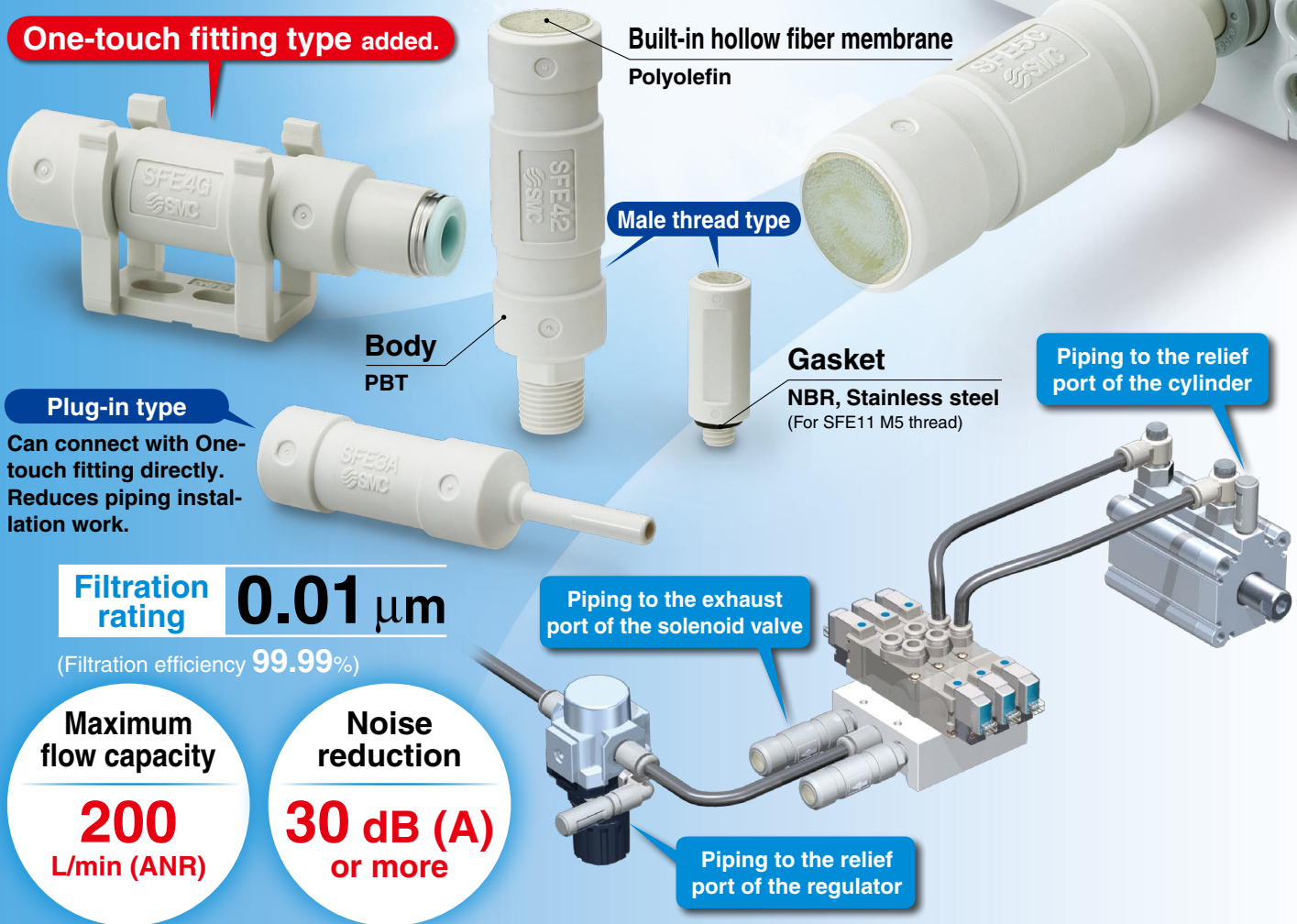
Clean Exhaust Filter

RoHS New

This filter enables direct exhaust of air in a clean room!

(Cleanliness class 4*: ISO14644-1) (* Based on SMC's measuring conditions.)

Air can be directly exhausted in a clean room only by mounting this product to the pneumatic equipment in the clean room.



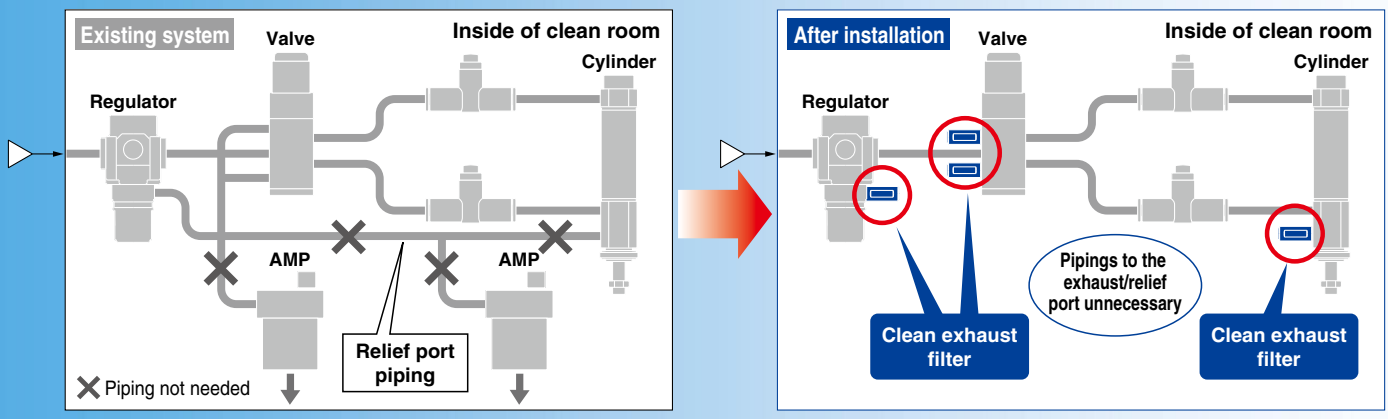
Filtration rating 0.01 μm

(Filtration efficiency 99.99%)

Maximum flow capacity
200 L/min (ANR)

Noise reduction
30 dB (A) or more

No need for piping for exhaust air and relief air. Reduces piping installation work and space.

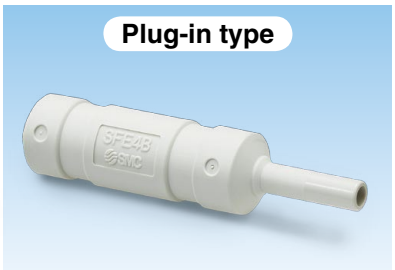


Series SFE

SMC

CAT.ES120-6B

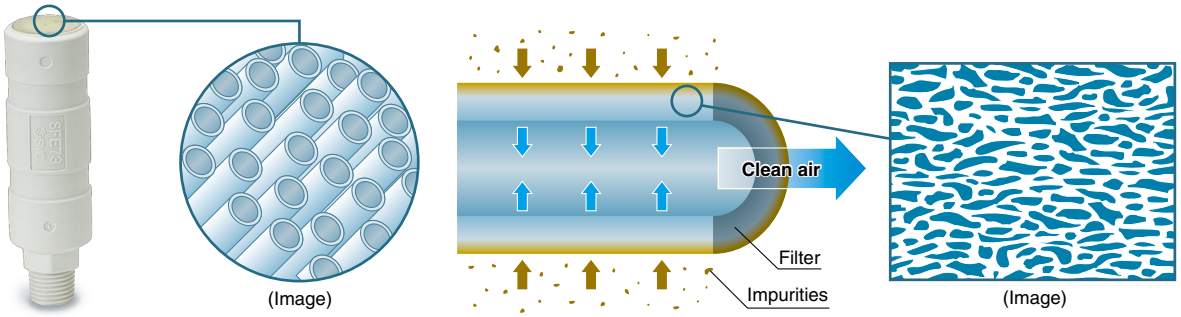
Mounting variations



Series	Maximum flow capacity L/min (ANR)	M5	R1/8	R1/4	ø4	ø6	ø8	ø10	ø4	ø6	ø8	ø10
SFE1	3	●										
SFE3	30				●				●			
SFE4	65		●			●				●		
SFE5	130		●	●			●				●	
SFE7	200			●				●				●

Hollow fiber membrane

The hollow fiber membrane has a porous construction with numerous fine holes on a straw type fiber membrane wall.
The hollow fiber membrane filter filtrates the impurities from the compressed air through the overlapping layered fine holes.



One-touch fitting type

Space-saving installation

- When there is no space in the exhaust direction
- In the case of interference with fittings

Model Selection

Selection Procedure

Model selection for the clean exhaust filters uses the flow-rate characteristic graphs for the corresponding exhaust flow rate from the equipment that the clean exhaust filter is mounted to.
Calculate the flow rate by performing “1. Calculation of Exhaust Flow Rate”, and then, select the correct model following the instructions in “2. Model Selection Based on Exhaust Flow Rate”. When the exhaust flow rate is already known, start selecting the model from “2. Model Selection Based on Exhaust Flow Rate”.

1. Calculation of Exhaust Flow Rate

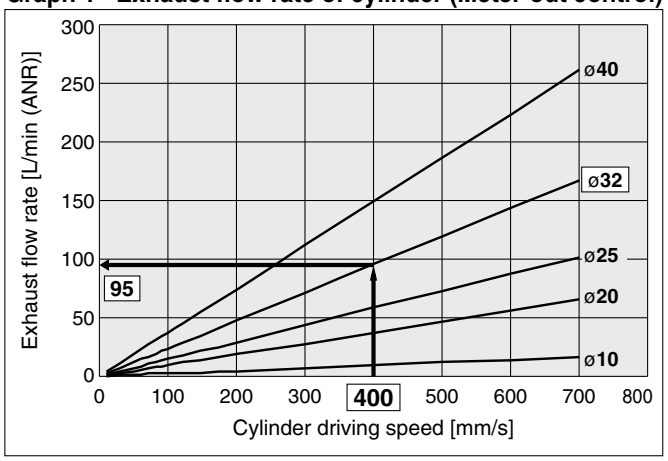
1) Exhaust flow rate from cylinder (from solenoid valve)

1. Find the exhaust flow rate of the cylinder from the cylinder bore size and the actuating speed using the graph shown below.
2. Correct the exhaust flow rate that is found into exhaust flow rate at the operating pressure (supply pressure to the cylinder) by calculation using the conversion formula shown below.

$$\text{Corrected exhaust flow rate} = \text{Exhaust flow rate} \times \frac{\text{Supply pressure to the cylinder (gauge pressure)} + 0.1}{0.5}$$

3. To operate more than one cylinder using collective piping with manifolds, etc, total the exhaust flow of the cylinders to find the maximum flow capacity.

Graph 1 Exhaust flow rate of cylinder (Meter-out control)



Example) Bore size: ø32, Driving speed: 400 mm/s,
Supply pressure: 0.5 MPaG
1. From the graph, exhaust flow rate is found to be 95 L/min (ANR).
2. Corrected exhaust flow rate found with the conversion formula:

$$95 \times \frac{0.5 + 0.1}{0.5} = 114 \text{ L/min (ANR)}$$

2) Exhaust from ejectors

In the case of ejectors, the exhaust flow rate is the total of the suction flow rate and the air consumption.

3) Exhaust from other equipment

Use the air consumption specified for each piece of equipment as a standard.

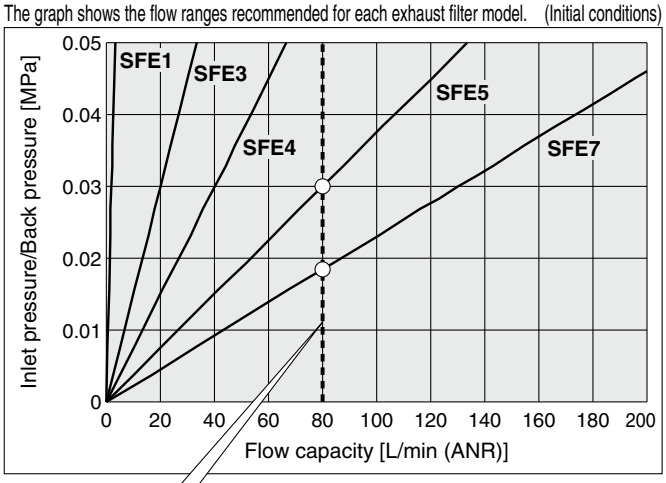
2. Model Selection Based on Exhaust Flow Rate

The exhaust flow rate that is calculated in step “1. Calculation of Exhaust Flow Rate” is the flow capacity shown in Graph 2. Select the model that is shown with a point where the dotted line, for flow capacity, and the solid line, for flow-rate characteristics, intersects.

- Some equipment may have problems with the operation or performance when back pressure is applied. Check the equipment’s back pressure range, with the catalog etc, and that the equipment will not be influenced, and select a model within that range.
- Long piping between the cylinder and the exhaust port increases exhaust resistance. Give some margin with the selected model.
- Depending on the equipment that the clean exhaust filter is mounted to, the filter body may interfere with the piping, making it difficult to be mounted. Please confirm the external dimensions so that it may cause no interference.

Graph 2 Flow-rate characteristics

The graph shows the flow ranges recommended for each exhaust filter model. (Initial conditions)



When the flow capacity is 80 L/min (ANR), the graph lines of **SFE5** and **SFE7** reach 80 L/min (ANR), thus either of these two models can be selected.

Clean Exhaust Filter
Series SFE

RoHS

How to Order

Male thread type

Plug-in type

One-touch fitting type

SFE 11

● **Size/Port size**

Male thread type

Symbol	Port size	Max. flow capacity L/min (ANR)
11	M5 x 0.8	3
42	R1/8	65
52	R1/8	130
53	R1/4	130
73	R1/4	200

Plug-in type

Symbol	Port size	Max. flow capacity L/min (ANR)
3A	ø4	30
4B	ø6	65
5C	ø8	130
7D	ø10	200

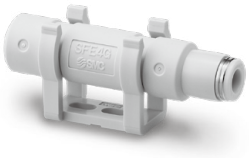
One-touch fitting type

Symbol	Applicable tubing O.D.	Max. flow capacity L/min (ANR)
3F	ø4	30
4G	ø6	65
5H	ø8	130
7J	ø10	200

Bracket

SFE-BR 3

Symbol	Applicable model
3	SFE3□
4	SFE4□
5	SFE5□
7	SFE7□



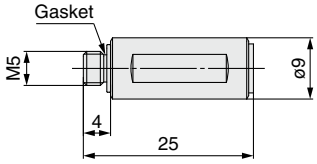
Specifications

Model		SFE11	SFE3□	SFE4□	SFE5□	SFE7□
Fluid Note 1)		Air				
Maximum flow capacity Note 2)		Up to 3 L/min (ANR)	Up to 30 L/min (ANR)	Up to 65 L/min (ANR)	Up to 130 L/min (ANR)	Up to 200 L/min (ANR)
Filtration rating Note 3)		0.01 μm (Trapping efficiency 99.99%)				
Noise reduction Note 3)		30 dB (A)				
Operating temperature		5 to 45°C				
Differential pressure proof Note 4) **(Maximum operating pressure)**		0.1 MPa				
Material Note 5)	**Body**	PBT, Polyolefin, Polyurethane, PP*, Stainless steel*, EPDM (Fluoro coated)*				
	Gasket	NBR, Stainless steel	—			
Weight	**Male thread**	1 g	—	7 g	12 g	17 g
	Plug-in	—	3 g	6 g	11 g	16 g
	One-touch fitting	—	5.5 g	8 g	16 g	24 g
Bracket weight		—	1.2 g	2.5 g	3.5 g	5.5 g
Applicable tubing material Note 6) **(One-touch fitting type)**		—	PFA, Polyolefin, Soft polyolefin, Polyurethane			
Replacement period		· 2 years or when back pressure reached 0.1 MPa · When the system fails to operate normally due to clogging				
Packaging		Antistatic double packaging processes				

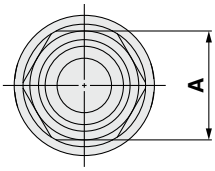
Note 1) Do not use this product in air containing ozone, since it may break.
Note 2) Model should be selected based on the flow capacity. (Refer to page 2.)
Note 3) Based on SMC's measuring conditions.
Note 4) Pressure applied to SFE, and not supply pressure to the equipment that SFE is mounted to (e.g. solenoid valve, cylinder).
Note 5) The materials with an asterisk (*) are used for the One-touch fitting type only.
Note 6) Due to the softness of polyurethane tubing, it may fold when being inserted. Hold the end of the tubing and insert it all the way in.

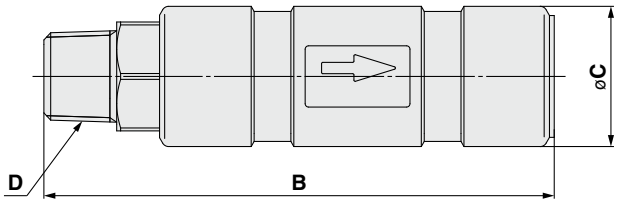
Dimensions

SFE11



SFE42/52/53/73

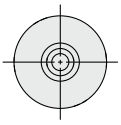


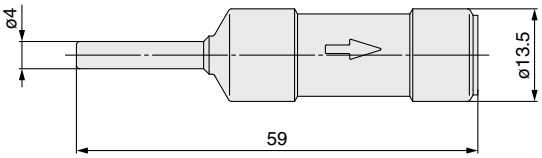


Dimensions (mm)

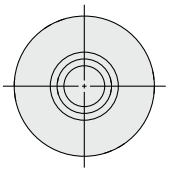
Model	A	B	C	D
SFE42	10	62	16.5	R1/8
SFE52	10	71	20.5	R1/8
SFE53	17	75	20.5	R1/4
SFE73	17	84	24	R1/4

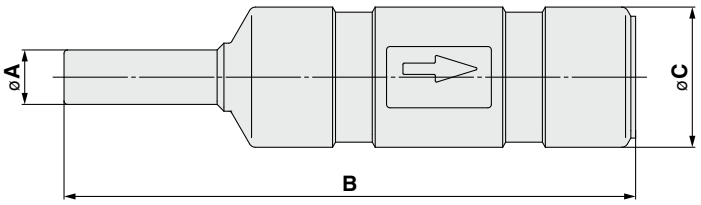
SFE3A





SFE4B/5C/7D



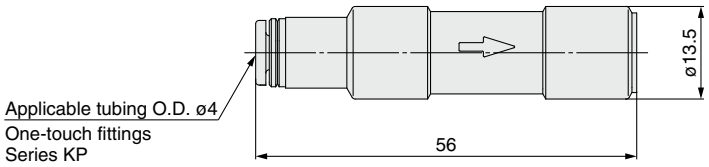


Dimensions (mm)

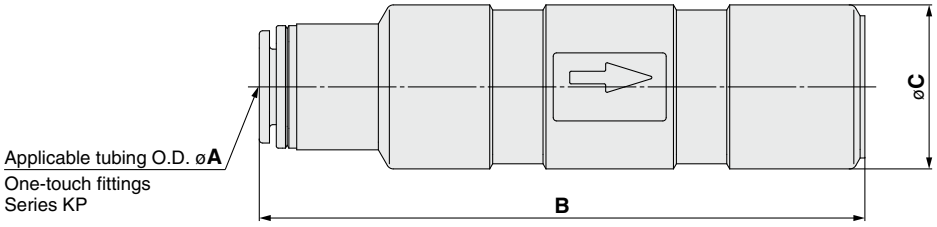
Model	A	B	C
SFE4B	6	73	16.5
SFE5C	8	84	20.5
SFE7D	10	94	24

Dimensions

SFE3F



SFE4G/5H/7J



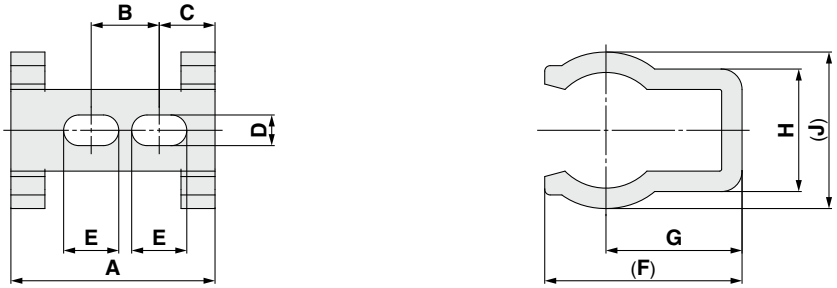
Dimensions (mm)

Model	A	B	C
SFE4G	6	68.5	16.5
SFE5H	8	79	20.5
SFE7J	10	89	24

Bracket

SFE-BR3

SFE-BR4/5/7



Dimensions (mm)

Model	A	B	C	D	E	F	G	H	J
SFE-BR4	30	16	7	4.5	7.5	(24.5)	17	15.5	(19.5)
SFE-BR5	30	10	8.2	4.5	8.1	(29)	20	18	(23)
SFE-BR7	34	14	7.35	4.5	9.8	(35)	24	20	(27.3)

( ): Reference dimensions

Specific Product Precautions

Be sure to read this before handling. Refer to the back cover for Safety Instructions. For Air Preparation Equipment Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, http://www.smcworld.com

Selection

⚠ Warning

1. **Thoroughly and carefully confirm the purpose of use, required specifications and operating conditions (fluid, pressure, flow rate, filtration rating, and environment), then select a model within the specifications.**
2. **Do not use this product for any purposes that may adversely influence, directly or indirectly, the human body such as for food or medical applications.**
3. **Do not use air which contains ozone, as it will cause damage to the product.**

Mounting

⚠ Caution

1. **Flush and clean the piping before connecting it to the product.**
2. **Do not apply excessive force to the product.**
   Install piping so that it does not apply pulling, pressing, bending or other forces on the products.
   Tighten the screws by hand, and then apply a wrench to the wrench flats to tighten the screw for additional 1 to 2 rotations.
   For the model with the M-thread, tighten the tip of the main body securely by hand until it is in contact with the end face, and then retighten it by hand. At this time, note that the retightening amount should be 30° or less. (Tighten it with 0.2 N·m or less.)
3. **Do not mount the product in a place where dust will be stirred up by the exhaust air from the product and affect peripheral equipment.**
4. **Do not mount the product in a location where air from the product will be directly exhausted to the workpiece.**
5. **If installing the products to valve ports, interference may occur with the fittings. Please confirm the dimensions before installing.**

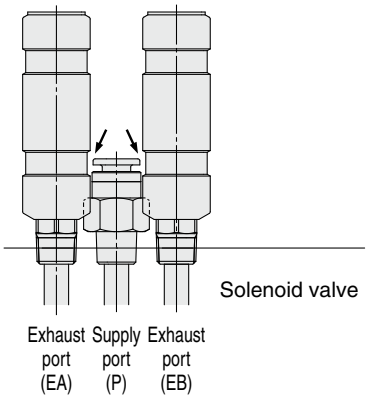


Fig. Example of the interference with fittings

Supply Air

⚠ Caution

1. **The product cannot be used with air containing water droplets.**
2. **Install a mist separator (Series AM), micro mist separator (Series AMD), or micro mist separator with pre-filter (Series AMH) on the air supply side.**

Supply Air

⚠ Caution

3. **When using on the ejector etc., do not allow liquids such as water or oil to be drawn in with the air.**

Operating Environment

⚠ Warning

1. **Do not operate under the conditions listed below due to a risk of malfunction.**
   1) In locations having ozone, corrosive gases, organic solvents, and chemical solutions, or in locations in which these elements are likely to adhere to the equipment.
   2) In locations in which sea water, water, or water steam could come in contact with the equipment.
   3) Where the product is exposed to ultraviolet rays or temperature increase.
   4) Where the product is exposed to heat sources or in areas that the product is exposed to radiant heat.
   5) In locations that are exposed to direct sunlight.
   6) In locations that are exposed to shocks and vibrations.

Maintenance

⚠ Warning

1. **Replace the product with a new one right away when it reaches its life.**
   Make sure to verify the operating conditions of the actuator at least once a day.
   — Criteria of the product's life —
   The service life of the product ends when either of the following two conditions occurs.
   1) After 2 years of usage has elapsed.
   2) When the back pressure of the SFE reaches 0.1 MPa even though the operating period has been less than 2 years.
   3) When the system fails to operate normally due to clogging.

Handling of One-touch Fitting Type

⚠ Caution

1. **Clean One-touch fittings (Series KP) are used for the One-touch fitting type. Grease is not used due to the series KP oil-free specifications. For this reason, a greater insertion force is required when the tube is installed. In particular, polyurethane tubing may fold when inserted due to its softness. Hold the end of the tubing, and insert it all the way in slowly and securely.**
2. **The outside diameter of tubes that have been used at high temperatures or for long periods of time will expand, and in some cases pipe fittings cannot be reattached. Tubes that cannot be attached should be discarded and replaced with new ones.**
3. **Refer to the precautions of the KP series for handling.**

⚠ 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.

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

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

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

*1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots – Safety.
etc.

⚠ 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. **Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
   1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
   2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
   3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
   4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

⚠ Caution

1. **The product is provided for use in manufacturing industries.**
   The product herein described is basically provided for peaceful use in manufacturing industries.
   If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
   If anything is unclear, contact your nearest sales branch.

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.

Revision history

Edition B ∗ One-touch fitting type added.

ST