"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.

### STLAGE series
- cylindrical roller bearings                     CAT.No.3037/E
- metric series large size tapered roller bearings CAT.No.3035/E
- series spherical roller bearings [Type EA, Type EM] CAT.No.3033/E
- sealed four-row tapered roller bearings for rolling mill roll necks [CROU...LL type]
- sealed spherical roller bearings [WA type]
- spherical roller bearings with high-strength cage [EMA type]
- deep groove ball bearings for high-speed servo motors [MA type]
- precision rolling bearings for machine tools
Cylindrical roller bearings [ULTAGE series]

ULTAGE series cylindrical roller bearings are the standard series 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
  - Extension of maintenance period

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

- **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 1.8 times longer (compared with NTN E type product)
   - (2) Basic dynamic load rating: Up to 20% higher (compared with NTN E type product)

2. Allowable misalignment (refer to Fig. 1)
   Allowable misalignment: 1/500 (mm/mm)
   Optimization of the roller crowning allows a combination of heavy loads ($0.20 C_r$) and allowable misalignment of 1/500 (mm/mm).
   - Necessary minimum load: 0.04 $C_0 r$

3. Allowable speed
   The allowable speed is increased up to 20% in oil lubrication (compared with NTN E type product).

4. Standard resin cage (refer to Fig. 2)
   (1) Higher speed and longer operating life have been realized through the use of a window type combined PA resin cage.
   (2) Resin cage materials: reinforced PA + GF
   * 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)

**Bearing number**

**Cylindrical roller bearing**

- ** NU 22 04 EA T2X C3 **
  - Radial internal clearance: C3
  - Cage code: resin cage
  - Type code: ULTAGE
  - Nominal bearing 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.
Large size tapered roller bearings [ULTAGE metric series]

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

- Allowable misalignment: 1/600
- Under the condition of \( F_r \leq 0.27 C_r \)

- The allowable speed is improved by up to 10% through optimization of the sliding contact zone between the roller and the inner ring

- Improved load capacity: Allowable misalignment 1/600
- Under the condition of \( F_r \leq 0.27 C_r \)

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: 3 times longer (compared to conventional NTN products)
   (2) Basic dynamic rating load: 30% 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 \( (0.27 C_r) \) and allowable misalignment of 1/600.
   Necessary minimum load: 0.04 \( C_0r \)

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

Examination condition

- Bearing model: ULTAGE product and conventional NTN product \(( \phi 80 \times \phi 170 \times 42.5 )\)
- Load: 0.27 \( C_r \)
- Allowable misalignment: 1/600

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 products by applying special heat treatment to bearing steel.
   - Reduction in dimension change over time
     - Conventional heat treatment: 1/10
     - 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.
**Bearing number**

**Single row tapered roller bearing**

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 bearing**

Type code: ULTAGE  
Nominal bore diameter: 140 mm  
Dimension series: 03  
Bearing type: double row back-to-back tapered roller bearing  

**Double row face-to-face tapered roller bearing**

Type code: ULTAGE  
Nominal bore diameter: 160 mm  
Dimension series: 31  
Bearing type: double row face-to-face tapered roller bearing  

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**Fig. 1** Contact surface pressure distribution of rollers  
**Fig. 2** Optimization of sliding surface between roller and inner ring  
**Fig. 3** Torque test result  
**Fig. 4** Temperature rise test result
Spherical roller bearings [ULTAGE series EA/EM types]

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

- **Long operating life**
  - Industry leading load rating
  - Extension of maintenance period
  - Dimensional and lightweight
  - Heat resistant temperature of 200°C

- **Improved handling**
  - Improved cage design that allows lubricating oil to enter easily
  - Easy to fill with grease

- **Higher speed**
  - Industry leading allowable speed
  - Optimized pressed steel cage design
  - Use of a guide ring is eliminated and roller guidance is achieved via the cage.

- **Features [EA type]**
  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 extension of the maintenance period (see Fig. 1).
     (1) Basic dynamic rating load: Up to 65% higher (compared to conventional products)
     (2) Basic static rating load: Up to 35% higher (compared to conventional products)
     (3) Rating life: Up to 5 times longer (compared to conventional 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: 20% higher (compared to conventional 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**

<table>
<thead>
<tr>
<th>Bearing number</th>
<th>Rating load (kN)</th>
<th>Boundary dimension (mm)</th>
<th>Bearing volume (cm³)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>222208</td>
<td>315</td>
<td>φ100×φ180×46</td>
<td>810</td>
<td>4.95</td>
</tr>
<tr>
<td>22218EA</td>
<td>385</td>
<td>φ90×φ160×40</td>
<td>550</td>
<td>3.28</td>
</tr>
</tbody>
</table>

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) Easy to fill with grease to roller surface
  (2) Easy assembly and disassembly due to small roller drop
**Bearing number**

Spherical roller bearing

![Diagram of spherical roller bearing with codes](image)

- Internal clearance code
  - No code: normal clearance
  - C3: C3 clearance
- Oil groove and oil hole code
  - D1: oil groove and oil hole (Japan specification)
  - W33: oil groove and oil hole (Europe specification)
- External configuration code
  - No code: inner diameter cylindrical bore
  - K: tapered bore
- Type code
  - EA: window type pressed steel cage
  - EM: one-piece high strength, machined brass cage
- Bore diameter code
- Dimension series code

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

**[Allowable misalignment]**

- 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.*