

# Electrical Solutions for Data Centers



A photograph of a data center aisle. The aisle is lined with rows of server racks on the left side. Each rack has a glass door and contains multiple server units. The floor is white with a large, rectangular area of perforated metal grating in the foreground, likely for cooling. The ceiling is white with recessed lighting fixtures. The overall scene is clean, organized, and brightly lit.

***A data center has 15–30 times the electrical density of a commercial building, and the costs of the electrical system may approach 70% of overall project costs.***

# Challenge and commitment

Data centers are becoming larger and more vital to everyday life with each smart phone, internet-connected computer or Wi-Fi® device sold. The recent emergence of cloud computing is spurring a boom in real-world construction. Data center operators need to manage a complex infrastructure of power and cooling equipment while providing 24x7 availability of data for commerce, financial transactions, enterprise resources or even streaming video for a night's entertainment. All of this has made the data center industry one of the fastest growing consumers of electrical power, using up to 2% of the U.S. electrical supply and resulting in a global carbon-equivalent footprint greater than the entire airline industry.

As a result, greater emphasis has been placed on using all of this power efficiently. One power metric, as defined by The Green Grid®, is Power Usage Effectiveness, or PUE, which is a value to compare total power used divided by the amount of power used for critical loads. The lower the PUE value, the more efficiently power is being used. Some state-of-the-art data centers are reporting PUE levels of 1.2, where only a few years ago, an average PUE value might have been at 2.0 or higher. A PUE value of 2.0 means that for every watt used for critical load, another watt is being used for support systems such as HVAC equipment.

With downtime costs reported as approaching \$350,000 per hour, the need for continuous, quality power is paramount. Given this, how can an owner improve the efficiency of an existing data center? There are several ways to do this. The IT portion of the data center is typically refreshed, or upgraded, every three to five years,

but power systems are part of capital equipment and are on a longer refresh cycle, which makes efficiency gains on the power side more difficult to come by. Some gains can be achieved by converting from perimeter cooling to segregating hot air from cold air (hot aisle/cold aisle containment) with simple mechanical barriers. Some companies make ducting to focus the cold air into the IT rack itself. Immediately, and perhaps easiest of all, you can follow the ASHRAE recommendations and increase the overall temperature in the white space, requiring less cooling regardless of scheme.

For the designer, electrical contractor or owner of a new data center, the issues can be compounded by the urgency of the construction process. A day that the project is delayed is a day of irrecoverable revenue loss. A data center has 15–30 times the electrical density of a commercial building, and the costs of the electrical system may approach 70% of overall project costs. Coupled with the complexity of a dual-source, concurrently redundant power system, this requires project management skills of the highest caliber.

Thomas & Betts understands the drive for efficiency at the data center and can provide products that enable you to build or improve your critical electrical systems while maintaining safety and power quality in a 24x7 environment. Today's data center has evolved into a complex data factory, and it needs a quality, reliable and easily maintained electrical system.

Wi-Fi is a registered trademark of the Wi-Fi Alliance.  
The Green Grid is a registered trademark of The Green Grid Association.

## Data Center Users



# Valuable solutions for the construction and operation of a data center.

## Our Value Commitment

Electrical installers for data centers must meet demanding project schedules while maintaining quality and safety and improving their profitability.

Thomas & Betts is committed to helping you meet these challenges with electrical solutions, services and systems that deliver value. These include:

**T&B Engineered solutions** — Our products are designed to perform dependably under conditions such as constant moisture, harsh chemicals, extreme temperatures, high-pressure washdown, ultraviolet exposure, hazardous areas, high-vibration equipment and continuous operation.

**Tested reliability** — Our products are rigorously tested for use in harsh environments, with proven results in thousands of installations.

**Expert support** — Thomas & Betts trained sales representatives and technical services experts are available at every stage of a project, from planning and site preparation through construction and MRO.

**Training and certification** — Thomas & Betts conducts training programs on specific products and systems and works closely with accredited electrical industry associations. Contact us for details.

**Product availability** — Our industry-leading distributor network assures you of reliable and on-time delivery. This global electrical product support system ensures that our solutions are available when and where you need them.



## Product Platforms

For more than a century, Thomas & Betts has provided system solutions to help customers design and build safe, reliable, high-quality electrical systems while increasing operational efficiencies and profitability.

**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.

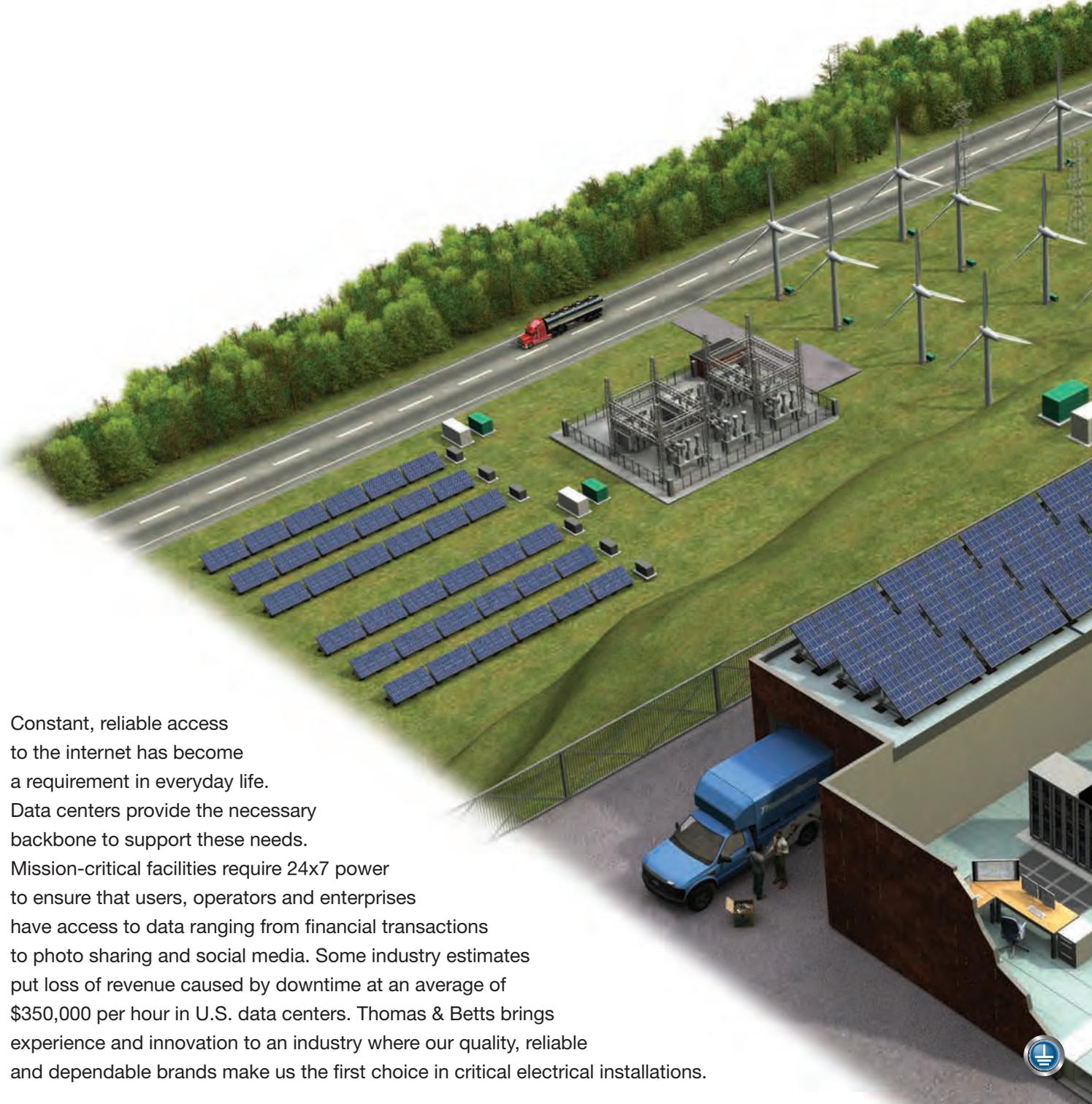
**Safety Technology** — Protecting lives and property requires state-of-the-art technology. T&B is a worldwide leader in emergency lighting and supporting central battery systems, lighting for hazardous locations, and surge protection. T&B Safety Technology extends the life of your electrical system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

### ***Key Concerns for Data Centers***

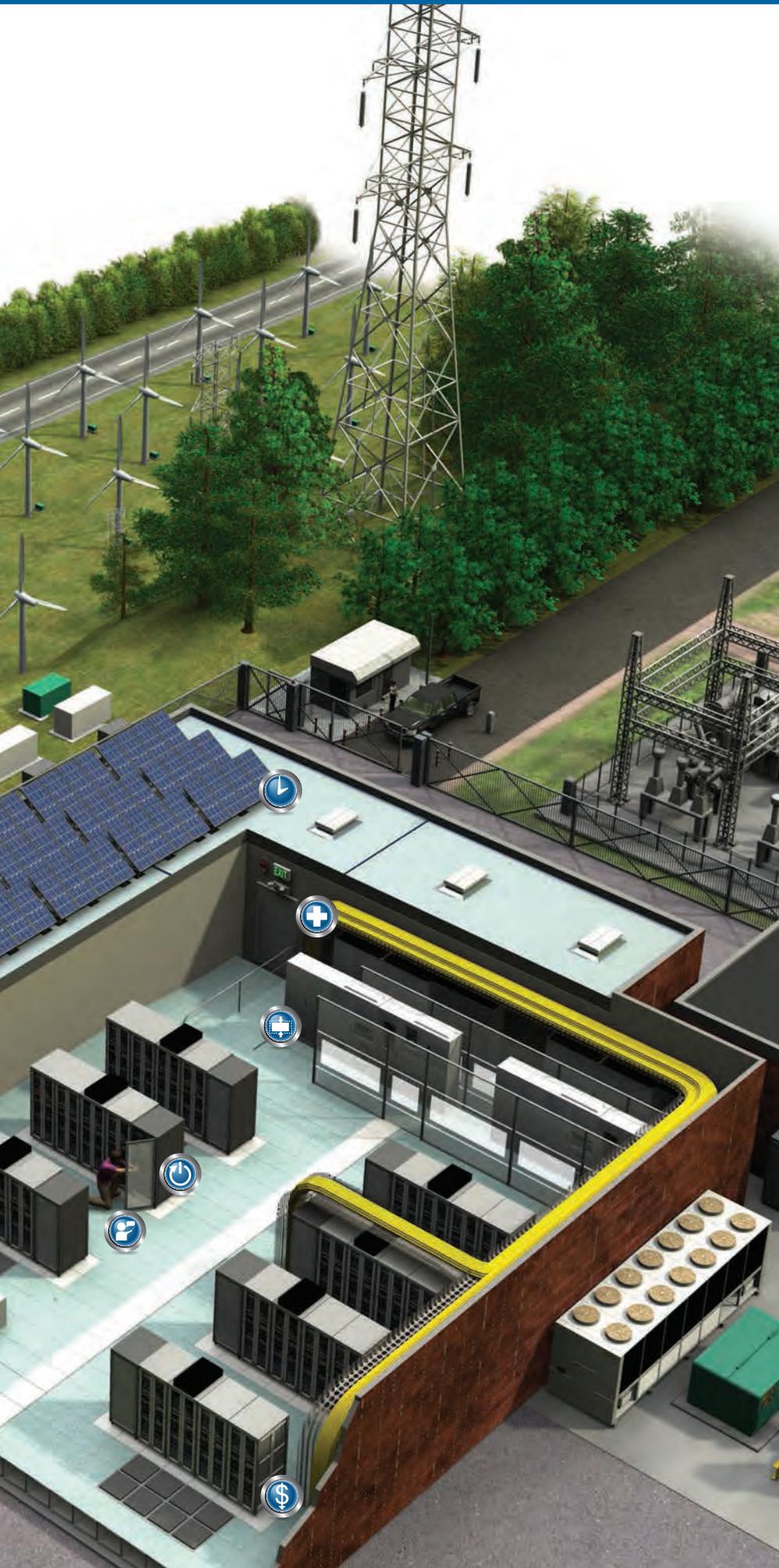
- ***Properly designed grounding system***
- ***Power quality and efficiency***
- ***Continuous operation and sustainability***



# *T&B Engineered solutions for data centers*



Constant, reliable access to the internet has become a requirement in everyday life. Data centers provide the necessary backbone to support these needs. Mission-critical facilities require 24x7 power to ensure that users, operators and enterprises have access to data ranging from financial transactions to photo sharing and social media. Some industry estimates put loss of revenue caused by downtime at an average of \$350,000 per hour in U.S. data centers. Thomas & Betts brings experience and innovation to an industry where our quality, reliable and dependable brands make us the first choice in critical electrical installations.



## ***Electrical System Issues for Data Centers***



***Continuous Operation  
& Sustainability***



***Power Quality,  
Efficiency & Reliability***



***Safety &  
Contamination***



***Space Savings***



***Total Project Cost  
Reduction***



***Grounding & Bonding***



***Services & Training***



# Continuous Operation & Sustainability

A data center operator needs to anticipate future requirements. The power system must be flexible enough for future IT loads but robust enough to meet the 24x7 “always-on” demands of today. Thomas & Betts offers electrical solutions to meet today’s needs coupled with the durability and energy efficiency required for a sustainable future.



## Steel City®

### Access Floor Modules

- Highest-quality BIM models for all in-floor electrical and low-voltage needs
- Hide wire clutter in a convenient, accessible location
- Easy to install and move
- Nylon covers reinforced with steel plate prevent buckling under heavy weights
- Five sizes range from extremely shallow to industry’s largest

## Russellstoll®

### DuraGard® Pin-and-Sleeve Connectors

- Complete line of 20–60A (600VAC/250VDC max.) connectors, plugs and receptacles
- UL94V-0 flammability-rated, corrosion-resistant non-metallic housings
- Waterproof whether mated or unmated

## Blackburn® Compression

### Connectors for Finely Stranded Cable

- Connectors and terminals for conductors more finely stranded than Class B and Class C
- Per revised NEC® Section 110.14(1)

## Sta-Kon®

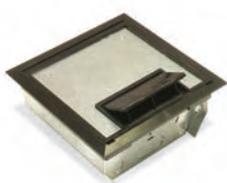
### Crimped Wire Termination Systems

- Complete line of rings, forks, splices, disconnects, pin terminals and wire ferrules, built with materials for high-performance applications
- Longer, selectively annealed barrel for increased pull-out strength and lowered crimping force, with funneled terminal barrel entry for faster installation
- Nylon terminals feature metal insulation grip sleeve for strain relief
- UL® Listed and CSA Certified

## ABB

### AF Series Contactors

- Provides continuous reliable operation, even with voltage fluctuation
- Modular accessories for reduced downtime
- Full range up to 2,050A; NEMA, IEC and horsepower rated



Steel City®  
Access Floor  
Modules



Russellstoll®  
DuraGard® Pin-and-  
Sleeve Connectors



Blackburn® Compression  
Connectors for Finely  
Stranded Cable



Sta-Kon®  
Crimped Wire  
Termination Systems



ABB  
AF Series  
Contactors



**Thomas & Betts provides electrical systems and components to ensure continuous operation, minimal downtime and sustainability to meet future needs.**

## **Thomas & Betts products for continuous operation & sustainability**

### **ABB**

- AF Series Contactors
- Tmax and Emax Circuit Breakers
- Pro M Miniature Circuit Breakers and Surge Protection Devices
- Terminal Blocks
- Jokab Safety Vital 1 Safety Controllers and Relays

### **Blackburn® Compression**

- Connectors for Finely Stranded Cable

### **Carlton®**

- ENT System
- Non-Metallic Enclosures

### **Red•Dot®**

- Code Keeper® Weatherproof While-in-Use Covers

### **Russellstoll®**

- DuraGard® Pin-and-Sleeve Connectors

### **Sta-Kon®**

- Crimped Wire Termination Systems

### **Steel City®**

- Access Floor Modules

### **T&B® Fittings**

- Liquidtight Cord Connectors
- Liquidtight Conduit and Fittings Systems
- Wire-Mesh Strain-Relief Cord and Conduit Grips

*NEC and National Electrical Code are registered trademarks of the National Fire Protection Association, Inc.*



# Power Quality, Efficiency & Reliability

From substation to remote power panels, Thomas & Betts products and solutions enable maximum uptime and control by:

- Detecting faults and protecting against overcurrent and voltage drops
- Preventing damage due to power quality disturbances
- Eliminating under performance, minimizing system losses and increasing availability

Electrical solutions from Thomas & Betts ensure uptime, improve customer satisfaction and protect stakeholder ROI.



## Digital Static Transfer Switches — 200–4,000A

- Improves system reliability with 25-cycle transfer between sources
- Improves system serviceability by allowing concurrent maintenance

## Power Distribution Systems

- Systems ranging from 50–500kVA
- Distributes and protects power to critical loads
- Energy monitoring

## Remote Power Panels

- Distributes and protects power to single-phase circuits
- Monitors power and individual circuits

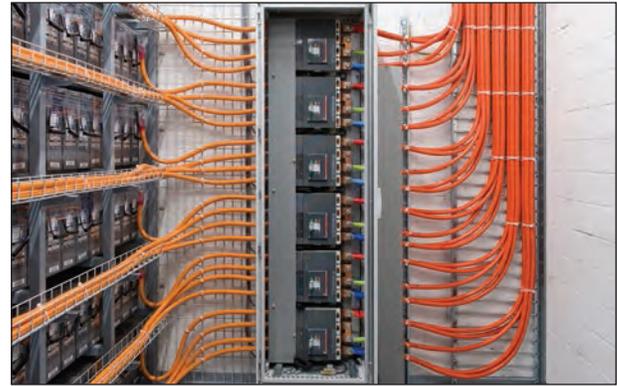
## IR Port Option

- Identifies emerging problems to allow scheduled preventive action
- Improves safety by decreasing possible arc flash occurrences
- Available on all Cyberex® mission-critical products



## Surge Protective Devices

- Facility-wide installation and equipment level protection



## Distribution Switchgear and Molded Vacuum Interrupters

- Solid EPDM insulating media makes them maintenance-free and environmentally friendly — no oil, no gas
- Compact modular switchgear designs allow for smaller footprint and field assembly inside tight vaults
- Molded vacuum interrupters provide compact, lightweight, submersible protection with predictable tripping for ease of upstream/downstream coordination



## ProLine Touch-Safe Panel Boards

- Fully coordinated circuit protection with ABB breakers
- IP20 touch-safe rating

## Tmax and Emax Circuit Breakers

- True RMS-sensing electronic trip units
- 200kAIC fuseless versions available
- Easily coordinated with Pro M Miniature Circuit Breakers

## Pro M Miniature Circuit Breakers and Surge Protection Devices

- Current-limiting for optimal protection
- The only branch breaker to fit in the ProLine Panel Board



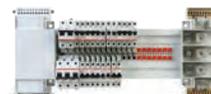
**Cyberex®**  
Power Distribution Systems



**Current Technology®**  
Surge Protective Devices



**Elastimold®**  
Distribution Switchgear



**ABB**  
ProLine Touch-Safe Panel Boards



**ABB**  
TMax and EMax Circuit Breakers



## **Thomas & Betts products for power quality, efficiency & reliability**

### **ABB**

- AF Series Contactors
- ProLine Touch-Safe Panel Boards
- Tmax and Emax Circuit Breakers
- Pro M Miniature Circuit Breakers and Surge Protection Devices
- Terminal Blocks

### **Current Technology®**

- Surge Protection Devices

### **Cyberex®**

- Digital Static Transfer Switches
- Integrated Systems
- Power Distribution Systems
- Remote Power Distribution
- Energy Management

### **Elastimold®**

- Solid-Dielectric Switchgear
- Switchgear Automation Packages
- Molded Vacuum Interrupters and Arresters

### **Fisher Pierce®**

- Faulted Circuit Indicators
- Voltage and Current Sensors

### **Joslyn Hi-Voltage®**

- Capacitor Switches

***Hot spots in data center equipment are signs of catastrophic problems leading to downtime. The integrated IR port option available with all Cyberex® mission critical products can detect hot spots, providing you with early detection of problems in electrical connections and components, so that you can take preventive action to avoid disruption to data center operations.***



# Safety & Contamination

As with any electrical system, data centers must be equipped to ensure safe operation. You'll find a complete assortment of safety products from Thomas & Betts, including labels and warning signs.

## EZCODE®

### Safety Labels, Tags, Signs and Barricade Tapes

- Help to ensure personnel and workplace safety, as well as regulatory compliance
- Highly visible and long-lasting materials
- Custom labels, tags and signs available

## Ty-Rap®

### High-Performance Cable Ties

- Hook-and-loop fasteners for bundling low-voltage and fiber optic cabling
- Plenum-rated for use in air-handling spaces above ceilings and under floors
- Weather-resistant for rooftops and other outdoor applications
- UL® Listed for metal-clad cable support in walls
- Stainless steel for corrosive environments

## Blackburn® Compression | Sta-Kon® | Ty-Rap®

### Ergonomic Application Tooling

- Consistent installation of lugs, terminals and cable ties
- Save time and increase reliability and profitability with hydraulic and pneumatic tooling
- Reduced handle force and ergonomic design lowers the risk of repetitive motion injuries
- Promotes safety by properly matching the correct tool with the electrical component it's designed to install



## EMERGI-LITE® / Lightalarms®

### Emergency Lighting Systems

- Energy-efficient, modern-design exit signage
- Nexus® Real-Time Emergency Lighting Monitoring & Control System lowers workload by providing testing and monitoring from any location in the world to meet code requirements
- LEED support

## ABB

### ProLine Touch-Safe Panel Boards

- IP20 touch-safe rating
- Fully coordinated circuit protection with ABB breakers
- 400A MLO or Tmax main circuit breaker
- Integrated neutral and grounding bus



**EZCODE®**  
Safety Labels, Tags,  
Signs and Barricade Tapes



**Ty-Rap®**  
High-Performance  
Cable Ties



**Blackburn® Compression  
Sta-Kon® | Ty-Rap®**  
Ergonomic Application Tooling



**Emergi-Lite®/  
Lightalarms®**  
Exit Signs



**ABB**  
ProLine Touch-Safe  
Panel Boards