

Fluoropolymer Tubing

PFA

RoHS

Max. operating temperature: 260°C

22 size variations

Metric size $\varnothing 2$ to $\varnothing 25$ (13 sizes)

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

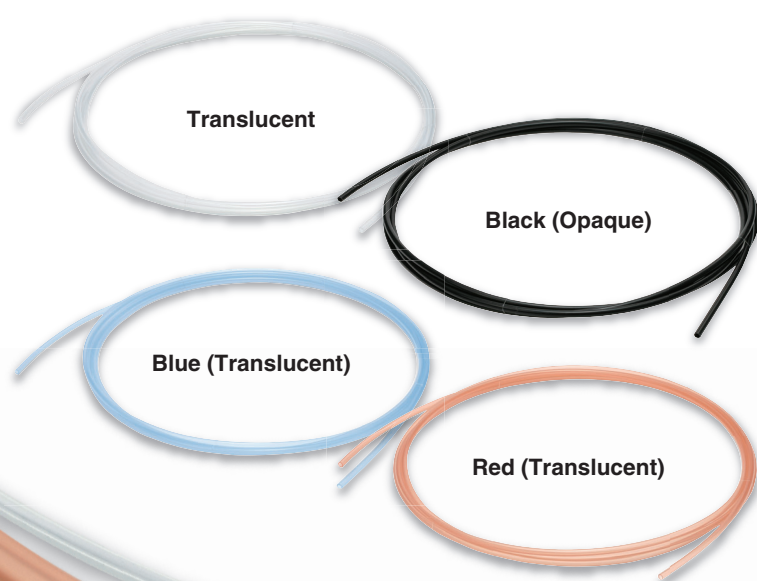
Straight 2 m

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

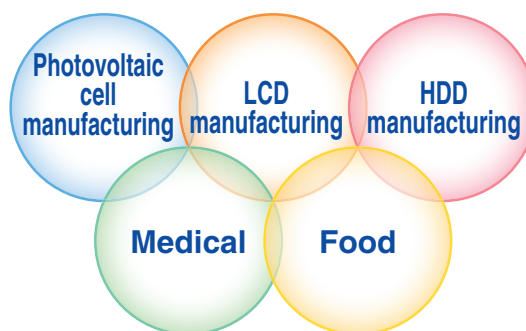
Length per roll 10 m, 20 m, 50 m, 100 m
16 m (50 ft), 33 m (100 ft)

Straight 2 m

4 color variations



Applications



Compatible with Food Sanitation Law

- Compatible with the test conforming to Japan's Food Sanitation Law based on the 370th notice given by the Ministry of Health and Welfare in 1959.
- Compatible with the §177-1550 elution test approved by the United States FDA (Food and Drug Administration).

Series TLM/TILM



CAT.ES50-36A

SMC Fluoropolymer Tubing Variations

Fluoropolymer Tubing (PFA)

Series **TLM/TILM** **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.

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



High Purity Fluoropolymer Tubing

Series **TL/TIL** **Material** Super PFA

It is suitable for applications which require a highly smooth internal surface and small amount of elution of fluorine ions.

* It has heat and chemical resistance equivalent to PFA.

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



Soft Fluoropolymer Tubing

Series **TD/TID** **Material** Modified PTFE

Flexibility improved by approx. 20%

(Compared with SMC TL/TIL Series)

Suitable for applications which require flexibility.

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

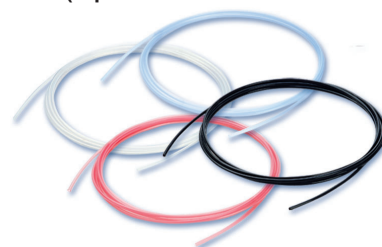


FEP Tubing (Fluoropolymer)

Series **TH/TH** **Material** FEP

This has better resistance in chemical environments.

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



Series		TLM/TILM	TL/TIL	TD/TID	TH/TH
Material		PFA	Super PFA	Modified PTFE	FEP
Chemical resistance		◎	◎	◎	○
Heat resistance		260°C	260°C	260°C	200°C
Flexibility		△	△	○	△
Ion elution		○	◎	○	○
Internal smoothness		△	○	○	◎
Fluid		Chemicals, Deionized water	Chemicals, Deionized water	Air, Water, Inert gas	
Tubing O.D.	Metric	ø2 to ø25	ø4 to ø19	ø4 to ø12	ø4 to ø12
	Inch	1/8" to 1 1/4"	1/8" to 1"	1/8" to 1/2"	1/8" to 3/4"
Colour		Translucent, Red, Blue, Black	Translucent	Translucent	Translucent, Red, Blue, Black
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	LQ1, LQ2, LQ3	LQ1, LQ2, LQ3	LQ1, LQ2, LQ3	LQ1, LQ2, LQ3

◎: 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.

Features 1



Fluoropolymer Tubing (PFA)

Metric Size

Series TLM

RoHS

Series

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

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 (Translucent)	R	●	●	●	●	●	●	●	●	●	●	●	●
		Blue (Translucent)	BU	●	●	●	●	●	●	●	●	●	●	●	●
		Black (Opaque)	B	●	●	●	●	●	●	●	●	●	●	●	●
	50 m	Translucent	N	●	●	●	●	●	●	●	●	●	●	●	●
Straight	100 m	Translucent	N	●	●	●	●	●	●	●	●	●	●	●	●
	2 m	Translucent	N	●	●	●	●	●	●	●	●	●	●	●	●

Inch O.D. size

5/32"

Inch O.D. size

5/16"

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 2.

Inch O.D. size
5/32"

Inch O.D. size
5/16"

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 2.

Specifications

Fluid <small>Note 1) 2) 3)</small> and applicable fittings <small>Note 1) 2) 3)</small>		Fluid: Refer to “Applicable Fluid List.”					Fittings: Fluoropolymer fittings LQ1, LQ2, LQ3							
		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.												
Min. bending radius (mm) <small>Note 4)</small>	Recommended radius	10	20	20	35	35	60	95	100	100	130	160	220	400
	Refraction value	7	15	15	20	20	40	60	65	65	110	130	160	290
Max. operating temperature		260°C												
Material		PFA (Tetrafluoroethylene perfluoroalkoxy vinyl ether copolymer)												

Note 1) Fluid varies depending on the applicable fittings.

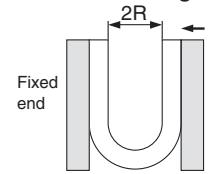
Note 2) When using a liquid fluid, the surge pressure must not exceed the maximum operating pressure. If the surge pressure exceeds the maximum operating pressure, it will result in damage to fittings and tubes. Furthermore, abnormal temperature rise caused by adiabatic compression may result in the 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" in the Series TLM/TILM Specific Product Precautions.) Refer to "Handling Precautions for SMC Products" (M-E03-3) for Fittings and Tubing Precautions and "Fluoropolymer Piping Equipment" (CAT.ES70-39) for Fluoropolymer Fittings Precautions.

Note 4) Minimum bending radius is measured as shown left as representative values.

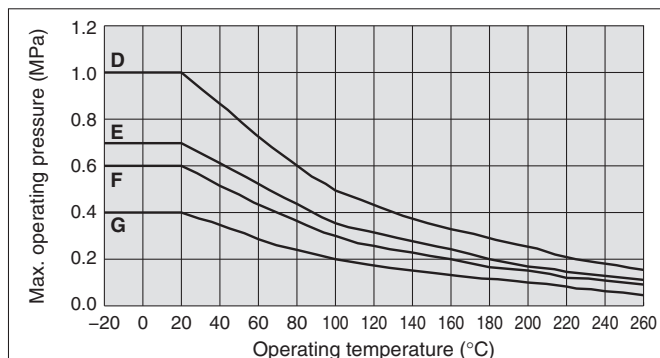
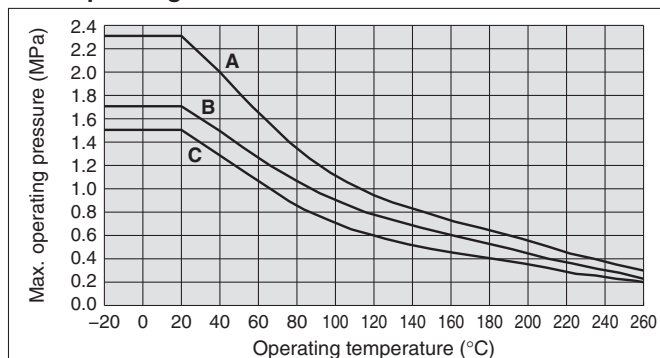
- Use a tube above the recommended minimum bending radius.
- The tube may be bent if used under the recommended minimum bending radius. Therefore, refer to the refraction value and make sure that the tube is not bent or flattened.
- Please note that the refraction value is not warranted because of the 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	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	1.5	0.7	0.35	0.2
	TLM0604				
	TLM0403				
D	TLM0806	1	0.5	0.25	0.15
	TLM1075				
	TLM1209				
E	TLM1008	0.7	0.35	0.17	0.11
	TLM1613				
F	TLM1210	0.6	0.3	0.15	0.1
	TLM1916				
G	TLM2522	0.4	0.2	0.1	0.05

How to Order

Metric size

TLM0425 N - 10

Tubing designation

Color indication

Symbol	Color
N	Translucent
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.

Fluoropolymer Tubing (PFA)

Inch Size

Series TILM

RoHS

Series

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

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 1/4" x 1 1/10"
O.D.	inch		1/8"	1/8"	3/16"	1/4"	3/8"	1/2"	3/4"	1"	1 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 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 (Translucent)	R	●	●	●	●			●	●
		Blue (Translucent)	BU	●	●	●	●	●	●	●	●
		Black (Opaque)	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 1.

Specifications

Fluid ^{Note 1) 2) 3)} and applicable fittings ^{Note 1) 2) 3)}		Fluid: Refer to “Applicable Fluid List.”			Fittings: Fluoropolymer fittings LQ1, LQ2, LQ3					
		Fluid: Air, Water, Inert gas			Fittings: One-touch fittings KQ2, KJ, KQG2, KQB2, Insert fittings KFG2					
Max. operating pressure (MPa)		Refer to the max. operating pressure curve.								
Min. bending radius (mm) ^{Note 4)}	Recommended radius	20	10	25	35	60	95	220	400	500
	Refraction value	12	6	20	20	30	60	160	290	360
Max. operating temperature		260°C								
Material		PFA (Tetrafluoroethylene perfluoroalkoxy vinyl ether copolymer)								

Note 1) Fluid varies depending on the applicable fittings.

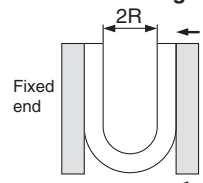
Note 2) When using a liquid fluid, the surge pressure must not exceed the maximum operating pressure. If the surge pressure exceeds the maximum operating pressure, it will result in damage to fittings and tubes. Furthermore, abnormal temperature rise caused by adiabatic compression may result in the 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" in the Series TLM/TILM Specific Product Precautions.) Refer to "Handling Precautions for SMC Products" (M-E03-3) for Fittings and Tubing Precautions and "Fluoropolymer Piping Equipment" (CAT.ES70-39) for Fluoropolymer Fittings Precautions.

Note 4) Minimum bending radius is measured as shown left as representative values.

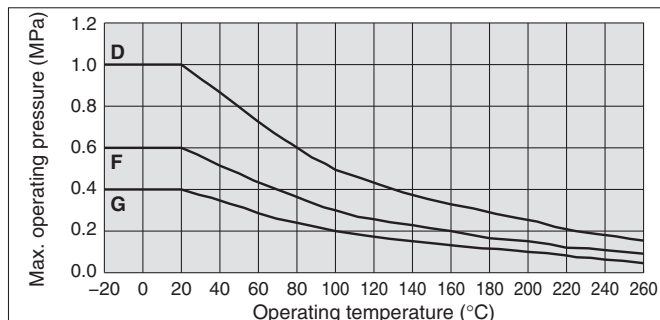
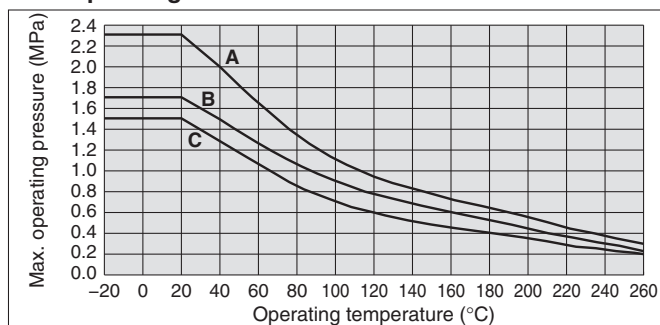
- Use a tube above the recommended minimum bending radius.
- The tube may be bent if used under the recommended minimum bending radius. Therefore, refer to the refraction value and make sure that the tube is not bent or flattened.
- Please note that the refraction value is not warranted because of the 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	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	1.5	0.7	0.35	0.2
	TILM11				
D	TILM01	1	0.5	0.25	0.15
	TILM13				
F	TILM19	0.6	0.3	0.15	0.1
G	TILM25	0.4	0.2	0.1	0.05
	TILM32				

How to Order

Inch size

TILM01 N - 20

Tubing designation

Color indication

Symbol	Color
N	Translucent
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	Roll	33 m (100 ft)
2S		2 m

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



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	Stearic acid
Ammonium phosphate	Coconut oil	Glue	Natrium peroxide	Styrene
Ammonium sulfate	Copper cyanide	Glycerine	Natural gas	Sucrose solution
Amyl acetate	Copper sulfate	Grease	Nickel acetate	Sulfur
Amyl alcohol	Corn oil	Hexaldehyde	Nickel chloride	Sulfur chloride
Amyl borate	Cottonseed oil	Hexane	Nickel sulfate	Sulfuric acid (98%)
Amyl naphthalene	Creosote oil	Hexyl alcohol	Nitric acid (60%)	Sulfurous acid gas
Aniline	Cresol	Hydrobromic acid	Nitrobenzene	Tannic acid
Aniline dye	Cupric chloride	Hydrochloric acid	Nitroethane	Tartaric acid
Animal oil (Lard oil)	Cyclohexane	Hydrocyanic acid	Nitromethane	Terpineol
Aqua regia	Cyclohexanol	Hydrofluoric acid (49%)	Nitropropane	Tetrachloroethane
Arsenic acid	Cyclohexanone (Anon)	Hydrofluoric acid anhydrous	Octyl alcohol	Tetraethyl lead
Asphalt	Dibutyl phthalate	Hydrogen peroxide (30%)	Oxalic acid	Tetrahydrofuran
Barium chloride	Dichlorobenzene	Hydrogen sulfide	Oxygen	Tetralin
Barium hydroxide	Diethyl sebacate	Hydroquinone	Ozone	Thionyl chloride
Barium sulfate	Diethylene glycol	Hypochlorous acid	Palmitic acid	Triacetin
Barium sulfide	Diisopropyl keton	Isobutyl alcohol	Perchlorate	Tributoxy ethyl phosphate
Beer	Diethyl phthalate	Isooctane	Perchloroethylene	Tributyl phosphate
Beet sugar liquors	Diethyl sebacate	Isopropyl acetate	Petroleum	Trichloroethylene
Benzaldehyde	Dipentene (Limonene)	Isopropyl alcohol	Phenol	Tricresyl phosphate
Benzine	Diphenyl	Isopropyl ether	Phosphoric acid (75%)	Triethanolamine
Benzene (Benzol)	Diphenyl oxide	Kerosene	Picric acid	Tung oil
Benzyl alcohol	Epichlorohydrin	Lead acetate	Piperidine	Turpentine oil
Benzyl benzoate	Ethanolamine	Lead nitrate	Potassium chloride	Vegetable oil
Benzyl chloride	Ethyl acetate	Lead sulfamate	Potassium dichromate	Vinegar
Borax	Ethyl acetoacetate	Linolenic acid	Potassium hydroxide	Water
Boric acid	Ethyl acrylate	Linseed oil	Potassium nitrate	Whiskey
Bromine	Ethyl alcohol	Liquid ammonia	Potassium permanganate	Xylene
Bunker oil	Ethyl benzene	LPG (Liquefied petroleum gas)	Potassium sulfate	Zeolite
Butane	Ethyl cellulose	Lubricating oil	Propyl acetate	Zinc acetate
Butter	Ethyl chloride	Magnesium chloride	Propyl alcohol	Zinc chloride
Butyl acetate	Ethyl oxalate	Magnesium hydroxide	Propylene	Zinc sulfide
Butyl acrylate	Ethyl silicate	Magnesium sulfate	Pyridine	
Butyl alcohol (Butanol)	Ethylene chlorohydrin	Maleic acid	Pyrrole	

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.



Series TLM/TILM

Specific Product Precautions

Be sure to read before handling. Refer to back cover for Safety Instructions, “Handling Precautions for SMC Products” (M-E03-3) for Fittings and Tubing Precautions and “Fluoropolymer Piping Equipment” (CAT.ES70-39) for Fluoropolymer Fittings Precautions.

Selection

Warning

1. Check 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. When 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. Check the model number, size, etc. before installing.

The TLM and TILM series 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. Also, check tubing for damage, gouges, cracks, etc.

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. In case of excessive condensation

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

2. 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 a 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 Preparation Equipment Model Selection Guide.”

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 radiant heat.

Maintenance

Caution

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

- a) Cracks, gouges, wearing, corrosion
- b) Air leakage
- c) Twists or crushing of tubing
- d) 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.

Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1), and other safety regulations.

-  **Caution:** **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
-  **Warning:** **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
-  **Danger:** **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

- *1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines.
(Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots - Safety.
etc.

Warning

- The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**
Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- Only personnel with appropriate training should operate machinery and equipment.**
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.
- Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**
 - The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
 - When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
 - Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
 - Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
 - Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.
 - An application which could have negative effects on people, property, or animals requiring special safety analysis.
 - Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

Caution

- The product is provided for use in manufacturing industries.**
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/ Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

Limited warranty and Disclaimer

- The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.*2)
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
- For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
- Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

- The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
- The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Safety Instructions

Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.

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