CKD Corporation

SM-5130-A

INSTRUCTION MANUAL

FOR

SELEX CYLINDER

SCA 2-T (Heat resistance type)
SCA2-T1 (Heat resistance 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.

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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Selex Cylinder
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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.

1. PRODUCT

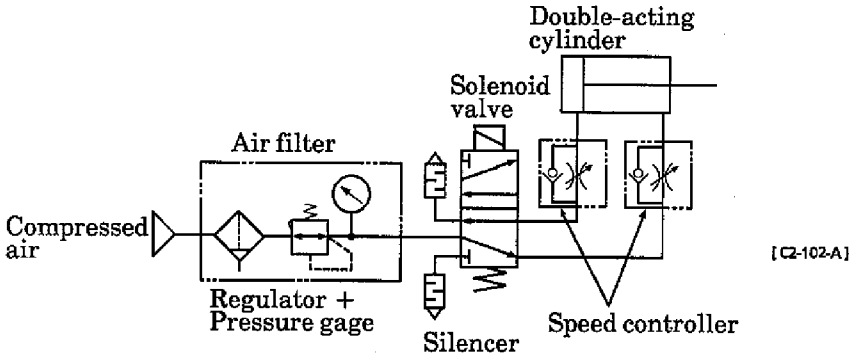
1.1 Specifications

Part number / Item	SCA2-T			SCA2-T1	
Action	Double - acting type				
Media	Compressed Air				
Maximum working pressure MPa {kgf/cm²}	1.0 {10.2}				
Minimum working pressure MPa {kgf/cm²}	0.05 {0.5}				
Proof pressure MPa {kgf/cm²}	1.6 {16.3}				
Ambient tempreature °C	5~120			5~150	
Bore coil mm	φ40	φ50	φ63	φ80	φ100
Port size Rc	1/4	3/8	3/8	1/2	1/2
Stroke tolerance mm	$^{+1.0}_{0}$ (~300), $^{+1.4}_{0}$ (~500), $^{+2.0}_{0}$ (1000)				
Working piston speed mm/s	50~1000 (Set the speed within the range of energy absorption.)				
Cushioning	Be able to select "have cushioning" or "no cushioning				

1.2 Fundamental Circuit Diagram & Selection of Related Equipment

1) Fundamental Circuit Diagram of Double-acting Cylinder

The following is the fundamental circuit diagram.



2) Selection of Related Equipment with the Fundamental Circuit Diagram above:

The related equipment depends on the tube inner diameter and speed of the driving cylinder. Select equipment from the Selection Guide Table. (The table provided on the next page is an example of related equipment.)

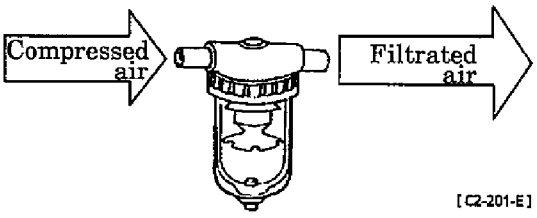
Selection Guide Table for Related Equipment (an example)

nner dia. of cylinder (mm)	Theoretical standard speed (mm/s)	Required flow rate (ℓ/min) at P=0.5MPa {5.1kgf/cm²}	solenoid valve		Speed controller	Silencer	Distribution tube (1m)
			Single solenoid	Double solenoid			
φ 40	250	110	A4F010-06	4F020-06	SC1-6	SL-M5	Bore size φ2.5 Copper tube (1m)
	500	230	A4F010-06	4F020-06	SC1-6	SL-M5	Bore size φ4 Copper tube (1m)
	750	340	4F110-08	4F120-08	SC1-8	SLW-8A	Bore size φ4 Copper tube (1m)
	1,000	450	4F210-08	4F220-08	SC1-10	SLW-8A	Bore size φ8 Copper tube (1m)
φ 50	250	180	A4F010-06	4F020-06	SC1-6	SL-M5	Bore size φ4 Copper tube (1m)
	500	350	4F110-08 4L210-08	4F120-08 4L220-08	SC1-8	SLW-6A	Bore size φ4 Copper tube (1m)
	750	530	4F210-08	4F220-08	SC1-10	SLW-8A	Bore size φ8 Copper tube (1m)
	1,000	710	4F410-10 4F310-10 4K310-10 4L310-10	4F420-10 4F320-10 4K320-10 4L320-10	SC1-10	SLW-10A	Bore size φ8 Copper tube (1m)
φ 63	250	280	4F110-08 4L210-08	4F120-08 4L220-08	SC1-8	SLW-6A	Bore size φ4 Copper tube (1m)
	500	560	4F210-08	4F220-08	SC1-10	SLW-8A	Bore size φ8 Copper tube (1m)
	750	840	4F410-10 4F310-10 4K310-10 4L310-10	4F420-08 4F320-10 4K320-10 4L320-10	SC1-10	SLW-10A	Bore size φ8 Copper tube (1m)
	1,000	1,100	4F510-10	4F520-20	SC1-10	SLW-10A	Bore size φ4 Copper tube (1m)
φ 80	250	450	4F210-08	4F220-08	SCI-10	SLW-8A	Bore size φ8 Copper tube (1m)
	500	910	4F410-08 4F310-08 4K310-08 4L310-08	4F420-08 4F320-08 4K320-08 4L320-08	SCI-10	SLW-8A	PT1/4 Steel pipe (1m)
	750	1,400	4F510-10	4F520-10	SC1-10	SLW-10A	PT3/8 Steel pipe (1m)
	1,000	1,800	4F510-15	4F520-15	SC-20A	SLW-15A	PT3/8 Steel pipe (or PT1/2) (1m)
φ100	250	710	4F410-10 4F310-10 4K310-10 4L310-10	4F420-10 4F320-10 4K320-10 4L320-10	SC1-10	SLW-10A	Bore size φ8 Copper tube (1m)
	500	1,400	4F510-10	4F520-10	SC1-10	SLW-10A	PT3/8 Steel pipe (1m)
	750	2,100	4F510-15	4F520-15	SC-20A	SLW-15A	PT3/8 Steel pipe (orPT1/2) (1m)
	1,000	2,800	4F610-20	4F620-20	SC-20A	SL-20A	PT3/8 Steel pipe (1m)

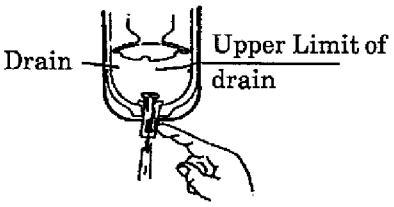
2. CAUTION

2.1 Fluid

1) It is necessary to use dehumidified air that has been filtered from compressed air. Carefully select an adequate filter that has an adequate filtration rate (preferably 5μm or less), flow rate and its mounting location (as nearest to the directional control valve as possible).
2) Be sure to drain out the accumulation in the filter periodically.
3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.



[C2-201-E]

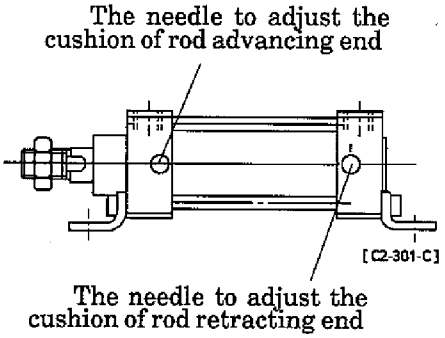


[C2-201-F]

3. OPERATION

1) The cylinder feed pressure is 0.05~1.0 MPa {0.5~10.2kgf/cm^2}; 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

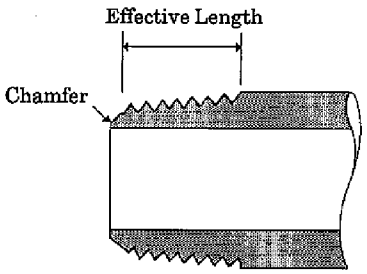
Tube I.D. (mm)	Absorbable energy J {kgf · m}		
	Effective cushion length (mm)	With cushion	Without cushion
ϕ40	14.6	4.29 {0.437}	0.15 {0.015}
ϕ50	16.6	8.37 {0.854}	0.24 {0.024}
ϕ63	16.6	15.8 {1.62}	0.24 {0.024}
ϕ80	20.6	27.9 {2.85}	0.54 {0.055}
ϕ100	23.6	49.8 {5.08}	0.87 {0.089}

3) Install a speed controller as shown in "Fundamental Circuit Diagram" on the page 1 to control the piston speed.

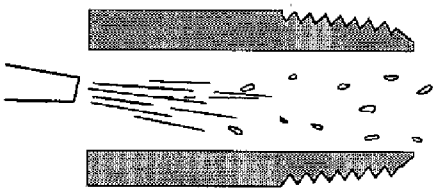
4. INSTALLATION

4.1 Piping

1) Use heat-resistance material pipe such as galvanized steel one for the piping after a filter. (Refer to Selection Guide Table for Related Equipment.)
2) See to it that the pipe connecting cylinder and solenoid valve has an effective sectional area which is needed for the cylinder to drive at the specified speed. (Refer to Selection Guide Table for Related Equipment.)
3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust and foreign substances in the drain of the pipe.
4) 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.
5) Flush air into the pipe to blow out foreign substances and chips before piping.

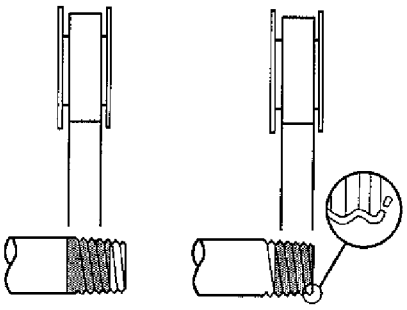


[C0-400-A]

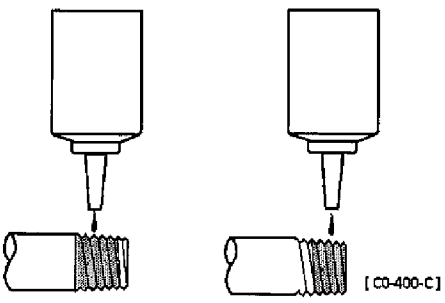

[C0-400-B]

6) 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

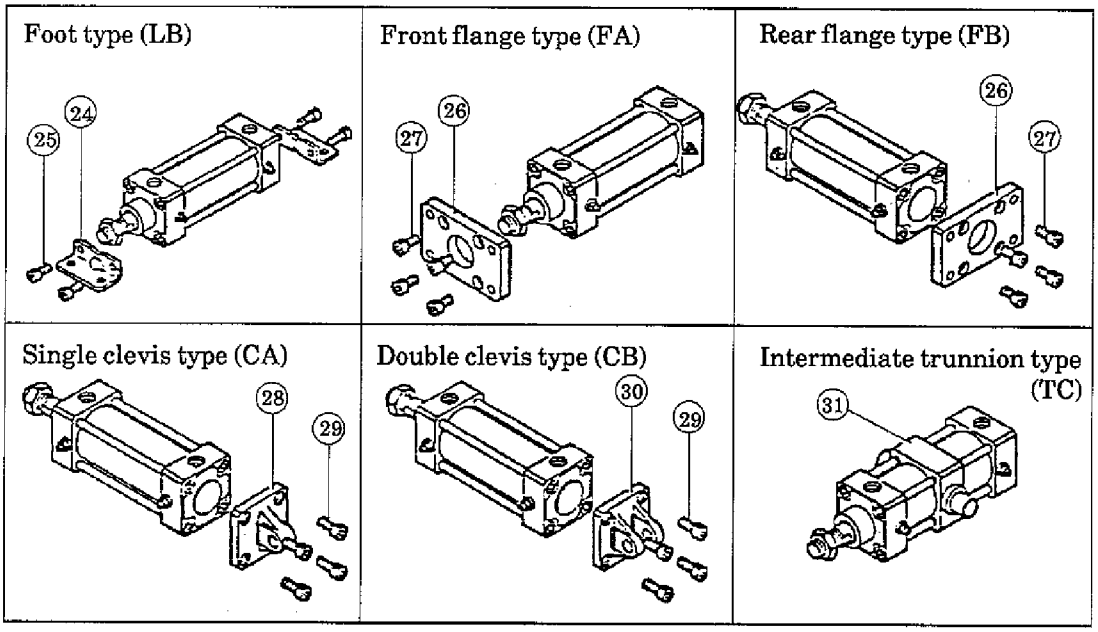
● Sealant (Paste or liquid)


[C0-400-C]
Right False

4.2 Installation

1) SCA2-T is possible to use in ambient air temperature between 5~120°C and SCA2-T1 is between 5~150°C. Those are under congelation-less condition.
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) 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)

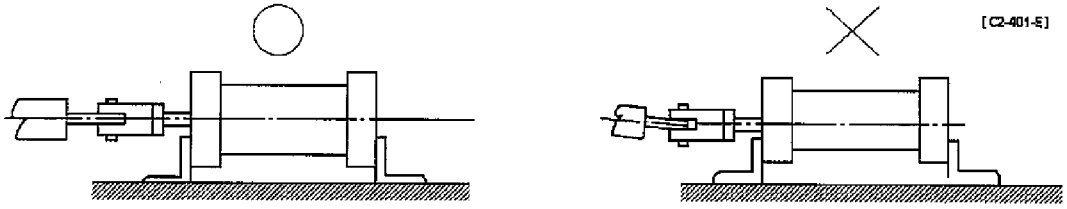


[C2-401-D]

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

6) When cylinder is fixed and rod end is connected with pin joint:

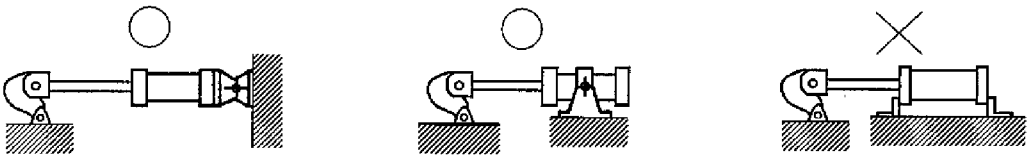
In case the load acting direction is not parallel with the rod axial center, the rod and tube may get entangled causing seizure, etc. Hence, make sure that the rod axial center and the load transfer direction are aligned to each other.



[C2-401-E]

7) When the load acting direction changes with the cylinder operation:

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



Clevise type　　Trunnion type　　Foot type

[C2-401-F]

5. MAINTENANCE

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

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. 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 deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load and/or install a mechanism with more secured cushion effect (e.g. external cushion mechanism).
	Exertion of transverse load	Install a guide. Reverse the installation state and/or change the supporting system.

5.3 Disassembling

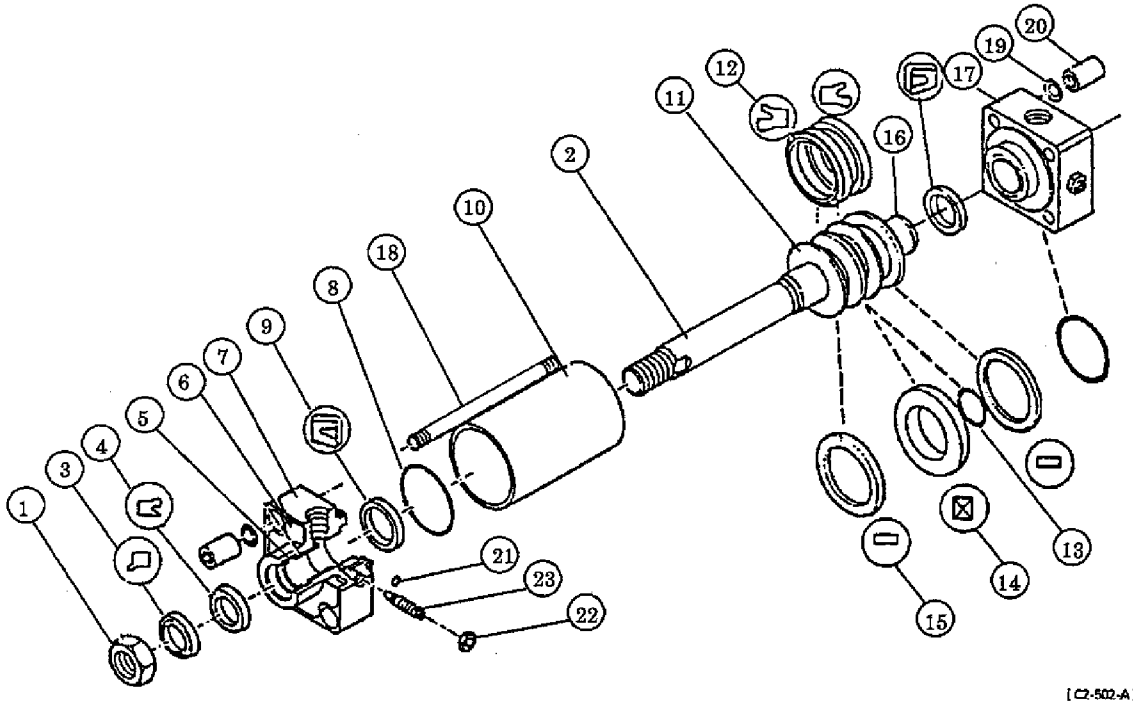
Should any air leakage occur, take the following corrective actions.

1) Prepare the following tools for disassemling.

Disassembling tools

Name	Qty	Place of use	Applicable tube ID (mm)
Hex. bar spanner (Nominal 8)	2	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 (R)	1	21	Needle gasket	2
2	Piston rod	1	12	Piston packing	2	22	Needle nut	2
3	Dust wiper	1	13	Piston gasket	1	23	Cushion needle	2
4	Rod packing	1	14	Piston magnet	1			
5	Bushing	1	15	Wear ring	2			
6	Masking plate	2	16	Piston (H)	1			
7	Rod cover	1	17	Head cover	1			
8	Cylinder gasket	2	18	Tie rod	4			
9	Cushion packing	2	19	Conical spring washer	8			
10	Cylinder tubu	1	20	Round nut	8			

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.)
   SCA2-T and SCA2-T1

Part No. / Name \ Tube ID(mm) / Kit No.		φ40	φ50	φ63	φ80	φ100
		SCA2-T-40K	SCA2-T-50K	SCA2-T-63K	SCA2-T-80K	SCA2-T-100K
3	Dust wiper	SFR-16F	SFR-20F	SFR-20F	SFR-25F	SFR-30F
4	Rod packing	PNY-16F	PNY-20F	PNY-20F	PNY-25F	PNY-30F
8	Cylinder gasket	F4-667140	F4-667141	F4-667142	F4-667143	F4-667144
9	Cushion packing	PCS-20F	PCS-24F	PCS-24F	PCS-35F	PCS-45F
12	Piston packing	PGY-40F	PGY-50F	PGY-63F	PGY-80F	PGY-100F
15	Wear ring	F4-650583	F4-650584	F4-650585	F4-650586	F4-650587
21	Needle gasket	P-3F	P-3F	P-3F	P-3F	P-3F

5) Coat heat-resistance grease at the time of the packing exchange.
   Recommended grease :FF-RM fluorine grease made by KYODO YUSHI

6. HOW TO ORDER

SCA2-T — LB — 40 B — 100 — Y
(Heat resistance type)

SCA2-T1 — LB — 40 B — 100 — Y
(Heat resistance type) ① ② ③ ④ ⑤

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 ID (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)			ⓔ Accessories & options	
Std. stroke	Max. stroke		I	Single knuckle
			Y	Double knuckle
25	Tube ID	Stroke	B1	Single bracket
50	ϕ 40	600	B2	Double bracket
75	ϕ 50	600	B4	Trunnion type No.2 bracket
100	ϕ 63	600	J	Bellow: Nylon tarpaulin
150	ϕ 80	700	L	Bellow: Silicone rubber glass cloth
200	ϕ100	800	M	Alteration in piston rod material
250			N	Alteration in piston rod lug length and thread area
300			No code	Cushion needle position R (Standard)
350			S	Cushion needle position S
400			T	Cushion needle position T
450				
500				

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