

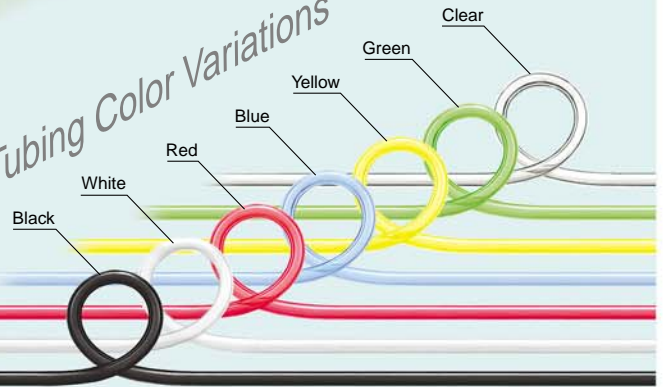
# Miniature Tubing & Miniature Fittings

Series *TU/M*

O.D.  $\varnothing 2$  X I.D.  $\varnothing 1.2$

Minimum bending radius: **4 mm**

Tubing Color Variations



Four types of fittings are available.

Barb fitting



Port size
M3
M5

Barb elbow



Port size
M3
M5

Barb one-touch



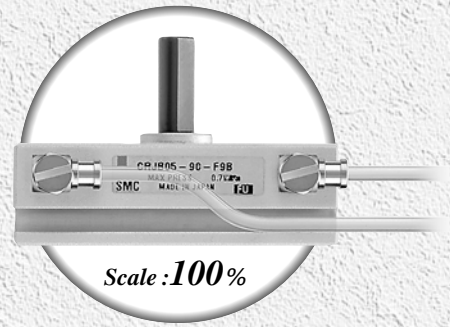
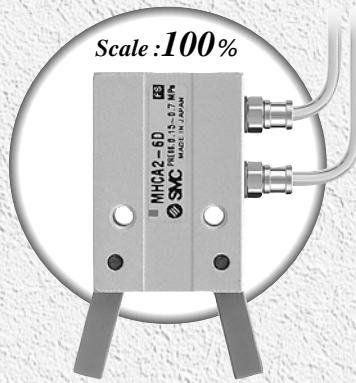
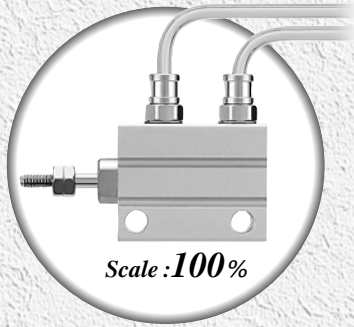
Tubing size
$\varnothing 3.2$
$\varnothing 4$

Reducer

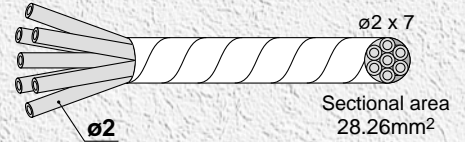
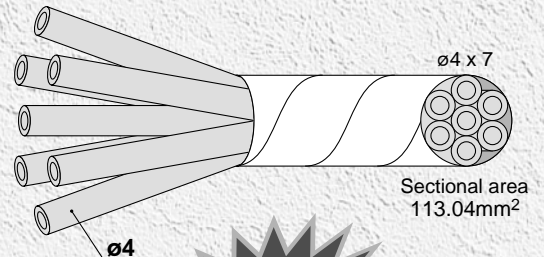
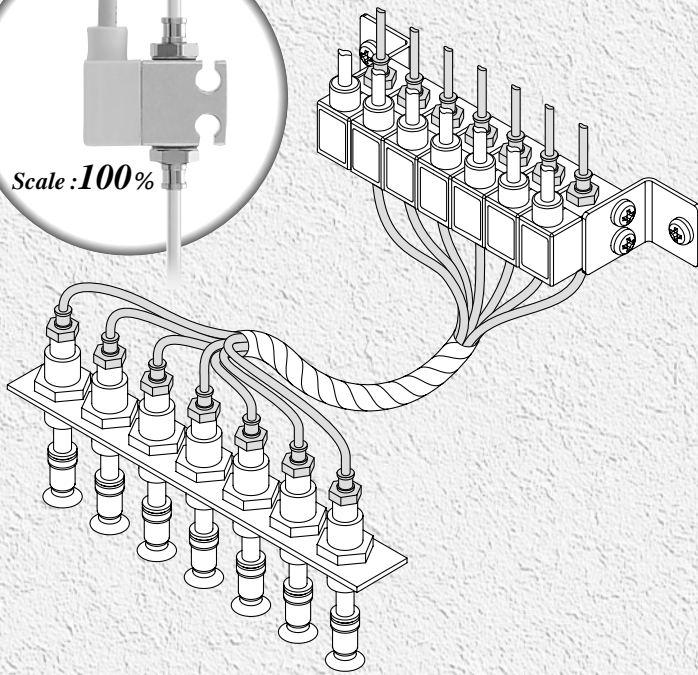
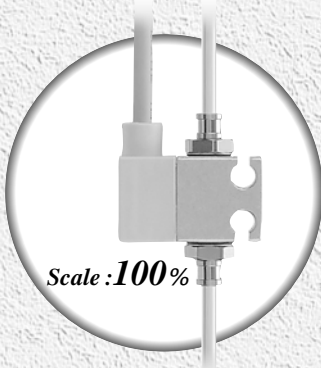


Fitting size
$\varnothing 3.2$
$\varnothing 4$

## Piping for compact actuator

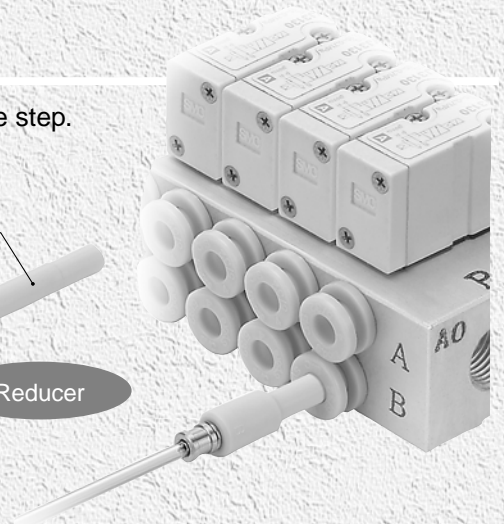
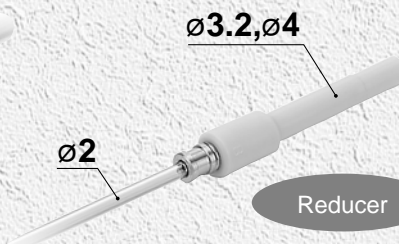
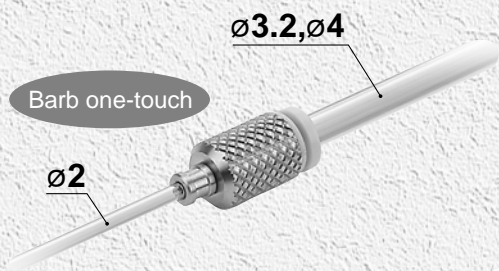


## Piping for compact pressure sensor



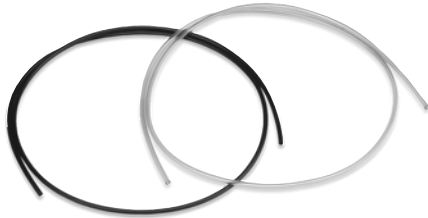
## Easy size reduction

Reduction of the tubing size from standard equipment is possible in a single step.



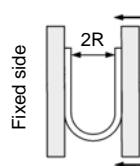
# Miniature Polyurethane Tubing

## Series TU



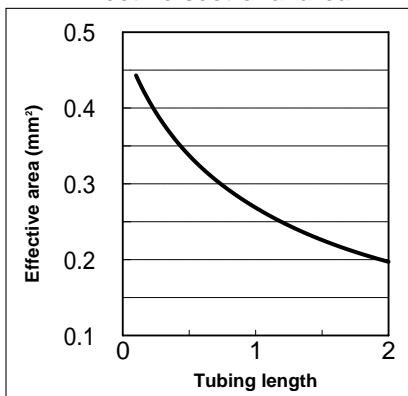
### Specifications

Model	TU0212
O.D. x I.D. (mm)	2 x 1.2
Fluid	Air, Water
Max. operating pressure (at 20°C)	0.8MPa
Burst pressure	Refer to pressure characteristics curve.
Min. bending radius (mm) <sup>Note)</sup>	4
Operating temperature	-20 to +60°C (Water: 0 to 40°C) (No freezing)
Material	Polyurethane
Color	Black(B), White(W), Red(R), Blue(BU), Yellow(Y), Green(G), Clear(C)

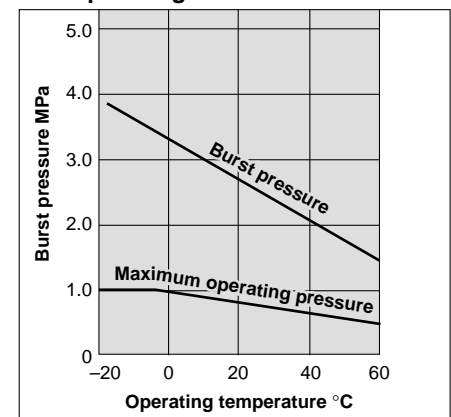


Note) At a temperature of 20°C bend the tubing into a U shape. Then with one side fixed, gradually close the other side and measure 2R at the point where the tubing folds or flattens, etc.

Effective sectional area



Burst Pressure Characteristic Curve and Operating Pressure



### ⚠ Precautions

Be sure to read before handling. Refer to page 4 through 6 for Safety Instructions and common precautions on the products mentioned in this catalog.

### ⚠ Caution

- 1 Applicable for general industry water. Consult SMC if using for other kinds of fluids. Surge pressure must be under the max. operating pressure. If exceeding that value, fitting may be damaged and tubing may burst.
- 2 The value of the max. operating pressure is at a temperature of 20°C. Refer to the burst pressure characteristics curve for other temperatures. Avoid abnormal temperature rises which may burst the tubing.
- 3 The values of the min. bending radius is at a temperature of 20°C. Higher temperatures allow the tubing to bend more.

### How to Order

**TU0212** **B** **20**

Indication of tubing model

Color indication

Symbol	Color
B	Black
W	White
R	Red
BU	Blue
Y	Yellow
G	Green
C	Clear

Length per roll

Symbol	Roll size
20	20m roll

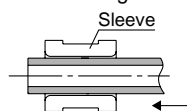
# Miniature Fittings (For exclusive Miniature tubing) Series M



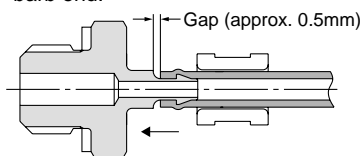
## Tubing connection and removal

### Installing tubing

1. Cut the tubing perpendicularly allowing additional length.
2. Insert the tubing into the sleeve.



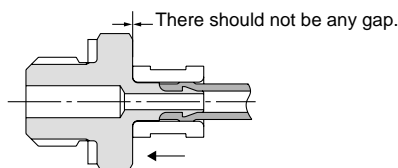
3. Insert the tubing slowly into the fittings. Make sure to secure a gap of approx. 0.5mm between the tubing end and the barb end.



4. Insert the sleeve slowly. Make sure not to allow any gap between the sleeve end side and the body end side. (Please refer to the illustration below.)

If you feel any strong resistance and cannot push the sleeve completely to the end side, this may be caused due to jamming. Remove and repeat again by starting from step 1 making sure to secure a gap in the step 3.

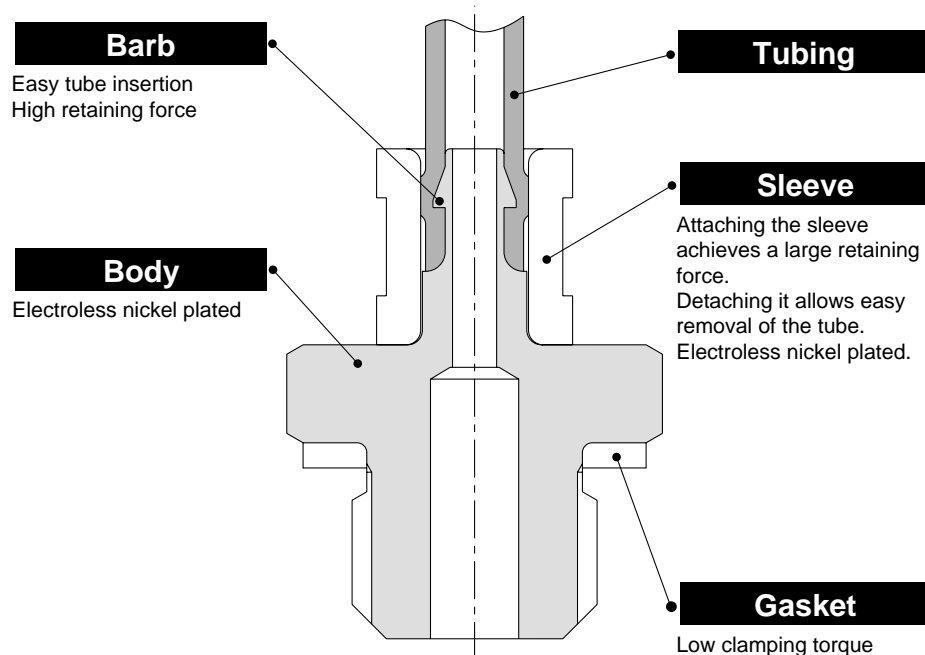
Note) When installing the tubing, the sleeve must be attached. Operation without attaching the sleeve may cause tubing disconnection.



### Removing tubing

Withdraw the sleeve straight along the tubing. Use a tool such as long-nose pliers if it is difficult to pull out by hand.

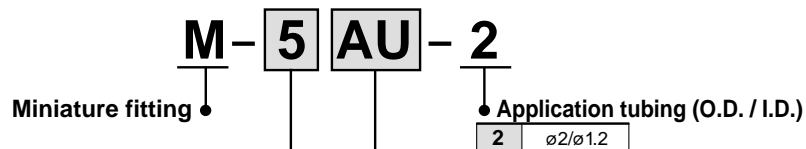
1. Withdraw the tubing straight.
2. When reusing the tubing, cut off the previously installed portion of the tubing to avoid possible leakage and/or disconnection of the tubing.



## Specifications

Applicable tube material	Polyurethane
Applicable tube dia.	ø2/ø1.2
Max. operating pressure (at 20°C)	1MPa
Port size	M3, M5, ø3.2, ø4
Thread	JIS B0209 Class 2 (Metric coarse thread)

## How to order



### Model

AU	Barb fitting	M3, M5
ALU	Barb elbow	M3
ALHU		M5
F	Barb one-touch	ø3.2, ø4
R	Reducer	

### Port size

3	M3
5	M5
32	ø3.2
04	ø4

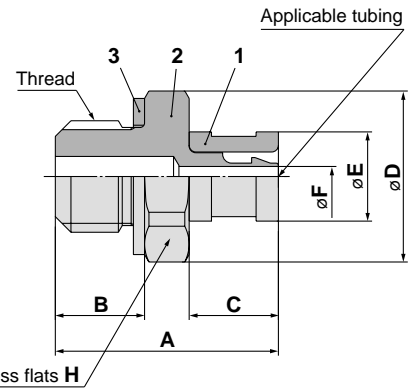
## Barb fitting: M-3AU-2, M-5AU-2



Applicable tubing O.D. x I.D. (mm)	Thread	Model	H	A	B	C	D	E	F	Weight g
	M5	M-5AU-2	7	10	4	4	7.7	4	0.9	1.5

### Parts list

No.	Description	Material	Note
1	Sleeve	Brass	Electroless nickel plated
2	Barb fitting	Brass	Electroless nickel plated
3	Gasket	NBR, Stainless steel	-



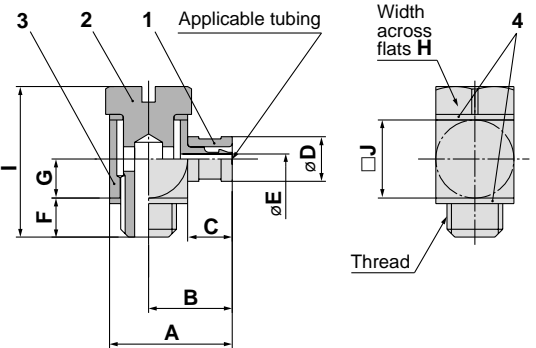
## Barb elbow: M-3ALU-2, M-5ALHU-2



Applicable tubing O.D. x I.D. (mm)	Thread	Model	H	A	B	C	D	E	F	G	I	J	Weight g
	M5	M-5ALHU-2	7	11	7.5	4	4	0.9	3	3.5	13.5	7	3.5

### Parts list

No.	Description	Material	Note
1	Sleeve	Brass	Electroless nickel plated
2	Stud	Brass	Electroless nickel plated
3	Barb elbow	Brass	Electroless nickel plated
4	Gasket	NBR, Stainless steel	-



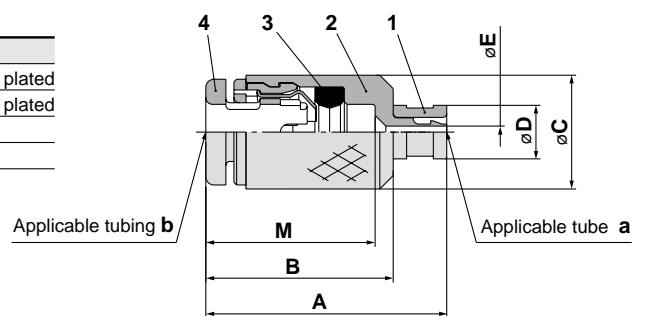
## Barb one-touch: M-32F-2, M-04F-2



Applicable tubing (mm) a (O.D. x I.D.) b (O.D.)	Model	A	B	C	D	E	M	Weight g
	M-04F-2	18	14	8.5	4	0.9	12.7	2.9

### Parts list

No.	Description	Material	Note
1	Sleeve	Brass	Electroless nickel plated
2	Body	Brass	Electroless nickel plated
3	Seal	NBR	-
4	Cassette	POM, Stainless steel	-

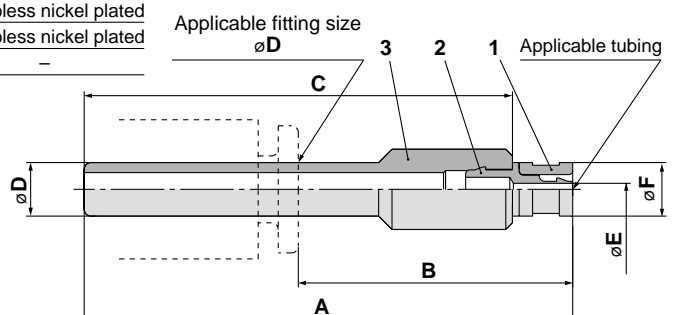


## Reducer: M-32R-2, M-04R-2

Applicable tubing O.D. x I.D. (mm)	Fitting size øD	Model	A	B	C	E	F	Weight g
	ø4	M-04R-2	36.5	20.5	32	0.9	4	0.8

### Parts list

No.	Description	Material	Note
1	Sleeve	Brass	Electroless nickel plated
2	Studded body	Brass	Electroless nickel plated
3	Stem	PP	-








*Series TU/M*

# Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a labels of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 <sup>Note 1)</sup>, JIS B 8370 <sup>Note 2)</sup> and other safety practices.

 **Caution** : Operator error could result in injury or equipment damage.

 **Warning** : Operator error could result in serious injury or loss of life.

 **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – General rules relating to systems.

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

## **Warning**

### **1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

### **2. Only trained personnel should operate pneumatically operated machinery and equipment.**

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

### **3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.**

1. Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driven object have been confirmed.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc.

### **4. Contact SMC if the product is to be used in any of the following conditions:**

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuit in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.





## Series TU/M

# Fittings & Tubing/Common Precautions

Be sure to read before handling.

### Selection

#### Warning

##### 1. Confirm the specifications.

The products appearing in this catalog are designed for use only in compressed air systems (including vacuum).

Do not use outside the specified ranges of pressure, temperature, etc., as this may cause damage or malfunction (Refer to specifications.)

Consult with SMC if fluids other than compressed air (including vacuum) are to be used.

### Mounting

#### Warning

##### 1. Read the instruction manual carefully.

The product should be mounted and operated with a good understanding of its contents. Also, keep the manual where it can be easily referred to at any time.

##### 2. Ensure space for maintenance.

Ensure the necessary space for maintenance activities.

##### 3. Strictly observe the tightening torque of the screw.

Tighten the screw at the recommended torque in installation.

### Piping

#### 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.

### Air Supply

#### Warning

##### 1. Types of fluid

This product is designed for use with compressed air. Consult SMC if a different fluid is to be used.

##### 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 Drain Catch should be installed upstream from filters.

##### 3. Drain management

If air filter drains are not flushed regularly, the drainage will flow outlet side leading to the malfunction of pneumatic equipment.

In cases where the management of drain flushing will be difficult, the use of filters with automatic drains is recommended.

For details on the quality of compressed air mentioned above, refer to SMC's Best Pneumatics catalog vol. 4.

##### 4. Types of air

Do not use compressed air containing chemicals, synthetic oil which includes organic solvents, salt, corrosive gases, etc., as this can cause damage or malfunction.

### Operating Environment

#### Warning

1. Do not operate in locations having an atmosphere of corrosive gases, chemicals, sea water, fresh water or water vapor, or where there will be contact with the same.

2. In locations which receive direct sunlight, the sunlight should be blocked.

3. Do not operate in locations where vibration or impact occurs.

4. Do not operate in a location near a heat source or where radiated heat will be received.

### Maintenance

#### Warning

1. Maintenance should be performed according to the procedure indicated in the instruction manual.

Improper handling can cause damage and malfunction of equipment and machinery.

##### 2. Maintenance operations.

Improper handling of compressed air is dangerous. Therefore, in addition to observing the product specifications, replacement of elements and other maintenance activities should be performed by personnel having sufficient knowledge and experience pertaining to pneumatic equipment.

##### 3. Drain flushing

Drains such as the air filter should be flushed regularly.

##### 4. Pre-maintenance inspection.

When removing this product, turn off the electric power, and be certain to shut off the supply pressure and exhaust the compressed air in the system. Proceed only after confirming that all pressure has been released to the atmosphere.

##### 5. Post maintenance inspection.

After installation or repair, reconnect compressed air and electricity and conduct appropriate inspections to confirm proper operation. If there is an audible air leakage, or if the equipment does not operate properly, stop operation and confirm that the equipment is installed correctly.

##### 6. Disassembly and modification prohibited.

Do not disassemble or modify the unit.



# Miniature Tubing and Miniature Fitting/ Specific Product Precautions

Be sure to read before handling.

## Selection

### Caution

1. Do not use in locations where the connected tubing will slide or rotate. This may result in damage of the fittings.
2. The tube bending radius in the vicinity of the fitting should be at least the minimum bending radius of the tubing. If bent more than the min. bending radius, tubing may fail or be crushed.
3. Do not use with fluids other than those shown in the applicable specifications. The tubing is applicable for air and general industrial water. Consult SMC when using with other fluids.
4. When using water, be careful than the surge pressure dose not cause the tubing to burst.

## Mounting

### Caution

1. Before mounting confirm the model and size, etc. Also, confirm that there are no blemishes, nicks or cracks in the product.
2. Mount so than the tubing and fittings are not subjected to twisting, pulling or moment loads, allowing sufficient leeway in the tubing length. Failure to consider this factor, can cause damage to the fittings and flattening, bursting or disconnection of the tubing.
3. All tubing is specified as immovable piping, except in the case of the coil tubing. For example, if tubing is used inside the cable carrier, any piping movement may result in increased frictional abrasion, tensile expansion, or tubing disconnection from the fittings. Please check carefully when piping.

## Operating Environment

### Warning

1. Do not use in locations where static electric charges will be a problem. Consult SMC regarding use in this kind of environment.
2. Do not use in locations where spatter occurs.  
There is a danger of spatter causing a fire.
3. Do not use in environments where there is direct contact with liquids such as cutting oil, lubricating oil or coolant oil, etc. Contact SMC regarding use in environments where there will be direct contact with cutting oil, lubricating oil or coolant oil, etc.

## Maintenance

### Caution

1. Check for the following during regular maintenance, and replace components as necessary.
  - a) Scratches, gouges, abrasion, corrosion
  - b) Leakage
  - c) Twisting, flattening or distortion of tubing
  - d) Hardening, deterioration or softness of tubing
2. Do not repair or patch the replaced tubing or fittings for reuse.

## Handling of One-touch Fittings

### Caution

1. Tubing attachment/detachment for One-touch fittings
  - 1) Attaching of tubing
    1. Take a tubing having no flaws on its periphery and cut it off at a right angle. When cutting the tubing, use tubing cutters TK-1, 2 or 3. Do not use pinchers, nippers or scissors, etc. If cutting is done with tools other than tubing cutters, the tubing may be cut diagonally or become flattened, etc. This can make a secure installation impossible, and cause problems such as the tubing pulling out after installation or air leakage. Allow some extra length in the tubing.
    2. The polyurethane tubing with internal pressure expands its O.D. This may result in failure of reconnection to One-touch fittings. Examine the tubing and do not cut the tubing but re-connect to the One-touch fittings when its O.D. accuracy is +0.15 or more. Make sure the tubing goes through the release bushing smoothly when reconnecting it to the One-touch fittings.
    3. Grasp the tubing and push it in slowly, inserting it securely all the way into the fitting.
    4. After inserting the tubing, pull on it lightly to confirm that it will not come out. If it is not installed securely all the way into the fitting, this can cause problems such as air leakage or the tubing pulling out.
  - 2) Detaching of tubing
    1. Push in the release bushing sufficiently. When doing this, push the collar evenly.
    2. Pull out the tubing while holding down the release bushing so that it does not come out. If the release bushing is not pressed down sufficiently, there will be increased bite on the tubing and it will become more difficult to pull it out.
    3. When the removed tubing is to be used again, cut off the portion which has been chewed before reusing it. If the chewed portion of the tubing is used as is, this can cause trouble such as air leakage or difficulty in removing the tubing.
2. Tightening of M3 and M5 screws
  - 1) M3
    1. After tightening by hand, the barb fitting type should be tightened by an additional 1/4 rotation using an appropriate wrench.
    2. After tightening by hand, the barb elbow type should be tightened by an additional 1/2 rotation using an appropriate wrench.
  - 2) M5
    1. After tightening by hand, the barb fitting type should be tightened by an additional 1/6 rotation using a suitable tool.
    2. After tightening by hand, the barb elbow type should be tighten an additional 1/3 rotation using an appropriate wrench.

Over tightening can cause air leakage due to damage to the threads and/or deformation of the gasket. Under tightening can cause loose threads and air leakage, etc.

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