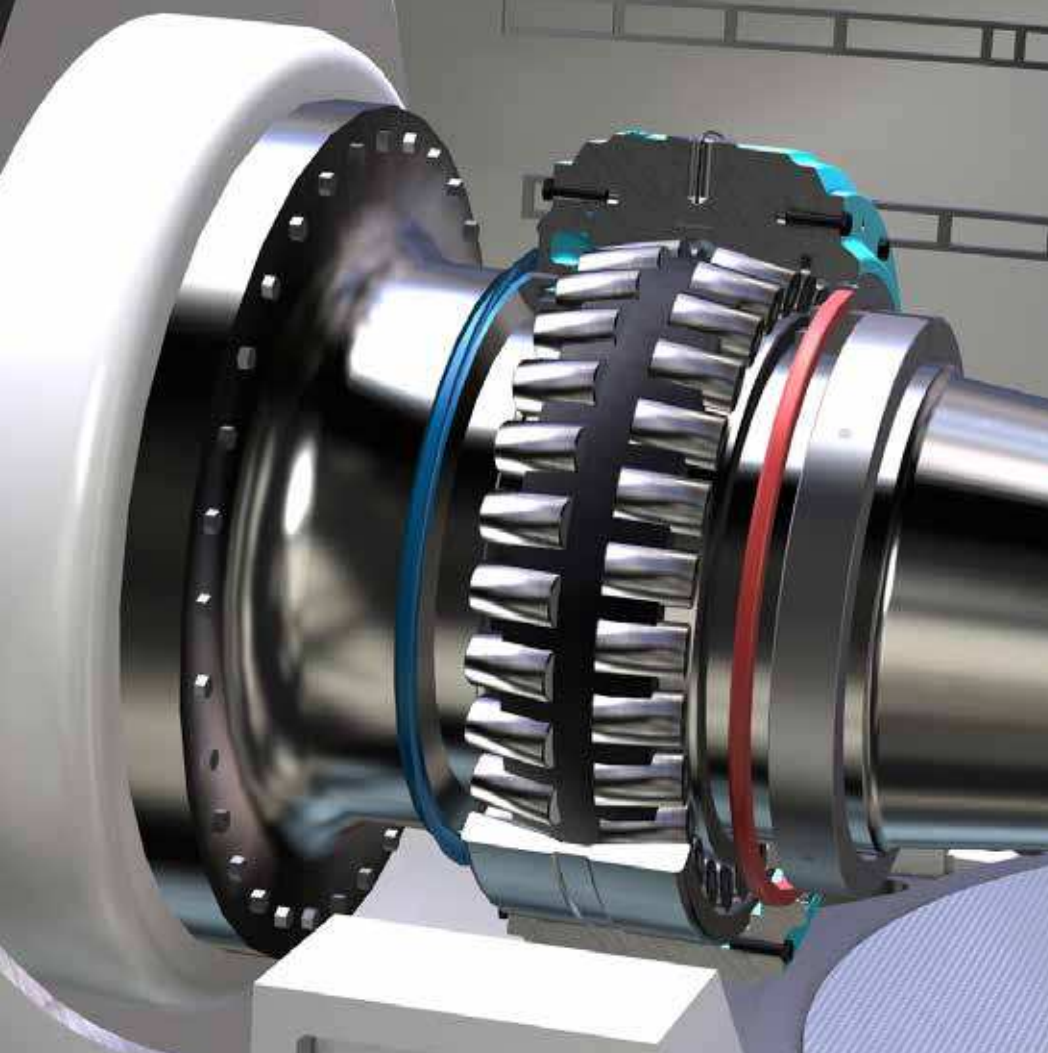


SKF spherical roller bearings for wind turbine main shafts

Improving turbine reliability for sustainable wind energy production





UP TO
2X
THE FATIGUE
LIFE

IMPROVED
ROBUSTNESS
(RADIAL/AXIAL)



UP TO
5%
WEIGHT
REDUCTION

Why a new spherical roller bearing design for wind turbine main shafts?

SKF spherical roller bearings are the most common bearing type used in wind turbine main shaft arrangements, with well over 100 000 installations worldwide. The reason? These self-aligning bearings have outstanding performance characteristics in respect to load carrying capacity and reliability, which can enable them to meet service life needs of more than 25 years.

As the world expert in rotating machinery reliability, SKF is continually exploring new ways to improve bearing performance in a wide range of applications. When examining the specific operating conditions of a wind turbine's main shaft, it was clear this application did not require the same bearing parameters for speed, load and temperature as did other large size industrial machinery. For example, these can require speeds as high as 600 r/min and peak temperatures as high as 200 °C, but typically are not subjected to the varying direction and high thrust loads of wind applications. So we set out to create a spherical roller bearing that was specifically optimized for turbine main shafts.



Typical large size industrial applications

- Speed: Low and high (up to 600 r/min)
- Temperature: -40 to 200 °C
- Load: Constant load direction varying (medium and high)
- Life: Varying, often many revolutions



Wind turbine main shaft applications

- Speed: Very low (max 25 r/min)
- Temperature: -40 to 80 °C
- Load: Varying direction, high loads
- Life: 25+ years, but fewer revolutions

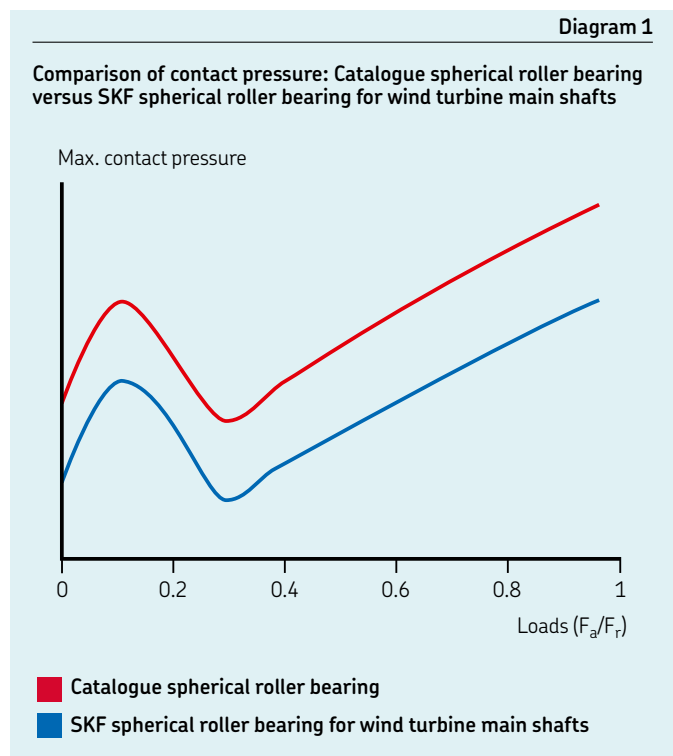
Increased service life, reduced levelized cost of energy (LCOE)

To make SKF spherical roller bearings an even more reliable and cost-effective choice, SKF has created the first symmetrical spherical roller bearing designed explicitly for wind turbine main shafts. By eliminating unnecessary features and improving those critical to the application, SKF was able to tailor an SKF Explorer spherical roller bearing that would be even more robust and reliable in main shaft arrangements.

The result is the SKF spherical roller bearing for wind turbine main shafts, a unique, industry-specific solution that can help meet demands for increasing size and power output of wind turbines. And, importantly, one that can reduce the levelized cost of energy, a goal that is increasingly challenging in light of dwindling government subsidies.

Primary benefits:

- Improved performance under typical wind operating conditions
- Improved robustness
- Reduced contact pressures (→ **diagram 1**)
- Up to twice the fatigue life (→ **diagrams 2 and 3**)
- Significant weight reduction
- Improved lubrication



Improved performance for both 3-point and 2-point main shaft arrangements

Self-aligning roller bearings are expected to remain the dominant bearing type in main shaft applications for wind turbines up to 4 MW. This includes three-point-suspensions where spherical roller bearings are used for the locating position, and two-point-suspensions, which use two spherical roller bearings or in some cases a CARB bearing in the non-locating position. SKF spherical roller bearings for main shafts can be used in either arrangement.

Designed for longer life and improved robustness

SKF spherical roller bearing

SKF spherical roller bearing for wind turbine main shafts



- Larger and more lubrication holes
- Optimized internal geometry
- Larger diameter of rollers
- Larger contact angle
- Circumferential groove on outer ring raceway
- No guide ring
- Wider outer lubrication groove
- Roller guided cast iron cage

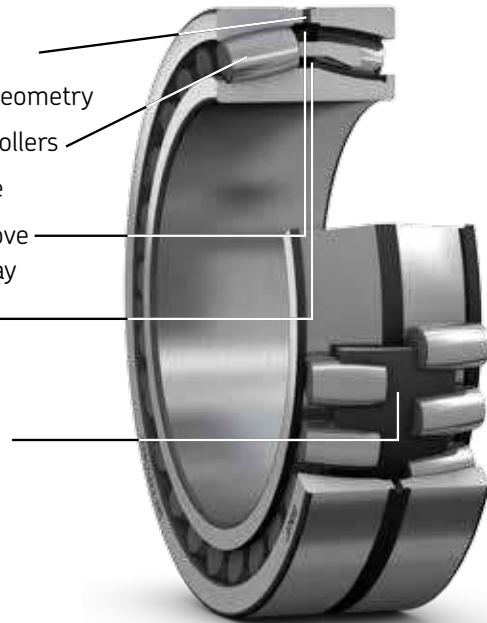
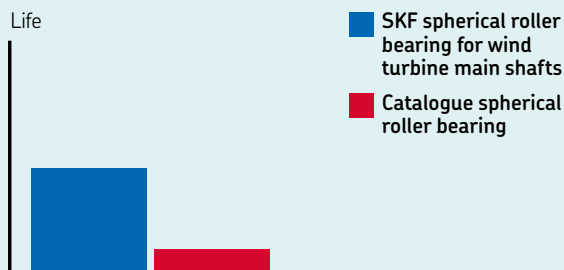


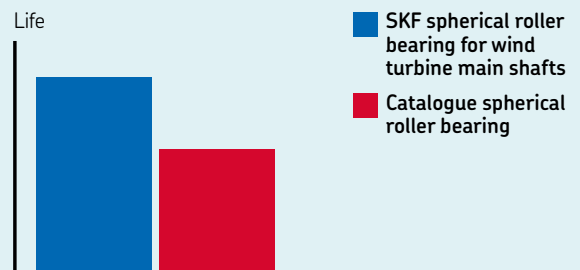
Diagram 2

Diagram 3

Fatigue life comparison under axial load conditions



Fatigue life comparison under radial load conditions



How will this new bearing design benefit your product or operation?

Whether you are designing and building new wind turbines or operating a wind farm, SKF spherical roller bearings deliver a number of important advantages. The SKF spherical roller bearing for wind turbine main shafts has ISO standard dimensions and is therefore fully replaceable with standard spherical roller bearings in new or already installed turbines.

A broad product range covers the majority of turbine ratings, enabling manufacturers to achieve an optimized cost/performance ratio for most arrangements using self-aligning bearings. SKF's global manufacturing footprint and consistent international standards are ideal for companies with an international customer base.

Wind farm owners and operators can benefit from increased service life under specific operating conditions, as SKF spherical roller bearings for main shafts can be retrofitted into wind turbines already in the field. The bearing's robust design has been optimized for typical three-point arrangements and can also be used in two-point arrangements. Global availability enables operators to secure spares efficiently and respond quickly to minimize downtime for maintenance.

Features	Benefits
Internal geometry optimized to handle dominating axial load	Improved performance under wind operating conditions
Advanced material and heat treatment	Handles deviations in operating conditions
Refined contact geometry to lower contact pressure for same load	Longer operating time with same bearing size
Roller guided cage, no guide ring	Increased robustness
Boundary dimensions in compliance to ISO. Symmetric bearing design	Compatible with existing arrangements
Maintained or increased C values	Known performance indicators
SKF Explorer performance class	Ensure best in class performance

Broad coverage for self-aligning bearing arrangements

Broad product range in 240-series

Thoroughly tested and validated in the application, SKF spherical roller bearings are available in the 240-series typically from bore diameters of 530 mm upwards. This covers the vast majority of the wind market using a self-aligning bearing solution, especially for the 3-point suspended turbine arrangements.

The wind industry specific design can be distinguished from other designs through the suffix BC, placed directly after the bore diameter information in the bearing designation (Example: 240/600 BC/C3 as a substitute for the catalogue spherical roller bearing 240/600 ECA/C3W33). This bearing is our recommendation, replacing the catalogue bearing as preferred bearing for wind turbine main shafts.

For more on SKF's full capabilities for the wind industry, visit skf.com/SRBwind.

Explore SKF solutions for wind in 3D

Download SKF's free Virtual Turbine app for an interactive look inside two typical wind turbines. Designed for both wind turbine operators as well as original equipment manufacturers, this app helps support the industry's goal of optimized life cycle cost efficiency. Scan the QR code or visit skf.com/virtualturbine.



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PUB 74/P2 16790 EN · August 2016

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