

High Purity Fluoropolymer Tubing

Series *TL/TIL*

Material: Super PFA

Series and Specifications

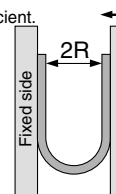
		Metric sizes (Series TL)						Inch sizes (Series TIL)							
Tubing model		TL0403	TL0604	TL0806	TL1008	TL1210	TL1916	TIL01	TILB01	TIL05	TIL07	TIL11	TIL13	TIL19	TIL25
Nominal diameter		—	—	—	—	—	—	1/8"	1/8"	3/16"	1/4"	3/8"	1/2"	3/4"	1"
Tubing size		ø4 x ø3	ø6 x ø4	ø8 x ø6	ø10 x ø8	ø12 x ø10	ø19 x ø16	1/8" x 0.086"	1/8" x 1/16"	3/16" x 1/8"	1/4" x 5/32"	3/8" x 1/4"	1/2" x 3/8"	3/4" x 5/8"	1" x 7/8"
O.D. (mm)	Basic diameter	4	6	8	10	12	19	3.18	3.18	4.75	6.35	9.53	12.7	19.05	25.4
	Tolerance	±0.1				+0.2 −0.1		±0.1					+0.2 −0.1		
Thickness (mm)	Basic diameter	0.5	1				1.5	0.5	0.8	0.8	1.2	1.6			
	Tolerance	±0.05	±0.1				±0.15	±0.05	±0.08	±0.08	±0.12	±0.15			
Bundle	10 m	—	—	—	●	●	●	—	—	—	—	●	●	—	—
	20 m	●	●	●	●	●	●	●	—	●	●	●	●	●	●
	50 m	●	●	●	●	●	●	●	—	●	●	●	●	●	●
	100 m	●	●	●	●	●	●	●	—	●	●	●	●	●	—
	50 Ft. (16 m)	—	—	—	—	—	—	●	●	●	●	●	●	●	●
	100 Ft. (33 m)	—	—	—	—	—	—	●	●	●	●	●	●	●	●
Straight pipe	2 m	●	●	●	●	●	●	●	—	●	●	●	●	●	●
Color		Translucent (color of material)													
Applicable fluid		Please refer to the applicable fluid in page 41.													
Max. operating pressure (at 20°C) ^{Note 1)}		1 MPa			0.9MPa	0.7 MPa	0.6 MPa	1 MPa						0.7 MPa	0.5 MPa
Burst pressure (at 20°C)		4.9 MPa	6.9 MPa	4.7 MPa	3.6MPa	2.9 MPa	2.6 MPa	6.4 MPa	9.9 MPa	6.7 MPa	7.9 MPa	6.7 MPa	4.6 MPa	2.8 MPa	2.0 MPa
Min. bending radius (mm) ^{Note 2)}		20		40	65	110	160	12	6	20		30	60	160	290
Max. operating temperature (Fixed use)		260°C													
Material		Super PFA													



Note 1) • The maximum operating pressure is the value at 20°C. For other temperatures, calculate from the burst pressure drop coefficient. Furthermore, an abnormal temperature increase due to adiabatic compression can cause tubing to burst. To operate at a temperature other than 20°C, the operating pressure must be no more than the value calculated using the equation below: When the value (calculated using the formula below) exceeds 1 MPa, the Max. operating pressure is 1 MPa.
(Max. operating pressure) = 1/4 x (burst pressure drop coefficient) x (burst pressure at 20°C)
 • When using a fluid in liquid form, the surge pressure must be no more than the maximum operating pressure. A surge pressure higher than the maximum operating pressure can cause breakage of the fitting or bursting of the tubing.

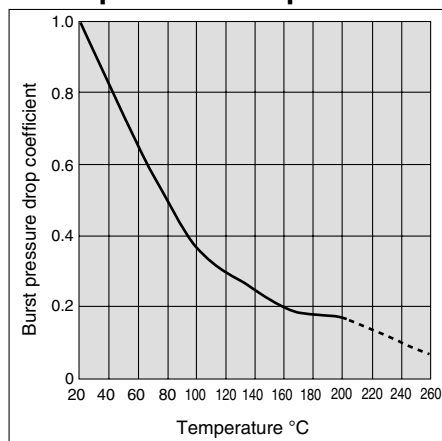
Note 2) The minimum bending radius is measured using the method shown in the figure at the right.

Note 3) It is connectable with LQ Series (3/4"size). As for other commercial items, there are some cases it is not able to connect due to tolerance of dimensions.



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.

Burst pressure drop curve



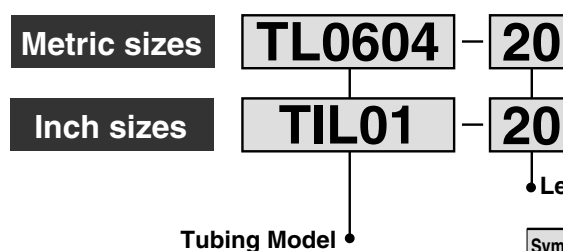
Note 4)

Eluting fluorine ion amount (μg/g)

Type	Fluorine ion
Eluting amount	0.1 or less

A 15 g piece of fluororesin tubing is cut off, washed in deionized water and immersed in 15 ml of 25% methyl alcohol extract at room temperature for 24 hours. Then the extract is diluted with deionized water to be subjected to a quantitative analysis of fluorine ions.

How to Order



• Length Applicable to both metric and inch size

Symbol	Type	Length
10	Roll	10 m
20		20 m
50		50 m
100		100 m
2S	Straight	2 m

Length Applicable to inch size only

Symbol	Type	Length
16	Roll	50 Ft. (16 m)
33		100 Ft. (33 m)

Please refer to the "Series and Specifications" above, as the tubing length differs dependant on each size.

Note 4)

Eluting metal ion amount (ng/cm²)

Type	Al	Fe	Ni	Na	Ca
Eluting amount	4.5	0.3	0.2	7.1	1.3

The interior of the fluororesin tubing is washed with super deionized water. Approximately 20g of super high purity hydrofluoric acid (48%) is measured and injected into the tubing. The interior wall of the tubing is immersed at normal temperature for one week with both ends of the tubing plugged. Then the extract was diluted with super deionized water to be subjected to a quantitative analysis on Al, Fe, Ni, Na and Ca by the stripping method.

Note 4) Figures shown in tables are representative values, not guaranteed values.



Applicable Fluids

Material and fluid compatibility check list for high purity fluoropolymer fittings

Chemical		Compatibility
Acetic acid	100%	○
Acetone	100%	○ Note 1)
Ammonium fluoride	40%	○
Ammonium hydroxide	30%	○
Butyl acetate	100%	○
Methylene chloride	100%	○
Hydrochloric acid	38%	○
Hydrofluoric acid	50%	○
Hydrogen peroxide	60%	○
Methanol	100%	○
Methyl ethyl Ketone	—	○
Nitric acid	70%	○
Phosphoric acid	86%	○
Caustic potash	85%	○
Sulfuric acid	100%	○
Toluene	—	○ Note 1)
Xylene	—	○
Sodium hydroxide	100%	○
1.1.1-Trichloroethane	100%	○
Phosphorus pentachloride	—	○
Isobutyl alcohol	—	○ Note 1)
Isopropyl alcohol	—	○ Note 1)
Ozone	—	○
Ethyl acetate	—	○ Note 1)
Deionized water	—	○
Nitrogen	—	○
Ultrapure water	—	○
Trimethylamine	—	○



The material and fluid compatibility check list provides reference values as a guide only.
Note 1) Since static electricity may be generated, implement suitable countermeasures.

Table symbol ○ can be used.

- Compatibility is indicated for fluid temperatures of 200°C or less.
- The material and fluid compatibility check list provides reference values as a guide only, therefore we do not guarantee the application to our product.
- The data above is based on the information presented by the material manufacturers.
- SMC is not responsible for its accuracy and any damage happened because of this data.

VC□

VDW

VQ

VX2

VX□

VX3

VXA

VN□

LVC

LVA

LVH

LVD

LVQ

LQ

LVN

TI/
TIL

PA

PAX

PB



Series LQ¹, LVN, TL/TIL

High Purity Fluoropolymer Fittings/ Needle Valve/Tubing Precautions 1

Be sure to read before handling.

Design and Selection

Warning

1. Confirm the specifications.

Give careful consideration to operating conditions such as the application, fluid and environment, and use within the operating ranges specified in this catalog.

2. Fluid

Operate within the indicated fluid temperature range.

3. Maintenance space

Ensure the necessary space for maintenance and inspections.

4. Fluid pressure range

Keep the supplied fluid pressure within the operating pressure range shown in the catalog.

5. Countermeasures for static electricity

Since static electricity may be generated depending on the fluid being used, implement suitable countermeasures.

Mounting

Warning

1. After mounting, perform suitable function and leak tests to confirm that the mounting is correct.

2. Instruction manual

Mount and operate the product after reading the manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

Piping

Caution

1. Connect tubing with special tools.

Refer to pages 17-5-127 through 17-5-129 regarding tubing connection and special tools.

2. Tighten the nut until it touches the end surface of the body, and then tighten it an addition 1/8 turn. As a guide, refer to the proper tightening torques shown below.

Nut tightening torque for piping

Body class	Torque (N·m)	
	LQ1	LQ2
2	0.3 to 0.4	1.5 to 2.0
3	0.8 to 1.0	3.0 to 3.5
4	1.0 to 1.2	7.5 to 9.0
5	2.5 to 3.0	11.0 to 13.0
6	5.5 to 6.0	—

3. Use sealant tape for the piping of taper thread parts such as LQ□H and LQ□L.

Tape the ridges tightly with the sealant tape, starting one ridge width left from thread end side. 3 to 4 sealant tapes are required.

Taper thread mounting torque

Bore size	Torque (N·m)
1/8	0.6 to 0.9
1/4	0.8 to 1.2
3/8	1.0 to 1.6
1/2	1.5 to 2.0
3/4	2.0 to 2.7
1	2.5 to 3.6



Series LQ¹, LVN, TL/TIL

High Purity Fluoropolymer Fittings/ Needle Valve/Tubing Precautions 2

Be sure to read before handling.

Operating Environment

⚠ Warning

1. Do not use in locations having an explosive atmosphere.
2. Do not operate in locations where vibration or impact occurs.
3. In locations near heat sources, block off radiated heat.

Maintenance

⚠ Warning

1. Perform maintenance in accordance with the procedures in the instruction manual.
Improper handling can cause damage.
2. When removing or reinstalling fittings, remove any remaining chemicals and carefully replace them with deionized water or air, etc., before beginning work activities.
3. Tightening of taper threads for piping
Because the taper threads are made of resin, minute leakage may gradually occur due to stress relaxation. Perform periodic inspections, and if leakage is detected correct the problem by additional tightening. If additional tightening becomes ineffective, replace the fitting with a new product.
4. Check the following during regular maintenance, and replace components as necessary.
 - a) Scratches, gouges, abrasion, corrosion
 - b) Twisting, flattening or distortion of tubing
 - c) Hardening, deterioration or softening of tubing
5. Do not repair or patch the replaced tubing or fittings for reuse.

Operating Precautions

⚠ Warning

1. Operate within the range of the maximum operating pressure.

⚠ Caution

1. After a long period of non-use, perform inspections before beginning operation.
2. Use sufficient care in the handling of series LQ clean packaging types when their packaging is opened.
3. For LVN Series, be careful not to apply any excessive force to the stroke end, which fully opens and closes, to avoid accidental damage or changes in flow characteristics.

Installation of Tubing

⚠ Caution

1. Cut the end of the tubing at a right angle and pass it through the fitting nut. After placing the tubing in the holder, push it onto the insert bushing until it stops and clamp it with the knob. As a guide when tightening the tubing with the knob, maintain a uniform gap (approx. 2 mm) on both sides of the holder.
 - When the tubing is curved, straighten it out before using it.
 - The tubing may slip if there is oil or dust, etc., on the holder. Remove the contamination using alcohol or another suitable cleaner.

Use of Tubing

⚠ Caution

1. Refer to the applicable tubing sizes shown below for tubing to be used.

Applicable tubing sizes

	Connection tubing size	O.D. (mm)		Internal thickness (mm)	
		Standard size	Tolerance	Standard size	Tolerance
Metric sizes	ø3 to ø2	3.0	+0.2 -0.1	0.5	±0.06
	ø4 to ø3	4.0		1.0	±0.1
	ø6 to ø4	6.0			
	ø8 to ø6	8.0			
	ø10 to ø8	10.0	+0.3 -0.1	1.5	±0.15
	ø12 to ø10	12.0			
	ø19 to ø16	19.0			
Inch sizes	1/8" to 0.086"	3.18	+0.2 -0.1	0.5	±0.1
	3/16" to 1/8"	4.75		0.8	
	1/4" to 5/32"	6.35		1.2	±0.12
	3/8" to 1/4"	9.53			
	1/2" to 3/8"	12.7	+0.3 -0.1	1.6	±0.15
	3/4" to 5/8"	19.0			
	1" to 7/8"	25.4			

VC□

VDW

VQ

VX2

VX□

VX3

VXA

VN□

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