

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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CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Requirements for safety.....	11
4.1 General considerations	11
4.2 Quality plan	11
4.3 Packaging.....	11
5 Type testing, sampling and re-testing	11
5.1 Type testing	11
5.2 Overcharge protection	12
5.3 Battery assemblies.....	12
5.3.1 General	12
5.3.2 Small battery assemblies	12
5.3.3 Large battery assemblies.....	12
5.4 Batteries forming an integral part of equipment.....	12
5.5 Sampling.....	12
5.6 Re-testing	13
6 Test methods and requirements.....	14
6.1 General.....	14
6.1.1 Cautionary notice.....	14
6.1.2 Ambient temperature	14
6.1.3 Parameter measurement tolerances	14
6.1.4 Pre-discharge and pre-cycling	14
6.2 Evaluation of test criteria	14
6.2.1 Shifting	14
6.2.2 Distortion.....	14
6.2.3 Short-circuit.....	15
6.2.4 Excessive temperature rise.....	15
6.2.5 Leakage	15
6.2.6 Venting.....	15
6.2.7 Fire.....	15
6.2.8 Rupture	15
6.2.9 Explosion.....	15
6.3 Tests and requirements – Overview	16
6.4 Transport tests.....	16
6.4.1 Test T-1: Altitude	16
6.4.2 Test T-2: Thermal cycling	16
6.4.3 Test T-3: Vibration	17
6.4.4 Test T-4: Shock	18
6.4.5 Test T-5: External short-circuit.....	18
6.4.6 Test T-6: Impact/crush.....	19
6.5 Misuse tests.....	21
6.5.1 Test T-7: Overcharge.....	21
6.5.2 Test T-8: Forced discharge.....	21

6.6	Packaging test – Test P-1: Drop test.....	21
6.7	Information to be given in the relevant specification	22
6.8	Test report summary	22
7	Information for safety.....	23
7.1	Packaging	23
7.2	Handling of battery cartons	23
7.3	Transport	23
7.3.1	General	23
7.3.2	Air transport.....	23
7.3.3	Sea transport.....	23
7.3.4	Land transport	23
7.3.5	Classification	23
7.4	Storage.....	24
8	Instructions for packaging and handling during transport – Quarantine	24
9	Marking	24
9.1	Marking of primary and secondary (rechargeable) cells and batteries	24
9.2	Marking of the packaging and shipping documents	24
Annex A (informative)	Shock test – adjustment of acceleration for large batteries	25
A.1	General.....	25
A.2	Shock energy depends on mass, acceleration, and pulse duration	25
A.3	The constant acceleration approach.....	26
A.4	The constant energy approach.....	27
Annex B (informative)	Deviations from Chapter 38.3 of the UN Manual	28
B.1	General.....	28
B.2	Summary table of required tests for primary cells and batteries	28
B.3	Summary table of required tests for rechargeable cells and batteries	29
B.4	Evaluation of a rupture.....	31
B.5	Evaluation of an explosion	31
Bibliography	32
Figure 1	– Example of a test set-up for the impact test.....	20
Figure A.1	– Half sine shock for batteries (constant peak acceleration).....	26
Figure A.2	– Half sine shock for batteries (constant energy)	27
Table 1	– Number of primary test cells and batteries for type testing	13
Table 2	– Number of secondary test cells and batteries for type testing	13
Table 3	– Number of packages with primary or secondary test cells and batteries.....	13
Table 4	– Mass loss limits.....	15
Table 5	– Transport and packaging tests and requirements	16
Table 6	– Vibration profile (sinusoidal).....	17
Table 7	– Shock parameters	18
Table B.1	– Summary table of required tests for primary cells and batteries.....	29
Table B.2	– Summary table of required tests for rechargeable cells and batteries	30

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF PRIMARY AND SECONDARY LITHIUM CELLS AND BATTERIES DURING TRANSPORT

FOREWORD

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International Standard IEC 62281 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.

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 Annex B 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.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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

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.

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