



Operation Manual

PRODUCT NAME

EHEDG Compliant Fittings

MODEL/ Series/ Product Number

KFG2H-E series*

SMC株式会社

Contents

1. Safety Instructions	3-4
2. Specific Product Precautions	5-8
3. Specifications	9
4. Troubleshooting	9
5. Construction	9



EHEDG Compliant Fittings 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. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not allowed.

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, combustion 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.



EHEDG Compliant Fittings Safety Instructions

Caution

SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries.

Use in non-manufacturing industries is not allowed.

Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country.

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.

2. Specific Product Precautions (1)

Design/Selection



Warning

(1) Check the specifications.

The product in this catalog is designed to be used in compressed air systems (including vacuum) only. If the product is used in an environment where pressure or temperature is out of the specified range, damage and/or malfunction may result. (Refer to the specifications.)

Do not use beverages or food as operating fluid used inside the product.

The design of this product is not intended to use beverages or food as an operating fluid.

Please consult with 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) Do not disassemble the product or make any modifications, including additional machining.

It may cause human injury and/or an accident.

(3) When operating at a high temperature, the fittings and tubing will also become very hot.

Touching the product may result in burns, so be sure to take safety measures before coming into direct contact with the product.



Caution

(1) Keep the connection part of fittings and tubing from rotating or oscillating movement.

The fittings may be damaged if they are used in the above manner.

(2) The tubing bending radius in the vicinity of the fitting should be at least the minimum bending radius of the tubing.

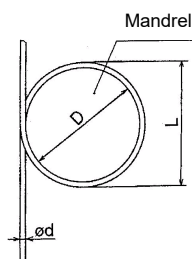
If the bending radius is less than the minimum value, fittings may be damaged, or tubing may crack or be crushed. The minimum bending radius of the FR soft nylon tubing (TRS series), FR double layer tubing (TRB series), antistatic soft nylon tubing (TAS series), polyolefin tubing (TPH series), soft polyolefin tubing (TPS series) is measured as following in accordance with JIS B8381. Tubing deformation ratio at the minimum bending radius is obtained through the following formula, based on tubing diameter and mandrel diameter by wrapping the same radius mandrel tube.

Tube deformation ratio at the minimum bending radius

$$\eta = \left(1 - \frac{L - D}{2d} \right) \times 100$$

Here, η : Deformation ratio (%)
 d : Tubing diameter (mm)
 L : Measured length (mm)
 D : Mandrel diameter (mm)
 (Twice against the minimum bending radius)

Test temperature: 20 $\pm$ 5°C
 Relative humidity: 65 $\pm$ 5%



(3) Do not use fluids other than listed on the specifications.

Applicable fluids are air and water, steam. Please consult with SMC if using other fluids.

(4) When it is used with water, the fittings or tubing may be damaged depending on the surge pressure.

(5) Surge pressure must be under the maximum operating pressure. If the surge pressure exceeds the maximum operating pressure, it will result in damage to fittings and tubing.

(6) The dimensions shown in the dimension drawings are merely reference dimensions. The actual dimensions will vary depending on the tolerance.

Be sure to provide sufficient clearance around the fitting for piping.

(7) This product is not sterilized. The product should be cleaned and sterilized before use.

Mounting/ Piping



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) Ensure sufficient space for maintenance activities.

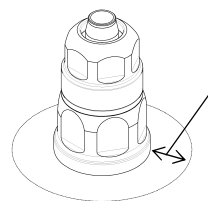
When installing the products, allow access for maintenance.

(3) Cleaning space

Allow space for cleaning when piping.

Connect the fitting so that it can be cleaned from all directions.

If more than one fitting is installed, or if the fitting is installed near the wall, keep at least 6mm of clearance



Minimum clearance: 6mm

(4) Adhere to the thread tightening method.

When installing the products, refer to "Connection Thread Tightening Method".

(5) There may be cases of the tubing detaching from the fitting and thrashing around uncontrollably due to tubing degradation or fitting breakage.

To prevent the situation from becoming uncontrollable, fit the tubing with a protective cover or fix it in place.

2. Specific Product Precautions (2)

Mounting/ Piping



Caution

(1) Preparation before piping

Before piping is connected, the mounting surface of the female thread should be thoroughly cleaned out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

(2) Check the model, type and size before installation.

Also, confirm that there are no scratches, gouges or cracks on the product.

(3) When connecting the tubing, take pressure or possible changes to the tubing length into account, and allow a sufficient margin.

Failure to do so may result in fitting breakage or detachment of the tubing. Refer to the recommended piping conditions.

(4) Do not apply unnecessary forces such as twisting, pulling, moment loads, vibration and impact, etc. on fittings or tubing.

This will cause damage to the fittings and will crush, burst or release tubing.

(5) Tubing, with the exception of coiled tubing, requires stationary installation. Do not use standard tubing (non-coiled) in applications where tubing is required to travel inside the flexible protection tube. Tubing that travels may sustain abrasion, extension, or severance due to tensile force, or may result in removal of tubing from fitting. Use caution prior to use for proper application.

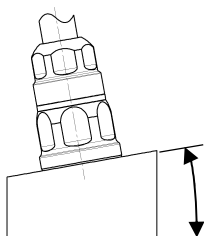
(6) To install the fitting, screw the fitting in using the hexagonal face of the body, and tighten with an appropriate wrench.

Affix the wrench at the base of the thread. If the size of hexagonal face and wrench do not match, or tightening takes place near the tube side, it may cause collapse or deformation of the hexagonal face, or damage to the equipment. After installing, confirm that there is no damage to the fitting, etc.

(7) Use a tool with soft internal surface, such as plastic to prevent damage to the fitting surface.

After mounting, check that the fitting is not damaged or deformed.

(8) In case of top mounting, mount the fitting at an angle so that water and detergent are not accumulated in the fitting.



Mount the fitting at an angle of 3° or more to prevent water and detergent from being accumulated in the fitting.

3° or more

(9) All mounting surfaces have to be clean with a roughness of $Ra < 0.8 \mu m$ to prevent dirt from being forced in under the seal.

Piping Method



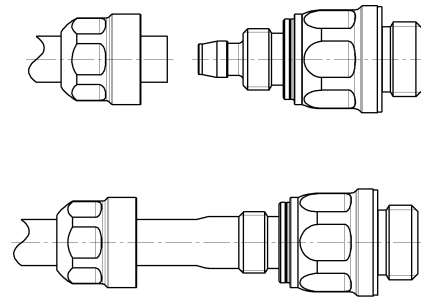
Caution

(1) Take a tube having no flaws on its periphery and cut it off at right angles.

Use SMC's tube cutter TK-1, 2, 3, 5 or 6 for cutting. Do not use pinchers, nippers or scissors, etc.

The tubing might be cut diagonally or flattened, making installation impossible or causing problems such as disconnection and leakage.

(2) Insert the tube into the union nut with the union nut removed. Grab the tube and gently push it throughly into the fitting.

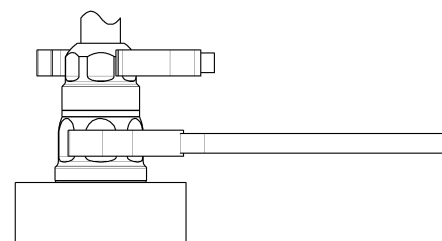
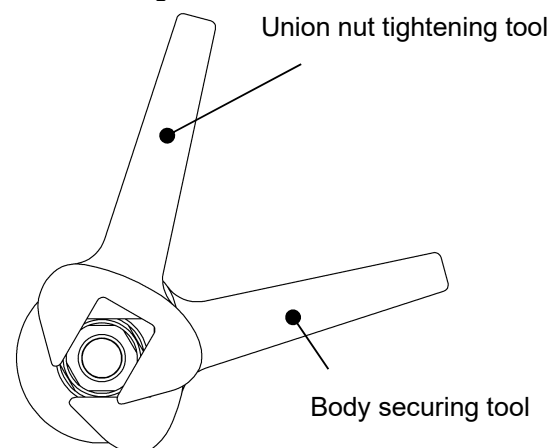


(3) After insertion, tighten the union nut temporarily by hand.

(4) Fix the body with a tool. Tighten the union nut to the end surface of the body using a suitable wrench.

Hex. across flats may be deformed, if using an improper wrench for hex. across flats.

If the body is not secured with a tool, this may cause breakage.



2. Specific Product Precautions (3)

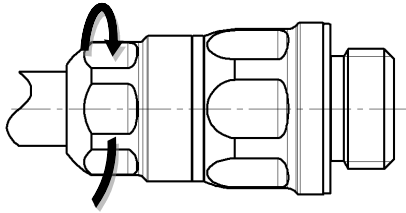
Piping Method

- (5) Fix the body with a tightening tool. Tighten the union nut to the end surface of the body using a suitable wrench.**

Hex. across flats may be deformed, if using an improper wrench for hex. across flats.

Tighten the union nut with the proper tightening torque shown below.

Union nut tightening direction



Fitting size	Proper tightening torque [N·m]
KFG2□04	2 to 3
KFG2□06	3 to 4
KFG2□08	5 to 6
KFG2□10	8 to 10
KFG2□12	10 to 12

Cleaning

Warning

- (1) Check the connection before cleaning.**
Clean the fittings whilst connected to the product.
Do not clean the fitting when the tube, union nut and body are not assembled.
- (2) Review the conditions before cleaning.**
Make sure that the fitting material is not affected or damaged by chemical solution, temperature, and water pressure before use.
- (3) Do not use a metal brush or tool which damages or scratches the fitting.**

Air Supply

Warning

- (1) Type of fluids**
Please consult with SMC when using the product in applications other than compressed air and water, steam. Regarding products for general fluids, please contact SMC concerning applicable fluids.
- (2) When there is a large amount of drainage.**
Compressed air containing a large amount of condensate can cause the malfunction of pneumatic equipment. An air dryer or water droplet separator should be installed upstream from the filters.

(3) Drain flushing

If condensate in the drain bowl is not emptied on a regular basis, the bowl will overflow and this may cause the malfunction of pneumatic equipment. If the drain bowl is difficult to check and remove, installation of a drain bowl with an auto drain option is recommended.

For details on the above compressed air quality, refer to SMC's Best Pneumatics catalog.

(4) Use clean air.

Do not use compressed air that contains chemicals, synthetic oils including organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

Caution

(1) Install an air filter.

Install an air filter at the upstream side of valve. Select an air filter with a filtration degree of 5µm or finer.

(2) Install an after cooler, air dryer or water droplet separator, etc.

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

(3) Ensure that the fluid and ambient temperature 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 and leading to equipment malfunction. Therefore, take appropriate measures to prevent freezing.

For details on the above compressed air quality, refer to SMC's Best Pneumatics catalog.

Operating Environment

Warning

- (1) Do not use in an atmosphere having corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these.**
Refer to each construction drawing on the fittings and tubing material.
- (2) Do not expose the product to direct sunlight for an extended period of time.**
- (3) Do not use in a place subject to heavy vibration and/or shock.**
- (4) Do not mount the product in locations where it is exposed to radiant heat.**
- (5) Do not use the ordinary fittings and tubing in locations where static electricity would be problematic.**
It may result in the system failure and trouble. In such places, use of antistatic fittings (KA series) and antistatic tubing (TA series) are recommended.

2. Specific Product Precautions (4)

Operating Environment

- (6) **Take note that if nylon tubing, soft nylon tubing and antistatic tubing are used in a clean room.**

The antioxidant on the surface of the soft nylon tubing may come off, thereby lowering the cleanness level.

- (7) **Do not use in environments where foreign matter may stick to the product or get mixed in the product's interior.**

This may cause leakage or disconnection of the tubing.

Maintenance



Warning

- (1) **Perform maintenance inspections according to the procedures indicated in the operation manual.**

If handled improperly, malfunction and damage of machinery of 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 air**

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 restarted, proceed with caution after confirming that appropriate measures are in place to prevent cylinders from sudden movement.



Caution

- (1) **Be certain to wear safety glasses at all times during periodical inspections.**

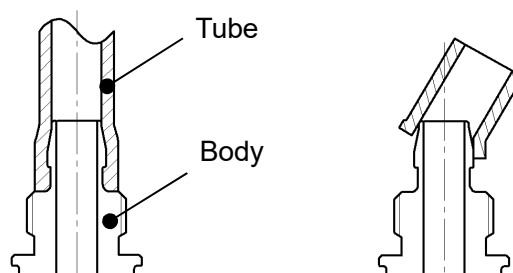
- (2) **During regular maintenance, check for the following and replace any components as necessary.**

- Scratches, gouges, abrasion, corrosion
- Leakage
- Flattening or distortion of tubing
- Hardening, deterioration or softness of tubing
- Loosening of the union nut

- (3) **Do not repair the fittings or patch the tubing for reuse.**

- (4) **After operation at a high temperature, leakage may occur due to time dependent change of the tube material. If leakage occurs, remove the tube, cut off the connecting part of the tube, and connect to the piping again.**

Check if the tube dimension accuracy is within the recommended tolerance. If it is difficult to take the tube out of the body, bend the tube to the side to remove.



Connection Thread Tightening Method



Caution

- (1) **First, tighten the fitting by hand, then use a wrench appropriate for the hexagon flats of the body to tighten it. For a tightening torque guide, see the table below.**

If the fitting is tightened with excessive torque, it may break.

Connection thread size	Tightening torque [N·m]
M5	1 to 1.5
G1/8	3 to 5
G1/4	8 to 12
G3/8	15 to 20
G1/2	20 to 25

- (2) **Insufficient tightening may cause seal failure, or loosen the threads.**

Precautions for use with non-SMC



Caution

- (1) **When using the KFG2H*-E series with tubing other than those from SMC, the products are not subject to warranty.**

3. Specifications

Fluid	Air, Water ^{Note1)} , Steam ^{Note3)}
Operating pressure range ^{Note2)}	-100 kPa to 1 MPa ^{Note 4)}
Ambient and fluid temperature	-5 to 150°C (No freezing) ^{Note 4)}

Note 1) Deionized water is not recommended for use as it may affect the material used in the fittings. In addition, it is known to degrade the water quality.

Note 2) Do not use the fittings with a leak tester or for vacuum retention because they are not guaranteed for zero leakage.

Note 3) Please contact SMC for applicable tubing separately.

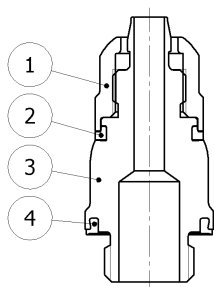
Note 4) Check the operating pressure range and operating temperature range of the tube.

4. Troubleshooting

KFG2H*-E series EHEDG Compliant Fittings cannot be disassembled or repaired in order to quality maintenance.

When failure such as "Non-removable tubing" occurs, please replace the whole product.

5. Construction



No.	Description	Material	Remarks
1	Union nut	Stainless steel 316	NSF H1 grease
2	Gasket	FDA compliant FKM	
3	Body	Stainless steel 316	
4	Gasket	FDA compliant FKM	

Stainless steel

Metal exists in nature as ore (like oxide or sulfide). This means that oxide or sulfide is more stable than pure metal. Accordingly, metallic material chemically oxidizes (metallic constituent becomes ion and melts out). It corrodes in the natural environment.

Even though corrosion of metal easily occurs in an environment where oxidizing tendency is stronger, some kinds of metal have a characteristic for which corrosion never happens if the level of oxidizing goes higher than a specific point. In such case, it is called "metal in passive state".

Stainless steel has corrosion resistance because of a thin coat of passive state on its surface. However, there does not exist stainless steel with absolute corrosion resistance; therefore, many types of stainless steel have been developed for improved corrosion resistance performance.

Revision history
A: Added information based on the review results. B: Changes made following discussions with the certification/review body. C: Product name and specifications revised to align with the catalog. D: Updated the “Safety Precautions” section, removed the SMC address, revised individual precautionary notes, and made changes following discussions with the certification/review body.

SMC Corporation

Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362

URL <https://www.smcworld.com>

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

© SMC Corporation All Rights Reserved