CKD

SM-3586-A

INSTRUCTION MANUAL

SELEX CYLINDER

SCA 2-H

(Low Hydraulic type)

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

CKD Corporation

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.

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SCA2-H (Low Hydraulic type)
Selex Cylinder
Manual No. SM-3586-A

NOTE : Letters & figures enclosed within Gothic style bracket (examples such as [C2-4PP07] · [V2-503-B] etc.) are editorial symbols being unrelated with contents of the book.

May.13.1985
Revision : Apr.06.2000

1. PRODUCT

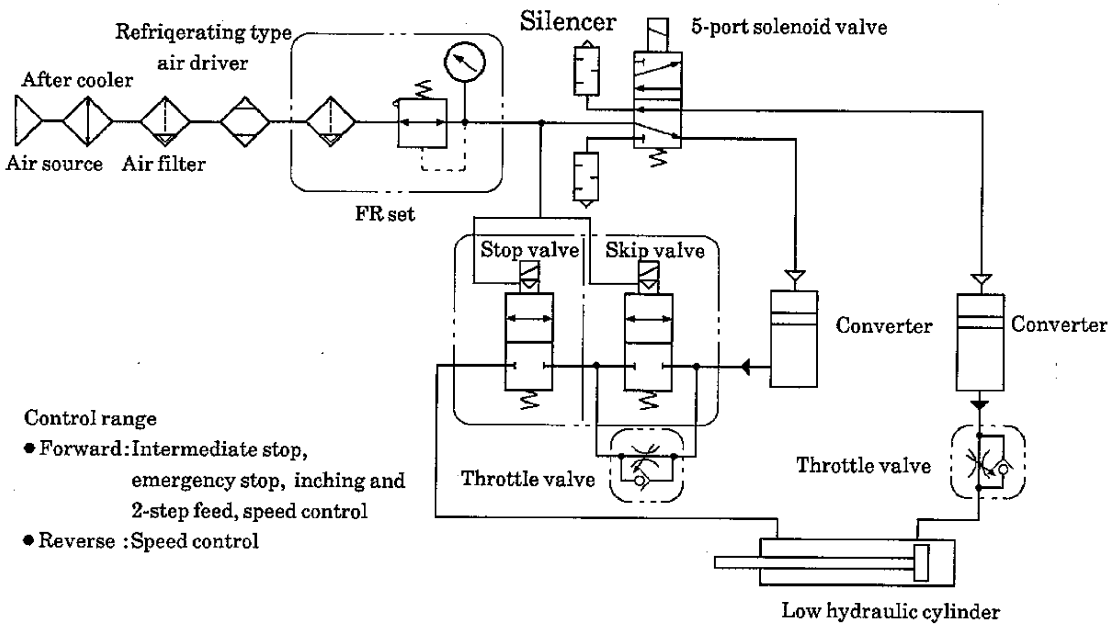
1.1 Specifications

Part number / Item		SCA2-H (Low Hydraulic Type)				
Tube bore	mm	φ40	φ50	φ63	φ80	φ100
Action		Double-acting Type				
Media		Hydraulic oil				
Maximum working pressure	MPa	1.0				
Minimum working pressure	MPa	0.2			0.15	
Proof pressure	MPa	1.0				
Ambient tempreature	°C	5 - 50				
Port size		Rc1/4	Rc3/8		Rc1/2	
Stroke tolerance	mm	$^{+1.0}_{0}$ (~300), $^{+1.4}_{0}$ (~500), $^{+2.0}_{0}$ (1000)				
Working piston speed	mm/s	See page 9.				
Cushion		Air cushion method				
Allowable surge pressure	MPa	2.9 (with cushion), 4.9 (without cushion)				
Nonpurple specification		Option				
Allowable absorption energy	J	4.29	8.37	15.8	27.9	49.8

Note 1. Cylinder switch is mountable on the cylinder of this type.

1.2 Fundamental Circuit Diagram & Selection of Related Equipment

1) Fundamental Circuit Diagram



2) Related equipment

The low hydraulic cylinder combindly uses an air-hydro converter.

- Converter unit (Converter stop valve, skip valve and throttle valve are mode into one unit.)
  CKD's model No. CU63 or CU100
- Converter (converter only)
  CKD's model No. CUT63 or CUT100
- Throttle valve

2. CAUTION

2.1 Warnings for design and selection

1) Do not use this product in a place close to a fire, and in equipment or machine at an ambient temperature exceeding 50°C.
   - Doing so may cause a fire since the low hydraulic cylinder uses flammable working oil.
2) This product cannot be used in a clean room.

2.2 Cautions for design and selection

1) A small amount of the oil may ooze from the packing sliding part or gasket fixing part of the low hydraulic cylinder. Do not use this product in a vacuum container or a place where oozed oil needs to be eliminated.
2) Always attach an exhaust cleaner to the directional control valve for the low hydraulic cylinder.
   A small amount of the working oil may be discharged from the exhaust port of the directional control valve in the low hydraulic cylinder, causing the work place around the product to be contaminated.
3) Always install the low hydraulic cylinder in a place where the maintenance work can be carried out easily. Keep a sufficient maintenance space since the low hydraulic cylinder requires several kinds of the maintenance work, such as working oil supply or air removal.
4) Select an optimal combination of the low hydraulic cylinder and converter unit.
   Proper operation is obtained by combining the low hydraulic cylinder with an appropriate converter unit. Always select an appropriate converter unit.
5) The load to the low hydraulic cylinder is designed to be 50% or less of the theoretical output. To obtain the performance close to that of the hydraulic cylinder, such as constant speed operation and stop accuracy, the load to the low hydraulic pressure cylinder needs to be 50% or less of the theoretical output.
6) Avoid the inching feed.
   If the inching feed of the low hydraulic pressure cylinder is performed, the oil level exceeds the upper limit of the converter and the oil may overflow. Do not perform the inching feed of the low hydraulic cylinder.

2.3 Working fluid

1) Turbine oil of the oil-base hydraulic working oil must be used as working oil. If nonflammable working oil, machine oil, or spindle oil is used, this may cause a trouble.
2) The proper viscosity must be 40 - 100 mm^2/s at an operating temperature. When the oil viscosity is ISO VG32, the operating temperature range becomes 15 - 35°C. If the oil viscosity exceeds ISO VG32, use ISO VG46 (25 - 45°C).
3) Recommended oils

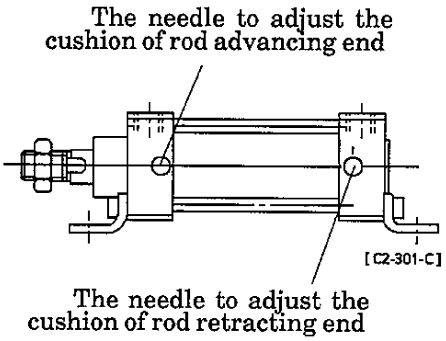
   It is recommended to use the following working oil with a viscosity of 40 mm^2/s at an operating temperature.

Fuji Kosan	:	Fucol Hydrol X 22
Nippon Oil	:	Hyrando Wide 22
Mitsubishi	:	Diamond Power Fluid 18
Shell	:	Shell Tellus Oil 22
Esso	:	Unibis J26
Mobil	:	Mobil DTE22
Idemitsu	:	Daphne Super Hydro 22WR

3. OPERATION

1) The cylinder feed pressure is ϕ40, ϕ50 : 0.2 - 1.0MPa and ϕ63 - ϕ100 : 0.15 - 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

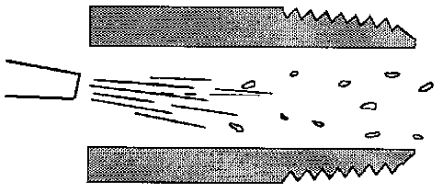
Tube I.D. (mm)	Absorbable energy (J)		
	Effective cushion length (mm)	With cushion	Without cushion
ϕ40	14.6	4.29	0.15
ϕ50	16.6	8.37	0.24
ϕ63	16.6	15.8	0.24
ϕ80	20.6	27.9	0.54
ϕ100	23.6	49.8	0.87

4. INSTALLATION

4.1 Piping

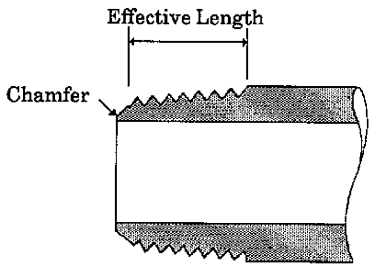
1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc.

2) Flush air into the pipe to blow out foreign substances and chips before piping.



[CO-400-B]

3) Be sure to adhere to the effective thread length of gas pipe and make a chamfer of approx. 1/2 pitch from the threaded end.

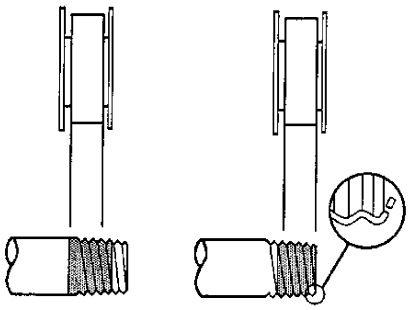


[CO-400-A]

4) If there is a large difference between the inside and outside diameters in the piping, the stable speed cannot be obtained. Additionally, the specified speed cannot be obtained if the joint is restricted or many 90° bents exist in the piping.

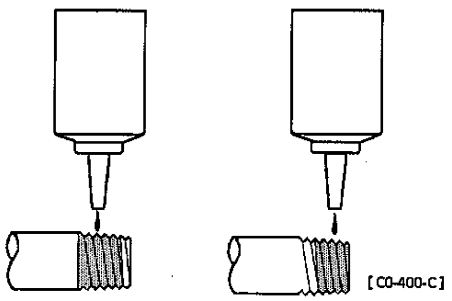
5) Refrain from mapplying sealant or sealing tape approx. two pitches of thread off the tip of the pipe to avoid residual substances from falling into the piping system.

● Seal Tape



Right False

● Sealant (Paste or liquid)



[CO-400-C]

Right False

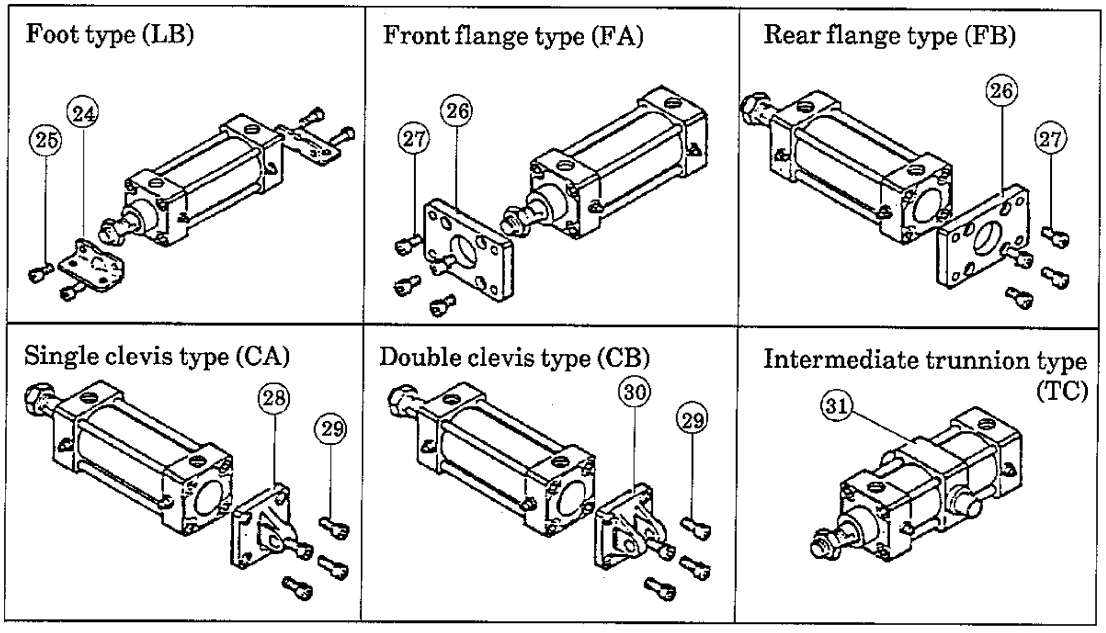
6) Always carry out the piping work of the converter and control units so that the drive units function in the control direction (meter-out direction).

7) After the piping work has been completed, check that no oil leaks from the connections.

4.2 Installation

1) The ambient temperature range for this cylinder is 5 - 50°C.
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) Mount the converter unit or converter so that the lower limit of the oil level in the converter is higher than the upper limit of the oil level in the cylinder.
5) Assembly of supporting metal fittings:
   The supporting metal fittings 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.

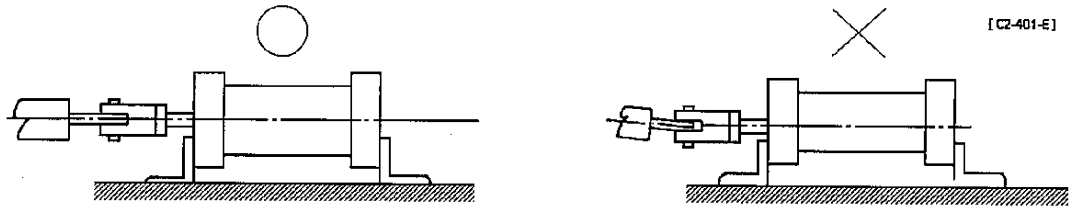
Assembly of supporting metal fitting (same as disassembling)



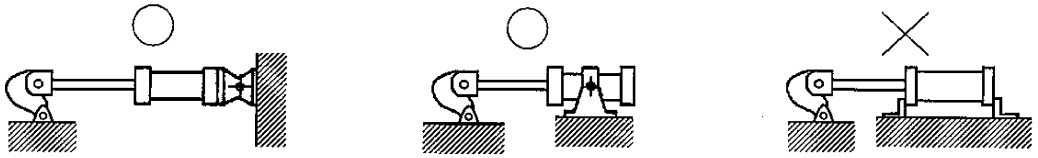
[C2-401-D]

6) 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).

7) 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]

8) 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

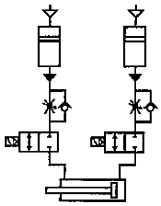
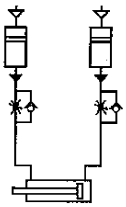
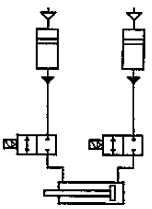
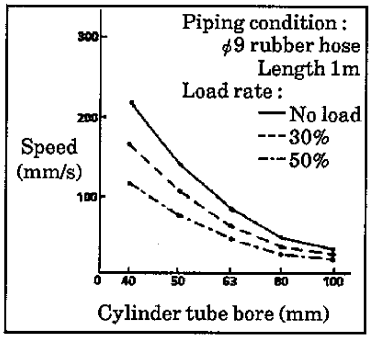
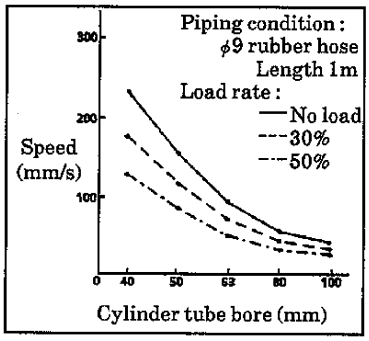
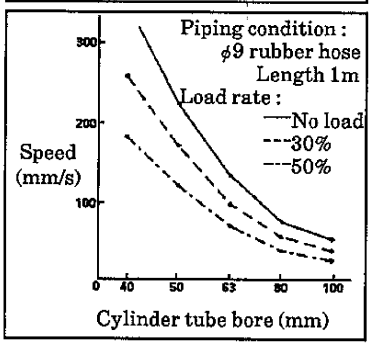
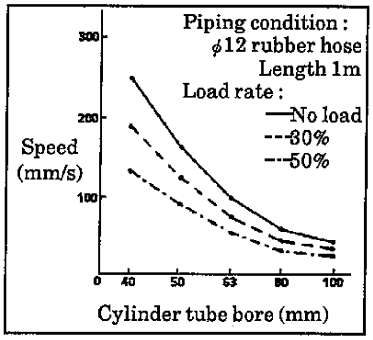
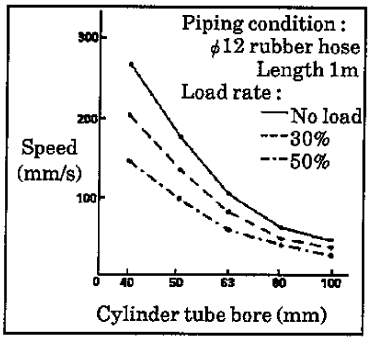
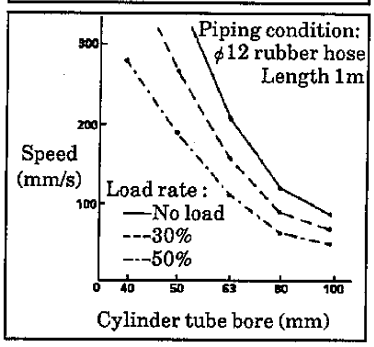
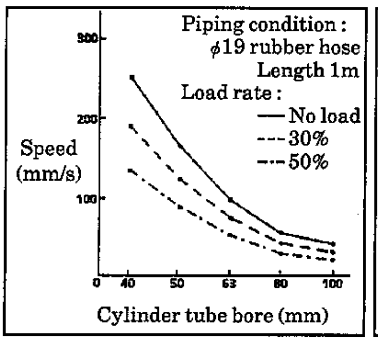
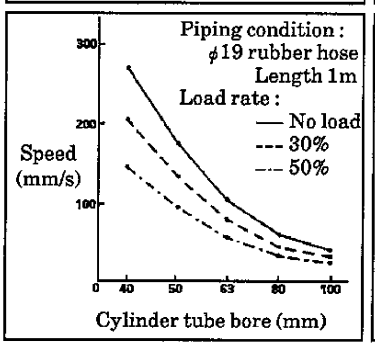
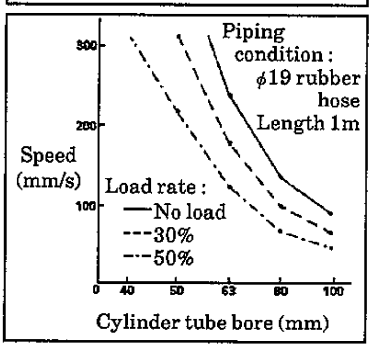
[C2-401-F]

5. MAXIMUM PISTON SPEED

Condition
- Working pressure : 0.5MPa
- Load rate : No load 30%, 50%
- Working direction: at pushing (The speed slows down by 20 to 30% at PULL.)
- Working oil : Viscosity 40mm²/s (cst) at25°C

• Diameter of the port bottom hole

Tube bore	Dir. of port bottom hole
ϕ40	ϕ11.1
ϕ50, ϕ63	ϕ14.6
ϕ80, ϕ100	ϕ18.2

Throttle valve and stop valve in use	Throttle valve in use	Stop valve in use
		
		
		
		

Note : The speed of hydraulic cylinder differs depending or the kind of valve such as throttle valve or stop valve, and the size of lower hole on piping port for the cylinder.

6. MAINTENANCE

6.1 Daily inspection and maintenance

1) Remove the air from the low hydraulic cylinder periodically.
The air may accumulate in the low hydraulic cylinder. Remove the air before starting the day's work. At this time, remove the air through the air vent valve installed on the piping.

2) Check the oil amount in the low hydraulic cylinder periodically.
As a small amount of the working oil is discharged from the low hydraulic cylinder and converter unit circuit, the oil amount is decreased gradually. Check the oil amount periodically. If the oil amount is insufficient, add the oil.
The oil amount can be checked using the level gauge on the converter unit.

3) If the working oil is mixed with drain, becomes whitish, deteriorates, and/or discolors, replace it with new one.
At this time, always replace the working oil with the same brand oil.

6.2 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", 6.3, should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

6.3 Trouble Shooting

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 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.
	Improper or misalignment of installation	Correct the installation state or change the supporting system.
	Exertion of transverse (lateral) load	Install a guide. Revise the installation state or change the supporting system.
	Excessive load	Increase the pressure itself 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 or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load 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 or change the supporting system.

6.4 Disassembling

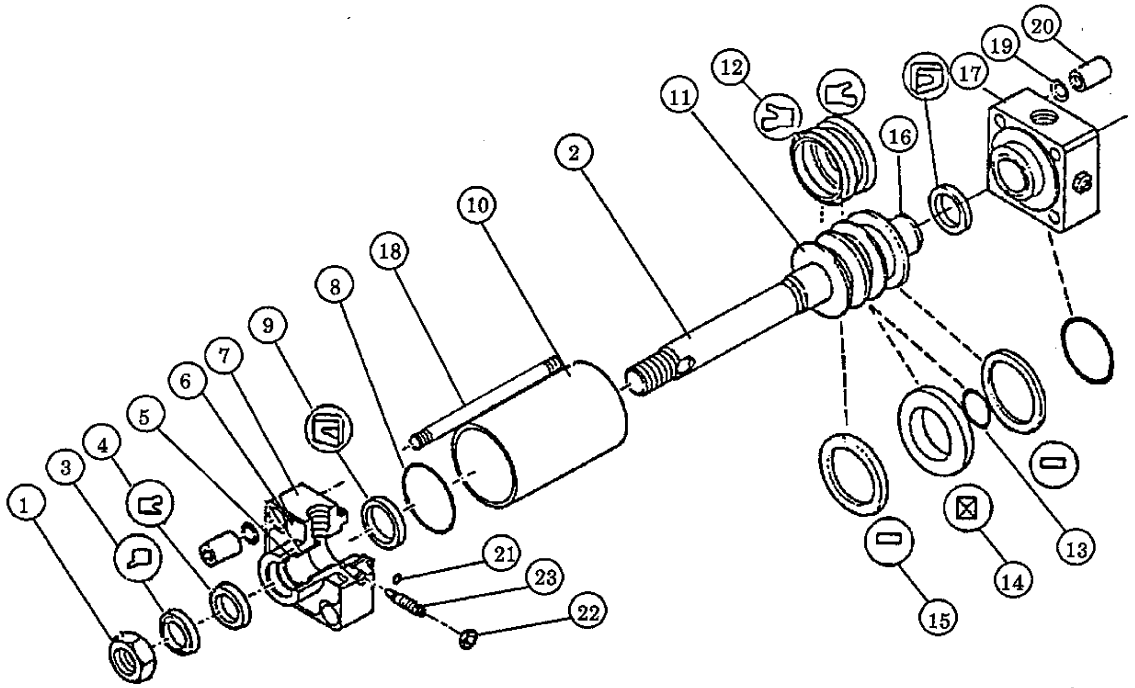
Should any oir leakage occur, take the following corrective actions.

1) Prepare the following tools for disassemling.

Disassembling tools

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

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



[C2-502-A]

Part No.	Part Name	Qty	Part No.	Part Name	Qty	Part No.	Part Name	Qty
1	Rod nut	1	11	Piston packing	2	22	Needle nut	2
2	Piston rod	1	12	Piston gasket	1	23	Cushion needle	2
3	Dust wiper	1	13	Piston magnet	1	24	Foot bracket	2
4	Rod packing	1	14	Wear ring	2	25	Hexagon socket head cap screw	4
5	Bushing	1	15	Piston (H)	1	26	Flange	1
6	Masking plate	2	16	Head cover	1	27	Hexagon socket head cap screw	4
7	Rod cover	1	17	Tie rod	4	28	Eye clevis	1
8	Cylinder gasket	2	18	Conical spring washer	8	29	Hexagon socket head cap screw	4
9	Cushion packing	2	19	Round nut	8	30	Cap clevis	1
10	Cylinder tubu	1	20	Round nut	8	31	Intermediate trunnion	1
11	Piston (R)	1	21	Needle gasket	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 bushing
   (d) Scratch marks, wear and crack of the surface of piston
   (e) Loosened connection of piston and rod
   (f) Crack of both end covers
   (g) Scratch marks and wear of packing in sliding part. (Dust wiper, rod packing, cushion packing and piston packing)

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

4) Followings are expendable parts. (Specify the kit No. when ordering.)
   (a) SCA2-H

Part No.	Name \ Tube ID(mm) / Kit No.	φ 40	φ 50	φ 63	φ 80	φ 100
		SCA2-H-40K	SCA2-H-50K	SCA2-H-63K	SCA2-H-80K	SCA2-H-100K
3	Dust wiper	SDR-16K	SDR-20K	SDR-20K	SDR-25K	SDR-30K
4	Rod packing	SKY-16	SKY-20	SKY-20	SKY-25	SKY-30
8	Cylinder gasket	F4-667115	F4-667116	F4-667117	F4-667118	F4-667119
9	Cushion packing	F4-650636	F4-650637	F4-650637	F4-650638	F4-650639
12	Piston packing	OSY-40	OSY-50	OSY-63	OSY-80	OSY-100
15	Wear ring	F4-650239	F4-650240	F4-650241	F4-650242	F4-650243
21	Needle gasket	P-3	P-3	P-3	P-3	P-3

7. HOW TO ORDER

SCA2-H — (LB) — (40) (B) — (100) — (Y)

(Low hydraulic type) ⓐ ⓑ ⓒ ⓓ ⓔ

An example coding shown to the left refers to selex cylinder type-2, axial foot type, inner dia. ϕ40; stroke 100mm with double knuckle.

ⓐ Mounting style		ⓑ Tube bore (mm)		ⓒ Cushion	
OO	Basic type	40	ϕ 40	B	With cushion at both ends
LB	Foot mounting type	50	ϕ 50	R	With cushion at rod side
FA	Front flange mounting type	63	ϕ 63	H	With cushion at head side
FB	Rear flange mounting type	80	ϕ 80	N	Without cushion
FC	Special rear flange mounting type	100	ϕ100		
CA	Single clevis mounting type				
CB	Double clevis mounting type				
TC	Intermediate trunnion type				
TA	Front trunnion mounting type				
TB	Rear trunnion mounting type				

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

ⓓ Stroke (mm)		
Std. stroke	Max. stroke	
	Tube bore	Stroke
25	ϕ 40	600
50	ϕ 50	600
75	ϕ 63	600
100	ϕ 80	700
150	ϕ100	800
200		
250		
300		
350		
400		
450		
500		

ⓔ Accessories & options	
I	Single knuckle
Y	Double knuckle
B1	Single bracket
B2	Double bracket
B4	Trunnion type No.2 bracket
J	Bellow: Nylon tarpaulin
L	Bellow: Silicone rubber glass cloth
M	Alteration in piston rod material
N	Alteration in piston rod lug length and thread area
No code	Cushion needle position R (Standard)
S	Cushion needle position S
T	Cushion needle position T

Note : Refer to the external dimension drawing for SCA2 catalogue for the position of cushion needle.