

Energy M2 Modules

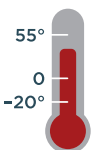
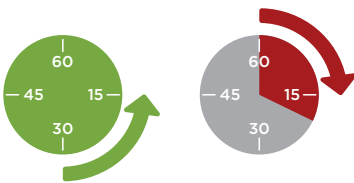
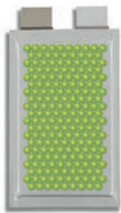
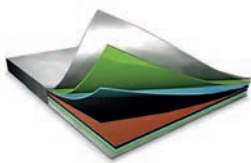
(G-NMC, 60 Ah)



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.

■ 8,000 Cycles

With 8,000 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 20 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 4,500 cycles.

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

The Leclanché G-NMC cells perform well across a broad range of temperatures (-20°C to 55°C).

* -20°C in discharge only, lower temperature limit for charge is 0°C

** 55°C in discharge only, upper temperature limit for charge is 45°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 38 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 200 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

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 unrivalled safety, quality and durability.

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

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

Battery System

Cell chemistry
 Cell voltages
 Nominal cell capacity
 Cycle Life
 (1C/1C @23°C at 80% DoD)
 Cycle Life
 (1C/1C @23°C at 100% DoD)
 Maximum calendar lifespan (@23°C)

G-NMC
3.7V nominal
60 Ah
8,000 cycles*
4,500 cycles
10 years

Battery Management

Integrated Battery Management System (BMS)
 Max. voltage
 External communications (from BCU)
 Isolation monitoring
 Multi string configurations

Yes (CE, DNV-GL & RINA cert.)
1,000 V
2x CAN bus
Yes
Supported with external PLC

* Expected

Module type	# of cells	Nominal Capacity	Nominal Energy	Max. Voltage	Nominal Voltage	Min. Voltage	Width	Height	Length	Weight
11s3p	33	180 Ah	7,2 kWh	46,2 V	40,2 V	33,0 V	175mm	334mm	537mm	50,8 kg
16s2p	32	120 Ah	7,0 kWh	67,2 V	58,4 V	48,0 V	175mm	334mm	522mm	49,4 kg
8s4p	32	240 Ah	7,0 kWh	33,6 V	29,2 V	24,0 V	175mm	334mm	522mm	49,4 kg
4s8p	32	480 Ah	7,0 kWh	16,8 V	14,6 V	12,0 V	175mm	334mm	522mm	49,4 kg
15s2p	30	120 Ah	6,6 kWh	63,0 V	54,8 V	45,0 V	175mm	334mm	493mm	46,6 kg
6s5p	30	300 Ah	6,6 kWh	25,2 V	21,9 V	18,0 V	175mm	334mm	493mm	46,6 kg
5s6p	30	360 Ah	6,6 kWh	21,0 V	18,3 V	15,0 V	175mm	334mm	493mm	46,6 kg
14s2p	28	120 Ah	6,1 kWh	58,8 V	51,1 V	42,0 V	175mm	334mm	463mm	43,8 kg
7s4p	28	240 Ah	6,1 kWh	29,4 V	25,6 V	21,0 V	175mm	334mm	463mm	43,8 kg
4s7p	28	420 Ah	6,1 kWh	16,8 V	14,6 V	12,0 V	175mm	334mm	463mm	43,8 kg
24s1p	24	60 Ah	5,3 kWh	100,8 V	87,6 V	72,0 V	175mm	334mm	404mm	38,2 kg
12s2p	24	120 Ah	5,3 kWh	50,4 V	43,8 V	36,0 V	175mm	334mm	404mm	38,2 kg
3s8p	24	480 Ah	5,3 kWh	12,6 V	11,0 V	9,0 V	175mm	334mm	404mm	38,2 kg
8s3p	24	180 Ah	5,3 kWh	33,6 V	29,2 V	24,0 V	175mm	334mm	404mm	38,2 kg
6s4p	24	240 Ah	5,3 kWh	25,2 V	21,9 V	18,0 V	175mm	334mm	404mm	38,2 kg
4s6p	24	360 Ah	5,3 kWh	16,8 V	14,6 V	12,0 V	175mm	334mm	404mm	38,2 kg
22s1p	22	60 Ah	4,8 kWh	92,4 V	80,3 V	66,0 V	175mm	334mm	375mm	35,4 kg
11s2p	22	120 Ah	4,8 kWh	46,2 V	40,2 V	33,0 V	175mm	334mm	375mm	35,4 kg
7s3p	21	180 Ah	4,6 kWh	29,4 V	25,6 V	21,0 V	175mm	334mm	360mm	34,0 kg
3s7p	21	420 Ah	4,6 kWh	12,6 V	11,0 V	9,0 V	175mm	334mm	360mm	34,0 kg
20s1p	20	60 Ah	4,4 kWh	84,0 V	73,0 V	60,0 V	175mm	334mm	345mm	32,6 kg
10s2p	20	120 Ah	4,4 kWh	42,0 V	36,5 V	30,0 V	175mm	334mm	345mm	32,6 kg
5s4p	20	240 Ah	4,4 kWh	21,0 V	18,3 V	15,0 V	175mm	334mm	345mm	32,6 kg
4s5p	20	300 Ah	4,4 kWh	16,8 V	14,6 V	12,0 V	175mm	334mm	345mm	32,6 kg
16s1p	16	60 Ah	3,5 kWh	67,2 V	58,4 V	48,0 V	175mm	334mm	286mm	27,0 kg
8s2p	16	120 Ah	3,5 kWh	33,6 V	29,2 V	24,0 V	175mm	334mm	286mm	27,0 kg
4s4p	16	240 Ah	3,5 kWh	16,8 V	14,6 V	12,0 V	175mm	334mm	286mm	27,0 kg
14s1p	14	60 Ah	3,1 kWh	58,8 V	51,1 V	42,0 V	175mm	334mm	257mm	24,2 kg
7s2p	14	120 Ah	3,1 kWh	29,4 V	25,6 V	21,0 V	175mm	334mm	257mm	24,2 kg
12s1p	12	60 Ah	2,6 kWh	50,4 V	43,8 V	36,0 V	175mm	334mm	227mm	21,4 kg
6s2p	12	120 Ah	2,6 kWh	25,2 V	21,9 V	18,0 V	175mm	334mm	227mm	21,4 kg
4s3p	12	180 Ah	2,6 kWh	16,8 V	14,6 V	12,0 V	175mm	334mm	227mm	21,4 kg
3s4p	12	240 Ah	2,6 kWh	12,6 V	11,0 V	9,0 V	175mm	334mm	227mm	21,4 kg
11s1p	11	60 Ah	2,4 kWh	46,2 V	40,2 V	33,0 V	175mm	334mm	212mm	20,0 kg
10s1p	10	60 Ah	2,2 kWh	42,0 V	36,5 V	30,0 V	175mm	334mm	198mm	18,6 kg
5s2p	10	120 Ah	2,2 kWh	21,0 V	18,3 V	15,0 V	175mm	334mm	198mm	18,6 kg
8s1p	8	60 Ah	1,8 kWh	33,6 V	29,2 V	24,0 V	175mm	334mm	168mm	15,8 kg
4s2p	8	120 Ah	1,8 kWh	16,8 V	14,6 V	12,0 V	175mm	334mm	168mm	15,8 kg

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