

INTERNATIONAL STANDARD

IEC 60086-1

Tenth edition
2006-12

Primary batteries –

Part 1: General

Withdrawn

© IEC 2006 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

X

For price, see current catalogue

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).....	14
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
5 Performance – Testing	16
5.1 General.....	16
5.2 Discharge testing	16
5.2.1 Application tests.....	17
5.2.2 Service output tests.....	17
5.3 Conformance check to a specified minimum average duration.....	17
5.4 Calculation method of the specified value of minimum average duration.....	18
5.5 OCV testing.....	18
5.6 Battery dimensions.....	18
5.7 Leakage and deformation	18
6 Performance – Test conditions	18
6.1 Pre-discharge conditioning	18
6.2 Commencement of discharge tests after storage.....	19
6.3 Discharge test conditions	19
6.4 Load resistance.....	19
6.5 Time periods	20
6.6 Test condition tolerances	20
6.7 Activation of ‘P’-system batteries.....	20
6.8 Measuring equipment	20
6.8.1 Voltage measurement.....	20
6.8.2 Mechanical measurement.....	20
7 Sampling and quality assurance	21
7.1 Sampling	21
7.1.1 Testing by attributes.....	21

7.1.2	Testing by variables	21
7.2	Product quality indices	21
7.2.1	Capability index (c_p)	21
7.2.2	Capability index (c_{pk})	21
7.2.3	Performance index (p_p)	21
7.2.4	Performance index (p_{pk})	22
8	Battery packaging	22
Annex A (normative)	Guidelines for the standardization of batteries	23
Annex B (normative)	Equipment design	24
Annex C (normative)	Designation system (nomenclature)	26
Annex D (normative)	Calculation method for the specified value of minimum average duration	38
Annex E (normative)	Code of practice for packaging, shipment, storage, use and disposal of primary batteries	39
Annex F (informative)	Standard discharge voltage U_S – Definition and method of determination	42
Annex G (informative)	Preparation of standard methods of measuring performance (SMMP) of consumer goods	46
Bibliography	47
Figure 1	– Schematic voltage transient	9
Figure 2	– Stud	13
Figure C.1	– Designation system for round batteries: $\varnothing < 100$ mm; height A < 100 mm	30
Figure C.2	– Designation system for round batteries: $\varnothing \geq 100$ mm; height A ≥ 100 mm	33
Figure C.3	– Designation system for non round batteries, dimensions <100 mm	34
Figure C.4	– Designation system for non round batteries, dimensions ≥ 100 mm	35
Figure F.1	– Normalized C/R-plot (schematic)	43
Figure F.2	– Standard discharge voltage (schematic)	44
Table 1	– Spacing of contacts	12
Table 2	– Snap fastener connectors	13
Table 3	– Standardized electrochemical systems	14
Table 4	– Conditions for storage before and during discharge testing	19
Table 5	– Resistive loads for new tests	19
Table 6	– Time periods for new tests	20
Table 7	– Test condition tolerances	20
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 diameters	31
Table C.5	– Diameter code for non-recommended diameters	31
Table C.6	– Height code for denoting the hundredths of a millimetre of height	32
Table C.7	– Height code for discrimination per tenth of a millimetre	35

Table C.8 – Physical designation and dimensions of round cells and batteries based on Clause C.2.....	36
Table C.9 – Physical designation and dimensions of non-round batteries based on Clause C.2.....	37
Table F.1 – Standard discharge voltage by system	45

Withdrawn

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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 tenth edition cancels and replaces the ninth edition (2000) and constitutes a technical revision.

The major technical changes concern the addition of "Test condition tolerances" in 6.6 and the standardization of the "Z" electrochemical system (Nickel oxyhydroxide) included in Table 3.

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

FDIS	Report on voting
35/1244/FDIS	35/1247/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 2.

A list of all the 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 publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

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

Withdrawn

INTRODUCTION

The technical content of this part of IEC 60086 provides fundamental requirements and information on primary cells and 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.

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

Withdrawn

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.

NOTE The requirements justifying the inclusion or the ongoing retention of batteries in the IEC 60086 series are given in Annex A.

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 standard form, fit and function. Furthermore, to ensure compliance with the above, this part specifies standard test methods for testing primary cells and batteries.

2 Normative references

The following referenced documents are indispensable for the application 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, *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*

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

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

ISO/IEC Directives, Part 1: *Procedures for the technical work*

ISO 3951 (all parts as applicable), *Sampling procedures for inspection by variables*