



SLOVENSKI STANDARD
SIST EN IEC 60086-1:2021

01-september-2021

Nadomešča:
SIST EN 60086-1:2015

Primarne baterije - 1. del: Splošno (IEC 60086-1:2021)

Primary batteries - Part 1: General (IEC 60086-1:2021)

Primärbatterien - Teil 1: Allgemeines (IEC 60086-1:2021)

Piles électriques - Partie 1: Généralités (IEC 60086-1:2021)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Ta slovenski standard je istoveten z: EN IEC 60086-1:2021

<https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6cf10d28f/sist-en-iec-60086-1-2021>

ICS:

29.220.10 Primarni členi in baterije Primary cells and batteries

SIST EN IEC 60086-1:2021 **en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN IEC 60086-1:2021

<https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021>

EUROPEAN STANDARD

EN IEC 60086-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2021

ICS 29.220.10

Supersedes EN 60086-1:2015 and all of its amendments
and corrigenda (if any)

English Version

Primary batteries - Part 1: General (IEC 60086-1:2021)

Piles électriques - Partie 1: Généralités
(IEC 60086-1:2021)Primärbatterien - Teil 1: Allgemeines
(IEC 60086-1:2021)

This European Standard was approved by CENELEC on 2021-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

(standards.iteh.ai)

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

<https://standards.iteh.ai/catalog/standards/sist/99e5b99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021>



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 60086-1:2021 (E)**European foreword**

The text of document 35/1465/FDIS, future edition 13 of IEC 60086-1, prepared by IEC/TC 35 "Primary cells and batteries" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60086-1:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-03-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-06-01

This document supersedes EN 60086-1:2015 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice**iTeh STANDARD PREVIEW**

The text of the International Standard IEC 60086-1:2021 was approved by CENELEC as a European Standard without any modification. (standards.iteh.ai)

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

<https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021>

IEC 60086-6 NOTE Harmonized as EN IEC 60086-6

IEC 62281 NOTE Harmonized as EN IEC 62281

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60086-2	2015	Primary batteries - Part 2: Physical and electrical specifications	EN 60086-2	2016
IEC 60086-3	-	Primary batteries - Part 3: Watch batteries	EN IEC 60086-3	-
IEC 60086-4	-	Primary batteries - Part 4: Safety of lithium batteries	EN IEC 60086-4	-
IEC 60086-5	-	Primary batteries - Part 5: Safety of batteries with aqueous electrolyte	EN 60086-5	-

STANDARD PREVIEW
(standards.iteh.ai)
SIST EN IEC 60086-1:2021
<https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 60086-1:2021](#)

<https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021>



IEC 60086-1

Edition 13.0 2021-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Primary batteries – **STANDARD PREVIEW**
Part 1: General **(standards.iteh.ai)**

Piles électriques –
Partie 1: Généralités **SIST EN IEC 60086-1:2021**
standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.220.10

ISBN 978-2-8322-9672-1

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	8
4 Requirements	11
4.1 General.....	11
4.1.1 Design	11
4.1.2 Battery dimensions	11
4.1.3 Terminals	11
4.1.4 Classification (electrochemical system)	13
4.1.5 Designation	14
4.1.6 Marking	14
4.1.7 Interchangeability: battery voltage	15
4.2 Performance	16
4.2.1 Discharge performance.....	16
4.2.2 Dimensional stability.....	16
4.2.3 Leakage	16
4.2.4 Open-circuit voltage limits	16
4.2.5 Service output	16
4.2.6 Safety	16
4.2.7 Validity of testing	17
5 Performance – Testing	17
5.1 Capacity testing versus application and service output testing	17
5.2 Discharge testing	17
5.2.1 General	17
5.2.2 Application tests	18
5.2.3 Service output tests	18
5.3 Conformance check to a specified minimum average duration	19
5.4 Guidance for considering proposed value of minimum average duration	19
5.5 OCV testing	19
5.6 Insulation resistance	19
5.7 Battery dimensions	19
5.8 Leakage and deformation.....	19
6 Performance – Test conditions	20
6.1 Storage and discharge conditions	20
6.2 Commencement of discharge tests after storage.....	20
6.3 Discharge test conditions	20
6.3.1 General	20
6.3.2 Compliance	20
6.4 Load resistance	21
6.5 Time periods.....	21
6.6 Test condition tolerances	21
6.7 Activation of ‘P’-system batteries	21
6.8 Measuring equipment.....	22
6.8.1 Voltage measurement.....	22

6.8.2	Mechanical measurement	22
7	Sampling and quality assurance	22
8	Battery packaging	22
Annex A (normative) Criteria for the standardization of batteries		23
Annex B (informative) Recommendations for equipment design		24
B.1	Technical liaison	24
B.2	Battery compartment	24
B.2.1	General	24
B.2.2	Limiting access by children	25
B.3	Voltage cut-off	25
Annex C (normative) Designation system (nomenclature)		26
C.1	General	26
C.2	Designation system in use up to October 1990	26
C.2.1	General	26
C.2.2	Cells	26
C.2.3	Electrochemical system	28
C.2.4	Batteries	28
C.2.5	Modifiers	29
C.2.6	Examples	29
C.3	Designation system in use since October 1990	29
C.3.1	General	29
C.3.2	Round batteries	29
C.3.3	Non-round batteries	33
C.3.4	Ambiguity	36
Annex D (informative) Standard discharge voltage U_S – Definition and method of determination		38
D.1	Definition	38
D.2	Determination	38
D.2.1	General considerations: the C/R -plot	38
D.2.2	Determination of the standard discharge resistor R_S	39
D.2.3	Determination of the standard discharge capacity C_S and standard discharge time t_S	40
D.3	Experimental conditions to be observed and test results	41
Annex E (informative) Preparation of standard methods of measuring performance (SMMP) of consumer goods		42
E.1	General	42
E.2	Performance characteristics	42
E.3	Criteria for the development of test methods	42
Annex F (informative) Guidance for proposing value of minimum average duration		43
F.1	General	43
F.2	Sampling	43
F.3	Calculation method	43
Annex G (normative) Code of practice for packaging, shipment, storage, use and disposal of primary batteries		44
G.1	General	44
G.2	Packaging	44
G.3	Transport and handling	44
G.4	Storage and stock rotation	44

G.5	Displays at sales points	45
G.6	Selection, use and disposal	45
G.6.1	Purchase	45
G.6.2	Installation	45
G.6.3	Use	45
G.6.4	Replacement	46
G.6.5	Disposal	46
Annex H (informative)	Compliance checklist	47
Bibliography	48
Figure C.1	– Designation system for round batteries: $d_1 < 100$ mm; height $h_1 < 100$ mm	30
Figure C.2	– Diameter code for non-recommended diameters	31
Figure C.3	– Height code for denoting the hundredths of a millimetre of height	32
Figure C.4	– Designation system for round batteries: $d_1 \geq 100$ mm; height $h_1 \geq 100$ mm	33
Figure C.5	– Designation system for non-round batteries, dimensions < 100 mm	34
Figure C.6	– Designation system for non-round batteries, dimensions ≥ 100 mm	35
Figure C.7	– Height code for discrimination per tenth of a millimetre	35
Figure D.1	– Normalized C/R-plot schematic)	39
Figure D.2	– Standard discharge voltage (schematic)	40
Table 1	– Standardized electrochemical systems	13
Table 2	– Marking requirements	15
Table 3	– Conditions for storage before and during discharge testing	20
Table 4	– Resistive loads for tests	21
Table 5	– Time periods for tests	21
Table 6	– Test condition tolerances	21
Table A.1	– Items necessary to standardize	23
Table C.1	– Physical designation and dimensions of round cells and batteries	27
Table C.2	– Physical designation and nominal overall dimensions of flat cells	28
Table C.3	– Physical designation and dimensions of square cells and batteries	28
Table C.4	– Diameter code for recommended diameter	31
Table C.5	– Physical designation and dimensions of round cells and batteries based on Clause C.2	36
Table C.6	– Physical designation and dimensions of non-round batteries based on Clause C.2	37
Table D.1	– Standard discharge voltage by system	41

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRIMARY BATTERIES –

Part 1: General

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60086-1 has been prepared by IEC technical committee 35: Primary cells and batteries.

This thirteenth edition cancels and replaces the twelfth edition published in 2015. This edition constitutes a technical revision.

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

- a) a compliance checklist was added as an Annex H;
- b) definitions were harmonized with the other 60086 series documents;
- c) the nominal voltage of the zinc air system is now listed as either 1,4 V or 1,45 V;
- d) Annex F for calculation of MAD values was simplified;
- e) a validity period for testing was added;
- f) the accelerated aging test at 45 °C was changed from 13 to 4 weeks;

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

FDIS	Report on voting
35/1465/FDIS	35/1469/RVD

Full information on the voting for the approval of this International Standard 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. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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 "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 60086-1:2021](https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021>

INTRODUCTION

The technical content of this part of IEC 60086 provides fundamental requirements and information on primary cells and batteries. All batteries within the IEC 60086 series are considered dry cell batteries. In this sense, IEC 60086-1 is the main component of the IEC 60086 series and forms the basis for the subsequent parts. For example, this part includes elementary information on definitions, nomenclature, dimensions and marking. While specific requirements are included, the content of this part tends to explain methodology (how) and justification (why).

Over the years, this part has been changed to improve its content and remains under continual scrutiny to ensure that the publication is kept up to date with the advances in both battery and battery-powered device technologies.

Safety requirements and recommendations are available in IEC 60086-4, IEC 60086-5 and IEC 62281. Specifications are available in IEC 60086-2 and IEC 60086-3. Environmental aspects are dealt with in IEC 60086-6.

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[SIST EN IEC 60086-1:2021](https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021)

<https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021>

PRIMARY BATTERIES –

Part 1: General

1 Scope

This part of IEC 60086 is intended to standardize primary batteries with respect to dimensions, nomenclature, terminal configurations, markings, test methods, typical performance, safety and environmental aspects.

This document on one side specifies requirements for primary cells and batteries. On the other side, this document also specifies procedures of how requirements for these batteries are to be standardised.

As a classification tool for primary batteries, this document specifies system letters, electrodes, electrolytes, and nominal as well as maximum open circuit voltage of electrochemical systems.

The object of this part of IEC 60086 is to benefit primary battery users, device designers and battery manufacturers by ensuring that batteries from different manufacturers are interchangeable according to standard form, fit and function. Furthermore, to ensure compliance with the above, this part specifies standard test methods for testing primary cells and batteries.

(standards.iteh.ai)

This document also contains requirements in Annex A justifying the inclusion or the ongoing retention of batteries in the IEC 60086 series.

<https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021>

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60086-2:2015, *Primary batteries – Part 2: Physical and electrical specifications*

IEC 60086-3, *Primary batteries – Part 3: Watch batteries*

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

IEC 60086-5, *Primary batteries – Part 5: Safety of batteries with aqueous electrolyte*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

application test

simulation of the actual use of a battery in a specific application

3.2

battery

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

[SOURCE:IEC 60050-482:2004, 482-01-04, modified – removal of "fitted with devices necessary for use.]"

3.3

button (cell or battery)

small round cell or battery where the overall height is less than the diameter, containing aqueous electrolyte

Note 1 to entry: See coin (cell or battery), lithium button (cell or battery).

[SOURCE: IEC 60050-482:2004 482-02-40]

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

[SOURCE:IEC 60050-482:2004, 482-01-01]

[SIST EN IEC 60086-1:2021](https://standards.iteh.ai/catalog/standards/sist/99e5f99a-b584-4800-a33c-7fb6efd0d28f/sist-en-iec-60086-1-2021)

3.5

closed-circuit voltage

CCV

voltage across the terminals of a battery when it is on discharge

[SOURCE:IEC 60050-482:2004, 482-03-28, modified – "voltage between the terminals of a cell or battery" replaced by "voltage across the terminals of a battery".]

3.6

coin (cell or battery)

lithium button (cell or battery)

small round cell or battery where the overall height is less than the diameter, containing non-aqueous electrolyte

Note 1 to entry: The nominal voltage of lithium batteries is typically greater than 2 V.

Note 2 to entry: See button (cell or battery).

3.7

cylindrical (cell or battery)

round cell or battery in which the overall height is equal to or greater than the diameter

[SOURCE:IEC 60050-482: 2004, 482-02-39, modified – "cell with a cylindrical shape" replaced with "round cell or battery"]

3.8

discharge (of a primary battery)

operation during which a battery delivers current to an external circuit