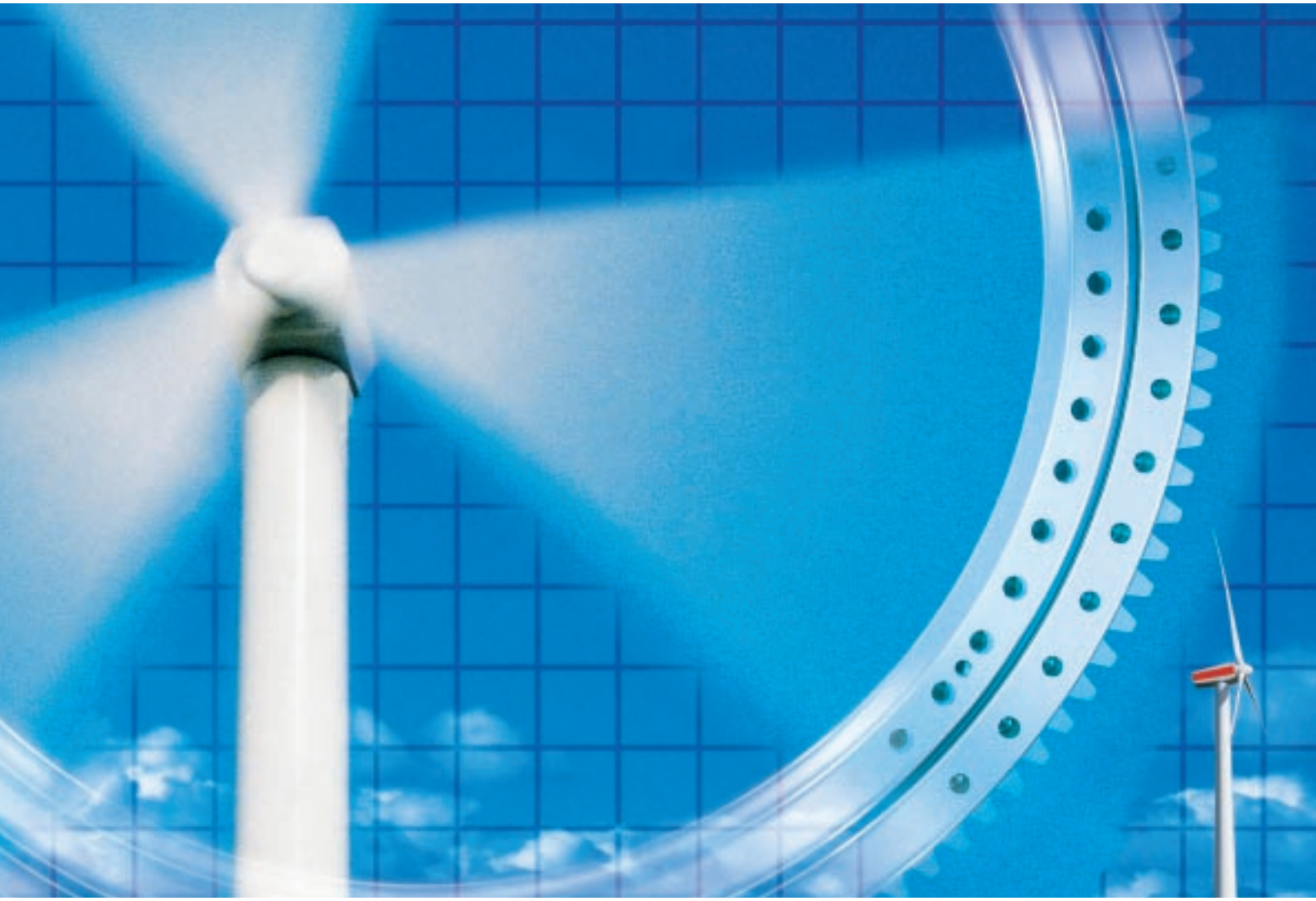
Rothe Erde® Slewing Ring Bearings.
Application: Wind Energy Turbines.



A ThyssenKrupp Technologies company

Rothe Erde

ThyssenKrupp

Worldwide successful with slewing ring bearings and rings.

As a ThyssenKrupp Technologies company Rothe Erde GmbH enjoys an excellent reputation as a global market leader in slewing ring bearings. Our production line includes ball and roller slewing ring bearings, turntables and seamless rolled rings made from steel or non-ferrous metals.

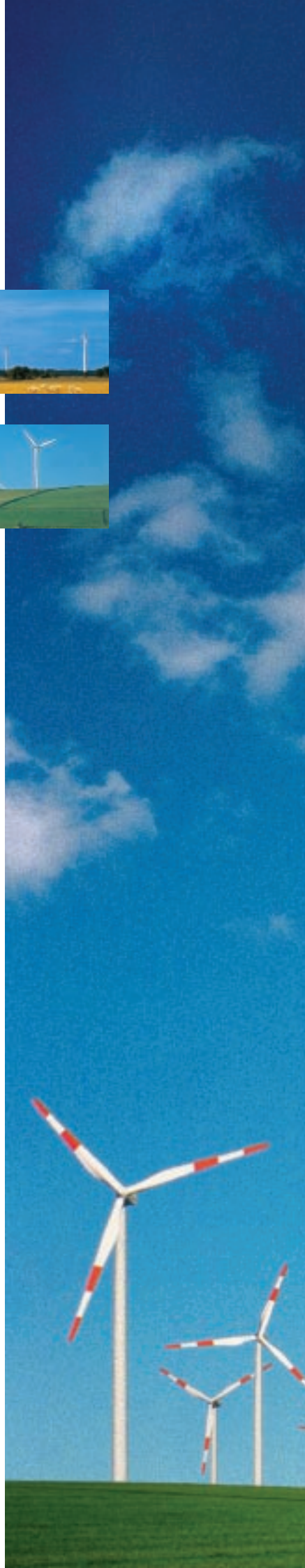
Rothe Erde bearings are manufactured in Germany, Great Britain, Italy, Spain, the United States, China, Japan and Brazil. Rothe Erde furthermore maintains its own distributors or sales agencies in all major industrialised countries.

Our domestic as well as our international production sites are committed to offering our customers nothing but the highest quality level. All our activities from application engineering to design and production including comprehensive customer service are based on the DIN/ISO 9001/2000 standard of quality.

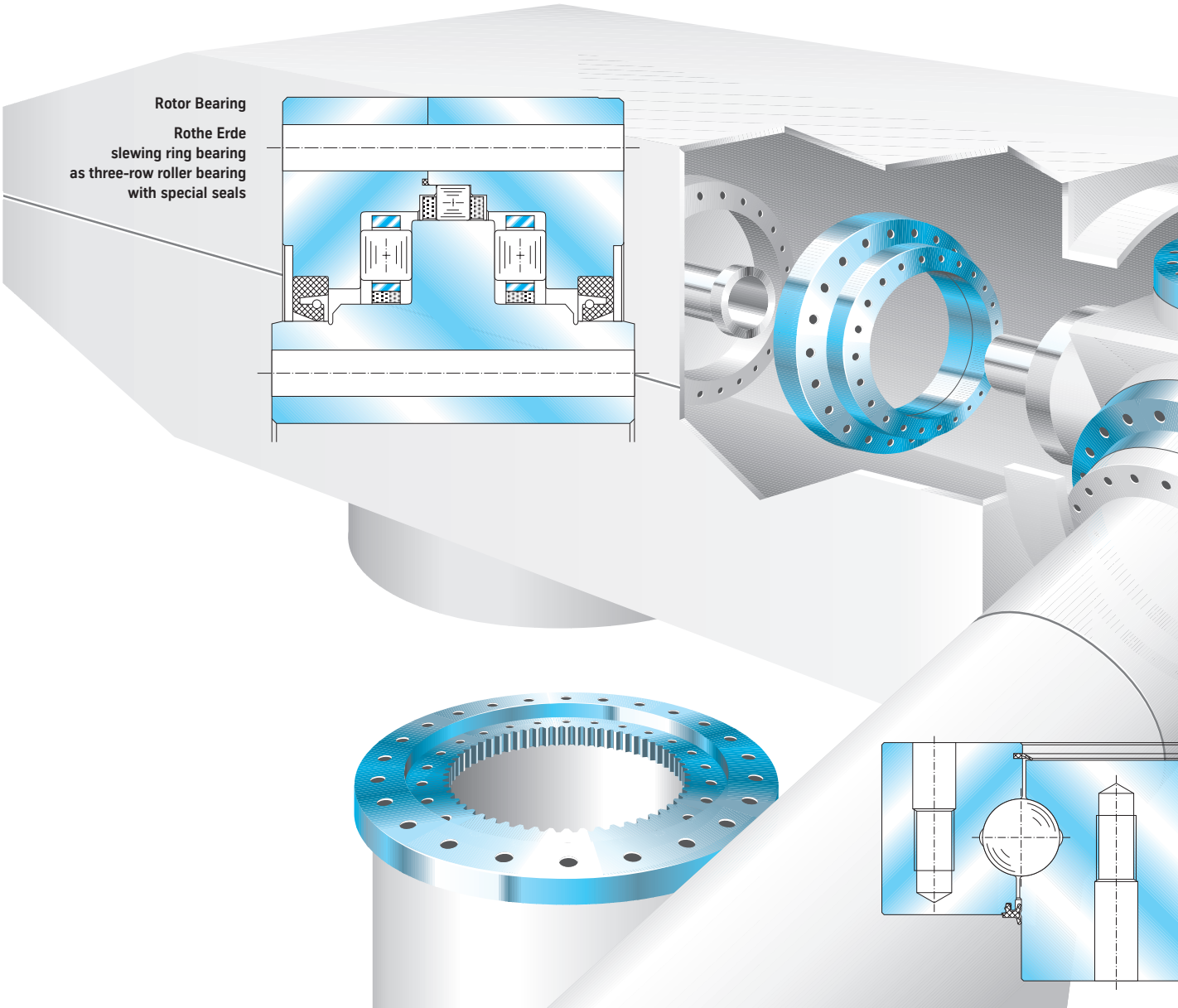
Wind power.
A renewable energy source.

Increasing environmental awareness and limited energy resources have made wind energy more and more important as an environmentally friendly complementary solution to conventional electrical power generation all over the world. And the percentage of regenerative energy generation will even increase in the years to come.

Continuous advancement in this technology has led to progressive growth in the various output classes. Considering that the average output of wind energy turbines amounted to no more than 250 kW in the early nineties, intensive research and development have now made turbines with outputs in the megawatt range the modern standard.

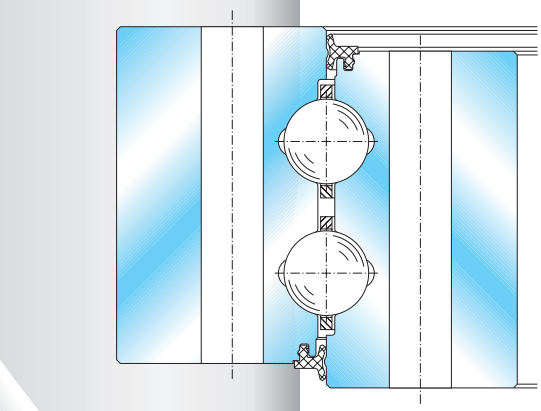


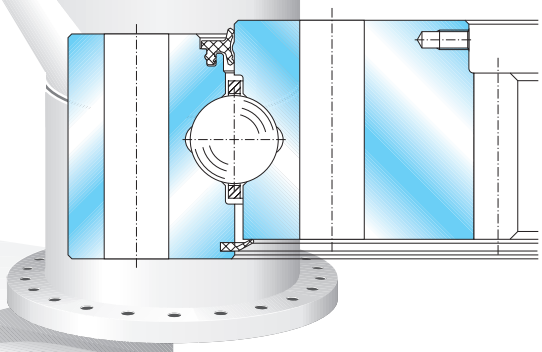
Rothe Erde slewing ring bearings meet the most stringent requirements.



The rotor bearing
In this application, slewing ring bearings functioning as self-retaining moment bearings are exposed to extreme dynamic loads. They do not require rotor hubs and allow to give the nacelle a low-profile and light construction.

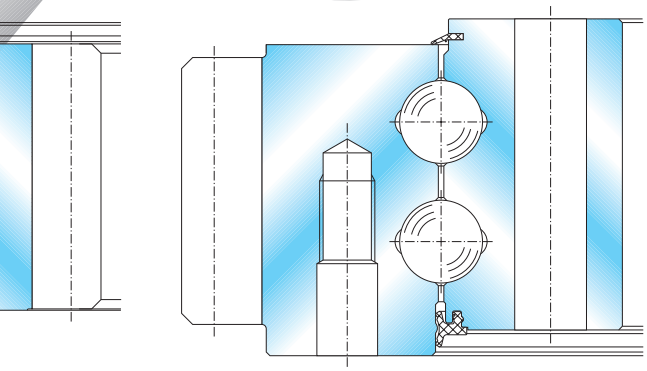
The yaw bearing
Yaw or azimuth bearings orient the nacelle to the direction of the wind and can be provided with outer or inner gearing.





Blade Bearing

Rothe Erde
slewing ring bearing
as preloaded ball bearing
with special seals



Yaw Bearing

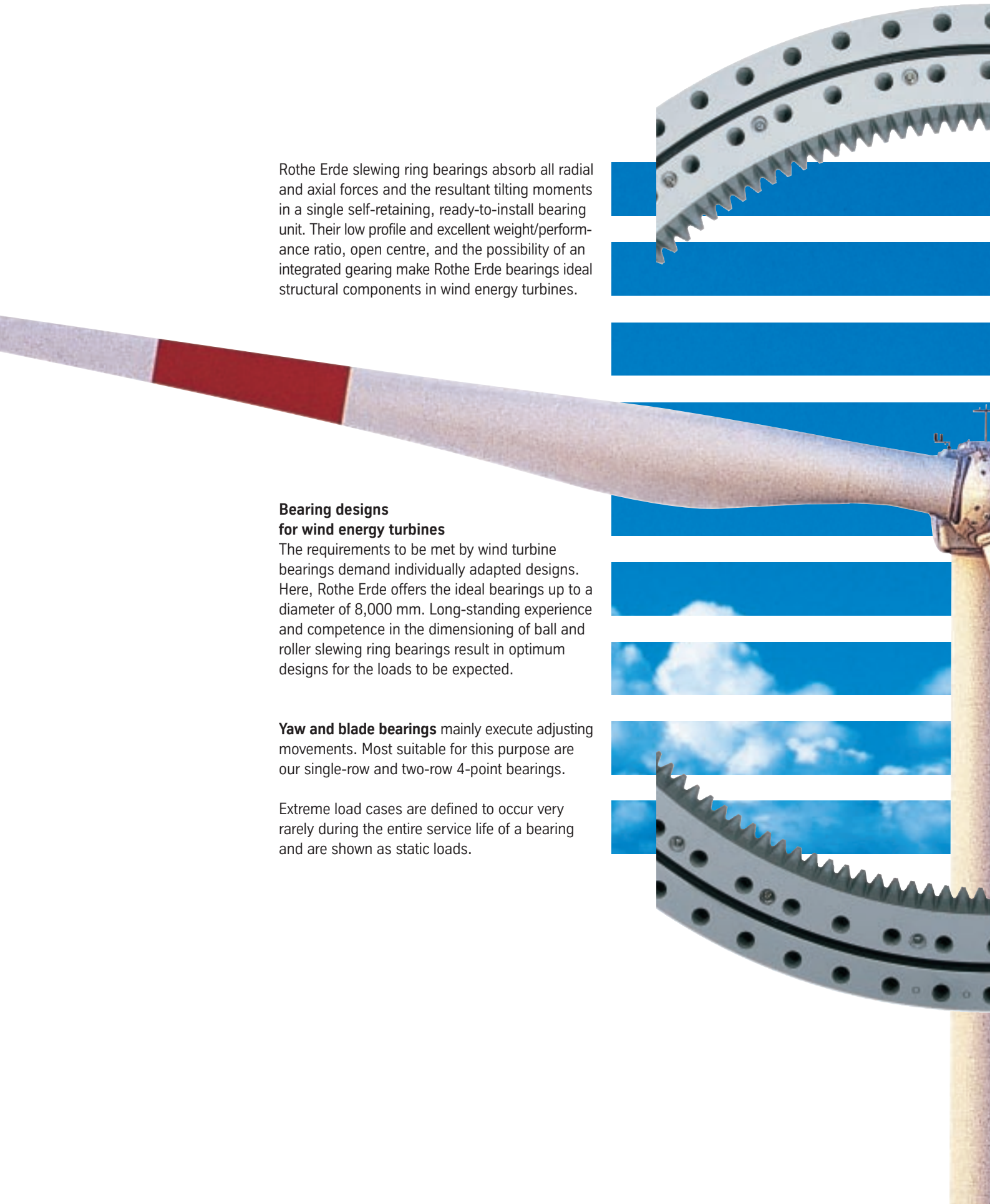
Rothe Erde
slewing ring bearing
as preloaded ball bearing
with special seals

The blade bearing

To assure optimum power output from the generator even at varying wind speeds, the pitch angles of the rotor blades must be adjustable. Depending on the pitch drive, blade bearings can be provided with or without integrated gearing.

Rothe Erde slewing ring bearings.
Precision for an innovative technology.

Rothe Erde slewing ring bearings absorb all radial and axial forces and the resultant tilting moments in a single self-retaining, ready-to-install bearing unit. Their low profile and excellent weight/performance ratio, open centre, and the possibility of an integrated gearing make Rothe Erde bearings ideal structural components in wind energy turbines.



Bearing designs
for wind energy turbines
The requirements to be met by wind turbine bearings demand individually adapted designs. Here, Rothe Erde offers the ideal bearings up to a diameter of 8,000 mm. Long-standing experience and competence in the dimensioning of ball and roller slewing ring bearings result in optimum designs for the loads to be expected.

Yaw and blade bearings mainly execute adjusting movements. Most suitable for this purpose are our single-row and two-row 4-point bearings.

Extreme load cases are defined to occur very rarely during the entire service life of a bearing and are shown as static loads.

The small twisting angle which is often not even within the pitch range of the rolling elements, makes the rating of both bearing types based on their theoretical service life (fatigue life) rather difficult. Blade bearings in particular have to withstand the continuous load changes resulting from pulsating loads. Therefore, the design of these bearings relies on the Hertzian pressure.

Rothe Erde yaw and blade bearings are given a slight preload with defined torque resistance values during production as a means to prevent unwanted false brinelling.

Special Rothe Erde double lip seals resistant to ozone and ultraviolet light are installed to assure optimum protection of the raceway system.

Rotor or main hub bearings rotate continuously. Three-row roller slewing ring bearings in particular have proven their superiority in this application.

Due to the high dynamic loads they are exposed to, these bearings are dimensioned with respect to their theoretical life.

Corrosion protection
Rothe Erde uses various reliable surface treatment methods to meet the specific requirements regarding outside corrosion protection. A highly suitable protection against detrimental environmental conditions is surface sand-blasting with subsequent zinc-flame-spraying to EN 22063.

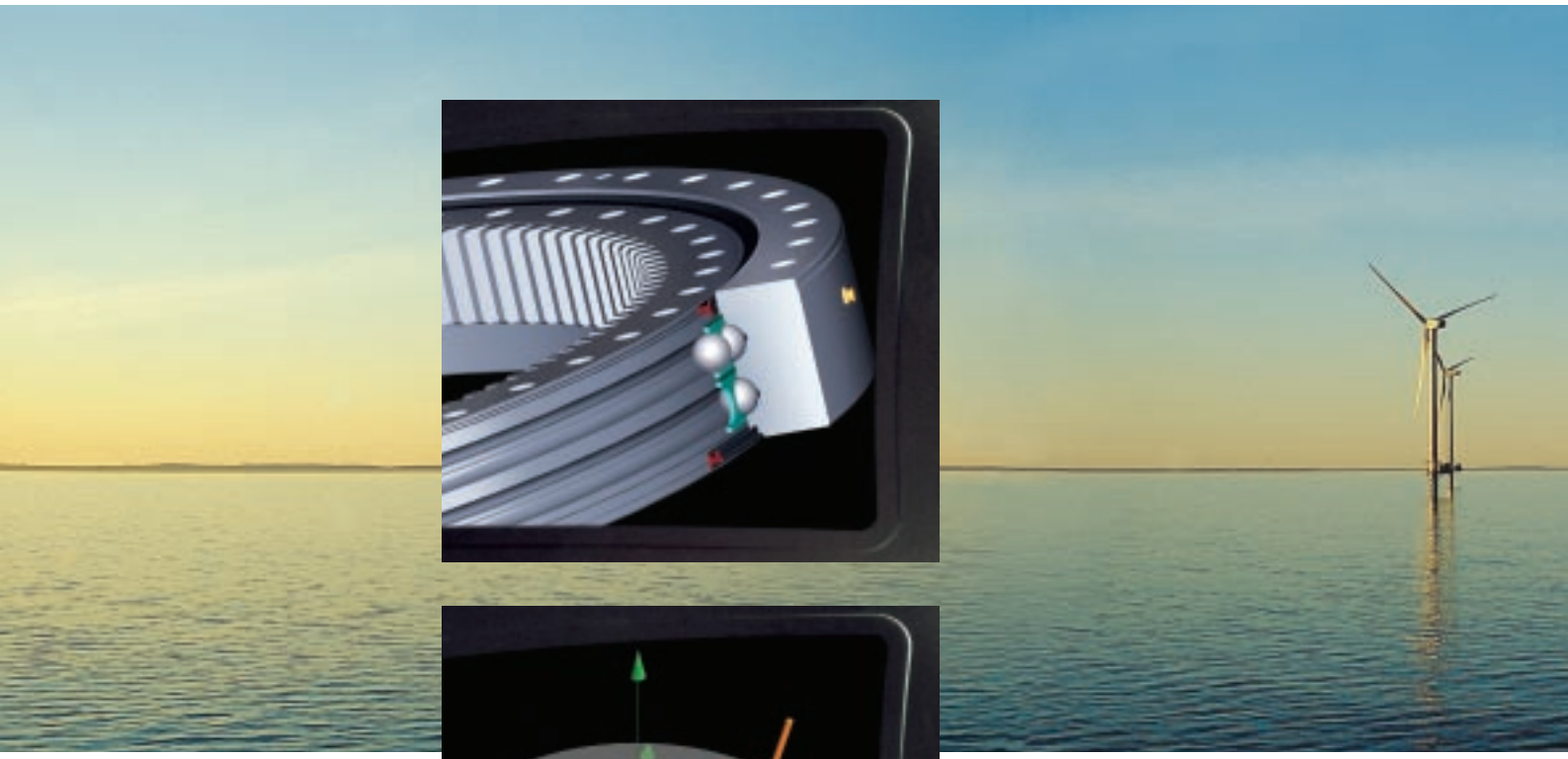
Any way the wind blows.
Rothe Erde bearings are doing an excellent job.

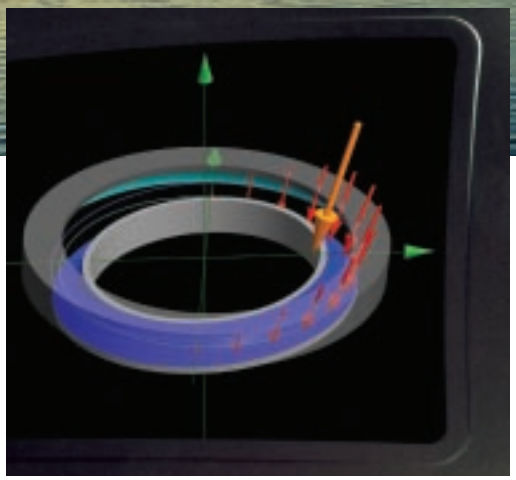
Rothe Erde has already been an active partner in the early design stages of the first wind energy research stations and prototypes. We are now in a position to make our long-standing experience available to international wind power turbine builders in concentrated form. Problem-related customer consulting during the design phase, elaboration of solutions and design optimisation are part of this effort as is precision manufacture in our ultramodern facilities.

Slewing ring bearings from Rothe Erde will continue to remain close to the wind well into the future. This page shows some examples of our purpose-built wind energy bearings. They have been successfully operating for many years in different wind station types and sizes in many places all over the world. World-wide excellent references are visible proof of our competence.

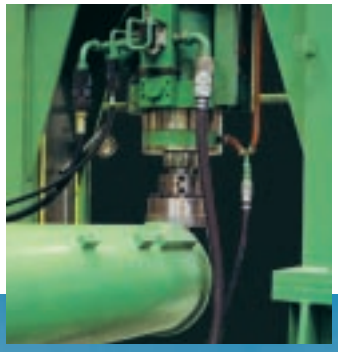
Looking ahead.
Design and development.

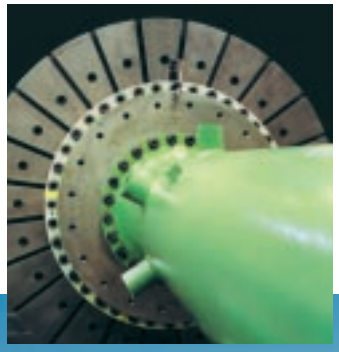
The new calculation method developed by Rothe Erde on the basis of the Finite Elements Method fosters a sustained development partnership between customer and manufacturer.

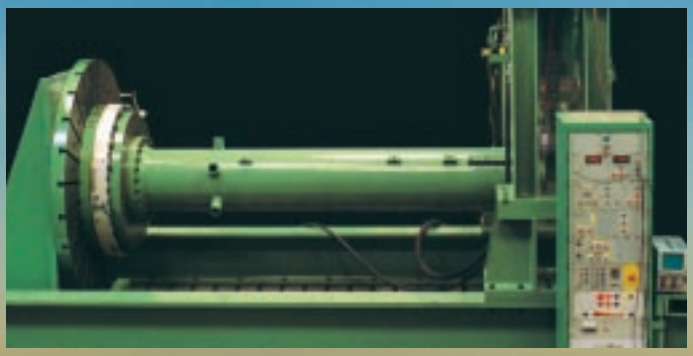


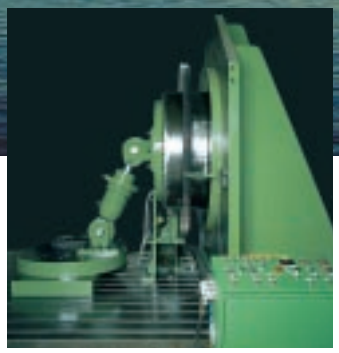


This new method allows a highly economical solution as well as from the mechanics point of view a very profound analysis of the overall system of slewing ring bearing and companion structure.









The Rothe Erde Research and Development Centre uses the most advanced high-tech equipment to subject our various bearing types to tests and trials under the most stringent service conditions. On-going development paves the way for future-orientated solutions to practical applications. Research results, experience and fresh ideas are thus culminating in market-conforming and customer-orientated products.

MaQus.
The Rothe Erde integrated management system.

The integrated management system put in place at Rothe Erde includes the following elements:

- Quality assurance system to DIN/ISO 9001/2000;
- Environmental protection to DIN/ISO 14001 and
- Occupational safety to OHSAS 18001.

Rothe Erde is aware of its responsibility vis-à-vis its staff, its business partners, and the population as a whole.

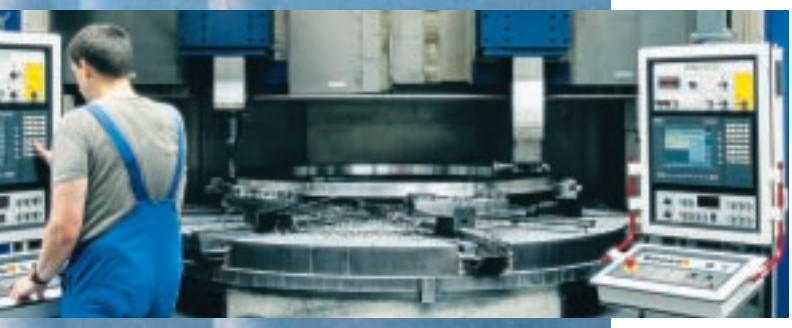
Our declared goal is to promote and intensify customer relations, to offer products of the highest possible quality, and to minimise detrimental effects on people, environment, and equipment. The protection of resources as well as continuous process improvement are important elements of our company policy.

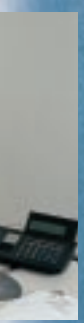
Our products are designed and manufactured to in-house standards and specific customer requirements based on tried and proven calculation methods, design guidelines and production processes.

Quality assurance, environmental protection and safety are the factors which have brought Rothe Erde economical success.

The foundation of our management system is the documentation of all procedures and process flows in the form of procedural and work instructions taking into account legal requirements, regulations, guidelines, specifications and agreements.

We believe that only highly motivated employees can achieve effective quality assurance, environmental protection, occupational and equipment safety. Regular exchange of experience as well as basic and on-going training promote the awareness of our employees at all levels allowing them to act competently and responsibly.





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