

Saft Ion-OnBoard® Regen Li-ion for Rail

Battery system 515 V - 218 kW

Innovative battery system for regenerative energy storage for light rail rolling stock.

Saft's Ion-OnBoard® Regen Li-ion battery system 515 V – 218 kW battery unit has a nominal voltage of 515 V and is able to provide high discharge capability up to 218 kW in 30 s and store 232 kW of regen power in 10 s.

One battery system consists of:

- 26 Saft **Modul'ion**®-12 (Mi 12-20.60 PFe) Super-Phosphate™ (SLFP) connected in series
- Power box equipped with a manual switch, contactor and fuses
- Liquid cooling system and, as an option, a BTMS ⁽¹⁾ for battery management

The **Modul'ion**®-12 and the power box are placed in a metallic box 'Long' type.



Applications

- For light rail systems: trams, streetcars and tram-trains
- To supply autonomous traction power for catenary free
- To store kinetic braking energy (regenerative braking) and reuse it for autonomous traction
- To maintain power quality for the local distribution network

Features

- Quick and high recharge capabilities (e.g. regenerative braking application)
- High life cycle performance
- Light weight and compact design for rail applications
- Robust construction withstanding onboard vehicle shocks and vibrations
- Liquid cooled system

Benefits

- High rate charge and discharge capability for an always available system
- Easy installation (roof mounted assembly)
- Minimum maintenance
- Reduced CO₂ footprint and saved energy

⁽¹⁾ BTMS: Battery Thermal Management System

Nominal characteristics	Values for 1 box
Li-ion module	Modul'ion ®-12 20.60 PFe
Number of modules in series	2 rows of 13
Voltage (Min/Max)	390 V – 601 V
Nominal voltage	515 V
Rated capacity at C ₅	56 Ah
Rated energy at C ₅	28.8 kWh
Energy at C	28.7 kWh
Mechanical characteristics	
Dimensions (without BTMS) L x W x H (mm)	1,713 x 1,385 x 300
Weight (without BTMS) (kg)	621
Cooling	Liquid cooled
Electrical characteristics at + 25°C	
Nominal continuous current/power in charge/discharge	150 A*/77 kW
Maximum pulse power:	
- in 10 s in charge	450 A/232 kW
- in 30 s in discharge	424 A/218 kW
Operating conditions	
Operating temperature	- 25°C to + 45°C (with BTMS)
Temperature for transport and storage	
- recommended	- 10°C to + 30°C
- possible	- 30°C to + 70°C
Maximum relative humidity	Up to 90%
Maximum sound power level	< or= 84.5 dB(A)

* Typical values. To be sized according to customer load and cycle profile



BMM ⁽²⁾ communication

- 2 power connections to railway equipment
- CAN Open bus communication protocol carrying:
 - State Of Charge (SOC)
 - State Of Health (SOH)
 - Alarms
 - Operating conditions (voltage, temperature)
 - Operating limits (maximum voltage and current values in charge and in discharge)
- CAN Black box registering alarms (overcurrent, overvoltage, high temperature) and the number of charge and discharge cycles

BTMS



Electrical connections

Data bus connection	CAN Open bus
Protection class for the battery box	IP 65
Protection class for the BTMS	IP 24
Fuse protection*	315 A
Electrical power connection	Pfisterer P2PS

Compliance to standards

Cell safety	UL 1642
Module safety	EN 50 178 / IEC 60 950
Shock and vibration	IEC 61 373 Cat 1 Class B
Fire and smoke	EN 45543-3/NFPA 130/SMP 800 C
Electrical insulation	NF EN 50 124-1
IP Protection	NF EN 60 529
Electrical safety	NF EN 50 155
E M C	NF EN 50 121-3-2
Welding	AWS D 1.1
Transportation qualification	UN 3480 - Class 9

* Typical values. To be sized according to customer load and cycle profile

Cooling system

Power	6 kW
Concentration of ethylene glycol	50%
Temperature control range	+ 15°C to + 45°C
Filling capacities	10 l
Operating weight	145 kg
Dimensions L x W x H (mm)	1,420 x 430 x 600

Battery box 'Long' type

Different numbers of **Modul'ion**[®]-12 Power (Mi -12-20.60 PFe) can be configured in the same battery box 'Long' type. Following characteristics can be achieved:

Number of modules MI 12 20-60 PFe	2 X 12	2 X 11
Nominal voltage	475 V	436 V
Maximum voltage	554 V	508 V
Minimum voltage	360 V	330 V
Rated energy at C ₅	26.6 kWh	24.4 kWh

Safety

Safety driven design for cells, modules and systems guarantees safe behavior in case of abuse usage or component failure. This includes:

- Stringent design rules and qualification
- Implementation of redundant safety features
 - at cell level (e.g. shutdown effect separator and mechanical vent)
 - at module level (e.g. electronic board, voltage and temperature monitoring, balancing)
 - at battery level (e.g. electronic board, power switch and current sensor)

⁽²⁾ BMM: Battery Management Module