ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

CELO CI VA-1 C
Famostar Emergency Lighting

EPD HUB, HUB-5122
Published on 29.01.2026, last updated on 29.01.2026, valid until 28.01.2031

Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1.

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Famostar Emergency Lighting
Address	Florijnweg 8, 6883JP Velp, The Netherlands
Contact details	info@famostar.nl
Website	www.famostar.nl

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR Version 1.2, 24 Mar 2025
Sector	Electrical product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with options, A4-A5, B4, B6 and modules C1-C4, D
EPD author	Daniël van den Heuvel, Famostar Emergency Lighting
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Vera Durão, as an authorised verifier acting for EPD Hub Limited

This EPD is intended for business-to-business and/or business-to-consumer communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	CELO CI VA-1 C
Additional labels	-
Product reference	391530
Place(s) of raw material origin	Germany / The Netherlands
Place of production	Florijnweg 8, 6883JP, Velp, Netherlands
Place(s) of installation and use	Netherlands
Period for data	FY 2024-2025
Averaging in EPD	No grouping
Variation in GWP-fossil for A1-A3 (%)	-
GTIN (Global Trade Item Number)	8715774012020
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	0,58

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 unit of CELO CI VA-1 C
Declared unit mass	0,372 kg
Mass of packaging	0,105 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	15,9
GWP-total, A1-A3 ($kgCO_2e$)	15,4
Secondary material, inputs (%)	13,1
Secondary material, outputs (%)	26,3
Total energy use, A1-A3 (kWh)	66,5
Net freshwater use, A1-A3 (m^3)	0,2

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Famostar is a fully Dutch manufacturer of emergency lighting. We have been designing and assembling our emergency lighting fixtures in-house for more than 65 years. These have been developed together with installers, consultants and end users: ease of use, durability and safety guaranteed.

PRODUCT DESCRIPTION

This EPD of the 391530 CELO CI VA-1 C represents a non-maintained recessed emergency lighting fixture designed to guide the user of a building safely outside in the event of an emergency. It is Produced at Famostar Emergency Lighting in Velp, The Netherlands. The product is used in high-traffic areas such as corridors, offices and stairwells.
The CELO CI VA-1 C is a reliable emergency lighting
The product contains a NiMH battery a housing made of bio-circulair PC and dedicated, high-quality electronics. It has a power consumption of 0,9 watt.
The product has 8-year battery warranty and 10-year luminaire warranty.
Expected technical lifetime of at least 15 years.
The product complies with the requirements of NEN-EN-IEC 60598-2-22.
Units weight = 0,372 kg;
Detailed technical information can be found from manufacturers webpages at https://famostar.nl/celo-ci-va-1-c/

Further information can be found at:
www.famostar.nl

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	41	Worldwide, Mainly EU
Minerals	4	Worldwide, Mainly EU
Fossil materials	58	Worldwide, Mainly EU
Bio-based materials	0	n/a

BIOGENIC CARBON CONTENT

Product’s biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0,14029

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 unit of CELO CI VA-1 C
Mass per declared unit	0,372 kg
Functional unit	Operating the product for 8760 hours per year consuming 0,9 Watts for 15 years and including necessary replacements
Reference service life	15

SUBSTANCES, REACH - VERY HIGH CONCERN

Substances of very high concern	EC	CAS
n/a	n/a	n/a

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	x	x	ND	ND	ND	x	ND	x	ND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Not declared = ND.

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

A market-based approach is used in modelling the electricity mix utilized in the factory.

The product is made of metals, plastics and electronic components. The component manufacturing happens outside of Famostar Emergency Lighting B.V. with subcontractors (injection moulding, aluminum production, PCB production,...) and are then transported to Famostar Emergency Lighting B.V. where they are assembled together. For each individual material, the transport distance to Famostar Emergency Lighting B.V. is based on the supplier's country of origin. Vehicle capacity utilization volume factor is assumed to be 100%, representing a full load. In practice, utilization may vary but since transportation emissions contribute only a small share of the total, this variation is considered negligible. Transport assumpations and distances of materials vary between 3 and 18264 kilometer.

The environmental impacts considered for the product stage cover the manufacturing of raw materials and components used in the production as well as packaging materials and other ancillary materials. It is assumed that there are no production losses during the production processes at the manufacturing site. The finished product is packed in cardboard packaging before being transported on a pallet an wrapped in LDPE foil to the installation site. Ancillary materials include tap water and rain water, with quantities determined based on factory level data. Energy source is only electricity.

Electricity is supplied to the factory through a combination of onsite photovoltaic generation and purchased grid power. A market-based approach is applied to model the purchased electricity grid mix, which is fully sourced from renewable energy. The use of green electricity is demonstrated through contractual instruments (GOs, RECs, etc), and its use is ensured throughout the validity period of this EPD.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to wholesaler cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

Transportation distance is defined according to the PCR. Average distance of transportation is 108 km. This distance only accounts the first leg from our factory in Velp to the wholesaler(no direct sales). Vehicle capacity utilization volume factor is assumed to be 100% which means full load. In reality, it may vary but as role of transportation emissions in total results is small, the variety in load is assumed to be negligible. Empty returns are not taken into account as it is assumed that return trip is used by the transportation company to serve the needs of other clients. Transported mass is 0,7 kg (including cardboard packaging, pallet and LDPE foil.

Transportation does not cause losses as products are packaged properly. Also, volume capacity utilisation factor is assumed to be 100% for the nested packaged products.

There are no material losses during installation. Environmental impacts from installation into the building include waste packaging materials (A5), calculations based on EUROSTAT (83% of the paper/cardboard packaging is recycled, 8% of the paper/cardboard packaging is incinerated and 9% of the paper/cardboard packaging is landfilled. The incineration results in exported electric and thermal energy). Transportation distance to treatment is assumed as 50 km and the transportation method is assumed to be lorry (C2). The impacts of energy consumption and the used ancillary materials during installation are considered negligible.

PRODUCT USE AND MAINTENANCE (B1-B7)

During the use phase (B6), the luminaire consumes power from electricity available on the low voltage level in The Netherlands (In general Ecoinvent 3.10 is used as a data source). Impacts due to electricity production include direct emissions to air, transformation, and transmission losses. Air, soil, and water impacts during the use phase have not been studied.

RSL of the product is assumed to be 15 years and 8760 hours operating hours a year. At this point, the light output is >1 lux on the floor and corresponding spacing tables are still representative. B4 Battery replacement after 70,000 hours (8 years warranty) has been included. RSL scenario alligns with EN15804+A2.

RSL is based on an indoor operating environment with a temperature range of +5°C to 30°C, installed by a qualified person, and maintained in accordance with ISSO 79.

The product is assumed to undergo replacement of selected components in intervals of time based on the lifespan of parts and components. This is to ensure that the product is fully functional throughout its lifetime. This is why B1-B3 and B5 are excluded. B7 is not applicable.

This EPD follows additional requirements for products using energy in module B6 of the use stage and permanently installed into building or infrastructure (defined by the manufacturer).

Such requirements are related to the declaration of module B6 and, when applicable, include any maintenance (B2), repair (B3) and replacement (B4) processes required to achieve the stated service life of the products, as well as emissions in use (B1) if relevant.

PRODUCT END OF LIFE (C1-C4, D)

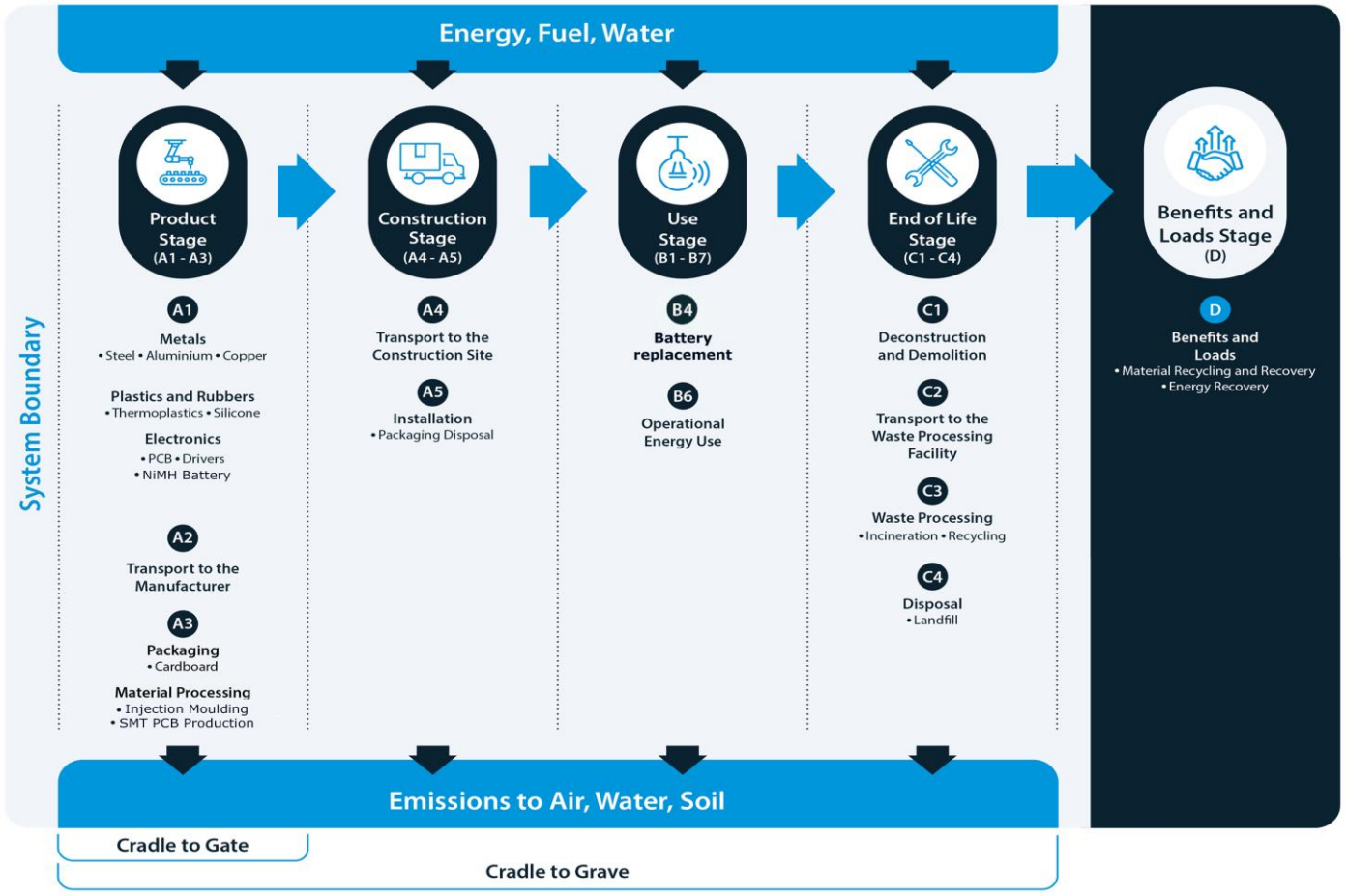
Consumption of energy and natural resources in disassembly process is assumed to be negligible. It is assumed that the waste is collected separately and transported to the waste treatment center. Transportation distance to treatment is assumed as 50 km and the transportation method is assumed to be lorry (C2).

According to EN 50693:2019, the sequence of treatment operations occurring to the product shall include de-pollution, fractions separation and preparation (dismantling, crushing, shredding, sorting), recycling, other material recovery, energy recovery and disposal. In this study, the default values from table G.4 of EN 50693 is used for treating materials in different waste treatment methods. For aluminum 70% recovery rate and 30% disposal rate. For copper 60% disposal rate and 40% disposal rate. Other plastics 50% energy recovery rate and 50% disposal rate.

Packaging waste is not included in the End of Life stages (C3–C4). All impacts related to packaging disposal are instead accounted for in stage A5 (installation).

Due to the material and energy recovery potential of parts in the lighting system, the end-of-life product is converted into recycled raw materials, while the energy recovered from incineration displaces electricity and heat production (D). Module D includes the environmental benefits from energy recovery (electricity and heat) from incineration of plastics at end-of-life, as well as the benefits and burdens associated with avoided production of aluminum, steel, and packaging materials. For packaging, the incineration and recycling impacts are aligned with the A5 stage (installation) end-of-life, and the transfer of PERM and GWP biogenic is also accounted for.

SYSTEM DIAGRAM



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

All industrial processes from raw material acquisition and pre-processing, production, product distribution, installation, use/application of product and end-of-life management are included. For easier modelling and because of lack of accuracy in available modelling resources many constituents under 0,1% of product mass are excluded. These include some additives and fasteners which are present in the product only in very small amounts and have no serious impact on the emissions. Further, water used for cleaning and maintenance of the equipment, transportation and waste streams of the packaging materials used for delivering the raw materials to the factory are omitted since the quantified mass contribution is less than 0.1%. The production of capital equipment, construction activities, and infrastructure, personnel-related activities, energy and water use related to company management and sales activities are excluded.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	No allocation
Ancillary materials	Not applicable
Manufacturing energy and waste	Allocated by mass or volume

This LCA study is conducted in accordance with all methodological considerations, such as performance, system boundaries, data quality, allocation procedures, and decision rules to evaluate inputs and outputs. Allocation used in Ecoinvent 3.10 environmental data sources follow the methodology 'Allocation, cut-off, EN15804'. This methodology is in line with the requirements of the EN 15804-standard.

All estimations and assumptions regarding the cut off criteria and the allocation are declared in the part "Cut-off Criteria except the

estimations/assumptions below:

- Module A2, A4 & C2: Vehicle capacity/average loading factors and empty returns are considered in the background data from ecoinvent.
- Module A4: Transportation does not cause losses as products are packaged properly. Additionally, transportation distance is based on the distance to the capital, Amsterdam, and a lorry is the assumed vehicle type used.
- Module B4 & B6: The product is assumed to undergo replacement of the battery once during its lifetime, based on the lifespan of parts and components. This is to ensure that the product is fully functional throughout its lifetime. The necessary electricity consumption for 15 years is included assuming product is operated annually for 24 hours/day 365 days/year.
- Module C2: Transportation distance to e-waste handling facility is estimated as 50 km and the transportation method is assumed as lorry.
- Module C3, C4, D: The product undergoes dismantling, and the parts are sorted into metals, plastics, paint and electronics. The waste treatment percentages based on EN 50693 are assumed to be applicable. Module C3 accounts for energy and resource inputs for sorting and treating these waste streams for recycling and incineration with energy recovery. Ash from recycling processes is negligible. The recycled end-of-life materials are assumed to serve as secondary raw materials in manufacturing, while incinerated materials displace the need for electricity and heat production.

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	No grouping
Grouping method	Not applicable
Variation in GWP-fossil for A1-A3, %	-

There is no average result considered in this study since this EPD refers to one specific product produced in one production plant.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator for EPD Hub V3 and EPD Process Certification v3.2.3. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1/3.11 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11 environmental data sources follow the methodology ‘allocation, Cut-off, EN 15804+A2‘.

Wood packaging waste treatment

- 32% of the wooden packaging is recycled (source: EUROSTAT, https://ec.europa.eu/eurostat/databrowser/view/env_waspac__custom_8519174/default/table?lang=en)
- 30% of the wooden packaging is incinerated (source: EUROSTAT, https://ec.europa.eu/eurostat/databrowser/view/env_waspac__custom_8519174/default/table?lang=en)
- Exported electric energy for the wooden pallet. This was calculated by (mass of materials incineration with energy recovery)*(energy as a material value) * 16% = MJ of exported energy. The fuel efficiency of the power plant is 38%, of which electricity accounts for 16% and heat for 22% (averaged from Debunking Efficient Recovery: The Performance of EU Incineration Facilities, 2023 https://zerowasteeurope.eu/wp-content/uploads/2023/01/Debunking-Efficient-Recovery-Full-Report-EN.docx.pdf).
- Exported thermal energy for the wooden pallet. This was calculated by (mass of materials incineration with energy recovery)*(energy as a material value) * 22% = MJ of exported energy. The fuel efficiency of the power plant is 38%, of which electricity accounts for 16% and heat for 22% (averaged from Debunking Efficient Recovery: The Performance of EU Incineration Facilities, 2023 https://zerowasteeurope.eu/wp-content/uploads/2023/01/Debunking-Efficient-Recovery-Full-Report-EN.docx.pdf).

Cardboard packaging waste treatment

- 83% of the paper/cardboard packaging is recycled. (source: EUROSTAT, https://ec.europa.eu/eurostat/databrowser/view/env_waspac__custom_8519259/default/table?lang=en)
- 8% of the paper/cardboard packaging is incinerated. (source: EUROSTAT, https://ec.europa.eu/eurostat/databrowser/view/env_waspac__custom_8519259/default/table?lang=en)
- 9% of the paper/cardboard packaging is landfilled
- Exported electric energy for the paper/cardboard packaging. This was calculated by (mass of materials incineration with energy recovery)*(energy as a material value) * 16% = MJ of exported energy. The fuel efficiency of the power plant is 38%, of which electricity accounts for 16% and heat for 22% (averaged from Debunking Efficient Recovery: The Performance of EU Incineration Facilities, 2023 https://zerowasteeurope.eu/wp-content/uploads/2023/01/Debunking-Efficient-Recovery-Full-Report-EN.docx.pdf).
- Exported thermal energy for the paper/cardboard packaging. This was calculated by (mass of materials incineration with energy recovery)*(energy as a material value) * 22% = MJ of exported energy. The fuel efficiency of the power plant is 38%, of which electricity accounts for 16% and heat for 22% (averaged from Debunking Efficient Recovery: The Performance of EU Incineration Facilities, 2023 https://zerowasteeurope.eu/wp-content/uploads/2023/01/Debunking-Efficient-Recovery-Full-Report-EN.docx.pdf).

Plastic packaging waste treatment

- 40% of the plastic packaging is recycled (source: EUROSTAT, https://ec.europa.eu/eurostat/databrowser/view/env_waspac__custom_8519242/default/table?lang=en)
- 37% of the plastic packaging is incinerated
- Exported electric energy for the packaging film. This was calculated by (mass of materials incineration with energy recovery)*(energy as a material value) * 16% = MJ of exported energy. The fuel efficiency of the power plant is 38%, of which electricity accounts for 16% and heat for 22% (averaged from Debunking Efficient Recovery: The Performance of EU Incineration Facilities, 2023 https://zerowasteeurope.eu/wp-content/uploads/2023/01/Debunking-Efficient-Recovery-Full-Report-EN.docx.pdf).
- Exported thermal energy for the packaging film. This was calculated by (mass of materials incineration with energy recovery)*(energy as a material value) * 22% = MJ of exported energy. The fuel efficiency of the power plant is 38%, of which electricity accounts for 16% and heat for 22% (averaged from Debunking Efficient Recovery: The Performance of EU Incineration Facilities, 2023 https://zerowasteeurope.eu/wp-content/uploads/2023/01/Debunking-Efficient-Recovery-Full-Report-EN.docx.pdf).
- 23% of the plastic packaging is landfilled

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	1,57E+01	5,95E-02	-3,10E-01	1,54E+01	8,14E-03	5,32E-01	ND	ND	ND	2,10E+00	ND	4,57E+01	ND	0,00E+00	1,03E-02	2,31E-01	1,21E-01	-6,79E-01
GWP – fossil	kg CO_2e	1,56E+01	5,94E-02	2,02E-01	1,59E+01	8,14E-03	1,57E-02	ND	ND	ND	2,09E+00	ND	4,57E+01	ND	0,00E+00	1,03E-02	2,31E-01	1,21E-01	-5,76E-01
GWP – biogenic	kg CO_2e	2,45E-02	9,35E-06	-5,17E-01	-4,92E-01	1,84E-06	5,17E-01	ND	ND	ND	3,98E-03	ND	0,00E+00	ND	0,00E+00	2,24E-06	-2,12E-05	-1,19E-05	-1,01E-01
GWP – LULUC	kg CO_2e	3,13E-02	3,12E-05	4,73E-03	3,61E-02	3,64E-06	1,36E-05	ND	ND	ND	8,30E-03	ND	2,24E-02	ND	0,00E+00	4,54E-06	4,87E-06	1,86E-06	-1,88E-03
Ozone depletion pot.	kg CFC_{-11}e	3,16E-06	8,57E-10	6,18E-09	3,16E-06	1,20E-10	1,64E-10	ND	ND	ND	2,47E-06	ND	1,59E-06	ND	0,00E+00	1,43E-10	1,13E-10	7,55E-11	-5,14E-09
Acidification potential	mol H^+e	1,60E-01	1,48E-03	1,07E-03	1,63E-01	2,77E-05	5,79E-05	ND	ND	ND	6,75E-02	ND	1,14E-01	ND	0,00E+00	3,42E-05	8,03E-05	3,54E-05	-1,10E-02
EP-freshwater[2)]	kg Pe	3,34E-01	2,35E-06	9,64E-05	3,34E-01	6,34E-07	2,87E-06	ND	ND	ND	1,04E-03	ND	1,36E-02	ND	0,00E+00	7,98E-07	2,15E-06	5,00E-07	-6,93E-03
EP-marine	kg Ne	5,60E-02	3,70E-04	3,92E-04	5,68E-02	9,12E-06	7,02E-05	ND	ND	ND	3,77E-02	ND	2,63E-02	ND	0,00E+00	1,11E-05	3,59E-05	1,69E-04	-2,98E-03
EP-terrestrial	mol Ne	2,27E-01	4,11E-03	3,21E-03	2,34E-01	9,92E-05	2,22E-04	ND	ND	ND	2,88E-02	ND	2,86E-01	ND	0,00E+00	1,21E-04	3,23E-04	1,64E-04	-4,28E-02
POCP ("smog")[3)]	kg NMVOCe	6,92E-02	1,13E-03	1,09E-03	7,14E-02	4,09E-05	7,54E-05	ND	ND	ND	1,23E-02	ND	9,09E-02	ND	0,00E+00	4,76E-05	8,43E-05	4,60E-05	-8,63E-03
ADP-minerals & metals[4)]	kg Sbe	5,20E-03	7,67E-08	2,77E-06	5,21E-03	2,27E-08	4,57E-08	ND	ND	ND	1,12E-04	ND	5,85E-04	ND	0,00E+00	3,37E-08	1,73E-07	1,10E-08	-1,27E-04
ADP-fossil resources	MJ	2,07E+02	7,51E-01	3,18E+00	2,11E+02	1,18E-01	1,43E-01	ND	ND	ND	2,51E+01	ND	6,98E+02	ND	0,00E+00	1,44E-01	7,57E-02	5,11E-02	-6,82E+00
Water use[5)]	m^3e depr.	8,78E+00	2,42E-03	1,41E-01	8,93E+00	5,83E-04	3,94E-03	ND	ND	ND	3,31E+00	ND	1,36E+01	ND	0,00E+00	6,68E-04	1,55E-02	7,69E-03	-2,61E-01

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	8,88E-07	2,49E-09	1,33E-08	9,04E-07	8,15E-10	9,56E-10	ND	ND	ND	1,67E-07	ND	6,37E-07	ND	0,00E+00	8,14E-10	6,63E-10	3,36E-10	-1,02E-07
Ionizing radiation[6)]	kBq U235e	2,37E+00	4,01E-04	2,00E-02	2,39E+00	1,03E-04	5,11E-04	ND	ND	ND	8,73E-01	ND	5,82E+00	ND	0,00E+00	1,16E-04	2,02E-04	7,08E-05	-5,44E-02
Ecotoxicity (freshwater)	CTUe	5,63E+02	6,55E-02	1,54E+00	5,64E+02	1,67E-02	1,61E-01	ND	ND	ND	1,62E+02	ND	1,09E+02	ND	0,00E+00	2,28E-02	4,67E-01	1,68E+00	-8,25E+01
Human toxicity, cancer	CTUh	1,31E-08	1,21E-11	4,03E-10	1,36E-08	1,34E-12	6,62E-12	ND	ND	ND	2,59E-09	ND	1,18E-08	ND	0,00E+00	1,74E-12	2,16E-11	1,07E-11	-2,99E-10
Human tox. non-cancer	CTUh	4,89E-07	2,44E-10	3,01E-09	4,92E-07	7,65E-11	3,55E-10	ND	ND	ND	3,96E-08	ND	5,93E-07	ND	0,00E+00	9,01E-11	8,19E-10	5,33E-10	-1,25E-08
SQP[7)]	-	1,02E+02	1,99E-01	3,30E+01	1,36E+02	1,19E-01	1,27E-01	ND	ND	ND	4,26E+01	ND	2,94E+02	ND	0,00E+00	8,60E-02	7,18E-02	6,82E-02	-8,02E+00

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8)]	MJ	2,96E+01	6,65E-03	5,40E+00	3,50E+01	1,62E-03	-4,90E+00	ND	ND	ND	9,34E+00	ND	2,35E+02	ND	0,00E+00	1,97E-03	6,75E-03	1,38E-03	-1,71E+00
Renew. PER as material	MJ	1,76E-07	0,00E+00	4,49E+00	4,49E+00	0,00E+00	-4,49E+00	ND	ND	ND	0,00E+00	ND	0,00E+00	ND	0,00E+00	0,00E+00	-5,82E-08	-1,18E-07	9,02E-01
Total use of renew. PER	MJ	2,96E+01	6,65E-03	9,89E+00	3,95E+01	1,62E-03	-9,39E+00	ND	ND	ND	9,34E+00	ND	2,35E+02	ND	0,00E+00	1,97E-03	6,75E-03	1,38E-03	-8,10E-01
Non-re. PER as energy	MJ	2,01E+02	7,51E-01	2,85E+00	2,04E+02	1,18E-01	1,14E-03	ND	ND	ND	2,47E+01	ND	6,98E+02	ND	0,00E+00	1,44E-01	-3,41E+00	-4,34E+00	-6,82E+00
Non-re. PER as material	MJ	6,15E+00	0,00E+00	3,61E-01	6,51E+00	0,00E+00	-3,61E-01	ND	ND	ND	0,00E+00	ND	0,00E+00	ND	0,00E+00	0,00E+00	-2,64E+00	-3,51E+00	1,18E-01
Total use of non-re. PER	MJ	2,07E+02	7,51E-01	3,21E+00	2,11E+02	1,18E-01	-3,59E-01	ND	ND	ND	2,47E+01	ND	6,98E+02	ND	0,00E+00	1,44E-01	-6,06E+00	-7,85E+00	-6,70E+00
Secondary materials	kg	4,87E-02	3,50E-04	1,17E-01	1,66E-01	5,03E-05	1,33E-04	ND	ND	ND	9,16E-03	ND	1,69E-01	ND	0,00E+00	6,47E-05	7,68E-05	2,99E-05	6,94E-02
Renew. secondary fuels	MJ	5,13E-03	1,44E-06	1,16E-01	1,21E-01	6,38E-07	1,08E-06	ND	ND	ND	2,97E-04	ND	1,91E-03	ND	0,00E+00	8,23E-07	2,98E-06	8,43E-07	-2,16E-04
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	0,00E+00	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	1,99E-01	6,31E-05	3,36E-03	2,02E-01	1,75E-05	-3,02E-04	ND	ND	ND	7,53E-02	ND	5,46E-01	ND	0,00E+00	1,91E-05	2,72E-04	-1,59E-04	-8,58E-03

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	1,59E+00	1,05E-03	1,65E-02	1,61E+00	2,00E-04	1,31E-03	ND	ND	ND	4,10E-01	ND	1,96E+00	ND	0,00E+00	2,51E-04	4,17E-03	2,03E-03	-1,03E-01
Non-hazardous waste	kg	5,37E+01	1,54E-02	4,34E-01	5,42E+01	3,70E-03	5,63E-01	ND	ND	ND	1,62E+01	ND	6,83E+01	ND	0,00E+00	4,70E-03	1,13E-01	4,53E-01	-5,06E-01
Radioactive waste	kg	1,81E-03	9,79E-08	5,12E-06	1,81E-03	2,52E-08	1,29E-07	ND	ND	ND	1,36E-03	ND	1,44E-03	ND	0,00E+00	2,85E-08	5,06E-08	1,77E-08	-1,37E-05

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	0,00E+00	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	2,68E-11	0,00E+00	0,00E+00	2,68E-11	0,00E+00	1,58E-01	ND	ND	ND	2,07E-02	ND	0,00E+00	ND	0,00E+00	0,00E+00	9,78E-02	0,00E+00	0,00E+00
Materials for energy rec	kg	1,40E-19	0,00E+00	0,00E+00	1,40E-19	0,00E+00	0,00E+00	ND	ND	ND	0,00E+00	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,12E-01	ND	ND	ND	7,70E-04	ND	0,00E+00	ND	0,00E+00	0,00E+00	1,11E+00	0,00E+00	0,00E+00
Exported energy – Electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,76E-01	ND	ND	ND	2,90E-04	ND	0,00E+00	ND	0,00E+00	0,00E+00	4,68E-01	0,00E+00	0,00E+00
Exported energy – Heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,36E-01	ND	ND	ND	4,80E-04	ND	0,00E+00	ND	0,00E+00	0,00E+00	6,44E-01	0,00E+00	0,00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	1,55E+01	5,91E-02	2,08E-01	1,58E+01	8,09E-03	3,11E-02	ND	ND	ND	2,08E+00	ND	4,55E+01	ND	0,00E+00	1,02E-02	2,31E-01	1,21E-01	-5,74E-01
Ozone depletion Pot.	kg $CFC_{-11}e$	3,63E-06	6,81E-10	5,30E-09	3,63E-06	9,59E-11	1,33E-10	ND	ND	ND	2,87E-06	ND	1,31E-06	ND	0,00E+00	1,15E-10	9,87E-11	6,41E-11	-4,34E-09
Acidification	kg SO_2e	1,35E-01	1,18E-03	8,08E-04	1,37E-01	2,12E-05	4,33E-05	ND	ND	ND	6,03E-02	ND	9,09E-02	ND	0,00E+00	2,62E-05	5,97E-05	2,54E-05	-7,68E-03
Eutrophication	kg PO_4^3e	5,00E-02	1,33E-04	3,08E-03	5,33E-02	5,16E-06	2,90E-05	ND	ND	ND	1,76E-02	ND	1,90E-02	ND	0,00E+00	6,37E-06	1,64E-05	1,53E-05	-2,45E-03
POCP (“smog”)	kg C_2H_4e	7,41E-03	5,94E-05	9,26E-05	7,56E-03	1,89E-06	7,06E-06	ND	ND	ND	2,96E-03	ND	7,02E-03	ND	0,00E+00	2,35E-06	3,78E-06	2,74E-06	-4,09E-04
ADP-elements	kg Sbe	5,21E-03	7,55E-08	2,75E-06	5,21E-03	2,21E-08	4,44E-08	ND	ND	ND	1,10E-04	ND	5,81E-04	ND	0,00E+00	3,29E-08	1,68E-07	8,43E-09	-1,26E-04
ADP-fossil	MJ	1,80E+02	7,44E-01	2,82E+00	1,84E+02	1,16E-01	1,35E-01	ND	ND	ND	2,25E+01	ND	5,92E+02	ND	0,00E+00	1,42E-01	7,25E-02	5,00E-02	-5,92E+00

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG[9)]	kg CO_2e	1,56E+01	5,94E-02	2,07E-01	1,59E+01	8,14E-03	1,57E-02	ND	ND	ND	2,10E+00	ND	4,57E+01	ND	0,00E+00	1,03E-02	2,31E-01	1,21E-01	-5,77E-01

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows – CH4 fossil, CH4 biogenic and Dinitrogen monoxide – were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterisation factor for biogenic CO2 is set to zero.

SCENARIO DOCUMENTATION

DATA SOURCES

Manufacturing energy scenario documentation

1. Electricity production, wind, 1-3MW turbine, offshore, Netherlands, Ecoinvent, 0.0168 kgCO2e/kWh
2. Electricity production, photovoltaic, 3kWp flat-roof installation, multi-Si, World, Ecoinvent, 0.0763 kgCO2e/kWh

Transport scenario documentation - A4 (Transport resources)

1. Market for transport, freight, lorry >32 metric ton, EURO5, 108 km

Transport scenario documentation A4

Scenario parameter	Value
Capacity utilization (including empty return) %	100
Bulk density of transported products	7,95E+01
Volume capacity utilization factor	<1

Installation scenario documentation - A5 (Installation waste)

1. Treatment of waste wood, post-consumer, sorting and shredding, Ecoinvent, Materials for recycling, 0.07 kg
2. Treatment of waste wood, untreated, municipal incineration, Ecoinvent, 0.066 kg
3. Exported Energy: Electricity, Ecoinvent, 0.15 MJ
4. Exported Energy: Electricity, Ecoinvent, 0.017 MJ
5. Exported Energy: Electricity, Ecoinvent, 0.0088 MJ
6. Exported Energy: Thermal, Ecoinvent, 0.2 MJ
7. Exported Energy: Thermal, Ecoinvent, 0.024 MJ
8. Exported Energy: Thermal, Ecoinvent, 0.012 MJ
9. Treatment of waste wood, untreated, sanitary landfill, Ecoinvent, 0.084 kg
10. Treatment of waste paperboard, unsorted, sorting, Ecoinvent, Materials for recycling, 0.087 kg
11. Treatment of waste packaging paper, municipal incineration, Ecoinvent, 0.0084 kg
12. Treatment of waste packaging paper, sanitary landfill, Ecoinvent, 0.0095 kg
13. Treatment of waste polyethylene, for recycling, unsorted, sorting, Ecoinvent, Materials for recycling, 0.0014 kg
14. Treatment of waste polyethylene, municipal incineration, Ecoinvent, 0.0013 kg
15. Treatment of waste polyethylene, sanitary landfill, Ecoinvent, 8.1E-4 kg

Use stages scenario documentation - B4 (Replacement data source)

1. Battery production, NiMH, rechargeable, prismatic, Ecoinvent, 0.069 kg
2. Treatment of waste electric and electronic equipment, shredding, Ecoinvent, 0.069 kg
3. Sorting and pressing of iron scrap, Ecoinvent, 0.0069 kg
4. Sorting and pressing of iron scrap, Ecoinvent, 0.0069 kg
5. Sorting and pressing of iron scrap, Ecoinvent, 0.0069 kg
6. Treatment of scrap aluminium, municipal incineration, Ecoinvent, 0.0035 kg
7. Treatment of waste aluminium, sanitary landfill, Ecoinvent, 0.0035 kg
8. Treatment of scrap copper, municipal incineration, Ecoinvent, 0.0035 kg
9. Treatment of copper slag, residual material landfill, Ecoinvent, 0.0035 kg
10. Treatment of waste plastic, mixture, municipal incineration, Ecoinvent, 0.0069 kg
11. Treatment of waste plastic, mixture, municipal incineration, Ecoinvent, 0.0035 kg
12. Treatment of waste plastic, mixture, sanitary landfill, Ecoinvent, 0.0035 kg
13. Exported Energy: Thermal, Ecoinvent, 4.8E-4 MJ
14. Exported Energy: Electricity, Ecoinvent, 2.9E-4 MJ
15. Treatment of inert waste, inert material landfill, Ecoinvent, 0.014 kg
16. Treatment of scrap steel, municipal incineration, Ecoinvent, 0.0035 kg
17. Treatment of scrap steel, inert material landfill, Ecoinvent, 0.0035 kg

Use stages scenario documentation - B4 Replacement

Scenario information	Value
Replacement cycle of battery / Number per RSL or year	1

Use stages scenario documentation - B6 (Energy data source)

1. Market for electricity, low voltage, Netherlands, Ecoinvent, 118.3 kWh

Use stages scenario documentation - B6-B7 Use of energy and use of water

Scenario information	Value
Ancillary materials specified by material / kg or units as appropriate	0
Characteristic performance, e.g., energy efficiency, emissions, variation of performance with capacity utilization, etc.	Market for electricity, low voltage ND, 0,39 kg CO2/kWh
Further assumptions for scenario development, e.g., frequency and period of use, number of occupants	power consumption 0,9W 365 d/year

End-of-life scenario documentation - C1-C4 (Data source)

1. Sorting and pressing of iron scrap, Ecoinvent, Materials for recycling, 0.0067 kg
2. Treatment of scrap steel, inert material landfill, Ecoinvent, 0.0067 kg
3. Treatment of scrap steel, inert material landfill, Ecoinvent, 0.0028 kg
4. Treatment of scrap steel, inert material landfill, Ecoinvent, 0.0055 kg
5. Treatment of scrap steel, inert material landfill, Ecoinvent, 0.0012 kg
6. Treatment of scrap steel, inert material landfill, Ecoinvent, 0.034 kg
7. Treatment of waste plastic, mixture, sanitary landfill, Ecoinvent, 0.025 kg
8. Treatment of waste plastic, mixture, sanitary landfill, Ecoinvent, 0.031 kg
9. Treatment of waste plastic, mixture, sanitary landfill, Ecoinvent, 0.0069 kg
10. Treatment of waste plastic, mixture, sanitary landfill, Ecoinvent, 0.01 kg
11. Sorting and pressing of iron scrap, Ecoinvent, Materials for recycling, 0.0063 kg
12. Sorting and pressing of iron scrap, Ecoinvent, Materials for recycling, 0.011 kg
13. Sorting and pressing of iron scrap, Ecoinvent, Materials for recycling, 0.0097 kg
14. Sorting and pressing of iron scrap, Ecoinvent, Materials for recycling, 0.0083 kg
15. Sorting and pressing of iron scrap, Ecoinvent, Materials for recycling, 0.0048 kg
16. Sorting and pressing of iron scrap, Ecoinvent, Materials for recycling, 0.051 kg
17. Treatment of waste aluminium, sanitary landfill, Ecoinvent, 0.0027 kg
18. Treatment of waste aluminium, sanitary landfill, Ecoinvent, 0.0041 kg
19. Treatment of waste plastic, mixture, municipal incineration, Ecoinvent, 0.061 kg
20. Treatment of waste plastic, mixture, municipal incineration, Ecoinvent, 0.031 kg
21. Treatment of waste plastic, mixture, municipal incineration, Ecoinvent, 0.014 kg
22. Treatment of waste plastic, mixture, municipal incineration, Ecoinvent, 0.0069 kg
23. Treatment of waste plastic, mixture, municipal incineration, Ecoinvent, 0.021 kg
24. Treatment of waste plastic, mixture, municipal incineration, Ecoinvent, 0.01 kg
25. Exported Energy: Electricity, Ecoinvent, 0.3 MJ
26. Exported Energy: Electricity, Ecoinvent, 0.068 MJ
27. Exported Energy: Electricity, Ecoinvent, 0.1 MJ
28. Exported Energy: Thermal, Ecoinvent, 0.41 MJ
29. Exported Energy: Thermal, Ecoinvent, 0.094 MJ
30. Exported Energy: Thermal, Ecoinvent, 0.14 MJ

Scenario information	Value
Scenario assumptions e.g. transportation	Waste flows: xkg -steel, ykg - aluminium, Zkg electronic e.g

THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15804+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

Verified tools

Tool verifier: Magaly Gonzalez Vazquez
Tool verification validity: 27 March 2025 - 26 March 2028

Vera Durão, as an authorised verifier acting for EPD Hub Limited

29.01.2026