High-performance Product Series
for Steel Production / Rolling Equipment
JTEKT...
Utilizing comprehensive strengths to manufacture products that respond to steel production equipment needs and support stable operations.

Steel production equipment are operated in extremely harsh environments, where machinery is exposed to high temperatures, water and mill scale. The bearings used in this equipment must continually withstand heavy loads and high-speed rotation. These conditions test not only each bearing, but also the overall strengths of peripheral parts and the integration thereof. As a general manufacturer of bearings, drive shafts and oil seals, JTEKT is a full-service provider for a wide range of products.

Recommendation...

JHS (JTEKT Hyper Strong) is a product series incorporating designs to meet the requirements of various industrial machinery. In order to achieve high durability of ever-evolving steel production equipment, JHS is evolving daily together with JTEKT customers and provides total support for bearings, drive shafts and oil seals.

JHS Series

- **Bearings**
  - RZ-type Spherical Roller Bearings (CAT.NO.B2023E)
  - Bearings for multi-rolling mill backup rolls (CAT.NO.B2012E)

  **Case-hardened steel is used on the inner ring to improve rolling life in low-viscosity lubrication.**

- **Bearings for roll necks** (CAT.NO.B2013E)

  **Standard**
  - By using our newly developed case-hardening steel in the bearing rings, we have improved the rolling life, toughness, and corrosion resistance.

  **Premium**
  - A special heat treatment is applied to the newly developed hardened steel to further improve rolling life and corrosion resistance.

- **Bearings for sintering machine pallet car**

**Drive shafts**

- **Drive shaft for roll drives** (CAT.NO.B2021E)
- **Hyper coupling** (CAT.NO.B1010E)

We will continue our efforts to enrich the JHS series.

Photo courtesy of Nippon Steel & Sumitomo Metal Corporation
### History of JTEKT products for steel production equipment

<table>
<thead>
<tr>
<th>Year</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>Developed three-row cylindrical roller bearings with cage for Sendzimir mills.</td>
</tr>
<tr>
<td>1955</td>
<td>Developed high-load/high-speed/continuous type bearings for rolling mills.</td>
</tr>
<tr>
<td>1960</td>
<td>Developed bearings with self-aligning ring.</td>
</tr>
<tr>
<td>1965</td>
<td>Developed sealed cylindrical roller bearings for Sendzimir mills.</td>
</tr>
<tr>
<td>1970</td>
<td>Developed long-life bearings with oil-film lubrication.</td>
</tr>
<tr>
<td>1975</td>
<td>Received award from the Japan Society of Mechanical Engineers for high-speed bearing.</td>
</tr>
<tr>
<td>1980</td>
<td>Developed new material for core hardening.</td>
</tr>
<tr>
<td>1985</td>
<td>Developed new material for core hardening.</td>
</tr>
<tr>
<td>1990</td>
<td>Developed new material for core hardening.</td>
</tr>
<tr>
<td>1995</td>
<td>Developed new material for core hardening.</td>
</tr>
<tr>
<td>2000</td>
<td>Developed new material for core hardening.</td>
</tr>
<tr>
<td>2005</td>
<td>Developed new material for core hardening.</td>
</tr>
<tr>
<td>2010</td>
<td>Developed new material for core hardening.</td>
</tr>
</tbody>
</table>

### Introduction to products for steel production equipment

<table>
<thead>
<tr>
<th>Iron ore</th>
<th>Sintering machine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone</td>
<td>Coke oven</td>
</tr>
<tr>
<td>Coal</td>
<td>Blast furnace</td>
</tr>
</tbody>
</table>

### Products for continuous casting machines

- Spherical roller bearings (fixed side)
- Spherical roller bearings (free side)
- Slewing rim bearings CAT.NO.B2025E
- HSC bearing units with half round outer ring

###轴承产品介绍

- 黑色带有红色线条的图片展示不同类型的轴承，如深沟球轴承、角接触球轴承等。
- 图片中描述了每种轴承的应用场景，如滚动轴承、推力轴承等。

###轴承和驱动轴

- 表格中列出了各种轴承和驱动轴的发展历程。
- 图片中展示了各种轴承和驱动轴的实物图，如滚柱轴承、推力滚子轴承等。

###轴承和驱动轴的发展

- 表格中列出了从1950年到2015年的发展历程。
- 图片中展示了各种轴承和驱动轴的发展历程。

###轴承和驱动轴的改进

- 表格中列出了从1950年到2015年的发展历程。
- 图片中展示了各种轴承和驱动轴的发展历程。
Steel production equipment

- **Products for rolling mills**: CAT.NO.B2013E
  - Four-row cylindrical roller bearings
  - Double-row tapered roller bearing

- **Rolling**
  - Slab
  - Bloom
  - Billet

- **Bearing types**
  - Unit bearings for Plate levelers
    - Four-row cylindrical roller bearings
    - Thrust spherical roller bearings
  - Unit bearings for tension levelers
    - Four-row cylindrical roller bearings
    - Matched pair angular contact ball bearings

- **Bearings for multi-roll mills**: CAT.NO.B2011E
  - Three-row cylindrical roller bearings
  - Sealed type double-row cylindrical roller bearings
  - Backup roll assembly

- **Bearing applications**
  - Hot finishing rolling mill
  - Cold strip mills
  - Skin-pass mill
  - Tension leveler
  - Plate leveler
  - Plate mills
  - Plate leveler
  - Rod/Wire Rod rolls
  - Rod/Wire Rod rolls

- **Assorted steel products**
  - Steel strip in coil
  - Stainless steel in coil
  - Magnetic steel in coil
  - Plate
  - Shaped steel
  - Rod
  - Wire rod

- **CAT.NO.B2012E**
**RZ-type Spherical Roller Bearings**

- Designed for maximum load rating; internal design reduces contact stress
- Designed to stabilize roll position
- Resistant to high temperature for use in various environments

**Roll configuration example 1** (single and split rolls)
- Optimal configuration for roll elongation absorption using single and split rolls

**Roll configuration example 2** ( pestle-shaped roll)
- Optimal configuration for roll elongation absorption using pestle-shaped roll

**Products for continuous casting machines**

Offering long-life bearings for systems, we manufacture bearings for continuous casting equipment, bearing housing units, oil/air lubrication devices, oil seals and other products.

**Required performance and issues**

- Measures for high contact stress/roll deflection under heavy load
- Measures for roll elongation under high temperature
- Measures for corrosion/lubrication failure due to the infiltration of steam (water)
- Measures for surface roughness/indentations due to the intrusion of mill scale

**Measures for heavy load / high temperature**

2 **Cylindrical roller bearings with self-aligning ring**

- Smooth absorption of roll movement in the axial direction
- Absorption of roll deflection and misalignment

3 **HSC bearing units with half round outer ring**

- Heavy load type using a compact sealing structure
- Water-cooled structure with high cooling efficiency

**Oil seals**

- Superior sealing performance
- Lip contact stress dispersed
- Materials used are hydrogenated nitrile rubber (HNBR) and fluoro rubber (FKM)
Bearings for roll necks

Bearings used to steel mill roll necks must cope with heavy loads and high-speed rotation in severe environments. In order to respond to these needs, JTEKT works daily to resolve related issues such as developing bearing materials and improving bearing seal performance.

**Required performance and issues**

- Enhancing durability and service life under heavy load / high-speed rotation
- Preventing the intrusion of water / mill scale

**Improvement of durability and service life to withstand heavy loads and high-speed rotations**

**Long-life / high corrosion-resistant carburized steel**

<table>
<thead>
<tr>
<th>Features</th>
<th>JHS 520 Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>By using our newly developed case-hardening steel in the bearing raceway, we have greatly improved the rolling life, toughness, and corrosion resistance compared to our conventional products.</td>
</tr>
<tr>
<td>Premium</td>
<td>By using our newly developed case-hardening steel and by applying special heat treatments, we have provided the premium specifications with further improved rolling fatigue life and corrosion resistance.</td>
</tr>
</tbody>
</table>

- Original carburizing heat treatment improves corrosion-resistance and wear-resistance qualities

**Examples of actual use**

<table>
<thead>
<tr>
<th>Cold strip mill work roll (open type)</th>
<th>Cold strip mill work roll (sealed type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional type</td>
<td>Conventional type</td>
</tr>
<tr>
<td>Used approximately 4.5 times longer (105)</td>
<td>Used for approximately 4.5 times longer (105)</td>
</tr>
<tr>
<td>Approx 5-fold</td>
<td>Approx 4.8-fold</td>
</tr>
</tbody>
</table>

**Technology for minimizing temperature increases**

**High sealing property oil seal for sealed-type, four-row tapered roller bearings**

- Greater robustness due to improved sealing property
  - Optimization of seal lip shape
  - Maximizing pump volume and reduced the amount of water infiltration into the interior of the bearing by 70% or more compared to conventional
- Expanded application range of the conventional material (NBR: nitrile rubber)
  - Reduced seal lip temperature by 60% compared to conventional
  - Expanded the application range of common and low-cost NBR to improve convenience
- Reduced maintenance costs
  - Contributed to reduction of customers’ maintenance costs through extended service life of seals

**Chock seals**

- Original design realizes an optimal lip structure that demonstrates excellent sealing performance

**For more information, please refer to catalog No. B2013E and No.B2002E.**
Bearings for multi-roll mill backup rolls

We provide high-precision bearings with excellent durability based on long years of experience and achievements.

**Bearings for oil mist lubrication**

- Improved bearing service life (2-fold/4-fold compared to the conventional type)
- High sealing performance
- Space-saving size for simple installation / removal

**Features**

- Conventional type
- JHS210 Standard
- Approx. 2-fold
- JHS210 Premium
- Approx. 4-fold

**Premium specifications**

- Case-hardened steel is used for the outer ring to improve the load capacity of rolling service life under low-viscosity lubrication.
- For oil-seal materials, fluoro rubber is used, improving sealing performance.
- Noise reduction is achieved with the outer ring hardness of approximately four-fold compared to the conventional type.

**Bearing-regrinding Jigs**

- Bearing radial runout minimized
- Installation / removal work simplified
- Reproduction of radial runout accuracy equivalent to that when product is new

**Features**

- Bearing section height variation on one shaft ± 0.006mm
- Variation between two adjacent bearings on one shaft ± 0.003mm

**Optimized load distribution**

Contributes to rolled coil quality / precision

**Core hardening**

Surface-hardened layer improved approximately 3-fold

**Measurement for Bearing Section Height**

- High rigidity, possible to make extremely accurate measurements
- Possible to measure outer ring rotational accuracy
- Adoption of mandrel shape realizes easy bearing insertion / removal

**For more information, please refer to catalog No. B2012E.**
Drive shafts for rolling mills

We provide high-strength, long-life drive shafts that have good torque transfer efficiency under severe environments.

Example of block-type configuration

Required performance and issues

- Stronger, longer-life drive shafts capable of handling increased rolling torque
- Stronger, longer-life drive shafts for use with smaller rolling-mill roll diameters
- Protecting rolling-mill drive systems from excessive torque
- Ability to randomly adjustment the roll rotational phase

The block-type configuration is part of the D/U/T Series; the products of which are the strongest and have the longest service life in the JTEKT line-up. It is used in rolling mills such as Plate mill, Blooming mill and Hot strip mills (roughing/finishing) where conditions are extremely harsh.

1. Application of different diameter rollers for cross & bearing

- Roller diameter at the end of the cross reduced slightly
- Uniform multi-row roller load

2. Ball burnishing on cross shaft

- Increasing of residual compressive stress at subsurface
- Increasing of surface hardness
- Fine surface roughness (Removal protrusion)

3. Thermal spraying coat of tungsten carbide (WC) on bearing cup key

- Restraining of clearance between key and key way due to corrosion wear
- Alleviating bending stress of bolt
- Minimizing heavy load at cross end

4. Application of form rolling to bearing set Bolt

- Thread section processing changed from machining to form after heat treatment
- Fiber flow is formed along the shape of the thread
- Residual compressive stress at subsurface beneath the bottom radius of the thread increases

For more information, please refer to catalog No. B2021E.
Improved service life of oil seals and cross bearings

Development of a high-sealing oil seal

- Operating environment:
  - Rolling mill water
- Movement of oil seal during operation:
  - Rotational oscillating motion
  - Axial oscillating motion
- Permanent elongation of each lip portion (residual deformation)
- Low sealing performance of the side lips
- Reduction in oil seal sealing performance

Material change:
- Improved sealing performance through material change
  - Reduction of permanent elongation under rolling mill water and high temperature (90°C) environment by 50% compared to conventional

Shape change:
- Improved sealing performance through shape change
  - By changing from side lip seal thrust contact to radial contact, sealing performance relative to axial oscillating motion has improved
  - Reduced decline in lip tension by 80% compared to conventional

These changes suppress sudden damage to the cross bearing caused by deterioration in lubricating ability, thus contributing to reduced maintenance costs and improved productivity for customers.

Optional mechanisms supporting drive shafts for rolling mill

Hyper coupling (torque limiter)

- Device for protecting rolling mill drive system from excessive torque
  - Significantly improved operating precision and durability
  - Easy to set operating torque
  - Significant reduced recovery time after finishing operation

Roll phase adjustment device (for bar & rod mill)

- Device enables the rotational phase of rolls to be randomly adjusted when producing screw reinforcing bar and deformed steel bar used for construction
  - Phase can be adjusted almost seamlessly in a short time, improving product accuracy
  - Operation being possible without dismounting the drive shafts

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Features
- Operating principle:
  - Hydraulic expansion chamber (oil-pressure charged)

- Shear valve replacement (x4)
- Re-pressurizing hydraulic expansion chamber

Product example:
- Screw reinforcing bar

- Adjustment work process (online work)
  - Measure misalignment of workplace
  - Set adjustment angle
  - Loosen the fixing nut
  - Turn the adjusting nut to the required amount
  - Tighten the fixing nut
Bearings for sintering machine pallet car

Sintering machines are used in harsh environments where high temperatures and large amounts of dust are generated. We provide sealed bearings and mill-scale seals capable of withstanding these kinds of environments.

Required performance and issues

- Measures for heavy load / shock load
- Preventing intrusion of dust

Pressure roller bearings
(sealed type double row cylindrical roller bearings)

- Optimized outer ring thickness and carburized steel adopted
- Sealing structure using special seal
- Prevents the intrusion of dust
- Full roller shape adopted
- High load capacity realized

Intermediate seal

- Structure combining two parts (1 and 2)
- No damage to peripheral parts
- High sealing performance owing to multilayer lip structure
- Prevents the intrusion of dust

Wheel bearings
(sealed type double row tapered roller bearings)

- Integrated seal structure offers both high load capacity and excellent sealing performance
- Can withstand heavy loads and prevents the intrusion of dust

Bearing units for plate levelers

We provide plate leveler units to cope with severe usage environments such as heavy loads, rust and the intrusion of water / foreign matter.

Required performance and issues

- Roll strength and bearing load rating improved as the result of integrating the roll and outer ring structure
- Special stainless steel for rolls developed
- Seal and shield are combined to form a labyrinth structure that has excellent sealing performance

Bearing units for tension levelers

We provide optimal tension leveler units that are compatible for high-speed rotation, wet / dry environments and low torque.

Required performance and issues

- Low torque
- Tightly sealed structure
- High section height accuracy

- Wet-specification unit has an oil seal that forms a tightly sealed structure and also realizes lower torque
- Dry-specification unit has a labyrinth seal structure that realizes the lowest possible torque
- Addition of a suitable, uniform corrective force by controlling bearing section height (H) dimensional accuracy

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JTEKT’s accumulated knowledge and experience helps our customers solve problems. We provide new, high-value-added products and processes for businesses with a global supply system developed to meet those demands.

Regarding large bearings used in the industrial machinery field, there have been many cases in the past where customers evaluate by using actual machines after conducting desk review and basic evaluation. As a result, development took too long due to unforeseen problems that arose. At the Large Size Bearing Technology Development Center which was established and launched operations, evaluation tests in environments close to actual machines are now possible within JTEKT. The accumulated data will be used to raise the accuracy of CAE analysis (simulation analysis) which will result in significant reduction of the product developmental period as well as the development of new, high-value-added products.

Our testing equipment is able to evaluate the scattering rolling mill water in high-temperature environments to recreate close to actual conditions. In this way, we can deliver bearings and oil seal components with excellent performance.

Please contact JTEKT to request a catalog or for advice regarding other technical issues or concerns.

- **JHS Series RZ-type Spherical Roller Bearings**
  - CAT.NO.B2023E

- **Roll neck bearings for rolling mill**
  - CAT.NO.B2013E

- **Cylindrical Roller Bearings for Multi-roll Mill Backup Rolls**
  - CAT.NO.B2012E

- **Oil Seal For Steel Production Equipment**
  - CAT.NO.B1020E

- **Drive shafts for steel production /industrial equipment**
  - CAT.NO.B2021E

- **JHS Series Hyper Coupling**
  - CAT.NO.B1010E
Providing high quality and cutting-edge technology for the world

Manufacturing in Japan enables JTEKT state-of-the-art material and technology to be implemented to JTEKT products, which leads to delivering top quality and excellent performance. Furthermore, JTEKT can contribute high quality and appropriate technical support to customers worldwide through JTEKT global network system.