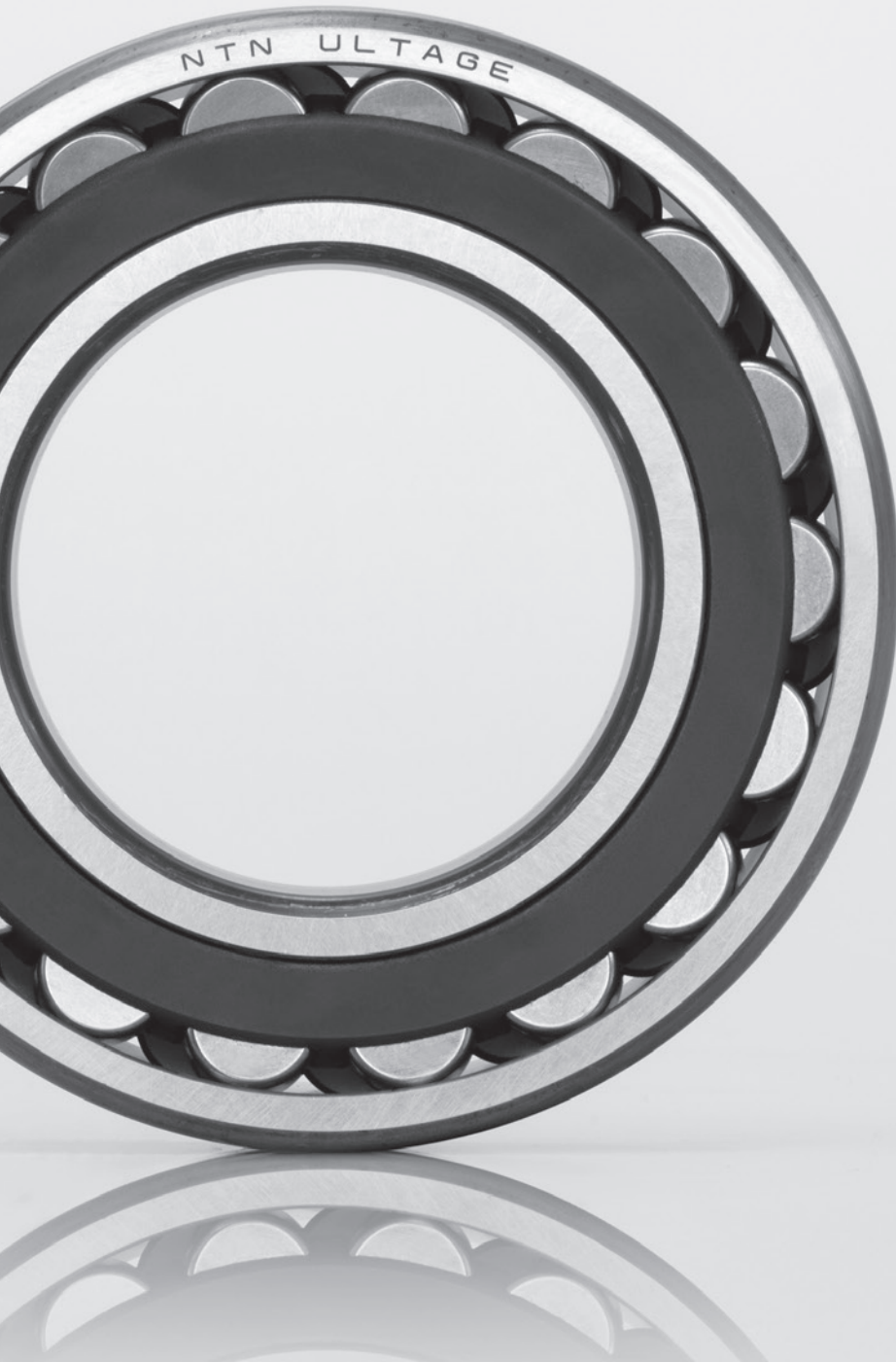


NTN New Generation Bearings (ULTAGE™ series)



Introduction of ULTAGE™ series

“ULTAGE” (a name created from the combination of “ultimate,” signifying refinement, and “stage,” signifying **NTN**'s intention that this series of products be employed in diverse applications) is the general name for **NTN**'s new generation of rolling bearings that are noted for their industry-leading performance. **NTN** is developing and expanding the ULTAGE series of each bearing type. Please see the introductory article on the following pages. The corresponding dimensions are specified in the dimension tables of each bearing type.

For details, see the following **NTN** catalogs.

- ULTAGE series cylindrical roller bearings CAT.No.3037/E
- ULTAGE series large size tapered roller bearings [Metric] CAT.No.3035/E
- ULTAGE series spherical roller bearings [Type EA, Type EM] CAT.No.3033/E

The following ULTAGE series bearings for special applications are also available.

For further details, please refer to the section of “C. Special Application Bearings.”

- ULTAGE series sealed four-row tapered roller bearings for rolling mill roll necks [CROU-LL type]
- ULTAGE series sealed spherical roller bearings [WA type]
- ULTAGE series spherical roller bearings with high-strength cage [EMA type]
- ULTAGE series deep groove ball bearings for high-speed servo motors [MA type]
- ULTAGE series precision rolling bearings for machine tools

Cylindrical roller bearings [ULTAGE™ series]

ULTAGE series cylindrical roller bearings are the products developed to meet the demands of "long operating life," "improved load capability," and "higher speed" that are required for various industrial machinery.

High reliability

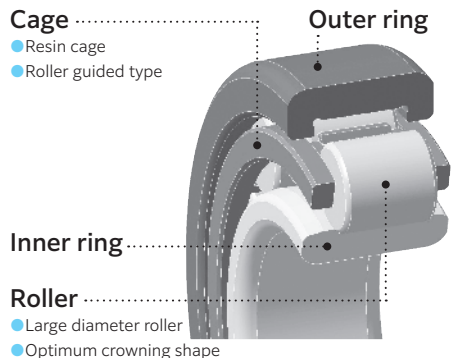
- Higher load capacity through optimization of internal specifications
- Extended maintenance intervals

Improved load capacity

- Allowable misalignment 1/500 (mm/mm)
- * Under the condition of $F_r \leq 0.20C_r$
- F_r : Radial load

Higher speed

- The allowable speed is improved by up to 20% through optimization of internal specifications
- * During oil lubrication



Features

- 1. Industry leading load rating**
Higher load capacity and longer operating life have been realized through the optimization of internal specifications.
 - (1) **Rating life: Up to 1.2 times longer** (compared with NTN E type product)
 - (2) **Basic dynamic load rating: Up to 7% higher** (compared with NTN E type product)
- 2. Allowable misalignment (see Fig. 1)**
Allowable misalignment: 1/500 (mm/mm)
Optimization of the roller crowning allows a combination of heavy loads ($0.20C_r$) and allowable misalignment of 1/500 (mm/mm).
* Necessary minimum load: $0.04C_{0r}$
- 3. Allowable speed**
The allowable speed is increased up to 20% in oil lubrication (compared with NTN E type product).

- 4. Standard resin cage (see Fig. 2)**
 - (1) Standard use of integrated resin cage results in higher limiting speed and longer life of grease.
 - (2) Resin cage material: polyamide reinforced with glass fiber.

* When machined cages are necessary for high speed and other special applications, consult NTN Engineering.
- 5. Interchangeability**
The boundary dimensions conform to ISO 15, JIS B 1533, and DIN 5412 and are the same as that of the NTN E type products.
- 6. Allowable axial load**
Same as NTN E type product
- 7. Allowable temperature**
Allowable bearing operating temperature: 120 °C (instantaneous), 100 °C (continuous)

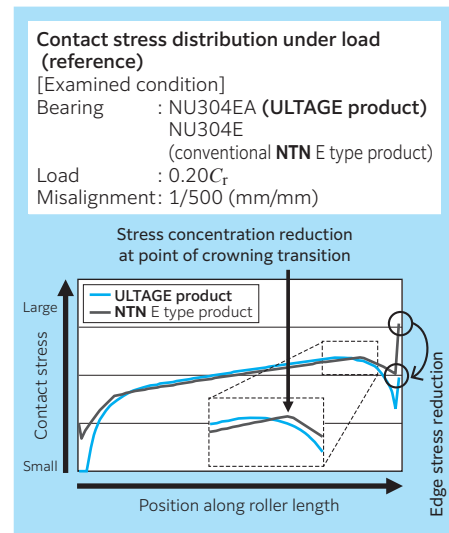


Fig. 1

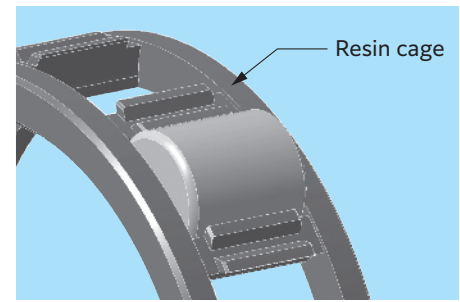


Fig. 2

Bearing number

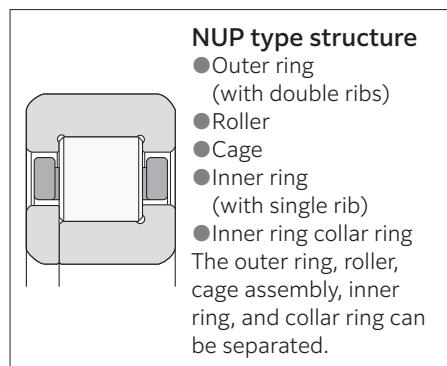
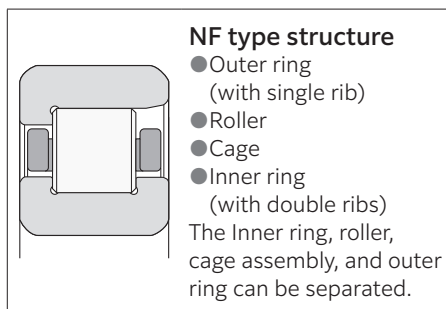
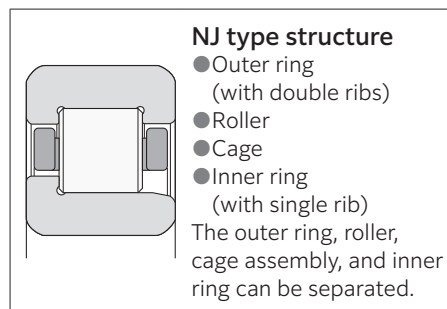
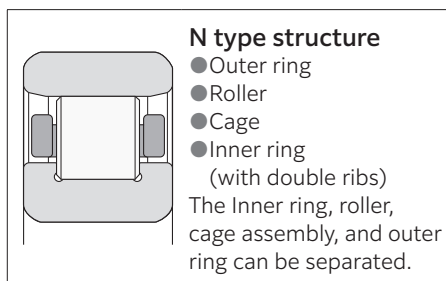
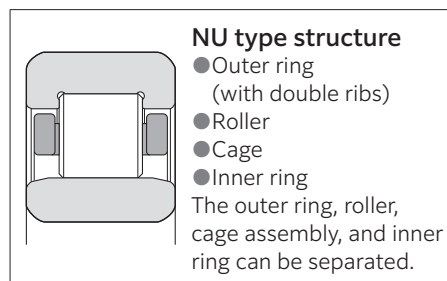
Cylindrical roller bearings

NU 22 04 EA T2X C3

- Radial internal clearance: C3
- Cage code: resin cage
- Type code: ULTAGE**
- Nominal bore diameter: 20 mm
- Dimension series: 22
- Bearing type: cylindrical roller bearing NU type

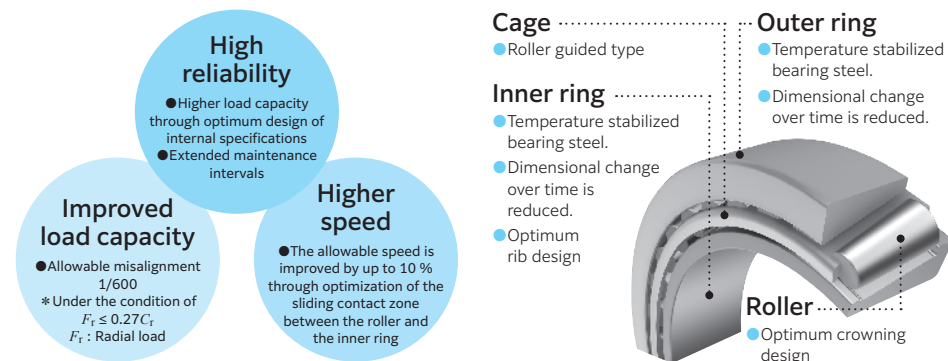
* When the bearing is the NUP type, a code U is added at the end of the part number.

[Bearing type]



Large size tapered roller bearings [ULTAGE™ series] metric

Large size tapered roller bearings (ULTAGE metric series with an outside diameter of $\phi 270$ mm or more) are the products developed to meet the demands of "long operating life," "improved load capability," and "higher speed" that are required for various industrial machinery.



Features

1. Industry leading reliability

The bearing load carrying capability has been improved by optimizing the roller crowning to reduce edge stress and allow a more uniform pressure distribution across the contact surface (see Fig. 1).

- (1) **Rating life: 1.6 times longer (compared to conventional NTN products)**
- (2) **Basic dynamic rating load: 16% larger (compared to conventional NTN products)**

2. Allowable misalignment

Allowable misalignment (single row): 1/600

Optimization of the roller crowning has allowed a combination of heavy loads ($0.27C_r$) and allowable misalignment of 1/600.

* Necessary minimum load: $0.04C_{0r}$

Fig. 1 shows the contact stress distribution of rollers considering an applied radial load of $F_r \leq 0.27C_r$. By optimizing the roller crowning, the edge stress is greatly reduced and the contact stress is made uniform compared with conventional NTN products.

[Examined condition]

Bearing: 30328UUTG (ULTAGE product)

30328U (conventional NTN product)

Load : $0.27C_r$

Misalignment: 1/600

* The allowable misalignment differs depending on the loads and the bearing type. Please consult NTN Engineering.

3. Allowable speed

The allowable speed is improved by up to 10% (compared with the conventional NTN products) by optimizing the sliding contact zone between the roller and the inner ring, thus reducing the rotational torque and temperature rise (see Fig. 2, Fig. 3, and Fig. 4).

4. Dimensional change over time

Dimensional change of bearings over time has been reduced compared with conventional NTN products by applying special heat treatment to bearing steel.

- Reduction in dimension change over time
- Bearing steel ratio: 1/10
- Carburizing (case hardened) steel ratio: 1/4

5. Interchangeability

The boundary dimensions conform to JIS B 1512-3 and ISO 355, and the installation dimensions are the same as that of the conventional NTN products.

In addition, the precision also conforms to JIS B 1514-1 and ISO 492.

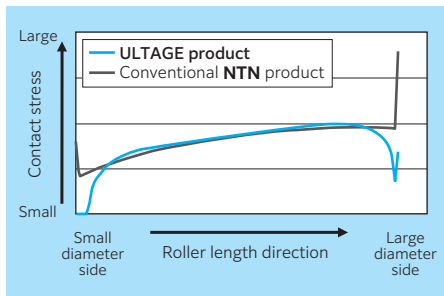


Fig. 1 Contact stress distribution of rollers

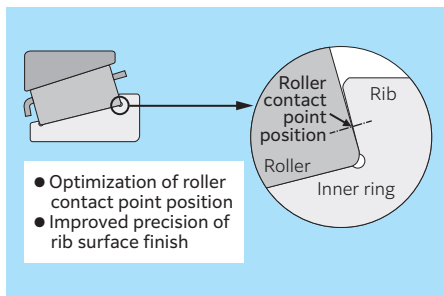


Fig. 2 Optimization of sliding surface between roller and inner ring

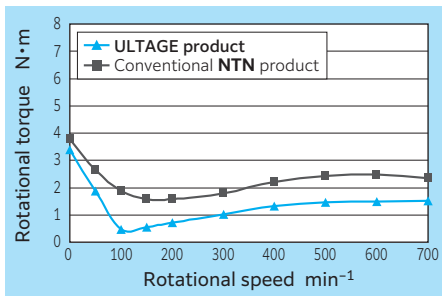


Fig. 3 Rotational torque test result

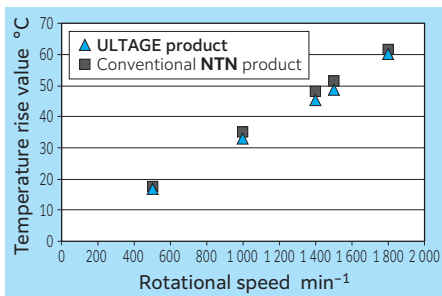


Fig. 4 Temperature rise test result

Bearing number

Single row tapered roller bearings

3 03 28 U UTG

Type code: **ULTAGE**

Internationally interchangeable bearings

Nominal bore diameter: 140 mm

Dimension series: 03

Bearing type: single row tapered roller bearing

Double row back-to-back tapered roller bearings

42 31 32 UTG

Type code: **ULTAGE**

Nominal bore diameter: 160 mm

Dimension series: 31

Bearing type: double row back-to-back tapered roller bearing

Double row face-to-face tapered roller bearings

32 31 32 UTG

Type code: **ULTAGE**

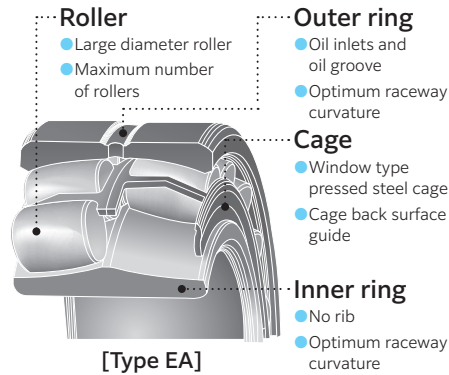
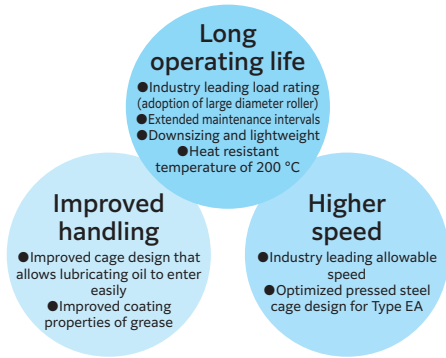
Nominal bore diameter: 160 mm

Dimension series: 31

Bearing type: double row face-to-face tapered roller bearing

Spherical roller bearings [ULTAGE™ series] Type EA, Type EM

ULTAGE series spherical roller bearings are the products developed to meet the demands of "long operating life," "higher speed," and "improved easy handling" that are required for various industrial machinery.



Features [Type EA]

1. Industry leading load rating

Higher load capacity and longer operating life are realized by increasing the roller diameter and maximizing the number of rollers. This allows extended maintenance intervals (see Fig. 1).

- (1) Basic dynamic rating load: Up to 50 % higher (compared to conventional NTN products)
- (2) Basic static rating load: Up to 35 % higher (compared to conventional NTN products)
- (3) Rating life: Up to 3.7 times longer (compared to conventional NTN products)

2. Allowable speed of the world's highest level

Higher speed is realized through the adoption of a new pressed steel cage design. [Allowable speed: Up to 20 % higher (compared to conventional NTN products)]

3. Standard use of pressed steel cage

For the pressed steel cage, "window" type with rigidity is adopted, and the roller pocket is provided with four tabs (projections) (see Fig. 2 and Fig. 3).

- (1) Cage back surface used for guidance.
- (2) The four pocket tabs stabilize the position of rollers.
- (3) The new pocket shape allows consistent supply of lubricating oil and grease to the internal bearing surfaces (see Fig. 4).
- (4) Special surface treatment is applied to the entire surface to improve the abrasion resistance.

4. Downsizing and lightweight

High load capacity has allowed for downsizing and a lighter weight.

Comparison example

Bearing number	Load rating (kN)		Boundary dimension (mm)	Bearing volume (cm ³)	Mass (kg)
	C _r	C _{0r}			
22220B	350	415	φ100×φ180×46	810	4.95
22218EA	384	398	φ90×φ160×40	550	3.34

The volume weight and mass weight can be reduced by about 30 %.

5. Improved handling

Adoption of the simple window type new pressed steel cage improved the workability at the time of assembly, disassembly, and grease application.

- (1) Improved application of grease to the roller surface
- (2) Improved roller retention contributes to easier assembly/disassembly

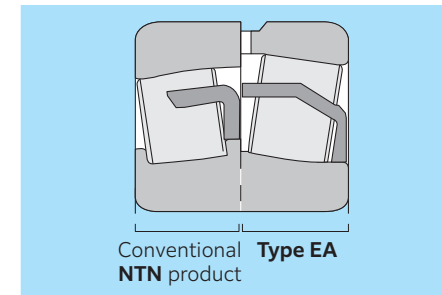


Fig. 1

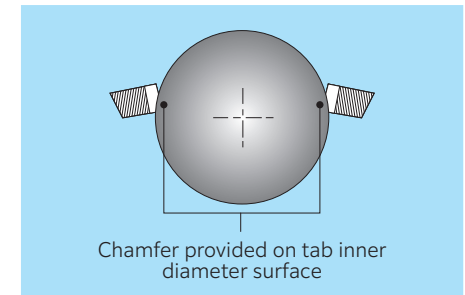


Fig. 3

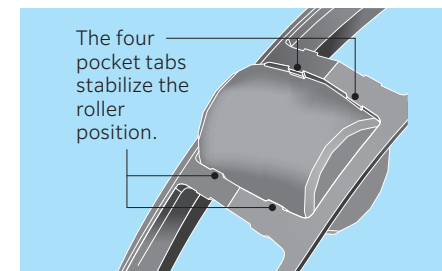


Fig. 2

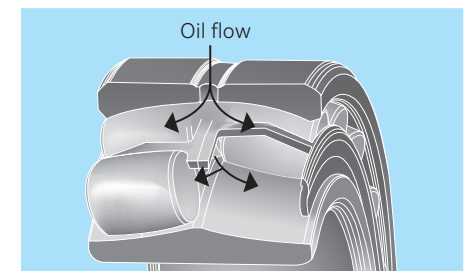
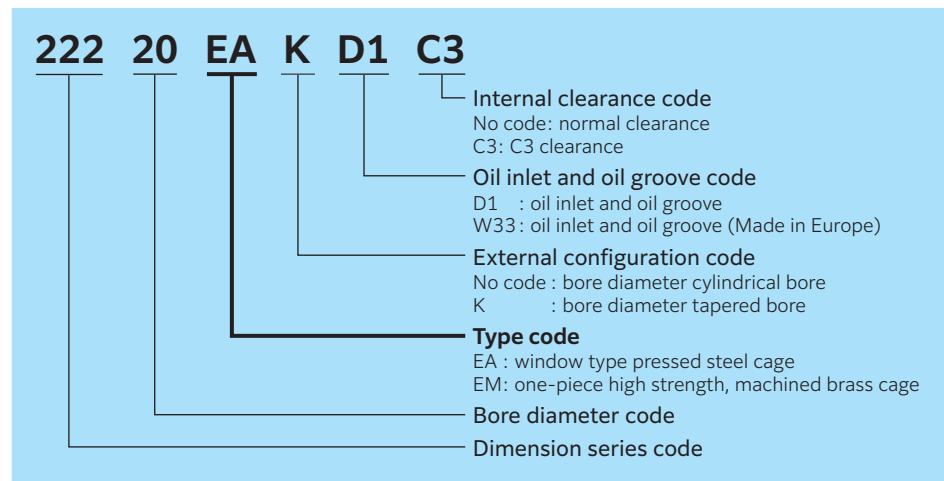


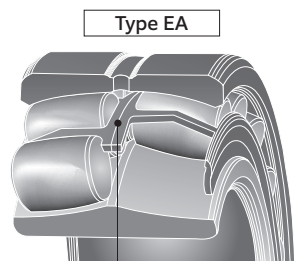
Fig. 4

Bearing number

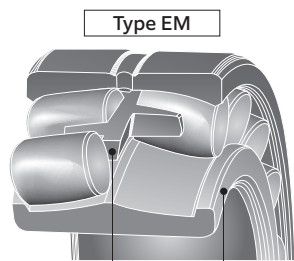
Spherical roller bearings



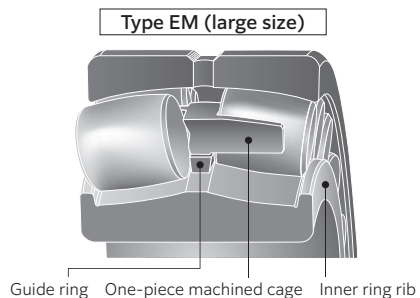
A combined machined cage (Type EM) is recommended for conditions with severe vibration and impact. (Type EM and Type EA have different inner ring shapes.)



Window type pressed steel cage



One-piece machined cage Inner ring rib



Guide ring One-piece machined cage Inner ring rib

[Allowable axial load]

$$F_a / F_r \leq e$$

F_a : Axial load

F_r : Radial load

e : Constant (see dimension table)

If this bearing type is used for a vertical shaft or under a large axial load, the load on the rollers of the row that is not subject to the axial load can become small. This small load on the rollers can result in skidding of the rollers, which can cause bearing damage. If the ratio of the radial load exceeds the factor e in the dimension table ($F_a / F_r > e$), consult **NTN Engineering**.

[Allowable misalignment angle]

- Normal load or more 1/115
- Light load 1/30

* Misalignment beyond the above limits may cause the roller to protrude from the outer ring, causing interference with the peripheral components.