ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

Medium voltage cold shrink/hybrid cable joint
Ensto Finland Ltd

EPD HUB, HUB-3708
Published on 27.07.2025, last updated on 27.07.2025, valid until 26.07.2030

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	Ensto Finland Ltd
Address	Ensio Miettisen katu 2 P.O.Box 77 06101 Porvoo Finland and Ensto Estonia AS Keki tn 1, 76606 Keila Estonia
Contact details	ensto@ensto.com, sales@ensto.com
Website	ensto.com

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
Parent EPD number	-
Scope of the EPD	Cradle to gate with options, A4-A5, B6, and modules C1-C4, D
EPD author	Marjo Ketonen, Ensto Finland Oy
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Sarah Curpen, as an authorized 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	Medium voltage cold shrink/hybrid cable joint
Additional labels	-
Product reference	-
Place(s) of raw material origin	EU
Place of production	Finland and Estonia
Place(s) of installation and use	EU
Period for data	12 months: January -December 2024
Averaging in EPD	Multiple products
Variation in GWP-fossil for A1-A3 (%)	+0% / -30%
GTIN (Global Trade Item Number)	-
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	67%

ENVIRONMENTAL DATA SUMMARY

Declared unit	1-phase joint as representative worst case product
Declared unit mass	2,15 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	23,2
GWP-total, A1-A3 ($kgCO_2e$)	22,6
Secondary material, inputs (%)	5,66
Secondary material, outputs (%)	45,1
Total energy use, A1-A3 (kWh)	79,3
Net freshwater use, A1-A3 (m^3)	0,26

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Ensto offers innovative and reliable, long-lifecycle overhead lines, underground networks, network automation technology products and solutions for electricity distribution networks.

PRODUCT DESCRIPTION

Cold shrink / hybrid joint for 1- or 3-core cables with Al/Cu conductor, polymeric insulation and Cu-wire screen. The kit contains components for one or three cable core. Mechanical connectors are included in the kit. Hybrid joint kits include cold shrinkable joint bodies with integrated geometric stress control elements, mechanical connectors for screen connection, heat shrinkable outer jacket tubes in hybrids joints and silicone based in cold shrinks, and all the additional components needed for creating a joint. Easy installation – most critical components integrated in one body
Spiral or tube technology – easy to apply to a wide range of cables
Integrated geometric stress control – most reliable operation in all networks
No special tools needed, Adapts to temperature variations.

Products:
CJ11.240xC
CJC11.240XC
CJH11.240xC
CJWH11.240xC
CJH33.240xC
CJAIO11.240xC
CJAIOW11.240xC

connection according to cable size, x = 2, 25, 3, 4, 45, 5, 55, 6

More information from product web:
https://www.ensto.com/products/medium-voltage-distribution-and-automation/mv-underground-cable-accessories/mv-cold-shrink-joints/

Further company information can be found at:
ensto.com

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	55	EU
Minerals	34	EU
Fossil materials	11	EU
Bio-based materials	-	-

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	0,59

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1-phase joint as representative worst case product
Mass per declared unit	2,15 kg
Functional unit	Joint connecting one phase in medium voltage cable system (24kV)
Reference service life	30 years

SUBSTANCES, REACH - VERY HIGH CONCERN

Substances of very high concern	EC	CAS
Octamethylcyclotetrasiloxane [D4]	209-136-7	556-67-2
Dodecamethylcyclohexasiloxane [D6]	208-762-8	540-97-6
Decamethylcyclopentasiloxane [D5]	208-764-9	541-02-6
Lead	231-100-4	7439-92-1

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	MND	MND	MND	MND	MND	X	MND	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

Modules not declared = MND. Modules not relevant = MNR

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered during the product stage include the manufacturing of raw materials, packaging, and ancillary materials used in production and assembly. These ancillary materials cover chemicals for metal treatment, water and oil processing, and machinery-related inputs. Energy consumption by machines and the management of waste generated during production at the manufacturing facilities are also part of this stage. Material losses occurring during manufacturing and electricity transmission are taken into account.

The materials included in the product family of cable joints primarily consist of metals (mainly aluminum and copper), silicone, plastics, polymer composites (e.g., sealing compounds, silicone greases), and various packaging, labeling, and printed instructional materials.

Along with packaging and ancillary additives, raw materials are transported by truck and ship to the production facilities. Metal preforms are machined, and some components undergo surface treatments, such as tinning and washing. Additional outsourced surface treatments are also included. These treatments represent less than 0.3% of the total material-related impacts in stages A1–A3.

Finished metal parts are manufactured and pre-assembled at Ensto's Porvoo site in Finland. Plastic heat-shrink components are also produced in Finland, including an outsourced radiation crosslinking step, which is based on primary energy consumption data provided by the supplier.

Silicone-based insulating and functional layers for the joints are produced at the Ensto Keila site in Estonia. Metal parts are shipped there from Ensto's Finnish machining operations and external component suppliers.

Final assembly of the joint kits, including accessories, takes place at the Estonian facility.

To account for variability in energy sourcing, the representative worst-case product was modeled using the location-based approach for both Finland and Estonia. This ensures validity over the EPD's 5-year duration in case of disruptions in renewable energy supply, Ensto uses renewable energy in production by a contractual instrument with purchased guarantees of origin during 2024 and aims to continue renewable energy sourcing as part of company sustainable strategy. Emission factors for used to add energy impact for purchased electricity were 0.14 kg CO_2e/kWh for Finland and 0.32 kg CO_2e/kWh for Estonia. The appendix demonstrates the impact with renewable energy option additionally to EPD's conservative approach in assumptions for energy impacts.

A cut-off rule was applied for factory forklift fuel emissions. Material transport distances from suppliers to the factory were estimated based on each supplier's country of origin. Electricity consumption for manufacturing was allocated based on annual production data from January to December 2024. This allocation accounts for multiple parallel machining lines with different outputs and technologies, as each product component may be produced across various lines in the same facility.
Final products are processed through the same facilities, with no geographical variation at market level. After the final assembly components are packaged in plastic bags and cardboard boxes, which are placed on wooden pallets. These pallets are assumed to consist of 80% virgin and 20% recycled wood, reflecting the packaging manufacturing burden in the system.
The environmental impacts considered during the product stage include the manufacturing of raw materials, packaging materials, and ancillary components. All primary raw materials are sourced externally, while Ensto performs material conversion processes such as metal machining and plastic extrusion.
The representative product was selected based on items covering 80% of the group's annual production in 2024. The modeling and calculations are based on primary and secondary data collected from Ensto's manufacturing operations and suppliers. Products were modeled and normalized to a 1 kg reference flow. They are used in 1-phase, 3-phase, or repair cable joints, with 3-phase models representing a tripled configuration of the 1-phase version, including additional variable components and accessories. There was no other independent verification outside internal data validation prior to conducting this LCA.

All these options were represented within the products used to determine the representative product. The most impactful product reference was chosen as the representative worst-case product for whole life cycle modelling. This same product was also the most produced during 2024, therefore averaging was not used or necessary for product composition representatives. All other sister products in the medium voltage cold shrink/hybrid joint family within this EPD's coverage, outside covered 80% volume each represent between 1% to 3% of the produced volumes during 2024. The Product IDs covered by this EPD are listed in the product general information section. All identified product models exhibited a total GWP variation ranging from 0% to -30% compared to the identified worst-case product. A scaling table for product variations, modeled separately and calculated according to worst-case impacts, is provided in the appendices.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

Transportation impacts (A4) include direct exhaust emissions from fuel combustion, environmental impacts from fuel production, and emissions related to transportation infrastructure. These impacts stem from delivering the final product to the construction site.
The products analyzed are sold globally. Average shipping and trucking distances were calculated using calendar year 2024 sales data, based on representative products included in the averaged product system. On average, a product and its packaging are transported 1,500 km by truck. The truck loading factor accounts for partial loads and empty return trips.
The installation phase (A5) does not result in material losses. However, some installation accessories are treated as waste along with packaging materials such as the loading tube/spiral. Waste collection and processing are included in this phase and cover the impacts from wooden pallet pre-treatment (e.g., wood chipping), as well as sorting of plastic film, paper, and cardboard.

PRODUCT USE AND MAINTENANCE (B1-B7)

EPD follows additional requirements for products considered as Electronic or Electric Equipment. Maintenance is not investigated as actions are not needed or possible during connector's lifespan. Product is replaced when distribution network infrastructure is under maintenance or re-build. This B6 energy consumption is investigated via energy losses. The Product is assumed to be installed in EU hence, the respective grid electricity dataset has been used in the LCI stage. The joint's connection dissipates energy due to Joule effect throughout its lifetime. Considering the linear resistivity of the product (6,5 · 10-5 Ω/m) and lifetime (30 years), joule effect is calculated under 1 A of current. Number of phases used is two for considering repair joint option between 1 and 3 phase joints.

$P(kWh)= I2 \cdot R \cdot RSL \cdot L \cdot N$

I: current (A) R: resistivity (Ω/km) RSL: reference service life (h), 100% use rate for 30 years L: length (m) N: number of phases.

The Product is assumed to be installed in EU hence, the respective grid electricity dataset has been used in the LCI stage (Energy supply, electricity transformation and distribution, distribution of medium voltage)
Connection joints are part of an electrical system connecting usually 0.5 km cables together. When comparing cable losses in the same scenario, the joint has less impact compared to cable. Following the principles of IEC 60228:2004, the maximum allowed resistance (20°C AC resistance) of a 240 mm aluminum conductor is defined to be 0,125 Ω/km. Connector's measured resistance in representative product is approximately 50% from the cable specification in example when comparing in the same geometrical proportion.
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

It is assumed that if the product is de-installed, this will occur manually during an update of the electricity distribution system, or the product will enter the waste stream as part of the deconstruction of the entire underground electricity distribution network.

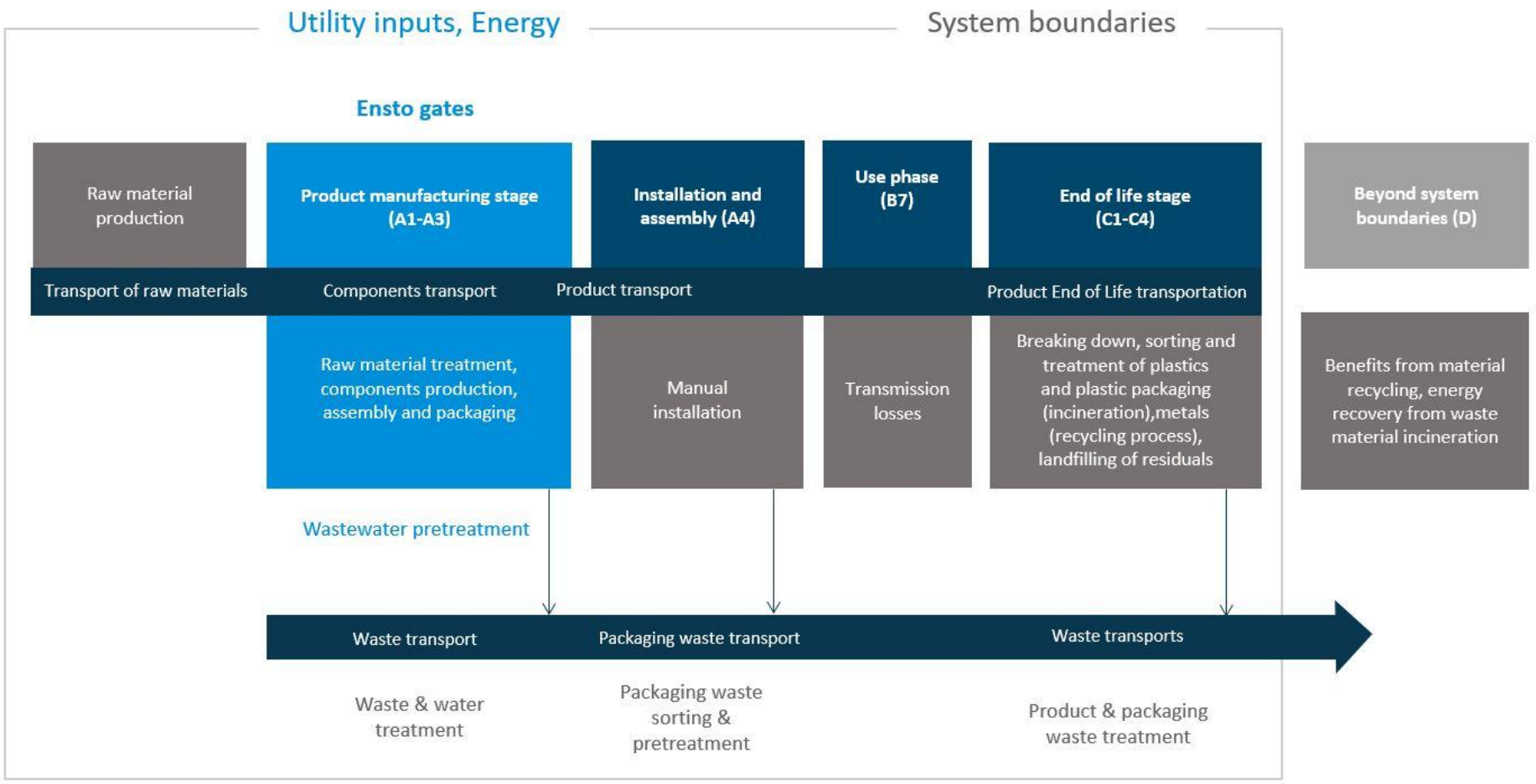
The recovered joint is assumed to undergo a shredding process, during which metals are separated for recycling. Waste is assumed to be collected separately and transported by lorry to a waste treatment facility, with an estimated transport distance of 100 km for both recycling and landfilling scenarios.

The recycling recovery rate for steel and aluminum is set at 85%, based on authoritative sources such as the World Steel Association and the European Aluminum Association. While aluminum alone typically reaches a higher recovery rate of 90%, a conservative consolidated rate of 85% has been applied for both metals.

Module C3 includes the energy and resource inputs required for processing these waste streams. It is assumed that metals, along with cardboard and paper from packaging, are recycled. A residual 15% of metals and composite materials (e.g., sealing mastics) are assumed to be landfilled.

Wooden pallets and plastic films are assumed to be incinerated, with energy recovery credited for displacing conventional electricity and heat production. These benefits, along with the environmental impacts of recycling and incineration of packaging materials, are accounted for in Module D.

MANUFACTURING PROCESS



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 that is 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.

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 and manually for validating and adjusting the specific data share output. The 'Cut-Off, EN 15804+A2' allocation method, and characterization factors are 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 made according to 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	No allocation
Manufacturing energy and waste	Allocated by mass or volume

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	Multiple products
Grouping method	Based on worst-case results
Variation in GWP-fossil for A1-A3, %	+0% / -30%

The product series is produced in the same manufacturing location with similar or identical raw material and components. The Products under the medium voltage cold shrink/hybrid joint series have similar but non-linearly scalable geometrical form and share of raw materials and they serve similar function for joining cables in medium voltage electricity distribution network installed underground.

LCA SOFTWARE AND BIBLIOGRAPHY

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

This EPD follows requirements for construction products considered as electric equipment. Assessment EPD is Based on ISO 14025:20061: Environmental labels and declarations — Type III environmental declarations — Principles and procedures, According SFS EN 50693:2019: Product category rules for life cycle assessments of electronic and electrical products and systems - Such c-PCRs can be used when they are not in contradiction with EN 15804:2012+A2:2019/AC2021 and ISO 21930:2017 as no construction product due to the variation in GWP compliance is limited. EN 50693:2019, EN ISO 14067:2018, and this PCR. In cases where there is conflicting information between this PCR and the c-PCR, this PCR must be followed. However, providing information as it is required by the c-PCR in such conflict cases as additional information may be done, but not required

EN 15804:2012 + A2:2019 and program operator's product category rules: EPD Hub's General Program Instructions v. 1.3 24 March 2025 and Core Product Category Rules v. 1.22 24 March 2025, and as well as according to ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services. EPD life cycle assessment follows also the rules of the ECO Platform, as set out in the Verification Guidelines document: Verification Guidelines for ECO EPD Programme Operators, Version 8.0, December 2024

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	2,06E+01	5,63E-01	1,47E+00	2,26E+01	1,08E+00	5,11E-01	MND	MND	MND	MND	MND	3,78E-07	MND	0,00E+00	2,33E-02	2,59E+00	3,71E-01	-3,59E+00
GWP – fossil	kg CO_2e	2,05E+01	5,63E-01	2,06E+00	2,32E+01	1,08E+00	2,57E-02	MND	MND	MND	MND	MND	3,77E-07	MND	0,00E+00	2,32E-02	2,59E+00	1,26E-02	-2,69E-01
GWP – biogenic	kg CO_2e	5,05E-02	1,13E-04	-6,06E-01	-5,55E-01	2,13E-04	4,86E-01	MND	MND	MND	MND	MND	3,80E-10	MND	0,00E+00	5,27E-06	-3,43E-04	3,58E-01	-3,33E+00
GWP – LULUC	kg CO_2e	2,32E-02	2,30E-04	1,84E-02	4,19E-02	3,80E-04	3,48E-05	MND	MND	MND	MND	MND	2,60E-10	MND	0,00E+00	1,04E-05	3,96E-04	7,75E-06	5,11E-03
Ozone depletion pot.	kg $CFC\text{-}_{11}$e	4,38E-05	9,60E-09	2,53E-08	4,39E-05	2,14E-08	2,22E-10	MND	MND	MND	MND	MND	5,38E-15	MND	0,00E+00	3,43E-10	2,93E-09	3,28E-10	-2,05E-08
Acidification potential	mol H^+e	1,77E-01	1,73E-03	5,68E-03	1,85E-01	3,36E-03	1,05E-04	MND	MND	MND	MND	MND	2,96E-09	MND	0,00E+00	7,93E-05	1,83E-03	8,75E-05	-6,08E-03
EP-freshwater[2)]	kg Pe	6,24E-02	4,09E-05	6,25E-04	6,30E-02	7,13E-05	6,64E-06	MND	MND	MND	MND	MND	1,41E-09	MND	0,00E+00	1,81E-06	9,13E-05	1,23E-06	-9,42E-05
EP-marine	kg Ne	3,95E-02	5,11E-04	1,59E-03	4,16E-02	1,13E-03	6,28E-05	MND	MND	MND	MND	MND	1,40E-09	MND	0,00E+00	2,60E-05	6,49E-04	3,35E-05	-1,42E-03
EP-terrestrial	mol Ne	5,11E-01	5,56E-03	1,31E-02	5,29E-01	1,23E-02	3,09E-04	MND	MND	MND	MND	MND	1,20E-08	MND	0,00E+00	2,83E-04	5,97E-03	3,63E-04	-2,48E-02
POCP ("smog")[3)]	kg NMVOCe	1,25E-01	2,54E-03	4,24E-03	1,32E-01	5,27E-03	1,05E-04	MND	MND	MND	MND	MND	3,24E-09	MND	0,00E+00	1,17E-04	1,71E-03	1,26E-04	-4,41E-03
ADP-minerals & metals[4)]	kg Sbe	1,20E-03	1,70E-06	5,31E-06	1,20E-03	3,52E-06	1,77E-07	MND	MND	MND	MND	MND	1,17E-12	MND	0,00E+00	6,49E-08	2,87E-06	2,77E-08	-7,42E-07
ADP-fossil resources	MJ	2,36E+02	8,05E+00	3,90E+01	2,83E+02	1,51E+01	2,63E-01	MND	MND	MND	MND	MND	3,22E-06	MND	0,00E+00	3,37E-01	3,28E+00	2,80E-01	-2,66E+00
Water use[5)]	m^3e depr.	9,73E+00	3,97E-02	1,07E+00	1,08E+01	7,42E-02	5,40E-03	MND	MND	MND	MND	MND	4,49E-07	MND	0,00E+00	1,67E-03	1,04E-01	1,28E-03	-5,55E-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	1,86E-06	4,93E-08	4,61E-08	1,96E-06	8,45E-08	3,10E-09	MND	MND	MND	MND	MND	3,25E-14	MND	0,00E+00	2,33E-09	1,65E-08	2,02E-09	-8,07E-08
Ionizing radiation[6]	kBq U235e	8,13E-01	8,46E-03	1,63E+00	2,45E+00	1,93E-02	1,83E-03	MND	MND	MND	MND	MND	6,82E-09	MND	0,00E+00	2,94E-04	1,91E-02	2,47E-04	-2,75E-02
Ecotoxicity (freshwater)	CTUe	7,71E+02	1,10E+00	5,61E+00	7,78E+02	1,98E+00	1,73E-01	MND	MND	MND	MND	MND	2,83E-06	MND	0,00E+00	4,77E-02	2,17E+01	6,73E-02	-8,46E-01
Human toxicity, cancer	CTUh	1,17E-08	9,39E-11	8,44E-10	1,26E-08	1,83E-10	3,50E-11	MND	MND	MND	MND	MND	7,08E-16	MND	0,00E+00	3,84E-12	8,71E-10	3,06E-12	-4,22E-10
Human tox. non-cancer	CTUh	3,14E-07	5,13E-09	1,35E-08	3,32E-07	9,48E-09	4,68E-10	MND	MND	MND	MND	MND	1,63E-14	MND	0,00E+00	2,18E-10	5,56E-08	6,85E-11	-1,63E-08
SQP[7]	-	1,05E+02	6,61E+00	6,31E+01	1,75E+02	8,99E+00	3,18E-01	MND	MND	MND	MND	MND	1,91E-06	MND	0,00E+00	3,40E-01	1,67E+00	6,50E-01	-9,92E+01

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	3,14E+01	1,23E-01	1,30E+01	4,45E+01	2,61E-01	-2,64E+00	MND	MND	MND	MND	MND	1,16E-07	MND	0,00E+00	4,62E-03	3,12E-01	3,96E-03	-2,07E+01
Renew. PER as material	MJ	0,00E+00	0,00E+00	5,30E+00	5,30E+00	0,00E+00	-2,16E+00	MND	MND	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	0,00E+00	-3,14E+00	-7,79E+00
Total use of renew. PER	MJ	3,14E+01	1,23E-01	1,83E+01	4,98E+01	2,61E-01	-4,80E+00	MND	MND	MND	MND	MND	1,16E-07	MND	0,00E+00	4,62E-03	3,12E-01	-3,14E+00	-2,85E+01
Non-re. PER as energy	MJ	2,12E+02	8,05E+00	2,06E+01	2,41E+02	1,51E+01	-8,22E+00	MND	MND	MND	MND	MND	3,22E-06	MND	0,00E+00	3,37E-01	-1,94E+01	2,31E-01	-2,61E+00
Non-re. PER as material	MJ	1,02E+01	0,00E+00	2,92E-01	1,05E+01	0,00E+00	-8,45E-02	MND	MND	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	0,00E+00	-5,22E+00	-4,15E-01
Total use of non-re. PER	MJ	2,22E+02	8,05E+00	2,09E+01	2,51E+02	1,51E+01	-8,31E+00	MND	MND	MND	MND	MND	3,22E-06	MND	0,00E+00	3,37E-01	-1,94E+01	-4,99E+00	-3,03E+00
Secondary materials	kg	1,22E-01	3,56E-03	1,70E-01	2,95E-01	6,92E-03	7,70E-04	MND	MND	MND	MND	MND	5,77E-06	MND	0,00E+00	1,44E-04	1,46E-03	9,97E-05	1,64E-01
Renew. secondary fuels	MJ	7,78E-03	4,48E-05	9,78E-02	1,06E-01	8,73E-05	6,14E-06	MND	MND	MND	MND	MND	2,84E-11	MND	0,00E+00	1,82E-06	1,31E-04	1,88E-06	1,51E-02
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	2,34E-01	1,14E-03	2,71E-02	2,62E-01	2,03E-03	1,22E-04	MND	MND	MND	MND	MND	4,66E-09	MND	0,00E+00	4,99E-05	2,27E-03	-3,86E-03	-9,69E-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	3,14E+00	1,27E-02	8,11E-02	3,23E+00	2,17E-02	2,52E-03	MND	MND	MND	MND	MND	3,95E-07	MND	0,00E+00	5,72E-04	2,23E-01	4,87E-04	-3,23E-02
Non-hazardous waste	kg	3,33E+01	2,49E-01	9,97E+00	4,36E+01	4,57E-01	6,61E-02	MND	MND	MND	MND	MND	1,27E-05	MND	0,00E+00	1,06E-02	1,59E+00	5,22E+00	-2,47E+00
Radioactive waste	kg	2,04E-04	2,09E-06	3,62E-04	5,68E-04	4,78E-06	4,67E-07	MND	MND	MND	MND	MND	1,74E-12	MND	0,00E+00	7,19E-08	4,69E-06	6,03E-08	-6,91E-06

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	MND	MND	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	4,81E-01	4,81E-01	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	7,96E-01	0,00E+00	0,00E+00
Materials for energy rec	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,91E-01	MND	MND	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	1,74E-01	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	0,00E+00	5,30E+00	0,00E+00
Exported energy – Electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	0,00E+00	8,00E-01	0,00E+00
Exported energy – Heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	0,00E+00	MND	0,00E+00	0,00E+00	0,00E+00	4,50E+00	0,00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

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	2,02E+01	5,60E-01	2,08E+00	2,28E+01	1,07E+00	3,02E-02	MND	MND	MND	MND	MND	3,73E-07	MND	0,00E+00	2,31E-02	2,59E+00	1,26E-02	-2,62E-01
Ozone depletion Pot.	kg $CFC_{-11}e$	5,13E-05	7,65E-09	2,13E-08	5,13E-05	1,70E-08	1,83E-10	MND	MND	MND	MND	MND	4,64E-15	MND	0,00E+00	2,74E-10	2,42E-09	2,62E-10	-2,49E-08
Acidification	kg SO_2e	1,36E-01	1,35E-03	4,56E-03	1,42E-01	2,55E-03	8,23E-05	MND	MND	MND	MND	MND	2,20E-09	MND	0,00E+00	6,05E-05	1,42E-03	6,48E-05	-4,13E-03
Eutrophication	kg PO_4^3e	1,42E-01	3,15E-04	3,57E-03	1,46E-01	6,50E-04	2,34E-05	MND	MND	MND	MND	MND	7,96E-10	MND	0,00E+00	1,48E-05	3,20E-04	2,67E-05	-1,01E-03
POCP (“smog”)	kg C_2H_4e	8,70E-03	1,22E-04	3,54E-04	9,17E-03	2,44E-04	1,10E-05	MND	MND	MND	MND	MND	1,56E-10	MND	0,00E+00	5,40E-06	1,04E-04	5,50E-06	-3,52E-04
ADP-elements	kg Sbe	1,19E-03	1,66E-06	5,26E-06	1,19E-03	3,44E-06	1,76E-07	MND	MND	MND	MND	MND	8,23E-13	MND	0,00E+00	6,32E-08	2,83E-06	2,69E-08	-7,46E-07
ADP-fossil	MJ	2,21E+02	7,91E+00	1,50E+01	2,44E+02	1,48E+01	2,32E-01	MND	MND	MND	MND	MND	3,11E-06	MND	0,00E+00	3,33E-01	2,97E+00	2,76E-01	-2,18E+00

ENVIRONMENTAL IMPACTS – 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	2,06E+01	5,63E-01	2,08E+00	2,32E+01	1,08E+00	2,57E-02	MND	MND	MND	MND	MND	3,77E-07	MND	0,00E+00	2,33E-02	2,59E+00	1,26E-02	-2,63E-01

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013). In addition, the characterisation factors for the flows - CH4 fossil, CH4 biogenic and Dinitrogen monoxide - were updated in line with the guidance of IES PCR 1.2.5 Annex 1. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterization factor for biogenic CO2 is set to zero.

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Market for electricity, medium voltage (Reference product: electricity, medium voltage) Finland, EU for Estonia with Renewable GO for Market energy
Electricity CO2e / kWh	0.14 (FI) and 0.32 (EE)
District heating data source and quality	Market for heat, district or industrial, natural gas (Reference product: heat, district or industrial, natural gas, Global
District heating CO2e / kWh	0.0389 kg CO2e / MJ

Transport scenario documentation A4

Scenario parameter	Value
Fuel and vehicle type. Eg, electric truck, diesel powered truck	Diesel: freight, lorry 16-32 metric ton, (EURO5) and
Average transport distance, km	1500
Capacity utilization (including empty return) %	50
Bulk density of transported products	95
Volume capacity utilization factor	<1

Installation scenario documentation A5

Scenario information	Value
Ancillary materials for installation (specified by material) / kg or other units as appropriate (Installation accessories are considered being part of the product)	0
Water use / m³	0
Other resource use / kg	0
Quantitative description of energy type (regional mix) and consumption during the installation process / kWh or MJ	0
Waste materials on the building site before waste processing, generated by the product's installation (specified by type) / kg	plastics 0.2 kg carboard 0.16 kg paper 0.01 kg
Output materials (specified by type) as result of waste processing at the building site e.g. collection for recycling, for energy recovery, disposal (specified by route) / kg	0.16 kg Recycling Rest 0.201 kg for energy recovery
Direct emissions to ambient air, soil and water / kg	0

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
Net fresh water consumption / m³	0
Type of energy carrier, e.g., electricity, natural gas, district heating / kWh	electricity
Power output of equipment / kW	n.a., used for electricity distribution
Characteristic performance, e.g., energy efficiency, emissions, variation of performance with capacity utilization, etc.	Resistivity 7,8 ·10^-6 Ohm/ connector
Further assumptions for scenario development, e.g., frequency and period of use, number of occupants	Dissipated energy calculated per 1 A (Ampere) with 2 connectors

End of life scenario documentation

Scenario information	Value
Collection process – kg collected separately	1.12 kg
Collection process – kg collected with mixed waste	2.15 kg
Recovery process – kg for re-use	0
Recovery process – kg for recycling	0.97 kg metals separation after shredding, yield 85%
Recovery process – kg for energy recovery	0.65 kg plastics and others incineration
Disposal (total) – kg for final deposition	0.55 kg landfilling
Scenario assumptions e.g. transportation	100 km truck

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 15802+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

Sarah Curpen, as an authorized verifier acting for EPD Hub Limited.

27.07.2025

APPENDIX

SCALING TABLE

Impact category	unit	A1-A3 EN 15804+A2					
	Joint types	1-phase worst case	1 -phase H	1 -phase CJC	1 -phase H	Repair 1 -phase	3 -phase H
Product weight, scaling factor	kg	**1,00**	**2,00**	**2,15**	**2,32**	**5,23**	**6,61**
GWP total /FU	kg CO_2 e /FU	10,3	20,7	22,3	24,0	54,2	68,4
GWP fossil	kg CO_2 e /FU	10,6	21,2	22,8	24,5	55,4	70,0
GWP biogenic	kg CO_2 e /FU	-0,3	-0,5	-0,6	-0,6	-1,4	-1,7
GWP -LULUC	kg CO_2 e /FU	0,02	0,04	0,04	0,04	0,10	0,13

FU= functional unit; product,
CS cold shrink, H Hybrid, CJC Compact joint

DEMONSTRATION OF PRODUCT IMPACTS WITH RENEWABLE ENERGY USE DURING A REPRESENTATIVE YEAR

The Environmental Product Declaration (EPD) is based on conservative assumptions.

The total Global Warming Potential (GWP) for A1-A3 is **$2.26 \cdot 10^{1}$ kg CO_2-eq**.

Below is an alternative modeling scenario for worst case representative product that incorporates the use of renewable energy.

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	2,06E+01	5,63E-01	6,91E-01	**2,19E+01**	1,08E+00	5,11E-01	MND	MND	MND	MND	MND	3,78E-07	MND	0,00E+00	2,33E-02	2,59E+00	3,71E-01	-3,59E+00
GWP – fossil	kg CO_2e	2,05E+01	5,63E-01	1,29E+00	2,24E+01	1,08E+00	2,57E-02	MND	MND	MND	MND	MND	3,77E-07	MND	0,00E+00	2,32E-02	2,59E+00	1,26E-02	-2,69E-01
GWP – biogenic	kg CO_2e	5,05E-02	1,13E-04	-6,08E-01	-5,58E-01	2,13E-04	4,86E-01	MND	MND	MND	MND	MND	3,80E-10	MND	0,00E+00	5,27E-06	-3,43E-04	3,58E-01	-3,33E+00
GWP – LULUC	kg CO_2e	2,32E-02	2,30E-04	7,21E-03	3,06E-02	3,80E-04	3,48E-05	MND	MND	MND	MND	MND	2,60E-10	MND	0,00E+00	1,04E-05	3,96E-04	7,75E-06	5,11E-03

1) GWP = Global Warming potential