CKD

SM－3435－A

INSTRUCTION MANUAL

SELEX CYLINDER

SCA2－P Series

(Adjustable stroke type・Extend)

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

CKD Corporation

The 3rd edition

For Safety Use

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

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

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

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, **read this operation manual carefully for proper operation.**

Observe the cautions on handling described in this manual, as well as the following instructions:

⚠ CAUTION :

- Before performing an overhaul inspection on the actuator, deactivate residual pressure completely.
- While the actuator is operating, do not step into or place hands in the driving mechanism.
- To prevent an electric shock, do not touch the electric wiring connections (exposed live parts) of the actuator equipped with a solenoid valve or switch.
  Perform an overhaul inspection with the power off. Also, do not touch these live parts with wet hands.

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SCA2-P
(Adjustable stroke type・Extend)

Manual No. SM-3435-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

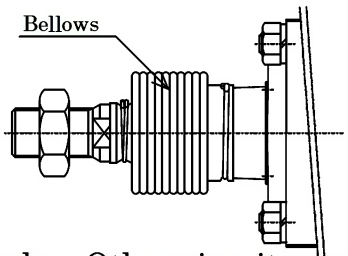
2.1 Installation

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.

Ambient temperature of bellows Unit : ℃

Material of bellows	Max. ambient temperature	Momentary Max. temp.
Polyolefin elastomer	60	100
Silicon rubber glass cloth	250	400

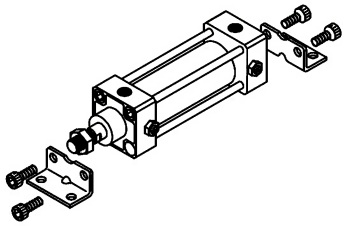
Note : Momentary max. temperature is the temperature as sparks or welding spatter hitting bellows momentarily.



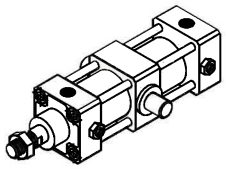
3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.
4) Assembly of mounting bracket:
The mounting bracket are supplied with the cylinder at the time of deliver. Install them as shown in the figures on this page.
However, the trunnion types (TC, TA and TB) are shipped with the trunnion mounted.

● Assembly of mounting bracket (same as disassembling)

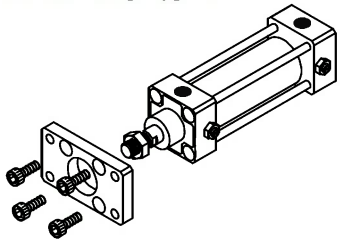
Foot mount type (LB)



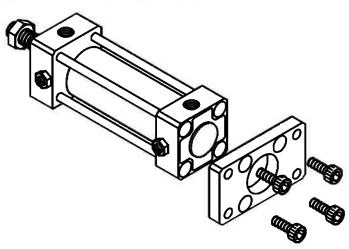
Intermediate trunnion type (TC)



Rod side flange type (FA)

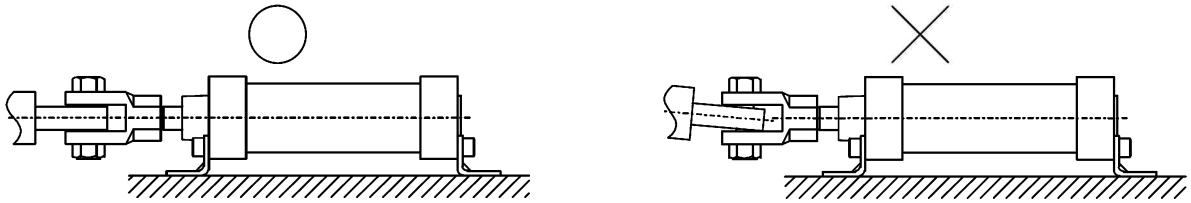


Head side flange type (FB)



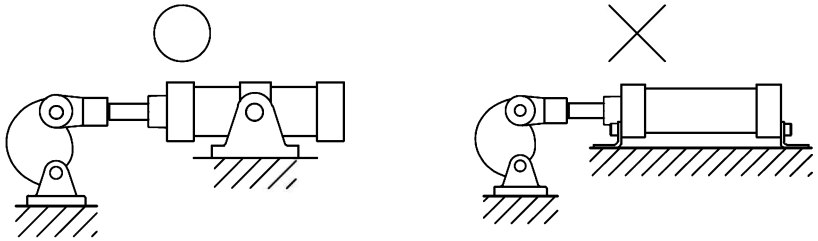
5) When cylinder is fixed and rod end is guided:
In case the piston rod of cylinder and the load are misaligned, the bushes and packings of the cylinder are extremely worn out. Hence, connect them with CKD floating connector (spherical bearing).

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 using a cylinder with a long stroke, install support to prevent damage to the rod caused by rod sagging, tube deflection, vibration, or external weight.

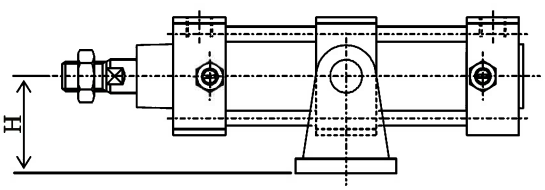
8) When the load acting direction changes with the cylinder operation:
Use an oscillating cylinder (trunnion type) capable of making revolution to a certain angle. Furthermore, install the rod and connecting metal (knuckle) so that it moves in the same direction as the cylinder main body does.



Trunnion type　　Foot mount type

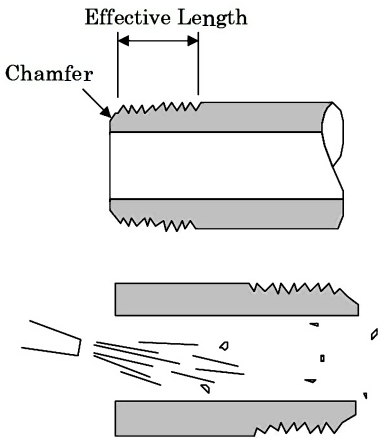
9) If clearance between the clevis or trunnion and mate bearing is large, bending will be applied on the pin or shaft. Do not increase this clearance too much. (Recommended maximum fitting : H10/e8)

10) If height H from the bearing bracket installation to the bearing position is high, a large force will be generated at the bracket installation section because of cylinder force. This could damage bolt, etc.

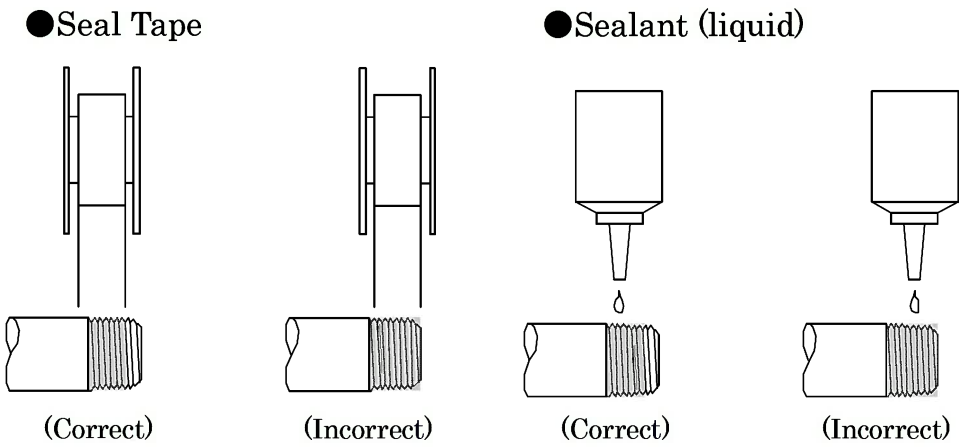


2.2 Piping

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.

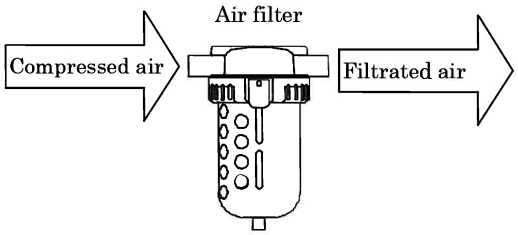


6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system. 2 .

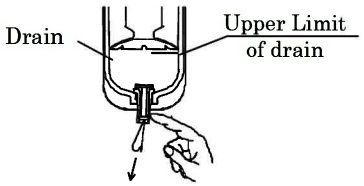


2.3 Fluid

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.

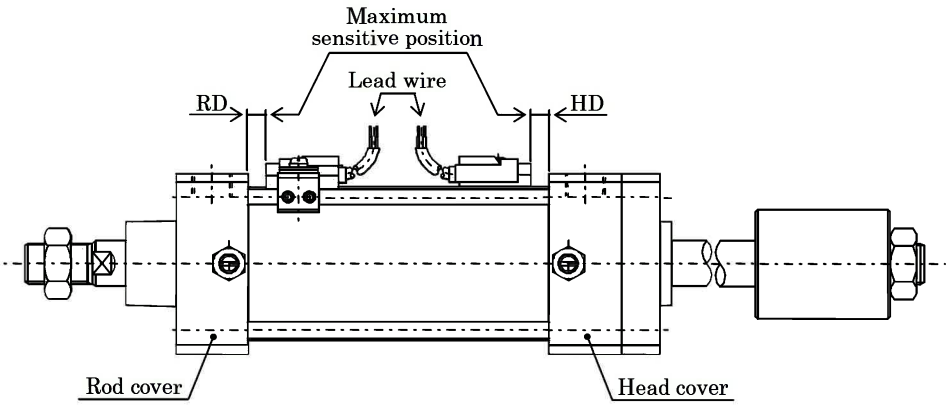


3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

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.



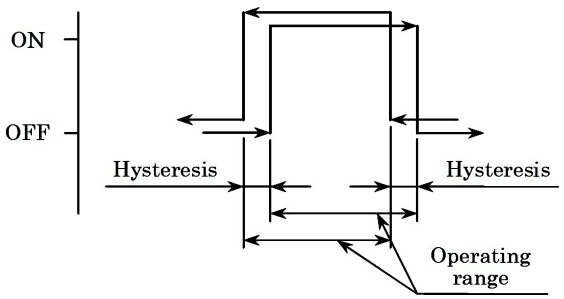
(1) At the stroke end
Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the maximum sensitive position.

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



4) Maximum sensitive position, operating range and hysteresis

R type (Unit: mm)

Item / Bore size	Maximum sensitive position	Solid state switch (R1, R2, R2Y, R3, R3Y)				Reed switch (R0, R4, R5, R6)	
	HD/RD	Operating range		Hysteresis		Operating range	Hysteresis
		One color type	Two color type	One color type	Two color type		
φ40	5.5	6.5 to 11.5	10 to 14	1.5 or less	1.0 or less	9.5 to 12.5	3 or less
φ50	7.5	8 to 12.5	12 to 16			10.5 to 14.5	
φ63		7.5 to 12.5					
φ80	9	8 to 13.5				11.5 to 15.5	
φ100	13	8 to 14	12 to 17			12 to 16	

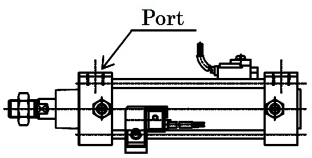
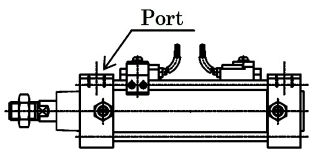
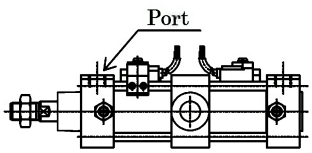
T2YD type (Unit: mm)

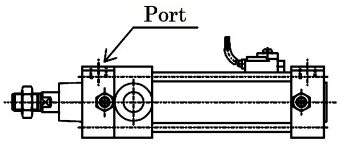
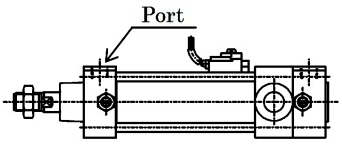
Item / Bore size	Maximum sensitive position	Strong magnetic field proof switch Solid state switch type (T2YD)			
	HD/RD	Operating range		Hysteresis	
		One color type	Two color type	One color type	Two color type
φ40	10	—	6.5 to 9	—	1.5 or less
φ50	12	—	7 to 10		
φ63		—			
φ80	13.5	—	7.5 to 10.5		
φ100	17.5	—	8 to 11		

5) Location of switches mounted at ex-factory

Switches are mounted at the maximum sensitive position on cylinder. The location along circumference of cylinder differs in accordance with stroke. Refer the table below.

(Unit : mm)

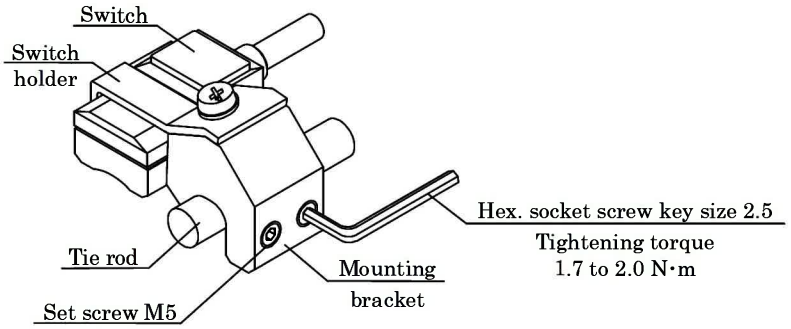
Item	Different surface installation				Same surface installation				Center trunnion mounted			
Rough sketch												
Switch quantity / Bore size (mm)	1	2	3	4	1	2	3	4	1	2	3	4
40 dia.	25	25	35	50	25	50	100	150	86(66)	86(66)	92(92)	92(92)
50 dia.	25	25	40	55	25	50	100	150	86(66)	86(66)	92(92)	92(92)
63 dia.	25	25	40	55	25	35	100	150	91(71)	91(71)	97(97)	97(97)
80 dia.	25	25	40	55	25	25	100	150	96(76)	96(76)	102(102)	102(102)
100 dia.	25	25	40	55	25	25	100	150	106(86)	106(86)	112(112)	112(112)

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 quantity / Bore size (mm)	1	1
40 dia.	38(28)	38(28)
50 dia.	36(26)	36(26)
63 dia.	41(31)	41(31)
80 dia.	44(34)	44(34)
100 dia.	50(40)	50(40)

Note 1 : Value in ( ) for R * B (terminal box type).

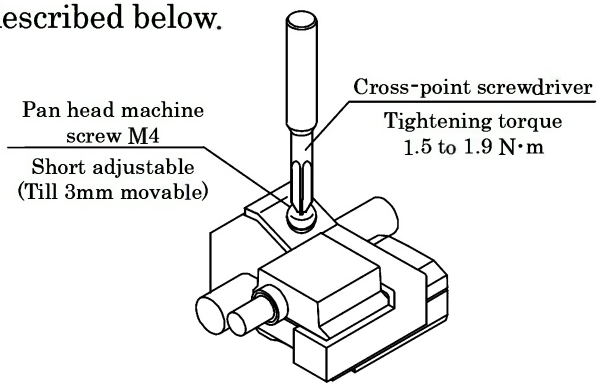
Note 2 : When stroke length is not greater than 15mm, two switches could turn ON at the same time. In this case, adjust the distance between switches as far as possible.

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.

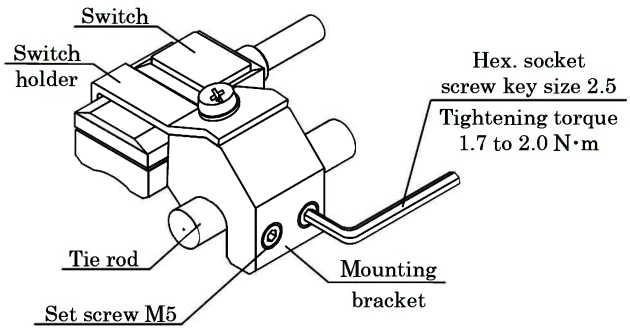


7) Installation of switch
Follow the procedures (1) to (3) as described below.

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



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



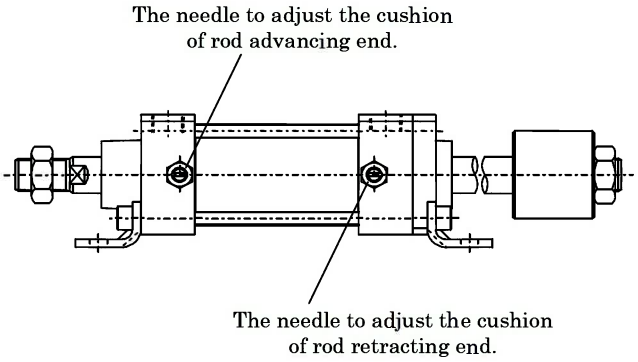
(3) To fix the mounting bracket on the tie rod, tighten screws while pressing bracket slightly against tube. Adequate torque of tightening screw is 1.7 to 2.0 N・m. It is considered to be sufficient, as a rule of thumb, when Allen wrench starts bending slightly.

3. OPERATION

3.1 Operating the Cylinder

1) The cylinder feed pressure is 0.1 to 1.0 MPa hence regulate the pressure within this pressure range.

2) Though the cushion has been adjusted at no load when delivered, adjust the cushion needle when the change of cushion effect is required.
Tightening the needle (clockwise) makes cushion more effective. Tighten the needle lock nut all the way after adjustment.



However, if kinetic energy such as load is heavy or speed is too fast, exceeding the values given in Table 1, consider of providing a shock absorber.

Table 1. Cushion characteristic chart

Bore size (mm)	Effective air cushion length (mm)	Allowable energy absorption (J)	
		With cushion	Without cushion
ϕ40	14.6	4.29	0.067
ϕ50	16.6	8.37	0.079
ϕ63	16.6	15.8	0.079
ϕ80	20.6	27.9	0.201
ϕ100	23.6	49.8	0.301

Note) The type without cushion cannot absorb a large energy generated by an external load.
We recommend installation of an external shock absorbing device.

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

3.2 How to adjustable stroke

1) Caution

(1) Release air before adjusting stroke.

(2) When carrying out stroke adjustment more than effective cushion length, a cushion completely loses its effect.

2) How to adjustable stroke

(1) Please fit a steel bar or a bolt over the hole made in a stopper's side, and loosen a lock nut with a adjustable spanner or a spanner. (Refer to Table 2 for a size.)

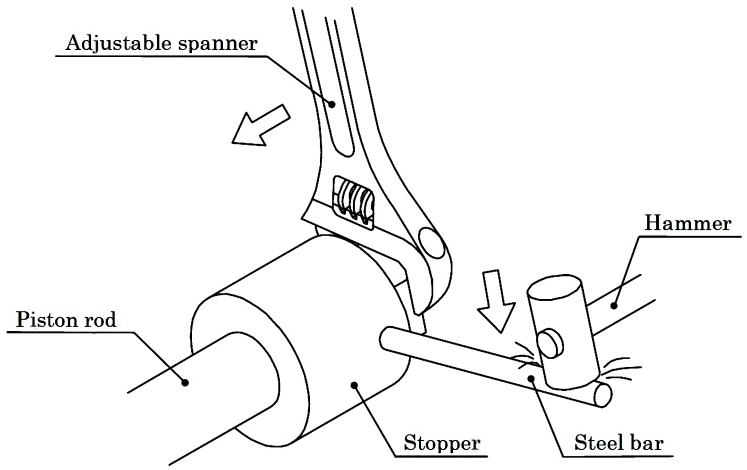
Table2. Width across flats

Bore size (mm)	Hole diameter of stopper (mm)	Width across flats of lock nut (mm)
φ40	φ6	22
φ50	φ6	27
φ63	φ6	27
φ80	φ10	32
φ100	φ10	41

(2) If it adjusts to a predetermined stroke and a stopper's position is determined, please fit a bar or a bolt over a stopper's hole, and tighten a lock nut with a adjustable spanner. (Please fix the lock nut with a adjustable spanner, with a hammer, strike shockingly a bar or the bolt fitted over a stopper's hole, and tighten it. The torque with a bundle is as in Table 3.)

Table3. Adjustable stroke recommended tighten torque.

Bore size (mm)	Recommended tighten torque (N･m)
φ40	67.7
φ50	108
φ63	108
φ80	147
φ100	289



3.3 How to use the Switches

3.3.1 Common items

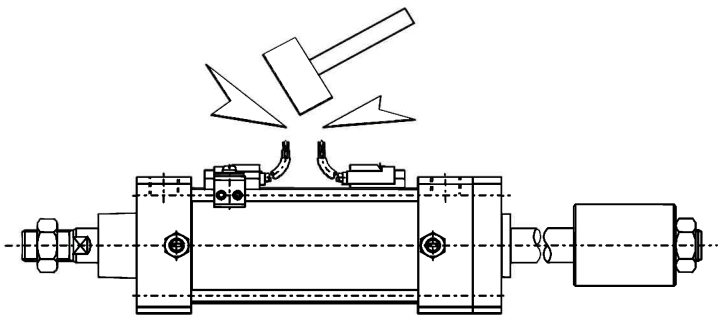
1) Magnetic environment
Do not use a switch other than the strong magnetic field proof switch in a place where strong magnetic field or large current (large magnet or spot welding machine, etc.) exists around the switch mounting position. If a cylinder with the switch is installed in parallel to this 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 activating the switch halfway of the stroke, the relay may not respond if the working piston speed is too fast.
When the operation time of the relay is 20 ms, operate the product at a working piston speed of 500 mm/s or less.

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



3.3.2 Reed switch type switch (R0, R4, R5, R6)

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 R0 switch, carefully check following items (1), (2).

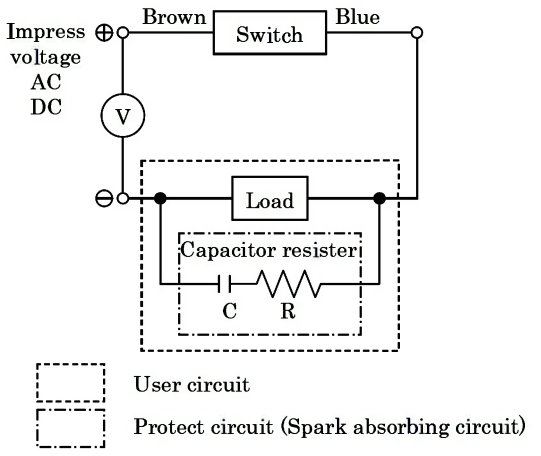
(1) When using the switch for DC power supply, connect the brown and blue lines to the positive and negative sides, respectively. If these lines are connected reversely, the switch is activated, but the indicator light is not lit.
(2) When the switch is connected to an AC relay or a programmable controller 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.
Note that the R4 and R5 switches have no polarities.

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

Table 4

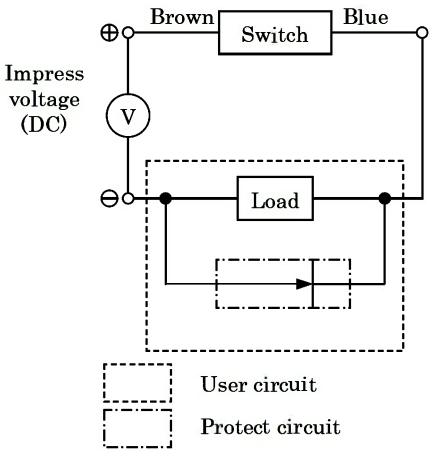
Switch	Electric power	Length of wire
R0, 5, 6	DC	100m
R0, 5	AC	10m
R4	AC	50m

(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

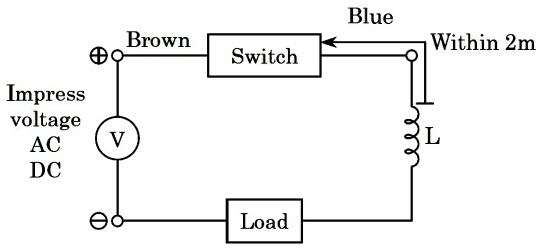
Fig.1 When capacitor resister is used.



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

Fig.2 When diode is used.

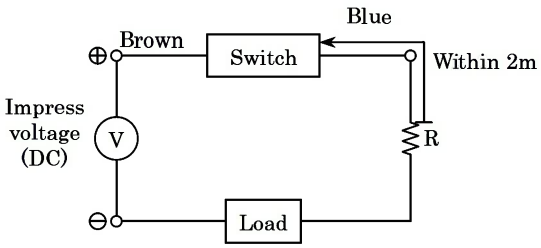
(2) Protective circuit when the wire length exceeds that stated Table 4.



・ 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. (R0, R6)

(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 R0 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 R0 switches are connected in series.

$2.4V \times 3 = 7.2\ V$

Since the voltage drop at the R5 switch is 0V, as many switches as required can be connected in series. When one R0 switch is used for checking of operation and R5 switch is used for other switches, they can be used with the voltage drop equivalent to one R0 switch (2.4V). In this case, the indicator light is lit only when all switches are turned ON.
If two R4 switches are connected at 100V AC or three or more R4 switches are connected at 200V AC, the indicator light is not lit. Additionally, the R6 switch cannot be connected in series.

(6) Parallel connection

When multiple R0 and R5 switches are connected in parallel, there are no limitations on the number of switches. When multiple R4 and R6 switches are connected in parallel, the Leakage current increases for the number of switches. Therefore, carefully check the load specifications to determine the number of switches to be connected.

However, if multiple R0 and R6 switches are turned ON at the same time, the indicator light becomes dark or is not lit. For R4 switch, if even one R4 switch is turned ON, all indicator lights go off.

3.3.3 Solid state switch (R1, R2, R3, 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 R2 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 R3 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 R3 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.

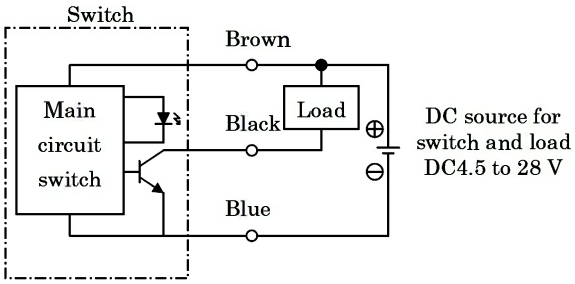


Fig.1 Fundamental circuit Example (1)
(In case the same source of power is used.)

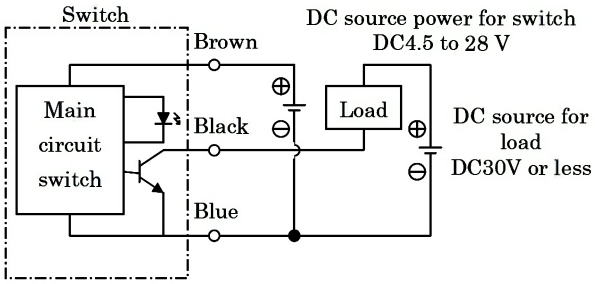


Fig.2 Fundamental circuit Example (2)
(In case individual sources of power are used.)

2) Connection load

The R1 switch can be connected to a load, such as AC programmable controller, relay, solenoid, or solenoid valve.

The R2 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 R3 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 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 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 "Trouble shooting", 5 should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

4.2 Disassembly

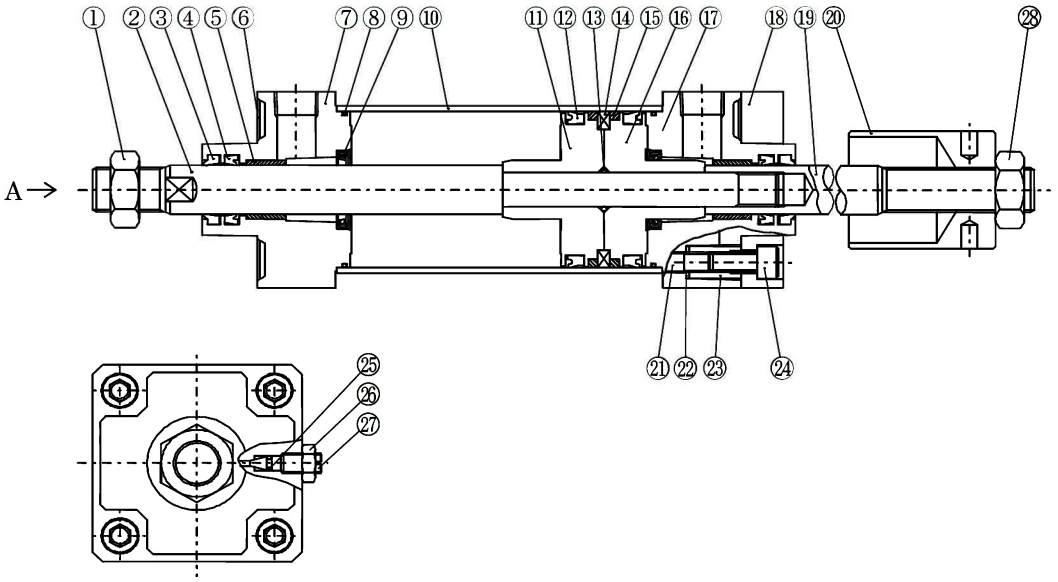
Should any air leakage occur, take the following corrective actions.

1) Prepare the following tools for disassembling.

Disassembling tools

Name	Qty	Place of use	Applicable tube ID (mm)
Hex. bar spanner (Nominal 8)	2	21	40, 50, 63
Hex. bar spanner (Nominal 12)	2	21	80, 100
Spanner (Nominal 13)	1	26	For all tube ID
Standard driver (Nominal 5.5×75)	1	27	For all tube ID
Minus tip screwdriver (Nominal 9×200)	1	9	For all tube ID
Ice pick	1	3, 4	For all tube ID

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



Viewed from A

Part No.	Part Name	Material	Part No.	Part Name	Material
1	Rod nut	Steel	15	Wear ring	Acetar resin
2	Piston rod (1)	Steel	16	Piston H	Aluminum alloy die casting
3	Dust wiper	Nitrile rubber	17	Head cover	Aluminum alloy die casting
4	Rod packing seal	Nitrile rubber	18	Plate	Steel
5	Bush	Oil impregnated bearing alloy	19	Piston rod (2)	Steel
6	Masking plate	Aluminum alloy	20	Adjustable stopper	Steel
7	Rod cover	Aluminum alloy die casting	21	Tie rod	Steel
8	Cylinder gasket	Nitrile rubber	22	Conical spring washer	Steel
9	Cushion packing seal	Urethane rubber, steel	23	Round nut	Steel
10	Cylinder tube	Aluminum alloy	24	Hex. soc. hd. cap screw	Steel
11	Piston R	Aluminum alloy die casting	25	Needle gasket	Nitrile rubber
12	Piston packing seal	Nitrile rubber	26	Needle nut	Copper alloy
13	Piston gasket	Nitrile rubber	27	Cushion needle	Copper alloy
14	Magnet	Plastic magnet	28	Lock nut	Steel

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

Bore size (mm) / Parts name / Kit No.	No.	③	④	⑧	⑨
		Dust wiper	Rod packing seal	Cylinder gasket	Cushion packing seal
φ40	SCA2-P-40K	SFR-16K	PNY-16	F4-667115	F4-436638
φ50	SCA2-P-50K	SFR-20K	PNY-20	AS568-031	F4-436639
φ63	SCA2-P-63K	SFR-20K	PNY-20	AS568-035	F4-436639
φ80	SCA2-P-80K	SFR-25K	PNY25	AS568-041	F4-436640
φ100	SCA2-P-100K	SFR-30K	PNY30	AS568-044	F4-436641

Bore size (mm) / Parts name / Kit No.	No.	⑫	⑮	㉕
		Piston packing seal	Wear ring	Needle gasket
φ40	SCA2-P-40K	PMY-40	F4-650239	P-3
φ50	SCA2-P-50K	PMY-50	F4-650240	P-3
φ63	SCA2-P-63K	PMY-63	F4-650241	P-3
φ80	SCA2-P-80K	PMY-80	F4-650242	P-3
φ100	SCA2-P-100K	PMY-100	F4-650243	P-3

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) Disassembly
(1) Shut off the fluid and remove the residual pressure.
(2) Disconnect pipes from cylinder.
(3) As the hexagon nut ㉔ is removed, each mounting bracket.
(4) As the Round nut ㉓ is removed, the rod cover ⑦, cylinder tube ⑩, head cover ⑰, tie rod ㉑, conical spring washer ㉒ can then be removed.
(5) Cushion needle ㉖ comes out when needle nut ㉗ is removed.

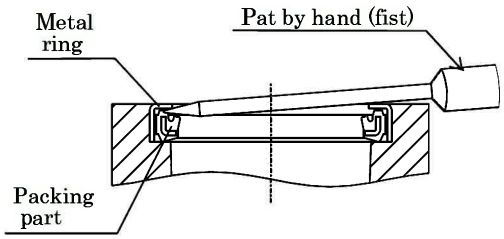
6) About cushion packing

As for ⑨ cushion packing , the kind of cushion packing changes with manufacture years. Remove in the following procedure after checking the manufacture day of manufacture name plate.

In addition, even if it exchanges for different cushion packing from before, a difference is not in the performance of cushion packing.

〈Manufacture years : The product by March,2002〉

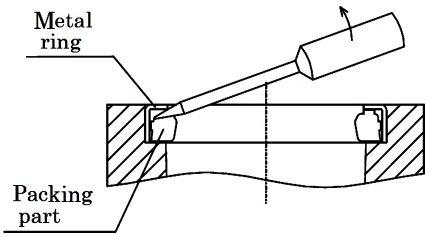
About the product by March, 2002, core metal is contained in the packing part, exchange of only the packing part cannot be performed. Exchange together with the metal ring.



Using the corner of cover as fulcrum and pushing a minus screw driver etc. on the metal ring, the metal ring is removed by patting a grip of the driver.

〈Manufacture years : The product after April, 2002〉

About the product after April, 2002, core metal is not contained in the packing part, exchange of only the packing part can be performed.



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.)

4.3 Assembly

1) Assembly procedure

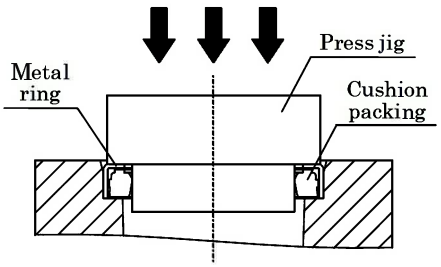
(1) Clean each component parts.

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

〈About assembling of cushion packing〉

Manufacture years : The product by March, 2002, needs to press the metal ring in the case of cushion packing exchange. Work according to the following procedure.



The packing part is incorporated in the metal ring so that a surface with a protruding portion may be on the metal ring side.
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 0.1 to 0.2mm below the top surface of the cover.

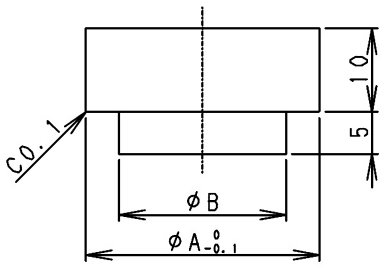


Table 5 and the illustration is an example of the jig.

Table 5. Press jig dimension

Bore size (mm)	A	B
φ40	28	20
φ50, φ63	32	24
φ80	45	35
φ100	55	45

2) 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. Table 6 displays the recommended range of torque for tightening.

Table 6. Tightening torque

Bore size (mm)	Torque (N·m)
φ40, φ50, φ63	10.0
φ80, φ100	35.5

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.INSTALLATION" as for replacing a switch and correcting its location.

6. HOW TO ORDER

6.1 How to order product

● Without Switch

SCA2-P – LB – 40 N B – 100 – 25 ———— S I

● With switch

SCA2-P – LB – 40 N B – 100 – 25 – R0 – R – S I

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

(a) Mounting style Note1		(b) Bore size (mm)		(c) Pipe thread type	
00	Basic type	40	φ40	Blank	Rc
LB	Axial foot type	50	φ50	N	NPT (custom order)
FA	Rod side flange type	63	φ63	G	G (custom order)
FB	Head side flange type	80	φ80		
TC	Center trunnion type	100	φ100		
TA	Rod side trunnion type				
TB	Head side trunnion type				

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

(d) Cushion		(e) Stroke length (mm) Note2			(f) Adjustable stroke range (mm)	
B	Both sides cushion	Bore size	Standard stroke length	Max. stroke length	20	20
R	Rod side cushion				50	50
H	Head side cushion	φ40	25・50・75・100・150・200・250・300・350・400・450・500	600	75	75
N	Non cushion	φ50			100	100
		φ63				
		φ80		700		
		φ100		800		

Note2 : When exceeding maximum stroke length, refer to catalog.

(g) Switch model No.						(h) Switch quantity	
Grommet type	Terminal box type		Switch type	Display	Lead wire	R	One on rod side
	Std. type	Splash-prf				H	One on head side
R1※	R1B	R1A	Solid state	1 color indicator	2 wire	D	Two
R2※	R2B	R2A				T	Three
R2Y※	R2YB	R2YA		2 color indicator			
T2YD※	—	—		Strong magnetic field proof switch	2 wire		
T2YDT※	—	—					
R3※	R3B	R3A		1 color indicator	3 wire		
R3Y※	R3YB	R3YA		2 color indicator			
R0※	R0B	R0A	Reed	1 color indicator	2 wire	※ Lead wire length	
R4※	R4B	R4A				Blank	1m (standard)
R5※	R5B	R5A		without indicator light		3	3m (option)
R6※	R6B	R6A		1 color indicator		5	5m (option)

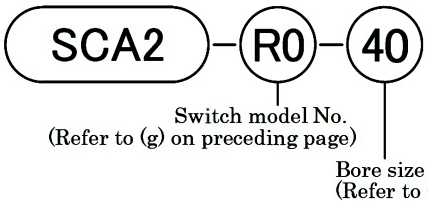
※ mark indicates the length of lead wire.

(i) Option Note3				(j) Accessory Note4	
		Max. ambient	Instant max.	I	Rod eye
J	Bellows	100℃	200℃	Y	Rod clevis (pin and snap ring attached)
L	Bellows	250℃	400℃	B4	Trunnion type No.2 bracket
M	Piston rod material change (stainless steel)				
Blank	Cushion needle position R (standard)				
S	Cushion needle position S				
T	Cushion needle position T				
P6	Copper and PTFE free (custom order)				

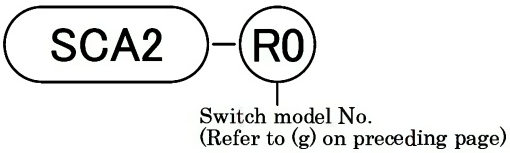
Note3 : Instantaneous maximum is the temperature when spark and spatter etc. instantaneously contact to bellows.
Note4 : "I" and "Y" cannot be selected simultaneously.

6.2 How to order switch

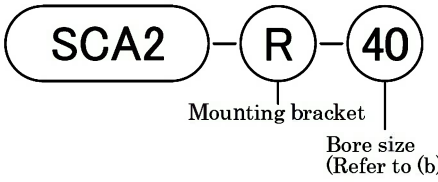
(A) Switch body + Mounting bracket



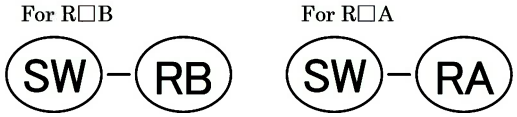
(B) Switch alone



(C) Set of mounting bracket

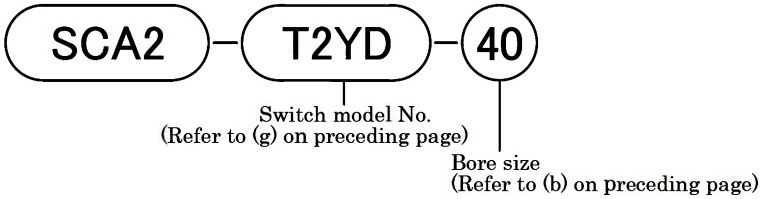


(D) Terminal box alone

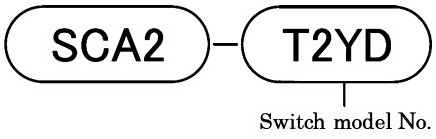


● T2YD type switch component parts Model coding

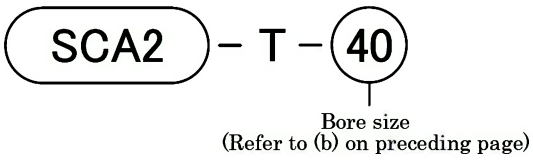
(A) Switch body + Mounting bracket



(B) Switch alone



(C) Set of mounting bracket



6.3 How to order mounting bracket

Mounting bracket \ Bore size (mm)	φ40	φ50	φ63	φ80	φ100
Foot (LB)	S1-LB-40	S1-LB-50	S1-LB-63	S1-LB-80	S1-LB-100
Flange (FA)	S1-FA-40	S1-FA-50	S1-FA-63	S1-FA-80	S1-FA-100

7. SPECIFICATION

7.1 Cylinder specifications

Model / Item			SCA2-P (stroke adjustable type・extend)				
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	0.1				
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 1000)				
Working piston speed		mm/s	50 to 1000 (Set the speed within the range of energy absorption.)				
Cushion			Air cushion				
Effective air cushion length		mm	14.6	16.6	16.6	20.6	23.6
Adjustable stroke range		mm	25, 50, 75, 100				
Lubrication			Not required (Use Grade 1 ISO VG 32 Turbine oil, if lubrication is preferred)				
Allowable energy absorption	With cushion	J	4.29	8.37	15.8	27.9	49.8
	Without cushion		0.067	0.079	0.079	0.201	0.301
			The type without cushion cannot absorb a large energy generated by an external load. We recommend installation of an external shock absorbing device.				

7.2 Switch specifications

Type & Model / Item	Reed switch type switch				
	R0			R4	
Applications	For use with relay, programmable controller			For use with high capacity relay, solenoid valve	
Load Voltage	DC12/24V	AC110V	AC220V	AC110V	AC220V
Load Current	5 to 50mA	7 to 20mA	7 to 10mA	20 to 200mA	10 to 200mA
Internal voltage drop	2.4V or lower			2V or lower	
Indicator light	Lit when LED is on			Lit when neon indicator light is off	
Leakage current	0mA			1mA or lower	
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.3mm²)				
Shock resistance	294m/s²				
Insulation resistance	20 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)	For Grommet - IEC Standard IP67, JIS C0920 (water tight type), Oil resistance				

Type & Model / Item	Reed switch type switch			
	R5			R6
Applications	For use with programmable controller, relay, IC circuit (without indicator light), series connection			For use exclusively with programmable controller (with DC self-holding function)
Load Voltage	DC12/24V	AC100V	AC200V	DC24V
Load Current	50mA or lower	20mA or lower	10mA or lower	5 to 50mA
Internal voltage drop	0V			5V or lower
Indicator light	Without			Lit when LED is on
Leakage current	0mA			0.1mA or lower
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.3mm²)			
Shock resistance	294m/s²			
Insulation resistance	20 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)	For Grommet - IEC Standard IP67, JIS C0920 (water tight type), Oil resistance			

Type & Model / Item	Solid state switch		
	R1	R2	R2Y (2-color display)
Applications	For use with programmable controller, relay, compact solenoid valve	For use exclusively with programmable controller	
Power supply voltage	—		
Load voltage	AC85 to 265V	DC10 to 30V	
Load current	5 to 100mA	5 to 30mA (Note 2)	
Current consumption	—		
Internal voltage drop	7V or lower	4V or lower	
Indicator light	Lit when LED is on		LED (Red/Green) (Lights while power is ON)
Leakage current	1mA or lower at ac110V 2mA or lower at ac220V	1mA or lower	1.2mA or lower
Lead wire length (Note 1)	Standard 1 m (Oil-proof vinyl cabtyre cord, 2-wire, 0.3mm²)		
Shock resistance	980m/s²		
Insulation resistance	20 MΩ or more measuring with DC500V megger tester		
Withstand voltage	AC1,500V for 1 minute	AC1,000V for 1 minute	
Ambient temperature	-10 to 60℃		
Degree of protection (Note 3)	For Grommet - IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance		

Type & Model / Item	Solid state switch		
	R3	R3Y (2-color display)	T2YD
Applications	For use with programmable controller, relay, IC circuit, compact solenoid valve		For use exclusively with programmable controller
Power supply voltage	DC4.5 to 28V		—
Load voltage	DC30V or lower	DC30V or lower	DC24V±10%
Load current	200mA or lower	150mA or lower	5 to 20mA
Current consumption	10mA or lower when it is on at DC24V	16mA or lower when it is on at DC24V	—
Internal voltage drop	0.5V or lower at 150mA	0.5V or lower	6V or lower
Indicator light	Lit when LED is on	LED (Red/Green) (Lights while power is ON)	Red/Green LED is lit when switch is on
Leakage current	10 μA or lower		1.0mA or lower
Output delay time (ON delay, OFF delay) (Note 4)	—		30 to 60mS
Lead wire length (Note 1)	Standard 1 m (Oil-proof vinyl cabtyre cord, 3-wire, 0.2mm²)		Standard 1 m (Oil-proof vinyl cabtyre cord, 2-cord, 0.5mm²) (Note 5)
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	AC1,000V for 1 minute		
Ambient temperature	-10 to 60℃		
Degree of protection (Note 3)	For Grommet - IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance		

Note 1 : 3m or 5m long lead wire is optionally available.
Note 2 : Maximum value, 30mA is at 25℃ of ambient temperature. Load current decreases less than 30mA when the ambient temperature exceeds 25℃.
Note 3 : R※B terminal box is not water-proof. The water-proof R※A type box (Matsushita Denko made) is the order made item.
Note 4 : This shows a period of time between detection of the magnet by the magnetic sensor and sending of switch output.
Note 5 : Non-flammable cabtyre cable available as option.
Note : This switch cannot be used under direct-current magnetic field environment.