

# Fluoropolymer Tubing **PFA** **New**

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

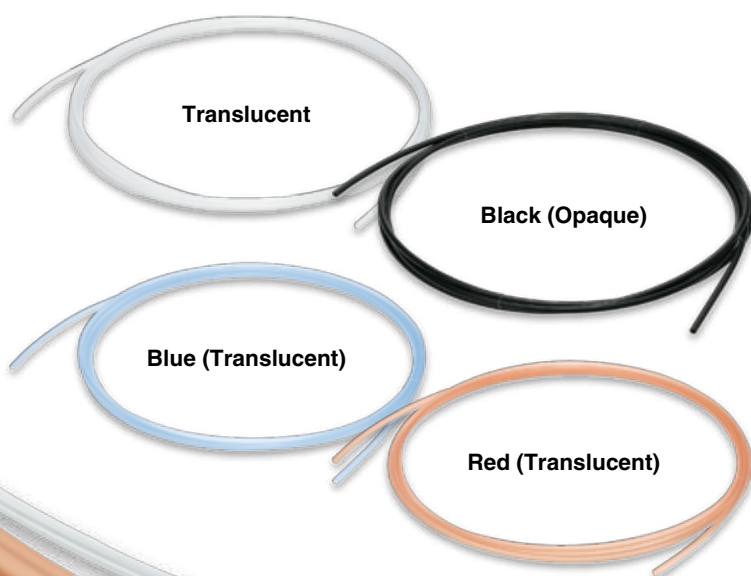
**Straight** 2 m

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

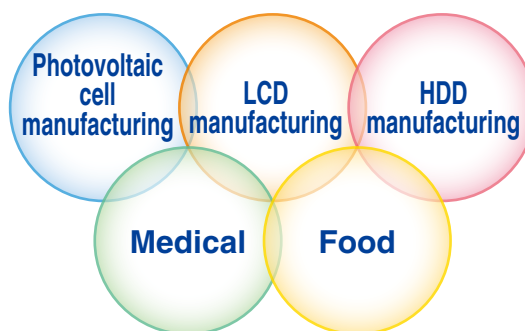
**Length per roll** 10 m, 20 m, 50 m, 100 m  
16 m (50 ft), 33 m (100 ft)

**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

**New**

## 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.



## 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.



## 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.



## FEP Tubing (Fluoropolymer)

Series **TH/TH** (Material) **FEP**

This has better resistance in chemical environments.



| Series                    |                        | <b>New</b> 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"                  |
| Color                     |                        | Translucent, Red, Blue, Black | Translucent                | Translucent              | Translucent, Red, Blue, Black |
| Applicable fitting series | One-touch fittings     | KQ2, KJ, KQG2, KP, KP□        | —                          | —                        | KQ2, KJ, KQG2, KP, KP□        |
|                           | Miniature fittings     | M, MS (Hose nipple type)      | —                          | M, MS (Hose nipple type) | M, MS (Hose nipple type)      |
|                           | Insert fittings        | 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



### 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 (Translucent)  | R           | ●       | ●         | ●       | ●       | ●       | ●          | ●        | ●        | ●         | ●         | ●         | ●         | ● |
|                 |             | Blue (Translucent) | BU          | ●       | ●         | ●       | ●       | ●       | ●          | ●        | ●        | ●         | ●         | ●         | ●         | ● |
|                 |             | Black (Opaque)     | B           | ●       | ●         | ●       | ●       | ●       | ●          | ●        | ●        | ●         | ●         | ●         | ●         | ● |
|                 | 50 m        | Translucent        | N           | ●       | ●         | ●       | ●       | ●       | ●          | ●        | ●        | ●         | ●         | ●         | ●         |   |
| 100 m           | Translucent | N                  | ●           | ●       | ●         | ●       | ●       | ●       | ●          | ●        | ●        | ●         | ●         | ●         |           |   |
| Straight        | 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.

### Specifications

|                                                                                                       |                                                                 |                                                                                                                                                       |    |    |    |    |    |    |     |     |     |     |     |     |
|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|
| <b>Fluid</b> <small>Note 1) 2) 3)</small> and <b>applicable fittings</b> <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, KJ, KQG2, Clean one-touch fittings KP, KP□<br>Insert fittings KF, KFG2, Miniature fittings M, MS (Hose nipple type) |    |    |    |    |    |    |     |     |     |     |     |     |
| <b>Max. operating pressure (MPa)</b>                                                                  | Refer to the max. operating pressure curve.                     |                                                                                                                                                       |    |    |    |    |    |    |     |     |     |     |     |     |
| <b>Min. bending radius (mm)</b> <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 |
| <b>Max. operating temperature</b>                                                                     | 260°C                                                           |                                                                                                                                                       |    |    |    |    |    |    |     |     |     |     |     |     |
| <b>Material</b>                                                                                       | PFA (Tetrafluoroethylene perfluoroalkoxy vinyl ether copolymer) |                                                                                                                                                       |    |    |    |    |    |    |     |     |     |     |     |     |

Note 1) Fluid varies depending on the applicable fittings.

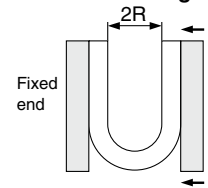
Note 2) When using a liquid fluid, the surge pressure must not exceed the maximum operating pressure. If the surge pressure exceeds the maximum operating pressure, it will result in damage to fittings and tubes. Furthermore, abnormal temperature rise caused by adiabatic compression may result in the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

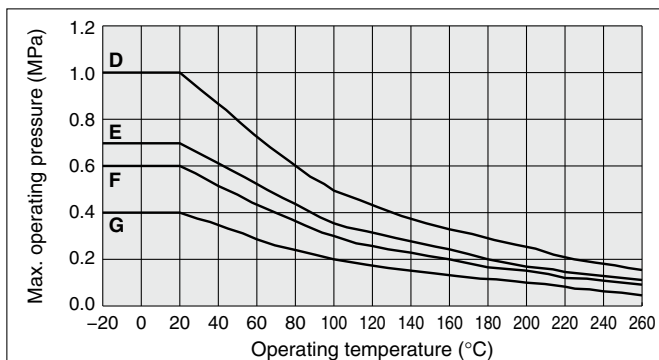
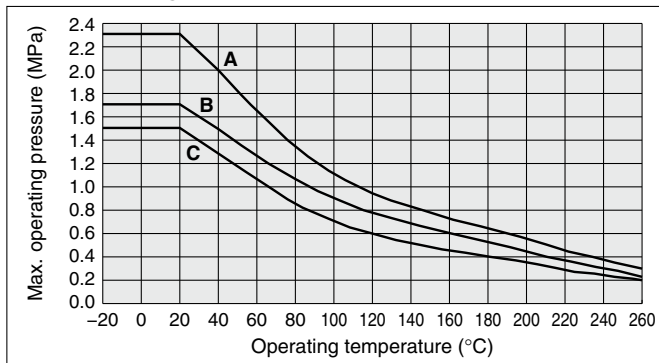
- Use a tube above the recommended minimum bending radius.
- The tube may be bent if used under the recommended minimum bending radius. Therefore, refer to the refraction value and make sure that the tube is not bent or flattened.
- Please note that the refraction value is not warranted because of the value when 2R is measured by the method in the right figure if the tube is bent or flattened, etc.

#### 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 |                               |       |       |       |
| D     | TLM0403 | 1.0                           | 0.5   | 0.25  | 0.15  |
|       | TLM0806 |                               |       |       |       |
|       | 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



### 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 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           |   |   |   |   |   |   |   |   |
|                 |               | Translucent        | N           | ● | ● | ● | ● | ● | ● | ● | ● |
|                 | 20 m          | 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

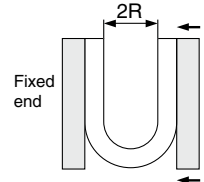
O.D. 5/32" is available in ø4 metric tubing, and O.D. 5/16" is available in ø8 metric tubing. For details, refer to the table "Series" on page 1.

### Specifications

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

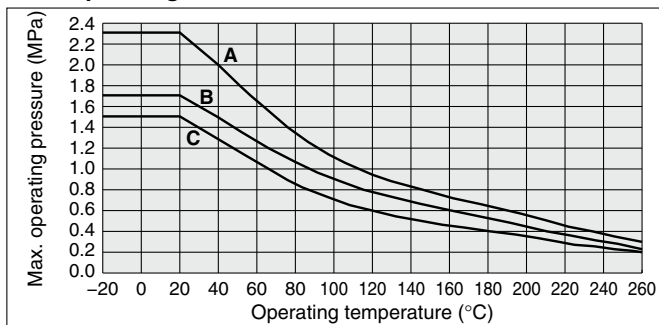
- Note 1) Fluid varies depending on the applicable fittings.  
 Note 2) When using a liquid fluid, the surge pressure must not exceed the maximum operating pressure. If the surge pressure exceeds the maximum operating pressure, it will result in damage to fittings and tubes. Furthermore, abnormal temperature 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.

#### 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

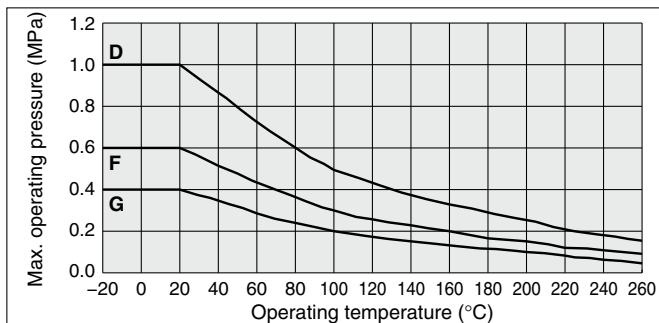
#### Color indication

| 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     | 33 m (100 ft) |              |
| 2S     | Straight      | 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 <sup>(Note)</sup>, 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                    | Diocetyl phthalate    | Isooctane                     | Perchloroethylene      | Tributyl phosphate        |
| Beet sugar liquors      | Diocetyl 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                   | Pyrrrole               |                           |

Note) "Chemically inert" means – not to cause any chemical reaction.



## 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.

- Cracks, gouges, wearing, corrosion
- Air leakage
- Twists or crushing of tubing
- 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

- 1. 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 catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- 2. 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.
- 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**
  1. 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.
  2. 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.
  3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
  1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
  2. 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 catalog.
  3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
  4. 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

- 1. 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

1. 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.
2. 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.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog 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

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. 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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