



NSAI
Standards

Irish Standard
I.S. EN 62660-1:2011

Secondary lithium-ion cells for the propulsion of electric road vehicles -- Part 1: Performance testing (IEC 62660 -1:2010 (EQV))

I.S. EN 62660-1:2011

Incorporating amendments/corrigenda issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

<i>This document replaces:</i>	<i>This document is based on:</i> EN 62660-1:2011	<i>Published:</i> 29 July, 2011
This document was published under the authority of the NSAI and comes into effect on: 10 August, 2011		ICS number: 29.220.20 43.120
NSAI 1 Swift Square, Northwood, Santry Dublin 9	T +353 1 807 3800 F +353 1 807 3838 E standards@nsai.ie W NSAI.ie	Sales: T +353 1 857 6730 F +353 1 857 6729 W standards.ie
Údarás um Chaighdeáin Náisiúnta na hÉireann		

EUROPEAN STANDARD

EN 62660-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2011

ICS 29.220.20; 43.120

English version

**Secondary lithium-ion cells for the propulsion of electric road vehicles -
Part 1: Performance testing
(IEC 62660-1:2010)**

Éléments d'accumulateurs lithium-ion pour
la propulsion des véhicules routiers
électriques -
Partie 1: Essais de performance
(CEI 62660-1:2010)

Lithium-Ionen-Sekundärzellen für den
Antrieb von Elektrostraßenfahrzeugen -
Teil 1: Prüfung des Leistungsverhaltens
(IEC 62660-1:2010)

This European Standard was approved by CENELEC on 2011-01-20. 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, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 21/728/FDIS, future edition 1 of IEC 62660-1, prepared by IEC TC 21, Secondary cells and batteries, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62660-1 on 2011-01-20.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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) 2011-10-20
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2014-01-20

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62660-1:2010 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 62660-2 NOTE Harmonized as EN 62660-2.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-482	-	International Electrotechnical Vocabulary - Part 482: Primary and secondary cells and batteries	-	-
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	EN 61434	-

This page is intentionally left BLANK.

CONTENTS

FOREWORD.....	4
INTRODUCTION	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions.....	7
4 Test conditions.....	8
4.1 General.....	8
4.2 Measuring instruments.....	8
4.2.1 Range of measuring devices	8
4.2.2 Voltage measurement.....	9
4.2.3 Current measurement.....	9
4.2.4 Temperature measurements.....	9
4.2.5 Other measurements	9
4.3 Tolerance.....	10
4.4 Test temperature.....	10
5 Dimension measurement	10
6 Mass measurement.....	11
7 Electrical measurement.....	11
7.1 General charge conditions	11
7.2 Capacity.....	12
7.3 SOC adjustment.....	12
7.4 Power	12
7.4.1 Test method	12
7.4.2 Calculation of power density.....	15
7.4.3 Calculation of regenerative power density.....	16
7.5 Energy.....	17
7.5.1 Test method	17
7.5.2 Calculation of energy density.....	17
7.6 Storage test.....	18
7.6.1 Charge retention test.....	18
7.6.2 Storage life test	19
7.7 Cycle life test.....	19
7.7.1 BEV cycle test	19
7.7.2 HEV cycle test	23
7.8 Energy efficiency test	27
7.8.1 Common tests.....	27
7.8.2 Test for cells of BEV application	29
7.8.3 Energy efficiency calculation for cells of HEV application	30
Annex A (informative) Selective test conditions.....	32
Annex B (informative) Cycle life test sequence	34
Bibliography.....	37
Figure 1 – Example of temperature measurement of cell.....	9
Figure 2 – Examples of maximum dimension of cell	11
Figure 3 – Test order of the current-voltage characteristic test.....	15

Figure 4 – Dynamic discharge profile A for BEV cycle test	21
Figure 5 – Dynamic discharge profile B for BEV cycle test	22
Figure 6 – Discharge-rich profile for HEV cycle test	25
Figure 7 – Charge-rich profile for HEV cycle test	26
Figure 8 – Typical SOC swing by combination of two profiles for HEV cycle test	27
Figure B.1 – Test sequence of BEV cycle test	35
Figure B.2 – Concept of BEV cycle test.....	36
Table 1 – Discharge conditions	12
Table 2 – Examples of charge and discharge current	13
Table 3 – Dynamic discharge profile A for BEV cycle test	21
Table 4 – Dynamic discharge profile B for BEV cycle test	22
Table 5 – Discharge-rich profile for HEV cycle test.....	25
Table 6 – Charge-rich profile for HEV cycle test.....	26
Table A.1 – Capacity test conditions.....	32
Table A.2 – Power test conditions	32
Table A.3 – Cycle life test conditions	32
Table A.4 – Conditions for energy efficiency test for BEV application.....	33
Table B.1 – Test sequence of HEV cycle test	36

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SECONDARY LITHIUM-ION CELLS FOR THE PROPULSION
OF ELECTRIC ROAD VEHICLES –**
Part 1: Performance testing

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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62660-1 has been prepared by IEC technical committee 21: Secondary cells and batteries.

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

FDIS	Report on voting
21/728/FDIS	21/732/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.

A list of all the parts in the IEC 62660 series, published under the general title *Secondary lithium-ion cells for the propulsion of electric road vehicles*, can be found on the IEC website.

I.S. EN 62660-1:2011

62660-1 © IEC:2010

– 5 –

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

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

INTRODUCTION

The commercialisation of electric road vehicles including battery, hybrid and plug-in hybrid electric vehicles has been accelerated in the global market, responding to the global concerns on CO₂ reduction and energy security. This, in turn, has led to rapidly increasing demand for high-power and high-energy density traction batteries. Lithium-ion batteries are estimated to be one of the most promising secondary batteries for the propulsion of electric vehicles. In the light of rapidly diffusing hybrid electric vehicles and emerging battery and plug-in hybrid electric vehicles, a standard method for testing performance requirements of lithium-ion batteries is indispensable for securing a basic level of performance and obtaining essential data for the design of vehicle systems and battery packs.

This standard is to specify performance testing for automobile traction lithium-ion cells that basically differ from the other cells including those for portable and stationary applications specified by the other IEC standards. For automobile application, it is important to note the usage specificity; i.e. the designing diversity of automobile battery packs and systems, and specific requirements for cells and batteries corresponding to each of such designs. Based on these facts, the purpose of this standard is to provide a basic test methodology with general versatility, which serves a function in common primary testing of lithium ion cells to be used in a variety of battery systems.

This standard is associated with ISO 12405-1-and ISO 12405-2¹.

IEC 62660-2 specifies the reliability and abuse testing for lithium-ion cells for electric vehicle application.

¹ Under consideration.

SECONDARY LITHIUM-ION CELLS FOR THE PROPULSION OF ELECTRIC ROAD VEHICLES –

Part 1: Performance testing

1 Scope

This part of IEC 62660 specifies performance and life testing of secondary lithium-ion cells used for propulsion of electric vehicles including battery electric vehicles (BEV) and hybrid electric vehicles (HEV).

The objective of this standard is to specify the test procedures to obtain the essential characteristics of lithium-ion cells for vehicle propulsion applications regarding capacity, power density, energy density, storage life and cycle life.

This standard provides the standard test procedures and conditions for testing basic performance characteristics of lithium-ion cells for vehicle propulsion applications, which are indispensable for securing a basic level of performance and obtaining essential data on cells for various designs of battery systems and battery packs.

NOTE 1 Based on the agreement between the manufacturer and the customer, specific test conditions may be selected in addition to the conditions specified in this standard. Selective test conditions are described in Annex A.

NOTE 2 The performance tests for the electrically connected lithium-ion cells may be performed with reference to this standard.

NOTE 3 The test specification for lithium-ion battery packs and systems is defined in ISO 12405-1 and ISO 12405-2 (under consideration).

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 60050-482, *International Electrotechnical Vocabulary – Part 482: Primary and secondary cells and batteries*

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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-482 and the following apply.

3.1

battery electric vehicle

BEV

electric vehicle with only a traction battery as power source for vehicle propulsion

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-