



# Comparison of metal gaskets

Product name

TOMBO No.

## 1850C

Octagonal ring joint gasket



This gasket is made of forged metal that is formed into an octagonal cross-section.

- The surface-to-surface contact of the gasket sealing face and the flange groove realizes excellent sealing performance.
- The gasket can be reused by re-grinding<sup>\*1</sup>.

\*1: This involves rubbing the metal surfaces against each other in order to obtain smoother surfaces.

This type of gasket is suitable for sealing pipe flanges, valves, pressure vessels, and heat exchangers, etc., under high-temperature and high-pressure, which is difficult to realize with a plain type metal gasket.

Depends upon the material.

Construction

TOMBO No.

## 1850V

Oval type ring joint gasket



This gasket is made of forged metal formed into an oval cross-section.

- Compared to an octagonal type, the sealing face of this type of gasket touches the flange along a line, thus realizing a good fit with the flange groove. On the other hand, the ring cannot be reused.

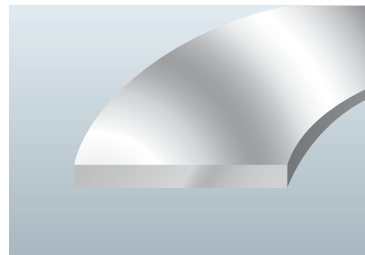
This type of gasket is suitable for flange faces on which an octagonal type gasket cannot be used, and also pipe flanges, valves, pressure vessels, heat exchangers, and other applications where fit is important.

Depends upon the material.

TOMBO No.

## 1850P

Flat type metal gasket



This is a flat gasket that is cut out from a flat sheet, circular rod, or a forged part, and shaped using a lathe.

- Flat type gasket made by flat-forming metal.
- A high tightening pressure is necessary to ensure a good fit between the seal face and the flange.

Pipe flanges, valves, pressure vessels, heat exchangers and other places under high-temperature and high-pressure where the flange cannot be formed to the designated shape.

Depends upon the material.

Features

Applications

Service range

Metal Gasket

These gaskets, which are made of various kinds of metal, are formed to the necessary shape and dimensions for the intended conditions of use.

TOMBO No.

**1890**

Serrated type metal gasket



Metal gasket with concentric serrations on its seating faces.

- Compared to a flat type metal gasket, the shape of this gasket results in high sealing performance.
- This gasket can withstand the application of concentrated face pressure. On the other hand, it can sometimes damage the flange.

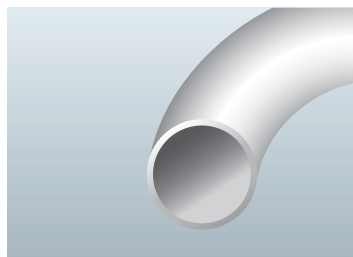
This gasket is used for pipe flanges, valves, pressure vessels, and heat exchangers, etc., where it is necessary to obtain higher sealing performance than that realized by a flat type gasket under the same tightening force.

Depends upon the material.

TOMBO No.

**9200P**

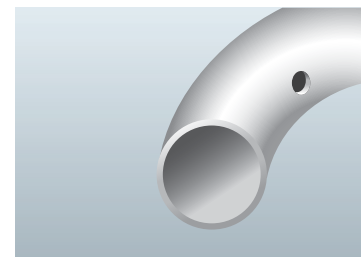
Standard type metal O-seal



TOMBO No.

**9200V**

Vent hole type metal O-seal



- This gasket is made of a fine metal pipe, which is formed into a circle with its ends welded and its surface finished to a high degree of precision.
- TOMBO 9200V has two or more small holes on its I.D. side (for internal pressure) or O.D. side (for external pressure), through which the fluid enters the ring to increase self-sealing performance.
- This gasket is used by inserting it into a groove and tightening it fully. It can thus provide a high pressure seal with only a small tightening force.

- It has stable, high sealing performance over a wide range of conditions from high temperature to low temperature, and from high pressure to negative pressure.
- When using this gasket in a gas, vacuum or highly volatile fluid, it is recommended that you use a PTFE-coated or silver-plated version.

This gasket is recommended for equipment couplings, forming machines, compression equipment and various engines that necessitate compact design.

- TOMBO No. 9200P...From a vacuum to fluid of about 7.0MPa
- TOMBO No. 9200V...High pressure seal of 7.0MPa or higher

Depends upon the material.

Product name

Construction

Features

Applications

Service range

Metal Gasket



# TOMBO No. 1850 series / 1890

## Metal solid gasket

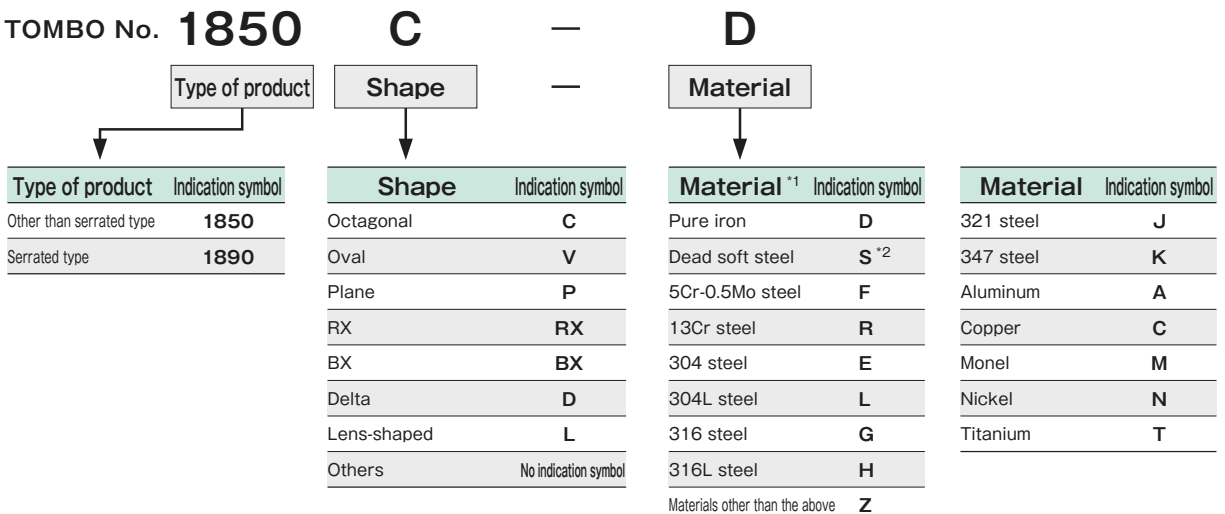
### Lineup

We can manufacture octagonal, oval, plain and serrated gaskets, and also metal gaskets of various shapes.

| Shape | Product name                  | Indication symbol    | Features  |
|-------|-------------------------------|----------------------|---|
|       | RX type ring joint gasket     | RX                   | This is a special octagonal ring joint intended for use on a 6B flange which is stipulated in API spec 6A.    |
|       | BX type ring joint gasket     | BX                   | This is a special octagonal ring joint intended for use on a 6BX flange which is stipulated in API spec 6A.   |
|       | Delta type metal gasket       | D                    | This is an auto-seal type metal gasket that has a triangular cross-section.                                   |
|       | Lens type metal gasket        | L                    | This is an auto-seal type metal gasket that has a lens-shaped cross-section. It is stipulated in DIN 2696.    |
|       | Double cone type metal gasket | No indication symbol | This is an auto-seal type metal gasket the cross section of which is a longitudinally split octagonal ring.   |
|       | Bridgeman type metal gasket   | No indication symbol | This is an auto-seal type metal gasket which has a wedge-shaped cross-section. It is also called a seal ring. |

\*For shapes other than the above, please contact us.

### How to read TOMBO No. When placing an order, please specify the following product specifications (TOMBO No.)



\*1: We can manufacture gaskets from other metals according to your specifications. We recommend that you select a gasket that has a Brinell hardness (HB) value of between 30 and 40 softer than that of the flange material.  
 \*2: A plane metal gasket made from rolled steel is indicated as SS.

Metal Gasket

## ■ Type of metal and usable temperature

| Material        | Material symbol | Max. service temperature [°C] | Max. hardness <sup>*2</sup> |    |
|-----------------|-----------------|-------------------------------|-----------------------------|----|
|                 |                 |                               | HB                          | HV |
| Pure iron       | D               | 538                           | 90                          | —  |
| Dead soft steel | S <sup>*1</sup> | 538                           | 120                         | —  |
| 5Cr-0.5Mo steel | F               | 649                           | 130                         | —  |
| 13Cr steel      | R               | 704                           | 170                         | —  |
| 304 steel       | E               | 816                           | 160                         | —  |
| 304L steel      | L               | 816                           | 150                         | —  |
| 316 steel       | G               | 816                           | 160                         | —  |
| 316L steel      | H               | 816                           | 150                         | —  |
| 321 steel       | J               | 816                           | 160                         | —  |
| 347 steel       | K               | 816                           | 160                         | —  |
| Aluminum        | A               | 300                           | —                           | 40 |
| Copper          | C               | 400                           | —                           | 80 |
| Monel           | M               | 800                           | 130                         | —  |
| Nickel          | N               | 760                           | 120                         | —  |
| Titanium        | T               | 800                           | 140                         | —  |

\*1: A plane metal gasket made from rolled steel is indicated as SS.  
 \*2: In the case of TOMBO No.1850P and No.1890, the actual values may differ from those indicated in the table.

\*All metal gaskets are made to order. Regarding the possibility of making a gasket from a material other than those listed in this table, please contact us.

## ■ Finish of the gasket seat

The recommended surface roughness when using a metal solid gasket is as follows.

- For sealing liquid: 1.6  $\mu$ m Ra max.
- For sealing gas: 1.6  $\mu$ m Ra max.

## Application standards

### ■ JPI-7S-23

"Ring joint gaskets and grooves for the petroleum industry"  
 (TOMBO No.1850C, TOMBO No.1850V)

### ■ ASME B16.20

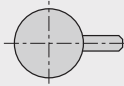

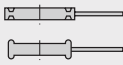
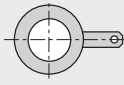
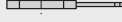
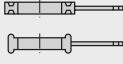
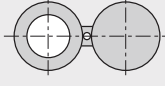

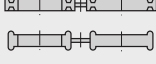
[Metallic Gaskets for Pipe Flanges-Ring-Joint, Spiral-Would, and Jacketed]  
 (TOMBO No.1850C, TOMBO No.1850V)

### ■ API spec 6A

[Wellhead Equipment 6BX Flanges]  
 (TOMBO No.1850C, 1850RX, 1850BX)

## Blinds, spacers, and spectacle blinds

Blinds and spacers are used together with gaskets for blocking pipes or for cutting off pressure during sealing or a pressure resistance test. We also manufacture spectacle blinds which are a combination of a blind and a spacer. In addition, we can also manufacture blinds, spacers and spectacle blinds integrated with ring joint gaskets. Please specify the required material, dimensions, and so on.

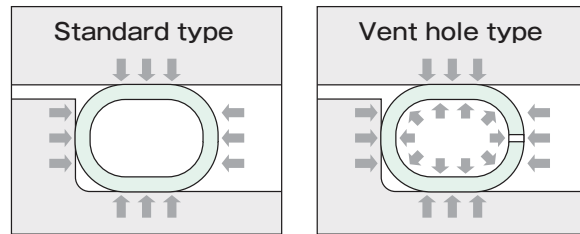
|                                     | Shape   | RF type  | RTJ type  |
|-------------------------------------|---|--|---|
| TOMBO No.1850-BL<br>Blind           |  |  |  |
| TOMBO No.1850-SP<br>Spacer          |  |  |  |
| TOMBO No.1850-SB<br>Spectacle blind |  |  |  |



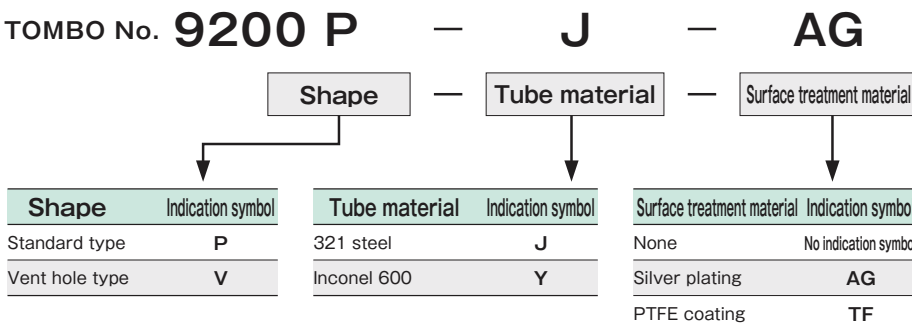
# TOMBO No. 9200 series

## Metal O-seal

The sealing performance of a metal O-seal is realized as the reaction to a compression force. A vent hole type O-seal provides greater sealing performance due to the fluid that enters the hollow part of the ring, so it is recommended that a vent hole type O-seal be used when the pressure is 7 MPa or greater.



■ How to read TOMBO No. When placing an order, indicate the required product specifications (TOMBO No.) from those set out below.



[Reference: Old material symbol]

|                |            |
|----------------|------------|
| 321 steel      | <b>321</b> |
| Inconel 600    | <b>In</b>  |
| Silver plating | <b>Ag</b>  |
| PTFE coating   | <b>TFE</b> |

## Service range

| Tube material <sup>*1</sup> | Surface treatment <sup>*2</sup> | Service temperature range [°C] | Serviceable pressure  |
|-----------------------------|---------------------------------|--------------------------------|---|
| 321 steel                   | None                            | -250~500                       | High water pressure: 400MPa<br>High-pressure gas: 300MPa<br>Vacuum: 10 <sup>-4</sup> Pa |
|                             | Silver plating                  |                                |   |
|                             | PTFE coating                    | -250~250                       |   |
| Inconel 600                 | None                            | -250~700                       |   |
|                             | Silver plating                  |                                |   |
|                             | PTFE coating                    | -250~250                       |   |

\*1: A metal O-seal can only be made from 321 steel or Inconel 600.

\*2: The surface treatment thickness is between 0.03 and 0.05 mm. For sealing a gas, vacuum or volatile fluid, surface treatment is necessary.

## Tightening criteria

| Tube cross-section diameter [mm] | Wall thickness [mm] | Compression load [N/mm] |
|----------------------------------|---------------------|-------------------------|
| φ 0.8                            | 0.15                | 69                      |
| φ 1.6                            | 0.25                | 118                     |
|                                  | 0.36                | 284                     |
| φ 2.4                            | 0.25                | 59                      |
|                                  | 0.46                | 235                     |
| φ 3.2                            | 0.25                | 49                      |
|                                  | 0.35                | 88                      |
|                                  | 0.5                 | 177                     |
| φ 4.8                            | 0.5                 | 69                      |
|                                  | 0.8                 | 333                     |
| φ 6.4                            | 0.8                 | 177                     |

To calculate the actual tightening load, add the load (Wa) of the end force part due to fluid pressure to the load (Wb) calculated from the compression load (Y). The compression load indicates the necessary load for applying the correct tightening force.

### Calculation of tightening force

$$W = W_a + W_b = \frac{\pi}{4} G^2 P + \pi G Y$$

W: Total bolt load [N]  
G: Gasket O.D. [mm]  
P: Pressure [MPa]  
Y: Compression load [N/mm]

## Standard dimensions

| Tube cross-section diameter [mm] | Wall thickness [mm] | O.D. dimension [mm]       |                           |
|----------------------------------|---------------------|---------------------------|---------------------------|
|                                  |                     | Recommended service range | Manufacturable dimensions |
| φ 0.8                            | 0.15                | 6 ~ 25                    | 6 ~ 30                    |
| φ 1.6                            | 0.25                | —                         | 10 ~ 200                  |
|                                  | 0.36                | 15 ~ 50                   | 11 ~ 200                  |
| φ 2.4                            | 0.25                | —                         | 40 ~ 500                  |
|                                  | 0.46                | 40 ~ 200                  | 20 ~ 500                  |
| φ 3.2                            | 0.25                | —                         | 60 ~ 1500                 |
|                                  | 0.35 <sup>*1</sup>  | —                         | 60 ~ 1500                 |
|                                  | 0.5                 | 65 ~ 700                  | 50 ~ 1500                 |
| φ 4.8                            | 0.5 <sup>*1</sup>   | —                         | 150 ~ 1500                |
|                                  | 0.8                 | 500 ~ 1200                | 150 ~ 1500                |
| φ 6.4                            | 0.8                 | 1000 ~ 1500               | 250 ~ 1500 <sup>*2</sup>  |

**Minimum value of the corner radius in the case of a square gasket**


For a standard wall thickness (hatched area)


Radius of I.D. side ≥ 8times the O.D. of the tube

For a wall thickness that is less than the standard wall thickness

Radius of I.D. side ≥ 8times the O.D. of the tube

 Indicates the standard wall thickness. For sealing gas, use the standard wall thickness.

 The minimum O.D. of a vent hole type is φ 10mm.

 The maximum O.D. of the PTFE coating is φ 1300mm. That of silver plating is φ 1100.

\*1: The only material that can be used to manufacture a tube is SUS321.

\*2: If you wish to use a diameter exceeding 1500mm, please consult us.

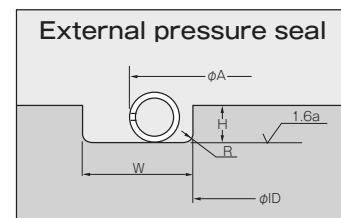
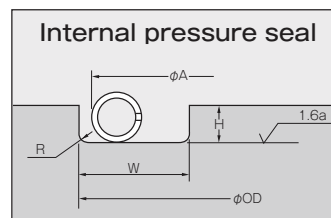
## Groove dimensions

| Tube cross-section diameter [mm] | For an internal pressure seal<br>Groove O.D. <sup>*1</sup><br>[mm] | For an external pressure seal<br>Groove I.D. <sup>*1</sup><br>[mm] | Groove width (W) <sup>*1</sup> [mm] |      | Groove depth (H)<br>[mm] | Groove corner rounding (R)<br>[mm]<br>Max. |
|----------------------------------|--|--|-------------------------------------|------|--------------------------|--|
|                                  |  |  | Recommended                         | Min. |                          |  |
| φ 0.8                            | A +0.35<br>+0.25   | (A-1.6) -0.25<br>-0.35   | 1.2 以上                              | 1.1  | 0.60 ± 0.05              | 0.2  |
| φ 1.6                            | A +0.40<br>+0.30   | (A-3.2) -0.30<br>-0.40   | 2.4 以上                              | 2.0  | 1.15 ± 0.05              | 0.3  |
| φ 2.4                            | A +0.40<br>+0.30   | (A-4.8) -0.30<br>-0.40   | 3.6 以上                              | 2.9  | 1.75 ± 0.05              | 0.5  |
| φ 3.2                            | A +0.50<br>+0.35   | (A-6.4) -0.35<br>-0.50   | 4.8 以上                              | 3.7  | 2.55 ± 0.05              | 0.8  |
| φ 4.8                            | A +0.50<br>+0.35   | (A-9.6) -0.35<br>-0.50   | 7.2 以上                              | 5.6  | 3.75 ± 0.05              | 0.8  |
| φ 6.4                            | A +0.55<br>+0.40   | (A-12.8) -0.40<br>-0.55  | 9.6 以上                              | 7.5  | 5.00 ± 0.05              | 0.8  |

[A = O.D. of gasket]

\*1: In the case of a PTFE-coated or silver-plated gasket, the dimensions of the groove will be changed as follows.

- For an internal pressure seal: 0.1mm will be added to the groove O.D., groove width (W) and the groove depth (H).
- For an external pressure seal: 0.1 mm will be reduced from the groove I.D., and 0.1 mm will be added to the groove width (W) and the groove depth (H).
- If the groove width is narrow, it will be difficult to remove the gasket, so the use of a wide groove width is recommended.



## Finish of groove

- For sealing gas or vacuum: 0.8μmRa max.
- In other cases: 1.6μmRa max.