

USER MANUAL

LITHIUM-FERROPHOSPHATE BATTERIES

SECURITY

Lithium iron phosphate (LiFePO₄) batteries are chemically safe.

Always wear protective gear when handling batteries.

Use a wrench with a rubber coated handle.

Do not place any object on top of your battery.

Do not place your battery on any metal surface.

Check that all cables are in good condition.

Make sure all cable connections are tight.

Install or remove your battery using the lifting handles provided.

Keep sparks, flames, and metal objects away from your battery.

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.

Do not install batteries in a compartment with no free space, overheating may occur.

Always leave at least space around all sides and the top of the battery.

The battery compartment and any material within 50cm. They must be fireproof.

BATTERY INSTALLATION

Battery connections:

To ensure safe handling and maximum performance from your battery, use the correct size wire and tighten the connections using the proper torque.

Wire Size:

Choose the proper wire size based on the expected load on your system.

Allowable amperages for copper cables are around 75°C operating at an ambient temperature of 30°C.

Over or under tightening of connections can result in terminal breakage, overheating and/or terminal melting.

Use an insulated or rubber-wrapped wrench when making terminal connections to prevent an external short.

Terminal protection:

Battery terminals should be covered with plastic wrap to prevent an external short circuit.

Terminals should be covered with protective wrap or non-conductive tape before disposing of your battery in a lithium recycler.

BATTERY ORIENTATION

Lithium batteries can be located on the top left or on the sides.

Do not install batteries in a compartment with no free space, overheating may occur.

Always leave at least 50 cm. of space around all sides and the top of the battery.

The battery compartment and any material within 50 cm. They must be fireproof.

CONNECTIONS IN SERIES OR PARALLEL:

When connecting batteries in series or in parallel, please follow the following:

(1) Make sure the batteries are within 50mV (0.05V) of each other before operating. This will reduce the risk of imbalance between them. If they get out of balance or the voltage between one battery and another is >50mV (0.05V) in the equipment, then you will need to charge each battery individually to re-balance them.

(2) Place them in parallel as they correspond:

Its capacity (fixed in amp/hour) when connected in parallel increases by a multiple of connected batteries (2x, 3x, 4x, etc).

However, current rates (charge and discharge) for parallel batteries only go up to 75% of the multiple of connected batteries (1.5x, 2.25x, 3x, etc).

(3) Batteries connected in series are best charged individually. Charging them together can lead to imbalances or reduced life, requiring an occasional individual charge to balance.

(4) Please only follow the LiFePO4 charging instructions of each model, for parallel or series charging.

BATTERY STORAGE

Storage temperature:

LiFePO4 can be stored at temperatures between -5 to 35°C. For storage longer than three months, the recommended temperature range is 0 to 25°C.

Storage conditions:

It is recommended to store your LiFePO4 batteries with at least a 50% charge in them. (SOC – State of Charge)

If batteries are stored for longer periods of time, use them at least every 6 months.

BATTERY DISCHARGE

Discharge temperature:

Lithium iron phosphate batteries generate a fraction of the heat compared to other lithium batteries, making them very safe.

LiFePO4 batteries can safely operate at temperatures between -20°C to 60°C. All LiFePO4 batteries come with a BMS that protects the battery from overheating. If the BMS disconnects due to high temperatures, please wait until the temperature decreases and the BMS reconnects the battery before using or charging the battery.

Please review your data sheet for BMS high temperature cut-out values.

LiFePO4 batteries can be discharged up to 100% of their capacity.

However, to optimize the performance of your LiFePO4 battery and to prevent the BMS from disconnecting the battery, we recommend limiting the discharge to 80%. Please review your battery's data sheet for the continuous and peak discharge percentages applicable to your specific battery model.

BATTERY CHARGE

If the LiFePO4 batteries are not completely discharged, they will not require charging after each use.

LiFePO4 batteries are not damaged by being left in a Partial State of Charge (PSOC). LiFePO4 batteries can be charged after each use or when they are already 80% discharged (20% SOC).

If the BMS disconnects the battery due to low voltage, at 100% full discharge, activate the charge to reconnect the battery circuit and charge the battery immediately. Remember that we recommend storing batteries at a State of Charge (SOC) of 50%.

Charging temperature:

Lithium iron phosphate batteries generate a fraction of the heat compared to other lithium batteries, making them very safe.

LiFePO₄ batteries can be safely charged at temperatures between -20°C to 55°C. However, in the presence of temperatures below 0°C, the charging current must be reduced as follows:

1. From 0°C to -10°C charge to 0.1C (10% of battery capacity)
2. From -10°C to -20°C charge to 0.05C (5% of battery capacity)

LiFePO₄ batteries do not require voltage temperature compensation when charging at low or high temperatures.

All LiFePO₄ batteries come with a BMS that protects the battery from overheating.

If the BMS disconnects due to high temperatures, please wait until the temperature decreases and the BMS reconnects the battery circuit before using or charging the battery.

Please check your battery's data sheet for BMS high temperature cutout values.

CHARGING WITH LEAD-ACID CHARGERS:

Most lead acid chargers can be used with LiFePO₄ batteries as long as they are within the proper voltage levels.

The AGM and GEL algorithms usually fit within the voltage requirements of LiFePO₄.

The voltages for overcharged battery charging algorithms are generally higher than those required by LiFePO₄ and this results in the BMS disconnecting the battery at the end of the charge cycle and may cause the charger to display an error code.

If that happens, it is recommended that you replace your charger. Since the BMS protects the battery, using lead acid chargers will not harm your battery.

BMS OPERATION

All LiFePO₄ batteries come with an internal BMS.

The BMS protects:

1. Low Voltage during discharge
2. Over voltage during charging and other conditions
3. Excess current during discharge
4. Overheating – during discharge
5. Short circuits – protects battery cells from damage.

Check the data sheet for the specific discharge criteria for your battery.

If the SMB disconnects your battery due to voltage or current limits, you must remove the load to reconnect the battery.

If the SMB disconnects the battery due to temperature limits, it must wait for the temperature to drop before reconnecting the battery. If your equipment has parasitic loads, it may require a physical disconnection of the terminals to reconnect the battery circuit.