

About Nordic Swan Ecolabelling of Refurbished OEM Toner and Ink Cartridges



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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 Justification of the product group definition

For a description of the product group definition, see "What can carry the Nordic Swan Ecolabel" in the criteria.

2 Summary

The product group includes refurbished toner cartridges, ink cartridges and OPC units (Optical Photosensitive Conductor cartridges containing only drum) that are originally manufactured by the OEM (Original Equipment Manufacturer) as described in section 2 "What can carry the Nordic Swan Ecolabel?".

The criteria set requirements for the number of reused materials in the cartridge, the chemicals used in the toner powder or ink, print quality, print capacity, take-back system for used cartridges, customer information and packaging.

The most important requirements are number of reused materials in the cartridge, the chemicals used in the toner powder or ink, print quality, print capacity and take-back system for used cartridges.

Changes and updates from generation 5 to 6

The most important changes are described below.

See also overview of changes in table in section 4.1.

Product group definition:

The product type ink cartridge has been added.

Name of criteria and wording of "refurbished/refurbishing":

The name of the criteria has changed to "Refurbished OEM Toner and Ink Cartridges" and the wording of "refurbished/refurbishing" is used instead of "remanufactured/remanufacturing" throughout the criteria.

Structure of the criteria:

The structure of the criteria has been changed so that it is clearer.

Requirement for description of the product (O1):

Added that declaration of conformity for all products according to EN ISO/IEC 17050-1 or ISO/IEC 17050-1 must be send.

Requirements for ingoing substances in toner powders and inks have been tightened (O3 and O4):

Several new classifications have been banned.

Ban against the following have been added:

- Diethylenetriamine pentaacetate (DTPA) and its salts.
- Hypochlorites and hypochlorous acid (instead of sodium or calcium hypochlorite).
- Bisphenols and bisphenol derivatives (34 bisphenols).
- Halogenated organic compounds.

List for endocrine disruptors have been updated to EU's List I, II and III.

Requirement for carcinogenic aromatic amines in toner powders and inks has been tightened (O5):

Azo dyes that may release carcinogenic aromatic amines must not be used. Before there were a limit for carcinogenic aromatic amines.

Requirement for heavy metals in toner powders and inks has been tightened (O6):

Now the content of lead (limit 25 mg/kg), cadmium (limit 5 mg/kg), mercury (limit 2 mg/kg), chromium VI (limit 3 mg/kg) and chromium (total) (limit 1 mg/kg) must be tested and have a lower limit value. Before it was declared that these heavy metals (except chromium (total), which is new) did not exceed 100 ppm.

Requirement for cobalt and nickel level is the same but must now be tested.

Requirement for VOC and tin organic compounds in toner powders and inks has been tightened (O6):

The limit value for benzene has been lower from 1 mg/kg to 0.35 mg/kg, so that the limit is the same as in "TÜV Rheinland LGA Products GmbH" analysis methods.

Test methods and limit values for tin organic compounds have been updated in line with "TÜV Rheinland LGA Products GmbH" analysis methods.

The option to use the test method BGW-VW-SG2 04 has been deleted, as the test method is no longer relevant.

Requirements for print quality and print capacity for ink cartridges have been added (O10 and O11):

In this generation of the criteria the product group ink cartridges have been added, and therefore also requirements for print quality and capacity for ink cartridges have been added.

Requirement for labour conventions has been added (O17):

The licensee must ensure that sites where refurbished cartridges are manufactured comply with the ILO Conventions stated in the requirement.

2.1 Changes compared to previous generation

The most important changes compared to the previous generation are briefly listed in below table. Ink cartridges have been included in generation 6 of the criteria.

Figure 1 Overview of changes to criteria for Refurbished OEM Toner and Ink Cartridges generation 6 compared with previous generation 5.

Req. gen. 6	Req. gen. 5	Same req.	Change	New req.	Deleted req.	Comments
O1	R1		X			Added that declaration of conformity for all products according to EN ISO/IEC 17050-1 or ISO/IEC 17050-1 must be send. In addition, smaller update of text.
O2	R2		X			Classifications EUH070, EUH029, EUH031 and EUH032 have been deleted. Exception has been added for inks, which are classification as H317 due to preservatives.
O3	R3		X			Classifications H370, H372, EUH380, EUH381, EUH430, EUH431, EUH450 and EUH451 have been added.
O4	R3		X			The following have been added: - Diethylenetriamine pentaacetate (DTPA) and its salts. - Hypochlorites and hypochlorous acid (instead of sodium or calcium hypochlorite). - Bisphenols and bisphenol derivatives (34 bisphenols). - Halogenated organic compounds. For endocrine disruptors: EU's priority list of endocrine disruptors in Annex L of the Final Report of the DHI study has been replaced by EU member state initiative "Endocrine Disruptor Lists" List I, List II and List III.
O5	R5		X			Azo dyes that may release carcinogenic aromatic amines must not be used. Before were a limit for the contents of carcinogenic aromatic amines.
O6	R4 + R6		X			Before it was declared that the heavy metal lead, cadmium, mercury and chromium VI did not exceed 100 ppm. Now the content of these heavy metals and chromium (total) must be tested and have a lower limit value of 25 mg/kg for lead, 5 mg/kg for cadmium, 2 mg/kg for mercury, 3 mg/kg for chromium VI and 1 mg/kg for chromium (total). Requirement for cobalt and nickel is the same.

						The limit value for benzene has been lower from 1 mg/kg to 0.35 mg/kg. Test methods and limit values for tin organic compounds have been updated. Test methods and test conditions have been updated.
O7	R13	X				
O8	R15	X				Small change in text regarding OEM-manufactures. Some text in documentation text moved to requirement text.
O9	R16	X				Some text in documentation text moved to requirement text.
O10	-			X		Print quality for ink cartridges.
O11	-			X		Print capacity for ink cartridges.
O12	R10	X				
O13	R11		X			Added option of take-back of cartridges as part of service of imaging equipment.
O14	R9	X				
O15	R24	X				Added that QR code can be used for information in point b) to d). Added that information about how to send used cartridge back for remanufacturing must be on packaging.
O16	R7	X				
O17	R22		X			Added that licensee must ensure that all manufacturing sites comply with the stated ILO Conventions.
O18	R17-R20		X			Updated to Nordic ecolabelling standard requirement.
O19	R21		X			Updated to Nordic ecolabelling standard requirement.
-	R12				X	
Appendix 1	R14	X				Requirements for analysis laboratory moved to appendix.

3 Requirements and justification of these

3.1 Description of the product

Background to requirement O1 Description of the product

The purpose of this requirement is to obtain a clear description of the product, the used toner powder or ink and at which production sites refurbishing take place, as well as all trade names and trademarks. Licensing usually involves many different names and trademarks. This requirement will simplify and clarify licensing.

The requirement is also to ensure that only cartridges originally manufactured by the OEM can be given the Nordic Swan Ecolabel. This requirement will help to improve the quality of Nordic Swan Ecolabelled toner cartridges and to ensure that newly manufactured copies/clones of cartridges which may infringe various patents are not given the Nordic Swan Ecolabel.

Declaration of conformity shall be sent for all products. Declaration of conformity shall be according to according to EN ISO/IEC 17050-1 or ISO/IEC 17050-1. The declaration of conformity shall minimum contain information about, the products names and models, which laws and directives are compliant with, who is responsible in EU, date and signing. The requirement is set to limit the risk of copy cartridges (not OEMs) and cartridges that are not refurbished (new cartridges) are applied for. In addition, the requirement also promotes more awareness of compliance with legislation.

3.2 Toner powder and ink

Refurbished OPC units (Optical Photosensitive Conductor cartridges) containing only drum are exempted from requirements in section 3.2.

Background to requirement O2 Classification of toner powder and ink

Based on the precautionary principle the requirement prohibits a wide range of the most problematic substances in toner powder and ink. The aim is to eliminate the most hazardous chemicals in toner powder and ink.

Background to requirement O3 Classification of ingoing substances

In addition to the requirement on classified toner powder and ink, there are a number of substances that are prohibited from use. Nordic Ecolabelling sets requirements based on the precautionary principle for environmental and health classification of ingoing substances to ensure that products that are toxic or harmful to the environment and/or health cannot be Nordic Swan ecolabelled.

We are aware that the classification of titanium dioxide is under discussion. Loose powder is the one generating the largest inhalation exposure according to SCCS/1617/2065.

According to SCCS/1661/23, genotoxicity from titanium dioxide cannot be ruled out in oral products and products that can be inhaled. Titanium dioxide is exempted, because it is needed as a pigment for colouring, which is the function for toner powders and inks.

Requirement O16 contains work environment requirements regarding handling of loose powder so that the exposure of loss powder is reduced.

Background to requirement O4 Excluded substances

In addition to the requirement on classified toner powder and ink, there are a number of substances that are prohibited from use. Nordic Ecolabelling sets requirements for environmental and health classification of ingoing substances to ensure that products that are toxic or harmful to the environment and/or health cannot be Nordic Swan ecolabelled.

Substances on the REACH Candidate list of SVHC (Substances of Very High Concern)

The Candidate List identifies substances of very high concern which fulfil the criteria in article 57 of the REACH Regulation (EC 1907/2006). The list includes carcinogenic; mutagenic; and reprotoxic substances (CMR, categories 1A and 1B in accordance with the CLP Regulation); and PBT (persistent, bioaccumulative and toxic) and vPvB (very persistent and very bioaccumulative) substances (as defined in REACH Annex XIII). In addition, two more substance groups are included if they are of equivalent level of concern (ELoC) as the ones previously mentioned. These are endocrine disruptors and substances which are environmentally hazardous without fulfilling the requirements for PBT or vPvB. Based on these adverse characteristics, Nordic Ecolabelling prohibits substances on the Candidate List. This means that we act ahead of the legislation and ban the substances before they are subject to authorisation and restriction in accordance with REACH.

PBT and vPvB substances in accordance with REACH Annex XIII

PBT and vPvB are abbreviations for substances that are persistent, bioaccumulative and toxic, and very persistent and very bioaccumulative, respectively, in accordance with REACH Annex XIII¹. This means that they are not biodegradable and that they accumulate in living organisms. Based on these adverse characteristics they pose a threat to the environment and human health. They are prohibited in all Nordic Swan Ecolabel products.

Potential or identified endocrine disruptors substances

Endocrine disruptors (EDs) are chemicals that alter the functioning of the endocrine (hormone) system and consequently cause adverse health effects. The hormone system regulates many vital processes in living organisms and when normal signalling is disturbed, adverse effects may result. EDs raise high concern for their risk of causing serious negative impact on the environment as well as on human health specifically. Special concern is raised for effects on reproduction and development and about possible links to increases in public health diseases. While effects in wildlife populations have been confirmed, evidence is pointing to effects also in humans. By excluding both identified and prioritised potential EDs which are under evaluation, Nordic Ecolabelling ensures a restrictive policy on EDs.

The ED lists I-III on <https://edlists.org/> are dynamic, and the companies are responsible for keeping track of updates, to keep labelled products compliant with the requirement throughout the validity of the licences. Nordic Ecolabelling acknowledges the challenges associated with new substances being introduced on particularly List II and III, and in some cases also List I. We will evaluate the circumstances and possibly decide on a transition period on a case-by-case basis.

Several substances that are moved from ED List II to sublist II, but can still be considered potential endocrine disruptors, is also prohibited.

¹ Europaparlamentets och rådets förordning (EG) nr 1907/2006 av den 18 december 2006 om registrering, godkännande och begränsning av kemikalier (REACH)<http://eur-lex.europa.eu/legal-content/sv/TXT/PDF/?uri=CELEX:02006R1907-20160203>

Ethylenediamine tetraacetate (EDTA, CAS No. 6381-92-6) and its salts and Diethylenetriamine pentaacetate (DTPA, CAS No. 67-43-6) and its salts.

EDTA, DTPA and their salts are not readily degradable, furthermore, they are both classified toxic for reproduction and poses a risk to consumers. For EDTA, the EU's risk assessment states that under the conditions at municipal water treatment plants EDTA is either not broken down or only breaks down to a slight degree. To-date in Europe, EDTA has been replaced in virtually all consumer products by readily biodegradable alternatives such as MGDA (methylglycine diacetic acid) and GLDA (glutamic acid diacetic acid).

Alkylphenols (AP), alkylphenol ethoxylates (APEO) and other alkylphenol derivatives (APD)

The non-ionic APEO group of surfactants are produced in large volumes and their uses lead to widespread release to the aquatic environment. APEOs are highly toxic to aquatic organisms and degrade to more environmentally persistent compounds (APDs). Ethoxylated nonylphenol and several other alkylphenols are included in the Candidate List due to endocrine disrupting properties.

Bisphenols and bisphenol derivatives

Several bisphenols with the general bisphenol structure and 'bisphenol derivatives' which have constituents with structural properties common to bisphenols are now prohibited. Based on the potential for widespread use and available information on potential endocrine disruptors, reproductive toxicity and PBT/vPvB properties, 34 substances were identified in need for further regulatory risk management in EU².

Hypochlorite and hypochlorous acid

Chlorine-based substances generally have undesirable health and environmental properties. Both hypochlorite and hypochloric acid can lead to formation of organic chlorine compounds and byproducts that are toxic and bioaccumulative, like trihalomethanes and haloacetic acids. Hypochlorous acid is not classified, and hypochlorite have the classification Very toxic to aquatic life (H400) and thus, they are not covered by the general requirement concerning environmentally hazardous substances. However, both pose an environmental risk due to the possibility of organic chlorine compounds forming.

Per- and polyfluorinated substances (PFAS)

Per- and polyfluorinated substances (PFAS) are used in inks for scratch resistance, modifying slip properties, matting effects and more³. Perfluorinated and polyfluorinated alkylated substances (PFAS) are a group of substances with undesirable properties. The substances are persistent and are readily absorbed by the body. PFASs are defined as fluorinated substances containing at least one fully fluorinated methyl or methylene carbon atom (without any H / Cl / Br / I atom attached to it), i.e., with a few listed exceptions, all

² Assessment of regulatory needs: Bisphenols. ECHA – 16 December 2021: Section 2.1: Bisphenols for which further EU RRM is proposed <https://echa.europa.eu/documents/10162/5e60f2fe-12d0-7f6b-5868-f199cfd7f984>

³ <https://www.clariant.com/en/Corporate/Blog/2022-Blog-Posts/12/Shaping-the-future-of-printing>, visited 10 March 2025.

chemicals with at least one perfluorinated methyl group ($-\text{CF}_3$) or a perfluorinated methylene group ($-\text{CF}_2-$) is a PFAS as described in the OECD recommendations.

Halogenated organic compounds

Halogenated organic substances contain halogenated substances such as chlorine, bromine, fluorine, or iodine. Halogenated organic substances include many substances that are harmful to health and the environment, in that they are very toxic to aquatic organisms, carcinogenic or harmful to health in some other way. Halogenated organic substances persist in the environment, which means they pose a risk of having harmful effects.

There is an exemption of the preservatives in inks and for pigments fulfilling the EU requirements for pigments in food packaging according to Resolution AP (89) point 2.5. The reason for including a requirement that pigments need to fulfil Resolution AP (89) is that the Nordic Ecolabelling does not wish to allow PCBs at all but since it is not possible to set a zero limit for pigments, the Nordic Ecolabelling has chosen to use the same limit as in food packaging (Resolution AP (89) point 2.5). This level has been chosen since it is a well-known method in the industry and the low level used in food packaging is considered strict enough for toner powders and inks in cartridges.

Background to requirement O5 Aromatic amines

Carcinogenic aromatic amines shall be avoided. Therefore, azo dyes that may release carcinogenic aromatic amines listed in Regulation (EC) No 1907/2006, Annex XVII, Appendix 8⁴, must not be used in toner powder and ink.

Background to requirement O6 Analysis for heavy metals, tin organic compounds and VOC

To ensure low levels of heavy metals, tin organic compounds and volatile organic compounds (VOC), all toner powders and inks for Nordic Swan Ecolabelled cartridges must be tested.

It is possible to test emissions from the cartridges, but it is also possible to test the content in the toner powder and ink instead, which is a more cost-effective solution. In addition, testing content of unwanted substances in the toner or ink is also assuring that not only health in use phase is considered, but also reducing the risk of distribution of unwanted chemicals for instance via the printed matter. It is therefore the content in the toner powder and ink that must be tested.

Test methods must be according to TÜV Rheinland's "List of criteria for testing and certification of printing modules with toner"⁵. However, also tests according to methods in the Blue Angel Criteria RAL-UZ 177 are accepted.

The limit values are the same as set in TÜV Rheinland's "List of criteria for testing and certification of printing modules with toner"⁶.

⁴ [Appendix 8: Entry 43 - Azocolourants - List of aromatic amines - ECHA](#)

⁵ <https://www.tuv.com/world/en/voc-and-formaldehyde-emission-testing.html>

⁶ As set by TÜV Rheinland's "List of criteria for testing and certification of printing modules with toner" per February 2025.

The test methods and limit values in the requirement are the same for both toner powders and inks. In the Blue Angel Criteria RAL-UZ 177 "Remanufactured toner cartridges and ink cartridges for printers, copiers and multifunction devices" the same applies, where the content of heavy metals and tin organic compounds of both toner powders and inks must be tested in line with TÜV Rheinland's test and have the same limit values. However, in the Blue Angel Criteria VOC must be tested by emissions tests and test and limit values are divided for toner powders and inks, respectively.

Heavy metals

Heavy metals can be used to e.g. pigments/colour production. The requirement includes particularly environmentally and health-damaging heavy metals, which are specified in the requirement.

Heavy metals are restricted because they are toxic to people and other organisms, both on land and in the aquatic environment^{7,8,9}. On forested land, metals can end up in microorganisms in such a way that the degradation of dead organic material and thus the release of nutrients are slowed. On agricultural land, metals can disrupt the organisms in the soil or have a directly toxic effect on plants. Metals on agricultural land can also be taken up by crops to varying degrees, leading to human exposure.

Tin organic compounds

Organotin compounds can be bioaccumulative and health-damaging^{10,11,12}.

Several of the tin-organic compounds are banned for selected areas of use through REACH Annex XVII entry 20 and the following three; TBTO, DBTC and DOTE are on the EU Candidate List.

VOC (volatile organic contents)

Several organic solvents are associated with harmful health effects^{13, 14}. Organic solvents can be absorbed through the lungs and skin and cause damage to several organs. The injuries can be acute or chronic.

⁷ Toxic heavy metals: impact on the environment and human health, and treatment with conducting organic polymers, a review, Sall, M.L., Diaw, A.K.D., Gningue-Sall, D. et al., 2020.

⁸ Heavy metals: toxicity and human health effects, Jomova, K., Alomar, S.Y., Nepovimova, E. et al., 2025.

⁹ Toxicity, mechanism and health effects of some heavy metals:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4427717/>

¹⁰ Forekomst af organiske tinforbindelser i planter og dyr fra danske farvande: Akkumulering og fødekæderelationer, Arbejdsrapport fra DMU, nr. 135, Miljø- og Energiministeriet Danmarks Miljøundersøgelser 2000, https://www2.dmu.dk/1_viden/2_Publikationer/3_arbrapporter/rapporter/AR135.pdf

¹¹ <https://www.bispebjerghospital.dk/giftlinjen/alt-om-gift/kemikalier/kemikalielisten/Sider/tinforbindelser.aspx>, visited 24 February 2025.

¹² <https://miljostatus.miljodirektoratet.no/tema/miljogifter/prioriterte-miljogifter/tbt-og-andre-organiske-tinforbindelser/>

¹³ European Parliament Pilot Project on Exposure to Indoor Air Chemicals and Possible Health Risks, European Commission Joint Research Centre, 2008.

¹⁴ Bruckner, J. V., Anand, S. S., & Warren, D. A. (2008). Toxic effects of solvents and vapors. Casarette and Doull's Toxicology: The Basic Science of Poison, 7th Ed. Klaassen CD (Eds.), 981-1051.

Acute harmful effects after inhalation of vapours are shown, such as headaches, fatigue etc. After prolonged exposure, organic solvents can cause chronic damage to the brain and nervous system. Certain organic solvents cause other irreparable health damage, such as cancer and reproductive damage (birth defects).

In addition, certain organic solvents contribute to the greenhouse effect, some to photochemical ozone formation and some to the depletion of the ozone layer.

3.3 Quality

Background to requirement O7 Production quality

High product quality is essential. Poor quality risks eroding the credibility of Nordic Ecolabelling and the user's faith in refurbished cartridges. This requirement is measured by the number of complaints received for each type of cartridge. The limit value is set at 1%. Data from previous licensing shows that this level is reasonable. Only complaints associated with Nordic Ecolabelling requirements shall be included in the statistics, such as print quality and capacity. Complaints regarding damage during shipping, for example, are not included.

Background to requirement O8 Print quality for toner cartridges

High print quality is of central importance to the user. Print quality shall be on a par with that of the equivalent OEM toner cartridge. If the applicant is an OEM-manufacturer this must also be shown.

All toner cartridges must be tested to and comply with DIN Technical Report 155¹⁵, ASTM F:2036¹⁶ (applies to monochrome printouts), DIN 33870-1 for monochrome printouts or DIN 33870-2 for colour printouts. These are recognised test methods, which can be used by players both large and small within the industry. 50% of the Nordic Swan Ecolabelled toner cartridges are to be tested annually while the licence remains valid. However, if the applicant is an OEM-manufacturer they can instead declare that the same toner powder and spare parts are used in the refurbished OEM cartridges as are used in the new manufactured OEM cartridges.

It is required that an independent auditor certify that testing complies with the standard. Alternatively, the company may be certified in line with the industry's own certification system, known as the Standardized Test Methods Committee (STMC) system¹⁷.

The licensee must make the test results available during inspection visits, plus the documentation must also be made available to Nordic Ecolabelling on request.

Background to requirement O9 Print capacity for toner cartridges

Print capacity is one of the most important requirements in the criteria. Print capacity equal to or better than the equivalent OEM toner cartridge is something all users expect and

¹⁵ DIN Technical Report 155 – Information Technology: Office and data technology – Requirements for refilled modules with toner (monochrome/colour).

¹⁶ ASTM F:2036 – Standard Test Method for Evaluation of Larger Area Density and Background on Electrophotographic Printers.

¹⁷ <https://i-itc.org/what-is-stmc/>

assure credibility to the refurbished toner cartridges. The number of printouts is to be tested in line with one of the following testing standards: DIN Technical Report 155, ISO/IEC 19752 for monochrome cartridges¹⁸, ISO/IEC 19798 for colour cartridges¹⁹, DIN 33870-1 for monochrome cartridges, DIN 33870-2 for colour cartridges or ASTM F:1856²⁰.

All types of toner cartridge shall be tested on application. 50% of the Nordic Swan Ecolabelled toner cartridges are to be tested annually while the licence remains valid.

To ensure that the refurbished OEM toner cartridge can produce the required yield of printouts, it is to be tested and compared against the capacity of the equivalent OEM cartridge. The capacity of the refurbished OEM cartridge must not fall below the capacity of the OEM cartridge by more than 10%.

Alternatively for OEM-manufactures regarding annual test of 50% of the cartridges and not fall below 10% capacity, the applicant can declare that the same toner powder and spare parts are used in the refurbished OEM cartridges as are used in the new manufactured OEM cartridges.

It is required that an independent auditor to certify that testing complies with the standard. Alternatively, the company may be certified in line with the industry's own certification system, known as the Standardized Test Methods Committee (STMC) system²¹.

The licensee must make the test results available during inspection visits, plus the documentation must also be made available to Nordic Ecolabelling on request.

Background to requirement O10 Print quality for ink cartridges

High print quality is of central importance to the user. Print quality shall be on a par with that of the equivalent OEM toner cartridge. If the applicant is an OEM-manufacturer this must also be shown.

All ink cartridges must be tested to and comply with DIN 33871-1²². DIN 33871-1 specifies the principles for recycling as well as testing of colour rendition quality and yield. The aim of the standard is to achieve constant print quality with black or coloured ink of the refillable inkjet print heads and inkjet tanks. 50% of the Nordic Swan Ecolabelled in cartridges are to be tested annually while the licence remains valid. However, if the applicant is an OEM-manufacturer they can instead declare that the same ink and spare parts are used in the remanufactured OEM cartridges as are used in the new manufactured OEM cartridges.

It is required that an independent auditor to certify that testing complies with the standard. Alternatively, the company may be certified in line with the industry's own certification system, known as the Standardized Test Methods Committee (STMC) system²³.

¹⁸ ISO/IEC 19752 – Method for the determination of toner cartridge yield for monochromatic Electrophotographic printers and multi-function devices that contain printer components.

¹⁹ ISO/IEC 19798:2017 – Method for the determination of toner cartridge yield for colour printers and multi-function devices that contain printer components.

²⁰ ASTM F:1856 – Standard practice for Determining Toner Usage for Printer cartridges.

²¹ <https://i-itc.org/what-is-stmc/>

²² DIN 33871-1 Office machines, inkjet print heads and inkjet tanks for inkjet printers - Part 1: Preparation of refilled inkjet print heads and inkjet tanks for inkjet printers.

²³ <https://i-itc.org/what-is-stmc/>

The licensee must make the test results available during inspection visits, plus the documentation must also be made available to Nordic Ecolabelling on request.

Background to requirement O11 Print capacity for ink cartridges

Print capacity is one of the most important requirements in the criteria. Print capacity equal to or better than the equivalent OEM ink cartridge is something all users expect. The number of printouts is to be tested in line with one of the following testing standards: DIN 33871-1²⁴, ISO/IEC 22505²⁵ for monochrome cartridges or ISO/IEC 24711²⁶ for colour cartridges.

All types of ink cartridge shall be tested on application. 50% of the Nordic Swan Ecolabelled ink cartridges are to be tested annually while the licence remains valid.

To ensure that the refurbished OEM ink cartridge can produce the required yield of printouts, it is to be tested and compared against the capacity of the equivalent OEM cartridge. The capacity of the refurbished OEM cartridge must not fall below the capacity of the OEM cartridge by more than 10%.

Alternatively for OEM-manufactures regarding annual test of 50% of the cartridges and not fall below 10% capacity, the applicant can declare that the same ink and spare parts are used in the refurbished OEM cartridges as are used in the new manufactured OEM cartridges.

It is required that an independent auditor to certify that testing complies with the standard. Alternatively, the company may be certified in line with the industry's own certification system, known as the Standardized Test Methods Committee (STMC) system²⁷.

The licensee must make the test results available during inspection visits, plus the documentation must also be made available to Nordic Ecolabelling on request.

3.4 Reuse and take-back system

Background to requirement O12 Reuse

After use the cartridge or container must be collected, cleaned, checked for defects, repaired and refilled with toner powder or ink.

The primary aim of the criteria is to reduce resource consumption through the reuse of materials, in particular plastics. Accordingly, Nordic Ecolabelling considers the requirement that toner cartridges comprise at least 75% reused materials to be the most important. This level has been used in previous generations of the criteria and has proven to be a suitable level. The maximum possible proportion of reused parts in a cartridge depends primarily on the design of the OEM cartridge, something Nordic Ecolabelling are unable to influence through these criteria.

²⁴ DIN 33871-1 Office machines, inkjet print heads and inkjet tanks for inkjet printers - Part 1: Preparation of refilled inkjet print heads and inkjet tanks for inkjet printers.

²⁵ ISO/IEC 22505 - Method for the determination of ink cartridge yield for monochrome inkjet printers and multi-function devices that contain ink.

²⁶ ISO/IEC 24711 - Method for the determination of ink cartridge yield for colour inkjet printers and multi-function devices that contain printer.

²⁷ <https://i-itc.org/what-is-stmc/>

The licensee is sometimes able to expand toner cartridges by adding new toner or ink containers that house more toner powder or ink and so give a higher print capacity than the original OEM cartridges. OEM toner cartridges are available for the same printers but with different print capacity. The printer may be delivered with a “Starter” cartridge that is then replaced with a “Standard” toner cartridge. In some cases, cartridges may be available with increased print capacity, and these may be referred to as “High Capacity” (HC), “More Capacity” or “X” toner cartridges. HC cartridges are generally used to increase print capacity. Nordic Swan Ecolabelled HC cartridges with new toner or ink containers must deliver at least 50% more printouts than the specified number from the equivalent of OEM HC cartridges. If an HC cartridge is available for the printer in question, the increased number of printouts is to be calculated from this level. Otherwise, the level is calculated from the specified number of printouts from the standard cartridge. For this type of HC cartridge, the refurbishing company may exclude any new toner/ink container from the 75% requirement if the toner/ink container needs to be replaced. This type of cartridge must naturally also meet the performance requirements for print quality (O8 or O10) and print capacity (O9 or O11).

Background to requirement O13 Take-back system for refurbishing

The collection of used cartridges is fundamental to the reuse of cartridges.

The aim of the requirement is to make it easy for end users to return used cartridges for refurbishing. The take back systems must be user friendly and easy to use.

Private consumers must be able to return individual cartridges free of charge. The licensee may resolve this issue in various ways, including offering free postage or recommending that individual cartridges can be deposited at the nearest store or take-back point.

The licensee must set up agreements with resellers and distributors to ensure that they also offer take-back systems.

3.5 Packaging

Background to requirement O14 Chlorinated plastics in packaging

Chlorinated plastics, e.g. PVC, must not be used in packaging because it is problematic in the waste sorting and treatment. Read more about Nordic Ecolabelling's position on PVC here: [PVC](#).

3.6 Customer information

Background to requirement O15 Customer information

Important customer information must accompany the product in order to gain the environmental effect of take-back and refurbishing. Information in point a) must be on the packaging. Information in point b) to d) can be on the packaging, in leaflet in the packaging or by QR code on/in packaging.

If information about how to send used cartridge for refurbishing is on a website, the website address on the packaging must be directly to the website describing this (not start website of the company).

Information about warranty and complaint procedures are to be given in all Nordic languages. If the products will not be sold on the Nordic market, such translation is not necessary.

Point c) only applies for toner cartridges.

3.7 Working environment and legislation

Background to requirement O16 Handling of loose toner powder

There may be a health risk when handling large quantities of loose toner powder, for example when refilling toner cartridges. To minimise the risk of inhaling loose toner powder, breathing masks and extraction fans or full mechanisation in the production of Nordic Swan Ecolabelled toner cartridges must be used. This must be documented in a description of how the requirement is fulfilled in the production process, and it is to be checked during on-site inspections.

Background to requirement O17 Legislation and labour conventions

The licensee must fulfil legislation. Respect of patents is of special concern in the industry^{28,29}, and Nordic Ecolabelling want to stress that this issue is important.

Nordic Ecolabelling requires that basic ILO conventions are respected at all sites where the Nordic Swan Ecolabelled cartridge are manufactured.

3.8 Licence maintenance

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

Background to requirement O18 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 perform these activities. During the on-site visit, Nordic Ecolabelling will check that the customer complaint handling is implemented in your

²⁸ Imaging equipment and its consumables. Preparatory Study for Ecodesign., European Commission, Joint Research Centre, 2024.

²⁹ <https://www.etira.org/posts/etiras-2025-vision-tackling-non-compliance-and-championing-sustainability/>

company as described. The customer complaints archive will also be checked during the visit.

Background to requirement O19 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.

4 Environmental impact of Refurbished OEM Toner and Ink Cartridges

The relevant environmental impacts found in the life cycle of refurbished OEM Toner and Ink Cartridges are set out in a MECO scheme (please see 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).

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. 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.

RPS scheme

Life cycle stages	Area and assessment of R, P, S (high, medium or low)	Comments
Raw materials		
Plastic	Plastic	High RPS for requirements for reuse of plastic.
Metal	R: High P: High S: High	Plastic is used in this product group. Plastic production is energy and resource intensive. This can be reduced by refurbishing the cartridges (reuse plastic). Recycled plastic and bio-based plastics also have reduced climate impact compared to virgin plastic. However, the greatest reduction is achieved by reusing the plastic (remanufacturing of the cartridges). A high proportion of the plastic parts of the used cartridges can often be reused, where only a few parts need to be changed and then can be refilled with toner powder/ink. There is therefore a high potential for setting requirement for the amount of reused parts in the cartridges.

		The amount of reused parts in the cartridges can be measured at the refurbishing site. Hereby there is a high steerability for amount for wt% reused materials in the cartridges.
	<p>Metal</p> <p>R: Medium</p> <p>P: Low</p> <p>S: Medium</p>	<p>Low to medium RPS for requirements for metal.</p> <p>Some parts in metal are used in especially toner cartridges.</p> <p>Production of metal is energy-intensive, however there are limited possibility to replace metal with other materials in this product group, because of functionality and durability. In addition, this product group only covers refurbished OEM cartridges, and metal is very durable, so it is expected that metal parts most often are reused in the products.</p>
Production/distribution		
<p>Chemicals harmful to the environment and health</p> <p>Energy consumption</p> <p>Loose toner powder in production</p>	<p>Chemicals</p> <p>R: High</p> <p>P: High</p> <p>S: High</p>	<p>High RPS for requirements for toner powder and ink, where harmful substances should be limited.</p> <p>Health exposure during refurbishing, if cartridges is damaged or emissions during use are relevant.</p> <p>Also, harmful substances from printed matter are relevant when the printed matter are to be recycled.</p> <p>There is potential and steerability to reduce harmful substances in and/or emissions from toner powders and inks. Requirements can be set by not allowing the most harmful substances and to test and set limits for specific relevant harmful substances such as heavy metals and VOC.</p> <p>These requirements ensure that both end-users and workers are exposed to as little harmful chemicals as possible.</p>
	<p>Energy consumption</p> <p>R: Low</p> <p>P: Medium</p> <p>S: Medium</p>	<p>Low RPS for requirements for energy consumption during refurbishing of the products.</p> <p>The primary energy consumption is probably in the raw material phase. Knowledge about energy consumption during refurbishing of the cartridges is low, but energy consumption at this phase is expected not to be high and not to have a significant environmental impact.</p> <p>The potential is low to medium because of the expected low energy consumption. The steerability is low to medium because of difficult to separate energy consumption used for refurbishing from other activities at production sites.</p>
	<p>Loose toner powder in production</p> <p>R: High</p> <p>P: High</p> <p>S: Medium</p>	<p>High RPS for requirements for handling of loose toner powder during refurbishing of the cartridges.</p> <p>Handling of toner powder during refurbishing has high relevance, because of the risk for inhalation by workers.</p> <p>The potential is high to minimise the amount of loose powder exposure e.g. by having suction at workstations or use breathing masks.</p> <p>It is not possible to have full steerability because it is difficult to control if workers actually use the means provide to reduce exposure of loose powder.</p>
Use phase		
<p>Print quality and capacity</p>	<p>Print quality and capacity</p> <p>R: High</p> <p>P: High</p> <p>S: Medium</p>	<p>High RPS for requirements for print quality and capacity of the cartridges.</p> <p>Both a good print quality and print capacity will mean less paper waste and less frequent cartridge replacements, which lower the carbon footprint^{30, 31}.</p> <p>The potential and steerability are high because standards and test methods for printing quality and capacity exist which can be used in requirements. By setting requirements that printing quality and capacity must be at same level as OEM cartridges, low quality is avoided.</p>

³⁰ [Lot 4 - Imaging equipment - Revision Task 1-7.pdf](#), 2019.

³¹ Imaging equipment and its consumables. Preparatory Study for Ecodesign., European Commission Joint Research Centre, 2024.

End of life		
Take-back system Recycling	Take-back system for remanufacturing R: High P: High S: Medium	High RPS for requirements for take-back system for refurbishing of cartridges. To ensure that the cartridges are returned for refurbishing it is important that a take-back system is established. The potential is high because a take-back system is the first step to reuse the cartridges and hereby save materials and reduce CO ₂ -impact. Steerability is only medium because in the end it is the end-user who decide if they want to use the take-back system or not.
	Materials in the packaging R: Medium P: Low S: High	Low to medium RPS for requirements that the packaging shall not contain chlorinated plastics, e.g., PVC. Chlorinated plastics should be avoided in packaging because it is more difficult to recycle than PP and PE ³² . The potential is low because PVC is not often used in packaging. However, it is still important to avoid any use of PVC in packaging. The steerability is high, as it is easy to avoid PVC and to document this.

³² Nordic Ecolabelling's position on PVC: [PVC](#).

MECO scheme

	Raw material	Production	Use	End of life	Transport
Material	<p>Cartridges typically consist of³³:</p> <ul style="list-style-type: none"> • 50–95% plastics such as ABS, PS, PP/PE (Crude oil) • 2–5% toner powder and ink chemicals. Pigments in the form of metals and others. • 1-20% metals such as steel and aluminium. 	<p>Energy sources during production:</p> <ul style="list-style-type: none"> • Crude oil, gas and electricity. • Recycled materials can potentially be used in the production. • Refurbishing of existing cartridges and design for remanufacturing. 	<p>Paper consumption³⁴:</p> <ul style="list-style-type: none"> • Toner cartridges yield approximately 7,500 (A4) to 25,000 (A3) pages • Ink cartridges yield about 300 pages <p>Print quality impacts the use of paper and the capacity has an impact on the yield.</p>	<p>Fate of Ink and Toner Cartridges³⁵:</p> <ul style="list-style-type: none"> • 15 % are refurbished • 32 % are recycled • 35 % are incinerated • 18 % end up in landfills <p>A take-back system facilitates refurbishing and material recycling, ensuring proper handling of waste toner/ink, plastic, and metal.</p>	<p>Fuel for distribution, material transport and take-back systems.</p>
Energy	<p>Energy for extraction of raw materials³⁶:</p> <ul style="list-style-type: none"> • Plastics: 80 - 100 MJ/kg • Steel: 25–35 MJ/kg • Aluminium: 150–200 MJ/kg • Toner powder: 140–160 MJ/kg • Ink: 50-60 MJ/kg 	<p>Energy consumption for:</p> <ul style="list-style-type: none"> • Polymer manufacturing. • Production of plastic granules and metal processing. • Production of toner powder, ink, additives, pigments and process chemicals. • production and refurbishing of cartridges. 	<p>Nothing.</p>	<p>Minimal impact at end-of-life: When plastic components are incinerated, the released energy can be recovered and utilized for heat and electricity generation</p>	<p>Energy consumption when transporting raw materials, products and remanufactured products.</p>

³³ Imaging equipment and its consumables. Preparatory Study for Ecodesign., European Commission Joint Research Centre, 2024.

³⁴ Imaging equipment and its consumables. Preparatory Study for Ecodesign., European Commission Joint Research Centre, 2024.

³⁵ [Lot 4 - Imaging equipment - Revision Task 1-7.pdf](#), 2019.

³⁶ Based on data from ecoinvent, and other databases

	Total impact per 1000 printed pages ³⁷ : 6 to 8,6 MJ and 0,25 to 0,38 kg CO ₂	Total impact per 1000 printed pages ³⁸ : 6,1 to 11 MJ and 0,35 to 0,60 kg CO ₂		Total impact per 1000 printed page ³⁹ : -1.4 to -1.9 MJ and -0.05 to -0.07 kg CO ₂	Total impact per 1000 printed pages ⁴⁰ : 0,16 to 0,29 MJ and 0,01 to 0,02 kg CO ₂
Chemicals	Raw materials: Emissions of e.g. VOC, Sox, Nox during extraction and refining processes	<p>Polymer manufacturing:</p> <ul style="list-style-type: none"> Emissions of VOCs, monomers (styrene, benzene), solvents, and additives (plasticizers, flame retardants). <p>Plastic granules & metal processing:</p> <ul style="list-style-type: none"> Emissions of VOCs, particulate matter, heavy metals (e.g., chromium, nickel), acid gases, and lubricants. <p>Toner powder & ink manufacturing:</p> <ul style="list-style-type: none"> Fine particulates (carbon black, pigment dust), VOC emissions from solvents, and potential heavy metal exposure. Cartridge refurbishing: Airborne toner/ink particles, 	<p>Potential exposure to toner powder/ink in case of leakage (inhalation, skin irritation).</p> <p>Ultrafine particles emission and emission of ozone from office laser printers⁴¹.</p> <p>Emissions of TVOCs (Total Volatile Organic Compounds) from non-OEM toner cartridges during printing⁴².</p>	<p>Emissions from incineration: Particulates, PAHs, VOCs, potential heavy metals from toner pigments.</p> <p>Environmentally hazardous substances from toner powder and inks that end up in recycled paper fibres when the written paper is recycled.</p>	<p>Maintenance chemicals such as lubricating oils, cleaning agent.</p> <p>Emission to air of PAH, CO₂, NO_x, SO_x, particulate matter etc.</p>

³⁷ Imaging equipment and its consumables. Preparatory Study for Ecodesign., European Commission Joint Research Centre, 2024.

³⁸ Imaging equipment and its consumables. Preparatory Study for Ecodesign., European Commission Joint Research Centre, 2024.

³⁹ Imaging equipment and its consumables. Preparatory Study for Ecodesign., European Commission Joint Research Centre, 2024.

⁴⁰ Imaging equipment and its consumables. Preparatory Study for Ecodesign., European Commission Joint Research Centre, 2024.

⁴¹ <https://www.sciencedirect.com/science/article/abs/pii/S0021850215300574>

⁴² <https://h20195.www2.hp.com/v2/GetDocument.aspx?docname=c08126273>

		<ul style="list-style-type: none"> VOCs from cleaning solvents, and residual chemical exposure during cartridge cleaning. 			
Other	<p>Social aspects and ethical aspects of raw material extraction.</p> <p>Agricultural raw materials can cause land-use change.</p>	Social and ethical aspects of refurbishing.	Information for the user about take-back system for remanufacturing.		

5 Areas without requirements

In generation 6 of the criteria ink cartridges were added as a new product type. Because drying out ink cartridges is a special issue for ink cartridges (both new and refurbished), it was investigated if any standards/test methods about drying out ink cartridges exist. However, no standards/test methods were found and therefore no requirements are set for drying out. In the criteria there are requirements for print quality and print capacity for ink cartridges.