

# TOMBO™ BRAND

## Packings





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\* “TOMBO” is a registered trademark or trademark of NICHIAS Corporation.

# Safe Usage

Please observe the following in order to obtain the full function of the products and to ensure safe usage.



## CAUTIONS

Properties/applications shown throughout this catalogue are typical.

Performance data referred to in this catalog are based on our own test results and on performance in general applications under normal conditions.

Products listed in this catalogue are used in diverse locations and for numerous types of machinery and equipment, and actual conditions of use also differ extensively. Consequently, when using these products, we recommend that you implement verification tests under the actual conditions of use.

Regarding individual applications, it is necessary to make a selection decision based on individual designs and on suitability evaluations. For special applications, please consult us.

The contents of this catalog are subject to change without prior notice.

1. Never use for any purpose other than the prescribed application.
2. When processing, use sharp cutting tools.
3. Always follow the instructions in this catalog or the instruction manual when installing equipment, etc.
4. Do not re-use packings.
5. When replacing, carefully remove all of the old material before installing the new product.
6. To maintain performance, store packaged products in a cool and dark place.
7. Please refer to SDS (Safety Data Sheet) concerning health and hygiene cautions.
8. When disposing, comply with all regulations in your country. Waste should be properly disposed of at a permitted disposal site. Do not incinerate the used products, especially those containing fluoropolymer resin as it will generate toxic gas when burning.

# Packing Recommendations - For valves

Fluid	Operating conditions		Recommended Packing (TOMBO™ No.)	Remarks
	Temperature (°C)	Pressure MPa		
<b>Steam</b>  <b>Hot water</b>  <b>Water</b>  <b>Salt water (Brine)</b>	600	18	2205P+2250	
		7	2280-S	
	500	24	2205P+2250	
		8	2280-S	
	350	34	2205P+2250	
		12	2280-S	
	260	39	2205P+2250	
		14	2280-S	
	100	44	2205P+2250	
		16	2280-S	
<b>Petroleum-based hydrocarbons</b> Gasoline Naphtha Kerosene Light oil Heavy oil Lubricating oil Oil gas Alcohol Animal and vegetable oils	600	18	2205P+2250	
		7	2280-S	
	500	24	2205P+2250	
		8	2280-S	
	350	34	2205P+2250	
		12	2280-S	
	260	39	2205P+2250	
		14	2280-S	
	150	43	2205P+2250	
		15	2280-S	
<b>Aromatics-based hydrocarbons</b> Benzene Toluene Xylene Cyclohexane  <b>Organic solutions</b>  <b>Heat transfer solutions</b>	600	18	2205P+2250	
		7	2280-S	
	500	24	2205P+2250	
		8	2280-S	
	350	34	2205P+2250	
		12	2280-S	
	260	39	2205P+2250	
		14	2280-S	
	150	43	2205P+2250	
		15	2280-S	
<b>Weak acid</b>  <b>Weak alkali</b>  <b>Salt solutions</b>	300	13	2205P+2250	
		4	9077	
	260	14	2205P+2250	
		5	9034	
		5	9077	



## Packing Recommendations - For valves

Fluid	Operating conditions		Recommended Packing (TOMBO™ No.)	Remarks
	Temperature (°C)	Pressure MPa		
Strong Acids Hydrochloric acid Acetic acid	300	13	2205P + 2250	Not used for strong oxidizing acids
		4	9077	Not used for strong oxidizing acids
	260	14	2205P + 2250	Not used for strong oxidizing acids
		5	9034	
		5	9077	Not used for strong oxidizing acids
Strong Alkali Caustic soda Caustic potassium	300	13	2205P + 2250	
		4	9077	
	250	14	2205P + 2250	
		5	9077	
		5	9034	
Air	350	34	2205P + 2250	
		8	2280-S	
Combustible gas Toxic gas Hydrogen gas Ammonia	500	8	2205P + 2250	
	350	12	2205P + 2250	
	260	14	2205P + 2250	
Cryogenic fluids LNG, LN <sub>2</sub> , LO <sub>2</sub> LPG, Ethylene	- 200	20	2205P + 2250	
		2	2280-S	

Note: (1) This selection guide shows typical recommended packings for fluids, temperatures, and pressures and not showing maximum condition of each valve packings.

Thus, depending on the other conditions, the products shown here are not necessarily suitable for use in some cases.

(2) For maximum service condition of each valve packings, please refer to the description of each product in this catalogue.

(3) In some cases, the product number shown here are only representative examples for that type.

## Service Range of Major Valve Packings

Valve Packing		Service Temperature (°C) <sup>(1)</sup>								Pressure Rating (Class) <sup>(2)</sup>							Remarks
For	TOMBO™ No.	- 100	0	100	200	300	400	500	600	150	300	400	600	900	1500	2500	
High-Temp	2250/2930 <sup>(5)</sup>								(3)	○	○	○	○	○	○	○	
	2200/2205-P <sup>(6)</sup>								(4)	○	○	○	○	○	○	○	
	2280-S								(3)	○	○	○	○	○	○		
Corrosive	9077									○	○						
	9034/9042									○	○						
General	9044									○							
	2996-NA									○	○						

Note: (1) Service temperature indicates design fluid temperature.

(2) Pressure rating indicates class of valve.

(3) TOMBO™ No.2250, 2930 and 2280-S can be used up to 400 under oxidizing atmosphere and up to 600 under non-oxidizing atmosphere and in steam.

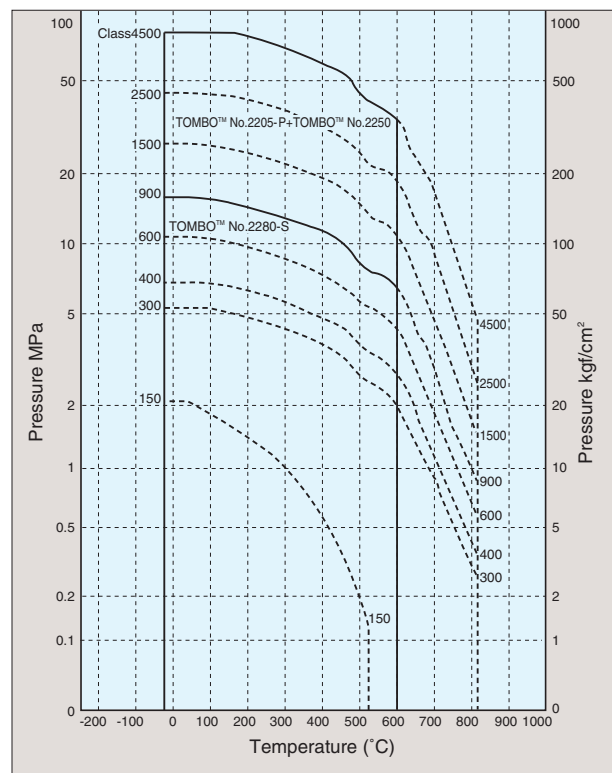
(4) TOMBO™ No.2200 series and 2205 series can be used up to 400 under oxidizing atmosphere and up to service temperature of adaptor packing under non-oxidizing atmosphere.

(5) Packing marked shall be used in combination with TOMBO™ No.2200 series or 2205 series.

(6) Packing marked shall be used in combination with adequate adaptor packings such as TOMBO™ No.2250, 2920, 2921, 2788-AF, 9077, 9075-V etc.

# Selection Guide

## Water type fluids / Oil type fluids



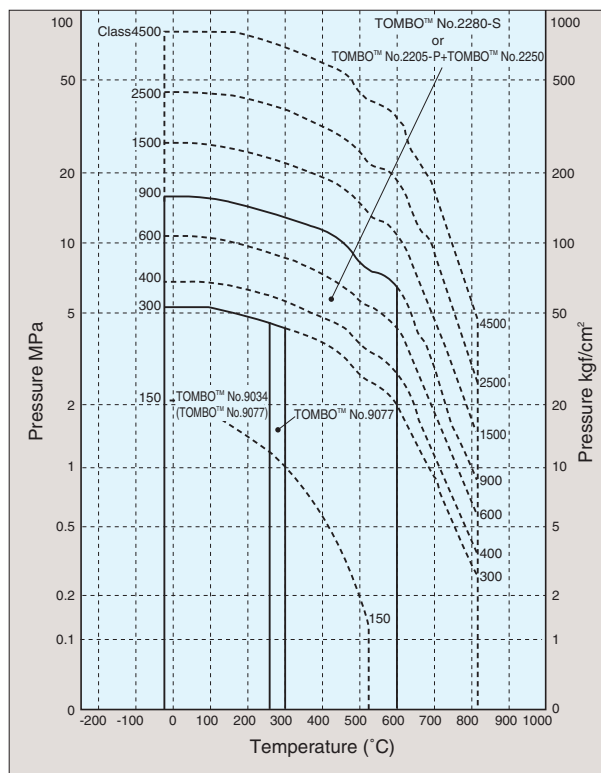
### Water type fluids

Fresh water, Brine, Industrial water, Hot water, Boiler feed water, Saturated steam, Superheated steam, Drain, Neutral salt solutions (Sodium chloride, Calcium chloride, Sodium nitrate, Sodium Sulfate, etc.)

### Oil type fluids

Crude oil, Naphtha, Gasoline, Heavy oil, Light oil, Kerosene, Fuel oil, Lubricant, Animal and vegetable oil, General mineral oil, Oil gas, Heat transfer oil (other than molten salts)

## Corrosive fluids (except strong oxidizing acids) / Solvents



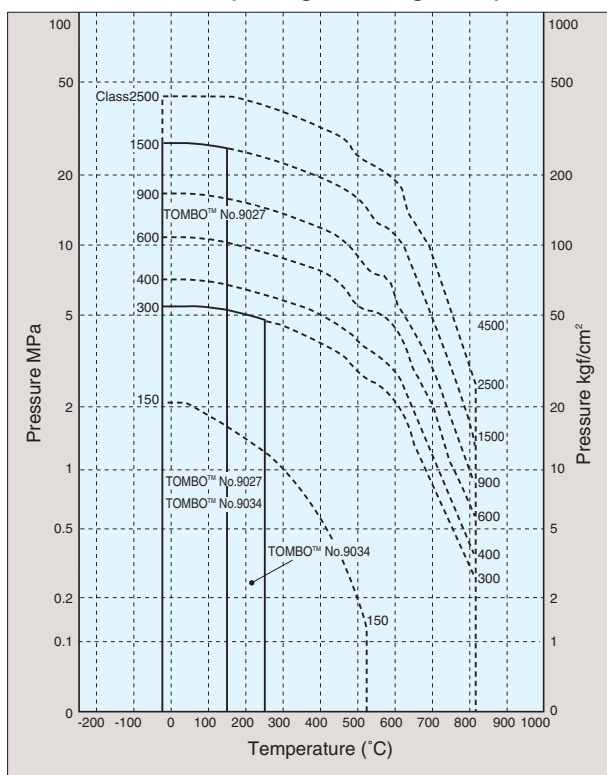
### Corrosive fluids (except strong oxidizing acids)

Hydrochloric acid, Organic acids (Acetic acid, Citric acid, Phthalic acid, Lactic acid, etc.), Alkali (Sodium hydroxide, Potassium hydroxide)

### Solvents

Aromatic hydrocarbons (Benzene, Toluene, Xylene), Alcohol, Ketone, Amines, Ether

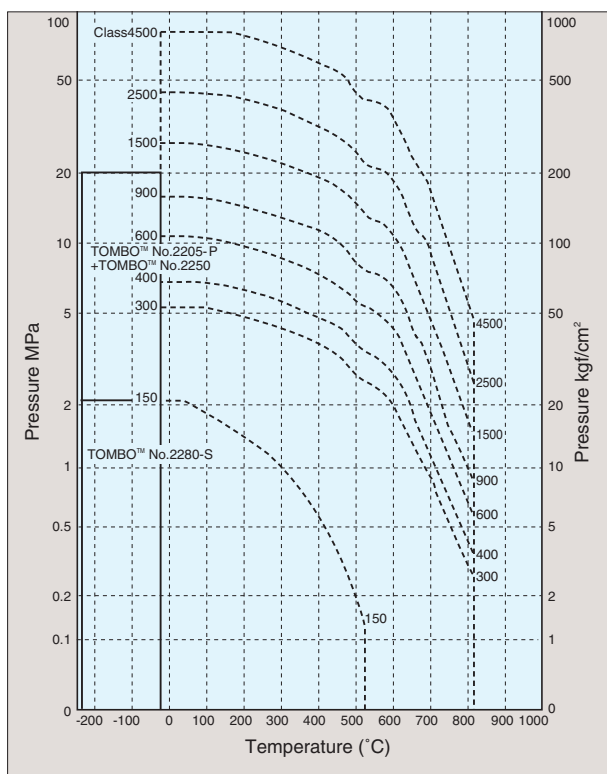
### Corrosive fluids (Strong oxidizing acids)



**Corrosive fluids (Strong oxidizing acids)**

Oxidizing acids (Nitric acid, Concentrated sulphuric acid, Chromic acid, Mixed acid, etc.)  
Oxidizing salts (Nitrate, Chlorate, Hypochlorite, etc.)

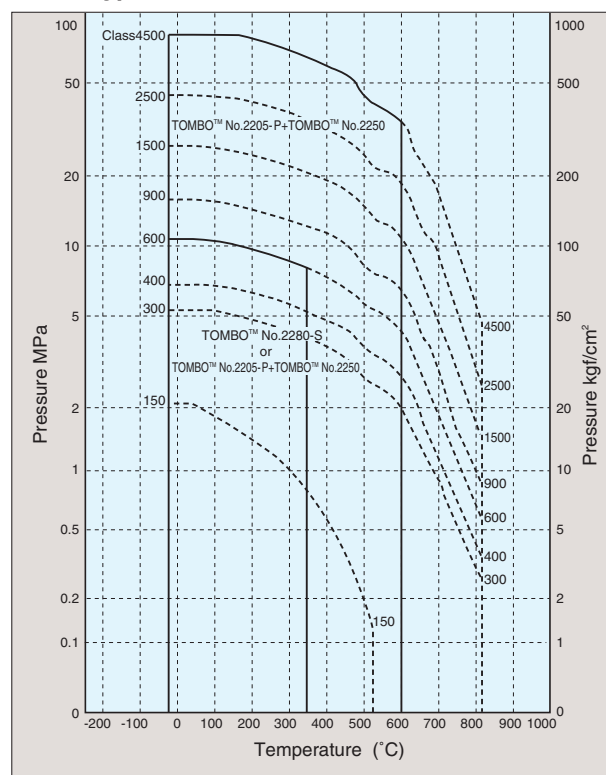
## Cryogenic fluids



## Cryogenic fluids

LNG, LPG, LN<sub>2</sub>, Ethylene, etc.

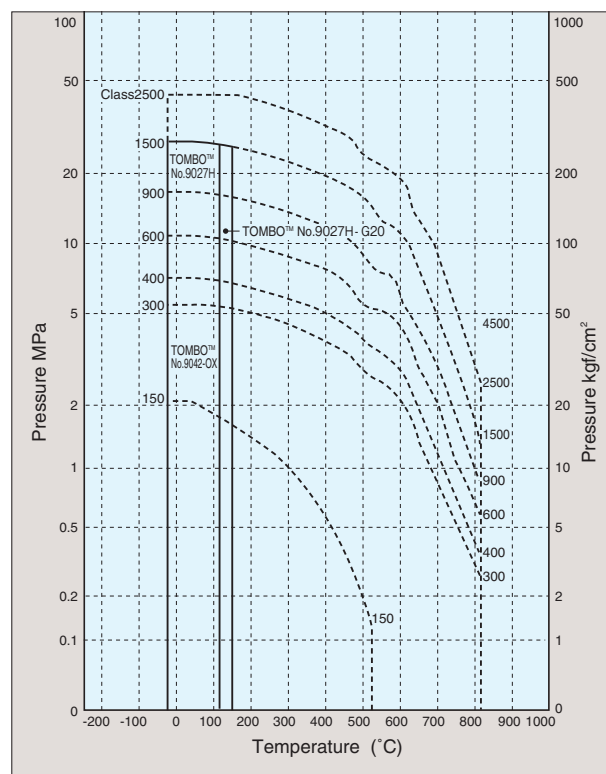
## Gas type fluids



## Gas type fluids

Incombustible gases (Carbon dioxide, Nitrogen, etc.),  
Air, Exhaust gas, Combustible gases (Methane,  
Ethane, Propane, Butane, Ethylene, Hydrogen,  
Acetylene, Propylene, Butylene, etc.)

## Supporting gases



## Supporting gases

## Oxygen, Ozone

# High Temperature Use Packings

## GRASEAL™ Packing

## TOMBO™ No.2200 and 2205 Series

### Construction

TOMBO™ No.2200 series is a packing made from expanded graphite (GRASEAL™) cut into strips and shaped into rings in a mold. The packing is treated to give it anti-corrosion features, and is an excellent packing for high temperature / high pressure applications.

We carry TOMBO™ No.2200-P and TOMBO™ No.2200-L models of this packing, each having different types of impregnated lubricant.

The TOMBO™ No.2205 series is a TOMBO™ No.2200 packing with the addition of a stainless steel mesh incorporated into its center so that the packing can be removed easily. Like the TOMBO™ No.2200 series, we carry TOMBO™ No.2205-P and TOMBO™ No.2205-L models.

45 degree bias cut is standard but non-cutting or 2 cutting are also available on request.

### Features

1. Superior sealing performance compared to asbestos products.
2. Little differences in performance from cryogenic to high temperatures.
3. Expanded graphite (GRASEAL™) has chemical resistance properties second only to PTFE, and can be used with almost any fluid (with the exception of those listed below).
4. Less shrinkage at high temperatures than asbestos packings, with little stress relaxation.

### Service Range

Temperature range	— 240 ~ 400°C (oxidizing atmosphere, in air)
	— 240 ~ 1650°C (non-oxidizing atmosphere)
Max. Pressure	78MPa (when used with a TOMBO™ No.2250 or other adapter packing)
Pressure Class	4500

### Application

Thermal power plants, petroleum refineries, shipbuilding, chemical plants, cryogenic services, high temperature gas plants, etc.  
Cast steel valves, forged steel valves, stainless steel valves, etc.

### Fluids

Water type fluids (water, hot water, steam, etc.), oil type fluids (oil, heat transfer oil, etc.), organic solvents, hydrocarbons, gaseous fluids (hydrogen, ammonia, etc.), chemical products, corrosive fluids (other than oxidizing fluids), and cryogenic fluids (LN<sub>2</sub>, liquid air, LNG, LPG, etc.).

### ⚠ Not applicable

Type	Fluid name
Oxidizing acids	Nitric acid, concentrated sulphuric acid, hot sulphuric acid, mixed acids, chromic acid, etc.
Oxidizing salts	Nitrate, chlorate, hypochlorite, etc.
Halogen compounds	Bromine, fluorine, iodine, chlorine dioxide, etc.
Combustion promoting gas	Oxygen (pure oxygen)



TOMBO™ No.2205-P

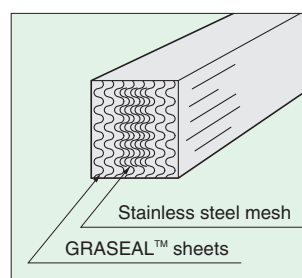


Fig. 1 TOMBO™ No.2205 Cross-section

- For packings with cross-sectional dimensions of less than 4 mm, stainless steel mesh is not incorporated.

### Standard Dimensions

The TOMBO™ No.2200 series, TOMBO™ No.2205 series, TOMBO™ No.2250, and TOMBO™ No.2930 products are ring form.

The TOMBO™ No.2200 series, TOMBO™ No.2205 series, and TOMBO™ No.2930 products are normally manufactured with a single 45 degree bias cut, and the TOMBO™ No.2250 is normally manufactured with a single straight cut.

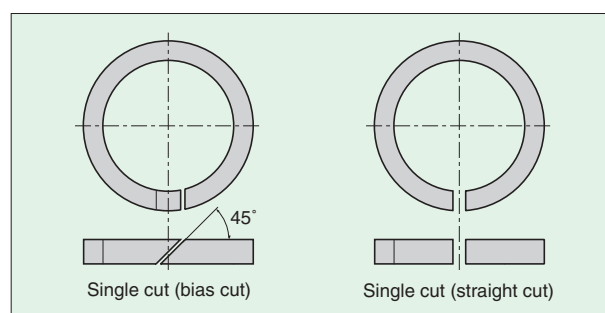


Fig. 2 Cutting Method

### Ordering Information

Please specify the ring ID, OD, height, and number of packings. Please order TOMBO™ No.2250 and TOMBO™ No.2930 (etc.) adapter packings along with TOMBO™ No.2200 series and TOMBO™ No.2205 series packings.



## High Temperature Use Adapter Packings

### Low Torque Adapter Packing

TOMBO™ No.2250

#### Construction

TOMBO™ No.2250 features a core of specially lubricated heat resistant inorganic fibers. The exterior of the core is made of expanded graphite (GRASEAL™), strengthened with heat resistant metal (316L stainless steel) filaments and treated with a special lubricant, graphite, and anti-corrosion materials. This adapter packing is well suited to high temperature and high pressure valves.

#### Features

1. When used with a GRASEAL™ packing, provides the same seal performance as our conventional GRASEAL™ packing sets (TOMBO™ No.2205-L with TOMBO™ No.2930, etc.) while greatly lowering friction resistance.
2. Little differences in performance from cryogenic to high temperatures.
3. Expanded graphite (GRASEAL™) has chemical resistance properties second only to PTFE, and can be used with almost any fluid (**with the exception of those listed on page 6**).
4. Less weight loss at high temperatures than asbestos packings, with little stress relaxation.

#### Service Range

Temperature range	— 240 ~ 400°C (oxidizing atmosphere, in air) — 240 ~ 600°C (non-oxidizing atmosphere)
Max. Pressure	78MPa (when used with a TOMBO™ No.2205-P or other GRASEAL™ packing)
Pressure Class	4500



TOMBO™ No.2250

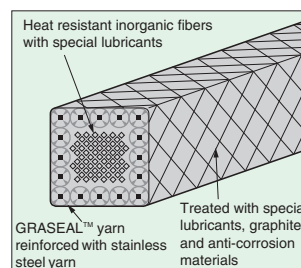


Fig. 3 TOMBO™ No.2250 Cross-section

● For nominal dimensions of 5.0 mm or less, a coreless square braid construction is used.

## High Temperature Use Adapter Packings

### High Guard Packing

TOMBO™ No.2930

#### Construction

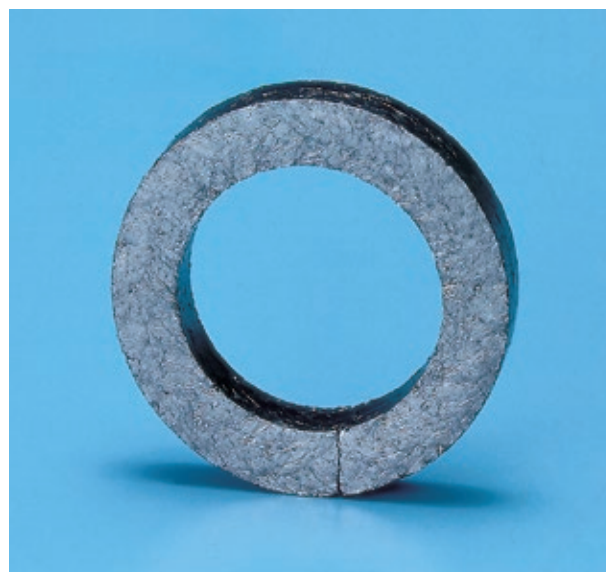
TOMBO™ No.2930 features an expanded graphite (GRASEAL™) core covered with braided stainless steel, and treated with lubricants, graphite, and anti-corrosion materials. This adapter packing is well suited to high temperature and high pressure valves.

#### Features

1. Superior sealing performance compared to asbestos products when used with a GRASEAL™ packing.
2. Little differences in performance from cryogenic to high temperatures.
3. Expanded graphite (GRASEAL™) has chemical resistance properties second only to PTFE, and can be used with almost any fluid (**with the exception of those listed on page 6**).
4. Less weight loss at high temperatures than asbestos packings, with little stress relaxation.

#### Service Range

Temperature range	— 240 ~ 400°C (oxidizing atmosphere, in air) — 240 ~ 600°C (non-oxidizing atmosphere)
Max. Pressure	78MPa (when used with a TOMBO™ No.2205-P or other GRASEAL™ packing)
Pressure Class	4500



TOMBO™ No.2930

# High Temperature Use Packings

## Super Seal Packing

TOMBO™ No.2280-S

### Construction

This is high temperature valve packing made of GRASEAL™ (expanded graphite) reinforced with stainless steel 316L filaments.

Finished with special lubricant, graphite and anti-corrosion materials.

### Features

1. As this is stored in coil form, this can be used for emergency requirements.
2. Superior sealing performance can be expected in comparison with asbestos braided packings.
3. Expanded graphite (GRASEAL™) has excellent chemical resistance next only to PTFE and can be used against almost all fluids except the prohibited fluids listed in the table on the right.
4. Applicable alone without use of adapter packings.
5. To facilitate inserting the packing into stuffing box, packings in coil form have rectangular cross-section.
6. As this is treated with our original anticorrosive, this has an excellent anticorrosive performance and is applicable to 13-chrome steel valve shaft.

### Application

Thermal power plants, petroleum refineries, shipbuilding, chemical plants, cryogenic services, high temperature gas plants, etc.

Cast steel valves, forged steel valves, stainless steel valves, etc.

### Service Range

<b>Temperature range</b>	— 240 ~ 400°C (oxidizing atmosphere, in air) — 240 ~ 600°C (non-oxidizing atmosphere)
<b>Max. Pressure</b>	25MPa
<b>Pressure Class</b>	1500

Note: Our experience to date shows that these packings may be used up to pressure classes of 1500, but the recommended class is 900 or below.

Please contact us concerning packings for gas seals that will be used at pressures exceeding 10 MPa or steam seals that will be used at pressures exceeding 19 MPa.

### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.0 (3.2)	5.0 (4.8)	6.5 (6.4)	8.0 (7.9)	9.5 (9.5)	11.0 (11.1)	12.5 (12.7)	14.5 (14.3)	16.0 (15.9)	19.0 (19.0)	22.0 (22.2)	25.5 (25.4)	Supply form
2280-S	Width (mm)	2.5	4.0	5.5	7.0	8.0	9.5	11.0	12.5	14.0	16.5	19.0	22.5	3meter /coil
	Height (mm)	4.5	8.5	11.0	13.0	14.5	15.7	16.5	19.5	20.0	24.0	26.0	30.0	
	Weight (kg) <sup>(1)</sup>	0.054	0.130	0.222	0.335	0.420	0.490	0.550	0.770	0.890	1.270	1.550	2.150	
	Braiding	Square braid							Braid over braid					

Notes: (1)Reference weight for 1 coil



TOMBO™ No.2280-S

### Fluids

Water type fluids (water, hot water, steam, etc.), Oil type fluids (oil, heat transfer oil, etc.), organic solvents, hydrocarbons, gaseous fluids (hydrogen, ammonia, etc.), chemical products, corrosive fluids (other than oxidizing fluids), and cryogenic fluids (LN<sub>2</sub>, liquid air, LNG, LPG, etc.).

### ⚠ Not applicable

Type	Fluid name
Oxidizing acids	Nitric acid, concentrated sulphuric acid, hot sulphuric acid, mixed acids, chromic acid, etc.
Oxidizing salts	Nitrate, chlorate, hypochlorite, etc.
Halogen compounds	Bromine, fluorine, iodine, chlorine dioxide, etc.
Combustion promoting gas	Oxygen (pure oxygen)

### Ordering Information

Molded Ring - Please specify ring ID, OD, height and number of rings.

Coil Form - Please specify nominal size and quantity.

## High Temperature Use Packings

### GRASEAL™ Packing RP (Ribbon Pack)

TOMBO™ No.2220

#### Construction

Crinkled GRASEAL™ tape without adhesion, designed for use as packing. Just with wrapping tape to stem or shaft, then stuffing, endless packing can be formed.

Easily installed for small diameter valves. This packing is also used for emergencies when spare packings are not available. For small diameter, narrow tape type, TOMBO™ No.2225, GRASEAL™ Packing-SP is also available.

#### Fluids

Water type fluids (water, hot water, steam, etc.), Oil type fluids (oil, heat transfer oil, etc.), organic solvents, hydrocarbons, gaseous fluids (hydrogen, ammonia, etc.), chemical products, corrosive fluids (other than oxidizing fluids), and cryogenic fluids (LN<sub>2</sub>, liquid air, LNG, LPG, etc.).

#### Service Range

Temperature range	— 240~400°C (oxidizing atmosphere, in air)
	— 240~1650°C (non-oxidizing atmosphere)
Max. Pressure	43MPa



TOMBO™ No.2220-RP

#### Standard Size & Package

Thickness (mm)	Width (mm)	Length (m)	Package
0.45	6.4	7.2	Plastic Case
	12.7	7.2	
	19.0	14.2	
	25.4	14.2	

# Selection Guidelines for High Temperature Use Packings

## Number of Rings and Tightening Stress

Table 1 shows the recommended number of rings (combination method), tightening stress, and compression ratios for high temperature use packings (low torque combination GRASEAL™ packings and Super Seal packings)

Because these packings have exceptional sealing performance, sufficient seal performance may be achieved with a fewer number of rings as compared to when using asbestos packings.

**Table 1 Number of Rings and Tightening Stress for High Temperature Use Packings**

TOMBO™ No.	2205P + 2250			2280-S		
Class	Number of Rings	Tightening Stress N/mm <sup>2</sup>	Compression Ratio %	Number of Rings	Tightening Stress N/mm <sup>2</sup>	Compression Ratio %
150	1+2+1	20~30	16	5	15~25	14
300	1+2+1	20~30	16	5	15~25	14
400	1+3+1	25~35	17	6	20~30	14
600	1+3+1	25~35	17	6	20~30	14
900	1+4+1	30~40	17	7	25~35	14
1500	1+4+1	35~45	18	7	25~35	14
2500	1+4+1 1+5+1	40~50	19	—	—	—

\* The number of rings for the 2205P + 2250 combination is shown as the number counted from the atmospheric side.

Compression ratios are guidelines for when the recommended tightening stress are used.

## Alignment of Packing Combinations

As a rule, our TOMBO™ No.2200 series, TOMBO™ No.2205 series, TOMBO™ No.2250 and TOMBO™ No.2930 products cannot be used alone. The TOMBO™ No.2200 or TOMBO™ No.2205 packing should be sandwiched between the TOMBO™ No.2250 or TOMBO™ No.2930 (etc.) adapter packings, as shown in the diagram below.

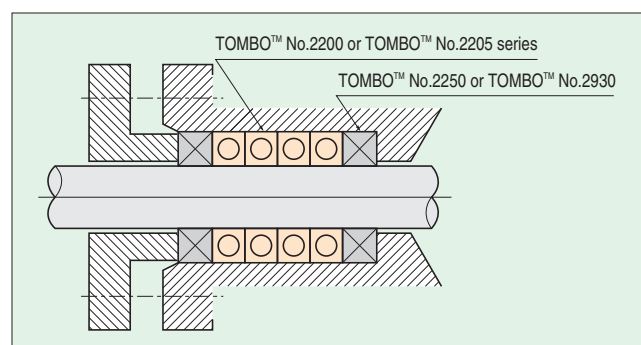


Fig. 4 A High Temperature Use Valve Packing Combination

## Metal Sleeve Usage

Because these packings have exceptional sealing performance, sufficient seal performance may be achieved with a fewer number of rings as compared to when using asbestos packings. For existing valves that use a large number of packing rings, we recommend the use of a metal sleeve in order to avoid excess friction resistance.

Metal sleeve specifications are as follows:

● **Material:** SUS304 or SUS403, etc.

● **Shape:** double split

● **Dimensions**

**Inner Diameter:** Stem diameter + 0.5 mm  
(deviation tolerance h7)

**Outer Diameter:** Stuffing box diameter - 0.2 mm  
(deviation tolerance H7)

**Height:**  $L_s = D - n \times h_p$

**L<sub>s</sub> :** Sleeve Height (mm)

**D :** Box Depth (mm)

**n :** Number of Packing Rings

**h<sub>p</sub> :** Nominal Packing Height of 1 Ring (mm)

## Sleeve Load

Sleeve resistance of packings is indicated by  $\mu k$  value. The  $\mu k$  value is determined experimentally according to the following formula, and the resulting  $\mu k$  values are shown in Table 2 below.

(1) Stem travel resistance

$$F = \mu \cdot k \cdot \pi \cdot D \cdot H \cdot P$$

(2) Stem torque

$$T = \frac{F \cdot D}{2} \times \frac{1}{1000} = \frac{\mu \cdot k \cdot \pi \cdot D^2 \cdot H \cdot P}{2} \times \frac{1}{1000}$$

The variables are:

F : Stem travel resistance (N)

T : Stem torque (N/m)

$\mu$  : Frictional coefficient

k : Lateral pressure coefficient

D : Stem diameter (mm)

H : Packing height (mm)

P : Packing tightening pressure (N/mm<sup>2</sup>)

**⚠ Caution:** When installing a TOMBO™ No.2200 series or TOMBO™ No.2205 series single cut product, be sure to open the packing in the axial direction, as shown in A of Fig. 5. Opening the packing as shown in B could result in damage.

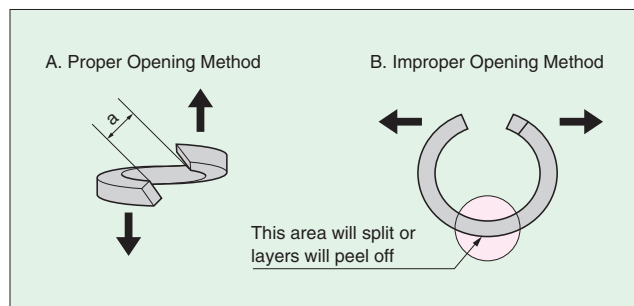


Fig. 5 Proper Installation

Table 2  $\mu k$  Values of High Temperature Packings

Packing Type	$\mu k$ Value
TOMBO™ No.2205-P+TOMBO No.2250 Low torque combination GRASEAL™ packing	0.03~0.04
TOMBO™ No.2205-L+TOMBO No.2930 Combination GRASEAL™ packing	0.05~0.07
TOMBO™ No.2280-S Super Seal packing	0.03~0.04

Note:  $\mu k$  values (frictional coefficient  $\times$  lateral pressure coefficient) have been experimentally determined, but these values can vary depending on a large number of factors such as the size of the packing, the number of rings, magnitude of the tightening force, stem diameter, stem finishing precision, temperature, internal pressure, etc., meaning that an absolute  $\mu k$  value does not exist. When designing actuators, etc., please take into account a sufficient safety factor.



## General Purpose Packings

### THERMALFLON™ Packing

TOMBO™ No.9044

#### Construction

This is a general use packing, composed of inorganic fibers, that has treated with PTFE dispersion and includes small amounts of a special lubricant.

#### Features

1. As this is in white color, this is applicable for production lines where packings in black color are not acceptable. This enables improvement in working environment.
2. Most economical among packings for use in valve.

#### Application

Oil refineries, shipbuilding, chemical plants etc.  
General use valves, ductile valves, malleable cast valves, cast steel valves, etc.

#### Fluid

Water type fluids (water, steam etc.), oil type fluids (with the exception of aromatic oil and heat transfer oil).

#### Service Range

Max. Temperature	180℃
Max. Pressure	3MPa
Pressure Class	150

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4	Supply form
9044	Weight (kgs) <sup>(1)</sup>	0.05	0.11	0.20	0.30	0.42	0.57	0.72	0.93	1.14	1.62	2.19	2.85	3 meter /coil
	Braiding method	Square braid				Braid over braid								

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.



TOMBO™ No.9044

#### Ordering Information

Molded Ring - Please specify ring ID, OD, height and number of rings.

Coil Form - Please specify nominal size and quantity.

⊘ TOMBO™ No.9044 can not be used for fluoric acid, alkalis, aromatic oils and thermal oils.

⚠ For semi-conductor use where contamination is not allowed, please use TOMBO™ No.9027-H.

## Packings for valves

### NAFLON™ Carbon Fiber Packing

TOMBO™ No.9077

#### Construction

This is a chemical use packing composed of carbon fiber yarn that treated with PTFE dispersion. The standard product is coil form but molded ring is also available.

#### Features

1. Excellent heat resistance
2. Excellent chemical resistance and it can be used with most chemicals except oxidizing acids.
3. Excellent conformity to shaft allow for good seal performance at low tightening stress.

#### Application

Thermal power plants, oil refineries, shipbuilding, chemical plants, low temperature plants, etc.  
General use valves, ductile valves, malleable cast valves, etc.

#### Service Range

Temperature range	— 200 ~ 300°C
Max. Pressure	5MPa
Pressure Class	300

⊘ TOMBO™ No.9077 can not be used for oxidizing acids (Nitric acid, Hydrochloric acid, Chromic acid, Aqua regia etc.).

⚠ For semi-conductor use where contamination is not allowed, please use TOMBO™ No.9027-H.

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4	Supply form
9077	Weight (kgs) <sup>(1)</sup>	—	0.08	0.14	0.21	0.30	0.45	0.54	0.69	0.84	1.20	1.62	2.12	3 meter /coil
	Braiding method	Square braid					Interlocking braid							

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.



TOMBO™ No.9077

#### Fluid

Water type fluids (water, steam etc.), oil type fluids (oil, heat transfer oil, etc.), organic solvents, hydrocarbons, chemical products, corrosive fluids (other than oxidizing acids) and low temperature fluids.

#### Ordering Information

Molded Ring - Please specify ring ID, OD, height and number of rings.

Coil Form - Please specify nominal size and quantity.

## Anti-corrosion use packings

### NAFLON™ Fiber Packing-T

TOMBO™ No.9033 / 9034

#### Construction

This is a chemical use packing made from 100% PTFE fibers. TOMBO™ No.9033 is a packing made only from PTFE fibers. TOMBO™ No.9034 is TOMBO™ No.9033 treated with PTFE dispersion.

#### Features

1. Excellent chemical resistance and it can be used with most chemicals from strong acids to strong alkalis.
2. For TOMBO™ No.9033, no dissolution or elution even when used with solvents or fine chemicals.
  - \* Conforms to the Standards and criteria for food and food additives, etc. (3-D-2, Public Notice No. 370 of the Ministry of Health & Welfare, 1959) stipulated by the Food Sanitation Act
3. As PTFE is self lubricating, valve stem torque is lower than that of asbestos packing.

#### Application

Chemical plants, semi-conductor related facilities, etc.

#### Service Range

TOMBO™ No.	9033	9034
Max. Temperature	260°C	260°C
Max. Pressure <sup>(1)</sup>	—	5MPa
Pressure Class <sup>(1)</sup>	—	300

Notes: (1) These values are for TOMBO™ No.9034 only.

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4	Supply form
9033	Weight (kgs) <sup>(2)</sup>	0.05	0.11	0.19	0.29	0.41	0.57	0.78	0.93	1.13	1.62	2.16	2.80	3 meter /coil
9034	Weight (kgs) <sup>(2)</sup>	0.06	0.13	0.22	0.33	0.47	0.63	0.83	1.05	1.29	1.87	2.48	3.25	
	Braiding method	Square braid					Interlocking braid							

Notes: (2) Molded ring is also available. \* Weight is per coil and reference only.



TOMBO™ No.9033

#### Fluid

DI water, corrosive fluids (strong acids, strong alkalis), chemicals.

- ⊘ This packing may not be used for alkali metal, quite strong oxidizing agent etc.
- ⚠ For semi-conductor use where contamination is not allowed, please use TOMBO™ No.9027-H.

## Anti-corrosion use packings

### NAFLON™ Fiber Packing-G

TOMBO™ No.9041 / 9042

#### Construction

This is a chemical use packing made from 100% PTFE fiber made by different way as the fiber for TOMBO™ No.9033, 9034.

TOMBO™ No.9041 is a packing made only from PTFE fibers. TOMBO™ No.9042 is treated with PTFE dispersion.

#### Service Range

TOMBO™ No.	9041	9042
Max. Temperature	260°C	260°C
Max. Pressure <sup>(1)</sup>	—	5MPa
Pressure Class <sup>(1)</sup>	—	300

Notes: (1) These values are for TOMBO™ No.9042 only.

- ⊘ This packing may not be used for alkali metal, quite strong oxidizing agent etc.
- ⚠ For semi-conductor use where contamination is not allowed, please use TOMBO™ No.9027-H.

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4	Supply form
9041	Weight (kgs) <sup>(2)</sup>	0.05	0.10	0.17	0.26	0.37	0.50	0.66	0.84	1.02	1.46	1.97	2.57	3 meter /coil
9042	Weight (kgs) <sup>(2)</sup>	0.05	0.11	0.20	0.30	0.43	0.58	0.75	0.96	1.17	1.68	2.26	2.96	
	Braiding method	Square braid					Interlocking braid							

Notes: (2) Molded ring is also available. \* Weight is per coil and reference only.



TOMBO™ No.9042

## For use in oxygen line

### NAFLON™ Fiber Packing-G

TOMBO™ No.9042-OX

#### Construction

Stretched and reinforced PTFE fiber is braided into square cross section and impregnated with PTFE dispersion and is processed in special cleansing.

#### Features

1. As this is easy to cut and hard to ravel from cut edge, it is easy to handle.
2. As this is 100% PTFE and does not contain lubricant, this is applicable in oxygen lines.

#### Application

Valves for use in oxygen lines.



TOMBO™ No.9042-OX

#### Service Range

Max. Temperature	260°C
Max. Pressure	5.2MPa
Pressure Class	300

⊘ In some cases this can not be used for alkali metals and extremely strong oxidizing agent.

⚠ TOMBO™ No.9027-H is recommendable for use in semi-conductor industries where contamination should be avoided.

⚠ Metal-molded packing in ring form is also available, but it would be contaminated with rust preventive oil or metallic coloring deriving from the metal mold.

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4	Supply form
9042-OX	Weight (kgs) <sup>(1)</sup>	0.06	0.12	0.20	0.31	0.44	0.59	0.78	0.99	1.20	1.72	2.32	3.02	3 meter /coil
	Braiding method	Square braid					Interlocking braid							

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.

## Other Packings for valves

## Graphite Fiber Packing

TOMBO™ No.2940

A high temperature packing manufactured from graphite fiber and treated with a special lubricant.  
Excellent in heat and chemical resistance.

## Service Range

Max. Temperature	400°C (in oxidizing atmosphere) 600°C (in non-oxidizing atmosphere)
Max. Pressure	2MPa

\* Above values show maximum for each condition.

It can not be used at maximum temperature with maximum pressure.

## Standard size and weight

Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4	Supply form
Weight (kgs) <sup>(1)</sup>	0.04	0.09	0.15	0.21	0.33	0.42	0.54	0.69	0.84	1.20	1.62	2.10	3 meter /coil
Braiding method	Square braid				Braid over braid								

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.



TOMBO™ No.2940

## Other Packings for valves

## AL-METAL™ Packing -AF

TOMBO™ No.2788-AF

Made from crinkled aluminium foil treated with a special lubricant and graphite. Flexible and resilient among metallic packings and excellent heat dispersal properties.

To be used in combination with TOMBO™ No.2200 or TOMBO™ No.2205-P.

## Service Range

Max. Temperature	550°C
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## Standard size and weight

To be supplied in ring form. Please specify ring ID, OD, Height and number of rings.



TOMBO™ No.2788-AF

## Other Packings for valves

## Plastic Graphite Packing -NA

TOMBO™ No.2996-NA

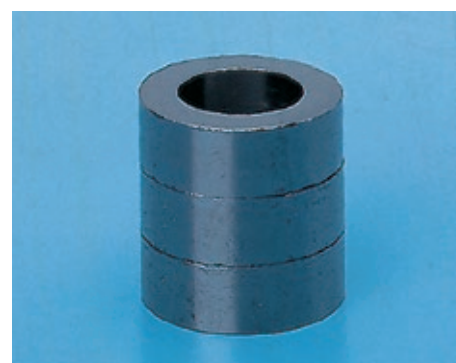
This plastic packing is a mixture of special heat resistant fibers, graphite, and synthetic rubber, mold formed into a ring shape. Superior flexibility aids in valve stem conformation, making for an excellent seal. A good packing for water, hot water, low pressure steam, oils, bronze gas valves, and cast steel valves.

## Service Range

Max. Temperature	200°C
Max. Pressure	2MPa

\* Above values show maximum for each condition.

It can not be used at maximum temperature with maximum pressure.



TOMBO™ No.2996-NA



# Packing Recommendations - Rotary Shaft Packings

Fluid	Operating Conditions				Recommended Packing	Remarks
	Temperature (°C)	Pressure MPa	Shaft Speed m/s	PV Value MPa·m/s {kgf/cm <sup>2</sup> ·m/s}		
Hot Water Water	260	2	16	15	9038	
			10	16.5	9077-L	
	200	2	16	16.5	9039	
	100	1	10	5.0	9079	
Light oil, Naptha, Heavy oil, Crude oil, Lubricant	260	2	16	15	9038	
			10	16.5	9077-L	
	200	2	16	16.5	9039	
Alcohol, Ester, Amine, Ketone, Aromatic hydrocarbons	260	2	16	15	9038	
			10	16.5	9077-L	
	200	2	16	16.5	9039	
Weak Alkali 7<pH<12	260	2	16	15	9038	
			10	16.5	9077-L	
			8	10	9036	
	200	2	16	16.5	9039	
Strong Alkali 12≤pH≤14	260	2	16	15	9038	
			10	16.5	9077-L	
			8	10	9036	
Weak acids 2<pH<7	260	2	16	15	9038	
			10	16.5	9077-L	
			8	10	9036	
	200	2	16	16.5	9039	
Strong acids 0≤pH≤2	260	2	16	15	9038	Not used for strong oxidizing acids
			10	16.5	9077-L	Not used for strong oxidizing acids
			8	10	9036	
Strong oxidizing acids	260	2	8	10	9036	Nitric acids, Hot sulphuric acids Chromic acids etc.

\* This selection guide shows typical recommended packings for fluids, temperatures, pressures, shaft speeds and PV values and not showing maximum condition of each rotary shaft packings. Thus, depending on the other conditions, the products shown here are not necessarily suitable for use in some cases.

\* For maximum service condition of each rotary shaft packings, please refer to the description of each product in this catalogue.

\* Rotary shaft packings are basically operated with small amount of leakage to keep lubricity etc. In case leakage of the internal fluid is not allowed, lantern ring shall be used and the fluid which leakage is allowed shall be filled at 0.1~0.2MPa (1~2kgf/cm<sup>2</sup>) higher pressure than internal pressure.

## Packings for use in rotating equipment

Packings for use in rotating equipment are sealing materials to prevent leakage from the contact area of the shaft of rotating equipment such as pumps, stirring machines and so on.

### Versatile packing

#### NAFLON™ impregnated CT Packing

TOMBO™ No.9079

##### Construction

Flexible cotton yarn is braided into square cross section and treated with PTFE dispersion and special lubricant.

##### Features

1. As this is in white color, this is applicable for production lines where packings in black color are not acceptable. This enables improvement in working environment.
2. Most economical among packings for use in rotating equipment.
3. As this is excellent in flexibility, it can be expected that this fits into the shaft and the wearing is reduced.

##### Application

A wide variety of pumps, stirring machines, etc.

##### Fluid

Water-based fluids (Clear water, industrial and sanitary sewage, seawater, etc.).

⊘ This would catch fire when this is used in temperatures above the maximum temperature.



TOMBO™ No.9079

##### Service Range

Max. Temperature	100℃
Max. Pressure	1.0MPa
Max. Velocity	10meter/sec
Max. PV Value	5MPa · m/sec
pH	4 ~ 10

### Anti-corrosion use packing

#### NAFLON™ Fiber Packing-G

TOMBO™ No.9042-S / 9042-OX

##### Construction

TOMBO™ No.9042-OX is made of stretched and reinforced PTFE fiber that is braided into square cross section and impregnated with PTFE dispersion and is processed in special cleansing.

TOMBO™ No.9042-S is made by treating TOMBO™ No.9042-OX with silicon-based lubricant.

##### Features

1. As this is easy to cut and hard to ravel from cut edge, it is easy to handle.
2. As this is made of PTFE, this is outstandingly low in sliding.

##### Application

Shaft seal of rotating equipment, Screw feeders, Stirring shafts, Pumps.

⊘ TOMBO™ No.9042-OX does not contain lubricant, in order to use stably for rotating equipment please use other packings or please use TOMBO™ No.9042-OX together with TOMBO™ No.9401 NAFLON™ Grease.

⚠ Metal-molded packing in ring form is also available, but it could be contaminated with rust preventive oil and metallic coloring that derive from the metal mold.



TOMBO™ No.9042-OX

##### Service Range

Max. Temperature	260℃
Max. Pressure	2MPa
Max. Velocity	4meter/sec
Max. PV Value	4MPa · m/sec
pH	0 ~ 14

## Anti-corrosion use packing

### G-FLON™ Packing

TOMBO™ No.9038

#### Construction

Graphite particles containing PTFE yarn is treated with PTFE dispersion and special lubricant, and then braided into square cross section and further treated with PTFE dispersion.

#### Features

1. Graphite particles containing PTFE yarn is excellent in chemical resistance and can be used with almost any fluids other than strong oxidizing acids.
2. Excellent in seal performance at high revolution speeds.
3. Because it contains graphite particles in PTFE yarn, heat dispersion characteristics are very good and among PTFE base packings, it has the highest heat resistance.

#### Application

All types of pumps, mixers, etc.

#### Fluid

Water base fluids (water, waste water, brine etc.), oil base fluids, organic solvents, hydrocarbons, chemicals, corrosive fluids except listed below.

- ⊗ TOMBO™ No.9038 can not be used for strong oxidizing acids such as fuming sulfuric acid, concentrated sulfuric acid, chromic acid, aqua regia etc.
- ⊗ This packing is not used for the fluids which contamination is not allowed, such as drinking water, pharmaceuticals, comestibles, semi-conductor manufacturing etc.



TOMBO™ No.9038

#### Service Range

Max. Temperature	260℃
Max. Pressure	2MPa
Max. Velocity	16meter/sec
Max. PV Value	15MPa · m/sec
pH	0 ~ 14

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4	Supply form
9079	Weight (kgs) <sup>(1)</sup>	—	0.08	0.15	0.22	0.32	0.43	0.57	0.71	0.88	1.24	1.67	2.16	3 meter /coil
	Braiding method	Square braid				Interlocking braid								
9042-S	Weight (kgs) <sup>(1)</sup>	0.06	0.13	0.21	0.33	0.46	0.63	0.83	1.05	1.28	1.83	2.47	3.22	
	Braiding method	Square braid				Interlocking braid								
9042-OX	Weight (kgs) <sup>(1)</sup>	0.06	0.12	0.20	0.31	0.44	0.59	0.78	0.99	1.20	1.72	2.32	3.02	
	Braiding method	Square braid				Interlocking braid								
9038	Weight (kgs) <sup>(1)</sup>	0.06	0.11	0.18	0.28	0.41	0.55	0.72	0.92	1.12	1.59	2.17	2.84	
	Braiding method	Square braid				Interlocking braid								

Notes: (1) Molded ring is also available. \* Weight is per coil and reference only.

## Anti-corrosion use packing

### NAFLON™ Fiber Packing (Soft)

TOMBO™ No.9036

#### Construction

This packing is made of PTFE fiber and finished with PTFE dispersion and heat resistant lubricant.

#### Features

1. PTFE is extremely chemical resistant, and can be used with almost any fluids from strong acids to strong alkalis.
2. Contamination of the fluid from this packing is very little.

#### Application

All types of pumps, mixers, etc.

#### Fluid

Water base fluids (water, waste water, brine etc.), oil base fluids, organic solvents, hydrocarbons, chemicals, corrosive fluids.

⊘ This packing is not used for the fluids which contamination is not allowed, such as drinking water, pharmaceuticals, comestibles, semi-conductor manufacturing etc.



TOMBO™ No.9036

#### Service Range

Max. Temperature	260℃
Max. Pressure	2MPa
Max. Velocity	8meter/sec
Max. PV Value	10MPa · m/sec
pH	0 ~ 14

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4
9036	Weight (kgs) <sup>(1)</sup>	0.07	0.14	0.23	0.35	0.49	0.67	0.86	1.09	1.34	1.92	2.57	3.37
	Braiding method	Square braid						Interlocking braid					
	Supply form	3 meter / coil											

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.

## Anti-corrosion use packing

### NAFLON™ Fiber Packing - T

TOMBO™ No.9033 / 9034

#### Construction

These packings are for chemical packings made of PTFE fiber.  
TOMBO™ No.9033 does not contain any lubricant.  
TOMBO™ No.9034 is treated with PTFE dispersion.

#### Features

1. PTFE is extremely chemical resistant, and can be used with almost any fluids from strong acids to strong alkalis.
2. This is ideal packing for chemical services because it will leave almost no elution even in solvents or fine chemicals.

#### Application

All types of pump, mixers, etc.

- ⚠ PTFE fiber is not suitable for high speed rotation due to its high coefficient of thermal expansion and low thermal conductivity.

#### Fluid

Water base fluids (water, waste water, brine etc.), oil base fluids, organic solvents, hydrocarbons, chemicals, corrosive fluids (strong acids, strong alkalis).

- ⚠ As TOMBO™ No.9033 does not contain lubricant etc. please use other packings or please use TOMBO™ No.9042-OX together with either TOMBO™ No.9401 NAFLON™ Grease or lubricant that does not affect the fluid such as edible oil, etc.



TOMBO™ No.9034

#### Service Range

Max. Temperature	260°C
Max. Pressure	2MPa
Max. Velocity	4meter/sec
Max. PV Value	4MPa · m/sec
pH	0 ~ 14

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4
9033	Weight (kgs) <sup>(1)</sup>	0.05	0.11	0.19	0.29	0.41	0.57	0.78	0.93	1.13	1.62	2.16	2.80
	Braiding method	Square braid					Interlocking braid						
9034	Weight (kgs) <sup>(1)</sup>	0.06	0.13	0.22	0.33	0.47	0.63	0.83	1.05	1.29	1.87	2.48	3.25
	Braiding method	Square braid					Interlocking braid						
	Supply form	3 meter / coil											

Notes: (1) Molded ring is also available. \* Weight is per coil and reference only.



## Anti-corrosion use packing

### NAFLON™ Carbon Fiber Packing - L

TOMBO™ No.9077-L

#### Construction

Carbon fiber is braided into square cross section and impregnated with PTFE dispersion and special lubricant.

#### Features

1. Good in heat resistance.
2. Carbon fiber is extremely chemical resistant, and can be used with almost any fluid other than strong oxidizing acids.
3. Maintain excellent seal performance for long time.
4. Less sleeve torque than asbestos packing.

#### Application

All types of pumps, mixers, etc.

#### Fluid

Water base fluids (water, waste water, brine etc.), oil base fluids, organic solvents, hydrocarbons, black / green / white liquor for paper mill, chemicals, corrosive fluids except listed below.

- ⊘ TOMBO™ No.9077-L can not be used for strong oxidizing acids such as fuming sulfuric acid, concentrated sulfuric acid, chromic acid, aqua regia etc.
- ⊘ This packing is not used for the fluids which contamination is not allowed, such as drinking water, pharmaceuticals, comestibles, semi-conductor manufacturing etc.



TOMBO™ No.9077-L

#### Service Range

Max. Temperature	260℃
Max. Pressure	2MPa
Max. Velocity	10meter/sec
Max. PV Value	16.5MPa · m/sec
pH	0 ~ 14

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4
9077-L	Weight (kgs) <sup>(1)</sup>	—	0.11	0.20	0.30	0.40	0.54	0.70	0.89	1.09	1.57	2.20	2.75
	Braiding method	Square braid				Interlocking braid							
	Supply form	3 meter / coil											

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.

## General Purpose Packing

### Aramid Fiber Packing

TOMBO™ No.9040

#### Construction

This packing is made of polyamide fiber and finished with PTFE dispersion and heat resistant lubricant.

#### Features

1. Better wear resistance than other packings and it allows long and stable seal performance. More suitable for slurries than other packings.
2. Good in heat resistance.

#### Application

All types of pumps, mixers, plungers etc.  
Suitable for the application at pulp or paper mills.

#### Fluid

Water base fluids (water, waste water, brine etc.), oil base fluids, organic solvents, hydrocarbons, weak acids, weak alkalis.

⊘ This packing is not used for the fluids which contamination is not allowed, such as drinking water, pharmaceuticals, comestibles, semi-conductor manufacturing etc.



TOMBO™ No.9040

#### Service Range

Max. Temperature	260℃
Max. Pressure	2MPa
Max. Velocity	10meter/sec
Max. PV Value	16.5MPa · m/sec
pH	2 ~ 13

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4
9040	Weight (kgs) <sup>(1)</sup>	—	0.12	0.20	0.29	0.42	0.57	0.74	0.95	1.14	1.65	2.19	2.85
	Braiding method	Square braid				Interlocking braid							
	Supply form	3 meter / coil											

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.

## General Purpose Packing

### Aramid Fiber Packing - White

TOMBO™ No.9040-W / 9040-WR

#### Construction

These packings are made of aramid fiber.

TOMBO™ No.9040-W is finished with PTFE dispersion and heat resistant lubricant.

TOMBO™ No.9040-WR is finished with PTFE dispersion. Lubricant is not used.

#### Features

1. White color for lines that can not use black color products.
2. More flexible than TOMBO™ No.9040 and it allows excellent conformity to shaft and reduces shaft wearing.

#### Application

All types of pump, mixers, dampers, etc. General application at pulp and paper mills.

TOMBO™ No.9040-WR is suitable for the lines which lubricant is not allowed.

#### Fluid

Water base fluids (water, waste water, brine etc.), oil base fluids, organic solvents, hydrocarbons, weak acids, weak alkalis pulp slurry, white liquor.

- ⊘ This packing is not used for the fluids which contamination is not allowed, such as drinking water, pharmaceuticals, comestibles, semi-conductor manufacturing etc.



TOMBO™ No.9040-W

#### Service Range

TOMBO™ No.	9040-W	9040-WR
Max. Temperature	260°C	260°C
Max. Pressure	2MPa	2MPa
Max. Velocity	10meter/sec	8meter/sec
Max. PV Value	16.5MPa · m/sec	10MPa · m/sec
pH	2 ~ 13	2 ~ 13

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4	Supply form
9040-W	Weight (kgs) <sup>(1)</sup>	—	0.09	0.14	0.21	0.31	0.43	0.54	0.68	0.85	1.28	1.70	2.20	3 meter/coil
	Braiding method	Square braid				Interlocking braid								
9040-WR	Weight (kgs) <sup>(1)</sup>	—	0.09	0.15	0.24	0.35	0.47	0.61	0.74	0.97	1.35	1.81	2.34	
	Braiding method	Square braid				Interlocking braid								

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.

## General Purpose Packing

### Oxidized PAN fiber Packing

TOMBO™ No.9039

#### Construction

This packing is made of Oxidized PAN (polyacrylonitrile) fiber and finished with PTFE dispersion and special lubricant.

#### Features

1. Good seal performance under high revolutions.
2. Less shaft and sleeve abrasion than asbestos packing.
3. Economical among packing.

#### Application

All types of pumps, mixers, sterntube, etc.

#### Fluid

Water base fluids (water, waste water, brine etc.), oil base fluids, organic solvents, hydrocarbons, weak acids, weak alkalis, slurries.

- ⊘ This packing is not used for the fluids which contamination is not allowed, such as drinking water, pharmaceuticals, comestibles, semi-conductor manufacturing etc.



TOMBO™ No.9039

#### Service Range

Max. Temperature	200℃
Max. Pressure	2MPa
Max. Velocity	16meter/sec
Max. PV Value	16.5MPa · m/sec
pH	2 ~ 12

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4
9039	Weight (kgs) <sup>(1)</sup>	0.05	0.11	0.19	0.29	0.38	0.52	0.67	0.85	1.05	1.49	2.01	2.63
	Braiding method	Square braid				Interlocking braid							
	Supply form	3 meter / coil											

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.

## High temperature Packing

### Graphite Fiber Packing

TOMBO™ No.2940

#### Construction

A high temperature packing manufactured from graphite fiber and treated with a special lubricant.

#### Features

1. Good in chemical resistance and can be used with almost any chemicals except strong oxidizing acids.
2. Can be used at high temperature where TOMBO™ No.9039 or TOMBO™ No.9077-L can not be used.

#### Application

All types of pump, mixers, dampers, etc.

#### Fluid

Water base fluids (water, waste water, brine etc.), oil base fluids, organic solvents, hydrocarbons, chemical products, corrosive fluids except strong oxidizing acid such as fuming sulfuric acid, concentrated sulfuric acid, chromic acid, aqua regia etc.

- ⊘ TOMBO™ No.2940 can not be used for strong oxidizing acids such as fuming sulfuric acid, concentrated sulfuric acid, chromic acid, aqua regia etc.
- ⊘ This packing is not used for the fluids which contamination is not allowed, such as drinking water, pharmaceuticals, comestibles, semi-conductor manufacturing etc.

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4
2940	Weight (kgs) <sup>(1)</sup>	0.04	0.09	0.15	0.21	0.33	0.42	0.54	0.69	0.84	1.20	1.62	2.10
	Braiding method	Square braid				Interlocking braid							
	Supply form	3 meter / coil											

Notes: (1) Molded ring is also available.

\* Weight is per coil and reference only.



TOMBO™ No.2940

#### Service Range

Max. Temperature	400°C (in oxidizing atmosphere)
	600°C (in non-oxidizing atmosphere)
Max. Pressure	2MPa (20kgf/cm <sup>2</sup> )
Max. Velocity	10meter/sec
Max. PV Value	10MPa · m/sec
pH	0 ~ 14



## Other Packing for rotary shaft

### AL-METAL™ Packing - AF

TOMBO™ No.2788-AF

#### Construction

This is metallic back-up packing made of aluminium foil that has been treated with a special lubricant and graphite.

#### Features

Flexible and resilient among metallic packings and good in heat dissipation. To be used in combination with other packings.

#### Service Range

Max. Temperature	550°C
Max. Pressure	depends on other packing
Max. Velocity	depends on other packing
Max. PV Value	depends on other packing
pH	5 ~ 9



TOMBO™ No.2788-AF

#### Standard size and weight

TOMBO™ No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.0	22.2	25.4
2788-AF	Width (mm)	—	4.5	6.0	7.5	9.0	10.0	12.0	—	15.0	18.0	21.0	24.0
	Height (mm)	—	5.0	7.0	9.5	11.0	13.0	14.0	—	18.0	22.0	25.0	28.0
	ID of coil (mm)	—	30	40	40	50	50	50	—	80	110	150	190
	Weight (kgs) <sup>(1)</sup>	—	0.09	0.12	0.21	0.29	0.38	0.53	—	0.90	1.10	1.43	1.83
Supply form		3.63 meter / coil in spiral form											

Notes: (1) Molded ring is also available. \* Weight is per coil and reference only.

## Packings for plungers and valves

### NAFLON™ PTFE Molded Packing

TOMBO™ No.9027

#### Construction

This is a self lip seal type packing machined from PTFE resin, available in VH, VL, and D type cross-sections. For high temperature and high pressure services, packings made of filled PTFE is also available.

#### Features

1. Can be used with almost any fluid.
2. Because this packing is made from PTFE, it has low frictional resistance with the stem and will not stick.
3. Will not contaminate the fluids.
4. By selecting suitable fillers, products for high temperature, pressure and wear resistant application are also available.

#### Fluid

Water base fluids (water, steam etc.), oil base fluids (oil, heat transfer oil etc.), organic solvent, hydrocarbons, gas type fluids (hydrogen, ammonia, etc.), chemical products, corrosive fluids (other than oxidizing fluids).



TOMBO™ No.9027

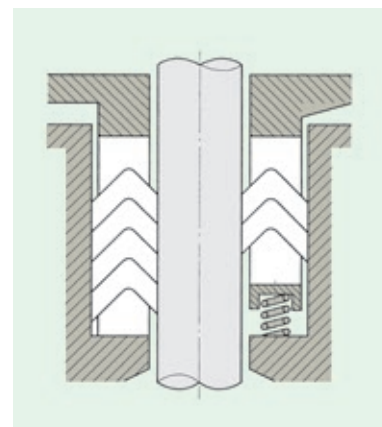
#### Service Range

<b>Max. Temperature</b>	200°C (Filled PTFE) 120°C (Pure PTFE)
<b>Max. Pressure</b>	30MPa Can be used with high pressure when combined with metal spacers.

#### Service Pressure, Number of Packings, Application, and Shape

Item	Type	VH-type	VL-type	D-type
Service Pressure MPa		2 ~ 30	~ 3	~ 2
Number of Packing		2 ~ 5MPa 3pcs {20 ~ 50kgf/cm <sup>2</sup> }	3 ~ 4pcs	1 ~ 3pcs
		5 ~ 15MPa 4pcs {50 ~ 150kgf/cm <sup>2</sup> }		
		15 ~ 30MPa 6pcs {150 ~ 300kgf/cm <sup>2</sup> }		
Application		High pressure valves, pistons, and plungers	Low pressure valves and control valves	Low pressure valves and mechanical seals
Shape				

#### Typical application of NAFLON™ PTFE Molded Packing



#### Type of Nafion PTFE Molded Packings with Fillers

TOMBO No.9027

—	H	—	G20
	Shape		Filler

Shape	Indication symbol	Filler	Indication symbol
VH-Type	H	none	—
VL-Type	L	with glass fiber	G20
D-Type	D	with glass fibers and graphite	GGR
		carbon fiber	CF10

⚠ Caution: Apply TOMBO™ No.9401 (PTFE Grease) to the packing and ensure that the lip is not damaged.

⚠ Caution: For low pressure gas, apply TOMBO™ No.9401 (PTFE Grease) to the packing and use with a spring (recommended spring pressure: 0.8MPa[8kgf/cm<sup>2</sup>])

⚠ Caution: Shaft surface finishing should be at least 1.6μmRa.

⚠ Caution: When used at temperatures over 120°C, use filled PTFE.

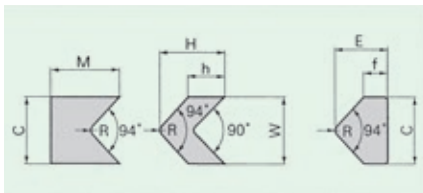
⊘ This packing may not be used for alkali metal, quite strong oxidizing agent etc.

■ Stem diameter & Width of PTFE Molded Packing unit : mm

Stem diameter (d)	Packing width
5 ~ 10	3 ~ 5
10 ~ 20	4 ~ 6.5
20 ~ 30	5 ~ 8
30 ~ 40	5 ~ 10
40 ~ 65	7 ~ 10
65 ~ 125	8 ~ 12.5
125 ~ 250	9.5 ~ 16

■ Standard dimensions of PTFE Molded Packing

● VH-type



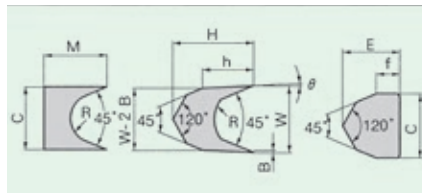
● Cross Section Dimensions of VH-type unit : mm

W	H	h	E	f	R
3	2.8	1.6	2.2	1.0	0.5
4	3.7	2.1	2.9	1.3	1.0
5	4.7	2.7	3.7	1.7	1.0
6	5.6	3.2	4.4	2.0	1.0
7	6.6	3.7	5.2	2.3	1.0
8	7.4	4.2	5.9	2.7	1.5
9	8.4	4.8	6.6	3.0	1.5
10	9.4	5.3	7.4	3.3	1.5
11	10.4	5.8	8.2	3.6	1.5
12	11.4	6.4	9.0	4.0	1.5
13	12.3	6.9	9.7	4.3	2.0
14	13.2	7.4	10.5	4.7	2.0
15	14.2	8.0	11.2	5.0	2.0
16	15.2	8.5	12.0	5.3	2.0
17	16.2	9.0	12.8	5.6	2.0
18	17.1	9.5	13.6	6.0	2.0
19	18.1	10.0	14.4	6.3	2.0
20	19.1	10.5	15.3	6.7	2.0

M=W C=W-0.2

Packing Height :  $M+nh+f$  (n=No. of packing)

● VL-type



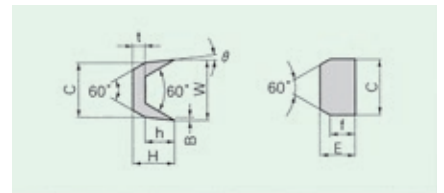
● Cross Section Dimensions of VL-type unit : mm

W	H	h	B	R	E	f	C
3	3.1	1.8	0.15	1.0	3.3	2	2.5
4	4.2	2.4	0.15	1.5	3.8	2	3.5
5	5.2	3.0	0.15	2.0	4.2	2	4.5
6	6.3	3.6	0.15	2.0	4.7	2	5.5
7	7.3	4.2	0.2	2.5	5.1	3	6.4
8	8.3	4.8	0.2	3.0	5.5	3	7.4
9	9.4	5.4	0.25	3.5	7.5	3.5	8.3
10	10.4	6.0	0.25	4.0	8.4	4	9.3
11	11.4	6.6	0.3	4.5	8.8	4	10.2
12	12.5	7.2	0.3	4.5	10.3	5	11.2
13	13.5	7.8	0.35	5.0	11.7	6	12.1
14	14.5	8.4	0.35	5.5	12.1	6	13.1
15	15.6	9.0	0.4	6.0	12.6	6	14.0
16	16.6	9.6	0.4	6.0	14.0	7	15.0
17	17.7	10.2	0.4	6.5	14.5	7	16.0
18	18.8	10.8	0.5	7.0	16.0	8	16.8
19	19.8	11.4	0.5	7.5	16.4	8	17.8
20	20.8	12.0	0.5	8.0	17.8	9	18.8

M=W

Packing Height :  $M+nh+f$  (n=No. of packing)

● D-type



● Cross Section Dimensions of D-type unit : mm

W	H	h	t	B	E	f
3	3	2	1	0.1	3	2
3.5	3	2	1	0.1	3	2
4	3	2	1	0.1	3	2
4.5	3.5	2.5	1	0.1	3	2
5	4	3	1	0.1	3	2
5.5	4	3	1	0.1	3	2
6	4	3	1	0.1	3	2
6.5	4.25	3.25	1	0.1	3.5	2.5
7	4.5	3.5	1	0.1	4	3
8	5.5	4	1.5	0.1	4.5	3
9	6	4.5	1.5	0.15	5	3.5
10	7	5	2	0.15	6	4
11	7.5	5.5	2	0.2	6	4
12	8	6	2	0.2	7	5
13	8.5	6	2.5	0.2	7.5	5
14	9	6.5	2.5	0.2	8.5	6
15	9.5	7	2.5	0.2	8.5	6
16	10	7.5	2.5	0.2	9.5	7

W dimension less than 10mm, C=W-0.4

W dimension more than 11mm, C=W-0.6

Packing Height :  $nh+E$  (n=No. of packing)

# Packings for Plungers, Rods, Rams and Pistons

## Lip Type Packings

TOMBO™ No.2660 / 2661 / 2665

### Construction

This type of packing is expanded automatically by fluid pressure and forms tight seal against stuffing box wall or shaft. Thus it is called automatic sealing packing.

### Type

#### ● TOMBO™ No.2660 Rubber Molded Packing with Cotton duck

Cotton duck treated with synthetic rubber is molded into ring forms.

#### ● TOMBO™ No.2661 Rubber Molded Packing

Various kinds of rubber are molded into ring forms. It has better seal performance than TOMBO™ No.2660 but less pressure resistance. Service range depends on rubber material.

#### ● TOMBO™ No.2665 Slip Mold Packing

Surface of TOMBO™ No.2660 is treated with PTFE dispersion for easy conformity to rod or shaft surface for initial break-in period.



TOMBO™ No.2660



TOMBO™ No.2661



TOMBO™ No.2665

### Application

Rod and piston seals for cylinder, plungers, Hydraulic rams, valve stems.

### Fluid

Water type fluids (water, waste water, sewage, brine etc.),  
Oil type water, Air.

### Service Range of TOMBO™ No.2660 and 2665

	V type	U type	L type	J type	S type	AF type
Cross Section						
Max. Temperature	~ 120°C	~ 120°C	~ 120°C	~ 120°C	~ 120°C	~ 120°C
Max. Pressure	~ 200MPa	~ 100MPa	~ 10MPa	—	~ 40MPa	~ 40MPa
Max. Velocity	0.8m/sec	0.15m/sec	0.15m/sec	—	0.4m/sec	—
pH	5 ~ 9	5 ~ 9	5 ~ 9	5 ~ 9	5 ~ 9	5 ~ 9

## Other Packings

### Rubber O-Ring

TOMBO™ No.2670

#### Construction

Molded rubber O-ring.

#### Application

Rod seal of cylinder, piston seal, and ram.

#### Service Range

Max. Temperature	Depends on rubber
Max. Velocity	0.1meter / sec.
pH	Depends on rubber



TOMBO™ No.2670

#### Fluid

Water type fluid (water, waste water, sewage, brine etc.), Various oil type fluids, Air.

#### Type of rubber and physical properties

Standard material		Feature	JIS symbol	Color	Working temperature range (°C )
Nichias product name	Nichias material symbol				
Nitrile elastmer	<b>NBR</b>	Mineral oil resistance	NBR-70-1	Black	− 30 ~ 120
Chloroprene elastmer	<b>CR</b>	Weaheer resitance and oil resistance	—	Black	− 30 ~ 120
Ethylene Propylene elastmer	<b>EP</b>	Weaheer resitance and water resistance	EPDM-70	Black	− 40 ~ 150
Silicone elastmer	<b>SI</b>	Heat resistance	VMQ-70	Reddish brown	− 50 ~ 200
Fluoro elastomer FA	<b>FA</b>	Heat resistance	FKM-70	Black	− 15 ~ 200
Fluoro elastomer FB	<b>FB</b>	Steam resistance and asid resistance	—	Black	0 ~ 200
BLAZER™ A	<b>BA</b>	Chemical resistance	—	Black	0 ~ 210
BLAZER™ NEXT	<b>BNX</b>	Heat resistance	—	Black	0 ~ 335
BLAZER™ S2	<b>BS2</b>	Steam resistance	—	Black	0 ~ 320

⚠ When O-ring is used more than 7MPa (70 kgf/cm<sup>2</sup>) for moving, TOMBO™ No.9026 PTFE Back-up ring shall be used together.

⚠ When O-ring is used for rotating equipment, enough lubrication is required.

## Other Packings

### NAFLON™ PTFE Back-up Ring

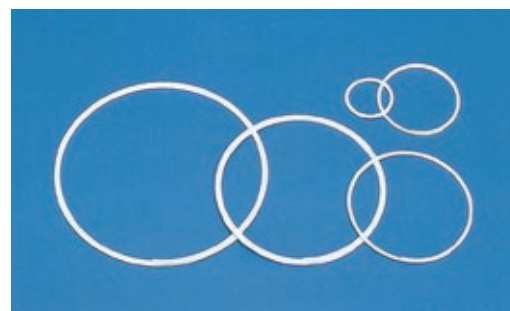
TOMBO™ No.9026

#### Construction

Machined PTFE ring. Endless ring, bias cut ring and spirally cut ring are available. Filled PTFE ring is also available.

#### Application

Back-up rings for rubber O-Rings for high pressue (over 7MPa).












TOMBO™ No.9026

Endless Type	Bias Cut Type	Spiral Type



## Static sealing for industrial furnaces, ducts, manholes, doors, etc.

Appearance	TOMBO™ No.	Product Name	Construction
	9079	NAFLON™ Impregnated CT Packing	Flexible cotton yarn is braided into square cross section and treated with PTFE dispersion and special lubricant.
	9044	THERMALFLON™ Packing	Inorganic fiber yarn is braided into square cross section treated with PTFE dispersion and a minimal amount of special lubricant.
	2280-S	Super Seal Packing	GRASEAL™ (expanded graphite) reinforced with stainless steel 316L filaments is braided into rectangular cross section treated with special lubricant, graphite and anti-corrosion material.
	8510-E	Square Braided Packing-E	Fiber glass yarn is braided into square cross section.
	8520	Square Braided Packing	Alkaline earth silicate (AES) wool reinforced with wire is braided into square cross section.
	8520-G	Square Braided Packing with graphite treatment	Surface of TOMBO™ No.8520 is treated with graphite.
	8520-H	Square Braided Packing-H	Wire reinforced alkaline earth silicate (AES) wool is densely braided into square cross section.
	8520-BH	Square Braided Packing-BH	Alkaline earth silicate (AES) wool reinforced with wire is densely braided into square cross section with graphite-based impregnation.
	8520-WH	Square Braided Packing-WH	Alkaline earth silicate (AES) wool reinforced with wire is densely braided into square cross section with titanium-based impregnation.

\* It is recommended to use it in an oxidizing atmosphere of 400°C or less and a non-oxidizing atmosphere of 600°C or less because the sealing property is deteriorated due to disappearance of the impregnating agent component.

	Features	Shape of cross section	Maximum	
			Temperature (°C )	Pressure MPa
	Most economical	Square	100	—
	Excellent in sealing performance due to dense filling treatment.	Square	180	—
	Excellent in heat resistance, chemical resistance and sealing performance.	Rectangular	400	—
	Economical	Square	400	—
	It is a packing which does not contain any impregnant.	Square	800	—
	Based on TOMBO™ No.8420/8520, it is a packing with improved sealability by graphite treatment.	Square	600*	—
	Compared to TOMBO™ No.8420/8520, it is packing with excellent sealability because it is braided at high density.	Square	800	—
	Based on TOMBO™ No.8420-H/8520-H, it is a packing subjected to graphite impregnation treatment in order to improve high temperature sealability.	Square	600*	—
	Based on TOMBO™ No.8420-H/8520-H, it is a packing subjected to titanium based impregnation treatment in order to improve high temperature sealing property.	Square	800	—

Appearance	TOMBO™ No.	Product Name	Construction
	8410-E	Round Braided Packing-E	Fiber glass yarn is braided into round cross section. Different from TOMBO™ No.8510-E only in round cross section.
	8420	Round Braided Packing	Alkaline earth silicate (AES) wool reinforced with wire is braided into round cross section. Different from TOMBO™ No.8520 only in round cross section.
	8420-G	Round Braided Packing with graphite treatment	Surface of TOMBO™ No.8420 is treated with graphite. Different from TOMBO™ No.8520-G only in round cross section.
	8420-H	Round Braided Packing-H	Alkaline earth silicate (AES) wool reinforced with wire is densely braided into round cross section. Different from TOMBO™ No.8520-H only in round cross section.
	8420-BH	Round Braided Packing-BH	Alkaline earth silicate (AES) wool reinforced with wire is densely braided into round cross section with graphite based impregnation. Different from TOMBO™ No.8520-BH only in round cross section.
	8420-WH	Round Braided Packing-WH	Alkaline earth silicate (AES) wool reinforced with wire is densely braided into round cross section with titanium-based impregnation. Different from TOMBO™ No.8520-WH only in round cross section.

\* It is recommended to use it in an oxidizing atmosphere of 400°C or less and a non-oxidizing atmosphere of 600°C or less because the sealing property is deteriorated due to disappearance of the impregnating agent component.

⚠ Caution As packings include a small amount of organic substance, it would generate smoke at the beginning of temperature rise. If packings are used in high temperatures, remove organic substance by heating prior to use.

	Features	Shape of cross section	Maximum	
			Temperature (°C )	Pressure MPa
	Economical	Round	400	—
	It is a packing which does not contain any impregnant.	Round	800	—
	Based on TOMBO™ No.8420/8520, it is a packing with improved sealability by graphite treatment.	Round	600*	—
	Compared to TOMBO™ No.8420/8520, it is packing with excellent sealability because it is braided at high density.	Round	800	—
	Based on TOMBO™ No.8420-H/8520-H, it is a packing subjected to graphite impregnation treatment in order to improve high temperature sealability.	Round	600*	—
	Based on TOMBO™ No.8420-H/8520-H, it is a packing subjected to titanium based impregnation treatment in order to improve high temperature sealing property.	Round	800	—

**Construction**

This is lubrication grease made of fine PTFE particles mixed with fluorinated oil as a base.

**Features**

Good in heat and chemical resistance, and lubrication property. It is non-combustible also.

**Application**

To be used as initial lubricant for braided packings, rubber molded packings and PTFE lip type packings. It is also used as grease for oxygen service.

**Service Range**

Max. Temperature	150℃
pH	0 ~ 14

**Standard packing**

50 gram / tube



TOMBO™ No.9401



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\*Names with TM are trademark of NICHIAS Corporation.



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## ■ 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)

#### SHANGHAI GOYU AUTO PARTS CO., LTD.

(上海五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.

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