Fluoropolymer Tubing Variations

TL/TIL/TLM/TILM/TH/TIH/TD/TID Series

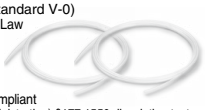
RoHS

High Purity Fluoropolymer Tubing
TL/TIL Series

Material: Super PFA

It is suitable for applications which require a highly smooth internal surface and small amount of elution of fluorine ions.
Cleanliness class (ISO class) 3
P.722
∗ It has heat and chemical resistance equivalent to PFA.
Flame resistant (Equivalent to UL-94 Standard V-0)
Compatible with the Japan Food Sanitation Law
- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant
- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

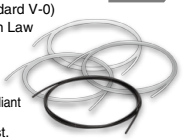


Fluoropolymer Tubing (PFA)
TLM/TILM Series

Material: PFA

The material consists of a good chemical resistant fluoropolymer. This also has good heat resistance, and it is suitable for a wide range of applications.
P.723
Flame resistant (Equivalent to UL-94 Standard V-0)
Compatible with the Japan Food Sanitation Law
- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant
- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

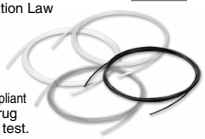


FEP Tubing (Fluoropolymer)
TH/TIH Series

Material: FEP

This has better resistance in chemical environments.
Flame resistant (Equivalent to UL-94 Standard V-0)
P.726
Compatible with the Japan Food Sanitation Law
- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant
- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

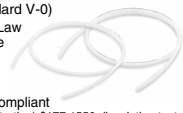


Soft Fluoropolymer Tubing
TD/TID Series

Material: Modified PTFE

Flexibility improved by approx. 20%
(Compared with SMC TL/TIL Series)
Suitable for applications which require flexibility.
P.729
Flame resistant (Equivalent to UL-94 Standard V-0)
Compatible with the Japan Food Sanitation Law
- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant
- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.



Series		TL/TIL	TLM/TILM	TH/TIH	TD/TID
Material		Super PFA	PFA	FEP	Modified PTFE
Chemical resistance		◎	◎	○	◎
Heat resistance		260°C	260°C	200°C	260°C
Flexibility		△	△	△	○
Ion elution		◎	○	○	○
Internal smoothness		○	△	◎	○
Fluid		Chemicals, Deionized water	Chemicals, Deionized water	Air, Water, Inert gas	
Tubing O.D.	Metric	ø4 to ø19	ø2 to ø25	ø4 to ø12	ø4 to ø12
	Inch	1/8" to 1"	1/8" to 1 1/4"	1/8" to 3/4"	1/8" to 1/2"
Color		Translucent	Translucent, Red, Blue, Black	Translucent, Red, Blue, Black	Translucent
Applicable fitting series	One-touch fittings	**KQ2, KQG2, KQB2, KP, KP□**	**KQ2, KQG2, KQB2, KP, KP□**	**KQ2, KQG2, KQB2, KP, KP□**	—
	Miniature fittings	**M, MS (Hose nipple type)**	**M, MS (Hose nipple type)**	**M, MS (Hose nipple type)**	**M, MS (Hose nipple type)**
	Insert fittings	**KF, KFG2**	**KF, KFG2**	**KF, KFG2**	**KF, KFG2**
	Fluoropolymer fittings	**LQ series**	**LQ series**	**LQ series**	**LQ series**

◎: Very good ○: Good △: Moderate
The comparison table shown above was prepared based on a relative comparison taking the characteristics of each fluoropolymer tubing into consideration.

Related Products

Tube Cutter: TK-5

P.731

As this product is made of stainless steel it can be used inside clean rooms.
∗ However, this product is packaged regularly, not in double packaging.

High Purity Fluoropolymer Tubing

TL/TIL Series

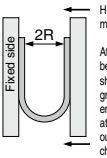
RoHS

Cleanliness class (ISO class) 3
Material: Super PFA
Flame resistant (Equivalent to UL-94 Standard V-0)
Compatible with the Japan Food Sanitation Law
• Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.
FDA (U.S. Food and Drug Administration) Compliant
• Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

Series and Specifications

		Metric sizes (TL series)						Inch sizes (TIL series)							
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	●	●	●	●	●	●	●	—	●	●	●	●	●	—
	16 m (50 ft)	—	—	—	—	—	—	●	●	●	●	●	●	●	●
	33 m (100 ft)	—	—	—	—	—	—	●	●	●	●	●	●	●	●
Straight pipe	2 m	●	●	●	●	●	●	●	—	●	●	●	●	●	●
Color		Translucent (color of material)													
Applicable fluid Note 1, 2, 3, 4)		Refer to the applicable fluid in page 732.													
Applicable fittings Note 1, 2, 3, 4)		Fluoropolymer Fittings LQ series: One-touch fittings KQ2, KQG2, KQB2, Clean One-touch fittings KP, KP□ Insert fittings KF, KFG2, Miniature fittings M, MS (Hose nipple type)													
Max. operating pressure (MPa)	20°C or less	1.0	1.0	1.0	0.9	0.7	0.6	1.0	1.0	1.0	1.0	1.0	1.0	0.7	0.5
	100°C	0.45	0.64	0.43	0.33	0.27	0.24	0.59	0.92	0.62	0.73	0.62	0.43	0.26	0.19
	200°C	0.21	0.29	0.20	0.15	0.12	0.11	0.27	0.42	0.28	0.34	0.28	0.20	0.12	0.09
	260°C	0.09	0.12	0.08	0.06	0.05	0.05	0.11	0.17	0.12	0.14	0.12	0.08	0.05	0.04
Operating vacuum pressure (kPa) Note 3)		–101.3													
Burst pressure (MPa at 20°C)		4.9	6.9	4.7	3.6	2.9	2.6	6.4	9.9	6.7	7.9	6.7	4.6	2.8	2.0
Min. bending radius (mm) Note 6)	Recommended radius	35	35	60	100	130	220	20	10	25	35	60	95	220	400
	Tube close bend radius	20	20	40	65	110	160	12	6	20	20	30	60	160	290
Operating temperature (fixed usage)		–65 to 260°C													
Material		Super PFA													

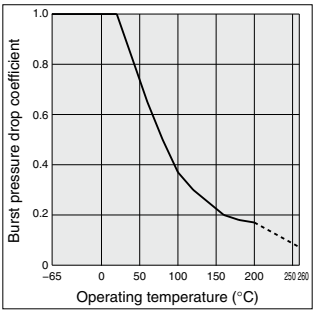
Note 1) When using the product at a temperature other than those shown in the table above, use it at a maximum operating pressure or less that is calculated from the following formula.
(Max. operating pressure) = 1/4 x (burst pressure drop coefficient) x (burst pressure at 20°C)
Note 2) When using a 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. Furthermore, abnormal temperature rise caused by adiabatic compression may result in the tube bursting.
Note 3) Do not use this product in a manner in which the tube is not fixed. Observe the lesser value of the maximum operating pressure between the tubing and fitting. A material change over a long duration or due to high-temperature may cause leakage. Perform periodic maintenance and replace with a new product immediately when abnormalities are detected. (Refer to "Maintenance" of the tubing precautions on page 735.)
For other precautions, refer to "Fittings & Tubing Precautions" on pages 14 to 18. When using the fluoropolymer fittings, refer to the precautions on pages 655 and 656.
Note 4) Fluid varies depending on the applicable fittings.
Note 5) The operating vacuum pressure varies depending on the applicable fitting, so refer to the fitting specifications for details.
Note 6) Minimum bending radius is measured as shown left as representative values. • Use a tube above the recommended minimum bending radius. • The tube may be bent if used under the recommended minimum bending radius. Therefore, refer to the tube close bend radius and make sure that the tube is not bent or flattened. • Please note that the tube close bend radius is not warranted because of the value when 2R is measured by the method in the right figure if the tube is bent or flattened, etc. • The minimum bending radius shown above does not apply to the straight pipe (2 m).



How to measure the minimum bending radius

At a temperature of 20°C, bend the tubing into a U shape. Fix one end and gradually move the other end closer. Measure 2R at the point where the outside diameter's rate of change is 5%.

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	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	16 m (50 ft)
33		33 m (100 ft)

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

Eluting fluorine ion amount Note 7) (μg/g)

Type	Fluorine ion
Eluting amount	0.1 or less

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

Eluting metal ion amount Note 7) (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 20 g 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 7) Figures shown in tables are representative values, not guaranteed values.

Fluoropolymer Tubing PFA

TLM/TILM Series

RoHS

Max. operating temperature: 260°C

22 size variations

Metric size ø2 to ø25 (13 sizes)

Length per roll 10 m, 20 m, 50 m, 100 m

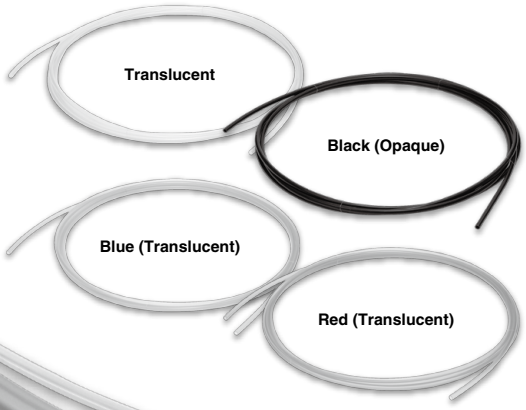
Straight 2 m

Inch size 1/8" to 1 1/4" (9 sizes)

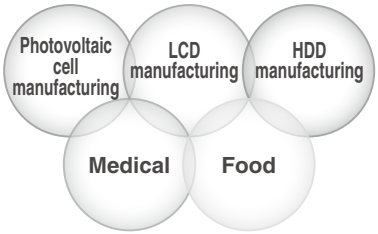
Length per roll 10 m, 20 m, 50 m, 100 m
16 m (50 ft), 33 m (100 ft)

Straight 2 m

4 color variations



Applications

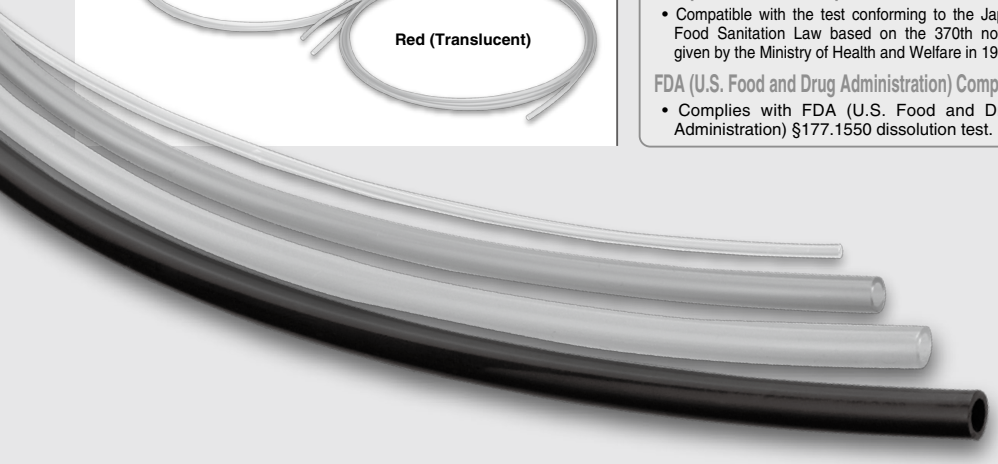


Compatible with the Japan Food Sanitation Law

- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant

- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.



RoHS

Fluoropolymer Tubing (PFA)
Metric Size
TLM Series

Flame resistant (Equivalent to UL-94 Standard V-0)

Compatible with the Japan Food Sanitation Law

- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant

- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

Series

Size			Metric size												
Model			TLM0201	TLM0302	TLM0425	TLM0403	TLM0604	TLM0806	TLM1075	TLM1008	TLM1209	TLM1210	TLM1613	TLM1916	TLM2522
Tubing size			ø2 x ø1	ø3 x ø2	ø4 x ø2.5	ø4 x ø3	ø6 x ø4	ø8 x ø6	ø10 x ø7.5	ø10 x ø8	ø12 x ø9	ø12 x ø10	ø16 x ø13	ø19 x ø16	ø25 x ø22
O.D. (mm)			2	3	4	4	6	8	10	10	12	12	16	19	25
I.D. (mm)			1	2	2.5	3	4	6	7.5	8	9	10	13	16	22
Length per roll		Color	Symbol												
Roll	10 m	Translucent	N							●	●	●	●	●	●	
	20 m	Translucent	N	●	●	●	●	●	●	●	●	●	●	●	●	●
		Red	R	●	●	●	●	●	●	●	●	●	●	●	●	●
		Blue	BU	●	●	●	●	●	●	●	●	●	●	●	●	●
		Black	B	●	●	●	●	●	●	●	●	●	●	●	●	●
	50 m	Translucent	N	●	●	●	●	●	●	●	●	●	●	●	●	●
	100 m	Translucent	N	●	●	●	●	●	●	●	●	●	●	●	●	
Straight	2 m	Translucent	N	●	●	●	●	●	●	●	●	●	●	●	●	●

Inch O.D. size 5/32" (ø4 x ø2.5)

Inch O.D. size 5/16" (ø8 x ø6)

O.D. 3.2 mm is available in ø 1/8 inch (3.18 mm) tubing. For details, refer to the table "Series" on page 725.

Specifications

Fluid Note 1) 2) 3) **and applicable fittings** Note 1) 2) 3)		Fluid: Refer to "Applicable Fluid List" on page 733. Fittings: Fluoropolymer fittings LQ series Fluid: Air, Water, Inert gas Fittings: One-touch fittings KQ2, KQG2, KQB2, Clean One-touch fittings KP, KP□ Insert fittings KF, KFG2, Miniature fittings M, MS (Hose nipple type)											
Max. operating pressure (MPa)		Refer to the max. operating pressure curve.											
Operating vacuum pressure (kPa) Note 4)		–101.3											
Min. bending radius (mm) Note 5)	Recommended radius	10	20	20	35	35	60	95	100	100	130	160	220	400
	Tube close bend radius	7	15	15	20	20	40	60	65	65	110	130	160	290
Operating temperature (fixed usage)		Air, Inert gas: –65 to 260°C Water: 0 to 100°C (No freezing)												
Material		PFA (Tetrafluoroethylene perfluoroalkoxy vinyl ether copolymer)												

Note 1) Fluid varies depending on the applicable fittings.

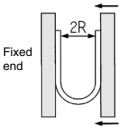
Note 2) When using a liquid fluid, the surge pressure must not exceed the maximum operating pressure. If the surge pressure exceeds the maximum operating pressure, it will result in damage to fittings and tubes. Furthermore, abnormal temperature rise caused by adiabatic compression may result in the tube bursting.

Note 3) Do not use this product in a manner in which the tube is not fixed. Observe the lesser value of the maximum operating pressure between the tubing and fitting. A material change over a long duration or due to high-temperature may cause leakage. Perform periodic maintenance and replace with a new product immediately when abnormalities are detected. (Refer to "Maintenance" of the tubing precautions on page 735.)
For other precautions, refer to "Fittings & Tubing Precautions" on pages 14 to 18. When using the fluoropolymer fittings, refer to the precautions on pages 655 and 656.

Note 4) The operating vacuum pressure varies depending on the applicable fitting, so refer to the fitting specifications for details.

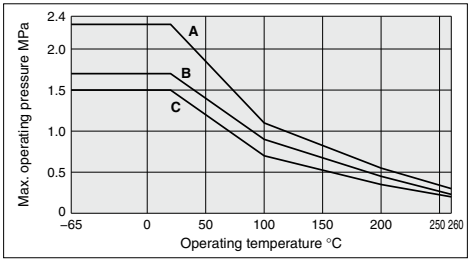
Note 5) Minimum bending radius is measured as shown left as representative values.
- Use a tube above the recommended minimum bending radius.
- The tube may be bent if used under the recommended minimum bending radius. Therefore, refer to the tube close bend radius and make sure that the tube is not bent or flattened.
- Please note that the tube close bend radius is not warranted because of the value when 2R is measured by the method in the right figure if the tube is bent or flattened, etc.
- The minimum bending radius shown above does not apply to the straight pipe (2 m).

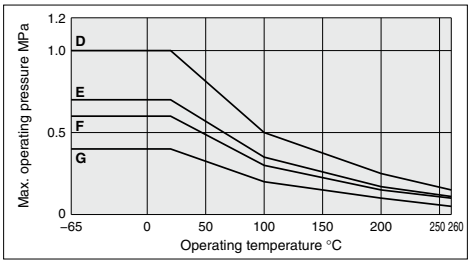
How to measure the minimum bending radius



At a temperature of 20°C, bend the tubing into a U shape. Fix one end and gradually move the other end closer. Measure 2R at the point where the outside diameter's rate of change is 5%.

Max. Operating Pressure





Group	Model	Max. operating pressure (MPa)			
		20°C or less	100°C	200°C	260°C
A	TLM0201	2.3	1.1	0.55	0.3
B	TLM0425	1.7	0.9	0.45	0.23
C	TLM0302 TLM0604	1.5	0.7	0.35	0.2
D	TLM0403 TLM0806 TLM1075 TLM1209	1	0.5	0.25	0.15
E	TLM1008 TLM1613	0.7	0.35	0.17	0.11
F	TLM1210 TLM1916	0.6	0.3	0.15	0.1
G	TLM2522	0.4	0.2	0.1	0.05

How to Order

Metric size

TLM0425 N – 20

Tubing designation

Color indication

Symbol	Color
N	Translucent (Material color)
R	Red (Translucent)
BU	Blue (Translucent)
B	Black (Opaque)

Length per roll

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

Note) Refer to the table "Series" above, as the tubing length differs depending on each size.

SMC

RoHS

Fluoropolymer Tubing (PFA)
Inch Size
TILM Series

Flame resistant (Equivalent to UL-94 Standard V-0)

Compatible with the Japan Food Sanitation Law

- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant

- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

Series

Size		Inch size								
Model		TILM01	TILMB01	TILM05	TILM07	TILM11	TILM13	TILM19	TILM25	TILM32
Tubing size		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"	$1\frac{1}{4}$" x $1\frac{1}{10}$"
O.D.	inch	1/8"	1/8"	3/16"	1/4"	3/8"	1/2"	3/4"	1"	$1\frac{1}{4}$"
	mm	3.18		4.75	6.35	9.53	12.7	19.05	25.4	31.75
I.D.	inch	0.086"	1/16"	1/8"	5/32"	1/4"	3/8"	5/8"	7/8"	$1\frac{1}{10}$"
	mm	2.18	1.58	3.15	3.95	6.33	9.5	15.85	22.2	27.95

Length per roll		Color	Symbol								
Roll	10 m	Translucent	N					●	●		
	20 m	Translucent	N	●	●	●	●	●	●	●	●	●
		Red	R	●	●	●	●	●	●	●	●	●
		Blue	BU	●	●	●	●	●	●	●	●	●
		Black	B	●	●	●	●	●	●	●	●	●
	50 m	Translucent	N	●		●	●	●	●	●	●	●
	100 m	Translucent	N	●		●	●	●	●	●		
	16 m (50 ft)	Translucent	N	●	●	●	●	●	●	●	●	●
	33 m (100 ft)	Translucent	N	●	●	●	●	●	●	●	●	●
Straight	2 m	Translucent	N	●		●	●	●	●	●	●	●

Metric O.D. size: 3.2

O.D. 5/32" is available in ø4 metric tubing, and O.D. 5/16" is available in ø8 metric tubing. For details, refer to the table "Series" on page 724.

Specifications

Fluid Note 1) 2) 3) **and applicable fittings** Note 1) 2) 3)		Fluid: Refer to "Applicable Fluid List" on page 733. Fittings: Fluoropolymer fittings LQ series Fluid: Air, Water, Inert gas Fittings: One-touch fittings KQ2, KQG2, KQB2, Insert fittings KFG2								
Max. operating pressure (MPa)		Refer to the max. operating pressure curve.								
Operating vacuum pressure (kPa) Note 4)		−101.3								
Min. bending radius (mm) Note 4)	Recommended radius	20	10	25	35	60	95	220	400	500
	Tube close bend radius	12	6	20	20	30	60	160	290	360
Operating temperature (fixed usage)		Air, Inert gas: −65 to 260°C Water: 0 to 100°C (No freezing)								
Material		PFA (Tetrafluoroethylene perfluoroalkoxy vinyl ether copolymer)								

Note 1) Fluid varies depending on the applicable fittings.

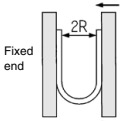
Note 2) When using a liquid fluid, the surge pressure must not exceed the maximum operating pressure. If the surge pressure exceeds the maximum operating pressure, it will result in damage to fittings and tubes. Furthermore, abnormal temperature rise caused by adiabatic compression may result in the tube bursting.

Note 3) Do not use this product in a manner in which the tube is not fixed. Observe the lesser value of the maximum operating pressure between the tube and fitting. A material change over a long duration or due to high-temperature may cause leakage. Perform periodic maintenance and replace with a new product immediately when abnormalities are detected. (Refer to "Maintenance" of the tubing precautions on page 735.)
For other precautions, refer to "Fittings & Tubing Precautions" on pages 14 to 18. When using the fluoropolymer fittings, refer to the precautions on pages 655 and 656.

Note 4) The operating vacuum pressure varies depending on the applicable fitting, so refer to the fitting specifications for details.

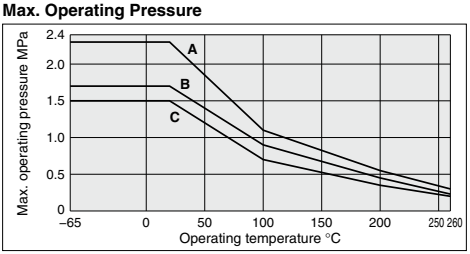
Note 5) Minimum bending radius is measured as shown left as representative values.
- Use a tube above the recommended minimum bending radius.
- The tube may be bent if used under the recommended minimum bending radius. Therefore, refer to the tube close bend radius and make sure that the tube is not bent or flattened.
- Please note that the tube close bend radius is not warranted because of the value when 2R is measured by the method in the right figure if the tube is bent or flattened, etc.
- The minimum bending radius shown above does not apply to the straight pipe (2 m).

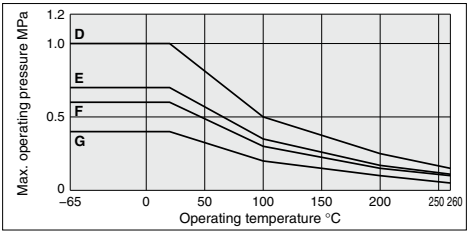
How to measure the minimum bending radius



At a temperature of 20°C, bend the tubing into a U shape. Fix one end and gradually move the other end closer. Measure 2R at the point where the outside diameter's rate of change is 5%.

Max. Operating Pressure





Group	Model	Max. operating pressure (MPa)			
		20°C or less	100°C	200°C	260°C
A	TILMB01	2.3	1.1	0.55	0.3
B	TILM07	1.7	0.9	0.45	0.23
C	TILM05 TILM11	1.5	0.7	0.35	0.2
D	TILM01 TILM13	1	0.5	0.25	0.15
F	TILM19	0.6	0.3	0.15	0.1
G	TILM25 TILM32	0.4	0.2	0.1	0.05

How to Order

Inch size

TILM01 N − 20

Tubing designation

Color indication

Symbol	Color
N	Translucent (Material color)
R	Red (Translucent)
BU	Blue (Translucent)
B	Black (Opaque)

Length per roll

Symbol	Type	Length
10	Roll	10 m
20		20 m
50		50 m
100		100 m
16		16 m (50 ft)
33		33 m (100 ft)
2S	Straight	2 m

Note) Refer to the table "Series" above, as the tubing length differs depending on each size.

FEP Tubing (Fluoropolymer)
Metric Size
TH Series

RoHS

Operating Temperature: Max. 200°C

It varies depending on the operating pressure. Refer to the graph for the maximum operating pressure.

Compatible with the Japan Food Sanitation Law

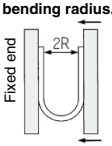
- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant

- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

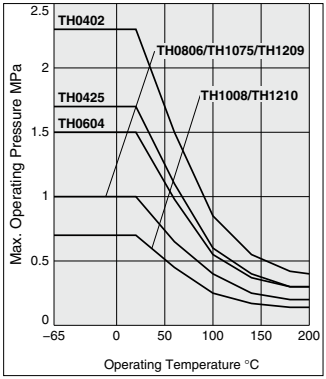
Flame Resistant (Equivalent to UL-94 Standard V-0)

How to measure the minimum bending radius.



At a temperature of 20°C, bend the tubing into a U shape. Fix one end and gradually move the other end closer. Measure 2R at the point where the outside diameter's rate of change is 5%.

Max. Operating Pressure



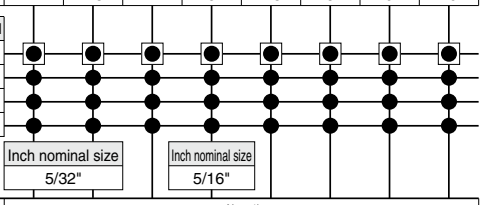
Note) The maximum operating pressure varies dependant on the I.D. bore size even if the O.D. is the same.

Series

●-20 m roll □-100 m roll

Model	Metric size							
	TH0402	TH0425	TH0604	TH0806	TH1075	TH1008	TH1209	TH1210
Tubing O.D. (mm)	4	4	6	8	10	10	12	12
Tubing I.D. (mm)	2	2.5	4	6	7.5	8	9	10

Color	Symbol
Translucent	N
Red	R
Blue	BU
Black	B



Specifications

Fluid		Air, Water Note 1), Inert gas						
Applicable fittings Note 2)		One-touch fittings, Insert fittings Note 3) Fluoropolymer fittings: LQ series Note 4) Miniature fittings: M, MS series (Hose nipple type)						
Max. operating pressure (MPa)	20°C or less	2.3	1.7	1.5	1	0.7	1	0.7
	100°C	0.85	0.6	0.55	0.4	0.25	0.4	0.25
	200°C	0.4	0.3	0.3	0.2	0.1	0.2	0.1
	Refer to the max. operating pressure curve.							
Operating vacuum pressure (kPa) Note 5)		–101.3						
Min. bending radius (mm) Note 6)	Recommended radius	15	20	35	60	95	100	130
	Tube close bend radius	10	15	20	40	60	65	110
Operating temperature (fixed usage)		Air, Inert gas: -65 to 200°C Water: 0 to 100°C (No freezing)						
Material		FEP (Fluorinated Ethylene Propylene Resin)						

Note 1) When using a fluid in liquid form, the surge pressure must not exceed the maximum operating pressure. A surge pressure higher than the maximum operating pressure can cause breakage of the fittings, or rupture of the tubing. Furthermore, an abnormal temperature increase due to adiabatic compression can also result in ruptured tubing.

Note 2) Do not use in locations where the FEP tubing will move.
Be sure to operate under the maximum operating pressure conditions using the lower maximum operating specification of either the tubing or fittings. After long term use or under high temperatures, some fittings leakage may occur due to material deterioration with age. Perform periodic inspections, and if any leakage is detected, replace with a new product immediately.
When the insert and miniature fittings are used over extended periods of time, it may cause leakage due to the material deterioration of age. In such a case, give an additional tightening to the tube connection part. If leakage still occurs after giving an additional tightening, replace the fitting with a new product. For other precautions, refer to "Fittings & Tubing Precautions". When using the fluoropolymer fittings, refer to the precautions on pages 655 and 656. Select the size after confirming O.D. and I.D.

Note 3) As leakage may occur with the KFG2 series if the fluid is repeatedly heated and cooled or if there is a sudden change in the ambient temperature, we recommend considering the TD series.

Note 4) TH0402, TH0425, TH1075 and TH1209 are not available because of different internal diameters.

Note 5) The operating vacuum pressure varies depending on the applicable fitting, so refer to the fitting specifications for details.

Note 6) The minimum bending radius is the representative value measured as shown in the left figure.
- Use a tube above the recommended minimum bending radius.
- The tubing may be bent if used under the recommended minimum bending radius. Therefore, refer to the tube close bend radius and make sure that the tubing is not bent or flattened.
- Please note that the tube close bend radius is not warranted because of the value when 2R is measured by the method in the left figure if the tubing is bent or flattened, etc.

How to Order

Metric size

TH0604 N – 20

Indication of tubing model

Color indication

Symbol	Color
N	Translucent (Material color)
R	Red (Translucent)
BU	Blue (Translucent)
B	Black (Opaque)

Length per roll

Symbol	Roll size
20	20 m roll
100 Note)	100 m roll

Note) 100 m roll is available with translucent (color indication: N) only.

SMC

FEP Tubing (Fluoropolymer) Inch Size
TIH Series

RoHS

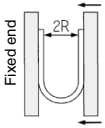
Operating Temperature: Max. 200°C
It varies depending on the operating pressure. Refer to the graph for the maximum operating pressure.

Compatible with the Japan Food Sanitation Law
- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant
- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

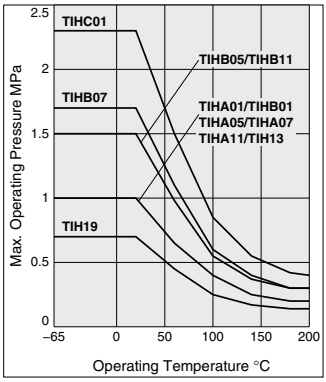
Flame Resistant (Equivalent to UL-94 Standard V-0)

How to measure the minimum bending radius.



At a temperature of 20°C, bend the tubing into a U shape. Fix one end and gradually move the other end closer. Measure 2R at the point where the outside diameter's rate of change is 5%.

Max. Operating Pressure



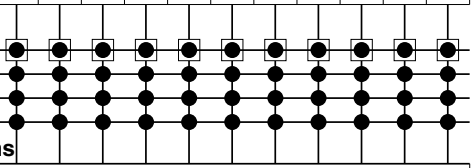
Note) The maximum operating pressure varies dependant on the I.D. bore size even if the O.D. is the same.

Series

●-16 m (50 ft) roll □-33 m (100 ft) roll

Model		Inch size									
		TIHA01	TIHB01	TIHC01	TIHA05	TIHB05	TIHA07	TIHB07	TIHA11	TIHB11	TIH13	TIH19
Tubing O.D.	inch	1/8"			3/16"		1/4"		3/8"		1/2"	3/4"
	mm	3.18			4.75		6.35		9.53		12.7	19.05
Tubing I.D.	inch	0.093"	0.086"	0.065"	0.137"	0.124" (1/8")	0.18"	0.156" (5/32")	0.275"	0.25" (1/4")	0.374" (3/8")	0.624" (5/8")
	mm	2.36	2.18	1.65	3.48	3.15	4.57	3.95	6.99	6.33	9.5	15.85

Color	Symbol
Translucent	N
Red	R
Blue	BU
Black	B



Specifications

Fluid		Air, Water Note 1), Inert gas									
Applicable fittings Note 2)		One-touch fittings, Insert fittings Note 3), Fluoropolymer fittings: LQ series Note 4)									
Max. operating pressure (MPa)	20°C or less	1	2.3	1	1.5	1	1.7	1	1.5	1	0.7
	100°C	0.4	0.85	0.4	0.55	0.4	0.6	0.4	0.55	0.4	0.25
	200°C	0.2	0.4	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.1
		Refer to the max. operating pressure curve.									
Operating vacuum pressure (kPa) Note 5)		–101.3									
Min. bending radius (mm) Note 6)	Recommended radius	25	20	10	35	25	55	35	85	60	95	220
	Tube close bend radius	20	12	7	25	20	35	20	55	30	60	160
Operating temperature (fixed usage)		Air, Inert gas: -65 to 200°C Water: 0 to 100°C (No freezing)									
Material		FEP (Fluorinated Ethylene Propylene Resin)									

Note 1) When using a fluid in liquid form, the surge pressure must not exceed the maximum operating pressure. A surge pressure higher than the maximum operating pressure can cause breakage of the fittings, or rupture of the tubing. Furthermore, an abnormal temperature increase due to adiabatic compression can also result in ruptured tubing.

Note 2) Do not use in locations where the FEP tubing will move.
Be sure to operate under the maximum operating pressure conditions using the lower maximum operating specification of either the tubing or fittings. After long term use or under high temperatures, some fittings leakage may occur due to material deterioration with age. Perform periodic inspections, and if any leakage is detected, replace with a new product immediately.
When the insert and miniature fittings are used over extended periods of time, it may cause leakage due to the material deterioration of age. In such a case, give an additional tightening to the tube connection part. If leakage still occurs after giving an additional tightening, replace the fitting with a new product. For other precautions, refer to "Fittings & Tubing Precautions". When using the fluoropolymer fittings, refer to the precautions on pages 655 and 656. Select the size after confirming O.D. and I.D.

Note 3) As leakage may occur with the KFG2 series if the fluid is repeatedly heated and cooled or if there is a sudden change in the ambient temperature, we recommend considering the TID series.

Note 4) TIHA01, TIHC01, TIHA05, TIHA07 and TIHA11 are not available because of different internal diameters.

Note 5) The operating vacuum pressure varies depending on the applicable fitting, so refer to the fitting specifications for details.

Note 6) The minimum bending radius is the representative value measured as shown in the left figure.
- Use a tube above the recommended minimum bending radius.
- The tubing may be bent if used under the recommended minimum bending radius. Therefore, refer to the tube close bend radius and make sure that the tubing is not bent or flattened.
- Please note that the tube close bend radius is not warranted because of the value when 2R is measured by the method in the left figure if the tubing is bent or flattened, etc.

How to Order

Inch size

TIHA01 **N** – **16**

Indication of tubing model

Color indication

Symbol	Color
N	Translucent (Material color)
R	Red (Translucent)
BU	Blue (Translucent)
B	Black (Opaque)

Length per roll

Symbol	Roll size
16	16 m (50 ft) roll
33 Note)	33 m (100 ft) roll

Note) 33 m(100 ft) roll is available with translucent (color indication: N) only.

FEP Tubing (Fluoropolymer)
Inch Size
TIH Series

RoHS

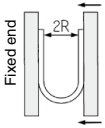
Operating Temperature: Max. 200°C
It varies depending on the operating pressure. Refer to the graph for the maximum operating pressure.

Compatible with the Food Sanitation Law
- Compatible with the test conforming to the Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (Food and Drug Administration) Compliant
- Complies with FDA (Food and Drug Administration) §177.1550 dissolution test.

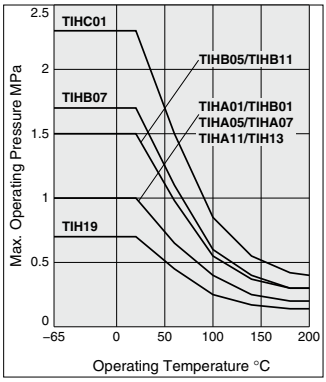
Flame Resistant (Equivalent to UL-94 Standard V-0)

How to measure the minimum bending radius.



At a temperature of 20°C, bend the tubing into a U shape. Fix one end and gradually move the other end closer. Measure 2R at the point where the outside diameter's rate of change is 5%.

Max. Operating Pressure



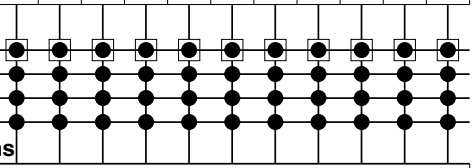
Note) The maximum operating pressure varies dependant on the I.D. bore size even if the O.D. is the same.

Series

●-16 m (50 ft) roll □-33 m (100 ft) roll

Model		Inch size										
		TIHA01	TIHB01	TIHC01	TIHA05	TIHB05	TIHA07	TIHB07	TIHA11	TIHB11	TIH13	TIH19
Tubing O.D.	inch	1/8"			3/16"		1/4"		3/8"		1/2"	3/4"
	mm	3.18			4.75		6.35		9.53		12.7	19.05
Tubing I.D.	inch	0.093"	0.086"	0.065"	0.137"	0.124" (1/8")	0.18"	0.156" (5/32")	0.275"	0.25" (1/4")	0.374" (3/8")	0.624" (5/8")
	mm	2.36	2.18	1.65	3.48	3.15	4.57	3.95	6.99	6.33	9.5	15.85

Color	Symbol
Translucent	N
Red	R
Blue	BU
Black	B



Specifications

Fluid		Air, Water Note 1), Inert gas									
Applicable fittings Note 2)		One-touch fittings, Insert fittings Note 3), Fluoropolymer fittings: LQ series Note 4)									
Max. operating pressure (MPa)	20°C or less	1	2.3	1	1.5	1	1.7	1	1.5	1	0.7
	100°C	0.4	0.85	0.4	0.55	0.4	0.6	0.4	0.55	0.4	0.25
	200°C	0.2	0.4	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.1
		Refer to the max. operating pressure curve.									
Operating vacuum pressure (kPa) Note 5)		–101.3									
Min. bending radius (mm) Note 6)	Recommended radius	25	20	10	35	25	55	35	85	60	95	220
	Tube close bend radius	20	12	7	25	20	35	20	55	30	60	160
Operating temperature (fixed usage)		Air, Inert gas: -65 to 200°C Water: 0 to 100°C (No freezing)									
Material		FEP (Fluorinated Ethylene Propylene Resin)									

Note 1) When using a fluid in liquid form, the surge pressure must not exceed the maximum operating pressure. A surge pressure higher than the maximum operating pressure can cause breakage of the fittings, or rupture of the tubing. Furthermore, an abnormal temperature increase due to adiabatic compression can also result in ruptured tubing.

Note 2) Do not use in locations where the FEP tubing will move.
Be sure to operate under the maximum operating pressure conditions using the lower maximum operating specification of either the tubing or fittings. After long term use or under high temperatures, some fittings leakage may occur due to material deterioration with age. Perform periodic inspections, and if any leakage is detected, replace with a new product immediately.
When the insert and miniature fittings are used over extended periods of time, it may cause leakage due to the material deterioration of age. In such a case, give an additional tightening to the tube connection part. If leakage still occurs after giving an additional tightening, replace the fitting with a new product. For other precautions, refer to "Fittings & Tubing Precautions". When using the fluoropolymer fittings, refer to the precautions on pages 655 and 656. Select the size after confirming O.D. and I.D.

Note 3) As leakage may occur with the KFG2 series if the fluid is repeatedly heated and cooled or if there is a sudden change in the ambient temperature, we recommend considering the TID series.

Note 4) TIHA01, TIHC01, TIHA05, TIHA07 and TIHA11 are not available because of different internal diameters.

Note 5) The operating vacuum pressure varies depending on the applicable fitting, so refer to the fitting specifications for details.

Note 6) The minimum bending radius is the representative value measured as shown in the left figure.
- Use a tube above the recommended minimum bending radius.
- The tubing may be bent if used under the recommended minimum bending radius. Therefore, refer to the tube close bend radius and make sure that the tubing is not bent or flattened.
- Please note that the tube close bend radius is not warranted because of the value when 2R is measured by the method in the left figure if the tubing is bent or flattened, etc.

How to Order

Inch size

TIHA01 **N** – **16**

Indication of tubing model

Color indication

Symbol	Color
N	Translucent (Material color)
R	Red (Translucent)
BU	Blue (Translucent)
B	Black (Opaque)

Length per roll

Symbol	Roll size
16	16 m (50 ft) roll
33 Note)	33 m (100 ft) roll

Note) 33 m(100 ft) roll is available with translucent (color indication: N) only.

Soft Fluoropolymer Tubing
Metric Size
TD Series

RoHS

Flexibility: Improved by approx. 20%

* SMC comparison (Fluoropolymer tubing, TL/TIL series)

Compatible with the Japan Food Sanitation Law

- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant

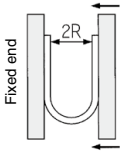
- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

Operating Temperature: Max. 260°C

It varies depending on the operating pressure. Refer to the graph for the maximum operating pressure.

Flame Resistant (Equivalent to UL-94 Standard V-0)

How to measure the minimum bending radius



Bend the tubing into the U-form at a temperature of 20°C. Fix one end and close loop gradually. Measure 2R when the deformed ratio of the tubing diameter at bending reaches 5%.

Model/Specifications

Size		Metric size				
Model		TD0425	TD0604	TD0806	TD1075	TD1209
Tubing O.D. (mm)		4	6	8	10	12
Tubing I.D. (mm)		2.5	4	6	7.5	9
Roll	10 m	●	●	●	●	●
	20 m	●	●	●	●	●
Color		Translucent (material color)				
Applicable fluid		Refer to the applicable fluid in page 732.				
Fluid Note 1)		Air, Water Note 1), Inert gas				
Applicable fittings Note 2)		Insert fittings KF series Stainless Steel 316 insert fittings KFG2 series Miniature fittings M, MS series (Hose nipple type) Fluoropolymer fitting LQ series				
Operating vacuum pressure (kPa) Note 3)		−101.3				
Max. operating pressure (MPa)	20°C or less	1.6	1.4	0.9	0.9	0.9
	100°C	0.9	0.7	0.5	0.5	0.5
	200°C	0.45	0.35	0.25	0.25	0.25
	260°C	0.23	0.2	0.15	0.15	0.15
Min. bending radius (mm) Note 4)	Recommended radius	15	25	45	55	75
	Tube close bend radius	8	16	31	35	41
Operating temperature (fixed usage)		Air, Inert gas: −65 to 260°C Water: 0 to 100°C (No freezing)				
Material		Modified PTFE (Polytetrafluoroethylene resin)				

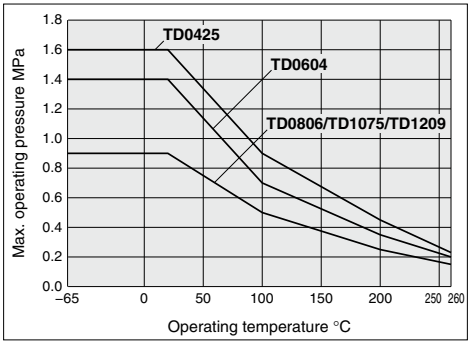
Note 1) When using a liquid fluid, the surge pressure must be under the maximum operating pressure. If the surge pressure exceeds the maximum operating pressure, it will result in damage to fittings and tubing. Furthermore, abnormal temperature rise caused by adiabatic compression may result in the tubing bursting.

Note 2) Do not use this product in a manner in which the tubing is not fixed.
Observe the lesser value of the maximum operating pressure between the tubing and fittings. A material change over a long duration or due to high-temperature may cause leakage.
Perform periodic maintenance and replace with a new product immediately when abnormalities are detected.
(Refer to "Maintenance" of the tubing precautions on page 735.)
For other precautions, refer to "Fittings & Tubing Precautions" on pages 14 to 18. When using the fluoropolymer fittings, refer to the precautions on pages 655 and 656.

Note 3) The operating vacuum pressure varies depending on the applicable fitting, so refer to the fitting specifications for details.

Note 4) The minimum bending radius is the representative value measured as shown in the left figure.
- Use a tube above the recommended minimum bending radius.
- The tubing may be bent if used under the recommended minimum bending radius. Therefore, refer to the tube close bend radius and make sure that the tubing is not bent or flattened.
- Please note that the tube close bend radius is not warranted because of the value when 2R is measured by the method in the left figure if the tubing is bent or flattened, etc.

Maximum Operating Pressure



How to Order

Metric size

TD0425 − 10

Length per roll

Symbol	Length
10	10 m roll
20	20 m roll

Tubing model

Soft Fluoropolymer Tubing
Inch Size
TID Series

RoHS

Flexibility: Improved by approx. 20%
* SMC comparison (Fluoropolymer tubing, TL/TIL series)

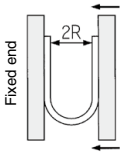
Compatible with the Japan Food Sanitation Law
- Compatible with the test conforming to the Japan Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.

FDA (U.S. Food and Drug Administration) Compliant
- Complies with FDA (U.S. Food and Drug Administration) §177.1550 dissolution test.

Operating Temperature: Max. 260°C
It varies depending on the operating pressure. Refer to the graph for the maximum operating pressure.

Flame Resistant (Equivalent to UL-94 Standard V-0)

How to measure the minimum bending radius



Bend the tubing into the U-form at a temperature of 20°C. Fix one end and close loop gradually. Measure 2R when the deformed ratio of the tubing diameter at bending reaches 5%.

Model/Specifications

Size		Inch size				
Model		TID01	TID05	TID07	TID11	TID13
Tubing O.D.	inch	1/8"	3/16"	1/4"	3/8"	1/2"
	mm	3.18	4.75	6.35	9.53	12.7
Tubing I.D.	inch	0.086"	0.124" (1/8")	0.156" (5/32")	0.25" (1/4")	0.374" (3/8")
	mm	2.18	3.15	3.95	6.33	9.5
Roll	8 m (25 ft)	●	●	●	●	●
	16 m (50 ft)	●	●	●	●	●
Color		Translucent (material color)				
Applicable fluid		Refer to the applicable fluid in page 732.				
Fluid Note 1)		Air, Water Note 1), Inert gas				
Applicable fittings Note 2)		Stainless Steel 316 insert fittings KFG2 series Fluoropolymer fitting LQ series				
Max. operating pressure (MPa)	20°C or less	1.4	1.4	1.6	1.4	0.9
	100°C	0.7	0.7	0.9	0.7	0.5
	200°C	0.35	0.35	0.45	0.35	0.25
	260°C	0.2	0.2	0.23	0.2	0.15
Operating vacuum pressure (kPa) Note 3)		−101.3				
Min. bending radius (mm) Note 4)	Recommended radius	15	20	25	40	75
	Tube close bend radius	9	10	15	23	42
Operating temperature (fixed usage)		Air, Inert gas: −65 to 260°C Water: 0 to 100°C (No freezing)				
Material		Modified PTFE (Polytetrafluoroethylene resin)				

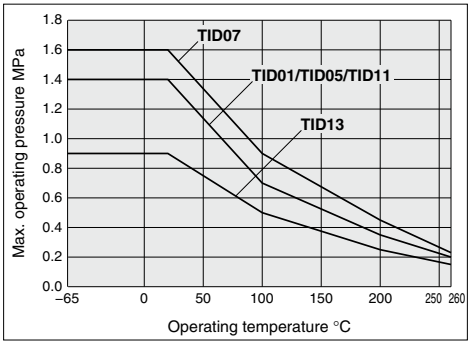
Note 1) When using a liquid fluid, the surge pressure must be under the maximum operating pressure. If the surge pressure exceeds the maximum operating pressure, it will result in damage to fittings and tubing. Furthermore, abnormal temperature rise caused by adiabatic compression may result in the tubing bursting.

Note 2) Do not use this product in a matter in which the tubing is not fixed.
Observe the lesser value of the maximum operating pressure between the tubing and fittings.
A material change over a long duration or due to high-temperature may cause leakage. Perform periodic maintenance and replace with a new product immediately when abnormalities are detected.
(Refer to "Maintenance" of the tubing precautions on page 735.)
For other precautions, refer to "Fittings & Tubing Precautions" on pages 14 to 18. When using the fluoropolymer fittings, refer to the precautions on pages 655 and 656.

Note 3) The operating vacuum pressure varies depending on the applicable fitting, so refer to the fitting specifications for details.

Note 4) The minimum bending radius is the representative value measured as shown in the left figure.
- Use a tube above the recommended minimum bending radius.
- The tubing may be bent if used under the recommended minimum bending radius. Therefore, refer to the tube close bend radius and make sure that the tubing is not bent or flattened.
- Please note that the tube close bend radius is not warranted because of the value when 2R is measured by the method in the left figure if the tubing is bent or flattened, etc.

Maximum Operating Pressure



How to Order

Inch size

TID01 − 8

- **Tubing model**
- **Length per roll**

Symbol	Length
8	8 m (25 ft) roll
16	16 m (50 ft) roll

SMC

Related Products

Tube Cutter: TK-5

As this product is made of stainless steel it can be used inside clean rooms.

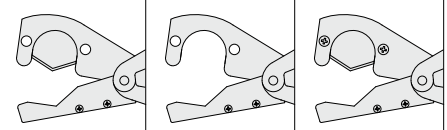
* However, this product is packaged regularly, not in double packaging.

Safety lock contained

Note) The blade can be easily replaced with a Phillips head screwdriver.
Please refrain from touching the blade tip during replacement. Failure to do so may result in injury.
Be aware that when loosening the mounting screws, the blade may fall out, causing injury.

Model	**TK-5**
Applicable tubing material	Fluoropolymer, Polyolefin, and other soft plastic tubing
Applicable tubing O.D.	25 mm or less
Weight	100 g
Replacement blade part no.	TK-DPM00132 (5 replacement blades)

How to Replace the TK-5 Blade



① Remove the mounting screws.

② Remove the blade.

③ Insert the replacement blade, and tighten the mounting screws.

TL/TIL/TD/TID Series
Applicable Fluid List
Chemical resistance of Fluoropolymer Super PFA, modified PTFE material

Chemicals in the list below are chemically inert [Note 1)] to Super PFA, modified PTFE material. Possible physical effects may occur such as penetration and swelling due to temperature, pressure and chemical concentration. To use Super PFA, modified PTFE tube in a chemical environment, tests should be performed with the same environment to ensure no problem occurs with operating environment.

1,1,1-Trichloroethane	Formic acid	Triethylamine
1,1,2-Trichloroethane	Ethyl formate	Trichloroethylene
1,2,3-Trichloropropane	Propyl formate	Trichloroacetic acid
1,2-Dichlorobutane	Methyl formate	Toluene
2,4-Dichlorotoluene	Xylene	Naphtha
2-chloropropane	Glycol	Carbon dioxide
2-nitro-2-methylpropane	Glycerine	Nitrogen dioxide
2-nitrobutanol	Cresol	Nitrobenzene
Pentabasic benzamide	Chromic acid	Nitromethane
Hydrochlorofluorocarbon-22	Chloracetic acid	Carbon disulfide
N-octadecanol	Chlorosulfonic acid	Piperidine
N-butylamine	Chloroform	Pyridine
o-chlorotoluene	Paraffinum liquidum	Pyrogallol
Isobutyl adipate	Acetate	Phenol
Acetyl chloride	Amyl acetate	Butanol
Acetophenone	Ethyl acetate	Phthalic acid
Acetone	Potassium	Hydrofluoric acid
Aniline	Butyl acetate	Furan
Sulfurous acid gas	Propyl acetate	Ethyl propionate
Allyl chloride	Methyl acetate	Propyl propionate
Benzoic acid	Salicylic acid	Methylpropionate
Ammonium	Sodium hypochlorite	Propylene chloride
Sulfur	Diisobutyl ketone	Bromobenzene
Isoamyl alcohol	Diethylamine	Hexachlorethane
Isooctane	Carbon tetrachloride	Hexane
Ethanol	Dioxane	Heptane
Ethyl ether	Cyclohexanone	Benzyl alcohol
Ethylene glycol	Cyclohexane	Benzaldehyde
Ethylene chloride	Dichloroethylene	Benzine
Ethylenediamine	Dichloropropylene	Benzoyl chloride
Zinc chloride	Dibutyl phthalate	Benzonitrile
Aluminum chloride	Dimethyl ether	Pentachloroethane
Ammonium chloride	Dimethylsulfoxide	Boric acid
Calcium chloride	Dimethylformamide	Sodium boric acid
Ferrous chloride	Hydrobromic acid	Formaldehyde
Mercuric chloride	Potassium dichromate	Acetic anhydride
Stannous chloride	Bromine	Methanol
Ferric chloride	Steam	Methyl ether
Cupric chloride	DI water (Pure water)	Methyl ethyl ketone
Sodium chloride	Nitric acid	Methylene chloride
Magnesium chloride	Ammonium hydroxide	Ethyl butyrate
Hydrochloric acid	Potassium hydroxide	Methyl butyrate
Chlorine	Sodium hydroxide	Hydrogen sulfide
Aqua regia	Soap, detergent	Sulphuric acid
Ozone	Diethyl carbonate	Zinc sulfate
Oleic acid	Sodium carbonate	Ammonium sulfate
Perchlorate	Tetrachloroethane	Ferrous sulfate
Hydrogen peroxide	Tetrachloroethylene	Copper sulfate
Natrium peroxide	Tetrahydrofuran	Phosphoric acid
Gasoline	Tetrabromoethane	Sodium phosphate
Potassium permanganate	Triethanolamine	

Note 1) “Chemically inert” means – not to cause any chemical reaction.
Note 2) The data above is based on the information presented by the material manufacturers.
Note 3) The applicable fluid list provides reference values as a guide only, therefore we do not guarantee the application to our product.
Note 4) SMC is not responsible for its accuracy and any damage happened because of this data.

TLM/TILM Series
Applicable Fluid List
Chemical resistance of Fluoropolymer PFA material

Chemicals in the list below are chemically inert [Note 1)], to PFA material. Possible physical effects may occur such as penetration and swelling due to temperature, pressure and chemical concentration.
To use PFA tube in a chemical environment, tests should be performed with the same environment to ensure no problem occurs with operating environment.

Acetate	Butyl stearate	Ethylene dicloride	Malic acid	Salicylic acid
Acetic anhydride	Calcium acetate	Ethylene glycol	Mercaptan	Silicate ester
Acetone	Calcium bisulfite	Ethylene oxide	Mercuric chloride	Silicone grease
Acetylene	Calcium chloride	Ethylenediamine	Mercury	Silicone oil
Acrylonitrile	Calcium hydroxide	Fatty acid	Methyl acetate	Silver nitrate
Aluminum acetate	Calcium hypochlorite	Ferric chloride	Methyl alcohol	Sodium bicarbonate
Aluminum nitrate	Calcium nitrate	Ferric nitrate	Methyl chloride	Sodium bisulfate
Aluminum bromide	Calcium sulfide	Ferric sulfate	Methyl ethyl ketone	Sodium bisulfite
Aluminum chloride	Carbon dioxide	Fluorboric acid	Methyl isobutyl ketone	Sodium hypochlorite (5%)
Aluminum fluoride	Carbon disulfide	Fluorobenzene	Methyl methacrylate	Sodium metaphosphate
Aluminum sulfate	Carbonic acid	Fluosilicic acid	Methylene dichloride	Sodium nitrate
Ammonia gas	Castor oil	Formaldehyde	Mineral oil	Sodium perborate
Ammonium carbonate	Caustic soda (30%)	Formic acid	Monochloroacetic acid	Sodium phosphate
Ammonium chloride	Cellosolve	Furfural	Monochlorobenzene	Sodium sulfite
Ammonium hydroxide	Chlorosulfonic acid	Gasoline	Monoethanolamine	Sodium thiosulfate
Ammonium nitrate	Chlorotoluene	Gelatine	Naphtha	Soybean oil
Ammonium nitrite	Chromic acid	Glauber's salt	Naphthalene	Stannic chloride
Ammonium persulfate	Citric acid	Glucose	Naphthenic acid	Steam
Ammonium phosphate	Coconut oil	Glue	Natrium peroxide	Stearic acid
Ammonium sulfate	Copper cyanide	Glycerine	Natural gas	Styrene
Amyl acetate	Copper sulfate	Grease	Nickel acetate	Sucrose solution
Amyl alcohol	Corn oil	Hexaldehyde	Nickel chloride	Sulfur
Amyl borate	Cottonseed oil	Hexane	Nickel sulfate	Sulfur chloride
Amyl naphthalene	Creosote oil	Hexyl alcohol	Nitric acid (60%)	Sulfuric acid (98%)
Aniline	Cresol	Hydrobromic acid	Nitrobenzene	Sulfurous acid gas
Aniline dye	Cupric chloride	Hydrochloric acid	Nitroethane	Tannic acid
Animal oil (Lard oil)	Cyclohexane	Hydrocyanic acid	Nitromethane	Tartaric acid
Aqua regia	Cyclohexanol	Hydrofluoric acid (49%)	Nitropropane	Terpineol
Arsenic acid	Cyclohexanone (Anon)	Hydrofluoric acid anhydrous	Octyl alcohol	Tetrachloroethane
Asphalt	Dibutyl phthalate	Hydrogen peroxide (30%)	Oxalic acid	Tetraethyl lead
Barium chloride	Dichlorobenzene	Hydrogen sulfide	Oxygen	Tetrahydrofuran
Barium hydroxide	Diethyl sebacate	Hydroquinone	Ozone	Tetralin
Barium sulfate	Diethylene glycol	Hypochlorous acid	Palmitic acid	Thionyl chloride
Barium sulfide	Diisopropyl keton	Isobutyl alcohol	Perchlorate	Triacetin
Beer	Dioctyl phthalate	Isooctane	Perchloroethylene	Tributoxy ethyl phosphate
Beet sugar liquors	Dioctyl sebacate	Isopropyl acetate	Petroleum	Tributyl phosphate
Benzaldehyde	Dipentene (Limonene)	Isopropyl alcohol	Phenol	Trichloroethylene
Benzine	Diphenyl	Isopropyl ether	Phosphoric acid (75%)	Tricresyl phosphate
Benzene (Benzol)	Diphenyl oxide	Kerosene	Picric acid	Triethanolamine
Benzyl alcohol	Epichlorohydrin	Lead acetate	Piperidine	Tung oil
Benzyl benzoate	Ethanolamine	Lead nitrate	Potassium chloride	Turpentine oil
Benzyl chloride	Ethyl acetate	Lead sulfamate	Potassium dichromate	Vegetable oil
Borax	Ethyl acetoacetate	Linolenic acid	Potassium hydroxide	Vinegar
Boric acid	Ethyl acrylate	Linseed oil	Potassium nitrate	Water
Bromine	Ethyl alcohol	Liquid ammonia	Potassium permanganate	Whiskey
Bunker oil	Ethyl benzene	LPG (Liquefied petroleum gas)	Potassium sulfate	Xylene
Butane	Ethyl cellulose	Lubricating oil	Propyl acetate	Zeolite
Butter	Ethyl chloride	Magnesium chloride	Propyl alcohol	Zinc acetate
Butyl acetate	Ethyl oxalate	Magnesium hydroxide	Propylene	Zinc chloride
Butyl acrylate	Ethyl silicate	Magnesium sulfate	Pyridine	Zinc sulfide
Butyl alcohol (Butanol)	Ethylene chlorohydrin	Maleic acid	Pyrrole	Deionized water (Pure water)

Note 1) "Chemically inert" means – not to cause any chemical reaction.
Note 2) The data above is based on the information presented by the material manufacturers.
Note 3) The applicable fluid list provides reference values as a guide only, therefore we do not guarantee the application to our product.
Note 4) SMC is not responsible for its accuracy and any damage happened because of this data.

Applicable Fluid List

Chemical Resistance of Fluoropolymer FEP Material

Chemicals in the list below are chemically inert Note 1) **to FEP material, however physical properties may be effected by temperature or pressure change.**
Please make sure that operating conditions do not cause problems since the use of FEP tubing under chemical environment is unsecured.

2-nitro-2-methyl propanol	Paraffinum liquidum	Perchloroethylene
2-nitrobutanol	Allyl acetate	Perphloroxylene
Pentabasic benzamide	Ethyl acetate	Unsymmetrical dimethylhydrazine
N-butylamine	Potassium	Hydrazine
N-octadecanol	Butyl acetate	Pinene
N-butyl acetate	Sodium hypochlorite	Piperidine
O-cresol	Carbon tetrachloride	Glacial acetic acid (Acetic acid)
Di-isobutyl adipate	Dioxane	Pyridine
Acetophenone	Cyclohexanone	Phenol
Acetone	Cyclohexane	Phthalic acid
Alniline	Dimethyl ether	Dybutyl phthalate
Abietic acid	Dimethylsulfoxide	Dimethyl phthalate
Sulfuric chloride	Dimethylformamide	Hydrofluoric acid
Isooctane	Bromine	Naphthalene fluoride
Liquid ammonia	Steam	Nitrobenzene fluoride
Ethyl alcohol	DI water (Pure water)	Furan
Ethyl ether	Nitric acid	Hexachlorethane
Ethylene glycol	Mercury	Hexane
Ethylenediamine	Ammonium hydroxide	Ethyl hexanoate
Zinc chloride	Potassium hydroxide	Phenylcarbinol
Aluminum chloride	Sodium hydroxide	Benzaldehyde
Ammonium chloride	Cetane	Benzonitrile
Calcium chloride	Soap, detergent	Borax
Sulfuric chloride	Dibutyl sebacate	Boric acid
Iron chloride (III)	Diethyl carbonate	Formic aldehyde (Formalin)
Benzoyl chloride	Tetrachloroethylene	Acrylic anhydride
Magnesium chloride	Tetrahydrofuran	Acetic anhydride
Hydrochloric acid	Tetrabromoethane	Methacrylic acid
Chlorine (absolute)	Triethanolamine	Allyl methacrylate
Aqua regia	Trichloroethylene	Vinyl methacrylate
Ozone	Trichloroacetic acid	Methyl alcohol
Hydrogen peroxide	Toluene	Methyl ethyl ketone
Natrium peroxide	Naphtha	Methylene chloride
Gasoline	Naphthalene	Sulphuric acid
Permanganate	Naphthol	Phosphoric acid
Formic acid	Lead	Iron phosphate (III)
Xylene	Carbon dioxide	Tri-n-butyl phosphate
Chromic acid	Nitrogen dioxide	Tricresyl phosphate
Chlorosulfonic acid	Nitrobenzene	
Chloroform	Nitromethane	

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Note 2) The data above is based on the information presented by the material manufacturers.
Note 3) The applicable fluid list provides reference values as a guide only, therefore we do not guarantee the application to our product.
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TL/TIL/TLM/TILM/TH/TIH/TD/TID Series
Tubing/Precautions

Be sure to read this before handling the products.

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.)

2. In case of using the product for medical care

This product is designed for use with compressed air system applications for medical care purposes. Do not use in contact with human bodily fluids, body tissues or transfer applications to a human living body.

⚠Caution

1. Do not use in locations where the connecting threads and tubing connection will slide or rotate.

The connecting threads and tubing connection will come apart under these conditions.

2. Use tubing at or above the minimum bending radius. Using below the minimum bending radius can cause breakage or flattening of the tubing.

3. Never use the tubing for anything flammable, explosive or toxic such as gas, fuel gas, or cooling mediums etc.

Because the contents may penetrate outward.

4. Use the fittings applicable to the tubing size.

Mounting

⚠Caution

1. Confirm model no., size, etc. before installing.

Check tubing for damage, gouges, cracks, etc.

The fluoropolymer tubing do not have the model number displayed on the product due to the resin material used. If tubing without a model label is mixed with other tubing which also does not have a model label, it is impossible to identify the model. Please avoid mixing the products with other models while it is being used and/or stored.

2. When tubing is connected, consider factors such as changes in the tubing length due to pressure, and allow sufficient leeway.

3. Do not apply unnecessary forces such as twisting, pulling, moment loads, etc. on fittings or tubing.

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

4. Mount so that tubing is not damaged due to tangling and abrasion.

This can cause flattening, bursting or disconnection of tubing, etc.

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. Not allowing chips of the piping thread or the seal material to go in.

Air Supply

⚠Warning

1. Types of fluid

This product is designed for use with compressed air.

2. In case of excessive condensation

Excessive condensation in a compressed air system may cause pneumatic equipment to malfunction. Installation of an air dryer, water separator before filter is recommended.

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 devices.
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 "Air Cleaning Equipment" catalog.

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

⚠Caution

1. Reform periodic inspections to check the following problems and replace tubing, if necessary.

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

2. Do not repair or patch the replaced tubing or fittings for reuse.

3. When using insert or miniature fittings over a long period, some leakage may occur due to age deterioration of the materials. If any leakage is detected, correct the problem by additional tightening.

If tightening becomes ineffective, replace the fittings with a new product immediately.