

INTERNATIONAL STANDARD

**Secondary cells and batteries containing alkaline or other non-acid electrolytes -
Sealed nickel-cadmium prismatic rechargeable cells and batteries for use in
industrial applications**

CONTENTS

FOREWORD	5
1 Scope	7
2 Normative references	7
3 Terms and definitions	7
3.1 Terms and definitions	7
3.20 Symbols and Abbreviated terms	10
4 Parameter measurement tolerances	10
5 Designation and marking	11
5.1 Cell designation (mandatory)	11
5.2 Cell designation (optional)	11
5.3 Cell termination	12
5.4 Battery designation	12
5.4.1 Battery structure formulation	12
5.4.2 Definitions of components of a battery system	12
5.4.3 Classes of usage of battery system	15
5.5 Marking	16
5.6 Safety recommendations	16
6 Dimensions	16
7 Electrical tests for cells	18
7.1 General	18
7.2 Charging procedure for test purposes	18
7.2.1 General	18
7.2.2 Charge procedure based on constant current	19
7.2.3 Charge procedure based on constant voltage at a given current	19
7.2.4 Rapid charge current	19
7.3 Discharge performances	19
7.3.1 General	19
7.3.2 Discharge performance at 20 °C	19
7.3.3 Discharge performance at +5 °C	20
7.3.4 Discharge performance at -18 °C	21
7.3.5 Discharge performance at low temperature	21
7.3.6 Discharge performance at high temperature	22
7.3.7 High rate current test	23
7.3.8 Measurement of the internal DC resistance	24
7.3.9 Pulse power calculation	25
7.3.10 Constant power measurement test	26
7.4 Charge retention	27
7.4.1 Test method	27
7.4.2 Acceptance criterion	27
7.5 Endurance for cells	27
7.5.1 Test conditions	27
7.5.2 Endurance in cycles	28
7.5.3 Final test after completion of endurance in cycles test	29
7.5.4 Determination of durability parameters	29
7.5.5 Permanent charge endurance	30
7.6 Charge acceptance at constant voltage	31

7.7	Vent plug operation.....	31
7.8	Electrolyte retention test	31
7.9	Storage.....	31
7.9.1	Test method	31
7.9.2	Acceptance criteria	31
7.10	Overcharge test	31
7.10.1	General	31
7.10.2	Test method	31
7.10.3	Acceptance criterion	32
7.11	Safety device operation	32
7.11.1	General	32
7.11.2	Test method	32
7.11.3	Acceptance criteria	32
7.12	Gas leakage test.....	32
7.12.1	General	32
7.12.2	Test method	32
7.12.3	Acceptance criterion	32
8	Mechanical tests.....	33
9	Physical appearance	33
10	Requirements at battery level	33
10.1	General requirements	33
10.2	Environmental conditions	33
10.3	Operating voltage range of the battery system	33
10.4	Optional additional components to battery system.....	34
10.4.1	General	34
10.4.2	Battery information system	34
10.4.3	Battery heater.....	35
10.4.4	Thermostat or cut-off switch	35
10.4.5	Mounting racks	35
10.4.6	Deported components.....	35
11	Performance requirement for the battery system.....	35
11.1	Design energy and power calculation methodology	35
11.1.1	General	35
11.1.2	Requirements for battery capacity sizing	36
11.1.3	Expected lifetime in years for the battery system	38
11.1.4	Deep discharge of batteries	38
11.1.5	Documentation	38
11.2	End of life performance	38
12	Conditions for approval and acceptance	39
12.1	Type approval	39
12.2	Batch acceptance	40
Annex A (normative)	CCCV charge methodology	41
Annex B (normative)	NiCd load profile verification documentation.....	43
B.1	General.....	43
B.2	General methodology.....	43
B.3	Battery sizing documentation	44
B.4	Operational verification (load profile test).....	44
B.5	Test report	45

Annex C (informative) Battery structure information	46
Annex D (informative) Declaration of cell model range representative of the testing.....	50
Bibliography.....	51
Figure 1 – Definition of cell(s), monobloc battery, crate, tray, and box, and example of mobile application.....	13
Figure 2 – Definition of cell(s), crate/block/module, battery, cabinet, and example of stationary application for telecom.....	14
Figure 3 – Definition of cell(s), crate/block/module, battery, rack, and example of stationary application	15
Figure 4 – Example of a sealed prismatic cell in steel container with two terminals and four lugs	17
Figure 5 – Pulsed discharge graph showing the voltage behaviour under a current pulse	25
Figure 6 – Example of a NiCd cell discharge curve at various constant discharge currents based on percentage of capacity	34
Figure A.1 – Overview of charging characteristic of NiCd	42
Figure C.1 – Three cells connected in series	46
Figure C.2 – Two cells connected in parallel.....	47
Figure C.3 – Three cells connected in series, with two series strings connected in parallel	47
Figure C.4 – Two cells connected in parallel, with four parallel strings connected in series	47
Figure C.5 – Two cells connected in parallel, with four parallel strings connected in series, and with three parallel and series connected strings connected in parallel.....	48
Figure C.6 – Two cells connected in parallel, with four parallel strings connected in series, and with three parallel and series connected strings connected in parallel.....	48
Figure C.7 – Three cells connected in series, with two series strings connected in parallel, and with three series and parallel connected strings connected in parallel.....	48
Figure C.8 – Four monoblocs connected in series, with each monobloc comprising five cells.....	49
Figure C.9 – Three cells connected in series, with two series strings connected in parallel, and with three series and parallel connected strings connected in parallel.....	49
Table 1 – Example of dimensions for unjacketed sealed nickel-cadmium prismatic cells	17
Table 2 – Example of dimensions for sealed nickel-cadmium prismatic cells in plastic containers.....	18
Table 3 – Measurement tolerances in millimetres (valid for widths and lengths)	18
Table 4 – Maximum values for rapid charge current <i>R</i>	19
Table 5 – Discharge performance at 20 °C.....	20
Table 6 – Discharge performance at +5 °C	20
Table 7 – Discharge performance at -18 °C	21
Table 8 – Discharge performance at low temperature	22
Table 9 – Discharge performance at high temperature	23
Table 10 – High currents values.....	23
Table 11 – Discharge currents for measurement of internal resistance.....	24
Table 12 – Endurance in cycles	28

Table 13 – Parameters and responsibility for battery capacity sizing.....	37
Table 14 – Sequence of tests for type approval	39
Table 15 – Recommended test sequence for batch acceptance	40
Table A.1 – NiCd batteries charging characteristics	41
Table C.1 – Battery electrical circuit and structure notation table	46

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Secondary cells and batteries containing alkaline or other non-acid electrolytes - Sealed nickel-cadmium prismatic rechargeable cells and batteries for use in industrial applications

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60622 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. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2002. This edition constitutes a technical revision.

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

- a) optional characterization of cells designed for performances at very low or very high temperature, or both;
- b) optional characterization of cells tested with **CCCV** charge (also known as IU curve);
- c) optional characterization of cells designed for rapid charge;

d) optional characterization of cells designed for high cycling.

The text of this International Standard is based on the following documents:

Draft	Report on voting
21A/980/FDIS	21A/993/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at http://www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at <http://www.iec.ch/publications>.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under <http://webstore.iec.ch> in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

1 Scope

IEC 60622 specifies marking, designation, dimensions, tests and requirements for sealed nickel-cadmium prismatic secondary single cells, and battery systems made of them for use in industrial applications.

NOTE In this context, "prismatic" refers to cells having rectangular sides and base.

When there exists an IEC standard specifying test conditions and requirements for cells used in special applications and which is in conflict with this document, the former takes precedence.

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 60417, *Graphical symbols for use on equipment - 12-month subscription to regularly updated online database comprising all graphical symbols published in IEC 60417 (available from: <http://www.graphical-symbols.info/equipment>)*

Bibliography

- [1] IEC 60050-482:2004, *International Electrotechnical Vocabulary (IEV) - Part 482: Primary and secondary cells and batteries*
 - [2] IEC 61434, *Secondary cells and batteries containing alkaline or other non-acid electrolytes - Guide to designation of current in alkaline secondary cell and battery standards*
 - [3] IEC TR 61438, *Possible safety and health hazards in the use of alkaline secondary cells and batteries - Guide to equipment manufacturers and users*
 - [4] IEC 62485-2:2010, *Safety requirements for secondary batteries and battery installations - Part 2: Stationary batteries*
 - [5] IEEE Std 1106-2015, *Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications*
-