1. Identification of the Substance or Preparation and Company

<table>
<thead>
<tr>
<th>Product</th>
<th>Primary Lithium/Thionyl chloride unit cells and multi-cell battery packs (Li-SOCl₂)</th>
</tr>
</thead>
</table>
| Production sites | Saft Ltd.  
River Drive  
Tyne & Wear  
South Shields  
NE33 2TR – UK  
Ph.: +44 191 456 1451  
Fax: +44 191 456 6383 | Saft  
Rue Georges Leclanché  
BP 1039  
86060 Poitiers cedex 9  
France  
Ph.: +33 (0)5 49 55 48 48  
Fax: +33 (0)5 49 55 48 50 | Saft America Inc  
313 Crescent Street  
Valdese  
NC 28690 – USA  
Ph.: +1 828 874 4111  
Fax: +1 828 874 2431 | Saft Batteries Co., Ltd  
Zhuhai Free Trade Zone  
Lianfeng Road  
Zhuhai 519030  
Guangdong Province China  
Ph.: +86 756 881 9318  
Fax: +86 756 881 9328 |

www.saftbatteries.com (section “Contact”)

Emergency contact +1 (703) 527 3887 (CHEMTREC US Service Center)  
within the USA : 800 424 9300

2. Hazards Identification

Do not short circuit, recharge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion. The Lithium-Thionyl chloride batteries described in this 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 not exposed to the outside, 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 container. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.

3. Composition & Information on Ingredients

Each cell consists of a hermetically sealed metallic container containing a number of chemicals and materials of construction of which the following could potentially be hazardous upon release.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Content</th>
<th>CAS No.</th>
<th>CHIP Classification</th>
</tr>
</thead>
</table>
| Lithium (Li) | 3.5-5% | 7439-93-2 | F; R14/15  
C, R34  
R14/15, R21,R22, R35,  
R41, R43  
S2, S8, S45 |
Thionyl chloride (SOCl₂)  
40-46%  
7719-09-7  
C; R14, R21, R22, R35, R37, R41, R42/43, S2, S8, S24, S26, S36, S37, S45

Aluminum chloride anhydrous (AlCl₃)  
1-5%  
7446-70-0  
R14, R22, R37, R41, R43, S2, S8, S22, S24, S26, S36, S45

Carbon (Cₙ)  
3-4%  
1333-86-4  
NONE KNOWN

Amount varies depending on cell size.

### 4. First Aid Measures

**Inhalation**  
Remove from exposure, rest and keep warm. In severe cases obtain medical attention.

**Skin contact**  
Wash off skin thoroughly with water. Remove contaminated clothing and wash before re-use. In severe cases obtain medical attention.

**Eye contact**  
Irrigate thoroughly with water for at least 15 minutes. Obtain medical attention.

**Ingestion**  
Wash out mouth thoroughly with water and give plenty of water to drink. Obtain medical attention.

**Further treatment**  
All cases of eye contamination, persistent skin irritation and casualties who have swallowed this substance or been affected by breathing its vapours should be seen by a Doctor.

### 5. Fire Fighting Measures

CO₂ extinguishers or, even preferably, copious quantities of water or water-based foam, can be used to cool down burning Li-SOCl₂ cells and batteries, as long as the extent of the fire has not progressed to the point that the lithium metal they contain is exposed (marked by deep red flames).

Do not use for this purpose sand, dry powder or soda ash, graphite powder or fire blankets. **Use only metal (Class D) extinguishers on raw lithium.**

**Extinguishing media**  
Use water or CO₂ on burning Li-SOCl₂ cells or batteries and class D fire extinguishing agent only on raw lithium.

### 6. Accidental Release Measures

Remove personnel from area until fumes dissipate. Do not breathe vapours or touch liquid with bare hands.

If the skin has come into contact with the electrolyte, it should be washed thoroughly with water.

Sand or earth should be used to absorb any exuded material. Seal leaking battery and contaminated absorbent material in plastic bag and dispose of as Special Waste in accordance with local regulations.
7. Handling and Storage

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 burns, 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

<table>
<thead>
<tr>
<th>Occupational exposure standard</th>
<th>Compound</th>
<th>8hr TWA</th>
<th>15min TWA</th>
<th>SK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sulfur dioxide</td>
<td>1 ppm</td>
<td>1 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydrogen chloride</td>
<td>1 ppm</td>
<td>5 ppm</td>
<td></td>
</tr>
</tbody>
</table>

Respiratory protection
In all fire situations, use self-contained breathing apparatus.

Hand protection
In the event of leakage wear gloves.

Eye protection
Safety glasses are recommended during handling.

Other
In the event of leakage, wear chemical apron.

9. Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Cylindrical or prismatic shape</td>
</tr>
<tr>
<td>Odour</td>
<td>If leaking, gives off a pungent corrosive odour.</td>
</tr>
<tr>
<td>pH</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable unless individual components exposed</td>
</tr>
<tr>
<td>Flammability</td>
<td>Not applicable unless individual components exposed</td>
</tr>
<tr>
<td>Relative density</td>
<td>Not applicable unless individual components exposed</td>
</tr>
<tr>
<td>Solubility (water)</td>
<td>Not applicable unless individual components exposed</td>
</tr>
<tr>
<td>Solubility (other)</td>
<td>Not applicable unless individual components exposed</td>
</tr>
</tbody>
</table>
10. Stability and Reactivity

Product is stable under conditions described in Section 7.

<table>
<thead>
<tr>
<th>Conditions to avoid</th>
<th>Heat above 100 (150°C for the LSH 20-150 cells and the battery packs assembled from them) or incinerate. Deform. Mutilate. Crush. Pierce. Disassemble. Recharge. Short circuit. Expose over a long period to humid conditions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials to avoid</td>
<td>Oxidising agents, alkalis, water. Avoid electrolyte contact with aluminum or zinc.</td>
</tr>
<tr>
<td>Hazardous decomposition Products</td>
<td>Hydrogen (H₂) as well as Lithium oxide (Li₂O) and Lithium hydroxide (LiOH) dust is produced in case of reaction of lithium metal with water. Chlorine (Cl₂), Sulfur dioxide (SO₂) and Disulfur dichloride (S₂Cl₂) are produced in case of thermal decomposition of Thionyl chloride above 140°C. Hydrochloric acid (HCl) and Sulfur dioxide (SO₂) are produced in case of reaction of Thionyl chloride with water at room temperature. 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 (LiAlCl₄) with water.</td>
</tr>
</tbody>
</table>

11. Toxicological Information

<table>
<thead>
<tr>
<th>Signs &amp; symptoms</th>
<th>None, unless battery ruptures. In the event of exposure to internal contents, corrosive fumes will be very irritating to skin, eyes and mucous membranes. Overexposure can cause symptoms of non-fibrotic lung injury and membrane irritation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td>Lung irritant.</td>
</tr>
<tr>
<td>Skin contact</td>
<td>Skin irritant</td>
</tr>
<tr>
<td>Eye contact</td>
<td>Eye irritant.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>Tissue damage to throat and gastro-respiratory tract if swallowed.</td>
</tr>
<tr>
<td>Medical conditions generally aggravated by exposure</td>
<td>In the event of exposure to internal contents, eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur.</td>
</tr>
</tbody>
</table>

12. Ecological Information

<table>
<thead>
<tr>
<th>Mammalian effects</th>
<th>None known if used/disposed of correctly.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-toxicity</td>
<td>None known if used/disposed of correctly.</td>
</tr>
<tr>
<td>Bioaccumulation potential</td>
<td>None known if used/disposed of correctly.</td>
</tr>
<tr>
<td>Environmental fate</td>
<td>None known if used/disposed of correctly.</td>
</tr>
</tbody>
</table>

13. Disposal Considerations

Do not incinerate, or subject cells to temperatures in excess of 100°C. Such abuse can result in loss of seal, leakage, and/or cell explosion. Dispose of in accordance with appropriate local regulations.
14. Transport Information

Note: when manufacturing a new battery pack, one must assure that it is tested in accordance with the UN Model Regulations, Manual of Tests and Criteria, Part III, subsection 38.3

Label for conveyance
For the single cell batteries and multicell 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 multicell 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
UN 3090 (shipment of cells and batteries in bulk)
UN 3091 (cells and batteries contained in equipment or packed with it)

Shipping names
Lithium Metal Batteries

Hazard classification
Depending on their lithium metal content, some single cells and small multicell battery packs may be non-assigned to Class 9 (Refer to Transport Certificate)

Packing Group
II

IMDG Code
3090 (Li batteries)
3091 (Li batteries contained in equipment or packed with it)

CAS
EmS No.
F-A, S-I

Marine pollutant
No

ADR Class
Class 9

15. Regulatory Information

Regulations specifically applicable to the product:
- ACGIH and OSHA: see exposure limits of the internal ingredients of the battery in section 8.
- 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

<table>
<thead>
<tr>
<th>Risk phrases</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| Lithium (Li)        | R14/15 | Reacts violently with water, liberating extremely flammable gases.  
                      | R21  | Harmful in contact with skin.  
                      | R22  | Harmful if swallowed.  
                      | R35  | Causes burns.  
                      | R41  | May cause sensitization by inhalation and skin contact.  
                      | R42/43 |  |
| Thionyl chloride (SOCl_2) | R14 | Reacts with water.  
                      | R22  | Harmful if swallowed.  
                      | R35  | Causes burns.  
                      | R37  | Irritating to respiratory system.  
                      | R41  | Risk of serious damage to eye.  
                      | R42/43 | May cause sensitization by inhalation and skin contact.  
| Aluminum chloride anhydrous (AlCl_3) | R14 | Reacts with water.  
                      | R22  | Harmful if swallowed.  
                      | R37  | Irritating to respiratory system.  
                      | R41  | Risk of serious damage to eye.  
                      | R43  | May cause sensitization by skin contact.  

MSDS Li-SOCl_2  
Rev. 9 February 2009
## Safety phrases

<table>
<thead>
<tr>
<th>Material</th>
<th>Safety Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium (Li)</td>
<td>S2: Keep out of reach of children. S8: Keep away from moisture. S45: In case of incident, seek medical attention.</td>
</tr>
<tr>
<td>Aluminum chloride anhydrous (AlCl₃)</td>
<td>S2: Keep out of reach of children. S8 S22 S24 S26: Keep away from moisture. Do not breathe dust. Avoid contact with skin. S36: In case of contact with eyes, rinse immediately with plenty of water. Wear suitable protective clothing.</td>
</tr>
</tbody>
</table>

## UK regulatory references

Classified under CHIP

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### 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, 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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Edition 9 – February 2009

Signature _____________________
Nicolas Paquin
Lithium Product Manager

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