

# Seanergy<sup>®</sup> battery system

## High energy and high power Li-ion battery system

The Seanergy<sup>®</sup> battery system has been designed to suit the various power and energy requirements of a large variety of marine applications.

Its modular design allows to adapt the battery configuration:

- to any system voltage up to 1000 V,
- for floating or cycling applications,
- to any discharge pattern from high energy: energy requirements (hours or days of discharge) to very high power demands of seconds or minutes

### Applications

- Passenger vessels (cruise liners, ferries, Ro-Pax, urban transports)
- Workboats (tugs, offshore vessels, administration ships, fishing vessels)
- Inland shippings (river-sea shuttles, pushers/tugs, freight)
- Leisure vessels (mega yachts, medium size yachts)

### Seanergy<sup>®</sup> battery system

The Seanergy<sup>®</sup> battery system integrates power, safety, management and communication. It is a stand-alone rackable battery system, which offers the benefits of Saft Li-ion Super Iron Phosphate<sup>®</sup> technology in a qualified industrial design.

The Seanergy<sup>®</sup> battery system provides maintenance-free energy storage in a reduced volume, combining safety and high operational reliability with outstanding lifetime under the most difficult environmental conditions.

### Features

Unprecedented design flexibility through:

- Series connection of base modules to suit system voltages of up to 750 V maximum
- One unique control module per string, containing battery management and communication
- Parallel operation

### Highest energy/power density

- Seanergy<sup>®</sup> modules use battery cells LiFePO<sub>4</sub> VL 41M Fe 265 Wh/liter, or VL 30P Fe 200 Wh/liter high power cell

### Stand-alone system

- Integrating power, controls, communication and safety into a standard rack-assembly



Example of configuration:	1010 V Power	750 V Energy
<b>Nominal characteristics</b>		
Nominal voltage (V) (with 14 modules max)	880	647
Capacity (C/5) (Ah)	60	82
Minimum energy (C/5) (kWh)	49	50
Nominal energy (C/5) (kWh)	52	53
<b>Mechanical characteristics (standard cabinet with 14 modules)</b>		
Width max (mm)		600
Height max (mm)		From 24U to 47U
Depth (mm)		800
Weight (without cabinet) (kg)		560
Maximum weight (with cabinet) (kg)		750
<b>Electrical characteristics</b>		
Voltage window (V)	718 to 1010	529 to 745
Maximum charge voltage (V)	1010	750
Maximum discharge current (A)	240	180
Maximum charge current (A)	240 (Power) - 160 (Energy)	
Std charging time (h) at nominal current (95% State of Charge)	0.5 (Power) - 2 (Energy)	



### Smart operation

- State of charge and state of health indication
- Built-in battery control for efficient operation
- Redundant safety
- Comprehensive communication
- Compatible with standard rectifiers

### Benefits

- Optimized battery configuration whatever application requirements, due to modular architecture with standardized base elements
- No development cost and time due to configure customized battery solutions
- Reduced battery space and weight
- Easy installation and upscaling
- High operational reliability
- Optimized supervision strategy though remote control/diagnostic
- Very long lifetime
- Preventive but not premature replacement at end of life

### Safety

Redundant safety design to cope with component failure or abusive conditions:

- At cell level: no reaction in an abuse event with inert iron phosphate positive material, shutdown-effect separator, mechanical vent
- At module level: electronic board, individual cell voltage monitoring, module temperature monitoring, balancing, fuse
- At battery system level: electronic board, power switch, current sensor



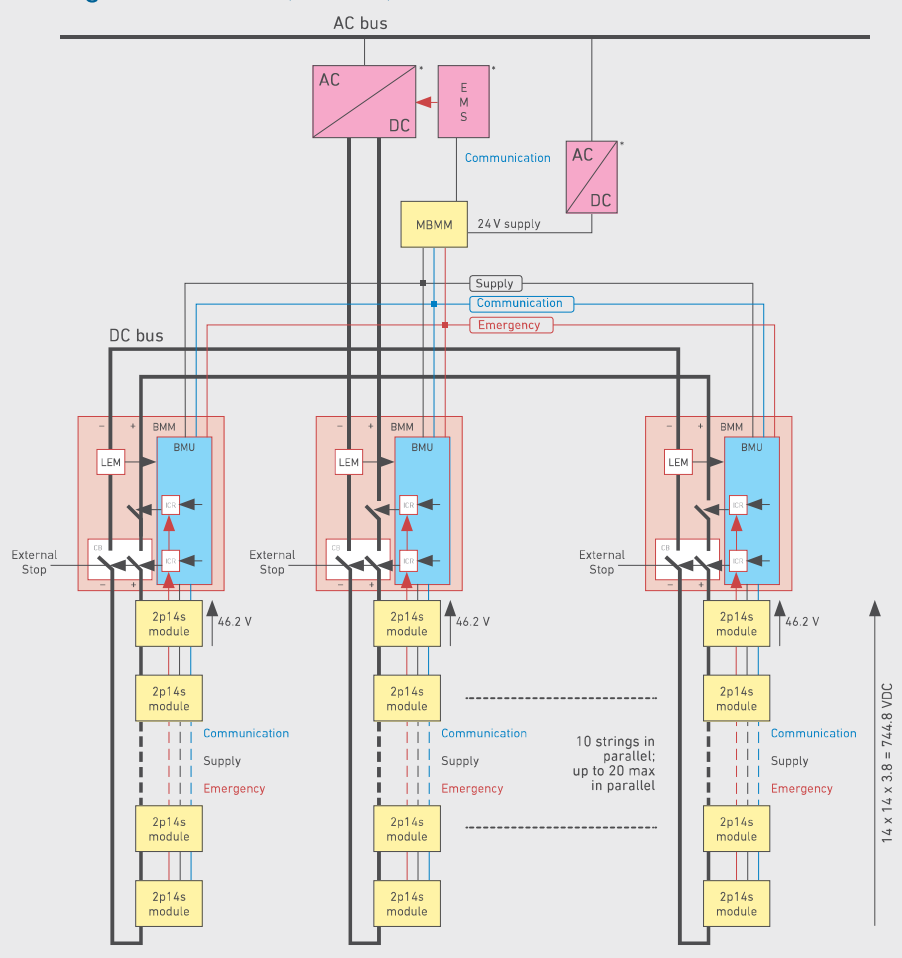
### Operating conditions

Lifetime at +20°C perm (+68°F)	20 years
Lifetime at +40°C (+104°F)	>10 years
Cycle life (depending on delta DoD%; +20°C/+68°F)	from 3000 to 1 million cycles
Operating temperature	-25°C/+55°C (-13°F/+131°F)
Storage temperature	-40°C/+55°C (-40°F/+131°F)

### Compliance to standards

Module safety	EN 50178, cCSAus 60950, IEC 60950
United Nation Class	UN 3480
Hazard classification	Class 9
Transportation regulation compliance	UN recommendations for dangerous goods transportation, model regulations and manual tests and criteria 38.3
EMC	EN 61000-4-2 Class B / EN 61000-4-3 Class A / EN 614000-4-4 Class B / EN 614000-4-6 Class A / EN 55022 Class B
Protection class	IP 22

### Example of a 500 kWh Battery System with a Master Battery Management Module (MBMM)



\* Not supplied by Saft  
\*\* Consult Saft

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