

Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested with satisfactory results in accordance with the relevant requirements of the Lloyd's Register Type Approval System.

Manufacturer	Leclanche SA
Address	Avenue des Sports 42, Yverdon-les-Bains, 1400, Switzerland
Place of Production	Leclanche SA Avenue des Sports 42, Yverdon-les-Bains, 1400, Switzerland
Type	Lithium-Ion Battery System
Description	The Lithium Ion battery system consists of battery modules, a battery monitoring unit (BMU) and a battery control unit (BCU). Modules are connected in series as a string and a switch for each string whereby the number of modules in series determining the system voltage and number of strings in parallel the capacity of the entire electrical stored energy system.
Trade Name	G/NMC Lithium Ion Battery
Application	The Lithium-Ion battery system for use as an electrical power source on seagoing and on Inland water way vessels.
Specified Standard	LR Type Approval Specification No.5: March 2019; IEC 62619:2017; IEC 62620:2014
Ratings	Cell Types: Cell type: GL55 55Ah

Type Approval Certificate

LecCell G/NMC 55Ah/200Wh
Lithium Nickel Manganese Cobalt oxide (NMC) – graphite
Nominal Capacity: 55Ah (C/10 discharge rate)
Nominal Voltage: 3,7V
Voltage range: 3,0V to 4,2V
Weight: ~1140g

Cell type: GL60 60Ah
LecCell G/NMC 60Ah/220Wh
Lithium Nickel Manganese Cobalt oxide (NMC) – graphite
Nominal Capacity: 60Ah (C/10 discharge rate)
Nominal Voltage: 3,7V
Voltage range: 3,0V to 4,2V
Weight: ~1120g

Cell type: GL65 65Ah
LecCell G/NMC 65Ah/245Wh
Lithium Nickel Manganese Cobalt oxide (NMC) – graphite
Nominal Capacity: 65Ah (C/10 discharge rate)
Nominal Voltage: 3,72V
Voltage range: 3,0V to 4,35V
Weight: ~1120g

Modules:

Type: M2 Marine Battery Module Technology

Description: Each module includes an integrated Battery Management Unit (BMU) which monitors temperatures and passive cell balancing. Also each module includes an independent heat detection line which disconnect the main switch and activates the fire suppression. Modules are contained in a IP65 box with water cooling and integrated exhaust channels. The Battery Control Unit (BCU) monitors all cell parameters to ensure safe operation in specified operation ranges e.g. during charging, discharging and cell balancing.

Type Approval Certificate

Battery Management Systems BMS G2 1.0.X

Software versions: BMU: 1.8.x and BCU: 1.1.x

Hardware versions: BMU 24 channels: rev C12, BMU 12 channels: rev C13 and BCU: rev C10

Useful Information Details:

Module Capacity: depending on battery module configurations (see Appendix)

Max ambient operating temperature: 0° - 45°C (Charge); -20°C - 55°C (Discharging)

Automatic shutdown cell temperature limit: allowable is <50°C ; max. 45 °C is normally specified for projects

Module operating voltage range; depending on battery module configurations (see Appendix)

Module and cell shutdown voltage limits; depending on cell types (see voltage ranges of Cell Type designations)

Continuous charge and discharge rate; depending on battery module configurations (see Appendix)

Peak bolted short circuit current; project specific value (see customer specifications)

Equipment ingress protection rating; IP65

Gas volume generated (calculated per module); ~130 l in average per cell ; with 32 cell in Module: ~ 4160 l

Gas Temperature Classification and Division/Zone Group : Temperature Class:

Type Approval Certificate

T2 (>300°C)

Other Conditions

For each project the following information for approval is to be submitted:

1. Detailed functional system description/arrangements including interfaces to other sub-systems as e.g. machinery alarm monitoring system
2. Electrical Circuit diagrams of the battery system arrangements including Switch units with fuses and contactors
3. Installation details about smoke detectors
4. Detailed arrangement description of the Fire Suppression System which is either a HI-Fog water mist or a foam based system including a technical justification of the specified capacity ratings for each project.
5. Capacity and speed ratings for smoke extraction and ventilation fans for the integrated exhaust ducts normally submitted by the integrator/yard.
6. Test programs for Factory, Harbour and Sea Trial Acceptance Tests
7. Project specific Software Quality Plans including used versions of modules and references to internal test reports

This certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register EMEA of any modification or changes to the equipment in order to obtain a valid Certificate.

The Design Appraisal Document HTS/ETS 1962025/41760-21 and its supplementary Type Approval Terms and Conditions form part of this Certificate.

Appendix

Trade name G/NMC Lithium Ion Battery

RATINGS Continued:

Battery module configurations;

Module Article No.	Cell Type	Config.	Cells	Nominal			Discharge		Charge
				Capacity	Energy	Voltage	Continuous	Pulse	Continuous
M2.GMNC(55)16s2p 034001011	55Ah	16s2p	32	110Ah	6.4kWh	59,2V	330A	550A	110A
M2.GMNC(55)8s4p 034001012	55Ah	8s4p	32	220Ah	6.4kWh	29,6V	660A	1100A	220A
M2.GMNC(55)4s8p 034001002	55Ah	4s8p	32	440Ah	6.4kWh	14,8V	680A	2200A	440A
M2.GMNC(55)6s5p 034001025	55Ah	6s5p	30	275Ah	6.4kWh	22,2V	680A	1375A	275A
M2.GMNC(60)4s8p 034001054	60Ah	4s8p	32	480Ah	7.0kWh	14,8V	680A	1200A	480A
M2.GMNC(60)8s4p 034001039	60Ah	8s4p	32	240Ah	7.0kWh	29,6V	660Ah	1200A	240A
M2.GMNC(60)16s2p 034001055	60Ah	16s2p	32	120Ah	7.0kWh	59,2V	360Ah	600A	120A
M2.GMNC(65)4s8p 034000974	65Ah	4s8p	32	520Ah	7.7kWh	14.9V	680Ah	680A	480A
M2.GMNC(65)8s4p 034000975	65Ah	8s4p	32	260Ah	7.7kWh	29.8V	660Ah	680A	260A
M2.GMNC(65)16s2p 034000976	65Ah	16s2p	32	130Ah	7.7kWh	59.5V	360Ah	390A	130A

Place of Cell Production:

Leclanché GmbH
Industriestrasse 1
77731 Willstätt
Deutschland

Place of Assembling Production:

Leclanché SA
Avenue des Sports 42
1400 Yverdon-les-Bains
Schweiz