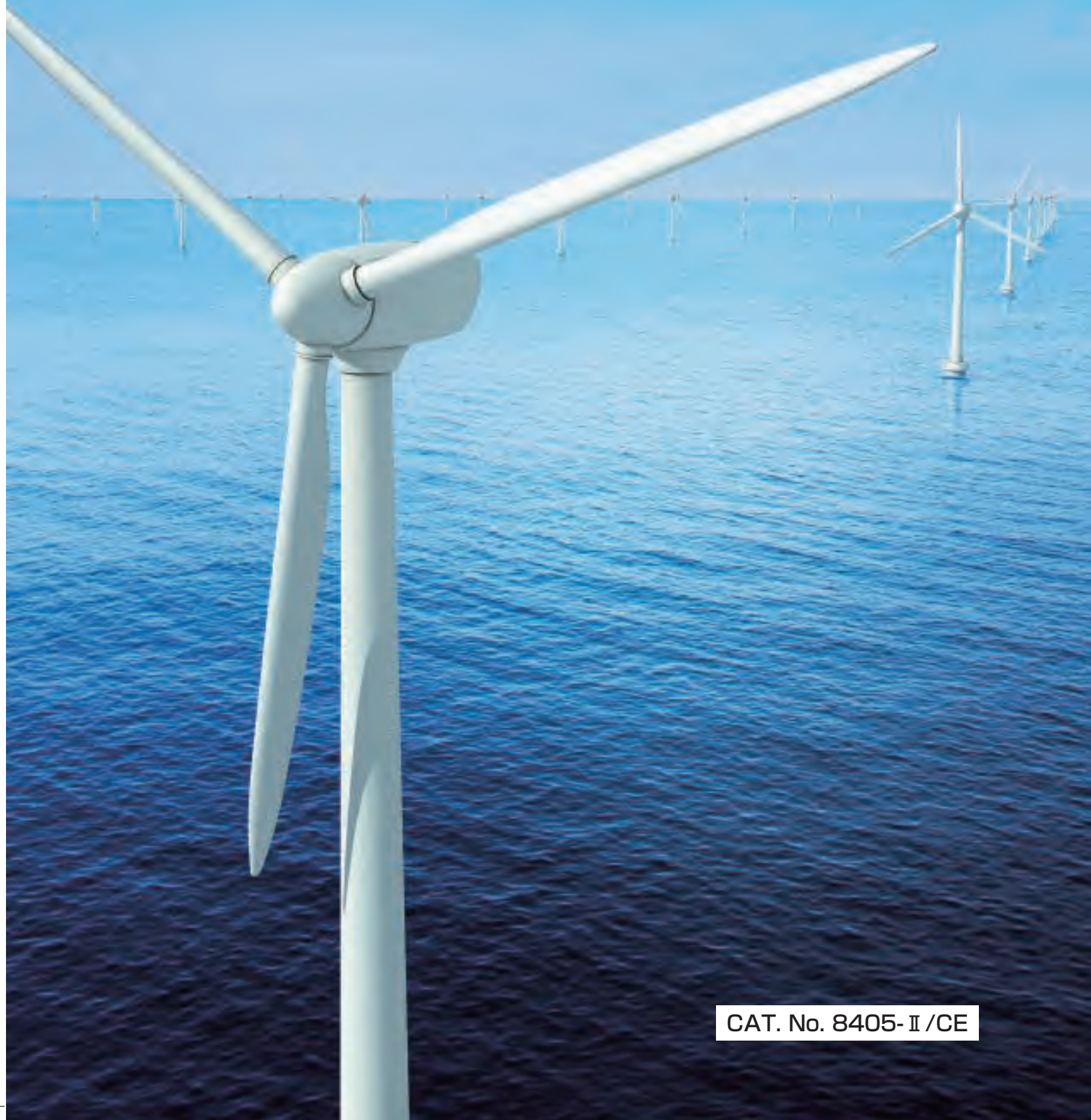




NTN®

NTN Bearings for Wind Turbines 风力发电机轴承



CAT. No. 8405-Ⅱ/CE



Wind Power – Our Energy

Proposals for the next generation of wind turbines

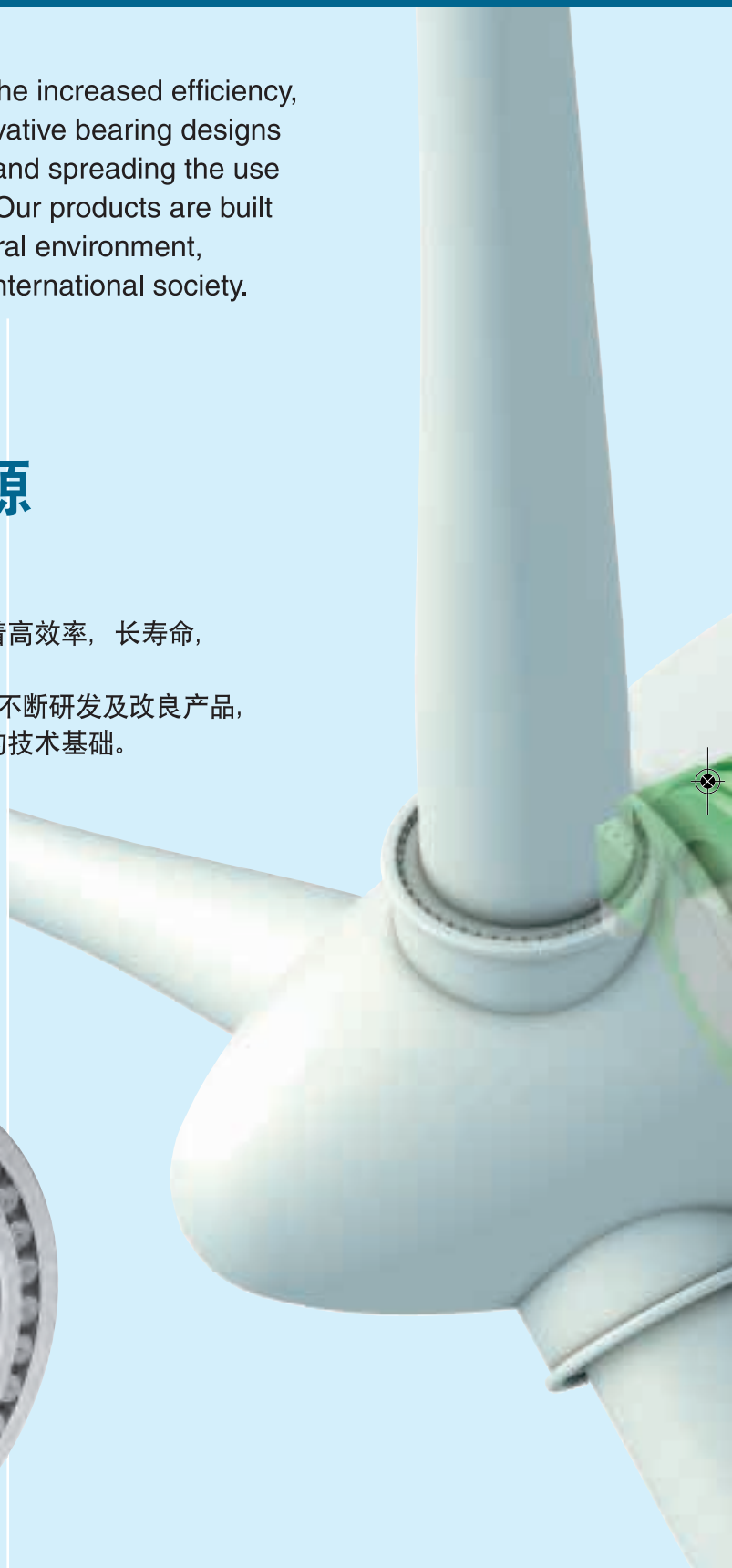
Wind turbine technology continues to progress for the increased efficiency, reliability and longer service life of equipment. Innovative bearing designs from **NTN** are instrumental in these improvements and spreading the use of wind technology for electrical power generation. Our products are built with three concepts in mind: harmony with the natural environment, improved energy conservation and contribution to international society.

风能—造福人类的新能源

为新一代风力发电机，提供优化解决方案

随着风力发电技术的不断发展进步，风力发电机正在向着高效率，长寿命，高可靠性的方向发展。

NTN本着“协调环境”，“节约能源”，“贡献社会”的原则不断研发及改良产品，其创新的轴承设计为风力发电的普及和发展奠定了坚实的技术基础。





Rotor Mainshaft Bearings

Handling diverse needs with a great track record and proven reliability

主轴轴承

丰富的经验和稳定可靠的产品性能可应对多样化需求

Gearbox Bearings

Life-extending technologies to handle even the most severe application conditions

齿轮箱用轴承

优化轴承设计，延长使用寿命

Generator Bearings

Insulated bearings that prevent the passage of electrical current through the bearings

发电机用绝缘轴承

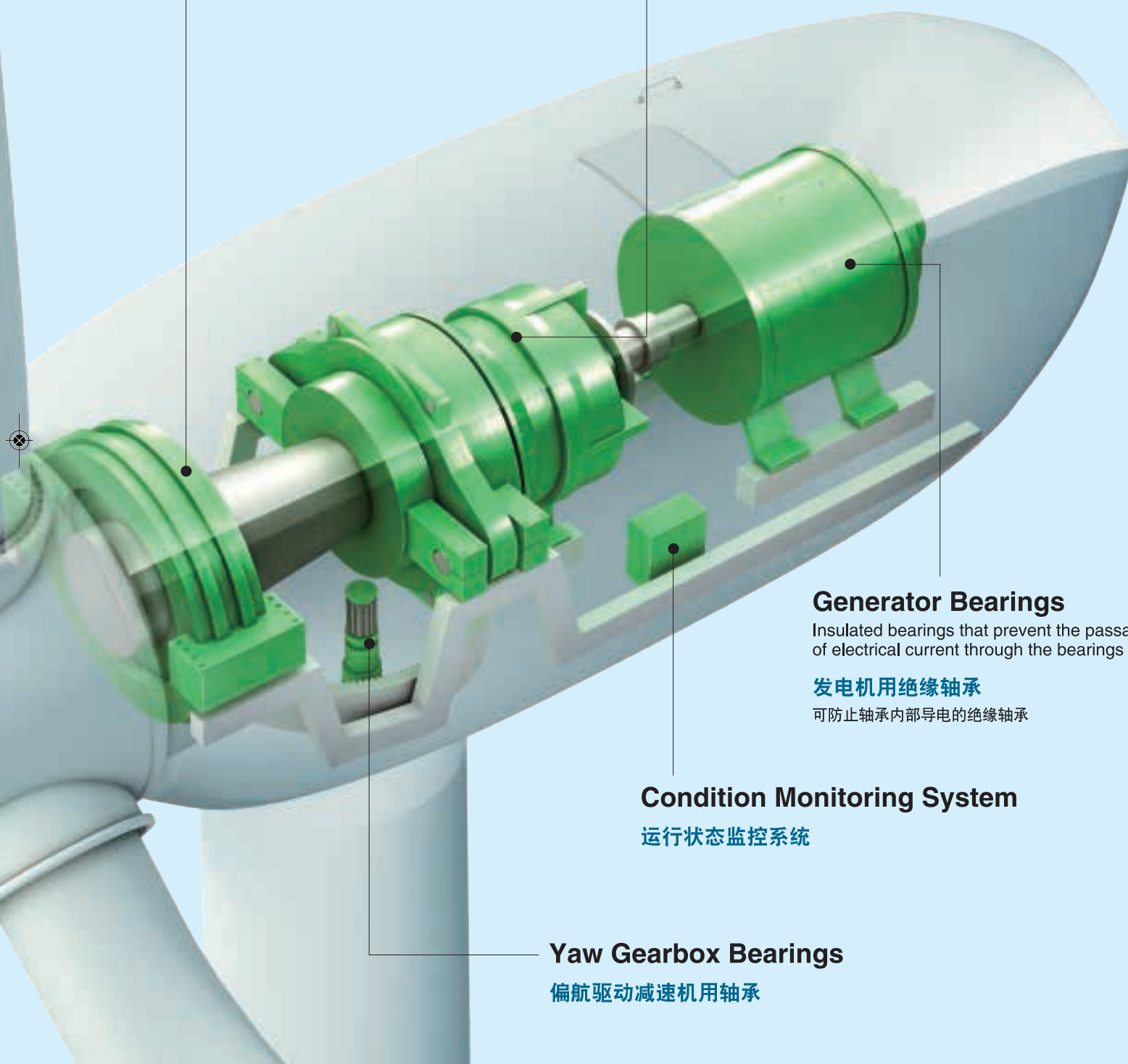
可防止轴承内部导电的绝缘轴承

Condition Monitoring System

运行状态监控系统

Yaw Gearbox Bearings

偏航驱动减速机用轴承



Rotor Mainshaft Bearings

Handling diverse needs with a great track record and proven reliability

主轴轴承

丰富的经验和稳定可靠的产品性能可应对多样化需求

Various types of bearings are used for the rotor mainshaft.

NTN provides bearings with high reliability and long service lives based upon the application conditions.

Additionally NTN is capable of providing large-bore bearings for ocean-based wind turbines with capacities greater than 5 MW.

主轴轴承的类型根据风力发电机配置方案的不同而有所不同，通常较为常用的配置方案如下表所示。

NTN根据客户的使用条件，需求提供性能可靠，长寿命的轴承产品。对于5MW以上的海上风力发电机轴承，我们也能为您提供完善的解决方案。



Spherical roller bearings
自动调心滚子轴承

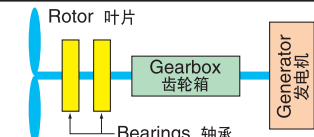
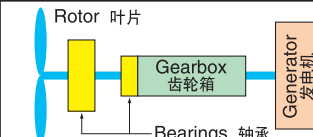
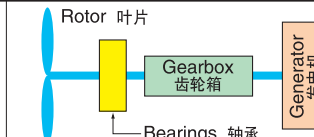


Cylindrical roller bearings
圆柱滚子轴承



Double-row tapered roller bearings
双列圆锥滚子轴承

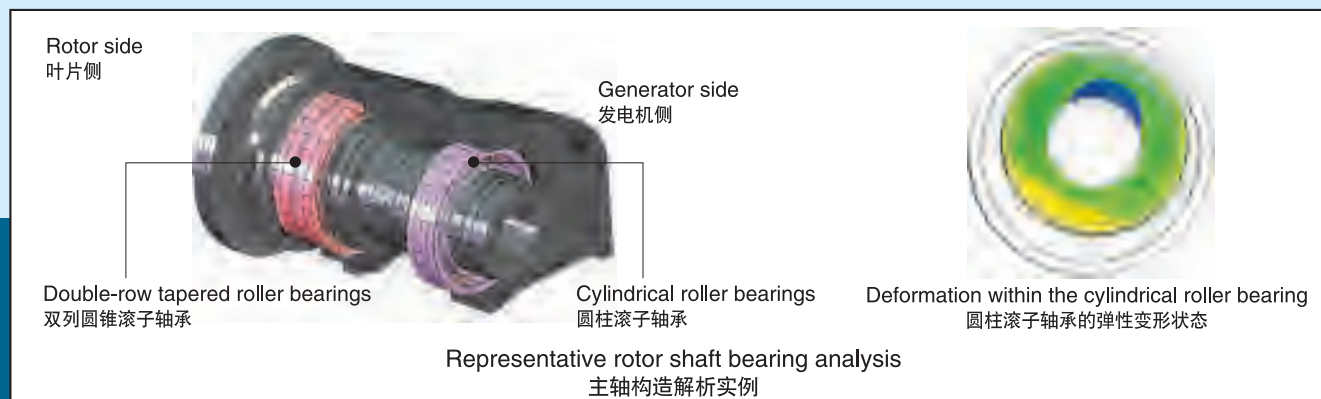
Typical Mainshaft bearing arrangements 典型的主轴轴承配置

Turbine Layout 配置方案			
Rotor side bearings 叶片侧轴承	Spherical roller bearings 调心滚子轴承 Cylindrical roller bearings 圆柱滚子轴承	Spherical roller bearings 调心滚子轴承	Double-row tapered roller bearings 双列圆锥滚子轴承
Generator-side bearings 发电机侧轴承	Spherical roller bearings 调心滚子轴承 Double-row tapered roller bearings 双列圆锥滚子轴承	(Cylindrical roller bearings) (圆柱滚子轴承)	

Representative rotor shaft bearing analysis 主轴构造解析实例

By analyzing the structure of the bearings, bearing housing, tower and other components of the turbine, NTN can modify the internal design of the bearing for high reliability even when accounting for housing deformation.

我们在产品设计时对轴承及包括轴承座、底座等轴承周边部件在内的结构进行有限元分析。在考虑到弹性变形等因素的基础上对轴承进行优化设计，从而为客户提供性能稳定可靠的产品。



Gearbox Bearings

Life-extending technologies to handle even the most severe application conditions

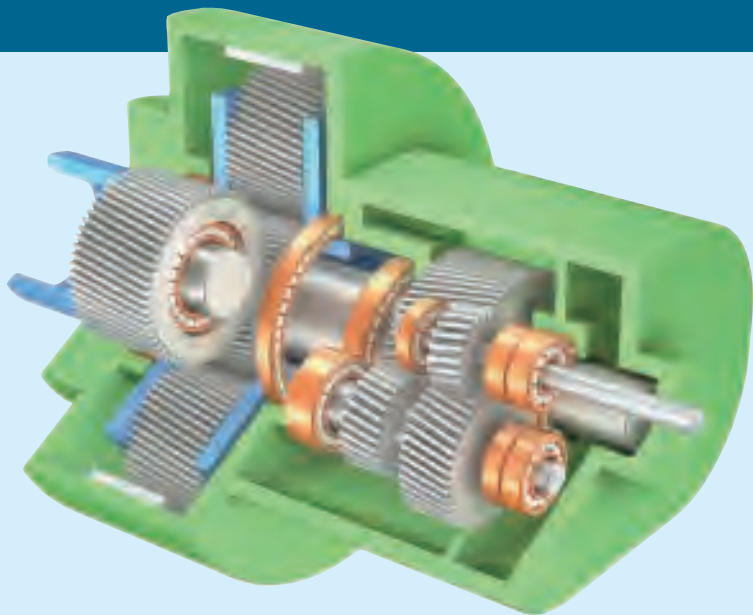
齿轮箱用轴承

优化轴承设计，延长使用寿命

The attributes needed in the bearings used in the gearbox differ according to their location within the gearbox.

齿轮箱中所使用的轴承，由于使用位置的不同对其性能要求也不同。

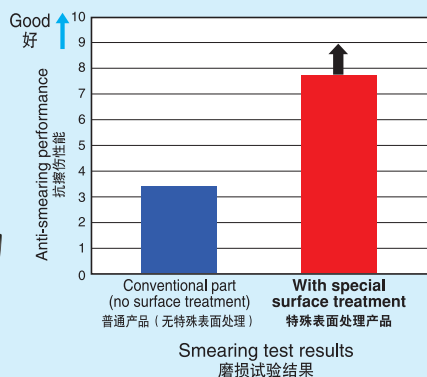
因此对齿轮箱进行构造解析是保证齿轮箱可靠性的重要手段。



Special surface treatment 特殊表面处理

By using a special surface treatment on the inner and outer raceways, as well as the rolling elements, oil film formation capability is increased and surface damage (i.e. smearing) is prevented. As shown in the graph below, anti-smearing performance is improved compared to that of a conventional part.

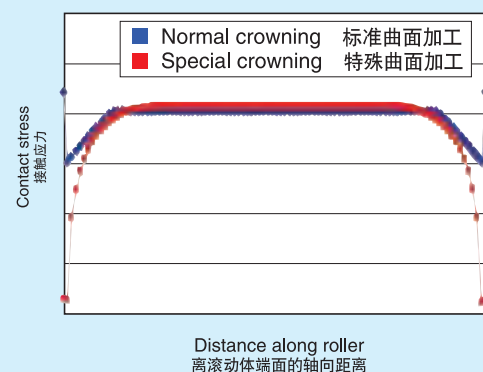
通过对轴承的内外圈，滚动体实施特殊表面处理，可以提高油膜形成能力，防止表面擦伤（滚动面、滚道面擦伤）。如图所示，与无实施特殊表面处理的产品相比，抗擦伤性能得到了显著提高。



Optimized roller element crowning 滚动体特殊曲面加工

Increased lifespan is sought by using an optimized crowning profile on the rolling elements to reduce edge stresses in the application.

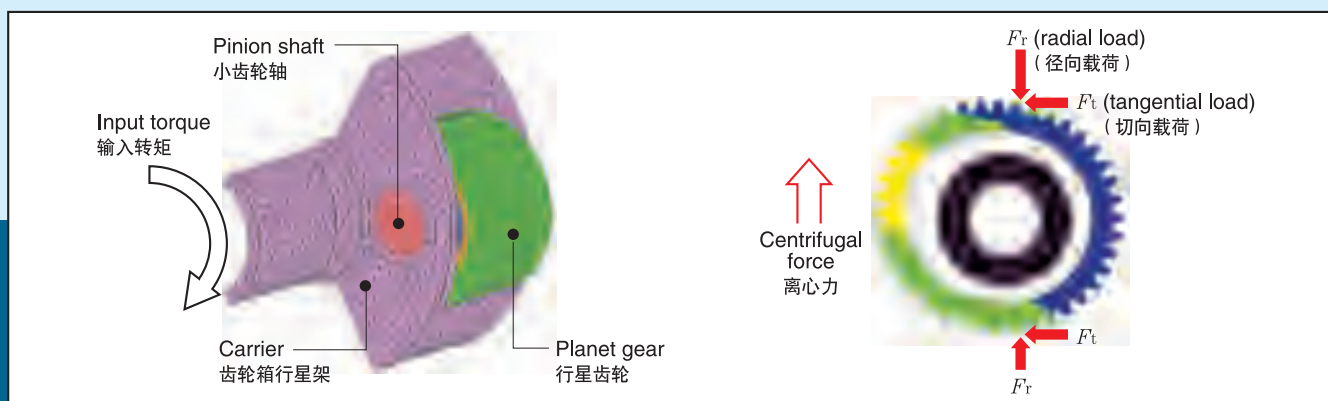
通过对滚动体实施特殊曲面加工，可降低滚动体两端的边缘应力集中，延长轴承使用寿命。



Representative analysis of a gearbox component, including bearings 齿轮箱行星部分构造解析实例

By analyzing the structure around the bearings (carriers, gears, etc.) NTN is able to optimize the internal design of the bearing to produce high reliability in cases where deformation is present.

我们在设计产品时对轴承及包括行星架、齿轮等轴承周边部件在内的结构进行有限元分析。在考虑到弹性变形等因素的基础上对轴承进行优化设计，从而为客户提供性能稳定可靠的产品。



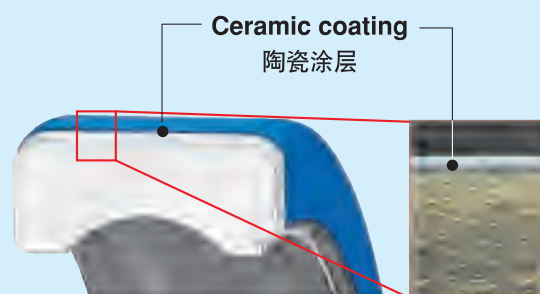
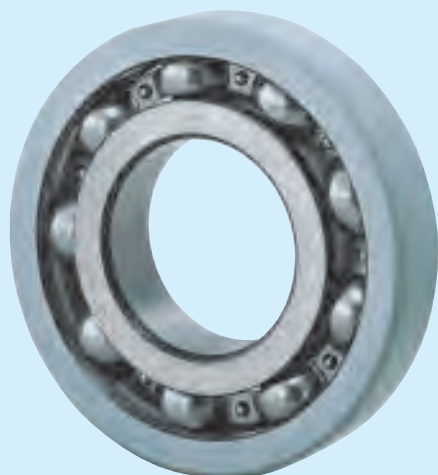
Generator Bearings

Insulated bearings for preventing the passage of electrical current through the bearings

发电机用绝缘轴承

可防止轴承内部导电的绝缘轴承

- A ceramic coating on the outer surface of the bearing creates an insulating layer and prevents electrolytic corrosion. (Insulating value when 500 V DC: 100 M or more; electrical breakdown power: 3 KV or more)
- Bearing dimensions and tolerances are identical to standard product, allowing for easy substitution.
- 通过对轴承外圈的表面和端面实施陶瓷涂层处理，使其具有高绝缘性能可有效的阻止轴承内部电流通过，防止电蚀的发生。（陶瓷涂层的绝缘电阻：100MΩ以上（DC500V时）；击穿电压：3KV以上）
- 另外，绝缘轴承与非绝缘轴承的尺寸、精度相同，完全可以互换。

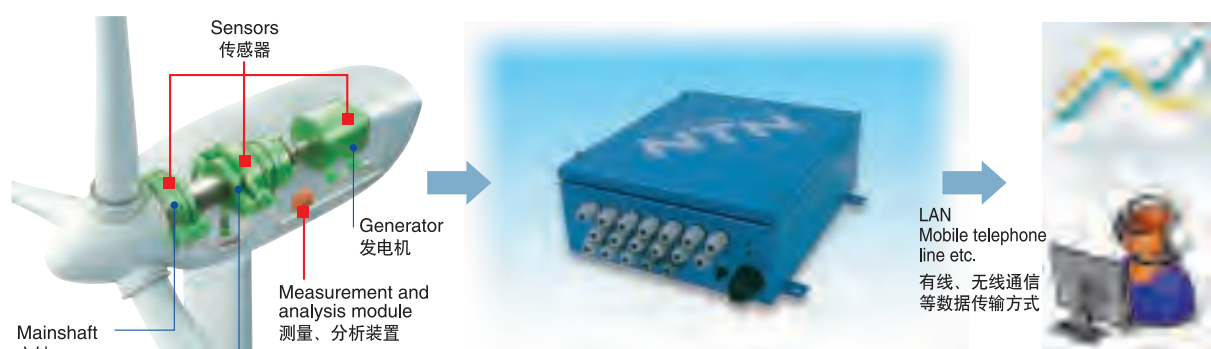


Condition Monitoring System

运行状态监控系统

With the installation of an NTN condition monitoring system, the in situ status of the bearings can be managed remotely, and faults can be detected early.

使用NTN的远程运行状态监控系统，可以对轴承的运行状况进行远程监控，并在数据分析处理之后对潜在的故障提前发布预警信息。



[Wind turbine]
【风力发电机】

- Vibration sensor
• 振动传感器
- Temperature sensor
• 温度传感器
- Rotation sensor
• 转速传感器

[Measurement and analysis module]
【测量、分析装置】

- FFT analysis
• FFT分析
- Various types of signal processing including envelope processing
• 包络线处理等各种信号处理

[User computer]
【用户PC】

Vibration and temperature trend graph display
显示振动与温度的变化趋势图

Overview of the NTN Group

NTN Head Office
in Osaka



Founded in 1918, NTN manufactures precision machinery components, with production centered on bearings. Now firmly established as an important business partner, NTN is a leading supplier in the field of bearings and constant velocity joints (CVJs) and a trusted, high-evaluated company in the eyes of its customers. Moreover, in recent years, NTN has been actively involved in developing its businesses in emerging markets overseas with their prominent developing economies. Local production centers for bearings and CVJs have been established in India, Brazil and Thailand. Due to the continuing rapid economic development occurring in China, NTN has also created a system of meeting local needs with regard to production and product development in a timely manner by establishing a new research and development center in addition to a total of 10 manufacturing centers serving the Chinese market for bearings and CVJs.

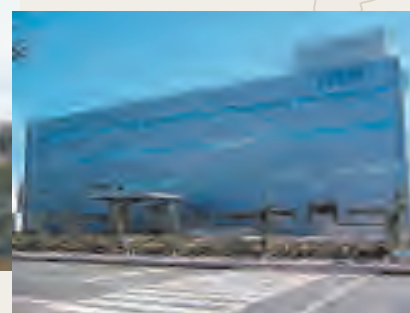
NTN is also actively meeting the challenge of developing innovative product fields. Electric vehicles (EV) have been drawing attention in recent years and NTN has developed a new product, a hitherto unseen unified control and drive unit for In-Wheel Motor System, One-Motor Type EV Drive System and Steering System for Steer-by-Wire. In order to realize the development of an international society and our coexistence with the natural environment, NTN will continue to spread its advanced technologies throughout the world as we try to move one step ahead of current needs.



NTN China Technical Center (Shanghai, China)



Research Institute of Advanced Technologies
(Mie pref, Japan)



NTN R&D Center (Shizuoka pref, Japan)

NTN中国技术中心

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