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Neuton Power Lithium

(12.8V) LiFePO4 Battery

User Manual & Warranty Card



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Neuton Power Lithium

12.8V LiFePO4 Battery

User's Guide

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Neuton Power 12.8V LiFePO4 Battery

The Neuton Power 12.8V lithium iron phosphate (LiFePO4) battery is designed as a replacement for common deep cycle 12V lead acid and AGM batteries. It features an integrated Battery Management System (BMS) for safety, high current output, and long-life performance, with up to 20 times longer cyclic life than standard lead acid batteries, saving cost and energy. Additionally, it is up to 70% lighter than SLA batteries, reducing logistic costs.

This document is intended for those responsible for the installation and operation of Li-ion batteries. It is important to carefully review this manual to identify any potential safety risks before proceeding. The owner must be familiar with all the features of the product to ensure proper installation and use. Failure to follow the instructions may result in damage that may not be covered under the limited warranty.



Warning: Explosion, Electrocution and Fire Hazard

- Batteries pose risks such as electric shock, burns from high short circuit current, fire, or explosion.
- Always observe proper precautions.
- Ensure cables are correctly sized for the battery.
- Strictly adhere to clearance requirements around the batteries.
- Maintain a well-ventilated and debris-free area around the batteries.
- Always use insulated tools and avoid dropping tools on batteries or electrical parts.
- Never charge a frozen battery.
- When removing a battery, always disconnect the grounded terminal first.
- Ensure all devices are disconnected before working on the battery.
- Do NOT store and use under direct sunlight.
- Ensure it is kept in a cool and dry place. Do NOT submerge battery under water.
- The battery must be operated in a humidity range of 0-90% RH (Non-Condensing).



Important

- Leave sufficient clearance between batteries during installation.
- When replacing batteries, use the same type and number of batteries.
- Avoid falls or collisions during the installation process.
- Do not remove battery components; maintenance should be performed by a professional engineer.
- Do not expose Li-ion batteries to temperatures exceeding 58°C during operation, or 60°C during storage.
- Do not incinerate or expose to open flames.
- Do not connect more than 4 sets of 12.8V Li-ion batteries in series, as incorrect operation may damage the BMS.
- Ensure all batteries in a bank are fully charged with the same voltage before making any connections, as different state of charge (SOC) between batteries may affect charging and discharging performance, reducing the usable capacity of the battery bank.
- Before parallel connection, ensure voltage difference between batteries is less than 0.1V to avoid high current impacts.

Charging Batteries

The 12.8V LiFePO4 (Lithium Iron Phosphate) batteries have specific charging requirements and should only be charged using chargers designed specifically for lithium batteries. Using chargers intended for lead acid or AGM batteries with LiFePO4 batteries can result in overcharging, which can be dangerous and potentially cause thermal runaways, leading to fire or explosion. Because of the greater risks associated with lithium, a battery management system (BMS) is incorporated for safer operations. The BMS may enter under-voltage protection if it was improperly cared for, and it may cause charging more difficult. Chargers that rely on voltage detection at the battery terminals to initiate charging may fail to wake up the Li-ion battery from a state of under-voltage protection, as the Li-ion battery may have a lower voltage than what the charger expects. Constant Voltage (CV) chargers may also result in an inrush of current due to the low impedance

of the Li-ion cells, which can interrupt the charging process. In such cases, it is recommended to reset the charger and continue charging normally if the charger trips.
To properly charge a single 12.8V Li-ion battery, the maximum charge voltage should be set at 14.6V, and the maximum charge current should be referred to Table 1 of the battery's specifications. It is important to avoid any inrush current, as it may cause overcurrent or short circuit protection to trigger.

Once the end-of-charge voltage is reached, it is recommended to apply a constant voltage, and hold at this voltage until the charging current decays to zero. This helps to charge the Li-ion cells to a 100% state of charge (SOC), ensuring optimal battery performance and longevity.

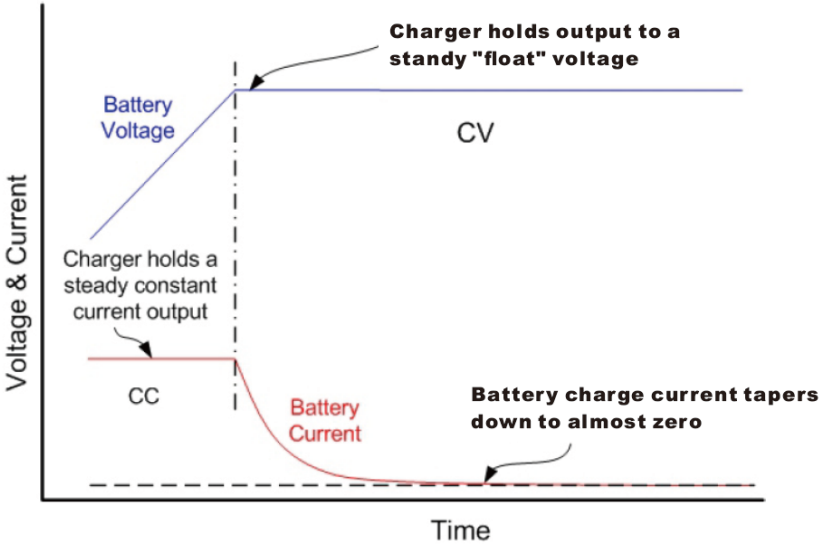


Figure 1: Battery voltage and current during recharge

Series String

Batteries connected in series increases the voltage output. Connect the positive terminal of one battery to the negative terminal of the next battery. The maximum number of 12.8V Li-ion battery that you can connect in a series is four to make 51.2V (nominal) for 48V applications.

Below figure 1 illustrates four 12.8V Li-ion batteries connected in series, for a 4S1P configuration.

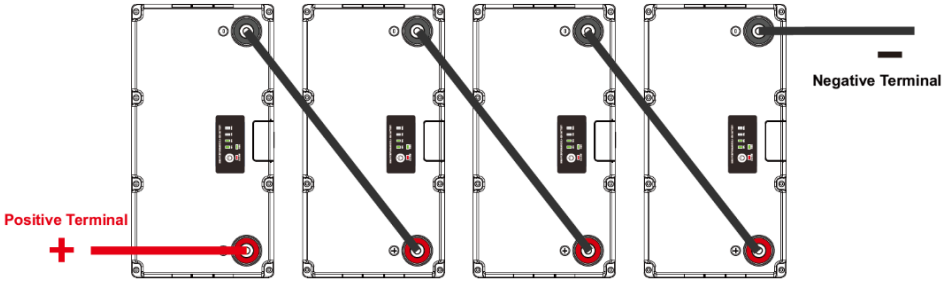


Figure 1: Series Connection of 4S1P

Parallel String

Batteries connected in parallel increases the usable capacity. Connect the like-polarity terminals together, positive terminal of one battery to the positive of the next battery, and the negative terminal to the negative of the next battery. The maximum allowable batteries in parallel is 4.

Important: Batteries in parallel does NOT increase the charge or discharge current.

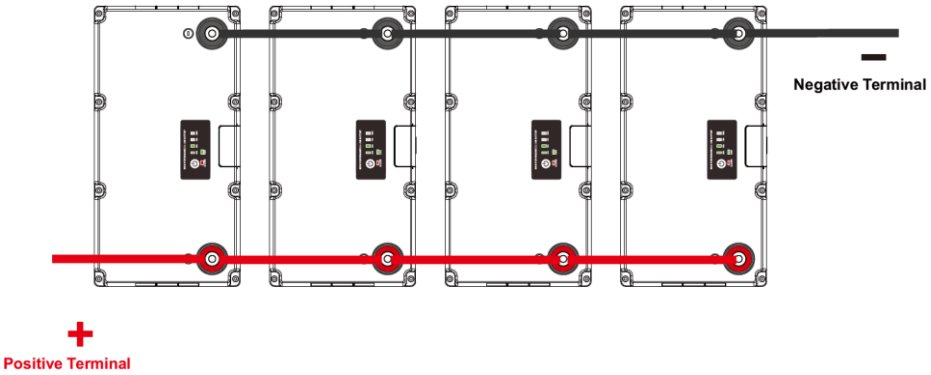


Figure 2: Parallel Connection of 1S4P

Battery Bank Limitations

There are limitations on how many lithium batteries can be connected in series and parallel due to several factors. With more batteries connected into a bank, the more unbalanced the system can be. The BMS have been designed to enable protection, and if these limitations were exceeded, the BMS will enter protection mode Frequent activation of the protection mode may cause eventual BMS failure. Please refer to the datasheet for the BMS parameters.

1. Voltage: Connecting batteries in series increases the voltage output, while connecting them in parallel increases the current output. Exceeding the recommended voltage or current can cause damage to the batteries and its BMS.
2. Capacity: Connecting batteries in parallel increases the total capacity, while connecting them in series does not. Mismatched batteries in parallel can cause unequal charging and discharging rates, leading to battery deterioration and failure.
3. Heat generation: Lithium batteries can generate heat during charging and discharging. Connecting too many batteries in series or parallel can result in excessive heat if there is no proper ventilation, which can damage the batteries and pose a safety risk.

Bank Connection Limitations	
NPL12-8	4S2P or 2S4P
NPL12-20	4S2P or 2S4P
NPL12-100MINI	4S2P or 2S4P
NPL12-150	4S2P or 2S4P
NPL12-135 / NPL12-135G2*	4S2P or 2S4P
NPL12-200G2*	4S2P or 2S4P
NPL12-100/BT**	4S2P or 2S4P
NPL12-100FT/BT**	4S2P or 2S4P

*Note: *G2 module **Bluetooth module*



Important

The Bluetooth models have a version 2 option which is not compatible with older versions due to bank connection limitations. Older versions have a limitation of 4S2P, while newer version support either 4S2P or 2S4P.
Version 2 would be denoted with a label on the box and battery.



Caution

- Do not connect more than four batteries in series, as this exceeds the voltage limit of the BMS.
- Do not short circuit the battery(s).
- Do not connect batteries from different batches, types, or age.
- Ensure that the voltage is the same, with no more than 100mV difference before connecting them into a bank.

- When connecting batteries in series, be aware that if one battery is charged fully (100% State of Charge), the other batteries may not charge fully, resulting in some batteries showing less than 100% SOC.
- Connecting multiple lithium batteries in parallel increase the usable energy (AH), the maximum allowable charge and discharge current remains the same. Systems needs to be designed within the BMS characteristics of one battery.

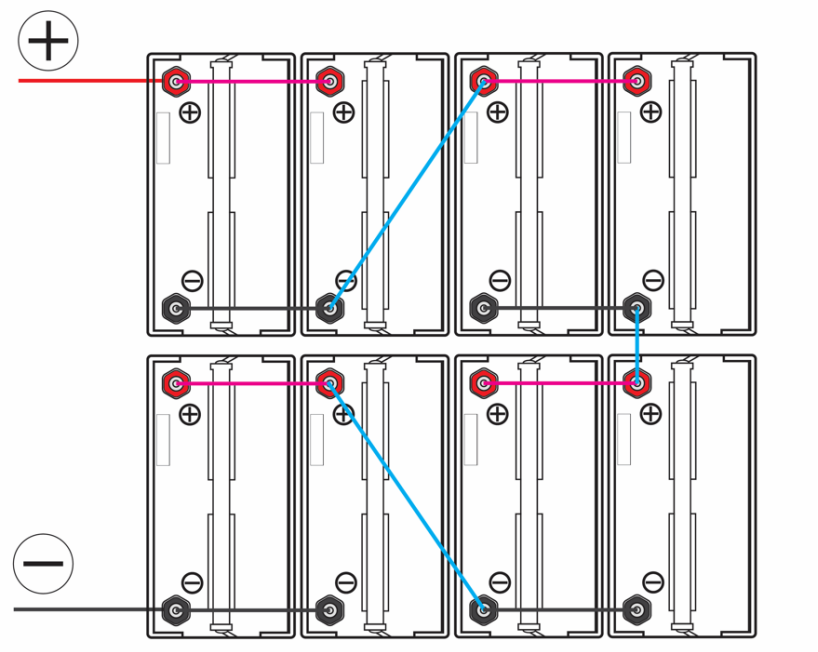


Figure 3: Configuration of 4S2P - 4 batteries in series, 2 strings in parallel.

Relationship Between Charge Limits and Temperature

To ensure optimum performance and durability of the Li-ion battery, it is important to adhere to the recommended charge limits based on ambient temperature, as the chemistry of Lithium-Ion cells can impact charge acceptance at different temperatures:

Temperature (Celsius)	Max. Charge current
-20	Prohibit charging
-10	Prohibit charging
0	Charge at 0.1C
10	Recommended charge current
20	Max. continuous charge current
35	Recommended charge current
45	0.2C
>55	Prohibit charging

Table 1: Charging limits (C denotes the capacity of the battery)

Storage

The recommended storage conditions for the 12.8V Li-ion battery are:
Temperature: between 0°C to +25°C
Relative humidity: between 10% and 90%, non-condensing



Warning: Do NOT use or store under direct sunlight
Do NOT submerge under water, or operate under high humidity environments

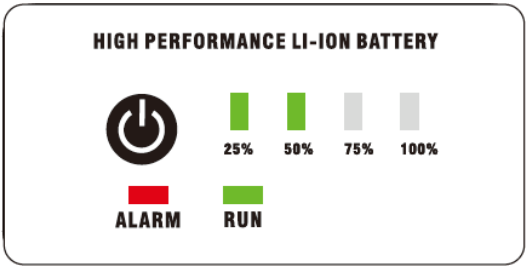
The battery is resistant against light pressure water spray, but they are not waterproof. Do not submerge the battery under water. Ensure the battery is kept in a cool and dry place.
For long storage periods, it's best to store them at 50% capacity at 25°C. It is recommended to charge the battery every half year. For temperatures above 40°C, the battery should be charged quarterly. Do not store Li-ion battery at temperatures above 60°C. The battery should be operated in a humidity range of 0-90% RH (Non-Condensing).

G2 Modules

ON/OFF Button and LED indicators

If the battery does not undergo any charge or discharge activity within a 24-hour period, it will enter sleep mode. Open circuit voltage can still be measured if the BMS isn't in protection mode and the voltage is above 10V. Charging or discharging the battery will wake it up from sleep mode. In case of over-discharge, the BMS will enter protection mode for approximately 5 minutes, during which no OCV will be present. However, applying a charge to the battery can activate it.

To activate the battery, simply press and hold the ON/OFF button for 6 seconds. This feature is designed to conserve energy while still allowing OCV measurement, and any subsequent charge or discharge operation will activate the battery.

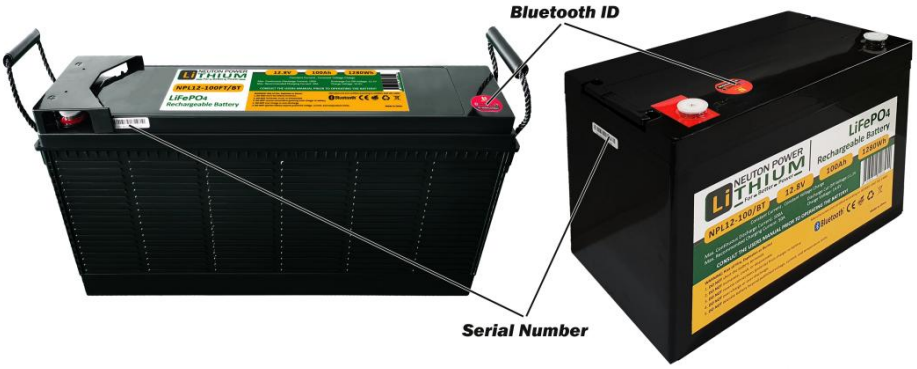


Status	Nominal Warning Protection	RUN	ALM	SOC				Description
Shut down	Dormancy	OFF	OFF	OFF	OFF	OFF	OFF	
Standby	Nominal	Flash 1	OFF	Follow module capacity				Standby
	Warning	Flash 1	Flash 3					Module at low voltage
Charge	Nominal	ON	OFF	Follow module capacity				
	Warning	ON	Flash 3					
	Over-charge Protection	ON	OFF	ON	ON	ON	ON	LED turn to standby if no power supply
	Temperature, over-current, Failure protection	OFF	OFF	OFF	OFF	OFF	OFF	Stop charging
Discharge	Nominal	ON	OFF	Follow module capacity				
	Warning	ON	Flash 3					
	Under voltage Protection	OFF	OFF	OFF	OFF	OFF	OFF	Stop discharging
	Temperature, over-current, short circuit, failure protection	OFF	ON	OFF	OFF	OFF	OFF	Stop discharging
Failure		OFF	ON	OFF	OFF	OFF	OFF	Stop charging and discharging

Note:
Flash 1: light 0.25s/off 3.75s; Flash 2: light 0.5s/ off 0.5s; Flash 3: light 0.5s / off 1.5s

Bluetooth Modules

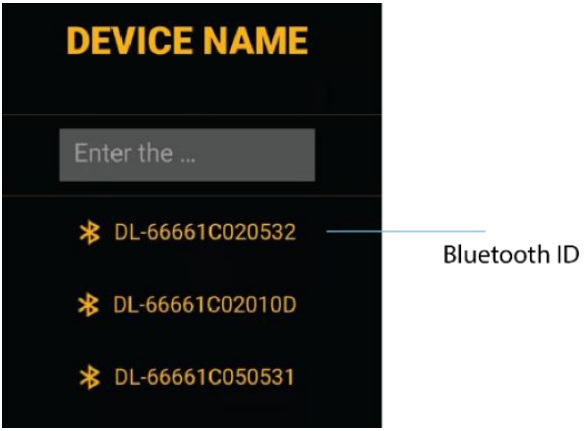
The Bluetooth modules enable smart devices to monitor your battery(s). The "Neuton Power" app is designed to help you manage your lithium batteries more effectively by providing remote monitoring capabilities. By connecting your device to the app, you can access real-time information about the status of your batteries, including their charge levels, temperature, and other key metrics. This information can help you identify potential issues before they become major problems, allowing you to take proactive steps to ensure the health and longevity of your batteries.

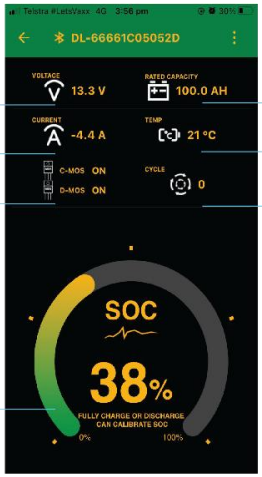


Connecting to the Neuton Power App

1. Install the "Neuton Power" app from App Store or Play Store.
2. Turn on Bluetooth on your device.
3. Open the "Neuton Power" app and locate the Bluetooth ID number, which is indicated by a red sticker.
4. Tap on the Bluetooth ID number to connect your device to the app.
5. Once connected, you can begin using the app to monitor your battery.
   Note: Only one battery can be connected at a time.

Scan the QR code to open the App store or Play store





Battery Voltage

Battery Current

Charge is positive
Discharge is negative

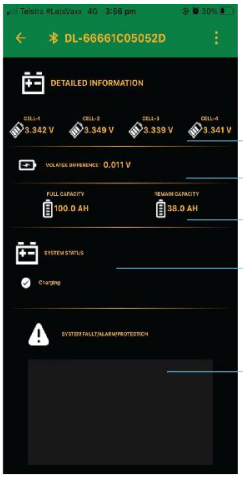
Charge control MOS
& Discharge control
MOS status

State of charge

Battery Rated
Capacity

Battery
Temperature

Cycle time



Cell Voltage

Max Cell Voltage Difference

Remain Capacity

Status:
Standby
Charge
Discharge

Alarm & Protection:
Low temperature alarm
High temperature alarm
Over current alarm
Low voltage alarm
Low temperature protection
High temperature protection
Over current protection
Short current protection
Low voltage protection

Warranty Statement

BATTERY INFORMATION

You must read all safety information, user manual, and battery FAQ before the installation. The battery should be installed by a qualified electrician/ technician.

- Neuton Power 12.8V series Lithium Iron Phosphate (LiFePO4) battery is a type of Lithium-ion battery known for its long design life, better energy density and importantly their safety.
- It has a built-in Battery Management System (BMS) to protect the lithium batteries against over/under charge, high/low temperature, internal short circuits and balances the charge of each cell. *Refer to datasheets.*
- The Bluetooth modules enable connectivity with smart devices for battery monitoring, such as voltage, charge/discharge current, temperature, State of Charge (SOC) and cycles used etc.
- Do NOT disassemble the battery.
- Battery should be stored in a cool and dry place. Do NOT submerge in water.
- Do NOT use for under bonnet or starting application. Do NOT expose under direct sunlight.
- Due to the legalities of transportation and storage, the battery comes with less than 50% SOC from the manufacturer. Please ensure that the correct type of LiFePO4 battery charger is used to charge the battery fully before use.

CHARGING PROCEDURE

The charging and discharging current must be within the limits specified in the data sheet. Exceeding the recommended limits specified by the data sheet may damage the battery and void warranty. Charger with Auto-Rejuvenation and Auto-pulse current is NOT suitable to charge LiFePO4 battery, a bulk charging that does not reach a minimum of 13.8V will not be able to fully charge the battery. Do NOT reverse charge as it will damage the battery.

HOW TO CHARGE:

- Always use a dedicated lithium LiFePO4 battery charger to recharge the battery.
- A Constant Current / Constant Voltage charge method is required.

Step 1. Refer to table 1: charging limits.
At 25°C, constant current charging is recommended at 0.5C rating (i.e., charging at a rate of 50% of the battery capacity per hour) until the voltage is raised to 13.8V. (BULK)
Step 2. Allow the voltage to stabilise at 13.8V charging and finish when the current is less than 0.02C. (Absorb).
Step 3. Charger stops. Floating not recommended.

Note: Some chargers provide a floating function after fully charge. For LiFePO4 battery, it has extremely low self-discharge rate, please stop the charger as soon as it is fully charged. Float charging is not recommended as it may affect battery life.
Please also note that a Li-ion battery charger could have different voltage setting. Please check with the supplier to find out which setting is suitable to charge your LiFePO4 battery(s)

ADDITIONAL INFORMATION

1. Always ensure the battery leads are connected firmly with the correct polarities.
2. If the BMS protection is activated during discharge, please disconnect the battery from the load. Rest the battery for approx. 20 minutes, then check the voltage on the battery. The BMS protection will be disarmed if the voltage bounces back to normal (11.2V), then put the battery on charge to fully recharge the battery.
3. Repeatedly over discharging the cells (activating BMS low voltage protection) will damage the battery. Please ensure that the battery is recharged immediately after use.
4. Recommended depth of discharge is to be kept within 80% to maximise cycle life.
5. To avoid triggering the BMS protection, please note that the following BMS operating range:
   a. BMS discharge cut-off voltage: 10.0V (recommended to set cut-off of 11.2V for inverter/device/supply). Refer to datasheet.
   b. Maximum charge voltage: 14.6V (refer to datasheet)
   c. Charging operating temperature: 0 ~ 50°C
   d. Discharging operating temperature: -20°C ~ 55°C
6. If the battery is on charge and the BMS over current protection is tripped, it will automatically release after 1min. If the battery isn't taken off charge, the BMS will trip 3 times and will require intervention.

ENSURE THE BATTERY IS PHYSICALLY SECURE

Even though lithium battery is light weight and robustly constructed, it is not designed to operate continuously in high shock or high vibration environments. Always ensure the battery is safely secured before travel. Normal use in a 4WD environment is acceptable, for the battery has been designed in accordance with these expected conditions. However, dropping the battery, prolonged exposure to sunlight and excessive vibrations may lead to the failure of the battery.

WARRANTY CONDITIONS

This warranty is given by YHI POWER PTY LTD for Neuton Power 12.8V series lithium Iron Phosphate (LiFePO4) batteries, identified with the proof of purchase and series number found on the battery.

YHI POWER provides a 3-year warranty for batteries under 50Ah and a 5-year warranty for batteries rated 50Ah and above, unless otherwise specified. This warranty covers defects in Neuton Power 12.8V LiFePO4 batteries from the date of initial purchase and applies only to batteries used in energy storage, deep cycle and backup applications.

The warranty is not transferable to any other person or entity. Please contact the place of purchase regarding any warranty claims. The warranty that comes with our goods are bound by Australian Consumer Law.

WARRANTY EXCLUSIONS

Warranty excludes from the following conditions, including but not limited to:

1. Exceeding the warranty period of 3 years for batteries under 50Ah, or 5 years for batteries 50Ah and above from purchase date.
2. Damage caused from the mishandling of the product from shipping and/or the user.
3. Damage due to improper installation; loose terminal connections, under-sized cabling, incorrect connections (series and parallel) for desired voltage and AH requirements, reverse polarity connections, insufficient space for airflow, or unauthorized disassembly or repair etc.
4. Product not stored in adherence to the manufacturer's storage guidelines.
5. Environmental damage, including exposure to direct sunlight, fire, extreme cold temperatures, high humidity, and water. Appropriate documentation proven that a controlled environment was maintained will be required for all claims.
6. Damage caused during operation; by collision or over-discharging the product as defined by the manufacturer.
7. Damage due to improper maintenance; lack of cleaning resulting in corroded terminal connections or build-up of dirt, debris, organic matter, fossil fuels or chemicals on the product casing.
8. Product that has been opened, modified, or tampered with.
9. Tampering or removal of manufacture date codes.
10. Product that was used for applications other than which it was designed and intended for, including under bonnet use or with starting applications.
11. Product that was under-sized for the application.

- Warranty replacement or repair will only occur after batteries are returned to seller to be tested and battery failure deemed to be a genuine claim.
- YHIP will deal with the faulty battery during warranty period based on faulty block(s), not whole string(s)
- YHIP is not responsible for and will not be bound by any additional warranties provided by resellers and does not authorize any other person to make or assume any obligation or liability in connection with any of the batteries.
- YHIP does not cover the cost of transport of batteries, labour for removal and replacement of the batteries.
- YHIP is not liable for any consequential loss or damage caused by an event of force majeure.

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WARRANTY CARD

Please complete the following details and keep this warranty card with the original purchase invoice.

Product Serial Number | | | | | | | | | | | | | | | | | | |

Date of Purchase: ____/_____/_____ Invoice Number: _____

Customer Name: _____

Address: _____

_____

City: _____

Postcode: _____ Phone Number: (___)_____

Email: _____

Please send the completed form to your battery supplier. Thank you!