CKD

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SM－279995－A

INSTRUCTION MANUAL

SELEX CYLINDER
Stroke Adjustable Type

SCS-P

- 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 3rd edition

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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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SCS-P

SELEX CYLINDER
Stroke Adjustable Type

Manual No. SM-279995-A

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1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Cylinder with Switch matches the type No. you ordered.

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

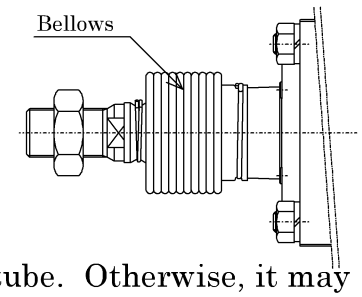
1) The ambient temperature for this cylinder is -5 to 60℃ (No freezing).

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

Ambient temperature of bellows Unit : ℃

Material of bellows	Max. ambient temperature	Momentary Max. temp.
Nylon tarpaulin	60	100
Neoplain sheet	100	200
Silicon rubber glass cloth	250	400

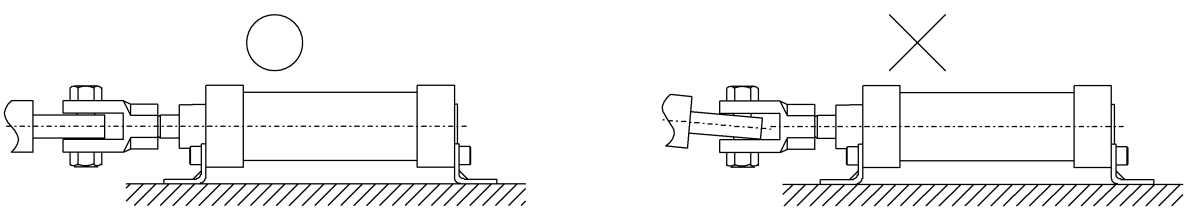
Note : Momentary max. temperature is the temperature as sparks or welding spatter hitting bellows momentarily.



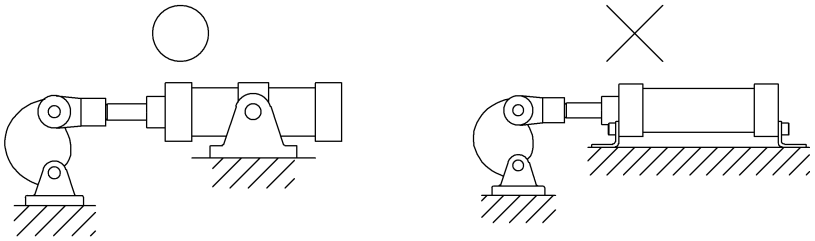
3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.

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 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.



6) When the load acting direction changes with the cylinder operation:
Use an oscillating cylinder (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.

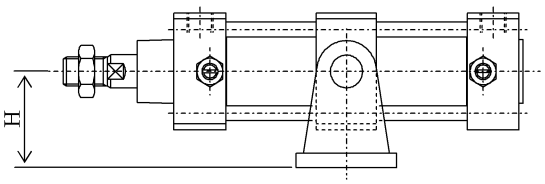


Trunnion type　　Foot mount type

7) When using a cylinder with a long stroke, install support to prevent damage to the rod caused by rod sagging, tube deflection, vibration, or external weight.

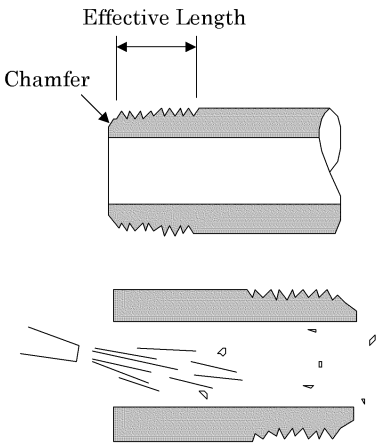
8) If clearance between the clevis or trunnion and mate bearing is large, bending will be applied on the pin or shaft. Do not increase this clearance too much. (Recommended maximum fitting : H10/e8)

9) If height H from the bearing bracket installation to the bearing position is high, a large force will be generated at the bracket installation section because of cylinder force. This could damage bolt, etc.

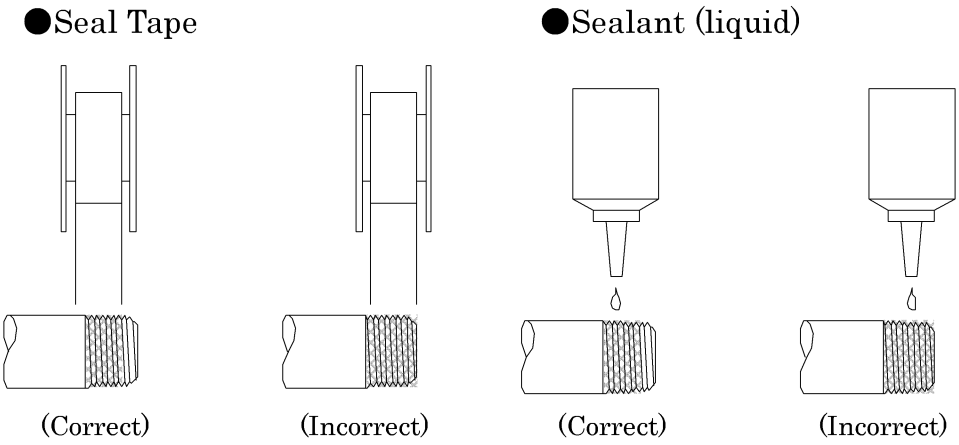


2.2 Piping

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 cross-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.



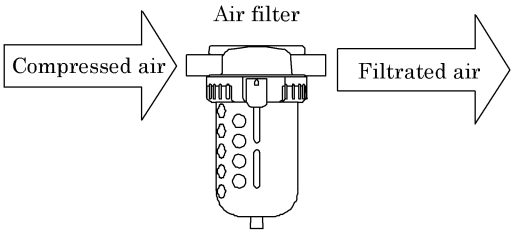
6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.



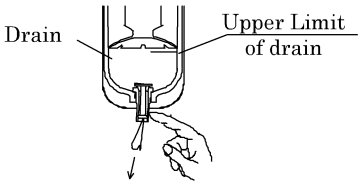
7) After the piping, make sure the presence of leakage by applying soap at each connected area. Be sure to wipe it out after the checking.

2.3 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 inspec-tion and maintenance of the com-pressor.

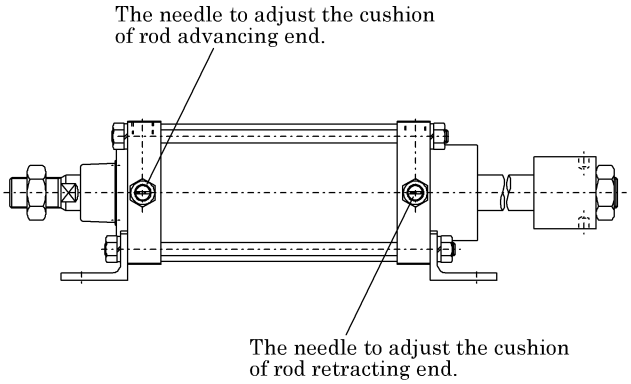
4) This cylinder does not require lubrication. It is recommended, however, to use Turbine oil Grade 1, ISO VG32 as a lubricant, if and when lubrication is needed.

3. OPERATION

3.1 Operating the Cylinder

1) The working pressure for this type of cylinder is specified in "Specification". Operate the system within this 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

Bore size (mm)	Effective air cushion length (mm)	Allowable energy absorption (J)
		With cushion
125 dia.	21.6	63.5
140 dia.	21.6	91.5
160 dia.	21.6	116
180 dia.	21.6	152
200 dia.	26.6	233
250 dia.	26.6	362

Note) The type without cushion cannot absorb a large energy generated by an external load.
We recommend installation of an external shock absorbing device.

3) Adjust the working piston speed with the speed controller mounted.

3.2 How to adjustable stroke

1) Caution

(1) Release air before adjusting stroke.

(2) When carrying out stroke adjustment more than effective cushion length, a cushion completely loses its effect.

2) How to adjustable stroke

(1) Please fit a steel bar or a bolt over the hole made in a stopper's side, and loosen a lock nut with a adjustable spanner or a spanner. (Refer to Table 2 for a size.)

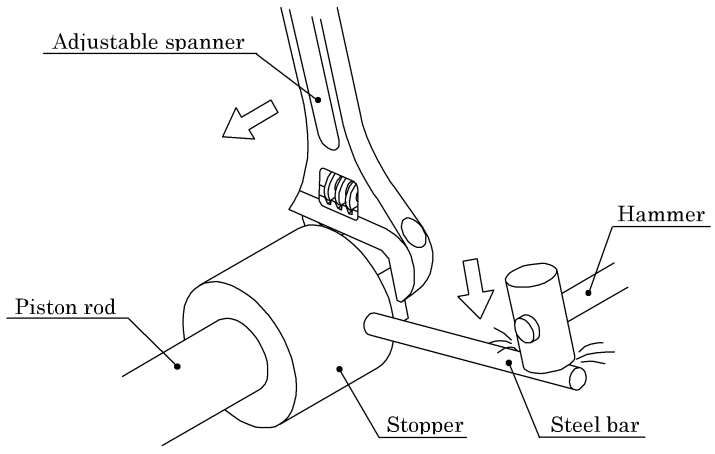
Table2. Width across flats

Bore size (mm)	Hole diameter of stopper (mm)	Width across flats of lock nut (mm)
125 dia.	10 dia.	46
140 dia.	10 dia.	46
160 dia.	14 dia.	55
180 dia.	14 dia.	60
200 dia.	14 dia.	70
250 dia.	14 dia.	85

(2) If it adjusts to a predetermined stroke and a stopper's position is determined, please fit a bar or a bolt over a stopper's hole, and tighten a lock nut with a adjustable spanner. (Please fix the lock nut with a adjustable spanner, with a hammer, strike shockingly a bar or the bolt fitted over a stopper's hole, and tighten it. The torque with a bundle is as in Table 3.)

Table3. Adjustable stroke recommended tighten torque.

Bore size (mm)	Recommended tighten torque (N･m)
125 dia.	363
140 dia.	363
160 dia.	647
180 dia.	843
200 dia.	1290
250 dia.	2550



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 brackets and mounting brackets for slackening.
   (2) Check to see that the cylinder operates smoothly.
   (3) Check any change of the working 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 bush
   (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 disassembling.

Disassembling tools

Name	Qty	Place of use	Applicable tube ID (mm)
Hex. bar spanner (Nominal 5)	1	Hexagon socket head cap screw	125 dia. , 140 dia.
Hex. bar spanner (Nominal 6)	1	Hexagon socket head cap screw	160 dia. , 180 dia.
Hex. bar spanner (Nominal 8)	1	Hexagon socket head cap screw	200 dia.
Hex. bar spanner (Nominal 10)	1	Hexagon socket head cap screw	250 dia.
Wrench (Nominal 22)	2	Hex. nut (Tie rod)	125 dia. , 140 dia.
Wrench (Nominal 24)	2	Hex. nut (Tie rod)	160 dia.
	1	Needle nut	For all tube ID
Wrench (Nominal 27)	2	Hex. nut (Tie rod)	180 dia.
Wrench (Nominal 30)	2	Hex. nut (Tie rod)	200 dia.
Wrench (Nominal 36)	2	Hex. nut (Tie rod)	250 dia.
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.

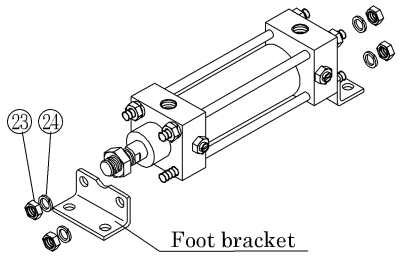
(3) Take out rod metal ④⑱ by removing hexagon socket head cap screw ㉘.

(4) As the hexagon nut ㉓ is removed, each mounting bracket and tie rod ㉒ can be removed. As the tie rod ㉒ is removed, the rod cover ⑥, head cover ⑯, and piston assembly (⑨,⑪ to ⑮) can then be removed.

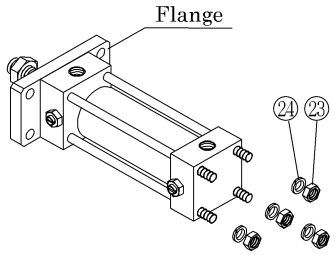
(5) Cushion needle ㉗ comes out when needle nut ⑨ is removed.

Mounting bracket disassembling or assembling procedures

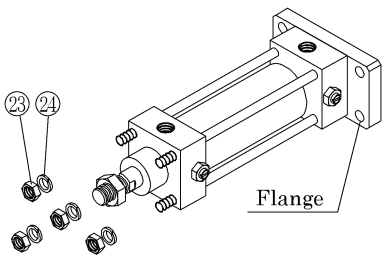
Foot mount type (LB)



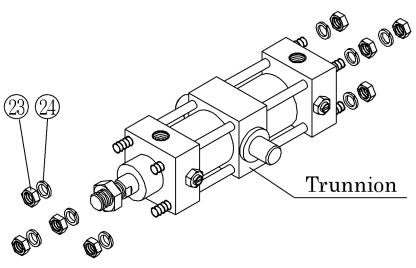
Rod side flange type (FA)



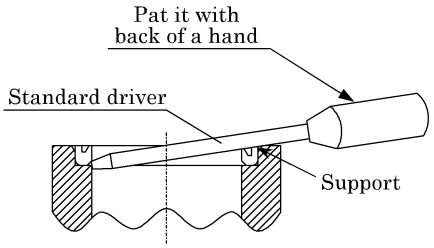
Head end flange type (FB)



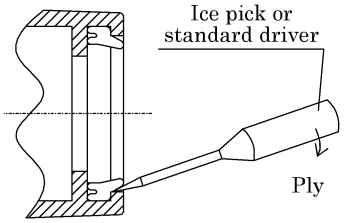
Intermediate trunnion tupe (TC)



(6) Disassembling cushion packing ⑧.
- 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.

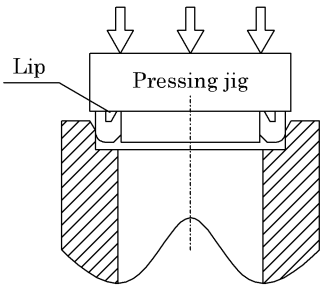


(7) Disassembling dust wiper ② and disassembling rod packing ③.
Pry the packing off with a tool having the sharp tip, such as standard screwdriver or ice pick.
(Do not reuse the detached packing.)



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.

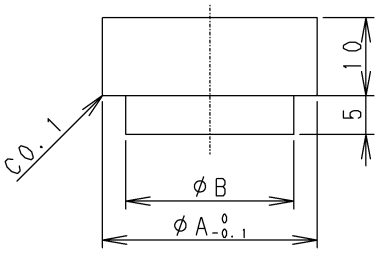


2) Assembling the cushion packing.
Use special jig to press the packing into the spot facing on the cover to avoid its tilting and also its damage. Press it down to the point that lip tip of packing settle approx. 0.1 to 0.2mm below the surface of the cover.

Table 4 and drawing are for a couple of examples of press jigs.

Table 4. Dimensions of press jigs

Bore size (mm)	A	B
125 dia., 140 dia.	55	45
160 dia., 180 dia.	67	55
200 dia.	72	60
250 dia	87	75



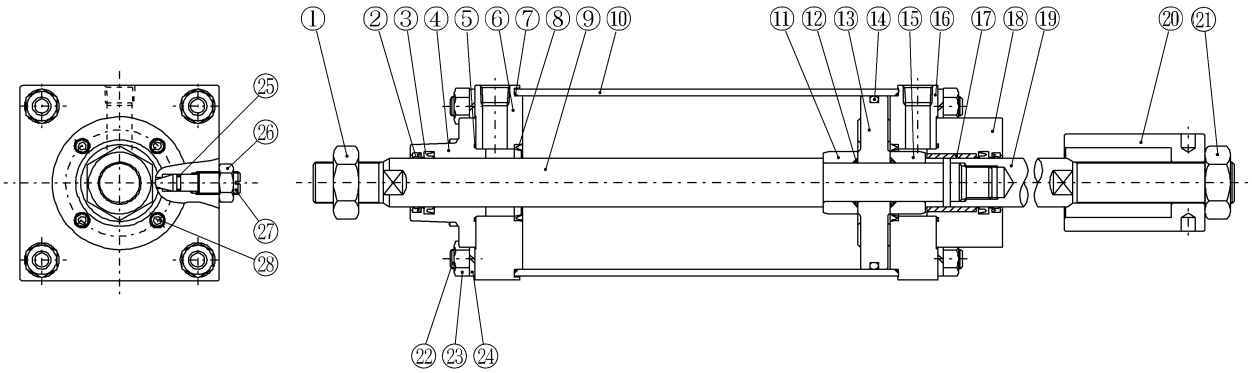
3) Apply a film of high grade grease (such as No. 1 or No. 2, Lithium base saponaceous grease) over the bore surface of Cylinder tube ⑩, circumference surface of Piston ⑬ and packings ②, ③, ⑤, ⑦, ⑧, ⑫, ⑭, ㉕.

4) 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 5. Tightening torque

Bore size (mm)	Torque (N·m)
125 dia., 140 dia.	22
160 dia	34
180 dia	49
200 dia.	69
250 dia	123

4.4 Internal structure and Expendable parts list



No.	Parts Name	Material	Qty	Remarks
1	Rod nut	Steel	1	Zinc chromate
2	Dust wiper	Nitrile rubber	2	
3	Rod packing	Nitrile rubber	2	
4	Rod bushing R	Cast iron	1	Painting
5	Metal gasket	Nitrile rubber	2	
6	Rod cover	Steel	1	Painting
7	Cylinder gasket	Nitrile rubber	2	Painting
8	Cushion packing	Nitrile rubber/steel	2	
9	Piston rod R	Steel	1	Industrial industrial chorome planting
10	Cylinder tube	Steel	1	Painting / Industrial industrial chorome planting
11	Cushion ring A	Steel	1	Zinc chromate
12	Piston gasket	Nitrile rubber	1	
13	Piston	Cast iron	1	Phosphoric acid mangan treatment
14	Piston packing	Nitrile rubber	2	
15	Cushion ring B	Steel	1	Zinc chromate
16	Head cover	Steel	1	Painting
17	Bush	Oil impregnated bearing alloy	1	
18	Rod bushing H	Steel	1	Phosphoric acid mangan treatment
19	Piston rod H	Steel	1	Industrial industrial chorome planting
20	Adjustable stopper	Steel	1	Phosphoric acid mangan treatment
21	Rock nut	Steel	1	
22	Tie rod	Steel	4	Painting
23	Hexagon nut	Steel	8	Painting
24	Spring washer	Steel	8	Painting
25	Needle gasket	Nitrile rubber	2	
26	Needle nut	Steel	2	Zinc chromate
27	Cushion needle	Steel	2	Zinc chromate
28	Hexagon socket head cap screw	Alloy steel	4	Blackening

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

Bore size (mm) / Part Name / Kit No. / Part No.		②	③	⑤	⑦
		Dust wiper	Rod packing	Metal gasket	Cylinder gasket
125 dia.	SCS-D-125K	SFR-35K	PNY-35	RG-53	P12115-12150200
140 dia.	SCS-D-140K	SFR-35K	PNY-35	RG-53	P12115-13450200
160 dia.	SCS-D-160K	SFR-40K	PNY-35	RG-63	H4-543105
180 dia.	SCS-D-180K	SFR-45K	PNY-45	RG-63	H4-543106
200 dia.	SCS-D-200K	SFR-50K	PNY-50	RG-70	P12115-19450200
250 dia.	SCS-D-250K	SFR-60K	PNY-60	RG-85	P12115-24097262

Bore size (mm) / Part Name / Kit No. / Part No.		⑧	⑭	㉕
		Cushion packing	Piston packing	Needle gasket
125 dia.	SCS-D-125K	PCS-45	P-115	P-9
140 dia.	SCS-D-140K	PCS-45	P-130	P-9
160 dia.	SCS-D-160K	PCS-55	P-150	P-9
180 dia.	SCS-D-180K	PCS-55	P-165	P-9
200 dia.	SCS-D-200K	PCS-60	P-185	P-9
250 dia.	SCS-D-250K	PCS-75	P-235	P-9

5. TROUBLE SHOOTING

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 mounting status and/or change the mounting style.
	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 mounting status and/or change the mounting style.

Discontinue

6. HOW TO ORDER

Without switch

SCS-P – LB – 125 N B – 50 – 25 – J Y

(a) (b) (c) (d) (e) (f) (g) (h)

(a) Mounting style		(b) Bore size (mm)		(c) Pipe thread type	
00	Basic type	125	125 dia.	Blank	Rc
LB	Axial foot type	140	140 dia.	N	NPT (custom order)
FA	Rod side flange type	160	160 dia.	G	G (custom order)
FB	Head side flange type	180	180 dia		
TC	Center trunnion type	200	200 dia.		
TA	Rod side trunnion type	250	250 dia.		
TB	Head side trunnion type				
TF	Center hole trunnion type (not available for 180 dia. to 250dia.)				
TD	Rod side hole trunnion type (not available for 180 dia. to 250dia.)				
TE	Head side hole trunnion type (not available for 180 dia. to 250dia.)				

(d) Cushion		(e) Stroke (mm) (Note1)			(f) Adjustable stroke range (mm)	
B	Both sides cushion	Standard stroke	Max. stroke		25	25
R	Rod side cushion		Bore size	Stroke	50	50
H	Head side cushion	50	125	800	75	75
N	Non cushion	75	140	800	100	100
		100	160	800		
		150	180	900		
		200	200	1000		
		250	250	1200		
		300				

(g) Option (Note2)(Note3)				(h) Accessory (Note4)	
		Max. ambient	Instant max.	I	Rod eye
J	Bellows	60℃	100℃	Y	Rod clevis (pin and snap ring attached)
K	Bellows	100℃	200℃	B1	Eye bracket
L	Bellows	250℃	400℃	B2	Clevis bracket (pin and snap ring attached)
C2	Cushion with a check valve				
M	Piston rod material change (stainless steel)				
Blank	Cushion needle position R (standard)				
S	Cushion needle position S				
T	Cushion needle position T				
P6	Copper and PTFE free				

Note1 : Custom stroke length is available per 1mm increment.
Note2 : Check cushion needle position indications on the dimensions drawing.
Note3 : Instantaneous maximum is the temperature when spark and spatter etc. instantaneously contact to bellows.
Note4 : "I" and "Y" cannot be selected simultaneously.

7. SPECIFICATION

Model / Item		SCS-P					
Bore size mm		125 dia.	140 dia.	160 dia.	180 dia.	200 dia.	250 dia.
Actuation		Double acting					
Working fluid		Compressed air					
Max. working pressure MPa		1.0					
Min. working pressure MPa		0.1					
Proof pressure MPa		1.6					
Ambient temperature ℃		−5 to 60 (No freezing)					
Port size		Rc1/2	Rc3/4				Rc1
Stroke tolerance mm		$^{+1.0}_{0}$ (to 300), $^{+1.4}_{0}$ (to 500), $^{+1.8}_{0}$ (to 1200)					
Working piston speed mm/s		20 to 1000 (use this within absorbed energy range.)					
Cushion		Air cushion (when adjustable stroke, rod side cushion is not provided.)					
Effective air cushion length mm		21.6				26.6	
Adjustable stroke range mm		25, 50, 75, 100					
Lubrication		Required (when lubrication, use turbine oil Class 1 ISO VG32)					
Allowable energy absorption J	Cushioned	63.5	91.5	116	152	233	362
		0.371	0.386	0.386	0.958	1.08	2.32
	Non cushion	The types without cushion cannot absorb a large energy generated by an external load. We recommend installation of an external shock absorbing device.					