

# 12V ELBT SERIES LiFePO4 BATTERY USER MANUAL



**Please read this manual prior to installation and use.**

This manual provides important information on how to install, operate, and care and maintenance of your lithium battery. This manual only applies to ELB Lithium Batteries. It does not apply to other lithium batteries or chemistries. Please read through the guide in detail before installing and using your new battery. Reading this guide in its entirety will help you achieve high performance and long life from your lithium battery investment. Should you have any questions concerning safety precautions, installation or use of your lithium battery, please contact us at [Info@ecolithiumbattery.com](mailto:Info@ecolithiumbattery.com).

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## 1.1. Product overview

Crafted out of Lithium Iron Phosphate (LiFePO<sub>4</sub>) technology, this is a battery built to last. With 2,000+ recharge cycles (and up to 7,000 under ideal charging conditions) the 100 Ah provides 5X the lifespan than your typical SLA battery. Combine 2 for 24 Volts or 3 for a 36 Volt system. ideal for industrial purposes where you need a long lifespan battery that charges quickly, or for outdoor uses like hiking or camping where weight is at a premium. Built in smart BMS, which can realize Bluetooth function and battery level display optional.

## 1.2. Product features

- 7000 cycle life@50%DOD
- Highest safe chemistry with high energy density
- Built-in protection BMS
- Maintenance free
- No memory effect
- High energy density
- Low internal resistance
- Low self-discharge character
- Light weight, about 40%~50% of the weight of SLA battery
- Same case with SLA battery

## 2. Applicable Range

This product specification applies to lithium iron phosphate battery products provided by our company, and the product provided in this manual complies with the requirements of the CE/IEC62133 standard.

Customer who use the battery manufactured or sold by our company must read this user manual carefully before using, we will not be responsible for accident or damage with incorrect operating.

## 3. Safety

Lithium Iron Phosphate (LiFePO<sub>4</sub>) batteries are an inherently safe chemistry. Please reference ELB's Lithium Iron Phosphate Safety Document for more details. However, as with any electronics, safety measures should always be taken. Please adhere to the instructions within this manual for safe handling and operation.

- Always wear protective gear when handling batteries
- Use a wrench with a rubber coated handle
- Do not place any objects on top of batteries
- Do not place batteries on a metallic surface
- Check that all cables are in good condition
- Make sure all cable connections are properly tightened
- Install and remove batteries using the lifting handles provided
- Keep sparks, flames and metal objects away from batteries
- Have an ABC extinguisher of the following type: a foam extinguisher,

CO2, ABC dry chemical, powdered graphite, copper powder or soda (sodium carbonate) on the premises

#### 4. EQUIPMENT

The following equipment may be required to install your battery:

- Protective Gear; gloves and eye protection
- Wrench with insulated/rubber coated handle
- Voltmeter

#### 5. LiFePO4 BATTERY BASICS (VS. LEAD-ACID)

##### 5.1. Basic Construction

ELB LiFePO4 battery packs include three main components:

1. Individual cells assembled inside a plastic case
2. M8 bolts
3. An internal BMS (Battery Management System) to protect the battery from abusive operation



##### 5.2 Cell and Battery Pack Voltages

| Lithium Iron Phosphate (LiFePO4) Nominal Voltage | Lead-Acid Equivalent Nominal Voltage |
|--|--------------------------------------|
| Cell = 3.2V                                      | Cell = 2.0V                          |
| 12.8V – 4 cells in series                        | 12V                                  |
| 25.6V – 8 cells in series                        | 24V                                  |
| 38.4V – 12 cells in series                       | 36V                                  |
| 51.2V – 16 cells in series                       | 48V                                  |

## 6. BATTERY INSTALLATION

### 6.1 Battery Connections

To maximize the performance and to ensure safe operation of your battery, use the appropriate cable size and tighten connections using the proper torque value. Refer to the data sheet for your particular battery's torque value. It is recommended to use a washer. Place the washer between the cable lug and nut, not between the cable lug and battery terminal surface.

### 6.3 cable Size

Choose the appropriate cable size based on the expected load of your system. See the table below--Allowable Ampacities for copper cables rated at 167°F (75°C) operating at an ambient temperature of 86°F (30°C).

| Wire Gauge (AWG) –<br>Copper Conductors | Ampacity (Amps) |
|---|-----------------|
| 14                                      | 25              |
| 12                                      | 30              |
| 10                                      | 40              |
| 8                                       | 55              |
| 6                                       | 75              |
| 4                                       | 95              |
| 2                                       | 130             |
| 1                                       | 150             |
| 1/0                                     | 170             |
| 2/0                                     | 195             |
| 4/0                                     | 260             |

## 6.4 Torque Values

Terminal connections should adhere to the appropriate torque values for the specified terminal type to provide optimum electrical conductivity. Refer to the data sheet for your particular battery's torque value. Over- or under- tightening the connections can result in terminal breakage, over-heating and/or terminal melting. Use a rubber handled or insulated wrench when making terminal connections to avoid an external short circuit.

## 6.5 Terminal Protection

Battery terminals may be covered with a plastic cap to prevent an external short circuit. Terminals must be covered with a protective cap or non-conductive tape prior to battery disposal to a lithium recycler.

## 6.6 Battery Orientation

Lithium batteries can be placed upright or on their sides.

## 6.7 Series or Parallel Connections

When connecting to your battery terminals, DO NOT finger tighten. Use a torque wrench to torque your hardware to the specification of 9 to 11 ft-lbs. Failure to adequately secure connections can result in severe damage and will void your warranty.



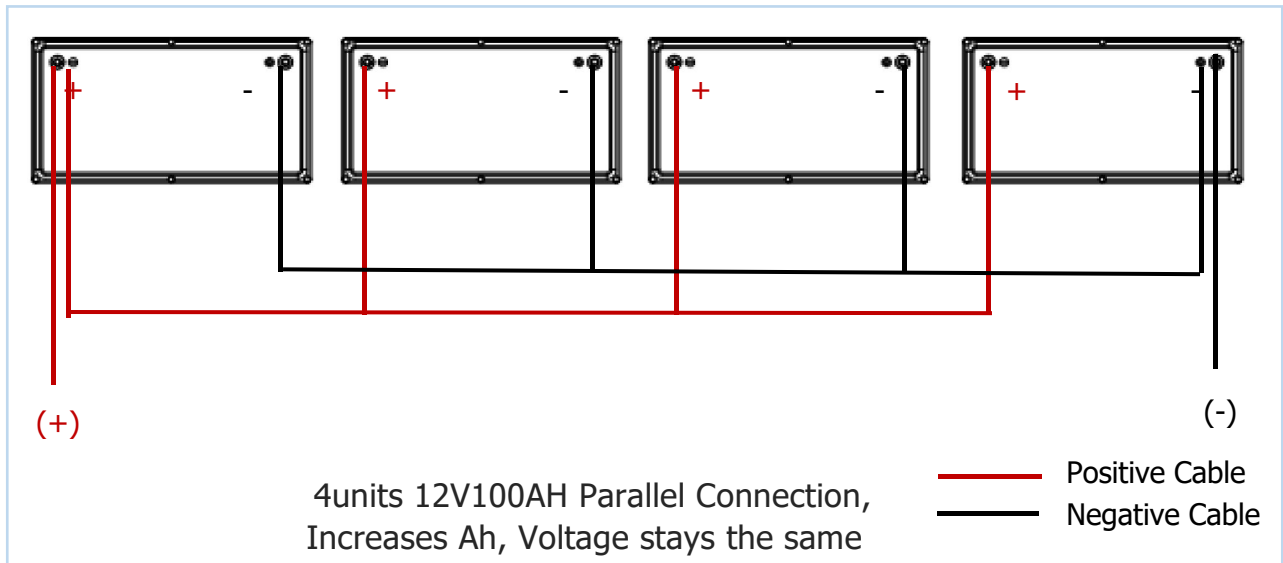
When connecting batteries in series or parallel, please follow these guidelines:

(1) Make sure each battery is within 50mV (0.05V) of each other before putting them in service. This will minimize the chance of imbalance between batteries. If your batteries get out of balance, the voltage of any battery is >50mV (0.05V) from another battery in the set, you should charge each battery individually to rebalance.

(2) Size batteries in parallel accordingly: The capacity of batteries (rated in amphotours) when connected in parallel is increased by the multiple of the batteries connected (2x, 3x, 4x, etc). However, the current ratings (discharge and charge) for parallel batteries is only increased by 75% of the multiple of the batteries connected (1.5x, 2.25x, 3x, etc).

(3) Batteries connected in series are best charged as individual batteries. charging as a series bank can lead to imbalances and reduced runtime, requiring an occasional individual balancing charge.

| Specifications for Batteries in Parallel |      |      |      |      |
|--|------|------|------|------|
| Battery Quantity                         | 1    | 2    | 3    | 4    |
| Voltage                                  | 12.8 | 12.8 | 12.8 | 12.8 |
| Capacity (Ah)                            | 100  | 200  | 300  | 400  |
| Max Continuous Discharge Current         | 100  | 150  | 225  | 300  |
| Peak Discharge Current                   | 200  | 300  | 450  | 600  |
| Rec'd Charge Current                     | 50   | 75   | 113  | 150  |
| Max Charge Current                       | 100  | 150  | 225  | 300  |



## 7. BATTERY STORAGE

### 7.1 Storage Temperature

LiFePO<sub>4</sub> can be stored between 23°F to 95°F (-5°C to 35°C). For storage longer than 3 months, the recommended temperature range is 32°F to 77°F (0°C to 25°C).

### 7.2 Storage Conditions

It is recommended to store LiFePO<sub>4</sub> batteries at 50% state of charge (SOC). If batteries are stored for long periods of time, cycle the batteries at least every 6 months.

## 8. BATTERY DISCHARGING

## 8.1 Discharge Temperature

Lithium Iron Phosphate batteries generate a fraction of the heat of other lithium chemistries making them very safe. LiFePO<sub>4</sub> batteries can safely operate between -4°F to 140°F (-20°C to 60°C). All ELB's LiFePO<sub>4</sub> come with a BMS that protects the battery from over-temperature. If the BMS disconnects due to high temperature, wait until the temperature reduces and the BMS reconnects the battery before using or charging the battery. Please refer to your battery data sheet for BMS high temperature cut-off value.

## 8.2 Discharging your LiFePO<sub>4</sub> Battery

LiFePO<sub>4</sub> batteries can be discharged up to 100% of their capacity. However, to optimize the performance of your LiFePO<sub>4</sub> battery, and to avoid the BMS disconnecting the battery, we recommend limiting the discharge to 80%. Please refer to your battery data sheet for the continuous and peak rates of discharge for your specific battery model.

## 9. BATTERY CHARGING

Check that your charger's cables are insulated and free of breakage. Charger terminal connectors should be clean and properly mate with the battery terminals to ensure a good connection and

optimum conductivity.

## 9.1 When to Charge your LiFePO4 Battery

If LiFePO4 batteries are not fully discharged, they do not need to be charged after each use. LiFePO4 batteries do not get damaged when left in a partial state of charge (PSOC). You can charge your LiFePO4 batteries after each use or when they have been discharged up to 80% (20% SOC). If the BMS disconnects the battery due to low voltage, at 100% depth of discharge, remove the load to reconnect the battery circuit and charge immediately. Please note that we recommend storing batteries at 50% state of charge (SOC).

## 9.2 Charging Temperature

Lithium Iron Phosphate batteries generate a fraction of the heat of other lithium chemistries making them very safe. LiFePO4 batteries can safely charge between -4°F to 131°F (-20°C to 55°C). However, at temperatures below 32°F (0°C) the charge current must be reduced as follows:

- 32°F to 14°F (0°C to -10°C) charge at 0.1C (10% of the battery capacity)
- 14°F to -4°F (-10°C to -20°C) charge at 0.05C (5% of the battery capacity)

LiFePO<sub>4</sub> batteries do not require temperature compensation for voltage when charging at hot or cold temperatures. All ELB's LiFePO<sub>4</sub> come with a BMS that protects the battery from over-temperature. If the BMS disconnects due to high temperature, wait until the temperature reduces and the BMS reconnects the battery circuit before using or charging the battery. Please refer to your battery data sheet for BMS high temperature cut-off and reconnect value.

### **9.3 Charging with Lead-Acid Chargers**

Most lead-acid battery chargers can be used with LiFePO<sub>4</sub> batteries as long as they are within the appropriate voltage guidelines. AGM and Gel algorithms typically fall within the LiFePO<sub>4</sub> voltage requirements. The voltage for flooded battery charging algorithms are often higher than LiFePO<sub>4</sub> requirements which will result in the BMS disconnecting the battery at the end of the charge cycle and may result in the charger displaying an error code. If this happens, it is generally a good practice to replace your charger. Since the BMS protects the battery, using lead-acid chargers will not damage the battery.

## **10. BMS OPERATION**

All ELB's LiFePO<sub>4</sub> batteries come with an internal smart BMS. The BMS

have function:

- Overcharge detection function
- Over discharge detection function
- Over current detection function
- Short detection function
- Temperature detection function
- Balance function

Refer to the data sheet for your battery's specific discharge criteria. If the BMS disconnects the battery due to voltage or current limits, you must remove the load to reconnect the battery. If the BMS disconnects the battery due to temperature limits, you must wait for the temperature to reduce to reconnect the battery. If your equipment has parasitic loads, it may require a physical disconnect of the terminals to reconnect the battery circuit. Please note, that while short-circuit protection protects the battery's cells, it still may produce a spark and damage your cable or bolt, so it is best to avoid short circuit conditions.

## **11. BATTERY RECYCLING**

Terminals must be covered with a protective cap or non-conductive tape prior to battery disposal to lithium recycler. Dispose of LiFePO<sub>4</sub> batteries at an authorized lithium recycling facility.

## Technical support

If you have technical questions about your ELB's battery, please contact the original place of purchase or ELB Battery directly:



ISO9001



ISO14001



ISO18001



IEC62133



CE



UL1642(CELL)



UN38.3



MSDS

ISO 9001:2015 Quality Management System ISO/TS

16949:2009 Quality Management System

ISO 14001:2004 Environmental Management System

OHSAS 18001:2007 Occupational Health and Safety

ELB Battery provides our customers with the highest quality and safest lithium products, in compliance with all regulatory standards.

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