POWER ELECTRONICS

Serving the Power Electronics Market

SAFETY & RELIABILITY
FOR ELECTRICAL POWER

MERSEN

Eldre | Ferraz Shawmut | R-Theta

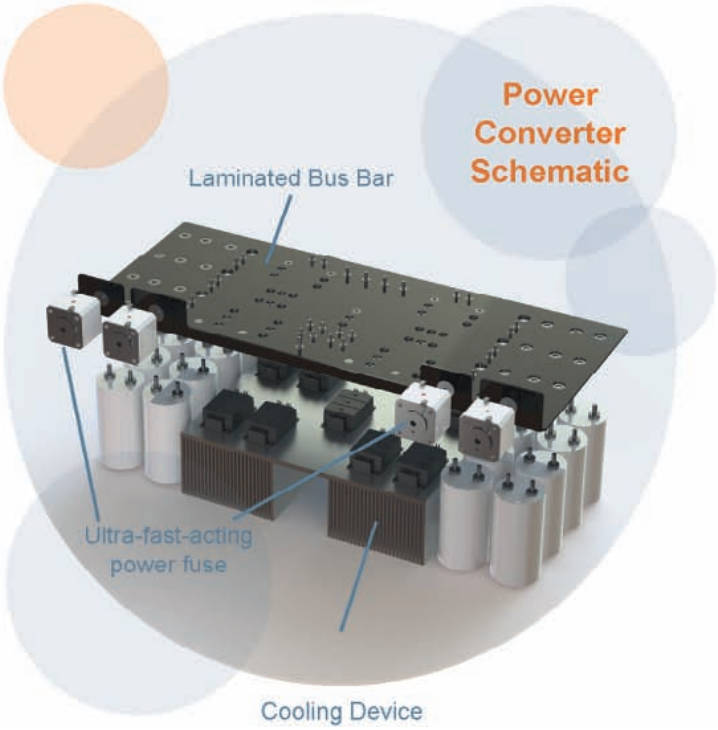
Maximize performance, safety, & reliability with power electronics solutions from Mersen

Growing energy needs demand power electronics

The demand for energy is growing at an astounding rate. This ever-increasing demand for energy has led to a need for power converters. Lowering the cost of power converters, reducing their overall size, and developing increased efficiency are key requirements for new power converter development.

Power semiconductor components are critical in achieving these new requirements. The benefits provided by these components are subject to certain constraints. For example, they operate at extremely high frequency, the heat they generate has to be dissipated, and they need to be protected against catastrophic failure when misapplied.

Mersen helps you overcome these constraints with a range of adapted products. On-state and commutation losses have to be dissipated. High switching frequency will lead to an increase of commutation losses if parasitic inductance isn't minimized. Mersen's **Protistor fast-acting fuses, bus bar, cooling systems, and surge protection** are key and interdependent power components in a powerful power electronics solution for you.



Dedicated solutions for your power electronics applications

Mersen is the go-to player for power electronics applications and has developed solutions to serve that market. Power converters provide more flexible use of energy and improve its management, transmission, and distribution.

Some examples of the uses of power converters are:

- **Renewable Energy:** In photovoltaic and wind energy systems, where power converters transform the source current and voltage waveforms before the energy is transferred to the grid
- **Mobility:** In rail transportation, where power converters manage and supply energy to train motors and collect energy generated at braking
- **Energy Efficiency:** In variable speed drives for controlling electric motors in industrial or commercial facilities

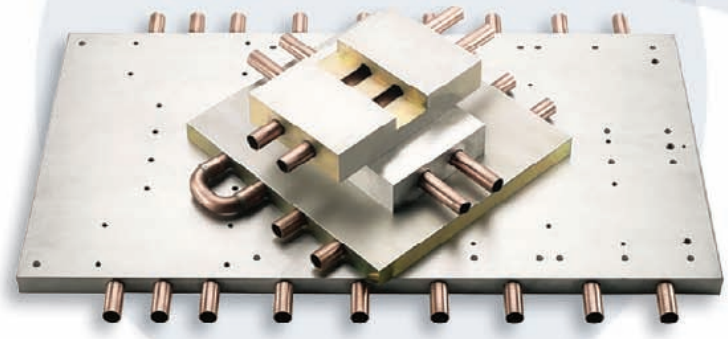
Mersen's integrated power electronics protection solution:

- ***Fast-acting fuses*** *for the protection of semiconductor devices*
- *Power electronics* ***cooling systems***
- ***Laminated bus bar***

Mersen provides you with industry-leading electrical protection

You already know Mersen as an expert in electrical protection, with industry-leading products that can improve efficiency and reliability:

- **Fast-acting fuses** and other electrical protection devices (switches and fail-safe surge protection devices) protect against catastrophic failure
- **Cooling systems** provide thermal protection for semiconductor components while enabling heat to dissipate
- **Laminated bus bar** plays a key role in power converters, and laminated and insulated bus bar provides connection between various components, limits parasitic inductance and eases assembly and integration, leading to an improvement of the overall power converter reliability, performance, and efficiency while minimizing assembly costs



SUPERIOR ELECTRICAL PROTECTION FOR YOUR POWER ELECTRONICS APPLICATIONS

Getting ahead of market trends

Bringing your development project to successful operation is as much a question of attitude as of high technology. Mersen has both, plus some decisive extras:

- **OPTIMIZATION:** From the design stage, with a well-designed stage gate process, we focus on footprint, weight, time to market, ease to install and service, energy efficiency, and total cost. We make sure that you get what you are looking for.
- **CONTROL:** We focus on product and process development. Our quality and manufacturing engineers are key members of our product development teams. Pointing out the attributes to control final product performance as well as process performance is our main focus.
- **ANTICIPATION:** We strive to anticipate market trends, such as a drop in nuclear power plant demand, the race to renewable energies, development, and an energy storage plan to support Smart Grids.

Anticipating your future technology requirements

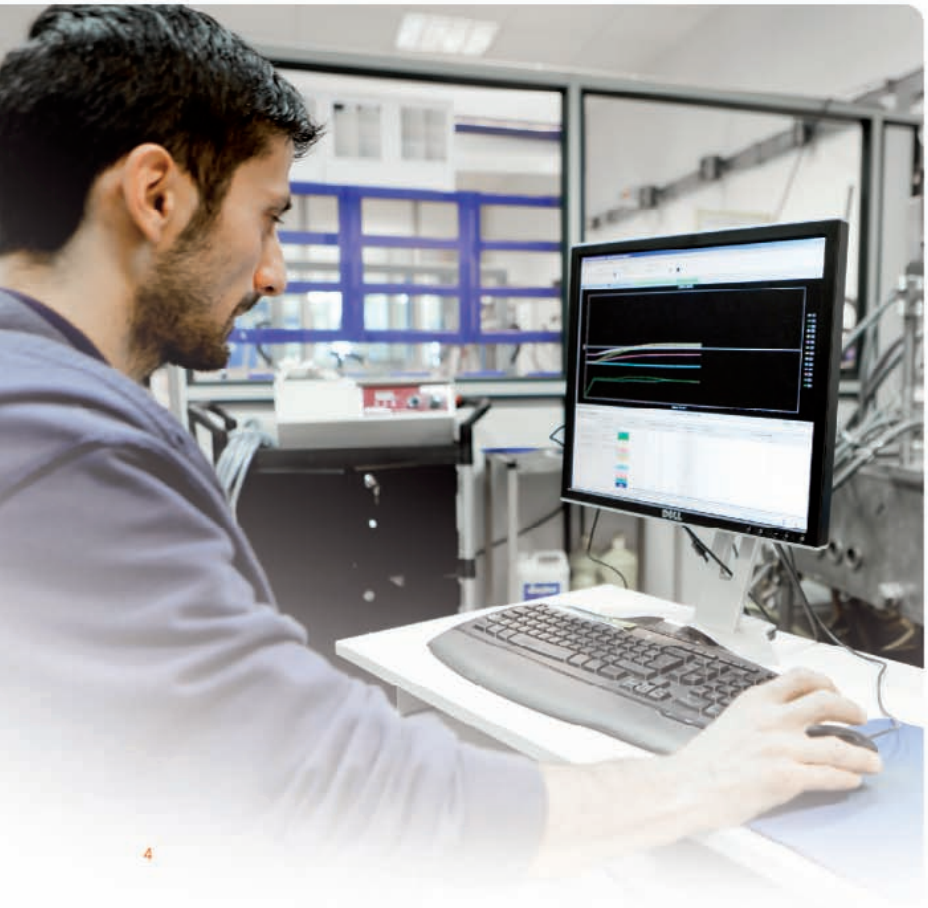
Mersen is committed to developing technologies to protect power electronics equipment, and we use many different approaches when researching and developing our innovative electrical protection products.

We attend standardizing committees to defend customers' interests. We participate in power electronics research conferences to survey power semiconductors as well as applications trends. We partner with outside consultants to challenge our view on power electronics applications. In addition, we use "Voice of the Customer" methodology as the basis for our own product development, giving Mersen a wider view of both today's and tomorrow's markets.

Surveys are also a key part of product development. By surveying power semiconductor trends, we ensure that our range of products meets the power semiconductor voltage and current ratings range. We also survey applications, such as PV, windmill, storage energy…

all with characteristics that challenge product performance. Mersen's R&D and Operations teams work hand in hand to develop, invest, and manufacture large bus bars and heat sinks.

With partnerships at leading European, North American, and Chinese universities, Mersen has been able to innovate in product and process development by qualifying cutting-edge technologies in terms of optimization and reliability. Our stage gates approach has allowed us to reduce the development cycle time and boost quality of execution without losing sight of market demand. Ultimately you will get the full benefit of our research and product developments.



MERSEN'S TEST LABS

Our two high power test labs are essential resources and major assets for Mersen. No product is released without testing. These internal testing facilities serve as auditing tools and have shortened our product development and help us maintain product performance.

The labs are located in Newburyport, MA and Saint-Bonnet-de-Mure, France. The two labs are highly complementary, running AC/DC testing in accordance with the two main standards, UL/CSA and IEC. Mersen's labs and in-house experts are also available to customers looking for lab time.

Mersen Quality Management System

To ensure customer requirements are met or exceeded, Mersen has put in place a Quality Management System based on ISO 9001. The Mersen Quality Management System ensures that product development includes a customer needs assessment (QFD, Voice of the Customer), customer need/design tolerance optimization (Criliflex), a formal risk analysis of our product designs (Product FMEA), and a strict assessment of our process risk (Process FMEA), equipment verification (Cpk) and product validation against the QFD. The Mersen Quality System includes not only audits oversight of our own production facilities, but also of our suppliers' products (First Article Test and Production Part Approval Process)and their quality systems (On Site Audits). The Mersen corrective/preventive action system logs all customer technical complaints and closes each of them with a formal action plan (8D). The goal for the Quality System as a whole is zero defects and we use various tools to move toward this goal (5S, Statistical Tools, Shingo Analysis, DoE, etc.).

Committed to the environment

Mersen is committed to environmentally friendly solutions. Eco-design is part of our development process from the very start, and we take into account all major environmental standards like RoHS and REACH. Did you know that Mersen was the first company in France to have an ISO 16000 certified plant?

Growing along with you

Mersen recently acquired Eldre Corporation, one of the world's leading suppliers of laminated bus bar for power electronic applications. With this acquisition, Mersen can better address your power electronic protection needs. By bundling power electronic components, you'll benefit from shorter time to market, lower cost for development, and lower cost for the final product. In addition, the Mersen power electronic specification team is dedicated to supporting your demanding power applications and will focus on offering the right product.

A global perspective

The Mersen Group is an expert in demanding electrical applications in safety and reliability. Mersen integrates its extensive expertise to provide outstanding solutions for the protection of power electronics applications. Around the globe, thousands of local sales representatives and distributors are ready to provide experienced and attentive customer service. Plus, our power electronics specification team will support you in selecting the right product for your power electronics application.

Powerful Power Electronics Solutions from Mersen

LAMINATED BUS BARS

Technology

- In-house metal machining (CNC, photo-chemical). In-house metal joining processes (ultrasonic welding, induction brazing, torch brazing, soldering). In-house plating capability (tin, tin-lead, copper, nickel, gold).
- Induction Solder (95% or more compared to Braze)
- Powder Coating
- Wide variety of dielectric materials (Nomex®, Tedlar®, Mylar®, Kapton®, Epoxy-Glass, GPO-3, Gatex, Phenolics, MICA)

Advantages

- Low inductance path to reduce semiconductor commutation losses
- Higher capacitance: lower impedance for better efficiency and overvoltage reduction
- Foolproof mounting and connection to address assembly and manufacturability design considerations
- More compact system with a sophisticated design and improved thermal management
- Meet Partial Discharge
- Low maintenance, easy installation

Support

- A partner who's a global reference in the power electronics industry
- Technical Support
- Dedicated power electronic specification experts in the field around the world

COOLING SYSTEMS

Mersen currently offers one of the world's widest ranges of aluminum and copper cooling systems and devices, spanning every technology available today from water and phase change to air.

Technology

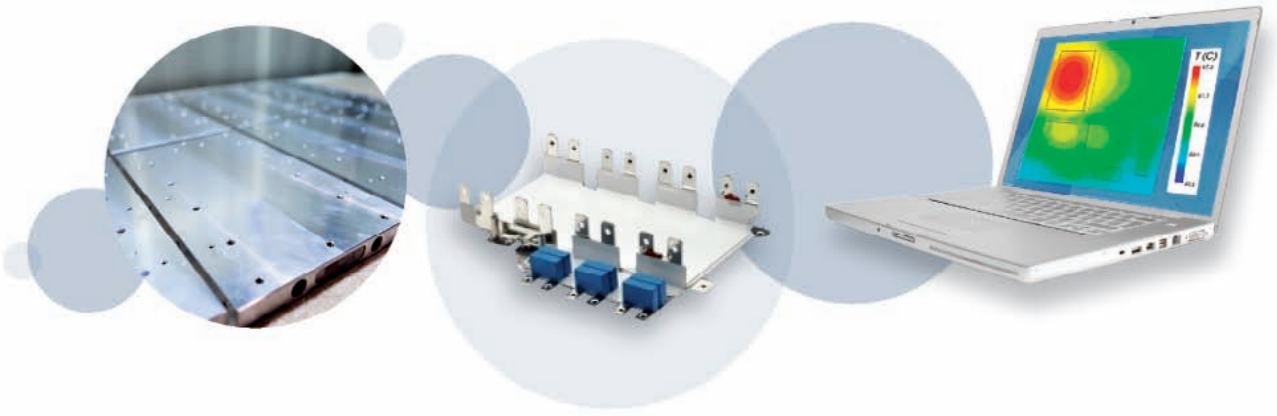
- Mersen is a master of vacuum brazing technology on co-laminated aluminum plates in a high-capacity industrial-scale furnace.
- Our copper heat sink design as well as copper brazing process guaranties parts free of leaks.
- Our patented swaging process enables us to produce thinner and higher fins than conventional extrusion process, resulting in a smaller footprint air-cooled heat sink with better thermal performance.

Advantages

- Every need from 40°C/kW to 1°C/kW met
- Reduced footprint of power conversion systems
- Maximum thermal conductivity
- Homogeneity of temperature under components
- Corrosion-free
- Leakage-free

Support

- R-Tools simulation software
- Global industrial coverage
- Technical Support
- Dedicated power electronic specification experts in the field around the world



FUSES FOR THE PROTECTION OF POWER SEMICONDUCTORS

Technology

- Mersen's expertise for more than 60 years – the safest and the most reliable fault current protection for your equipment.
- Mersen's Protistor® fuses are designed for maximum ease of use: wide range of electrical and mechanical characteristics. We comply with most of the international standards (IEC, UL, CCC, CSA...).
- Mersen's two high power test labs will support any customer-specific fuse application.

Advantages

- Highly current limiting
- Very low let-thru I^2t
- Superior cycling capability
- The most extended voltage/current rating
- Can be customized to fit your application

Support

- Select-A-Fuse/Power Electronics
- Technical Support
- A partner who's a global reference in the power electronics industry
- Dedicated power electronic specification experts in the field around the world

Other solutions by Mersen

- General Purpose Fuses & Fusegear
- Surge Protective Devices
- Power Switches and Contactors

DESIGN ASSISTANCE

System Performance

- Safety of people and equipment
- Higher switching frequency while maintaining commutation losses under control
- Lower inductance, maximize capacitance
- Limiting electrical contact
- Limiting hydraulic connections
- Low maintenance, easy installation

System Compactness

- Connection optimized via bus bar
- Higher thermal performance in small footprint

System Cost

- Minimizing assembly costs
- Engineering time optimized
- Fewer parts

System Safety & Reliability

- Fewer parts reduce risk
- Protection against catastrophic failure
- No leaks
- Foolproof mounting
- Optimized footprint
- Cutting-edge technologies
- Corrosion-free components

Time to market

- Fewer parts are better (easier to assemble, reducing the production cycle time)
- Consistency via Integrated Business Planning
- In-house test labs for shortened product development time
- Simulation software eases the selection step

Contact us!

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MERSEN
Expertise, our source of energy

A WORLD LEADER
in safety & reliability
for electrical power

A GLOBAL PLAYER

Global expert in materials and equipment for extreme environments and in the safety and reliability of electrical equipment.

Mersen designs innovative solutions to address its clients' specific needs to enable them to optimize their manufacturing process in sectors such as Energy, Transportation, Electronics, Chemical, Pharmaceutical and Process Industries.

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