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KRW Leipzig

# Railway & Transportation

Industry range

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# Railway and Transportation

Kugel- und Rollenlagerwerk Leipzig GmbH has served the world's leading vehicle manufacturers, vehicle operators, gearbox and component manufacturers as a flexible and high-performance supplier for several decades. Our many years of experience and our broad expertise in the field of traction motor, gearbox and wheel set bearings make us a highly reliable partner, and not just for new developments.

Today's rolling bearings are no longer just standard parts, but integrated and cost-optimized assemblies. The specialists at KRW also develop individual bearing solutions in small series, which are precisely tailored to meet individual customer requirements, such as the available installation space and the respective load spectrum. KRW accompanies you from the very first sketch through the testing phase to series production and finally to obsolescence management.





## The perfect rolling bearing for every application

KRW provides all-round support for its customers in the design of the bearing arrangement. Our specialists for application engineering and product development work with you to find the optimum bearing solution and implement it in practice. In doing so, we always keep your application and its special requirements for the rolling bearings in mind. And our KRW project management team will accompany you throughout the process.

### Traction motors

The classic engine bearing arrangement consists of a locating-non-locating bearing in with primarily deep groove ball bearings or cylindrical roller bearings. A distinction is made between the drive end and non-drive end side.

Within a motor, there is a potential difference between the rotor and stator. In order to prevent potential equalization via the rolling bearings, KRW offers current-insulating coatings up to 3,000 V DC and hybrid bearings.

In the case of current-insulating bearings, an oxide ceramic insulating layer is applied to the outside diameter and faces of the bearing rings. This eliminates the need for expensive conventional insulation methods.

Hybrid bearings consist of rings made of rolling bearing steel which are paired with ceramic rolling elements (e.g. made of silicon nitride). Especially for alternating current motors with high-frequency control, they are the safest method to prevent damaging current passage in the bearing.



### Types

Type	Series
Deep groove ball bearings	60, 62, 63*
Cylindrical roller bearings	NU, NUP, NJ, NJP, N*

\* Further series/ types and dimensions on request

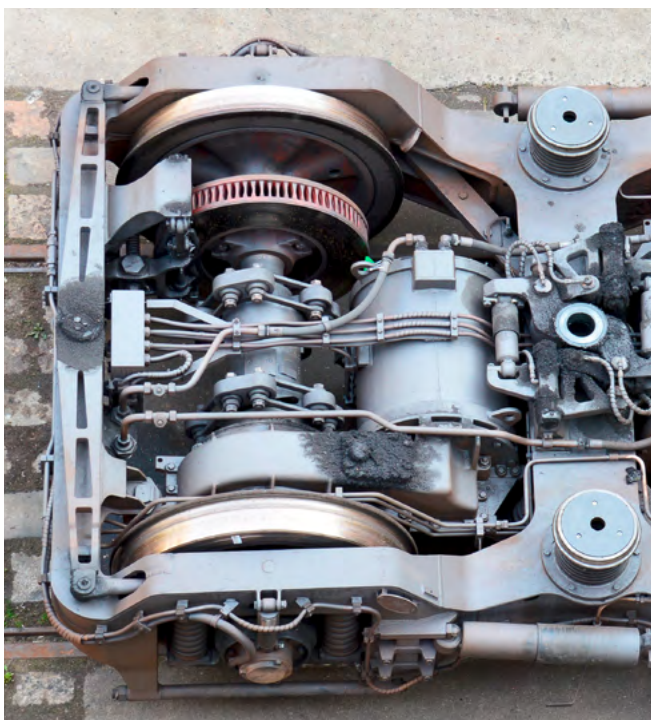
## The advantages at a glance

### Current-insulated bearings

- Economical and efficient solution against current passage damage to rolling bearings
- Main dimensions, tolerances, assembly/disassembly identical with standard bearings
- Improved operational reliability and extended availability
- Defined minimum dielectric strength (design-dependent)
- No additional insulation of bearing points necessary

### Hybrid bearings

- High electrical resistance
- Suitable for very high speeds
- Better emergency running properties than standard bearings
- Less need for lubricant
- Significantly longer service life than rolling bearings made from standard steels
- No additional insulation of bearing points necessary



## Transmission bearings

As a result of the increased demands placed on the durability of gearboxes, lightweight design and energy-saving mobility, the requirements placed on rolling bearings and their components have become increasingly stringent in recent years.

Transmission bearings have to be able to withstand extreme loads due to acting forces, high speeds, vibrations, shocks and large temperature differences. Furthermore, given the small space available, a compact design is absolutely essential.

Tapered roller bearings, four-point contact ball bearings and cylindrical roller bearings are most commonly used in rail vehicle gearboxes. Spherical roller bearings, deep groove ball bearings and angular contact ball bearings are used less frequently.

### Reliable gearbox bearings for every customer requirement:

- Development of the MPEA cage for cylindrical roller bearings
- Reinforced inner construction
- Railway-compliant sheet metal cages for tapered roller bearings
- Retaining grooves in the outer ring to avoid axial displacement or rotation of the outer ring
- Narrowed tolerances for adjacent dimensions

Gear shafts are supported in different ways depending on their type and task. A distinction is made between input/drive shafts, intermediate shafts and output shafts.

In most cases, the drive or input shaft is equipped with a locating-non-locating bearing. The locating bearing consists of a four-point contact ball bearing, which absorbs the axial forces, and a cylindrical roller bearing, which absorbs the radial force (force component separation). Predominantly, the non-locating bearing is a simple cylindrical roller bearing. Bearings of series 2, 22 and 23 are frequently used.

Intermediate shafts in multi-stage gearboxes are usually supported as floating bearings by two cylindrical roller bearings of the type NJ. The bearings commonly correspond to series 2, 3 and rarely 4. Alternatively, adjusted bearings with tapered roller bearings can be used. These are special bearings individually adapted to the available installation space and loads

Output shafts usually have adjusted or locating-non-locating bearing arrangements. Narrow, large tapered roller bearings in special designs are used as adjusted bearings. For locating-non-locating bearing arrangements, deep groove ball bearings or cylindrical roller bearings of the type NUP are used as locating bearings. Cylindrical roller bearings of the type NU of series 18, 19, 28 and 29 are used as non-locating bearings. In rare cases - mostly with older designs - the locating-non-locating bearing arrangement consists of two spherical roller bearings.

### Types

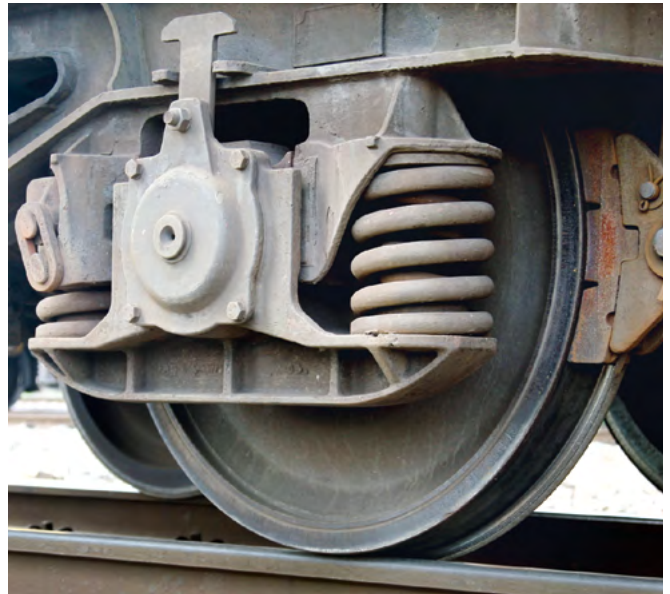
Type	Series
Deep groove ball bearings	60, 62, 63, 64*
Four-point contact ball bearings	Q, QJ*
Cylindrical roller bearings	NU, NJ, NUP*
Spherical roller bearings	222, 223, 232, 230, 239*
Tapered roller bearings	Special bearings individually adapted to the installation space and loads

\* Further series/ types and dimensions on request

## Wheelset bearings

Wheelset bearings are the defined interface between wheel set and bogie and are therefore safety-relevant components. The most common types are cylindrical roller bearings. However, tapered roller bearings and spherical roller bearings are also used.

Frequently used cylindrical roller bearings are standardized in DIN 5412-11. They are manufactured according to the highest quality class of DIN EN 12080 (Class 1) and equipped with glass fiber reinforced polyamide cages (suffix TVP) or brass cages. Other cage designs are available on request or are designed for specific applications.



Each wheelset bearing can be optimized by our product development department to meet your specific requirements. The spectrum extends from the adaptation of edge spacings and the current-insulating coating of the rings to the supply of sealed and greased wheelset bearing units. The lubricating greases that we use are in compliance with DIN EN 12081.

When manufacturing these sensitive components, we are always aware of our high level of responsibility and carefully inspect each individual component of the wheelset bearing for internal and external defects. As such, KRW wheelset bearings meet the highest quality requirements. In addition to one hundred percent traceability of all components back to the molten steel, all parts are subject to special non-destructive tests. After completion, our rolling bearing rings undergo ultrasonic and magnetic particle testing. Rolling elements are inspected using eddy current testing, and the brass or polyamide rolling bearing cages are also subjected to several high-precision dimensional, functional and material testings.

At the customer's request, all KRW wheelset bearings are validated to DIN EN 12080 with cooperation partners certified to DIN EN ISO/IEC 17025 in accordance with the given standards.

## Types

Type	Series
Cylindrical roller bearings	NU, NJ, NJP, WJ, WJP, WJZ, WU, WUZ, WUZP, RWU*
Tapered roller bearings	Special designs
Spherical roller bearings	Special designs

\* Further series/ types and dimensions on request



## Flexible manufacturing

We partner with our customers and are always working to make you even more competitive. That is why Kugel- und Rollenlagerwerk Leipzig GmbH continuously invests in the development of new, innovative and future-oriented products. As a medium-sized rolling bearing manufacturer, we are proud of our vertical range of manufacture, which allows us to control every step in the production of a rolling bearing. We employ variable manufacturing cells and state-of-the-art technologies in all areas of production. This keeps us flexible for our customers.



The following table provides an overview of the most important manufacturing specifications for the most common bearing types and variants for the railway and transport sector.

Suffix	Description
FV1	Bearings and components in special design for traction motors and generators
FV2	Bearings and components in special design for wheelset bearings EN 12080
FV3	Limited width tolerance

## Service and Engineering

In addition to the common standard roller bearing types, the KRW portfolio offers an extensive range of special bearings for individual bearing solutions. Our application engineers will support you from the selection and design of the best roller bearing solution through to assembly and disassembly on your site.



*Close up of a material fatigue*

### Assembly support

Pre-damage during assembly or handling of roller bearings is the second most common cause of premature bearing failure after lubrication. Heavy and large roller bearings in particular are not easy to assemble. They can be easily damaged by carelessness, incorrect transport or errors made during assembly.

Avoid such unnecessary problems and costs! Our engineers will advise you before the installation of the bearing and help you to avoid initial mistakes. We recommend the best assembly strategy and are also available to support you on site.



**Assembly and disassembly instructions**

### Diagnosis and damage analysis

Roller bearings are by far one of the most heavily loaded machine components. Thus, in the case of machine defects, the most obvious signs and massive damage can often be found on the bearings.

However, the roller bearing itself is only rarely the cause. We help you to find the cause of the bearing failure and to avoid damage in the future.

**Take advantage of our experience and our extensive capabilities:**

- Visual bearing diagnosis
- Lubricant analysis
- Metallographic examinations and evaluation of roller bearings
- Metrological analysis of all components
- Measurement of form deviations and surface structures of roller bearing components
- SEM examination for the detection of e.g. elements or current passage
- Verification of bearing design and calculation of bearing arrangement
- FE analyses of machine components and strength analysis

**The experienced KRW application technology team will be pleased to support you.**



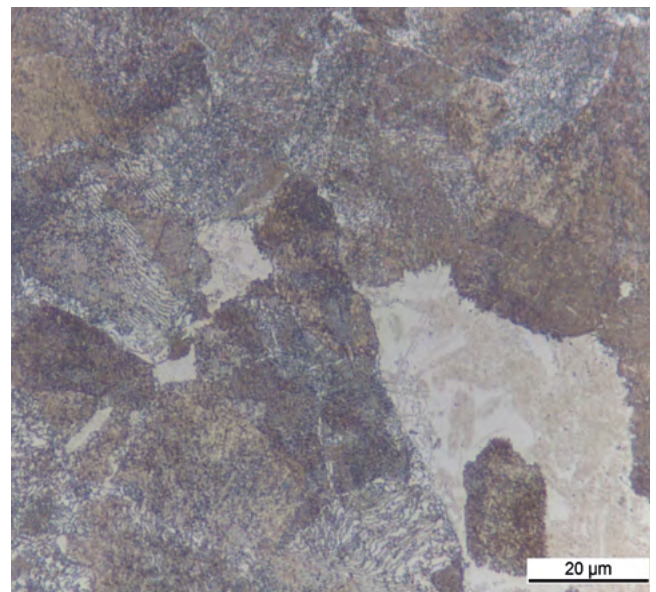
## Quality and Certification

High-precision roller bearings require first-class quality. This is ensured by our innovative manufacturing processes, our quality management system and our high standards of occupational safety and environmental protection. Quality assurance is an important part of our manufacturing process and is supported by regular audits. This allows us to guarantee consistent and highest product quality to our customers.

### Material testing

In addition to material technology tests such as hardness testing, metallographic examinations to determine the chemical composition, determine the degree of purity and assess the respective microstructures have become standard for roller bearing applications.

Ultrasonic, magnetic particle, eddy current and grinding burn tests are also carried out in our in-house materials testing laboratory. Thus, we are able to ensure the quality of the materials before and after heat treatment.

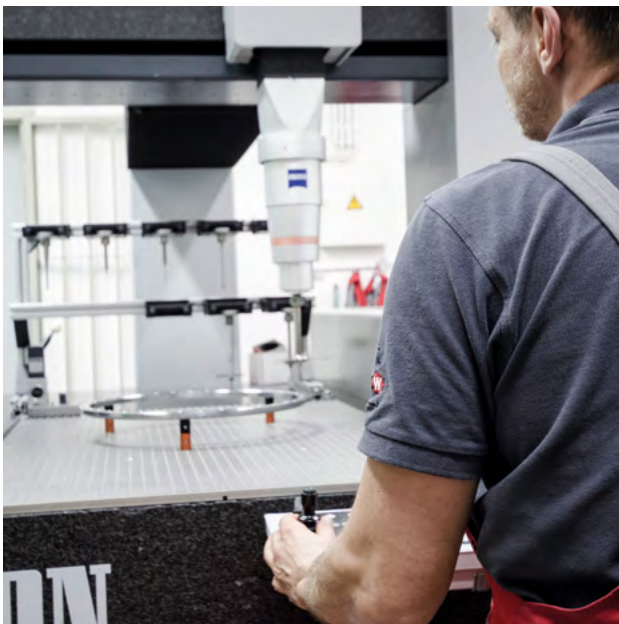


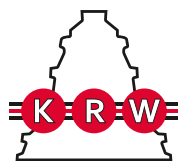
*Microstructure of a rolling bearing component*

### Certified quality

Our quality management is certified according to DIN EN ISO 9001. In addition, KRW meets the high requirements of the energy management system of DIN EN ISO 50001.

As a Q1 supplier of Deutsche Bahn with manufacturer-related product qualification (HPQ) KRW has been qualified to supply safety-relevant components such as wheelset bearings for more than ten years.





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