

INTERNATIONAL STANDARD

IEC 62281

First edition
2004-05

GROUP SAFETY PUBLICATION

Safety of primary and secondary lithium cells and batteries during transport

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF PRIMARY AND SECONDARY LITHIUM CELLS AND BATTERIES DURING TRANSPORT

FOREWORD

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International Standard IEC 62281 has been prepared jointly by IEC technical committee 35: Primary cells and batteries and by subcommittee 21A: Secondary cells and batteries containing alkaline or other non-acid electrolytes, of IEC technical committee 21: Secondary cells and batteries.

It has the status of a group safety publication in accordance with IEC Guide 104: *The preparation of safety publications and the use of basic safety publications and group safety publications*.

The text of this standard is based on the following documents:

FDIS	Report on voting
35/1202/FDIS	35/1206/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

Withdawn

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INTRODUCTION

Primary lithium cells and batteries were first introduced in military applications in the 1970s. At that time, little commercial interest and no industrial standards existed. Consequently, the United Nations (UN) Committee of Experts on the Transport of Dangerous Goods, although usually referring to industrial standards for testing and criteria, introduced a sub-section in the Manual of tests and criteria, dealing with safety tests relevant to transport of primary lithium cells and batteries. Meanwhile, commercial interest in primary and secondary (rechargeable) lithium cells and batteries has grown and several industrial standards exist. However, the existing IEC standards are manifold, not completely harmonized, and not necessarily relevant to transport. They are not suitable to be used as a source of reference in the UN Model Regulations. Therefore, a new group safety standard has been prepared to harmonize the tests and requirements relevant to transport.

This International Standard applies to primary and secondary (rechargeable) lithium cells and batteries containing lithium in any chemical form: lithium metal, lithium alloy or lithium-ion. Lithium-metal and lithium alloy primary electrochemical systems use metallic lithium and lithium alloy, respectively, as the negative electrode. Lithium-ion secondary electrochemical systems use intercalation compounds (intercalated lithium exists in an ionic or quasi-atomic form within the lattice of the electrode material) in the positive and in the negative electrodes.

This International Standard also applies to lithium polymer cells and batteries, which are considered either as primary lithium-metal cells and batteries or as secondary lithium-ion cells and batteries, depending on the nature of the material used in the negative electrode.

The history of transporting primary and secondary lithium cells and batteries is worth noting. Since the 1970s, over ten billion primary lithium cells and batteries have been transported, and since the early 1990s, over one billion secondary (rechargeable) lithium cells and batteries utilizing a lithium-ion system have been transported. As the number of primary and secondary lithium cells and batteries to be transported is increasing, it is appropriate to also include in this standard the safety testing of packaging used for the transportation of these products.

This International Standard specifically addresses the safety of primary and secondary lithium cells and batteries during transport and also the safety of the packaging used. Other International Standards dealing with the safety of primary and secondary lithium cells and batteries are referenced in Clause 2 and in the bibliography of this standard. They include the safety of primary and secondary lithium cells and batteries during handling, use and disposal and also address particular aspects of primary lithium batteries (IEC 60086-4) and secondary lithium cells and batteries (IEC 62133). They also contain some test methods and acceptance criteria that are relevant to transport. Consideration may, in the future, be given to the harmonization of these standards with this standard.

SAFETY OF PRIMARY AND SECONDARY LITHIUM CELLS AND BATTERIES DURING TRANSPORT

1 Scope

This International Standard specifies test methods and requirements for primary and secondary (rechargeable) lithium cells and batteries to ensure their safety during transport other than for recycling or disposal. Requirements specified in this standard do not apply in those cases where special provisions given in the relevant regulations, listed in 7.3, provide exemptions.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60086-4, *Primary batteries – Part 4: Safety of lithium batteries*

IEC 61960, *Secondary cells and batteries containing alkaline or other non-acid electrolyte – Secondary lithium cells and batteries for portable applications*

IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

aggregate lithium content

total lithium content or lithium equivalent content of the cells comprising a battery

3.2

battery

one or more cells electrically connected by permanent means, fitted in a case, with terminals, markings and protective devices, etc., as necessary for use

3.3

button cell

coin cell

cell with a cylindrical shape in which the overall height is less than the diameter, e.g. in the shape of a button or a coin

NOTE In practice, the term coin is used exclusively for non-aqueous lithium cells.

3.4

cell

basic functional unit, consisting of an assembly of electrodes, electrolyte, container, terminals and, usually, separators that is a source of electric energy obtained by direct conversion of chemical energy

3.5**component cell**

cell contained in a battery

3.6**cycle** (of a secondary (rechargeable) cell or battery)

set of operations that is carried out on a secondary (rechargeable) cell or battery and is repeated regularly in the same sequence

NOTE These operations may consist of a sequence of a discharge followed by a charge or a charge followed by a discharge under specified conditions. This sequence may include rest periods.

3.7**cylindrical cell**

cell with a cylindrical shape in which the overall height is equal to or greater than the diameter

3.8**depth of discharge****DOD**

percentage of rated capacity discharged from a battery

3.9 first cycle

initial cycle of a secondary (rechargeable) cell or battery following completion of all manufacturing, formation and quality control processes

3.10**fully charged**

state of charge of a secondary (rechargeable) cell or battery corresponding to 0 % depth of discharge

3.11**fully discharged**

state of charge of a cell or battery corresponding to 100 % depth of discharge

3.12**large battery**

battery in which the aggregate lithium content is more than 500 g

3.13**large cell**

cell in which the lithium content or lithium equivalent content is more than 12 g

3.14**lithium cell** (primary or secondary (rechargeable))

cell containing a non-aqueous electrolyte and a negative electrode of lithium or containing lithium

NOTE Depending on the design features chosen, a lithium cell may be primary or secondary (rechargeable).

3.15**lithium content**

mass of lithium in the negative electrode of a lithium metal or lithium alloy cell or battery in the undischarged or fully charged state