The BORDLINE® M2 AC auxiliary converter is a compact, rugged unit developed to feed auxiliary services of locomotives and coaches (e.g. Passenger Information Systems, low power sockets).

System overview
The BORDLINE® M2 AC converter is based on modern IGBT technology.

The system is composed by:
- Input stage: it rectifies the input voltage and generate DC bus to supply inverter stage
- Input filter: for inrush current reduction and current line harmonics reduction
- Inverter stage: generates the sine wave output voltage
- Insulation transformer: insulate the mains to the load for safety requirements satisfaction
- Control unit: used to control the converter by generating the PWM for IGBT drive and it manages the converter protections. It also manages the user interface

Functionality
The BORDLINE® M2 AC converter turns the three-phase input voltage (400 Vac 50 Hz) in a single-phase sine wave (230 Vac 50 Hz) to feed auxiliary services of the vehicle.

Characteristics
- DSP technology
- Compact and rugged design
- Fed by 3-phase 400 Vac – 50 Hz (300-500 Vac)
- Output voltage single-phase sine wave (230 Vac 50 Hz)
- IP65 protection
- Ethernet/USB diagnostic
- On board installation
- High reliability thanks to consolidated building blocks

Technical data

<table>
<thead>
<tr>
<th>BORDLINE® M2 AC_400V</th>
<th>Input voltage</th>
<th>400 Vac 50 Hz 3ph (300 - 500 Vac)</th>
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</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>230 Vac ±2% - 50 Hz ±2%</td>
<td></td>
</tr>
<tr>
<td>AC output power</td>
<td>2 kVA</td>
<td></td>
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<tr>
<td>Maximum output power</td>
<td>3 kVA (5 sec)</td>
<td></td>
</tr>
<tr>
<td>THD</td>
<td>&lt; 3%</td>
<td></td>
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<tr>
<td>Protection degree</td>
<td>IP65</td>
<td></td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td>395 x 335 x 237 mm</td>
<td></td>
</tr>
<tr>
<td>Ambient temperatures</td>
<td>-40°C +70°C</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>25 kg</td>
<td></td>
</tr>
</tbody>
</table>

DSP Technology
Control and monitoring
The converter is full digital controlled (DSP technology). The monitoring of the converter is supported by Ethernet interface (via M12 connector) or USB. A web server, compatible with the most common browsers (e.g. Internet Explorer) provides monitoring of the converter status (main technical parameters, alarms codes, etc).

Cooling system
The unit is cooled by natural convection. A special heatsink drawing allows vertical or horizontal mounting position without changes.

Mechanical design
The converter is suitable to be mounted on board (locomotive or coach). Thanks to IP65 protection degree, without any modification, an internal or external mounting is foreseen.

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 communication interface is available.

Application example
BORDLINE® M2 AC_400V is mounted in DDR coaches (VIRM double deck train sets) running in Netherlands. Each coach train is equipped with two converters.