CKD

SM－2944－A

INSTRUCTION MANUAL

SELEX CYLINDER

SCA2

(Standard type)

SCA2-L2

(Strong magnetic field proof switch)

SCA2-T2

(Fluorine rubber packing type)

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

CKD Corporation

The 7th edition

For Safety Use

To use this product safety, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your 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:

⚠ Precautions

- 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.

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Selex Cylinder
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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.

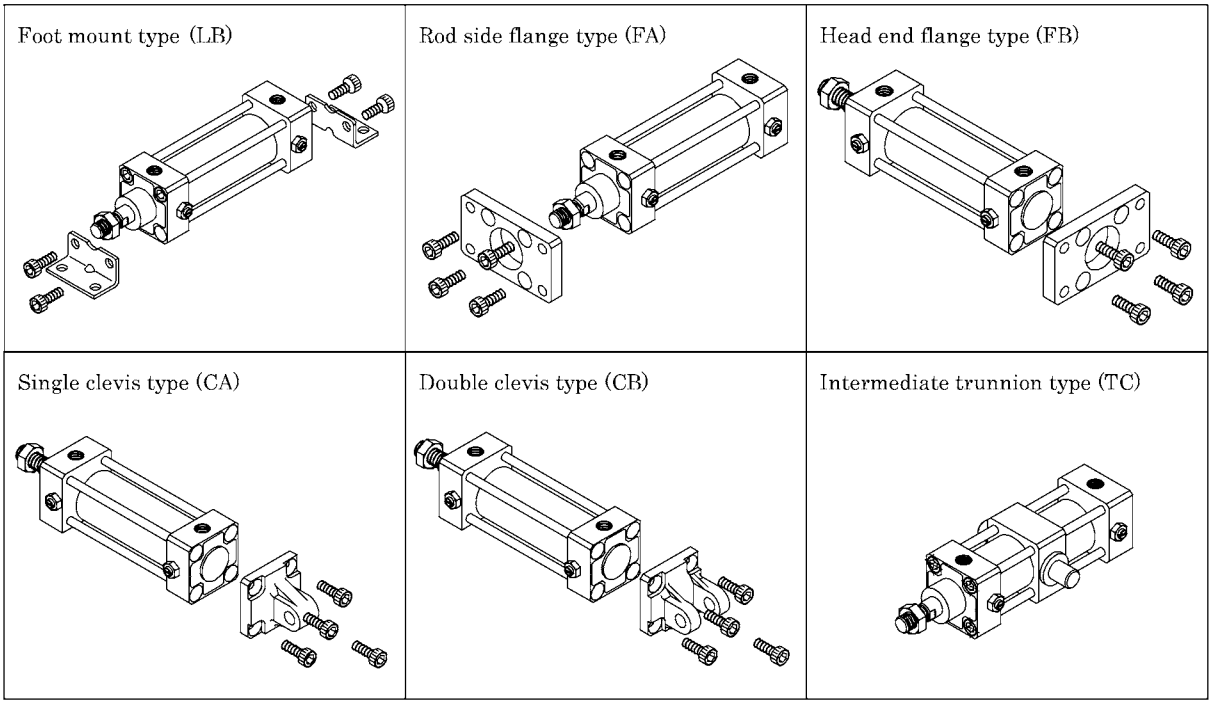
2. INSTALLATION

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 mounting bracket:
   The mounting 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.
   However, the trunnion types (TC, TA and TB) are shipped with the trunnion mounted.

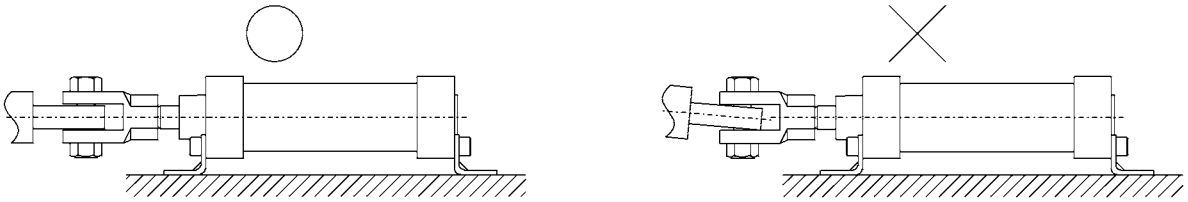
Bore size	Recommendation tightening torque
φ40・φ50・φ63	9.8 N・m
φ80・φ100	34.8 N・m

Assembly of mounting bracket(same as disassembling)

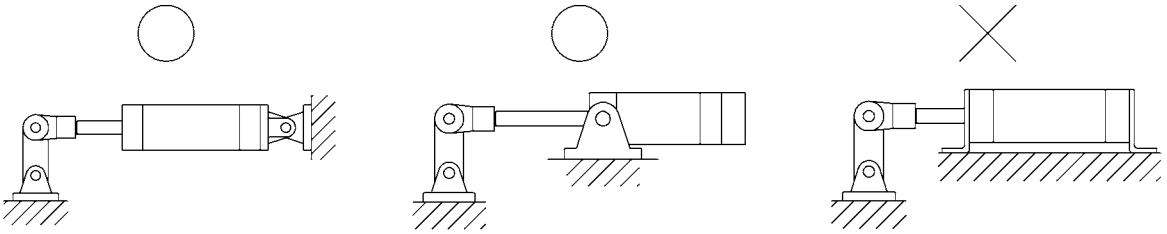


5) When cylinder is fixed and rod end is guided:
In case the piston rod of cylinder and the load are misaligned, the bushes and packings of the cylinder are extremely worn out. Hence, connect them with CKD floating connector (spherical bearing).

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.



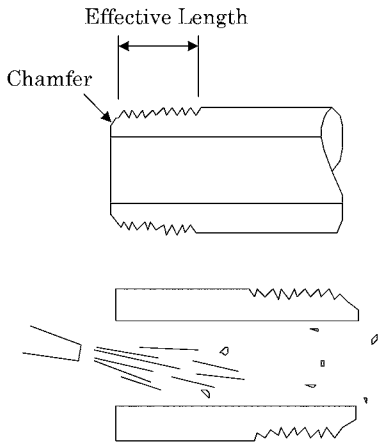
7) When the load acting direction changes with the cylinder operation:
Use an oscillating cylinder (clevis type or trunnion type) capable of making revolution to a certain angle. Furthermore, install the rod and connecting metal (knuckle) so that it moves in the same direction as the cylinder main body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



Clevis type　　Trunnion type　　Foot mount type

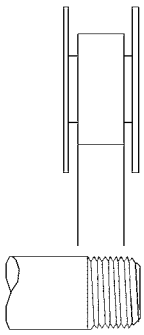
2.2 Piping

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.

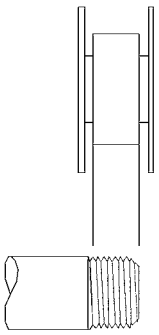


6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

●Seal Tape



(Correct)



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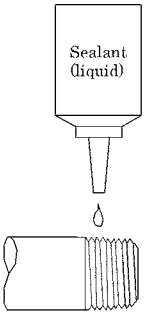
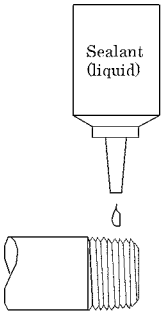
●Sealant (liquid)



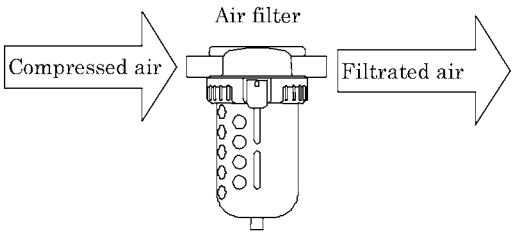
(Correct)



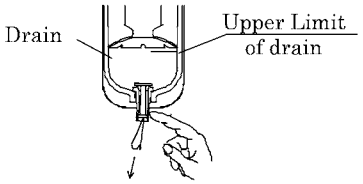
(Incorrect)

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.

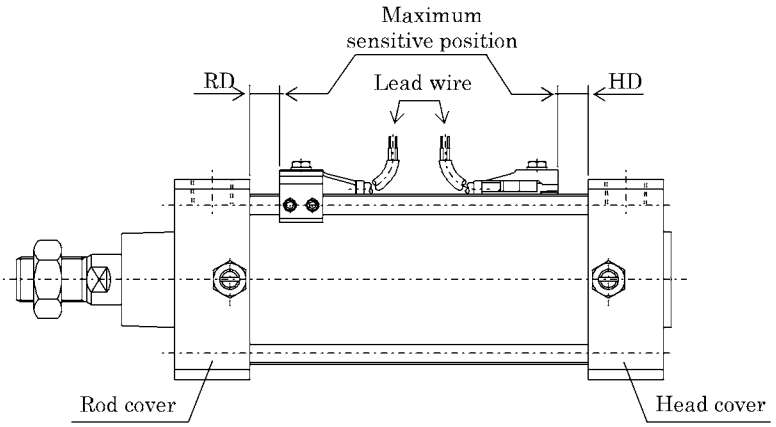


3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

4) 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



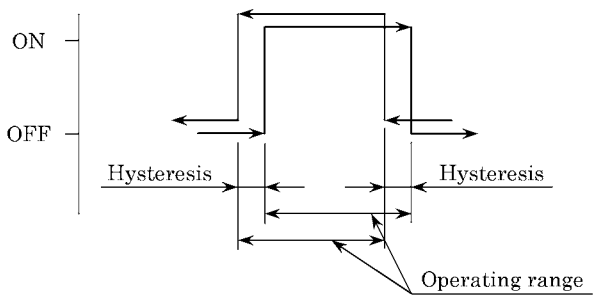
(1) At the stroke end
Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of maximum sensitive position.

(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 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.

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



4) Maximum sensitive position, operating range and hysteresis.

Solid state switch (SCA2)

Item / Bore size (mm)	T2H/V,T3H/V,T2JH/V,T2YH/V,T3YH/V							
	Maximum sensitive position				Operating range		Hysteresis	
	HD		RD					
	1 color	2 color	1 color	2 color	1 color	2 color	1 color	2 color
φ40	11	10	11	10	2 to 7	3 to 10	1.5 or less	1.0 or less
φ50	13	12	13	12	2 to 7.5	3 to 10		
φ63	13	12	13	12	2.5 to 7.5	3.5 to 10.5		
φ80	14.5	13.5	14.5	13.5	3 to 8	4 to 11.5		
φ100	18.5	17.5	18.5	17.5	3 to 8.5	4 to 11.5		

Item / Bore size (mm)	T1H/V							
	Maximum sensitive position				Operating range		Hysteresis	
	HD		RD					
	1 color	2 color	1 color	2 color	1 color	2 color	1 color	2 color
φ40	10	—	10	—	2 to 7	—	1.5 or less	—
φ50	12	—	12	—	2 to 7.5	—		
φ63	12	—	12	—	2.5 to 7.5	—		
φ80	13.5	—	13.5	—	3 to 8	—		
φ100	17.5	—	17.5	—	3 to 8.5	—		

Reed switch (SCA2)

Item / Bore size (mm)	T0H/V,T5H/V			
	Maximum sensitive position		Operating range	Hysteresis
	HD	RD		
φ40	11	11	5 to 12.5	3 or less
φ50	13	13	5.5 to 13.5	
φ63	13	13	5.5 to 14	
φ80	14.5	14.5	6.5 to 14.5	
φ100	18.5	18.5	6.5 to 15.5	

Item / Bore size (mm)	T8H/V			
	Maximum sensitive position		Operating range	Hysteresis
	HD	RD		
φ40	5	5	5 to 12.5	3 or less
φ50	7	7	5.5 to 13.5	
φ63	7	7	5.5 to 14	
φ80	8.5	8.5	6.5 to 14.5	
φ100	12.5	12.5	6.5 to 15.5	

Strong magnetic field proof Solid state switch (SCA2)

Item / Bore size (mm)	T2YD											
	Maximum sensitive position								Operating range (Reference)		Hysteresis	
	HD				RD							
	Strokes								1 color	2 color	1 color	2 color
	15	30	45	60	15	30	45	60				
ϕ 40	10				10				—	6.5 to 9	—	1.5 or less
ϕ 50	12				12				—	7 to 10		
ϕ 63	12				12				—	7 to 10		
ϕ 80	13.5				13.5				—	7.5 to 10.5		
ϕ 100	17.5				17.5				—	8 to 11		

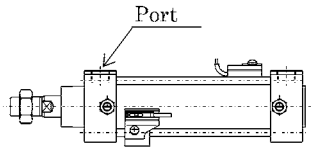
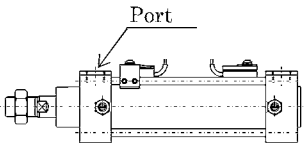
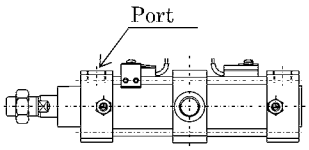
Strong magnetic field proof Reed switch (SCA2-L2)

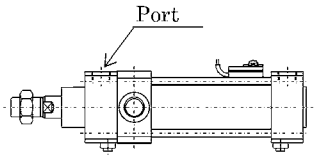
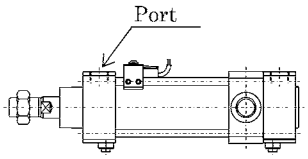
Item / Bore size (mm)	H0,H0Y									
	Maximum sensitive position								Operating range (Reference)	Hysteresis
	HD				RD					
	Stroke									
	15	30	45	60	15	30	45	60		
ϕ 40	4				4				4 to 7.5 (10.5 to 13.5)	3 or less
ϕ 50	6				6				4 to 7.5 (11 to 14)	
ϕ 63	6				6				5 to 8 (11.5 to 14.5)	
ϕ 80	7.5				7.5				5 to 8 (10.5 to 14.5)	
ϕ 100	11.5				11.5				5 to 8 (10.5 to 14.5)	

Note : Dimension shown in parentheses are H0Y type.

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

Minimum stroke with T0／T5 switch (Unit : mm)

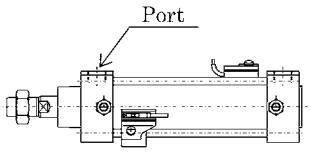
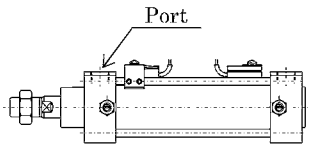
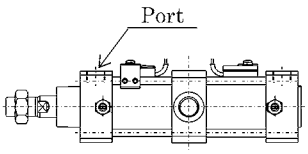
Item	Different surface installation				Same surface installation				Center trunnion mounted			
Rough sketch												
Switch Q'ty	1	2	3	4	1	2	3	4	1	2	3	4
ϕ 40	20(10)	20(20)	40(40)	60(60)	20(10)	60(45)	105(75)	150(105)	110(110)	110(110)	175(145)	175(145)
ϕ 50	15(10)	20(20)	40(40)	60(60)	15(10)	20(20)	65(50)	65(60)	135(135)	135(135)	135(135)	135(135)
ϕ 63	15(10)	20(20)	40(40)	60(60)	15(10)	20(20)	70(55)	70(60)	110(95)	110(95)	110(100)	110(100)
ϕ 80	15(15)	25(25)	45(45)	65(65)	15(15)	25(25)	70(55)	70(65)	115(85)	115(85)	115(105)	115(105)
ϕ 100	15(15)	25(25)	45(45)	70(70)	15(15)	25(25)	70(55)	70(70)	125(95)	125(95)	125(115)	125(115)

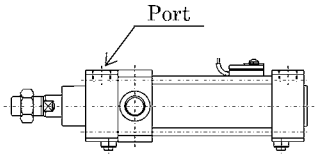
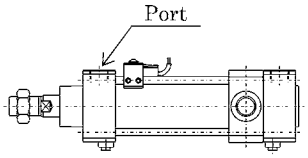
Item	Rod side trunnion mounted	Head side trunnion mounted
Rough sketch	 The piston at rod side stroke end cannot be detected.	 The piston at head side stroke end cannot be detected.
Switch Q'ty	1	1
ϕ 40	50(50)	50(50)
ϕ 50	60(60)	60(60)
ϕ 63	50(45)	50(45)
ϕ 80	55(40)	55(40)
ϕ 100	60(45)	60(45)

Note 1: Dimension shown in parentheses are the case of T※V(Axial lead wire).

Note 2: 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.

Minimum stroke with T8 switch (Unit : mm)

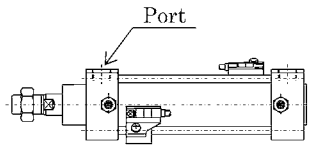
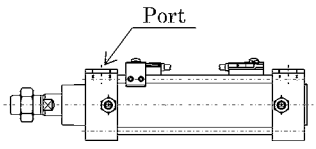
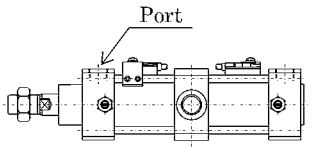
Item	Different surface installation				Same surface installation				Center trunnion mounted			
Rough sketch												
Switch Q'ty	1	2	3	4	1	2	3	4	1	2	3	4
ϕ 40	15(10)	20(20)	40(40)	60(60)	15(10)	50(35)	95(65)	140(95)	95(85)	95(85)	155(125)	155(125)
ϕ 50	10(10)	20(20)	40(40)	60(60)	10(10)	20(20)	70(55)	70(60)	115(115)	115(115)	135(135)	135(135)
ϕ 63	10(10)	20(20)	40(40)	60(60)	10(10)	20(20)	70(55)	70(60)	95(75)	95(75)	110(110)	110(110)
ϕ 80	15(15)	25(25)	45(45)	65(65)	15(15)	25(25)	70(55)	70(65)	100(70)	100(70)	115(115)	115(115)
ϕ 100	15(15)	25(25)	45(45)	65(65)	15(15)	25(25)	70(55)	70(65)	110(80)	110(80)	125(125)	125(125)

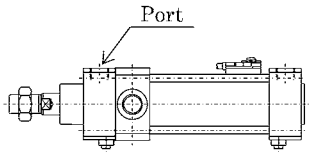
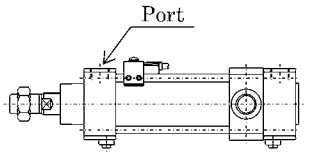
Item	Rod side trunnion mounted	Head side trunnion mounted
Rough sketch	 The piston at rod side stroke end cannot be detected.	 The piston at head side stroke end cannot be detected.
Switch Q'ty	1	1
ϕ 40	45(40)	45(40)
ϕ 50	50(50)	50(50)
ϕ 63	45(35)	45(35)
ϕ 80	50(35)	50(35)
ϕ 100	55(40)	55(40)

Note 1: Dimension shown in parentheses are the case of T※V(Axial lead wire).

Note 2: 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.

Minimum stroke with T1／T2／T3／T2Y／T3Y switch (Unit : mm)

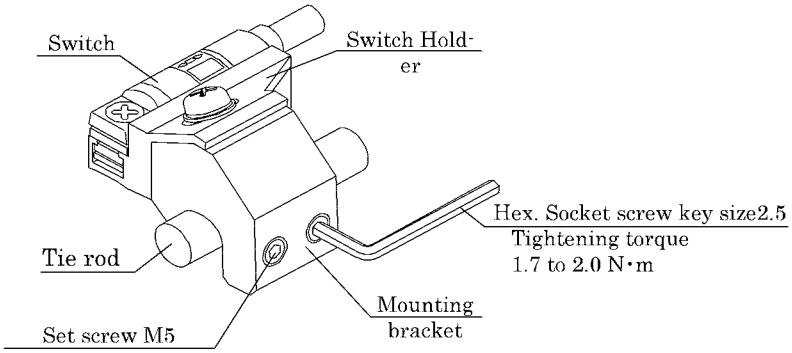
Item	Different surface installation				Same surface installation				Center trunnion mounted			
Rough sketch												
Switch Q'ty	1	2	3	4	1	2	3	4	1	2	3	4
ϕ 40	20(10)	20(15)	25(25)	40(40)	20(10)	60(45)	105(75)	150(105)	105(75)	105(75)	165(135)	165(135)
ϕ 50	15(10)	15(15)	25(25)	40(40)	15(10)	15(15)	60(45)	60(45)	105(75)	105(75)	105(75)	105(75)
ϕ 63	15(10)	15(15)	25(25)	40(40)	15(10)	15(15)	60(45)	60(45)	110(80)	110(80)	110(85)	110(85)
ϕ 80	15(10)	15(15)	30(30)	45(45)	15(10)	15(15)	60(45)	60(45)	115(85)	115(85)	115(90)	115(90)
ϕ 100	10 (10)	15(15)	30(30)	45(45)	10 (10)	15(15)	60(45)	60(45)	125(95)	125(95)	125(100)	125(100)

Item	Rod side trunnion mounted	Head side trunnion mounted
Rough sketch	 The piston at rod side stroke end cannot be detected.	 The piston at head side stroke end cannot be detected.
Switch Q'ty	1	1
ϕ 40	50(35)	50(35)
ϕ 50	45(30)	45(30)
ϕ 63	50(35)	50(35)
ϕ 80	55(40)	55(40)
ϕ 100	60(45)	60(45)

Note 1: Dimension shown in parentheses are the case of T※V(Axial lead wire).

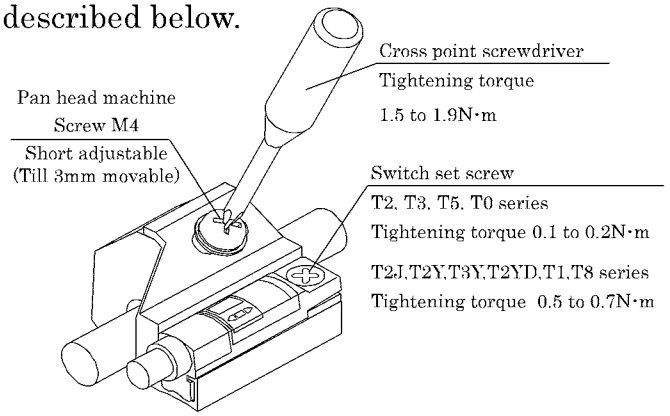
Note 2: When stroke length is not greater than 15mm, two switches could turn ON at the same time. In this case, adjust the distance between switches as far as possible.

6) Relocation of switch
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.

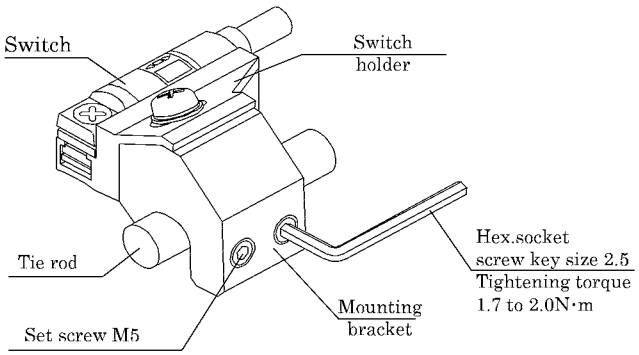


7) Installation of switch
Follow the procedures (1) to (3) as described below.

(1) While holding a switch underneath of switch holder, tighten M4×10 pan headed machine screws to mount it on the bracket.
※1 : In case of T2YD/T2YDT,
slotted hexagon head bolt
※2 : In case of T2YD/T2YDT,
minus headed screw driver.



(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.



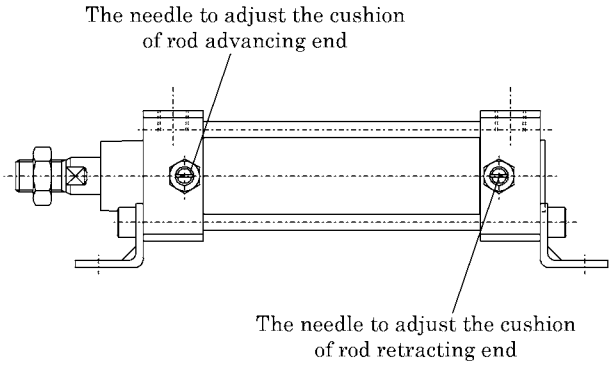
(3) To fix the mounting bracket on the tie rod, tighten screws while pressing bracket slightly against tube. Adequate torque of tightening screw is 1.7 to 2.0 N・m. It is considered to be sufficient, as a rule of thumb, when Allen wrench starts bending slightly.

3. OPERATION

3.1 Operating the Cylinder

1) The working pressure for this type of cylinder is specified in "Product Specifications". Operate the system within this range.

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 Tolerable energy absorption of "7.1 Product Specification", 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.

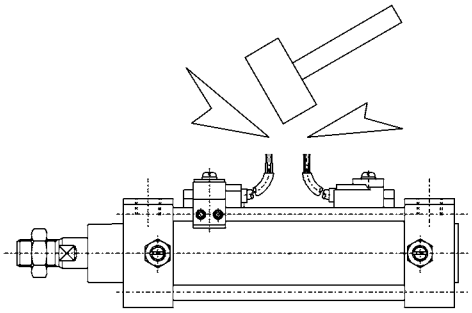
3) Operating temperature
Do not operate the product at a high temperature (Over than 60℃).
Always avoid operation of the product in a hot place due to temperature characteristics of magnetic and electronics parts.

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 8(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, T8, H0, H0Y)

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).

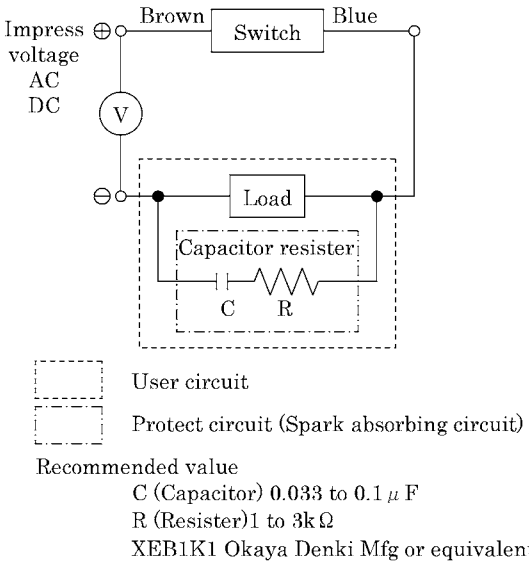
(1) When using the switch for DC power supply, connect the brown and blue lines to the positive and negative sides, respectively. If these lines are connected reversely, the switch is activated, but the indicator light is not lit.
(2) When the switch is connected to an AC relay or a programmable controller 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

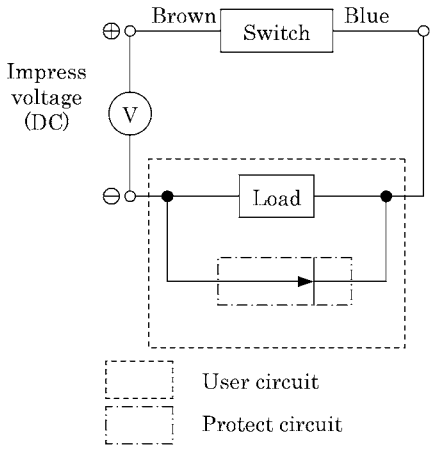
Electric power	Length of wire
DC	50m
AC	10m

(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

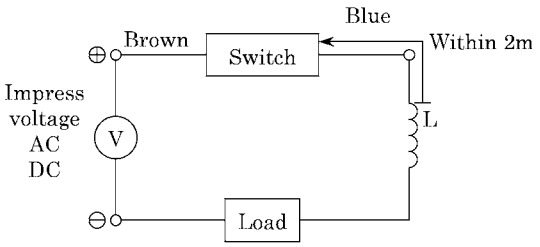
Fig.1 When capacitor resister is used.



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

Fig.2 When diode is used.

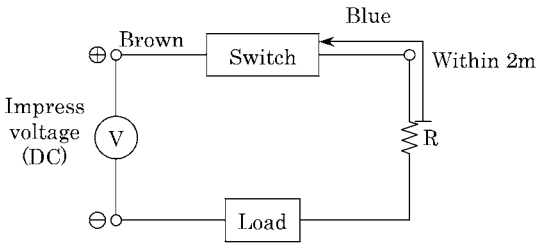
(2) Protective circuit when the wire length exceeds that stated Table 1



・ 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. (T0, T8)

(4) Relay
Always use the relays listed below.
Omron Corporation ·····MY type
Fuji Electric Co.,Ltd. ·····HH5 type
Panasonic, Ltd. ·····HC type

(5) Series connection
When multiple T0 or T8 switches are used with they connected in series, the voltage drop at the switch becomes the sum of voltage drop values of all switches.
Therefore, the voltage applied to the load becomes a voltage that the voltage drop at the switch is subtracted from the power supply voltage. Thus, always check the minimum operating voltage value of the load.

Example: The following shows the voltage drop at the switch when three T0 switches are connected in series.
2.4V × 3 = 7.2 V

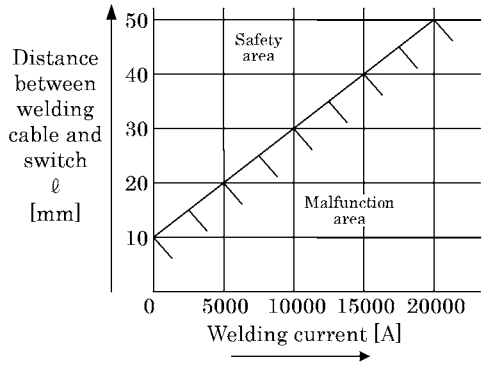
Since the voltage drop at the T5 switch is 0V, as many switches as required can be connected in series. When one T0 switch is used for checking of operation and T5 switch is used for other switches, they can be used with the voltage drop equivalent to one T0 switch (2.4V). In this case, the indicator light is lit only when all switches are turned ON.

(6) Parallel connection
When multiple switches are connected in parallel, there are no limitations on the number of switches.
However, if multiple T0 or T8 switches are turned ON at the same time, the indicator light becomes dark or is not lit.

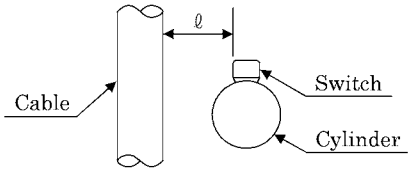
3) Strong magnetic field proof switch (H0, H0Y)

- External magnetic field proof performance (spot welding current – switch output malfunction distance characteristics)

In case of H0

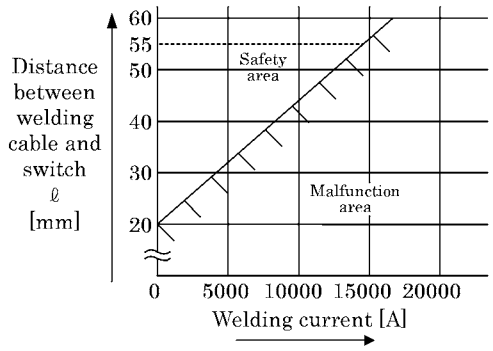


- The characteristics shown on the left may vary depending on the following layout between the cable and switch. (Outside diameter of cable: ϕ 36 mm)



- The external magnetic field proof characteristics of H0 are obtained when the switch is mounted in an area of maximum sensitivity position ±1 mm.

In case of H0Y



- The external magnetic field proof characteristics of H0Y are obtained when the switch is mounted in its optimal mounting area (green LED lit range).

- For both H0 and H0Y, if two or more welding cables exist and the power is supplied to these cables at the same time, the magnetic flux may increase. Therefore, the characteristics shown on the left may not apply. Additionally, if the switch is located within the loop of the welding cable, the characteristics shown on the left cannot be used.

- The minimum mounting stroke shall be designed to 25 mm or more. If the minimum mounting stroke is 25 mm or less, the performance shown on the left is not satisfied.

3.2.3 Solid state switch (T1, T2, T3, T2YD)

1) Lead wire connections
Do not connect the lead wires of the switch to the power supply directly. Always connect the loads in series.

(1) For T2 switch, connect the brown and blue lines to the positive and negative sides, respectively. If these lines are connected reversely, the switch and load are always kept activated. In this case, the indicator light is not lit.
For T3 switch, pay special attention to Fig. 2 below.

(2) Always connect the lead wires while referring to the colors shown on the lead wires. At this time, turn OFF the power to the unit in the electrical circuit on the connection side before starting the wire connection work.
For T3 switch, if the wiring is performed incorrectly or the load is short-circuited, this may cause the switch, as well as the electrical circuit on the load side to break. Carefully connect the lead wires so that they are not connected incorrectly or short-circuited.
Additionally, the work with the power supplied may cause the switch and electrical circuit to break if the work is performed in an incorrect manner even though the incorrect wiring is not performed.

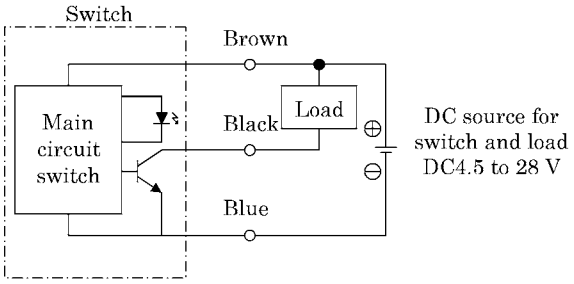


Fig.1 Fundamental circuit Example (1)
(In case the same source of power is used.)

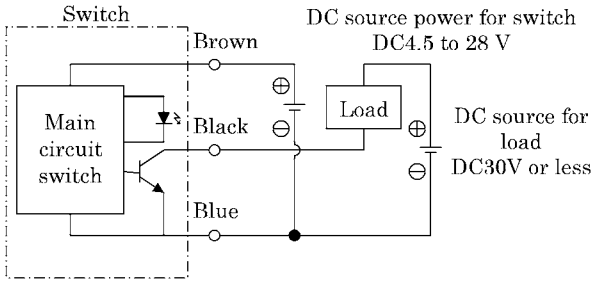


Fig.2 Fundamental circuit Example (2)
(In case individual sources of power are used.)

2) Connection load

The T1 switch can be connected to a load, such as AC programmable controller, relay, solenoid, or solenoid valve.

The T2 switch is specially designed as a programmable controller switch. Since this switch uses two wires, it is connected to either the sink input or source input.

The T3 switch can be connected to a load, such as digital IC, microcomputer, programmable controller, relay, solenoid, or solenoid valve.

When selecting or designing a load, carefully check the static electrical characteristics, as well as transient electrical characteristics (rush current when the switch is turned ON or surge voltage when the switch is turned OFF) so that they do not exceed the switch ratings. Additionally, if the electrical characteristics may exceed the switch ratings, appropriate protective measures are taken (surge absorbing element or rush current limiting resistance, etc.).

3) 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 solid state 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 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 "5. TROUBLE SHOOTING" should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

4.2 Disassembling

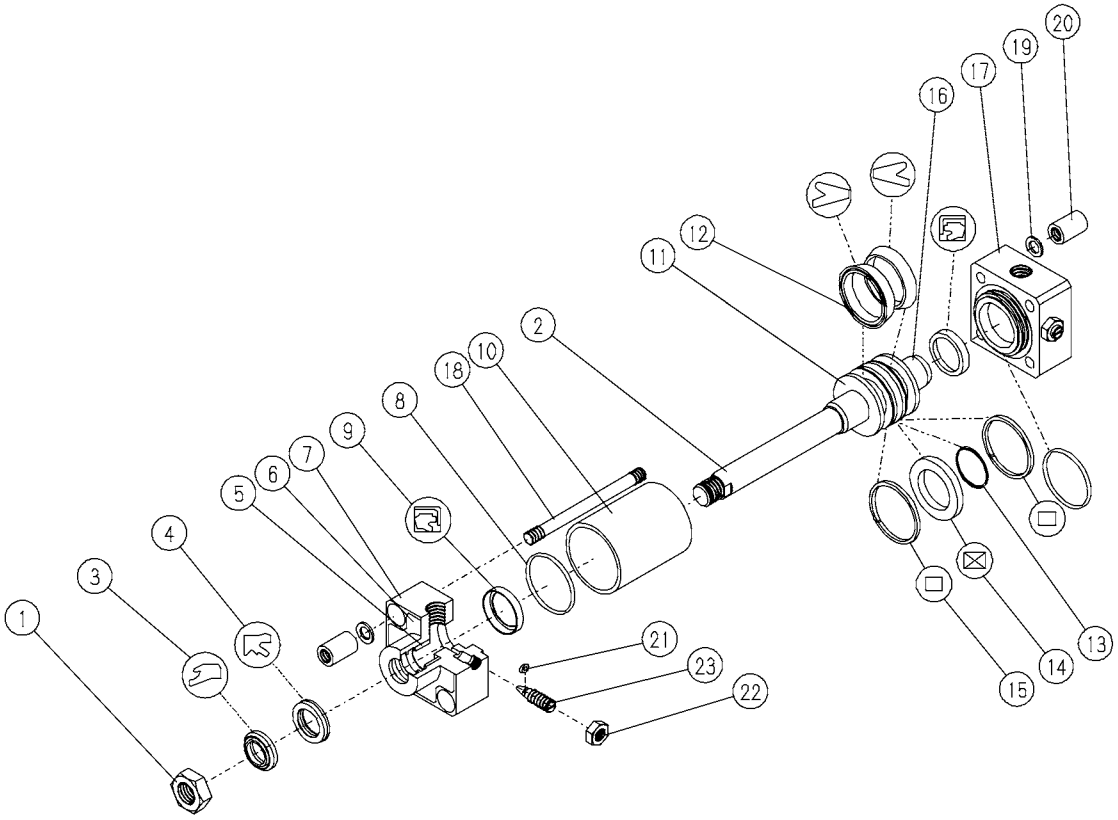
Should any air leakage occur, take the following corrective actions.

1) Prepare the following tools for disassembling.

Disassembling tools

Name	Qty	Place of use	Applicable tube ID (mm)
Hex. bar spanner (Nominal 8)	2	20	40, 50, 63
Hex. bar spanner (Nominal 12)	2	20	80, 100
Spanner (Nominal 13)	1	22	For all tube ID
Standard driver (Nominal 5.5×75)	1	12, 23	For all tube ID
Minus tip screwdriver (Nominal 9×200)	1	9	For all tube ID
Marret hammer	1	For disassembling 7, 17 and 10	For all tube ID
Ice pick	1	3, 4, 8,21	For all tube ID

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



Part No.	Part Name	Qty	Part No.	Part Name	Qty	Part No.	Part Name	Qty
1	Rod nut	1	9	Cushion packing	2	17	Head cover	1
2	Piston rod	1	10	Cylinder tube	1	18	Tie rod	4
3	Dust wiper	1	11	Piston (R)	1	19	Conical spring washer	8
4	Rod packing	1	12	Piston packing	2	20	Round nut	8
5	Bush	1	13	Piston gasket	1	21	Needle gasket	2
6	Masking plate	2	14	Magnet	1	22	Needle nut	2
7	Rod cover	1	15	Wear ring	2	23	Cushion needle	2
8	Cylinder gasket	2	16	Piston (H)	1			

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 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 wears 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.

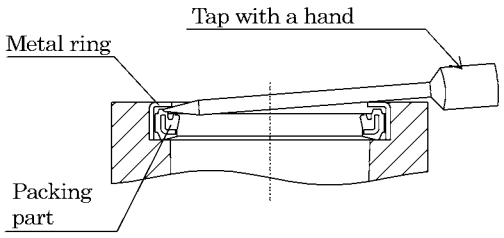
4) About cushion packing

   ⑨ Cushion packing is different by the manufactured date. Please confirm the day of manufacturing the product plaque, and detach it according to the following procedure.
   There is no difference in the cushion performance even when exchanging it for Cushion packing different from former.

〈Manufactured date : Product made before March, 2002〉

The product before March 2002 cannot exchange packing alone because there is Shin cane in Packing.
Please exchange it with a metal ring.

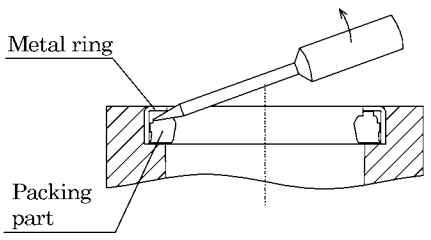
Forcing a minus driver etc. on a metal ring, the handle of a driver is struck by using the corner of a cover as a fulcrum, and a metal ring is removed.



〈Manufactured date : Product made after April, 2002〉

Because the product since April 2002 doesn't have Shin cane in Packing, only Packing can be exchanged.

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.)



5) Assembly

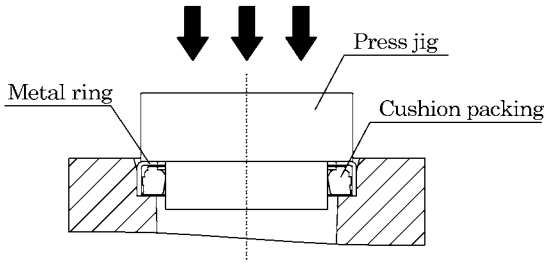
(1) Clean each component parts.

(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) Apply thinly and uniformly a film of high grade grease (Lithium alkali base) over the inner surface of cylinder tube ⑩, outer surface of piston (R) ⑪, piston (H) ⑯, and packings (③ , ④ , ⑤ , ⑧ , ⑨, ⑫ ,㉑).

〈Assembling cushion packings〉

The product before March 2002 should press-fit a metallic ring when Cushion packing is exchanged, and exchange it according to the following procedure, please.



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

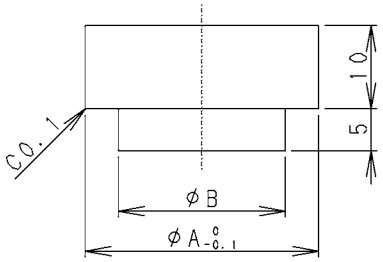
To prevent damage to packing also a tilt of it, use a jig and carefully press it in the place.

Make sure to press it down so as the upper edge of its metal ring sink about 0.1 to 0.2 mm below the top surface of the cover.

Table 2 and the illustration is an example of the jig.

Table 2 Press Jig dimension

Bore size(mm)	A	B
40 dia.	28	20
50 dia. , 63 dia.	32	24
80 dia.	45	35
100 dia.	55	45



(4) 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 3 displays the recommend range of torque for tightening.

Table 3 Tightening torque

Bore size(mm)	Torque(N·m)
40 dia., 50 dia, 63 dia	10.0
80 dia, 100 dia.	35.5

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

(a) SCA2 / SCA2-L2

Part No.	Name \ Bore size (mm) / Kit No.	φ 40	φ 50	φ 63	φ 80	φ 100
		SCA2-40K	SCA2-50K	SCA2-63K	SCA2-80K	SCA2-100K
3	Dust wiper	SFR-16K	SFR-20K	SFR-20K	SFR-25K	SFR-30K
4	Rod packing	PNY-16	PNY-20	PNY-20	PNY-25	PNY-30
8	Cylinder gasket	F4-667115	F4-667116	F4-667117	F4-667118	F4-667119
9	Cushion packing	F4-436638	F4-436639	F4-436639	F4-436640	F4-436641
12	Piston packing	PMY-40	PMY-50	PMY-63	PMY-80	PMY-100
15	Wear ring	F4-650239	F4-650240	F4-650241	F4-650242	F4-650243
21	Needle gasket	P-3	P-3	P-3	P-3	P-3

(b) SCA2-T2

Part No.	Name \ Bore size (mm) / Kit No.	φ 40	φ 50	φ 63	φ 80	φ 100
		SCA2-T-40K	SCA2-T-50K	SCA2-T-63K	SCA2-T-80K	SCA2-T-100K
3	Dust wiper	SFR-16F	SFR-20F	SFR-20F	SFR-25F	SFR-30F
4	Rod packing	PNY-16F	PNY-20F	PNY-20F	PNY-25F	PNY-30F
8	Cylinder gasket	F4-667140	F4-667141	F4-667142	F4-667143	F4-667144
9	Cushion packing	PCS-20F	PCS-24F	PCS-24F	PCS-35F	PCS-45F
12	Piston packing	PGY-40F	PGY-50F	PGY-63F	PGY-80F	PGY-100F
15	Wear ring	F4-650583	F4-650584	F4-650585	F4-650586	F4-650587
21	Needle gasket	P-3F	P-3F	P-3F	P-3F	P-3F

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.
	Grease shortage	Grease is spread.
Breakage and/or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load and/or install a mechanism with more secured cushion effect (e.g.external cushion mechanism).
	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 Product Number Coding

SCA2 – a – b c – d – e – f – g h

Strong magnetic field proof switch (H0, H0Y)

SCA2-L2 – a – b c – d – e – f – g h

Fluorine rubber packing type

SCA2-T2 – a – b c – d – e – f – g h

(a) Mounting style (Note1)		(b)Bore size(mm)		(c) Cushion		(d) Stroke (mm) (Note2)	
00	Basic type	40	ϕ 40	B	With cushion at both ends	25	250
LB	Foot mount type, along axis	50	ϕ 50	R	With cushion at rod side	50	300
FA	Rod side flange type	63	ϕ 63	H	With cushion at head side	75	350
FB	Head end flange type	80	ϕ 80	N	Without cushion	100	400
FC	Head end special flange type	100	ϕ 100			150	450
CA	Single clevis type					200	500
CB	Double clevis type						
TC	Intermediate trunnion type						
TA	Rod side trunnion type						
TB	Head end trunnion type						

Note1: Mounting bracket is attached to the product at shipment. (The trunnion mounting types are assembled at shipment.)

Note2: Refer to catalog as for cylinder exceeding max. stroke.

(e1) Switch model code (H type) (Note3) (Note4)			
Grommet type	Switch type	Display	Lead wire
H0※	Reed	Strong magnetic field proof	2-wire
H0Y※		Strong magnetic field proof 2 color indicator type	

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

Note 3: T2YD、H0、H0Y are strong magnetic field proof switches. For further information, contact CKD.

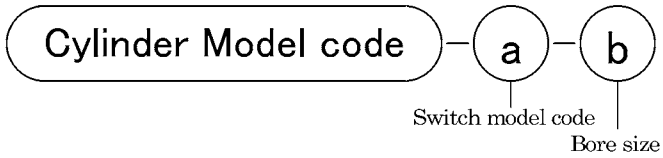
Note 4: ※ mark indicates lead wire length.

(e2) Switch model code (T type) (Note3) (Note4)				
Lead wire		Switch type	Display	Lead wire
Axial lead wire	Radial lead wire			
T0H※	T0V※	Reed	1 color indicator	2-wire
T5H※	T5V※		Without indicator light	
T8H※	T8V※		1 color indicator	
T1H※	T1V※	Solid state		
T2H※	T2V※			
T3H※	T3V※			3-wire
T2YH※	T2YV※		2 color indicator	2-wire
T3YH※	T3YV※			
T2YD※	—		Strong magnetic field proof switch	2-wire
T2YDT※	—			
T2JH※	T2JV※		Off-delay type	

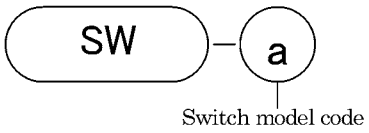
(f) Switch quantity		(g) Option		(h) Accessory	
R	One on rod side	J	Bellow: Polyolefin elastomer	I	Rod eye
H	One on head side	L	Bellow: Silicone rubber glass cloth	Y	Rod clevis (pin and snap ring attached)
D	Two	M	Alteration in piston rod material (Stainless steel)	B1	Eye bracket
T	Three	Blank	Cushion needle position R (Standard)	B2	Clevis bracket (pin and snap ring attached)
		S	Cushion needle position S	B3	Eye bracket
		T	Cushion needle position T	B4	Trunnion type No.2 bracket
		P6	Copper and PTFE free		

6.2 Component parts Model coding

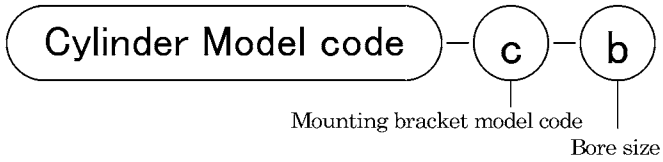
(1) Switch body + Mounting bracket



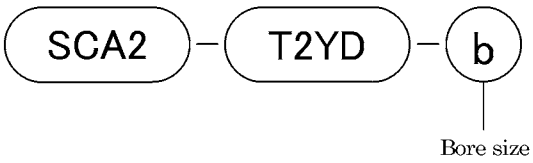
(2) Switch alone



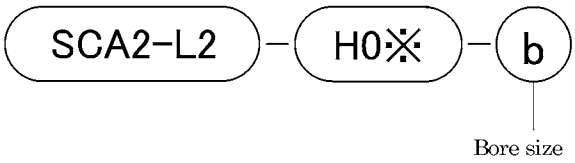
(3) A set of mounting bracket



※ In case of T2YD



※ In case of H0, H0Y



(a1) Switch model code (H type) (Note1) (Note2)			
Grommet type	Switch type	Display	Lead wire
H0※	Reed	Strong magnetic field proof	2-wire
H0Y※		Strong magnetic field proof 2 color indicator	

(a2) Switch model code (T type) (Note1) (Note2)				
Lead wire		Switch type	Display	Lead wire
Axial lead wire	Radial lead wire			
T0H※	T0V※	Reed	1 color indicator	2-wire
T5H※	T5V※		Without indicator light	
T8H※	T8V※		1 color indicator	
T1H※	T1V※	Solid state		
T2H※	T2V※			
T3H※	T3V※			3-wire
T2YH※	T2YV※		2 color indicator	2-wire
T3YH※	T3YV※			
T2YD※	—		Strong magnetic field proof switch	2-wire
T2YDT※	—			
T2JH※	T2JV※		Off-delay type	

Note 1: T2YD、H0、H0Y are strong magnetic field proof switches. For further information, contact CKD.
Note 2: ※ mark indicates lead wire length.

(b)Bore size(mm)	
40	ϕ 40
50	ϕ 50
63	ϕ 63
80	ϕ 80
100	ϕ 100

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

(c) Mounting bracket model code	
TS	For T type switch
T	For T2YD/T2YDT type switch
H	For H type switch

7. SPECIFICATION

7.1 Product Specifications

Model / Item			SCA2・SCA2-L2・SCA2-T2 (Note 1)				
Bore size		mm	φ40	φ50	φ63	φ80	φ100
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		℃	-10 to 60 (No freezing)				
Port size			Rc1/4	Rc3/8		Rc1/2	
Stroke tolerance		mm	$^{+0.9}_{0}$ (to 360), $^{+1.4}_{0}$ (to 800)				
Working piston speed		mm/s	50 to 1000 (Set the speed within the range of allowable energy absorption.)				
Cushion			Air cushion				
Effective air cushion length		mm	14.6	16.6	16.6	20.6	23.6
Lubrication			Not required (Use Grade 1 ISO VG 32 Turbine oil, if lubrication is preferred)				
Allowable energy absorption	Cushioned		4.29	8.37	15.8	27.9	49.8
	No cushion		If "No cushion is selected, the large energy generated by the external load cannot be absorbed. So an external shock absorber should be used.				

Note1. SCA2-T2 is not heat resistance type cylinder. This is the one which includes only fluorine rubber packings. Cylinder switch is mountable on the cylinder of this type.

7.2 Switches Specifications

(1) H type switch

Type & Model	Strong magnetic field proof reed 2-wire		
Item	H0		H0Y (2 color indicator type)
Applications	For use with Programmable controller, relay		For use with programmable controller
Load Voltage	DC12/24V	AC110V	DC24V
Load Current	5 to 50mA(Note2)	7 to 20mA(Note2)	5 to 20mA(Note2)
Internal voltage drop	5V or less		6V or less
Indicator light	Green LED (ON lighting)		Red / green LED (ON lighting)
Leakage current	10 μ A or less		
Lead wire length (Note 1)	Standard 1m (Fire-resistant cabtyre cord, 2-core, 0.5mm^2)		
Shock resistance	294m/s^2		
Insulation resistance	100MΩ or more measuring with DC500V megger tester		
Withstand voltage	No abnormalities should occur after applying AC1000V for 1 minute		
Ambient temperature	-10 to 60℃		
Degree of protection (Note 3)	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance		

Note 1: 3m or 5m long lead wire is optionally available.
Note 2: Max. load current above is value at 25℃.The current will be lower if the temperature around switch is higher than 25℃. (50% at 60℃)

(2) T type switch

Type & Model / Item	Reed 2-wire			
	T0H,T0V		T5H,T5V	
Applications	For use with Programmable controller, relay		For use with Programmable controller, relay IC circuit(without indicator light), series connection	
Load Voltage	DC12/24V	AC110V	DC5/12/24V	AC110V
Load Current	5 to 50mA (Note2)	7 to 20mA (Note2)	50mA or less	20mA or less
Current consumption	—			
Internal voltage drop	3V or less		0V	
Indicator light	LED (ON lighting)		Without indicator light	
Leakage current	0mA			
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-core, 0.2mm²)			
Shock resistance	294m/s²			
Insulation resistance	20 MΩ or more measuring with DC500V megger tester			
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute			
Ambient temperature	-10 to 60℃			
Degree of protection (Note 3)	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance			

Type & Model / Item	Reed 2-wire		
	T8H,T8V		
Applications	For use with programmable controller, relay,		
Load Voltage	DC12/24V	AC110V	AC220V
Load Current	5 to 50mA (Note2)	7 to 20mA (Note2)	7 to 10mA (Note2)
Current consumption	—		
Internal voltage drop	3V or less		
Indicator light	LED (ON lighting)		
Leakage current	0mA		
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-core, 0.3mm²)		
Shock resistance	294m/s²		
Insulation resistance	100 MΩ or more measuring with DC500V megger tester		
Withstand voltage	No abnormalities should occur after applying AC1,500V for 1 minute		
Ambient temperature	-10 to 60℃		
Degree of protection (Note 3)	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance		

Type & Model / Item	Solid state 2-wire	
	T2H,T2V	T2YH,T2YV
Applications	For use with programmable controller	
Load Voltage	DC10 to 30V	
Load Current	5 to 20mA (Note 2)	
Current consumption	—	
Internal voltage drop	4V or less	
Indicator light	LED (ON lighting)	Red/Green LED (ON lighting)
Leakage current	1mA or less	
Lead wire length (Note 1)	Standard 1m (Oil-proof cabtyre cord, 2-core, 0.2mm²)	Standard 1m (Oil-proof vinyl cabtyre cord, 2-core 0.3mm²)
Shock resistance	980m/s²	
Insulation resistance	20 MΩ or more measuring with DC500V megger tester	100 MΩ or more measuring with DC500V megger tester
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute	
Ambient temperature	-10 to 60℃	
Degree of protection(Note3)	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance	

Type & Model / Item	Solid state 2-wire	
	T2JH,T2JV	T1H,T1V
Applications	For use with programmable controller	For use with Programmable controller, relay small solenoid calve
Load Voltage	DC10 to 30V	AC85 to 265V
Load Current	5 to 20mA (Note 2)	5 to 100mA (Note2)
Current consumption	—	
Internal voltage drop	4V or less	7V or less
Off delay time	200±50ms	—
Indicator light	LED (ON lighting)	
Leakage current	1mA or less	1mA or less at AC100V 2mA or less at AC200V
Lead wire length (Note 1)	1m (Oil-proof cabtyre cord, 2-core, 0.3mm²)	1m (Oil-proof vinyl cabtyre cord, 2-core, 0.3mm²)
Shock resistance	980m/s²	
Insulation resistance	100 MΩ or more measuring with DC500V megger tester	
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute	No abnormalities should occur after applying AC1,500V for 1 minute
Ambient temperature	-10 to 60℃	
Degree of protection (Note 3)	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance	

Type & Model / Item	Solid state 3-wire	
	T3H,T3V	T3YH,T3YV
Applications	For use with programmable controller, relay	
Power supply voltage	DC10 to 28V	
Load Voltage	DC30V or lower	
Load Current	100mA or less	50mA or less
Current consumption	10mA or lower when it is on at DC24V	
Internal voltage drop	0.5V or lower	
Indicator light	LED (ON lighting)	Red/Green LED (ON lighting)
Leakage current	10μA or lower	
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 3-core, 0.2mm²)	
Shock resistance	980m/s²	
Insulation resistance	20 MΩ or more measuring with DC500V megger tester	100 MΩ or more measuring with DC500V megger tester
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute	
Ambient temperature	-10 to 60℃	
Degree of protection (Note 3)	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance	

7 SPECIFICATION

Item	Solid state 2-wire	
	T2YD	T2YDT
Applications	For use with programmable controller	
Load voltage	DC24V±10%	
Load current	5 to 20mA	
Current consumption	—	
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 (Note 1)	1m(Oil-proof vinyl cabtyre cord, 2-wire, 0.5mm²) (Standard)	1m(Fire-resistant vinyl cabtyre cord, 2-wire, 0.5mm²) (Option)
Shock resistance	980m/s²	
Insulation resistance	100MΩ or more at DC500V megger tester	
Withstand voltage	No abnormalities should occur after applying AC 1,000V for 1 minute	
Ambient temperature	-10 to 60℃	
Degree of protection (Note3)	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance	

Note 1: 3m or 5m long lead wire is optionally available.
Note 2 :Max. Load current above is value at 25℃. The current will be lower if the temperature aryound switch is higher than 25℃. (50% at 60℃)
Note 3: Time to the generation of switch output through detection of magnet by magnetic sensor.