Doc.no.FGX-OM-L008-B

Operation Manual

PRODUCT NAME

Industrial Filter

MODEL / Series / Product Number

FGES/L 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.

Safety Instructions for the FGES/L Series

Be sure to read before handling.

These safety instructions are intended to prevent a hazardous situation and/or damage to human and equipment by using FGES, L series properly.

Operating condition range

⚠ Warning

1. Operating pressure
Do not use pressure exceeding specified range.

2. Operating temperature
Do not use where temperature exceeds specified range.

3. Operating fluid
Do not use this for gases.
Do not use with corrosive fluid.
Do not use fluid which swell or deteriorates packing, "O" ring or element.

4. Operating environment
Do not use in corrosive environment.
Do not use where exposed to vibration or impact.

Caution on operation

⚠ Warning

1. Do not loosen V-band while pressure is applied.

2. Install V-band correctly to specified position. (See page 11)

⚠ Caution

1. Replace deteriorated or swollen O-ring.
Replace O-ring one year after starting use, or if fluid leakage occurs.
(See page 7 Table 1: O-ring for replacement)

2. Do not use a V-band which is deformed or with a damaged thread.
(See page 7 table 1: V-band for replacement)

Design and installation

⚠ Warning

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

⚠ Caution

1. Pressure drop (ΔP)
Set the flow so that the initial pressure drop is 0.02 MPa or less.

2. Space to install
Reserve maintenance space for installation and piping.

[Space for maintenance]
- Opening space for the upper cover (Space for removing the basket when replacing the element)
  FGE$^{S}_{L}$ A: 179 mm or more
  FGE$^{S}_{L}$ B: 419 mm or more
  FGE$^{S}_{L}$ C: 669 mm or more
- Peripheral part of the band (Space for removing the band when replacing the element): 50 mm or more

3. Flushing
Flush piping line with air before the first usage.

4. Prepare air discharge circuit where necessary.

5. For high temp. type, protection against burning shall be prepared.

6. Prepare a drain for the circuit to discharge fluid where necessary.

7. Use the filter with a circuit in which the changing load of pressure and flow is small.

8. Use a circuit which does not lead to backflow to the filter.

FGES・L Series/Safety Instruction

Be sure to read before handling.

Maintenance

⚠ Caution

1. Foreign matter shall be discharged from the drain outlet.

2. Replacement of the element

When it is the time for replacement of the element, replace with a new element immediately.

-The life of element-

・ When pressure drop reaches 0.1 MPa, replace the element referring to the procedure in this manual. Incorrect handling can cause damage of equipment and device, and operation failure.
(See Page 10: Replacement of element)

3. Cleaning of equipment

When replacing the element, clean O-ring, packing seat surface, the joint part of V-band, and thread for sealing properly.

4. Surface temp.

Confirm that the surface temp. is 40ºC or lower when replacing the element. For high temp. use attention should be taken to avoid burning.

Piping and operation

⚠ Caution

1. Ensure the direction of IN/OUT is correct for piping.

2. Arrange piping so that air discharging work is available.

3. Check each port size for selecting valves and fittings suitable for operating conditions. Flush piping line with air before operation to check for any problems including fluid leakage.

4. Fix the feet to the ground firmly using foundation bolts (M12).

5. The piping of IN/OUT shall be fixed firmly to the mounting frame using the saddle so that loads including vibration or weight are not applied to the piping.

6. When supplying pressure by starting the pump, ensure opening/closing of piping and connecting parts are completely sealed.
If fluid leakage is present, stop operation immediately. Investigate the cause, and replace O-ring with a new one.
Then, tighten the fitting and perform any corrective action for fluid leakage before restarting operation.

7. When supplying pressure by starting the pump, open the relief port (hexagon plug) to discharge air.
Release the air (loosen the hex. plug) at the same time supplying the fluid to substitute air in the product with fluid. When air is discharged, close the relief port (tighten the hex. plug) before starting operation.

1. Construction

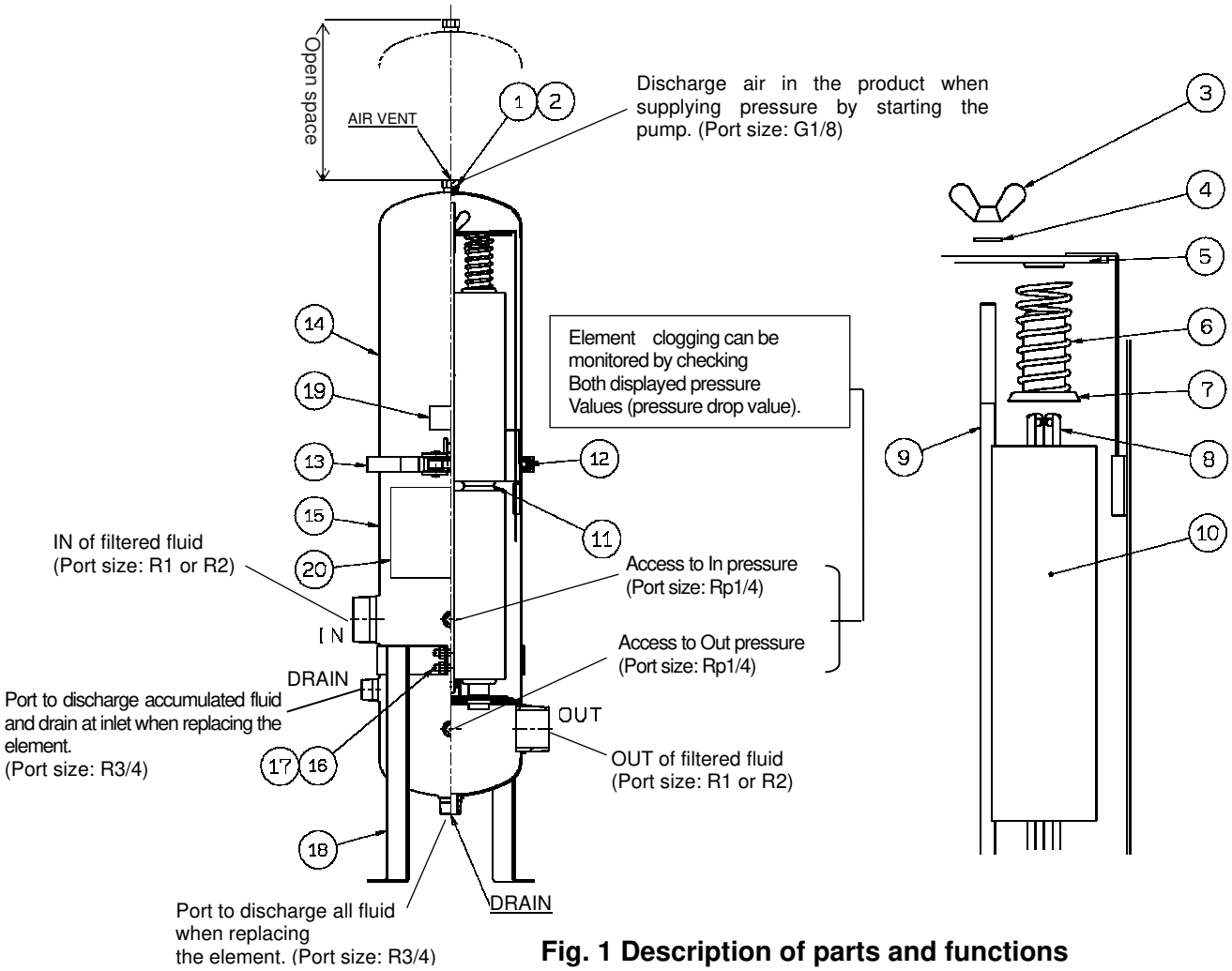


Fig. 1 Description of parts and functions

Table 1. Description and function of parts

No.	Description	Part number	Material	Function
(1)	Hex. plug	FGE-OP008 7 (NBR) 8 (FKM)	SUS304	Plug to release air in the housing
(2)	O-ring		NBR or FKM	O-ring to seal the cover and hex. plug
(3)	Wing nut	M10×1.5 Class 1	SUS304	Fix the element retainer
(4)	Washer	M10	SUS304	
(5)	Element retainer	-	SUS304	Fix the element
(6)	Spring	FGE-OP005	SUS316WPA	Stabilizes the element seal
(7)	Element holder		SUS316	Seals the element
(8)	Element guide	-	SUS304	Guides the element
(9)	Tension bolt	-	SUS304	Shaft to fix the element
(10)	Element	-	-	Assemble elements into this
(11)	Joint	FGD-OP001	SUS316	Seal the space between element
(12)	O-ring	FGE-KT001	NBR	O-ring used to seal the sealing part of the cover and the case
		FGE-KT002	FKM	
(13)	V band	CY-24S	SUS304/SWCH	Engage the cover and the case and settle them
(14)	Cover	FGE-CV 001(FGES/LA) 002(FGES/LB) 003(FGES/LC)	SUS304	The lid of the product
(15)	Case	-	SUS304	Main body of the case
(16)	Hex. bolt	M8×1.25×L30	SS400	Fix the Leg
(17)	Hex. nut	M8×1.25	SS400	
(18)	Leg	-	SS400	Support the body（Fix to the ground）
(19)	Description on label	-	Tetlon	Model has been described.
(20)	Caution label	-	Tetlon	Notes are listed.

2. Specification

Table 2. Specifications

Model		FGE$^{S}_{L}$ A	FGE$^{S}_{L}$ B	FGE$^{S}_{L}$ C
Operating fluid note1)		Various kind of liquid (Industrial water, washing liquid, general solvent, etc.)		
Port size(R)		1、2		
Max. Operating Pressure (MPa)		0.7		
Max. Operating temp. (ºC)		80ºC (60ºC for a product with pressure gauge)		
Number of element		4	4 Note2) or 8	4 Note2) or 12
Element size (mm) note3)		φ65 to 70 × 250	φ65 to 70 × 500 (For 8 elements: φ65 to 70 × 250)	φ65 to 70 × 750 (For 12 elements : φ65 to 70 × 250)
Element replacement differential pressure (MPa)		0.1		
Material	Cover	SUS304		
	Case	SUS304		
	O-ring	FGES□: NBR FGEL□: FKM		
	Leg	SS400		
Mass (kg) Body only		10	13	18
Internal capacity (L)		14	21	29

Note1)Cannot be used with gases.
Note2)In the case of sintered metal element of paper element.
Note3)The element size is a nominal length.

3. Installation / Piping

1）Installation

- Install and arrange piping at a place with enough space for maintenance.

Mounting of legs

* Removable legs are used to make it easy to connect piping work of the liquid discharge port. Connecting the piping work of the liquid discharge port will be easier before mounting the legs. (The rotation range of the mounting tool will be limited if the piping work of the liquid discharge port is performed after mounting the legs.)
  Mount the legs according to steps (1) and (2) below.

<Accessories> - Legs: 1 set (2 pcs.) - Hexagon head bolt / hexagon nut: 4 for each (1 bag)

(1) Mount the legs onto the case. (See Fig. 2-1)
When mounting the legs, align them with a label which shows the leg mounting position.

⚠ **Caution** Make sure that the case is laid down on the floor when mounting the legs.

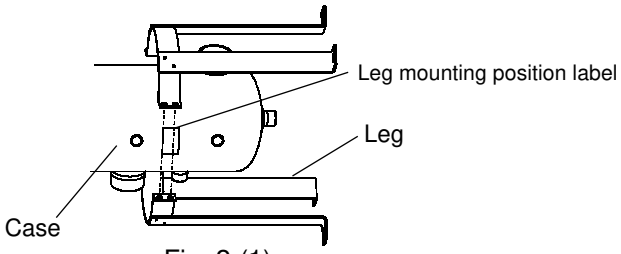


Fig. 2-(1)

(2) Close the legs, and mount the hexagon head bolts and nuts, which are delivered together with the product, onto the bolt mounting holes on the legs and tighten them at 12.5 Nm.

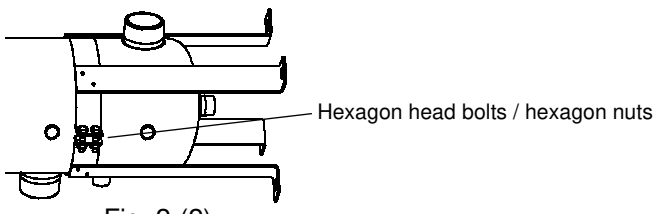


Fig. 2-(2)

2) Piping

- Check connection port size to use valves and fitting suitable for operating conditions.
  - Before piping, clean the piping materials to be used.
  - Arrange the piping so that pressure in the product can be released.
    As this product is assembled in a general environment, clean the inside of the filter with the operating fluid when starting operation or replacing the element to remove the dirt in the filter.
  - After reconfirming that the piping on inlet and outlet sides is connected correctly, supply the operating fluid to check whether leakage occurs from the piping connection parts on the inlet and outlet sides.
  - Mount a V-band correctly, and start operation after confirming that no leakage occurs.
    ∗ Confirm cautions on page 3, 4, 5 and 6 for use.

4. Operation

1) Operation

- When starting operation, open upper relief port (loosen hex. plug) to discharge air.
  (When tightening the hexagon plug, tighten it by hand until its surface touches the cover.)

2) Replacing the element

- Replace the element with a new one when the pressure drop reaches its replacement pressure (0.1 MPa).
  Refer to "5. Replacement of the element" on page 9 and 10 for the element replacement procedure.
  ∗ Confirm cautions on page 3, 4, 5 and 6 for use.

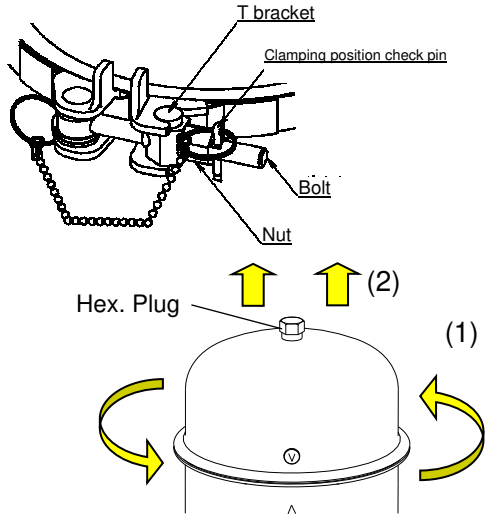
5. Replacement of the element

5-1 [Removal of the cover]

(1) Stop operation
(2) Close the valve in order of INL, then, OUT.
(3) Release the hexagon plug to reduce the pressure in the filter to zero.
(4) Discharge all fluid in the filter by opening the hexagon plug, liquid discharge port and drain port.
(5) Pull out the V band clamping position check pin.
(6) Loosen V band tightening nut and remove the latch. Then, remove the cover
(7) Rotate the cover counterclockwise and lift it to remove the cover.
(In order of (1), (2) in drawing on the right)
(8) If O-ring is swollen, replace it with a new O-ring.

【"O" ring for replacement】 Part No.: FGE-KT001 (NBR)
Part No.: FGE-KT002 (FKM)

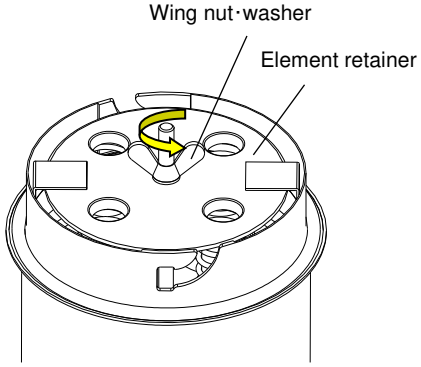
⚠**Warning** **Remove V band/cover after confirming the pressure in the filter is zero.**



5-2 [Removal of element]

(1) Remove the wing nut and the washer.
(2) Remove the element retainer.
(3) Remove the element mount bracket (a part integrating the element holder and the spring).
(4) Take out parts in order of the element, then, joint (element guide).
* It is not required to remove the element guide forcibly.
The element and joint can be removed simultaneously by removing the element guide. (Refer to Figure 1 on the left on page 7)
Note) Joint is not required for the sintered element or paper element.

⚠**Caution** **Attention should be taken to avoid burning for high temp. type.**



5-3 [Mounting of the element]

(1) To prevent foreign matter from getting inside the product during replacement, make sure to perform flushing and confirm that no foreign matter flows out before starting operation.
(2) To reuse the micro mesh element and sintered element, eliminate any dust between the end plate and the packing completely.

⚠**Caution** **Replace all equipment using fluororesin packing. Reusing used packing leads seal leakage.**

(3) Mount the element guide if it has been removed.
(4) Insert components in order of element, joint, element and element mounting bracket so that they are aligned. (Refer to Figure 1 on the left on page 7)
Note) Joint is not required for the sintered element or paper element.

⚠**Caution** **When mounting the element, do not drop it from the upper end of the element guide.**

(5) If two to three elements are stacked, an element guide in which the elements and joints have been already mounted can be mounted onto the element support.
(6) Mount the element mounting bracket.
(7) Mount the spring so that it is put into the convex portion of the element holder.
(8) Tighten the wing nut onto the tension bolt. Confirm that the wing nut is tightened securely. The tightening amount of the wing nut is different depending on the material or the number of element. Table 3 shows the guideline of the wing nut tightening amount. Refer to the following figure for the position of the tightening amount shown in the table.

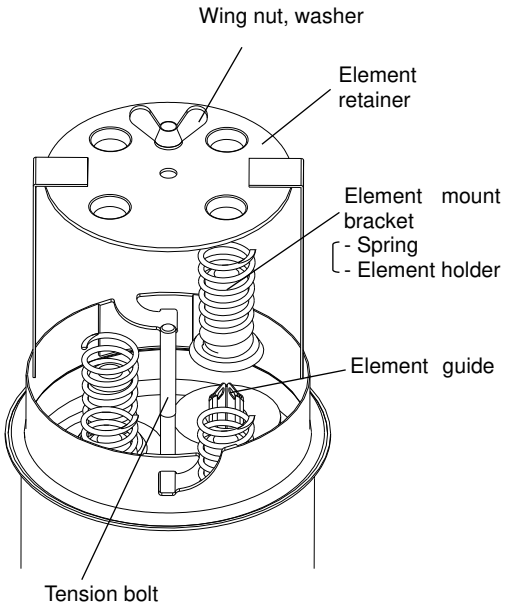
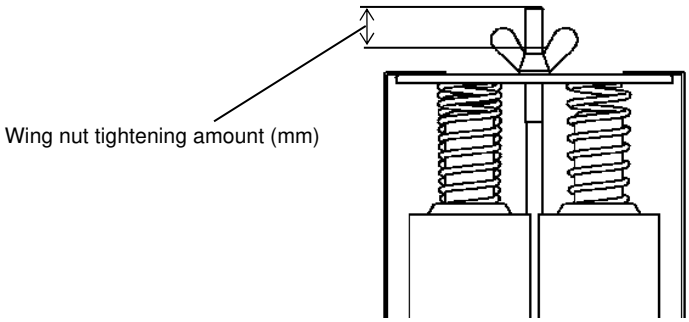


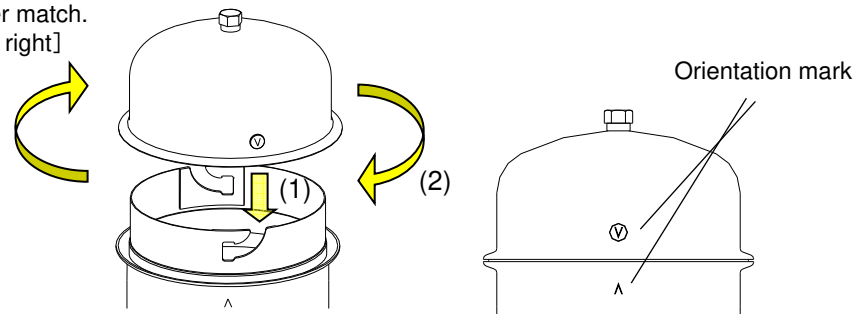
Table 3 Guideline of the wing nut tightening amount

Model	FGE$^{S}_{L}$ A	FGE$^{S}_{L}$ B		FGE$^{S}_{L}$ C	
Element size (mm)	φ65 to 70 × 250	φ65 to 70 × 500	φ65 to 70 × 250	φ65 to 70 × 750	φ65 to 70 × 250
Wing nut tightening amount (mm)	26 to 30	40 to 45	33 to 38	51 to 55	27 to 44



5-4 [Mount O-ring and cover]

(1) Set O-ring to the case
(2) Rotate the cover clockwise while pushing till the end so that the orientation mark of the case and the cover match.
［In order of (1) and (2) on drawing on the right］



5-5 [Mount and tighten V-band]

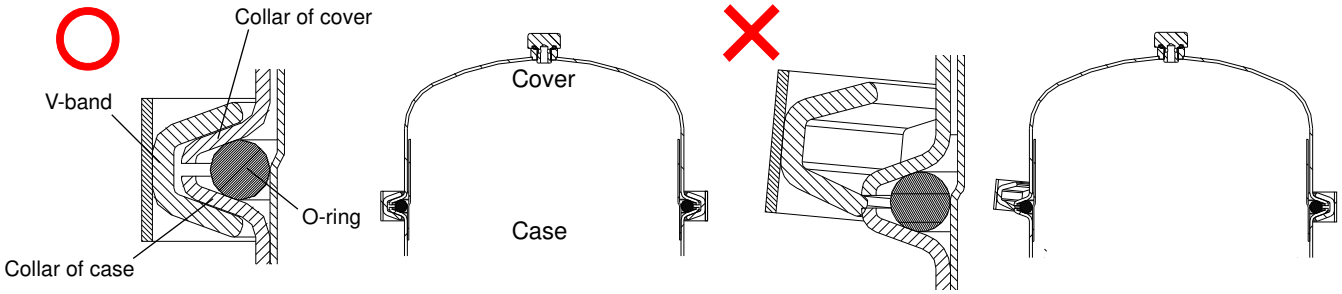


Fig. (a) Correct mounting of V-band

Fig. (b) Incorrect mounting of V-band
(Not correctly fit with collar of cover)

(1) Mount V band to the collar of the cover and the case correctly. [Refer Fig. (a), (b)］

⚠ **Warning The cover may be fallen off due to incorrect mounting. Mount the cover properly.**

(2) Hit the circumference of V-band lightly with plastic hammer for secure mounting.
(3) Mount T-bracket to the latch correctly. [See Fig. (c)]
(4) Tighten the clamping nut to specified nut (position from where clamping position check pin can be inserted), and insert the clamping position check pin. [See Fig.(c)]
(5) When tightening if the nut cannot be tightened to specified position (position where clamping position check pin can be inserted), replace V-band and O-ring to new ones. (See table 1).

⚠ **Caution Clean V band and the contact surface between the cover and the case before mounting. Dirty contact surface lead to cause leakage.**

⚠ **Warning Replace with a new V-band when deformation or worn out by screw is found on the band.**
[V-band for replacement] No.: CY-24S

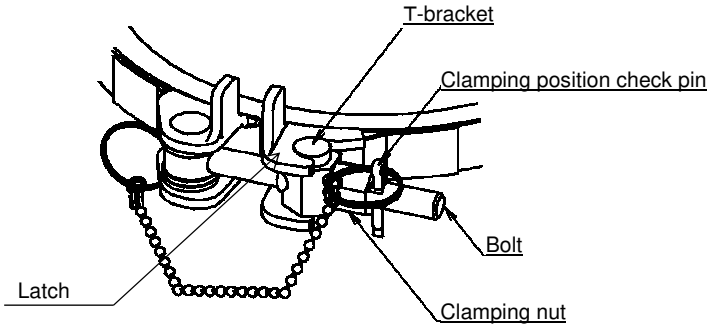


Fig. (c) V band tightening

5-6 [Restart and air discharge]

(1) When restart the operation after the replacement of the element, follow the procedure of section 4 “Operation”.
(2) When restart the operation, open the upper air relief port to **discharge air.**

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SMC Corporation

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