High Temperature Sheet Gasket

This is newly developed non-asbestos gasketing sheet for high temperature application. Main material of expanded graphite is mixed with aramid fibers, rubber and chemicals and then processed by calendering machine.

NA Joint Sheets for High Temperature

CLINSIL-Top
TOMBO No.1120

Features:
- It can be used at 260°C × 1MPa condition.
- This gasket can be used for 2MPa saturated steam.
- Seal performance and chemical resistance are quite similar to conventional asbestos joint sheets.
- "m" and "y" value are the same as asbestos joint sheets.
- Maximum outer diameter is 2520 mm and irregular shapes are available.
- Not like graphite sheet, surface is not scratched by normal handling process. Also good in flexibility.
- Thanks to the flexibility of expanded graphite, bolt re-tightening is possible.
- It will not cause corrosion pitching when it is used for stainless steel flange.

Applications:
Gaskets for various types of piping flanges, valves, equipment etc.

Service Range (For details, please refer to the diagram on page 10)
- Temperature: -29°C ~ 260°C
- Pressure: Saturated steam, hot water
  →See Page 10
  Water, salt solutions, weak acid and weak alkali solutions. →Max.4.0MPa
  Oil at 120°C or lower. →Max.4.0MPa
  Air, exhaust gas, inert gas. →Max.1.0MPa

Availability

<table>
<thead>
<tr>
<th>Thickness</th>
<th>0.5</th>
<th>0.8</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
<th>3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width × Length</td>
<td>1270 × 1270 (1S)</td>
<td>1270 × 3810 (3S)</td>
<td>1270 × 1270 (1S)</td>
<td>2540 × 3810 (6S)</td>
<td>1270 × 3810 (3S)</td>
<td></td>
</tr>
</tbody>
</table>

Recommended seating stress of Gasket:
Please refer to page 8.

Chemical resistance:

Fluids not suitable for use with Clinsil-Top:

<table>
<thead>
<tr>
<th>Type</th>
<th>Fluid name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxidizing acids</td>
<td>Nitric acid, concentrated sulphuric acid, hot sulphuric acid, mixed acids, chromic acid, etc.</td>
</tr>
<tr>
<td>Oxidizing salts</td>
<td>Nitrate, chlorate, hypochlorite, etc.</td>
</tr>
<tr>
<td>Halogen compounds</td>
<td>Bromine, fluorine, iodine, chlorine dioxide, etc.</td>
</tr>
<tr>
<td>Combustion promoting gas</td>
<td>Oxygen (pure oxygen)</td>
</tr>
</tbody>
</table>

Caution for handling:
- Please pay attention to over compression, especially for small diameter flanges. Maximum allowable tightening stress is listed in the table of page 8.
- For gas sealing, please refer to the cautions on page 11.
JOINT SHEETS

Compressed fiber joint sheet is a gasket made of a uniform mixture of fibrous material, filler, rubber and chemicals which is hot rolled by calendering to obtain smooth sheets. The sheets are processed to the required shapes and dimensions for applications in equipment, etc., in a wide range of industries.

General-purpose NA Joint Sheets

**CLINSIL®-Brown**

- **Features**: Inorganic filler is added to inorganic fibers and aramid fibers; then oil-resistant synthetic rubber is added as binder to form brown NA (non-asbestos) joint sheets which contain absolutely no asbestos. This gasket can be used for stainless steel flange since leachable halogens are little.

- **Applications**: Gaskets for various types of piping flanges and valves, equipment, etc.

- **Service Range** (For details, please refer to the diagram on page 10.)
  - **Temperature**: –100 °C ~ 183 °C
  - **Pressure**: Saturated steam, hot water
  - See Page 10
    - Water, salt solutions, weak acid and weak alkali solutions. → Max. 3.0 MPa
    - Oil at 100 °C or lower. → Max. 3.0 MPa
    - Air, exhaust gas, inert gas. → Max. 1.0 MPa

- **Applicable standards**
  - JIS F 0602 HJ, ASTM F104 F712100-B5E12M5
  - JIS F 7102 HJ

- **Availability**

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Width×Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>–</td>
<td>1270×1270 (1S) 1270×3810 (3S)</td>
</tr>
<tr>
<td>–</td>
<td>1270×1270 (1S) 2540×3810 (6S)</td>
</tr>
</tbody>
</table>

**CLINSIL®-Super**

- **Features**: The main components are inorganic fibers to which inorganic filler and aramid fibers are added; oil-resistant synthetic rubber is then added as binder to form green NA (non-asbestos) joint sheets, which contain absolutely no asbestos. This gasket can be used for stainless steel flange since leachable halogens are little.

- **Applications**: Gaskets for various types of piping flanges and valves, equipment, etc.

- **Service Range** (For details, please refer to the diagram on page 10.)
  - **Temperature**: –100 °C ~ 214 °C
  - **Pressure**: Saturated steam, hot water
  - See Page 10
    - Water, salt solutions, weak acid and weak alkali solutions. → Max. 3.0 MPa
    - Oil at 100 °C or lower. → Max. 3.0 MPa
    - Air, exhaust gas, inert gas. → Max. 1.0 MPa

- **Applicable standards**
  - JIS F 0602 HJ, ASTM F104 F712100-B5E12M5
  - JIS F 7102 HJ

- **Availability**

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Width×Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>– 0.5</td>
<td>1270×1270 (1S)</td>
</tr>
<tr>
<td>0.8</td>
<td>1270×1270 (1S) 1270×3810 (3S)</td>
</tr>
<tr>
<td>1.0</td>
<td>1270×1270 (1S) 2540×3810 (6S)</td>
</tr>
<tr>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
</tr>
</tbody>
</table>
### Other Joint Sheets

<table>
<thead>
<tr>
<th>Appearance</th>
<th>TOMBO No.</th>
<th>Product name</th>
<th>Construction and features</th>
<th>Application</th>
<th>Service temperature range (°C)</th>
<th>Applicable standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1938</td>
<td>CLINSIL-UF</td>
<td>Aramid fibers, inorganic fibers, inorganic filler and oil-resistant rubber are mixed uniformly and then compressed and calendered to form NA (non-asbestos) joint sheets with outstanding shear strength and easy cutting feature.</td>
<td>Union joints Fluid: water, hot water, gas</td>
<td>~100 ~ 100</td>
<td>JIS F 0602 HJ ASTM F104 (F712100)</td>
</tr>
<tr>
<td></td>
<td>1991-NF</td>
<td>CLINSIL-NF</td>
<td>NA (non-asbestos) joint sheet for refrigerator. Suitable to use with POE (ester oil) or combination of R134a / POE. Tensile strength and gas sealing performance is almost same as our TOMBO No.1901 and total oxidation from gasket is quite minimum.</td>
<td>Refrigerator compressors and related equipment Fluid: substitute freon, refrigerator oil</td>
<td>~100 ~ 180</td>
<td>JIS F 0602 HJ ASTM F104 (F712100-M7)</td>
</tr>
</tbody>
</table>

### Availability

<table>
<thead>
<tr>
<th>TOMBO No.1938</th>
<th>Thickness</th>
<th>Width X Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>–</td>
<td>1270 X 1270 (15)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOMBO No.1991-NF</th>
<th>Thickness</th>
<th>Width X Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.4</td>
<td>1270 X 1270 (15)</td>
</tr>
<tr>
<td></td>
<td>0.5</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>0.8</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

### Compressed Fiber Joint Sheet Standards and Physical Properties (Test data only)

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Applicable standards</th>
<th>Test data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength</td>
<td>N/mm²</td>
<td>15.7min</td>
</tr>
<tr>
<td>Compressibility</td>
<td>%</td>
<td>12.5</td>
</tr>
<tr>
<td>Recovery</td>
<td>%</td>
<td>45 min</td>
</tr>
<tr>
<td>Flexibility</td>
<td>%</td>
<td>34.3N/rel</td>
</tr>
<tr>
<td>Oil resistance</td>
<td>%</td>
<td>15%</td>
</tr>
<tr>
<td>Steam test</td>
<td>%</td>
<td>50 max</td>
</tr>
<tr>
<td>Ignition loss</td>
<td>%</td>
<td>28 max</td>
</tr>
<tr>
<td>Stress relaxation</td>
<td>%</td>
<td>40 max</td>
</tr>
<tr>
<td>Density</td>
<td>g / cm²</td>
<td>1.7 ~ 2.0</td>
</tr>
</tbody>
</table>

* Test sample thickness: 1.5mm (1.0mm for TOMBO No.1991-NF)

### Recommended Seating Stress of Gasket

<table>
<thead>
<tr>
<th>Thickness (mm)</th>
<th>Gasket factor (m)</th>
<th>Minimum designed seating stress (N/mm²)</th>
<th>Minimum seating stress (N/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8</td>
<td>3.50</td>
<td>44.8</td>
<td>14.7</td>
</tr>
<tr>
<td>1.5</td>
<td>2.75</td>
<td>25.5</td>
<td>14.7</td>
</tr>
<tr>
<td>3.0</td>
<td>2.00</td>
<td>11.0</td>
<td>14.7</td>
</tr>
</tbody>
</table>

*Reference: Asbestos joint sheet (TOMBO No.1100)
Service Range

TOMBO No.1120  CLINSIL®-Top

- Water type fluids
- Oil type fluids
- Gas type fluids

Water type fluids
- Recommended gasket life for steam pipe sealing at 100°C or above is as follows:
  - A: 5 ~ 10 years
  - B: 1 ~ 2 years

Oil type fluids
- Do not use for aromatic-based fluids.

Gas type fluids
- Do not use for toxic gases or combustion promoting gas (oxygen).

TOMBO No.1995  CLINSIL®-Brown

- Water type fluids
- Oil type fluids
- Gas type fluids

Water type fluids
- Recommended gasket life for steam pipe sealing at 100°C or above is as follows:
  - For steam higher than 100°C, hot water, please refer to cautions in page 7.

Oil type fluids
- Do not use for aromatic-based fluids.

Gas type fluids
- Do not use for toxic gases or combustion promoting gas (oxygen).

TOMBO No.1993  CLINSIL®-Super

- Water type fluids
- Oil type fluids
- Gas type fluids

Water type fluids
- Recommended gasket life for steam sealing is as follows:
  - A: 5 ~ 10 years
  - B: 1 ~ 2 years

Oil type fluids
- Do not use for aromatic-based fluids.

Gas type fluids
- Do not use for toxic gases or combustion promoting gas (oxygen).

※ Please consult us for the service other than the above service range.

※ For steam higher than 120°C, hot water, please refer to cautions in page 7.
Cautions

- **Flange Finish**
  The recommended surface roughness of flange is as follows:
  - For liquids: 6.3 μm Ra
  - For gas: 3.2 μm Ra

- **Seating Stress**
  The seating stress should be one the maximum value, as shown below:
  a. Wm1 according to JIS B 8273.
  b. Wm2 according to JIS B 8273.
  c. Minimum seating stress required for sealing liquids.
    - For water, oil: 14.7 N/mm²
    - For gas: 34.3 N/mm²

- **Prevention of Gas Permeability**
  The following are recommendations for gas seals:
  - Apply a thin coat of gasket paste uniformly on the surface and inner diameter.
  - Apply enough seating stress (Please refer above.)
  - Gaskets should be ring-shaped (FR shape) with a thickness of 1.5 mm or less.
  - When an air tight test is required, 2-3 hours after tightening.
  - Non-asbestos joint sheet shall not be used for toxic gas or high vacuum sealing.

- **Joint Sheets for stainless steel flanges**
  TOMBO No.1993, 1995 are recommended for this service since leachable halogens are little.
  Gasket paste is not required generally. However, if paste is used, please consult us.

- **Compressive Stress**
  Over compression leads to damage of gasket and causes failure.
  Maximum recommended compressive stress for joint sheets are as follows:

<table>
<thead>
<tr>
<th>NA joint sheet</th>
<th>Thickness (mm)</th>
<th>Without paste (N/mm²)</th>
<th>With paste (N/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOMBO No.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1120</td>
<td>0.8</td>
<td>294.2</td>
<td>68.6</td>
</tr>
<tr>
<td>1995</td>
<td>1.5</td>
<td>196.1</td>
<td>68.6</td>
</tr>
<tr>
<td>1993</td>
<td>3.0</td>
<td>147.1</td>
<td>68.6</td>
</tr>
</tbody>
</table>

Notes: The NA joint sheets have low strength, so please exercise special caution to avoid uneven tightening.
Do not use solvent-based gasket paste (hermetic SL-1, etc.) on NA joint sheets.

- **Installation**
  Tighten bolts from side to side around the joint in a star like crossing pattern.
  All bolts should be tightened in four to five increments, according proper bolting patterns.
  Immediate tightening can cause leaks and compression damage.

- **Gasket Thickness**
  We recommend the use of gasket thickness as follows:
  Non-Asbestos Joint Sheet 1.5mm

- **Placing orders**
  - Sheets
    Please specify the thickness, width and length.
    Example: 1.5t×1270×1270 or 1.5t×1S.
  - Cut gaskets
    In the case of flanges for JIS or JPI (ANSI) piping, etc., please specify pressure rating (class), nominal diameter, flange type (RF or FF) and gasket thickness.
    Example: JIS 10K×50A, RF, 1.5t, JPI class 150×2B, RF, 1.5t.
    Please provide a drawing for non-standard dimensions.

- **Caution**
  - These joint sheet gaskets contain organic materials; therefore they are not recommended for combustion promoting application gas (oxygen gas).
  - For further details, please refer to the separate handling instructions.