

**SAFT**



# Soft lithium product Selector guide

Connected Energy Division



**TotalEnergies**

# Saft, your trusted partner for reliable high-quality batteries

Saft is a battery maker like no other. From research to manufacturing and sales, we set the pace. In fact, Saft pioneered the development and production of both primary lithium cells and lithium-ion technology, and continues today to invest in the development of technologies and solutions that serve the evolving needs of its customers around the world.

When it comes to innovative, robust and reliable batteries, no one can match Saft. Your complex systems, your high-tech equipment and your state-of-the-art devices deserve batteries that are just as focused on performance and reliability as you are.

We serve a huge range of market sectors from IoT to utility metering, tracking, security and alarms, oil & gas, medical or military equipment, offering our lithium-based standard and customised battery systems for many different types of applications.

Beyond knowing you can trust the quality of our extremely wide range of primary and rechargeable lithium battery offer, manufacturers and OEMs can also count on Saft's teams of experts and their comprehensive services covering every step of the manufacturing cycle.

### Focused on innovation

For an advanced technology company such as Saft,

research and development are a constant. We are always building on our previous achievements and seeking ways to improve existing products and implement new technologies as customers' needs evolve.

### Quality as a way of life

Saft's founding strategy is to provide customers with the best battery solutions available. We implement best practices in all fields, and consider high performance and rigorous discipline as our standard operating procedure.

### Transport and safety

Saft's packaging, labeling and shipping practices conform to the highest levels of international standards governing battery testing and classification. This allows us to ensure safe and secure transportation and storage to anywhere in the world.



# A lithium battery that meets your application's needs

Whether you choose from one of our three primary lithium technologies or from our rechargeable lithium-ion range, Saft has the right lithium battery for your application.

	Primary lithium			Rechargeable lithium	
	Li-SOCl <sub>2</sub>	Li-SO <sub>2</sub>	Li-MnO <sub>2</sub>	Li-ion	Li-ion
	LS/LSH/LSP	LO/G	LM/M	MP	Small VL
<b>Internet of Things (IoT) &amp; Industrial Internet of Things (IIoT)</b> Smart parking sensors, Industrial IoT, environment monitoring equipment, dataloggers, smart energy management systems, smart building equipment	■		■	■	■
<b>Utility metering</b> Automatic meter reading (AMR), advanced metering infrastructure (AMI), traditional metering, smart metering systems for electricity, water, gas, and heat, fixed telecommunication devices for Wide Area Network	■		■	■	■
<b>Medical</b> Defibrillators, respirators & oxygen concentrators, monitoring equipment, mobile diagnostic equipment, infusion pumps, telemedicine equipment		■	■	■	
<b>Military &amp; defence</b> Portable radio communications, night vision equipment & thermal imagers, tactical engagement simulators, precision gunnery simulators, chemical agent detectors, field radars, munitions & firing systems, torches & lamps	■	■	■	■	■
<b>Oil &amp; gas</b> Measurement while drilling (MWD), logging while drilling (LWD), well completion & well production tools, subsea equipments, explosive atmosphere devices, seismic survey equipment, pipeline inspection gauges (PIG)	■		■	■	■
<b>Professional electronics</b> Professional handheld tools and portable devices, professional displays, ticketing & information kiosks, vehicle telematics	■		■	■	
<b>Security &amp; alarms</b> Home and pool surveillance, smoke and CO <sub>2</sub> detectors, locking systems, video surveillance, wireless sirens, call points, PIR presence detectors, glass break detectors, perimeter protection, biometric readers, contact-less card readers and complete wireless alarm systems.	■		■	■	
<b>Tracking</b> Asset tracking equipment, vehicle tracking systems, tollgate transponders	■	■	■		
<b>Marine &amp; signaling</b> Buoys, beacons, lighthouses, life jackets, oceanography	■	■	■	■	■

# Saft primary lithium

## An offer ranging from single cylindrical cells to complex battery systems

### Three distinct technologies

- Lithium-thionyl chloride (Li-SOCl<sub>2</sub>) for our LS/LSH/LSP cells (3.6 V)
- Lithium-sulfur dioxide (Li-SO<sub>2</sub>) for our LO/G cells (2.8 V)
- Lithium-manganese dioxide (Li-MnO<sub>2</sub>) for our LM/M cells (3.0 V)

### High and stable operating voltage

3.6 V for LS/LSP cells, 2.8 V for LO/G and 3.0 V for LM/M cells.

### Wide range of current capabilities

From a few microamperes base current to more than 10 A pulses for some LO/G and LM/M cells.

### Wide range of operating temperatures

From -60°C to +85°C, depending on cells, current drain and environmental conditions. Our LSH 20-150 cell will operate safely and reliably up to +150°C.

### Long shelf life

From less than 1 % to maximum 3 % annual capacity loss in storage at +20°C, after the cell's stabilization period.

### Extended operating life

Typically more than 5 years, and up to 20 years or more for some applications.

### High energy densities

Three to ten times greater than non-lithium systems.

### Excellent behavior in humid environments

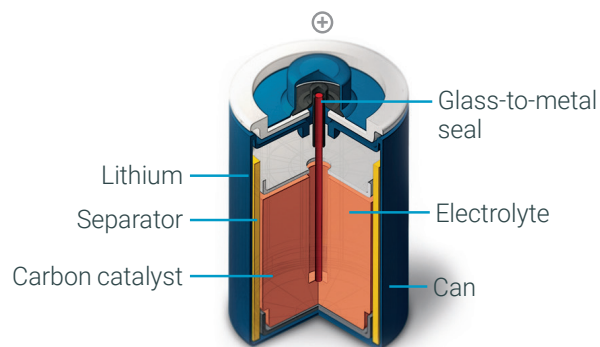
Corrosion-free, hermetically-sealed container.

### Safety

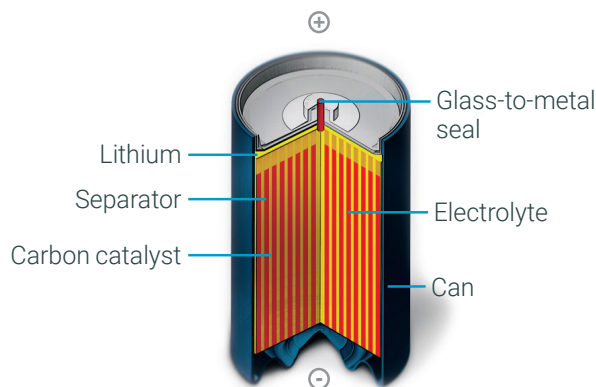
Saft's lithium cells meet UL and IEC standards UL 1642 and IEC 60086-4 and are certified in accordance with UN transport regulations. Most battery packs comply with European and US military standards. Several cell sizes from the (Li-SOCl<sub>2</sub>) LS and (Li-MnO<sub>2</sub>) M and LM product range have been independently assessed and relevant parts of IEC 60079-0 and IEC 60079-11 of the IECEx system. This allows them to be considered for applications in hazardous locations and potentially explosive atmospheres.

### High quality cell construction

- Stainless steel or nickel-plated cans
- Laser welding & glass-to-metal seals
- Safety vents
- Built-in fuses or PTC
- Shutdown separator



Bobbin construction (LS and LSP ranges)



Spiral construction (LSH, LM, M, LO, G range)

# Li-SOCl<sub>2</sub> product range

High energy, high voltage, high pulse capability, long life, wide temperature range

- Lowest self-discharge for extended operating life
- Well controlled passivation
- Operating temperature: -60°C to +150°C
- The LS cell product range has been independently assessed and tested to the relevant parts of IEC 60079-0 and IEC 60079-11 in the IECEx system. This allows them to be considered for applications in hazardous locations and potentially explosive atmospheres.
- Non-flammable electrolyte
- Excellent resistance to corrosion
- Low magnetic signature
- Bobbin LS cells are designed specifically for long term applications (5 to 20+ years), featuring a few  $\mu$ A base currents and periodic pulses, typically in the 5-150 mA range.
- Spiral LSH cells are designed for long term applications (2 to 10+ years), featuring low background currents



and periodic pulses (typically in the 50 mA to 2 A range) and for applications requiring continuous currents from 0.1 A to 1.8 A.

	ENERGY						POWER			HIGH TEMPERATURE	
	LS 14250	LS 14500	LS 17330	LS 17500	LS 26500	LS 33600	LSH 14 light	LSH 14	LSH 20	LSH 20 HTS	LSH 20 150
Cell size	1/2 AA	AA	2/3 A	A	C	D	C	C	D	D	D
Cell construction	Bobbin	Bobbin	Bobbin	Bobbin	Bobbin	Bobbin	Spiral	Spiral	Spiral	Spiral	Spiral
Nominal voltage	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V
Nominal capacity	1.2 Ah	2.6 Ah	2.1 Ah	3.6 Ah	7.7 Ah	17.0 Ah	3.6 Ah	5.8 Ah	13.0 Ah	11.0 Ah	14.0 Ah
Max. continuous current	35 mA	50 mA	25 mA	100 mA	150 mA	250 mA	1.3 A	1.3 A	1.8 A	1.0 A	300 mA
Max. pulse discharge rate	0.1 A	0.25 A	0.12 A	0.25 A	0.3 A	0.4 A	2.0 A	2.0 A	4.0 A	3.0 A	0.5 A
Max. outside diameter	14.55 mm	14.55 mm	16.5 mm	17.13 mm	26.0 mm	33.4 mm	26.0 mm	26.0 mm	33.4 mm	33.4 mm	32.05 mm
Max. height	25.15 mm	50.3 mm	33.4 mm	50.9 mm	50.4 mm	61.6 mm	50.4 mm	50.4 mm	61.6 mm	61.6 mm	61.7 mm
Typical weight	8.9 g	16.7 g	14.4 g	21.9 g	48 g	90 g	51 g	51 g	100 g	100 g	104.5 g
Operating temperature range	-60 / +85°C	-60 / +85°C	-60 / +85°C	-60 / +85°C	-60 / +85°C	-60 / +85°C	-60 / +85°C	-60 / +85°C	-60 / +85°C	-60 / +85°C	-40 / +150°C

Typical values relative to cells stored for one year or less at +30°C max; Performances vary according to discharge characteristics (current, duration, frequency), temperature conditions, storage conditions prior to usage and applications acceptable minimum voltage.



The hybrid LSP range consists of a LS bobbin cell assembled in parallel with a pulse support component, selected to sustain high amplitude / long duration pulses. Please, consult Saft.

	HIGH PULSE				
	LSP 14500-20F	LSP 17330-20F	LSP 17500-20F	LSP 26500-20F	LSP 33600-20F
Cell size	AA	2/3A	A	C	D
Cell construction	Hybrid	Hybrid	Hybrid	Hybrid	Hybrid
Nominal voltage	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V
Nominal capacity	2.6 Ah	2.1 Ah	3.6 Ah	7.7 Ah	17.0 Ah
Max. continuous current	50 mA	25 mA	100 mA	150 mA	250 mA
Typical Pulse Capability	1 A for 3 seconds at +20°C to 2 V				
Max. outside diameter	15.2 mm	17.5 mm	17.5 mm	26.5 mm	33.5 mm
Max. height	52.7 mm	35.5 mm	52.5 mm	51.5 mm	62.5 mm
Typical weight	22 g	20 g	28 g	52 g	92 g
Operating temperature range	-20 / +70°C	-20 / +70°C	-20 / +70°C	-20 / +70°C	-20 / +70°C

Typical values relative to cells stored for one year or less at +30°C max; Performances vary according to discharge characteristics (current, duration, frequency), temperature conditions, storage conditions prior to usage and applications acceptable minimum voltage.



# IOTSENS Gimeno IoT division Case study

## Reliable power protects Saudi Arabia's water resources

IoTSENS provides Internet of Things scalable and interoperable vertical solutions to collect and exchange data connecting physical world with digital world resulting in improved efficiency, accuracy and economic benefit. The company needed to find a reliable power source for data loggers in harsh environments.



Because drinking water is a scarce resource in Saudi Arabia, the country's government has established a project to optimize and streamline consumption. An important part of this is the network of Watchmeter data loggers supplied by IoTSENS, that creates and develops integrated solutions for smart cities.

By sensing and monitoring high-frequency vibration in the water distribution network, the Watchmeter units monitor consumption patterns without having to break into water mains to install an inline meter. The result is that customers can monitor and control their own consumption.

However, the Saudi climate represents a challenge as heat causes many batteries to experience premature ageing.

IoTSENS turned to Saft's high-power LSH 20 primary lithium battery as the ideal solution thanks to its exceptional pulse capability and long design life that builds on Saft's 30-year plus expertise in Li-SOCl<sub>2</sub> technology. The LSH 20 also has the proven capability to deliver high performance over extreme temperatures.

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***"We needed a solution that could work in the tough conditions experienced in Saudi Arabia. Saft's unique LSH 20 batteries were simply the only solution."***

***Ignacio Llopis, Managing Director of IoTSENS***

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### Key benefits for IoTSENS

- Proven reliability in harsh environment
- High quality and in real time information on water usage
- ROI objectives met with liters of water saved
- Risk mitigation with the choice of mature technology

# Li-SO<sub>2</sub> product range

## High power, excellent functionality in cold environments

- Operating temperature: -60°C to +70°C
- Non-flammable electrolyte
- Superior pulse capacity
- Excellent capacity above 1 A
- Superior power at -40°C
- Wide acceptance for military use
- Well controlled passivation
- Low self-discharge during storage
- Excellent energy density under high discharge rates
- Fully hermetic seals up to +95°C
- LO/G spiral cells are designed for applications featuring continuous currents in the 0.1-5 A range, with pulses as high as 20 A.



	POWER						HIGH POWER			
	LO 34 SX	LO 35 SX	LO 40 SX	LO 26 SX	LO 26 SXC	LO 25 SX	LO 29 SHX	LO 43 SHX	LO 30 SHX	LO 26 SHX
Cell size	1/3 C	2/3 C	2/3 thin D	D	D	Fat D	C	5/4 C	Thin D	D
Cell construction	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral
Nominal voltage	2.8 V	2.8 V	2.8 V	2.8 V	2.8 V	2.8 V	2.8 V	2.8 V	2.8 V	2.8 V
Nominal capacity	1.0 Ah	2.2 Ah	3.5 Ah	7.75 Ah	9.2 Ah	8.0 Ah	3.75 Ah	5.0 Ah	5.75 Ah	7.5 Ah
Max. continuous current	0.5 A	2.0 A	2.0 A	2.5 A	2.5 A	2.5 A	2.5 A	2.5 A	3.0 A	4.0 A
Max. pulse discharge rate	1.0 A	5.0 A	5.0 A	5.0 A	10.0 A	10.0 A	6.0 A	10.0 A	10.0 A	15.0 A
Max. outside diameter	25.6 mm	25.9 mm	28.95 mm	34.2 mm	34.2 mm	39.5 mm	25.6 mm	26.0 mm	29.1 mm	34.2 mm
Max. height	20.45 mm	35.9 mm	42.29 mm	59.3 mm	59.3 mm	50.3 mm	50.4 mm	59.2 mm	62.5 mm	59.3 mm
Typical weight	16 g	30 g	40 g	85 g	85 g	96 g	40 g	53 g	63 g	85 g
Operating temperature range	-40 / +70°C	-60 / +70°C	-60 / +70°C	-60 / +70°C	-60 / +70°C	-60 / +70°C	-60 / +70°C	-60 / +70°C	-60 / +70°C	-60 / +70°C

Typical values relative to cells stored for one year or less at +30°C max; Performances vary according to discharge characteristics (current, duration, frequency), temperature conditions, storage conditions prior to usage and applications acceptable minimum voltage.



	POWER				
	G 06/6	G 36/2	G 52/3	G 54/3	G 26/2
Cell size	AA	Long A	C	5/4 C	D
Cell construction	Spiral	Spiral	Spiral	Spiral	Spiral
Nominal voltage	2.8 V	2.8 V	2.8 V	2.8 V	2.8 V
Nominal capacity	0.95 Ah	1.7 Ah	3.2 Ah	5.0 Ah	7.75 Ah
Max. continuous current	0.5 A	1.5 A	2.5 A	2.5 A	2.5 A
Max. pulse discharge rate	0.8 A	2.5 A	5.0 A	5.0 A	5.0 A
Max. outside diameter	14.2 mm	16.3 mm	25.6 mm	25.6 mm	34.5 mm
Max. height	50.3 mm	57.7 mm	49.5 mm	60.2 mm	59.8 mm
Typical weight	15 g	18 g	47 g	58 g	85 g
Operating temperature range	-60 / +70°C	-60 / +70°C	-60 / +70°C	-60 / +70°C	-60 / +70°C

Typical values relative to cells stored for one year or less at +30°C max; Performances vary according to discharge characteristics (current, duration, frequency), temperature conditions, storage conditions prior to usage and applications acceptable minimum voltage.



# Daniamant Case study

## Daniamant equip their RL5 Liferaft lights with Saft LO 26 SX batteries- a reliable solution that resists extreme temperatures for navigation in polar waters.

Daniamant has made 'Safety at Sea' its motto. The company has, over the years, become the specialist and world leader in the design, manufacture and sale of Survivor Location Lights, Salinometers and BNWAS for commercial deep-sea vessels, cruise and ferry ships, yachts and military vessels.

Trusting in your safety equipment is a prerequisite when you are at sea. You need to be able to rely completely on your life saving devices, knowing that they will resist the toughest elements, extreme temperatures, and vibrations. This is even truer when you are navigating in polar waters. The company was challenged with creating reliable, long-life safety liferaft lights, capable of instantly activating themselves even in extreme temperatures.

**Daniamant RL5 Liferaft light** is a compact combined internal and external light for liferafts. It can be easily fixed to the raft, and includes a single point of activation for both internal and external lights. Once activated, the lights are individually controllable. This survivor location light uses LED technology and is designed to withstand the harshest environments.



It has been tested to - 52C° in readiness for use in these extreme conditions. It is completely watertight, corrosion resistant and delivers a minimum of 12 hours of light duration, as required by IMO SOLAS regulations. The device also has a lifetime guarantee of 5 years.



An application such as this, designed for emergency situations, presents a number of challenges for a battery. Indeed, at - 52°C, the electrochemical efficiency is slowed down, which can create low voltage readings. And, since most of the time, the device is in sleep mode, the battery has to work hard to instantly activate both lights without any time lag. More than a technical hindrance, it is a question of life and death.

Saft's LO 26 SX (Li-SO<sub>2</sub>) batteries deliver high power and excellent functionality in cold environments. The spiral construction and a well-controlled passivation offer a superior pulse capacity, ensuring an instantaneous activation, even after long sleep periods. The cells are hermetically sealed, which protects them even at very high or very low temperatures. Their excellent energy density under high discharge rates allows Daniamant to include a 5 year lifetime guarantee of the device to their customers.

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***"We have been equipping our products with Saft batteries for over 15 years. Their batteries deliver the expected quality at all time which is paramount when you develop safety devices. Their extensive test data and product knowledge are a real advantage to support our efforts to meet international standards."***

***Kevin Rough CEO, Daniamant***

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# Li-MnO<sub>2</sub> product range

## High power and high energy with no passivation

- Operating voltage: 3.0 V
- Operating temperature: -40°C to +85°C
- Spiral construction
- Non-corrosive electrolyte
- Cells non-pressurised at room temperature
- High pulse capability
- Minimal voltage delay
- Competitive capacity at high current and low temperatures (-40°C)
- Low self-discharge compatible with long storage duration and extended operating life
- Spiral cells designed specifically for applications featuring continuous currents in the 0.1-5 A range, with pulses as high as 10 A.
- Excellent resistance to passivation, even after long-term storage in uncontrolled temperature environments.



	POWER							HIGH POWER		
	M 52	M 52 CV	M 56	M 19	M 20	M 20 CV	M 62	M 52 HR	M 19 HR	M 20 HR
Cell size	C	C	5/4 C	Short D	D	D	DD	C	Short D	D
Cell construction	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral
Nominal voltage	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V
Nominal capacity	5.6 Ah	5.3 Ah	6.7 Ah	10.3 Ah	12.6 Ah	12.5 Ah	33.0 Ah	4.8 Ah	10.3 Ah	11.5 Ah
Max. continuous current	2.0 A	2.0 A	2.5 A	3.0 A	3.5 A	3.5 A	6.0 A	2.0 A	4.0 A	4.0 A
Max. pulse discharge rate	4.0 A	4.0 A	6.0 A	7.5 A	8.0 A	8.0 A	12.0 A	5.0 A	10.0 A	10.0 A
Max. outside diameter	26.2 mm	25.7 mm	26.2 mm	33.5 mm	34.2 mm	33.8 mm	42.5 mm	26.2 mm	33.5 mm	34.2 mm
Max. height	51.5 mm	51.5 mm	61.5 mm	58.5 mm	61.5 mm	61.5 mm	133 mm	51.5 mm	58.5 mm	61.5 mm
Typical weight	58 g	59 g	70 g	105 g	117 g	120 g	355 g	59 g	107 g	117 g
Operating temperature range	-40 / +72°C	-40 / +72°C	-40 / +72°C	-40 / +72°C	-40 / +72°C	-40 / +72°C	-40 / +72°C	-40 / +72°C	-40 / +72°C	-40 / +72°C

Typical values relative to cells stored for one year or less at +30°C max; Performances vary according to discharge characteristics (current, duration, frequency), temperature conditions, storage conditions prior to usage and applications acceptable minimum voltage.



	POWER				ATEX/IECEx certified*	
	LM 17130	LM 17500	LM 26500	LM 33600	M 52 EX SV*	M 20 EX SV*
Cell size	1/3 A	A	C	D	C	D
Cell construction	Spiral	Spiral	Spiral	Spiral	Spiral	Spiral
Nominal voltage	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V
Nominal capacity	0.5 Ah	3.0 Ah	7.4 Ah	13.4 Ah	5.6 Ah	12.4 Ah
Max. continuous current	0.3 A	1.5 A	2.0 A	4.0 A	2.0 A	3.5 A
Max. pulse discharge rate	0.4 A	2.0 A	4.0 A	8.0 A	4.0 A	8.0 A
Max. outside diameter	16.7 mm	17.5 mm	26.0 mm	33.7 mm	26.2 mm	34.2 mm
Max. height	16.33 mm	51.5 mm	51.5 mm	61.3 mm	51.5 mm	61.5 mm
Typical weight	8 g	28 g	61 g	113 g	58 g	115 g
Operating temperature range	-40 / +70°C	-40 / +85°C	-40 / +85°C	-40 / +85°C	-40 / +72°C	-40 / +72°C

Typical values relative to cells stored for one year or less at +30°C max; Performances vary according to discharge characteristics (current, duration, frequency), temperature conditions, storage conditions prior to usage and applications acceptable minimum voltage.



\*Cells with ATEX/IECEx component certificates according to (EN) IEC 60079-0 /-11 and manufactured under the standard ISO/IEC 80079-34 (Explosive atmospheres - Part 34: Application of quality management systems for Ex Product manufacture).

# ALSTOM Case study

## Keeping trains on track with innovative predictive maintenance

Alstom is one of the world's leading integrated transport systems' company. The company is paving the way for predictive maintenance.

Among other projects, their R&D department has developed an IoT solution that offers real-time monitoring of crucial elements in high speed trains: rotating elements, such as axle-boxes, gear-boxes, blowers, motor bearings and wheels.

The device, Motes, is an inspection product based on a network of intelligent wireless sensors that capture the acceleration of rotating machines and trigger specific analysis processes according to maintenance needs.



The embedded Motes accelerometer makes these devices an optimal solution monitoring vibrations and providing health indicators for all Rolling Stock rotating elements through Edge Computing. The Motes sends the Health Indicators to Health Hub using a LoRa gateway. Its objective is to ensure the passengers' safety and to optimize train maintenance operational costs. Alstom needed to find a reliable autonomous power solution capable of withstanding high pulses, vibrations, and multiple temperatures.

Operating conditions featuring high temperatures and constant vibration, were two of the main reasons that led Alstom Transport to choose Saft's LM 17500 batteries for their device.

They tested different scenarios of battery combinations to make sure their chosen power supply could perform well under any weather conditions and in high vibrating environments as the monitoring solution is designed to be installed on trains anywhere in the world, above or below the ground. The device needed high peak current power supplies to enable frequent data communication and Alstom Transport was looking at a 3 year minimum battery lifetime. These factors, led us to recommend using the LM range that delivers on all fronts. We designed the battery and our Spanish partner, Amopack, assembled it, ensuring stock availability, rapidity, and flexibility.

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***"Saft customized battery solution fitted perfectly with our technical requirement!"***

***Jordi Lafuente, R&D Engineer at Alstom Transport***

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## Key benefits for Alstom Transport

- 3 years+ operating lifetime guaranteed
- Reliable solution for complete security of a mission-critical IoT railway application
- A ruggedized solution compatible with high vibration environment and extreme temperatures

# Saft rechargeable lithium-ion

## Cutting-edge technology for high performance

### Two distinct technologies

Lithium mixed oxide (NMC/NCA) for MP xlr and VL xlr (energy applications), with the MP ise specially designed as an ATEX compatible component. NMC technology for MP xtd (extended life and temperatures).

### Extended operating life

In most circumstances, Saft's Li-ion technologies will more than double the operating lifetime as compared to competitor's cells. This extended life can take place over a broad temperature range, beyond that of most commercial cells.

### Wide temperature range

Saft's Li-ion technologies offer unique performances in unregulated outdoor conditions or in extreme conditions, either hot or cold.

### Rugged design

Saft's Li-ion cells and batteries are designed to meet the harsh environments of industrial & defence applications.

### Safety

All of Saft's Li-ion cells meet the relevant UL and IEC standards, and are certified in accordance with UN transport regulations. Our military batteries comply with European and US military standards. Saft's MP ise cells are compatible with IEC 60079-11 requirements for intrinsic safety. Contact Saft for further details.

### Flexibility of design

A range of formats including prismatic and cylindrical.



### High quality cell construction

MP xtd and MP ise cells have an aluminium can, while the MP xlr and VL xlr cells have a stainless steel can. All cell designs have a safety vent, circuit breaker and shutdown separator.

Diagram MP xtd/ise cells

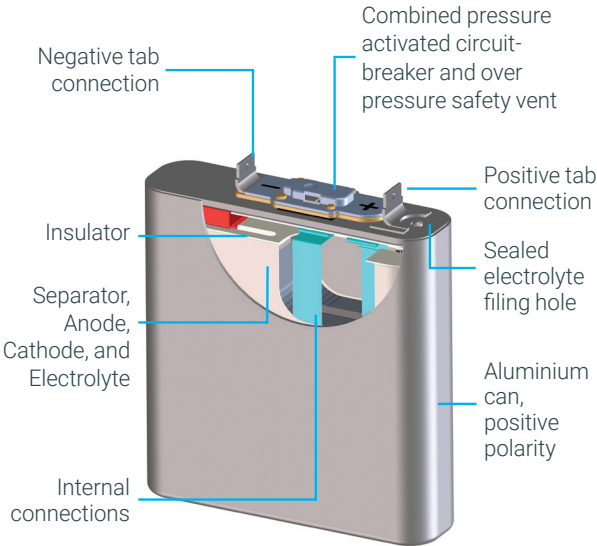
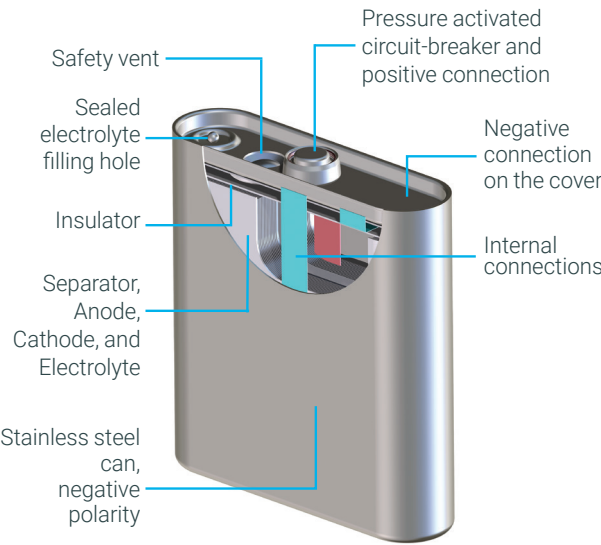


Diagram MP xlr cells



# Li-ion product range

## Greater energy density, wider temperature range and longer life

- Extended lifetime in cycling, floating and calendar conditions, even at high temperature
- Unrivalled operating temperature range:
  - 35°C to + 60°C for Saft's MP xlr range and
  - 40°C to + 85°C for Saft's MP xtd range
- High operating voltage: 4.2 V - 2.5 V range
- Unrivalled low and high temperature performance
- High energy density: up to 364 Wh/l and 165 Wh/kg
- Maintenance-free reliability
- Low life cycle cost
- Powering portable equipment in potentially explosive atmospheres: Saft's MP ise cells are compatible with IEC 60079-11 requirements for intrinsic safety. Consult Saft for further details.

	ENERGY				EXTENDED LIFE & TEMPERATURE	
	VL 34570 xlr	MP 144350 xlr	MP 174865 xlr	MP 176065 xlr	MP 174565 xtd	MP 176065 xtd
<b>Form factor</b>	Cylindrical D	Prismatic	Prismatic	Prismatic	Prismatic	Prismatic
<b>Nominal voltage</b>	3.65 V	3.65 V	3.65 V	3.65 V	3.65 V	3.65 V
<b>Nominal capacity</b>	5.4 Ah	2.6 Ah	5.3 Ah	6.8 Ah	4.0 Ah	5.6 Ah
<b>Max. continuous discharge current</b>	11.0 A	5.0 A	10.0 A	14.0 A	8.0 A	11.0 A
<b>Max. pulse discharge rate</b>	21.0 A	10.0 A	21.0 A	27.0 A	16.0 A	22.0 A
<b>Max. charge current</b>	5.4 A	2.6 A	5.0 A	6.8 A	4.0 A	5.6 A
<b>Cycle life</b> <i>(Cycled to 70 % of the cells original capacity)</i>	>3600 (100 % DoD, C/2-C/2, + 20°C)	1100 (100 % DoD, C-C/2, + 20°C)	950 (100 % DoD, C-C/2, + 20°C)	1800 (100 % DoD, C-C/2, + 20°C)	2700 (100 % DoD, C-C/2, + 25°C)	2700 (100 % DoD, C-C/2, + 25°C)
<b>Typical weight</b>	130 g	66 g	121 g	150 g	97 g	135 g
<b>Discharge temperature range</b>	- 35 / + 60°C	- 35 / + 60°C	- 35 / + 60°C	- 35 / + 60°C	- 40 / + 85°C	- 40 / + 85°C
<b>Charge temperature range</b>	- 30 / + 60°C	- 30 / + 60°C	- 30 / + 60°C	- 30 / + 60°C	- 30 / + 85°C	- 30 / + 85°C

Typical values relative to cells stored for one year or less at + 30°C max; Performances vary according to discharge characteristics (current, duration, frequency), temperature conditions, storage conditions prior to usage and applications acceptable minimum voltage.



IECEx certified component cells and batteries - IEC 60079-11 (10.5.2 and 10.5.3 (b))				
	MP 174565 ise <sup>1</sup>	MP 176065 ise <sup>1</sup>	1s1p INT174565 isr FL	1s1p INT176065 isr FL
<b>IECEx ExTR</b>	FR/INE/ExTR18.0022/00	FR/INE/ExTR18.0024/00	FR/INE/ExTR19.0047/00	FR/INE/ExTR19.0047/00
<b>Form factor</b>	Prismatic	Prismatic	Prismatic	Prismatic
<b>Nominal voltage</b>	3.65 V	3.65 V	3.65 V	3.65 V
<b>Nominal capacity</b>	4.0 Ah	5.6 Ah	4.0 Ah	5.6 Ah
<b>Max. continuous discharge current</b>	8.0 A	11.0 A	8.0 A	11 A
<b>Max. pulse discharge rate</b>	16.0 A	22.0 A	16.0 A	22.0 A
<b>Max. charge current</b>	4.0 A	5.6 A	4.0 A	5.6
<b>Cycle life</b> <i>(Cycled to 70 % of the cells original capacity)</i>	2300 (100 % DoD, C-C/2, + 25°C)	2200 (100 % DoD, C-C/2, + 25°C)	2300 (100 % DoD, C-C/2, + 25°C)	2200 (100 % DoD, C-C/2, + 25°C)
<b>Typical weight</b>	97 g	135 g	107 g	155 g
<b>Discharge temperature range</b>	- 30 / + 60°C	- 30 / + 60°C	- 30 / + 60°C	- 30 / + 60°C
<b>Charge temperature range</b>	- 30 / + 60°C	- 30 / + 60°C	- 30 / + 60°C	- 30 / + 60°C
<b>Part number</b>	70345Q	70346R	70462J	70463K

Typical values relative to cells stored for one year or less at + 30°C max; Performances vary according to discharge characteristics (current, duration, frequency), temperature conditions, storage conditions prior to usage and applications acceptable minimum voltage.



IECEx certified products are manufactured under the standard ISO/IEC 80079-34:2018. Explosive atmospheres - Part 34: Application of quality management systems for Ex Product manufacture.

# Beyond cell manufacturing, offering high-value services and expertise

## Battery Packs for a wide array of applications and environments

- High/Low Temperatures
- Complex fit in to enclosures
- Hazardous Locations (Atex)

Battery Packs designed and built to meet industry standards of safety and compliance in challenging markets such as military, IoT, medical and security.

Full design process supported by Saft, from conception and technical feasibility through to preproduction, and volume mass production.

Saft battery packs are made only with Saft- manufactured cells, ensuring a full turn-key solution, and providing traceability to customers.

Our capability is from simple, high volume battery packs to complex, niche requirements.



### IoT Smart Tools

**Looking for the best battery to match your use case?** Whether you are at the beginning or at an advanced stage of your smart device development, our tools will help you find the right battery for your project.

If you are at an early stage of your project, the **Smart Selector** can help you –in just seven steps– discover which batteries match your use case, how much space you need to leave in your product design to accommodate them, an average estimation of their lifetime, and their price level. You can then edit the parameters of your application to find out in real time their impact on your battery choice. You can download a customized report, for free, at the end of the process.

If you are further advanced in your project and need some more accurate modelling, the **Wisebatt for Saft** platform is for you! You can estimate your device's power consumption and try out software and hardware options to optimize its lifetime.



Access here to test our IoT Smart Tools | Saft4U (saftbatteries.com)

### Energizing IoT

How to read a datasheet, Things to know before transporting lithium batteries, 5 tips to charge to lithium-ion batteries...

From basics to advanced technical topics, we are sharing with you all the resources you need to master the battery power topic and make the most of your Saft batteries



Access here to read the blog Energizing IoT | Saft | Batteries to energize the world (saftbatteries.com)

# Additional information on primary and rechargeable cells

Whether you choose from one of our three primary lithium technologies or from our rechargeable lithium-ion range, Saft has the right lithium cell or battery for your industrial application.



**The Saft Li-SOCl<sub>2</sub> product range** offers high energy and a high open circuit voltage, with the spiral cells offering high pulse capability coupled with a long life and a wide temperature range. Want to know more? Flash the QR Code or click on the link.

**The Saft Li-SO<sub>2</sub> products** feature a very high surface area with spiral electrodes, offering high power and maximum current pulse capability with excellent functionality in extreme cold environments. Want to know more? Flash the QR Code or click on the link.



**The Saft Li-MnO<sub>2</sub> products** feature a very high surface area with spiral electrodes, offering high power and maximum current pulse capability with excellent functionality in extreme cold environments. Want to know more? Flash the QR Code or click on the link.

**The Saft Li-ion MP and VL products** boast strong nominal capacities with a long cycle-life, and a wide operational temperature range, with multiple built-in safety features at the cell level. Want to know more? Flash the QR Code or click on the link.



## Transportation



Wondering where you can find out how to ship your products containing Lithium batteries or to ship Lithium batteries as spare parts? Look no further, batteriestransport.org is an industry initiative designed to make this task as easy as possible. Want to know more? Flash the QR Code or click on the link.

# Environmental Responsibility

**Respect for the environment is a Saft priority. Our batteries are emissions-free and we are reducing their entire environmental footprint. We take legal requirements on health and safety and environmental protection as a minimum.**

## Environmental Responsibility

Efficient use of resources and reducing our impact on the environment are at the heart of everything we do. We are committed to high standards of environmental stewardship and to developing sustainably-responsible products. From eco-design, life-cycle assessments, recycling raw materials and reducing our own emissions to ensuring that our customers can recycle spent batteries, we are investing in our sustainable future. A great example is Saft's revolutionary, lithium-ion rechargeable technology. Not only does it offer improved performance, extending the lifetime of industrial batteries, but it significantly cuts their environmental impact.

## Clean energy

Our batteries are zero CO<sub>2</sub> energy-storage devices. Li-ion technology provides innovative and sustainable energy.

## Sustainable design

Advanced batteries tailored to customer needs increase our customers' energy efficiency. Our batteries are designed to be recycled as easily as possible, without compromising performance.

## Circular economy

Our take-back network (Bring Back Points) recycles used nickel-based batteries. More than 75 percent of materials from returned, spent batteries are extracted to be reused by industry.

## Manufacturing

Saft is committed to minimizing the environmental impact of our manufacturing operations. Saft always strives to exceed compliance with national laws and regulations governing environmental protection.

## The sustainable and ethical supply of minerals (e.g. nickel, cobalt, cadmium & lithium).

Saft does everything it can to avoid including any unethically mined minerals in the manufacture of its electrodes and batteries and has developed a Code of Conduct to this end.

To ensure that our suppliers and subcontractors share our values, we ask that they sign and return a formal agreement

(referred to as 'Ethics Letter') that summarizes the Code's principles. We also ask that they do the same for their own suppliers and subcontractors. The agreement covers three areas - social responsibility, ethics and environmental responsibility.



Total code of ethics



Ethics letter



Environmental responsibility

We energize  
the world.  
On land,  
at sea,  
in the air  
and in space.

**SAFT**

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**Saft, a company of TotalEnergies**  
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