

ILNAS

Institut luxembourgeois de la normalisation
de l'accréditation, de la sécurité et qualité
des produits et services

ILNAS-EN 62133-2:2017

Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and

Accumulateurs alcalins et autres
accumulateurs à électrolyte non acide -

Exigences de sécurité pour les
accumulateurs portables étanches, et

Sekundärzellen und -batterien mit
alkalischen oder anderen nicht-
säurehaltigen Elektrolyten -
Sicherheitsanforderungen für tragbare

05/2017



National Foreword

This European Standard EN 62133-2:2017 was adopted as Luxembourgish Standard ILNAS-EN 62133-2:2017.

Every interested party, which is member of an organization based in Luxembourg, can participate for FREE in the development of Luxembourgish (ILNAS), European (CEN, CENELEC) and International (ISO, IEC) standards:

- Participate in the design of standards
- Foresee future developments
- Participate in technical committee meetings

<https://portail-qualite.public.lu/fr/normes-normalisation/participer-normalisation.html>

THIS PUBLICATION IS COPYRIGHT PROTECTED

Nothing from this publication may be reproduced or utilized in any form or by any mean - electronic, mechanical, photocopying or any other data carries without prior permission!

English Version

**Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems
(IEC 62133-2:2017)**

Accumulateurs alcalins et autres accumulateurs à électrolyte non acide - Exigences de sécurité pour les accumulateurs portables étanches, et pour les batteries qui en sont constituées, destinés à l'utilisation dans des applications portables - Partie 2: Systèmes au lithium
(IEC 62133-2:2017)

Sekundärzellen und -batterien mit alkalischen oder anderen nichtsäurehaltigen Elektrolyten - Sicherheitsanforderungen für tragbare gasdichte Akkumulatoren und daraus hergestellte Batterien für die Verwendung in tragbaren Geräten - Teil 2: Lithiumsysteme
(IEC 62133-2:2017)

This European Standard was approved by CENELEC on 2017-03-14. 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, Serbia, 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 21A/620/FDIS, future edition 1 of IEC 62133-2, prepared by SC 21A "Secondary cells and batteries containing alkaline or other non-acid electrolytes", of IEC/TC 21 "Secondary cells and batteries" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62133-2:2017.

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) 2017-12-14
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2020-03-14

This document supersedes EN 62133:2013 (partially).

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 62133-2:2017 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 standards indicated:

| | | |
|-----------|------|--------------------------------|
| IEC 60051 | NOTE | Harmonized in EN 60051 series. |
| IEC 60664 | NOTE | Harmonized in EN 60664 series. |
| IEC 61434 | NOTE | Harmonized as EN 61434. |
| IEC 62281 | NOTE | Harmonized as EN 62281. |

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 60050-482 | 2004 | International Electrotechnical Vocabulary (IEV) - Part 482: Primary and secondary cells and batteries | - | - |
| IEC 61960 | - | Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications | EN 61960 | - |
| ISO/IEC Guide 51 | - | Safety aspects - Guidelines for their inclusion in standards | - | - |

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications –
Part 2: Lithium systems**

**Accumulateurs alcalins et autres accumulateurs à électrolyte non acide –
Exigences de sécurité pour les accumulateurs portables étanches, et pour les batteries qui en sont constituées, destinés à l'utilisation dans des applications portables –
Partie 2: Systèmes au lithium**



CONTENTS

| | |
|---|----|
| FOREWORD..... | 5 |
| 1 Scope..... | 7 |
| 2 Normative references | 7 |
| 3 Terms and definitions | 7 |
| 4 Parameter measurement tolerances | 10 |
| 5 General safety considerations | 10 |
| 5.1 General..... | 10 |
| 5.2 Insulation and wiring..... | 11 |
| 5.3 Venting | 11 |
| 5.4 Temperature, voltage and current management | 11 |
| 5.5 Terminal contacts | 11 |
| 5.6 Assembly of cells into batteries | 12 |
| 5.6.1 General | 12 |
| 5.6.2 Design recommendation | 12 |
| 5.6.3 Mechanical protection for cells and components of batteries..... | 13 |
| 5.7 Quality plan | 13 |
| 5.8 Battery safety components..... | 13 |
| 6 Type test and sample size | 13 |
| 7 Specific requirements and tests | 14 |
| 7.1 Charging procedures for test purposes | 14 |
| 7.1.1 First procedure | 14 |
| 7.1.2 Second procedure | 14 |
| 7.2 Intended use..... | 15 |
| 7.2.1 Continuous charging at constant voltage (cells)..... | 15 |
| 7.2.2 Case stress at high ambient temperature (battery)..... | 15 |
| 7.3 Reasonably foreseeable misuse..... | 15 |
| 7.3.1 External short-circuit (cell)..... | 15 |
| 7.3.2 External short-circuit (battery)..... | 16 |
| 7.3.3 Free fall..... | 16 |
| 7.3.4 Thermal abuse (cells) | 16 |
| 7.3.5 Crush (cells)..... | 17 |
| 7.3.6 Over-charging of battery..... | 17 |
| 7.3.7 Forced discharge (cells) | 17 |
| 7.3.8 Mechanical tests (batteries)..... | 18 |
| 7.3.9 Design evaluation – Forced internal short-circuit (cells)..... | 19 |
| 8 Information for safety..... | 21 |
| 8.1 General..... | 21 |
| 8.2 Small cell and battery safety information..... | 22 |
| 9 Marking | 22 |
| 9.1 Cell marking..... | 22 |
| 9.2 Battery marking..... | 23 |
| 9.3 Caution for ingestion of small cells and batteries | 23 |
| 9.4 Other information | 23 |
| 10 Packaging and transport..... | 23 |
| Annex A (normative) Charging and discharging range of secondary lithium ion cells for safe use..... | 24 |

| | | |
|-----------------------|---|----|
| A.1 | General..... | 24 |
| A.2 | Safety of lithium ion secondary battery..... | 24 |
| A.3 | Consideration on charging voltage | 24 |
| A.3.1 | General | 24 |
| A.3.2 | Upper limit charging voltage | 24 |
| A.4 | Consideration of temperature and charging current..... | 26 |
| A.4.1 | General | 26 |
| A.4.2 | Recommended temperature range | 26 |
| A.4.3 | High temperature range | 27 |
| A.4.4 | Low temperature range | 28 |
| A.4.5 | Scope of the application of charging current | 29 |
| A.4.6 | Consideration of discharge | 29 |
| A.5 | Sample preparation..... | 30 |
| A.5.1 | General | 30 |
| A.5.2 | Insertion procedure for nickel particle to generate internal short | 30 |
| A.5.3 | Disassembly of charged cell | 31 |
| A.5.4 | Shape of nickel particle | 31 |
| A.5.5 | Insertion of nickel particle in cylindrical cell | 31 |
| A.5.6 | Insertion of nickel particle in prismatic cell..... | 34 |
| A.6 | Experimental procedure of the forced internal short-circuit test | 36 |
| A.6.1 | Material and tools for preparation of nickel particle | 36 |
| A.6.2 | Example of a nickel particle preparation procedure | 37 |
| A.6.3 | Positioning (or placement) of a nickel particle | 37 |
| A.6.4 | Damaged separator precaution | 38 |
| A.6.5 | Caution for rewinding separator and electrode | 38 |
| A.6.6 | Insulation film for preventing short-circuit | 39 |
| A.6.7 | Caution when disassembling a cell | 39 |
| A.6.8 | Protective equipment for safety | 39 |
| A.6.9 | Caution in the case of fire during disassembling | 39 |
| A.6.10 | Caution for the disassembling process and pressing the electrode core..... | 39 |
| A.6.11 | Recommended specifications for the pressing device | 39 |
| Annex B (informative) | Recommendations to equipment manufacturers and battery assemblers | 42 |
| Annex C (informative) | Recommendations to the end-users | 43 |
| Annex D (normative) | Measurement of the internal AC resistance for coin cells | 44 |
| D.1 | General..... | 44 |
| D.2 | Method | 44 |
| Annex E (informative) | Packaging and transport..... | 45 |
| Annex F (informative) | Component standards references | 46 |
| Bibliography..... | | 47 |
| Figure 1 | – Forced discharge time chart | 18 |
| Figure 2 | – Jig for pressing | 21 |
| Figure 3 | – Ingestion gauge | 22 |
| Figure A.1 | – Representation of lithium ion cells operating region for charging..... | 25 |
| Figure A.2 | – Representation of lithium ion cell operating region for discharging | 30 |
| Figure A.3 | – Shape of nickel particle..... | 31 |

| | |
|--|----|
| Figure A.4 – Nickel particle insertion position between positive and negative active material coated area of cylindrical cell | 31 |
| Figure A.5 – Nickel particle insertion position between positive aluminium foil and negative active material coated area of cylindrical cell | 32 |
| Figure A.6 – Disassembly of cylindrical cell | 33 |
| Figure A.7 – Nickel particle insertion position between positive and negative (active material) coated area of prismatic cell..... | 34 |
| Figure A.8 – Nickel particle insertion position between positive aluminium foil and negative (active material) coated area of prismatic cell | 35 |
| Figure A.9 – Disassembly of prismatic cells | 36 |
| Figure A.10 – Dimensions of a completed nickel particle..... | 37 |
| Figure A.11 – Positioning of the nickel particle when it cannot be placed in the specified area | 38 |
| Figure A.12 – Cylindrical cell | 38 |
| Figure A.13 – Distance / time ratio of several types of pressing devices | 41 |
| | |
| Table 1 – Sample size for type tests | 14 |
| Table 2 – Condition of charging procedure..... | 15 |
| Table 3 – Conditions for vibration test..... | 19 |
| Table 4 – Shock parameters | 19 |
| Table 5 – Ambient temperature for cell test..... | 20 |
| Table A.1 – Examples of operating region charging parameters | 25 |
| Table A.2 – Recommended specifications of a pressing device..... | 40 |
| Table F.1 – Component standard references | 46 |