

Secondary lithium cells and batteries for portable applications —

Part 1: Secondary lithium cells

The European Standard EN 61960-1:2001 has the status of a
British Standard

ICS 29.220.30

National foreword

This British Standard is the official English language version of EN 61960-1:2001. It is identical with IEC 61960-1:2000, including Corrigendum February 2002.

The UK participation in its preparation was entrusted by Technical Committee PEL/21, to Subcommittee PEL/21/1, Alkaline secondary cells and batteries, 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 Subcommittee can be obtained on request to its secretary.

From 1 January 1997, all IEC publications have the number 60000 added to the old number. For instance, IEC 27-1 has been renumbered as IEC 60027-1. For a period of time during the change over from one numbering system to the other, publications may contain identifiers from both systems.

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.

This British Standard, having been prepared under the direction of the Electrotechnical Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 August 2001

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 26, an inside back cover and a back cover.

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

Amendments issued since publication

Amd. No.	Date	Comments
13813 Corrigendum No. 1	26 June 2002	Change to clause 5.2.2.1.1

© BSI 26 June 2002

ISBN 0 580 38165 X

EUROPEAN STANDARD

EN 61960-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2001

ICS 29.220.30;29.220.90

English version

Secondary lithium cells and batteries for portable applications
Part 1: Secondary lithium cells
(IEC 61960-1:2000)

Eléments et batteries d'accumulateurs
au lithium pour applications portables
Partie 1: Eléments d'accumulateurs au
lithium
(CEI 61960-1:2000)

Lithium-Sekundärzellen und -batterien
für tragbare Geräte
Teil 1: Lithium-Sekundärzellen
(IEC 61960-1:2000)

This European Standard was approved by CENELEC on 2000-12-01. 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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, 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

© 2001 CENELEC - All rights of exploitation in any form and by any means reserved worldwide for CENELEC members.

Foreword

The text of document 21A/283/FDIS, future edition 1 of IEC 61960-1, 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 61960-1 on 2000-12-01.

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) 2001-09-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2003-12-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annex A is informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61960-1:2000 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 60086-4 NOTE: Harmonized as EN 60086-4:2000 (not modified).

CONTENTS

	Page
INTRODUCTION.....	5
Clause	
1 General	6
1.1 Scope.....	6
1.2 Normative references	6
1.3 Definitions	7
1.4 Parameter measurement tolerances.....	9
2 Designation and marking	9
2.1 Cell designation.....	9
2.1.1 Cylindrical secondary lithium cells	9
2.1.2 Prismatic secondary lithium cells.....	10
2.2 Marking	11
3 Standard types	11
4 Electrical tests	11
4.1 Charging procedure for test purposes	11
4.2 Discharge performance.....	12
4.2.1 Discharge performance at 20 °C (rated capacity).....	12
4.2.2 Discharge performance at –20 °C	12
4.2.3 High rate discharge performance at 20 °C	12
4.3 Charge (capacity) retention and recovery	13
4.4 Charge (capacity) recovery after storage.....	13
4.5 Endurance in cycles.....	14
5 Safety evaluation	14
5.1 Intended use simulation tests.....	15
5.1.1 Electrical test.....	15
5.1.2 Mechanical tests	15
5.1.3 Environmental tests	16
5.2 Reasonably foreseeable misuse simulation tests.....	17
5.2.1 Electrical tests	17
5.2.2 Mechanical tests	19
5.2.3 Environmental tests	19
6 Test protocol and conditions for type approval.....	20
6.1 Test protocol	20
6.2 Conditions for type approval.....	20
6.2.1 Dimensions.....	20
6.2.2 Electrical tests	20
6.2.3 Intended use simulation tests.....	20
6.2.4 Reasonably foreseeable misuse simulation tests	20
6.2.5 Conditional type approval.....	20

Clause	Page
7 Transportation tests (non-use)	22
7.1 Transportation tests	23
7.1.1 Mechanical tests	23
7.1.2 Environmental tests	23
7.1.3 Electrical test	23
7.2 Test protocol	23
Annex A (informative) Other transportation requirements	24
Annex ZA (normative) Normative references to international publications with their corresponding European publications	26
Bibliography	25

INTRODUCTION

Recent progress in the battery industry has seen secondary lithium cells and batteries evolve from the research environment to a state of regular commercial production and sale. In response to this situation, the IEC has prepared a new standard to cover secondary lithium cells and batteries for portable electronic applications. This part of IEC 61960 covers secondary lithium cells. Part 2 of IEC 61960 covers secondary lithium batteries and should be used in conjunction with this part.

This standard has been prepared so that it covers only those secondary lithium cells that are:

- commercially available, and
- available from two or more manufacturers.

Traditionally the manufacturers and users of alkaline secondary cells and batteries have expressed the current used to charge and discharge these cells and batteries as a multiple of the capacity. For example, a current of 20 A used to charge a cell with a rated capacity (C Ah) of 100 Ah would be expressed as $C/5$ A or $0,2 C$ A. This method of current designation has been used in earlier standards relating to alkaline secondary cells and batteries.

Comments have been made that this method of current designation is dimensionally incorrect, in that a multiple of the capacity (ampere hours) will be in ampere hours and not, as required for current, in amperes. As a result of these comments, the method described in IEC 61434 has been used in this standard.

In brief, the method states that the reference test current (I_t) is expressed as:

$$I_t \text{ A} = C_n \text{ Ah} / 1 \text{ h}$$

where

C_n is the rated capacity declared by the manufacturer in ampere hours (Ah), and

n is the time base in hours (h) for which the rated capacity is declared.

SECONDARY LITHIUM CELLS AND BATTERIES FOR PORTABLE APPLICATIONS –

Part 1: Secondary lithium cells

1 General

1.1 Scope

This International Standard specifies performance and safety tests, designations, markings, dimensions and other requirements for secondary lithium single cells.

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

This standard defines a minimum required level of performance and safety, 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 via the declared specification and thus be able to select the cell best suited for their intended application.

This standard covers secondary lithium cells 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.

For the avoidance of doubt, the scope of this standard does not include secondary lithium batteries which are covered in IEC 61960-2.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(486), *International Electrotechnical Vocabulary (IEV) – Chapter 486: Secondary cells and batteries*

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

IEC 60068-2-6, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*

IEC 60068-2-32, *Environmental testing – Part 2: Tests – Test Ed: Free Fall (Procedure 1)*

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

IEC 61434, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Guide to the designation of current in alkaline secondary cell and battery standards*

IEC 61960-2, *Secondary lithium cells and batteries for portable applications – Part 2: Secondary lithium batteries* ¹⁾

1.3 Definitions

For the purpose of this International Standard, the definitions contained in IEC 60050(486) and the following definitions apply:

1.3.1

charge (capacity) recovery

percentage of the rated capacity which a cell or battery can deliver after storage, at a specific temperature, for a specific time, when the cell or battery has been subsequently discharged and recharged, using the method declared by the manufacturer

1.3.2

charge (capacity) retention

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

1.3.3

depth of discharge

ratio of the capacity used during a discharge to the rated capacity

1.3.4

end-of-charge current

charge current at which the charging of a cell or battery, at the constant voltage specified by the manufacturer, is terminated

1.3.5

explosion

the bursting of a cell or battery casing resulting in the expulsion of projectiles

1.3.6

final voltage

cut-off voltage

the specified voltage at which a discharge of a cell or battery is considered finished

1.3.7

fire

the emission of flames

¹⁾ To be published.