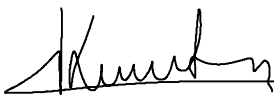






STANDARD SPECIFICATION

Non-rechargeable Li-SOCl₂ cell

LSH 20 Type

	Name	Position	Date	Signature
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Edition Nr	5	6	7	8	9

LSH 20

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RECORD OF REVISIONS

REVISION DATE	EDITION NUMBER	REVISION PAGE	MODIFICATIONS
01/1995	1		Creation
01/1995	2		
06/1998	3		
11/2000	4		
12/2002	5	3005 3006 3009 to 3012	Added UN documents references New wording for transport class assignment Adjusted cell dimension and better quality drawings
06/2003	6	3009 to 3012	Adjusted cell dimensions
10/2003	7	3003 § 2 B 3009 to 3012	Nominal voltage (on 1200 k Ω /3 mA) → (on 1780 k Ω /2mA) Adjusted cell dimensions
11/2004	8	3003 § 2E 3008 § 10	Pulse current capability 4000 mA Cell's coding system
08/2007	9	3009 § 11 3010 & 3012	P/N corrected for LSH 20 P/N corrected for LSH 20 CNR



1. Subject

This specification presents typical and guaranteed ex-works values for the Lithium-Thionyl Chloride (Li-SOCl₂) cell type LSH 20 (IEC standard R20, ANSI standard D).

This cell is specifically designed for applications featuring high current drains (in continuous or pulse mode), and requesting superior voltage response.

2. Typical values

A. Designation

LSH 20.

B. Nominal voltage

3.6 V (on 1780 k Ω /2 mA at + 20°C).

C. Nominal capacity

13.0 Ah (on 240 Ω /20 mA, at + 20°C, cut-off voltage 2 V).

(The capacity restored by the cell varies according to the current drain, the temperature and the voltage cut-off).

D. Maximum recommended continuous current

1800 mA.

(at 20°C and 0 V cut off, in order to maintain cell heating within safe limits. For other conditions. Consult Saft).

E. Pulse current capability

Typically up to 4000 mA (4000 mA/0.1 second pulses, drained every 2 mn at + 20°C from undischarged cells with 10 μ A base current, yield voltage readings above 3.0 Volts).

It may vary according to pulse characteristics (frequency, duration), temperature, cell history (storage conditions prior to usage) and the application's acceptable minimum voltage. *Consult Saft for case by case study.*

Note : The individual cell is protected by a non-resettable external fuse which activates typically in 10 second under a 5.5 A current (in less than 100 msec in case of short circuit).



F. Operating temperature range

- 60/+ 85°C in operation.

(short excursions up to 110°C possible without leakage but external sleeve deterioration may occur above 100°C).

(Operation above ambient temperature may lead to reduced capacity on lower voltage readings at the beginning of pulses. Operation with current continuously above 1 A may restrict upper T range. Consult Saft).

G. Nominal weight

100 grams.

3. Construction and visual aspect

A. Construction

The LSH 20 cell is constructed according to the spiral electrodes technology.

A glass-to-metal seal ensures the hermeticity of the cell ($\leq 10^{-7}$ atm.cc/sec under 1 atm He).

The LSH 20 cell comes in two versions which differ by the profile of their positive end and their overall length, one with an individual "5 A" fuse (which activates typically in less than 5 seconds under 5.5 Amps), the other, (to be assembled within battery packs), without protection fuse.

B. Visual aspect

When inspected with naked eyes, the LSH 20 cell should not show any trace of dents, swelling, corrosion or electrolyte leakage. Marking should be readable.

4. Environment and mechanical tests

A. Altitude simulation

The LSH 20 cell complies with the UN** and IEC*** tests which consist in a storage at + 20°C during at least 6 hours under an absolute pressure of 11.6 kPa ($\approx 15,240$ m altitude) without any leakage, fire, vent or explosion.

B. Free fall

The LSH 20 cell complies with the IEC*** test which consists in 2 drops/plane (6 in total, samples randomly oriented) onto a concrete floor from an height of 1.0 m without any leakage, vent, explosion or fire.



C. Vibration

The LSH 20 cell complies with the UL* and IEC*** tests which consist in performing the following:

- Frequency span : 10 to 55 Hz.
- Peak to peak amplitude : 1.6 mm.
- Test duration : 95 ± 5 mm per axis.

Test carried out on three perpendicular axes. The cell must retain its operational characteristics and normal visual aspect.

D. Mechanical shock

The LSH 20 cell complies with the UL* and IEC*** tests which consist in performing the following:

- Average acceleration : 75 g.
- Maximum acceleration : 125 – 175 g.

Shock applied to each to the three perpendicular axes. The cell must retain its operational characteristics and normal visual aspect.

Safety standards mentioned:

- *UL Underwriters Laboratories Inc
"Standard for Lithium Batteries" – UL 1642 – Third Edition – 1995
- **UN Secretariat of the United Nations
"Model Regulations on the Transport of Dangerous Goods"
Ref. ST/SG/AC.10/1 – Revision 13 – 2003
+ "Manual of Tests and Criteria"
Ref. ST/SG/AC.10/11 – Revision 3 – Amendment 1 "Lithium Batteries"
– 2002
- ***IEC International Electrotechnical Commission
International safety standard for lithium batteries
"IEC 60086-4" – Second Edition – 2000



5. Storage

Before use, the LSH 20 cell should be stored in dry and cool conditions, at a temperature preferably not exceeding + 30°C.

Storage at higher temperature is possible but it may affect later the cell capacity and its ability to show good start up voltage characteristics.

6. Safety

We advise, during usage of the LSH 20 cell, to observe the following precautions:

- a) Do not remove the cells from their original packing before use.
- b) Do not store the cells in bulk in order to avoid accidental short circuiting.
- c) Do not heat above 100°C or incinerate.
- d) Do not disassemble.
- e) Do not recharge.
- f) Do not solder directly on the cell. *(use tabbed cell finish versions instead).*
- g) Do not mix new and used cells or cells from different origins.
- h) Respect the polarities of the cell.
- i) Do not short circuit (will blow the protection fuse).

The 5 A-fused versions of the LSH 20 cell are recognized as "Technician Replaceable" by the Underwriters Laboratories Inc. under the file number MH 12609.

7. Transport

The LSH 20 cell has demonstrated an ability to pass the safety tests listed in the United Nations "Recommendations on the Transport of Dangerous Goods – Manual of Tests and Criteria" Reference ST/SG/AC.10/11 – Revision 3 : Amendment 1 "Lithium Batteries" – 2002.

Hence, and in accordance with the United Nations "Model Regulation on the Transport of Dangerous Goods" Reference ST/SG/AC.10/1 – Revision 13 – 2003, the LSH 20 cell which contains more than 1 gram of lithium metal, is declared restricted to transport that is assigned to class 9.

This class 9 assignment also applies to all battery packs assembled from LSH 20 cells.



8. Guaranteed minimum values

	Initial [*]	Up to 12 months storage ^{**} in the recommended + 30°C max conditions
Open Circuit Voltage (OCV) (Voltmeter with 10 Megohm impedance and ± 1 mV precision)	3.640 V	3.640 V
On Load Voltage (after 6 seconds on $3 \Omega \pm 1\%$ at + 20°C) ($I \approx 1030$ mA)	3.10 V	2.90 V
Capacity (on $240 \Omega \pm 1\%$ at + 20°C 2 V cut-off)	11.7 Ah	11.2 Ah

9. Incoming inspection

Prior to release from factory, the LSH 20 cell is 100 % inspected in Open Circuit Voltage (OCV) and On Load Voltage.

The capacity, visual aspect and dimensions are checked by sampling.

In case of incoming inspection, Saft recommends the following:

A. Sampling standards

French	British	German	American	ISO
NFX 06-022 NFX 06-023	BS 6001 BS 6002	DIN 40080 DIN ISO 3951	MIL STD 10 5D MIL STD 414	2859 3951

* Initial: Within one month following the date code printed on the sleeve.

** Following the date code printed on the sleeve.



B. Acceptable Quality Levels (AQL)

- Visual inspection (§ 3.B) : 1.00 %
- Electrical inspection (§ 8) : 0.40 %
- Dimensional inspection (§ 11) : 1.00 %

10. Labelling

The external surface of the LSH 20 cell displays the following:

SAFT LITHIUM LSH 20 Made in France 3.6V +/- polarities

UL logo Safety warning Crossed-out wheeled refusal bin logo

Cell finish date code with year/day/traceability indication.

Example:

04 029 A023

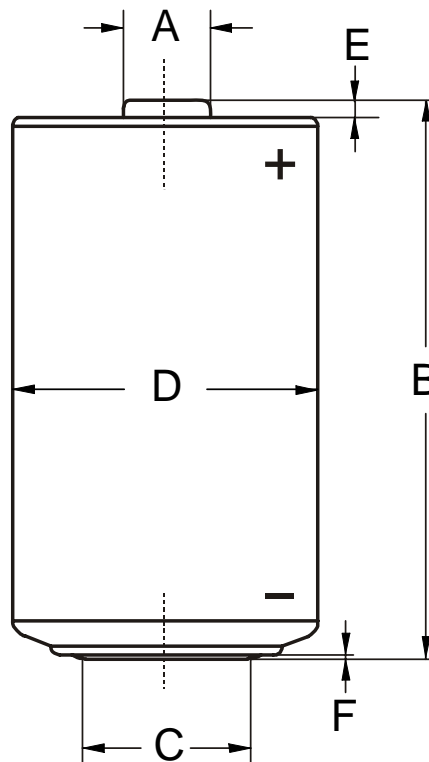
(cell finished the 29th day of year 2004. Batch internal reference A023)

11. Untabbed/fused/sleeved cell external dimensions

(Dimensions in mm)

P/N 03577 R

Version with protruding positive end



	A	B	C	D	E	F
LSH 20	9.3 ± 0.1 (on flat surface)	61.0 ± 0.6	18.0 ± 0.2 (on flat surface)	33.2 ± 0.2	2.1 ± 0.2	0.5 ± 0.1



12. Main cell finish versions

(The B suffix letter designates unfused cell versions with a flat positive end).

A. LSH 20 B

(Unfused version with non-protruding positive end)

P/N 04084 Z

B. LSH 20 CNR

(5A-fused version with 2 rectangular nickel-plated steel radial tabs)

P/N 03576 N

See corresponding drawings on the following pages.

Other finish versions are available on request. Consult Saft.

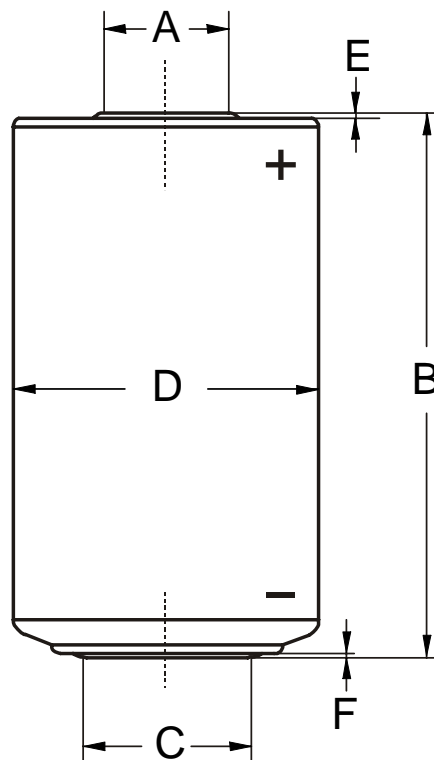


LSH 20 B

P/N 04084 Z

(dimensions in mm)

Unfused version with non-protruding positive end



LSH 20 B	A	B	C	D	E	F
	13.8 / flat	59.6 ± 0.6	18.0 ± 0.2	33.2 ± 0.2	0.6 ± 0.2	0.5 ± 0.1

LSH 20

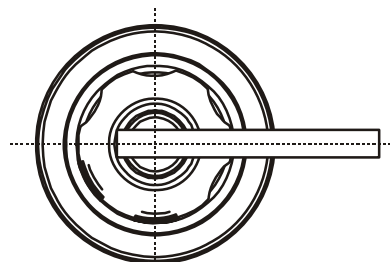
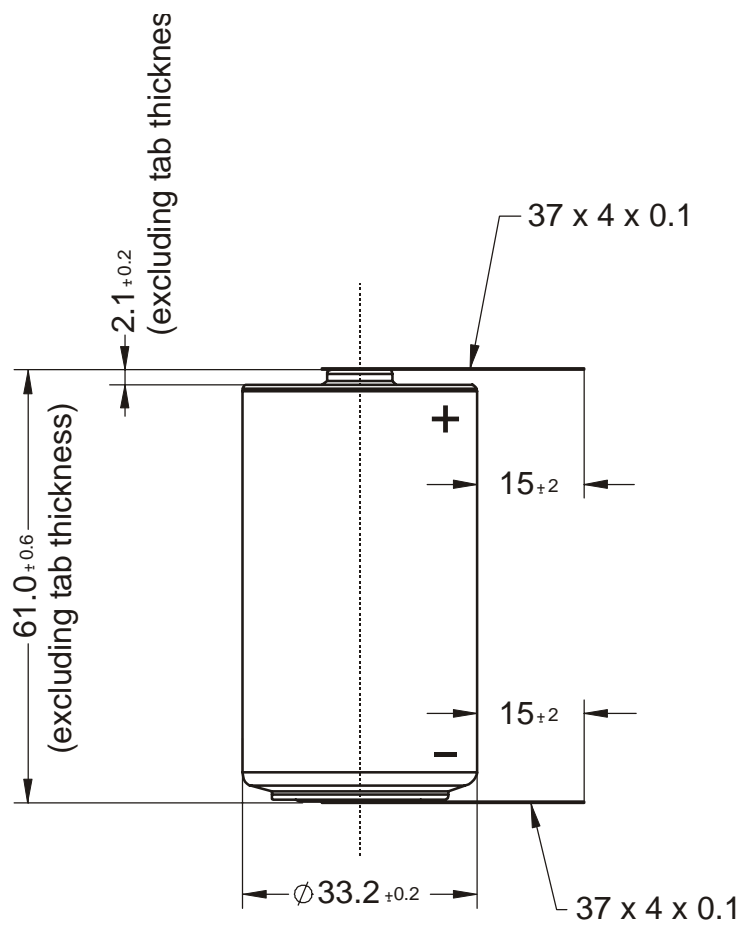


LSH 20 CNR

P/N 03576 N

(dimensions in mm)

5A-fused version with 2 nickel-plated steel rectangular radial tabs



LSH 20