

REDLINE VERSION



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.220.30

ISBN 978-2-8322-4140-0

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

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	29
7.7 Overcharge	29
7.7.1 Small prismatic, L, M, H, X, LS or MS cylindrical, and button cells	29
7.7.2 LT/LU, MT/MU or HT/HU cylindrical cells	30
7.7.3 J cylindrical cells	30
7.7.4 JT cylindrical cells	30
7.7.5 R cylindrical cells	31
7.8 Safety device operation	31
7.9 Surface temperature limitation device operation (for S cell only)	31

7.10	Storage	32
7.10.1	Button cells or batteries, small prismatic cells or batteries, cylindrical cells or batteries	32
7.10.2	Button cells or batteries, small prismatic cells or batteries, cylindrical cells or batteries (high recovery type)	33
7.11	Charge acceptance at +55 °C for LT, MT or HT cylindrical cells	34
7.12	Trickle charge acceptance for JT cylindrical cells	35
7.13	Internal resistance	35
7.13.1	General	35
7.13.2	Measurement of the internal AC resistance	36
7.13.3	Measurement of the internal DC resistance	36
8	Mechanical tests	37
9	Safety requirements	37
10	Type approval and batch acceptance	37
10.1	General	37
10.2	Type approval	37
10.2.1	Type approval for small prismatic cells and button cells	37
10.2.2	Type approval for cylindrical cells	41
10.2.3	Type approval for batteries	43
10.3	Batch acceptance	44
	Bibliography	46
	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	27
Table 19 – Permanent charge endurance for LU, MU or HU cells	29
Table 20 – Overcharge at 0 °C.....	30
Table 21 – Capacity deterioration due to storage period for cells or batteries.....	33
Table 22 – Capacity deterioration due to storage period for cells or batteries (high recovery type).....	34
Table 23 – Charge and discharge at +55 °C.....	35
Table 24 – Trickle charge acceptance for JT cylindrical cells	35
Table 25 – Constant discharge currents used for measurement of DC resistance	37
Table 26 – Sequence of tests for type approval for small prismatic and for button cells.....	38
Table 27 – Sequence of tests for type approval for small prismatic cells (high recovery type)	39
Table 28 – Sequence of tests for type approval for button cells.....	40
Table 29 – Sequence of tests for type approval for button cells (high recovery type).....	41
Table 30 – Sequence of tests for type approval for cylindrical cells	42
Table 31 – Sequence of tests for type approval for cylindrical cells (high recovery type)	43
Table 32 – Sequence of tests for type approval for batteries	44
Table 33 – Sequence of tests for type approval for batteries (high recovery type)	44
Table 34 – Recommended test sequence for batch acceptance	45

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SECONDARY CELLS AND BATTERIES CONTAINING
ALKALINE OR OTHER NON-ACID ELECTROLYTES –
~~PORTABLE SEALED RECHARGEABLE SINGLE CELLS~~ 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 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.

DISCLAIMER

This Redline version is not an official IEC Standard and is intended only to provide the user with an indication of what changes have been made to the previous version. Only the current version of the standard is to be considered the official document.

This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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://webstore.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.

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

**SECONDARY CELLS AND BATTERIES CONTAINING
ALKALINE OR OTHER NON-ACID ELECTROLYTES –
~~PORTABLE SEALED RECHARGEABLE SINGLE CELLS~~ 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 ~~portable secondary~~ sealed nickel-metal hydride small prismatic, cylindrical and button ~~rechargeable single~~ 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 (all parts), Primary batteries~~

IEC 60086-1 ~~(2006)~~, *Primary batteries – Part 1: General*

IEC 60086-2 ~~(2006)~~, *Primary batteries – Part 2: Physical and electrical specifications*

~~IEC 60410, Sampling plans and procedures for inspection by attributes~~

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*

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

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

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 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 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://webstore.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*

SOMMAIRE

AVANT-PROPOS	49
1 Domaine d'application	51
2 Références normatives	51
3 Termes et définitions	51
4 Tolérances de mesure relatives aux paramètres	53
5 Désignation et marquage des éléments et des batteries	54
5.1 Désignation des éléments et batteries	54
5.1.1 Petits éléments parallélépipédiques et éléments cylindriques	54
5.1.2 Éléments boutons	55
5.1.3 Batteries	56
5.2 Sorties électriques des éléments ou batteries	56
5.3 Marquage	56
5.3.1 Petits éléments parallélépipédiques et éléments cylindriques	56
5.3.2 Éléments boutons	57
5.3.3 Batteries	57
5.4 Exemption de formulation	57
6 Dimensions.....	57
6.1 Petits éléments parallélépipédiques et éléments cylindriques.....	57
6.1.1 Généralités	57
6.1.2 Petits éléments parallélépipédiques	58
6.1.3 Éléments cylindriques	58
6.2 Éléments boutons	60
6.3 Batteries au nickel-métal hydrure de type 9 V	61
7 Essais électriques	62
7.1 Généralités	62
7.2 Mode de charge pour les essais.....	62
7.2.1 Mode de charge des éléments	62
7.2.2 Mode de charge des batteries.....	62
7.3 Caractéristiques de décharge	62
7.3.1 Généralités	62
7.3.2 Caractéristiques de décharge à 20 °C.....	62
7.3.3 Caractéristiques de décharge à 0 °C.....	64
7.3.4 Caractéristiques de décharge des éléments à charge rapide (éléments R).....	65
7.4 Conservation de charge	65
7.5 Endurance	65
7.5.1 Endurance en cycles.....	65
7.5.2 Endurance en charge permanente	68
7.6 Aptitude à la charge à tension constante.....	72
7.7 Surcharge	72
7.7.1 Petits éléments parallélépipédiques, éléments cylindriques L, M, H, X, LS ou MS et éléments boutons	72
7.7.2 Éléments cylindriques LT/LU, MT/MU ou HT/HU	73
7.7.3 Éléments cylindriques J	73
7.7.4 Éléments cylindriques JT	73
7.7.5 Éléments cylindriques R	74

7.8	Fonctionnement du dispositif de sécurité	74
7.9	Fonctionnement du dispositif de limitation de la température de surface (seulement pour éléments S)	74
7.10	Stockage.....	75
7.10.1	Éléments ou batteries boutons, petits éléments ou batteries parallélépipédiques, éléments ou batteries cylindriques.....	75
7.10.2	Éléments ou batteries boutons, petits éléments ou batteries parallélépipédiques, éléments ou batteries cylindriques (à récupération élevée)	76
7.11	Aptitude à la charge à +55 °C des éléments cylindriques LT, MT ou HT	78
7.12	Aptitude à la charge d'entretien des éléments cylindriques JT.....	78
7.13	Résistance interne	79
7.13.1	Généralités	79
7.13.2	Mesure de la résistance interne en courant alternatif	79
7.13.3	Mesure de la résistance interne en courant continu	80
8	Essais mécaniques.....	80
9	Exigences de sécurité.....	80
10	Conditions d'homologation et de réception.....	80
10.1	Généralités	80
10.2	Conditions d'homologation.....	81
10.2.1	Conditions d'homologation des petits éléments parallélépipédiques et des éléments boutons.....	81
10.2.2	Conditions d'homologation des éléments cylindriques.....	84
10.2.3	Conditions d'homologation des batteries	86
10.3	Conditions de réception	87
	Bibliographie.....	89
	Figure 1 – Éléments cylindriques gainés	58
	Figure 2 – Petits éléments parallélépipédiques gainés	58
	Figure 3 – Éléments gainés dimensionnellement interchangeables avec des piles	59
	Figure 4 – Éléments boutons	60
	Figure 5 – Batteries au nickel-métal hydrure de type 9 V	61
	Tableau 1 – Dimensions des petits éléments parallélépipédiques gainés	58
	Tableau 2 – Dimensions des éléments cylindriques gainés dimensionnellement interchangeables avec des piles	59
	Tableau 3 – Dimensions des éléments cylindriques gainés non dimensionnellement interchangeables avec des piles	60
	Tableau 4 – Dimensions des éléments boutons	61
	Tableau 5 – Dimensions des batteries au nickel-hydrure métallique de type 9 V	61
	Tableau 6 – Caractéristiques de décharge à 20 °C des petits éléments parallélépipédiques et des éléments cylindriques.....	63
	Tableau 7 – Caractéristiques de décharge à 20 °C des éléments boutons	63
	Tableau 8 – Caractéristiques de décharge à 20 °C des batteries	63
	Tableau 9 – Essai de conformité de la capacité assignée (mAh) (exemple).....	64
	Tableau 10 – Caractéristiques de décharge à 0 °C des petits éléments parallélépipédiques et des éléments cylindriques.....	64

Tableau 11 – Caractéristiques de décharge à 0 °C des éléments boutons	65
Tableau 12 – Endurance en cycles des petits éléments parallélépipédiques, des éléments boutons et des éléments cylindriques non-dimensionnellement interchangeables avec des piles	66
Tableau 13 – Endurance en cycles des éléments H ou X	66
Tableau 14 – Endurance en cycles des éléments X	67
Tableau 15 – Endurance en cycles des éléments HR ou XR	67
Tableau 16 – Endurance en cycles des éléments cylindriques dimensionnellement interchangeables avec des piles	68
Tableau 17 – Endurance en charge permanente des éléments L, M, H ou X	69
Tableau 18 – Endurance en charge permanente des éléments LT, MT ou HT	70
Tableau 19 – Endurance en charge permanente des éléments LU, MU ou HU	71
Tableau 20 – Surcharge à 0 °C	73
Tableau 21 – Détérioration de la capacité des éléments et des batteries liée à la période de stockage	76
Tableau 22 – Détérioration de la capacité des éléments et batteries (à récupération élevée) liée à la période de stockage	77
Tableau 23 – Charge et décharge à +55 °C	78
Tableau 24 – Aptitude à la charge d'entretien des éléments cylindriques JT	79
Tableau 25 – Courants constants de décharge utilisés pour la mesure de la résistance en courant continu	80
Tableau 26 – Conditions d'homologation des petits éléments parallélépipédiques	81
Tableau 27 – Séquence d'essais pour l'homologation des petits éléments parallélépipédiques (à récupération élevée)	82
Tableau 28 – Conditions d'homologation des éléments boutons	83
Tableau 29 – Conditions d'homologation des éléments boutons (à récupération élevée)	84
Tableau 30 – Séquence d'essais pour l'homologation des éléments cylindriques	85
Tableau 31 – Séquence d'essais pour l'homologation des éléments cylindriques (à récupération élevée)	86
Tableau 32 – Séquence d'essais pour l'homologation des batteries	87
Tableau 33 – Séquence d'essais pour l'homologation des batteries (à récupération élevée)	87
Tableau 34 – Séquence des essais conseillés pour la réception	88

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**ACCUMULATEURS ALCALINS ET AUTRES
ACCUMULATEURS À ÉLECTROLYTE NON ACIDE –
ACCUMULATEURS ÉTANCHES POUR APPLICATIONS PORTABLES –****Partie 2: Nickel-métal hydrure****AVANT-PROPOS**

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale IEC 61951-2 a été établie par le sous-comité 21A: Accumulateurs alcalins et autres accumulateurs à électrolyte non acide, du comité d'études 21 de l'IEC: Accumulateurs.

Cette quatrième édition annule et remplace la troisième édition parue en 2011. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- ajout du type de batterie;

- ajout de la désignation 'F' (type à récupération élevée) pour les éléments et batteries;
- ajout de la désignation 'I' (type à autodécharge faible) pour les éléments;
- révision de la Figure 3 (6.1.3.1);
- ajout de la note "picot facultatif" au contact positif;
- modification de la position de la ligne de repère du picot aux surfaces planes du contact positif (B et G).

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
21A/623/FDIS	21A/629/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 61951, présentées sous le titre général *Accumulateurs alcalins et autres accumulateurs à électrolyte non acide – Accumulateurs étanches pour applications portables*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives à la publication recherchée. A cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

ACCUMULATEURS ALCALINS ET AUTRES ACCUMULATEURS À ÉLECTROLYTE NON ACIDE – ACCUMULATEURS ÉTANCHES POUR APPLICATIONS PORTABLES –

Partie 2: Nickel-métal hydrure

1 Domaine d'application

La présente partie de l'IEC 61951 spécifie le marquage, la désignation, les dimensions, les essais et les exigences applicables aux éléments et batteries d'accumulateurs parallélépipédiques, cylindriques et boutons, étanches, au nickel-métal hydrure, pouvant être utilisés dans toutes les orientations, pour applications portables.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60050-482:2004, *Vocabulaire Électrotechnique International (VEI) – Partie 482: Piles et accumulateurs électriques*

IEC 60086-1, *Primary batteries – Part 1: General* (disponible en anglais seulement)

IEC 60086-2, *Piles électriques – Partie 2: Spécifications physiques et électriques*

IEC 61959, *Accumulateurs alcalins et autres accumulateurs à électrolyte non acide – Essais mécaniques pour accumulateurs portables étanches*

IEC 62133-1, *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 1 Systèmes au nickel*