

# INTERNATIONAL STANDARD

# IEC 62133

First edition  
2002-10

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**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**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

## FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62133, which supersedes IEC 61809, 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.

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

| FDIS         | Report on voting |
|--------------|------------------|
| 21A/363/FDIS | 21A/371/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.

The committee has decided that the contents of this publication will remain unchanged until 2008-01. 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- withdrawn;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 –  
SAFETY REQUIREMENTS FOR PORTABLE SEALED  
SECONDARY CELLS, AND FOR BATTERIES MADE FROM THEM,  
FOR USE IN PORTABLE APPLICATIONS**

## 1 General

### 1.1 Scope

This International Standard specifies requirements and tests for the safe operation of portable sealed secondary cells and batteries (other than button) containing alkaline or other non-acid electrolyte, under intended use and reasonably foreseeable misuse.

### 1.2 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 60285, *Alkaline secondary cells and batteries – Sealed nickel-cadmium cylindrical rechargeable single cells*

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

IEC 61436, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-metal hydride rechargeable single cells*

IEC 61438, *Possible safety and health hazards in the use of alkaline secondary cells and batteries – Guide to equipment manufacturers and users*

IEC 61440, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-cadmium small prismatic rechargeable single cells*

IEC 61951-1, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Portable sealed rechargeable single cells – Part 1: Nickel-cadmium*

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

IEC 61960, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications*<sup>1</sup>

ISO/IEC Guide 51, *Safety aspects – Guidelines for their inclusion in standards*

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

### 1.3 Definitions

For the purpose of this international standard, the definitions contained in IEC 60050-486 and ISO/IEC Guide 51 as well as the following definitions apply.

#### 1.3.1

**safety**

freedom from unacceptable risk

#### 1.3.2

**risk**

a combination of the probability of occurrence of harm and the severity of that harm

#### 1.3.3

**harm**

physical injury or damage to the health of people or damage to property or to the environment

#### 1.3.4

**hazard**

potential source of harm

#### 1.3.5

**intended use**

use of a product, process or service in accordance with specifications, instructions and information provided by the supplier

#### 1.3.6

**reasonably foreseeable misuse**

use of a product, process or service in a way which is not intended by the supplier, but which may result from readily predictable human behaviour

#### 1.3.7

**secondary cell**

basic manufactured unit providing a source of electrical energy by direct conversion of chemical energy that consists of electrodes, separators, electrolyte, container and terminals, and that is designed to be charged electrically

#### 1.3.8

**secondary battery**

assembly of secondary cell(s) ready for use as a source of electrical energy characterized by its voltage, size, terminal arrangement, capacity and rate capability

#### 1.3.9

**leakage**

visible escape of liquid electrolyte

#### 1.3.10

**venting**

release of excessive internal pressure from a cell/battery in a manner intended by design to preclude rupture or explosion

#### 1.3.11

**rupture**

mechanical failure of a cell container or battery case induced by an internal or external cause, resulting in exposure or spillage but not ejection of materials

**1.3.12****explosion**

failure that occurs when a cell container or battery case opens violently and major components are forcibly expelled

**1.3.13****fire**

the emission of flames from a cell or battery

**1.3.14****portable battery**

a battery for use in a device or appliance which is conveniently hand carried

**1.3.15****portable cell**

a cell intended for assembly in a portable battery

**1.3.16****rated capacity**

quantity of electricity  $C_5$  Ah (ampere-hours) declared by the manufacturer which a single cell can deliver when discharged at the reference test current of  $0,2 I_n$  A to a specified final voltage, after charging, storing and discharging under specified conditions

**1.4 Parameter measurement tolerances**

The overall accuracy of controlled or measured values, relative to the specified or actual parameters, shall be within these tolerances.

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

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 IEC 60051 for analogue instruments and IEC 60485 for digital instruments. The details of the instrumentation used shall be provided in any report of results.

**2 General safety considerations**

The safety of secondary cells and batteries requires the consideration of two sets of applied conditions:

- a) intended use;
- b) reasonably foreseeable misuse.

Cells and batteries shall be so designed and constructed that they are safe under conditions of both intended use and reasonably foreseeable misuse. It is expected that cells or batteries subjected to misuse may fail to function following such experience. They shall not however present significant hazards. It may also be expected that cells and batteries subjected to intended use shall not only be safe but shall continue to be functional in all respects.



Potential hazards which are the subject of this standard are:

- a) fire,
- b) burst/explosion,
- c) leakage of cell electrolyte,
- d) venting,
- e) burns from excessively high external temperatures,
- f) rupture of battery case with exposure of internal components.

Conformity with 2.1 to 2.6 is checked by inspection, by the tests of clause 4, and in accordance with the appropriate standard (see 1.2).

## 2.1 Insulation and wiring

The insulation resistance between the positive terminal and externally exposed metal surfaces of the battery excluding electrical contact surfaces shall be not less than 5 M $\Omega$  at 500 V d.c.

Internal wiring and its insulation shall be sufficient to withstand the maximum anticipated current, voltage and temperature requirements. The orientation of wiring shall be such that adequate clearances and creepage distances are maintained between connectors. The mechanical integrity of internal connections shall be sufficient to accommodate conditions of reasonably foreseeable misuse.

## 2.2 Venting

Battery cases and cells shall incorporate a pressure relief mechanism or shall be so constructed that they will relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition. If encapsulation is used to support cells within an outer case, the type of encapsulant and the method of encapsulation shall neither cause the battery to overheat during normal operation nor inhibit pressure relief.

## 2.3 Temperature/current management

The design of batteries shall be such that abnormal temperature-rise conditions are prevented.

NOTE Where necessary, means can be provided to limit current to safe levels during charge and discharge.

## 2.4 Terminal contacts

Terminals shall have clear polarity marking on the external surface of the battery. The size and shape of the terminal contacts shall ensure that they can carry the maximum anticipated current. External terminal contact surfaces shall be formed from conductive materials with good mechanical strength and corrosion resistance. Terminal contacts shall be arranged so as to minimize the risk of short circuits.

## 2.5 Assembly of cells into batteries

Cells used in the assembly of batteries shall have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer. Batteries that are designed for the selective discharge of a portion of their series connected cells shall incorporate separate circuitry to prevent the cell reversal caused by uneven discharges.

## 2.6 Quality plan

The manufacturer shall prepare a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery.

## 3 Type test conditions

Tests are made with the number of cells or batteries specified in Table 1, using cells or batteries that are not more than three months old. Unless otherwise specified, tests are carried out in an ambient temperature of  $20\text{ °C} \pm 5\text{ °C}$ .

NOTE Test conditions are for type tests only and do not imply that intended use includes operation under these conditions. Similarly, the limit of three months is introduced for consistency and does not imply that battery safety is reduced after three months.

**Table 1 – Sample size for type tests**

| Test   | Cell               | Battery            |
|--------|--------------------|--------------------|
| 4.2.1  | 5                  | –                  |
| 4.2.2  | 5                  | 5                  |
| 4.2.3  | –                  | 3                  |
| 4.2.4  | 5                  | 5                  |
| 4.3.1  | 5 sets of 4        | –                  |
| 4.3.2  | 5 sets/Temperature | 5 sets/Temperature |
| 4.3.3  | 3                  | 3                  |
| 4.3.4  | 5                  | 5                  |
| 4.3.5  | 5                  | –                  |
| 4.3.6  | 5                  | –                  |
| 4.3.7  | 3                  | –                  |
| 4.3.8  | 5                  | 5                  |
| 4.3.9  | 5                  | –                  |
| 4.3.10 | 5                  | –                  |
| 4.3.11 | 5                  | –                  |

## 4 Specific requirements and tests

### 4.1 Charging procedure for test purposes

Unless otherwise stated in this standard, the charging procedure for test purposes is carried out in an ambient temperature of  $20\text{ °C} \pm 5\text{ °C}$ , using the method declared by the manufacturer.

Prior to charging, the battery shall have been discharged at  $20\text{ °C} \pm 5\text{ °C}$  at a constant current of  $0,2 I_t$  A down to a specified final voltage.

**Warning: THESE TESTS USE PROCEDURES WHICH MAY RESULT IN HARM IF ADEQUATE PRECAUTIONS ARE NOT TAKEN. TESTS SHOULD ONLY BE PERFORMED BY QUALIFIED AND EXPERIENCED TECHNICIANS USING ADEQUATE PROTECTION.**