The M2 Series is a family of lithium-ion battery modules with scalable capacity and voltage, suitable for road, marine and other transport applications.
Leclanché is a Swiss-German company with 110 years of experience providing battery systems and energy storage solutions with high precision and reliability.

**The Lithium Titanate Series (LTO)**

The heart of any storage device is the cell. Its quality determines the performance of the entire storage system. Leclanché’s Lithium Titanate cells are vastly superior to conventional lithium-ion cells with regard to performance, reliability, service life and load cycles.

**Industry Leading Safety and Reliability**

The already high levels of safety found with LTO cells is further enhanced in Leclanché cells by the addition of a ceramic separator integrated with the unique bi-cell design. All IEC61233 and UNDot 38.3 tests have been passed by this cell including: overcharge, external short circuit, puncture and crush.

**15,000 Full Cycles**

Rated at more than 15,000 full cycles and a 20 year calendar life, Leclanché’s LTO cells set a benchmark for durability and performance. These battery packs can be optimized and fast-charged repeatedly while still delivering a long operational life. This dramatically improves the long-term value proposition. This long cycle life can be further lengthened to 21,000 cycles for 80% DoD applications.

**6C Charge/6C Discharge**

4C charge means that the battery can be charged to 80% SOC within 10 mins, more than 15,000 times with 80+% of the original capacity left at the end. This is mirrored in discharge where a 6C peak allows a relatively small battery to generate a lot of power repeatedly such as in a hybridized drivetrain.

**100% Depth of Discharge**

The 100% depth of discharge (DoD) capability of the Lithium Titanate cell considerably increases the efficiency of the storage system. The DoD remains stable over the 15,000 charge/discharge life of the cells.

**Wide Operational Temperature Range (-20°C to 55°C)**

Unlike other Li-ion chemistries, LTO type cells can be safely charged at low temperatures (down to -20°C). LTO can also be safely operated at higher temperatures (up to 55°C) than other Li-ion chemistries, without the accelerated degradation seen in other Li-ion chemistries such as LMO.

**Water-Based Cell Manufacturing**

Leclanché is the only company currently capable of manufacturing water based (solvent free) electrodes. This technology is both environmentally responsible and provides an increased resistance to gassing allowing a longer battery life.
With industry leading lithium-ion technology, we customize battery solutions for power and energy intensive applications.

The **M2 Modules**

Leclanché pouch cells represent the highest quality, safety and cycle life. The M2 modules provide convenient access to the exceptional performance of the cells while providing:

- Faster pack assembly – Less time connecting individual cells and integrating battery management.
- Choice of capacity, voltage and size.
- Better thermal management – Each module is designed using careful thermal analysis to ensure even temperature distribution and heat sink across all cells in the module.
- All modules have built-in battery management electronics to simplify installation.

There are 35 separate LTO configurations based on 14 module sizes (see table). Parallel string connections are also supported for higher pack capacities. Modules can be liquid cooled using conformal cooling plates.

The **Advanced Battery Manufacturing Facilities**

- Leading edge manufacturing technology with multiple patents and a fully automated, large-scale production line.
- Production capability of >1 million large format, prismatic pouch cells annually – up to 170 MWh.
- External testing and certification performed by renowned laboratories, including VTT Technical Research Centre of Finland, ENEL, TÜV Rheinland and Landshut University of Applied Sciences.
- Leclanché has considerable experience and field data from its Li-ion battery products, with thousands of battery packs in operation worldwide.

Engineered to rigorous standards in Switzerland, our cells are manufactured in a state-of-the-art production facility in Germany. Our modules, packs and racks are produced in Switzerland. Leclanché battery products offer unrivaled safety, quality and durability.

The **Leclanché Advantage**

- Engineered to rigorous standards in Switzerland, our cells are manufactured in a state-of-the-art production facility in Germany. Our modules, packs and racks are produced in Switzerland. Leclanché battery products offer unrivaled safety, quality and durability.

The Leclanché Philosophy: Provide customers with the highest possible quality, reliability and service.
## Battery System

- **Cell chemistry**: NCA/LTO
- **Cell voltages**: 2.2V nominal
- **Nominal cell capacity**: 30 Ah
- **Specified cycles (4C/4C @23°C at 80% DoD)**: 20,000 cycles
- **Specified cycles (4C/4C @23°C at 100% DoD)**: 15,000 cycles
- **Expected calendar lifespan (@23°C)**: 20 years

### Battery Management

- **Integrated Battery Management System (BMS)**: Yes (CE, e, and DNV-GL cert.)
- **Monitored cells in series**: 732
- **Max. voltage**: 1,000 V
- **External communications (from BCU)**: 2x CAN bus
- **Isolation detection**: Yes
- **Multi string configurations**: Supported with external PLC

## Specifications

<table>
<thead>
<tr>
<th>Module Type</th>
<th># of Cells</th>
<th>Nominal Capacity</th>
<th>Nominal Energy</th>
<th>Nominal Voltage</th>
<th>Max. Voltage</th>
<th>Nominal Voltage</th>
<th>MBC Width</th>
<th>MBC Height</th>
<th>MBC Length</th>
<th>Weight</th>
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<tr>
<td>11s3p</td>
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<td>90 Ah</td>
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<td>2.3 kWh</td>
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<td>522 mm</td>
<td>48,2 kg</td>
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<tr>
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<tr>
<td>4x7p</td>
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<td>210 Ah</td>
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<td>45,5 kg</td>
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<tr>
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<td>30 Ah</td>
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<tr>
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<td>90 Ah</td>
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<td>0.8 kWh</td>
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We are in charge.

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### M2 - LTO Battery Module for Mobility

- **Cell chemistry**: NCA/LTO
- **Cell voltages**: 2.2V nominal
- **Nominal cell capacity**: 30 Ah
- **Specified cycles (4C/4C @23°C at 80% DoD)**: 20,000 cycles
- **Specified cycles (4C/4C @23°C at 100% DoD)**: 15,000 cycles
- **Expected calendar lifespan (@23°C)**: 20 years

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