

Primary batteries - Part 5: Safety of batteries with
aqueous electrolyte

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 60086-5:2016 sisaldab Euroopa standardi EN 60086-5:2016 ingliskeelset teksti.	This Estonian standard EVS-EN 60086-5:2016 consists of the English text of the European standard EN 60086-5:2016.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 18.11.2016.	Date of Availability of the European standard is 18.11.2016.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 29.220.10

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:

Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

**Primary batteries - Part 5: Safety of batteries with aqueous electrolyte
(IEC 60086-5:2016)**

Piles électriques - Partie 5: Sécurité des piles à électrolytes aqueux
(IEC 60086-5:2016)

Primärbatterien - Teil 5: Sicherheit von Batterien mit wässrigem Elektrolyt
(IEC 60086-5:2016)

This European Standard was approved by CENELEC on 2016-08-17. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 35/1360/FDIS, future edition 4 of IEC 60086-5, prepared by IEC/TC 35 "Primary cells and batteries" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60086-5:2016.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-05-17
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2019-08-17

This document supersedes EN 60086-5:2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 60086-5:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated :

IEC 60086-3	NOTE	Harmonized as EN 60086-3.
IEC 60086-4	NOTE	Harmonized as EN 60086-4.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-6	-	Environmental testing -- Part 2-6: Tests Test Fc: Vibration (sinusoidal)	-EN 60068-2-6	-
IEC 60068-2-27	-	Environmental testing -- Part 2-27: Tests Test Ea and guidance: Shock	-EN 60068-2-27	-
IEC 60068-2-31	-	Environmental testing -- Part 2-31: Tests Test Ec: Rough handling shocks, primarily for equipment-type specimens	-EN 60068-2-31	-
IEC 60086-1	-	Primary batteries - Part 1: General	EN 60086-1	-
IEC 60086-2	-	Primary batteries - Part 2: Physical electrical specifications	and EN 60086-2	-

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references.....	8
3 Terms and definitions	8
4 Requirements for safety.....	10
4.1 Design	10
4.1.1 General	10
4.1.2 Venting	10
4.1.3 Insulation resistance	11
4.2 Quality plan.....	11
5 Sampling	11
5.1 General.....	11
5.2 Sampling for type approval.....	11
6 Testing and requirements	12
6.1 General.....	12
6.1.1 Applicable safety tests	12
6.1.2 Cautionary notice	13
6.1.3 Ambient temperature.....	13
6.2 Intended use	13
6.2.1 Intended use tests and requirements	13
6.2.2 Intended use test procedures	13
6.3 Reasonably foreseeable misuse	16
6.3.1 Reasonably foreseeable misuse tests and requirements	16
6.3.2 Reasonably foreseeable misuse test procedures.....	16
7 Information for safety.....	18
7.1 Precautions during handling of batteries	18
7.2 Packaging.....	20
7.3 Handling of battery cartons.....	20
7.4 Display and storage	20
7.5 Transportation.....	21
7.6 Disposal.....	21
8 Instructions for use	21
9 Marking	22
9.1 General (see Table 7)	22
9.2 Marking of small batteries (see Table 7)	22
9.3 Safety pictograms	22
Annex A (informative) Additional information on display and storage	23
Annex B (informative) Battery compartment design guidelines	24
B.1 Background.....	24
B.1.1 General	24
B.1.2 Battery failures resulting from poor battery compartment design.....	24
B.1.3 Potential hazards resulting from battery reversal.....	24
B.1.4 Potential hazards resulting from a short circuit.....	24
B.2 General guidance for appliance design	25

B.2.1	Key battery factors to be first considered	25
B.2.2	Other important factors to consider	25
B.3	Specific measures against reversed installation	26
B.3.1	General	26
B.3.2	Design of the positive contact	26
B.3.3	Design of the negative contact	26
B.3.4	Design with respect to battery orientation	27
B.3.5	Dimensional considerations	28
B.4	Specific measures to prevent short-circuiting of batteries	29
B.4.1	Measures to prevent short-circuiting due to battery jacket damage	29
B.4.2	Measures to prevent external short-circuit of a battery caused when coiled spring contacts are employed for battery connection	30
B.5	Special considerations regarding recessed negative contacts	31
B.6	Waterproof and non-vented devices	32
B.7	Other design considerations	32
Annex C (informative)	Safety pictograms	34
C.1	General	34
C.2	Pictograms	34
C.3	Recommendations for use	36
Bibliography	37
Figure 1	– Sampling for type approval tests and number of batteries required	11
Figure 2	– Temperature cycling procedure	16
Figure 3	– Circuit diagram for incorrect installation (four batteries in series)	17
Figure 4	– Circuit diagram for external short circuit	17
Figure 5	– Circuit diagram for overdischarge	18
Figure 6	– XYZ axes for free fall	18
Figure 7	– Ingestion gauge	20
Figure B.1	– Example of series connection with one battery reversed	24
Figure B.2	– Positive contact recessed between ribs	26
Figure B.3	– Positive contact recessed within surrounding insulation	26
Figure B.4	– Negative contact U-shaped to ensure no positive (+) battery contact	27
Figure B.5	– Design with respect to battery orientation	27
Figure B.6	– Example of the design of a positive contact of an appliance	28
Figure B.7	– Example of a short circuit, a switch is piercing the battery insulating jacket	29
Figure B.8	– Typical example of insulation to prevent short circuit	29
Figure B.9	– Insertion against spring (to be avoided)	30
Figure B.10	– Examples showing distorted springs	30
Figure B.11	– One example of protected insertion	30
Figure B.12	– Example of negative contacts	32
Figure B.13	– Example of series connection of batteries with voltage tapping	33
Table 1	– Test matrix	12
Table 2	– Intended use tests and requirements	13
Table 3	– Shock pulse	14

Table 4 – Test sequence	14
Table 5 – Test sequence	15
Table 6 – Reasonably foreseeable misuse tests and requirements	16
Table 7 – Marking requirements	22
Table B.1 – Dimensions of battery terminals and recommended dimensions of the positive contact of an appliance in Figure B.6	28
Table B.2 – Minimum wire diameters	31
Table B.3 – Dimensions of the negative battery terminal	32
Table C.1 – Safety pictograms	34

This document is a preview generated by EVS

INTRODUCTION

The concept of safety is closely related to safeguarding the integrity of people and property. This part of IEC 60086 specifies tests and requirements 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.