

Environmental Product Declaration



In accordance with ISO 14025 and EN 15804:2012+A2:2019
Single product

KRONE Flex wood/alu – Inwards-opening tilt/turn window

From



Programme:	The International EPD® System, www.environdec.com
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): <i>PCR 2019:14 Construction products (EN 15804:A2) (1.3.2)</i> <i>PCR 2019:14-c-PCR-007 c-PCR-007 Windows and doors (EN 17213) (2020-04-09)</i>
PCR review was conducted by: <i>CEN Technical Committee</i> <i>The review panel may be contacted via the Secretariat www.environdec.com/contact.</i>
Life Cycle Assessment (LCA)
LCA practitioner: Anna Pantze and Emanuel Lindbäck at Tyréns Sverige AB
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: <input checked="" type="checkbox"/> EPD verification by individual verifier Third-party verifier: <i>Daniel Böckin, Miljögiraff AB</i> Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programs, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Krone Vinduer A/S, Aalborgvej 576, Harken, 9760 Vrå, Denmark

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Description of the organisation:

KRONE is a Danish window manufacturer with experience within the production of windows since 1953. The main office and production are situated in Northern Jutland, where it has been located since the beginning in 1953. Later another production facility has been added to the company, Mølhaven, in which KRONE Flex is being produced.

KRONE is a professional window partner, who aim at giving their customers most possible flexibility when choosing windows. With KRONE there are no standard programme, windows and doors are produced after order, and often new ideas are being tested and implemented in co-operation with customers, such as architects and constructors.

KRONE has a team of highly qualified employees and offer a big knowledge and experience within the window industry. KRONE is known as a deliverer of exclusive and high-quality products, in Denmark, Norway, Sweden and the UK.

KRONE is a part of DOVISTA, which is one of the leading manufacturers of facade windows and doors in Europe. DOVISTA is a part of the VKR Group. KRONE is a trademark used under license by DOVISTA A/S, CVR-no. 21147583.

Product-related or management system-related certifications:

KRONE Flex window and door systems are third party DVV certified. Byggeriets kvalitetskontrol (The buildings Quality Controlle) certification under VI tekniske bestemmelser (Technical Decisions) for windows and door products and the roles for EN 14351-1:2006 + A2:2016., which is based on the Product Certification Standard EN 45011 for notified bodies. Krone Vinduer A/S is registered in the Vinduesindustriens (the Danish Window Industry) database.

Name and location of production site(s):

Krone Vinduer A/S, Mølhavevej 10, 9440 Aabybro, Denmark.

Product information

Product name: KRONE Flex – inwards-opening tilt/turn window

Product identification: KRONE Flex

Product description:

KRONE Flex – inwards-opening tilt and turn windows and doors with triple glazing.

KRONE Flex is composed with triple glazing. The inner side is produced in pine wood and the outer side is made in durable aluminium. The window and doors can be produced in many different colours and sizes, so it can match every building.

KRONE Flex is suitable for modern building as well as older buildings.

KRONE Flex units are made to measure, drained, and ventilated, and factory finished. They are manufactured in accordance with EN 14351-1:2006 + A2:2016.

Opening functions are tested according to and third-party verified for:

- Resistance to wind load (Test: EN 12211:2000, Classification: EN 12210:2000)
- Watertightness (Test: EN 1027:2000, Classification: EN 12208:2000)
- Air permeability (Test: EN 1026:2000, Classification: EN 12207:2000)
- Load-bearing capacity of safety devices (EN 14609:2004)
- Thermal transmittance (EN 10077-2: 2003/2012)
- Security level (PAS24 and to Secured by Design standard and RC 2).
- Acoustic performance rating (EN ISO 10140-2:2010)

For frames, sashes, mullions, and transoms we use FSC®-certified pine from European forests, licence code FSC®- C137921.

We use a water-based diffusion open timber surface treatment, system 2ØKO from Teknos A/S, which is certified by VinduesIndustrien (the Danish Window Industry), and our windows and doors are Danish Indoor Climate certified.

Approach to chemicals (hazardous substances):

We work to protect the environment and therefore require from our suppliers, that their products comply with relevant legislation regarding hazardous substances. To be approved as one of our suppliers, the supplier is required to sign our Code of Conduct and Hazardous Substances Restriction. (the underlined words should link to <https://dovista.com/interesseret/leverandoer/>)

Our Hazardous Substances Restrictions Appendix A list (the underlined words should link to <https://dovista.com/interesseret/leverandoer/hazardous-substances-restriction/>) does not allow neither products that contain restricted substances in concentrations that exceed the maximum concentration values listed in applicable Relevant Laws, nor products that exceed the maximum concentration values restricted due to DOVISTA's internal requirements.

Our Appendix A list, that is regularly updated according to Relevant Laws, contains Material / Chemical substances related to the following regulations and directives:

- REACH Registration, Evaluation and Authorisation of Chemicals (REACH) European Union (1907/2006/EC) (annex XIV, annex XVII and candidate list). The candidate list may be found at Candidate List of substances of very high concern for Authorisation. (the underlined words should link to <https://echa.europa.eu/candidate-list-table>)
- Restrictions of Hazardous Substances (RoHS) European Union (65/2011/EU)
- Battery Directive (2006/66/EC)

- Packaging and Packaging Waste Directive (EU) 2018/852 + (94/62/EC)
- CLP Regulation (EC) No 1272/2008 (Regulation on classification, labelling and packaging of substances and mixtures (EC) No 1272/2008)
- Biocidal Product Regulation (528/2012/EU)
- Substances that deplete the ozone layer Regulation (1005/2009/EC)
- Persistent Organic Pollutants Regulation (2019/1021/EU) + (2020/1021/EU)
- Conflict Minerals (EU) 2017/821) + (EU) 2019/821

UN CPC code: 54

Geographical scope:

Module A1 and A2 Material suppliers are Europe

Module A3 production is located in Denmark

Module A5, C and D scenarios are for Europe

LCA information

Functional unit / declared unit: 1 m²

Standard size is 1230 x 1480 mm

Conversion factor for the product is 40.2 kg per m²

Reference service life: Not declared

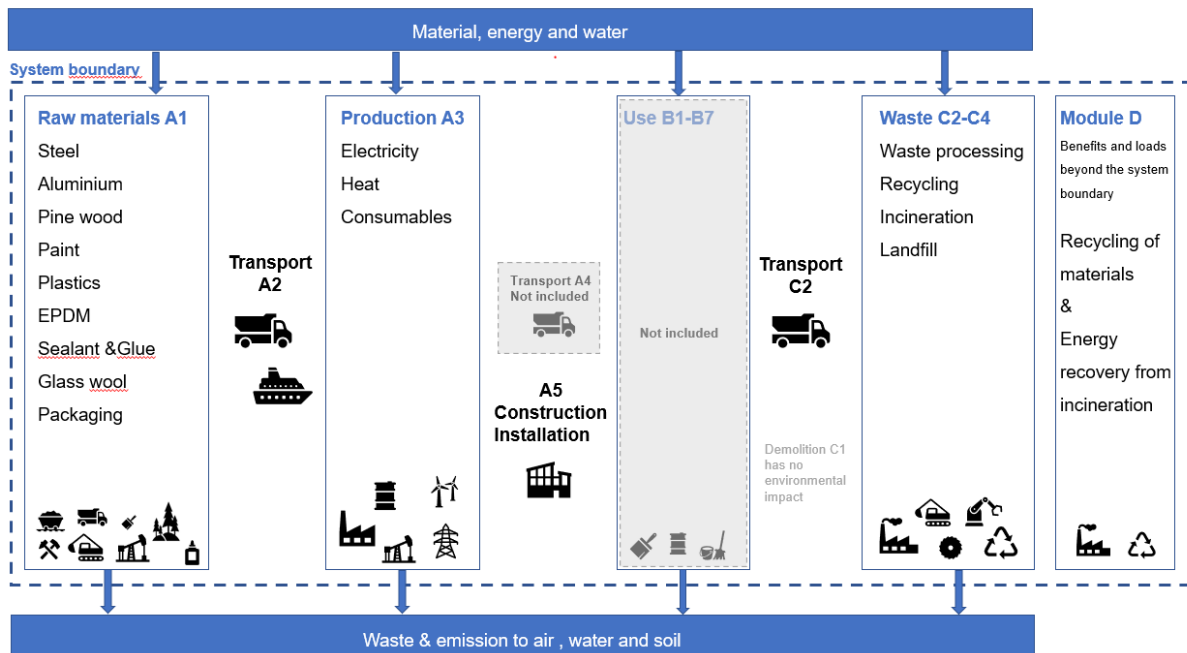
Time representativeness: The LCA is based on production data from 2022 but is deemed to be representative of an average year of production.

Database(s) and LCA software used: The LCA software is Simapro Flow and the database is Ecoinvent 3.9.1. When modelling in Simapro, Ecoinvent data (updated November 2022) has been used for generic data.

Description of system boundaries:

Cradle to gate (A1-A3), installation (A5), end of life (C1-C4) and benefits beyond system boundary (D) (A1-A3 + A5+ C + D)

System diagram:



Production

Main materials used for production:

- Wood: main raw material used is finger jointed and glued pine scantlings supplied by FSC labelled suppliers only. Optionally, raw oak solid material is used.
- Aluminum: extruded profiles are produced in EU; later profiles are either powder coated in DK or anodized in Denmark or Germany.
- Glass: double or triple glazed units supplied by suppliers in EU.
- Paint: water-based paint that can be tinted to more than 200 colors, incl. clear lacquer.

Around 4% of wood and 3 % aluminum becomes waste during the production process. Wood waste is utilized internally in own bio boilers that supply heat for both process and heating needs; Aluminum waste is sent for recycling.

All raw materials are processed in one production facility. Production process consists of 3 main flows:

- Wood production. Wood material is cut to length, profiled, milled, painted, and assembled into window+doors frames and sashes.
- Alu production. Aluminum profiles are cut to length, drilled/milled and assembled for mounting to the wood sash and frame.
- Final assembly. Frames and sashes are assembled, and glass and alu cladding are mounted into complete windows that are adjusted in a way that prevents the need for further adjustments during installation. Windows are then protected with plastic in corners and cardboard covers and packed on wooden pallets, secured by wooden planks.

Pallets are wrapped in plastic foil to protect the goods from environmental elements during transport and storage at construction sites.

Produced windows are transported by trucks into a central storage for distribution for customer and some directly to customer.

More information:

This EPD is generated with a pre-verified EPD tool. All processes are fixed and variable input data for each window i.e constituent material/components (Items) is governed by a menu. The results of the EPD are checked for plausibility. The review of the EPD-generator its constituent processes and the fixed content of the EPD is accepted based on the verification of the tool and the first EPD verification by the tool. Identification name and version number of the EPD-generator: Dovista EPD-generator 3.0.

Electricity data

Electricity consumption in A3 module (Krone Vinduer A/S, Mølhavevej 10, 9440 Aabybro, Denmark) is market electricity in Denmark. Climate impact for the electricity is 0,2 kg CO₂eq. per kWh (GWP-GHG).

Estimates and assumptions

All transport in A2 and C2 is with EURO 5 trucks.

In the C module the end-of-life scenario considered is that the window is demounted during the deconstruction process and no separate energy from machine is required for this process.

The used windows are transported in its entirety to a municipal waste collection and sorting station, the average transport distance from the demolition place to the station is assumed to be 50km.

After demolition of the window:

- 70% of the glass cassette is assumed to be transported 50km to a facility for landfill and disposed. The remaining 30% is transported 50km for material recycling.
- 95% of the aluminum, steel and zinc is assumed to be transported 50km to a facility where its treated (fragmentized and sorted). 5% is assumed to be transported 50km to facility for landfill and disposed.
- 95% of the wood frame is assumed to be transported 50km to a facility where its treated (chipped). 5% is assumed to be transported 50km to facility for landfill and disposed(chipped).

For calculations in Module D following assumptions have been made:

The recycled steel and aluminum are replacing production of primary steel and aluminum.

Module D also contains benefits from exported energy from waste incineration declared in module C. Exported energy assumed to be 77 % heat and 23 % electricity from incineration.

The infrastructure or capital goods used in the product system for underlying processes are included, as infrastructure or capital goods cannot be excluded in SimaPro FLOW. Therefore, results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity, noncancer and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological, and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

Results for the additional impact categories particulate matter, ionising radiation, ecotoxicity (freshwater), human toxicity (cancer), human toxicity (non-cancer) and Land use is not declared. EN 15804 reference package based on EF 3.1 has been used.

Background data

The data quality of the background data is considered good. The assessment considers all available data from the production process, including all raw materials and auxiliary materials used as well as the energy consumption in relation to available Ecoinvent 3.9.1 datasets and EPD's.

EPD used for background data in EPD-tool:

EPD Pressglas, Insulating glass units Double and triple glass configurations. M-EPD-MIG-GB-002036
TEKNOS EPD, Water-borne varnishes and furniture paints and coatings. RTS_15_18 RTS Building Information

EPD Mill finished and fabricated aluminum profiles S-P-06710

EPD Barrus, laminated wood, EPD HUB, EPD number 0100

Data quality

When modeling in Simapro, Ecoinvent data (updated November 2022) has been used for generic data. The database is considered to be of high quality. For some material supplier's product specific and third party verified EPD's has been used. The EPD's used is of high quality.

In data is gathered from the actual manufacturing plant with product-specific processes, specific amounts, specific waste and spillage %, specific energy mix, specific transportation distances and transportation type and EPD's from some of the suppliers. All together 80% of specific data specific data is used in this EPD.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage		
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential		
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
Modules declared	X	X	X	ND	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X		
Geography	EU	EU	DK	ND	EU	ND	ND	ND	ND	ND	ND	ND	EU	EU	EU	EU	EU		
Specific data used	80% *					-	-	-	-	-	-	-	-	-	-	-	-	-	
Variation – products	not relevant					-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	not relevant					-	-	-	-	-	-	-	-	-	-	-	-	-	-

* The percentage of specific data is assumed to be larger than 60% in EPD*s, but it cannot be proved since one or several EPDs that are used as data sources lack information on the percentage of specific data used.

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight % and kg C/declared unit
Steel	1.41E+00	0.00 %	0.00 %
Plastic	8.08E-02	0.00 %	0.00 %
Zinc	1.19E-01	0.00 %	0.00 %
Aluminium	2.38E+00	0.00 %	0.00 %
Paint	7.24E-01	0.00 %	0.00 %
Sealant and Glue	8.13E-02	0.00 %	0.00 %
EPDM	2.67E-01	0.00 %	0.00 %
Insulated Glass unit	2.21E+01	0.00 %	0.00 %
Wood	1.31E+01	0.00 %	32.49 % and 6.53
TOTAL	4.02E+01	0.00 %	32.49 % and 6.53
Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/declared unit
Cardboard and paper	2.20E-02	0.05 %	0.00
Wood	8.61E-01	2.14 %	0.43
Steel	1.10E-02	0.03 %	0.00
Plastic	3.08E-02	0.08 %	0.00
TOTAL	9.25E-01	2.30 %	0.43
Dangerous substances from the candidate list of SVHC for Authorisation	EC No.	CAS No.	Weight-% per functional or declared unit
not relevant	-	-	-

Environmental Information

Potential environmental impact – mandatory indicators according to EN 15804

Results per m ²								
Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	6.70E+01	1.18E-04	0.00E+00	6.43E-01	6.18E-01	7.00E-02	-3.42E+01
GWP-biogenic	kg CO ₂ eq.	-1.77E+01	1.39E+00	0.00E+00	5.25E-04	1.64E+01	8.48E-01	0.00E+00
GWP-luluc	kg CO ₂ eq.	1.10E+00	3.67E-08	0.00E+00	2.53E-04	2.68E-04	1.61E-05	-3.68E-01
GWP-total	kg CO ₂ eq.	5.05E+01	1.39E+00	0.00E+00	6.44E-01	1.70E+01	9.18E-01	-3.45E+01
ODP	kg CFC 11 eq.	2.08E-06	2.48E-11	0.00E+00	1.50E-07	3.87E-08	3.60E-08	-2.92E-06
AP	mol H ⁺ eq.	1.28E-01	8.42E-07	0.00E+00	2.63E-03	2.52E-02	6.96E-04	-2.44E-01
EP-freshwater	kg P eq.	1.89E-02	7.08E-09	0.00E+00	4.18E-05	2.02E-04	4.12E-06	-1.59E-02
EP-marine	kg N eq.	5.95E-02	3.30E-07	0.00E+00	7.93E-04	1.13E-02	2.61E-04	-3.79E-02
EP-terrestrial	mol N eq.	2.83E-01	3.74E-06	0.00E+00	8.67E-03	1.30E-01	2.87E-03	-3.95E-01
POCP	kg NMVOC eq.	8.63E-02	1.73E-06	0.00E+00	2.65E-03	4.14E-02	8.22E-04	-1.23E-01
ADP-minerals&metals*	kg Sb eq.	2.01E-03	2.93E-10	0.00E+00	2.26E-06	1.35E-05	1.43E-07	-1.30E-04
ADP-fossil*	MJ	1.04E+03	1.79E-03	0.00E+00	9.81E+00	7.50E+00	2.35E+00	-5.05E+02
WDP*	m ³	8.13E+00	3.46E-05	0.00E+00	4.41E-02	5.01E-01	1.23E-01	-3.16E+01
Acronyms		GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

Disclaimer: The results of modules A1-A3 should not be used without considering the results of module C. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks

**Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Potential environmental impact – additional mandatory and voluntary indicators

Results per m ²								
Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP-GHG ¹	kg CO ₂ eq.	6.81E+01	1.18E-04	0.00E+00	6.43E-01	6.18E-01	7.00E-02	-3.46E+01

Disclaimer: The results of modules A1-A3 should not be used without considering the results of module C. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Use of resources

Results per m ²								
Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
PERE	MJ	3.70E+02	-9.22E-05	0.00E+00	1.38E-01	3.49E+00	4.75E-02	-1.80E+02
PERM*	MJ	2.65E+02	-1.64E+01	0.00E+00	0.00E+00	-2.27E+02	-1.19E+01	0.00E+00
PERT	MJ	6.35E+02	-1.64E+01	0.00E+00	1.38E-01	-2.23E+02	-1.19E+01	-1.80E+02
PENRE	MJ	1.08E+03	1.91E-03	0.00E+00	1.04E+01	7.80E+00	2.50E+00	-5.39E+02
PENRM*	MJ.	2.92E+01	-5.05E+00	0.00E+00	0.00E+00	-1.08E+01	-7.04E-01	0.00E+00
PENRT	MJ	1.11E+03	-5.04E+00	0.00E+00	1.04E+01	-3.04E+00	1.79E+00	-5.39E+02
SM	kg	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	1.01E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	1.97E+02	1.45E-04	0.00E+00	1.13E+00	4.06E+01	3.62E-01	-5.70E+02
Acronyms		PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

Disclaimer: The results of modules A1-A3 should not be used without considering the results of module C.

**For the PERM and PENRM the new "GUIDANCE TO CALCULATING THE PRIMARY ENERGY USE INDICATORS" in Annex 3 of the PCR is followed and calculated according to option A.*

¹ The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Waste production and output flows

Waste production

Results per m ²								
Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.56E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	4.82E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed	kg	1.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Disclaimer: The results of modules A1-A3 should not be used without considering the results of module C

Output flows

Results per m ²								
Indicator	Unit	A1-A3	A5	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	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	6.63E+00	0.00E+00	0.00E+00	0.00E+00	5.47E+01	0.00E+00	0.00E+00
Exported energy, thermal	MJ	2.22E+01	0.00E+00	0.00E+00	0.00E+00	1.83E+02	0.00E+00	0.00E+00

Disclaimer: The results of modules A1-A3 should not be used without considering the results of module C

Additional information

ID: EPD Calculation KRONE _ Aabybro- EPD Generator 12-03-2024 12:01

References

Ecoinvent, < <https://ecoinvent.org/the-ecoinvent-database/> >

General Programme Instructions of the International EPD® System. Version 4.0.

PCR 2019:14 Construction products (EN 15804:A2) (1.3.2)

SIS (2022). EN 16757:2022 “Sustainability of construction works – Environmental product declarations – Product Category Rules for concrete and concrete elements”. Svenska Institutet för Standarder

SIS (2021). EN 15804:2012+A2:2019, “Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products”. Svenska Institutet för Standarder

