



PRODUCT MANUAL



48V LIFEPO4 BATTERY

INTRODUCTION

The Nz Lithium 51.2v range of Lifepo4 battery modules are a robust, high quality energy storage solution designed for stationary and mobile applications.

The battery module has been designed, and made in New Zealand, to suit a range of customer requirements within the Off-Grid energy storage sector.

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	48V-105AH
Nominal Voltage	51.2V
Nominal Capacity	105AH
Nominal Capacity watt hours	5,376WH
Cell type	Prismatic LiFePO4
Cell configuration	16S
Capacity @ 0°C	84AH
Capacity @ 55°C	99AH
Series connection	NOT PERMITTED
Parallel connection	15 with comms / Unlimited without comms
Recommended depth of discharge	90%
Usable capacity at recommended DOD	4,848WH
Battery Charging Temperature range. Protected via internal BMS	0 - 55°C
Normal Charge Voltage CV/CC*	56.8V
Standby (Float) Voltage	54.0V
Maximum Charge Current	100A
Recommended Charge Current	1-50A
Absorption Time	1h
Battery Discharge Temperature range. Protected via internal BMS	-20°C to +55°C
Battery Output Voltage Range	41.6V - 56.8V
Maximum Discharge Current	110A @ 25°C for 15min
Continuous Discharge Current	105A @ 25°C
Pulse Discharge Current	300A @ 25°C for 60 sec
Maximum Discharge Power	5.6Kw @ 25°C for 15min
Continuous Discharge Power	5.3Kw @ 25°C
Pulse Discharge Power	15Kw @ 25°C for 60 sec
Over-charge Protection Per Cell	3.65V ± 0.05V
Over-charge Release Per Cell	3.50V ±0.05V
Over-charge Release Method	Cell discharges below release voltage
Over-discharge Protection Per Cell	2.60V ± 0.05V
Over-discharge Release Per Cell	2.65V ± 0.05V
Over-discharge Release Method	Voltage rising above 2.65V per cell

Specifications:

Discharge Over Current	> 110A for 60s
Short circuit protection	400A for 1500us
Over Current Release Method	Disconnect load
Battery Discharge Over Temperature	Protection 55°C Release 50°C
Battery Charge Over Temperature	Protection 55°C Release 50°C
Battery Charge Under Temperature	Protection 0°C Release 5°C
Electrical connection type	Positive M8 Terminal Negative M8 Terminal
Cooling method	Natural Convection
Casing material	Powder Coated Steel
Depth	475mm
Width	315mm
Height	258mm
Weight	Approx 40kg
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 (cell level)	GB/UN38.3 IEC62619
Certifications (Complete Battery)	IEC62619 Compliant - SDOC Available
Recommended Fuse Type	Class T 20K AIC
Recommended DC Breaker Type	DC MCCB 20KA ICU
Calculated short circuit current at terminals	TBC

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 $>56\text{v}$ 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 48v 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 51.2v (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.

Checking that inverter voltage matches reported battery BMS voltage, failure to ensure minimal voltage drop between the battery module and inverter will mean the BMS is unable to correctly control the Absorption and float time of the system (Very important if the battery has communication to inverter / charger connected)

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.

Charge & Discharge Information

RCV - RFV - SOC 100% Logic:

When using the battery in a system with closed loop communication, the BMS will command specific charging parameters.

The operation is as follows.

BMS will command a bulk charge voltage of 56.4v, once this target has been reached, the absorption timer will begin, after the designated absorption time has elapsed (30 min) and all battery cells are above 3.50v, the SOC will reset to 100% and the BMS will now command a float voltage of 54.0v, If the battery's SOC falls below 97% SOC, the BMS will then command the bulk voltage once again, and the cycle restarts.

Smart Sleep Information:

The Smart Sleep function helps conserve energy when the battery isn't in use. If the battery voltage stays below 52.8 V (3.30v per cell) with 0A of incoming or outgoing current for a continuous period of 48 hours, the BMS will enter Smart Sleep to reduce energy drain attributed to the BMS self consumption.

Waking the Battery

To wake the battery:

- Press the ON/OFF button on your battery.

After waking, the battery operates normally and can power your system as usual.

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, and it will protect the powdercoating on the underneath of the module.

Ensure your battery module is not installed in direct sunlight.

Ensure the humidity is in line with the figure within the battery modules specification, the battery modules are not sealed from the outside environment, and 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.

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 $<15^{\circ}$ 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 $25^{\circ} \pm 5^{\circ}$ performance will be restored.

If the battery modules temperature is $<15^{\circ}$ 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.

Horizontal mounting

Nz Lithium 51.2v Battery modules are designed to be mounted horizontally

Nz Lithium do not currently have a stacking system available for the 51.2v battery modules, please make contact if you need a stacking solution for your installation.

Installation

Vertical mounting

Nz Lithium battery modules can be mounted vertically, in one orientation only (terminals at the top)

This is the most practical mounting position for multiple battery module's, however there can be drawbacks, so please make contact with Nz Lithium for further information and permission to install the battery in this orientation.

Tie downs can be used through the handles to secure the battery module, If you need custom brackets made instead, get in touch.

Location

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



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 FT-LBS

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 12,000 A 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.

Initial Start-up

The battery module will have a small silver button on the front or side panel, this button is to switch the battery module's internal BMS on / off, the operation of this button is simple, if the battery is switched off (no button illumination) then press the button, you may hear a few short beeps, and the button will now be illuminated, the battery is now on, and the terminals are live.

To switch the battery off, simply press and hold the button for 3-5 seconds, remove your finger and the illumination will be gone, current will no longer flow through the terminals, there may be some residual voltage on the terminals.

If you wish to view the SOC and status of the battery via the JK BMS Bluetooth APP, the battery must be switched on.

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.

BMS App

APP DETAILS:

To download the JK BMS Bluetooth APP simply search JK BMS in the Google Play Store or Apple APP Store, it is free to download.



The APP is not compatible with some devices

- Android devices older than Android 6
 - Apple Devices earlier than IOS 13.0 or IPHONE 6s,
- If you have trouble with an error on the Android app get in contact with NZ Lithium, you may need an earlier version of the App.

<https://apps.apple.com/us/app/jk-jbms/id1425725691>

<https://play.google.com/store/apps/details?id=com.jktech.bms&hl=en&gl=US>

Please accept all permissions the APP asks for, If not the APP may not function as desired.

The Password set on the App is 1234, you can change this if you wish.

The Parameter Settings on this BMS has been locked out to prevent accidental adjustments.

The APP offers a reasonably accurate SOC(State of Charge) generally within 5-10%. The battery will take several cycles of charge/discharge to calculate this.

If you are using coulomb counter/battery monitor shunt like a Victron BMV, Just use this for your SOC.

Note – Cell voltage delta shown on the BMS Bluetooth app will rise and fall depending on the current your charging/discharging and the SOC of the battery and temperature.

Parallel Communication Connection

The battery module is equipped with an internal BMS that can communicate and control the charging profile of several brands of inverter charger.

The battery module can be connected in parallel with or without battery to battery communication.

If you wish to use battery to battery communication, parallel units are limited to 15.

If you don't wish to utilise battery to battery communication, parallel units are basically unlimited.

Parallel battery module communication is achieved by connecting the RS485-1 and RS485-2 ports on the front of the battery module in a daisy chain configuration.

How to set the DIP switch on the battery for battery to battery communication

The Master battery will control the charge algorithm for each and all battery modules connected in parallel with battery to battery communication.

The master battery will be the point of connection to your inverter charger communication port via RS485 or CAN

The master battery module must be set to address 0
Additional battery modules will count up from here

Parallel Communication Connection

Example – the installation has 3 battery modules connected in parallel utilizing battery to battery communication

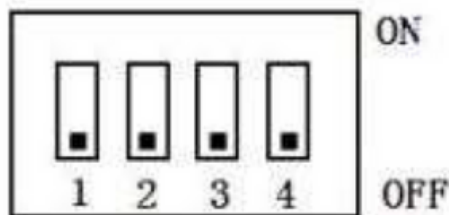
Master battery module DIP set to 0

Battery module #2 DIP will be set to 1

Battery module #3 DIP will be set to 2

While this may seem counter intuitive, it is the way the system works.

If a single battery module is being used in the installation, the DIP switch will be set to #1



Address	Dial switch position			
	1	2	3	4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

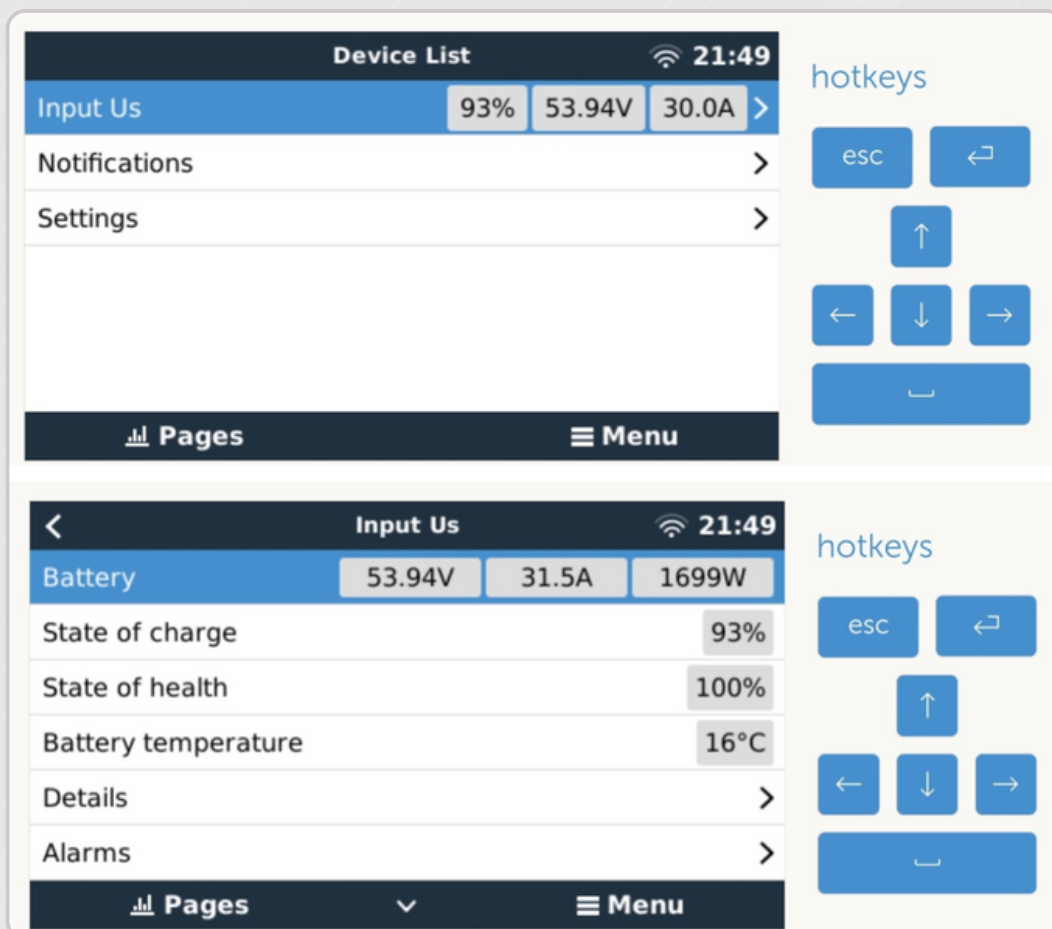
Inverter communication guide

The battery module can communicate and control the charge algorithm of many different brands of inverter charger via RS485 or CAN, Custom made communication cables may be needed to function correctly with your particular brand, the following are the most common brands used in New Zealand.

Victron

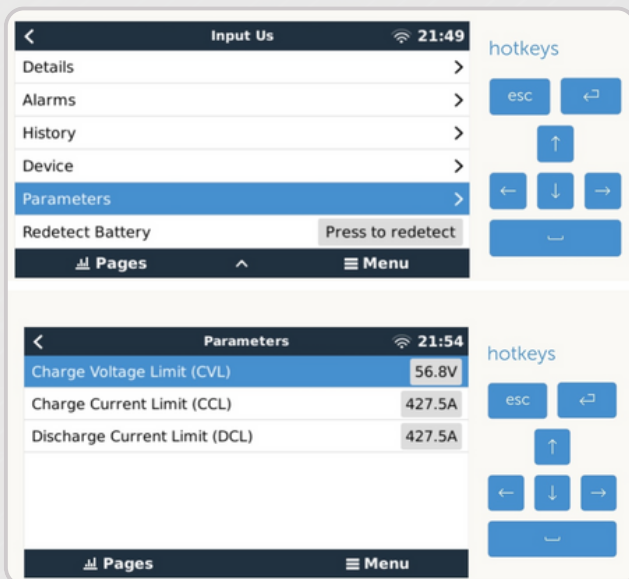
Communication via CAN - Type A Victron cable

Connect Victron type A cable between battery module CAN port and the BMS CAN port on your GX Device, open the Victron remote console, the battery module/s information should be showing.

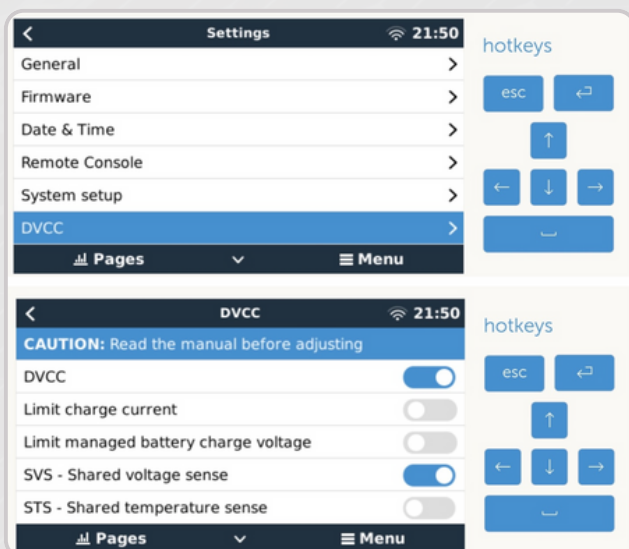


Inverter communication guide

Victron Continued



Navigate to the parameters section and check that the bulk charge voltage - CVL has been displayed correctly, as well as the CCL and DCL (CCL and DCL will show approx 5% lower than all online battery modules protection parameters combined shown in the specification sheet)



Navigate back to the main page and enter the settings section, scroll down to DVCC, ensure DVCC is not in a forced on state, if it is in a forced on state, you will need to go back to the battery module within the remote console, and redetect battery, this could require a few attempts and unplug / replug of the CAN cable.

Make sure Shared Voltage Sense -SVS is in the ON position within the DVCC menu. Once battery modules have been commissioned, complete a full charge cycle, and ensure the CVL has decreased to the float voltage shown within the specification sheet after the 1 hour absorption time has elapsed.

Your charge controllers should be showing that they are now under BMS control, and the charge values shown in the parameters section, match that shown within the charge controller.

Inverter Communication guide

MPP Solar inverter/charger

Communication via RS485 – LIB Protocol - Custom cable

Connect the custom RS485 cable between the battery RS485 port (NOT RS485-1 or RS485-2)

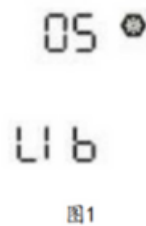
This communication cable is directional, and must be installed correctly or it will not function.

Select the LIB protocol within the MPP inverter/charger menu #05
Once communication is established successfully, the battery symbol on the inverter display will continuously flash

Voltronic / MPP Solar inverter setup

Inverter parameter settings:

1. Press and hold the SET button to enter the setting page;
2. Set item 05 to LIB, as shown in Figure 1



Navigate to menu #26 and #27 and ensure the voltages are the same, and correct according to the specification sheet for bulk charge voltage.

Once battery modules have been commissioned, complete a full charge cycle.

Ensure the #26 and #27 has decreased to the float voltage shown within the specification sheet after the 1 hour absorption time has elapsed.

Inverter Communication Guide

Growatt inverter / charger

Communication via RS485 or CAN – Standard RJ45 cable

Growatt inverter setup

Inverter setup steps:

1. Press and hold the Enter key to enter setting mode
2. Set item 05 to LI (as shown in Figure 1);
2. After successful setting, it will jump to item 36;
3. If RS485 communication is used, set item 36 to L01 (as shown in Figure 2); if CAN communication is used, set item 36 to L51 (as shown in Figure 3);



图 1



图 2



图 3

DEYE inverter / charger

Communication via CAN – LI BMS Setting – Standard RJ45 cable

DEYE inverter setup

Inverter setup steps:

1. Go to the settings page (Figure 1)
2. Click on Battery Setting and set it to Lithium (Figure 2);
3. Click Advanced Function and set BMS _Err_Stop (Figure 3);

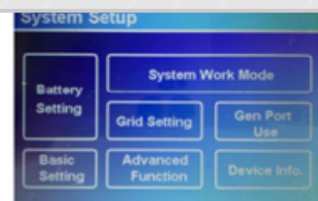
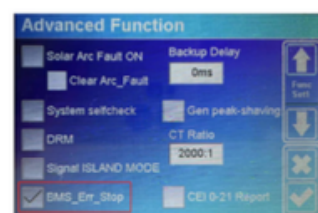


图 1



图 2



Inverter Communication Guide

SRNE inverter / charger

Communication via RS485 - Standard RJ45 cable

SRNE inverter setup

Inverter parameter settings:

1. Press and hold the SET button to enter the setting page;
2. Set 32 items into BMS, as shown in Figure 1;
3. Set item 33 to WOW, as shown in Figure 2;
4. Set 39 items to BMS, as shown in Figure 3;



图1



图2



图3

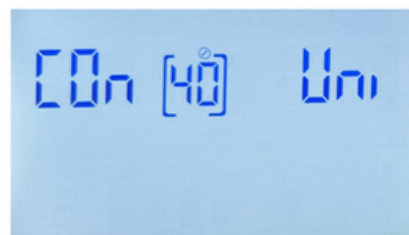
MUST inverter / charger

Communication via CAN – Custom cable

Must inverter setup

Inverter setup steps:

1. Press and hold the Enter key to enter the settings page
2. Use the Enter key to switch between 40 items;
3. Set the setting items as shown in the picture, otherwise blind charging will be performed according to the inverter settings;



Victron Smartshunt settings

The settings provided here will get you started in calibrating your Victron Smartshunt to suit Nz Lithium battery modules.

You will still need to enter the capacity of your battery module and synchronise to 100% SOC once the battery has reached the bulk / absorption voltage listed in the specification sheet and the current has tapered off completely.

← Battery settings

Battery capacity	105Ah
Charged voltage	55.8V
Discharge floor	0%
Tail current	2.00%
Charged detection time	5m
Peukert exponent	1.05
Charge efficiency factor	99%
Current threshold	0.10A
Time-to-go averaging period	1m

Battery SOC on reset

Keep SOC

State-of-Charge

Manually set the current state-of-charge

100.0%

Synchronize SOC to 100%

Synchronize

Zero current calibration

Calibrate

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 90% 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.

Safety & Disposal

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

CO₂

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.



**DESIGNED
ASSEMBLED & TESTED
IN NEW ZEALAND**

PRODUCT MANUAL 48V LIFEPO4 BATTERY



Contact: sales@nzlithium.co.nz

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