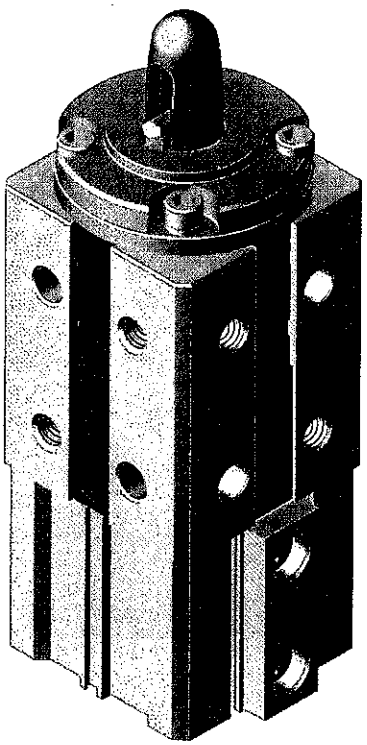
SMC

No.	CKQ＊－OM0002H

OPERATION MANUAL

PIN CLAMP CYLINDER

【C(L)KQ Series】



(type: CKQS*50*-****)

☆Read this manual thoroughly before mounting and operation.

☆Especially, carefully read the description concerning safety.

☆Keep this manual where accessible when necessary.

SMC CORPORATION

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1. Safety Instruction

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard by labeling "Caution", "Warning", and "Danger". To ensure safety, be sure to observe ISO4414*1), JIS B8370*2) and other safety precautions.

⚠ Caution :	Operator error could result in injury or equipment damage.
⚠ Warning :	Operator error could result in serious injury or loss of life.
⚠ Danger :	In extreme conditions, there is a possibility of serious injury or loss of life.

※1) ISO 4414:Pneumatic fluid power Recommendation for the application of equipment to transmission and control systems.

※2) JIS B 8370: Pneumatic system axiom.

⚠ Warning

1.The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

2.Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3.Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1.Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked out control positions.

2.When equipment is to be removed, confirm the safety process as mentioned above. Cut the pressure supply for the equipment and exhaust all residual compressed air in the system.

3.Before machinery/equipment is re-started, take measures to prevent quick extensions of the cylinder piston rod etc.

4.Contact SMC if the product is to be used in any of the following conditions.

1.Conditions and environments beyond the given specifications or if product is used outdoors.

2.Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications or safety equipment.

3.An application which has the possibility of having negative effects on people, property, or animals requiring special safety analysis.

2. Specifications

2—1. Base cylinder (common to locked/non-locked type)

Action	Double acting	
Cylinder tube I.D. [mm]	50	
Fluid	Air	
Pressure proof	1.5MPa	
Max. operating pressure	1.0MPa	
Min. operating pressure	CKQ:0.1MPa	CLKQ:0.15Mpa※
Ambient and fluid temp.	−10 to 60℃(no freezing)	
Cushion	None	
Lubrication	Non-lube	
Piston speed	50 to 300mm/sec	
Port size	1/4(Rc, NPT, G)	

※When the cylinder and the lock part are laid in the same way, the minimum operating pressure becomes 0.2MPa.

2—2. Lock mechanism (only for locked type)

Action	Spring lock (for exhaust)
Unlocking pressure	0.2MPa or more
Locking pressure	0.05MPa or less
Locked direction	Forward(unclamping)
Max. operating pressure	1.0 MPa
Unlocking port size	1/8(Rc, NPT, G)
Holding force (max. static load) [N]	982

2—3. Clamp (common to locked/non-locked type)

Clamp stroke	Without shim	With shim
	$10\ ^{0}_{-0.5}$ mm	10mm～12mm
Number of arm	1	
Guide pin shape	Round, Diamond	

For detail such as clamping force, refer to "4. Model selection" on page 10.

⚠ Warning

1) Mind the features of the product.

The base cylinder is designed to minimize various dimensions including full length for downsizing and space saving in entire system. And so if used same as conventional cylinder, it can't keep the performance for expected life period and may be damaged under some operating conditions.

2) Check the specifications.

The products specified in this operation manual are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use under these conditions.

3. Installation and Handling

3－1. Air source

The compressed air supplied for the cylinder shall be filtered by air filter, SMC's AF series and decreased to given set pressure by regulator, SMC's AR series for use.

⚠ Warning

1) Use clean air.

If compressed air includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., it can damage or malfunction.

⚠ Caution

2) Install air filter.

Install air filter at upstream side of valves. The filtration degree should be 5 μm or less.

3) Install air dryer, after cooler, etc.

Air that includes excessive condensate may cause malfunction of pneumatic equipments. To prevent this, install air cleaning equipment such as air dryer, after cooler, etc.

4) Use the product within the specified range of fluid and ambient temperature.

Take measures prevent freezing, since moisture in circuits will be frozen under 5 deg. C, and this may cause damage to seals and lead to malfunction. The allowable operating range for this product is between −10 and 60 deg. C. If the cylinder is used at temp. out of this range, the packing is hardened, the grease is lost and the packing is worn, finally the air leaks is caused. For the further detail on compressed air quality, refer to SMC's "Air Cleaning Equipment".

5) Lubrication to non-lube. style cylinder (only for CKQ)

Install a lubricator in the circuit, and use class 1 turbine oil (no additive) ISO VG32. And once the lubrication is started, it must be continued because stopping of the lubrication on the way may lead to malfunction due to loss of original lubricant. And, CLKQ cylinder must not be given lubricant to avoid serious impair in locking mechanism.

6) Use clean and oil-free air to keep performance (only for CLKQ)

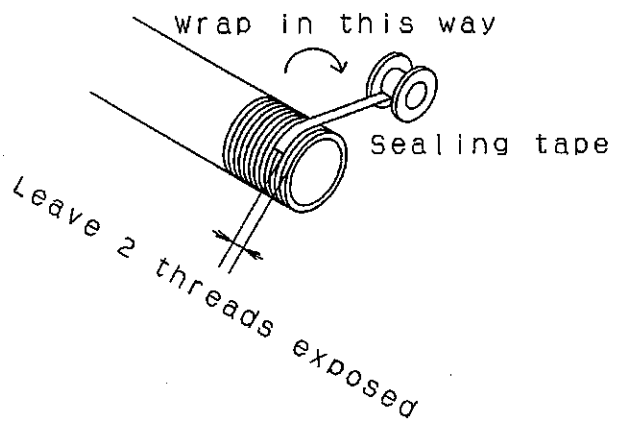
If the air containing the lubricant, compressor oil or drain enters the cylinder, the locking mechanism may be impaired seriously.

7) Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove cutting chips, cutting oil and other debris from inside the pipe.

8) Wrapping of sealant tape

When piping or fitting is connected, make sure that cutting chips from the pipe threads and sealing material do not get inside the piping. Also, when sealant tape is used, leave 1.5 to 2 thread mounting exposed a t the end of the pipe/fitting.



3－2. Environment

⚠ Warning

1) Do not use in environments where there is a danger of corrosion.

Refer to the construction drawings regarding materials used for cylinder.

2) Avoid highly humid place for storage of the cylinder.

The cylinder should be stored in less humid place.

3－3. Speed adjustment

The cylinder can be adjusted to desired speed by SMC's speed controller, AS series. There are two ways to do it depending on the port of the cylinder which restricts the supplied air, supply or exhaust port. However, it should be noted normally the air is restricted at exhaust port.

⚠ Caution

1) Adjust the speed of the cylinder from low to high by mounted speed controller until desired speed is achieved.

3－4. Direction control

The cylinder can be switched in movement direction by SMC's solenoid valve, which is selected from various styles to become optimum to the cylinder.

⚠ Warning

1) Design circuitry to prevent sudden quick extension of driven objects.

When a cylinder is driven by an exhaust center directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will extend suddenly at high speeds if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder. Therefore, equipment should be selected and circuits designed to prevent sudden lurching, because there is a danger of human injury and/or damage to equipment when this occurs.

3－5. Design

⚠ Warning

1) There is a possibility of dangerous sudden action by air cylinders. The sliding parts of machinery are twisted due to external forces etc.

In such a case, human injury may occur, e.g. by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to avoid such dangers..

2) A protect cover is recommended to minimize the risk of personal injury.

If a stationary object and moving parts of a cylinder are in close proximity human injury may occur. Design the structure to avoid contact with the human body.

3) Securely tighten all stationary parts and connected parts so that they will not become loose.

When a cylinder operates with high frequency or a cylinder is installed where there is a lot of vibration, ensure that all parts remain secure.

4) Design the system not to allow external force over max. output of the cylinder to act.

Excessive external force may break the cylinder and lead to human injury and equipment damage.

5) Consider the force output by the cylinder to check the adequacy of mounting base in rigidity.

If the mounting base is not rigid enough, the human injury and equipment damage may be caused.

6) Consider a possible drop in operating pressure due to a power outage, etc.

When a cylinder is used in a clamping mechanism, there is a danger of work dropping if there is a drop in circuit pressure caused by a power outage, etc.

Therefore, safety equipment should be installed to prevent damage to machinery and human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

7) Consider a possible failure of power source.

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

8) Consider emergency stops.

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

9) Consider the action when operation is restarted after an emergency stop or abnormal stop.

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install manual safety equipment.

10) Intermediate stops

When intermediate stopping of a cylinder piston is performed with a 3 position closed center directional control valve, it is difficult to achieve stopping positions a accurate and minute as with hydraulic pressure due to the compressibility of air.

Furthermore, since valves and cylinders, etc. are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Contact SMC in case it is necessary to hold a stopped position for an extended period.

3－6. Installation and Setting-up

⚠ Caution

1) Do not scratch or gouge the sliding portion of the cylinder tube or the guide rod striking it with an object, or squeezing it.

The tube bore is manufactured under precise tolerances. Thus, even a slight deformation could lead to a malfunction. Furthermore, any scratches or gouges on the sliding portion of the piston rod could damage the seals, which could lead to air leakage.

2) Prevent the rotating parts from seizing.

Apply grease to the rotating parts (such as the pin) to prevent them from seizing.

3) Do not use until it is verified that the equipment can operate properly.

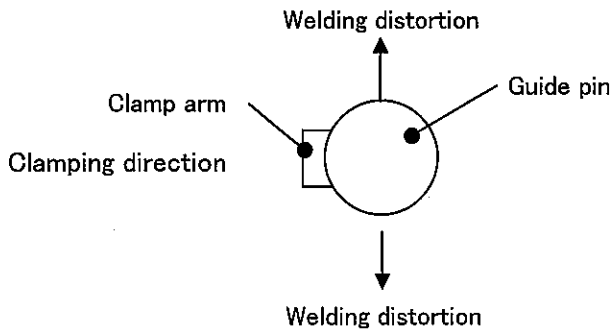
After mounting, repair or modification, etc., connect the air supply and electric power, and then confirm proper mounting by means of appropriate function and leak inspections.

4) Do not turn the opening of the guide pin to the direction where the spatter splashes.

If the spatter enters the cylinder through the opening, the life is shortened and operating failure is caused.

5) Consider the distortion created by welding to decide the mounting orientation of the clamping arm.

If the welding distortion acts on clamping direction, the clamping arm may be damaged. To prevent this, decide the clamping direction to relieve the welding distortion to the orientations as shown below.



6) Shorten the piping length.

If the piping is connected too long, the content volume of the piping becomes larger than the cylinder and the fog created by adiabatic swelling is prevented from escaping to the air and obliged to stay inside the tube. As the operation is repeated, the amount of the fog is increased and expected to turn into the water. Then, the grease is washed away by the water and a lack of lubrication, wear of packing, air leakage, friction resistance increase and operating failure is caused subsequently. To prevent this, the following measure should be taken.

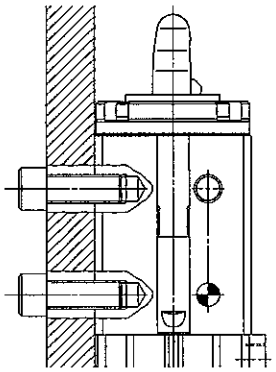
(1)Shorten the piping tube between solenoid valve and cylinder as much as possible to ensure the created fog is exhausted to the air. For reference, the following relation should be achieved.
Cylinder content volume at atmospheric pressure × 0.7 ≧ Piping tube content volume

(2)Connect speed exhaust controller ASV and quick exhaust valve in the circuit of the cylinder to exhaust the pressure to atmosphere directly.

(3)Locate the piping port downward to prevent the moisture created in the piping from returning to the cylinder easily.

7) Pressurize only unlocking port during assembly and adjustment (only for CKLQ)

8) Keep tightening torque to mount the cylinder on the system as follows.



Thread size	Tightening torque (N·m)
M10	20～25
M12	35～42

9) Check the operation of auto switch for the use in welding environment.

Select strong magnetic field compatible auto switch D-P5DWL.

10) Keep enough distance from the cylinder with auto switch to the floor.

The lead wire of the auto switch must not be bend over min. bending radius.

Applicable auto switch	A
D-F7□・D-J79・D-F7NTL	4mm or more
D-A7□H・D-A80	5mm or more
D-F7BA・D-F7□W・D-J79・D-F79F	9mm or more
D-A9□・D-F9□・D-M9□	10mm or more
D-F9□W	15mm or more
D-F9BAL	19.5mm or more
D-P5DWL・D-P5DWSC	32.5mm or more
Length taking out type	0mm

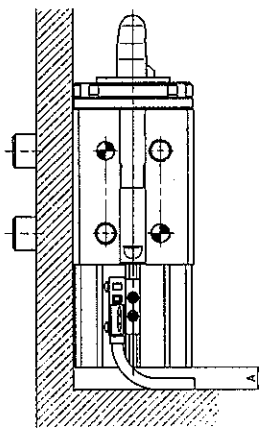


Fig. 3－1 D-P5DW□ type

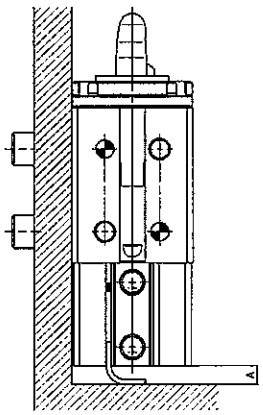


Fig. 3－2 Excluding the D-P5DW□ type

3－7. Auto switch

The type and specifications of applicable auto switch and the cautions for handling of them can be found on the catalog and operation manual respectively.

3－7－1. Mounting position for detection at stroke end

Mounting position of auto switch (mm)

Environment	General									
Installation method	Rail Mount									
Model	D-A79W		D-A72		D-A73・D-A80		D-A7■H・D-A80H D-A73C・D-A80C D-F7■WV D-F7BAL D-F7BAVL D-F7■W・D-J79W D-F7NTL D-F79F		D-F7■V D-J79C D-F7■・D-J79	
	A	B	A	B	A	B	A	B	A	B
CKQ	8.5	33 or more	11	27 or more	11	28 or more	11.5	27 or more	11.5	22 or more
CLKQ	43.5		46		46		46.5		46.5	

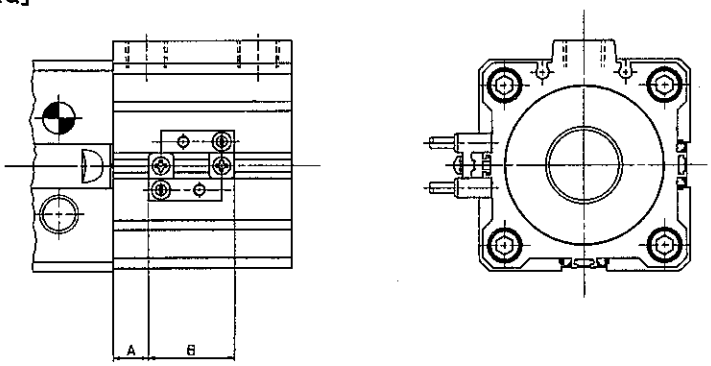
Environment	General									
Installation method	Direct Mount									
Model	D-A9■ D-A9■V		D-F9■W D-F9■WV		D-F9BAL		D-F9■V D-M9■V		D-F9■ D-M9■	
	A	B	A	B	A	B	A	B	A	B
CKQ	10	30 or more	14	22 or more	13	—	14	17 or more	14	19 or more
CLKQ	45		49		48	—	49		49	54 or more

Environment	Welding	
Installation method	Rail Mount	
Model	D-P5DWL D-P5DWSC	
	A	B
CKQ	7	17 or more
CLKQ	42	52 or more

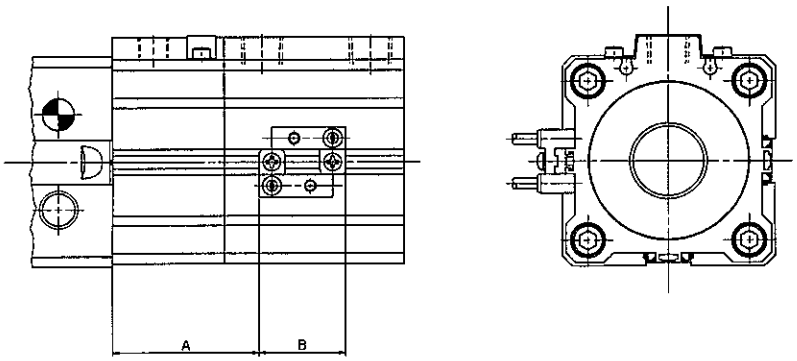
Rail Mount(General environment)

・Adjustment auto switch: D-A79W・D-A7■・D-A80・D-A7■H・D-A80H・D-A73C・D-A80C・D-F7■WV
D-F7BAL・D-F7BAVL・D-F7■W・D-J79W・D-F7NTL・D-F79F・D-F7■V
D-J79C・D-F7■・D-J79

[CKQ]



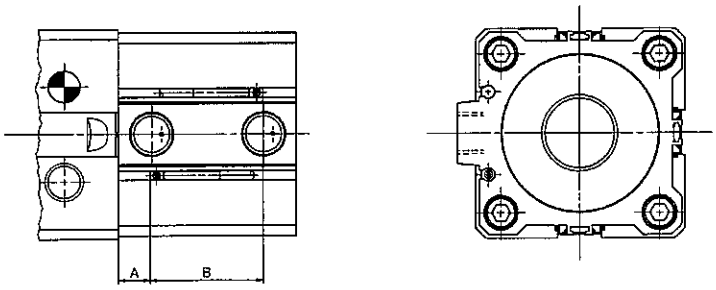
[CLKQ]



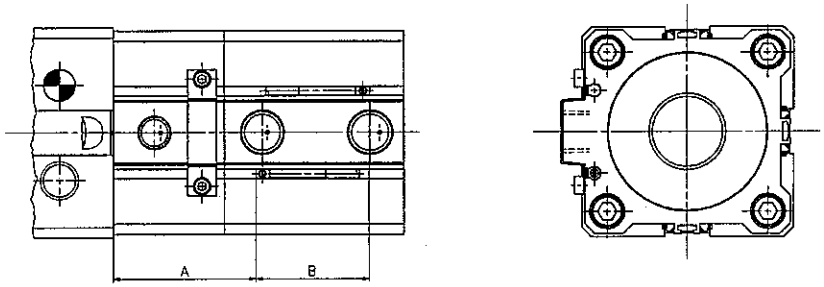
Direct Mount(Welding environment)

・Adjustment auto switch: D-A9■・D-A9■V・D-F9■V・D-F9■W・D-F9■WV・D-M9■V・D-F9BAL

[CKQ]

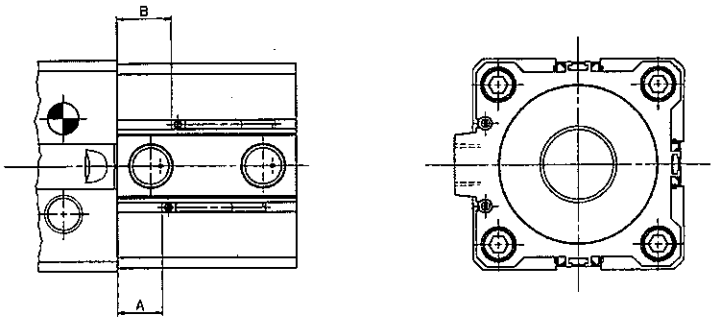


[CLKQ]

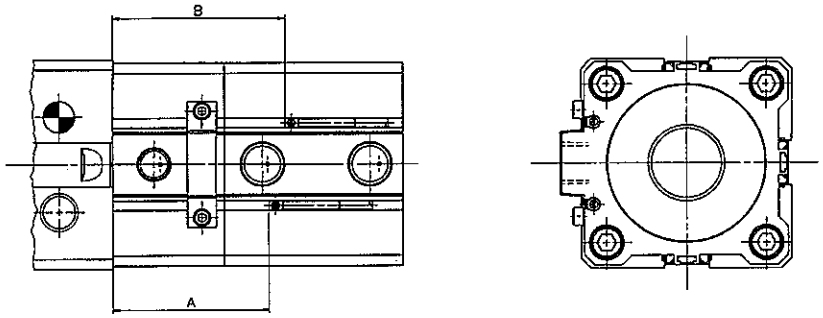


・Adjustment auto switch : D-F9■・D-M9■

[CKQ]



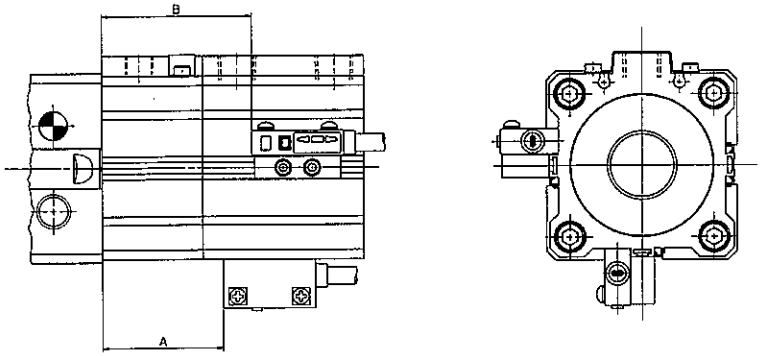
[CLKQ]



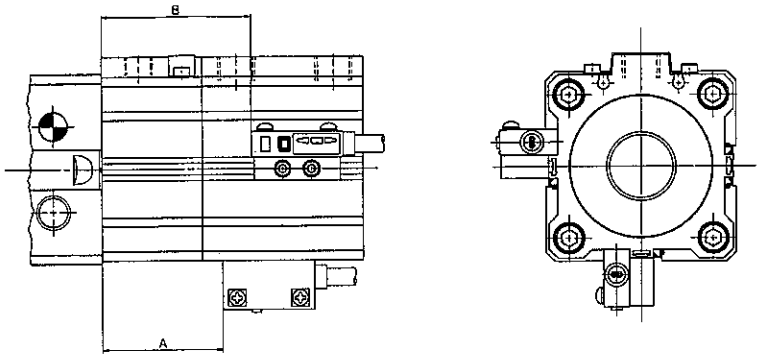
Rail Mount(Welding environment)

・Adjustment auto switch : D-P5DWL・D-P5DWSC(Installation on different side)

[CKQ]



[CLKQ]



3−7−2. How to mount auto switch

(1) D−A7□□□、A80□□□
D−F7□□□、J79□□□

Insert the auto switch mounting nut into the mating slot and set the auto switch around the given mounting position. Then, push the auto switch spacer into the rail over the nut and engage the convex of the auto switch mounting arm with the concave of the spacer. After that, put the auto switch mounting screw into the hole of the mounting arm and rotate it into the mounting nut slightly. Then, slide the mounting assembly close to detected position of the cylinder and fix it there by tightening the mounting screw to the end by watch driver with 5 to 6mm grip diameter and 0. 5 to 0.7N·m torque.

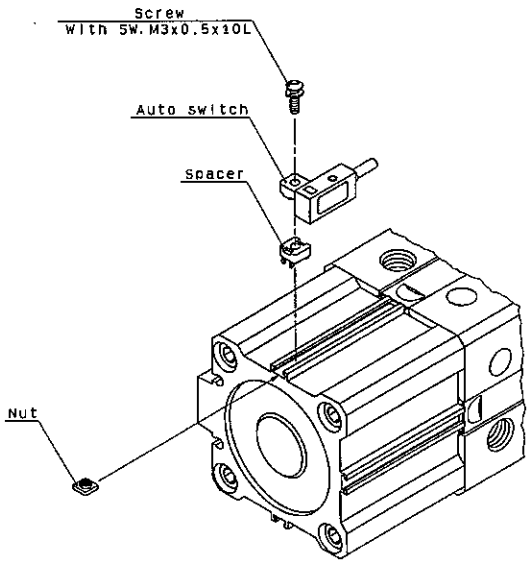


Fig. 3−3

Part no. of auto switch mounting bracket

Cylinder tube I.D. [mm]	Part no.	Including and Qty.
50	BQ−2	・Screw × 1pcs ・Spacer × 1pcs ・Nut × 1pcs

Note) For built−in magnet cylinder, 2 sets of mounting bracket are packaged together.

(2) D−A9□□、F9□□

Insert the auto switch into the mating slot from the direction shown on Fig. 3−5, set it around the given mounting position and fix it by tightening mounting screws attached as accessory. The screws should be tightened by watch driver with 5 to 6mm grip diameter and 0.1 to 0.2N·m torque. As reference, the screw should be rotated 90 deg. more after the resistance is felt.

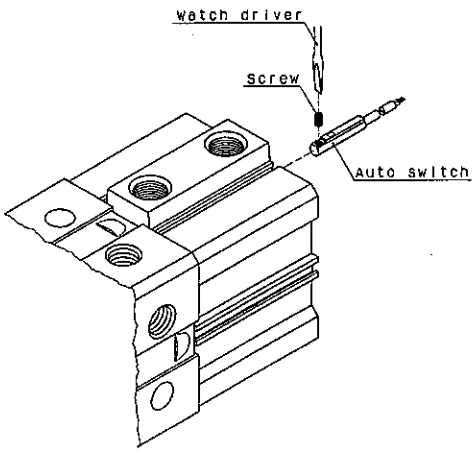


Fig. 3−4

(3) D−P5DW□□

Insert the auto switch into the mating slot from the direction shown on Fig. 3-6, set it around the given mounting position and fix it by tightening mounting screws attached as accessory. The screws should be tightened by watch driver with 5 to 6mm grip diameter and 0.1 to 0.2N·m torque. As reference, the screw should be rotated 90 deg. more after the resistance is felt.

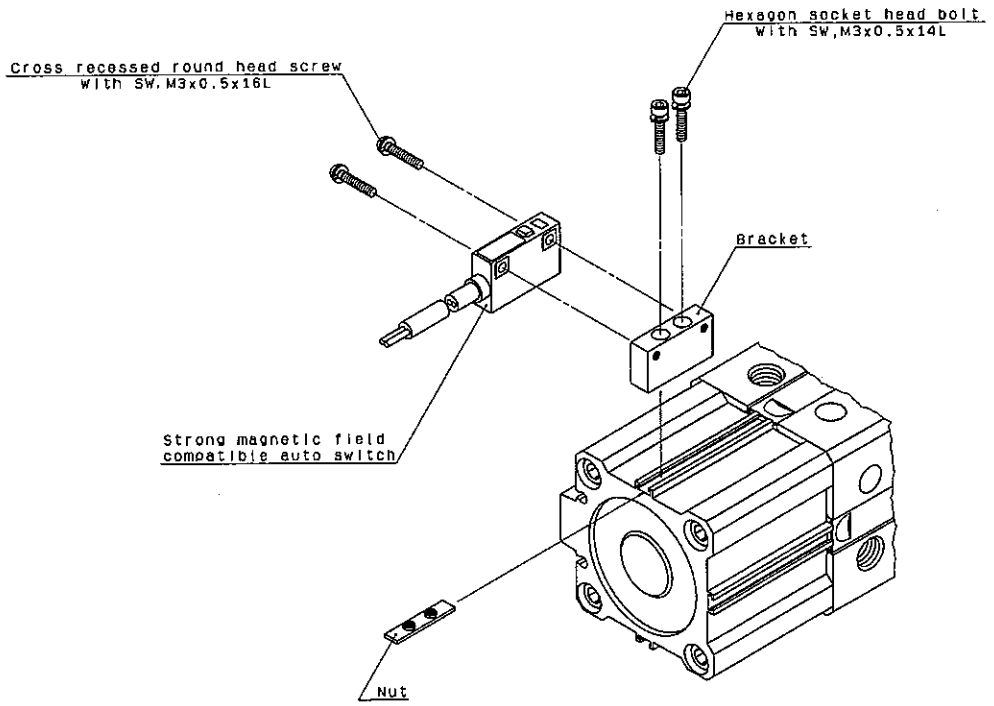


Fig. 3−5

Part no. of auto switch mounting bracket

Cylinder tube I.D. [mm]	Part no.	Including and Qty.
50	BQP1−050	・Bracket × 1pcs ・Spacer × 1pcs ・Cross recessed round head screw × 2pcs ・Hexagon socket head bolt × 2pcs ・Spring washer × 4pcs

3−8. Preparation before operation

⚠ Warning

1) Use CLKQ as it is on receipt because it doesn't have unlocking holding function.

2) If the cylinder is restarted at locking position, be sure to start pressurization to port B shown on Fig. 5-2.

If the port A is pressurized before port B, the lock is released and causes sudden movement of the cylinder which may create serious danger.

4. Model selection

⚠ Warning

1) Do not use the cylinder for the purpose other than clamping.

This cylinder is intended to perform positioning of the work and clamp simultaneously and if used for other purposes, it may break and result in the accident.

2) Do not tamper the cylinder.

If this cylinder is tampered, breakage, lifer out at earlier period and accident may be caused to the cylinder. If such a tamper is necessary absolutely, contact SMC separately.

3) Keep thickness of the clamped work 10mm or less.

The clamping stroke of this cylinder is 10mm and not allowed to clamp the work bigger than it.

＊The cylinder with shim can clamp the work up to 12mm when all of the shim are removed.

4) Do not clam the work to the face which is not flat.

5) If the work is transferred at high speed in 3 axes by robot etc. after clamped, be sure to keep the weight of work 1/10 or less of theoretical thrust (clamping force) or protect the work from being blown away by stopper.

6) Do not perform clamping when there is no work.

If the clamp arm is slapped to the seat face directly without the work, the surface flatness of the arm (clamping face) is impaired.

7) Do not give impact, strong vibration and rotation to the cylinder.

This cylinder is composed by precisely machined parts and may break or end the life at shorter period when exposed to strong impact, vibration and rotation from outside.

< Only for CLQK >

8) Do not stop the cylinder on the way of movement.

This cylinder is intended to lock the unintentional movement at clamping position and if it is stopped during operation, life out at shorter period may be caused.

9) Mind the locked direction. The locked type cylinder is locked only in forward movement and not locked in reverse direction.

The locked cylinder type F doesn't output holding force when retracting. And the locked direction can't be changed.

10) The cylinder can move by approx. 1mm in locked direction when external force including work weight is given even if locked.

Even if the cylinder is locked, when the pressure is decreased, the cylinder may have approx. 1mm movement in locked direction by external force including work weight. (Refer to "8. Structural principle".)

4－1. Applicable guide pin diameter

Guide pin shape	Round						Round and diamond					
Applicable hole size	Φ13		Φ15		Φ16		Φ18		Φ20		Φ25	
Guide pin I.D. [mm]	12.5	12.7	14.5	14.7	15.5	15.7	17.5	17.7	19.5	19.7	24.5	24.7

4－2. Clamping force

(N)

Model	Operating pressure [MPa]								
	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
CKQ	164.9	329.8	494.7	659.6	824.5	989.4	1154.3	1319.2	1484.1
CLKQ	82.4	247.3	412.2	577.1	742.0	906.9	1071.8	1236.7	1401.6

Note1) CLKQ has 982N holding force and should be provided with circuit designed suitable to the force when operated at 0.75MPa or more. If the load bigger than the force is given, wear of locking mechanism, life out at shorter period and accident may be caused to the cylinder.

Note2) It takes approx. 0.3 sec until the cylinder generates clamping force from the unclamped condition (in case of no speed controller mounted). And the circuit should be designed with consideration of this.

Note3) The clamping force should be decided with consideration of the strength of the work which may be damaged by excessive clamping force.

5. Pneumatic circuit

5－1. Recommended circuit for CKQ series

The typical circuit for CKQ series where air filter, regulator, solenoid valve and speed controller (meter-out) are used for operation is as follows.

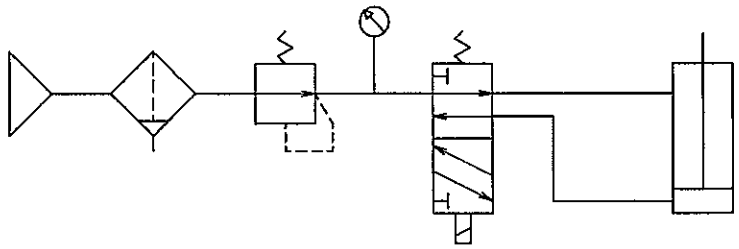


Fig. 5－1 Recommended pneumatic circuit

5－2. Recommended circuit for CKLQ series

⚠ Warning

1) **Never use position valve (including closed center, perfect valve, exhaust center and pressure center).**
   The position valve may allow unlocking pressure to enter and release the lock unintentionally.
2) **Install the speed controller so that it will work as meter-out.**
   If the speed controller is used as meter-in, operating failure may be caused.
3) **Concern possible reverse flow of exhaust pressure from common exhaust style valve manifold.**
   The reverse flow of exhaust pressure may release the lock and so single exhaust style manifold or single valve are recommended.
4) **Branch the pneumatic piping connected with lock unit between the cylinder and speed controller.**
   If it is branched at other parts, the expected life may not be achieved.
5) **Connect the piping so that the part toward lock unit from branched part will be shorter.**
   If the piping toward lock unit is longer than cylinder port side, unlocking failure and life out at shorter period may be caused.

⚠ Caution

6) **For the above reasons, 2 position and double solenoid style valve is recommended.**

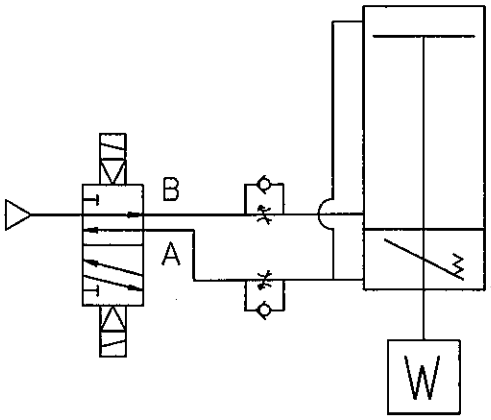


Fig. 5－2 Recommended pneumatic circuit

7) **The pneumatic circuit shown on Fig. 5-3 is also available, but in that case, be sure to release the lock before the cylinder is moved regardless of operating direction.**

If the lock is released late, the cylinder may break seriously and end on at quite short period and also move at dangerous speed. Therefore, be sure to release the lock first if the cylinder is moved in freed direction.

8) **If the pneumatic circuit shown on Fig. 5-3 is used, concern large displacement in stroking direction at locked position.**

The piping length and timing of exhaust may delay the locking operation and cause displacement in stroking direction.

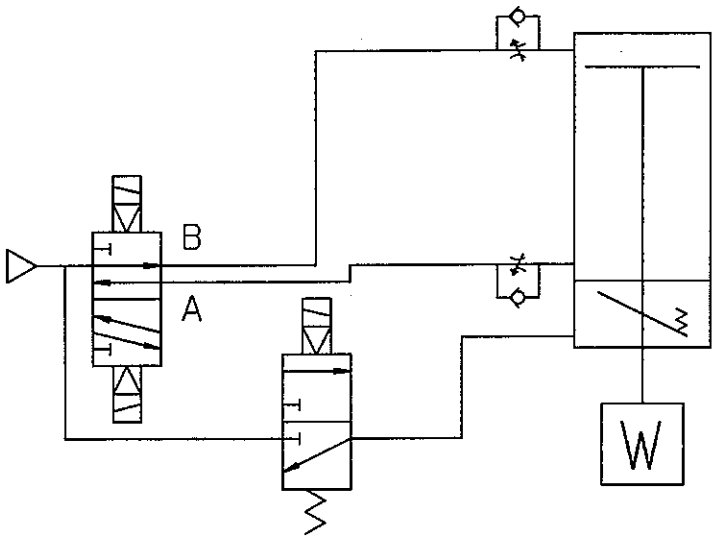


Fig. 5—3 Recommended pneumatic circuit

9) **Shorten the piping between the cylinder and solenoid valve as much as possible. For the detail, refer to item 6) of "3-6 Installation and setting-up".**

6. Operation

6－1. Manual release

⚠Warning

1)Do not release the lock with external force including load and spring force applied.

In this condition, the cylinder moves suddenly and causes dangerous situation. Take the following measure to prevent it.

①Release the lock after pneumatic pressure of line B in circuit returns to operating pressure and then decrease the pressure gradually.

②If pneumatic pressure is not available, stop movement of cylinder by lifter such as jack and then release the lock.

2)Perform manual release in the following procedure after safety is ensured.

Manual release may cause sudden movement of load. Confirm there is no person in a range of movement to ensure any danger is not accompanied.

How to release manually

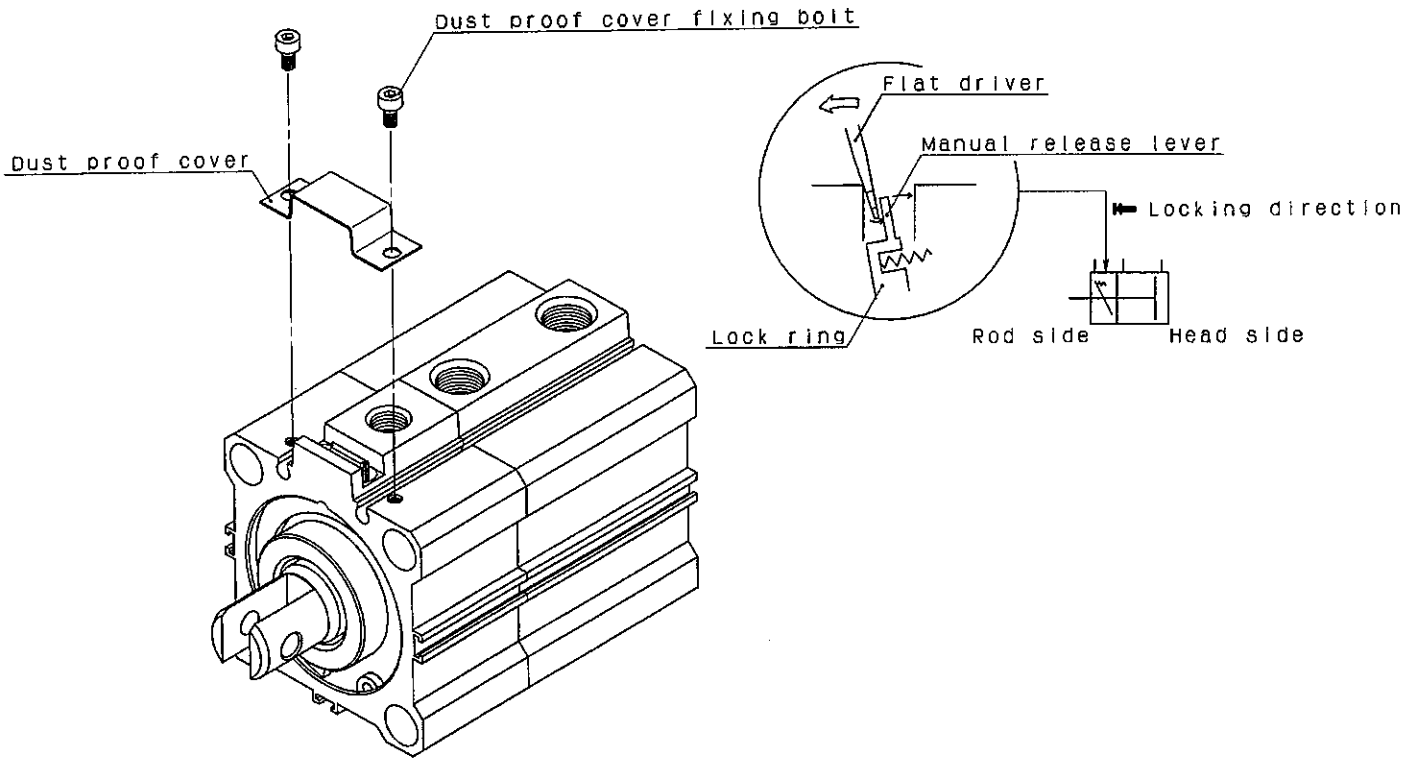


Fig. 6－1

1)Remove the dust proof cover.

2) Insert flat driver into rod side of manual release lever and set up the lever straight toward direction marked with arrow (rod side) by the driver with slight force. Then, lock is released.

7. Maintenance and Check

7－1. Daily check

1) Is the operation smooth?
2) Is there no abnormal change in piston speed and cycle time?
3) Is there no abnormality in clamping stroke?
4) Is there no damage on guide pin and clamp arm?

7－2. Periodical check

1) Is there no looseness of the cylinder mounting bolt?
2) Is there no looseness and abnormal deflection of cylinder mounting frame?
3) Is the operation smooth?
4) Is there no abnormal change in piston speed and cycle time?
5) Is there no external leakage?
6) Is there no abnormality in clamping stroke?
7) Is there no serious wear and damage on guide pin and clamp arm?
8) Is drain of air filter removed periodically?

If any defect is found during these check, give additional tightening and contact local sales office for other measures.

⚠ Warning

1) Perform maintenance in above procedure.

If the cylinder is handled incorrectly, breakage and operating failure of the equipments around the cylinder may be caused.

2) Removal of equipment and supply and exhaust of compressed air

When the equipment is removed, after confirming the prevention for drop or run away of the work and cylinder is taken, cut off air and power supply for the system and exhaust compressed air from the system. If the system is restarted, confirm the prevention for quick extension of the cylinder is taken.

⚠ Warning

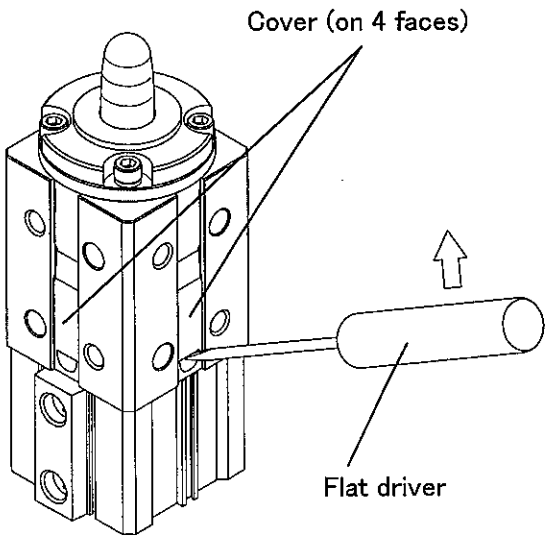
1) Confirm air is not supplied for the cylinder before disassembly and reassembly.

2) Never disassembly lock unit (only for CLKQ).

The lock unit is equipped with heavy duty spring and may cause danger if disassembled. Also, if it is reassembled incorrectly, the locking performance is impaired and desired function become unavailable. For these reasons, the disassembly of lock unit at customer's site is prohibited strictly. (If disassembly or replacement of a part is required absolutely, contact SMC.)

7－3. Removal of spatter

(1) Insert flat driver into the groove of cover and set up the cover straight toward direction marked with arrows by the driver. Then the cover is opened.
* If excessive force is given to do this, the cover may be damaged.
(2) Collect the spatter inside the groove.
(3) Push the cover until it snaps.



7－4. Replacement of guide pin and clamp arm

a) Disassembly of clamping part

(1) Cleaning of appearance

Wipe off the dirt of appearance to prevent intrusion of dust and foreign materials during disassembly.

(2) Removal of guide pin (Fig. 7-1, 7-2)

Loosen hexagon socket head bolt (4pcs) and remove spring washer, seat and guide pin.

(Pay attention not to damage inserted part of guide pin which is assembled on the body precisely.)

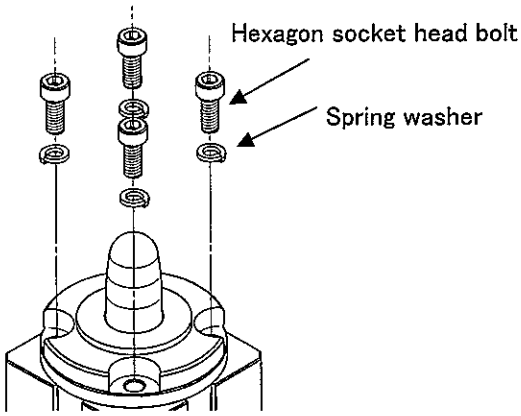


Fig. 7－1

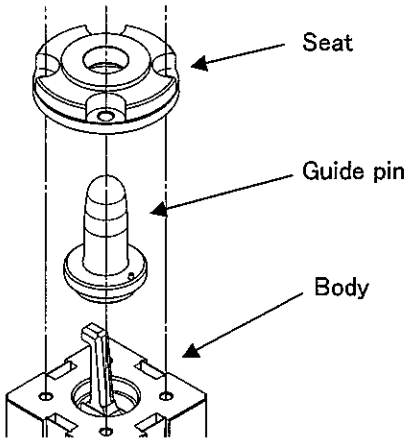


Fig. 7－2

(3) Removal of clamp arm

- Take off the cover and remove pin A. (Fig. 7-3, 7-4)
- Loosen hexagon socket head bolt to mount base cylinder and remove the body. (Fig. 7-5)
- Pull out slotted pin and remove pin B. (Fig. 7-6, 7-7)

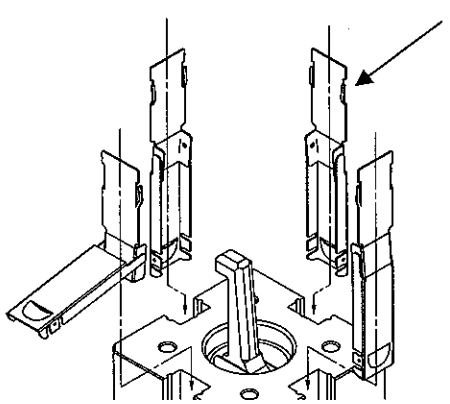


Fig. 7－3

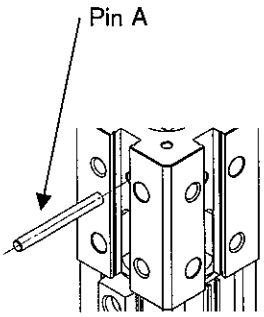


Fig. 7－4

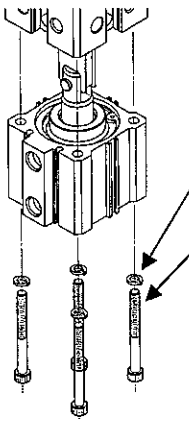


Fig. 7－5

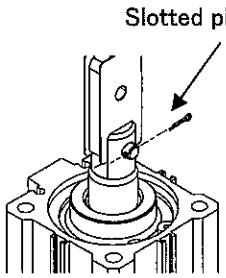


Fig. 7－6

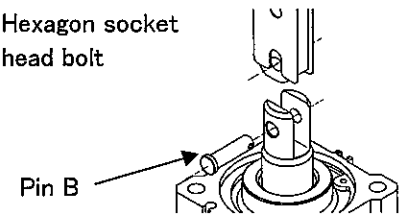


Fig. 7－7

b) Reassembly

(1) Check of part no.

- Check the number printed on clamp arm, guide pin and seat with reference to the following table.

Combination reference

	Printed no.		
	Seat	Clamp arm	Guide pin
Applicable combination	13 or 13S	13	125 or 127
	15 or 15S	1516	145 or 147
	16 or 16S	1516	155 or 157
	18 or 18S	18	175 or 177
	20 or 20S	20	195 or 197
	25 or 25S	25	245 or 247

(2) Mounting of clamp arm

- Apply the grease (lithium type) on the diagonal part of clamp arm. (Fig. 7-8)
- Mount spatter cover on the clamp arm so that the grooves of pin hole and cam can be seen. (Fig. 7-8) Note: Mind direction of spatter cover.
- Apply the grease (lithium type) on pin B and the diagonal part of piston rod. (Fig. 7-9) Note: Pay attention not to damage the finger by sharp edge of slit of the piston rod.
- Insert clamp arm (with spatter cover) into slit of the piston rod and put pin B into pin hole of the piston rod. (Fig. 7-10)
- Insert slotted pin into mating pinhole of the pin B and bend its end by radio pliers as shown on Fig. 7-11. (Fig. 7-10, 7-11) Note: Insert the slotted pin in horizontal direction as shown on Fig. 7-10 and then bend it.
- Rotate clamp arm so that its finger will be located perpendicular to one of mounting directions from A to D. (Fig. 7-12)

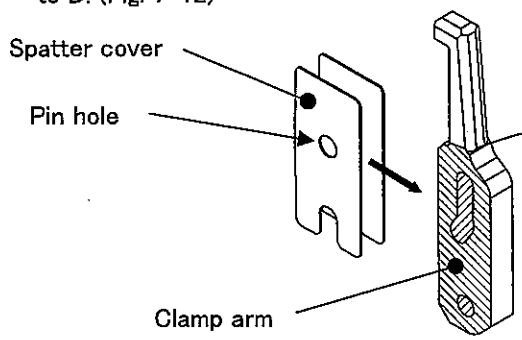


Fig. 7-8

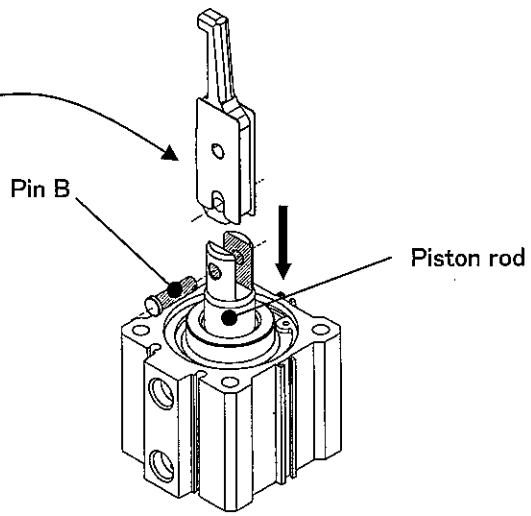


Fig. 7-9

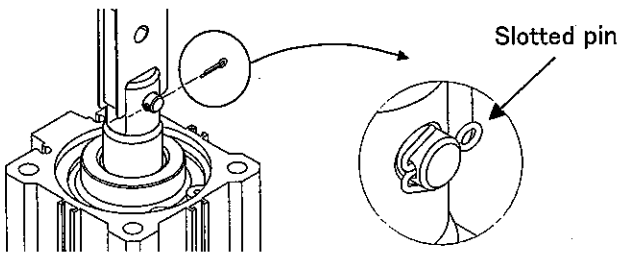


Fig. 7-10

Fig. 7-11

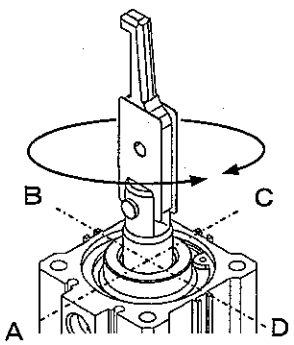


Fig. 7-12

(3) Mounting of guide pin

- Put in the body and tighten spring washer and hexagon socket head bolt accessible from head side in written order. (Fig. 7–13) Note: Keep tightening torque 4 to 6N·m.
- Apply the grease (lithium type) on pin A and insert it into the body. (Fig. 7–14)
  (At this time, keep piston rod extended.)
- Mount the cover on the body. (Fig. 7–15) Note: Mind the direction.
- Insert spring pin into guide pin.
- Insert the guide pin into seat. (Fig. 7–16)
  Note: Meet the spring pin inserted into the guide pin with the mating pin hole on the seat.
- Insert spring washer and hexagon socket head bolt into the seat in written order and assembled on the body precisely. (Fig. 7–16)
  Note: Keep tightening torque 4 to 6N·m. And perform flashing enough to remove the foreign materials from the inserted part of the guide pin because it needs to be mounted with high tolerance on the body.
- If the shim is attached, insert it between the guide pin and body. (Fig. 7–17)
  Note: The mounting order of shim is as shown on Fig. 7–17.

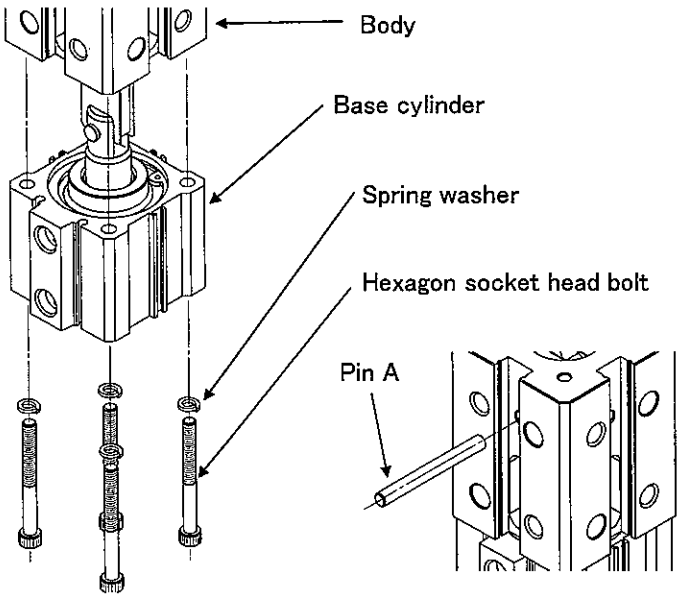


Fig. 7—13

Fig. 7—14

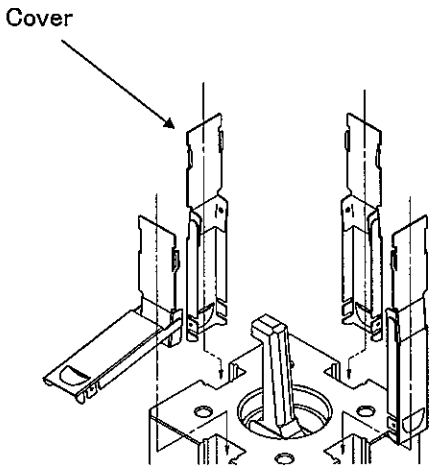


Fig. 7—15

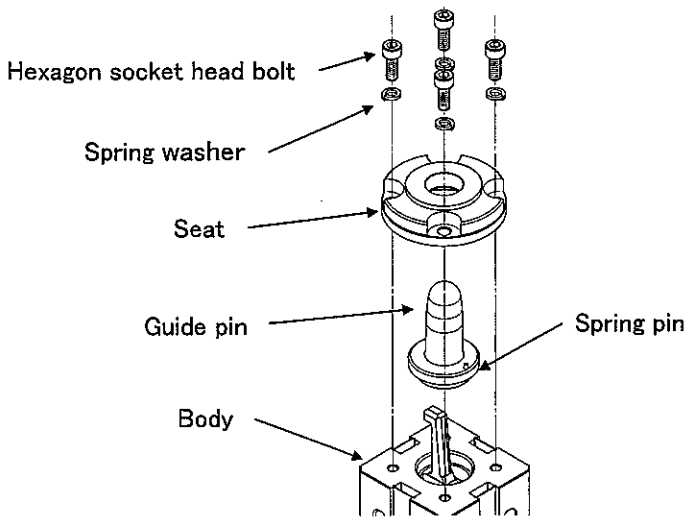


Fig. 7—16

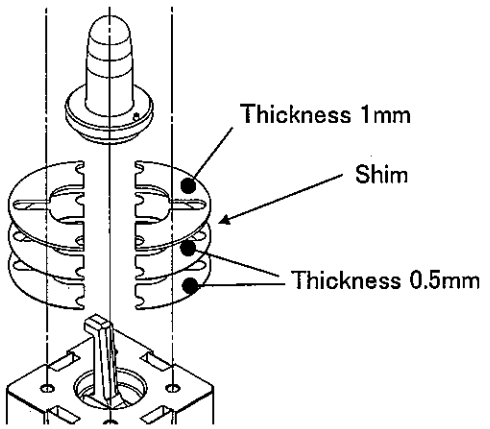


Fig. 7—17

7－5. Replacement of packing (only for CKQ series because disassemble of CLKQ is unacceptable.)

a) Disassembly of base cylinder

(1) Cleaning of appearance

Wipe off the dirt of appearance to prevent intrusion of dust and foreign materials during disassembly. Intensively, pay attention to surface of piston rod and collar.

(2) Removal of stop ring (Fig. 7-18)

Use adequate pliers (specific for C stop ring). And pay attention not to cause the stop ring to pop out and damage the human body and peripheral equipments.

(3) Disassembly (Fig. 7-19)

Take off the piston rod with collar by pulling out the pin A inserted into the hole on the end of piston rod (actually for pin B) and then remove the collar from the piston rod. At the time, pay attention not to give any flaw on inner face of the tube and bearing of the collar.

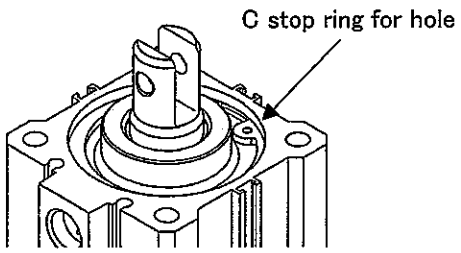


Fig. 7－18

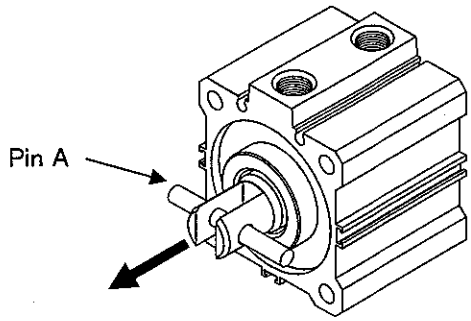


Fig. 7－19

b) Removal of packing

(1) Rod packing (Fig. 7-20)

Remove by precision driver inserted from the front of collar.

⚠ Warning

1) Do not give any flaw on the groove of the collar packing.

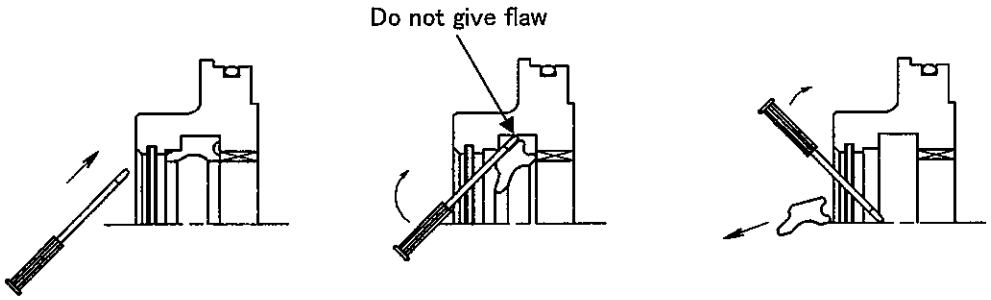


Fig. 7－20

(2) Piston packing (Fig. 7-21)

Since the piston packing is inserted deeply, push it partially to make it come off and pull it out manually. Do not use precision driver.

(3) Tube gasket (Fig. 7-21)

Push the packing gasket partially to make it come off and pull it out manually.

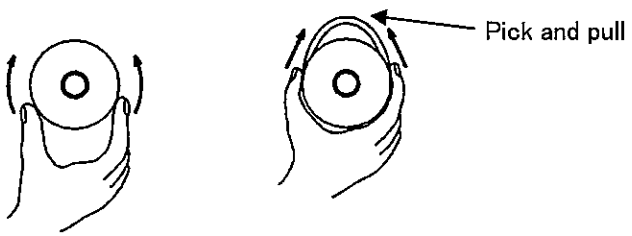


Fig. 7－21

c) Application of grease

(1) Rod packing and piston packing (Fig. 7-22,7-23)
Apply the grease all around new packing evenly. Also add the grease inside the groove.

(2) Tube gasket
Spread over the grease thin.

Fig. 7－22(Rod packing)

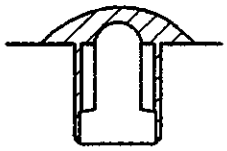


Fig. 7－23(Piston packing)

(3) Each components of cylinder
Spread over the grease entirely. (Fig. 7-24)

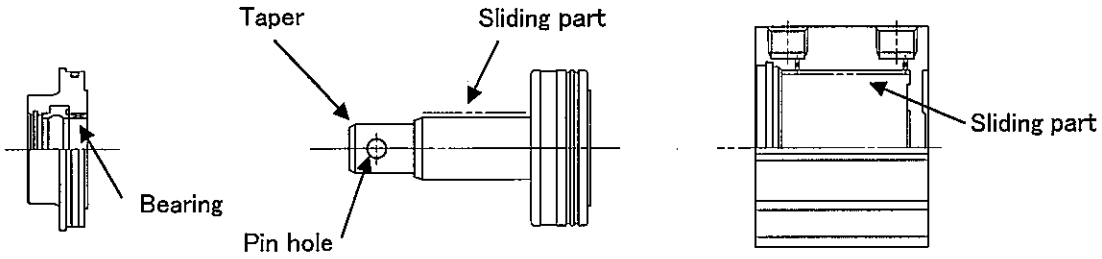


Fig. 7－24

d) Mounting of packing

(1) Rod packing (Fig. 7-25)
Mount the packing with attention to direction.
Then, apply the grease on the packing and bearing evenly.

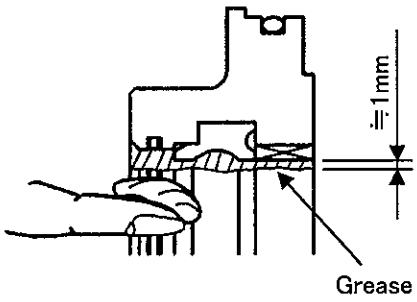


Fig. 7－25

(2) Piston packing
Mount the packing without twist. Then, apply the grease around the packing and clearance between the packing and groove as shown on Fig. 7-25

(3) Tube gasket
Pay attention not to make the gasket come off.

e) Reassembly of cylinder

(1) Insert the piston rod into the collar. (Fig. 7-24)
Apply the grease on the end of piston rod or 30 deg. taper and spanner flat and then insert the rod packing slowly and carefully not to damage it.

(2) Insert the piston and collar into the tube. (Fig. 7-24)
Apply the grease on the part inserted into the tube and insert them slowly and carefully not to damage them by edge of stop ring mounting hole.

(3) Mounting of stop ring (Fig. 7-18)
Use adequate pliers (specific for C stop ring). And pay attention not to cause the stop ring to pop out and damage the human body and peripheral equipments. After mounting, confirm the stop ring is secured firmly by the mating hole.

(4) Check of reassembly condition
Confirm there is no air leakage from packing etc. and the cylinder can be moved smoothly at min. operating pressure.

7－6. Consumable parts

7－6－1. Replaced parts

Packing set

Part no.	Content and qty.		
	Rod packing	Piston packing	Tube gasket
CQ2B50－PS	1	1	1

Grease package

Part no.	Net
GR-S-010	10g

The single component included into the packing set is not enclosed in individual packaging and must be used within a year. If stored for extended period, it should be enclosed (put in the polyethylene bag and additionally packed in a box) and kept as described below.

Guide pin Ass'y

Part no.	Content and qty.	
	Guide pin	Spring pin
CKQ－R125	1	1
CKQ－R127	1	1
CKQ－R145	1	1
CKQ－R147	1	1
CKQ－R155	1	1
CKQ－R157	1	1
CKQ－R175	1	1
CKQ－R177	1	1
CKQ－R195	1	1
CKQ－R197	1	1
CKQ－R245	1	1
CKQ－R247	1	1
CKQ－D175	1	1
CKQ－D177	1	1
CKQ－D195	1	1
CKQ－D197	1	1
CKQ－D245	1	1
CKQ－D247	1	1

Clamp arm

Part no.	Content and qty.	
	Clamp arm	Slotted pin
CKQ－A13	1	1
CKQ－A15	1	1
CKQ－A18	1	1
CKQ－A20	1	1
CKQ－A25	1	1

7－6－2. Storage of packing (for extended period)

1) Put the packing into enclosed package for storage
2) Avoid exposure to direct sunray and high temp. and humidity.
   Especially, shut off the equipment which possibly causes heat, radiation and ozone from the package.
3) Do not give any deformation and flaw on the packing by piling up large amount and putting heavy weight on it.
4) The packing may have white powder on the surface during storage, but it doesn't indicate impair in performance.

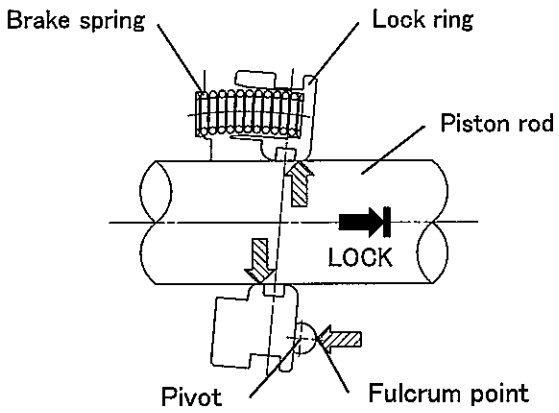
8. Operating principle

8－1. Locking mechanism

Locked type low profile cylinder has self-lock mechanism to lock the piston rod firmly by inclination of the lock ring which is originally inclined a certain extent by brake spring.

Operating principle

Locked



Unlocked

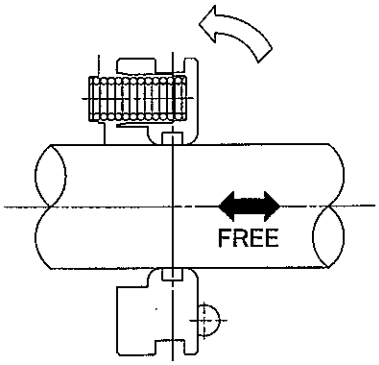


Fig. 8－1

8－1－1. Lock of forward movement (F type)…Prevention for drop of work in vertical and downward mounting (holding original position)

If there is not pneumatic pressure applied to the cylinder due to cut of air supply, the lock mechanism starts working to prevent the drop of work by self weight (i.e. to hold the work at original position).

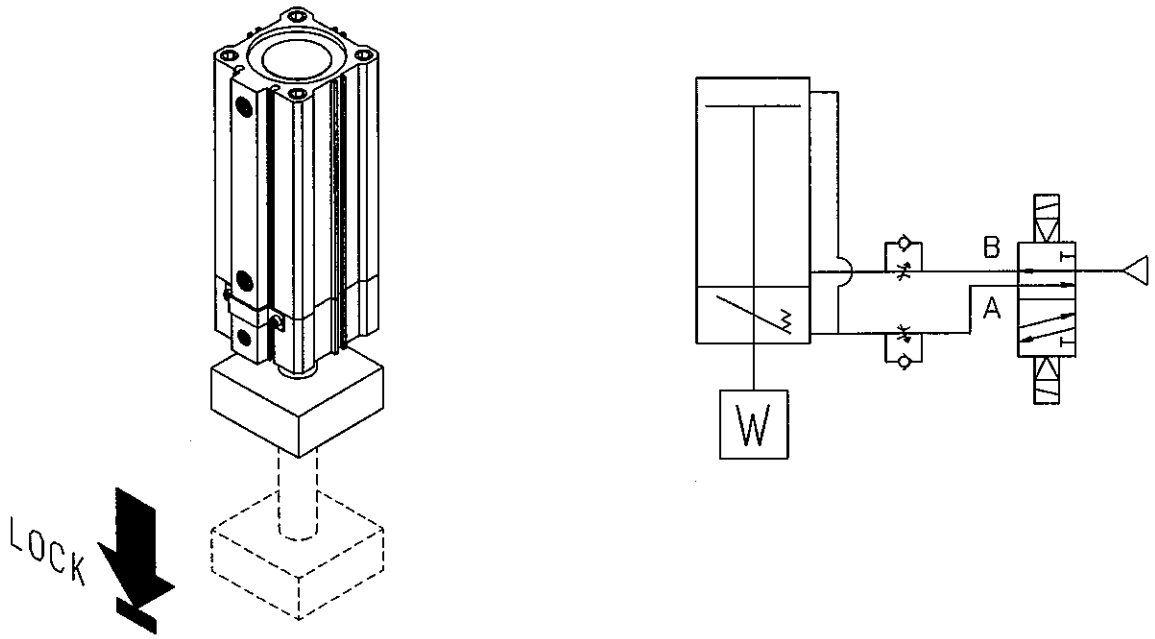


Fig. 8－2

(1) Locking

When rod side port B is supplied with pneumatic pressure, the lock ring is set up straight by exhaust pressure from head side port (unlocked condition) and the cylinder starts moving (in freed direction). Then, when the cylinder stops at stroke end, the pressure is exhausted completely and the lock ring is inclined by spring force to lock the piston rod. This locked condition is continued if pneumatic pressure of rod side port lowers.

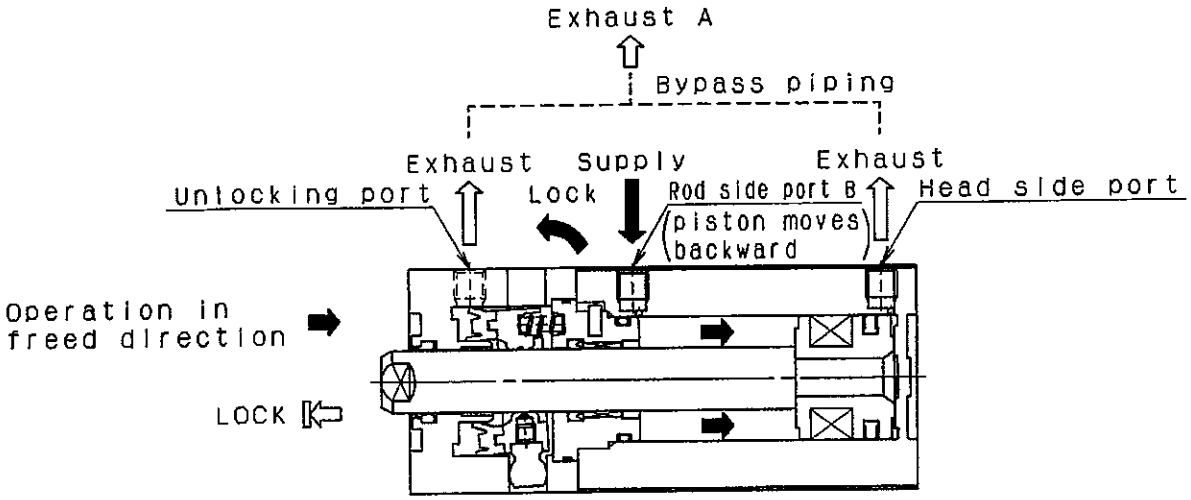


Fig. 8—3

(2) Unlocking

When unlocking port and head side port are supplied with pneumatic pressure via bypass piping, the lock ring is set up straight to release the lock, and simultaneously the piston rod is pressurized to make the piston rode start moving forward.

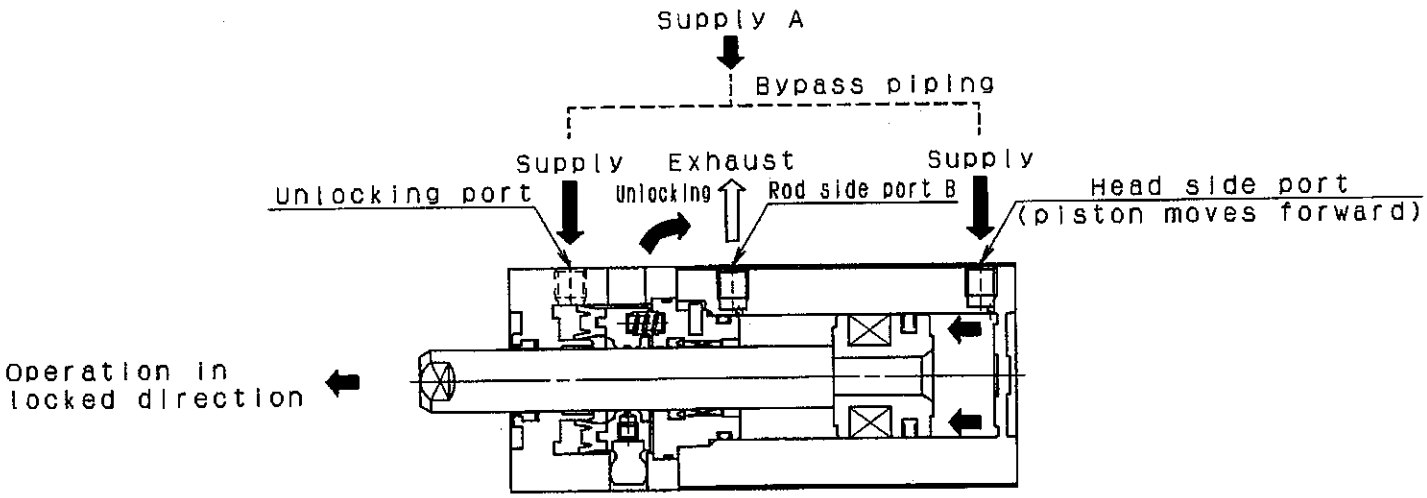


Fig. 8—4

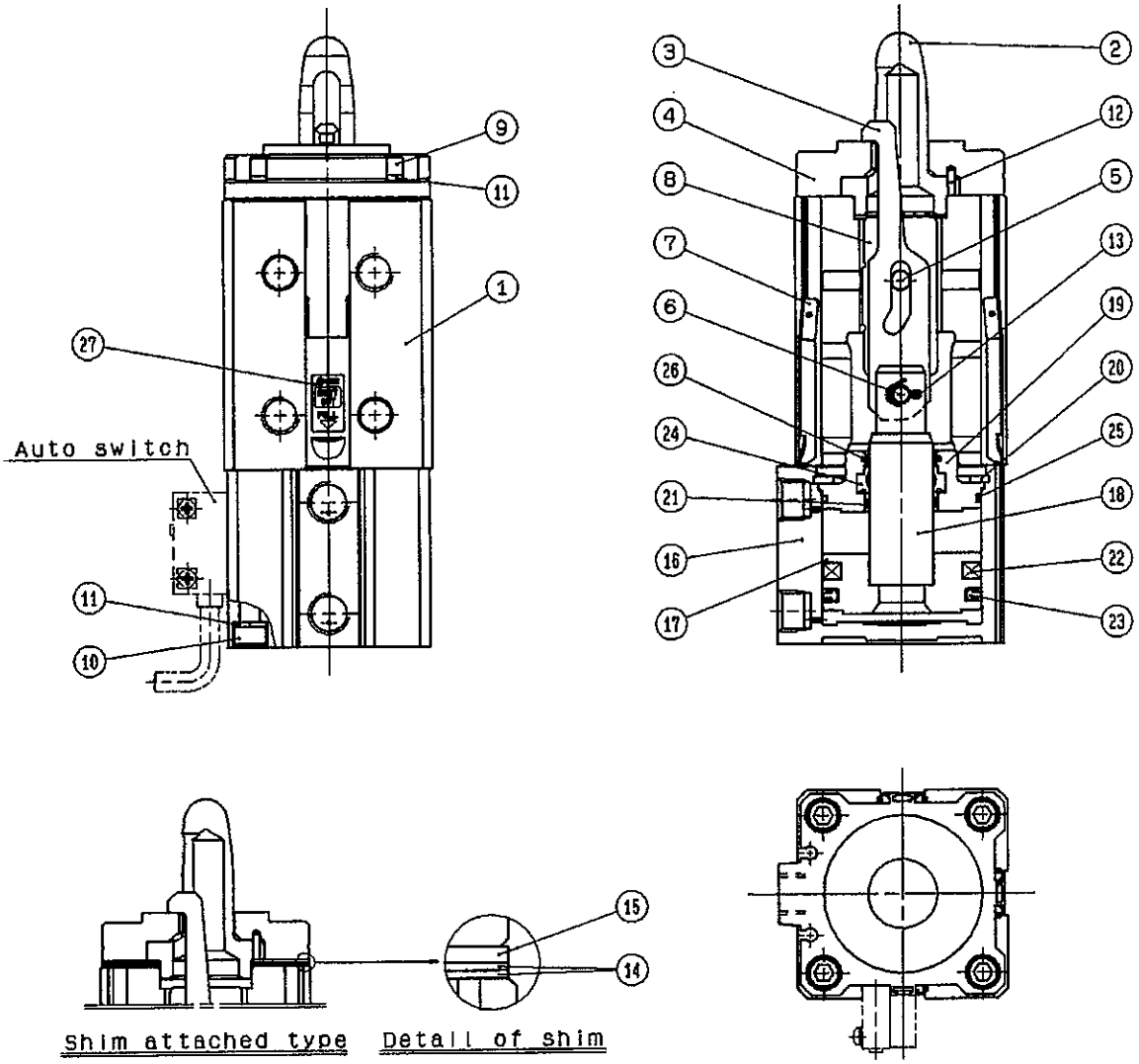
9. Troubleshooting

Trouble	Phenomenon	Possible cause	Remedy	Related section
The cylinder can't clamp or open.	Air leakage (external)	1. The rod packing is worn by flaw on piston rod. 2. The rod packing is worn by a lack of grease on piston rod. 3. The rod packing is worn by use at temp. over allowable value. 4. Foreign materials (spatter) are allowed to enter.	1. replace piston rod Ass'y and rod packing. (CLKQ needs replacement of cylinder body.) 2. Apply the grease on piston rod and replace packing. (CLKQ needs replacement of cylinder body.) 3. Keep operating temp. range and replace rod packing. (CLKQ needs replacement of cylinder body.) 4. Remove foreign materials from rod packing. 5. Remove spatter periodically.	3−1 3−6 7−4
	Air leakage (internal)	1. The piston packing is worn due to grease washed away by water including drain. 2. The lubrication is stopped on the way (only for CKQ because lubrication to CLKQ is unacceptable.) 3. Foreign materials are allowed to enter from the piping.	1. Install air cleaning equipments including air filter in the piping and replace piston packing. (CLKQ needs replacement of cylinder body.) 2. Apply the grease inside cylinder tube and replace piston packing. (CLKQ needs replacement of cylinder body.) 3. Remove foreign materials from the piping by flashing and mount sealant on thread of tube fitting in place without protrusion.	3−1 7−4
	A lack of pneumatic pressure	1.The pressure from factory source lowers. 2. The setting of regulator is displaced. 3. The piping is clogged.	1. Supply adequate pressure. 2. Set regulator properly. 3. Perform flashing to the piping.	3−6
	Friction	1. The openings of clamp arm and guide pin interfered.	1. Adjust position of clamp arm to avoid interference or apply the grease on interfered part of openings.	7−3
	Breakage or failure of equipment other than cylinder	1. Directional control valve falls in trouble. 2. Speed controller is not adjusted properly. 3. Speed controller falls in trouble. 4. The filter is clogged etc.	Inspect these equipments one by one.	3−1 3−2 3−3 3−4 3−5
A part is damaged.	Breakage of clamp arm and guide pin	1. The abnormal external force is applied.	1. Remove excessive load (tentative load) and replace clamp arm and guide pin.	4−2 7−3

10. Basic construction

[CKQ]

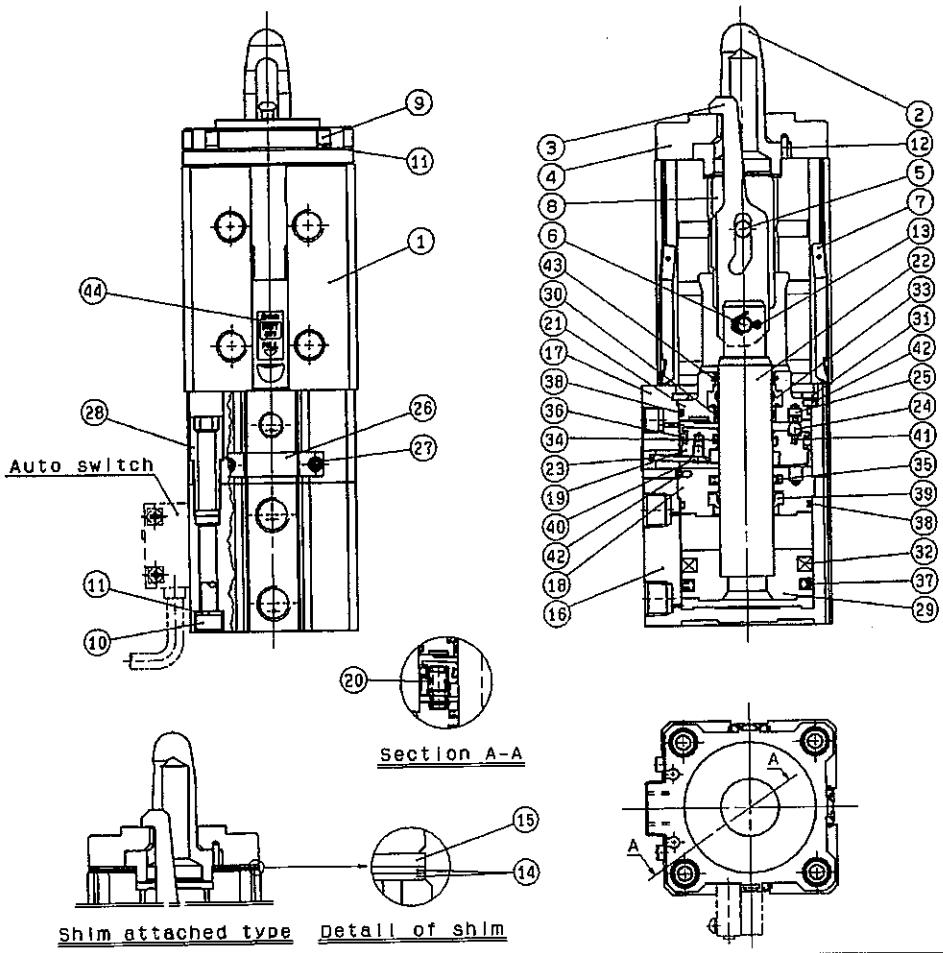
Note) The following figures show clamped condition.



14	Shim A	SUS			
13	Slotted pin	SUS	27	Seal	PET
12	Spring pin	Tool steel	26	Coil scraper	Bronze
11	Spring washer	Steel wire	25	Tube gasket	NBR
10	Hexagon socket head bolt	Structural steel	24	Rod packing	NBR
9	Hexagon socket head bolt	Structural steel	23	Piston packing	NBR
8	Spatter cover	Tough pitch copper	22	Plastic magnet	Magnet
7	Cover Ass'y	SUS	21	Bushing	Lead bronze casting
6	Pin B	Structural steel	20	C stop ring	Tool steel
5	Pin A	Structural steel	19	Collar	Aluminum alloy
4	Seat	Structural steel	18	Piston rod	SUS
3	Clamp arm	Structural steel	17	Piston	Aluminum alloy
2	Guide pin	SUS	16	Cylinder tube	Aluminum alloy
1	Body	Aluminum alloy	15	Shim B	SUS
No.	Description	Material	No.	Description	Material

[CLKQ]

Note) The following figures show clamped condition.



No.	Description	Material	No.	Description	Material
1	Body	Aluminum alloy	23	Lever	SUS
2	Guide pin	SUS	24	Pivot pin	Structural steel
3	Clamp arm	Structural steel	25	Pivot key	Structural steel
4	Seat	Structural steel	26	Dust proof cover	Steel band
5	Pin A	Structural steel	27	Dust proof cover fixing bolt	Structural steel
6	Pin B	Structural steel	28	Unit fixing bolt	Structural steel
7	Cover Ass'y	SUS	29	Piston	Aluminum alloy
8	Spatter cover	Tough pitch copper	30	Bushing	Lead bronze casting
9	Hexagon socket head bolt	Structural steel	31	C stop ring	Tool steel
10	Hexagon socket head bolt	Structural steel	32	Plastic magnet	Magnet
11	Spring washer	Steel wire	33	Rod packing A	NBR
12	Spring pin	Tool steel	34	Rod packing B	NBR
13	Slotted pin	SUS	35	Rod packing C	NBR
14	Shim A	SUS	36	Piston packing A	NBR
15	Shim B	SUS	37	Piston packing B	NBR
16	Cylinder tube	Aluminum alloy	38	Tube gasket	NBR
17	Lock body	Aluminum alloy	39	Scraper	NBR
18	Intermediate collar	Aluminum alloy	40	Hexagon socket head countersunk screw	Structural steel
19	Lock ring	Tool steel	41	Spring pin	Tool steel
20	Brake spring	Steel wire	42	Parallel pin	SUS
21	Collar	Aluminum alloy	43	Coil scraper	Bronze
22	Piston rod	SUS	44	Seal	PET