



**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.



JHS (JTEKT Hyper Strong) is a product series incorporating designs to meet the requirements of various steel production equipment.

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

- Bearings for multi-roll mill backup rolls



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

- Spherical roller bearings for continuous casting machines



Improved wear resistance with developed steel + special heat treatment on the outer ring

- Bearings for roll necks



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.

Drive shafts

- Drive shaft for roll drives
- Hyper coupling

Oil seals

- Oil seals for continuous casting machines



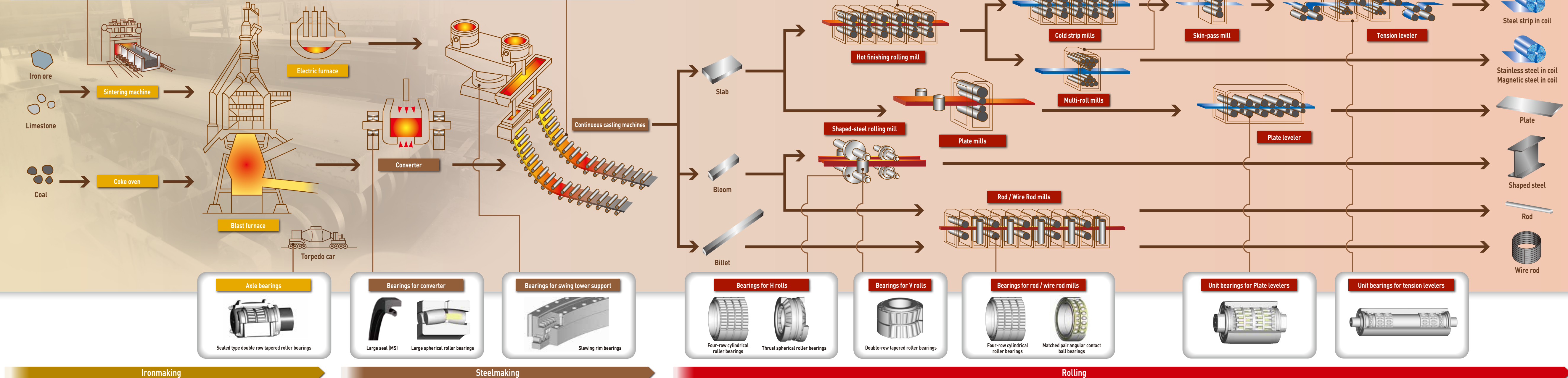
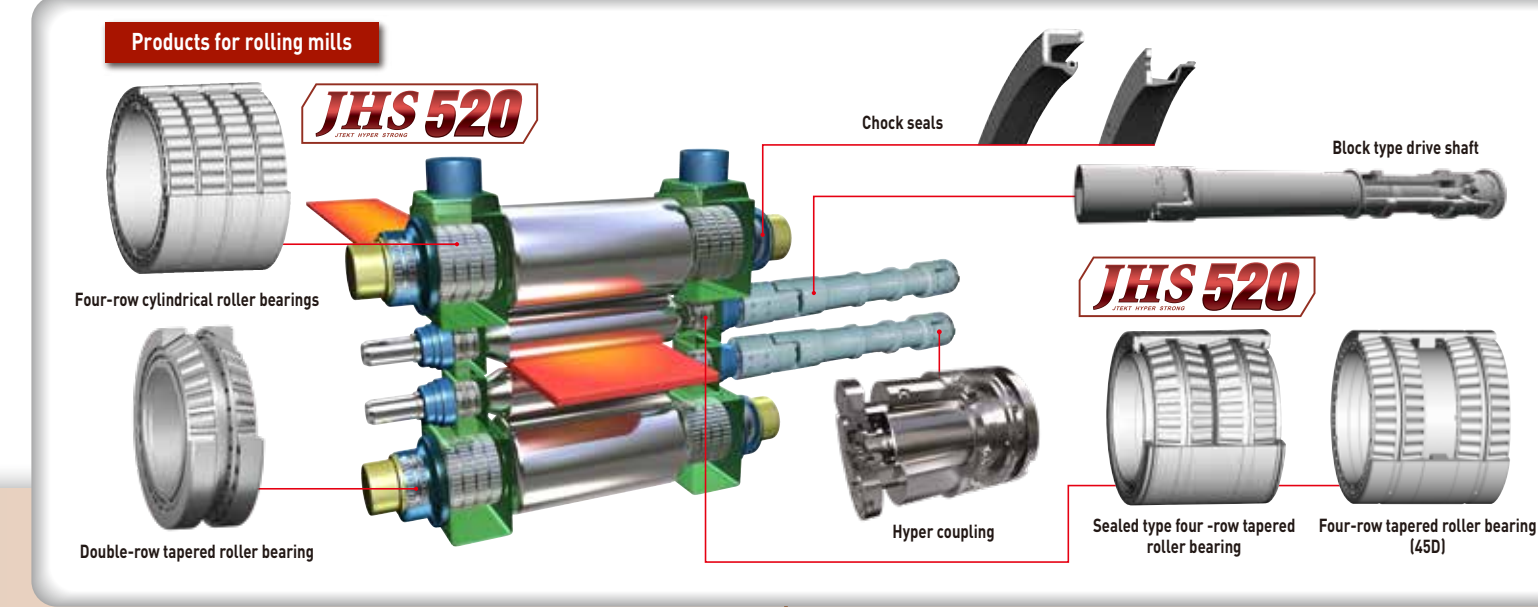
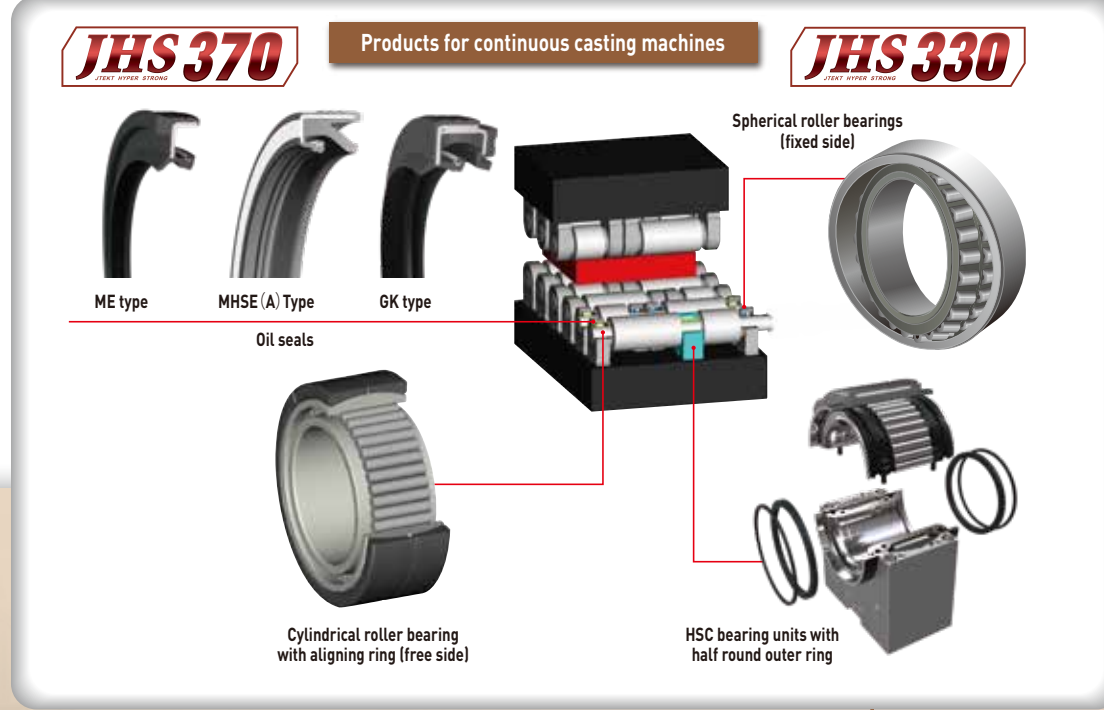
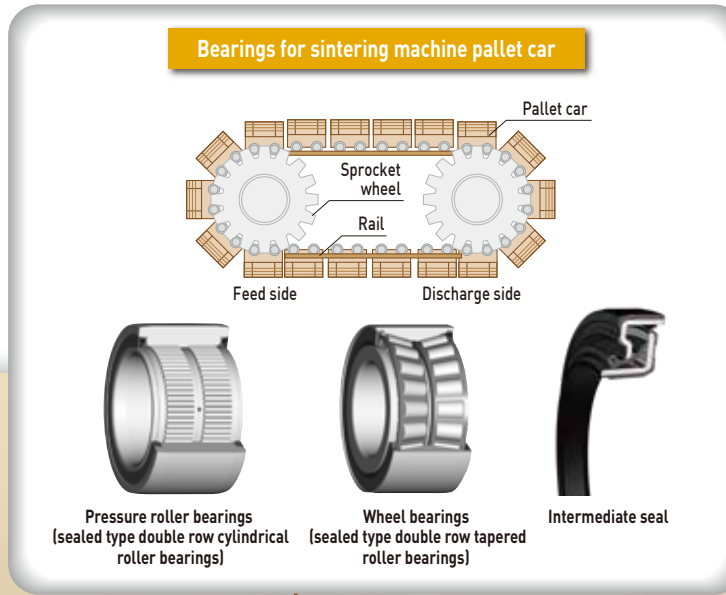
Steel production equipment are operated in extremely harsh environments, where machinery is exposed to high temperatures, water and mill scale. The bearings used in this equipment must continually withstand heavy loads and high-speed rotation. These conditions test not only each bearing, but also the 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.

Only One Partner

We will continue our efforts to enrich the JHS series.

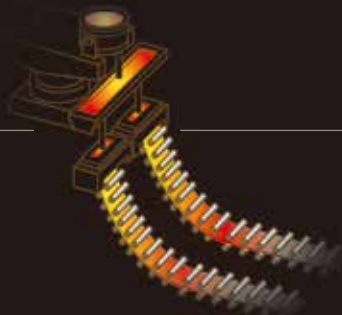
Year	Social conditions / Events	Steel manufacturer trends	JTEKT products for steel production equipment
			(■ Bearings ■ Drive shafts)
1940	WWII	Steel production in Japan	
1950	Post-WWII	Catching up with industry overseas	Developed four-row tapered roller bearings for hot-strip mill work rolls Japan 1st Developed tapered roller bearings for hot-strip mill backup rolls Japan 1st
1960	High growth period	Mass production, increase productivity, high-speed, high-precision, continuous	Developed three-row cylindrical roller bearings with cage for Sendzimir mills First delivery of drive shafts for wire-rod mills Japan 1st
1970			Entered agreement with Sendzimir Japan, Ltd. to manufacture backup roll assemblies Started production of Sendzimir mill backup roll assemblies Unique to Japan Adopted roller bearings for 1,480m/min cold-strip mill backup rolls Japan 1st First delivery of drive shafts for cold-strip mills Japan 1st First delivery of drive shafts for hot-strip mills Japan 1st
1975			Received award from the Japan Society of Mechanical Engineers for hot-strip mill drive shaft
1980	Stable growth period	Large-scale, low-volume production, improve thickness accuracy, reduce maintenance cost	Developed sealed cylindrical roller bearings for Sendzimir mills Developed (sealed) roll neck bearings for 6H work roll shift mills Improved bearings for backup rolls from oil-film bearings to roller bearings Japan 1st Developed split bearing units (spherical roller bearings)
1985			Developed CR mill backup roll assemblies First delivery of drive shafts for hot-strip WR shift mills Japan 1st Developed fastening-ring split bearing units with fastening-ring Developed cylindrical roller bearings with self-aligning ring
1990	Bubble economy	Pursue higher functionality/better quality	Developed oil/air lubrication system Developed long-life Cross & Bearing with different diameter rollers First delivery of drive shafts for pair cross mills Developed carburized steel (CH213) for large bearings
1995	Burst in bubble / Economic stagnation		Developed HSC split bearing units First delivery of drive shafts for Plate mills World 1st
2000	Economic expansion	Pursue higher functionality/better quality	Developed new material for core hardening Developed sealed cylindrical roller bearings for new Sendzimir mill producing magnetic steel sheets Developed long-life Cross & Bearing with cross burnishing process
2005			First delivery of hyper coupling Adopted newly developed material and carbonitriding process (premium) for JHS520 highly corrosion-resistant long-life bearings
2010	Period of economic change	Pursue higher functionality/better quality	Developed JHS210 high-performance backup roll bearings for new Sendzimir mill producing magnetic steel sheets Developed a long-life, high-speed JHS Series spherical roller bearings Commenced full-scale operation of the Large Bearing Technical Development Center
2015			Developed an oil seal for sealed-type, four-row tapered roller bearings, for roll neck Developed an oil seal for drive shaft cross bearings

Introduction to products for steel production equipment



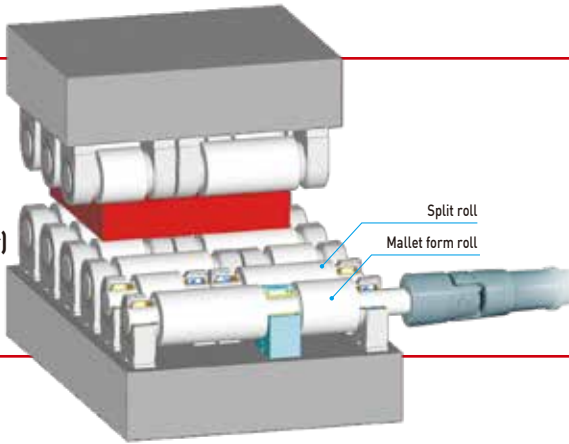
Products for continuous casting machines

We provide long-life products such as bearings for continuous casting machines, bearing housing units, and oil seals.



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

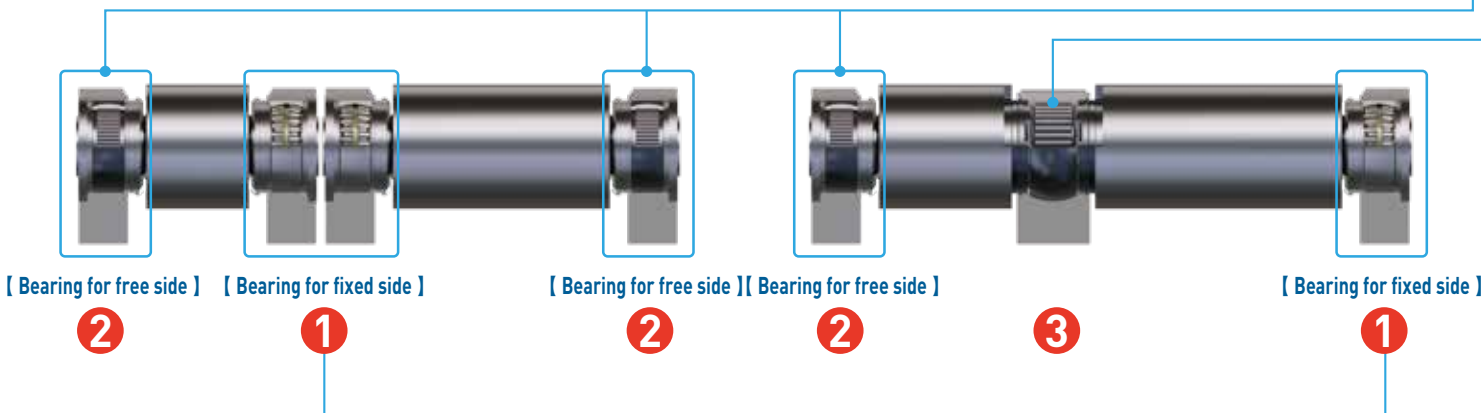


Roll configuration example 1 (single and split rolls)

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



Measures for heavy load

1 JHS330 Spherical roller bearings

JHS330

- Outer ring made of developed steel with optimized amounts of Chromium (Cr), Molybdenum (Mo), Vanadium (V) and a special heat treatment
- Improved wear resistance through control of the fine precipitates and increased hardness
- Designed for maximum load rating ; internal design reduces contact stress
- Roller position stabilization design

[Service life]
Conventional bearing

Approx. **1.5-fold or better**

JHS330
Spherical roller bearing

Outer ring

• JTEKT developed steel

Roller

- Roller maximized
- Number of rollers increased
- Roller position stabilized

Inner ring

• JTEKT specification steel



JHS330 spherical roller bearing structure

Measures for heavy load / high temperature

2 Cylindrical roller bearings with self-aligning ring (SC bearings)

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

[Static load rating]

Spherical roller bearings

Max. **10%** increase (approx)

Cylindrical roller bearings with self-aligning ring



3 Bearing units with half round outer ring (HSC bearings)

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

[Service life]

Conventional unit

Approx. **2.4-fold**

HSC bearing units with half round outer ring

[Rated static load]

Conventional unit

Max. **30%** increase (approx)

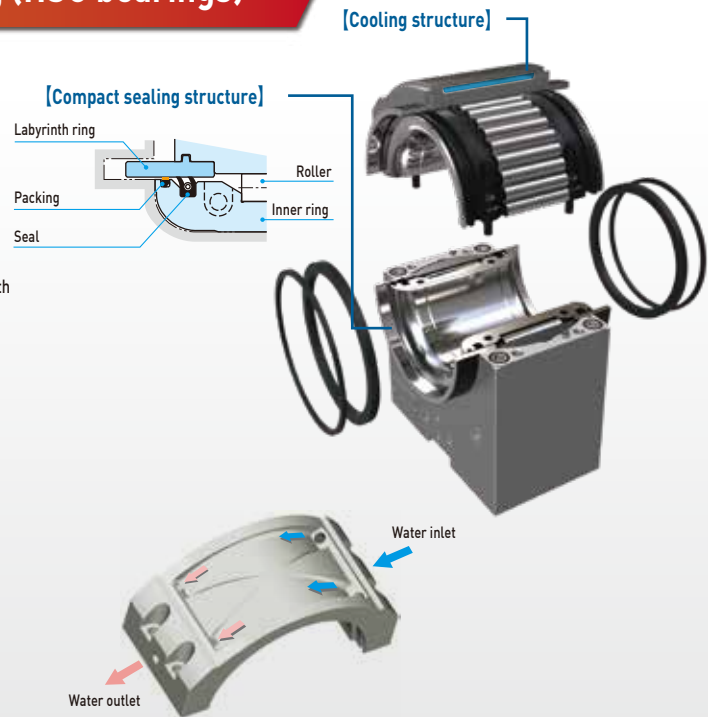
HSC bearing units with half round outer ring

[Flow consumption]

Conventional unit

Reduced **45%** (approx)

HSC bearing units with half round outer ring



Measures for intrusion of water / mill scale

Oil seals

JHS370

- Highly durable protective lip to inhibit water and scale intrusion
- Bumper lip structure used for main lip to reduce shaft wear
- Standard design featuring HNBR rubber material with excellent heat resistance and stable usability against water vapor and urea-based grease

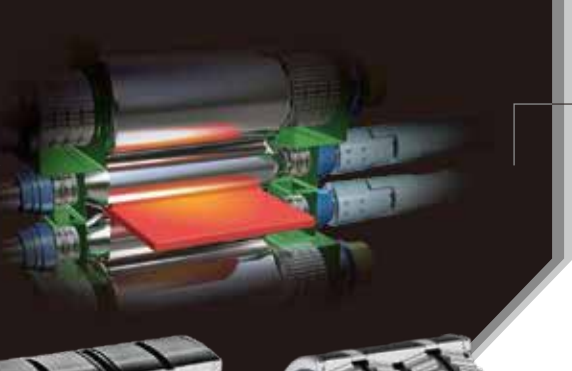


For details, please scan QR code on the right to refer to the catalog for bearings for continuous casting machines.



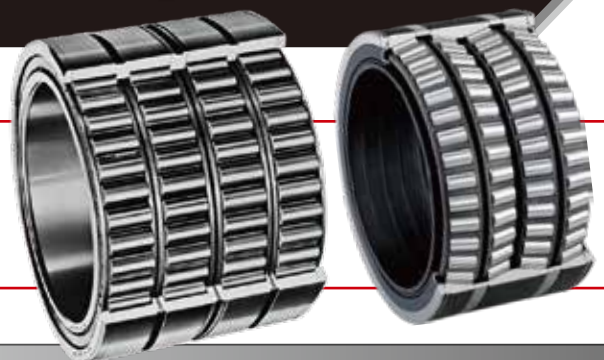
Bearings for roll necks

Bearings used to steel mill roll necks must cope with heavy loads and high-speed rotation in harsh 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

- Long-life and high corrosion-resistant steel with optimized content of chromium and molybdenum
- Original carbonitriding heat treatment improves corrosion-resistance and wear-resistance qualities



◆ Standard
By using our newly developed case-hardening steel in the bearing rings, we have greatly improved the rolling life, toughness, and corrosion resistance compared to our conventional products.

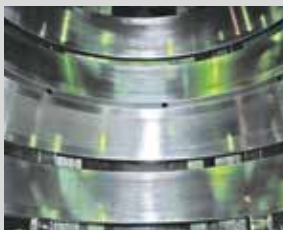
◆ Premium
By using our newly developed case-hardening steel and by applying special heat treatment, we have provided the premium specification with further improved rolling fatigue life and corrosion resistance.

	Results of evaluations of bearings in an environment prone to rust (filled with water-mixed grease)		Results of evaluations of bearings in clean oil	
	Rust resistance comparison		Rust resistance comparison Life (JTEKT bench test)	
Conventional product				
Developed steel, carburized product ① (JHS520 standard)		Approx. 2.2-fold		Approx. 4-fold
Developed steel, special heat treated product ① + ② (JHS520 premium)		Approx. 3.8-fold		Approx. 7-fold
Test conditions	Humidity cabinet test conditions Test temperature: 49°C ± 1°C Relative humidity: 95% or more Test period: 96 hours		Sample: Tapered roller bearing Main dimensions: ø50 × ø120 × 30 Loading cycle frequency: 285 Hz Lubricating oil: Turbine oil (ISO #VG68) Oil supply: 2 L/min (room temperature) * Test was stopped after 50 × 107 times.	

Examples of actual use

Cold strip mill work roll (open type)

Conventional type
Used approximately 4 million tons (under DS)
Approx. 5-fold



No flaking

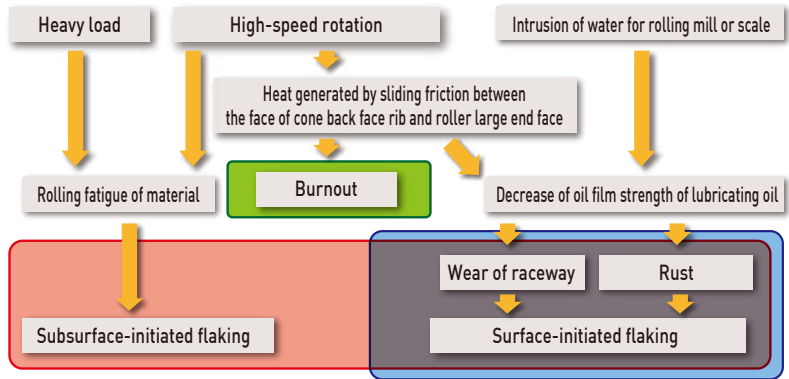
Cold strip mill work roll (sealed type)

Conventional type
Used for approximately 24 mont (under OP)
Approx. 4.8-fold



Hardly any indication of rust

(Failure mechanisms and countermeasure technologies for roll neck bearings)



(Countermeasure technologies)

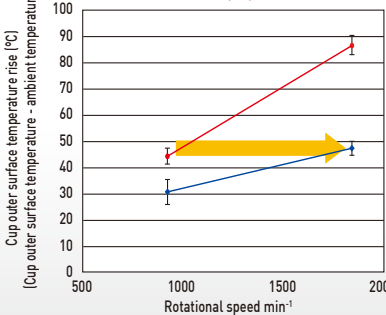
- Long-life/high corrosion-resistant steel
- Minimizing temperature increases
- High-performance seal

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

Technology for minimizing temperature increases (for application to thrust bearings)

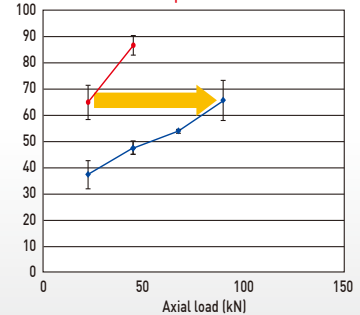
- On the basis of the EHL theory, improvement of the lubrication of the rolling part between the roller large end face and the face of cone back face rib
- Optimization of the shapes and suppression of temperature rising for the rolling part between the roller large end face and the face of cone back face rib

High-speed resistance comparison
Axial load (Fa): 45 kN



2 times the speed performance (at the same temperature rise)

Load resistance comparison
Rotational speed: 1840 min⁻¹

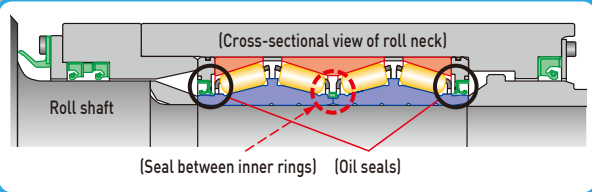


4 times the load performance (at the same temperature rise)

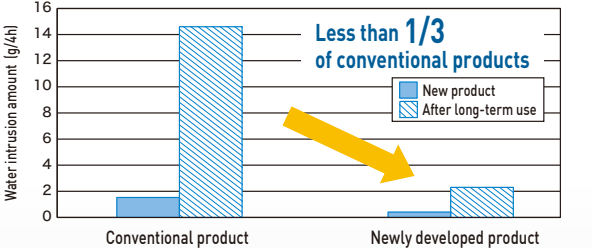
Preventing intrusion of water / mill scale

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

- JTEKT has developed a seal that adopts two improvements for preventing damage in oil seals: sealing performance and negative internal bearing pressure control.
 - Compared to conventional products, this prevents intrusion of coolant and scale for long-term maintenance-free performance.
- *This product was developed in collaboration with JTEKT SEALING TECHNO CORPORATION.

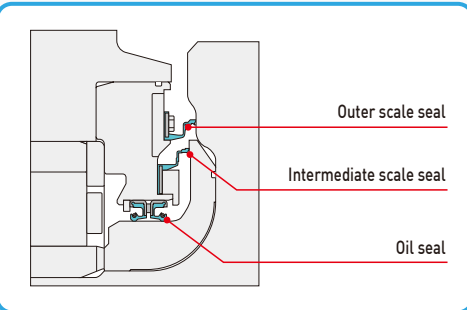


Water intrusion test results



Chock seals

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



For details, please scan QR code on the right to refer to the catalog for

- Roll neck bearings for rolling mill
- Large size ball & roller bearings



Bearings for multi-roll mill backup rolls

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



Required performance and issues

- Seal structure that maintains a favorable lubricated state
- Longer inner ring rolling fatigue service life
- Improving outer ring durability
- Improving outer ring rotational accuracy
- Improving ease of outer ring regrinding work

- Seal structure that maintains a favorable lubricated state
- Longer inner ring rolling fatigue service life
- Improving outer ring durability
- Improving outer ring rotational accuracy

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

[Service life]

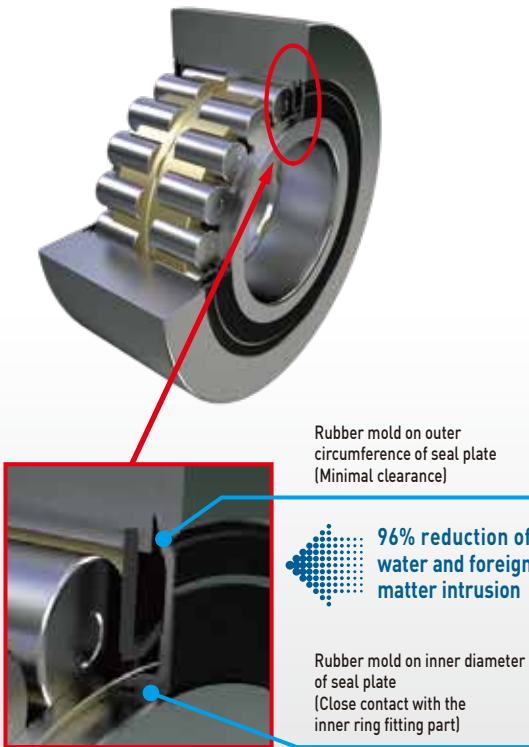
Conventional type

Approx. 2-fold (JHS210 Standard)

Approx. 4-fold (JHS210 Premium)

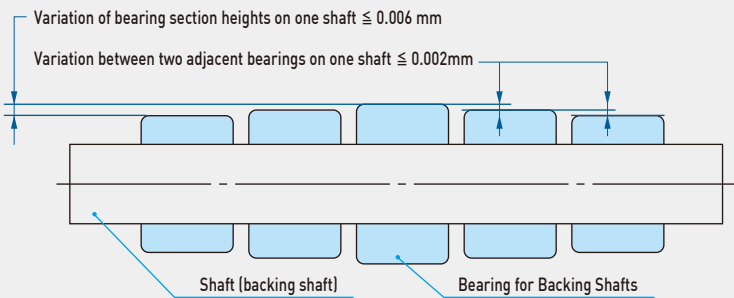
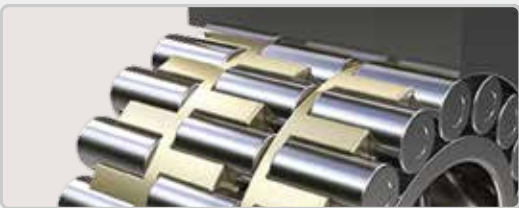
Premium specifications
JHS 210

Case-hardened steel is used for the inner ring to suppress the loss of rolling service life under low-viscosity lubrication. For oil-seal materials, fluoro rubber is used, improving sealing performance and realizing an increase in bearing service life of approximately four-fold compared to the conventional type.



Optimized load distribution

Contributes to rolled coil quality / precision



- Longer inner ring rolling fatigue service life
- Improving outer ring durability
- Improving outer ring rotational accuracy

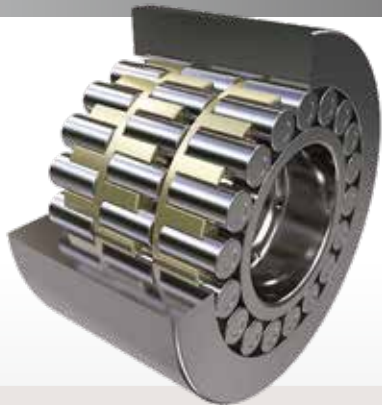
Bearings for forced oil lubrication

- Outer ring with both high rigidity and durability realized
- High resistance to fatigue realized owing to superior materials composition
- Design optimized to match surrounding structure

[Service life]

Conventional type

Approx. 1.5~3-fold (JHS210 premium specification)



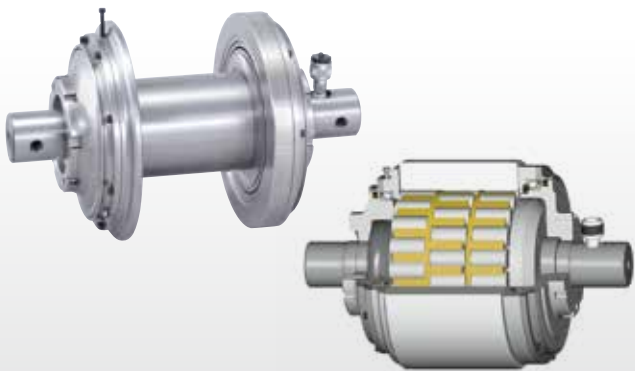
Premium specifications
JHS 210

Case-hardened steel is used for the inner ring to suppress the loss of rolling service life under low-viscosity lubrication. Bearing service life is approx. 1.5~3-fold that of conventional products.

- Improving ease of outer ring regrinding work

Bearings-regrinding Jigs

- The jigs minimize the radial run out of the bearings after regrinding
- The jigs improve efficient installation and removal



- Improving ease of outer ring regrinding work

Measurement for Bearing Section Height

- Possible to measure to 1/1000mm
- Possible to measure bearings radial run-out
- Easy bearing installation / removal



Core hardening

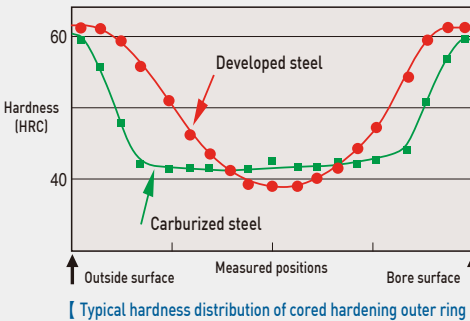
Surface-hardened layer improved approximately 3-fold

[Surface-hardened layer]

Carburized steel

Developed Steel

Approx. 3-fold

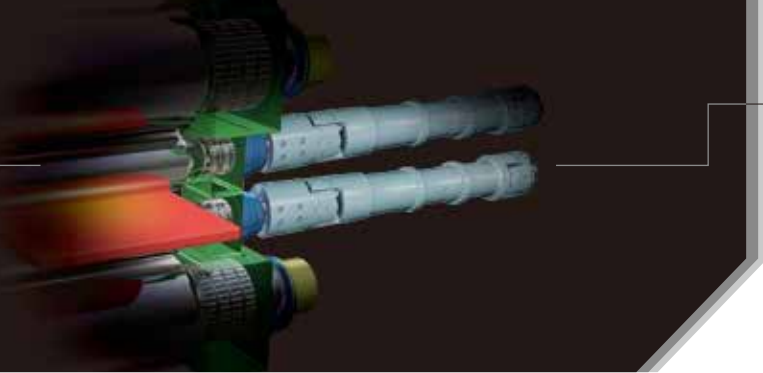


For details, please scan QR code on the right to refer to the catalog for cylindrical roller bearings for multi-roll mill backup rolls.



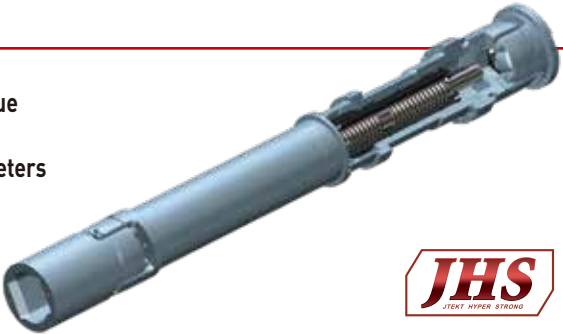
Drive shafts for rolling mills

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

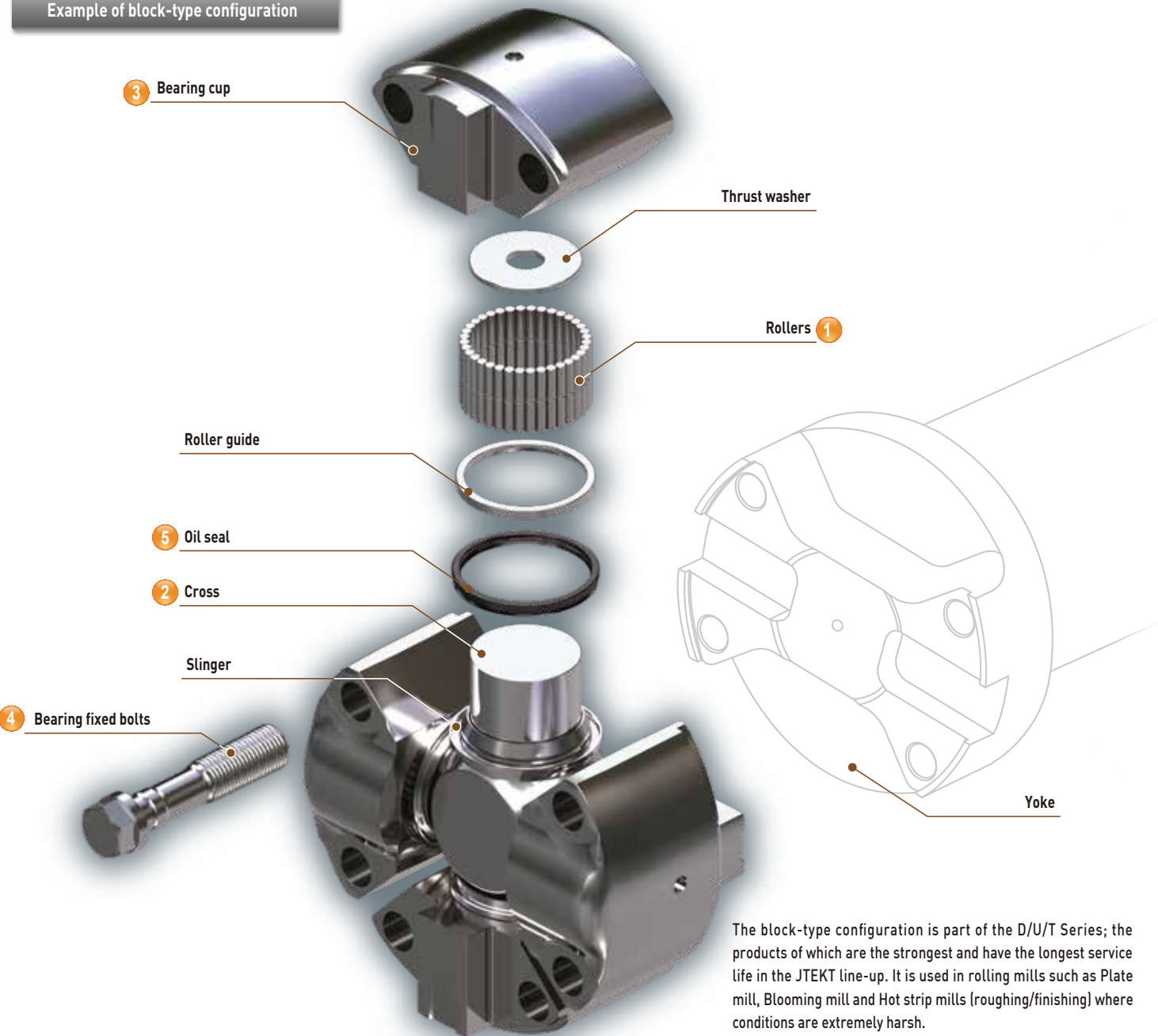


Required performance and issues

- 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



Example of block-type configuration



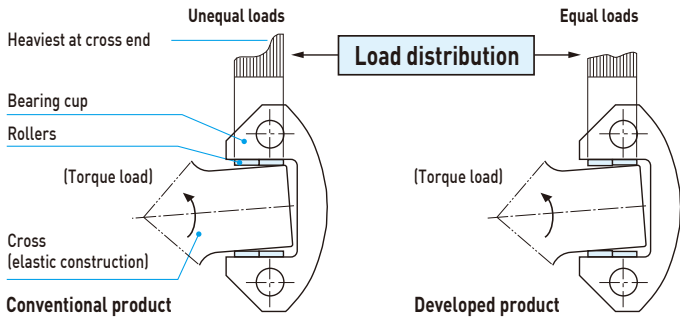
The block-type configuration is part of the D/U/T Series; the products of which are the strongest and have the longest service life in the JTEKT line-up. It is used in rolling mills such as Plate mill, Blooming mill and Hot strip mills (roughing/finishing) where conditions are extremely harsh.

Contributing to stronger, longer-life drive shafts

1 Application of different diameter rollers for cross & bearing

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

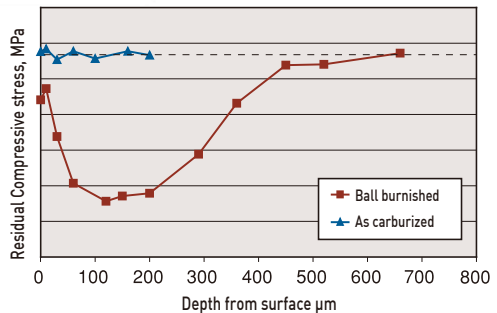
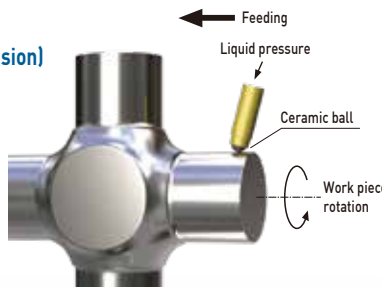
[Longer service life]



2 Ball burnishing on cross shaft

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

[Longer service life]

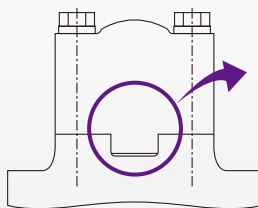


(Measurement result of residual compressive stress)

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

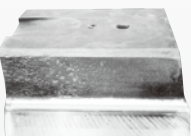
- Restraining of clearance between key and key way due to corrosion wear
- Alleviating bending stress of bolt ... Restraint of Strength reduction
- Minimizing heavy load at cross end ... Longer service life

[Improved corrosion resistance]

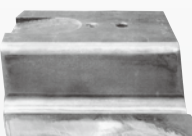


13 months

20 months



Without WC coat (corrosion)

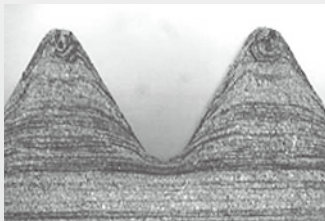


WC coated product (no corrosion)

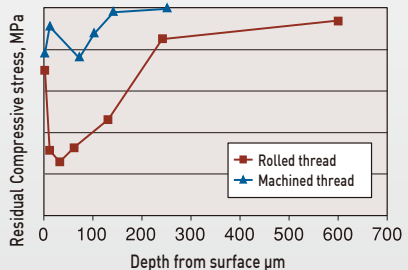
4 Application of form rolling to bearing set Bolt

- 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

[Improved fatigue strength]



[Fiber flow of rolled thread]



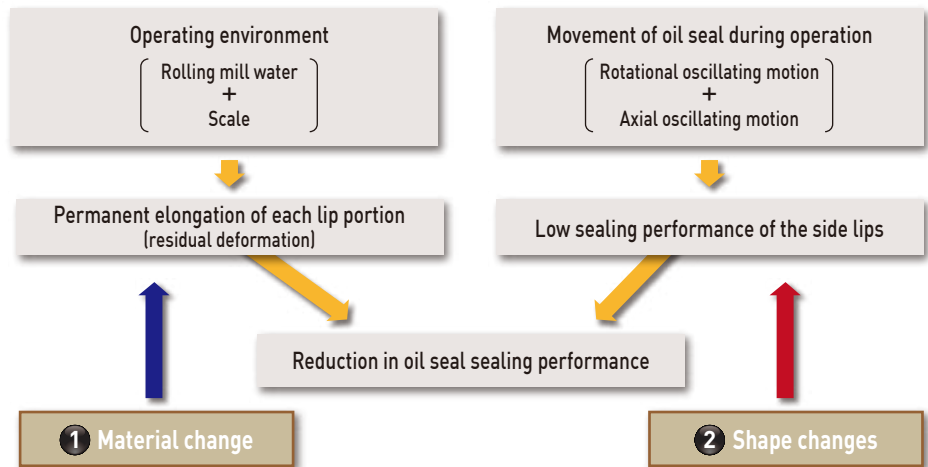
[Residual compressive stress distribution of rolled thread]

For details, please scan QR code on the right to refer to the catalog for drive shafts for steel production / industrial equipment.



Improved service life of oil seals and cross bearings

5 High-sealing oil seal



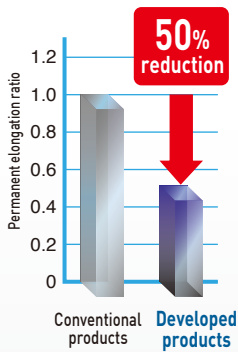
Features 1 Improved sealing performance through material change

- By changing from nitrile rubber to high nitrile rubber, permanent elongation under rolling mill water and high temperature (90°C) environment is reduced by 50% compared to conventional products.

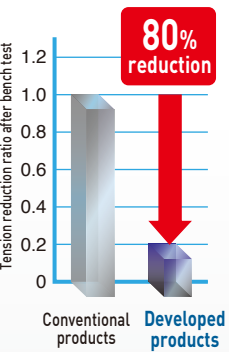
2 Improved sealing performance through shape change

- 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 conventional
- Reduced intrusion of rolling mill water by 80% compared to conventional products

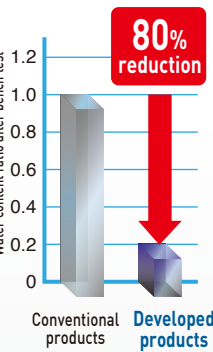
1 Confirmation of permanent elongation



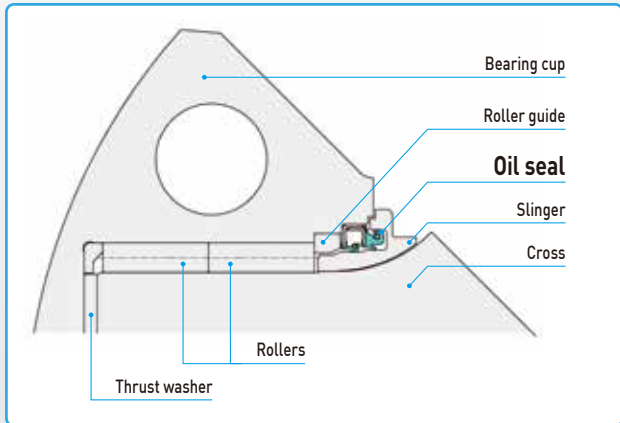
2 Confirmation of lip tension



3 Confirmation of sealing performance



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.



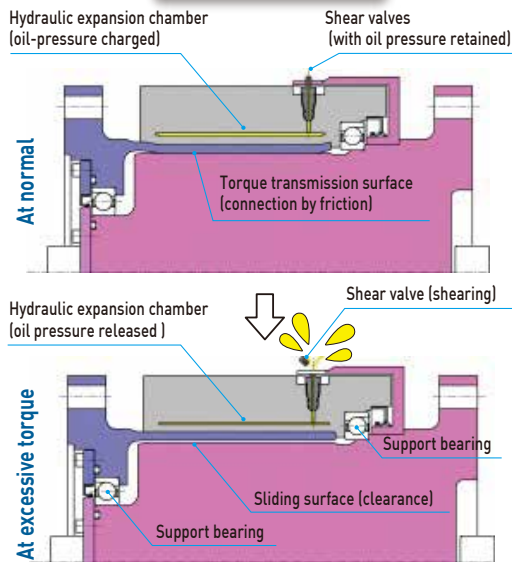
Optional mechanisms supporting drive shafts for rolling mill

Hyper coupling (torque limiter)

- Features
- 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



Operating principle



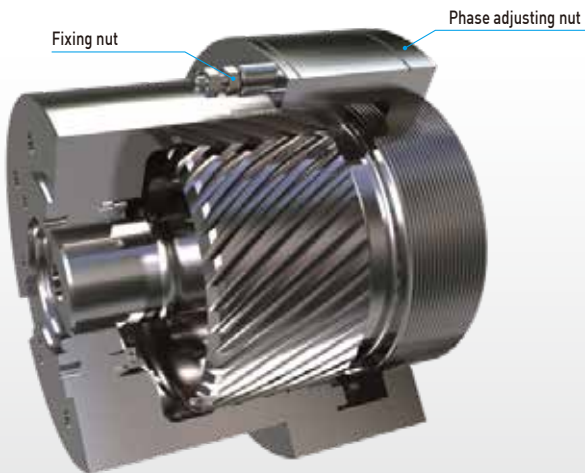
Recovery work process (required time: 30min)

- 1 Phase alignment
- 2 Shear valve replacement
- 3 Re-pressurizing hydraulic expansion chamber

Optional mechanisms supporting drive shafts for rolling mill

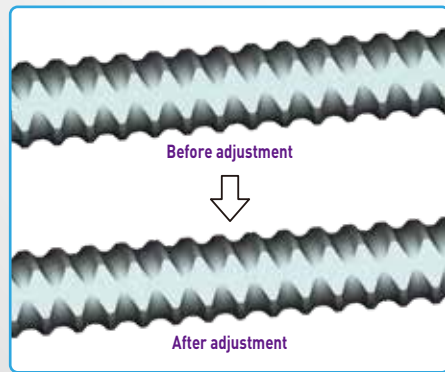
Roll phase adjustment device (for bar & rod mill)

- Features
- 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 dismantling the drive shafts.



Product example

Screw reinforcing bar

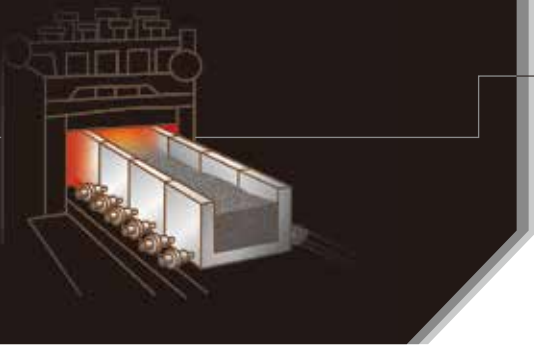


Adjustment work process (online work)

- 1 Measure misalignment of workpiece
- 2 Set adjustment angle
- 3 Loosen the fixing nut
- 4 Turn the adjusting nut the required amount
- 5 Tighten the fixing nut

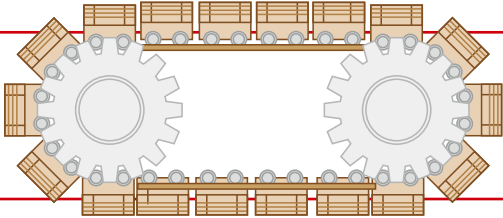
Bearings for sintering machine pallet car

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)

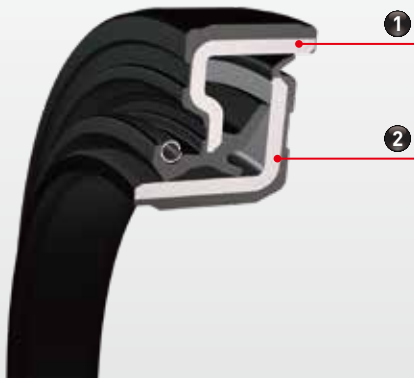
- Features
- Optimized outer ring thickness and carburized steel adopted
 - Capable of withstanding heavy loads/impact loads
 - Sealing structure using special seal
 - Prevents the intrusion of dust
 - Full roller shape adopted
 - High load capacity realized

Wheel bearings (Sealed type double row tapered roller bearings)

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

Intermediate seal

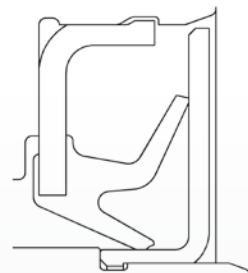
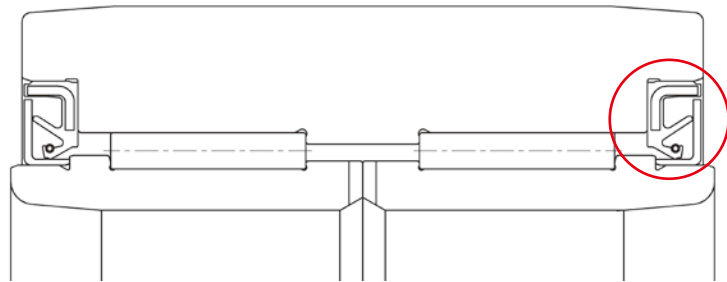
- Features
- Structure combining two parts (① and ②)
 - No damage to peripheral parts
 - High sealing performance owing to multilayer lip structure
 - Prevents the intrusion of dust



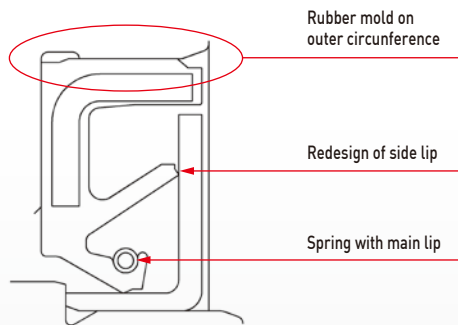
Preventing intrusion of dust

Improvement of special seals for sealed double-row cylindrical roller bearings

- Features
- Improvements have been made to the special seal of the sealed type double-row cylindrical roller bearing used in the pressure roller bearing, reducing the amount of foreign matter intrusion to the bearing by 70% compared to conventional products.
 - Improved flexibility by adding a spring to the main lip.
 - Improved sealing by flexible side lip and rubber mold on outer circumference.

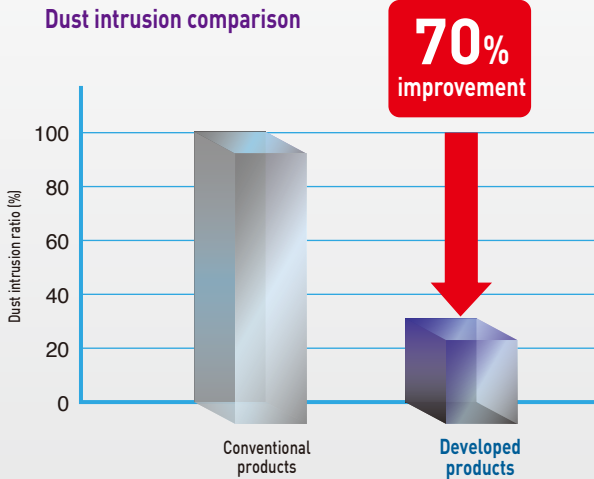


Conventional special seal



Developed special seal

Dust intrusion comparison



Bearing units for plate levelers

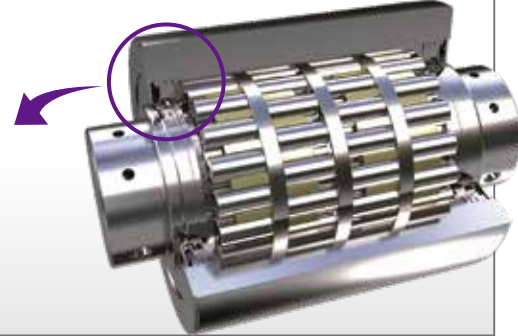
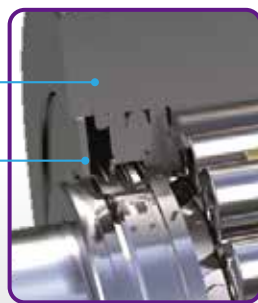
We provide plate leveler units to cope with harsh usage environments such as heavy loads, rust and the intrusion of water / foreign matter.



Required performance and issues

- Stable operation under heavy load
- High corrosion resistance
- Prevent the intrusion of water / foreign matter

- 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



Large Size Bearing Technology Development Center

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.

Bearing testing equipment for steel production equipment

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.



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.



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