Rolling Bearings & Bearing Units

1 Characteristics of Rolling Bearings for Food Processing Machinery

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

❶ "Spot-pack" prelubrication is provided with bearings with solid grease.
❷ Applicable bearing types are deep-groove ball bearings and ball bearings for bearing units.
❸ Contact with organic solvent, wash oil or other chemicals can degrade the lubricating performance of solid grease.

◎Excellent ○Good △Fair ×Poor

2 Selecting Bearing Units/Food Machinery Bearing Housings

Bearing housing specifications	Corrosion resistance	Food safety	Cost	
			Short-term	Long-term
Standard painted type	×	×	◎	×
Resin (plastic)	◎	◎	△	○
Stainless steel	◎	◎	×	◎

◎Excellent ○Good △Fair ×Poor

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)

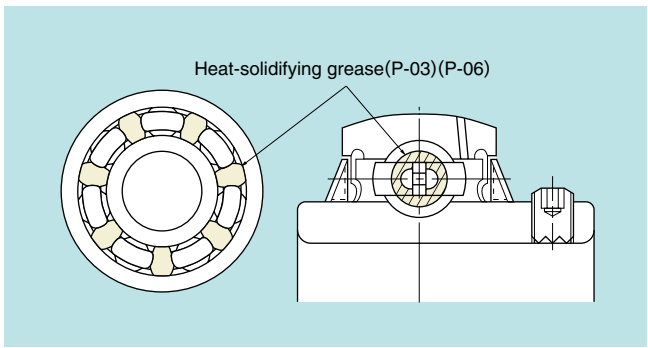
- **Features**
  (1) More resistant to centrifugal force-induced leakage.
  (2) Fouling from grease leaks on or around the bearing is positively prevented.
  (3) Water does not emulsify the grease or cause the grease to leak. Thus, the grease has a longer lubricating life.
  (4) Unlike ordinary grease, 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=bearing bore diameter d(mm)×operating speed n(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=bearing bore diameter d(mm)×operating speed n(min^{-1}))]
- **Applicable bearings**
  Ball bearings for stainless steel bearing units, with a maximum bore diameter of 50 mm (model UC)
  Grease code: LP06

Bearings with solid grease for food machinery

Prelubricated bearing for food machinery



Stainless steel bearings with solid grease

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

Bearings with solid grease for food machinery/prelubricated bearing for food machinery/ bearings with solid grease for general use

4.1 Features

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

Parts		Materials
Bearing	Bearing ring	Martensitic stainless steel (SUS440C or equivalent)
	Rolling element	Martensitic stainless steel (SUS440C)
	Slinger/cage	Austenitic stainless steel (SUS304)
	Rubber seal	Nitrile rubber
	W-point setscrew	Martensitic stainless steel (SUS410)
Bearing housing		Austenitic stainless steel (SCS13)

4.3 Lubricants, operating temperature range, and speed

Bearing	Lubricant	Permissible operating temperature range (at outer ring)	Permissible speed
Bearings with solid grease for food machinery	Heat-solidifying grease (P-06) ❶	−10˚C～+100˚C (80˚C max. for continuous operation)	Permissible dn value : 100 000 ❸
Prelubricated bearing for food machinery	CALTEX FM grease EP2 ❷	−20˚C～+110˚C	Permissible dn value : 120 000 ❸
Bearings with solid grease for general use	Heat-solidifying grease (P-03)	−20˚C～+ 80˚C (60˚C max. for continuous operation)	

❶ 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.
❷ Grease satisfying the USDA's H-1 standard
❸ dn=bearing bore diameter d (mm) × operating speed n (min^{-1})

4.4 Corrosion resistance

Material \ Conditions	In air		※ In water		In acid	
	Ventilated	Humid	Natural water	Seawater	Nitric acid	Hydrochloric acid
Martensitic stainless steel SUS440C, SUS410	○	△	△	▲	▲	×
Austenitic stainless steel SUS304, SCS13	◎	◎	◎	○	◎	△
High carbon chromium bearing steel SUJ2	△	▲	▲	×	×	×
Carbon steel/cast iron	▲	×	×	×	×	×

※ Not recommended for use in water

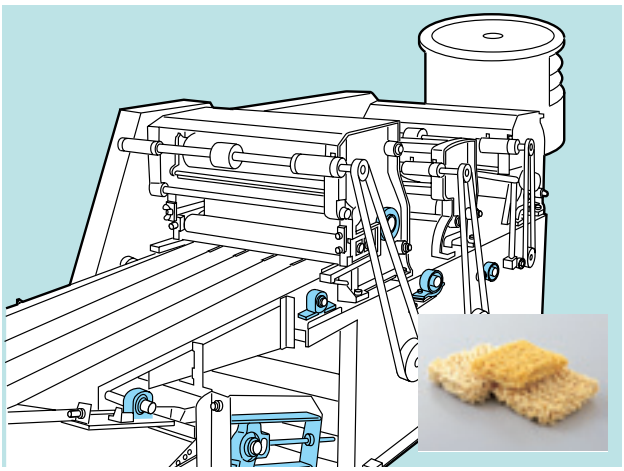
◎Excellent ○Good △Fair ▲Poor ×Unacceptable

4.5 Applicable bearings (unit designations)

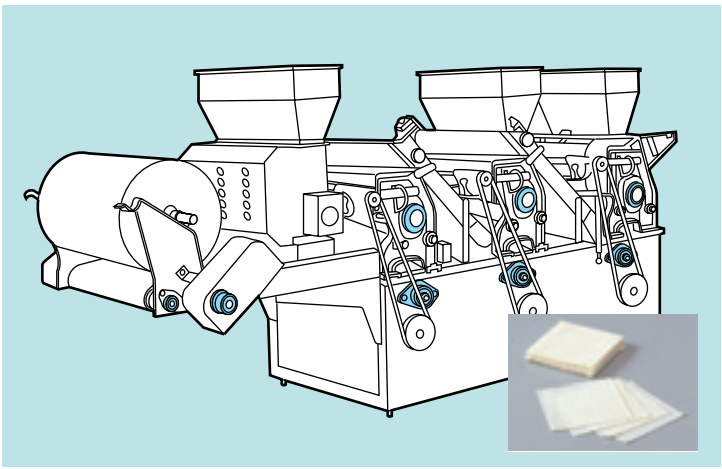
Bearing	Pillow block bearing units	Rhombic flanged housing bearing units
Bearings with solid grease for food machinery ❶	F−UCPM204／LP06～F−UCPM210／LP06	F−UCFM204／LP06～F−UCFM210／LP06
Prelubricated bearing for food machinery	F−UCPM204／L596～F−UCPM210／L596	F−UCFM204／L596～F−UCFM210／L596
Bearings with solid grease for general use	F−UCPM204／LP03～F−UCPM210／LP03	F−UCFM204／LP03～F−UCFM210／LP03

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

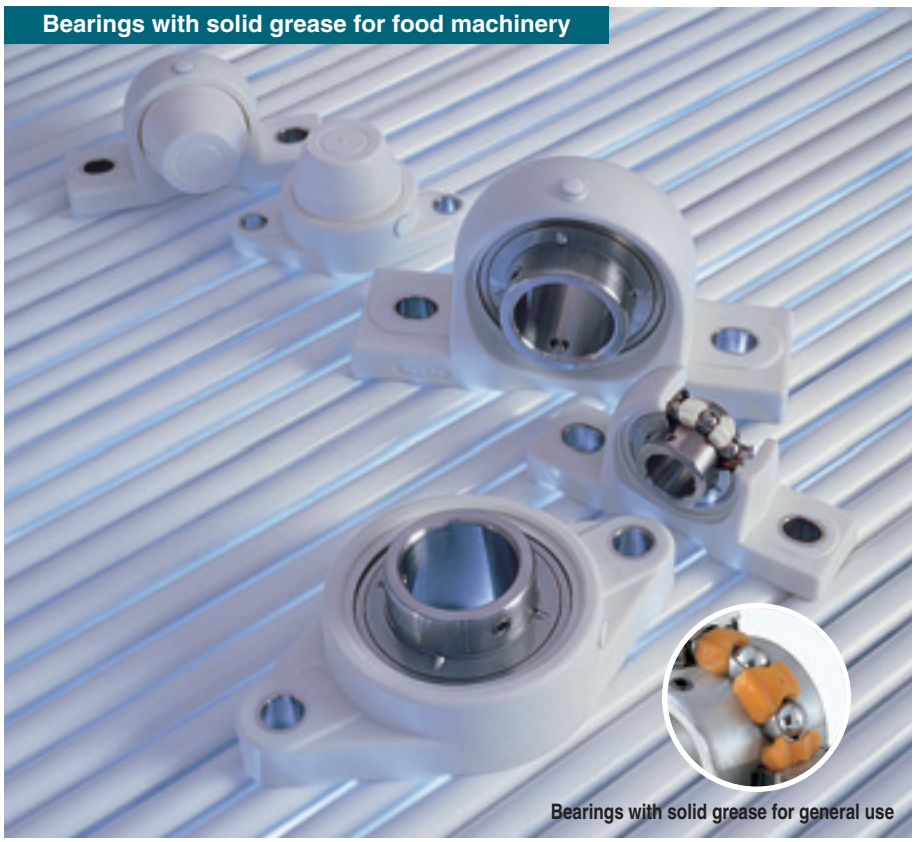
4.6 Applications



Noodle machine (instant noodles & soups)



Automated pasta-wrapping line



Bearings with solid grese for food machinery/prelubricated bearings for food machinery/ bearings with solid grease for general use

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

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

5.3 Lubricants, operating temperature range, and speed

Bearing	Lubricant	Permissible operating temperature range (at outer ring)	Permissible speed
Bearings with solid grease for food machinery	Heat-solidifying grease (P-06)❶	−10˚C～+ 80˚C	Permissible dn value：100 000❸
Prelubricated bearing for food machinery	CALTEX FM grease EP2❷	−20˚C～+ 80˚C	Permissible dn value：120 000❸
Bearings with solid grease for general use	Heat-solidifying grease (P-03)	−20˚C～+ 80˚C (60˚C max. for continuous operation)	

❶ 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.
❷ Grease satisfying the USDA's H-1 standard
❸ dn=bearing bore diameter d (mm) × operating speed n (min^{-1})

5.4 Corrosion resistance

Material \ Conditions	In air		※ In water		In acid	
	Ventilated	Humid	Natural water	Seawater	Nitric acid	Hydrochloric acid
Martensitic stainless steel SUS440C, SUS410	○	△	△	▲	▲	×
Austenitic stainless steel SUS303, SUS304	◎	◎	◎	○	◎	△
Thermoplastic polyester resin	◎	◎	◎	◎	▲	○
Polypropylene/polyethylene	◎	◎	◎	◎	○	○
High carbon chromium bearing steel SUJ2	△	▲	▲	×	×	×
Carbon steel/cast iron	▲	×	×	×	×	×

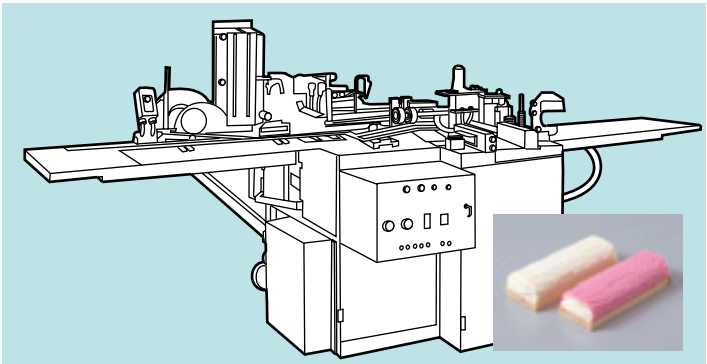
※ Not recommended for use in water

◎Excellent ○Good △Fair ▲Poor ×Unacceptable

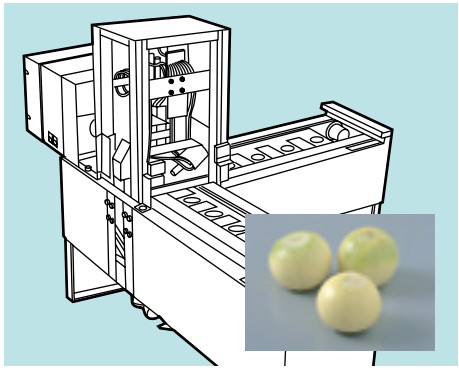
5.5 Applicable bearings (unit designations)

Bearing	Pillow block bearing units	Rhombic flanged housing bearing units
Bearings with solid grease for food machinery	F−UCPR204／LP06～F−UCPR208／LP06	F−UCFLR204／LP06～F−UCFLR208／LP06
Prelubricated bearing for food machinery	F−UCPR204／L596～F−UCPR208／L596	F−UCFLR204／L596～F−UCFLR208／L596
Bearings with solid grease for general use	F−UCPR204／LP03～F−UCPR208／LP03	F−UCFLR204／LP03～F−UCFLR208／LP03

5.6 Applications



Automatic packing machine for Japanese-style fish cake



Automatic onion skinning machine

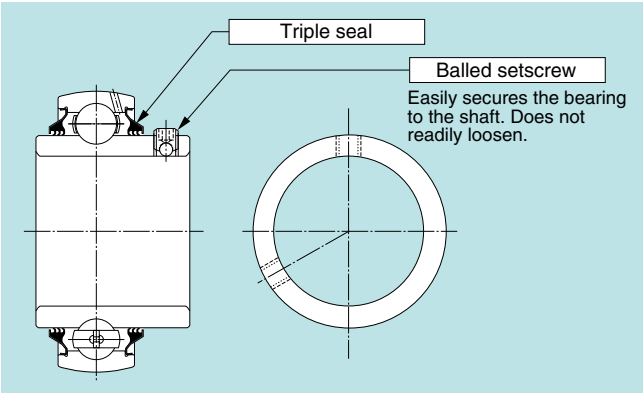
Triple-sealed bearings with secure dustproofing / waterproofing

Provides a longer service life even when exposed to heavy airborne dust and splashing water.

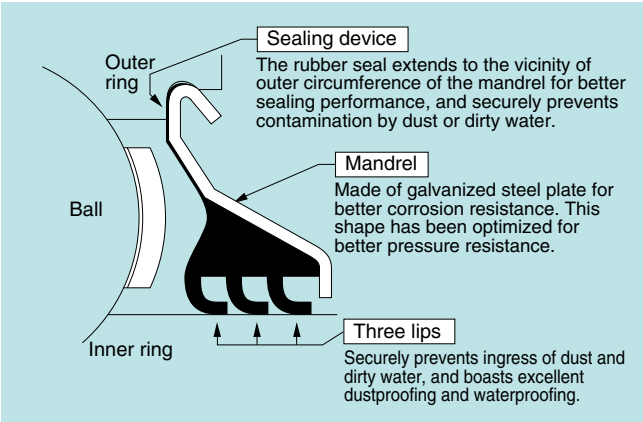
6.1 Features

- **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



Triple-seal

6.3 Permissible operating temperature range and speed

Use the triple-sealed bearing within the temperature range of −15 to 100˚C.

Permissible dn value: 36 000

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

6.4 Applicable bearings

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

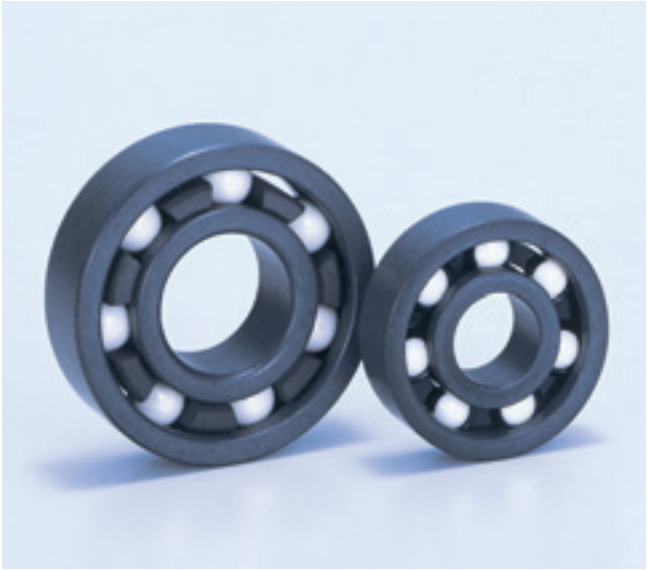
UC201D1LLJ～UC218D1LLJ

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

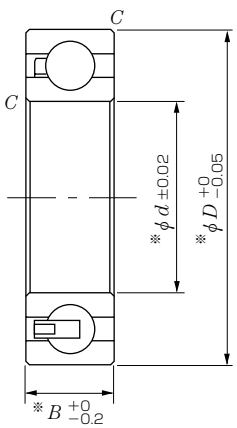
Standard bearings cannot be used in environments where they will be exposed to water or liquid chemicals. In contrast, **NTN** resin rolling bearings can operate without relubrication, at a lower torque in such environments because their inner and outer rings, balls, and cage are made of unique corrosion-proof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

Parts	Materials
Inner/outer rings	BEAREE AS5701 (PPS-base), or BEAREE PI 5001 (polyimide-base)
Balls	Glass or ceramic
Cage	Glass fiber reinforced nylon 66 or BEAREE FL3700

7.3 Bearing number and bearing table

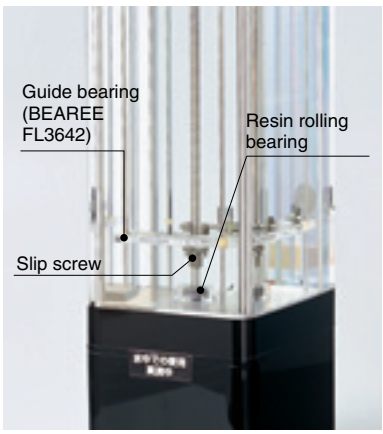


Inner/outer ring: BEAREE AS5701,
Cage: Glass fiber reinforced nylon

Bearing	Basic load rating (approx.)	Boundary dimensions mm				Mass g (approx.)
		d	*D*	*B*	*C*	
6000	3	10	26	8	0.3	5
6001	3	12	28	8	0.3	6
6002	3	15	32	9	0.3	8
6003	5	17	35	10	0.3	10
6004	6	20	42	12	0.6	17
6200	4	10	30	9	0.3	8
6201	5	12	32	10	0.6	10
6202	6	15	35	11	1.0	12
6203	8	17	40	12	1.0	17
6204	10	20	47	14	1.0	28

Radial internal clearance(mm) : 0.05～0.20
※ The dimensional and running accuracy differ from that of standard bearings

7.4 Operation



Bearing operation in water

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