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Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 2: Reliability and abuse testing

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2: Reliability and abuse testing

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International Standard IEC 62660-2 has been prepared by IEC technical committee 21: Secondary cells and batteries.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

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

a) The procedure of forced discharge test has been clarified (6.4.3.2).

b) "Cell block" has been added to the scope (Clause 1).

c) Option of temperature cycling test with electrical operation has been deleted (6.3.2).

d) The test conditions for overcharge test have been revised (6.4.2.2).

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

FDIS	Report on voting
21/976/FDIS	21/986/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 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.

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INTRODUCTION

The commercialization 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 CO_2 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~~ the rapid spread of hybrid electric vehicles and the emergence of battery and plug-in hybrid electric vehicles, a standard method for testing reliability and abuse requirements of lithium-ion batteries is indispensable for securing a basic level of safety and obtaining essential data for the design of vehicle systems and battery packs.

This document specifies reliability and abuse testing for automobile traction lithium-ion cells that basically differ from the other cells including those for portable and stationary applications specified by other IEC standards. For automobile application, it is important to note the usage specificity; i.e. the design 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 document 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. ~~For the requirements for cells differ depending on the system designs of battery pack or vehicle, and should be evaluated by the users,~~ This document does not provide any pass-fail criteria for the tests, but specifies a standard classification of descriptions for test results.

This document is associated with ~~ISO 12405-1 and ISO 12405-2~~ ISO 12405-4 [1][1].

IEC 62660-1 [2] specifies the performance testing of lithium-ion cells for electric vehicle application.

IEC 62660-3 [3] specifies the safety requirements of lithium-ion cells for electric vehicle application.

[1] Numbers in square brackets refer to the Bibliography.

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

Part 2: Reliability and abuse testing

1 Scope

This part of IEC 62660 specifies test procedures to observe the reliability and abuse behaviour of secondary lithium-ion cells and cell blocks used for propulsion of electric vehicles including battery electric vehicles (BEV) and hybrid electric vehicles (HEV).

NOTE 1 Secondary lithium-ion cells used for propulsion of plug-in hybrid electric vehicles (PHEV) can be tested by the procedure either for BEV application or HEV application, according to the battery system design, based on the agreement between the cell manufacturer and the customer.

This document specifies the standard test procedures and conditions for basic characteristics of lithium-ion cells for use in propulsion of battery and hybrid electric vehicles. The tests are indispensable for obtaining essential data on reliability and abuse behaviour of lithium-ion cells for use in various designs of battery systems and battery packs.

This document provides standard classification of description of test results to be used for the design of battery systems or battery packs.

~~NOTE The reliability and abuse tests for the electrically connected lithium-ion cells may be performed with reference to this standard.~~

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

NOTE 2 Cell blocks can be used as an alternative to cells according to the agreement between the cell manufacturer and the customer.

NOTE 3 The safety requirements of lithium-ion cells for electric vehicle application are defined in IEC 62660-3 [3].

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

IEC 60068-2-64, *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance*

~~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*~~

ISO 16750-3, *Road vehicles – Environmental conditions and testing for electrical and electronic equipment – Part 3: Mechanical loads*

ISO 16750-4, *Road vehicles – Environmental conditions and testing for electrical and electronic equipment – Part 4: Climatic loads*

ISO/TR 8713, *Electrically propelled road vehicles – Vocabulary*

IEC 62660-2

Edition 2.0 2018-12

INTERNATIONAL STANDARD

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Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 2: Reliability and abuse testing

Éléments d'accumulateurs lithium-ion pour la propulsion des véhicules routiers électriques – Partie 2: Essais de fiabilité et de traitement abusif

IEC 62660-2:2018-12(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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This document is associated with ISO 12405-4 [1][1].

IEC 62660-1 [2] specifies the performance testing of lithium-ion cells for electric vehicle application.

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

Part 2: Reliability and abuse testing

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This part of IEC 62660 specifies test procedures to observe the reliability and abuse behaviour of secondary lithium-ion cells and cell blocks used for propulsion of electric vehicles including battery electric vehicles (BEV) and hybrid electric vehicles (HEV).

NOTE 1 Secondary lithium-ion cells used for propulsion of plug-in hybrid electric vehicles (PHEV) can be tested by the procedure either for BEV application or HEV application, according to the battery system design, based on the agreement between the cell manufacturer and the customer.

This document specifies the standard test procedures and conditions for basic characteristics of lithium-ion cells for use in propulsion of battery and hybrid electric vehicles. The tests are indispensable for obtaining essential data on reliability and abuse behaviour of lithium-ion cells for use in various designs of battery systems and battery packs.

This document provides standard classification of description of test results to be used for the design of battery systems or battery packs.

NOTE 2 Cell blocks can be used as an alternative to cells according to the agreement between the cell manufacturer and the customer.

NOTE 3 The safety requirements of lithium-ion cells for electric vehicle application are defined in IEC 62660-3 [3].

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ISO/TR 8713, *Electrically propelled road vehicles – Vocabulary*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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ÉLÉMENTS D'ACCUMULATEURS LITHIUM-ION POUR LA PROPULSION DES VÉHICULES ROUTIERS ÉLECTRIQUES –

Partie 2: Essais de fiabilité et de traitement abusif

AVANT-PROPOS

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Cette deuxième édition annule et remplace la première édition parue en 2010. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) La procédure d'essai de décharge forcée a été clarifiée (6.4.3.2).
b) Le concept de "bloc d'éléments" a été ajouté au domaine d'application (Article 1).

c) L'option d'essai de cycles de température avec fonctionnement électrique a été supprimée (6.3.2).

d) Les conditions d'essai relatives à l'essai de surcharge ont été révisées (6.4.2.2).

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
21/976/FDIS	21/986/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 62660, publiées sous le titre général *Éléments d'accumulateurs lithium-ion pour la propulsion des véhicules routiers électriques*, peut être consultée sur le site web de l'IEC.

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INTRODUCTION

La commercialisation des véhicules routiers électriques, comprenant les véhicules électriques à batterie, les véhicules électriques hybrides et les véhicules électriques hybrides rechargeables, a été accélérée sur le marché international, répondant ainsi aux préoccupations mondiales concernant la réduction du CO_2 et la sécurité en matière d'énergie. Par voie de conséquence, cela a conduit à une demande rapidement croissante de batteries de traction de forte puissance et de grande densité énergétique. Il est estimé que les batteries lithium-ion sont les accumulateurs les plus prometteurs pour la propulsion des véhicules électriques. Du fait de la diffusion rapide des véhicules électriques hybrides et de l'émergence des véhicules électriques à batterie et hybrides rechargeables, une méthode normalisée d'essai relative aux exigences de performance des batteries lithium-ion est indispensable pour fixer un niveau de sécurité de base et obtenir des données essentielles pour la conception des systèmes des véhicules et des packs de batteries.

Le présent document spécifie les essais de fiabilité et de traitement abusif des éléments lithium-ion destinés à la traction automobile qui diffèrent fondamentalement des autres éléments y compris ceux destinés aux applications portatives et fixes spécifiées par d'autres normes IEC. Dans le cas d'une application automobile, il est important de tenir compte de la spécificité d'usage, c'est-à-dire la diversité de conception des packs et des systèmes de batteries pour automobile, ainsi que la diversité des exigences spécifiques relatives aux éléments et aux batteries correspondant à chacune de ces conceptions. Basé sur ces faits, le but du présent document est de fournir une méthodologie fondamentale d'essai ayant une polyvalence générale, remplissant une fonction d'essais préliminaires communs pour les éléments lithium-ion destinés à être utilisés dans divers systèmes de batterie. Le présent document ne fournit aucun critère d'acceptation ou de refus pour les essais, mais spécifie une classification normalisée des descriptions de résultats d'essai.

Le présent document est associé à l'ISO 12405-4 [1][1].

L'IEC 62660-1 [2] spécifie les essais de performance des éléments lithium-ion pour application aux véhicules électriques.

L'IEC 62660-3 [3] spécifie les exigences de sécurité des éléments lithium-ion pour application aux véhicules électriques.

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1 Les chiffres entre crochets se réfèrent à la Bibliographie.

ÉLÉMENTS D'ACCUMULATEURS LITHIUM-ION POUR LA PROPULSION DES VÉHICULES ROUTIERS ÉLECTRIQUES –

Partie 2: Essais de fiabilité et de traitement abusif

1 Domaine d'application

La présente partie de l'IEC 62660 spécifie les procédures d'essai destinées à observer la fiabilité et le comportement sous traitement abusif des éléments et des blocs d'éléments d'accumulateurs lithium-ion utilisés pour la propulsion des véhicules électriques, y compris les véhicules électriques à batterie (BEV) et les véhicules électriques hybrides (HEV).

NOTE 1 Les éléments d'accumulateurs lithium-ion pour la propulsion des véhicules électriques hybrides rechargeables (PHEV) peuvent être soumis à l'essai avec la procédure pour application BEV ou pour application HEV, selon la conception des systèmes de batteries, sur la base de l'accord entre le fabricant de l'élément et le client.

Le présent document spécifie les procédures et les conditions d'essai normalisées pour des caractéristiques fondamentales des éléments lithium-ion utilisés pour la propulsion des véhicules électriques à batterie d'accumulateurs et hybrides. Les essais sont indispensables pour obtenir des données importantes sur la fiabilité et sur le comportement sous traitement abusif des éléments lithium-ion utilisés dans différentes conceptions de systèmes de batteries et de packs de batteries.

Le présent document donne une classification normalisée de la description des résultats d'essai à utiliser pour la conception des systèmes de batteries et des packs de batteries.

NOTE 2 Des blocs d'éléments peuvent être utilisés à la place d'éléments conformément à l'accord entre le fabricant de l'élément et le client.

NOTE 3 Les exigences de sécurité des éléments lithium-ion pour application aux véhicules électriques sont définies dans l'IEC 62660-3 [3].

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60068-2-64, *Essais d'environnement – Partie 2-64: Essais – Essai Fh: Vibrations aléatoires à large bande et guide*

ISO 16750-3, *Véhicules routiers – Spécifications d'environnement et essais des équipements électrique et électronique – Partie 3: Contraintes mécaniques*

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