CKD

SM－209145－A

INSTRUCTION MANUAL

SELEX CYLINDER

Position locking type

SCA2-Q2

- 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 4th 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.

[SM-209145-A]

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SCA2-Q2
Selex Cylinder
Position locking type
Manual No. SM-209145-A

1. UNPACKING

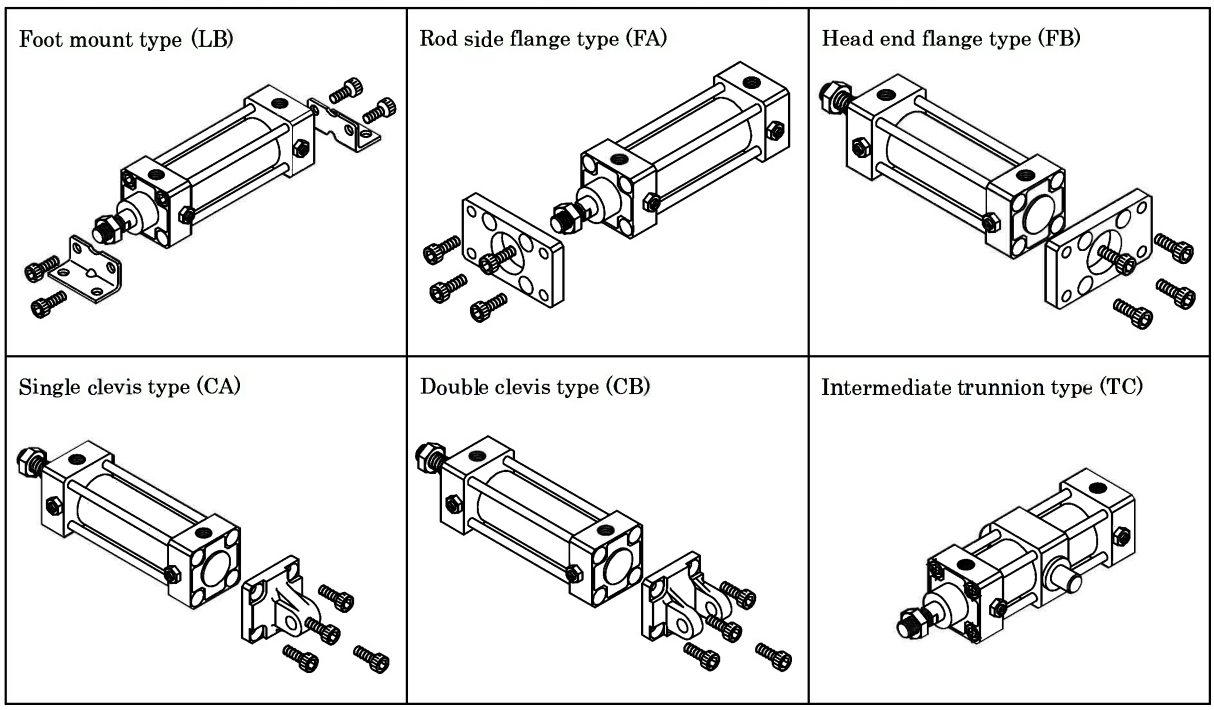
1) Make sure that the type No. on the nameplate of the delivered Selex Cylinder matches the type No. you ordered.
2) Check the appearance for any damage.
3) Stop up the piping port with a sealing plug to prevent the entry of foreign substances into the cylinder. Remove the sealing plug before piping.

2. INSTALLATION

2.1 Installation

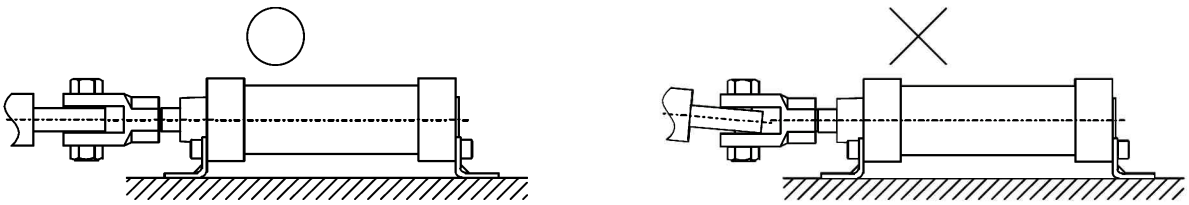
1) The ambient temperature for this cylinder is -10 to 60℃ (to be unfrozen).
2) Consult CKD, when the cylinder is used in the dusty atmosphere, because there may be a case that foreign substances go inside through breathing hole of locking mechanism and cause malfunction.
3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.
4) 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 supporting metal fitting (same as disassembling)

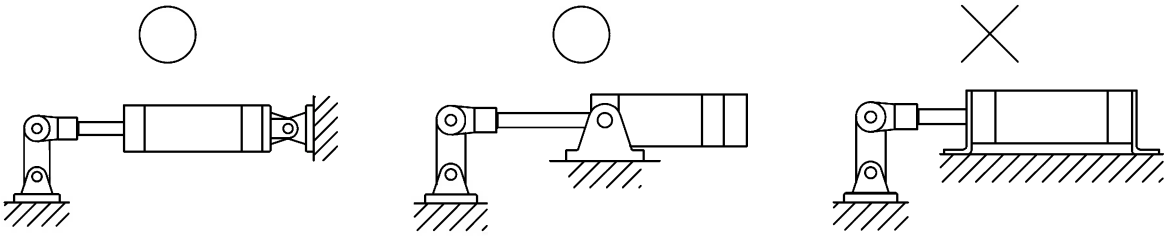


5) When cylinder is fixed and rod end is guided:
In case the piston rod of cylinder and the load are misaligned, the bushes and packings of the cylinder are extremely worn out. Hence, connect them with CKD floating connector (spherical bearing).

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.



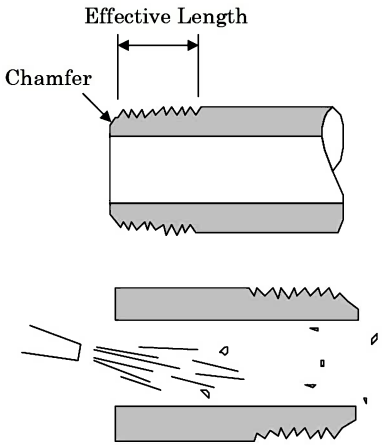
7) When the load acting direction changes with the cylinder operation:
Use an oscillating cylinder (clevis type or trunnion type) capable of making revolution to a certain angle. Furthermore, install the rod and connecting metal (knuckle) so that it moves in the same direction as the cylinder main body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



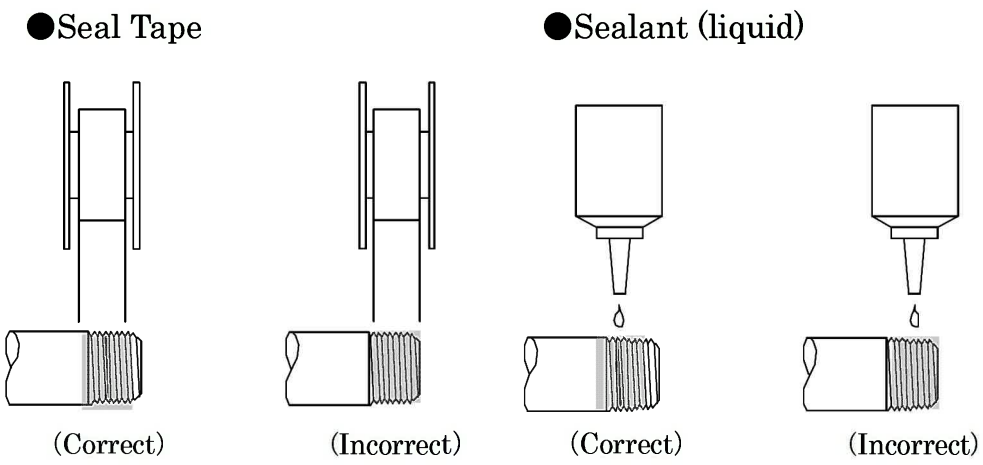
Clevise type　　Trunnion type　　Foot mount type

2.2 Piping

1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc.
2) See to it that the pipe connecting cylinder and solenoid valve has effective cross-sectional area which is needed for the cylinder to drive at the specified speed.
3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust, foreign substance in the drain of the pipe.
4) Be sure observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.
5) Flush air into the pipe to blow out foreign substances and chips before piping.

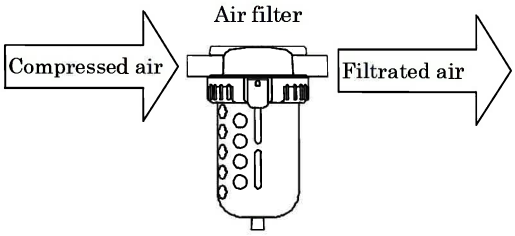


6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

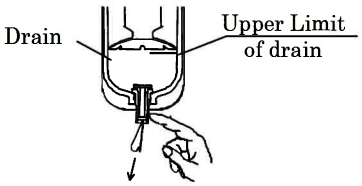


2.3 Fluid

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



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

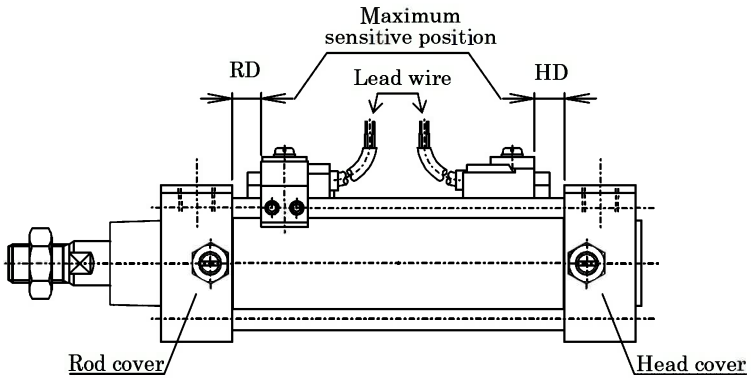


3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

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

2.4 Location of Mounting Switches on a Cylinder

1) Location of mounting switches on a cylinder.



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

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

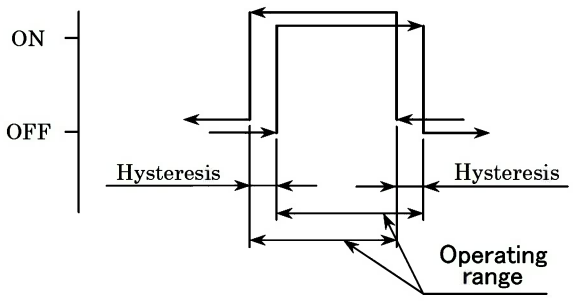
(3) Location around the circumference of cylinder
There is no restriction. However,90° interval around circumference will be the most appropriate location when considered convenient posture of mounting tie rods.

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

3) Hysteresis

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

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



4) Maximum sensitive position (HD・RD), operating range and hysteresis.

T series maximum sensitive position (RD/HD) (Unit:mm)

Item / Bore size	T0H/V,T5H/V T2H/V,T3H/V		T2JH/V,T2YD T2YDT,T1H/V		T8H/V	
	RD	HD	RD	HD	RD	HD
φ40	11	15.5	10	14.5	5	9.5
φ50	13	18	12	17	7	12
φ63	13	19	12	18	7	13
φ80	14.5	23.5	13.5	22.5	8.5	17.5
φ100	18.5	29.5	17.5	28.5	12.5	23.5

T series Operating range (Unit:mm)

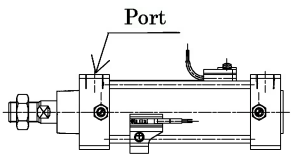
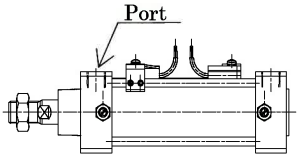
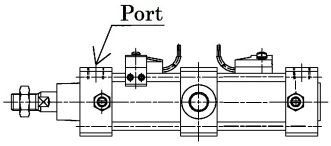
Item / Bore size	T0H/V,T5H/V T8H/V	T1H/V,T2H/V T3H/V,T2JH/V	T2YD T2YDT
φ40	5～12.5	2～7	6.5～9
φ50	5.5～13.5	2～7.5	7～10
φ63	5.5～14	2.5～7.5	7～10
φ80	6.5～14.5	3～8	7.5～10.5
φ100	6.5～15.5	3～8.5	8～11

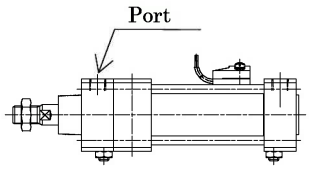
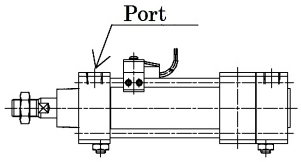
T series Hysteresis (Unit:mm)

Item / Bore size	T0H/V,T5H/V T8H/V	T1H/V,T2H/V T3H/V,T2JH/V	T2YD T2YDT
φ40～φ100	3 on less	1.5 on less	1.5 on less

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.

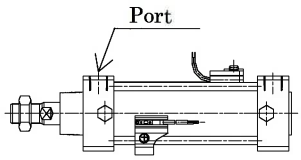
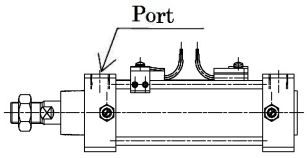
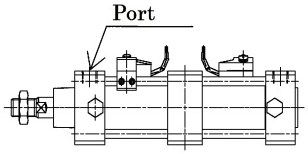
T 0／T 5 Series (Unit : mm)

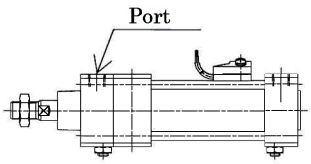
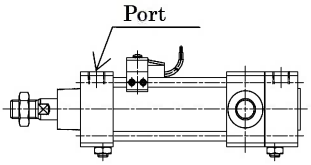
Item	Different surface installation				Same surface installation				Center trunnion mounted			
Rough sketch												
Switch quantity / Bore size(mm)	1	2	3	4	1	2	3	4	1	2	3	4
ϕ40	20(10)	20(20)	40(40)	60(60)	20(10)	60(45)	105(75)	150(105)	135(135)	135(135)	200(170)	200(170)
ϕ50	15(10)	20(20)	40(40)	60(60)	15(10)	20(20)	65(50)	65(60)	160(160)	160(160)	160(160)	160(160)
ϕ63	15(10)	20(20)	40(40)	60(60)	15(10)	20(20)	70(55)	70(60)	135(120)	135(120)	135(125)	135(125)
ϕ80	15(15)	25(25)	45(45)	65(65)	15(15)	25(25)	70(55)	70(65)	140(110)	140(110)	140(130)	140(130)
ϕ100	15(15)	25(25)	45(45)	70(70)	15(15)	25(25)	70(55)	70(70)	150(120)	150(120)	150(145)	150(145)

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
ϕ40	50(50)	50(50)
ϕ50	60(60)	60(60)
ϕ63	50(45)	50(45)
ϕ80	55(40)	55(40)
ϕ100	60(45)	60(45)

Note1 : ( )Dimensions of T□V switch.
Note2 : 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.

T 8 Series (Unit : mm)

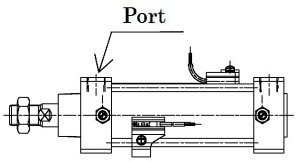
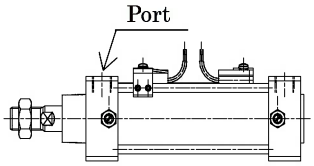
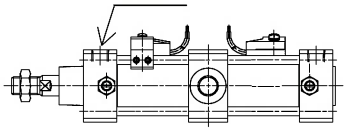
Item	Different surface installation				Same surface installation				Center trunnion mounted			
Rough sketch												
Switch quantity / Bore size(mm)	1	2	3	4	1	2	3	4	1	2	3	4
ϕ40	15(10)	20(20)	40(40)	60(60)	15(10)	50(35)	95(65)	140(95)	125(125)	125(125)	190(160)	190(160)
ϕ50	10(10)	20(20)	40(40)	60(60)	10(10)	20(20)	70(55)	70(60)	150(150)	150(150)	175(175)	175(175)
ϕ63	10(10)	20(20)	40(40)	60(60)	10(10)	20(20)	70(55)	70(60)	120(110)	120(110)	140(140)	140(140)
ϕ80	15(15)	25(25)	45(45)	65(65)	15(15)	25(25)	70(55)	70(65)	130(100)	130(100)	145(145)	145(145)
ϕ100	15(15)	25(25)	45(45)	65(65)	15(15)	25(25)	70(55)	70(65)	140(110)	140(110)	155(155)	155(155)

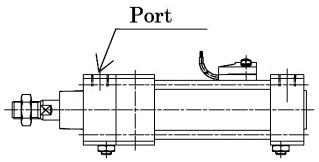
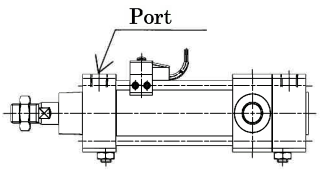
Item	Rod side trunnion mounted	Head side trunnion mounted
Rough sketch	 The piston at rod side stroke end cannot be detected	 The piston at head side stroke end cannot be detected.
Switch quantity / Bore size(mm)	1	1
ϕ40	45(40)	45(40)
ϕ50	50(50)	50(50)
ϕ63	45(35)	45(35)
ϕ80	50(35)	50(35)
ϕ100	55(40)	55(40)

Note1 : ( )Dimensions of T□V switch.

Note2 : 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.

T 1 ／T 2 ／T 3 ／T 2 Y／T 3 Y Series (Unit : mm)

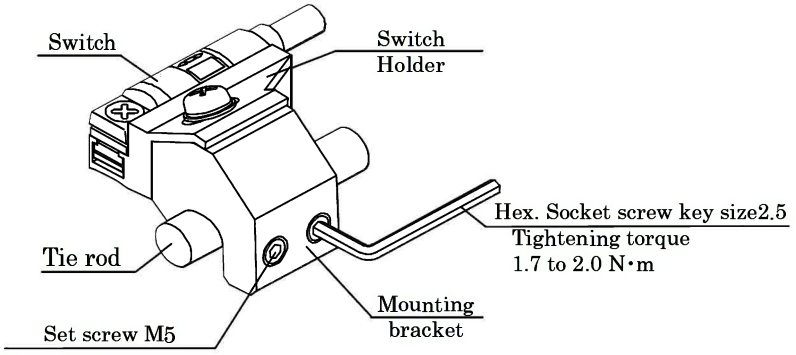
Item	Different surface installation				Same surface installation				Center trunnion mounted			
Rough sketch												
Switch quantity / Bore size(mm)	1	2	3	4	1	2	3	4	1	2	3	4
ϕ 40	20(10)	20(15)	25(25)	40(40)	20(10)	60(45)	105(75)	150(105)	130(100)	130(100)	190(160)	190(160)
ϕ 50	15(10)	15(15)	25(25)	40(40)	15(10)	15(15)	60(45)	60(45)	130(00)	130(100)	130(105)	130(105)
ϕ 63	15(10)	15(15)	25(25)	40(40)	15(10)	15(15)	60(45)	60(45)	135(105)	135(105)	135(110)	135(110)
ϕ 80	15(10)	15(15)	30(30)	45(45)	15(10)	15(15)	60(45)	60(45)	140(110)	140(110)	140(120)	140(120)
ϕ 100	10(10)	15(15)	30(30)	45(45)	10(10)	15(15)	60(45)	60(45)	150(120)	150(120)	150(130)	150(130)

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
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)

Note1 : ( )Dimensions of T□V switch.

Note2 : 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.

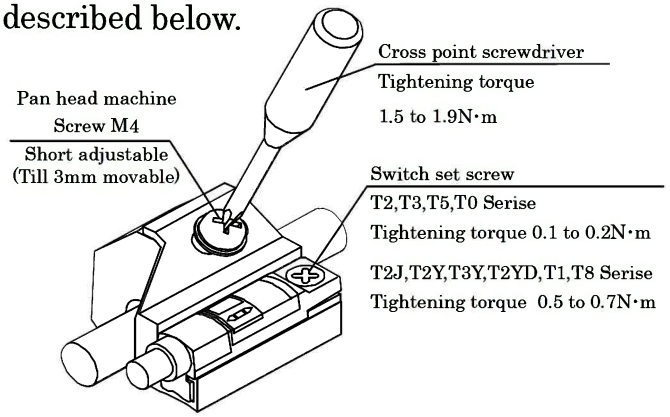


7) Installation of switch
Follow the procedures (1) to (3) as described below.

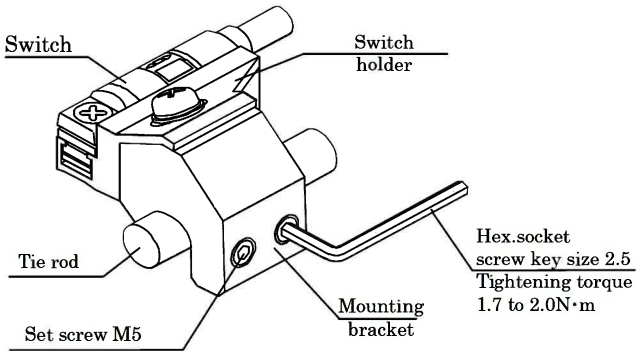
(1) While holding a switch underneath of switch holder, tighten M4×10 pan headed machine screws to mount it on the bracket.

※1 : In case of T2YD/T2YDT,
Slotted Hexagon head bolt

※2 : In case of T2YD/T2YDT,
Slotted-head screwdriver.



(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.



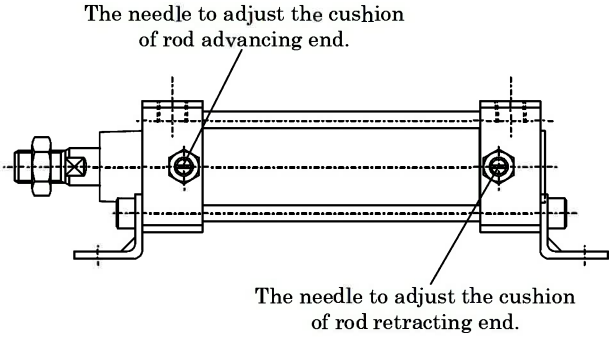
(3) To fix the mounting bracket on the tie rod, tighten screws while pressing bracket slightly against tube. Adequate torque of tightening screw is 1.7 to 2.0 N・m. It is considered to be sufficient, as a rule of thumb, when Allen wrench starts bending slightly.

3. OPERATION

3.1 Operating the Cylinder

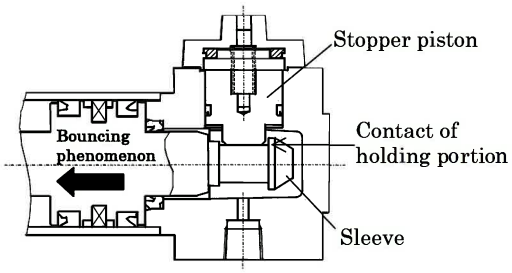
1) The cylinder feed pressure is 0.1 to 1.0 MPa hence regulate the pressure within this pressure range.
Let the load factor of the cylinder be 50 % or less.

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



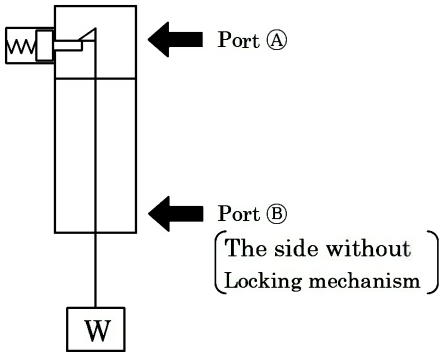
Please consider the accumulator separately when the kinetic energy is larger than the permissible absorption energy of "7.1 cylinder specification" as the load heavy and speed are fast etc.

If the cushion If the cushion adjusting needle on the locking mechanism side is fastened too tight, the piston bounces on the stroke end to bring the sleeve and the stopper piston into contact with a bump, thereby resulting in damage in the locking mechanism. On the other hand, if the cushion adjusting needle is opened too much, the piston bounces on the end of stroke, it also causes damage to the mechanism. Make adjustments of the needle for the cushion so as not to allow bouncing of the piston.
When an external cushion dumper (such as a shock absorber) is used to stop the piston, it is also needed to make adjustments so as not to allow bouncing of the piston.
Conduct periodic inspections once or two times a year to check for damage on the holding portion by this phenomenon.

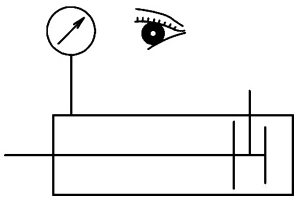


3) Adjust the working piston speed with the speed controller mounted.

4) To release the locking, be sure to remove the load to locking mechanism by supplying pressure to the port B first where no locking mechanism is installed.
It is quite dangerous to supply pressure to the A direct while piston is being locked after both ports A and B are exhausted because the piston rod is apt to pop out all the sudden due to the load on the tip of piston rod. When the port A is pressurized, at the same moment, pilot line releases the locking mechanism.

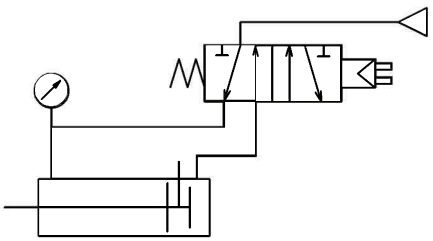


5) Confirm by an air gage, before starting daily operation, that the cylinder chamber where no locking device mounted (port B) is adequately pressurized.

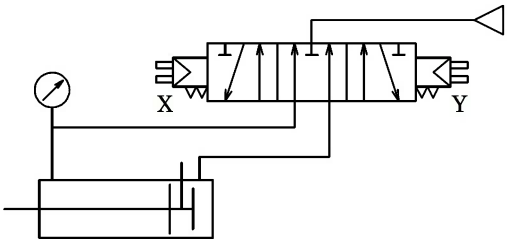


6) During the design of circuit layout, make sure the pressure delivery just before starting daily operation is so arranged as shown on the illustration.

(A) A satisfactory layout



(B) A sample of layout which requirs a particular consideration to start a system.



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

7) There is a tendency that it takes some lengthy time before locking when the exhausting air speed is excessively slow from the chamber of locking mechanism side. (For instance, speed control is set at low speed while piping is long and small diameter.)
When pressure becomes 0.1MPa or less, it locks automatically.

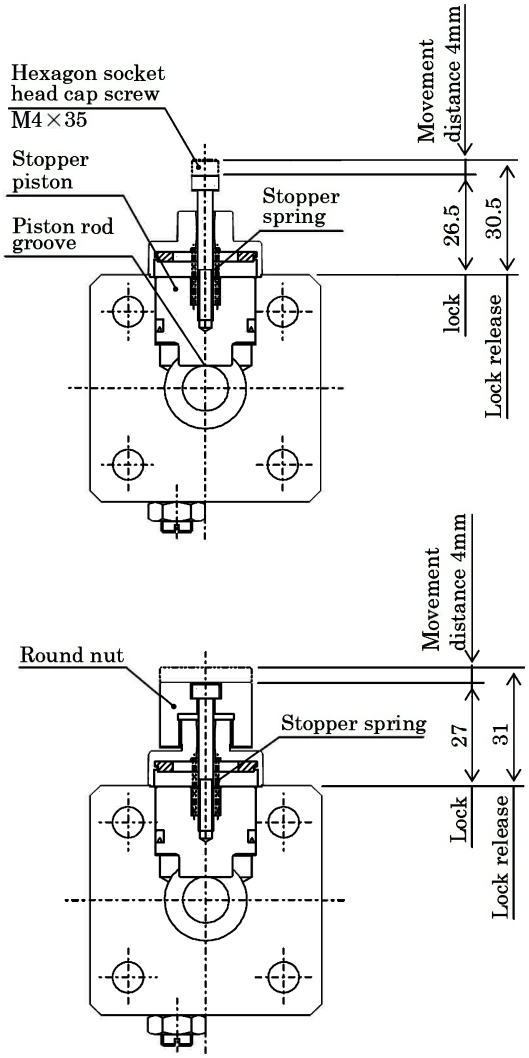
8) There is approx. 1mm play along piston rod axis under locking status.

9) It only locks when piston comes to its stroke end of mechanism side.

10) Unlocking procedures by manual control.

(a) Non-lock manual device (option M0)
Screw a hexagon socket head cap screw into a stopper piston, and pull the bolt 4 mm with more than 20N. Movement of stopper piston results in unlocking. (For no load horizontal installation or the oppsite side port pressurization) releasing a hand leads to return of stopper piston by integrated spring force, and inserting this into piston rod groove results in locking of piston.

(b) Lock manual device (option M1)
Turning the round nut counterclockwise results in stopper piston movement and release of lock.
Turning the round nut clockwise to set at the lock position leads to return of the stopper pin. Inserting this pin into the piston rod groove results in locking.



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.

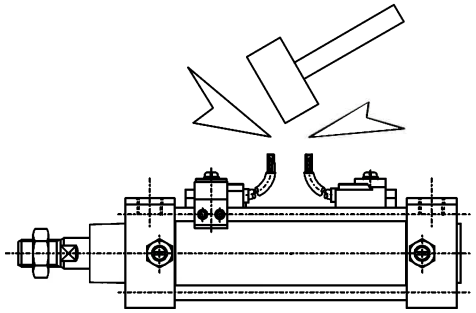
3) Operating temperature
Do not operate the product at a high temperature (Over than 60℃).
Always avoid operation of the product in a hot place due to temperature characteristics of magnetic and electronics parts.

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) Shock resistance
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)

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.

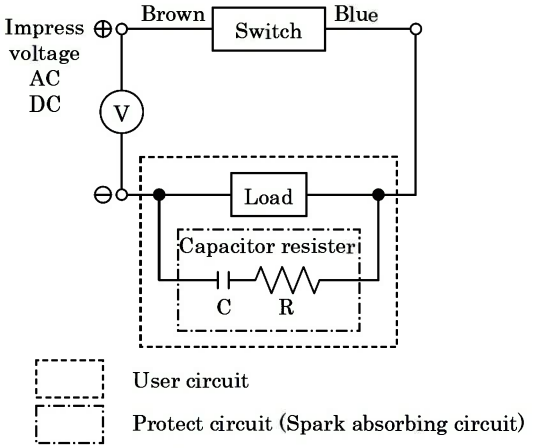
2) Contact capacity
Do not use a load exceeding the maximum contact capacity of the switch. Additionally, if the current is lower than the rated current value, the indicator light may not be lit.

Table1

Electric power	Length of wire
DC	50m
AC	10m

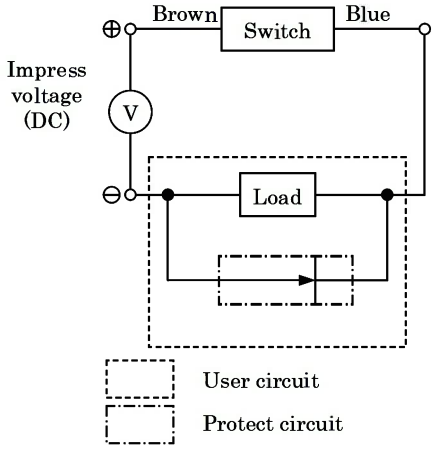
3) Contact protective measures
When an inductive load, such as relay is used or the wire length exceeds that stated in Table 1, always install a contact protective circuit.

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



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

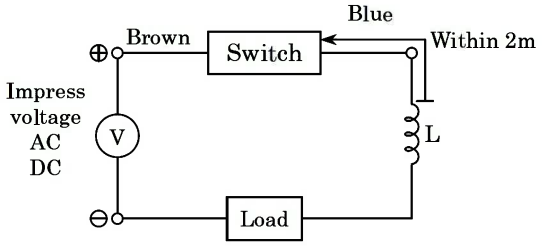
Fig.1 When capacitor resister
(In case the same source of power is used.)



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

Fig.2 When diode is used.

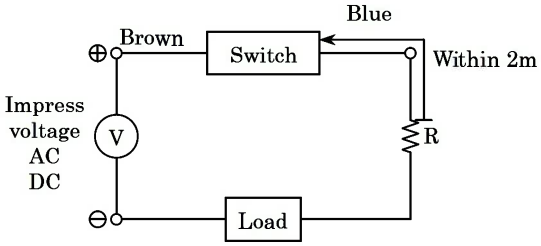
(2) Protective circuit when the wire length exceeds that stated Table 1.



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

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

Fig.3



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

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

Fig.4

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

5) Serial connection
Total voltage loss, when connected T0 switches in series, equals to the sum of respective voltage loss of each switch.
The total voltage loss becomes equivalent to one T0 (approx. 2.4V) when connecting the combination of one T0 for actuation confirming and rest of T5 switches. Indicator light is lit only when all switches turn on.

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

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

1) Connection of lead cord

Comply with the color coding specified on the illustrations. Be sure to turn the power off before starting connecting work.
An erroneous wiring or short circuiting of load causes damage to not only switches, but also load side circuit. Wiring work without shutting electricity off may cause damage to the load side circuit.

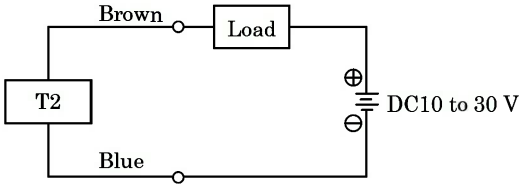


Fig.1 Fundamental circuit Example

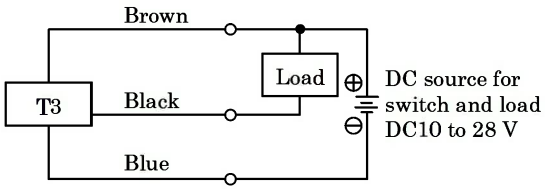


Fig.2 Fundamental circuit Example (1)
(In case the same source of power is used.)

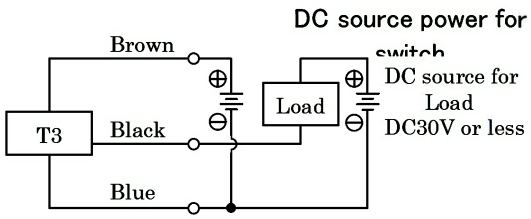


Fig.3 Fundamental circuit Example (2)
(In case individual sources of power are used.)

2) Output circuit protection

Install some protective circuit as illustrated in Fig. 4 when inducing type load (Relay or solenoid valve) are to be used because those types apt to generate surge current switch off.

Install some protective circuit as illustrated in Fig. 5 when capacitor type load (Capacitor type) are to be used, because these types apt to generate a dash current when turning the switch ON.

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

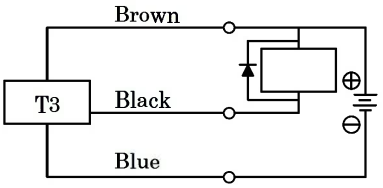
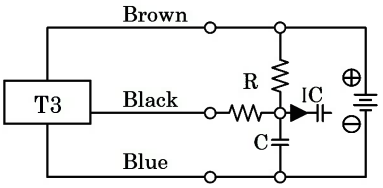


Fig.4 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



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

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

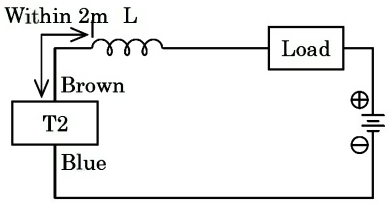


Fig.6 ・Choke coil
L = a couple hundred μH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

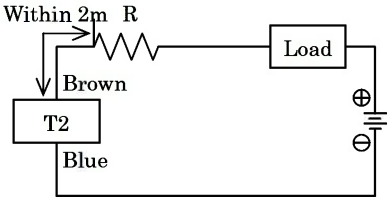


Fig.7 ・Dash current restriction resister.
R = As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

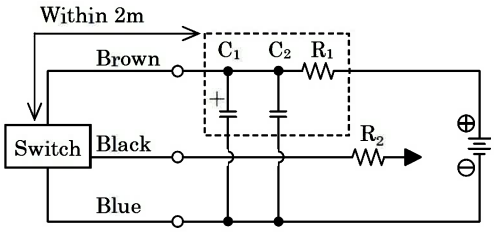


Fig8 ・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor
(Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30 Ω

・Dash current restriction resister.
R_2=As much large resister as the load circuit can afford.
・Install it nearby the switch (Within 2m)

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

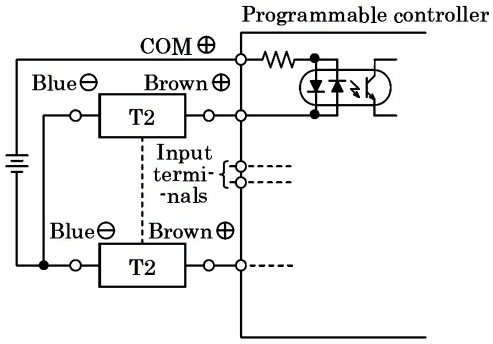


Fig.9 An example of T2 connection to source input type (an external power source)

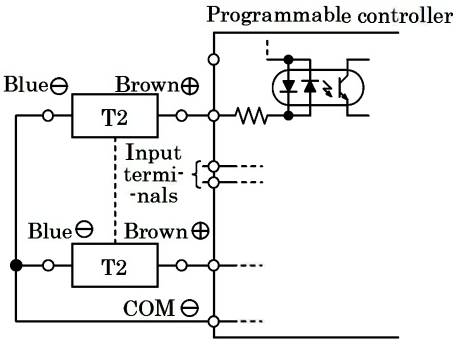


Fig.10 An example of T2 connection to source input type (an internal power source)

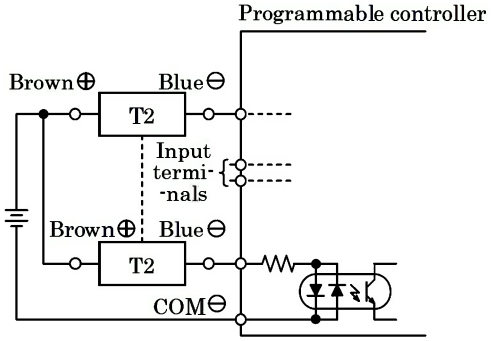


Fig.11 An example of T2 connection to source input type

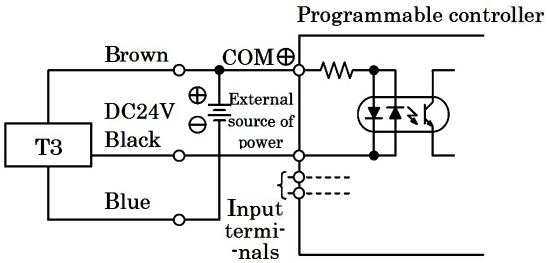


Fig.12 An example of T3 connection to source input type (an internal power source)

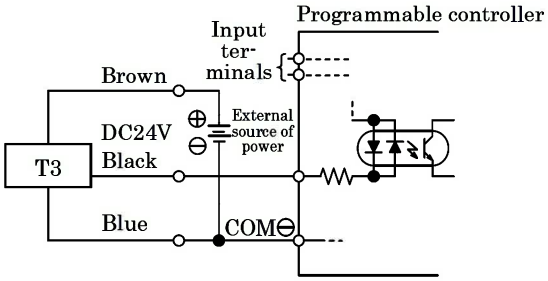


Fig.13 An example of T3 connection to source input type (an internal power source)

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

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

5) Strong magnetic field proof switch(T2YD)

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

This strong magnetic field proof switch can be used for all T-type strong magnetic field non-contact switch (T2YD) built-in cylinder models or operated in a status that the welding cable is in contact with the cylinder or switch.
However, this switch cannot be used for two or more welding cables or within the cable loop.

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

3.3 Principle of Mechanism Motion

1) Locking Motion

(a) Stopper piston ③ is pushed up by the slant of sleeve tip ② as the piston ① of cylinder approaches to its stroke end.(fig. 1)
The stopper piston ③, however, is held up by the pressure when the pressure within the chamber Ⓐ is 0.1 Mpa or higher.

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

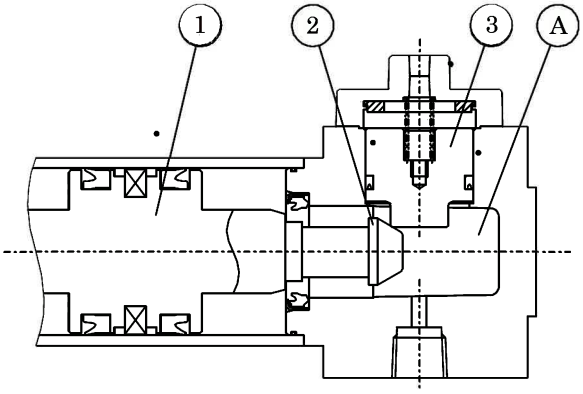


Fig. 1

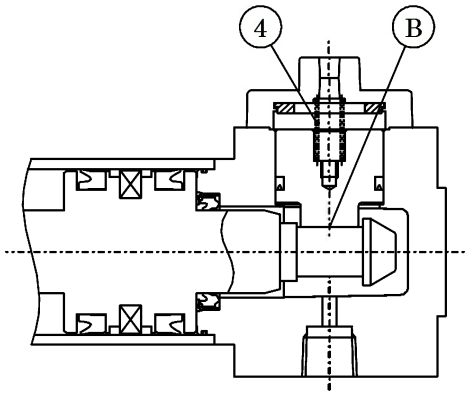


Fig.2

2) Unlocking Motion

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

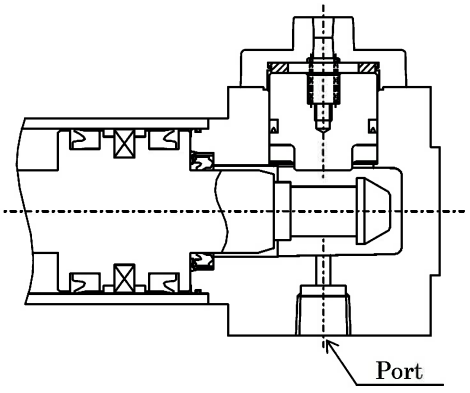


Fig. 3

4. MAINTENANCE

4.1 Periodical Inspection

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

2) Inspection items
(1) Check the bolts and nuts fitting the piston rod end 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.
(7) Check if the position locking mechanism is securely locked.

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

4.2 Disassembling

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

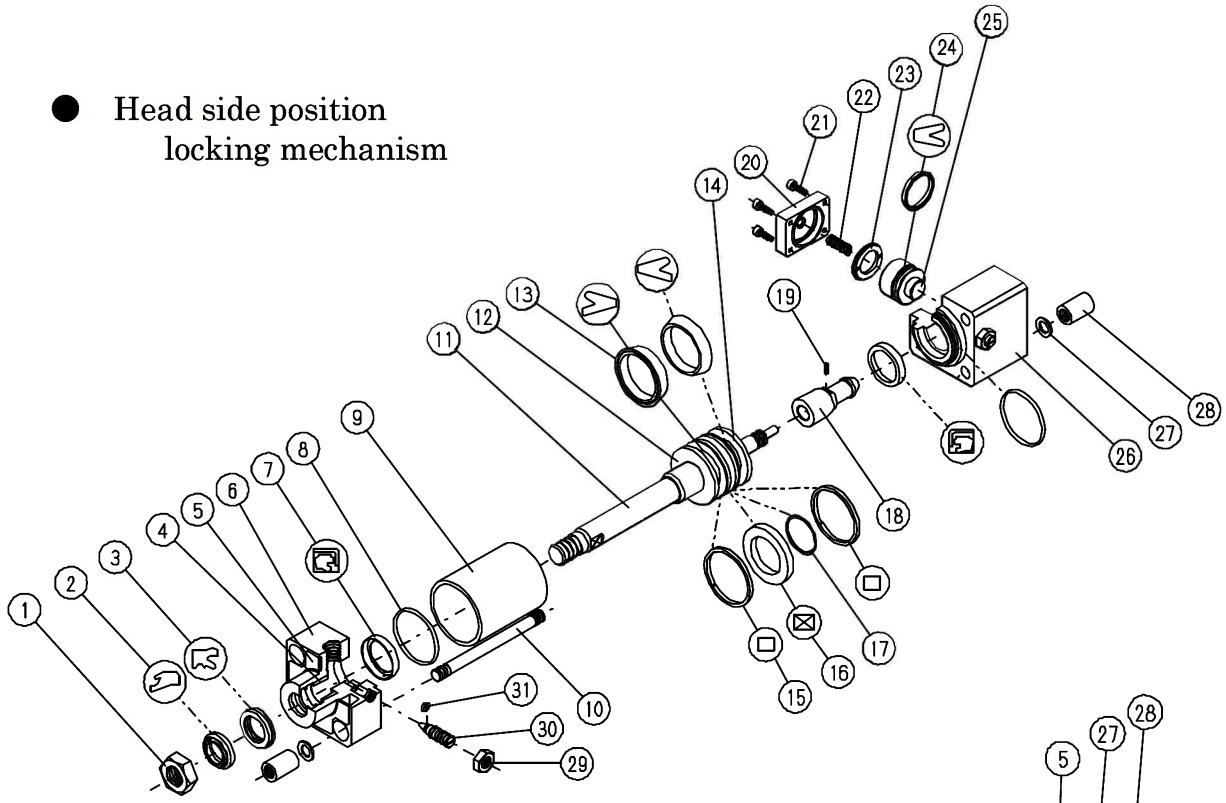
1) Prepare the following tools for disassemling.

Disassembling tools

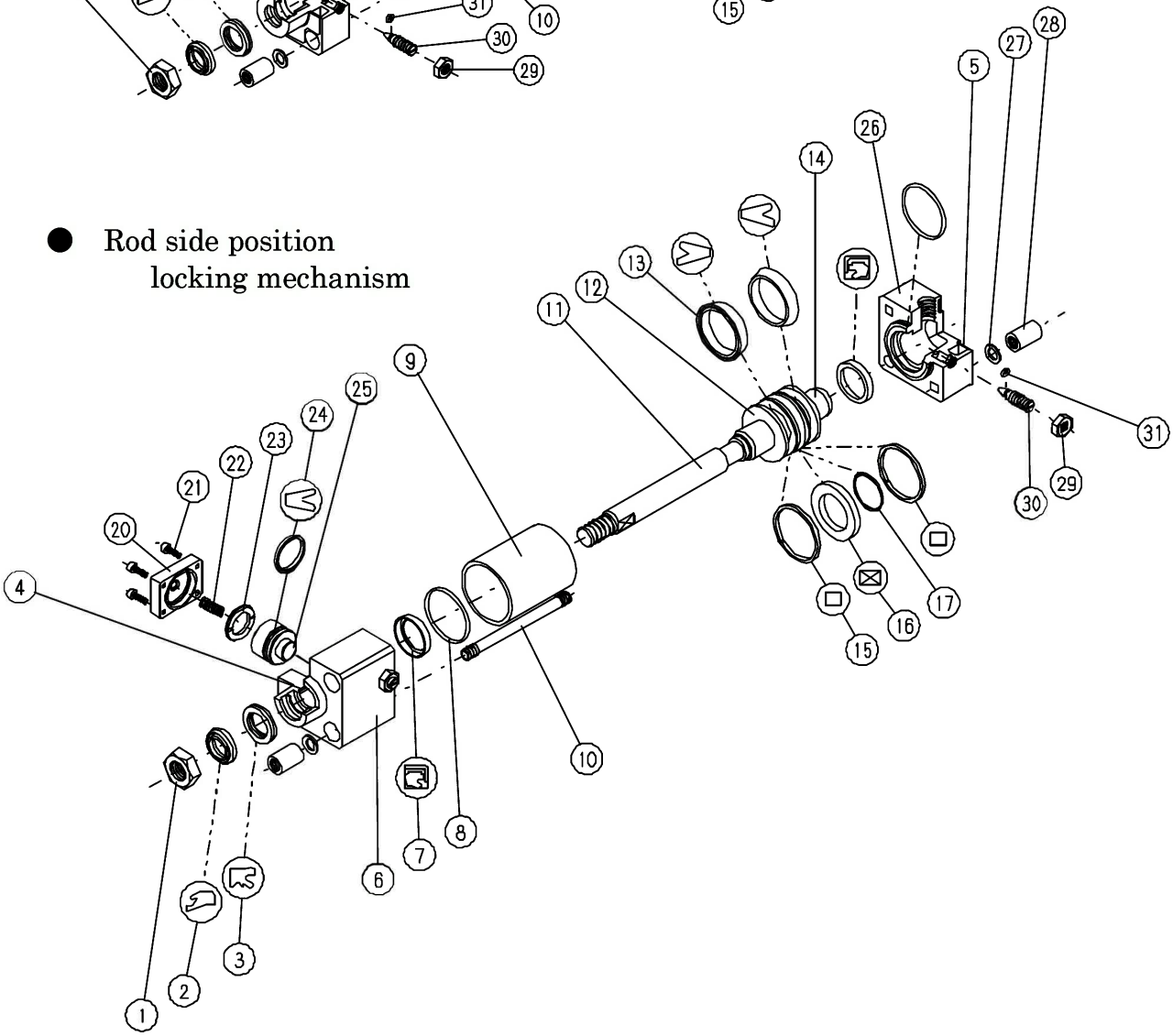
Name	Qty	Place of use	Applicable tube ID (mm)
Hex. bar spanner (Nominal 8)	2	28	40, 50, 63
Hex. bar spanner (Nominal 12)	2	28	80, 100
Spanner (Nominal 13)	1	29	For all tube ID
Standard driver (Nominal 5.5×75)	1	13, 30	For all tube ID
Minus tip screwdriver (Nominal 9×200)	1	7	For all tube ID
Marret hammer	1	For disassembling 6, 26 and 9	For all tube ID
Ice pick	1	2, 3, 8,31	For all tube ID

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

● Head side position
locking mechanism

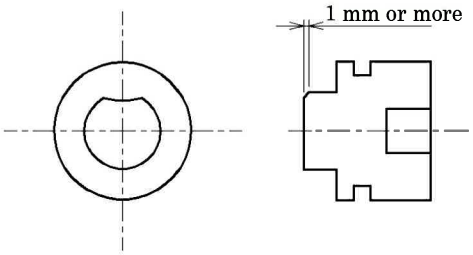


● Rod side position
locking mechanism



Part No.	Part Name	Qty	Part No.	Part Name	Qty
1	Rod nut	1	17	Head cover	2
2	Piston rod	1	18	Tie rod	1
3	Dust wiper	1	19	Conical spring washer	1
4	Rod packing seal	1	20	Round nut	1
5	Bush	1	21	Needle gasket	4
6	Masking plate	1	22	Needle nut	1
7	Rod cover	2	23	Cushion needle	1
8	Cylinder gasket	2	24	Stopper packing seal	1
9	Cushion packing seal	1	25	Stopper piston	1
10	Cylinder tube	4	26	Head cover	1
11	Piston (R)	1	27	Conical spring washer	8
12	Piston packing	1	28	Round nut	8
13	Piston gasket	1	29	Needle nut	2
14	Magnet	1	30	Cushion needle	2
15	Wear ring	1	31	Needle gasket	2
16	Piston (H)	2			

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 wear of packing in sliding part. (Dust wiper, rod packing seal, cushion packing seal and piston packing seal)
   (h) Check for scratches, wear and tear on the position locking mechanism (sleeve, stopper piston, stopper packing seal, coil spring, etc.)
   When a permanent deformation of 1 mm or more is observed on the stopper piston, the stopper piston needs to be replaced.
   Since this may be caused by a permanent deformation of the sleeve, the sleeve also needs to be checked in this case.



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

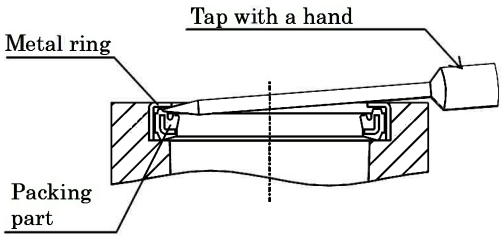
4) About cushion packing

⑦ 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.

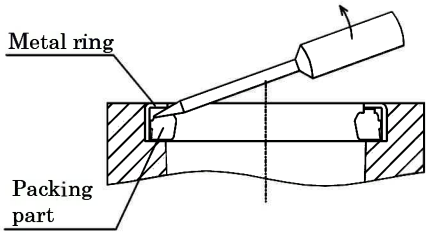
Forcing a minus driver etc. on a metal ring, the handle of a driver is struck by using the corner of a cover as a fulcrum, and a metal ring is removed.



〈Manufactured date : Product made after April, 2002〉

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

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

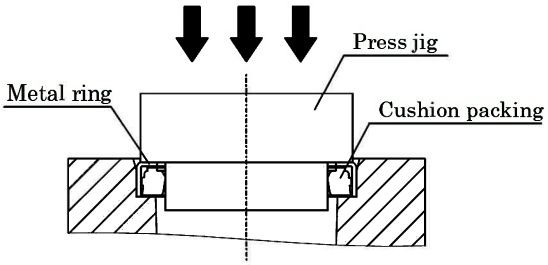


5) Assembly

(1) Clean each component parts.
(2) Take reversed sequence of disassembly to assemble cylinder after cleaning parts. Carefully avid giving damage to packings to prevent maifunction or air leakage.
(3) Apply thinly and uniformly a film of high grade grease (Litium alkali base) over the inner surface of cylinder tube ⑨, outer surface of piston (R) ⑫, piston (H) ⑭, and packings (② , ③ , ④ , ⑦ , ⑧ , ⑬ , ㉔ , ㉛).

〈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.

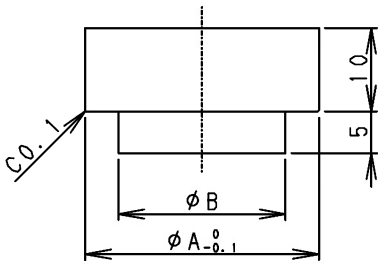


The packing part is incorporated in the metal ring so that a surface with a protruding portion may be on the metal ringside.
To prevent damage to packing also a tilt of it, use a jig carefully and press it in the place.
Make sure to press it down so as the upper edge of its metal ring sink about 0.1 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 roun nuts, gra ually tighten each nut on iagonal location to each other respectively, instea of tightening one nut all the way up. The table right isplays the recommen e 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.

Bore size (mm)	Kit No.	Part No., Name
ϕ40	SCA2-Q2-40K	②Dust wiper ③Rod packing ⑦Cushion packing ⑧Cylinder gasket ⑬Piston packing ⑰Wear ring ㉓Cushion rubber ㉔Stopper packing ㉛Needle gasket
ϕ50	SCA2-Q2-50K	
ϕ63	SCA2-Q2-63K	
ϕ80	SCA2-Q2-80K	
ϕ100	SCA2-Q2-100K	

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 piston packing.
Does not function smoothly.	Speed is below the low speed limit	Limit the load variation.
	Improper or misalignment of installation.	Correct the installation state and/or change the mounting style.
	Exertion of transverse (lateral) load.	Install a guide. Revise the installation state and/or change the mounting style.
	Excessive load.	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of "Meter in" circuit.	Change the meter-out circuit of the speed control valve.
	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) Cylinder position locking mechanism

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

3) Switch

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

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

＜Exaple of displaying model＞

● without switch

SCA2-Q2 – LB – 40 B – 100 – H ———— S I

● With switch

SCA2-Q2 – LB – 40 B – 100 – H – T0H – R – S I

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

(a) Mounting style (Note1)		(b) Bore size (mm)		(c) Cushion		(d) Stroke (mm) (Note2)	
00	Basic type	40	40 dia.	B	Both sides cushion	25	250
LB	Axial foot type	50	50 dia.	R	Rod side cushion	50	300
FA	Rod side flange type	63	63 dia.	H	Head side cushion	75	350
FB	Head side flange type	80	80 dia.	N	Non cushion	100	400
FC	Specisl head side flange type	100	100 dia.			150	450
CA	Eye bracket type					200	500
CB	Clevis bracket type						
TC	Center trunnion type						
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.)

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

(e) Position locking mechanism		(f) Switch model (Note3)					(g) Switch quantity	
H	Head side position locking	Lead wire		Switch type	Display	Lead wire	R	One on rod side
R	Rod side position locking	Axial lead wire	Radial lead wire				H	One on head side
		T0H※	T0V※	Reed	1 color indicator type	2-wire	D	Two
		T5H※	T5V※		Without indicator light		T	Three
		T8H※	T8V※	Solid state	1 color indicator type			
		T1H※	T1V※					
		T2H※	T2V※					
		T3H※	T3V※			3-wire		
		T2YD※	—		Strong magnetic field proof switch	2-wire		
		T2YDT※	—					
		T2JH※	T2JV※		Off-delay type			

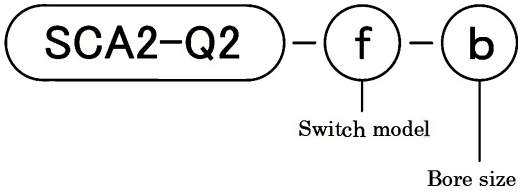
※ Lead wire length	
Blank	1m (Standard)
3	3m (Optional)
5	5m (Optional)

Note3 : T2YD are strong magnetic field proof switches. For further information, contact CKD.

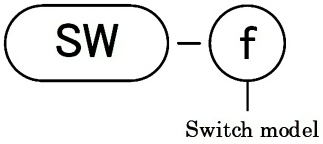
(h) Option		(i) Accessory	
J	Bellow: Nylon tarpaulin	I	Single knuckle
L	Bellow: Silicone rubber glass cloth	Y	Double knuckle
M	Alteration in piston rod material (Stainless steel)	B1	Eye bracket
Blank	Cushion needle position R (Standard)	B2	Clevis bracket
S	Cushion needle position S	B3	Eye bracket
M0	Non-locking manual override(release bolt attached)	B4	Trunnion type No.2 bracket
M1	Locking manual override		

6.2 Component Parts Model Coding

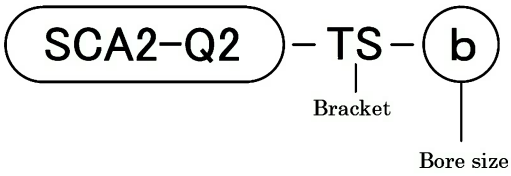
(1) Switch body + Mounting bracket



(2) Switch alone

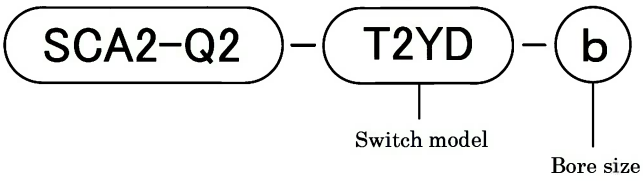


(3) Mounting bracket

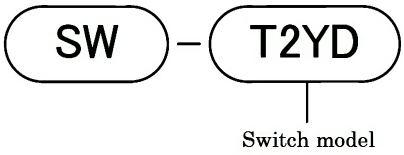


※ In case of T2YD

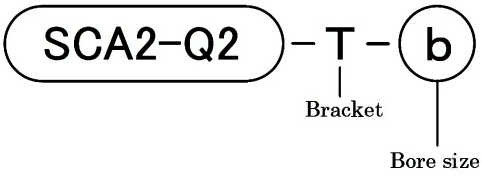
(4) Switch body + Mounting bracket



(5) Switch alone



(3) A set of mounting bracket



(a) Switch model (T type)					(b) Bore size (mm)	
Lead wire		Switch type	Display	Lead wire	40	ϕ 40
Axial lead wire	Radial lead wire				50	ϕ 50
T0H※	T0V※	Reed	1 color indicator type	2-wire	63	ϕ 63
T5H※	T5V※		Without indicator light		80	ϕ 80
T8H※	T8V※	Solid state	1 color indicator type		100	ϕ 100
T1H※	T1V※					
T2H※	T2V※					
T3H※	T3V※			3-wire		
T2YD※	—		Strong magnetic field proof switch	2-wire		
T2YDT※	—					
T2JH※	T2JV※		Off-delay type			

※ mark indicates the length of lead wire.

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

7. SPECIFICATION

7.1 Product Specifications

Model / Item		SCA2-Q2 (Position locking type)				
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		$^{+0.9}_{0}$ (less than 360), $^{+1.4}_{0}$ (less than 1000)				
Working piston speed mm/s		50 to 1000 (Use this within allowable energy absorption range.)				
Cushion		Air cushion				
Position locking mechanism		Head side, rod side				
Holding force N		Max. thrust × 0.7				
Lubrication		Not required (When lubrication, use Turbine oil Class 1 ISO VG 32)				
Allowable energy absorption J	Cushioned	4.29	8.37	15.8	27.9	49.8
	No cushion	The types without cushion cannot absorb a large energy generated by an external load. We recommend installation of an external shock absorbing device.				

7.2 Switches Specifications

Type & Model / Item	Reed switch type switch reed 2-wire			
	T0H,T0V		T5H,T5V	
Applications	For use with Programmable controller,relay		For use with Programmable controller,relay IC circuit(w/o indicator light), serial connection	
Load Voltage	DC12/24V	AC110V	DC5/12/24V	AC110V
Load Current	5 to 50mA	7 to 20mA	5 to 50mA	20mA or less
Internal voltage drop	2.4V or lower		2V or lower	
Indicator light	Lit when LED is on		Without indicator light	
Leakage current	0mA			
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.2mm^2)			
Shock resistance	294m/s^2			
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)	For Grommet - IEC Standard IP67, JIS C0920 (water tight type), Oil resistance			

Type & Model / Item	Reed switch type switch reed 2-wire		
	T8H,T8V		
Applications	For use with programmable controller, relay,		
Load Voltage	DC12/24V	AC100V	AC200V
Load Current	5 to 50mA	7 to 20mA	7 to 10mA
Internal voltage drop	0V		
Indicator light	Lit when LED is on		
Leakage current	0mA		
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.3mm^2)		
Shock resistance	294m/s^2		
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 reed 2-wire	
	T2H,T2V	T2YH,T2YV
Applications	For use with programmable controller	
Load Voltage	DC10 to 30V	
Load Current	5 to 20mA (Table 2)	
Internal voltage drop	—	
Indicator light	Lights when LED is on	LED (Red/Green) (Lights while power is ON)
Leakage current	1mA or lower	
Lead wire length (Note 1)	Standard 1m (2-core fire-resistant cab-tyre cord, 0.2mm^2)	Standard 1m (2-core fire-resistant cab-tyre cord, 0.3mm^2)
Shock resistance	980m/s^2	
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 AC1,300V for 1 minute	
Ambient temperature	-10 to 60℃	
Degree of protection	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℃.

6 HOW TO ORDER

Type & Model / Item	Solid state switch reed 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 (Table2)	5 to 100mA
Internal voltage drop	4V or lower	7V or lower
Indicator light	Lit when LED is on	
Out put delay time (ON delay, OFF delay)	200±50ms	
Leakage current	1mA or lower	1mA or lower at AC100V 2mA or lower at AC200V
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-wire, 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	-10～60℃	
Degree of protection (Note 3)	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance	

Type & Model / Item	Solid state switch reed 2-wire	
	T3H,T3V	T3YH,T3YV
Applications	For use with programmable controller,relay,	
Voltage of source of power	DC10 to 28V	
Load Voltage	DC30V or lower	
Load Current	100mA or lower	50mA or lower
Current consumption	10mA or lower when it is on at DC24V	
Internal voltage drop	0.5V or lower	
Indicator light	Lit when LED is on	LED (Red/Green) (Lights while power is ON)
Leakage current	10 μA or lower	
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-wire, 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 AC1,500V for 1 minute	
Ambient temperature	-10～60℃	
Degree of protection (Note 3)	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance	