

Nexans



**Customized cabling solutions
for wind turbines, worldwide**

Winds of change for the energy industry

The international wind industry market is continuing to achieve record growth. In fact, despite occasional lulls, wind power has held its position as the world's fastest growing energy source, with over 30% growth yearly. According to experts, free, abundant and inexhaustible wind has the potential to be a € 25 billion business by 2010! Even today, global wind power produces 40,000 MW, enough to satisfy the needs of 50 million people worldwide. At present, 73% of the global wind energy is produced and consumed in Europe. By 2020, it is estimated that 12% of the world's energy will be produced by wind in some 50 countries. Some recent trends include: a move from onshore to offshore installations, the upscaling of wind turbines to over 1 MW, with a 3 MW now becoming a norm for many new wind parks; and an upswing in demand in the UK, Italy, US, Australia, Japan, India and China.

Nine out of ten of the world's suppliers of wind turbines and windmill structures are based in Europe and are responsible for over 90% of total supply in the international market. Despite long-term optimism, they are currently faced with important challenges. After a

dozen years of steady growth, many projects have been put on hold because of hesitation in funding; higher towers require a time-consuming approval process; and cable routes and visibility have become a sensitive issue with the public, with "green" advocates and critics about equally divided. Since many European countries already have sufficient land-based sites, manufacturers and installers are now looking offshore for new and bigger installations, while the harsh marine environment creates a new series of demands in terms of watertightness, reliability and remote land-based control.

What wind turbine and sub-system manufacturers expect from cable manufacturers:

- A comprehensive range of high-quality windmill cables and accessories from one supplier
- Light, flexible cables that can handle vibration, extreme temperatures and torque, providing durability
- Customized products, pre-cuts, connectivity and special palletizing
- Innovative materials and production procedures for easy assembly and installation
- Strong worldwide presence to serve national projects



Nexans expertise supports your technological evolution



Although onshore wind turbines are still playing an important role in countries with a large landmass, like the US and Canada, or in countries with numerous coastal islands (Norway), sea-installed wind power has increasingly become an alternative in land-scarce Europe and in the developing world. Stronger breezes mean that higher installation costs can be justified by higher output per unit: 3-5 megawatts. Based on its maritime experience in both energy and data transmission, Nexans has cabling solutions adapted to the demanding marine environment. At the same time, for both land-based and offshore windmills, we customize our cable types to strict turbine manufacturer requirements in terms of size, weight and performance. We also add value wherever possible to speed up assembly and simplify installation. More than just a cable provider, Nexans offers a wide range of services, from pre-assembly design to dedicated logistics.

Nexans expertise for a revolutionary technology

- World supplier of all data/energy cables and components for wind turbines
- Ability to innovate and provide customized solutions for a state-of-the-art industry
- Close partnership with leading wind turbine manufacturers, sub-system suppliers and operators
- easy-to-install, pre-engineered solutions for end-assembly
- Fast delivery times through dedicated logistics
- Mastery of maritime conditions based on shipbuilding, oil & gas, and submarine energy and telecom cabling experience
- Flexible multi-conductor cables for motor supply and data signals that can handle maximum torque in the tower
- Cables with an ability to withstand extreme ambient temperatures (-40°C to +55°C)
- Light, compact, durable, vibration-resistant cables



Nexans provides a comprehensive range of cables for wind turbines...

Low-voltage cables

An entire family of cables up to 1 kV. These rubber-insulated or rigid cables run between the generator and the transformer, whether it is located at the base of the tower, or high above in the nacelle. They also provide energy for various motors and electronic devices.

Nexans low-voltage cables provide energy to the coolers and heaters, the braking system, lighting, the service crane, and the various steering and switching devices.

Medium-voltage cables

Up to 18-35 kV, these cables also run between the generator and the transformer in larger (2-5 MW), often located offshore. They also power steering and switching equipment.

At Bohain, France, Nexans has invested in test equipment to make our cables more reliable. To develop a new flexible core LV and MV cable, a test bench was used to reproduce the way cable moves in a windmill.

Control cables

These flexible shielded cables contain from 2 to 100 cores. They are used to carry both the energy (usually 300-500 volts) and low-frequency signals to control the motor drive or the generator for breaking, positioning or optimizing rotor RPMs.

Nexans supplied NEG Micon with 40 km of precision cut control cables that were capable of withstanding four complete twists per 15 meters of cable, while exhibiting minimum mobile bending radius for the untwisted part.

Sensor cables and fieldbus cables

Sensor cables are used to measure windspeed, temperatures within the nacelle, and various performance parameters, while fieldbus cables are used in parallel with energy cables to digitally control all electronic and mechanical devices over an extensive area.

Nexans sensor and fieldbus cables have proven their reliability on ships and in the oil & gas industry. Fieldbus technology uses only two cores, gaining precious space, while delivering the kind of complexity needed to handle a large wind park.

Fiber optic data cables

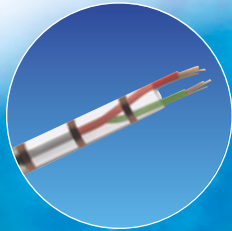
Optical fiber cables allow manufacturers to meet the need for higher data transmission capacity within the windmill, mainly for remote control and monitoring purposes. Nexans supplies both traditional silica and a new generation of Plastic Optical Fibers (POFs).

By replacing copper data wires, fiber optic cables achieve important weight and space savings, and are immune to the intense EMI in the immediate environment.

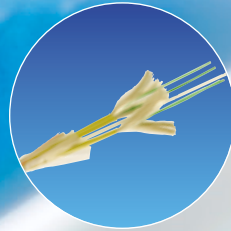
Fiber optic accessories

Nexans produces a full range of fiber access routing technology. Nexans' Fiber Art™ splicing frame optimizes fiber routing through the nacelle's physical cabling network, thus guaranteeing network integrity.

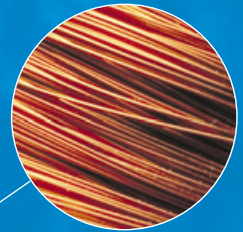
Nexans modular distribution frames provide a complete architecture for main exchange nodes or point-of-presence, including water-resistant dome structures, located at the tower base.



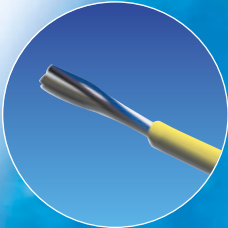
Control cables



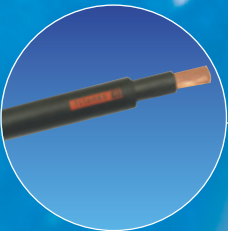
Fiber optic data cables



Winding wires for motors and rotor generators



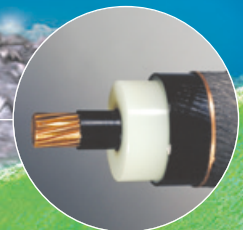
Sensor cables and fieldbus cables



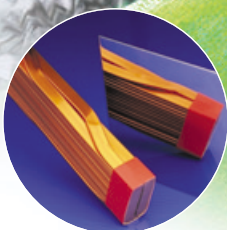
Low-voltage cables



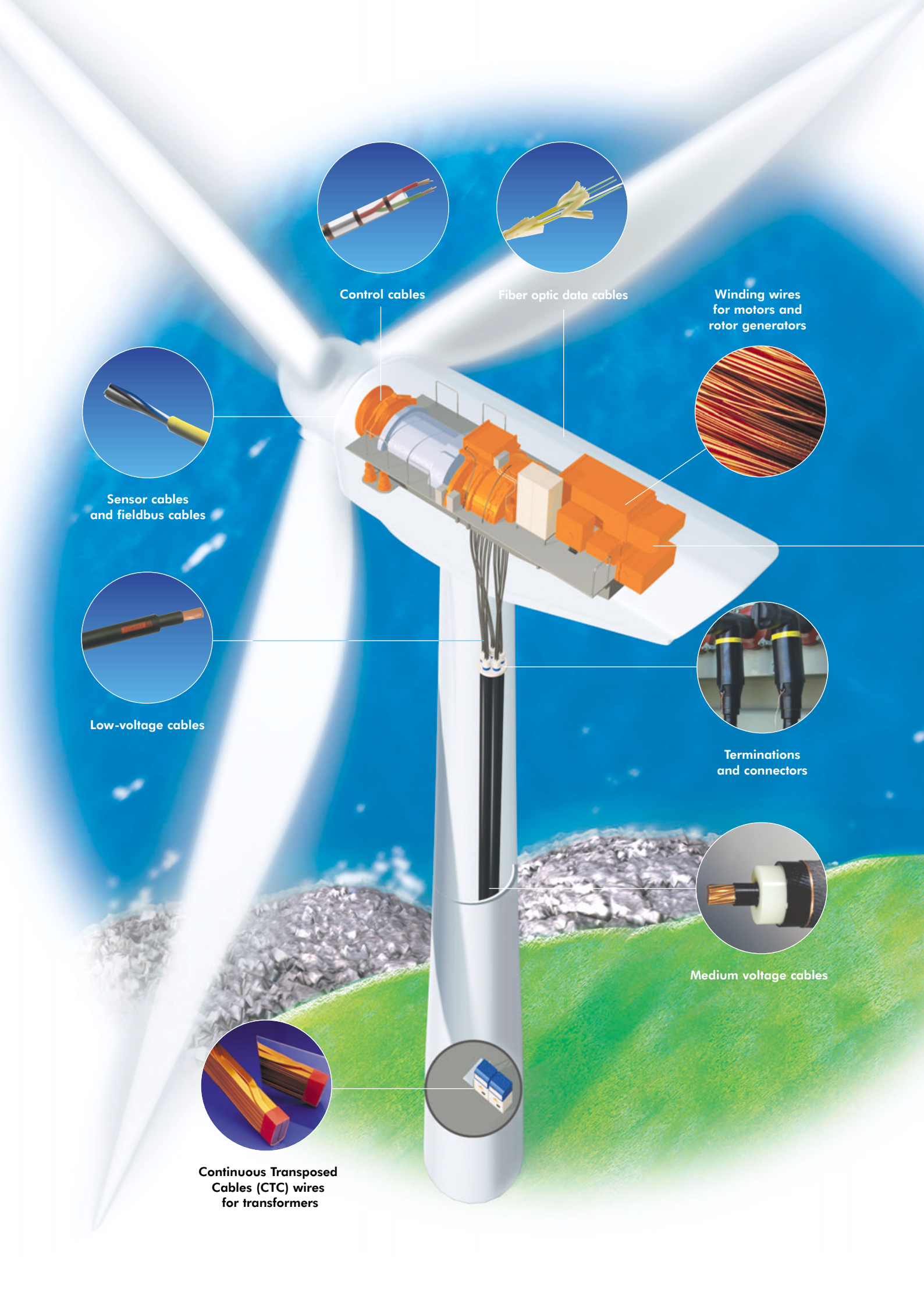
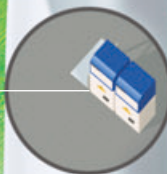
Terminations and connectors



Medium voltage cables



Continuous Transposed Cables (CTC) wires for transformers



...to improve power output and performance

Winding wires for motors and rotor generators

Nexans has developed and produced a complete family of specialty winding wires, including fine and ultra-fine wires for timers, valve relays and small transformers, and self-bonding wires for electrical motors of all sizes.

Nexans winding wires offer specialized characteristics in terms of solderability, heat-resistance, insulation properties to achieve performance gains.

Continuous Transposed Cables (CTC) for transformers

CTCs are easier to wind, and more efficient for medium-voltage transformers. They are extremely durable, with a lifespan of over 25 years.

Nexans CTC cable allows transformer dimensions to be reduced considerably, especially for low-voltage. Nexans provides CTC to Siemens worldwide for a wide range of electrical equipment.

Terminations and connectors

As a self-powered entity, windmills not only contain cables, they also house numerous types of connectors and terminations. Nexans provides "safe-to-touch" separable connectors, and a whole range of modular terminations and joints.

Since several suppliers can be involved in wind turbine construction and installation, Nexans offers interconnective solutions to guarantee system integrity and ease-of-installation and maintenance, with no risk to personnel.

Halogen-free cables

To protect sensitive onshore and offshore equipment all Nexans wind turbine cables are available in halogen-free versions, being flame or fire retardant, while providing low toxicity, corrosion and smoke density.

Since the Danish manufacturer, Vestas, uses HFFR cabling so as to protect the environment and to avoid corrosion of electrical devices in case of a fire, Nexans provides a complete range of halogen-free, fire retardant solutions, many of which we pioneered.

Special kits

Since manufacturers want to produce more efficiently, Nexans has prepared two cabling production kits, one for energy and the other for control cables. The kits contain a wide variety of pre-cut and often pre-fitted cables for easy installation per unit.

Nexans has sold power and control kits to General Electric Wind for windmill projects in Spain and Germany. The kits not only eliminate waste, they provide advanced color-coding, reduce need for multiple orders, and offer a guaranteed, one-supplier product.



Fiber optic accessories

Nexans... generating service and support

To help you meet your goals of easy assembly, efficient installation especially offshore and abroad, and product reliability, Nexans goes beyond cable to offer a number of important services:

Expertise

Over many decades, Nexans has accumulated expertise in land-based and maritime energy/telecom cable products and installations. Not only can we promptly respond to wind turbine specifications, we also understand the overall energy context, from generation, to transmission and final distribution within the grid. We are especially concerned with customizing solutions, and finding the right technical solution for every manufacturer, even though cable types and standards vary widely among OEMs. Wherever possible, we provide them with complete answers to every aspect of their business.

Global presence

Being pre-qualified in many countries around the world for industrial, infrastructure and building projects, etc. we are well-positioned to take on multi-supplier projects and international

joint ventures. With plants on five continents and representatives in over 65 countries, we can follow them with ease. We can even count on our local production plants to provide turbine manufacturers with needed cable on the spot. We can also resolve complex logistics problems at the global level by providing you with sequenced deliveries and a reliable source of supply.

Performance

We execute our projects within strict deadlines, and this includes installation which can depend on variable weather windows. In the case of Horns Rev, we laid key cables within three days. To assure quality and consistency, all cables and components are controlled throughout production. We can even provide you with a process chronology, the basis of our extended warranties. Our separable connectors show a remarkably low

failure rate compared to other technologies.

We strive to make products which are easy-to-install, interconnective, and long-lasting, so that your windmills can achieve a maximum life cycle.

Partnership

We provide important engineering assistance during feasibility studies, and routinely create engineering roundtables with extensive plant visits so as to facilitate line production. Wherever possible, we add value at our end so as to save you steps, and reduce the labor required for every windmill produced. Our A to Z service backup, including delivery logistics and post-installation follow-up, explains our preferred status with many of the world's leading manufacturers.





Global expert in cables and cabling systems

Nexans is the worldwide leader in the cable industry, with an industrial presence in 29 countries and commercial activities in 65. The Group employs 17,000 people. Its sales amount to 4 billion Euros. Nexans brings an extensive range of advanced copper and optical fiber cable solutions to the infrastructure, industry and building markets. Its cables and systems can be found in every area of people's lives, from telecommunications and energy networks, to aeronautics, aerospace, automobiles, railways, buildings, petrochemicals, medical applications, etc.

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