



Operation Manual

PRODUCT NAME

Stainless cylinder/
Non-adjustable air cushion type

MODEL / Series / Product Number

HF2A-C * G5 * C * * SV- *

SMC Corporation

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Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)^{*1)}, and other safety regulations.

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots
etc.



Danger

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



Warning

Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



Caution

Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Warning

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

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.



Safety Instructions

Caution

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.

Use in non-manufacturing industries is not covered.

Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

1. Specifications

1-1 Specifications

Fluid	Air
Proof pressure	1.5MPa
Max. operating pressure	1.0MPa
Min. operating pressure	0.05MPa
Ambient and fluid temperature	-10 to +70°C. -10 to +60°C with built-in magnet (No freezing)
Lubrication	Not required (non-lube)
Stroke length tolerance	to 1000st $^{+1.4}_0$ mm
Cushion	Non-adjustable air cushion + Bumper cushion
Piston speed	50 to 500mm/sec
Action	Double acting

Use the actuator with allowable kinetic energy or less.

(Refer to 2-6-1. Allowable kinetic energy (Page 12))

Warning

1. Confirm the specifications.

The product is designed only for use in industrial compressed air systems. Do not operate at pressures, temperatures or kinetic energy beyond the range of specifications, as this can cause damage to cylinder or malfunction.

(Refer to the specifications.)

2. There may be cases in which a speed-reduction circuit or a shock absorber is required.

If the driven object moves at high speeds or is heavy, it will be unfeasible for only the cylinder's cushion to absorb the shock. Therefore, provide a speed-reduction circuit to reduce the cylinder's speed before the thrust is applied to the cushion or an external shock absorber to dampen the shock. If these countermeasures are taken, make sure to take the rigidity of the mechanical equipment into consideration.

2. Installation and Handling

2-1. Air supply

The compressed air supplied to the cylinder should be filtered by SMC AF series air filter and regulated to the specified set pressure by SMC AR series regulator.

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 cylinder damage or malfunction.

2. When there is a large amount of drainage

Compressed air containing a large amount of drainage can cause the malfunction of pneumatic equipment. An air dryer or water separator should be installed upstream from filters.

3. Drain flushing

If condensation in the drain bowl is not emptied on a regular basis, the bowl will overflow and allow the condensation to enter the compressed air lines. This causes the malfunction of pneumatic equipment.

If the drain bowl is difficult to check and remove, the installation of a drain bowl with an auto drain option is recommended. For compressed air quality, refer to SMC catalog "Compressed Air Purification System".

Caution

1. When extremely dry air is used as the fluid, degradation of the lubrication properties inside the equipment may occur, resulting in reduced reliability (or reduced service life) of the equipment.

2. Install an air filter.

Install an air filter upstream near the valve. Select an air filter with a filtration size of 5 µm or smaller.

3. Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.

Compressed air that contains a large amount of drainage can cause the malfunction of pneumatic equipment, such as valves. Therefore, take appropriate measures to ensure air quality, such as by providing an aftercooler, air dryer, or water separator.

4. Ensure that the fluid and ambient temperatures are within the specified range.

If the fluid temperature is 5°C or less, the moisture in the circuit could freeze, causing damage to the seals or equipment malfunction. Therefore, take appropriate measures to prevent freezing.

For compressed air quality, refer to SMC catalog "Compressed Air Purification System".

5. Precautionary measures against condensation

Moisture condensation can occur inside pneumatic systems due to a drop in temperatures caused by the piping or operating conditions. This can degrade or wash away grease, resulting in a shortened service life or a malfunction.

For details, refer to the catalog "Precautionary measures against condensation in a pneumatic system".

6. Lubricating non-lube type cylinders

These cylinders have been lubricated for life at the factory and can be used without any further lubrication.

However, in the event that it is additionally lubricated, be sure to use class 1 turbine oil (with no additives) ISO VG32. Do not use machine oil or spindle oil.

Stopping lubrication later on may lead to a malfunction because the new lubricant will displace the original lubricant.

Therefore, lubrication must be continued once it has been started.

If turbine oil is used, refer to the corresponding Safety Data Sheet (SDS).

2-2. Design

The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

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, injury may occur, such as hands or feet getting caught in the machinery, or damage to the machinery itself may occur. Design the machinery to avoid such dangers.

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

If the moving portion of the product will pose a hazard to humans or will damage machinery or equipment, provide a construction that prevents direct contact with those areas.

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

Do not use the product where operation frequency is high or the product is exposed to vibration.

4. Design the system so that it will not apply an external force over the maximum force to the product.

The product can break, causing a risk of injury or damage to equipment.

5. The product generates a large force. Install on a sufficiently rigid mounting base, taking this force into consideration.

There is a risk of injury or damage to equipment.

6. Consider the possibility of a reduction in the circuit air pressure caused by a power failure.

When a cylinder is used in a clamping mechanism, the work piece may come off due to a decrease in clamping force because of a decrease in the circuit pressure caused by a power failure, etc. Therefore, safety equipment should be installed to prevent damage to machinery and injury. Suspension equipment and lifting devices also require measures to prevent dropping.

7. Consider a possible loss of power source.

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

8. Consider the behavior of the rotary actuator in the event of an emergency stop.

Devise a safety system so that if a person engages the emergency stop, or if a safety device is tripped during a system malfunction such as a power outage, the movement of the cylinder will not cause a hazard to humans or damage the equipment.

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

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

10. Intermediate stop

It is difficult for this product to make a piston stop at the required intermediate position accurately and precisely using a 3 position closed center type directional control valve, due to the compressibility of air. Furthermore, since valves and cylinders are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for extended periods of time.

11. Avoid synchronized operation using cylinders only.

Even if multiple pneumatic cylinders are initially set to the same speed, their speeds may vary due to changes in operating conditions. Therefore, avoid designs where a single load is moved by synchronizing multiple cylinder operations.

12. Do not make any modifications, including additional machining.

Doing so may cause human injury and/or an accident.

13. Refer to the Auto Switches Precautions for using with an auto switch.

14. When a cylinder is used in a clamping, suspending, or lifting mechanism

There is a danger of workpieces dropping if there is a decrease of thrust 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/or human injury.

Caution

1. Operate the cylinder component parts within a range such that collision damage will not occur at the stroke end.

For applications where a piston with inertial force strikes a cover and stops at the stroke end, follow the cylinder model selection procedure, or select while taking into account the allowable kinetic energy. (Refer to 2-6. Allowable kinetic energy (Page 12))

2. Avoid having a large gap between the clevis and mating bushing, as this exposes the pin to a bending load.

3. Do not let foreign matter such as cutting chips get into the product from the suction port.

4. Do not touch the cylinder during high speed and high frequency operation of the cylinder.

When the cylinder is operating at a high speed and high frequency, the cylinder tube surface temperature increases, and may cause a burn.

5. If pressure is applied to the external cylinder parts, there is a possibility that air will get inside the cylinder from the rod seal section.

(Example: inside a chamber, etc.)

6. Resumption after a long stop.

When resuming operation after a long stop, there are cases in which the starting pressure rises or there is a delay in the piston starting time due to adhesion.

Conducting several cycles of running-in operation will solve this problem. Please consider implementing this before resumption.

7. Do not use the air cylinder as an air-hydro cylinder.

If working fluid of the air cylinder is turbine oil, oil leakage can result.

2-3. Mounting and Installation

- 1) The foot mounting cylinder has a hole in the foot to drive a pin into for accurate positioning and fixing.

Warning

1. Ensure sufficient space for maintenance activities.

When installing the products, allow access for maintenance and inspection.

2. Tighten threads with the proper tightening torque.

When installing the products, follow the listed torque specifications.

3. Do not place a magnetic object near the product.

The auto switch is a magnetic sensing type. If a magnetic object is placed close to it, the actuator could operate suddenly, which could pose a hazard to humans or damage the machinery and equipment.

4. Do not perform additional machining on the product.

Performing additional machining on the product can result in insufficient strength and cause damage to the product. This can lead to possible human injury or damage to the surrounding equipment.

5. Risk to people with pacemakers

As coming into close proximity with strong magnets may interfere with the function of pacemakers, posing a life-threatening risk to those with pacemakers, they should stay away from products with built-in magnets or take safety measures to block their magnetic force. Failure to heed caution may result in the malfunction of electronic equipment such as pacemakers.

! Caution

1. Do not apply excessive lateral load to the piston rod.

The bold solid lines in Fig. 1 show the allowable lateral load on the cylinder for a certain stroke length.

Refer to Table 2 Maximum Allowable Kinetic Energy. (Page 12)

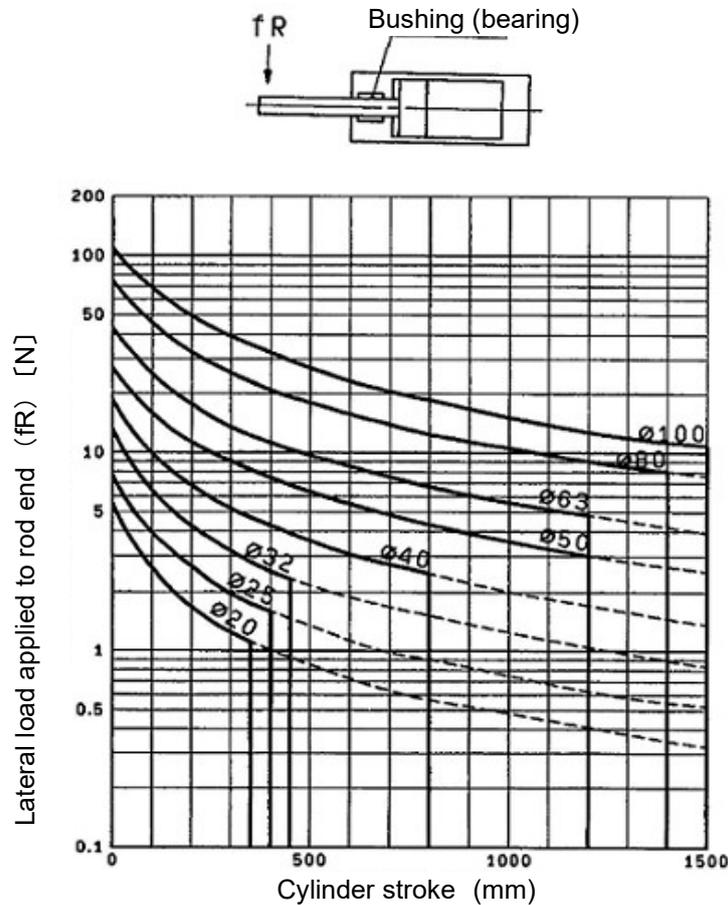


Fig. 1 Allowable lateral load applied to rod end

2. Be careful not to apply vibration or impact to the cylinder body when it is operated while fixed on one side and free on the other side (basic type, flange type). Bending moment may be applied to the cylinder by vibration generated at the stroke end, which can damage the cylinder.

In such a case, install a support bracket to suppress the vibration of the cylinder body or decrease the piston speed until the cylinder body does not vibrate at the stroke end.

Use a support bracket also when moving the cylinder body or when a cylinder is mounted horizontally and fixed at one end.

3. Be sure to connect the piston rod and the load so that their axial centers and movement directions match.

If they do not match, stress could be applied to the rod and the cylinder tube, causing the inner surface of the cylinder tube, the bushing, the rod surface, and the seals to wear and become damaged.

To address the centre misalignment in connection with a load, it is also effective to use with a floating joint or the like that absorbs the misalignment. Please consider use of a floating joint by checking the allowable eccentricity and rotating angle.

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

5.Refer to the torque in Table 1 when tightening the foot, flange and plug bolt to the cylinder.

Table 1 Tightening torque (Unit: N·m)

Bore(mm)	Foot Flange Plug bolt
20	1.5
25	2.9
32	2.9
40	4.9

6.Do not hit or grasp the sliding parts of the cylinder tube and piston rod with other objects.

The internal diameter of the tube and the sliding part of the piston rod are manufactured to precise tolerances, so that even a slight deformation may cause faulty operation.

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

7.Prevent the stoppage of rotating parts.

Prevent the stoppage of rotating parts (pins, etc.) by applying grease.

8.Do not use the product until you have verified that the equipment can operate properly.

After installation or repair, apply air and power supplies to the equipment and perform appropriate functional and leakage inspections to make sure the equipment is mounted properly.

9.Do not let foreign matter such as cutting chips get into the product from the supply port.

When the product is installed on a machine on site, the debris from drilled mounting holes can get in the supply port of the product. Take sufficient care to prevent this.

2-4. Environment

Warning

1. Do not expose the product to direct sunlight for an extended period of time.
2. Do not use in a place subject to heavy vibration and/or shock.
3. Do not mount the product in locations where it is exposed to radiant heat.
4. When using the cylinder in a dusty environment or location where it is exposed to splashes of oil, install a protective cover over the whole cylinder. With a single acting cylinder in particular, pay attention not to allow dust and water droplets to enter the cylinder from the breathing hole.
5. When using auto switches, do not operate in an environment with strong magnetic fields.
6. A decrease in the base oil of grease may be accelerated by the properties of the compressed air used in pneumatic equipment, the external environment, operating conditions, etc., and the resulting drop in lubricating performance may have an effect on the equipment's service life.
7. **Avoid storing the product in humid conditions.**
Store the cylinder in an environment with a non-excessive humidity to prevent generation of rust.

Caution

1. Internal lubricant or the base oil of grease may seep out of the cylinder depending on the operating conditions (an ambient temperature of 40°C or more, pressure retention, low-frequency actuation, etc.). Take great care when a clean environment is required.

2.Preparation before piping

Before piping, perform air blow (flushing) or cleaning to remove any cutting chips, cutting oil, dust, etc. from the piping and fitting.

3.Wrapping of sealant tape

When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not enter the piping.

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

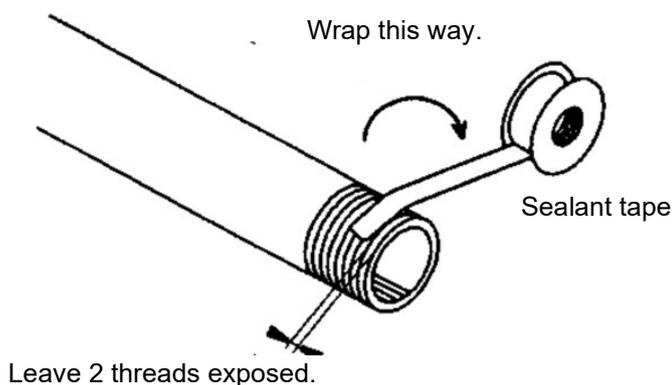


Fig. 2 Sealant tape

2-5. Speed control

When the piston speed is adjusted, install SMC AS series speed controller near the air supply port to adjust to the specified speed. There are two methods of speed adjustment, one is to restrict air supplied to the product (meter-in), and the other is to restrict air exhausted from the product (meter-out). Normally, the meter-out type should be adopted.

Caution

1.Piston speed should be controlled gradually from low speed to the specified speed with a speed controller fully closed.

2-6. Cushion

Caution

1. There is no cushion adjustment.
2. Note that there may be a slight bounce at the stroke end.
3. It is not intended to slow down the piston speed near the end of the stroke.

2-6-1. Allowable kinetic energy

The applied kinetic energy must be within the allowable value.

Please refer to "Fig.1 Allowable lateral load applied to rod end ".(Page 8)

Table 2 Allowable kinetic energy

Bore(mm)	E _{max} (J)
20	0.28
25	0.41
32	0.66
40	1.2

Formula

$$E = (m/2) \times v^2$$

E: Kinetic energy(J)

m: Load mass(Kg)

v: Maximum piston speed(m/s)

Satisfy the range of $E \leq E_{\max}(J)$.

Warning

1. Use the actuator with allowable kinetic energy (Table 2) or less.

Operation with a kinetic energy over the allowable value can break the product and cause injury or damage to equipment. If excessive kinetic energy is expected, install an external absorber to prevent impact to the body of the product. In this case, please verify the rigidity of the equipment carefully.

2-7. Control of direction

To switch the operating direction of the cylinder, mount an applicable solenoid valve selected from SMC's range of solenoid valves.

Warning

1. Design a circuit to prevent sudden action of a driven object.

When the product is actuated by an exhaust center type directional control valve or when one side of the piston is pressurized with air exhaust, such as when the product is started after the exhaust of the residual pressure from the circuit, driven objects may act suddenly at high speed. In such cases, injury may occur, such as hands or feet getting caught in the machinery, or damage to the machinery itself may occur. Design the machinery to avoid such dangers.

2-8. Auto switches

When an auto switch is mounted, refer to Fig. 3, 4 and 5.

Caution

1. Please use the switch rail accessory to mount the auto switch.
2. Tighten mounting screws to the appropriate torque.
3. The auto switch can only be used for cylinders with a built-in magnet for auto switch (e.g. HF2A-CDG5).

How to install the switch rail

Remove the rail plug attached to the cover and use the fixing bolts included with the switch rail accessory to secure the switch rail and base as shown in Figure 3.

The tightening torque for the fixing bolts should be 1.12 to 1.68 N·m.

The auto switch that can be installed is D-F6□.

Fig. 3 How to install the switch rail

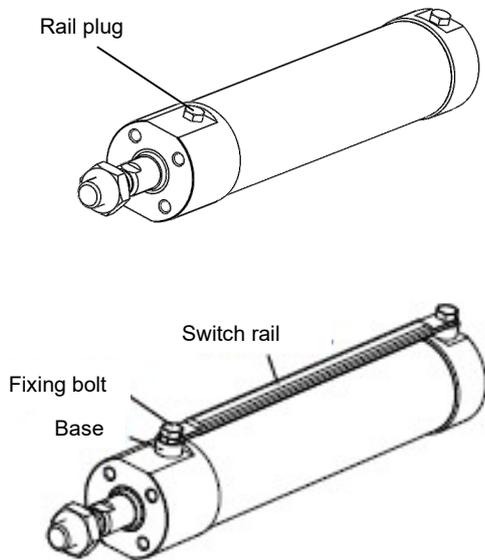


Fig. 4 How to install the switch

Proper tightening torque

When the mounting screw is tightened, use a special tool (D-F6B-650) or torque wrench. The tightening torque of the M3 mounting screw should be 0.8 to 1.4 N·m.

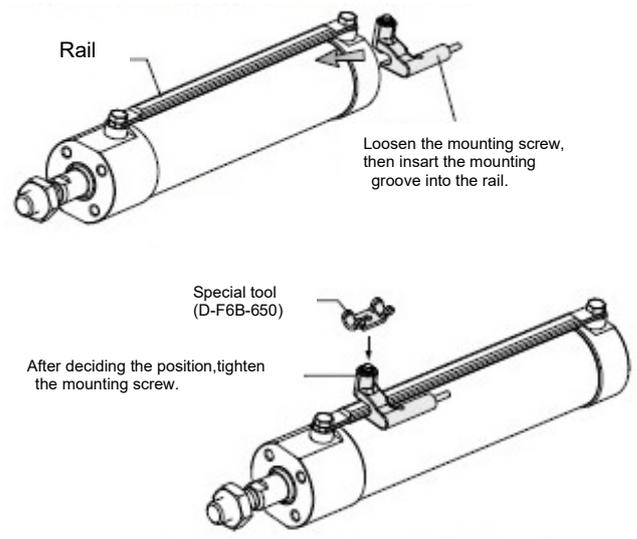
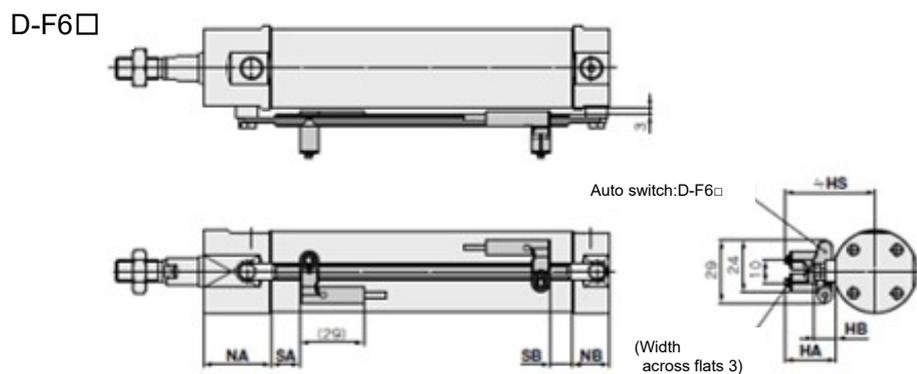


Fig. 5 Auto switch proper mounting poition (detection at stroke end) and how to install the switch rail and switch



(mm)

Bore size	Stroke range	NA	NB	SA	SB	HS	HA	HB
20	~600	29.5	15	10.5	11	34.8	20.3	6.6
25		30	15	11.5	12	37.5	23	9.3
32		31.1	16.6	13	10.3	41.4	23.6	9.9
40		33.5	17.1	14.2	14.3	45	23	9.3

Note) The above values are a guide in the stroke end detection of the mounting position of the auto switch. Please adjust in an actual setting after confirming the operating state of the auto switch.

3. Maintenance

3-1. Checks

The following checks are required for proper cylinder operation.

- 1) Smooth operation
- 2) Changes in piston speed and cycle time
- 3) Abnormal stroke
- 4) Looseness of mounting bolt and rod end nuts
- 5) Looseness of mounting frame and excessive deflection
- 6) Internal and external leakage (Change in output)
- 7) Damage to the piston rod sliding surface
- 8) Clogging and discharge drainage of the air filter
- 9) Lubrication of rotating parts (double knuckle joint, clevis pin, etc.)
- 10) Position of auto switches

When any abnormality is found as a result of checking the points above, eliminate causes and take necessary measures such as retightening screws and the application of grease.

Warning

1. As a minimum, maintenance should be performed according to the above items. Perform additional maintenance as necessary.

Improper handling can cause damage and malfunction of equipment and machinery.

2. Maintenance work

If handled improperly, compressed air can be dangerous.

Assembly, handling, repair, and element replacement of pneumatic systems should be performed by a knowledgeable and experienced person.

3. Drain flushing

Remove drainage from air filters regularly.

4. Removal of equipment, and supply/exhaust of compressed air.

Ensure that drop prevention measures and safe lock out of the moving parts are taken, the power of the facility and supply air is shut off and the compressed air in the system is exhausted before removing the equipment.

Before restarting the equipment, confirm that measures are taken to prevent sudden action.

3-2. Replacement of seals

It is possible to replace the rod seal, piston seal, scraper and lube-retainer.

Warning

1. Only people who have sufficient knowledge and experience are allowed to replace seals.

The person who disassembles and reassembles the cylinder is responsible for the safety of the product.

Caution

2. When replacing seals, carefully handle parts to prevent injury to your hands or fingers on the corners of parts.

3-2-1. Disassembly / Reassembly

Caution

1. **Disassemble and assemble the cylinder on a clean cloth in a clean location. Perform on a clean cloth.**

For disassembling, hold the flats of the tube cover gently in a vice and hold the flats of the rod cover with a spanner or adjustable wrench to loosen and remove the rod cover. When reassembling, tighten 0 to 2 degrees more than the original position before disassembling.

3-2-2. Removal of seals

- 1) Rod seal, scraper, lube-retainer

Insert a precision screwdriver from the front of the cover to pull out the seal as shown in Fig. 6.

Caution

1. **Take care not to damage the seal groove of the cover at this time.**

- 2) Piston seal, tube gasket

Wipe off grease around seal first to make seal removal easier.

As shown in Fig. 7, hold the piston seal with one hand and push it into the groove so that the piston seal can be lifted off and pulled out without using a precision screwdriver.

The groove of the rod cover is deep, so if the rod seal is removed with a precision screwdriver, it might be damaged.

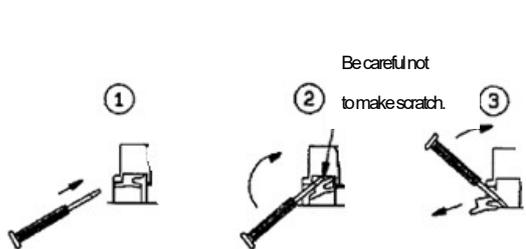


Fig. 6 How to remove rod seal, scraper, lube-retainer

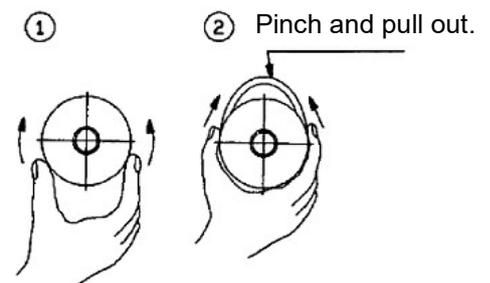


Fig. 7 How to remove seal

3-2-3. Grease

! Caution

1. Use SMC's recommended grease.

Grease pack part number: GR-H-010 (10g)

1) Rod seal, scraper, lube-retainer

Apply a thin layer of grease to all surfaces of the new seal to make it easy to mount the rod seal and improve sealing.

Fill the groove of the seal with grease, which is necessary for operation.

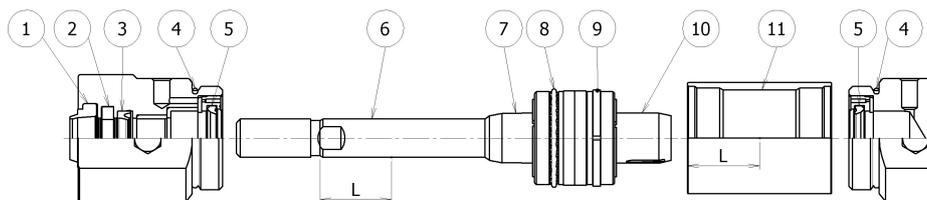
2) Piston seal, tube gasket

Apply a thin layer of grease to the all surfaces of the seal to make it easy to mount the seal.

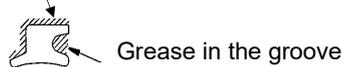
3) Parts of cylinder

Grease is applied to the locations shown in Fig. 8. The amount of grease per cylinder of 100 stroke is shown in attached table 4. Roughly, one scoop with a forefinger is approximately 3g.

$$L \doteq 100\text{mm, or stroke} \times \frac{1}{2}$$



Grease on the outer circumference



① Rod seal part

Approx. 3g



A little less than 1cm

Amount of grease

Fig. 8 Position for application of grease

Table 4 Amount of grease

units: g

Stroke \ Bore size	φ 20	φ 25	φ 32	φ 40	Position for grease
					① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪
At 100st	2	3	3	3~4	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪
50st added	0.5	0.5	0.5	1	⑥ ⑪

3-2-4. Mounting of seals

1) Rod seal (Fig.9)

Pay attention to the mounting direction of the seal.

Apply grease all over the seal and inner surface of the bushing.

2) Piston seal (Fig. 10)

Mount with care not to twist the piston seal. Apply grease to the seal groove and outer circumference by rubbing grease into them.

3) Tube gasket

Mount with care not to twist the tube gasket.

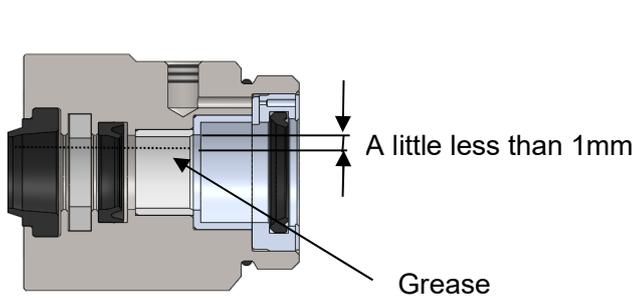


Fig. 9 Rod seal

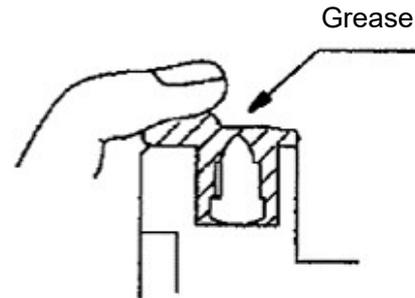


Fig. 10 Piston seal

! Caution

1. Confirm that there is no problem with operation and air tightness after assembly.

3-3. Consumable parts

3-3-1 Replacement parts

	ø20	ø25	ø32	φ40
Seal kit number	CG5C20V-PS	CG5C25V-PS	CG5C32V-PS	CG5C40V-PS
Contents of the seal kit	Rod seal(1 pc) Tube gasket(2 pcs) Lube-retainer(1 pc)		Piston seal(1 pc) Scraper(1 pc) Wearing(1 pc)	
Grease pack	GR-H-010(10g)			

3-3-2. Storage of seals

! Caution

1. Store seals in sealed packaging such as polyethylene bag and place it in a box.
2. Avoid locations exposed to direct sunlight and high temperature and humidity. In particular, isolate from equipment that can generate heat, radiation and ozone.
3. Do not stack a lot of seals, or deform or damage seals by putting a heavy object on top of them.
4. White particles can emerge from the surface of the seal during storage, but they do not affect its performance.

3-4. Troubleshooting

Problem	Major causes	Countermeasures
Operation has lost smoothness.	1. Lubrication failure	- Apply the specified grease after cleaning of parts (Grease pack: GR-H-010(10g))
	2. Deformation of piston rod	- Replace the cylinder with a new one. When reinstalling the product, adjust the load and mounting position.
	3. Insufficient pressure	- Supply appropriate pressure.
	4. Operation at a low speed outside of the limit.	- Use a low speed cylinder.
Output force has decreased.	1. Air leakage from piston seal	- Replace the piston seal with a new one. See 3-2. Replacement of seals. (Page 15)
	2. Air leakage from rod seal	- Replace the rod seal with a new one. See 3-2. Replacement of seals. (Page 15)
	3. Insufficient air pressure	- Supply appropriate pressure.
	4. Insufficient flow rate	- The resistance in the fluid path may have increased due to deformation or foreign matter entering the product. Perform repair or cleaning.
	5. Incorrect mounting position of the product	- Mount in a proper position without any force applied to the product.
	6. Deformation of piston rod	- Replace the cylinder with a new one. When reinstalling the product, adjust the load and mounting position.
	7. Lubrication failure	- Refer to the countermeasure for the trouble "Operation has lost smoothness/ lubrication failure."
Piston speed is too fast.	1. Speed controller is not used.	- Use a speed controller suitable for the size of the product. Refer to the catalog and operation manual of the speed controller for details.
	2. Insufficient fine adjustment of speed controller	- Select a speed controller, which can be adjusted to the required speed. Refer to the catalog and operation manual of the speed controller for details.
Piston speed is too slow.	1. Directional control valve is too small.	- Select directional control valves with suitable size. Refer to the catalog and operation manual of the directional control valve for details.
	2. Resistance of equipment in the piping route is too large	- Use components and equipment of an appropriate size. It affects the piping diameter and length. Equipment at the exhaust side should also be of an appropriate size. Refer to the catalog and operation manual of the components and equipment for details.
The product sometimes does not operate.	1. Operation at a very low speed	- Operation at a very low speed can create a condition with almost no pressure difference between the supply side and exhaust side and lower sealing effect, which can cause operation failure. Keep the specified piston speed.
	2. Problem of equipment other than this product	- Check all items in the system one by one to find the cause. Refer to the catalog and operation manual of the components and equipment for details.

Problem	Major causes	Countermeasures
The product has become unable to operate.	1. Damage of piston seal	- If there is leakage from the piston seal, it will be exhausted from the exhaust port of the directional control valve all the time. Replace the piston seal. See 3-2. Replacement of seals. (Page 15)
	2. Problem of equipment other than this product	- Check all items in the system one by one to find the cause. Refer to the catalog and operation manual of the components and equipment for details.
	3. Insufficient pressure	- Supply appropriate pressure.
The piston rod has been deformed and broken.	1. Operation at high speed	- Replace the cylinder with a new one. Operation at a high speed can cause impact from the load, and deform and damage the product. Keep within the specified piston speed and allowable kinetic energy.
	2. Excessive external force	- Structural interference, eccentric load or over-load may cause damage and deformation of the cylinder. Eliminate the cause and replace the product with a new one.
Piston speed cannot be adjusted with the speed controller.	1. Incorrect speed controller selection	- Use a speed controller suitable for the size of the product. Refer to the catalog and operation manual of the speed controller for details.
	2. Problem of the speed controller	- Replace the speed controller with a new one. Refer to the catalog and operation manual of the speed controller for details.
The product has stick and slip movement.	1. Speed too slow	- Use a low speed cylinder.
	2. Insufficient margin of output	- Supply appropriate pressure. - Replace with a product of a larger bore size.
	3. Use of a meter-in circuit	- In case of the operation with low pressure or low speed, the operation may become stable if the product is used with meter-in. Use of a meter-out circuit.
The product jump out after being stopped for extended periods of time.	1. Fluctuation of residual pressure in the product between continuous operation and operation after stoppage for extended periods of time	- Consider the use of a suitable pneumatic circuit to prevent sudden action of the product.
The cushion does not work.	1. Allowable kinetic energy exceeded	-Keep your kinetic energy within acceptable cushioning or use an external cushion.
Switch does not turn on (Switch sometimes does not turn on)	1. Power supply failure or connection failure	- Check the power supply. - Connect the product properly.
	2. Displacement of auto switch position	- Try to slide the auto switch over the product to check its ON position, and move it to a correct position.
	3. Reduction of magnetic force	- If there is a magnetic source near the product, move it away or install a shield plate to reduce the effect from the magnet. - When the product gets hot, adjust operating frequency to lower it to 60°C. - If the above measures do not resolve the problem, replace the product with a new one.

Problem	Major causes	Countermeasures
Switch does not turn on (Switch sometimes does not turn on)	4. Lowered sensitivity of auto switch	- Eliminate the problem of ambient temperature, vibration, or impact. Replace the switch with a new one if the problem is not solved.
Switch does not turn off (Switch sometimes does not turn off)	1. Fused contact of auto switch (reed type)	- Check the voltage and load are within the specified rated values, and replace the auto switch with a new one.
	2. External magnetic field keeping auto switch on.	- If there is a magnetic source near the product, move it away or install a shield plate to reduce the effect from the magnet.

4. Basic Circuit for Cylinder Operation

The basic circuit for operating the product with air filter, regulator, solenoid valve and speed controller (meter-out) is shown in the following figure.

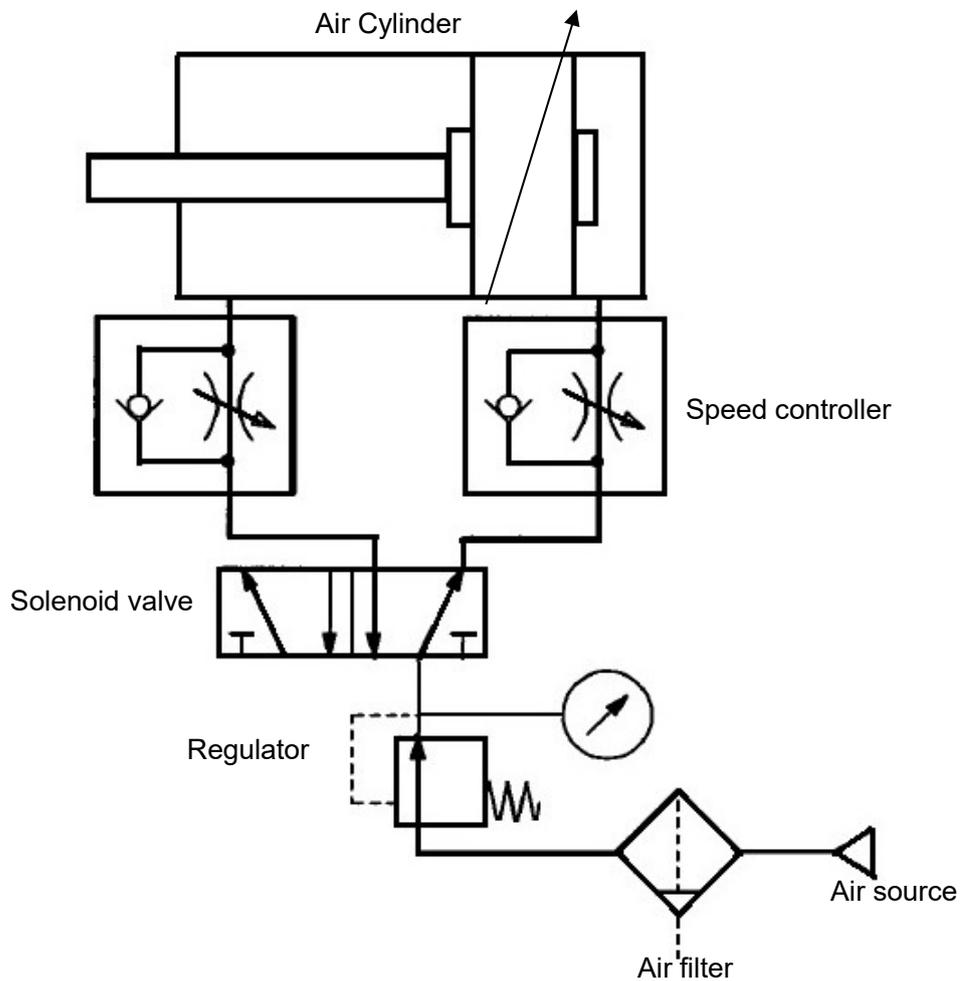
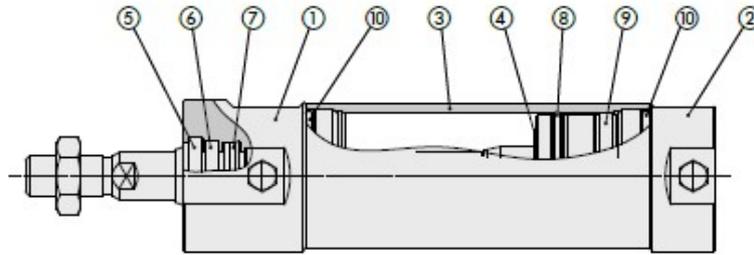


Fig. 10 Basic Circuit

5. Construction



Component parts

NO.	Description
1	Rod cover
2	Head cover
3	Cylinder tube
4	Piston ass'y
5	Scraper
6	Lube-retainer
7	Rod seal
8	Piston seal
9	Wearing
10	Tube gasket

Replacement parts/Seal kit

Bore(mm)	Seal kit no.	Contents
20	CG5C20V-PS	Set of nos.above ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
25	CG5C25V-PS	
32	CG5C32V-PS	
40	CG5C40V-PS	

※Since the seal kit does not include a grease pack, order it separately.

Grease pack part no.: GR-H-010 (10 g)

Fig. 11 Double acting/single rod

6. Other safety Instructions

- 1) When selecting equipment, carefully consider the application, required specifications, and operating conditions (fluid, pressure, flow rate, filtration, and environment), making sure not to exceed the specification range.
- 2) Quality management relating to hygiene for food and medical treatment is not implemented for this product.
- 3) Compressed air hygiene should be managed in accordance with national and regional rules and regulations.
- 4) Uses NSF H1 grade food grease.
- 5) Equipment that comes into contact with food sold as a commercial product must use materials that comply with laws and regulations.
- 6) If used above food sold as a commercial product, there is a chance that grease, wear powder, etc., will fall on top of the product. Therefore, be sure to take appropriate preventive measures.
- 7) If food products sold as a commercial product or cleaning fluids come into contact with the equipment, it may result in corrosion or reduced lubrication, which may shorten the life of the equipment.
- 8) Please use the product in accordance with the specifications provided in the catalog/operation manuals. It is your responsibility to check the suitability of your workpiece and equipment.

Revision history

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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