NTN Bearings for Wind Turbines
風力発電装置用軸受

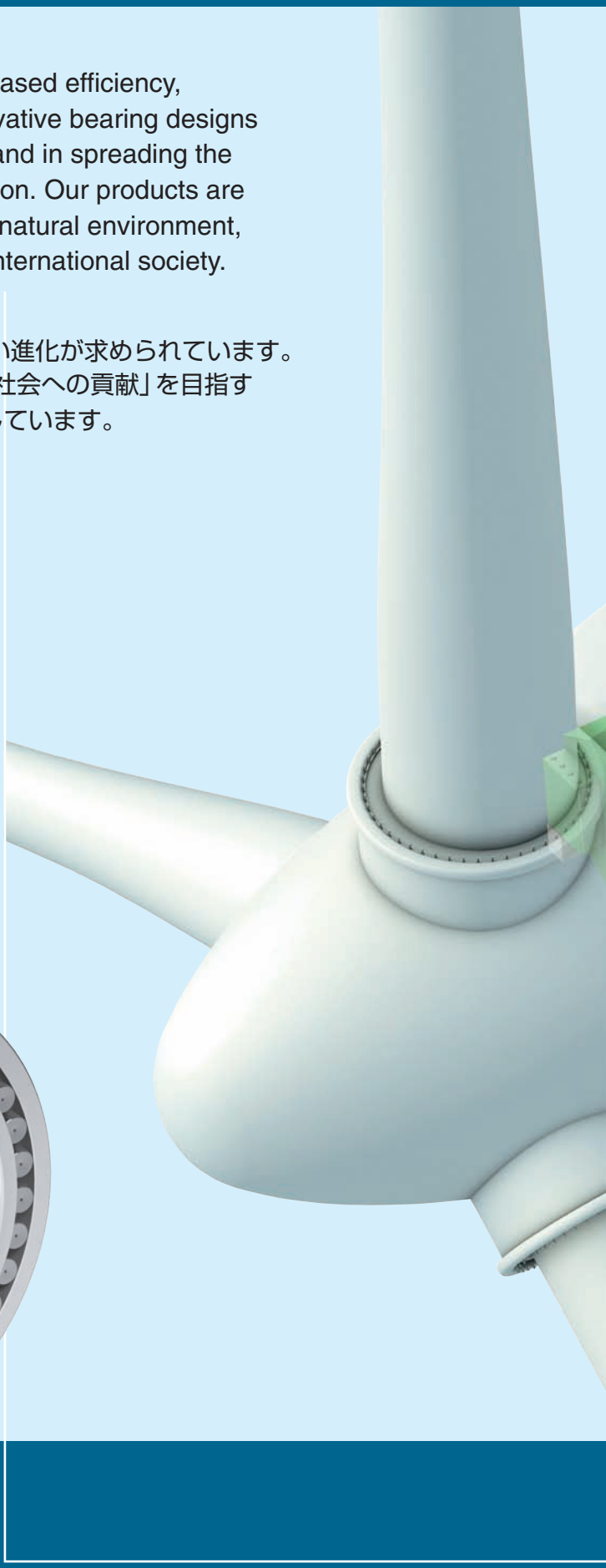
CAT. No. 8405-Ⅱ/JE

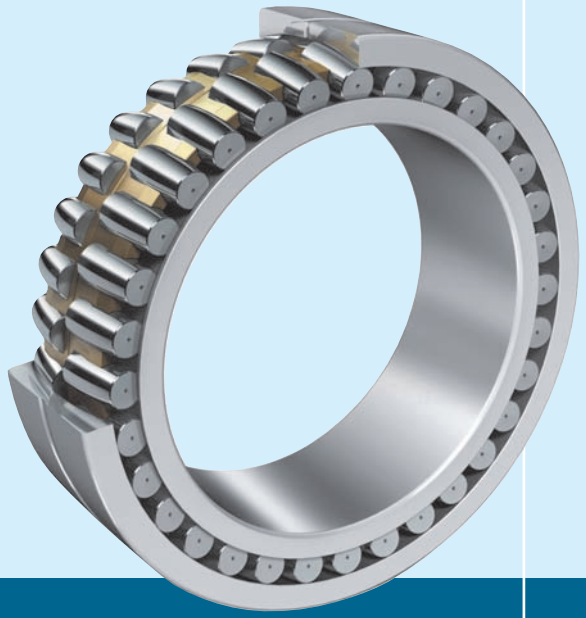
Wind Power – Our Energy

Solutions for the next generation of wind turbines

Wind turbine technology continues to demand increased efficiency, reliability and longer service life of equipment. Innovative bearing designs from **NTN** are instrumental in these improvements and in 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.

風力発電技術には、効率、信頼性、耐用年数への限りない進化が求められています。「自然環境との調和」、「エネルギー資源の保護」、「国際社会への貢献」を目指す**NTN**の軸受は、これらの要求と風力発電の普及に貢献しています。





風力発電 — 私達のエネルギー

次世代風力発電装置への提案

Rotor Mainshaft Bearings

Meeting demanding requirements with a proven track record and reliability

主軸受

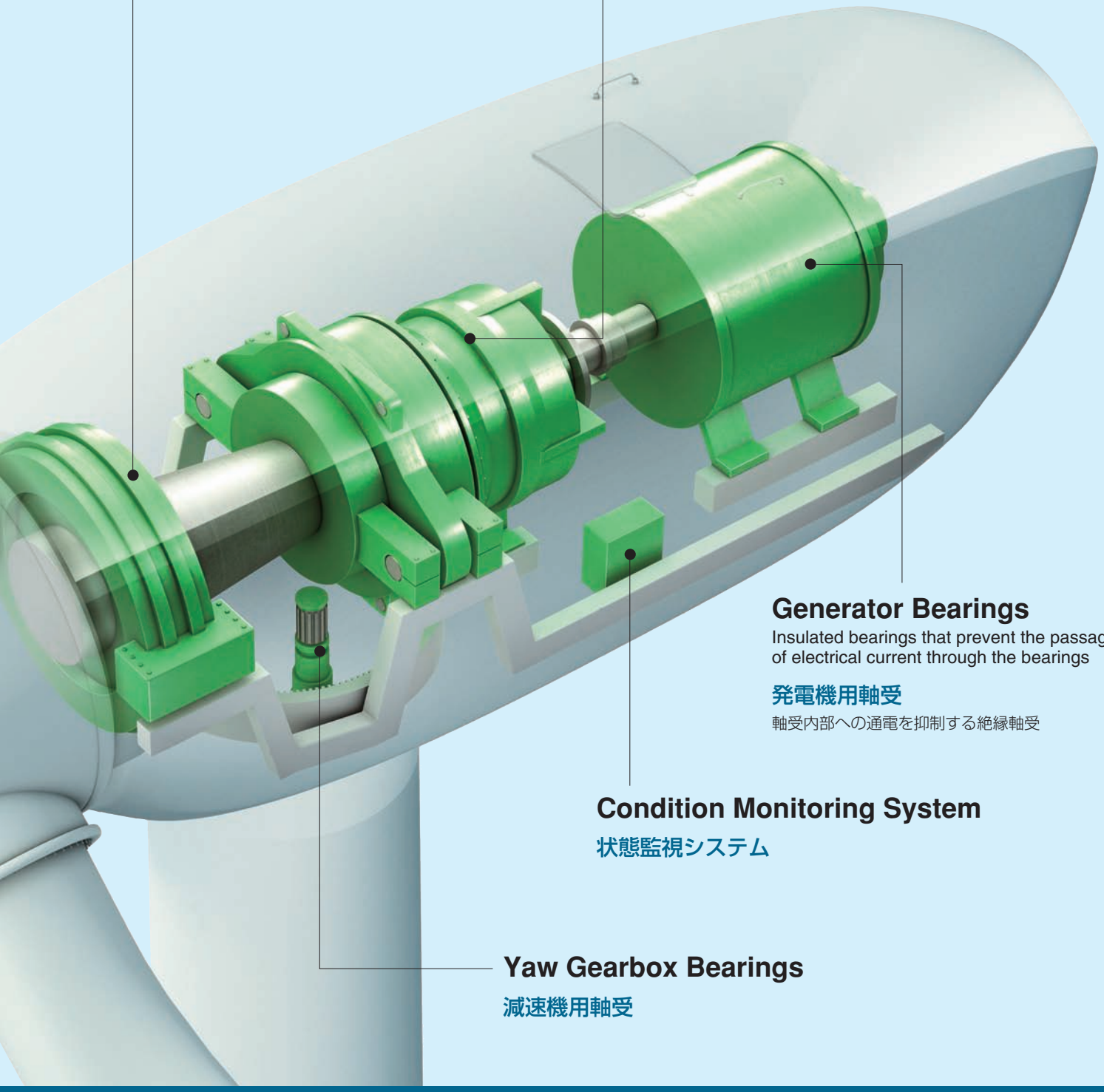
豊富な実績と確かな信頼性で多様なニーズに対応

Gearbox Bearings

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

増速機用軸受

過酷な使用条件にも対応する長寿命化技術



Generator Bearings

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

発電機用軸受

軸受内部への通電を抑制する絶縁軸受

Condition Monitoring System

状態監視システム

Yaw Gearbox Bearings

減速機用軸受

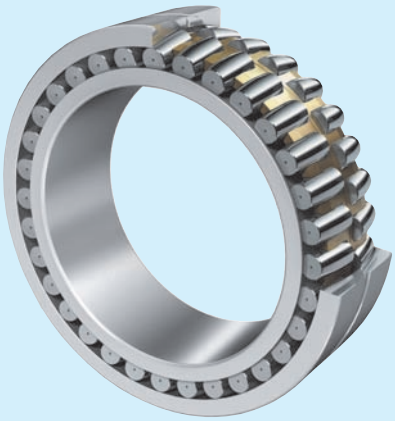
Rotor Mainshaft Bearings 主軸受

Meeting demanding requirements with a proven track record and reliability

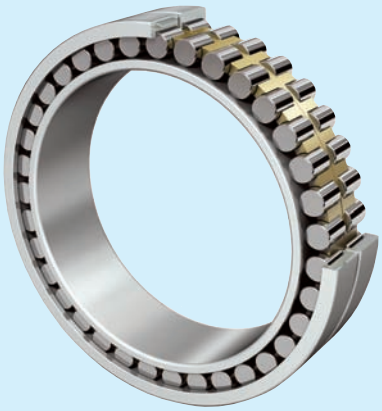
豊富な実績と確かな信頼性で多様なニーズに対応

Various types of bearings are used for the rotor mainshaft.
NTN provides bearings with high reliability and long service lives based on the application conditions.
Additionally **NTN** is capable of providing large-bore bearings for offshore wind turbines with capacities greater than 5 MW.

主軸受には様々な軸受形式が採用されます。
NTNは、使用条件に応じて信頼性の高い長寿命な軸受を提供します。
また、5MW以上の洋上風力発電装置用大形軸受も対応可能です。



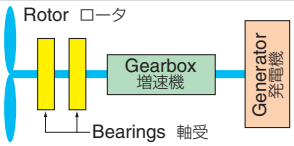
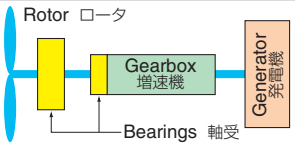
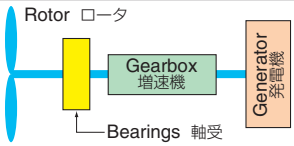
Spherical roller bearings
自動調心ころ軸受



Cylindrical roller bearings
円筒ころ軸受

Double-row tapered roller bearings
複列円すいころ軸受

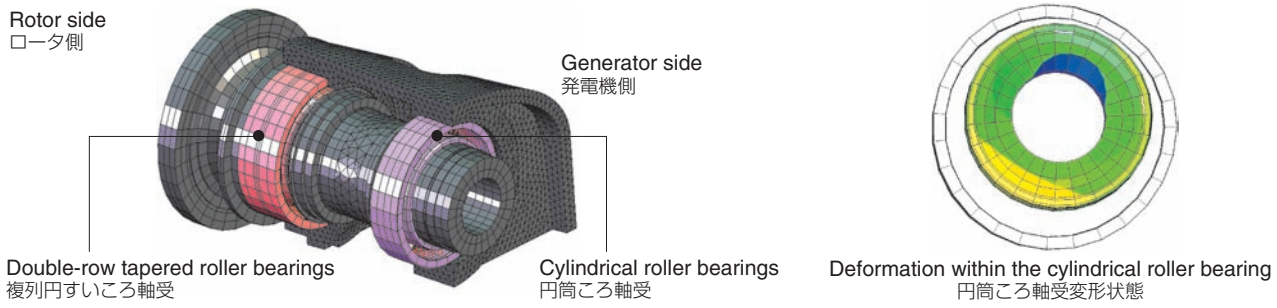
Typical Mainshaft bearing arrangements 主な主軸受配列

Turbine Layout 配列			
Rotor side bearings ロータ側軸受	Spherical roller bearings 自動調心ころ軸受 Cylindrical roller bearings 円筒ころ軸受	Spherical roller bearings 自動調心ころ軸受	Double-row tapered roller bearings 複列円すいころ軸受
Generator side bearings 発電機側軸受	Spherical roller bearings 自動調心ころ軸受 Double-row tapered roller bearings 複列円すいころ軸受	(Cylindrical roller bearings) （円筒ころ軸受）	

Representative rotor shaft bearing analysis 主軸受解析例

Using structural analysis of the bearings, housing, frame, and other components of the turbine, **NTN** can design highly reliable bearing internal geometry, which accounts for component deformation.

軸受や軸箱、架台などの軸受周辺部品を含めた構造解析により、変形を考慮した信頼性の高い軸受内部設計を実現。



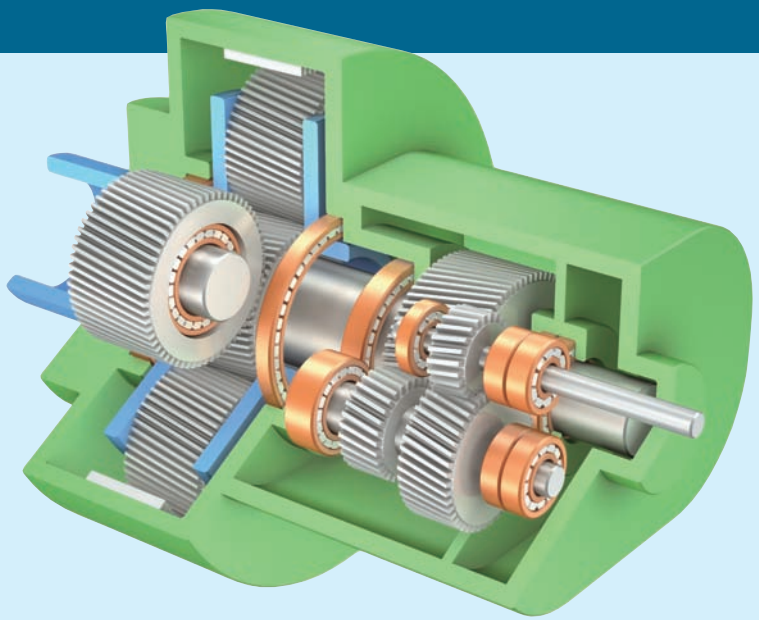
Representative rotor shaft bearing analysis
主軸受解析例

Gearbox Bearings

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

増速機用軸受

過酷な使用条件にも対応する長寿命化技術



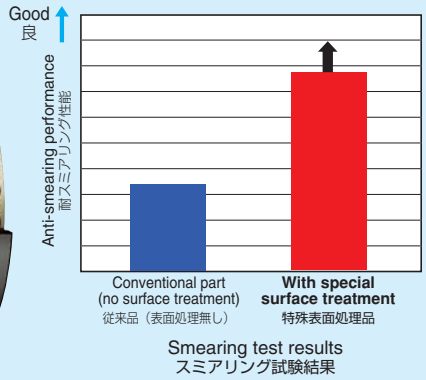
Required bearing attributes differ depending on their position within the gearbox.

増速機に使用される軸受は、部位によって要求される機能が異なります。

Special surface treatment
特殊表面処理

By using a special surface treatment on the inner and outer raceways, and rolling elements, oil film formation is improved 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.

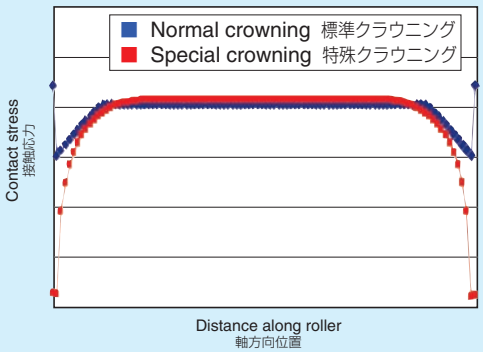
内外輪および転動体への特殊な表面処理により、油膜形成能力が向上して表面損傷（スミアリング損傷）を防ぎます。以下のグラフに示すように、従来品に比べて耐スミアリング性能が向上します。



Special roller crowning
転動体特殊クラウニング

Increased lifespan is sought by using a special crowing profile on the rolling elements to reduce edge stresses in the application.

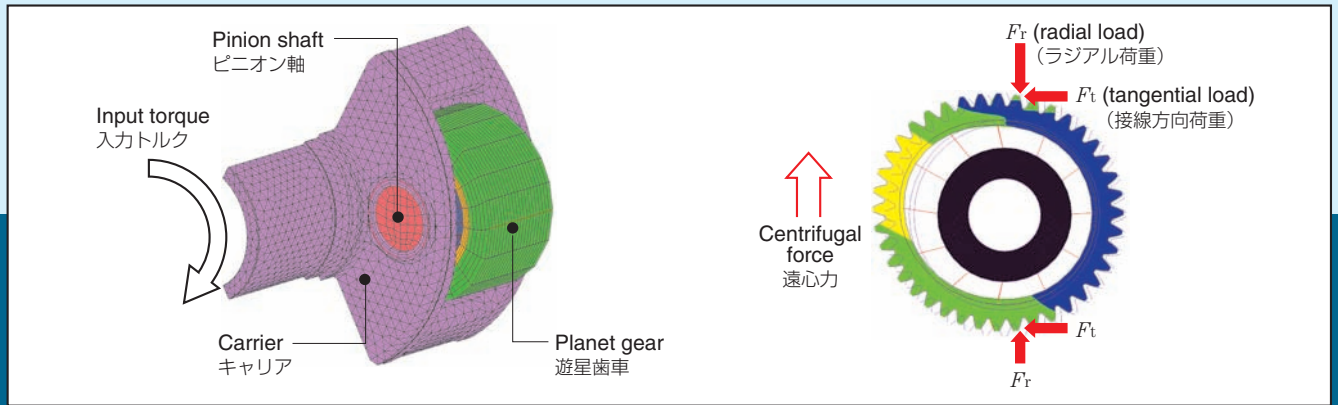
転動体に特殊クラウニングを施し、エッジ応力の低減により長寿命化を図ります。



Representative analysis of a bearing, including gearbox components
増速機部品を含む軸受の解析例

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.

キャリア、歯車などの軸受周辺部品を合わせた解析により、変形を考慮した信頼性の高い軸受内部設計を実現。



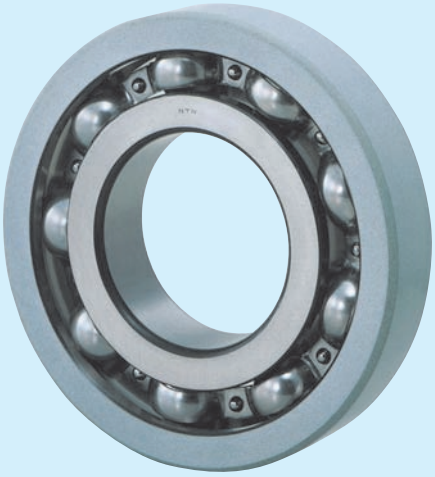
Generator Bearings　発電機用軸受

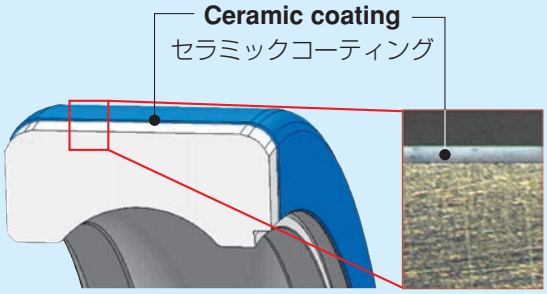
Insulated bearings for preventing the passage of electrical current through the bearings

軸受内部への通電を抑制する絶縁軸受

- A ceramic coating on the outer surface of the bearing creates an insulating layer and prevents electrical corrosion. (Insulating value when 500 V DC: 100 MΩ or more; electrical breakdown power: 3 kV or more)
- Bearing dimensions and tolerances are identical to standard product (without insulation), allowing for easy substitution.
  ※Standard products are also available upon request.

- 軸受外輪表面のセラミックコーティングにより、高い絶縁性能を実現し、電食を防止します。
（DC500V時の絶縁性能：100MΩ以上、絶縁破壊電圧：3KV以上）
- 軸受寸法、寸法精度は標準軸受（非絶縁仕様）と同一であり、互換性を有しています。
※ご要望により標準軸受の製作も可能です。



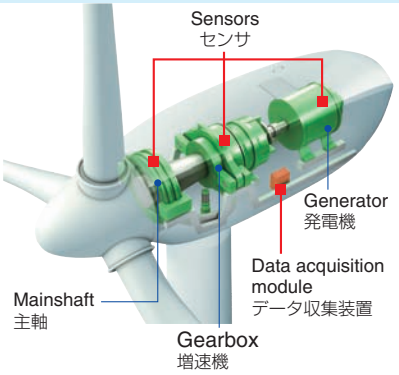


Condition Monitoring System for Wind Turbines 〃Wind Doctor™〃

風力発電装置用状態監視システム 〃Wind Doctor™〃

Wind Doctor™, an **NTN** condition monitoring system (CMS) for wind turbines, enables remote monitoring of the in-situ bearing status for early failure detection of the bearings. Utilizing diagnosis reports from **NTN** by signing the monitoring service contract, it will contribute to reduction of the maintenance cost as well as improving the availability factor of the turbines, through preventing secondary damage, advance preparation of the parts, and avoiding unexpected maintenance work.

NTNの風力発電装置用状態監視システム「Wind Doctor™」を搭載することで、軸受運転状況の遠隔監視と早期の故障検知が可能です。モニタリングサービス契約により提供される診断分析情報により、損傷の拡大防止や交換部品の事前手配、計画的な補修が行えるため、メンテナンス費用の低減だけでなく稼働率の向上にも寄与します。



LAN, Mobile telephone line etc.
LAN、携帯電話回線など

[Wind turbine]
【風力発電装置】

- Vibration sensor
  振動センサ
- Rotation sensor
  回転センサ

[Data acquisition module]
【データ収集装置】

- FFT analysis
  FFT分析
- Various types of signal processing including envelope processing
  エンベロープ処理などの各種信号処理

[User computer]
【ユーザPC】

- Vibration and trend graph display
  振動データのトレンドグラフ表示