Energy M2 Modules (G-NMC)

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-Ion Graphite/NMC Series (G-NMC)

The heart of any storage system is the cell. Its quality determines the performance of the entire storage system. Leclanché’s Li-ion G-NMC cells are made of the highest quality materials, with a robust bi-cell construction, using unique, state-of-the-art processes to maximise safety and cycle life.

- Industry Leading Safety and Reliability
  Unique features such as the bi-cell laminate design, integrated with a ceramic separator, make Leclanché’s G-NMC cells capable of withstanding abuse without catastrophic, thermal runaway occurring.

- High Energy Density
  The G-NMC technology used by Leclanché provides a 25% energy density advantage over LFP chemistries allowing a greater payload or a longer range.

- 6,400 Cycles
  With 6,400 charge/discharge cycles at 80% DoD, Leclanché’s G-NMC cell typically quadruples the cycle life of most competitors and is ideal for long term investments and low-maintenance energy storage systems.

- 1C Charge and 3C Discharge
  The design and quality of the G-NMC cells permit a constant discharge of up to 3C and 1C charging. The cells are capable of 5C for a 10 second pulsed discharge.

- Up to 100% Depth of Discharge
  The Leclanché G-NMC cells can be operated at up to 100% Depth of Discharge (DoD). If the battery is depleted completely through each cycle, the lifetime will be 3,600 cycles.

- Wide Temperature Range (-10°C* to 45°C)
  The Leclanché G-NMC cells perform well across a broad range of temperatures (-10°C to 45°C). The G-NMC cells out perform LFP at lower temperatures.

* -10°C in discharge only, lower temperature limit for charge is 0°C
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 give convenient access to the good performance of the cells while providing:

- Rugged and resilient (50g acc. and 4kV isolation tested) housing for high quality pouch cells.
- 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 sinking across all cells in the module.
- All modules have built-in battery management electronics to simplify installation.

There are 37 separate G-NMC configurations based on 14 module sizes (see table). Parallel string connections are also supported for higher pack capacities. Modules can be liquid cooled with conductive cooling plates or force air cooled.

The **Advanced Battery Manufacturing Facilities**

- Annual production capability of >1 million large format, prismatic pouch cells – up to 185 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.
- ISO14001 environmental certification underscoring Leclanché’s commitment to the environment and its protection.
- Unique water based* cell manufacturing process providing improved cell longevity with lower environmental impact

*Solvent free manufacturing using unique waterbased slurry process

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 unrivalled safety, quality and durability.

The **Leclanché Advantage**
The **Energy M2 Battery Module for Mobility** (G-NMC)

### Battery System
- **Cell chemistry**: G-NMC
- **Cell voltages**: 3.7V nominal
- **Nominal cell capacity**: 55 Ah
- **Specified cycles**
  - (1C/1C @23°C @80% DoD): 6,400 cycles
  - (1C/1C @23°C @100% DoD): 3,600 cycles
- **Maximum calendar lifespan (@23°C)**: 10 years

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

<table>
<thead>
<tr>
<th>Module Type</th>
<th># of cells</th>
<th>Nominal Capacity</th>
<th>Nominal Energy</th>
<th>Max. Voltage</th>
<th>Nominal Voltage</th>
<th>Min. Voltage</th>
<th>Width</th>
<th>Height</th>
<th>Length</th>
<th>Weight</th>
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</thead>
<tbody>
<tr>
<td>16s3p</td>
<td>24</td>
<td>110 Ah</td>
<td>330 kWh</td>
<td>65,10 V</td>
<td>58,40 V</td>
<td>49,60 V</td>
<td>175 mm</td>
<td>334 mm</td>
<td>49,5 kg</td>
<td></td>
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<tr>
<td>16s4p</td>
<td>32</td>
<td>220 Ah</td>
<td>660 kWh</td>
<td>26,80 V</td>
<td>28,70 V</td>
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<td>1,050 kWh</td>
<td>20,50 V</td>
<td>20,50 V</td>
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<tr>
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<td>330 kWh</td>
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