CKD

SM－478078－A

INSTRUCTION MANUAL

SELEX CYLINDER

HEAT RESISTANCE TYPE

SCS2－T

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

CKD Corporation

The first edition

For Safety Use

To use this product safety, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, **read this operation manual carefully for proper operation.**

Observe the cautions on handling described in this manual, as well as the following instructions:

⚠ CAUTION :

- 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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SCS2-T
Selex Cylinder
Heat resistance type
Manual No. SM-478078-A

1. UNPACKING

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

2. INSTALLATION

2.1 Installation

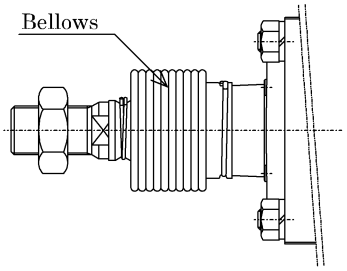
1) The ambient temperature range for this cylinder is 5 to 120℃.

2) Use cylinder with bellows over its rod within the area with much dust.

Working temperature of bellows Unit : ℃

Material of bellows	Max. ambient temperature	Momentary Max. temp.
Silicon rubber glass cloth	250	400

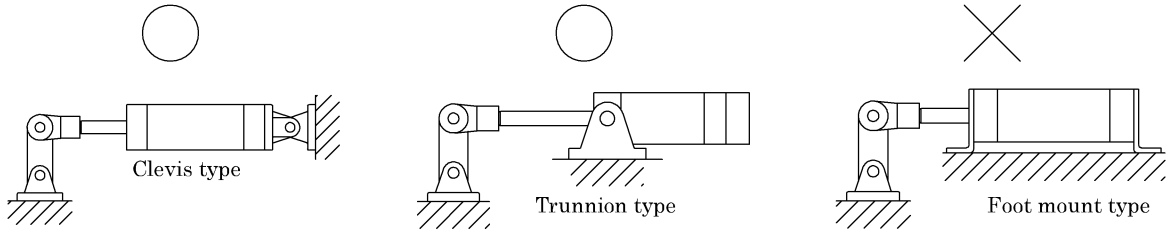
Note: Momentary max. temperature is the temperature as sparks or welding spatter hitting bellows momentarily.



3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.

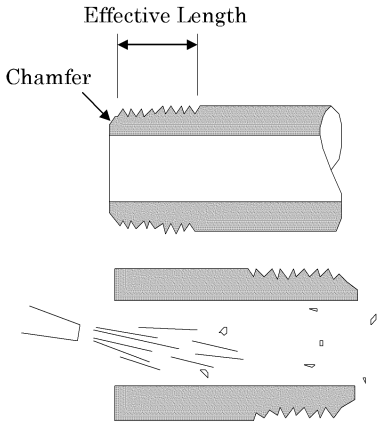
4) When cylinder is fixed and rod end is guided:
In case the piston rod of cylinder and the load are misaligned, the bushes and packings of the cylinder are extremely worn out. Hence, connect them with CKD floating connector (spherical bearing).

5) When 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.



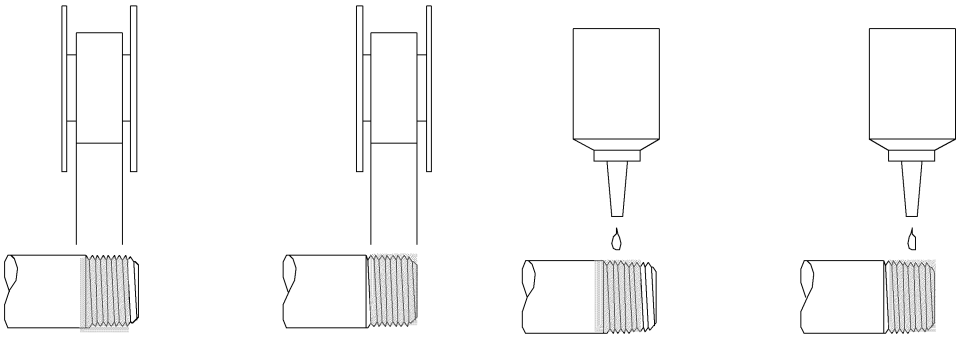
2.2 Piping

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



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

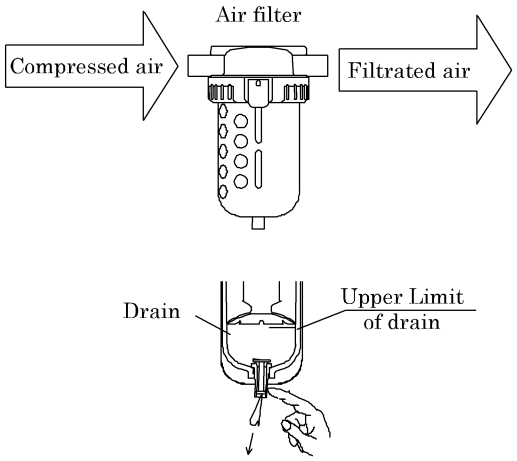
●Seal Tape　　●Sealant (Paste or liquid)



2.3 Fluid

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

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



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

4) Use this cylinder with oil-free specifications. (Must be oil-free)

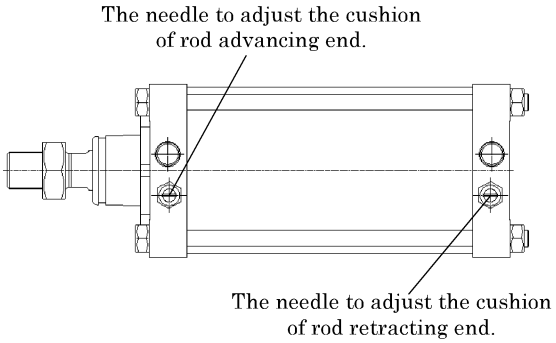
3. OPERATION

3.1 Operating the Cylinder

1) Heat resistance type cylinder is possible to use in ambient air temperature between 5 to 120℃. Those are under congelation-less condition.

2) The cylinder feed pressure is 0.05 to 1.0 MPa hence regulate the pressure within this pressure range.

3) 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)	Effective cushion length (mm)	Tolerable energy absorbable (J)	
		With cushion	Without cushion
φ125	21.6	63.5	0.371
φ140	21.6	91.5	0.386
φ160	21.6	116	0.386
φ180	21.6	152	0.958
φ200	26.6	233	1.08
φ250	26.6	362	2.32

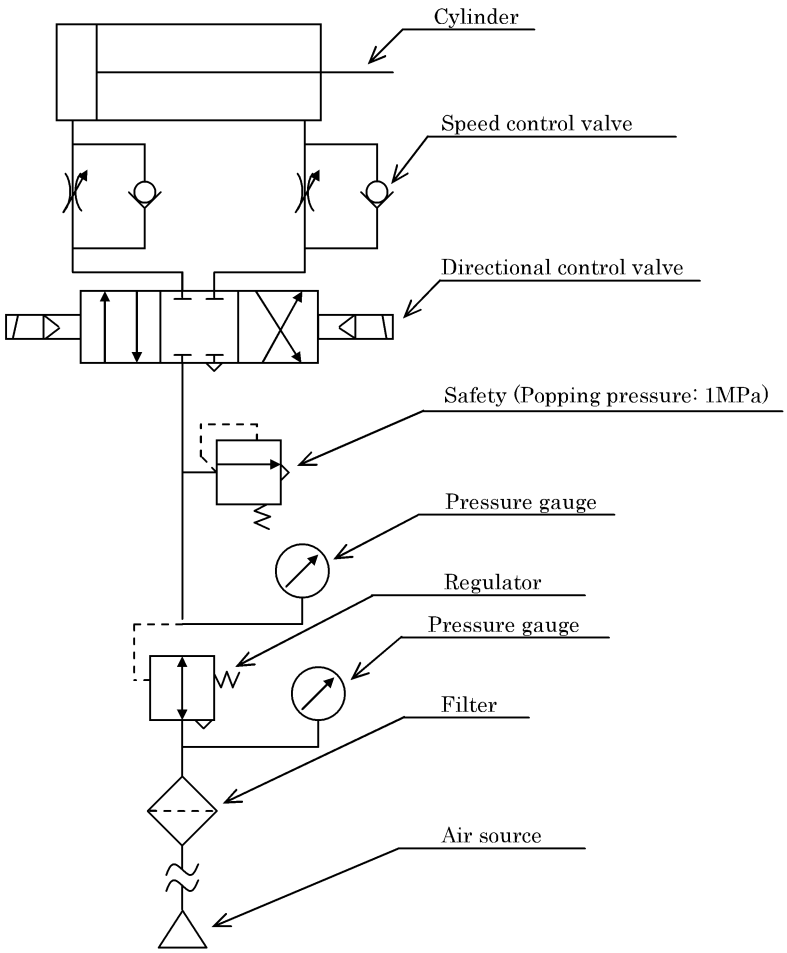
4) Adjust the piston speed with the speed controller mounted.

3.2 About the system applicable to class 2 pressure vessel

If the system is applicable to class-2 pressure vessel, install a safety valve while referring to the fundamental pneumatic circuit diagram shown below. (The following diagram shows an example of the safety valve installation position.)

When the pressure of air source is 1.0 or less MPa, installation of a safety valve is unnecessary.

The class-2 pressure vessel structure standard is laws and ordinances when it is used in the Japanese country.



<Fundamental pneumatic circuit diagram>

4. MAINTENANCE

4.1 Periodical Inspection

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

2) Inspection items
   (1) Check the bolts and nuts fitting the piston rod end fittings and supporting fittings for slackening.
   (2) Check to see that the cylinder operates smoothly.
   (3) Check any change of the piston speed and cycle time.
   (4) Check for internal and/or external leakage.
   (5) Check the piston rod for flaw (scratch) and deformation.
   (6) Check the stroke for abnormality.
   See "Trouble shooting", 5 should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

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.

4.2 Disassembling

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

1) Prepare the following tools for disassemling.

Disassembling tools

Name	Qty	Place of use	Applicable tube ID (mm)
Wrench (Nominal 19)	1	Needle nut	ϕ 125 to 180
Wrench (Nominal 22)	2	Hex. nut (Tie rod)	ϕ 125, ϕ 140
Wrench (Nominal 24)	2	Hex. nut (Tie rod)	ϕ 160
	1	Needle nut	ϕ 200, ϕ 250
Wrench (Nominal 27)	2	Hex. nut (Tie rod)	ϕ 180
Wrench (Nominal 30)	2	Hex. nut (Tie rod)	ϕ 200
Standard driver	2	Cushion needle, Piston packing Cushion packing disassembling	For all tube ID
Marret hammer	1	For disassembling Cover and Tube	For all tube ID
Ice pick	1	Packing other than piston packing	For all tube ID
Press jig	1	Cushion packing assembly	For all tube ID

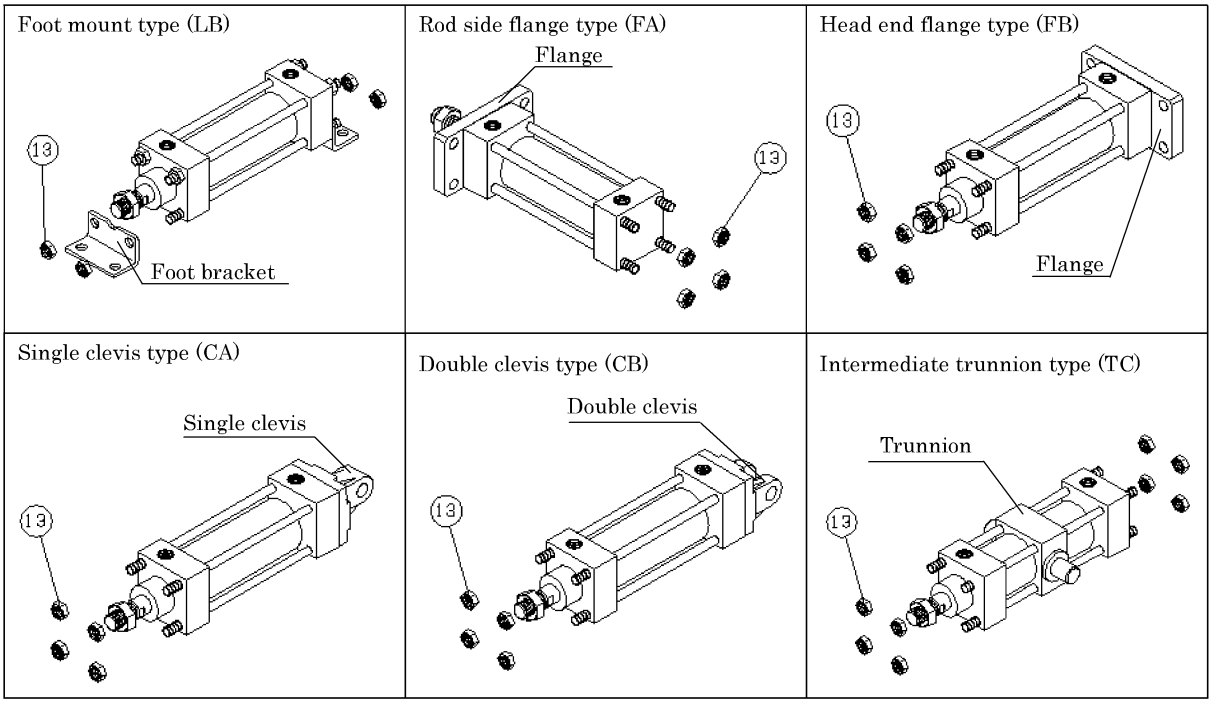
2) Disassembly

(1) Shut off the fluid and remove the residual pressure.

(2) Disconnect pipes from cylinder.

(3) As the hexagon nut ⑬ is removed, each mounting bracket and tie rod ⑭ can be removed. As the tie rod ⑭ is removed, the rod cover ⑤, head cover ⑫, and piston assembly (②, ⑧ to ⑪, ⑮ to ⑰) can then be removed.

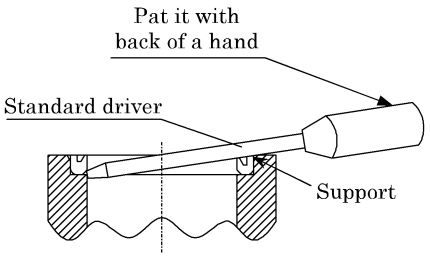
Bracket disassembling or assembling procedures



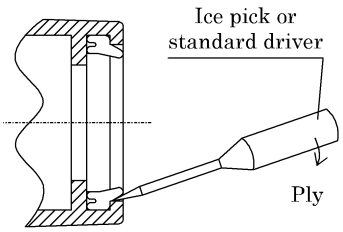
(4) Cushion needle ⑲ comes out when needle nut ⑱ is removed.

(5) Disassembling cushion packing ⑯

- Clamp the cover in a vise.
- Place the standard driver underneath of lip of packing, then ply the shuttle driver making the corner of the spot facing a fulcrum. Patting the driver handle with the back of hand will let the packing come out of its spot facing on the cover.



(6) Disassembling dust wiper ㉑ and disassembling rod packing ③
Pry the packing off with a tool having the sharp tip, such as standard screwdriver or ice pick.
(Do not reuse the detached packing.)



4.3 Assembly

1) Clean and wash every part.
Carefully assemble them in the reversed procedure of disassembling, particularly, to prevent any damage to lips of packings and seals as it causes malfunction and/or air leakage when it is placed back to service.

2) Assembling the cushion packing.
Use special jig to press the packing into the spot facing on the cover to avoid its tilting and also its damage. Press it down to the point that lip tip of packing settle approx. 0.1 to 0.2mm below the surface of the cover.

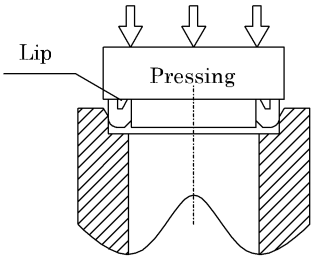
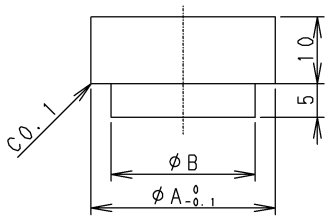


Table 2 and drawing are for a couple of examples of press jigs.

Table 2. Dimensions of press jigs

Tube bore (mm)	A	B
ϕ125, ϕ140	55	45
ϕ160, ϕ180	67	55
ϕ200	72	60
ϕ250	87	75



3) Apply a film of molybdenum disulfide grease over the bore surface of Cylinder tube ⑦, circumference surface of Piston ⑯ and packings ③, ⑥, ⑨, ⑩, ⑯, ⑳ and ㉑.

4) Cylinder gasket ⑥ is assembled in the head cover, the rod cover, and the triangular ditch part of the chamfering part of the cylinder tube. Please insert the cylinder gasket ⑥ in the cover ditch interior. Please assemble the tube and the cover with the cylinder gasket ⑥ installed.

5) When tightening the nuts on tie rods, gradually tighten each nut on diagonal location to each other respectively, instead of tightening one nut all the way up. The table right displays the recommended range of torque for tightening.

Table 3. Tightening torque

Tube bore (mm)	Torque (N·m)
ϕ125, ϕ140	34
ϕ160	50
ϕ180	66
ϕ200	90
ϕ250	155

4.4 Inspection

1) Function Test

After a couple of trial running, the piston should reciprocate smoothly when pressure is charged alternately to each end of cylinder respectively.

- Inspection terms
- Pressure supplied 0.05Mpa and working pressure
- Cushion needle Fully open

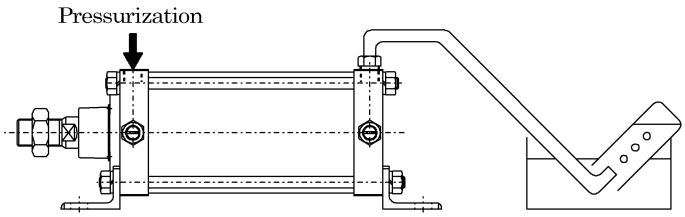
2) Leakage test

When compressed air is charged from head end and rod end alternately while holding piston in one position, the leakage should be held less than the followings :

Internal leakage $3+0.15\times D$ cm^3/min (Standard condition)
External leakage $3+0.15\times d$ cm^3/min (Standard condition)
} or less.

Whereas D = Cylinder tube bore (mm)
d = OD of piston rod (mm)

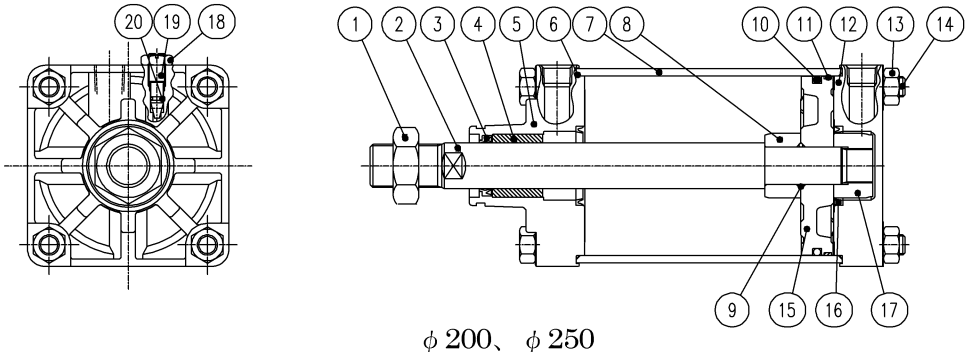
・Procedures of inspection
・Substitution with water



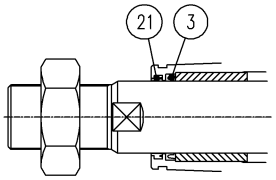
・Soapy water bubble balloon method
It only displays whether there is air leakage or not, while it is unable to decide the volume of leakage.

4.5 Internal structure and Expendable parts list

φ 125～ φ 180



φ 200、 φ 250



Part No.	Part Name	Material	Qty	Note
1	Rod nut	Steel	1	Zinc chromate
2	Piston rod	Steel	1	Industrial chromium plating
3	Rod packing	Fluoro rubber	1	
4	Bushing	Oil impregnated bearing alloy	1	
5	Rod cover	Aluminum alloy	1	
6	Cylinder gasket	Fluoro rubber	2	
7	Cylinder tube	Aluminum alloy	1	Hard alumite disposal
8	Cushion ring A	Steel	1	Zinc chromate
9	Piston gasket	Fluoro rubber	1	
10	Piston packing	Fluoro rubber	1	
11	Wear ring	Fiber reinforced phenol resin	1	
12	Head cover	Aluminum alloy	1	Chromate
13	Hexagonal nut	Steel	8	Zinc chromate
14	Tie rod	Steel	4	Zinc chromate
15	Piston	Aluminum alloy	1	
16	Cushion packing	Fluoro rubber, Steel	2	
17	Cushion ring B	Steel	1	Zinc chromate
18	Needle nut	Steel	2	Zinc chromate
19	Cushion needle	φ 125 to φ 180: Brass φ 200, φ 250: Steel	2	φ 200, φ 250: Zinc chromate
20	Needle gasket	Fluoro rubber	2	
21	Dust wiper	Fluoro rubber	1	

Note: ⑯ and ⑱ parts are lost when there is no cushion, and ⑲ parts change to the cushion needle flag.

Expendable parts list (Specify the kit No. on your purchase order.)

1) SCS2-T

Tube bore (mm)	Kit no.	Parts no.
φ 125	SCS2-T-125K	③ ⑥ ⑩ ⑪ ⑯ ⑳
φ 140	SCS2-T-140K	
φ 160	SCS2-T-160K	
φ 180	SCS2-T-180K	
φ 200	SCS2-T-200K	③ ⑥ ⑩ ⑪ ⑯ ⑳ ㉑
φ 250	SCS2-T-250K	

Note: Packings are stocked as a kit. This kit basically contains parts necessary for replacement. It is recommended not only to replace the defective parts, but also to replace the complete parts with ones included in the kit. Specify the kit No. when ordering.

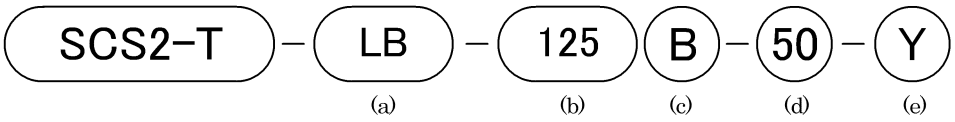
5. TROUBLE SHOOTING

1) Cylinder

Trouble	Causes	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 mounting status. Connect the floating connector. Change the mounting style.
	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 mounting status. Connect the floating connector. Change the mounting style.
	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 meter-out circuit 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.

6. HOW TO ORDER

6.1 Product Number Coding



(a) Mounting style		(b) Tube bore (mm)		(c) Cushion	
00	Basic type	125	φ125	B	With cushion at both ends
LB	Foot mount type, along axis	140	φ140	R	With cushion at rod side
FA	Rod side flange type	160	φ160	H	With cushion at head side
FB	Head end flange type	180	φ180	N	Without cushion
CA	Single clevis type	200	φ200		
CB	Double clevis type	200	φ250		
TC	Intermediate trunnion type				
TA	Rod side trunnion type				
TB	Head end trunnion type				

(d) Stroke			(e) Options & Accessories	
Standard stroke	Maximum stroke		L	Bellow: Silicone rubber glass cloth
	Tube bore	Stroke	M	Alteration in piston rod material
50	125	800	R	Cushion needle position R
75	140	800	S	Cushion needle position S
100	160	800	T	Cushion needle position T
150	180	900	C2	Cushion with a check valve
200	200	1000	I	Single knuckle
250	250	1200	Y	Double knuckle
300			B1	Single bracket
			B2	Double bracket

7. SPECIFICATION

7.1 Cylinder Specification

Descriptions		SCS2-T (HEAT RESISTANCE TYPE)					
Bore size	mm	ϕ 125	ϕ 140	ϕ 160	ϕ 180	ϕ 200	ϕ 250
Actuation		Double-acting type					
Working fluid		Compressed Air					
Max. working pressure	MPa	1.0					
Min. working pressure	MPa	0.05					
Proof pressure	MPa	1.6					
Ambient temperature	℃	5 to 120 (Note 2)					
Port size		Rc1/2	Rc3/4				Rc1
Stroke tolerance	mm	$^{+1.0}_{0}$ (300 or less), $^{+1.4}_{0}$ (Over than 300 and 1000 or less), $^{+1.8}_{0}$ (Over than 1000 and 1200 or less)					
Working piston speed	mm/s	20 to 1000 (Set the speed within the range of energy absorption.)					
Cushion		Air cushion					
Lubrication		Must be oil free(Note 1)					
Allowable energy absorption	J	63.5	91.5	116	152	233	362

Note1: Regularly apply heat-resistance grease.

Note2: Ambient temperature of the products below is 50 to 100 ℃.

Tube bore(mm)	Strokr length
ϕ 160	1948 and over
ϕ 180	1526 and over
ϕ 200	946 and over
ϕ 250	752 and over