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Do NOT Charge a Lithium (LiFePO₄) battery below 0°C / 32°F

If you have a Lithium (LiFePO₄) battery, there are some things to consider when charging under extreme temperature conditions.

Lithium battery manufacturers often state an operational temperature range of -30°C to +80°C / -22°F to +176°F and an optimal temperature range of -10°C to +50°C / 14°F to 122°F (this varies depending on brand and model, consult your manufacturer). This is often misconstrued as a safe temperature range for both charging and discharging, this is not the case. The operational temperature range is referring to discharging the battery only.

Charging a Lithium battery in ambient temperatures below 0°C / 32°F must be avoided. The reason for this is it may potentially damage the battery and / or reduce its lifespan.

The optimum ambient temperature for charging a Lithium battery is +5°C to +45°C / 41°F to 113°F.

When attempting to charge a Lithium battery below 0°C / 32°F a chemical reaction referred to as “Lithium Plating” occurs. Lithium plating is caused by the charge current forcing the lithium ions to move at a faster reaction rate and accumulate on the surface of the anode.

When this chemical reaction occurs, the internal resistance of the battery increases and reduces the rate of chemical metabolism. This chemical reaction causes a permanent reduction of the battery’s capacity and will continue to reduce its capacity each time this reaction occurs.

If you plan on using a Lithium battery in a location that may drop below 0°C / 32°F, you must be cautious as to when you attempt to charge the battery. Simply waiting for the temperature to raise during the day is a simple solution. Having the batteries mounted in a location that will have a higher ambient temperature than outside temperature is also advisable.

Having a battery management system that can monitor the batteries temperature will be beneficial and convenient. With the touch of a button you can see what the standing temperature of the battery is and therefore whether it is safe to charge.

TECH TIP

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