



Bearing Enhancements

Take advantage of all the strength and efficiency a Timken® bearing has to offer. We bring you three levels of protection for meeting different application requirements:

1. Through-hardened bearings with black oxide for low-demand positions;
2. Case-carburized bearings with black oxide for where you need better performance; and
3. Case-carburized bearings with ES302 diamond-like carbon coatings, or DLC, for where you need maximum performance.

Lubrication

A Better Bearing Grease

The main bearing position is a challenging application for grease, leading Timken to develop a special formulation just for mainshaft bearings. Our tribology experts tested every option and dialed in the right mix of high-temp, antiwear additives for extreme wind environments.

Automated Lubrication Delivery

Groeneveld® automated lubrication systems dispense precise amounts of grease at regular

intervals to reduce up-tower labor compared to periodic manual greasing. Our systems can improve the performance and extend the life of pitch, yaw, mainshaft and generator bearings.



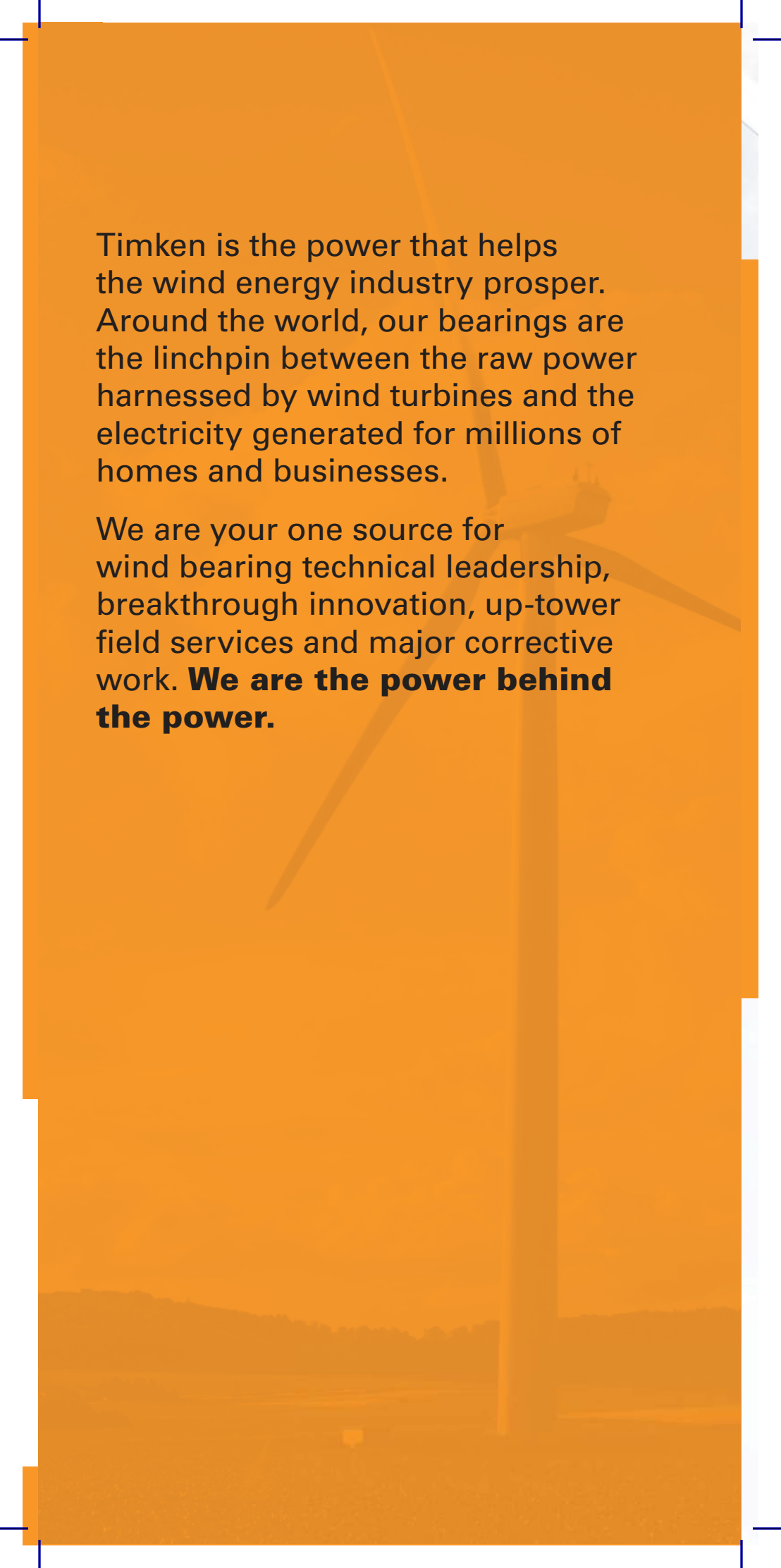
The Products Behind the Power

In the early 2000s, we made a strategic decision to focus on problems occurring in the field. As turbines grew larger, bearing failures increased, sending ownership costs sky high. By engaging power producers, OEMs and industry collaborators worldwide, we engineered a powerful portfolio of products that is moving wind energy forward. Timken is the leader in bearing innovation, minimizing downtime and improving total system performance in wind turbines.

Timken Wind Energy Upgrades

- Upgraded Spherical Roller Bearings
- Tapered Double Inner Mainshaft Bearings
- Tapered and Cylindrical Carrier Bearings
- High-Speed and Intermediate Gearbox Bearings
- Enhanced Planet Bearings
- Ball Bearings for Generators
- Stronger High-Speed Couplings
- Torque Control to Remove Damaging Loads





Timken is the power that helps the wind energy industry prosper. Around the world, our bearings are the linchpin between the raw power harnessed by wind turbines and the electricity generated for millions of homes and businesses.

We are your one source for wind bearing technical leadership, breakthrough innovation, up-tower field services and major corrective work. **We are the power behind the power.**

The Power to Choose

In wind energy, Timken saw an opportunity to apply a century of combined materials, power transmission and friction management expertise to bring stronger solutions to the market, and we exceeded the mark.

The accumulative knowledge Timken engineers and wind experts have gained can dramatically reduce your operations and maintenance spending. We focus on the complete project life cycle because we intend to be engaged with our customers long after the sale, consistently building on observations and data to drive down your cost per kilowatt hour.

Improve the availability of your wind turbines and increase annual energy production when you choose Timken—the power behind the power.

Contact your local Timken representative or visit [Timken.com/wind-energy](https://timken.com/wind-energy) to learn more.

TIMKEN

The Timken team applies their know-how to improve the reliability and performance of machinery in diverse markets worldwide. The company designs, makes and markets bearings, gear drives, automated lubrication systems, belts, brakes, clutches, chain, couplings, linear motion products and related power transmission rebuild and repair services.



TIMKEN

**The Power
Behind the Power**

A close-up, high-angle shot of a white wind turbine's internal components. The image shows the thick, cylindrical nacelle and the central hub where the blades are attached. The hub features a circular flange with a series of dark, rectangular bolts or fasteners. The lighting is soft and even, highlighting the smooth, industrial texture of the white-painted metal. The composition is clean and modern, emphasizing the engineering and design of the renewable energy technology.

The Power Behind the Power

Upgraded Spherical Roller Bearings

ES302 Coated Rollers

- Extend mainshaft bearing life by significantly reducing surface wear and preventing damage with a diamond-like coating
- Improve fatigue life by up to 400% versus standard (untreated) rollers through optimized profiles and clearances that distribute loads evenly
- Reduce cage damage with split cage design, allowing rows to operate independently

Mainshaft

Gearbox

Interchanges are available for all major makes and models, giving you complete upgrade solutions for turbine designs.

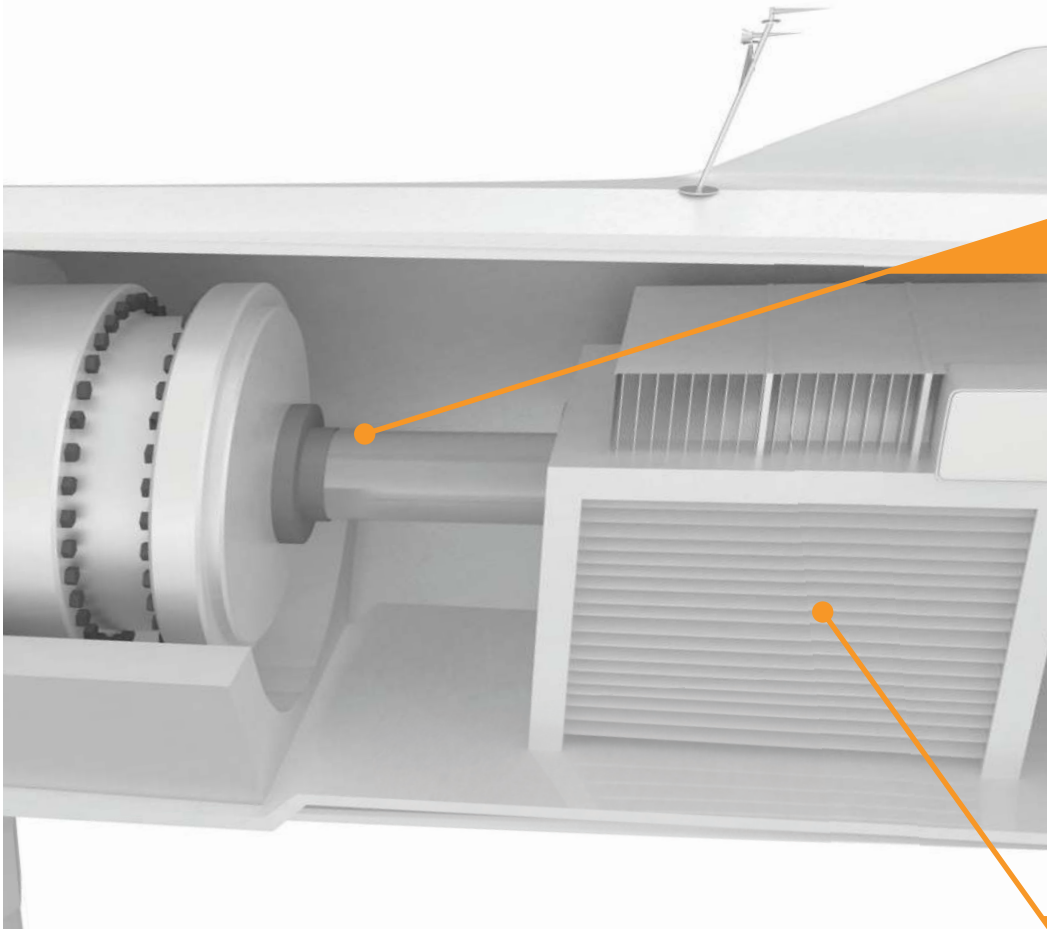
Stronger Carrier Support Bearings

- Single-row tapered roller bearings support combinations of radial and thrust loading, minimizing momentary loading on carrier bearings
- Full-complement cylindrical roller bearings offer high radial load-carrying capability and outstanding float capability in nonlocating positions
- Available with black oxide to mitigate adhesive wear

Innovative TDI Mainshaft Bearings

Case-Carburized Tapered Roller Bearings

- Drop-in replacements for original spherical roller bearings
- Designed to handle the demanding axial loads common to wind turbines
- Reduce adhesive wear—the most common spherical roller bearing damage—with true rolling motion
- Improved load sharing between rows through preloaded arrangement
- Reduce axial thrust into gearbox by up to 67%, improving gearbox life



Innovative Planetary Gear Assemblies

- Upgraded drop-in replacement designs with improved case-carburized material to improve debris and white etching crack (WEC) resistance
- Integrated bearing and flexpin redesigns to increase load rating and better handle damaging nontorque loads
- Also available with:
 - Black oxide to mitigate adhesive wear
 - ES302 coatings to improve debris resistance, shown to extend bearing life up to 300%

AeroTorque® Torsional Control Technology

- Dampens torsional oscillations and the effects of torque reversals to your gearbox and drivetrain
- Extends the life of your drivetrain by removing damaging loads
- Proven in the field on turbines from 750KW to 2.3MW, with monitoring available
- Available as a stand-alone unit, adapted for your coupling, or as an integrated Lovejoy® coupling

Lovejoy® Couplings

The reliable connection between gearbox and generator

- Custom-engineered solutions with a complete range of couplings in every size and type
- Transmit torque while protecting attached components from overload and leakage currents
- Prevent generator eddy current damage to gearbox bearings with unique anti-flail device and integrated electrical isolation joint

Couplings



Durable Deep-Groove Ball Bearings

- Insulated, high-resistance design reduces electricity arcing
- Hybrid (ceramic) balls provide ultimate protection from stray electrical currents

Generator

Case-Carburized Bearings

Tougher High-Speed and High-Speed-Intermediate Bearings

- Resist white etching area transformation, brittle flaking and axial cracking
- Increase white etching crack (WEC) resistance by up to 130% compared to standard through-hardened bearings
- Also available with:
 - Black oxide to mitigate adhesive wear
 - ES302 coatings to minimize adhesive wear and improve debris resistance, which has been shown to extend bearing life up to 300%



The People Behind the Power

Timken brings you the power and the people to take more control of your wind assets. In an industry that sees new challenges every day, H&N Wind Power Systems by Timken keeps you online, from routine inspections to scheduled overhauls to large correctives. Our expert team will solve your problems safely, professionally and efficiently.

Full Suite of Up-Tower Services

We offer a wide array of up-tower services, because time is money. Discover why many top energy producers trust our skilled technicians to perform the most critical tasks, including gearbox oil changes, bearing replacements, shaft repair, carbon brush replacements and preventive maintenance strategies.

A Leader in Large Correctives

At 300 feet in the air, lifting equipment upward of 100,000 pounds, there's no margin for error—and no substitute for experience. As turbines age and warranties expire, major corrective work can revitalize older assets and unlock new potential. Tap into a more powerful maintenance team.

Generator Rebuilds, Rewinds and Overhauls

We can help you correct premature failures up-tower or in our repair centers. H&N Wind Power Systems brings you a powerful combination of OEM-certified techs, experienced engineering teams and bearing experts who can generate a better ROI for your operation.