ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

Circular Spiral Ventilation Duct

Rokaflex GmbH - Part of Vento Group

EPD HUB, HUB-6546
Published on 31.05.2026, last updated on 31.05.2026, valid until 31.05.2031

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	Rokaflex GmbH - Part of Vento Group
Address	Waldweg 2, 22145 Braak, Germany
Contact details	email@rokaflex.de
Website	https://www.rokaflex.de/

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	Construction product
Category of EPD	Third party verified EPD
Parent EPD number	-
Scope of the EPD	Cradle to gate with options, A4-A5, and modules C1-C4, D
EPD author	Hannah Stücke, Vento Group
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Magaly Gonzalez Vazquez as an authorized verifier for EPD Hub

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	Circular Spiral Ventilation Duct
Additional labels	SR, SREN, SREND, SRENX, SRENXD, SRD, SRLU
Product reference	-
Place(s) of raw material origin	Europe, Asia
Place of production	Braak, Nürnberg, and Wuppertal, Germany
Place(s) of installation and use	Europe
Period for data	07/2024 - 06/2025
Averaging in EPD	Multiple products and multiple factories
Variation in GWP-fossil for A1-A3 (%)	+0.8 / -1.8
GTIN (Global Trade Item Number)	-
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	6,69

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 kg
Declared unit mass	1 kg
Mass of packaging	0,063 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	2,48
GWP-total, A1-A3 ($kgCO_2e$)	2,39
Secondary material, inputs (%)	34
Total energy use, A1-A3 (kWh)	8,98
Net freshwater use, A1-A3 (m^3)	0,03

MANUFACTURER

ABOUT ROKAFLEX – PART OF VENTO GROUP

Rokaflex is a leading manufacturer within the European ventilation systems industry and an integral part of the Vento Group. With more than 25 years of experience as a family-owned company, Rokaflex has grown into Germany's market leader in air duct system components. Each year, the company processes around 12,000 t of galvanised sheet metal and over 400 t of aluminium into millions of high-quality ventilation components.

At Rokaflex, our production portfolio continues to grow and today includes spiral ducts, fittings, silencers, flexible ducts, and volume flow controllers, all produced at our own sites. In addition to circular duct systems, we also offer rectangular components such as sound insulation baffles and splitter silencers. These components are the indispensable link between air handling units and inlets or outlets, ensuring optimal indoor air quality to maintain a healthy indoor climate for humans.

Rokaflex products are designed to meet high-quality standards while ensuring efficient and flexible solutions. Our long-standing, trust-based partnerships with customers in building and ventilation wholesale, shipbuilding, duct construction, industrial applications, and OEM sectors form the foundation of our work and drive our commitment to reliable service and continuous development.

WE CARE FOR AIR

At Vento Group, our slogan “We care for air” is more than just words - it is our guiding principle. Air is vital for life, yet we often overlook its importance - especially indoors, where we spend more than 90% of our time. Clean, well-ventilated air is essential for health, energy, and overall well-being, influencing everything from focus and comfort to long-term respiratory health - a connection supported by scientific findings (WHO, 2010). Recognising this, we develop components for air handling systems as one way to help ensure that every breath indoors is fresh, healthy, and not including harmful pollutants.

We are also working to improve the environmental impact of our products and processes, for example, by improving material efficiency in production and using green electricity. Our aim is to develop energy-efficient solutions that support healthier indoor environments. This is part of our ongoing effort to contribute to more sustainable building practices and long-term well-being.

OUR VISION

As a family-owned business, we take our responsibility to future generations seriously. Sustainability is not just a goal - it is the foundation of our decisions, shaping both our strategy and daily operations. We strive to integrate environmental, social, and economic responsibility into everything we do.

By developing sustainable solutions, using resources thoughtfully, and creating lasting value, we seek to make a meaningful difference. Our dedication extends across all aspects of our business - from production and supply chains to the environmental footprint of our products.

For us, sustainability is an ongoing journey. We continuously evaluate existing practices, explore innovative solutions, and collaborate with partners to drive positive change. Through clear objectives and transparent measures, we contribute to preserving a liveable world for future generations.

THE IMPORTANCE OF VENTILATION

Air quality is a crucial factor in creating safe and comfortable environments, yet it is often taken for granted. While outdoor pollution tends to draw attention, indoor air can be just as compromised - whether in homes, workplaces, or industrial facilities. Efficient ventilation systems ensure that fresh, filtered air enters human living spaces, while stale air and airborne pollutants are safely removed.

Beyond residential and commercial spaces, controlled air circulation plays a key role in industrial applications, where process air must meet strict safety and quality standards. Removing hazardous substances, maintaining clean air flows, and ensuring compliance with industrial regulations are essential for protecting both people and operations. By facilitating controlled air circulation and filtration, advanced ventilation solutions contribute to a healthier environment, improve comfort, and support productivity across various sectors.

PRODUCT

PRODUCT DESCRIPTION

Our circular spiral ducts are used for air distribution in building ventilation systems. Manufactured from galvanised steel in a spiral-wound construction, they are compliant with standards EN 1506 and EN 12237. They provide low-leakage airflow performance when used together with compatible duct fittings. The product is approved and tested for airtightness class D systems according to EN 12237.

The relevant standards are currently being revised. EN 1506 and EN 12237 are expected to be replaced by prEN 18289 “Metallic ventilation ducts – Requirements and test methods”. As part of this update, airtightness class D will transition to ATC 2 once the new standard is adopted.

The ducts described in this EPD represent the company’s complete spiral-wound product range made from galvanised steel, produced at three German manufacturing sites (Braak, Nürnberg, and Wuppertal) operating with similar technologies and materials. This range includes typical lengths, diameters from 100 mm to 1250 mm, and variants with different sheet thicknesses or optional features such as sealed folds and plastic end caps. To reflect this product group consistently, the EPD uses averaged data across all sites and variants, with only minimal variation identified between facilities. The environmental indicators are therefore presented per kilogram of product as an averaged dataset, ensuring that differences in geometry or configuration do not affect the comparability of results.

Further information on our products can be found in our catalogue under https://www.rokaflex.de/katalog/

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	100	Europe / Asia
Minerals	0	
Fossil materials	0	
Bio-based materials	0	

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	0,0249

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 kg
Mass per declared unit	1 kg
Functional unit	-
Reference service life	50 years

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

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	ND	ND	ND	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 utilised in the factory.

The ducts are produced from galvanised steel DX51D+Z275. The transport distance for raw materials is between 470 and 9570 km. After delivery, the steel coils undergo incoming quality inspection, and the required slitted coils selected according to the production order to minimize scrap. The circular ducts are then rolled to the desired shape by spiro machines. An emulsion is applied during forming to limit equipment wear and maintain stable processing conditions.

The packaging of the ducts varies according to customer preferences. For most customers, the manufactured ducts are either shipped loose or placed in steel crates. A smaller percentage is shipped in wooden one-way boxes. For specific customers, these wooden crates are also fitted with a protective plastic cover. For some duct variants, the product is equipped with protective caps or films, based on the diameter, to repel dirt. The products are then delivered to the customer by lorry. Metal crates are reused and transported by lorry to and from the customer. This minimises the amount of packaging material required.

Production losses occur during processing of steel, the scrap rate in production was 1.6% during the reference period. Scrap is collected separately and sent for recycling to waste treatment facilities (distance between 25 and 35 km).

During the first part of the reference period, the facility operated using conventional electricity; at the beginning of 2025, the site transitioned to electricity from renewable sources. However, due to a lack of Guarantees of Origin, the electricity was modelled entirely as conventional electricity.

In addition, a mixture of water and lubricant is used during production, which is collected and disposed. The distance between the production site and the waste treatment facilities is between 25 and 35 km.

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 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. The average transport distance to the customer is 345 km. It is based on the annual sales weight.
Due to the wide variety of possible installation scenarios, no mounting and installation materials were considered in the calculation of this EPD. Material loss during installation is estimated to be zero. The installation requires electricity, based on a conservative scenario.

For steel packaging, it is assumed that 81% is recycled, and 19% is landfilled. For plastic packaging, it is assumed that 40% is recycled, 37% is incinerated, and 23% is landfilled. For wood packaging, it is assumed that 32% is recycled, 30% is incinerated, and 38% is landfilled. These assumptions are based on Eurostat Waste Statistics for 2021A transport distance of 50 km by lorry is assumed.

PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not cover the use phase. Impacts during these life cycle stages depend on the specific application and operating conditions of the product and must be assessed separately as part of a project-specific assessment. The stated reference service life of 50 years reflects an indicative minimum lifespan under normal operating conditions and is based on experience with galvanised steel ventilation components. Actual service life may vary depending on installation and environmental conditions.

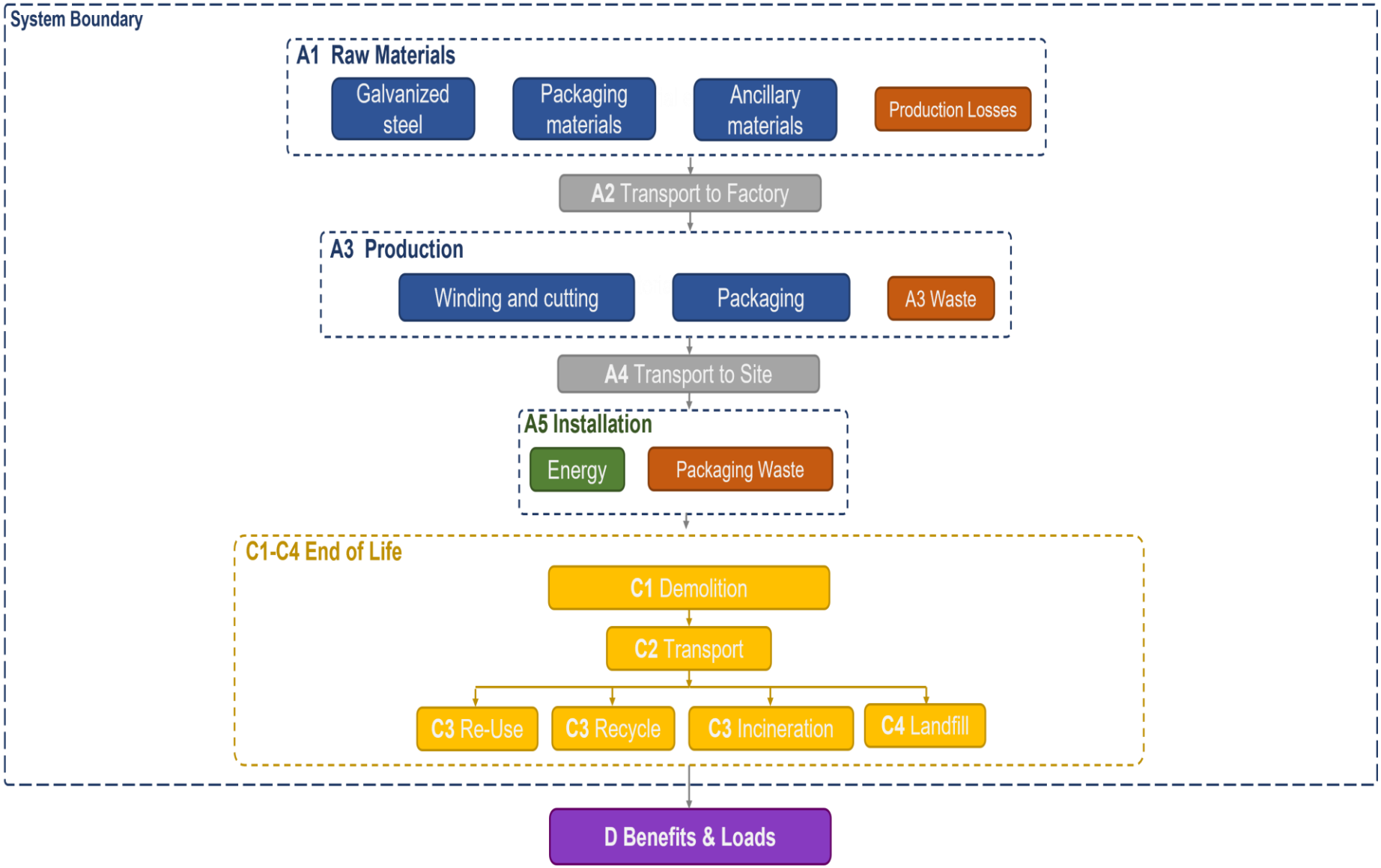
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

End-of-life treatment is assumed to take place within Europe, using typical regional recycling and disposal routes consistent with where the products are sold and installed. The applied scenario reflects current European practice for steel ventilation components and represents one of the most likely end-of-life pathways currently in use. The ducts are assumed to be dismantled manually at end of life, and no additional energy consumption during demolition is modelled. Transport to waste treatment is modelled with typical regional distances: 250 km by lorry to a recycling facility and 50 km by lorry to landfill. End-of-life treatment follows European waste statistics (Eurostat 2021), assuming that 85 % of the steel is recovered for recycling and 15 % is landfilled. These percentages are applied consistently across all product variants.

Module D includes the benefits and loads associated with material recovery beyond the system boundary. For the steel content, credits are given for the avoided production of primary steel and zinc, while the recycling process itself is included as a load. Packaging materials (wood, plastic and steel) are also included in Module D using EU-representative end-of-life assumptions based on Eurostat Waste Statistics (2021). These datasets reflect current European waste treatment practice and represent the most likely end-of-life routes for the packaging types used.

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. No relevant processes were 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 characterisation 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	Physical Properties
Ancillary materials	Physical Properties
Manufacturing energy and waste	Physical Properties

The estimated service life of the steel boxes used for transport was based on practical experience within the company.

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	Multiple products and multiple factories
Grouping method	Based on average results of product group - by total mass & representative factory
Variation in GWP-fossil for A1-A3, %	+0.8 / -1.8

The EPD does not represent a single product variant but an average across the full product family of spiral-wound ventilation ducts made from galvanised steel. These ducts are used for air distribution in building ventilation systems and are manufactured in accordance with EN 1506 and EN 12237. All products included in the EPD serve the same function and are produced using the same spiral-winding technology.

The product range covered by this EPD includes all spiral-wound ducts produced by the company, spanning standard lengths (1–6 m), diameters from 100 mm to 1250 mm, and various sheet thicknesses. The range also includes variants with or without sealed folds and with or without plastic end caps. Differences in geometry or

optional features do not imply different uses or performance functions within the product family.

Production takes place at three German manufacturing sites: Braak, Nürnberg, and Wuppertal. All sites produce the same product range using comparable materials, equipment, and process steps, and operate at similar production volumes. Braak is used as the representative site for modelling, and the declared results therefore reflect average production conditions across the company's overall production network.

The average product group is characterised by a material composition of 100 % galvanised steel and is declared per kilogram of product. As environmental impacts scale with mass rather than geometry, the averaging approach does not introduce restrictions on the use of the EPD for the included product family. The declared results are representative of all spiral-wound ducts produced at the three sites and are applicable to products supplied within Germany and neighbouring countries where these sites operate.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator for EPD Hub V3 and EPD Process Certification v3.2.5. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1/3.11/3.12 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11/3.12 environmental data sources follow the methodology 'allocation, Cut-off, EN 15804+A2'.

A5 Installation waste: Eurostat packaging waste statistics 2021: https://ec.europa.eu/eurostat/databrowser/view/env_waspac__custom_20239299/default/table
A5 installation resources: Bozdağ, Ö & Seçer, M. 2007
C3-C4: World Steel Association 2021: https://worldsteel.org/wp-content/uploads/Life-cycle-inventory-LCI-study-2020-data-release.pdf

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	2,26E+00	1,49E-01	-1,93E-02	2,39E+00	6,95E-02	1,11E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,30E-02	1,92E-02	9,37E-04	-1,45E+00
GWP – fossil	kg CO_2e	2,26E+00	1,49E-01	7,16E-02	2,48E+00	6,95E-02	1,91E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,30E-02	1,92E-02	9,36E-04	-1,42E+00
GWP – biogenic	kg CO_2e	2,31E-03	2,85E-05	-9,11E-02	-8,87E-02	1,40E-05	9,15E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,38E-06	-4,08E-05	-2,98E-07	-2,30E-02
GWP – LULUC	kg CO_2e	1,88E-03	5,95E-05	1,43E-04	2,08E-03	2,50E-05	1,11E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,90E-05	2,37E-05	5,35E-07	-5,47E-04
Ozone depletion pot.	kg CFC_{-11}e	1,57E-08	2,80E-09	5,41E-08	7,27E-08	1,38E-09	8,50E-11	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,01E-10	2,58E-10	2,71E-11	-6,12E-09
Acidification potential	mol H^+e	1,00E-02	1,06E-03	2,73E-04	1,13E-02	1,45E-04	2,40E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,43E-04	2,29E-04	6,64E-06	-6,23E-03
EP-freshwater[2)]	kg Pe	1,13E-03	9,35E-06	2,60E-05	1,17E-03	4,68E-06	5,88E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,34E-06	1,24E-05	7,70E-08	-6,87E-04
EP-marine	kg Ne	2,26E-03	2,73E-04	6,58E-05	2,60E-03	3,47E-05	1,52E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,64E-05	5,06E-05	2,53E-06	-1,40E-03
EP-terrestrial	mol Ne	2,40E-02	3,00E-03	6,72E-04	2,77E-02	3,75E-04	7,38E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,05E-04	5,72E-04	2,76E-05	-1,53E-02
POCP ("smog")[3)]	kg NMVOCe	8,19E-03	1,05E-03	3,38E-04	9,58E-03	2,41E-04	2,36E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,99E-04	1,69E-04	9,90E-06	-5,04E-03
ADP-minerals & metals[4)]	kg Sbe	1,22E-04	4,29E-07	4,08E-07	1,23E-04	2,31E-07	5,81E-08	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,41E-07	1,36E-06	1,49E-09	-7,45E-05
ADP-fossil resources	MJ	2,52E+01	2,04E+00	1,43E+00	2,87E+01	9,78E-01	9,10E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,03E-01	2,58E-01	2,30E-02	-1,38E+01
Water use[5)]	m^3e depr.	1,14E+00	9,64E-03	2,54E-02	1,18E+00	4,86E-03	2,06E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,80E-03	4,64E-03	6,63E-05	-3,61E-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	1,72E-07	1,00E-08	5,27E-09	1,87E-07	5,12E-09	2,64E-10	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,41E-09	3,10E-09	1,51E-10	-9,10E-08
Ionizing radiation[6)]	kBq U235e	1,51E-01	2,40E-03	9,67E-03	1,63E-01	1,26E-03	1,01E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,88E-04	2,19E-03	1,44E-05	2,54E-02
Ecotoxicity (freshwater)	CTUe	3,63E+01	2,57E-01	2,22E-01	3,67E+01	1,30E-01	2,97E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,53E-02	1,50E-01	1,93E-03	-2,04E+01
Human toxicity, cancer	CTUh	3,77E-09	2,64E-11	2,87E-11	3,82E-09	1,17E-11	2,67E-12	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,31E-12	1,72E-11	1,73E-13	-6,32E-10
Human tox. non-cancer	CTUh	4,59E-08	1,15E-09	7,19E-10	4,78E-08	6,19E-10	1,33E-10	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,77E-10	1,17E-09	3,97E-12	-2,33E-08
SQP[7)]	-	7,78E+00	1,06E+00	1,05E+01	1,93E+01	5,91E-01	4,79E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,60E-01	5,02E-01	4,52E-02	-4,57E+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	2,77E+00	3,35E-02	1,20E+00	4,01E+00	1,71E-02	-7,14E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	8,27E-03	4,81E-02	2,22E-04	-9,23E-01
Renew. PER as material	MJ	0,00E+00	0,00E+00	7,92E-01	7,92E-01	0,00E+00	-7,92E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,02E-01
Total use of renew. PER	MJ	2,77E+00	3,35E-02	1,99E+00	4,80E+00	1,71E-02	-1,51E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	8,27E-03	4,81E-02	2,22E-04	-7,21E-01
Non-re. PER as energy	MJ	2,52E+01	2,04E+00	1,03E+00	2,83E+01	9,78E-01	-3,14E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,03E-01	2,58E-01	2,30E-02	-1,38E+01
Non-re. PER as material	MJ	0,00E+00	0,00E+00	3,74E-01	3,74E-01	0,00E+00	-3,74E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,87E-01
Total use of non-re. PER	MJ	2,52E+01	2,04E+00	1,41E+00	2,87E+01	9,78E-01	-6,88E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,03E-01	2,58E-01	2,30E-02	-1,36E+01
Secondary materials	kg	3,40E-01	1,01E-03	1,03E-03	3,42E-01	4,54E-04	4,77E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,71E-04	3,15E-04	5,78E-06	7,76E-01
Renew. secondary fuels	MJ	2,27E-04	1,03E-05	2,29E-04	4,66E-04	5,74E-06	5,32E-07	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,45E-06	1,46E-05	1,20E-07	-1,09E-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	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	2,53E-02	2,60E-04	7,35E-04	2,63E-02	1,33E-04	-3,46E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,99E-05	1,37E-04	2,39E-05	-6,21E-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	8,89E-01	3,09E-03	6,91E-03	8,99E-01	1,42E-03	4,81E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,05E-03	1,69E-03	2,54E-05	-4,35E-01
Non-hazardous waste	kg	6,51E+00	6,03E-02	3,96E-01	6,97E+00	3,00E-02	1,53E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,97E-02	6,09E-02	5,80E-04	-3,84E+00
Radioactive waste	kg	3,85E-05	5,95E-07	2,55E-06	4,17E-05	3,13E-07	2,93E-07	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,20E-07	5,60E-07	3,52E-09	6,68E-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	ND	ND	ND	ND	ND	ND	ND	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	1,63E-02	1,63E-02	0,00E+00	2,18E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	8,50E-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	0,00E+00	ND	ND	ND	ND	ND	ND	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	1,42E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+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	6,00E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	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	8,20E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	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	2,25E+00	1,48E-01	7,15E-02	2,47E+00	6,91E-02	2,02E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,27E-02	1,92E-02	9,28E-04	-1,41E+00
Ozone depletion Pot.	kg CFC_{-11}e	1,41E-08	2,23E-09	3,64E-08	5,27E-08	1,10E-09	7,10E-11	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,80E-10	2,13E-10	2,15E-11	-6,27E-09
Acidification	kg SO_2e	8,09E-03	8,44E-04	2,20E-04	9,15E-03	1,16E-04	1,88E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,10E-04	1,84E-04	4,91E-06	-5,02E-03
Eutrophication	kg PO_4^3e	1,48E-03	1,25E-04	1,30E-04	1,73E-03	2,93E-05	6,09E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,67E-05	2,66E-05	1,56E-06	-9,26E-04
POCP (“smog”)	kg C_2H_4e	9,53E-04	5,39E-05	3,14E-05	1,04E-03	1,23E-05	1,71E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,83E-06	1,09E-05	4,65E-07	-7,07E-04
ADP-elements	kg Sbe	1,22E-04	4,19E-07	4,01E-07	1,23E-04	2,26E-07	5,77E-08	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,38E-07	1,36E-06	1,46E-09	-7,45E-05

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
ADP-fossil	MJ	2,28E+01	2,00E+00	1,26E+00	2,60E+01	9,57E-01	7,16E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,95E-01	2,20E-01	2,28E-02	-1,43E+01

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	2,26E+00	1,49E-01	7,18E-02	2,48E+00	6,95E-02	1,91E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,30E-02	1,92E-02	9,37E-04	-1,42E+00

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, medium voltage, residual mix, Germany, Ecoinvent, 0.80 kgCO2e/kWh

Transport scenario documentation - A4 (Transport resources)

1. Transport, freight, lorry 16-32 metric ton, EURO6, 304.5 km
2. Transport, freight, lorry 16-32 metric ton, EURO6, 40.0 km

Transport to the building site (A4) - Scenario documentation

Scenario parameter	Value
Capacity utilization (including empty return) %	50
Bulk density of transported products	38
Volume capacity utilization factor	1

Installation at the building site (A5) - Scenario documentation

Scenario parameter	Value
Energy: type and consumption (MJ or kWh)	On average 0.01 kWh/kg electricity required for building deconstruction according to (Bozdağ, Ö & Seçer, M. 2007).
Water use (m^3)	-
Ancillary materials: type and mass (kg)	-
Waste materials: type and mass (kg)	0.00228 kg of steel crate, 0.00012 kg of wooden crate, 0.00606 kg of LPDE from end caps and foil, 0.00086 kg of PE from plastic cover, and 0.00349 kg of PET from strapping band per declared unit
Waste materials: output routes	For steel packaging around 0.00185 kg recycling, and 0.0004 kg landfill. For all plastic packaging (LPDE, PE, and PET) around 0.00417 kg recycling, 0.00385 kg incineration, and 0.00240 kg landfill. For wood packaging around 0.000038 kg recycling, 0.000036 kg incineration, and 0.000046 kg landfill
Direct emissions (kg)	-

End of life (C1-C4) - Scenario documentation

Scenario information	Value
Collection process: collected separately (kg)	Steel: 0.85 kg recycling, 0.15 kg landfill
Collection process: Mixed waste (kg)	-
Recovery: re-use (kg)	0
Recovery: recycling (kg)	0,85
Recovery: energy recovery (kg)	0
Disposal (kg)	0
Scenario assumptions e.g. transportation (mode, km) & other	Recycling, 250 km. Landfill, 50 km.

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 is 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

Magaly Gonzalez Vazquez as an authorized verifier for EPD Hub Limited

31.05.2026