



IEC 60086-3

Edition 5.0 2021-04

INTERNATIONAL STANDARD

**Primary batteries –
Part 3: Watch batteries**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.220.10; 39.040.10

ISBN 978-2-8322-9686-8

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

| | |
|--|----|
| FOREWORD | 4 |
| INTRODUCTION | 6 |
| 1 Scope | 7 |
| 2 Normative references | 7 |
| 3 Terms and definitions | 7 |
| 4 Physical requirements | 8 |
| 4.1 Battery dimensions, symbols and size codes | 8 |
| 4.2 Terminals | 11 |
| 4.3 Projection of the negative terminal (h_5) | 11 |
| 4.4 Shape of battery | 11 |
| 4.5 Mechanical resistance to pressure | 12 |
| 4.6 Deformation | 12 |
| 4.7 Leakage | 12 |
| 4.8 Marking | 12 |
| 4.8.1 General | 12 |
| 4.8.2 Disposal | 13 |
| 5 Electrical requirements | 13 |
| 5.1 Electrochemical system, nominal voltage, end-point voltage and open-circuit voltage | 13 |
| 5.2 Closed circuit voltage U_{CC} (CCV), internal resistance and impedance | 13 |
| 5.3 Capacity | 13 |
| 5.4 Capacity retention | 13 |
| 6 Sampling and quality assurance | 14 |
| 7 Test methods | 14 |
| 7.1 Shape and dimensions | 14 |
| 7.1.1 Shape requirement | 14 |
| 7.2 Electrical characteristics | 14 |
| 7.2.1 Environmental conditions | 14 |
| 7.2.2 Equivalent circuit – Effective internal resistance – DC method | 14 |
| 7.2.3 Equipment | 15 |
| 7.2.4 Measurement of open-circuit voltage U_{OC} (OCV) and closed circuit voltage U_{CC} (CCV) | 16 |
| 7.2.5 Calculation of the internal resistance R_i | 17 |
| 7.2.6 Measurement of the capacity | 17 |
| 7.2.7 Calculation of the internal resistance R_i during discharge in case of method A (optional) | 19 |
| 7.3 Test methods for determining the resistance to leakage | 19 |
| 7.3.1 Preconditioning and initial visual examination | 19 |
| 7.3.2 High temperature and humidity test | 20 |
| 7.3.3 Test by temperature cycles | 20 |
| 8 Visual examination and acceptance conditions | 20 |
| 8.1 Preconditioning | 20 |
| 8.2 Magnification | 21 |
| 8.3 Leakage levels and classification | 21 |
| 8.4 Acceptance conditions | 22 |

| | |
|---|----|
| Annex A (normative) Designation | 23 |
| Bibliography | 24 |
| Figure 1 – Dimensional drawing | 8 |
| Figure 2 – Shape of battery | 11 |
| Figure 3 – Shape requirement | 14 |
| Figure 4 – Schematic voltage transient | 15 |
| Figure 5 – Curve: $U = f(t)$ | 16 |
| Figure 6 – Circuitry principle | 16 |
| Figure 7 – Circuitry principle for method A | 18 |
| Figure 8 – Circuitry principle for method B | 19 |
| Figure 9 – Test by temperature cycles | 20 |
| Table 1 – Zinc systems L and S dimensions and size codes | 9 |
| Table 2 – Lithium systems B and C dimensions and size codes | 10 |
| Table 3 – Values of I_1 | 11 |
| Table 4 – Applied force F by battery dimensions | 12 |
| Table 5 – Standardised electrochemical systems | 13 |
| Table 6 – Test method for U_{CC} (CCV) measurement | 17 |
| Table 7 – Test method A for U_{CC} (CCV) measurement | 18 |
| Table 8 – Storage conditions for the recommended test | 20 |
| Table 9 – Storage conditions for optional test | 20 |
| Table 10 – Leakage levels and classification | 21 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRIMARY BATTERIES –**Part 3: Watch batteries****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 60086-3 has been prepared by IEC technical committee 35: Primary cells and batteries, and ISO technical committee 114: Horology.

This fifth edition cancels and replaces the fourth edition published in 2016. This edition constitutes a technical revision.

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

- a) reformatted Table 1 and Table 2. The reformatted tables are now divided by system. Dimensional tolerances were changed when appropriate. Cell sizes were removed or added based on the size prevalence in the market place;
- b) in Table 3 the minimum values of I_1 were reformatted;
- c) the minimum OCV for the S system in Table 5 was changed to 1,55 V.

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

| FDIS | Report on voting |
|--------------|------------------|
| 35/1467/FDIS | 35/1470/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, published 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

This part of IEC 60086 provides specific requirements and information for primary watch batteries. This part of IEC 60086 was prepared through joint work between the IEC and ISO to benefit primary battery users, watch designers and battery manufacturers by ensuring the best compatibility between batteries and watches.

This part of IEC 60086 will remain under continual scrutiny to ensure that the publication is kept up to date with the advances in both battery and watch technologies.

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

PRIMARY BATTERIES –

Part 3: Watch batteries

1 Scope

This part of IEC 60086 specifies dimensions, designation, methods of tests and requirements for primary batteries for watches. In several cases, a menu of test methods is given. When presenting battery electrical characteristics and/or performance data, the manufacturer specifies which test method was used.

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*

IEC 60086-2, *Primary batteries – Part 2: Physical and electrical specifications*

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

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