

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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

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





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# 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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ELECTROTECHNICAL  
COMMISSION

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## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references .....	8
3 Terms and definitions .....	8
4 Requirements for safety.....	11
4.1 Design .....	11
4.2 Quality plan .....	12
5 Type testing and sampling.....	12
5.1 Validity of testing .....	12
5.2 Test samples .....	12
6 Testing and requirements .....	13
6.1 General.....	13
6.1.1 Test application matrix.....	13
6.1.2 Cautionary notice.....	14
6.1.3 Ambient temperature .....	14
6.1.4 Parameter measurement tolerances .....	14
6.1.5 PredischARGE .....	15
6.1.6 Additional cells .....	15
6.2 Evaluation of test criteria .....	15
6.2.1 Short-circuit.....	15
6.2.2 Excessive temperature rise.....	15
6.2.3 Leakage .....	15
6.2.4 Venting .....	15
6.2.5 Fire.....	16
6.2.6 Rupture .....	16
6.2.7 Explosion.....	16
6.3 Tests and requirements – Overview .....	16
6.4 Tests for intended use .....	17
6.4.1 Test A: Altitude.....	17
6.4.2 Test B: Thermal cycling .....	17
6.4.3 Test C: Vibration.....	18
6.4.4 Test D: Shock.....	18
6.5 Tests for reasonably foreseeable misuse .....	19
6.5.1 General .....	19
6.5.2 Test E: External short-circuit.....	19
6.5.3 Test F: Impact .....	19
6.5.4 Test G: Crush .....	20
6.5.5 Test H: Forced discharge.....	21
6.5.6 Test I: Abnormal charging.....	22
6.5.7 Test J: Free fall .....	22
6.5.8 Test K: Thermal abuse.....	23
6.5.9 Test L: Incorrect installation.....	23
6.5.10 Test M: Overdischarge.....	24
6.6 Information to be given in the relevant specification .....	25
6.7 Evaluation and report.....	25

7	Information for safety.....	26
7.1	Safety precautions during design of equipment.....	26
7.1.1	General.....	26
7.1.2	Charge protection.....	26
7.1.3	Parallel connection.....	26
7.2	Precautions during handling of batteries.....	27
7.3	Additional information for safety of coin cells.....	29
7.4	Packaging.....	29
7.5	Handling of battery cartons.....	29
7.6	Transport.....	29
7.6.1	General.....	29
7.6.2	Air transport.....	30
7.6.3	Sea transport.....	30
7.6.4	Land transport.....	30
7.7	Display and storage.....	30
7.8	Disposal.....	30
8	Instructions for use.....	31
9	Marking and packaging.....	31
9.1	General.....	31
9.2	Marking of batteries too small to accommodate all markings.....	32
9.3	Additional requirements for swallowable coin cells and batteries.....	32
9.4	Safety pictograms.....	33
	Annex A (informative) Guidelines for the achievement of safety of lithium batteries.....	34
	Annex B (informative) Guidelines for designers of equipment using lithium batteries.....	35
	Annex C (informative) Additional information on display and storage.....	38
	Annex D (informative) Safety pictograms.....	39
	D.1 General.....	39
	D.2 Pictograms.....	39
	D.3 Instruction for use.....	40
	Annex E (normative) Child resistant packaging of coin cells.....	41
	E.1 General.....	41
	E.2 Applicability.....	41
	E.3 Packaging tests.....	41
	E.3.1 General.....	41
	E.3.2 Test items.....	42
	E.3.3 Test procedure.....	43
	E.3.4 Criteria.....	43
	Annex F (normative) Use of the KEEP OUT OF REACH OF CHILDREN safety sign.....	44
	F.1 General.....	44
	F.2 Safety sign.....	44
	F.3 Marking on the packaging.....	44
	F.4 Marking on the cell.....	44
	Annex G (normative) Measures against misuse of batteries not intended for consumer replacement.....	45
	G.1 Background.....	45
	G.2 Additional measures for the prevention of confusion of primary batteries not intended for consumer replacement with secondary batteries.....	45

G.2.1	Identification of primary (non-rechargeable) batteries not intended for consumer replacement .....	45
G.2.2	Marking and information requirements for primary batteries not intended for consumer replacement .....	46
G.2.3	Information responsibility of manufacturers and distributors .....	46
	Bibliography .....	47
	Figure 1 – Thermal cycling procedure .....	17
	Figure 2 – Example of a test set-up for the impact test.....	20
	Figure 3 – Examples of a test set-up for the crush test.....	21
	Figure 4 – Axes for free fall.....	23
	Figure 5 – Circuit diagram for incorrect installation .....	24
	Figure 6 – Circuit diagram for overdischarge.....	25
	Figure 7 – Examples of wiring for charge protection.....	26
	Figure 8 – Ingestion gauge .....	27
	Figure 9 – Example for warning against swallowing, particularly coin cell batteries .....	27
	Figure A.1 – Battery design guidelines .....	34
	Figure E.1 – Bending test .....	42
	Figure E.2 – Torsion test.....	42
	Figure E.3 – Tearing test .....	42
	Figure E.4 – Pushing test.....	43
	Figure E.5 – Maximum packaging opening.....	43
	Figure F.1 – Safety signs for use on coin cells .....	44
	Table 1 – Number of test samples.....	13
	Table 2 – Test application matrix .....	14
	Table 3 – Mass loss limits.....	15
	Table 4 – Tests and requirements .....	16
	Table 5 – Vibration profile (sinusoidal).....	18
	Table 6 – Shock parameters .....	19
	Table 7 – Resistive load for overdischarge.....	24
	Table 8 – Parameters to be specified .....	25
	Table 9 – Marking requirements.....	32
	Table 10 – Additional marking and packaging requirements for swallowable coin cells and batteries.....	33
	Table B.1 – Equipment design guidelines.....	35
	Table D.1 – Safety pictograms .....	39
	Table E.1 – Test procedure.....	43

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**PRIMARY BATTERIES –****Part 4: Safety of lithium batteries****FOREWORD**

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

This sixth edition cancels and replaces the fifth edition published in 2019. This edition constitutes a technical revision.

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

- a) Added definitions for leakage and venting, in addition to the test criteria;
- b) Revised overdischarge test;
- c) Revised marking requirements;
- d) Revised criteria for the child resistant packaging test;
- e) Changed the purpose of Annex F from "informative" to "normative";

- f) Added a new Annex G with additional measures against misuse of batteries not intended for consumer replacement;
- g) Integrated the contents of Interpretation Sheet 1 (IEC 60086-4:2019/ISH1:2020);
- h) In Clause 3, terms were reordered according their functions: basic terms, electrochemical systems, battery shapes, battery sizes, electrical characteristics, specifications, safety aspects, failure modes;
- i) In 6.4.4, the exemption for the shock acceleration for lithium primary batteries was reduced from 12 kg to 4,482 kg in order to reflect the fact that this is the threshold in IEC 62281, Test T-4, where the peak acceleration decreases below 150  $g_n$ .

The text of this International Standard is based on the following documents:

Draft	Report on voting
35/1571/FDIS	35/1579/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

NOTE 1 The following print types are used:

- 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 document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

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- withdrawn, or
- revised.

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## INTRODUCTION

The concept of safety is closely related to safeguarding the integrity of people and property. This document 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 document 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 document.

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 document and, for transport, IEC 62281. The fourth edition of this document reflected 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 Annex B reflect experience with lithium batteries used in camera applications and are based on [22]<sup>1</sup>.

The ingestion hazard of coin cell batteries has become an issue and was addressed in the fifth and sixth editions of this document by several independent measures such as the development of a new safety sign "KEEP OUT OF REACH OF CHILDREN" as well as the introduction of child resistant packaging.

A new Annex G addresses measures against misuse of cells and batteries not intended for consumer replacement.

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 document, when followed on a judicious "use when applicable" basis, will provide reasonably consistent standards for safety.

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