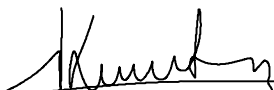






## STANDARD SPECIFICATION

Non-rechargeable Li-SOCl<sub>2</sub> cell

LS 33600 Type

	Name	Position	Date	Signature
Written by	A. Kerouanton	Lithium Product Manager	05/06	
Checked by	P. Hans	Primary Lithium Quality Manager	05/06	
Approved by	H. Drehmer	Lithium Sales Director	05/06	

Issued by	A. Kerouanton	A. Kerouanton	A. Kerouanton		
Date	11/04	02/05	05/06		
Edition Nr	9	10	11		

**LS 33600**

Page 3001  
May 2006  
N° 8708 Ed. 11



## RECORD OF REVISIONS

REVISION DATE	EDITION NUMBER	REVISION PAGE	MODIFICATIONS
06/1993	1		Creation
10/1993	2		
04/1994	3		
06/1998	4		
11/2000	5		
12/2002	6	3005 3006 - § 7 3009 to 3015	Added UN documents references Non-restricted → Restricted to transport Adjusted cell dimensions and better quality drawings
06/2003	7	3009 to 3015	Adjusted cell dimensions
10/2003	8	3003 § 2C 3007 § 8 3009 to 3015	Nominal capacity 16.5 → 17.0 Ah Capacity initial 14.8 → 15.2 Ah / after storage 14.4 → 14.8 Ah Adjusted cell dimensions
11/2004	9	3003 § 2E 3008 § 10	Pulse current capability 80 mA → 400 mA Cell's coding system
02/2005	10	3005 & 3006	ATEX Certification
05/2006	11	3006 3010  3011 § 3012	Mention of the RoHS directive P/N for CNR version rectified: 04299Z → 04589U CNR finish: Ni-plated steel radial tabs → nickel tabs FL finish: Ni-plated steel radial tabs → stainless steel tabs Updated drawings



## 1. Subject

This specification presents typical and guaranteed ex-works values for the Lithium-Thionyl Chloride (Li-SOCl<sub>2</sub>) cell type LS 33600 (IEC standard R20, ANSI standard D).

This cell is preferably intended for high energy applications in - 60/+ 85°C environments.

## 2. Typical values

### A. Designation

LS 33600

### B. Nominal voltage

3.6 V (on 5 k $\Omega$ /0.7 mA at + 20°C)

### C. Nominal capacity

17.0 Ah (on 700  $\Omega$ /5 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

250 mA

*(to get 50 % of the nominal capacity at + 20°C and 2 V cut-off. Higher currents are possible. Consult Saft).*

### E. Pulse current capability

Typically up to 400 mA (400 mA/0.1 second pulses, drained every 2 mn at + 20°C from undischarged cells with 10  $\mu$ A base current, yield voltage readings above 3.0 Volts). The cell voltage response varies 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.*

The use of parallel capacitor to enhance the voltage during the first tens of millisecond of the pulses might be recommended. *Consult Saft.*



#### **F. Operating temperature range**

- 60/+ 85°C

(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 and lower voltage readings at the beginning of pulses).*

#### **G. Typical weight**

90 grams.

### **3. Construction and visual aspect**

#### **A. Construction**

The LS 33600 cell is constructed according to the concentric electrodes "bobbin" technology.

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

The LS 33600 cell comes in two basic finishing versions, (both of which are unfused), which differ by their positive end profile and overall length.

#### **B. Visual aspect**

When inspected by naked eyes, the LS 33600 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 LS 33600 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 LS 33600 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 LS 33600 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 :  $95 \pm 5$  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 LS 33600 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 4
- \*\*\*IEC International Electrotechnical Commission  
"International safety standard for lithium batteries"  
IEC 60086-4 – Second Edition – 2000
- ATEX Intrinsic Safety Standard for use in explosive atmospheres  
EN 50020 – Clause 10.9 – 2002



## 5. Storage

Before use, the LS 33600 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 LS 33600 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.

The LS 33600 cell is recognized as "Technician Replaceable" by the Underwriters Laboratories Inc. under the file number MH 12609.

The LS 33600 cell complies with the International Electrotechnical Commission (IEC) Safety Standard IEC 60086-4.

The LS 33600 cell complies with the requirements of the clause 10.9 of the ATEX Safety Standard and is assigned to the class T4.

The LS 33600 cell does not contain any amount of the substances that are mentioned in the Directive 2002/95 EC of the European Parliament and on the *Council "on the Restriction of the use of certain Hazardous Substances in electrical electronic equipment"* (in abbreviate RoHS).



## 7. Transport

The LS 33600 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 4.

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 LS 33600 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 LS 33600 cells.

## 8. Guaranteed minimum values

	Initial *	Up to 12 months storage ** in the recommended + 30°C max. conditions
<b>Open Circuit Voltage (OCV)</b> (Voltmeter with 10 Megaohm impedance and $\pm 1$ mV precision)	3.640 V	3.640 V
<b>On Load Voltage</b> (after 6 seconds on $30 \Omega \pm 1\%$ at + 20°C) ( $I \approx 100$ mA)	3.10 V	2.90 V
<b>Capacity</b> (on $700 \Omega \pm 1\%$ at + 20°C 2 V cut-off)	15.2 Ah	14.8 Ah

## 9. Incoming inspection

Prior to release from factory, the LS 33600 cell is 100 % inspected in Open Circuit Voltage (OCV) and On Load Voltage.

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

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

\*\* Following the date code printed on the sleeve.



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

#### 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 LS 33600 cell displays the following:

SAFT LITHIUM LS 33600 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:**

**06 029 A023**

*(cell finished the 29<sup>th</sup> day of year 2006. Batch internal reference A023)*



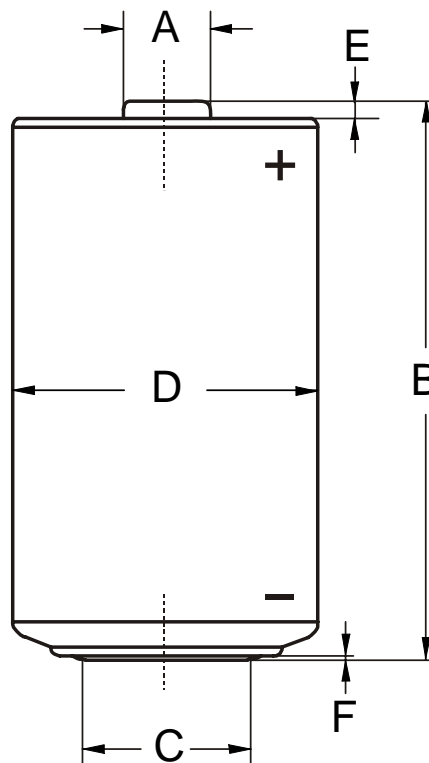


### 11. Untabbed/sleeved cell external dimensions

(Dimensions in mm)

P/N 04262L

Version with protruding positive end



	A	B	C	D	E	F
LS 33600	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 cell versions with a flat, non-protruding, positive end).

### A. **LS 33600 B**

(untabbed cell; flat version with non-protruding positive end) P/N 04238M

### B. **LS 33600 CNR**

(protruding cell version with 2 rectangular nickel radial tabs) P/N 04589U

### C. **LS 33600 B CNR**

(flat cell version with 2 rectangular nickel radial tabs) P/N 04240P

### D. **LS 33600 B FL**

(flat cell version with 2 stainless steel radial tabs and flying leads) P/N 04239N

### E. **LS 33600 CNA**

(protruding cell version with 2 tinned-copper axial leads) P/N 04234H

See corresponding drawings on the following pages.

Other finish versions are available on request. Consult Saft.

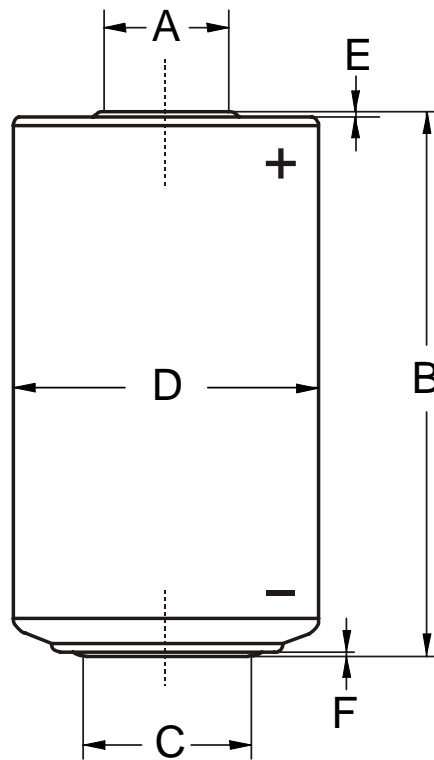


**LS 33600 B**

**P/N 04238M**

(dimensions in mm)

**Flat cell version with non-protruding positive end**



	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
<b>LS 33600 B</b>	13.8 ± 0.2 (on flat surface)	59.6 ± 0.6	18.0 ± 0.2 (on flat surface)	33.2 ± 0.2	0.6 ± 0.2	0.5 ± 0.1

**LS 33600**

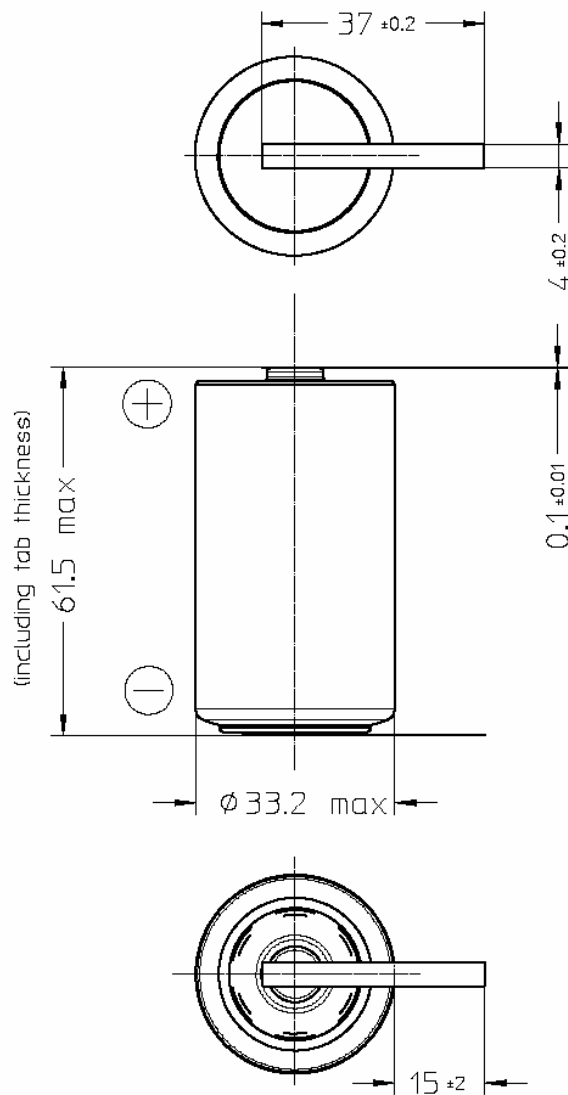
Page 3011  
May 2006  
N° 8708 Ed. 11



**LS 33600 CNR**  
(dimensions in mm)

**P/N 04589U**

**Protruding cell version with 2 rectangular nickel radial tabs**



**LS 33600**

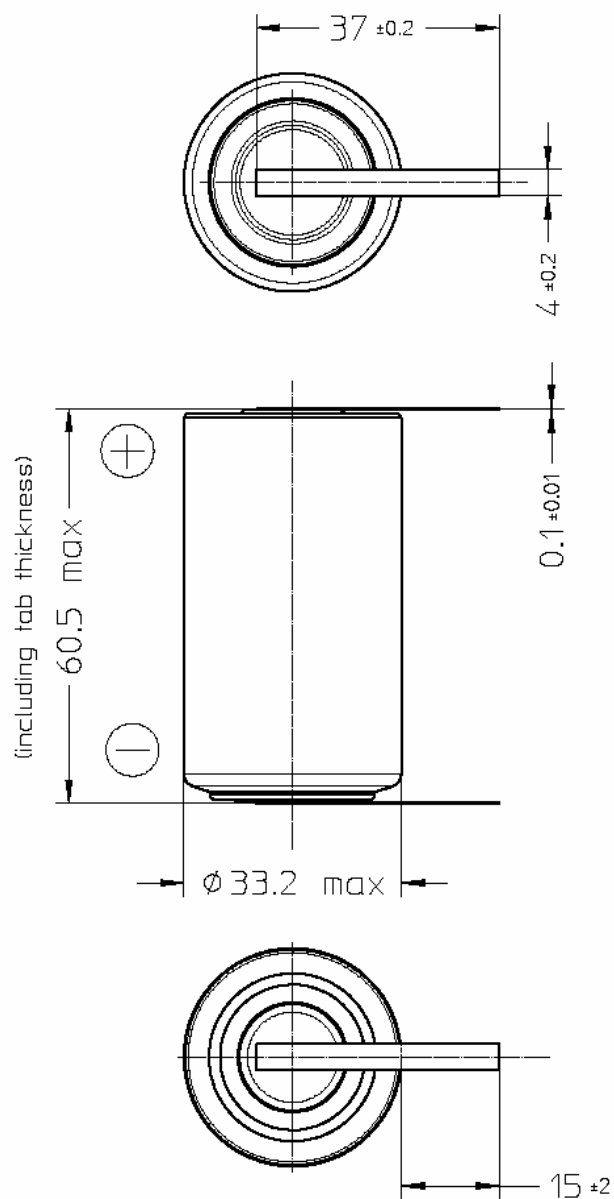
Page 3012  
May 2006  
N° 8708 Ed. 11



**LS 33600 B CNR**  
(dimensions in mm)

**P/N 04240P**

**Flat cell version with 2 rectangular nickel radial tabs**



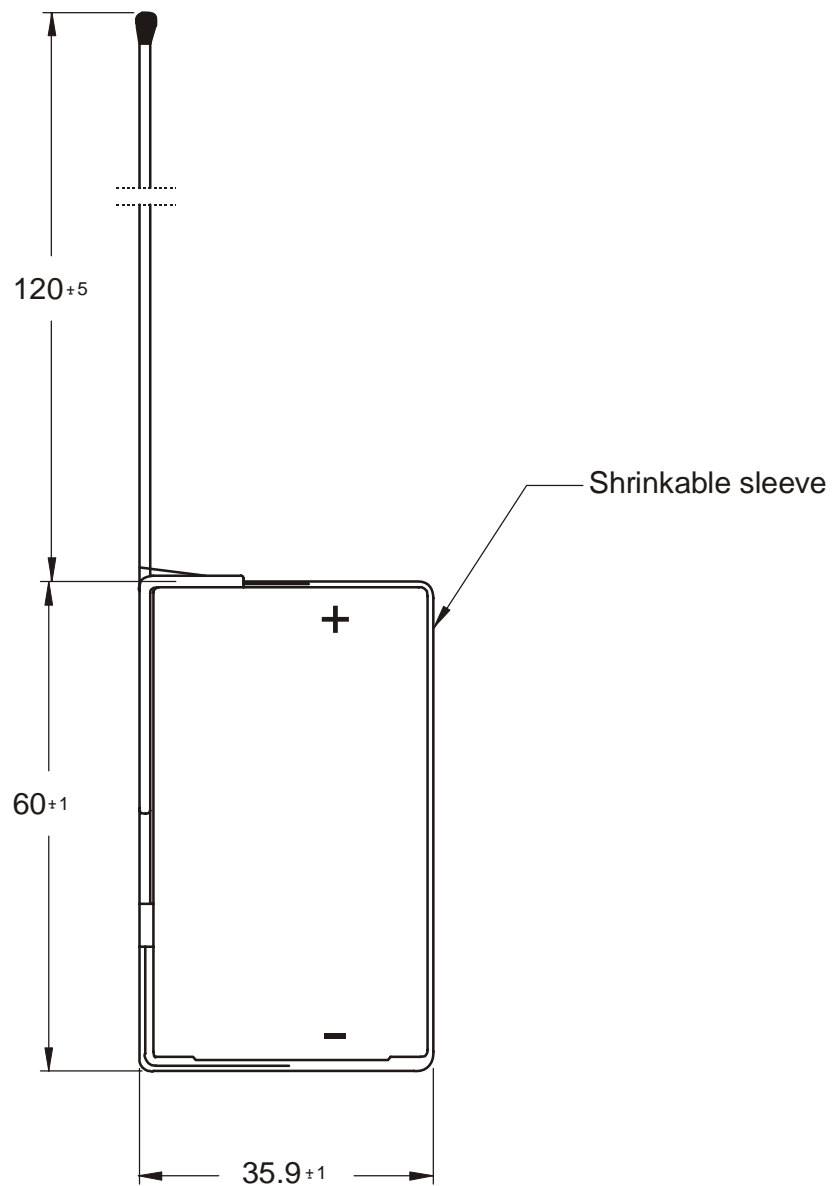
**LS 33600**



**LS 33600 B FL**  
(dimensions in mm)

**P/N 04239N**

**Flat cell version with 2 stainless steel radial tabs and flying leads**



**LS 33600**

Page 3014  
May 2006  
N° 8708 Ed. 11



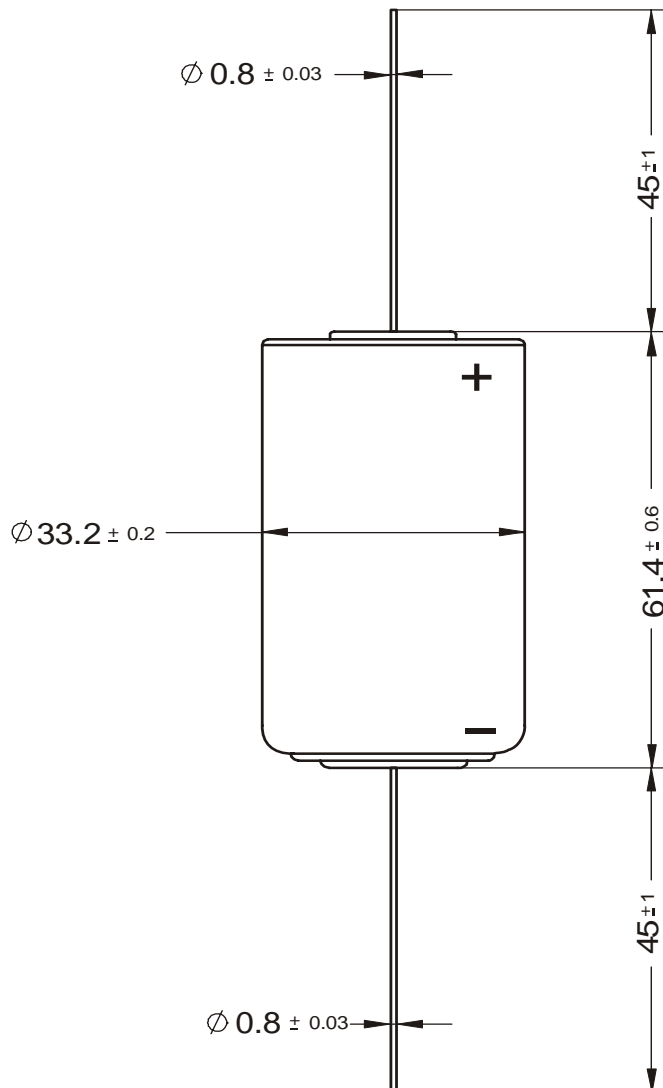
**LS 33600 CNA**

(dimensions in mm)

**P/N 04234 H**

(LS 33600 AX in USA)

**Protruding cell version with 2 tinned-copper axial leads**



**LS 33600**