

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 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-roll 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)

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.

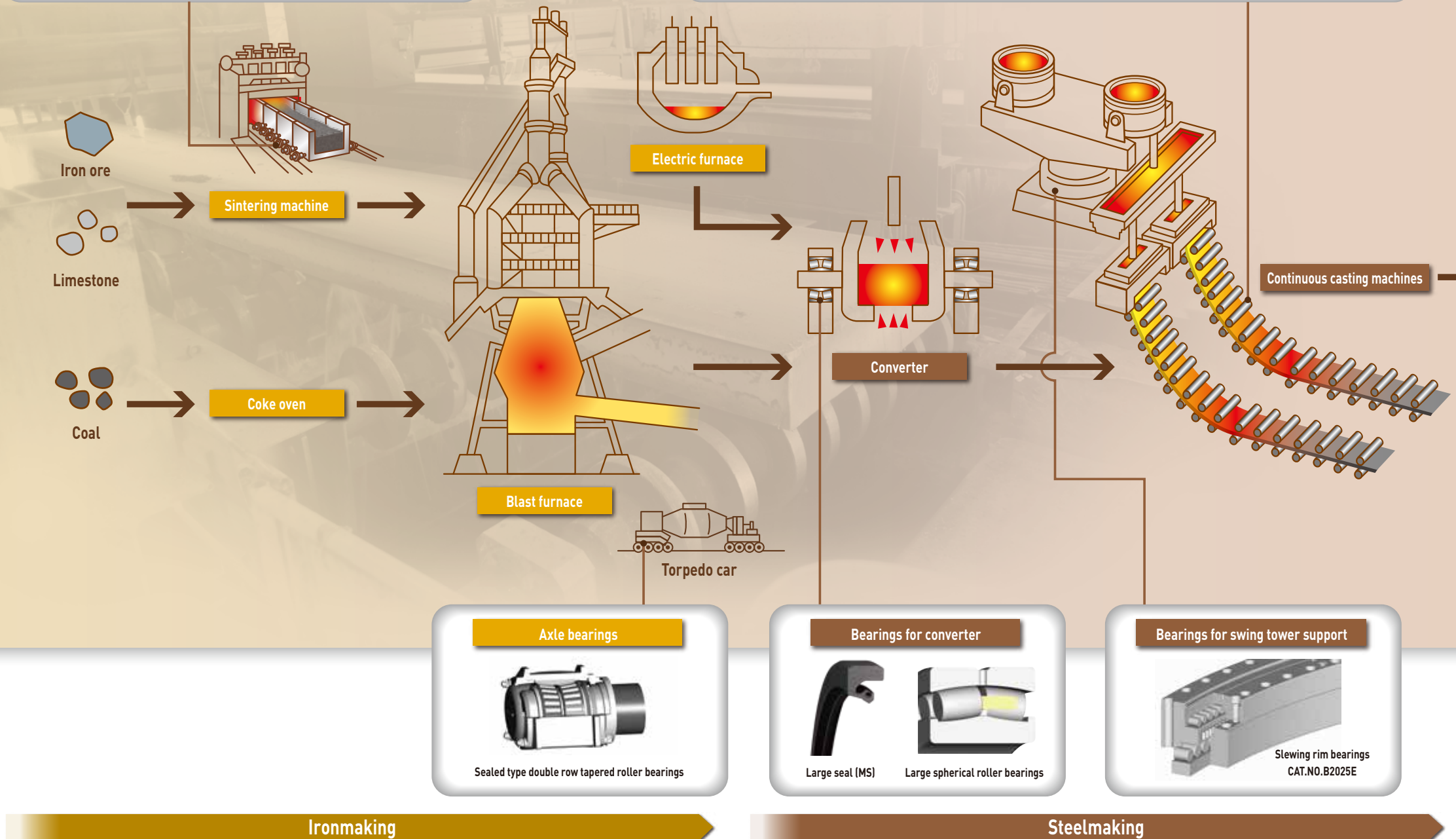
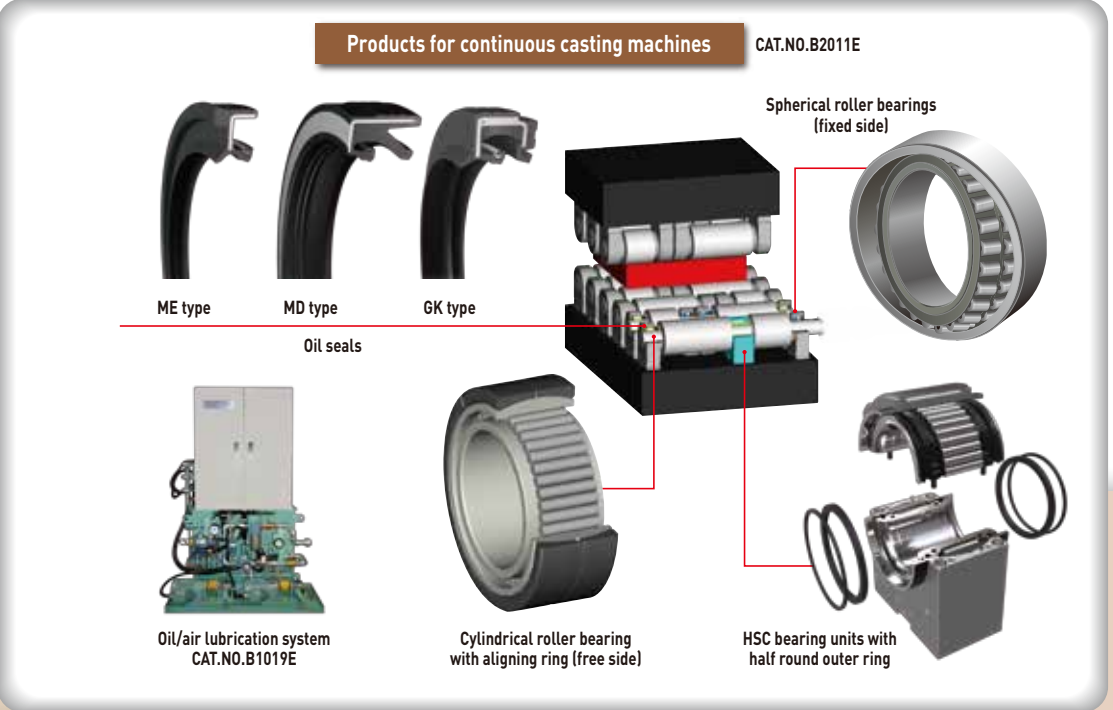
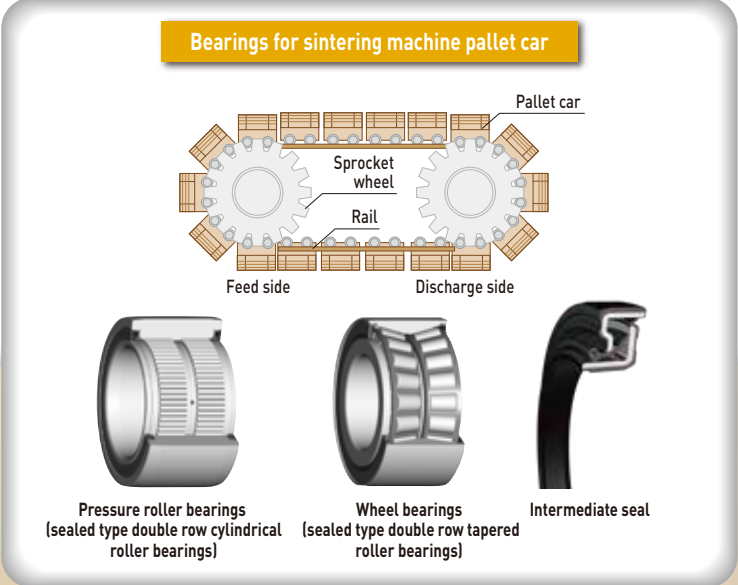
Only One Partner

We will continue our efforts to enrich the JHS series.

History of JTEKT products for steel production equipment

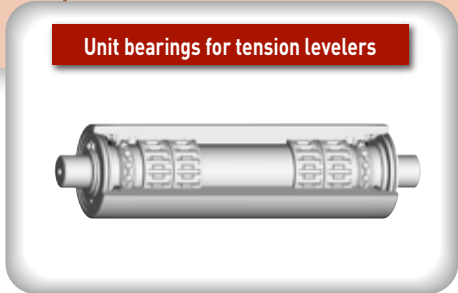
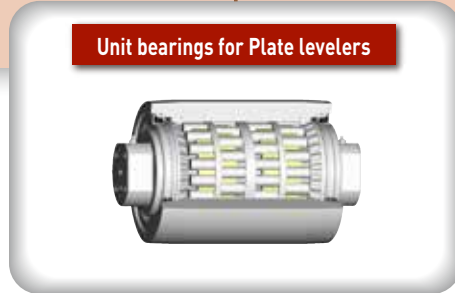
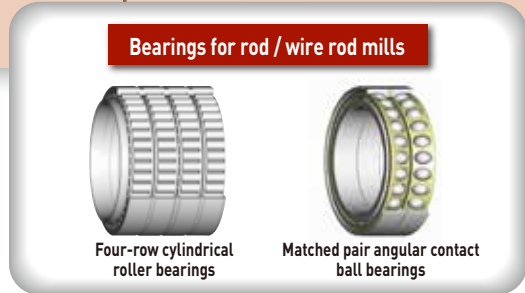
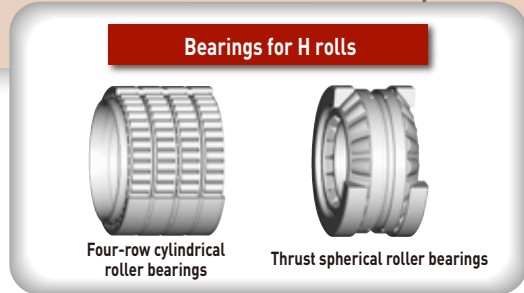
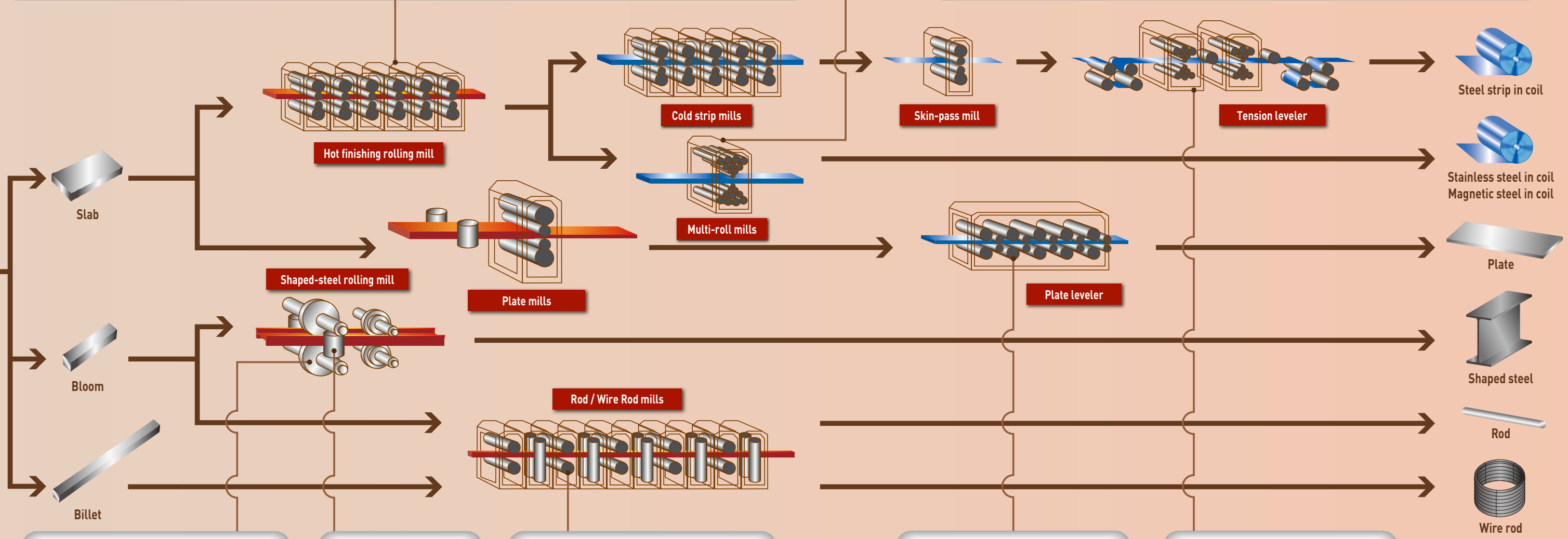
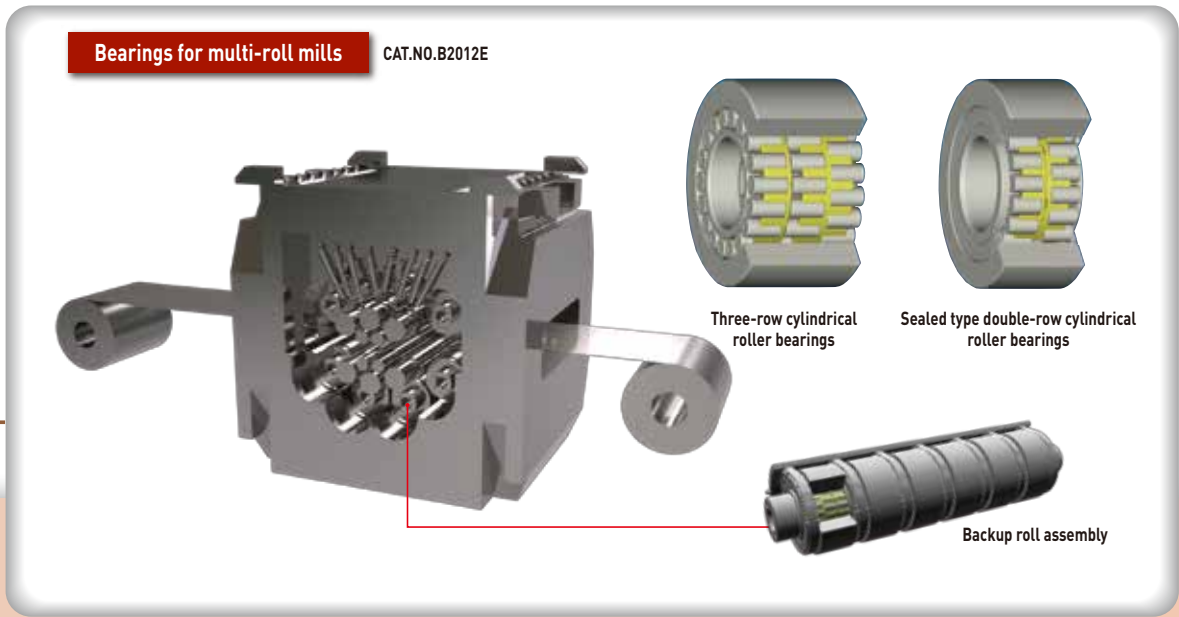
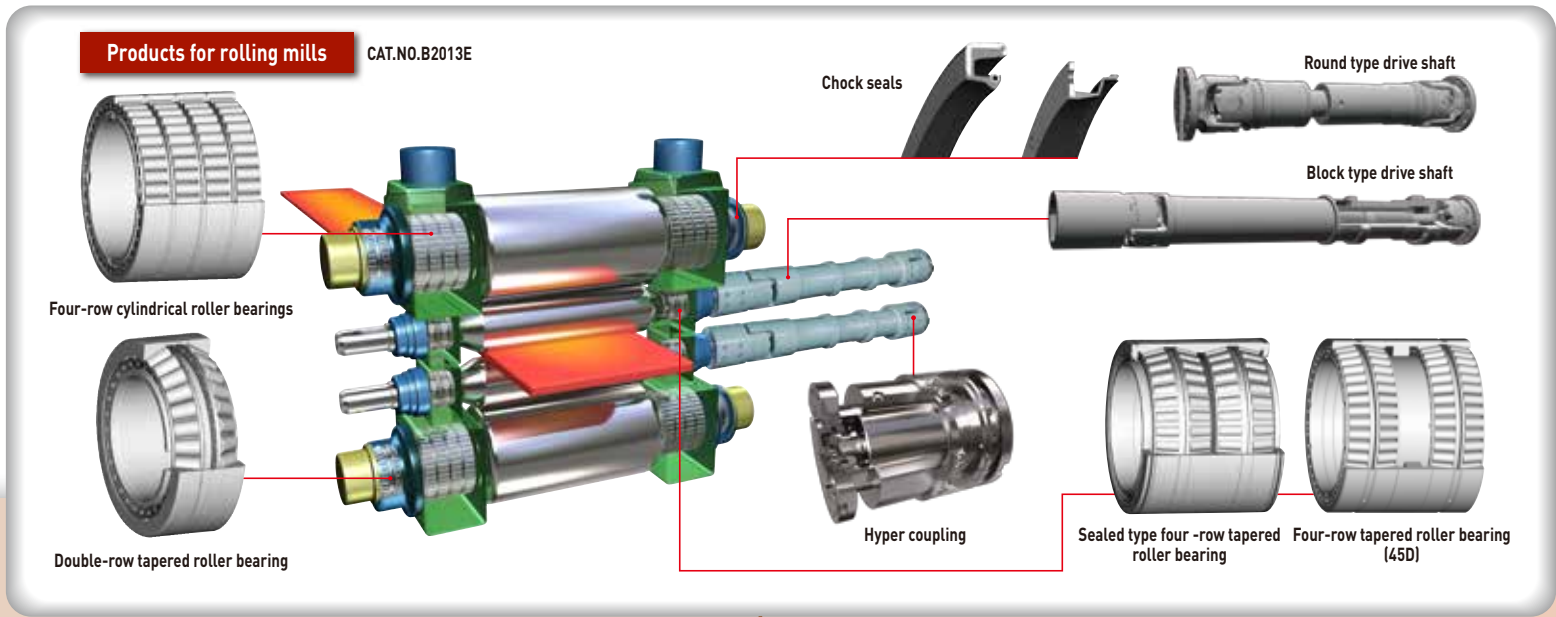
Year	Social conditions / Events	Steel manufacturer trends		
			(■ Bearings ■ Drive shafts)	
1940	WWII	Catch-up with industry overseas	Domestic production of bearings for rolling mills	Developed four-row tapered roller bearings for hot-strip mill work rolls Japan 1st Developed tapered roller bearings for hot-strip mill backup rolls Japan 1st
1950	Post-WWII			
1960	High growth period			Developed three-row cylindrical roller bearings with cage for Sendzimir mills First delivery of drive shafts for wire-rod mills Japan 1st
1970		Mass production, increase productivity; high-load / high-speed/continuous	Development of high-performance bearings (longer service life, high-speed compatibility)	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 1,680m/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	Stable growth period		Introduction of overseas Drive shaft technologies; domestic production	Received award from the Japan Society of Mechanical Engineers for hot-strip mill drive shaft Developed sealed cylindrical roller bearings for Sendzimir mills
1980				Developed (sealed) roll neck bearings for 6HI work roll shift mills
1985	Bubble economy	Large-variety, low-volume production; improve thickness accuracy; reduce maintenance cost	Development of bearings/drive shafts compatible with shape-controlled rolling mills	Improved bearings for backup rolls from oil-film bearings to roller bearings Japan 1st Developed split bearing units (spherical roller bearings) 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	Economic stagnation			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			Longer-life bearings/drive shafts and extended maintenance interval	Developed HSC split bearing units First delivery of drive shafts for Plate mills World 1st
2000	Economic expansion			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		Pursue higher functionality/better quality		First delivery of hyper coupling Adopted newly developed material and carbonitriding process (premium) for JHS520 highly corrosion-resistant long-life bearings
2010				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	Period of economic change			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



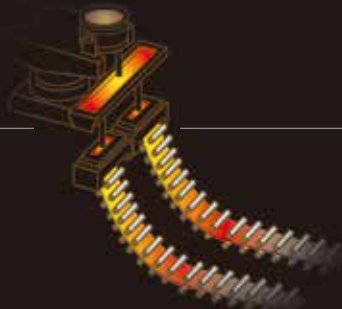
Ironmaking

Steelmaking



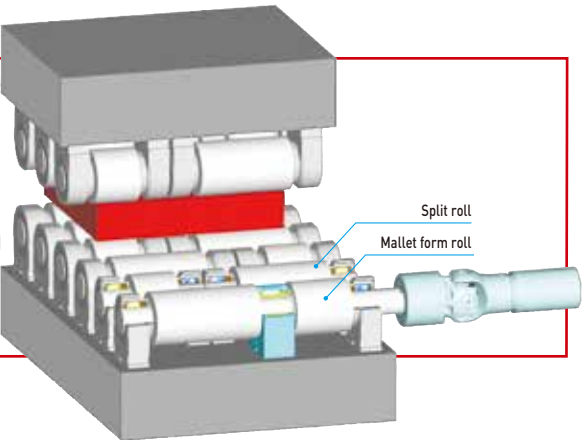
Products for continuous casting machines

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

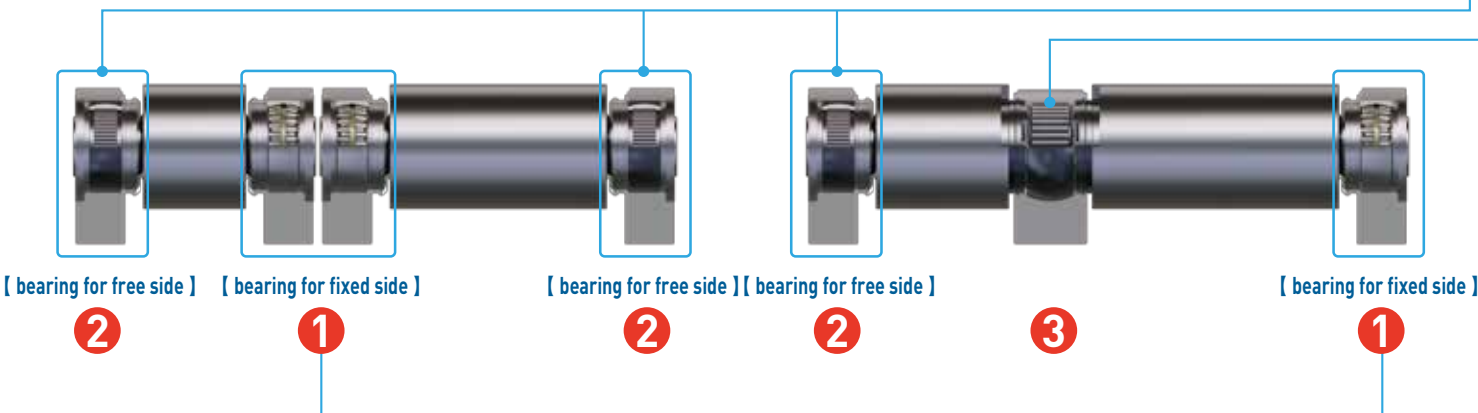


Roll configuration example 1 (single and split rolls)

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 / high temperature

1 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



Outer ring

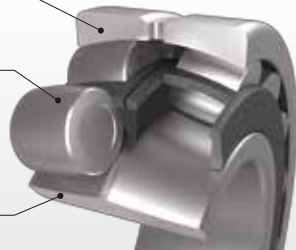
• JTEKT specification steel

Roller

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

Inner ring

• JTEKT specification steel



Bearing composition diagram

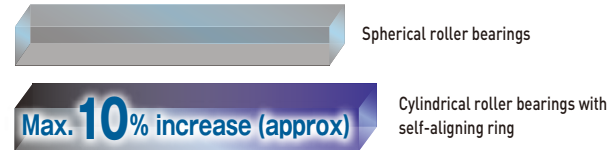


Measures for heavy load / high temperature

2 Cylindrical roller bearings with self-aligning ring

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

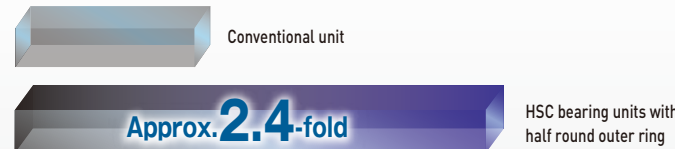
[Static load rating]



3 HSC bearing units with half round outer ring

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

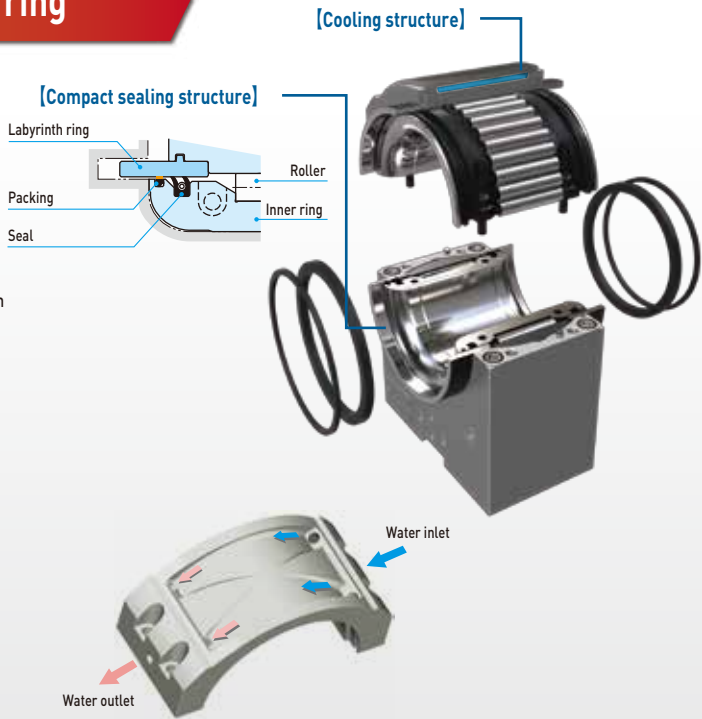
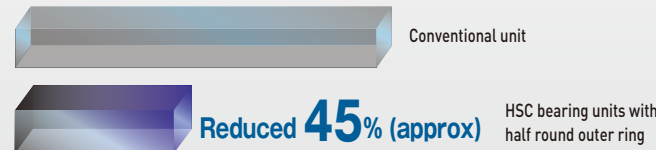
[Service life]



[Rated static load]



[Flow consumption]



Measures for intrusion of water / mill scale

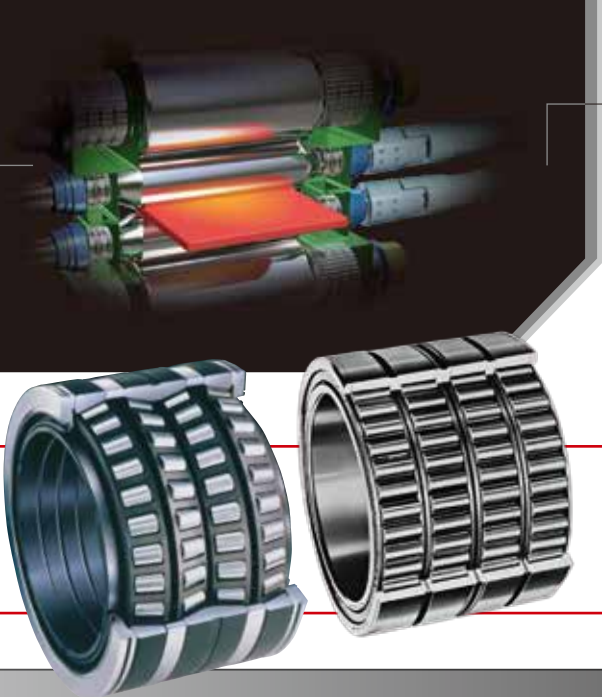
Oil seals

- 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

- 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

JHS 520

◆ 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 Lubrication: Grease (water content ratio, 30%)		
	Test piece form: 20 mm dia., 32 mm length Maximum contact stress: 5 800 MPa 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)

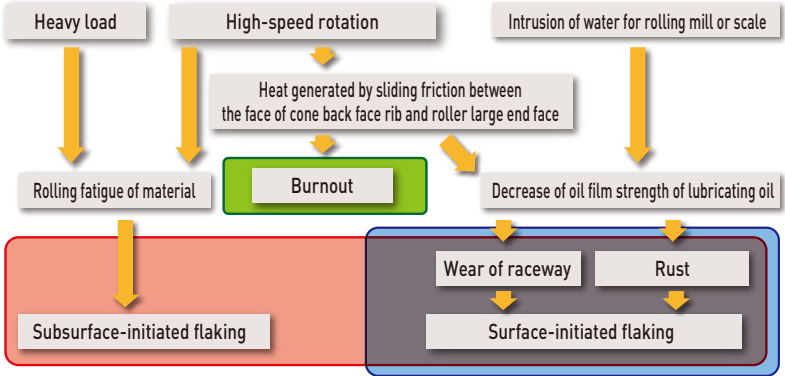
Conventional type

Used for approximately 24 mont (under OP)

Approx. 4.8-fold



Hardly any indication of rust



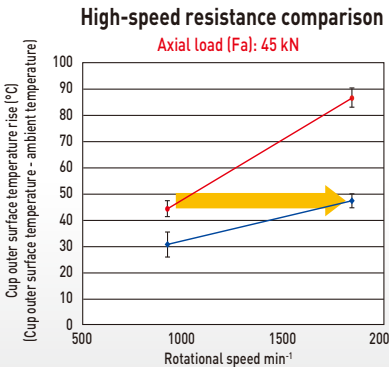
(Countermeasure technologies)

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

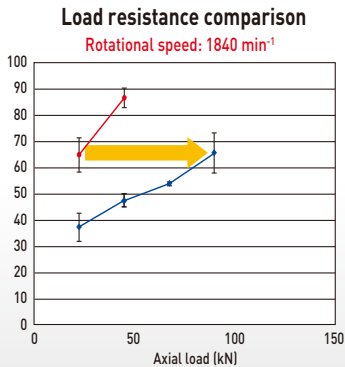
Improvement of durability and service life to withstand heavy loads and high-speed rotations

Technology for minimizing temperature increases

- 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



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

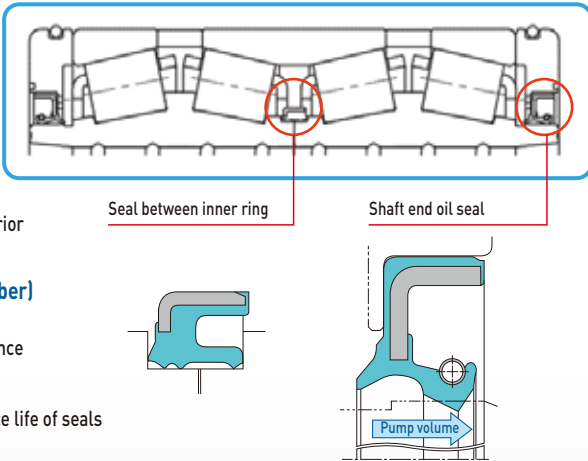


4 times the load performance
(at the same temperature rise)

Preventing intrusion of water / mill scale

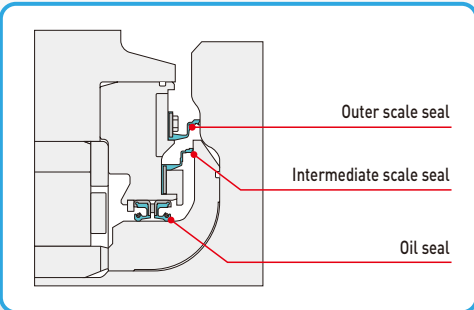
High sealing property oil seal for sealed-type, four-row tapered roller bearings

- Greater robustness due to improved sealing property
 - Optimization of seal lip shape
 - Maximized 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 30% 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



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

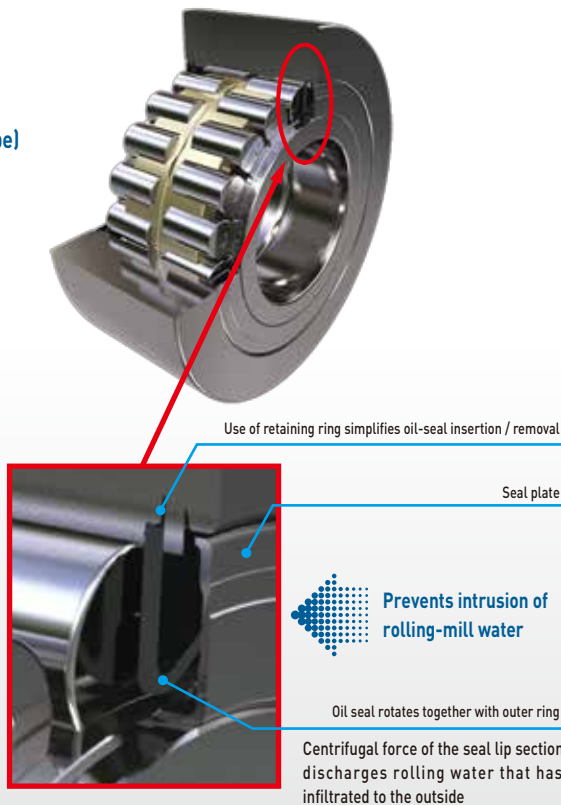
- Features
- Improved bearing service life (2-fold/4-fold compared to the conventional type)
 - High sealing performance
 - Space-saving size for simple installation / removal



Premium specifications

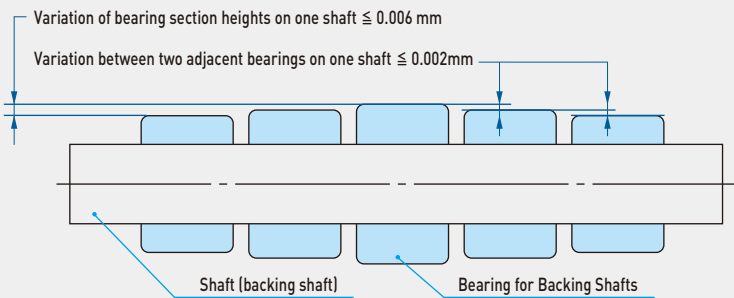
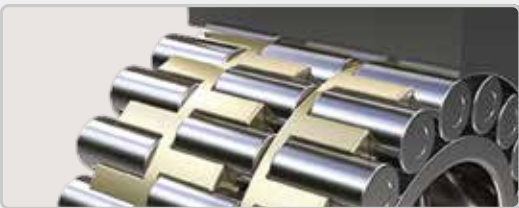
JHS 210

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

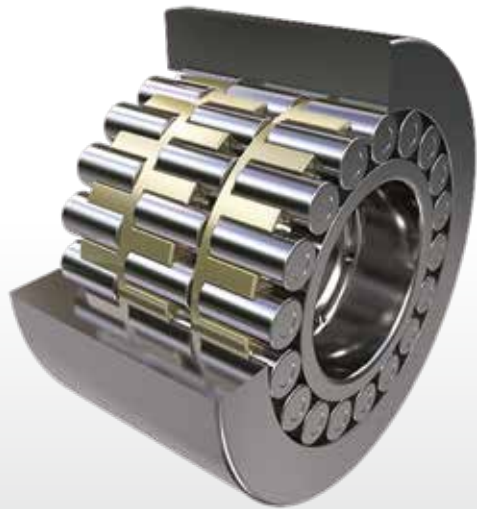
Bearings for forced oil lubrication

- Features
- 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

Premium specifications

JHS 210

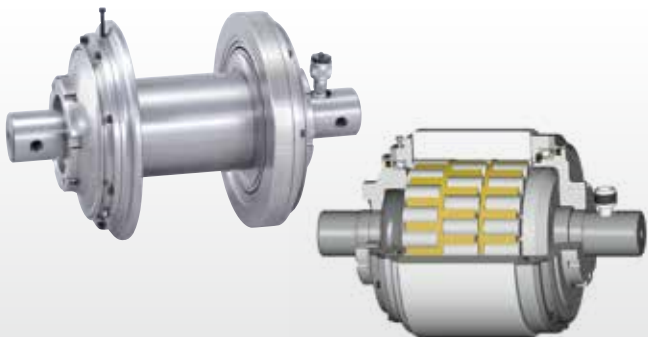
Case-hardened steel is used for the inner ring to suppress the loss of rolling service life under low-viscosity lubrication. Bearing service life is approx. 1.5-3-fold that of conventional products.



Improving ease of outer ring regrinding work

Bearings-regrinding Jigs

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



Improving ease of outer ring regrinding work

Measurement for Bearing Section Height

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



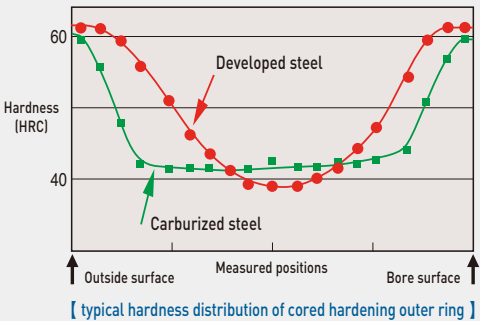
Core hardening

Surface-hardened layer improved approximately 3-fold

[Surface-hardened layer]

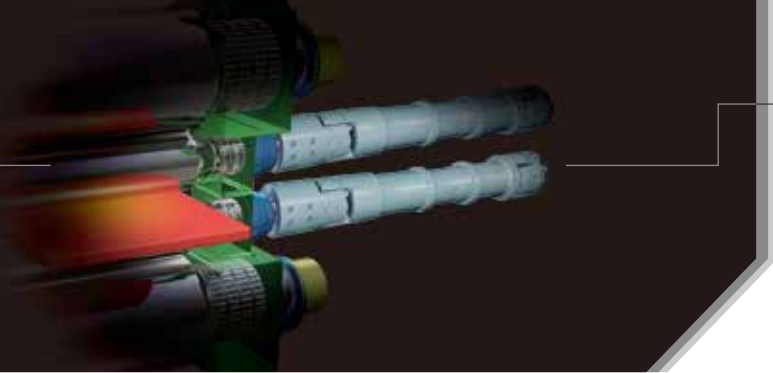


Approx. 3-fold



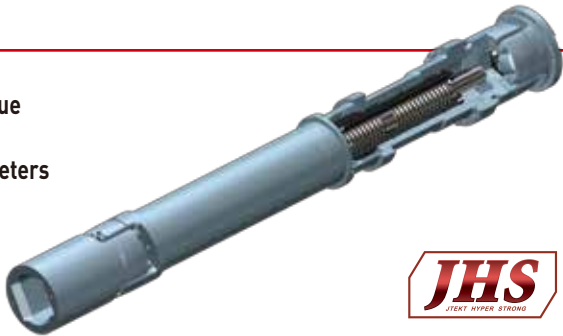
Drive shafts for rolling mills

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

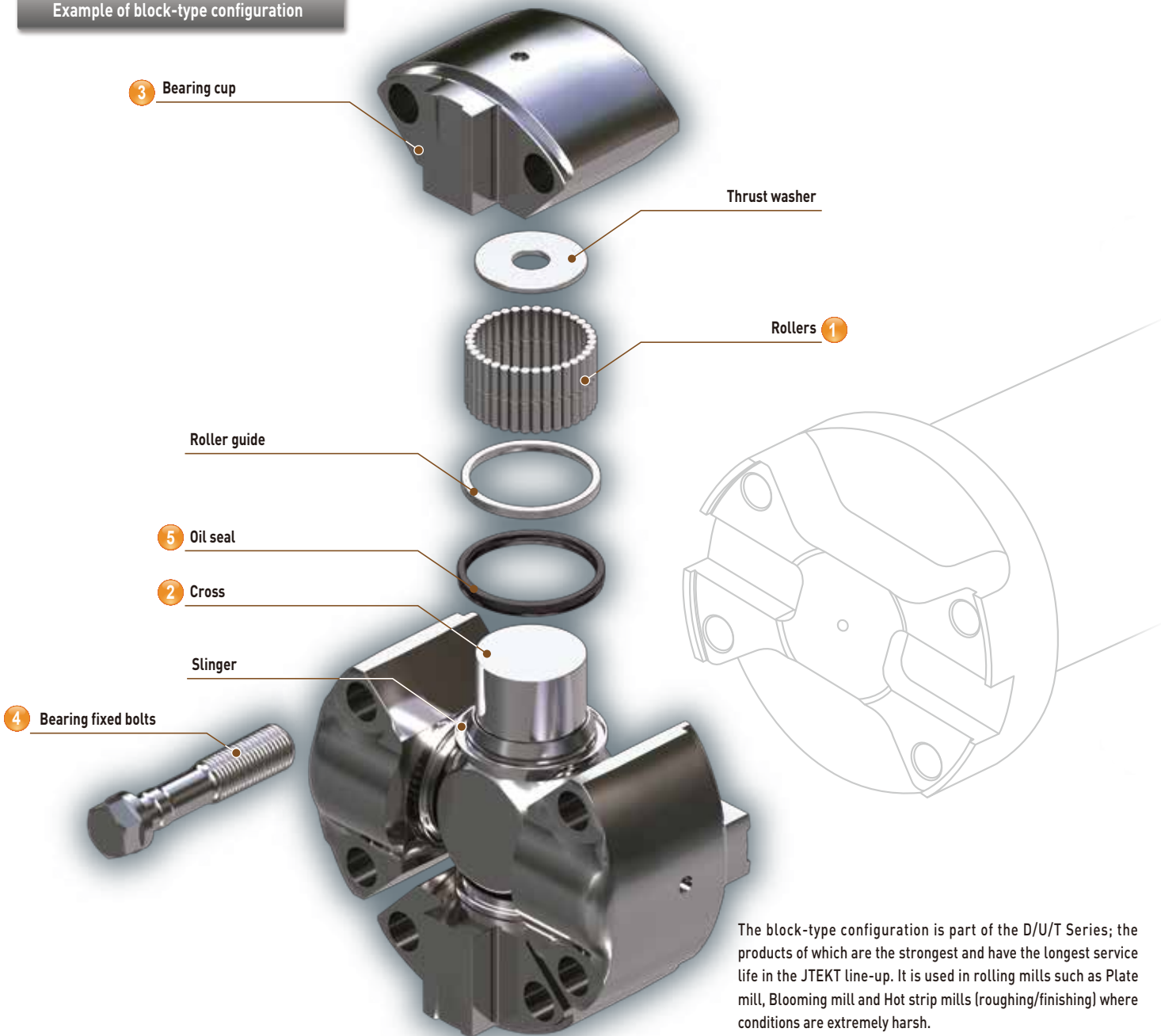


Required performance and issues

- 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



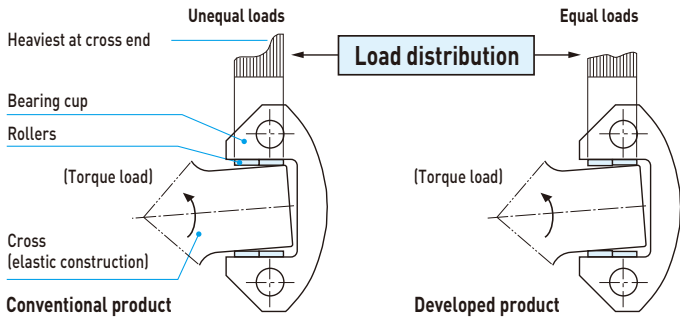
The block-type configuration is part of the D/U/T Series; the products of which are the strongest and have the longest service life in the JTEKT line-up. It is used in rolling mills such as Plate mill, Blooming mill and Hot strip mills (roughing/finishing) where conditions are extremely harsh.

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

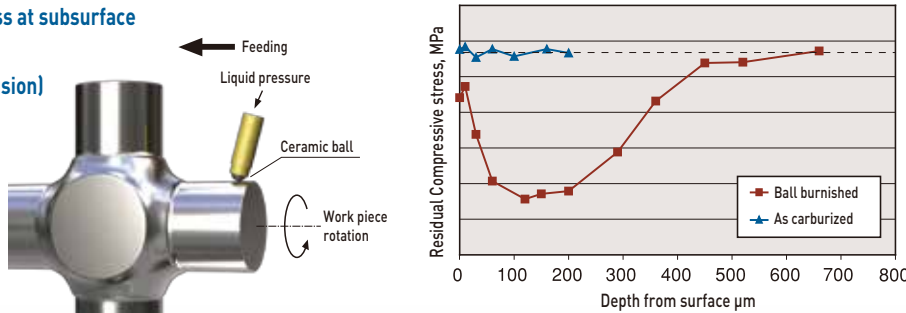
[Longer service life]



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]



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
- Longer service life

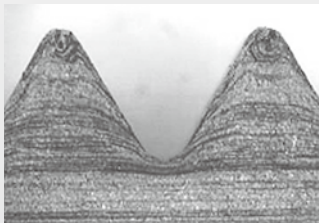
[Improved corrosion resistance]



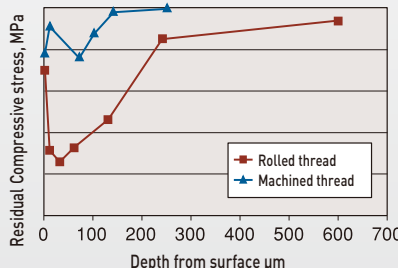
4 Application of form rolling to bearing set Bolt

- 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]

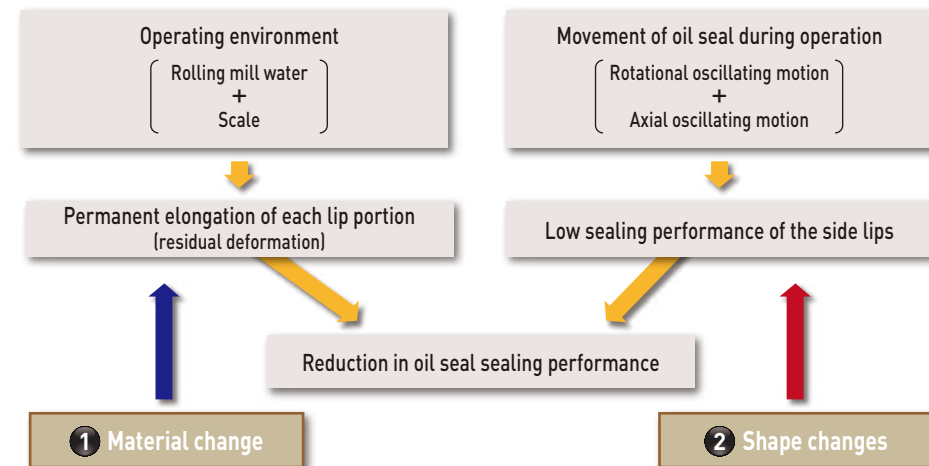


[Residual compressive stress distribution of rolled thread]



Improved service life of oil seals and cross bearings

5 Development of a high-sealing oil seal



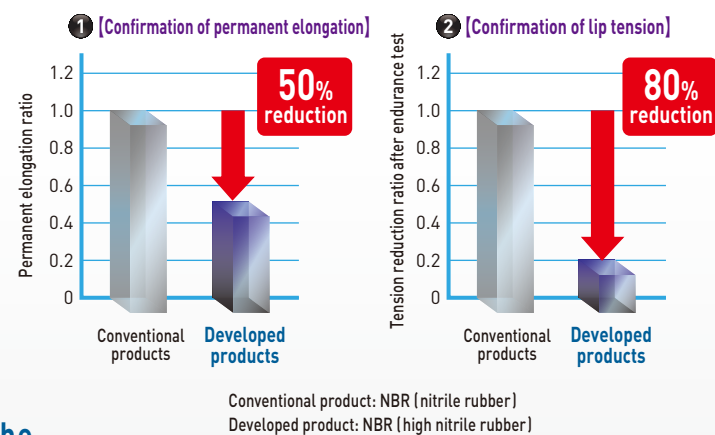
Features

1 Improved sealing performance through material change

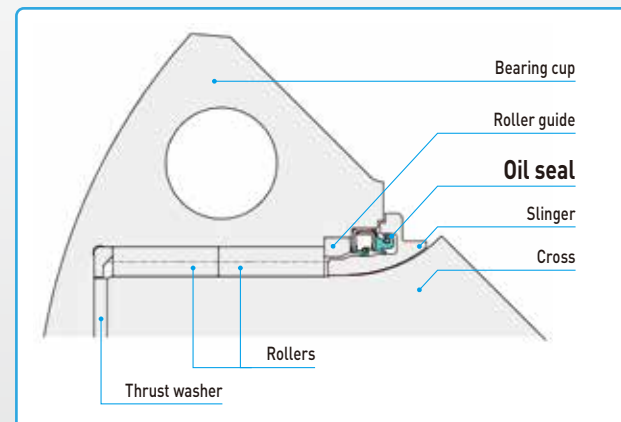
- Reduction of permanent elongation under rolling mill water and high temperature (90°C) environment by 50% compared to conventional

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 to conventional



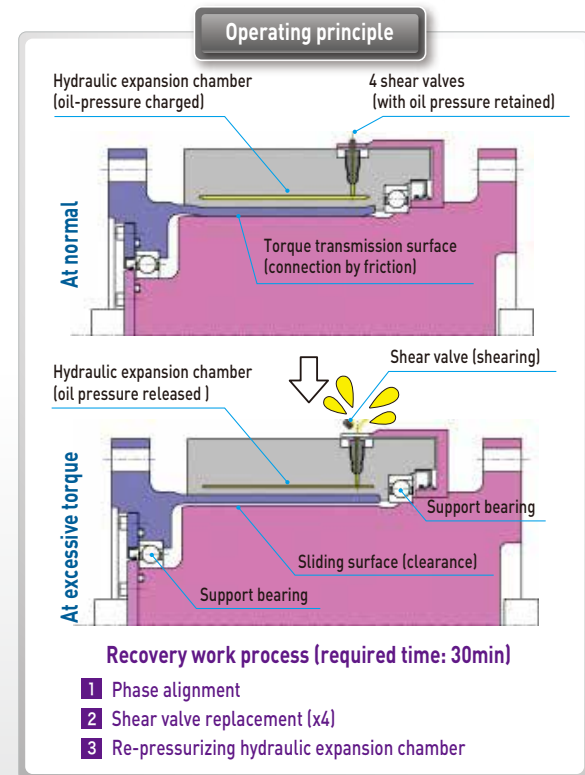
These changes suppress sudden damage to the cross bearing caused by deterioration in lubricating ability, thus contributing to reduced maintenance costs and improved productivity for customers.



Optional mechanisms supporting drive shafts for rolling mill

Hyper coupling (torque limiter)

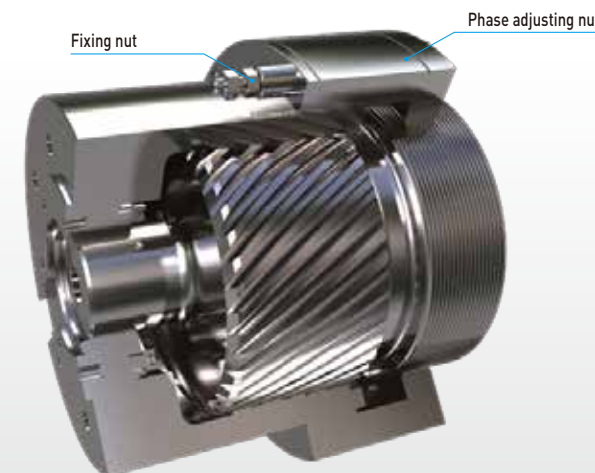
- Features
- Device for protecting rolling mill drive system from excessive torque
 - Significantly improved operating precision and durability
 - Easy to set operating torque
 - Significant reduced recovery time after finishing operation



Optional mechanisms supporting drive shafts for rolling mill

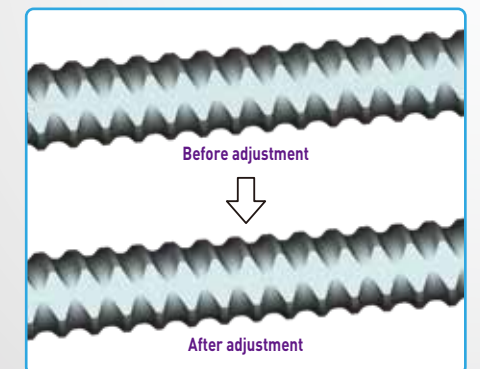
Roll phase adjustment device (for bar & rod mill)

- 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

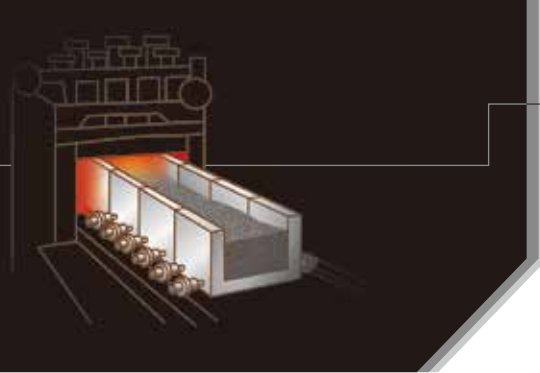


Adjustment work process (online work)

- 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

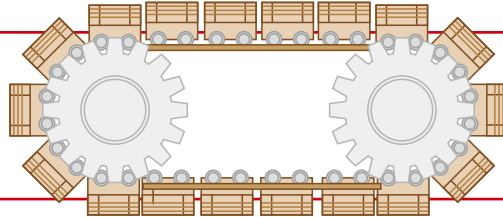
Bearings for sintering machine pallet car

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)

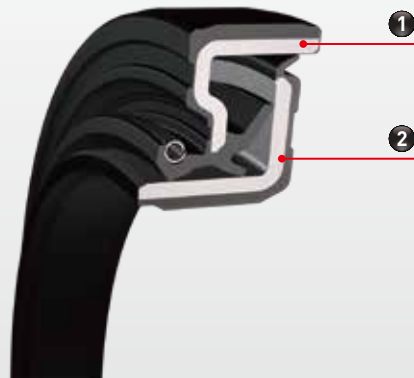
- Optimized outer ring thickness and carburized steel adopted
 - Capable of withstanding heavy loads/impact loads
- Sealing structure using special seal
 - Prevents the intrusion of dust
- Full roller shape adopted
 - High load capacity realized

Wheel bearings (sealed type double row tapered roller bearings)

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

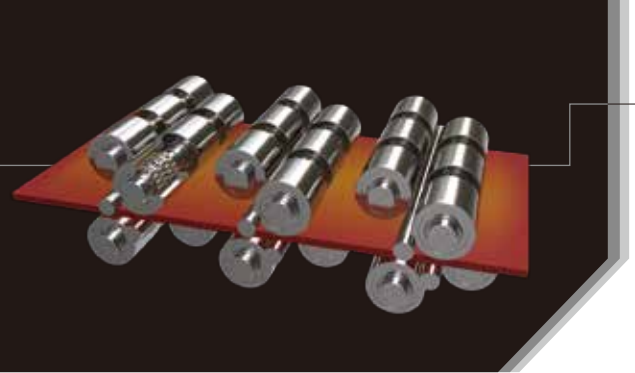
Intermediate seal

- 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



Bearing units for plate levelers

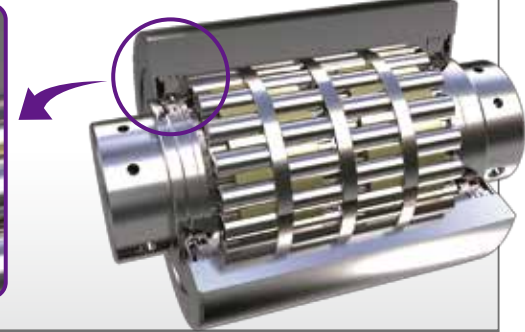
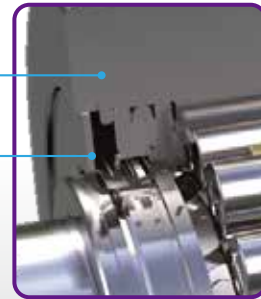
We provide plate leveler units to cope with severe usage environments such as heavy loads, rust and the intrusion of water / foreign matter.



Required performance and issues

- 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.



*Our Customers
around the World*

JTEKT Technologies and Quality from Japan

JTEKT Corporation WEB site

<https://www.jtekt.co.jp/e/>



JTEKT Bearing WEB site

<https://koyo.jtekt.co.jp/en/>



JTEKT Overseas hubs

<https://www.jtekt.co.jp/e/company/global.html>



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