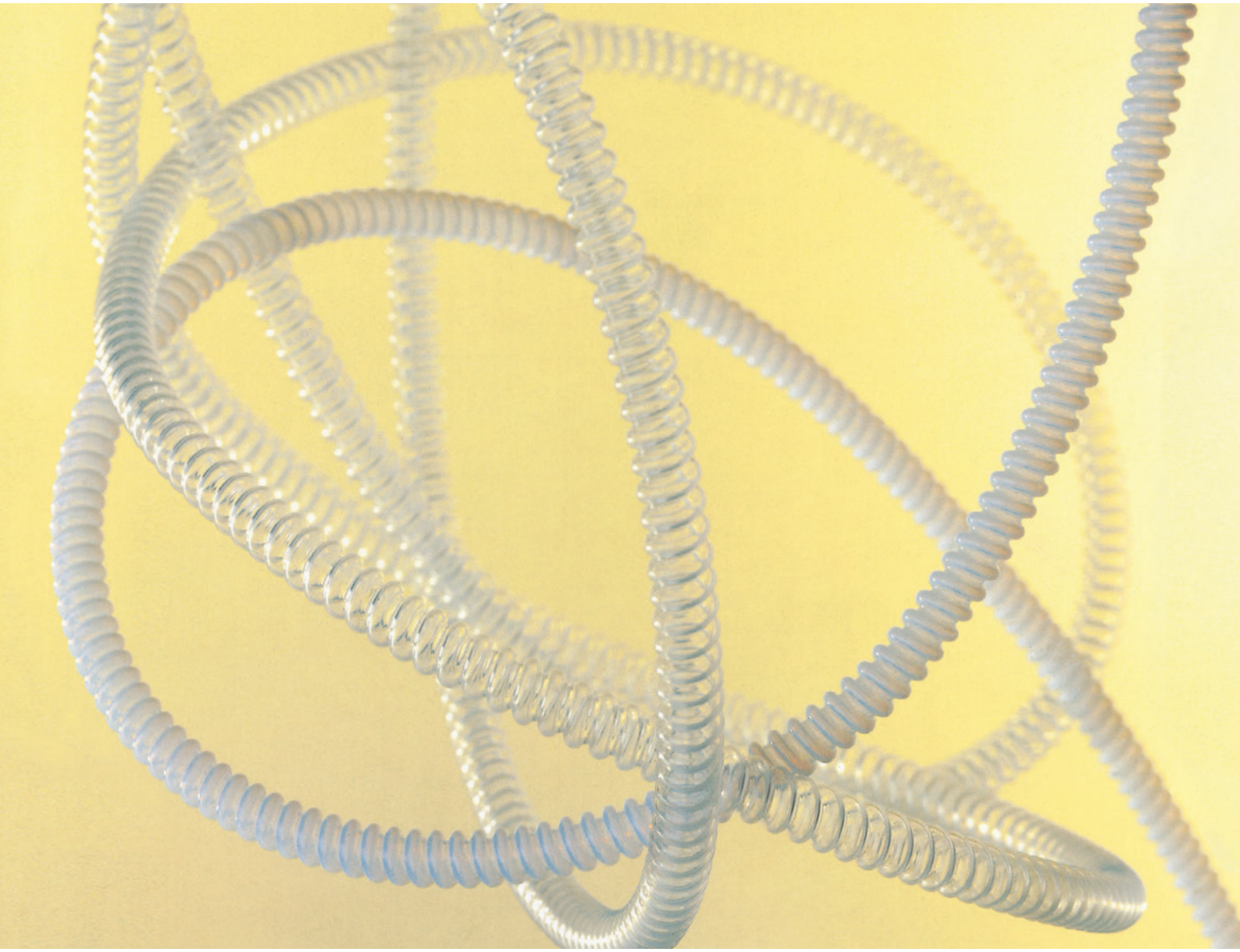
# TOMBO™ BRAND

# NAFLON™ Tubing

## Fluoropolymer Products



NICHIAS

# NAFLON™ Tubing

When compared with other types of plastics, fluoropolymer tubing have exceptional heat resistance, low frictional coefficients, and electrical insulation, chemical resistance, anti-adhesion, and weather resistance properties. TOMBO™ BRAND fluoropolymer Products are pleased to bring to you the highest quality fluoropolymer tubing, created in clean environments using our unique forming technologies. These tubing may be used in cutting edge fields of technology such as semiconductor and liquid crystal electronics manufacturing, biotechnology, medical and food processing, and in the chemical industry, as well as in a wide variety of other fields such as petroleum chemistry and general engineering.

**●Regarding the reference information in this catalogue**

All the information, including features, applications, specifications, and data, cannot be provided for every possible condition such as usages, applications, and environments, and as such, is given for your reference only.

Before using the products, please carefully study the contents of the "Precautions for using the products" section at the end of this catalogue.

## Explanatory notes for customers

The following signs and abbreviations are used in this catalogue.

Product name with TM are registered trademarks or trademarks of NICHIAS Corporation.

**●TOMBO**

TOMBO is a registered trademark or trademark of NICHIAS Corporation.

**●Fluoropolymer Engineering Plastic**

PTFE: Poly-tetra-fluoro-ethylene (tetra fluoride)
PFA: Perfluoro-alkoxyl-alkane
FEP: Perfluoro-ethylene-prolylene copolymer (tetra, hexa-fluoride)

## Features of Fluorine Plastic Tubing and Usage Examples

### Chemical Resistance

Features:

Will not be deteriorated by even the strongest acids, alkalis, solvents, or most any corrosive fluids on the market (exceptions being molten alkaline metals, high temperature fluorine gas, etc.)

Applications:

- Waste fluid lines for highly corrosive materials
- Protective coverings for wiring

### Usable Temperature Spans

Features:

These tubing are usable in a wide range of temperatures, from extremely low temperatures −40°C up to 260°C (in the case of PFA and PTFE).

Applications:

- Acidic/alkaline cleaning lines in plating plants
- Steam transport lines
- Fuel transport lines for aircraft, automobiles, etc.

### Anti-Adhesion Properties (Low Frictional Coefficients)

Features:

These tubing have high levels of anti-adhesion, so even the most viscous of fluids will hardly stick to them.

Applications:

- Transport lines for foam polyurethane fluid
- Paint transport lines
- Transport of powders with a tendency to clump
- Transport of glues and adhesives
- Coverings for pipes, rollers, etc.

## Selection guidelines

| Type | TOMBO No.9003 NAFLON Tubing | | | TOMBO No.9003-PFA-HG NAFLON PFA-HG Tubing | TOMBO No.9003-SG NAFLON PFA-SG Tubing |
|---|---|---|---|---|---|
| Feature \ Material | PTFE | PFA | FEP | PFA | PFA |
| Pliability | C | C | C | C | C |
| Little liquid accumulation | A | A | A | A | A |
| Ease of fluid visibility | C | B | A | B | C |
| Heat resintance | A | A | B | A | A |
| Permeation Rresistance | B | B | B | B | A |
| Manufacture of long tubing | A | A | A | A | A |
| Page | 2 | | | 3 | 4 |

Performance Rating: A: Excellent , B: Good and C: Not recommended.
Please contact us for enquiry for other fluororesin tubes. (ETFE etc.)

# Contents



## Purity

### Features:

Do not contain any fillers or plasticizers, there will be very little pollution of the carried fluid.

### Applications:

- High purity chemical transport for semiconductor manufacturing
- Transport of ultrapure water
- Manufacturing processes for beverages
- Manufacturing processes for medication and foodstuffs
- Clean air transport lines
- Fluid and gas analysis device tubing

## Electrical insulation

### Features:

One of the best insulators in terms of electrical characteristics, and stable over a wide range of temperatures and frequencies.

### Applications:

- Tubing for electrical coverings
- Cooling tubing for electronics and electrical devices
- Insulation for wiring and heaters
- Electric Insulating coating for wiring

## Weather resistance

### Features:

Excellent weather-resistant, there is no aging degradation.

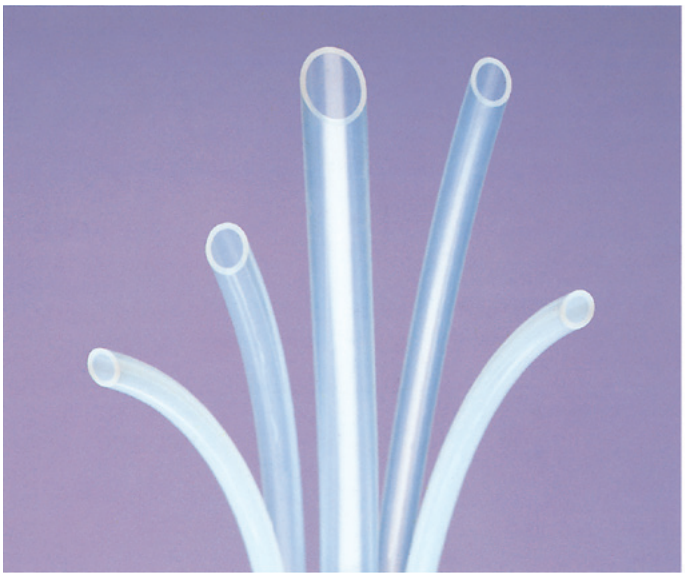
### Applications:

- Applications where exchanging worn tubing is not practical (aerospace applications, use in nuclear power plants, etc.)
- Usage near the ocean, where potential damage from salt and ultraviolet light is extreme

| | TOMBO No.9003-NE NAFLON PFA-NE Tubing | TOMBO No.9003-AS NAFLON PFA-AS Tubing | TOMBO No.9003-SF NAFLON SF Tubing | TOMBO No.9003-BT NAFLON BT Tubing | TOMBO No.9003-RPL NAFLON PFA-RPL Tubing |
|---|---|---|---|---|---|
| | PFA | PFA | — | PTFE | PFA |
| | C | C | A | B | A |
| | A | A | A | A | C |
| | B | B | A | C | C |
| | A | A | C | A | A |
| | B | B | C | B | B |
| | A | A | C | A | B |
| | 10～11 | 12～13 | 14 | 15 | 17 |

# NAFLON™ PTFE/PFA/FEP Tubing

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



## Features

- Excellent nona properties prevent most dirtying and scaling.
- Almost no loss of electrical properties under high temperature, high humidity, and high frequency conditions, making these tubing excellent electrical insulators.
- Excellent weather-resistant properties.

## Specifications

- Service temperature range: −40°C～260°C (PTFE/PFA), −40°C～200°C (FEP)
- Maximum usage pressure: Refer to page 18, "Maximum Usage Pressure".

## Types

- PTFE Tubing is avalable in Red, Blue, Yellow, Green, Black color.
- ETFE Tubing are available upon request.

## Standards

- PTFE Tubing: Please refer to page 5～6.
- PFA Tubing: Please refer to page 7.
- FEP Tubing: Please refer to page 7.

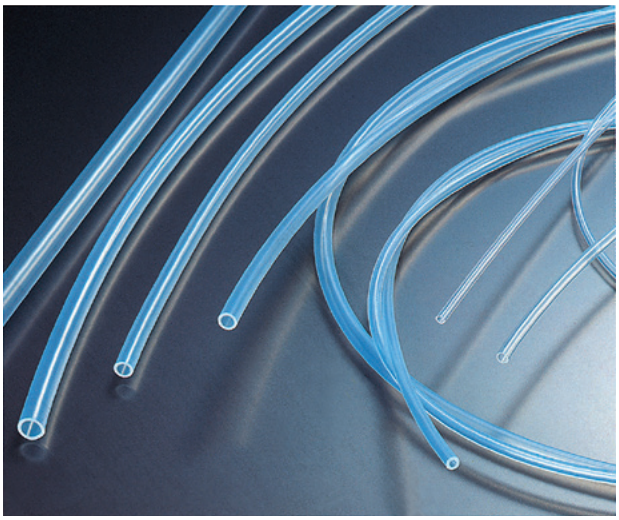
## Caution

- There may be slight difference of color tone for PTFE Tubing depending on production lot. (There is no quality issue.)

# TOMBO™ No.9003-PFA-HG

# NAFLON™ PFA-HG Tubing

The NAFLON PFA-HG Tubing is made from "Super PFA", a material with low levels of eluted fluorine ions. By allowing for control of the structure of PFA (miniaturization of spherulites), this tubing allows for further smoothing of the inner tubing surface. This tubing is perfect for use in the manufacture of semiconductors and liquid crystal products, where ultra-clean environments are required.



## Features

In addition to the features of our standard PFA Tubing:

- **Smoothness of the tubing inner surface is increased to Rt = 0.2μm. (Rt is approximately equal to Rmax, maximum height)**
  - Reduced incidence of retained particles or chemicals
  - Reduced time required for cleaning
  - Reduced chemical absorption due to a lessening of tubing inner surface area
  - Improved transparency
  - Longer performance as an insulator
- **Uses a Super PFA material**
  - Reduction in eluted fluorine ions
  - Resistant to cracking under stress conditions such as exposure to SPM or fuming sulphuric acid

## Specifications

- Service temperature range: Same as NAFLON PFA-Tubing (Please refer to page 2).
- Maximum usage pressure: Same as NAFLON PFA Tubing (Please refer to page 18).
- Minimum bending radius: Same as NAFLON PFA Tubing (Please refer to page 9).

## Standard Dimensions

- Please refer to the NAFLON™ PFA-HG Tubing dimensions table on page 9.

## Other Features

- **Metallic ion elution**

units: (μg)

| Element | Amount eluted |
|---|---|
| K | <0.02 |
| Na | <0.01 |
| Ca | <0.01 |
| Al | <0.02 |
| Cr | <0.01 |
| Ni | <0.01 |
| Fe | <0.02 |
| Cu | <0.01 |

Measured by NICHIAS Corporation

Method of analysis:

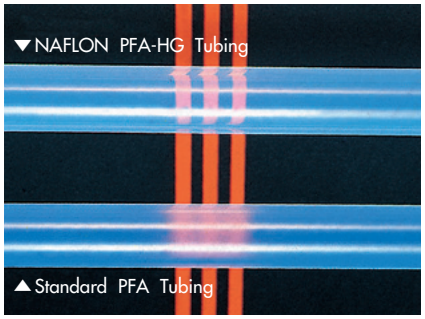
(1) A 1m section of the ø10×ø12 NAFLON™ PFA-HG Tubing to be tested was cut, the cut portion cleaned, and then the tubing was washed in water.

(2) Approximately 70 ml (length: 900 mm) of hydrofluoric acid was added, and the test material was allowed to sit at room temperature for Six days.

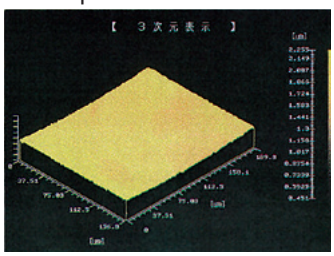
(3) At the conclusion of the test period, the elution liquid was allowed to evaporate. After nitric acid was added to the remaining liquid, the mixture was diluted with pure water, and frameless atomic absorption analysis was used to determine the amounts of each element contained in the elution liquid.

∗ The values given above are intended as representative values, not standard values.

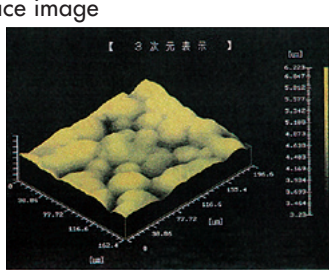
- **Comparison of transperancy**




- **Comparison of inner wall surface image**



NAFLON™ PFA-HG Tubing



Standard PFA Tubing

- **Comparison of Inner Surface Roughness With PFA Tubing**

units: (μm)

| | Units | NAFLON PFA-HG Tubing | Competitor A | Competitor B | New PFA Tubing |
|---|---|---|---|---|---|
| Surface Roughness (Rt) | (μm) | 0.2 | 0.8 | 0.8 | 0.8 |

Measured by NICHIAS Corporation

Notes:

∗ The values given above are intended as representative values, not standard values.

∗ Rt ≒ Rmax

∗ Products from Competitor A and B are standard PFA Tubing.

- **fluorine ions elution**

units: ppm

| | NAFLON PFA-HG Tubing | Standard PFA Tubing |
|---|---|---|
| Elution concentration | 0.3 | 4.2 |

Measured by NICHIAS Corporation

Method of analysis:

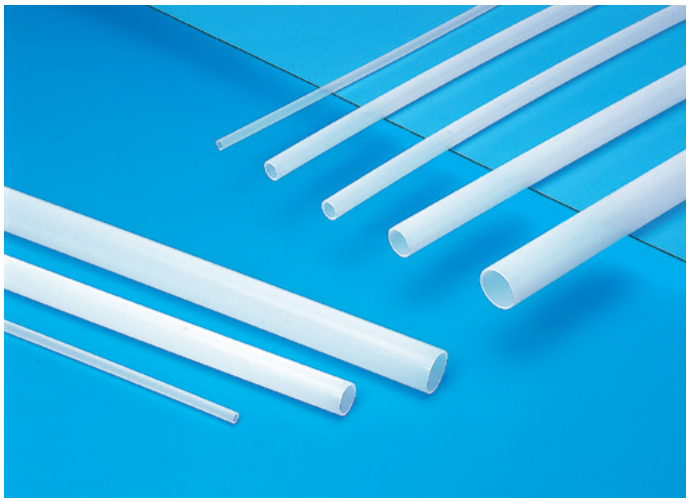
(1) A sample tubing (inner diameter of ø22.2×outer diameter of ø25.4) was cut into pellets.

(2) The sample was immersed in an extraction liquid. After leaving it for 24 hours at room temperature, its fluorine ion concentration was measured using a F-ion measuring device (EXPANDABLE ION ANALIZER EA940, manufactured by Orion Research). (Ion extraction liquid: Water + methanol + TISAB(II) [1:1:2], 20 ml).

∗ The values given above are intended as representative values, not standard values.

# NAFLON™ PFA-SG Tubing

The NAFLON PFA-SG Tubing have lower permeability to chemicals and gases, while retaining the features of our NAFLON PFA-HG Tubing (NEW PFA Tubing with low fluorine ion elusion and smoothened inner tubing surface). These tubing are expected to perform strongly against high osmotic and permeability chemicals (such as hydrochloric acid, fluoride, nitric acid, ozone, hyper-hydrated ammonia, amine chemicals, and fluorochemical surfactants) used in the manufacturing of semiconductors and liquid crystal products, in reverse permeation caused by reduced gas penetration in high temperature processes, and for the reduction of chemical pollution in the atmosphere.



## Features

- Less permeation of chemicals. (In comparison with PFA-HG, the amount of the permeated chemicals is reduced to approximately 60% (measured with chloride, nitrogen, and oxygen).)

∗ Permeation volume of PFA-HG is roughly 50% less than that of ordinary PFA Tubing. (as far as HCL is concerned)

- Little elution of fluorine ions. (as little as PFA-HG Tubing)
- Smooth inner surface. (as smooth as PFA-HG Tubing)

## Specifications

- Service temperature range: Same as NAFLON PFA Tubing (Please refer to page 2.)
- Maximum usage pressure: Same as NAFLON PFA Tubing (Please refer to page 18.)
- Maximum bending radius: Same as NAFLON PFA Tubing (Please refer to page 9.)

## Other Features

### Metallic ion elution

units: (μg/cm²)

| Element | NAFLON PFA-SG Tubing | NAFLON PFA-HG Tubing |
|---|---|---|
| Na | <0.002 | <0.002 |
| Mg | <0.001 | <0.001 |
| Al | <0.001 | <0.001 |
| K | <0.001 | 0.001 |
| Ca | <0.001 | <0.001 |
| Cr | 0.005 | 0.020 |
| Mn | <0.001 | <0.001 |
| Fe | <0.008 | 0.006 |
| Ni | 0.020 | 0.028 |
| Cu | 0.002 | <0.001 |
| Zn | <0.001 | <0.001 |
| Pb | <0.001 | <0.001 |

Measured by NICHIAS Corporation

Method of analysis:

A sample tubing (inner diameter of ø4.35 × outer diameter of ø6.35, liquid contact area: approximately 100 cm²) was folded in two, 3.6% aqueous hydrochloric acid was inserted, and then the sample liquid was measured using the ICP-MS method after leaving it at room temperature for 20 hours.

∗ The values given above are intended as representative values, not standard values.

### Comparison of Inner Surface Roughness With PFA Tubing

units: (μm)

| | NAFLON PFA-SG Tubing | NAFLON PFA-HG Tubing |
|---|---|---|
| Surface Roughness (Rt) | 0.2 | 0.2 |

Measured by NICHIAS Corporation

∗ The values given above are intended as representative values, not standard values.
∗ Rt shows the maximum roughness.

## Caution

- Slightly whiter than NAFLON PFA-HG Tubing.
- Slightly harder than NAFLON PFA-HG Tubing.

## Standard Dimensions

- Please refer to the NAFLON PFA-HG Tubing dimensions table on page 8.

### fluorine ions elution

untis: (ppm)

| | NAFLON PFA-SG Tubing | NAFLON PFA-HG Tubing |
|---|---|---|
| Elution concentration | 0.3 | 0.3 |

Measured by NICHIAS Corporation

Method of analysis:

A sample tubing (inner diameter of ø22.2 × outer diameter of ø25.4) was cut into pellets. The sample was immersed in an extraction liquid. Then its fluorine ion concentration was measured after leaving it for 24 hours at room temperature using a F-ion measuring device (EXPANDABLE ION ANALIZER EA940, manufactured by Orion Research). (Ion extraction liquid: Water + methanol + TISAB(II) [1:1:2], 20 ml).

∗ The values given above are intended as representative values, not standard values.

### Measurement results of the amount of permeated hydrochloric acid

units: ($10^{-2}$μg/cm²)

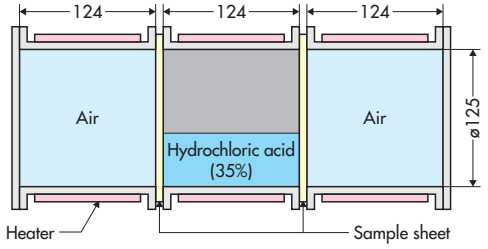
| Test period | NAFLON PFA-SG Tubing | NAFLON PFA-HG Tubing | The ratio of permeated amounts |
|---|---|---|---|
| 7 days | 4.47 | 7.17 | 62% |
| 14 days | 8.86 | 13.8 | 64% |
| 30 days | 17.7 | 27.2 | 65% |

Measured by NICHIAS Corporation

Method of analysis:

The test apparatus, as shown in the following figure, was assembled using a 1t sheet. 35% aqueous hydrochloric acid was poured into the middle straight pipe, clean air was filled into the straight pipes on both ends, and then the apparatus was maintained at 70° using a heater.

∗ The values given above are intended as representative values, not standard values.
∗ The ratio of permeated amounts shows the ratio between PFA-SG Tubing and PFA-HG Tubing.



# TOMBO™ No.9003 NAFLON™ PTFE Tubing

[ Metric Size ]

| Nominal Dimensions | Inner Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 0.5 × 1.5 | 0.5 | +0.30 −0.10 | 0.5 | +0.13 −0.10 | 10 20 30 | +2% −0 |
| 1.0 × 2.0 | 1.0 | | 0.5 | | | |
| 1.0 × 3.0 | 1.0 | | 1.0 | | | |
| 1.5 × 2.5 | 1.5 | +0.40 −0.20 | 0.5 | | | |
| 2.0 × 3.0 | 2.0 | +0.50 −0.20 | 0.5 | | | |
| 2.0 × 4.0 | 2.0 | | 1.0 | | | |
| 3.0 × 4.0 | 3.0 | +0.50 −0.40 | 0.5 | | | |
| 3.0 × 5.0 | 3.0 | | 1.0 | | | |
| 4.0 × 5.0 | 4.0 | | 0.5 | | | |
| 4.0 × 6.0 | 4.0 | | 1.0 | | | |
| 5.0 × 6.0 | 5.0 | | 0.5 | | | |
| 5.0 × 7.0 | 5.0 | | 1.0 | | | |
| 6.0 × 7.0 | 6.0 | | 0.5 | | | |
| 6.0 × 8.0 | 6.0 | | 1.0 | | | |
| 7.0 × 8.0 | 7.0 | | 0.5 | | | |
| 7.0 × 9.0 | 7.0 | | 1.0 | | | |
| 8.0 × 9.0 | 8.0 | | 0.5 | | | |
| 8.0 × 10.0 | 8.0 | | 1.0 | | | |
| 9.0 × 10.0 | 9.0 | | 0.5 | | | |
| 9.0 × 11.0 | 9.0 | | 1.0 | | | |
| 10.0 × 11.0 | 10.0 | | 0.5 | | | |
| 10.0 × 12.0 | 10.0 | | 1.0 | | | |
| 11.0 × 12.0 | 11.0 | ±0.50 | 0.5 | | 10 | |
| 11.0 × 13.0 | 11.0 | | 1.0 | | | |
| 12.0 × 13.0 | 12.0 | | 0.5 | | | |
| 12.0 × 14.0 | 12.0 | | 1.0 | | | |
| 12.5 × 14.0 | 12.5 | | 0.75 | | | |
| 13.0 × 15.0 | 13.0 | | 1.0 | | | |
| 13.0 × 16.0 | 13.0 | | 1.5 | ±0.18 | | |
| 14.0 × 16.0 | 14.0 | ±0.50 | 1.0 | +0.13 −0.10 | 10 | |
| 16.0 × 17.5 | 16.0 | ±0.60 | 0.75 | +0.13 −0.10 | | |
| 16.0 × 19.0 | 16.0 | | 1.5 | ±0.18 | | |
| 19.0 × 21.0 | 19.0 | | 1.0 | ±0.13 ±0.10 | | |
| 20.0 × 23.0 | 20.0 | | 1.5 | ±0.18 | | |
| 21.5 × 23.5 | 21.5 | ±0.70 | 1.0 | +0.13 −0.10 | 1 5 | |
| 22.0 × 24.0 | 22.0 | | 1.0 | | | |
| 23.0 × 25.0 | 23.0 | | 1.0 | | | |
| 23.0 × 27.0 | 23.0 | | 2.0 | ±0.28 | | |
| 25.0 × 27.0 | 25.0 | | 1.0 | +0.13 −0.10 | | |
| 25.0 × 28.0 | 25.0 | | 1.5 | ±0.18 | | |
| 26.0 × 29.0 | 26.0 | ±0.80 | 1.5 | ±0.18 | | |
| 27.5 × 29.5 | 27.5 | | 1.0 | +0.13 −0.10 | | |
| 33.0 × 36.0 | 33.0 | ±1.00 | 1.5 | ±0.18 | | |
| 39.0 × 42.0 | 39.0 | ±1.50 | 1.5 | ±0.18 | | |
| 46.0 × 50.0 | 46.0 | | 2.0 | ±0.28 | | |
| 49.0 × 53.0 | 49.0 | | | | | |
| 64.0 × 68.0 | 64.0 | ±2.00 | | | | |
| 76.0 × 80.0 | 76.0 | ±2.50 | | | | |

* Please enquire for information relating to delivery dates and availability.

[ Inch size ]

| Nominal Dimensions | Inner Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 1.59 × 3.17 | 1.59 | +0.50 −0.20 | 0.79 | +0.13 −0.10 | 10 20 30 | +2% −0 |
| 3.17 × 6.35 | 3.17 | +0.50 −0.40 | 1.59 | ±0.18 | | |
| 4.35 × 6.35 | 4.35 | | 1.00 | +0.13 −0.10 | | |
| 6.35 × 9.52 | 6.35 | | 1.59 | ±0.18 | | |
| 7.52 × 9.52 | 7.52 | | 1.00 | +0.13 −0.10 | | |
| 9.52 × 12.70 | 9.52 | | 1.59 | ±0.18 | | |
| 10.70 × 12.70 | 10.70 | ±0.50 | 1.00 | +0.13 −0.10 | | |
| 15.88 × 19.05 | 15.88 | ±0.60 | 1.59 | ±0.18 | | |

* Please enquire for information relating to delivery dates and availability.

## TOMBO™ No.9003 NAFLON™ PTFE Tubing (AWG Electrical Wiring)

| AWG (No.) | Inner Diameter × Wall Thickness | Inner Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|---|
| | | Standard Value | Allowed Variance | Standard Value | Allowed Variance | Standard Value | Allowed Variance |
| 30 | 0.31 × 0.28 | 0.31 | +0.10 0 | 0.28 | +0.10 −0.05 | 10 20 50 | +2% −0 |
| 28 | 0.38 × 0.28 | 0.38 | | | | | |
| 26 | 0.46 × 0.28 | 0.46 | +0.20 0 | | +0.15 −0.05 | | |
| 24 | 0.57 × 0.28 | 0.57 | | | | | |
| 22 | 0.70 × 0.28 | 0.70 | | | | | |
| 20 | 0.87 × 0.33 | 0.87 | | 0.33 | +0.20 −0.10 | | |
| 19 | 0.97 × 0.33 | 0.97 | +0.30 0 | | | | |
| 18 | 1.08 × 0.33 | 1.08 | | | | | |
| 17 | 1.20 × 0.33 | 1.20 | | | | | |
| 16 | 1.36 × 0.33 | 1.36 | | | | | |
| 15 | 1.51 × 0.33 | 1.51 | | | | | |

| AWG (No.) | Inner Diameter × Thickness | Inner Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|---|
| | | Standard Value | Allowed Variance | Standard Value | Allowed Variance | Standard Value | Allowed Variance |
| 14 | 1.69 × 0.33 | 1.69 | +0.30 0 | 0.33 | +0.20 −0.10 | 10 20 50 | +2% −0 |
| 13 | 1.93 × 0.33 | 1.93 | | | | | |
| 12 | 2.16 × 0.33 | 2.16 | | | | | |
| 11 | 2.41 × 0.33 | 2.41 | | | | | |
| 10 | 2.69 × 0.33 | 2.69 | | | | | |
| 9 | 3.00 × 0.38 | 3.00 | | 0.38 | | | |
| 8 | 3.35 × 0.38 | 3.35 | | | | | |
| 7 | 3.76 × 0.38 | 3.76 | | | | | |
| 6 | 4.22 × 0.38 | 4.22 | | | | | |
| 5 | 4.72 × 0.38 | 4.72 | | | | | |

∗ Standard inventory items

## TOMBO™ No.9003 NAFLON™ PTFE Tubing (Other sizes)

| Size (No.) | Thick Walled | | | | | Thin Walled | | | | | Standard Walled | | | | | Length (m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inner Diameter (mm) | | | Wall Thickness (mm) | | Inner Diameter (mm) | | | Wall Thickness (mm) | | Inner Diameter (mm) | | | Wall Thickness (mm) | | Standard Dimensions | Allowed Variance |
| | Minimum | Standard | Maximum | Standard Value | Allowed Variance | Minimum | Standard | Maximum | Standard Value | Allowed Variance | Minimum | Standard | Maximum | Standard Value | Allowed Variance | | |
| 30 | 0.25 | 0.30 | 0.38 | 0.23 | ±0.05 | 0.25 | 0.30 | 0.38 | 0.15 | ±0.05 | 0.25 | 0.30 | 0.38 | 0.23 | ±0.05 | 10 20 30 | +2% −0 |
| 28 | 0.33 | 0.38 | 0.48 | 0.23 | ±0.05 | 0.33 | 0.38 | 0.46 | 0.15 | ±0.05 | 0.33 | 0.38 | 0.48 | 0.23 | ±0.05 | | |
| 26 | 0.41 | 0.46 | 0.56 | 0.23 | ±0.05 | 0.41 | 0.46 | 0.53 | 0.15 | ±0.05 | 0.41 | 0.46 | 0.56 | 0.23 | ±0.05 | | |
| 24 | 0.51 | 0.56 | 0.68 | 0.30 | ±0.08 | 0.51 | 0.56 | 0.60 | 0.20 | ±0.05 | 0.51 | 0.56 | 0.68 | 0.25 | ±0.08 | | |
| 23 | 0.58 | 0.66 | 0.76 | 0.30 | ±0.08 | — | — | — | — | — | 0.58 | 0.66 | 0.76 | 0.25 | ±0.08 | | |
| 22 | 0.64 | 0.71 | 0.81 | 0.30 | ±0.08 | 0.60 | 0.71 | 0.81 | 0.20 | ±0.05 | 0.64 | 0.71 | 0.81 | 0.25 | ±0.08 | | |
| 21 | 0.74 | 0.81 | 0.91 | 0.30 | ±0.08 | — | — | — | — | — | 0.74 | 0.81 | 0.91 | 0.25 | ±0.08 | | |
| 20 | 0.81 | 0.86 | 1.02 | 0.41 | ±0.08 | 0.81 | 0.86 | 0.96 | 0.20 | ±0.05 | 0.81 | 0.86 | 1.02 | 0.30 | ±0.08 | | |
| 19 | 0.91 | 0.96 | 1.12 | 0.41 | ±0.08 | 0.91 | 0.96 | 1.07 | 0.20 | ±0.05 | 0.91 | 0.96 | 1.12 | 0.30 | ±0.08 | | |
| 18 | 1.02 | 1.07 | 1.24 | 0.41 | ±0.08 | 1.02 | 1.07 | 1.17 | 0.20 | ±0.05 | 1.02 | 1.07 | 1.24 | 0.30 | ±0.08 | | |
| 17 | 1.14 | 1.19 | 1.37 | 0.41 | ±0.08 | 1.14 | 1.19 | 1.32 | 0.20 | ±0.05 | 1.14 | 1.19 | 1.37 | 0.30 | ±0.08 | | |
| 16 | 1.30 | 1.35 | 1.55 | 0.41 | ±0.08 | 1.30 | 1.35 | 1.47 | 0.20 | ±0.05 | 1.30 | 1.35 | 1.55 | 0.30 | ±0.08 | | |
| 15 | 1.45 | 1.50 | 1.70 | 0.41 | ±0.08 | 1.45 | 1.50 | 1.65 | 0.20 | ±0.05 | 1.45 | 1.50 | 1.70 | 0.30 | ±0.08 | | |
| 14 | 1.62 | 1.68 | 1.88 | 0.41 | ±0.08 | 1.62 | 1.68 | 1.83 | 0.20 | ±0.05 | 1.62 | 1.68 | 1.88 | 0.30 | ±0.08 | | |
| 13 | 1.83 | 1.93 | 2.08 | 0.41 | ±0.08 | 1.83 | 1.93 | 2.06 | 0.20 | ±0.05 | 1.83 | 1.93 | 2.08 | 0.30 | ±0.08 | | |
| 12 | 2.06 | 2.16 | 2.31 | 0.41 | ±0.08 | 2.06 | 2.16 | 2.31 | 0.20 | ±0.05 | 2.06 | 2.16 | 2.31 | 0.30 | ±0.08 | | |
| 11 | 2.31 | 2.41 | 2.56 | 0.41 | ±0.08 | 2.31 | 2.41 | 2.56 | 0.20 | ±0.05 | 2.31 | 2.41 | 2.56 | 0.30 | ±0.08 | | |
| 10 | 2.59 | 2.69 | 2.84 | 0.41 | ±0.08 | 2.59 | 2.69 | 2.84 | 0.20 | ±0.05 | 2.59 | 2.69 | 2.84 | 0.30 | ±0.08 | | |
| 9 | 2.90 | 3.00 | 3.15 | 0.51 | ±0.10 | 2.90 | 3.00 | 3.15 | 0.20 | ±0.05 | 2.90 | 3.00 | 3.15 | 0.38 | ±0.08 | | |
| 1/8 | 3.05 | 3.18 | 3.30 | 0.51 | ±0.10 | — | — | — | — | — | — | — | — | — | — | | |
| 8 | 3.28 | 3.38 | 3.58 | 0.51 | ±0.10 | 3.28 | 3.38 | 3.53 | 0.20 | ±0.05 | 3.28 | 3.38 | 3.58 | 0.38 | ±0.08 | | |
| 7 | 3.66 | 3.76 | 4.01 | 0.51 | ±0.10 | 3.66 | 3.76 | 3.94 | 0.20 | ±0.05 | 3.66 | 3.76 | 4.01 | 0.38 | ±0.08 | | |
| 6 | 4.11 | 4.22 | 4.52 | 0.51 | ±0.10 | 4.11 | 4.22 | 4.42 | 0.25 | ±0.08 | 4.11 | 4.22 | 4.52 | 0.38 | ±0.08 | | |
| 5 | 4.62 | 4.72 | 5.03 | 0.51 | ±0.10 | 4.62 | 4.72 | 4.95 | 0.25 | ±0.08 | 4.62 | 4.72 | 5.03 | 0.38 | ±0.08 | | |
| 4 | 5.18 | 5.28 | 5.69 | 0.51 | ±0.10 | 5.18 | 5.28 | 5.54 | 0.25 | ±0.08 | 5.18 | 5.28 | 5.69 | 0.38 | ±0.08 | | |
| 3 | 5.82 | 5.93 | 6.32 | 0.51 | ±0.10 | 5.82 | 5.93 | 6.20 | 0.25 | ±0.08 | 5.82 | 5.93 | 6.32 | 0.38 | ±0.08 | | |
| 1/4 | 6.35 | 6.48 | 6.60 | 0.51 | ±0.10 | — | — | — | — | — | — | — | — | — | — | | |
| 2 | 6.55 | 6.68 | 7.06 | 0.51 | ±0.10 | 6.55 | 6.68 | 6.93 | 0.25 | ±0.08 | 6.55 | 6.68 | 7.06 | 0.38 | ±0.08 | | |
| 1 | 7.34 | 7.47 | 7.90 | 0.51 | ±0.10 | 7.34 | 7.47 | 7.75 | 0.25 | ±0.08 | 7.34 | 7.47 | 7.90 | 0.38 | ±0.08 | | |
| 5/16 | 7.95 | 8.15 | 8.48 | 0.51 | ±0.10 | — | — | — | — | — | — | — | — | — | — | | |
| 0 | 8.26 | 8.38 | 8.81 | 0.51 | ±0.10 | 8.26 | 8.38 | 8.69 | 0.30 | ±0.08 | 8.26 | 8.38 | 8.81 | 0.38 | ±0.08 | | |

∗ Please enquire for information relating to delivery dates and availability.

# TOMBO™ No.9003-PFA/FEP NAFLON™ PFA/FEP Tubing

## PFA Tubing

[ Metric size ]

| Nominal Dimensions | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 2× 3 | 3.0 | ±0.10 | 0.5 | ±0.05 | 10, 20, 50, 100, 200 | +1% −0 |
| 2× 4 | 4.0 | | 1.0 | ±0.06 | | |
| 3× 4 | 4.0 | | 0.5 | ±0.05 | | |
| 3× 5 | 5.0 | | 1.0 | ±0.06 | | |
| 4× 5 | 5.0 | | 0.5 | ±0.05 | | |
| 4× 6 | 6.0 | | 1.0 | ±0.06 | | |
| 5× 6 | 6.0 | | 0.5 | ±0.05 | | |
| 5× 7 | 7.0 | ±0.12 | 1.0 | ±0.06 | 10, 20, 50, 100 | |
| 6× 8 | 8.0 | | 1.0 | ±0.06 | | |
| 7× 8 | 8.0 | | 0.5 | ±0.05 | | |
| 7× 9 | 9.0 | | 1.0 | ±0.06 | | |
| 8× 9 | 9.0 | | 0.5 | ±0.05 | | |
| 8×10 | 10.0 | | 1.0 | ±0.06 | | |
| 9×10 | 10.0 | | 0.5 | ±0.05 | | |
| 9×11 | 11.0 | | 1.0 | ±0.06 | | |
| 9×12 | 12.0 | | 1.5 | ±0.10 | | |
| 10×12 | 12.0 | | 1.0 | ±0.06 | | |
| 11×12 | 12.0 | | 0.5 | ±0.05 | | |
| 11×13 | 13.0 | | 1.0 | ±0.06 | 10, 20, 50 | |
| 12×14 | 14.0 | | 1.0 | ±0.06 | | |
| 12×15 | 15.0 | | 1.5 | ±0.10 | | |
| 13×15 | 15.0 | | 1.0 | ±0.06 | | |
| 13×16 | 16.0 | | 1.5 | ±0.10 | | |
| 14×16 | 16.0 | | 1.0 | ±0.06 | | |
| 15×17 | 17.0 | | 1.0 | ±0.06 | | |
| 15×18 | 18.0 | | 1.5 | ±0.10 | | |
| 16×18 | 18.0 | | 1.0 | ±0.06 | | |
| 16×19 | 19.0 | | 1.5 | ±0.10 | | |
| 17×19 | 19.0 | | 1.0 | ±0.06 | | |
| 18×21 | 21.0 | ±0.15 | 1.5 | ±0.10 | | |
| 19×22 | 22.0 | | 1.5 | ±0.10 | | |
| 20×22 | 22.0 | | 1.0 | ±0.06 | | |
| 22×25 | 25.0 | | 1.5 | ±0.10 | | |
| 23×25 | 25.0 | | 1.0 | ±0.06 | | |

∗ Please enquire for information relating to delivery dates and availability.

[ Inch size ]

| Nominal Dimensions | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 1.59× 3.17 | 3.17 | ±0.10 | 0.79 | ±0.05 | 10, 20, 50, 100, 200 | +1% −0 |
| 3.17× 6.35 | 6.35 | | 1.59 | ±0.10 | | |
| 3.96× 6.35 | 6.35 | | 1.20 | ±0.10 | | |
| 4.35× 6.35 | 6.35 | | 1.00 | ±0.06 | | |
| 6.35× 9.52 | 9.52 | ±0.12 | 1.59 | ±0.10 | 10, 20, 50, 100 | |
| 7.52× 9.52 | 9.52 | | 1.00 | ±0.06 | | |
| 9.52×12.70 | 12.70 | | 1.59 | ±0.10 | | |
| 10.70×12.70 | 12.70 | | 1.00 | ±0.06 | | |
| 15.88×19.05 | 19.05 | | 1.59 | ±0.10 | 10, 20, 50 | |
| 22.22×25.40 | 25.40 | ±0.15 | 1.59 | ±0.10 | | |

∗ Please enquire for information relating to delivery dates and availability.

## FEP Tubing

[ Metric size ]

| Nominal Dimensions | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 2.0× 4.0 | 4.0 | +0.20 −0.10 | 1.0 | ±0.10 | 10, 20, 50, 100, 200 | +1% −0 |
| 4.0× 6.0 | 6.0 | | 1.0 | | | |
| 6.0× 8.0 | 8.0 | | 1.0 | | 10, 20, 50, 100 | |
| 8.0×10.0 | 10.0 | | 1.0 | | | |
| 9.0×12.0 | 12.0 | | 1.5 | ±0.15 | | |
| 10.0×12.0 | 12.0 | | 1.0 | ±0.10 | | |

∗ Please enquire for information relating to delivery dates and availability.

[ Inch size ]

| Nominal Dimensions | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 4.57× 6.35 | 6.35 | +0.20 −0.10 | 0.89 | ±0.10 | 10, 20, 50, 100, 200 | +1% −0 |
| 5.90× 7.94 | 7.94 | | 1.02 | | 10, 20, 50, 100 | |
| 6.99× 9.53 | 9.53 | | 1.27 | ±0.12 | | |
| 9.56×12.70 | 12.70 | +0.30 −0.10 | 1.57 | ±0.15 | | |

∗ Please enquire for information relating to delivery dates and availability.

# TOMBO™ No.9003-PFA-HG/SG NAFLON™ PFA-HG/PFA-SG Tubing

## PFA-HG Tubing

[ Metric size ]

| Nominal Dimensions (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 2× 3 | 3.0 | ±0.10 | 0.5 | ±0.05 | 10, 20, 50, 100, 200 | +1% −0 |
| 2× 4 | 4.0 | | 1.0 | ±0.06 | | |
| 3× 4 | 4.0 | | 0.5 | ±0.05 | | |
| 4× 6 | 6.0 | | 1.0 | ±0.06 | | |
| 5× 6 | 6.0 | | 0.5 | ±0.05 | | |
| 6× 8 | 8.0 | ±0.12 | 1.0 | ±0.06 | 10, 20, 50, 100 | |
| 8×10 | 10.0 | | 1.0 | ±0.06 | | |
| 10×12 | 12.0 | | 1.0 | ±0.06 | | |
| 12×14 | 14.0 | | 1.0 | ±0.06 | | |
| 16×19 | 19.0 | | 1.5 | ±0.10 | | |
| 22×25 | 25.0 | ±0.15 | 1.5 | ±0.10 | | |

* Please enquire for information relating to delivery dates and availability.

[ Inch Size ]

| Nominal Dimensions (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 1.59× 3.17 | 3.17 | ±0.10 | 0.79 | ±0.05 | 10, 20, 50, 100, 200 | +1% −0 |
| 2.17× 3.17 | 3.17 | | 0.50 | ±0.05 | 10, 20, 50, | |
| 3.96× 6.35 | 6.35 | | 1.20 | ±0.10 | 10, 20, 50, | |
| 4.35× 6.35 | 6.35 | | 1.00 | ±0.06 | 100, 200 | |
| 6.35× 9.52 | 9.52 | ±0.12 | 1.59 | ±0.10 | 10, 20, 50, 100 | |
| 7.52× 9.52 | 9.52 | | 1.00 | ±0.06 | | |
| 9.52×12.70 | 12.70 | | 1.59 | ±0.10 | | |
| 15.88×19.05 | 19.05 | | 1.59 | ±0.10 | | |
| 22.22×25.40 | 25.40 | ±0.15 | 1.59 | ±0.10 | | |

* Please enquire for information relating to delivery dates and availability.

## PFA-SG Tubing

[ Metric size ]

| Nominal Dimensions (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 2× 4 | 4.0 | ±0.10 | 1.0 | ±0.06 | 10, 50, 100 | +1% −0 |
| 4× 6 | 6.0 | | 1.0 | | | |
| 6× 8 | 8.0 | ±0.12 | 1.0 | | | |
| 8×10 | 10.0 | | 1.0 | | | |
| 10×12 | 12.0 | | 1.0 | | | |
| 16×19 | 19.0 | | 1.5 | ±0.10 | | |
| 22×25 | 25.0 | ±0.15 | 1.5 | | | |

* Please enquire for information relating to delivery dates and availability.

[ Inch Size ]

| Nominal Dimensions (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 2.17× 3.17 | 3.17 | ±0.10 | 0.50 | ±0.05 | 10, 50, 100 | +1% −0 |
| 4.35× 6.35 | 6.35 | | 1.00 | ±0.06 | | |
| 6.35× 9.52 | 9.52 | ±0.12 | 1.59 | ±0.10 | | |
| 7.52× 9.52 | 9.52 | | 1.00 | ±0.06 | | |
| 9.52×12.70 | 12.70 | | 1.59 | | | |
| 15.88×19.05 | 19.05 | | 1.59 | ±0.10 | | |
| 22.22×25.40 | 25.40 | ±0.15 | 1.59 | | | |

* Please enquire for information relating to delivery dates and availability.

# NAFLON™ Tubing Room-Temperature Destructive Pressure and Minimum Bend Radius

## PFA/FEP Tubing

| Inner Diameter (mm) | Outer Diameter (mm) | Room-Temperature Destructive Pressure (Mpa) | Minimum Bend Radius (mm) |
|---|---|---|---|
| 2 | 3 | 5.7 | 15 |
| 2 | 4 | 8.8 | 15 |
| 2.5 | 4 | 6.6 | 15 |
| 3 | 4 | 4.1 | 20 |
| 3 | 5 | 6.9 | 20 |
| 4 | 5 | 3.2 | 25 |
| 4 | 6 | 5.7 | 25 |
| 5 | 6 | 2.7 | 35 |
| 5 | 7 | 4.8 | 40 |
| 6 | 7 | 2.2 | 50 |
| 6 | 8 | 4.1 | 50 |
| 7 | 8 | 2.0 | 65 |
| 7 | 9 | 3.6 | 60 |
| 8 | 9 | 1.7 | 80 |
| 8 | 10 | 3.2 | 80 |
| 9 | 10 | 1.5 | 105 |
| 9 | 11 | 2.9 | 100 |
| 9 | 12 | 4.1 | 65 |
| 10 | 12 | 2.7 | 130 |
| 11 | 12 | 1.4 | 170 |
| 10 | 13 | 3.8 | 75 |
| 11 | 13 | 2.4 | 155 |
| 12 | 14 | 2.2 | 190 |
| 12 | 15 | 3.2 | 105 |
| 13 | 15 | 2.1 | 210 |
| 13 | 16 | 3.0 | 125 |
| 14 | 16 | 2.0 | 145 |
| 15 | 17 | 1.8 | 290 |
| 15 | 18 | 2.7 | 170 |
| 16 | 18 | 1.7 | 340 |
| 16 | 19 | 2.5 | 200 |
| 17 | 19 | 1.6 | 400 |
| 18 | 21 | 2.2 | 250 |
| 19 | 22 | 2.1 | 280 |
| 20 | 22 | 1.4 | 560 |
| 20 | 23 | 2.0 | 310 |
| 22 | 25 | 1.9 | 370 |
| 23 | 25 | 1.3 | 740 |
| 1.59 | 3.17 | 8.8 | 15 |
| 2.17 | 3.17 | 5.3 | 15 |
| 3.17 | 6.35 | 8.8 | 20 |
| 3.96 | 6.35 | 6.5 | 20 |
| 4.35 | 6.35 | 5.3 | 30 |
| 6.35 | 9.52 | 5.7 | 40 |
| 7.52 | 9.52 | 3.4 | 70 |
| 9.52 | 12.7 | 4.1 | 75 |
| 10.7 | 12.7 | 2.5 | 150 |
| 15.88 | 19.05 | 2.6 | 200 |
| 22.22 | 25.4 | 2.0 | 370 |

## PTFE Tubing

| Inner Diameter (mm) | Outer Diameter (mm) | Room-Temperature Destructive Pressure (Mpa) | Minimum Bend Radius (mm) |
|---|---|---|---|
| 0.5 | 1.5 | 23.5 | — |
| 1.0 | 2.0 | 11.8 | 5 |
| 1.0 | 3.0 | 23.5 | 5 |
| 2 | 3 | 5.9 | 10 |
| 2 | 4 | 11.8 | 10 |
| 3 | 4 | 3.9 | 15 |
| 3 | 5 | 7.8 | 15 |
| 4 | 5 | 2.9 | 30 |
| 4 | 6 | 5.9 | 25 |
| 5 | 6 | 2.4 | 50 |
| 5 | 7 | 4.7 | 35 |
| 6 | 7 | 2.0 | 65 |
| 6 | 8 | 3.9 | 45 |
| 7 | 8 | 1.7 | 85 |
| 7 | 9 | 3.4 | 60 |
| 8 | 9 | 1.5 | 115 |
| 8 | 10 | 2.9 | 70 |
| 9 | 10 | 1.3 | 140 |
| 9 | 11 | 2.6 | 85 |
| 9 | 12 | 3.9 | 55 |
| 10 | 11 | 1.2 | 215 |
| 10 | 12 | 2.4 | 105 |
| 11 | 12 | 1.1 | 210 |
| 11 | 13 | 2.1 | 120 |
| 12 | 13 | 1.0 | 265 |
| 12 | 14 | 2.0 | 140 |
| 12.5 | 14 | 1.4 | 200 |
| 13 | 15 | 1.8 | 160 |
| 13 | 16 | 2.7 | 90 |
| 14 | 16 | 1.7 | 120 |
| 15 | 17 | 1.6 | 200 |
| 16 | 17.5 | 1.1 | 290 |
| 16 | 19 | 2.2 | 120 |
| 19 | 21 | 1.2 | 295 |
| 20 | 23 | 1.8 | 165 |
| 21.5 | 23.5 | 1.1 | 380 |
| 22 | 24 | 1.1 | 390 |
| 23 | 25 | 1.0 | 425 |
| 23 | 27 | 2.0 | — |
| 25 | 27 | 0.9 | — |
| 25 | 28 | 1.4 | — |

| Inner Diameter (mm) | Outer Diameter (mm) | Room-Temperature Destructive Pressure (Mpa) | Minimum Bend Radius (mm) |
|---|---|---|---|
| 26 | 29 | 1.4 | — |
| 27.5 | 29.5 | 0.9 | — |
| 33 | 36 | 1.1 | — |
| 39 | 42 | 0.9 | — |
| 46 | 50 | 1.0 | — |
| 49 | 53 | 1.0 | — |
| 64 | 68 | 0.7 | — |
| 76 | 80 | 0.6 | — |
| 1.59 | 3.17 | 11.7 | 5 |
| 3.17 | 6.35 | 11.8 | 15 |
| 4.35 | 6.35 | 5.4 | 30 |
| 6.35 | 9.52 | 6.0 | 35 |
| 7.52 | 9.52 | 3.1 | 65 |
| 9.52 | 12.7 | 3.9 | 65 |
| 10.7 | 12.7 | 2.1 | 115 |
| 15.88 | 19.05 | 2.3 | 120 |

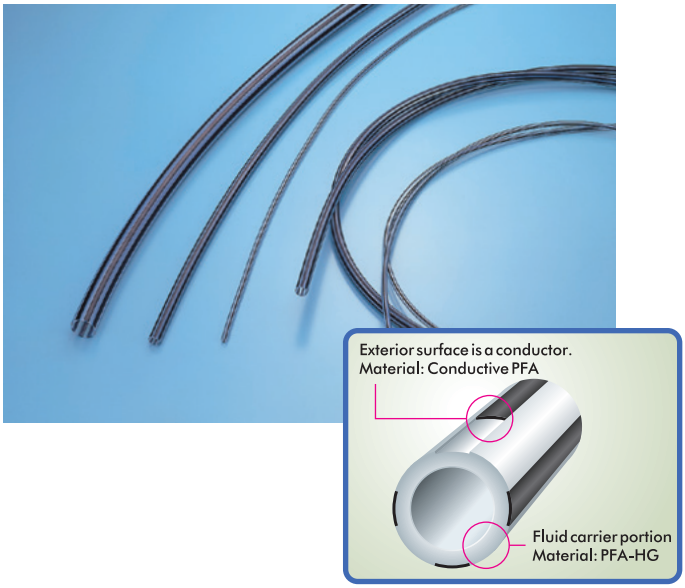
Measured by NICHIAS Corporation

* Please enquire for information relating to delivery dates and availability.

* The minimum bend radius shows 1.2 times larger values than actually measured (calculated) values.

# NAFLON™ PFA-NE Tubing

The NAFLON-PFA-NE Tubing is constructed with a PFA conducting stripe on surface of our PFA-HG Tubing. Thanks to the conducting PFA portion's sheilding effect, these tubing are excellent at preventing fires that could occur due to sparking between an atmosphere of transported flammable gases and the exterior surface of the tubing.




## Features

- The conductig PFA's shielding effect
  - Prevents the release of sparks that could result in the starting of fires.
  - Prevents tubing insulation damage that could result form electric release from an insulated atmosphere.
- The fluid carrier portion being constructed from PFA-HG Tubing
  - Little elution of fluorine ions.
  - Little permeation or accumulation of chemicals.
  - The same chemical resistance, heat resistance, and strength as PFA.
- Compared with PFA Tubing coated with a shielding conductor as an anti-electrical measure
  - No unsettling corrosion as with metallic wires and meshes.
  - Reduction in construction costs and variations in construction.
  - No risk of losing grounding due to variation in coating work.

## Specifications

- Service temperature range: Same as naflon PFA Tubing (Please refer to page 2.)
- Maximum usage pressure: Same as naflon PFA Tubing (Please refer to page 18.)
- Maximum bending radius: Same as naflon PFA Tubing (Please refer to page 9.)

＊ Since the fluid-carrier portion is made of insulating PFA-HG, these tubing are considered to be ineffective in preventing insulation damage caused by flow electrification with liquids.

- Volumetric Resistance

units: (Ω-cm)

| Material | Volumetric Resistance |
|---|---|
| Conductive PFA | $5.3 \times 10^{2}$ |
| PFA-HG | $>10^{18}$ |

Measured by NICHIAS Corporation

**Method of measurement:** As per JIS K 7194

＊The values given above are intended as representative values, not standard values.

- Anti-Static Features

units: (V)

| Tubing Types | Center of 1m Length tubing | Center of 15m Length tubing | Ends of 15m Length tubing |
|---|---|---|---|
| PFA-NE Tubing | 0.5～0.7 | 0.5～0.7 | 0.5～0.7 |
| PFA-HG Tubing | >2.0 (limit of measurement capability) | — | — |

Measured by NICHIAS Corporation

**Method of measurement :** One end was grounded, and cotton rubbed 50 times along a 20 cm span, eitherin the center or at the ends of the tubing. Electric potential was then measured in the applicable area.

＊The values given above are intended as representative values, not standard values.

## Caution

- These tubing are not effective in preventing insulation damage caused by friction electrification between insulating fluids and these tubing.
- These tubing can be used with joints manufactured by different companies which use standard PFA Tubing.

## Usage Notes

These tubing must always be grounded when used. Please use our conductive grounding band (sold separatelly) for grounding.

Grounding Band

＊Please contact us with any enquiry about product usage and selection.

＊The outer diameter of the applicable tubing is up to ø19.05.

## Standard Dimensions

[ Metric size ]

| Nominal Dimension (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Thickness of conductive part (mm) | | Width of conductive part (mm) | Number of stripes | Length (m) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | | | | | Standard Dimensions | Allowed Variance |
| 2× 3 | 3.0 | +0.15 −0.10 | 0.5 | ±0.07 | 0.03 | +0.04 −0.01 | 0.6±0.3 | 4 | 10, 50, 100 | +1% −0 |
| 2× 4 | 4.0 | | 1.0 | | 0.06 | +0.06 −0.03 | 0.8±0.3 | | | |
| 3× 4 | 4.0 | | 0.5 | | 0.03 | +0.04 −0.01 | 0.8±0.3 | | | |
| 4× 6 | 6.0 | | 1.0 | | 0.06 | +0.06 −0.03 | 1.4±0.4 | | | |
| 6× 8 | 8.0 | | 1.0 | | 0.06 | +0.06 −0.03 | 1.8±0.4 | | | |
| 8×10 | 10.0 | | 1.0 | | 0.06 | +0.06 −0.03 | 2.3±0.4 | | | |
| 10×12 | 12.0 | +0.25 −0.10 | 1.0 | | 0.06 | +0.06 −0.03 | 2.6±0.6 | 8 | | |
| 16×19 | 19.0 | | 1.5 | ±0.12 | 0.06 | +0.06 −0.03 | 3.8±0.8 | | 10, 50 | |
| 22×25 | 25.0 | | 1.5 | | 0.06 | +0.06 −0.03 | 4.9±0.8 | | | |

*Please enquire for information relating to delivery dates and availability.

[ Inch size ]

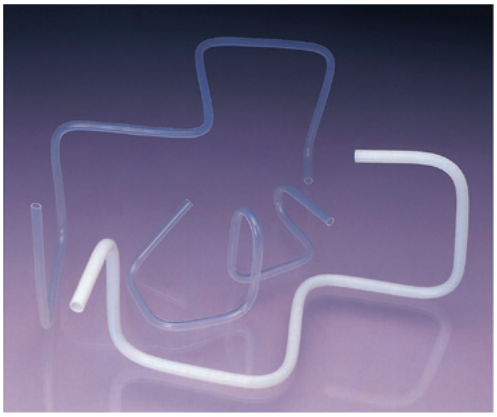
| Nominal Dimension (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Thickness of conductive part (mm) | | Width of conductive part (mm) | Number of stripes | Length (m) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | | | | | Standard Dimensions | Allowed Variance |
| 2.17× 3.17 | 3.17 | +0.15 −0.10 | 0.50 | ±0.07 | 0.03 | +0.04 −0.01 | 0.6±0.3 | 4 | 10, 50, 100 | +1% −0 |
| 4.35× 6.35 | 6.35 | | 1.00 | ±0.07 | 0.06 | +0.06 −0.03 | 1.5±0.4 | | | |
| 6.35× 9.52 | 9.52 | | 1.59 | ±0.12 | 0.06 | +0.06 −0.03 | 2.4±0.4 | | | |
| 7.52× 9.52 | 9.52 | | 1.00 | ±0.07 | 0.06 | +0.06 −0.03 | 2.2±0.4 | | | |
| 9.52×12.70 | 12.70 | +0.25 −0.10 | 1.59 | ±0.12 | 0.06 | +0.06 −0.03 | 2.6±0.6 | 8 | | |
| 15.88×19.05 | 19.05 | | 1.59 | ±0.12 | 0.06 | +0.06 −0.03 | 3.8±0.8 | | 10, 50 | |
| 22.22×25.40 | 25.40 | | 1.59 | ±0.12 | 0.06 | +0.06 −0.03 | 4.9±0.8 | | | |

*Please enquire for information relating to delivery dates and availability.

## TOMBO™ No.9055-PFA/PTFE

# NAFLON™ Bent Tubing

NAFLON bent Tubing are created with a special bending manufacturing process. This prevents leakage problems that can occur from the use of joints, and also helps to greatly reduce loss of pressure.



### Features

- Reduces space required for piping.
- Decreasing the number of joints is possible.

### Specifications

- Maximum usage temperature: 150°C

## Minimum Bend Radius and Measurement Variance

| Inner Diameter × Outer Diameter | Minimum Bend Radius | R variance | Bend Area Flatness | Bend Area Thickness | Angle |
|---|---|---|---|---|---|
| 4.35× 6.35 | 10R | ±2 | ≥85% | ≥0.8 mm | ±10° |
| 7.52× 9.52 | 15R | ±3 | ≥85% | ≥0.8 mm | ±10° |
| 9.52×12.7 | 20R | ±4 | ≥85% | ≥1.3 mm | ±10° |
| 15.88×19.05 | 30R | ±5 | ≥85% | ≥1.3 mm | ±10° |

Measured by NICHIAS Corporation

*The values given above are intended as representative values, not standard values.
*No bending work is possible in the field.

# NAFLON™ PFA-AS Tubing

The NAFLON PFA-AS Tubing is constructed with a PFA conducting stripe on both inner and outer surfaces of our PFA-HG Tubing. This tubing can prevent destruction of the tubing insulation during the transport of organic solvents, fuels, refrigerant, powders, and vapors. In addition, transparency allows checking the liquid inside the tubing.


## Features

- As resistant to chemicals, heat, and weather as PFA Tubing.
- Since these tubing have an anti-electrification function, insulation damage of the tubing caused by friction electrification with fluids can be prevented.
- Transparency allows checking the liquid running inside.

## Specifications

- Service temperature range: −40°C～260°C (same as PFA Tubing)
- Maximum usage pressure: Same as NAFLON PFA Tubing (Please refer to page 18.)
- Room-Temperature Destructive Pressure: Same as NAFLON PFA Tubing (Please refer to page 9.)
- Maximum bending radius: Same as NAFLON PFA Tubing (Please refer to page 9.)

＊Since special fillers are added in the conductive PFA portion, customers are strongly advised to carry out tests and verification procedures to judge the suitability of these tubing for use in applications requiring purity.

### Volumetric Resistance

units: (Ω-cm)

| Material | Volumetric Resistance |
|---|---|
| Conductive PFA | $5.3\times10^{2}$ |
| PFA-HG | $>10^{18}$ |

Measured by NICHIAS Corporation

**Method of measurement:** As per JIS K 7194

＊The values given above are intended as representative values, not standard values.

### Electrical resistance values

| Inner Diameter × Outer Diameter | Both ends of 100mm long tubing (Ω) |
|---|---|
| 4.35×6.35 | $1.3\times10^{5}$ |
| 6.35×9.52 | $0.3\times10^{5}$ |

Measured by NICHIAS Corporation

**Method of measurement:** 250V is applied to the conductive PFA portions of the inner and exterior layers at both ends using an electric resistance meter to measure the electrical resistance values.

＊The values given above are intended as representative values, not standard values.

## Caution

- This product was designed in accordance with the Electrostatic Safety Guidelines (issued by the National Institute of Industrial Safety of the Ministry of Health, Labor and Welfare).
- Proper and careful examinations are recommended before use according to the application.

## Usage Notes

These tubing must always be grounded when used.
Please use our conductive grounding band (sold separatelly) for grounding.


Grounding Band

＊Please contact us with any enquiry about product usage and selection.

＊The outer diameter of the applicable tubing is up to ø19.05.

## Standard Dimensions

[ Metric size ]

| Nominal Dimension (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 4×6 | 6.0 | +0.15 −0.10 | 1.0 | ±0.10 | 10, 50, 100 | +1% −0 |
| 6×8 | 8.0 | | 1.0 | | | |
| 8×10 | 10.0 | | 1.0 | | | |
| 10×12 | 12.0 | +0.25 −0.10 | 1.0 | | | |
| 16×19 | 19.0 | | 1.5 | ±0.15 | | |
| 22×25 | 25.0 | | 1.5 | | | |

Conductive PFA

| Nominal Dimension (mm) | Inner surface | | | | Exterior surface | | | | Wall Thickness | | Number of stripes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Thickness (mm) | | Width (mm) | | Thickness (mm) | | Width (mm) | | Width (mm) | | |
| | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | |
| 4×6 | 0.02 | +0.18 −0.015 | 1.4 | ±0.5 | 0.02 | +0.18 −0.015 | 2.1 | ±0.5 | 0.02 | +0.18 −0.015 | 4 |
| 6×8 | | | 2.1 | ±0.7 | | | 2.8 | ±0.9 | | | |
| 8×10 | | | 2.8 | ±0.9 | | | 3.5 | ±1.1 | | | |
| 10×12 | | | 1.3 | ±0.6 | | | 2.2 | ±0.8 | | | 8 |
| 16×19 | | | 2.0 | ±0.8 | | | 3.2 | ±1.0 | | | |
| 22×25 | | | 2.7 | ±1.0 | | | 4.4 | ±1.4 | | | |

[ Inch size ]

| Nominal Dimension (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 3.96×6.35 | 6.35 | +0.15 −0.10 | 1.20 | ±0.12 | 10, 50, 100 | +1% −0 |
| 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 | | |
| 9.52×12.70 | 12.70 | +0.25 −0.10 | 1.59 | ±0.15 | | |
| 15.88×19.05 | 19.05 | | 1.59 | | | |
| 22.22×25.40 | 25.40 | | 1.59 | | | |

Conductive PFA

| Nominal Dimension (mm) | Inner surface | | | | Exterior surface | | | | Wall Thickness | | Number of stripes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Thickness (mm) | | Width (mm) | | Thickness (mm) | | Width (mm) | | Width (mm) | | |
| | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | |
| 3.96×6.35 | 0.02 | +0.18 −0.015 | 1.6 | ±0.5 | 0.02 | +0.18 −0.015 | 2.3 | ±0.5 | 0.02 | +0.18 −0.015 | 4 |
| 4.35×6.35 | | | | | | | | | | | |
| 6.35×9.52 | | | 2.2 | ±0.7 | | | 3.4 | ±0.9 | | | |
| 7.52×9.52 | | | | | | | | | | | 8 |
| 9.52×12.70 | | | 1.2 | ±0.6 | | | 2.3 | ±0.8 | | | |
| 15.88×19.05 | | | 2.0 | ±0.8 | | | 3.2 | ±1.0 | | | |
| 22.22×25.40 | | | 2.6 | ±1.0 | | | 4.3 | ±1.4 | | | |

＊Please enquire for information relating to delivery dates and availability.
＊Please consult us if you have any requests for other sizes.

# NAFLON™ SF Tubing

The NAFLON SF Tubing is exceptionally weather-resistant and chemical-resistant fluoro thermo plastic tubing created from a copolymer of tetrafluoroethylene, hexafluoropropylene, and vinylidene fluorides. These tubing are softer than PFA, PTFE, and other fluorine plastic tubing, and are therefore more suited to tubing in tight spaces. These tubing contain no additives such as fillers or plasticizers, and therefore release little gas and elution.

## Features

- Resistant to both acids and alkalis.
- Soft and flexible.
- Excellent resistance to repeated flexing.
- Extremely transparent. (superior to PFA-HG)

## Specifications

- Service temperature range: Room temperature～50°C
- Maximum usage pressure: These tubing are recommended to be used at a maximum pressure of between a third and a fifth of the destructive pressure indicated below.
- Chemical resistance to acids and alkalis, but not to organic solvents.

## NAFLON™ SF Tubing Room-Temperature Destructive Pressure and Minimum Bend Radius

| Inner Diameter × Outer Diameter (mm) | Room-Temperature Destructive Pressure (Mpa) | Minimum Bend Radius (mm) |
|---|---|---|
| 4× 6 | 2.0 | 25 |
| 6× 8 | 1.3 | 35 |
| 8×10 | 1.0 | 50 |
| 10×12 | 0.8 | 70 |

Measured by NICHIAS Corporation

＊The values given above are intended as representative values, not standard values.
＊The minimum bend radius shows 1.2 times larger values than actually measured (calculated) values.

## Standards Dimensions

| Nominal Dimension (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|
| Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 4× 6 | 6.0 | +0.2 −0.1 | 1.0 | ±0.1 | 10 | +2% −0 |
| 6× 8 | 8.0 | | | | | |
| 8×10 | 10.0 | | | | | |
| 10×12 | 12.0 | | | | | |

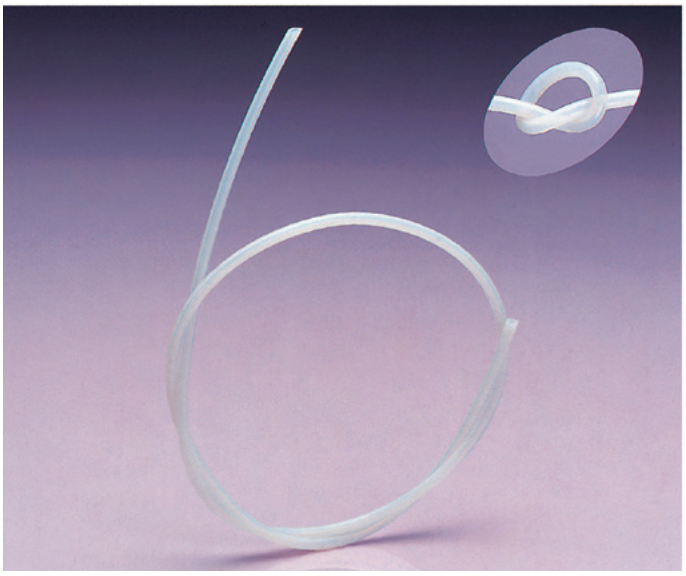
＊Please enquire for information relating to delivery dates and availability.

## Caution

- Please enquire for information relating to resistance to chemicals.
- Not for use with foods and drinking water.

# NAFLON™ BT Tubing

NAFLON BT Tubing are a PTFE Tubing with added flexibility and transparency. They bend easily and will not buckle, making them perfect for applications where tubing in tight spaces is required.



## Features

- Bends easily, and will not buckle.
- More transparent than normal PTFE Tubing.

## Specifications

- Service temperature range: −40°C～260°C
- Maximum usage pressure: Refer to page 18.

## Caution

- Even if there is a different colour tone arising from each production lot, none of which affects the performance of the product.

## NAFLON™ BT Tubing Room-Temperature Destructive Pressure and Minimum Bend Radius

| Inner Diameter × Outer Diameter | Room Temperature Destructive Pressure (MPa) | Minimum Bend Radius [mm] |
|---|---|---|
| 2× 4 | 11.8 | 10 |
| 3× 6 | 11.8 | 10 |
| 5× 8 | 7.4 | 25 |
| 7×10 | 5.0 | 40 |
| 9×12 | 3.9 | 55 |
| 1.59×3.17 | 11.7 | 6 |
| 3.17×6.35 | 9.8 | 10 |
| 6.35×9.52 | 6.0 | 30 |
| 9.52×12.7 | 4.0 | 55 |

Measured by NICHIAS Corporation

＊The values given above are intended as representative values, not standard values.
＊The minimum bend radius shows 1.2 times larger values than actually measured (calculated) values.

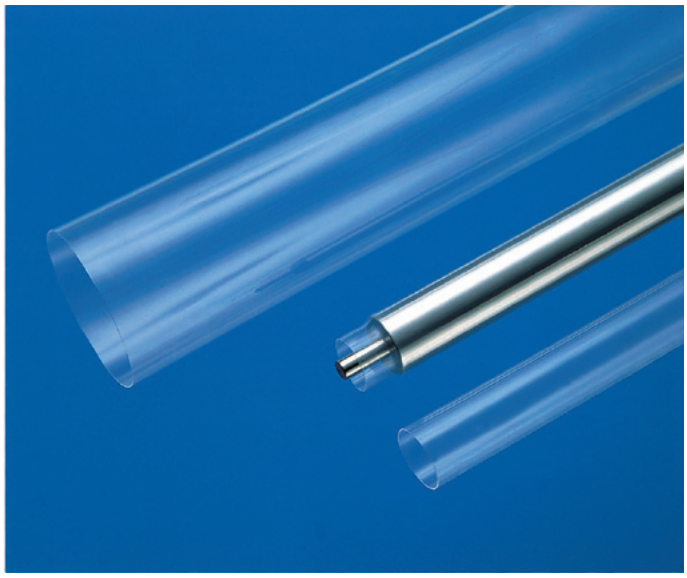
## Standard Dimensions

| Nomina diameter | Nominal Dimension (mm) | Outer Diameter (mm) | | Wall Thickness (mm) | | Length (m) | |
|---|---|---|---|---|---|---|---|
| | Inner Diameter × Outer Diameter | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance | Standard Dimensions | Allowed Variance |
| 1/8 B | 1.59× 3.17 | 3.17 | ±0.10 | 0.79 | ±0.10 | 10<br>20<br>30 | +5%<br>−0% |
| 1/4 B | 3.17× 6.35 | 6.35 | | 1.59 | ±0.15 | | |
| 3/8 B | 6.35× 9.52 | 9.52 | | 1.59 | | | |
| 1/2 B | 9.52×12.70 | 12.70 | ±0.15 | 1.59 | | | |
| 4 A | 2.00× 4.00 | 4.00 | ±0.10 | 1.00 | ±0.10 | 10<br>20<br>30 | +5%<br>−0% |
| 6 A | 3.00× 6.00 | 6.00 | | 1.50 | ±0.15 | | |
| 8 A | 5.00× 8.00 | 8.00 | | 1.50 | | | |
| 10 A | 7.00×10.00 | 10.00 | | 1.50 | | | |
| 12 A | 9.00×12.00 | 12.00 | ±0.15 | 1.50 | | | |

＊Please enquire for information relating to delivery dates and availability.

# NAFLON™ FEP Shrinkable Tubing

The NAFLON FEP shrinkable Tubing decrease in diameter when heated to temperatures between 100˚C and 200˚C. When rolls are covered with these tubing, chemical resistance, anti-adhesiveness, and electrical insulating properties can be added to the rolls using the heat-shrinkage process.
These tubing can coat even a relatively small diameter material with sufficient clearance.



## Features

- Theses tubing can be easily processed in the field using a hot air gun.

## Specifications

- The shrinkage percentage in the radial direction is approximately 24%, and the extension percentage in the long direction is approximately 7% (at a temperature of 150°C).

## Shrinking method

- Cover the object with a tube and heat evenly with hot air. Shrinkable with hot air at 100°C～200°C.

## Standard Dimensions

| Nominal Dimension (mm) | TOMBO No. | Coatable outer diameter range (mm) | Minimum inner diameter before shrinkage (mm) | Wall thickness after shrinkage (mm) | Standard length (mm) | | Special oder length | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Standard Dimensions | Allowed Variance | MIN (mm) | MAX (mm) |
| 10F | 9051 | 9.3～ 11.5 | 11.6 | 0.3 | 1,000 | +50<br>0 | 500 | 3,000 |
| 12F | 9051 | 11.5～ 14.5 | 14.6 | 0.4 | | | | |
| 15F | 9051 | 14.5～ 19.0 | 19.1 | 0.4 | | | | |
| 20F | 9051 | 18.0～ 24.0 | 24.1 | 0.5 | | | | |
| 25F | 9051 | 23.0～ 28.0 | 28.1 | 0.5 | | | | |
| 30F | 9051 | 28.0～ 35.0 | 35.1 | 0.5 | | | | |
| 40F | 9051 | 35.0～ 45.0 | 45.1 | 0.5 | | | | |
| 50F | 9051 | 44.0～ 54.0 | 54.1 | 0.5 | | | | |
| 60F | 9051 | 54.0～ 66.0 | 66.1 | 0.5 | | | | |
| 70F | 9051 | 65.0～ 78.0 | 78.1 | 0.5 | | | | |
| 85F | 9051 | 78.0～ 90.0 | 90.1 | 0.5 | | | | |
| 100F | 9051 | 90.0～103.0 | 103.1 | 0.5 | | | | |

## Caution

- Since there is a possibility of natural shrinkage, please keep these tubing in a cool place (30°C or lower).
- Please note that these tubing may melt with overheating at high temperature.

# NAFLON™ RPL Tubing

In addition to the features of our NAFLON PTFE Tubing, NAFLON RPL Tubing has a spiral-shaped groove. This provides excellent flexibility, a small bending radius, low friction, and non-adhesivity. It also allows minimum loss of fluid from pressure and minimum attachment of fluid on the inner walls.

## Features

- Excellent flexibility

## Specifications

- Material: PTFE
- Service temperature range: −40°C～200°C
- Maximum usage pressure: Please refer to page 18.

## Standard sizes/properties

| Nomina diameter | Standard inside diameter tubing (I) | | | | | Standard outside diameter tubing (O) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inside diameter of ends (mm) | Outside diameter of spiral part (mm) | Destructive pressure at ambient temp (MPa) | Minimum bending radius (mm) | Maximum length available (m) | Inside diameter of ends (mm) | Outside diameter of spiral part (mm) | | Destructive pressure at ambient temp (MPa) | | Minimum bending radius (mm) | | Maximum length available (m) |
| | | | | | | | A,B Type | C Type | A,B Type | C Type | A,B Type | C Type | |
| 6A | 6 | 8.5 | 1.8 | 6.0 | 3.0 | 6 | 8.5 | | 1.8 | | 6.0 | | 3.0 |
| 8A | 8 | 10.5 | 1.4 | 7.0 | 3.0 | 8 | 9.5 | 10.5 | 1.6 | 1.4 | 7.0 | | 3.0 |
| 10A | 10 | 13.0 | 1.0 | 10.0 | 3.0 | 10 | 12.0 | 13.0 | 1.3 | 1.0 | 9.0 | 10.0 | 3.0 |
| 12A | 12 | 16.0 | 0.9 | 15.0 | 3.0 | 12 | 14.5 | 16.0 | 1.0 | 0.9 | 10.0 | 15.0 | 3.0 |
| 15A (1) | 16 | 17.5 | 0.8 | 25.0 | 3.0 | — | — | | — | | — | | — |
| 1/4B | 6.4 | 8.5 | 1.8 | 6.0 | 3.0 | 6.4 | 8.5 | | 1.8 | | 6.0 | | 3.0 |
| 3/8B | 9.5 | 13.0 | 1.0 | 10.0 | 3.0 | 9.5 | 12.0 | 13.0 | 1.3 | 1.0 | 9.0 | 10.0 | 3.0 |
| 1/2B | 12.7 | 16.0 | 0.9 | 15.0 | 3.0 | 12.7 | 14.5 | 16.0 | 1.0 | 0.9 | 10.0 | 15.0 | 3.0 |

Measured by NICHIAS Corporation

Notes: (1) Edge shape type A is the standard for 15A.

* The above dimensions are standard values. Please contact us separately about lengths greater than 3m.
* The values given above are intended as representative values, not standard values.
* Please consult us if you want to use them in applications involving repeated expansion or contraction and flexing.

## Types

End sizes come in two types, an inner-diameter standard (I), and an outer-diameter standard (O), according to the application.

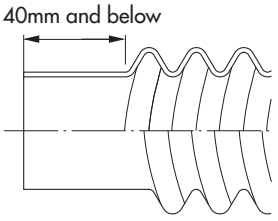
- Inner diameter standard tubing (I)

These tubing can be connected with pipes inside the tubing. These tubing can be connected with glass, metal and resin pipes

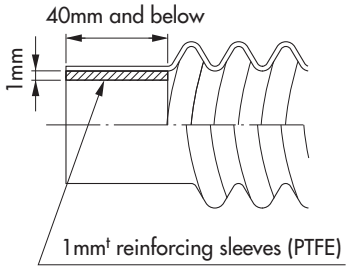
- Outer diameter standard tubing (I)

There tubing are suitable when using tubing joints. As for the end shapes, three types of structures are available according to the application. Please use Types B or C when using fluoropolymer tubing joints.

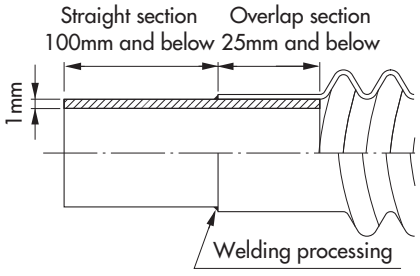
### A Type
Straight at both ends




### B Type
Reinforcing sleeves at both ends



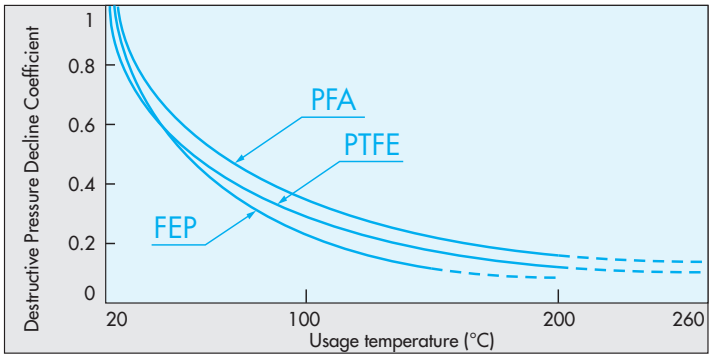

### C Type
Straight welded at both ends



# Maximum Usage Pressure

## Destructive Pressure Decline Coefficient

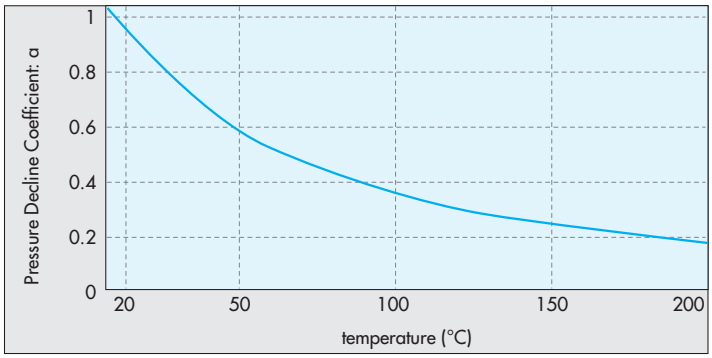
NAFLON PFA/FEP/PTFE Tubing




Measured by NICHIAS Corporationn

＊The values given above are intended as representative values, not standard values.

NAFLON RPL Tubing




Measured by NICHIAS Corporatio

## Please only use our tubing at pressures below PU.T as determined by the following formula:

$P_{U.T} = S \times \alpha \times P_{R.T}$

- $P_{R.T}$: Tubing room temperature destructive pressure
- $\alpha$: Destructive pressure decline coefficient
  ＊The destructive pressure decline coefficient by material can be obtained from the table to the right.
- $S$: Safety factor (1/3–1/5)
  ＊A safety factor of 1/3–1/5 is obtained according to the fluid types (gas or liquid), danger level and the existence of impact pressure levels.
- $P_{U.T}$: Maximum usage pressure at a given temperature.

# Precautions for handling fluoropolymer products

## ⚠ DANGER

- Never allow the product to come into direct contact with body tissues or fluids.
- Never  administer (including by mistake) to humans.

## ⚠ CAUTION

- Do not use any product for any purpose other than those described in the catalog and specification.
- For disposal, follow local regulations.

## Handling precautions

**Please note the following points in order to maintain the original function of the product.**

- Use products within the service temperature range specified in the catalogue.
- In cases when using or processing the product at above the maximum service temperature, fluorinated gas will be generated. The room must be adequately ventilated so as to prevent inhalation of gas.
- Do not bring the product close to open flame or weld. It may cause damage to the product or cause leakage.

**Please note the following points in order to maintain the original function of the product.**

- Technical data given in this catalogue (to show the performance of the product) are all actual values measured in experiments or representative values; they are not guaranteed values. Please carefully consider in advance the suitability of the product for your intended purpose.
- Especially careful consideration is required when using acid, alkali, or other poisonous fluids. Please contact our technical staff for advice.
- Because of the nature of the materials, repeated loading, highly concentrated loading, or bending loading could affect the durability of the product. Always check the usage environment in advance.
- Fluoropolymer is self-lubricating by nature, but does become worn after some time. Periodical replacement is recommended for the parts where much friction is observed.
- Due to the nature of fluoropolymer, curing and change in size could occur or fluid could penetrate the fluoropolymer depending on the usage environment, which may not comply with the general specifications. Always check the usage environment in advance.

If you are unsure about any other issues, please contact our sales or technical staff for advice.

Using this product as part of a heat exchanger and exporting it may infringe upon security export controls.
Please contact us for advice.

E20 Issued in Mar. 2020

# NICHIAS Corporation


## Head Office

6-1, Hatchobori 1-chome, Chuo-ku, Tokyo 104-8555, Japan
**International Marketing and Sales Group**
Phone: 81-3-4413-1132 Fax: 81-3-3552-6108
Web Site: https://www.nichias.co.jp/

## Overseas Sales Companies

**Indonesia**
**PT. NICHIAS SUNIJAYA**
Panin Life Center, 2nd Floor, Room 205, Jl. Letnan Jenderal S. Parman Kav. 91, Jakarta 11420, Indonesia
Phone: +62-21-56956207 Fax: +62-21-56956208/56956209

**Malaysia**
**NICHIAS SOUTHEAST ASIA SDN. BHD.**
Suite A1102, 11th Floor, West Wing, Wisma Consplant 2,
No. 7, Jalan SS 16/1, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia.
Phone: +60-3-5636-4067 Fax: +60-3-5636-4078

**Singapore**
**NICHIAS SINGAPORE PTE. LTD.**
25 International Business Park, #01-15/17 German Centre,
Singapore 609916
Phone: +65-6571-0830/0838 Fax: +65-6265-7681

**Vietnam**
**NICHIAS VIETNAM CO., LTD**
Room 12-K, 12Floor, Center Building,
Hapulico Complex No1 Nguyen Huy Tuong,
Thanh Xuan Trung, Thanh Xuan, Hanoi, Vietnam
Phone: + 84-4-3791-7194 Fax: + 84-4-3791-6203

**Thailand**
**NICHIAS (THAILAND) CO., LTD.**
85 Moo 1, Wellgrow Industrial Estate T. Homsin, A. Bangpakong
Chachoengsao 24180, Thailand
Phone: +66-38-570-600 Fax: +66-38-570-601

**THAI NICHIAS INTERNATIONAL CO., LTD.**
Unit 1107, 11th Floor, AIA Capital Center
89 Ratchadaphisek Road, Dindaeng, Dindaeng, Bangkok 10400 Thailand
Phone: +66-2-001-2060 Fax: +66-2-001-2062

**China**
**NICHIAS (SHANGHAI) TRADING CO., LTD.**
霓佳斯（上海）贸易有限公司
Room 1701, THE PLACE, Tower A, No. 100 Zun Yi Road,
Changning District, Shanghai, P.R.China Postcode 200051
中国上海市长宁区遵义路100号虹桥南丰城A栋1701室 邮编200051
Phone: +86-21-6236-1783 Fax: +86-21-6236-1781

**NICHIAS (SHANGHAI) TRADING CO., LTD. Guangzhou Branch**
霓佳斯（上海）贸易有限公司 广州分公司
17F-G, Gold Sun Building, No.109 Tiyu West Road, Guangzhou,
Guang Dong Province, 510620, P.R.China
中国广东省广州市天河区体育西路109号高盛大厦17楼G室 邮编 510620
Phone: +86-20-3879-1640 Fax: +86-20-3879-1647

**NICHIAS (SHANGHAI) AUTOPARTS TRADING CO., LTD.**
霓佳斯（上海）汽车零部 贸易有限公司
Room 1702, THE PLACE, Tower A, No. 100 Zun Yi Road,
Changning District, Shanghai, P.R.China Postcode 200051
中国上海市长宁区遵义路100号虹桥南丰城A栋1702室 邮编200051
Phone: +86-21-6236-2668 Fax: +86-21-6236-2667

**Germany**
**NICHIAS AUTOPARTS EUROPE GmbH**
Prinzenallee 7, 40549 Düsseldorf, Germany
Phone: +49 (0)211-52391-058 Fax: +49 (0)211-52391-200

## Overseas Construction Companies

**Malaysia**
**NICHIAS SOUTHEAST ASIA SDN. BHD.**
Suite A1102, 11th Floor, West Wing, Wisma Consplant 2,
No. 7, Jalan SS 16/1, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia.
Phone: +60-3-5636-4067 Fax: +60-3-5636-4078

**Thailand**
**THAI-NICHIAS ENGINEERING CO., LTD.**
45 Huaypong-Nongbon Road, Huaypong, Muang Rayong,
Rayong Province 21150, Thailand
Phone: +66-38-682-242 Fax: +66-38-691-156

## Overseas Factories

**Indonesia**
**PT. NICHIAS ROCKWOOL INDONESIA**
**PT. NICHIAS METALWORKS INDONESIA**

**Malaysia**
**NICHIAS FGS SDN. BHD.**
**NT RUBBER-SEALS SDN. BHD.**

**Vietnam**
**NICHIAS HAIPHONG CO., LTD.**

**China**
**SUZHOU NICHIAS INDUSTRIAL PRODUCTS CO., LTD.**
(苏州霓佳斯工业制品有限公司)
**SUZHOU NICHIAS SEAL MATERIAL CO., LTD.**
(苏州霓佳斯密封材料有限公司)
**SHANGHAI XINGSHENG GASKET CO., LTD.**
(上海兴盛密封垫有限公司)
**SUZHOU SHUANGYOU AUTOPARTS CO., LTD.**
(蘇州双友汽车零部件有限公司)

**India**
**NICHIAS INDUSTRIAL PRODUCTS PRIVATE LTD.**

**Czech**
**NICHIAS AUTOPARTS EUROPE a.s.**

**Mexico**
**NAX MFG, S.A.DE C.V.**