

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Primary batteries –  
Part 4: Safety of lithium batteries**

**Piles électriques –  
Partie 4: Sécurité des piles au lithium**

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**Primary batteries –  
Part 4: Safety of lithium batteries**

**Piles électriques –  
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PRIMARY BATTERIES –

## Part 4: Safety of lithium batteries

## FOREWORD

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International Standard IEC 60086-4 has been prepared by technical committee 35: Primary cells and batteries.

This fourth edition cancels and replaces the third edition published in 2007. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Harmonisation with the second edition of IEC 62281 [12]<sup>1</sup>;
- b) Alternative protective circuits in 7.1.1;

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<sup>1</sup> Numbers in square brackets refer to the Bibliography.

- c) More information regarding risks of swallowing lithium batteries in (former) 7.2.m) and promotion of this item to 7.2a);
- d) A new Annex D with pictograms for some of the safety precautions in 7.2.

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

FDIS	Report on voting
35/1324/FDIS	35/1332/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.

NOTE The following print types are used:

- requirements: in roman type;
- instructions/warnings for consumers: *in italic type*.

A list of all parts in the IEC 60086 series, under the general title *Primary batteries*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

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## INTRODUCTION

The concept of safety is closely related to safeguarding the integrity of people and property. This standard specifies tests and requirements for lithium batteries and has been prepared in accordance with ISO/IEC guidelines, taking into account all relevant national and international standards which apply.

Lithium batteries are different from conventional primary batteries using aqueous electrolyte in that they contain flammable materials.

Consequently, it is important to carefully consider safety during design, production, distribution, use, and disposal of lithium batteries. Based on such special characteristics, lithium batteries for consumer applications were initially small in size and had low power output. There were also lithium batteries with high power output which were used for special industrial and military applications and were characterized as being “technician replaceable”. The first edition of this standard was drafted to accommodate this situation.

However, from around the end of the 1980s, lithium batteries with high power output started to be widely used in the consumer replacement market, mainly as a power source in camera applications. Since the demand for such lithium batteries with high power output significantly increased, various manufacturers started to produce these types of lithium batteries. As a consequence of this situation, the safety aspects for lithium batteries with high power output were included in the second edition of this standard.

Primary lithium batteries both for consumer and industrial applications are well-established safe and reliable products in the market, which is at least partly due to the existence of safety standards such as this standard and, for transport, IEC 62281. The fourth edition of this standard therefore reflects only minor changes which became necessary in order to keep it harmonized with IEC 62281 and to continuously improve the user information about safety related matters.

Guidelines addressing safety issues during the design of lithium batteries are provided in Annex A. Annex B provides guidelines addressing safety issues during the design of equipment where lithium batteries are installed. Both Annex A and B reflect experience with lithium batteries used in camera applications and are based on [20].

Safety is freedom from unacceptable risk. There can be no absolute safety: some risk will remain. Therefore a product, process or service can only be relatively safe. Safety is achieved by reducing risk to a tolerable level determined by the search for an optimal balance between the ideal of absolute safety and the demands to be met by a product, process or service, and factors such as benefit to the user, suitability for purpose, cost effectiveness, and conventions of the society concerned.

As safety will pose different problems, it is impossible to provide a set of precise provisions and recommendations that will apply in every case. However, this standard, when followed on a judicious “use when applicable” basis, will provide reasonably consistent standards for safety.