

Primary batteries —

Part 4: Safety standard for lithium batteries

The European Standard EN 60086-4:1996 has the status of a British Standard

ICS 29.220.10

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee CPL/35, Primary batteries, upon which the following bodies were represented:

- British Battery Manufacturers' Association
- British Horological Federation
- British Horological Institute
- British Railways Board
- British Toy and Hobby Association
- Consumer Policy Committee of BSI
- Consumers' Association
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- Department of Transport
- Federation of the Electronics Industry
- Institute of Trading Standards Administration
- Ministry of Defence

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 September 1996

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National foreword

This British Standard has been prepared by Technical Committee CPL/35 and is the English language version of EN 60086-4:1996 *Primary batteries — Part 4: Safety standard for lithium batteries*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 86-4:1996 published by the International Electrotechnical Commission (IEC).

Cross-references

Publication referred to	Corresponding British Standard
EN 60086-1:1995 (IEC 86-1:1995)	BS EN 60086 <i>Primary batteries</i> BS EN 60086-1:1996 <i>General</i>
EN 60068-2-27:1993 (IEC 68-2-27:1993)	BS EN 60068 <i>Environmental testing</i> BS EN 60068-2 <i>Test methods</i> BS EN 60068-2-27:1993 <i>Environmental testing procedures.</i> <i>Tests. Test Ea and guidance. Shock</i>

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing surveillance, which may be coupled with assessment of supplier's quality systems against the appropriate Part of BS EN ISO 9000.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 18, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

ICS 29.220.10

Descriptors: Primary batteries, lithium batteries, marking, safety requirements, tests

English version

Primary batteries Part 4: Safety standard for lithium batteries

(IEC 86-4:1996)

Piles électriques
Partie 4: Norme de sécurité pour les piles au
lithium
(CEI 86-4:1996)

Primärbatterien
Teil 4: Sicherheitsnorm für Lithium-Batterien
(IEC 86-4:1996)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

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Foreword

The text of document 35/960/FDIS, future edition 1 of IEC 86-4, prepared by IEC TC 35, Primary cells and batteries, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60086-4 on 1996-03-05.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-12-01

For products which have complied with the relevant national standard before 1996-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2001-12-01.

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given for information only. In this standard, annex ZA is normative and annexes A, B and C are informative. Annex ZA has been added by CENELEC.

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Introduction

The concept of safety is closely related to safeguarding the integrity of people and property. This part of IEC 86 defines performance requirements for primary lithium batteries to ensure their safe operation under normal use and reasonably foreseeable misuse.

Safety is a balance between freedom from risks of harm and other demands to be met by the product. There can be no absolute safety. Even at the highest level of safety, the product can only be relatively safe. In this respect, decision-making is based on risk evaluation and safety judgement.

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.

NOTE 1 This standard will be revised periodically; therefore, the user should be sure the latest edition is consulted.

NOTE 2 Secondary lithium batteries are under consideration.

1 Scope

This part of IEC 86 specifies performance requirements for primary lithium batteries to assure their safe operation under normal use and foreseeable misuse and abuse.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 86. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 86 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 86-1:1993 — *Primary batteries — Part 1: General.*

IEC 68-2-27:1987 — *Basic environmental testing procedures — Part 2: Tests — Test Ea and guidance: Shock.*

ISO/IEC GUIDE 51:1990, *Guidelines for the inclusion of safety aspects in standards.*

3 Definitions

For the purposes of this part of IEC 86, the following definitions apply:

3.1

safety

freedom from unacceptable risk of harm

3.2

risk

the probable rate of occurrence of a hazard causing harm and the degree of severity of the harm

3.3

hazard

a potential source of harm

3.4

intended use

the use of a product, process or service under conditions or for purposes in accordance with specifications and instructions provided by the supplier — including information for publicity purposes

3.5

reasonably foreseeable misuse

the use of a product, process or service under conditions or for purposes not intended by the supplier, but which may happen, induced by the design of the product in combination with, or as a result of, common human behaviour

3.6

cell

a source of electrical energy obtained by the direct conversion of chemical energy that is not designed to be charged by any other electrical source

3.7

battery

one or more primary cells, including case, terminals and marking

3.8

consumer batteries

batteries readily available in the commercial retail market and that are considered user replaceable, i.e. replaceable without the need of special tools

3.9

industrial batteries

any batteries not meeting the requirements of 3.8

3.10 test result

3.10.1 weight loss – W

weight loss exceeding the values shown below.

Weight of battery	g	Maximum weight loss from the original weight	%
weight ≤ 1		0,5	
1 < weight ≤ 5		0,2	
weight > 5		0,1	

3.10.2 distortion – D

any change in physical dimensions exceeding 10%
NOTE Distortion should be reported with the cause.

3.10.3 leakage – L

the escape of electrolyte or other visible substances from a battery

3.10.4 venting – V

the release of excessive internal pressure from a battery in a manner intended by design to preclude explosion

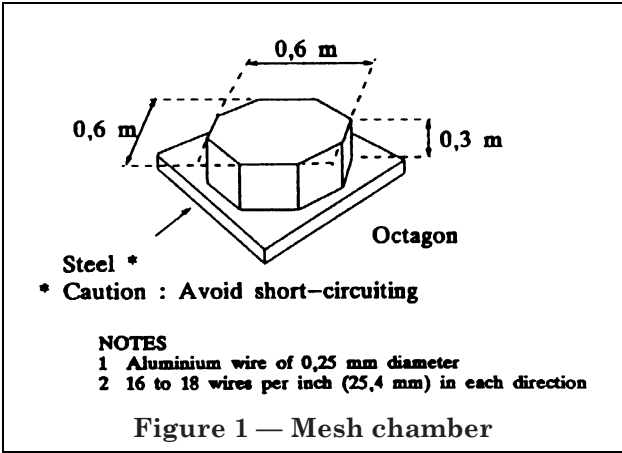
NOTE If electrolyte leaks from the vent area without vent operation, it is defined as “Leakage – L”.

3.10.5 explosion – E

solid materials are ejected from the battery

- a) E1: Level 1
Battery explodes but ejected solid material does not pass through the wire mesh chamber, specified in Figure 1.
- b) E2: Level 2
Battery explodes and ejected solid material passes through the wire mesh chamber, specified in Figure 1.

NOTE 1 Aluminium wire mesh chamber as shown in Figure 1 is centered over test battery. As required, battery is subjected to tests in Table 1 or Table 2 where indicated.
NOTE 2 The Figure 1 chamber is only required to distinguish between the result of E1 and E2 levels.
NOTE 3 For protection, this test is to be conducted in a room separate from the observer. Each test sample, battery, is to be placed on a horizontal plate covered by the mesh chamber in Figure 1.



3.10.6 fire – F

battery materials ignite

4 Symbols and abbreviations

4.1 Test conditions

- T_d: Duration time
- C_n: Nominal capacity
- U_n: Nominal voltage
- U_c: Charge voltage
- R_L: Limiting resistance

4.2 Test requirements

- NW (No weight loss):
- No weight loss
 - No distortion
 - No leakage
 - No venting
 - No explosion E1
 - No explosion E2
 - No fire

- ND (No distortion):
- No distortion
 - No leakage
 - No venting
 - No explosion E1
 - No explosion E2
 - No fire