

# Battery Information Sheet

## *Primary Li-SOCl<sub>2</sub> single cells and multi-cell battery packs*

According to REACH regulation (EC 1907/2006, Art 31) and to OSHA regulation (29 CFR 1910.1200), batteries are **ARTICLES** with no intended release. As such, they are not covered by legal requirements to generate and supply an SDS or an MSDS.

This Battery Information Sheet is provided solely as information document for the purpose of assisting our customers, as an “Article Safety Datasheet”.

### 1. IDENTIFICATION

#### 1.1 Product

Lithium-thionyl dichloride primary unit cells and multi-cell battery systems composed of these cells

#### 1.2 Supplier

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**1.3 Emergency contact** For chemical emergency ONLY (in case of spill, leak, fire, exposure or accident) call CHEMTREC at:  
**International: +1-703-527-3887 for English**  
**Within the USA: +1-800-424-9300**

## 2. HAZARD IDENTIFICATION

The Li-SOCl<sub>2</sub> batteries described in this Battery Information Sheet are sealed units which are not hazardous under normal operating conditions in accordance with manufacturer's recommendations, as stated in the user's manual or other similar documentation. Under normal use, the battery integrity is maintained and the active components it contains are isolated from the outside. In particular, the battery should not be submitted to any mechanical (opening, puncture, immersion), thermal (burning, heating to temperatures above the normal temperature range of the product) or electrical abuse (short-circuit, recharge, forced discharge), which will lead to the activation of safety valves and/or the rupture of the battery container. Any accidental release of the inner components of the cell, or their combustion products could be highly hazardous. Battery content exposition to air humidity/liquid water may be followed by severe battery vent/explosion/fire, depending on the hazard causes and circumstances.

### Protection from charging:

Whenever lithium batteries are not the single power source in a circuit, the following measures recommended by Underwriters Laboratories are relevant. The cells should not be connected with an electrical power source that would increase the load through the cells. The electronic circuit shall include one of the following:

- A. Two suitable diodes or the equivalent in series with the cells to prevent any reverse (charging) current. The second diode is used to provide protection in the event that one would fail. Quality control, or equivalent procedures, shall be established by the device manufacturer to check that the diode polarity is correct for each unit.

Or

- B. A blocking diode or the equivalent to prevent any reverse (charging) current and a resistor to limit current in case of diode failure. The resistor should be sized to limit the reverse (charging) current to the maximum value according to the data sheet of the cell.

## 3. COMPOSITION, INFORMATION OR INGREDIENTS

Each unit cell consists of a hermetically sealed metallic can containing a number of chemicals and materials of construction of which the following are potentially hazardous upon release to air.

Component	CAS Number	EINECS/ELINCS	Content (wt. %)*
Lithium metal	7439-93-2	231-102-5	2-6
Thionyl dichloride	7719-09-7	231-748-8	18-47
Aluminium chloride	7446-70-0	231-208-1	1-5
Gallium chloride	13450-90-3	236-610-0	0-2
Lithium chloride	7447-41-8	231-212-3	1-2
Carbon	1333-86-4	215-609-9	2-5
PTFE	9002-84-0	N/A	0-1
Stainless steel, Nickel and inert material	N/A	N/A	remainder

\* Quantities may vary with cell model

In the course of battery production, active substances detailed in the previous table are embedded in a mechanical substrate to form electrodes. These electrodes are then further assembled with the other battery components such as separator, electrolyte, connectors and casing to obtain a finished battery. This battery is defined in the REACH regulation as "an article with no intended release" meaning that, under normal and reasonably foreseeable conditions of use, no end-user of this battery will be exposed to any chemical substances.

#### 4. FIRST AID MEASURES (not anticipated under normal use)

##### 4.1 Electrolyte contact

**EYE CONTACT:** Immediately flush with plenty of water for at least 15 minutes and get medical attention.

**SKIN CONTACT:** Remove contaminated clothing and immediately flush with plenty of water for at least 15 minutes. In severe cases, get medical attention.

**INHALATION:** Contents of an opened cell may cause respiratory tract and mucus membrane irritation. Remove from exposure, rest and keep warm. Immediately inhale Cortisone spray. In severe cases, track medical surveillance for 48 hours.

**INGESTION:** Wash out mouth thoroughly with water and give plenty of water to drink. Get medical attention.

**FURTHER TREATMENT:** All cases of eye contamination, persistent skin irritation and casualties who have swallowed this substance or have breathed its vapours should be seen by a Doctor.

##### 4.2 Lithium metal contact

**EYE CONTACT:** Immediately flush with large quantities of water for at least 15 minutes, with open eyelids, and get medical attention.

**SKIN CONTACT:** Remove particles of lithium from skin as quick as possible. Immediately flush with plenty of water for at least 15 minutes and get medical attention.

**INHALATION/INGESTION:** Contents of an opened cell may cause respiratory tract and mucus membrane irritation. Remove from exposure, rest and keep warm. Immediately inhale Cortisone spray. In severe cases, track medical surveillance for 48 hours.

#### 5. FIRE FIGHTING MEASURES (not anticipated under normal use)

##### EXTINGUISHING MEDIA:

- During a fire with lithium batteries, using large amounts of cold water or water-based foam has some cooling effect and is effective to prevent fire expansion as long as the extent of the fire has not progressed to the point that the lithium metal they contain is exposed (as marked by appearance of deep red flames). Do not use warm or hot water.
- Lith-X Class D extinguishers are effective on fires involving only a few lithium batteries.
- Do not use CO<sub>2</sub> or Halon-type extinguishers.
- Do not use sand, dry powder or soda ash, graphite powder or fire blankets.
- **Use only class D metal extinguishers on raw lithium metal.**

##### SPECIAL FIRE FIGHTING PROCEDURES:

- Fire fighters should wear approved/certified positive pressure self-contained breathing apparatus.
- Full protective clothing is necessary to prevent potential body contact with electrolyte solution.
- During water spraying, caution is advised as burning pieces of lithium may be ejected from the fire.
- It is permissible to use any class of extinguishing medium, specified above, on these batteries or their packing material. Cool exterior of batteries if exposed to fire to prevent rupture.
- If the cells or batteries are not located at the center of the fire, copious amounts of water may be supplied using a diffuser type nozzle so that the cells remain cool during the fire containment and extinction. A sprinkler system should be suitable for this purpose, the critical factor being that the lithium cells do not experience temperatures above the melting point of lithium (180°C).
- Small amounts of water should never be used such as the volumes contained within portable fire extinguishers. Standard dry powder extinguishers are ineffective. It should be kept in mind that a hazard of hydrogen formation exists whenever hot lithium metal comes into contact with water.

## 6. ACCIDENTAL RELEASE MEASURES (not anticipated under normal use)

**INDIVIDUAL PRECAUTIONS:** Evacuate the employees from area until fumes dissipate. In case of electrolyte leakage from a cell or battery, do not inhale vapors or touch liquid with bare hands. In case of skin or eye contact, inhalation or ingestion, follow the measures described in section 12.

**ENVIRONMENTAL PRECAUTION:** Avoid sewage, surface water and underground water contamination. Avoid ground and atmosphere contamination.

**WAYS OF CLEANING:** With protective glasses and gloves, use absorbent material (sand, earth, chalk ( $\text{CaCO}_3$ ) or lime ( $\text{CaO}$ ) powder or Vermiculite) to absorb any exuded material. Seal leaking battery (unless hot) and contaminated absorbent material tight in plastic bag, and dispose of as hazardous waste in accordance with local regulations. Electrolyte traces may be wiped off dryly using household paper. Rinse with water afterwards.

## 7. HANDLING AND STORAGE

**IMPORTANT NOTICE:** Lithium-thionyl chloride batteries are not rechargeable and should not be tentatively charged or recharged. Manufacturer's recommendations should be followed regarding maximum current and operating





temperature range. Applying pressure or deforming the battery may lead to disassembly and cause eye, skin and throat irritation.

**STORAGE:** Store in a cool, regulated (preferably below  $21^\circ\text{C}$  and in any case below  $30^\circ\text{C}$ ), dry and ventilated area, away from possible sources of heat, open flames, food and drink. Avoid exposure to direct sunlight for long periods. Temperatures above  $100^\circ\text{C}$  (or higher for High Temperatures cells and batteries such as the LSH20-150 cell- refer to individual data sheets for maximum temperatures) may cause leakage and rupture, and result in shortened battery service life. Keep proper clearance space between batteries and walls. Since short circuit can cause burn hazard, leakage or explosion hazard, keep batteries in original packaging until use and do not mix them.

### HANDLING:

- Do not open the battery system.
- Do not crush or pierce the cells.
- Do not short (+) or (-) terminal with conductors.
- Do not reverse the polarity.
- Do not submit to excessive mechanical stress.
- Do not mix batteries of different types or mix new and old ones together.
- Do not use the unit without its electronic management system.
- Do not expose the unit to water or condensation.
- Do not directly heat, solder or throw into fire. Such unsuitable use can cause leakage or spout vaporized electrolyte fumes and may cause fire or explosion.

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION\* (not anticipated under normal use)

	<b>Respiratory protection</b>	In all fire situations, use self-contained breathing apparatus
	<b>Hand protection</b>	In case of leakage wear protective gloves
	<b>Eye protection</b>	Safety glasses are mandatory during handling
	<b>Other</b>	In the event of leakage or ruptured cells, wear a rubber apron and protective clothes.

\*AFNOR pictograms

### Occupational exposure standard:

Compound	8 hour TWA	15 min TWA	SK
Sulfur Dioxide	1 ppm	1 ppm	-
Hydrogen chloride	1 ppm	5 ppm	-

## 9. PHYSICAL AND CHEMICAL PROPERTIES

The lithium-thionyl chloride cell or battery described by this Battery Information Sheet is a sealed unit when offered for sale. It is a manufactured "article" and does not expose the user to hazardous chemicals when used in accordance with manufacturer specifications.

Appearance – Cylindrical shape	
Odour – If leaking, gives off a pungent corrosive odour	
Flash point – Not applicable	Flammability – Not applicable
Boiling Point – Not applicable	Melting Point – Not applicable
Vapor Pressure – Not applicable	Vapor Density – Not applicable
pH – Not applicable	Specific Gravity – Not applicable
Solubility (in water) – Not applicable	Solubility (other) – Not applicable

## 10. STABILITY AND REACTIVITY

The battery system is stable when handled and stored according to section 4.

**MATERIALS TO AVOID:** Oxidizing agents, bases, water. Avoid electrolyte contact with aluminium or zinc.

**CONDITIONS TO AVOID:** Do not heat above 100°C (or higher (150°C) for High Temperatures cells and batteries such as the LSH20-150 cell- refer to individual data sheets for maximum temperatures) or incinerate. Do not disassemble, crush, pierce, short, charge or recharge. Avoid mechanical or electrical abuse. Do not repair or maintain when not authorized.

**HAZARDOUS DECOMPOSITION PRODUCTS:** Hydrogen (H<sub>2</sub>) as well as lithium oxide (Li<sub>2</sub>O) and lithium hydroxide (LiOH) dust are produced in case of reaction of lithium metal with water (hydrolysis).

Chlorine (Cl<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>) and disulfur dichloride (S<sub>2</sub>Cl<sub>2</sub>) are produced in case of thermal decomposition of thionyl dichloride above 100°C. Hydrochloric acid (HCl) and sulfur dioxide (SO<sub>2</sub>) are produced in case of reaction of thionyl dichloride with water at room temperature.

Hydrochloric acid (HCl) fumes, lithium oxide (Li<sub>2</sub>O), lithium hydroxide (LiOH) and aluminium hydroxide (Al(OH)<sub>3</sub>) dust are produced in case of reaction of lithium tetrachloroaluminate (LiAlCl<sub>4</sub>) with water.

## 11. TOXICOLOGICAL INFORMATION

There is no risk, unless the battery ruptures. In the event of accidental exposure to internal contents, corrosive fumes will cause severe skin, eye and mucous membrane irritation. Medical conditions are generally aggravated by exposure to battery internal contents: eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur. Overexposure may cause symptoms of non-fibrotic lung injury and ingestion can cause tissue damage to throat and gastro-respiratory tract.

## 12. ECOLOGICAL INFORMATION

The batteries do not contain mercury, cadmium or other heavy metals.

Eco-toxicity	None known if used/disposed of correctly.
Mammalian affects	None known if used/disposed of correctly.
Bioaccumulation potential	None known if used/disposed of correctly.
Environmental fate	None known if used/disposed of correctly.

## 13. DISPOSAL CONSIDERATIONS

Batteries do not contain hazardous materials according to EC Directives 91/157/EEC, 93/86/EEC, and 2002/95/EC (RoHS Directive). Battery recycling is either mandatory or recommended: The European Directive 2006/66/EC has been implemented by most EC member states.

Dispose of in accordance with local laws and regulations. Store material for disposal as indicated in Section 4. A disposal service is offered upon request by Tadiran Batteries.

Do not incinerate, or subject cells to temperatures in excess of 100°C (or 150°C for LSH20-150 cells and the battery packs assembled from them). Such abuse can result in loss of seal, electrolyte leakage and/or violent disassembly with risk of material projections.

For additional information a Technical Notice is available upon request. See the section on “Sustainability & Environment” on <https://www.saftbatteries.com/about-us/environmental-responsibility>

## 14. TRANSPORTATION INFORMATION

Persons engaged in the transport of dangerous goods shall be trained in the contents of dangerous goods requirements commensurate with their responsibilities (Chapter 1.3, UN Recommendations on the Transport of Dangerous Goods Model Regulations).

To verify that the Saft cells or batteries have been tested for transport according to the UN Model Regulations, Manual of Tests and Criteria, Part III, subsection 38.3, please perform the below two steps ;

1. Go on-line to <https://customerportal.saftbatteries.com/tsr> or scan the QR Code:
2. Enter the cell or battery part number from the transport documents (Waybill or Packing Slip) and click "Search" to receive a PDF copy of the relevant UN 38.3 Test Summary Report for the product being shipped.



### 14.1 UN Class 9 Miscellaneous Dangerous Goods

Proper shipping Name	Class	UN No.
LITHIUM METAL BATTERIES	9	3090
LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT	9	3091
LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT	9	3091

### 14.2 International Agreements

By Air International:	IATA: DGR Edition 2021 (62nd)
By Sea International:	IMDG: Code 2020 Edition
European road transportation:	ADR: 1 January 2021
European rail transportation:	RID: Dangerous Goods by Rail 2021

## 15. REGULATORY INFORMATION

Regulations specifically applicable to the product:

- ACGIH and OSHA: see exposure limits of the internal components of the battery in section 14.
- IATA/ICAO (air transportation): UN 3090 or UN 3091.
- IMDG (sea transportation) : UN 3090 or UN 3091.
- Transportation within the US-DOT, 49 Code of Federal Regulations
- UK regulatory references: Classified under CHIP.
- Battery Directive (2006/66/EC): see section 9

## 16. OTHER INFORMATION

This information has been compiled from sources considered to be dependable and is, to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, neither exhaustively nor perfect reliability can be granted. Information does not imply implicit or specific warranty of it.

This information relates to the specific products designated and may not be valid for such products used in combination with any other materials or in any process. It is the user's responsibility to satisfy himself as to the suitability and completeness of this information for his particular use.

Saft does not accept liability for any loss or damage that may occur, whether direct, indirect, incidental or consequential, from the use of this battery information sheet provided as a service to our customers. Saft does not offer warranty against patent infringement.



# LS 14500

## Primary Li-SOCl<sub>2</sub> cell

### 3.6 V AA size bobbin cell high energy density

Saft's LS 14500 cell is ideally suited for long-term applications (typically from 5 to 20+ years), featuring low base currents and periodic pulses.

#### Benefits

- High capacity and high energy (1122 Wh/l and 520 Wh/kg).
- High voltage response, stable during most of the lifetime of the application.
- Wide operating temperature range (-60°C / +85°C).
- Low self-discharge, compatible with a long operating life (less than 1% per year of storage, at +20 °C, after 1 year).
- Superior resistance to corrosion.
- Low magnetic signature.

#### Key features

- Bobbin construction.
- Well controlled passivation.
- Hermetic construction with glass-to-metal seal.
- Stainless steel container.
- Non-flammable electrolyte.
- RoHS and REACH compliance.
- Manufactured in France, China, UK.

#### Designed to meet all major quality, safety and environmental standards.

- Safety: UL 1642, IEC 60086-4.
- IEC 60079-11 part 10.5, (T4 temperature rating at +60 °C).
- Transport: UN 3090 and UN 3091.
- Quality: ISO 9001, Saft World Class continuous evaluation program.

#### Typical applications

- Utility Metering.
- Internet of Things.
- Tracking systems.
- Alarms and security.
- Connected sensors.
- Medical devices.



#### Electrical characteristics <sup>[i]</sup>

Nominal capacity (under 2 mA, +20 °C, 2.0 V cut-off) <sup>[iii]</sup>	2.6 Ah
Open circuit voltage (at + 20 °C)	3.67 V
Nominal voltage (under 0.2 mA, + 20 °C)	3.6 V
Nominal energy	9.36 Wh
Pulse capability <sup>[iv]</sup>	Up to 250 mA
Maximum recommended continuous current	50 mA

#### Operating conditions

Operating temperature range <sup>[v]</sup>	-60 °C / +85 °C (-76 °F / +185 °F)
Storage temperatures (recommended) <sup>[vi]</sup>	+30 °C (+86 °F) max

#### Physical characteristics <sup>[ii]</sup>

Diameter (max)	14.62 mm (0.575 in)
Height (max)	50.28 mm (1.98 in)
Typical weight	17 g (0.6 oz)
Li metal content	approx. 0.7 g

#### Termination suffix

CN, CNR	Radial tabs
2 PF, 2 PF, 3PF RP, 4 PF	Radial pins
CNA	Axial leads
FL	Flying leads

Other configurations upon request

[i] Typical values relative to cells stored up to one year at + 30 °C max.

[ii] Sleeved cell.

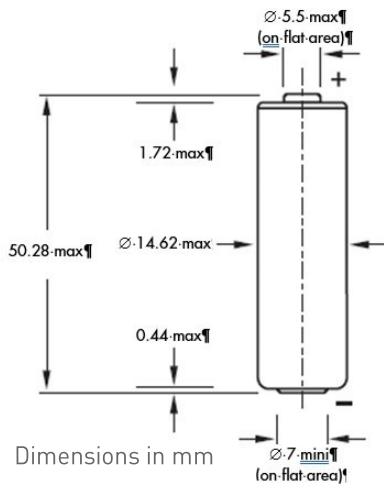
[iii] Dependent upon current drain, temperature, cut-off and cell orientation.

[iv] Under 250 mA / 0.1 second pulses, drained every 2 minutes at + 20 °C from undischarged cells during 24 h, with 10 µA base current, yield voltage readings above 3.0 V after initial stabilisation. The readings may vary according to the pulse characteristics, the temperature, and the cell's previous history. Fitting the cell with a capacitor may be recommended in severe conditions or for high pulse currents. Consult Saft.

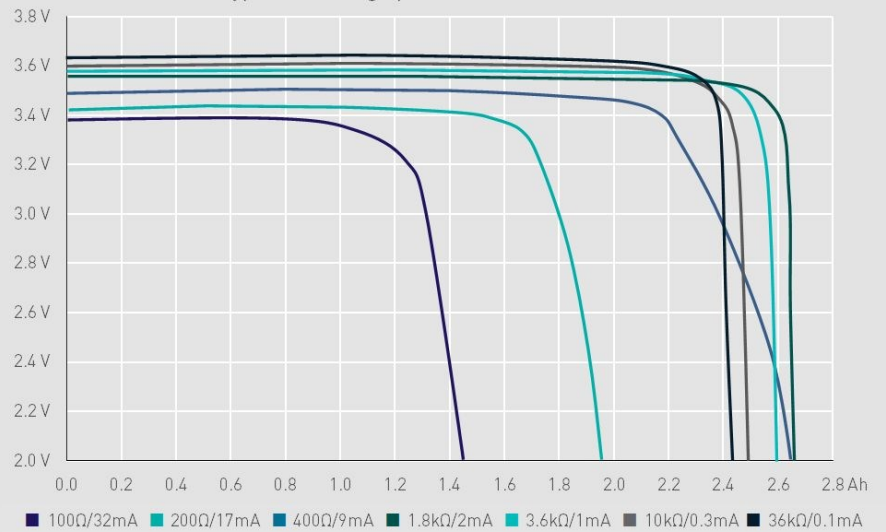
[v] Operation above ambient temperature may lead to reduced capacity and lower voltage readings. Consult Saft.

[vi] For more severe conditions, consult Saft.

# LS 14500



LS 14500 Typical discharge profiles at 20°C under various rates



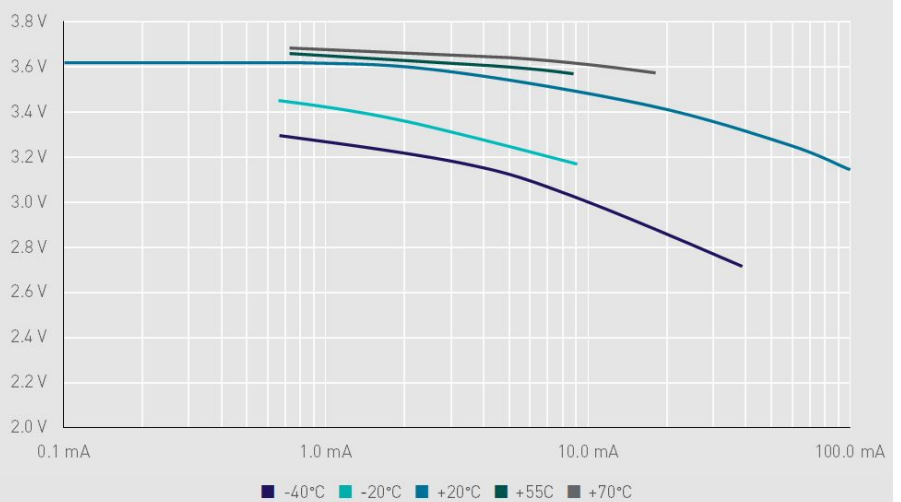
## Storage

- The storage area should be clean, cool (preferably not exceeding +30 °C), dry and ventilated.

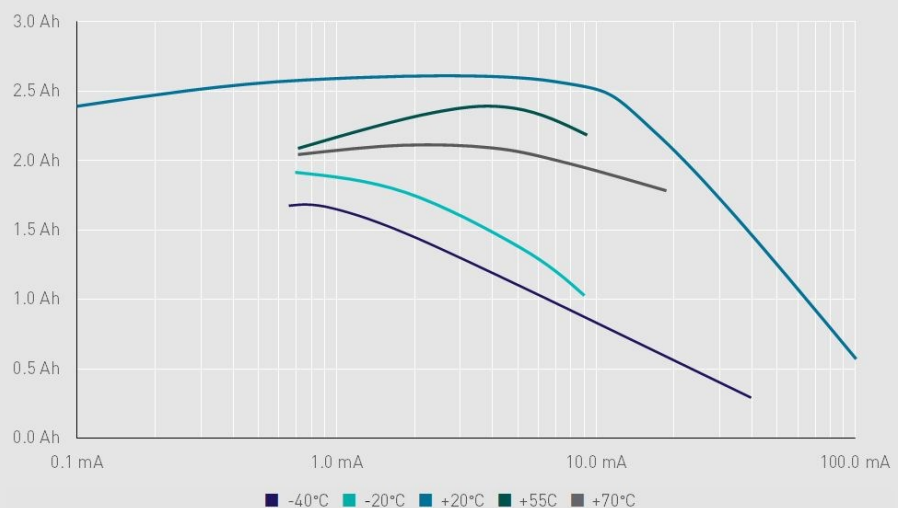
## Warning

- Fire, explosion and burn hazard.
- Do not recharge, short circuit, crush, disassemble, heat above 100 °C (212°F), incinerate, or expose contents to water.
- Do not solder directly to the cell (use tabbed cell versions instead).

LS 14500 Voltage plateau vs current and temperature (at mid-discharge)



LS 14500 Capacity vs current at various temperatures



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