





Material/Product Safety Data Sheet (MSDS-PSDS)

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| LS/LSH Products | Lithium/Thionyl chloride single cells and multi-cell battery packs |
| Revision 16 Date 01/2018 | |

| 1. Identification of the Substance or Preparation and Company | |
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| Product | Primary Lithium/Thionyl chloride unit cells and multi-cell battery packs (Li-SOCl₂) |
| Production sites | Saft (Zhuhai Free Trade Zone) Batteries Co., Ltd Lianfeng Road Zhuhai 519030 Guangdong Province China Ph. : +86 756 629 0288 Fax : +86 756 629 0289 |

| 2. Hazards Identification |
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| <p>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.</p> <p>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.</p> |

| 3. Composition & Information on Ingredients | | | | |
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| 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. | | | | |
| Ingredient | Content | CAS No. | CHIP Classification | |
| Lithium (Li) | 3.5-5% | 7439-93-2 |  |  |
| | | | F; R14/15 C; R34 R14/15, R21,R22, R35, R41, R43 S2, S8, S45 | |



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|--|--------|-----------|--|--|--|
| Thionyl chloride (SOCl ₂) | 40-46% | 7719-09-7 | | | C; R14, R21, R22, R35, R37, R41, R42/43 S2, S8, S24, S26, S36, S37, S45 |
| | | | | | |
| Aluminum chloride anhydrous (AlCl ₃) | 1-5% | 7446-70-0 | | | R14, R22, R37, R41, R43. S2, S8, S22, S24, S26, S36, S45 |
| Carbon (C _n) | 3-4% | 1333-86-4 | | | NONE KNOWN |
| <i>Amount varies depending on cell size.</i> | | | | | |





| 4. First Aid Measures | |
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| 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 | |
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| <p>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.</p> | |
| Extinguishing media | Use water or CO ₂ on burning Li-SOCl ₂ cells or batteries and class D fire extinguishing agent only on raw lithium. |

| 6. Accidental Release Measures | |
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| <p>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.</p> | |



| 7. Handling and Storage | |
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| 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 | | | | |
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| Occupational exposure standard | Compound | 8hr TWA | 15min TWA | SK |
| | Sulfur dioxide | 1 ppm | 1 ppm | - |
| | Hydrogen chloride | 1 ppm | 5 ppm | - |
|  | 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 | |
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| Appearance | Cylindrical or prismatic shape |
| Odour | If leaking, gives off a pungent corrosive odour. |
| pH | Not applicable |
| Flash point | Not applicable unless individual components exposed |
| Flammability | Not applicable unless individual components exposed |
| Relative density | Not applicable unless individual components exposed |
| Solubility (water) | Not applicable unless individual components exposed |
| Solubility (other) | Not applicable unless individual components exposed |



| 10. Stability and Reactivity | |
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| Product is stable under conditions described in Section 7. | |
| Conditions to avoid. | 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. |
| Materials to avoid | Oxidising agents, alkalis, water. Avoid electrolyte contact with aluminum or zinc. |
| Hazardous decomposition Products | Hydrogen (H ₂) as well as Lithium oxide (Li ₂ O) and Lithium hydroxide (LiOH) dust is produced in case of reaction of <i>lithium metal</i> with water. Chlorine (Cl ₂), Sulfur dioxide (SO ₂) and Disulfur dichloride (S ₂ Cl ₂) are produced in case of thermal decomposition of <i>Thionyl chloride</i> above 140°C. Hydrochloric acid (HCl) and Sulfur dioxide (SO ₂) are produced in case of reaction of <i>Thionyl chloride</i> with water at room temperature. Hydrochloric acid (HCl) fumes, Lithium oxide, (Li ₂ O), Lithium hydroxide (LiOH) and Aluminum hydroxide (Al(OH) ₃) dust are produced in case of reaction of <i>Lithium tetrachloroaluminate (LiAlCl₄)</i> with water. |

| 11. Toxicological Information | |
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| Signs & symptoms | 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. |
| Inhalation | Lung irritant. |
| Skin contact | Skin irritant |
| Eye contact | Eye irritant. |
| Ingestion | Tissue damage to throat and gastro-respiratory tract if swallowed. |
| Medical conditions generally aggravated by exposure | In the event of exposure to internal contents, eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur. |

| 12. Ecological Information | |
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| Mammalian effects | None known if used/disposed of correctly. |
| Eco-toxicity | None known if used/disposed of correctly. |
| Bioaccumulation potential | None known if used/disposed of correctly. |
| Environmental fate | None known if used/disposed of correctly. |

| 13. Disposal Considerations | |
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| 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

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| 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 <i>in bulk</i>) UN 3091 (cells and batteries <i>contained in equipment or packed with it</i>) |
| 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. Shipment can ship via AIR as NON D.G as per IATA regulation. (Refer to Transport Certificate) |
| Packing Group | IA |
| 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(59th edition of DGR)/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
- Lithium Metal Batteries in compliance with Section II of PI968 or PI970.

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| Risk phrases | Lithium (Li) | R14/15 R21 R22 R35 R41 R42/43 | Reacts violently with water, liberating extremely flammable gases. Harmful in contact with skin. Harmful if swallowed. Causes burns. Risk of serious damage to eye. May cause sensitization by inhalation and skin contact. |
| | Thionyl chloride (SOCl ₂) | R14 R22 R35 R37 R41 R42/43 | Reacts with water. Harmful if swallowed. Causes burns. Irritating to respiratory system. Risk of serious damage to eye. May cause sensitization by inhalation and skin contact. |



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| Risk phrases | Aluminum chloride anhydrous (AlCl ₃) | R14 R22 R37 R41 R43 | Reacts with water. Harmful if swallowed. Irritating to respiratory system. Risk of serious damage to eye. May cause sensitization by skin contact. |
| Safety phrases | Lithium (Li) | S2 S8 S45 | Keep out of reach of children Keep away from moisture In case of incident, seek medical attention. |
| | Thionyl chloride (SOCl ₂) | S2 S8 S24 S26 S36 S37 S45 | Keep out of reach of children. Keep away from moisture. Avoid contact with skin. In case of contact with eyes, rinse immediately with plenty of water. Wear suitable protective clothing. Wear suitable gloves. In case of incident, seek medical attention. |
| | Aluminum chloride anhydrous (AlCl ₃) | S2 S8 S22 S24 S26 S36 | Keep out of reach of children. Keep away from moisture. Do not breathe dust. Avoid contact with skin. In case of contact with eyes, rinse immediately with plenty of water. Wear suitable protective clothing. |
| UK regulatory references | Classified under CHIP | | |

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| 16. Other Information |
| <p>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.</p> <p>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.</p> <p>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.</p> |

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