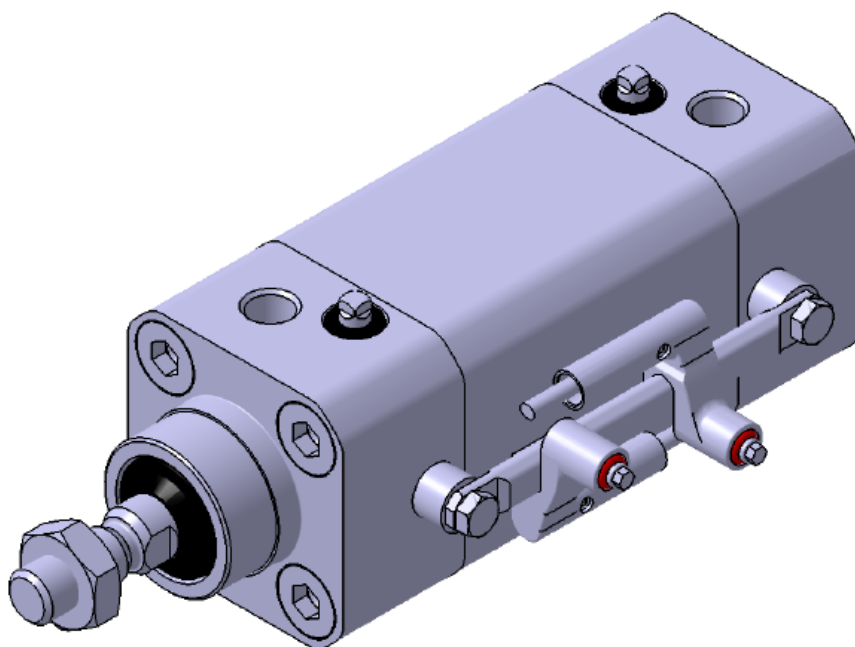


# OPERATION MANUAL

## HYGIENIC DESIGN CYLINDER

### 【HYC Series】

Φ32, Φ40, Φ50, Φ63



☆Read this manual thoroughly before mounting and operating.

☆Pay special attention to the safety instructions.

☆Keep this manual in an easily accessible location.

SMC株式会社

## 承認・変更来歴表

対応文書名:取扱説明書

対応文書NO:HYC\* -OM0002I

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コピー提出不要

承 認	確 認	確 認	作 成

[illegible]

本書は、対応文書の原紙と一緒に保管する。

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# 1. Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard by labels of “Danger”, “Warning” or “Caution”. To ensure safety, be sure to observe ISO 4414<sup>\*1)</sup>, JIS B 8370<sup>\*2)</sup> and other safety practices.

## ■ Indications

Indication	Indications
 <b>Danger :</b>	In extreme conditions, there is a possible result of serious injury or loss of life.
 <b>Warning :</b>	Operator error could result in serious injury or loss of life.
 <b>Caution :</b>	Operator error could result in injury <sup>*3)</sup> or equipment damage <sup>*4)</sup> .

※1) ISO 4414: Pneumatic fluid power – General rules relating to systems

※2) JIS B 8370: General Rules for Pneumatic Equipment

※3) An injury herein, doesn't mean staying in, or going to the hospital for a long period to recover. This includes burns and electric shocks..

※4) An equipment damage meant herein is an extensive damage related to equipments and machines.

## ■ Selection/Handling/Application

### 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. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

### 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.

(A trained and experienced operator is required to have understanding of JIS B 8370 “General Rules for Pneumatic Equipments” and other safety regulations.)

### 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 once measures to prevent falling or runaway of the driver objects have been confirmed.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment, exhaust all residual compressed air in the system and relieve all energy (liquid pressure, spring force, capacitor, gravity).
3. Before machinery/equipment is restarted, 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 or place where direct sunshine strikes.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in 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.
4. Interlock circuit. In this case, provide double interlock circuit by providing a mechanical protective function for possible failure of either of them. Also, perform periodical check to ensure it works properly.

**■Exemption**

- ①SMC doesn't take any responsibility for the damage resulting from an earthquake, fire due to other causes than our products, the third party behavior and the customer's intentional or unintentional fault, misuse and operation in other abnormal conditions.
- ②SMC doesn't take any responsibility for the damage associated with use of our product or out-of-service product (including loss of company profits, suspension of company activity).
- ③SMC doesn't take any responsibility for the damage resulting from use in a manner other than specified in the catalogue or Operation Manual and beyond specifications.
- ④SMC doesn't take any responsibility for the damage resulting from malfunction due to use of our product in combination with equipments or software we have no involvement with.

## 2. Specifications

### 2-1. Specifications

Bore size(mm)	32	40	50	63
Action	Double acting , Single rod			
Fluid	Air			
Proof pressure	1.5MPa			
Maximum operating pressure	1.0MPa			
Minimum operating pressure	0.15MPa			
Ambient and fluid temperature	Without auto switch: 0 to 70°C With auto switch: 0 to 60°C			
Cushion	Air cushion			
Lubrication	Not required (Non-lube)			
Piston speed	50 to 500mm/s (pressurized at 1.0MPa )			
Thread tolerance	Conforming to ISO 965			
Stroke length tolerance	Up to 250mm <sup>+1.0</sup> <sub>0</sub> 251 to 600mm <sup>+1.4</sup> <sub>0</sub>			
Piston rod material	SUS304, hard chrome plated			
Port size	1/8(Rc, NPT, G)	1/4(Rc, NPT, G)	3/8(Rc, NPT, G)	

## Warning

### 1) Note the features of the product.

A hygienic design cylinder HYC belongs to a product family developed upon request from overseas country (Europe) and conforms to ISO standard in its outline and mounting dimensions. Also, different from the conventional actuator, it is dedicated for machines in food and packaging industries.

The concept of hygienic design is not a cylinder which is sterilized, it is a cylinder with a profile which can be easily cleaned and kept hygienic.

—Allowable mounting zone—

	Detail	Allowed/Not allowed to mount in zone
Food zone	The food released to the market is in direct contact with the cylinder.	Not allowed
Splash zone (directly)	The food might directly contact the cylinder, but the food isn't released on the market.	Allowed
Non-food zone	The food is never in contact with the cylinder.	Allowed

※Never set it up in the food zone.

### 2) Confirm the specifications.

The products are designed for use in industrial compressed air systems. If the products are used in conditions where pressure and/or temperature are outside the range of specifications, damage and/or malfunctions may occur. Do not use in these conditions. (Refer to the specifications.)

Please consult with SMC if you use a fluid other than compressed air.

## 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.

Do not use compressed air which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as this can cause damage or malfunction.

#### Caution

##### 2) Install air filters.

Install air filters close to valves at their upstream side. A filtration degree of  $5\mu\text{m}$  or less should be selected.

##### 3) Install an aftercooler, air dryer, or water separator (Drain Catch).

Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, aftercooler or water separator, etc.

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

Take measures to prevent freezing when below  $5^{\circ}\text{C}$ , since moisture in circuits can freeze and cause damage to seals and lead to malfunctions.

The allowable operating range for this product is between :

Without auto switch  $0$  to  $70^{\circ}\text{C}$

With auto switch  $0$  to  $60^{\circ}\text{C}$

If the cylinder is used at temp out of this range, the packing hardens, the grease is lost and the packing is worn, finally air leaks can result.

For compressed air quality, refer to "Air Preparation Equipment" catalog.

##### 5) Lubrication of cylinder

###### 【Grease for standard (for non-food)】

The cylinder has been lubricated for life at the factory and can be used without any further lubrication.

However, in the event that it is lubricated additionally, be sure to use Class 1 turbine oil (with no additive) ISO VG32.

Stopping lubrication later may lead to malfunctions because the new lubricant will cancel out the original lubricant. Therefore, lubrication must be continued once it has been started.

###### 【Grease for food】

The cylinder has been lubricated for life at the factory and can be used without any further lubrication.

If the cylinder is supplied with lubrication, it may fail in operation..

**6) Do not wipe off the grease attached on the sliding face of the cylinder.**

If the grease is removed from the sliding part of the cylinder forcibly, a malfunction could be caused. When the cylinder is operated for a long distance, its sliding parts can become blackened. In that case, to keep the cylinder operating, wipe off the grease from the sliding part once and then add new grease again. (When the grease is wiped off, use water. If it is wiped off with alcohol or special solvent, the packing could be damaged.)

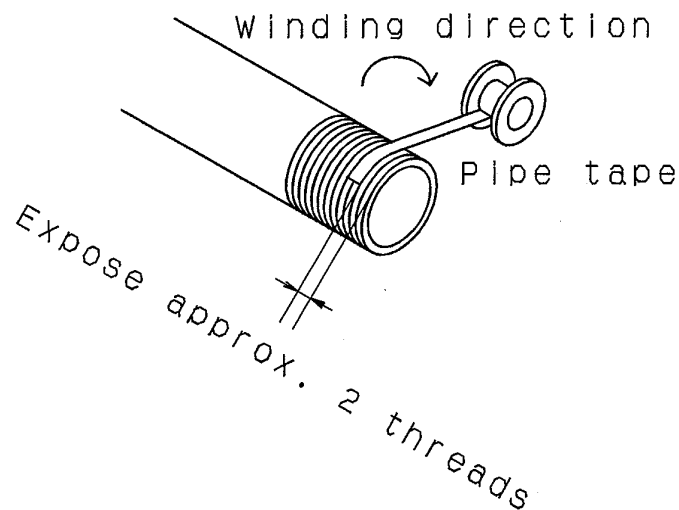
**7) Before piping**

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

**8) Wrapping of pipe tape**

When screwing piping or fitting into ports, ensure that chips from the pipe threads or sealing material do not get inside the piping.

Also, when the pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



**Fig 1**

**3—2. Operating Environment**

**⚠ Warning**

- 1) Do not use in atmospheres or locations where corrosion hazards exist.**

Refer to the construction drawings regarding cylinder materials.

- 2) In dusty locations or where water or oil, etc., splash on the equipment, take suitable measures to protect the rod.**

- 3) Avoid highly humid places for storage of the cylinder.**

When the cylinder is stored, avoid humidity to prevent the occurrence of rust and keep the piston rod retracted.

- 4) When using auto switches, do not operate in an environment with strong magnetic fields.**



### 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) **Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.**
- 2) **Perform speed adjustment in the actual operating conditions.**

If it is performed under different conditions, it might deviate.

### 3—4. Direction control

The cylinder can be switched in movement direction by an SMC solenoid valve, which is selected from various styles for the optimum performance of the cylinder.

#### Warning

- 1) **Design circuitry to prevent sudden lurching of driven objects.**

When a cylinder is driven by an exhaust center type 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 speed 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. Caution on 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 adjusted to operate smoothly and 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.**

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

**4) A deceleration circuit or shock absorber may be required.**

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the impact. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the impact.

In this case, the rigidity of the machinery should also be examined.

**5) Consider a possible drop in circuit pressure due to a power outage, etc.**

When a cylinder is used in a clamping mechanism, there is a danger of workpieces dropping if there is a decrease in clamping force due to 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.

**6) Consider a possible loss of power source.**

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

**7) 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.

**8) 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.

**9) Design the system not to allow external force over max. output of the cylinder.**

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

**10) 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.

**11) Do not operate multiple cylinders simultaneously.**

Air is a compressive fluid and difficult to control in its speed. The change in supply pressure, load, temperature, lubrication and deviation and change over the time of performance of the cylinder could affect the speed. Therefore, the simultaneous operation of the cylinders are possible for short period by adjusting with a speed controller, but these factors may easily break the simultaneous operation. If it breaks, an excessive force is given to the piston rod due to difference in the positions. The force becomes a lateral load and causes eccentric wear of the packing, wear of the bushing and damage between the cylinder tube and piston. For this reason, the design to depend on the simultaneous operation of the cylinders should be avoided. If it is compelled, use a rigid and high accurate guide to compensate the force outputted by each cylinder.

**12) About intermediate stop**

In the case of a 3 position closed center valve, it is difficult to make a piston stop at the required position as accurately and precisely as with hydraulic pressure, due to 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. Please contact SMC in the case it is necessary to hold stopped position for extended period.



## Caution

- 13) **Operate the piston within a range such that collision damage will not occur at the stroke end.**

The operation range should prevent damage from occurring when a piston, having inertial force, stops by striking the cover at the stroke end. Refer to the cylinder model selection procedure for the maximum usable stroke.

### 3—6. Installation, Setting-up and Other



## Caution

- 1) **Be certain to match the rod shaft center with the load and direction of movement when connecting.**

When not properly matched, problems may arise with the rod and tube, and damage may be caused due to friction on areas such as the inner tube surface, bushings, rod surface, and seals.

- 2) **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.**

- 3) **Do not scratch or dent the sliding portion of the cylinder tube or the piston rod by 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.

Moreover, scratches or gouges, etc. in the piston rod may lead to damaged seals and cause air leakage.

- 4) **Do not use until you verify that the equipment can operate properly.**

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

- 5) **Prevent the rotating parts from seizing.**

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.

- 6) **Be sure to hold spanner flat of the piston rod when mounting and removing the load.**

If the piston rod at load side is not held, the connected (threaded) part of the piston rod could be loosened.

## 7) Shorten the piping length.

If piping, too long is connected, the volume of the piping becomes larger than that of the cylinder, and the mist created by adiabatic swelling is prevented from escaping to the air and remains inside the tube. As the operation is repeated, the amount of mist is increased and may turn into 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 mist is exhausted to the air. For reference, the following relation should be achieved.

Cylinder content volume at atmospheric pressure  $\times 0.7 \geq$  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.

## 8) Give consideration not to splash chemical, which could wash away oil, on the sliding part of the cylinder.

Some chemicals could wash away the grease from the sliding part of the piston rod. Any chemical other than general cleaning fluid for water and food could shorten the life significantly. Consult SMC if it is used.

## 9) Mount the cylinder, support bracket and plug bolt with the following specific tightening torque.

Table 1

Applicable bore size	Thread size	Tightening torque(N·m)
Φ 32·40	M6 × 1	4.22 ~ 7.60
Φ 50·63	M8 × 1.25	10.20 ~ 18.40

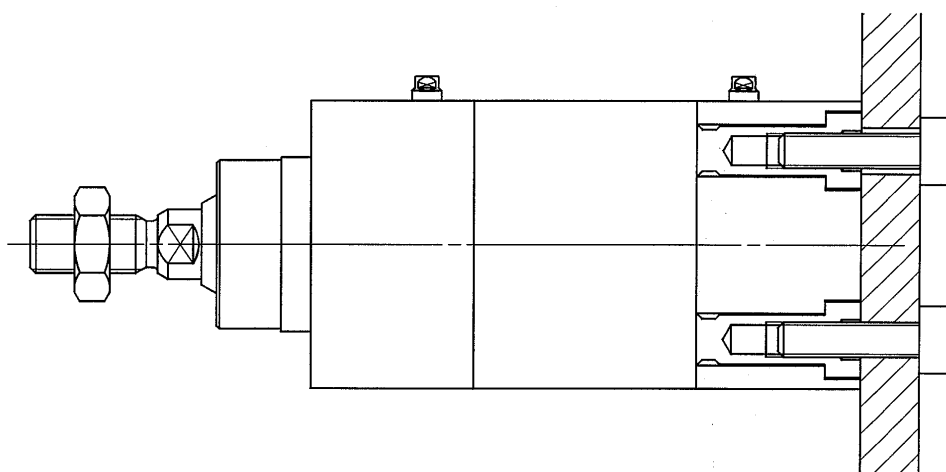


Fig 2

## 10) The mounting screw and bracket for the cylinder might let the dust collected in some operating conditions.

Take a measure depending on the operating conditions when mounting.

### 3-7. Auto switch

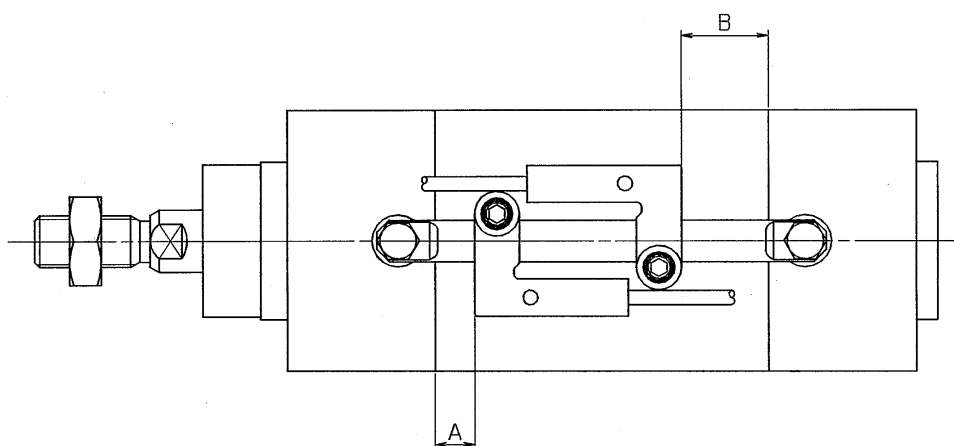
The type and specifications of applicable auto switch and the cautions for handling of them can be found on the catalog and operation manual respectively.

#### 3-7-1. Mounting position for detection at stroke end and Operating Range

Table 2

Unit:mm

Applicable bore size	A	B	Operating Range
Φ 32	7.5	16.5	7.5
Φ 40	12	23	
Φ 50	9	19	
Φ 63	19	24	

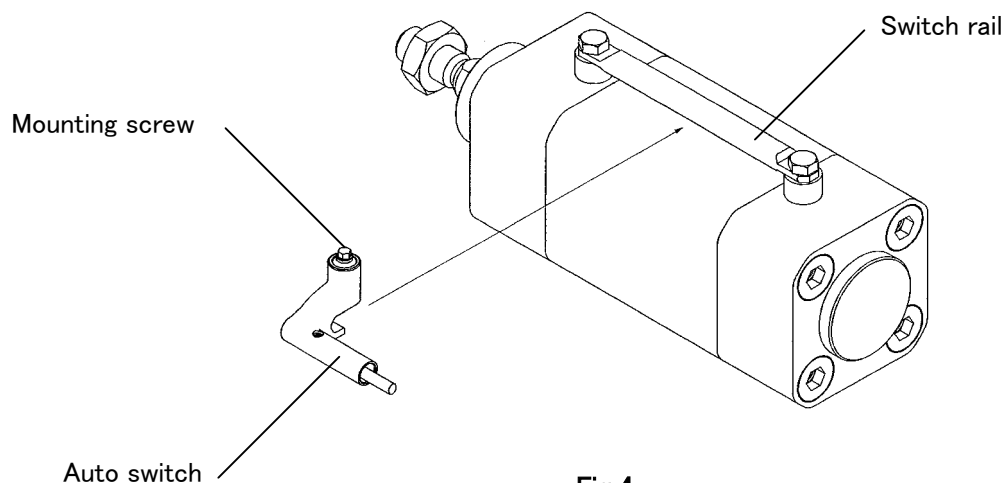


**Fig 3**

#### 3-7-2. How to mount auto switch

- ①Insert the rail into the mounting groove. Loosen the mounting screw in advance.
- ②Decide the position and tighten the screw.

Tightening torque: 0.8~1.4N·m



**Fig 4**

### 3—7—3. Minimum Strokes for Auto Switch Mounting

Table 3

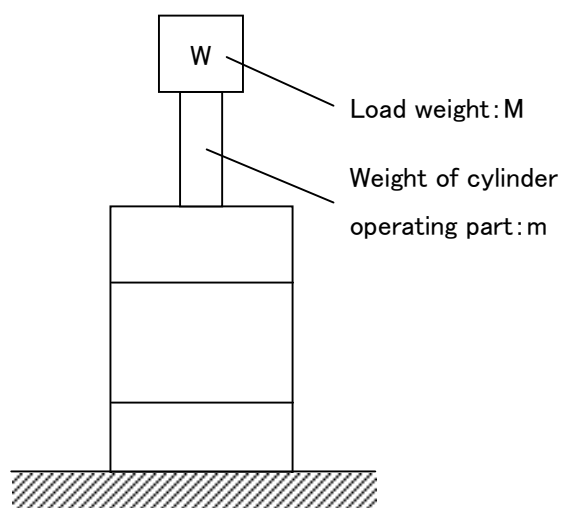
No. of auto swithes	D-F6□
1	5
2	10

## 4. Model selection

### 4—1. Allowable Kinetic Energy

Table 4

Bore size(mm)	32	40	50	63
Piston speed(m/s)	0.05~0.5			
Allowable kinetic energy(J)	2.2	3.4	5.9	11



【Formula】

$$\text{Kinetic energy } E(\text{J}) = \frac{(m + M)V^2}{2}$$

m: Weight of cylinder operating part(kg)

M: Load weight(kg)

V: Piston speed(m/s)

Weight of cylinder movable parts / Without built-in magnet

Unit: kg

Bore size (mm)	Cylinder stroke(mm)											
	25	50	75	100	125	150	200	250	300	400	500	600
32	0.20	0.23	0.25	0.27	0.29	0.32	0.36	0.41	0.45	0.54	0.63	—
40	0.37	0.41	0.45	0.49	0.53	0.57	0.65	0.73	0.81	0.97	1.13	—
50	0.63	0.69	0.75	0.82	0.88	0.94	1.07	1.19	1.31	1.56	1.81	2.06
63	0.84	0.90	0.96	1.02	1.08	1.15	1.27	1.40	1.52	1.77	2.02	2.27

Weight of cylinder movable parts / With built-in magnet

Unit: kg

Bore size (mm)	Cylinder stroke(mm)											
	25	50	75	100	125	150	200	250	300	400	500	600
32	0.21	0.24	0.26	0.28	0.30	0.33	0.37	0.42	0.46	0.55	0.64	—
40	0.38	0.42	0.46	0.50	0.54	0.58	0.66	0.74	0.82	0.98	1.14	—
50	0.64	0.70	0.76	0.83	0.89	0.95	1.08	1.20	1.32	1.57	1.82	2.07
63	0.85	0.91	0.97	1.03	1.09	1.16	1.28	1.41	1.53	1.78	2.03	2.28

## 4-2. Lateral Load at Rod End

### Caution

The load applied on the piston rod shall be kept in axial direction all the time in principle. If it can't be avoided to apply the lateral load, keep the lateral load applied on the bushing of the cylinder 1/20 or less of maximum output of the cylinder.

— Calculation of allowable lateral load —

$$fB = \frac{F}{20}, F = \frac{\pi}{4} D^2 \cdot P$$

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

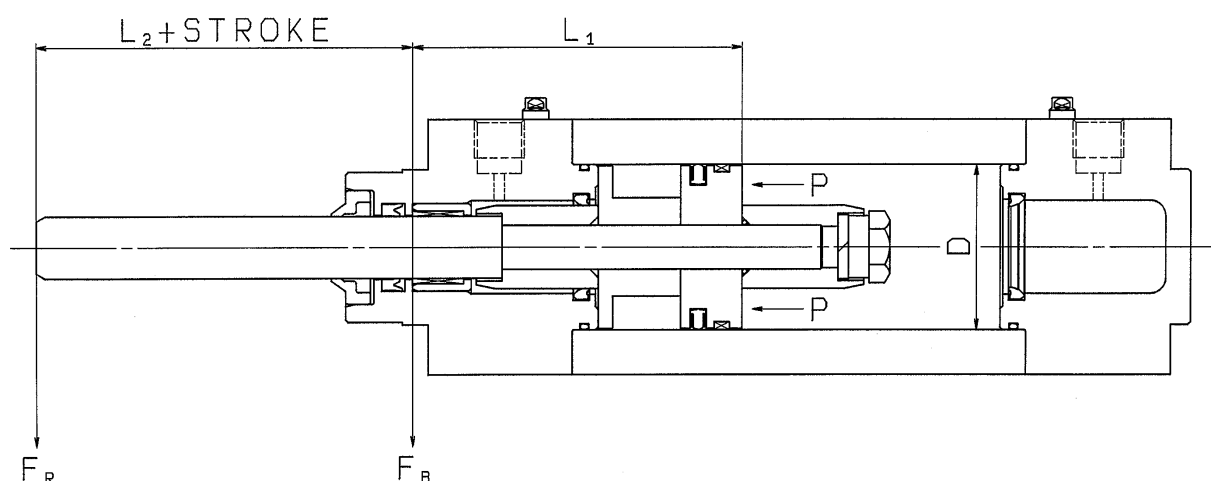
F: Maximum output(MPa)

fB: Allowable maximum load to bushing(N)

D: Bore size(mm)

P: Maximum operating pressure(MPa)

fR: Allowable mounted load(N)



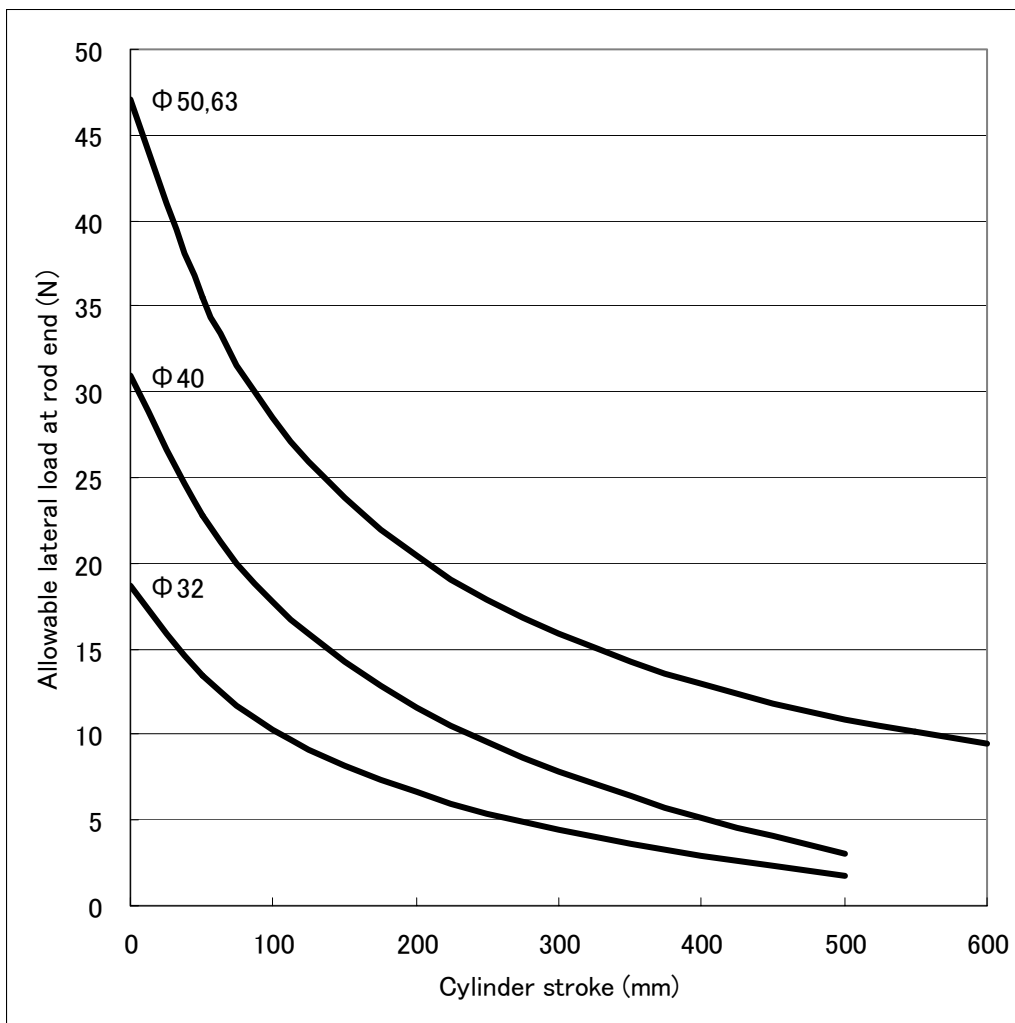
**Fig 5**

**Table 5**

D (mm)	L <sub>1</sub> (mm)	L <sub>2</sub> (mm)	fB (N)	Stroke range (mm)
Φ 32	64	23	40.2	25,50,75,100,125,150,200,250,300,400,500
Φ 40	75.5	26.5	62.8	
Φ 50	75.5	30.5	98.2	25,50,75,100,125,150,200,250,300,400,500,600
Φ 63	90.5	30.5	155.9	

※When the load is mounted on the rod end, add the distance to the center of gravity to the dimension L2.





**Graph 1**

The thick solid line of graph 2 shows the allowable lateral load to the cylinder.

(The distance between the rod end and load is 50mm.)

**1) Readjust with the cushion needle.**

The cushion is adjusted and almost fully closed at the time of shipment. Therefore, adjust the cushion needle mounted inside of the cover depending on the load and operating speed before using. When the cushion needle is rotated clockwise, the restriction becomes smaller and the cushion works stronger.

**2) Do not operate the actuator with the cushion needle fully closed.**

This could damage the seals.

**3) During adjustment of the cushion needle, keep the torque applied on the cushion adjustor within the following value.**

The torque over the following value could damage the adjusting part.

Tightening torque: 0.5N·m

**4) Do not exceed the cushion needle adjusting range for use.**

If the cushion needle is rotated forcibly over its adjusting range, it could be damaged.

Table 6.

Applicable bore size	Rotations
Φ 32・40	4 rotations or less
Φ 50・63	5 rotations or less

## 5. Pneumatic circuit

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

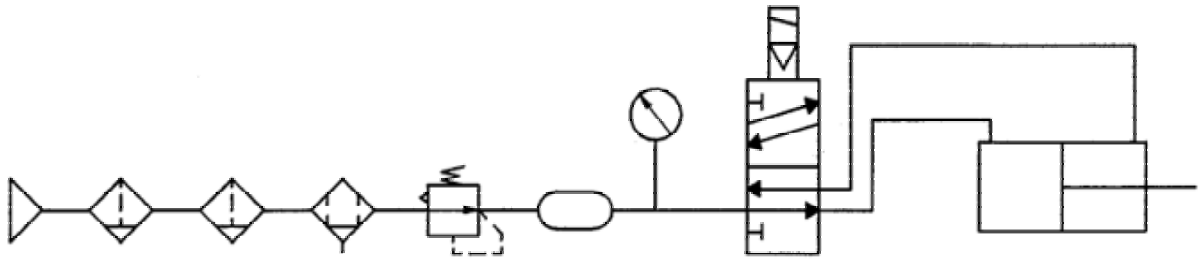


Fig 6

## 6. Maintenance and Check

### 6—1. Daily check

- 1) Is the operation smooth?
- 2) There is no abnormal change in piston speed and cycle time?
- 3) Is there any abnormality in stroke?

### 6—2. Periodical check

- 1) Is there any looseness of the cylinder mounting bolt and work?
- 2) Is the operation smooth?
- 3) Is there any abnormal change in piston speed and cycle time?
- 4) Is there any external leakage?
- 5) Is there any abnormality in stroke?
- 6) Flaws on the piston rod
- 7) Is drain of air filter removed periodically?

Check the above-mentioned items, and if any defect is found, take an appropriate measure. If there is unclear point, consult SMC's sales.



## 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, the 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 measures to prevent quick extension of the cylinder have been taken.

### 6—3. How to replace packing

#### 1. Disassembly of cylinder

##### ① Cleaning of appearance

Wipe off the surface dirt to prevent intrusion of dust and foreign materials during disassembly. Especially, please note it on the surface of the piston rod.

##### ② Removal of switch rail【if the switch is mounted】

Loosen the hexagon bolt and remove the switch rail and switch rail pedestal .

##### ③ Removal of rod cover

Loosen the tie rod nut and remove the rod cover.

##### ④ Disassembly

Pull out the piston rod by holding a nut mounted on the piston rod end. At this time, take care not to mark the internal face of the cylinder tube.

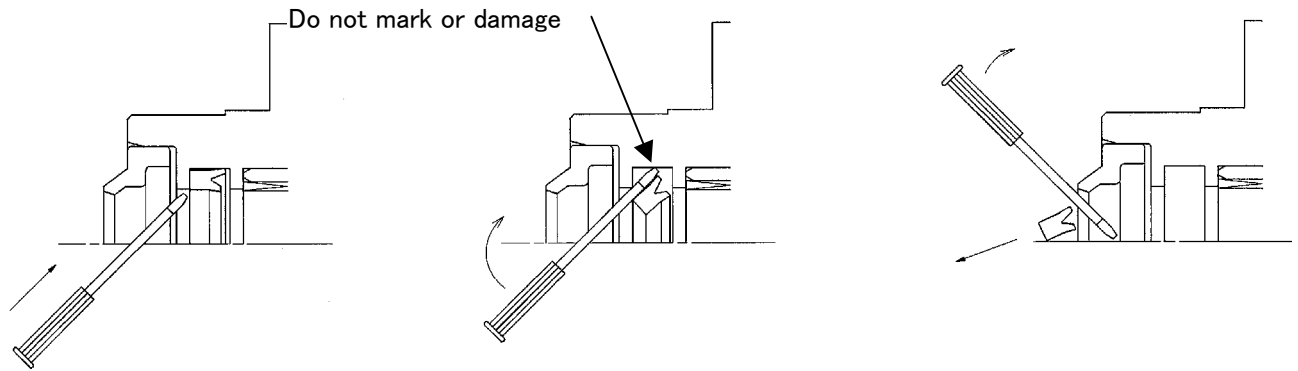
### ⑤Removal of head cover

Loosen the tie rod nut and remove the head cover.

## 2. Removal of packing

### ①Rod packing【Fig 7】

Insert a precision screwdriver, from the front of the rod cover and push out. Take care not to mark or damage the packing groove or rod scraper.

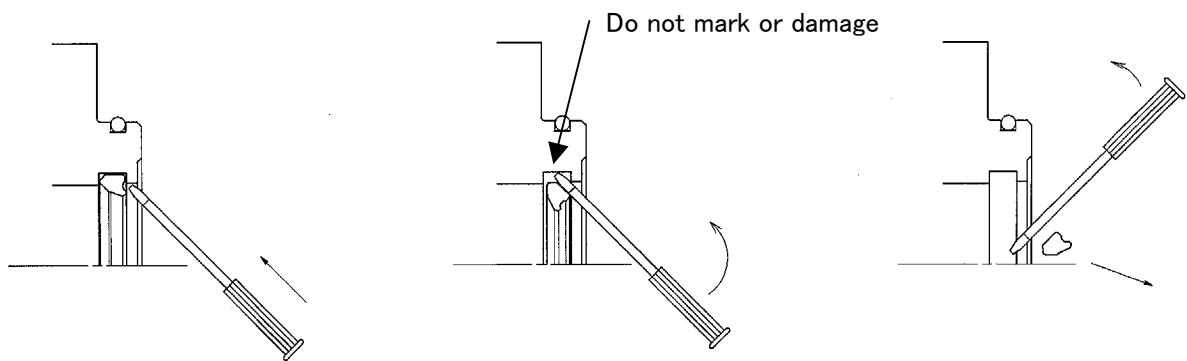


**Fig 7**

### ②Cushion packing【Fig 8】

Insert a precision screwdriver etc. from the front of the rod cover and take out. Take care not to mark or damage the packing groove of the rod cover.

Likewise, insert the precision screwdriver etc. from the front of the head cover and take out. Do not mark or damage the packing groove of the head cover.

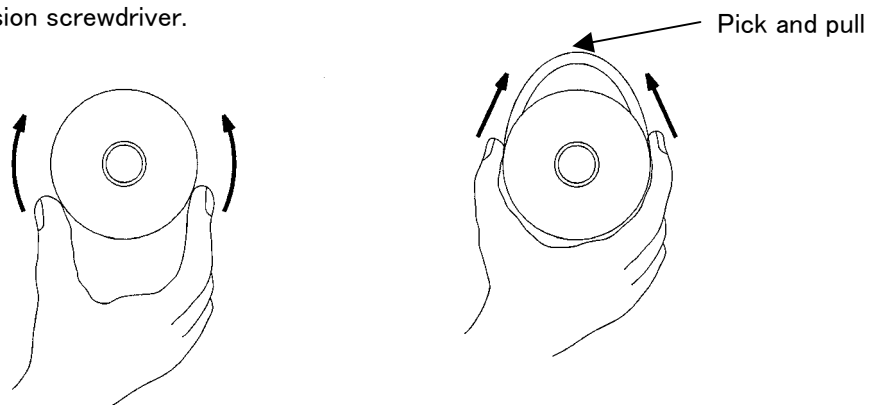


**Fig 8**

### ③Piston packing【Fig 9】

Since the piston packing is inserted deeply, push it partially to make it come off and pull it out manually.

Do not use precision screwdriver.



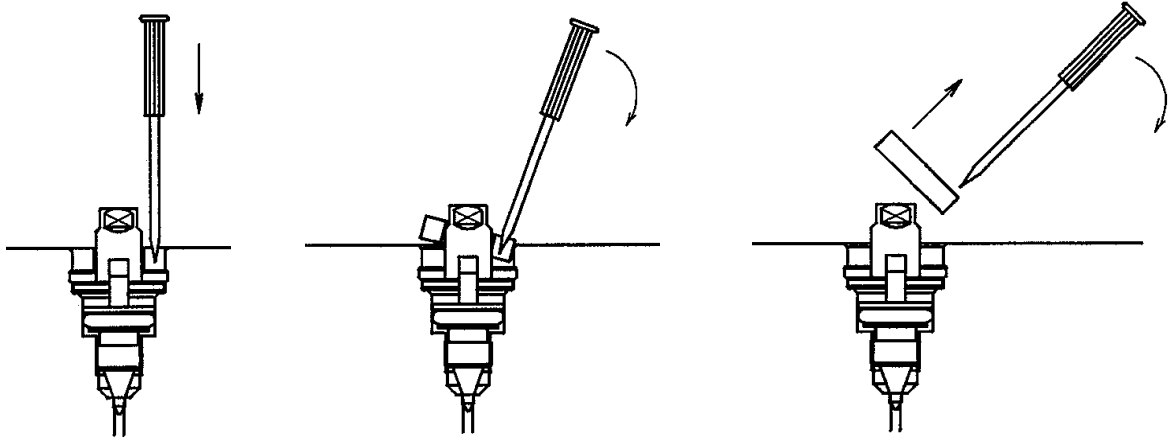
**Fig 9**

**④Tube gasket【Fig 9】**

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

**⑤Needle scraper【Fig 10】**

Insert a tool with point end into the needle scraper and take out. Take care not to be injured.

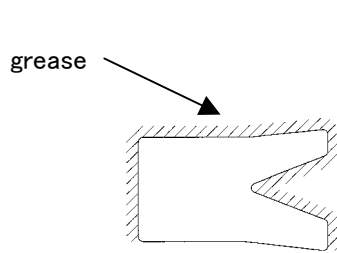


**Fig 10**

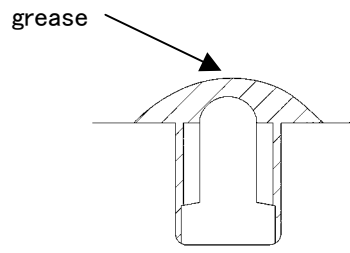
**3. Application of grease**

**①Rod packing, Piston packing and Cushion packing【Fig 11, Fig 12, Fig 13】**

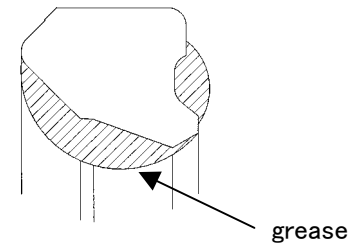
Apply the grease all around new packing evenly. Also add the grease inside the groove.



**Fig 11. Rod packing**



**Fig 12. Piston packing**



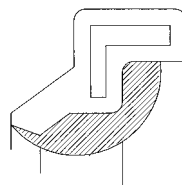
**Fig 13. Cushion packing**

**②Tube gasket**

Spread the grease thinly over the surface.

**③Rod scraper【Fig 14】**

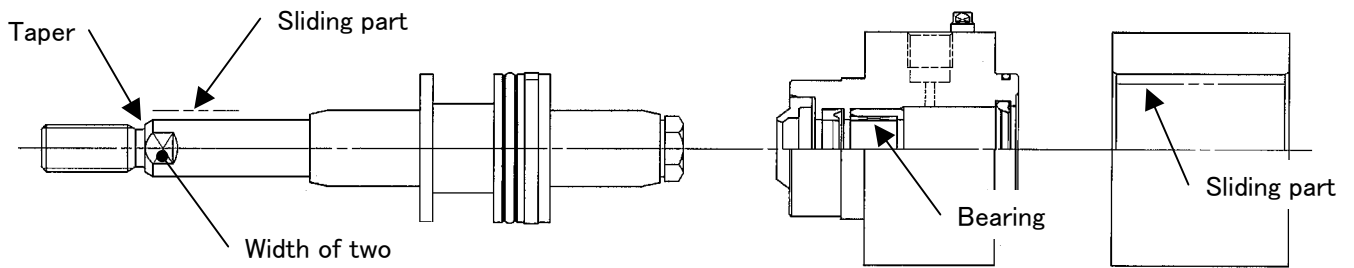
Fill the rod scraper groove with the grease.



**Fig 14**

④Each components of cylinder【Fig 15】

Cover entirely with grease.



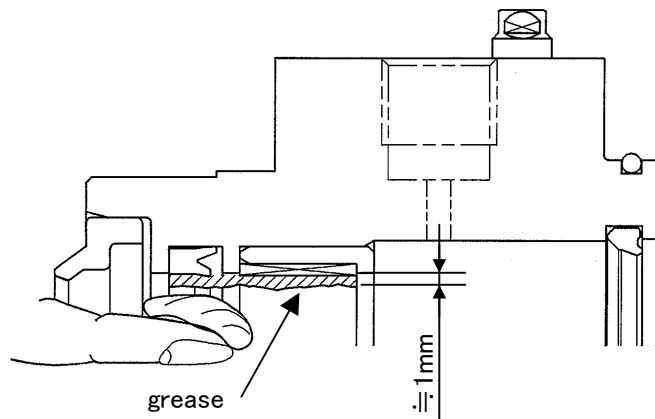
**Fig 15**

4. Mounting of packing

①Rod packing【Fig 16】

Note the direction, when mounting the packing.

Then, apply the grease on the packing and bearing evenly.



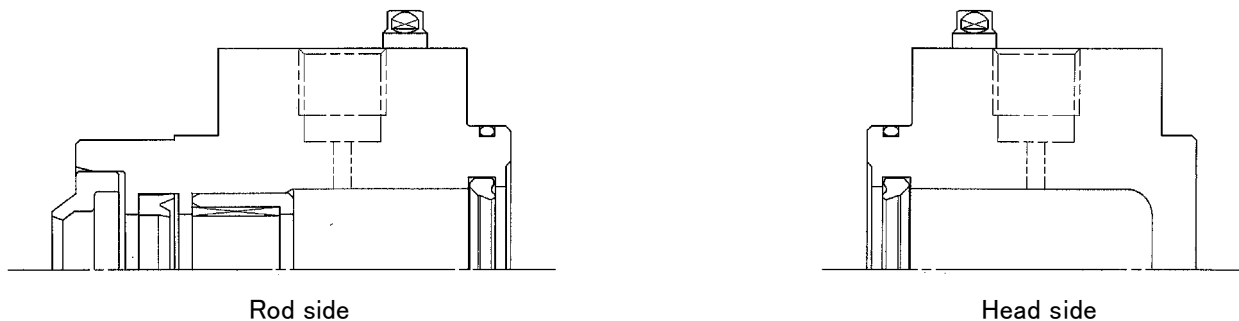
**Fig 16**

②Piston packing

Make sure not to twist the packing, when mounting.

③Cushion packing【Fig 17】

Note the direction when mounting the packing..



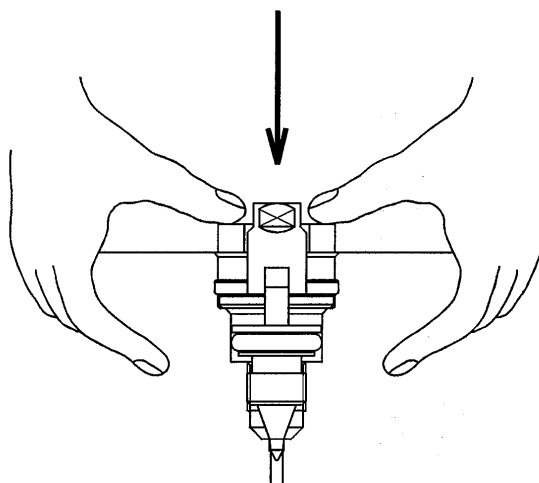
**Fig 17**

④Tube gasket

Pay attention not to make the gasket come off.

⑤Needle scraper【Fig 18】

Press down with hand to mount. At that time, ensure there is no protrusion from the cover end face.



**Fig 18**

5. Reassembly of cylinder

①Tighten the head cover.

Wipe off the adhesive from the threaded part of the tie rod bolt and apply adhesive (Loctite 242 (blue) ) newly.

Tighten the cylinder tube and head cover with tie rod bolt.

Table 7

Unit: N·m

Applicable bore size	Tightening torque
Φ 32	8.8~16.2
Φ 40	
Φ 50	17.2~31.8
Φ 63	

②Insert the rod assembly into the cylinder tube.

Apply the grease to the part receiving the cylinder tube and insert the rod assembly carefully and slowly, so as not to damage the piston packing and gasket.

③Tighten the rod cover.

Wipe off the adhesive from the threaded part of the tie rod bolt and apply adhesive (Loctite 242 (blue) ) newly.

Tighten the cylinder tube and rod cover with tie rod bolt. (Tightening torque: refer to table 7)

④Mount the switch rail (if the switch is mounted).

Table 8

Unit: N·m

Applicable bore size	Tightening torque
Φ 32 to 63	2.2~2.7

⑤Check the assembly condition.

Confirm there is no air leakage from the packing and the cylinder can operate smoothly at minimum

operating pressure.

## 6—4. Consumable parts

### 6—4—1. Replaced parts

The service parts are as follows.

HYCB□□-PS

Bore size ●

● Packing material

Symbol	Material
R	NBR
H	External FKM ※

※External seal including the rod packing, tube gasket and needle scraper are made of FKM.

Table 9. Seal Kit(Material:NBR)

Bore size (mm)	Kit no.	Content and qty.				
		Cushion packing	Piston packing	Rod packing	Tube gasket	Needle scraper
		—	Material:NBR			
32	HYCB32R-PS	2	1	1	2	2
40	HYCB40R-PS	2	1	1	2	2
50	HYCB50R-PS	2	1	1	2	2
63	HYCB63R-PS	2	1	1	2	2

Table 10. Seal Kit(Material:外部 FKM)

Bore size (mm)	Kit no.	Content and qty.				
		Cushion packing	Piston packing	Rod packing	Tube gasket	Needle scraper
		—	Material: NBR	Material:FKM		
32	HYCB32H-PS	2	1	1	2	2
40	HYCB40H-PS	2	1	1	2	2
50	HYCB50H-PS	2	1	1	2	2
63	HYCB63H-PS	2	1	1	2	2

### 6—4—2. Storage of packing (for extended period)

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



### 6—4—3. Grease package

When the grease is added during replacement of the packing and maintenance of the cylinder, use the grease package.

Table 11. Grease package【Grease for standard(for non-food)】

Part no.	Net
GR-S-010	10g

Table 12. Grease package【Grease for food】

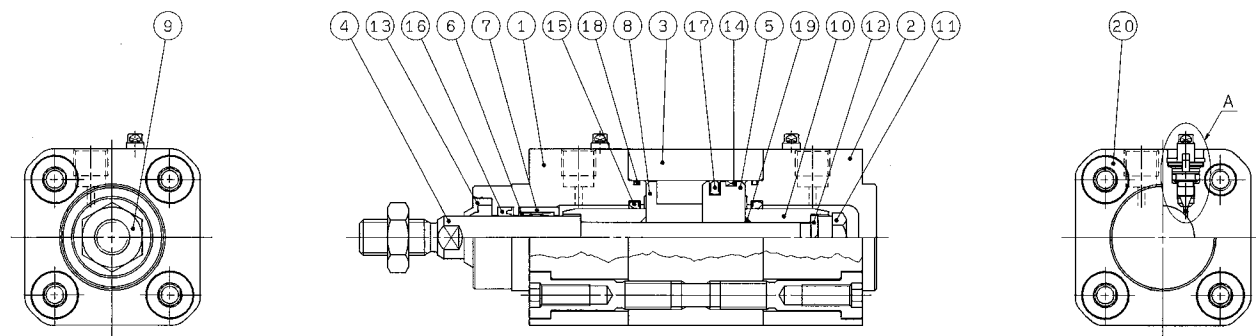
Part no.	Net
GR-H -010	10g

## 7. Troubleshooting

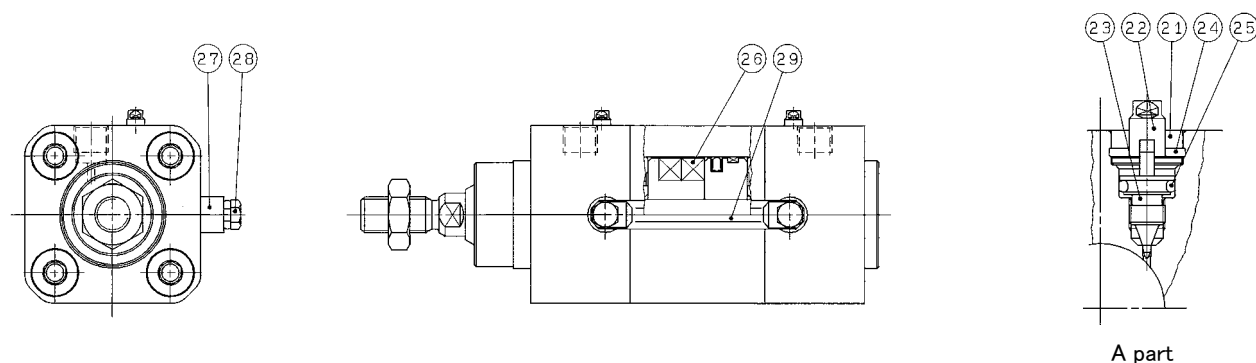
Trouble	Phenomenon	Possible cause	Remedy	Related section
<ul style="list-style-type: none"> <li>•The operation is not smooth.</li> <li>•The output force is reduced.</li> <li>•The cylinder doesn't operate.</li> </ul>	Air leakage (external)	1、The rod packing is worn by damage on piston rod. 2、The rod packing is worn by a lack of grease on piston rod. 3、The rod packing is worn by use at temp. over allowable value. 4、Shortage of grease 5、Foreign materials are allowed to enter.	1、replace piston rod and rod packing. 2、Apply the grease on piston rod and replace packing. 3、Keep operating temp. range and replace rod packing. 4、Add the grease. 5、Remove foreign materials from rod packing.	6-3
	Air leakage (internal)	1、The piston packing is worn due to grease washed away by water, including drain.	1、Install air cleaning equipments including air filter in the piping and replace piston packing.	3-1
	A lack of pneumatic pressure	1、The pressure from factory source is low. 2、The setting of regulator is changed. 3、The piping is clogged.	1、Supply adequate pressure. 2、Set regulator properly. 3、Perform flashing to the piping.	3-1
	Overload	1、The lateral load over the allowable value is applied.	1、Use within the allowable value.	4-2
	Low operating speed	1、The speed is lower than specified piston speed.	1、Use within specifications.	3-3
	Improper pneumatic circuit setting	1、The system construction is not suitable.	1、Select adequate size of tube, fitting, directional control valve, speed controller etc. Consisting of the system.	3-1 3-5

A part is damaged.	Breakage of piston rod, rod cover and cylinder tube	<p>1、The speed is too high due to insufficient adjustment of the speed controller.</p> <p>2、A kinetic energy over the allowable value is applied.</p> <p>3、A lateral load over the allowable value is applied.</p> <p>4、An abnormal external force is applied.</p>	<p>1、Adjust the speed with the speed controller again so that the speed will be decreased to within specifications.</p> <p>2、Use within the allowable value.</p> <p>3、Use within the allowable value.</p> <p>4、Mechanism interference, eccentric load and overload could cause deformation and damage of the cylinder. Remove these factors.</p>	<p>3-3</p> <p>4-1</p> <p>4-2</p>
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## 8. Basic construction



Built-in magnet type



15	Cushion packing	Resin	2	
14	Wear-ring	Resin	1	
13	Rod scraper	NBR	1	(FKM is available.)
12	Spring washer	Steel	1	
11	Piston nut	Stainless steel	1	
10	Cushion ring	Steel	2	Zinc chromated
9	Rod end nut	Stainless steel	1	
8	Magnet holder	Aluminum alloy	1	Chromated
7	Bushing holder	Aluminum alloy	1	Chromated
6	Bushing	Resin	1	
5	Piston	Aluminum alloy	1	Chromated
4	Piston rod	Stainless steel	1	Hard chrome plated
3	Cylinder tube	Aluminum alloy	1	Anodic oxidization coating
2	Head cover	Aluminum alloy	1	Anodic oxidization coating
1	Rod cover	Aluminum alloy	1	Anodic oxidization coating
No	Description	Material	Qty	Note

29	Switch rail	Stainless steel	1	(only for built-in magnet type)
28	Hexagon bolt	Stainless steel	2	(only for built-in magnet type)
27	Switch rail pedestal	Stainless steel	2	(only for built-in magnet type)
26	Magnet	Resin	2	(only for built-in magnet type)
25	Cushion valve packing	NBR	2	
24	Retaining ring	Steel	2	Nickel plated
23	Cushion needle	Stainless steel	2	
22	Cushion adjuster	Stainless steel	2	
21	Needle scraper	NBR	2	(FKM is available.)
20	Tie rod bolt	Stainless steel	8	
19	Piston gasket	NBR	1	
18	Cylinder tube gasket	NBR	2	(FKM is available.)
17	Piston packing	NBR	1	
16	Rod packing	NBR	1	(FKM is available.)
No	Description	Material	Qty	Note