

INSTRUCTION MANUAL  
FOR  
**SELEX CYLINDER**  
SCA2-D

Please read this operation manual carefully before using this product, particularly the section describing safety.

Retain this operation manual with the product for further consultation whenever necessary.

# 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 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.

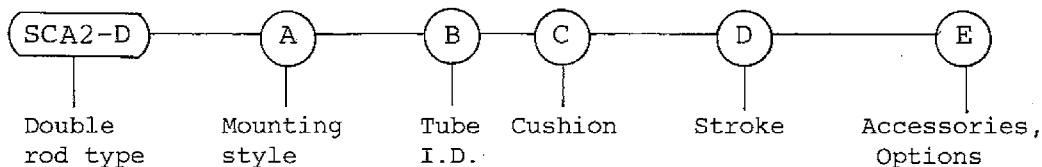
Perform an overhaul inspection with the power off. Also, do not touch these live parts with wet hands.

Thank you very much for purchasing the CKD product.  
 This INSTRUCTION MANUAL deals with the basic items regarding the installation, operation, maintenance, etc. required for bringing the efficiency of the air cylinder into full play.  
 Our products are produced under severe quality control.  
 You are requested to thoroughly go through this INSTRUCTION MANUAL before using the valve, and to perform correct operation and maintenance.

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1. HOW TO SEE MODEL NUMBER



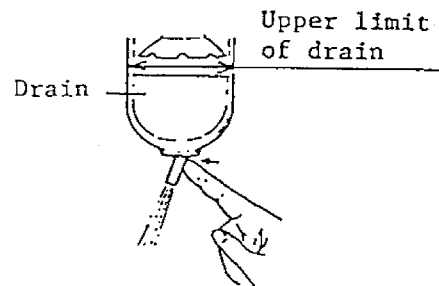
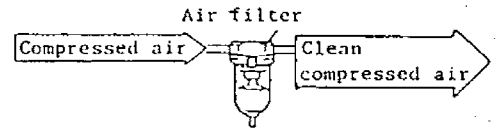
A Mounting styles		B Tube I.D. (mm)		C Cushion	
OO	Basic type	40	φ40	B	Cushion at both end
LB	Foot mounting type	50	φ50	R	Cushion at front end
FA	Front flange mounting type	63	φ63	H	Cushion at rear
		80	φ80	N	Without cushion
FB	Rear flange mounting type	100	φ 100		
TC	Intermediate trunnion mounting type	Note) Mounting bracket will be attached to the product when shipping. (However the trunnion type mounting bracket is assembled to the product.) The standard for mounting is that the cushion needle faces toward upon with the cylinder port directing upward, when viewed from the side.			
TA	Front trunnion mounting type				
TB	Rear trunnion mounting type				

D Stroke			E Accessories and options	
Std. stroke	Max. stroke			
	Tube I.D.	Stroke		
25			I	Rod eye
50	φ40	600	Y	Rod clevis
75	φ50	600	B1	Eye bracket
100	φ63	600	B2	Clevis bracket
150	φ80	700	J	Bellows (Material: Nylon tarpaulin)
200	φ100	800	K	Bellows (Material: Neoprene sheet)
250			L	Bellows (Material: Silicon rubber-glass cloth)
300	Note) If the stroke length exceeds the maximum stroke, refer to page .		M	Piston rod (Material being changed)
350			N	Piston rod, with lug length and thread area being changed
400			No mark	Cushion needle position R (Standard)
450			S	Cushion needle position S
500			T	Cushion needle position T

## 2. Cautions for Use

### 2-1 General cautions for use

- (1) On the compressed air used to drive a cylinder, use clean and moistureless air. For this purpose, use a filter at a circuit and take care of the degree of filtration ( $5\mu$  or finer), flow, mounting position (brought close to a directional control valve) and the like for the filter.
- (2) Discharge the drain collected in the filter periodically before exceeding the upper limit.
- (3) Intrusion of a carbide (carbon or tar-shaped material) contained in the compressor oil into the circuit causes malfunction of valve and cylinder. Sufficient care of the maintenance and inspection of a compressor should be taken.
- (4) Oilless use is possible for the cylinder. Use ISOVG32 in the case where oiling is preformed.
- (5) The range of ambient temperature for using a cylinder is 5 to  $60^{\circ}\text{C}$ .



In case the temperature is below  $5^{\circ}\text{C}$ , take a measure to prevent the fluid from freezing, as the moisture in the circuit may freeze and trouble is liable to be caused.

#### \* Recommended lubricant

For high temperature: Molytherm #0 (Sumitomo Metal)  
 For low temperature: Daphne grease XLA-2 (IDEMITSU),  
 SH33 (TORAY SILICONE)

#### \* Anti-freezing

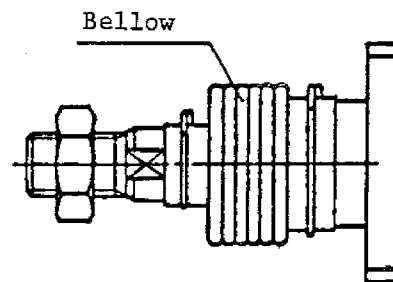
- (a) Remove moisture from compressed air. (Use of dry pack dryer is recommended.)
- (b) Lower the freezing point by mixing an anti-freeze (Use of ethylene glycol is recommended.).
- (c) Perform the heat insulation and heating of an equipment and piping, and keep them more than the temperature of the freezing point.

- 6) When a rod is used at the place with bad ambient atmosphere and the many dusts, use the rod, with a bellows attached.

o Service temperature of a bellows  
Unit: °C

Material of a bellows	Max. ambient temperature	Max. instantaneous temperature
Nylon tarpoulin	60	100
Neo plain sheet	100	200
Silicone rubber glass cloth	250	400

Note: Maximum instantaneous temperature means the temperature where spar, chip and the like strike on a bellows instantaneously.

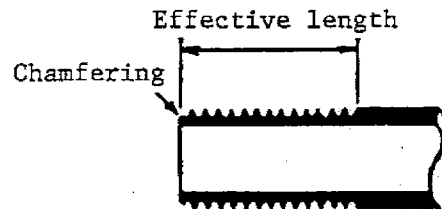


## 2-2 Cautionary instructions in piping

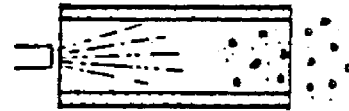
- (1) Use a pipe difficult to corrode such as a galvanized pipe, a nylon pipe, a rubber pipe and the like for the piping material after a filter. (A galvanized pipe shall be recommended also for the piping material before a filter).
- (2) On the line connecting a cylinder with a directional control valve, make sure whether the sectional area has an effective sectional area enough to attain a fixed piston speed.
- (3) Install a filter as close as possible to a directional control valve to remove rust, foreign matter and drain in the line.

- (4) Keep the effective screw length for the screw length of a gas pipe.

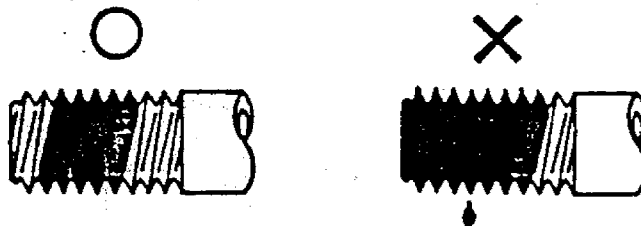
In addition, perform the chamfered finish for a half pitch grade from the extreme point of a screw area.



- (5) Perform flushing to remove the foreign matter chips and the like in the pipe before piping.



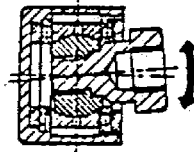
- (6) When the lines are connected to the product, cautions should be taken to the amount of a sealant, the applied position, and also to the wound position of a sealing tape, so that the sealant, the sealing tape and the like may not enter the lines.



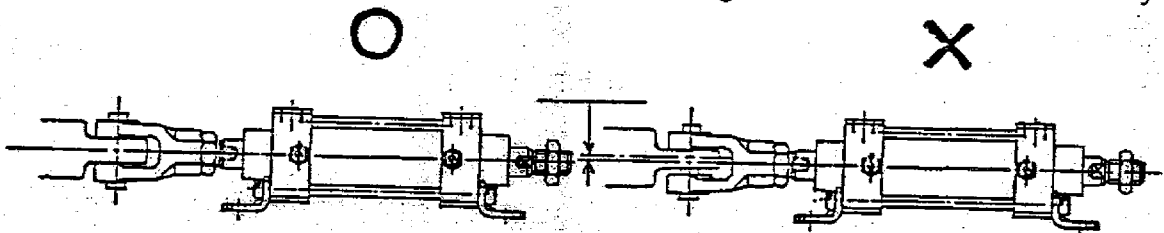
- (7) After the piping, make sure the presence of leakage by applying soap at each connected area. Be sure to wipe it out after the checking.

## 2-3 Cautionary instructions in installation

- 1) In order to prevent the breakage of a screw at the point of a rod and the wear or seizure of bushing, the connection area between the point portion of the rod and load should be connected with a spherical bearing so that it may not be twisted at any position of stroke.

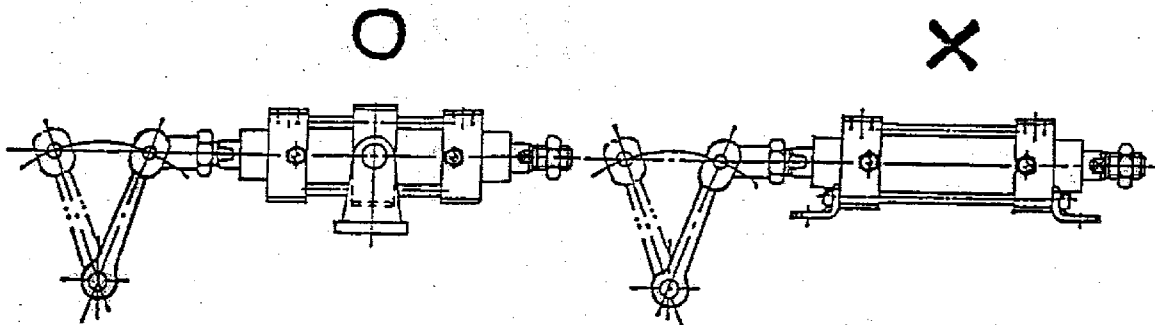


- 2) In the case where the load moving direction is not in parallel with the axis of a rod, twist is caused at the rod or a tube. As a result, there is the possibility of seizure or breakage. Accordingly, the coincidence of the axis of the rod with the load moving direction is mandatory.



- 3) In the case of a cylinder with long stroke, install a support, in order to prevent the sag of a rod, the flexure of a tube and the injure of a rod due to vibration and an external load.

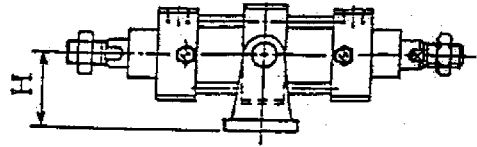
- 4) It is undesirable to connect a fixed cylinder with an arm in a circular motion. In this case, connect the arm with an oscillating cylinder.



- 5) In the case where the load moving direction varies with the operation of a cylinder, use an oscillating cylinder (Clevis type or trunnion type) where the cylinder itself is rotatable for any angle. In addition, install the connecting metal fittings (Knuckle) at the point of the rod, too, so that it may move in the same direction as that of the motion of the cylinder body.

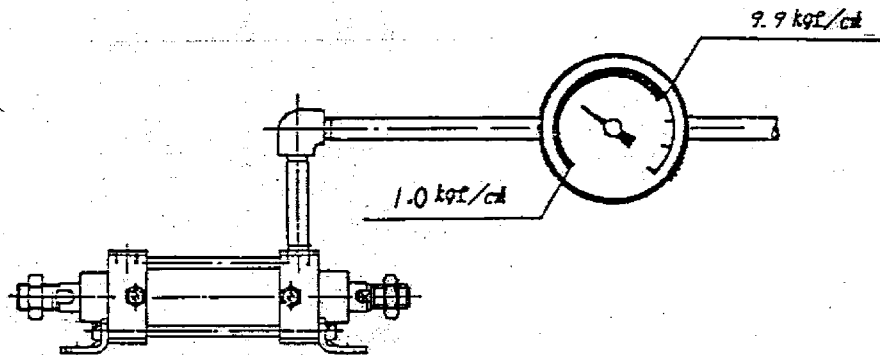


- 6) Large clearance between a clevis or a trunnion and the opposite bearing causes the working of bending action upon a pin or an axis. Therefore, the clearance should not be too large. (Recommended maximum fit:  $H 10/e8$ )
- 7) When the height (H) from the attached surface of a bearing bracket to the bearing position is high, the large force generated by a cylinder force at the attached area of a bracket may cause the failure of fitting bolt and the like.



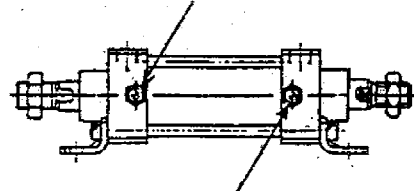
## 2-4 Operation and adjustment

- 1) The supply pressure to a cylinder should be kept within the range of 1.0 to 9.9 kgf/cm<sup>2</sup> (bar). Smooth operation may not be performed if the supply pressure is less than 1.0 kgf/cm<sup>2</sup>. In addition, the cylinder should never be operated at the pressure of more than 9.9 kgf/cm<sup>2</sup> (bar).



- 2) An effect of a cushion has been adjusted at no-load when delivered, but adjust a cushion needle when the effect of the cushion is changed to match load. Tightening of a needle (clockwise) results in a good effect of a cushion. Tighten and set a needle nut after the adjustment.

Adjust the side rod pushed out.



Adjust the side rod pulled in.

In addition, take particular consideration into a shock absorber, in the case where the kinetic energy such as heavy load, fast speed and the like is larger than the value in Table 1.

Table 1 Characteristic table of a cushion

Tube I.D. (mm)	Allowable absorbed energy (kgf·cm)		
	Effective cushion length (mm)	Cushion-loaded	Non-cushion
40	14.6	43.7	1.5
50	16.6	85.4	2.4
63	16.6	161.6	2.4
80	20.6	284.9	5.5
100	23.6	507.7	8.9

### 3. Maintenance - Check

#### 3-1 Periodic check

- 1) Perform a periodic check one or two times a year so that a cylinder may be used at the optimum condition.
- 2) Checking items
  - a) Looseness of a cylinder attaching bolt and nut.
  - b) Looseness of metal fittings at the point of a piston rod and of the bolt and nut for mounting of a support.
  - c) Smoothness of operating condition.
  - d) Change in a piston speed, a cycle time.
  - e) External and internal leakage.
  - f) Flaw and deformation of a piston rod.
  - g) The presence of the abnormal state for the stroke.

The above points should be made sure. If something unusual are found there, they should be further tightened or disassembled, and treated.

#### 3) Checking items at disassembly

- a) Flaw, plating exfoliation and rust at the internal surface of a tube.
- b) Flaw, plating exfoliation and rust at the surface of a piston rod.
- c) Flaw and wear at the internal surface of bushing.
- d) Flaw, wear, and crack at the surface of a piston.
- e) Looseness at the connecting area of a piston with a rod.
- f) Crack over both end covers.
- g) Flaw and wear of a packing at a sliding area (Dust wiper, rod packing, cushion packing and piston packing).

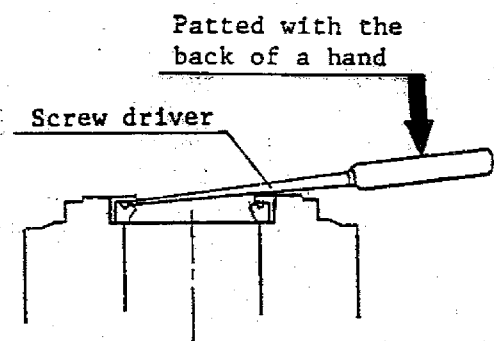
Above points should be made sure. If something unusual are found there, they should be repaired or replaced by parts and treated.

## 3-2 Disassembly—Reassembly—Inspection

## • Disassembly

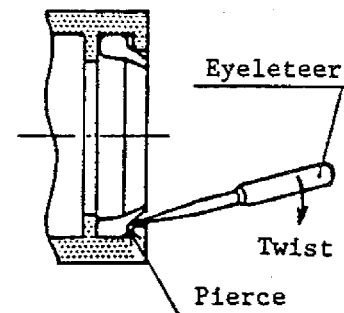
- 1) Stop a fluid and remove residual pressure.
- 2) Demount the line and make a cylinder solid.
- 3) Demount the socket screw ②⑤ ②⑦ of each support and each support ②④ ②⑥ will be free.
- 4) Demount a circular nut ②⑨, and ⑦ ⑩ ①⑥ ①⑧ and ①⑨ will be free.
- 5) Demount a needle nut ②② and a cushion needle ②③ will be free.
- 6) Disassembly of a cushion packing ⑨

- a) Fix a rod cover, with it being placed between a vise (or vice).
- b) Insert a ⊖ screwdriver under the metal ring of the packing and, using a corner of the cover as a fulcrum, top the other end of the screwdriver with a hand.



- 7) Disassembly of a dust wiper ③ and a rod packing ④.

Twist them out, with the packing being pierced with a pointed tool (an eyeleteer). (Reuse of a demounted packing is impermissible).



## • Reassembly

- 1) Cleaning of each part
- 2) After cleaning, carefully assemble each part in the reverse

3) Installation of cushion packing

Press fit the packing carefully with a press so that the rip will not be damaged or the ring does not fit in due to inclination, until the upper face of the metal ring becomes approx. 0.5 mm below the edge of cover.

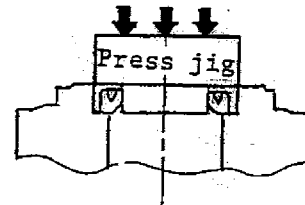
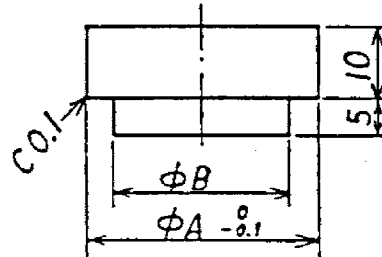


Table 2 and the figure are an example of a jig for a press. Refer to them.

Table 2. Size of jig for a press

Tube I.D. (mm)	A	B
40	28	20
50, 63	32	24
80	45	35
100	55	45



4) Apply a good grease (Lithium soap base grease No.1, No.2 and the like) to the internal surface of a cylinder tube ⑩, external surface of piston ⑪, packing and others ③ ④ ⑨ ⑫ ⑰.

5) On the clamping of a circular and a socket screw for the mounting of a support, clamp them diagonally. Besides, Table 3 is recommended for torque.

Table 3 (Clamping) torque

Tube I.D. (mm)	Torque (kgf·cm)
40, 50	100
63	100
80, 100	355

• Inspection

1) Operation inspection

After an initial machine warm up several times, inspect whether a smooth operation is performed by giving pressure alternately from the head side and rod side of a cylinder.

\* Inspection conditions

Supplied pressure; 1.0 kgf/cm<sup>2</sup> (bar) and working pressure

Average speed; adjusted to 50 mm/sec.

Cushion needle; full admission

## (2) Leakage inspection

Keep the cylinder standstill and apply pressure (working pressure) from head side and rod side alternately, and inspect in the following manner.

## o Inspection method

## (a) Displacement process (Water)

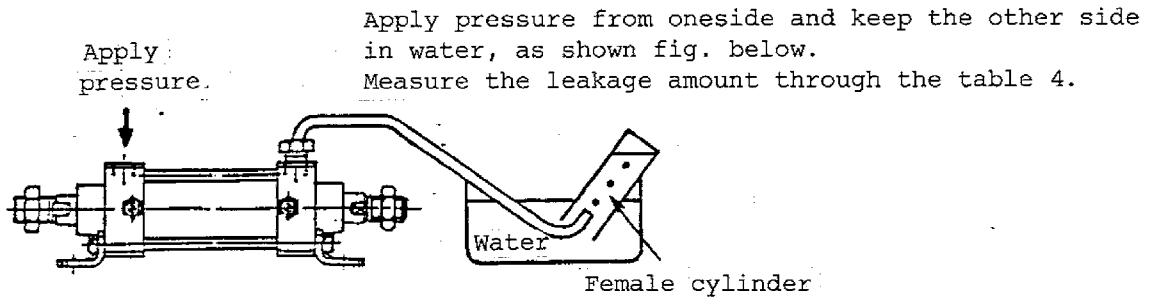


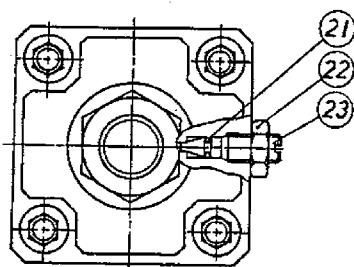
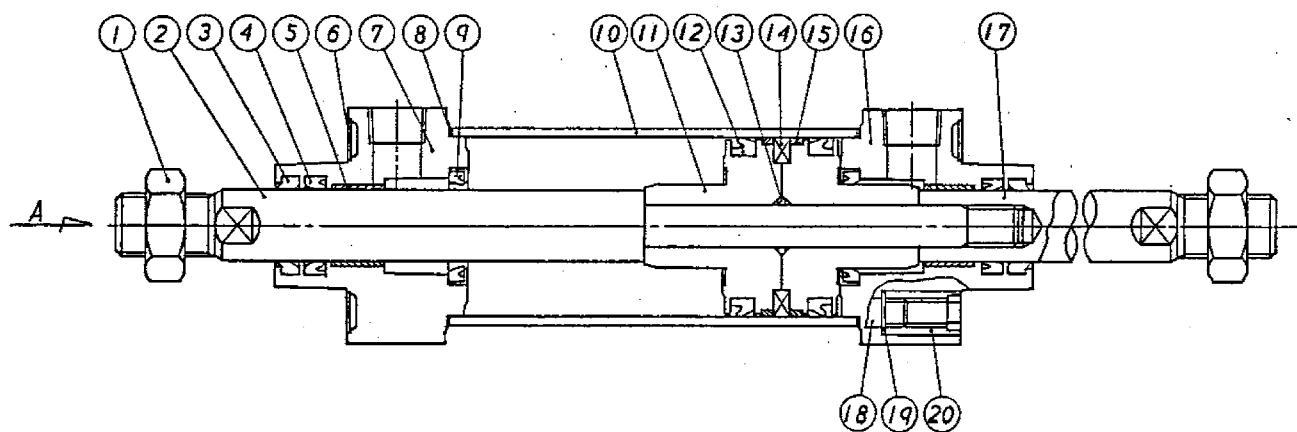
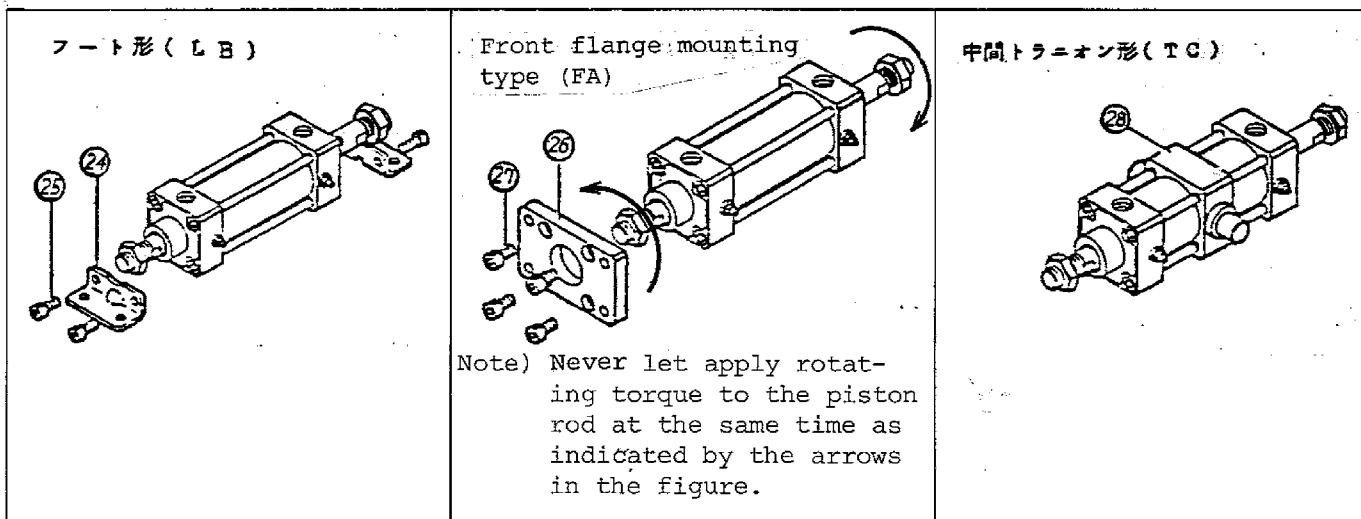
Table 4 Leakage amount

Tube I.D. (mm)	Leakage amount (cm <sup>3</sup> /min)
40	9
50	10.5
63	12.5
80	15
100	18

## (b) Soap film process

This process is to judge whether any leakage exists by applying soap water over the section where there is a chance of leakage.

However the leakage appears in the form of tiny bubbles.



A-View

Part No.	Part name	Q'ty	Part No.	Part name	Q'ty	Part No.	Part name	Q'ty
1	Rod nut	2	11	Piston (R)	2	21	Needle gasket	2
2	Piston rod (1)	1	12	Piston packing	2	22	Needle nut	2
3	Dust wiper	2	13	Piston gasket	1	23	Cushion needle	2
4	Rod packing	2	14	Piston magnet	1	24	Foot bracket	2
5	Bush	2	15	Wearing	2	25	Hex. socket head cap screw	4
6	Masking plate	2	16	Rod cover (I)	1	26	Flange	1
7	Rod cover	1	17	Piston rod (2)	1	27	Hex. socket head cap screw	4
8	Cylinder gasket	2	18	Tie rod	4			
9	Cushion packing	2	19	Conical spring washer	8			
10	Cylinder tube	1	20	Round nut	8	28	Intermediate trunnion	1

## 3-3 Trouble and the Countermeasure

Trouble	Cause	Countermeasure A1 ~ A3	Countermeasure A4
Rod does not operate	<ul style="list-style-type: none"> <li>* No pressure, Shortage of pressure</li> <li>* A signal is not feeded into a directional control valve</li> <li>* Installation is out of alignment</li> <li>* Breakage of piston packing</li> </ul>	<ul style="list-style-type: none"> <li>* Secure pressure source</li> <li>* Correct control circuit</li> <li>* Correct installation state</li> <li>* Change supporting type</li> <li>* Replace packing</li> </ul>	
Smooth operation of a rod is not performed	<ul style="list-style-type: none"> <li>* Installation is not feeded into a directional control valve</li> <li>* Lateral load is applied</li> <li>* Speed less than a low speed limit</li> <li>* Large load</li> <li>* Speed control valve has become a meter-in circuit</li> </ul>	<ul style="list-style-type: none"> <li>* Correct installation state</li> <li>* Change supporting type</li> <li>* Provide guide</li> <li>* Correct installation state</li> <li>* Change supporting type</li> <li>* Mitigate load fluctuation</li> <li>* Examine the use of low hydraulic cylinder</li> <li>* Raise pressure</li> <li>* Enlarge tube I.D.</li> <li>* Change a mounting direction of speed control valve.</li> </ul>	
Damage deformation	<ul style="list-style-type: none"> <li>* Impact force due to a high speed operation</li> <li>* Lateral load is applied</li> </ul>	<ul style="list-style-type: none"> <li>* Cushion should be further calculated upon an effect</li> <li>* Make a speed slow</li> <li>* Lighten load</li> <li>* Provide a further positive cushion mechanism. (Exter</li> <li>* Provide guide</li> <li>* Correct installation state</li> <li>* Change supporting type</li> </ul>	



## 4. TOOLS

Tool name	Q'ty	Used points (Part No.)	Applied tube I.D.(mm)
Hexagon stock spanner (Nominal size: 6)	2	②⑤ ②⑦	40, 50, 63
" (Nominal size: 8)	2	②⑩	40, 50, 63
" (Nominal size: 10)	2	②⑤ ②⑦	80, 100
" (Nominal size: 12)	2	②⑩	80, 100
Spanner (Nominal size: 13)	1	②②	Total tube I.D.
⊖ Screw driver (Nominal size: 5.5 x 70)	1	①② ①③	Total tube I.D.
⊖ Screw driver (Nominal size: 9 x 200)	1	⑨	Total tube I.D.
Wooden hammer	1	Disassembling of ⑦ ①⑦ and ①⑩	Total tube I.D.
Syeleteer	1	③ ④ ⑧ ②①	Total tube I.D.
Press jig	1	Attachment for ⑨	Total tube I.D.

## 5. Expendable parts

Tube I.D. (mm)	40	50	63	80	100
Part No. / Kit No.	SCA2-D -40K	SCA2-D -50K	SCA2-D -63K	SCA2-D -80K	SCA2-D -100K
Part name					
③ Dust wiper	SFR-16K	SFR-20K	SFR-20K	SFR-25K	SFR-30K
④ Rod packing	PNY-16	PNY-20	PNY-20	PNY-25	PNY-30
⑧ Cylinder gasket	F4-650631	F4-650632	F4-650633	F4-650634	F4-650635
⑨ Cushion packing	F4-650636	F4-650637	F4-650637	F4-650638	F4-650639
⑫ Piston packing	PGY-40	PGY-50	PGY-63	PGY-80	PGY-100
⑮ Wearing	F4-650239	F4-650240	F4-650241	F4-650242	F4-650243
⑳ Needle gasket	P-3	P-3	P-3	P-3	P-3

Note: Packings are stored as a kit which consists of parts requiring replacement.

We recommend you to replace one set of parts.

When ordering, please inform us of the kit number.