CKD

SM-276420-A

# INSTRUCTION MANUAL

## SELEX CYLINDER WITH FREE-POSITION LOCKING

## USC Series

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

CKD Corporation

# For Safety Use

To use this product safely, 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 instruction 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.

# INDEX

USC Series
SELEX cylinder with free position locking
Manual No. SM 276420-A

# 1. PRODUCT

## 1.1 Cylinder Specification

Specification

| Model code & class / Item | | | USC (Double acting / single rod type) USC-G1 (Double acting / with coil scraper) | | | | |
|---|---|---|---|---|---|---|---|
| Operating method | | | Double acting type | | | | |
| Media | | | Compressed air | | | | |
| Max.working pressure | | MPa | 1.0 | | | | |
| Min.working pressure MPa | Cylinder part | | 0.1 | | | | |
| | Locking mechanism part | | 0.25 | | | | |
| Proof pressure | | MPa | 1.6 | | | | |
| Ambient temperature | | ℃ | −10 to 60 (No freezing) | | | | |
| Tube bore | | mm | ϕ40 | ϕ50 | ϕ63 | ϕ80 | ϕ100 |
| Connecting port dia. | Cylinder part | | Rc1/4 | Rc3/8 | Rc3/8 | Rc1/2 | Rc1/2 |
| | Locking mechanism part | | Rc1/8 | | | | |
| Holding horce | | N | 1005 | 1570 | 2493 | 4021 | 6283 |
| Operational piston speed | | mm/s | 50 to 1000 (Use this unit within absorbed energy.) | | | | |
| Option | | | The presence or absence of cushion can be selected. | | | | |
| Lubrication | | | Not required.(For lubrication, use Turbine Oil Class 1 ISO VG32.) After lubrication start, always apply oil continuously. However, it is not allowed to lubricate the locking mechanism unit. | | | | |

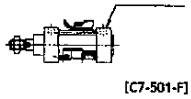
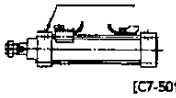
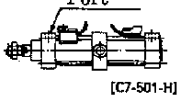
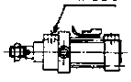
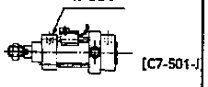
Stroke

| Tube bore (mm) | Standard stroke (mm) | Max. stroke (mm) | ※Min. stroke when the switch is provided (mm) |
|---|---|---|---|
| ϕ40 | 25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500 | 600 | 10 |
| ϕ50 | | | |
| ϕ63 | | | |
| ϕ80 | | 700 | |
| ϕ100 | | 800 | |

※Where the switch is provided, the minimum stroke varies, depending on the installation method. For this matter, refer to the minimum stroke where the switch is provided.

Minimum Stroke where the switch is provided:

(The minimum stroke varies, depending on the stroke mounting method. Refer to the table below.) (mm)

| Skeleton diagram / Inside diameter | Mounting on Different Surfaces | Mounting on Same Surface | Intermediate Trunnion Type | Rod Side Trunnion Mounting | Head Side Trunnion Mounting |
|---|---|---|---|---|---|
| | Port  [C7-501-F] | Port  [C7-501-G] | Mounting Port  [C7-501-H] | Port  [C7-501-] No position detection at the rod side stroke end is possible. | Port  [C7-501-J] No position detection at the head side stroke end is possible. |
| ϕ40 | 10 | 34 | 86 (66) | 38 (28) | 38 (28) |
| ϕ50 | | | 86 (66) | 36 (26) | 36 (26) |
| ϕ63 | 10 | 10 | 91 (71) | 41 (31) | 41 (31) |
| ϕ80 | | | 96 (76) | 44 (34) | 44 (34) |
| ϕ100 | | | 106 (86) | 50 (40) | 50 (40) |

NOTE 1: The numerical value given in parenthesis above should be for R※B (Terminal box type).

2: Where the stroke is 15 mm Max., 2 switches may be turned ON at the same time. In this case, adjust the position so that the switch attaching positions are apart from each other.

## 1.2 Switch Specification

### Cylinder Switch R Type - Specifications

| Model code / Item | Solid state type switch | | |
|---|---|---|---|
| | R1 | R2 | R2Y (bi colors indication) |
| Application | For programmable controller, relay and small solenoid valve | Exclusively for Programmable Controller | |
| Power Supply Voltage | —— | | |
| Load Voltage | AC85 to 265V | DC10 to 30V | |
| Load Current | 5 to 100mA | 5 to 30mA | |
| Current consumption | —— | | |
| Internal Voltage Drop | 7V or lower | 4V or lower | |
| Lamp | LED is lit when Power is ON | | Red/green LED (Lights up at "ON".) |
| Leak Current | 1mA or lower at AC100V<br>2mA or lower AC200V | 1mA or lower | 1.2mA or lower |
| Length of Lead wire | 1m<br>(Oil resistance Vinyl cabtyre cord, 2-wire 0.3mm²) | | |
| Max. Shock | 980m/s²{100G} | | |
| Insulation Resistance | 20MΩ or more with DC 500Vmeggar tester | | |
| Withstand voltage | Should be no abnormality for 1 minute charging AC1500V | Should be no abnormality for 1 minute charging AC1000V | |
| Ambience Temperature | −10 to +60°C | | |
| Protective Structure | The grommet type conforms to IEC Standard IP67<br>& JIS C 0920 (Water-tight type) and is resistant to oil. | | |
| Option | R※A (IP64) with terminal box, R※B (no waterproofing) with terminal box | | |

| Model code / Item | Solid state type switch | |
|---|---|---|
| | R3 | R3Y (bi colors indication) |
| Application | For programmable controller, relay,<br>IC circuit and solenoid valve | |
| Power Supply Voltage | DC4.5 to 28V | |
| Load Voltage | DC30V or lower | DC30V or lower |
| Load Current | 200mA or lower | 150mA or lower |
| Current consumption | At 24 V DC (at "ON") | |
| | 10mA or lower | 16mA or lower |
| Internal Voltage Drop | 0.5V or lower at 150mA | 0.5V or lower |
| Lamp | LED is lit when Power is ON | Red/green LED<br>(Lights up at "ON".) |
| Leak Current | 10μA or lower | |
| Length of Lead wire | 1m<br>(Oil resistance Vinyl cabtyre cord, 3-core 0.2mm²) | |
| Max. Shock | 980m/s²{100G} | |
| Insulation Resistance | 20MΩ or more with DC 500Vmeggar tester | |
| Withstand voltage | Should be no abnormality for 1 minute charging AC1000V | |
| Ambience Temperature | −10 to +60°C | |
| Protective Structure | The grommet type conforms to IEC Standard IP67<br>& JIS C 0920 (Water-tight type) and is resistant to oil. | |
| Option | R※A (IP64) with terminal box<br>R※B (no waterproofing) with terminal box | |

| Model code / Item | Reed type switch | | | | |
|---|---|---|---|---|---|
| | R0 | | | R4 | |
| Application | for Relay and Programmable Controller | | | For high-capacity relay and solenoid valve | |
| Power Supply Voltage | ——— | | | | |
| Load Voltage | DC12/14V | AC100V | AC200V | AC100V | AC200V |
| Load Current | 5 to 50mA | 7 to 20mA | 7 to 10mA | 20 to 200mA | 10 to 200mA |
| Current consumption | ——— | | | | |
| Internal Voltage Drop | 2.4V or lower | | | 2V or lower | |
| Lamp | LED is lit when Power is ON | | | Neon lamp(Lights up at "OFF".) | |
| Leak Current | 0mA | | | 1mA or lower | |
| Length of Lead wire | 1m (Oil resistance Vinyl cabtyre cord, 2-core 0.3mm²) | | | | |
| Max. Shock | 294m/s² {30G} | | | | |
| Insulation Resistance | 20MΩ or more with DC 500V meggar tester Should be no abnormality for 1 minute charging | | | | |
| Withstand voltage | AC1500V | | | | |
| Ambience Temperature | −10 to +60°C | | | | |
| Protective Structure | The grommet type conforms to IEC Standard IP67 & JIS C 0920 (Water-tight type) and is resistant to oil. | | | | |
| Option | R※A (IP64) with terminal box, R※B (no waterproofing) with terminal box | | | | |

| Model code / Item | Reed type switch | | | |
|---|---|---|---|---|
| | R5 | | | R6 |
| Application | for programmable controller, relay and IC circuit (with no lamp) - series connection | | | Exclusively for programmable controller (with DC self-holding function) |
| Power Supply Voltage | ——— | | | |
| Load Voltage | DC5/12/24V | AC100V | AC200V | DC24V |
| Load Current | 50mA | 20mA | 10mA | 5 to 50mA |
| Current consumption | ——— | | | |
| Internal Voltage Drop | 0V | | | 5V or lower |
| Lamp | None | | | LED is lit when Power is ON |
| Leak Current | 0mA | | | 0.1mA or lower |
| Length of Lead wire | 1m (Oil resistance Vinyl cabtyre cord, 2-core 0.3mm²) | | | |
| Max. Shock | 294m/s² {30G} | | | |
| Insulation Resistance | 20MΩ or more with DC 500V meggar tester Should be no abnormality for 1 minute charging | | | |
| Withstand voltage | AC1500V | | | |
| Ambience Temperature | −10 to +60°C | | | |
| Protective Structure | The grommet type conforms to IEC Standard IP67 & JIS C 0920 (Water-tight type) and is resistant to oil. | | | |
| Option | R※A (IP64) with terminal box, R※B (no waterproofing) with terminal box | | | |

## Cylinder Switch H Type - Specifications

| Model code / Item | Solid state type switch | | |
|---|---|---|---|
| | H0 | | H0Y(bi colors indication) |
| Application | for Programmable Controller and Relay | | Exclusively for Programmable Controller |
| Load Voltage | DC12/24V | AC100V | DC24V |
| Load Current | 5 to 50mA | 7 to 20mA | 5 to 20mA |
| Internal Voltage Drop | 5V or lower | | 6V or lower |
| Leak Current | 10μA or lower | | 10μA or lower |
| Lamp | Green light-emitting diode (Lights up at "ON".) | | Red/green light-emitting diode (Lights up at "ON".) |
| Length of Lead wire | 1m (Fire-resistant cabtyre cable, 2-wire 0.5mm²) | | |
| Insulation Resistance | 100 MΩ or more with DC 500Vmeggar tester | | |
| Withstand voltage | Should be no abnormality for 1 minute charging AC1000V | | |
| Max. Shock | 294m/s² {30G} | | |
| Ambience Temperature | −10 to +60°C | | |
| Protective Structure | IEC Standard IP67, JIS C0920 (water tight type), Oil resistance | | |

## Cylinder Switch T2YD Type - Specifications

| Model code / Item | Solid state type switch |
|---|---|
| | T2YD |
| Application | Exclusively for Programmable Controller |
| Lamp | Red/green light-emitting diode (Lights up at "ON".) |
| Load Voltage | DC24V ±10% |
| Load Current | 5 to 20mA |
| Internal Voltage Drop | 6V or lower |
| Leak Current | 1.2mA or lower |
| Output delay time (ON/OFF) *1 | 30 to 60mS |
| Length of Lead wire *2 | 1m (Oil resistance Vinyl cabtyre cord, 2-wire 0.5mm²) |
| Insulation Resistance | 100 MΩ or more with DC 500Vmeggar tester |
| Withstand voltage | Should be no abnormality for 1 minute charging AC1000V |
| Max. Shock | 980m/s² {100G} |
| Ambience Temperature | −10 to +60°C |
| Protective Structure | IEC Standard IP67, JIS C0920 (water tight type), Oil resistance |

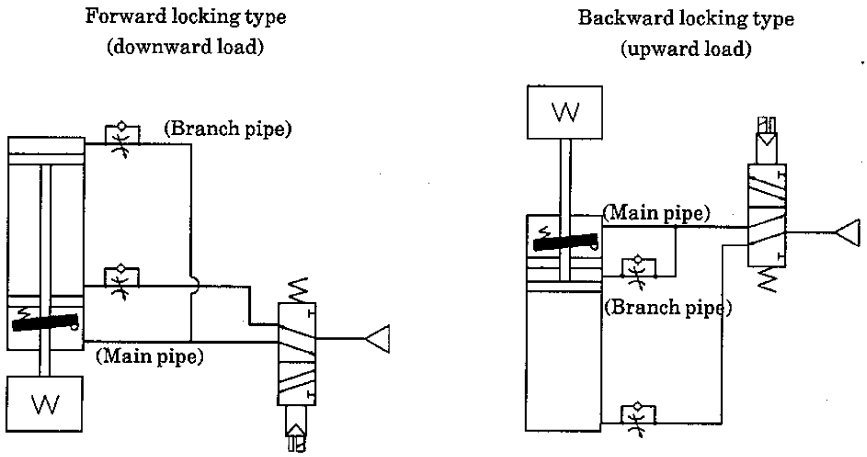
*1: The output delay time indicates the time before the magnetic sensor detects piston magnet and switch output is transmitted.

*2: For a lead wire, also optionally available is a fire-resistant cabtyre cable.

*3: This switch cannot be used in the DC magnetic field environment.

## 1.3 Fundamental Circuit Diagram

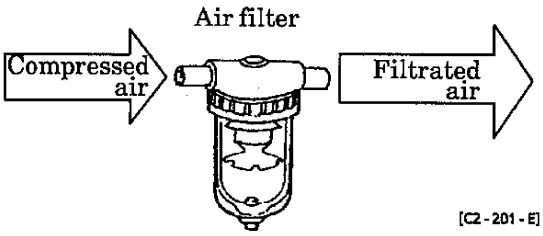
1) The air pipe of this cylinder must be branched at a position after the valve as shown in the Fig. below. Two pipes are connected to the position locking part (the pipe to the lock release port is determined as main pipe) and cylinder part (the pipe to cylinder port is determined as branch pipe). Additionally, the main pipe is made thicker and shorter than the branch pipe.
2) If the cylinder action becomes faster than the lock release, the lock may not be released or the piston rod may project even after the lock has been released. To prevent such troubles, the piping is so designed that the lock release becomes faster than the cylinder action.
3) If the back pressure is applied during locking, the lock may be released. Therefore, an individual solenoid valve or solenoid valve with the individual exhaust manifold needs to be used.
4) If the pipe is individually connected to the position locking part or if the piping other than that shown in the Fig. below is performed, contact CKD.



# 2. CAUTION

## 2.1 Fluid

1) Use the compressed air, filtrated and dehumidified. Carefully select a filter of an adequate filtration rate (5$\mu$m or lower preferred), flow rate and its mounting location (as closest to solenoid valve as possible).
2) Be sure to drain out the accumulation in filter periodically.
3) Note that the intrusion of carbide of compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of solenoid valve and cylinder. Be sure to carry out thorough inspection and maintenance of compressor.



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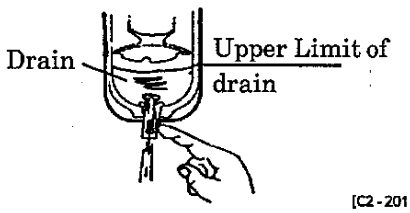


[C2-201-F]

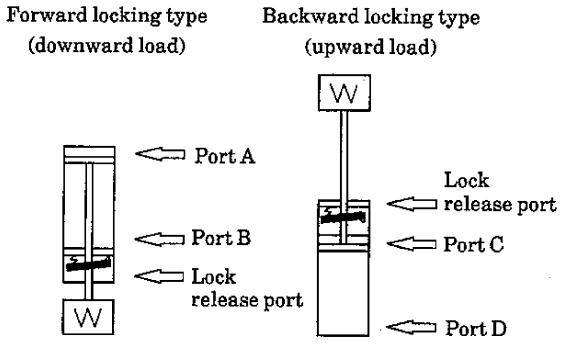
4) This cylinder has the oilless specification. Where this cylinder is lubricated, use Turbine Oil Class 1 ISO VG32. In this case, continuously apply oil after lubrication start.

If the locking part is lubricated, this may cause the retention force to lower. Never attempt to lubricate this cylinder.

# 3. OPERATION

## 3.1 Cautions for Handling

1) This product is a cylinder with position locking (retention of the cylinder stationary status) mechanism. If this cylinder is used for the emergency stop or urgent stop (stop from the cylinder action state), contact CKD.
2) If any rotational force (torque) is applied to the rod when the lock is operated, the retention force is lowered, causing personal injury. To prevent such trouble, do not apply the rotational force to the rod. Additionally, operate this cylinder in a mechanism, in which the rod is not rotated.
3) The piston rod may drop approximately 1 mm (movement of piston rod) due to the structure of this cylinder.
4) When releasing the lock, apply the pressure to the port B or port D so that the load is not applied to the lock mechanism, and then release the lock. If the pressure is applied to the port A or port C with all ports exhausted and the piston locked, the lock may not be released or the piston rod may project even after the lock has been released, causing personal injury.

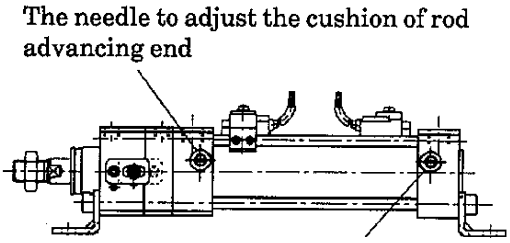



5) If the cylinder is locked after it has been operated with the lock released for an extended period of time, the response delay may occur in the lock. The cylinder must not be left with the pressure applied to the lock. The lock is operated every time the cylinder is operated.
(Use the fundamental circuit diagram shown on page 4.)
6) If there is no air pressure when the cylinder is operated with it mounted vertically, the retention force may cease when releasing manually, and then the rod may be moved (lowered) by own weight of the load.

If the above situation is predicted, perform the manual release after the following preparations have been taken in order to ensure the safety.
(1) Move the load to its lower limit.
(2) Put the stopper on the load.
(3) Apply the air pressure to the cylinder to make the load balanced.

## 3.2 Tolerable Energy Absorption

1) The cylinder feed pressure is 0.1 to 1.0MPa; hence regulate the pressure within this pressure range.
2) Though the cushion has been adjusted at no load when delivered, adjust the cushion needle when the change of cushion effect is required.




Tightening the needle (clockwise) makes cushion more effective. Tighten the needle lock nut all the way after adjustment.

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

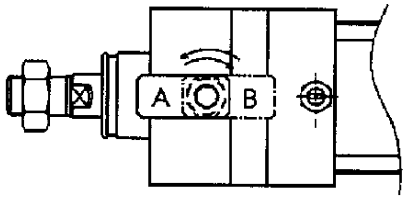
Table 1 : Table of cushion characteristics

| Tube bore (mm) | Tolerable energy absorption (J) | | |
|---|---|---|---|
| | Effective cushion length(mm) | With cushion | Without cushion |
| ϕ 40 | 14.6 | 4.29 | 0.15 |
| ϕ 50 | 16.6 | 8.37 | 0.24 |
| ϕ 63 | 16.6 | 15.8 | 0.24 |
| ϕ 80 | 20.6 | 27.9 | 0.54 |
| ϕ100 | 23.6 | 49.8 | 0.87 |

3) Install a speed controller as shown in the fundamental circuit diagram shown on page 3. Gradually open the speed controller from the close state to adjust the piston speed within the product specification.
4) If a unit having an excessive inertia is operated, this may cause the cylinder main body to be damaged or malfunction. Always operate the cylinder within the allowable range.

## 3.3 Performing The Manual Release

1) Loosen the hexagon socket head cap screw and turn the release lever 180 degrees in the direction of ↷ (Reset lever position B): the lock is released, and the piston rod becomes free.




2) Turn the release lever 180 degrees in the direction of ↶ (Reset lever position A) and tighten the hexagon socket head cap screw to the tightening torque of 10N·m: the piston rod is locked.

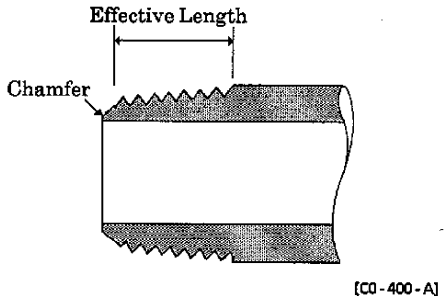
NOTES : · Be sure to turn this lever in the direction indicated by the arrow. No removal is allowed.

· During normal operation, use this unit with the reset lever set in the locking position.

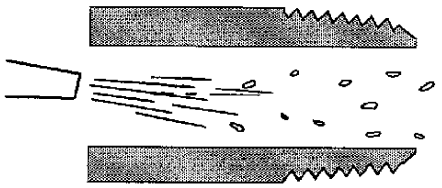
# 4. INSTALLATION

## 4.1 Piping

1) For piping beyond the filter, use pipes that hardly get corroded such as galvanized pipes, nylon tubes, rubber tubes, etc.
2) See to it that the pipe connecting cylinder and solenoid valve has effective sectional area needed for the cylinder to drive at specified speed.
3) Install filter preferably adjacent upper-stream to solenoid valve for eliminating rust, foreign substance and drain in the pipe.
4) Strictly 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.

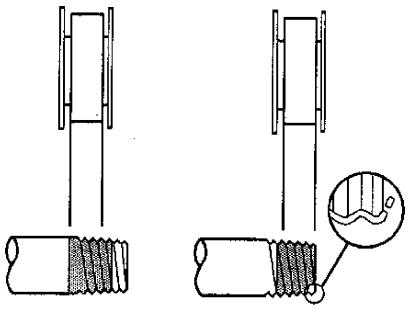


[CD-400-A]

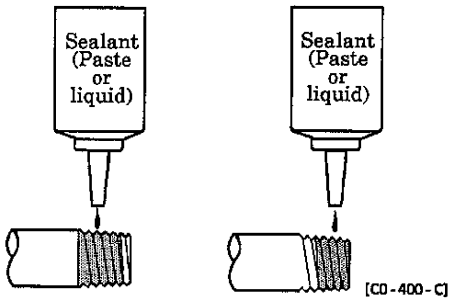

[CD-400-B]

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

● Seal Tape


Correct Incorrect

● Sealant (Paste or liquid)

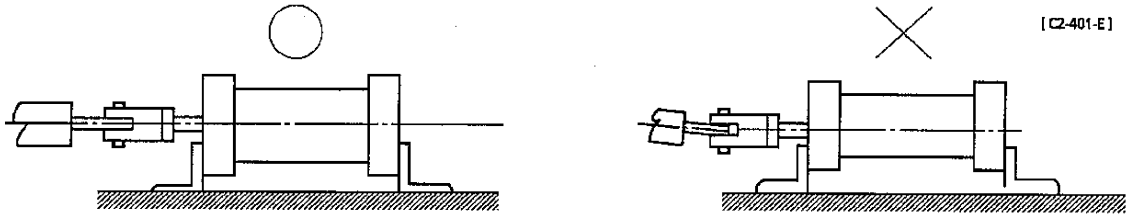


[CD-400-C]

Correct Incorrect

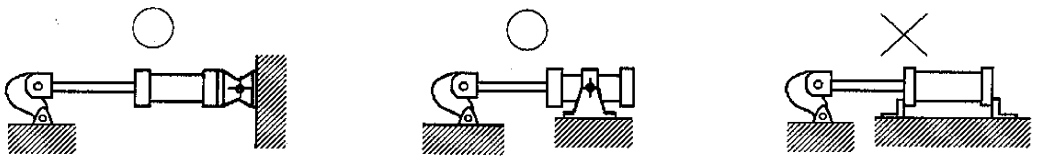
## 4.2 Installation

1) The ambient temperature range for this cylinder is −10 to 60°C (Not to be frozen).
2) Use cylinder with bellows over its rod within the area with much dust.
3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.
4) When cylinder is fixed and rod end is guided:
   In case the piston rod of cylinder and the load are misaligned, the bushes and packings of the cylinder are extremely worn out. Hence, connect them with CKD floating connector (spherical bearing).
5) When 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.



[C2-401-E]

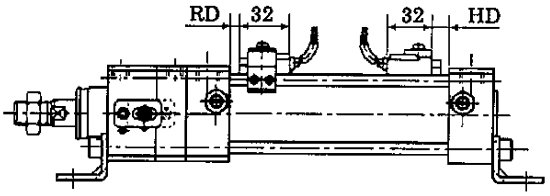
6) When the load acting direction changes with the cylinder operation:
   Use an oscillating cylinder (clevis type or trunnion type) capable of making revolution to a certain angle. Furthermore, install the rod and connecting metal (knuckle) so that it moves in the same direction as the cylinder main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



Clevise type　　Trunnion type　　Foot type

[C2-401-F]

## 4.3 Switch Mounting




1) Switch mounting location

(1) Stroke end mounting

Install one switch at the distance of RD away from rod end and the other at the distance of HD away from cylinder head, so as to have each switch function at its most sensitive location. Also, install the switch in such a direction that the lead wire comes inside as shown above.

(2) Mounting it at an intermediate point of stroke

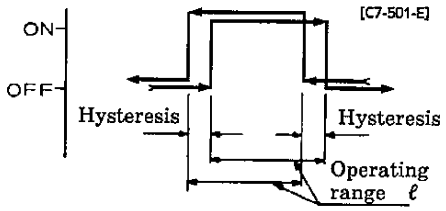
In the case of detection in the course of stroke, fix the piston in the stop position, move the switch forward and backward on the piston, and find out the location where each switch turns ON first. The center point of those two points is the most sensitive point of the switch and it is the switch mounting location, accordingly.

(3) Mounting in the circumferential direction

There is no limit to the mounting position in the circumferential direction. However, since the tie-rod is attached, install the switch in an easy-to-use direction by turning 90 degrees each.

2) Operating range

(1) It is the distance of two positions where switch turns ON, while piston continues its stroke in one directin, and where it turns OFF.



### 3) Best operating position (HD, RD), Operating range, Hysteresis

- Cylinder Switch R Type

(mm)

| Item / Tube bore(mm) | Best operating position HD / RD | Solid state type | | | | | Reed switch type | |
|---|---|---|---|---|---|---|---|---|
| | | R1, R2, R3 | | R2Y, R3Y (bi colors indication) | | | R0, R4, R5 R6 | |
| | | Operating range (Red lamp lit) | Hys-teresis | Operating range (Red lamp lit) | Best operating position (Green lamp lit) | Hys-teresis | Operating range (Red lamp lit) | Hys-teresis |
| ϕ40 | 5.5 | 6.5 to 11.5 | 1.5 or less | 10 to 14 | 3 to 6 | 1 or less | 9.5 to 12.5 | 3 or less |
| ϕ50 | 7.5 | 8 to 12.5 | | 12 to 16 | 5 to 8 | | 10.5 to 14.5 | |
| ϕ63 | | 7.5 to 12.5 | | | | | 10.5 to 14.5 | |
| ϕ80 | 9 | 8 to 13.5 | | | 5 to 9 | | 11.5 to 15.5 | |
| ϕ100 | 13 | 8 to 14 | | | | | 12 to 16 | |

- Cylinder Switch H Type

(mm)

| Item / Tube bore(mm) | Best operating position HD / RD | Reed switch type | | | | |
|---|---|---|---|---|---|---|
| | | H0 | | H0Y | | |
| | | Operating range (Green lamp lit) | Hys-teresis | Operating range (Red lamp lit) | Best operating position (Green lamp lit) | Hys-teresis |
| ϕ40 | 4 | 4 to 7.5 | 3 or less | 10.5 to 13.5 | 5 to 8 | 3 or less |
| ϕ50 | 6 | 5 to 8 | | 11 to 14 | 5.5 to 8 | |
| ϕ63 | | | | 11.5 to 14.5 | | |
| ϕ80 | 7.5 | | | 10.5 to 14.5 | 5 to 8.5 | |
| ϕ100 | 11.5 | | | | | |

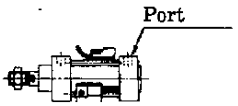
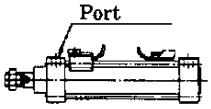
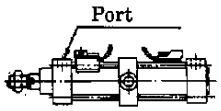
- Cylinder Switch T2YD Type

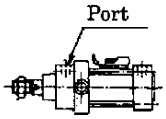
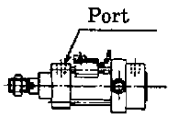
(mm)

| Item / Tube bore(mm) | Best operating position HD / RD | Solid state type | | |
|---|---|---|---|---|
| | | T2YD | | |
| | | Operating range (Red lamp lit) | Best operating position (Green lamp lit) | Hys-teresis |
| ϕ40 | 10 | 6.5 to 9.5 | 2.5 to 5.5 | 1.5 or less |
| ϕ50 | 12 | 7 to 10 | 3 to 6 | |
| ϕ63 | | | | |
| ϕ80 | 13.5 | 7.5 to 10.5 | 3.5 to 6.5 | |
| ϕ100 | 17.5 | 8 to 11 | 4 to 7 | |

## 4.4 Location of switches mounted at ex-factory

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

| Item | Stroke mounted different surface | Stroke mounted same surface | Stroke mounted on an intermediate trunnion type |
|---|---|---|---|
| Sketch / Bore |  [C7-501-F] |  [C7-501-G] |  [C7-501-H] |
| φ40 | 10 to 33 | More than 34 | More than 86 (More than 66) |
| φ50 | | | |
| φ63 | — | More than 10 | More than 91 (More than 71) |
| φ80 | | | More than 96 (More than 76) |
| φ100 | | | More than 106 (More than 86) |

| Item | Stroke mounted rod side trunnion type | Stroke mounted head side trunnion type |
|---|---|---|
| Sketch / Bore |  [C7-501-I] |  [C7-501-J] |
| φ40 | More than 38 (More than 28) | More than 38 (More than 28) |
| φ50 | More than 36 (More than 26) | More than 36 (More than 26) |
| φ63 | More than 41 (More than 31) | More than 41 (More than 31) |
| φ80 | More than 44 (More than 34) | More than 44 (More than 34) |
| φ100 | More than 50 (More than 40) | More than 50 (More than 40) |

# 5. OPERATION

## 5.1 Periodical Inspection

1) In order to upkeep the cylinder in optimum condition, carry out periodic inspection once or twice a year.

2) Inspection items

ⓐ Check the bolts and nuts fitting the piston rod end fittings and supporting fittings for slackening.

ⓑ Check to see that the cylinder operates smoothly.

ⓒ Check any change of the piston speed and cycle time.

ⓓ Check for internal and/or external leakage.

ⓔ Check the piston rod for flaw (scratch) and deformation.

ⓕ Check the stroke for abnormality.

See "Trouble shooting", 5.2, should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

## 5.2 Trouble Shooting

### 1) Cylinder

| Trouble | Cause | Countermeasure |
|---|---|---|
| Does not operate | No pressure or inadequate pressure | Provide an adequate pressure source. |
| | Signal is not transmitted to direction control valve | Correct the control circuit. |
| | Improper or misalignment of installation | Correct the installation state and/or change the supporting system. |
| | 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 supporting system. |
| | Exertion of transverse (lateral) load | Install a guide.<br>Revise the installation state and/or change the supporting system. |
| | Excessive load | Increase the pressure itself and/or the inner diameter of the tube. |
| | Speed control valve is built in the way of "Meter in" circuit | Change the installation direction of the speed control valve |
| Breakage and/or de-formation | Impact force due to high speed operation | Make the cushion more effective.<br>Turn the speed down.<br>Reduce the load.<br>Install cushion device with more efficiency. (External cushion) |
| | Exertion of transverse load | Install a guide.<br>Reverse the installation state and/or change the supporting system. |
| Lock is not unlocked | No pressure is applied to the locking mechanism side. | Correct the control circuit. |
| | Pressure insufficient | Secure the pressure. |
| Lock is not locked | Damaged spring in the lock metal part | Replace the locking mechanism unit. |
| | The locking mechanism side is pressurized. | Correct the control circuit. |
| | Wrong selection of locking direction | Select the locking direction correctly. |

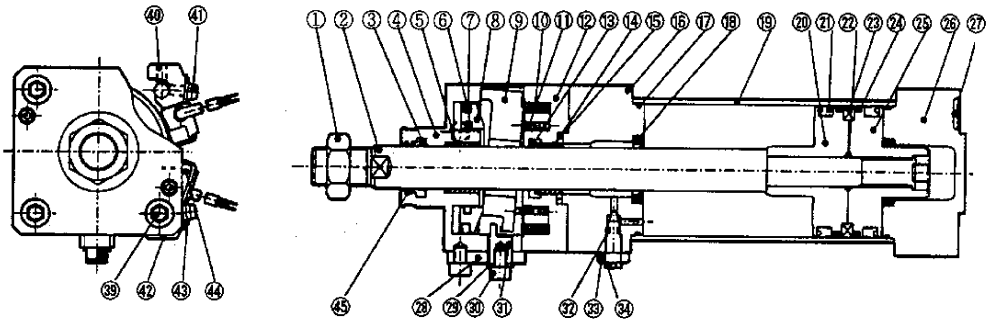
## 2) Switch

| Trouble | Possible cause | Countermeasure |
|---|---|---|
| Lamp is not lit | Deposited contact point | Replace the switch |
| | Excessive load than rated capacity | Replace the relay with a recommended one or replace the switch |
| | Damage to the lamp | Replace the lamp |
| | 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 |
| | Incorrect direction of switch mounting | Correct the direction of the switch |
| | Relay is unable to respond properly within the piston stroke | Adjust speed slow<br>Replace the relay |
| | Excessive load than rated capacity | Replace the relay with a recommended one or replace the switch |
| Switch does not return | Piston is not moving | Correct to have piston move |
| | Deposited contact point | Replace the switch |
| | Excessive load (relay) than rated capacity | Replace the relay with a recommended one or replace the switch |
| | Improper ambient temperature | Adjust the ambient temperature within the range of −10 to 60°C |
| | Existence of a foreign magnetic field | Shield the magnetic field |
| | Inadequate incoming signal | Review the external signal circuit and remove the causes |

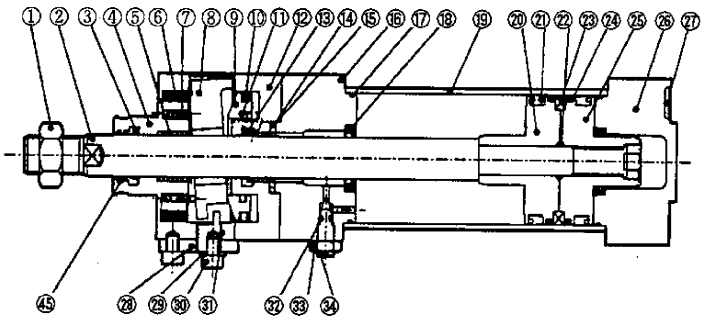
## 5.3 Disassembling

### 1) Parts Structure and Consumable Parts List

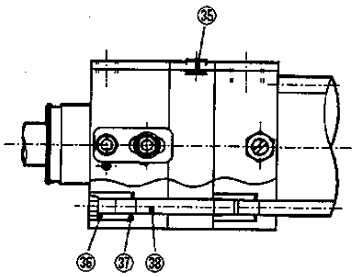
<F & B Common>  <F : Forward Lock Type>




<B : Backward Lock Type>




<F & B Common>



## Parts list

| No. | Parts name | Material | Note | | Parts name | Material | Note |
|---|---|---|---|---|---|---|---|
| 1 | Rod nut | Steel | Zinc chromate | 21 | Piston packing | Nitrile rubber | |
| 2 | Piston rod | Steel | Industrial chromium plating | 22 | Piston gasket | Nitrile rubber | |
| | | | | 23 | Piston magnet | Plastic magnet | |
| | | | | 24 | Wear ring | Polyacetal | |
| 3 | Dust wiper | Nitrile rubber | | 25 | Piston (H) | Aluminium alloy Die-casting | |
| 4 | Brake main body A | Aluminium alloy | Black alumite | 26 | Head cover | Aluminium alloy Die-casting | Paint |
| 5 | Bushing | Oil impregnated bearing alloy | | 27 | Masking plate | Aluminium | Paint |
| 6 | Reset piston packing A | Nitrile rubber | | 28 | Reset (Release) lever | Steel | |
| 7 | Reset piston packing B | Nitrile rubber | | 29 | Plain washer | Steel | |
| 8 | Reset piston | Steel | Uniquro galvanizing | 30 | Hexagon socket head cap screw | Steel | |
| | | | | 31 | Reset cam | Steel | |
| 9 | Locking plate | Steel | | 32 | Needle gasket | Nitrile rubber | |
| 10 | Cushion rubber | Urethane rubber | | 33 | Needle nut | Copper alloy | |
| 11 | Spring | Steel | Black oxide finish | 34 | Cushion needle | Copper alloy | |
| | | | | 35 | Blanke plug | Steel | |
| 12 | Brake main body B | Aluminium alloy | Black alumite | 36 | Circular nut | Steel | Zinc chromate |
| 13 | Rod packing | Nitrile rubber | | 37 | Conical spring washer | Steel | Black oxide finish |
| 14 | Bushing | 含油軸受合金Oil impregnated bearing alloy | | 38 | Tie rod | Steel | Zinc chromate |
| | | | | 39 | Hexagon socket head cap screw | Steel | |
| 15 | Gasket | Nitrile rubber | | 40 | Hexagon socket set screw | Steel | Black oxide finish |
| 16 | Rod cover | Die-casting | Paint | | | | |
| 17 | Cylinder gasket | Nitrile rubber | | 41 | Cross headed pan | Steel | Zinc chromate |
| 18 | Cushion packing | Urethane rubber, Steel | | 42 | Switch mounting base | Aluminium alloy | |
| 19 | Cylinder tubu | Aluminium alloy | Hard alumite disposal | 43 | Switch holder | Stainless steel | |
| | | | | 44 | Cylinder switch | | |
| 20 | Piston (R) | Aluminium alloy Die-casting | | 45 | Coil scraper | Phosphor bronze | Only with coil scraper |

## Repair kits list

| Tube bore (mm) / Kit No. / No. / Parts name | | ϕ 40 | ϕ 50 | ϕ 63 | ϕ 80 | ϕ 100 |
|---|---|---|---|---|---|---|
| No. | Parts name | USC-40K | USC-50K | USC-63K | USC-80K | USC-100K |
| 3 | Dust wiper | SFR-16 | SFR-20 | SFR-20 | SFR-25 | SFR-30 |
| 13 | Rod packing | PNY-16 | PNY-20 | PNY-20 | PNY-25 | PNY-30 |
| 15 | Gasket | P-22A | P-28 | P-28 | P-34 | P-45 |
| 17 | Cylinder gasket | F4-650631 | F4-650632 | F4-650633 | F4-650634 | F4-650635 |
| 18 | Cushion packing | F4-650636 | F4-650637 | F4-650637 | F4-650638 | F4-650639 |
| 21 | Piston packing | PMY-40 | PMY-50 | PMY-63 | PMY-80 | PMY-100 |
| 24 | Wear ring | F4-650239 | F4-650240 | F4-650241 | F4-650242 | F4-650243 |
| 32 | Needle gasket | P-3 | P-3 | P-3 | P-3 | P-3 |

2) To Detach Lock Part:

(1) Loosen 2 hexagon socket head cap screws ㉚ and turn the reset lever ㉘ 180 degrees to release the lock manually.

(2) Remove 4 round nuts ㊱ with a hexagonal bar spanner to detach the lock part.

3) Checking Item

Check the parts in the following items:

(1) Tube internal flaw
(2) Flaw on the piston rod surface, plating separation and rusting
(3) Bushing internal flaw and wear
(4) Flaw, wear and cracking on the piston surface
(5) Looseness in the piston and rod coupling part
(6) Cracking on both-end covers
(7) Flaw and wear on the packing in the sliding part (dust wiper, rod packing, cushion packing & piston packing)

Check the places described above, and if any abnormality is found, repair the defectives or replace the parts.

4) To Attach Lock Part:

For re-installation, reverse the removal procedure - "2) To Detach Lock Part" given in "5.3 Disassembly": attach the lock part according to the steps (2) to (1).

During assembly, give care to the following:

(1) Always wipe out grease with waste cloth or the like if it adheres to piston rod ②.

(2) Apply grease to gasket ⑮ and assemble it with special care so that it is not damaged.

(3) When assembling the lock part, tighten round nut ㊱ in the diagonal order so that it is not twisted.
Also, after assembly, check to see if the piston rod ② moves smoothly.

(4) Turn the reset lever ㉘ 180 degrees, tighten 2 hexagon socket head cap screws ㉜, and return it to the locking position.

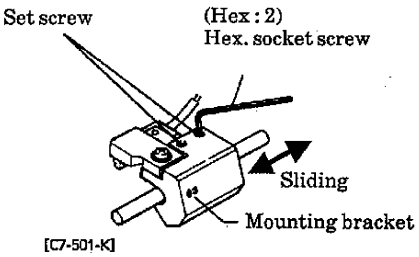
## 5.4 Relocation of switch and mounting it

1) Relocation

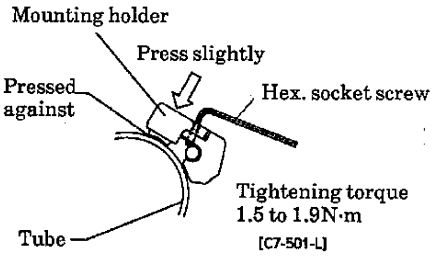
Loosen the set screws (2 ea.) for approx. 1/2 to 3/4 turn. It enables the switch to slide along the tie rod without letting screws drop off.

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 1.5 to 1.9N·m. It is considered to be sufficient, as a rule of thumb, when Allen wrench starts bending slightly.

<Relocation>




<Tightening>



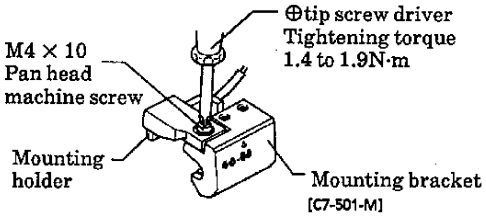

2) Installation of switch

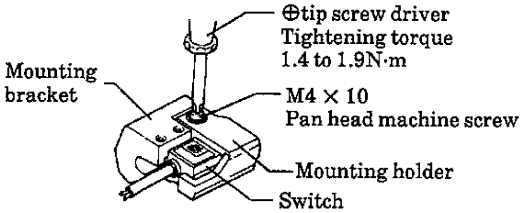
Follow the procedures (1) to (3) as described below.

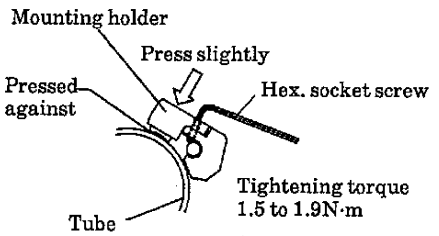
(1) While holding a switch underneath of switch holder, tighten M4×10 pan headed machine screws to mount it on the bracket.

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

Make use this merit when engaged in adjusting location of the switch set.

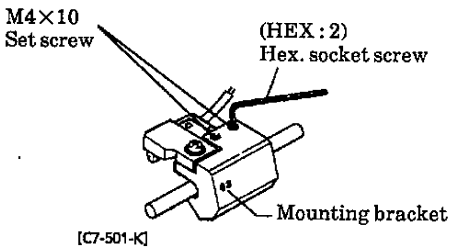


(3) To fix the mounting bracket on the tie rod, tighten screws while pressing bracket slightly against tube.

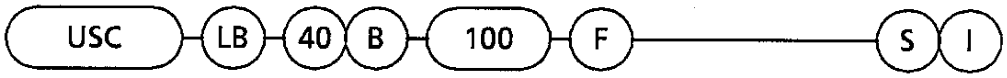
Adequate torque of tightening screw is 1.5 to 1.9N·m. It is considered to be sufficient, as a rule of thumb, when Allen wrench starts bending slightly.



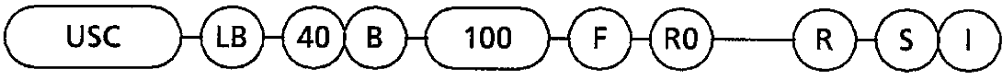
# 6. HOW TO ORDER

## 6.1 Product Model Coding

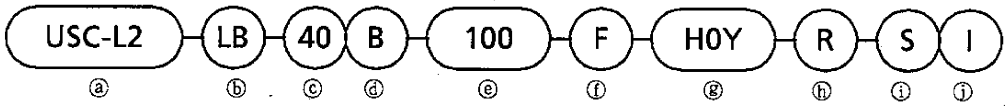
● Cylinder without switch




● Cylinder with switch




●Cylinder with switch of critical magnetic proof



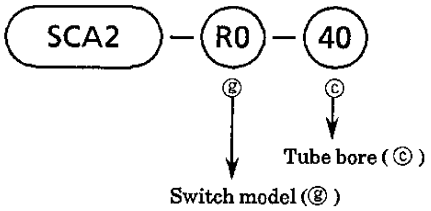
| | | | | ⓐ Model No. | |
|---|---|---|---|---|---|
| | | | | Double acting / single rod type | Double acting / with coil scraper |
| | | | | USC | USC-G1 |
| ⓑ Mounting style | | | | | |
| OO | Basic type | | | ● | ● |
| LB | Foot mounting type | | | ● | ● |
| FA | Front flange mounting type | | | ● | ● |
| FB | Rear flange mounting type | | | ● | ● |
| FC | Special rear flange mounting type | | | ● | ● |
| CA | Single clevis mounting type | | | ● | ● |
| CB | Double clevis mounting type | | | ● | ● |
| TC | Intermediate trunnion type | | | ● | ● |
| TA | Front trunnion mounting type | | | ● | ● |
| TB | Rear trunnion mounting type | | | ● | ● |
| ⓒ Tube bore (mm) | | | | | |
| 40 | φ40 | | | ● | ● |
| 50 | φ50 | | | ● | ● |
| 63 | φ63 | | | ● | ● |
| 80 | φ80 | | | ● | ● |
| 100 | φ100 | | | ● | ● |
| ⓓ Cushion | | | | | |
| B | Cushion both ends | | | ● | ● |
| R | Cushion at rod end | | | ● | ● |
| H | Cushion at head end | | | ● | ● |
| N | Without cushion | | | ● | ● |
| ⓔ Stroke (mm) | | | | | |
| 25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500 | | | | ● | ● |
| ⓕ Lock direction | | | | | |
| F | Forward locking type | | | ● | ● |
| B | Backward locking type | | | ● | ● |
| ⓖ Switch mode | | | | | |
| R1※ | Solid state type | 2-wire | Grommet | ● | ● |
| R2※ | | | | ● | ● |
| R2Y※ | Bi colors solid state | | | ● | ● |
| T2YD※ | Solid state -for critical magnetic proof | | | ● | ● |
| R3※ | Solid state type | 3-wire | | ● | ● |
| R3Y※ | Bi colors solid state | | | ● | ● |
| R0※ | Reed switch type | 2-wire | | ● | ● |
| R4※ | | | | ● | ● |
| R5※ | | | | ● | ● |
| R6※ | | | | ● | ● |
| H0※ | Reed switch type -for critical magnetic proof | 2-wire | Terminal box | ● | ● |
| H0Y※ | Bi colors reed switch for critical magnetic proof | | | ● | ● |
| R1B※ | Solid state type | | | ● | ● |
| R2B※ | | | | ● | ● |
| R2Y※ | Bi colors solid state | | | ● | ● |
| R3B※ | Solid state type | 3-wire | | ● | ● |
| R3YB※ | Bi colors solid state | | | ● | ● |
| R0B※ | Reed switch type | 2-wire | | ● | ● |
| R4B※ | | | | ● | ● |
| R5B※ | | | | ● | ● |
| R6B※ | | | | ● | ● |

| | | ⓐ Model No. | |
|---|---|---|---|
| | | Double acting · single rod type | Double acting ·with coil scraper |
| | | USC | USC-G1 |
| ※Lead cord length | | | |
| No code | 1m (Standard) | ● | ● |
| 3 | 3m (Optional) | ● | ● |
| 5 | 5m (Optional) | ● | ● |
| ⓗ Qty of switch | | | |
| R | 1 ea., Rod end | ● | ● |
| H | 1 ea., Head end | ● | ● |
| D | 2 ea. | ● | ● |
| T | 3 ea. | ● | ● |
| ⓘ Option | | | |
| J | Bellow : polyoefin elastomer | ● | ● |
| L | Bellow : silicone rubber glass cloth | ● | ● |
| M | Piston rod, material revised (stainless) | ● | ● |
| No code | Cushion needle R position(standard) | ● | ● |
| S | Cushion needle S position | ● | ● |
| T | Cushion needle T position | ● | ● |
| P6 | Copper and PTFE free | ● | ● |
| ⓘ Accessories | | | |
| I | Single knuckle | ● | ● |
| Y | Double knuckle | ● | ● |
| B1 | Single bracket | ● | ● |
| B2 | Double bracket | ● | ● |
| B4 | Trunnion type 2nd bracket | ● | ● |

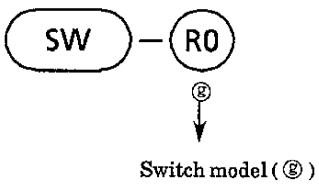
## 6.2 Individual Switch Model Coding

### (1) Cylinder Switch R Type

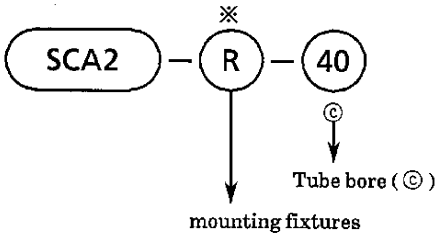
- Switch body + Complete set of mounting fixtures




- Switch alone



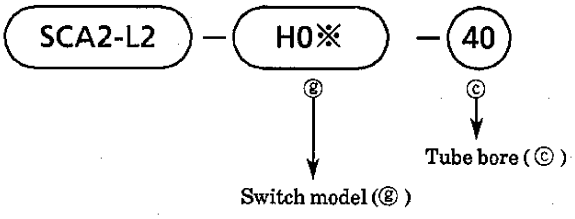

- Complete set of mounting fixtures



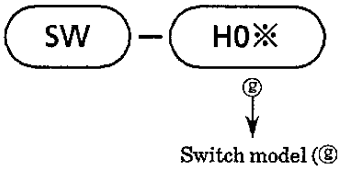

※ "RF" is for chips countermeasures.
(However, the switches are only R2YK and R3YK.)

(2) Cylinder Switch H0 Type

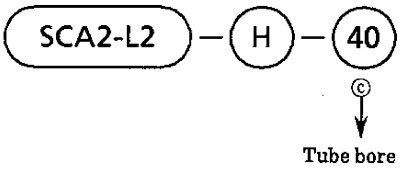
● Switch body + Complete set of mounting fixtures




● Switch alone

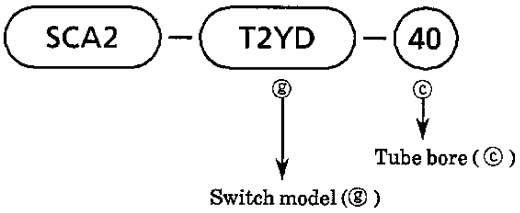



● Complete set of mounting fixtures

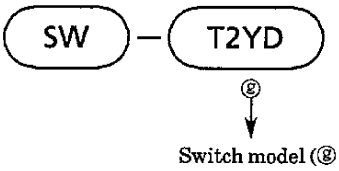



(3) Cylinder Switch T2YD Type

● Switch body + Complete set of mounting fixtures




● Switch alone




● Complete set of mounting fixtures