

LITHIUM IRON PHOSPHATE BATTERY SUMMARY



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INFORMATIONAL PURPOSES ONLY

OBJECTIVE

This document provides an overview of lithium iron phosphate (LiFePO₄) batteries and what you should know when integrating with Seakeeper. For more information, ABYC guidelines should be followed.

BENEFIT OF USING LiFePO₄ BATTERIES

Lithium batteries provide the following benefits:

- Last for over 3,000 cycles compared to several hundred cycles for AGM batteries
- About half the weight of the same amp-hour size AGM battery bank
- Discharge curve (voltage) is flatter than AGM batteries (maintains higher voltage longer)
- Can use typically 80% of battery capacity (amp-hour capacity) compared to AGM batteries where only roughly 60% of battery capacity can be used
- Available amp-hour capacity is negligibly affected based on change in amperage draw
- Only discharges about 2-3% capacity over a month if battery is not being used
- Max charge voltage is around 14.6V
- Accepts fast recharge and in most cases up to 100% of its own amp-hour capacity (200 amp-hour battery may be charged with a 200-amp charging source)

SAFETY CONCERNS

The main concern with lithium-ion batteries is thermal runaway when charging and discharging (this can lead to a destructive result).

- Too high of voltage can cause an internal short on the lithium metal anode
- Rapid charging at low temperatures or uncontrolled charging can also cause plating of the lithium metal on the anode
- If the battery is discharged too low the battery can short or even reverse polarity when recharging

There are several measures taken to protect the cells in lithium-ion batteries to prevent thermal runaway. Lithium batteries should not be installed without an internal or external disconnect switch and Battery Management System (BMS) which monitors the following:

- High or low voltage and high current protection from rapid charging
- Temperature (high and low temperature charging protection)
- Cell balancing to ensure cells in series remain at the same state of charge

DC Seakeeper's low voltage shutoff alarm does not work when power source is lithium-ion batteries

CHARGING LITHIUM-ION BATTERIES

The charging of LiFePO₄ batteries is a process that needs to be engineered for safety. There is danger in charging lithium batteries too quickly or at too low or high of a temperature. Battery management systems can protect the battery cells, but a current limiting electronic charge relay with reverse current protection should be used when the batteries are charged directly from engine alternators. As lithium batteries are very power hungry this also protects the alternator from overheating. Please reach out to Sales@seakeeper.com for more information regarding lithium-ion batteries.