Fittings & Tubing Precautions 1

Be sure to read this before handling.

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 or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the specifications.)
Please contact 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. Check if PTFE can be used in application.

PTFE powder (Polytetrafluoroethylene resin) is included in the seal material. Confirm that the use of it will not cause any adverse affect on the system.

⚠Caution

1. Keep the connection part of fittings and tubing from rotating or oscillating movement. Use Rotary One-touch Fittings Series KS or KX 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.

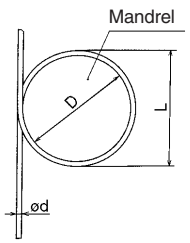
If the bending radius is less than the min. value, fittings may damage, or tubing may crack or be crushed. The minimum bending radius, with the exception of TS soft nylon tubing, TU polyurethane tubing, TUH hard polyurethane tubing, TUS soft polyurethane tubing, TRBU FR double layer polyurethane tubing, TH FEP tubing, TL PFA tubing, TD modified PTFE tubing, is measured as following in accordance with JIS B 8381-1995. 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.

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

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 ±5°C
Relative humidity: 65 ±5%.

Tube deformation ratio at the minimum bending radius



3. Applicable for air and water.

Please consult with SMC if using other fluids.

4. If surge voltage pressure exceeds the max. operating pressure, fitting or tubing may be damaged.

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

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. Tighten threads with the proper tightening torque.

When installing the products, follow the listed torque specifications.

4. 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.

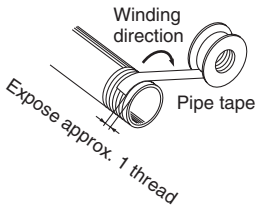
⚠Caution

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. Wrapping of pipe tape

When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not enter the piping. Also, if pipe tape is used, leave 1 thread ridge exposed at the end of the threads.



3. Confirm model no., size, etc. before installing. Check tubing for damage, gouges, crack, etc.

4. 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.

5. Do not apply unnecessary forces such as twisting, pulling, moment loads, vibratioin and impact, etc. on fittings or tubing.

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

6. 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. Tubing that travels may sustain abrasion, extention, or severance due to tensile force, or may result in removal of tubing from fitting. Use caution prior to use for proper application.

7. To install the fitting, screw the fitting into 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.

Fittings & Tubing Precautions 2

Be sure to read this before handling.

Air Supply

⚠Warning

1. Type of fluids

Please consult with SMC when using the product in applications other than compressed air.

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 drainage can cause malfunction of pneumatic equipment. An air dryer or water separator should be installed upstream from filters.

3. Drain flushing

If condensation in the drain bowl is not emptied on a regular basis, the bowl will overflow and allow the condensation to enter the compressed air lines. It causes 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 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 upstream near the valve. Select an air filter with a filtration size of 5 μm or smaller.

2. Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.

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 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 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.

Operating Environment

⚠Warning

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 (Series KA) and antistatic tubing (Series TA) are recommended.

6. Do not use the ordinary fittings and tubing in locations where spatter is generated.

Spattering may result in a fire hazard. In such a place, use of flame resistant fittings (Series KR/KRM) and tubing (Series TRS/TRB) are recommended.

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

Please contact SMC if using for an environment exposed to cutting oil, lubricant or coolant oil, etc.

8. Take note that if nylon tubing and soft nylon 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.

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

Fittings & Tubing Precautions 3

Be sure to read this before handling.

Maintenance

⚠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.

One-touch Fittings

Mounting / Piping

⚠Caution

1. Tubing insertion and removal from one-touch fittings

1) Attaching of tubing

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

(2) The outside diameter of the polyurethane tubing swells when inernal 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 +0.07 mm or larger for ø2, +0.15 mm or larger for other sizes, 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 tube, slowly push it into the one-touch fittings 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 tube to release.

2) Removing of tubing

(1) Push flange evenly and push the release button sufficiently.

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

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

2. Connecting products with metal rods

After connecting the products with metal rods (Series KC, etc.) to the one-touch fittings, do not use tubes, resin plugs or reducers, etc. These may come off the fittings.

3. When mounting tubing, resin plugs, metal rods, etc., do not press the release button before mounting.

Also, do not press the release button before mounting. This may result in detachment.

Mounting / Piping

⚠Caution

4. Tightening the threaded portion of the connection thread M3, M5 or M6

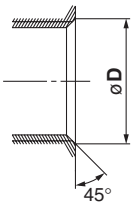
1) M3
First, tighten it by hand, then give it an additional 1/4 turn with a wrench. A reference value for the tightening torque is 0.4 to 0.5 N·m.

2) M5, M6 and 10-32UNF
First, tighten it by hand, then give it an additional 1/6 turn to 1/4 turn with a wrench. A reference value for the tightening torque is 1 to 1.5 N·m.

Note) Excessive tightening may damage the thread portion or deform the gasket and cause air leakage.
If the screw is too shallowly screwed in, it may come loose or air may leak.

5. Chamfered female thread size of the connection thread M3, M5, 10-32UNF

Confirming to ISO16030 (air pressure fluid dynamics – connection – boards and stud ends), the chamfered thread sizes shown below are recommended.



Female thread size	Chamfered port size ø**D** (Recommended value)
M3	3.1 to 3.4
M5	5.1 to 5.4
10-32UNF	5.0 to 5.3

Recommended Piping Conditions

1. When connecting piping to the one-touch fitting, use pipe length with sufficient margin, in accordance with the piping conditions shown in Figure 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 Figure 2)

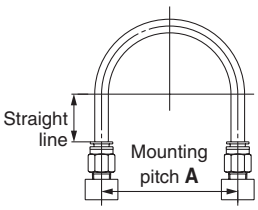


Figure 1 Recommended piping

Unit: mm

Tubing size	Mounting pitch **A**			Straight-line pipe length
	Nylon tube	Soft nylon tube	Polyurethane tube	
ø3.2, 1/8"	44 or more	35 or more	25 or more	16 or more
ø4, 5/32"	56 or more	44 or more	26 or more	20 or more
ø3/16"	67 or more	52 or more	38 or more	24 or more
ø6	84 or more	66 or more	39 or more	30 or more
ø1/4"	89 or more	70 or more	57 or more	32 or more
ø8, 5/16"	112 or more	88 or more	52 or more	40 or more
ø10	140 or more	110 or more	69 or more	50 or more
ø3/8"	134 or more	105 or more	69 or more	48 or more
ø12	168 or more	132 or more	88 or more	60 or more
ø1/2"	178 or more	140 or more	93 or more	64 or more
ø16	224 or more	176 or more	114 or more	80 or more

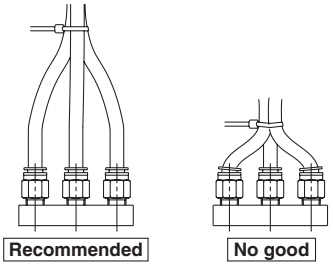


Figure 2 When using a tying band to bind the piping together

Fittings & Tubing Precautions 4

Be sure to read this before handling.

Tubing
Design / Selection

⚠Caution

1. When using a tubing other than from SMC, be careful of the tolerance of the tubing O.D. and tubing material.

1) Nylon tubing ≤ ±0.1 mm
2) Soft nylon tubing ≤ ±0.1 mm
3) Polyurethane tubing ≤ +0.15 mm, ≤ –0.2 mm

When the tolerance of the tubing O.D. is insufficient, or the tubing I.D. is different from SMC dimensions, do not use the tube, because the following problems may occur: difficulty in connecting the tubing, leakage, disconnection of the tubing, or fitting damage.

When used with tubing other than those from SMC, due to their properties, the products listed below are not subject to warranty.

KQG, KQB, KFG, KF, ø2KJ, ø2M

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