Electrical Solutions for Power Transmission and Distribution

Thomas&Betts

A Global Leader in Innovative...

Wire & Cable Management • Cable Protection Systems • Power Connection & Control • Safety Technology
No other industry touches the lives of commercial, industrial and residential customers as directly as the power transmission and distribution industry. It must provide a continuous, reliable stream of quality electric power across the grid, because if the power flow stops, everyone notices.
Challenge and commitment.

Transmission and distribution utilities worldwide are striving to ensure reliable, efficient and automated service while keeping their operations and maintenance costs low. They are trusted with managing a constant and growing flow of power across their entire system, from the transmission line to the final power consumer.

Electricity consumers expect and demand continuous delivery of quality power and the shortest possible downtime, regardless of whether an outage is caused by an equipment malfunction or a storm. As a business, power delivery utilities are also concerned with running their operations efficiently, cost effectively, safely and at peak performance.

However, achieving each of these goals requires overcoming common challenges, including:

- System faults and outages
- Power restoration
- High peak demand
- Safety
- Growing rate of energy consumption
- Changing government and industry standards

To better manage this responsibility, the industry is turning to increasingly intelligent electrical systems and smart controls that minimize the cost of installing, operating and maintaining electrical products while ensuring peak performance of the power system.

With the advent of the Smart Grid, transmission and distribution utilities are embedding intelligent communications, controls and monitoring systems in the power delivery infrastructure to automate previously manual tasks. They even have access to demand response and renewable energy programs that increase availability by allowing consumers to return or sell excess energy back into the grid.

For over 100 years, Thomas & Betts has delivered customer-driven innovations that solve electrical system challenges faced by the power delivery industry. We offer a broad range of solutions for overhead and underground transmission, substation, distribution and service entrance applications that:

- Improve reliability
- Increase efficiency
- Reduce operations and maintenance costs
- Ensure power quality

For power transmission lines, whether overhead or underground, suitable strength and appearance for the given terrain are required, and right-of-way and installation limitations must be considered. Engineered steel structures provide an extended service life and minimize the impact on the environment.

Substations also have strength and aesthetic considerations. Simplifying connections in the substations and the local service entrance helps to control operating costs. Proper terminations for grounding and bonding connections safeguard people and property.

Distribution automation solutions with real-time monitoring and intelligent controls improve reliability and reduce system losses. Tools to actively manage power flow increase system capacity and reduce losses. Voltage optimization technologies improve power quality.
Delivering value through innovative system solutions.

Our Value Commitment

Sustained reliability and efficiency are required to keep the power flowing to every business and residential consumer on the grid. Our world-class R&D, manufacturing facilities and expert design engineers produce state-of-the-art automation and Smart Grid solutions for power delivery. In addition, Thomas & Betts provides optimal professional services, product support and delivery systems to ensure your success. Our value commitment includes:

T&B Engineered solutions — Our products are designed with the power utility’s performance in mind. From the transmission line to the service entrance connection for a residential customer, our solutions can be applied to improve reliability and efficiency. No-maintenance, lower-installed-cost and environmentally friendly designs are but a few of the characteristics of our products.

Expert support — From the initial training to around-the-clock service during emergencies, Thomas & Betts lays the foundation for end user success. Customer Service, Technical Service, Field Service and Application Engineering Support professionals ensure that each of Thomas & Betts’ customers receives the maximum return on investment.

Product availability — With a robust distributor network, our customers’ needs are served in a timely manner. Products for overhead and underground transmission, substation and distribution applications are handled through our global electrical product support system. Storm stock and other disaster-relief initiatives from Thomas & Betts ensure availability in emergencies.

Product Platforms

Whether you are constructing, operating or maintaining a power utility system, Thomas & Betts has electrical solutions to ensure the reliable delivery of electric power. Our wide array of products ranges from cable ties and cable tray systems to connectors, fuses and switching and protection devices.

Wire and Cable Management — T&B invented the Ty-Rap® cable tie in 1958 and continues to lead the world in innovative wire and cable management. OEMs, panel builders, contractors and maintenance personnel depend on T&B electrical boxes, cable ties, weatherproof enclosures, cable tray and modular metal framing to do the job right and help reduce installation time and costs.

Cable Protection Systems — T&B Cable Protection Systems provide unsurpassed protection for wire and cables in the most demanding applications. They encompass industry-leading flexible conduit systems, PVC-coated conduit and fittings recognized as the standard in oil and gas applications and explosion-proof conduit systems meeting worldwide standards for hazardous locations.

Power Connection and Control — For reliable connection and intelligent control of electrical power, T&B mechanical and compression connectors, grounding products, medium-voltage cable accessories, high-voltage fuses, vacuum interrupters, reclosers and capacitor switches are specified worldwide in the industrial, construction and utility markets.

Safety Technology — Protecting lives and property requires state-of-the-art technology. T&B is a worldwide leader in emergency lighting and supporting central battery systems, lighting for hazardous locations and surge protection. T&B Safety Technology extends the life of your electrical system and protects your employees and assets.
Key T&D drivers

• Improving reliability and efficiency
• Reducing operation and maintenance costs
• Improving power quality
From transmission lines and local distribution networks that crisscross the landscape to the customer premises, you’ll find Thomas & Betts products to help you manage and control the constant flow of power.

We understand that your customers depend on you to deliver a continuous, uninterrupted power flow, and that you rely on us to provide solutions that enable optimal reliability and efficiency. We also recognize your need to reduce the maintenance, repair and operations costs in your electric power transmission and distribution systems.

Whether your systems are overhead or underground, we are your partner in power delivery. Our broad family of electrical solutions enables us to support your design, construction and O&M requirements economically, with fewer and shorter outages.

T&B Engineered solutions for your power transmission and distribution system

- Transmission
- Substation
- Distribution
- Service Entrance
Transmission and Distribution System Solutions

- Power Quality, Efficiency & Reliability
- Continuous Operation & Sustainability
- Grounding & Bonding
- Space Savings
- Services & Training
Power Quality, Efficiency & Reliability

The transmission and distribution industry’s foremost challenge is to provide reliable, quality power. In today’s electronics-oriented culture, it is virtually impossible for a power loss or power quality disturbance to go unnoticed, and the risks to the utility are great:

- Power quality disturbances cause equipment damage and blackouts
- Improper power factor control sacrifices energy efficiency
- Unreliable electric service reduces customer satisfaction and affects rates that T&D utilities can charge

Power delivery utilities must operate safely and with minimal impact on the population and environment even as they adapt to growing populations and expanding businesses in their service area. Smart Grid initiatives target improvements in reliability and efficiency. For example, new regulations and recommendations designed to reduce peak demand and control load flow are moving the industry toward greater energy efficiency. Enabling monitoring and control capabilities enhances energy efficiency and system reliability, including distribution automation volt/VAR control, fault detection, overcurrent protection and demand-reduction programs.

Surge Protection Devices
- Facility-wide protection: service entrance to equipment level
- Proprietary designs and individually fused MOVs maximize performance and reliability
- Multiple voltage configurations with available surge ratings of 25kA to 400kA
- Listed to UL® 1449 3rd Edition; RoHS compliant

Capacitor Switches
- Vacuum interruption and solid-dielectric insulation translate into maintenance-free and environmentally friendly designs — no oil, no gas
- Exclusive Vacstat® vacuum interrupter monitoring

Distribution Switchgear
- Solid EPDM insulating media makes it maintenance-free and environmentally friendly — no oil, no gas
- Compact, modular, field-upgradable design enables smaller footprint and field assembly inside tight vaults

Faulted Circuit Indicators
- Adaptive trip reset logic reduces inventory and eliminates the need to replace FCIs as load changes
- Temporary fault detection option to help locate nuisance temporary faults

Current-Limiting Fuses
- Greatly reduce energy let-through, minimizing the risk of catastrophic failures
- Interrupting capabilities up to 50,000A
With Thomas & Betts, you can modernize your existing electrical infrastructure with a wide array of solutions that increase power reliability and efficiency, without having to rebuild.
Continuous Operation & Sustainability

Severe storms, ice accumulations, earthquakes and other natural disasters have the potential to wreak havoc on transmission and distribution system operation. Likewise, man-induced disasters such as terrorism and hacking could put the grid at risk. Large-scale electrical service disruptions are felt immediately and the results of a blackout can be devastating, particularly if restoration is not timely. Among the consequences are:

- Interrupted or corrupted industrial processes
- Food storage concerns
- Water quality concerns
- Traffic light hazards
- Life-or-death situations

For this reason, power delivery utilities are steadfast in their quest for continuous, sustainable operation. Best practices like proactive vegetation management combined with sophisticated electrical systems help to prevent and mitigate service outages. Distribution automation improves outage notification, fault isolation and planning and implementation of power reroutes and restoration, resulting in fewer and shorter outages and greater customer satisfaction. Burying at-risk lines and creating breakaway points to protect power poles accelerate service recovery.

**Smart Crab™ Network Connectors**
- Replace traditional crab joints, which use fuse links for load protection, in underground networks
- Use current-limiting fuses for complete overcurrent protection up to 50,000A
- Provide SCADA connections to identify the exact location of the fault and the faulted leg in the joint

**Transformer Connectors**
- Spade or stud mounted
- For copper and aluminum conductors to 1000 kcmil

**Elastimold® Cable Accessories**
- Elastimold® cable accessories are available from 5kV to 138kV and include solutions for protecting, grounding, connecting, splicing and terminating underground cable
- Starting with the first underground elbow connector ever sold, the Elastimold® brand was and continues to be the number one innovator of cable accessories with pioneer products such as extended and repair elbows, jacket seal elbows and shrink-fit joints to name a few

**Ty-Rap® Deltec® Outdoor Fastening System**
- Reduces lost time, accidents and downtime
- Faster installation
- Minimum 20-year outdoor life
- 200-lb. minimum tensile
- Made to size or cut to length
Thomas & Betts products for continuous operation & sustainability

Blackburn®
- Mechanical Connectors, Compression Lugs and Connectors, Exothermic Grounding Systems
- Motor Lead Disconnects
- Automatic Splices for Overhead Lines
- Ergonomic Compression Tools

Elastimold®
- Solid-Dielectric Distribution Switchgear for Riser Pole, Vault and Padmount Applications
- Switchgear Automation and Source Transfer Packages
- Underground Cable Accessories for 5 to 35kV, including Elbows, Joints and Terminations
- Reclosers

Hi-Tech®
- Current-Limiting Fuses for Overhead and Underground Transformers and Capacitor Banks

Homac®
- Low-Voltage Power Distribution Connectors for Underground Applications
- Network Transformer Connectors
- Substation Connectors
- Cable Splices
- Temporary Service Adapters
- Smart Crab™ Network Connectors

Meyer®
- Tubular Steel Transmission and Distribution Poles

Ty-Rap®
- Nylon 6.6 Cable Ties
- Extra-High Temperature and Flame-Retardant UL94V-0 Nylon Cable Ties
- Weather-Resistant Nylon 12 Messenger Hanger Straps
- Weather-Resistant Releasable Polypropylene Hanger Lashing Ties
- Deltec® Outdoor Fastening System
- Coated and Uncoated Stainless Steel Cable Ties
- Ty-Rap Tote® Dispensers and Ergonomic Installation Tools

How much does a service outage cost you per minute?
**Grounding & Bonding**

Today’s power delivery utilities have become almost entirely dependent on electronic technologies. As a result, the need is greater to review and upgrade electrical systems with more emphasis on grounding and bonding.

When a grid’s electrical systems are properly grounded, they will absorb current surges. Ineffective grounding can cause voltage variances that damage electrical equipment or sensitive electronic devices, leading to power loss and costly, unplanned downtime. Bonding removes dangerous current from electrically conductive materials when a ground fault occurs. If the metal parts are not bonded to an effective ground-fault current path, they can become dangerously energized.

Grounding and bonding systems must continually adapt to evolving industry standards, such as IEEE 837. Thomas & Betts provides long-lasting, code-compliant grounding and bonding systems and the training and technical expertise required to optimize grid availability. Our solutions enable you to:

- Reduce failure rates
- Extend the electrical system life cycle
- Increase overall equipment effectiveness
- Reduce project costs with a complete grounding package
- Ensure supplier product availability to minimize downtime

**Blackburn®**

**Mechanical Grounding Connectors**
- Comprehensive line of pipe, ground rod and structure grounding solutions
- UL® Listed for direct burial applications

**Compression Grounding and Bonding Connectors**
- E-Z-Ground® connectors are UL® Listed for direct burial applications
- Range-taking products will reduce the number of connectors and dies needed for your installation
- Featuring the Color-Keyed® Compression System that ensures proper connections

**Exothermic Grounding Solutions**
- Self-contained method of forming high-quality electrical connections
- Require no external power or heat source and are completely portable
- Will withstand repeated fault currents without loosening
Is your service area especially prone to lightning strikes? Are your electrical systems situated in corrosive environments?
Space Savings

In power delivery applications where space is limited, compact electrical equipment and systems are required. Space-saving designs:

- Ensure sufficient operating clearance
- Accommodate load growth within the existing available space
- Enable you to retrofit older equipment without altering the surrounding infrastructure

The old adage that bigger is better does not hold true in all cases. For instance, compact substation footprints bring cost reductions during construction, operations and maintenance, have less environmental impact and limit the use of components that have high failure rates. Consequently, the utility benefits from lower life cycle costs and improved availability.

In the power transmission and distribution industry’s pursuit of a better grid, opportunities for devices that work well in confined spaces — above ground and underground, outdoors and indoors — are growing. Thomas & Betts offers space-saving and modular solutions for fusing, connectors and switchgear.

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**elastimold**

**Distribution Switchgear**

- Compact and modular designs allow for smaller footprint and field assembly inside tight vaults
- Suitable for submersible installations and can be installed in any position
- Uses solid EPDM as the insulating media, making it maintenance-free and environmentally friendly — no oil, no gas
- Field upgradable to accommodate changes required by Smart Grid and compatible with Schweitzer electronic controls

**ZEEBAR® Transformer Connectors**

- Compact bar design fits double the connections in the same space inside the transformer and halves the cantilever stresses
- Easy to install; all screws are on top and a ½" hex wrench does it all — including the streetlight outlet
- Dual-rated for copper and aluminum conductors

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**CombO™ Cable Accessories**

- When stacking 600A elbows, CombO™ saves 2.7" of space for every two elbows
- Allow for more operating clearance in confined vaults
- Can be installed in existing switchgear without the need for larger enclosures
How do you fit switchgear through a manhole? Size constraints and confined spaces can be a real challenge.

Thomas & Betts products for space savings

Elastimold®
- Solid-Dielectric Distribution Switchgear for Riser Pole, Vault and Padmount Applications
- ComboT™ Cable Accessories

Homac®
- Low-Voltage Power Distribution Connectors for Underground Applications
- Network Transformer Connectors
- EZ-Keeper® Transformer Connector Series
- RAB 1/0 Series Connectors
- ZEEBAR® Transformer Connectors

Meyer®
- Tubular Steel Transmission and Distribution Poles

Ty-Rap®
- Weather-Resistant Cable Ties
- Low-Profile Nylon 6.6 Cable Ties
- Multi-Color UV-Stabilized Nylon Cable Ties
Managing and retaining a skilled workforce in the transmission and distribution industry is a greater challenge now than it has been in the past. Three primary trends are affecting employee retention:

- High attrition
- Aging workforce
- Skills gap

For decades, the power delivery industry operated with incremental and relatively minor changes to its systems and processes. Employees became experts at their responsibilities and enjoyed long careers with their utility.

Now, new devices and systems are streaming into the market, designed to add intelligence and automation throughout the power delivery chain. From transmission and distribution to the substations and service entrance, innovations are transforming the way power is delivered. Baby Boomer employees are working to adapt to the changes or heading into retirement. Younger employees entering this highly sophisticated field require experience that is not taught in schools.

Because the recent technological advancements require specialized training, power delivery utilities are increasingly relying on manufacturers like Thomas & Betts to provide high-tech electrical product training, services and support.
As of 2008, about 53% of the utilities industry workforce was age 45 or older; many of these workers will either retire or prepare to retire within the next 10 years. – U.S. Bureau of Labor Statistics
### High-quality products to address key issues in transmission and distribution

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Thomas & Betts Specification Guide

Thomas & Betts product guide specifications are available as Microsoft Word documents at www.tnb.com. They follow the CSI three-part format, using section numbers from Master Format® 2010 Update. This enables their simple and seamless incorporation into any CSI compliant electrical specification. Following are products referenced in this brochure:

- 26 05 26.01 Compression and Mechanical Grounding Connectors
- 26 05 26.03 Exothermic Welding System
- 26 05 33.24 Liquidtight Conduit Fittings
- 26 05 83.12 Wiring Connections: Compression Lugs, Splices and Connectors
- 26 05 83.14 Wiring Connections: Aluminum and Copper Compression Lugs and Splices
- 26 05 83.16 Wiring Connections: Mechanical Connectors
- 26 05 83.17 Wiring Connections: Crimp Tools for Aluminum and Copper Lugs and Splices
- 26 13 19.01 Medium-Voltage Underground Distribution Switchgear
- 26 21 16.11 Low-Voltage Underground Splices and Connectors
- 26 36 23 Automatic Transfer Switches
- 26 43 13 Surge Protective Devices for Service Entrance
- 33 72 11 Utility Substation Capacitor Switches and Controls

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Visit the T&B world of electrical product solutions

Visit our web site for more information about Thomas & Betts solutions and our newest products. For a user-friendly catalog and competitive part number search, application and technical support and other useful information, go to: www.tnb.com

Industry codes and specifications

All Thomas & Betts products for use in power transmission and distribution applications meet or exceed applicable industry specifications or codes which are detailed in the appropriate T&B product literature.

IEEE ANSI IEC

United States
Thomas & Betts Corporation
Electrical Division Headquarters
8155 T&B Boulevard
Memphis, TN 38125
Phone: 901.252.8000
Fax: 901.252.1354
Technical Services:
888.862.3289
Customer Service:
1.800.816.7809
Email: elec_custserv@tnb.com

Canada
Thomas & Betts Ltd
700 Avenue Thomas
St.-Jean-sur-Richelieu
Quebec J2X 2M9
Phone: 450.347.5318
Fax: 450.347.1976

Latin America
Mexico: 01-800-TNB-HELP
Central America & Caribbean:
+52.81.8329.7707
South America:
+52.81.8329.7643
Email: servicioalcliente@tnb.com

Europe/Africa
T&B European Centre
200 Chaussée de Waterloo
B-1640 Rhode-St-Genèse
Belgium
Phone: +32.235.98200
Email: europe_inquiry@tnb.com

Middle East
Thomas & Betts Ltd
PO Box 54567
Office 107 5EA East Wing
Dubai Airport Free Zone
Dubai
United Arab Emirates
Phone: +9714.609.1635
Fax: +9714.609.1636
Email: me_ex_enquiry@tnb.com

Asia Pacific
Thomas & Betts Asia Pte Ltd
10 Ang Mo Kio Street 65
#06-07 Techpoint
Singapore 569059
Phone: +65.6720.8828
Fax: +65.6720.8780
Email: asia_inquiry@tnb.com

American Recovery and Reinvestment Act (ARRA)

Get certification letters for compliant products online at:
www.tnb.com/ARRA

Thomas & Betts Corporation
8155 T&B Boulevard
Memphis, TN 38125
901.252.8000

www.tnb.com