

High Energy density Marine Energy Storgae System (ESS) Altus® -350

Altus®-350 Energy Storage System utilises next generation of Latium Iron-Phosphate cells with multiple micro controller module management system to monitor the cell state and voltage balancing among the cells. High efficiency of the module is achieved by operating the cells within their operating range of voltage, temperature and state of charging and discharging currents.



Batter management system offers micro controller states the art cell technology to provide you with up-to 7,500 cycles of energy storage. It is user friendly with following benefits it offers over the Lithium-Ion energy storage system

- A. Cost effective and user-friendly Lithium Iron Phosphate based energy storage system (Li-Po4 ESS) benefits from Lithium Iron Phosphate's inheritance property of strong energy density.
- B. Electrodes of Lithium Iron Phosphate cells does not heat up and have no risk of thermal runaway "Safe and worry-free operation"
- C. The following table shows the comparative benefits of Super capacitor-based energy storage system (SCESS), Lithium Iron

Phosphate (LiFePo4) and Lithium Ion based Energy Storage Systems.

(Although the supplier of Lithium Ion based energy storage system claims that in the event of thermal runaway their system will respond very quickly and safely shut down. But they can not avoid the event, if the shut down system fails, then what?).

ESS Compariosn Super-Capacitor, Lithium Iron Vs Lithium Ion Technologies			
Function	Spar Supercapacitor	Lithium Iron Phospahte (LiFePo4)	Lithium-ion (general)
Charge time	1-12 Minutes	30-60 minutes	60-120 minutes(See note-2)
Cycle life	250,000	7,500	500-3,000
Cell voltage	2.5V Nom. 2.75V Max.	3.2V nominal, 3.65V Max	3.2V nominal 3.6V max.
Service life (Industrial)	>20 years	5 to 10 years	5 to 10 years
Charge temperature	-40 to 65°C (-40 to 149°F)	0 to 45°C (32°to 113°F)	0 to 45°C (32°to 113°F)
Discharge temperature	-40 to 65°C (-40 to 149°F)	-20 to 60°C (-4 to 140°F)	-20 to 60°C (-4 to 140°F)
Ambient	0 deg. C	15-20 Deg C	15-20 Deg C
Danger of thermal runaway	None	None	High (see Note-1)
Depth of Discharge	100%	80%	80%
Environmental impact	None	Yes	Yes
Disposal Cost	None	Yes	Yes
Installation	Can be installed in the electrical room adjacent to power converter	Can be installed in the electrical room adjacent to power converter	Needs a searate battery room, due to thermal run away problem and need fire supression system

NOTES:

1. Charging and dischrng Lithium Ion batteries than 0.5C, tend to heat up the electrode and cuses thermal runaway.
By design it can be reduced to mitigate but the event can not be eliminated, which is inheriant to the design.
2. Lithium ion batteries are not safe, due to thermal runaway problem. For more information please click on the link

<https://www.google.com/search?source=univ&tbm=isch&q=images+of+Lithium+Ion+Battery+fires&client=firefox-b>

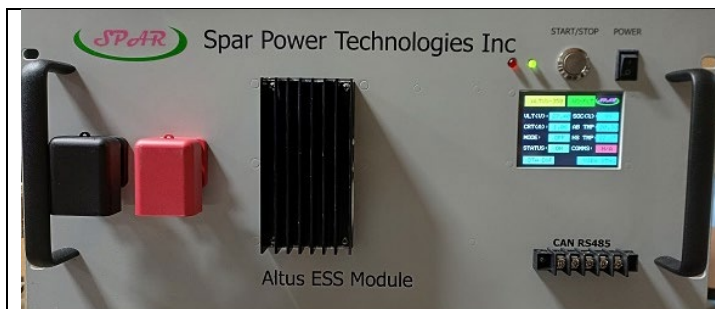
Applications:

The Altus®-350 ESS is modular and can be configured in any configuration for DC bus voltage and Energy storage capacity. System is suitable for both hybrid electric and all electric vessels include:

- Ferries
- Yachts
- Canal Boats
- Tourist Vessels
- Sightseeing Vessels

Features:

- Low C-rate for slow charging and discharging (0.5 to 1.5C)
- Modular Installation
- Hot swipe able modules
- 19-inch standard rack configuration
- Scalable for the vessel requirements
- Designed for Voltages up to 1500 VDC
- Enhanced EMI immunity design for maritime environments
- Modular Battery Management System (MBMS) with following protection functions:



Colour touch screen

Passive Cell Balancing

Under/Over cell voltage protection

Under/Overage String voltage protection

Over Current protection

Short circuit protection

Under/Over temperature protection