

Nordic Ecolabelling for Non-rechargeable portable batteries



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Contents

1	Environmental communication guideline for Nordic Swan Ecolabel non-rechargeable portable batteries	4
2	What can carry the Nordic Swan Ecolabel?	5
2.1	Justification of the product group definition	5
3	How to read this criteria document	6
4	Summary	6
4.1	Changes compared to previous generation	7
5	Requirements and justification of these	8
5.1	Production and product description	10
5.2	Resources.....	10
5.3	Packaging and information	13
5.4	Corporate Social Responsibility.....	16
5.5	Electrical testing.....	19
5.6	Safety	24
5.7	Waste plan.....	25
5.8	Energy in production.....	26
5.9	Licence maintenance.....	29
6	Environmental impact of non-rechargeable portable batteries	30
7	Future criteria generation.....	35
8	How to apply and regulations for the Nordic Ecolabelling	35
Appendix 1	Description of the non-rechargeable portable battery, material composition and production	
Appendix 2	Excluded substances	
Appendix 3	Battery label	
Appendix 4	Packaging	
Appendix 5	Consumer information on the battery	
Appendix 6	Analysis and testing laboratories	

Contact information

In 1989, the Nordic Council of Ministers decided to introduce a voluntary official ecolabel, the Nordic Swan Ecolabel. These organisations/companies operate the Nordic Ecolabelling system on behalf of their own country's government. For more information, see the websites:

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1 Environmental communication guideline for Nordic Swan Ecolabel non-rechargeable portable batteries

Nordic Swan Ecolabel non-rechargeable portable batteries have a reduced environmental and climate impact. They meet strict requirements on responsible sourcing, raw materials, energy sources used in production and quality.

Nordic Swan Ecolabel non-rechargeable portable batteries:

- Have a reduced climate impact by being manufactured by at least 20 % self-produced renewable electricity and with no fossil oil and coal in production.
- Guarantees a performance quality level verified by a third party.
- Contain lower levels of mercury, cadmium and lead than permitted by legislation, thereby reducing the spread and use of harmful metals.
- Comply with requirements regarding chemicals that are harmful to environment and human health, including bans on PVC and PFAS.
- Contain responsibly sourced mineral raw materials and the manufacturers actively address social and environmental risks associated with the sourcing, processing, and trading of these materials throughout the entire supply chain.

Why choose the Nordic Swan Ecolabel?

- The manufacturer of non-rechargeable portable batteries may use the Nordic Swan Ecolabel trademark for marketing. The Nordic Swan Ecolabel is a very well-known and well-reputed trademark in the Nordic region.
- The Nordic Swan Ecolabel is a cost-effective and simple way of communicating environmental work and commitment to customers and suppliers.
- Reducing environmental impact often creates scope for lowering costs, such as reducing the energy use.
- Environmentally suitable operations prepare the manufacturer for potential future environmental legislation.
- Environmental issues are complex. It can take a long time and extensive resources to gain an understanding of a specific area. Nordic Ecolabelling can be seen as aid in this work.
- The Nordic Swan Ecolabel not only covers environmental issues but also quality requirements, since the environment and quality often go hand in hand. This means that a Nordic Swan Ecolabel licence can also be seen as a mark of quality.

2 What can carry the Nordic Swan Ecolabel?

The product group comprises the following products:

Non-rechargeable portable batteries in accordance with the definition given in the European Union's Battery Regulation (EU) 2023/1542.

The following batteries and electrical appliances cannot be Nordic Swan Ecolabelled according to these criteria:

- Rechargeable batteries, for which separate criteria exist.
- Batteries that are built into or form a permanent part of electronic products and where replacement of the batteries is not possible.
- Car batteries, LMT batteries (Light Means of Transport), SLI batteries (Starting, Lighting, Ignition) and industrial batteries.

2.1 Justification of the product group definition

The product group includes non-rechargeable portable batteries in accordance with the definition given in the new European Union's Battery Regulation (EU) 2023/1542¹. The new battery regulation entered into force 17 August 2023 and replace the former Directive 2006/66/EC.

The definition of portable batteries is overall the same in the new regulation (EU) 2023/1542 compared to the former directive. The former use of the term "primary batteries" has been changed to "non-rechargeable portable batteries":

Battery' means any device delivering electrical energy generated by direct conversion of chemical energy, having internal storage, and consisting of one or more non-rechargeable portable battery cells, modules or of packs of them, and includes a battery that has been subject to preparation for repurposing, repurposing or remanufacturing.

The term "portable battery" means a battery that is sealed, weighs 5 kg or less, is not designed specifically for industrial use and is neither an electric vehicle battery, a Light Means of Transport (LMT battery), nor a Starting, Lighting, Ignition (SLI battery).

The term "portable battery of general use" means a portable battery, whether or not rechargeable, that is specifically designed to be interoperable and that has one of the following common formats 4,5 Volts (3R12), button cell, D, C, AA, AAA, AAAA, A23, 9 Volts (PP3).

The definition of the product group is aligned to the new Regulation (EU) 2023/1542. This means that the name of the product group is changed from "primary batteries" to "non-rechargeable portable batteries" in generation 6 of the criteria.

As in generation 5 of the criteria, Nordic Ecolabelling has chosen to exclude batteries that are built into or form a fixed part of electrical products and that accordingly cannot be

¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1542> (visited April 2025).

replaced. Tools, for example, such as cheaper screwdrivers and drills, beauty products or toys, can have non-rechargeable portable - or rechargeable batteries that cannot be replaced when they get old and cannot be recharged. Nordic Ecolabelling believes that it is an unnecessary waste of resources to have to discard an electrical appliance simply because the battery no longer functions optimally.

A different Nordic Ecolabelling criteria document allows rechargeable batteries and portable chargers to be Nordic Swan Ecolabelled.

3 How to read this criteria document

Each requirement is marked with the letter O (obligatory requirement) and a number. All requirements must be fulfilled to be awarded a licence.

The text describes how the applicant shall demonstrate fulfilment of each requirement. There are also icons in the text to make this clearer. These icons are:

↑ Upload

- Requirement checked on site

4 Summary

Nordic Ecolabelling criteria for non-rechargeable portable batteries has been revised to generation 6. Despite differences in battery technology, the overall life cycle remains consistent with those covered in the previous criteria: production of raw materials, production of batteries, usage, and end-of-life battery treatment. Non-rechargeable portable batteries impact the environment throughout the entire life cycle, but life cycle assessments indicate that a long service life significantly reduces the overall environmental impact.

The focus of the revised criteria has been to introduce new mandatory requirements targeting energy consumption in battery production, with a strong emphasis on the use of non-fossil energy sources. These requirements and their thresholds have been developed through close dialogue with the battery industry and supported by collected data. During the evaluation process of generation 5, it was determined that the existing performance requirements for non-rechargeable portable batteries could not be further strengthened. The current thresholds remain appropriate and relevant for the market, reinforcing the decision to focus this revision on energy-related aspects.

In addition, the due diligence requirements have been strengthened and clarified to align and be more stringent compared to the updated EU Batteries Regulation (EU) 2023/1542. Further, the name has changed from "primary batteries" to "non-rechargeable portable batteries" due to updated vocabulary in the new EU battery regulation (EU) 2023/1542.

The most important changes within this revision are presented in Table 1.

4.1 Changes compared to previous generation

All changes and updates to the requirements in generation 6 compared to previous generation 5 are summarized in Table 1 below. Further details on the requirements are provided in Chapter 5.

Table 1 Overview of changes to criteria for Nordic Swan Ecolabel non-rechargeable portable batteries generation 6 compared with previous generation 5.

Proposal Generation 6	Generation 5	Same req.	Change	New req.	Comments
Product group definition	Product group definition		X		Now referring to new EU battery regulation (EU) 2023/1542. Changed name from "primary batteries" to "non-rechargeable portable batteries".
Production and product description					
O1 Description of the product	O1	X			
Resources					
O2 Metal content	O2	X			Updated name. Previous "Metal content of batteries".
O3 Excluded substances	O3		X		Per- and polyfluoroalkyl (PFAS) substances are added as an excluded substance. The ban of chlorine-based plastic remains the same. Changed name from "Plastic" to "Excluded substances".
Packaging and information					
O4 Labels and packaging	O4	X			Updated name. Previous "Battery labels and packaging".
O5 Consumer information	O5	X			Updated name. Previous "Consumer information on the battery and primary packaging"
Corporate social responsibility					
O6 Responsible sourcing of mineral raw materials	O6 Sourcing of conflict-free minerals and O7 Critical raw materials		X		All licensees, regardless of turnover, must have a Due diligence management system according to the new EU Batteries Regulation (EU) 2023/1542. Further, all smelters and refiners now must be verified by a relevant third party, such as the Responsible Mineral initiative (RMI). The requirement has been stringent to include all mineral raw materials. Generation 5 only included the conflict minerals tin, tantalum, tungsten, gold and cobalt.
O7 Working conditions	O8	X			
Electrical testing					
O8 Electrical testing	O9	X			
O9 Delayed discharge performance (shelf life)	O10	X			
O10 Lithium batteries, safety	O11	X			

Proposal Generation 6	Generation 5	Same req.	Change	New req.	Comments
Waste plan					
O11 Waste sorting in the production process	O12	X			
Energy in production					
O12 Energy consumption	-			X	Energy consumption data must be reported.
O13 Energy source - fossil fuels	-			X	Fossil oil and coal are prohibited in the production of batteries. Maximum limit of natural gas in the production of batteries.
O14 Renewable electricity	-			X	Minimum limit of own renewable electricity generation in the production of batteries.
Licence maintenance					
O15 Customers complains			X		Replace the former requirements (O13 to O19)
O16 Traceability			X		Replace the former requirements (O13 to O19)
Removed requirements from gen. 5					
	O13				Removed.
	O14				Removed.
	O15				Removed.
	O16				Removed.
	O17				Removed.
	O18				Removed.
	O19				Removed.

5 Requirements and justification of these

This section presents all the requirements, including the associated documentation requirements. The appendices referred to in the requirements can be found in the end of the criteria document. Background to the requirements, the levels of the requirement, and any changes since generation 5 are described in the background document.

Definitions

Terms	Definition/Explanation
Button cell	Any small round portable battery or accumulator whose diameter is greater than its height and which is used for special purposes such as hearing aids, watches, small portable equipment and back-up power.
Conflict-affected and high-risk areas	Areas in a state of armed conflict, fragile post-conflict areas, as well as areas witnessing weak or non-existing governance and security, such as failed states. In these areas, there are often widespread and systematic violations of international law, including human rights abuses.
DoD	Depth of Discharge.
High, medium or low energy drain level	High energy drain is >500 milliamperes. Medium energy drain is >100<500 milliamperes. Low energy drain is <100 milliamperes.
Li-ion	Lithium-ion.
LMT battery (light means of transport battery)	A battery that is sealed, weighs 25 kg or less and is specifically designed to provide electric power for the traction of wheeled vehicles that can be powered by an electric motor alone or by a combination of motor and human power, including type-approved vehicles of category L.
LPG	Liquefied petroleum gas
mAh or Ah	Milliamp hours or amp hours: the amount of power expected over time. The higher the number, the greater the capacity. This is the electrical charge (current) that passes through a specific circuit in one hour.
MAD	Minimum Average Duration.
Non-rechargeable portable battery	A battery not designed to be electrically recharged (Regulation (EU) 2023/1542). Portable battery of general use' means a portable battery, that is specifically designed to be interoperable and that has one of the following common formats 4,5 Volts (3R12), button cell, D (LR20), C (LR14), AA (LR6), AAA (LR03), AAAA, A23, 9 Volts (PP3);
PVC	PolyVinyl Chloride
Pre- and post-consumer material	Pre- and post-consumer defined in accordance with ISO 14021: Pre-consumer: Material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it. Post-consumer/commercial: Material created by households or commercial, industrial or institutional facilities in the role of end users of a product which can no longer be used for the intended purpose. This includes return of material from the distribution chain.
Primary packaging	Refers to the purchase packaging for the consumer, e.g. the packaging that holds 4 batteries or one portable charger, and what the consumer encounters in sales.
Secondary packaging	Refers to the transport packaging and protects the packs of batteries and portable chargers during transport to stores and consumers.
SLI battery (starting, lighting and ignition battery)	A battery that is specifically designed to supply electric power for starting, lighting, or ignition and that can also be used for auxiliary or backup purposes in vehicles, other means of transport or machinery.
WEEE	Waste Electrical and Electronic Equipment

5.1 Production and product description

O1 Description of the product

The applicant must submit the following information about the product(s):

- Brand and trading name(s).
- Name and contact details of production location(s) for the manufacture and brand owner(s) of batteries.
- Description of the product(s), detailing all constituent substances present in the battery in the application (weight %); cathode-and anode ingredients, electrolyte solutions, conductor-, separator- and container ingredients and other materials.
- Description of materials used in the primary packaging. Primary packaging: refers to the purchase packaging for the consumer, e.g. the packaging that holds the batteries, and which the consumer encounters in sales.
- Description of the manufacturing process for the product, including a general description of the batteries manufacturing process e.g. in a form of flow chart and which technology that is being used to produce the batteries.

↑ Description of the above points. Appendix 1 may be used. A flow chart is recommended to explain the production process.

Background to requirement O1 Description of the product

This requirement remains unchanged in generation 6 of the criteria.

The intention of the requirement is to provide an adequate picture of the manufacturing process and the life cycle of the product and any packaging: which raw materials and production processes are used, which metals, other solid substances and liquid chemical substances are used in the battery, and so on. Details of all constituent substances present in the battery must be given in weight-%. The requirement will thus give an insight into the product(s) in the application, in order to ensure that the application is processed correctly.

5.2 Resources

O2 Metal content

The metal content of the battery may not exceed the following limits:

Metal	Content
Mercury	< 0.1 ppm
Cadmium	< 1.0 ppm
Lead	< 10 ppm

It should be noted that the EU's Battery Regulation (EU) 2023/1542 permits a maximum cadmium content of 20 ppm and a maximum mercury content of 5 ppm. The test laboratory may need special equipment in order to test batteries for a mercury content of <0.1 ppm.

At least four examples of the product in question must be analysed and all four must meet the requirement.

The metal content of the batteries must be analysed in accordance with “Battery Industry Standard Analytical Method. For the determination of Mercury, Cadmium and Lead in Alkaline Manganese Cells Using AAS, ICP-AES and “Cold Vapour”. European Portable Battery Association (EPBA), Battery Association of Japan (BAJ), and National Electrical Manufacturers Association (NEMA; USA). April 1998”.

Similar test methods may be approved if assessed and adjudged to be equivalent to the recommended method by an independent third party.

- ↑ Report from the analysis body showing the metal content of the batteries.
- ↑ Declaration confirming that the institution performing the analysis is impartial and fulfils the general requirements applicable to test laboratories, as described in the requirements applicable to the analysis laboratory/test institutions in appendix 6.

Background to requirement O2 Metal content of batteries

This requirement remains unchanged in generation 6 of the criteria.

Nordic Ecolabelling is aware that substances that are harmful to the environment are used in non-rechargeable portable batteries and that some of these substances are known to offer direct technical benefits. Unfortunately, at the present time we do not have sufficient knowledge of how these harmful metals might be limited without reducing the performance of the battery. On the other hand, we have known for many years that certain harmful metals can be limited without detrimental effect for battery performance:

- Mercury, which is very hazardous to health and the environment, accumulates in the body and is known to be highly volatile.
- Cadmium, which accumulates in the body, particularly the kidneys, and is known to be hazardous to health and the environment and in certain connections is carcinogenic, mutagenic or toxic for reproduction.
- Lead, which is known to be toxic for reproduction, environmentally harmful and has negative effects on the nervous system².

The EU’s Battery Regulation (EU) 2023/1542 requires batteries to be labelled if they contain concentrations of one or more of the three metals: mercury (more than 5 ppm), cadmium (more than 20 ppm) and lead (more than 40 ppm). In addition, the Regulation prohibits the marketing of ordinary consumer batteries with a mercury content in excess of 5 ppm and a cadmium content in excess of 20 ppm. At these levels, legislation has ensured that these three heavy metals may not be added to portable batteries deliberately. Even so, pollutants may nevertheless occur.

A German test study from 2013³, which examined around 300 batteries, taken from stores, discovered that in some batteries, represented in the market, these metals may exceed the permitted EU limit, yet this is an exception: strict control in this sector will make it possible to completely erase commercial batteries with a prohibited level of such metals. Nevertheless, according to the same study, Li-ion batteries possess a significantly better chemical profile: the level of heavy metals is much lower than is allowed under the Regulation.

² <http://mst.dk/kemi/kemikalier/fokus-paa-saerlige-stoffer/>

³ <https://www.umweltbundesamt.de/en/press/pressinformation/batteries-put-to-the-test-too-many-heavy-metals> (visited May 2015).

As far back as in generation 3 of the criteria, Nordic Ecolabelling opted to introduce stricter requirements than those of the authorities in this respect, in order to ensure that only the best constituent substances with very low concentrations of pollutants of the above metals may be used in Nordic Swan Ecolabelled batteries.

The requirement refers to a test method for determining the content of the above metals, which was developed for use on Alkaline Manganese (AlMg) batteries. Nordic Ecolabelling is aware that applications may be submitted for ecolabels for other types of non-rechargeable portable batteries, and Nordic Ecolabelling is aware that the specified test method is old. Similar test methods may therefore be approved if assessed and adjudged to be equivalent to the recommended method by an independent third party.

O3 Excluded substances

The following substances must not be present/used in the non-rechargeable portable batteries:

- Chlorine-based plastic
- Per- and polyfluoroalkyl substances (PFAS)*

**PFAS: as any substance that contains at least one fully fluorinated methyl (CF₃-) or methylene (-CF₂-) carbon atom (without any H/Cl/Br/I attached to it).*

† Declaration from the manufacturer of the battery that no chlorine-based plastic or per- and polyfluoroalkyl substances are used. Appendix 2 may be used.

Background to requirement O3 Excluded substances

This is partly a new requirement in generation 6 of the criteria. Per- and polyfluoroalkyl substances are added as an excluded substance in generation 6 of the criteria. Chlorine-based plastic was already banned in the previous generation 5 of the criteria. The requirement has changed name from "Plastic" to "Excluded substances".

Certain problematic substances and substance groups are difficult to exclude through general chemical requirements. To address this, Nordic Ecolabelling has compiled a list of substances that must not be present as ingoing substances in the ecolabelled product.

The ban on use of PVC plastic in non-rechargeable portable batteries were introduced in generation 5 of the criteria as this was typically used as separators between the individual 1,5 V cells inside the battery instead of other types of plastic such as PE and nylon. Nordic Ecolabelling position on PVC can be found on Nordic Ecolabelling's webpage⁴.

Per- and polyfluoroalkyl substances (PFAS) are used in many types of products due to their water and dirt repellent properties. These compounds constitute a group of substances that have highly problematic intrinsic hazardous properties. They are extremely persistent and accumulate in the body. They are spread all over the globe, from the large oceans to the Arctic, and are found in e.g. wild birds and fish and their eggs. Also, shorter chain compounds (2–6 carbon atoms) have been discovered in nature. The substances in this group are suspected to be endocrine disruptors, carcinogenic and to have a negative impact on the human immune system. PFAS are primarily found in rechargeable batteries,

⁴ <https://www.nordic-swan-ecolabel.org/nordic-ecolabelling/environmental-aspects/circular-economy-and-resource-efficiency/pvc/>

especially in advanced types such as lithium-ion batteries. In non-rechargeable portable batteries, the occurrence is generally low or uncommon but not completely excluded. Applying the precautionary principle, the Nordic Swan Ecolabelling has chosen to exclude PFAS from non-rechargeable portable batteries.

5.3 Packaging and information

O4 Labels and packaging

Battery labels:

The battery label* must not contain PVC or other halogenated organic compounds in general (including flame retardants).

** The label itself, not any pigment or inks used for printing on the label.*

Packaging:

Primary packaging must consist of ≥ 80 wt. % pre- and post-consumer* material.

Chlorine-based plastic must not be used in primary and secondary packaging.

The primary packaging must be designed in such a way that dismantling is possible for all individual parts for waste sorting (e.g. cardboard, paper, plastic, metal) without using any tools.

Small antitheft RFID components are excluded from the dismantling requirement.

**Pre- and post-consumer material is defined in accordance with ISO 14021, see the list of definitions in the beginning of chapter 5.*

- † Declaration from the manufacturer of the battery label that the requirement is fulfilled. Appendix 3 may be used.
- † Description of the primary and secondary packaging. Declaration from the manufacturer of the battery or brand owner(s) showing that the requirement is fulfilled. Appendix 4 may be used.
- † Documentation from packaging suppliers showing the proportion of pre- and post-consumer recycled material in their products.
- † Declaration from the manufacturer of the battery or brand owner(s) showing that the total proportion of pre- and post-consumer recycled material in the primary packaging exceeds 80% weight. Appendix 4 may be used.

Background to requirement O4 Battery labels and packaging

This requirement remains unchanged in generation 6 of the criteria.

Non-rechargeable portable battery labels are made of thermal plastic, mostly PVC but also Polyethylene terephthalate (PET). The recycling processes (pyrometallurgy⁵ and hydrometallurgy⁶) for alkaline batteries reuses the plastic for energy purpose e.g. the PVC/PET is burned off. The environmental impact of PVC is described under requirement O3.

⁵ [RESURSEFFEKTIVISERING VID NYPRODUKTION AV ELBILSBATTERIER](#)

⁶ http://www.revatech.be/en/revatech_piles.html (visited October 2018)

It is possible to add flame retardants to the PET used in the battery label. Flame-retardants function is mainly to protect the plastic in the use phase. Therefore, they are deliberately constructed so that they do not break easily, making the flame-retardants persistent if spread in the nature. The greatest attention is directed toward the brominated flame-retardants, partly because they are detected in breast milk and in blood. Because of this, battery labels must not contain halogenated organic compounds in general (including flame retardants).

Nordic Ecolabelling has reviewed the proportion of recycled materials in the packaging of producers of Nordic Swan Ecolabelled primary/rechargeable batteries and concluded that a figure of 80% for post-consumer recycled material in packaging is too ambitious. The requirement of at least 80% by weight for pre- and post-consumer recycled material applies to the total % by weight of the primary packaging.

The typical material in packaging is cardboard and PET plastic (blister cups). Data from cardboard packaging suppliers for batteries shows that the share of post-consumer recycled material varies between 50 to 90%. In cases, where plastic foils are used to create blister-cups for blister-packs; the plastic foil typically does not contain recycled material. Blisters are often produced in PET, and we see that the PET/blister market has an increased focus on using recycled pre- and post-consumer PET plastic.

Use of pre-consumer recycled material in cardboard or plastic also benefits in the efforts to efficiently manage resources and minimize the burden on the environment. By allowing both the use of pre- and post-consumer recycled material in the primary packaging, the requirements immediately encourage the use of cardboard in the primary packaging. However, the proportion by weight of primary packaging that consists of both cardboard and a blister-cup typically vary between 70-75% cardboard and 30-25% plastic. This means that the requirement (minimum 80% recycled material) promotes the use of pre- and post-consumer material in plastic in the primary packaging.

The primary packaging must be designed in such a way that dismantling is possible for all individual parts for waste sorting (e.g. cardboard, paper, plastic, metal) without using any tools. The typical primary packaging for non-rechargeable portable batteries consists of cardboard/paper and plastic. The reason for this requirement is to ensure that the packaging can easily be separated in material-types to ensure optimal recycling.

Small antitheft RFID components added to the primary packaging are excluded from the dismantling requirement. The antitheft components are often added to the primary packaging after the battery has left the production site, which means that the licensee /brand owner has very limited steerability to control this. Consumer batteries are a product type that is most often stolen in conjunction with shop thefts. The products are therefore sometimes equipped with small antitheft components, in order to minimize the number of thefts. According to the waste handling, industry of cardboard, small antitheft component (labels) does not cause a problem for recycling.

O5 Consumer information

The battery must be marked in accordance with IEC 60086 and the battery regulation (EU) 2023/1542.

The primary packaging must clearly state:

- a) The types of energy-intensive appliances for which the battery is recommended in order to secure optimum use from the battery. This information must contain:
 - Information on whether the batteries are suitable for appliances with high, medium, low energy drain or if the batteries are suitable for all types of electrical appliances. The information must be shown with either pictograms or clear visible text.
 - b) Date of manufacture or best before of the batteries (year and month).
 - c) Use of the Nordic Swan Ecolabel according to "Guidelines for using the Nordic Swan Ecolabel"⁷
- ↑ Declaration from the manufacturer of the battery or brand owner(s) showing that the battery is marked in accordance with IEC 60086 and the battery Regulation (EU) 2023/1542. Appendix 5 may be used.
- ↑ Sample of packaging showing compliance with the requirement.

Background to requirement O5 Consumer information on the battery and primary packaging

This requirement remains unchanged in generation 6 of the criteria.

The IEC 60086-1:2021 and IEC 60086-4:2019 standards specify minimum information requirements on the battery, such as expiration of a recommended usage period, nominal voltage, name or trademark of the manufacturer or supplier, cautionary advice and safety pictograms for lithium batteries. With this requirement, Nordic Ecolabelling ensures that the batteries are marked with relevant and accepted information for consumers.

The EU battery regulation (EU) 2023/1542 sets requirements for labelling and marking of batteries in relation to e.g. battery category, capacity and recycling.

Studies conducted by the industry^{8,9} reveal that there are major environmental impacts associated with the incorrect use of batteries. If, for example, a low capacity batteries are used in energy-intensive applications the battery will run down quickly. This will reduce the life of the battery or reduce its performance, which in turn will mean more frequent replacement of the battery and accordingly a greater consumption of batteries.

In order to extend the useful life of batteries it is important to ensure that end users are provided with clear information on the types of uses for which the battery in question is optimally suited. There are major differences between the level of information provided for consumers on battery packs, and accordingly potential exists for ensuring that customers receive the best possible information.

Nordic Ecolabelling requires that the information on the batteries is as readily understandable to the consumer as possible by requiring the information to be in a form that is accessible to the consumer (pictograms or clear visible text). The pictograms will encourage the consumer to consider what he/she intends to use the battery for before

⁷ [Marketing guidelines](#)

⁸ "European Commission ENV.G.4/FRA/2007/0067 Study on Elements for an impact assessment on proposed capacity labelling on portable primary batteries in the context of the batteries directive 2006/66/EC" June 2010

⁹ <http://ec.europa.eu/environment/waste/batteries/pdf/CENELEC%20feasibility%20study.pdf> (November 2012)

purchasing. Alternative, if the batteries are suitable for all different types of energy-consuming appliances (high-, medium- and low energy drain) it is possible to use a clear text (instead of pictograms) saying that the batteries are suitable for all appliances. In requirement O9, batteries are to be tested against several electrical applications representing both high-, medium- and low energy drain (3 to 6 different application). Requirement O9 therefore supports the possibility to market the battery as an “all round” battery”.

Unfortunately, Nordic Ecolabelling has not been able to find any statutory or industrywide commonly agreed definitions of high, medium and low energy drain.

For this reason, there are no common agreements on pictograms for these three energy drain levels, which may be because the same type of electrical appliance may show light variations in energy drain levels.

Nordic Ecolabelling has concluded that the following levels could be used as guidelines for when an appliance has:

- High energy drain is >500 milliamperes
- Medium energy drain is >100<500 milliamperes
- Low energy drain is <100 milliamperes

These ampere levels have not been incorporated in the requirement since they are intended only to function as a guideline. Instead, there are proposals for pictograms for use for the various levels. The requirement permits the use of other pictograms if Nordic Ecolabelling is provided with an explanation of the reason for the choice of a different pictogram.

Nordic Ecolabelling has added a new information requirement saying that the primary packaging must be clearly stated with “date of manufacture” of the batteries (the year and month of manufacture) or “best before”. According to EN 60086 batteries shall be marked with expiration of a recommended usage period or year and month or week of manufacture.

A new requirement is the reference to the logo guidelines as Nordic Ecolabelling has experienced many examples of wrong use of the Nordic Swan Ecolabel.

5.4 Corporate Social Responsibility

O6 Responsible sourcing of mineral raw materials

The licensee must:

- have a due diligence management system* for responsible sourcing of mineral raw materials used in Nordic Swan Ecolabelled batteries. This includes commonly used minerals such as steel, aluminium, graphite and lithium but also minerals listed on EU Conflict Minerals Regulation (2017/821)¹⁰ and EU's newest list of critical raw materials¹¹.

¹⁰ https://policy.trade.ec.europa.eu/development-and-sustainability/conflict-minerals-regulation_en

¹¹ https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en

- have a system for identifying and assessing all smelters/refiner's due diligence measures. All smelters/refiners must have been verified/in a process of being verified by relevant 3rd party such as the Responsible Mineral Initiative (RMI)
- be member of an established multi-stakeholder program that works at supporting responsible sourcing of minerals.
- annually publish information/summary on due diligence approaches, measures, and results.

** According to the EU Battery Regulation 2023/1542. The due diligence management system must be reviewed and approved by an independent third party.*

- ↑ Description of due diligence management system for responsible sourcing of mineral raw materials.
- ↑ Documentation showing that the due diligence management system has been reviewed and approved by an independent third party.
- ↑ Documentation showing that all smelters/refiners have been verified/is in a process of being verified by relevant 3rd party such as the Responsible Mineral Initiative (RMI).
- ↑ Documentation showing membership of an established multi-stakeholder program that works at supporting responsible sourcing of minerals.
- ↑ Submit (or link to) latest annually publishes report on due diligence approaches, measures, and results.

Background to requirement O6 Responsible sourcing of mineral raw materials

This is partly a new requirement in generation 6 of the criteria and replaces the previous requirements "O6 Sourcing conflict-free minerals" and "O7 Critical raw materials" in generation 5.

The new EU Batteries Regulation (EU) 2023/1542 aims to ensure that batteries placed on the EU market are sustainable, efficient and safe throughout their lifecycle. One of the new features of the Regulation is that it imposes an obligation on all economic operators (in first place operators with a net turnover of 40 million euro or more) placing batteries on the market or putting them into service, to have a due diligence management system to address the social and environmental risks linked to sourcing, processing and trading raw materials along the whole supply chain. The requirement applies to all NSE applicants regardless of turnover.

The requirement has been stringent to include all mineral raw materials used in the NSE batteries opposite generation 5 which included the conflict minerals tin, tantalum, tungsten, gold (regulated by EU Conflict Minerals Regulation (2017/821) and cobalt. To strengthen the risk assessment all smelters and refiners must have been verified/in a process of being verified by a relevant third party such as the Responsible Mineral Initiative (RMI). It's recommended to align due diligence management system with OECD due diligence guidance for responsible supply chain of minerals.¹²

Involvement in multi-company coordinated programs that supports the development of responsible sourcing initiatives within the conflict-affected and high-risk areas is essential,

¹² <https://mneguidelines.oecd.org/mining.htm> (visited April 2025)

since they help suppliers meet due diligence requirements, maintain trade and benefit local mining communities, whose livelihoods depend on a legitimate mining trade.

To ensure transparency the applicant must annually publish a report (information must be accessible to the public) on due diligence approaches, measures, and results. Transparency is central to ensuring accountability in supply chains, allowing stakeholders, including consumers and investors, to assess the sustainability of a company's operations.

O7 Working conditions

The licensee must have a written Code of Conduct that explains how the licensee ensures compliance with the following UN conventions and the UN Global Compact at component and battery suppliers:

- The UN Convention on the Rights of the Child, Article 32.
- The UN Declaration (61/295) on the Rights of Indigenous Peoples.

The UN's: Global Compact¹³, which comprises the following ten principles:

- Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights.
- Principle 2: Make sure that they are not complicit in human rights abuses.
- Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining (ILO Conventions 87 and 98).
- Principle 4: The elimination of all forms of forced and compulsory labour; (ILO Conventions 29 and 105).
- Principle 5: The effective abolition of child labour (ILO Conventions 138 and 182).
- Principle 6: the elimination of discrimination in respect of employment and occupation (ILO Conventions 100 and 111).
- Principle 7: Businesses should support a precautionary approach to environmental challenges.
- Principle 8: Undertake initiatives to promote greater environmental responsibility.
- Principle 9: Encourage the development and diffusion of environmentally friendly technologies.
- Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.

The licensee must ensure that all suppliers are familiar with and comply with the Code of Conduct.

If components and/or batteries are produced in countries in which these conventions are incorporated as part of the requirements of the authorities, no further documentation will be required beyond the signed application form for a licence for Nordic Ecolabelling.

- † Licensees must submit a written Code of Conduct that explains how the licensee ensures that its suppliers comply with the requirements of the UN conventions and the UN Global Compact.
- † A description of how the licensee's Code of Conduct is communicated to all of its suppliers.

¹³ <http://www.unglobalcompact.org>

Background to requirement O7 Working conditions

This requirement remains unchanged in generation 6 of the criteria.

Nordic Ecolabelling has adopted a common requirement for working conditions which, in addition to compliance with the UN Global Compact¹⁴, also includes compliance with the UN Convention on the Rights of the Child (Article 32) and the UN Declaration (61/295) on the Rights of Indigenous Peoples.

Nordic Ecolabelling is aware that it may be difficult to ensure that the working environment of all suppliers in the Nordic Swan Ecolabelled battery production chain is satisfactory. Nevertheless, Nordic Ecolabelling is convinced that as more component suppliers and battery producers are confronted with the requirement/signal from their customers that compliance with a Code of Conduct is required, the more likely it is to be achieved. Licensees must inform their suppliers about their Code of Conduct. However, the licensee is not required to guarantee that it will be complied with by its suppliers.

If component suppliers and battery producers operate in countries in which these conventions are incorporated as part of the authorities' requirements, no further documentation will be required beyond the signed application form for a licence for Nordic Swan Ecolabelling.

5.5 Electrical testing

O8 Electrical testing

Minimum average duration (MAD)

The test conditions under which the batteries are tested must be in accordance with IEC 60086-1.

This requirement encompasses the testing of the operating time in various applications depending on the type of battery; see Table 5-9 below. The tables use the designations in IEC 60086-2.

Each test includes at least eight batteries per size and model, and all eight must meet the requirements.

The battery must meet the minimum permitted operation time specified in Table 5-9 for the specific battery dimension.

The battery must meet the test requirement for all applications specified in Table 5-9 for the specific battery dimension. E.g., battery dimension LR20 must meet the test requirements for all three tests specified in Table 5 in order to be approved.

Button cells and all other types of batteries with dimensions that do not match those specified in Table 5–9, including specially designed batteries, are subject to the following requirement:

- If the battery in question is found in the standard IEC 60086-2, the battery must be tested in accordance with the standard, and the test result must show that the battery is minimum 50% better than the operation time specified in the standard (MAD).

¹⁴ <http://www.unglobalcompact.org>

- In the case of batteries of type and sizes not found in IEC 60086-2: contact Nordic Ecolabelling. Nordic Ecolabelling will conduct an internal assessment of the operation time requirements that should be applicable with respect to such battery.
- In the case of batteries with a different chemical composition than alkaline, but of the same size as the batteries specified in Table 5-9, the requirement in Table 5-9 applicable to the relevant battery dimension must be met.

Table 1: Household batteries, dimension LR20

Battery dimension	Application	Load	Daily period	EV (V)	Minimum permitted operating time
LR20	Portable lighting	2,2 Ω	4 min on, 11 min off for 8 h per day	0,9	19,5 h
LR20	Toy	2,2 Ω	1 h	0,8	24 h
LR20	Portable stereo	Current drain 600 mA	2 h	0,9	17 h

Table 2: Household batteries, dimension LR14

Battery dimension	Application	Load	Daily period	EV (V)	Minimum permitted operating time
LR14	Toy	3,9 Ω	1 h	0,8	21 h
LR14	Portable lighting	3,9 Ω	4 min on, 11 min off for 8 h per day	0,9	19 h
LR14	Portable stereo	Current drain 400 mA	2 h	0,9	13 h

Table 3: Household batteries, dimension LR6

Battery dimension	Application	Load	Daily period	EV (V)	Minimum permitted operating time
LR6	Digital still camera	1500 mW 650 mW	*	1,05	70 pulses
LR6	Portable lighting	3,9 Ω	4 min on, 56 min off for 8 h per day	0,9	370 min
LR6	Motor/toy	3,9 Ω	1 h	0,8	7,5 h
LR6	Toy, non-motorized	250 mA	1 h	0,9	8 h
LR6	CD, digital audio, wireless gaming and accessories	100 mA	1 h	0,9	24 h
LR6	Radio/clock/remote control	50 mA	1 h on, 7 h off for 24 h per day	1,0	47,5 h
*According to part 6.1.4 in IEC 60086-2.					

Table 4: Household batteries, dimension LR03

Battery dimension	Application	Load	Daily period	EV (V)	Minimum permitted operating time
LR03	Portable lighting	5,1 Ω	4 min on, 56 min off for 8 h per day	0,9	3,5 h
LR03	Toy	5,1 Ω	1 h	0,8	190 min
LR03	Digital audio	50 mA	1 h on, 11 hr off for 24 h	0,9	19 h
LR03	Remote control	24 Ω	15 s per min 8 h per day	1,0	21 h

Table 5: Household batteries, dimension 6LR61/LF22

Battery dimension	Application	Load	Daily period	EV (V)	Minimum permitted operating time
6LR61	Toy	270 Ω	1 h	5,4	21 h
6LR61	Clock radio	620 Ω	2 h	5,4	47 h
6LR61	Smoke detector*	Background: 10 k Ω Pulse: 0,62 k Ω	1 s on, 3599 s off for 24 h day*	7,5	20 days
*According to part 6.6.8 in IEC 60086-2.					

Leakage

During testing, no leakage may occur.

The requirements concerning test laboratories and test instructions for operation time (MAD) and leakage are stated in Appendix 6.

- ↑ Complete test report, including information that the batteries have been tested in accordance with IEC 60086-1 and that no leakage has occurred during testing.
- ↑ Documentation showing that the test laboratory fulfils the requirements stated in Appendix 6. Independent competent third party must confirm that the testing has been carried out in line with the requirement.

Background to O8 Electrical testing

This requirement remains unchanged in generation 6 of the criteria.

The RPS analysis shows that the use phase is very important in an LCA perspective. A short-lived use stage for batteries results in a higher environmental impact. A long lifespan of non-rechargeable portable batteries results in potential resource savings and decreasing waste¹⁵.

¹⁵ Helgstrand A.: AA batteries, disposable or rechargeable – A comparative Life Cycle Assessment of potential climate impact of rechargeable NiHM and alkaline disposable AA batteries. Linköping Universitet (2011).

The test conditions under which the batteries are tested must be in accordance with IEC 60086-1. The battery must meet the test requirement for all applications specified in Table 5-9 for the specific battery dimension. E.g., battery dimension LR20 must meet the test requirements for all three tests specified in Table 5 in order to be approved. The selected applications correspond to the application specified in IEC 60086-2.

The requirement to the minimum permitted operation time was adjusted in generation 5 according to test-data from existing licensees, external battery test¹⁶ and feedback received during the public consultation for generation 5. Both test-data from existing licensees and the external battery tests at that time showed that there was a potential to tighten the requirement to minimum permitted operation time compared to the requirement levels in IEC 60086-2 for all battery types. The requirement to MAD for the types of batteries was adjusted in generation 5 to the following requirement levels compared to IEC 60086-2 listed in the table below.

Table 6: Requirement to MAD compared to the specific MAD-requirement in IEC 60086-2 for different battery dimension

Battery dimension	Application	The requirements, compared to the specific MAD-requirement in IEC 60086-2
LR20	Toy, Portable lighting and Portable stereo	50-55%
LR14	Toy and Portable stereo	50-55%
LR14	Portable lighting	45%
LR6	Digital still camera	75%
LR6	Portable lighting, Toy, non-motorized, CD, digital audio, wireless gaming and accessories and Radio/clock/remote control	60%
LR6	Motor/toy	50%
LR03	Portable lighting, Toy and Digital audio	60%
LR03	Remote control	45%
6LR61	Toy	75%
6LR61	Clock radio	45%
6LR61	Smoke detector	25%

Button cells and all other types of batteries with dimensions that do not match those specified in Table 5–9 but is found in the standard IEC 60086-2, must perform minimum 50% better than the operation time specified in the standard (MAD) for all applications/battery type.

In the case of batteries with a different chemical composition than alkaline (e.g. lithium battery) but of the same size as the batteries specifies in Table 5-9, the requirement in Table 5–9 applicable to the relevant battery dimension must be met.

In the case of batteries of type and sizes not found in IEC 60086-2: contact Nordic Ecolabelling. Nordic Ecolabelling will conduct an internal assessment of the operation time requirements that should be applicable with respect to such battery.

¹⁶ <https://www.altomdata.dk/aa-batterier-test-kaempe-forskel/2> and <https://www.radron.se/tester/boende-tradgard--husdjur/batterier-aaa/> (visited November 2017)

In generation 5 the no leakage requirement was added. This requirement is the same as in the Korean Eco-label standard (EL764:2012) for rechargeable batteries¹⁷ and IEC 60086-1. The requirement ensures that the batteries meet high safety and quality requirements.

The requirement for minimum average duration (MAD) and leakage must be documented with a complete test report according to IEC 60086-1 and-2. The report shall be conducted by an independent testing laboratory. The independent testing laboratory must confirm that the testing has been carried out in line with the requirement. This will ensure that it is the relevant batteries (eight selected batteries) being tested.

O9 Delayed discharge performance (shelf life)

The battery must achieve a delayed discharge performance after 4 weeks when using the high temperature test, of minimum 90% of the specific MAD limit listed in requirement O9 for each battery dimension and applications.

The test conditions under which the batteries are tested must be in accordance with IEC 60086-1.

Each test includes at least eight batteries per size and model, and all eight must meet the requirements.

In case the manufacturer of the battery or licensee has not had time to perform a delayed discharge test (new battery design/-chemistries) at the time of application, the licensee must present a specific plan for when the test is started and expected to be completed.

The requirements concerning test laboratories are stated in Appendix 6.

- ↑ Complete test report.
- ↑ Documentation showing that the test laboratory fulfils the requirements stated in Appendix 6. Independent competent third party must confirm that the testing has been carried out in line with the requirement.
- ↑ In case of no test at the time of application: The licensee must present a specific plan for performing delayed discharge performance tests for the relevant battery/ies. When the test is completed, it must be sent to Nordic Swan Ecolabel.

Background to O9 Delayed discharge performance (shelf life)

This requirement remains unchanged in generation 6 of the criteria.

The requirement for delayed discharge performance ensures that the battery holds a high operation time even after 12 months of storage. The new requirement supports the overall requirement to ensure a long battery operation time. The fewer batteries that are used, the lower the overall environmental impact of batteries. It is also possible to use the high temperature test (accelerated test method) with a duration of only 4 weeks, which is also described in the standard. This is to make the application process to the Nordic Swan Ecolabel license more flexible.

The test conditions under which the batteries are tested must be in accordance with IEC 60086-1. The limit of minimum 90 % of the specific MAD limit listed in requirement O9 for each battery dimension/applications is identical to the MAD-limit in IEC 60086-2. Each test includes at least eight batteries per size and brand model, and all eight batteries must meet

¹⁷ [Microsoft Word - EL764_2012_126_eng](#)

the requirement. E.g., eight batteries dimension LR20 must meet the test requirements for all three test specified in Table 5 in requirement 09.

The requirement for delayed discharge performance must be documented with a complete test report according to IEC 60086-1. The report shall be conducted by an independent testing laboratory. The independent testing laboratory must confirm that the testing has been carried out in line with the requirement. This will ensure that it is the relevant batteries (eight selected batteries) being tested.

In case the manufacturer of the battery or licensee has not had time to perform a delayed discharge test (new battery design/-chemistries) at the time of application, the licensee must present a specific plan for when the test is started and expected to be completed. Complete test report must be sent to Nordic Ecolabelling.

5.6 Safety

O10 Lithium batteries, safety

Lithium batteries must fulfil the testing requirements in IEC 60086-4.

The requirements concerning test laboratories are stated in Appendix 6.

- ↑ Complete test report.
- ↑ Documentation showing that the test laboratory fulfils the requirements stated in Appendix 6.

Background to O10 Safety

This requirement remains unchanged in generation 6 of the criteria.

Batteries are an essential part of many of today's high-technology products. Together with the continuous development of battery technology and the increasing perfecting of manufacturing techniques, batteries are used more widely as a "green power" enabler for all kinds of applications, whether they are high-performance Lithium batteries or the more conventional zinc-alkaline manganese batteries.

The use of Lithium batteries/cells has grown exponentially in recent years.

While Li-ion batteries are widely used in consumer electronics, many users are not aware that these batteries are considered to be hazardous, especially due to the risk of overheating, fire and short circuiting.

The main hazards for lithium batteries are:

- Explosion
- Fire
- Overheating and fire danger

Primary causes:

- Improper charging
- Improper use
- Overheating
- Electrical abuse

- Over-current
- Over-voltage
- Over-temperature
- Other abuses
 - Internal short-circuiting
 - Transportation
 - Miscellaneous

The batteries must fulfil the testing requirements in IEC 60086-4: “Safety of lithium batteries”, paragraph six, “testing and requirements”.

5.7 Waste plan

O11 Waste sorting in the production process

A waste plan for sorting waste generated in the production process must be submitted. The waste plan must as a minimum contain the following:

- Overview of all waste fractions occurring in production. The waste plan must specify discarded batteries and discarded semi-manufactured batteries.
- Description of how waste is handled during the production process and after delivery (landfill, incineration, waste treatment, material recycling)
- Name and address of the business/organisation(s)/authority (authorities) that collect/receive the waste.

Discarded batteries and discarded semi-manufactured batteries* must be collected and sent for recycling. Documentation must be submitted in the form of a declaration from the collector/recipient confirming that these batteries/semi-manufactured batteries have been sent for material recycling.

**In case of specific national regulatory requirements that prohibit companies to recycle discharged batteries/discharged semi-manufactured partial batteries (i.e. unsealed cans), the licensee must:*

- describe and document the national regulatory requirements for recycling of discharged semi-manufactured partial batteries

- describe how they handle discarded semi-manufactured partial batteries

- ↑ Waste plan as described in the requirement.
- ↑ Declaration from collector/recipient of discarded batteries and discarded semi-manufactured batteries confirming that they are sent for material recycling.
- ↑ In case of specific national regulatory requirements for recycling of discarded batteries, the licensee must: a) describe and document the national regulatory requirements for recycling of discharged semi-manufactured partial batteries and b) describe how they handle discarded semi-manufactured partial batteries.

Background to O11 Waste sorting in the production process

This requirement remains unchanged in generation 6 of the criteria.

As in all other types of production, waste is produced in the production of batteries. Some of the waste fractions created during battery production contains substances that are harmful to health and the environment and need to be processed correctly. Some waste fractions consist of raw materials or material residues containing raw materials that constitute a limited resource and should therefore be collected and reused. For example, potential exists for environmental improvement in the production process if during production semi-manufactured and/or discarded batteries are collected and recycled with a view to material recovery in the same way as post-consumer used batteries. For this reason, Nordic Ecolabelling has chosen to impose the requirement that producers must have a waste processing plan and that this plan must comply with certain requirements. Checks will be conducted during audits to ensure that the waste processing plan is correctly implemented in the production process.

5.8 Energy in production

O12 Energy consumption

Energy consumption data for each energy source must be reported for each production site* handling Nordic Swan Ecolabelled non-rechargeable portable batteries. Nordic Ecolabelling's reporting sheet** for non-rechargeable portable batteries must be used.

** From gate to gate (phase A3 in EPDs) in all factories (manufacturing, packaging, etc.) handling Nordic Swan Ecolabelled non-rechargeable portable batteries.*

*** The reporting sheet is available on Nordic Ecolabelling's websites.*

↑ Filled in reporting sheet.

↑ Documentation (e.g. invoices or similar documents) confirming purchased and/or generated energy from the last year.

Background to requirement O12 Energy consumption

New requirement in generation 6.

Limited data on energy consumption and energy sources hinders progress within the industry. Without accurate data, it becomes difficult to identify major energy use hotspots, compare performance between producers, or evaluate the effectiveness of energy efficiency measures. To support continuous improvement and enable more targeted and impactful criteria development, Nordic Ecolabelling has introduced a requirement to collect detailed energy data. This will lay the foundation for future criteria generations that better address climate impact and drive the transition towards more sustainable production practices.

O13 Energy source - fossil fuels

The licensee must ensure the fulfilment of the following:

1. Fossil oil and coal are not allowed* as energy source in the production** of non-rechargeable portable batteries.

2. A maximum of 15 % of the total energy consumption for the production** of non-rechargeable portable batteries may originate from natural gas.

Calculation of the share of energy coming from natural gas must be done as follows:

$$\text{Share of natural gas} = \frac{\text{Total energy consumption from natural gas (all factories)}}{\text{Total energy consumption (all factories)}} *$$

If the applicants use natural gas in the battery production the applicant must work actively with energy savings by either:

- Being certified according to ISO 50001 or
- Being certified according to ISO 50002 or
- Being certified according to ISO 14001 (must contain an energy review corresponding to part 6.3 of ISO 50001 upon recertification) or
- Have undergone an audit according to EN 16247 within the last 3 years.

** Fossil fuel used for transport or potential backup emergency systems are excluded from the requirement. Grid electricity and district heating and their associated energy sources are excluded from the requirement.*

*** From gate to gate (phase A3 in EPDs) in all factories (manufacturing, packaging, etc.) handling Nordic Swan Ecolabelled non-rechargeable portable batteries.*

- † Confirmation that no fossil oil or coal are used in the production. Nordic Ecolabelling's reporting sheet from requirement O12 can be used.
- † Calculated annual energy coming from natural gas relative to the total energy consumption for all factories handling Nordic Swan Ecolabelled non-rechargeable portable batteries. Nordic Ecolabelling's reporting sheet from requirement O12 can be used.
- † If natural gas is used in the battery production: Documentation for certification according to ISO 50001, ISO 50002, ISO 14001 (including extended energy review corresponding to part 6.3 of ISO 50001 upon recertification) or audit according to EN 16247 performed within the last 3 years.

Background to requirement O13 Energy source - fossil fuels

New requirement in generation 6.

Burning fossil fuels like coal, oil and natural gas results in greenhouse gas emissions, which contributes to climate change as well as air and water pollution¹⁸. Excluding or limiting the use of fossil fuels supports EUs climate policy to achieve climate neutrality by 2050¹⁹. Dialog and data received from manufactures of non-rechargeable portable batteries shows that fossil fuels sometimes are used in emergency back up systems and fire protection systems. Due to safety reasons, these kinds of systems are excluded from the requirement. Regarding transport, Nordic Ecolabelling has too little data to prohibit fossil fuels in transport in this generation of the criteria.

¹⁸ <https://www.greenpeace.org/usa/8-reasons-why-we-need-to-phase-out-the-fossil-fuel-industry/> (visited April 2024)

¹⁹ <https://www.consilium.europa.eu/en/press/press-releases/2023/10/16/cop28-council-sets-out-eu-position-for-un-climate-summit-in-dubai/>

Dialog and data received from manufactures of non-rechargeable portable batteries shows that natural gas is still a widely used energy source. A ban on the use of natural gas will therefore have consequences for the ability to produce Nordic Swan Ecolabelled non-rechargeable portable batteries. However, dialogue and data from manufactures show that a maximum limit on 15 % will encourage manufactures to reduce their consumption of natural gas. Manufactures who use natural gas must further work actively with energy savings by either being certified according to ISO 50001, ISO 50002, ISO 14001 (including extended energy review corresponding to part 6.3 of ISO 50001 upon recertification) or audit according to EN 16247 performed within the last 3 years. Nordic Ecolabelling aim to ban the use of all fossil fuels, including natural gas, in the next generation.

O14 Renewable electricity

At least 20% of the total annual electricity consumption for the manufacturing and packaging of batteries must originate from on-site renewable electricity production.

Calculation of the share of renewable electricity must be done as follows:

$$\text{Share of renewable electricity} = \frac{\text{Total renewable electricity generation (all factories)} *}{\text{Total electricity consumption (all factories)} **}$$

* Total annual on-site renewable electricity generation across all factories (manufacturing, packaging etc.) handling any Nordic Swan Ecolabel non-rechargeable portable batteries. Renewable electricity can come from for example own solar PV, own wind power or own other renewable energy sources situated on the production sites or in the immediate vicinity to the production sites.

** Total annual electricity consumption across all factories (manufacturing, packaging etc.) handling any Nordic Swan Ecolabelled non-rechargeable portable batteries.

- ↑ Description of the installation of locally produced renewable electricity (solar PV etc.) and its location.
- ↑ Calculated annual electricity generation relative to the total electricity consumption across all factories handling Nordic Swan Ecolabelled non-rechargeable portable batteries. If the installations are less than one year old, estimated annual electricity generation data (MWh/year) must be reported. Nordic Ecolabelling's reporting sheet from requirement O12 can be used.

Background to requirement O14 Renewable electricity

New requirement in generation 6.

Renewable electricity, generated from sources such as solar and wind, offers environmental advantages.²⁰ Unlike fossil fuels, renewable energy produces little to no greenhouse gas emissions, helping to mitigate climate change. In addition, renewable energy helps reduce air and water pollution and lowers the overall ecological footprint of electricity generation.

Dialog and data received from manufactures of non-rechargeable portable batteries shows that electricity is an important energy source in the production of batteries. Since battery factories often are located in countries with electricity grids heavily reliant on fossil fuels, it becomes important to transition to renewable energy sources, such as solar PV, at the production sites. At the moment, the amount of own produced electricity varies in the market,

²⁰ [Förnybar energi | Faktablad om Europeiska unionen | Europaparlamentet](#)

where some battery producers have started their transition, whilst others have not. A limit on 20 % of the total electricity consumption coming from own produced renewable electricity production is an ambitious but realistic limit according to dialog and data received from producers of non-rechargeable portable batteries.

The requirement calculates on the total share of renewable electricity in relation to the overall electricity consumption across all factories involved in producing the Nordic Swan Ecolabelled non-rechargeable portable batteries. The requirement regards the total energy consumption of the factories, regardless of the proportion that is dedicated to manufacturing Nordic Swan Ecolabel non-rechargeable portable batteries. This approach acknowledges that factories have different possibilities and conditions for installing renewable electricity solutions such as solar PV and wind power. By allowing flexibility in where renewable electricity investments are made, the Nordic Swan Ecolabel ensures that the collective share of renewable electricity remains meaningful and aligned with environmental goals.

To ensure steerability and actual environmental improvements, licensees that have renewable electricity installations more than one year old are asked to report the actual electricity generation from the installations. If the installations are less than one year old, estimated electricity generation data are allowed to be reported.

5.9 Licence maintenance

The purpose of the licence maintenance is to ensure that fundamental quality assurance is dealt with appropriately.

O15 Customer complaints

The licensee must guarantee that the quality of the Nordic Swan Ecolabel product does not deteriorate during the validity period of the licence. Therefore, the licensee must keep an archive over customer complaints.

Note that the original routine must be in one Nordic language or in English.

↑ Upload your company's routine for handling and archiving customer complaints.

Background to requirement O15 Customer complaints

Nordic Ecolabelling requires that your company has implemented a customer complaint handling system. To document your company's customer complaint handling, you must upload your company's routine describing these activities. The routine should be dated and signed and will normally be part of your company's quality management system.

If your company does not have a routine for customer complaint handling, it is possible to upload a description of how your company performs these activities. During the on-site visit, Nordic Ecolabelling will check that the customer complaint handling is implemented in your company as described. The customer complaints archive will also be checked during the visit.

O16 Traceability

The licensee must be able to trace the Nordic Swan Ecolabel products in the production. A manufactured / sold product should be able to trace back to the occasion (time and date) and the location (specific factory) and, in relevant cases, also which machine / production line where it was produced. In addition, it should be possible to connect the product with the actual raw material used.

You can upload your company's routine or a description of the actions to ensure traceability in your company.

↑ Please upload your routine or a description.

Background to requirement O16 Traceability

Nordic Ecolabelling requires that your company has implemented a traceability system. To document your company's product traceability, you must upload your company's routine describing these activities. The routine should be dated and signed and will normally be part of your company's quality management system.

If your company does not have a routine for product traceability, it is possible to upload a description of how your company perform these activities. During the on-site visit, Nordic Ecolabelling will check that the product traceability is implemented in your company as described.

6 Environmental impact of non-rechargeable portable batteries

The relevant environmental impacts found in the life cycle of non-rechargeable portable batteries are set out in the MECO scheme below. A MECO describes the key areas that have impact on the environment and health throughout the life cycle of the product – including consumption of materials/resources (M), energy (E), chemicals (C) and other impact areas (O). This MECO analysis was performed in conjunction with Nordic Ecolabelling's evaluation of the criteria in 2024. The MECO analyses are based on LCA studies^{21, 22, 23} and scientific reports²⁴.

Nordic Ecolabelling sets requirements concerning the topics and processes in the life cycle that have a high environmental impact – also called hotspots. Based on the MECO analysis, an RPS tool is used to identify where ecolabelling can have the greatest effect. R represents the environmental relevance; P is the potential to reduce the environmental impact, and S is the steerability on how compliance with a requirement can be documented and followed up.

²¹ Giovanni Dolci et al.: Life cycle assessment of consumption choices: a comparison between disposable and rechargeable household batteries. The International Journal of Life Cycle Assessment (2016).

²² Helgstrand A.: AA batteries, disposable or rechargeable – A comparative Life Cycle Assessment of potential climate impact of rechargeable NiHM and alkaline disposable AA batteries. Linköping Universitet (2011).

²³ Mia Romare, Lisbeth Dahllöf (2017). The life cycle energy consumption and greenhouse gas emissions from Lithium-ion batteries, IVL Swedish Environmental Research Institute.

²⁴ Wang, X. (2014). Managing End-of-Life Lithium-ion Batteries: an Environmental and Economic Assessment. Thesis. Rochester Institute of Technology.

The criteria contain requirements in those areas in the life cycle that have been found to have high RPS, since there is potential to achieve positive environmental gains.

The product group non-rechargeable portable batteries include different materials and types of production, but with a uniform function: namely to store energy and provide a portable source of power to charge drained electronic devices. Despite differences in battery technology, the overall life cycle remains consistent with those covered in the current criteria: production of raw materials, production of batteries, usage and end-of-life battery treatment. The differences between products lie primarily in the specific battery chemistry and technology used.

RPS scheme

Area and assessment	RPS level (high-medium-low)	Comments
The spreading and use of metals, especially heavy metals, from the batteries	R: High P: Medium S: Medium	When it comes to the spreading and use of metals, there are differences in which substances the batteries in the market today contain, and at which concentrations. There is thus relevance (R) and potential (P) to distinguish between more or less environmentally hazardous types of batteries. The Battery Regulation (EU) 2023/1542, already regulates the content of mercury (Hg), cadmium (Cd) and lead (Pb) in batteries. However, Nordic Ecolabelling have seen that there is a potential (P) for a stricter requirement concerning the use of mercury, cadmium and lead. This ensure that the raw materials used in a Nordic Swan Ecolabelled battery have a high purity, which has an impact on the quality (R) of the battery. The steerability (S) of the Hg, Cd and Pb content in the batteries is increased by requiring relevant test analyses.
Mining and refining materials used in batteries	R: High P: High S: Low	Mining and refining of materials used in batteries is by far the biggest environmental impact across the life cycle of alkaline batteries. According to LCA studies almost 80% of environmental impacts across the life cycle of these batteries were found to occur during the mining and refining of materials. There is thus high relevance (R) for reducing the environmental impacts from mining and refining. The steerability (S) is however low at the moment, but new legislation and new initiatives to verify and trace minerals from mines through the supply chain, is coming forward. When it comes to emissions to air and water, chemical used during extraction and biodiversity loss there are also low steerability. Requirements for the responsible sourcing of mineral raw materials in battery production ensure that batteries placed on the EU market are sustainable, efficient and safe throughout their lifecycle. All licenced batteries within Nordic Swan Ecolabelled non-rechargeable portable batteries must have a due diligence management system to address the social and environmental risks linked to sourcing, processing and trading raw materials along the whole supply chain, regardless of turnover. The requirement is supporting the new EU regulations.
Quality/safety of non-rechargeable portable batteries	R: High P: Low/Medium S: High	Materials composition and production methods vary between the individual product types of non-rechargeable portable batteries. This has a major impact on the quality of the products. It is therefore highly relevant (R) to ensure that the quality of non-rechargeable portable batteries is good. This can be ensured by requirements to apply quality standards (P). The steerability (S) of the quality of the battery is increased by requiring relevant quality parameters to be tested by independent, qualified third parties. Imposing stringent requirements of the quality of non-rechargeable portable batteries not only ensure good energy efficiency and durability but also increases the lifetime of the battery and ensures that no

		leakage occurs during the use phase. A long battery lifetime also leads to a smaller amount of batteries in the commercial and waste stream. It is important that only high quality and durable batteries, both for low and high-energy devices, can be Nordic Swan Ecolabelled. Safety and quality requirements of non-rechargeable portable batteries ensure safe, energy-effective (long duration) and consumer-friendly batteries. Swedish consumer tests and license data shows that there is a lower potential for tighten the requirement for the batteries minimum permitted operation time compared with today's limits in criteria generation 5.
Overuse of batteries: due to lack of knowledge about optimized use, use of incorrect battery type for electrical appliances, and use of poor-quality batteries, incorrect handling of used batteries in the waste flow	R: High P: Medium/High S: Low	One important parameter for the environmental impact of non-rechargeable portable batteries is the overuse of batteries. The fewer batteries that are used, the lower the overall environmental impact of the non-rechargeable portable batteries. Accordingly, it is important to ensure that Nordic Ecolabel licences are awarded only to batteries that offer the longest operating time. For the consumer, there are economic and environmental benefits from choosing the right battery with the best capacity for the electronic application, thereby ensuring a long and optimised battery life. There is generally a low level of steerability for the consumers' use of batteries, however an improper use or poor matching of battery type and device lead to unnecessary disposal of batteries. Nordic Ecolabelling sets information requirements to the customers on the packaging of batteries, but it is presumably limited who is reading the information. However, the requirements of consumer information and the design of the packaging ensure a high degree of recycling of the products.
End-of-life for non-rechargeable portable batteries: downcycling, energy in recycling processes, emissions	R: High P: Low/Medium S: Low	Important and valuable material is lost if the recycling processes of non-rechargeable portable batteries are not functioning. Since non-rechargeable portable batteries are a disposable product the end-of-life is extra important for non-rechargeable portable batteries. The recycling in the Nordic countries is a developed and functioning system governed by a combination of EU regulations and national policies. Each country has implemented systems to manage the collection and recycling of non-rechargeable portable batteries. Collection points are widely available in all countries which makes the potential low to medium. The steerability of setting requirements is low since the producer do not have any controllability after the battery is sold and no controllability over the recycling processes. However, due to the fact that waste is also produced in the production of batteries, Nordic Ecolabelling has chosen to impose a requirement that producers must have a waste processing plan and that this plan must comply with certain requirements. Further, by requiring information concerning the content of the battery, Nordic Ecolabelling can collect evidence in order to assess how we will set requirements of the battery content in the future. Requirements of consumer information and material used in packaging will ensure a high degree of recycling of the products.
Corporate Social Responsibility	R: High P: High S: Low	Social aspects such as child labour, unsafe working conditions, etc are common within mining and production in countries around the world. The relevance and potential remain high, however the steerability in making a difference remains low due to low controllability in the supply chain. Nordic Ecolabelling has a requirement for working conditions which, in addition to compliance with the UN Global Compact, also includes compliance with the UN Convention on the Rights of the Child (Article 32) and the UN Declaration (61/295) on the Rights of Indigenous Peoples.
PVC in plastic and labelling	R: Medium/High P: High S: High	PVC is still used in some non-rechargeable portable battery components, especially labels and 9-volt battery casings. Although PVC accounts for a smaller part of a battery's weight, its environmental impact is significant. PVC contains substances with known adverse health effects such as phthalates and chlorine-based compounds, and its incineration releases harmful dioxins. Alternatives to PVC, such as PET, PE, nylon, and steel, are widely used in many battery types, indicating strong market potential for substitution. Nordic Swan Ecolabel therefore has a high degree of steerability to prohibit PVC.

PFAS in batteries	R: Medium P: High S: High	Per- and polyfluoroalkyl substances (PFAS) are used in many types of products due to their water and dirt repellent properties. These compounds constitute a group of substances that have highly problematic intrinsic hazardous properties. They are extremely persistent and accumulate in the body. They are spread all over the globe, from the large oceans to the Arctic, and are found in e.g. wild birds and fish and their eggs. Also, shorter chain compounds (2–6 carbon atoms) have been discovered in nature. The substances in this group are suspected to be endocrine disruptors, carcinogenic and to have a negative impact on the human immune system. PFAS are primarily found in rechargeable batteries, especially in advanced types such as lithium-ion batteries. In non-rechargeable portable batteries, the occurrence is generally low or uncommon but not completely excluded. Applying the precautionary principle, the Nordic Swan Ecolabelling has chosen to exclude PFAS from non-rechargeable portable batteries.
Energy in the production of batteries	R: High P: High S: Medium	The production of non-rechargeable portable batteries requires energy, particularly in areas such as electrode material preparation, filling and sealing, line production and drying process. Further, the energy source (renewables vs. fossil) heavily affects the footprint of the production. The relevance of setting requirements for energy in production is therefore high and offers an opportunity to reduce greenhouse gas emissions. The potential for improvements in the battery sector is growing, with an increasing number of manufacturers investing in more energy efficient processes and shifting to renewable energy sources, such as solar PV. The steerability of setting realistic and ambitious requirements are medium since external suppliers are common where the steerability are lower. However, energy data for the production help determine the level and type of requirements that can be effectively implemented.

MECO scheme non-rechargeable portable batteries

25 26 27 28 29 30	Raw material	Production	Use	End of life
Material	Metals (Zn, Mn/MnO ₂ , Li, Fe and more)	(Mostly assembly) PVC in components and labelling	(minimal risk of leakage)	Loss of useful materials (Zn, Mn, Li) due to lacking recycling processes (downcycling)
Energy	Energy use – mining of metal used in batteries Processing of raw material	Electricity/energy of the production of the main product (drying and assembly processes) Energy source (renewable/fossil) highly affects footprint	(no energy use)	Energy for recycling of metals / materials
Chemicals	Emissions to air and water related to mining Chemicals used during extraction	Emissions to air and chemical exposure (NMP, electrolytes, VOC)	Potential risk of leak of electrolytes/chemicals	Emissions to air and water from the recycle process Emissions to air and water in incorrect recycling (landfill) Emission from incineration
Other	Biodiversity/habitat destruction due to mining Social aspects (Conflict and critical raw minerals) (child labor, unsafe working conditions, etc.)	Unsafe working conditions Waste treatment Waste water with heavy metals or chemical residues	Battery quality and performance Improper use / poor matching of battery type and device which lead to unnecessary disposal	

²⁵ [\(PDF\) Life cycle assessment of consumption choices: a comparison between disposable and rechargeable household batteries \(researchgate.net\)](#) 2016

²⁶ PEFCR Batteries, 2020, version 1.1

²⁷ Giovanni Dolci et al.: Life cycle assessment of consumption choices: a comparison between disposable and rechargeable household batteries. The International Journal of Life Cycle Assessment (2016).

²⁸ Helgstrand A.: AA batteries, disposable or rechargeable – A comparative Life Cycle Assessment of potential climate impact of rechargeable NiHM and alkaline disposable AA batteries. Linköping Universitet (2011).

²⁹ Mia Romare, Lisbeth Dahllöf (2017). The life cycle energy consumption and greenhouse gas emissions from Lithium-ion batteries, IVL Swedish Environmental Research Institute.

³⁰ Wang, X. (2014). Managing End-of-Life Lithium-ion Batteries: an Environmental and Economic Assessment. Thesis. Rochester Institute of Technology

7 Future criteria generation

As part of any future evaluation of the criteria, it will be relevant to consider the following:

- Banning natural gas in the production of batteries.
- Higher share of renewable energy in production of batteries.
- Absolute limit of energy consumption per produced battery cell.
- Performance

8 How to apply and regulations for the Nordic Ecolabelling

Application and costs

For information about the application process and fees for this product group, please refer to the respective national website. For contact information see the beginning of this document.

The application consists of an application form/web form and documentation showing that the requirements are fulfilled.

Licence validity

The Nordic Swan Ecolabel licence is valid providing the criteria are fulfilled and until the criteria expire. The validity period of the criteria may be prolonged or adjusted, in which case the licence is automatically prolonged, and the licensee informed.

Revised criteria shall be published at least one year prior to the expiry of the present criteria. The licensee is then offered the opportunity to renew their licence.

On-site inspection

In connection with handling of the application, Nordic Ecolabelling normally performs on-site inspection visit/-s to ensure adherence to the requirements. For such an inspection, data used for calculations, original copies of submitted certificates, test records, purchase statistics, and similar documents that support the application must be available for examination.

Queries

Please contact Nordic Ecolabelling if you have any queries or require further information. See contact info in the beginning of this document. Further information and assistance (such as calculation sheets or electronic application help) is available. Visit the relevant national website for further information.

Follow-up inspections

Nordic Ecolabelling may decide to check whether non-rechargeable portable batteries fulfil Nordic Ecolabelling requirements during the licence period. This may involve a site visit, random sampling, or similar test.

The licence may be revoked if it is evident that the products does not meet the requirements.

Random samples may also be taken in-store and analysed by an independent laboratory. If the requirements are not met, Nordic Ecolabelling may charge the analysis costs to the licensee.

Regulations for the Nordic Ecolabelling of products

When the Nordic Swan Ecolabel is used on products the licence number shall be included.

More information on graphical guidelines, regulations and fees can be found at www.nordic-swan-ecolabel.org/regulations

Appendix 1 Description of the non-rechargeable portable battery, material composition and production

This declaration is based on the knowledge we have at the time of the application, based on tests and/or declarations from raw material manufacturers, with reservations for new advances and new knowledge. Should such new knowledge arise, the undersigned is obliged to submit an updated declaration to Nordic Ecolabelling.

Product: Brand/trading name(s):	
Name and contact details of production location(s) for the manufacture and brand owner(s) of batteries:	

For each battery type, detailing list of all constituent substances present the battery in the application (weight %); cathode-and anode ingredients, electrolyte solutions, conductor-, separator- and container ingredients and other materials.

Product name:		
Cathode ingredients: Substance and CAS nr.:	Concentration of total weight-%	Function:
Anode ingredients: Substance and CAS nr.:		
Electrolyte solutions: Substance and CAS nr.:		
Conductor: Substance and CAS nr.:		
Seperator: Substance and CAS nr.:		
Other ingredients: Substance and CAS nr.:		
Container: Substance and CAS nr.:		
Battery label: Substance and CAS nr.:		

Description of materials used in the primary packaging:

Primary packaging: refers to the purchase packaging for the consumer, e.g. the packaging that holds 4 batteries, and which the consumer encounters in sales.

Description of manufacturing process of the product:

Nordic Ecolabelling wants a general description of the batteries manufacturing process and which technology that is being used to produce the batteries. A flow chart is recommended to explain the production process:

Applicant's or manufactures signature:

Place and date	Company name
Responsible person	Responsible persons signature
Telephone number	E-mail

Appendix 2 Excluded substances

Name of the manufacturer of the battery:	
Name/type of non-rechargeable portable battery/-batteries:	

This declaration is based on the best available knowledge at the time of the application, including test results and/or declarations from raw material manufacturers. It is subject to change if new information or scientific findings become available. In such cases, an updated declaration must be submitted.

I hereby declare that:

- chlorine-based plastic (PVC) is not used in the non-rechargeable portable battery/-batteries.
- per- and polyfluoroalkyl substances (PFAS) are not used in the non-rechargeable portable battery/-batteries.

Manufacture of the battery signature:

Place and date	Company name
Responsible person	Responsible persons signature
Telephone number	E-mail

Appendix 3 Battery label

Type of battery (e.g. AAA or AA): Materials in the battery label:	
Name of the manufacturer of the battery label:	

I hereby declare that the battery label* does not contain PVC or other halogenated organic compounds in general (including flame retardants).

** The label itself, not any pigment or inks used for printing on the label.*

Manufacture of the battery label:

Place and date	Company name
Responsible person	Responsible persons signature
Telephone number	E-mail

Appendix 4 Packaging

Name of the manufacturer of the battery or brand owner:	
Name/type of non-rechargeable portable battery/-batteries:	

Definitions:

Primary packaging: refers to the purchase packaging for the consumer, e.g. the packaging that holds four batteries, and which the consumer encounters in sales.

Secondary packaging: refers to the transport packaging and protects the packs of batteries during transport to stores and consumers.

Post-consumer material is defined in accordance with ISO 14021: "Post-consumer/commercial" is defined as material created by households or commercial, industrial or institutional facilities in the role of end users of a product, which can no longer be used for the intended purpose. This includes return of material from the distribution chain.

Description of materials used in the primary and secondary product packaging:

I hereby declare that:

- the total proportion of pre- and post-consumer recycled material in the primary packaging for the batteries is at least 80% by weight.
- chlorine-based plastic is not used in the primary and secondary product packaging.
- the primary packaging is designed in such a way that dismantling is possible for all individual parts for waste sorting (e.g. cardboard, paper, plastic, metal) without using any tools.

Small antitheft RFID components are excluded from the dismantling requirement.

Manufacturer of the battery or brand owner signature:

Place and date	Company name
Responsible person	Responsible persons signature
Telephone number	E-mail

Appendix 5 Consumer information on the battery

Name of the manufacturer of the battery or brand owner:	
Name/type of non-rechargeable portable battery/-batteries:	

I hereby declare that the battery is marked in accordance with IEC 60086 and the battery Regulation (EU) 2023/1542.

Manufacturer of the battery or brand owner signature:

Place and date	Company name
Responsible person	Responsible persons signature
Telephone number	E-mail

Appendix 6 Analysis and testing laboratories

Testing of quality specifications must be performed by laboratories, which are accredited to the current standard and fulfil the general requirements in the standard EN ISO/IEC 17025 or have official GLP status. A non-accredited laboratory may perform tests if the laboratory has applied for accreditation according to the current testing method, but has not yet been granted approval, or if accreditation is not available for the technical specification or proposed standard. In such case, the laboratory must prove that it is an independent, competent laboratory.

The manufacturer's analysis laboratory/test procedure may be approved for analysis and testing if:

- Sampling and analysis are monitored by the authorities; or
- The manufacturer's quality assurance system covers analyses and sampling and is certified to ISO 9001; or
- The manufacturer can demonstrate agreement between a first-time test conducted at the manufacturer's own laboratory, and testing carried out in parallel at an independent test institute, and the manufacturer takes samples in accordance with a fixed sampling schedule.