

# Environmental Product Declaration



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

## Rationel AURAPLUS / Rationel FORMAPLUS

– top-guided window

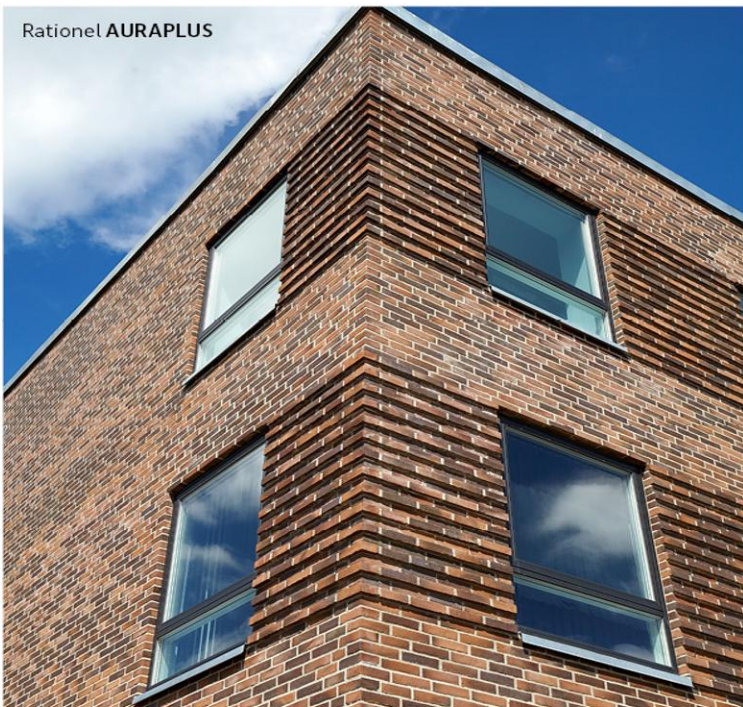
from:

**rationel**<sup>®</sup>

Programme:	The International EPD System, <a href="http://www.environdec.com">www.environdec.com</a>
Programme operator:	EPD International AB
EPD registration number:	S-P-07597
Publication date:	2023-02-10 (Revision date 2023-09-13)
Valid until:	2028-02-10

*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](http://www.environdec.com)*

Rationel AURAPLUS



Rationel FORMAPLUS



## General information

### Programme information

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

<b>Accountabilities for PCR, LCA and independent third-party verification</b>
<b>Product Category Rules (PCR)</b>
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products (EN 15804:A2) (1.2.5) PCR 2019:14-c-PCR-007 c-PCR-007 Windows and doors (EN 17213) (2020-04-09)
PCR review was conducted by: CEN Technical Committee The review panel may be contacted via the Secretariat <a href="http://www.environdec.com/contact">www.environdec.com/contact</a> .
<b>Life Cycle Assessment (LCA)</b>
LCA accountability: Tyrens Sverige AB
<b>Third-party verification</b>
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: Daniel Bockin, Milogiraff and signature of the third-party verifier
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 programmes, 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 characterisation 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:

Rational, Dalgas Alle 7, 7400 Herning, Denmark

Contact:

Manoli Ly Pedersen, Global Product Sustainability Specialist  
 Tel. direct +45 6025 1653  
 E-mail maly@dovista.com

Description of the organization:

Rational creates windows and doors that frame our everyday lives. To provide the best setting for daily life and the best conditions for a safe, bright and vibrant home. A home with new possibilities and functions.

We take pride in being present for our customers. Having built a solid, long-lasting community with our business partners we can provide strong local roots. Meaning, we are always near when you need us. With 60 years of experience, we operate on a solid foundation which means that we will be here both today and going forward.

Rational is a Danish based company with sales activities in Denmark, United Kingdom and Ireland. Rational is a part of DOVISTA, that is one of the leading manufacturers of facade windows and doors in Europe. DOVISTA is a part of the VKR Group, also the parent company of VELUX.

Rational is a trademark used under license by DOVISTA A/S, CVR-no. 21147583.

Product-related or management system-related certifications:

Rational window and door systems are third party Q-Mark certified. BM TRADA operates the Q-Mark product certification for construction products, which is based on the Product Certification Standard EN 45011. Rational is registered in the BM Trada database under our parent company DOVISTA A/S. In the UK Rational windows and doors are compliant with Part Q of the Building Regulations.

Name and location of production site(s):

DOVISTA Polska Sp. z o.o. Wedkowy, PL-83-115 Swarozyn

**Product information:**

Product name: Rational AURAPLUS / Rational FORMAPLUS – top guided window (wood/alu)



Product description:

The Rational top-guided outward opening triple-glazed windows with aluminium cladding can be made as Rational AURAPLUS or Rational FORMAPLUS. The results in this LCA study will reflect both products as the materials in the windows are the same, with a small difference in material weight.

The life cycle inventory includes weights for the Rational AURAPLUS model. There are the following differences between the products:

Rational AURAPLUS contains about 270 grams more wood than Rational FORMAPLUS.

Rational AURAPLUS contains about 200 grams less aluminium than Rational FORMAPLUS.

The Rational AURAPLUS wood/aluminium windows are constructed using the same solid timber structure as our all-timber windows, with the addition of external aluminium cladding.

Rational AURAPLUS personifies clean lines. The sleek, flat frame gives your window a flush finish for a truly modern, Scandinavian feel. Windows are made to measure and come in a large range of opening functions. Glazing can be triple-glazed or double-glazed as per requirement. Optional glazing bars can increase the architectural elegance of this style. The external cladding comes in hundreds of colours and gives you the flexibility to have one colour inside your home and another on the outside.

Made from sustainably sourced timber, your windows and doors will last for decades if looked after. And with the external aluminium cladding, maintenance becomes minimal and life expectancy rises.

Suitable for both new build and replacement windows in domestic projects, multi-plot housing and commercial buildings.

The Rational FORMAPLUS wood/ aluminium windows are constructed using the same solid timber structure as our all-timber windows, with the addition of external aluminium cladding.

Rational FORMAPLUS is designed to complement traditional architecture and the FORMAPLUS window range comes with angled glazing bead and ovolo moulded profile making it an ideal choice for country-style and traditional designs. Windows are made to measure and come in a large range of opening functions.

Rational FORMAPLUS is available with or without glazing bars which particularly suits this style of windows. Glazing can be triple-glazed or double-glazed as per requirement and an extensive range of colour choices are available.

Made from sustainably sourced timber, your windows and doors will last for decades if looked after. And with the external aluminium cladding, maintenance becomes minimal and life expectancy rises.

All window and door 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 to and third-party verified for a wide range of conditions including resistance to wind load, water tightness, air permeability, load-bearing capacity of safety devices. Please refer to the Declaration of Performance document (DoP) for the product system and see the performance tested for each specific opening function.

For frames, sashes, mullions, and transoms we use FSC-certified pine from North European forests, licence code FSC(R)-C101947.

We use a water-based diffusion open timber surface treatment, system 2OKO 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 seek to protect the environment and therefore demand our suppliers to secure, that their products comply with relevant law concerning hazardous substances.

Suppliers are required to sign our Code of Conduct and Hazardous Substances Restriction. Please see <https://dovista.com/interesseret/leverandoer/>

Our Hazardous Substances Restrictions Appendix A list 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 DOVISTAs internal requirements. Please see <https://dovista.com/interesseret/leverandoer/hazardous-substances-restriction/>

Our Appendix A list, which 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), please see <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 Global  
Module A3 production is located in Poland  
Module A5, C and D scenarios are for Europe

**LCA information:**

Functional unit / declared unit: 1 m<sup>2</sup> window

Reference service life: Not specified

Time representativeness:

The LCA is based on production data from 2021-2022 but is deemed to be representative of an average year of production.

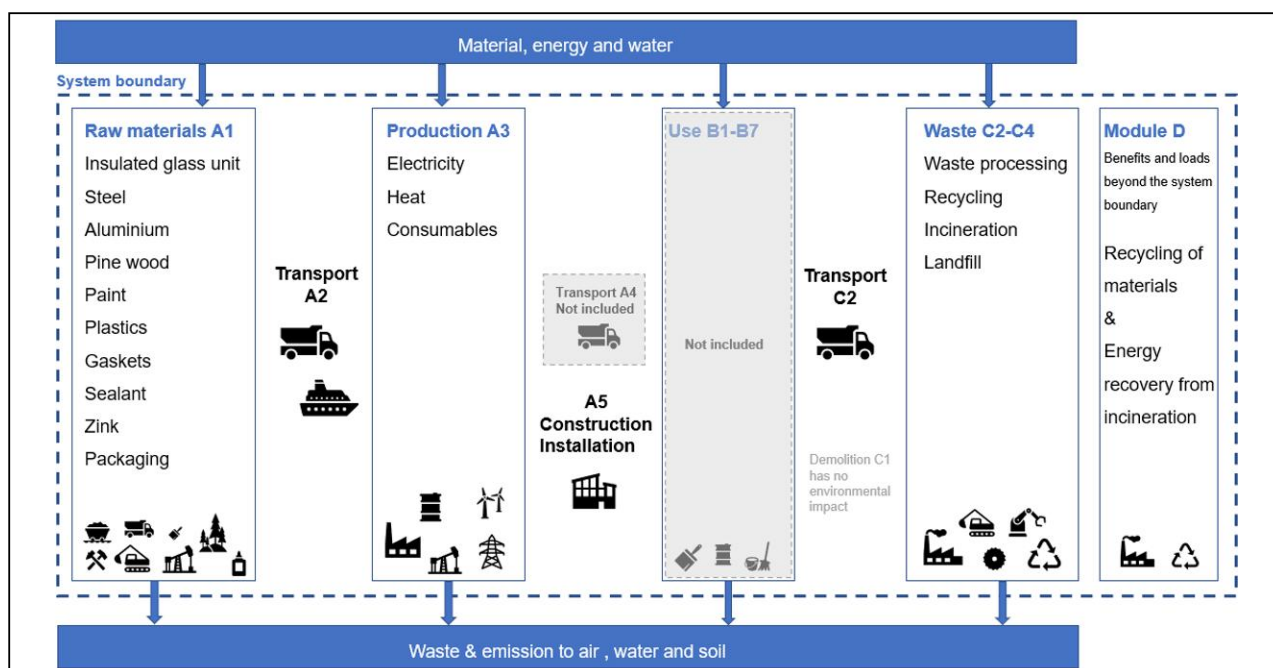
Database(s) and LCA software used:

The LCA software is SimaPro 9.4.0.2 and the database is EcoInvent 3.9.1. When modeling in Simapro, Ecoinvent data (updated May 2023) has been used for generic data.

Description of system boundaries:

Cradle to gate with modules C1 - C4 and module D (A1 - A3 + A5 + C + D)

System boundaries:



**Production:**

Main materials used for production:

- Wood: main raw material used is finger joined and glued pine scantlings supplied by FSC labelled suppliers only.
- Aluminum: extruded profiles are produced in EU; later profiles are either powder coated in Poland 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 7% of wood and 15% 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, impregnated, 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 is mounted into complete windows that are adjusted in a way that prevents the need for further adjustments during installation. Windows are then protected with cardboard corners 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 to distribution centers in Poland and Germany, where they are bundled and sent to final customers.

**More information:**

LCA practitioners: Anna Pantze, Ida Adolfsson and Emanuel Lindback at Tyrens Sverige AB.

The basic LCA model is based on a standard size according to c-PCR-007 Windows and doors (EN 17213).

**EPD generator 2.0**

This EPD is generated with a pre-verified EPD tool. All processes are fixed and variable input data for each window or patio/sliding door i.e constituent material/components (Items) is governed by a menu. The results of the EPD is 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 2.0.

**Electricity data**

Electricity consumption in A3 module (DOVISTA Polska Sp. z o.o. Wedkowy, PL-83-115 Swarozyn) comes from 100% renewable energy according to Certificate RGP STXSERV 2022-08-25 1716 from RGP. RGP declares a renewable energy mix of 99 % wind power and 1% solar. Climate impact for the renewable energy mix is 0,025 kg CO<sub>2</sub>eq. per kWh (GWP-GHG).

**Biogenic carbon calculations**

The implementation of Ecoinvent in Simapro makes it necessary to correct the biogenic carbon flows manually in the EPD. Biogenic stored carbon is calculated according to EN 16485. The uptake of biogenic carbon in the products and packaging is reported in module A1-A3. The emission of the biogenic carbon stored in the product is reported in module C and the emission of the biogenic carbon stored in the packaging is reported in module A5, this balance out the biogenic carbon content.

Calculation of biogenic carbon in wood: The wood is assumed to have 12% moisture content and half of the dry wood is carbon, C. Each kg of stored biogenic carbon is equal to 44/12 kg of CO<sub>2</sub>.

### Estimates and assumptions

All transport in A2 and C2 is with EURO V 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 window is 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 it is 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 it is 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 energy recovery from wood is replacing energy heat production mix of Europe with 25% Coal, 40% natural Gas and 35% renewable and biofuels (European commission, 2019).

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

### 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 EPDs.

#### EPD used for background data:

EPD Pressglas, Insulating glass units Double and triple glass configurations. M-EPD-MIG-GB-002036

EPD Pilkington, Insulating glass units Double and triple glass configurations. M-EPD-MIG-GB-002034

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, Finger-jointed laminated wood profile, EPD HUB, EPD number 0100

### Data quality

When modeling in Simapro, Ecoinvent data (updated May 2023) 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 EPDs have been used. The EPDs used are of high quality.

### Impact assessments methods

Potential environmental impacts are calculated with Environmental Footprint 3.0 method as implemented in SimaPro, EN 15804 +A2 V1.00 / EF 3.0 normalization and weighting set. Resource use values are calculated from Cumulative Energy Demand V 1.11.

An extra method was chosen for assessing the potential impact on the climate, calculated according to the old standard EN 15804+A1, it is called climate change potential (GWP-GHG) according to the program operator EPD international.





## Content information

Product component	Weight (kg)	Post-consumer material, weight - %	Biogenic material, weight - % and kg C/ kg
Insulated Glass unit	22.07	0%	
Wood	10.13	0%	100% and 0.44 kg C / kg
Steel & Metals	1.48	19-26 %	
Aluminium	1.52	0-7.3 %	
Plastics	0.01	0%	
Paint	1.15	0%	
EPDM	0.36	0%	
Sealant and Glue	0.08	0%	
<b>TOTAL</b>	<b>36.80</b>		
Packaging materials	Weight (kg)	Post-consumer material, weight - %	Biogenic material, weight - % and kg C/ kg
Packaging plastic	0.08	0.22%	
Packaging wood	2.10	5.71%	100% and 0.44 kg C / kg
Packaging Cardboard and Paper	0.16	0.43%	
Packaging Steel	0.02	0.04%	
<b>TOTAL</b>	<b>2.36</b>	<b>6.40%</b>	

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 1 m <sup>2</sup> window							
Indicator	A1-A3	A5	C1	C2	C3	C4	D
GWP-Total [kg CO <sub>2</sub> eq.]	4.01E+01	3.42E+00	0	5.87E-01	2.40E+01	1.31E+00	-2.29E+01
GWP-Fossil [kg CO <sub>2</sub> eq.]	6.59E+01	2.85E-02	0	5.85E-01	1.98E-01	7.02E-02	-2.51E+01
GWP-Biogenic [kg CO <sub>2</sub> eq.]	-2.74E+01	3.39E+00	0	1.55E-03	2.38E+01	1.24E+00	2.38E+00
GWP-luluc [kg CO <sub>2</sub> eq.]	1.64E+00	8.74E-06	0	2.30E-04	2.50E-04	1.61E-05	-2.18E-01
ODP [kg CFC 11 eq.]	3.71E-06	5.80E-09	0	1.35E-07	2.09E-08	3.55E-08	-2.19E-06
AP [mol H(+) eq.]	6.48E-01	7.00E-04	0	2.38E-03	9.72E-04	6.87E-04	-1.69E-01
EP - freshwater [kg P eq.]	2.38E-02	2.09E-06	0	3.77E-05	4.39E-05	4.07E-06	-8.70E-03
EP-marine [kg N eq.]	5.85E-02	3.20E-04	0	7.15E-04	4.45E-04	2.58E-04	-1.98E-02
EP - terrestrial [mol N eq.]	5.78E-01	3.71E-03	0	7.82E-03	3.44E-03	2.83E-03	-2.09E-01
POCP [kg NMVOC eq.]	1.80E-01	9.84E-04	0	2.39E-03	9.83E-04	8.12E-04	-6.71E-02
ADP-minerals & metals* [kg Sb eq.]	2.18E-03	8.85E-08	0	2.03E-06	2.42E-06	1.41E-07	-1.04E-04
ADP - fossil* [MJ]	1.04E+03	4.43E-01	0	8.85E+00	1.94E+00	2.32E+00	-3.22E+02
WDP* [m <sup>3</sup> ]	1.81E+01	4.43E-02	0	3.98E-02	6.22E-02	1.21E-01	-1.85E+01

Acronyms

GWP-total= Global Warming Potential total; 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 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 1 m <sup>2</sup> window							
Indicator	A1-A3	A5	C1	C2	C3	C4	D
GWP - GHG [kg CO <sub>2</sub> eq.]	6.59E+01	2.83E-02	0	5.80E-01	2.75E-01	7.04E-02	-2.48E+01

Use of resources

Results per 1 m <sup>2</sup> window							
Indicator	A1-A3	A5	C1	C2	C3	C4	D
PERE [MJ]	6.64E+02	5.68E-03	0	1.25E-01	1.41E-01	4.69E-02	5.51E+01
PERM [MJ]	3.10E+02	0	0	0	0	0	0
PERT [MJ]	9.74E+02	5.68E-03	0	1.25E-01	1.41E-01	4.69E-02	5.51E+01
PENRE [MJ]	1.08E+03	4.77E-01	0	9.39E+00	2.05E+00	2.47E+00	-3.45E+02
PENRM [MJ]	2.91E+01	0	0	0	0	0	0
PENRT [MJ]	1.11E+03	4.77E-01	0	9.39E+00	2.05E+00	2.47E+00	-3.45E+02
SM [kg]	3.90E-01	0	0	0	0	0	0
RSF [MJ]	0	0	0	0	0	0	0
NRSF [MJ]	0	0	0	0	0	0	0
FW [m <sup>3</sup> ]	0	0	0	0	0	0	0

Acronyms	<p><i>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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water</i></p>
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**Waste production and output flows**

**Waste production**

Results per 1 m <sup>2</sup> window							
Indicator	A1-A3	A5	C1	C2	C3	C4	D
Hazardous waste disposed [kg]	2.16E+00	0	0	0	0	0	0
Non-hazardous waste disposed [kg]	3.40E+01	0	0	0	0	0	0
Radioactive waste disposed [kg]	1.35E-02	0	0	0	0	0	0

**Output flows**

Results per 1 m <sup>2</sup> window							
Indicator	A1-A3	A5	C1	C2	C3	C4	D
Components for re-use [kg]	0	0	0	0	0	0	0
Material for recycling [kg]	3.34E+00	0	0	0	9.47E+00	0	0
Material for energy recovery [kg]	4.67E-01	0	0	0	9.98E+00	0	0
Exported energy, electricity [MJ]	0	0	0	0	0	0	0
Exported energy, thermal [MJ]	0	0	0	0	0	0	0

## Additional information

### Conversion factor

Standard size is 1230 x 1480mm and the weight of the window is 36.80 kg per m<sup>2</sup>

### Differences versus previous version 2023-02-10:

Conversion factor for the product is added to the EPD.

Small changes in amount of paint and plastic impact the paint and plastic content.

In the new version, EPD from supplier have replaced generic data from Ecoinvent: EPD Mill finished and fabricated aluminum profiles S-P-06710 and EPD HUB, EPD number 0100 for wood profile from Barrus.

The source for generic data for the previous EPD, Ecoinvent 3.8 updated February 2022 , was replaced with Ecoinvent 3.9.1 updated 30 May 2023.

## References

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

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

LCA report EPD-GENERATOR 2.0 (2023-03-16)

PCR 2019:14 Construction products (EN 15804:A2) (1.2.4)

PCR 2019:14-c-PCR-007 c-PCR-007 Windows and doors (EN 17213) (2020-04-09)

SIS (2020). EN 17213:2020, Windows and doors - Environmental Product Declarations - Product category rules for windows and pedestrian doorsets. Svenska Institutet for 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 for Standarder.