CKD

SM－491370－A

INSTRUCTION MANUAL

SELEX CYLINDER

SCS2
(Lubrication type without switch)
SCS2-N
(Non-lubrication type without switch)
SCS2-LN
(Non-lubrication type with switch)

- 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 3rd 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 application, 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.

[SM-491370-A]

INDEX

SCS2,
SCS2-N, SCS2-LN
Selex Cylinder
Manual No. SM-491370-A

1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Cylinder with Switch matches the type No. you orderd.
2) Check the appearance for any damage.
3) 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

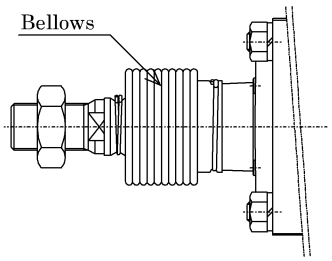
1) The ambient temperature range for this cylinder is -5 to 60℃.

2) Use cylinder with bellows over its rod within the area with much dust.

Working temperature of bellows Unit : ℃

Material of bellows	Max. ambient temperature	Momentary Max. temp.
Nylon tarpaulin	60	100
Neoplain sheet	100	200
Silicon rubber glass cloth	250	400

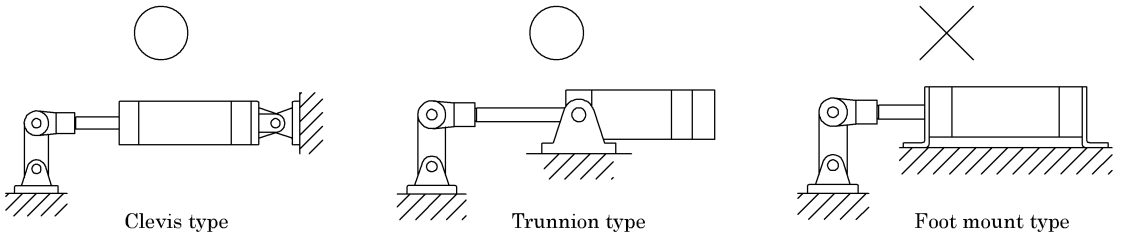
Note: Momentary max. temperature is the temperature as sparks or welding spatter hitting bellows momentarily.



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

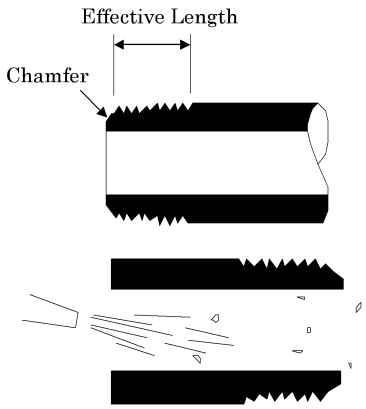
4) When cylinder is fixed and rod end is guided:
In case the piston rod of cylinder and the load are misaligned, the bushes and packings of the cylinder are extremely worn out. Hence, connect them with CKD floating connector (spherical bearing).

5) When the load acting direction changes with the cylinder operation:
Use an oscillating cylinder (clevis type or trunnion type) capable of making revolution to a certain angle. Furthermore, install the rod and connecting metal (knuckle) so that it moves in the same direction as the cylinder main body does.



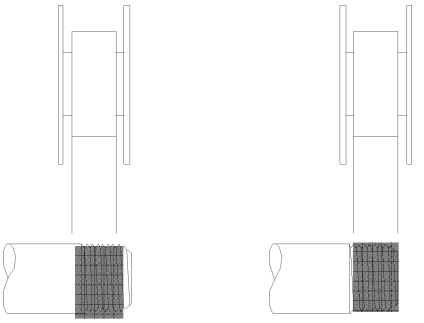
2.2 Piping

1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc.
2) See to it that the pipe connecting cylinder and solenoid valve has effective 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 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.



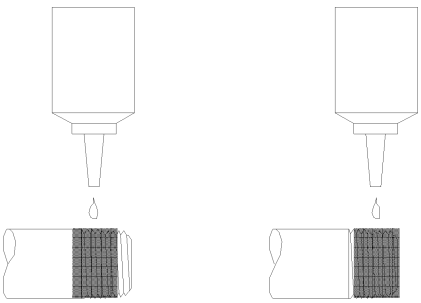
6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

●Seal Tape



(Correct) (Incorrect)

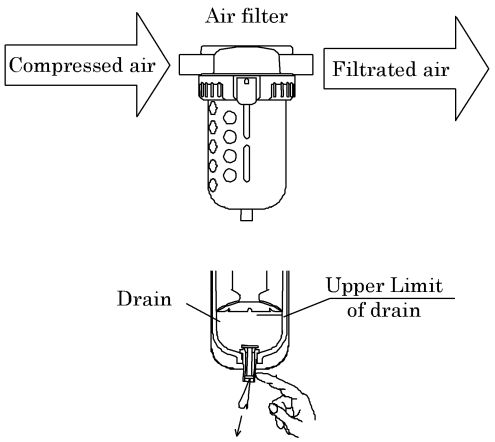
●Sealant (Paste or liquid)



(Correct) (Incorrect)

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).



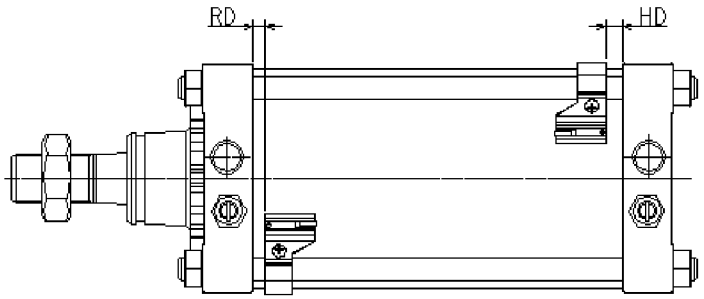
2) Be sure to drain out the accumulation in the filter periodically.

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.

4) Lubrications
It is necessary to lubricate SCS2. To use Turbine oil Grade 1, ISO VG32.
It is not necessary to lubricate SCS2-N or SCS2-LN. However, when lubricating, use turbine oil Class 1 ISO VG32.

2.4 Location of mounting Switches on a Cylinder

1) Location of mounting switches on a cylinder.

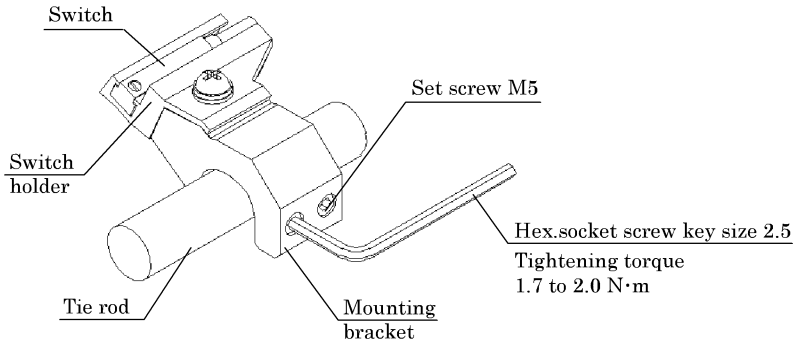


(1) At the stroke end
Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the highest sensitivity.

(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 highest sensitivity and where the switch is supposed to be installed.

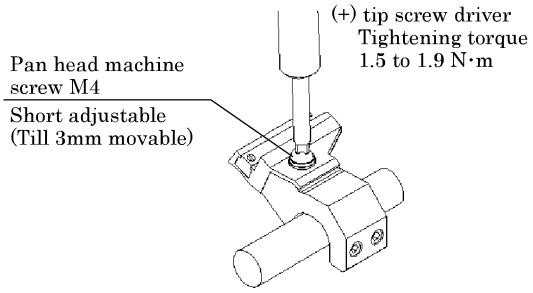
(3) Location around the circumference of cylinder
There is no restriction. However,90° interval around circumference will be the most appropriate location when considered convenient posture of mounting tie rods.

(4) Relocation of switch
Loosen the set screws (2 ea.) for approx. 1/2 to 3/4 turn. It enables the switch to slide along the tie rod without letting screws drop off.
After setting the new location of switch, hold switch holder against the tube surface and tighten set screws to the tie rod. Adequate torque of tightening it is 1.7 to 2.0 N・m. It is considered to be sufficient, as a rule of thumb, when Allen wrench starts bending slightly.

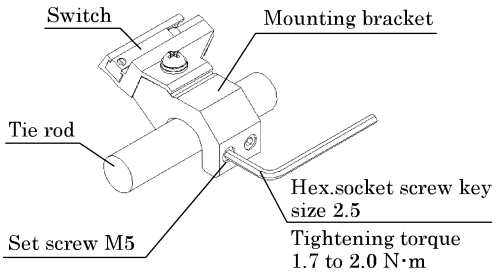


2) Installation of switch
Follow the procedures (1) to (3) as described below.

(1) While holding a switch underneath of switch holder, tighten M4×10 pan headed machine screws to mount it on the bracket.



(2) Screw-in the set screws to mount the bracket on the tie rod. While letting the mounting bracket hook the tie rod, slightly screw further until it touches the rod. Thus, it eliminates the whole set of switch from falling off the rod, yet enables to slide the set along the rod. Make use this merit when engaged in adjusting location of the switch set.

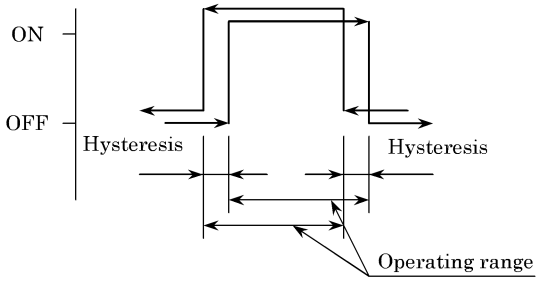


(3) To fix the mounting bracket on the tie rod, tighten screws while pressing bracket slightly against tube. Adequate torque of tightening screw is 1.7 to 2.0 N·m. It is considered to be sufficient, as a rule of thumb, when Allen wrench starts bending slightly.

3) 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.

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

5) Table of the dimension of best operating position (HD・RD), operating range and hysteresis.



(Unit mm)

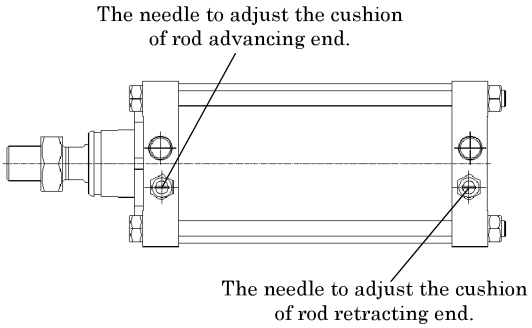
Tube bore (mm)	Solid state switch type (T2H/T2V, T3H/T3V)				Reed switch type switch (T0H/T0V, T5H/T5V)			
	Best operating position		Operating range (Reference value)	Hysteresis	Best operating position		Operating range (Reference value)	Hysteresis
	RD	HD			RD	HD		
φ125	8.5	4	4 to 8	1.5 or less	8.5	4	4 to 10	3 or less
φ140	8.5	7	4 to 8		8.5	7	4 to 10	
φ160	10.5	8	4 to 8		10.5	8	4 to 10	
φ180	13	9.5	4 to 8		13	9.5	4 to 10	
φ200	17.5	13	4 to 8		17.5	13	4 to 11	
φ250	18.5	19	4 to 8		18.5	19	4 to 14	

3. OPERATION

3.1 Operating the Cylinder

1) The cylinder feed pressure is 0.05 to 1.0 MPa hence regulate the pressure within this pressure range.

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 1, consider of providing a shock absorber.

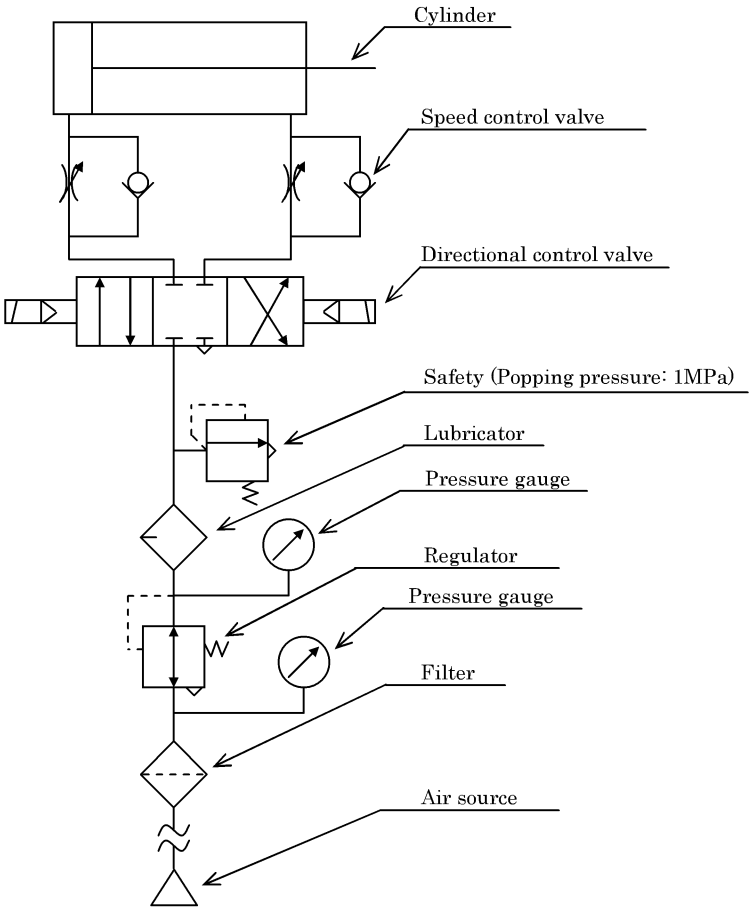
Table 1. Table of cushion characteristics

Tube bore (mm)	Effective cushion length (mm)	Tolerable energy absorbable (J)	
		With cushion	Without cushion
ϕ 125	21.6	63.5	0.371
ϕ 140	21.6	91.5	0.386
ϕ 160	21.6	116	0.386
ϕ 180	21.6	152	0.958
ϕ 200	26.6	233	1.08
ϕ 250	26.6	362	2.32

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

3.2 About the system applicable to class 2 pressure vessel

If the system is applicable to class-2 pressure vessel, install a safety valve while referring to the fundamental pneumatic circuit diagram shown below.
(The following diagram shows an example of the safety valve installation position.)
When the pressure of air source is 1.0 or less MPa, installation of a safety valve is unnecessary.
The class-2 pressure vessel structure standard is laws and ordinances when it is used in the Japanese country.



<Fundamental pneumatic circuit diagram>

3.3 How to use the Switches

3.3.1 Common items

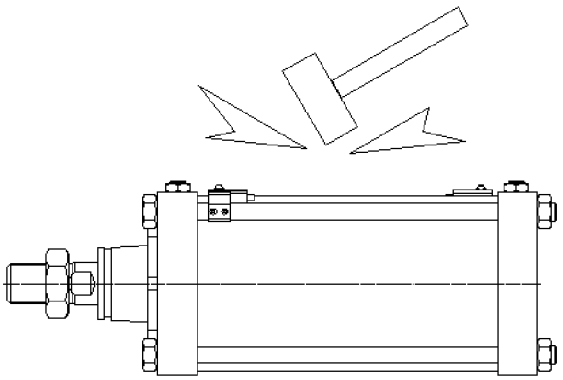
1) Magnetic environment
Do not operate this product in a place where a strong magnetic field or large current (large magnet or spot welder, etc.) exists. If a cylinder with the switch is installed in parallel to this product or the magnetic substance moves near the cylinder, the mutual interference may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

2) Lead wire wiring
Carefully perform the wiring so that a bending stress or tensile strength does not apply to the lead wire repeatedly.
Additionally, connect wires for robot having the bending resistance to movable parts.

3) Operating temperature
Do not operate the product at a high temperature (60°C).
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 piston speed is too fast.
When the operation time of the relay is 20 ms, operate the product at a piston speed of 500 mm/s or less.

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



3.3.2 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 lamp is not lit.

Ⓑ When the switch is connected to an AC relay or a programmable controller input, the lamp 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 lamp may then be lit.

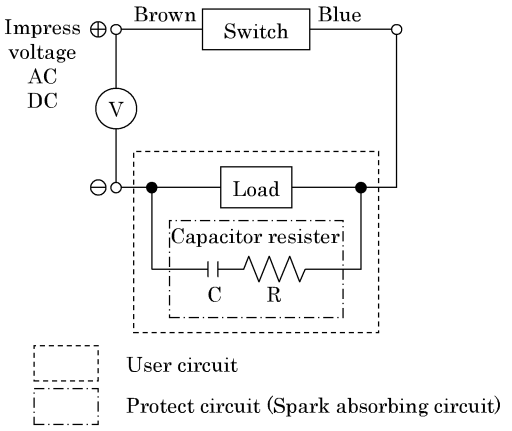
2) Contact capacity
Do not use a load exceeding the maximum contact capacity of the switch. Additionally, if the current is lower than the rated current value, the lamp may not be lit.

3) Contact protective measures
When an inductive load, such as relay is used or the wire length exceeds that stated in Table 1, always install a contact protective circuit.

Table1

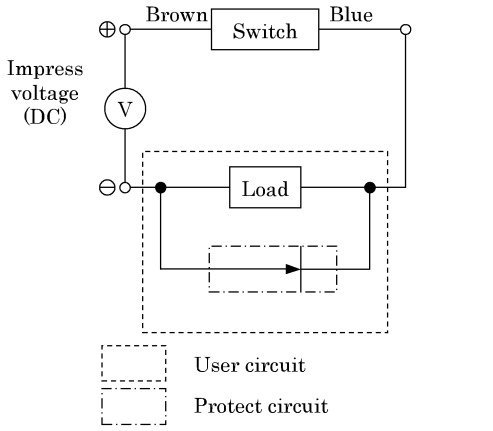
Electric power	Length of wire
DC	50m
AC	10m

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



Recommended value
C (Capacitor) 0.033 to 0.1 μF
R (Resister)1 to 3kΩ
XEB1K1 Okaya Denki Mfg or equivalent

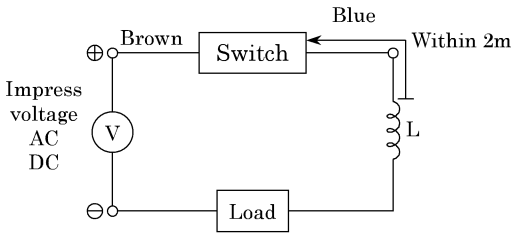
Fig.1 When capacitor resister
(In case the same source of power is used.)



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

Fig.2 When diode is used.

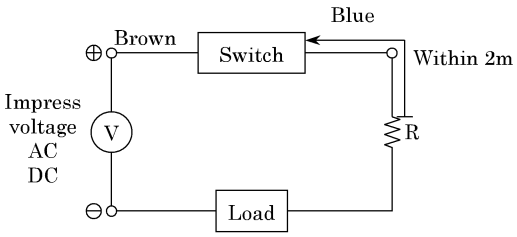
(2) Protective circuit when the wire length exceeds that stated Table 1.



· 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

4) Relay
Always use the relays listed below.
Omron Corporation ····· MY type
Fuji Electric Co., Ltd. ····· HH5 type
Matsushita Electric Works, 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. Lamp 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, sometimes, cause a dimmed lamp or complete lamp failure.

3.3.3 Operational Cautions, Solid state switch (T1, T2, T3, T2YD)

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.

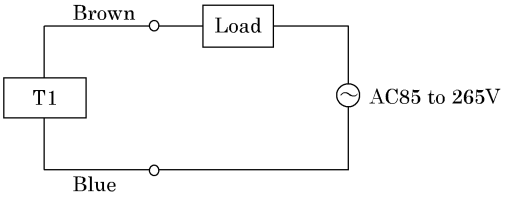


Fig. 1 : Basic Circuit Example of T1

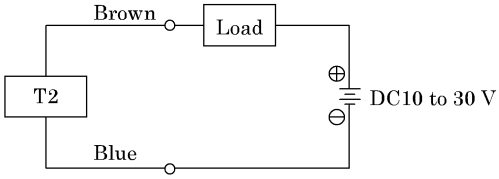


Fig.2 Fundamental circuit Example

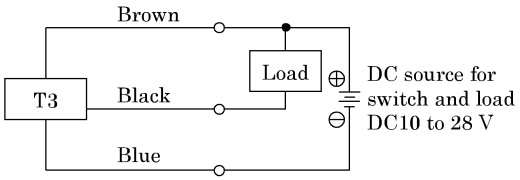


Fig.3 Fundamental circuit Example (1)
(In case the same source of power is used.)

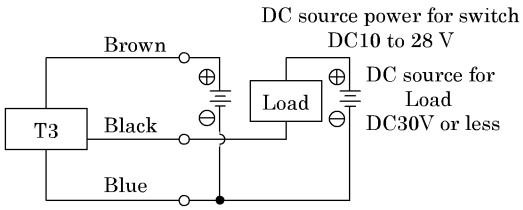


Fig.4 Fundamental circuit Example (2)
(In case individual sources of power are used.)

2) Output circuit protection

Install some protective circuit as illustrated in Fig. 5 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. 6 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. 7 or 8 (in case of model T2) and Fig 9 (in case of model T3).

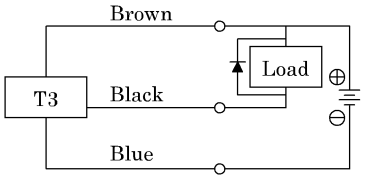
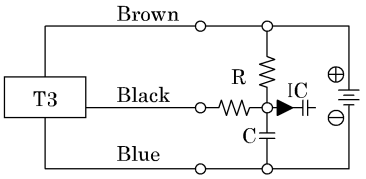


Fig.5 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



Flg.6 An example of using capacitor type load together with current regulating resister R.
Comply with the following formula to figure out required R.

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

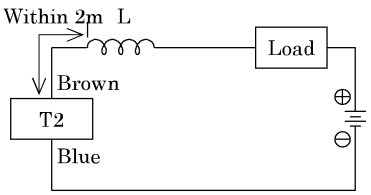


Fig.7 ・Choke coil
L = a couple hundred μH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

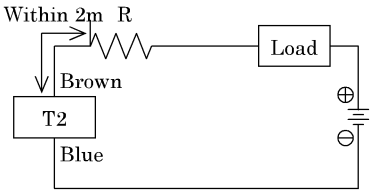


Fig.8 ・Dash current restriction resister.
R = As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

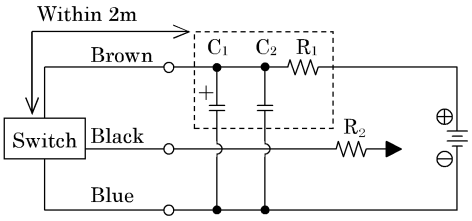


Fig9 ・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor (withstanding 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30 Ω

・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 programmable controller (Sequencer).
Type of connection varies depending upon the model of the programmable controller. Refer to the following Fig. 10 to 14 respectively.

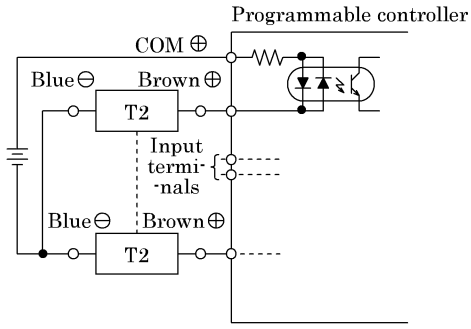


Fig.10An example of T2 connection to source input type (an external power source)

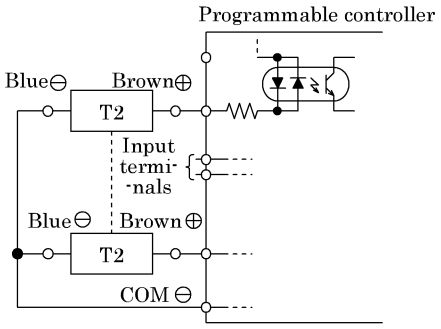


Fig.11 An example of T2 connection to source input type (an internal power source)

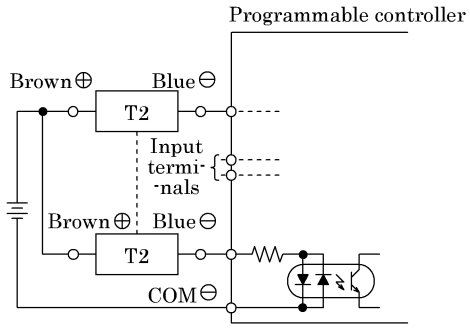


Fig.12 An example of T2 connection to source input type

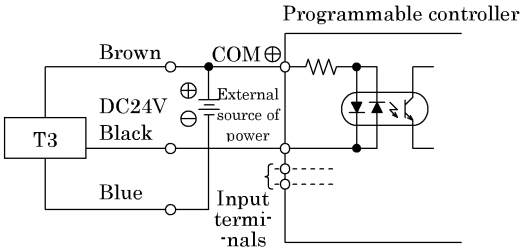


Fig.13 An example of T3 connection to source input type (an internal power source)

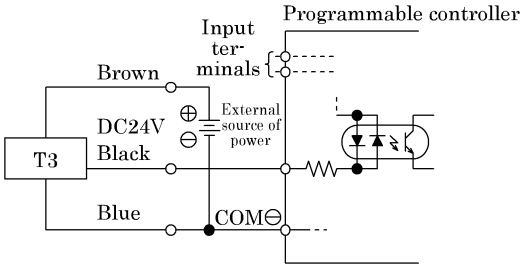


Fig.14 An example of T3 connection to source input type (an internal power source)

4) Parallel 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 lamp may exist.

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

5) Strong magnetic field proof switch (T2YD)
External magnetic field proof performance (at welding current of AC14000A)
T This strong magnetic field proof switch can be used for all T-type strong magnetic field solid state type switch (T2YD) built-in cylinder models or operated in a status that the welding cable is in contact with the cylinder or switch. However, this switch cannot be used for two or more welding cables or within the cable loop.

NOTE: If this switch is used at a welding current of more than AC14000A, the welding cable must be made 35 mm or more apart from the cylinder tube surface.
(Testing conditions: Outside diameter of the cable is ϕ 36.)

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.

2) Inspection items
   (1) Check the bolts and nuts fitting the piston rod end fittings and supporting fittings for slackening.
   (2) Check to see that the cylinder operates smoothly.
   (3) Check any change of the 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.
   See "Trouble shooting", 5 should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

3) Inspect the following items.
   (a) Scratch marks on the boar surface of the tube
   (b) Scratch marks on the surface of piston rod, peel-off of plating and rusting
   (c) Scratch marks and wear inside of the bushing
   (d) Scratch marks, wear and crack of the surface of piston
   (e) Loosened connection of piston and rod
   (f) Crack of both end covers
   (g) Scratch marks and wear of packing in sliding part. (Dust wiper, rod packing, cushion packing and piston packing)
   Check all of above items. If any abnormality is found, repair it or replace the parts, when defective.

4.2 Disassembling

Should any air leakage occur, take the following corrective actions.

1) Prepare the following tools for disassemling.

Disassembling tools

Name	Qty	Place of use	Applicable tube ID (mm)
Wrench (Nominal 19)	1	Needle nut	ϕ 125 to 180
Wrench (Nominal 22)	2	Hex. nut (Tie rod)	ϕ 125, ϕ 140
Wrench (Nominal 24)	2	Hex. nut (Tie rod)	ϕ 160
	1	Needle nut	ϕ 200, ϕ 250
Wrench (Nominal 27)	2	Hex. nut (Tie rod)	ϕ 180
Wrench (Nominal 30)	2	Hex. nut (Tie rod)	ϕ 200
Standard driver	2	Cushion needle, Piston packing Cushion packing disassembling	For all tube ID
Marret hammer	1	For disassembling Cover and Tube	For all tube ID
Ice pick	1	Packing other than piston packing	For all tube ID
Press jig	1	Cushion packing assembly	For all tube ID

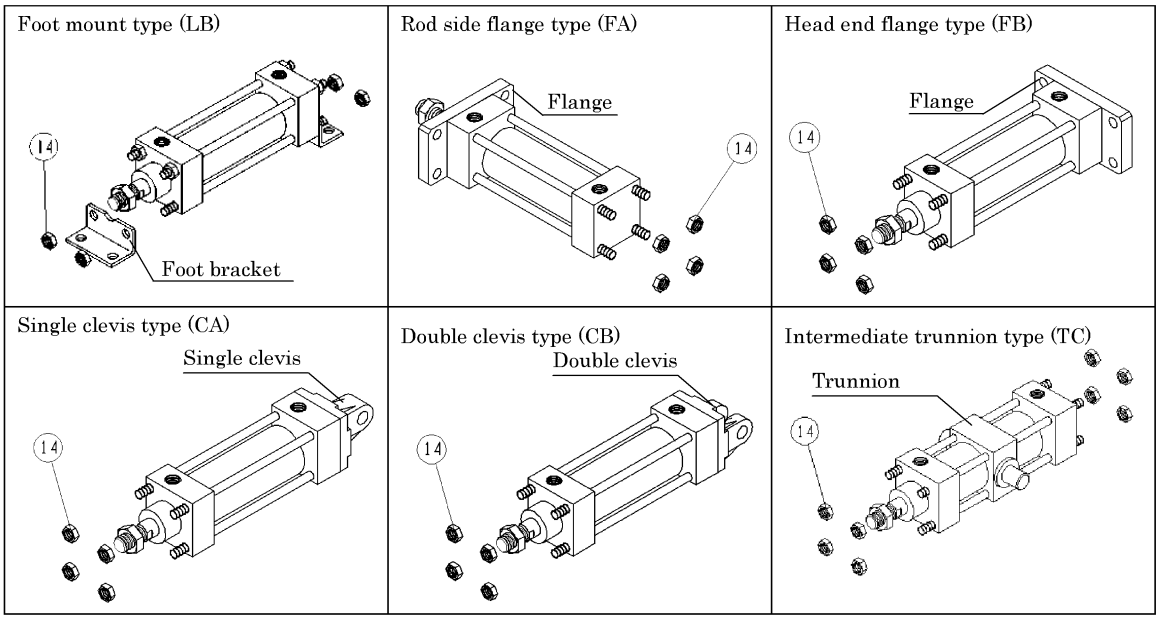
2) Disassembly

(1) Shut off the fluid and remove the residual pressure.

(2) Disconnect pipes from cylinder.

(3) As the hexagon nut ⑭ is removed, each mounting bracket and tie rod ⑮ can be removed. As the tie rod ⑰ is removed, the rod cover ⑤, head cover ⑬, and piston assembly (②, ⑧ to ⑫, ⑯ to ⑱) can then be removed.

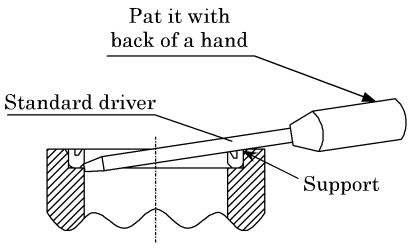
Bracket disassembling or assembling procedures



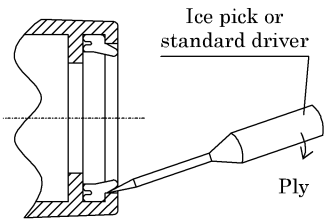
(4) Cushion needle ⑲ comes out when needle nut ⑳ is removed.

(5) Disassembling cushion packing ⑰

- Clamp the cover in a vise.
- Place the standard driver underneath of lip of packing, then ply the shuttle driver making the corner of the spot facing a fulcrum. Patting the driver handle with the back of hand will let the packing come out of its spot facing on the cover.



(6) Disassembling dust wiper ㉗ and disassembling rod packing ③
Pry the packing off with a tool having the sharp tip, such as standard screwdriver or ice pick.
(Do not reuse the detached packing.)



4.3 Assembly

1) Clean and wash every part.
Carefully assemble them in the reversed procedure of disassembling, particularly, to prevent any damage to lips of packings and seals as it causes malfunction and/or air leakage when it is placed back to service.

2) Assembling the cushion packing.
Use special jig to press the packing into the spot facing on the cover to avoid its tilting and also its damage. Press it down to the point that lip tip of packing settle approx. 0.1 to 0.2mm below the surface of the cover.

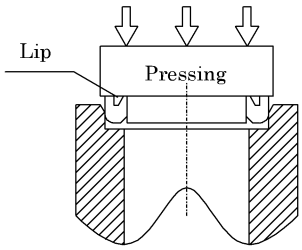
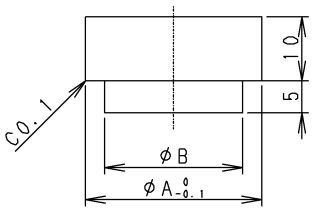


Table 2 and drawing are for a couple of examples of press jigs.

Table 2. Dimensions of press jigs

Tube bore (mm)	A	B
ϕ 125, ϕ 140	55	45
ϕ 160, ϕ 180	67	55
ϕ 200	72	60
ϕ 250	87	75



3) Apply a film of high grade grease (such as No. 1 or No. 2, Lithium base saponaceous grease) over the bore surface of Cylinder tube ⑦, circumference surface of Piston ⑯ and packings ③, ⑥, ⑨, ⑩, ⑰, and . ㉑ ㉗

4) Cylinder gasket ⑥ is assembled in the head cover, the rod cover, and the triangular ditch part of the chamfering part of the cylinder tube. Please insert the cylinder gasket ⑥ in the cover ditch interior. Please assemble the tube and the cover with the cylinder gasket ⑥ installed.

5) When tightening the nuts on tie rods, gradually tighten each nut on diagonal location to each other respectively, instead of tightening one nut all the way up. The table right displays the recommended range of torque for tightening.

Table 3. Tightening torque

Tube bore (mm)	Torque (N·m)
ϕ 125, ϕ 140	34
ϕ 160	50
ϕ 180	66
ϕ 200	90
ϕ 250	155

4.4 Inspection

1) Function Test

After a couple of trial running, the piston should reciprocate smoothly when pressure is charged alternately to each end of cylinder respectively.

- Inspection terms
- Pressure supplied 0.05Mpa and working pressure
- Cushion needle Fully open

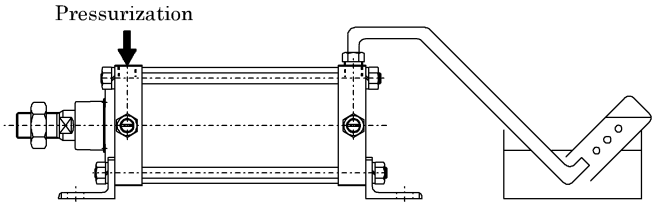
2) Leakage test

When compressed air is charged from head end and rod end alternately while holding piston in one position, the leakage should be held less than the followings :

Internal leakage $3+0.15\times D$ cm^3/min (Standard condition)
External leakage $3+0.15\times d$ cm^3/min (Standard condition)
} or less.

Whereas D = Cylinder tube bore (mm)
d = OD of piston rod (mm)

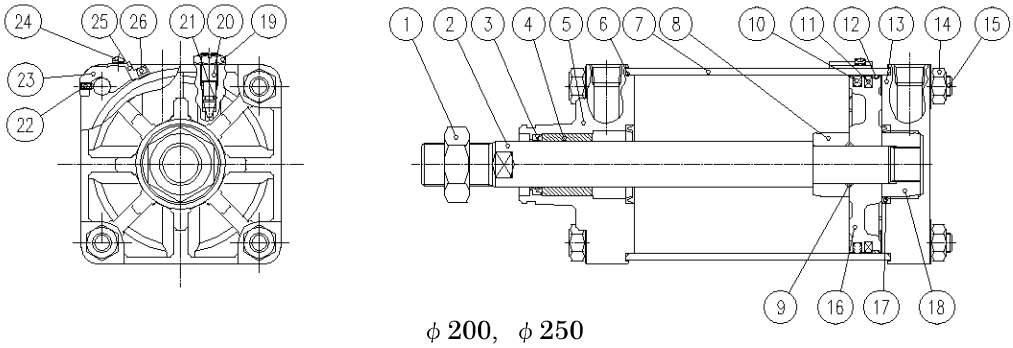
・Procedures of inspection
・Substitution with water



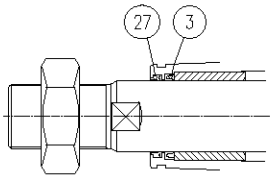
・Soapy water bubble balloon method
It only displays whether there is air leakage or not, while it is unable to decide the volume of leakage.

4.5 Internal structure and Expendable parts list

ϕ 125 to ϕ 180



ϕ 200, ϕ 250



Part No.	Part Name	Material	Qty	Note
1	Rod nut	Steel	1	Zinc chromate
2	Piston rod	Steel	1	Industrial chromium plating
3	Rod packing	Nitril rubber	1	
4	Bushing	Oil impregnated bearing alloy	1	
5	Rod cover	Aluminum alloy	1	
6	Cylinder gasket	Nitril rubber	2	
7	Cylinder tube	Aluminum alloy	1	Hard alumite disposal
8	Cushion ring A	Steel	1	Zinc chromate
9	Piston gasket	Nitril rubber	1	
10	Piston packing	Nitril rubber	1	
11	Piston magnet	Rubber magnet	1	at SCS2-LN
12	Wear ring	Polyacetal resin	1	
13	Head cover	Aluminum alloy	1	Chromate
14	Hexagonal nut	Steel	8	Zinc chromate
15	Tie rod	Steel	4	Zinc chromate
16	Piston	Aluminum alloy	1	
17	Cushion packing	Nitril rubber, Steel	2	
18	Cushion ring B	Steel	1	Zinc chromate
19	Needle nut	Steel	2	Zinc chromate
20	Cushion needle	ϕ 125 to ϕ 180 : Brass ϕ 200, ϕ 250 : Steel	2	ϕ 200, ϕ 250 : Zinc chromate
21	Needle gasket	Nitril rubber	2	
22	Hexagon socket set screw	Steel	4	Black oxide finish
23	Switch mounting base	Aluminum alloy	2	
24	Cross recessed round head screw with spring washer and small round washer	Steel	2	Zinc chromate
25	Switch holder	Aluminum alloy	2	
26	Cylinder switch		2	
27	Dust wiper	Nitril rubber	1	

Note: ⑰ and ⑲ parts are lost when there is no cushion, and ⑳ parts change to the cushion needle flag.

Expendable parts list (Specify the kit No. on your purchase order.)

1) SCS2

Tube bore (mm)	Kit no.	Parts no.
ϕ 125	SCS2-125K	③ ⑥ ⑩ ⑫ ⑰ ㉑
ϕ 140	SCS2-140K	
ϕ 160	SCS2-160K	
ϕ 180	SCS2-180K	
ϕ 200	SCS2-200K	③ ⑥ ⑩ ⑫ ⑰ ㉑ ㉗
ϕ 250	SCS2-250K	

2) SCS2-N、SCS2-LN

Tube bore (mm)	Kit no.	Parts no.
ϕ 125	SCS2-N-125K	③ ⑥ ⑩ ⑫ ⑰ ㉑
ϕ 140	SCS2-N-140K	
ϕ 160	SCS2-N-160K	
ϕ 180	SCS2-N-180K	
ϕ 200	SCS2-N-200K	③ ⑥ ⑩ ⑫ ⑰ ㉑ ㉗
ϕ 250	SCS2-N-250K	

Note: Packings are stocked as a kit. This kit basically contains parts necessary for replacement. It is recommended not only to replace the defective parts, but also to replace the complete parts with ones included in the kit. Specify the kit No. when ordering.

5. TROUBLE SHOOTING

1) Cylinder

Trouble	Causes	Countermeasure
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 mounting status. Connect the floating connector. 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 mounting status. Connect the floating connector. Change the mounting style.
	Exertion of transverse (lateral) load.	Install a guide. Revise the installation state and/or change the supporting system.
	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 supporting system.

2) Switch

Troubles	Causes	Remedies
Lamp 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 lamp	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. Tightening torque is 1.5 to 1.9 N·m
	Incorrect direction of switch mounting	Correct the direction of the switch mounting.
	Relay is unable to respond properly	Replace the relay with a recommended one.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
	Excessive speed of piston if it is to sense an intermediate point of stroke	Reduce the speed of piston.
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.
	Improper ambient temperature	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.

Note 1. Refer "2. INSTALLATION" as for replacing a switch and correcting its location.

6. HOW TO ORDER

6.1 Product Number Coding

SCS2-LN – LB – 125 B – 50 – T0H – R – Y

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

(a) Model name		(b) Mounting style		(c) Tube bore (mm)		(d) Cushion	
SCS2	Lubrication type without switch	00	Basic type	125	ϕ 125	B	With cushion at both ends
		LB	Foot mount type, along axis	140	ϕ 140	R	With cushion at rod side
SCS2-N	Non lubrication without switch	FA	Rod side flange type	160	ϕ 160	H	With cushion at head side
		FB	Head end flange type	180	ϕ 180	N	Without cushion
SCS2-LN	Non lubrication with switch	CA	Single clevis type	200	ϕ 200		
		CB	Double clevis type	200	ϕ 250		
		TC	Intermediate trunnion type				
		TA	Rod side trunnion type				
		TB	Head end trunnion type				

(e) Stroke			(f) Switch model code				
Standard stroke	Maximum stroke		Axial lead wire	Radial lead wire	Contact	Display	Lead wire
	Tube bore	Stroke					
50	125	800					
75	140	800	T0H※	T0V※	Reed	1 color indicator type	2-wire
100	160	800	T5H※	T5V※		Without light	
150	180	900	T8H※	T8V※		1 color indicator type	
200	200	1000	T2H※	T2V※	Proximity	1 color indicator type	2-wire
250	250	1200	T3H※	T3V※			3-wire
300			T2WH※	T2WV※		2 color indicator type	2-wire
			T3WH※	T3WV※			3-wire
			T2YH※	T2YV※			2-wire
			T3YH※	T3YV※			3-wire
			T2YD※			Strong magnetic field proof switch	2-wire
			T2YDT※				
			T2JH※	T2JV※		Off-delay type	
			T1H※	T1V※		1 color indicator type	

※ mark indicates the length of lead wire.

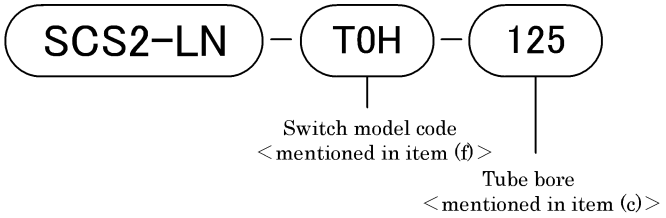
(g) Qty. of switch	
R	Rod side, 1 ea
H	Head side, 1 ea
D	2 ea
T	3 ea
4	4 ea

※ Lead wire length	
Blank	1m (Standard)
3	3m (Option)
5	5m (Option)

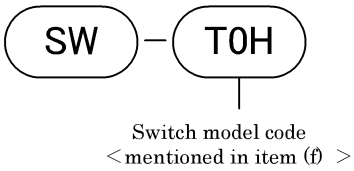
(h) Options & Accessories	
J	Bellow: Nylon tarpaulin
K	Bellow: Neoprene sheet
L	Bellow: Silicone rubber glass cloth
M	Alteration in piston rod material
R	Cushion needle position R
S	Cushion needle position S
T	Cushion needle position T
C2	Cushion with a check valve
I	Single knuckle
Y	Double knuckle
B1	Single bracket
B2	Double bracket

6.2 Switch component parts Model coding

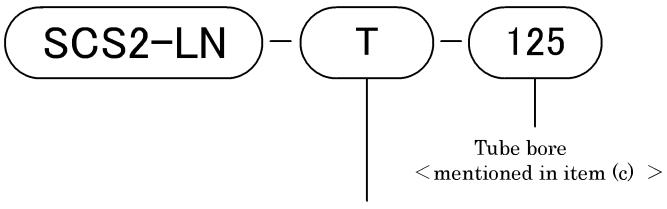
- Switch body + Mounting bracket



- Switch alone



- A set of mounting bracket



Mounting bracket	
T	T type switch
TS	T2YD type switch

7. SPECIFICATION

7.1 Cylinder Specification

Descriptions		SCS2, SCS2-N, SCS2-LN					
Bore size	mm	φ 125	φ 140	φ 160	φ 180	φ 200	φ 250
Actuation		Double-acting type					
Working fluid		Compressed Air					
Max. working pressure	MPa	1.0					
Min. working pressure	MPa	0.05					
Proof pressure	MPa	1.6					
Ambient temperature	℃	-5 to 60 (Not to be frozen)					
Port size		Rc1/2	Rc3/4				Rc1
Stroke tolerance	mm	$^{+1.0}_{0}$ (300 or less), $^{+1.4}_{0}$ (Over than 300 and 1000 or less), $^{+1.8}_{0}$ (Over than 1000 and 1200 or less)					
Working piston speed	mm/s	20 to 1000 (Set the speed within the range of energy absorption.)					
Cushion		Air cushion					
Lubrication		SCS2 : Required (Use Grade 1 ISO VG 32 Turbine oil, if lubrication is preferred) SCS2-N, LN: Not required (Use Grade 1 ISO VG 32 Turbine oil, if lubrication is preferred)					
Allowable energy absorption	J	63.5	91.5	116	152	233	362

7.2 Switch Specification

Type & Model / Item	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 voltage	—						
Load Voltage	DC12/24V	AC110V	DC12/24V	AC110V	DC12/24V	AC110V	AC220V
Load Current	5 to 50mA	7 to 20mA	50mA or less	20mA or less	5 to 50mA	7 to 20mA	7 to 10mA
Current consumption	—						
Internal voltage drop	3V or less		0V		3V or less		
Light	LED (ON lighting)		—		LED (ON lighting)		
Leakage current	0						
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)		
Max. 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 range	−10 to 60℃						
Protection structure	IEC Standards IP67, JIS C0920 (water tight type), oil resistance						

Type & Model / Item	Solid state 2 wire				
	T1H/V	T2H/V	T2JH/V	T2YH/V	T2WH/V
Applications	programmable controller, relay, ompact solenoid valve	Programmable controller			
Power voltage	—				
Load Voltage	AC85 to 265V	DC10 to 30V			DC24V±10%
Load Current	5 to100mA	5 to 20mA (Note2)			
Current consumption	—				
Internal voltage drop	7V or less	4V or less			
Light	LED (ON lighting)			Red/green LED (ON lighting)	
Leakage current	1mA at AC100V or less 2mA at AC200V or less	1 mA or less			
Lead wire length (Note1)	Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.3mm²)	Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.2mm²)	Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.3mm²)		Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.2mm²)
Max. shock resistance	980m/s²				
Insulation resistance	100MΩ over at DC500V megger	20MΩ over at DC500V megger	100MΩ over at DC500V megger		20MΩ over at DC500V megger
Withstand voltage	No failure impressed at AC1500V for one minute	No failure impressed at AC1000V for one minute			
Ambient temperature range	-10 to 60℃				
Protection structure	IEC Standards IP67, JIS C0920 (water tight type), oil resistance				

Type & Model / Item	Solid state 3 wire		
	T3H/V	T3YH/V	T3WH/V
Applications	Programmable controller, relay		
Power voltage	DC10 to 28V		
Load Voltage	DC30V or less		
Load Current	100 mA or less	50mA or less	
Current consumption	10mA at DC24V(ON) or less		
Internal voltage drop	0.5V or less		
Light	LED (ON lighting)	Red/green LED (ON lighting)	
Leakage current	10 μA or less		
Lead wire length (Note1)	Standard 1m (Oil resistant vinyl cabtire cord 3 conductor 0.2mm²)	Standard 1m (Oil resistant vinyl cabtire cord 3 conductor 0.3mm²)	Standard 1m (Oil resistant vinyl cabtire cord 3 conductor 0.2mm²)
Max. shock resistance	980m/s²		
Insulation resistance	20MΩ over at DC500V megger	100MΩ over at DC500V megger	20MΩ over at DC500V megger
Withstand voltage	No failure impressed at AC1000V for one minute		
Ambient temperature range	-10 to 60℃		
Protection structure	IEC Standards IP67, JIS C0920 (water tight type), oil resistance		

SPECIFICATION

Type & Model / Item	Solid state type	
	T2YD	T2YDT
Applications	Programmable controller	
Load voltage	DC24V±10%	
Load current	5 to 20mA	
Internal voltage drop	6V or less	
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)	1m (Oil resistant vinyl cabtire cord 2 conductor 0.5mm^2) (standard)	1m (Flame resistant vinyl cabtire cord 2 conductor 0.5mm^2) (option)
Max. shock resistance	980m/s^2	
Insulation resistance	100MΩ over at DC500V megger	
Withstand voltage	No failure impressed at AC1000V for one minute	
Ambient temperature range	−10 to 60℃	
Protection structure	IEC Standards IP67, JIS C0920 (water tight type), oil resistance	

Note1: 3m or 5m long lead wire is optionally available.

Note2: Maximum value, 20mA is at 25℃ of ambient temperature. Load current decreases less than 20mA when the ambient temperature exceeds 25℃. (For example: it may be 5 to 10mA at 60)

Note3: This shows the time from magnetic sensor detects piston magnet until outputs a signal.