Box 1794 · Appleton, WI 54912 · (920) 735-6242 · Fax (920) 735-6245 · asp-usa.com

MSDS
Material Safety Data Sheet

CR123A Batteries

1. PRODUCT & COMPANY IDENTIFICATION

Manufacturer Name	Armament Systems and Procedures, INC
Address	2511 E Capitol Drive, Appleton, WI 54911
Telephone No	(920) 735-6242
Date	24 JAN 13
Model	CR123A
Chemical System	Lithium Metal Battery

2. HAZARDS IDENTIFICATION

Invasion Route

Skin Contact: Contact with battery electrolyte may cause burns and skin irritation.
Eye Contact: Contact with battery electrolyte may cause burns. Eye damage is possible.
Inhalation: Inhalation of vapors or fumes released due to heat or a large number of leaking batteries may cause respiratory and eye irritation.
Ingestion: Ingestion of battery contents may cause mouth, throat and intestinal burns and damage.

Health Hazards

The chemical is contained in a sealed can. Risk of exposure occurs only if the battery is mechanically or electrically abused.

Environment Hazards

Do not dispose of the battery into the environment.

Burn and Burst Danger

Do not dispose of battery in fire or recharge battery; it may explode. Do not short-circuit the battery or it may cause burns.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	*Molecular Formula*	*CAS No**	*Weight (%)*
Lithium	Li	7239-93-2	3.0-4.0
Carbon	C	7782-42-5	2.0-3.0
Manganese Dioxide	MnO_2	1313-13-9	35.0-45.0
Aluminum	Al	7429-90-5	2.0
1,2-Dimethoxyethane	$C_4H_{10}O_2$	110-714-4	7.0
Propylene Carbonate	$C_4H_6O_3$	108-32-7	7.0
Lithium Perchlorate	$LiClO_4$	7791-03-9	1.0-1.5
Polypropylene	$(C_3H_6)n$	9003-07-0	3.0
Polytetrafluoroethene	$(C_2F_4)n$	9002-84-0	5.0
Ferrum	Fe	7429-90-5	2.0
Nickel	Ni	7440-02-0	1.0

*Chemical Abstract Service Registry Number

4. FIRST AID MEASURES

Eye	If the battery is leaking and the contained material contacts the eyes, flush the eyes with plenty of water or saline water at least 15 minutes. Seek medical attention right away.
Skin	If the battery is leaking and the contained material contacts the skin, remove contaminated clothes quickly and rinse the skin with plenty of water at least 15 minutes. If irritation or pain persists. Seek medical attention right away.
Inhalation	If the battery is leaking, remove to fresh air immediately. Keep the respiratory tract smooth. Use oxygen if available. Seek medical attention.
Ingestion	If the battery is leaking and the contained material is ingested, rinse mouth and surrounding area with clear water. Seek medical attention right away.

5. FIRE FIGHTING MEASURES

Danger Characteristic	Exposure to excessive heat can cause venting of the liquid electrolyte. Battery may burst and release hazardous decomposition products when exposed to a fire situation.
Hazardous Combustion Products	CO, CO2, metal oxides, irritating fumes
Fire Fighting Method	The person must be equipped with a filtermask (full mask) or isolated breathing apparatus. The person must wear the clothes which can defend the fire in an upwind direction. Remove the container to the open space as soon as possible. Spray water on the containers in the fire place to keep them cool until fire extinguishment.
Extinguishing Media	Hazy water, foam power, CO2, sandy clay

6. ACCIDENTAL RELEASE MEASURES

Emergency Treatment	If the battery material is released, remove personnel from area until fumes dissipate. Provide maximum ventilation to clear out hazardous gasses. The preferred response is to leave the area and allow the batteries to cool and vapors to dissipate. Avoid skin and eye contact or inhalation of vapors. Remove spilled liquid with absorbent and incinerate waste.

7. HANDLING AND STORAGE

Handling	1. Do not allow battery terminals to contact each other or contact other metals. 2. Pack batteries separately so that single batteries are not mixed together. 3. Do not expose battery to excessive physical shock or vibration. 4. Do not immerse a battery in water. 5. Short-circuiting should be avoided. Short-circuit will reduce the life of the battery and can lead to ignition of surrounding materials. Physical contact with two short-circuited batteries can cause skin burn. 6. The batteries should not be opened, destroyed or incinerated. The ingredients contained in the hermetically sealed container may leak or rupture and release into the environment. 7. Place the cell beyond the child packing and container. 8. Never keep battery in an airtight compartment or sealed container. 9. Do not mix old and new batteries together. Do not mix with Ni-Cd, dry batteries or another manufacturer's batteries or product.
Storage	1. Batteries should be separated from other materials and stored in a noncombustible, well ventilated, sprinkler-protected structure with sufficient clearance between walls and battery stacks. 2. Keep the battery in a cool, dry and well ventilated place. Do not expose to direct sunlight for long periods. Keep away from fire and heat sources. Do not keep the battery with oxidizer and acid. 3. Keep batteries in original package until use and do not combine them. 4. Equip with relevant types and quantities of the extinguishment instructions. The storage place should be equipped with suitable shelter materials for divulgence handling.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

Engineering Control	Keep away from heat and open flame. Supply with sufficient partial air exhaust. Store in a cool, dry place.
Respiratory Protection	Not necessary under conditions of normal use. Wear self contained breathing filter mask if the density exceeds in the air. Wear breathing apparatus under the condition of emergency rescue or evacuation.
Eyes Protection	Not necessary under conditions of normal use. Wear protective glasses if handling a leaking or ruptured battery.
Body Protection	Not necessary under conditions of normal use. Wear fireproofing, gas defense clothes in case of handling a leaking or ruptured battery.
Hands Protection	Not necessary under conditions of normal use. Wear chemical resistant rubber gloves in case of handling a leaking or ruptured battery.
Other Protections	No smoking, dining or drinking water in the workplace. Keep good habit of hygiene.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Cylinder
Odor	Odorless
Solubility	Insoluble in water

10. STABILITY AND REACTIVITY

Stability	Stable under normal temperature and pressure.
Distribution of Ban	Strong oxidizer, strong acid and corrosives
Conditions to Avoid	Fire source, heating source, disassembly, short-circuit or immersion in water.
Hazardous Decomposition Products	The battery may release irritative gas if the electrolyte leaks.

11. TOXICOLOGICAL INFORMATION

Irritation	The liquid in the battery may irritate eyes and skin with any contact.
Sensitization	The liquid in the battery may cause sensitization to some people.
Others	Since the materials in this battery are sealed in the can, the potential for exposure to the components of the battery is negligible when the battery is used as directed. However technical or electrical abuse of the battery may result in the release of battery contents.

12. ECOLOGICAL INFORMATION

Do not dispose of the battery into the environment. It may cause water or soil pollution.

13. DISPOSAL CONSIDERATIONS

Refer to national or local regulations before handling. Disposal of the battery should be performed by permitted, professional disposal firms knowledgeable in national or local regulations of hazardous waste treatment and hazardous waste transportation. The battery should be completely discharged prior to disposal in order to prevent short-circuit. The battery contains recyclable materials. It is suggested to recycle.

14. TRANSPORT INFORMATION

According to packing instruction 968-970 of IATA DGR 54th Edition for transportation, the special provision 188 of IMDG (inc Amdt 35-10), the batteries should be securely packed and protected against short-circuits. Examine whether the package of the containers are integrate and tightly closed before transport. Take care with cargo; do not fall, drop or break. Prevent collapsing of cargo piles and becoming wet by rain. The transport vehicle and ship must be cleaned and sterilized otherwise it is not allowed to assemble articles. During transport, the vehicle should avoid exposure, rain and high temperatures. For stopovers, the vehicle should be away from fire and heat sources. When transported by sea, the assemble place should keep away from bedroom, kitchen and isolated from the engine room, power and fire source. Under the condition of road transportation, the driver should drive in accordance with regulated route, do not stop in a residential area or congested area.

15. Regulatory Information

ISO 11014-2009: Safety data sheet for chemical products - content and order of sections.

Regulation (EC) No 1272/2008: Classification, Labeling and Packaging of Substances and Mixtures

International Air Transport Association (IATA) Dangerous Goods Regulations, 54th Edition

The International Maritime Dangerous Goods (IMDG) Code (inc Amdt 35-10)

16. ADDITIONAL INFORMATION

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFT

SPECIALTY BATTERY GROUP
Lithium Battery Division

MATERIAL SAFETY DATA SHEET

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

NAME : *LITHIUM, THIONYL CHLORIDE (Li-$SOCl_2$)*
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-$SOCl_2$)*
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 ($AlCl_3$).

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

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

Metals	%	Plastics	%	Others	%
- Steel *(Iron 30 % Nickel 10 %)* - Lithium	35-40* 4-5*	- PVC	2-3*	- Thionyl chloride - Carbon - Glass - Aluminum chloride - Salts	40-46* 4 1-4* 1.5* 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	Classi fication			
N° EEC *(CAS N°)*	Chemical symbol	Mass %		Letter	Indication of danger	Special risk (1)	Safety advice (2)
231 102 5 *(7439-93-2)*	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 *(7719-09-7)*	$SOCl_2$	40-46	-104.5° C	C	Irritant Corrosive Harmful	R14 R21 R22 R35 R37 R41 R42/43	S2 S8 S24 S26 S36 S37 S45
(00744-67-00)	$AlCl_3$	≈ 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.

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 is 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.

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 unappropriate 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 unproper 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 (Na_2CO_3) or 1:1 mixture of soda ash and slaked slime. Keep away from water, rain, snow. Place in approved container (after cooling if necessary) and dispose in accordance with local regulations.

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.

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 : 0.5xnominal voltage x 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.

Hydrochloric acid (HCl) fumes, lithium oxide, (Li_2O), lithium hydroxide (LiOH) and aluminum hydroxide ($Al(OH)_3$) dust are produced in case of reaction of *lithium thetrachloroaluminate* 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.

14 - TRANSPORT INFORMATION

14.1 United Nations :

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

14.3 Other : In the USA — Code of Federal Regulations (49 CFR Ch. 1 § 173-185)

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.

This information relates to the specific materials designated and may not be valid for such material 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 information. Saft does not offer warranty against patent infringement. Additional information is available by calling the telephone number above designated purpose.

Revision 3 Date 11/2003
(Previous issue Revision 2 06/2000)

Signed _____
Lithium Product Manager

Battery Information Sheet

Primary Li-SOCl$_2$ 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.

1. IDENTIFICATION

1.1 Product

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

1.2 Supplier

Headquarters	**Saft S.A.S.**
Address	12 rue Sadi Carnot, 93170 BAGNOLET – France
Phone/Fax	+33 (0)1 49 93 19 18 /+33 (0)1 49 93 19 50
Factory	**Saft Poitiers**
Address	Rue Georges Leclanché, BP 1039, 86060 POITIERS Cedex 9 – France
Phone/Fax	+33 (0)5 49 55 48 48 /+33 (0)5 49 55 48 50
Factory	**Saft Ltd.**
Address	River Drive, Tyne & Wear, SOUTH SHIELDS, NE33 2TR – United Kingdom
Phone/Fax	+1 44 191 456 1451/+1 44 191 456 6383
Factory	**Saft America Inc.**
Address	313 Crescent Street, VALDESE, NC 28690 – USA
Phone/Fax	+1 828 874 4111/+1 828 874 2431
Factory	**Saft Batteries Co., Ltd.**
Address	Zhuhai Free Trade Zone, Lianfeng Road, ZHUHAI 519030, Guangdong Province – China
Phone/Fax	+86 756 881 9318/+86 756 881 9328
Factory	**Tadiran Batteries Ltd.**
Address	34 Y. Rabin Avenue – KIRYAT EKRON 76950 - Israel
Phone/Fax	+972 894 44374/+972 894 13066
Factory	**Tadiran Batteries GmbH**
Address	Industriestrasse 22, D-63654 BÜDINGEN – Germany
Phone/Fax	+49 (0)6 042 954 599/+49 (0)6 042 954 190

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
In France, INRS Orfila : +33(0) 1 45 42 59 59 for French

2. HAZARD IDENTIFICATION

The Li-$SOCl_2$ 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 in series 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*

4. HANDLING AND STORAGE

IMPORTANT NOTICE: Lithium-thionyle 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°C and in any case below 30°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°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.

5. 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

6. 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 of 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.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen (H_2) as well as lithium oxide (Li_2O) and lithium hydroxide (LiOH) dust are produced in case of reaction of lithium metal with water (hydrolysis).
Chlorine (Cl_2), sulfur dioxide (SO_2) and disulfur dioxide (S_2Cl_2) are produced in case of thermal decomposition of thionyl dichloride above 100°C. Hydrochloric acid (HCl) and sulfur dioxide (SO_2) are produced in case of reaction of thionyl dichloride with water at room temperature.

Hydrochloric acid (HCl) fumes, lithium oxide (Li_2O), lithium hydroxide (LiOH) and aluminium hydroxide ($Al(OH)_3$) dust are produced in case of reaction of lithium tetrachloroaluminate ($LiAlCl_4$) with water.

7. 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.

8. 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.

9. 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:
http://www.saftbatteries.com/TheSaftGroup/Environment/Takebackpolicy/tabid/104/Language/en-US/Default.aspx
http://www.saftbatteries.com/TheSaftGroup/Environment/BringBackPoints/tabid/435/Language/en-US/Default.aspx

10. TRANSPORTATION INFORMATION

Note: when manufacturing a new battery pack, one must assure that it has fulfilled the tests according to the UN Model Regulations, Manuel of Tests and Criteria, Part III, subsection 38.3.

10.1 United Nations Class

For the single cell batteries and multi-cell battery packs that are non-restricted to transport (non-assigned to the Miscellaneous Class 9), use lithium batteries inside label.

For the single cell batteries and multi-cell battery packs which are restricted to transport (assigned to Class 9), use Class 9 Miscellaneous Dangerous Goods and UN Identification Number Labels.

In all cases, refer to the product transport certificate issued by the manufacturer.

UN Numbers:	3090	LITHIUM METAL BATTERIES: Shipment of cells and batteries *in bulk*
	3091	LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT: Cells and batteries *contained in equipment* or *packed with it*

Shipping name	LITHIUM METAL BATTERIES
Hazard Classification:	9 Depending on their lithium metal content, some single cells and small multi-cell battery packs may be non-assigned to Class 9. Refer to Transport Certificate.
Packaging:	Group II

10.2 International agreements

By Air International:	IATA/ICAO: UN 3090 or UN3091
By Sea International:	IMDG: UN 3090 or UN 3091
European road transportation:	ADR
European rail transportation:	RID

11. 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

12. FIRST AID MEASURES (not anticipated under normal use)

12.1. 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.

12.2. 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.

13. FIRE FIGHTING MEASURES (not anticipated under normal use)

ESTINGUISHING 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_2 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.

14. EXPOSURE CONTROLS AND PERSONAL PROTECTION* (not anticipated under normal use)

	**Respiratory protection**	In all fire situations, use self-contained breathing apparatus
	**Hand protection**	In case of leakage wear protective gloves
	**Eye protection**	Safety glasses are mandatory during handling
	**Other**	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	-

15. 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 measured 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 ($CaCO_3$) or lime (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.

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.

12, rue Sadi Carnot
93170 Bagnolet – France
Tel.: +33 (0)1 49 93 19 18
Fax: +33 (0)1 49 93 19 69
www.saftbatteries.com

Doc N° BIS04-11-12
Edition: November 2012
Version 1.1

Battery Information Sheet

Rechargeable lithium-ion cells, modules and battery systems

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 an information document for the purpose of assisting our customers.

1. IDENTIFICATION

1.1 Product

Lithium-Ion rechargeable cells and modules or battery systems composed of these cells

1.2 Supplier

Headquarter	**Saft S.A.S.**
Address	12 rue Sadi Carnot, 93170 BAGNOLET – France
Phone/Fax	Phone/Fax: +33 (0)1 49 93 19 18 /+33 (0)1 49 93 19 50
Factory	**Saft Bordeaux**
Address	111-113, boulevard Alfred Daney, 33074 BORDEAUX - France
Phone/Fax	+33 (0)5 57 10 64 00 /+33 (0)5 57 10 68 77
Factory	**Saft Jacksonville**
Address	13575, Waterworks street, JACKSONVILLE, FL 32221 - USA
Phone/Fax	+1 904 861 1501/+1 904 772 1463
Factory	**Saft Nersac**
Address	Zone industrielle, 16440 NERSAC - France
Phone/Fax	+33 (0)5 49 55 48 48 /+33 (0)5 49 55 48 50
Factory	**Saft Raskovice**
Address	Raskovice 247, 73904 PRAZMO - Czech Republic
Phone/Fax	+420 558 426 257/+420 558 692 226
Factory	**Saft Poitiers**
Address	Rue Geoges Leclanché – BP n°1039, 86060 POITIERS Cedex 9 - France
Phone/Fax	+33 (0)5 45 90 50 26 /+33 (0)5 45 90 50 71
Factory	**Saft Cockeysville**
Address	107 Beaver Court, COCKEYSVILLE, MD 21030 - USA
Phone/Fax	+1 410 771 3200/+1 410 771 1144
Factory	**Saft Valdese**
Address	313 Crescent Street, VALDESE, NC 28690 - USA
Phone/Fax	+1 828 874 4111/+1 828 874 2431

1.3 Emergency contact

Chemtrec US Service within the USA: +800 424 93 00/outside : +1-202-483-7616 for English speaking
INRS Orfila : +33(0) 1 45 42 59 59 for French speaking

2. HAZARD IDENTIFICATION

2.1 At cell level

Not chemically dangerous with normal use in accordance with Saft recommendations as stated in the user manuals or other similar documentation. In particular, the battery should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful.

EYE CONTACT: contents of an opened cell within a battery can cause eye irritation. Dust may cause inflammation of eyelids

SKIN CONTACT: Electrolyte solution inside cells can cause skin irritation. Contact with positive active material may in addition cause allergic dermatitis or irritation to skin.

INHALATION: Contents of an opened cell can cause respiratory tract and mucus membrane irritation. Overexposure to lithiated nickel compounds may cause an allergic response. If gas is generated during battery disassembly, throat irritation may occur.

2.2 At module and battery system level

HIGH VOLTAGE: Always use the large battery systems in a restricted access area. Only authorized people aware of high voltage hazards and trained to work on such systems are allowed to enter in the battery area.

TEMPERATURE: Do not place the batteries on or near fires or other high-temperature locations (> 70°C). Doing so may cause the batteries to overheat or ignite. Using the batteries in this manner may also result in a loss of performance and a shortened life expectancy.

3. COMPOSITION, INFORMATION OR INGREDIENTS

3.1 At cell level

Component	CAS Number	EINECS/ELINCS	Content (wt. %)*
Lithiated metal Oxide	N/A	N/A	15-30
Organic Electrolyte	N/A	N/A	10-20
Carbon, as Graphite	7440-44-0	231-153-3	10-25
Copper	7440-50-8	231-159-6	1-30
Aluminium	7429-90-5	231-072-3	1-20
Stainless, Nickel and inert material	N/A	N/A	remainder

** Quantities may vary a little with cell model*

3.2 At module and battery system level

Depending on the type of battery system, it may contain either a glycol ethylene based coolant or a refrigerated coolant.

4. HANDLING AND STORAGE

IMPORTANT NOTICE: The battery should not be opened without Saft approval, destroyed or incinerated since the battery may cause fire or the ingredients contained in the cells could be harmful under some circumstances if exposed.

STORAGE : Store in a cool, dry and ventilated area. Elevated temperatures can result in shortened battery life. Since short circuit can cause burn hazard, leakage or explosion hazard, keep batteries in original packaging until use and do not jumble them.

HANDLING :

- Do not short (+) or (-) terminal with conductors.
- Do not reverse the polarity
- Do not mix different type batteries or mix new and old ones together.
- Do not open the battery system or modules
- Do not use the unit without its electronic management system.
- Do not submit to excessive mechanical stress.
- 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.
- Immediately disconnect the batteries if, during operation, they emit an unusual smell, feel hot, change shape, or appear abnormal in any other way. Contact Saft if any of these problems are observed.

CHARGING/DISCHARGING : Charge with specified charger designed for this battery or commercial cycling equipment that has upper voltage fail safe conditions. Do not overcharge as venting and combustion can occur. Do not over-discharge. Discharge limits are dependent on the specific product. Refer to Saft Instructions.

5. PHYSICAL AND CHEMICAL PROPERTIES

The lithium-Ion 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.

Boiling Point – Not applicable	Melting Point – Not applicable
Vapor Pressure – Not applicable	Vapor Density – Not applicable
Specific Gravity – Not applicable	

6. STABILITY AND REACTIVITY – the battery system is stable when handled and stored according to section 4

MATERIALS TO AVOID: Oxidizing agents, acids, bases and reducing agents.

CONDITIONS TO AVOID: Avoid exposing battery to fire or high temperature. Do not disassemble, crush or short or install with incorrect polarity. Avoid mechanical or electrical abuse.

HAZARDOUS DECOMPOSITION PRODUCTS: Lithium hexafluorophosphate may react with water in the atmosphere and produce some traces of hydrogen fluoride, which do not worsen the gas toxicity. Thermal decomposition of the cell may produce release of electrolyte liquid and vapour, harmful materials, and dusts.

7. TOXICOLOGICAL INFORMATION

Risk of irritation occurs only if the cell is mechanically, thermally or electrically abused to the point of compromising the enclosure. If this occurs, irritation to the skin, eyes and respiratory tract may occur.

8. ECOLOGICAL INFORMATION

None known if used/disposed of correctly

9. DISPOSAL CONSIDERATIONS

Battery recycling is either mandatory (European Directive 2006/66/EC) or recommended.
Batteries should be fully discharged prior to disposal and terminals protected.
Dispose in accordance with local laws and regulations. Store material for disposal as indicated in Section 4.
Do NOT dump into any sewers, on the ground or into any body of water.

See:
http://www.saftbatteries.com/TheSaftGroup/Environment/Takebackpolicy/tabid/104/Language/en-US/Default.aspx
http://www.saftbatteries.com/TheSaftGroup/Environment/BringBackPoints/tabid/435/Language/en-US/Default.aspx

10. TRANSPORTATION INFORMATION

10.1 United Nations Class

Lithium-ion cells and batteries are listed in the hazardous materials list according to UN Recommendations on Dangerous Goods Transportation.

Class UN N°:	3480
Hazard Classification:	9
Packaging:	Group II

10.2 International agreements

By Air International:	IATA
By Sea International:	IMDG
European road transportation:	ADR (road)
European rail transportation:	RID

11. REGULATORY INFORMATION

Marking Consideration
European Union: According to directive 2006/66/EC, the batteries have to be marked with the crossed wheel bin symbol. Lithium-ion batteries, which contain electronic modules (e.g. PCM) and which are subjected to the EMC directive 93/97/EEC, must be approved and must wear the CE marking.

International safety standards: The basis cells are approved according to UL 1642.

12. FIRST AID MEASURES (not anticipated under normal use)

EYE CONTACT : Immediately flush with copious amount of water for more than 15 minutes. Seek immediate medical attention.

SKIN CONTACT: Remove contaminated clothing and flush affected areas with plenty of water for at least 15 minutes. Wash skin with soap and water. If skin irritation persists, call for a medical attention.

INHALATION: Remove to fresh air and seek immediate medical attention. Obtain medical advice.

INGESTION: Clear mouth with water and afterwards drink plenty of water. Do not induce vomiting. Seek immediate medical attention.

13. FIRE FIGHTING MEASURES (not anticipated under normal use)

ESTINGUISHING MEDIA:

- Small fires: use D type fire extinguisher, inert gas (for instance blend of argon and nitrogen), CO_2, dry chemical powder or foam extinguishers
- Large fires: use large quantities of water for the surrounding fire and to prevent propagation. If water is used on live batteries, caution should be taken to avoid the electrical hazard that may be present.

SPECIAL FIRE FIGHTING PROCEDURES: Fire fighters should wear self-contained breathing apparatus.
Use approved / certified vapour respirator to avoid breathing toxic fumes. Wear protective clothing and equipment to prevent potential body contact with electrolyte solution. 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.

PARTICULAR HAZARDS RESULTING FROM EXPOSURE TO THE SUBSTANCE/PREPARATION, TO COMBUSTION AND GAS PRODUCTS: The cell can spout vaporized or decomposed electrolyte fumes with fire when being heated over +100°C (+212°F) or disposed in fire. Solvents within the electrolyte are flammable liquids and must be kept away from any kind of ignition source.

14. EXPOSURE CONTROLS AND PERSONAL PROTECTION* (not necessary under normal use)

Handle an opened battery only in a well ventilated place.

	**Respiratory protection**	In case of incident or after an abusive use, in case of a cell opening or a leak, use gas mask which covers the whole face and equipped with ABEK type filters or escape mask type Self-Contained Breathing Apparatus. Fire fighters should wear self-contained breathing apparatus.
	**Hand protection**	Use polypropylene, polyethylene, rubber or Viton gloves when handling leaking or ruptured cells.
	**Eye protection**	In case of incident or after an abusive use, in case of a leak or cell opening, wear safety glasses with protected side shields or a mask covering the whole face when handling leaking or ruptured cells
	**Other**	In the event of leakage or ruptured cells, wear a rubber apron and protective clothes.

**AFNOR pictograms*

15. ACCIDENTAL RELEASE MEASURES (not anticipated under normal use)

INDIVIDUAL PRECAUTIONS: Evacuate the employees from the contaminated area until fumes dispersal. In case of electrolyte leakage from a cell or battery, do not inhale the gas as possible. In case of skin or eye contact, inhalation or ingestion, follow the measured described in section 4.

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

WAYS OF CLEANING: Using protective glasses and gloves, use absorbent material (sand, earth or vermiculite) to absorb any exuded material. Seal leaking battery (unless hot) and contaminated absorbent material in plastic bag and dispose of as Special waste in accordance with local regulations.

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.

12, rue Sadi Carnot
93170 Bagnolet – France
Tel.: +33 (0)1 49 93 19 18
Fax: +33 (0)1 49 93 19 69
www.saftbatteries.com

Doc N° BIS01-2-12
Edition: March 2012
Version 1.1

Electrochem Solutions
Subsidiary of Greatbatch, Inc.
670 Paramount Drive
Raynham, MA 02767 USA
Tel 716-759-6901 Fax 716-759-2562

MATERIAL SAFETY DATA SHEET

Issued: 12/9/2010

Section 1 – IDENTIFICATION

Product Name:

LITHIUM SULFURYL CHLORIDE
CELLS AND BATTERIES

Hermetically-Sealed Lithium Sulfuryl Chloride Cells & Batteries
All Electrochem CSC & PMX Cells and Batteries

Section 2 – COMPOSITION/INFORMATION ON INGREDIENTS

Sulfuryl Chloride **7791-25-5**	**TLV/PEL: N/A**
Lithium **7439-93-2**	**TLV/PEL: N/A**
Chlorine **7782-50-5**	**ACGIH: 1.5mg/m3 TLV/TWA**
Carbon **1333-86-4**	**ACGIH: 3.5 mg/m3 TLV/TWA**

Section 3 – HAZARDS IDENTIFICATION

****DANGER**** INTERNAL CONTENTS ARE EXTREMELY HAZARDOUS. LEAKING FLUID IS CORROSIVE AND DANGEROUS UPON INHALATION. BATTERY MAY BE EXPLOSIVE AT HIGHER TEMPERATURES.

Do not expose to temperatures above the maximum rated temperature as specified by the manufacturer due to leak hazard.

If cell or battery leaks or vents

Primary Routes of Entry: Inhalation.
Carcinogenicity: Not listed by NTP, IARC, or regulated by OSHA.
Health Hazards: **Acute –** Vapors are very irritating to skin, eyes, and mucous membranes. Inhalation of Thionyl chloride or sulfuryl chloride vapors may result in pulmonary edema.
Chronic – Overexposure can cause symptoms of non-fibrotic lung injury.
Signs and Symptoms of Exposure: Eye and mucous membrane irritation.
Medical Conditions Generally Aggravated by Exposure: Asthma, other respiratory disorders, skin allergies, and eczema.

Section 4 – FIRST AID MEASURES

Eye Contact: Flush with running water for at least 15 minutes. Hold eyelids apart. Seek immediate medical attention. Contact results in acidic burns.
Skin Contact: Rinse with large amounts of running water. Avoid hot water and rubbing skin. If burns develop, seek medical attention. Contact results in acidic burns.
Inhalation: Remove to fresh air. If breathing is difficult, administer oxygen. If not breathing, give artificial respiration. May result in pulmonary edema.
Ingestion: Drink copious amounts of water (or milk if available). Do not induce vomiting. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. Immediately seek medical attention.

Section 5 – FIRE FIGHTING MEASURES

Flash Point: N/A **Auto-Ignition Temp:** N/A **Flammable Limits:** N/A
Extinguisher Media: Copious amounts of water. Lith-X powder, Class D fire extinguisher, Dry Lithium Chloride, Graphite Powder, Pyrene G-1 may not be effective on resulting secondary fires.
Special Fire Fighting Procedures: Cover with Lith-X powder, Class D fire extinguisher, dry lithium chloride, or graphite powder. DO NOT USE CO_2, Class ABC, or soda ash extinguisher. Wear protective breathing apparatus; a positive pressure Self Contained Breathing Apparatus (SCBA), or Air Purifying Respirator (APR). Be aware of secondary fires.
Unusual Fire and Explosion Hazards: Do not short circuit, recharge, over discharge (discharge below 0.0 Volts), puncture, crush or expose to temperatures above the maximum rated temperature as specified by the manufacturer**.** Cell may leak, vent, or explode. If a bright white flame is present, lithium content is exposed and on fire.

Section 6 – ACCIDENTAL RELEASE MEASURES

Accidental Releases: Do not breathe vapors or touch liquid with bare hands (see section 4).
Waste Disposal Methods: Evacuate area. If possible, a trained person should attempt to stop or contain the leak by neutralizing spill with soda lime or baking soda. A NIOSH Approved Acid Gas Filter Mask or Self-Contained Breathing Apparatus should be worn. Seal leaking battery and soda lime or baking soda in a plastic bag and dispose of as hazardous waste.
Other: Follow North American Emergency Response Guide (NAERG) #138 for cells involved in an accident, cells that have vented, or have exploded.

Section 7 – HANDLING & STORAGE

Storage: Cells should be stored at room temperature, approx. 21°C (70°F). Do not store batteries in high humidity environments for long periods. High Temperature storage will degrade performance.
Precautions: Do not short circuit or expose to temperatures above the maximum rated temperature as specified by the manufacturer. Do not recharge, over discharge, puncture or crush.
Other Conditions: Do not store cells in close proximity of other combustible / flammable materials.

Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

When handling internal components:

Respiratory Protection: NIOSH Approved Acid Gas Filter Mask, or Self-Contained Breathing Apparatus.
Protective Gloves: Nitrile or PVC, Gloves should be 15 ml (0.015 in), or thicker.
Eye Protection: Chemical Worker Safety Glasses or face shield.
Ventilation To Be Used: Negative pressure chemical fume hood.
Other Protective Clothing & Equipment: Chemical Laboratory Safety Glasses, Protective Apron, Acid Resistant Protective Clothing, and face shield.
Hygienic Work Practices: Use good chemical hygiene practice. Do not eat or drink when handling contents. Avoid unnecessary contact.

Section 9 – PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point:	Sulfuryl Chloride: 69oC
Vapor Pressure:	Sulfuryl Chloride: 105mm @ 20 °C
Vapor Density:	Sulfuryl Chloride: 4.7 (air = 1)
Solubility in Water:	Sulfuryl Chloride: Decomposes violently on contact with water.
Specific Gravity:	Sulfuryl Chloride: 13.8 lb/gal
Melting Point:	Sulfuryl Chloride: -54 °C
Evaporation Rate:	No Data
Water Reactive:	Sulfuryl Chloride hydrolyzes to form sulfuric, chlorosulfuric, and hydrochloric acids and strongly acidic wastewater.
Appearance & Odor:	Sulfuryl Chloride – Yellow; sharp, pungent odor.
Other:	N/A

Section 10 – STABILITY & REACTIVITY

Stability: Stable **Incompatibility:** N/A **Hazardous Polymerization:** Will not occur.
Conditions to Avoid: Temperatures above the maximum rated temperature as specified by the manufacturer due to leak hazard. High humidity for extended periods.
Hazardous Decomposition Products: Sulfur Dioxide $_{(g)}$, Hydrogen Chloride $_{(g)}$, Hydrogen $_{(g)}$

Section 11 – TOXICOLOGICAL INFORMATION

Acute Toxicity (as applicable):

Thionyl Chloride		**Sulfuryl Chloride**	
LC_{50} (Inhalation):	500 ppm (rat 1-hr)	**LC_{50}** (Inhalation):	130-250 ppm (rat 1-hr)
LD_{50}:	N/A	**LD_{50}:**	N/A
Eye Effects:	Corrosive	**Eye Effects:**	Corrosive
Skin Effects:	Corrosive	**Skin Effects:**	Corrosive

Section 12 – ECOLOGICAL INFORMATION

Aquatic Toxicity: Do not let internal components enter marine environments. Avoid releases into waterways, wastewater or groundwater.

Section 13 – DISPOSAL CONSIDERATIONS

Proper Shipping Name: Waste Lithium Batteries
UN Number: 3090
Hazard Classification: Class 9 (Misc.)
Packing Group: II
Labels Required: MISCELLANEOUS, HAZARDOUS WASTE
Waste Disposal Code: D003
Other: All lithium thionyl chloride batteries should be disposed of by a certified hazardous waste disposal facility.

Section 14 – TRANSPORT INFORMATION

US DOT (per 49 CFR 172.101) and IATA/ICAO
Proper Shipping Name: Lithium Metal Batteries
UN Number: UN 3090 (UN 3091 for *Lithium Metal Batteries Contained in Equipment or Lithium Metal batteries Packed With Equipment*)
Hazard Classification: Class 9 (Misc.)
Packing Group: II
Labels Required: MISCELLANEOUS HAZARD CLASS 9, LITHIUM BATTERY LABEL (IATA 7.4.8)
Other: CARGO AIRCRAFT ONLY (Forbidden as cargo aboard passenger aircraft)
Shipping Requirements
DOT: Lithium batteries and cells are subject to shipping requirements exceptions under 49 CFR 173.185.
IATA: Shipping of lithium batteries in aircrafts are regulated by the International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA) requirements in Special Provision A48, A88, A99, A154, A164 and Packing Instruction 968, 969, or 970.

Section 15 – REGULATORY INFORMATION

OSHA Status: This product is considered an "Article" and the internal component (thionyl chloride / sulfuryl chloride) is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1920.1200.

Section 16 – OTHER INFORMATION

Lithium Battery Safety
With proper use and handling, lithium batteries have demonstrated an excellent safety record. The success and wide use of lithium batteries is partially due to the fact that they contain more energy per unit weight than conventional batteries. However, the same properties that result in a high energy density also contribute to potential hazards if the energy is released at a fast-uncontrolled rate. In recognition of the high-energy content of lithium systems, safety has been incorporated into the design and manufacture of all Electrochem batteries. However, abuse or mishandling of lithium batteries can still result in hazardous conditions. The information provided here is intended to give users some guidelines to safe handling and use of Electrochem lithium batteries.

Cell Abuse
In general, the conditions that cause damage to cells and jeopardize safety are summarized on the label of each cell. These conditions include:

- Short Circuit
- Charging
- Forced Over discharge
- Excessive heating or incineration
- Crush, puncture or disassembly
- Very rough handling or high shock and vibration could also result in cell damage.

Cell Handling and Inspection Guidelines
The most frequent forms of cell abuse can easily be identified and controlled in the workplace. It is our experience that inadvertent short circuits are the largest single cause of field failures.

Problems associated with shorting as well as other hazardous conditions can be greatly reduced by observing the following guidelines:

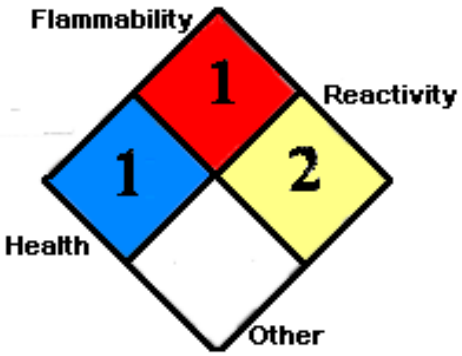
- Cover all metal work surfaces with an insulating material.
- The work area should be clean and free of sharp objects that could puncture the insulating sleeve on each cell.
- Never remove the shrink-wrap from a cell or battery pack.
- All persons handling cells should remove jewelry items such as rings, wristwatches, pendants, etc., that could come in contact with the battery terminals.
- If cells are removed from their original packages for inspection, they should be neatly arranged to preclude shorting.
- Cells should be transported in plastic trays set on pushcarts. This will reduce the chances of cells being dropped on the floor, causing physical damage.
- All inspection tools (calipers, rulers, etc.) should be made from non-conductive materials, or covered with a non-conductive tape.
- Cells should be inspected for physical damage. Cells with dented cases or terminal caps should be inspected for electrolyte leakage. If any is noted, the cell should be disposed of in the proper manner.

Cell Storage
Cells should be stored in their original containers. Store cells in a well ventilated, cool, dry area. Store cells in an isolated area, away from combustible materials. Never stack heavy objects on top of boxes containing lithium batteries to preclude crushing or puncturing the cell case.

Handling During Product Assembly
All personnel handling batteries should wear appropriate protective equipment such as safety glasses.

- Do not solder wires or tabs directly to the battery. Only solder to the leads welded to the cell by the manufacturer.
- Never touch a cell case directly with a hot soldering iron. Heat sinks should be used when soldering to the tabs, and contact with the solder tabs should be limited to a few seconds.
- Cells should not be forced into (or out of) battery holders or housings. This could deform the cell causing an internal short circuit, or fracturing the glass to metal hermetic seal.
- All ovens or environmental chambers used for testing cells or batteries should be equipped with an over-temperature controller to protect against excessive heat.
- Only precision convection ovens should be used for cell testing. Lesser ovens may exhibit uneven heating and hot spots that can exceed the rated temperature of the battery.
- Do not connect cells or batteries of different chemistries together.
- Do not connect cells or batteries of different sizes together.
- Do not connect old and new batteries together.
- Consult Electrochem before encapsulating batteries during discharge. Cells may exceed their maximum rated temperature if insulated.
- Although we have provided a general overview of lithium battery safety and handling, we urge you to call us with any questions. Our technical services staff will be pleased to assist you with your questions.

NFPA RATING



- For cells or battery packs involved in an accident, cells that have vented, or exploded, follow the North American Emergency Response Guide (NAERG) #138.

- **24-HOUR EMERGENCY RESPONSE PHONE NUMBER:**
  (800) 255-3924

Rev. 2010A
Date: 05/05/2010