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SM－1109－A

INSTRUCTION MANUAL

SELEX CYLINDER
(Non lubrication type)
SCS-N (φ125 - φ250)

- 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.

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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-N (ϕ 125 - ϕ 250)
Selex Cylinder (Non Lubrication Type)
Manual No. SM-1109-A

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1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Selex Cylinder 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

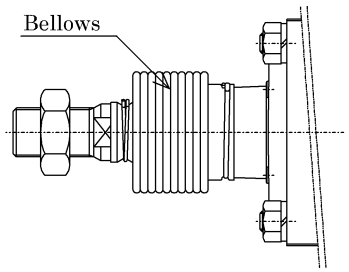
1) The ambient temperature for this cylinder is -5 to 60℃.

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

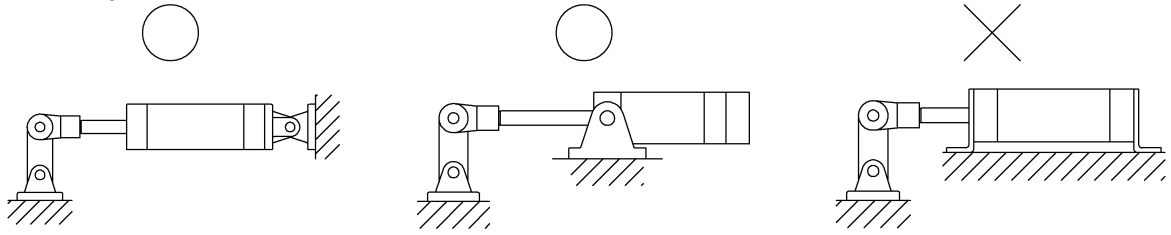
Note : Momentary max. temperature is the temperature as sparks or welding spatter hitting bellows momentarily.



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).

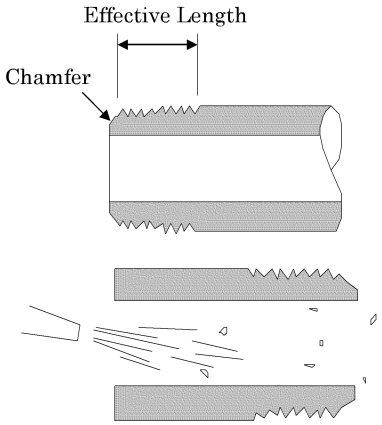
5) When the load acting direction changes with the cylinder operation:
Use an oscillating type (clevis type or trunnion type) capable of making revolution to a certain angle. Furthermore, install the rod and connecting metal (knuckle) so that it moves in the same direction as the cylinder main body does.



Clevise type Trunnion type Foot mount type

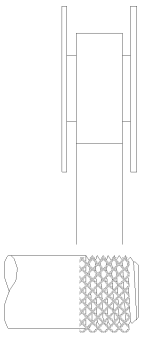
2.2 Piping

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



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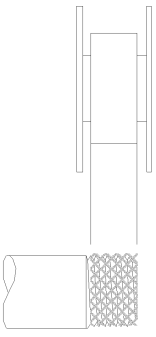

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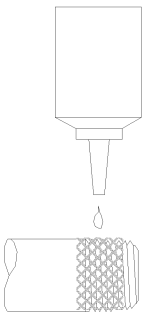
●Sealant (Paste or liquid)



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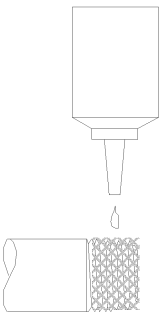

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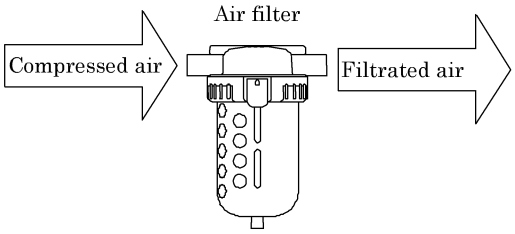
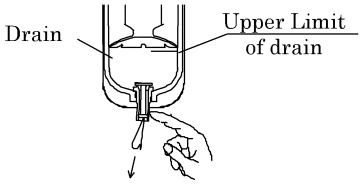
2.3 Fluid

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 μm 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) This valve does not require lubrication. It is recommended, however, to use Turbine oil Grade 1, ISO VG32 if lubrication is preferred.

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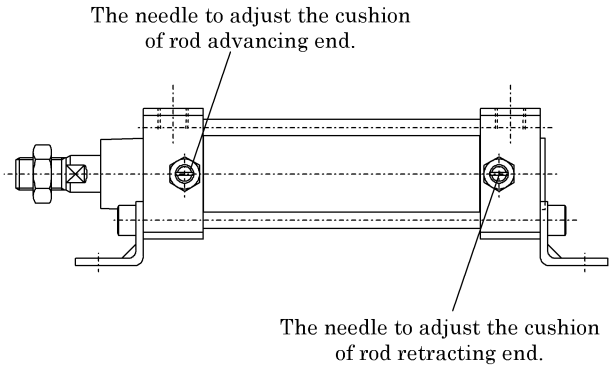
3. OPERATION

3.1 Operation

1) The cylinder feed pressure is 0.05 to 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 bore (mm)	Effective cushion length (mm)	Tolerable energy absorbable (J)	
		With cushion	Without cushion
ϕ125	21.6	63.5	0.1
ϕ140		91.5	
ϕ160		116	1.5
ϕ180		152	2.1
ϕ200	26.6	233	2.8
ϕ250		362	3.9

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

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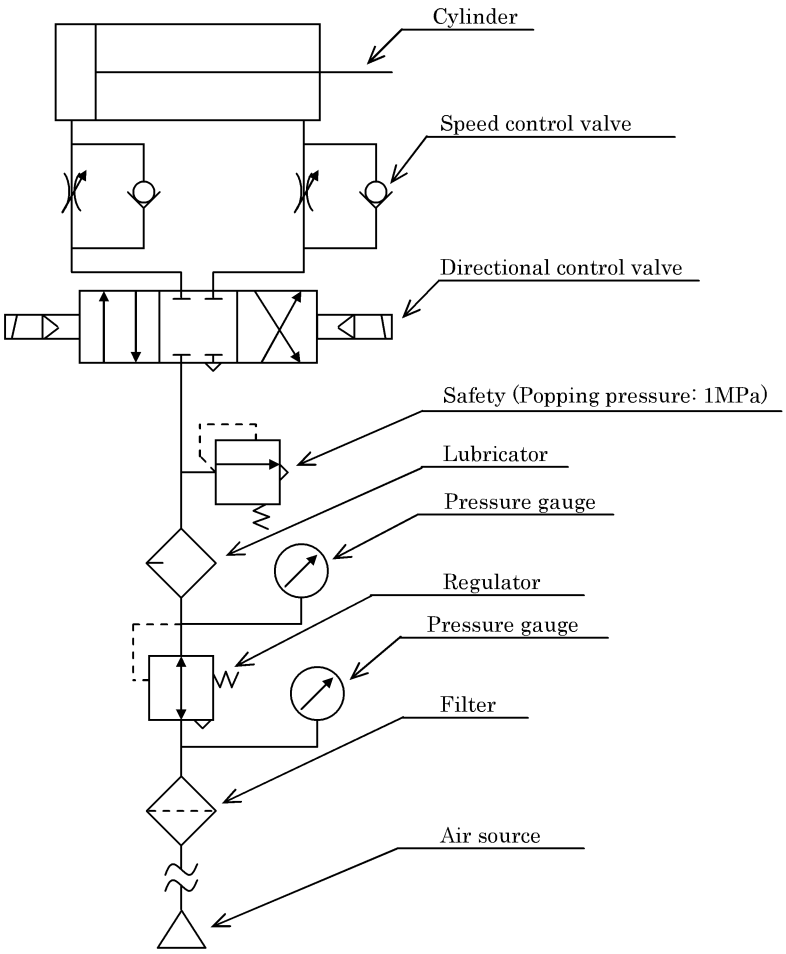
3.2 About the system applicable to class 2 pressure vessel

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 mounting position.)



<Fundamental pneumatic circuit diagram>

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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
   (a) Check the bolts and nuts fitting the piston rod end fittings and supporting fittings for slackening.
   (b) Check to see that the cylinder operates smoothly.
   (c) Check any change of the working piston speed and cycle time.
   (d) Check for internal and/or external leakage.
   (e) Check the piston rod for flaw (scratch) and deformation.
   (f) 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.

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.

No.	Name \ Tube bore (mm)	φ125	φ140	φ160	φ180	φ200	φ250
	Kit No.	SCS-N-125K	SCS-N-140K	SCS-N-160K	SCS-N-180K	SCS-N-200K	SCS-N-250K
②	Dust wiper	SFR-35K	SFR-35K	SFR-40K	SFR-45K	SFR-50K	SFR-60K
③	Rod packing	PNY-35	PNY-35	PNY-40	PNY-45	PNY-50	PNY-60
⑤	Metal gasket	RG-53	RG-53	RG-63	RG-63	RG-70	RG-85
⑦	Cylinder gasket	P12115 -12150200	P12115 -13450200	H4-543105	H4-543106	P12115 -19450200	P12115 -24097262
⑧	Cushion packing	PCS-45	PCS-45	PCS-55	PCS-55	PCS-60	PCS-75
⑭	Piston packing	PSD-125	PSD-140	PSD-160	PSD-180	PSD-200	PSD-250
㉒	Needle gasket	P-9	P-9	P-9	P-9	P-9	P-9
㉖	Wear ring	F4-666997	F4-666998	F4-666999	—	—	—

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.

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4.2 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 installation 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 installation 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 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 installation state and/or change the mounting style.

4.3 Disassembling

Should any trouble occur, tale the following corrective actions.

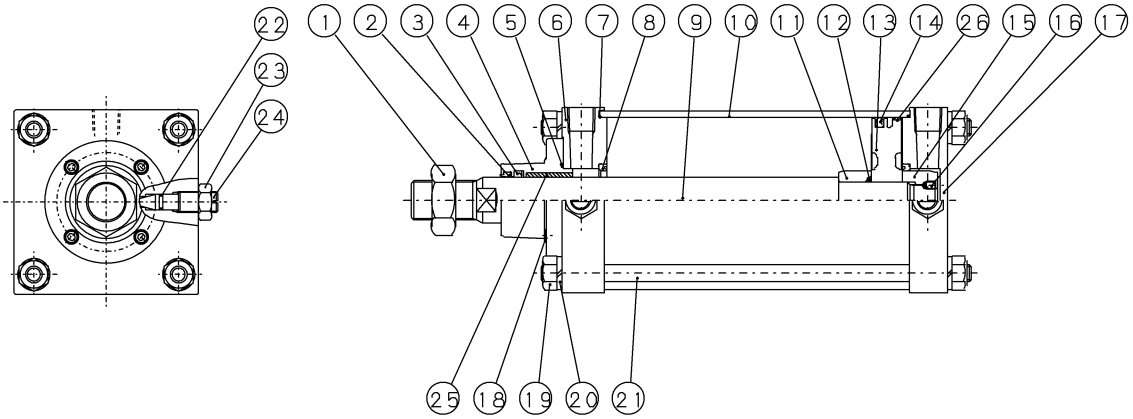
1) Prepare the following tools for disassembling.

Disassembling tools

Name	Qty	Part No.	Place of use	Applicable tube ID (mm)
Hex. bar spanner (Nominal 5)	1	18	Hexagon socket head cap screw	ϕ125, ϕ140
Hex. bar spanner (Nominal 6)				ϕ160, ϕ180
Hex. bar spanner (Nominal 8)				ϕ200
Hex. bar spanner (Nominal 10)				ϕ250
Wrench (Nominal 22)	2	19	Hex. nut (Tie rod)	ϕ125, ϕ140
Wrench (Nominal 24)				ϕ160
	1	23	Needle nut	For all tube ID
Wrench (Nominal 27)	2	19	Hex. nut (Tie rod)	ϕ180
Wrench (Nominal 30)				ϕ200
Wrench (Nominal 36)				ϕ250
Standard driver	1	8	Cushion needle, Piston packing, Cushion packing disassembling	For all tube ID
		14		For all tube ID
		24		
Marret hammer	1	6	For disassembling Cover and Tube	For all tube ID
		10		
		17		
Ice pick	1		Packing other than piston packing	For all tube ID
Press jig	1	6	Cushion packing assembly	For all tube ID
		8		
		17		

2) Internal structure drawing

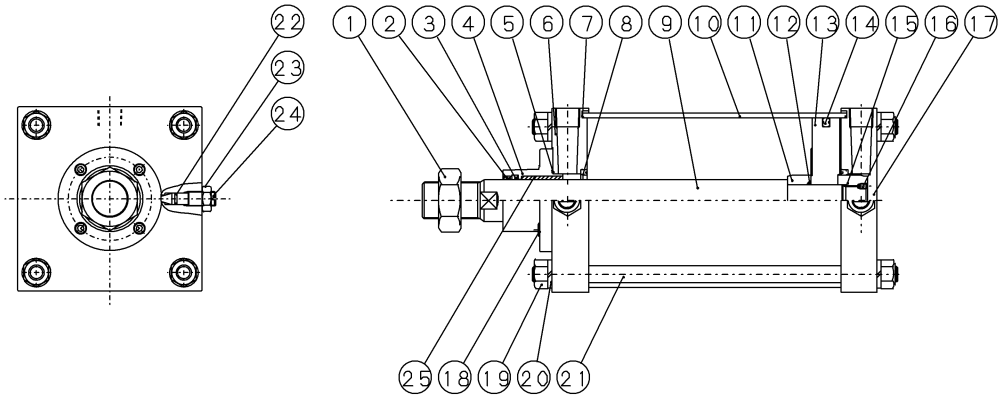
- φ125 to φ160



Part No.	Part Name	Material	Qty	Note
1	Rod nut	Carbon steel	1	Zinc chromate
2	Dust wiper	Nitril rubber	1	
3	Rod packing	Nitril rubber	1	
4	Rod metal	Cast iron	1	Paint
5	Metal gasket	Nitril rubber	1	
6	Rod cover	Rolled steel	1	Paint
7	Cylinder gasket	Nitril rubber	2	
8	Cushion packing	Nitril rubber	2	
9	Piston rod	Carbon steel	1	Industrial chromium plating
10	Cylinder tube	Carbon steel pipe	1	Paint, Industrial chromium plating
11	Cushion ring A	Carbon steel	1	Zinc chromate
12	Piston gasket	Nitril rubber	1	
13	Piston	Aluminum alloy die-casting	1	
14	Piston packing	Nitril rubber	1	
15	Cushion ring B	Carbon steel	1	Zinc chromate
16	Hexagon socket set screw	Alloy steel	1	Black oxide finish
17	Head cover	Rolled steel	1	Paint
18	Hexagon socket head cap screw	Alloy steel	4	Black oxide finish
19	Hexagonal nut	Carbon steel	8	Paint
20	Spring washer	Steel	8	Paint
21	Tie rod	Carbon steel	4	Paint
22	Needle gasket	Nitril rubber	2	
23	Needle nut	Carbon steel	2	Zinc chromate
24	Cushion needle	Carbon steel	2	Zinc chromate
25	Busing	Oil impregnated bearing alloy	1	
26	Wear ring	Polyacetal	1	

Note : Parts 8, 22, 23, 24 are not required when it is without cushion.

- ϕ 180 to ϕ 250



Part No.	Part Name	Material	Qty	Note
1	Rod nut	Carbon steel	1	Zinc chromate
2	Dust wiper	Nitril rubber	1	
3	Rod packing	Nitril rubber	1	
4	Rod metal	Cast iron	1	Paint
5	Metal gasket	Nitril rubber	1	
6	Rod cover	Rolled steel	1	Paint
7	Cylinder gasket	Nitril rubber	2	
8	Cushion packing	Nitril rubber	2	
9	Piston rod	Carbon steel	1	Industrial chromium plating
10	Cylinder tube	Carbon steel pipe	1	Paint, Industrial chromium plating
11	Cushion ring A	Carbon steel	1	Zinc chromate
12	Piston gasket	Nitril rubber	1	
13	Piston	Cast iron	1	
14	Piston packing	Nitril rubber	1	
15	Cushion ring B	Carbon steel	1	Zinc chromate
16	Hexagon socket set screw	Alloy steel	1	Black oxide finish
17	Head cover	Rolled steel	1	Paint
18	Hexagon socket head cap screw	Alloy steel	4	Black oxide finish
19	Hexagonal nut	Carbon steel	8	Paint
20	Spring washer	Steel	8	Paint
21	Tie rod	Carbon steel	4	Paint
22	Needle gasket	Nitril rubber	2	
23	Needle nut	Carbon steel	2	Zinc chromate
24	Cushion needle	Carbon steel	2	Zinc chromate
25	Busing	Oil impregnated bearing alloy	1	

Note : Parts 8, 22, 23, 24 are not required when it is without cushion.

3) Disassembly (Refer to “Internal Structure Drawing” page 10)

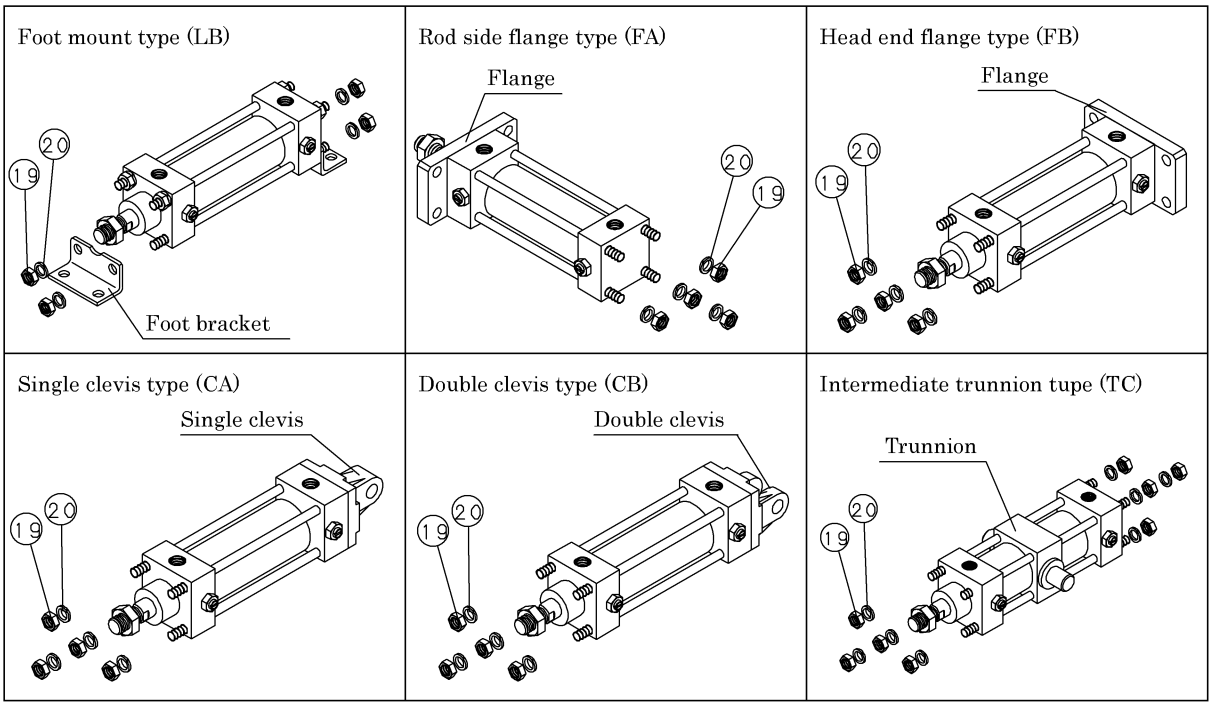
(1) Shut off the fluid and remove the residual pressure.

(2) Disconnect pipes from cylinder.

(3) Take out rod metal ④ by removing hexagon socket head cap screw ⑱.

(4) As the hexagon nut ⑲ is removed, each mounting bracket and tie rod ㉑ can be removed. As the tie rod ㉑ is removed, the rod cover ⑥, head cover ⑰, and piston assembly (⑨, ⑪ to⑯) can then be removed.

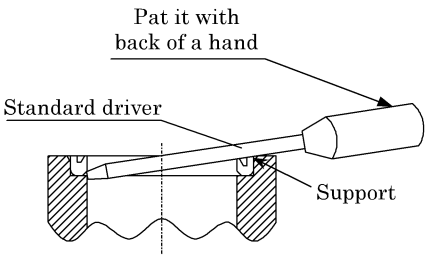
Bracket disassembling or assembling procedures



(5) Cushion needle ㉔ comes out when needle nut ㉓ is removed.

(6) Disassembling cushion packing ⑧

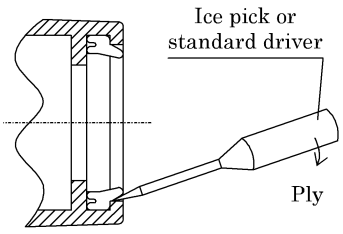
- Clamp the cover in a vise.
- Place the standard driver underneath of lip of packing, then ply the shuttle driver making the corner of the spot facing a fulcrum. Patting the driver handle with the back of hand will let the packing come out of its spot facing on the cover.



(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.

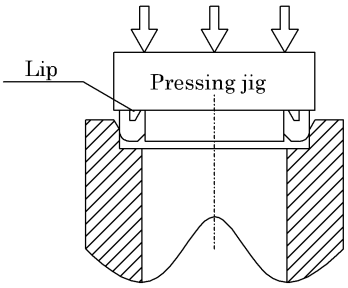
(Do not reuse the detached packing.)



4) Assembly

(a) Clean and wash every part.

(b) 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.

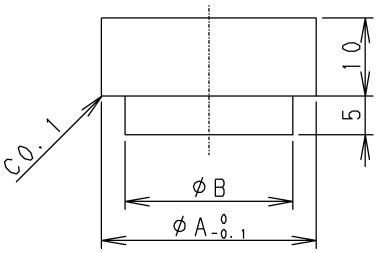


(c) Assembling the cushion packing.
Use special jig to press the packing into the spot facing on the cover to avoid its tilting and also its damage. Press it down to the point that lip tip of packing settle approx. 0.1 to 0.2mm below the surface of the cover.

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



(d) Apply a film of high grade grease (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 and ㉒.

(e) 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	22
ϕ160	34
ϕ180	49
ϕ200	69
ϕ250	123

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5) 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
- Average speed Set it to 20 mm/s
- Cushion needle Fully open

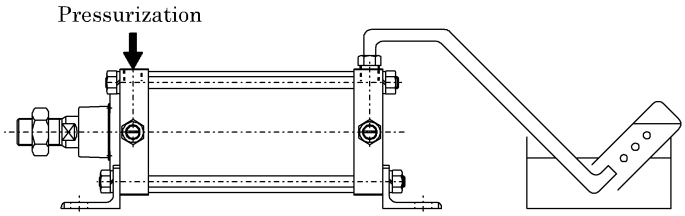
(2) Leakage test

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×D cm^3/min (Standard condition)
External leakage 3+0.15×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.

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5. HOW TO ORDER

SCS-N – a – b c – d – e f

Cylinder model

(a) Mounting style (Note 1)		(b) Tube bore (mm) (Note 2)		(c) Cushion	
LB	Foot mount type, along axis	125	ϕ 125	B	With cushion at both ends
FA	Rod side flange type	140	ϕ 140	R	With cushion at rod side
FB	Head end flange type	160	ϕ 160	H	With cushion at head side
CA	Single clevis type	180	ϕ 180	N	Without cushion
CB	Double clevis type	200	ϕ 200		
TC	Intermediate trunnion type	250	ϕ 250		
TA	Rod side trunnion type				
TB	Head end trunnion type				

(d) Stroke (mm)		(e) Options (Note 3)		(f) Accessories	
50	50	C2	Cushion with a check valve	I	Single knuckle
75	75	J	Bellow: Nylon tarpaulin	Y	Double knuckle
100	100	K	Bellow: Neoprene sheet	B1	Single bracket
150	150	L	Bellow: Silicone rubber glass cloth	B2	Double bracket
200	200	M	Alteration in piston rod material		
250	250	No code	Cushion needle position R (Standard)		
300	300	S	Cushion needle position S		
		T	Cushion needle position T		
		P6	Nonpurple		

Note 1 : Please contact CKD when ordering the hole-type trunnion.
Note 2 : Refer to catalog as for cylinder exceeding max. stroke.
Note 3 : To check the cushion needle position marking, refer to the dimensioned outside drawing.

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5
HOW TO ORDER

6. PRODUCT SPECIFICATIONS

Model code / Item		SCS-N					
Tube bore	mm	ϕ125	ϕ140	ϕ160	ϕ180	ϕ200	ϕ250
Operating method		Double-acting type					
Media		Compressed Air					
Maximum working pressure	MPa	1.0					
Minimum working pressure	MPa	0.05					
Proof pressure	MPa	1.6					
Ambient temperature	℃	-5 to 60 (Not to be frozen)					
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.)					
Cushioning		Air cushion					
Lubrication		Not required (Use Grade 1 ISO VG 32 Turbine oil, if lubrication is preferred)					
Nonpurple specification		Option					
Tolerable energy absorption	J	63.5	91.5	116	152	233	362