

RESERVE TYPE LITHIUM-THIONYL CHLORIDE CELLS (EXTENDED ABSTRACT)

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Lithium batteries, especially hermetically-sealed systems have a very long, proven shelf life. However, during storage without load, a more or less pronounced voltage delay develops, depending on the kind of system. Therefore, for some applications, it may be advisable to use reserve-type cells instead of active cells.

The main requirements for reserve-type systems are, normally, short rise times. Since, after activation, for many applications only a short life time is required, more aggressive electrolytes can be used leading to higher load capabilities.

Two cell sizes of a lithium/thionyl chloride reserve-type system were developed (size A and A/2). The external dimensions are given in Fig. 1.

A schematic cut through the cell is given in Fig. 2. Lithium foil is swaged to the inner wall of the cell case. The separator material is nonwoven glass fiber. A thin, highly-porous cathode is pressed against the separator by

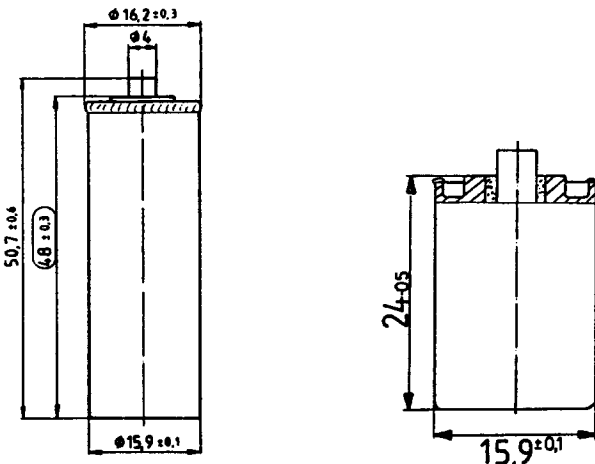


Fig. 1. External dimensions of the A size and A/2 size lithium-thionyl chloride reserve-type cells.

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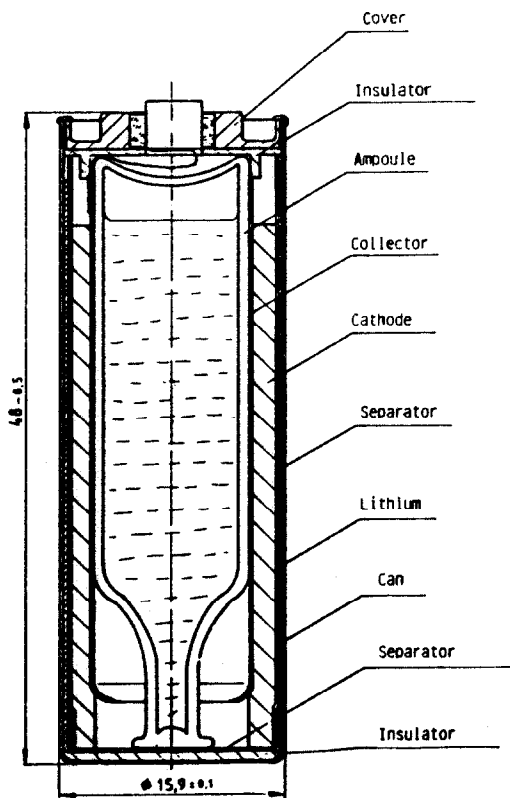


Fig. 2. Internal construction of the A size cell.

a metallic collector. An alternative method is for the cathode to be pressed directly on a metal screen.

To achieve short activation times, it is advisable to use acidic electrolytes in lithium-thionyl chloride reserve-type cells. The excess of AlCl_3 prevents early exhaustion of the cathode since it reacts with the discharge product, LiCl , to form complex salts. On the other hand, a competitive corrosion reaction of AlCl_3 with the lithium anode can also occur. This corrosion reaction, however, helps to achieve higher current loads in such cells, since there is no passivation of the lithium.

Performance tests, according to MIL specifications, especially of the A size cell, included transport vibration, flight vibration, temperature shock, etc.

Under low loads ($1.2 \text{ k}\Omega$ for the A size cell, $2.4 \text{ k}\Omega$ for the A/2 cell), the activation times, even at -40°C are very low. Typical times are well below 100 ms. At room temperature the rise time is typically less than 1 ms.

An improved cell capacity at -40°C can be achieved by using a mixed carbon cathode.

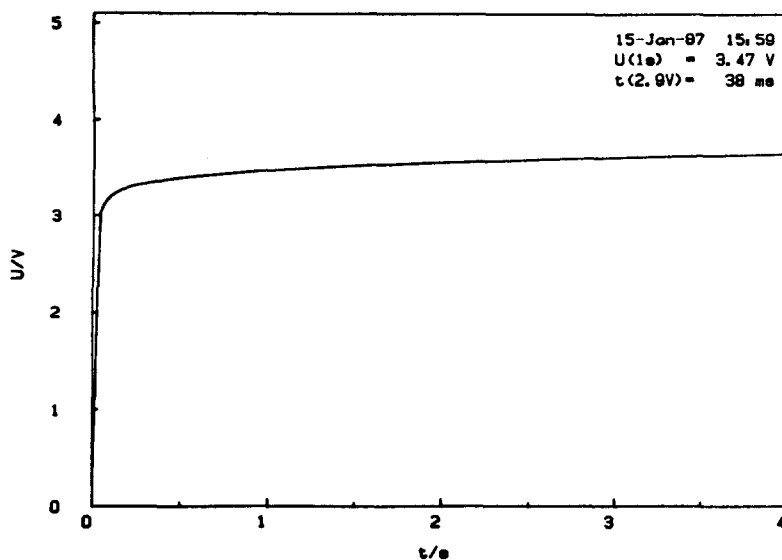


Fig. 3. Activation curve of an A/2-size cell at $-40\text{ }^{\circ}\text{C}$, current approx. 1.25 mA.

Figure 3 shows the rise time of an A/2 cell at $-40\text{ }^{\circ}\text{C}$ ($2.4\text{ k}\Omega$). The cell was squib activated. However, an activation by shock should also be possible.

In general such cells are very flexible, since the internal design, as well as the chemical composition can be adjusted (within limits) for different applications.