

TOMBO™ BRAND

Apr. 2024

GLAND PACKING

GASKETNAVI™



GASKETNAVI



 **NICHIAS**

Safety precautions

Please observe the following items in order to maintain the original functions of the Packing in this catalog and use them safely.



Common precautions for handling the products listed in this catalog

The physical characteristics, application selection, range of use, etc. described in this catalog are typical. In addition, the performance data is based on our test results and achievements in general applications. Since this product is used in various places and equipment and the actual usage conditions are also different, it is recommended to carry out a confirmation test under the actual conditions when using it. For individual applications, it is necessary to judge the selection after evaluating individual design and compatibility. Please contact us for special applications.

- Do not use for any purpose other than those listed in the catalog.
- Use products within the service temperature range specified in the catalog.
- When processing, use sharp cutting tools.
- Always follow the instructions in the instruction manual when installing equipment, etc.
- Do not reuse the Packing.
- When replacing, carefully remove all of the old material before installing the new product.
- Store products indoor at ordinary temperature and humidity, and strictly avoid to get wet.
- Check the precautions for occupational health using the SDS.
- For disposal, follow local regulations.

Precautions for handling GRASEAL™ Gasket

Since there is high risk of causing deformation and/or scratch damage on this product, pay enough attention to the following handling precautions.

If deformation and/or scratch damage is caused on the surface of the product, original performance may not be maintained.

- Do not place heavy items on the product.
- Do not hit GRASEAL™ product on a hard item.
- Do not step on the product nor bend the product.
- When a cutter knife, etc. is used to open a package, be careful not to damage the product.
- Do not pick up the product before completely opening the package.
- Wear the protection glove in order not to be hurt, when reinforcing metal sheet is exposed on the edge.

Precautions for handling Manhole Gasket

- Wear the protection glove in order not to be hurt, when reinforcing metal sheet is exposed on the edge.

Precautions for handling Jointing Sheet

- The surface sometimes becomes white, but this has no effect on performance.
- Recommended gasket paste TOMBO No.9105, 9106, or 9400. Please consult us when using any other paste.

Precautions for handling fluoropolymer gaskets

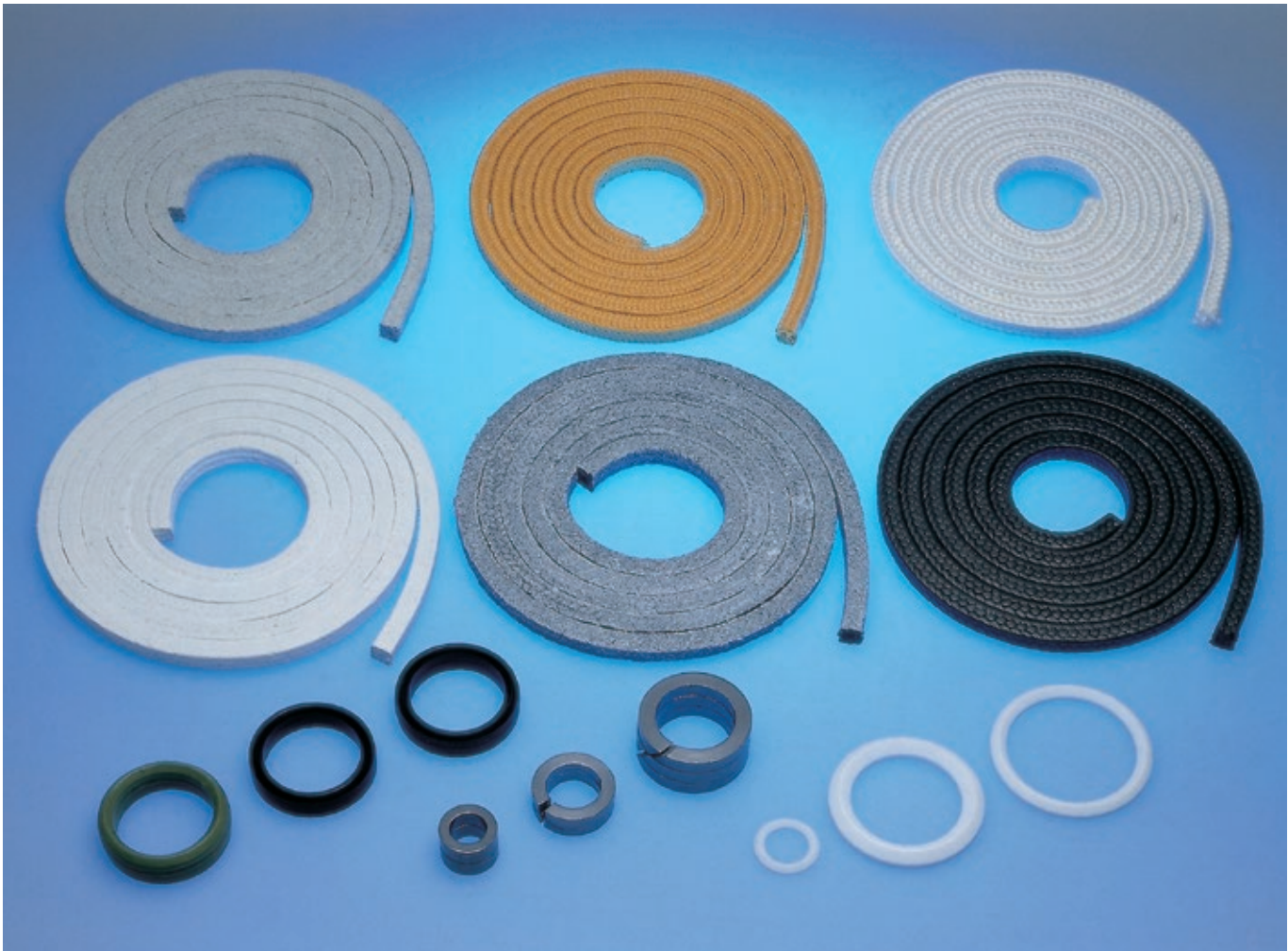


DANGER

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

- 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.

TOMBO™ BRAND
GLAND PACKING



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Packing Recommendations - For valves

Fluid	Operating conditions		Recommended Packing (TOMBO No.)	Remarks
	Temperature (°C)	Pressure MPa		
Steam Hot water Water Salt water (Brine)	600	18	2205P+2250-A	
		7	2280-S	
	500	24	2205P+2250-A	
		8	2280-S	
	350	34	2205P+2250-A	
		12	2280-S	
	260	39	2205P+2250-A	
		14	2280-S	
100	44	2205P+2250-A		
	16	2280-S		
Petroleum-based hydrocarbons Gasoline Naphtha Kerosene Light oil Heavy oil Lubricating oil Oil gas Alcohol Animal and vegetable oils	600	18	2205P+2250-A	
		7	2280-S	
	500	24	2205P+2250-A	
		8	2280-S	
	350	34	2205P+2250-A	
		12	2280-S	
	260	39	2205P+2250-A	
		14	2280-S	
150	43	2205P+2250-A		
	15	2280-S		
Aromatics-based hydrocarbons Benzene Toluene Xylene Cyclohexane Organic solutions Heat transfer solutions	600	18	2205P+2250-A	
		7	2280-S	
	500	24	2205P+2250-A	
		8	2280-S	
	350	34	2205P+2250-A	
		12	2280-S	
	260	39	2205P+2250-A	
		14	2280-S	
150	43	2205P+2250-A		
	15	2280-S		
Weak acid	300	13	2205P+2250-A	
		4	9077	
Weak alkali Salt solutions	260	14	2205P+2250-A	
		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-A	Not used for strong oxidizing acids
		4	9077	Not used for strong oxidizing acids
	260	14	2205P+2250-A	Not used for strong oxidizing acids
		5	9034	
		5	9077	Not used for strong oxidizing acids
Strong Alkalis Caustic soda Caustic potassium	300	13	2205P+2250-A	
		4	9077	
	250	14	2205P+2250-A	
		5	9077	
		5	9034	
Air	350	34	2205P+2250-A	
		8	2280-S	
Combustible gas Toxic gas Hydrogen gas Ammonia	500	8	2205P+2250-A	
	350	12	2205P+2250-A	
	260	14	2205P+2250-A	
Cryogenic fluids LNG, LN ₂ , LO ₂ LPG, Ethylene	- 200	20	2205P+2250-A	
		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.

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

Note (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) ⁽¹⁾							Pressure Rating(Class) ⁽²⁾						Remarks			
For	TOMBO No.	-	100	0	100	200	300	400	500	600	150	300	400	600		900	1500	2500
High-Temp	2250-A/2930 ⁽⁵⁾																	
	2200/2205-P ⁽⁶⁾																	
	2280-S																	
Corrosive	9077																	
	9034																	
General	9044																	

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

Note (2): Pressure rating indicates class of valve.

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

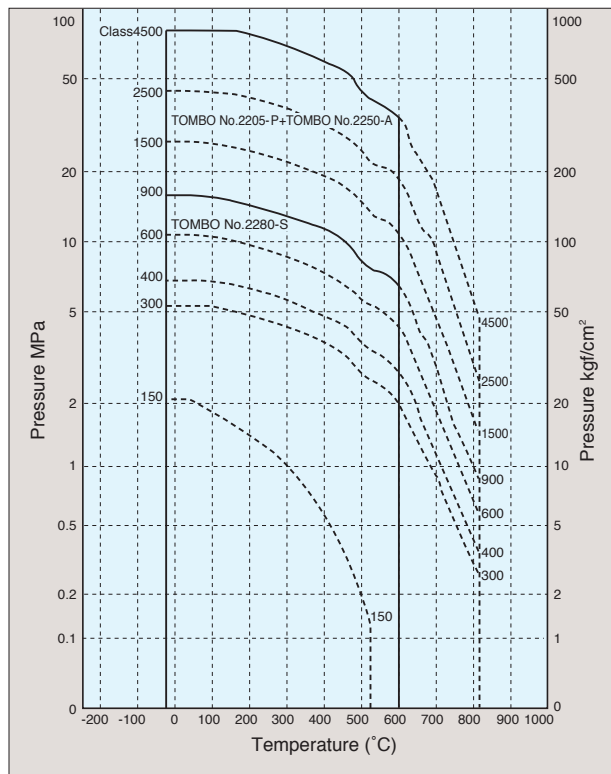
Note (4): TOMBO No.2200 series and 2205 series can be used up to 400 under oxidizing atmosphere and up to service temperature of adaptor packing under non-oxidizing atmosphere.

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

Note (6): Packing marked shall be used in combination with adequate adaptor packings such as TOMBO No.2250-A, 2930, 2920, 2921, 2788-AF, 9077, 9075-V etc.

Selection Guide

Water type fluids / Oil type fluids



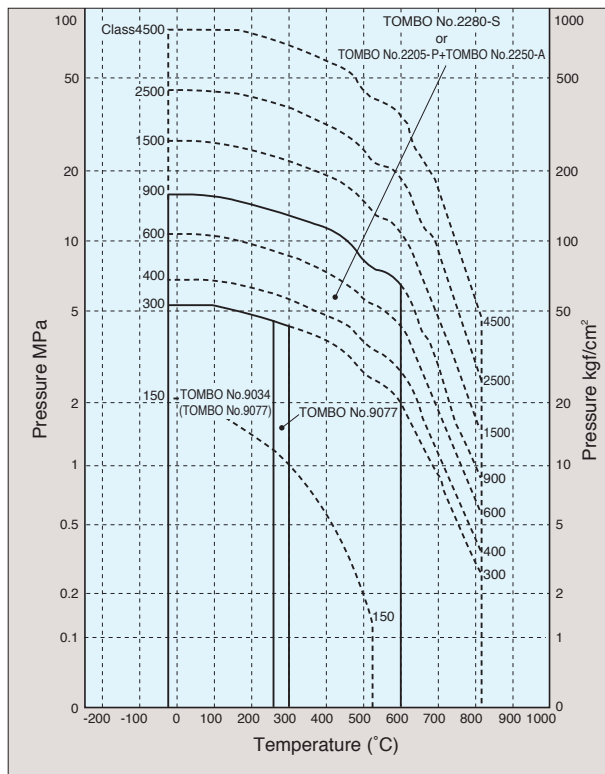
Water type fluids

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



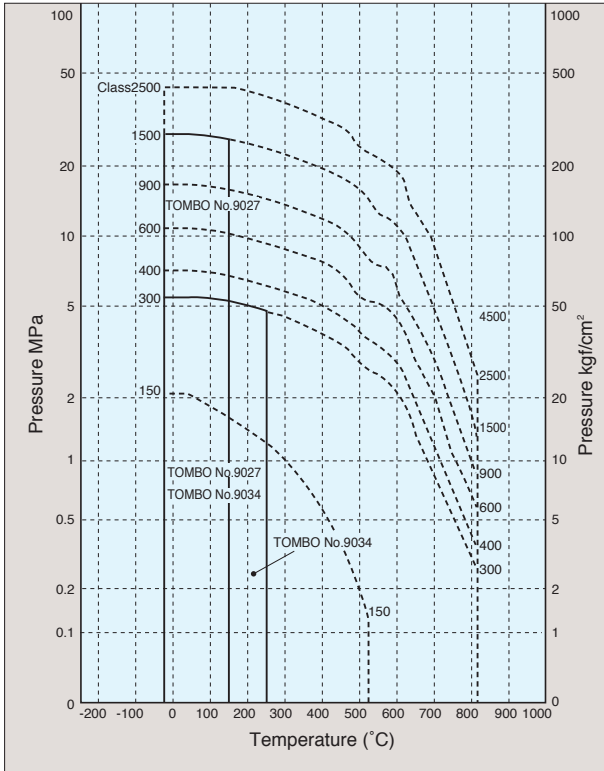
Corrosive fluids (except strong oxidizing acids)

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

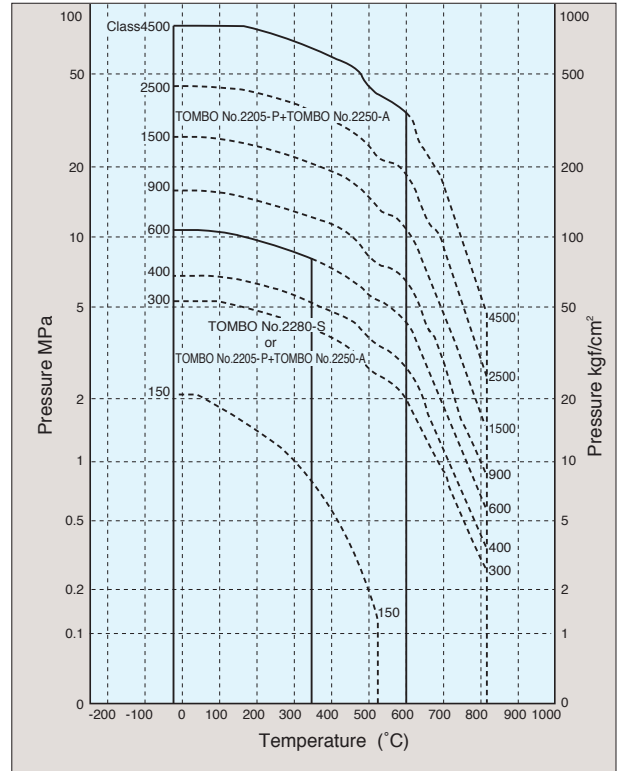
Corrosive fluids (Strong oxidizing acids)



Corrosive fluids (Strong oxidizing acids)

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

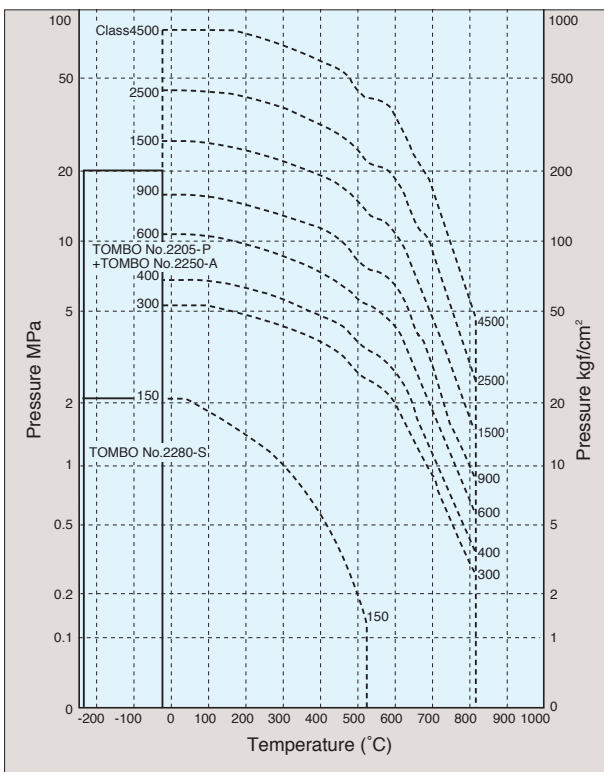
Gas type fluids



Gas type fluids

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

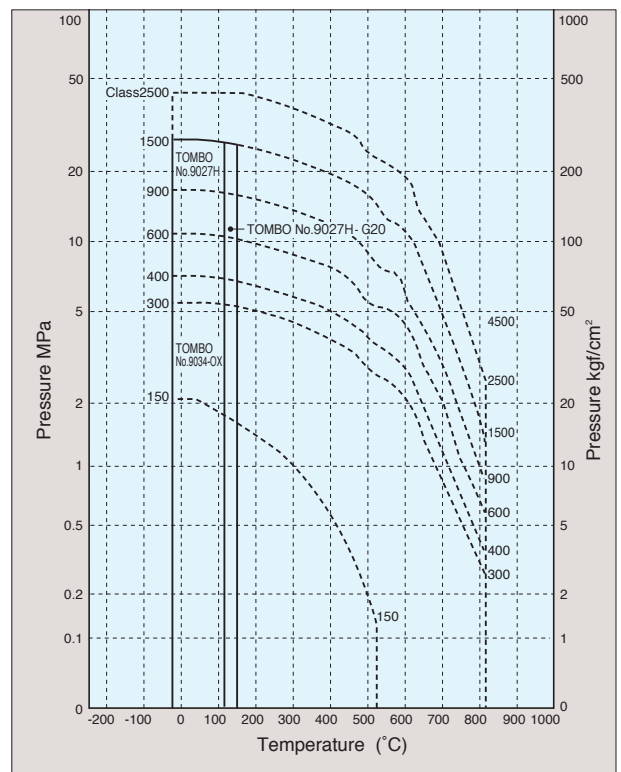
Cryogenic fluids



Cryogenic fluids

LNG, LPG, LN₂, Ethylene, etc.

Combustion supporting gases



Combustion supporting gases

Oxygen, Ozone

High temperature packings for use in valve

Valve packings are sealing materials that are incorporated into the valve stuffing box to seal leakage from the valve rod (stem) contact area.

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-A 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 (LN₂, 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 supporting gases	Oxygen (pure oxygen)



TOMBO No.2205-P

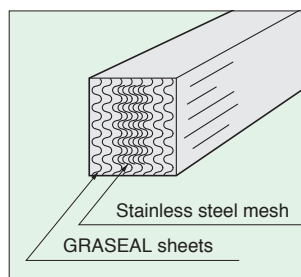


Fig. 1 TOMBO No.2205 Cross-section

Standard Dimensions

The TOMBO No.2200 series, TOMBO No.2205 series, TOMBO No.2250-A, 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-A is normally manufactured with a single straight cut.

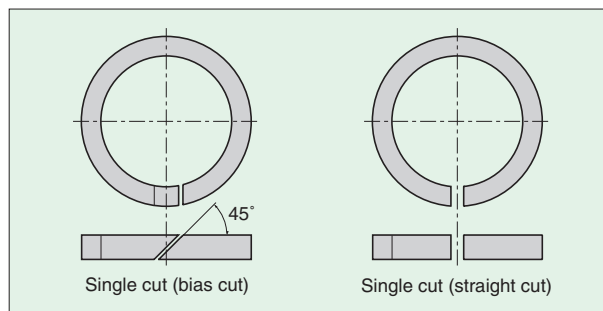


Fig. 2 Cutting Method

Ordering Information

Please specify the ring ID, OD, height, and number of packings. Please order TOMBO No.2250-A 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-A

Construction

TOMBO No.2250-A features a core of Carbonized fiber. 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-A

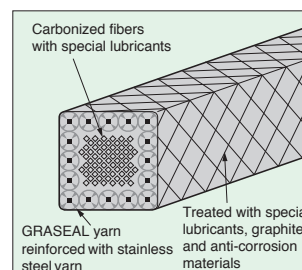


Fig. 3 TOMBO No.2250-A Cross-section

- 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 / 2280-S-SQ

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.

Coil form are available in rectangular cross section (TOMBO No. 2280-S) for easy attachment to stuffing boxes and in square cross section (TOMBO No. 2280-S-SQ) for general use.

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

Temperature Range	– 240 ~ 400°C (oxidizing atmosphere, in air)
	– 240 ~ 600°C (non-oxidizing atmosphere)
Max. Pressure	25MPa
Pressure Class	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.2280-S is standard in ring moulded form. In coil form, the following applies.

TOMBO No.	Nominal size (mm)	3.0	3.5	5.0	6.5	8.0	9.5	11.0	12.5	14.5	16.0	19.0	22.0	25.5	Supply form
2280-S	Weight (kg) ⁽¹⁾	0.05	—	0.13	0.22	0.34	0.42	0.49	0.55	0.77	0.89	1.27	1.55	2.15	3 m/coil
	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	
	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	
	Braiding	Square braid	—	Square braid						Braid over braid					
2280-SQ	Weight (kg) ⁽¹⁾	—	0.05	0.11	0.15	0.22	0.34	0.42	0.55	0.77	0.89	1.27	1.55	2.15	
	Width (mm)	—	3.5	5.0	6.5	8.0	9.5	11.0	12.5	14.5	16.0	19.0	22.0	25.5	
	Height (mm)	—	3.5	5.0	6.5	8.0	9.5	11.0	12.5	14.5	16.0	19.0	22.0	25.5	
	Braiding	—	Square braid						Braid over braid						



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 (LN₂, liquid air, LNG, LPG, etc.).

⊘ **Prohibited:** Not for use with the following fluids.

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 supporting gases	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

Super Seal™ Packing

TOMBO™ No.2280

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. Superior sealing performance can be expected in comparison with various types of fibre braided packing.
2. Applicable alone without use of adapter packings.
3. To facilitate inserting the packing into stuffing box, packings in coil form have rectangular cross-section.

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.

Prohibited: Not for use with the following fluids.

Type	Fluid Name
Oxidizing acids	Nitric acid, conc. 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 supporting gases	Oxygen (pure oxygen)

Standard size and weight

TOMBO No.2280 is standard in ring moulded form. In coil form, the following applies.

TOMBO No.	Nominal size (mm)	3.0 ⁽¹⁾	5.0 ⁽¹⁾	6.5	8.0	9.5	11.0	12.5	14.5	16.0	19.0	22.0	25.5	Supply form
2280	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	3 m/coil
	Height (mm)	4.0	6.0	8.0	9.5	11.5	13.0	14.5	16.5	18.0	22.0	25.5	28.5	
	Braiding	Square braid		Braid over braid										

Note (1): Packings with a nominal diameter of 5.0 or less have a structure without a core, are made of square braid type, and are treated with special lubricant, graphite, and anti-corrosion treatment.

When ordering: When ordering ring molded products, please specify the OD, ID, height, and number of rings of the packing. When ordering in coil form, please specify the nominal size and quantity.



TOMBO No.2280

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 (LN₂, liquid air, LNG, LPG, etc.).

Service Range

Temperature Range	– 240 ~ 400°C (oxidizing atmosphere, in air) – 240 ~ 600°C (non-oxidizing atmosphere)
Max. Pressure	25MPa
Pressure Class	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.

High Temperature Use Packings

HighTemp Mica™ Packing

TOMBO™ No.2282

Construction

This packing is made of braided mica reinforced with heat-resistant metal wire (SUS316L), impregnated with a special lubricant, and molded into a ring shape using a mold.

Features

1. Can be used in high-temperature oxidising atmosphere applications where expanded graphite packing is difficult to use.
2. The use of mica with excellent heat and oxidation resistance means that there is almost no weight loss in high-temperature oxidising atmospheres and strongly oxidising fluids.

Application

Gas turbine flame propagation tubes, HTS (heat transfer salts) and high temperature air valves.

Service Range

TOMBO No.	2282
Max. Temperature	800°C
Max. Pressure	2MPa

If the operating temperature is below 400°C, expanded graphite-based packing is recommended.

When ordering: Please specify the OD, ID, height and number of rings for the packing as only ring mouldings are supplied.



TOMBO No.2282

Fluids

Hot air, strong oxidising fluids (strong oxidising acids, strong oxidising salts).

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.	2205-P+2250-A			2280-S			
	Class	Number of Rings ⁽¹⁾	Tightening Stress N/mm ²	Compression Ratio ⁽²⁾ %	Number of Rings	Tightening Stress N/mm ²	Compression Ratio ⁽²⁾ %
150	150	1+2+1	20 ~ 30	16	5	15 ~ 25	14
300	300	1+2+1	20 ~ 30	16	5	15 ~ 25	14
400	400	1+3+1	25 ~ 35	17	6	20 ~ 30	14
600	600	1+3+1	25 ~ 35	17	6	20 ~ 30	14
900	900	1+4+1	30 ~ 40	17	7	25 ~ 35	14
1500	1500	1+4+1	35 ~ 45	18	7	25 ~ 35	14
2500	2500	1+4+1 1+5+1	40 ~ 50	19	—	—	—

Note (1): The number of rings for the 2205-P + 2250-A combination is shown as the number counted from the atmospheric side.

Note (2): 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-A 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-A or TOMBO No.2930 (etc.) adapter packings, as shown in the diagram below.

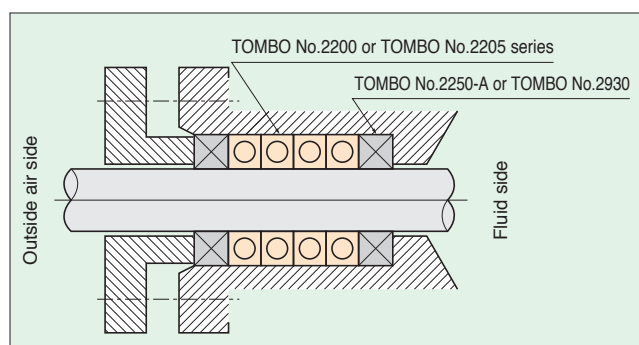


Fig. 4 A High Temperature Use Valve Packing Combination

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_s : Sleeve Height (mm)**
 - D : Box Depth (mm)**
 - n : Number of Packing Rings**
 - h_p : Nominal Packing Height of 1 Ring (mm)**

■ Sleeve Load

Sleeve resistance of packings is indicated by μk value. The μk value is determined experimentally according to the following formula, and the resulting μk 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

$$T = \frac{F \cdot D}{2} \times \frac{1}{1000}$$

The variables are:

F : Stem travel resistance (N)

T : Stem torque (N/m)

μ : Frictional coefficient

k : Lateral pressure coefficient

D : Stem diameter (mm)

H : Packing height (mm)

P : Packing tightening pressure (N/mm²)

⚠ 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.

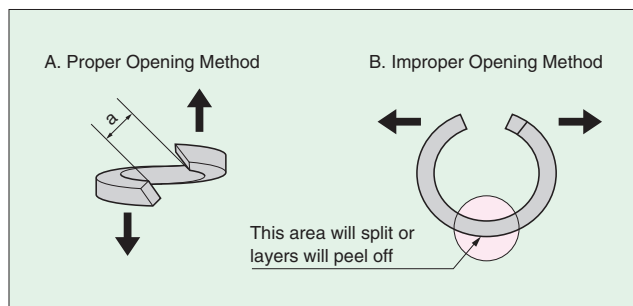


Fig. 5 Proper Installation

Table 2 μk Values of High Temperature Packings

Packing Type	μk Value
TOMBO No.2205-P+TOMBO No.2250-A 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: μk 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 μk value does not exist. When designing actuators, etc., please take into account a sufficient safety factor.

Packings for use in valve

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°C
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 (kg) ⁽¹⁾	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 m/coil
	Braiding	Square braid				Braid over braid								

Note (1): Reference weight for 1 coil.

*Molded rings can also be manufactured.



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 rings can also be manufactured.

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 (kg) ⁽¹⁾	—	0.08	0.14	0.21	0.30	0.45	0.54	0.69	0.84	1.20	1.62	2.12	3 m/coil
	Braiding	Square braid						Interlocking braid						

Note (1): Reference weight for 1 coil. *Molded rings can also be manufactured.



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.



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.

For use in oxygen line

NAFLON™ Fiber Packing-T

TOMBO™ No.9034-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.

⊘ 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.



TOMBO No.9034-OX

Service Range



TOMBO No.	9033	9034	9034-OX
Max. Temperature	260°C	260°C	260°C
Max. Pressure	—	5MPa	5.2MPa
Pressure Class	—	300	300

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 (kg) ⁽¹⁾	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 m/coil
9034	Weight (kg) ⁽¹⁾	0.06	0.13	0.22	0.33	0.47	0.65	0.90	1.07	1.30	1.86	2.48	3.21	
9034-OX	Weight (kg) ⁽¹⁾	0.06	0.13	0.23	0.34	0.49	0.68	0.93	1.10	1.34	1.92	2.57	3.33	
Braiding		Square braid					Interlocking braid							

Note (1): Reference weight for 1 coil. *Molded rings can also be manufactured.

Other packings for use in valves

Appearance	TOMBO No.	Product Name	Construction
	2940	Graphite Fiber Packing	A high temperature packing manufactured from graphite fiber and treated with a special lubricant.
	2788-AF	AL-METAL™ Packing -AF	Made from crinkled aluminium foil treated with a special lubricant and graphite. Flexible and resilient among metallic packings and excellent heat dispersal properties.

*Maximum operating conditions refer to the highest value for each condition and cannot be used for maximum operating pressure at maximum operating temperature.

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	19.1	22.2	25.4	Supply form
2940	Weight (kg) ⁽¹⁾	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 m/coil
	Braiding	Square braid					Braid over braid							
2788-AF (Spiral Product)	Width (mm)	—	4.5	6.0	7.5	9.0	10.0	12.0	—	15.0	18.0	21.0	24.0	3.63 m/coil
	Height (mm)	—	5.0	7.0	9.5	11.0	13.0	14.0	—	18.0	22.0	25.0	28.0	
	Roll ID (mm)	—	30	40	40	50	50	50	—	80	110	150	190	
	Weight (kg) ⁽¹⁾	—	0.09	0.12	0.21	0.29	0.38	0.53	—	0.90	1.10	1.43	1.83	
	Braiding	Spiral Shape												

Note (1): Reference weight for 1 coil. *Molded rings can also be manufactured.

	Features	Maximum		
		Temperature (°C)	Pressure (MPa)	Pressure Class
	Packing with excellent heat and chemical resistance. Can be used for most fluids except strong oxidising acids.	400 (oxidizing atmosphere, in air) 600 (non-oxidizing atmosphere)	2	—
	Among metallic packings, this packing is highly flexible and elastic, and also has excellent heat dissipation properties. Please use in combination with TOMBO No.2200 (or TOMBO No.2205-P, etc.). Can be used for water-based fluids and oil-based fluids.	550	—	—

■ Standard size and weight

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

Valve Packing Instruction Manual

1. Introduction

This instruction manual provides precautions for the correct use of “Valve Packing”, which includes the design, selection, processing, installation, replacement, storage and disposal.

Please read this instruction manual carefully and be sure to follow the precautions when using this product. If you have any questions about our products, please contact us.

2. Applicable Products

(1) This instruction manual was created for the following “Valve Packing” handled by NICHIAS Corporation.

Target Products: Packings listed on Pages 10 to 21 of this catalog and packings approved by NICHIAS Corporation for use in valves.

(2) “Valve Packing” is a sealing material incorporated into the valve stuffing box and used to seal leakage and back leakage from the valve rod (stem) contact area. (Hereinafter referred to as “packing”) There are gland packing made of braided various fibers (carbon fiber, PTFE fiber, polyamide fiber, inorganic fiber, metal fiber, etc.) and molded packing made of expanded graphite, PTFE resin, rubber, etc. There are also some packing types treated with PTFE dispersion or lubricant to improve sealing performance. Please do not use the “Valve Packing” for any purpose other than its intended use.

3. Precautions

3-1 Handling Precautions

- (1) Do not apply strong external force to the “packing” before use.
Strong external forces can deform the “packing” and in some cases damage it.
Please do not use deformed or damaged “packing”.
- (2) When carrying the “packing”, handle it carefully in its original packaging.
- (3) Ensure that the “packing” is free from foreign objects. If foreign objects get on the “packing”, it may prevent sealing or damage the “packings”, valve stem, stuffing box, etc.
- (4) Unwrap the “packing” immediately before use.
- (5) Always gargle and wash hands after handling.
- (6) Clean the work area, installation site and handling tools and keep them free of packing debris.
- (7) Always remove any dust from work clothing etc.

3-2 Notes on design and selection

- (1) Usage range and performance depends on the type of “packing”.
To ensure safe use, select a material that can withstand operating conditions such as temperature, pressure, and fluid.
- (2) Appropriate “packing” varies depending on usage conditions, usage environment, equipment, etc.
When using the product for the first time, or when changing the operating conditions, be sure to check safety by evaluating the actual device before use.
- (3) Ensure that the required tightening stress for the seal is applied evenly.
Insufficient tightening stress may cause leakage.
- (4) Use a “packing” that matches the stem diameter of the valve.

Table 3 Stem diameter and packing width Unit: (mm)

Stem diameter	Packing width
~ 10	3.2
10 ~ 18	4.8
18 ~ 25	6.4
25 ~ 35	7.9
35 ~ 50	9.5
50 ~ 70	11.1 or 12.7
70 ~ 100	12.7
100 ~ 150	15.9
150 ~ 200	15.9
200 ~ 250	19.0

- (5) The packing width should be the same or smaller than the stuffing box width.
- (6) Use a “packing” with the correct number of rings for the operating pressure, etc.

Table 4 Operating pressure and number of rings

Pressure Class	Braided Packing		Combination Graseal packing			
	Graseal braided packing	Others	A	B	C	
			+	+	+	+
150	5	5	1	2	+	1
300	5	6	1	2	+	1
400	6	8	1	3	+	1
600	6	8	1	3	+	1
900	7	9	1	4	+	1
1500	—	9	1	4	+	1
2500	—	10	1	4	+	1

*A and C in the table refer to adapter packings such as TOMBO No.2250-A, while B refers to Graseal molded packings such as TOMBO No.2205-P. For API600 applicable valves, use 6 rings or more.

Please use GRASEAL molded packing (TOMBO No.2200, TOMBO No.2205-P, etc.) and adapter packing (TOMBO No.2250-A, etc.) in combination. For the combination, place the GRASEAL molded packing in the middle and the adapter packing at the bottom and top, as shown in Fig. 6 on the right.

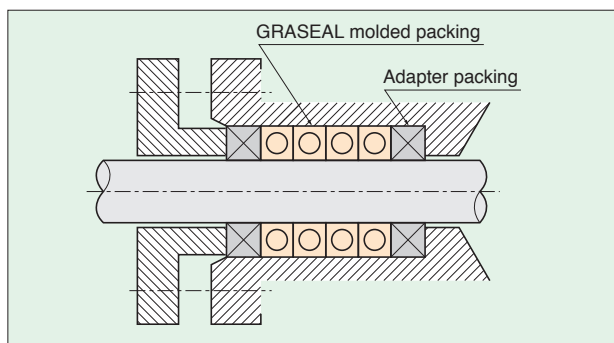


Fig. 6 Combination example

3-3 Storage Precautions

- (1) Store the “packing” in its original packaging.
- (2) Always store the “packing” in a well-ventilated, cool and dark place indoors.
The “packing” will deteriorate if it is stored in hot or cold places, in high humidity or in direct sunlight.
- (3) Keep the “packing” in its packaging so that the part number, combination, dimensions and date of delivery of the “packing” can be identified.
Display labels or tags were attached to make it easy to identify the product number, combination, dimensions, etc. of the “packing”.
- (4) Once the “packing” has been unwrapped, please re-wrap it in its original wrapper or placed in a plastic bag.
Please ensure that the product number, combination and dimensions of the “packing” are clearly marked.
- (5) Store the “packing” in such a way that it does not come into contact with other substances.
- (6) Do not place any objects on the “packing”.

3-4 Precautions for New Installation

- (1) Be sure to follow the instruction manual or precautions issued by the valve manufacturer.
- (2) Check that there is no dirt on the “packing”, stem, stuffing box, gland holder, and lantern ring.
If there is dirt, remove the dirt or replace it.
- (3) Check that there are no scratches, irregularities, or deformations (undulations, etc.) on the stem, stuffing box, gland holder, or lantern ring.
If there are scratched, uneven, or deformities, it will no longer be able to seal properly, so repair or replace it.
- (4) Check that there is no rust on the stem or stuffing box.
If rust has developed, the seal will not work, so remove the rust or replace the rusted part (or the entire valve).
- (5) Ensure that no foreign objects can get between the “packing” and the stem, stuffing box, gland holder or lantern ring.
- (6) When installing the “packing”, make sure that there is no rust or dirt on the bolts.
If there is rust or dirt, remove the rust or dirt or replace the bolt.

- (7) In order to obtain stable performance for the “packing”, use ring-molded products as much as possible.
If it is unavoidable to cut the coil-shaped packing on-site, please refer to section 3-7.
- (8) Do not hit the “packing” with a hammer or similar object to insert it into the stuffing box.
- (9) Set the “packing” in the correct combination order.
Insert the “packing” one ring at a time in the correct combination order.
- (10) Insert the “packing” at a 90° or 120° angle so that the cut ends do not overlap.

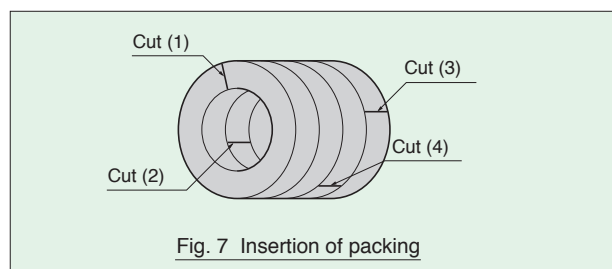


Fig. 7 Insertion of packing

- (11) When installing the ring-formed packing, twist it open in the axial direction as shown in Fig. 8 A. If opening it as shown in B, the “packing” may be damaged.
- (12) Do not open the opening (a) in Fig. 8 A wider than the stem diameter. If it is opened too wide, the “packing” may be damaged.

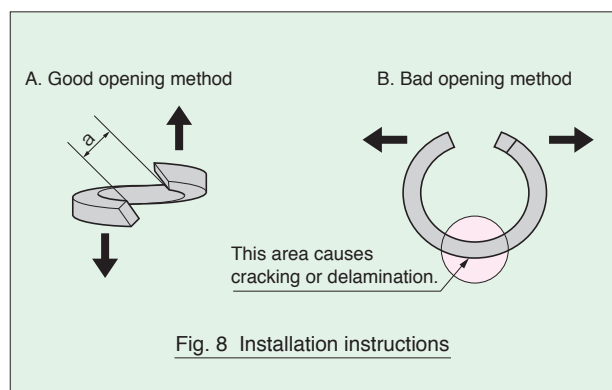


Fig. 8 Installation instructions

- (13) Do not forcefully insert the “packing” if it gets caught on the edge of the stuffing box.
The outer circumference of the “packing” will be damaged and will not seal.
- (14) Set the gland (packing holder) in the correct position.
- (15) Tighten the tightening nut by hand, then use a special tightening tool such as a torque wrench.
- (16) When tightening, tighten all bolts (screws) evenly to the tightening stress listed in Table 1 on page 14.
- (17) If there are two or more tightening bolts, tighten them alternately while making sure that the gap between the box and the packing holder is even.
Failure to tighten alternately will result in uneven tightening and leakage will occur.
- (18) Move the stem after each tightening to familiarise the “packing” with the stem.

- (19) After tightening, check that the gland holder has at least one ring of packing height left for additional tightening.
- (20) Check that the stem operates smoothly from fully open to fully closed.
- (21) Before use, check if the tightening nuts are loose or not.
If the specified tightening torque has not been reached, retighten.

3-5 Precautions on Replacement

- (1) Please observe the precautions described in section 3-4 "Precautions for New Installations".
- (2) Before removing the existing "packing", check the following:
 - (a) Valve type and bore size
 - (b) Packing dimensions and combination method
 - (c) Fluid name
 - (d) Temperature
 - (e) Pressure
- (3) When removing the "packing", make sure to completely reduce the fluid pressure inside the piping to atmospheric pressure.
If the gland bolt is loosened under pressure, the internal fluid may blow out due to the pressure difference, which is extremely dangerous.
- (4) In case of hazardous fluids, replace the "packing" only after the fluid has been completely removed.
- (5) Remove the gland bolt using a special tool such as a spanner or wrench.
- (6) When removing the "Packing", completely remove the old "Packing".
Make sure there is no old remaining "packing" in the back of the stuffing box.
- (7) When using the packing tool, be careful not to damage the stem or inside of the stuffing box.
- (8) Check the number of rings in the "packing" that was removed.
- (9) Remove any oil or foreign matter from the stem, stuffing box, gland (packing holder), lantern ring and gland bolt.
If it is not removed, the "packing" may not be able to be set properly.
- (10) When disassembling the valve bonnet and replacing the "packing," the bonnet gasket with must also be replaced with a new one.

3-6 Precautions After Usage Start

- (1) When using at high temperatures, retighten immediately after operation.
When the operating temperature rises, the tightening force of the "packing" decreases rapidly, causing leakage.
- (2) If a small amount of leakage is detected during operation, immediately open the back seat and retighten the bolts.

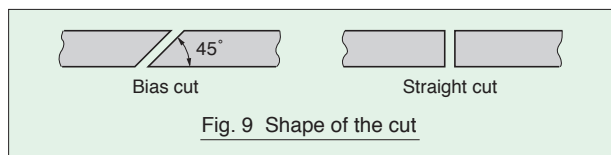
If the leakage is left for a long period of time, a leakage path will form in the "packing" and it will not be stopped even if the bolts are retightened.

- (3) When using a valve that has been left unused for more than one year, replace it with a new "packing" before use.

3-7 Precautions on Processing

As much as possible, please use molded ring "packing". When processing and using coil form "packing," be sure to observe the following precautions:

- (1) When processing the "packing", use a sharp tool and cut it to the length shown below:
Packing length = $\pi/2$ (stem diameter + stuffing box inner diameter) x 1.03 to 1.05
- (2) Ensure that the two ends of the "packing" cut are matched up to each other.
- (3) Cut on the bias or straight cut.
- (4) Process the "packing" so as not to damage it.
Do not use the "packing" that has been damaged.



- (5) When processing the "packing", please wear an appropriate dust mask, or use a local exhaust system and dust collector.
- (6) Clean the work area, installation area, handling tools, etc. and keep them free of dust.
- (7) Be sure to remove dust from work clothing, etc.

3-8 Precautions about Molded Ring Products

Unless otherwise specified, some molded ring products have their edges treated with tape to prevent them from falling apart.

If the use of tape is not desired, remove the tape before installation or specify 'No Tape' when ordering.

TOMBO No.	Processing Method
9033	Seal Tape
9040	
9041	
2940	Cellophane Tape

3-9 Precautions for cleaning and disposal

- (1) When cleaning or disposing of the "Packing", processing waste, used products, etc., be careful not to scatter dust into the surrounding environment.
- (2) When cleaning, sprinkle water on the dust to make it less likely to scatter, and then sweep it into a plastic bag.
When using a vacuum cleaner, use a high-performance vacuum cleaner.
- (3) Dispose the "Packing" as industrial waste in accordance with the local disposal and environmental laws.

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 ² ·m/s}		
Hot Water Water	260	2	16	15	9038	
			10	16.5	9077-L	
	200	2	16	16.5	9039	
			10	5	9079	
Light oil, Naphtha, 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/cm²) 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°C
Max. Pressure	1.0MPa
Max. Velocity	10m/sec
Max. PV Value	5MPa · m/sec
pH	4 ~ 10

Anti-corrosion use packing

NAFLON™ Fiber Packing-T

TOMBO™ No.9034-S / 9034-OX

Construction

TOMBO No.9034-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.9034-S is made by treating TOMBO No.9034-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.9034-OX does not contain lubricant, in order to use stably for rotating equipment please use other packings or please use TOMBO No.9034-OX together with TOMBO No.9401 Fluorine 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.9034-S

Service Range

Max. Temperature	260°C
Max. Pressure	2MPa
Max. Velocity	4m/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°C
Max. Pressure	2MPa
Max. Velocity	16m/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 (kg) ⁽¹⁾	—	0.08	0.15	0.22	0.32	0.43	0.57	0.71	0.88	1.24	1.67	2.16	3 m/coil
	Braiding	Square braid					Interlocking braid							
9034-S	Weight (kg) ⁽¹⁾	0.06	0.14	0.24	0.37	0.52	0.72	0.99	1.18	1.44	2.06	2.75	3.56	
	Braiding	Square braid					Interlocking braid							
9034-OX	Weight (kg) ⁽¹⁾	0.06	0.13	0.23	0.34	0.49	0.68	0.93	1.10	1.34	1.92	2.57	3.33	
	Braiding	Square braid					Interlocking braid							
9038	Weight (kg) ⁽¹⁾	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	Square braid					Interlocking braid							

Note (1): Reference weight for 1 coil. *Molded rings can also be manufactured.

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).

- ⊘ This packing may not be used for alkali metal, quite strong oxidizing agent etc.
- ⚠ As TOMBO No.9033 does not contain lubricant etc. please use other packings or please use TOMBO No.9034-OX together with either TOMBO No.9401 Fluorine Grease or lubricant that does not affect the fluid such as edible oil, etc.



TOMBO No.9034

Service Range

TOMBO No.	9033	9034	9036	9077-L
Max. Temperature	260°C	260°C	260°C	260°C
Max. Pressure	2MPa	2MPa	2MPa	2MPa
Max. Velocity	4m/sec	4m/sec	8m/sec	10m/sec
Max. PV Value	4MPa · m/sec	4MPa · m/sec	10MPa · m/sec	16.5MPa · m/sec
pH	0 ~ 14	0 ~ 14	0 ~ 14	0 ~ 14

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

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 legia etc.



TOMBO No.9077-L

- ⊗ 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	Supply form		
9033	Weight (kg) ⁽¹⁾	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 m/coil		
	Braiding	Square braid					Interlocking braid									
9034	Weight (kg) ⁽¹⁾	0.06	0.13	0.22	0.33	0.47	0.65	0.90	1.07	1.30	1.86	2.48	3.21		3 m/coil	
	Braiding	Square braid					Interlocking braid									
9036	Weight (kg) ⁽¹⁾	0.07	0.14	0.23	0.35	0.49	0.67	0.86	1.09	1.34	1.92	2.57	3.37			3 m/coil
	Braiding	Square braid					Interlocking braid									
9077-L	Weight (kg) ⁽¹⁾	—	0.11	0.20	0.30	0.40	0.54	0.70	0.89	1.09	1.57	2.20	2.75	3 m/coil		
	Braiding	Square braid					Interlocking braid									

Note (1): Reference weight for 1 coil.

*Molded rings can also be manufactured.

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.



TOMBO No.9040

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.



TOMBO No.9040-W

Service Range

TOMBO No.	9040	9040-W	9040-WR	9039	2940
Max. Temperature	260°C	260°C	260°C	200°C	400°C (oxidizing atmosphere, in air) 600°C (non-oxidizing atmosphere)
Max. Pressure	2MPa	2MPa	2MPa	2MPa	2MPa
Max. Velocity	10m/sec	10m/sec	8m/sec	16m/sec	10m/sec
Max. PV Value	16.5MPa · m/sec	16.5MPa · m/sec	10MPa · m/sec	16.5MPa · m/sec	10MPa · m/sec
pH	2 ~ 13	2 ~ 13	2 ~ 13	2 ~ 12	0 ~ 14

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

⚠ Note: TOMBO No.9040, 9040-W and 9040-WR are made of high-strength polyamide fibre, which may cause shaft wear depending on the material.

General Purpose Packing

Oxidized PAN fiber Packing

TOMBO™ No.9039

Construction

This packing is made of Carbonized 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.



TOMBO No.9039

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 legia etc.

⊘ TOMBO No.2940 can not be used for strong oxidizing acids such as fuming sulfuric acid, concentrated sulfuric acid, chromic acid, aqua legia etc.





TOMBO No.2940

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	Weight (kg) ⁽¹⁾	—	0.12	0.20	0.29	0.42	0.57	0.74	0.95	1.14	1.65	2.19	2.85	3 m/coil
	Braiding	Square braid				Interlocking braid								
9040-W	Weight (kg) ⁽¹⁾	—	0.09	0.14	0.21	0.31	0.43	0.54	0.68	0.85	1.28	1.70	2.20	
	Braiding	Square braid				Interlocking braid								
9040-WR	Weight (kg) ⁽¹⁾	—	0.09	0.15	0.24	0.35	0.47	0.61	0.74	0.97	1.35	1.81	2.34	
	Braiding	Square braid				Interlocking braid								
9039	Weight (kg) ⁽¹⁾	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	Square braid				Interlocking braid								
2940	Weight (kg) ⁽¹⁾	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	Square braid				Braid over braid								

Note (1): Reference weight for 1 coil. *Molded rings can also be manufactured.

Other Packing for rotary shaft

Appearance	TOMBO No.	Product Name	Construction
	2788-AF	AL-METAL™ Packing-AF	This is metallic back-up packing made of aluminium foil that has been treated with a special lubricant and graphite.
	2200	GRASEAL Packing	This is a high-temperature packing made by cutting expanded graphite into a tape and molded into a ring shape.

*Maximum operating conditions refer to the highest value for each condition and cannot be used for maximum operating pressure at maximum operating temperature.

Standard size and weight (Spiral shape product)

TOMBO No.	Nominal size (mm)	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	19.1	22.2	25.4	Supply form
2788-AF	Width (mm)	—	4.5	6.0	7.5	9.0	10.0	12.0	—	15.0	18.0	21.0	24.0	3.63 m/coil
	Height (mm)	—	5.0	7.0	9.5	11.0	13.0	14.0	—	18.0	22.0	25.0	28.0	
	Roll ID (mm)	—	30	40	40	50	50	50	—	80	110	150	190	
	Weight (kg) ⁽¹⁾	—	0.09	0.12	0.21	0.29	0.38	0.53	—	0.90	1.10	1.43	1.83	
	Braiding	Spiral Shape												

Note (1): Reference weight for 1 coil.

Features	Maximum				
	Temperature (°C)	Pressure MPa	Velocity m/sec	PV Value MPa · m/sec	pH
Flexible and resilient among metallic packings and good in heat dissipation. To be used in combination with other packings.	550	— (Depend on other packing)	— (Depend on other packing)	— (Depend on other packing)	5 ~ 9
It can be used on lines with high temperatures and high velocities without causing wear on the shaft. In addition, it can be used with almost all fluids except strongly oxidizing fluids. When used, it should be used in combination with other packings (TOMBO No. 2788-AF).	−240 ~ 400 (oxidizing atmosphere, in air) −240 ~ 1650 (non-oxidizing atmosphere)	2	30	30	2 ~ 14

■ Ordering Information

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

Coil Form - Please specify nominal size and quantity.

⊘ **Prohibited:** Not for use with the following fluids.

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 supporting gases	Oxygen (pure oxygen)

Instruction Manual “Rotary Shaft Packing”

1. Introduction

This instruction manual provides precautions for the correct use of “Rotary Shaft Packing”, which includes the design, selection, processing, installation, replacement, storage and disposal.

Please read this instruction manual carefully and be sure to follow the precautions when using this product. If you have any questions about our products, please contact us.

2. Applicable Products

(1) This instruction manual was created for the following “Rotary Shaft Packing” handled by NICHIAS Corporation.

Target Products: Packings listed on Pages 26 to 33 of this catalog and packings approved by NICHIAS Corporation for use in rotating equipment.

(2) “Rotary Shaft Packing” is a sealing material used to seal leakage and back leakage from the shaft contact area of rotating equipment such as pumps and agitators.

(Hereinafter referred to as “Packing”) There are gland packing made of braided various fibers (carbon fiber, PTFE fiber, polyamide fiber, inorganic fiber, metal fiber, etc.) and molded packing made of expanded graphite, PTFE resin, rubber, etc.

There are also some packing types treated with PTFE dispersion or lubricant to improve sealing performance. Please do not use the “Rotary Shaft Packing” for any purpose other than its intended use.

3. Precautions regarding Rotary Shaft Packing

3-1 Handling Precautions

(1) Do not apply strong external force to the “packing” before use.

Strong external forces can deform the “packing” and in some cases damage it.

Please do not use deformed or damaged “packing”.

(2) When carrying the “packing”, handle it carefully in its original packaging.

(3) Unwrap the “packing” immediately before use.

(4) Ensure that the “packing” is free from foreign objects. If foreign objects get on the “packing”, it may prevent sealing or damage the “Packings”, shaft, stuffing box, etc.

(5) Always gargle and wash hands after handling.

(6) Clean the work area, installation site and handling tools and keep them free of packing debris.

(7) Always remove any dust from work clothing etc.

3-2 Notes on design and selection

(1) Usage range and performance depends on the type of “packing”.

To ensure safe use, select a material that can withstand operating conditions such as temperature, pressure, fluid, velocity, PV value and pH.

(2) Appropriate “packing” varies depending on usage conditions, usage environment, equipment, etc.

When using the product for the first time, or when changing the operating conditions, be sure to check safety by evaluating the actual device before use.

(3) Tighten evenly so that the leakage amount is appropriate for the seal.

(4) Use a “packing” that matches the shaft diameter.

Table 5 Shaft diameter and packing width Unit: (mm)

Stem diameter	Packing width
~ 20	4.8
20 ~ 35	6.4
35 ~ 50	9.5
50 ~ 75	12.7
75 ~ 110	15.9
110 ~ 150	19.0
150 ~ 200	22.2
200 ~	25.4

(5) The surface roughness of the rotary shaft should be as shown in the table below.

Table 6 Surface Finish

Kinetic Form		Surface Finish
Fast Rotation (Rotary pumps, etc.)		1.6 ~ 6.3 μ mRa
Slow Rotation		0.4 ~ 6.3 μ mRa
Ram/ Reciprocating	Cloth-Reinforced Rubber	0.4 ~ 3.2 μ mRa
	Rubber	0.4 ~ 1.6 μ mRa
Stuffing Box		3.2 ~ 12.5 μ mRa

(6) Use a “packing” with the number of rings that matches the working pressure.

Table 7 Working pressure and number of rings

Operating Pressure MPa	Number of Packings
0.0 ~ 0.5	4
0.5 ~ 1.0	5
1.0 ~ 2.0	6
2.0 ~ 5.0	7

3-3 Storage Precautions

- (1) Store the "Packing" in its original packaging.
- (2) Always store the "Packing" in a well-ventilated, cool and dark place indoors.

The "packing" will deteriorate if it is stored in hot or cold places, in high humidity or in direct sunlight.

- (3) Keep the "Packing" in its packaging so that the part number, combination, dimensions and date of delivery of the "Packing" can be identified.

Display labels or tags were attached to make it easy to identify the product number, combination, dimensions, etc. of the "Packing"

- (4) Once the "Packing" has been unwrapped, please re-wrap it in its original wrapper or placed in a plastic bag.

Please ensure that the product number, combination and dimensions of the "Packing" are clearly marked.

- (5) Store the "Packing" in such a way that it does not come into contact with other substances.
- (6) Do not place any objects on the "Packing"

3-4 Precautions for New Installation

- (1) Be sure to follow the instruction manual or precautions issued by the rotary equipment manufacturer.

- (2) Check that there is no dirt on the "Packing" shaft, stuffing box, gland holder, and lantern ring.
If there is dirt, remove the dirt or replace it.

- (3) Check that there are no scratches, irregularities, or deformations (undulations, etc.) on the shaft, stuffing box, gland holder, or lantern ring.
If there are scratched, uneven, or deformities, it will no longer be able to seal properly, so repair or replace it.

- (4) Check that there is no rust on the shaft or stuffing box.

If rust has developed, the seal will not work, so remove the rust or replace the rusted part (or the entire pump).

- (5) Ensure that no foreign objects can get between the "packing" and the shaft, stuffing box, gland holder or lantern ring.

- (6) The shaft runout should be kept to 0.05mm or less.

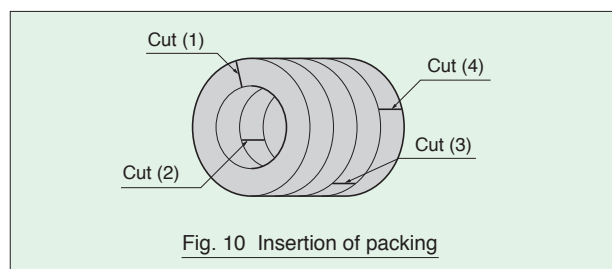
- (7) When installing the "packing", make sure that there is no rust or dirt on the bolts.

If there is rust or dirt, remove the rust or dirt or replace the bolt.

- (8) In order to obtain stable performance for the "packing", use ring-molded products as much as possible.

If it is unavoidable to cut the coil-shaped packing on-site, please refer to section 3-7.

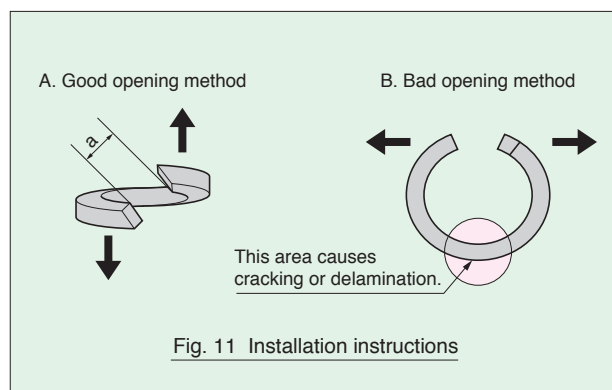
- (9) Do not hit the "packing" with a hammer or similar object to insert it into the stuffing box.
- (10) Set the "packing" in the correct combination order.
Insert the "Packings" one ring at a time in the correct combination order.
- (11) Insert the "packing" at a 90° or 120° angle so that the cut ends do not overlap.



- (12) When installing the ring-formed packing, twist it open in the axial direction as shown in Fig. 11 A.
If opening it as shown in B, the "Packing" may be damaged.

- (13) Do not open the opening (a) as shown in Fig. 11 A wider than the stem diameter.

If it is opened too wide, the "packing" may be damaged.



- (14) Do not forcefully insert the "Packing" if it gets caught on the edge of the stuffing box.

The outer circumference of the "Packing" will be damaged and will not seal.

- (15) Set the gland holder in the correct position.
- (16) Tighten the tightening nut by hand, then use a special tightening tool such as a torque wrench.
- (17) When tightening, tighten all bolts (screws) evenly to the tightening stress listed in Table 1 on page 14.

(18) Please conduct a pre-operating trial run.

In the trial run, start the rotating equipment and tighten the tightening nut little by little to achieve a suitable leakage volume for the rotating equipment while observing the leakage volume.

The amount of tightening should be done at an angle of rotation of 30° or less.

The maximum tightening stress should be 10% higher than the internal fluid pressure.

If the amount of leakage from the packing is small, heat will be generated by friction heat, damaging the packing and shaft (sleeve).

Table 8 Standard leakage rate

Packing [TOMBO No.]	Standard leakage rate (cc/min)
9038, 9039, 9040, 9040-W, 9077-L	3 ~ 6
9036, 9079	10 ~ 20

*Standard leakage volume refers to a shaft diameter of 25 mm, a velocity of 4.6 m/s and fluid: water.

(19) If there are two or more tightening bolts, tighten them alternately while making sure that the gap between the box and the packing holder is even. Failure to tighten alternately will result in uneven tightening and leakage will occur.

(20) After tightening, check that the gland holder has at least one ring of packing height left for additional tightening.

(21) Ensure that rotating equipment operates smoothly.

3-5 Precautions on Replacement

(1) Please observe the precautions described in section 3-4 "Precautions for New Installations".

(2) Before removing the existing "packing", check the following:

- Equipment name and type
- Packing dimensions and combination method
- Fluid name
- Temperature
- Pressure
- Velocity
- PV Value
- pH

(3) When removing the "packing", make sure to completely reduce the fluid pressure inside the piping to atmospheric pressure.

If the gland bolt is loosened under pressure, the internal fluid may blow out due to the pressure difference, which is extremely dangerous.

(4) In case of hazardous fluids, replace the "packing" only after the fluid has been completely removed.

(5) Remove the gland bolt using a special tool such as a spanner or wrench.

(6) When removing the "packing", completely remove the old "packing".

Make sure there is no old remaining "packing" in the back of the stuffing box.

(7) When using the packing tool, be careful not to damage the stem or inside of the stuffing box.

(8) Check the number of rings in the "packing" that was removed.

(9) Remove any oil or foreign matter from the shaft, stuffing box, gland (packing holder), lantern ring and gland bolt.

If it is not removed, the "packing" may not be able to be set properly.

⚠ Caution: Existing packing may contain asbestos, and must be dealt with in accordance with local regulations.

3-6 Precautions After Usage Start

(1) When the retightening allowance has been used up, replace the packing with a new one.

If it is not possible to replace the "Packing", stop the rotating equipment, return the pressure to atmospheric pressure, remove the fluid, and then remove 2 to 3 rings of the old packing.

After removing the old "packing", replenish the new "packing" with the same number of rings as the number of "packing" removed, plus two more rings.

Please replace the gasket with a new one at the next maintenance.

(2) When using rotating equipment that has been left unused for more than a year, replace it with new packing before using it.

3-7 Precautions on Processing

As much as possible, please use molded ring "packing".

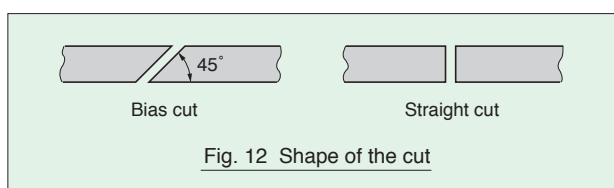
When processing and using coil form "packing", be sure to observe the following precautions:

(1) When processing the "packing", use a sharp tool and cut it to the length shown below:

Packing length = $\pi/2$ (stem diameter + stuffing box inner diameter) x 1.03 to 1.05

(2) Ensure that the two ends of the "packing" cut are matched up to each other.

(3) Cut on the bias or straight cut.



- (4) Process the “packing” so as not to damage it.
Do not use the “packing” that has been damaged.
- (5) When processing the “packing”, please wear an appropriate dust mask, or use a local exhaust system and dust collector.
- (6) Clean the work area, installation area, handling tools, etc. and keep them free of dust.
- (7) Be sure to remove dust from work clothing, etc.

3-8 Precautions about Molded Ring Products

Unless otherwise specified, some molded ring products have their edges treated with tape to prevent them from falling apart.

TOMBO No.	Processing Method
9033	Seal Tape
9040	
2940	Cellophane Tape

If the use of tape is not desired, remove the tape before installation or specify ‘No Tape’ when ordering.

3-9 Precautions for cleaning and disposal

- (1) When cleaning or disposing of the “Packing”, processing waste, used products, etc., be careful not to scatter dust into the surrounding environment.
- (2) When cleaning, sprinkle water on the dust to make it less likely to scatter, and then sweep it into a plastic bag.
When using a vacuum cleaner, use a high-performance vacuum cleaner.
- (3) Dispose the “Packing” as industrial waste in accordance with the local disposal and environmental laws.

Packings for plungers and valves

NAFLON™ PTFE Molded Packing

TOMBO™ No.9027

Construction

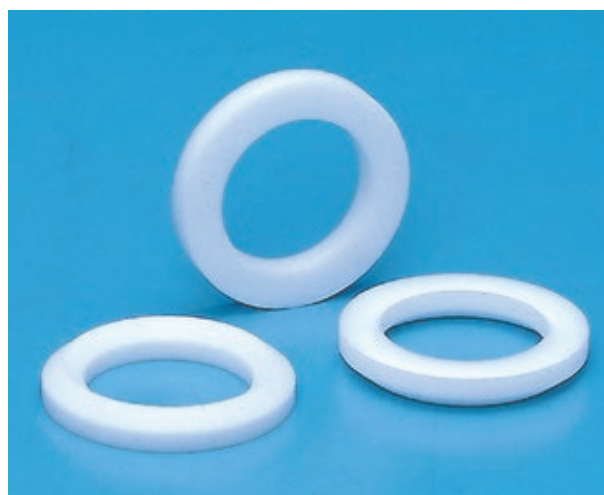
This is a self lip seal type packing machined from PTFE resin, available in VH, VL, and D type cross-sections. For high temperature and high pressure services, packings made of filled PTFE is also available.

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

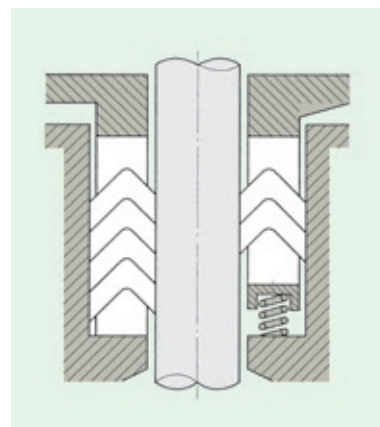
Service Range

Max. Temperature	200°C (Filled PTFE) 120°C (Pure PTFE)
Max. Pressure	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	3 ~ 4pcs	1 ~ 3pcs
		5 ~ 15MPa 4pcs		
		15 ~ 30MPa 6pcs		
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 (Fluorine Grease) to the packing and ensure that the lip is not damaged.

⚠ Caution: For low pressure gas, apply TOMBO No.9401 (Fluorine Grease) to the packing and use with a spring (recommended spring pressure: 0.8MPa[8kgf/cm²])

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

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

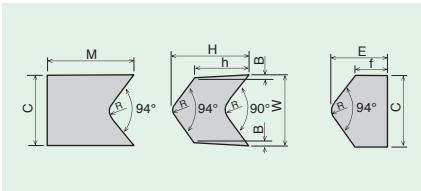
⊘ This packing may not be used for alkali metal, quite strong oxidizing agent etc.

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



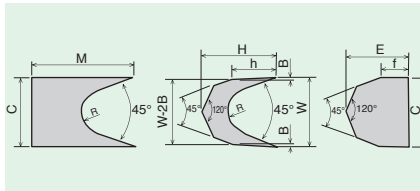
Cross Section Dimensions of VH-type
unit : mm

W	H	h	B	E	f	R
3	2.8	1.6	0.2	2.2	1.0	0.5
4	3.7	2.1	0.2	2.9	1.3	1.0
5	4.7	2.7	0.2	3.7	1.7	1.0
6	5.6	3.2	0.2	4.4	2.0	1.0
7	6.6	3.7	0.2	5.2	2.3	1.0
8	7.4	4.2	0.2	5.9	2.7	1.5
9	8.4	4.8	0.3	6.6	3.0	1.5
10	9.4	5.3	0.3	7.4	3.3	1.5
11	10.4	5.8	0.3	8.2	3.6	1.5
12	11.4	6.4	0.3	9.0	4.0	1.5
13	12.3	6.9	0.4	9.7	4.3	2.0
14	13.2	7.4	0.4	10.5	4.7	2.0
15	14.2	8.0	0.4	11.2	5.0	2.0
16	15.2	8.5	0.4	12.0	5.3	2.0
17	16.2	9.0	0.4	12.8	5.6	2.0
18	17.1	9.5	0.5	13.6	6.0	2.0
19	18.1	10.0	0.5	14.4	6.3	2.0
20	19.1	10.5	0.5	15.3	6.7	2.0

$M=W$ $C=W-0.2$

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

VL-type



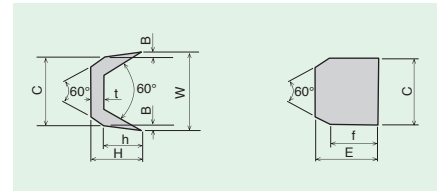
Cross Section Dimensions of VL-type
unit : mm

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)

For Plungers, Rods, Rams and Pistons

Cloth-reinforced rubber molded packing.

TOMBO™ No.2660

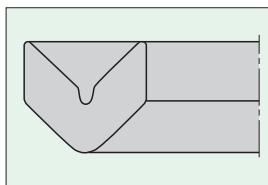
Construction

This is a self-sealing packing made by applying NBR (acrylonitrile-butadiene rubber) to cotton cloth, heated and pressure-moulded into various shapes.

V-Type

Features

1. This is an auto-lip seal type packing whose V-shaped lip opens and seals due to internal pressure. It also follows pressure changes well.
2. It does not contain substances that contaminate petroleum-based hydraulic fluids, corrode metals, or cause stickiness.



Application

Cylinder rod and piston seals, plungers, rams, valve stems.

Fluid

Water-based fluids (fresh water, wastewater, sewage, seawater), various oil-based fluids, air.

Pressure and number of packings

Operating pressure MPa	Number of V-Type packings used (By adapter)
Below 4	3
Over 4 & below 8	4
Over 8 & below 16	4
Over 16 & below 30	5
When over 30	6

*Please contact us if the pressure is over 100MPa.

Standard size and weight

Please refer to pages 48-49.

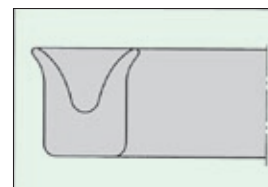


TOMBO No.2660

U-Type

Features

1. Can be sealed with 1 ring.
2. Used for locations with a velocity of 0.15m/s or less or shaft seals that do not move.
3. It is recommended that a rubber O-ring or square ring is used in conjunction to help the lip stick out.
4. When setting, apply a small amount of grease to the lip to extend the life of the packing.



Application

Cylinder rod and piston seals, ram.

Fluid

Water-based fluids (fresh water, wastewater, sewage, seawater), various oil-based fluids, air.

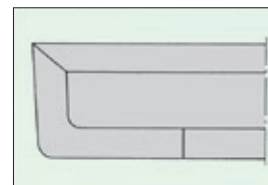
Prohibited

Cannot be used in areas with high velocity.

L-Type

Features

This is an auto-lip seal type packing whose lip opens and seals due to internal pressure.



Application

For sliding on the outer surface of cylinder piston seals, etc.

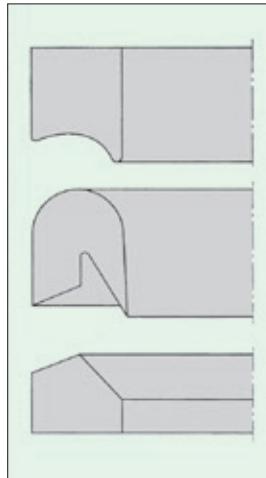
Fluid

Water-based fluids (fresh water, wastewater, sewage, seawater), various oil-based fluids, air.

S-Type

■ Features

1. Unlike the V-type, this type has sharp, long lips that operate independently, so it provides excellent sealing performance even at low pressures.
2. It also has excellent followability to changes in pressure.



⊘ Prohibited

It cannot be used where the velocity is 0.4m/s or more.

⊘ Prohibited

Cannot be used for high pressures above 40.0 MPa.

■ Application

Cylinder rod seals, plungers and valve stems.

■ Fluid

Water-based fluids (fresh water, wastewater, sewage, seawater), various oil-based fluids, air.

■ Pressure and number of packings

Operating pressure MPa	Number of S-Type packings used (By adapter)
Below 10	4
Over 10 & below 25	5
Over 25 & below 40	6

*Please contact us if the pressure is over 10MPa.

■ Service Range

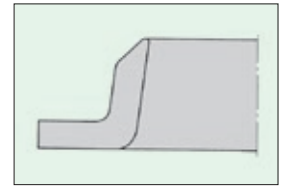
Item \ Type	V-Type	U-Type	L-Type	J-Type	S-Type	AF-Type
Max. Temperature (°C)	120	120	120	120	120	120
Max. Pressure (MPa)	200	100	10	—	40	40
Max. Velocity (m/sec)	0.8	0.15	0.15	—	0.4	—
pH	5 ~ 9	5 ~ 9	5 ~ 9	5 ~ 9	5 ~ 9	5 ~ 9

*See pages 48-51 for standard dimensions of TOMBO No. 2660 Cloth-reinforced rubber molded packing.

J-Type

■ Features

1. Like the L-type, it is used for medium pressure seals.
2. Unlike the L type, the sliding part is the inside diameter of the packing.



■ Application

Cylinder rod seal.

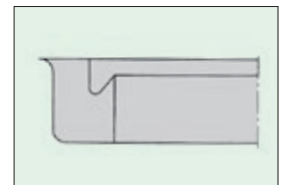
■ Fluid

Water-based fluids (fresh water, wastewater, sewage, seawater), various oil-based fluids, air.

AF-Type

■ Features

1. This is a modification of the S-Type packing, which has increased hardness and strengthened the "back" to better withstand high pressure.
2. Only the lip of the internal sliding part is designed to be sensitively activated by internal pressure.



■ Application

Cylinder rod seal.

■ Fluid

Water-based fluids (fresh water, wastewater, sewage, seawater), various oil-based fluids, air.

For plungers, rods, rams, pistons

Rubber molded packing

TOMBO™ No.2661

Construction

Endless molded packing made by vulcanizing various types of rubber in a mold.

Features

1. It has superior sealing performance compared to cloth-reinforced rubber mold packing, but has inferior pressure resistance.
2. Other details are the same as the cloth-reinforced rubber mold packing.

Application

Cylinder rod seals and piston seals, plungers, rams and valve stems.

Fluid

Water-based fluids (fresh water, wastewater, sewage, seawater), various oil-based fluids, air.

Standard size and weight

Please refer to pages 52-53.

The range of use depends on the rubber material and cross-sectional shape.

Cross-sectional shapes such as V-Type, U-Type, L-Type, and J-Type can be manufactured.



TOMBO No.2661

Pressure and number of packings

Operating pressure MPa	Number of V-Type packings used (By adapter)
Below 4	3
Over 4 & below 8	4
Over 8 & below 16	5
Over 16 & below 30	5

Other Packings

Rubber O-Ring

TOMBO™ No.2670

Construction

This is a self-sealing packing made by vulcanizing various rubber materials into an endless ring with a circular cross section using a mold.

Features

1. A seal can be created with a small tightening force.
2. The seal part can be designed compactly.
3. Capable of sealing from vacuum to high pressure.

Application

Rod seal of cylinder, piston seal, and ram.

Fluid

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

Standard Size

JIS B 2401-1 O-rings, AS 568B Aerospace Size Standard
For O-Rings, JIS B 8365 Dimensions of clamped-type
vacuum couplings
Please contact us for other dimensions.

Type of rubber and physical properties

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

⚠ When O-ring is used more than 7MPa (70 kgf/cm²) 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.



TOMBO No.2670-NBR

Service Range

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

Others

Fluorine Grease

TOMBO™ No.9401

Construction

This is lubrication grease made of fine Fluorine 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.

Standard packing

50 gram / tube









TOMBO No.9401

Service Range

Max. Temperature	150°C
pH	0 ~ 14

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

Appearance	TOMBO No.	Product Name	Construction	Features	Shape of cross section	Maximum Temperature (°C)
	8510-E	Square Braided Packing-E	Fiber glass yarn is braided into square cross section.	Economical	Square	400
	8520	Square Braided Packing	Alkaline earth silicate (AES) wool reinforced with wire is braided into square cross section.	It is a packing which does not contain any impregnant.	Square	800
	8520-G	Square Braided Packing with graphite treatment	Surface of TOMBO No.8520 is treated with graphite.	Based on TOMBO No.8420/8520, it is a packing with improved sealability by graphite treatment.	Square	600 ⁽¹⁾
	8520-H	Square Braided Packing-H	Wire reinforced alkaline earth silicate (AES) wool is densely braided into square cross section.	Compared to TOMBO No.8420/8520, it is packing with excellent sealability because it is braided at high density.	Square	800
	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.	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 ⁽¹⁾
	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.	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

Note (1): 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.







Standard size and weight

TOMBO No.	Nominal size (mm) ⁽⁴⁾	4.8	6.4	7.9	9.5	11.1 (11.0)	12.7 (12.5)	14.3 (14.5)	15.9 (16.0)	19.0 (19.0)	22.2 (22.0)	25.4 (25.5)	Supply form
8510-E	Weight (kg) ⁽²⁾	0.9	1.6	2.3	3.2	4.4	5.7	7.3	9.1	13.0	17.7	23.2	30 m/coil
	Braiding	Braid over braid											
8520 ⁽³⁾	Weight (kg) ⁽²⁾	0.60	1.04	1.55	2.15	2.96	3.80	4.80	2.98	4.20	5.63	7.39	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	Square braid						Interlocking braid					
8520-G ⁽³⁾	Weight (kg) ⁽²⁾	0.66	1.14	1.70	2.35	3.21	4.13	5.21	3.21	4.49	5.97	7.84	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	Square braid						Interlocking braid					
8520-H ⁽³⁾	Weight (kg) ⁽²⁾	—	—	—	—	3.23	4.03	5.58	3.38	4.47	5.60	6.98	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	—				Square braid			Braid over braid				
8520-BH ⁽³⁾	Weight (kg) ⁽²⁾	—	—	—	—	3.86	4.84	6.69	4.05	5.36	6.72	8.25	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	—				Square braid			Braid over braid				
8520-WH ⁽³⁾	Weight (kg) ⁽²⁾	—	—	—	—	4.67	5.81	8.06	4.89	6.45	8.09	9.90	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	—				Square braid			Braid over braid				

Note (2): Reference weight for 1 coil.

Note (3): Please contact us for dimensions with a nominal diameter of 25.4 mm or more.

44 Note (4): Dimensions in () are the nominal diameters of 8520-H, -BH, and -WH.

Appearance	TOMBO No.	Product Name	Construction	Features	Shape of cross section	Maximum Temperature (°C)
	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.	Economical	Round	400
	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.	It is a packing which does not contain any impregnant.	Round	800
	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.	Based on TOMBO No.8420/8520, it is a packing with improved sealability by graphite treatment.	Round	600 ⁽¹⁾
	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.	Compared to TOMBO No.8420/8520, it is packing with excellent sealability because it is braided at high density.	Round	800
	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.	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 ⁽¹⁾
	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.	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

Note (1): 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.




■ Standard size and weight

TOMBO No.	Nominal size (mm) ⁽⁴⁾	4.8	6.4	7.9	9.5	11.1 (11.0)	12.7 (12.5)	14.3 (14.5)	15.9 (16.0)	19.0 (19.0)	22.2 (22.0)	25.4 (25.5)	Supply form
8410-E	Weight (kg) ⁽²⁾	0.7	1.3	1.9	2.7	3.5	4.5	5.8	7.1	10.1	13.9	18.2	30 m/coil
	Braiding	Braid over braid											
8420 ⁽³⁾	Weight (kg) ⁽²⁾	—	—	—	1.81	2.49	3.19	4.03	2.52	3.53	4.87	6.38	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	Braid over braid											
8420-G ⁽³⁾	Weight (kg) ⁽²⁾	—	—	—	1.97	2.70	3.47	4.38	2.74	3.83	5.30	6.94	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	Braid over braid											
8420-H ⁽³⁾	Weight (kg) ⁽²⁾	—	—	—	—	2.65	3.49	4.30	2.69	3.92	5.04	6.62	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	Braid over braid											
8420-BH ⁽³⁾	Weight (kg) ⁽²⁾	—	—	—	—	3.15	4.13	5.07	3.18	4.64	5.97	7.83	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	Braid over braid											
8420-WH ⁽³⁾	Weight (kg) ⁽²⁾	—	—	—	—	3.76	4.97	6.12	3.82	5.54	7.16	9.40	30 m/coil (Until 14.3) 15 m/coil (15.9 & above)
	Braiding	Braid over braid											

Note (2): Reference weight for 1 coil.

Note (3): Please contact us for dimensions with a nominal diameter of 25.4 mm or more.

Note (4): Dimensions in () are the nominal diameters of 8520-H, -BH, and -WH.

Appearance	TOMBO No.	Product Name	Construction	Features	Shape of cross section	Maximum Temperature (°C)
	9079	NAFLON™ impregnated CT Packing	Flexible cotton yarn is braided into square cross section and treated with PTFE dispersion and special lubricant.	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. Most economical among packings for use in rotating equipment. As this is excellent in flexibility, it can be expected that this fits into the shaft and the wearing is reduced.	Square	100
	9044	THERMALFLON™ Packing	This is a general use packing, composed of inorganic fibers, that has treated with PTFE dispersion and includes small amounts of a special lubricant.	Packing with excellent sealing properties that has been subjected to precise sealing treatment.	Square	180
	2280-S	Super Seal Packing	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.	A packing that combines heat resistance, chemical resistance, and sealing properties.	Rectangular	400
	2280-S-SQ				Square	

⚠ 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.

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 (kg) ⁽¹⁾	—	0.08	0.15	0.22	0.32	0.43	0.57	0.71	0.88	1.24	1.67	2.16	3 m/coil
	Braiding	Square braid				Interlocking braid								
9044	Weight (kg) ⁽¹⁾	0.05	0.11	0.20	0.30	0.42	0.57	0.72	0.93	1.14	1.62	2.19	2.85	
	Braiding	Square braid				Braid over braid								

Note (1): Reference weight for 1 coil.

*Please contact us for dimensions with a nominal diameter of 25.4 mm or more.

TOMBO No.	Nominal size (mm)	3.0	3.5	5.0	6.5	8.0	9.5	11.0	12.5	14.5	16.0	19.0	22.0	25.5	Supply form
2280-S	Weight (kg) ⁽¹⁾	0.05	—	0.13	0.22	0.34	0.42	0.49	0.55	0.77	0.89	1.27	1.55	2.15	3 m/coil
	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	
	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	
	Braiding	Square braid	—	Square braid						Braid over braid					
2280-S-SQ	Weight (kg) ⁽¹⁾	—	0.05	0.11	0.15	0.22	0.34	0.42	0.55	0.77	0.89	1.27	1.55	2.15	
	Width (mm)	—	3.5	5.0	6.5	8.0	9.5	11.0	12.5	14.5	16.0	19.0	22.0	25.5	
	Height (mm)	—	3.5	5.0	6.5	8.0	9.5	11.0	12.5	14.5	16.0	19.0	22.0	25.5	
	Braiding	—	Square braid						Braid over braid						

Note (1): Reference weight for 1 coil.

*Please contact us for dimensions with a nominal diameter of 25.5 mm or more.

Dimension Tables

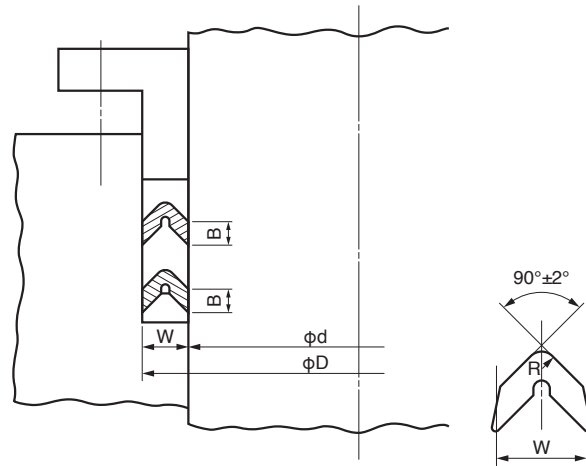
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Standard Dimensions

TOMBO No.2660 Cloth-reinforced rubber molded packing standard dimensions

(1) Standard dimensions of V Packing (JIS B 2403-2009, F Type)



Appendix 1

Unit (mm)

O-Ring Number	Nominal Size			Height, B ⁽¹⁾		R
	ID d	OD D	Width W	Std. Size	Tolerance	Min.
F 6.3	6.3	16.3	5	3	+ 0.5 - 0.2	0.5
F 7.1	7.1	17.1				
F 8	8	18				
F 9	9	19				
F 10	10	20				
F 11.2	11.2	21.2				
F 12.5	12.5	22.5				
F 14	14	24				
F 16	16	26				
F 15	15	28	6.5	3	+ 0.5 - 0.2	0.75
F 18	18	31				
F 18.5	18.5	31.5				
F 20	20	33				
F 22.4	22.4	35.4				
F 25	25	38				
F 27	27	40				
F 28	28	41				
F 31.5	31.5	44.5				
F 32	32	45				
F 34	34	50	8	4	+ 0.5 - 0.2	1
F 35.5	35.5	51.5				
F 40	40	56				
F 45	45	61				
F 47	47	63				
F 50	50	66				
F 53	53	69				
F 55	55	71				
F 56	56	72				
F 60	60	76				
F 63	63	79				
F 64	64	80				
F 67	67	87	10	5	+ 0.5 - 0.2	2
F 70	70	90				
F 71	71	91				
F 75	75	95				
F 80	80	100				

Note (1): B indicates the height per piece when V Packing is installed.

Appendix 2

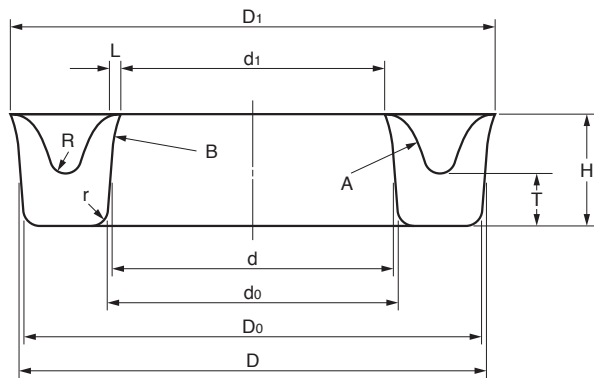
Unit (mm)

O-Ring Number	Nominal Size			Height, B ⁽¹⁾		R
	ID d	OD D	Width W	Std. Size	Tolerance	Min.
F 85	85	105	10	5	+ 0.5 - 0.2	2
F 90	90	110				
F 92	92	112				
F 95	95	115				
F 100	100	120				
F 105	105	125				
F 106	106	126				
F 112	112	132				
F 118	118	138				
F 120	120	140				
F 125	125	150	12.5	6	+ 0.5 - 0.2	2
F 132	132	157				
F 135	135	160				
F 140	140	165				
F 145	145	170				
F 150	150	175				
F 155	155	180				
F 160	160	185				
F 165	165	190				
F 170	170	195				
F 175	175	200				
F 180	180	205				
F 190	190	215				
F 199	199	224				
F 200	200	225				
F 212	212	237				
F 224	224	249				
F 225	225	250				
F 236	236	261				
F 250	250	275				
F 265	265	297	16	7	+ 0.8 - 0.3	3
F 280	280	312				
F 300	300	332				
F 315	315	347				
F 335	335	367				
F 355	355	387				
F 375	375	407				
F 400	400	432				
F 425	425	457				
F 450	450	482				
F 475	475	507				
F 500	500	532				
F 530	530	570	20	8	+ 1.2 - 0.4	4
F 560	560	600				
F 600	600	640				
F 630	630	670				
F 670	670	710				
F 710	710	750				
F 750	750	790				
F 800	800	840				
F 850	850	890				
F 900	900	940				
F 950	950	990				
F 1000	1000	1040				

Note (1): B indicates the height per piece when V Packing is installed.

Standard Dimensions

(2) U-Type Packing Standard Cross-Sectional Dimensions



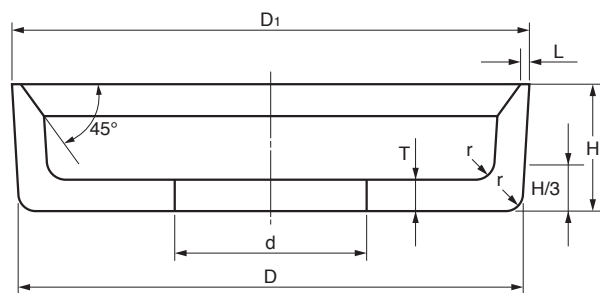
Appendix 3

Unit (mm)

d Category	D	d ₀	D ₀	d ₁	D ₁	H	T	L	R	r	A	B
Under 12.5	d + 12	d + 0.5	D - 0.5	d - 0.5	D + 0.5	7 ^{+0.5} _{-0.2}	2.5	0.4	0.7	1.7	7	7
12.5 & Above Under 25	+ 16	+ 0.8	- 0.8	- 0.8	+ 0.8	10 ∕	3.5	0.5	1.0	∕	10	10
25 & Above Under 50	+ 20	+ 1.0	- 1.0	- 1.0	+ 1.0	12 ∕	4.5	0.6	1.2	∕	12	12
50 & Above Under 100	+ 25	+ 1.2	- 1.2	- 1.2	+ 1.2	15 ∕	5.5	0.7	1.5	∕	15	15
100 & Above Under 200	+ 30	+ 1.5	- 1.5	- 1.5	+ 1.5	18 ∕	6.5	0.8	1.8	∕	18	18
200 & Above Under 400	+ 40	+ 1.8	- 1.8	- 1.8	+ 1.8	24 ^{+0.5} _{-0.2}	8.5	1.0	2.5	∕	24	24
400 & Above Under 800	+ 50	+ 2.0	- 2.0	- 2.0	+ 2.0	30 ∕	10.5	1.2	3.0	∕	30	30
800 & Above	+ 60	+ 2.2	- 2.2	- 2.2	+ 2.2	36 ∕	13.5	1.5	3.7	∕	36	36

*For U-Type dimensions, specify the shaft diameter, d, and design according to the standard dimensions.

(3) L-Type Packing Standard Cross-Sectional Dimensions



Appendix 4

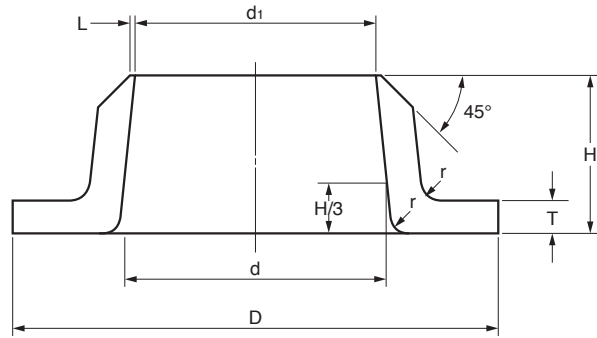
Unit (mm)

D Category	d	D ₁	H	T	r	L
Over 25 & Under 35	D - 10	D + 0.5	10 ^{+0.5} _{-0.2}	3 ^{+0.3} ₀	1	0.3
Over 35 & Under 50	- 20	+ 0.6	12 ^{+0.7} _{-0.2}	∕	∕	∕
Over 50 & Under 75	- 30	+ 0.8	∕	4 ^{+0.4} ₀	∕	0.4
Over 75 & Under 100	- 40	+ 1.0	15 ^{+0.7} _{-0.2}	∕	∕	∕
Over 100 & Under 125	- 50	+ 1.2	∕	∕	∕	∕
Over 125 & Under 150	- 60	+ 1.5	20 ^{+0.7} _{-0.2}	5 ^{+0.5} ₀	2	0.5
Over 150 & Under 175	- 70	+ 1.7	∕	∕	∕	∕
Over 175 & Under 200	- 80	+ 1.9	∕	∕	∕	∕
Over 200 & Under 230	- 100	+ 2.1	25 ^{+1.0} _{-0.2}	6 ^{+0.6} ₀	∕	0.6
Over 230 & Under 260	- 120	+ 2.3	∕	∕	∕	∕
Over 260 & Under 300	- 150	+ 2.5	30 ^{+1.2} _{-0.2}	∕	∕	∕

*For L-Type dimensions, specify the cylinder inner diameter, D, and design according to the standard dimensions.

Dimension Tables

(4) J-Type Packing Standard Cross-Sectional Dimensions

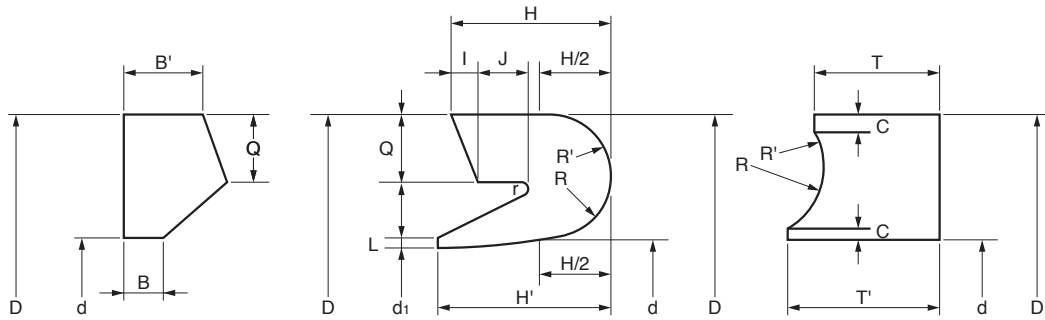


Appendix 5

d Category	D	d ₁	H	T	L	r
Under 15	d + 15	d - 0.5	10 ^{+0.5} _{-0.2}	3 ^{+0.3} ₀	1	0.3
15 & Above Under 25	+ 20	- 0.7	∕	∕	∕	∕
25 & Above Under 50	+ 25	- 0.9	12 ^{+0.7} _{-0.2}	4 ^{+0.4} ₀	∕	0.4
50 & Above Under 75	+ 30	- 1.2	15 ∕	∕	∕	∕
75 & Above Under 100	+ 35	- 1.4	18 ∕	5 ^{+0.5} ₀	2	0.5
100 & Above Under 150	+ 40	- 1.6	20 ∕	∕	∕	∕
150 & Above Under 200	+ 50	- 1.8	25 ∕	6 ^{+0.6} ₀	∕	0.6

*For J-Type dimensions, specify the shaft diameter, d, and design according to the standard dimensions.

(5) S-Type Packing Standard Cross-Sectional Dimensions



Appendix 6

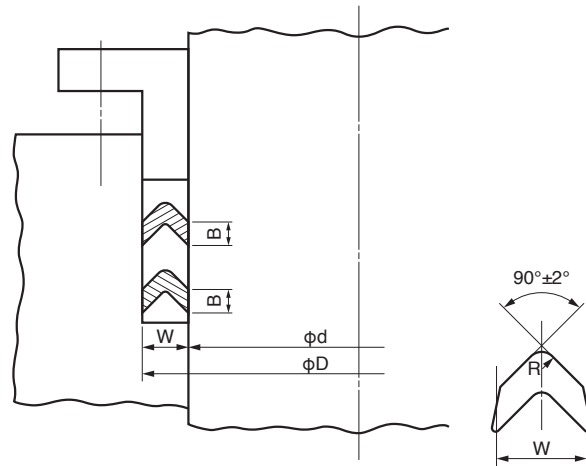
d Category	Packing dimension												Adaptor dimensions				
	D	d ₁	D ₁	d	H'	I	J	Q	L	R	R'	r	B	B'	T	T'	C
Under 50	d + 24	d - 1.2	D + 0.5	16	18	3	6.5	6.5	0.7	8	4	0.5	4	9	12	14	1
50 & Above Under 100	d + 30	d - 1.5	D + 0.8	20	22	3	7	8	1	10	5	0.5	5	10	15	18	1

*For S-Type dimensions, specify the shaft diameter, d, and design according to the standard dimensions.

Standard Dimensions

TOMBO No.2661 Rubber molded packing standard dimensions

(1) Standard dimensions of V Packing (JIS B 2403-2009, H Type)



Appendix 7

Unit (mm)

O-Ring Number	Nominal Size			Height, B ⁽¹⁾		R
	ID d	OD D	Width W	Std. Size	Tolerance	Min.
H 6.3	6.3	16.3	5	2.5	±0.3	0.5
H 7.1	7.1	17.1				
H 8	8	18				
H 9	9	19				
H 10	10	20				
H 11.2	11.2	21.2				
H 12.5	12.5	22.5				
H 14	14	24				
H 16	16	26	6.5	3	±0.3	0.75
H 15	15	28				
H 18	18	31				
H 18.5	18.5	31.5				
H 20	20	33				
H 22.4	22.4	35.4				
H 25	25	38				
H 27	27	40				
H 28	28	41	8	3.5	±0.3	1
H 31.5	31.5	44.5				
H 32	32	45				
H 34	34	50				
H 35.5	35.5	51.5				
H 40	40	56				
H 45	45	61				
H 47	47	63				
H 50	50	66	10	4	±0.3	2
H 53	53	69				
H 55	55	71				
H 56	56	72				
H 60	60	76				
H 63	63	79				
H 64	64	80				
H 67	67	87				
H 70	70	90				
H 71	71	91	10	4	±0.3	2
H 75	75	95				
H 80	80	100				

Note (1): B indicates the height per piece when V Packing is installed.

Appendix 8

Unit (mm)

O-Ring Number	Nominal Size			Height, B ⁽¹⁾		R
	ID d	OD D	Width W	Std. Size	Tolerance	Min.
H 85	85	105	10	4	±0.3	2
H 90	90	110				
H 92	92	112				
H 95	95	115				
H 100	100	120				
H 105	105	125				
H 106	106	126				
H 112	112	132				
H 118	118	138				
H 120	120	140				
H 125	125	150	12.5	5	±0.3	2
H 132	132	157				
H 135	135	160				
H 140	140	165				
H 145	145	170				
H 150	150	175				
H 155	155	180				
H 160	160	185				
H 165	165	190				
H 170	170	195				
H 175	175	200				
H 180	180	205				
H 190	190	215				
H 199	199	224				
H 200	200	225				
H 212	212	237				
H 224	224	249				
H 225	225	250				
H 236	236	261				
H 250	250	275				
H 265	265	297	16	6	±0.4	3
H 280	280	312				
H 300	300	332				

Note (1): B indicates the height per piece when V Packing is installed.

TOMBO™ BRAND
GLAND PACKING

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 - Damage arising due to the willful intent or negligence of the customer or the user, or due to the improper use or use under abnormal conditions of the products;
 - Damage arising due to the failure to carry out regular checkups and appropriate repairs, maintenance and part replacements, considering various conditions, such as the usage conditions, usage environment and usage period, etc., of the product;
 - Indirect damage (including any operational damage, lost profits, opportunity losses, etc.) arising due to the use of or inability to use our company's product;
 - Damage arising due to a situation which was unforeseeable under the technical standards at the time of the shipment of our company's product; or
 - Damage arising due to reasons that are not attributable to our company.