

ERIFLEX[®]
ERITECH[®]
LENTON[®]

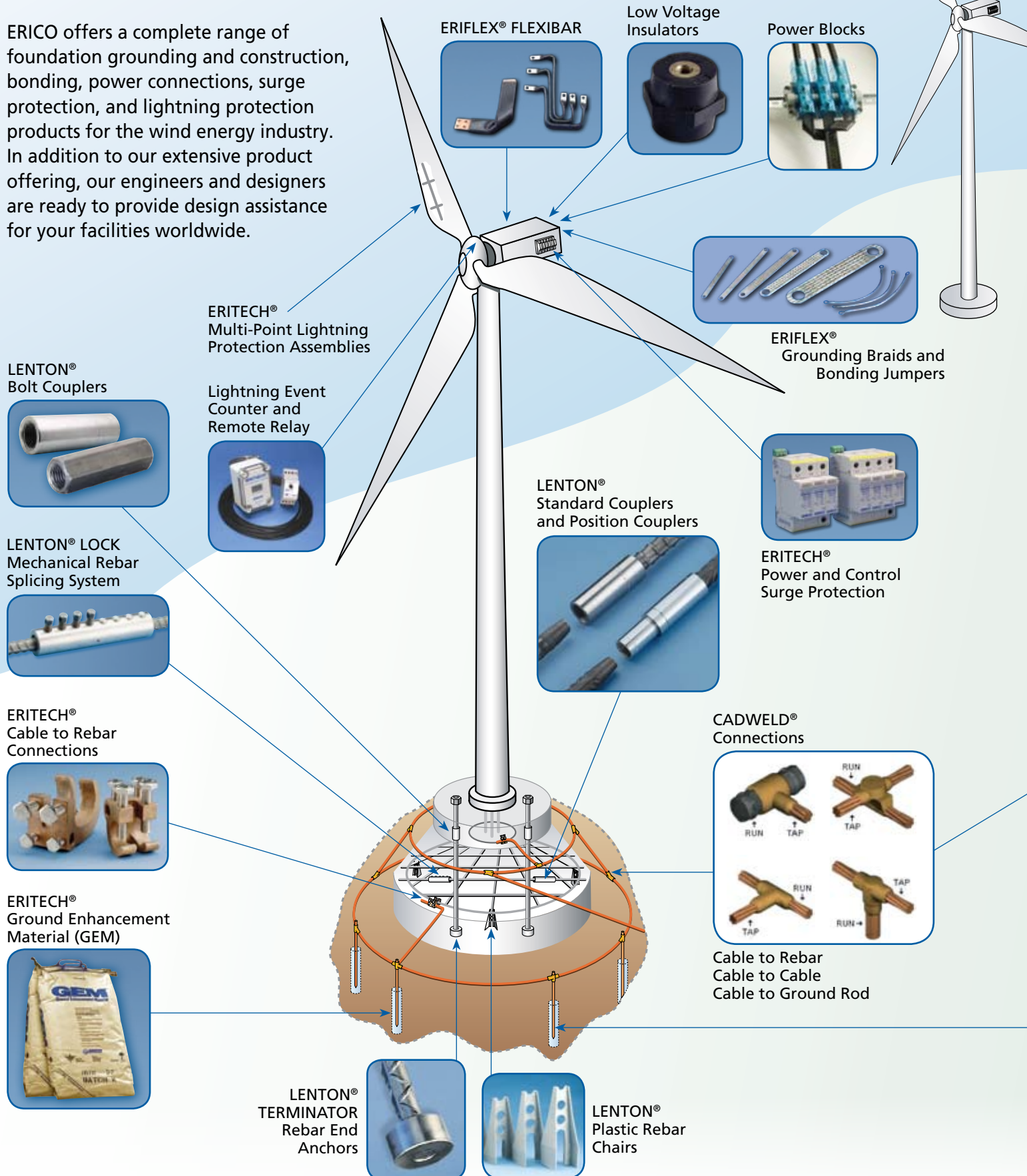
Wind Power Solutions

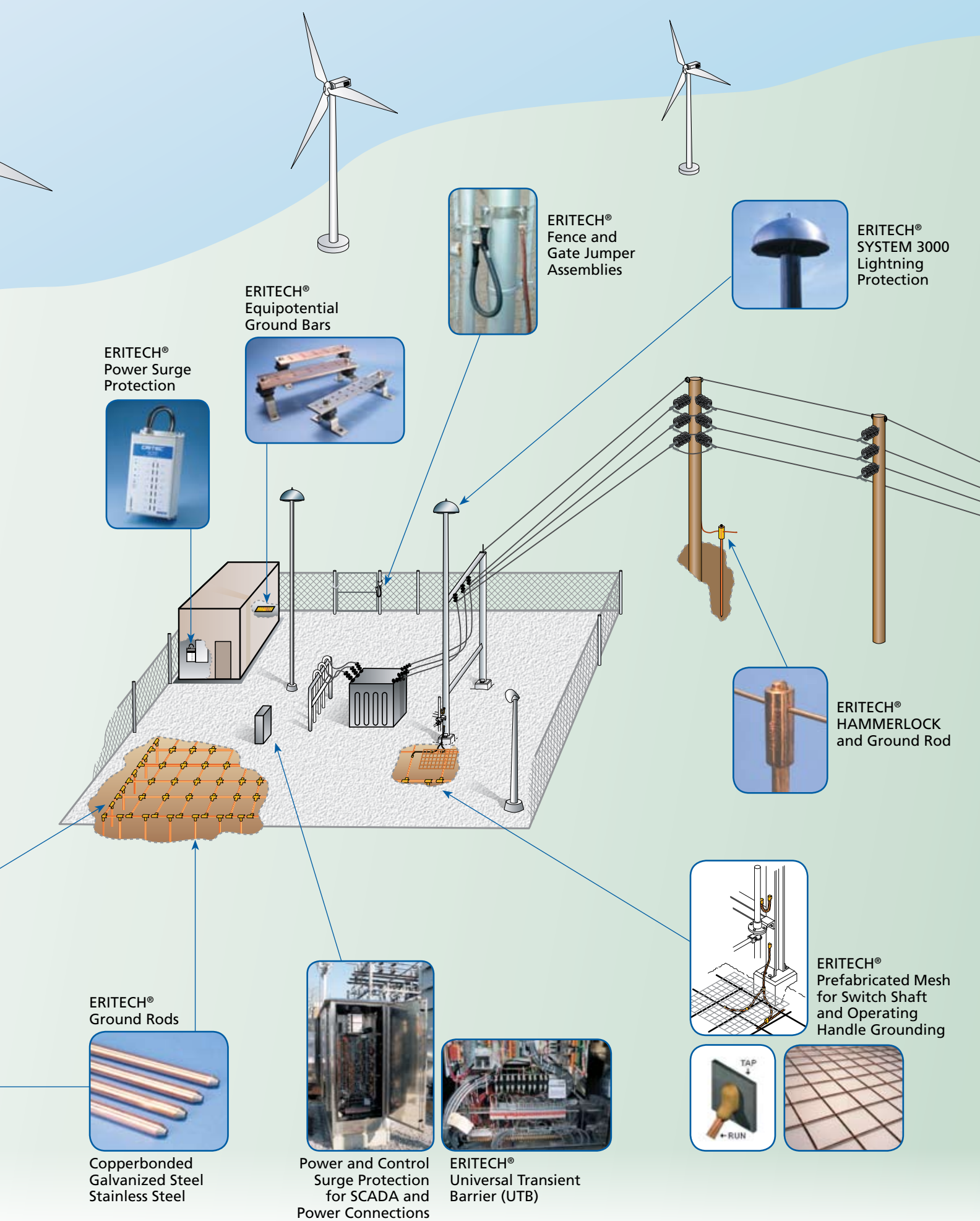


ERICO[®]

Foundation Grounding and Construction, Bonding, Power Connections, Surge Protection, and Lightning Protection

ERICO offers a complete range of foundation grounding and construction, bonding, power connections, surge protection, and lightning protection products for the wind energy industry. In addition to our extensive product offering, our engineers and designers are ready to provide design assistance for your facilities worldwide.





Introduction

Years of experience in the fields of grounding and bonding, lightning protection, low voltage power distribution and reinforced concrete construction, combined with global manufacturing capabilities, allow ERICO to provide comprehensive solutions for the wind energy industry. Three of our product lines have joined together to offer a full range of solutions: ERITECH® facility electrical protection products, ERIFLEX® low-voltage power distribution products and LENTON® concrete reinforcement products.

ERICO is recognized as a trusted industry leader with high-quality products and well-known brand names. As a global manufacturer, ERICO can serve a wide range of customers worldwide.

Blade

Lightning protection assemblies have been installed on thousands of wind turbine blades worldwide. Components cover a range of ERITECH products, including receptors, CADWELD® exothermically welded connections, conductors, lightning event counters/lightning registration systems.

Nacelle

To help protect the electrical components housed within the nacelle, ERICO supplies products, such as grounding braids, insulators, ERIFLEX® FLEXIBAR, power blocks and conductors.

Tower

Tower lightning protection products include grounding braids, insulators, conductors, ERIFLEX FLEXIBAR and copper busbar.

Foundation Grounding and Construction

Grounding products include CADWELD exothermically welded connections, rebar clamps, ground/earth testers, Ground Enhancement Material and ground rods. Foundation construction products include LENTON® bolt couplers, LENTON® LOCK Mechanical Rebar Splicing System, LENTON® TERMINATOR rebar end anchors, standard couplers and plastic rebar chairs.

Surge Protection

ERICO offers a complete line of surge protection devices that can be coordinated into an effectively staged electrical protection plan.

Power Connections

Products recommended for power distribution throughout the nacelle, tower and power hut include: splice blocks, power shunts, distribution blocks, ERIFLEX FLEXIBAR and busbar supports.

Support and Training

The research and development team at ERICO continues to develop new products to improve performance and installation efficiency for the ever-evolving wind power industry. The goal of providing cost-effective, long-term solutions is realized through in-house, cooperative and independent research and testing.

ERICO specializes in:

- Custom design and packaging of lightning protection assemblies for wind turbine blades
- Grounding and bonding applications of the nacelle and tower
- Design and manufacture of lightning protection downconductors and connection systems
- Computer grounding layouts and analysis for the foundation

ERICO provides extensive training to OEMs, engineers and contractors on our product capabilities and installation techniques to help ensure optimum performance. ERICO's worldwide presence makes us an ideal partner for companies with a global reach.



ERICO is a well-established and trusted worldwide leader in lightning protection. The ERITECH® brand of lightning protection assembly kits for wind turbine blades are designed and manufactured to meet or exceed OEM specifications. In addition, product development teams at ERICO continue to work closely with OEMs to refine component designs for improved reliability and enhance lightning protection performance.

Lightning Event Counter and Remote Relay



Lightning Registration System

1. Conductors

Designed and manufactured to meet specific criteria for effective and reliable conduction, lightning conductors should have:

- Low inductance per unit length and low surge impedance
- Current-carrying capability to withstand, without degradation, the thermal and mechanical effects of lightning
- Resistance to environmental effects and mechanical fatigue

Conductors offered include:

- Aluminum, copper and stainless steel
- Insulated and non-insulated
- Solid and woven conductors in both flat and rounded configurations

2. Receptors

As a world leader in the design of strike termination devices, ERICO applies this expertise to the design of its lightning receptors. Important factors include:

- Blade material and manufacturing process
- Ease of receptor installation and insulation requirements
- Attachment method to lightning protection conductor
- Attracting the lightning strike to a preferred attachment point
- Field serviceability

Conductors



Receptors



Connections

3. Connections

Blade lightning protection connections may range from a CADWELD® welded connection to a mechanically bolted connection. Considerations include:

- Lightning protection conductor material
- Resistance to vibration and corrosion
- Material impedance
- National/international standard requirements
- Costs and benefits

4. Lightning Event Counters

ERICO provides the ability to collect data for the analysis of lightning strikes. The devices are ideal for both land-based and offshore turbines.

5. Lightning Registration System

The lightning registration system consists of three components and is ideal for use on land and offshore. The system captures data for analysis of lightning impacts and breakdown.

ERICO offers a full line of ERIFLEX® low-voltage products to help protect the electrical components housed within the nacelle from the devastating effects of lightning strikes. Products include:

- Power blocks designed to provide a safe entry point for incoming power generated by the wind turbine
- Grounding braids for any grounding and bonding power connection
- ERIFLEX® FLEXIBAR to help improve power density within the nacelle, tower and power hut
- Conductors to withstand the electromechanical effects of lightning
- Low-voltage insulators to promote stability of electrical and mechanical parameters

1. Grounding Braids

Grounding braids consist of tinned, electrolytic, woven copper wire. Each braid has solid hole-punched ends for easy connection. Grounding braids are the first cost-effective alternative to grounding cables with crimped lugs.

Grounding braids can be used for any grounding and bonding power connection. Because of their low contact resistance, they are particularly adapted to decrease EMC problems.

ERICO can provide made-to-order custom configurations to your drawing specifications. Copper braids can be made to custom lengths, widths, thicknesses and hole patterns, with PVC installation, in flat or tubular shapes, in continuous coils or with soldered studs or crimped lugs.

2. ERIFLEX® FLEXIBAR

ERIFLEX FLEXIBAR is an effective alternative to using cables and lugs to help improve power density within the nacelle, tower and power hut. This innovative flexible insulated busbar offers space and weight savings of up to 70% (improving power density).

By eliminating the need for compression lugs, ERIFLEX FLEXIBAR improves the reliability of the power connection and reduces the number of power connections that are needed. It also extends power density to even greater levels within the nacelle, tower and power hut using made-to-order (MTO) ERIFLEX FLEXIBAR and MTO braids. MTO products from ERICO can be configured to your specifications, helping to reduce equipment and packaging sizes.

3. Conductors

Designed and manufactured to meet specific criteria for effective and reliable conduction, lightning conductors should have:

- Low inductance per unit length and low surge impedance
- Current-carrying capability to withstand, without degradation, the thermal and mechanical effects of lightning
- Resistance to environmental effects and mechanical fatigue

Conductors offered include:

- Aluminum, copper and stainless steel
- Insulated and non-insulated
- Solid and woven conductors in both flat and rounded configurations

4. Power and Distribution Blocks

Power blocks are the entry point for incoming power generated by the wind turbine, carried to the inverter.

5. Surge Protection

DIN rail mounted components

- UL® Listed

6. Low-Voltage Insulators

ERICO offers ERIFLEX® brand of low-voltage insulators.

- Manufactured of rugged, polyamide, halogen-free nylon material, which is reinforced with glass fiber
- Low-voltage insulators, from 15 to 100 mm height, for indoor use
- Very high resistance to leakage current
- Great stability of electrical and mechanical parameters
- Meets the requirements of UL 94 V0 for self-extinguishing materials
- Working temperature -40°C to +130°C
- UL Recognized

7. Lightning Protection

ERITECH® Isolated Down Conductor provides a low impedance insulated path past critical equipment.

Lightning Event Counters/Lightning Registration Systems

ERICO provides the ability to monitor data for the analysis of lightning strikes. The devices are ideal for both land-based and offshore turbines.





ERICO offers a variety of products to help create effective lightning protection and power distribution systems for the wind turbine tower. Designed to meet the current IEC®, NFPA® or a proprietary design method, lightning protection and power distribution systems from ERICO are ideal for use with the three styles of tower design:

- Tubular steel towers
- Precast concrete towers
- Lattice towers

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2. Copper Busbar

ERICO offers a variety of electrolytic copper bars – plain, punched or threaded. Busbar/connectors are also available.

- Threaded Busbars
 - Electrolytic copper
 - Rounded corners
 - Thickness from 2 to 10 mm
 - Length from 1,000 to 2,000 mm
- Punched and Plain Busbars
 - Design and assembly time-saving
 - Current up to 7400 A
 - Thickness from 4 to 40 mm
 - Length from 1,000 to 4,000 mm
- Busbar Connectors
 - Quick and easy connections
 - Large and versatile range
 - Connections from 2.5 to 35 mm²

3. ERIFLEX® FLEXIBAR and Braids

ERIFLEX FLEXIBAR is an effective alternative to using cables and lugs to help improve power density within the nacelle, tower and power hut. This innovative flexible insulated busbar offers space and weight savings of up to 70% (improving power density).

By eliminating the need for compression lugs, ERIFLEX FLEXIBAR improves the reliability of the power connection and reduces the number of power connections that are needed. It also extends power density to even greater levels within the nacelle, tower and power hut using made-to-order (MTO) ERIFLEX FLEXIBAR and MTO braids. MTO products from ERICO can be configured to your specifications, helping to reduce equipment and packaging sizes.

4. Conductors

Designed and manufactured to meet specific criteria for effective and reliable conduction, lightning conductors should have:

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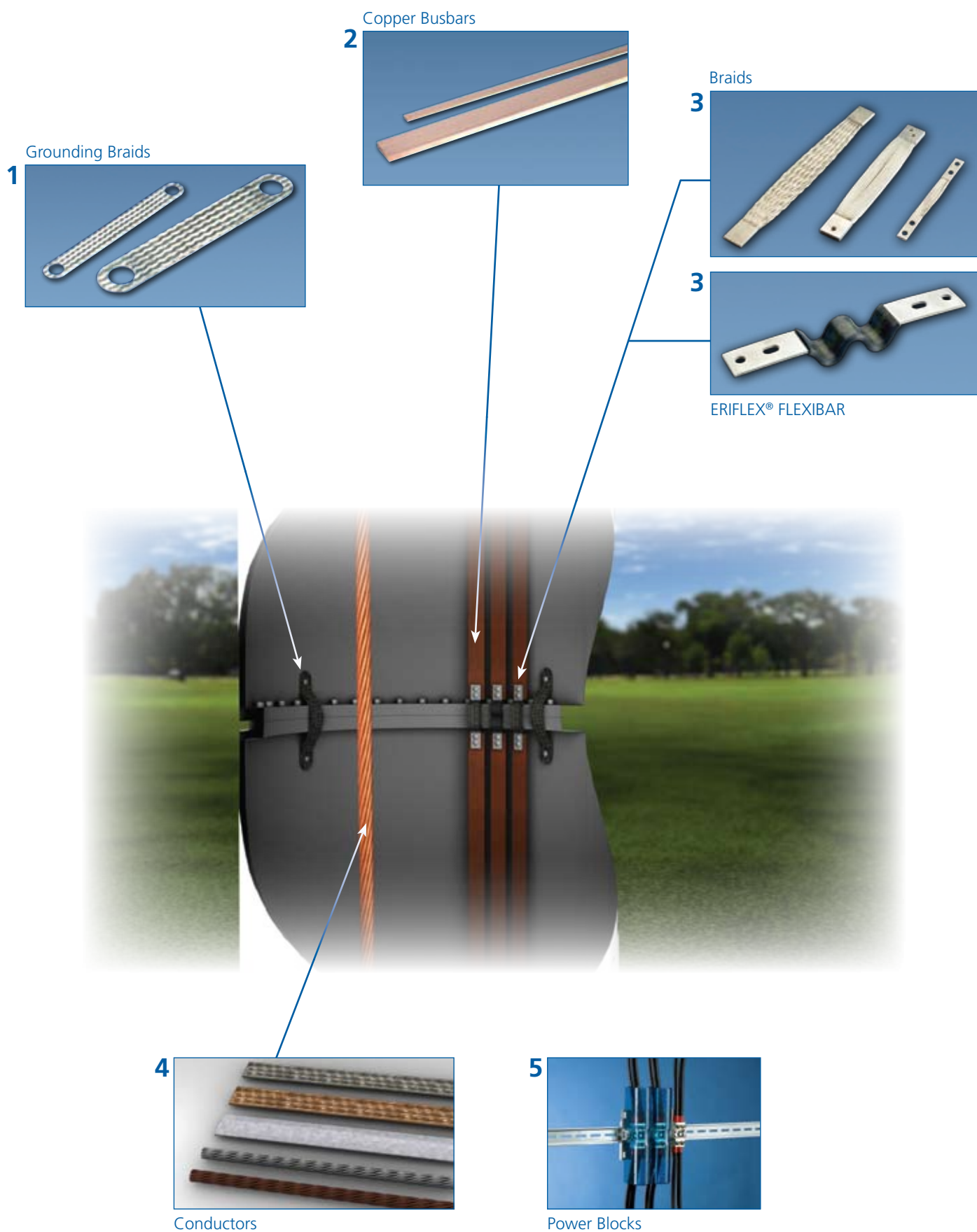
Conductors offered include:

- Aluminum, copper and stainless steel
- Insulated and non-insulated
- Solid and woven conductors in both flat and rounded configurations

5. Power Blocks

High conductivity tinned copper blocks provide a good solution to interconnect two elements of the tower. They can be mounted directly inside the tower or pre-assembled in junction panels.





Foundation Grounding and Construction

Site location is critical to capture the wind and often involves areas of high soil resistivity. The increasing height of newer wind turbines enhances the threat of lightning strikes. Proper design and integrity of a grounding grid facilitates long-term safety and operation of any wind turbine site during both lightning and fault current events.

Wind turbine grounding system design has to meet three main criteria:

- Satisfy the step-and-touch potential requirements regarding the safety of personnel

- Provide sufficient ground reference potential to assure proper functionality of electrical equipment
- Effectively dissipate the lightning energy

The application engineering team at ERICO can analyze and provide grounding system design assistance for tower and power substation grounding using the latest grounding design software. ERICO also offers an extensive line of grounding products to meet your specific foundation grounding needs.

Construction

1. Bolt Couplers

Bolt couplers, part of the LENTON® line of concrete products, provide a full strength joint between a reinforcing bar and a standard parallel thread bolt. Both the LENTON S4 and S5 couplers are for use in North America and provide continuity between reinforcing bar and imperial UN or UNC all-thread rod or bolts. The LENTON S13 couplers provide continuity between reinforcing bar and ISO 965 metric all-thread rod and bolts. The bolt couplers are typically used to tie a pedestal base to the foundation and to anchor miscellaneous equipment to the foundation.

2. LENTON® LOCK

The LENTON® LOCK mechanical rebar splicing system requires no bar-end preparation and installs with simple hand tools or an impact wrench. LENTON LOCK is typically used to connect bent bars in the foundation.

3. LENTON® TERMINATOR

The LENTON® TERMINATOR is an over-sized end anchor that is secured to the end of a length of reinforcing steel, creating anchorage within the concrete. LENTON TERMINATOR replaces hooked bars and provides anchorage, and also eases congestion.

4. Standard Couplers and Position Couplers

LENTON® standard couplers are designed to splice the same diameter bars where one bar is free to move and can be rotated. Position couplers are designed to splice two curved, bent or straight bars when neither bar can be rotated.

5. Plastic Rebar Chairs

Plastic rebar chairs are used in tilt-up, precast and cast-in-place slab and deck construction. They are ideal for both light and heavy-duty rebar support applications and are suitable for stainless, black and epoxy rebar. The rebar chairs can be used to support either lower or upper mats of rebar. The larger sizes have an arch to straddle lower mats of rebar when used to support the upper mats.

Grounding

1. Ground Rods

ERICO is the world's largest manufacturer of copper-bonded steel ground rods and offers a wide range of accessories. ERITECH® brand of copper-bonded ground rods exceed the requirements of ANSI®/UL. They are also highly corrosion resistant and provide at least a 30-year service life in most soils.

2. Mechanical Connectors

The durable RC70/RC100 rebar clamps provide two connection points to rebar in the wind turbine grounding foundation and meet the NEC® standard requirement for bonding to rebar.

3. Ground Enhancement Material (GEM)

GEM is a low-resistance carbon concrete that improves grounding effectiveness in areas of poor conductivity. GEM is ideal for wind turbine foundations where limited space makes adequate grounding difficult by conventional methods.

4. Exothermically Welded Connections

The CADWELD® molecular bonding process is superior in performance to any known mechanical or compression-type surface-to-surface contact connector. By virtue of the molecular bond, CADWELD connections provide current-carrying (fusing) capacity equal to that of the conductor and will not deteriorate with age.

CADWELD connections are UL® Listed and satisfy IEEE® Standard (Standard for Permanent Connections Used in Substation Grounding).

5. Ground/Earth Testers

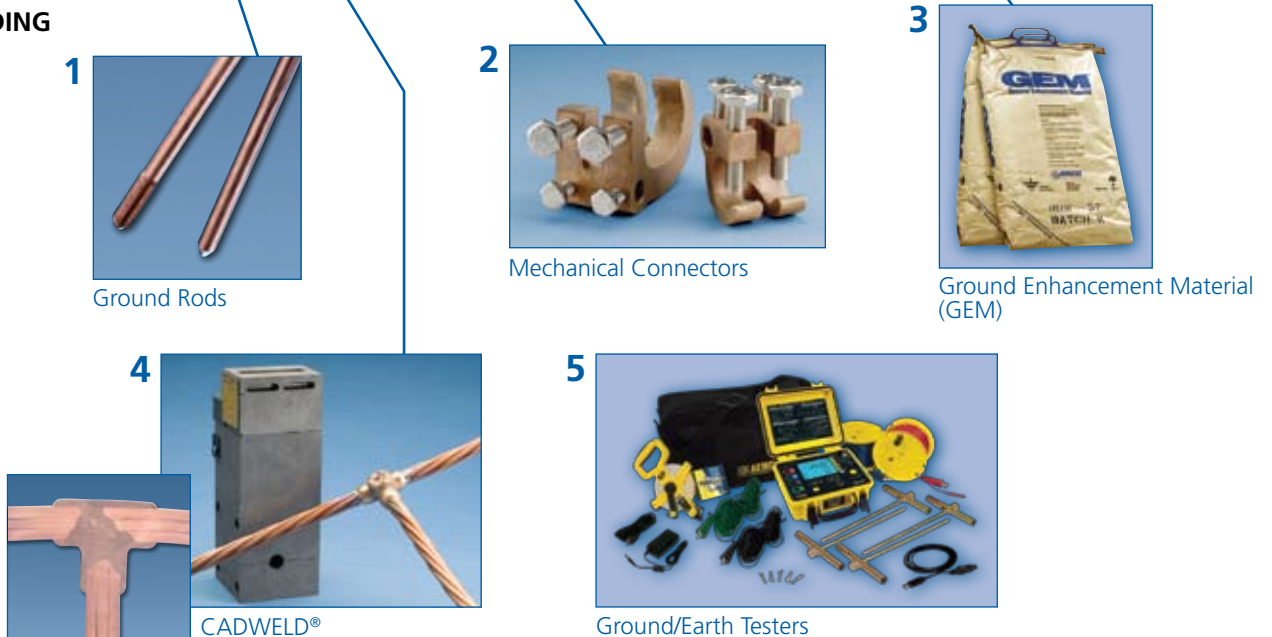
ERICO offers a range of ground/earth testers that are lightweight and portable for ease of use in the field. The ground testers are ideal for determining soil resistivity prior to designing the wind turbine foundation ground system and for testing the final resistance of the ground system after installation.

Foundation Grounding and Construction

CONSTRUCTION



GROUNDING



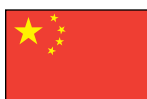


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