CKD

SM－363444－A

INSTRUCTION MANUAL

TIEROD CYLINDER

SCG Series

- 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 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.

INDEX

SCG Series (Tierod cylinder)

Manual No. SM-363444-A

1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Selex Cylinder matches the type No. you ordered.
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.

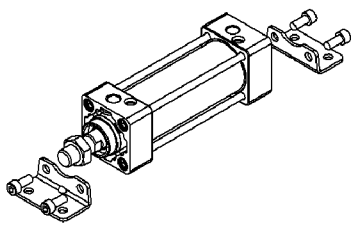
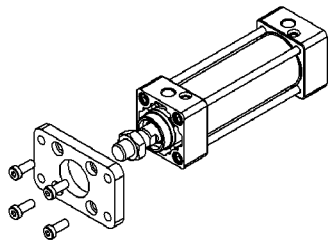
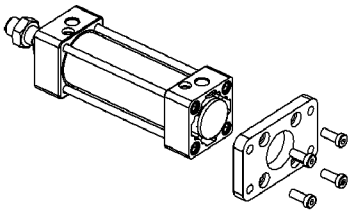
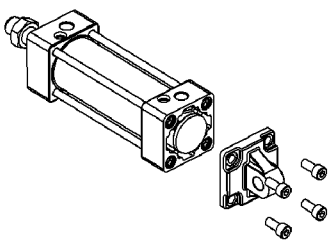
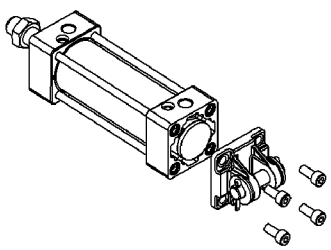
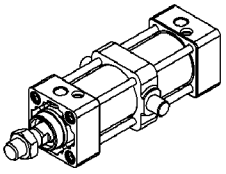
2. INSTALLATION

2.1 Installation

1) The ambient temperature for this cylinder is -10 to 60℃ (No freezing).
2) Use cylinder with bellows over its rod within the area with much dust.
3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.
4) Assembly of mountaing bracket:
   The mountaing bracket are supplied with the cylinder at the time of deliver. Install them as shown in the figures on this page.
   Tighten the screws equally with the torque shown on the chart on the right (An unequal tightening may lead to unstable operation).
   However, the trunnion types (TC, TA and TB) are shipped with the trunnion mounted.

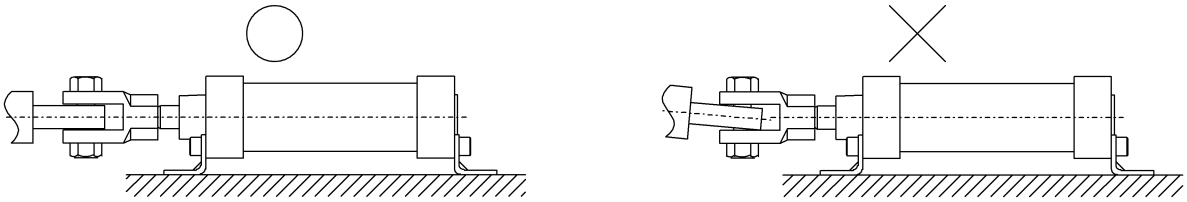
Bore size	Recommendation Tightening torque
φ32・40	4.4 N・m
φ50・63	9.8 N・m
φ80・100	21.1 N・m

● Assembly of mounting brackets (same as disassembling)

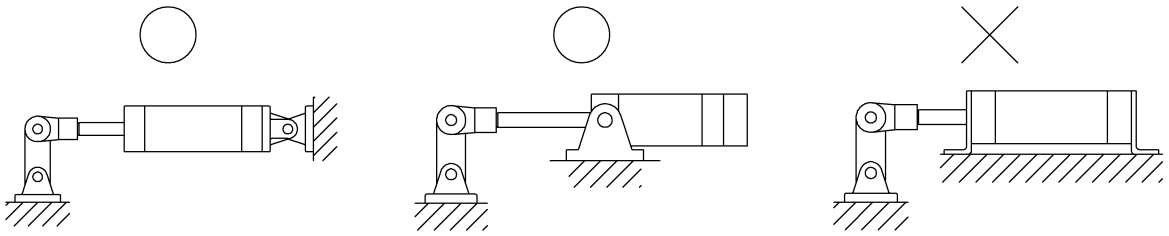
Footmount type (LB) 	Rod side flange type (FA) 	Head side flange type (FB) 
Eye bracket type (CA) 	Clevis bracket type (CB) 	Intermediate trunnion type (TC) 

5) 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).

6) When cylinder is fixed and rod end is connected with pin joint:
In case the load acting direction is not parallel with the rod axial center, the rod and tube may get entangled causing seizure, etc. Hence, make sure that the rod axial center and the load transfer direction are aligned to each other.



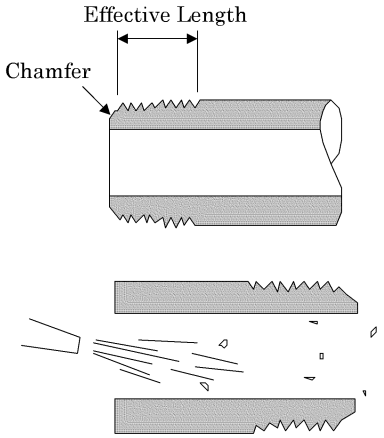
7) When the load acting direction changes with the cylinder operation:
Use an oscillating cylinder (clevis type or trunnion type) capable of making revolution to a certain angle. Furthermore, install the rod and connecting metal (knuckle) so that it moves in the same direction as the cylinder main body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



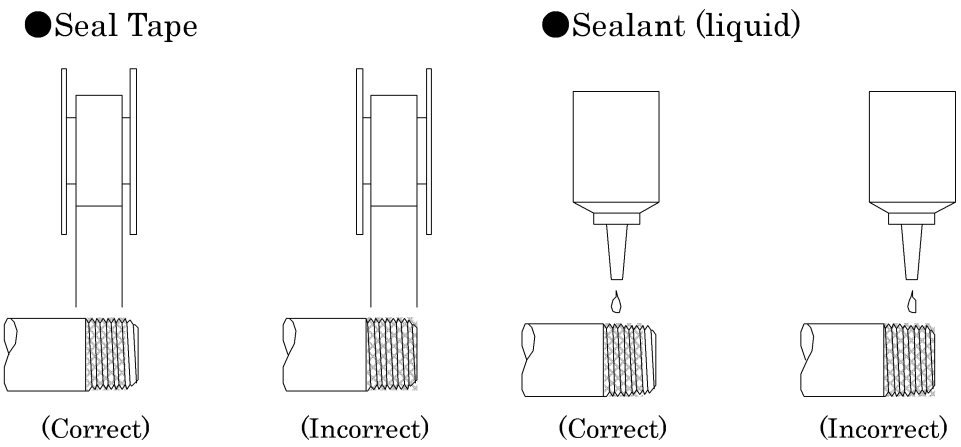
Clevise type　　Trunnion type　　Foot mount type

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 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 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.

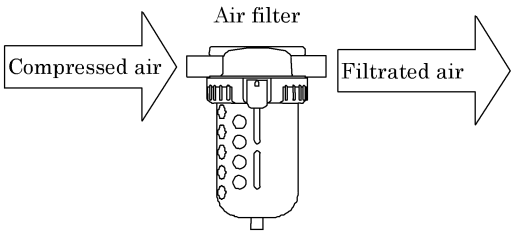


6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

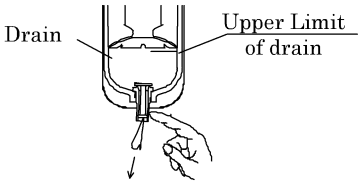


2.3 Fluid

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.



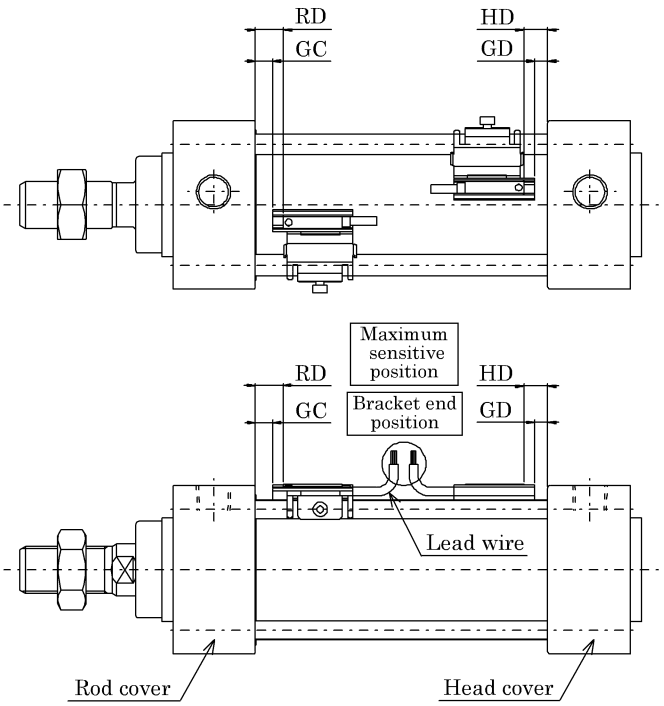
3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

4) This cylinder does not require lubrication. It is recommended, however, to use Turbine oil Grade 1, ISO VG32 as a lubricant, if and when lubrication is needed.

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 maximum sensitive position.



(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.

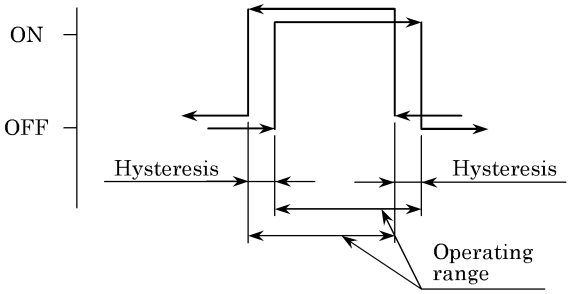
(3) Location around the circumference of cylinder
There is no restriction. However, 90° interval around circumference will be the most appropriate location when considered convenient posture of mounting tie rods.

2) 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.

3) 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.



4) Maximum sensitive position, operating range and hysteresis

1 color indicator (Unit:mm)

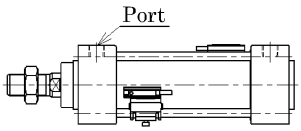
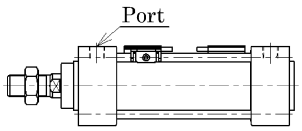
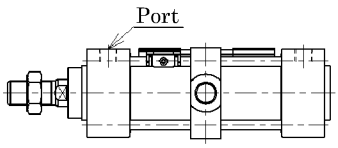
Bore size (mm)	Solid state switch (T2H/T2V, T3H/T3V)						Reed switch (T0H/T0V, T5H/T5V)					
	Maximum sensitive position				Operating range (reference value)	Hysteresis	Maximum sensitive position				Operating range (reference value)	Hysteresis
	GC	GD	RD	HD			GC	GD	RD	HD		
32 dia.	1(4)	1(4)	5(8)	5(8)	2 to 7	1.5 or less	1(4)	1(4)	5(8)	5(8)	6 to 11	3 or less
40 dia.	1(4)	1(4)	5(8)	5(8)			1(4)	1(4)	5(8)	5(8)	7 to 12	
50 dia.	2.5 (6.5)	1(5)	6.5 (10.5)	5(9)			2.5 (6.5)	1(5)	6.5 (10.5)	5(9)	7.5 to 12	
63 dia.					2 to 7.5						8.5 to 13	
80 dia	8.5 (13.5)	2(7)	12.5 (17.5)	6(11)	2.5 to 8		8.5 (13.5)	2(7)	12.5 (17.5)	6(11)	9 to 13.5	
100 dia.	8(13)	2.5 (7.5)	12(17)	6.5 (11.5)			8(13)	2.5 (7.5)	12(17)	6.5 (11.5)	9 to 14	

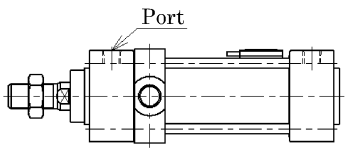
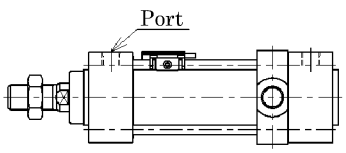
2 color indicator (Unit:mm)

Bore size (mm)	Solid state switch (T2H/T2V, T3H/T3V)			
	Maximum sensitive position		Operating range (reference value)	Hysteresis
	GC／RD	GD／HD		
32 dia.	4(7)	4(7)	6 to 9	1.0 or less
40 dia.	4(7)	4(7)	6.5 to 9	
50 dia.	5.5(9.5)	4(8)	7 to 10	
63 dia.				
80 dia	11.5(16.5)	5(10)	7.5 to 10.5	
100 dia.	11(16)	5.5(10.5)	8 to 11	

5) Location of switches mounted at ex-factory
Switches are mounted at the maximum sensitive position on cylinder. Minimum stroke length of T types with switch refers the table below.

(単位：mm)

Item	Different surface installation				Same surface installation				intermediate trunnion mounted			
Sketch												
Switch q'ty / Bore size (mm)	1	2	3	4	1	2	3	4	1	2	3	4
32 dia.	10	25	30	35	10	40	75	120	63	63	93	93
40 dia.	10	25	30	35	10	40	75	120	68	68	98	98
50 dia.	10	25	30	35	10	25	40	45	68	68	98	98
63 dia.	10	25	30	35	10	25	40	45	74	74	98	98
80 dia.	10	25	30	35	10	25	40	45	86	86	101	101
100 dia.	10	25	30	35	10	25	40	45	92	92	107	107

Item	Rod side trunnion mounted	Head side trunnion mounted
Sketch	 The piston at rod side stroke end cannot be detected.	 The piston at head side stroke end cannot be detected.
Switch q'ty / Bore size (mm)	1	1
32 dia.	37	37
40 dia.	42	42
50 dia.	42	42
63 dia.	48	48
80 dia.	54	54
100 dia.	60	60

Note1：When stroke length is not greater than 15mm, two switches could turn ON at the same time. In this case, adjust the distance between switches as far as possible.

6) Relocation of switch

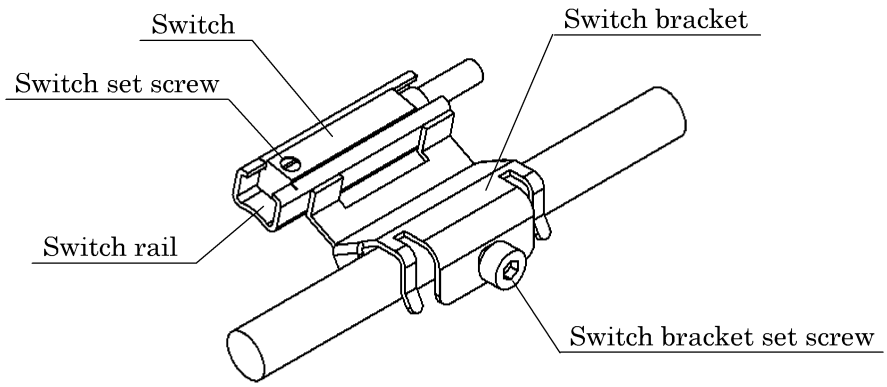
The cylinder with switch is set at the factory default so that the maximum sensitive position is at the stroke end. If it is desirable not to make detection at the stroke end, adjust the position of the switch in the following way.

(1) Fine adjustment of ±3 mm or less (one color cylinder switch only)

Fine adjustment of ±3 mm can be made for the one color cylinder switch (T□H/V) by loosening the switch fixing screw. After the adjustment is complete, tighten the fixing screw as mentioned in "7) Installation of switch".

(2) Relocation of one color cylinder switch of more than ±3 mm and relocation of bi-color cylinder switch

To relocate the one color cylinder switch (T□H/V) by more than ±3 mm or relocate the bi-color cylinder switch, loosen the switch bracket fixing screw, move the switch together with the switch bracket. In case of relocation of several mm, let the switch bracket slide. In case of relocation of more than several mm or in case that a tie rod is to be changed, remove the switch bracket once and fit it at a desired position. After the adjustment, tighten the switch bracket fixing screw as mentioned in "7) Installation of switch".



7) Installation of switch

The switch may be installed either before or after the installation of the switch bracket.

(1) Installation of switch bracket

Fit the switch bracket on the tie rod and adjust it to a desired position. Tighten the hexagon socket head cap screw by pressing the bracket slightly so that the switch rail comes in close contact with the cylinder tube. The tightening torque is 0.6 to 0.9 Nm

(2) Installation of switch

Insert the switch into the bracket rail, adjust it to a desired position and tighten the switch fixing screw.

When securing the switches T2, T3, T0, and T5, use a standard driver with a grip diameter of 5 to 6 mm, end form width 2.4 mm or less and thickness 0.3 mm or less (micro screwdriver, precision screwdriver, etc.) to tighten the screw. Tighten the screw at the tightening torque 0.1 to 0.2 Nm.

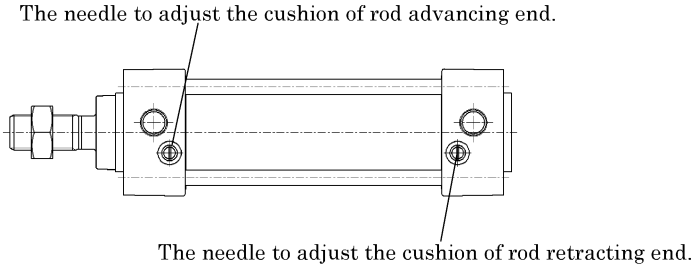
For tightening T*C, T2J, T2Y, T3Y, T2YF, T3YF, T2YM, and T3YM, tighten them at the tightening torque 0.5 to 0.7 Nm.

3. OPERATION

3.1 Operating the Cylinder

1) The working pressure for this type of cylinder is 0.05 to 1.0 MPa. Operate the system within this 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 the allowable Energy absorption of "7.1 Product Specifications", consider of providing a shock absorber.

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

3.2 How to use the Switches

3.2.1 Common items

1) Magnetic environment
Do not use a switch other than the strong magnetic field proof switch in a place where strong magnetic field or large current (large magnet or spot welding machine, etc.) exists around the switch mounting position. 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 (Over than 60℃).
Always avoid operation of the product in a hot place due to temperature characteristics of magnetic and electronics parts.

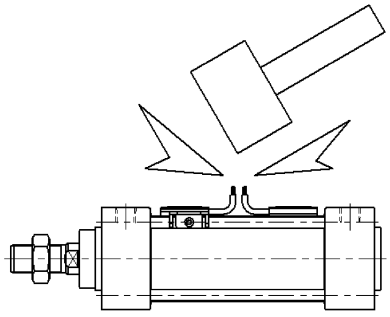
4) Intermediate position detection
When setting the cylinder switch at mid-stroke and driving a load when the piston changes, if the speed is too fast, the cylinder switch will function but operation time will be too short and the load may not respond correctly.

The maximum detectable working piston speed is :

$$V(\text{mm/s}) = \frac{\text{Cylinder switch operation range (mm)}}{\text{Load operation time (s)}}$$

Refer to the minimum value of the table on page 7 4) about cylinder switch operating range.

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



3.2.2 Reed switch (T0, T5)

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 (1), (2).

(1) 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.

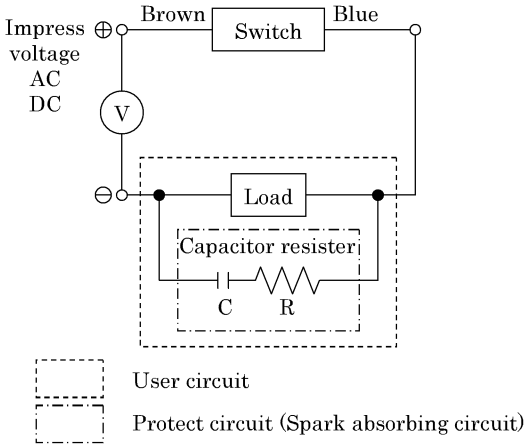
(2) When the switch is connected to an AC relay or a programmable controller input, the indicator light on the switch is not lit if the half-wave rectification is performed in the connected circuit. If this occurs, reverse the polarities of the switch lead wire connection. The indicator light may then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

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

Table1

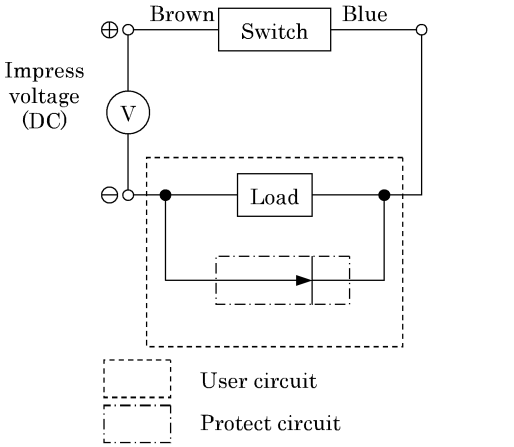
Electric power	Length of wire
DC	100m
AC	10m

(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

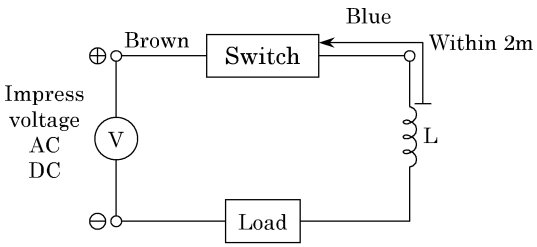
Fig.1 When capacitor resister
(In case the same source of power is used.)



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

Fig.2 When diode is used.

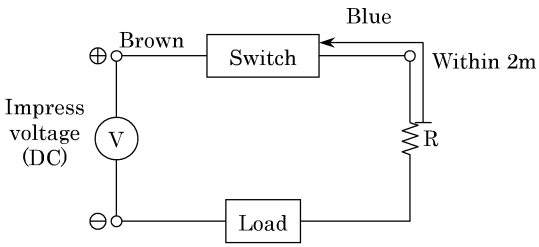
(2) Protective circuit when the wire length exceeds that stated Table 1.



・ 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

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, sometimes, cause a dimmed indicator light or complete indicator light failure.

3.2.2 Operational Cautions, Solid state switch (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

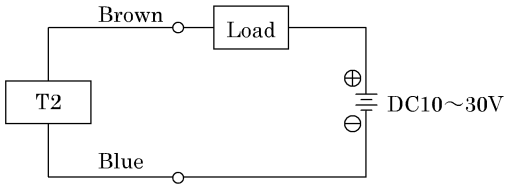


Fig.1 Fundamental circuit Example

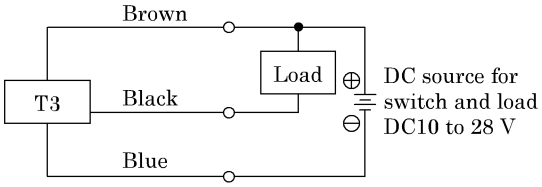


Fig.2 Fundamental circuit Example (1)
(In case the same source of power is used.)

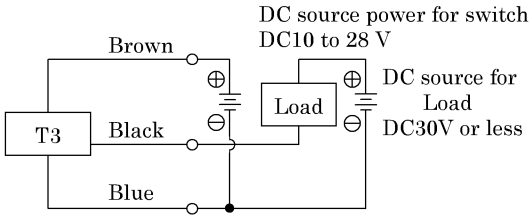


Fig.3 Fundamental circuit Example (2)
(In case individual sources of power are used.)

2) Protection of output circuit

Install some protective circuit as illustrated in Fig. 4 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. 5 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. 6 or 7 (in case of model T2) and Fig 8 (in case of model T3).

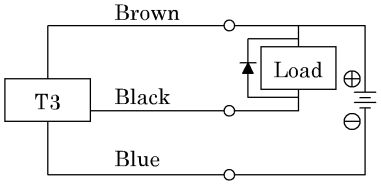
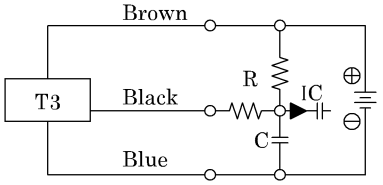


Fig.4 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



Flg.5 An example of using capacitor type load together with current regulating resister R.
Comply with the following formula to figure out required R.

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

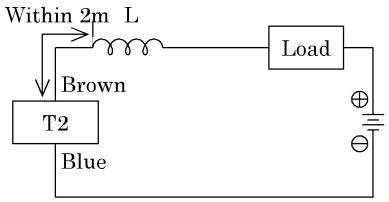


Fig.6 ・Choke coil
L = a couple hundred μH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

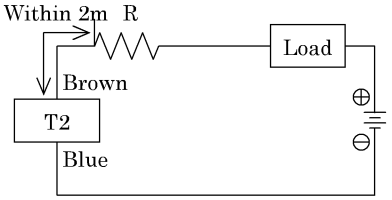


Fig.7 ・Dash current restriction resister.
R = As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

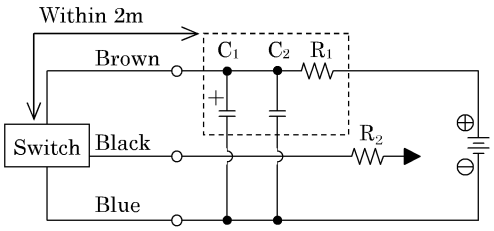


Fig8 ・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor (Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30 Ω

・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 a programmable controller (Sequencer).
Type of connection varies depending upon the model of the programmable controller. Refer to the following Fig. 9 to 13 respectively.

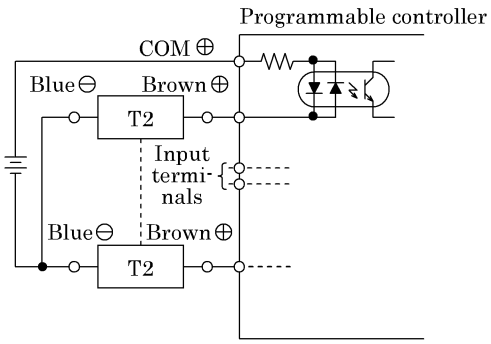


Fig.9 An example of T2 connection to source input type (an external power source)

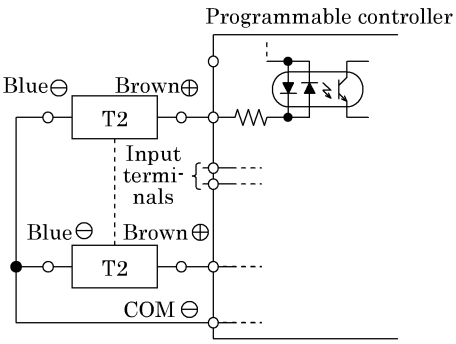


Fig.10 An example of T2 connection to source input type (an internal power source)

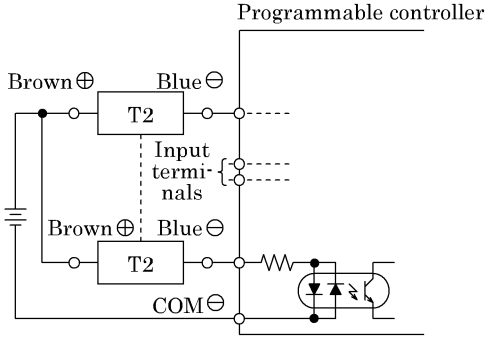


Fig.11 An example of T2 connection to source input type

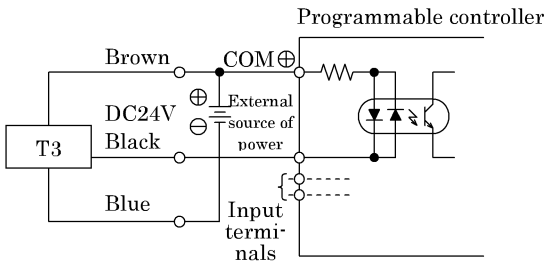


Fig.12 An example of T3 connection to source input type (an internal power source)

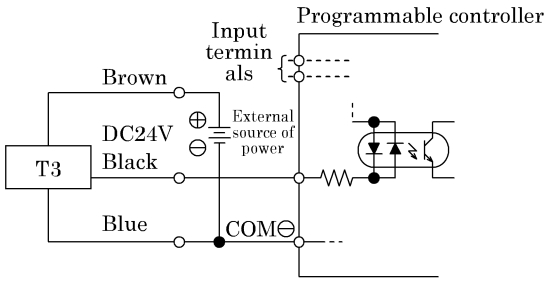


Fig.13 An example of T3 connection to source input type (an internal power source)

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 μ A, then leakage may occur. Usually dimming and failure of the indicator light do not occur.

5) Strong magnetic field proof switch (T2YD)

● External magnetic field proof performance (at welding current of AC14000A)

This strong magnetic field proof switch can be used for all T-type strong magnetic field non-contact 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 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.

   See "Trouble shooting", 5 should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

4.2 Disassembling

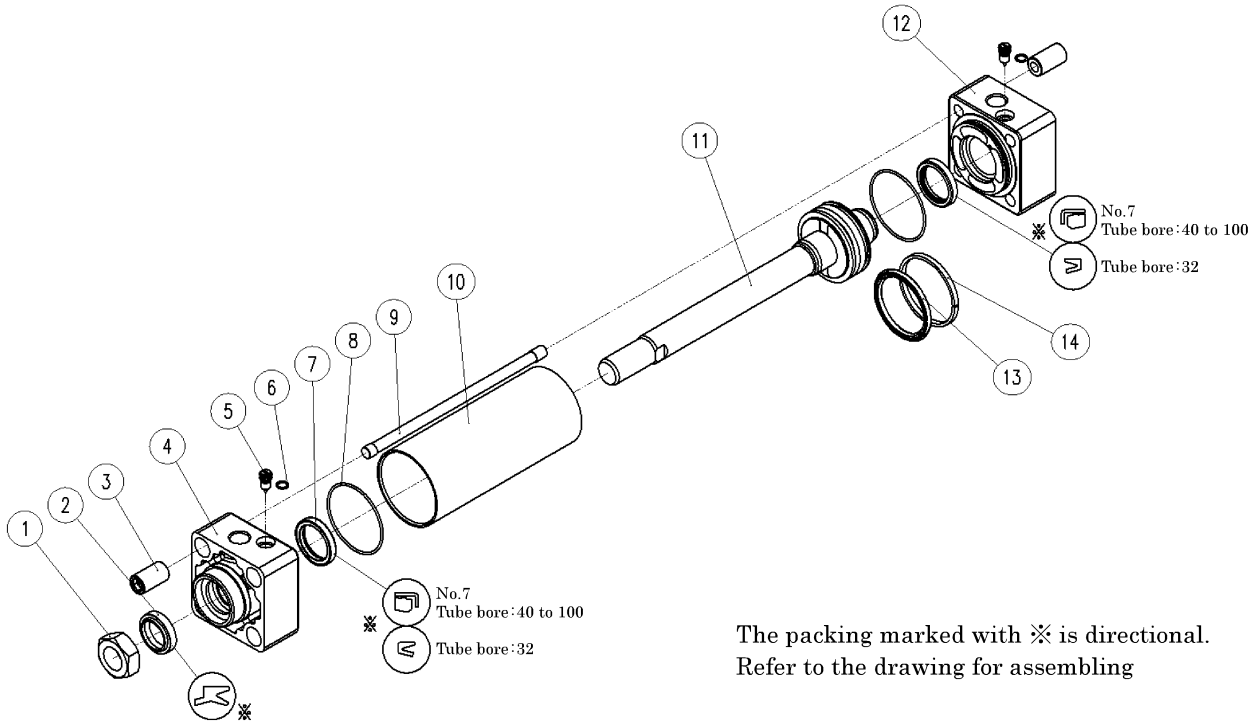
Should any air leakage occur, take the following corrective actions.

1) Prepare the following tools for disassembling.

Disassembling tools

Name	Q'ty	Place of use	Applicable tube ID (mm)
Hex. bar spanner (Nominal 6)	2	3	32, 40
Hex. bar spanner (Nominal 8)	2	3	50, 63
Hex. bar spanner (Nominal 10)	2	3	80, 100
Standard driver (Nominal 5.5×7.5)	1	5,7	For all tube ID "7" is required only when 32 dia.
Ice pick	1	2,6,7,8,13	For all tube ID

2) Disassemble the cylinder, referring to the following drawing.

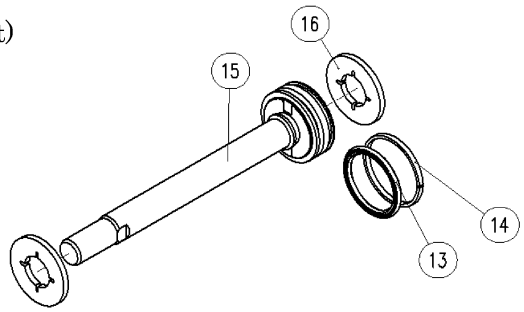


The packing marked with ※ is directional.
Refer to the drawing for assembling

.No.	Parts name	Q'ty	No.	Parts name	Q'ty	No.	Parts name	Q'ty
1	Rod nut	1	6	Needle gasket	2	11	Piston rod assy	1
2	Rod packing	1	7	Cushion packing	2	12	Head cover	1
3	Round nut	8	8	Cylinder gasket	2	13	Piston packing	1
4	Rod cover	1	9	Tie rod	4	14	Wear ring	1
5	Cushion needle	2	10	Cylinder tube	1			

・With cushion rubber (Piston rod ass'y is different)

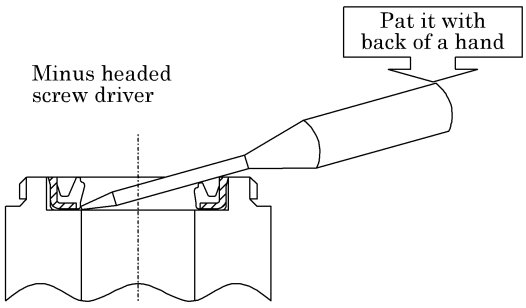
No.	Parts name	Q'ty
15	Piston rod assy	1
16	Cushion rubber	2



3) Replacement of cushion packing

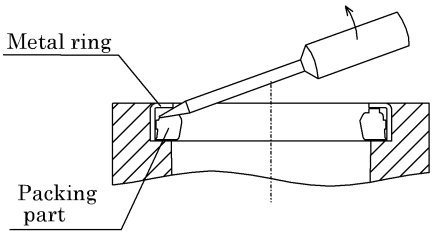
〈32 dia.〉

When removing the cushion packing, secure the cover, and press a standard driver against the packing inner bottom with the driver supported by the corner of the cover as shown below. Hit the grip of the driver with your palm and remove the packing.



〈40 dia. to 100 dia.〉

Remove only the packing part using sharp pointed tool such as minus screw driver or ice pick. (The metal ring is left as it is without removing.)



4) 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 bush
(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)

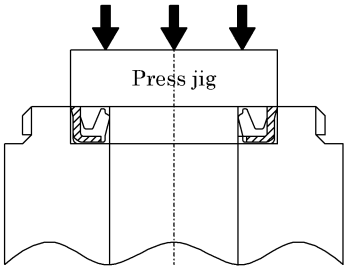
Check all of above items. If any abnormality is found, repair it or replace the parts, when defective.

5) Assembly

(1) Clean each component parts.

(2) Take reversed sequence of disassembly to assemble cylinder after cleaning parts. Carefully avoid giving damage to packings to prevent malfunction or air leakage.

(3) About assembling of cushion packing



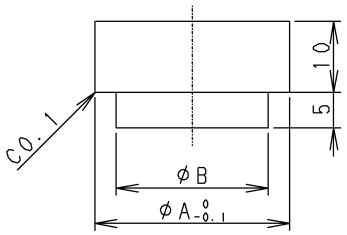
〈32 dia.〉

To prevent a damage to packing also a tilt of it, use a jig and carefully press it in the place. Make sure to press it down so as the upper edge of its metal ring sink about 0.5 below the top surface of the cover.

Table2 and the following diagram is an example of the jig.

Table 2. Press jig dimension (mm)

Bore size	A	B
32 dia.	20	14



〈40 dia. to 100 dia.〉

The packing part is incorporated in the metal ring so that a surface with a protruding portion may be on the metal ringside.

(4) Apply thinly and uniformly a film of grade grease (Lithium alkali base) over the inner surface of cylinder tube ⑩ , outer surface of piston rod ass'y ⑪, and packings (⑥、⑦、⑧、⑬、⑭).

(5) When tightening the round nuts, 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

Bore size (mm)	Torque (N･m)
32 dia., 40 dia.	4.8
50 dia., 63 dia.	12.0
80 dia., 100 dia.	24.0

6) Followings are expendable parts.
Specify the kit No. when ordering.

(a) SCG (air cushioned)

Bore size (mm)	32 dia.	40 dia.	50 dia.	63 dia.	80 dia.	100 dia.
Kit No.	SCG-32BK	SCG-40BK	SCG-50BK	SCG-63BK	SCG-80BK	SCG-100BK
Structure	②⑥⑦⑧⑬⑭					

(b) SCG (rubber cushioned)

Bore size (mm)	32 dia.	40 dia.	50 dia.	63 dia.	80 dia.	100 dia.
Kit No.	SCG-32DK	SCG-40DK	SCG-50DK	SCG-63DK	SCG-80DK	SCG-100DK
Structure	②⑥⑧⑬⑭⑯					

4.3 Keeping

When you keep a product, be careful of the following point.

(a) Keep it away from direct sunlight and radiation.
(b) Keep it in a dark cool place away from heat source.
(c) Consider water proof and moisture proof , in order to prevent generating of rust.
(d) Prevent foreign matter and dust with the packing style before unpacking.

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 and consider the adoption of low pressure cylinder.
	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) 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. 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.
	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.

Note 1. Refer "2.4 Location of mounting Switches on a Cylinder" as for replacing a switch and correcting its location.

6. HOW TO ORDER

6.1 How to order product

SCG – a – b c – d – e – f – g

(a) Mounting style (Note1)		(b) Bore size (mm)		(c) Cushion		(d) Stroke (mm) (Note2)	
00	Basic type	32	32 dia.	B	Both side (air cushion)	25	250
LB	Axial foot type	40	40 dia.			50	300
FA	Rod side flange type	50	50 dia.	D	Both side (rubber cushion)	75	350
FB	Head side flange type	63	63 dia.			100	400
CA	Eye bracket type	80	80 dia.			150	450
CB	Clevis bracket type	100	100 dia.			200	500
TC	intermediate trunnion type						
TA	Rod side trunnion type						
TB	Head side trunnion type						

(e) Switch model No. (Note3) (Note4)					(f) Switch quantity	
Lead wire		Switch type	Indicator light	Lead wire	R	One on rod side
Axial lead wire	Radial lead wire				H	One on head side
T0H※	T0V※	Reed	1 color indicator	2-wire	D	Two
T5H※	T5V※		With out indicator light		T	Three
T2H※	T2V※	Solid state	1 color indicator		4	Four
T3H※	T3V※			3-wire	5	Five
T2YH※	T2YV※		2 color indicator (No indicator light for preventive mainte. output)	2-wire		
T3YH※	T3YV※					
T2YFH※	T2YFV※		2 color indicator (Indicator light for preventive mainte. Output(1 color))	3-wire		
T3YFH※	T3YFV※			4-wire		
T2YMH※	T2YMV※			3-wire		
T3YMH※	T3YMV※			4-wire		
T2YD※	—		Strong magnetic field proof switch	2-wire		
T2YDT※	—					
T2JH※	T2JV※		Off-deray type			

※ Lead wire length

Blank	1m (standard)
3	3m (option)
5	5m (option)

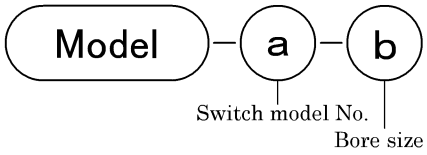
※mark indicates the length of lead wire.

(g) Option・Accessory	
J	Bellow material φ32:nylin tarpaulin φ40～100:polyolefin elastomer
M	Piston rod material change (stainless steel)
P6	Copper and PTFE free
I	Rod eye
Y	Rod clevis
B1	Eye bracket
B2	Clevis bracket
B3	Eye bracket
B4	Trunnion type No.2 bracket

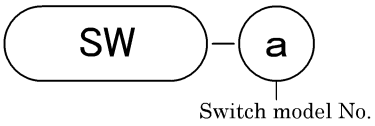
Note1 : Mounting bracket is attached to the product at shipment. (The trunnion mounting types excluded.)
Note2 : Refer to catalog as for cylinder exceeding max. stroke.
Note3 : T3PH、T3PV type is also available. (Custom order)
Note4 : Refer to “how to order switch” on the next page.

6.2 How to order switch

(1) Switch body + Mounting bracket

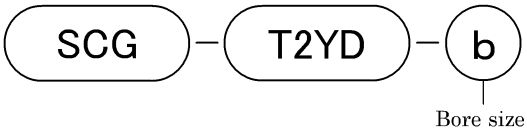


(2) Switch alone

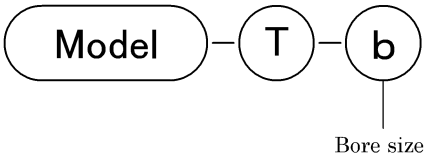


Note: Please contact us when the use of an environmentally-friendly T-type switch is desired.

※ When T2YD



(3) Set of mounting bracket



(e) Switch model No.					(b) Bore size (mm)	
Axial lead wire	Radial lead wire	Switch type	Indicator light	Lead wire	32	32 dia.
					40	40 dia.
T0H※	T0V※	Reed	1 color indicator	2 wire	50	50 dia.
T5H※	T5V※		Without indicator light	2 wire	63	63 dia.
T2H※	T2V※	Solid state	1 color indicator	3 wire	80	80 dia.
T3H※	T3V※				100	100 dia.

※mark indicates the length of lead wire.

※ Lead wire length	
Blank	1m (standard)
3	3m (option)
5	5m (option)

7. SPECIFICATION

7.1 Cylinder specifications

Model / Item			SCG					
Bore size		mm	32 dia.	40 dia.	50 dia.	63 dia.	80 dia.	100 dia.
Actuation			Double acting					
Working fluid			Compressed air					
Max. working pressure		MPa	1.0					
Min. working pressure		MPa	0.05					
Proof pressure		MPa	1.6					
Ambient temperature		℃	−10 to 60 (No freezing)					
Port size			Rc1/8	Rc1/4		Rc3/8		Rc1/2
Stroke tolerance mm	Rubber cushioned		$^{+1.4}_{0}$ (to 1000)、$^{+1.8}_{0}$ (to 1500)					
	Air cushioned		$^{+1.0}_{0}$ (to 360)、$^{+1.4}_{0}$ (to 1000)、$^{+1.8}_{0}$ (to 1500)					
Working piston speed		mm/s	50 to 1000 (use this within allowable Energy absorption range.)					
Cushion			Rubber cushion/air cushion can be selected.					
Effective air cushion length		mm	8.6	8.6	13.4	13.4	15.4	15.4
Lubrication			Not required (Use Grade 1 ISO VG 32 Turbine oil, if lubrication is preferred)					
Allowable energy absorption	Rubber cushioned	J	0.5	0.9	1.6	1.6	3.3	5.8
	Air cushioned	J	2.5	3.7	8.0	14.4	25.4	45.6

7.2 Switch specification

Descriptions	Read 2 wire			
	T0H, T0V		T5H, T5V	
Applications	Programmable controller, relay		Programmable controller, relay, IC circuit (without indicator light), serial connection	
Load voltage	DC12/24V	AC110V	DC5/12/24V	AC110V
Load current	5 to 50mA	7 to 20mA	50mA or less	20mA or less
Current consumption	—			
Internal voltage drop	2.4V or less		0V	
Indicator light	LED (ON lighting)		Without indicator loght	
Leakage current	0mA			
Lead wire length (note 1)	1m (oil resistant vinyl cabtire code 2 conductor 0.2mm^2)			
Shock resistance	294m/s^2			
Insulation resistance	20MΩ over at DC500V megger			
Withstand voltage	No failure at AC100V inmressed 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		
	T2H, T2V	T2YH, T2YV	T2JH, T2JV
Applications	Programmable controller		
Power supply voltage	—		
Load voltage	DC10 to 30V		
Load current	5 to 20mA (note 2)		
Current consumption	—		
Internal voltage drop	4V or less		
Delay hour off	—		200±50ms
Indicator light	LED (ON lighting)	Red / green LED (ON lighting)	LED (ON lighting)
Leakage current	1mA or less		
Lead wire length (note 1)	1m (oil resistant cabtire code 2 conductor 0.2mm^2)	1m (oil resistant vinyl cabtire code 2 conductor 0.3mm^2)	1m (oil resistant cabtire code 2 conductor 0.3mm^2)
Shock resistance	980m/s^2		
Insulation resistance	20MΩ over at DC500V megger	100MΩ over at DC500V megger	
Withstand voltage	No failure at AC1000V impressed 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, T3V	T3YH, T3YV
Applications	Programmable controller, relay	
Power supply voltage	DC10 to 28V	
Load voltage	DC30V or less	
Load current	100mA or less	50mA or less
Current consumption	10mA or less st DC24V	
Internal voltage drop	0.5V or less	
Delay hour off	—	
Indicator light	LED (ON lighting)	Red/green LED (ON lighting)
Leakage current	10μA or less	
Lead wire length (note 1)	1m (oil resistant vinyl cabtire code 3 conductor, 0.2mm^2)	
Shock resistance	980m/s^2	
Insulation resistance	20MΩ over at DC500V megger	100MΩover at DC500V megger
Withstand voltage	No failure at AC1000V impressed for one minute	
Ambient temperature	−10 to +60℃	
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance	

Discriptions		Solid state 3 wire	Solid state 4 wire
		T2YFH, T2YFV	T3YFH, T3YFV
Applications		Programmable controller	Programmable controller, relay
Indicator light	Mounting orientation adjustment	Red / green LED (ON lighting)	
	Preventive maintenance output	—	
Output	Power supply voltage	—	DC10 to 28V
	Loadvoltage	DC10 to 30V	DC30V
	Load current	5 to 20mA	50mA or less
	Internal voltage drop	4V or less	0.5V or less
	Current consumption	—	10mA or less
	Leakage current	1mA or less	10 μA or less
Preventivem aintenance output	Load voltage	DC30V or less	
	Load current	20mA or less	50mA or less
	Internal voltage drop	0.5V or less	
	Leakage current	10 μA or less	
	Signal holding (T on)	—	
	Signal release (T off)	—	
Lead wire length(note 1)		1m (oil resistant vinyl cabtire code 3 conductor 0.2mm²)	1m (oil resistant vinyl cabtire code 4 cores 0.2mm²)
Shock resistance		980m/s²	
Insulation resistance		100MΩ over at DC500V megger	
Withstand voltage		No failure at AC1000V impressed for one minute	
Ambient temperature		-10 to +60 °C	
Degree of protection		IEC standards IP67, JIS C0920 (water tight type), oil resistance	

Descriptions		Solid state 3 wire	Solid state 4 wire
		T2YMH, T2YMV	T3YMH, T3YMV
Applications		Programmable controller	Programmable controller, relay
Indicator light	Mounting orientation adjustment	Red / green LED (ON lighting)	
	Preventive maintenance output	Yellow LED (ON lighting)	
Output	Power supply voltage	—	DC10 to 28V
	Loadvoltage	DC10 to 30V	DC30V or less
	Load current	5 to 20mA	50mA or less
	Internal voltage drop	4V or less	0.5V or less
	Current consumption	—	10mA or less
	Leakage current	1.2mA or less	10 μA or less
Preventivem aintenance output	Load voltage	DC30V or less	
	Load current	5 to 20mA or less	50mA or less
	Internal voltage drop	4V or less	2.4V or less
	Leakage current	10 μA or less	
	Signal holding (Ton)	0.4 ±0.2sec from after mounting orientation adjustment part red LED turned on.	
	Signal release (Toff)	0.7 ±0.2sec from after mounting orientation adjustment part green LED turned on.	
Lead wire length(note 1)		1m (oil resistant vunyl cabtire code 3 conductor 0.2mm²)	1m (oil resistant vunyl cabtire code 4 cores 0.2mm²)
Shock resistance		980m/s²	
Insulation resistance		100MΩ over at DC500V megger	
Withstand voltage		No failure at AC1000V impressed for one minute	
Ambient temperature		-10 to +60°C	
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	
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 0.5mm)	Opsion 1m (Flame resistant vinyl cabtire cord 2 conductor 0.5mm)
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	

Note 1: 3m or 5m long lead wire is optionally available.
Note 2: Maximum value, 25mA is at 25℃ of ambient temperature. Load current decreases less than 25mA when the ambient temperature exceeds 25℃. For example: it may be 5 to 10mA at 60℃
Note 3: This shows a period of time between detection of the magnet by the magnetic sensor and sending of switch output.