SMC

No.	CUJ*−OM0001J

OPERATION MANUAL

Mini Free Mount Cylinder

Series CUJB (∅4 to ∅10)

- ○ Thoroughly read and understand this operation manual before use.
- ○ Give special attention to the description concerning safety.
- ○ Keep this operation manual handy to refer to it anytime.

SMC CORPORATION

1. Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by label of **"Caution", "Warning" or "Danger".** To ensure safety, be sure to observe ISO 4414 [Note 1)], JIS B 8370 [Note 2)] and other safety practices.

⚠ **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.

Note1) ISO4414:Pneumatic fluid power—Recommendations for the application of equipment to transmission and control systems
Note2) JIS B 8370: General Rule for Pneumatic Systems.

⚠ 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 for 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 component 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 supply pressure for this equipment and exhaust all residual compressed air in the system.
   (3) Before machinery / equipment is re-started, take measures to prevent shooting out of 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. Product specifications

2-1. Specifications

Table 1. Product specifications

Bore size (mm)		4	6	8	10
Action		Double acting/Single acting, spring return			
Fluid		Air			
Proof pressure (MPa)		1.05			
Min. Operating pressure (MPa)	Double acting	0.15			0.1
	Single acting, spring return	0.35	0.3		0.2
Max. Operating pressure (MPa)		0.7			
Ambient and fluid temperature (°C)		Without auto switch:-10 to +70(No freezing) With auto switch :-10 to +60(No freezing)			
Cushion		None			
Lubrication		Non-lube			
Piston speed (m/s)		0.05 to 0.5			
Tolerance of rod end thread		JIS Class 2			
Tolerance of stroke length (mm)		$^{+0.5}_{0}$			
Mounting		Through hole			

⚠ Warning

1) Use with knowledge of the features of the product.

CUJ mini free mount cylinder is designed to make dimensions minimum including overall length for minimizing the size of whole equipment and saving its space. So, if the cylinder is used in the same applications as the existing cylinders (such as CU and CJ2), not only it cannot demonstrate its original performance for a long time, but also it may be damaged depending on operating conditions.

2) Check the specifications.

This product is designed to use in industrial compressed air systems. If the product is used in conditions where pressures and temperatures are out of specification range, it may be damaged or malfunctioned. Do not use the product under these conditions. Consult SMC for non-industrial applications or the use of fluids other than compressed air.

3) A deceleration circuit or shock absorber may be required.

When a driven object is operated at high speeds, or the load is heavy, install a deceleration circuit to reduce the speed before the stroke end, or install an external shock absorber to relieve the shock. In this case, the rigidity of the machinery should also be examined.

3. Installation and operation

3-1. Operating air

For compressed air supplied to the cylinder, use air that is filtrated by SMC filter such as the series AF and adjusted to a specified setting pressure by SMC regulator such as the series AR.

⚠ Warning

1) Use clean air.

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

⚠ Caution

2) Install air filters.

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

3) Install an air dryer, after cooler, etc.

Air that includes excessive condensate may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, after cooler, etc.

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

Take measures to prevent freezing, since moisture in circuits will be frozen under 5°C, and this may cause damage to seals and lead to malfunction.

Allowable temperature range of standard cylinder is:

- ●Without switch → -10 to +70°C (No freezing)
- ●With switch → -10 to +60°C (No freezing)

Use the cylinder within the above ranges. If it is used out of range, abnormal wear and tear due to hardened packing causes air leakage and insufficient performance of lubricating grease, which may result in lubrication failure. Refer to SMC catalog of "Air Cleaning Equipment" for details of compressed air quality.

Note) Difference in the above temperature ranges is due to operating temperature of built-in magnet and auto switch, which is from –10 to +60°C. Both products, "with" and "without" switch, use the same packing.

5) Lubrication of the non-lube style of cylinders.

Special grease is used for this cylinder so that it can be used in a wide range of operating piston speed. So, if this cylinder is used with lubrication, consult SMC in advance because this cylinder may become unable to satisfy original performance.

3-2. Design

⚠ Warning

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

In such cases, 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 protective cover is recommended to minimize the risk of personal injury.

If a stationary object and moving parts of a cylinder are in close proximity, personal 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 equipment to avoid giving the cylinder an external force over a maximum output.

Cylinder may break and cause human injury or equipment damage.

5) Install a mounting base considering its rigidity and suitability, as the cylinder gives large outputs.

If the mounting base doesn't have enough rigidity, it may cause human injury or equipment damage.

6) Do not use cylinders synchronously without guide.

As air is compressive fluid, it is difficult to use for speed control. There are many factors of speed fluctuations such as change in supply pressure, load, temperature, lubrication conditions as well as differences in individual cylinder performance and aged deterioration of each part. Therefore, cylinders may be synchronized for a short period of time by adjusting their speed with speed controllers. With various changes in operating conditions, however, cylinders will be easily uncoordinated. When cylinders are uncoordinated, differences of positions give excessive force to piston rod, creating lateral load, which may cause wear of packing and bearing as well as cylinder tube and piston rubbed against each other. From these reasons, do not use cylinders synchronously. If it is absolutely necessary, use guides with high rigidity and accuracy to avoid wearing even with differences in individual cylinder outputs.

7) 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.

8) Consider a possible loss 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.

9) 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.

10) 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.

11) 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 as 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.

⚠ Caution

12) Operate the piston within a range such that collision damage will not occur at the end of the stroke.

Operate within a range such that damage will not occur when the piston having inertial force stops by striking the cover at the stroke end. Refer to "3-6. Allowable kinetic energy."

3-3. Mounting and setting

⚠ Caution

1) When the cylinder is hold by through bolt, tighten with proper tightening torque.

Table 2. Operating bolt and proper tightening torque

	Operating bolt	Proper tightening torque N • m
CUJB4	M2.5 × 0.45	0.54
C(D)UJB6	M3 × 0.5	1.06
C(D)UJB8		
C(D)UJB10		

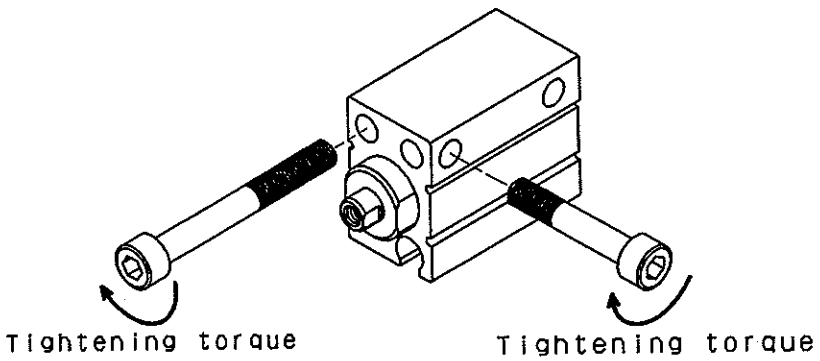


Figure 1. Mounting of cylinder

2) Don't give excessive lateral load on piston rod.

Use the cylinder so that the load given on its piston rod is in axis direction all the time. If it is inevitable that lateral load is given to a piston rod, limit the lateral load on cylinder bushing to1/50 (for ∅4 and ∅6) or 1/40 (for ∅8 and ∅10) or less of a maximum cylinder output.

How to calculate allowable lateral load

$$FB = \frac{F}{K}, \quad F = \frac{\pi}{4} D^2 \cdot P$$

$$fR \leqq \frac{L_1}{L_1 + (L_2 + \text{stroke})} \cdot fB$$

F: Maximum output (N)
fB: Maximum load given to bushing (N)
D: Cylinder bore (mm)
P: Maximum operating pressure (MPa)
fR: Allowable lateral load (N)
K: 50 (for ∅4 and ∅6) or 40 (for ∅8 and ∅10)

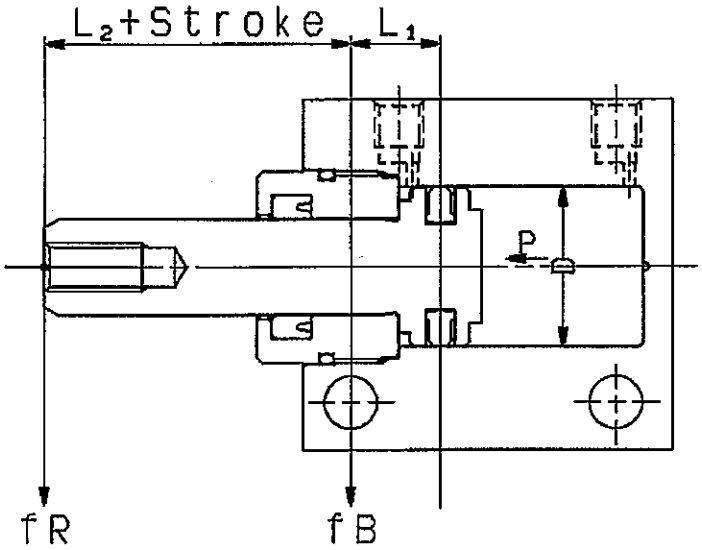
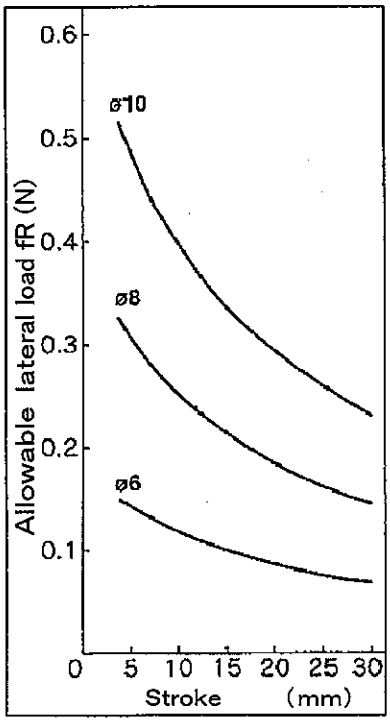


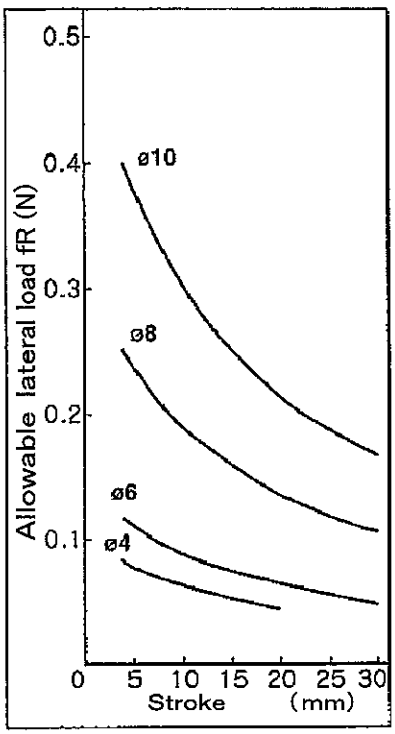
Figure 2. Profile of how to calculate lateral load

Table 3. Dimension of each part of cylinder

	L_1 (mm)	L_2 (mm)	fB (N)	Stroke range (mm)
∅4	8.5	5.7	0.18	4 to 20
∅6	5.5	9	0.40	4 to 30
∅8	5.3	9.3	0.88	4 to 30
∅10	5.4	9.3	1.37	4 to 30

Note 1) When connecting a load to the rod end, add the distance to the center of gravity to L2.





Female screw with switch **Female screw without switch**

Figure 3. Limit of lateral load given to the rod end

3) Make sure to connect the piston rod and the load to match their centers and movement directions.
If they do not match, the piston rod and cylinder tube will be twisted, causing wear or damage of the inner surface of the cylinder tube, bushing, piston rod surface and seals.

4) When an external guide is used, connect the rod end and the load in such a way that there is no interference at any point within the stroke.

5) Do not scratch or bite the sliding portion of the cylinder tube or the piston rod by striking it with an object, or squeezing it.
The cylinder 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.

6) Do not use until you verify 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.

7) Prevent intrusion of particulates from supply port, such as cutting chips,

7) Prevent intrusion of particulates from supply port, such as cutting chips, into the cylinder.

If the cylinder is mounted at site, care must be taken to insure that cutting chips from mounting holes drilling do not intrude from the supply port of the cylinder laying down on the floor.

8) Make piping length short.

When cylinder piping is too long, mists generated by adiabatic expansion will have a larger content volume of piping tube than that of the cylinder. Therefore, mists are not released to outside air but remain and accumulate inside the tube with repeated operations, which may generate moisture. As a result, grease inside the cylinder is washed away and the condition of lubrication gets worse. This may cause malfunction due to air leakage caused by wear of packing or increase of frictional resistance. As countermeasures, the following should be done.

(1) Make piping from solenoid valve to cylinder as short as possible to surely release mists to atmosphere. Use the following formula for referential value. Converted content volume of cylinder at atmospheric pressure $\times 0.7 \geqq$ Content volume of piping tube

(2) Make exhaust pressure discharge directly to atmosphere by installing speed exhaust controller or quick exhaust valve.

(3) Make piping port face downward to suppress a return of moisture generated in piping to cylinder.

9) Mounting of speed controller and tube fitting

⚠ Caution

Port size of cylinder is M3 × 0.5. If speed controller and tube fitting are mounted to cylinder directly, use the models shown in Tables 4 through 7.

- After tightening by hand, use a tool to tighten more securely by approximately a quarter-turn. Where fittings have two gaskets, such as universal elbow and universal tees, tighten them securely by a half-turn (twice the others). Over-tightening may bend threads or deform gaskets, which will cause air leakage. Under-tightening also cause loosening of threads or air leakage.

〈Speed controller〉

Table 4. With auto switch

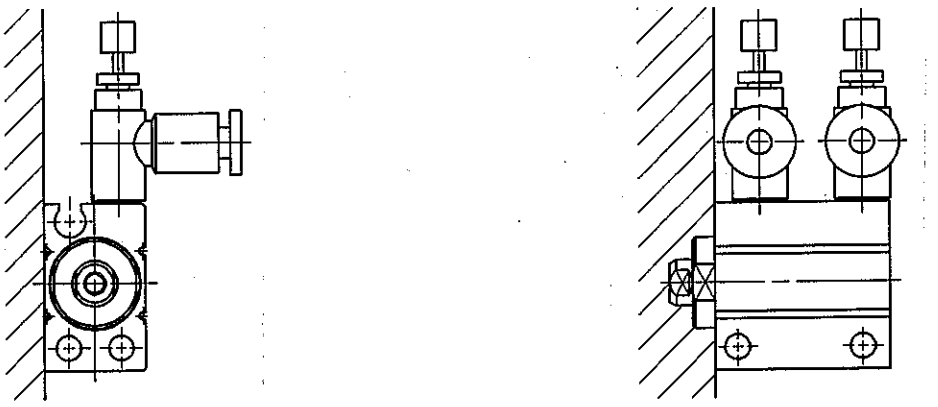
Bore size (mm)	6, 8, 10
Port size	M3×0.5
Stroke (mm)	4 or longer
AS12□1F-M3-23	●
AS12□1F-M3-04	●
AS13□1F-M3-23	●
AS13□1F-M3-04	●

※Applied only to mounting in Figure 4.

Table 5. Without auto switch

Bore size (mm)	4, 6, 8, 10	
Port size	M3×0.5	
Stroke (mm)	6	8 or longer
AS12□1F-M3-23	●	●
AS12□1F-M3-04	–	●
AS13□1F-M3-23	●	●
AS13□1F-M3-04	–	●

※Applied only to mounting in Figure 4.



a) Side mounting　　b) Rod side mounting

Figure 4. Mounting styles of speed controller

〈One-touch fitting or hose nipple〉

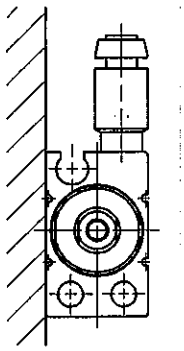
Table 6. With auto switch

Bore size (mm)		6, 8, 10	
Port size		M3×0.5	
Stroke (mm)		4	6 or longer
One-touch fitting	KJS23-M3	●	●
Hose nipple	M-3AU	●	●
	M-3ALU	●	●

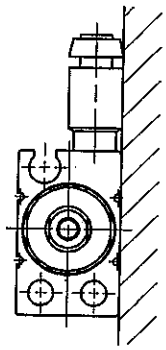
Table 7. Without auto switch

Bore size (mm)		4		6, 8, 10	
Port size		M3×0.5			
Stroke (mm)		4	6 or longer	4	6 or longer
One-touch fitting	KJS23-M3	●	●	●	●
	KJS04-M3	—	○	—	△
	KJH23-M3	—	○	—	△
	KJH04-M3	—	○	—	△
	KJL23-M3	—	○	—	△
	KJL04-M3	—	○	—	△
	KJW23-M3	—	○	—	△
	KJW04-M3	—	○	—	△
Hose nipple	M-3AU	●	●	●	●
	M-3ALU	●	●	●	●

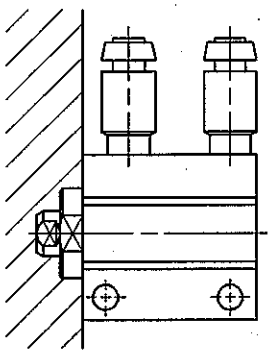
●: Applicable to mounting styles 1, 2, 3 and 4.
○: Applicable to mounting styles 1, 2 and 3.
△: Applicable to mounting styles 1 and 3.



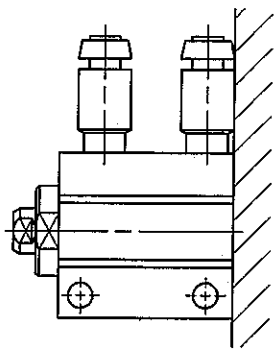
Mounting 1



Mounting 2



Mounting 3



Mounting 4

Figure 5. Mounting styles of one-touch fitting

3-4. Operating environment requirement

⚠ Warning

1) **Do not use in environments where there is a danger of corrosion.**
   Refer to the construction drawings regarding cylinder materials.

2) **Install a cover over the rod if it is used in an area that is dusty, or in an environment in which water or oil splashes on the cylinder.**

3) **Avoid high humidity for storage of cylinder.**
   Store the cylinder with piston rod retracted in a place where humidity is low and countermeasures against rust have been taken.

⚠ Caution

4) 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.

5) Wrapping of sealant tape.

When connecting pipes and fittings, etc., be certain 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 ridges exposed at end of the pipe/ fitting.

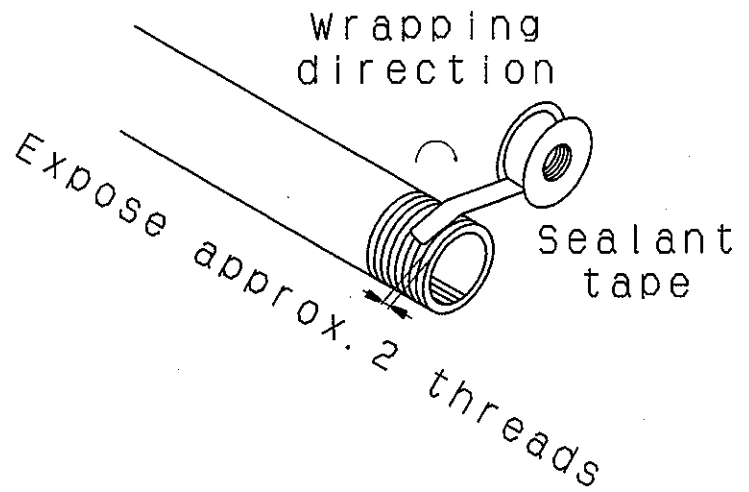


Figure 6. How to wrap sealant tape

3-5. Speed control

To adjust cylinder to a desired speed, install a speed controller near the supply port of air. For speed control, air may be throttled at either supply to or exhaust from the cylinder. In general, air is throttled at exhaust.

⚠ Caution

Install a speed controller to adjust cylinder drive speed and start to increase a speed gradually from a low to a desired speed.

3-6. Allowable kinetic energy

To drive inertial load, operate the cylinder at or below the allowable kinetic energy. Area surrounded by thick full line in Figure 7 shows the usable range relative to load weight and maximum driving speed.

Table 8. Operating piston speed and kinetic energy

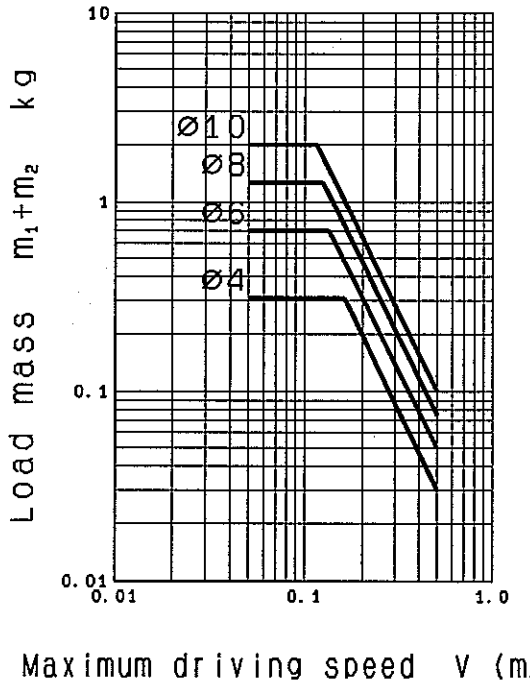
Bore size (mm)	4	6	8	10
Operating piston speed (m/s)	0.05 to 0.5			
Allowable kinetic energy (J)	3.8×10^{-3}	6.25×10^{-3}	9.35×10^{-3}	12.5×10^{-3}

Table 9. Moving part weight (at four strokes) Unit: g

Magnet	Shape of rod end	Action	ϕ4	ϕ6	ϕ8	ϕ10
Without	Female thread	Double acting	0.66	2.02	3.31	4.97
		Single acting	0.78	2,13	3.62	5.59
	Male thread	Double acting	1.01	2.75	4.86	7.55
		Single acting	1.13	2.89	5.17	8.08
With	Female thread	Double acting	-	2.24	3.45	5.64
		Single acting	-	2.08	2.97	5.50
	Male thread	Double acting	-	2.99	4.55	8.22
		Single acting	-	2.86	5.06	8.00

Table 10. Extra weight per two strokes Unit: g

	ϕ4	ϕ6	ϕ8	ϕ10
Extra weight	0.05	0.20	0.31	0.44



$$\text{Kinetic energy } E\ (J) = \frac{(m1+m2)\cdot V^2}{2}$$

m1:Weight of moving part (kg)
m2:Load weight (kg)
V : Piston speed (m/s)

Figure 7. Relation between load weight and maximum driving speed

3-7. Direction control

To change operating direction of cylinder, install an adequate solenoid valve selected among various SMC valves.

⚠ Warning

1)Design circuitry to prevent sudden lurching 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 lurch 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.

2)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 as accurate and minute as with hydraulic pressure, due to the compressibility of air.

Furthermore, since valves and cylinders are not guaranteed for zero air leakage, it may be impossible 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.

3-8. Auto switch

Refer to the catalogue for the models and specifications of applicable auto switches, and the operation manual for their handling.

1) Adequate mounting position to detect the stroke end

① D-F8N , F8P, F8B

When D-F8N , F8P or F8B auto switch is mounted to this cylinder, set the switch in the position as shown in Figure 8.

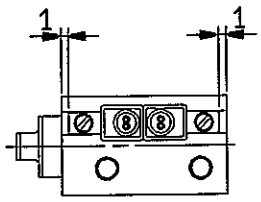
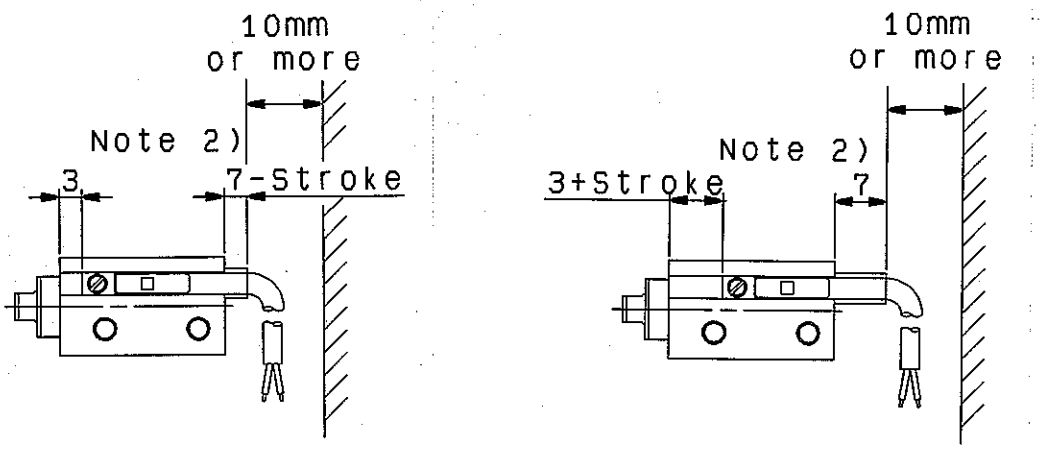


Figure 8. Mounting of D-F8N , F8P, F8B

② D-F9N , F9P, F9B

When D-F9N , F9P or F9B auto switch is mounted to this cylinder, the position to set the switch differs depending on where to detect, at extending end or retracting end. Refer to Figure 9 and set the switch properly.



a)Detection at extending end **b)Detection at retracting end**

Figure 9. Mounting of D-F9N , F9P, F9B

Note 1) D-F9□ solid state auto switch is basically attached to the cylinder one by one.

Note 2) To prevent interference of lead wires, leave 10mm or more of space.

2) Minimum mounting stroke for auto switch

For auto switches applicable to this cylinder, in case of four or less strokes, there is a possibility that an auto switch turns ON through the stroke, and two switches turn ON at the same time. So, be sure to use them securing 4 mm or more of actual moving distance.

3) How to mount auto switch

First, insert auto switch into mounting groove on cylinder from the direction shown in Figure 10. After setting the mounting position, tighten mounting screw attached. For tightening, use a miniature driver with 5 to 6mm diameter of grip and apply 0.05 to 0.1N·m of tightening torque. Turn 90° further from the point where the screw starts to become tight.

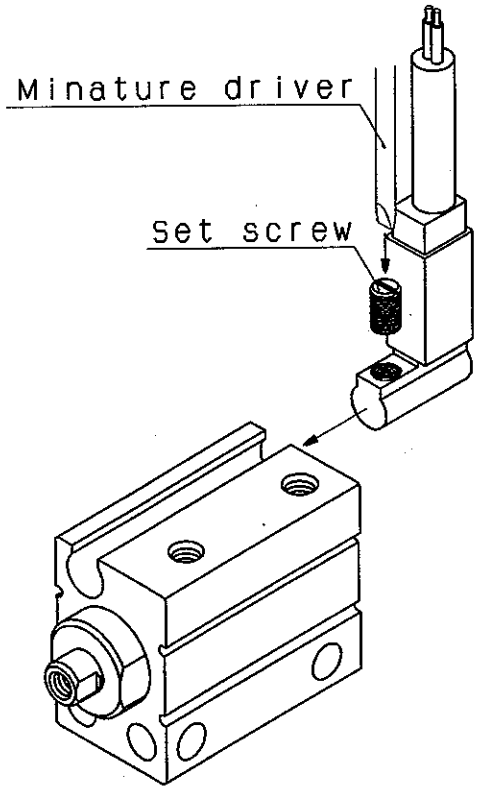


Figure 10. How to mount auto switch

4) Cautions for close installation of cylinders with auto switches

① When cylinders with auto switches are used close to each other as shown in Figure 11, leave a space described in Tables 11 and 12 or more between them.
Smaller space may cause malfunction of auto switch due to the magnet on the next cylinder.

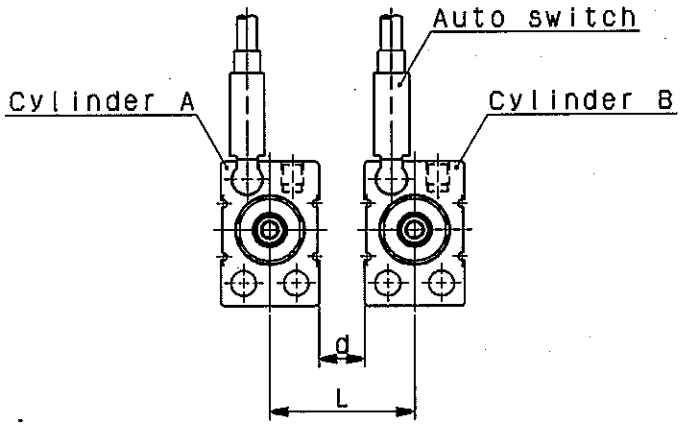


Table 11. With shield plate

	∅6	∅8	∅10
L	19	19	19.5
d	6	6	6

Table 12. Without shield plate

	∅6	∅8	∅10
L	16	13.5	14
d	3	0.5	0.5

Figure 11. Required space for close installation

※ A required space can be made smaller by attaching shield plate (0.2 to 0.3mm thick of iron plate) to the sides of the cylinder. For a cylinder whose tube inner diameter is ∅6, be sure to attach the plate to Cylinder A (the opposite side to switch groove) in Figure 11.

② For ⌀6 cylinder with auto switch, set the side where switch groove is located apart from magnetic substance by 2.5mm or more.
If magnetic substance is within 2.5mm, auto switch may cause malfunction as magnetic force lowers.

※ When this switch groove side is used for mounting, non-magnetic (such as aluminum steel) spacer is required as shown in Figure 12.

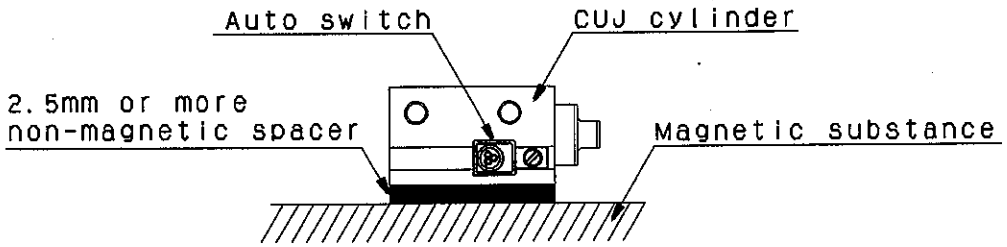


Figure 12. How to mount ⌀6 cylinder with auto switch

4. Maintenance

4-1. How to replace packing

4-1-1. How to disassemble

1) Disassembly

Lightly hold cylinder tube in a vise. Set a spanner to spanner flat of rod cover and turn it counterclockwise to detach the rod cover.

2) Removal of old packing

For piston packing and tube gasket, pick their edges and pull them out of groove. For rod packing, use a miniature driver to remove it from groove. At the same time, be careful not to scratch the inside of the groove and bearing.

4-1-2. How to assemble

1) Installation of packing

①Tube gasket

Spread the surface of tube gasket with special grease included in a packing set and mount the gasket in the specified groove. (For double acting cylinders only.)

②Piston packing

Fill a concavity at the side of piston packing with the special grease. Then, mount the packing in the specified groove without a twist.

③Rod packing

Spread the entire rod packing and fill U-shape groove with the special grease. Then, mount the rod packing in the specified groove. Make sure to mount it in the right direction (See Figure 13.). (For double acting cylinders only.)

2) Grease application to cylinder tube

- It is recommended that grease should be applied to cylinder tube in case of packing replacement.
- Wipe existing grease with clean waste. Be careful not to scratch the inside of cylinder tube and leave out any fiber of the waste as well. Air leakage may occur otherwise.

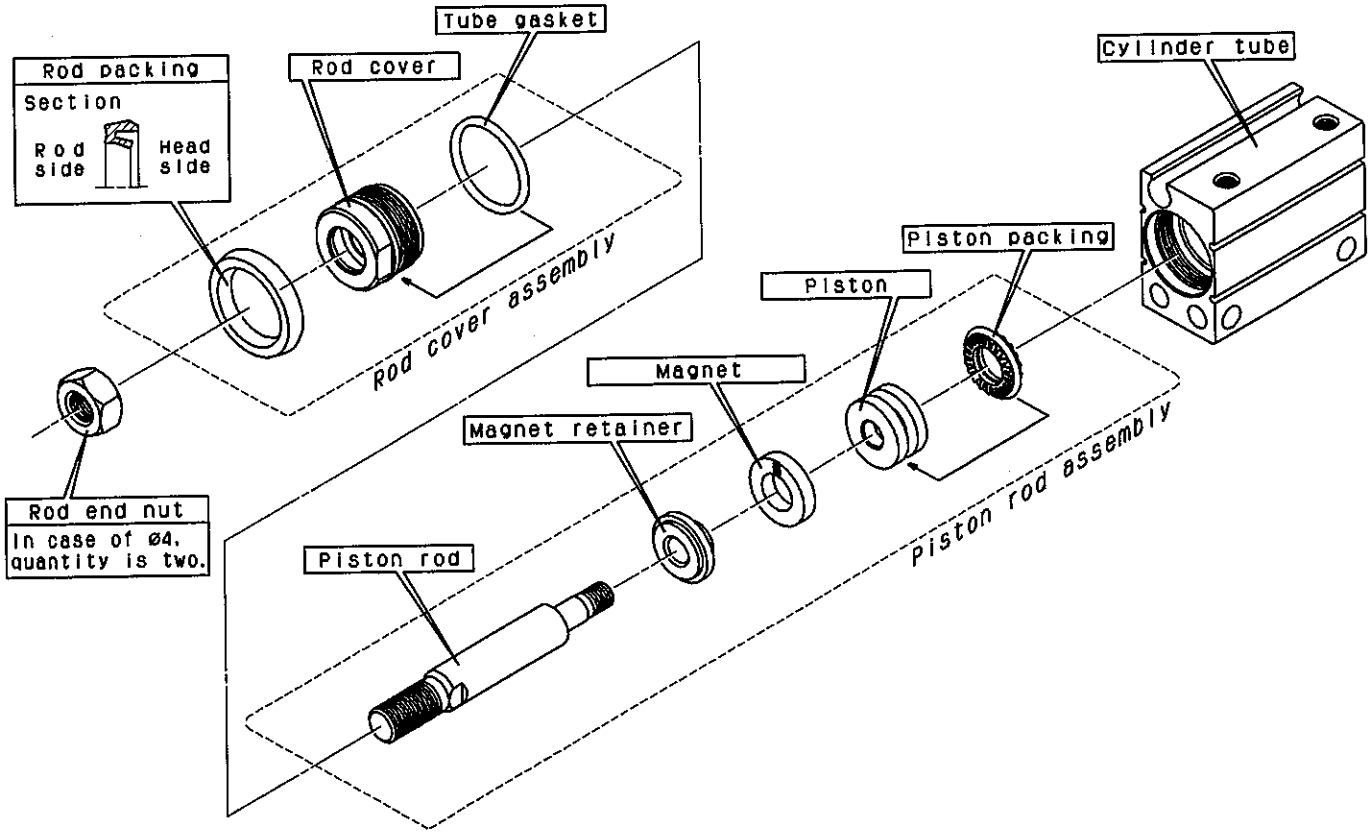
3) Assembly

- After attaching rod cover assembly to rod assembly, set them into cylinder tube.
- Tighten rod cover at 0.97N·m for ∅4, 3.08 N·m for ∅6, 5.02N·m for ∅8 and 5.63N·m for ∅10.

4-1-3. Inspection

Inspect cylinders with replaced packing for proper operation and air leakage so as to confirm there is no defect before use.

※ For the components of this cylinder, refer to Figure 13.



Rod cover assembly

Bore	
ø4	Packing retainer
ø6 ø8 ø10	

Piston rod assembly

Bore	Without switch	With switch
ø4	Piston	
ø6 ø8 ø10	Piston	

Figure 13. Inside of cylinder disassembled

4-2. Check

4-2-1. Daily check

1)Smoothness of operation

2)Change of piston speed and cycle time

3)Abnormality of stroke

4-2-2. Periodical check

1)Looseness of cylinder mounting bolts and rod end nut connected to work.

2)Smoothness of operation

3)Change of piston speed and cycle time

4)External leakage

5)Abnormality of stroke

6)Flaws in piston rod

7)Regular draining from air filter

Check the items above and take action in abnormality if any. Contact SMC when any question arises.

⚠ Warning

① Maintenance should be done according to the procedures mentioned above.

Improper handling may result in breakage and malfunction of machinery and equipment.

②Removal of machinery, and supply and exhaust of compressed air.

Prior to the removal of machinery, check that measures to prevent dropping of driven objects and runaway of equipment are taken. Then, cut off supply air and electric power, and exhaust all compressed air from the system.

Carefully restart the operation after ensuring preventive measures against sudden extension.

4-3. Consumables

4-3-1. Replaceable parts

Replaceable parts are shown below.

Table 13. Packing set

		No. for ordering	Description and quantity of parts contained			
			Rod packing	Piston packing	Tube gasket	Grease (Grease pack) (Net 5g)
Double acting, Single rod	Ø4	CUJB4-PS	1	1	1	1
	Ø6	CUJB6-PS	1	1	1	1
	Ø8	CUJB8-PS	1	1	1	1
	Ø10	CUJB10-PS	1	1	1	1
Single acting, Spring return	Ø4	CUJB4-S-PS	-	1	-	1
	Ø6	CUJB6-S-PS	-	1	-	1
	Ø8	CUJB8-S-PS	-	1	-	1
	Ø10	CUJB10-S-PS	-	1	-	1

Use packing supplied by SMC within one year as its package is not sealed up. For long time storage, package it airtight (e.g. Sealed in a polyethylene bag and put it into a box.) and store it in the procedure below.

4-3-2. How to store packing

1)Package packing airtight and store it as it is.

2)Avoid direct sunlight. Keep packing at low temperature and humidity.
Especially, make sure to shut packing off from equipment which has strong possibility of generating heat, radiation and ozone.

3)Avoid piling up large a amount of packing and putting heavy weight on it, or packing may be deformed and flawed.

4)White particles may appear on the surface of rubber parts during storage, which makes no difference in their performance.

4-3-3. Grease pack

For additional grease application on replacement of packing and maintenance of cylinder, use a grease pack included in every packing set.

5. Basic circuit for cylinders

When cylinder is operated by using air filter, regulator, solenoid valve and speed controller, the basic circuit (in case of meter-out control) is as follows.

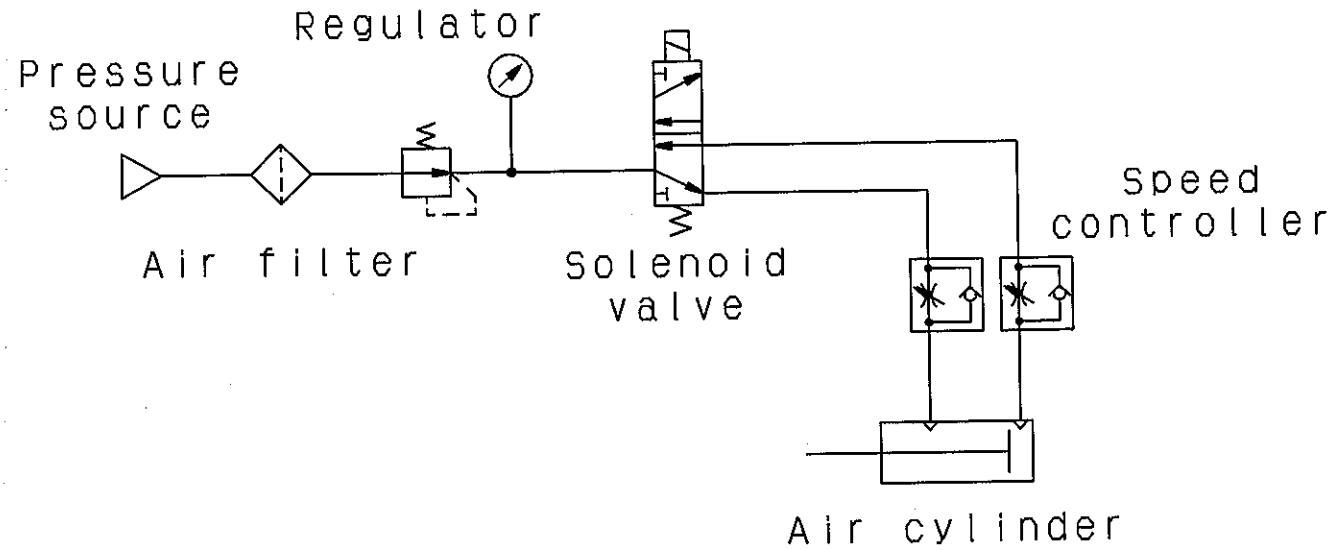


Figure 14. Basic circuit

6. Troubleshooting

Table 14

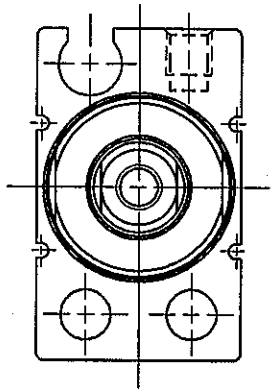
Problem	Cause	Countermeasure	Corresponding item
・Operation is not smooth. ・Lower output ・Cylinder does not operate.	・Lack of Grease for Sliding sections	・Add grease. Possible factors are as follows. • Grease flew out as moisture (drain) entered the cylinder. • Lubrication was discontinued. • Cylinder is operated under environment where dust flies and liquid splashes.	3-1 3-4 4-1
	・Misalignment of work and cylinder axis, or work guide and cylinder axes.	・Aligning should be done. Ensure that cylinder operates smoothly with no air supplied, and consider the use of floating joint.	3-3
	・Deformation of piston rod.	・Replace the cylinder. Possible factors are as follows. • Misalignment of cylinder and load. • Excessive lateral load was applied. • Excess of allowable kinetic energy • Forced mounting of load	3-2 3-3 3-6
	・Air leak (Wearing of packing)	・Replace the packing. Possible factors are as follows. • Misalignment of cylinder and load. • Excessive lateral load was applied. • Operating temperature exceeds its specified range. • Lack of grease • Contamination with foreign matter	3-1 3-2 3-3 3-4 3-6 4-1
	・Lack of air pressure	・Supply adequate pressure. Possible factors are as follows. • Pressure source lowered. • Displacement of regulator setting • Clogging of piping	2-1 3-1
	・Low speed operation	・Use the cylinder within the specification range.	2-1
	・Lack of cylinder output	・Increase operating pressure, or change the inside diameter to larger one. Consideration of load factor is needed due to the resistance of cylinder and mechanism.	2-1
	・Non-conforming configuration of system	・Use tubing, fitting, directional control valve and speed controller of adequate sizes.	3-1 3-2

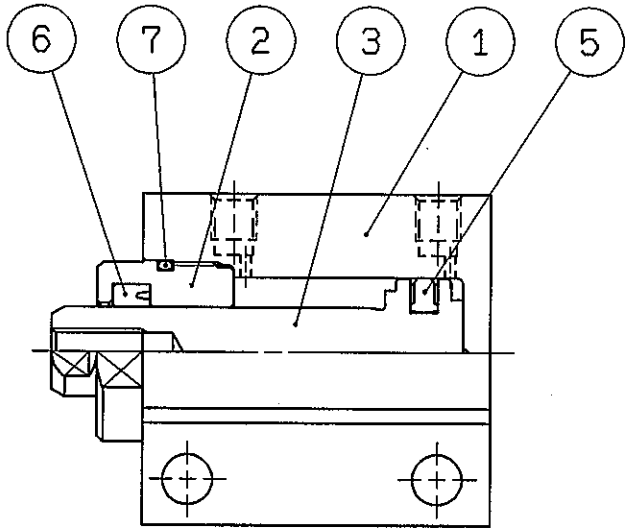
Table 15

Problem	Cause	Countermeasure	Corresponding item
・Operation is not smooth. ・Lower output ・Cylinder does not operate.	・Failure or defect of equipment other than cylinder.	・Examine relevant systems one by one in order. Possible factors are as follows. • Failure of directional control valve • Improper adjustment of speed controller • Failure of speed controller • Clogging of piping • Clogging of filter	3-1 3-5 3-7
・Breaks in parts	・High speed operation	・Adjust the speed by using speed controller and use the cylinder within the specification range.	2-1 3-5
	・Overload	・Use the cylinder within the range of allowable kinetic energy.	3-6
	・Lateral load	・Use the cylinder within the range of allowable lateral load.	3-3
	・Abnormal external force	・Interruption to mechanism, offset load and over lateral load may deform and damage cylinder. Remove these factors.	3-2 3-3

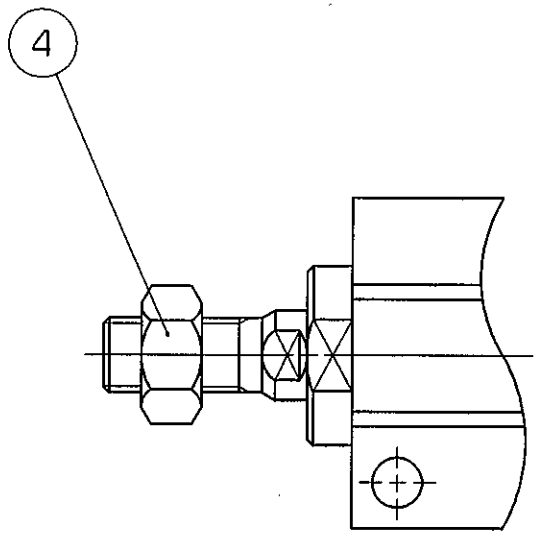
7. Basic construction

Basic constructions of double acting single rod cylinder and single acting spring return cylinder are shown in Figures 15 and 16.





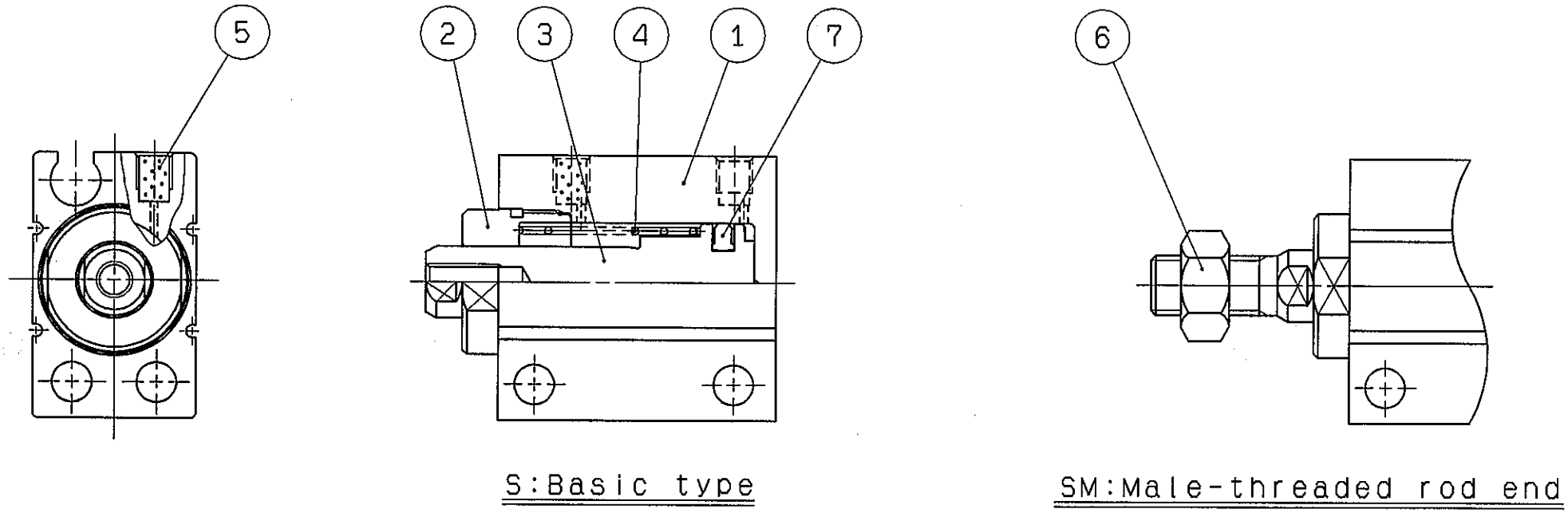
D:Basic type



DM:Male-threaded rod end

7		Tube gasket	NBR	1	
6		Rod packing	NBR	1	
5		Piston packing	NBR	1	
4		Rod end nut	Rolled steel	1	Nickel plating
3		Piston	Stainless steel	1	
2		Rod cover	Copper alloy	1	Electroless nickel plating
1		Cylinder tube	Aluminum alloy	1	Hard anodized

Figure 15. Basic construction of double acting single rod cylinder



7		Piston packing	NBR	1	
6		Rod end nut	Rolled steel	1	Nickel plating
5		Element	Sintered metal BC	1	
4		Return spring	Piano string	1	Zinc chromated
3		Piston	Stainless steel	1	
2		Rod cover	Copper alloy	1	Electroless nickel plating
1		Cylinder tube	Aluminum alloy	1	Hard anodized

Figure 16. Basic construction of single acting spring return cylinder