NZ LITHIUM

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MARINE PRODUCT MANUAL

12V LIFEPO4 BATTERY

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INTRODUCTION

The Nz Lithium 12.8V MARINE range of Lifepo4 battery modules are a robust, high quality energy storage solution designed specifically to comply with AS/NZS: 3004.2:2014

The battery module has been designed, and made in New Zealand.

Ease of installation and commissioning has been a high priority for all of our battery modules.

Nz Lithium uses locally sourced, high quality components where available.

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Specifications:

MODEL NUMBER	12V-560AH MARINE GEN2
Nominal Voltage	12.8V
Nominal Capacity	560AH
Nominal Capacity watt hours	7168WH
Cell type	Prismatic LiFePO4
Cell configuration	2P 4S
Capacity @ 0°C	448AH
Capacity @ 55°C	504AH
Series connection	NOT PERMITTED
Parallel connection	Unlimited
Recommended depth of discharge	90%
Usable capacity at recommended DOD	6451WH
Battery Charging Temperature range. Protected via internal BMS	0 - 55°C
Normal Charge Voltage CV/CC*	14.2V
Standby (Float) Voltage	13.4V
Maximum Charge Current	250A
Recommended Charge Current	0-140A
Absorption Time	1 Hour
Battery Discharge Temperature range. Protected via internal BMS	-20°C to +55°C
Battery Output Voltage Range	10.4V - 14.2V
Maximum Discharge Current	300A @ 25°C for 30 mins
Continuous Discharge Current	250A @ 25°C
Pulse Discharge Current	450A @ 25°C for 3 seconds
Maximum Discharge Power	3.2Kw @25°C for 30 mins
Continuous Discharge Power	2.5Kw @ 25°C
Pulse Discharge Power	5.7Kw @25°C for 3 seconds
Over-charge Per cell	Alarm 3.65V ± 0.05V Protection (10sec Delay) 3.675V ± 0.05V Release 3.55V ±0.05V
Over-charge Pack Total	Alarm 14.60V ± 0.05V Protection (10sec Delay) 14.70V ± 0.05V Release 14.20V ±0.05V
Over-charge Release Method	Cell / Pack voltage discharges below release voltage

Specifications:

Over-discharge Per Cell	Alarm 2.65V ± 0.05V Protection (10sec Delay) 2.60V ± 0.05V Release 2.75V ± 0.05V
Over-discharge Pack Total	Alarm 10.60V ± 0.05V Protection (10sec Delay) 10.40V ± 0.05V Release 11.00V ±0.05V
Over-discharge Release Method	Cell / Pack voltage rises above release value
Charge Over Current	Alarm >250A Protection (10sec Delay) >260A Protection (3sec Delay) >300A
Charge Over Current Release Method	Isolate ALL charge sources until protection has cleared. Investigate cause of over current. Protection will clear automatically after 180 seconds
Discharge Over Current	Alarm >300A Protection (10sec Delay) >301A Protection (1sec delay) > 450A
Discharge Over Current Release Method	Isolate ALL load sources until protection has cleared. Investigate cause of over current. Protection will clear automatically after 180 seconds
Short circuit protection	1500A for 50us
Battery Discharge Over Temperature	Alarm 55°C Protection (10sec Delay) 60°C Release 50°C
Release Method	Battery temperature falls below release value
Battery Discharge Under Temperature	Alarm -5°C Protection (10sec Delay) -10°C Release 0°C
Release Method	Battery temperature rises above release value
Battery Charge Over Temperature	Alarm 55°C Protection (10sec Delay) 60°C Release 50°C
Release Method	Battery temperature falls below release value
Battery Charge Under Temperature	Alarm 1°C Protection (10sec Delay) 0°C Release 5°C
Release Method	Battery temperature rises above release value

Specifications:

Cell temperature differiential	Alarm 15°C Protection (10sec Delay) 16°C Release 10°C
Release Method	Cell temperature difference falls below release value
Electrical connection type	Positive M8 Terminal Negative M8 Terminal
Cooling method	Natural Convection
Casing material	Powder Coated SS304
Depth	460mm
Width	370mm
Height	265mm
Weight	Approx 62kg
Mounting arrangement	Horizontal only
Humidity Range non condensing	<80% RH
Self-discharge Rate	≤3% Per Month
Warranty period	5 Years - Refer to NZ Lithium warranty statement
Certifications (Complete Battery)	Tested to IEC62619 in NZ
Compliance (Complete Battery)	Written compliance to AS/NZS3004.2.2014 (Clause 2.9.3)
Recommended Fuse Type	Class T 20K AIC
Recommended DC Breaker Type	DC MCCB 20KA ICU
Calculated short circuit current at terminals	5899A

Charge & Discharge Information

Lifepo4 Battery packs are unlike conventional Lead acid battery systems in several ways, the following information should be considered by your system installer.

Lifepo4 battery modules have a very flat Charge & Discharge curve, this means that using voltage is not at all accurate in determining SOC (state of charge) of the battery pack, an external battery monitor (shunt) should be used to accurately determine the SOC of the battery module. There are several options for this available, contact Nz Lithium for current available options.

The only time that voltage can be used to make a remotely accurate assumption on SOC is when we are close to 100% or 0%

Example

If the battery module has reached the target bulk charge voltage >14v and the charge current has began to taper off significantly without loss of sun / charging source then one could assume the battery is very close to 100% SOC
If the battery module has less than 12v with zero load or close to, one could assume the battery is very close to 0% SOC
Typical battery pack voltage under load will be 12.8v (SOC and temperature dependent)

Charge & Discharge Information

If multiple charging sources are being used, they should be synchronised if possible, if syncing is not possible, you may find that tweaking each individual charge source's bulk charge and float voltages is necessary, in order to prevent one charge source triggering the next to enter float, cycling on / off etc.

The battery module should not be left or cycled in a highly discharged state, your system designer / installer should ensure that the battery module can be recharged to 100% SOC at least once per week in all seasons, failure to reach the target charge voltage often, will leave the BMS unable to balance the cells within the battery module, potentially causing over voltage protections on individual cells as the BMS works to rebalance the cells on the next full recharge. If the battery module reaches and under voltage protection – 0% SOC, the user must ensure the battery module is recharged within 24 hours to prevent irreversible damage.

Installation

Environment

Makes sure your area of installation is dry, clean, vermin proof, and the area where the battery will be installed is flat and level.
Installing the battery module on some gym matting is a good solution to combat any small lumps and bumps in the area of installation.
Ensure your battery module is not installed in direct sunlight.
Ensure the humidity is in line with the figure within the battery modules specification, they are a large thermal mass, failure to regulate the humidity within the battery modules installation area can cause condensation to form on the inside and outside of the battery modules case, potentially damaging sensitive electronics. (Humidity is more relevant if you have a metal cased battery module)

Temperature

Temperature has a dramatic effect on the lifespan and performance of your battery module, minimum and maximum temperatures that are given in the battery module specification must be adhered to.
Sustained High temperatures will degrade your battery module prematurely, high charge & discharge rates increase the internal temperature of the battery module.

Installation

Temperature continued:

Low temperatures <15° will limit the storage capacity and discharge performance of the battery module, this phenomenon is normal and is not permanent. Once the battery module is back to normal operating temperature 25°± 5° performance will be restored.

If the battery modules temperature is <15° charging current must be limited to 0.2C until normal operating temperature is achieved.

The BMS installed within the battery module continuously monitors the temperature of the cells, and the critical components within the BMS itself, if temperatures rise or fall below protection values listed within the battery modules specification, the BMS will not allow charging / discharging, once the battery module is within the specification listed, charging / discharging will resume as usual.

Mounting

Nz Lithium 12.8v Battery modules are designed to be mounted in the upright position with the terminals facing forwards. A strap can be used to secure the battery module, If you need custom brackets, or a mounting tray made instead, get in touch.

Installation

Location

Local regulations should be followed when determining a suitable mounting location for the battery module.

Upright battery position

DC Battery Module Connections

The Battery module is equipped with 1 x M8 Positive connection point and 1 x M8 Negative connection point.

Battery cable lugs should be torqued to 12-15 NM

Stacking battery lugs should be avoided where practical.

Nz Lithium battery modules CAN NOT be connected in series to multiply voltage.

Parallel connection is allowed.

Parallel connection's should be made after individual DC MCCB or Class T fuses by using a positive and negative bus bar, with cable runs in as equal lengths as possible, to ensure even charging / discharging of each battery module.

Each individual battery module must be fused or have a suitable DC MCCB fitted as close to the battery module as practical.

The need to ensure the use of suitable fuses / breakers on each module becomes clear when we look at the extremely high short circuit current available at the terminals of Lifepo4 battery modules, often in excess of 7,000A per module.

Battery cable conductors should be sized according to your maximum load, cable run, and a maximum of 3% voltage drop between the battery module and inverter under full load.

Fuses / DC MCCB should be sized in order to enable full load and to protect the cabling that is attached to them in the case of an over current event that the BMS can not control.

DC Battery Module Connections

Check all connections to the battery are secure and not able to move freely, as the bolt supplied may not be of the correct length for your choosen cable lugs. You may use a washer on TOP of your cable lug to secure it in place. NEVER put a washer BETWEEN the battery terminal and cable lug.

Inverters should be pre-charged before completing connection.
Failure to pre-charge large inverters can cause a discharge short circuit error in the BMS due to the large inrush current, this will usually clear on its own in a matter of minutes.
If you are having trouble with this, please contact Nz Lithium.

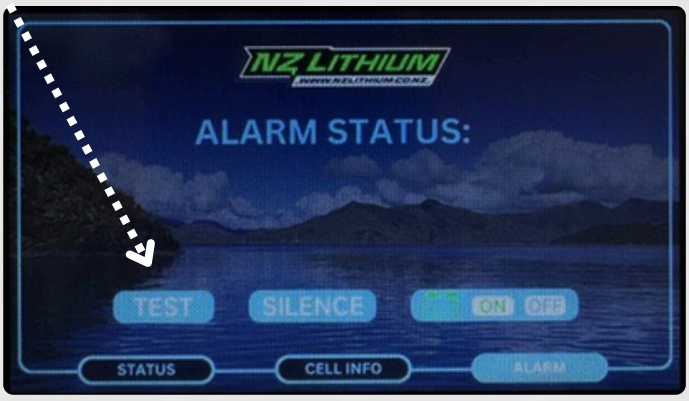
Initial Start-up

This page is about getting familiar with your battery and the LCD display functions.

Plug in LCD Display, buzzer and emergency stop switch.

Turn emergency stop switch (pictured left) to the on position by turning clockwise in the direction of the arrows

The battery is now on, you can now check on the LCD Display charge / discharge should be ON and you can check the buzzer function with the test button.



The silence button will silence the alarm buzzer, it will not stop/override a protection event from occurring. It may be used to silence the buzzer while troubleshooting. Once the alarm/protection has been cleared the buzzer will reset.

Alternator Disconnection Relay

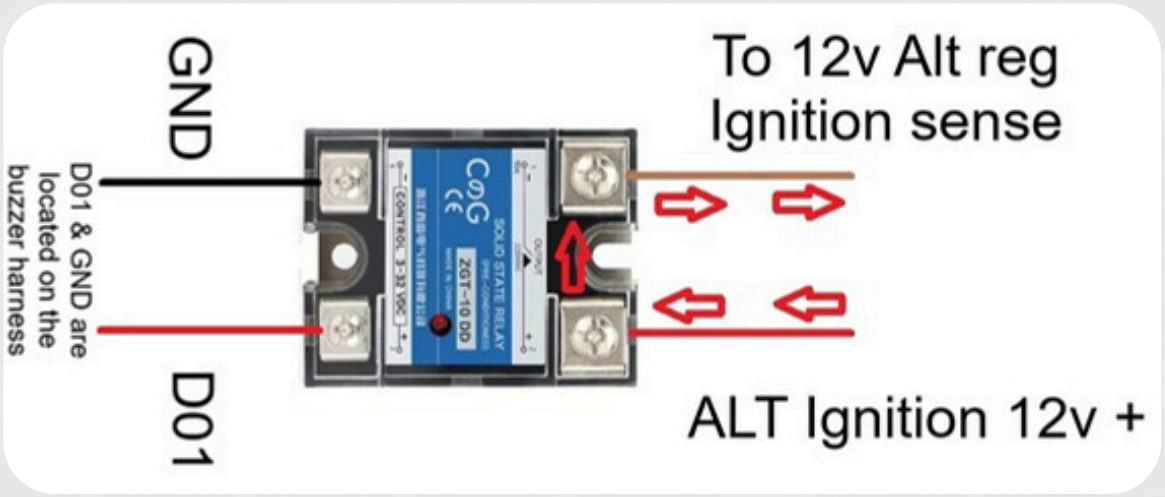
Alternator Disconnection Relay – Installation Instructions

The alternator disconnection relay is a crucial safety component designed to shut down alternator charging in the event of a BMS alarm, preventing potential system damage.

Wiring Instructions:

- Please follow the below diagram carefully.

⚠ Warning: This relay is directional, failure to follow the below diagram will result in a relay that does not function as intended.



Alternator Reset Button Functionality:

- The relay works in conjunction with the **alternator reset button** for manual reset.
- When the ignition is on and the icon glows **green**, the relay is supplying 12V to the alternator reg signal wire.
- If an alarm is triggered, the buzzer will sound, the relay will open circuit removing 12v from the alternator reg signal wire, the icon will glow **red and highlight OFF**, indicating the alternator regulator is off.
- **To reset**, press the ON button—it will glow **green** again, restoring alternator operation.
- If the buzzer is still ringing, you will **not** be able to reset the relay until the alarm has cleared and the buzzer has stopped. **Investigate the cause of the alarm before attempting to reset.**

Storage

Storage

If you intend to store your battery module for a prolonged period of time, you must ensure these instructions are followed, failure to do so may result in irreversible capacity loss.

Switch the battery module OFF whilst in storage, it will remove the parasitic drain from the BMS
Complete a full charge / discharge / recharge cycle to approx 70% SOC at least every 3 months.

DO NOT leave the installation permanently powered and charging the battery module daily whilst in storage, this may cause capacity loss as the battery module will live in a permanent state of 100% SOC

Safety & Disposal

Designers and Installers MUST have read and understood the information within this manual before undertaking the installation and commissioning of the battery module/s

Installers MUST be competent in installation and commissioning of DC power systems.

Any and All local regulations regarding installation of DC power systems MUST be followed.

Battery module charging, discharging and storage specifications MUST be adhered to at all times.

Battery module/s MUST not be used if they have been damaged in any visible way.

Battery module/s MUST not be disassembled for any reason.

Battery module/s MUST not be installed in any area that humidity is >80%

Battery module/s MUST be kept dry at all times

Battery module/s MUST not be installed in direct sunlight.

Battery module/s MUST not be installed, transported or placed in any orientation other than those stated in the product manual, without permission from Nz Lithium.

Battery module/s that are leaking, MUST be disposed of at a suitable recycling facility.

Battery module/s are heavy, a two person lift is required.

Battery module/s are classified as Class 9 dangerous goods, and must be transported according to local regulations.

First Aid

General Advice

The chemicals in this product are contained in a sealed package. Exposure to the contents will not occur unless the battery leaks, is exposed to high temperatures or is mechanically, physically, or electrically abused.

Eye
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin
Remove contaminated clothes and rinse skin with plenty of water or shower for 15 minutes. Get medical aid.

Inhalation
Remove from exposure and move to fresh air immediately. Use oxygen if available.

Ingestion
Give at least 2 glasses of milk or water. Induce vomiting unless patient is unconscious. Call a physician.

Safety & Disposal

Fire Fighting Measures

Fire and Explosion Hazards: Batteries may burst and release hazardous decomposition products when exposed to a fire situation.

Extinguishing Media
C02

Special Fire-Fighting Procedures
Self-contained breathing apparatus.

Unusual Fire and Explosion Hazards
Cell may vent when subjected to excessive heat-exposing battery contents.

Hazardous Combustion Products
Carbon monoxide, carbon dioxide, lithium oxide fumes.

Accidental Release Measures

Steps to be taken in case Material is Released or Spilled
If the battery material is released, remove personnel from area until fumes dissipate. Provide maximum ventilation to clear out hazardous gases. Wipe it up with a cloth, and dispose of it in a plastic bag and put into a steel can. The preferred response is to leave the area and allow the battery to cool and vapors to dissipate. Provide maximum ventilation. Avoid skin and eye contact or inhalation of vapors.
Use butyl rubber gloves when handling leaking batteries.

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ENERGY TO EXPLORE

DESIGNED
ASSEMBLED & TESTED
IN NEW ZEALAND

PRODUCT MANUAL

12V LIFEPO4 BATTERY

Contact: sales@nzlithium.co.nz