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REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Secondary cells and batteries – Marking symbols for identification of their chemistry

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SECONDARY CELLS AND BATTERIES – MARKING SYMBOLS FOR IDENTIFICATION OF THEIR CHEMISTRY

FOREWORD

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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 62902:2019. 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 62902 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 2019. This edition constitutes a technical revision.

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

a) Addition of an Introduction;
b) Addition of exemptions and clarifications for the marking background colour requirement;
c) Addition of a calculation method for the battery volume;
d) Addition of a new note to the Scope;
e) Addition of a term and definition for the principal display panel;
f) Addition of further chemistry information for Li-ion batteries;
g) Addition of a new subclause on adaptive size;
h) Clarification of the test methods for durability and permanence of the marking.

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

Draft	Report on voting
21/1195/CDV	21/1208/RVC

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/publications.

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 in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

This document introduces uniform marking symbols for the identification of the secondary battery chemistries prevailing on the market. A primary reason is that lead smelters around the world are reporting increasing numbers of lithium ion batteries finding their way into the lead-acid battery waste stream. Because the shape and design of these batteries sometimes is very similar, it can be difficult for sorting facilities and battery smelters to distinguish one technology from the other if there is no clear identification of the battery chemistry by marking symbols.

Processing lithium ion batteries within a lead smelter, e-waste facility, or municipal waste sorting facility, can result in fire or explosions, with numerous accidents or near-accidents already reported in European and US recycling facilities.

Besides lead-acid and lithium ion batteries, the labelling scheme should also apply to other battery chemistries with a significant market share, such as nickel metal hydride and nickel cadmium. Other batteries, such as sodium ion batteries, should be included in the marking scheme when their market share becomes significant.

A clear identification of the battery chemistry would be helpful throughout the entire battery lifetime, i.e. from the selection and purchase of a new battery (e.g. by economic operators as well as end users), to transportation, installation and use of the battery and then to waste battery collection, sorting, storage and treatment.

The following standards and recommendations were considered during the development of this document.

The Battery Association of Japan (BAJ) has issued "Guidelines for Recycle Mark on rechargeable cells and batteries for portable applications" which include an optional colour code system for identifying major (rechargeable) battery chemistries: Pb, Ni-Cd, Ni-MH, and Li-ion. These guidelines also distinguish different cathode materials as well as important impurities (mostly from the anode material)[1].

Call2Recycle has introduced in Canada and the United States of America a licensed labelling program for batteries. It is a non-profit organization that collects and recycles batteries on behalf of companies that pay a fee to license the label.

The recycling symbol required on batteries within the scope of this document is the general symbol for recovery/recyclable as standardised in ISO 7000-1135:2004-01, see item 1 in Table 1. It is worth noting the information that ISO provides for this symbol: Function/description: to indicate that the marked item or its material is part of a recovery or recycling process. Additional information: the symbol is applicable only to those products or materials for which at the end of life there is a well-established collection route and recycling process, and which does not significantly impair the effectiveness of other recycling schemes.

Battery marking can also be subject to regional legislation. One example being the crossed-out wheeled bin used in the European Union (EU) and in some other countries to make consumers aware of their obligation to make their batteries available for separate collection. Some other regulations, e.g. Regulation (EU) 2023/1542 on batteries and waste batteries, can require the use of additional symbols for substances of very high concern (SVHC), namely cadmium (Cd) and lead (Pb) exceeding certain concentration levels[2].

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1 For more information see the document referred to under "Source reference" for item 5 in Table 1.

2 Regulation EU 2023/1542 does not require the addition of the Hg symbol to the separate collection symbol. However, there is a requirement for max. 0,0005 % Hg for all batteries in Annex I *Restriction on substances* of the Batteries Regulation.

In a comment submitted by Battery Council International (BCI) on a request by the Environmental Protection Agency (USA) for information regarding the development of best practices for the collection of batteries to be recycled and voluntary battery labelling guidelines, it was suggested that battery labels should have a consistent and simple marking (e.g. a colour code) across all battery chemistries to encourage and aid appropriate handling which should, at a minimum, address three primary goals – in descending order of priority:

1) inform and educate consumers to keep batteries out of the trash and curbside recycling, and direct batteries to dedicated battery recycling networks where available;
2) provide consumers and recycling network employees with human-readable information to enable sorting of used batteries among major chemistry families (e.g. Pb, Li-ion, Ni-Cd, Ni-MH, and Li-metal);
3) if appropriate within a chemistry family, inform recyclers of the unique features, components or constituents or both, for recovery (e.g. cathode material).

Table 1 contains a list of recycling and ecolabels that can be expected on batteries.

Table 1 – Recycling and ecolabels regarding batteries

No.	Symbol	Official name	Alternative information	Purpose	Source reference
1		General symbol for recovery/recyclable	Möbius loop, three curved arrows	To indicate that the marked item or its material is part of a recovery or recycling process.	ISO 7000-1135:2004-01 www.iso.org/obp
2		4 in 1 symbol	The white interior shows 4 arrows pointing outwards		Environmental Protection Administration of Taiwan (Province of China)
3		Crossed-out wheeled bin		To indicate "separate collection" for all batteries and accumulators	Regulation (EU) 2023/1542
4		Call 2 Recycle battery seal		Private recycling program in the USA and Canada	Battery recycling Seal usage standards
5		Recycling symbol and chemistry for batteries[a]	Guidelines for recycle mark on batteries	Compliance with the Japanese Law for the Promotion of Effective Utilization of Resources	Tecchio, P. el al., Analysis of material efficiency aspects of personal computers product group, JRC Report EUR 28394 EN (2018), page 60
6		U.S. Mercury-Containing and Rechargeable Battery Recycling Act symbol (Battery Council International model)	See footnote[b]	See footnote[c]	42 U.S.C. § 14322(b)

[a] The symbol has two placeholders after "Li-ion" where codes for details of the chemistry are entered.

[b] Three chasing arrows or a comparable recycling symbol. For nickel-cadmium batteries, the symbol must also state "Ni-Cd" and the phrase "BATTERY MUST BE RECYCLED OR DISPOSED OF PROPERLY." For lead acid batteries, the symbol must also state "Pb" or the words "LEAD", "RETURN", and "RECYCLE" and if the regulated battery is sealed, the phrase "BATTERY MUST BE RECYCLED."

[c] Model symbol developed by Battery Council International for Small Sealed Lead Acid (SSLA) batteries in compliance with the U.S. Mercury-Containing and Rechargeable Battery Recycling Act. Variations allowed.

During the preparation of the second edition, the Scope of this document was subject to intensive discussions. One of the subjects that were discussed, was the inclusion of a battery's energy content. Some experts thought that a limit like the 100 Wh limit used in dangerous goods transportation regulations to distinguish between "fully regulated" and "exempted" when offering batteries for transport under UN numbers 3480 and 3481 could be suitable to distinguish between the different levels of labelling requirements. However, these thoughts were not pursued as they applied only to lithium ion batteries and could hardly be translated into a technology agnostic language. No generally acceptable calculation method was found that would enable the transfer of the energy limit from lithium ion batteries to other chemistries.

A limit of 100 Wh for lithium ion spare batteries in the Federal Aviation Administration (FAA) (of the United States) and International Air Transport Association (IATA) regulations for carry-on baggage on board of passenger aircraft was not considered to be suitable for consideration for similar reasons. The same applied even more to a mass limit of 500 g applicable during the collection of lithium batteries according to UNECE, Special Provision 636 of the Agreement for the carriage of Dangerous goods by Road (ADR).

Other suggestions were made to limit the Scope to batteries with one or more dimension(s) exceeding 5 cm or, in a different proposal, 100 mm. However, it could not be shown how these limits would correlate with each other and with the volume limit of 900 cm^3 and why they would be more suitable than the volume limit.

It was also discussed to add the following recommendation: "In addition, the markings may be used also on secondary battery packaging and in accompanying documents when secondary batteries are placed on the market".

SECONDARY CELLS AND BATTERIES – MARKING SYMBOLS FOR IDENTIFICATION OF THEIR CHEMISTRY

1 Scope

This document specifies methods for the clear identification of secondary cells, batteries, battery modules and monoblocs according to their chemistry (electrochemical storage technology).

~~The markings described in this document are applicable for secondary cells,batteries,battery modules andmonoblocs with a volume of more than 900 cm^3.~~

~~The marking of the chemistry is useful for the installation, operation and decommissioning phases of battery life.~~

The markings described in this document are applicable to

– secondary cells,
– batteries,
– battery modules, and
– monoblocs,

when they are placed on the market for end use and when their battery volume exceeds 900 cm^3.

The chemistry marking is useful for the installation, operation and decommissioning phases in the battery's life cycle.

Many recycling processes are chemistry specific, thus undesired events can occur when a battery which is not of the appropriate chemistry enters a given recycling process. Therefore, the battery is marked so as to identify its chemistry to ensure safe handling during sorting and recycling processes.

This document defines the conditions of use of the markings indicating the chemistry of these secondary batteries.

The details of markings and their application are defined in this document.

~~NOTE Nothing in this document precludes the marking of batteries with recycling and chemistry symbols required by state, federal, national or regional laws or regulations or with a seal under license by a national recycling program.~~

NOTE The 900 cm^3 limit has been chosen because it is a reasonable compromise between larger format batteries and small batteries. On small batteries, the space for additional labels is limited which can result in a readability conflict.

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 60896-21:2004, *Stationary lead-acid batteries – Part 21: Valve regulated types – Methods of test*

IEC 60896-22:2004, *Stationary lead-acid batteries – Part 22: Valve regulated types – Requirements*

IEC 61960-3:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications – Part 3: Prismatic and cylindrical lithium secondary cells and batteries made from them*

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

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
cell
basic functional unit, consisting of an assembly of electrodes, electrolyte, container, terminals and usually separators that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: IEC 60050-482:2004, 482-01-01, modified – The Note to entry has been ~~omitted~~ deleted.]

3.2
secondary cell
cell which is designated to be electrically recharged

[SOURCE: IEC 60050-482:2004, 482-01-03, modified – The Note to entry has been deleted.]

3.3
battery
one or more cells fitted with devices necessary for use, for example case, terminals, marking and protective devices

[SOURCE: IEC 60050-482:2004, 482-01-04]

3.4
battery volume
displacement of the battery

Note 1 to entry: Refer to Annex B for a method for the calculation of the displacement of a battery.

3.5
battery module
group of cells connected together either in a series and/or parallel configuration with or without protective devices (e.g. fuse or positive temperature coefficient, PTC) and monitoring circuitry

[SOURCE: IEC 62620:~~2014~~2023, 3.8, modified – The word "battery" has been added to the term, and "positive temperature coefficient" to the definition.]

~~**3.6**~~
~~**secondary lithium battery**~~
~~lithium battery which is designed to be electrically recharged~~

~~Note 1 to entry: The recharge is accomplished by way of a reversible chemical reaction.~~

~~[SOURCE: IEC 60050-482:2004, 482-01-03, modified – The term has been changed from "secondary cell" to "secondary lithium battery". In the definition, "cell" has become "lithium battery".]~~

3.6
monobloc battery
battery, with multiple separate but electrically connected cell compartments each of which is designed to house an assembly of electrodes, electrolyte, terminals or intercell connections and possible separators

[SOURCE: IEC 60050-482:2004, 482-02-17, modified –The word "interconnections" has been replaced with "intercell connections" in the definition and the Note to entry has been deleted.]

3.7
lead acid battery
secondary battery with aqueous electrolyte based on dilute sulfuric acid, a positive electrode of lead dioxide and a negative electrode of lead

[SOURCE: IEC 60050-482:2004, 482-05-01, modified – The term has been changed from "lead dioxide lead battery" to "lead acid battery", and the Note to entry has been deleted.]

3.8
valve regulated lead acid battery
VRLA battery
secondary battery in which cells are closed but have a valve which allows the escape of gas if the internal pressure exceeds a predetermined value

Note 1 to entry: The cell or battery cannot normally receive additions to the electrolyte.

Note 2 to entry: This note only applies to the French language.

[SOURCE: IEC 60050-482:2004, 482-05-15, modified – Note 2 to entry has been added.]

3.9
lithium ion battery
secondary battery with an organic solvent electrolyte and positive and negative electrodes which utilize an intercalation 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]

3.10
lithium metal battery
battery which incorporates one or more lithium cells with an organic solvent electrolyte or a solid electrolyte, a positive electrode and a negative electrode composed of lithium metal

3.11
nickel cadmium battery
secondary battery with an alkaline electrolyte, a positive electrode containing nickel oxide and a negative electrode of cadmium

[SOURCE: IEC 60050-482:2004, 482-05-02, modified – The first preferred term "nickel oxide cadmium battery" has been ~~omitted~~ deleted.]

3.12
nickel metal hydride 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]

3.13
marking
line, shape, pattern, letter or symbol on the surface, which helps to identify features of the marked product or material

3.14
symbol
written character or mark used to represent information

EXAMPLE The recycling symbol represents the information that the battery is to be recycled.

3.15
label
sheet with an adhesive layer containing information for application on products

3.16
principal display panel
portion of a battery's surface bearing the markings designed to be most prominently displayed, shown, presented, or examined under conditions of retail sale, handling, sorting, and inspection

4 Application of markings

4.1 General

Markings defined in Clause 5 are applicable to all products according to their size and configuration as defined in the scope of this document.

Each end product in accordance with this document shall be marked ~~in accordance with this Clause 4~~ before being placed on the market. For the purposes of this document, cells made available on the market for end use, are designated as batteries.

In case of dismantling the batteries into monoblocs and modules for the purpose of reuse of the monoblocs and modules, additional marking of these monoblocs or batteries shall be carried out in accordance with this document.

Single cells should not be marked if they are fitted into batteries or modules.

4.2 Marking of electrochemical battery systems

This marking is only applicable to secondary cells and batteries of the following chemistries:

a) lead acid (Pb),
b) nickel cadmium (Ni-Cd),
c) nickel metal hydride (Ni-MH),
d) lithium ion (Li-ion),

e) lithium metal (Li-metal).

Batteries or modules applying more than one of these chemistries shall be marked for all applied chemistries.

This marking is not applicable for batteries of other chemistries and technologies such as:

f) flow batteries,

~~g) sodium-sulfur high temperature batteries,~~

h) Na-NiCl high temperature batteries, and

i) all other chemistries not listed here.

ISO/IEC Guide 71:2014, *Guide for addressing accessibility in standards*, should be consulted when additional colours are standardized for marking of more electrochemical systems.

4.3 Marking requirements for additional chemistry information of Li-ion batteries

If applicable, for lithium ion batteries, codes A1 and A2 designating the basic materials of the negative and positive electrodes as specified in IEC 61960-3:2017, 5.1 shall be applied on the battery. These codes shall follow after "Li-ion", separated by a space.

EXAMPLE The required text of the marking for a Lithium ion battery with a negative electrode based on carbon and a positive electrode based on cobalt is: Li-ion IC.

4.4 Application of the markings on the battery

The markings can be fixed on the battery either by:

a) printing, or

b) labelling, or

c) other methods.

~~The markings shall be applied on the battery or modules before these are placed on the market.~~

The markings shall be visible, legible and indelible over the expected life of the batteries.

The markings with the design described in Clause 5 may be integrated into existing printings or labels.

The marking shall be placed on ~~the displayed side, which is the side on which the battery information is placed,~~ the principal display panel to achieve good visibility.

If, for design reasons or because of customer requirements, the marking cannot be placed on the ~~displayed side~~ principal display panel, the size of the marking shall nevertheless be as defined in 5.4.

5 Markings

5.1 Markings without recycling symbol

5.1.1 General

Markings shown in Figure 1 to Figure 5 shall be used if the recycling symbol is applied in other markings or if it is not necessary or if it is not possible to declare a recycling symbol ~~does not need to be declared or cannot be declared~~.

5.1.2 Lead acid batteries

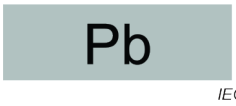


Figure 1 – Example of marking for lead acid batteries

5.1.3 Nickel cadmium batteries

Figure 2 – Example of marking for nickel cadmium batteries

5.1.4 Nickel metal hydride batteries

Figure 3 – Example of marking for nickel metal hydride batteries

5.1.5 Lithium ion batteries

Figure 4 – Example of marking for lithium ion batteries

5.1.6 Lithium metal batteries

Figure 5 – Example of marking for lithium metal batteries

5.2 Optional markings with recycling symbol

5.2.1 General

The markings shown in Figure 6 to Figure 10 with the recycling symbol in accordance with ISO 7000-1135:2004-01 shall be used in the event that the recycling symbol is not applied in other markings and if it is necessary to declare a recycling symbol ~~needs to be declared~~.

NOTE The applicability and meaning of the recycling symbol can vary by country.

5.2.2 Lead acid batteries

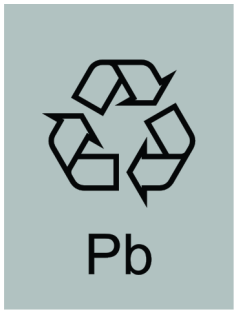


Figure 6 – Example of marking with recycling symbol for lead acid batteries

5.2.3 Nickel cadmium batteries

Figure 7 – Example of marking with recycling symbol for nickel cadmium batteries

5.2.4 Nickel metal hydride batteries

Figure 8 – Example of marking with recycling symbol for nickel metal hydride batteries

5.2.5 Lithium ion batteries

Figure 9 – Example of marking with recycling symbol for lithium ion batteries

5.2.6 Lithium metal batteries

Figure 10 – Example of marking with recycling symbol for lithium metal batteries

5.3 Background colours

Except as described in 5.4.8, the following colours shall be used for the background within the marking area defined in 5.4.3 or 5.4.4, as applicable, and may also be used for the label ~~and/~~or the casings or sleeves of ~~battery~~ cell blocks, battery modules, or cells.

a) Pb silver grey, grey, or white
b) Ni-Cd light green
c) Ni-MH orange
d) Li-ion blue
e) Li-metal blue

The background colour of the marking or the frame, if any, shall be different from the colour of the battery case.

~~A reference for the specified colours in accordance with established colour systems is listed in informative Annex A.~~

See Annex A for a definition of these colours with reference to some colour systems.

5.4 Design of markings and symbols

5.4.1 General

The size of marking is defined by the ~~largest side of the battery~~ principal display panel. ~~If the battery manufacturer and the device manufacturer are in agreement, the size of marking can be defined by the displayed side which is defined in 4.3.~~

5.4.2 Dimensions for symbols

The symbols used for the dimensions of the marking are listed in Table 2.

Table 2 – List of dimensions for symbols

Symbol	Definition	See
a	Width of the recycling symbol	Figure 13
R	Width of the marking	Figure 11 Figure 12 Figure 13
h	Height of the marking without recycling symbol	Figure 11
H	Height of the marking with recycling symbol	Figure 12
b	Height of the letters	Figure 14
l	Line thickness of the letters	Figure 14
S	Size of the marking	5.4.3 and 5.4.4
k	Ratio between b and R	5.4.7

5.4.3 Dimensions for markings without recycling symbol

The dimensions specified in this subclause apply to all markings in accordance with 5.1, the marking for Ni-MH being used as an example.

For ~~prismatic~~ non-round batteries, the markings without recycling symbol should have a size of at least 2 % of the surface area of the ~~largest side~~ principal display panel of the battery.

For ~~non-prismatic~~ round batteries, the markings without recycling symbol should have a size of at least 1 % of the surface area of the principal display panel of the battery.

The size of the marking without recycling symbol is the product of width R and height h as shown in Figure 11.

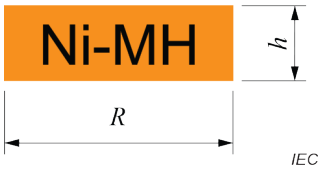


Figure 11 – Size of marking without recycling symbol

Height h is $\frac{1}{3}$ of width R.

The size of the marking shall be not less than 1,9 cm^2.

The minimum dimensions are:

Width:	R	min. 24 mm
Height:	$h = \frac{1}{3} \times R$	min. 8 mm
Size of the marking:	$S = R \times h$	min. 1,9 cm^2

For markings without recycling symbol, it is not necessary to apply a size larger than 12 cm^2, corresponding to a width R of 60 mm, even if the calculated size S would be larger than 12 cm^2.

~~The marking can optionally have a black frame so as to achieve a better contrast against the outside wall or label.~~

5.4.4 Dimensions for markings with recycling symbol

The dimensions specified in this subclause apply to all markings in accordance with 5.2, the marking for Ni-MH being used as an example.

For ~~prismatic~~ non-round batteries, the markings with recycling symbol should have a size of at least 3 % of the surface area of the ~~largest side~~ principal display panel of the battery.

For ~~non-prismatic~~ round batteries, the markings with recycling symbol should have a size at least 1,5 % of the surface area of the principal display panel of the battery.

The size of marking with recycling symbol is the product of width R and height H as shown in Figure 12.

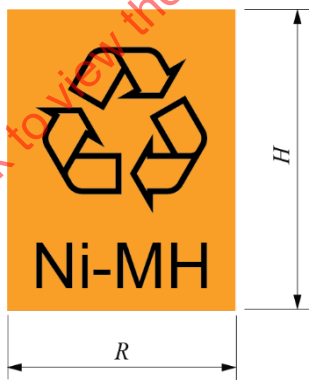


Figure 12 – Size of marking with recycling symbol

Height H is $\frac{4}{3}$ of width R.

The size of the marking shall be not less than 3 cm^2.

Minimum dimensions are:

Width:	R	min. 15 mm
Height:	$H = \frac{4}{3} \times R$	min. 20 mm
Size of the marking:	$S = R \times H$	min. 3 cm^2

For markings with recycling symbol, it is not necessary to apply a size larger than 17 cm^2, corresponding to a width R of 36 mm, even if the calculated size S would be larger than 17 cm^2.

~~The marking can optionally have a black frame so as to achieve a better contrast against the outside wall or label.~~

5.4.5 Adaptive size

If the specific outer contour of the battery housing (outer shape of the battery pack) requires the marking to be of a slightly smaller size (10 % of the size as required in 5.4.3 and 5.4.4, respectively), the size of the symbol may be reduced by up to 10 % of the required size, given that the symbol legibility is not impaired.

5.4.6 Design of the recycling symbol

Figure 13 shows the recycling symbol. It is in accordance with ISO 7000-1135:2004-01.

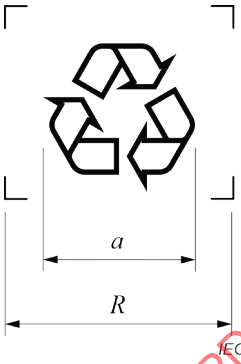


Figure 13 – Design of recycling symbol

The following formula describes the dimensions of the recycling symbol:

$$a = \frac{2}{3} R$$

where

R is the width of the marking shown in Figure 12;

a is the width of the recycling symbol.

Except as described in 5.4.8, the colour of the recycling symbol shall be black.

5.4.7 Design of the letters (characters)

Letter height b is the product of the width of marking R and factor k:

$b = R \times k$, where k is between 0,2 and 0,3

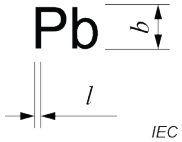


Figure 14 – Design of letters

Line thickness, l, shall be not less than 0,2 mm.

Style of lettering: Regular, sans-serif font type.

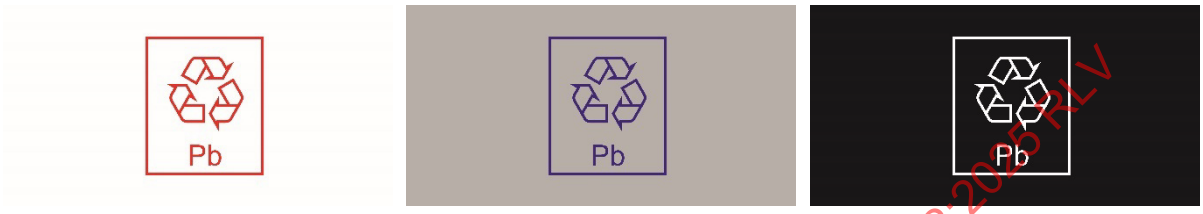
Italic font style or a decorative font shall not be used.

NOTE Arial or Helvetica are typical sans-serif font types.

Except as described in 5.4.8, the colour of the letters shall be black.

5.4.8 Exception for marking with a single colour

Where the battery marking is applied using a single colour (e.g. black on white or laser ablation), the marking shall be highlighted by a frame having at least the thickness of dimension "*l*" in 5.4.7 to achieve a better contrast against the outside wall or label. Examples for a good contrast are black and white. See more examples in Figure 15.



a) Red symbol and frame on white battery case

b) Blue symbol and frame on grey battery case

c) White symbol and frame on black battery case

Figure 15 – Examples for markings with frames of a contrasting colour

6 Durability of markings with respect to chemical agents

6.1 General

Markings in accordance with this document shall be legible and shall be easily discernible under normal light conditions.

For each battery chemistry covered by this document, appropriate tests shall be carried out.

Tests shall be carried out with the following agents in accordance with Table 3.

Table 3 – Test matrix for durability test of markings

Agent	Battery chemistry				Method see:
	Lead acid vented	Ni-Cd vented	Ni-MH Ni-Cd sealed Lead acid VRLA	Lithium	
Water	x	x	x	x	6.2.2
Electrolyte	x	x			6.2.3
Cleaning agent	x	x	x	x	6.2.2
Neutralization agent	x				6.2.4

Solvents should not be used to clean batteries and modules as otherwise this can result in damage to the plastic components. Approved cleaning fluids are only those that are expressly specified by the battery manufacturer.

6.2 Test procedure

6.2.1 General

The test shall be carried out on three of the required markings in their definitive size, form, material and execution.

The test shall consist of a visual inspection to check the presence and legibility of all required markings before and after exposure to selected chemicals.

The durability of the marking shall be tested in accordance with IEC 60896-21:2004, 6.6 and IEC 60896-22:2004, 6.6.

6.2.2 Test with water and recommended cleaning agents

The markings shall be rubbed for 15 s with a piece of cloth soaked with water and then rubbed for 15 s with a piece of cloth soaked with the cleaning agent recommended by the battery manufacturer for battery cleaning, dried in air and then inspected visually.

6.2.3 Test with electrolyte

The markings shall be rubbed for 15 s with a piece of cloth soaked with electrolyte, dried in air and then inspected visually.

6.2.4 Test with neutralizing solutions

The markings shall be rubbed for 15 s with a piece of cloth soaked with a saturated solution of sodium carbonate (Na_2CO_3) or sodium bicarbonate ($NaHCO_3$) in water, dried in air, and then inspected visually.

6.3 Criteria

The marking symbols shall be readable and visible after each test.

Annex A
(informative)

Colours for background

A.1 General

Annex A defines colours with reference to some widely established colour systems.

A.2 Colour definition for background

The colours specified in 5.3 should be equal or similar to those listed as colour references in Table A.1.

Table A.1 – Colour references

Colour	Pantone® system[3]	RAL system
Light green	367 or 389	6018
Orange	151 or 1375	2002 or 2005
Blue	312	5005 or 5015
Grey	421	7004
Silver grey	14-0000	7001
White	11-0601 or 11-4262	9001 or 9003

[3] The Pantone system is a product supplied by Pantone®. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the system. Equivalent systems may be used if they can be shown to lead to the same results.

Annex B
(informative)

Calculation method for the battery volume

For the purposes of this document, particularly to determine if a battery falls within the Scope or not, the battery volume should be calculated by forming the sum of the displacements of its component cells and excluding all other elements of the battery (e.g. battery management system electronics, battery housing, handles, terminals, removable packaging etc.). The displacement of a cell should be calculated by forming the product of its largest extensions in the direction of each of its three axes of symmetry. For a monobloc battery, the calculation is analogous to that for a prismatic cell.

Unless the number and size of the component cells is known (e.g. because it is marked in accordance with IEC 61960-3:2017, 5.1), the volume of the battery should be determined on the basis of its external dimensions.

EXAMPLE 1 For a lithium ion battery comprising 5 round cells, e.g. type 18650, with a maximum diameter of 18,5 mm and a maximum height of 65,5 mm, the displacement is calculated as follows: 5 × 1,85 cm × 1,85 cm × 6,55 cm = 112,09 cm^3.

EXAMPLE 2 For a nickel-metal hydride battery comprising 8 prismatic or pouch cells, e.g. type HF 18/07/49 according to IEC 61951-2:2003, with a maximum width of 18 mm, a maximum thickness of 7 mm, and a maximum height of 49 mm, the displacement is calculated as follows: 8 × 1,8 cm × 0,7 cm × 4,9 cm = 49,39 cm^3.

EXAMPLE 3 For a lead-acid motor-cycle battery, e.g. type VWF I according to IEC 60095-7:2019, with a maximum length of 152 mm, a maximum width of 67 mm, and a maximum height of 95 mm, the displacement is calculated as follows: 1 × 15,2 cm × 6,7 cm × 9,5 cm = 967,48 cm^3.

Bibliography

IEC 60050-482:2004, *International Electrotechnical Vocabulary – Part 482 Primary and secondary cells and batteries*

IEC 60095 (all parts), *Lead-acid starter batteries*

IEC 60622, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-cadmium prismatic rechargeable single cells*

IEC 61056 (all parts), *General purpose lead-acid batteries (valve-regulated types)*

IEC 61951-1, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary sealed cells and batteries for portable applications – Part 1: Nickel-Cadmium*

IEC 61951-2, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary sealed cells and batteries for portable applications – Part 2: Nickel-metal hydride*

~~IEC 61960-3, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications – Part 3: Prismatic and cylindrical lithium secondary cells and batteries made from them*~~

IEC 62620:2014, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for use in industrial applications*

IEC 62675, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-metal hydride prismatic rechargeable single cells*

ISO 7000-1135:2004-01, *Graphical symbols for use on equipment – Registered symbols* (available at http://www.graphical-symbols.info/equipment)

Comment submitted by Battery Council International (BCI) on document EPA-HQ-OLEM-2022-0340-0001, https://www.regulations.gov/comment/EPA-HQ-OLEM-2022-0340-0046

Request for Information: Development of Best Practices for Collection of Batteries to be Recycled and Voluntary Battery Labeling Guidelines, Environmental Protection Agency (USA), https://www.regulations.gov/document/EPA-HQ-OLEM-2022-0340-0001

IEC 62902

Edition 2.0 2025-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Secondary cells and batteries – Marking symbols for identification of their chemistry

Batteries d'accumulateurs – Symboles de marquage pour l'identification de leur caractéristique chimique

IEC 62902:2025-02(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SECONDARY CELLS AND BATTERIES – MARKING SYMBOLS FOR IDENTIFICATION OF THEIR CHEMISTRY

FOREWORD

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IEC 62902 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 2019. This edition constitutes a technical revision.

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

a) Addition of an Introduction;
b) Addition of exemptions and clarifications for the marking background colour requirement;
c) Addition of a calculation method for the battery volume;
d) Addition of a new note to the Scope;
e) Addition of a term and definition for the principal display panel;
f) Addition of further chemistry information for Li-ion batteries;

g) Addition of a new subclause on adaptive size;

h) Clarification of the test methods for durability and permanence of the marking.

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

Draft	Report on voting
21/1195/CDV	21/1208/RVC

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/publications.

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 in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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

This document introduces uniform marking symbols for the identification of the secondary battery chemistries prevailing on the market. A primary reason is that lead smelters around the world are reporting increasing numbers of lithium ion batteries finding their way into the lead-acid battery waste stream. Because the shape and design of these batteries sometimes is very similar, it can be difficult for sorting facilities and battery smelters to distinguish one technology from the other if there is no clear identification of the battery chemistry by marking symbols.

Processing lithium ion batteries within a lead smelter, e-waste facility, or municipal waste sorting facility, can result in fire or explosions, with numerous accidents or near-accidents already reported in European and US recycling facilities.

Besides lead-acid and lithium ion batteries, the labelling scheme should also apply to other battery chemistries with a significant market share, such as nickel metal hydride and nickel cadmium. Other batteries, such as sodium ion batteries, should be included in the marking scheme when their market share becomes significant.

A clear identification of the battery chemistry would be helpful throughout the entire battery lifetime, i.e. from the selection and purchase of a new battery (e.g. by economic operators as well as end users), to transportation, installation and use of the battery and then to waste battery collection, sorting, storage and treatment.

The following standards and recommendations were considered during the development of this document.

The Battery Association of Japan (BAJ) has issued "Guidelines for Recycle Mark on rechargeable cells and batteries for portable applications" which include an optional colour code system for identifying major (rechargeable) battery chemistries: Pb, Ni-Cd, Ni-MH, and Li-ion. These guidelines also distinguish different cathode materials as well as important impurities (mostly from the anode material)[1].

Call2Recycle has introduced in Canada and the United States of America a licensed labelling program for batteries. It is a non-profit organization that collects and recycles batteries on behalf of companies that pay a fee to license the label.

The recycling symbol required on batteries within the scope of this document is the general symbol for recovery/recyclable as standardised in ISO 7000-1135:2004-01, see item 1 in Table 1. It is worth noting the information that ISO provides for this symbol: Function/description: to indicate that the marked item or its material is part of a recovery or recycling process. Additional information: the symbol is applicable only to those products or materials for which at the end of life there is a well-established collection route and recycling process, and which does not significantly impair the effectiveness of other recycling schemes.

Battery marking can also be subject to regional legislation. One example being the crossed-out wheeled bin used in the European Union (EU) and in some other countries to make consumers aware of their obligation to make their batteries available for separate collection. Some other regulations, e.g. Regulation (EU) 2023/1542 on batteries and waste batteries, can require the use of additional symbols for substances of very high concern (SVHC), namely cadmium (Cd) and lead (Pb) exceeding certain concentration levels[2].

---

1 For more information see the document referred to under "Source reference" for item 5 in Table 1.

2 Regulation EU 2023/1542 does not require the addition of the Hg symbol to the separate collection symbol. However, there is a requirement for max. 0,0005 % Hg for all batteries in Annex I *Restriction on substances* of the Batteries Regulation.

In a comment submitted by Battery Council International (BCI) on a request by the Environmental Protection Agency (USA) for information regarding the development of best practices for the collection of batteries to be recycled and voluntary battery labelling guidelines, it was suggested that battery labels should have a consistent and simple marking (e.g. a colour code) across all battery chemistries to encourage and aid appropriate handling which should, at a minimum, address three primary goals – in descending order of priority:

1) inform and educate consumers to keep batteries out of the trash and curbside recycling, and direct batteries to dedicated battery recycling networks where available;
2) provide consumers and recycling network employees with human-readable information to enable sorting of used batteries among major chemistry families (e.g. Pb, Li-ion, Ni-Cd, Ni-MH, and Li-metal);
3) if appropriate within a chemistry family, inform recyclers of the unique features, components or constituents or both, for recovery (e.g. cathode material).

Table 1 contains a list of recycling and ecolabels that can be expected on batteries.

Table 1 – Recycling and ecolabels regarding batteries

No.	Symbol	Official name	Alternative information	Purpose	Source reference
1		General symbol for recovery/recyclable	Möbius loop, three curved arrows	To indicate that the marked item or its material is part of a recovery or recycling process.	ISO 7000-1135:2004-01 www.iso.org/obp
2		4 in 1 symbol	The white interior shows 4 arrows pointing outwards		Environmental Protection Administration of Taiwan (Province of China)
3		Crossed-out wheeled bin		To indicate "separate collection" for all batteries and accumulators	Regulation (EU) 2023/1542
4		Call 2 Recycle battery seal		Private recycling program in the USA and Canada	Battery recycling Seal usage standards
5		Recycling symbol and chemistry for batteries[a]	Guidelines for recycle mark on batteries	Compliance with the Japanese Law for the Promotion of Effective Utilization of Resources	Tecchio, P. el al., Analysis of material efficiency aspects of personal computers product group, JRC Report EUR 28394 EN (2018), page 60
6		U.S. Mercury-Containing and Rechargeable Battery Recycling Act symbol (Battery Council International model)	See footnote[b]	See footnote[c]	42 U.S.C. § 14322(b)

[a] The symbol has two placeholders after "Li-ion" where codes for details of the chemistry are entered.

[b] Three chasing arrows or a comparable recycling symbol. For nickel-cadmium batteries, the symbol must also state "Ni-Cd" and the phrase "BATTERY MUST BE RECYCLED OR DISPOSED OF PROPERLY." For lead acid batteries, the symbol must also state "Pb" or the words "LEAD", "RETURN", and "RECYCLE" and if the regulated battery is sealed, the phrase "BATTERY MUST BE RECYCLED."

[c] Model symbol developed by Battery Council International for Small Sealed Lead Acid (SSLA) batteries in compliance with the U.S. Mercury-Containing and Rechargeable Battery Recycling Act. Variations allowed.

During the preparation of the second edition, the Scope of this document was subject to intensive discussions. One of the subjects that were discussed, was the inclusion of a battery's energy content. Some experts thought that a limit like the 100 Wh limit used in dangerous goods transportation regulations to distinguish between "fully regulated" and "exempted" when offering batteries for transport under UN numbers 3480 and 3481 could be suitable to distinguish between the different levels of labelling requirements. However, these thoughts were not pursued as they applied only to lithium ion batteries and could hardly be translated into a technology agnostic language. No generally acceptable calculation method was found that would enable the transfer of the energy limit from lithium ion batteries to other chemistries.

A limit of 100 Wh for lithium ion spare batteries in the Federal Aviation Administration (FAA) (of the United States) and International Air Transport Association (IATA) regulations for carry-on baggage on board of passenger aircraft was not considered to be suitable for consideration for similar reasons. The same applied even more to a mass limit of 500 g applicable during the collection of lithium batteries according to UNECE, Special Provision 636 of the Agreement for the carriage of Dangerous goods by Road (ADR).

Other suggestions were made to limit the Scope to batteries with one or more dimension(s) exceeding 5 cm or, in a different proposal, 100 mm. However, it could not be shown how these limits would correlate with each other and with the volume limit of 900 cm^3 and why they would be more suitable than the volume limit.

It was also discussed to add the following recommendation: "In addition, the markings may be used also on secondary battery packaging and in accompanying documents when secondary batteries are placed on the market".

SECONDARY CELLS AND BATTERIES – MARKING SYMBOLS FOR IDENTIFICATION OF THEIR CHEMISTRY

1 Scope

This document specifies methods for the clear identification of secondary cells, batteries, battery modules and monoblocs according to their chemistry (electrochemical storage technology).

The markings described in this document are applicable to

– secondary cells,
– batteries,
– battery modules, and
– monoblocs,

when they are placed on the market for end use and when their battery volume exceeds 900 cm^3.

The chemistry marking is useful for the installation, operation and decommissioning phases in the battery's life cycle.

Many recycling processes are chemistry specific, thus undesired events can occur when a battery which is not of the appropriate chemistry enters a given recycling process. Therefore, the battery is marked so as to identify its chemistry to ensure safe handling during sorting and recycling processes.

This document defines the conditions of use of the markings indicating the chemistry of these secondary batteries.

The details of markings and their application are defined in this document.

NOTE The 900 cm^3 limit has been chosen because it is a reasonable compromise between larger format batteries and small batteries. On small batteries, the space for additional labels is limited which can result in a readability conflict.

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 60896-21:2004, *Stationary lead-acid batteries – Part 21: Valve regulated types – Methods of test*

IEC 60896-22:2004, *Stationary lead-acid batteries – Part 22: Valve regulated types – Requirements*

IEC 61960-3:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications – Part 3: Prismatic and cylindrical lithium secondary cells and batteries made from them*

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

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
cell
basic functional unit, consisting of an assembly of electrodes, electrolyte, container, terminals and usually separators that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: IEC 60050-482:2004, 482-01-01, modified – The Note to entry has been deleted.]

3.2
secondary cell
cell which is designated to be electrically recharged

[SOURCE: IEC 60050-482:2004, 482-01-03, modified – The Note to entry has been deleted.]

3.3
battery
one or more cells fitted with devices necessary for use, for example case, terminals, marking and protective devices

[SOURCE: IEC 60050-482:2004, 482-01-04]

3.4
battery volume
displacement of the battery

Note 1 to entry: Refer to Annex B for a method for the calculation of the displacement of a battery.

3.5
battery module
group of cells connected together either in a series and/or parallel configuration with or without protective devices (e.g. fuse or positive temperature coefficient, PTC) and monitoring circuitry

[SOURCE: IEC 62620:2023, 3.8, modified – The word "battery" has been added to the term, and "positive temperature coefficient" to the definition.]

3.6
monobloc battery
battery, with multiple separate but electrically connected cell compartments each of which is designed to house an assembly of electrodes, electrolyte, terminals or intercell connections and possible separators

[SOURCE: IEC 60050-482:2004, 482-02-17, modified –The word "interconnections" has been replaced with "intercell connections" in the definition and the Note to entry has been deleted.]

3.7
lead acid battery
secondary battery with aqueous electrolyte based on dilute sulfuric acid, a positive electrode of lead dioxide and a negative electrode of lead

[SOURCE: IEC 60050-482:2004, 482-05-01, modified – The term has been changed from "lead dioxide lead battery" to "lead acid battery", and the Note to entry has been deleted.]

3.8
valve regulated lead acid battery
VRLA battery
secondary battery in which cells are closed but have a valve which allows the escape of gas if the internal pressure exceeds a predetermined value

Note 1 to entry: The cell or battery cannot normally receive additions to the electrolyte.

Note 2 to entry: This note only applies to the French language.

[SOURCE: IEC 60050-482:2004, 482-05-15, modified – Note 2 to entry has been added.]

3.9
lithium ion battery
secondary battery with an organic solvent electrolyte and positive and negative electrodes which utilize an intercalation 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]

3.10
lithium metal battery
battery which incorporates one or more lithium cells with an organic solvent electrolyte or a solid electrolyte, a positive electrode and a negative electrode composed of lithium metal

3.11
nickel cadmium battery
secondary battery with an alkaline electrolyte, a positive electrode containing nickel oxide and a negative electrode of cadmium

[SOURCE: IEC 60050-482:2004, 482-05-02, modified – The first preferred term "nickel oxide cadmium battery" has been deleted.]

3.12
nickel metal hydride 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]

3.13
marking
line, shape, pattern, letter or symbol on the surface, which helps to identify features of the marked product or material

3.14
symbol
written character or mark used to represent information

EXAMPLE The recycling symbol represents the information that the battery is to be recycled.

3.15
label
sheet with an adhesive layer containing information for application on products

3.16
principal display panel
portion of a battery's surface bearing the markings designed to be most prominently displayed, shown, presented, or examined under conditions of retail sale, handling, sorting, and inspection

4 Application of markings

4.1 General

Markings defined in Clause 5 are applicable to all products according to their size and configuration as defined in the scope of this document.

Each end product in accordance with this document shall be marked before being placed on the market. For the purposes of this document, cells made available on the market for end use, are designated as batteries.

In case of dismantling the batteries into monoblocs and modules for the purpose of reuse of the monoblocs and modules, additional marking of these monoblocs or batteries shall be carried out in accordance with this document.

Single cells should not be marked if they are fitted into batteries or modules.

4.2 Marking of electrochemical battery systems

This marking is only applicable to secondary cells and batteries of the following chemistries:

a) lead acid (Pb),
b) nickel cadmium (Ni-Cd),
c) nickel metal hydride (Ni-MH),
d) lithium ion (Li-ion),
e) lithium metal (Li-metal).

Batteries or modules applying more than one of these chemistries shall be marked for all applied chemistries.

This marking is not applicable for batteries of other chemistries and technologies such as:

f) flow batteries,
g) Na-NiCl high temperature batteries, and
h) all other chemistries not listed here.

ISO/IEC Guide 71:2014, *Guide for addressing accessibility in standards*, should be consulted when additional colours are standardized for marking of more electrochemical systems.

4.3 Marking requirements for additional chemistry information of Li-ion batteries

If applicable, for lithium ion batteries, codes A1 and A2 designating the basic materials of the negative and positive electrodes as specified in IEC 61960-3:2017, 5.1 shall be applied on the battery. These codes shall follow after "Li-ion", separated by a space.

EXAMPLE The required text of the marking for a Lithium ion battery with a negative electrode based on carbon and a positive electrode based on cobalt is: Li-ion IC.

4.4 Application of the markings on the battery

The markings can be fixed on the battery either by:

a) printing, or

b) labelling, or

c) other methods.

The markings shall be visible, legible and indelible over the expected life of the batteries.

The markings with the design described in Clause 5 may be integrated into existing printings or labels.

The marking shall be placed on the principal display panel to achieve good visibility.

If, for design reasons or because of customer requirements, the marking cannot be placed on the principal display panel, the size of the marking shall nevertheless be as defined in 5.4.

5 Markings

5.1 Markings without recycling symbol

5.1.1 General

Markings shown in Figure 1 to Figure 5 shall be used if the recycling symbol is applied in other markings or if it is not necessary or if it is not possible to declare a recycling symbol.

5.1.2 Lead acid batteries

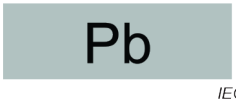


Figure 1 – Example of marking for lead acid batteries

5.1.3 Nickel cadmium batteries

Figure 2 – Example of marking for nickel cadmium batteries

5.1.4 Nickel metal hydride batteries

Figure 3 – Example of marking for nickel metal hydride batteries

5.1.5 Lithium ion batteries

Figure 4 – Example of marking for lithium ion batteries

5.1.6 Lithium metal batteries

Figure 5 – Example of marking for lithium metal batteries

5.2 Optional markings with recycling symbol

5.2.1 General

The markings shown in Figure 6 to Figure 10 with the recycling symbol in accordance with ISO 7000-1135:2004-01 shall be used in the event that the recycling symbol is not applied in other markings and if it is necessary to declare a recycling symbol.

NOTE The applicability and meaning of the recycling symbol can vary by country.

5.2.2 Lead acid batteries

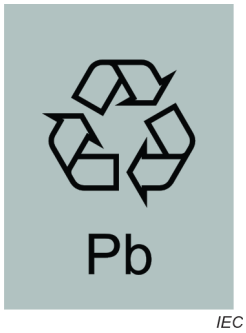


Figure 6 – Example of marking with recycling symbol for lead acid batteries

5.2.3 Nickel cadmium batteries

Figure 7 – Example of marking with recycling symbol for nickel cadmium batteries

5.2.4 Nickel metal hydride batteries

Figure 8 – Example of marking with recycling symbol for nickel metal hydride batteries

5.2.5 Lithium ion batteries

Figure 9 – Example of marking with recycling symbol for lithium ion batteries

5.2.6 Lithium metal batteries

Figure 10 – Example of marking with recycling symbol for lithium metal batteries

5.3 Background colours

Except as described in 5.4.8, the following colours shall be used for the background within the marking area defined in 5.4.3 or 5.4.4, as applicable, and may also be used for the label or the casings or sleeves of cell blocks, battery modules, or cells.

a) Pb silver grey, grey, or white
b) Ni-Cd light green
c) Ni-MH orange
d) Li-ion blue
e) Li-metal blue

The background colour of the marking or the frame, if any, shall be different from the colour of the battery case.

See Annex A for a definition of these colours with reference to some colour systems.

5.4 Design of markings and symbols

5.4.1 General

The size of marking is defined by the principal display panel.

5.4.2 Dimensions for symbols

The symbols used for the dimensions of the marking are listed in Table 2.

Table 2 – List of dimensions for symbols

Symbol	Definition	See
a	Width of the recycling symbol	Figure 13
R	Width of the marking	Figure 11 Figure 12 Figure 13
h	Height of the marking without recycling symbol	Figure 11
H	Height of the marking with recycling symbol	Figure 12
b	Height of the letters	Figure 14
l	Line thickness of the letters	Figure 14
S	Size of the marking	5.4.3 and 5.4.4
k	Ratio between b and R	5.4.7

5.4.3 Dimensions for markings without recycling symbol

The dimensions specified in this subclause apply to all markings in accordance with 5.1, the marking for Ni-MH being used as an example.

For non-round batteries, the markings without recycling symbol should have a size of at least 2 % of the surface area of the principal display panel of the battery.

For round batteries, the markings without recycling symbol should have a size of at least 1 % of the surface area of the principal display panel of the battery.

The size of the marking without recycling symbol is the product of width R and height h as shown in Figure 11.

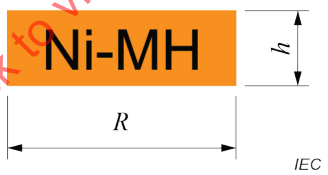


Figure 11 – Size of marking without recycling symbol

Height h is $\frac{1}{3}$ of width R.

The size of the marking shall be not less than 1,9 cm^2.

The minimum dimensions are:

Width:	R	min. 24 mm
Height:	$h = \frac{1}{3} \times R$	min. 8 mm
Size of the marking:	$S = R \times h$	min. 1,9 cm^2

For markings without recycling symbol, it is not necessary to apply a size larger than 12 cm^2, corresponding to a width R of 60 mm, even if the calculated size S would be larger than 12 cm^2.

5.4.4 Dimensions for markings with recycling symbol

The dimensions specified in this subclause apply to all markings in accordance with 5.2, the marking for Ni-MH being used as an example.

For non-round batteries, the markings with recycling symbol should have a size of at least 3 % of the surface area of the principal display panel of the battery.

For round batteries, the markings with recycling symbol should have a size at least 1,5 % of the surface area of the principal display panel of the battery.

The size of marking with recycling symbol is the product of width R and height H as shown in Figure 12.

Figure 12 – Size of marking with recycling symbol

Height H is $\frac{4}{3}$ of width R.

The size of the marking shall be not less than 3 cm^2.

Minimum dimensions are:

Width: R min. 15 mm

Height: $H = \frac{4}{3} \times R$ min. 20 mm

Size of the marking: $S = R \times H$ min. 3 cm^2

For markings with recycling symbol, it is not necessary to apply a size larger than 17 cm^2, corresponding to a width R of 36 mm, even if the calculated size S would be larger than 17 cm^2.

5.4.5 Adaptive size

If the specific outer contour of the battery housing (outer shape of the battery pack) requires the marking to be of a slightly smaller size (10 % of the size as required in 5.4.3 and 5.4.4, respectively), the size of the symbol may be reduced by up to 10 % of the required size, given that the symbol legibility is not impaired.

5.4.6 Design of the recycling symbol

Figure 13 shows the recycling symbol. It is in accordance with ISO 7000-1135:2004-01.

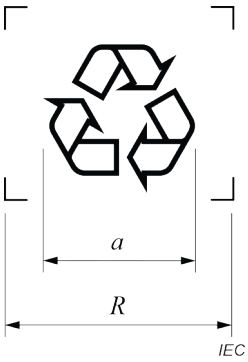


Figure 13 – Design of recycling symbol

The following formula describes the dimensions of the recycling symbol:

$$a = \frac{2}{3} R$$

where

R is the width of the marking shown in Figure 12;

a is the width of the recycling symbol.

Except as described in 5.4.8, the colour of the recycling symbol shall be black.

5.4.7 Design of the letters (characters)

Letter height b is the product of the width of marking R and factor k:

$b = R \times k$, where k is between 0,2 and 0,3

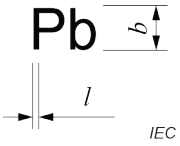


Figure 14 – Design of letters

Line thickness, l, shall be not less than 0,2 mm.

Style of lettering: Regular, sans-serif font type.

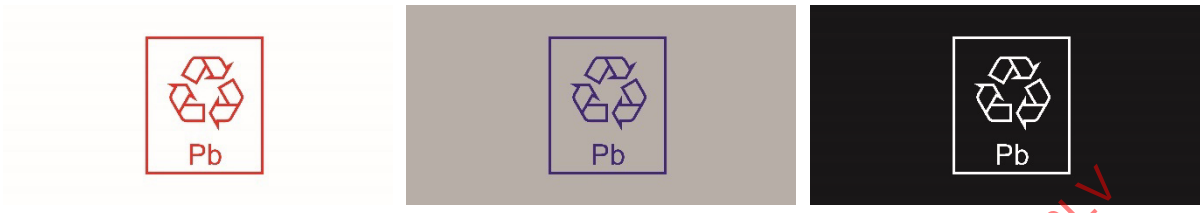
Italic font style or a decorative font shall not be used.

NOTE Arial or Helvetica are typical sans-serif font types.

Except as described in 5.4.8, the colour of the letters shall be black.

5.4.8 Exception for marking with a single colour

Where the battery marking is applied using a single colour (e.g. black on white or laser ablation), the marking shall be highlighted by a frame having at least the thickness of dimension "*l*" in 5.4.7 to achieve a better contrast against the outside wall or label. Examples for a good contrast are black and white. See more examples in Figure 15.



a) Red symbol and frame on white battery case

b) Blue symbol and frame on grey battery case

c) White symbol and frame on black battery case

Figure 15 – Examples for markings with frames of a contrasting colour

6 Durability of markings with respect to chemical agents

6.1 General

Markings in accordance with this document shall be legible and shall be easily discernible under normal light conditions.

For each battery chemistry covered by this document, appropriate tests shall be carried out.

Tests shall be carried out with the following agents in accordance with Table 3.

Table 3 – Test matrix for durability test of markings

Agent	Battery chemistry				Method see:
	Lead acid vented	Ni-Cd vented	Ni-MH Ni-Cd sealed Lead acid VRLA	Lithium	
Water	x	x	x	x	6.2.2
Electrolyte	x	x			6.2.3
Cleaning agent	x	x	x	x	6.2.2
Neutralization agent	x				6.2.4

Solvents should not be used to clean batteries and modules as otherwise this can result in damage to the plastic components. Approved cleaning fluids are only those that are expressly specified by the battery manufacturer.

6.2 Test procedure

6.2.1 General

The test shall be carried out on three of the required markings in their definitive size, form, material and execution.

The test shall consist of a visual inspection to check the presence and legibility of all required markings before and after exposure to selected chemicals.

The durability of the marking shall be tested in accordance with IEC 60896-21:2004, 6.6 and IEC 60896-22:2004, 6.6.

6.2.2 Test with water and recommended cleaning agents

The markings shall be rubbed for 15 s with a piece of cloth soaked with water and then rubbed for 15 s with a piece of cloth soaked with the cleaning agent recommended by the battery manufacturer for battery cleaning, dried in air and then inspected visually.

6.2.3 Test with electrolyte

The markings shall be rubbed for 15 s with a piece of cloth soaked with electrolyte, dried in air and then inspected visually.

6.2.4 Test with neutralizing solutions

The markings shall be rubbed for 15 s with a piece of cloth soaked with a saturated solution of sodium carbonate (Na_2CO_3) or sodium bicarbonate ($NaHCO_3$) in water, dried in air, and then inspected visually.

6.3 Criteria

The marking symbols shall be readable and visible after each test.

Annex A
(informative)

Colours for background

A.1 General

Annex A defines colours with reference to some widely established colour systems.

A.2 Colour definition for background

The colours specified in 5.3 should be equal or similar to those listed as colour references in Table A.1.

Table A.1 – Colour references

Colour	Pantone® system[3]	RAL system
Light green	367 or 389	6018
Orange	151 or 1375	2002 or 2005
Blue	312	5005 or 5015
Grey	421	7004
Silver grey	14-0000	7001
White	11-0601 or 11-4262	9001 or 9003

[3] The Pantone system is a product supplied by Pantone®. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the system. Equivalent systems may be used if they can be shown to lead to the same results.

Annex B
(informative)

Calculation method for the battery volume

For the purposes of this document, particularly to determine if a battery falls within the Scope or not, the battery volume should be calculated by forming the sum of the displacements of its component cells and excluding all other elements of the battery (e.g. battery management system electronics, battery housing, handles, terminals, removable packaging etc.). The displacement of a cell should be calculated by forming the product of its largest extensions in the direction of each of its three axes of symmetry. For a monobloc battery, the calculation is analogous to that for a prismatic cell.

Unless the number and size of the component cells is known (e.g. because it is marked in accordance with IEC 61960-3:2017, 5.1), the volume of the battery should be determined on the basis of its external dimensions.

EXAMPLE 1 For a lithium ion battery comprising 5 round cells, e.g. type 18650, with a maximum diameter of 18,5 mm and a maximum height of 65,5 mm, the displacement is calculated as follows: 5 × 1,85 cm × 1,85 cm × 6,55 cm = 112,09 cm^3.

EXAMPLE 2 For a nickel-metal hydride battery comprising 8 prismatic or pouch cells, e.g. type HF 18/07/49 according to IEC 61951-2:2003, with a maximum width of 18 mm, a maximum thickness of 7 mm, and a maximum height of 49 mm, the displacement is calculated as follows: 8 × 1,8 cm × 0,7 cm × 4,9 cm = 49,39 cm^3.

EXAMPLE 3 For a lead-acid motor-cycle battery, e.g. type VWF L according to IEC 60095-7:2019, with a maximum length of 152 mm, a maximum width of 67 mm, and a maximum height of 95 mm, the displacement is calculated as follows: 1 × 15,2 cm × 6,7 cm × 9,5 cm = 967,48 cm^3.

Bibliography

IEC 60050-482:2004, *International Electrotechnical Vocabulary – Part 482 Primary and secondary cells and batteries*

IEC 60095 (all parts), *Lead-acid starter batteries*

IEC 60622, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-cadmium prismatic rechargeable single cells*

IEC 61056 (all parts), *General purpose lead-acid batteries (valve-regulated types)*

IEC 61951-1, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary sealed cells and batteries for portable applications – Part 1: Nickel-Cadmium*

IEC 61951-2, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary sealed cells and batteries for portable applications – Part 2: Nickel-metal hydride*

IEC 62620:2014, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for use in industrial applications*

IEC 62675, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-metal hydride prismatic rechargeable single cells*

ISO 7000-1135:2004-01, *Graphical symbols for use on equipment – Registered symbols* (available at http://www.graphical-symbols.info/equipment)

Comment submitted by Battery Council International (BCI) on document EPA-HQ-OLEM-2022-0340-0001, https://www.regulations.gov/comment/EPA-HQ-OLEM-2022-0340-0046

Request for Information: Development of Best Practices for Collection of Batteries to be Recycled and Voluntary Battery Labeling Guidelines, Environmental Protection Agency (USA), https://www.regulations.gov/document/EPA-HQ-OLEM-2022-0340-0001

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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BATTERIES D'ACCUMULATEURS – SYMBOLES DE MARQUAGE POUR L'IDENTIFICATION DE LEUR CARACTÉRISTIQUE CHIMIQUE

AVANT-PROPOS

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Cette deuxième édition annule et remplace la première édition parue en 2019. Cette édition constitue une révision technique.

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

a) ajout d'une Introduction;
b) ajout d'exemptions et de clarifications concernant l'exigence sur les couleurs de fond pour le marquage;
c) ajout d'une méthode de calcul pour le volume de batterie;
d) ajout d'une nouvelle note au Domaine d'application;
e) ajout d'un terme et d'une définition pour l'espace d'affichage principal;
f) ajout d'informations supplémentaires sur la caractéristique chimique des batteries Li-ion;
g) ajout d'un nouveau paragraphe sur la taille adaptative;
h) clarification des méthodes d'essai pour la durabilité et la permanence du marquage.

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

Projet	Rapport de vote
21/1195/CDV	21/1208/RVC

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.

Ce 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/publications/.

Le comité a décidé que le contenu de ce 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, ou
- révisé.

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INTRODUCTION

Le présent document introduit des symboles de marquage uniformes pour identifier les batteries d'accumulateurs les plus courantes sur le marché. La raison principale est que, dans le monde entier, les fonderies de plomb constatent que de plus en plus de batteries ion-lithium se retrouvent dans le flux de déchets des batteries au plomb. La forme et la conception de ces batteries étant parfois très similaires, il peut être difficile pour les centres de tri et fonderies de batteries de faire la distinction entre ces deux technologies en l'absence d'identification claire de la caractéristique chimique des batteries par des symboles de marquage.

Le traitement des batteries ion-lithium dans une fonderie de plomb, des installations de gestion d'e-déchets ou un centre de tri de déchets municipaux peut entraîner des incendies ou des explosions; de nombreux accidents ou quasi-accidents ont déjà été signalés dans les centres de recyclage en Europe et aux États-Unis.

Outre les batteries au plomb et les batteries ion-lithium, il convient que le programme d'étiquetage s'applique également à d'autres caractéristiques chimiques de batteries représentant une part de marché considérable, comme le nickel-métal hydrure et le nickel-cadmium. Il convient ainsi d'intégrer d'autres batteries au programme de marquage, par exemple les batteries ion sodium, dès lors que leur part de marché devient significative.

Une identification claire de la caractéristique chimique des batteries serait également utile tout au long de la durée de vie des batteries, c'est-à-dire de la sélection et l'achat d'une nouvelle batterie (par les acteurs économiques aussi bien que par les utilisateurs finaux, par exemple), au transport, à l'installation et à l'utilisation des batteries, puis à la collecte, au tri, au stockage et au traitement des déchets de batteries.

Les normes et recommandations ci-dessous ont été prises en compte lors de l'établissement du présent document.

L'Association japonaise des batteries (BAJ, *Battery Association of Japan*) a publié des "lignes directrices relatives aux marques de recyclage sur les accumulateurs et batteries rechargeables pour applications portables", qui prévoient un système de code couleur facultatif permettant d'identifier les principales caractéristiques chimiques des batteries (rechargeables): Pb, Ni-Cd, Ni-MH et Li-ion. Ces lignes directrices distinguent également différents matériaux de cathode, ainsi que d'importantes impuretés (provenant pour la plupart du matériau de l'anode)[1].

Call2Recycle a introduit au Canada et aux États-Unis d'Amérique un programme d'étiquetage sous licence pour batteries. Il s'agit d'une association à but non lucratif qui collecte et recycle les batteries au nom d'entreprises qui paient un droit pour mettre leur étiquette sous licence.

Le symbole de recyclage exigé sur les batteries entrant dans le Domaine d'application du présent document est le symbole général de valorisation/recyclage normalisé dans l'ISO 7000-1135:2004-01, voir l'élément 1 dans le Tableau 1. Il est à noter que, pour ce symbole, l'ISO indique les informations suivantes: Fonction/description: indiquer que l'article présentant le marquage ou son matériau fait partie d'un procédé de valorisation ou de recyclage. Informations supplémentaires: ce symbole s'applique uniquement aux produits ou matériaux pour lesquels un procédé de parcours de collecte et de recyclage bien précis est prévu en fin de vie, procédé qui n'impacte pas significativement l'efficacité d'autres programmes de recyclage.

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1 Pour plus d'informations, se reporter au document mentionné dans "Référence de le source" pour l'élément 5 du Tableau 1.

Le marquage des batteries peut également être soumis à la législation régionale. Par exemple, une poubelle sur roues barrée d'une croix est utilisée au sein de l'Union européenne (UE) et dans d'autres pays pour indiquer aux consommateurs leur obligation de mettre à disposition leur batteries pour une collecte séparée. Certains autres règlements, par exemple le Règlement (UE) 2023/1542 relatif aux batteries et aux déchets de batteries, peuvent exiger l'utilisation de symboles supplémentaires pour les substances extrêmement préoccupantes (SVHC, *Substances of Very High Concern*), à savoir le cadmium (Cd) et le plomb (Pb) qui dépassent certains niveaux de concentration[2].

Dans un commentaire soumis par le Conseil international des batteries (BCI, *Battery Council International*) sur demande de l'Agence américaine pour la protection de l'environnement concernant des informations liées à l'élaboration des meilleures pratiques pour la collecte des batteries à recycler et des lignes directrices relatives à l'étiquetage volontaire des batteries, il a été suggéré ce qui suit: il convient que les étiquettes de batteries possèdent un marquage simple et cohérent (par exemple, un code couleur) commun à toutes les caractéristiques chimiques des batteries pour favoriser et aider au traitement adéquat dont il convient, au minimum, qu'il atteigne les trois objectifs principaux suivants (par ordre décroissant de priorité):

1) informer et éduquer les consommateurs à ne pas jeter les batteries avec les ordures ménagères ou dans les poubelles de tri sélectif, mais plutôt à se tourner vers les réseaux de recyclage propres aux batteries lorsque ceux-ci sont disponibles;
2) mettre à disposition des consommateurs et des employés des réseaux de recyclage des informations lisibles par un humain pour leur permettre de trier les batteries usagées par grandes familles de produits chimiques (par exemple, Pb, Li-ion, Ni-Cd, Ni-MH, et Li-métal);
3) si cela est pertinent pour une famille chimique, informer les recycleurs de ses caractéristiques, composants ou constituants particuliers ou les deux, à des fins de valorisation (par exemple, le matériau d'une cathode).

Le Tableau 1 présente une liste des symboles de recyclage et de labels écologiques qui sont susceptibles d'être apposés sur des batteries.

[2] Le Règlement UE 2023/1542 n'exige pas l'ajout du symbole Hg au symbole de collecte séparée. Toutefois, l'Annexe I *Restriction applicable aux substances* du règlement relatif aux batteries prévoit une exigence de max. 0,000 5 % Hg pour toutes les batteries.

Tableau 1 – Marques de recyclage et labels écologiques pour batteries

N°	Symbole	Désignation officielle	Informations alternatives	Objectif	Référence de la source
1		Symbole général de valorisation/recyclage	Ruban de Möbius, trois flèches incurvées	Indiquer que l'article présentant le marquage ou son matériau fait partie d'un procédé de valorisation ou de recyclage.	ISO 7000-1135:2004-01 www.iso.org/obp
2		Symbole 4 en 1	L'intérieur blanc représente 4 flèches dirigées vers l'extérieur		Administration taïwanaise de la protection environnementale (Province chinoise)
3		Poubelle à roues barrée d'une croix		Indiquant le "tri séparé" de l'ensemble des batteries et accumulateurs	Règlement (UE) 2023/1542
4		Sceau de batterie Call2Recycle		Programme de recyclage privé des USA et du Canada	Recyclage des batteries Norme d'utilisation de sceau
5		Symbole de recyclage et caractéristique chimique pour batteries[a]	Lignes directrices relatives à la marque de recyclage sur les batteries	Conformité à la loi japonaise sur la promotion de l'utilisation effective des ressources	Tecchio, P. el al., Analysis of material efficiency aspects of personal computers product group, rapport JRC EUR 28394 EN (2018), page 60
6		Symbole de la loi américaine sur la teneur en mercure et le recyclage des batteries rechargeables (modèle du Battery Council International)	Voir la note de bas de page[b]	Voir la note de bas de page[c]	42 U.S.C. § 14322(b)

[a] Le symbole comporte deux espaces réservés après "Li-ion", où les codes concernant les détails des caractéristiques chimiques sont entrés.

[b] Trois flèches formant un triangle ou un symbole de recyclage comparable. Pour les batteries nickel-cadmium, le symbole doit également indiquer "Ni-Cd" et la mention "BATTERY MUST BE RECYCLED OR DISPOSED OF PROPERLY" (les batteries doivent être recyclées ou éliminées selon une méthode appropriée). Pour les batteries au plomb, le symbole doit également indiquer "Pb", ou les mots "LEAD" (plomb), "RETURN" (à retourner) et "RECYCLE" (à recycler) et si la batterie réglementée est scellée, la mention "BATTERY MUST BE RECYCLED" (la batterie doit être recyclée).

[c] Modèle de symbole conçu par le Battery Council International pour les batteries au plomb de petite taille (SSLA, *Small Sealed Lead Acid*) conformément à la loi américaine sur la teneur en mercure et le recyclage des batteries rechargeables. Variations autorisées.

Lors de l'établissement de la deuxième édition, le Domaine d'application du présent document a fait l'objet d'intenses discussions. L'un des sujets ayant été traités a été l'intégration de la valeur énergétique d'une batterie. Certains experts ont pensé qu'une limite telle que celle de 100 Wh utilisée dans les réglementations sur le transport de marchandises dangereuses, visant à distinguer les batteries faisant l'objet d'une "réglementation exhaustive" des batteries "exemptées" lorsqu'elles sont proposées à l'expédition en vertu des numéros UN 3480 et 3481, pourrait permettre de faire la distinction entre les différents niveaux d'exigences d'étiquetage. Toutefois, ces considérations n'ont pas été approfondies, car elles s'appliquent uniquement aux batteries ion-lithium et il aurait été difficile de les transposer dans un langage applicable à toutes les technologies. En effet, aucune méthode de calcul généralement acceptable qui permettrait de transférer la limite énergétique des batteries ion-lithium à d'autres caractéristiques chimiques n'a été trouvée.

La limite de 100 Wh pour les batteries ion-lithium de rechange visée dans les réglementations de l'Administration fédérale de l'aviation (FAA, *Federal Aviation Administration*) (des États-Unis) et l'Association du transport aérien international (IATA, *International Air Transport Association*) pour les bagages cabine des passagers d'aéronefs n'a pas été retenue, n'ayant pas été jugée pertinente pour des raisons similaires. Il en a été de même pour une limite de masse de 500 g applicable à la collecte des batteries lithium conformément à l'UNECE (Commission économique des Nations Unies pour l'Europe, *United Nations Economic Commission for Europe*) en vertu de la Disposition spéciale 636 de l'accord relatif au transport international des marchandises dangereuses par route (ADR, *Agreement for the Carriage of Dangerous goods by Road*).

D'autres suggestions ont été évoquées pour limiter le Domaine d'application aux batteries dont une ou plusieurs dimensions dépassent 5 cm ou, selon une proposition différente, 100 mm. Cependant, la corrélation entre ces limites et la limite de volume de 900 cm^3 et la raison pour laquelle ces limites seraient plus adaptées que la limite de volume n'ont pas pu être démontrées.

Il a également été envisagé d'ajouter la recommandation suivante: "De plus, les marquages peuvent être également utilisés sur les emballages de batteries d'accumulateurs et leurs documents d'accompagnement lorsque les batteries d'accumulateurs sont mises sur le marché".

BATTERIES D'ACCUMULATEURS – SYMBOLES DE MARQUAGE POUR L'IDENTIFICATION DE LEUR CARACTÉRISTIQUE CHIMIQUE

1 Domaine d'application

Le présent document spécifie les méthodes permettant d'identifier clairement les batteries d'accumulateurs, batteries, modules de batteries et monoblocs selon leur caractéristique chimique (technologie de stockage électrochimique).

Les marquages décrits dans le présent document s'appliquent aux:

– accumulateurs;
– batteries;
– modules de batteries;
– monoblocs,

lorsqu'ils sont mis sur le marché en vue d'une utilisation finale et lorsqu'ils ont un volume de batterie supérieur à 900 cm^3.

Le marquage de la caractéristique chimique sert aux différentes phases de vie de la batterie, à savoir l'installation, le fonctionnement et la mise hors service lors du cycle de vie de la batterie.

Dans la mesure où de nombreux procédés de recyclage dépendent de la caractéristique chimique, des événements non désirés peuvent se produire lorsqu'une batterie dont la caractéristique chimique n'est pas appropriée est soumise à un procédé de recyclage donné. Par conséquent, la batterie est marquée afin d'identifier sa composition chimique, pour assurer une manutention sûre pendant les procédés de tri et de recyclage.

Le présent document définit les conditions d'utilisation des marquages indiquant la caractéristique chimique de ces batteries d'accumulateurs.

Les détails des marquages et leur application sont définis dans le présent document.

NOTE La limite de 900 cm^3 a été choisie, car elle constitue un compromis raisonnable entre les batteries plus grandes et les petites batteries. Sur les petites batteries, l'espace pour des étiquettes supplémentaires est limité, ce qui peut entraîner un conflit de lisibilité.

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 60896-21:2004, *Batteries stationnaires au plomb – Partie 21: Types étanches à soupapes – Méthodes d'essai*

IEC 60896-22:2004, *Batteries stationnaires au plomb – Partie 22: Types étanches à soupapes – Exigences*

IEC 61960-3:2017, *Accumulateurs alcalins et autres accumulateurs à électrolyte non acide – Accumulateurs au lithium pour applications portables – Partie 3: Éléments et batteries d'accumulateurs au lithium, parallélépipédiques et cylindriques*

ISO 7000, *Symboles graphiques utilisables sur le matériel* (disponible à l'adresse http://www.graphical-symbols.info/equipment)

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse https://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse https://www.iso.org/obp

3.1
élément
unité fonctionnelle de base, consistant en un assemblage d'électrodes, d'électrolyte, de conteneur, de bornes et généralement de séparateurs, qui est une source d'énergie électrique obtenue par transformation directe d'énergie chimique

[SOURCE: IEC 60050-482:2004, 482-01-01, modifié – La note à l'article a été supprimée.]

3.2
accumulateur
élément qui est conçu pour être rechargé électriquement

[SOURCE: IEC 60050-482:2004, 482-01-03, modifié – La note a été supprimée.]

3.3
batterie
un ou plusieurs éléments équipés des dispositifs nécessaires pour l'emploi, par exemple boîtier, bornes, marquage et dispositifs de protection

[SOURCE: IEC 60050-482:2004, 482-01-04]

3.4
volume de batterie
déplacement de la batterie

Note 1 à l'article: Voir l'Annexe B pour une méthode de calcul du déplacement d'une batterie.

3.5
module de batterie
groupe d'éléments connectés ensemble en série et/ou en parallèle avec ou sans dispositif de protection (fusible ou coefficient de température positif (CTP) par exemple) et circuit de surveillance

[SOURCE: IEC 62620:2023, 3.8, modifié – Les mots "de batterie" ont été ajoutés au terme, ainsi que "coefficient de température positif" dans la définition.]

3.6
batterie monobloc
batterie comportant plusieurs compartiments d'éléments séparés mais reliés électriquement, dont chacun est conçu pour renfermer un assemblage d'électrodes, d'électrolyte, de bornes ou de connexions interéléments et éventuellement de séparateurs

[SOURCE: IEC 60050-482:2004, 482-02-17, modifié – Le terme "interconnexions" a été remplacé par "connexions interéléments" dans la définition et la note a été supprimée.]

3.7
batterie au plomb
batterie d'accumulateurs comprenant un électrolyte aqueux à base d'acide sulfurique dilué, une électrode positive en bioxyde de plomb et une électrode négative en plomb

[SOURCE: IEC 60050-482:2004, 482-05-01, modifié – Le terme "batterie au plomb-bioxyde de plomb" a été remplacé par "batterie au plomb" et la note a été supprimée.]

3.8
batterie étanche à soupapes
batterie VRLA
batterie d'accumulateurs dans laquelle les éléments sont fermés mais munis d'une soupape qui permet l'échappement des gaz lorsque la pression interne excède une valeur prédéterminée

Note 1 à l'article: L'élément ou la batterie ne peuvent normalement pas recevoir d'addition à leur électrolyte.

Note 2 à l'article: L'abréviation "VRLA" est dérivée du terme anglais développé correspondant "Valve Regulated Lead Acid".

[SOURCE: IEC 60050-482:2004, 482-05-15, modifié – La Note 2 a été ajoutée.]

3.9
batterie ion-lithium
batterie d'accumulateurs comprenant un électrolyte au solvant organique et des électrodes positive et négative dans lesquelles est intercalé un composé dans lequel le lithium est stocké

Note 1 à l'article: Une batterie ion-lithium ne contient pas de lithium métallique.

[SOURCE: IEC 60050-482:2004, 482-05-07]

3.10
batterie métal lithium
batterie comprenant un ou plusieurs éléments d'accumulateur au lithium avec un électrolyte au solvant organique ou un électrolyte solide, une électrode positive et une électrode négative composées de lithium métallique

3.11
batterie nickel-cadmium
batterie d'accumulateurs comprenant un électrolyte alcalin, une électrode positive contenant de l'oxyde de nickel et une électrode négative en cadmium

[SOURCE: IEC 60050-482:2004, 482-05-02, modifié – Le premier terme préférentiel "batterie au cadmium-oxyde de nickel" a été supprimé.]

3.12
batterie au nickel-métal-hydrure
batterie d'accumulateurs comprenant un électrolyte à l'hydroxyde de potassium aqueux, une électrode positive contenant du nickel à l'état d'hydroxyde de nickel et une électrode négative contenant de l'hydrogène sous forme d'hydrure métallique

[SOURCE: IEC 60050-482:2004, 482-05-08]