Seanergy® battery system

High energy and high power Li-ion battery system

The Seanergy® 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® battery system

The Seanergy® 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® technology in a qualified industrial design.

The Seanergy® 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® modules use battery cells $LiFePO_4$ 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
Nominal characteristics		
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
Mechanical characteristics (standard cabinet with 14 modules)		
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
Electrical characteristics		
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)

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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

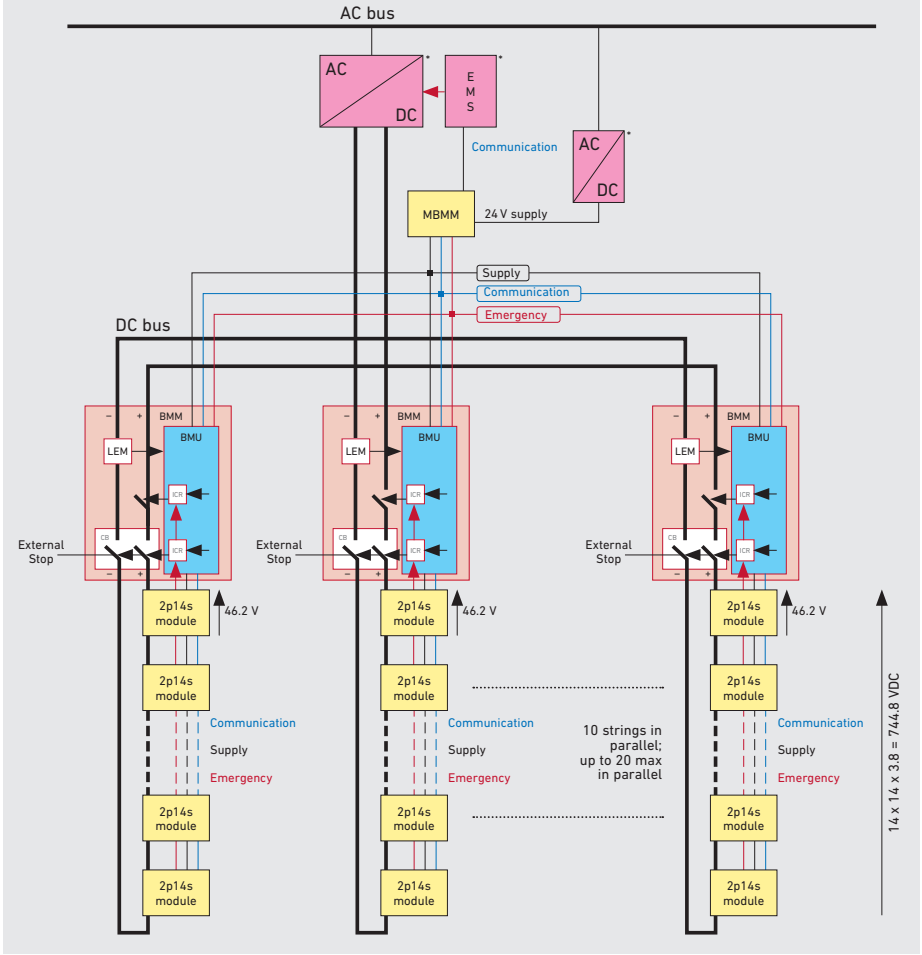
Safety

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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