

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)	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)	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.

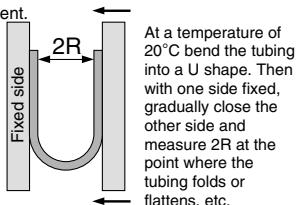
(Max. operating pressure) = 1/4 x (burst pressure drop coefficient) x (burst pressure at 20°C)

• When using a fluid in liquid form, the surge pressure must be no more than the maximum operating pressure.

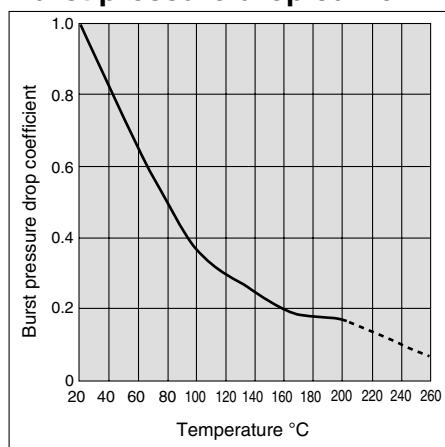
A surge pressure higher than the maximum operating pressure can cause breakage of the fitting or bursting of the tubing.

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.



Burst pressure drop curve



How to Order

Metric sizes **TL0604** - **20**

Inch sizes **TIL01** - **20**

Tubing Model •

Length **Applicable to both metric and inch size**

Symbol	Type	Length
10		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		50 Ft. (16 m)
33	Roll	100 Ft. (33 m)

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.

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%	<input type="radio"/>
Acetone	100%	<input type="radio"/> Note 1)
Ammonium fluoride	40%	<input type="radio"/>
Ammonium hydroxide	30%	<input type="radio"/>
Butyl acetate	100%	<input type="radio"/>
Methylene chloride	100%	<input type="radio"/>
Hydrochloric acid	38%	<input type="radio"/>
Hydrofluoric acid	50%	<input type="radio"/>
Hydrogen peroxide	60%	<input type="radio"/>
Methanol	100%	<input type="radio"/>
Methyl ethyl Ketone	—	<input type="radio"/>
Nitric acid	70%	<input type="radio"/>
Phosphoric acid	86%	<input type="radio"/>
Caustic potash	85%	<input type="radio"/>
Sulfuric acid	100%	<input type="radio"/>
Toluene	—	<input type="radio"/> Note 1)
Xylene	—	<input type="radio"/>
Sodium hydroxide	100%	<input type="radio"/>
1.1.1-Trichloroethane	100%	<input type="radio"/>
Rhosphorus pentachloride	—	<input type="radio"/>
Isobutyl alcohol	—	<input type="radio"/> Note 1)
Isopropyl alcohol	—	<input type="radio"/> Note 1)
Ozone	—	<input type="radio"/>
Ethyl acetate	—	<input type="radio"/> Note 1)
Deionized water	—	<input type="radio"/>
Nitrogen	—	<input type="radio"/>
Ultrapure water	—	<input type="radio"/>
Tmah	—	<input type="radio"/>

 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.

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

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.



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

Metric sizes	Connection tubing size	O.D. (mm)		Internal thickness (mm)	
		Standard size	Tolerance	Standard size	Tolerance
	ø3 to ø2	3.0		0.5	±0.06
	ø4 to ø3	4.0			
	ø6 to ø4	6.0			
	ø8 to ø6	8.0	+0.2 -0.1		
	ø10 to ø8	10.0			
	ø12 to ø10	12.0			
	ø19 to ø16	19.0	+0.3 -0.1		
Inch sizes	ø25 to ø22	25.0		1.0	±0.1
	1/8" to 0.086"	3.18		1.5	±0.15
	3/16" to 1/8"	4.75			
	1/4" to 5/32"	6.35	+0.2 -0.1		
	3/8" to 1/4"	9.53			
	1/2" to 3/8"	12.7			
	3/4" to 5/8"	19.0	+0.3 -0.1		
	1" to 7/8"	25.4		1.6	±0.15

VC□
VDW
VQ
VX2
VX□
VX3
VXA
VN□
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LVH
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LQ
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TI/
TIL
PA
PAX
PB