

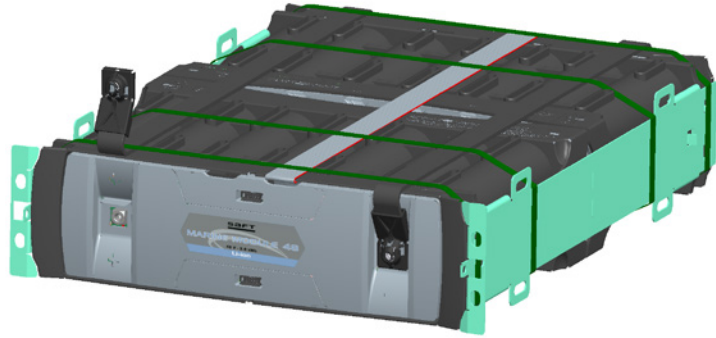
# Marine module 48

## High energy lithium-ion 3U standard

The Saft new marine module is the ideal choice for local energy management, particularly in conjunction with hybrid propulsion, photovoltaic and other renewable energy generators.

Built with proven Saft Li-ion Super-Iron Phosphate® (LiFePO<sub>4</sub>) technology, the marine module provides maintenance-free energy storage in a reduced volume, combining high operational reliability over thousands of cycles with outstanding energy efficiency. Its modular design allows adaptation of the battery configuration to various energy and voltage levels.

Saft always supplies Li-ion 3U module with an associated Battery Management System (BMS).



### Applications

- Hybrid-electric and/or full electric propulsion
- Auxiliary systems, hotel load
- Emergency back-up
- Actuators

### Benefits of the Li-ion technology

- Reduced mass and volume
- Very long calendar, storage and cycling life
- Faster charging time
- Maintenance-free
- Operates in any orientation
- No memory effect
- High power (continuous and pulses)

### Operational benefits

- Enable full electric propulsion with a compact volume (entering and exiting harbours and restricted areas)
- Load-levelling function to keep high level of fuel efficiency and reduced number of generating sets
- Standby power at shore
- Design flexibility (improved scalability and modularity)

Nominal characteristics	
Nominal voltage (V)	46.2
Minimum capacity (C/5) (Ah)	80
Capacity (C/5) (Ah)	86
Minimum energy (C/5) (Wh)	3640
Nominal energy (C/5) (Wh)	3900
Nominal volumetric energy density (Wh/l)	108
Nominal gravimetric energy density (Wh/kg)	99
Mechanical characteristics	
Width (mm)	448
Height (mm)	133
Depth (mm)	602.5
Weight (kg)	39.5
Electrical characteristics	
Voltage window (V)	37.8 to 53.2
Maximum discharge current (A)	180
Nominal charge current (A)	45
Recharge time (h) at nominal current (95% State of Charge)	2
Operating conditions	
Lifetime at +20°C perm (+68°F)	20 years
Lifetime at +30°C (+86°F)	>10 years
Cycle life (60% dod; +20°C/+68°F)	6000 cycles
Operating temperature	
Discharge	-25°C/+55°C (-13°F/+131°F)
Charge	0°C/+55°C (+32°F/+131°F)
Storage temperature	-40°C/+55°C (-40°F/+131°F)
Storage time	6 months
Compliance to standards	
Cell safety	UL 1642
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 20



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## Features

- Compact modules integrating VLE Fe Li-ion cells, module supervision and cell balancing
- Advanced industrial design offering highest reliability and robustness
- 20 years design life with high daily energy throughput
- Multiple cycling patterns from daily deep discharge to dynamic multiple charge/discharge profiles from any state of charge
- Best energy efficiency of all available energy storage systems
- State of charge and state of health indication (through BMM)
- 2-level redundant safety

## System capability

- Series connection of up to 750 V
- Battery string management and interfacing through separate BMM module
- Multi-string paralleling through MBMM to upscale battery energy

## Functional characteristics

Saft marine module technology contains VLE Fe cells with advanced nickel-based lithium-ion Super-Iron Phosphate® technology:

- Best safety among Li-ion chemistries
- Outstanding calendar and cycle life and reliability
- Stable internal resistance over entire life
- High capacity cell

## Mechanical & electrical interface

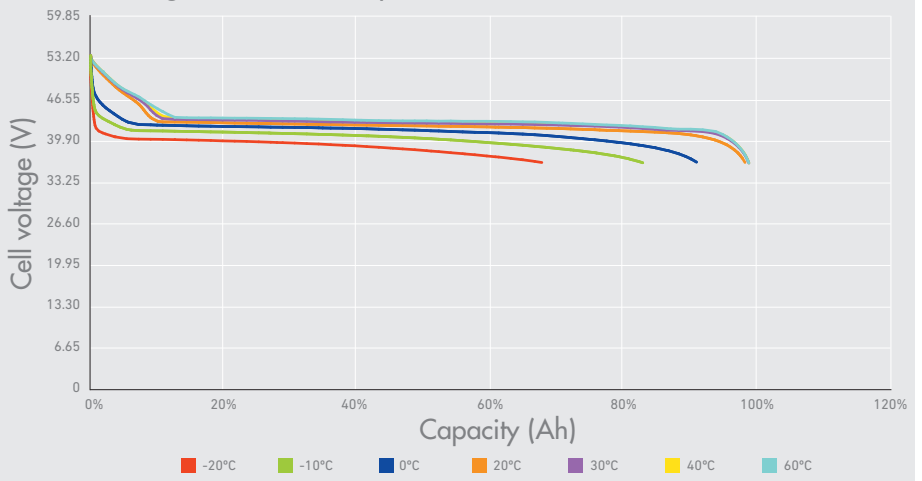
- Vertical or horizontal implementation
- Systems for 19" rack-mount in 3U height
- Stackable
- Optional 3U rack-mount brackets
- 2 screw terminals

## Safety

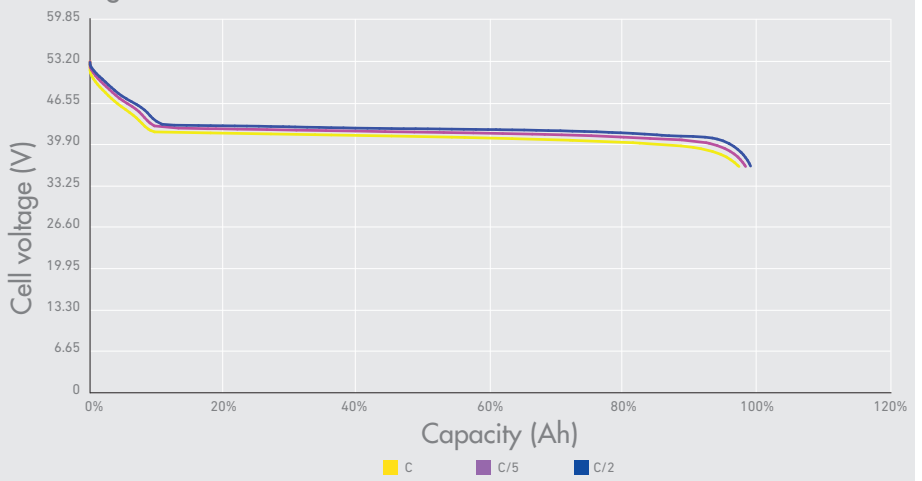
Redundant safety design to cope with component failure or abusive conditions:

- 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

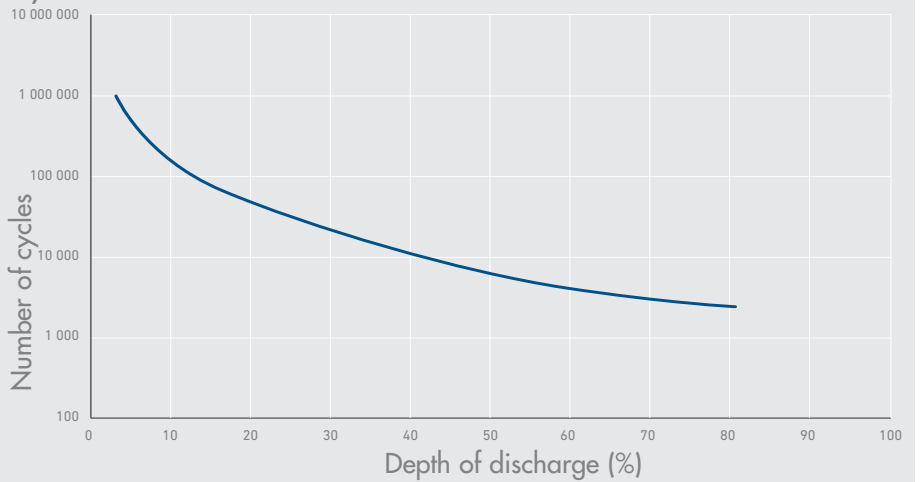
## C/5 discharge at various temperatures



## Discharge at 25°C at various rates



## Cycle life at +25°C / +77°F



## Saft

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