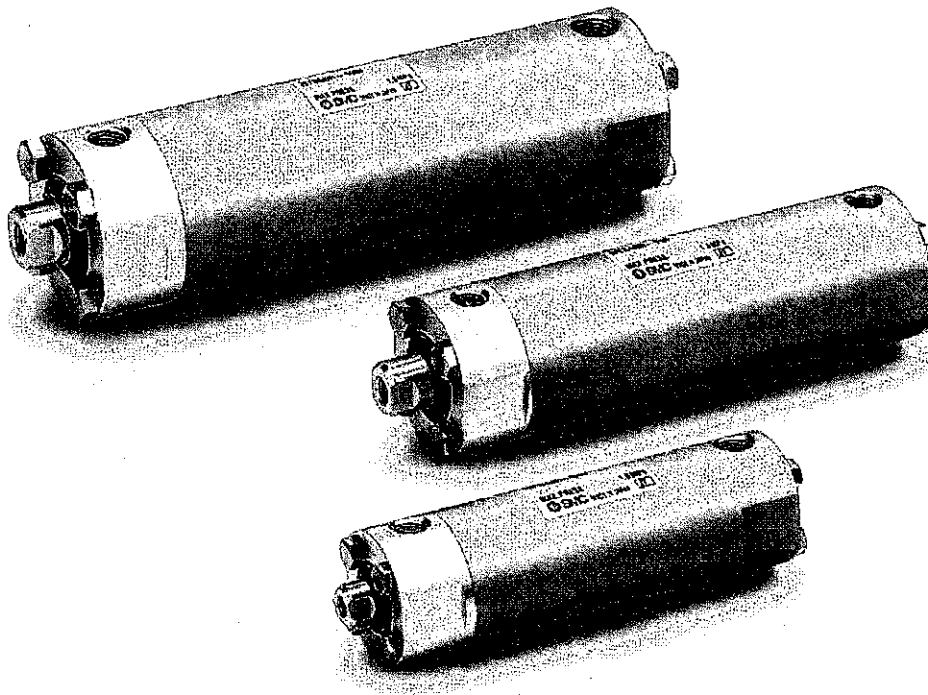


OPERATION MANUAL

HYGIENIC DESIGN CYLINDER

【HYB Series】

Φ20, Φ25, Φ32, Φ40, Φ50, Φ63, Φ80, Φ100



☆Read this manual thoroughly before mounting and operating the actuator.

☆Pay particular attention to the section concerning safety.

☆Keep this manual in an accessible location.

SMC Corporation

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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 labels of "Danger", "Warning" or "Caution". To ensure safety, be sure to observe ISO 4414^{※1)}, JIS B 8370^{※2)} and other safety practices.

■ Indications

Indication	Indications
Danger:	In extreme conditions, there is a possible result of serious injury or loss of life.
Warning:	Operator error could result in serious injury or loss of life.
Caution:	Operator error could result in injury ^{※3)} or equipment damage ^{※4)} .

※1) ISO4414: Pneumatic fluid power – General rules relating to systems

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

※3) An injury does not necessitate staying or going to a hospital for a long period of time to recover. This includes burns and electric shocks.

※4) Equipment damage is extensive damage related to equipment 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 catalogue 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 placed 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 checks to ensure it works properly.

■ Exemption

① SMC 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.

② SMC 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).

③ SMC doesn't take any responsibility for the damage resulting from the use in the manner other than specified in the catalogue or Operation Manual.

④ SMC doesn't take any responsibility for the damage resulting from malfunction due to use of our product in combination with equipments or software from another manufacturer.

2. Specifications

2-1. Specifications

Bore size(mm)	20	25	32	40	50	63	80	100
Action	Double acting , Single rod							
Fluid	Air							
Proof pressure	1.5MPa							
Maximum operating pressure	1.0MPa							
Minimum operating pressure	0.2MPa	0.15MPa				0.07MPa		
Ambient and fluid temperature	Without auto switch: 0~70°C With auto switch: 0~60°C							
Cushion	Rubber bumper							
Lubrication	Not required (Non-lube)							
Piston speed	50 to 500mm/s (pressurized at 1.0MPa)							
Stroke length tolerance	+1.4 0 mm							
Piston rod material	SUS304, hard chrome plated							
Port size	M5×0.8	1/8 (Rc, NPT, G)		1/4 (Rc, NPT, G)		3/8 (Rc, NPT, G)	1/2 (Rc, NPT, G)	

Warning

① Features of the product.

The actuator, has been designed specifically for use in machines in the food ,packaging industries and For machine tool (Coolant).

The concept of hygienic design is a cylinder which is sterilized, is a cylinder having a shape which can be easily cleaned and kept hygienic.

—Allowable mounting zone—

	Detail	Allowed/Not allowed to mount in zone
Food zone	The food product has direct contact with the cylinder.	Not allowed
Splash zone (directly)	The food product can contact the cylinder, but the food product is not consumed.	Allowed
Non-food zone	The food does not contact the cylinder and environment such as machine tools.	Allowed

※The cylinder should never be mounted in the food zone.

3. Precautions

3-1. 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 **Design circuitry to prevent sudden lurching of driven objects.**

When a cylinder is driven by an exhaust centre 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.

- 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.

Caution

① 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 occur. When the cylinder has been in operation for a long distance, the sliding parts become discolored black.. In such cases, to prolong cylinder life, wipe off the grease from the sliding parts, and add new grease. (When the grease is wiped off, use water. If it is wiped off with alcohol or special solvent, the packing could be damaged.)

② Avoid giving external force over maximum output to the cylinder.

A pieces of cylinder broken by the force may damage the human and the device.

③ Don't use plural cylinders synchronously without guide.

It is difficult to control speed of the cylinder using air, which is compressive fluid, because speed is given an effect by change of supplied pressure, load, temperature, lubrication and each part, and difference of the performance of each cylinder. For a short time, it is possible to adjust speed of plural cylinders by speed controller, but for a long time, above mentioned factors may break synchronism of those cylinders. If synchronism is broken, lateral load caused by difference of position is given to piston rod and may wear packing and bearing, and make galling to cylinder tube and piston. If it is necessary to use plural cylinders synchronously, use the guide with hardness and high accuracy not to make difference to speed of each cylinder which has individual output.

④ Prevent intrusion of obstruction such as cutting chip from supply port into inside of the cylinder.

If the cylinder is put on the floor at field during positioning for installation, cutting chip made by the drill for mounting hole may intrude from supply port of the cylinder and cause failure.

⑤ Cut the length of piping short.

Too long cylinder piping makes volume of mist in the cylinder (the mist is caused by adiabatic expansion) less than one in the piping tube, and prevent the mist from being released to air. Residual mist in the tube becomes pooled by repeating actuation, and may leads to occurrence of water which removes the grease of the cylinder. As the result of it, the condition of lubrication becomes worse and air leakage caused by wear of packing and malfunction by increase of friction resistance occur. In order to solve this issue, following countermeasure is necessary.

(1) Cut piping tube from solenoid valve to cylinder short as much as possible and make mist release to atmosphere properly. Following formula is referred.

$$\frac{\text{Converted value of content volume of cylinder to atmospheric pressure} \times 0.7 \geq}{\text{Content volume of piping tube}}$$

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

(3) Direct piping port downwardly so that moisture occurring in piping wouldn't return to cylinder.

⑥ Perform speed adjustment in the place having the actual operating conditions.

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

⑦ 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.

3-2. Selection

Speed control

When cylinder is adjusted to desired speed, install speed controller such as SMC's AS series near supply port of air. For this adjustment, either of supply air or exhaust air is squeezed, generally exhaust air is done.

Direction control

When actuating direction of cylinder is changed, install adequate solenoid valve selected among SMC's various models.

Warning

① Confirm the specifications.

The products featured in this catalog 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.

② About intermediate stop

In the case of 3 position closed center of a 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 a stopped position for an extended period.

Caution

① Operate within the limits of the maximum usable stroke.

Refer to the selection procedures for the air cylinder to be used for the maximum usable stroke.

② 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 Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.

④ Provide intermediate supports for long stroke cylinders.

An intermediate support should be provided in order to prevent damage to a cylinder having a long stroke, due to problems such as sagging of the rod, deflection of the cylinder tube, vibration and external load.

3-3. Mounting

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 gouge 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 **Instruction manual**

Install the products and operate them only after reading the instruction manual carefully and understanding its contents.

Also keep the manual where it can be referred to as necessary.

- ⑥ **Set the mounting base suitable to large force given by the cylinder.**

If the mounting base doesn't have enough hardness, the human and the device may be damaged.

- ⑦ **Do not apply any force to a lead wire when an auto switch is mounted on the cylinder.**

As such stress can be not only a cause of breakage of the lead wire, but also conveyed to the inside of the switch, an internal component of the switch may be broken.

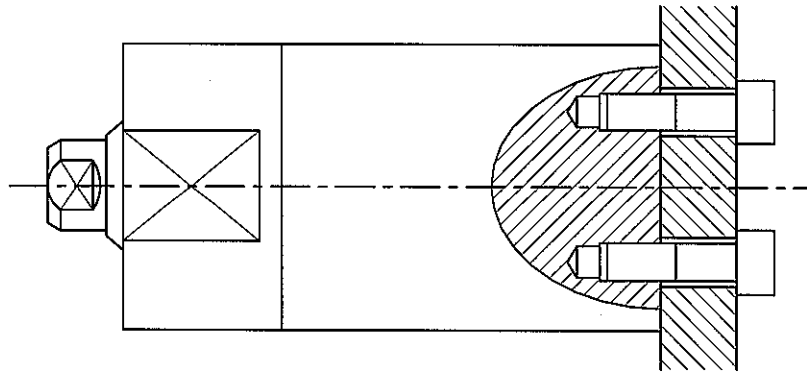
If the clearance between the switch and the cylinder becomes long when the lead wire is pulled, the switch may not be able to operate.

- ⑧ **Do not let any magnetic substance get close to the clearance between an auto switch and the cylinder or around them.**

If a magnetic substance gets close to the clearance between an auto switch and the cylinder or around them, the magnetic force inside the cylinder will be weakened. That may result in malfunction of the auto switch.

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

Bore size (mm)	Thread size	Tightening torque (N·m)
20	M4 × 0.7	1.1~1.9
25·32	M5 × 0.8	2.1~3.9
40	M6 × 1	3.7~6.7
50	M8 × 1.25	8.8~16.2
63·80	M10 × 1.5	17.2~31.8
100	M12 × 1.75	29.4~54.6



3-4. Piping

Caution

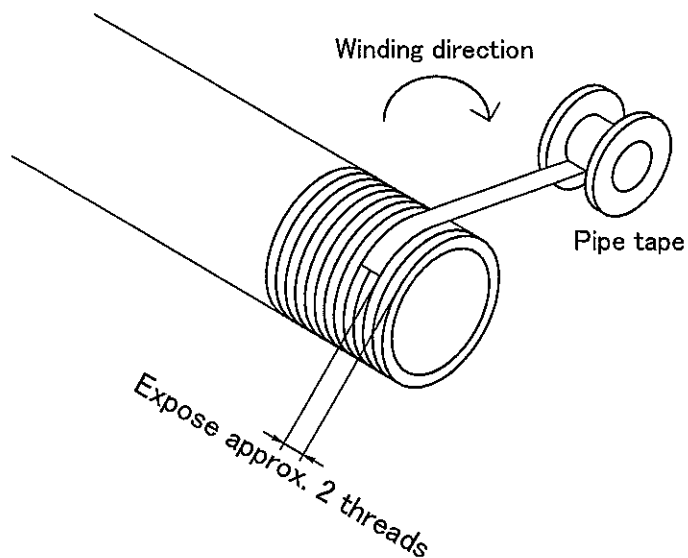
① Before piping

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.

② Wrapping of pipe tape

When screwing piping or fittings 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.



3-5. Lubrication

Caution

① Lubrication of cylinder

【Grease for standard(for non-food)】

Install a lubricator in the circuit, and use Class 1 turbine oil (with no additive) ISO VG32.

Do not use machine or spindle oil.

【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 must be continually lubricated, otherwise it may fail in operation..

3-6. Air Supply

For compressed air supplied to the cylinder, use the air which is filtrated by SMC's filter such as AF series and adjust to specified setting pressure by SMC's regulator such as AR series.

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

① 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.

② 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.

③ Use the product within the specified range of fluid and ambient temperature.

Take measures to prevent freezing when below 5°C , since moisture in circuits can freeze and cause damage to seals and lead to malfunctions.

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

3-7. 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, take suitable measures to protect the rod.
- ③ When using auto switches, do not operate in an environment with strong magnetic fields.
- ④ Avoid much humidity for storage of cylinder.

Store the cylinder with piston rod retracted under the environment with little humidity and countermeasure for rusty.

Caution

- ① The cylinder should never be mounted in the food zone.
- ② Longevity might become remarkably short when the cleaning agent and the drug solutions other than water disperse to the cylinder and ask SMC for the work.
- ③ Please go in the range of the temperature of the cylinder in a defense short time when washing it because of steam.
- ④ A weak part must not be overpowered in strength in the auto switch lead line part etc. when washing it with a brush etc.

3-8. Maintenance

Warning

- ① Perform maintenance procedures as shown in the instruction manual.
If it is handled improperly, malfunction or damage of machinery or equipment may occur.
- ② Removal of equipment, and supply/exhaust of compressed air

Before any machinery or equipment is removed, first ensure that the appropriate measures are in place to prevent the fall or erratic movement of driven objects and equipment, then cut off the electric power and reduce the pressure in the system to zero. Only then should you proceed with the removal of any machinery and equipment.

When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent cylinders from sudden movement.

Caution

- ① Drain flushing
Remove drainage from air filters regularly.

3-9. Operating Precautions

Caution

- 1) Do not clean a sliding part unless it needs to do so. Otherwise, grease will run out, and the product will have a short life.
- 2) Plug any mounting port which is not in use. If water gets in such a mounting port, germs may propagate.

3-10. Auto Switches

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

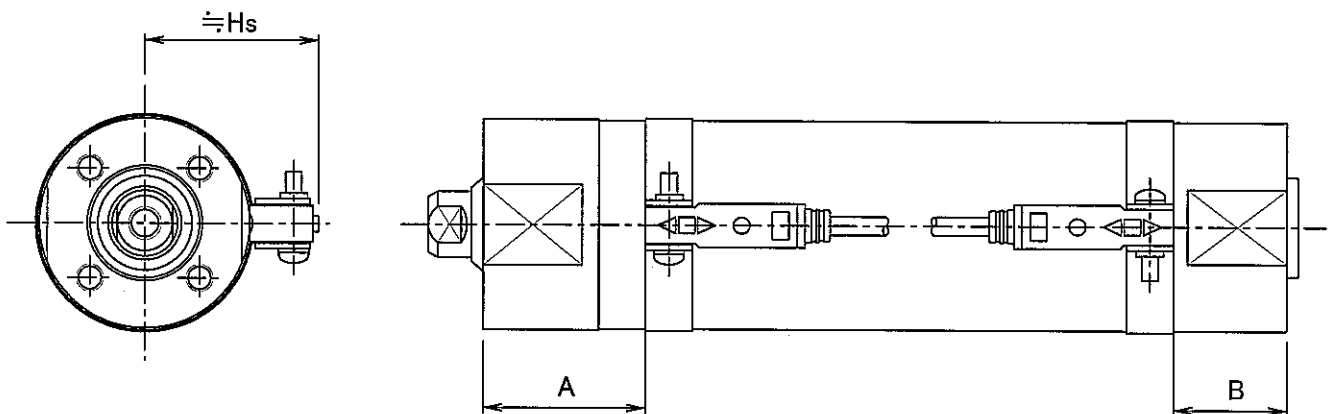
① Proper Auto Switch Mounting Position (Detection at stroke end) and Its Mounting Height

Unit: mm

Bore size (mm)	D-H7BAL			D-G5BAL		
	A	B	Hs	A	B	Hs
20	28.5	19.5	24.5	—	—	—
25	28.5	19.5	27			
32	29.5	20.5	30.5			
40	34.5	22.5	35			
50	41.5	27.5	40.5			
63	41.5	27.5	47.5			
80	—			40	40	59
100	—			48	32	69.5

※The above numbers are reference for mounting positions of those auto switches to detect a stroke end. In the actual setting, determine the actual operation of the auto switch, and adjust the position.

※Please install the position where it installs since piece third within the range with which it does not interfere in an auto switch which does not provide especially, and is adjacent when the amount of an auto switch is 3 pieces or more.



② Operating Range

Unit: mm (at 25°C)

Bore size (mm)	D-H7BAL	D-G5BAL
20	4	—
25	4	
32	4.5	
40	5	
50	6	
63	6.5	
80	—	6.5
100		7

※Since this is a guideline including hysteresis, not meant to be guaranteed.

(Assuming approximately $\pm 30\%$ dispersion)

There may be the case to change substantially depending on an ambient environment.

③ Minimum Strokes for Auto Switch Mounting

Unit: mm

The applicable auto switches	1 pc.	2 pcs.	n pcs.
D-H7BAL	10	15	$15 + 45 \frac{(n-2)}{2}$ (n=2,4,6···)
D-G5BAL			$15 + 50 \frac{(n-2)}{2}$ (n=2,4,6···)

④ Auto switch mounting bracket kit no.

The applicable auto switch: D-H7BAL

Bore size (mm)	Kit no.		Net	Qty
20	D-H7BAL	BMA2-020	• Auto switch • Auto switch mounting band • Auto switch mounting screw (SUS: M3 × 0.5 × 14L)	Each one
25		BMA2-025		
32		BMA2-032		
40		BMA2-040		
50		BMA2-050		
63		BMA2-063		

The applicable auto switch: D-G5BAL

Bore size (mm)	Kit no.		Net	Qty
80	D-G5BAL	BA-08	• Auto switch • Auto switch mounting band • Auto switch mounting screw (SUS: M4 × 0.7 × 22L)	Each one
100		BA-10		

※The machine screw of the plastron is appended when the above-mentioned installation metal fittings are arranged with the unit, and use the machine screw made of the stainless steel the following appended to the switch with the class, please.

Mounting screws set made of stainless steel

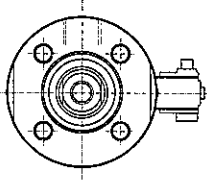
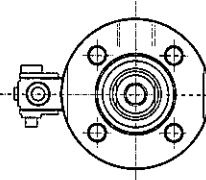
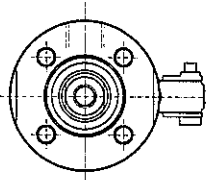
BBA3: For D-G5BA

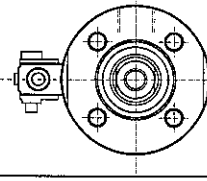
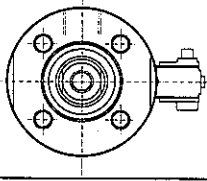
BBA4: For D-H7BA

※“D-5GBA” and “D-H7BA” switch are set on the cylinder with the stainless steel screws above when shipped. When a switch is shipped independently, “BBA3” or “BBA4” screws are attached.

⑤ Auto switch installation side

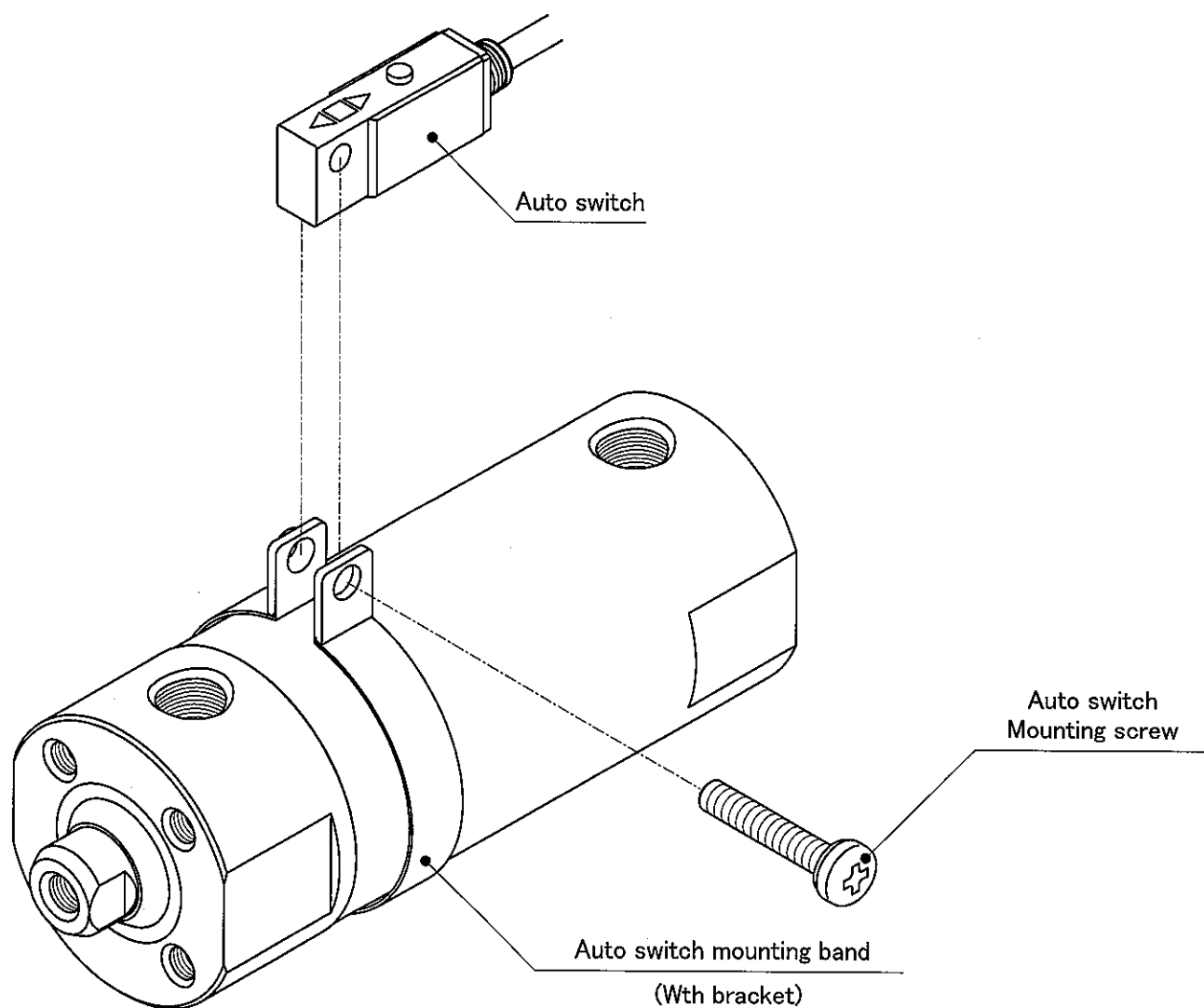
Please install it as shown in the following so that the auto switch installation side is different according to the stroke when you install an auto switch.

Auto switch Number of installations	1 pc.	2 pcs.	
		Installation on different side	Installation on the same side
Auto switch Clamp face	Port side 	Port side 	Port side 
D-H7BAL	10st or more	15st~59st	60st or more
D-G5BAL		15st~74st	75st or more

Auto switch Number of installations	n pcs.	
	Installation on different side	Installation on the same side
Auto switch Clamp face	Port side 	Port side 
D-H7BAL	$15 + 45 \frac{(n-2)}{2}$ st or more (n=2,4,6···)	60+45(n-2) st or more
D-G5BAL	$15 + 50 \frac{(n-2)}{2}$ st or more (n=2,4,6···)	75+55(n-2) st or more

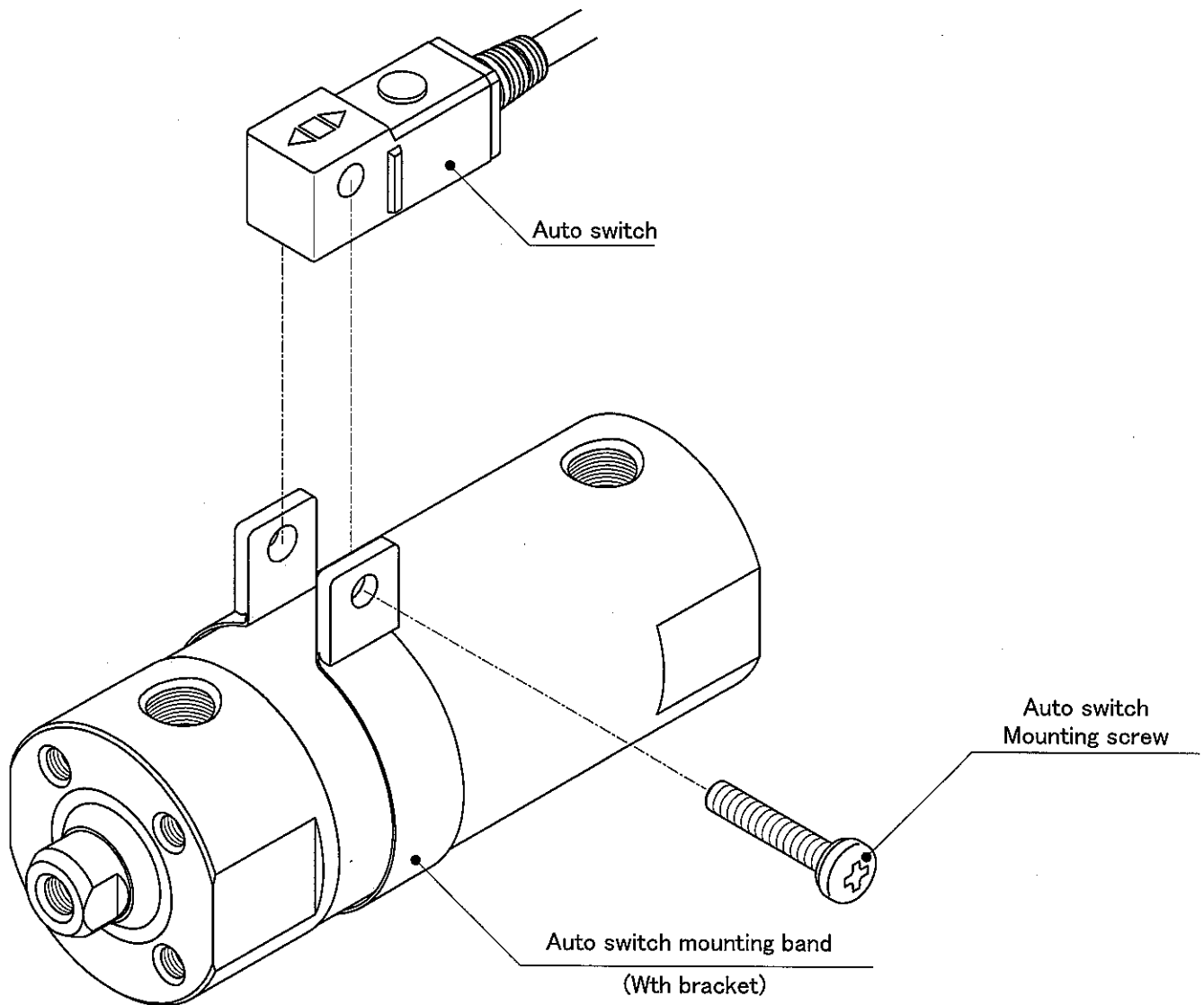
⑥ How to mount auto switch

The applicable auto switch: D-H7BAL



- ① Put a mounting band on the cylinder tube and set it at the auto switch mounting the mounting hole to the hole of stationary fitting.
- ② Put the mounting section of the auto switch between the band mounting holes, then adjust the position of mounting holes of switch to those of mounting band.
- ③ Lightly thread the auto switch mounting screw through the mounting hole into the thread part of band fitting.
- ④ Set the whole body to the detecting position by sliding, tighten the mounting screw to secure the auto switch.
(Tightening torque of M3 screw should be 0.8 to 1.0 N·m)
- ⑤ Modification of the detection position should be made in the condition of 3.

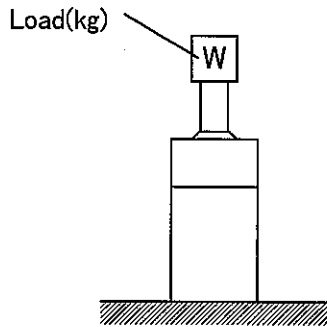
The applicable auto switch: D-G5BAL



- ① Put a mounting band on the cylinder tube and set it at the auto switch mounting the mounting hole to the hole of stationary fitting.
- ② Put the mounting section of the auto switch between the band mounting holes, then adjust the position of mounting holes of switch to those of mounting band.
- ③ Lightly thread the auto switch mounting screw through the mounting hole into the thread part of band fitting.
- ④ After reconfirming the detecting position, tighten the mounting screw to secure the auto switch.
(Tightening torque of M4 screw should be 1 to 1.2N·m)
- ⑤ Modification of the detection position should be made in the condition of 3.

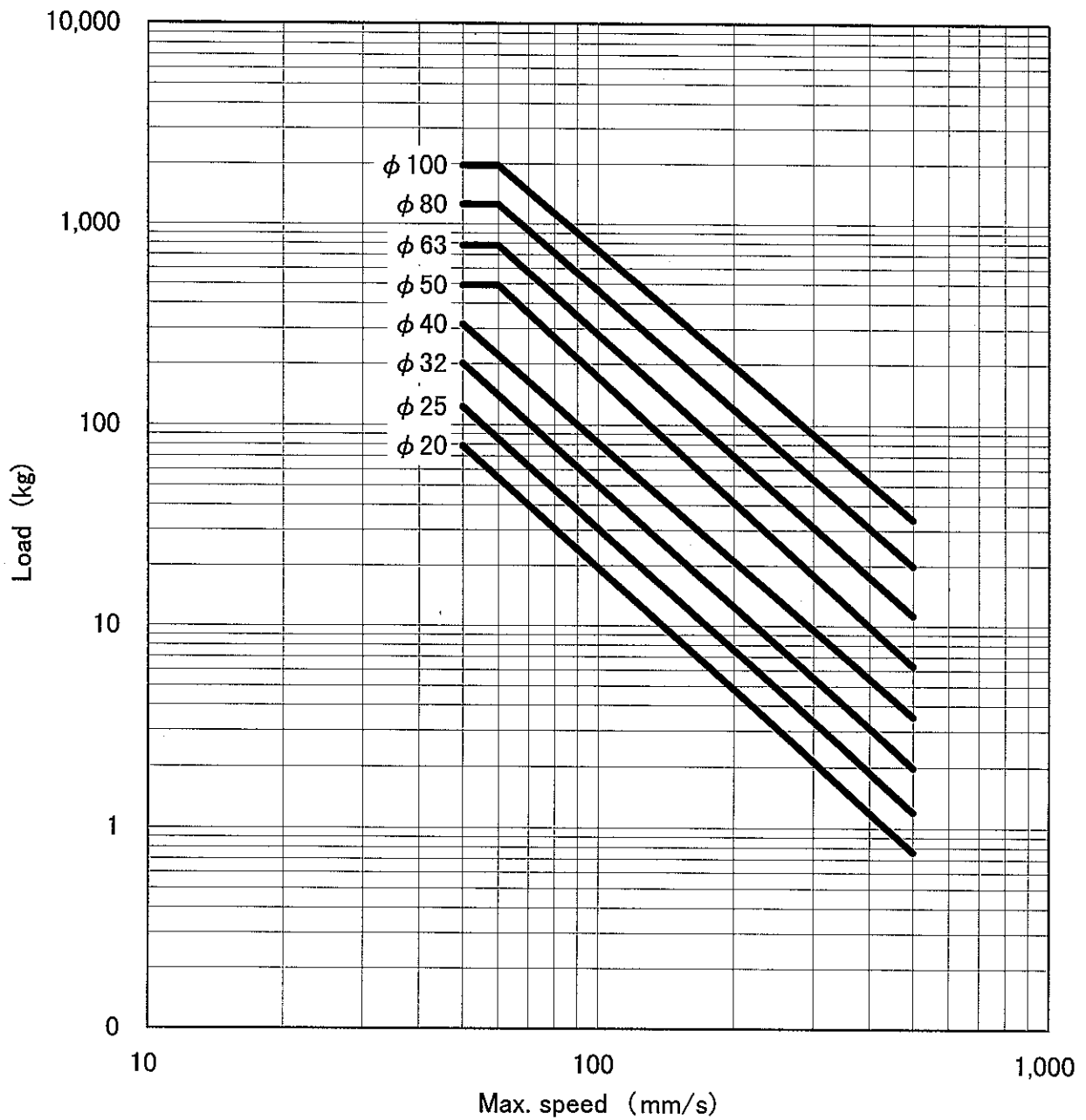
4. Model selection

4-1. Allowable Kinetic Energy



Conditions: A load mounted perpendicularly
(the condition on left figure)

(Operating: 0.5MPa)



4-2. Lateral Load at Rod End

Caution

In principle, the load applied to the piston rod should always be kept in the axial direction. If this situation cannot be avoided, keep the lateral load applied on the bushing of the cylinder, to 1/20 or less of the maximum output of the cylinder.

— Calculation of allowable lateral load —

$$f_B = \frac{F}{20} \quad F = \frac{\pi}{4} D^2 \cdot P$$

$$f_R < \frac{L_1}{L_1 + (L_2 + \text{stroke})} \cdot f_B$$

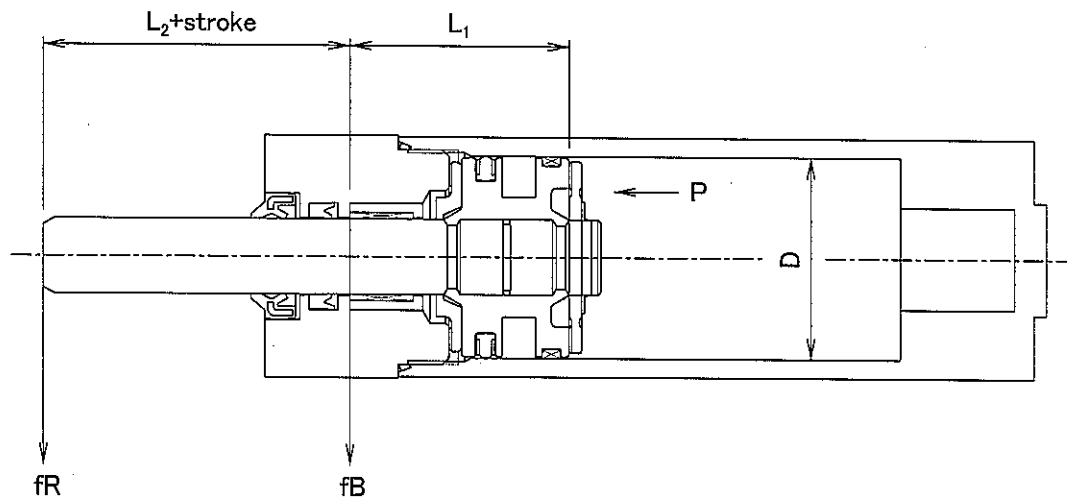
F: Maximum output(MPa)

fB: Allowable maximum load to bushing(N)

D: Bore size(mm)

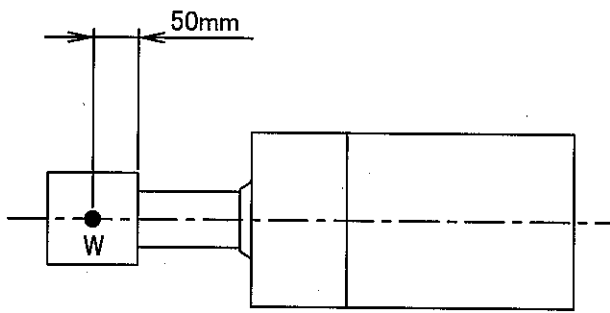
P: Maximum operating pressure(MPa)

fR: Allowable mounted load(N)



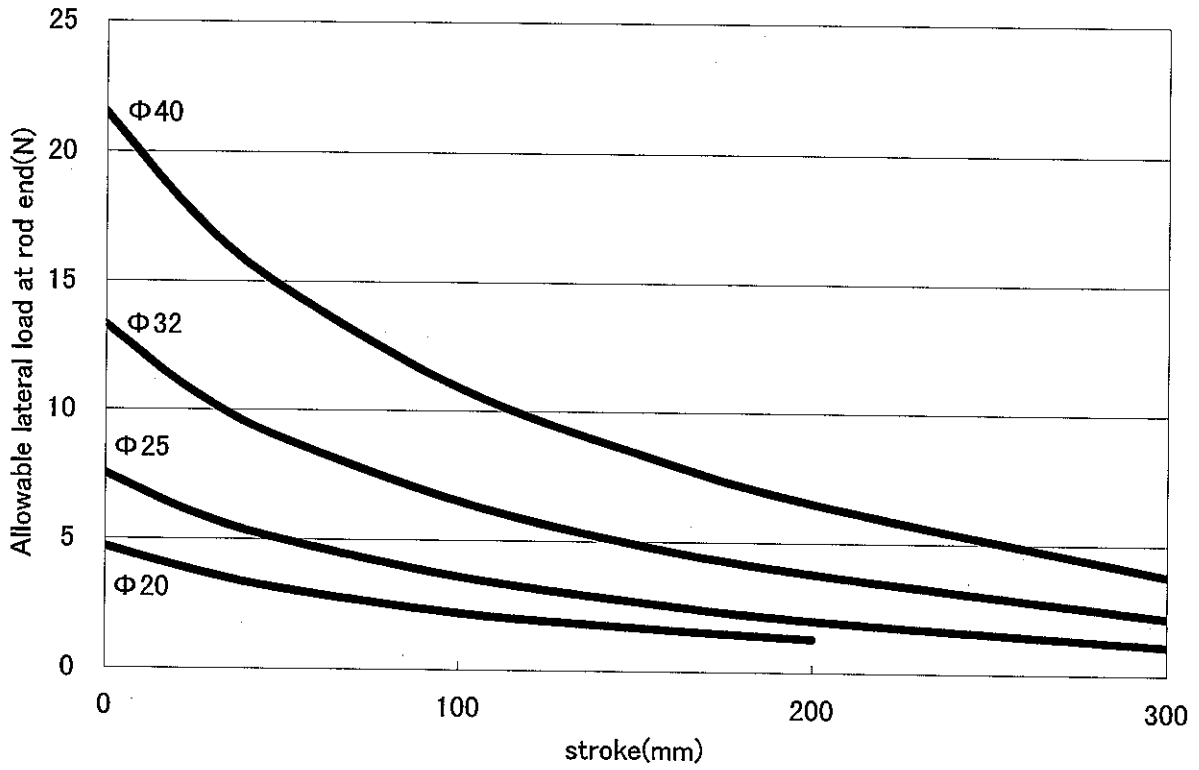
D (mm)	L1 (mm)	L2 (mm)	fB (N)	Stroke range (mm)
Φ 20	32.7	25.3	15.7	25,50,75,100,125,150,200
Φ 25	33.4	24.6	24.5	25,50,75,100,125,150,200,250,300
Φ 32	36.6	23.4	40.2	
Φ 40	41.8	29.2	62.8	
Φ 50·Φ 63	44.8	34.2	98.2	
Φ 80	51.8	43.2	251.3	
Φ 100	56.8	38.2	392.7	

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

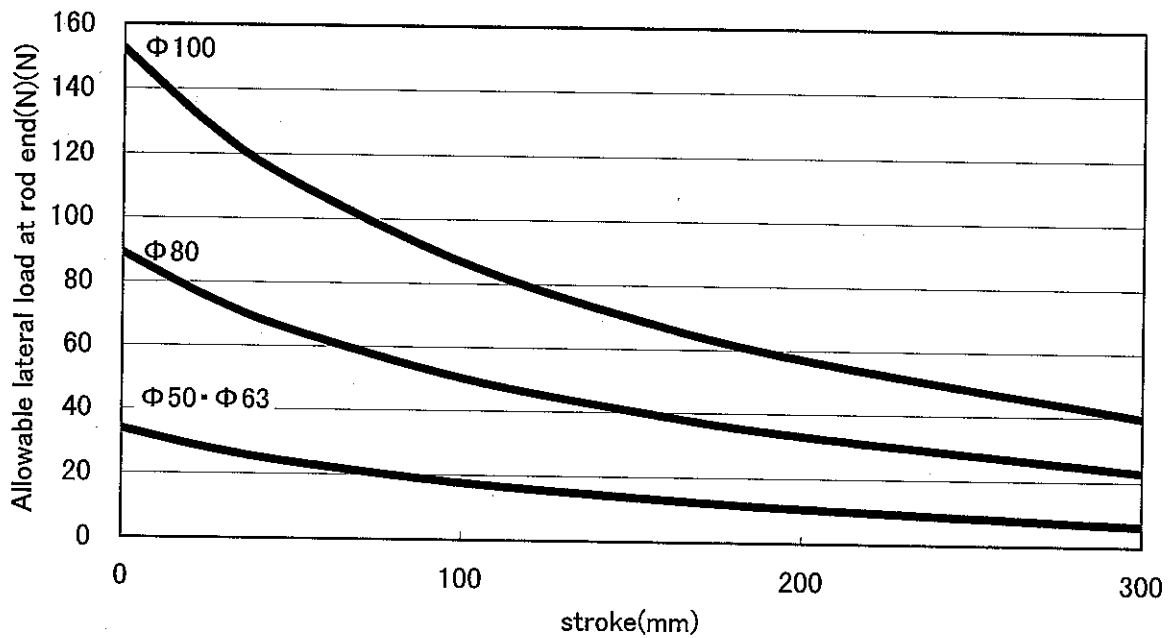


Conditions: The distance between the rod end and load is 50mm.

$\Phi 20 \sim \Phi 40$

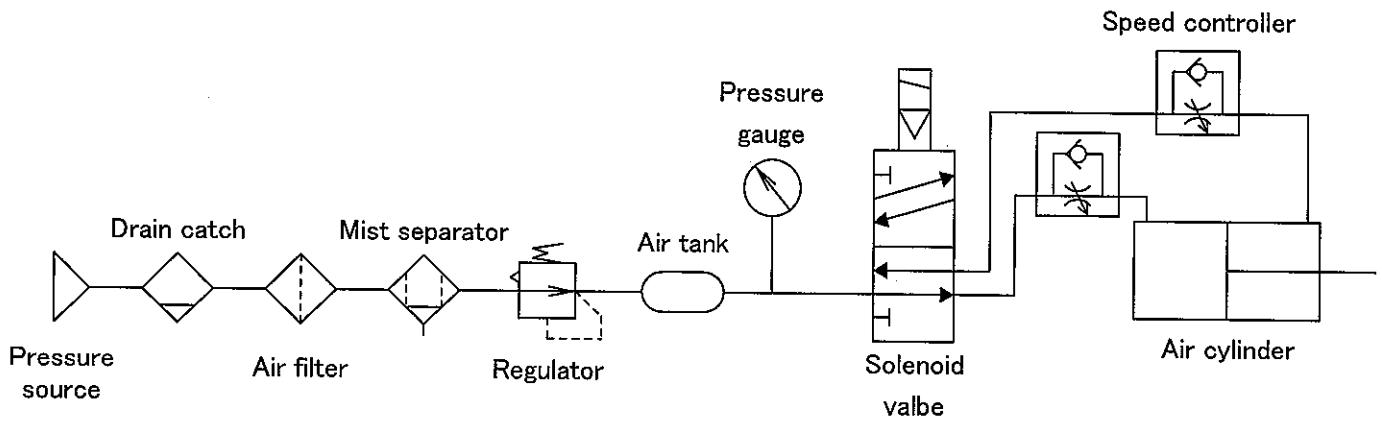


$\Phi 50 \sim \Phi 100$



5. Pneumatic circuit

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



6. Maintenance and Check

6-1. Daily check

- ① Is the operation smooth?
- ② Is there any abnormal change in the piston speed and cycle time?
- ③ Is there any abnormality in the stroke?

6-2. Periodical check

- ① Are the cylinder mounting bolts and work, firmly fixed?
- ② Is the operation smooth?
- ③ Are there any abnormal changes in the piston speed and cycle time?
- ④ Is there any external leakage?
- ⑤ Is there any abnormality in the stroke?
- ⑥ Are there any flaws on the piston rod
- ⑦ Is the drain of the air filter removed periodically?

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

6-3. How to replace packing

Caution

Ask SMC for replacing a packing if a tube inside diameter has 50mm or more.

The cylinder with internal diameter of 50mm or more has extremely large tightening torque at the rod cover. Therefore, if the cylinder needs to be disassembled for replacing a packing, ask SMC for the work.

1. Disassembly of the cylinder

① Cleaning

Prior to disassembly, wipe off any dirt from the outside of the actuator.

This will prevent intrusion of dust and foreign materials during disassembly.

Take particular care on the surface of the piston rod.

② Removal of rod cover

Please place other width of two of the rod cover or the tube cover with the vise etc., multiply, loosen the spanner and the monkey, etc. to the other, and detach the cover.

③ Disassembly

Pull out the piston rod by holding a bolt mounted on the piston rod end.

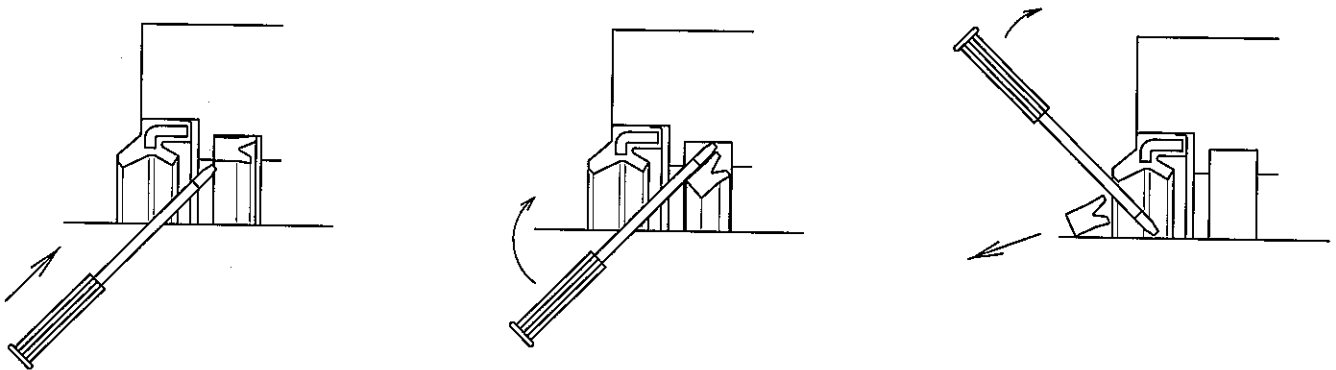
Take care not to scratch or mark the internal face of the tube.

2. Removal of the packing

① Rod packing

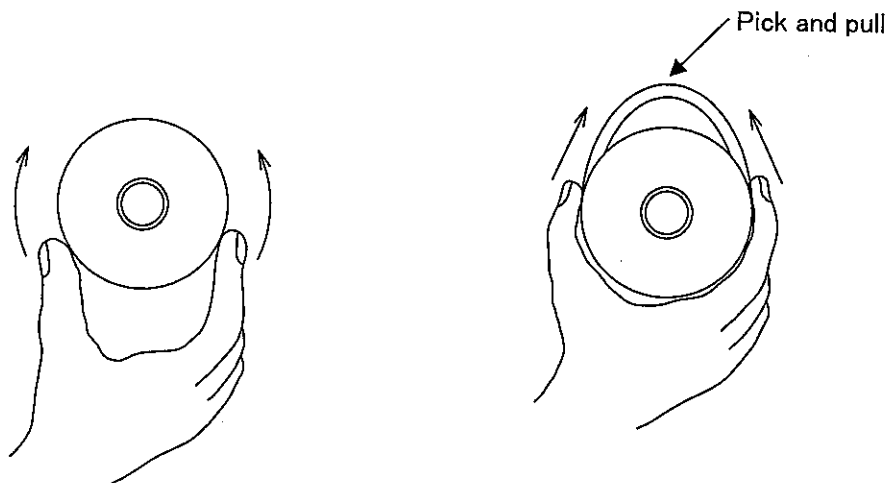
Insert a precision driver etc. from front the rod cover and prise the packing out.

Take care not to scratch or score the packing groove in the rod cover and scraper.



② Piston packing

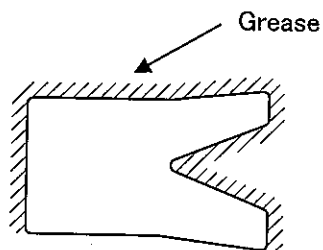
Push the tube gasket partially to make it come off and pull it out manually.



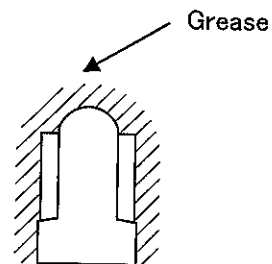
3. Application of grease

① Rod packing and Piston packing

Apply the grease all around new packing evenly.



Rod packing



Piston packing

② Tube gasket

Spread a thin film of grease, over the tube gasket.

4. Mounting of packing

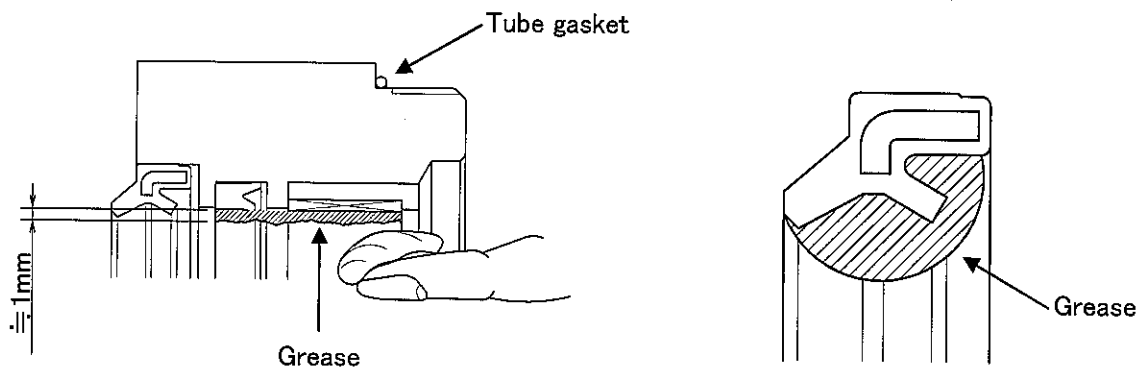
① Rod packing and tube gasket

Mount the rod packing with attention to direction.

Pay attention not to make the tube gasket come off.

Then, apply the grease on the packing evenly.

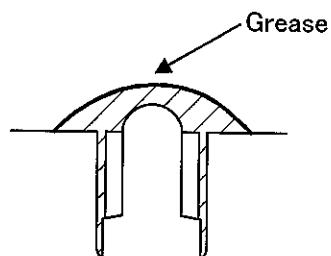
Fill the scraper groove with grease.



② Piston packing

When mounting the packing, ensure there are no twists in the packing.

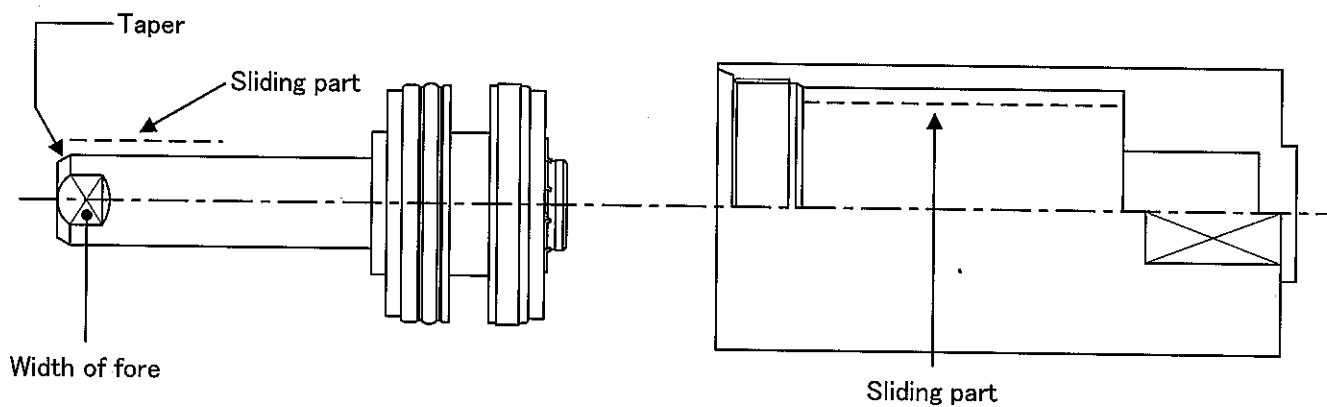
Also add the grease inside the groove.



5. Application of grease

① Each component of the cylinder

Spread grease entirely over the parts shown.



6. Reassembly of the cylinder

① Insertion of piston rod ASS 'Y

Please insert piston rod ASS 'Y in the tube cover.

② Tighten the rod cover.

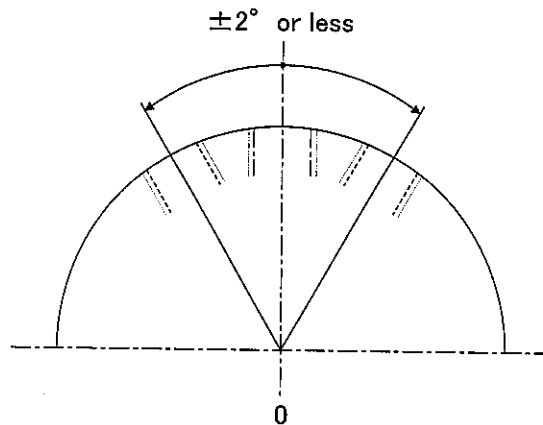
After tightening, it tightens by the tube cover and the rod cover's torqueing it the following temporary tightening.

In that case, please bite the tube gasket in the rod cover screw and note not crowding.

Please adjust this tightening and the following port hole angle (gap) to $\pm 2^\circ$ or less.

Unit: N·m

Bore size(mm)	Temporary tightening torque
20	7.7
25	15.3
32	
40	19.1



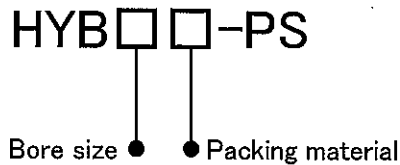
③ Check the assembly condition.

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

6-4. Consumable parts

① Replaced parts

The service parts are as follows.



Symbol	Material
R	NBR
H	External FKM ※

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

Seal Kit(Material: NBR)

Bore size (mm)	Kit no.	Content and qty.		
		Rod packing	Tube gasket	Piston packing
		Material: NBR		
20	HYB20R-PS	1	1	1
25	HYB25R-PS	1	1	1
32	HYB32R-PS	1	1	1
40	HYB40R-PS	1	1	1

Seal Kit(Material: External FKM)

Bore size (mm)	Kit no.	Content and qty.		
		Rod packing	Tube gasket	Piston packing
		Material: FKM		Material: NBR
20	HYB20H-PS	1	1	1
25	HYB25H-PS	1	1	1
32	HYB32H-PS	1	1	1
40	HYB40H-PS	1	1	1

② Storage of packing (for extended period)

- 1) Put the packing into an enclosed package for storage
- 2) Avoid exposure to direct sunlight, high temp. and humidity.

Especially, shut off the equipment which possibly causes heat, radiation and ozone from the package.

- 3) Do not deform or damage the packing by crushing..
- 4) The packing may have white powder on the surface during storage. This will not effect the performance of the packing.

③ Grease package

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

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

Kit no.	Net
GR-S-010	10g

Grease package【Grease for food】

Kit no.	Net
GR-H-010	10g

6-5. Bracket

Foot and the rod side flange were prepared in this product.

Foot

Bore size (mm)	Kit no.	Net
32	CG-L032SUS	・Foot(1 pc.) ・Installation bolt(2 pcs.)
40	CG-L040SUS	
50	CG-L050SUS	
63	CG-L063SUS	
80	CG-L080SUS	
100	CG-L100SUS	

※Please arrange the amount by two for the order for Foot, and one cylinder's worth.

※Material is stainless steel.

※Please consult separately about for $\Phi 20 \cdot \Phi 25$.

Rod side flange

Bore size (mm)	Kit no.	Net
32	CG-F032SUS	・Flange(1 pc.) ・Installation bolt(4 pcs.)
40	CG-F040SUS	
50	CG-F050SUS	
63	CG-F063SUS	
80	CG-F080SUS	
100	CG-F100SUS	

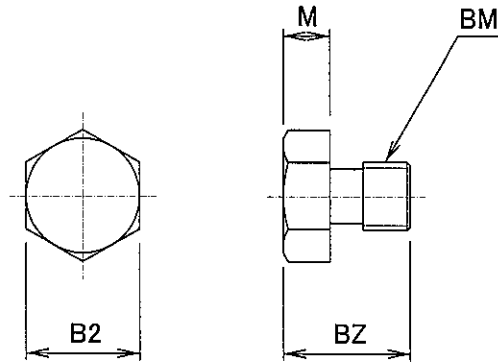
※Material is stainless steel.

※Please consult separately about for $\Phi 20 \cdot \Phi 25$.

6-6. Option

A plug bolt is available as an optional part for this product.

Application: To plug a mounting hole, which is not in use



Unit: mm

Bore size (mm)	Kit no.	B2	BM	BZ	M
20	HYB-H020SUS	7	M4 × 0.7	9	3
25	HYB-H025SUS	8	M5 × 0.8	9.5	3.5
32					
40	HYB-H040SUS	10	M6 × 1	12	4
50	HYB-H050SUS	13	M8 × 1.25	15.5	5.5
63	HYB-H063SUS	17	M10 × 1.5	19	7
80					
100	HYB-H100SUS	19	M12 × 1.75	24	8

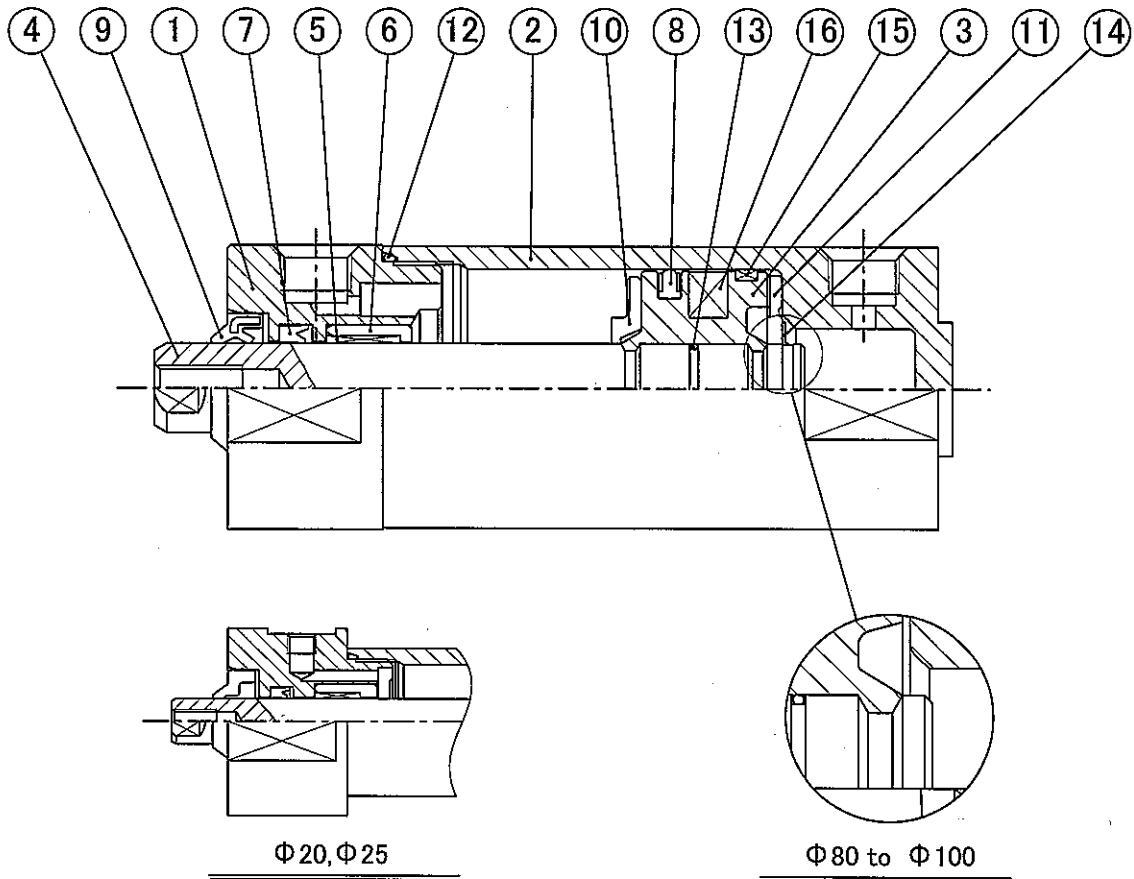
※Four bolts are included to the above part numbers.

※Material is stainless steel.

7. Troubleshooting

Trouble	Phenomenon	Possible cause	Remedy	Related section
<ul style="list-style-type: none"> • The operation is not smooth. • The force output is reduced. • The cylinder doesn't operate. 	Air leakage (external)	<ol style="list-style-type: none"> 1、 The rod packing is damaged by flaws on the piston rod. 2、 The rod packing is damaged by a lack of grease on the piston rod. 3、 The rod packing is damaged by use at temp out of the specified range. 4、 Shortage of grease 5、 Foreign materials are allowed to enter. 	<ol style="list-style-type: none"> 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 grease. 5、 Remove foreign materials from rod packing. 	<p>2-1</p> <p>6-3</p> <p>6-4</p>
	Air leakage (internal)	<ol style="list-style-type: none"> 1、 The piston packing is worn due to grease washed away by water. 	<ol style="list-style-type: none"> 1、 Install air cleaning equipment, in the line, and replace the piston packing. 	<p>3-6</p> <p>6-3</p>
	A lack of pneumatic pressure	<ol style="list-style-type: none"> 1、 The pressure from the factory source is reduced. 2、 The regulator setting has been displaced. 3、 The piping is clogged. 	<ol style="list-style-type: none"> 1、 Supply adequate pressure. 2、 Set regulator properly. 3、 Flush the piping. 	<p>2-1</p> <p>3-4</p> <p>3-6</p>
	Overload	<ol style="list-style-type: none"> 1、 The lateral load has been exceeded. 	<ol style="list-style-type: none"> 1、 Use within the allowable value. 	<p>4-2</p>
	Low operating speed	<ol style="list-style-type: none"> 1、 The speed is lower than specified piston speed. 	<ol style="list-style-type: none"> 1、 Use within specifications. 	<p>2-1</p>
	Improper pneumatic circuit design.	<ol style="list-style-type: none"> 1、 The system construction is not suitable. 	<ol style="list-style-type: none"> 1、 Select adequate size of tube, fitting, directional control valve, speed controller etc. 	<p>3-2</p> <p>3-4</p>
• A part is damaged.	Breakage of damper, piston rod, rod cover and cylinder tube	<ol style="list-style-type: none"> 1、 The speed is too high due to insufficient adjustment of the speed controller. 2、 The kinetic energy exceeds the allowable value. 3、 The pressure from the factory source is reduced. 4、 An abnormal external force is applied. 	<ol style="list-style-type: none"> 1、 Adjust the speed with the speed controller again so that the speed will decrease within the specifications. 2、 Use within the allowable value. 3、 Use within the allowable value. 4、 Mechanism interference, eccentric load and overload could cause deformation and damage of the cylinder. Remove these factors. 	<p>2-1</p> <p>3-2</p> <p>4-1</p> <p>4-2</p>

8. Basic construction



16	Magnet	Resin	1	(only for built-in magnet type)
15	Wear ring	Resin	1	
14	Retaining ring	Stainless steel	1	(Only $\Phi 20$ to $\Phi 63$)
13	Piston gasket	NBR	1	
12	Tube gasket	NBR	1	(FKM is available)
11	Bumper B	Resin	1	($\Phi 20$ to $\Phi 32$)
	Bumper A		1	($\Phi 40$ to $\Phi 100$)
10	Bumper A	Resin	1	
9	Scraper	NBR	1	(FKM is available)
8	Piston packing	NBR	1	
7	Rod packing	NBR	1	(FKM is available)
6	Bushing holder	Aluminum alloy	1	Chromated
5	Bushing	Resin	1	
4	Piston rod	Stainless steel	1	Hard chrome plated
3	Piston	Aluminum alloy	1	Chromated
2	Tube cover	Aluminum alloy	1	Anodic oxidization coating
1	Rod cover	Aluminum alloy	1	Anodic oxidization coating
No	Description	Material	Qty	Note