



IEC 61960-3

Edition 1.0 2017-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications – Part 3: Prismatic and cylindrical lithium secondary cells, and batteries made from them

Accumulateurs alcalins et autres accumulateurs à électrolyte non acide – Accumulateurs au lithium pour applications portables – Partie 3: Éléments et batteries d'accumulateurs au lithium, parallélépipédiques et cylindriques



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.220.99

ISBN 978-2-8322-3908-7

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CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	7
3 Terms and definitions	7
4 Parameter measurement tolerances	8
5 Cell designation and marking.....	8
5.1 Cell and battery designation.....	8
5.2 Marking.....	10
5.3 Providing the design and produce requirement of batteries	10
6 Examples of cells	10
7 Electrical tests	11
7.1 General.....	11
7.2 Charging procedure for test purposes	12
7.3 Discharge performance	12
7.3.1 Discharge performance at 20 °C (rated capacity)	12
7.3.2 Discharge performance at –20 °C	12
7.3.3 High rate discharge performance at 20 °C.....	12
7.4 Charge (capacity) retention and recovery.....	13
7.5 Charge (capacity) recovery after long term storage	13
7.6 Endurance in cycles.....	14
7.6.1 General.....	14
7.6.2 Endurance in cycles at a rate of 0,2 I_t A	14
7.6.3 Endurance in cycles at a rate of 0,5 I_t A (accelerated test procedure).....	14
7.7 Battery internal resistance	14
7.7.1 General.....	14
7.7.2 Measurement of the internal AC resistance	15
7.7.3 Measurement of the internal DC resistance.....	15
7.8 Electrostatic discharge (ESD)	16
7.8.1 General.....	16
7.8.2 Test procedure	16
7.8.3 Acceptance criterion	16
8 Test protocol and conditions for type approval.....	16
8.1 Test protocol.....	16
8.2 Conditions for type approval	16
8.2.1 Dimensions.....	16
8.2.2 Electrical tests	16
8.2.3 Conditional type approval	16
Annex A (informative) Dimensions of the cell with a laminate film case	19
A.1 General.....	19
A.2 Measuring method of cell thickness	19
A.3 Measuring method of cell width	19
Annex B (informative) Capacity after storage	21
Bibliography.....	22
Figure 1 – Sample sizes and sequence of tests	17

Figure A.1 – Thickness measuring method.....	20
Figure A.2 – Width measuring method	20
Table 1 – Specification examples of secondary lithium cells for portable applications	11
Table 2 – Examples of secondary lithium cells for portable applications.....	11
Table 3 – Endurance in cycles at a rate of $0,2 I_t$ A.....	14
Table 4 – Endurance in cycles at a rate of $0,5 I_t$ A.....	14
Table 5 – Minimum requirements for each type of secondary lithium cells and batteries.....	18
Table B.1 – Capacity after storage	21

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 3: Prismatic and cylindrical lithium secondary cells, and batteries made from them

FOREWORD

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International Standard IEC 61960-3 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 first edition cancels and replaces the second edition of IEC 61960 published in 2011. It is a technical revision.

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

- adding definition of portable applications (Scope),
- update of examples of cells (Table 1 and 2),

- adding “Dimensions of the cell with a laminate film case” (Annex A),
- adding “Capacity after storage” (from the date of manufacture) (Annex B).

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

FDIS	Report on voting
21A/618/FDIS	21A/625/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61960 series, published under the general title *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications*, can be found on the IEC website.

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,
- replaced by a revised edition, or
- amended.

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

Part 3: Prismatic and cylindrical lithium secondary cells, and batteries made from them

1 Scope

This part of IEC 61960 specifies performance tests, designations, markings, dimensions and other requirements for secondary lithium single cells and batteries for portable applications.

The objective of this document is to provide the purchasers and users of secondary lithium cells and batteries with a set of criteria with which they can judge the performance of secondary lithium cells and batteries offered by various manufacturers.

Portable applications comprise hand-held equipment, transportable equipment and movable equipment.

Examples of the main uses are shown below:

- a) hand-held equipment: smartphone, tablet PCs, audio/video players, and similar equipment;
- b) transportable equipment: notebook computers, CD players, and similar equipment;
- c) movable equipment
 - 18 kg or less in mass and not fixed in place, or
 - provided with wheels, castors, or other means to facilitate movement by an ordinary person as required to perform its intended use,
 - power tools, power assisted cycles, business-use video cameras, and similar equipment.

NOTE 1 All applications using batteries whose nominal voltages are equal to or over the hazardous voltage of 60 V DC are excluded.

NOTE 2 EESS (Electrical Energy Storage Systems) and UPS, which use batteries over 500 Wh of electric energy are excluded.

NOTE 3 Self-propelled vehicles are excluded.

This document defines a minimum required level of performance and a standardized methodology by which testing is performed and the results of this testing reported to the user. Hence, users will be able to establish the viability of commercially available cells and batteries via the declared specification and thus be able to select the cell or battery best suited for their intended application. The end user can handle only batteries which have completely fulfilled all the requirements of this document and others concerning safety such as IEC 62133-2.

This document covers secondary lithium cells and batteries with a range of chemistries. Each electrochemical couple has a characteristic voltage range over which it releases its electrical capacity, a characteristic nominal voltage and a characteristic final voltage during discharge. Users of secondary lithium cells and batteries are requested to consult the manufacturer for advice.

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 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 62133-2:2017, *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 2: Lithium 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

charge recovery

capacity recovery

capacity that a cell or battery can deliver with subsequent recharge after storage, at a specific temperature, for a specific time, as a percentage of the rated capacity

3.2

charge retention

capacity retention

capacity that a cell or battery can deliver after storage, at a specific temperature, for a specific time without subsequent recharge as a percentage of the rated capacity

3.3

final voltage

end-of-discharge voltage

specified closed circuit voltage at which a discharge of a cell or battery is terminated

3.4

nominal voltage

suitable approximate value of the voltage used to designate or identify a cell, a battery or an electrochemical system

Note 1 to entry: The nominal voltages of secondary lithium cells are shown in Table 1 and 2.

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.

[SOURCE: IEC 60050-482:2004, 482-03-31, modified – Addition Notes 1 and 2 to entry.]

3.5 rated capacity

capacity value of a cell or battery determined under specified conditions and declared by the manufacturer

Note 1 to entry: The rated capacity is the quantity of electricity C_5 Ah (ampere-hours) declared by the manufacturer which a single cell can deliver during a 5-h period, when charged, stored and discharged under the conditions specified in 7.3.1

[SOURCE: IEC 60050-482:2004, 482-03-15, modified – Addition of Note 1 to entry.]

3.6 secondary lithium battery

unit which incorporates one or more secondary lithium cells and which is ready for use

Note 1 to entry: It may incorporate adequate housing and a terminal arrangement and may have electronic control devices.

3.7 secondary lithium cell

secondary cell where electrical energy is derived from the insertion/extraction reactions of lithium ions or oxidation/reduction reaction of lithium between the negative electrode and the positive electrode

Note 1 to entry: The cell typically has an electrolyte that consists of a lithium salt and organic solvent compound in liquid, gel or solid form and has a metal or a laminate film casing. It is not ready for use in an application because it is not yet fitted with its final housing, terminal arrangement and electronic control device.

3.8 lithium ion polymer cell

cell using gel polymer electrolyte or solid polymer electrolyte, not liquid electrolyte

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

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

The details of the instrumentation used shall be provided in any report of results.

5 Cell designation and marking

5.1 Cell and battery designation

Batteries shall be designated with following form:

$$N_1 A_1 A_2 A_3 N_2 / N_3 / N_4 - N_5$$

Cells shall be designated with following form:

$$A_1 A_2 A_3 N_2 / N_3 / N_4$$

where

N_1 is the number of series connected cells in the battery;

A_1 designates the negative electrode basis in which

- I is carbon;
- L is lithium metal or lithium alloy;
- T is titanium;
- X is others;

A_2 designates the positive electrode basis in which

- C is cobalt;
- F is iron;
- Fp is iron phosphate;
- N is nickel;
- M is manganese;
- Mp is manganese phosphate;
- T is titanium;
- V is vanadium;
- X is others;

A_3 designates the shape of the cell in which

- R is cylindrical;
- P is prismatic;

N_2 is the maximum diameter (if R) or the maximum thickness (if P) in millimetres rounded up to the next whole number;

N_3 is the maximum width (if P) in millimetres rounded up to the next whole number (N_3 not shown if R);

N_4 is the maximum overall height in millimetres rounded up to the next whole number;

NOTE 1 If any dimension is less than 1 mm, the units used are tenths of millimetres and the single number is written tN.

N_5 is the number of parallel connected cells if two or more (not shown if value is 1).

EXAMPLE 1 ICR19/66 designates a cylindrical Li-ion secondary cell, with a cobalt-based positive electrode, a maximum diameter which is greater than 18 mm and less than or equal to 19 mm, a maximum overall height which is greater than 65 mm and less than or equal to 66 mm.

EXAMPLE 2 ICP9/35/150 designates a prismatic Li-ion secondary lithium cell, with a cobalt-based positive electrode, a maximum thickness which is greater than 8 mm and less than or equal to 9 mm, a maximum width which is greater than 34 mm and less than or equal to 35 mm, and a maximum overall height which is greater than 149 mm and less than or equal to 150 mm.

EXAMPLE 3 ICPT9/35/48 designates a prismatic Li-ion secondary lithium cell, with a cobalt-based positive electrode, a maximum thickness which is greater than 0,8 mm and less than or equal to 0,9 mm, a maximum width which is greater than 34 mm and less than or equal to 35 mm, and a maximum overall height which is greater than 47 mm and less than or equal to 48 mm.

EXAMPLE 4 1ICR20/70 designates a cylindrical Li-ion secondary battery with one single cell, a cobalt-based positive electrode, a maximum diameter which is greater than 19 mm and less than or equal to 20 mm, and a maximum overall height which is greater than 69 mm and less than or equal to 70 mm.

EXAMPLE 5 2ICP20/34/70 designates a prismatic Li-ion secondary battery with two series connected cells, a cobalt-based positive electrode, a maximum thickness which is greater than 19 mm and less than or equal to 20 mm, a maximum width which is greater than 33 mm and less than or equal to 34 mm, and a maximum overall height which is greater than 69 mm and less than or equal to 70 mm.