NTN Food Machinery Components

As customer needs for food preparation have become increasingly diverse, demands regarding the taste, price, and variety of food have become more stringent. A wide variety of dedicated food-processing machines have been developed to deal with this trend and to contribute to the design of more advanced food-processing centers.

NTN offers a full line of easy-to-use mechanical components optimized for food processing machinery. Significantly, they incorporate hygienic design to allow for easy washing and effectively prevent bacteria propagation. As well, they are made of safe materials that comply with the USDA (U.S. Department of Agriculture) and other food standards.
Rolling Bearings & Bearing Units
These unique products embody optimal combinations of stainless steel, engineered plastic, and special grease. Ideal for food processing machinery, they take advantage of the basic features of rolling bearings.

Precision Resins (BEAREE products)
This product group covers a wide range of food processing applications. BEAREE products are made from fluorine resin-based super engineered plastic and sliding elastomer. These products are available as plain bearings, seals, and blades.

Parts Feeders
NTN parts feeders ensure hygienic environments while accommodating the essential functions of automatic food processing lines - storage, alignment, and supply.

Constant Velocity Joints
NTN constant velocity joints smoothly transmit revolution and even accommodate large operating angles and offsets across shafts. Moreover, they provide extremely high durability.

Feedscrews
NTN feedscrews efficiently convert rotary motion into linear motion by combining polyimide.
Characteristics of Rolling Bearings for Food Processing Machinery

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Lubricant type</th>
<th>Food-grade solid grease</th>
<th>Food-grade general-purpose grease</th>
<th>General-purpose solid grease</th>
<th>Resin rolling bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible operating temperature (at bearing outer ring)</td>
<td>Symbol</td>
<td>LP06</td>
<td>L596</td>
<td>LP03</td>
<td>—</td>
</tr>
<tr>
<td>—10~100°C (60°C max. for continuous operation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>—20~110°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>—20~80°C (60°C max. for continuous operation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>—20~80°C (60°C max. for continuous operation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable bearing</td>
<td>Standard product SUJ2</td>
<td>Not permissible</td>
<td>Permissible</td>
<td>Permissible</td>
<td>Permissible</td>
</tr>
<tr>
<td>Stainless steel SUS440C</td>
<td>Permissible</td>
<td>Permissible</td>
<td>Permissible</td>
<td>Permissible</td>
<td>PPS or polyimide</td>
</tr>
<tr>
<td>Cost</td>
<td>Short-term</td>
<td>△</td>
<td>○</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Long-term (including maintenance)</td>
<td>○</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td></td>
</tr>
<tr>
<td>Lubricant life</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Oil loss or leakage</td>
<td>○</td>
<td>△</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Bearing torque</td>
<td>Relatively low</td>
<td>Standard</td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Food safety</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>

1. “Spot-pack” prelubrication is provided with bearings with solid grease.
2. Applicable bearing types are deep-groove ball bearings and ball bearings for bearing units.
3. Contact with organic solvent, wash oil or other chemicals can degrade the lubricating performance of solid grease.
3.1 Bearings with solid grease

Solid grease is a unique solid bearing lubricant that essentially comprises lubricating grease and super molecular weight polyethylene. Before being packed into a bearing, it resembles ordinary grease. However, once heated and cooled, it solidifies and takes on a solid resin-like appearance. Spot packing is the standard lubricant prefill system. The cage is provided with grease at several spots.

**a) Bearings with solid grease for general use (P-03)**

- **Features**
  1. More resistant to centrifugal force-induced leakage.
  2. Fouling from grease leaks on or around the bearing is positively prevented.
  3. Water does not emulsify the grease or cause the grease to leak. Thus, the grease has a longer lubricating life.
  4. Unlike ordinary grease, bearings with solid grease exhibits virtually no stirring drag and therefore contributes to lower bearing torque.

- **Permissible operating temperature range and speed**
  Temperature at bearing outer ring:
  Use the bearing in a temperature range of −20°C to 80°C (60°C max. for continuous operation).
  Permissible $dn$ value: 120 000
  \[dn = \text{bearing bore diameter } d (\text{mm}) \times \text{operating speed } n (\text{min}^{-1})\]

- **Applicable bearings**
  Ball bearings for bearing units, with a maximum bore diameter of 140 mm (models UC, UK, AS, CS)
  Grease code: LP03

**b) Bearings with solid grease for food machinery (P-06)**

- **Features**
  In addition to the advantages of the general-use bearings with solid grease (P-03) as mentioned in a) above, bearings with solid grease type P-06 boasts a high degree of safety because its heat-solidifying grease for food machinery is composed of food-grade lubricating grease that complies with the USDA’s H-1 standard (permitting contact with food) and super molecular weight polyethylene approved according to an FDA (US Food and Drug Administration) standard.

- **Permissible operating temperature range and speed**
  Temperature at bearing outer ring:
  Use the bearing in a temperature range of −10 to 100°C (80°C max. for continuous operation).
  Permissible $dn$ value: 100 000
  \[dn = \text{bearing bore diameter } d (\text{mm}) \times \text{operating speed } n (\text{min}^{-1})\]

- **Applicable bearings**
  Ball bearings for stainless steel bearing units, with a maximum bore diameter of 140 mm (all models).
  Grease code: L596

3.2 Prelubricated bearings for food machinery

- **Features**
  This bearing type provides a high degree of safety, as it is filled with lubricating grease compliant with the USDA’s H-1 standard.

- **Permissible operating temperature range**
  −20°C ~ 110°C.
  Note: Heat-resistant bearing can be used up to 140°C.

- **Applicable bearings**
  Ball bearings for stainless steel bearing units, with a maximum bore diameter of 140 mm (all models).
  Grease code: L596

Grease
4.1 Features

**Bearing Units/Stainless Steel Series**

NTN stainless series bearing units comprise a stainless steel ball bearing and a stainless steel bearing housing, which provide much greater corrosion resistance than standard cast iron bearing units.

- **Bearings with solid grease for food machinery**
  
  This ball bearing unit employs food-grade heat-solidifying grease for improved safety and minimum lubricant leakage. This reduces the possibility of environmental contamination. Another hygienic feature of this bearing unit is the smooth cast surface of its housing, which attracts minimal amounts of foreign matter.

- **Prelubricated bearing for food machinery**
  
  Because the ball bearing employs food-grade grease complying with the USDA's H-1 standard (permitting contact with food), this bearing unit features outstanding safety.

- **Bearings with solid grease for general use**
  
  This ball bearing unit employs general-purpose heat-solidifying grease for minimized lubricant leakage. This reduces the possibility of environmental contamination. Another hygienic feature of this bearing unit is the smooth cast surface of its housing, which attracts minimal amounts of foreign matter.
4.2 Materials

<table>
<thead>
<tr>
<th>Parts</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing ring</td>
<td>Martensitic stainless steel (SUS440C or equivalent)</td>
</tr>
<tr>
<td>Rolling element</td>
<td>Martensitic stainless steel (SUS440C)</td>
</tr>
<tr>
<td>Bearing Slinger/cage</td>
<td>Austenitic stainless steel (SUS304)</td>
</tr>
<tr>
<td>Rubber seal</td>
<td>Nitrile rubber</td>
</tr>
<tr>
<td>W-point setscrew</td>
<td>Martensitic stainless steel (SUS410)</td>
</tr>
<tr>
<td>Bearing housing</td>
<td>Austenitic stainless steel (SCS13)</td>
</tr>
</tbody>
</table>

4.3 Lubricants, operating temperature range, and speed

<table>
<thead>
<tr>
<th>Bearing</th>
<th>Lubricant</th>
<th>Permissible operating temperature range (at outer ring)</th>
<th>Permissible speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearings with solid grease for food machinery</td>
<td>Heat-solidifying grease (P-06)</td>
<td>-10°C~+100°C (80°C max. for continuous operation)</td>
<td>Permissible (dn) value : 100 000</td>
</tr>
<tr>
<td>Prelubricated bearing for food machinery</td>
<td>CALTEX FM grease EP2</td>
<td>-20°C~+110°C (60°C max. for continuous operation)</td>
<td>Permissible (dn) value : 120 000</td>
</tr>
<tr>
<td>Bearings with solid grease for general use</td>
<td>Heat-solidifying grease (P-03)</td>
<td>-20°C~+80°C</td>
<td></td>
</tr>
</tbody>
</table>

- **1** Solid lubricant formulated with grease complying with the USDA's H-1 standard and super molecular weight polyethylene approved according to standards of the FDA.
- **2** Grease satisfying the USDA's H-1 standard
- **3** \(dn\)=bearing bore diameter \(d\) (mm) \(\times\) operating speed \(n\) (min\(^{-1}\))

4.4 Corrosion resistance

<table>
<thead>
<tr>
<th>Material</th>
<th>Conditions</th>
<th>In air</th>
<th>In water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ventilated</td>
<td>Humid</td>
</tr>
<tr>
<td>Martensitic stainless steel SUS440C, SUS410</td>
<td>○</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Austenitic stainless steel SUS304, SCS13</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>High carbon chromium bearing steel SUJ2</td>
<td>△</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>Carbon steel/cast iron</td>
<td>▲</td>
<td>△</td>
<td>×</td>
</tr>
</tbody>
</table>

- **1** Not recommended for use in water

4.5 Applicable bearings (unit designations)

<table>
<thead>
<tr>
<th>Bearing</th>
<th>Pillow block bearing units</th>
<th>Rhombic flanged housing bearing units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearings with solid grease for food machinery</td>
<td>F=UCPM204/LP06~F=UCPM210/LP06</td>
<td>F=UCFM204/LP06~F=UCFM210/LP06</td>
</tr>
<tr>
<td>Prelubricated bearing for food machinery</td>
<td>F=UCPM204/L596~F=UCPM210/L596</td>
<td>F=UCFM204/L596~F=UCFM210/L596</td>
</tr>
<tr>
<td>Bearings with solid grease for general use</td>
<td>F=UCPM204/LP03~F=UCPM210/LP03</td>
<td>F=UCFM204/LP03~F=UCFM210/LP03</td>
</tr>
</tbody>
</table>

- **1** For safety reasons, solid lubricants lack anti-rusting agents. Therefore, only bearings made of stainless steel are applicable.

4.6 Applications

- Noodle machine (instant noodles & soups)
- Automated pasta-wrapping line
5.1 Features

NTN plastic series bearing units combine a stainless steel ball bearing and a resin bearing housing. They feature hygienic safety as their bearing housings are free of peeling paint and rusting.

- **Bearings with solid grease for food machinery**
  This ball bearing unit employs food-grade heat-solidifying grease for improved safety and minimum lubricant leakage. This reduces the possibility of environmental contamination. As an added safety feature, the housing does not develop peeling paint or rusting.

- **Prelubricated bearings for food machinery**
  This bearing unit features outstanding safety thanks to the ball bearing's lubrication with food-grade grease, complying with the USDA's H-1 standard.

- **Bearings with solid grease for general use**
  This ball bearing unit employs general-purpose heat-solidifying grease for minimized lubricant leakage. This reduces the possibility of environmental contamination. As an added safety feature, the housing does not develop peeling paint or rusting.
5.2 Materials

<table>
<thead>
<tr>
<th>Parts</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing ring</td>
<td>Martensitic stainless steel (SUS440C or equivalent)</td>
</tr>
<tr>
<td>Rolling element</td>
<td>Martensitic stainless steel (SUS440C)</td>
</tr>
<tr>
<td>Slinger/cage</td>
<td>Austenitic stainless steel (SUS304)</td>
</tr>
<tr>
<td>Rubber seal</td>
<td>Nitrile rubber</td>
</tr>
<tr>
<td>W-point setscrew</td>
<td>Martensitic stainless steel (SUS410)</td>
</tr>
<tr>
<td>Housing proper</td>
<td>Glass fiber-reinforced thermoplastic polyester</td>
</tr>
<tr>
<td>Sleeve for mounting bolt</td>
<td>Austenitic stainless steel (SUS304)</td>
</tr>
<tr>
<td>Mounting nut for grease nipple</td>
<td>Austenitic stainless steel (SUS303)</td>
</tr>
<tr>
<td>Cover</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>Spare plug</td>
<td>Polyethylene</td>
</tr>
</tbody>
</table>

5.3 Lubricants, operating temperature range, and speed

<table>
<thead>
<tr>
<th>Bearing</th>
<th>Lubricant</th>
<th>Permissible operating temperature range (at outer ring)</th>
<th>Permissible speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearings with solid grease for food machinery</td>
<td>Heat-solidifying grease (P-06)</td>
<td>-10°C~+80°C</td>
<td>Permissible (dn) value : 100 000</td>
</tr>
<tr>
<td>Prelubricated bearing for food machinery</td>
<td>CALTEX FM grease EP2</td>
<td>-20°C~+80°C</td>
<td>Permissible (dn) value : 120 000</td>
</tr>
<tr>
<td>Bearings with solid grease for general use</td>
<td>Heat-solidifying grease (P-03)</td>
<td>-20°C~+80°C</td>
<td>60°C max. for continuous operation</td>
</tr>
</tbody>
</table>

1. Solid lubricant formulated with grease complying with the USDA's H-1 standard and super molecular weight polyethylene approved according to standards of the FDA.
2. Grease satisfying the USDA's H-1 standard
3. \(dn\)=bearing bore diameter \(d\) (mm) \(\times\) operating speed \(n\) (min\(^{-1}\))

5.4 Corrosion resistance

<table>
<thead>
<tr>
<th>Material</th>
<th>Conditions</th>
<th>In air</th>
<th>In water</th>
<th>In acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martensitic stainless steel</td>
<td>Ventilated</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Austenitic stainless steel</td>
<td>Humid</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Thermoplastic polyester resin</td>
<td></td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Polypropylene/polyethylene</td>
<td></td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>High carbon chromium bearing steel</td>
<td></td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Carbon steel/cast iron</td>
<td></td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
</tbody>
</table>

\(\bigtriangleup\) Excellent  \(\O\) Good  \(\bigtriangledown\) Fair  \(\blacktriangleleft\) Poor  \(\times\) Unacceptable

5.5 Applicable bearings (unit designations)

<table>
<thead>
<tr>
<th>Bearing</th>
<th>Pillow block bearing units</th>
<th>Rhombic flanged housing bearing units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearings with solid grease for food machinery</td>
<td>F=UCPR204／L96～F=UCPR208／L96</td>
<td>F=UCFLR204／L96～F=UCFLR208／L96</td>
</tr>
<tr>
<td>Prelubricated bearing for food machinery</td>
<td>F=UCPR204／L96～F=UCPR208／L96</td>
<td>F=UCFLR204／L96～F=UCFLR208／L96</td>
</tr>
<tr>
<td>Bearings with solid grease for general use</td>
<td>F=UCPR204／L96～F=UCPR208／L96</td>
<td>F=UCFLR204／L96～F=UCFLR208／L96</td>
</tr>
</tbody>
</table>

5.6 Applications

Automatic packing machine for Japanese-style fish cake

Automatic onion skinning machine
Triple-sealed bearings with secure dustproofing / waterproofing
Provides a longer service life even when exposed to heavy airborne dust and splashing water.

6.1 Features

- **Better dustproofing and waterproofing ensures longer bearing life.**
  The triple-sealed bearing is provided with a triple-lipped bearing seal. The special seal offers reliable dustproofing and waterproofing superior to those of standard bearings for bearing units. It therefore ensures longer service life even under conditions of heavy airborne dust and dirty splashing water.

- **Reduces maintenance cost.**
  With a longer bearing life than ordinary bearings used in unit configurations, these bearings have longer maintenance intervals, greatly reduced maintenance costs (for inspection, relubrication, replacement, etc.), and increased productivity of machines.

- **Decreases price of bearing unit and allows for much more compact machinery.**
  Under certain operating conditions, the triple-sealed bearing unit can replace conventional covered bearing units, greatly decreasing the cost of bearing units. Furthermore, if the cover is not needed, machinery can be made much more compact.

- **Balled setscrew ensures secure fastening**
  The triple-sealed bearing is mounted on the shaft with NTN's unique balled setscrew, which has an embedded ball in its tip. This setscrew boasts much greater resistance to loosening than serrated or cup-point setscrews, and does not readily loosen due to vibration or impact.

- **Interchangeability**
  The triple-sealed bearing unit conforms to the JIS standard for UC-type bearings. It can be readily used as a relubricable bearing, and can replace NTN's conventional bearing unit and other manufacturers' products. It can therefore easily be used to replace existing bearing units during machinery maintenance.

6.2 Construction

- **Triple-sealed bearing**
  The triple-sealed bearing is provided with a triple-lipped bearing seal. The special seal offers reliable dustproofing and waterproofing superior to those of standard bearings for bearing units. It therefore ensures longer service life even under conditions of heavy airborne dust and dirty splashing water.

  - **Double-set screw**
    Easily secures the bearing to the shaft. Does not readily loosen.

  - **Triple seal**
    Made of galvanized steel plate for better corrosion resistance. This shape has been optimized for better pressure resistance.

  - **Three lips**
    Securely prevents ingress of dust and dirty water, and boasts excellent dustproofing and waterproofing.

  - **Sealing device**
    The rubber seal extends to the vicinity of outer circumference of the mandrel for better sealing performance, and securely prevents contamination by dust or dirty water.

6.3 Permissible operating temperature range and speed

Use the triple-sealed bearing within the temperature range of −15 to 100°C. Permissible \( \text{dn} \) value: 36 000

\[ \text{Permissible } \text{dn} = \text{bearing bore diameter } d \ (\text{mm}) \times \text{operating speed } n \ (\text{min}^{-1}) \]

6.4 Applicable bearings

Ball bearings for bearing units, with a maximum bore diameter of 90 mm. 
UC201D1LLJ–UC218D1LLJ

6.5 Typical applications

Triple-sealed bearing units are suitable for machines used in locations subjected to splashing water and heavy dust, such as bread-making/confectionery machines, noodle-making machines, fish-processing machines, flour mills, rice/barley pearling mills, beverage processing machines, brewing machines, and bottle-making machines.

6.6 Special specification bearing units

The standard products of this series are prelubricated with lithium mineral grease. Contact NTN Engineering for information on optional bearings, such as those containing Polylube (heat-solidifying grease) or food-grade grease, and stainless steel bearings.
7.1 Features

Standard bearings cannot be used in environments where they will be exposed to water or liquid chemicals. In contrast, NTN resin rolling bearings can operate without relubrication, at a lower torque in such environments because their inner and outer rings, balls, and cage are made of unique corrosion-proof self-lubricating materials.

Note, however, these bearings must be used at a lower load rating and limiting speed because their inner and outer rings are made of resin.

7.2 Materials

<table>
<thead>
<tr>
<th>Parts</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner/outer rings</td>
<td>BEAREE AS5701 (PPS-base), or BEAREE PI 9001 (polyimide-base)</td>
</tr>
<tr>
<td>Balls</td>
<td>Glass or ceramic</td>
</tr>
<tr>
<td>Cage</td>
<td>Glass fiber reinforced nylon 66 or BEAREE FL3700</td>
</tr>
</tbody>
</table>

7.3 Bearing number and bearing table

Inner/outer ring: BEAREE AS5701, Cage: Glass fiber reinforced nylon

<table>
<thead>
<tr>
<th>Bearing</th>
<th>Basic load rating (approx.)</th>
<th>Boundary dimensions mm</th>
<th>Mass (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
<tr>
<td>6000</td>
<td>3</td>
<td>10</td>
<td>26</td>
</tr>
<tr>
<td>6001</td>
<td>3</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td>6002</td>
<td>3</td>
<td>15</td>
<td>32</td>
</tr>
<tr>
<td>6003</td>
<td>5</td>
<td>17</td>
<td>35</td>
</tr>
<tr>
<td>6004</td>
<td>6</td>
<td>20</td>
<td>42</td>
</tr>
<tr>
<td>6200</td>
<td>4</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>6201</td>
<td>5</td>
<td>12</td>
<td>32</td>
</tr>
<tr>
<td>6202</td>
<td>6</td>
<td>15</td>
<td>35</td>
</tr>
<tr>
<td>6203</td>
<td>8</td>
<td>17</td>
<td>40</td>
</tr>
<tr>
<td>6204</td>
<td>10</td>
<td>20</td>
<td>47</td>
</tr>
</tbody>
</table>

Radial internal clearance(mm) : 0.05~0.20

* The dimensional and running accuracy differ from that of standard bearings

7.4 Operation

7.5 Typical applications

- **Photographic film developing machine (Types #6202 and 6203)**
  Operating conditions: Radial load: max. 0.95 kgf
  Speed: 1000 min⁻¹
  Environment: Developer solution of pH 0.9 to 12

- **Aluminum foil forming line (Types UC205 and 206)**
  Operating conditions: Radial load: 13 ~ 15 kgf
  Speed: 1 min⁻¹
  Environment: Acidic or water vapor

- **Magneto-optical disk sputtering machine (dia. 20×dia. 25×4 mm)**
  Operating conditions: Radial load: 1.0 kgf
  Speed: 120 min⁻¹
  Environment: Vacuum

- **Hard disk washing machine**
  Operating conditions: Radial load: 2.0 kgf
  Limiting speed: 400 min⁻¹
  Environment: Pure water

Aromatic thermosetting resin rolling bearings
BEAREE Products Meet Diverse Needs in the Food Machinery Industry.

1. BEAREE satisfies the specification test for synthetic resin utensils, containers, and packaging materials by Japan Food Research Laboratories.
2. It is available in the hygienic colors of white or pale yellow.

### BEAREE FL3642 (Fluororesin Series)

#### 1.1 Features
1. Excellent friction/wear characteristics when not lubricated or when operating in liquid.
2. Higher permissible PV value. Maximum permissible operating temperature is 260°C.
3. Good compatibility with mild steel or stainless steel.
4. Least affected by acid, base, or solvent.

#### 1.2 Sliding characteristics
- Comparison of wear characteristics with various BEAREE products
  Wear characteristics of FL3642, either in a dry state or with water lubrication, are compared with those of other BEAREE materials.
  - Test conditions: Thrust tester
    - Bearing pressure: 0.98 MPa
    - Peripheral speed: 32 m/min
    - Mating material: SUS304
    - Lubrication: Dry or water
    - Test duration: 50 hrs.

#### Time-dependent change in dynamic friction coefficient
The graphical plot below represents the time-dependent change in the dynamic friction coefficient under the above-mentioned test conditions, either in dry state or with water lubrication.

### Products for food machinery
Other BEAREE materials also satisfy the above specification test, and are used according to the intended applications.

#### Typical BEAREE materials that satisfy the specification test for synthetic resin containers and packaging materials

<table>
<thead>
<tr>
<th>Material description</th>
<th>Color</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEAREE FL 3040</td>
<td>Black</td>
<td>Bearing for soft mating materials</td>
</tr>
<tr>
<td>BEAREE FL 3700</td>
<td>Black</td>
<td>Bearing for underwater applications</td>
</tr>
<tr>
<td>BEAREE AS 5000</td>
<td>Light brown</td>
<td>General-purpose</td>
</tr>
</tbody>
</table>
BEAREE ER3600 〈Sliding Fluororubber〉

3.1 Features
1. Its elasticity ensures an excellent seal.
2. Better friction/wear characteristics than general-purpose fluororubber
3. Maximum continuous operating temperature of 230˚C
4. Good compatibility with soft mating materials

3.2 Characteristics of BEAREE ER as a sliding material

3.3 $PV$ value and relative wear

BEAREE UH3000 〈Base Resin PE〉

4.1 Features
1. Excellent friction/wear characteristics at lower $PV$ value
2. Excellent impact resistance
3. Very economical

Note: NTN also supplies BEAREE UH300 in rod and pipe forms.

4.2 Typical characteristic values

<table>
<thead>
<tr>
<th>Specific gravity</th>
<th>Compression creep %</th>
<th>Hardness</th>
<th>Tensile strength MPa</th>
<th>Tensile strength kgf/cm²</th>
<th>Elongation %</th>
<th>Young's modulus in flexure MPa</th>
<th>Young's modulus in flexure kgf/cm²</th>
<th>Water absorption %</th>
<th>Coefficient of linear expansion x 10⁻⁵/˚C</th>
<th>Max. permissible operating temp. ˚C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.94</td>
<td>11.0</td>
<td>65</td>
<td>20</td>
<td>200</td>
<td>200</td>
<td>20</td>
<td>200</td>
<td>610</td>
<td>6100</td>
<td>0.01</td>
</tr>
</tbody>
</table>

1 Hardness: Durometer
2 Coefficient of linear expansion: Average coefficient in the range from room temperature to 80˚C.
Parts feeders are generally used for the following:

- **Storage**
- **Alignment**
- **Supply**

The most important task is alignment. Alignment techniques include the attachment alignment system (the most common method) and the use of sensors or image processing systems.

With the attachment alignment system, variously configured lanes and mechanical arrangements are provided in and around the bowl to align the work pieces.

An automatic food processing line can run stably and reliably with a combination of NTN’s unique parts feeder and an alignment system optimized for each type of work piece.
Storage
A specific quantity of work pieces is stored in random orientation.

Supply
Work pieces arranged in a common orientation are delivered to a downstream process.

Alignment
Work pieces in random orientations and traveling upward on a track on a bowl are arranged into a common orientation.
NTN parts feeders can feed work pieces of various forms and textures, including candy, ice cream, biscuits, dried noodles, and powders.

### Typical Parts Feeder Applications

- Lifting
- Combining
- Separation

- Individual work pieces are separated from a queue by a cylinder.
- Work pieces of different forms, each supplied separately, are mechanically mated.
- Work pieces are lifted, with their hole used as a guide.

### Escapement

- **Separation**
  - Individual work pieces are separated from a queue by a cylinder.
- **Combining**
  - Work pieces of different forms, each supplied separately, are mechanically mated.
- **Lifting**
  - Work pieces are lifted, with their hole used as a guide.

### Bowl One-touch Clamp

5.1 **Features**

The bowl can be attached or detached quickly and easily.

5.2 **Applications**

- When the bowl must be sterilized or washed at regular intervals, for example, on food-processing or medicine-packing lines.
- When the bowl must be replaced frequently to accommodate small-lot, multiple-product manufacturing. (The one-touch clamp feature is most useful when combined with a computerized variable frequency controller.)
Parts Feeder Applications

- Work piece: Biscuits
- Work piece: Rice cakes
- Work piece: Ice cream (chocolate coating)
- Work piece: Caramels
- Work piece: Candy
## 1.1 Features

- **Smooth operation**
  The constant velocity mechanism ensures smooth and quiet rotation.

- **Secure sealing**
  The grease is fully contained within a boot, ensuring a clean and hygienic environment.

- **Requires no relubrication for a prolonged period.**
  The boot provides a reliable seal that prevents grease leakage and water ingress, ensuring a long period of relubrication-free operation.

- **Wide range of variants**
  We offer a wide range of constant velocity joints of various types and sizes. Choose the optimal joint design or configuration to meet the intended application and operating conditions.

## 1.2 Types and features of constant velocity joint

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Joint number</th>
<th>Max. permissible operating angle</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed type</strong></td>
<td>Cup type</td>
<td>BJ75C ~ BJ225C</td>
<td>25˚</td>
<td>Greater permissible operating angle</td>
</tr>
<tr>
<td></td>
<td>Drum type</td>
<td>BJ75M ~ BJ125M</td>
<td></td>
<td>Outstanding sealing performance</td>
</tr>
<tr>
<td><strong>Sliding type</strong></td>
<td>DOJ flanged type</td>
<td>DOJ 68F ~ DOJ200F</td>
<td>20˚ - 20˚</td>
<td>Expansion is possible within the joint.</td>
</tr>
<tr>
<td></td>
<td>TBJ flanged type</td>
<td>TBJ8SF ~ TBJ60SF</td>
<td>16˚ - 18˚</td>
<td>Low sliding resistance (expanding resistance)</td>
</tr>
<tr>
<td></td>
<td>TBJ bossed type</td>
<td>TBJ8SB ~ TBJ60SB</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Coupling type</strong></td>
<td>BC series</td>
<td>BC68 ~ BC200</td>
<td>5˚</td>
<td>No alignment work is needed.</td>
</tr>
<tr>
<td></td>
<td>TBJ DF series</td>
<td>TBJ8DF ~ TBJ60DF</td>
<td>8˚</td>
<td>Easy mounting.</td>
</tr>
<tr>
<td></td>
<td>TBJ DB series</td>
<td>TBJ8DB ~ TBJ60DB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. The maximum permissible operating angle is limited by the boot, as well as the number of revolutions and operating conditions of the joint assembly.
2. We can manufacture larger joints upon customer request. For details, contact NTN Engineering.
1.3 Type selection flowchart

- Operating conditions
  - Is operating angle within 5°?
    - NO
    - Used at fixed site?
      - NO
        - Inline motion?
          - NO
            - Detrimental atmosphere (splashing water vapor, dust, etc.)?
              - YES
                - Is operating angle 14° to 18° or greater?
                  - YES
                    - Contact NTN Engineering.
                  - NO
                    - Used at fixed site?
                      - NO
                        - Inline motion?
                          - NO
                            - Coupling type
                              - [BC series]
                              - [TBJ series]
                            - Sliding type
                              - [Type DOJ] [TBJ series]
                            - Fixed type
                              - [Cup Type] [Drum Type]
                      - YES
                        - Coupling type
                          - BJ (Ball fixed joint)
                          - DOJ (Double offset joint)
                          - BC coupling
                          - TBJ (Tri-ball joint)

1.4 Typical applications

- Canning lines for fish, meat, fruit, beverages, food and delicacies.
- Bottling lines for beverages, liquid seasonings, etc.
- Packing lines for instant foods/retort-packaged foods.
- Rotary drives in bottle-washing machines, labelers, kneading machines, etc.

Note:
The constant velocity joint is a rotating mechanism. Before using it in an environment requiring protection from contamination by foreign matter, cover the joint to prevent it from emitting any foreign matter.

Remarks:
The above flowchart should be used for joint selection. However, a different selection process may be required for applications with non-standard operating conditions. In such a case, contact NTN Engineering for technical assistance.
1.1 Features
1. Accommodates a variety of environments.
   - Lubrication-free, corrosion-resistant, and heat-resistant
2. Lower noise than ball screw configurations.
3. The low-friction resin nut ensures higher screw efficiency.
4. NTN will machine the shaft end to customer specifications.

1.2 Specifications
- Type: Single-flanged single nut
- Material/resin nut: AS 5000
- Threaded shaft: SUS304

1.3 Bearing numbers and bearing table

<table>
<thead>
<tr>
<th>Bearing number</th>
<th>Threaded shaft</th>
<th>Resin nut</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nominal dia. d</td>
<td>Nominal lead</td>
</tr>
<tr>
<td>R-MSS0401Y</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>R-MSS0402Y</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>R-MSS0601Y</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>R-MSS0602Y</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>R-MSS0801Y</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>R-MSS0802Y</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>R-MSS1002Y</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>R-MSS1015Y</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>R-MSS1030Y</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>R-MSS1202Y</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>R-MSS1215Y</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>R-MSS1236Y</td>
<td>33</td>
<td>2</td>
</tr>
</tbody>
</table>

NTN miniature resin slide screws incorporate both BEAREE AS5000 nuts, which feature excellent friction/wear characteristics, and stainless steel threaded shafts.