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**Primary batteries - Part 1: General**

Primary batteries -- Part 1: General

Primärbatterien -- Teil 1: Allgemeines

Piles électriques -- Partie 1: Généralités

**Ta slovenski standard je istoveten z: EN 60086-1:2001**[SIST EN 60086-1:2002](https://standards.iteh.ai/catalog/standards/sist/00d8a419-2f26-4813-9613-eca659e71845/sist-en-60086-1-2002)<https://standards.iteh.ai/catalog/standards/sist/00d8a419-2f26-4813-9613-eca659e71845/sist-en-60086-1-2002>**ICS:**

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EUROPEAN STANDARD

**EN 60086-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2001

ICS 29.220.10

Supersedes EN 60086-1:1997 + A1:1999 + A2:1999

English version

**Primary batteries**  
**Part 1: General**  
(IEC 60086-1:2000)

Piles électriques  
Partie 1: Généralités  
(CEI 60086-1:2000)

Primärbatterien  
Teil 1: Allgemeines  
(IEC 60086-1:2000)

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This European Standard was approved by CENELEC on 2000-12-01. 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 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

## 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

## Foreword

The text of document 35/1131/FDIS, future edition 9 of IEC 60086-1, prepared by IEC TC 35, Primary cells and batteries, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60086-1 on 2000-12-01.

This European Standard supersedes EN 60086-1:1997 + A1:1999 + A2:1999.

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) 2001-09-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2003-12-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A to E and ZA are normative and annexes F to H are informative.

Annex ZA has been added by CENELEC.

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### Endorsement notice

The text of the International Standard IEC 60086-1:2000 was approved by CENELEC as a European Standard without any modification.

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## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60086-2	2000	Primary batteries Part 2: Physical and electrical specifications	EN 60086-2	2001
IEC 60086-3	1995	Part 3: Watch batteries	-	-
IEC 60086-4	2000	Part 4: Safety standard for lithium batteries	EN 60086-4	2000
IEC 60086-5	2000	Part 5: Safety of batteries with aqueous electrolyte	EN 60086-5	2000
IEC 60410	1973	Sampling plans and procedures for inspection by attributes	-	-
IEC 61429	1995	Marking of secondary cells and batteries with the international recycling symbol. ISO 7000-1135 and indications regarding directives 93/86/EEC and 91/157/EEC	EN 61429 + corr. October + A11	1996 1998 1998
ISO 3951	1989	Sampling procedures and charts for inspection by variables for percent non-conforming	-	-
ISO/IEC Directives Part 2	1992	Methodology for the development of International Standards	-	-

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# INTERNATIONAL STANDARD

# IEC 60086-1

Ninth edition  
2000-11

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## Primary batteries –

### Part 1: General

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*Piles électriques –*  
**(standards.iteh.ai)**

*Partie 1:*

*Généralités* SIST EN 60086-1:2002

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Международная Электротехническая Комиссия

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## CONTENTS

	Page
FOREWORD .....	3
INTRODUCTION .....	5
Clause	
1 Scope .....	6
2 Normative references .....	6
3 Definitions .....	6
4 Requirements .....	9
4.1 General .....	9
4.2 Performance .....	14
5 Performance – Testing .....	14
5.1 General .....	14
5.2 Discharge testing .....	15
5.3 Conformance check to a specified minimum average duration .....	16
5.4 Calculation method of the specified value of minimum average duration .....	16
5.5 OCV testing .....	16
5.6 Battery dimensions .....	16
5.7 Leakage and deformation .....	16
6 Performance – Test conditions .....	16
6.1 Pre-discharge conditioning .....	16
6.2 Commencement of discharge tests after storage .....	17
6.3 Discharge test conditions .....	17
6.4 Load resistance .....	17
6.5 Time periods .....	18
6.6 Activation of 'P'-system batteries .....	18
6.7 Measuring equipment .....	18
7 Sampling and quality assurance .....	18
7.1 Sampling .....	18
7.2 Product quality indices .....	18
8 Battery packaging .....	19
Annex A (normative) Designation system (nomenclature) .....	20
Annex B (normative) Code of practice for packaging, shipment, storage, use and disposal of primary batteries .....	32
Annex C (normative) Equipment design .....	35
Annex D (normative) Calculation method for the specified value of minimum average duration .....	37
Annex E (normative) Guidelines for the standardization of batteries .....	38
Annex F (informative) Preferred dimensions for primary batteries .....	39
Annex G (informative) Standard discharge voltage-definition and method of determination .....	41
Annex H (informative) Preparation of standard methods of measuring performance (SMMP) of consumer goods .....	45
Bibliography .....	46



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## PRIMARY BATTERIES –

## Part 1: General

## FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The 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 ninth edition cancels and replaces the eighth edition and its amendments 1 and 2, published in 1996, and constitutes a technical revision.

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

FDIS	Report on voting
35/1131/FDIS	35/1141/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 3.

Annexes A, B, C, D and E form an integral part of this standard.

Annex F, G and H are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2001. At this date, the publication will be

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

IEC 60086 consists of the following parts, under the general title: Primary batteries:

- Part 1: General
- Part 2: Physical and electrical specifications<sup>1)</sup>
- Part 3: Watch batteries
- Part 4: Safety of lithium batteries
- Part 5: Safety of batteries with aqueous electrolyte<sup>1)</sup>

A bilingual version of this standard may be issued at a later date.

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<sup>1)</sup> To be published.

## INTRODUCTION

The technical content of this part of IEC 60086 provides fundamental requirements and information on primary cells and batteries. In this sense, part 1 is the main component of IEC 60086 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).

The objective of IEC 60086-1 is to benefit primary battery users, device designers and battery manufacturers by ensuring that batteries from different manufacturers are interchangeable according to a standard form, fit and function. Furthermore, to ensure compliance with the above, this part specifies standard test methods for testing primary cells and batteries.

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. This current revision is the result of a reformatting initiative, as well as some content changes, aimed at making it more user-friendly, less ambiguous, and on a cross-reference basis, fully harmonized with other parts of IEC 60086 (such as IEC 60086-2 and IEC 60086-3).

NOTE Safety information has been removed from IEC 60086-1 and is now available in IEC 60086-4 and IEC 60086-5.

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## PRIMARY BATTERIES –

### Part 1: General

#### 1 Scope

The purpose of this part of IEC 60086 is to standardize primary batteries with respect to their electrochemical system, dimensions, nomenclature, terminal configurations, markings, test methods, typical performance, safety and environmental aspects.

#### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60086. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60086 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60086-2, *Primary batteries – Part 2: Physical and electrical specifications*<sup>2)</sup>

IEC 60086-3:1995, *Primary batteries – Part 3: Watch batteries*

IEC 60086-4:2000, *Primary batteries – Part 4: Safety of lithium batteries*

IEC 60086-5, *Primary batteries – Part 5: Safety of batteries with aqueous electrolyte*<sup>2)</sup>

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

IEC 61429:1995, *Marking of secondary cells and batteries with the international recycling symbol ISO 7000-1135*

ISO 3951:1989, *Sampling procedures and charts for inspection by variables for percent non-conforming*

ISO/IEC Directives – Part 2: 1992

#### 3 Definitions

For the purpose of this part of IEC 60086, the following definitions apply.

##### 3.1

##### application test

test which simulates the actual use of a battery in a specific application, for example "portable lighting", "tape recorder" or "transistor radio" test

<sup>2)</sup> To be published.

### 3.2

#### discharge (of a primary battery)

operation during which a battery delivers current to an external circuit

### 3.3

#### dry (primary) battery

primary battery in which the liquid electrolyte is immobilized

### 3.4

#### effective internal resistance – DC method

resistance of any electrical component determined by calculating the ratio between the voltage drop  $\Delta U$  across this component and the range of current  $\Delta i$  passing through this component and causing the voltage drop  $R = \Delta U / \Delta i$

NOTE As an analogy, the internal d.c. resistance  $R_i$  of any electrochemical cell is defined by the the following relation:

$$R_i (\Omega) = \frac{\Delta U (V)}{\Delta i (A)} \quad (1)$$

The internal d.c. resistance is illustrated by the schematic voltage transient as given below:

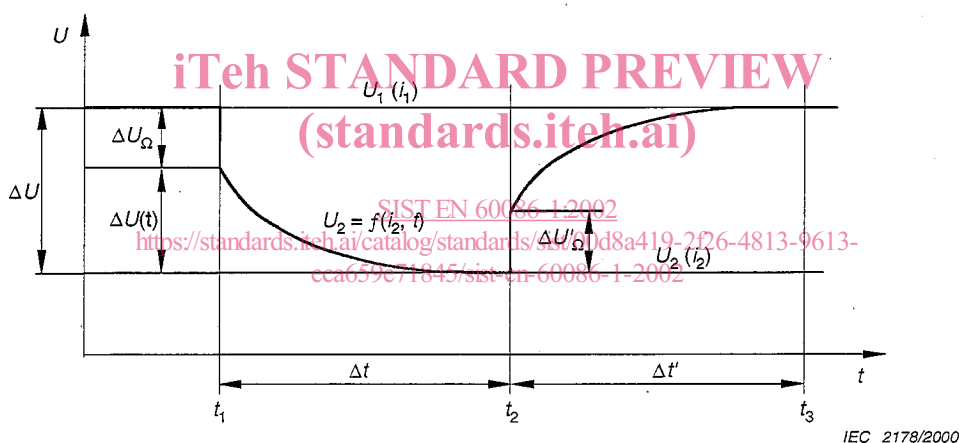


Figure 1 – Schematic voltage transient

As can be seen from this diagram, the voltage drop  $\Delta U$  of the two components differs in nature, as shown in the following relation:

$$\Delta U = \Delta U_{\Omega} + \Delta U(t) \quad (2)$$

The first component  $\Delta U_{\Omega}$  for  $(t = t_1)$  is independent of time, and results from the increase in current  $\Delta i$  according to the relation:

$$\Delta U_{\Omega} = \Delta i \times R_{\Omega} \quad (3)$$

In this relation,  $R_{\Omega}$  is a pure ohmic resistance. The second component  $\Delta U(t)$  is time dependent and is of electrochemical origin.

### 3.5

#### end-point voltage

specified closed circuit voltage at which a service output test is terminated

### 3.6

#### leakage

unplanned escape of electrolyte, gas or other material from a battery

**3.7****minimum average duration (MAD)**

minimum average time on discharge which is met by a set of batteries

NOTE The discharge test is carried out according to the specified methods or standards and designed to show conformity with the standard applicable to the battery types.

**3.8****nominal voltage of a primary battery**

suitable approximate value of voltage used to identify the voltage of a primary battery

**3.9****on-load voltage**

closed circuit voltage (CCV)

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

**3.10****open-circuit voltage (OCV)**

off-load voltage

voltage across the terminals of a battery when no external current is flowing

**3.11****primary battery**

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

**3.12****primary cell**

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

**3.13****service output (of a primary battery)**

service life, or capacity, or energy output of a battery under specified conditions of discharge

**3.14****service output test**

test designed to measure the service output of a battery

NOTE A service output test may be prescribed, for example, when:

- a) an application test is too complex to replicate;
- b) the duration of an application test would make it impractical for routine testing purposes.

**3.15****storage life**

duration, under specified conditions, at the end of which a battery retains its ability to perform a specified service output

**3.16****terminals (of a primary battery)**

conductive parts provided for the connection of a battery to external conductors

## 4 Requirements

### 4.1 General

#### 4.1.1 Design

Primary batteries are sold mainly in consumer markets. In recent years, they have become more sophisticated in both chemistry and construction, for example both capacity and rate capability have increased to meet the growing demands from new, battery-powered equipment technology.

When designing primary batteries, the aforementioned considerations shall be taken into account. Specifically, their dimensional conformity and stability, their physical and electrical performance and their safe operation under normal use and foreseeable misuse conditions shall be assured.

#### 4.1.2 Battery dimensions

The dimensions for individual types of batteries are given in IEC 60086-2 and IEC 60086-3.

#### 4.1.3 Terminals

Terminals shall be in accordance with clause 7 of IEC 60086-2.

Their physical shape shall be designed in such a way that they ensure that the batteries make and maintain good electrical contact at all times.

They shall be made of materials that provide adequate electrical conductivity and corrosion protection.

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##### 4.1.3.1 Contact pressure resistance

When mentioned in the battery specification tables or the individual specification sheets in IEC 60086-2, the following applies:

- a force of 10 N applied through a steel ball of 1 mm diameter at the centre of each contact area for a period of 10 s shall not cause any apparent deformation which might prevent satisfactory operation of the battery.

NOTE See also IEC 60086-3 for exceptions.

##### 4.1.3.2 Cap and base

This type of terminal is used for batteries which have their dimensions specified according to figures 1, 2, 3 or 4 of IEC 60086-2, and which have the cylindrical side of the battery insulated from the terminals.

##### 4.1.3.3 Cap and case

This type of terminal is used for batteries which have their dimensions specified according to figures 2, 3 or 4 of IEC 60086-2, but in which the cylindrical side of the battery forms part of the positive terminal.

##### 4.1.3.4 Screw terminals

This contact consists of a threaded rod in combination with either a metal or insulated metal nut.