IEC 60086-2

Edition 14.0 2021-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Primary batteries –
Part 2: Physical and electrical specifications

Piles électriques –
Partie 2: Spécifications physiques et électriques

IEC 60086-2:2021-04(en-fr)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.220.10

ISBN 978-2-8322-1042-7

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PRIMARY BATTERIES –

Part 2: Physical and electrical specifications

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.
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International Standard IEC 60086-2 has been prepared by IEC technical committee 35: Primary cells and batteries.

This fourteenth edition cancels and replaces the thirteenth 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) clarification and distinct separation of the terms used for coin (lithium button) and button cells and batteries;
b) importation of the dimensional stability from 60086-1;
c) reordering category 1, 5 and 6 batteries by volume;
d) addition of cochlear implant tests and a new zinc air hearing aid battery type;
e) modification of PR70 hearing aid tests;
f) addition of a compliance checklist annex (Annex E);

g) modifications to the LR1/R1 tests;

h) addition of new specifications for 8LR932, CR1632, CR1225, CR2477, 6AS6P, 6AS6S, 6PS6P, 6PS6S, 6PS4P, 6PS4S, 5PR175/172, 6PR225/155, AS4, AS6, AS8, AS10, AS12, PS121/195S, PS121/195P, AS149/195, 6AS4S, AR40, 5AR40, 6AR40.

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

FDIS	Report on voting
35/1466/FDIS	35/1468/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.

INTRODUCTION

The technical content of this part of IEC 60086 provides physical dimensions, discharge test conditions and discharge performance requirements. IEC 60086-2 complements the general information and requirements of IEC 60086-1.

This part was prepared to benefit primary battery users, device designers and battery manufacturers by furnishing the specifics of form, fit and function for individual standardized primary cells and batteries. Over the years, this part has been changed to improve its contents and may again be revised in due course in the light of comments made by national committees and experts on the basis of practical experience and changing technology.

This current revision is the result of a reformatting initiative, as well as some content changes, aimed at making this part more user-friendly, less ambiguous, and, from a cross reference basis, fully harmonized with other parts of IEC 60086.

NOTE Safety information is available in IEC 60086-4, IEC 60086-5 and IEC 62281.

PRIMARY BATTERIES –

Part 2: Physical and electrical specifications

1 Scope

This part of IEC 60086 is applicable to primary batteries which are based on standardised electrochemical systems.

It specifies

– the physical dimensions,

– the discharge test conditions and discharge performance requirements.

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 60086-1, *Primary batteries – Part 1: General*

ISO 1101, *Geometrical product specifications (GPS) – Geometrical tolerancing – Tolerances of form, orientation, location and run-out*

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC 60086-1 and the following 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 Terms and definitions

3.1.1
application test
simulation of the actual use of a battery in a specific application

3.1.2
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).

3.1.3
closed-circuit voltage
CCV
voltage across the terminals of a battery when it is on discharge

3.1.4
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.

3.1.5
end-point voltage
EV
specified voltage of a battery at which the battery discharge is terminated

[SOURCE: IEC 60050-482:2004, 482-03-30]

3.1.6
minimum average duration
MAD
minimum average time on discharge which is met by a sample of batteries

Note 1 to entry: 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.

3.1.7
nominal voltage (of a primary battery)
U_n
suitable approximate value of the voltage used to designate or identify a cell, a battery or an electrochemical system

[SOURCE: IEC 60050-482:2004, 482-03-31, modified – addition of "(of a primary battery)" and symbol U_n.]

3.1.8
open-circuit voltage
OCV
voltage across the terminals of a cell or battery when it is off discharge

3.1.9
primary (cell or battery)
cell or battery that is not designed to be electrically recharged

3.1.10
round (cell or battery)
cell or battery with circular cross section

3.1.11
service output (of a primary battery)
service life, or capacity, or energy output of a battery under specified conditions of discharge

3.1.12
service output test
test designed to measure the service output of a battery

Note 1 to entry: 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.

3.1.13
storage life
duration under specified conditions at the end of which a battery retains its ability to perform a specified service output

[SOURCE: IEC 60050-482:2004, 482-03-47, modified – "specified function" replaced by "specified service output".]

3.1.14
terminals (of a primary battery)
conductive parts of a battery that provide connection to an external circuit

3.2 Symbols and abbreviated terms

EV	end-point voltage
MAD	minimum average duration
OCV	open-circuit voltage (off-load voltage)
CCV	closed-circuit voltage (on-load voltage)
R	load resistance
U_n	nominal voltage of a primary battery

4 Battery dimensions, symbols

The symbols used to denote the various dimensions are as follows:

h_1 maximum overall height of the battery;

h_2 minimum distance between the flats of the positive and negative contacts;

h_3 minimum projection of the flat positive contact;

h_4 maximum recess of the negative flat contact surface;

h_5 minimum projection of the flat negative contact;

d_1 maximum and minimum diameters of the battery;

d_2 minimum diameter of the flat positive contact;

d_3 maximum diameter of the positive contact within the specified projection height;

d_4 minimum diameter of the flat negative contact;

d_5 maximum diameter of the negative contact within the specified projection height;

d_6 minimum outer diameter of the negative flat contact surface;

d_7 maximum inner diameter of the negative flat contact surface;

$\varnothing P$ concentricity of the positive contact.

Recesses are permitted in the negative flat contact surface defined by dimensions d_6 and d_7 for batteries having the shape shown in Figure 1a), provided that batteries placed end to end in series make electrical contact with each other and that the contact separation is an integral multiple of the contact separation for one battery. The following conditions shall be satisfied:

$$d_6 > d$$

$$d_2 > d_7$$

$$h_3 > h_4$$

5 Dimensional stability

Refer to IEC 60086-1 for dimensional stability.

6 Validity of testing

Portable primary batteries shall be subjected to the tests, as required in the IEC 60086 series. Testing remains valid until a design change or requirement revision has been made. Retesting is required when:

a) a battery specification changes by more than 0,1 g or 20 % mass, whichever is greater, for the cathode, anode or electrolyte;

b) a battery specification changes that would lead to a failure of any of the tests;

c) there is an addition of new tests or requirements; or

d) there is a requirement change that would lead to a failure on any of the tests.

7 Constitution of the battery specification tables

– Batteries are categorized into several groups according to their shapes.

– In each category, batteries having the same shape but belonging to a different electrochemical system are grouped together and shown in succession.

– Batteries are always listed in ascending order of nominal voltage and, within each nominal voltage, in ascending order of volume.

– One common shape drawing of these batteries which fall in the same group is exhibited.

– Designation, nominal voltage, dimensions, discharge conditions, minimum average duration and application for these batteries which fall into the same group are summarized in one table.

– When a drawing represents only one type of battery, the dimensions of the relevant battery may be directly shown on the drawing.

– Batteries are categorized into the following groups:

  a) Category 1 batteries:

     R1, R03, R6P, R6S, R14P, R14S, R20P, R20S

     LR8D425, LR1, LR03, LR6, LR14, LR20

     FR10G445, FR14505

  b) Category 2 batteries:

     CR14250, CR15H270, CR17345, CR17450, BR17335

  c) Category 3 batteries:

     LR9, CR11108

d) Category 4 batteries:

PR70, PR41, PR48, PR44, PR1154

LR41, LR55, LR54, LR43, LR44

SR62, SR63, SR65, SR64, SR60, SR67, SR66, SR58, SR68, SR59, SR69, SR41, SR57, SR55, SR48, SR54, SR42, SR43, SR44

CR1025, CR1216, CR1220, CR1225, CR1616, CR1632, CR2012, CR1620, CR2016, CR2025, CR2320,

CR2032,CR2330, CR2412, CR2430, CR2477, CR2354, CR3032, CR2450

BR1225, BR2016, BR2320, BR2325, BR3032

e) Category 5: Other round batteries – Miscellaneous

2CR13252

4LR44

4SR44

8LR932

AR40

5AR40

6AR40

5PR175/172

6PR 225/155

f) Category 6: Non-round batteries – Miscellaneous

3R12P, 3R12S, 3LR12

4LR61

CR-P2

2CR5

AS4, AS6P, AS6S, AS8, AS10, AS12, PS8S, PS8P, PS10

4R25X, 4LR25X

4R25Y

4R25-2, 4LR25-2

6F22, 6LR61, 6LP3146

6AS4S, 6PS4S, 6PS4P

6AS6P, 6AS6S, 6PS6P, 6PS6S

– The specification drawings show the shape of the relevant batteries. Dimensions for each battery are shown in the tables of Clause 8 and in Figure 1 to Figure 31.

NOTE See Annex A, Annex B and Annex C for ease of locating battery sizes.

8 Physical and electrical specifications

8.1 Category 1 batteries

8.1.1 General

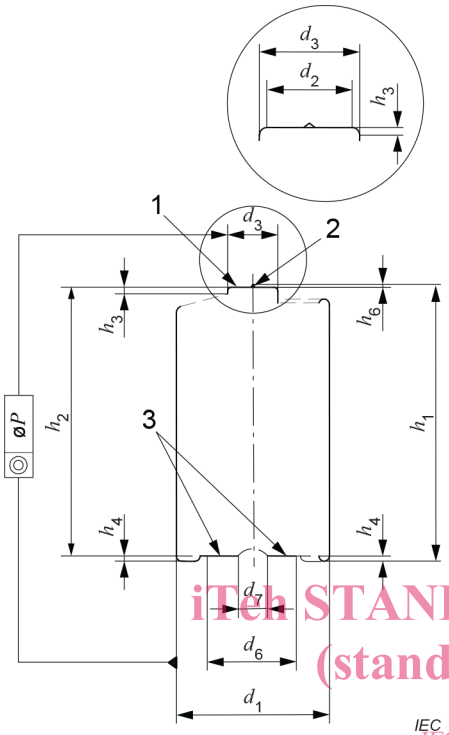

Figure 1a)

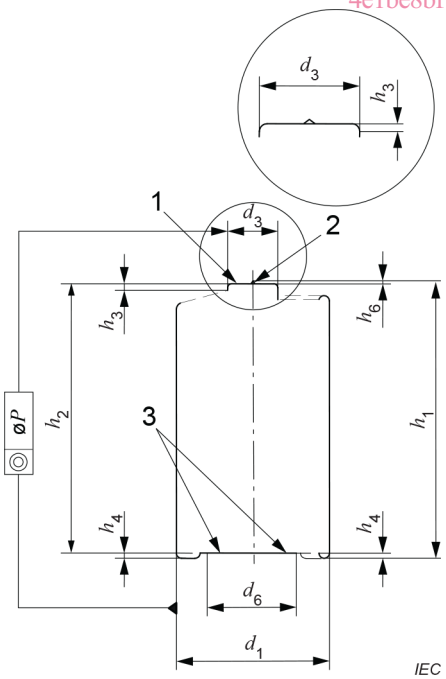

Figure 1b)

Figure 1 – Dimensional drawing: Category 1

For the definition of the dimensions, see Clause 4.

The cylindrical surface is insulated from the contacts.

Terminals: flat/cap and base.

For general information, see IEC 60086-1.

Figure 1a): negative contact surface may not be flat over the whole area.

Figure 1b): negative contact surface shall be essentially flat over the whole surface area.

For batteries complying with Figure 1a) and Figure 1b), flat negative contact is not necessarily recessed.

When the flat negative contact surface forms the lower part of the battery, dimensions "h_1" and "h_2" are both measured from the surface and dimension "h_4" is zero.

Dimensions "$\varnothing P$" to be measured in accordance with ISO 1101.

The profile over the dotted lines is not specified.

1 Positive contact

2 Optional pip (dimension "h_6" for batteries having the pip is 0,4 mm max.)

3 Negative contact area