Primary lithium batteries

Selector guide

June 2004

saft

Saft Lithium batteries

meeting your needs...

For more than 31 years, Saft has pioneered the development and production of primary lithium cells and battery packs in Europe, North America and Asia/Pacific. Autonomy, power, voltage, shape, weight, service life, price... Saft knows how to tailor battery solutions you can count on.

With more than 4,000 employees, 2 R&D centers, 9 manufacturing facilities and 26 local sales organizations, a product range offer covering the 3 main primary lithium chemistries of today, Saft is a truly international player in the field of batteries and power supply systems for professional, industrial, space and military uses.

Among recognized characteristics of the Saft spirit worldwide are quality, performance, reliability, openness and an ability to meet the most demanding challenges. Take advantage of them for your applications!

Lithium power at your service

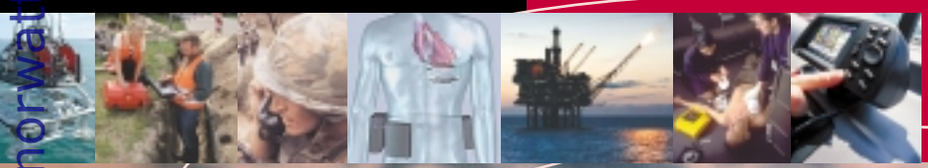
Lithium is a light metal which exhibits an exceptional specific capacity (3.86 Ah/gram) and unique electrochemical characteristics.

Combining lithium with manganese dioxide (MnO_2) powder or low-freezing point liquid cathode materials such as thionyl chloride ($SOCl_2$) or sulfur dioxide (SO_2), results in batteries with high energy, low weight, reduced self-discharge rate, and ability to operate under extreme conditions.

Saft's lithium products

3 lithium chemistries are currently available:

- Lithium-thionyl chloride (Li-$SOCl_2$) in *LS/LST/LSX/LSH* 3.6 V cells,
- Lithium-sulfur dioxide (Li-SO_2) in *G/LO* 3.0 V cells,
- Lithium-manganese dioxide (Li-MnO_2) in *LM* 3.0 V cells.



Key features

- **High and stable operating voltage**
  – Above 3 V for LS/LST/LSX/LSH cells.
  – Above 2 V for LO/G/LM cells.
- **Wide current capability range**
  From a few microamperes base current for the LM buttons and small LS/LST cells to more than 10 A pulses for some LO, G, and LM cells.
- **Wide operating temperature range**
  From – 60°C up to +85°C depending on cell type, current drain and environment conditions.
- **Long shelf life**
  Capacity loss in storage at +20°C below 1% (LS, LST, LM), 2% (LSX) and 3% (LSH, G, LO) per year.
- **Extended operating life**
  Typically above 5 years, and up to 15 years for some applications.
- **High energy densities**
  3-10 times greater than the non-lithium systems.
- **Disposal**
  According to local regulations.
- **Adequate safety**
  Most of Saft's lithium cells are UL (Underwriters Laboratories) recognized, non-restricted for transport and EN 50020 approved. Most battery packs comply with European and US Army standards.
- **Storage**
  The storage area should be clean, cool (not exceeding +30°C), dry and ventilated.

*** Primary cells and batteries are not rechargeable.**

Saft primary lithium chemistries: specific qualities

- **Li-$SOCl_2$** (LS, LST, LSX, LSH cell series)
  – Operating voltage > 3 V
  – Ability to operate from – 60 to +85°C
  – Non-flammable electrolyte
  – Cells non-pressurized at room temperature
  – Hermeticity guaranteed up to +110°C
  – Unrivaled nominal capacities (LS, LST)
- **Li-SO_2** (G, LO cell series)
  – Non-flammable electrolyte
  – Superior pulse capability
  – Excellent capacity above 1 A
  – Superior power at – 40°C
  – Hermeticity guaranteed up to +95°C
  – Wide military acceptance
- **Li-MnO_2** (LM cell series)
  – Non-corrosive electrolyte
  – Cells non-pressurized at room temperature
  – Spiral cells with good pulse capability
  – Minimal voltage delay
  – Competitive capacity at high current and low temperature (– 40°C)

▶ "C" cell versions are recommended for use in cool environments, typical of indoor applications. They yield higher voltage during pulsing at temperature not exceeding repeatedly +55°C.

▶ "SHX" cell versions offer superior pulse capability for discharges not exceeding the declared voltage cut-off.

Saft lithium cell series: performance data

Data given on following pages relates to batteries aged up to 12 months and properly stored. Consult Saft regarding specific pulse conditions or usage following prolonged storage and/or exposure to extreme temperatures.

- Nominal capacity at +20°C and 2 V discharge cut-off (continuous current).
- Maximum recommended continuous current:
  - LS/LST/LSX bobbin and coiled cells : the current providing 50% of the nominal capacity at +20°C and 2 V cut-off.
  - LSH/G/LO/LM spirals : the above definition or the current that keeps the cells self-heating within safe limits, whichever is smaller.
- Maximum recommended pulse current : varies according to pulse characteristics (duration, frequency), temperature conditions, cell storage conditions prior to usage and the application's acceptable minimum voltage. The use of parallel capacitor to enhance the voltage at the beginning of pulses might be recommended. Consult Saft.
- Transport status: according to UN model Regulations Ref. ST/SG/AC.10/1 Revision 13 (2003) and Manual of Tests and Criteria Ref. ST/SG/AC.10/11 Revision 3, Amendment 1 "Lithium Batteries" – 2002.

Exceptional performance

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Examples of standard individual cell tabbing arrangements

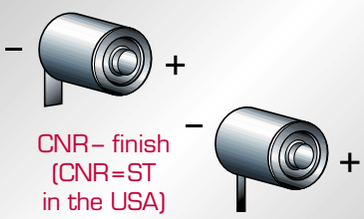
STD without tabs

CNR finish

CN finish

CNR+ finish

CN+ finish



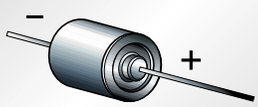
CNR– finish
(CNR=ST
in the USA)

CN– finish

2 PF finish

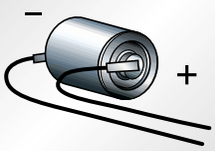
3 PF finish

3 PF RP finish



CNA finish (AX in the USA)

4 PF finish



FL finish

Other cell finishes are available upon request

Check availability and dimensions of tabbing arrangement for considered cell

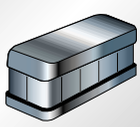
Examples of standard battery packs configurations

Stick

Side-by-side

Triangle

Side-by-side with end-flanges or complete casing



...exceeding your expectations

The LS and LST cells are *cylindrical* and based on the high-energy concentric *"bobbin"* electrode configuration. They are available in *standard* and *high capacity "C"* versions, both adapted to low current applications.

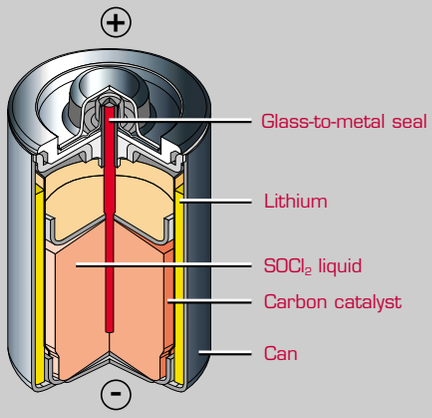
The LSX, LSH, G, LO and LM cells are also *cylindrical* but use the power-optimized *"coiled"* and *"spiral"* electrode constructions. The Li-SO_2 cells are available in "SX" and "G" standard versions and in *high pulse capability* "SHX" versions.

The spiral LM cell series is completed with 3 button cells aimed at memory back-up.

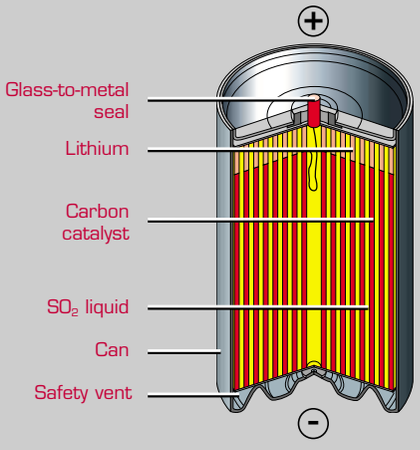
Corrosion-proof containers, hermetic sealing based on rugged glass-to-metal seals and TIG or laser welds, built-in safety vents and individual protection fuses are design features common to most of Saft's lithium cells.

The LS/LST/LSX/LSH/G/LO/LM cells are available as single units (with different optional finishes) or assembled within battery packs.

Whatever your application, you will probably find a Saft lithium battery able to meet your particular requirements. If not, custom-made solutions can be developed within your time-to-market constraints.



Bobbin construction (small LS, LST)



Spiral construction (LO, G)

Saft primary lithium batteries: applications

	Memory back-up	Real-time clocks	Utility metering AMR	Security Alarms	Electronic toll collection	Automotive electronics	Radio communi-cation	Emergency location Buoys	Lighting Night vision	Medical defibril-lators	Downhole logging	Meteor-ology Space	Profess-ional electronics	GPS/GSM tracking
LM buttons	●	●		○									●	
LM spirals			○	●		●	●	●	●	●		●	●	●
LS, LST small bobbins (½ AA, AA, ⅔ A, A)	●	●	●	●	●	●		●	●		●		●	●
LS large bobbins (C, D)	●		●	●		○		●	●		○	●	●	
LSH spirals			○	●		○	●	●	●		●	●	●	●
LSX small coils (AA)			●	●	●	●			●				●	
G/LO spirals			○	●		●	●	●	●	●		●	●	●

● recommended ○ possible

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