 wire
T5H※	T5V※		Without indicator light	
T8H※	T8V※		1 color indicator	
T1H※	T1V※	Solid state	1 color indicator	
T2H※	T2V※			
T3H※	T3V※			3 wire
T2YH※	T2YV※		2 color indicator	2 wire
T3YH※	T3YV※			3 wire
T2JH※	T2JV※		Off delay type	2 wire

※ mark indicates the length of lead wire.

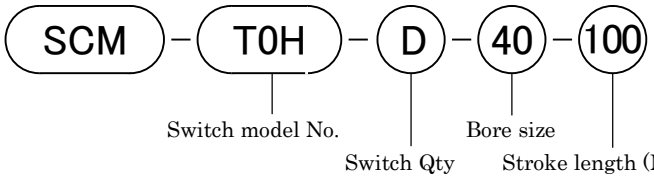
(g) Switch Q'ty. (Note3, 4)		※ Lead wire length		(h) Switch installation type		(i) Option	
R	1 on rod side	Blank	1m(standard)	Blank	Rail method	Q	Switch rail attached at delivery
H	1 on head side	3	3m(option)	Z	Band method		
D	2	5	5m(option)				
T	3						
4	4						

(j) Clean room specifications			
	Structure	Material restriction	
P7	Exhaust treatment	—	
P71	Vacuum treatment	—	
P5	Exhaust treatment	Copper, silicon, halogen-based (fluorine, chlorine, oxalic) unacceptable.	(Custom order)
P51	Vacuum treatment	Copper, silicon, halogen-based (fluorine, chlorine, oxalic) unacceptable.	(Custom order)

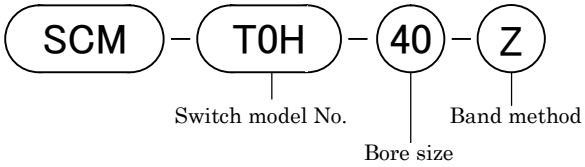
Note1: Mounting bracket is attached to the product at shipment.
Note2: T3PH, T3PV type is also available. (Custom order)
Note3: Specify the number of switches if four or more switches are to be used.
Note4: For details of switch model coding, see the page 35.

6.2 Component parts Model coding

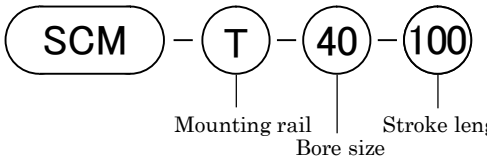
(1) Switch body + Set of mounting rail



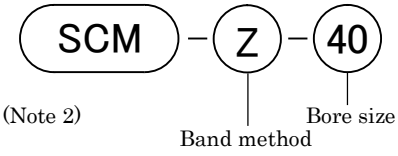
(2) Switch body + mounting rail + Band



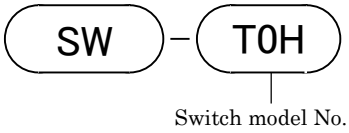
(3) Mounting rail only



(4) Mounting rail + Band



(5) Switch body only



(b) Bore size (mm)		(d) Stroke (mm)	(f) Switch model					(g) Switch Q'ty (Note 3)	
20	φ 20	Standard stroke	Axial lead wire	Radial lead wire	Switch type	Indicator light	Lead wire	R	One on rod side
25	φ 25	25						H	One on head side
32	φ 32	50						D	Two
40	φ 40	75	T0H※	T0V※	Reed	1 color indicator	2 wire	T	Three
50	φ 50	100	T5H※	T5V※				4	4
63	φ 63	125	T8H※	T8V※					
80	φ 80	150	T1H※	T1V※	Solid state	1 color indicator		※ Lead wire length	
100	φ 100	200	T2H※	T2V※				Blank	1m(standard)
		250	T3H※	T3V※			3 wire	3	3m(option)
		300	T2YH※	T2YV※		2 color indicator	2 wire	5	5m(option)
		X	T3YH※	T3YV※			3 wire		
			T2JH※	T2JV※		Off delay type	2 wire		

Note1: When making an order for a single switch whose stroke is more than 300 mm, enter "X". A short rail (switch's adjustable traveling distance 100 mm) accompanies each switch with a stroke of more than 300mm.
Note2: When making an order only for rails for switches represented by "X", the number of rails must be equivalent to the number of switches to be used.
Note3: Specify the number of switches if four or more switches are to be used.

7. SPECIFICATION

7.1 Product Specifications

Model / Item		SCM－P7※/P5※							
Bore size mm		φ20	φ25	φ32	φ40	φ50	φ63	φ80	φ100
Actuation		Double acting							
Working fluid		Compressed Air							
Max. working pressure MPa		1.0							
Min. working pressure MPa		0.15				0.1			
Proof pressure MPa		1.6							
Ambient temperature ℃		-10 to 60 (No freezing)							
Port size	Rubber cushioned	Rc1/8				Rc1/4		Rc3/8	Rc1/2
	Air cushioned	M5		Rc1/8		Rc1/4		Rc3/8	Rc1/2
Port size (Relief port)		M5							
Stroke tolerance mm	Rubber cushioned	$^{+1.4}_{0}$ (to 1000)			$^{+1.4}_{0}$ (to 1500)	$^{+2.3}_{0}$ (to 1000), $^{+2.7}_{0}$ (to 1500)			
	Air cushioned	$^{+1.4}_{0}$ (to 1000)			$^{+1.4}_{0}$ (to 1500)	$^{+1.4}_{0}$ (to 1000), $^{+1.8}_{0}$ (to 1500)			
Working piston speed mm/s		30 to 1000 (use it within the range of allowable energy absorption.)							
Cushion		Rubber cushion/air cushion can be selected.							
Effective air cushion length mm		8.1	8.1	8.6	8.6	13.4	13.4	15.4	15.4
Lubrication		Not permissible							
Allowable energy absorption J	Rubber cushioned	0.1	0.2	0.5	0.9	1.6	1.6	3.3	5.8
	Air cushioned	0.8	1.2	2.5	3.7	8.0	14.4	25.4	45.6

Model / Item	SCM－Q－P7※/P5※							
Bore size mm	φ20	φ25	φ32	φ40	φ50	φ63	φ80	φ100
Actuation	Double acting / Position locking type							
Working fluid	Compressed Air							
Max. working pressure MPa	1.0							
Min. working pressure MPa	0.2				0.15			
Proof pressure MPa	1.6							
Ambient temperature ℃	-10 to 60 (No freezing)							
Port size	M5		Rc1/8		Rc1/4		Rc3/8	Rc1/2
Port size (Relief port)	M5							
Stroke tolerance mm	$^{+1.4}_{0}$ (to 1000)			$^{+1.4}_{0}$ (to 1500)	$^{+1.4}_{0}$ (to 1000), $^{+1.8}_{0}$ (to 1500)			
Working piston speed mm/s	30 to 200 (use it within the range of allowable energy absorption.)							
Cushion	Air cushion							
Effective air cushion length mm	8.1	8.1	8.6	8.6	13.4	13.4	15.4	15.4
Lubrication	Not permissible							
Position locking mechanism	Head side or rod side							
Holding force N	Max. thrust × 0.7							
Allowable energy absorption J	0.8	1.2	2.5	3.7	8.0	14.4	25.4	45.6

7.2 Switch Specifications

Descriptions	Reed 2 wire						
	T0H/V		T5H/V		T8H/V		
Applications	Programmable controller, relay		Programmable controller, relay, IC circuit (without indicator light), series connection		Programmable controller, relay		
Power supply voltage	—						
Load voltage	DC12/24V	AC110V	DC5/12/24 V	AC110V	DC12/24V	AC110V	AC220V
Load current	5 to 50mA (Note 2)	7 to 20mA (Note 2)	50mA or less	20mA or less	5 to 50mA (Note 2)	7 to 20mA (Note 2)	7 to 10mA (Note 2)
Current consumption	—						
Internal voltage drop	3V or less		0V		3V or less		
Indicator light	LED (ON lighting)		Without indicator light		LED (ON lighting)		
Leakage current	0mA						
Lead wire length (Note1)	Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.2mm²)				Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.3mm²)		
Shock resistance	294m/s²						
Insulation resistance	20MΩ over at DC500V megger				100MΩ over at DC500V megger		
Withstand voltage	No failure impressed at AC1000V for one minute				No failure impressed at AC1500V for one minute		
Ambient temperature	-10 to 60℃						
Degree of protection	IEC Standards IP67, JIS C0920 (water tight type), oil resistance						

Descriptions	Solid state 2 wire			
	T1H/V	T2H/V	T2JH/V	T2YH/V
Applications	Programmable controller, relay, compact solenoid valve	Programmable controller		
Power supply voltage	—			
Load voltage	AC85 to 265V	DC10 to 30V		
Load current	5 to 100mA (Note 2)	5 to 20mA (Note 2)		
Current consumption	—			
Internal voltage drop	7V or less	4V or less		
Indicator light	LED (ON lighting)			Red/green LED (ON lighting)
Leakage current	1 mA or less at AC100V 2 mA or less at AC200V	1 mA or less		
Lead wire length (Note1)	Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.3mm²)	Standard 1m (Oil resistant cabtire cord 2 conductor 0.2mm²)	Standard 1m (Oil resistant cabtire cord 2 conductor 0.3mm²)	Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.3mm²)
Shock resistance	980m/s²			
Insulation resistance	100MΩ over at DC500V megger	20MΩover at DC500V meggeer	100MΩ over at DC500V megger	
Withstand voltage	No failure impressed at AC1500V for one minute	No failure impressed at AC1000V for one minute		
Ambient temperature	-10 to 60℃			
Degree of protection	IEC Standards IP67, JIS C0920 (water tight type), oil resistance			

Descriptions	Solid state 3 wire	
	T3H/V	T3YH/V
Applications	Programmable controller, relay	
Power supply voltage	DC10 to 28V	
Load voltage	DC30V or less	
Load current	100 mA or less	50mA or less
Current consumption	10mA or less at DC24V	
Internal voltage drop	0.5V or less	
Indicator light	LED (ON lighting)	Red/green LED (ON lighting)
Leakage current	10μA or less	
Lead wire length (Note1)	Standard 1m (Oil resistant vinyl cabtire cord 3 conductor 0.2mm²)	
Shock resistance	980m/s²	
Insulation resistance	20MΩover at DC500V meggeer	100MΩ over at DC500V megger
Withstand voltage	No failure impressed at AC1000V for one minute	
Ambient temperature	-10 to 60℃	
Degree of protection	IEC Standards IP67, JIS C0920 (water tight type), oil resistance	

Descriptions	Solid state 2 wire	
	T2YD	T2YDT
Applications	Programmable controller	
Load voltage	DC24V±10%	
Load current	5 to 20mA (Note 2)	
Internal voltage drop	6V or less	
Indicator light	Red/green LED (ON lighting)	
Leakage current	1.0mA or less	
Output delay time (Note3) (ON delay, OFF delay)	30 to 60ms	
Lead wire length (Note1)	Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.5mm²)	Option 1m (Flame resistant vinyl cabtire cord 2 conductor 0.5mm²)
Shock resistance	980m/s²	
Insulation resistance	100MΩ over at DC500V megger	
Withstand voltage	No failure impressed at AC1000V for one minute	
Ambient temperature	−10 to 60℃	
Degree of protection	IEC Standards IP67, JIS C0920 (water tight type), oil resistance	

Note1: 3m or 5m long lead wire is optionally available.
Note2: Max. load current above is value at 25 ℃. The current will be lower if the temperature around switch is higher than 25 ℃. (50% at 60℃).
Note3: Time to the generation of switch output through detection of magnet by magnetic sensor.