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KRW Leipzig

## Current-insulated bearings

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Product range

MADE IN GERMANY

## KRW - Product range

# Current-insulated bearings

Traction motors in rail vehicles, DC and AC motors in drive technology, and generators in wind turbines are commonly mounted on rolling bearings. The rolling bearings in these machines are often exposed to the risk of passage of electrical current, which can result in the deterioration of the lubricant and damage to the raceways and rolling elements. This results in a premature and usually unexpected equipment failure. In addition to the costs for new rolling bearings, high expenses are then also incurred for machine repair as well as for production downtime.

For these applications, Kugel- und Rollenlagerwerk Leipzig GmbH recommends electrically insulated rolling bearings which offer reliable protection against the passage of current. Current-insulated bearings from KRW are available in a range of design variants - to suit your individual requirements.



## Preventing the passage of current

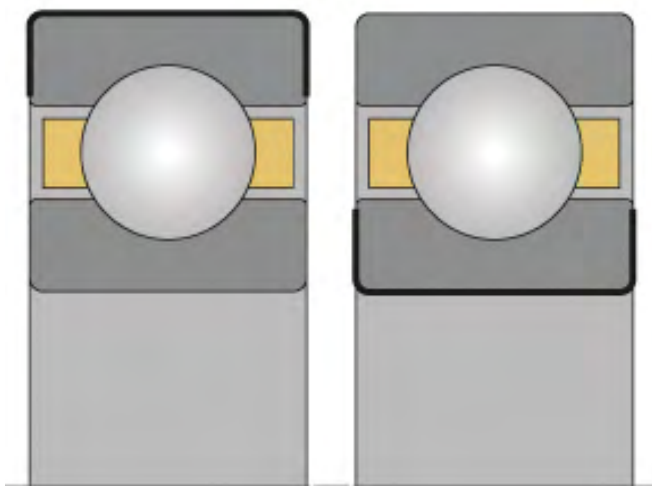
In electrical machines and drives, potential differences may occur between the rotor and stator or between the shaft and housing. To prevent potential equalization via the bearings, KRW uses current-solving coatings up to 3,000 V DC. The oxide ceramic insulated coating is applied to the outside diameter and end faces or the bore diameter of the bearing rings. This eliminates the need for costly conventional insulation methods.

The main dimensions of current-insulated bearings are identical to those of standard bearings, making it easy to change from standard to electrically insulated rolling bearings.

If it is not structurally possible or practical to insulate the bearings, bearing insulation washers are used instead. These are utilized, for example, to protect large axial bearings. Insulation washers are available from KRW up to a diameter of 1,300 millimeters and a maximum breakdown voltage of up to 3,000 V DC.

The current-insulated designs of our bearings can be selected to suit the specific application:

KRW Suffix	
Oxide ceramic insulation ( $\text{Al}_2\text{O}_3$ with $\text{TiO}_2$ ) on outer ring	SJ10, SJ30
Oxide ceramic insulation ( $\text{Al}_2\text{O}_3$ with $\text{TiO}_2$ ) on inner ring	SJ10J, SJ30J
Oxide ceramic insulation ( $\text{Al}_2\text{O}_3$ ) on outer ring	SJ10W
Oxide ceramic insulation ( $\text{Al}_2\text{O}_3$ ) on inner ring	SJ10WJ
Special designs are available on request.	





# Oxide ceramic coating

White ceramic coating of aluminum oxide ( $\text{Al}_2\text{O}_3$ ) provides good resistance to abrasion, sliding wear, friction and oxidation. The gray-blue insulation of aluminum oxide and titanium dioxide ( $\text{Al}_2\text{O}_3$  with  $\text{TiO}_2$ ) has a higher fracture toughness and better resistance to shock and impact than a coating of pure aluminum oxide due to the proportion of titanium oxide.



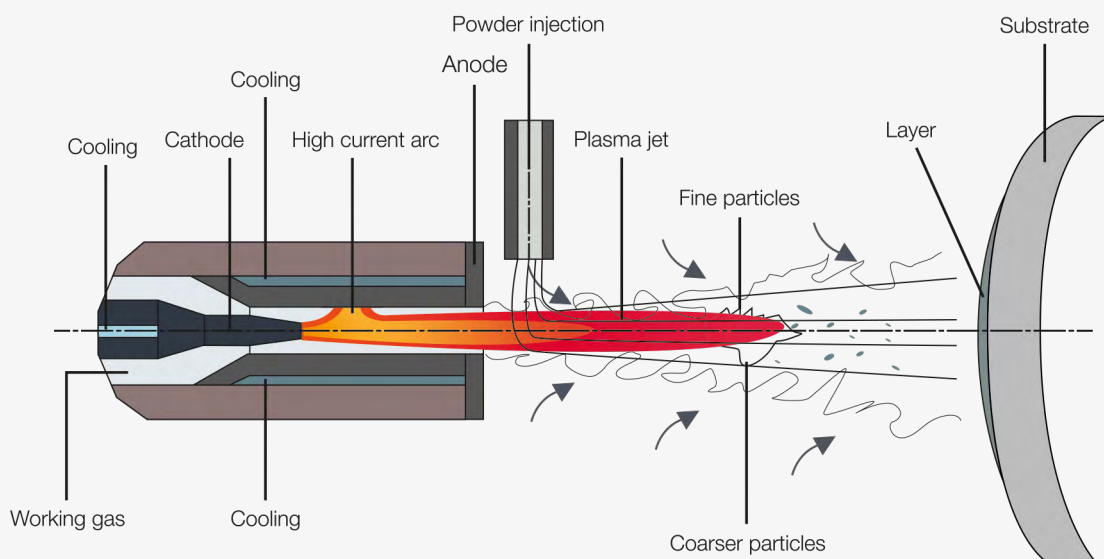
## Advantages of current-insulated bearings

- Main dimensions and tolerances are identical to standard bearings DIN 616 (ISO 15), enabling easy changeover from conventional rolling bearings to electrically insulated rolling bearings
- Assembly and disassembly process is the same as for standard bearings
- Improved operational reliability and availability of the unit/ machine
- Economical and efficient solution to prevent current passage damage to bearings
- Defined minimum dielectric strength (design-dependent)
- No additional insulation of bearing points necessary
- Conventional insulation is no longer necessary

## Coating process

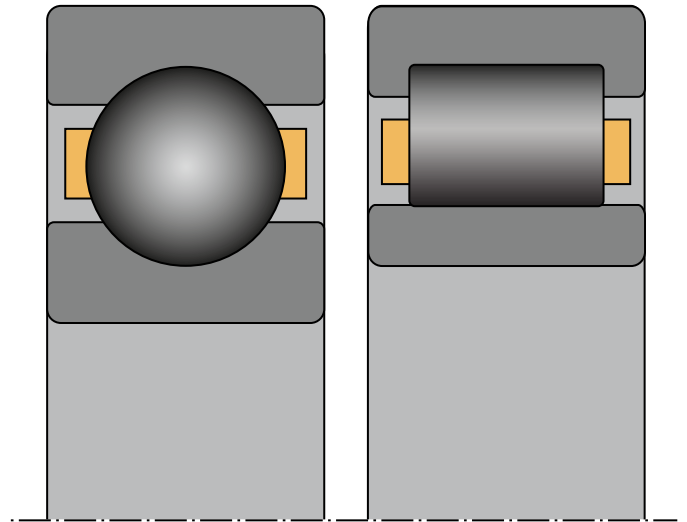
The oxide ceramic coating on current-insulating rolling bearings is applied by means of plasma spraying. In this process, a DC voltage generates an arc between two electrodes, which ionizes the incoming noble gas. This creates a plasma jet.

This plasma jet is fed with an oxide ceramic powder mixture, which is melted by the high plasma temperature. The plasma stream carries the powder particles, which are blown in with the aid of a carrier gas, and sprays them at high speed onto the outer or inner ring (substrate) to be coated. The ceramic layer applied in this way adheres very well to the prepared surfaces of the bearing components. Finally, it is ground and sealed.



# Hybrid bearings

Hybrid KRW bearings (suffix HC5) offer another option for current insulation. All-ceramic rolling elements, e.g. made of silicon nitride S<sub>3</sub>N<sub>4</sub>, are used here. They offer reliable protection against passage of current even at high AC voltages and temperatures.



## Advantages of 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 bearings with steel rolling elements

KRW supplies hybrid bearings in the types of ball bearings and cylindrical roller bearings. Special dimensions are also available on request.

For more information on our hybrid bearings, please visit: [www.krw.de/en/products](http://www.krw.de/en/products).

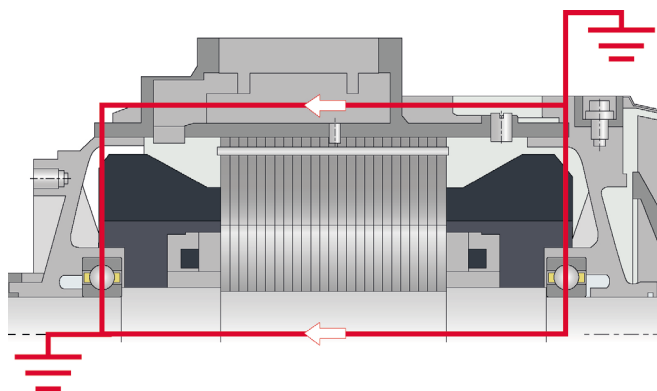
## Prevention of passage of current

It is difficult to eliminate the particular cause of electrical stresses on the rolling bearing. Damage can therefore only be avoided by the flow of current through the bearing. Here, the use of current-insulating coatings or ceramic rolling elements eliminates the need for costly conventional insulation methods.

### Voltage between shaft and housing

If voltage occurs between the shaft and housing, current flows in the same direction through each of the two bearings. In order to prevent this current flow, both bearings must be insulated.

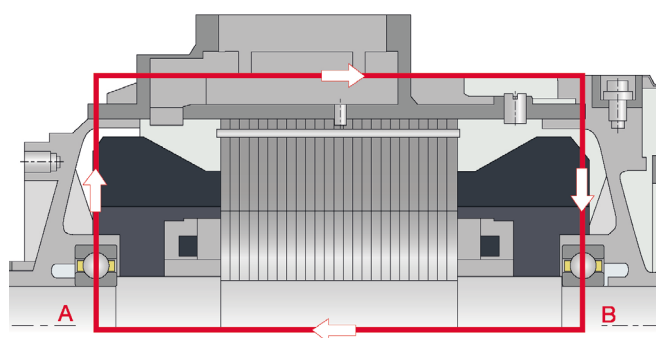
When selecting the current insulation, the time characteristic of the applied voltages must be taken into account. The ohmic resistance is decisive in the case of a DC voltage or a slowly varying AC voltage. In these cases, ceramic-coated rolling bearings are a particularly good remedy against rolling bearing damage caused by current flow.



In the case of a higher-frequency AC voltage, on the other hand, the capacitive resistance of the bearing is important. In such cases, the use of hybrid bearings may be necessary to prevent current flow damage.

### Induced voltage along the shaft

Uneven distribution of magnetic flux in the motor often results in an induced voltage along the shaft. This creates an electric circuit that closes via bearing A, the housing and bearing B. Insulating one of the two bearings is sufficient to interrupt the current flow.



**Do you have any questions or need further information about our products?**

Our sales team will be happy to assist you with any request.



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[sales@krw.de](mailto:sales@krw.de)

## 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.

### 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.**



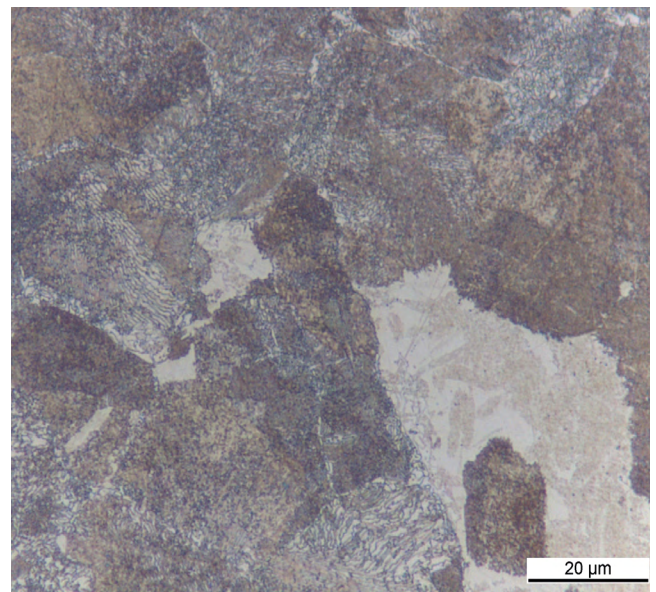
## Quality and Certification

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.

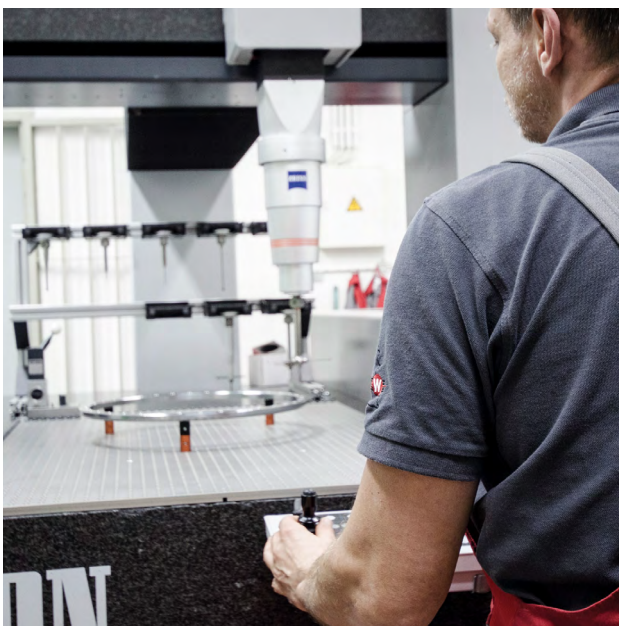


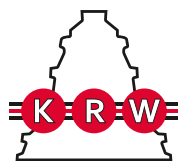
*Microstructure of a rolling bearing component*

### 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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