

# Environmental Product Declaration

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

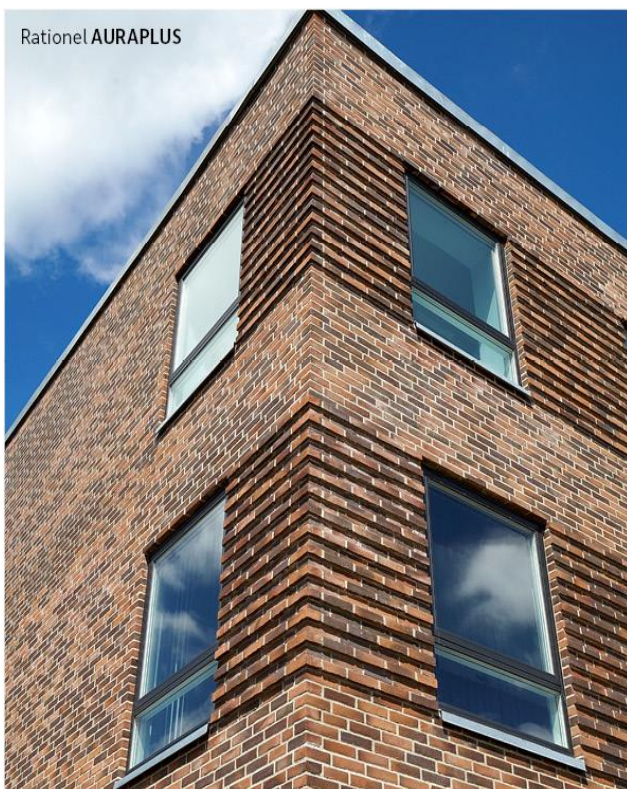
## Rationel AURAPLUS / Rationel FORMAPLUS

– Top guided window  
from

**rationel**®

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
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)*



## 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>	<a href="http://www.environdec.com">www.environdec.com</a>
<b>E-mail:</b>	<a href="mailto:info@environdec.com">info@environdec.com</a>

<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): <i>PCR 2019:14 Construction products (EN 15804:A2) (1.2.4)</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 <a href="http://www.environdec.com/contact">www.environdec.com/contact</a>.</i>
<b>Life Cycle Assessment (LCA)</b>
LCA accountability: <i>Tyréns Sverige AB</i>
<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: <i>Marcus Wendin and 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 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 Allé 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 organisation:

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. · Wędkowy · PL-83-115 Swarzędz

## 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.

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

Rational AURAPLUS and Rational FORMAPLUS 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).
Acoustic performance rating	(EN ISO 10140-2:2010)

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

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. In order to be approved as one of our suppliers, the supplier is required to sign our Code of Conduct and Hazardous Substances Restrictions (<https://dovista.com/interesseret/leverandoer/>).

Our Hazardous Substances Restrictions Appendix A list

(<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 (<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 C and D scenarios are for Europe

## LCA information

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

Standard size is 1230 x 1480mm

Reference service life: Not specified

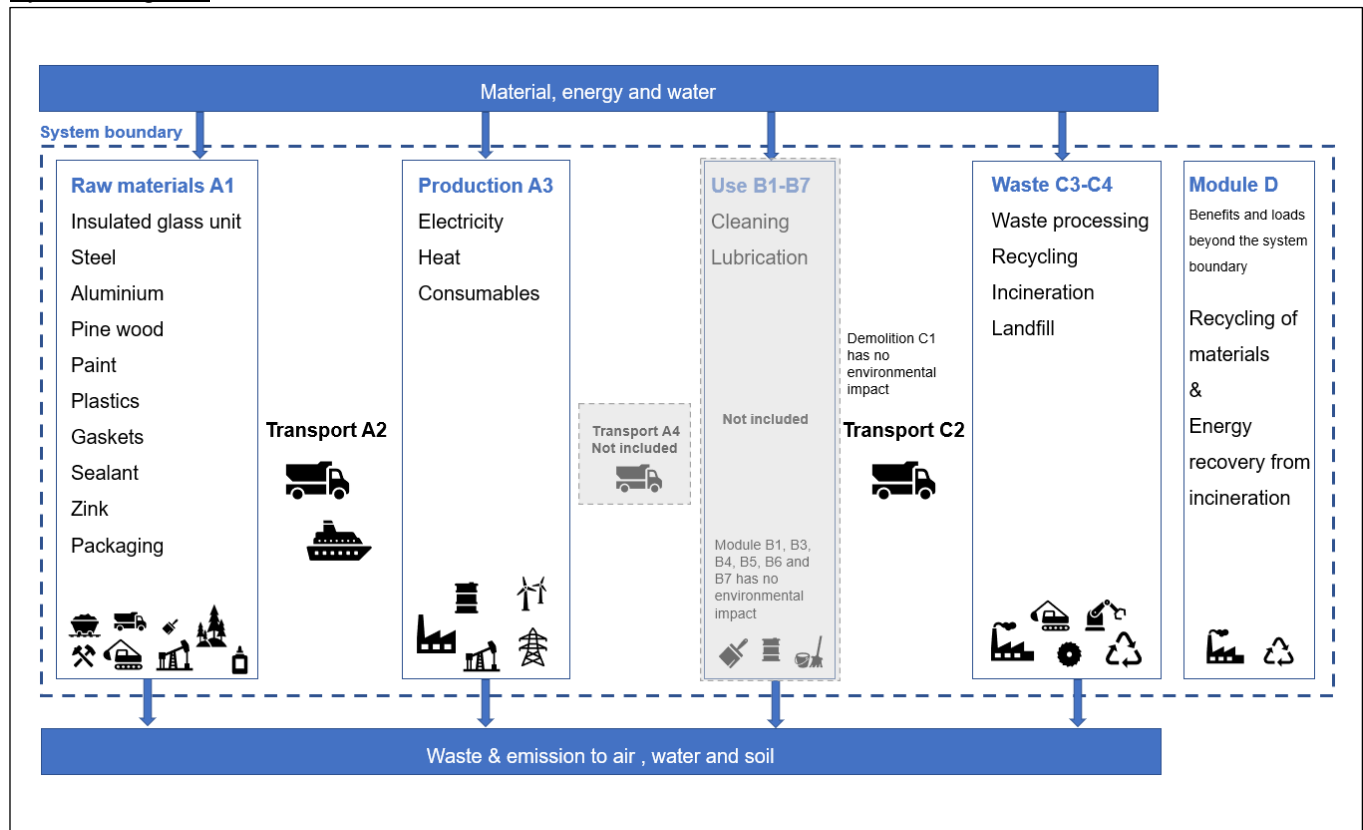
Time representativeness: The LCA is based on production data from 2021 but is deemed to be representative of an average year of production.

Database(s) and LCA software used: The LCA software is SimaPro 9.4.0.2 and the database is Ecoinvent 3.8. When modeling in Simapro, Ecoinvent data (updated February 2022) has been used for generic data.

Description of system boundaries:

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

System diagram:





Main materials used for production:

- Wood: main raw material used is finger joined and glued pine scantlings supplied by FSC labeled 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 production facilities DOVISTA Polska Sp. z o.o. · Wędkowy · PL-83-115 Swarzędz.

. 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 Lindbäck at Tyréns Sverige AB

#### *LCA model*

The basic LCA model is based on a standard size is 1230 x 1480mm according to *c-PCR-007 Windows and doors (EN 17213)*

#### *Electricity data*

Electricity consumption in A3 module (DOVISTA Polska Sp. z o.o. · Wędkowy · PL-83-115 Swarzędz) comes from 100% renewable energy according to Certificate RGP STXSERV 2022-08-25 1716 from RGP (Appendix 4). 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).

#### *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 50 km for material recycling.

- 95% of the aluminum, steel and zink is assumed to be transported 50km to a facility where its treated (fragmentized and sorted). 5 % is assumed to be transported 50 km 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.
- For calculations in Module 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.

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	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	PL	ND	ND	ND	ND	ND	ND	ND	ND	ND	EU	EU	EU	EU	EU
Specific data used	>90 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	1 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-



## Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Insulated Glass unit	22,07	0 %	0 %
Pine Wood	10,31	0 %	100% and 0,44 kg C / kg
Steel	1,42	19-26 %	0 %
Aluminium	1,52	0-2 %	0 %
Plastic	0,18	0 %	0 %
Paint	1,03	0 %	0 %
Gaskets	0,42	0 %	0 %
Sealant and Glue	0,08	0 %	0 %
TOTAL	36,85		
Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
Packaging Plastic	0,080	0,2 %	
Packaging wood	1,939	0,4 %	100% and 0,44 kg C / kg
Packaging Cardboard and Paper	0,147	0,04 %	
Packaging Steel	0,014	0,6 %	
TOTAL	2,179		

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	Unit	A1-A3	A4-A5	B1-B7	C1	C2	C3	C4	D
GWP-total	kg CO <sub>2</sub> eq.	4,66 E+01	ND	ND	0,00 E+00	6,06 E-01	2,83 E+01	1,54 E+00	-2,43 E+01
GWP-fossil	kg CO <sub>2</sub> eq.	6,85 E+01	ND	ND	0,00 E+00	6,04 E-01	2,01 E-01	7,39 E-02	-2,64 E+01
GWP-biogenic	kg CO <sub>2</sub> eq.	-2,35 E+01	ND	ND	0,00 E+00	1,60 E-03	2,81 E+01	1,47 E+00	2,36 E+00
GWP-luluc	kg CO <sub>2</sub> eq.	1,55 E+00	ND	ND	0,00 E+00	2,37 E-04	2,58 E-04	1,69 E-05	-2,32 E-01
ODP	kg CFC 11 eq.	4,09 E-06	ND	ND	0,00 E+00	1,40 E-07	2,12 E-08	3,74 E-08	-2,35 E-06
AP	mol H <sup>+</sup> eq.	6,55 E-01	ND	ND	0,00 E+00	2,45 E-03	9,81 E-04	7,24 E-04	-1,82 E-01
EP-freshwater	kg P eq.	2,76 E-02	ND	ND	0,00 E+00	3,89 E-05	4,42 E-05	4,29 E-06	-9,12 E-03
EP-marine	kg N eq.	5,48 E-02	ND	ND	0,00 E+00	7,39 E-04	4,49 E-04	2,72 E-04	-2,17 E-02
EP-terrestrial	mol N eq.	5,30 E-01	ND	ND	0,00 E+00	8,08 E-03	3,47 E-03	2,98 E-03	-2,31 E-01
POCP	kg NMVOC eq.	1,73 E-01	ND	ND	0,00 E+00	2,47 E-03	9,93 E-04	8,55 E-04	-7,27 E-02
ADP-minerals&metals*	kg Sb eq.	2,25 E-03	ND	ND	0,00 E+00	2,10 E-06	2,39 E-06	1,48 E-07	-1,14 E-04
ADP-fossil*	MJ	1,14 E+03	ND	ND	0,00 E+00	9,14 E+00	1,96 E+00	2,45 E+00	-3,40 E+02
WDP*	m <sup>3</sup>	1,52 E+01	ND	ND	0,00 E+00	2,65 E-02	4,83 E-02	7,64 E-03	-2,52 E+00
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 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	Unit	A1-A3	A4-A5	B1-B7	C1	C2	C3	C4	D
GWP-GHG <sup>1</sup>	kg CO <sub>2</sub> eq.	6,83 E+01	ND	ND	0,00 E+00	6,00 E-01	2,78 E-01	7,40 E-02	-2,62 E+01
Additional voluntary indicators e.g. the voluntary indicators from EN 15804 or the global indicators according to ISO 21930:2017									

## Use of resources

Results per 1 m <sup>2</sup> window									
Indicator	Unit	A1-A3	A4-A5	B1-B7	C1	C2	C3	C4	D
PERE	MJ	6,84 E+02	ND	ND	0,00 E+00	1,29 E-01	1,42 E-01	4,94 E-02	5,11 E+01
PERM	MJ	1,95 E+02	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
PERT	MJ	8,79 E+02	ND	ND	0,00 E+00	1,29 E-01	1,42 E-01	4,94 E-02	5,11 E+01
PENRE	MJ	1,19 E+03	ND	ND	0,00 E+00	9,70 E+00	2,08 E+00	2,60 E+00	-3,65 E+02
PENRM	MJ	2,22 E+01	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
PENRT	MJ	1,22 E+03	ND	ND	0,00 E+00	9,70 E+00	2,08 E+00	2,60 E+00	-3,65 E+02
SM	kg	2,84 E-01	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
RSF	MJ	8,31 E+01	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
NRSF	MJ	0,00 E+00	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
FW	m <sup>3</sup>	5,05 E-02	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
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 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								

<sup>1</sup> This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO<sub>2</sub> is set to zero.

## Waste production and output flows

### Waste production

Results per 1 m <sup>2</sup> window									
Indicator	Unit	A1-A3	A4-A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2,84 E-02	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
Non-hazardous waste disposed	kg	2,69 E+01	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
Radioactive waste disposed	kg	1,22 E-02	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00

### Output flows

Results per 1 m <sup>2</sup> window									
Indicator	Unit	A1-A3	A4-A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	kg	0,00 E+00	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
Material for recycling	kg	2,31 E+00	ND	ND	0,00 E+00	0,00 E+00	9,67 E+00	0,00 E+00	0,00 E+00
Materials for energy recovery	kg	5,34 E-01	ND	ND	0,00 E+00	0,00 E+00	9,79 E+00	0,00 E+00	0,00 E+00
Exported energy, electricity	MJ	0,0 E+00	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
Exported energy, thermal	MJ	0,00 E+00	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00

## Additional environmental information

The Rational FORMAPLUS has a 1 % higher impact on climate change – fossil compared to Rational AURAPLUS. The environmental impact in this EPD is reported is for Rational AURAPLUS. The work to find documentation for service life of certain specific constituent parts is ongoing and thereafter the service life for the entire window will be updated as well as this EPD.

## References

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

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

LCA Report Dovista for Velfac & Rational - GP21, Tyréns, 2022-12-20

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 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.

