Doc.no.FGX-OMZ0025-A

Operation Manual

PRODUCT NAME

Industrial Filter

MODEL / Series / Product Number

FGA series

SMC Corporation

Contents

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.

Model Selection/Range of Operating Conditions

Do not select a model exceeding specification ranges and carefully consider the purpose of use, required specifications, and operating conditions, such as fluid,pressure, flow rate, temperature, and environment.

Mishandling may lead to an unexpected accident.

⚠Warning

1.Operating pressure

Do not use the product beyond the operating pressure range.

Do not use in locations where peak pressure exceeds the operating pressure range due to water hammer, surge pressure, etc.

2.Operating temperature

Do not use the product beyond the operating temperaturerange. Do not use at temperatures at or above the boiling point of the fluid.

3.Fluid

-Do not use the product for fluid other than those described in the drawing and the catalog.

-Do not use fluids which cause the corrosion or swelling of the material used for each part of the filter.

-The standard product may not support when a gas is used as the operating fluid and is subject to the laws and regulations of a pressure vessel (such as Class 2 Pressure Vessel and High Pressure Gas Safety Act). Make sure to confirm the specifications in advance.

-Do not use any fluid which will cause the seal, O-ring, or element to swell or deteriorate. The fluid may deteriorate these parts, causing leakage.

4.Operating environment

-Do not use in operating conditions or environments where changes in color or deterioration of material due to corrosion may occur.

-Do not use this product in a place where shock or vibrations occur.

-**Do not use the industrial filter outdoors**

⚠Caution

1.Pressure drop(△P)

-Set the flow rate through the product such that the initial pressure drop is 0.02 MPa or less.

Design and Installation

⚠Caution

【Design】

1.Design the system with operating conditions, including operating pressure, operating temperature, operating fluid, and operating environment appropriate for safe operation.

2.Use the product with a circuit that has minimal fluctuations to the filter caused by pressure or flow. (Ex.: circulating circuit, etc.)Provide necessary countermeasures, such as installation of an accumulator, if water hammer, surge pressure, or a similar event is expected.

3.Prevent back pressure and backflow from occurring.

The element may be damaged by back pressure or backflow.

4.Prevent the propagation of an excess moment load and vibration from the piping side.

5. Provide a safe circuit design in the end-user's system when using this product.

6.Provide adequate space for maintenance and inspection before installing and piping the product.

【Piping】

1. Connect the piping to the correct ports of IN and OUT.

This product cannot be used when the connection is reversed.

2.Connect the valves or fittings suited to the operating conditions by checking the size of each connection port.

During connection work, make sure that powder from the piping screws or seal material does not get into the interior of the piping.

Prior to operating, flush the piping line and check for abnormalities, such as fluid leakage.

3.Firmly secure the piping to the mounting frame using a saddle, etc., to avoid vibration or force caused by weight.

4.During element replacement, it is necessary to release fluid from the vessel.

Be sure to connect the pipes so that fluid can be released without issue.

5.Make sure that air releasing is conducted.

Provide countermeasures such as installing an air bleed at a high area when the pump position is high since it may idle run when restarting.

6. Operation in low temperature

During cold periods such as wintertime, operating fluid viscosity may become high depending on the fluid properties, which may generate a large differential pressure.

In this case, warm up the fluid until it reaches the customer's operating temperature before starting operation.

7. Securely fix the filter on a vertical surface such as a concrete floor using foundation bolts. Refer to the catalog for the size of the foundation bolt.

Operation

⚠ Warning

1.Never loosen the tightened parts (bolt) under pressurized conditions.

⚠ Caution

1.Releasing the air

When applying pressure for starting a pump, be sure to release the air by opening the air release valve (air vent) on the top.

2.When operating

When applying pressure for starting a pump, confirm that each of the connecting parts are completely sealed. If any abnormality is found, such as fluid leakage, stop the product immediately and locate the possible cause of the failure.

Resume operation after taking appropriate measures to stop the fluid leakage by replacing the gasket or retightening the fittings.

Maintenance

⚠ Warning

1.Failure to follow proper procedures will likely cause fluid leakage or the removal of the cover, which may lead to an unexpected accident. Follow the procedure indicated in the operation manual.

2.Make sure that the line is stopped and the pressure is atmospheric pressure (gauge pressure: zero) before starting maintenance and inspection.

3.Depending on the fluid, there may be effects on the human body. Check the SDS of the fluid, and take all necessary precautions.

⚠ Caution

1. Timing of element replacement

-Replace the element before the differential pressure reaches 0.1 MPa.

To check the element replacement timing, install a pressure gauge, pressure sensor, or other instruments on IN and OUT sides of the filter.

If the element is not replaced, it may become damaged.

2.Element replacement

-Incorrect handling can cause damage to equipment and device, causing operation failure.

-Before replacing the elements, be sure to wear protective gloves and safety glasses.
There is a possibility of being injured by the captured foreign matter. There is also a possibility of being injured by hand slippage caused by the adhesion of fluid.

-After the elements are replaced, correctly perform the attachment and assembly of each part of the filter in the predetermined positions according to the operation manual.

3. Cleaning each component

During element replacement, in order for firm sealing to take place, clean the sealing surface of the O-ring and seal, and/or remove the paint which is left on the tightened parts or the thread parts.

4.Replacing gascket and seals

Replace any deteriorated or expanded gascket and seals.

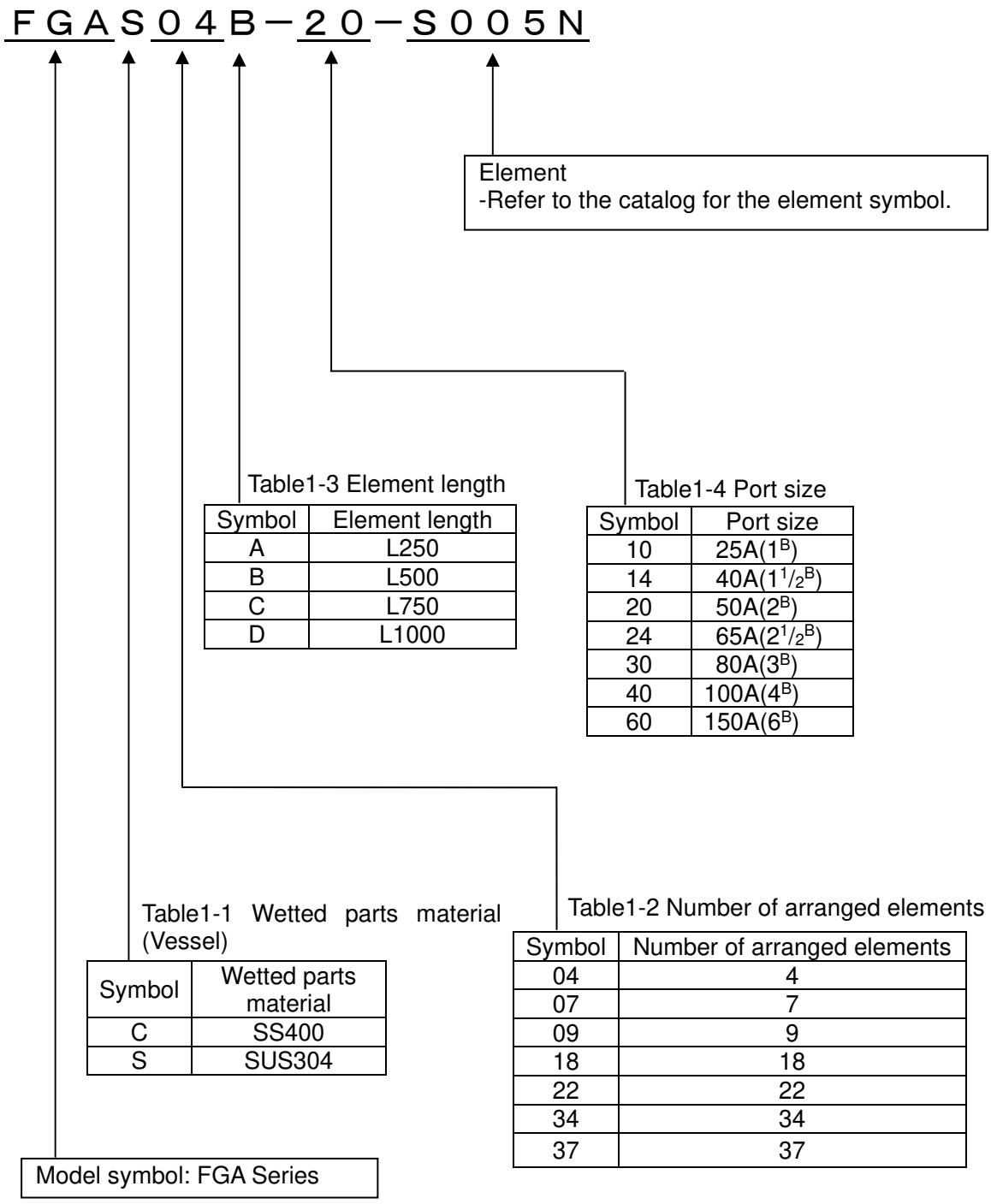
Also, replace the seal after it has been used for one year or when fluid leakage occurs.

5.Temperature

When operating at high temperatures (40°C to 80°C), there is a danger of burns.

Confirm that the surface temperature of the filter and other operating parts are 40°C or less, to eliminate the risk of burns.

1. How to Order



Symbol	Element length
A	L250
B	L500
C	L750
D	L1000

Symbol	Port size
10	25A(1B)
14	40A(1 1/2B)
20	50A(2B)
24	65A(2 1/2B)
30	80A(3B)
40	100A(4B)
60	150A(6B)

Symbol	Wetted parts material
C	SS400
S	SUS304

Symbol	Number of arranged elements
04	4
07	7
09	9
18	18
22	22
34	34
37	37

2. Specifications

Table2-1 Specifications

Item			Specifications
Model			Refer to 「1. How to Order」(6 pages)
Fluid			General fluid or gas that is not flammable, toxic, corrosive or causes other hazards
Max. operating pressure			For liquid: 1.0 MPa, For gas: 0.97MPa -The standard product cannot be used when gas is used and the vessel volume is 40 liters or more since it is subject to Class 2 Pressure Vessel Regulations.
Max. operating temperature			-Maximum operating temperature (80°C) of the vessel or the maximum operating temperature of the element, whichever value is lower. Do not use a fluid when the operating temperature exceeds the boiling point.
Operating environment			Indoors avoiding locations exposed to direct sunlight, wind, and rain
Nominal filtration			Depends on the used element type.
Element size (mm) nominal size			ø65×L250, ø65×L500 (two layers of L250) , ø65×L750 (three layers of L250) , ø65×L1000 (four layers of L250) (Refer to Table2-2)
Differential pressure for element replacement			0.1MPa
Material	Case Cover	FGAC	SS400, SGP
		FGAS	SUS304(Wetting part), SS400
	Gasket		Non-asbestos gasket(V#6500)
	Element		Depends on the used element type.
	Internal parts		Refer to「3. Construction and Name of Components」(9 pages)
Surface Treatment	FGAC		Parkerizing, exterior aluminum paint spray
	FGAS		Acid cleaning, exterior SS400 part aluminum paint spray
IN/ OUT port size			Refer to Table2-2
Number of arranged elements			
Internal volume (L)			
Weight (kg)			

(Note)
1. To check the element replacement differential pressure, install a pressure gauge, pressure sensor, or other instruments provided by the customer on IN and OUT sides of the filter.
2. The filter is not for outdoor use.

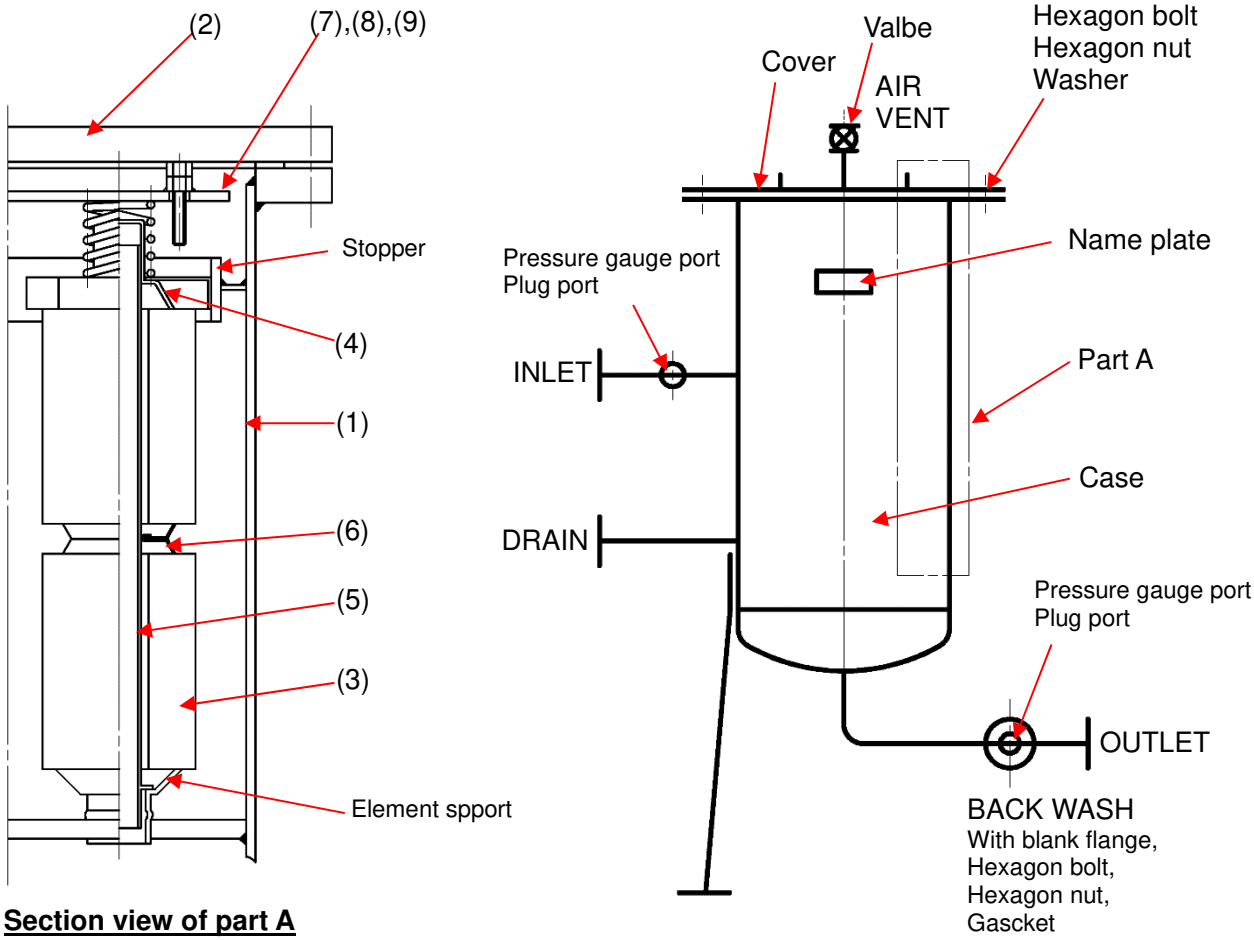
Table2-2 Specifications

Model	Number of arranged elements	Element length (L)	IN/ OUT port size			Weight (Vessel only) (kg)	Internal volume (L)
FGAC FGAS	4	250 (250 × 1 layers)	25A (1B)	40A (1 1/2B)	50A (2B)	70	15
		500 (250 ×2 layers)				80	24
		750 (250 × 3 layers)				90	32
		1000 (250 ×4 layers)				105	41
	7	500 (250 ×2 layers)	25A (1B)	40A (1 1/2B)	50A (2B)	115	37
		750 (250 × 3 layers)				130	50
		1000 (250 ×4 layers)				150	64
	9	500 (250 ×2 layers)	40A (1 1/2B)	50A (2B)	65A (2 1/2B)	150	54
		750 (250 × 3 layers)				175	73
		1000 (250 ×4 layers)				200	92
	18	500 (250 ×2 layers)	65A (2 1/2B)	80A (3B)	100A (4B)	260	103
		750 (250 × 3 layers)				295	137
		1000 (250 ×4 layers)				340	171
	22	500 (250 ×2 layers)				330	131
		750 (250 × 3 layers)				380	173
		1000 (250 ×4 layers)				430	217
	29	500 (250 ×2 layers)	80A (3B)	100A (4B)	150A (6B)	375	163
		750 (250 × 3 layers)				435	216
		1000 (250 ×4 layers)				495	269
	34	750 (250 × 3 layers)				560	262
		1000 (250 ×4 layers)				635	326
	37	750 (250 × 3 layers)				630	317
		1000 (250 ×4 layers)				710	394

(Note)

1. The number of mounted elements is "(Number of arranged elements) × (Number of element layers)."
When EB, ES or EP series element is selected, the element length is made up of a single layer.
2. The element length differs according to the element type. Please refer to the catalog for details.
3. The IN/ OUT port sizes can be selected from three sizes for each number of arranged elements. The IN/ OUT ports are the same size.
4. Refer to the catalog for the element product number to mount.

3. Construction and Name of Components



Section view of part A

Table3 Main parts

Number	Part name	Part No.	Material	Quantity	Remarks
(1)	Case	—	Refer to Table2-1	1	
(2)	Cover	—	Refer to Table2-1	1	
(3)	Element	—	Refer to Table2-1	Refer to Table2-2	
(4)	Element holder assembly	FGA-OP002	SUS316	Number of arranged elements	
(5)	Element guide	Note 1	SUS304	Number of arranged elements	
(6)	Joint	FGD-OP001	SUS316	Note 2	
(7)	Element holder	—	SUS304	1	
(8)	Stud bolt	—	SUS304	3	
(9)	Hexagon nut	—	SUS304	3	

Note1.For element length L250: For FGA-0P001-A, element length L500: For FGA-OP001-B, element length L750: For FGA-OP001-C, element length L1000: FGA-OP001-D.
Note2.A joint is inserted between elements when elements with a length of L250 are layered. “Quantity = (Number of element layers - 1) × Number of arranged elements”.

4. Installation and Piping

[1] Installation

When installing, allow sufficient space for maintenance.

Reserve a space above the vessel equal to “Used element length” + “300 mm”.

[2] Piping

Check each port size for selecting valves and fittings suitable for operating conditions.

Please check Safety Instruction before use.

5. Maintenance

Replace the element before the differential pressure reaches “0.1 MPa” due to clogging.
Replacement of element should be performed according to the procedure below.

[1] Removing the cover (Refer to Fig4)

1) Stop operation.
2) Confirm that the pressure of the system in which the filter is installed is zero.
3) After closing the piping valve on the IN side of the filter, close the piping valve on the OUT side of the filter.
4) Discharge the residual fluid inside from the drain port.
5) Remove the hexagon bolt and hexagon nut of the cover.
6) Remove the cover. **Use tools such as a winch to remove the cover since it is heavy.**
7) Remove the element holder.
8) Remove the element holder assembly.

⚠ **Warning: Confirm that the internal pressure of the filter is zero before removing hexagon bolts and nuts f the cover.**

⚠ **Caution: When using the product at a high temperature, be sure to check that the surface temperature of the filter container is not more than 40 ºC before starting operation in order to prevent burns.**

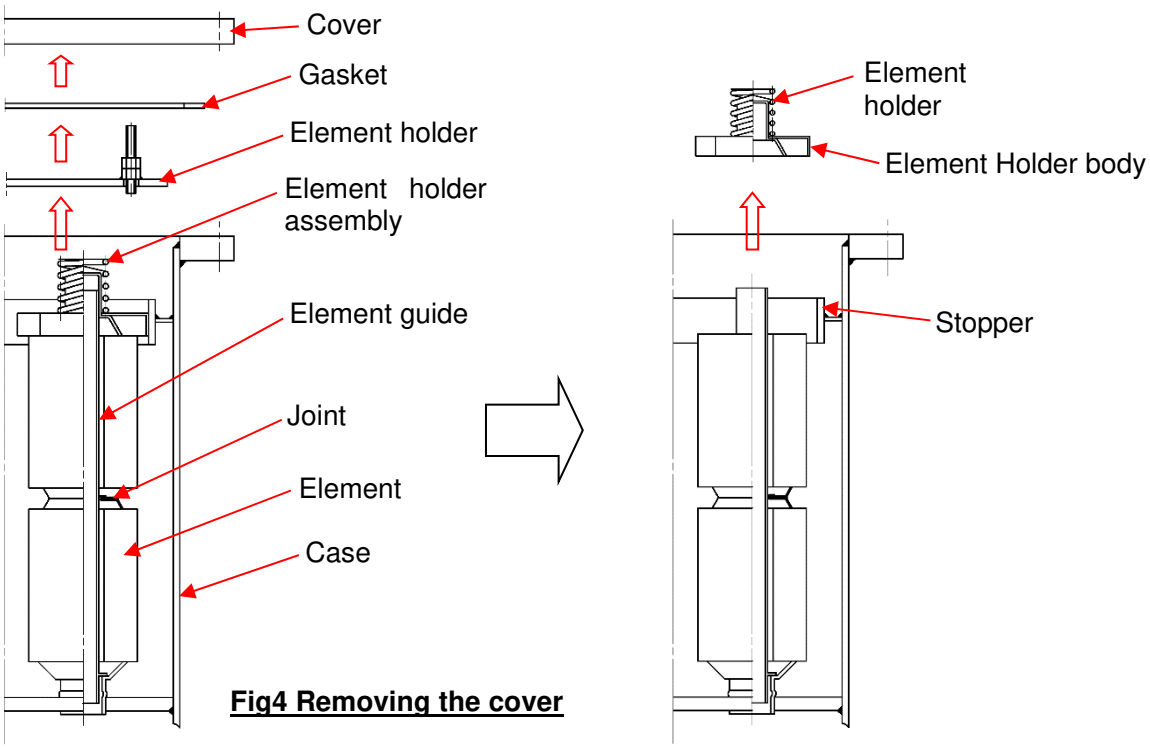


Fig4 Removing the cover

[2] **Removing the element** (Refer to Fig5)

1) Pull the element out of the case and replace it with a new element. When a joint is used, pull the joint out also.
Confirm the details of the engraving mark of the product label to identify the replacement element product number.
Clean the sealing surface to ensure proper sealing.
The element guide can be pulled out also when pulling out the element.
(A hooking hole is provided at the upper part of the element guide. Use the hole when pulling out the element with the element guide.)

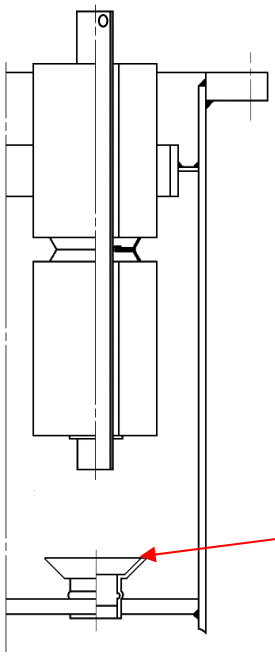


Fig5 Pulling out element using element guide

[3] **Mounting of element**

1) Mount the element in the reversed sequence of 5. [2] “Removing the element.”
2) When setting the element holder assembly, place the hexagon bearing body inside the stopper of the case as shown in Fig. 4 and Fig. 6.

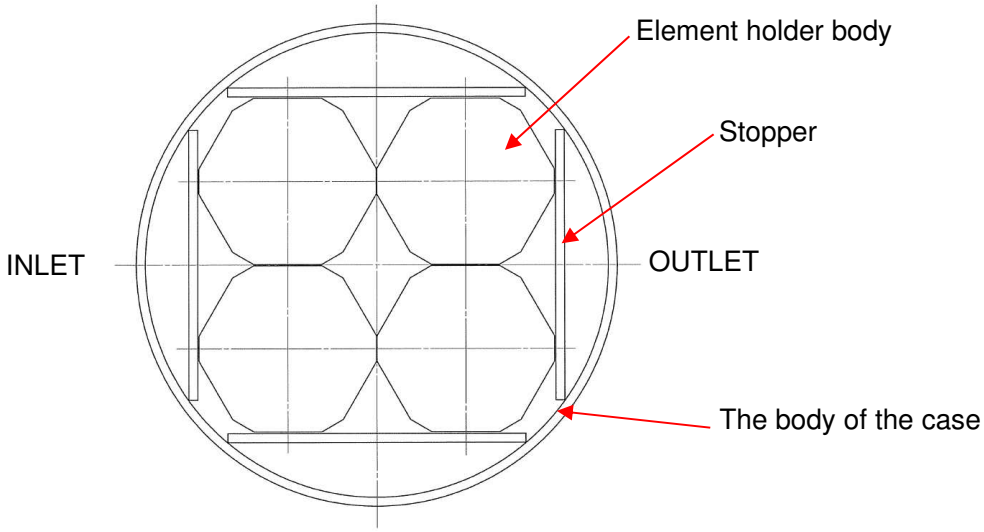


Fig6 Example of allocation of hexagon bearing bodies (When the number of arranged elements is four)

[4] **Mounting the element holder**

1) Adjust the dimension as shown in Fig. 7 for the element holder stud bolt and tighten it with hexagon

nuts. Next, mount it on the element holder assembly.

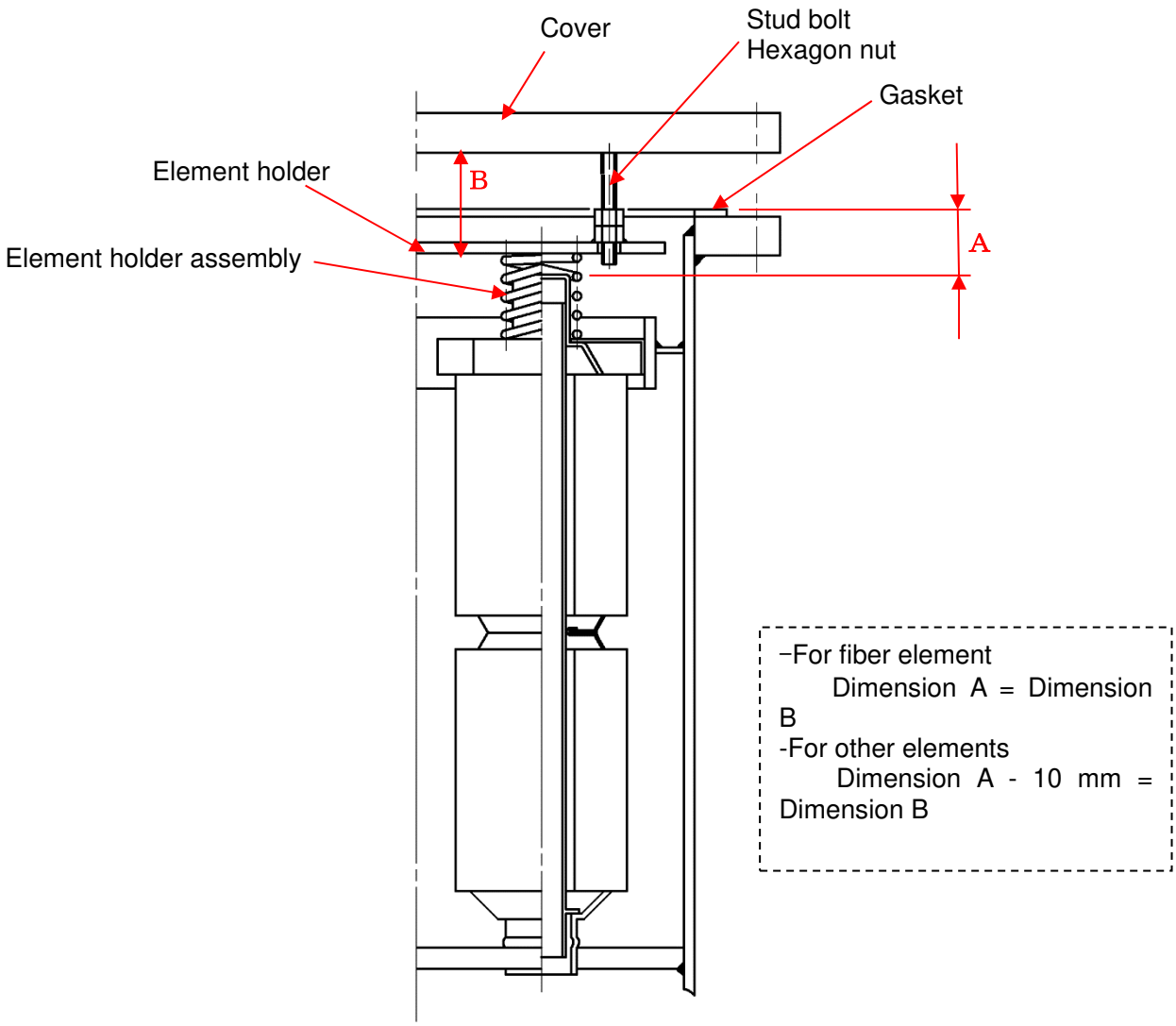


Fig7 Adjusting the element holder stud bolt position

[5] Mounting the cover

1) Mount the cover in the reversed sequence of 5. [1] “Removing the cover.” Check the gasket, if it is swollen or damaged replace it with a new gasket.

[6] Tightening of hexagon bolts and hexagon nuts

1) Tighten hexagon bolts and hexagon nuts evenly in the diagonal direction. (Refer to Fig7)
2) Refer to Table 5-1 for the tightening torque of hexagon bolts and hexagon nuts.

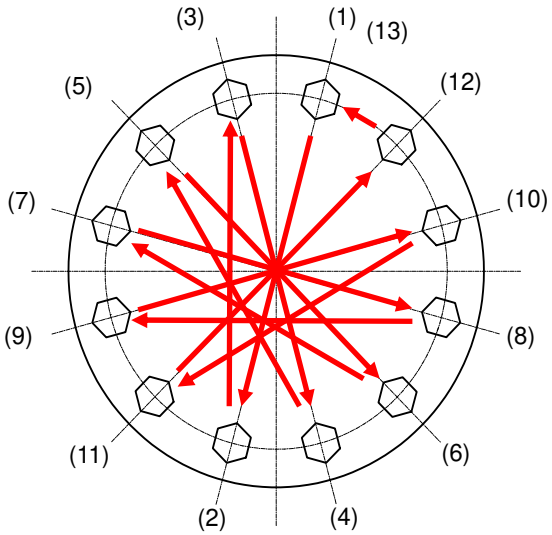


Fig7 Tightening hexagon bolts and hexagon nuts for the cover

Table5-1　Recommended tightening torque of hexagon socket head cap bolt

Hexagon bolt and hexagon nut size	Recommended tightening torque (N・m)	Applicable filter model
M20×2.5	204	FGA*04
M22×2.5	282	FGA*07、FGA*09
M24×3.0	360	FGA*18、FGA*22、FGA*29
M30×3.5	700	FGA*34、FGA*37

[7] Restart the operation

After the replacement of the element, check the parts are assembled correctly before restarting operation. In case of fluid leakage, stop the operation immediately. Check the sealing condition and take corrective actions.

6. Maintenance parts

[1] Replacement Element

1) To order a replacement element, check the product number printed on the product label of the filter, refer to the catalog, and specify the necessary quantity.

[2] Consumables

1) To order other consumables such as gaskets, refer to the drawings and specify the necessary quantity.

Revision history
1st edition : July 2021 Revision : March 2024

SMC Corporation

Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362
URL https://www.smcworld.com