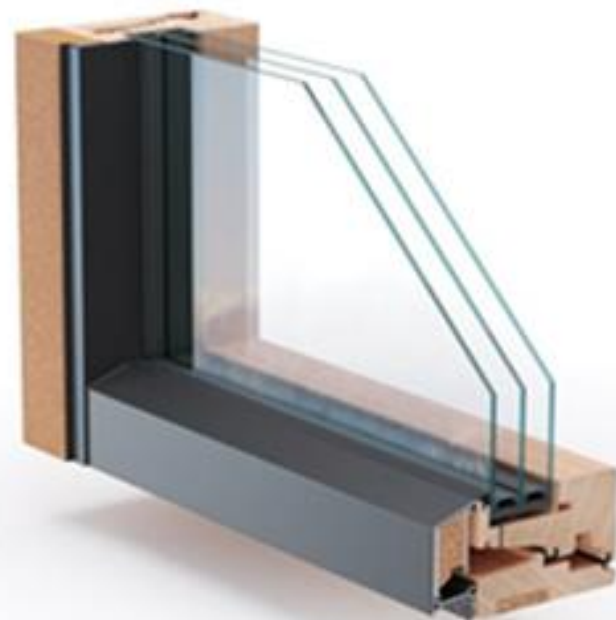


ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

SMARTWIN FIX and SMARTWIN window
I2



EPD HUB, EPDHUB-0153

Publishing date 14 October 2022, last updated date 19 October 2022, valid until 14 October 2027

GENERAL INFORMATION

MANUFACTURER

Manufacturer	I2
Address	Kalēju iela 9, Jaunsaurieši Salaspils novads LV-2169, Latvija
Contact details	info@i2.lv
Website	https://i2.lv/

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804+A2:2019 and ISO 14025
PCR	EPD Hub Core PCR version 1.0, 1 Feb 2022 EN 17213 Windows and doors
Sector	Construction product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with options, A4-A5, and modules C1-C4 and D
EPD author	The EPD has been worked out by Bureau Veritas Latvia, tel. +371 67 25 68 29, Adress: Dunties iela 17A, Ziemeļu rajons, Rīga, LV-1005, e-mail: riga@lv.bureauveritas.com, web-page: www.bureauveritas.lv
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☒ External verification
EPD verifier	E.A as an authorized verifier acting for EPD Hub

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	smartwin fix and smartwin
Place of production	Jaunsaurieši, Latvija
Period for data	2021
Averaging in EPD	Multiple products
Variation in GWP-fossil for A1-A3	12.8 %

ENVIRONMENTAL DATA SUMMARY

Declared unit	1m2
Declared unit mass	39.9873 kg
GWP-fossil, A1-A3 (kgCO2e)	48.7
GWP-total, A1-A3 (kgCO2e)	1.24
Secondary material, inputs (%)	2.94
Secondary material, outputs (%)	47.2
Total energy use, A1-A3 (kWh)	1430.0
Total water use, A1-A3 (m3e)	5.14

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Our products meet the highest energy efficiency requirements, at the same time they have high design value - frame-less solutions, selected materials, unique technology that gives a understanding of window production possibilities. Our main products are innovative windows, doors and glazed facade systems.

i2 Factory is advanced technological carpentry, specialized in a High performance, Passivhouse certificated windows and glazed solutions.

PRODUCT DESCRIPTION

The window is fully integrated in a building envelope with minimalistic frame and functions as a barrier between in- and outdoor climate. Suitable for buildings with highest demands for Thermal isolation (energy efficiency), Solar control (by add-on screens and blinds and glass coating), Soundproofing.

Product application

Window with the following dimensions: 1.23 m x 1.48 m with a total surface area of 1,82 m²

Physical properties of the product

Acoustic performance RW (C;Ctr) according to /EN 14351-1/: Glazing 4-18-4-18-4 : 36(-2;-6)dB

Resistance for wind load according to /EN 12210; EN 12211/: B5(C4)

Air permeability according to /EN 14351-1/: class 4

Water tightness according to /EN 14351-1/: class 9A

Total energy transmittance g according to /EN 410/: 0,53

Thermal transmittance of glass Ug according to /EN 673/: 0,53 W/(m²K)

Triple glazing IGU pane composition: 4/18/4/18/4 mm

Thermal transmittance of the window UW according to /EN ISO 10077-2: smartwin 0,63 W/(m²K), smartwin fix 0,60 W/(m²K)

Technical specifications

Window sash is fully insulated with wood fiberboard insulation and can be installed in a frame-less manner. The window is fitted with triple glazed glazing unit (4/18/4/18/4) sealed by Swisspacer Ultimate spacer.

EPD is developed from the average data of two types of windows - Passive House suitable pH A class wood/aluminum inward opening sash type, tilt and turn (SMARTWIN) and fixed (SMARTWIN FIX) windows. EPD description Section 3 explains how product averages are obtained.

Further information can be found at <https://i2.lv/>.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	3.74	EU
Minerals	49.34	EU
Fossil materials	3.91	EU
Bio-based materials	43.01	EU

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	9.8
Biogenic carbon content in packaging, kg C	1.7

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1m ²
Mass per declared unit	39.99 kg

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	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR.

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.

For processes A1-A3, data on the materials used in the production of wood-aluminium windows were obtained from the suppliers EPDs. Where EPDs were not available, the Ecoinvent 3.6 database was used. Wood-aluminium windows are made of wood, metal, and glass. The main production processes are the elongation and milling of the timber, the painting and oiling process and the assembly and glazing of the window. The production process requires electricity and heat. Ancillary materials are also included. The product is packaged before being transported from the factory and then transported by truck and/or ferry to be installed.

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. In the product installation phase (A5), the material consumption - tape and screws, which are used during the installation phase of the product and waste generated from the product packaging are taken into account. In the distribution phase (A4), the transport distance is defined by the product manufacturer and the transport method is truck and ferry. The scenario considers transportation from the factory to distribution point in Stockholm, Sweden.

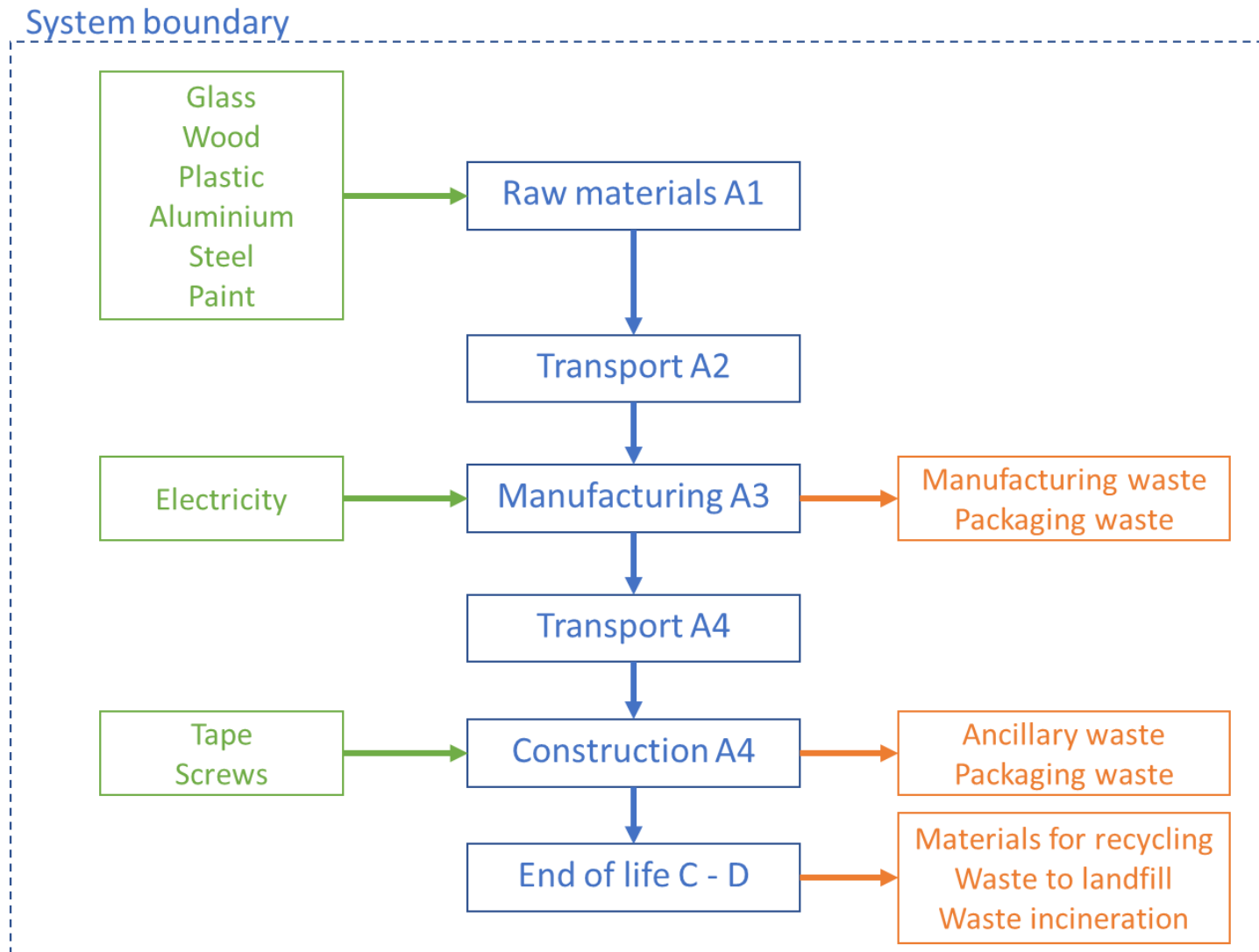
PRODUCT USE AND MAINTENANCE (B1-B7)

After installation, maintenance, repair, replacement and refurbishment depend on the end-users product usage habits. Impacts are not considered at this stage. The maintenance of the product by the consumer can be done by regular cleaning of the windows with water and detergent. Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

The consumption of energy and natural resources in the demolition process is assumed to be negligible. Waste is assumed to be collected and transported for treatment. The transport distance to treatment is assumed to be 50 km and the transport method is truck (C2). Module C3 accounts for energy and resource inputs for sorting and treating these waste streams for recycling and incineration with energy recovery. Waste statistics, 70% of glass waste, 100% of hazardous waste (paint) and 5% of steel and 5% of aluminium waste goes to landfill. Additionally, hazardous waste that is incinerated is included in Module C4 while the flow not included in Module D for benefits. The wooden pallet and other plastic packaging used during transportation is also incinerated for energy recovery. The benefits and loads of incineration and recycling are included in Module D.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw materials 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 of 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.

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	Allocated by mass or volume
Packaging materials	Allocated by mass or volume
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

AVERAGES AND VARIABILITY

Type of average	Multiple products
Averaging method	Averaged by shares of total volume
Variation in GWP-fossil for A1-A3	12.8 %

EPD is developed based on average values for SMARTWIN FIX and SMARTWIN windows. Average values were obtained for all input data in the model by the formula $(a+b)/2$.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. Ecoinvent and One Click LCA databases were used as sources of environmental data.

ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

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 ₂ e	-1,87E1	8,08E-1	1,91E1	1,24E0	2,19E0	7,68E0	MND	MND	MND	MND	MND	MND	MND	0E0	3,27E-1	2,03E1	2,04E0	-1E1
GWP – fossil	kg CO ₂ e	3,64E1	8,08E-1	1,15E1	4,87E1	2,21E0	1,75E0	MND	MND	MND	MND	MND	MND	MND	0E0	3,27E-1	1,32E0	1,94E0	-2,72E1
GWP – biogenic	kg CO ₂ e	-5,66E1	4,62E-4	7,61E0	-4,9E1	-4,1E-4	5,93E0	MND	MND	MND	MND	MND	MND	MND	0E0	1,76E-4	1,9E1	9,93E-2	1,74E1
GWP – LULUC	kg CO ₂ e	1,55E0	3,12E-4	8,76E-3	1,56E0	1,33E-3	1,9E-3	MND	MND	MND	MND	MND	MND	MND	0E0	1,18E-4	1,13E-3	3,94E-4	-1,88E-1
Ozone depletion pot.	kg CFC ₋₁₁ e	2,5E-6	1,82E-7	8,24E-7	3,51E-6	4,48E-7	1,21E-7	MND	MND	MND	MND	MND	MND	MND	0E0	7,43E-8	1,1E-7	1,72E-7	-2,45E-6
Acidification potential	mol H ⁺ e	2,47E-1	3,22E-3	9,84E-2	3,49E-1	6,98E-2	1,04E-2	MND	MND	MND	MND	MND	MND	MND	0E0	9,38E-4	1,27E-2	7,95E-3	-2,19E-1
EP-freshwater ²⁾	kg Pe	1,78E-3	7,33E-6	5,82E-4	2,37E-3	9,66E-6	7,64E-5	MND	MND	MND	MND	MND	MND	MND	0E0	2,78E-6	1,04E-4	4,3E-5	-1,17E-3
EP-marine	kg Ne	4,54E-2	9,23E-4	1,47E-2	6,11E-2	1,74E-2	1,72E-3	MND	MND	MND	MND	MND	MND	MND	0E0	1,86E-4	1,36E-3	1,29E-3	-2,95E-2
EP-terrestrial	mol Ne	4,93E-1	1,02E-2	1,96E-1	6,99E-1	1,94E-1	1,93E-2	MND	MND	MND	MND	MND	MND	MND	0E0	2,08E-3	1,68E-2	1,58E-2	-3,56E-1
POCP (“smog”) ³⁾	kg NMVOCe	1,31E-1	3,22E-3	4,94E-2	1,84E-1	5,01E-2	6,24E-3	MND	MND	MND	MND	MND	MND	MND	0E0	7,96E-4	4,88E-3	6,63E-3	-1,04E-1
ADP-minerals & metals ⁴⁾	kg Sbe	5,57E-3	2,26E-5	3,68E-5	5,63E-3	1,57E-5	5,36E-5	MND	MND	MND	MND	MND	MND	MND	0E0	9,01E-6	5,77E-5	1,26E-5	-3,48E-4
ADP-fossil resources	MJ	1,55E3	1,13E1	1,2E2	1,69E3	2,85E1	2,32E1	MND	MND	MND	MND	MND	MND	MND	0E0	4,94E0	1,56E1	1,48E1	-3,96E2
Water use ⁵⁾	m ³ e depr.	1,58E1	4,38E-2	1,17E0	1,7E1	5,7E-2	1,31E0	MND	MND	MND	MND	MND	MND	MND	0E0	1,62E-2	6,84E-1	6,03E-2	-5,75E0

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

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	4,44E-6	5,71E-8	1,2E-6	5,69E-6	7,22E-8	1,21E-7	MND	MND	MND	MND	MND	MND	MND	0E0	2,08E-8	7,26E-8	1,11E-7	-2,04E-6
Ionizing radiation ⁶⁾	kBq U235e	1,46E0	5,34E-2	2,8E-1	1,79E0	1,23E-1	6,9E-2	MND	MND	MND	MND	MND	MND	MND	0E0	2,16E-2	6,34E-2	4,01E-2	-2,17E0
Ecotoxicity (freshwater)	CTUe	9,8E2	9,71E0	3,19E2	1,31E3	1,77E1	5,26E1	MND	MND	MND	MND	MND	MND	MND	0E0	3,83E0	9,26E1	8,09E1	-5,93E2
Human toxicity, cancer	CTUh	1E-7	2,89E-10	7,37E-9	1,08E-7	1,14E-9	1,58E-8	MND	MND	MND	MND	MND	MND	MND	0E0	1,1E-10	2,06E-9	1,04E-9	-1,85E-8
Human tox. non-cancer	CTUh	9,31E-7	1,09E-8	2,08E-7	1,15E-6	1,46E-8	4,91E-8	MND	MND	MND	MND	MND	MND	MND	0E0	4,19E-9	1,07E-7	7,48E-8	1,07E-8
SQP ⁷⁾	-	1,21E2	1,19E1	1,5E1	1,48E2	2,82E0	5,1E0	MND	MND	MND	MND	MND	MND	MND	0E0	4,18E0	5,82E0	1,46E1	-3,52E1

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁸⁾	MJ	3,27E3	1,76E-1	1,57E2	3,42E3	1,88E-1	3,78E0	MND	MND	MND	MND	MND	MND	MND	0E0	7,07E-2	1,89E0	4,36E-1	-1,27E2
Renew. PER as material	MJ	1,15E3	0E0	5,96E1	1,21E3	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	-3,76E-1
Total use of renew. PER	MJ	4,42E3	1,76E-1	2,16E2	4,63E3	1,88E-1	3,78E0	MND	MND	MND	MND	MND	MND	MND	0E0	7,07E-2	1,89E0	4,36E-1	-1,28E2
Non-re. PER as energy	MJ	1,58E3	1,13E1	1,17E2	1,71E3	2,85E1	2,27E1	MND	MND	MND	MND	MND	MND	MND	0E0	4,94E0	1,56E1	1,48E1	-3,44E2
Non-re. PER as material	MJ	1,14E1	0E0	2,88E0	1,42E1	0E0	4,78E-1	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	-5,12E1
Total use of non-re. PER	MJ	1,6E3	1,13E1	1,2E2	1,73E3	2,85E1	2,32E1	MND	MND	MND	MND	MND	MND	MND	0E0	4,94E0	1,56E1	1,48E1	-3,96E2
Secondary materials	kg	1,18E0	0E0	1,44E-3	1,18E0	0E0	1,05E-2	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	2,46E0
Renew. secondary fuels	MJ	8,94E-3	0E0	0E0	8,94E-3	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	8,14E-5	0E0	0E0	8,14E-5	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m ³	5,11E0	2,08E-3	2,75E-2	5,14E0	2,75E-3	1,09E-2	MND	MND	MND	MND	MND	MND	MND	0E0	8,53E-4	7,32E-3	1,05E-2	-1,32E-1

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	7,82E0	1,25E-2	9,62E-1	8,79E0	3,07E-2	9,95E-1	MND	MND	MND	MND	MND	MND	MND	0E0	5,08E-3	0E0	2,85E-1	-2,76E0
Non-hazardous waste	kg	9,34E1	8,79E-1	2,44E1	1,19E2	5,22E-1	3,88E0	MND	MND	MND	MND	MND	MND	MND	0E0	3,5E-1	0E0	1,77E1	-3,14E1
Radioactive waste	kg	4,62E-3	7,71E-5	3,54E-4	5,05E-3	2E-4	6,21E-5	MND	MND	MND	MND	MND	MND	MND	0E0	3,38E-5	0E0	5,59E-5	-1,6E-3

END OF LIFE – OUTPUT FLOWS

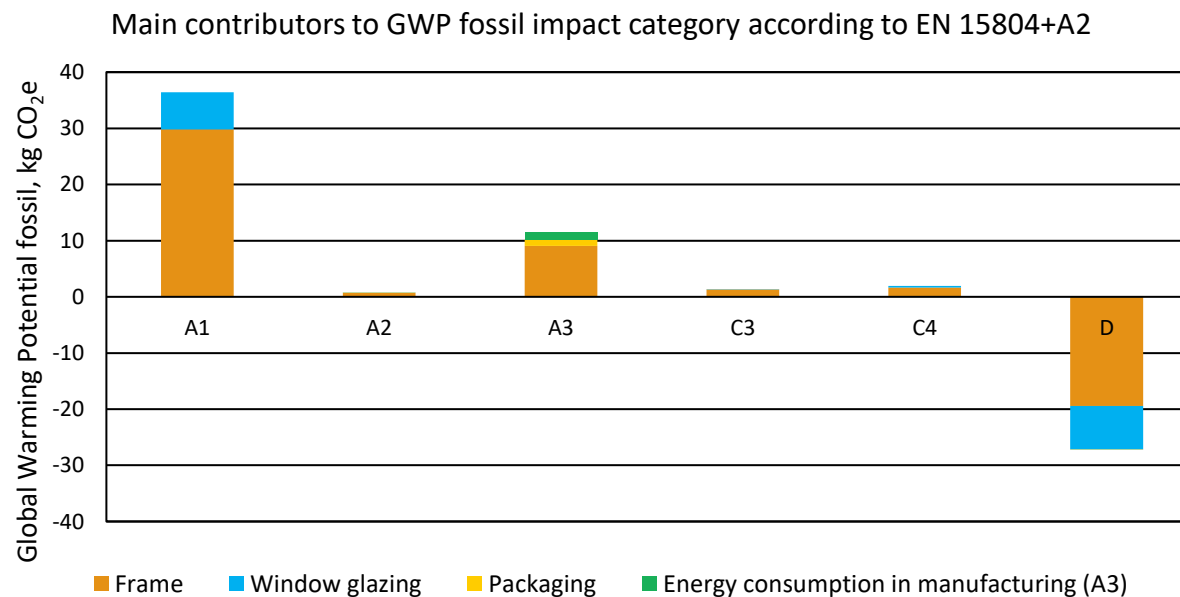
Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	2,99E-4	0E0	1,1E0	1,1E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	1,48E-1	0E0	6,1E-2	2,09E-1	0E0	2,41E-1	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	1,02E1	0E0	0E0
Materials for energy rec	kg	9,62E-3	0E0	8,66E0	8,67E0	0E0	5,4E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	8,7E0	0E0	0E0
Exported energy	MJ	4,69E-5	0E0	0E0	4,69E-5	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0

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

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ e	1,23E2	7,45E-1	1,13E1	1,35E2	2,19E0	1,69E0	MND	MND	MND	MND	MND	MND	MND	0E0	3,24E-1	1,3E0	1,9E0	-2,67E1
Ozone depletion Pot.	kg CFC ₁₁ e	1,26E-5	1,35E-7	7,08E-7	1,34E-5	3,55E-7	1,06E-7	MND	MND	MND	MND	MND	MND	MND	0E0	5,91E-8	9,53E-8	1,85E-7	-2,26E-6
Acidification	kg SO ₂ e	3,11E-1	1,54E-3	8,15E-2	3,94E-1	5,56E-2	8,48E-3	MND	MND	MND	MND	MND	MND	MND	0E0	6,59E-4	1,19E-2	6,18E-3	-1,37E-1
Eutrophication	kg PO ₄ ³ e	4,18E-1	3,3E-4	1,79E-2	4,36E-1	6,28E-3	3,3E-3	MND	MND	MND	MND	MND	MND	MND	0E0	1,36E-4	5,03E-3	1,69E-3	-3,7E-2
POCP ("smog")	kg C ₂ H ₄ e	1,01E-1	9,93E-5	4,43E-3	1,06E-1	1,44E-3	6,14E-4	MND	MND	MND	MND	MND	MND	MND	0E0	3,94E-5	4,87E-4	1,63E-3	-9,69E-3
ADP-elements	kg Sbe	5,57E-3	2,26E-5	3,68E-5	5,63E-3	1,57E-5	5,36E-5	MND	MND	MND	MND	MND	MND	MND	0E0	9,01E-6	5,77E-5	1,26E-5	-3,48E-4
ADP-fossil	MJ	1,55E3	1,13E1	1,2E2	1,69E3	2,85E1	2,32E1	MND	MND	MND	MND	MND	MND	MND	0E0	4,94E0	1,56E1	1,48E1	-3,96E2

INTERPRETATION OF RESULTS

Windows smartwin and smartwin fix consist of two main components: a wooden frame with metal parts and window glazing. Figure “Main contributors to GWP fossil impact category according to EN 15804+A2” shows that in module A1 the production of raw materials for wooded frames is the main contributor to the release of emissions related to GWP (not considering the biogenic carbon uptake) equal to 29.8 kg of CO₂e and is the biggest contributor to release of emissions in the whole life cycle of the product, in total contributing to release of 42.49 kg of CO₂e (23.07 kg of CO₂e including avoided impact in module D). The window glazing production contributes to a much smaller amount of emissions released equal to 6.6 kg of CO₂e in module A1 and 6.99 kg of CO₂e in the whole life cycle of the product. Contribution to the release of emissions related to GWP in module A3 occurs due to the incineration of wood waste obtained in the production of the wooden frame and the energy used for manufacturing the product. The GWP fossil impact category emissions for modules A2, C3 and C4 are low compared to other modules. Module C4 does not contribute to the direct release of emissions related to GWP. Module D shows the avoided emissions due to the recycling of product components. The main benefit of avoided impact can be observed for the frame component and window glazing.



Note: The wooden frame component is applicable with any standard size window glazing on demand of the client. In such case, the indicator GWP total emissions can be different.

VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliance with the reference standard, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The digital background data for this EPD

Why does verification transparency matter? Read more online

This EPD has been generated by One Click LCA EPD generator, which has been verified and approved by the EPD Hub.

THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the EPD, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Elisabet Amat as an authorized verifier acting for EPD Hub Limited
14.10.2022

