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# INTERNATIONAL STANDARD



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## Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 3: Safety requirements

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**SECONDARY LITHIUM-ION CELLS FOR THE PROPULSION  
OF ELECTRIC ROAD VEHICLES –****Part 3: Safety requirements****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.
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**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62660-3:2016. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

IEC 62660-3 has been prepared by IEC technical committee 21: Secondary cells and batteries. It is an International Standard.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision.

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

- a) The new method for the internal short-circuit test has been added in 6.4.4.2.2 and Annex C, as an alternative option to the test in 6.4.4.2.1.
- b) The vibration test has been deleted.
- c) The test conditions of overcharge (6.4.2.2) have been partially revised.

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

Draft	Report on voting
21/1133/FDIS	21/1137/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 [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

A list of all 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.

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

- reconfirmed,
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- amended.

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

~~The electric road vehicles (EV) including hybrid and plug-in hybrid electric vehicles are beginning to diffuse in the global market with backing from global concerns on CO<sub>2</sub> reduction and energy, recent advances in technology and cost reduction. This has led to a rapidly increasing demand for high-power and high-energy density traction batteries represented by lithium-ion batteries.~~

~~For securing a basic level of quality of lithium-ion batteries for automotive applications, relevant international standards, i.e. IEC 62660-1, IEC 62660-2, ISO 12405-1 and ISO 12405-2, have been published. These standards specify the performance, reliability and abuse testing of lithium-ion battery cells, packs and systems for EV applications. Further, in the light of increasing concerns on the safety of lithium-ion batteries and demand for a referenceable international standard, safety requirements for lithium-ion battery packs and systems are defined in ISO 12405-3. Regulations, such as UN ECE R100, are also being revised that include acceptance criteria for rechargeable energy storage systems of EVs.~~

~~It is essential to specify the safety criteria at cell level in this standard, in order to secure the basic safety level of cells which differ in performance and design, and are applied to a variety of types of packs and systems. For automobile applications, it is important to note 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 standard is to provide a basic level of safety test methodology and criteria with general versatility, which serves a function in common primary testing of lithium-ion cells to be used in a variety of battery systems. Specific requirements for the safety of cells differ depending on the system designs of battery packs or vehicles, and should be evaluated by the users. Final pass-fail criteria of cells are to be based on the agreement between the cell manufacturers and the customers.~~

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

## Part 3: Safety requirements

### 1 Scope

This part of IEC 62660 specifies test procedures and acceptance criteria for safety performance of secondary lithium-ion cells and cell blocks used for propulsion of electric vehicles (EV) including battery electric vehicles (BEV) and hybrid electric vehicles (HEV).

~~NOTE 1—Cell blocks can be used as an alternative to cells according to the agreement between the manufacturer and the customer.~~

~~NOTE 2—Concerning the cell for plug-in hybrid electric vehicle (PHEV), the manufacturer can select either the test condition of the BEV application or the HEV application.~~

This document determines the basic safety performance of cells used in a battery pack and system under intended use and reasonably foreseeable misuse or incident, during the normal operation of the EV. The safety requirements of the cell in this document are based on the premise that the cells are properly used in a battery pack and system within the limits for voltage, current and temperature as specified by the cell manufacturer (cell operating region).

The evaluation of the safety of cells during transport and storage is not covered by this document.

NOTE 1 The safety performance requirements for lithium-ion battery packs and systems are defined in ~~ISO 12405-3~~ ISO 6469-1. The specifications and safety requirements for lithium-ion battery packs and systems of electrically propelled mopeds and motorcycles are defined in ISO 18243. IEC 62619 covers the safety requirements for the lithium-ion cells and batteries for industrial applications, including, for example, forklift trucks, golf carts, and automated guided vehicles.

~~NOTE 4—Information on the cell operating region is provided in Annex A.~~

NOTE 2 Lithium cells, modules, battery packs, and battery systems are regulated by International Air Transport Association (IATA) and International Maritime Organization (IMO) for air and sea transport, and, regionally, by other authorities, mainly for land transport. Refer to IEC 62281 for additional information.

### 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 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 62619:—<sup>1</sup>, Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications

<sup>1</sup> Second edition under preparation. Stage at the time of publication: IEC FDIS 62619:2015/2021.

| IEC 62660-2:~~2010~~2018, *Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 2: Reliability and abuse testing*

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



# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Secondary lithium-ion cells for the propulsion of electric road vehicles –  
Part 3: Safety requirements**

**Éléments d'accumulateurs lithium-ion pour la propulsion des véhicules routiers  
électriques –  
Partie 3: Exigences de sécurité**

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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

### Part 3: Safety requirements

#### 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.
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<sup>1</sup> Second edition under preparation. Stage at the time of publication: IEC FDIS 62619:2021.

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## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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

#### Partie 3: Exigences de sécurité

##### AVANT-PROPOS

- 1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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L'IEC 62660-3 a été établie par le comité d'études 21 de l'IEC: Accumulateurs. Il s'agit d'une Norme internationale.

Cette deuxième édition annule et remplace la première édition parue en 2016. Cette édition constitue une révision technique.

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

- a) La nouvelle méthode pour l'essai de court-circuit interne a été ajoutée au 6.4.4.2.2 et à l'Annexe C, comme option alternative à l'essai au 6.4.4.2.1.
- b) L'essai de vibration a été supprimé.
- c) Les conditions d'essai de la surcharge (6.4.2.2) ont été partiellement révisées.

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

Projet	Rapport de vote
21/1133/FDIS	21/1137/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). Les principaux types de documents développés par l'IEC sont décrits plus en détail sous [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

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.

Le comité a décidé que le contenu du présent document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous [webstore.iec.ch](http://webstore.iec.ch) dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé,
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- amendé.

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

## Partie 3: Exigences de sécurité

### 1 Domaine d'application

La présente partie de l'IEC 62660 spécifie les procédures d'essai et les critères d'acceptation en matière de performance de sécurité des éléments d'accumulateurs lithium-ion et des blocs d'éléments utilisés pour la propulsion des véhicules électriques (VE), y compris les véhicules électriques à batterie (VEB) et les véhicules électriques hybrides (VEH).

Le présent document a pour objet de déterminer les performances de sécurité de base des éléments utilisés dans un groupe et système de batteries dans les conditions d'utilisation prévue et les mauvaises utilisations ou incidents raisonnablement prévisibles, pendant le fonctionnement normal du VE. Dans le présent document, les exigences de sécurité de l'élément s'appuient sur l'hypothèse selon laquelle les éléments sont correctement utilisés dans un groupe et système de batteries dans les limites de tension, de courant et de température spécifiées par le fabricant de l'élément (plage de fonctionnement de l'élément).

L'évaluation de la sécurité des éléments pendant le transport et le stockage n'est pas couverte par le présent document.

NOTE 1 Les exigences de performance de sécurité des groupes et systèmes de batteries lithium-ion sont définies dans l'ISO 6469-1. Les spécifications et exigences de sécurité des groupes et systèmes de batteries lithium-ion des cyclomoteurs et motocycles à propulsion électrique sont définies dans l'ISO 18243. L'IEC 62619 traite des exigences de sécurité des accumulateurs lithium-ion pour les applications industrielles, comprenant par exemple le chariot élévateur à fourche, la voiturette de golf et le véhicule à guidage automatique.

NOTE 2 Les éléments, les modules, les groupes et systèmes de batteries au lithium sont réglementés par l'Association du Transport Aérien International (IATA) et l'Organisation maritime internationale (OMI) pour le transport aérien et maritime, et, au niveau régional, par d'autres autorités, principalement pour le transport terrestre. Se reporter à l'IEC 62281 pour des informations supplémentaires.

### 2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils 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 62619:—<sup>1</sup>, *Accumulateurs alcalins et autres accumulateurs à électrolyte non acide – Exigences de sécurité pour les accumulateurs au lithium pour utilisation dans des applications industrielles*

IEC 62660-2:2018, *Éléments d'accumulateurs lithium-ion pour la propulsion des véhicules routiers électriques – Partie 2: Essais de fiabilité et de traitement abusif*

ISO/TR 8713, *Véhicules routiers électriques – Vocabulaire*

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<sup>1</sup> Deuxième édition en cours d'élaboration. Stade au moment de la publication: IEC FDIS 62619:2021.