

# INSOCOAT electrically insulated rolling bearings

– a solution for increased reliability and machine uptime



# Prevention of electric erosion in bearings

SKF electrically insulated bearings, called INSOCOAT, are designed to protect a bearing against electric current passage. By integrating the insulating properties into the bearing, INSOCOAT bearings can improve reliability and increase machine uptime by virtually eliminating the damaging effect of electrical erosion in applications including:

- Industrial electric motors
- Traction motors
- Generators

## The effects of stray electric current

Electric current passing through the bearing can cause micro-cratering on the raceways of the inner and outer rings and on the rolling element surfaces (→ **fig. 1**). Heat generated by the electrical discharges causes local melting that creates micro craters and changes in the structure of the metal, which can be recognized as a dull grey discoloration of the raceways. If such a bearing continuous to be operated, further a washboarding pattern may develop as a secondary damage (→ **fig. 2**).

Local high temperatures cause the additives in the lubricant to char or burn the base oil. This causes the additives to be consumed more quickly. In the case of grease lubrication, the grease turns black and hard. This significantly shortens grease life, leading to shorter bearing service life (→ **fig. 3**).

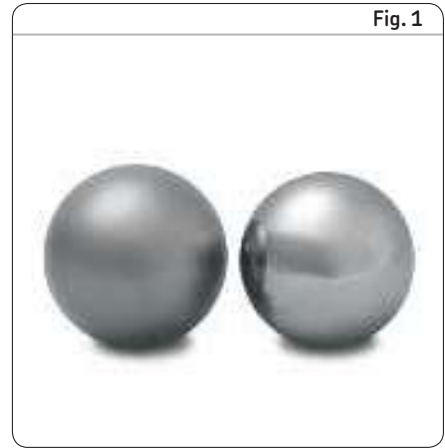
Once bearing damage from electric erosion has progressed, increased noise levels, reduced effectiveness of the lubricant, increased heat and finally excessive vibration can all contribute to significantly decreased bearing service life.

## A cost-effective solution

INSOCOAT bearings are a very cost effective solution for protecting bearings against damage or failure due to passage of electric current through the rolling contacts. The total cost of INSOCOAT bearings is lower than shaft or housing insulation (**table 1**).

### Benefits:

- Two functions in one solution
  - a bearing function
  - electrical insulation
- Virtually eliminates premature bearing failures caused by stray electric currents
- Increased machine uptime
- Reduced maintenance costs
- Provide an economical solution when compared with other insulation solutions
- Global availability of a wide assortment
- Easy mounting and ready to use solutions



# INSOCOAT bearing designs

INSOCOAT bearings have an aluminum-oxide coating on the external surfaces of the outer ring or the inner ring. The coating is sealed with a resin to provide stable electrical properties in humid environments.

Bearings with an electrically insulating coating provide enhanced protection against electric current damage. The enhanced protection results from the increased impedance due to the smaller coated surface area.

The basic coating is tested to withstand voltages of at least 1 000 V DC. Coating variants with the capability to withstand higher voltages can be supplied on request (table 2).

The standard range of INSOCOAT bearings in the most frequently used sizes and variants are available from stock as:

- single row deep groove ball bearings
- single row cylindrical roller bearings.

The performance data as well as the dimensional and running accuracy of INSOCOAT bearings are identical to standard non-insulated bearings (table 3).

Specific customized ranges are deliverable on request.

Table 1

Total cost of the INSOCOAT bearing solution relative to other insulation approaches

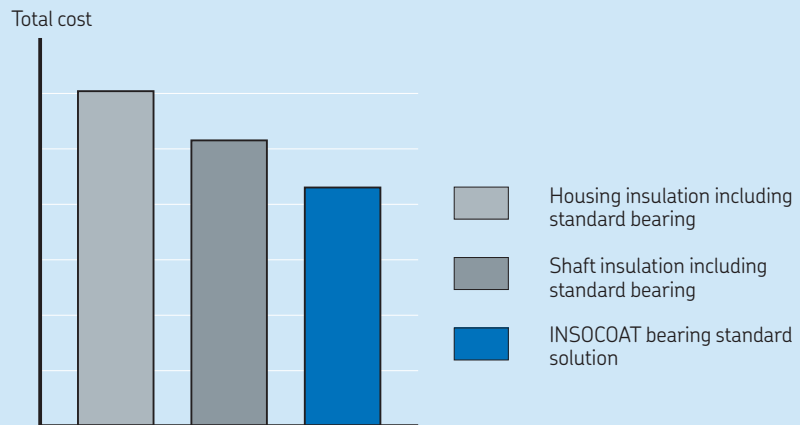


Table 2

## INSOCOAT specifications

| SKF specification designation suffix              | No electrical breakdown up to operating voltage |                          | Electrical resistance |
|---|---|--------------------------|-----------------------|
|   | [V] DC  |                          | min. [MΩ]             |
|   | <b>Outer ring coated</b>                        | <b>Inner ring coated</b> |                       |
| <b>SKF standard coating</b><br>VL0241             | VL2071  | 1 000                    | 50                    |
| <b>SKF customized coating</b><br>VL0244<br>VL0246 | VL2074<br>VL2076                                | 2 000<br>3 000           | 200<br>200            |

Table 3

## INSOCOAT bearing data

Deep groove ball bearings and cylindrical roller bearings

|                        |   |
|------------------------|---|
| Dimension standards    | Boundary dimensions: ISO 15   |
| Tolerances             | Normal, higher accuracy on request<br>Values: ISO 492, for additional information, refer to SKF catalogues.<br>The aluminium-oxide layer on the external surfaces of either the outer or the inner ring does not influence the accuracy   |
| Internal clearance     | C3 as standard, check availability for other internal clearance classes.<br>Values are valid for new bearings before mounting under zero measuring load: ISO 5753-1, see SKF catalogues   |
| Allowable misalignment | Identical to the comparable standard bearings   |
| Electrical properties  | The standard INSOCOAT layer provides protection against AC and DC currents.<br>The minimum ohmic resistance is 50 MΩ at 1 000 V DC.<br>Tests at SKF have shown that electrical breakdown of the insulating layer occurs above 3 000 V DC. |

# INSOCOAT standard bearings

## Product features

### High-quality coating

A plasma spray technique is used to apply the aluminum oxide layer. Sophisticated pre- and post- application processes result in an outstanding coating quality.

### Protective sealant

INSOCOAT bearings are treated with a unique sealant to guard against humidity penetrating the coating and reducing its effectiveness.

### Optimized solutions

SKF can supply values for relevant electric parameters for the bearings (capacitance, impedance) to optimize the insulating solution for any application.

## INSOCOAT bearings with coated outer ring

Bearings with an electrically insulating coating on the external surfaces of the outer ring are the most common INSOCOAT bearings.

- Bearings with a coated outer ring are identified by the suffix VLO241.
- Outer ring coated INSOCOAT bearings are recommended for medium-size motors, that use bearing sizes smaller than 6226, 6324.
- INSOCOAT bearings with an outer ring coating are suitable for all types of housings.
- Outer ring coating can be applied to bearings with an outside diameter > 80 mm.



*INSOCOAT deep groove ball bearings with outer ring coating*

## INSOCOAT bearings with coated inner ring

Bearings with an electrically insulating coating on the external surfaces of the inner ring provide enhanced protection against electric current damage. The enhanced protection results from the increased impedance due to the smaller coated surface area.

- Bearings with a coated inner ring are identified by the suffix VL2071.
- Inner ring coated INSOCOAT bearings are recommended for larger-size motors, that use bearing sizes from 6226, 6324 or other applications where the bearings risk being subjected to high shaft voltages.
- Inner ring coating can be applied to bearings with a bore diameter > 70 mm.



*INSOCOAT cylindrical roller bearings with inner ring coating*

# Examples of specific customized solutions

In addition to the standard range SKF can offer special coated ring designs, large size bearings and bearing units.



*Flanged tapered roller bearings  
with outer ring coating*



*Traction motor bearing units  
with inner ring coating*



*Tapered roller bearing units  
with outer ring coating*

## The Power of Knowledge Engineering

Combining products, people, and application-specific knowledge, SKF delivers innovative solutions to equipment manufacturers and production facilities in every major industry worldwide. Having expertise in multiple competence areas supports SKF Life Cycle Management, a proven approach to improving equipment reliability, optimizing operational and energy efficiency and reducing total cost of ownership.

These competence areas include bearings and units, seals, lubrication systems, mechatronics, and a wide range of services, from 3-D computer

modelling to cloud-based condition monitoring and asset management services.

The SKF BeyondZero portfolio offers products and services with enhanced environmental performance characteristics.

SKF's global footprint provides SKF customers with uniform quality standards and worldwide product availability. Our local presence provides direct access to the experience, knowledge and ingenuity of SKF people.

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