

Material Safety Data Sheet (MSDS)

Product picture and name:



TG8

T8LTE

EN: This material safety data sheet refers to the batteries encapsulated in **all Trusted data loggers/trackers in the 8-series***. Standard products are pictured.

Trusted A/S declares that these products contain **SCA04+HLC** battery packs as documented on the following pages.

DE: Dieses Sicherheitsdatenblatt bezieht sich auf die Batterien, die in **allen Trusted Datenloggern/Trackern der 8er-Serie*** verkapselt sind. Standardprodukte sind abgebildet.

Trusted A/S erklärt, dass diese Produkte **SCA04+HLC** enthalten Akkupacks, wie auf den folgenden Seiten dokumentiert.

FR: Cette fiche de données de sécurité fait référence aux batteries encapsulées dans tous **les enregistreurs de données/traqueurs Trusted de la série 8***. Les produits standard sont illustrés.

Trusted A/S déclare que ces produits contiennent **SCA04+HLC** batteries comme documenté dans les pages suivantes.

ES: Esta hoja de datos de seguridad del material se refiere a las baterías encapsuladas en **todos los registradores/rastreadores de datos Trusted de la serie 8***. Los productos estándar se muestran en la imagen.

Trusted A/S declara que estos productos contienen **SCA04+HLC** baterías como se documenta en las siguientes páginas.

IT: Questa scheda di sicurezza dei materiali si riferisce alle batterie incapsulate in **tutti i data logger/tracker Trusted della serie 8***. I prodotti standard sono illustrati.

Trusted A/S dichiara che questi prodotti contengono **SCA04+HLC** batterie come documentato nelle pagine seguenti.

PT: Esta ficha de dados de segurança do material refere-se às baterias encapsuladas em **todos os registradores/rastreadores de dados Trusted da série 8***. Os produtos padrão são retratados.

Trusted A/S declara que estes produtos contêm **SCA04+HLC** baterias conforme documentado nas páginas a seguir.

Table of contents:

- Battery Information Sheet, March 2023, Saft
- Primary Lithium Battery, LS 17500, Saft
- UN 38.3 Test Summary Report, Saft
- Test Report UN 38.3, Research Network Łukasiewicz

* All relevant editions are marked with "Type: T8.xxx" on the label



Battery Information Sheet

Primary Li-SOCl₂ single cells and multi-cell battery packs

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

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

1. IDENTIFICATION

1.1 Product

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

1.2 Supplier

Headquarters Address Phone/Fax	Saft S.A.S. 26 quai Charles Pasqua, 92300 LEVALLOIS-PERRET – France Phone / Fax : +33 1 58 63 16 00/+33 1 58 63 16 18
Factory Address Phone/Fax	Saft Poitiers Rue Georges Leclanché, BP 1039, 86060 POITIERS Cedex 9 – France +33 (0)5 49 55 48 48 /+33 (0)5 49 55 48 50
Factory Address Phone/Fax	Saft Ltd. River Drive, Tyne & Wear, SOUTH SHIELDS, NE33 2TR – United Kingdom +1 44 191 456 1451/+1 44 191 456 6383
Factory Address Phone/Fax	Saft America Inc. 313 Crescent Street, VALDESE, NC 28690 – USA +1 828 874 4111/+1 828 874 2431
Factory Address Phone/Fax	Saft Batteries Co., Ltd. Zhuhai Free Trade Zone, Lianfeng Road, ZHUHAI 519030, Guangdong Province – China +86 756 881 9318/+86 756 881 9328
Factory Address Phone/Fax	Tadiran Batteries Ltd. 34 Y. Rabin Avenue – KIRYAT EKRON 76950 - Israel +972 894 44374/+972 894 13066
Factory Address Phone/Fax	Tadiran Batteries GmbH Industriestrasse 22, D-63654 BÜDINGEN – Germany +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



2. HAZARD IDENTIFICATION

The Li-SOCl₂ batteries described in this Battery Information Sheet are sealed units which are not hazardous under normal operating conditions in accordance with manufacturer's recommendations, as stated in the user's manual or other similar documentation. Under normal use, the battery integrity is maintained and the active components it contains are isolated from the outside. In particular, the battery should not be submitted to any mechanical (opening, puncture, immersion), thermal (burning, heating to temperatures above the normal temperature range of the product) or electrical abuse (short-circuit, recharge, forced discharge), which will lead to the activation of safety valves and/or the rupture of the battery container. Any accidental release of the inner components of the cell, or their combustion products could be highly hazardous. Battery content exposition to air humidity/liquid water may be followed by severe battery vent/explosion/fire, depending on the hazard causes and circumstances.

Protection from charging:

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

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

Or

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

3. COMPOSITION, INFORMATION OR INGREDIENTS

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

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

* Quantities may vary with cell model

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

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

4.1 Electrolyte contact

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

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

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

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

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

4.2 Lithium metal contact

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

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

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

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

EXTINGUISHING MEDIA:

- During a fire with lithium batteries, using large amounts of cold water or water-based foam has some cooling effect and is effective to prevent fire expansion as long as the extent of the fire has not progressed to the point that the lithium metal they contain is exposed (as marked by appearance of deep red flames). Do not use warm or hot water.
- Lith-X Class D extinguishers are effective on fires involving only a few lithium batteries.
- Do not use CO₂ or Halon-type extinguishers.
- Do not use sand, dry powder or soda ash, graphite powder or fire blankets.
- **Use only class D metal extinguishers on raw lithium metal.**

SPECIAL FIRE FIGHTING PROCEDURES:

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

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

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

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

WAYS OF CLEANING: With protective glasses and gloves, use absorbent material (sand, earth, chalk (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.

7. HANDLING AND STORAGE

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





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

STORAGE: Store in a cool, regulated (preferably below 21°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.

8. 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	-

9. PHYSICAL AND CHEMICAL PROPERTIES

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

Appearance – Cylindrical shape

Odour – If leaking, gives off a pungent corrosive odour

Flash point – Not applicable

Boiling Point – Not applicable

Vapor Pressure – Not applicable

pH – Not applicable

Solubility (in water) – Not applicable

Flammability – Not applicable

Melting Point – Not applicable

Vapor Density – Not applicable

Specific Gravity – Not applicable

Solubility (other) – Not applicable

10. STABILITY AND REACTIVITY

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

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

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

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen (H₂) as well as lithium oxide (Li₂O) and lithium hydroxide (LiOH) dust are produced in case of reaction of lithium metal with water (hydrolysis).

Chlorine (Cl₂), sulfur dioxide (SO₂) and disulfur dichloride (S₂Cl₂) are produced in case of thermal decomposition of thionyl dichloride above 100°C. Hydrochloric acid (HCl) and sulfur dioxide (SO₂) are produced in case of reaction of thionyl dichloride with water at room temperature.

Hydrochloric acid (HCl) fumes, lithium oxide (Li₂O), lithium hydroxide (LiOH) and aluminium hydroxide (Al(OH)₃) dust are produced in case of reaction of lithium tetrachloroaluminate (LiAlCl₄) with water.



11. TOXICOLOGICAL INFORMATION

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

12. ECOLOGICAL INFORMATION

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

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

13. DISPOSAL CONSIDERATIONS

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

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

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

See the section on "Sustainability & Environment" on,
<https://www.saft.com/about-us/manufacturing-our-batteries/our-sustainability-global-approach>



14. TRANSPORTATION INFORMATION

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

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

1. Go on-line to <https://saft4u.saft.com/en/tsr> or scan the QR Code:
2. Enter the cell or battery part number from the transport documents (Waybill or Packing Slip) and click "Search" to receive a PDF copy of the relevant UN 38.3 Test Summary Report for the product being shipped.



14.1 UN Class 9 Miscellaneous Dangerous Goods

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

14.2 International Agreements

By Air International:	IATA: DGR Edition 2023 (64 th)
By Sea International:	IMDG: Code 2022 Edition
European road transportation:	ADR: 1 January 2023 Edition
European rail transportation:	RID: Dangerous Goods by Rail 2023
European inland waterways	ADN: 1 January 2023 Edition

15. REGULATORY INFORMATION

Regulations specifically applicable to the product:

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



16. OTHER INFORMATION

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

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

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



26 Quai Charles Pasqua
92300 Levallois-Perret –
France
Tel.: +33 (0)1 49 93 19 18
Fax: +33 (0)1 49 93 19 69
www.saft.com

Doc N° BIS12-04-19
Edition: March 2023
Version 2.2

Data in this document is
subject to change without
notice and becomes
contractual only after written
confirmation.

Primary lithium battery

LS 17500

3.6 V Primary lithium-thionyl chloride (Li-SOCl₂)
High energy density
A-size bobbin cell



Benefits

- High voltage response, stable during most of the lifetime of the application
- Wide operating temperature range (-60/+85°C)
- Low self-discharge rate (less than 1 % after 1 year of storage at +20°C)
- Easy integration into compact systems
- Superior resistance to atmospheric corrosion

Key features

- Stainless steel container and end caps (low magnetic signature)
- Hermetic glass-to-metal sealing
- Non-flammable electrolyte
- Underwriters Laboratories (UL) Component Recognition
- Compliant with IEC 60086-4 safety standard and IEC 60079-11 intrinsic safety standard (class T3 assignment)
- Non-restricted for transport/ Non-assigned to Class 9 according to the UN Recommendations on the transport of dangerous goods – Model Regulations
- Manufactured in France

Main applications

- Utility metering
- Automatic meter reading
- Alarms and security devices
- Tollgate systems
- Identification tags
- Tracking systems
- Automotive electronics
- Professional electronics

Cell size reference

A

Electrical characteristics

(typical values relative to cells stored for one year or less at +30°C max.)

Nominal capacity 3.6 Ah
(at 3 mA +20°C 2.0 V cut-off. The capacity restored by the cell varies according to current drain, temperature and cut-off)

Open circuit voltage (at +20°C) 3.67 V

Nominal voltage (at 0.3 mA +20°C) 3.6 V

Nominal energy 12.96 Wh

Pulse capability: Typically up to 250 mA (250 mA/0.1 second pulses, drained every 2 mn at +20°C from undischarged cells with 10 µA base current, yield voltage readings above 3.0 V. The readings may vary according to the pulse characteristics, the temperature, and the cell's previous history. Fitting the cell with a capacitor may be recommended in severe conditions. Consult Saft)

Maximum recommended continuous current 100 mA
(Higher currents are possible. Consult Saft)

Storage (recommended) +30°C (+86°F) max
(for more severe conditions, consult Saft)

Operating temperature range -60°C/+85°C
(Operation above ambient T may lead to reduced capacity and lower voltage readings at the beginning of pulses. Consult Saft)

Physical characteristics

Diameter (max) 17.13 mm (0.67 in)

Height (max) 50.9 mm (2.00 in)

Typical weight 21.9 g (0.8 oz)

Li metal content approx. 0.9 g

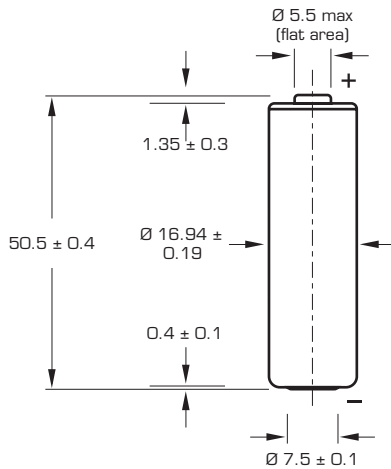
Available termination suffix

CN, CNR	radial tabs
2 PF, 3 PF, 3 PF RP, 4 PF	radial pins
CNA (AX)	axial leads
FL	flying leads...etc.



saft

LS 17500



Dimensions in mm.

Storage

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

Warning

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

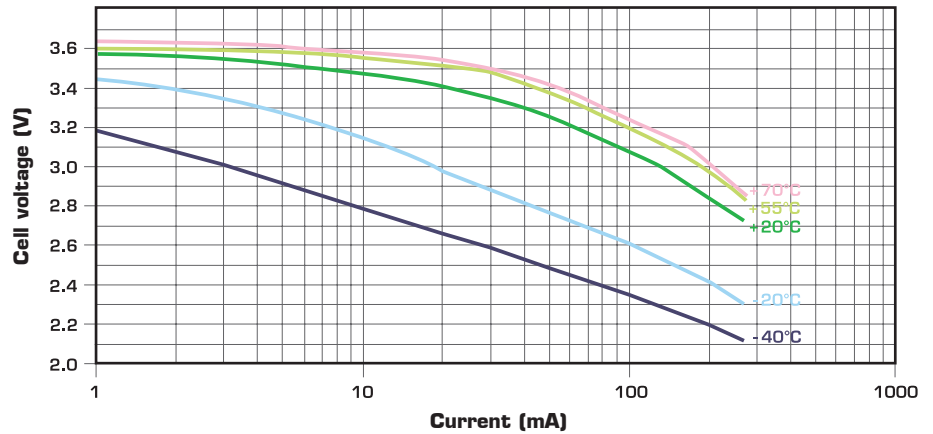
Saft

Specialty Battery Group

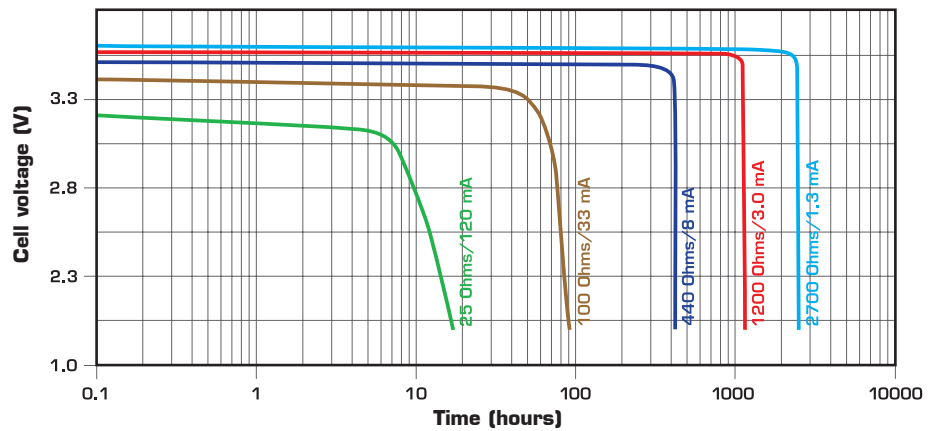
12, rue Sadi Carnot
93170 Bagnolet - France
Tel.: +33 (0)1 49 93 19 18
Fax: +33 (0)1 49 93 19 69

www.saftbatteries.com

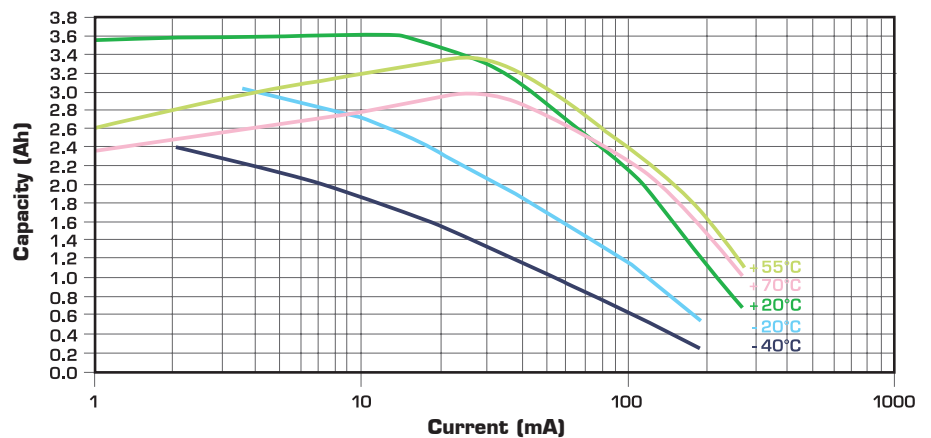
Voltage plateau versus Current and Temperature (at mid-discharge)



Typical discharge profiles at +20°C



Restored Capacity versus Current and Temperature (2.0 V cut-off)



Doc. N° 31029-2-0710

Information in this document is subject to change without notice and becomes contractual only after written confirmation by Saft.

For more details on primary lithium technologies please refer to Primary Lithium Batteries Selector Guide Doc N° 31048-2.

Published by the Communications Department.

Photo credit: Saft

Société anonyme au capital de 31 944 000 €
RCS Bobigny B 383 703 873

Produced by Arthur Associates Limited.



SAFT

UN 38.3 Test Summary Report

Lithium Cell or Battery Test Summary in Accordance with Section 2.9.4 UN Model Regulations and Sub-section 38.3 of the UN Manual of Tests and Criteria, Part III, subsection 38.3.5

[a] ☒ Cell ☐ Battery ☐ Product
☒ **Tested Type Part #** 04811V
☒ **Same Type Part #** see list

[d] Unique report ID: LS17500 – 10-2021-1

[e] Report date: 2018.07.24

[b] **Manufacturer**
 Saft Connected Energy Division
 Saft SAS
 Rue Georges Leclanché, BP1039
 86000 Poitiers
 T. +33 (0)5 49 55 48 48
 Lithiumsales.fr@saftbatteries.com
 https://www.saftbatteries.com

[c] **Test Laboratory**
 Saft Connected Energy Division
 Saft SAS
 Rue Georges Leclanché, BP1039
 86000 Poitiers
 T. +33 (0)5 49 55 48 48
 Lithiumsales.fr@saftbatteries.com
 https://www.saftbatteries.com

☒ **Same Type Part Numbers # (all):** 04910X, 04911Y, 04912Z, 04915C, 04938C, 05412E, 05634L, 05666U, 05717X, 05718Y, 05780N, 05809T, 05943H, 06005X, 06100W, 06123V, 06144S, 06162L, 06170U, 06196W, 06197X, 06209K, 06346C, 06405P, 06407R, 06441B, 06456S, 60014Q, 60176J

[f] (i) ☐ Li-ion ☒ Li-metal.

(iv) **Description:** A sized LiSOCl₂ cell without any protection device.

(ii) Mass: 23 g

(iii) ☐ Watt hour rating or ☒ Lithium content: 1 g

(v) ☒ Cell ☐ Battery ☐ Product. Model number/Part number: LS17500

[g] List of Tests Conducted	Result (Pass / Fail / N.A.)	Test record reference
38.3.4.1 T.1: Altitude simulation	Pass	T0274-18
38.3.4.2 T.2: Thermal test	Pass	T0274-18
38.3.4.3 T.3: Vibration	Pass	T0274-18
38.3.4.4 T.4: Shock	Pass	T0274-18
38.3.4.5 T.5: External short circuit	Pass	T0274-18
38.3.4.6 T.6: Impact/Crush (cell only test)	Pass	T0274-18
38.3.4.7 T.7: Overcharge (N.A for Li-metal only)		N.A
38.3.4.8 T.8: Forced discharge (cell only test)	Pass	T0274-18

[h] Battery assembly: ☒ Not Applicable. ☐ UN38.3.3 (f) ☐ UN38.3.3 (g)

[i] Test Reference: UN Manual of Tests and Criteria, Part III, sub-section 38.3 ST/SG/AC.10/11/Rev.6

[j] Signatory A. Date: 2021.10.29

Name: Cristophe Serre

Title: Quality Mgr – C.E. Div- Poitiers site

Signature:  Signature numérique de
 SERRE Christophe
 Date : 2021.10.29
 18:24:21 +02'00'



[j] Signatory B. Date: 2021.10.29

Name: Catherine Lepiller

Title: Primary Lithium Technical Manager

Signature:  LEPILLER Catherine
 2021.11.08
 09:36:30 +01'00'

Important! The above signatory / signatories affirm that this document is a true and correct summary of the original individual tests and test data. The original test data is confidential information available to competent State Authorities with valid identification and only upon their formal request. Disclosure of the original test data to any other entity upon its request will be considered by Saft and, should Saft consider this request is with merit, may be subject to the prior execution of a nondisclosure agreement.



AB 124

CHEMICAL POWER SOURCES TESTING LABORATORY

TEST REPORT

№ S 80/2019/1

Test object/product: Lithium-thionyl chloride battery pack (primary)

	NAME/POSITION	SIGNATURE/STAMP
TEST RESULTS AUTHORIZED BY	Marek Szymczyk Technician Supervising Tests	Laboratorium Badań Chemicznych Źródeł Prądu TECHNIK NADZORUJĄCY BADANIA
TEST REPORT VALIDATED BY	Jędrzej Kałużny Vice-manager	KIEROWNIK Laboratorium Badań Chemicznych Źródeł Prądu mgr Kamil Frączek
Date of test report: 04/11/2019		Distribution list: 1 copy for Client, 1 copy a/a



1. This test report presents results of accredited tests covered by the scope of Laboratory's accreditation and the not-accredited ones or performed by a subcontractor.
2. Acronyms:
A – accredited test covered by the scope of Laboratory's Accreditation No PCA AB 124, NA – non-accredited test.
3. Chemical Power Sources Testing Laboratory is accredited by Polish Centre for Accreditation, a signatory of EA MLA and ILAC MRA. Accreditation № AB 124.
4. Test results refer only to the tested sample.
5. This test report cannot be reproduced without Laboratory's written consent.
6. Client is entitled to submit his claims up to 14 days after reception of this test report.
7. Test report with no accreditation marking means that all tests therein are non-accredited.
8. Annexe: Test summary (refers only to UN TESTS).

Test report no: S 80/2019/1			
F-01/LPO-10	Form date F: 11.04.2019	Form issue no: 03	Page 2/8

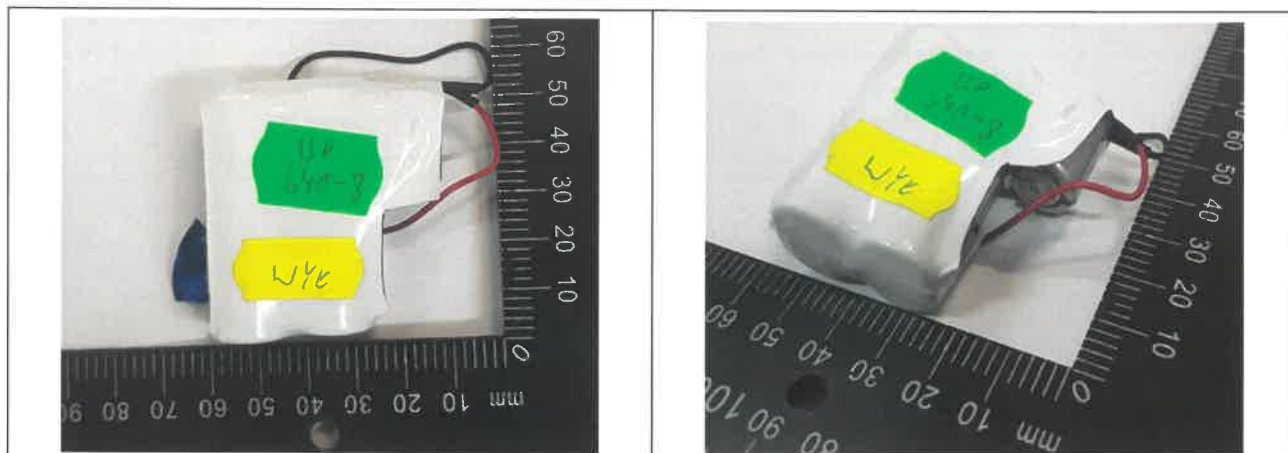
GENERAL INFORMATION	
CLIENT/MANUFACTURER	DOCUMENT
Name: WESTERBERG Sp. z o.o. Address: Elektryków 4a, 43-603 Jaworzno	Order / agreement №: 80/2019 date: 11/10/2019

TESTED OBJECT / PRODUCT	
Name:	Lithium-thionyl chloride battery pack (primary) SCA04+HLC Pack 2 LS17500 + 1 x HLC1520
Description / state:	Rated capacity: 7,239 Ah Rated voltage: 3,67 V
Sampling / sample delivery method:	Sample was delivered by the Client
Sample size:	8 pieces
Sample collection date: 14.10.2019	Sample production date: -
Test initiation date: 14.10.2019	Test completion date: 31.10.2019

SCOPE AND METHODOLOGY
Tests carried out according to: Recommendations on the Transport Of Dangerous Goods Manual of Tests and Criteria ST/SG/AC.10/11/Rev.6/Amend.1, Section 38.3 Lithium metal and lithium ion batteries (hereinafter referred to as UN TEST)

SAMPLE IDENTIFICATION NUMBERS	
Laboratory identification numbers (sample ID): BP 64 – (1÷8)	
(undischarged state) BP 640-(1÷4)	(fully discharged at the laboratory) BP 640-(5÷8)

Test report no: S 80/2019/1			
F-01/LPO-10	Form date F: 11.04.2019	Form issue no: 03	Page 3/8



TEST PROGRAMME

Item	Test name	Methodology		Sample ID:	Page of report
1.	T1. Altitude simulation	A	UN TEST paragraph 38.3.4.1.2 / LPB-08	BP 640-1+8	4
2.	T2. Thermal test	A	UN TEST paragraph 38.3.4.2.2/ LPB-08	BP 640-1+8	5
3.	T3. Vibration	NA	UN TEST paragraph 38.3.4.3.2/ LPB-AO-18	BP 640-1+8	6
4.	T4. Shock	NA	UN TEST paragraph 38.3.4.4.2/ LPB-BP -12	BP 640-1+8	7
5.	T5. External short circuit	A	UN TEST paragraph 38.3.4.5.2/ LPB-09	BP 640-1+8	8

The batteries BP 640-(5+8) were discharged:

- constant current intensity: $I_{\text{const}} = 0,1 \text{ A}$
- final voltage: $U = 2,5 \text{ V}$

Test report no: S 80/2019/1			
F-01/LPO-10	Form date F: 11.04.2019	Form issue no: 03	Page 4/8

T.1 ALTITUDE SIMULATION

Test procedure (document): UN TEST paragraph 38.3.4.1.2 **Sample ID:** BP 640-(1÷8)

Test conditions: pressure in the chamber 11kPa/ time $t \geq 6h$ /ambient temperature $20 \pm 5^\circ C$

TEST RESULTS								
Sample ID	State	VOLTAGE [V]			MASS [g]			Sample observation
		before testing	after testing	change OCV [%]	before testing	after testing	change mass [%]	
BP 640-1	undischarged	3,661	3,660	99,97	56,0	56,0	0,00	O
BP 640-2	undischarged	3,665	3,663	99,95	56,0	56,0	0,00	O
BP 640-3	undischarged	3,666	3,665	99,97	55,9	55,9	0,00	O
BP 640-4	undischarged	3,665	3,664	99,97	55,9	55,9	0,00	O
BP 640-5	fully discharged	-----	-----	-----	56,1	56,1	0,00	O
BP 640-6	fully discharged	-----	-----	-----	56,1	56,1	0,00	O
BP 640-7	fully discharged	-----	-----	-----	56,0	56,0	0,00	O
BP 640-8	fully discharged	-----	-----	-----	56,0	56,0	0,00	O
Measurement uncertainty:		± 0,001 V				± 0,1 g		
Result:		PASS						

Description phenomenon: D – disassembly; F – fire; L – leakage; R – rupture; V – venting;
SN – the open circuit voltage after testing is not less than 90% of its voltage immediately prior the test
Acceptance criteria: O – none of the above phenomena were observed

Test equipment:	ATT TD150C vacuum chamber
	METRAHIT X-TRA multimeter
	SARTORIUS PT600 balance
NOTE: No deviation from LPB-08 procedure was employed.	

Test report no: S 80/2019/1			
F-01/LPO-10	Form date F: 11.04.2019	Form issue no: 03	Page 5/8

T.2 THERMAL TEST

Test procedure (document): UN TEST paragraph 38.3.4.2.2 **Sample ID:** BP 640-(1÷8)

Test conditions: storage at a test temp. $72\pm 2^{\circ}\text{C}$ for $t \geq 6\text{h}$ / storage at a test temp. $-40\pm 2^{\circ}\text{C}$ for $t \geq 6\text{h}$ / x 10 cycles

TEST RESULTS								
Sample ID	State	VOLTAGE [V]			MASS [g]			Sample observation
		before testing	after testing	change OCV [%]	before testing	after testing	change mass [%]	
BP 640-1	undischarged	3,660	3,658	99,95	56,0	56,0	0,00	O
BP 640-2	undischarged	3,663	3,662	99,97	56,0	56,0	0,00	O
BP 640-3	undischarged	3,665	3,664	99,97	55,9	55,9	0,00	O
BP 640-4	undischarged	3,664	3,663	99,97	55,9	55,9	0,00	O
BP 640-5	fully discharged	-----	-----	-----	56,1	56,1	0,00	O
BP 640-6	fully discharged	-----	-----	-----	56,1	56,1	0,00	O
BP 640-7	fully discharged	-----	-----	-----	56,0	56,0	0,00	O
BP 640-8	fully discharged	-----	-----	-----	56,0	56,0	0,00	O
Measurement uncertainty:		± 0,001 V				± 0,1 g		
Result:		PASS						

Description phenomenon: D – disassembly; F – fire; L – leakage; R – rupture; V – venting;
SN – the open circuit voltage after testing is not less than 90% of its voltage immediately prior the test
Acceptance criteria: O – none of the above phenomena were observed

Test equipment:	ATT TD150C climatic chamber
	METRAHIT X-TRA multimeter
	SARTORIUS PT600 balance
NOTE: No deviation from LPB-08 procedure was employed.	

Test report no: S 80/2019/1			
F-01/LPO-10	Form date F: 11.04.2019	Form issue no: 03	Page 6/8

T.3 VIBRATION

Test procedure (document): UN TEST paragraph 38.3.4.3.2 **Sample ID:** BP 640-(1÷8)

Test conditions: frequency 7Hz ÷ 200Hz ÷ 7Hz/ cycle time 15 minute/ number of cycles 12 cycles for each axis

TEST RESULTS								
Sample ID	State	VOLTAGE [V]			MASS [g]			Sample observation
		before testing	after testing	change OCV [%]	before testing	after testing	change mass [%]	
BP 640-1	undischarged	3,658	3,660	100,05	56,0	56,0	0,00	O
BP 640-2	undischarged	3,662	3,663	100,03	56,0	56,0	0,00	O
BP 640-3	undischarged	3,664	3,664	100,00	55,9	55,9	0,00	O
BP 640-4	undischarged	3,663	3,664	100,03	55,9	55,9	0,00	O
BP 640-5	fully discharged	-----	-----	-----	56,1	56,1	0,00	O
BP 640-6	fully discharged	-----	-----	-----	56,1	56,1	0,00	O
BP 640-7	fully discharged	-----	-----	-----	56,0	56,0	0,00	O
BP 640-8	fully discharged	-----	-----	-----	56,0	56,0	0,00	O
Measurement uncertainty:		± 0,001 V				± 0,1 g		
Result:		PASS						

Description phenomenon: D – disassembly; F – fire; L – leakage; R – rupture; V – venting; SN – the open circuit voltage after testing is not less than 90% of its voltage immediately prior the test
Acceptance criteria: O – none of the above phenomena were observed

Test equipment:	TIRA
	METRAHIT X-TRA multimeter
	SARTORIUS PT600 balance
NOTE: No deviation from LPB-AO-18 procedure was employed.	

Test report no: S 80/2019/1			
F-01/LPO-10	Form date F: 11.04.2019	Form issue no: 03	Page 7/8

T.4 SHOCK

Test procedure (document): UN TEST paragraph 38.3.4.4.2 **Sample ID:** BP 640-(1÷8)

Test conditions: peak acceleration 150g / pulse duration 6 ms / 3 shocks for each axis and each direction/ total 18 shocks

TEST RESULTS								
Sample ID	State	VOLTAGE [V]			MASS [g]			Sample observation
		before testing	after testing	change OCV [%]	before testing	after testing	change mass [%]	
BP 640-1	undischarged	3,660	3,660	100,00	56,0	56,0	0,00	O
BP 640-2	undischarged	3,663	3,664	100,03	56,0	56,0	0,00	O
BP 640-3	undischarged	3,664	3,664	100,00	55,9	55,9	0,00	O
BP 640-4	undischarged	3,664	3,665	100,00	55,9	55,9	0,00	O
BP 640-5	fully discharged	-----	-----	-----	56,1	56,1	0,00	O
BP 640-6	fully discharged	-----	-----	-----	56,1	56,1	0,00	O
BP 640-7	fully discharged	-----	-----	-----	56,0	56,0	0,00	O
BP 640-8	fully discharged	-----	-----	-----	56,0	56,0	0,00	O
Measurement uncertainty:		± 0,001 V				± 0,1 g		
Result:		PASS						

Description phenomenon: D – disassembly; F – fire; L – leakage; R – rupture; V – venting; SN – the open circuit voltage after testing is not less than 90% of its voltage immediately prior the test
Acceptance criteria: O – none of the above phenomena were observed

Test equipment:	TIRA
	METRAHIT X-TRA multimeter
	SARTORIUS PT600 balance
NOTE: No deviation from LPB-BP -12 procedure was employed.	

Test report no: S 80/2019/1			
F-01/LPO-10	Form date F: 11.04.2019	Form issue no: 03	Page 8/8

T.5 EXTERNAL SHORT CIRCUIT

Test procedure (document): UN TEST paragraph 38.3.4.5.2 (1+8) **Sample ID:** BP 640 -

Test conditions: heating time $t \geq 6h$ / temperature $57 \pm 4^\circ C$ / external resistance $< 0,1\Omega$ / short circuit duration $t_z \geq 1h$

TEST RESULTS				
Sample ID	State	Temp. of external case after heating [°C]	Max. temp. of external case during test [°C]	Observation of the sample after 6h
BP 640-1	undischarged	57,4	79,8	O
BP 640-2	undischarged	58,9	82,9	O
BP 640-3	undischarged	59,2	83,3	O
BP 640-4	undischarged	57,2	85,0	O
BP 640-5	fully discharged	56,0	66,0	O
BP 640-6	fully discharged	56,8	64,8	O
BP 640-7	fully discharged	56,3	65,8	O
BP 640-8	fully discharged	56,5	62,0	O
Measurement uncertainty:		$\pm 0,2^\circ C$		
Result:		PASS		

Description phenomenon: D – disassembly; R – rupture; F – fire; T - temperature $>170^\circ C$

Acceptance criteria: O – none of the above phenomena were observed during the test and within 6 h after the test

Test equipment:	MSK-TE901-UL device to short-circuit tests
	Temperature chamber
	Hioki resistance tester
	Electronic thermometer
NOTE: No deviation from LPB-09 procedure was employed.	

END OF TEST REPORT

TEST SUMMARY

Product: **LITHIUM-THIONYL CHLORIDE BATTERY PACK (PRIMARY)**

Model №: **SCA04+HLC Pack**

Product description: **SCA04+HLC Pack 2 LS17500 + 1 x HLC1520**

Mass: **56,5 g** Nominal energy: **26,567 Wh**

Manufacturer (name, address): **WESTERBERG Sp. z o.o.**

Elektryków 4a, 43-603 Jaworzno

Based on the following test results:

UN TEST PARAGRAPH	TEST NAME	RESULT/CONFIRMATION OF CONFORMITY ¹⁾
38.3.4.1.2	T.1 Altitude simulation	passed
38.3.4.2.2	T.2 Thermal test	passed
38.3.4.3.2	T.3 Vibration	passed
38.3.4.4.2	T.4 Shock	passed
38.3.4.5.2	T.5 External short circuit	passed
38.3.4.6.2	T.6a Impact	not applicable
38.3.4.6.3	T.6b Crush	not applicable
38.3.4.7.2	T.7 Overcharge	not applicable
38.3.4.8.2	T.8 Forced discharge	not applicable

1) according to Test Report № S 80/2019/1

result: passed/failed/not applicable (not required or not included in the order)

it is confirmed that the product met requirements of:

Recommendations on the Transport Of Dangerous Goods Manual of Tests and Criteria ST/SG/AC.10/11/Rev.6/Amend.1, Lithium metal and lithium ion batteries (Section 38.3) except paragraph 38.3.4.6.2, 38.3.4.6.3, 38.3.4.7.2, 38.3.4.8.2.

Technician supervising test


Marek Szymczyk



Laboratory Manager


mgr inż. Jędrzej Kałużny

Poznań, 04.11.2019