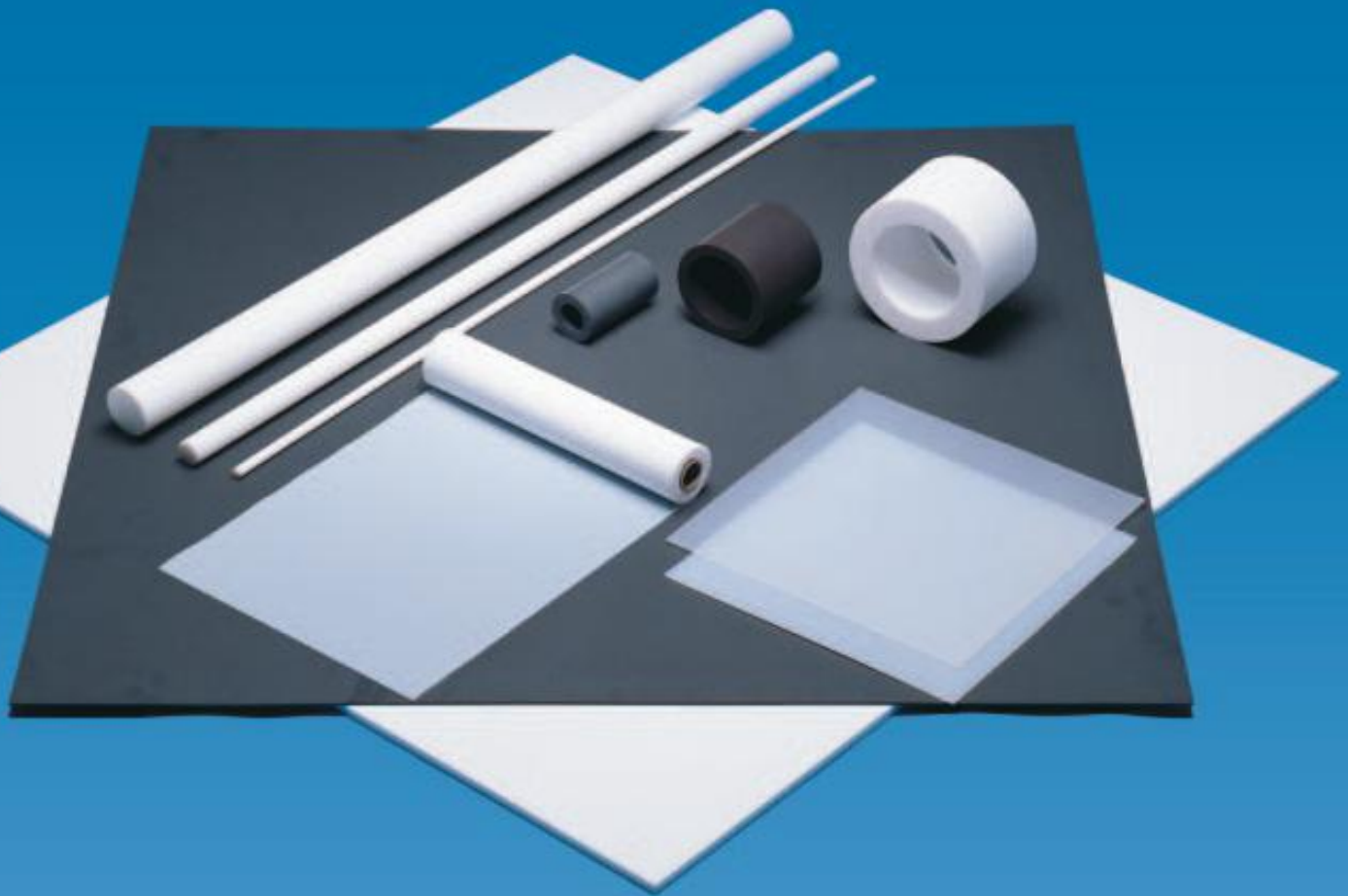


# TOMBO BRAND<sup>®</sup>

## NAFLON<sup>®</sup> Materials

PTFE/PFA/PVDF/PCTFE



**NICHIAS Corporation**

**LD**  
**LUAN DUNG**

# NAFLON® Materials

## PTFE/PFA/PVDF/PCTFE

NAFLON® is the registered trademark of NICHIAS Corporation fluoropolymer resins products. fluoropolymer resins products generally have the following excellent properties

**1 Chemical resistance**

**2 Non contamination (Chemically Inert)**

**3 Heat resistance**

**4 Electric insulation**

**5 Non-stick**

**6 Low friction coefficient**

**7 Weather resistance**

**8 Low flammability**

**PTFE (Polytetrafluoroethylene)**

It has many outstanding properties and it is a thermoplastic used extensively in a broad spectrum of industries.

**PFA (Perfluoroalkoxy)**

It has the same kind of properties as PTFE, and like thermoplastics it can be formed (extrusion, etc.)

**PFA-HG**

By stabilizing the terminal molecule groups, we have developed a New-PFA product that curbs the melt-out of F-ions and a Super-PFA product (T/#9003PFA-HG tubes) that improves the surface viscosity.

**PVDF (Polyvinyliden fluoride)**

Compared to para fluoropolymer resins such as PTFE and PFA, it has lower chemical and heat resistance and higher coefficient of friction. However, it is excellent in the areas of mechanical properties, non-friction, gas permeability and radiation resistance.

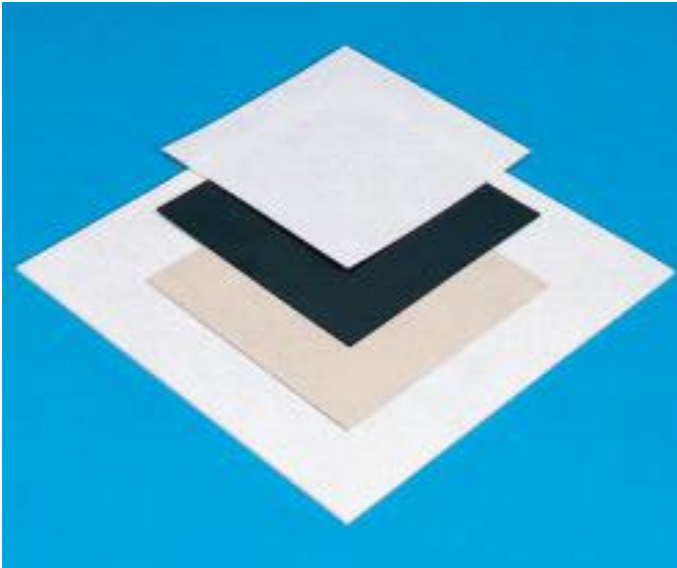
**PCTFE (Polychlorotrifluoroethylene)**

It has good mechanical strength, and excellent transparency and radiation resistance. Recommended for cryogenic service and gas sealing applications.

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NAFLON PTFE Sheet is made from pure PTFE or mixed with a range of inorganic fillers. The feedstock powder is pressure-formed and the sheet can be used for a wide range of applications.

Standard sheet size is 1,220 × 1,220mm

### Applications

It is used for a broad spectrum of applications encompassing gaskets, electric insulation materials, and machinery parts.

### NAFLON PTFE Sheets with Fillers

By adding various inorganic fillers to these Sheets, anti-wear properties, creep resistance, the thermal conductivity ratio and thermal dimensional stability are all improved.

These are ideal for machinery parts requiring heat and wear resistance.

Some of the chemicals are not suitable for some grade. For details, please consult us.

### Dimensions

#### ● Square Sheets

Thickness : Sheet1-6t (by Skiving method)

Sheet : 4-100t (by die forming method)

Size mm : 300<sup>□</sup>, 500<sup>□</sup>, 1000<sup>□</sup>, 1220<sup>□</sup>, 1500<sup>□</sup>

Maximum size of sheets with fillers are 1000<sup>□</sup>.

(LC, SC are 1.5t-3t, maximum size is 1220<sup>□</sup>)

GL is 3t, maximum size is 610 × 1210

FD is 3t, maximum size is 1220<sup>□</sup>

#### ● Disc

Thickness : 10, 20, 30, 40, 50, 60, 70t

Diameter (mm) :  $\phi$  400,  $\phi$  500,  $\phi$  600,  $\phi$  700,  $\phi$  800,  
 $\phi$  900,  $\phi$  1000

※ For Standard dimensions, please refer to the dimension chart on page 9-10.

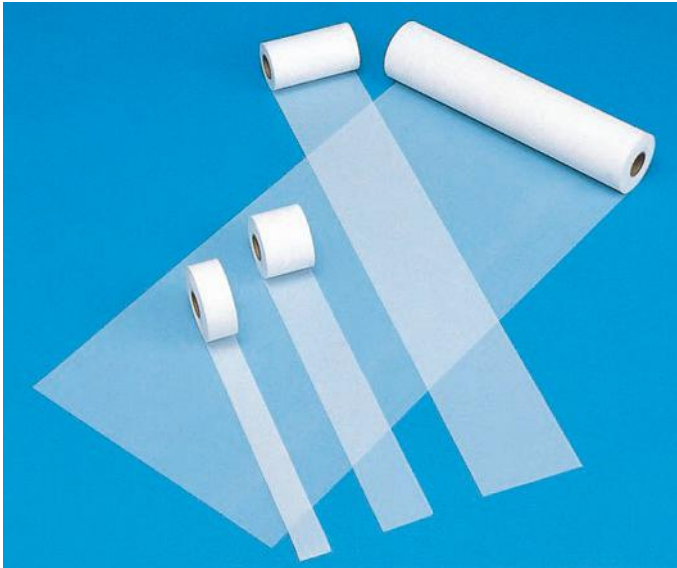
### Types

- T/#9000-G15, 20, 25=Glass fiber (15%, 20%, 25%)
- T/#9000-GR15, 30=Graphite (15%, 30%)
- T/#9000-GMo=Glass fiber (15%) + Molybdenum disulfide (5%)
- T/#9000-GGR=Glass fiber (20%)+Graphite (5%)
- T/#9000-BR=Bronze (60%)
- T/#9000-SC=Special carbon
- T/#9000-LC=Low creep Sheet
- T/#9000-GL=For glass lining application
- T/#9000-FD=For food, pharmaceutical and glass lining application

# NAFLON PTFE Tape

TOMBO No.9001

PTFE



This product is a thin gauge PTFE Tape made to the required thickness from a cylindrical PTFE formed block.

## Applications

It is used extensively in heat and electric insulation of high-temperature electric motors and generators. It is also commonly used as a release media in various plastic forming processes and for the interior of hoppers, etc.

## NAFLON PTFE tape with Fillers

### Types

- T/#9001-G15, 20, 25=Glass fiber (15%, 20%, 25%)
- T/#9001-GR15, 30=Graphite (15%, 30%)
- T/#9001-GMo=Glass fiber (15%)+Molybdenum disulfide (5%)
- T/#9001-CF 10, 15=Carbon fiber (10%, 15%)
- T/#9001-GGR=Glass fiber (20%)+Graphite (5%)
- T/#9001-B=Slide Tape (With adhesive Tape)
- T/#9001-BT=Slide Tape
- T/#9001-BR=Bronze (60%)

## Standard

T/#9001 NAFLON PTFE Tape, UL (Underwriters Laboratories) -94 class 94V-O certified

## Dimensions

Thickness : 0.05t-3.0t

Width : 300mm, 500mm

Length : 1, 5, 10, 30, 50, 100 Mtr (Max length depending on thickness)

※ For Standard dimensions, please refer to the dimension chart on page 11.

# NAFLON PTFE Cementable Tape

TOMBO No.9004

Tapes are available with treatment on both sides or on one side only. Caution must be taken when exposed to ultraviolet light as it will affect the adhesive property of the cementable tape. Tapes with adhesive tape attached are available on special order.

## Types

- T/#9004-K=NAFLON PTFE Cementable Tape coated on one side
- T/#9004-R=NAFLON PTFE Cementable Tape coated on both sides

# NAFLON PTFE Rod

TOMBO No.9002

PTFE



NAFLON PTFE Rods are formed to the required thickness by ram extrusion forming or pressure forming of the powder feedstock. They can be machined for use as electrical insulation parts and machinery parts.

## Applications

Electrical parts like connectors, terminals, etc.  
In valve applications, used as valve seats and seals, balls for ball check valves, etc.

## NAFLON PTFE Rod with Fillers

By using various fillers, mechanical & compressive strength and dimensional stability can all be drastically improved.

## Standard

NAFLON PTFE Rod has been authorized as MIL-P-19468A by the Defense Agency.

## Dimensions

Diameter :  $\phi$  1-  $\phi$  340mm  
Length : 100-250, 1000mm

※ For Standard dimensions, please refer to the dimension chart on pages 12-13.

## Types

- T/#9002-G15, 20, 25=Glass fiber (15%, 20%, 25%)
- T/#9002-GR15, 30=Graphite (15%, 30%)
- T/#9002-GMo=Glass fiber (15%)+Molybdenum disulfide (5%)
- T/#9002-CF 10, 15=Carbon fiber (10%, 15%)
- T/#9002-SC=Special carbon
- T/#9001-GGR=Glass fiber (20%)+Graphite (5%)
- T/#9001-BR=Bronze (60%)

# NAFLON PTFE/PFA/FEP Tubes

TOMBO No.9003



Naflon tubes are pure fluoropolymer resins tubes, and contain no additives such as fillers or plasticizers. Each of the PTFE, PFA, and FEP tubes has exceptional chemical-resistant, heat-resistant, and weather-resistant features.

※ For details of each tubings, please refer to the catalogue of "Tombo Brand NAFLON Tube".



NAFLON PTFE Pipe products are pressure formed cylindrical PTFE products. They can be machined for use as chemically resistant valve seats, V packings, non-lubricated bearings for machinery parts, as well as for gaskets, and packings over a wide range.

### Standard

JIS K6897 equivalent

### Standard Dimensions

(mm)

| Length | Outer diameter                  |
|--------|---------------------------------|
| 100    | $\phi$ 20 - $\phi$ 1115         |
| 1000   | $\phi$ 19, $\phi$ 21, $\phi$ 30 |

※ For Standard dimensions, please refer to the dimension chart on pages 13.16.17.

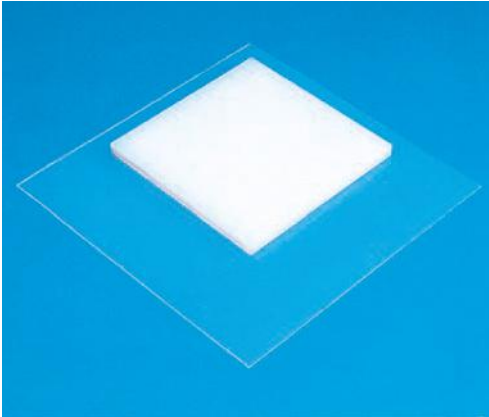


### Types of NAFLON PTFE Pipe with Fillers

| TOMBO No.                 | Filler                           | Application  |
|---------------------------|----------------------------------|--|
| G15<br>T/#9008-G20<br>G25 | Glass fiber<br>(15%, 20%, 25%)   | packings, bearings, piston rings, machinery parts, electrical insulation materials |
| T/#9008-GGR               | Glass fiber/<br>Graphite         | Non-lubricated bearings, piston rings, valve sheets                                |
| T/#9008-GMo               | Glass fiber/molybdenum disulfide | Bearings, etc.   |
| T/#9008-BR                | Bronze (60%)                     | High-speed bearings, machinery parts, etc.   |
| T/#9008-SC                | Special carbon                   | Gaskets, valve discs, valves sheets, machinery parts (for fluoric acid) etc.       |
| T/#9008-GR15<br>GR30      | Graphite                         | Bearings, piston rings, mechanical seals   |
| T/#9008-CF10<br>CF15      | Carbon fiber                     | Valve sheets, valve discs, bearings, etc.  |
| T/#9008-SCCF              | Special carbon, carbon fiber     | Valve sheets, valve discs, etc.  |

## NAFLON PFA Sheet

TOMBO No.9000-PFA



### Standard Dimensions

(mm)

| Dimensions | Thickness   |
|------------|---|
| 200 × 200  | 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 24, 25, 26, 28, 30, 35, 40     |
| 300 × 300  | 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 18, 20, 22, 25, 30, 35, 40     |
| 500 × 500  | 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 19, 20, 24, 25, 30, 40 |

NAFLON PFA Sheet products are pressure-formed into Sheets of a thickness ranging from 3 to 40mm. The Sheets can be machined or bonded/welded as required.

P  
F  
A

## NAFLON PFA Rod

TOMBO No.9002-PFA



### Standard Dimensions

(mm)

| Dimensions | Thickness   |
|------------|---|
| 100        | $\phi$ 45, $\phi$ 50, $\phi$ 55, $\phi$ 60, $\phi$ 70, $\phi$ 80, $\phi$ 90, $\phi$ 100   |
| 1000       | $\phi$ 1, $\phi$ 2, $\phi$ 3, $\phi$ 4, $\phi$ 6, $\phi$ 8, $\phi$ 10, $\phi$ 12, $\phi$ 14, $\phi$ 15, $\phi$ 16, $\phi$ 18, $\phi$ 20, $\phi$ 30, $\phi$ 40, $\phi$ 50, $\phi$ 60, $\phi$ 70, $\phi$ 80, $\phi$ 100 |

※ Please consult us on length requirements.

NAFLON PFA Rod is pressure-formed products. After machining, it can be welded to meet requirements.

## NAFLON PVDF Sheet

**TOMBO No.9000-PVDF**



NAFLON PVDF Sheet is formed thermoplastic Vinylidenfluoride products. They can be machined to meet requirements.

### Standard Dimensions

(mm)

| Dimensions  | Thickness                                    |
|-------------|--|
| 1000 × 2000 | 2, 3, 4, 5, 6, 8, 10, 15, 20, 25, 30, 40, 50 |

## NAFLON PVDF Rod

**TOMBO No.9002-PVDF**



NAFLON PVDF Rod is molten extrusion formed Vinylidenfluoride rod products. They can be machined to meet requirements.

### Standard Dimensions

(mm)

| Dimensions | Length | Dimensions | Length |
|------------|--------|------------|--------|
| 10         | 1000   | 60         | 1000   |
| 15         |        | 75         |        |
| 20         |        | 80         |        |
| 25         |        | 90         |        |
| 30         |        | 100        |        |
| 40         |        | 125        |        |
| 50         |        | 200        |        |

## NAFLON PVDF Pipe

**TOMBO No.9008-PVDF**



NAFLON PVDF Pipe is molten extrusion formed Vinylidenfluoride solid pipe products. They can be machined to meet requirements using thermal or melting methods.

### Standard Dimensions

(mm)

| Nominal size | Out side diameter | Wall thickness | Inside diameter |
|--------------|-------------------|----------------|-----------------|
| 15A          | 20                | 1.9            | 16.2            |
| 20A          | 25                | 1.9            | 21.2            |
| 25A          | 32                | 2.4            | 27.2            |
| 32A          | 40                | 2.4            | 35.2            |
| 40A          | 50                | 3.0            | 44.0            |
| 50A          | 63                | 3.0            | 57.0            |
| 65A          | 75                | 3.6            | 67.8            |
| 80A          | 90                | 4.3            | 81.4            |
| 100A         | 110               | 5.3            | 99.4            |

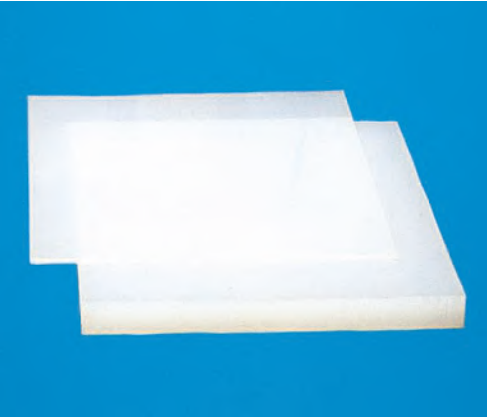
Standard length : 5meters

For large diameter products, please consult us.



## NAFLON PCTFE Sheet

## TOMBO No.9000-PCTFE



NAFLON PCTFE Sheet is pressure formed products that are easy to machine. In addition to gasket and packings, they can also be used to make various chemical instruments and parts for electrical machinery.

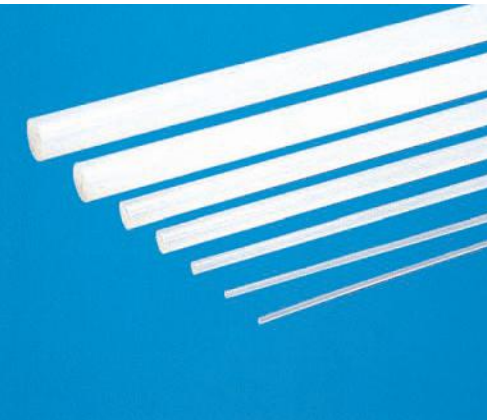
### Standard Dimensions

(mm)

| Dimensions | Thickness   |
|------------|---|
| 200 × 200  | 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 15, 20, 25, 30, 35, 40, 45, 50                 |
| 300 × 300  | 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, 18, 20, 22, 25, 28, 30, 35, 40             |
| 500 × 500  | 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 18, 19, 20, 22, 23, 25, 28, 30, 35, 40 |

## NAFLON PCTFE Rod

## TOMBO No.9002-PCTFE



NAFLON PCTFE Rod is suitable for machining.

### Standard Dimensions

(mm)

| Length           | 100mm   | 1000mm  |
|------------------|---|---|
| Outside diameter | φ 50, φ 55, φ 60, φ 65, φ 70, φ 80, φ 85, φ 90, φ 95, φ 100 | φ 3, φ 4, φ 5, φ 6, φ 7, φ 8, φ 9, φ 10, φ 11, φ 12, φ 13, φ 14, φ 15, φ 16, φ 17, φ 18, φ 19, φ 20, φ 22, φ 23, φ 25, φ 28, φ 30, φ 35 |

\* Also available in 200, 250 and 300mm lengths.

# List of Standard Available Sizes and Tolerances

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**T/#9000**

**NAFLON PTFE Sheet (Skived)**

**Standard Dimensions**

(Unit : mm)

| Thickness | Size        | Tolerance |            |
|-----------|-------------|-----------|------------|
|           |             | Thickness | Size       |
| 1.0       | 300 × 300   | +0.10     | +10<br>- 0 |
| 1.5       |             | -0.05     |            |
| 2.0       |             |           |            |
| 3.0       | 500 × 500   | +0.20     |            |
| 4.0       | 1000 × 1000 | -0.05     |            |
| 5.0       | 1220 × 1220 |           |            |
| 6.0       |             | +0.30     |            |
|           |             | -0.10     |            |

※ We hold stock in the above sizes

**T/#9000-D**

**NAFLON PTFE Sheet (Disc)**

**Standard Dimensions**

(Unit : mm)

| Thickness | Size   | Tolerance |            |
|-----------|--------|-----------|------------|
|           |        | Thickness | Size       |
| 10        | φ 400  | +2.4      | +10<br>- 0 |
| 15        |        | -0        |            |
| 20        | φ 500  | +3.6      |            |
| 25        |        | -0        |            |
| 30        | φ 600  | +4.0      |            |
| 35        |        | -0        |            |
| 40        | φ 700  | +5.0      |            |
| 45        |        | -0        |            |
| 50        | φ 800  | +6.0      |            |
| 55        |        | -0        |            |
| 60        | φ 900  | +8.0      |            |
| 65        |        | -0        |            |
| 70        | φ 1000 | -0        |            |

※ We hold stock in the above sizes

**T/#9000**

**NAFLON PTFE Sheet (Die formed)**

**Standard Dimensions**

(Unit : mm)

| Thickness | Size   | Tolerance |            |
|-----------|--|-----------|------------|
|           |  | Thickness | Size       |
| 7.0       | 300 × 300<br>500 × 500<br>1000 × 1000<br>1220 × 1220<br>1500 × 1500<br>1000 × 1000 | +0.8      | +10<br>- 0 |
| 8.0       |  | 0         |            |
| 9.0       |  |           |            |
| 10.0      |  | +1.0      |            |
| 11.0      |  | 0         |            |
| 12.0      |  |           |            |
| 13.0      |  | +1.1      |            |
| 14.0      |  | 0         |            |
| 15.0      |  | +1.2      |            |
| 16.0      |  | 0         |            |
| 17.0      |  |           |            |
| 18.0      |  | +1.4      |            |
| 19.0      |  | 0         |            |
| 20.0      |  | +1.8      |            |
| 22.0      |  | 0         |            |
| 25.0      |  |           |            |
| 30.0      | +2.0   |           |            |
| 35.0      | 0  |           |            |
| 40.0      |  |           |            |
| 45.0      | +2.5   |           |            |
| 50.0      | 0  |           |            |
| 60.0      | +3.0<br>0  |           |            |
| 70.0      | +4.0   |           |            |
| 80.0      | 0  |           |            |
| 90.0      | +5.0   |           |            |
| 100.0     | 0  |           |            |

**T/#9000**

**NAFLON PTFE Sheet (Roll form)**

● Please consult us regarding roll form.

PTFE

## T/#9000-G • GR • GMo • CF • GGR • BR

## NAFLON

PTFE Sheet with Fillers (Die formed)

## Standard Dimensions

(Unit : mm)

| Thickness | Size                                  | Tolerance         |            |
|-----------|---------------------------------------|-------------------|------------|
|           |                                       | Average Thickness | Size       |
| 4.0       | 300 × 300<br>500 × 500<br>1000 × 1000 | +0.45             | +10<br>- 0 |
|           |                                       | -0.20             |            |
| 5.0       |                                       | +0.55             |            |
| 6.0       |                                       | -0.30             |            |
| 7.0       |                                       | +0.75             |            |
| 8.0       |                                       | -0.35             |            |
| 9.0       |                                       | +0.95             |            |
| 10.0      |                                       | -0.45             |            |
| 12.0      |                                       | +1.20             |            |
| 15.0      |                                       | -0.60             |            |
| 20.0      | +1.70                                 |                   |            |
| 25.0      | -0.80                                 |                   |            |
| 30.0      | +2.00                                 |                   |            |
| 35.0      | -1.00                                 |                   |            |
| 40.0      | +2.50                                 |                   |            |
|           | -1.30                                 |                   |            |
| 50.0      | +3.00                                 |                   |            |
|           | -1.50                                 |                   |            |

## T/#9000-G20

## NAFLON

Glass filled PTFE sheet (Skived)

## Standard Dimensions

(Unit : mm)

| Thickness | Size                                  | Tolerance |            |
|-----------|---------------------------------------|-----------|------------|
|           |                                       | Thickness | Size       |
| 1.0       | 300 × 300<br>500 × 500<br>1000 × 1000 | +0.10     | +10<br>- 0 |
| 1.5       |                                       | -0.05     |            |
| 2.0       |                                       | +0.20     |            |
| 3.0       |                                       | -0.10     |            |
| 4.0       |                                       | +0.45     |            |
|           |                                       | -0.20     |            |
| 5.0       |                                       | +0.55     |            |
|           |                                       | -0.30     |            |

## T/#9000-SC

## NAFLON

Special carbon filled PTFE sheet

## Standard Dimensions

(Unit : mm)

| Thickness | Size        | Tolerance         |            |
|-----------|-------------|-------------------|------------|
|           |             | Average Thickness | Size       |
| 1.5       | 1220 × 1220 | +0.30             | +15<br>- 0 |
| 2.0       |             | -0.15             |            |
| 3.0       |             | +0.40             |            |
|           |             | -0.20             |            |

※ We hold stock in the above sizes

## T/#9000-LC

## NAFLON

Low Creep PTFE sheet

## Standard Dimensions

(Unit : mm)

| Thickness | Size        | Tolerance |            |
|-----------|-------------|-----------|------------|
|           |             | Thickness | Size       |
| 1.5       | 1220 × 1220 | +0.20     | +15<br>- 0 |
| 2.0       |             | -0.10     |            |
| 3.0       |             | +0.25     |            |
|           |             | -0.15     |            |

※ We hold stock in the above sizes

## T/#9000-GL

## NAFLON

PTFE sheet for glass lining

## Standard Dimensions

(Unit : mm)

| Thickness | Size       | Tolerance |                       |
|-----------|------------|-----------|-----------------------|
|           |            | Thickness | Size                  |
| 3.0       | 610 × 1220 | ±0.20     | +15<br>( 610 )<br>- 0 |
|           |            |           | +30<br>(1220)<br>- 0  |

## T/#9000-FD

NAFLON PTFE sheet for food  
(Pharmaceutical and food appreciation)

## Standard Dimensions

(Unit : mm)

| Thickness | Size        | Tolerance |            |
|-----------|-------------|-----------|------------|
|           |             | Thickness | Size       |
| 3.0       | 1220 × 1220 | ±0.25     | +30<br>- 0 |

## T/#9001

### NAFLON PTFE Tape

| Thickness (mm) | Width (mm) | Length (mm) |
|----------------|------------|-------------|
| ● 0.05         | 300<br>500 | 10          |
| ▲ 0.08         |            |             |
| ● 0.10         |            |             |
| ▲ 0.13         |            |             |
| ▲ 0.15         |            |             |
| 0.18           |            |             |
| ● * 0.20       |            |             |
| * 0.25         |            |             |
| ● * 0.30       |            |             |
| ● * 0.40       |            |             |
| ● * 0.50       |            |             |
| ● * 0.80       |            |             |
| ● * 1.00       |            | 10          |
| * 1.50         |            |             |
| * 2.00         |            |             |
| * 3.00         |            |             |

\* mark indicates maximum width is 1500mm

● mark indicates we hold stock of 300w × 10mtr, 500 × 10mtr

▲ mark indicates we hold stock of 300w × 10mtr

※ We can also manufacture widths and lengths other than the above.  
Please contact us for such requirements.

## T/#9001-G

### NAFLON PTFE Tape containing glass fiber

#### Standard Dimensions

(Unit : mm)

| Thickness | Width | Length (MT) | Tolerance |                   |      |
|-----------|-------|-------------|-----------|-------------------|------|
|           |       |             | Size      | Average Thickness | Size |
| 0.20      | 100   | 150         | ±0.02     | + 15              | +2.0 |
| 0.30      |       | 100         |           |                   |      |
| 0.40      |       | 70          |           |                   |      |
| 0.50      | 200   | 60          | ±0.04     | - 0               | -0   |
| 0.80      |       | 40          | ±0.07     |                   |      |
| 1.00      |       | 30          | ±0.08     |                   |      |
| 1.50      |       | 20          | ±0.12     |                   |      |

※ Please consult us regarding other fillers such as G, GR, GMo, CF, GGR, BR

PTFE

## T/#9001

### Dimensional tolerances

| Thickness (mm)      |                     |
|---------------------|---------------------|
| Standard Dimensions | Tolerance allowable |
| 0.05-0.10           | ±0.01               |
| 0.13-0.30           | ±0.02               |
| 0.40                | ±0.03               |
| 0.50                | ±0.04               |
| 0.80                | ±0.07               |
| 1.00                | ±0.08               |
| 1.50-2.00           | ±0.12               |

| Width (mm)          |                     |
|---------------------|---------------------|
| Standard Dimensions | Tolerance allowable |
| 300, 500            | ±15<br>- 0          |

| Length (mm)         |                     |
|---------------------|---------------------|
| Standard Dimensions | Tolerance allowable |
| 10-100              | ±2%<br>-0           |

T/#9002

**NAFLON PTFE Rod (1000mm)**

**Standard Dimensions**

(Unit : mm)

| Diameter | Length | Tolerance  |            |
|----------|--------|------------|------------|
|          |        | Diameter   | Length     |
| ● 1.0    | 1000   | +0.4<br>-0 | +20        |
| ● 2.0    |        |            | - 0        |
| ● 3.0    |        |            | +10<br>- 0 |
| ● 4.0    |        |            |            |
| ● 5.0    |        |            |            |
| ● 6.0    |        |            |            |
| 6.2      |        |            |            |
| ● 7.0    |        |            |            |
| ● 7.3    |        |            |            |
| ● 7.5    |        |            |            |
| ● 8.0    |        |            |            |
| ● 9.0    |        |            |            |
| ● 10.0   |        |            |            |
| 10.3     |        |            |            |
| ● 11.0   |        |            |            |
| ● 12.0   |        |            |            |
| 12.3     |        |            |            |
| ● 13.0   |        |            |            |
| ● 14.0   |        |            |            |
| ● 15.0   |        |            |            |
| ● 16.0   |        |            |            |
| ● 17.0   |        |            |            |
| ● 18.0   |        |            |            |
| ● 20.0   |        |            |            |
| ● 22.0   |        |            |            |
| ● 25.0   |        |            |            |
| ● 30.0   |        |            |            |
| ● 35.0   |        |            |            |
| ● 40.0   |        |            |            |
| ● 45.0   |        |            |            |
| ● 50.0   |        |            |            |
| ● 55.0   |        |            |            |
| ● 60.0   |        |            |            |
| ● 65.0   |        |            |            |
| ● 70.0   |        |            |            |
| ● 80.0   |        |            |            |
| ● 90.0   |        |            |            |
| ● 100.0  |        |            |            |
| ● 120.0  |        |            |            |
| ● 150.0  |        |            |            |

● mark indicates we hold stock of these products

T/#9002

**NAFLON PTFE Rod (100mm)**

**Standard Dimensions**

(Unit : mm)

| Diameter | Length                      | Tolerance  |            |
|----------|-----------------------------|------------|------------|
|          |                             | Diameter   | Length     |
| 15       | Standard 100<br>Maximum 120 | +2.0<br>-0 | +4.0<br>-0 |
| 17       |                             |            |            |
| 18       |                             |            |            |
| 20       |                             |            |            |
| 22       |                             |            |            |
| 23       |                             |            |            |
| 25       |                             |            |            |
| 27       |                             |            |            |
| 28       |                             |            |            |
| 30       |                             |            |            |
| 33       |                             |            |            |
| 35       |                             |            |            |
| 38       |                             |            |            |
| 40       |                             |            |            |
| 43       |                             |            |            |
| 45       |                             |            |            |
| 48       |                             |            |            |
| 50       |                             |            |            |
| 53       |                             |            |            |
| 55       |                             |            |            |
| 58       |                             |            |            |
| 60       |                             |            |            |
| 63       |                             |            |            |
| ● 65     |                             |            |            |
| ● 70     |                             |            |            |
| ● 75     |                             |            |            |
| ● 80     |                             |            |            |
| ● 85     |                             |            |            |
| ● 90     |                             |            |            |
| ● 95     |                             |            |            |
| ● 100    |                             |            |            |
| 105      |                             |            |            |
| ● 110    |                             |            |            |
| 115      |                             |            |            |
| ● 120    |                             |            |            |
| ● 130    |                             |            |            |
| ▲ 135    |                             |            |            |
| ▲ ● 140  |                             |            |            |
| ● 150    |                             |            |            |
| ● 160    |                             |            |            |
| ● 170    |                             |            |            |
| ▲ ● 180  |                             |            |            |
| ● 190    |                             |            |            |
| ● 200    |                             |            |            |

PTFE

**Standard Dimensions**

(Unit : mm)

| Diameter | Length                      | Tolerance  |            |
|----------|-----------------------------|------------|------------|
|          |                             | Diameter   | Length     |
| 210      | Standard 100<br>Maximum 250 | +6.0<br>-0 | +5.0<br>-0 |
| ▲ 220    |                             |            |            |
| 230      |                             |            |            |
| 240      |                             |            |            |
| 250      | Standard 100<br>Maximum 150 | +8.0<br>-0 | +5.0<br>-0 |
| 260      |                             |            |            |
| 270      |                             |            |            |
| 280      |                             |            |            |
| 290      |                             |            |            |
| 300      |                             |            |            |
| 310      |                             |            |            |
| 320      |                             |            |            |
| 330      |                             |            |            |
| 340      |                             |            |            |

● mark indicates we hold stock of 100mm

▲ mark indicates maximum length is 120mm

**Standard Dimensions**

(Unit : mm)

| Diameter | Length | Tolerance  |           |
|----------|--------|------------|-----------|
|          |        | Diameter   | Length    |
| 18       | 100    | +3.0<br>-0 | +5%<br>-0 |
| 20       |        |            |           |
| 23       |        |            |           |
| 25       |        |            |           |
| 28       |        |            |           |
| 30       |        |            |           |
| 33       |        |            |           |
| 35       |        |            |           |
| 38       |        |            |           |
| 40       |        |            |           |
| 43       |        |            |           |
| 45       |        |            |           |
| 48       |        |            |           |
| 50       |        |            |           |
| 53       |        |            |           |
| 55       |        |            |           |
| 60       |        |            |           |
| 65       |        |            |           |
| 70       |        |            |           |
| 75       |        |            |           |
| 80       |        |            |           |
| 85       |        |            |           |
| 90       |        |            |           |
| 95       |        |            |           |
| 100      |        |            |           |
| 105      |        |            |           |
| 110      |        |            |           |
| 115      |        |            |           |
| 120      |        |            |           |
| 125      |        |            |           |
| 130      |        |            |           |
| 135      |        |            |           |
| 140      |        |            |           |
| 150      |        |            |           |
| 160      |        |            |           |
| 170      |        |            |           |
| 180      |        |            |           |
| 190      |        |            |           |
| 200      |        |            |           |

※ Physical properties of NAFLON containing fillers are give in charts on pages 18 and 19.

**T/#9002-G20**

**NAFLON PTFE Rod containing glass fiber**

**Standard Dimensions**

(Unit : mm)

| Diameter | Length | Tolerance |           |
|----------|--------|-----------|-----------|
|          |        | Diameter  | Length    |
| 8        | 1000   | +1.5      | +2%<br>-0 |
| 10       |        | -0        |           |
| 12       |        | -0        |           |
| 13       |        | +2.0      |           |
| 15       |        | -0        |           |

※ We hold stock in the above sizes

**T/#9008**

**NAFLON Long Pipes**

**Standard Dimensions**

(Unit : mm)

| Outer Diameter |           | Inner Diameter |           | Length         |           |
|----------------|-----------|----------------|-----------|----------------|-----------|
| Standard value | Tolerance | Standard value | Tolerance | Standard value | Tolerance |
| 19             | +2<br>-0  | 13             | +0<br>-3  | 1000           | +20<br>-0 |
| 21             |           |                |           |                |           |
| 30             |           |                |           |                |           |

Standard Dimensions

| Nominal dimensions |                     | Inner Diameter (mm) |                     | Wall thickness (mm) |                     | Length (m)     |                | Nominal dimensions |                     | Inner Diameter (mm) |                     | Wall thickness (mm) |                     | Length (m) |  |
|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------|----------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|--|
| Inner × Outer      | Standard dimensions | Tolerance           | Standard dimensions | Tolerance           | Standard dimensions | Tolerance      |                | Inner × Outer      | Standard dimensions | Tolerance           | Standard dimensions | Tolerance           | Standard dimensions | Tolerance  |  |
| 0.25 × 0.75        | 0.25                | +0.20<br>-0.10      | 0.25                | ±0.10               |                     |                |                | 13.0 × 16.0        | 13.0                | ±0.50               | 1.5                 | ±0.18               | 1<br>5<br>10        |            |  |
| 0.5 × 1.5          | 0.5                 | +0.30<br>-0.10      | 0.5                 | +0.13<br>-0.10      | 10<br>20<br>30      | +2%<br>-0      |                | 14.0 × 16.0        | 14.0                |                     | 1.0                 | +0.13               |                     |            |  |
| 0.8 × 1.8          | 0.8                 |                     | 0.5                 |                     |                     |                |                | 15.0 × 17.0        | 15.0                | 1.0                 | -0.10               |                     |                     |            |  |
| 1.0 × 2.0          | 1.0                 | 0.5                 | 15.0 × 18.0         |                     |                     |                |                | 15.0               | 1.5                 | ±0.18               |                     |                     |                     |            |  |
| 1.0 × 3.0          | 1.0                 | 0.5                 | 16.0 × 17.5         |                     |                     |                |                | 16.0               | 0.75                | +0.13               |                     |                     |                     |            |  |
| 1.5 × 2.5          | 1.5                 | +0.40<br>-0.20      | 0.5                 |                     |                     |                |                | 16.0 × 18.0        | 16.0                | 1.0                 | -0.10               |                     |                     |            |  |
| 1.5 × 3.5          | 1.5                 | 1.0                 | 16.0 × 19.0         |                     |                     |                |                | 16.0               | 1.5                 | ±0.18               |                     |                     |                     |            |  |
| 2.0 × 3.0          | 2.0                 | +0.50<br>-0.20      | 0.5                 |                     |                     |                |                | 18.0 × 21.0        | 18.0                | 1.5                 | ±0.18               |                     |                     |            |  |
| 2.0 × 4.0          | 2.0                 |                     | 1.0                 |                     |                     |                |                | 19.0 × 21.0        | 19.0                | 1.0                 | +0.13<br>-0.10      |                     |                     |            |  |
| 2.5 × 3.5          | 2.5                 | 0.5                 | 20.0 × 23.0         |                     |                     |                |                | 20.0               | 1.5                 | ±0.18               | 1<br>5              |                     |                     |            |  |
| 2.5 × 4.5          | 2.5                 | 1.0                 | 21.5 × 23.5         |                     |                     |                |                | 21.5               | 1.0                 | +0.13<br>-0.10      |                     |                     |                     |            |  |
| 3.0 × 4.0          | 3.0                 | 0.5                 | 22.0 × 24.0         | 22.0                | 1.0                 | -0.10          |                |                    |                     |                     |                     |                     |                     |            |  |
| 3.0 × 5.0          | 3.0                 | 1.0                 | 23.0 × 25.0         | 23.0                | 1.0                 | ±0.28          |                |                    |                     |                     |                     |                     |                     |            |  |
| 4.0 × 5.0          | 4.0                 | 0.5                 | 23.0 × 27.0         | 23.0                | 2.0                 | ±0.13<br>-0.10 |                |                    |                     |                     |                     |                     |                     |            |  |
| 4.0 × 6.0          | 4.0                 | +0.50<br>-0.40      | 1.0                 | 25.0 × 27.0         | 25.0                | 1.0            | +0.13<br>-0.10 | 1                  | +2%<br>-0           |                     |                     |                     |                     |            |  |
| 5.0 × 6.0          | 5.0                 |                     | 0.5                 | 25.0 × 28.0         | 25.0                | 1.5            | ±0.18          | 2                  |                     |                     |                     |                     |                     |            |  |
| 5.0 × 7.0          | 5.0                 | 1.0                 | 25.0 × 29.0         | 25.0                | 2.0                 | ±0.18          | 3              |                    |                     |                     |                     |                     |                     |            |  |
| 6.0 × 7.0          | 6.0                 | +0.50<br>-0.40      | 0.5                 | 26.0 × 29.0         | 26.0                | 1.5            | ±0.18          | 1<br>2<br>3        |                     |                     |                     |                     |                     |            |  |
| 6.0 × 8.0          | 6.0                 |                     | 1.0                 | 27.5 × 29.5         | 27.5                | 1.0            | +0.13<br>-0.10 |                    |                     |                     |                     |                     |                     |            |  |
| 7.0 × 8.0          | 7.0                 | 0.5                 | 30.0 × 34.0         | 30.0                | 2.0                 | ±0.28          |                |                    |                     |                     |                     |                     |                     |            |  |
| 7.0 × 9.0          | 7.0                 | 1.0                 | 33.0 × 36.0         | 33.0                | 1.5                 | ±0.18          | 1<br>2         |                    |                     |                     |                     |                     |                     |            |  |
| 8.0 × 9.0          | 8.0                 | 0.5                 | 35.0 × 39.0         | 35.0                | 2.0                 | ±0.28          |                |                    |                     |                     |                     |                     |                     |            |  |
| 8.0 × 10.0         | 8.0                 | 1.0                 | 38.0 × 42.0         | 38.0                | 1.5                 | ±0.18          | 1<br>2<br>3    |                    |                     |                     |                     |                     |                     |            |  |
| 9.0 × 10.0         | 9.0                 | 0.5                 | 39.0 × 42.0         | 39.0                | ±1.5                | 2.0            |                |                    | ±0.28               |                     |                     |                     |                     |            |  |
| 9.0 × 11.0         | 9.0                 | 1.0                 | 40.0 × 44.0         | 40.0                |                     |                |                |                    |                     |                     |                     |                     |                     |            |  |
| 9.0 × 12.0         | 9.0                 | 1.5                 | 45.0 × 49.0         | 45.0                | 2.0                 | ±0.28          |                |                    |                     |                     |                     |                     |                     |            |  |
| 10.0 × 11.0        | 10.0                | 0.5                 | 46.0 × 50.0         | 46.0                |                     |                |                |                    |                     |                     |                     |                     |                     |            |  |
| 10.0 × 12.0        | 10.0                | 1.0                 | 49.0 × 53.0         | 49.0                | ±2.0                | 2.0            |                |                    | ±0.28               |                     |                     |                     |                     |            |  |
| 11.0 × 12.0        | 11.0                | 0.5                 | 50.0 × 54.0         | 50.0                |                     |                |                |                    |                     |                     |                     |                     |                     |            |  |
| 11.0 × 13.0        | 11.0                | 1.0                 | 64.0 × 68.0         | 64.0                | ±2.0                | 2.0            |                |                    | ±0.28               |                     |                     |                     |                     |            |  |
| 12.0 × 13.0        | 12.0                | ±0.50               | 76.0 × 80.0         | 76.0                |                     |                |                |                    |                     |                     |                     |                     |                     |            |  |
| 12.0 × 14.0        | 12.0                | 1.0                 |                     |                     |                     |                |                |                    |                     |                     |                     |                     |                     |            |  |
| 12.5 × 14.0        | 12.5                | 0.75                |                     |                     |                     |                |                |                    |                     |                     |                     |                     |                     |            |  |
| 13.0 × 15.0        | 13.0                | 1.0                 |                     |                     |                     |                |                |                    |                     |                     |                     |                     |                     |            |  |

※ Please check with us regarding delivery time (stock availability)

| Nominal dimensions |                     | Inner Diameter (mm) |                     | Wall thickness (mm) |                      | Length (m) |  |
|--------------------|---------------------|---------------------|---------------------|---------------------|----------------------|------------|--|
| Inner × Outer      | Standard dimensions | Tolerance           | Standard dimensions | Tolerance           | Standard dimensions  | Tolerance  |  |
| 1.59 × 3.17        | 1.59                | ±0.50<br>-0.20      | 0.79                | +0.13<br>-0.10      | 10<br>20<br>30<br>50 | +2%<br>-0% |  |
| 3.17 × 6.35        | 3.17                | +0.50<br>-0.40      | 1.59                |                     |                      |            |  |
| 4.35 × 6.35        | 4.35                |                     | 1.00                |                     |                      |            |  |
| 6.35 × 9.52        | 6.35                | 1.59                |                     |                     |                      |            |  |
| 7.52 × 9.52        | 7.52                | 1.00                |                     |                     |                      |            |  |
| 9.52 × 12.70       | 9.52                | 1.59                |                     |                     |                      |            |  |
| 10.70 × 12.70      | 10.70               | ±0.50               | 1.00                |                     |                      |            |  |
| 15.83 × 19.05      | 15.83               | ±0.60               | 1.61                |                     |                      |            |  |

※ Please check with us regarding delivery time (stock availability)



T/#9003

## NAFLON PFA/FEP Tube

### Standard Dimensions NAFLON PFA/PFA-HG Tube

| Nominal dimensions<br>Inner × Outer | Outer Diameter (mm) |              | Wall thickness (mm) |           | Length (m)          |           |
|-------------------------------------|---------------------|--------------|---------------------|-----------|---------------------|-----------|
|                                     | Standard dimensions | Tolerance    | Standard dimensions | Tolerance | Standard dimensions | Tolerance |
| 2 × 3                               | 3.0                 | +0.2<br>-0.1 | 0.5                 | ±0.06     | 10                  | +2%<br>-0 |
| ● 2 × 4                             | 4.0                 |              | 1.0                 | ±0.10     |                     |           |
| 3 × 4                               | 4.0                 |              | 0.5                 | ±0.06     |                     |           |
| 4 × 5                               | 5.0                 |              | 0.5                 | ±0.06     |                     |           |
| ● 4 × 6                             | 6.0                 |              | 1.0                 | ±0.10     |                     |           |
| 5 × 6                               | 6.0                 |              | 0.5                 | ±0.06     | 100                 |           |
| 5 × 7                               | 7.0                 |              | 1.0                 | ±0.10     |                     |           |
| ● 6 × 8                             | 8.0                 |              | 1.0                 | ±0.10     |                     |           |
| 7 × 8                               | 8.0                 |              | 0.5                 | ±0.06     |                     |           |
| ● 8 × 10                            | 10.0                |              | 1.0                 | ±0.10     |                     |           |
| 9 × 10                              | 10.0                |              | 0.5                 | ±0.06     | 100                 |           |
| 9 × 11                              | 11.0                |              | 1.0                 | ±0.10     |                     |           |
| ● 10 × 12                           | 12.0                |              | 1.0                 | ±0.10     |                     |           |
| 11 × 12                             | 12.0                |              | 0.5                 | ±0.06     |                     |           |
| 11 × 13                             | 13.0                |              | 1.0                 | ±0.10     |                     |           |
| 12 × 14                             | 14.0                |              | 1.0                 | ±0.10     | 10                  |           |
| 12 × 15                             | 15.0                |              | 1.5                 | ±0.15     |                     |           |
| 13 × 15                             | 15.0                |              | 1.0                 | ±0.10     |                     |           |
| 13 × 16                             | 16.0                |              | 1.5                 | ±0.15     |                     |           |
| ● 14 × 17                           | 17.0                |              | 1.5                 | ±0.15     |                     |           |
| 15 × 18                             | 18.0                | 1.5          | ±0.15               |           |                     |           |
| 16 × 18                             | 18.0                | 1.0          | ±0.10               | 50        |                     |           |
| 16 × 19                             | 19.0                | 1.5          | ±0.15               |           |                     |           |
| 17 × 19                             | 19.0                | 1.0          | ±0.10               |           |                     |           |
| 19 × 22                             | 22.0                | 1.5          | ±0.15               |           |                     |           |
| 20 × 22                             | 22.0                | 1.0          | ±0.10               |           |                     |           |
| ● 22 × 25                           | 25.0                | 1.5          | ±0.15               | 50        |                     |           |
| 23 × 25                             | 25.0                | 1.0          | ±0.10               |           |                     |           |

| Nominal dimensions<br>Inner × Outer | Outer Diameter (mm) |                | Wall thickness (mm) |           | Length (m)          |           |
|-------------------------------------|---------------------|----------------|---------------------|-----------|---------------------|-----------|
|                                     | Standard dimensions | Tolerance      | Standard dimensions | Tolerance | Standard dimensions | Tolerance |
| 1.59 × 3.17                         | 3.17                | +0.20<br>-0.10 | 0.75                | ±0.10     | 10                  | +2%<br>-0 |
| 3.17 × 6.35                         | 6.35                |                | 1.59                | ±0.15     |                     |           |
| ● 3.96 × 6.35                       | 6.35                |                | 1.20                | ±0.12     |                     |           |
| 4.35 × 6.35                         | 6.35                |                | 1.00                | ±0.10     |                     |           |
| ● 6.35 × 9.52                       | 9.52                |                | 1.59                | ±0.15     |                     |           |
| 7.52 × 9.52                         | 9.52                |                | 1.00                | ±0.10     | 10                  |           |
| ● 9.52 × 12.70                      | 12.70               |                | 1.59                | ±0.15     |                     |           |
| 10.70 × 12.70                       | 12.70               |                | 1.00                | ±0.10     |                     |           |
| ● 15.88 × 19.05                     | 19.05               |                | 1.59                | ±0.15     |                     |           |
| ● 22.22 × 25.40                     | 25.40               |                | 1.59                | ±0.15     |                     |           |

※ Please check with us regarding delivery time (stock availability)

● mark indicates PFA-HG tube dimensions

### Standard Dimensions FEP Tube

| Nominal dimensions<br>Inner × Outer | Outer Diameter (mm) |              | Wall thickness (mm) |           | Length (m)          |           |
|-------------------------------------|---------------------|--------------|---------------------|-----------|---------------------|-----------|
|                                     | Standard dimensions | Tolerance    | Standard dimensions | Tolerance | Standard dimensions | Tolerance |
| 2.0 × 4.0                           | 4.0                 | +0.2<br>-0.1 | 1.0                 | ±0.10     | 10                  | +2%<br>-0 |
| 4.0 × 6.0                           | 6.0                 |              | 1.0                 |           |                     |           |
| 6.0 × 8.0                           | 8.0                 |              | 1.0                 |           |                     |           |
| 8.0 × 10.0                          | 10.0                |              | 1.0                 |           |                     |           |
| 9.0 × 12.0                          | 12.0                |              | 1.5                 |           |                     |           |
| 10.0 × 12.0                         | 12.0                |              | 1.0                 | ±0.10     | 100                 |           |
| 2.36 × 3.18                         | 3.18                |              | 0.41                | ±0.07     |                     |           |
| 3.18 × 4.76                         | 4.76                |              | 0.79                | ±0.10     |                     |           |
| 4.57 × 6.35                         | 6.35                |              | 0.89                |           |                     |           |
| 5.90 × 7.94                         | 7.94                |              | 1.02                |           |                     |           |
| 6.99 × 9.53                         | 9.53                | 1.27         | ±0.12               |           |                     |           |
| 9.56 × 12.70                        | 12.70               | 1.57         | ±0.15               |           |                     |           |

※ Please check with us regarding delivery time (stock availability)

T/#9003-BT/FC

## NAFLON BT/FC Tube

### Standard Dimensions

| Nominal dimensions<br>Inner × Outer | Inner Diameter (mm) |                | Outer Diameter (mm) |           | Wall thickness (mm) |           | Length (m)          |            |            |
|-------------------------------------|---------------------|----------------|---------------------|-----------|---------------------|-----------|---------------------|------------|------------|
|                                     | Standard dimensions | Tolerance      | Standard dimensions | Tolerance | Standard dimensions | Tolerance | Standard dimensions | Tolerance  |            |
|                                     |                     | FC             |                     | BT        |                     | FC, BT    |                     | FC         | BT         |
| 2.00 × 4.00                         | 2.00                | +0.50<br>-0.20 | 4.00                | ±0.10     | 1.00                | ±0.10     | 10<br>20<br>30      | +2%<br>-0% | +5%<br>-0% |
| 3.00 × 6.00                         | 3.00                | +0.50<br>-0.40 | 6.00                |           | 1.50                |           |                     |            |            |
| 5.00 × 8.00                         | 5.00                |                | 8.00                |           | 1.50                |           |                     |            |            |
| 7.00 × 10.00                        | 7.00                |                | 10.00               |           | 1.50                |           |                     |            |            |
| 9.00 × 12.00                        | 9.00                | 12.00          | ±0.15               |           | 1.50                |           |                     |            |            |
| 1.59 × 3.17                         | 1.59                | +0.50<br>-0.20 | 3.17                | ±0.10     | 0.79                | ±0.10     | 10<br>20<br>30      | +2%<br>-0% | +5%<br>-0% |
| 3.17 × 6.35                         | 3.17                | +0.50<br>-0.40 | 6.35                |           | 1.59                |           |                     |            |            |
| 6.35 × 9.52                         | 6.35                |                | 9.52                |           | 1.59                |           |                     |            |            |
| 9.52 × 12.70                        | 9.52                |                | 12.70               |           | ±0.15               | 1.59      |                     |            |            |

※ Please check with us regarding delivery time (stock availability)

※ BT indicates external diameter standard dimensions FC

## Standard Dimensions

(Unit : mm)

| Outer Diameter    |              | Inner Diameter          |              | Length          |              |
|-------------------|--------------|-------------------------|--------------|-----------------|--------------|
| Standard Diameter | Tolerance    | Standard Diameter       | Tolerance    | Standard Length | Tolerance    |
| 20                | + 2.0<br>- 0 | 10                      | + 0<br>- 2.0 | 100             | +10.0<br>- 0 |
| 23                |              |                         |              |                 |              |
| 25                |              |                         |              |                 |              |
| 28                |              |                         |              |                 |              |
| 30                |              |                         |              |                 |              |
| 33                |              |                         |              |                 |              |
| 35                |              |                         |              |                 |              |
| 38                |              |                         |              |                 |              |
| 40                |              |                         |              |                 |              |
| 43                |              |                         |              |                 |              |
| 45                |              |                         |              |                 |              |
| 48                | + 3.0<br>- 0 | 18·23·28·33·38          | + 0<br>- 3.0 |                 |              |
| 50                |              |                         |              |                 |              |
| 53                |              |                         |              |                 |              |
| 55                |              |                         |              |                 |              |
| 58                |              |                         |              |                 |              |
| 60                |              |                         |              |                 |              |
| 63                |              |                         |              |                 |              |
| 65                |              |                         |              |                 |              |
| 68                |              |                         |              |                 |              |
| 70                |              |                         |              |                 |              |
| 73                |              |                         |              |                 |              |
| 75                |              |                         |              |                 |              |
| 78                |              |                         |              |                 |              |
| 80                |              |                         |              |                 |              |
| 83                |              |                         |              |                 |              |
| 85                |              |                         |              |                 |              |
| 88                |              |                         |              |                 |              |
| 90                |              |                         |              |                 |              |
| 93                |              |                         |              |                 |              |
| 95                |              |                         |              |                 |              |
| 98                | + 5.0<br>- 0 | 38·48·58·68·73·78·83·88 | + 0<br>- 5.0 |                 |              |
| 100               |              |                         |              |                 |              |
| 105               |              |                         |              |                 |              |
| 110               |              |                         |              |                 |              |
| 115               |              |                         |              |                 |              |
| 120               |              |                         |              |                 |              |
| 125               |              |                         |              |                 |              |
| 130               |              |                         |              |                 |              |
| 135               |              |                         |              |                 |              |
| 140               |              |                         |              |                 |              |
| 145               |              |                         |              |                 |              |
| 150               |              |                         |              |                 |              |
| 155               |              |                         |              |                 |              |
| 160               |              |                         |              |                 |              |
| 165               |              |                         |              |                 |              |
| 170               |              |                         |              |                 |              |
| 175               |              |                         |              |                 |              |
| 180               |              |                         |              |                 |              |
| 185               |              |                         |              |                 |              |
| 190               |              |                         |              |                 |              |
| 195               |              |                         |              |                 |              |

※ Continued on next page.

## Standard Dimensions

(Unit : mm)

| Outer Diameter    |                             | Inner Diameter   |              | Length          |              |
|-------------------|-----------------------------|--|--------------|-----------------|--------------|
| Standard Diameter | Tolerance                   | Standard Diameter  | Tolerance    | Standard Length | Tolerance    |
| 200               | + 7.0<br>- 0                | 90 · 100 · 110 · 120 · 130 · 140 · 150 · 160 · 170 · 175 · 180 · 185 | + 0<br>- 7.0 | 100             | +10.0<br>- 0 |
| 210               |                             | 100 · 110 · 120 · 130 · 140 · 150 · 160 · 170 · 180 · 190            |              |                 |              |
| 220               |                             | 110 · 120 · 130 · 140 · 150 · 160 · 170 · 180 · 200                  |              |                 |              |
| 230               |                             | 120 · 130 · 140 · 150 · 160 · 170 · 175 · 180 · 200 · 210            |              |                 |              |
| 240               |                             | 130 · 140 · 150 · 160 · 170 · 180 · 190 · 200 · 210 · 220            |              |                 |              |
| 250               |                             | 140 · 150 · 160 · 170 · 180 · 190 · 200 · 210 · 220 · 230            |              |                 |              |
| 260               |                             | 150 · 160 · 170 · 180 · 190 · 200 · 210 · 220 · 230 · 240            |              |                 |              |
| 270               |                             | 160 · 170 · 180 · 190 · 200 · 210 · 220 · 230 · 240 · 250            |              |                 |              |
| 280               |                             | 170 · 180 · 190 · 200 · 210 · 220 · 230 · 240 · 250 · 260            |              |                 |              |
| 290               |                             | 180 · 190 · 200 · 210 · 220 · 230 · 240 · 250 · 260 · 270            |              |                 |              |
| 300               | + 9.0<br>- 0                | 190 · 200 · 210 · 220 · 230 · 240 · 250 · 260 · 270 · 280            | + 0<br>- 9.0 |                 |              |
| 309               |                             | 197 · 218 · 244 · 251 · 260 · 270 · 277                              |              |                 |              |
| 318               |                             | 244 · 251 · 260 · 277  |              |                 |              |
| 328               |                             | 197 · 208 · 218 · 251 · 260 · 270 · 277 · 287                        |              |                 |              |
| 338               |                             | 177 · 197 · 210 · 251 · 260 · 270 · 277 · 287 · 298 · 308            |              |                 |              |
| 348               |                             | 197 · 203 · 218 · 244 · 270 · 287 · 298 · 308                        |              |                 |              |
| 357               |                             | 227 · 251 · 277 · 298 · 308  |              |                 |              |
| 367               |                             | 244 · 251 · 260 · 298 · 308 · 318 · 329                              |              |                 |              |
| 377               |                             | 218 · 251 · 270 · 287 · 298 · 308 · 318 · 329 · 339                  |              |                 |              |
| 386               |                             | 251 · 270 · 308 · 329 · 339  |              |                 |              |
| 396               | 298 · 308 · 318 · 329 · 339 |  |              |                 |              |
| 406               | +11.0<br>- 0                | 204 · 227 · 251 · 277 · 287 · 298 · 339 · 350 · 365                  | + 0<br>-11.0 |                 |              |
| 425               |                             | 260 · 329 · 350 · 365 · 375  |              |                 |              |
| 445               |                             | 298 · 329 · 339 · 385 · 395  |              |                 |              |
| 464               |                             | 287 · 298 · 365 · 375 · 385 · 415                                    |              |                 |              |
| 479               |                             | 365 · 385 · 395 · 415 · 425 · 439                                    |              |                 |              |
| 508               | +13.0<br>- 0                | 385 · 415 · 439 · 454  | + 0<br>-13.0 |                 |              |
| 527               |                             | 425 · 474  |              |                 |              |
| 532               |                             | 425 · 439 · 474  |              |                 |              |
| 551               |                             | 439 · 454 · 474 · 503  |              |                 |              |
| 609               |                             | 454 · 474 · 503 · 527 · 543  |              |                 |              |
| 650               | +16.0<br>- 0                | 481 · 539 · 598  | + 0<br>-16.0 |                 |              |
| 708               |                             | 539 · 598 · 657  |              |                 |              |
| 760               |                             | 598 · 657 · 716  |              |                 |              |
| 824               | +21.0<br>- 0                | 657 · 716 · 775  | + 0<br>-21.0 |                 |              |
| 882               |                             | 716 · 775 · 833  |              |                 |              |
| 940               |                             | 775 · 883 · 892  |              |                 |              |
| 999               |                             | 833 · 892 · 951  |              |                 |              |
| 1057              | +24.0<br>- 0                | 892 · 951 · 1010   | + 0<br>-24.0 |                 |              |
| 1115              |                             | 951 · 1010 · 1069  |              |                 |              |

※ If you inform us of the final dimension of the products, we can select the optima materials.

# Properties of various fluoropolymer resins

| Properties                            |   | Unit  | ASTM test method                                      | PTFE                   |                 |
|---------------------------------------|---|---|---|------------------------|-----------------|
| PHYSICAL                              | Melting point                               | °C  | -   | 327                    |                 |
|                                       | Specific gravity                            | -   | D792  | 2.13-2.20              |                 |
| MECHANICAL                            | Tensile strength                            | MPa<br>{kgf/cm <sup>2</sup> }                 | D638  | 13.7-34.3<br>{140-350} |                 |
|                                       | Elongation                                  | %   | D638  | 200-400                |                 |
|                                       | Compressive strength                        | MPa<br>{kgf/cm <sup>2</sup> }                 | D695  | 11.8<br>{120}          |                 |
|                                       | Impact strength (Aizot)                     | J/m<br>{kgf·cm/cm}                            | D256  | 160<br>{16.3}          |                 |
|                                       | Hardness (Rockwell)                         | -   | D785  | -                      |                 |
|                                       | Hardness (Shore)                            | -   | D2240   | D50-55                 |                 |
|                                       | Bending elasticity                          | GPa<br>{10 <sup>3</sup> kgf/cm <sup>2</sup> } | D790  | 0.55<br>{5.6}          |                 |
|                                       | Tensile Strength                            | GPa<br>{10 <sup>3</sup> kgf/cm <sup>2</sup> } | D638  | 0.40-0.55<br>{4.1-5.6} |                 |
|                                       | Coefficient of dynamic friction             | -   | -<br>[ 0.93MPa<br>{7kgf/cm <sup>2</sup> }<br>3m/min ] | 0.10                   |                 |
|                                       | THERMAL                                     | Thermal conductivity                          | W/(m·K)<br>{kcal/(m·hr·°C)}                           | C177                   | 0.25<br>{0.22}  |
| Specific heat                         |   | J/(°C·g)<br>{cal/(°C·g)}                      | -   | 1.05<br>{0.25}         |                 |
| Coefficient of linear expansion       |   | 10 <sup>-5</sup> /°C                          | D696  | 10                     |                 |
| Ball pressure                         |   | °C  | -   | 180                    |                 |
| Temperature Thermal deformation ratio |   | 1.81MPa {18.5kgf/cm <sup>2</sup> }            | °C  | D648                   | 55              |
|                                       |   | 0.45MPa {4.6kgf/cm <sup>2</sup> }             | °C  | D648                   | 121             |
| Max. Service Temperature              |   | °C  | Unloaded  | 260                    |                 |
| ELECTRICAL                            | Volumetric resistance ratio                 | Ω·cm  | D257<br>(50%.RH.23D)                                  | >10 <sup>18</sup>      |                 |
|                                       | Dielectric breakdown strength (Short term)  | MV/m<br>kV/mm (3.2mm thickness)               | D149  | 19                     |                 |
|                                       | Dielectric constant {Relative permittivity} | 60Hz  | pF/m  | D150                   | <18.6<br>{<2.1} |
|                                       |   | 10 <sup>3</sup> Hz                            | pF/m  | D150                   | <18.6<br>{<2.1} |
|                                       |   | 10 <sup>6</sup> Hz                            | pF/m  | D150                   | <18.6<br>{<2.1} |
|                                       | Dielectric dissipation factor               | 60Hz  | -   | D150                   | 0.0002          |
|                                       |   | 10 <sup>3</sup> Hz                            | -   | D150                   | 0.0002          |
|                                       |   | 10 <sup>6</sup> Hz                            | -   | D150                   | 0.0002          |
| Anti arcing property                  | sec   | D495  | >300  |                        |                 |
| DURABILITY                            | Water absorption (24h)                      | %   | D570  | 0.01                   |                 |
|                                       | 3.2mm thickness combustibility              | -   | (UL/94)   | V-0                    |                 |
|                                       | Oxygen index                                | -   | D2863   | >95                    |                 |
|                                       | Effect of direct sunlight                   | -   | -   | No                     |                 |
|                                       | Effect of weak acid                         | -   | D543  | No                     |                 |
|                                       | Effect of strong acid                       | -   | D543  | No                     |                 |
|                                       | Effect of weak alkali                       | -   | D543  | No                     |                 |
|                                       | Effect of strong alkali                     | -   | D543  | No                     |                 |
|                                       | Effect of solvent alkali                    | -   | D543  | No                     |                 |

|  | PFA                    | FEP                    | PCTFE                                   | ETFE                     | ECTFE                  | PVDF                             |
|--|------------------------|------------------------|---|--------------------------|------------------------|----------------------------------|
|  | 310                    | 260                    | 220                                     | 270                      | 245                    | 151-178                          |
|  | 2.12-2.17              | 2.15-2.17              | 2.10-2.2                                | 1.73-1.74                | 1.68-1.69              | 1.75-1.78                        |
|  | 27.5-29.4<br>{280-300} | 18.6-21.6<br>{190-220} | 30.9-41.2<br>{315-420}                  | 45.1<br>{460}            | 41.2<br>{420}          | 24.5-50.0<br>{250-510}           |
|  | 300                    | 250-330                | 80-250                                  | 100-400                  | 200-300                | 12-430                           |
|  | -                      | 15.2                   | 31.4-51.0                               | 49.0                     | -                      | 45.1-96.1                        |
|  | -                      | {155}                  | {320-520}                               | {500}                    | -                      | {460-980}                        |
|  | No destruction         | No destruction         | 133-144<br>{13.6-14.7}                  | No destruction           | No destruction         | 160-374<br>{16.3-38.1}           |
|  | -                      | -                      | R75-112                                 | R50                      | R93-95                 | R77-83                           |
|  | D64                    | D60-65                 | D75-80                                  | D75                      | D55                    | D75-77                           |
|  | 0.82<br>{8.4}          | 0.55-0.66<br>{5.6-6.7} | 1.25-1.79<br>{12.7-18.3}                | 1.37<br>{14}             | 0.66-0.69<br>{6.7-7.0} | 2.00-2.48<br>{20.4-25.3}         |
|  | -                      | 0.34                   | 0.049-2.06                              | 0.83                     | 1.65                   | 1.00-2.94                        |
|  | -                      | {3.5}                  | {0.5-21}                                | {8.4}                    | {16.8}                 | {10.2-30}                        |
|  | 0.2                    | 0.3                    | 0.37                                    | 0.4                      | -                      | 0.39                             |
|  | 0.25<br>{0.22}         | 0.25<br>{0.22}         | 0.20-0.22<br>{0.17-0.19}                | 0.24<br>{0.21}           | 0.16<br>{0.14}         | 0.10-0.13<br>{0.09-0.11}         |
|  | 1.05<br>{0.25}         | 1.17<br>{0.28}         | 0.92<br>{0.22}                          | 1.93-1.97<br>{0.46-0.47} | -                      | 1.38<br>{0.33}                   |
|  | 12                     | 8.3-10.5               | 4.5-7.0                                 | 5.9                      | 8                      | 7-14                             |
|  | 230                    | 170                    | 170                                     | 185                      | -                      | -                                |
|  | 47                     | 50                     | -                                       | 74                       | 77                     | 54-115                           |
|  | 74                     | 72                     | 126                                     | 104                      | 116                    | 138                              |
|  | 260                    | 200                    | 177-220                                 | 150-180                  | 165-180                | 150                              |
|  | >10 <sup>18</sup>      | >10 <sup>18</sup>      | 1.2 × 10 <sup>18</sup>                  | >10 <sup>16</sup>        | 10 <sup>15</sup>       | 2 × 10 <sup>14</sup>             |
|  | 20                     | 20-24                  | 20-24                                   | 16                       | 20                     | 10-11                            |
|  | <18.6<br>{<2.1}        | <18.6<br>{<2.1}        | 19.8-24.8<br>{2.24-2.8}                 | 23.0<br>{2.6}            | 23.0<br>{2.6}          | 74.4<br>{8.4}                    |
|  | <18.6<br>{<2.1}        | <18.6<br>{<2.1}        | 20.4-23.9<br>{2.3-2.7}                  | 23.0<br>{2.6}            | 23.0<br>{2.6}          | 68.4<br>{7.72}                   |
|  | <18.6<br>{<2.1}        | <18.6<br>{<2.1}        | 20.4-22.1<br>{2.3-2.5}                  | 23.0<br>{2.6}            | 23.0<br>{2.6}          | 56.9<br>{6.43}                   |
|  | 0.0002                 | 0.0002                 | 0.0012                                  | 0.0006                   | <0.0005                | 0.049                            |
|  | 0.0002                 | 0.0002                 | 0.023-0.027                             | 0.0008                   | 0.0015                 | 0.018                            |
|  | 0.0002                 | 0.0002                 | 0.009-0.017                             | 0.005                    | <0.015                 | 0.17                             |
|  | >300                   | >300                   | 300                                     | 75                       | 18                     | 50-70                            |
|  | 0.01                   | 0.01                   | 0.01                                    | 0.03                     | 0.01                   | 0.03-0.06                        |
|  | V-0                    | V-0                    | V-0                                     | V-0                      | V-0                    | V-0                              |
|  | >95                    | >95                    | <95                                     | 32                       | 60                     | 44                               |
|  | No                     | No                     | No                                      | No                       | No                     | No                               |
|  | No                     | No                     | No                                      | No                       | No                     | No                               |
|  | No                     | No                     | No                                      | No                       | No                     | Attacked by fuming sulfuric acid |
|  | No                     | No                     | No                                      | No                       | No                     | No                               |
|  | No                     | No                     | No                                      | No                       | No                     | No                               |
|  | No                     | No                     | Halogen compounds cause slight swelling | No                       | Good resistance        | Mostly resistance                |

The source : Handbook "FLUOROPOLYMER RESINS" published by JAPAN FLUOROPOLYMERS INDUSTRY ASSOCIATION

# Properties of various PTFE Fillers

|   | Unit   | Filler (weight%)                                     |   | Pure PTFE   | Glass fiber 15% G15                                 |
|---|--|--|---|---|---|
|   |  | Measurement conditions                               |   |   |   |
| Specific gravity                          | —  | 25°C   |   | 2.17  | 2.23  |
| Thermal conductivity ratio                | W/ (m·K)<br>{kcal/m·hr·°C}                         |  |   | 0.25<br>{0.22}  | 0.34<br>{0.29}                                      |
| Coefficient of thermal expansion          | × 10 <sup>-5</sup> /°C                             | 25-100°C   | MD  | 11  | 11  |
|   |  |  | CD  | 10  | 8   |
|   |  | 25-150°C   | MD  | 12  | 12  |
|   |  |  | CD  | 11  | 8   |
|   |  | 25-200°C   | MD  | 14  | 13  |
|   |  |  | CD  | 12  | 9   |
| 25-250°C                                  | MD   | 17   | 14  |   |   |
|   | CD   | 16   | 10  |   |   |
| Tensile strength                          | MPa {kgf/cm <sup>2</sup> }                         | JISK6891   |   | 32.4 {330}  | 28.4 {290}  |
| Expansion                                 | %  | JISK6891   |   | 350   | 340   |
| Compressive strength                      | MPa {kgf/cm <sup>2</sup> }                         | 0.2%offset<br>24°C                                   | MD  | —   | —   |
|   |  |  | CD  | 7.2<br>{73}   | 7.3<br>{74}   |
|   |  | 1%Deformation<br>24°C                                | MD  | —   | —   |
|   |  |  | CD  | 4.3 {44}  | 4.9 {50}  |
|   |  | 25%Deformation<br>24°C                               | MD  | —   | —   |
|   |  |  | CD  | 27.5 {280}  | 27.5 {280}  |
| Compressive elasticity                    | MPa<br>{kgf/cm <sup>2</sup> }                      |  |   | —   | —   |
|   |  | MD   | 5.6 × 10 <sup>2</sup><br>{5.7 × 10 <sup>3</sup> } | 8.6 × 10 <sup>2</sup><br>{8.8 × 10 <sup>3</sup> }         |   |
| Bending strength (elasticity ration)      | MPa<br>{kgf/cm <sup>2</sup> }                      | ASTMD-790  |   | 3.4-6.2 × 10 <sup>2</sup><br>{3.5-6.3 × 10 <sup>3</sup> } | 21.4 × 10 <sup>2</sup><br>{21.8 × 10 <sup>3</sup> } |
| Compression creep<br>a. Deformation ratio | %  | ASTMD-621<br>13.7MPa/cm <sup>2</sup><br>25°C · 24hrs | MD  | 9.5   | 8.8   |
|   |  |  | CD  | —   | —   |
|   |  | 6.9MPa/cm <sup>2</sup><br>100°C · 24hrs              | MD  | 4.8   | 4.4   |
|   |  |  | CD  | —   | —   |
| b. Permanent deformation                  | %  | 13.7MPa/cm <sup>2</sup><br>25°C · 24hrs              | MD  | 7.0   | 6.9   |
|   |  |  | CD  | —   | —   |
|   |  | 6.9MPa/cm <sup>2</sup><br>100°C · 24hrs              | MD  | 4.6   | 3.8   |
|   |  |  | CD  | —   | —   |
| Hardness Shore-D                          | Shore-D  |  |   | 58  | 58  |
| Friction coefficient (Dynamic)            |  |  |   | 0.22  | 0.24  |
| Friction coefficient (Static)             |  |  |   | 0.045   | 0.065   |
| Friction coefficient                      | $\frac{m/km}{MPa}$<br>{ $\frac{mm/km}{kgf/cm^2}$ } | 65hrs by Suzuki-method<br>test machine               |   | 2 × 10 <sup>-1</sup><br>{2 × 10 <sup>-2</sup> }           | 1.2 × 10 <sup>-4</sup><br>{1.2 × 10 <sup>-5</sup> } |
| Dielectric strength                       | kv/mm  | JIS C 2110 (oil)                                     |   | 46.4  | 17.4  |
| Dielectric constant                       |  | JIS D 6911   | 10 <sup>3</sup> Hz                                | 2.06  | 2.64  |
|   |  |  | 10 <sup>6</sup> Hz                                | 2.06  | 2.80  |
| Water absorption                          | %  | 3.2mmt24H<br>ASTM D570                               |   | 0.00  | 0.015   |

※ MD indicates parallel forming CD indicates right-angle forming ※ This chart includes some data values from the fluoropolymer manufacturers  
The values are test data under set environmental conditions. They may vary slightly under different environmental conditions. (These are not standard values)

PTFE with various fillers

|  | Glass fiber 20%<br>G20                           | Glass fiber 25%<br>G25                           | Graphite 15%<br>GR15                             | Graphite 30%<br>GR30                             | Glass fiber 15% G15<br>Molybdenum disulfide (5%)<br>GMO | Glass fiber 20%<br>Graphite 5%<br>GGR            |
|--|--|--|--|--|---|--|
|  | 2.24   | 2.26   | 2.16   | 2.16   | 2.28  | 2.21   |
|  | 0.35<br>{0.30}                                   | 0.40<br>{0.34}                                   | 0.40<br>{0.34}                                   | 0.41<br>{0.35}                                   | 0.33<br>{0.28}  | 0.36<br>{0.31}                                   |
|  | 10   | 9  | 10   | 8  | 12  | 14   |
|  | 7  | 6  | 8  | 6  | 7   | 5  |
|  | 11   | 10   | 11   | 9  | 13  | 14   |
|  | 8  | 7  | 9  | 7  | 7   | 5  |
|  | 12   | 11   | 12   | 10   | 14  | 15   |
|  | 9  | 7  | 9  | 7  | 8   | 6  |
|  | 13   | 13   | 14   | 12   | 17  | 17   |
|  | 10   | 9  | 11   | 7  | 9   | 7  |
|  | 22.9 {234}                                       | 21.6 {220}                                       | 19.6 {200}                                       | 12.8 {131}                                       | 17.5 {178}  | 15.8 {161}                                       |
|  | 338  | 310  | 325  | 130  | 300   | 220  |
|  | 8.3<br>{85}                                      | –  | –  | 10.3<br>{105}                                    | 8.5<br>{87}   | 11.1<br>{112}                                    |
|  | 7.5<br>{76}                                      | 7.8<br>{80}                                      | 9.8<br>{100}                                     | 10.4<br>{106}                                    | 8.2<br>{84}   | 9.8<br>{100}                                     |
|  | 6.2 {63}   | –  | –  | 5.7 {58}   | 6.9 {70}  | 6.9 {70}   |
|  | 5.9 {60}   | 7.8 {80}   | 6.9 {70}   | 9.3 {95}   | 6.5 {66}  | 6.5 {66}   |
|  | 24.9 {254}                                       | –  | –  | 31.7 {323}                                       | 30.6 {312}  | 35.3 {360}                                       |
|  | 27.7 {283}                                       | 28.4 {290}                                       | 29.4 {300}                                       | 30.3 {310}                                       | 28.0 {286}  | 29.4 {300}                                       |
|  | –  | –  | –  | –  | –   | –  |
|  | $9.4 \times 10^2$<br>{ $9.6 \times 10^3$ }       | $10.4 \times 10^2$<br>{ $10.6 \times 10^3$ }     | $7.6 \times 10^2$<br>{ $7.8 \times 10^3$ }       | $8.9 \times 10^2$<br>{ $9.1 \times 10^3$ }       | $8.5 \times 10^2$<br>{ $8.7 \times 10^3$ }              | $10.3 \times 10^2$<br>{ $10.5 \times 10^3$ }     |
|  | $18.6 \times 10^2$<br>{ $19.0 \times 10^3$ }     | $16.4 \times 10^2$<br>{ $16.7 \times 10^3$ }     | –  | $21.6 \times 10^2$<br>{ $22.0 \times 10^3$ }     | $16.6 \times 10^2$<br>{ $16.9 \times 10^3$ }            | $19.1 \times 10^2$<br>{ $19.5 \times 10^3$ }     |
|  | 8.5  | 7.9  | 5.0  | 3.6  | 7.1   | 6.8  |
|  | –  | –  | –  | –  | –   | 6.7  |
|  | 3.6  | 3.5  | 3.1  | 1.8  | 2.5   | 2.1  |
|  | –  | –  | –  | –  | –   | –  |
|  | 6.7  | 6.2  | 3.8  | 2.5  | 4.8   | 3.6  |
|  | 11.5   | –  | –  | –  | –   | 3.9  |
|  | 3.5  | 3.3  | 3.0  | 1.6  | 2.9   | 1.8  |
|  | –  | –  | –  | –  | –   | –  |
|  | 59   | 60   | 58   | 62   | 63  | 63   |
|  | 0.24   | 0.26   | 0.23   | 0.25   | 0.24  | 0.25   |
|  | 0.073  | 0.085  | 0.058  | 0.065  | 0.073   | 0.085  |
|  | $1.1 \times 10^{-4}$<br>{ $1.1 \times 10^{-5}$ } | $1.0 \times 10^{-4}$<br>{ $1.0 \times 10^{-5}$ } | $6.8 \times 10^{-4}$<br>{ $6.7 \times 10^{-5}$ } | $2.0 \times 10^{-4}$<br>{ $2.0 \times 10^{-5}$ } | $1.0 \times 10^{-4}$<br>{ $1.0 \times 10^{-5}$ }        | $0.5 \times 10^{-4}$<br>{ $0.5 \times 10^{-5}$ } |
|  | 15.5   | 13.7   | 4.1  | 1.5  | 20.2  | 10.2   |
|  | 2.91   | 2.94   | –  | –  | 3.45  | 7.18   |
|  | 2.77   | 2.89   | –  | –  | 3.24  | 6.99   |
|  | 0.014  | 0.013  | 0.01>  | 0.010  | 0.010   | 0.016  |

| Bronze 60%<br>BR                                 | Carbon fiber 10%<br>CF10                         | Carbon fiber 15%<br>CF15                         | Special Carbon<br>SC                       | Special Carbon<br>Carbon fiber 15%<br>SCCF | Low creep<br>LC                            |
|--|--|--|--|--|--|
| 3.95   | 2.09   | 2.04   | 2.04                                       | 1.95                                       | 2.24                                       |
| 0.46<br>{0.40}                                   | 0.46<br>{0.40}                                   | 0.46<br>{0.40}                                   | –  | –  | –  |
| 9  | 17   | 14   | 10   | 11   | –  |
| 7  | 7  | 5  | 8  | 6  | –  |
| 10   | 19   | 16   | 11   | 12   | –  |
| 7  | 7  | 5  | 8  | 6  | –  |
| 11   | 21   | 18   | 12   | 14   | –  |
| 9  | 8  | 6  | 9  | 7  | –  |
| 13   | 24   | 22   | 14   | 16   | –  |
| 10   | 10   | 7  | 10   | 8  | –  |
| 16.7 {170}                                       | 24.0 {245}                                       | 20.6 {210}                                       | 12.5 {128}                                 | 9.2 {94}                                   | 14.7 {150}                                 |
| 220  | 300  | 280  | 180  | 40   | 300  |
| –  | –  | –  | 9.5<br>{97}                                | 11.3<br>{115}                              | 12.3<br>{125}                              |
| 12.0<br>{122}                                    | –  | 11.4<br>{116}                                    | 9.7<br>{99}                                | 12.1<br>{123}                              | –  |
| –  | –  | –  | 9.5 {97}                                   | 10.7 {109}                                 | 7.0 {71}                                   |
| 9.8 {100}  | –  | 7.8 {80}   | 9.3 {95}                                   | 11.5 {117}                                 | –  |
| –  | –  | –  | 32.3 {329}                                 | 39.5 {403}                                 | 32.9 {336}                                 |
| 43.1 {440}                                       | –  | 43.7 {446}                                       | 30.6 {312}                                 | 33.3 {340}                                 | –  |
| –  | –  | –  | $1.2 \times 10^3$<br>{ $1.2 \times 10^4$ } | $1.3 \times 10^3$<br>{ $1.3 \times 10^4$ } | $6.9 \times 10^2$<br>{ $7.0 \times 10^3$ } |
| $11.1 \times 10^2$<br>{ $11.3 \times 10^3$ }     | $7.8 \times 10^2$<br>{ $8.0 \times 10^3$ }       | $9.3 \times 10^2$<br>{ $9.5 \times 10^3$ }       | $1.1 \times 10^3$<br>{ $1.1 \times 10^4$ } | $1.3 \times 10^3$<br>{ $1.4 \times 10^4$ } | –  |
| $13.5 \times 10^2$<br>{ $13.8 \times 10^3$ }     | $12.2 \times 10^2$<br>{ $12.4 \times 10^3$ }     | –  | –  | –  | –  |
| 4.5  | 4.2  | 3.3  | 1.5  | 1.1  | 1.0  |
| 4.9  | –  | –  | 1.3  | 1.6  | –  |
| 2.1  | –  | 1.6  | 0.9  | 0.4  | –  |
| –  | –  | –  | 0.8  | 0.7  | –  |
| 2.0  | 2.3  | 2.4  | 1.3  | 0.8  | 1.2  |
| 2.3  | –  | –  | 1.2  | 0.8  | –  |
| 1.8  | –  | 0.8  | 1.1  | 0.5  | –  |
| –  | –  | –  | 0.9  | 0.9  | –  |
| 67   | 63   | 64   | 65   | 67   | –  |
| 0.24   | 0.27   | 0.29   | –  | –  | –  |
| 0.090  | –  | –  | –  | –  | –  |
| $0.7 \times 10^{-4}$<br>{ $0.7 \times 10^{-5}$ } | $0.4 \times 10^{-4}$<br>{ $0.4 \times 10^{-5}$ } | $1.0 \times 10^{-4}$<br>{ $1.0 \times 10^{-5}$ } | –  | –  | –  |
| –  | –  | –  | –  | –  | –  |
| –  | –  | –  | –  | –  | –  |
| –  | –  | –  | –  | –  | –  |
| 0.01>  | –  | –  | –  | –  | –  |



## **WARNING**

**NAFLON products are made of fluoropolymers. In order to ensure original functions and properties are maintained and to ensure safety in use, please observe the following precautions.**

1. Tombo NAFLON products should never be used for any purpose other than prescribed application.
2. Tombo NAFLON products are not designed or manufactured for use in contact with human body fluids and tissues.
3. Tombo NAFLON products should never be administered (including by mistake) to human.
4. Tomob NAFLON products should never be used when operating temperature is at the maximum prescribed in this catalog.
5. Fluorine vapours and fumes liberated during hot processing is harmful to human and should be exhausted completely from the work area.
6. When waste disposed, it is indispensable to ensure conformity with all applicable disposal regulations in all designated countries. When waste incinerated, the incineration plant should be fully equipped with suitable facilities such as neutralization one.

## **CAUTIONS FOR HANDLING PRODUCTS**

**NAFLON Fluoropolymer product shall be used on the understanding of the followings to maintain own functional design :**

1. Technical data in this catalogue such as physical properties of products are obtained from actual or typical test figures and should not be used for specification purpose. It is required to conduct a careful examination depending on each application.
2. When the products are used for acids, alkalis and toxic fluids, more careful examination should be conducted. If the assistance is required, please consult to Nichias' sales/technical section.
3. Due to the nature of fluoropolymer, repeated load, extra ordinary concentrated and bending load may affect lifetime of the products.  
When used in severe conditions, careful examination should be conducted before use.
4. Fluoropolymer has self lubricating property but the abrasion is processing during the application. Periodical replacement is recommended for the case when continuous abrasion is existing.
5. Due to the nature of fluoropolymer, the fluid may permeate the resin under certain conditions. Hardening and dimensional deformation are also occurred. To avoid these affects, careful examination should be conducted.
6. Please consult us for the products using in special conditions not prescribed in this catalogue. However, please take unexpected cost or lead time into consideration.
7. Please consult to Nichias' sales/technical section when you have any kind of questions for the products in this catalogue.


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