The BORDLINE® M60 battery charger is a compact, rugged unit developed for railway vehicles to supply DC loads and charge the batteries.

**System overview**
The battery charger is based on IGBT technology. BORDLINE® M60 AC contains the following functional blocks:
- Three-phase input rectifier to produce a DC intermediate bus
- DC/DC converter providing galvanic isolation
- Digital control based on microprocessor/DSP
- Customer Interface based on MVB
- Redundant cooling system

**Functionality**
The BORDLINE® M60 AC battery charger turns an input nominal AC voltage to a DC output to charge batteries and supply DC loads. The converters operate at high switching frequencies allowing for low ripple voltage and compact build size.

**Characteristics**
- DSP technology
- Rugged design
- On board installation
- Reliable thanks to consolidated building blocks

**Technical data**

<table>
<thead>
<tr>
<th>Technical data</th>
<th>BORDLINE® M60 AC_480V</th>
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<tbody>
<tr>
<td>AC voltage input</td>
<td>480 Vac 60 Hz</td>
</tr>
<tr>
<td>DC voltage output, nominal</td>
<td>110 Vdc</td>
</tr>
<tr>
<td>DC output power</td>
<td>60 kW</td>
</tr>
<tr>
<td>Protection degree (rack-mounted)</td>
<td>IP54</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-25°C .... +55°C</td>
</tr>
<tr>
<td>Diagnostic interface</td>
<td>Ethernet</td>
</tr>
<tr>
<td>TCMS interface</td>
<td>MVB</td>
</tr>
<tr>
<td>Dimensionen (L x W x H)</td>
<td>1000 x 1035 x 1900 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>450 kg</td>
</tr>
</tbody>
</table>
Control and monitoring
The converter is fully digital controlled by using a digital signal processor (DSP). The control unit monitors voltages, currents and internal temperatures to protect the device. External overload conditions such as short circuit, excessive ambient temperature, overvoltage are handled safely. The driver electronics supply the trigger signals for the power semiconductors and are also responsible for the protection of the power semiconductors. All outputs are short-circuit proof.

Diagnostics and service
The converter has been designed with highly standardized components, high reliability, excellent spare parts availability, and optimized life-cycle costs. For maintenance, a Ethernet communication interface is available.

Application example
BORDLINE® M60 AC is used in high speed trains running in Saudi Arabia. Each power head is equipped with one battery charger.

Control interface
Monitoring and configuration of the converter is provided by means of MVB interface connected to TCMS.

Cooling system
The unit is cooled by air forced cooling with internal air to water heat exchanger used to cool power semiconductors by liquid cooling with fast on/fast off system without liquid leakage.

Mechanical design
The metal structure, based on stainless steel material, has been designed to be mounted on board of coaches or in the machine room in vertical position.