

Saft Li-ion battery systems for off-road vehicles

Modular solutions to simplify electrification transition



Driving sustainability for off-road vehicles

Lithium-ion battery know-how

Saft's lithium-ion (Li-ion) battery know-how is focused on specific applications where electric drivetrains can ensure efficient, sustainable and cost-effective operation. The aim is to **reduce vehicle running costs** and **minimize carbon footprint** throughout an extended service life.

We understand that customers want flexible and adaptable solutions to suit a wide range of vehicles without needing a new battery for every project. With Saft, you get the building blocks to create ideal solutions for integration across multiple vehicles.

Saft's Li-ion battery systems for a wide range of industrial vehicles



Ground support equipment

- Meet stringent air-side safety standards
- Work reliably across extreme temperature range
- Compact to fit in any vehicle

Saft batteries installed and tested inside largest aircraft pulling tractors



Material handling

- Lower Total Cost of Ownership than lead acid
- Fast charge in less than one hour
- Compact to fit in any vehicle

Saft batteries energize more than 12,000 trucks around the world



Construction and mining

- Robust design
- Fast charge in less than one hour
- Compact to fit in any vehicle

Saft's 250 kWh mining battery can be charged in 20 minutes



Port equipment

- High power capability for heavy loads and regeneration
- Long cycle life

Saft-powered hybrid RTG cranes are handling 80 twenty-foot equivalent units (TEU) per day



Urban equipment

- R100-2 compatible
- Long life
- Robust design

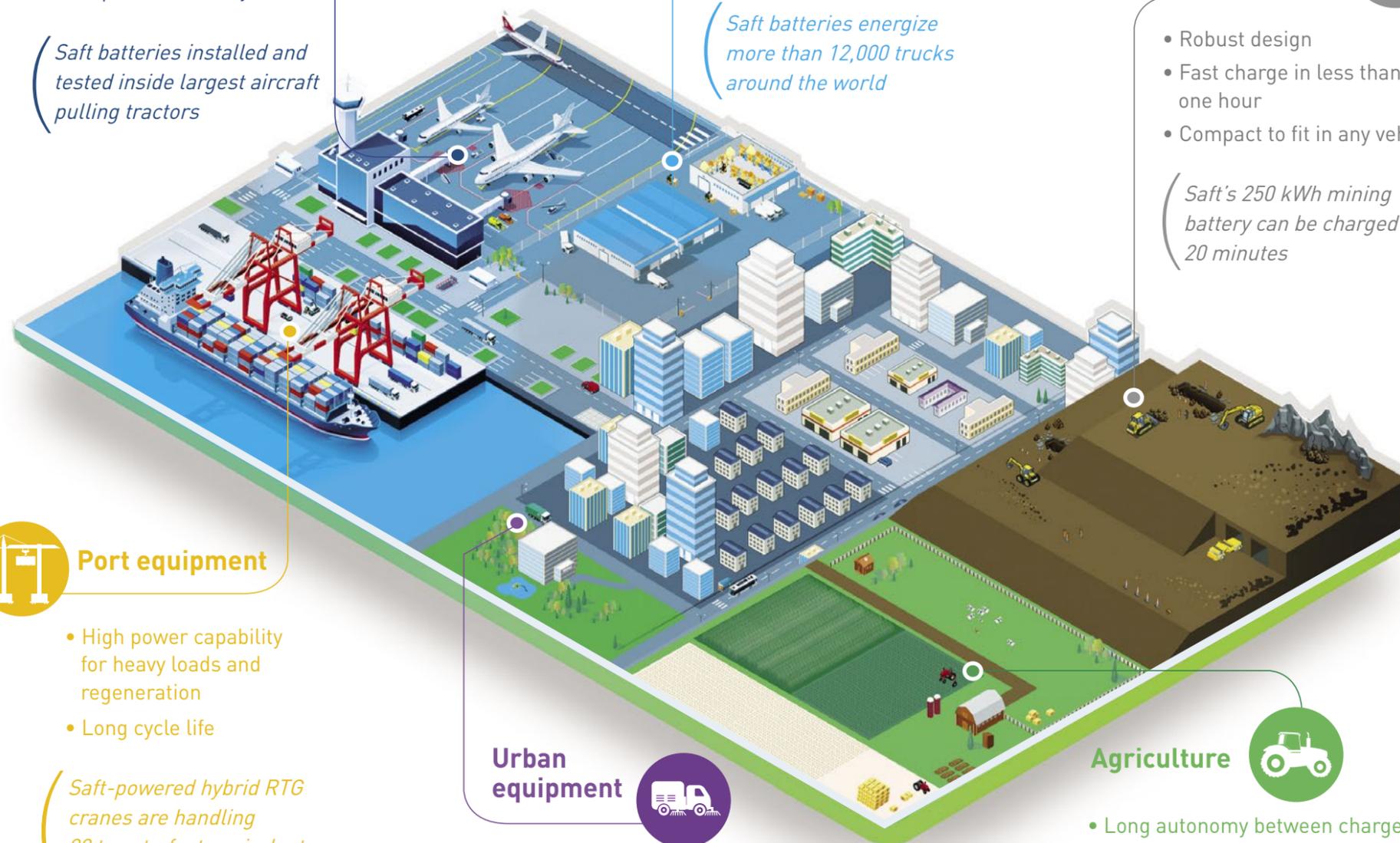
Saft batteries offer 6 minutes charging to PHEV buses across Europe and US



Agriculture

- Long autonomy between charges
- Long life
- Robust design

Saft batteries adapted to the future of agriculture robotic



High performance modular approach

ARROK's flexible and robust design allows the electrification of any off-road application. Its modular approach enables EV designers to closely match voltage, power and energy requirements. By basing our technology on advanced electrochemistries, we can either deliver fast charging in one hour with energy cell or within minutes with power cells with no compromise on battery life.

Compact batteries for compact applications



ARROK® LOW VOLTAGE



For 48 V powertrain



For 96 V powertrain

High Energy

1 hour charging	NMC Graphite
Battery voltage 51 V Nominal	Scalable Up to 118 V max
Battery energy 4,2 kWh	Scalable Up to 100 kWh
80A charging 100A discharging	Full BMS included
Compact design 216 Wh/L	Off-road design IP6K9K

Fit to any voltage range

Ultra fast charging



ARROK® HIGH VOLTAGE SYSTEMS



For powertrain up to 900 V



High Energy

1 hour charging	NMC Graphite
Battery voltage 51 V Nominal	Scalable Up to 882 V max
Module energy 4,2 kWh	Scalable Up to 750 kWh
80A charging 100A discharging	Full BMS in powerbox
Compact design 216 Wh/L	Off-road design IP6K9K

High power

12 minutes charging	NMC Titanate
Battery voltage 50 V Nominal	Scalable Up to 891 V max
Module energy 1,5 kWh	Scalable Up to 750 kWh
150A charging 150A discharging	Full BMS in powerbox
Long life 20 000 cycles at 4C/4C 80%	Off-road design IP6K9K

Our philosophy is to offer transferrable solutions. Once a customer has developed a drivetrain, their Saft battery system can be readily adapted to future vehicle programs.

Saft's Modul'ion® range

The Modul'ion® range is the ideal basis for off-road vehicle battery systems that require high power, fast charging in Iron-Phosphate chemistry.

The modules are available in 20 V and 40 V versions, which can be combined in series and parallel to create solutions of up to 900 V.

Medium Power		Power	
1 hour charging	sLFP Chemistry	12 minutes charging	sLFP Chemistry
Module voltage 20 V or 40 V Nominal	Scalable Up to 900 V max	Module voltage 20 V or 40 V Nominal	Scalable Up to 900 V max
Module energy 1,6 kWh	Scalable Up to 500 kWh	Module energy 1,2 kWh	Scalable Up to 400 kWh
82A charging 200A discharging	Full BMS in powerbox	140A charging 200A discharging	Full BMS in powerbox
Liquid cooled	IP20	Liquid cooled	IP20



Energy storage for always available charging power

Availability of charging power is just as critical as EV battery design. That's why we also offer energy storage systems (ESS) to optimize the supply of power

and energy for your vehicles. Saft's Intensium® Max containerized Li-ion battery solutions enable highly efficient local energy storage to support the charging infrastructure of off-road EV:

- Guarantee availability of high charging power when needed, even when grid connections are limited or in case of outages
- Enable storage of locally produced clean energy
- Help optimize your electricity bill by avoiding peak prices and/or participation in demand response programs

View Saft's Intensium® Max containers [▶](#)



Charging at TotalEnergies



Backed by its industrial capacity and technical know-how, TotalEnergies supports its customers' mobility by providing them with the energy they need, wherever they need it: at home, at workplace, on the road. In the context of the transport and energy transition, TotalEnergies offers concrete solutions helping to remove one of the main obstacles to this market growth: the deployment of charging infrastructure accessible to as many as possible.

TotalEnergies develops integrated solutions

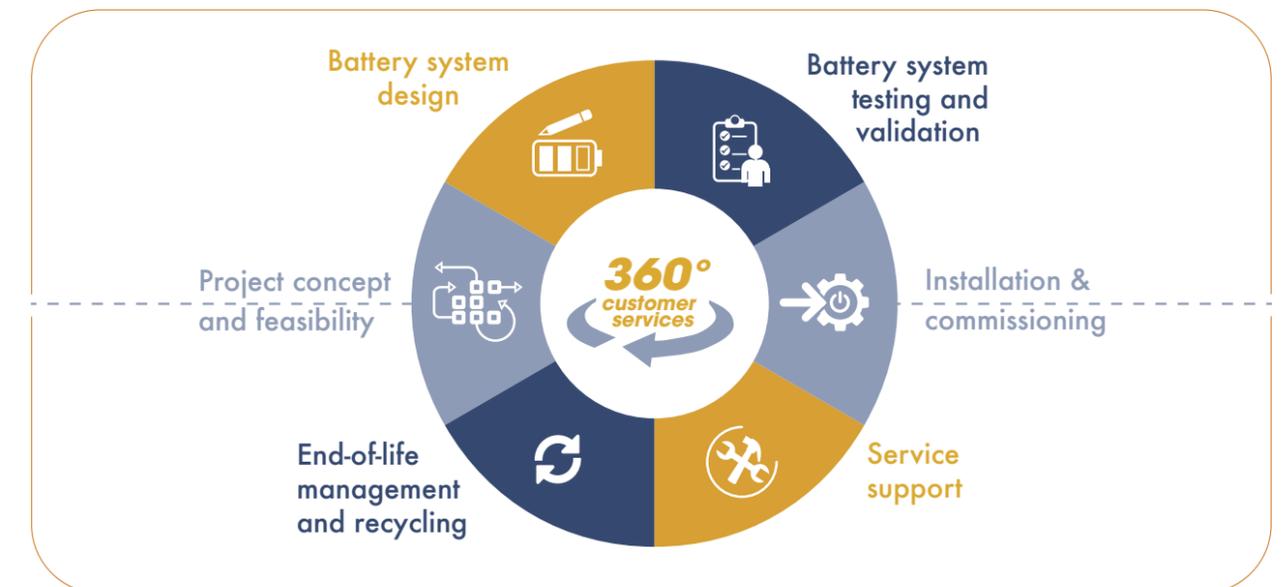
across the entire value chain, from the supply of low-carbonated energy to the charging service operation. We act as a charge point operator by managing the charge points installation and supervision, and the charging service operation. As a mobility service provider, the Group provides its professionals customers with solutions to access a large public charging network. We propose comprehensive and easy-to-use solutions for a seamless charging service.



more information evcharge.total [▶](#)

360° customer service and support

We support you at all stages of the battery lifecycle. Our goal is to help OEM customers and end users to maximize their return on investment.



At the cutting edge of technology

Soft has more than a century of experience in the development and volume delivery of industrial batteries including nickel based electrochemistry. Customers rely

on Soft's comprehensive expertise from cell chemistry to battery system design, combined with industrial-scale manufacturing capability to provide innovative EV solutions.

Key features and benefits of Soft's Li-ion battery systems

-  Fast charging for optimized vehicle utilization throughout its shift
-  Optimized cycle life to enhance Total Cost of Ownership
-  High rate charge and discharge enables efficient regenerative braking

-  Digital battery monitoring provides State of Charge (SOC) and State of Health (SOH) data for diagnostics
-  Cloud connectivity for remote monitoring and maintenance

Soft's track record in batteries for electric and hybrid vehicles



Soft's global footprint

Industrial scale manufacturing

Soft manufactures Li-ion battery systems on an industrial scale in Europe and the US. This includes multiple chemistries and cell configurations to suit various market requirements. Soft is also engaged in joint ventures with companies such as China's Tianneng Group to expand our global Li-ion manufacturing capability.

We have an off-the-shelf approach to suit the requirements of projects from small volumes to global-scale production.



Our cell technologies include:

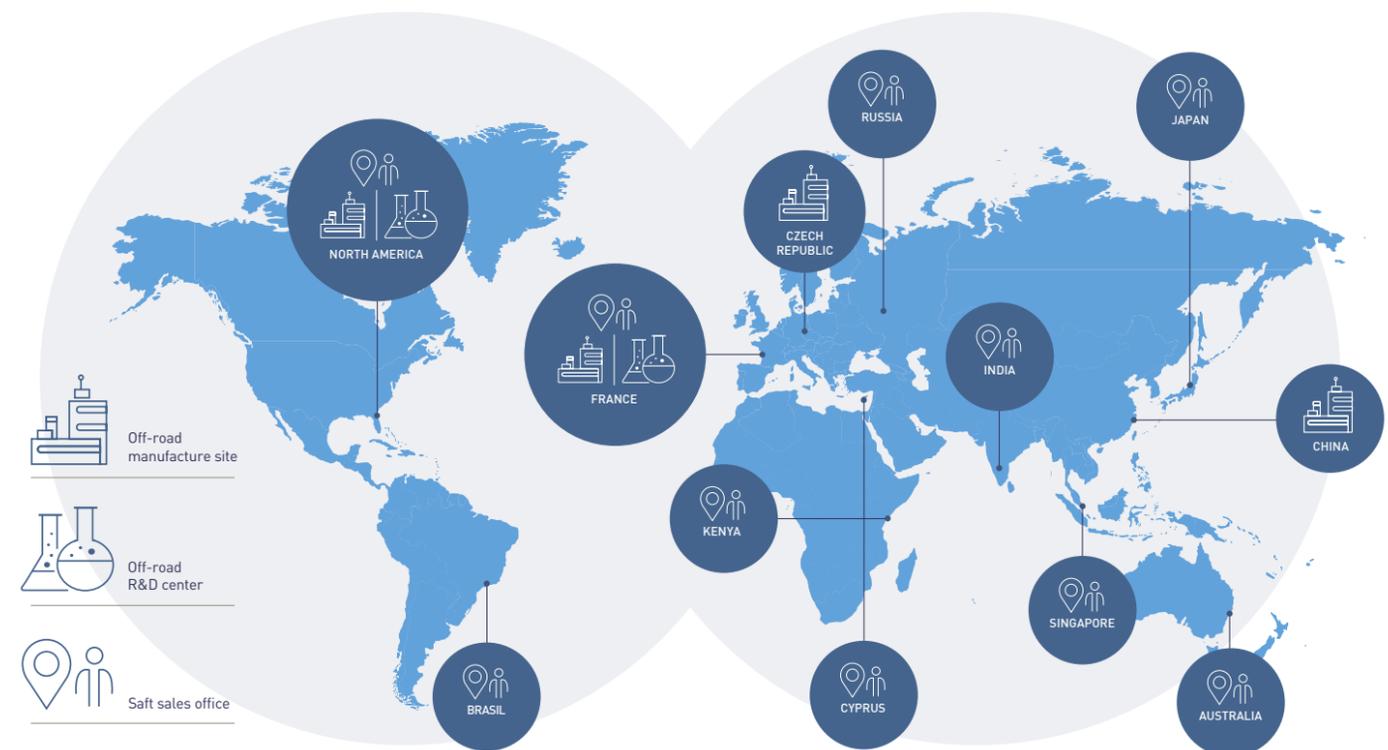
- Oxide-based cathodes: NCA, NMC, blends
- Titanate anodes
- sLFP® patented chemistry

Research and development

Soft is committed to a major ongoing investment in advanced R&D, with more than 10% of our sales being reinvested in research. Our multidisciplinary team of researchers includes chemists and engineers who are focused on fundamental research to refine, develop

and expand our leading-edge Li-ion technologies.

In addition, Soft created a technology incubator in 2016 to develop and foster ideas, produce proof of concept prototypes, de-risk innovation and accelerate product development.



Safety – our number one priority

Building a resilient safety chain that safeguards batteries from design to operation

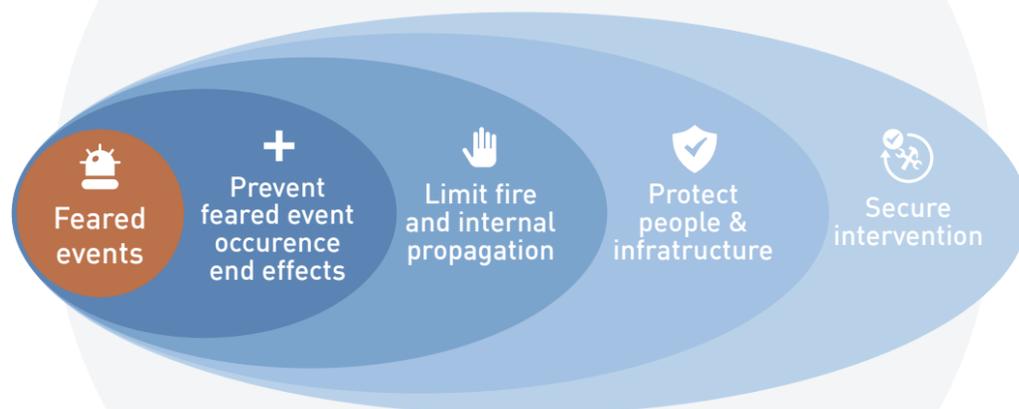


Safety is central to our philosophy and we take a holistic approach that covers risk analysis and mitigation, testing and certification. This encompasses everything from individual components to the complete system design and operation.



Safety at every step

Saft's design is based on detailed analysis of possible risks and their consequences, as well as mitigation measures at system and environment level. The objective is to minimize risk through exhaustive testing and certification.



Saft is committed to the highest standards of environmental stewardship

As part of its environmental commitment, Saft gives priority to recycled raw materials over virgin raw materials, reduces its plants' releases to air and water year after year, minimizes water usage, reduces fossil energy consumption and associated CO₂ emissions, and

ensures that its customers have recycling solutions available for their spent batteries. Saft assists users of its batteries in finding environmentally sound recycling solutions. Please contact your sales representative for further information.





Want to know more about
Saft off-road products? 



Saft

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