

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary sealed cells and batteries for portable applications – Part 2: Nickel-metal hydride**

**Accumulateurs alcalins et autres accumulateurs à électrolyte non acide – Accumulateurs étanches pour applications portables – Partie 2: Nickel-métal hydrure**





**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2017 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, 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 either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

#### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

#### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

#### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

#### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

#### Recherche de publications IEC - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)

65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

---

**Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary sealed cells and batteries for portable applications – Part 2: Nickel-metal hydride**

**Accumulateurs alcalins et autres accumulateurs à électrolyte non acide – Accumulateurs étanches pour applications portables – Partie 2: Nickel-métal hydrure**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 29.220.30

ISBN 978-2-8322-4011-3

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	7
4 Parameter measurement tolerances .....	9
5 Cell and battery designation and marking .....	10
5.1 Cell and battery designation.....	10
5.1.1 Small prismatic cells and cylindrical cells.....	10
5.1.2 Button cells.....	11
5.1.3 Batteries.....	12
5.2 Cell or battery termination.....	12
5.3 Marking.....	12
5.3.1 Small prismatic cells and cylindrical cells.....	12
5.3.2 Button cells.....	13
5.3.3 Batteries.....	13
5.4 Exemption of wording.....	13
6 Dimensions.....	13
6.1 Small prismatic cells and cylindrical cells.....	13
6.1.1 General .....	13
6.1.2 Small prismatic cells .....	14
6.1.3 Cylindrical cells .....	14
6.2 Button cells.....	16
6.3 9 V type nickel-metal hydride batteries.....	17
7 Electrical tests.....	18
7.1 General.....	18
7.2 Charging procedure for test purposes .....	18
7.2.1 Charging procedure for cell.....	18
7.2.2 Charging procedure for battery .....	18
7.3 Discharge performance.....	18
7.3.1 General.....	18
7.3.2 Discharge performance at 20 °C.....	19
7.3.3 Discharge performance at 0 °C.....	20
7.3.4 Discharge performance for rapid charge cells (R cells) .....	21
7.4 Charge (capacity) retention.....	21
7.5 Endurance .....	22
7.5.1 Endurance in cycles.....	22
7.5.2 Permanent charge endurance.....	25
7.6 Charge acceptance at constant voltage.....	28
7.7 Overcharge.....	28
7.7.1 Small prismatic, L, M, H, X, LS or MS cylindrical, and button cells.....	28
7.7.2 LT/LU, MT/MU or HT/HU cylindrical cells.....	29
7.7.3 J cylindrical cells .....	29
7.7.4 JT cylindrical cells .....	29
7.7.5 R cylindrical cells.....	30
7.8 Safety device operation .....	30
7.9 Surface temperature limitation device operation (for S cell only) .....	30

7.10	Storage.....	31
7.10.1	Button cells or batteries, small prismatic cells or batteries, cylindrical cells or batteries .....	31
7.10.2	Button cells or batteries, small prismatic cells or batteries, cylindrical cells or batteries (high recovery type) .....	32
7.11	Charge acceptance at +55 °C for LT, MT or HT cylindrical cells .....	33
7.12	Trickle charge acceptance for JT cylindrical cells .....	34
7.13	Internal resistance .....	34
7.13.1	General .....	34
7.13.2	Measurement of the internal AC resistance.....	35
7.13.3	Measurement of the internal DC resistance .....	35
8	Mechanical tests.....	36
9	Safety requirements .....	36
10	Type approval and batch acceptance.....	36
10.1	General.....	36
10.2	Type approval .....	36
10.2.1	Type approval for small prismatic cells and button cells.....	36
10.2.2	Type approval for cylindrical cells .....	40
10.2.3	Type approval for batteries .....	42
10.3	Batch acceptance .....	43
	Bibliography.....	45
	Figure 1 – Jacketed cylindrical cells.....	14
	Figure 2 – Jacketed small prismatic cells .....	14
	Figure 3 – Jacketed cells dimensionally interchangeable with primary cells .....	15
	Figure 4 – Button cells .....	17
	Figure 5 – 9 V type nickel-metal hydride batteries.....	17
	Table 1 – Dimensions of jacketed small prismatic cells .....	14
	Table 2 – Dimensions of jacketed cylindrical cells dimensionally interchangeable with primary cells .....	15
	Table 3 – Dimensions of jacketed cylindrical cells not dimensionally interchangeable with primary cells .....	16
	Table 4 – Dimensions of button cells.....	17
	Table 5 – Dimensions of 9 V type nickel-metal hydride batteries .....	18
	Table 6 – Discharge performance at 20 °C for small prismatic cells and cylindrical cells.....	19
	Table 7 – Discharge performance at 20 °C for button cells.....	19
	Table 8 – Discharge performance at 20 °C for batteries .....	20
	Table 9 – Rated capacity (mAh) compliance test (example) .....	20
	Table 10 – Discharge performance at 0 °C for small prismatic cells and cylindrical cells.....	21
	Table 11 – Discharge performance at 0 °C for button cells.....	21
	Table 12 – Endurance in cycles for small prismatic, button and cylindrical cells not dimensionally interchangeable with primary cells .....	22
	Table 13 – Endurance in cycles for H or X cells .....	23
	Table 14 – Endurance in cycles for X cells.....	23
	Table 15 – Endurance in cycles for HR or XR cells .....	24

Table 16 – Endurance in cycles for cylindrical cells dimensionally interchangeable with primary cells .....	24
Table 17 – Permanent charge endurance for L, M, H or X cells .....	25
Table 18 – Permanent charge endurance for LT, MT or HT cells .....	26
Table 19 – Permanent charge endurance for LU, MU or HU cells .....	28
Table 20 – Overcharge at 0 °C .....	29
Table 21 – Capacity deterioration due to storage period for cells or batteries .....	32
Table 22 – Capacity deterioration due to storage period for cells or batteries (high recovery type) .....	33
Table 23 – Charge and discharge at +55 °C .....	34
Table 24 – Trickle charge acceptance for JT cylindrical cells .....	34
Table 25 – Constant discharge currents used for measurement of DC resistance .....	36
Table 26 – Sequence of tests for type approval for small prismatic cells .....	37
Table 27 – Sequence of tests for type approval for small prismatic cells (high recovery type) .....	38
Table 28 – Sequence of tests for type approval for button cells .....	39
Table 29 – Sequence of tests for type approval for button cells (high recovery type) .....	40
Table 30 – Sequence of tests for type approval for cylindrical cells .....	41
Table 31 – Sequence of tests for type approval for cylindrical cells (high recovery type) .....	42
Table 32 – Sequence of tests for type approval for batteries .....	43
Table 33 – Sequence of tests for type approval for batteries (high recovery type) .....	43
Table 34 – Recommended test sequence for batch acceptance .....	44

currently in preview, click buy full version

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SECONDARY CELLS AND BATTERIES CONTAINING  
ALKALINE OR OTHER NON-ACID ELECTROLYTES –  
SECONDARY SEALED CELLS AND BATTERIES  
FOR PORTABLE APPLICATIONS –****Part 2: Nickel-metal hydride**

## 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 expressed, as early 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 61951-2 has been prepared by subcommittee 21A: Secondary cells and batteries containing alkaline or other non-acid electrolytes, of IEC technical committee 21: Secondary cells and batteries.

This fourth edition cancels and replaces the third edition published in 2011 of which it constitutes a technical revision.

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

- addition of battery type;
- addition of 'F' (high recovery type) designation for cells and batteries;
- addition of 'I' (low self-discharge type) designation for cells;

- revision of Figure 3 (6.1.3.1);
- addition of “optional pip” note to positive contact;
- changed leader line position from pip to flats of positive contact (B and G).

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

FDIS	Report on voting
21A/623/FDIS	21A/629/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 parts of the IEC 61951 series can be found, under the general title *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary sealed cells and batteries for portable applications*, on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://www.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.

# SECONDARY CELLS AND BATTERIES CONTAINING ALKALINE OR OTHER NON-ACID ELECTROLYTES – SECONDARY SEALED CELLS AND BATTERIES FOR PORTABLE APPLICATIONS –

## Part 2: Nickel-metal hydride

### 1 Scope

This part of IEC 61951 specifies marking, designation, dimensions, tests and requirements for secondary sealed nickel-metal hydride small prismatic, cylindrical and button cells and batteries, suitable for use in any orientation, for portable applications.

### 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 60050-482:2004, *International Electrotechnical Vocabulary (IEV) – Part 482: Primary and secondary cells and batteries*

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

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

IEC 61959, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Mechanical tests for sealed portable secondary cells and batteries*

IEC 62133-1, *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 1: Nickel systems*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-482 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1

##### **nominal voltage**

suitable approximate value of the voltage used to designate or identify a cell or a battery

Note 1 to entry: The nominal voltage of a sealed nickel-metal hydride rechargeable single cell is 1,2 V.

Note 2 to entry: The nominal voltage of a battery of  $n$  series connected cells is equal to  $n$  times the nominal voltage of a single cell.