Cylindrical Roller Bearings for the Backing Shafts of Cluster Mills
1. Introduction

Based on many years of experience and recorded success in the area of cluster mills, JTEKT supplies high-durability, high-precision cylindrical roller bearings for backing shafts. JTEKT also supplies regrinding jigs that can grind the outside diameter surface of the bearings with exact precision.
2. Construction and Advantages of Koyo Bearings

On each backing shaft of a cluster mill, several bearings are installed side by side. With their outside diameter surfaces in direct contact with the intermediate rolls, these bearings rotate while carrying components of rolling force. Therefore, the outer rings of these bearings are required to have adequate rigidity and fatigue strength, and should be finished with high precision.

**Three row cylindrical roller bearing**
- Maximized load rating of internal design is adopted.
- Forced oil lubrication with mineral oil is applied.

**Sealed type double-row cylindrical roller bearing**
- Lubricated condition of the bearing inside is maintained well for a long period.
- Oil mist lubrication is applied.

- The outside diameter surfaces of these bearings are crowned, preventing load concentration at the ends and thus protecting the intermediate rolls from damage.

![Fig. 2 Typical Contact Stress Distribution of Outer-ring Outside Surface](image)

![Fig. 3 Typical Hardness Distribution of cored hardening Outer Ring](image)

The outer rings of Koyo bearings for backing shafts are made from a newly developed steel material, processed by JTEKT’s original cored hardening treatment. Compared with carburized steel, this newly developed steel has the following advantages:
- The suitably soft core ensures superior impact resistance.
- The thick hardened surface layer ensures high rigidity and provides the outside diameter surface with an increased regrinding allowance.
- The excellent material composition realizes high fatigue strength.

![Fig. 4 Macroscopic Material Composition](image)

* The cored hardening treatment is applicable to bearings of no less than 130 mm in bore diameter.
3. Regrinding Jigs for Bearings for Backing Shafts

Overview
The outside diameter surfaces of the bearings used on the backing shafts of cluster mills should be ground periodically to retain precise bearing performance, thus ensuring the quality of rolled products. JTEKT supplies the jigs that grind bearing's outside diameter surface with high precision.

Advantages

1. The jigs minimize the radial runout of the bearings.

   Once the bearing is installed into the jig, the jig completely nullifies any clearance on the fitting surface between the jig and bearing and the internal clearance of the bearing, eliminating play in the radial direction. The jig grinds the outside diameter surface while turning the outer ring and retaining the inner ring as stationary, enabling grinding under the same conditions as when in operation.

2. The jigs improve efficient installation and removal.

   Bearings can be installed on and removed from the jig easily without the need of disassembling the inner ring and outer ring. There is no possibility that rollers will come off.

Jig Types and Constructions

The jigs come in two types, which should be selected according to the dimensions and types of backing-shaft bearings. Please specify the type suitable to your needs.

- **Type 1**
  - This type is suitable to bearings with the outer ring with ribs and with a bore diameter no less than 70 mm.
  - This jig requires holes for work carrier on the end face of the outer ring.

- **Type 2**
  - This jig is suitable with bearings with the outer ring without ribs, such as those used on the Sendzimir Rolling Mills ZR21 an ZR22.
4. Measurement for Bearing Section Height

Overview
When the outside diameter surface of a bearing is ground, it is critical to accurately control the variation of bearing section heights of all the bearings installed on the backing shaft. JTEKT supplies Measurement for bearing section height that suit the individual bearings listed on the dimensional table.

Advantages
1. These bearing section height measurements are highly rigid and perform extremely precise measurement.
2. These measurements can measure the running accuracy of the outer rings as well.
3. For easy bearing installation and removal, the measurements are arbor-shaped.

Reference information
JTEKT can supply the bearings listed in the dimensional table such that they can be assembled on the backing shaft so as to satisfy the bearing section height tolerances shown below:

Variation of bearing section heights on one shaft ≤ 0.006 mm
Variation between two adjacent bearings on one shaft ≤ 0.002 mm
## 5. Dimension Tables

<table>
<thead>
<tr>
<th>Boundary dimensions (mm)</th>
<th>Basic load rating (kN)</th>
<th>Bearing number</th>
<th>Fig.</th>
<th>Bearing section height at the time of manufacture (mm)</th>
<th>Mass (kg)</th>
<th>Compatible Rolling Mill Model</th>
<th>Number of bearings used per mill(1)</th>
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Note 1) Parenthesized figures indicate the numbers of bearings required for a mill. Difference from the parenthesized figure means the use of bearings of different number.
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*Figures: Cylindrical Roller Bearings for the Backing Shafts of Cluster Mills*
### 6. Varieties of Cluster Mills and Their Roll Arrangements

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<thead>
<tr>
<th>Variety</th>
<th>Description</th>
<th>Diagram</th>
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Sendzimir, Z-High, KOBELCO, KST, KT, and Sundwig are trademarks or registered trademarks of individual companies.
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Value & Technology