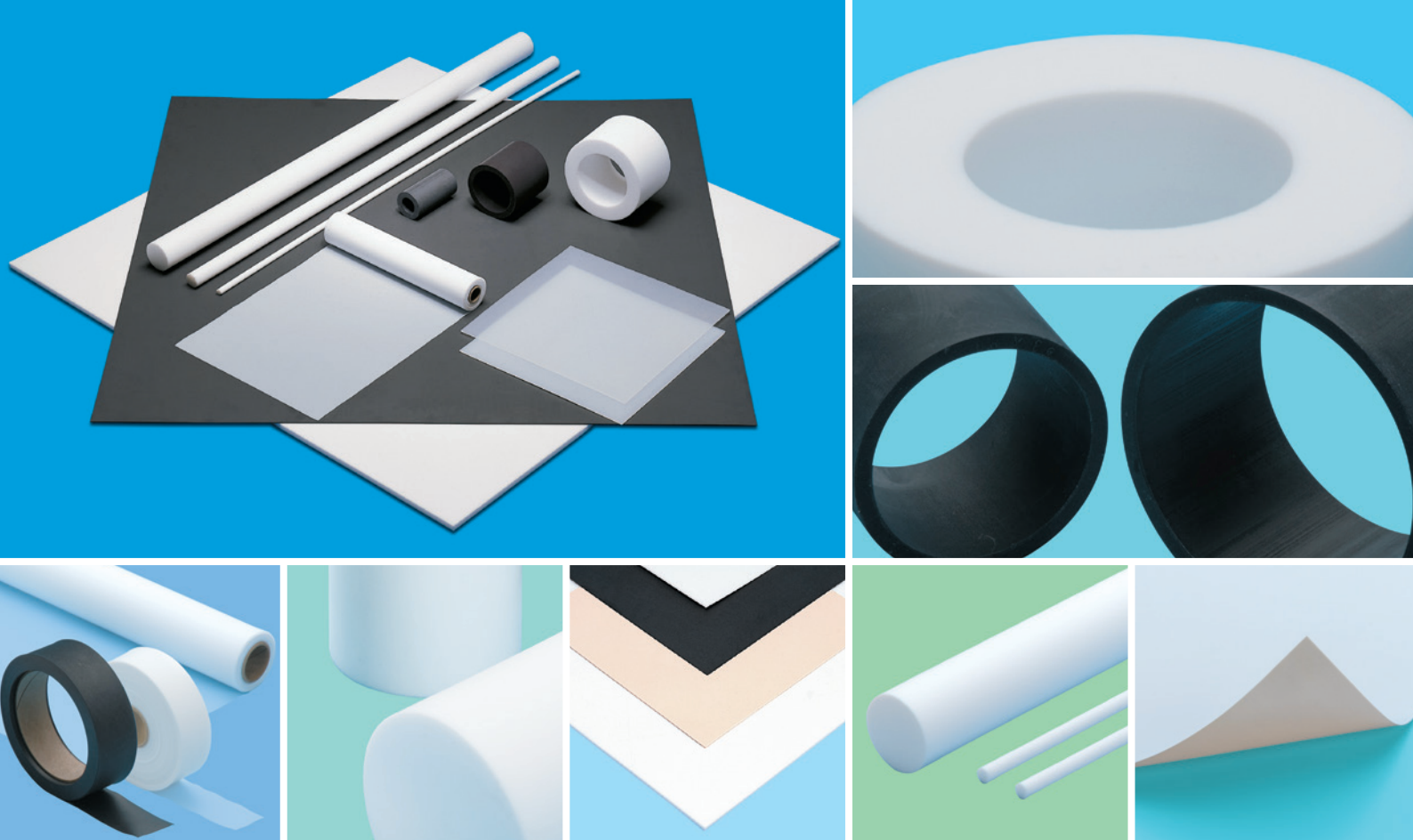


# TOMBO™ BRAND

Mar. 2025

PTFE / PFA / PCTFE

## NAFLON™ Materials



NICHIAS' Fluoropolymer Products

# NAFLON™ Materials

PTFE / PFA / PCTFE

## NAFLON™

NICHIAS'

**fluoropolymer  
products**

have various  
excellent properties.

Chemical  
resistance

Purity

Thanks to the stable molecular structure of our products, they are practically resistant against almost all chemicals.

Heat  
resistance

Thanks to the strong intermolecular binding force of our products, they can withstand low to high temperatures.

Electrical  
insulation

Dielectric  
properties

Our fluoropolymer products are poor conductors of electricity and are not adversely affected by high frequencies. As a result, they are highly effective as insulation materials.

Non-adhesive

As our fluoropolymer products possess water-resistant properties, they do not stick or adhere.

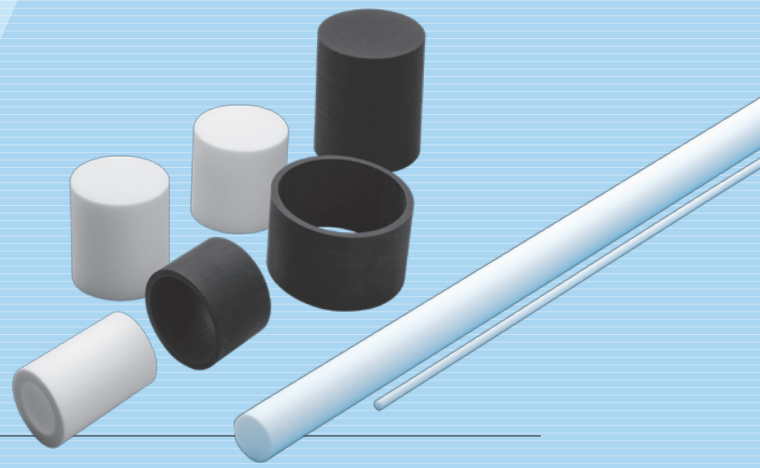
Low friction  
coefficient

As our fluoropolymer products have the lowest dynamic friction coefficient among all solids, they have a slipperiness that is unparalleled by other resins.

Weather  
resistance

Flame retardant  
properties

As our fluoropolymer products are not affected by ultraviolet rays and water absorption, their physical properties do not deteriorate even after many years of exposure.



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## Key Names and Terms Used in This Catalog

The marks and abbreviations used in this catalog are as follows.

**TOMBO** TOMBO is a trademark or registered trademark of NICHIAS Corporation.

**NAFLON** NAFLON is a trademark or registered trademark of NICHIAS Corporation.

### Fluororesin

Official name: **polytetrafluoroethylene** (PTFE)

It is a thermoplastic resin that offers the best performance among fluororesins and is widely used in various industries.

Official name: **tetrafluoroethylene-perfluoroalkoxy ethylene copolymer** (PFA)

It offers the same performance as PTFE and can be molded (injection molding, etc.) in the same way as general thermoplastic resins.

Official name: **polychlorotrifluoroethylene** (PCTFE)



It has magnificent mechanical strength and excellent transparency, cryogenicity, gas permeability, and radiation resistance.

\*For information on fluororesin tubes, refer to our 'NAFLON Tubes' catalog.

# Precautions for handling fluoropolymer products

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## **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.

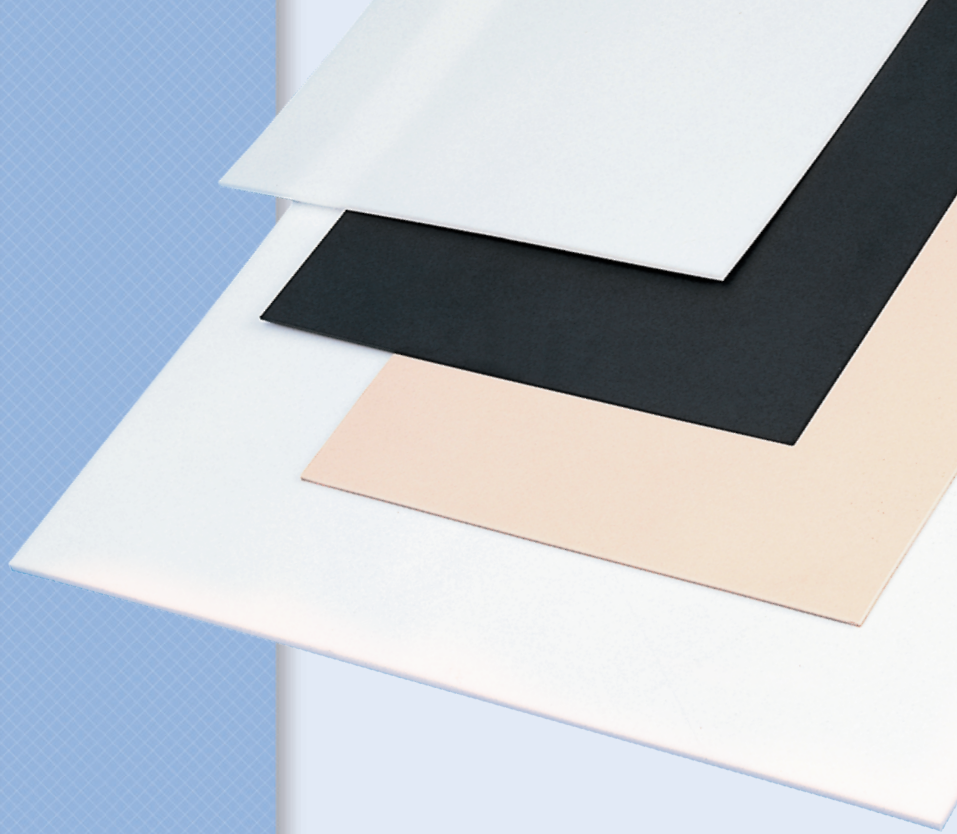
Please note the following points in order to maintain the original function of the product.

- 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.

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



NAFLON™ Sheet

# SHEET

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NAFLON™ PTFE Sheet ——— P4  
Pure PTFE

NAFLON™ PTFE Sheet ——— P5  
PTFE with filler

NAFLON™ PFA Sheet ——— P6

NAFLON™ PCTFE Sheet ——— P6

# NAFLON™ PTFE Sheet

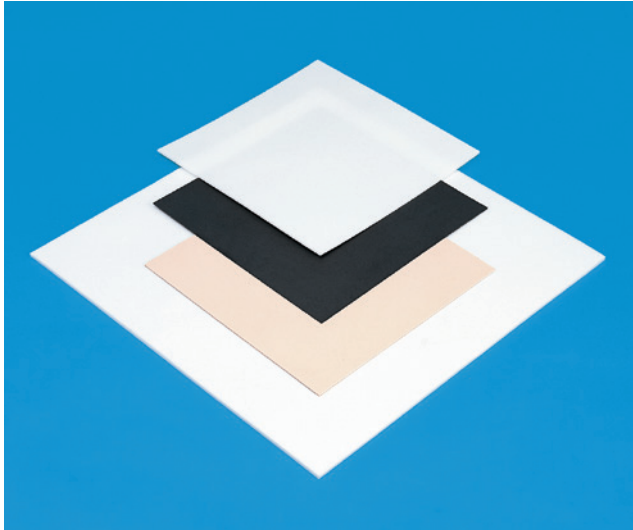
The NAFLON PTFE sheet is a versatile material made by compression molding a single-substance PTFE or a powdered raw PTFE material in

Pure  
PTFE

TOMBO™ No.9000 / TOMBO™ No.9000-S

It is a sheet material that combines the excellent chemical stability, electrical properties, and low friction coefficient of fluororesin.

Sheet



## Application

NAFLON PTFE sheets are widely used in gaskets, electrical insulation materials, mechanical parts, etc. due to fluororesin's excellent chemical stability, electrical properties, and low friction coefficient. If you require wear resistance and compression strength, use the sheet with filler.

## Type

Product color

TOMBO No.9000  
NAFLON PTFE Sheet **Stamped**  
Formed by compression molding

(White)



TOMBO No.9000-S  
NAFLON PTFE Sheet **Cut**  
Formed by cutting

(White)



\*The product color is an impression for illustrative purposes.

## Standard Dimensions

\*The standard dimensions are subject to change without notice.  
Please make sure to check the standard dimensions before ordering.

Unit: [mm]

NAFLON PTFE Sheet <b>Stamped</b>		TOMBO No.9000	
Thickness		Vertical × horizontal	
Dimensions	Tolerance	Dimensions	Tolerance
7	+0.8 -0	300 × 300 500 × 500 1000 × 1000 1220 × 1220	+10 -0
8			
10	+1.0 -0		
12			
15			
18	+1.2 -0		
20			
22	+1.4 -0		
25			
30			
35	+1.8 -0		
40			
45	+2.0 -0		
50			
60			
70	+2.5 -0		
80			

\*Products with dimensions other than those indicated above are available.  
If you are interested, please contact us.

Unit: [mm]

NAFLON PTFE Sheet <b>Cut</b>		TOMBO No.9000-S	
Thickness		Vertical × horizontal	
Dimensions	Tolerance	Dimensions	Tolerance
1	+0.10 -0.05	300 × 300 500 × 500 1000 × 1000 1220 × 1220	+10 -0
1.5			
2			
3	+0.20 -0.05		( 300 × 300 ) ( 500 × 500 )
4			
5			
6	+0.30 -0.10	( 1000 × 1000 ) ( 1220 × 1220 )	

\*The sizes above are for products we stock as standard.

\*For products with a thickness of 3 mm or less, we can manufacture a longer version of the product. If you are interested, please contact us.

which various inorganic fillers are mixed with the PTFE.

## PTFE with filler

### TOMBO™ No.9000-G, -GR, -GMo, -GGR, -BR, -CF, -LC, -SC / TOMBO™ No.9000-S-G20









It is a sheet material that offers improved wear resistance, creep resistance, thermal conductivity, and thermal dimensional stability by blending various inorganic fillers with PTFE.

## Application

It has improved wear resistance, creep resistance, thermal conductivity, and thermal dimensional stability, making it perfect for use with mechanical parts that require heat resistance and wear resistance.

\*Depending on the usage atmosphere (type of chemical solution, etc.), some grades cannot be used. If you have any questions, please contact us.

## Type

	Product color
TOMBO No.9000 - G15, G20, G25 TOMBO No.9000 - S - G20 <b>Glass fiber (15%, 20%, 25%)</b>	(White) 
TOMBO No.9000 - GR15, GR30 <b>Graphite (15%, 30%)</b>	(Black) 
TOMBO No.9000 - GMo <b>Glass fiber (15%) + molybdenum disulfide (5%)</b>	(Black) 
TOMBO No.9000 - GGR <b>Glass fiber (20%) + graphite (5%)</b>	(Black) 
TOMBO No.9000 - BR <b>Bronze (60%)</b>	(Brown) 
TOMBO No.9000 - CF10, CF15 <b>Carbon fiber (10%, 15%)</b>	(Black) 
TOMBO No.9000 - LC <b>Special filler</b>	(Reddish brown) 
TOMBO No.9000 - SC <b>Special carbon</b>	(Black) 

\*For the properties of the filler, see "Types and Properties of Fillers" on page 18.

\*The product color is an impression for illustrative purposes.

\*The color tone of TOMBO No. 9000-LC may vary.

## Standard Dimensions

\*The standard dimensions are subject to change without notice. Please make sure to check the standard dimensions before ordering.

Unit: [mm]

NAFLON PTFE Sheet with filler <b>Stamped</b> TOMBO No.9000 - G, GR, GMo, GGR, BR, CF			
Thickness		Vertical × horizontal	
Dimensions	Tolerance	Dimensions	Tolerance
4	+0.65 -0	300 × 300 500 × 500 1000 × 1000	+10 -0
5	+0.85 -0		
6			
7			
8	+1.10 -0		
9			
10	+1.4 -0		
12			
15	+1.8 -0		
20	+2.5 -0		
25			
30	+3.0 -0		
35			
40	+4.0 -0		
50	+5.0 -0		

\*The sizes above are made to order.

Unit: [mm]

NAFLON PTFE Sheet with glass fiber <b>Cut</b> TOMBO No.9000 - S - G20			
Thickness		Vertical × horizontal	
Dimensions	Tolerance	Dimensions	Tolerance
1	+0.10 -0.05	300 × 300 500 × 500 1000 × 1000 1220 × 1220	+10 -0
1.5			
2			
3	+0.20 -0.10		
4	+0.45 -0.20		
5	+0.55 -0.30		
6			

\*The sizes above are made to order.

Unit: [mm]

NAFLON PTFE Sheet with special carbon TOMBO No.9000 - SC			
Thickness		Vertical × horizontal	
Dimensions	Tolerance	Dimensions	Tolerance
1.5	+0.30 -0.15	1220 × 1220	+15 -0
2			
3	+0.40 -0.20		

\*The sizes above are for products we stock as standard.

Unit: [mm]

NAFLON PTFE Sheet with special filler TOMBO No.9000 - LC			
Thickness		Vertical × horizontal	
Dimensions	Tolerance	Dimensions	Tolerance
1.5	+0.20 -0.10	1220 × 1220	+15 -0
2			
3	+0.25 -0.15		

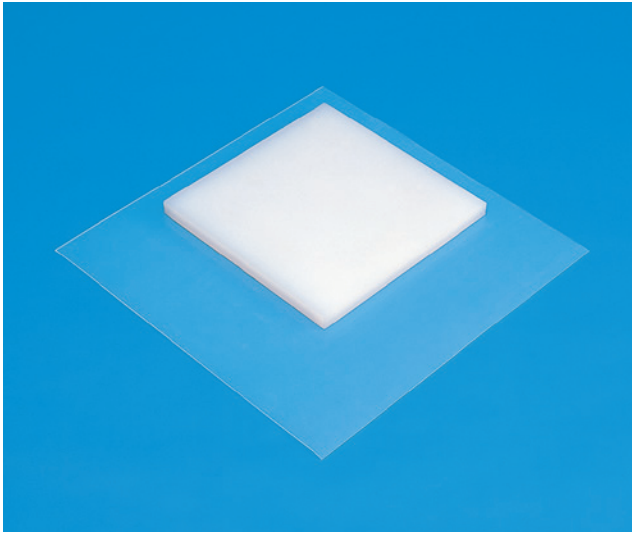
\*The sizes above are for products we stock as standard.

# NAFLON™ PFA Sheet

It is a PFA sheet formed by compression molding.

TOMBO™ No.9000-PFA

Sheet



## Application

It is a PFA sheet formed by compression molding.

## Standard Dimensions

\*The standard dimensions are subject to change without notice.  
Please make sure to check the standard dimensions before ordering.

Unit: [mm]

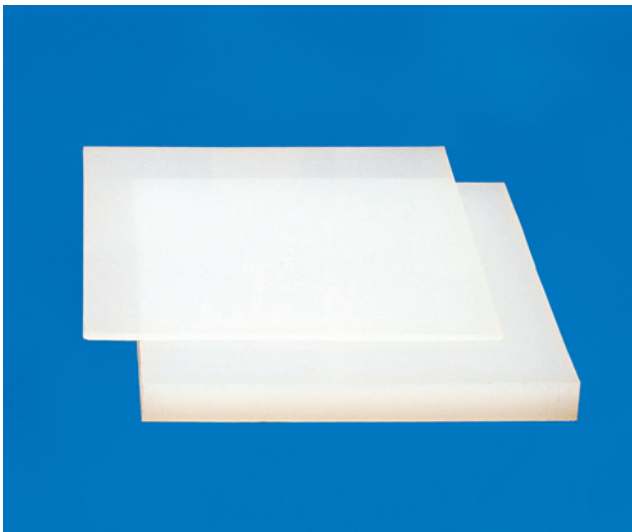
NAFLON PFA Sheet		TOMBO No.9000-PFA
Vertical × Horizontal	Thickness	
200 × 200	5, 8, 10, 12, 15, 20, 25, 30, 35, 40	
300 × 300	5, 8, 10, 12, 15, 20, 25, 30, 35, 40, 45	
500 × 500	5, 8, 10, 12, 15, 20, 25, 30, 40	

\*Please contact us for other available thicknesses.

# NAFLON™ PCTFE Sheet

It is a PCTFE sheet formed by compression molding.

TOMBO™ No.9000-PCTFE



## Application

It can be used as a processing material for various chemical and electrical equipment parts, not to mention gaskets and packings of a whole host of different shapes.

## Standard Dimensions

\*The standard dimensions are subject to change without notice.  
Please make sure to check the standard dimensions before ordering.

Unit: [mm]

NAFLON PCTFE Sheet		TOMBO No.9000-PCTFE
Vertical × Horizontal	Thickness	
200 × 200	5, 8, 10, 12, 15, 20, 25, 30, 35, 40	
300 × 300	5, 8, 10, 12, 15, 20, 25, 30, 35, 40, 45	
500 × 500	5, 8, 10, 12, 15, 20, 25, 30, 35, 40	

\*Please contact us for other available thicknesses.





NAFLON™ Tape

# TAPE

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NAFLON™ PTFE Tape ————— P8  
Pure PTFE

NAFLON™ PTFE Tape ————— P9  
PTFE with filler

NAFLON™ PTFE Cementable Tape P10

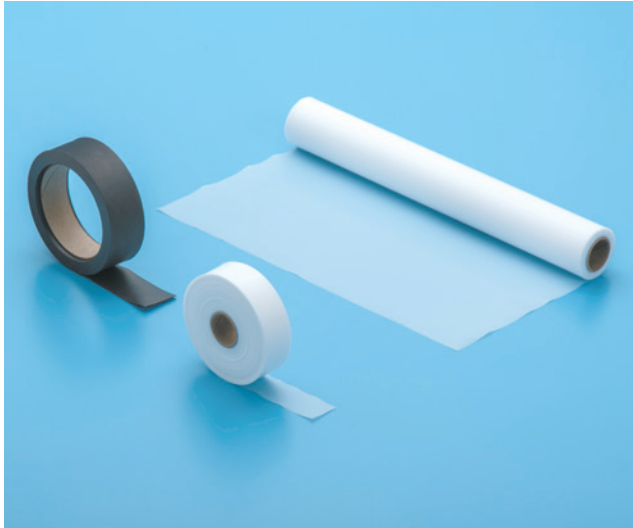
# NAFLON™ PTFE Tape

It is a thin PTFE tape that is cut to a specified thickness from a cylindrical PTFE forming block.

Pure  
PTFE

TOMBO™ No.9001

It is a tape that combines PTFE's excellent electrical properties, non-adhesiveness, and low friction coefficient.



Tape

## Application

It is used for motors that use high-temperature and corrosive gases, insulation materials for generators, coil winding insulation, slot insulation, mold release materials for the molding of various plastics, and the lining of hoppers.

## Type

TOMBO No.9001  
NAFLON PTFE Tape

Product color

(White)



\*The product color is an impression for illustrative purposes.

## Standard Dimensions

\*The standard dimensions are subject to change without notice.  
Please make sure to check the standard dimensions before ordering.

Unit: [mm]

NAFLON PTFE Tape				TOMBO No.9001		
Thickness		Maximum width		Length		
Dimensions	Tolerance	Dimensions	Tolerance	Minimum length/ roll [MT]	Maximum length/ roll [MT]	Tolerance
▶ 0.05	±0.01	500	±3.0	10	100	+2% -0%
▷ 0.08						
▶ 0.10						
▷ 0.13						
▷ 0.15						
0.18						
▶ 0.20						
0.25						
▶ 0.30						
▶ 0.40	±0.03					
▶ 0.50	±0.04	50				
▶ 0.80	±0.07	30				
▶ 1.00	±0.08	10				
1.50	±0.12	1	5			
2.00						
3.00						

\*▶: 300 w × 10 MT products and 500 w × 10 MT products are in stock as standard.

\*▷: 300 w × 10 MT products are in stock as standard.

\*No mark: A made-to-order product.

\*With regards to thickness, width, and length, we can manufacture products of dimensions other than those indicated above. If you are interested, please contact us.

## ⚠ Note

● It does not come with adhesive tape.

**PTFE**  
with filler






**TOMBO™ No.9001-G, -GR, -GMO, -GGR, -CF**

It is a tape with improved mechanical and thermal properties such as wear resistance, creep resistance, compressive strength, rigidity, conductivity, and linear expansion coefficient all the while basically keeping the excellent properties of PTFE intact.

**Application**

It is used in applications that require heat resistance, sliding properties, and creep resistance.

**Type**

	Product color
TOMBO No.9001 - G20 Glass fiber (20%)	(White) 
TOMBO No.9001 - GR15 Graphite (15%)	(Black) 
TOMBO No.9001 - GMO Glass fiber (15%) + molybdenum disulfide (5%)	(Black) 
TOMBO No.9001 - GGR Glass fiber (20%) + graphite (5%)	(Black) 
TOMBO No.9001 - CF15 Carbon fiber (15%)	(Black) 

\*For the properties of the filler, see "Types and Properties of Fillers" on page 18.  
\*The product color is an impression for illustrative purposes.

**Standard Dimensions**

\*The standard dimensions are subject to change without notice.  
Please make sure to check the standard dimensions before ordering.

Unit: [mm]

NAFLON PTFE Tape with filler				TOMBO No.9001 - G20	
Thickness		Width		Length	
Dimensions	Tolerance	Dimensions	Tolerance	Dimensions [MT]	Tolerance
0.20	±0.02	100 200	+15 -0	150	+2% -0%
0.30				100	
0.40	±0.03			70	
0.50	±0.04			60	
0.80	±0.07			40	
1.00	±0.08			30	
1.50	±0.12			20	

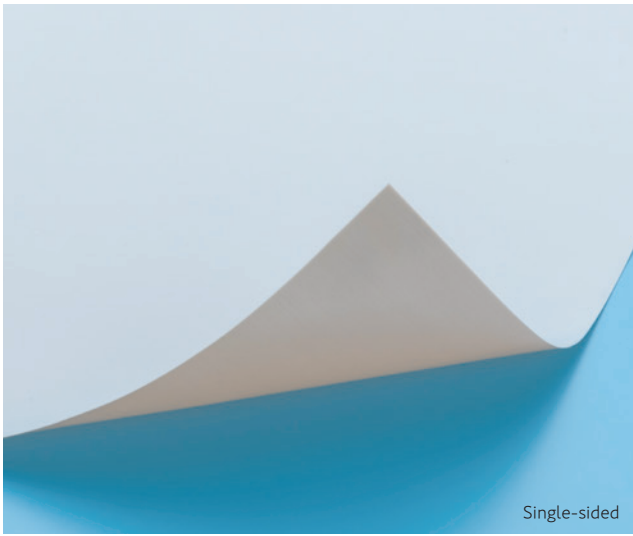
\*Feel free to contact us about other filler materials.

# NAFLON™ PTFE Cementable Tape

It is a cementable NAFLON PTFE tape.

TOMBO™ No.9004





Tape



## Application

It is a cementable NAFLON PTFE tape that can be bonded with an adhesive. We have both double-sided and single-sided NAFLON PTFE cementable tape. Be aware that the bonding effect will diminish when exposed to ultraviolet rays. Please contact us if you have any questions about adhesive NAFLON PTFE cementable tape.

## Type

	Product color	
<b>TOMBO No.9004-K Single-sided NAFLON PTFE Cementable Tape</b>	 Front surface (white)	 Rear surface (light brown)
<b>TOMBO No.9004-R Double-sided NAFLON PTFE Cementable Tape</b>	 Front surface (light brown)	 Rear surface (light brown)

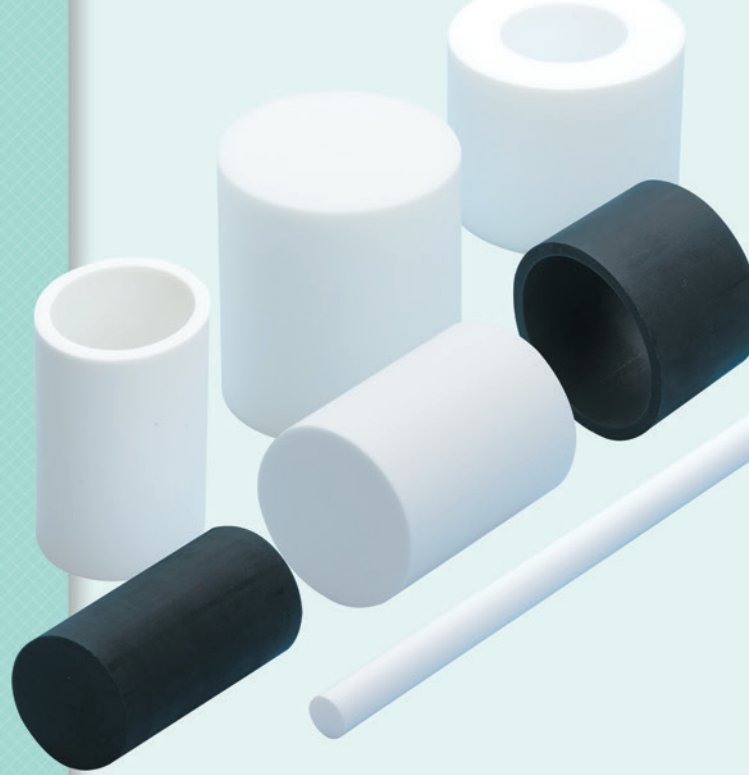
\*The product color is an impression for illustrative purposes.

## Dimensions

Please contact us if you have any questions about dimensions.

## Note

- Rubbing the treated surface with one's hand or exposing it to ultraviolet rays will diminish the bonding effect.
- It is a surface-treated product and does not come with adhesive tape. Please contact us if you have any questions about adhesive NAFLON PTFE cementable tape.
- We also offer cementable PTFE tape with filler. If you are interested in this product, please contact us.
- If you are interested in cementable cutting sheets, please contact us.



NAFLON™ Rod/Pipe

# ROD & PIPE

NAFLON™ PTFE Rod ——— P12  
Pure PTFE

NAFLON™ PTFE Rod ——— P13  
PTFE with filler

NAFLON™ PFA Rod ——— P14

NAFLON™ PCTFE Rod ——— P14

NAFLON™ PTFE Pipe ——— P15  
Pure PTFE  
PTFE with filler

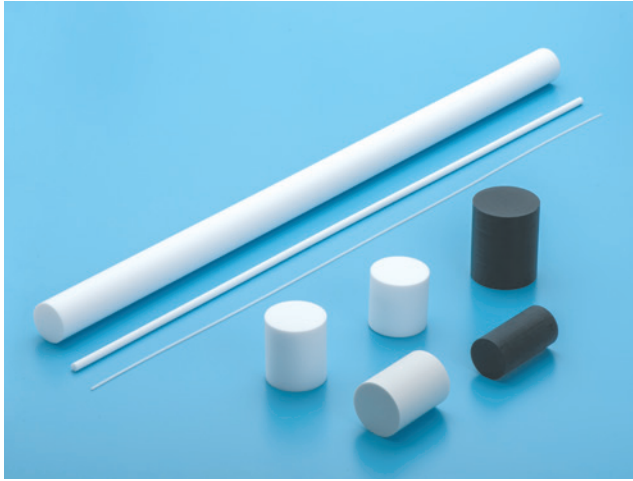
# NAFLON™ PTFE Rod

The NAFLON PTFE rod is a PTFE material made by molding raw PTFE powder to a specified diameter by way of either ram extrusion molding

Pure  
PTFE

TOMBO™ No.9002

It is a rod that combines PTFE's excellent electrical properties, non-adhesiveness, and low friction coefficient.



## Application

It is used in connectors, terminals, other electrical components, stopcocks for laboratory equipment, check valve balls, etc.

## Type

TOMBO No.9002  
NAFLON PTFE Rod



\*The product color is an impression for illustrative purposes.

Rod

## Standard Dimensions

\*The standard dimensions are subject to change without notice. Please make sure to check the standard dimensions before ordering.

Unit: [mm]

NAFLON PTFE Rod		TOMBO No.9002				
Diameter		Length				
Dimensions	Tolerance	Dimensions	Tolerance			
1.0	+0.4 -0	1000	+2.0			
2.0			-0			
3.0			+10 -0			
4.0						
5.0						
6.0						
7.0						
7.3						
7.5						
8.0						
9.0						
10.0	+0.6 -0	1000		+20 -0		
11.0						
12.0						
13.0						
14.0						
15.0						
16.0						
17.0						
18.0						
20.0			+1.0 -0		1000	+20 -0
22.0						
25.0						
30.0						
35.0						
40.0						
45.0						
50.0						
55.0						
60.0	+4.0 -0	150		+5% -0		
65.0						
70.0						
80.0						
90.0						
100.0						
120.0						
150.0						
150.0			+5.0 -0		150	+5% -0
120.0						
150.0						
150.0						
150.0						
150.0						
150.0						
150.0						
150.0						
150.0	+6.0 -0	150		+5% -0		
150.0						
150.0						
150.0						
150.0						
150.0						
150.0						
150.0						
150.0						
150.0			+7.0 -0		150	+5% -0
150.0						
150.0						
150.0						
150.0						
150.0						
150.0						
150.0						
150.0						

\*The sizes above are for products we stock as standard.  
\*With regards to diameter and length, we can manufacture rods of dimensions other than those indicated above. If you are interested, please contact us.

Unit: [mm]

NAFLON PTFE Rod		TOMBO No.9002	
Diameter		Length	
Dimensions	Tolerance	Maximum length	Tolerance
15	+3.0 -0	150	+5% -0
16			
17			
18			
20			
22			
23			
25			
27			
28			
30	+4.0 -0	150	+5% -0
33			
35			
38			
40			
43			
45			
46			
48			
50			
53	+5.0 -0	150	+5% -0
55			
60			
65			
66			
70			
75			
78			
80			
85			
90	+6.0 -0	150	+5% -0
92			
95			
100			
103			
105			
110			
115			
120			
125			
130	+7.0 -0	150	+5% -0
135			
140			
140			
150			
160			
170			
180			
190			
200			
210			

\*With regards to diameter and length, we can manufacture rods of dimensions other than those indicated above. If you are interested, please contact us.

or compression molding. The rod can be cut for use as electrical or mechanical parts.









**PTFE**  
with filler

**TOMBO™ No.9002-G, -GR, -GMO, -GGR, -BR, -CF, -SC, -SCCF**

Abrasion resistance, compressive strength, and dimensional stability are improved by adding various fillers to PTFE.

**Type**

Product color

TOMBO No.9002 - G15, G20, G25 Glass fiber (15%, 20%, 25%)	(White) 
TOMBO No.9002 - GR15, GR30 Graphite (15%, 30%)	(Black) 
TOMBO No.9002 - GMO Glass fiber (15%) + molybdenum disulfide (5%)	(Black) 
TOMBO No.9002 - GGR Glass fiber (20%) + graphite (5%)	(Black) 
TOMBO No.9002 - BR Bronze (60%)	(Brown) 
TOMBO No.9002 - CF10, CF15 Carbon fiber (10%, 15%)	(Black) 
TOMBO No.9002 - SC Special carbon	(Black) 
TOMBO No.9002 - SCCF Special carbon + carbon fiber	(Black) 

\*For the properties of the filler, see "Types and Properties of Fillers" Materials on page 18.  
 \*The product color is an impression for illustrative purposes.  
 \*As TOMBO No. 9002-SCCF contains a large amount of filler, if it is used as a gas sealing material, it may leak depending on the conditions of use. If you have any questions about this matter, please contact us.

**Standard Dimensions**

\*The standard dimensions are subject to change without notice. Please make sure to check the standard dimensions before ordering.

Unit: [mm]

NAFLON PTFE Rod with filler			
TOMBO No.9002-G, GR, GMO, GGR, BR, CF, SC, SCCF			
Diameter		Length	
Dimensions	Tolerance	Maximum length	Tolerance
15	+3.0 -0	150	+5% -0%
16			
17			
18			
20			
22			
23			
25			
27			
28			
30			
33			
35			
38			
40			
43	+4.0 -0	150	+5% -0%
45			
46			
48			
50			
53			
55			
60			
65			
66			
70			
75	+5.0 -0	150	+5% -0%
78			
80			
85			
90			
92			
95			
100			
103			
105			
110	+6.0 -0	150	+5% -0%
115			
120			
125			
130			
135			
140			
150			
160			
170			
180			

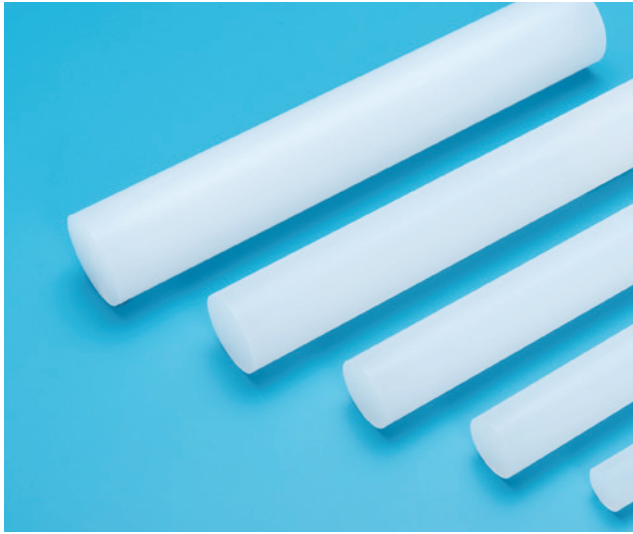
\*For the property values of NAFLON with filler, refer to "Properties of PTFE with Filler" on pages 16-18.  
 \*With regards to diameter and length, we can manufacture rods of dimensions other than those indicated above. If you are interested, please contact us.  
 \*Feel free to contact us about other filler materials.

Rod

# NAFLON™ PFA Rod

It is a PFA rod formed by compression molding.

TOMBO™ No.9002-PFA



## Application

It can be used as a material for cutting and welding.

## Standard Dimensions

\*The standard dimensions are subject to change without notice.  
Please make sure to check the standard dimensions before ordering.

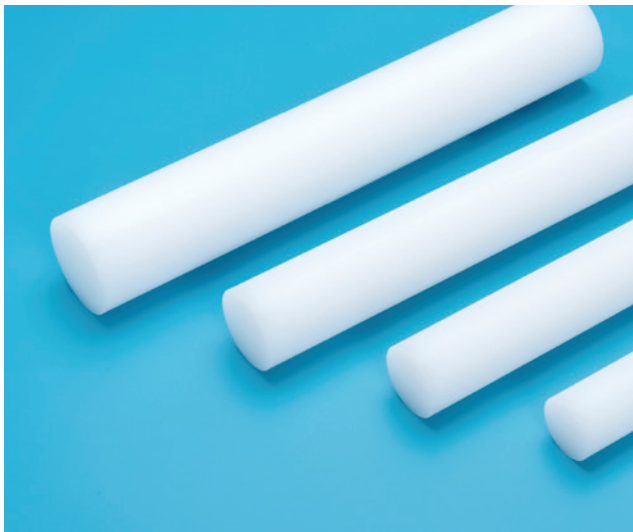
Unit: [mm]

NAFLON PFA Rod		TOMBO No.9002-PFA
Length	Diameter	
250	12, 15	
300	40, 45, 50	

# NAFLON™ PCTFE Rod

It is a PCTFE rod formed by compression molding.

TOMBO™ No.9002-PCTFE



## Application

Taking advantage of its dimensional stability at low temperatures, it is used for packing and so on in low temperature environments. It is a material that is easy to machine thanks to its excellent mechanical strength.

## Standard Dimensions

\*The standard dimensions are subject to change without notice.  
Please make sure to check the standard dimensions before ordering.

Unit: [mm]

NAFLON PCTFE Rod		TOMBO No.9002-PCTFE
Length	Diameter	
300	40, 45, 50	



# NAFLON™ PTFE Pipe

Pure  
PTFE

TOMBO™ No.9008

It is a thick-walled pipe material that is formed into a cylindrical shape by way of compression molding.



## Application

NAFLON PTFE pipe can be widely used for the likes of valve seats, V-packings, no-lubrication bearings of machine parts, gaskets, and packings, which are cut and require chemical resistance.

## Standard Dimensions

\*The standard dimensions are subject to change without notice.  
Please make sure to check the standard dimensions before ordering.

Unit: [mm]

NAFLON PTFE Pipe		TOMBO™ No.9008
Length	Outer diameter	
100	20 to 1115	

\*If you inform us of the final product, we will select the optimum material dimensions for you.

\*Please contact us if you have any questions about the length.

Pipe

PTFE  
with filler









TOMBO™ No.9008-G, -GR, -GMO, -GGR, -BR, -CF, -SC, -SCCF

Abrasion resistance, compressive strength, and dimensional stability are improved by adding various fillers to PTFE.

## Application

It can be used for processing materials for applications that require wear resistance and compression resistance, such as various bearings, piston rings, and seal rings.

## Type

	Product color		Product color
<p>TOMBO No.9008 - G15, G20, G25 <b>Glass fiber (15%, 20%, 25%)</b> Packings, bearings, piston rings, mechanical parts, electrical insulators, etc.</p>	(White) 	<p>TOMBO No.9008 - BR <b>Bronze (60%)</b> High-speed bearings, mechanical parts, etc.</p>	(Brown) 
<p>TOMBO No.9008 - GR15, GR30 <b>Graphite (15%, 30%)</b> Bearings, piston rings, mechanical seals</p>	(Black) 	<p>TOMBO No.9008 - CF10, CF15 <b>Carbon fiber (10%, 15%)</b> Valve seats, valve disks, bearings, etc.</p>	(Black) 
<p>TOMBO No.9008 - GMO <b>Glass fiber (15%) + molybdenum disulfide (5%)</b> Bearings, etc.</p>	(Black) 	<p>TOMBO No.9008 - SC <b>Special carbon</b> Gaskets, valve discs, valve seats, mechanical parts (for hydrofluoric acid applications), etc.</p>	(Black) 
<p>TOMBO No.9008 - GGR <b>Glass fiber (20%) + graphite (5%)</b> No-lubrication bearings, piston rings, valve seats, etc.</p>	(Black) 	<p>TOMBO No.9008 - SCCF <b>Special carbon + carbon fiber</b> Valve seats, valve disks, etc.</p>	(Black) 

\*Feel free to contact us about other filler materials.

\*If you have any questions about dimensions, please contact us.

\*The product color is an impression for illustrative purposes.

\*As TOMBO No. 9008-SCCF contains a large amount of filler, if it is used as a gas sealing material, it may leak depending on the conditions of use. If you have any questions about this matter, please contact us.

- This table contains typical values of data from tests conducted in certain environments. They are not guaranteed values.
- The properties of products using fluororesin included in this table may differ from the typical values due to differences in the manufacturing method and environment. Make sure to check the usage of the product under actual conditions before using. If you have any questions, please make sure to contact our sales staff or technical staff before using our products.

Properties	Unit	Measurement Conditions <sup>Note1</sup>		Filler Material (Weight %)				
				Pure PTFE	G15 Glass fiber 15%	G20 Glass fiber 20%	G25 Glass fiber 25%	
Specific gravity	—	25°C		2.17	2.23	2.24	2.26	
Thermal conductivity	W/(m·K)	—		0.24	0.37	0.41	0.45	
Thermal expansion coefficient	$\times 10^{-5}/^{\circ}\text{C}$	25 to 100°C	MD	11	11	10	9	
			CD	10	8	7	6	
		25 to 150°C	MD	12	12	11	10	
			CD	11	8	8	7	
		25 to 200°C	MD	14	13	12	11	
			CD	12	9	9	7	
		25 to 250°C	MD	17	14	13	13	
			CD	16	10	10	9	
Tensile strength	MPa	JIS K6891		32.4	28.4	22.9	21.6	
Elongation	%	JIS K6891		350	340	338	310	
Compressive strength	MPa	0.2% offset 24°C	MD	—	—	8.3	—	
			CD	7.2	7.3	7.5	7.8	
		1% deformation 24°C	MD	—	—	6.2	—	
			CD	5.6	7.8	5.9	7.8	
		25% deformation 24°C	MD	—	—	24.9	—	
			CD	27.5	27.5	27.7	28.4	
Compressive modulus of elasticity	MPa	—		MD	—	—	—	
				CD	$5.6 \times 10^2$	$8.6 \times 10^2$	$9.4 \times 10^2$	$10.4 \times 10^2$
Bending modulus of elasticity	MPa	ASTM D790		CD	$3.4 \text{ to } 6.2 \times 10^2$	$21.4 \times 10^2$	$18.5 \times 10^2$	$16.4 \times 10^2$
Compression creep A. Deformation rate	%	ASTM D621 13.7MPa 25°C,24hrs	MD	9.5	8.8	8.5	7.9	
			CD	—	—	—	—	
		6.9MPa 100°C,24hrs	MD	4.8	4.4	3.6	3.5	
			CD	—	—	—	—	
B. Permanent deformation	%	13.7MPa 25°C,24hrs	MD	7.0	6.9	6.7	6.2	
			CD	—	—	11.5	—	
		6.9MPa 100°C,24hrs	MD	4.6	3.8	3.5	3.3	
			CD	—	—	—	—	
Hardness	Shore D	—		55	60	62	63	
Friction coefficient (dynamic)	—	P=0.7MPa V=0.5/sec		0.22	0.39-0.42	0.38-0.42	0.50-0.54	
Friction coefficient (static)	—	P=3.43MPa		0.05-0.08	0.10-0.13	0.10-0.13	0.10-0.13	
Wear coefficient	$\frac{\text{mm/km}}{\text{MPa}}$	Tested with a Suzuki-type tester		$2 \times 10^{-1}$	$1.2 \times 10^{-4}$	$1.1 \times 10^{-4}$	$1.0 \times 10^{-4}$	
Dielectric strength	kV/mm	JIS C2110 (oil)		46.4	17.4	15.5	13.7	
Permittivity	—	JIS K6911		10 <sup>3</sup> Hz	2.06	2.64	2.91	2.94
				10 <sup>6</sup> Hz	2.06	2.80	2.77	2.89
Water absorption rate	%	3.2mmt, 24hrs ASTM D570		0.00	0.015	0.014	0.013	

Note 1: MD is the direction parallel to molding, and CD is the direction perpendicular to molding.

Note 2: The property values of SC and LC are the measured values of the sheet material (a thickness of 3 mm).

Filler Material (Weight %)										
	GR15 Graphite 15%	GR30 Graphite 30%	GMo Glass fiber 15% Molybdenum disulfide 5%	GGR Glass fiber 20% Graphite 5%	BR Bronze 60%	CF10 Carbon fiber 10%	CF15 Carbon fiber 15%	SC <sup>Note2</sup> Special carbon	SCCF Special carbon Carbon fiber 15%	LC <sup>Note2</sup> Special filler
	2.17	2.16	2.29	2.23	3.95	2.09	2.04	2.07	1.95	2.30
	0.45	0.41	0.33	0.36	0.47	0.46	0.46	—	—	—
	10	8	12	14	9	17	14	10	11	—
	8	6	7	5	7	7	5	8	6	—
	11	9	13	14	10	19	16	11	12	—
	9	7	7	5	7	7	5	8	6	—
	12	10	14	15	11	21	18	12	14	—
	9	7	8	6	9	8	6	9	7	—
	14	12	17	17	13	24	22	14	16	—
	11	7	9	7	10	10	7	10	8	—
	19.6	12.8	17.5	15.8	16.7	24.0	20.6	22.5	9.2	14.7
	325	130	300	220	220	300	280	390	39	300
	—	10.3	8.5	11.0	—	—	—	9.5	11.3	12.3
	9.8	10.4	8.2	9.8	12.0	—	11.4	9.7	12.1	—
	—	5.7	6.9	6.9	—	—	—	9.5	10.7	7.0
	6.9	9.3	6.5	6.5	9.8	—	7.8	9.3	11.5	—
	—	31.7	30.6	35.3	—	—	—	32.3	39.5	32.9
	29.4	37.3	28.0	29.4	43.1	—	43.7	30.6	33.3	—
	—	—	—	—	—	—	—	1.2 × 10 <sup>3</sup>	1.3 × 10 <sup>3</sup>	6.9 × 10 <sup>2</sup>
	7.6 × 10 <sup>2</sup>	8.9 × 10 <sup>2</sup>	8.5 × 10 <sup>2</sup>	10.3 × 10 <sup>2</sup>	11.1 × 10 <sup>2</sup>	7.8 × 10 <sup>2</sup>	9.3 × 10 <sup>2</sup>	1.1 × 10 <sup>3</sup>	1.3 × 10 <sup>3</sup>	—
	—	21.6 × 10 <sup>2</sup>	16.6 × 10 <sup>2</sup>	19.1 × 10 <sup>2</sup>	13.5 × 10 <sup>2</sup>	12.2 × 10 <sup>2</sup>	—	—	—	—
	5.0	3.6	7.1	6.8	4.5	4.2	3.3	1.5	1.1	1.0
	—	—	—	6.7	4.9	—	—	1.3	1.6	—
	3.1	1.8	2.5	2.1	2.1	—	1.6	0.9	0.4	—
	—	—	—	—	—	—	—	0.8	0.7	—
	3.8	2.5	4.8	3.6	2.0	2.3	2.4	1.3	0.8	1.2
	—	—	—	3.9	2.3	—	—	1.2	0.8	—
	3.0	1.6	2.9	1.8	1.8	—	0.8	1.1	0.5	—
	—	—	—	—	—	—	—	0.9	0.9	—
	61	62	65	65	70	63	64	65	67	—
	0.22-0.25	0.25	0.29-0.31	0.29-0.30	0.12-0.17	0.27-0.30	0.29	—	—	—
	0.08-0.10	0.065	0.08-0.10	0.08-0.10	0.08-0.10	—	—	—	—	—
	6.8 × 10 <sup>-4</sup>	2.0 × 10 <sup>-4</sup>	1.0 × 10 <sup>-4</sup>	0.5 × 10 <sup>-4</sup>	0.7 × 10 <sup>-4</sup>	0.4 × 10 <sup>-4</sup>	1.0 × 10 <sup>-4</sup>	—	—	—
	4.1	1.5	20.2	10.2	—	—	—	—	—	—
	—	—	3.45	7.18	—	—	—	—	—	—
	—	—	3.24	6.99	—	—	—	—	—	—
	0.00	0.010	0.010	0.016	0.00	—	—	—	—	—

## Types and Properties of Filler Materials

Filler Material	Properties	Remarks
<b>1</b> Glass fiber <b>G</b>	<ul style="list-style-type: none"> <li>Significantly improved mechanical properties and wear resistance</li> <li>Almost no loss of chemical or electrical properties</li> </ul>	<ul style="list-style-type: none"> <li>Not suitable for use in water</li> <li>A shortcoming of it is that it wears the adjacent material</li> </ul>
<b>2</b> Graphite <b>GR</b>	<ul style="list-style-type: none"> <li>Improved creep resistance under high temperature loads</li> <li>Good heat conduction and excellent chemical resistance</li> </ul>	<ul style="list-style-type: none"> <li>Used in combination with glass fiber and carbon</li> </ul>
<b>3</b> Bronze <b>BR</b>	<ul style="list-style-type: none"> <li>Improved wear resistance, hardness, compressive strength, and heat conduction</li> </ul>	<ul style="list-style-type: none"> <li>Poor chemical resistance due to metallic properties</li> <li>Conductive and low insulation</li> </ul>
<b>4</b> Carbon fiber <b>CF</b>	<ul style="list-style-type: none"> <li>Improved compression strength and wear resistance</li> <li>Excellent creep properties especially in high temperature areas and wear resistance in water</li> </ul>	<ul style="list-style-type: none"> <li>Its tensile strength and elongation are superior to carbon</li> </ul>
<b>5</b> Molybdenum disulfide <b>MoS<sub>2</sub></b>	<ul style="list-style-type: none"> <li>Improved creep resistance, hardness, and wear resistance</li> </ul>	<ul style="list-style-type: none"> <li>It is not used alone, but in combination with glass fiber, etc.</li> </ul>
<b>6</b> Special carbon <b>SC</b>	<ul style="list-style-type: none"> <li>Improved creep resistance and wear resistance</li> <li>Can be used for strong alkaline fluids</li> </ul>	<ul style="list-style-type: none"> <li>Cannot be used with oxidizing fluids such as nitric acid, concentrated sulfuric acid, and chromic acid</li> </ul>
<b>7</b> Special filler <b>LC</b>	<ul style="list-style-type: none"> <li>Improved creep resistance</li> <li>Can be used for strong acidic fluids</li> </ul>	<ul style="list-style-type: none"> <li>Cannot be used for hydrofluoric acid and strong alkali</li> </ul>

We also have filler materials other than those indicated above. Feel free to contact us about other filler materials.

- This table contains typical values for the properties of fluororesin described in the 'Fluororesin Handbook' Ver.14 issued by the Japan Fluoropolymers Industry Association. These values are not related to our products and they are not guaranteed values.
- The properties of products that use fluororesins included in this table may be outside the scope of the typical values due to differences in the manufacturing method. Make sure to check the usage of the product under actual conditions before using. If you have any questions, please make sure to contact our sales staff or technical staff before using our products.

Properties		Unit	ASTM test method	PTFE	PFA	FEP	PCTFE	ETFE	ECTFE	PVDF	
Physical	Melting point	°C	—	327	310	260	220	270	245	151-178	
	Specific gravity	—	D792	2.13-2.20	2.12-2.17	2.15-2.17	2.10-2.20	1.73-1.74	1.68-1.69	1.75-1.78	
Mechanical	Tensile strength	MPa	D638	20-35	25-35	20-30	31-41	38-42	41-48	30-70	
	Elongation	%	D638	200-400	300-350	250-330	80-250	300-400	200-300	20-370	
	Compressive strength (10% deformation)	MPa	D695	10-15	15-20	14-19	31-51	40-50	35-40	32-74	
	Impact strength (Izod)	J/m	D256	150-160	Did not break	Did not break	135-145	Did not break	Did not break	160-375	
	Hardness (Rockwell)	R scale	D785	R20	R50	R50	R80	R50	R50	R93-116	
	Hardness (Shore)	D scale	D2240	D50-55	D62-66	D60-65	D75-80	D67-78	D53-57	D64-79	
	Bending modulus of elasticity	GPa	D790	0.53-0.58	0.54-0.64	0.55-0.67	1.25-1.79	0.90-1.20	0.66-0.69	0.60-1.99	
	Tensile modulus	GPa	D638	0.40-0.60	0.31-0.35	0.32-0.36	1.03-2.10	0.70-0.85	1.55-1.70	0.37-2.58	
Dynamic friction coefficient	0.69MPa 3m/min	D1894	0.1	0.2	0.3	0.4	0.4	0.4	0.4		
Thermal	Thermal conductivity	W/(m·K)	C177	0.23	0.19	0.20	0.22	0.24	0.16	0.17	
	Specific heat	J/(°C·g)	—	1.0	1.0	1.2	0.9	2.0	2.0	1.2	
	Linear expansion coefficient	10 <sup>-5</sup> /°C	D696	10	12	9	6	6	8	16	
	Ball pressure	°C	—	180	230	170	170	185	180	150	
	Thermal deformation temperature	1.81Mpa	°C	D648	55	47	50	90	74	77	100
		0.45Mpa	°C	D648	120	74	72	126	104	116	156
Maximum working temperature (continuous)	°C	(No load)	260	260	200	120	150	150	150		
Electrical	Volume resistivity	$\frac{\Omega \cdot \text{cm}}{(50\%RH, 23D)}$	D257	>10 <sup>18</sup>	>10 <sup>18</sup>	>10 <sup>18</sup>	>10 <sup>18</sup>	>10 <sup>17</sup>	>10 <sup>15</sup>	>10 <sup>15</sup>	
	Strength of dielectric breakdown (short time)	MV/m (3.2 mm thickness)	D149	19	20	22	22	16	20	11	
	Permittivity	60Hz	pF/m	D150	<18.6	<18.6	<18.6	19.8-24.8	23.0	23.0	74.4
		10 <sup>3</sup> Hz	pF/m	D150	<18.6	<18.6	<18.6	20.4-23.9	23.0	23.0	68.4
		10 <sup>6</sup> Hz	pF/m	D150	<18.6	<18.6	<18.6	20.4-22.1	23.0	23.0	56.9
	Relative permittivity	60Hz	—	D150	2.1	2.1	2.1	2.6	2.6	2.6	8.4
		10 <sup>3</sup> Hz	—	D150	2.1	2.1	2.1	2.6	2.6	2.6	7.7
		10 <sup>6</sup> Hz	—	D150	2.1	2.1	2.1	2.6	2.6	2.6	6.4
	Dissipation factor	60Hz	—	D150	0.0002	0.0002	0.0002	0.0012	0.0006	0.0005	0.049
		10 <sup>3</sup> Hz	—	D150	0.0002	0.0002	0.0002	0.025	0.0008	0.0015	0.018
10 <sup>6</sup> Hz		—	D150	0.0002	0.0003	0.0005	0.020	0.005	0.015	0.017	
Arc resistance	sec	D495	>300	>300	>300	>300	75	18	60		
Durability and other	Water absorption rate (24 h)	%	D570	0.01	0.01	0.01	0.01	0.03	0.01	0.03	
	3.2 mm thickness Flammability	—	(UL/94)	Equivalent to V-0	Equivalent to V-0	Equivalent to V-0	Equivalent to V-0	Equivalent to V-0	Equivalent to V-0	Equivalent to V-0	
	Oxygen Index	—	D2863	>95	>95	>95	>95	32	60	43	
	Effect of direct sunlight	—	—	None	None	None	None	None	None	None	
	Effect of weak acid	—	D543	None	None	None	None	None	None	None	
	Effect of strong acid	—	D543	None	None	None	None	None	None	Affected by fuming sulfuric acid	
	Effect of weak alkali	—	D543	None	None	None	None	None	None	None	
	Effect of strong alkali	—	D543	None	None	None	None	None	None	None	
Effect of solvent alkali	—	D543	None	None	None	Slight swelling with halogen compounds	None	Withstands well	Withstands for the most part		



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### Thailand

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## Overseas Factories

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#### PT. NICHIAS METALWORKS INDONESIA

### Malaysia

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#### NT RUBBER-SEALS SDN. BHD.

### Vietnam

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### China

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(上海兴盛密封垫有限公司)

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### India

#### NICHIAS INDUSTRIAL PRODUCTS PRIVATE LTD.

### Czech

#### NICHIAS AUTOPARTS EUROPE a.s.

### Mexico

#### NAX MFG, S.A.DE C.V.

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