



 **Wafangdian Bearing Group Corp.,Ltd.**

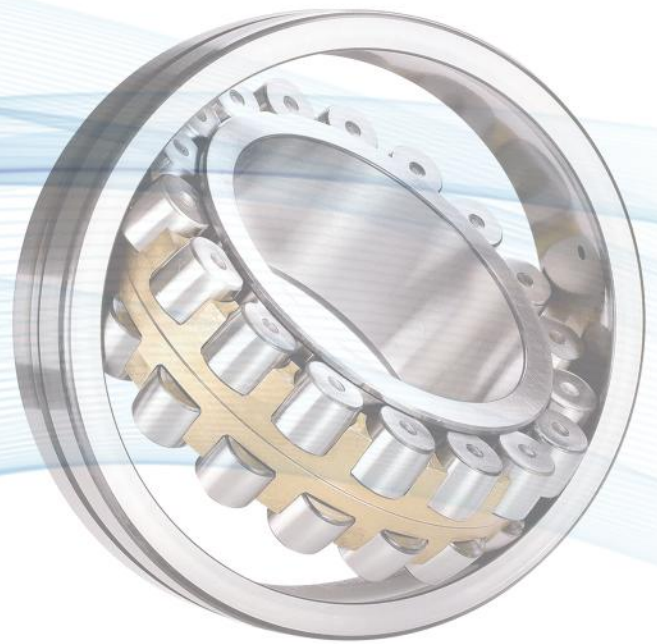
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ZWZ GROUP



ENTERPRISE LAYOUT



2012

ZWZ American company
(Los Angeles, USA)



2013

ZWZ Germany Production Base
(Leipzig, Germany)



2013

ZWZ US Overseas Warehouse
(California, USA)



2015

ZWZ Europe Research & Development Center
(Schweinfurt, Germany)



2014

ZWZ US Engineering Technical Center
(Detroit, USA)



1938

ZWZ Head Quarter(Wafangdian,Dalian)



2005

Precision Technology and Manufacturing Industrial Park (Wafangdian,Dalian)



2010

High-end manufacturing Industrial Park (Wafangdian,Dalian)



2008

Motor Bearing Plant(Bonded Area, Dalian)



1994

Rolling Element Manufacturing Plant (Pulandian,Dalian)



1970

Liaoyang Bearing Company(Taizihe,Liaoyang)



2002

Car Wheel-hub Company(Area for development,Dalian)



2013

Ball Screw Plant(Area for development,Dalian)

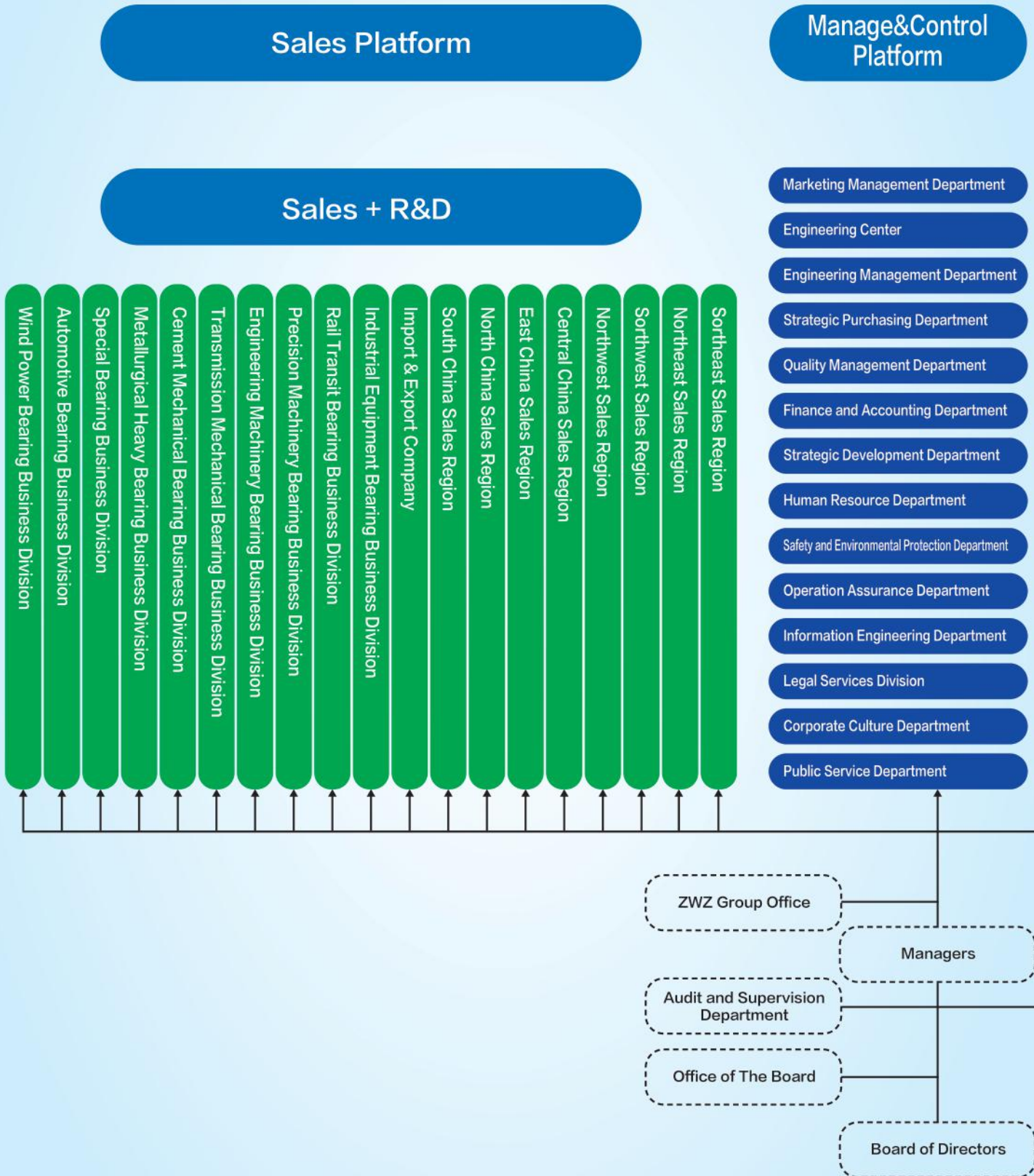


2013

National Large Size Bearing Engineering Research Center (Wafangdian,Dalian)



Organization Chart



**Independent Legal Person
(Business Unit) Platform**

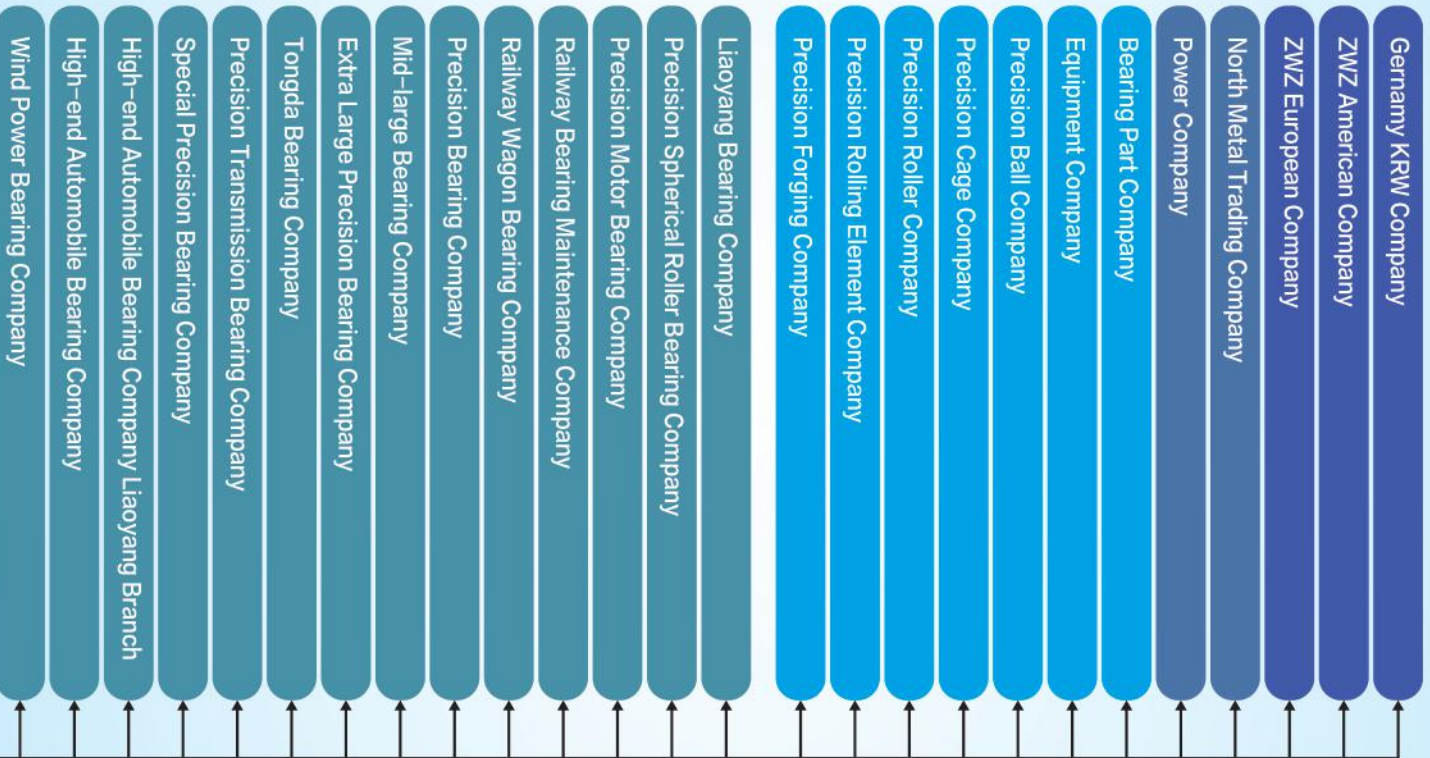
Wholly Owned, Holding

Finished Product Unit

Spare Parts Unit

**Insurance
Unit**

**Overseas
Units**





ZWZ Profile

Wafangdian Bearing Corp Ltd, branded ZWZ is the most famous bearing manufacturer in China.

More than 80 years' experience of bearing manufacturing, ZWZ has produced more than 20000 types of bearings, and 400 new types are added every recent year.

ZWZ has strong technical support capability. It's R&D center is the national large-size bearing technological center. It has ZWZ-Romax global bearing joint simulation technology center, ZWZ-Taylor Hobson joint testing laboratory and full-functional bearing life testing center. In addition, ZWZ's Schweinfurt R&D Center in Germany is responsible for research and development of high-end industrial equipment bearings and wind power bearings. ZWZ Detroit R&D Center is for automotive bearings.

ZWZ has 9 manufacturing bases, 8 in China, 1 in Germany. There are totally 11000 employees. Production range is from ID 20mm to OD 16000mm for all kind of bearings. The highest precision is P2.

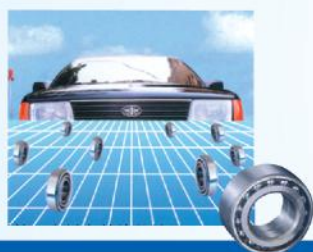
ZWZ is serving to steel plants, cement industries, mining industries, diversified transmission gearboxes, construction machineries, oil machineries, wind mills, automobile, railway, and shipping, etc.

China Bearing No.1

- The first piece of industrial bearing (1949 year)
- The first piece of automotive bearing (1953 year)
- The first piece of tank inducer bearing (1958 year)
- The first piece of railway locomotive wheel bearing (1958 year)
- The first piece of nuclear industry bearing (1961 year)
- The first piece of railway wagon bearing without axle box (1963 year)
- The first piece of machine tool precision bearing (1965 year)
- The first piece of metallurgical rolling mill bearing (1974 year)
- The first piece of bearing for large satellite observers (1969 year)
- The first piece of front wheel hub bearing (1989 year)
- The first piece of speed-up passenger, locomotive and wagon bearings (1989 year)
- The first piece of insulated bearing (2001 year)
- The first piece of new type armed helicopter turret slewing bearing (2003 year)
- The first piece of megawatt wind power bearing (2006 year)
- The first enterprise provided bearing for wind power turbines in all-round way.
- The first piece of the largest and heaviest cement roller press bearing (2013 year)
- The only one company provides full range of passenger train,railway wagon,and locomotive and subway light rail axle box bearings.
- The first enterprise realized “Made in China” of railway heavy duty wagon bearings.
- The first largest steel ball in China (2014 year)
- The first piece of thrust ball bearing for the world's largest reclaimmer. (2014 year)
- The first bearing applied in the core part of the first antenna of SKA from international scientific engineering project.
- The first piece of 4.5MW pitch bearings for mainstream onshore models of European world-renowned wind power manufacturers (2019 year)
- The first piece of bearing for the world's largest semi-direct-drive offshore wind turbine of 11MW.(2020 year)



The First Industry Bearing of New China come from here



The First front Car Hub Bearing of China



The First Railway Locomotive Bearing of China
The First Railway Cargo Non-Journal Box Bearing of China
The First Railway Passenger Car Bearing of China



The First Double-Row Sealed Radial Ball Bearing of China



The First Nuclear Industry Bearing of China



The First Large size Track Telescope high precision Bearing of China



The First Rolling Mill Bearing of China



The First Tank Inducement-Wheel Bearing of China



The first piece of megawatt wind power bearing



Research And Development

Top Overseas Engineering And Technology Company

The Global Joint Center With Romax For Bearing Simulation Technology



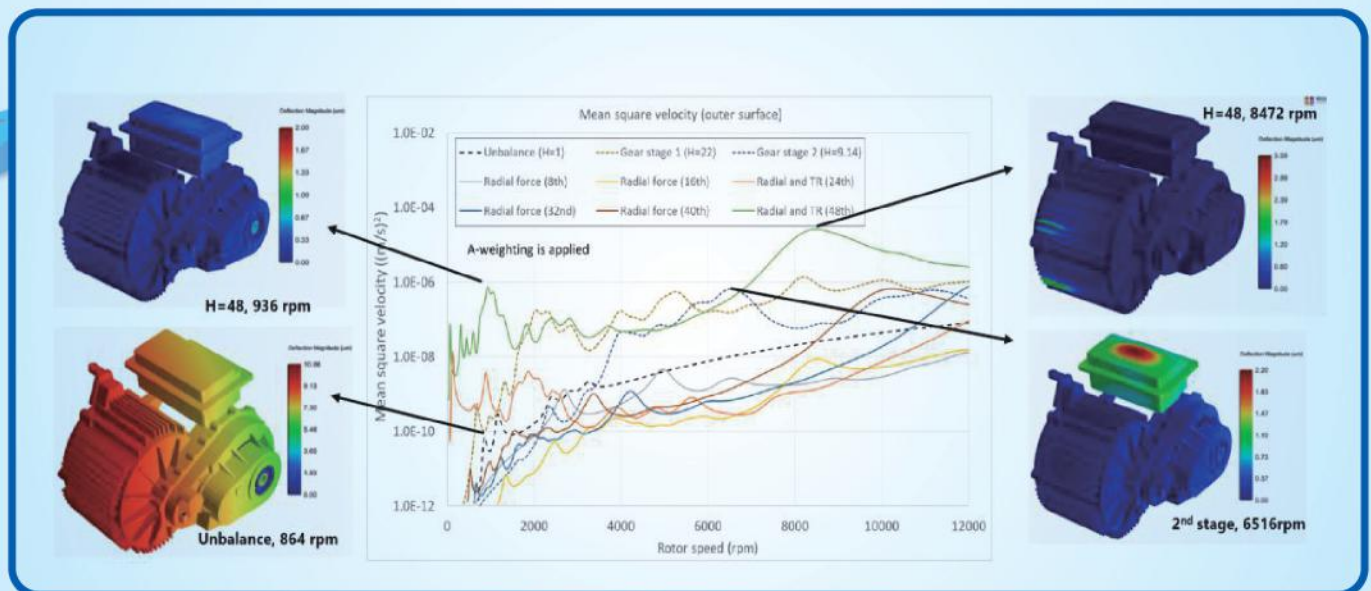
Invest the world's most excellent bearing expert team resources, to research the most cutting-edge bearing simulation technology, and carry out cooperation in the fields of large megawatt offshore wind power main bearings, aerospace bearings, railway bearings, automotive bearings, RV robot reducer bearings and so on.

Simulation Research

- Research on Optimization method of bearing parameters
- Research on bearing fault diagnosis and failure mechanism

Generic Technology

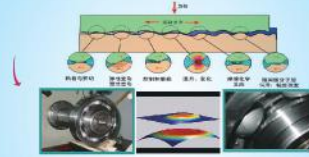
- Mechanism and optimization method of macroscopic and microscopic skid of high speed bearing
- Influence of high-speed bearing system characteristics on motion characteristics of electromechanical system and bearing parameter optimization method.
- The Influence of size characteristics and deformation on the life of large bearing rings and the theory of bearing optimization



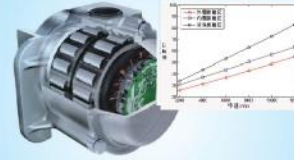
Projects Cooperated with Universities with Specialty



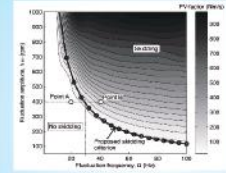
Research on correlation between macro-micro design and manufacturing parameters and vibration of bearing raceway.



Dynamics consideration boundary lubrication contact and control technology of rolling body motion attitude.



Theory and test method of bearing thermal reference speed.



Theory of bearing dynamic performance (friction torque, etc.) and evaluation method.



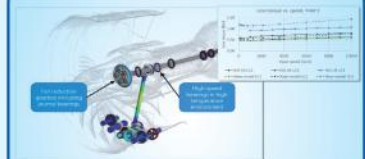
Theory and test method of bearing correction life (high reliability life) and infinite life.



Analysis theory of bearing kinematics and dynamics.



Preparation and application technology of advanced engineering plastics and ceramic materials.



Research on power consumption characteristics of bearings considering the influence of load sharing, dislocation and lubricating oil.

Modern Design Method of Bearing

Antifriction design, lightweight design, reliability design, etc.

Advanced Heat Treatment Technology and Surface Modification Technology

Shape control, retained austenite content and residual stress control, etc.

Precision Measurement Technology

Thin-walled parts measurement, multi-parameter measurement, on-line active measurement, etc.

Dynamic Spectrum Analysis Technology of Bearing

High Resolution Nondestructive Testing Technology

Ultrasound, industrial CT, etc.

Dynamic Quality Inspection System and Statistical Technology of Bearings

Research on Digital Design and Manufacture of Bearing

Theory and Test Method of Bearing Correction Life (High Reliability Life) and Infinite Life

Preparation and Application Technology of Advanced Engineering Plastics and Ceramic Materials

ZWZ Group Engineering Technology Research Center

ZWZ-Taylor Joint Laboratory



ZWZ-Taylor Joint Laboratory was established in January 2017, it is a high-end technical platform for detection technology level, research on detection methods and development of various measuring instruments. According to the latest international standards, it can detect and analyze the three-dimensional roughness and surface microscopic contour shape, analyze the surface roughness and contour shape of bearing parts, accurately detect complex curved surfaces and detect the shape and position tolerances such as roundness, cylindricity, straightness, parallelism and flatness of bearing parts. The evaluation and analysis of advanced harmonics are realized, and the detection level reaches the domestic leading level.

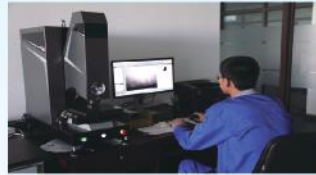
Top Institutions And Institutes In China

Cooperate with Institute of Automation of Chinese Academy of Sciences to Develop Intelligent Detection Technology



- Science and Technology Support Project (Robot Bearing Development).
- National Natural Science Foundation Project Guide (Influence Mechanism of Thermal Deformation in Bearing Ring Processing).
- In-depth cooperation has been carried out in intelligent detection of bearings.
- The full-automatic inspection line project for bearing rings of railway wagon is in progress.
- The automatic appearance inspection and sorting project of rolling bodies is in progress.

Physical And Chemical Test



Micro-vickers hardness tester-GEMAN



Oxygen, nitrogen and hydrogen analyzer-LECO, USA



Metallographic microscope-Leica



Fourier analysis spectrum-BRUKER



Quenching medium cooling rate tester



Pendulum Charpy impact tester-Meters



Electronic universal testing machine-meters



Direct reading spectrum-Thermo USA



Electronic tensile testing machine



Infrared carbon-sulfur analyzer



Granularity analysis system of bearing cleanliness

Testing

Dynamic Detection Equipment

Wind Power Bearing Test Platform



Rail Transit Bearing Test Platform



Universal Bearing Test Platform



- Research and development and introduction of windpower speed increasing box, yaw, pitch, spindlebearing testing machine 6 sets.
- Test 98 models and more than 300 pieces of windpower bearings.
- 6 customers at home and abroad: NGC, Siemens, SANY, Gold wind and so on.
- Self-developed 3 special testing machines for railway bearings.
- Thermal performance and durability test of axle boxbearings of railway wagon, locomotive and metro.
- 48 Bearing Strengthening Life Testing Machines.
- Lifetime and reliability tests on various types of radial bearings.
- Maximum testing range: bearings with ID of 240mm and OD of less than 440mm.

Automotive bearing test platform



- There are 9 testing machines for automotive wheel hub, clutch, front suspension and generator bearing.
- Automotive bearing simulation performance test, fatigue endurance and muddy endurance test.

High-Speed Bearing Test Platform



- 5 testing machines, the maximum testing speed can reach 25000rpm.
- High-speed performance tests for high-speed wire rod rolling mills, gasturbines, high-speed precision machine bearings, etc.



ZWZ Rail Traffic Series Bearing

High-Power AC Drive Locomotive Axle Box Bearing

Application

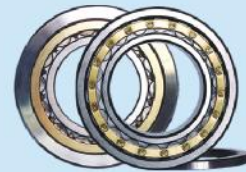
- High power heavy-duty railway transportation.

Characteristic

- Precision can reach P5 or above, maintenance period of 10 years or 1 million kilometers. Lifetime is 3 million kilometers.

Key Technology

- Special seal technology can improve bearing maintenance cycle.
- Apply plastic cage to ensure low vibration and low noise.
- The application of high purity special material.
- The hardness gradient control technology of non-uniform cross section of carburized steel rings.



High Speed EMU Bogie Power And Transmission System Bearing

Application

- High speed railway transportation.

Characteristic

- Precision can reach P4 or above, service life of gearbox is 2.9 million kilometers. Traction motor bearings are 1.65 million kilometers.

Key Technology

- High speed rotation and low vibration.
- Motor bearing insulation technology.
- Light weight design and application technology of cage.
- High precision manufacturing technology.



High Speed EMU Bogie Axle Box Bearing

Application

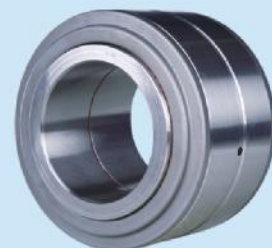
- High speed railway transportation.

Characteristic

- Precision can reach P5 or above, application speed 250~350km/h, maintenance period is 1.65 million kilometers and service life is 3.3 million kilometers.

Key Technology

- Rolling elements logarithmic curve modification improves bearing loading capacity.
- Optimizing the contact state between the rib and rollers base surface increases the axial loading capacity.
- Light contacted sealing structure and good sealing performance.
- Plastic cage ensures low vibration, low noise and good emergency.



ZWZ Rail Traffic Series Bearing

Urban Rail Transit Bogie Axle Box Bearing

Application

- Urban rail transit.

Characteristic

- Precision can reach P5 or above, the service life of gearbox is 2.4 million kilometers, traction motor bearing service life is 2.4 million kilometers.

Key Technology

- High performance, low torque sealing technology.
- High reliability, long life, long maintenance cycle design technology.
- Working surface with phosphating treatment.
- High precision manufacturing technology.



Urban Rail Transit Bogie Power And Transmission System Bearing

Application

- Urban rail transit.

Characteristic

- Precision can reach P5 or above, service life of gearbox is 2.4 million kilometers. Traction motor bearing service life is 2.4 million kilometers.

Key Technology

- High rotation speed and low vibration.
- Motor bearing insulation technology.
- Light weight design and application technology of cage.
- High precision manufacturing technology.



Wagon Bearing

Application

- Railway transportation.

Characteristic

- Precision can reach P6 or above, maintenance period of 8 years or 0.8 million kilometers. Lifetime 1.6 million kilometers.

Key Technology

- Compact structure design improves bearing loading stress.
- Light contacted sealing technology improves bearing maintenance cycle.
- Application of plastic cage improves the safety of bearing application.
- High precision manufacturing technology improves bearing quality consistency.





Pathfinder of Full Range of Rotating Solutions for Global Wind Power Equipment

—Integrate the wisdom of ZWZ to realise the target of carbon neutrality

Milestone of Breaking through Critical Technologies



Installed Capacity Statistics of ZWZ Wind Power Bearings over the Years



Wind Power Bearings

Yaw And Pitch Bearing

- Supporting globally 20000 sets wind turbine.

Main Bearing

- Supplying stable 12 years.

Speed-Increase Gearbox Bearing

- European standard design and manufacture, the production capacity of the whole manufacturing chain, high reliability, high load and long service life.

Driver Bearing

- Supporting globally 148000 sets driving gearbox.

Generator Bearing

- European design.



Pitch Bearing



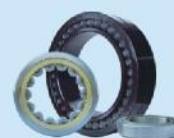
Main Bearing



Driving Reducer Bearing



Yaw Bearing



Accelerator Bearing



Generator Bearing



ZWZ Automobile Series Bearing For Passenger Car Application



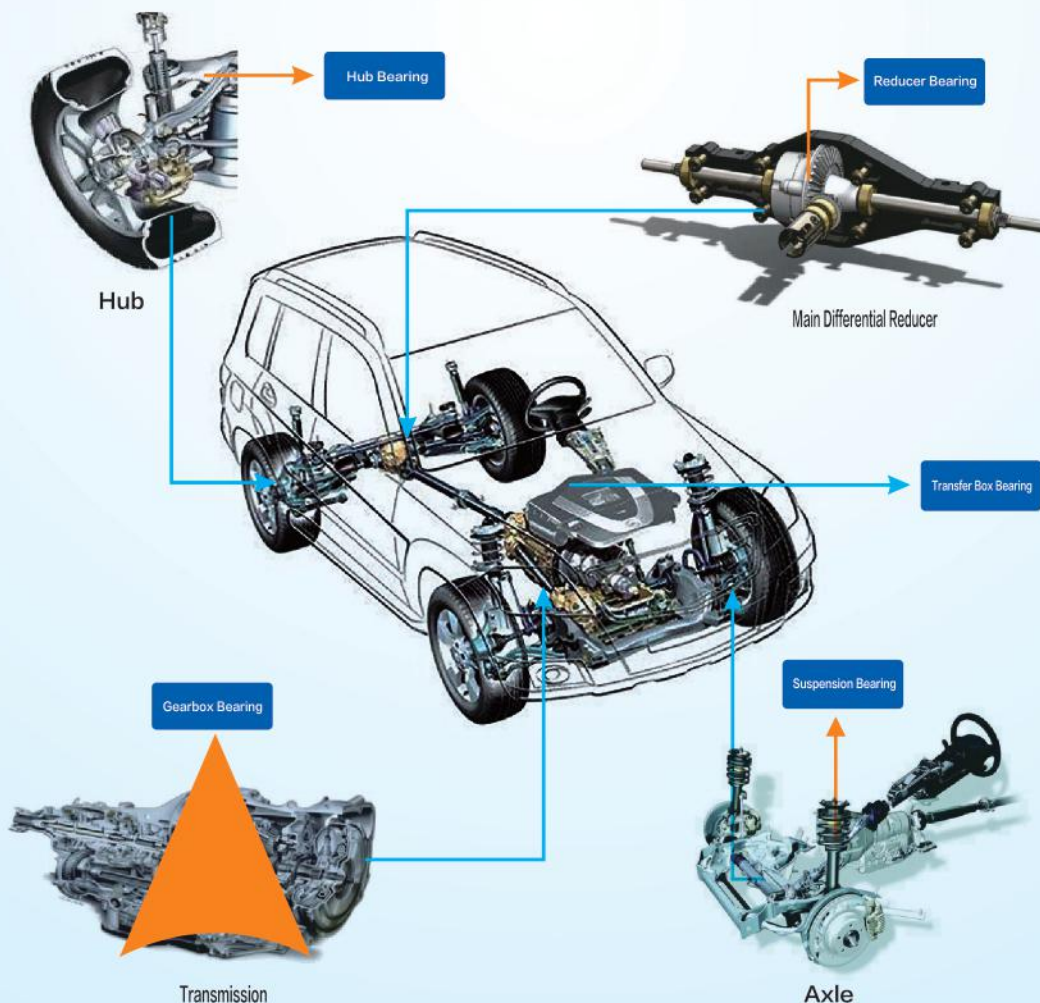
- Gearbox, reducer, transfer box, clutch, suspension, hub.

Characteristic

- Long life, low friction, low noise, maintenance free, impact resistance, light weight.

Key Technology

- Apply with MASTA software modeling and simulation analysis.
- Hub bearing unit integrated design.
- Small size bearing carburizing steel material application.
- Application of carbonitriding technology.
- Tapered roller bearings, ball bearings and cylindrical roller bearings apply with low friction torque design.
- High sealing design.



ZWZ Automobile Series Bearing



For Commercial Vehicle Application

Application

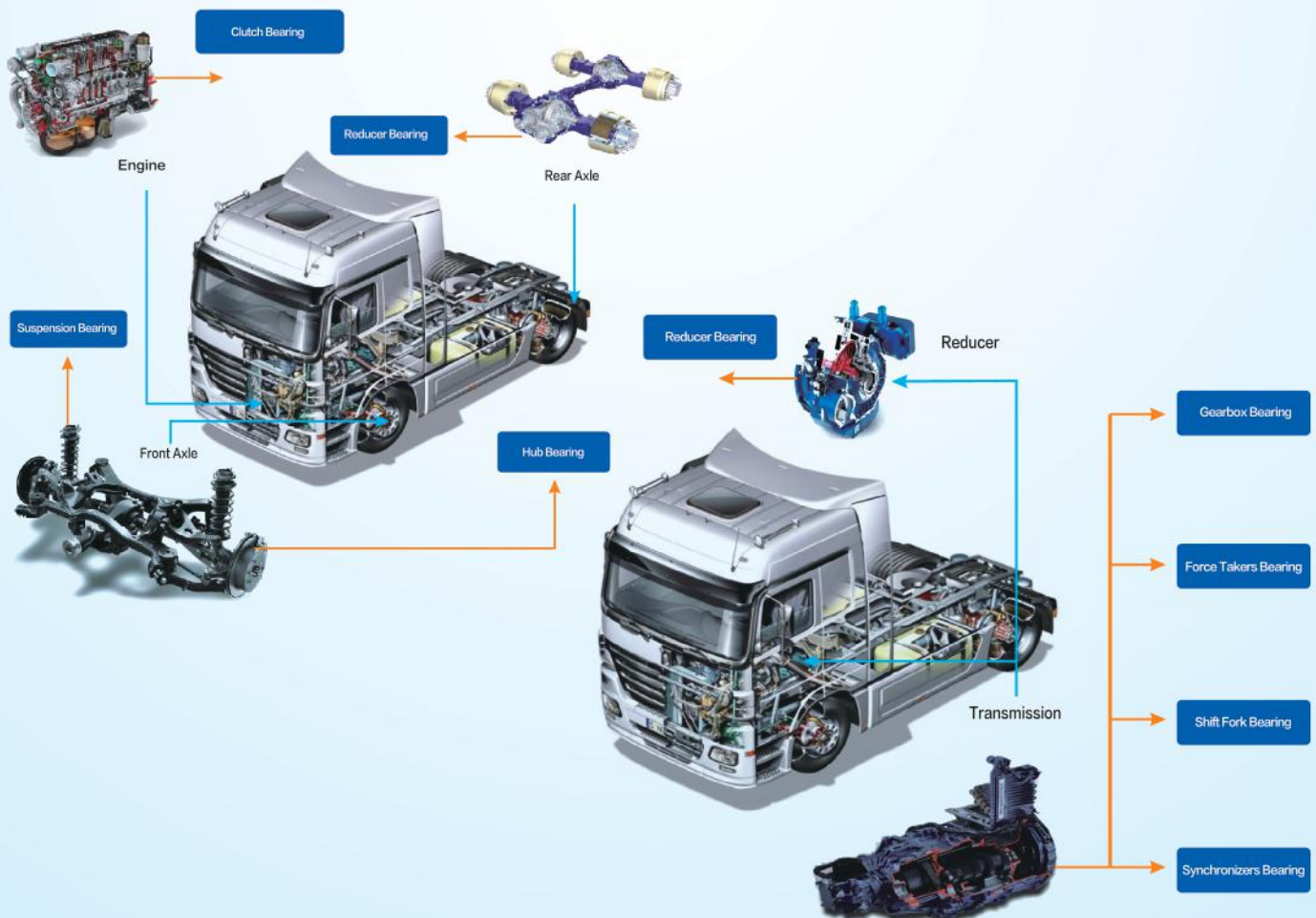
- Wheel hub, reducer, gearbox, retarder, synchronizer, force device, shift fork, clutch.

Characteristic

- High capacity, high reliability, low friction torque, low noise, impact resistance.

Key Technology

- Apply with MASTA software modeling and simulation analysis.
- Hub bearings realize personalized design.
- The main cone head bearing of reducer adopts the design of large cone angle tapered roller bearing.
- The raceway of inner ring and outer diameter of rolling element of large cone angle bearing are designed with logarithmic curve modification.
- Transmission bearings with 1.5 million kilometers of maintenance-free design.
- Tapered roller bearings, ball bearings and cylindrical roller bearings apply with low friction torque design.
- Long life design for double-row tapered roller bearing.





ZWZ Automobile Series Bearing For New Energy Vehicles Application



Application

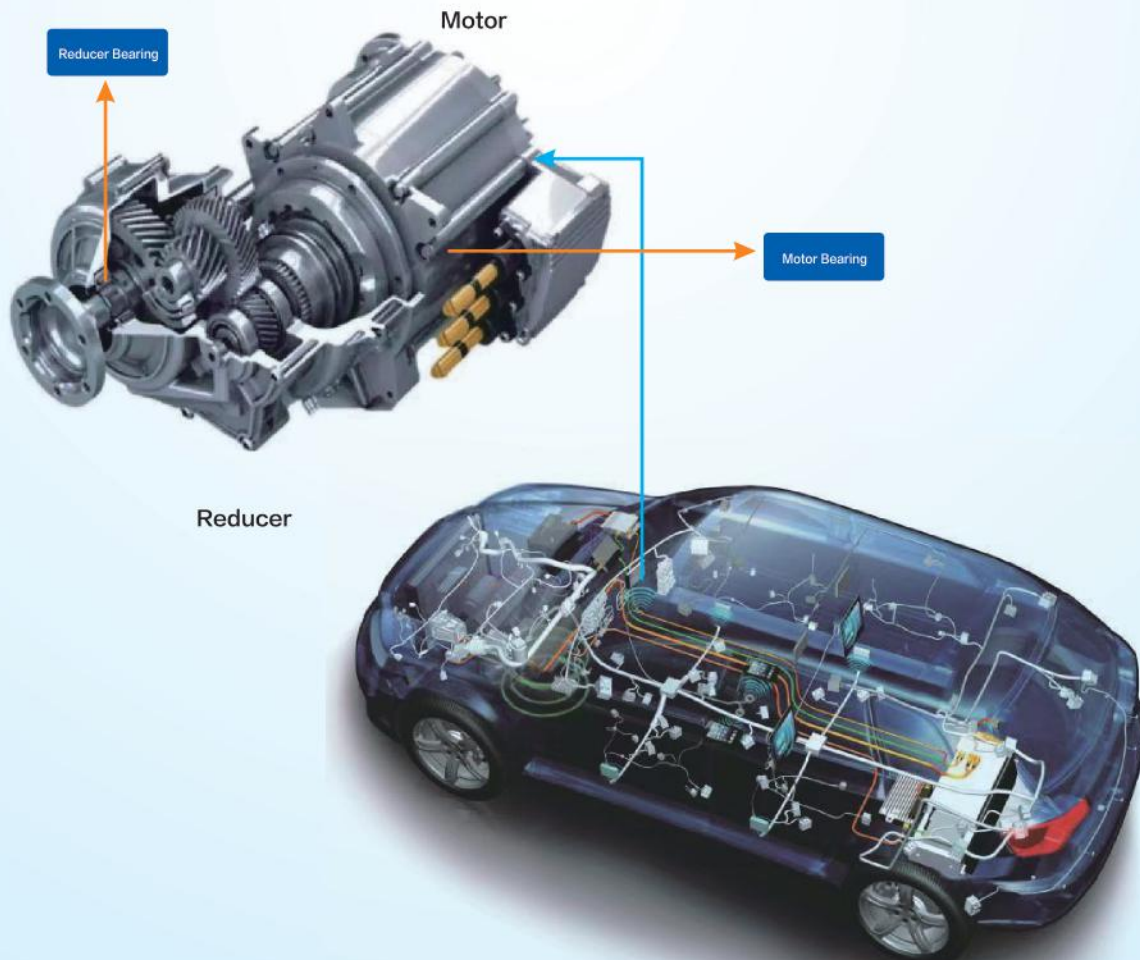
- Reducer, motor.

Characteristic

- High speed, high load, high efficiency, long life, low friction, low noise, electrical conductivity.

Key Technology

- Apply with MASTA software modeling and simulation analysis.
- High load and high speed bearing design.
- Motor conductive bearing design.
- Tapered roller bearings, ball bearings and cylindrical roller bearings apply with low friction torque design.
- Small size bearing carburizing steel material application.
- Application of carbonitriding technology.



Transmission Series Bearing

Application

- Industrial gearbox, wind power gearbox, marine gearbox, automotive gearbox and railway gearbox.

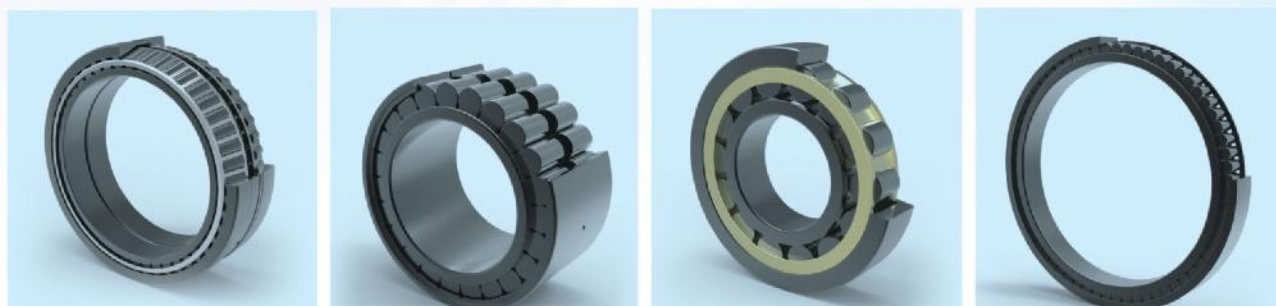
Characteristic

- Precision can reach P5 or above.
- The advantage of lower temperature rise, lower vibration and high reliability.



Key Technology

- All bearings adopt black oxide treatment, which has the advantages of anti-rust and anti-slip.
- Cages of cylindrical roller bearings adopt the design concept of integrated double spheres to enhance the strength of the cage and effectively avoid jams and high temperature rise.
- End faces of the rolling elements of cylindrical roller bearings adopt the design of spherical surface, which can not only withstand large axial force and high speed under severe and variable working conditions, but also ensure the requirement of low temperature rise.
- Cages of tapered roller bearings adopt the design of micro-extended and the cage only undergoes elastic deformation during assembly, to ensure the bearing's P5 accuracy.
- Tapered roller bearings adopt the design of the special spherical base surface, which can not only withstand large axial forces and high speeds, but also ensure the requirement of low temperature rise.





Steel Bearing Series

Continuous Casting Segment Series Bearings

Application

- High speed wire rod finishing mill.

Characteristic

- Bearing performance index reaches P2
- High speed, impacting resistance, high reliability.

Key Technology

- Achieve universal assembly for angular contact ball bearing products.
- The fixed point balance and detection technology of parts can suppress the vibration of bearings under high speed operation.
- Cage silver plating technology enhances integral cylinder cage design and processing technology.

Ladle Turntable Bearing

Application

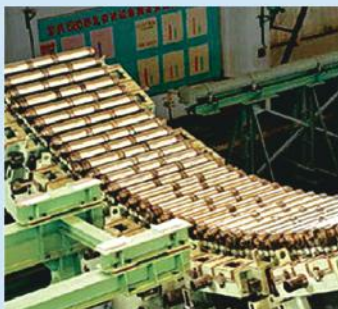
- Ladle turntable.

Characteristic

- Large slewing bearing, withstand large overturning moment and axial load, withstand alternating loads under various working conditions.

Key Technology

- Maximum load bearing and safety factor design.
- The technology application of special raceway arc length processing.
- The technology application of special raceway arc length heattreatment.
- Special sealing structure design.



Steel Bearing Series

Sendzimir Backup Cold Rolling Mill Bearing

Application

- Cold rolling.

Characteristic

- Precision can reach P4 or above.
- High load, high speed.

Key Technology

- The height difference of the cross-section of the matching bearing is within 5 μ m. Bearing is dynamic sealed to maintain constant pressure.
- Precision control technology of hardness gradient in heat treatment.

High Speed Wire Rod Finishing Mill Bearing

Application

- High speed wire rod finishing mill.

Characteristic

- Precision can reach P4 or above.
- High load, high speed.

Key Technology

- Achieve universal assembly for angular contact ball bearing.
- The fixed point balance and detection technology of parts can suppress the vibration of bearings under high speed operation.
- Cage silver plating technology enhances integral cylinder cage design and processing technology.





Engineering Machinery Series Bearing

Special Transport Machinery

Application

- Mining dump trucks, forklifts.

Characteristic

- P5 level precision, light and thin series.

Key Technology

- Dedicated raw materials.
- Thin-wall heat treatment technology.
- Low starting torque.
- Shock and vibration resistance.



Axle Box Bearing



Electric Wheel Bearing



Hoisting Machinery

Application

- Crawler cranes, truckcranes, tower cranes.

Characteristic

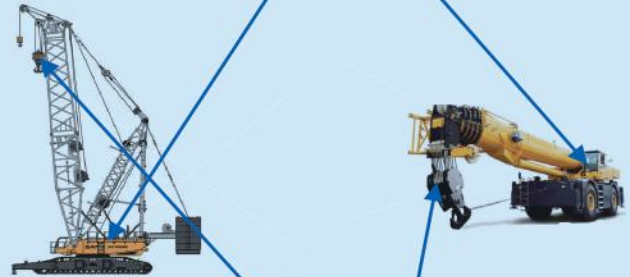
- Low speed, heavy load, long life.

Key Technology

- Dedicated raw materials.
- FEA analysis calculation.
- Quick disassembly and assembly structure design.
- Limit load design control.



Main Pivotal Bearing



Pulley Block Bearing

Coal Machinery

Application

- Shearer, tunneling machine, scraper, stacker-reclaimer and reclaimer.

Characteristic

- P5 level precision, heavy load, high reliability.

Key Technology

- Dedicated raw materials.
- Low starting torque.
- Special raceway heat treatment technology.
- Special rolling element modification.
- Special clearance control.



Engineering Machinery Series Bearing

Port Machinery

Application

- Portal bridges, quay cranes, field bridges clearance.



Wheel Bearing

Characteristic

- Low speed, heavy load, high reliability.

Key Technology

- Dedicated raw materials.
- Low starting torque.
- Special raceway heat treatment technology.
- Special rolling element modification.



Main Pivotal Bearing



Main Pivotal Bearing

Earthmoving Machinery

Application

- Bulldozers, loaders, excavators.

Characteristic

- P5 precision, high load capacity.

Key Technology

- Integrated design.
- Low friction.
- Low temperature rise.
- Limit load design.



Main Pivotal Bearing



Motor, Reducer Bearing



Cement Series Bearing

For Roller Press Application

Application

- Mixed pressure machine main roller bearing.

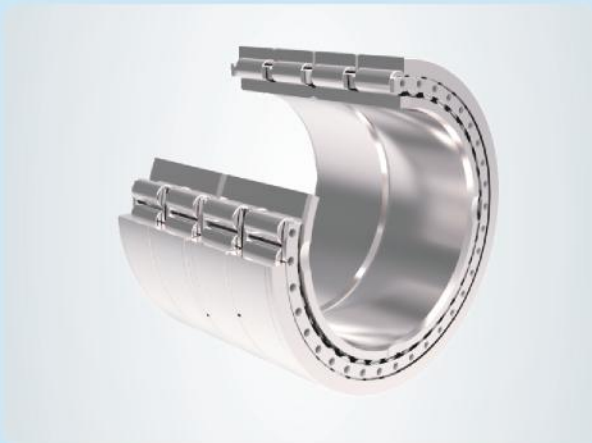
Characteristic

- Precision can reach P5 or above.
- Theoretical design life is more than 30,000 hours.
- Low speed and heavy load, high working temperature, vibration and wear resistance.



Key Technology

- Light weight design of the cages avoids scratches on the assembly raceway.
- Strictly control the difference between the diameters of the two rows of rolling elements and the diameter of each row of rolling elements to improve the rotation accuracy.
- Strictly control the hard layer depth of the heat treatment, the hardness and its uniformity after heat treatment.
- All-round UT detection is performed on rings and rolling elements.



Cement Series Bearing For Vertical Mill Application

Application

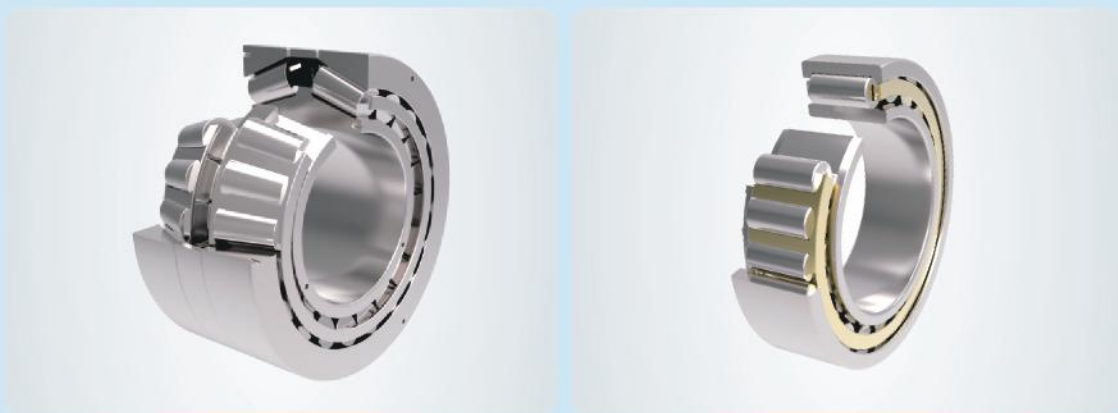
- Vertical mill main roller bearing.

Characteristic

- Precision can reach P5 or above.
- Theoretical design life is more than 50,000 hours.
- Low speed and heavy load, high working temperature, vibration and wear resistance.

Key Technology

- Main roller bearings of the large vertical mill adopt double-sided welding structure to improve welding reliability.
- Strictly control the processing accuracy of the pillar cages to improve the rotation accuracy.
- Realize the best convexity matching between the rolling elements and the raceway to ensure the uniform distribution of the contact stress between the rollers and the raceways.
- Strictly control the pillar hole roughness of the hollow rolling element to improve the rotation accuracy.
- Strictly control the effective carburized layer depth and the hardness after heat treatment to improve the wear resistance.
- Control the difference between the inner diameter or outer diameter of the two inner and outer rings of the same set of bearings to avoid unbalanced load.
- Adopt a special process to improve the hardness of the spacer and enhance its wear resistance.





Precision Machinery Series Bearing For Motor Application Pump and Compressor

Application

- Motor bearing.

Characteristic

- P5.
- Satisfies: the operation requirements of high-efficiency, universal motors, special motors (explosion-proof motors), servo motors.
- Long life.
- Low noise: group Z3 internal control clearance standard.

Key Technology

- Based on the experimental basis of harmonics and noise, the influence of harmonic distribution parameters on bearing noise sound pressure levels are studied, and the optimal harmonic control equation for internal noise control is obtained, to realize low vibration and low noise of motor bearings.

Application

- Pump and compressor bearing.

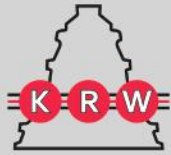
Characteristic

- P5.
- High axial load capacity.
Service life ≥ 40000 h standard.

Key Technology

- Accuracy control technology for the ellipse edge integrity between spherical end face and rib of the tapered roller bearing.
- Cylindrical roller bearing axial load capacity and roller skew limit angle control.





KRW Company Overviews

Kugel- und Rollenlagerwerk Leipzig GmbH is evolved from the company group Deutsche Kugellagerfabriken GmbH (DKF) and continues the development, production and worldwide distribution of roller bearings under the brand name "KRW" with the seal of quality "Made in Germany".

With over 100 years of engineering experience, highly skilled employees, an innovative research and development department as well as modern production techniques KRW Leipzig GmbH reaches extremely valuable bearing products. By a consistent implementation of a stringent quality management KRW continually meets the criteria for obtaining the DIN EN ISO 9001 certification, which is awarded by TUV as an independent inspecting authority.

Our company product range contains improved standard products and many innovations in various bearing series. Besides the production of standard bearings KRW pays particular attention to the development of customer-specific bearing solutions. Currently more than 20 percent of the produced bearings are special constructions.

