



IEC 62660-3

Edition 2.0 2022-03
REDLINE VERSION

INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.220.20; 43.120

ISBN 978-2-8322-1086-1

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CONTENTS

FOREWORD	4
INTRODUCTION	7
1 Scope	7
2 Normative references	7
3 Terms and definitions	8
4 Test conditions	10
4.1 General	10
4.2 Measuring instruments	10
4.2.1 Range of measuring devices	11
4.2.2 Voltage measurement	11
4.2.3 Current measurement	11
4.2.4 Temperature measurements	11
4.2.5 Other measurements	12
4.3 Tolerance	12
4.4 Test temperature Thermal stabilization	13
5 Electrical measurement	13
5.1 General charge conditions	13
5.2 Capacity	13
5.3 SOC adjustment	13
6 Safety tests	13
6.1 General	13
6.2 Mechanical tests	14
6.2.1 Vibration	14
6.2.1 Mechanical shock	14
6.2.2 Crush	14
6.3 Thermal test	15
6.3.1 High temperature endurance	15
6.3.2 Temperature cycling	16
6.4 Electrical tests	16
6.4.1 External short-circuit	16
6.4.2 Overcharge	16
6.4.3 Forced discharge	17
6.4.4 Internal short-circuit test	17
Annex A (informative) Operating region of cells for safe use	20
A.1 General	20
A.2 Charging conditions for safe use	20
A.2.1 General	20
A.2.2 Consideration on charging voltage	20
A.2.3 Consideration on temperature	21
A.3 Example of operating region	22
Annex B (informative) Explanation for the internal short-circuit test	23
B.1 General concept	23
B.2 Internal short-circuit caused by the particle contamination	23
Annex C (normative) Alternative internal short-circuit test (6.4.4.2.2)	25
C.1 General	25

C.2	Test preparation and test set-up	25
C.2.1	Preparation of cell before the test	25
C.2.2	Test setup	27
C.2.3	Preliminary test	28
C.3	Test procedure.....	29
C.4	Acceptance criteria	29
Bibliography		30
Figure 1	– Example of temperature measurement of cell.....	12
Figure 2	– Example of crush test.....	15
Figure A.1	– An example of operating region for charging of typical lithium-ion cells	22
Figure A.2	– An example of operating region for discharging of typical lithium-ion cells	22
Figure C.1	– Example of case thinning.....	25
Figure C.2	– Example of thinning tool	26
Figure C.3	– Example of removing hard case.....	26
Figure C.4	– Example of hard case removal method during cell manufacturing	26
Figure C.5	– Example of fixation of cell.....	27
Figure C.6	– Test setup image for voltage measurement.....	27
Figure C.7	– Example of abrupt voltage drop	28
Table B.1	– Examples of the internal short-circuit of cell	24

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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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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. The main document types developed by IEC are described in greater detail at 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.

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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 CO₂ 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:—¹, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications*

¹ **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**

CONTENTS

FOREWORD	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 Test conditions	9
4.1 General	9
4.2 Measuring instruments	9
4.2.1 Range of measuring devices	9
4.2.2 Voltage measurement	9
4.2.3 Current measurement	9
4.2.4 Temperature measurements	9
4.2.5 Other measurements	10
4.3 Tolerance	10
4.4 Thermal stabilization	10
5 Electrical measurement	10
5.1 General charge conditions	10
5.2 Capacity	11
5.3 SOC adjustment	11
6 Safety tests	11
6.1 General	11
6.2 Mechanical tests	12
6.2.1 Mechanical shock	12
6.2.2 Crush	12
6.3 Thermal test	13
6.3.1 High temperature endurance	13
6.3.2 Temperature cycling	13
6.4 Electrical tests	14
6.4.1 External short-circuit	14
6.4.2 Overcharge	14
6.4.3 Forced discharge	14
6.4.4 Internal short-circuit test	15
Annex A (informative) Operating region of cells for safe use	17
A.1 General	17
A.2 Charging conditions for safe use	17
A.2.1 General	17
A.2.2 Consideration on charging voltage	17
A.2.3 Consideration on temperature	18
A.3 Example of operating region	19
Annex B (informative) Explanation for the internal short-circuit test	20
B.1 General concept	20
B.2 Internal short-circuit caused by the particle contamination	20
Annex C (normative) Alternative internal short-circuit test (6.4.4.2.2)	22
C.1 General	22
C.2 Test preparation and test set-up	22
C.2.1 Preparation of cell before the test	22

C.2.2	Test setup	24
C.2.3	Preliminary test	25
C.3	Test procedure.....	26
C.4	Acceptance criteria	26
Bibliography		27
Figure 1	– Example of temperature measurement of cell.....	10
Figure 2	– Example of crush test.....	13
Figure A.1	– An example of operating region for charging of typical lithium-ion cells	19
Figure A.2	– An example of operating region for discharging of typical lithium-ion cells	19
Figure C.1	– Example of case thinning	22
Figure C.2	– Example of thinning tool	23
Figure C.3	– Example of removing hard case	23
Figure C.4	– Example of hard case removal method during cell manufacturing	23
Figure C.5	– Example of fixation of cell	24
Figure C.6	– Test setup image for voltage measurement.....	24
Figure C.7	– Example of abrupt voltage drop	25
Table B.1	– Examples of the internal short-circuit of cell	20

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SOMMAIRE

AVANT-PROPOS	30
1 Domaine d'application	32
2 Références normatives	32
3 Termes et définitions	33
4 Conditions d'essai	35
4.1 Généralités	35
4.2 Instruments de mesure	36
4.2.1 Plage de mesure des dispositifs de mesure	36
4.2.2 Mesurage de la tension	36
4.2.3 Mesurage du courant	36
4.2.4 Mesurages de la température	36
4.2.5 Autres mesurages	36
4.3 Tolérance	37
4.4 Stabilisation thermique	37
5 Mesurage électrique	37
5.1 Conditions générales de charge	37
5.2 Capacité	37
5.3 Ajustement de l'état de charge	37
6 Essais de sécurité	38
6.1 Généralités	38
6.2 Essais mécaniques	38
6.2.1 Choc mécanique	38
6.2.2 Compression	39
6.3 Essais thermiques	40
6.3.1 Endurance à haute température	40
6.3.2 Cycles de température	40
6.4 Essais électriques	40
6.4.1 Court-circuit externe	40
6.4.2 Surcharge	41
6.4.3 Décharge forcée	41
6.4.4 Essai de court-circuit interne	41
Annexe A (informative) Plage de fonctionnement des éléments pour une utilisation en toute sécurité	43
A.1 Généralités	43
A.2 Conditions de charge pour une utilisation en toute sécurité	43
A.2.1 Généralités	43
A.2.2 Considérations relatives à la tension de charge	43
A.2.3 Considérations relatives à la température	44
A.3 Exemple de plage de fonctionnement	45
Annexe B (informative) Explication pour l'essai de court-circuit interne	47
B.1 Concept général	47
B.2 Court-circuit interne provoqué par une contamination par particules	47
Annexe C (normative) Essai de court-circuit interne alternatif (6.4.4.2.2)	49
C.1 Généralités	49
C.2 Préparation et mise en place du dispositif d'essai	49

C.2.1	Préparation de l'élément avant l'essai.....	49
C.2.2	Mise en place du dispositif d'essai.....	51
C.2.3	Essai préliminaire	52
C.3	Procédure d'essai	53
C.4	Critères d'acceptation	54
	Bibliographie.....	55
	Figure 1 – Exemple de mesurage de température d'un élément	36
	Figure 2 – Exemple d'essai de compression	39
	Figure A.1 – Exemple de plage de fonctionnement pour la charge des éléments au lithium-ion classiques.....	45
	Figure A.2 – Exemple de plage de fonctionnement pour la décharge des éléments au lithium-ion classiques.....	46
	Figure C.1 – Exemple d'amincissement d'un boîtier	49
	Figure C.2 – Exemple d'outil d'amincissement	50
	Figure C.3 – Exemple de retrait d'un boîtier rigide	50
	Figure C.4 – Exemple de méthode de retrait d'un boîtier rigide pendant la fabrication d'un élément	51
	Figure C.5 -Exemple de fixation d'un élément	51
	Figure C.6 – Image de la mise en place du dispositif d'essai pour le mesurage de la tension.....	52
	Figure C.7 – Exemple de chute de tension soudaine	53
	Tableau B.1 – Exemples de courts-circuits internes de l'élément	48

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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

Partie 3: Exigences de sécurité

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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. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous 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 dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture du présent document indique qu'il contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer le présent document en utilisant une imprimante couleur.

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:—¹, *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*

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