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SCHAEFFLER TECHNOLOGIES GMBH & CO. KG, SCHWEINFURT

Bearings for wind tracking and blade adjustment

Slewing rings for exact positioning

Wind turbines must be aligned to the wind conditions. The tower and the rotor blades are adjusted so that they make optimal use of the wind conditions and are not subject to excessive loads that could cause damage. Tower and blade adjustment are therefore significant prerequisites for cost-effective operation of wind turbines.

Schaeffler Group Industrial (INA/FAG) develops and manufactures slewing rings with an outside diameter of up to 4,000 millimeters for applications for wind tracking of the nacelle and adjustment of the rotor blades in wind turbines with up to 5.0 MW output. Due to their design, they can transmit radial and axial forces and tilting moments. They are designed as single row or double row four point contact bearings without gear teeth or with internal and/or external gear teeth. They enable exact angular adjustment at varying loads.

Blade adjustment (pitch bearings)

In order to control the output of the wind turbine, the blade angle must always be optimally adjusted to the wind speed via the rotary motion of the blade bearing. The rotor speed can thus be controlled via the blade adjustment to ensure relatively uniform generation of electricity. Very high loads occur in some instances from the dynamic load of the rotor blades. These loads must be transferred securely via the raceways and the screw connections of the blade bearings into the rotor hub. Double row four point contact bearings with or without gear teeth on the inner or outer rings are mainly used here.

Tower bearings (azimuth bearings)

A slewing ring is also required in order to optimally adjust the position of the nacelle to the wind direction. The wind load and the dynamic inertia forces are transferred via the raceways and the screw connections into the tower head. Single row four point contact bearings with or without gear teeth on the inner or outer rings are mainly used here.

Due to its unique expertise, e.g. in zinc thermal sprayed surfaces, multi-layer painting, finished seal running surfaces and high-strength tempered steel (e.g. 42CrMo4V), Schaeffler can offer slewing rings with the highest level of reliability, rating life and security against premature damage such as fatigue in the raceway and surface corrosion. The bearings are suitable for temperatures of up to minus 30 degrees Celsius due to the material and the applied surface protection. Schaeffler produces high-quality

slewing rings for use in multi-megawatt class turbines worldwide with state-of-the-art manufacturing facilities and the highest level of manufacturing expertise.

Calculations improve quality and reliability
Schaeffler Group Industrial has state-of-the-art software and calculation programs that ensure the highest level of quality and reliability for bearings and slewing rings. The Schaeffler Group uses BEARINX® to model and calculate slewing rings. The external forces acting on the rolling bearings, the internal loads in the rolling bearings, the comparative stresses of the shafts and the most important parameters are presented in tabular and diagrammatic form. The internal load distribution in the bearing is calculated precisely – including contact pressure taking account of the raceway osculation. Based on the individual rolling contact loads, BEARINX® determines the calculated bearing life more precisely than ever before. For more detailed analysis, FEM calculations can be used to determine the influence of the adjacent construction on the rolling bearings and vice versa.

In addition, the program calculates a safety factor against dynamic core crushing when designing the bearing. This safety factor is based on the bearing load at which the permissible dynamic stress level is achieved in the transition from edge to core. The material stress is compared with the permissible material strength limits based on the depth of the material.

• Press picture "00014A48.jpg"
Schaeffler Group Industrial (INA/FAG) develops and manufactures slewing rings with an outside diameter of up to 4,000 millimeters for applications for wind tracking of the nacelle and adjustment of the rotor blades.
(Figure: Schaeffler Group)

• Press picture "00015AA7.jpg"
In cooperation with manufacturers, the Schaeffler Group develops innovative blade bearings for precise, dynamic and continuous adjustment of each individual blade depending on the rotor position, the wind conditions and the operating condition.
(Figure: Schaeffler Group)

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FAG is a brand of the Schaeffler Group.

The Schaeffler Group with its product brands INA, LuK and FAG is a leading manufacturer of rolling bearings and linear products as well as a renowned supplier to the automotive industry of high-precision products and systems for engines, transmissions and chassis applications. The group of companies stands for exceptional customer focus, innovative ability and the highest possible level of quality. Sales of over € 9.5 billion were generated at over 180 locations in more than 50 countries in 2010. With around 70,000 employees worldwide, the Schaeffler Group is one of the largest German and European industrial companies in family ownership.

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