

## Solutions for the Wind Energy Industry

**Meeting the Needs  
of Harsh Industrial  
and Mission-critical  
Environments**





Belden® Products Have Been  
Designed To Meet the Specific  
Needs of the Wind Energy Industry.

**Belden's Signal Transmission Solutions  
Increase the Reliability Factor at  
Every Critical Stage of Your Wind Power  
Generation and Distribution Process.**



## Belden 'Connects' with Wind Energy

Extracting power from wind offers many advantages, most notably that it's free. But it's also an inherently unpredictable source of energy, one that fluctuates. What's more, the environment experienced in a wind farm setting can be surprisingly harsh and extreme.

For example, the components used in a wind farm installation might experience extremes of temperature, humidity, condensation, vigorous and prolonged vibration, electromagnetic interference, and even lightning strikes and damage from rodents. And, of course, unless properly designed, cabling and switching components in both offshore and onshore facilities will always be at risk of corrosion.

*Only Belden has the proven track record, the reliability you need.*

### Can You Afford Downtime?

Consider this: a 1% loss of productivity, for any reason, in a large, 100MW wind farm equates to roughly \$250,000 in revenue loss – and that doesn't even take into account repair costs should a component fail.

Now, factor in the lack of certainty about wind availability, extreme environmental conditions and the potentially high costs associated with downtime and you have the 'perfect storm': making it all the more crucial to have cabling, connectivity and active networking devices in your wind turbine installation that are rock-solid reliable. You need components you can rely on to keep your power production up and running when Nature cooperates. You can't control Nature, but you can control the quality of your infrastructure.

### Belden Offers Maximum Uptime, Peace of Mind

As a long-time leader in the industrial arena, Belden offers high-performance data and signal transmission solutions that are ideal for wind power generation and distribution: *systems that permit the desired level of control, 99.999% reliably.*



Additionally, Belden products are not only able to ensure maximum uptime and maximum peace of mind for your wind energy operation, but they are also available when and where you need them – anywhere in the world.

Belden top-performing products and services for the wind industry include:

- Managed and unmanaged Ethernet switches
- Networking connectivity components
- Copper and fiber optic cables
- Wireless LAN systems
- Industrial network management software
- Comprehensive consultation services

*Peace of mind is at-hand with Belden leading-edge, zero-downtime active networking devices, cabling and connectivity products.*

### Belden Provides End-to-end Ethernet

Of particular importance to wind farm operations – due to the increasing use of Ethernet communications – is our end-to-end Ethernet offering called *Complete Industrial Solutions*. This high-performance, highly reliable line of fully integrated Ethernet switches, connectivity and cabling products not only provides mission-critical reliability to your operation, but includes access to a host of system design verification and technical support services, as well as extended product warranties.

*Belden is your Ethernet solution.*

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## Belden Means Five 9s Reliability, or Complete Peace of Mind.

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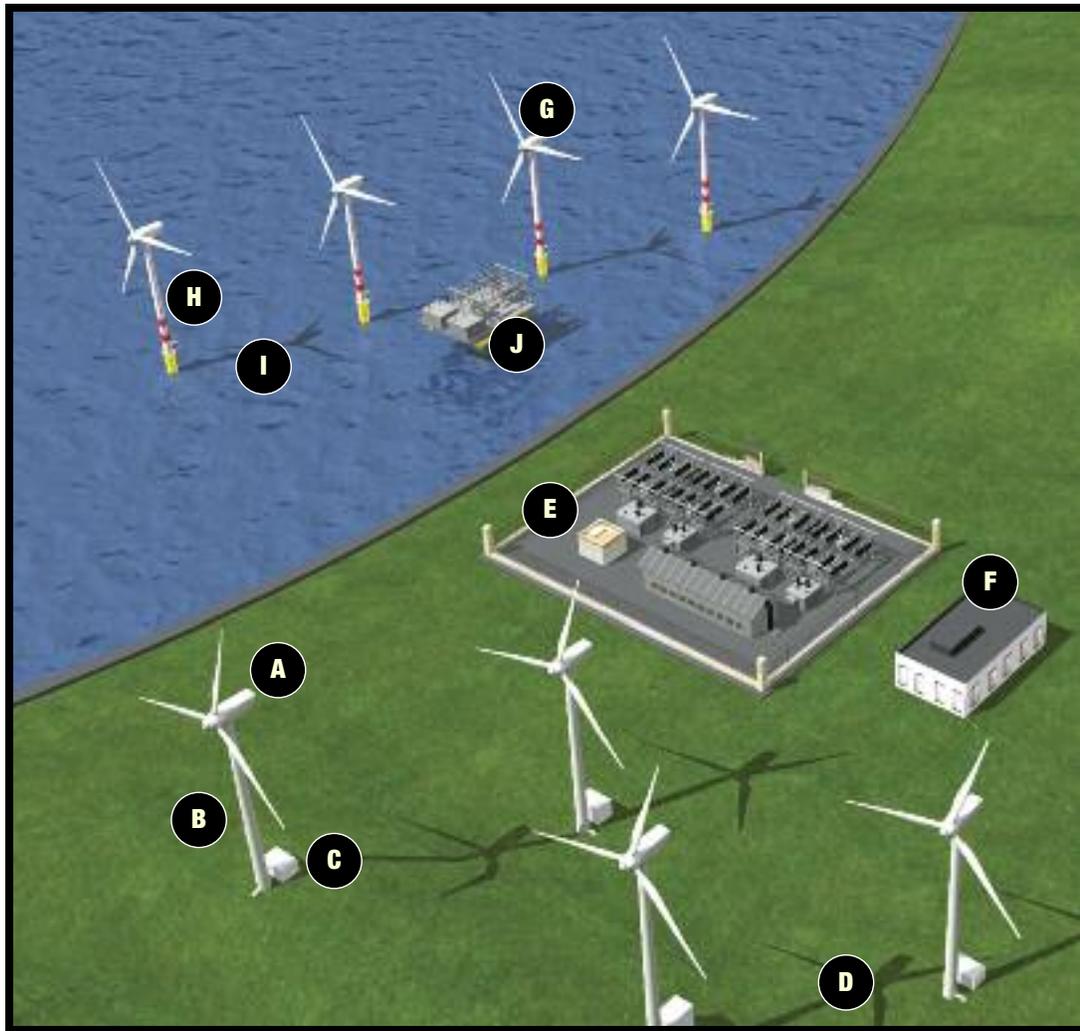
### Belden Leads the Way

Belden has been the leading manufacturer of industrial cabling products for decades – providing an extensive range of industrial networking products for control, data, instrumentation and power that have been engineered specifically for tough, demanding environments. These products have also been subjected to stringent tests to ensure their viability in applications like yours.

Belden understands that consistent and predictable operation is absolutely critical to the commercial viability of your wind farm investment. And, Belden provides the resources needed to help ensure that the wind energy industry lives up to its stated goal for providing over 10% of the world's electricity by the year 2020.

**From the Nacelle to the Control Center - and Everywhere In Between -  
Belden Sends All the Right Signals®**

Belden's end-to-end Ethernet system, called Complete Industrial Solutions, is key to Wind Farm operations.



See [www.belden.com/industrial](http://www.belden.com/industrial) for more product information.



## Onshore

### A Nacelle/Hub

**Cables:** DeviceBus® cable, lead wire, specialized WTTC hi-temp, chemical- and oil-resistant cable and wire.

**Connectivity:** IBDN copper patch cords; FiberExpress® fiber patch cords and breakout kits; cordsets, receptacles, distribution boxes and connectors.

**Ethernet Switches and Networking Devices:** Spider unmanaged switches and OpenRail RS20 switches; e2c 20 IP20 I/O system and LioN-Link IP67 decentralized I/O system.

### B Tower

**Cables:** FiberExpress multimode cable, DataTuff® Ethernet cable, RS-485 cable and WTTC control cable.

**Connectivity:** FiberExpress fiber cordsets, Optimax® field-installable connectors, patch panels and breakout kits; cordsets, receptacles, distribution boxes, field-attachable connectors, M12 connectors and IBDN copper patch panels.

**Ethernet Switches and Networking Devices:** BAT IP67 wireless system and LioN-Link IP67 decentralized I/O system.

### C Tower Base

**Cables:** FiberExpress single-mode cable.

**Connectivity:** IBDN Cat 5e copper patch cords; FiberExpress fiber patch cords, Optimax field-installable connectors, Ultra patch panels, Ultra adapter strips and breakout kits.

**Ethernet Switches and Networking Devices:** OCTOPUS control level switches, RS20/RS30 rail switches and MICE modular switches.

### D Tower Interconnection

**Cables:** Outside plant, single-mode and multimode cable with multiple jacket and armoring options.

**Connectivity:** FiberExpress single-mode pigtailed, Optimax field-installable connectors and breakout kits.

### E Power Substation

**Cables:** FiberExpress single-mode and multimode cables; DataTuff Ethernet Cat 5e cable; RS-485 cable, 600V shielded control cable and lead wire.

**Connectivity:** FiberExpress Optimax field-installable connectors, single-mode pigtailed and breakout kits.

**Ethernet Switches and Networking Devices:** MACH1000 and RSR DIN rail switches.

### F Control Center

**Cables:** FiberExpress fiber and IBDN copper LAN cable.

**Connectivity:** IBDN copper patch cords and patch panels; FiberExpress fiber patch cords and Optimax field-installable connectors.

**Ethernet Switches and Networking Devices:** MACH100 and MACH4000 switches, OpenRail compact switches, EAGLE VPN/firewall appliances and network management software.

**Cable Management:** Enclosures and racks.

## Offshore

### G Nacelle/Hub

**Connectivity:** FiberExpress Optimax field-installable connectors, linking panel, breakout kits; cordsets, actuator/sensor connectors, field-attachable connectors, M12 connectors, receptacles, distribution boxes, decentralized modules and e2c 20 centralized IP20 I/O system.

**Ethernet Switches and Networking Devices:** OpenRail RS20 switches, LioN-Link IP67 decentralized I/O system and the FiberExpress connectivity manager.

### H Tower

**Cables:** FiberExpress breakout cable.

**Connectivity:** FiberExpress Optimax field-installable connectors, linking panels and breakout kits; receptacles, distribution boxes; cordsets; sensor, rectangular, field-attachable and MicroFX connectors.

**Ethernet Switches and Networking Devices:** Fieldbus repeaters, OpenRail RS20 switches, MICE modular switches, BAT IP67 wireless system and LioN-Link IP67 decentralized I/O system.

### I Tower Interconnection

**Connectivity:** FiberExpress Optimax field-installable connectors, single-mode fiber pigtailed and breakout kits.

### J Power Substation

**Ethernet Switches and Networking Devices:** MACH1000 and RSR DIN rail switches.





### DataTuff® Category 6, Enhanced 5e and 5e Industrial Ethernet Copper Cables

- Unshielded and shielded Bonded-Pair and Nonbonded-Pair cables with heavy-duty, oil- and UV-resistant jackets; many are Ethernet/IP compliant; upjacketed and armored versions are available for the most extreme areas

### DataTuff Connectivity Components – as complements to UTP or FTP Cable Constructions

- Category 5e RJ45 cordsets for IP67 or IP20 installations
- Category 5e RJ45/IP67 jacks
- Category 5e RJ45/IP67 plug kits
- IP67 surface mount boxes with stainless steel covers
- IP67 stainless steel faceplates

### DeviceBus® Cables for DeviceNet™

- Typically designated as Class 1 (600V) or Class 2 (300V)

### RS-485/EIA-485 Cables

- Shielded, twisted pair, PLTC cables: 28 AWG, 25-pair, stranded

### Instrumentation and Control Cables

- WTC 1,000V approved products
- Hundreds of UL/CSA cables for every conceivable device/control application

### Lead Wire

- EPDM, high-temperature hook up/lead wire (UL AWM Styles 3340 and 3374)

### Specialty Cable & Wire

- High-temperature, chemical- and oil-resistant cable for custom applications

Additionally, Belden cables can be customized to meet your unique needs, utilizing any number of construction features, such as:

- Armoring: Aluminum Interlock, Steel Interlock, and Continuous Corrugated Aluminum
- Armor Tapes: Corrugated Copper, Aluminum, and Steel
- Jackets: PVC, CPE, TPE, PE, Fluorocopolymer, Oil Res II, Haloarrest® Low Smoke Zero Halogen, and Polyurethane
- Shielding: Overall Beldfoil®, Duofoil®, TC Braid, TC Double Braid, and Individual Beldfoil Copper Tape Shields

- Insulations: Datalene®, XLPE, FEP, Polypropylene, Foam FEP, HDPE, PVC, TPE, and PVC-Nylon
- Conductors: Solid and Stranded conductors, either tinned or bare copper

### LAN Cabling Systems

- FiberExpress fiber optic end-to-end systems
- IBDN copper end-to-end systems
- Enclosures and racks, including custom designs

### Durable Connectivity Components

The Lumberg Automation™ connectivity line rounds out the Belden media and switch offering for wind energy and includes:

#### Cordsets

- Mini (7/8", 1" and 1-1/8"), Micro (M12) and Pico (M8) single- and double-ended overmolded cordsets with various configurations
  - 2 to 19 poles
  - Straight- and right-angle versions
  - With or without LED function indicators
  - TPE, PVC, PUR, CPE and halogen-free cable types

#### Receptacles

- Mini (7/8", 1" and 1-1/8"), Micro (M12) and Pico (M8) female and male front panel-mount receptacles with various thread sizes

#### Field Attachable Connectors

- Mini (7/8", 1" and 1-1/8"), Micro (M12) and Pico (M8) female and male field attachable connectors used to modify cable runs with integrated quick disconnect connectors

#### Distribution/Junction Boxes

- Mini (7/8", 1" and 1-1/8"), Micro (M12) and Pico (M8) distribution boxes with various configurations
- Top or side entry
- 4-, 6-, 8-, 10-, or 12-ports
- On-board quick disconnect, integrated home run cable, or integrated home run cable with quick disconnect
- One or two signals per port
- With or without LED function indicators



### Rectangular DIN Valve Connectors

- Types A, B and C

### I/O Systems and Modules

- Centralized e2c 20 in-cabinet (IP20) or e2c 67 (IP67) enclosure-less modular/compact fieldbus systems for DeviceNet and Profibus-DP applications
- Decentralized I/O fieldbus modules (LioN-Link) and associated overmolded cordsets, receptacles, and field attachable connectors for DeviceNet, CANopen, Profibus, and AS-Interface applications

### MicroFX Connectors with Integrated Fiber Optic Connections

- Switches, cordsets and field attachables, cable plugs and adaptors.

These Belden products have been designed, tested, proven and warranted to work together and they can be trusted to provide outstanding performance at every level/segment of the wind energy industry. What's more, Belden provides the four key service and support areas that are critical to your success: *Network design, training, technical support and system performance.*

For more information go to:  
[www.belden.com/industrial](http://www.belden.com/industrial)  
to see what we can do for you.

**GLOBAL LOCATIONS**

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