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IEC 63218

Edition 1.0 2021-08

INTERNATIONAL STANDARD

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colour inside

Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium, nickel cadmium and nickel-metal hydride cells and batteries for portable applications – Guidance on environmental aspects

Accumulateurs alcalins et autres accumulateurs à électrolyte non acide – Accumulateurs et batteries d'accumulateurs lithium, nickel-cadmium et nickel-métal hydrure pour applications portables – Recommandations relatives aux aspects environnementaux

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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SECONDARY CELLS AND BATTERIES CONTAINING ALKALINE OR OTHER NON-ACID ELECTROLYTES – SECONDARY LITHIUM, NICKEL CADMIUM AND NICKEL-METAL HYDRIDE CELLS AND BATTERIES FOR PORTABLE APPLICATIONS – GUIDANCE ON ENVIRONMENTAL ASPECTS

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

FDIS	Report on voting
21A/763/FDIS	21A/768/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.

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INTRODUCTION

Secondary batteries, such as secondary lithium, nickel cadmium (Ni-Cd) and nickel-metal hydride cells and batteries, consume a large amount of non-renewable resources like copper, manganese, lithium, and nickel. In addition to that, Ni-Cd cells and batteries include hazardous material like cadmium as a negative electrode. Nevertheless, there is no international environmental standard for secondary batteries.

The primary purpose of this document is to contribute to improving environmental sustainability by providing:

a) basic consideration and information relating to the environmental aspects and environmental impact of secondary cells and batteries;

b) basic guidance for the collection and recycling of secondary cells and batteries;

c) basic guidance for environmental impact assessment across all life cycle stages for the designing and manufacturing of secondary cells and batteries;

d) useful information for interested parties regarding regulations on secondary cells and batteries.

Additionally various countries and regions have their own environmental regulations for secondary cells and batteries. These differing regulations could lead to trade barriers in the future. Therefore, the secondary purpose of this document is to avoid potential trade barrier issues by providing countries and regions that lack secondary battery collection and recycling regulations with guidance with which they can establish harmonized standardization with the international standard.

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This document provides guidance and recommendations for the collection, recycling, environmental impact assessment, including design, manufacturing, transportation, storage and disposal of secondary cells and batteries.

Collection and recycling are activities that are conducted across national borders. Therefore, international standards are necessary in addition to transport regulations.

The expected users of this document are:

1) cell and battery manufacturers, end-product manufacturers, recycling organizations, transport organizations and distributors;

2) national, regional, and local authorities that establish the regulation of the collection and recycling, environmental impact assessment, including design, manufacturing, transportation, storage and disposal of secondary cells and batteries;

3) national, regional, and local authorities that revise the regulation of the collection and recycling, environmental impact assessment, including design, manufacturing, transportation, storage and disposal of secondary cells and batteries.

However, this document does not preclude other stakeholders from using this document.

National and regional standards, regulations and voluntary stewardship programmes are given priority in the matters covered in this document.

SECONDARY CELLS AND BATTERIES CONTAINING ALKALINE OR OTHER NON-ACID ELECTROLYTES – SECONDARY LITHIUM, NICKEL CADMIUM AND NICKEL-METAL HYDRIDE CELLS AND BATTERIES FOR PORTABLE APPLICATIONS – GUIDANCE ON ENVIRONMENTAL ASPECTS

1 Scope

This document provides requirements and recommendations on environmental aspects of secondary lithium, nickel cadmium and nickel-metal hydride cells and batteries for portable applications (hereafter referred to as “relevant secondary cells and batteries”).

Relevant secondary cells and batteries are specified within the scopes of IEC 61960-3, IEC 61960-4, IEC 61951-1, and IEC 61951-2.

NOTE Portable applications are defined in IEC 61960-3 as comprising hand-held equipment, transportable equipment, and movable equipment. See IEC 61960-3 for examples.

This document is not intended to be applied to batteries embedded in end-use products. Once the embedded battery is removed from an end-use product, this document becomes applicable to it.

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The safety and control circuits as well as cases associated with relevant secondary batteries, except for those forming part of an end-use product, are covered by this document as parts of the relevant secondary batteries.

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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 62133-2:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems*
IEC 62133-2:2017/AMD1:—[1]

IEC 62902, *Secondary cells and batteries – Marking symbols for identification of their chemistry*

ISO 7000, *Graphical symbols for use on equipment – Registered symbols*
(available at http://www.graphical-symbols.info/equipment)

ISO 14021:2016, *Environmental labels and declarations – Self-declared environmental claims (Type II environmental labelling)*

ISO 14040:2006, *Environmental management – Life cycle assessment – Principles and framework*

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[1] Under preparation. Stage at the time of publication: IEC FDIS 62133-2:2017/AMD1:2021

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
product
any goods or service

[SOURCE: ISO 14050:2020, 3.5.12]

3.2
waste battery
battery which the holder discards or intends or is required to discard

3.3
environment
surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelationships

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Note 1 to entry: Surroundings in this context extend from within an organization to the global system.

[SOURCE: ISO 14050:2020, 3.2.2, modified – Note to entry added.]

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3.4
environmental aspect
element of a product that, during its life cycle, can interact with the environment

3.5
environmental impact
change to the environment, wholly or partly resulting from a product environmental aspect

3.6
environmental impact assessment
process to determine the magnitude and significance of environmental impacts within the confines of the goals, scope, and objectively defined in the life cycle assessment

3.7
life cycle
consecutive and interlinked stages from raw material acquisition or generation from natural resources to final disposal

[SOURCE: ISO 14050:2020, 3.6.1]

3.8
life cycle thinking
LCT
consideration of all relevant environmental aspects during the entire life cycle of products

[SOURCE: IEC Guide 109:2012, 3.10]

3.9
life cycle assessment
LCA
compilation and assessment of the inputs, outputs and the potential environment impacts of a product system throughout its life cycle

[SOURCE: ISO 14050:2020, 3.6.2]

3.10
input
material or energy which enters a product system at any stage, from raw acquisition to final disposal

3.11
output
material or energy which leaves a product system at any stage, from raw acquisition to final disposal

3.12
end of life
EOL
life cycle stage of a product starting when it is finally removed from its intended use-phase

[SOURCE: IEC 62075:2012, 3.4, modified – The symbol has been added and "removed from a use stage" has been replaced with "finally removed from its intended use-phase" in the definition.]

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3.13
hazardous substance
substance that has, according to defined classification criteria, the potential for adversely impacting human health and/or the environment

Note 1 to entry: The criteria for determining whether a substance is classified as hazardous are defined by law or regulation.

[SOURCE: IEC Guide 109:2012, 3.6]

3.14
recycling
processing of plastics waste materials for the original purpose or for other purposes, excluding energy recovery

[SOURCE: ISO 15270:2008, 3.30]

3.15
recycling efficiency
ratio obtained by dividing the mass of output fractions accounting for recycling by the mass of the waste batteries input fraction expressed as a percentage

3.16
reuse
cell or battery life extension process which occurs after the EOL stage of end-use products has been reached

Note 1 to entry: Term entries 3.17 "originally intended reuse" and 3.18 "originally unintended reuse" are specific types of reuse.

3.17
originally intended reuse
operation by which secondary batteries that are not waste are used again in the same equipment as when first placed on the market as originally intended from the design stage, after refurbishing (intended refurbishing), or used again in equipment different from that when first placed on the market, but as originally intended from the design stage (intended repurposing)

Note 1 to entry: The term "repair" covers any process to recover the original performance of a secondary battery during first use, and "refurbishing" covers any process to recover original (or comparable) performance of a secondary battery after use in end-use equipment EOL.

3.18
originally unintended reuse
operation by which secondary batteries that are not waste are used again in the same equipment as when first placed on the market, but not as originally intended at the design stage, after refurbishing (unintended refurbishing), or used again in equipment different from that when first placed on the market, and not as originally intended at the design stage (unintended repurposing)

Note 1 to entry: The term "repair" covers any process to recover the original performance of a secondary battery during first use, and "refurbishing" covers any process to recover original (or comparable) performance of a secondary battery after use in end-use equipment EOL.

3.19
secondary cell
basic manufactured unit providing a source of electrical energy by direct conversion of chemical energy, that consists of electrodes, separators, electrolyte, container and terminals, and that is designed to be charged electrically

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3.20
secondary battery
assembly of secondary cell(s) which may include associated safety and control circuits and case, ready for use as a source of electrical energy characterized by its voltage, size, terminal arrangement, capacity and rate capability

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Note 1 to entry: The term "secondary battery" includes single cell batteries.

3.21
portable cell
cell intended for assembly in a portable battery

3.22
portable battery
battery for use in an end-use product or in an appliance which is conveniently hand-carried

3.23
lithium ion battery
Li-ion battery
secondary battery with an organic solvent electrolyte and positive and negative electrodes which utilize an intercalation or insertion compound in which lithium is stored

Note 1 to entry: A lithium ion battery does not contain lithium metal.

[SOURCE: IEC 60050-482:2004, 482-05-07, modified – The second preferred term "Li-ion battery" has been added, and the words "or insertion" have been added to the definition.]

3.24
nickel cadmium battery
Ni-Cd battery
secondary battery with an alkaline electrolyte, a positive electrode containing nickel hydroxide and a negative electrode of cadmium

[SOURCE: IEC 60050-482:2004, 482-05-02, modified – The term "nickel oxide cadmium battery" has been replaced with "Ni-Cd battery" and the words "nickel oxide" have been replaced with "nickel hydroxide" in the definition.]

3.25
nickel-metal hydride battery
Ni-MH battery
secondary battery with an electrolyte of aqueous potassium hydroxide, a positive electrode containing nickel as nickel hydroxide and a negative electrode of hydrogen in the form of a metal hydride

[SOURCE: IEC 60050-482:2004, 482-05-08, modified – The term "Ni-MH battery" has been added.]

3.26
carbon footprint
amount of carbon dioxide released into the atmosphere as the result of activities, usually expressed in equivalent tonnes of carbon dioxide (CO2). A standard concerning carbon footprint is under development (IEC 63369).

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4 General considerations

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Every cell or battery has some effect on the environment. And the process of anticipating or identifying a battery's environmental effects is complex. This is because these effects can occur at all stages of the product's life cycle and can be global, regional, local, or a combination of all three.

This document approaches environmental aspects and considerations as follows:

a) by identifying the critical environmental aspects of secondary cells and batteries according to the principles of life cycle thinking that are described in ISO Guide 64;
b) by the use of generally accepted environmental strategies listed in IEC Guide 109;
c) by considering that although attempts to address a given environmental effect can have consequences at any or all of the stages of a battery's life cycle, a battery's environmental effects should be balanced against other factors, including function, performance, safety and health, cost, marketability, and quality.

5 Requirements and recommendations

5.1 General

Secondary cells or batteries contain valuable substances and/or hazardous substances. In order to prevent the emission of hazardous substances into the environment, and to prevent the disposal of valuable materials, end-of-life secondary batteries should be managed by the following methods:

a) restriction of environmentally hazardous substances (5.3);
b) marking (5.4);
c) collection and sorting (5.5);
d) recycling (5.6).

The requirements and recommendations in this document other than those of 5.1 a) and 5.3 are not applied for small secondary coin cells which meet both the following conditions:

– there is insufficient space for the marking requirements in 5.1 b), and the collection and recycling of these small cells is not a practical means to save resources;
– if the internal resistance specified in Annex D of IEC 62133-2:2017 is greater than 3 Ω, the safety tests of IEC 62133-2 are not applied to these cells owing to a low safety risk.

See Annex A, Annex B, and Annex C for examples of regional regulations applicable and not applicable to batteries.

5.2 Environmental aspects of relevant secondary cells and batteries

5.2.1 Environmental aspects of relevant secondary cells and batteries including valuable and/or hazardous metals

Ni-Cd, Ni-MH, and Li-ion cells and batteries contain non-renewable resources. Among them, Li-ion cells and batteries use the greatest amount of resources as they are widely and increasingly used in various applications.

Although secondary cells and batteries may contain hazardous metals, they are used in essential applications, and therefore continue to be produced. Appropriate collection and recycling should be in place in order to limit the environmental harm of such substances contained in waste batteries.

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Battery collection and recycling helps to save resources and increases supply security by recovering valuable metals such as nickel and cobalt. The use of recycled metals from batteries can reduce energy consumption resulting from mining for resources.

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The items to be considered for an environmental impact assessment for relevant secondary cells and batteries that include valuable and/or hazardous metals are provided in Clause 6.

5.2.2 Environmental aspects of relevant secondary cells and batteries other than those specified in 5.2.1

For secondary batteries not specified in 5.2.1, environmental aspects should be assessed via an environmental impact assessment (Clause 6, Clause 7).

5.3 Requirements and recommendations on environmental hazardous substances

5.3.1 Heavy metals in relevant secondary cells and batteries

a) Mercury content shall be no more than 0,000 5 % by weight.
b) Lead content should be no more than 0,004 % by weight.
c) Cadmium content should be no more than 0,002 % by weight (this is not applicable to nickel cadmium batteries see 5.3.3).
d) Other materials such as nickel and cobalt but also the hazardous materials included in electrolyte are to be considered.

NOTE 1 Nickel and cobalt compounds can be hazardous, but only in specific chemical compositions.

NOTE 2 The reason for this document using a "shall" statement for mercury but "should" statements for the other heavy metals included in 5.3.1 is that in some countries it is law that mercury content in batteries may not exceed a limit of 0,000 5 % by weight. However, for the other heavy metals included in 5.3.1, there are limits for the contents in batteries, but a manufacturer can exceed the limits and mark the battery accordingly.

The contents limitation of each element is a percentage of the total weight of the relevant secondary cells or batteries.

5.3.2 Analysis methods

Analysis for mercury, cadmium and lead content should be implemented based on IEC 62321, IEC 62321-4, and IEC 62321-5.

5.3.3 Nickel cadmium cells and batteries

Nickel cadmium cells and batteries contain cadmium which is a hazardous substance. However, most nickel cadmium cells for portable applications have a sealed structure, so that cadmium is not exposed to the human body and can be used safely. See 5.3.1.

For example, nickel cadmium batteries perform well in low temperatures, do not have the risk of sudden death, have a very high reliability and are widely used in emergency equipment (e.g. emergency lighting, aviation, railways, etc.).

5.4 Marking

Marking according to battery chemistry is useful for improving sorting efficiency and ensuring safety in the collection and recycling processes.

a) Cells and batteries with a volume of more than 900 cm^3

- Relevant secondary cells and batteries shall be marked according to IEC 62902:2019.

NOTE 1 The scope of IEC 62902:2019 covers secondary batteries with a volume of more than 900 cm^3.

- The use of the recycling symbol specified in ISO 7000-1135:2004-01 shall be marked according to ISO 14021.

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NOTE 2 The recycling symbol ISO 7000-1135:2004-01 is used to indicate that the marked item or its material is part of a recovery or recycling process.

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b) Cells and batteries with a volume of 900 cm^3 or less

- Relevant secondary cells and batteries shall be marked according to national or regional regulations. If national or regional regulations are not available, the recycling symbol specified in ISO 7000-1135:2004-01, shall be marked according to ISO 14021.

In countries or regions that require a marking different from those specified in this document, that different marking should be used.

Markings should be placed on the outer surface of cells or batteries.

5.5 Collection and sorting

In countries and regions currently lacking secondary battery collection programmes, voluntary and co-regulated stewardship programmes are encouraged and recommended. In order to avoid possible safety issues, secondary battery collection programmes should follow good practices related to hazardous waste management. Protection of terminals is recommended to prevent short-circuits, which could result in a fire in the waste stream.

5.6 Recommendations to improve recycling possibilities

Recycling is the most useful means of preventing diffusion of hazardous substances and effective utilization of non-renewable resources. However more efficient recycling technology and systems are necessary in order to maximize the recycling potential of relevant secondary cells and batteries.

The opportunities for recycling can be increased by the design of batteries and by the development of more cost- and energy-efficient recycling technologies. The design of relevant secondary cells and batteries can affect their recyclability through the selection of materials that are compatible with recycling processes, as well as through form factors that result in the easy separation of parts and materials.