



Operation Manual

PRODUCT NAME

Polyurethane Tubing

MODEL / Series / Product Number

HF2B-TU Series

SMC Corporation

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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.



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.Product specific -precautions(1)

Design/Selection

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.) We do not guarantee against any damage if the product is used outside of the specification range.

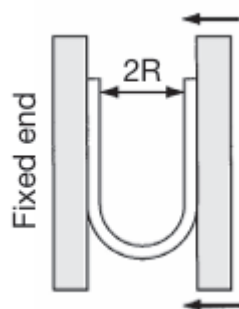
2. Do not disassemble the product or make any modifications, including additional machining. It may cause human injury and/or an accident

Caution.

1. Keep the connection part of fittings and tubing from rotating or oscillating movement. Use Rotary One-touch Fittings (KS or KX series) in these cases. 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 damage, or tubing may crack or be crushed. The tube of the minimum bending radius is measured at the temperature of 20°C as shown in the figure below.



Bend the tube into U-form at a temperature of 20°C. Fix one end and close loop gradually. Measure 2R when the tube breaks or is crushed.

Design/Selection

Caution.

3. Do not use fluids other than listed on the specifications. Applicable fluids are air and water.

4. When used with liquid fluid, the fittings or tubing may be damaged depending on the surge pressure.

5. 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.

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.Maintenance space

Allow sufficient space for maintenance and inspection.

3. 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.

Caution.

1.Preparation before piping

Before piping is connected, it should be thoroughly blown 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 is 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.

2.Product specific -precautions(2)

Mounting/Piping

Warning.

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 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.

Air Supply

Warning.

1.Type of fluids

Be sure to use compressed air for the fluid. Regarding products for general fluids, please contact SMC concerning applicable fluids

2. 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. 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 impact.

4. Do not mount the product in locations where it is exposed to radiant heat.

Operating Environment

Warning.

5. Do not use non-anti-static fittings or tubing in locations where static electricity may pose a problem.

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.

6. Do not use non-flame-resistant fittings or tubing in areas where spatter may be generated. Spattering may result in a fire hazard. In such a place, use of flame resistant fittings (KR/KRM series) and flame resistant tubing (TRS/TRB/TRBU/TRTU series) are recommended.

7. Do not use in an environment where the product is directly exposed to cutting oil, lubricant, coolant oil, etc.

8. 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 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.

2.Product specific -precautions(3)**Maintenance****Warning.****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.Replace fittings or tubing having the following problems.

- 1) Cracks, gouges, wearing, corrosion
- 2) Air leakage
- 3) Twists or crushing of tubing
- 4) Hardening, deterioration, softening of tubing

3. When replacing tubes or fittings, do not try to mend or repair and then reuse them

Maintenance**Installation and removal of tubing****Caution.****a) Installation of tubing**

(1) Cut the tubing perpendicularly, being careful not to damage the outside surface. Use an SMC tube cutter TK-1, 2, 3, 5 or 6. Do not cut the tubing with pliers, nippers, scissors, etc., otherwise, the tubing will be deformed and trouble may result.

Maintenance**Installation and removal of tubing****Caution.****a) Installation of tubing**

(2) The outside diameter of the polyurethane tubing swells when internal pressure is applied to it. Therefore, it may be possible that the tubing cannot be re-inserted into the One touch fitting.

Check the tubing outside diameter, and when the accuracy of the outside diameter is +0.15 mm or more, insert into the One touch fitting again, without cutting the tubing to use it. When the tubing is re-inserted into the One-touch fitting, confirm that the tubing goes through the release button smoothly.

(3) Grasp the tubing, slowly push it straight (0 to 5°) into the One-touch fitting until it comes to a stop.

(4) Pull the tubing back gently to make sure it has a positive seal. Insufficient installation may cause air to leak or the tubing to release. As a guide for checking the tubing is not pulled out, refer to the following table.

Tubing Size	Tensile force of tubing [N]
ø4	8
ø6	12
ø8	20
ø10	30
ø12	35

b) Removal of tubing

(1) Push the release button flange evenly and sufficiently to release the tube. Do not push in the tubing before pressing the release button.

(2) Pull out the tubing while keeping the release button depressed. If the release button is not held down sufficiently, the tubing cannot be withdrawn.

(3) To reuse the tubing, remove the previously lodged portion of the tubing. If the lodged portion is left on without being removed, it may result in air leakage and removal of the tubing difficult.

2.Product specific -precautions(4)

Recommended Piping Condition



Caution.

1. When connecting piping to the One-touch fitting, use pipe length with sufficient margin, in accordance with the piping conditions shown in Fig. 1. Also, when using a tying band, etc., to bind the piping together, make sure that external force does not come to bear on the fitting. (See Fig. 2.)

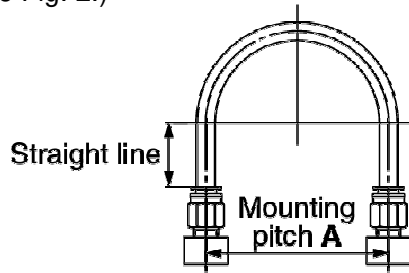


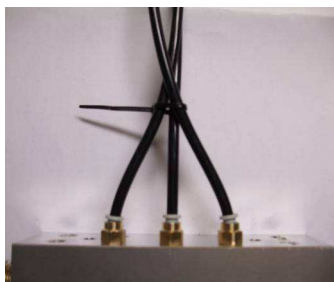
Fig. 1 Recommended piping

Unit:[mm]

Tubing size	Mounting Pitch A	Straight line length
	Polyurethane tubing	
φ4	26 or more	20 or more
φ6	39 or more	30 or more
φ8	52 or more	40 or more
φ10	69 or more	50 or more
φ12	88 or more	60 or more



Recommended



No good

Fig.2 When using a tying band to bind the piping together

Design/Selection



Caution.

1. When using fittings other than those from SMC, be certain to confirm that operating conditions are such that no problems will arise.

2. If there is a risk of unintended tensile load being applied to the tubing, the use of an inner sleeve is recommended to improve reliability.

Model	Applicable inner sleeve	
	TJ Series	TJG Series
HF2B-TU0425	TJ-0425	TJG-0425
HF2B-TU0604	TJ-0604	TJG-0604
HF2B-TU0805	TJ-0805	TJG-0805
HF2B-TU1065	TJ-1065	TJG-1065
HF2B-TU1208	TJ-1208	TJG-1208

3. Specifications

Series label

Model	HF2B-TU0425	HF2B-TU0604	HF2B-TU0805	HF2B-TU1065	HF2B-TU1208
Tubing O.D.mm	φ4	φ6	φ8	φ10	φ12
Tubing I.D.mm	φ2.5	φ4	φ5	φ6.5	φ8

Color	Black (B)	●	●	●	●	●
	White (W)					
	Red (R)					
	Blue (BU)					
	Yellow (Y)					
	Green (G)					
	Clear (C)					
	Orange (YR)					
	Clear green (G2)					
	Clear yellow (Y2)					

Specifications

Fluid, Applicable fittings		Air/Water ^{Note1)}				
		One-touch fittings, Insert fittings, Miniature fittings				
Max. operating pressure (MPa) ^{Note2)} , ^N ^{ote3),Note4)}	20°C or less	Air	0.8			
		Water	0.8			
	40°C	Air	0.65			
		Water	0.65			
	60°C	Air	0.5			
		Water	-			
Min. bending radius (mm)		10	15	20	27	35
Operating temperature	Air	-20 to +60°C(No freezing)				
	Water	0~40°C(No freezing)				
Material		Polyurethane				
Compliance Standards (dissolution test)	Japan	Food sanitation ACT Compliance test based ministry of health and welfare notification No.370 of 1959				
	U.S.	FDA:§177.2600				
	EU	(EU) No.10/2011				

Note 1: Surge pressure must be used within the maximum operating pressure.

Note 2: Confirm the operating pressure range of the fittings.

Note 3: Since leakage is not completely zero, avoid use in applications requiring vacuum retention such as leak testers.

Note 4: Abnormal temperature rise due to adiabatic compression may cause tube rupture.

4.Troubleshooting

The polyurethane tubing HF2B-TU series is designed in a non-repairable structure to maintain product quality.

Therefore, if any nonconformity occurs, such as the inability to attach or detach the tubing, replace the product

5. Structural drawing

HF2B-TU Series

Polyuretane



No.	Product Name	Material
①	Polyuretane tubing	Polyuretane

Revision history
1: Revision of the Minimum Bending Radius Measurement Method for Tubing

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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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