

## Solutions for Wind Farms



**Belden offers complete, integrated solutions for reliable, cost-effective operation of modern wind farms – both wired and wireless solution for onshore and offshore windmills.**

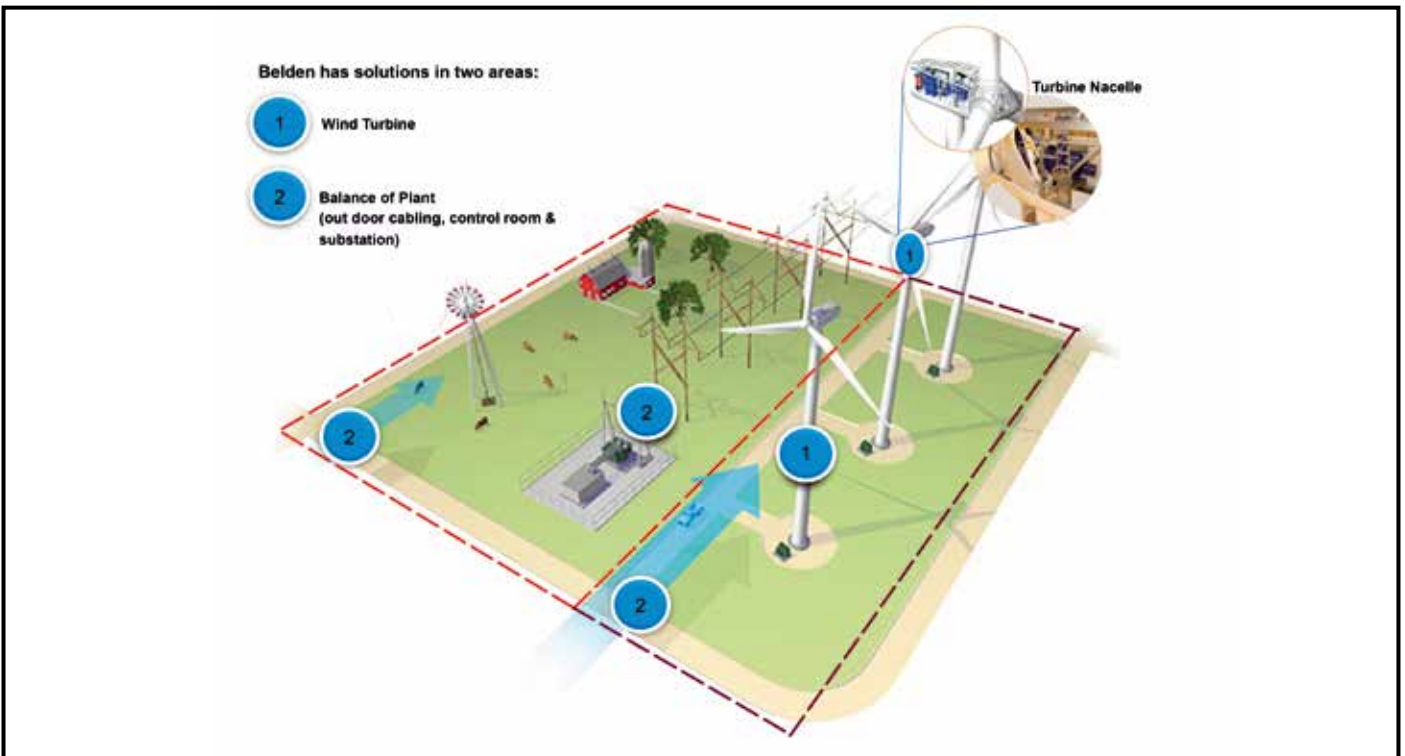


## Integrated Solutions for Wind Farms – Onshore and Offshore (Wired & Wireless Communication Solution)

As one of the world's leading suppliers of connectivity solutions for wind power stations, Belden meets the highest customer requirements and standards, even under the most challenging conditions. With a wide portfolio of innovative products from the Belden, Hirschmann™ and Lumberg Automation™ brands, backed by our outstanding solution and service expertise, we offer our customers reliable, cost-effective solutions for their wind power stations.



Whether for complex cabling in the turbines, at extreme temperatures, with vigorous vibrations and electromagnetic interference, Belden can optimally address all needs and requirements with its wide portfolio of solutions – all the way through to remote maintenance.



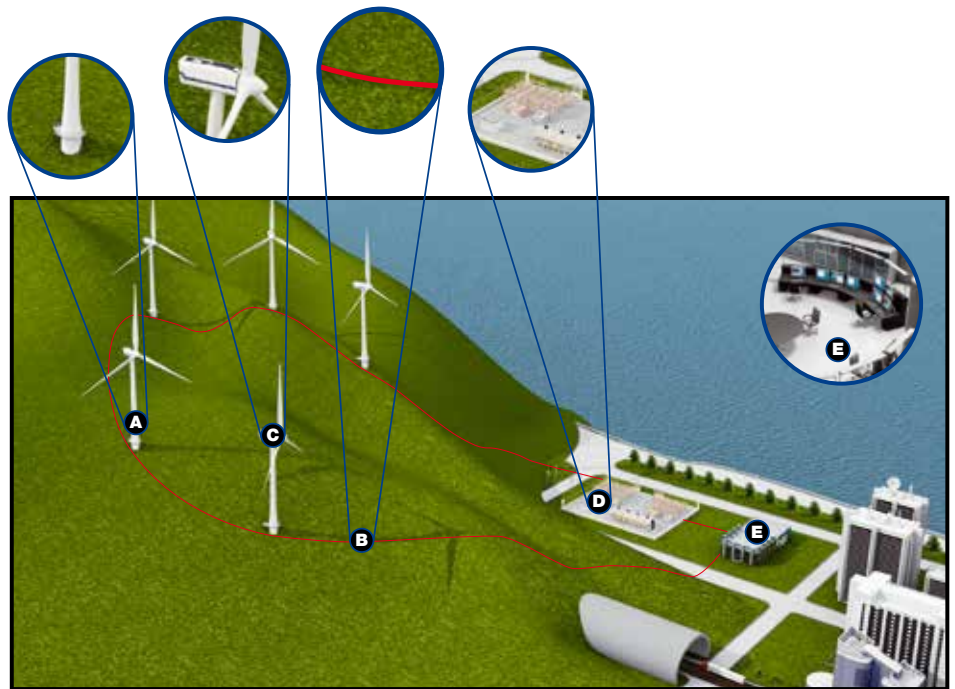
Belden's wired & wireless solution covers two areas in a wind farm i.e. wind turbines and balance plant (control room & substation).

**Complete Onshore-Wired Solutions from a Single Source**

Belden's innovative solutions are based on state-of-the-art FiberOptic technology and ensure the highest availability of communication system.

As a leading provider of Layer 2 and Layer 3 communication solutions, Belden offers a wide portfolio of maintenance-free products for long-distance connections in temperatures ranging from -40° C up to + 85° C. Belden is ideally positioned to fulfill all requirements in today's onshore applications.

- monitoring wind turbine control data
- monitoring the generated energy
- operation of emergency telephones (Voice over IP)
- tower surveillance via video or IP camera
- remote wind turbine maintenance



**A Turbine**

**OpenRail family**

- redundant power supply
- available in customized versions
- available with conformal coating



**Fieldbus systems and distributors**

- Fieldbus modules for AS-Interface, DeviceNet, Can open and Profibus
- Actuator / sensor distribution box
- IP67 / IP69K protection class, vibration and shock resistant



**Fiber Express Systems & Modular Patch Panel**

- Fiber Express Manager easy patch cords routing and management in a minimum space
- FiberExpress Bar: a compact, modular and resilient linking panel



**Modular Patch Panel-MIPP**

- a compact din-rail fiber patch panel solution for the outdoor fiber cables

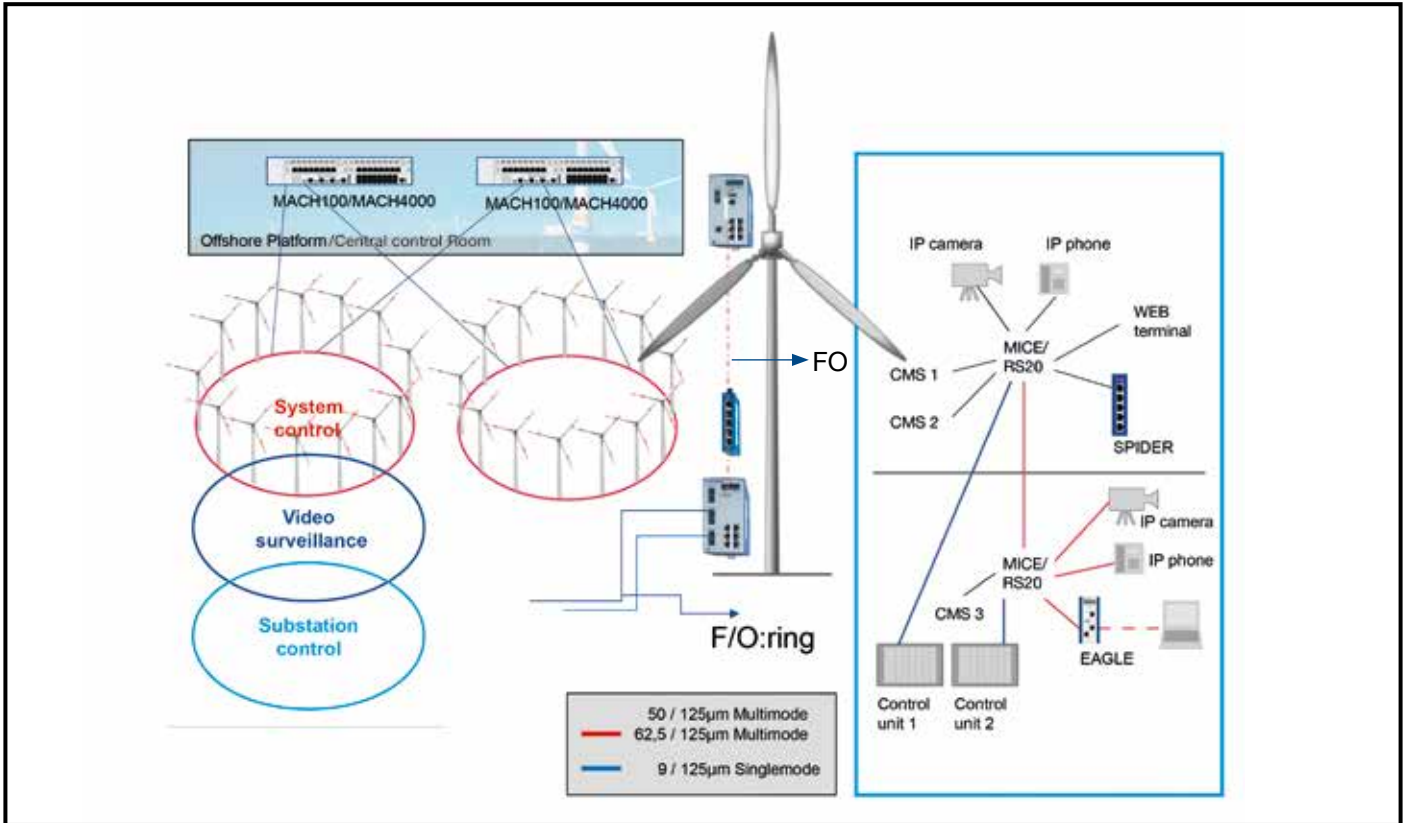


**Connectivity solutions**

- Actuator / sensor connecting and Inter-connecting cables
- Field attachable connectors
- M8, M12, M23, 7/8"
- Valve connectors A, B and C design
- IP-65 - IP69k protection class



**Network Schematic**



**B Cables**

**Tower Interconnect Cables**

- direct burial, duct or Outside devices
- for inside and outside use FRNC / LSNH
- weather resistant
- protection from mechanical and rodent damage with or without metallic armour



**Connectivity solutions**

- actuator / sensor connecting and inter-connecting cables
- field attachable connectors
- M8, M12, M23, 7/8"
- valve connectors A, B and C design
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**E Control room**

**MACH100**

- modular fanless Industrial Ethernet rack mount switch
- hot-swappable modules
- optional redundant power supply



**MACH4000**

- Gigabit backbone routing switches
- up to 48 Gigabit Ethernet ports and three 10 Gigabit Ethernet ports
- highly redundant



**EAGLE ONE**

- high-speed VPN, firewall and routing solution
- transparent and routing mode
- various media connection options



**C Turbine**

**SPIDER family**

- entry-level switches in many varieties
- fiber to copper conversion
- unmanaged
- 2 to 8 (+2) ports plus optional optical fiber ports



**D Substation**

**MACH1000**

- rack-mount ruggedized switch maximum uptime in extreme environmental conditions
- extended temperature range: -40° C up to + 85° C.



**RSR / RSP / RSPL / RSPE compact ruggedized**

- DIN Rail Switches
- extremely high EMI resistance
- withstands tremendous shocks and vibrations

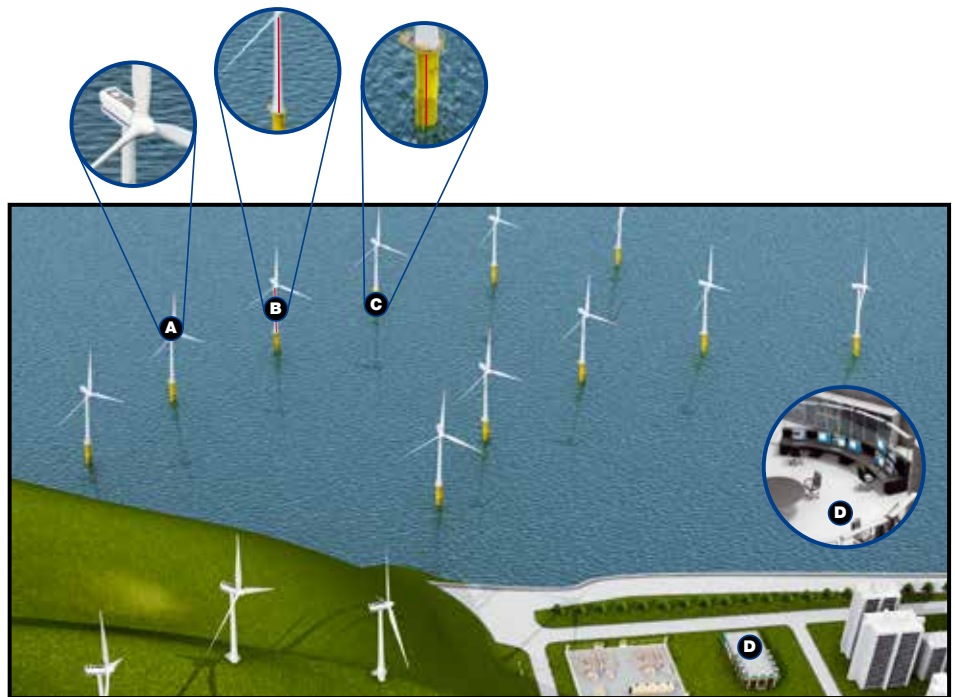


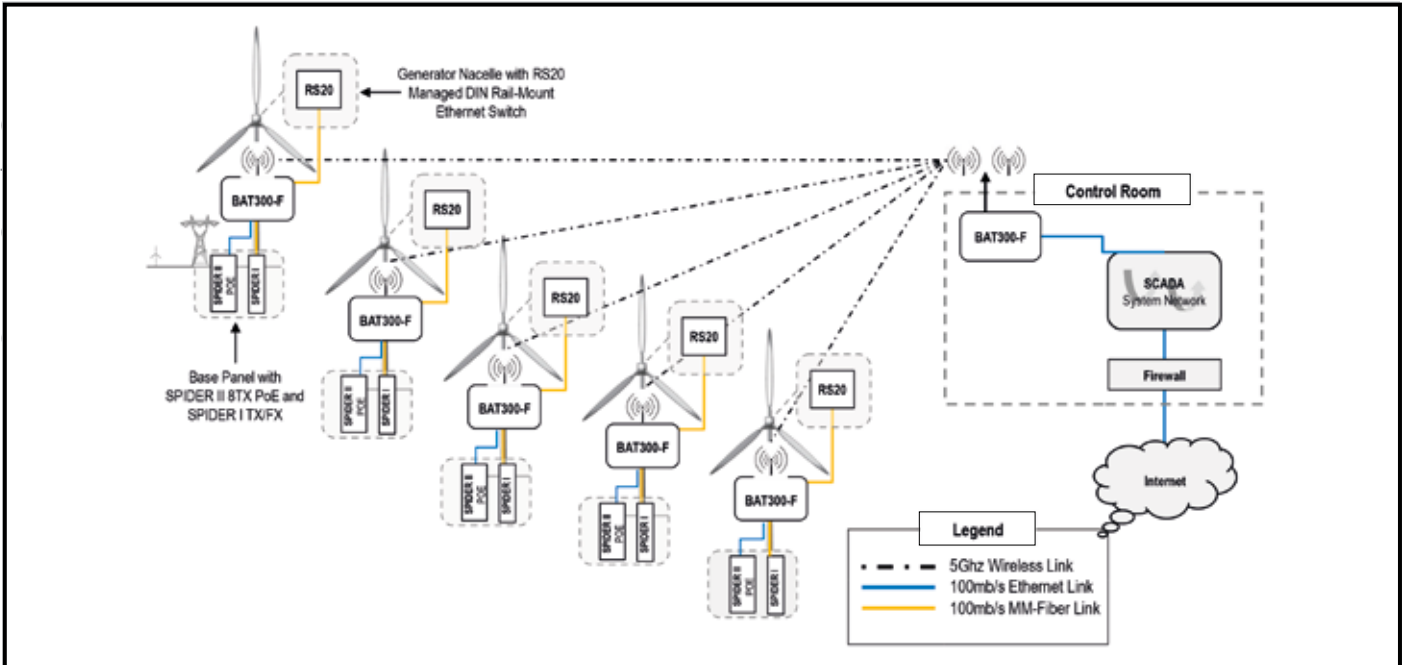
## **Solutions for Offshore / On-Shore-Wireless Applications Under Extreme Conditions**

For offshore power stations, ensuring the highest system stability and avoiding cost-intensive maintenance by ship or helicopter are decisive.

Most offshore wind farms are located some distance from the coast. They are monitored and controlled from a central control room onshore. This very challenging application environment calls for highly reliable and extremely low-maintenance products, in order to ensure cost-effective operation:

- high-quality products and solutions
- highest system stability
- reliable network management
- very high resistance to corrosion
- extreme temperature resistance
- GL approval





## A Turbine

### OpenRail family

- redundant power supply
- available in customized versions
- available with conformal coating



## B Tower

### BAT family®

- wireless access points and clients
- bridge functionality
- redundant WLAN links for reliable data transfer
- IP67 protection class
- PoE-powered
- Point-multipoint functionality
- Bandwidth manageable



## C Base

### OCTOPUS family

- first manageable ruggedized IP67 PoE switch
- extended management by SNMP
- redundancy via HIPER-Ring / MRP and Rapid Spanning Tree
- access control via IEEE 802.1X



### MICE family

- modular switch family
- extensive range of hot-swappable media modules
- maximum flexibility by comprehensive selection of media types
- supports a comprehensive selection of connectors
- MICE PoE media modules available



### Fieldbus repeaters

- for the most common fieldbus protocols
- protocol specific fieldbus repeaters available
- predictive maintenance



### Connectivity Solution

- IP67 Ethernet connector
- industrial M12 technology
- optical and electrical contacts



## D Control room

### Network Management Software

- Industrial HiVision network management software for network supervision and device configuration
- OPC and ActiveX for SCADA integration



Wireless installation on tower.

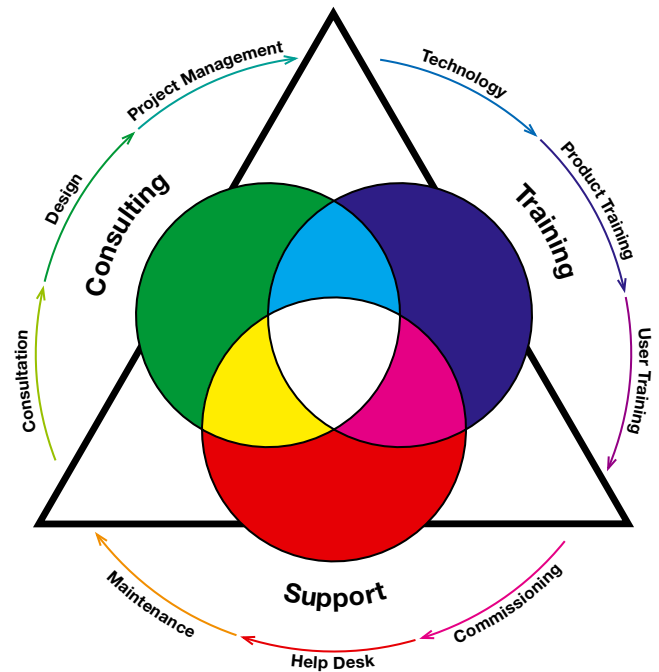


## The Belden Competence Center

As the use and complexity of connectivity solutions have increased, so has the pressures on users to design, implement and maintain them. From plant-level Ethernet networks to Building Management Systems and from Data Centers to Broadcast Studios – all installations and applications require highly sophisticated installation, as well as complex operations and processes.

The Belden Competence Center offers access to unrivalled experience and technical support. Our staff has extensive hands-on experience in designing, installing and using solutions created with our range of Belden, Hirschmann and Tofino Security products.

Each member of Belden's service team has their own field of technical expertise, ensuring that customers get the very best assistance and support.



### What we can do for you – and how

	Optimal Network Solution	Know-how for Reliable Operation	Protection Against Downtimes	Lasting Cost Control
<p><b>Consulting</b></p>	<ul style="list-style-type: none"> <li>Individual consultation, design, project management</li> <li>Network design and migration concepts</li> <li>Compatibility testing</li> <li>On-site wireless site survey</li> </ul>	<ul style="list-style-type: none"> <li>Training plans</li> <li>Documentation</li> <li>Maintenance concepts</li> <li>Security concepts (network security)</li> </ul>	<ul style="list-style-type: none"> <li>Integration of redundancy</li> <li>Spare parts store concept</li> <li>Emergency concepts</li> </ul>	<ul style="list-style-type: none"> <li>Service planning</li> <li>Complete costing</li> </ul>
<p><b>Training</b></p>	<ul style="list-style-type: none"> <li>Technology and product training courses for network designers</li> <li>Introduction courses for decision makers</li> </ul>	<ul style="list-style-type: none"> <li>Individual user training courses</li> <li>Security training</li> <li>Workshops</li> </ul>	<ul style="list-style-type: none"> <li>Qualification / certification of your employees and external service providers</li> </ul>	<ul style="list-style-type: none"> <li>Update training for technologies and product</li> </ul>
<p><b>Support</b></p>	<ul style="list-style-type: none"> <li>Pre-configuration and pre-assembly of systems</li> <li>On-site commissioning</li> <li>Application tests</li> </ul>	<ul style="list-style-type: none"> <li>Network monitoring and support by in-house experts or partners</li> <li>Network security audit</li> <li>Network baselining</li> </ul>	<ul style="list-style-type: none"> <li>24 x 7 support hotline</li> <li>On-site support</li> <li>Remote service</li> <li>Replacement hardware services</li> </ul>	<ul style="list-style-type: none"> <li>Warranty extension</li> <li>Individual, product-related service packages</li> </ul>

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