No.FGX-OM-Q013-A

Operation Manual

PRODUCT NAME

In-line Air Filter

MODEL / Series / Product Number

Series ZFC

ZFC1*-*
ZFC3*-*
ZFC5*-*
ZFC7*-*

SMC Corporation

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In-line Air Filter 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 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 10218-1992: Manipulating industrial robots -Safety.
etc.

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.

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.

In-line Air Filter Safety Instructions

⚠ 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.**

Series ZFC
Specific product precautions (1)

Be sure to read before handling.
Refer to “Handling Precautions for SMC Products” (M-E03-3) for Safety Instructions.

Design

⚠ Warning

1. **Confirm the specifications.**
   Products represented in this catalog are designed only for use in compressed air systems (including vacuum).
   Do not operate at pressures, temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the specifications.)
   Please contact SMC when using a fluid other than compressed air (including vacuum).
   We do not guarantee against any damage if the product is used outside of the specification range.
2. **Modification prohibited**
   Do not make any modifications, including additional machining. It may cause human injury and/or an accident and will void the warranty.

⚠ Caution

1. **When vacuum adsorption and release are used on the same line, the dust trapped by the vacuum adsorption scatters again during vacuum release. Therefore, both cacuum pressure and positive pressure cannot be used together on the same line.**

Mounting

⚠ Warning

1. **Operation manual**
   Install the products and operate them only after reading the operation manual carefully and understanding its contents. Also, keep the manual where it can be referred to as necessary.
2. **Maintenance space**
   Allow sufficient space for maintenance and inspection.
3. **Observe the tightening torque for screws.**
   Tighten the screws to the recommended torque for mounting the product.
4. **Connect tubing to the IN and OUT One-touch fittings in accordance with the precautions for One-touch fittings.**

⚠ Caution

1. **Connect the piping after checking the arrow indication showing the flow direction on the body. If the piping is connected the other way around, it is not possible to seal the element.**
2. **Allow a sufficient margin of the tube length when piping in order to prevent twisting, tensile, moment loads, vibration, or impact being applied to the tubes and filter body.**

Air Supply

⚠ Warning

1. **Type of fluids**
   Please consult with SMC when using the product in applications other than compressed air.
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.

Refer to “SMC Air Preparation System” for further details on compressed air quality.

4. **Use clean air.**
   Do not use compressed air that contains chemicals, synthetic oils that include organic solvents, salt, corrosive gases, etc., as they can cause damage or malfunction.

Operating Environment

⚠ Warning

1. **Do not use in an atmosphere where corrosive gases, chemicals, sea water, water, or water steam is present. Do not use in cases where there is direct contact with any of the above.**
2. **Do not use in a place subject to heavy vibration and/or impact.**
3. **Do not use in an environment where flammable gas or explosive gas is present. Usage may cause a fire or explosion. The products do not have an explosion proof construction.**
4. **The valve should not be exposed to prolonged sunlight. Use a protective cover if necessary.**
5. **Remove any sources of excessive heat.**
6. **In locations where there is contact with water, oil, weld spatter, etc., take suitable protective measures.**

Series ZFC
Specific product precautions (2)

Be sure to read before handling.
Refer to “Handling Precautions for SMC Products” (M-E03-3) for Safety Instructions.

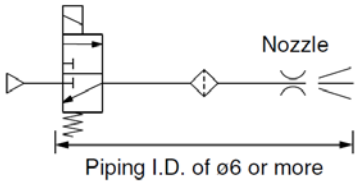
Handling Precautions

⚠ Warning

Use of intermittent air blow may increase piping temperatures. Therefore, observe the temperature for several hours during the trial operation. Also, pay attention to the product temperature during inspection.
The flow rate is throttled in the nozzle. If compressed air is supplied repeatedly, the air inside the piping may cause adiabatic compression. As a result, the temperature inside the piping increases. In this case, if the heat radiation to surroundings is not sufficient, the product temperature may exceed its operating temperature range. If compressed air is supplied under conditions where the product temperature exceeds its operating temperature range, this may cause the product to break. Take the preventive measures shown below.

1) Design to reduce piping capacity.
2) Build materials or mechanisms with high heat radiation ability into the areas around the nozzle.
3) Select a product with a wide operating temperature range.

Example of circuit when piping temperatures increase:
Pressure of 0.5 MPa or more, Ten times per minute



Maintenance

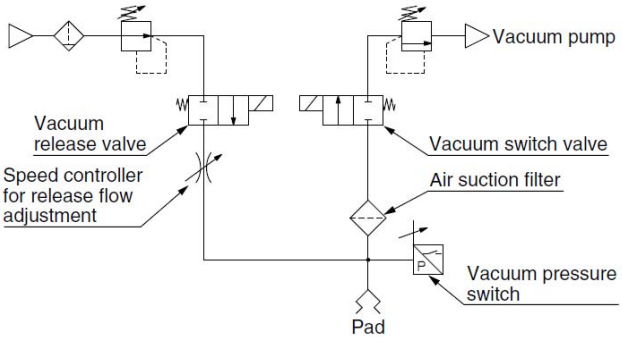
⚠ Warning

1. **Perform maintenance inspections according to the procedures indicated in the operation manual.**
   If handled improperly, malfunction and damage of machinery or equipment may occur.
2. **Maintenance work**
   If handled improperly, compressed air can be dangerous. The 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**
   When components are removed, first confirm that measures are in place to prevent workpieces from dropping, run-away equipment, etc. Then, cut off the supply pressure and electric power, and exhaust all compressed air from the system using the residual pressure release function.
   When the equipment is operated after remounting or replacement, confirm that the equipment is operating normally.

Maintenance

⚠ Warning

5. **The performance of an ejector will deteriorate due to clogged suction filters and silencers.**
   High flow filters should be used, especially in dusty locations.



   If a filter is required on the release pressure side, a different filter should be prepared.
   * It is not possible to use vacuum pressure and positive pressure together on the same line.

6. **When the element becomes clogged, stop operation and adjust the internal pressure of the filter to atmospheric pressure before replacing the element.**

⚠ Caution

1. **Element should be replaced in either of the two cases below.**
   1) When pressure drop reaches 0.1 MPa of positive pressure or 20 kPa of vacuum pressure.
   2) When the set values (flow rate, vacuum reaching time) change.
2. **During disassembly and assembly, confirm that there are no scratches, damage, etc, to the O-ring.**
3. **Before using, confirm there is no leakage after replacing elements.**
4. **Be sure to check that the lock mechanism is locked securely before use.**

1. Product components and functions

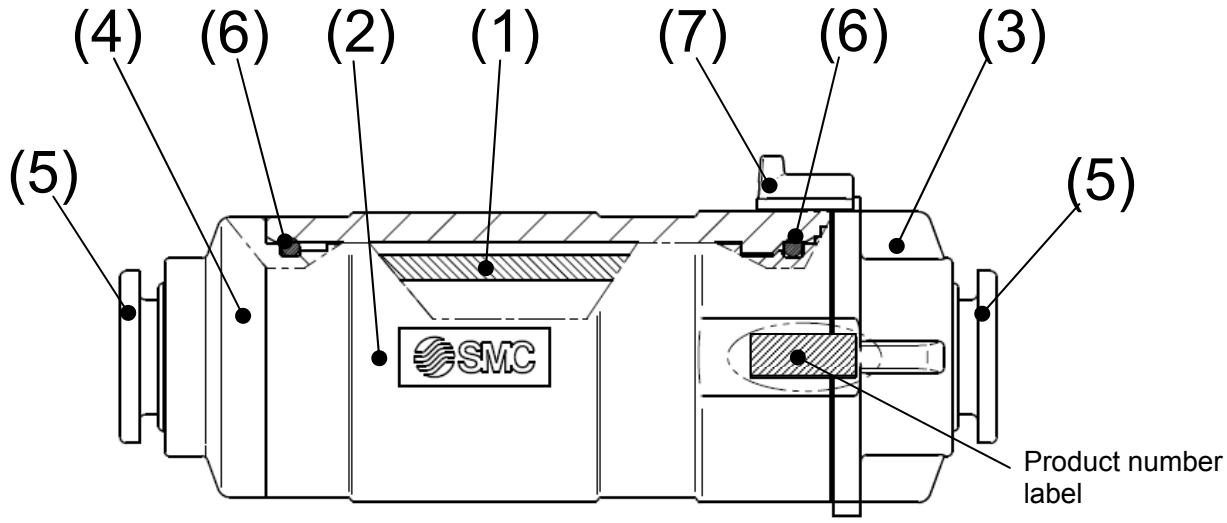
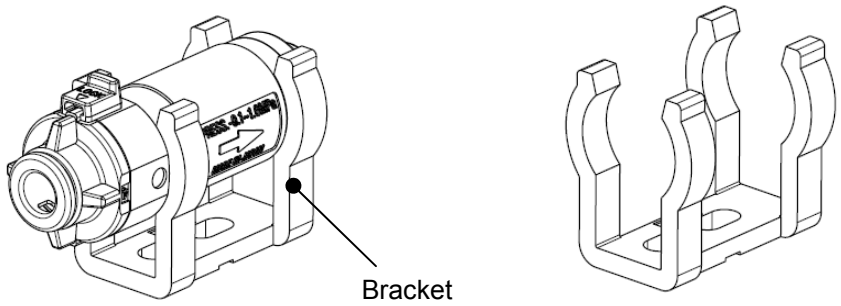


Table 1 Name and function of components

No.	Description	Material	Function
(1)	Element	PE	Catches foreign matter. (Replace the element when it is clogged.)
(2)	Case	PC	Vessel body (The clogging of the element can be checked visually).
(3)	Cover (IN side)	PBT	Used to connect the IN side tube. (The cover can be removed when replacing the element).
(4)	Cover (OUT side)	PBT	Used to connect the OUT side tube. (The cover cannot be removed).
(5)	Cassette	–	Tube can be removed, mounted or held with a chuck.
(6)	O-ring	HNBR	Seals the case and cover.
(7)	Lock mechanism	POM	Locks the rotation of the cover (IN side). (Be sure to lock the rotation of the cover during operation).

Optional part: Bracket (material: PBT)/ This bracket fixes the filter body.



2. Specifications

2-1 How to Order

Z F C □ □ — □

Body size

Symbol	Body size	Filtration area
1	5 L/min	140 mm^2
3	10 L/min	470 mm^2
5	20 L/min	750 mm^2
7	100 L/min	1260 mm^2

Applicable tubing O.D.

Metric size

Symbol	Applicable tubing O.D.	ZFC1	ZFC3	ZFC5	ZFC7
1	ϕ2	●	-	-	-
2	ϕ3.2	●	●	-	-
3	ϕ4	-	●	●	-
4	ϕ6	-	-	●	●
5	ϕ8	-	-	-	●
6	ϕ10	-	-	-	●
7	ϕ12	-	-	-	●

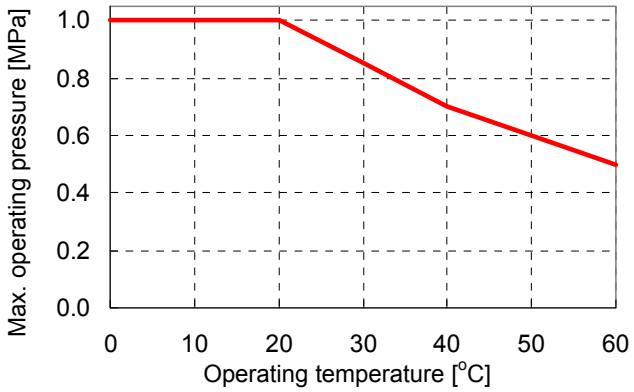
Inch size

A	ϕ1/8”	●	●	-	-
B	ϕ5/32”	-	●	●	-
D	ϕ1/4”	-	-	●	●
E	ϕ5/16”	-	-	-	●
F	ϕ3/8”	-	-	-	●

Option

Nil	None
B	With bracket

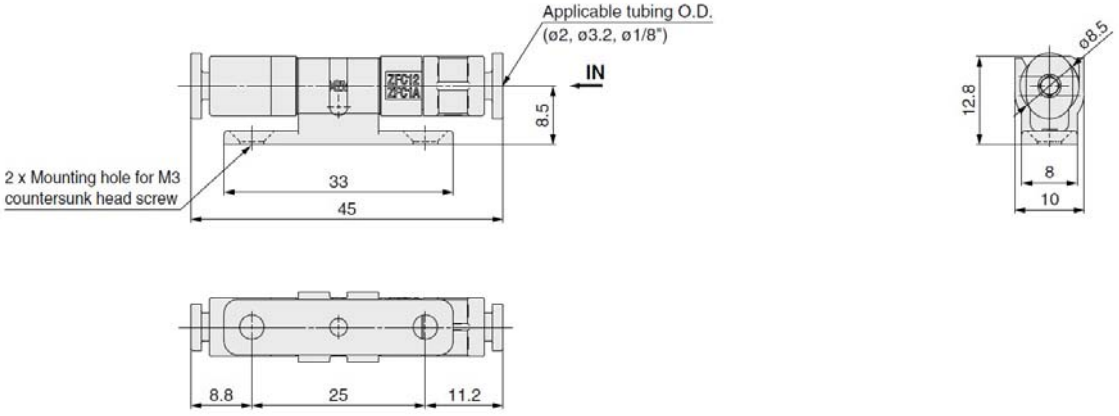
2-2 Specifications

Specifications		Remarks
Fluid	Air, Nitrogen	This product cannot be used in an environment exposed to chemicals.
Operating pressure range	-100 kPa to 1.0 MPa (at 20 °C)	The maximum operating pressure varies depending on the temperature. Refer to the graph below for the relation between the operating temperature and maximum operating pressure. 
Operating temperature range	0 to 60 °C	No freezing
Filtration	5 μm	Filtration efficiency 95%
Element replacement differential pressure	With positive pressure: 0.1 MPa With negative pressure: 20 kPa	Even though the pressure drop does not reach the values indicated on the specifications, replace the element if the set values (flow rate, time required to reach the specified vacuum) change.
Applicable tubing material	Nylon, Soft nylon, Polyurethane	-

2-3 Dimensions

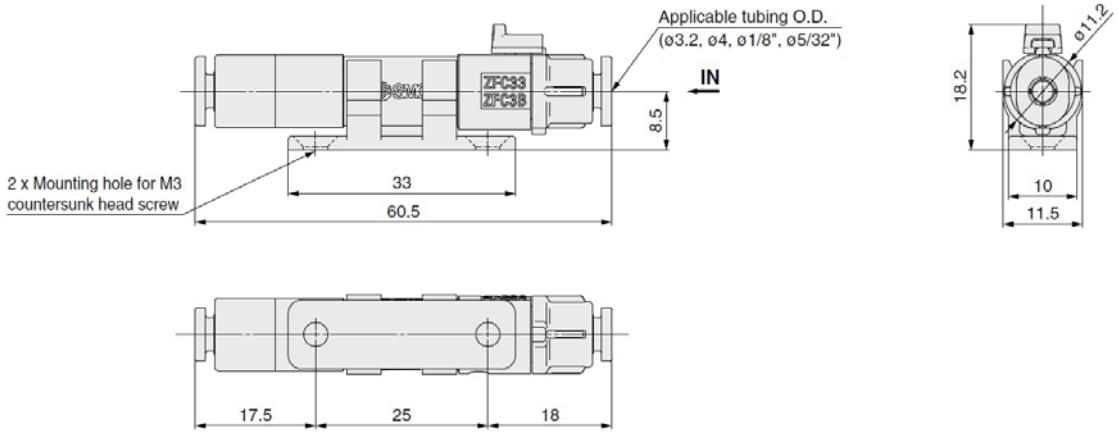
1) ZFC1∗-∗

Applicable tubing O.D. (ϕ2,ϕ3.2,ϕ1/8")



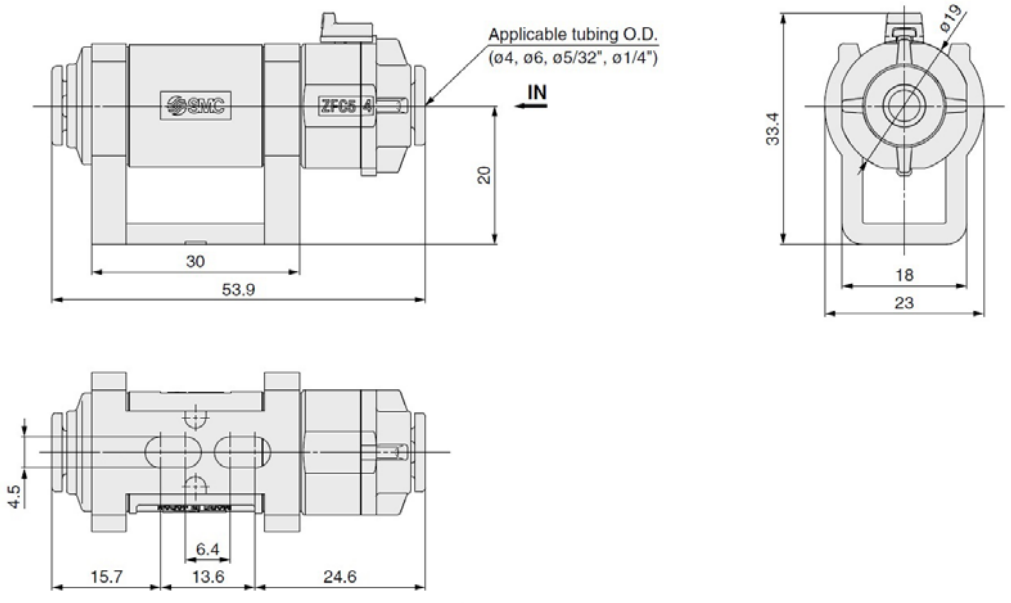
2) ZFC3∗-∗

Applicable tubing O.D. (ϕ3.2,ϕ4,ϕ1/8",ϕ5/32")



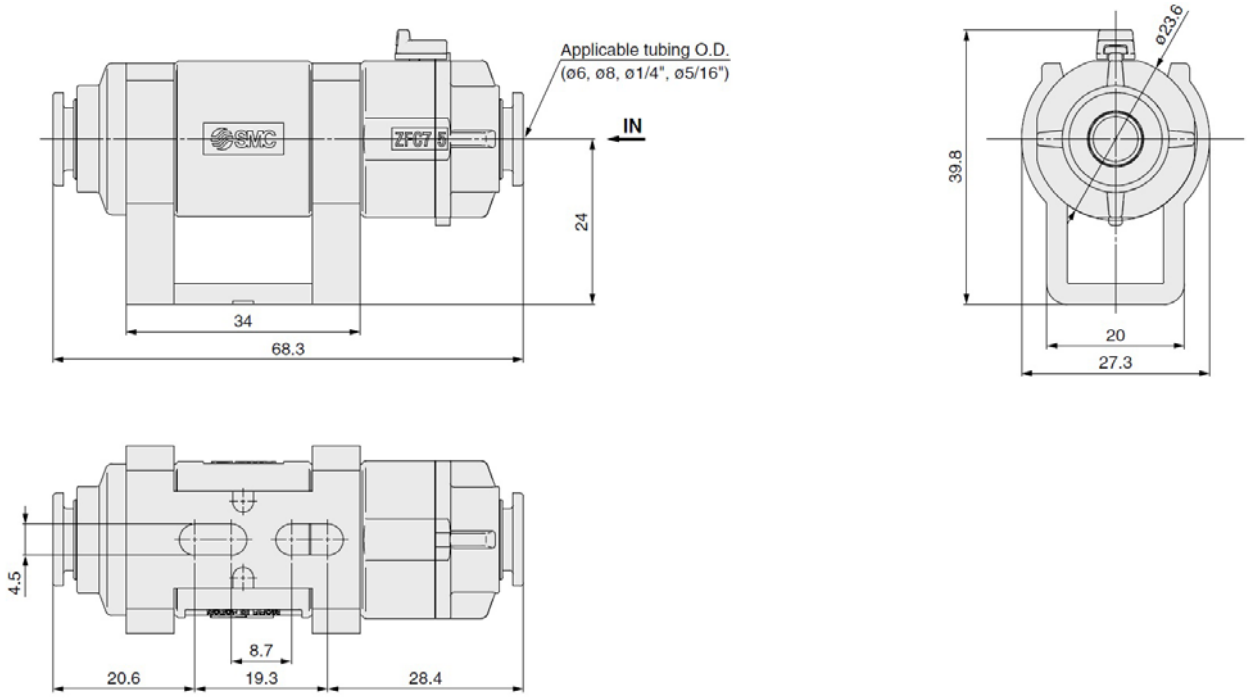
3) ZFC5∗-∗

Applicable tubing O.D. (ϕ4,ϕ6,ϕ5/32",ϕ1/4")

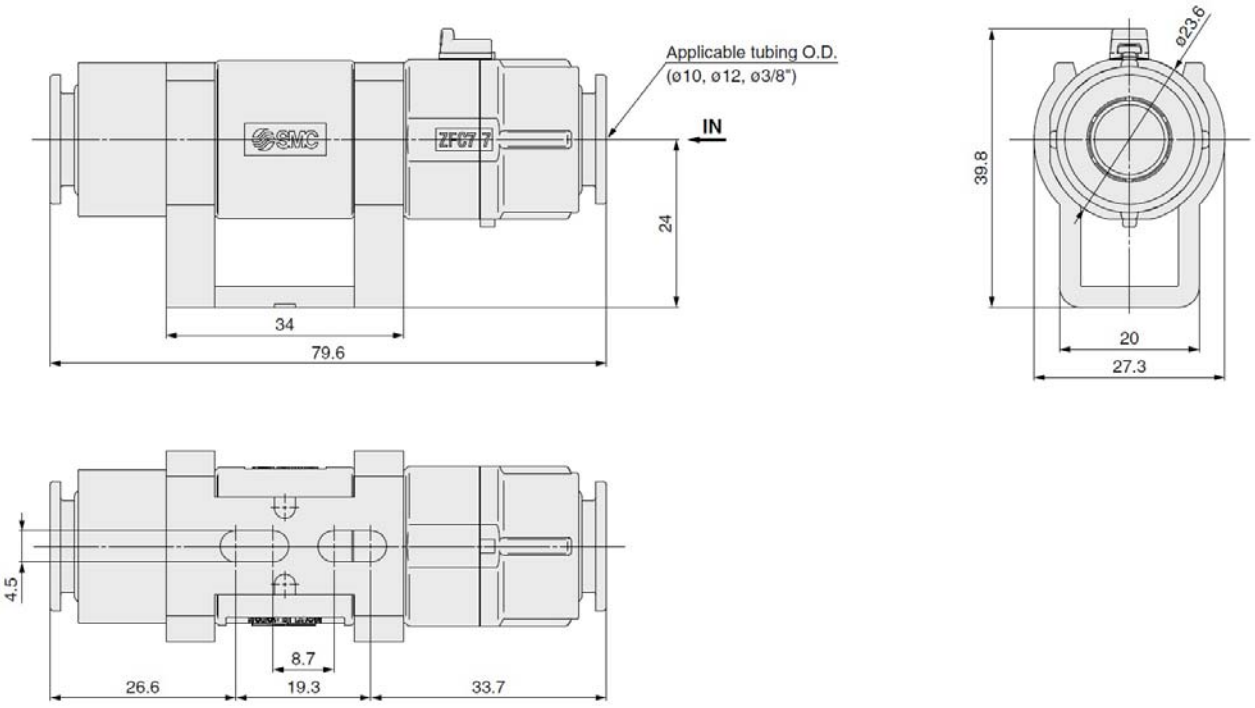


4) ZFC7∗-∗

Applicable tubing O.D. (ϕ6,ϕ8,ϕ1/4”,ϕ5/16”)



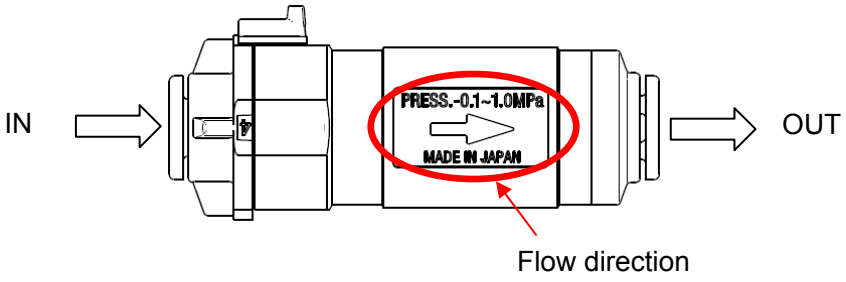
Applicable tubing O.D. (ϕ10,ϕ12,ϕ3/8”)



3. Mounting

1) Tube connection

- Check the IN side and OUT side before connecting the tube.
  IN/OUT direction can be identified by the arrow (showing the flow direction) displayed on the transparent case.

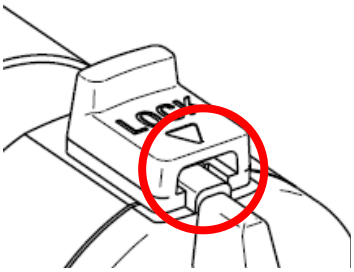


Note) When replacing the element, ensure that there is enough space for removing the cover (IN side).
Note) Refer to "One-touch Fittings Precautions" for mounting and removal of the tube.

2) Operation

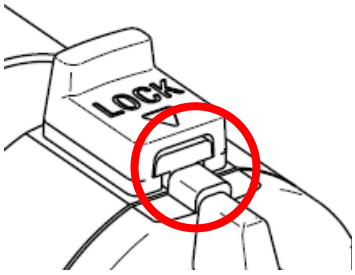
- **<u>Be sure to check that the lock mechanism is locked to prevent the cover (IN side) from rotating and that there is no leakage from seals before starting the operation.</u>**
  (The ZFC1 series is not equipped with a lock mechanism.)

Locked



The raised part of the cover (IN side) is not visible.

Unlocked



The raised part of the cover (IN side) is visible.

4. Element Replacement

Replace the element at least once a year or when the following conditions apply.

1) When pressure drop reaches 0.1MPa in a positive pressure or 20kPa in a vacuum pressure.
2) When the set values (flow rate, time required to reach the specified vacuum) change.

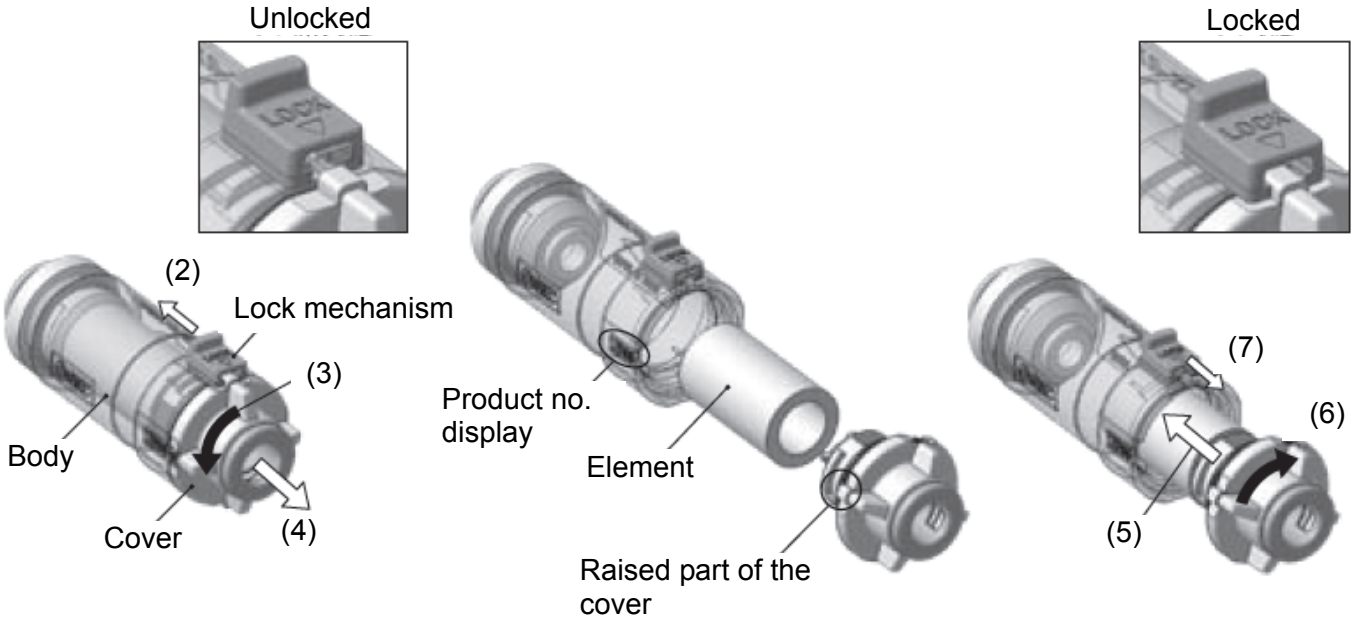
Replacement Element Part no.

Part no.	Applicable filter model	Element size	Set description
ZFC-EL-1	ZFC1	ϕ5 x ϕ 3 x L11	Spare element: 10 pcs.
ZFC-EL-2	ZFC3	ϕ6 x ϕ 4 x L25	
ZFC-EL-3	ZFC5	ϕ12 x ϕ 8 x L20	
ZFC-EL-4	ZFC7	ϕ 16 x ϕ 12 x L25	

<Element Replacement>

Procedure

(1) Stop the operation and release the pressure in the filter to the atmospheric pressure (return the vacuum pressure to the atmospheric pressure).
(2) Slide the lock mechanism in the direction of the arrow to release the lock. (The ZFC1 series is not equipped with a lock mechanism.)
(3) Rotate the cover counterclockwise at least 90 degrees.
(4) Pull out the cover from the body to remove the element. Eliminate the dust stuck to the internal surface of the body with air blow. (Check that the O-ring is not damaged.)
(5) Mount a new element to the cover and insert it into the body.
(6) Align the raised part of the cover with the model no. display of the body, and push the cover into the body and rotate it clockwise until it stops.
(7) Set the lock mechanism and check that the cover is locked completely.



Revision history
Rev.A: The ZFC1series and ZFC3 series added.

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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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