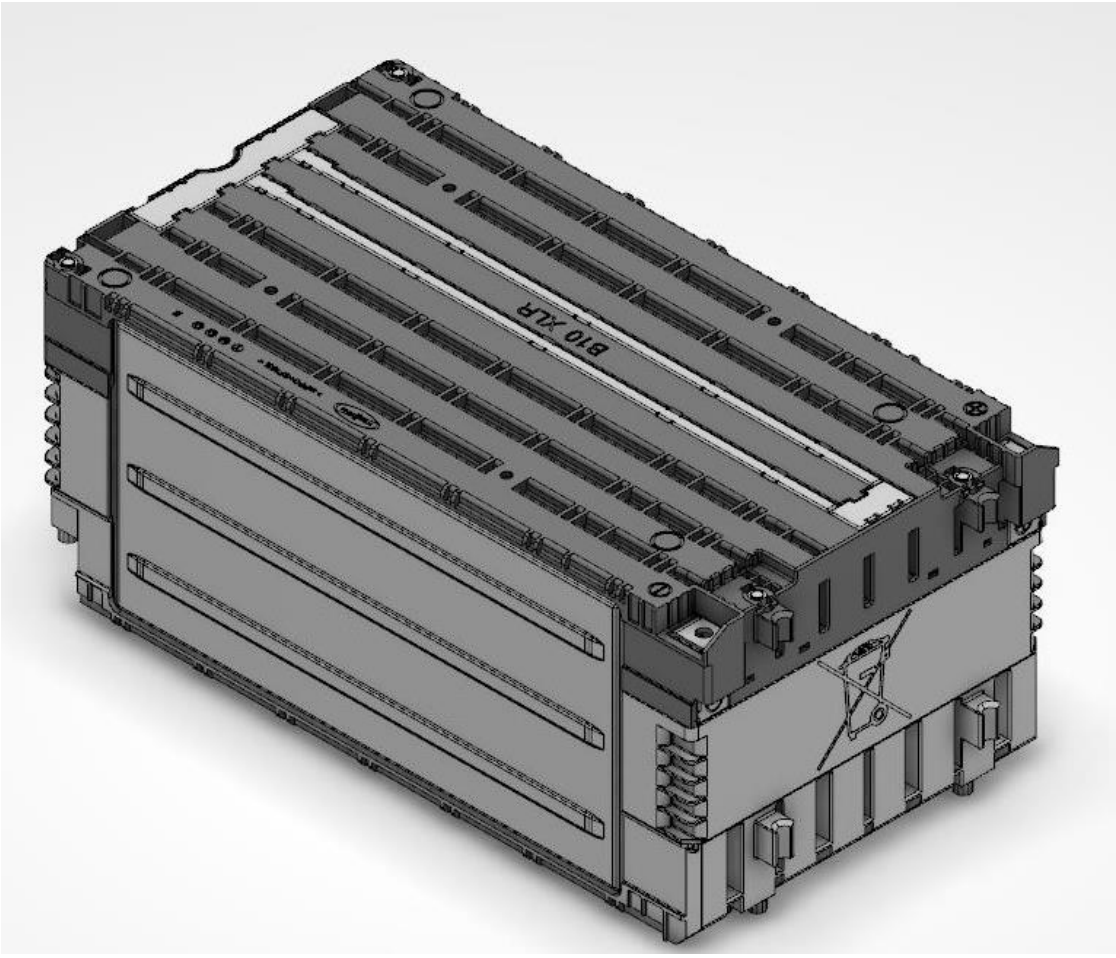
LG Energy Solution



BATTERY MODULE – B10XLR

B10XLR – Module Datasheet

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1 GENERAL

This document and its appendixes gather the information known by the seller, in the usage and operation environment for which the module was developed for (traction battery for Renault Zoé Electrical Vehicle).

They include a description of the battery module in BOL conditions with its main internal components, its characteristics, installation and safety requirements. Despite the efforts made by the module manufacturer to provide qualitative and quantitative information via this document and its appendixes, the module manufacturer nor the seller cannot be held responsible:

- if the integrator/ buyer/user fails to check the full compatibility of the B10 XLR module with the intended usage and/or environment,
- in case of events resulting in the usage of the module in conditions (usage and/or environment) which were not assessed by the module manufacturer in the development of the module,
- in case of violation of the requirements or restrictions specified in this document and appendixes.

Battery modules are potentially dangerous, proper precautions must be taken in handling, operation, maintenance and recycling to avoid severe staff body injury, environment pollution and/or property damages. Only trained and qualified operators with appropriate safety equipment shall be allowed to manipulate battery modules.

1.1 Validation

	Name	Date
Written by	**LGES Renault Marketing Team**	28/07/2025
Checked by		
Checked by		

1.2 History

Version	Date	Description
V0_working document	28/07/2025	First release

1.3 Glossary

Term	Explanation
Module	Composed of 16 lithium-ion cells in 2P8S configuration
BSOC (Battery State Of Charge)	Level of charge of the battery in percentage (example: 100% = battery fully charged).
OCV (Open Circuit Voltage)	Electric potential difference between the + and – when current equals to 0 A. Varies alongside with the state of charge.
DCIR	Direct Current Internal Resistance
BOL	Beginning of Life (1st life)
HV +	High Voltage (positive)
HV -	High Voltage (negative)

2 GLOBAL DESCRIPTION OF THE BATTERY MODULE

2.1 Module main characteristics

Battery module main characteristics are:

Cell supplier	LG Energy Solution
Cell chemistry	NMC 622 / Carbon
Module dimensions [mm]	388.8 (L) x 204.8 (W) x 160.7 (H)
Module weight	20.8kg
Nominal voltage	29.016V
Module configuration	2P8S
Applicable voltage range	20V – 33.6V
Current max. value	300 A (60 sec max)
Nominal Energy	4.45 kWh (@25°C* & C/2)
BOL module capacity (C_0)	153.4 Ah (@25°C* & C/2)
Power (max.)	10.58 kW
Recommended Operating Temperature	-30 °C to 65°C
Operation altitude (max.)	in environment pollution degree 3 according to IEC 60664-1
Insulation resistance	≥ 10MOhm (DC500V, 20sec, between HV terminal and module aluminum lateral casings)
Sensing fuse clearing time	0.01sec <time< 5sec @4A & 25°C
Maximum module AC impedance range	4.8 mOhm (@BOL,1kHz, 15%<BSOC< 18%, & 11°C<T<28°C)
Maximum DCIR	cf. Appendix 4
Maximum DCIR deviation ratio (DCIR max/DCIR average)	1.06 mOhm

Table 1 Battery module main characteristics

* *Module temperature (@ beginning of charge/discharge) with an ambient temperature maintained at 20°C along the test duration*

2.2 General views of the module

Pink- and purple-colored parts in figure 1 are plastic casings, grey ones are aluminum lateral casings.

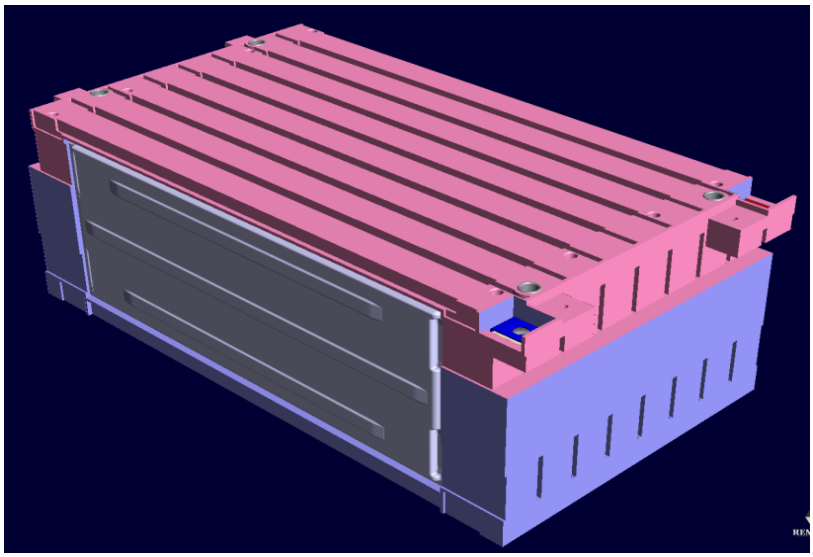


Figure 1 : 3D view of the module

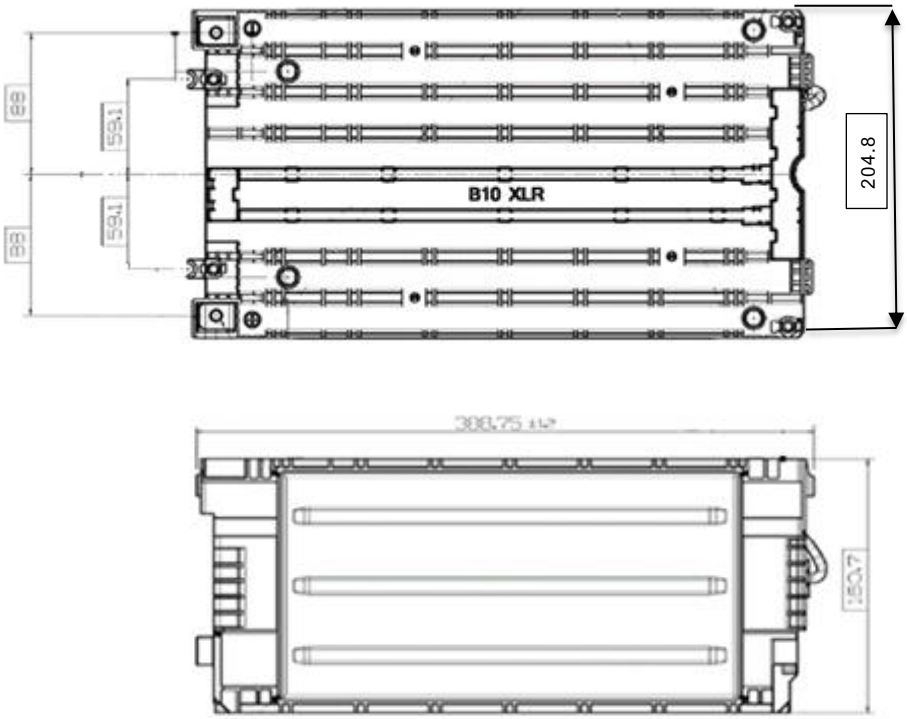


Figure 2 : module main dimensions

2.3 Cell arrangement and internal components

Opening or dismantling the modules is forbidden for safety and quality reasons. Figures given at cell level are for information only.

2.3.1 Cell

Cell arrangement: pair of cells connected in series are then arranged in parallel (2P8S).

Cells are integrated vertically in the modules with cooling paths designed to allow air circulation between cells on their larger surfaces. Air pushed in or extracted out the module through the cooling paths shall be distributed homogeneously over these module surfaces.

One NTC (Negative Temperature Coefficient) sensor is integrated on the upper side of the module between 2 central cells. Its measures (accuracy: ±1°C @ -30°C < < 60°C; resolution: 0.1°C) are accessible through the signal connector of the module.

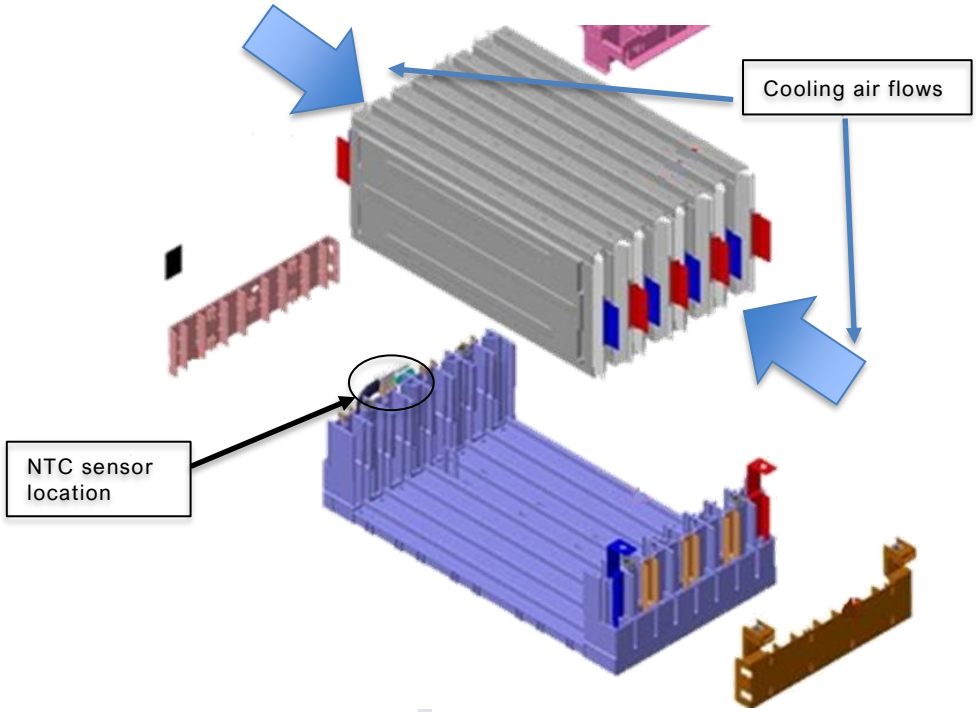


Figure 3 : module exploaded view

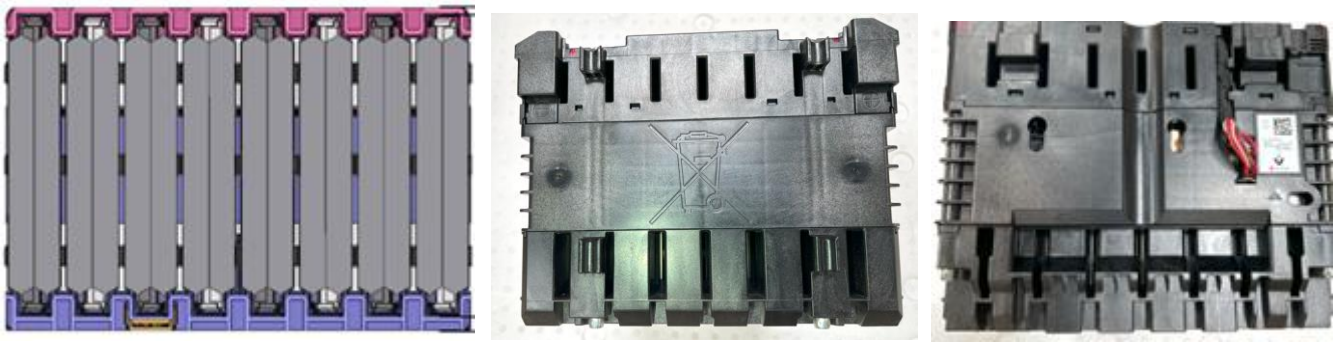


Figure 4 : Module views showing the space between cells and the slots in lateral sides allowing air circulation

Nominal Voltage	3.627 V
Cell Capacity (C/2, 25°C, SOH = 100%)	76.7 Ah
Discharge voltage limit (cf. §7.1.4)	2.50 V
Max. Charge Voltage (cf. §7.1.4)	4.20 V

Table 2 cell electrical characteristics

2.3.2 Power Connectors

- Positive terminal (+marking indicated on module plastic top casing: see picture below):
- Negative terminal (-marking indicated on module plastic top casing: see picture below):

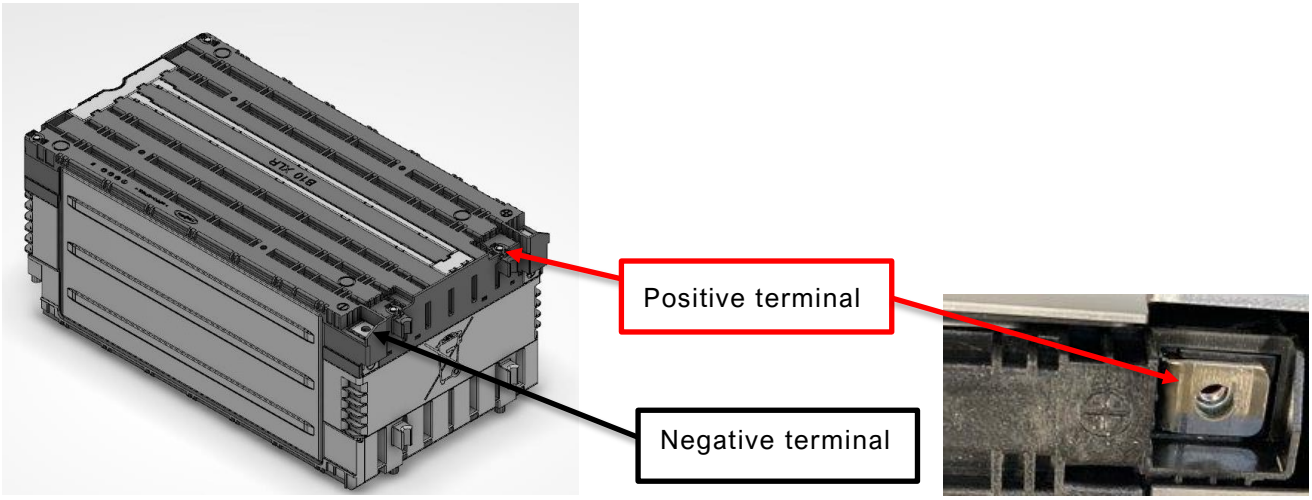
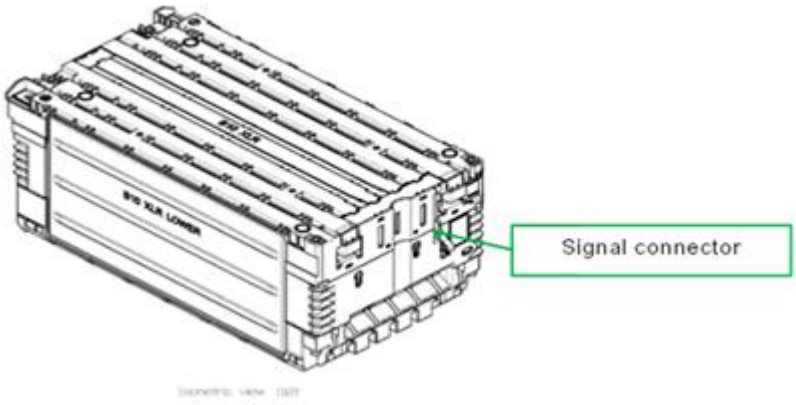
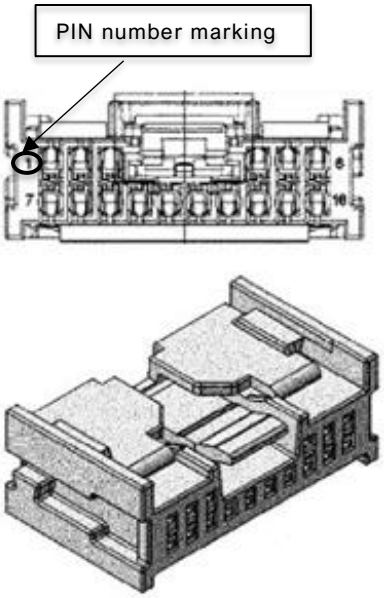


Figure 3 : Power terminal locations

- For power connection, the recommended minimum section is 37.48 mm^2 for copper C1100 material cable. User shall scale the cross section according to the expected currents profiles and cable conductive material.
- Module power terminals are M6 locked-in nuts, recommended torque is 10Nm (maximum 10Nm). Avoid brute force when there is some abnormal resistance, check the holes alignment or the screw/bolt/nut thread conditions instead.
- Power connection terminal are not designed to sustain multiple assemblies and dismantling.
- For information, the power terminal contact surface is 176mm^2.
- For information, contact resistance measured on module power terminal shall be around 0.1mOhm.

2.3.3 Signal connector





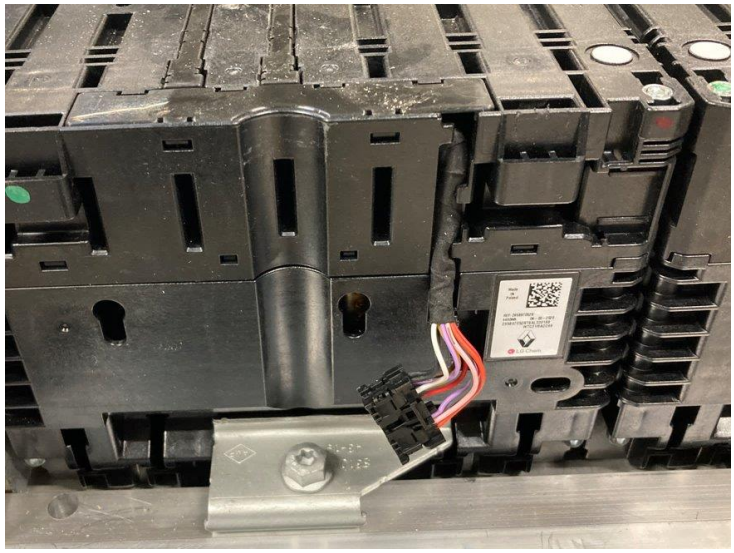


Figure 4 : signal connector

The wire between module and connector is 62.7 mm long.

Male connector reference is MOLEX: 34824-1164

PIN n°	Description	Nominal voltage (V)	Voltage range (V)	Comments
1	S8	3.6	2.5 - 4.2	Cell 8
2	S6	3.6	2.5 - 4.2	Cell 6
3	S4	3.6	2.5 - 4.2	Cell 4
4	S2	3.6	2.5 - 4.2	Cell 2
5	NC			
6	Temperature (+)	–·–	–	
7	S7	3.6	2.5 - 4.2	Cell 7
8	S5	3.6	2.5 - 4.2	Cell 5
9	NC			
10	NC			
11	NC			
12	S4	3.6	2.5 - 4.2	Cell 4
13	S3	3.6	2.5 - 4.2	Cell 3
14	S1	3.6	2.5 - 4.2	Cell 1
15	Ground (reference negative point)	3.6	2.5 - 4.2	Not to be connected with earthing system
16	Temperature (-)	–	–	-

Table 3 LV Pin assignment

*Current dedicated for cell balancing has to be defined by integrator in consideration with this limit and with that the max current the wire can endure is 3A, along with BMS electrical characteristics

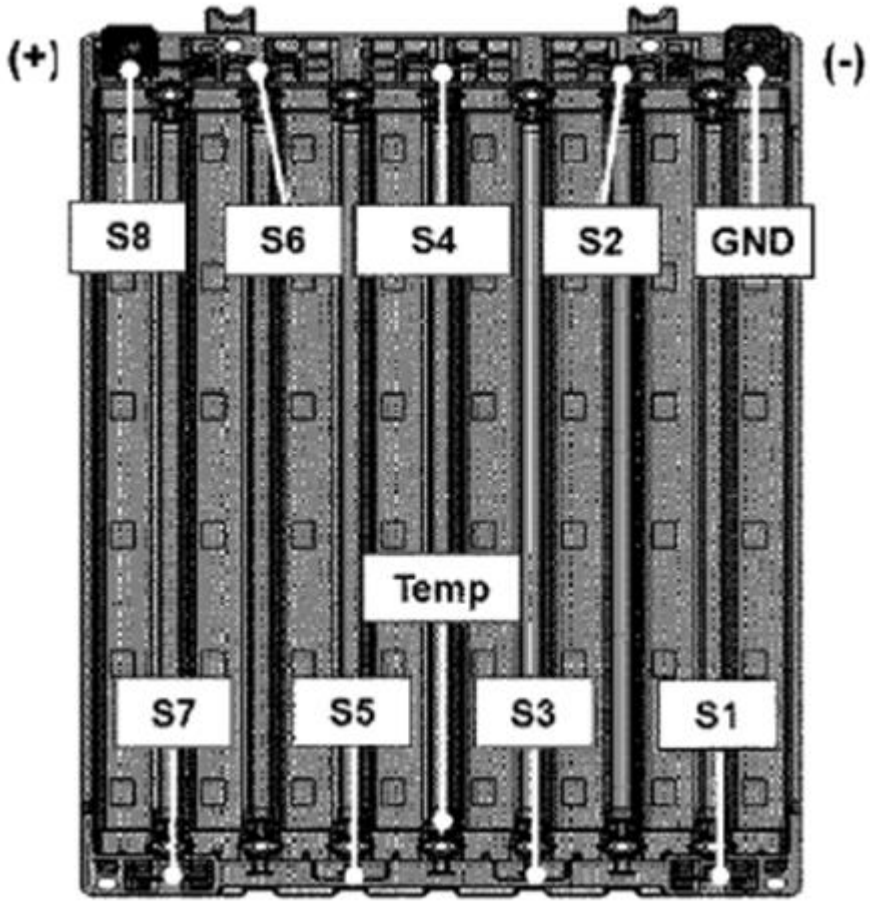


Figure 5: Cell numbers

Cells (S1 to S8) pins should be used for cells voltage measurement.

3 RECYCLING

Waste modules and waste batteries shall be collected separately and recycled by authorized waste operators in accordance with applicable regulation. Module dismantling shall be conducted by professional, trained and certified organizations or companies complying with local applicable codes and standards.

In the European Union, recycling of batteries shall comply, in particular, with the requirements of EU Regulation n°2023/1542.

4 LG CERTIFICATE (UN38.3 transport testing)

This module was validated in accordance with UN38.3 regulation by LG Chem under module reference B10 XLR in 2018, August 31st.

5 LABELLING

Each module could be identified through a standardized label indicating its Module Identification Number (MIN) and some other individualized information.

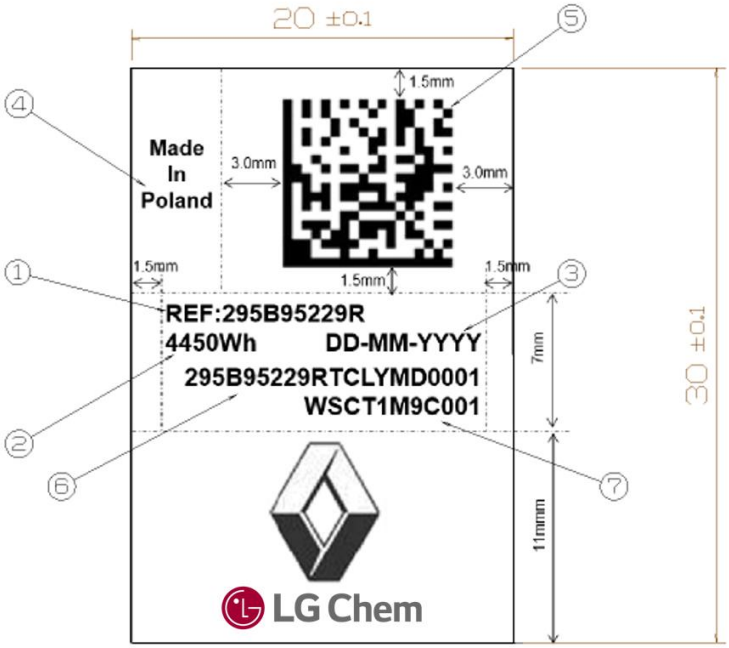


Figure 6: module traceability label

1	Renault module reference number	4	Country of production	7	LG Chem product codification number
2	Module nominal capacity	5	Unitary Module QR code		Renault logo
3	Module date of production	6	Unitary MIN (Module Identification Number)		LG Chem logo (module supplier)

Table 4 module identification label reading

6 SAFETY

6.1 Foreword

It is the responsibility of the integrator/ buyer/user developing the system integrating the module and/or developing the final industrial/energy project, to:

- carry out a risk analysis during the system and project design phase to evaluate the preventive measures to be considered in that system and, if applicable, project,
- carry out a risk analysis over the system life cycle to identify the preventive measures to be taken on the different stages of the system life cycle (ex.: documented procedure for system mounting & testing, protective equipment requirements, qualification of operators, system user manual, system repair and dismantling guide),
- consider the risks generated by the equipment within the final installation and in its environment when the equipment is in a place with safety issues,
- assess the technical compatibility of the module characteristics and capability and the intended usage,
- draw up an emergency plan considering the result of the above-mentioned studies.

6.2 Hazardous issues

In any case, for safety reasons, modules shall not be dismantled, opened or modified.

Major risks of use, transport or storage of the battery are the risks of electric shock, thermal incidents and risk of emission of smoke.

Different kinds of barriers have been implemented to maintain the functional safety of the module against electrical shocks. The barriers are based on regulations, safety analysis and testing. There are mainly 2 kinds of barriers: passive and active ones.

It is the responsibility of the integrator/buyer to maintain these protections capability in the module integration design and to include additional active ones according to their integration and usage risk assessment.

Additionally, the following requirements are to be satisfied by the system to be developed by the modules integrator:

- Electric shock protection:
  - Creepage and clearance distances: to be defined according to applicable standards, usage specifications and environment.
  - Insulation resistance monitoring: implement a system for loss of insulation resistance detection and warning.
  - Insulation: the aluminum part of the module casing and the elements made of conductive materials involved in the modules arrangement in the system must be electrically insulated from each other (cf. table 1).
  - Detection of battery cell resistance increases.

- Module deformation and cell swelling protection:

Module plastic casing is not designed to withstand by itself to resist the cell swelling during charging and discharging. Therefore, additional mechanical structure shall be designed by the integrator in its module's arrangement system to maintain the module dimensions (cf. chapter 6.6) during usage.

- Mechanical and penetration protection

Modules shall be mechanically protected against object penetration and intrusion. Enhanced measures shall be taken to protect the plastic parts of the modules such as its external sides and the connectors.

- Venting protection:

In case of abusive use such as over discharge, overcharging, short-circuit, over-heating or damage the cell compounds risk to release hot gas that could lead to a venting. Thus, modules shall not be used or stored in sealed compartments and be protected from venting causes.

- Thermal runaway protection:

In case of severe damage or temperature conditions the cell compounds risk igniting a fire and expel gas very quickly. Thus, modules shall not be used or stored in fire exposed environment.

- Leakage protection:

In case of cell perforation, toxic and flammable substances may leak. Thus, modules shall not be used or stored with other hazardous or sensitive elements nearby. In case of the electrolyte leakage (the electrolyte of the lithium-ion battery is a clear flammable liquid with an organic solvent characteristic smell), recommendations are:

1. Ventilate the area.
2. Wear chemical protection gloves against corrosion, appropriate protection glasses and a gas mask.
3. Disperse absorbent products then collect them to be treated with classic organic solvents.

- Waterproofness:

The module is not liquid proofed and therefore it is within the responsibility of the integrator to design the system and set the system waterproofness accordingly to the expected usage and environment to avoid any safety hazard.
There are proven hazards and safety risks associated with module immersion or the introduction of liquid into the module.

- Humidity and condensation:

Modules shall be operated, stored and transported in a clean (minimum ISO 14644-1 class 9), cool and dry direct environment. Condensation shall be avoided within the system integrating the modules.
It is the responsibility of the integrator to design the module integration system according to these requirements and the system environment.

Any issue detected by the operator during module transportation, storage, usage (including system assembly) shall be checked and corrected to avoid consequential risk affecting safety conditions.

Casual discard of battery modules is forbidden since this can lead to hazards and/or serious pollution of the environment. Battery modules disposal into fire or furnace shall be avoided for safety reasons.

For further details and requirements related to safety, refer to Appendix 1.

6.3 Limitations

6.3.1 Operating temperature

Authorized operation temperature range: -30°C (minimum) to 65°C (maximum).

For safety reasons, module temperature must never exceed 130°C at any circumstances.

Moreover, since the module doesn't have any specific cooling system, a prolonged or regular high-power demand will lead to heating of the module and premature ageing. To maintain the module at a temperature below 65°C, power limitation or cooling system development in the system integrating the module shall be considered.

6.3.2 Charge Powermaps

Recommendations and limitations relating to pulse (10sec.) and steady-state charging parameters are set out in Appendix 4.

6.3.3 Discharge Powermap

Recommendations and limitations relating to pulse (10sec.) and steady-state discharging parameters are set out in Appendix 4.

6.3.4 Cell voltage

The OCV/SOC characteristics of the cell are given at 25°C module temperature in Appendix 4.

Because of internal losses such as ohmic phenomenon the voltage under current load may drop lower than the 0 % SOC OCV value. Power cut-off shall occur when cell voltage reaches 2.5 V.

6.4 Module Storage conditions requirements

Module storage conditions and installation requirements are:

- The storage temperature range must be between 15°C and 25°C.
- Area shall be protected from direct water, ventilated and without flood-risk, away from heat sources, sparks, flames, and humidity.
- Once defined, the storage location must be validated by the on-site risk prevention service or by HSE service of the integrator.
- Any abusive damage such as shock, perforation, crushing or drop shall be avoided otherwise the module can no longer be used for safety reasons.
- In case of module deterioration caused by shock (ex: damage to the integrity of the module casing, fall, etc.), safety risks are numerous. Their criticality depends on the nature of the deterioration (deformation, etc.) which could lead up to electrolyte leak or fire caused by short circuit.
- Modules shall be stored in packaging able to retain electrolyte in the event of leakage and water in the event of fire. The capacity of liquid retention shall be defined by the on-site risk prevention service or the HSE department of the integrator.
- Direct mechanical loads on the top face of the modules shall be avoided during storage.
- Module packaging: maximal modules pallet stacking is 1/1 with or without modules inside.

In case of the electrolyte leakage, refer to §6.2.

6.5 Transportation

- Modules are certified following UN38.3 regulation (Appendix_UN38-3 certificate)
- Transport means shall protect modules and transport casing from direct water and from heat sources, sparks and flames.
- Direct mechanical loads on the top face of the modules must be avoided during transportation.
- Modules in normal conditions shall be transported in UN3480 class 9 casing (external dimensions : 1355.(mm) x 860 (mm) x 559 (mm)



Figure 7 : module packaging

- Module packaging: maximal modules pallet stacking is 3 stacks with modules inside and is 4 stacks when empty.
- Damaged module must be transported in adapted casing (P908 or P911 after risk analysis) with respect of the latest ADR (Agreement concerning the International Carriage of Dangerous Goods by Road) requirements.
- Ideal transport temperature is in the -30 °C to 65 °C range, following the recommended operating temperature of a cell, but not specified for transport.

6.6 Mounting/Assembling

- Modules shall lay on their lower face on a flat and rigid surface able to support the weight of the module's assembly without deformation.
- Direct mechanical loads on the top face of the modules shall be avoided.
- Modules should be compressed along its 2 largest sides, for example between rigid endplates, to avoid swelling and to allow better durability.
- Compression force and width reference:
  - Maximum pressure: **500N (45 sec).**
  - Width: **204 ± 08** mm.

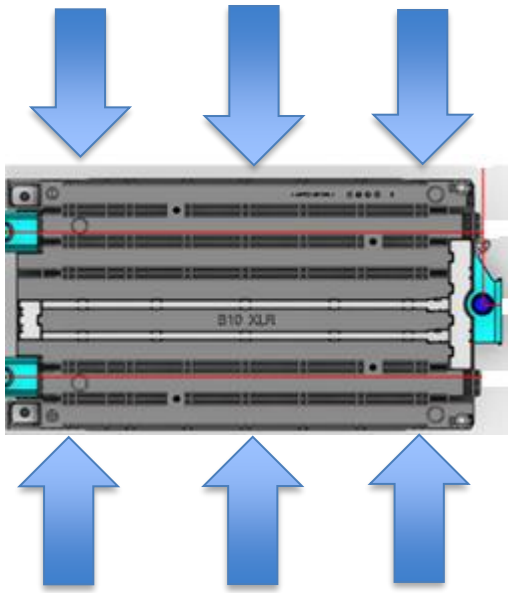


Figure 8 : module compression for swelling protection

Three zones predisposed for mechanical fastening exist in the module.
Recommended torque for module's upper fixation (M6) is 8Nm, and 12Nm for module's lower fixations (M8).

7 ATTACHED DOCUMENTS

- Appendix 1_ Cell MSDS (Material Safety DataSheet)
- Appendix 2_UN38.3 certificate
- Appendix 3_Module 3D model (not binding information)
- Appendix 4_ Module Charging and discharging powermaps.
- Appendix 5_Temperature sensor R-T characteristics & tolerance