

## SQ77 : NKE Electrically Insulated Rolling Bearings



### The Problem

**The passage of electrical current under unfavourable circumstances may damage rolling bearings used in electrical machines.**

Such a passage of electric current may be caused by faulty or damaged insulation of the bearing shields or by an ineffective earth connection of the machine.

Particularly in the case of modern electrical machines that feature a high degree of performance and increased customer requirements, in terms of high reliability and a long service life, such damage may cause considerable and expensive problems.

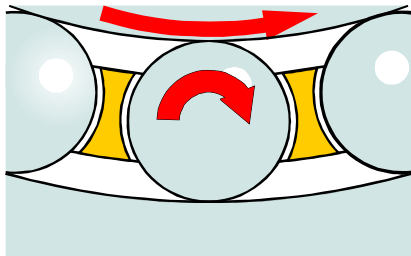
### Defect mechanisms:

The amount and appearance of bearing damage, due to passage of electrical currents, is dependant upon the individual operating conditions, e.g. the actual effective voltage.

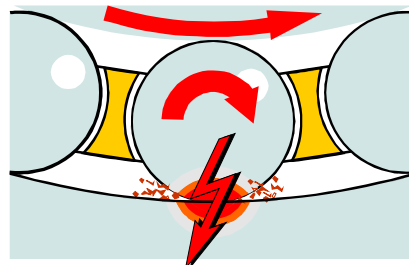
The appearance of the damage may vary between single craters (that can be easily identified by a visual inspection), and a continuous row of shallow flutes with discolorations around the actual areas.

In a somewhat simplified form, the development of damage caused by electro corrosion may be described as follows:

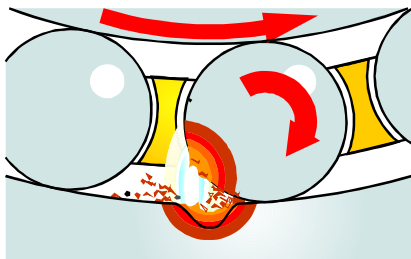
- 1) A potential difference caused by a defect in the electric system develops between the shaft (i.e. inner ring) and the housing (i.e. outer ring) of the rotating bearing.



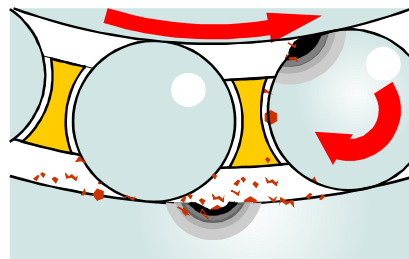
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- 2) As soon as the voltage has reached a certain level, the current brakes through the lubricating layer between the metal parts of the bearing.
- 3) The subsequent rolling motion of the affected rolling elements can trigger the development of electrical arcs and cause significantly changed material structure on the affected area. Also the surface quality of the bearing is destroyed.
- 4) As a consequence any subsequent over rolling of the damaged areas causes more material particles to enter the contacting zone. In this way a localised overloading of the bearing material occurs. This again causes an accelerated fatigue of the bearing steel.

The user may notice this process only by symptoms such as an increase in the levels of running noise and/or vibrations, until the bearing fails prematurely.

## The Solution

**The effective electrical insulation of the end shields is, in most cases, only possible with great care and additional efforts. In the case of existing designs, any improvement of electrical insulation could also be difficult from a technical point of view.**

The simplest solution is provided by the use of NKE Electrically Insulated Rolling Element Bearings. These are bearings that have an extremely efficient electrical insulation integrated that avoids the passage of electric current through the bearing.

For this reason, the additional electrical insulation of the end covers may be omitted. This means, in addition to the total cost savings by the removal of the conventional insulation, an increase in reliability and actual service life can occur.

## Design Variants

### SQ77: Bearings with an oxide ceramic insulating layer applied to the outer ring.

The application of the thin - layer of insulation coating is completed by a **plasma spraying method**. The guaranteed minimum breakdown resistance of this insulating layer is **1000V** alternating or direct current.

### SQ77B: Bearings with rolling elements made from oxide ceramic (hybrid bearings).

This alternative method of insulating should be applied, preferably, to smaller bearings. The theoretical breakdown resistance of insulating rolling elements is  $\infty$ .

## Technical Characteristics of NKE Electrically Insulated Bearings

- Optimum protection against bearing damage, caused by the passage of electric currents. Therefore increased operating safety compared to conventional bearings.
- Defined break-down resistance voltage levels depending upon the actual design.
- Economical and efficient solution for protection against electro corrosion of bearings.
- All boundary dimensions and tolerances are identical to those of standard bearings, therefore the complete inter-changeability of NKE electrically insulated bearings with conventional bearings.
- **Load ratings (i.e. both static and dynamic) are equal to the conventional standard bearings.**
- Mounting and dismounting are the same as for the standard bearings.
- No peeling or chipping-off of the insulation layer with correct handling of bearings.
- Upon request, **NKE electrically insulated bearings** are also available in different special variants.

## Standard Range

In principle, almost all rolling bearings of the NKE Standard Programme are available in electrically insulated execution, provided the batch quantity is economical to produce.

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