



SPECIALTY BATTERY GROUP
Lithium Battery Division

MATERIAL SAFETY DATA SHEET

(form according to EEC Directive 93/112/EC)

NAME : *LITHIUM, THIONYL CHLORIDE (Li-SOCl₂)
NON-RECHARGEABLE BATTERIES*

1 - IDENTIFICATION (of the product and the supplier)

1.1. Product :

Rechargeable battery

yes	
no	X

Trade name and model :

*LITHIUM, THIONYL CHLORIDE (Li-SOCl₂)
NON-RECHARGEABLE BATTERIES*

IEC designation :

Models : LS and LSH series

LS 14250, LS 14250 C, LS 14500, LS 14500 C,
LS 17500, LS 26500, LS 26500 C, LS 33600,
LS 33600 C, LSH 26180, LSH 14, LSH 20

Electrochemical system :

Electrodes	Negative electrode Lithium metal (Li)	Positive electrode Thionyl chloride (SOCl ₂)
Electrolyte	Solution of lithium tetrachloroaluminate* (LiAlCl ₄) in thionyl chloride	
Nominal voltage	3.6 Volt	

* Lithium tetrachloroaluminate is a combination of lithium chloride (LiCl) and aluminum chloride (AlCl₃).

1.2 - Supplier :

Name :

SAFT

Address :

Rue Georges Leclanché - BP 1039
86060 Poitiers Cedex 09 – France
Tel. : 33 (0)5 49 55 48 48
Fax : 33 (0)5 49 55 48 50

1.3. - Emergency contact :

M. Poitiers Plant Manager
Tel. : 33 (0)5 49 55 48 48



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2 - COMPOSITION (typical weight percentages of basic material within undischarged individual cells)

Metals	%	Plastics	%	Others	%
- Steel <i>(Iron 30 % Nickel 10 %)</i>	35-40*	- PVC	2-3*	- Thionyl chloride	40-46*
- Lithium	4-5*			- Carbon	4
				- Glass	1-4*
				- Aluminum chloride	1.5*
				- Salts	4-7*

* % slightly depending from cell type.

3 - HAZARDS IDENTIFICATION

3.1 - Physical :

The lithium-thionyl chloride batteries described in this Material Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the manufacturer.

Under normal conditions of use, the electrode materials and liquid electrolyte they contain are non-reactive provided the battery integrity is maintained and seals remain intact. Risk of exposure only in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery containers. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.

3.2 - Chemical :

**Classification of dangerous substances contained into the product
as per directive 67/548/EEC**

Substance		Content*	Melting point	Classification			
N° EEC (CAS N°)	Chemical symbol	Mass %		Letter	Indication of danger	Special risk (1)	Safety advice (2)
231 102 5 <i>(7439-93-2)</i>	Li	4-5	180.5° C	F	Corrosive Flammable	R14/15 R21 R22 R41 R43	S2 S8 S22 S24 S26 S37 S43 S45
231 748 8 <i>(7719-09-7)</i>	SOCl ₂	40-46	- 104.5° C	C	Irritant Corrosive Harmful	R14 R21 R22 R35 R37 R41 R42/43	S2 S8 S24 S26 S36 S37 S45
<i>(00744-67-00)</i>	AlCl ₃	≈ 1.5	190°C	C	Irritant Corrosive	R14 R22 R37 R41 R43	S2 S8 S22 S24 S26 S36 S45

* slight variations depending from cell type.



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1 - Nature of special risks :

- R 14/15 Reacts with water and yields flammable gases.
- R 21 Harmful in contact with skin.
- R 22 Harmful if swallowed.
- R 35 Causes severe burns.
- R 41 Risk of serious damage to the eye.
- R 42/43 May cause sensitization by inhalation and skin contact.
- R 43 May cause sensitization by skin contact.

2 - Safety advices :

- S 2 Keep out of reach from children.
- S 8 Keep away from moisture.
- S 22 Do not breathe dust.
- S 24 Avoid contact with skin.
- S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical attention.
- S 36 Wear suitable protective clothing.
- S 37 Wear suitable gloves.
- S 45 In case of incident, seek medical attention.

4 - FIRST AID MEASURES

In case of battery rupture or explosion, evacuate personnel from contaminated area and provide maximum ventilation to clear out corrosive fumes/gases and pungent odour.

In all case, seek immediate medical attention.

Eye contact : Flush with plenty of water (eyelids held open) for at least 15 minutes.

Skin contact : Remove all contaminated clothing and flush affected areas with plenty of water and soap for at least 15 minutes.
Do not apply greases or ointments.

Ingestion : Dilute by giving plenty of water and get immediate medical attention. Assure that the victim does not aspirate vomited material by use of positional drainage.
Assure that mucus does not obstruct the airway.
Do not give anything by mouth to an unconscious person.

Inhalation : Remove to fresh air and ventilate the contaminated area.
Give oxygen or artificial respiration if needed.



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5 - FIRE-FIGHTING MEASURES

- Fire and explosion hazard :** The battery can spout vaporized or decomposed electrolyte fumes in case of exposure above 100°C resulting from inappropriate use or the environment. Risk of explosion is increased if the melting point of lithium (180.5°C) is exceeded. Hydrogen coming from the decomposition of lithium metal with water is flammable.
- Extinguishing media :** *Suitable :* Type D extinguishers, Lith-X
Water may be used only to keep battery cool.
Not to be used : Water in case of battery rupture or explosion (detectable by the pungent odour).
- Special exposure hazards :** Following cell overheating due to external source or due to improper use, electrolyte leakage or battery container rupture may occur and release inner component/material in the environment.
Eye contact : The electrolyte solution contained in the battery is corrosive to all ocular tissues.
Skin contact : The electrolyte solution contained in the battery is corrosive and causes skin irritation and burns.
Ingestion : The ingestion of electrolyte solution causes tissue damage to throat and gastro/respiratory tract.
Inhalation : Contents of a leaking or ruptured battery can cause respiratory tract, mucus, membrane irritation and edema.
- Special protective equipment :** Use self-contained breathing apparatus to avoid breathing irritant fumes.
Wear protective clothing and equipment to prevent body contact with electrolyte solution.

6 - ACCIDENTAL RELEASE MEASURES

The material contained within the batteries would only be expelled under abusive conditions.

Using shovel or broom, cover battery or spilled substances with dry sand or, preferably, sodium carbonate (Na₂CO₃) or 1:1 mixture of soda ash and slaked lime. Keep away from water, rain, snow. Place in approved container (after cooling if necessary) and dispose in accordance with local regulations.



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7 - HANDLING AND STORAGE

The batteries should not be opened, destroyed nor incinerated since they may leak or rupture and release in the environment the ingredients they contain (see Section 6).

Handling : Do not crush, pierce, short (+) and (-) battery terminals with conductive (i.e. metal) goods. Do not directly heat or solder. Do not throw into fire. Do not mix batteries of different types and brands. Do not mix new and used batteries. Keep batteries in non conductive (i.e. plastic) trays.

Storage : Store in a cool (preferably below 30°C) and ventilated area away from moisture, sources of heat, open flames, food and drink. Keep adequate clearance between walls and batteries. Temperature above 100°C may result in battery leakage and rupture. Since short circuit can cause burn, leakage and rupture hazard, keep batteries in original packaging until use and do not jumble them.

Other : Lithium-thionyl chloride batteries are not rechargeable and should not be tentatively charged.

Follow Manufacturers recommendations regarding maximum recommended currents and operating temperature range.

Applying pressure on deforming the battery may lead to disassembly followed by eye, skin and throat irritation.

8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory protection : *Not necessary under normal use.* In case of battery rupture, use self contained full-face respiratory equipment with type ABEK filter.

Hand protection : *Not necessary under normal use.* Use Viton rubber gloves if handling a leaking or ruptured battery.

Eye protection : *Not necessary under normal use.* Wear safety goggles or glasses with side shields if handling a leaking or ruptured battery.

Skin protection : *Not necessary under normal use* Use rubber apron and protective working in case of handling of a ruptured battery.



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9 - PHYSICAL AND CHEMICAL PROPERTIES

9.1 Appearance : (Physical shape and color as supplied)
Small metal cylinders, hermetically sealed and fitted with an external plastic sleeving.

9.2 Temperature range :

	Continuous	Occasional
in storage	+ 30°C max	-60/+100°C
during discharge	-60/+85°C	-60/+100°C
during charge	NA	NA

9.3 Specific energy : 400 - 700 Wh/kg, depending on cell type
Note : Wh = Nominal voltage x rated Ah as defined in IEC Standard N° 285. Kg = Average battery weight)

9.4 Specific instant power : 2-10 Wh/kg, depending on cell type
(Note : $0.5 \times \text{nominal voltage} \times I_p$ with I_p = current in amperes delivered by a non discharged battery to half the nominal voltage in 1 second)

9.5 Mechanical resistance : As defined in relevant IEC Standard

9.6 Other :

10 - STABILITY AND REACTIVITY

Conditions to avoid : Heat above 100°C or incinerate.
Deform, mutilate, crush, pierce, disassemble, recharge.
Short circuit.
Prolonged exposure to humid conditions.

Materials to avoid : Oxidizing agents, alkalis, water.
Avoid electrolyte contact with aluminum or zinc.

Hazardous decomposition products :
Hydrogen (H_2) as well as lithium oxide (Li_2O) and lithium hydroxide ($LiOH$) dust is produced in case of reaction of *lithium metal* with water..

Chlorine (Cl_2), sulfur dioxide (SO_2) and disulfur dichloride (S_2Cl_2) are produced in case of thermal decomposition of *thionyl chloride* above 140°C.

Hydrochloric acid (HCl) and sulfur dioxide (SO_2) are produced in case of reaction of *thionyl chloride* with water at room temperature.



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Hydrochloric acid (HCl) fumes, lithium oxide, (Li₂O), lithium hydroxide (LiOH) and aluminum hydroxide (Al(OH)₃) dust are produced in case of reaction of *lithium tetrachloroaluminate* with water.

11 - TOXOLOGICAL INFORMATION

The Saft primary lithium-thionyl chloride batteries do not contain toxic materials.

12 - ECOLOGICAL INFORMATION

When properly used or disposed, the lithium-thionyl chloride batteries do not present environmental hazard.

13 - DISPOSAL CONSIDERATIONS

Dispose in accordance with applicable regulations which vary from country to country.

(In most countries, the thrashing of used batteries is forbidden and the end-users are invited to dispose them properly, eventually through non profit organizations, mandated by local governments or organized on a voluntary basis by professionals).

Lithium batteries should have their terminals insulated prior to disposal.

13.1 . Incineration : Incineration should never be performed by battery users but eventually by trained professionals in authorized facilities with proper gas and fumes treatment.

13.2 . Landfilling : Leachability regulations (mg/l)

Component	Leachability	EC limit	EPA	Other*
Iron	100			5
Nickel	500	2		0.5

* applicable to France

13.3 . Recycling : Send to authorized recycling facilities, eventually through licensed waste carrier.



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14 - TRANSPORT INFORMATION

<u>14.1 United Nations :</u>	UN N°	3090
	Classification	9
	Packaging	ICAO 903 for Air Transport IMDG for Sea Transport

14.2 International conventions :

Air	IATA	Yes
Sea	IMDG	Yes
Land	ADR (road)	Yes
	RID (rail)	Yes

<u>14.3 Other :</u>	In the USA	Code of Federal Regulations (49 CFR Ch. 1 § 173-185)
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15 - REGULATORY INFORMATION

The transport of lithium batteries is regulated by various bodies (IATA, IMA, ADR, US-DOT) that follow the United Nations *"Recommendations on the Transport of Dangerous Goods, Model Regulations, 13th Revised edition - 2003 - Ref. ST/SG/AC.10/1/ Rev. 13"*.

Depending on their lithium metal content, design, and ability to pass safety tests defined by the UN in the *"Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria 3rd Revised edition - 2002 - Ref. ST/SG/AC.10/11 Rev.3 Amendment 1 "Lithium Batteries"*, the lithium-thionyl chloride cells and the battery packs may or may not be assigned to the UN N° 3090 Class-9 that is restricted for transport.

Individual lithium-thionyl chloride cells and battery packs with respectively less than 1 and 2 grams of lithium metal content that pass the UN-defined safety tests, are not restricted for transport.

16 - OTHER INFORMATION / DISCLAIMER

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, no representation, warranty (either expressed or implied) or guarantee is made to the accuracy, reliability or completeness of the information contained herein.

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Signed _____
Lithium Product Manager