

# Secondary cells and batteries containing alkaline or other non-acid electrolytes — Portable sealed rechargeable single cells —

## Part 2: Nickel-metal hydride

The European Standard EN 61951-2:2003 has the status of a  
British Standard

ICS 29.220.30

## National foreword

This British Standard is the official English language version of EN 61951-2:2003. It is identical with IEC 61951-2:2003. It supersedes BS EN 61951-2:2001, BS EN 61436:1998 and BS EN 61808:2001, all of which will be withdrawn on 2006-06-01.

The UK participation in its preparation was entrusted to Technical Committee PEL/21/1, Secondary cells and batteries containing alkaline and other non-acidic electrolytes, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

### Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

### Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 27 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

### Amendments issued since publication

| Amd. No. | Date | Comments |
|----------|------|----------|
|          |      |          |
|          |      |          |
|          |      |          |
|          |      |          |
|          |      |          |

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 26 September 2003

© BSI 26 September 2003

ISBN 0 580 42664 5

English version

**Secondary cells and batteries containing  
alkaline or other non-acid electrolytes –  
Portable sealed rechargeable single cells  
Part 2: Nickel-metal hydride  
(IEC 61951-2:2003)**

Accumulateurs alcalins et autres  
accumulateurs à électrolyte non-acide -  
Accumulateurs individuels portables  
étanches  
Partie 2: Nickel-métal hydrure  
(CEI 61951-2:2003)

Akkumulatoren und Batterien mit  
alkalischem oder anderen  
nichtsäurehaltigen Elektrolyten –  
Tragbare wiederaufladbare gasdichte  
Einzelzellen  
Teil 2: Nickel-Metallhydrid  
(IEC 61951-2:2003)

This European Standard was approved by CENELEC on 2003-06-01. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

**CENELEC**

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

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

The text of document 21A/374/FDIS, future edition 2 of IEC 61951-2, 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 was approved by CENELEC as EN 61951-2 on 2003-06-01.

This European Standard supersedes EN 61436:1998, EN 61808:2000 and EN 61951-2:2001.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2004-03-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2006-06-01

Annexes designated "normative" are part of the body of the standard.  
In this standard, annex ZA is normative.  
Annex ZA has been added by CENELEC.

---

## Endorsement notice

The text of the International Standard IEC 61951-2:2003 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61434      NOTE      Harmonized as EN 61434:1996 (not modified).

---

## CONTENTS

|        |                                                                      |    |
|--------|----------------------------------------------------------------------|----|
| 1      | Scope .....                                                          | 5  |
| 2      | Normative references .....                                           | 5  |
| 3      | Definitions .....                                                    | 5  |
| 4      | Parameter measurement tolerances .....                               | 6  |
| 5      | Cell designation and marking .....                                   | 7  |
| 5.1    | Cell designation .....                                               | 7  |
| 5.1.1  | Small prismatic cells .....                                          | 7  |
| 5.1.2  | Cylindrical cells .....                                              | 7  |
| 5.1.3  | Button cells .....                                                   | 8  |
| 5.2    | Cell termination .....                                               | 8  |
| 5.3    | Marking .....                                                        | 8  |
| 5.3.1  | Small prismatic cells and cylindrical cells .....                    | 8  |
| 5.3.2  | Button cells .....                                                   | 9  |
| 6      | Dimensions .....                                                     | 9  |
| 6.1    | Small prismatic cells and cylindrical cells .....                    | 9  |
| 6.1.1  | Small prismatic cells .....                                          | 10 |
| 6.1.2  | Cylindrical cells .....                                              | 10 |
| 6.2    | Button cells .....                                                   | 11 |
| 7      | Electrical tests .....                                               | 12 |
| 7.1    | Charging procedure for test purposes .....                           | 12 |
| 7.2    | Discharge performance .....                                          | 12 |
| 7.2.1  | Discharge performance at 20 °C .....                                 | 12 |
| 7.2.2  | Discharge performance at 0 °C .....                                  | 13 |
| 7.2.3  | Discharge performance for rapid charge cells (R cells) .....         | 14 |
| 7.3    | Charge (capacity) retention .....                                    | 14 |
| 7.4    | Endurance .....                                                      | 14 |
| 7.4.1  | Endurance in cycles .....                                            | 14 |
| 7.4.2  | Permanent charge endurance .....                                     | 17 |
| 7.5    | Charge acceptance at constant voltage .....                          | 18 |
| 7.6    | Overcharge .....                                                     | 19 |
| 7.6.1  | Small prismatic, L, M, H or X cylindrical, and button cells .....    | 19 |
| 7.6.2  | LT, MT or HT cylindrical cells .....                                 | 19 |
| 7.6.3  | R cylindrical cells .....                                            | 19 |
| 7.7    | Safety device operation .....                                        | 20 |
| 7.8    | Storage .....                                                        | 20 |
| 7.9    | Charge acceptance at +55 °C for LT, MT or HT cylindrical cells ..... | 21 |
| 7.10   | Internal resistance .....                                            | 21 |
| 7.10.1 | Measurement of the internal a.c. resistance .....                    | 21 |
| 7.10.2 | Measurement of the internal d.c. resistance .....                    | 22 |
| 8      | Mechanical tests .....                                               | 22 |

|                                                                                                                                 |                                                               |    |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----|
| 9                                                                                                                               | Type approval and batch acceptance.....                       | 23 |
| 9.1                                                                                                                             | Batch approval .....                                          | 47 |
| 9.1.1                                                                                                                           | Type approval for small prismatic cells and button cells..... | 23 |
| 9.1.2                                                                                                                           | Type approval for cylindrical cells .....                     | 23 |
| 9.2                                                                                                                             | Batch acceptance.....                                         | 24 |
| Annex ZA (normative) Normative references to international publications with their<br>corresponding European publications ..... |                                                               | 26 |
| Bibliography.....                                                                                                               |                                                               | 27 |
| Figure 1 – Jacketed cylindrical cells.....                                                                                      |                                                               | 9  |
| Figure 2 – Jacketed small prismatic cells .....                                                                                 |                                                               | 9  |
| Figure 3 – Button cells .....                                                                                                   |                                                               | 11 |
| Table 1 – Dimensions of jacketed small prismatic cells .....                                                                    |                                                               | 10 |
| Table 2 – Cylindrical cells dimensionally interchangeable with primary batteries .....                                          |                                                               | 10 |
| Table 3 – Dimensions of jacketed cylindrical cells not dimensionally interchangeable<br>with primary batteries.....             |                                                               | 11 |
| Table 4 – Dimensions of button cells .....                                                                                      |                                                               | 12 |
| Table 5 – Discharge performance at 20 °C for small prismatic cells and cylindrical cells .....                                  |                                                               | 13 |
| Table 6 – Discharge performance at 20 °C for button cells.....                                                                  |                                                               | 13 |
| Table 7 – Discharge performance at 0 °C for small prismatic cells and cylindrical cells.....                                    |                                                               | 13 |
| Table 8 – Discharge performance at 0 °C for button cells.....                                                                   |                                                               | 14 |
| Table 9 – Endurance in cycles for small prismatic, button and cylindrical cells.....                                            |                                                               | 15 |
| Table 10 – Endurance in cycles for H or X cells .....                                                                           |                                                               | 15 |
| Table 11 – Endurance in cycles for X cells.....                                                                                 |                                                               | 16 |
| Table 12 – Endurance in cycles for HR or XR cells .....                                                                         |                                                               | 16 |
| Table 13 – Permanent charge endurance for L, M, H or X cells.....                                                               |                                                               | 17 |
| Table 14 – Permanent charge endurance for LT, MT or HT cells.....                                                               |                                                               | 18 |
| Table 15 – Overcharge at 0 °C.....                                                                                              |                                                               | 19 |
| Table 16 – Charge and discharge at +55 °C.....                                                                                  |                                                               | 21 |
| Table 17 – Constant discharge currents used for measurement of d.c. resistance.....                                             |                                                               | 22 |
| Table 18 – Sequence of tests for type approval for small prismatic cells and<br>for button cells .....                          |                                                               | 23 |
| Table 19 – Sequence of tests for type approval for cylindrical cells.....                                                       |                                                               | 24 |
| Table 20 – Recommended test sequence for batch acceptance .....                                                                 |                                                               | 25 |

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

### Part 2: Nickel-metal hydride

#### 1 Scope

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

#### 2 Normative references

The following referenced documents are indispensable for the application 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 60050-486, *International Electrotechnical Vocabulary – Chapter 486: Secondary cells and batteries*

IEC 60051 (all parts), *Direct acting indicating analogue electrical measuring instruments and their accessories*

IEC 60086 (all parts), *Primary batteries*

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

IEC 60485, *Digital electronic d.c. voltmeters and d.c. electronic analogue-to-digital converters*

IEC 61959, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Mechanical tests for sealed portable secondary cells and batteries*<sup>1</sup>

#### 3 Definitions

For the purposes of this document, the definitions contained in IEC 60050-486 and the following apply:

##### 3.3.1

##### **small prismatic cell**

cell in the form of a rectangular parallelepiped whose width and thickness dimensions are not more than 25 mm

---

<sup>1</sup> To be published.

**3.3.2****cylindrical cell**

cell of circular cross-section in which the overall height is equal to, or greater than the overall diameter

**3.3.3****button cell**

cell of circular cross-section in which the overall height is less than the overall diameter

**3.3.4****nickel-metal hydride cell**

cell containing a nickel hydroxide compound for the positive electrode and a hydrogen absorbing alloy for the negative electrode

**3.3.5****sealed cell**

cell which remains closed and does not release either gas or liquid when operated within the limits of charge and temperature specified by the manufacturer. The cell is equipped with a safety device to prevent dangerously high internal pressure. The cell does not require addition to the electrolyte and is designed to operate during its life in its original sealed state

NOTE The nickel-metal hydride cell, however, may release gas towards the end of its life due to the accumulation of hydrogen in the cell.

**3.3.6****nominal voltage**

nominal voltage of a sealed nickel-metal hydride rechargeable single cell: 1,2 V

**3.3.7****portable cell**

cell designed mainly for use in an easily hand-carried battery

**3.3.8****rated capacity**

quantity of electricity  $C_5$  Ah (ampere-hours) declared by the manufacturer which a single cell can deliver during a 5 h period when charging, storing and discharging under the conditions specified in 7.2.1

**4 Parameter measurement tolerances**

The overall accuracy of controlled or measured values, relative to the specified or actual values, shall be within the following tolerances:

- a)  $\pm 1$  % for voltage;
- b)  $\pm 1$  % for current;
- c)  $\pm 1$  % for capacity;
- d)  $\pm 2$  °C for temperature;
- e)  $\pm 0,1$  % for time.

These tolerances comprise the combined accuracy of the measuring instruments, the measurement techniques used and all other sources of error in the test procedure.

For assistance in selecting instrumentation, see the IEC 60051 series for analogue instruments and IEC 60485 for digital instruments. The details of the instrumentation used shall be provided in each report of results.

## 5 Cell designation and marking

### 5.1 Cell designation

#### 5.1.1 Small prismatic cells

Sealed nickel-metal hydride small prismatic rechargeable single cells shall be designated by the letters "HF" followed by three groups of figures, each one separated by a solidus.

- The two figures to the left of the first solidus shall indicate the maximum width specified for the cell, expressed in millimetres, rounded up to the next whole number.
- The two figures in the middle shall indicate the maximum thickness specified for the cell, expressed in millimetres, rounded up to the next whole number.
- The two figures to the right of the second solidus shall indicate the maximum height specified for the cell, expressed in millimetres, rounded up to the next whole number.

EXAMPLE HF 18/07/49 designation identifies a small prismatic cell, with a maximum width of 18 mm, a maximum thickness of 7 mm and a maximum height of 49 mm.

#### 5.1.2 Cylindrical cells

Sealed nickel-metal hydride cylindrical rechargeable single cells shall be designated by the letters "HR" followed by a letter L, M, H or X which signifies:

- low rate of discharge (L);
- medium rate of discharge (M);
- high rate of discharge (H);
- very high rate of discharge (X).

NOTE These cells are typically but not exclusively used for the following discharge rates:

- L up to  $0,5 I_t$  A;
- M up to  $3,5 I_t$  A;
- H up to  $7,0 I_t$  A;
- X up to and above  $7,0 I_t$  A.

When a cell is intended for permanent charge at elevated temperatures, typically higher than 40 °C, a letter "T" is placed after the letter L, M, H or X.

When a cell is intended for rapid charge, typically at  $1,0 I_t$  A, a letter "R" is placed after the letter L, M, H or X.

The group of three (or four) letters shall then be followed by two groups of figures separated by a solidus.

- The two figures to the left of the solidus shall indicate the maximum diameter specified for the cell, expressed in millimetres, rounded up to the next whole number.
- The two figures to the right of the solidus shall indicate the maximum height specified for the cell, expressed in millimetres, rounded up to the next whole number.

When a manufacturer designs a cell with dimensions and tolerances which make it interchangeable with a primary battery, the designation of Table 2 shall also be marked on the cell.