

Cooling devices for power electronics

The three principal cooling technologies—air-based, water-based and diphasic—cater for different industrial applications. This article is devoted to Mersen's expertise in the water cooling devices used to protect power electronics.

Cooling converters

The development of power converters is currently racing ahead owing to the growth in demand for energy. Cost reductions and the growing need for compact and efficient solutions are key factors for the development of new converters. The progress achieved in recent years in power electronics also requires the use of increasingly efficient components at the heart of these converters. In this edition, we take an in-depth look at cooling devices, the core elements providing thermal protection for converters.

The goal of a cooling system is to allow the heat generated by an electrical or electronic system through its use to be dissipated to stop components from overheating and to prevent their premature deterioration.

The key task of a cooling device is thus to maximize the efficiency of heat dissipation. This is particularly crucial in power electronics where the heat generated by the electronic components that needs to be dissipated is very high indeed.

This dissipation of heat depends on a number of key factors:

- > the thermal conductivity of the materials used,
- > the size of the exchange surface between the item for cooling and the cooling device,
- > the cooling device's thermal exchange coefficient.

The manufacturing technology used by Mersen satisfies these requirements by harnessing the Group's unique brazing and tooling expertise.

Mersen cooling devices for green energy projects in the North Sea

Mersen has signed a contract with Siemens Energy to supply thousands of cooling devices to protect the converters used for the transmission via sub-aquatic cables of the electricity generated by offshore wind farms in the North Sea and their connection to onshore power grids.

Harnessing HVDC technology for high-voltage power transmission, the systems developed by Siemens Energy can be used for extremely high power transmission over very long distances and provide a trusted method to connect asynchronous grids or grids of different frequencies, while reducing losses. These systems are also equipped with a new generation of voltage-sourced converters (VSCs), well-known for their flexibility and suitability where only limited space is available.

Mersen's cooling devices were chosen because they satisfy the requirement of

flawless reliability for this advanced technology equipment, which is used in highly exacting environments and conditions.



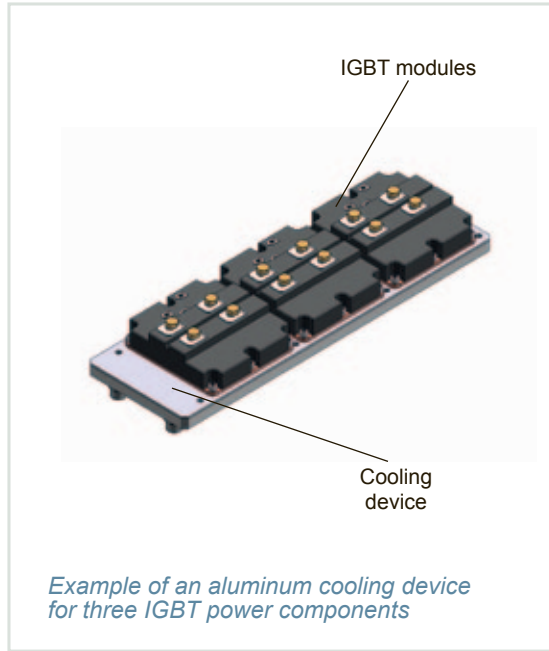
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* High Voltage Direct Current

1 – Brazing

This consists in joining two metal parts together.

The aluminum vacuum brazing technology employed by Mersen is well-known for the reliability and robustness it affords systems. This very high-temperature process ensures the cohesiveness of two or more metal parts, by allowing molecules to agglomerate directly without the addition of any filler material. This very clean technology that delivers proven robustness helps to optimize heat exchanges, thereby boosting the dissipation of the heat given off by the electronic components, while preventing the risks of corrosion or leakage, which are very critical indeed when water is used in close proximity to electric circuits.



2 – Tooling

This consists in creating the internal hydraulic circuits within the cooling device. The precision of Mersen's tooling produces highly sophisticated circuits, and this sophistication is instrumental in maximizing heat exchanges and the dissipation of heat.

Thanks to its ability to design solutions geared to meeting the constraints specific to each industrial challenge and its aluminum vacuum brazing technology and high-speed tooling, Mersen has become a key player in cooling systems for electronic components and helps its customers to minimize their costs. Mersen works with Siemens and Thalès, as well as on applications in the energy, transportation and aerospace sectors.

Mersen in cooling technologies

Mersen has three sites in Europe, North America and Asia, which master the three principal cooling technologies.

All these facilities can recommend the right solution from Mersen's range of cooling systems to meet customers' specific requirements in their respective region with a view to maximizing their cost efficiency and technical performance. That said, each of them has specializations deriving from their history.

Based in La Mure, the French facility boasts particular expertise in designing solutions and vacuum brazing technology, which it harnesses to deliver water cooling solutions. It also possesses a unit manufacturing heat pipe cooling devices.

The Toronto facility in North America largely focuses on manufacturing technical air cooling devices by drawing on a unique, patented technology.

Lastly, the Shanghai plant in China has capacity dedicated to air and water cooling technologies and is supported by the expertise of the other two facilities.