The BORDLINE® M200 is a bidirectional galvanically isolated DC/DC power converter for Energy Storage Systems in railway applications.

System overview
The BORDLINE® M200 DC converter is based on modern IGBT Technology.

The system is composed by:
• Galvanically Isolated DC/DC in order to allows the connection between the Energy Storage System (ESS) and 3kVdc traction DC-Link
• Interfaces with vehicle water cooling system
• A CPU-based PEC Controller able to perform all control, supervision and communication functions
• Fire extinguish system

Technical data BORDLINE® M200 DC

<table>
<thead>
<tr>
<th>Technical data</th>
<th>BORDLINE® M200 DC</th>
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<tbody>
<tr>
<td>Traction DC Voltage</td>
<td>3000 Vdc (2000 Vdc – 4200 Vdc)</td>
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<tr>
<td>ESS DC Voltage</td>
<td>718 Vdc (468 Vdc - 842 Vdc)</td>
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<tr>
<td>Charging Power</td>
<td>200 kW</td>
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<tr>
<td>Traction Power</td>
<td>200 kW</td>
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<tr>
<td>Protection degree</td>
<td>IP65</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-25°...+45°C</td>
</tr>
<tr>
<td>Communication Interface</td>
<td>CAN SAE J1939 + IPTCom</td>
</tr>
<tr>
<td>Dimension</td>
<td>1141 x 1834 x 777 mm</td>
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<tr>
<td>Weight</td>
<td>&lt; 550</td>
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Functionality
The DC/DC has two operating modes:
• in the charging mode the energy for ESS charging is taken from 3kV catenary or from vehicle braking. The ESS voltage is regulated accordingly with the state of charge and battery’s temperature given by an external Battery Management System (BMS)
• in the discharge mode the ESS stored energy is used to supply the traction system for a catenary free operation.

BORDLINE® M200 DC is able to interface with other source of energy, such as diesel generator, in order to optimize energy consumptions and implement hybrid vehicle concept.

Characteristics
• Bidirectional converter
• IGBT technology
• Compact and robust design
• Input/output DC-Link Filter Capacitors
• Fire extinguish system
• TCMS communication bus via CAN
  SAE J1939 and Ethernet IPTCom
• Full digital control
• Roof installation (IP65)
• Liquid cooling
Control and monitoring
Control system of BORDLINE® M auxiliary converter is based on the AC800 PEC control platform. AC800 PEC controller is a modular high speed programmable and measurement device, which is used widely in several industrial & traction control applications.
The operating conditions of the converter as well as various analogue values can be transmitted as outputs over the TCMS bus.

Cooling system
The converter is cooled by liquid. The internally mounted heat exchanger allows to cool the internal ambient and passive components. A thermal monitoring device protects the converter from becoming overheated.

Fire extinguish system
The converter is equipped with an independent fire defector and extinguishing system.

Mechanical design
The metal structure, based on galvanized aluminum material, has been designed for IP65 protection and to be mounted on train (roof). The complete equipment contains replaceable modules. All power modules are single and independent LRUs which contain all active components. Each LRU can be easily removed upwards.

Diagnostics and service
The service-friendly modular design with highly standardized components, ensures high reliability, excellent spare parts availability, and optimized lifecycle costs.
The main purpose of the service concept is to define and specify the activities and processes in order to assure the RAMS (Reliability, Availability, Maintainability, and Safety) requirements. Following this norm, the service concept allows to offer tailor-made service solutions in order to assure the predictability of low life-cycle costs while maintaining high product availability. The service package is optional available.

Application example
BORDLINE® M200 DC is designed to be mounted in the roof of any railway hybrid vehicle.