

INTERNATIONAL STANDARD

IEC
60086-5

First edition
2000-07

Primary batteries –

Part 5: Safety of batteries with aqueous electrolyte

Piles électriques –

*Partie 5:
Sécurité des piles à électrolyte aqueux*

IEC 60086-5:2000

<https://standards.iteh.ai/catalog/standards/iec/1bc49018-c98b-43b3-ad7a-27fab835151c/iec-60086-5-2000>



Reference number
IEC 60086-5:2000(E)

Numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series.

Consolidated publications

Consolidated versions of some IEC publications including amendments are available. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Validity of this publication

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology.

Information relating to the date of the reconfirmation of the publication is available in the IEC catalogue.

Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is to be found at the following IEC sources:

- **IEC web site***
- **Catalogue of IEC publications**
Published yearly with regular updates
(On-line catalogue)*
- **IEC Bulletin**
Available both at the IEC web site* and as a printed periodical

Terminology, graphical and letter symbols

For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary (IEV)*.

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

* See web site address on title page.

INTERNATIONAL STANDARD

IEC 60086-5

First edition
2000-07

Primary batteries –

Part 5: Safety of batteries with aqueous electrolyte

Piles électriques –

Partie 5: Sécurité des piles à électrolyte aqueux

IEC 60086-5:2000

<https://standards.iteh.ai/catalog/standards/iec/1bc49018-c98b-43b3-ad7a-27fab835151c/iec-60086-5-2000>

© IEC 2000 — 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
Telefax: +41 22 919 0300

3, rue de Varembé Geneva, Switzerland
e-mail: inmail@iec.ch

IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

U

For price, see current catalogue

CONTENTS

	Page
FOREWORD	4
INTRODUCTION	6
 Clause	
1 Scope	7
2 Normative references	7
3 Definitions	7
4 Requirements for safety	9
4.1 Design	9
4.2 Quality plan	9
5 Sampling	9
6 Testing and requirements	10
6.1 Intended use	10
6.2 Reasonably foreseeable misuse	14
7 Information for safety	17
7.1 Safety precautions during handling of batteries	17
7.2 Safety precautions during packaging, handling, transportation, display, storage, and disposal	19
8 Instructions for use	20
9 Marking	21
9.1 General	21
9.2 Small batteries	21
Annex A (informative) Additional information to subclause 7.2.3	22
Annex B (informative) Battery compartment guidelines	23
Bibliography	27
 Figure 1 – Sampling for type approval tests and number of batteries required	 10
Figure 2 – Temperature cycling procedure	13
Figure 3 – Incorrect installation (four batteries in series)	14
Figure 4 – External short circuit	15
Figure 5 – Overdischarge	15
Figure 6 – XYZ axis of round battery	16
Figure 7 – Ingestion gauge	19
Figure B.1 – Positive contact recessed between ribs	23
Figure B.2 – Positive contact is recessed	24
Figure B.3 – Negative contact which is shaped to avoid the positive terminal	24
Figure B.4 – Preferred battery arrangements inside a device	26

	Page
Table 1 – Intended use tests and requirements	10
Table 2 – Shock pulse	11
Table 3 – Test sequence	11
Table 4 – Test sequence	12
Table 5 – Reasonably foreseeable misuse tests and requirements	14
Table 6 – Testing and requirements	17

Withdawn

iTech Standards
(<https://standards.itih.ai>)
Document Preview

IEC 60086-5:2000
<https://standards.itih.ai/standards/iec/1bc49018-c98b-43b3-ad7a-27fab835151c/iec-60086-5-2000>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRIMARY BATTERIES –

Part 5: Safety of batteries with aqueous electrolyte

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 60086-5 has been prepared by IEC technical committee 35: Primary cells and batteries.

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

FDIS	Report on voting
35/1127/FDIS	35/1130/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.

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

- Part 1: General
- Part 2: Specification sheets
- Part 3: Watch batteries
- Part 4: Safety of lithium batteries
- Part 5: Safety of batteries with aqueous electrolyte

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A and B are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2002. 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

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 60086-5:2000](https://standards.iteh.ai/standards/iec/16049018-c98b-43b3-ad7a-27fab835151c/iec-60086-5-2000)

<https://standards.iteh.ai/standards/iec/16049018-c98b-43b3-ad7a-27fab835151c/iec-60086-5-2000>

INTRODUCTION

The concept of safety is closely related to safeguarding the integrity of people and property. This part of IEC 60086 specifies requirements and tests for primary batteries with aqueous electrolyte and has been prepared in accordance with ISO/IEC guidelines, taking into account all relevant national and international standards which apply. Also included in this standard is guidance for appliance designers with respect to battery compartments and information regarding packaging, handling, warehousing and transportation.

Safety is a balance between freedom from risks of harm and other demands to be met by the product. There can be no absolute safety. Even at the highest level of safety, the product can only be relatively safe. In this respect, decision-making is based on risk evaluation and safety judgement.

As safety will pose different problems, it is impossible to provide a set of precise provisions and recommendations that will apply in every case. However, this standard, when followed on a judicious "use when applicable" basis, will provide reasonably consistent standards for safety.

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 60086-5:2000](https://standards.iteh.ai/standards/iec/16049018-c98b-43b3-ad7a-27fab835151c/iec-60086-5-2000)

<https://standards.iteh.ai/standards/iec/16049018-c98b-43b3-ad7a-27fab835151c/iec-60086-5-2000>

Withholding

PRIMARY BATTERIES –

Part 5: Safety of batteries with aqueous electrolyte

1 Scope

This part of IEC 60086 specifies tests and requirements for primary batteries with aqueous electrolyte to ensure their safe operation under normal use and reasonably foreseeable misuse.

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 ISO and IEC maintain registers of currently valid International Standards.

IEC 60086-1:1996, *Primary batteries – Part 1: General*

IEC 60086-2:1997, *Primary batteries – Part 2: Specification sheets*

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

IEC 60050(481):1996, *International Electrotechnical Vocabulary (IEV) – Chapter 481: Primary cells and batteries*

IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*

IEC 60068-2-32:1975, *Environmental testing – Part 2: Tests – Test Ed: Free fall (Procedure 1)*

3 Definitions

For the purpose of this part of IEC 60086, the definitions given in IEC 60050(481) (some of which are repeated below for convenience) and the following definitions apply.

3.1

battery (primary)

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

3.2

button battery

small round battery, where the overall height is less than the diameter; batteries complying with figures 2, 3 and 4 of IEC 60086-1

3.3
cell (primary)

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

3.4
cylindrical battery

primary battery with cylindrical geometry where the overall height is equal to or greater than the diameter; batteries complying with figures 1A and 1B of IEC 60086-1

3.5
explosion

an instantaneous release wherein solid matter from any part of the battery is propelled to a distance greater than 25 cm away from the battery

3.6
harm

physical injury and/or damage to health or property

3.7
hazard

a potential source of harm

3.8
intended use

the use of a product, process or service under conditions or for purposes in accordance with specifications and instructions provided by the supplier – including information for publicity purposes

3.9
leakage

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

3.10
nominal voltage

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

3.11
prismatic battery

primary battery with non-round geometry; batteries not complying with IEC 60086-1, 4.3

3.12
reasonably foreseeable misuse

the use of a product, process or service under conditions or for purposes not intended by the supplier, but which can happen

3.13
risk

the probable rate of occurrence of a hazard causing harm and the degree of severity of the harm

3.14
safety

freedom from unacceptable risk of harm

3.15

venting

the release of excessive internal pressure from a battery in a manner intended by design to preclude explosion

4 Requirements for safety

4.1 Design

4.1.1 General

Batteries shall be so designed that they do not present a safety hazard under conditions of normal (intended) use.

4.1.2 Venting

All batteries shall incorporate a pressure relief feature or shall be so constructed that they will relieve excessive internal pressure at a value and rate which will preclude explosion. If encapsulation is necessary to support cells within an outer case, the type of encapsulant and the method of encapsulation shall not cause the battery to overheat during normal operation nor inhibit the operation of the pressure relief feature.

The battery case material and/or its final assembly shall be so designed that, in the event of one or more cells venting, the battery case does not present a hazard in its own right.

4.1.3 Insulation resistance

The insulation resistance between externally exposed metal surfaces of the battery excluding electrical contact surfaces and either terminal shall be not less than 5 M Ω at (500 \pm 20) V.

4.2 Quality plan

The manufacturer shall prepare a quality plan defining the procedures for the inspection of materials, components, cells and batteries to be applied to the total process of producing a specific type of battery.

5 Sampling

5.1 Samples are drawn from production lots in accordance with accepted statistical methods.

5.2 Sampling for type approval