

**Safety of primary and secondary lithium cells and
batteries during transport (IEC 62281:2019 +
IEC 62281:2019/A1:2021 +
IEC 62281:2019/AMD2:2023)**

EESTI STANDARDI EESSÕNA**NATIONAL FOREWORD**

See Eesti standard EVS-EN IEC 62281:2019+A1+A2:2023 sisaldab Euroopa standardi EN IEC 62281:2019 ja selle muudatuste A1:2021 ja A2:2023 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 62281:2019+A1+A2:2023 consists of the English text of the European standard EN IEC 62281:2019 and its amendments A1:2021 and A2:2023.
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English Version

**Safety of primary and secondary lithium cells and batteries
during transport
(IEC 62281:2019 + IEC 62281:2019/A1:2021 + IEC
62281:2019/AMD2:2023)**

Sécurité des piles et des accumulateurs au lithium pendant
le transport
(IEC 62281:2019 + IEC 62281:2019/A1:2021 + IEC
62281:2019/AMD2:2023)

Sicherheit von Primär- und Sekundär-Lithiumzellen und -
batterien beim Transport
(IEC 62281:2019 + IEC 62281:2019/A1:2021 + IEC
62281:2019/AMD2:2023)

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

The text of document 35/1416/FDIS, future edition 4 of IEC 62281, prepared by IEC/TC 35 "Primary cells and batteries" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62281:2019.

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IEC 60068-2-6	NOTE	Harmonized as EN 60068-2-6
IEC 60068-2-27	NOTE	Harmonized as EN 60068-2-27
IEC 60086-4	NOTE	Harmonized as EN 60086-4
IEC 61960-3	NOTE	Harmonized as EN 61960-3
IEC 62133-2	NOTE	Harmonized as EN 62133-2
IEC 62660-1	NOTE	Harmonized as EN IEC 62660-1

A1 Amendment A1 European foreword

The text of document 35/1459/FDIS, future IEC 62281/A1, prepared by IEC/TC 35 "Primary cells and batteries" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62281:2019/A1:2021.

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A₂ Amendment A2 European foreword

The text of document 35/1511/FDIS, future IEC 62281/AMD2, prepared by IEC/TC 35 "Primary cells and batteries" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62281:2019/A2:2023.

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INTERNATIONAL STANDARD

NORME INTERNATIONALE



Safety of primary and secondary lithium cells and batteries during transport

Sécurité des piles et des accumulateurs au lithium pendant le transport



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Edition 4.2 2023-02
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Safety of primary and secondary lithium cells and batteries during transport

Sécurité des piles et des accumulateurs au lithium pendant le transport

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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ELECTROTECHNIQUE
INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF PRIMARY AND SECONDARY LITHIUM CELLS
AND BATTERIES DURING TRANSPORT**

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This fourth edition cancels and replaces the third 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) button cell definition revised, moved to coin (cell or battery);
- b) addition of provisions for batteries forming an integral part of equipment (5.4);
- c) all tests for secondary cells and batteries now also contain a requirement for 25 charge and recharge cycles prior to the test;
- d) addition of alternative tables for Table 1 and Table 2 in Annex B;
- e) addition of "forcible" to the rupture criteria;
- f) test report 6.8 merged with test certificate 6.9 and replaced with the items listed in [12];

- g) addition of an informative 0 with important deviations from the UN Manual of Tests and Criteria, Chapter 38.3.

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

FDIS	Report on voting
35/1416/FDIS	35/1422/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.

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AMENDMENT A1 FOREWORD

This amendment has been prepared jointly by IEC technical committee 35: Primary cells and batteries and subcommittee 21A: Secondary cells and batteries containing alkaline or other non-acid electrolytes, of IEC technical committee 21: Secondary cells and batteries.

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

FDIS	Report on voting
35/1459/FDIS	35/1463/RVD

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A2 Amendment A2 FOREWORD

Amendment 2 to IEC 62281:2021 has been prepared jointly by IEC technical committee 35: Primary cells and batteries and subcommittee 21A: Secondary cells and batteries containing alkaline or other non-acid electrolytes, of IEC technical committee 21: Secondary cells and batteries.

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

Draft	Report on voting
35/1511/FDIS	35/1513/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 Amendment 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/.

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INTRODUCTION

Primary lithium cells and batteries were first introduced in military applications in the 1970s. At that time, little commercial interest and no industrial standards existed. Consequently, the United Nations (UN) Committee of Experts on the Transport of Dangerous Goods, although usually referring to industrial standards for testing and criteria, introduced a sub-section in the Manual of tests and criteria concerning safety tests relevant to transport of primary lithium cells and batteries. Meanwhile, commercial interest in primary and secondary (rechargeable) lithium cells and batteries has grown and several industrial standards exist. However, the existing IEC standards are manifold, not completely harmonized, and not necessarily relevant to transport. They are not suitable to be used as a source of reference in the UN Model Regulations. Therefore this group safety standard has been prepared to harmonize the tests and requirements relevant to transport.

This document applies to primary and secondary (rechargeable) lithium cells and batteries containing lithium in any chemical form: lithium metal, lithium alloy or lithium-ion. Lithium-metal and lithium alloy primary electrochemical systems use metallic lithium and lithium alloy, respectively, as the negative electrode. Lithium-ion secondary electrochemical systems use intercalation compounds (intercalated lithium exists in an ionic or quasi-atomic form within the lattice of the electrode material) in the positive and in the negative electrodes.

This document also applies to lithium polymer cells and batteries, which are considered either as primary lithium-metal cells and batteries or as secondary lithium-ion cells and batteries, depending on the nature of the material used in the negative electrode.

The history of transporting primary and secondary lithium cells and batteries is worth noting. Since the 1970s, over ten billion primary lithium cells and batteries have been transported, and since the early 1990s, over one billion secondary (rechargeable) lithium cells and batteries utilizing a lithium-ion system have been transported. As the number of primary and secondary lithium cells and batteries to be transported is increasing, it is appropriate to also include in this document the safety testing of packaging used for the transportation of these products.

This document specifically addresses the safety of primary and secondary lithium cells and batteries during transport and also the safety of the packaging used.

The UN Manual of Tests and Criteria [12]¹ distinguishes between lithium metal and lithium alloy cells and batteries on the one hand, and lithium ion and lithium polymer cells and batteries on the other hand. While it defines that lithium metal and lithium alloy cells and batteries can be either primary (non-rechargeable) or rechargeable, it always considers lithium ion cells and batteries as rechargeable. However, test methods in the UN Manual of Tests and Criteria are the same for both secondary lithium metal and lithium alloy cells and batteries and lithium ion and lithium polymer cells and batteries. The concept is only needed to distinguish between small and large battery assemblies. Battery assemblies assembled from (primary or secondary) lithium metal and lithium alloy batteries are distinguished by the aggregate lithium content of all anodes (measured in grams), while battery assemblies assembled from lithium ion or lithium polymer batteries are distinguished by their "nominal" energy (measured in Watt-hours).

¹ Numbers in square brackets refer to the Bibliography.

A2 INTRODUCTION to Amendment 2

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

- a) Changes based on amendments to chapter 38.3 of the UN Manual of Tests and Criteria as published in UN document ST/SG/AC.10/11/Rev.7/Amend.1;
- b) Addition of "assembled from batteries that have passed all applicable tests" to 5.3.3, based on chapter 38.3.3 g) of the UN Manual of tests and criteria as published in UN document ST/SG/AC.10/11/Rev.7. **A2**

SAFETY OF PRIMARY AND SECONDARY LITHIUM CELLS AND BATTERIES DURING TRANSPORT

1 Scope

This International Standard specifies test methods and requirements for primary and secondary (rechargeable) lithium cells and batteries to ensure their safety during transport other than for recycling or disposal. Requirements specified in this document do not apply in those cases where special provisions given in the relevant regulations, listed in 7.3, provide exemptions.

NOTE Different standards may apply for lithium-ion traction battery systems used for electrically propelled road vehicles.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

aggregate lithium content

total lithium content of the cells comprising a battery

3.2

battery

one or more cells electrically connected and fitted in a case, with terminals, markings and protective devices etc., as necessary for use

Note 1 to entry: This definition is different from the definition used in the UN Manual of Tests and Criteria [12]. This document was, however, carefully prepared so that the test set-up for each test is harmonized with the UN Manual.

Note 2 to entry: A cell used in equipment where the equipment is providing the functions of a case, terminals, markings and protective devices etc., as necessary for use in the equipment, is, for the purposes of this document, considered to be a battery.

[SOURCE: IEC 60050-482:2004 [1], 482-01-04, modified – Reference to "electrically connected" has been added.]

3.3

battery assembly

battery comprising two or more batteries

3.4

coin cell or battery

lithium button cell or battery

small round cell or battery where the overall height is less than the diameter, containing non-aqueous electrolyte