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SM－288832－A

# INSTRUCTION MANUAL

## SELEX CYLINDER

## Heavy Duty Scraper Type

## SCS－G（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.

CKD Corporation

The 4th 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 applications, 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-G ( $\phi$ 125 to $\phi$ 250)
Selex Cylinder
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Manual No. SM-288832-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 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

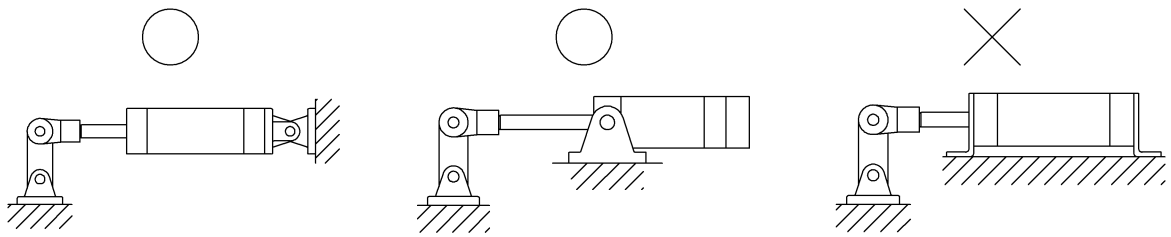
## 2.1 Installation

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

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

3) 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).

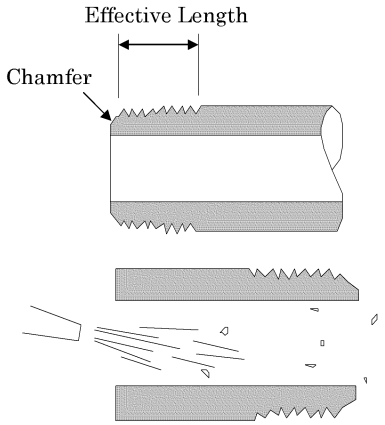
4) When the load acting direction changes with the cylinder operation:
Use an oscillating type (clevis type or trunnion type) capable of making revolution to a certain angle. Furthermore, install the rod and connecting metal (knuckle) so that it moves in the same direction as the cylinder main body does.



Clevise type　　Trunnion type　　Foot mount type

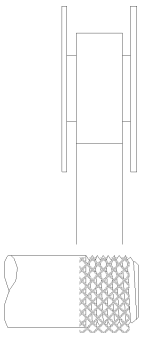
## 2.2 Piping

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 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.

●Seal Tape



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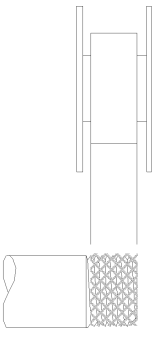

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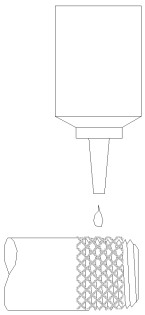
●Sealant (Paste or liquid)



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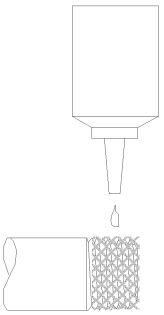
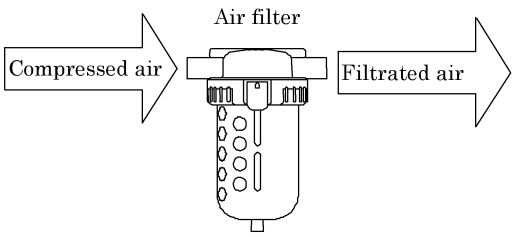


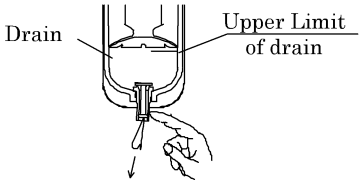
(Incorrect)

## 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.



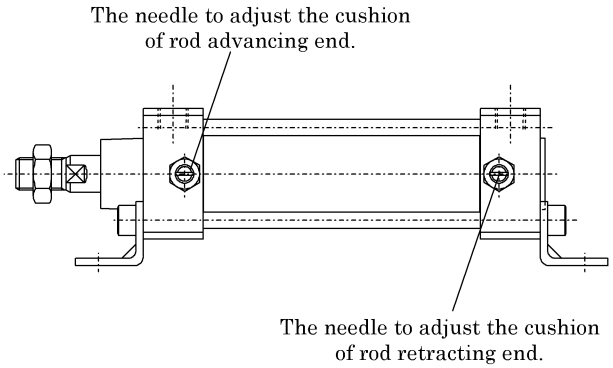

3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

4) Operate the cylinder of this type with lubrication. Turbine oil class 1, ISO VG32 is recommended.

# 3. OPERATION

## 3.1 Operation

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



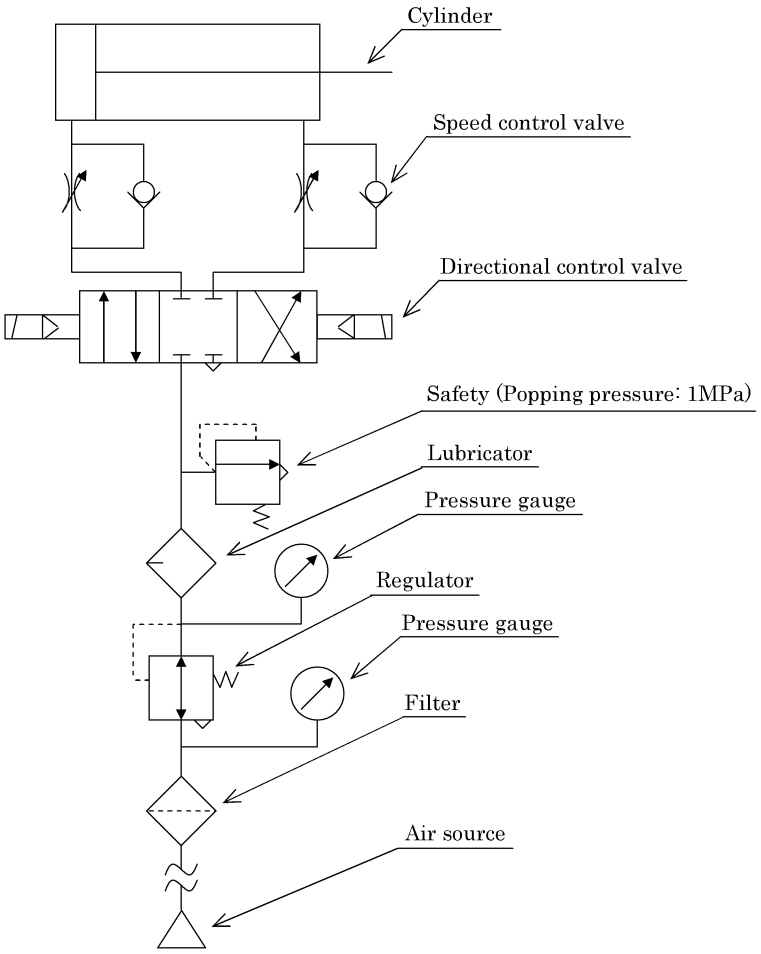

2) Though the cushion has been adjusted at no load when delivered, adjust the cushion needle when the change of cushion effect is required.
Tightening the needle (clockwise) makes cushion more effective. Tighten the needle lock nut all the way after adjustment.

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.

3) Adjust the working 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 mounting orientation.)




<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 brackets and mounting brackets 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", 4-2 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 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) Followings are expendable parts.

| No. | Name \ Bore size (mm) | ϕ 125 | ϕ 140 | ϕ 160 | ϕ 180 | ϕ 200 | ϕ 250 |
|---|---|---|---|---|---|---|---|
| | Kit No. | SCS-G-125K | SCS-G-140K | SCS-G-160K | SCS-G-180K | SCS-G-200K | SCS-G-250K |
| ② | Dust wiper | SCB-35 | SCB-35 | SCB-40 | SCB-45 | SCB-50 | SCB-60 |
| 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 | P-115 | P-130 | P-150 | P-165 | P-185 | P-235 |
| ㉒ | Needle gasket | P-9 | P-9 | P-9 | P-9 | P-9 | P-9 |

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.

## 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 mounting status.<br>Connect the floating connector.<br>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.<br>Connect the floating connector.<br>Change the mounting style. |
| | Exertion of transverse (lateral) load. | Install a guide.<br>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.<br>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.<br>Reverse the installation state and/or change the mounting style. |

## 4.3 Disassembling

Should any trouble occur, tale the following corrective actions.

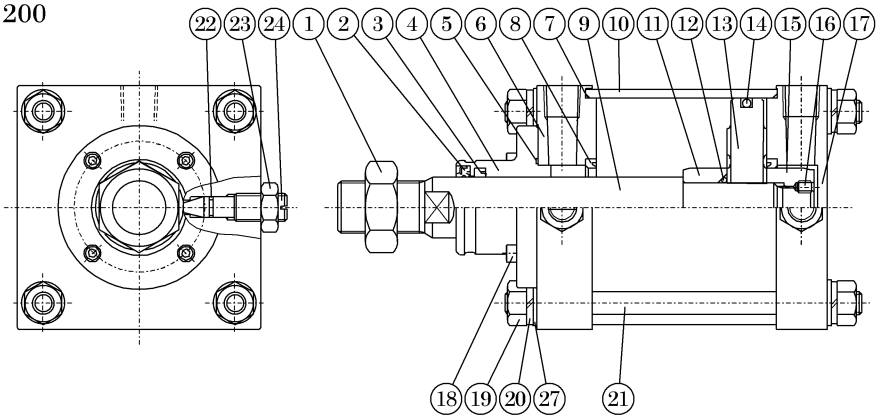
1) Prepare the following tools for disassembling.

Disassembling tools

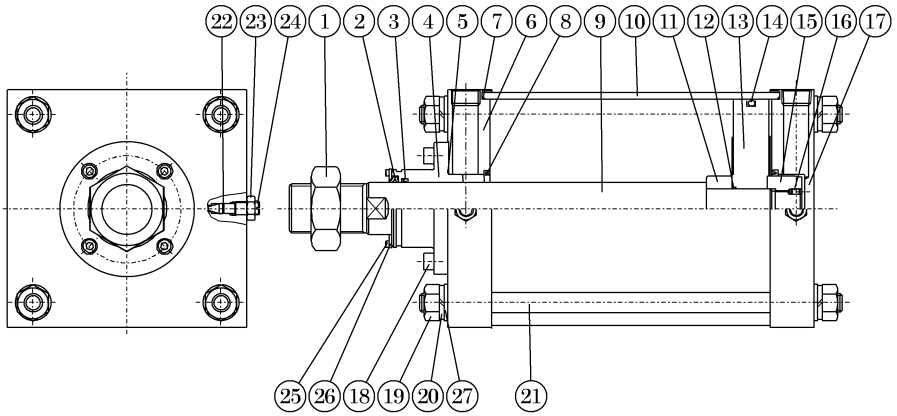
| Name | Qty | Part No. | Place of use | Applicable tube ID (mm) |
|---|---|---|---|---|
| Hex. bar spanner (Nominal 5) | 1 | 18 | Hexagon socket head cap screw | $\phi$ 125, $\phi$ 140 |
| Hex. bar spanner (Nominal 6) | | | | $\phi$ 160, $\phi$ 180 |
| Hex. bar spanner (Nominal 8) | | | | $\phi$ 200 |
| Hex. bar spanner (Nominal 10) | | | | $\phi$ 250 |
| Hex. bar spanner (Nominal 3) | | 26 | Hexagon socket head cap screw | $\phi$ 250 |
| Wrench (Nominal 22) | 2 | 19 | Hex. nut (Tie rod) | $\phi$ 125, $\phi$ 140 |
| Wrench (Nominal 24) | | | | $\phi$ 160 |
| | 1 | 23 | Needle nut | For all tube ID |
| Wrench (Nominal 27) | 2 | 19 | Hex. nut (Tie rod) | $\phi$ 180 |
| Wrench (Nominal 30) | | | | $\phi$ 200 |
| Wrench (Nominal 36) | | | | $\phi$ 250 |
| Standard driver | 1 | 8 | Cushion needle,<br>Piston packing,<br>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

$\phi$ 125～ $\phi$ 200




$\phi$ 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 | Zinc chromate |
| 5 | Metal gasket | Nitril rubber | 1 | |
| 6 | Rod cover | Rolled steel | 1 | Zinc chromate |
| 7 | Cylinder gasket | Nitril rubber | 2 | |
| 8 | Cushion packing | Nitril rubber | 2 | |
| 9 | Piston rod | Carbon steel | 1 | Industrial chrome plating |
| 10 | Cylinder tube | Carbon steel pipe | 1 | Painting, Industrial chrome 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 | Zinc chromate |
| 18 | Hexagon socket head cap screw | Alloy steel | 4 | Black oxide finish |
| 19 | Hexagonal nut | Carbon steel | 8 | Zinc chromate |
| 20 | Spring washer | Steel | 8 | Zinc chromate |
| 21 | Tie rod | Carbon steel | 4 | Zinc chromate |
| 22 | Needle gasket | Nitril rubber | 2 | |
| 23 | Needle nut | Carbon steel | 2 | Zinc chromate |
| 24 | Cushion needle | Carbon steel | 2 | Zinc chromate |
| 25 | Holding plate | Carbon steel | 1 | Manganese Phosphate Coatings |
| 26 | Hexagon socket head cap screw | Alloy steel | 4 | Black oxide finish |
| 27 | Small round plain washer | Steel | 8 | Zinc chromate |

Note1： Parts 8, 22, 23, 24 are not required when it is without cushion.

Note2： Parts 25, 26 applies only to $\phi$ 250.

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

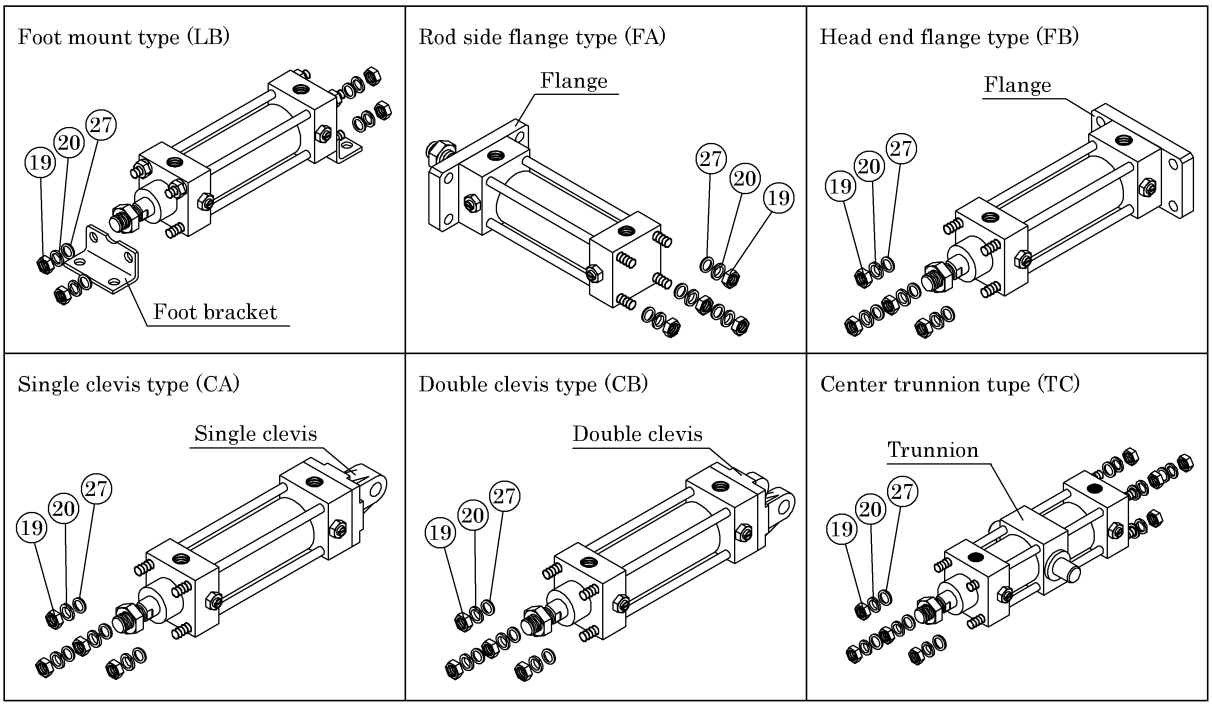
(1) Shut off the fluid and remove the residual pressure.

(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

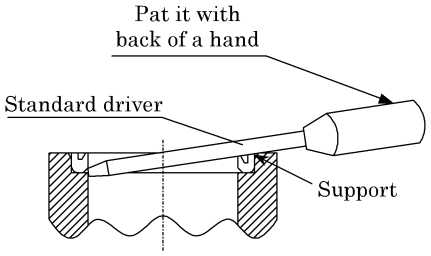



(5) Cushion needle ㉔ comes out when needle nut ㉓ is removed.

(6) Disassembling cushion packing ⑧

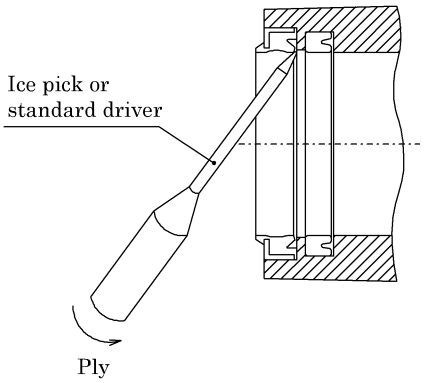
・Clamp the cover in a vise.

・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.



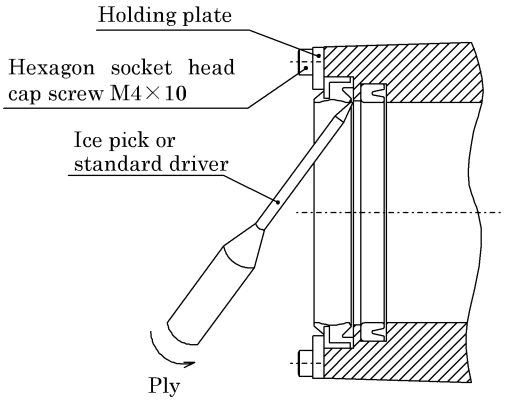
(7) Disassembling dust wiper ② and disassembling rod packing ③

a) $\phi$125 to $\phi$200
Ply the dust wiper and rod packing off with a tool having the sharp tip, such as standard screwdriver or ice pick.
(Do not reuse the detached dust wiper and rod packing.)




b) $\phi$250

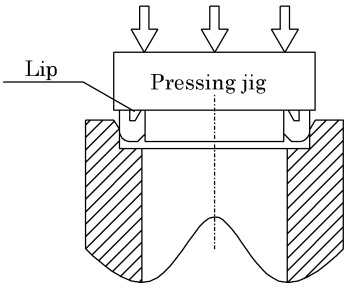
- Hexagon socket head cap screw (M4×10) is removed and Holding plate is removed.
- Ply the dust wiper and rod packing off with a tool having the sharp tip, such as standard screwdriver or ice pick.
  (Do not reuse the detached dust wiper and rod packing.)




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.

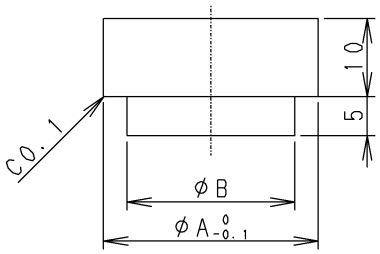



(c) Assembling the cushion packing.
Use special jig to press the packing into the spot facing on the cover to avoid its tilting and also its damage. Press it down to the point that lip tip of packing settle approx. 0.1 to 0.2mm below the surface of the cover.

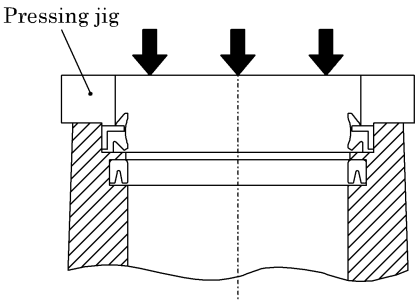
Table 1 and drawing are for a couple of examples of press jigs.

Table 1. Dimensions of press jigs

| Bore size (mm) | A | B |
|---|---|---|
| ϕ125, ϕ140 | 55 | 45 |
| ϕ160, ϕ180 | 67 | 55 |
| ϕ200 | 72 | 60 |
| ϕ250 | 87 | 75 |



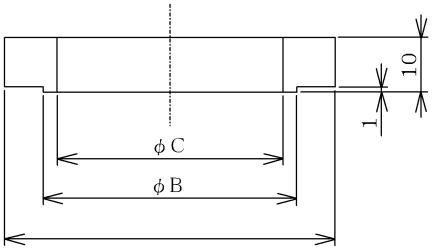

(d) Assembling the dust wiper (scraper).
Use special jig to press the dust wiper in to the spot facing on the cover to avoid its tilting.
Dimensions of pressing jig and shapes put following, and through.



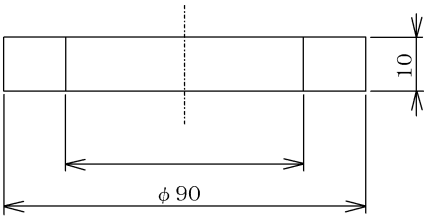

a) ϕ125～ϕ200

Table 2. Dimensions of press jigs

| Bore size (mm) | A | B | C |
|---|---|---|---|
| ϕ125, ϕ140 | 60 | 46 | 41 |
| ϕ160 | 65 | 51 | 46 |
| ϕ180 | 70 | 56 | 51 |
| ϕ200 | 75 | 61 | 56 |




a) ϕ250



(e) 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.

(f) 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

| Bore size (mm) | Torque (N·m) |
|---|---|
| φ125, φ140 | 22 |
| φ160 | 34 |
| φ180 | 49 |
| φ200 | 69 |
| φ250 | 123 |

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
  - ・Cushion needle Fully open

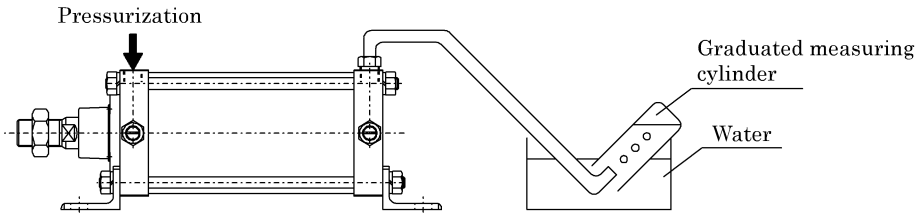
(2) Leakage test

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 bore size (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.

Discontinue



# 5. HOW TO ORDER

SCS-G – a – b c – d – e f

Cylinder model

| (a) Mounting style (Note 1) | | (b) Bore size (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 | Center trunnion type | 250 | ϕ 250 | | |
| TA | Rod side trunnion type | | | | |
| TB | Head end trunnion type | | | | |

| (d) Stroke (mm) | | (e) Options (Note 2) | | (f) Accessories | |
|---|---|---|---|---|---|
| 50 | 50 | C2 | Cushion with a check valve | I | Rod eye |
| 75 | 75 | J | Bellow: Nylon tarpaulin | Y | Rod clevis |
| 100 | 100 | K | Bellow: Neoprene sheet | B1 | Eye bracket |
| 150 | 150 | L | Bellow: Silicone rubber glass cloth | B2 | Clevis bracket |
| 200 | 200 | M | Alteration in piston rod material | | |
| 250 | 250 | Blank | Cushion needle position R (Standard) | | |
| 300 | 300 | S | Cushion needle position S | | |
| | | T | Cushion needle position T | | |
| | | P6 | Copper and PTFE free | | |

Note 1 : Please contact CKD when ordering the hole-type trunnion.
Note 2 : To check the cushion needle position marking, refer to the dimensioned outside drawing.

# 6. PRODUCT SPECIFICATIONS

| Mode / Item | | SCS-G | | | | | |
|---|---|---|---|---|---|---|---|
| Bore size | mm | φ125 | φ140 | φ160 | φ180 | φ200 | φ250 |
| 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 60 (No freezing) | | | | | |
| Port size | | Rc1/2 | Rc3/4 | | | | Rc1 |
| Stroke length tolerance | mm | $^{+1.0}_{0}$ (to 300), $^{+1.4}_{0}$ (to 1000), $^{+1.8}_{0}$ (to 1200) | | | | | |
| Working piston speed | mm/s | 20 to 1000 (use this within absorbed energy range.) | | | | | |
| Cushion | | Air cushion | | | | | |
| Lubrication | | Required (When lubrication, use turbine oil Class 1 ISO VG32) | | | | | |
| Copper and PTFE free specification | | Option | | | | | |
| Allowable energy Absorption J | Cushioned | 63.5 | 91.5 | 116 | 152 | 233 | 362 |
| | Noncushion | The types without cushion cannot absorb a large energy generated by an external load. We recommend installation of an external shock absorbing device. | | | | | |