Puutuoteteollisuus

Generic windows manufactured in Finland: openable MSE 2+1 and fixed MEK 3K

Program operator, publisher:	Rakennustietosäätiö RTS sr, The Building Information Foundation RTS Malminkatu 16 A, 00100 Helsinki https://cer.rts.fi/
Owner of the declaration:	Puutuoteteollisuus ry, Federation of the Finnish Woodworking Industries Siltasaarenkatu 12 A, 00530 Helsinki https://puutuoteteollisuus.fi/
Names of the products:	MSE 2+1 window MEK 3K window
Declaration number:	RTS_184_22
Registration number:	-
ECO Platform reference number:	-
Issue date:	May 6, 2022
Update:	January 26, 2026
Valid to:	May 6, 2027
Scope of the declaration:	This environmental product declaration covers the environmental impacts of MSE 2+1 and MEK 3K windows. The declaration has been prepared in accordance with EN 15804:2019 and ISO 14025 standards and the additional requirements stated in the RTS PCR (English version, 26.8.2020). This declaration covers the life cycle stages from cradle-to-gate with options, modules C1-C4 and module D.

Jukka Seppänen
RTS EPD Committee Secretary

Laura Apilo
Managing Director

Verified according to the requirements of EN 15804:2019 (product group rules)	
Independent verification of the declaration and data, according to ISO14025:2010 is carried out by	
☐ Internal	☒ External
Third party verifier: Sigita Židonienė Vesta Consulting UAB	

GENERAL INFORMATION

Owner of the declaration

Puutuoteteollisuus ry
Siltasaarenkatu 12 A
FI-00530 Helsinki
https://puutuoteteollisuus.fi/

Author of the life cycle assessment and declaration

LCA Consulting Oy
Laserkatu 6
FI-53850 Lappeenranta
https://lca-consulting.fi/

1. Product names

This trade association EPD is created for two generic windows manufactured in Finland: openable MSE 2+1 and fixed MEK 3K.

2. Manufacturers

The following five manufacturers have contributed data for this trade association EPD: Alavus Ikkunat Oy, Kaskipuu Oy, Lammin Ikkuna Oy, Pihla Group Oy and Skaala IFN Oy.

3. Additional information

Puutuoteteollisuus ry: Aila Janatuinen. firstname.lastname@puutuoteteollisuus.fi.
LCA Consulting Oy: Heli Kumpulainen. firstname.lastname@lca-consulting.fi.

4. Product Category Rules and the scope of the declaration

The declaration has been prepared in accordance with EN 15804:2019 and ISO 14025 standards and the additional requirements stated in the RTS PCR (English version, 26.8.2020) and the PCR for windows and doorsets (EN 17213). EPDs of construction materials may not be comparable if they do not comply with EN 15804 and seen in a building context. Year 2020 is the reference year for primary data used in calculation.

5. Verification

The declaration was verified by Sigita Židonienė from Vesta Consulting UAB according to abovementioned standards and PCR rules. Bebru str. 1, Vilnius, Lithuania, +37068018594, sigita@vestaconsulting.lt.
Third party verification on 18.3.2022. Verification is valid 18.3.2022-18.3.2027.

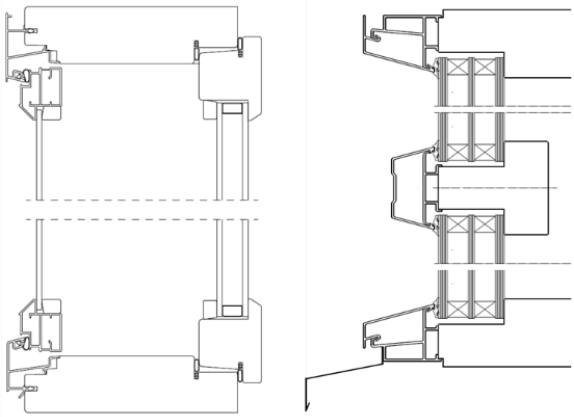
6. Declaration issue date and validity

Declaration issue date 06.05.2022. The declaration is valid 5 years, 06.05.2022-06.05.2027.

PRODUCT INFORMATION

7. Product description and uses

This declaration is made for two windows representing the typical windows on the market in Finland. Windows are used to provide lighting to indoor spaces while providing sufficient thermal insulation. The products are wooden aluminium-cladded windows with standard dimensions of 1.23x1.48 m and a casing depth of 170 mm and with a U-value of 1.0 W/m^{2}K. Optional devices such as shutters or blinds are not considered.



a) MSE 2+1 is an openable window composed of inner sash with a double-glazed insulating glass unit consisting of two 4 mm glasses, argon gas and double gaskets, and outer sash with a single 4 mm float glass and a single gasket. Both sashes have pin hinges and locks, and inner sash has metal hole covers.

b) MEK 3K is a single-sash fixed window with triple glazed insulation glass unit with argon gas, 4 mm glass panes and gaskets on both sides of the window. No metal hardware or hinges.

8. Raw materials of the products / MSE 2+1 and MEK 3K windows

The main raw materials of the windows are pine timber comprising the window frame and sashes (MSE 2+1 only), glass, aluminium and plastics. Mass shares of different materials in the windows are shown in the table below. Mass shares of materials and the other reported results are calculated as weighted averages between the five manufacturers.

Product composition	Quantity, wt.%, MSE 2+1 window	Quantity, wt.%, MEK 3K window	Usability			
			Renewable	Non-renewable	Recycled	Origin
Pine timber	31.2 %	24.7 %	x			MSE 2+1: Finland, EU MEK 3K: Finland
Aluminium	7.1 %	3.2 %		x		Finland, EU
Metal hardware	1.3 %	0.1 %		x		Finland, non-EU
Glass	55.6 %	67.0 %		x		Finland, EU, non-EU
Plastic components	0.8 %	3.8 %		x		Finland, EU, non-EU
Gaskets and sealants	2.9 %	0.3 %		x		Finland, EU
Surface treatment and glue	1.1 %	0.8 %		x		Finland, EU

9. Product standards (c-PCR)

Product category rules for windows and doors (EN 17213) are applied in the calculation.

10. Physical properties

Dimensions 1.23x1.48 m, casing depth 170 mm. U-value is 1.0 W/m^{2}K.

11. Results of environmental information reported / 1 kg window

The GWP – total results of MSE 2+1 and MEK 3K windows do not differ by more than ±10 %.

Per 1 kg MSE 2+1 window:

Parameter	Unit	A1-A3	A3	C1	C2	C3	C4	D
Global warming potential – total (GWP-total)	kg CO_2 eq./kg	1.51E+00		6.24E-04	9.67E-03	3.64E-01	5.90E-01	-1.15E+00
Depletion of abiotic resources – minerals and metals (ADP-M)	kg Sb eq./kg	1.76E-05		5.51E-11	8.48E-10	2.26E-07	2.00E-09	-3.19E-06
Depletion of abiotic resources – fossil fuels (ADP-F)	MJ net calorific value/kg	3.04E+01		8.29E-03	1.27E-01	5.79E+00	2.50E-01	-1.78E+01
Water use (WDP)	m^3 world eq. deprived/kg	3.14E-01		5.77E-06	8.88E-05	2.13E-02	6.71E-02	-1.67E-01
Biogenic carbon content in product	kg C/kg		0.24					
Use of secondary material	kg/kg	0						

Per 1 kg MEK 3K window:

Parameter	Unit	A1-A3	A3	C1	C2	C3	C4	D
Global warming potential – total (GWP-total)	kg CO_2 eq./kg	1.47E+00		6.24E-04	9.45E-03	4.15E-01	5.10E-01	-1.02E+00
Depletion of abiotic resources – minerals and metals (ADP-M)	kg Sb eq./kg	4.28E-06		5.51E-11	8.29E-10	2.68E-07	1.83E-09	-4.07E-06
Depletion of abiotic resources – fossil fuels (ADP-F)	MJ net calorific value/kg	3.01E+01		8.29E-03	1.25E-01	6.62E+00	2.30E-01	-1.60E+01
Water use (WDP)	m^3 world eq. deprived/kg	3.09E-01		5.77E-06	8.68E-05	2.52E-02	5.65E-02	-2.00E-01
Biogenic carbon content in product	kg C/kg		0.19					
Use of secondary material	kg/kg	0						

12. Substances under European Chemicals Agency's REAH, SVHC restrictions

Either of the products are not known to include substances from ECHA's Candidate List of Substances of Very High Concern.

SCOPE OF THE LIFE CYCLE ASSESSMENT

The type of this declaration is cradle to gate with options, modules C1-C4 and module D. Covered modules are marked with an X in the table below.

Product stage			Construction stage		Use stage							End of life stage				Supplementary information beyond the life cycle		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	☒
Raw material supply	Transport	Manufacturing	Transport	Construction	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

	Mandatory modules
	Mandatory as per RTS PCR section 6.2.1 rules and terms
	Optional modules based on scenarios

13. Declared unit

The declared unit is 1 m^2 of window. The results are presented separately for MSE 2+1 and MEK 3K. The conversion factors from m^2 to kg are shown in the table below:

Parameter	Value	Unit
Declared unit	1	m^2
Conversion factor, MSE 2+1	42.2	kg/m^2
Conversion factor, MEK 3K	39.9	kg/m^2

14. System boundary

The system boundary is cradle to gate with options, modules C1-C4 and module D and includes the following life cycle stages:

- **A1: Raw material supply** includes raw material extraction, forestry operations and raw material processing to semi-finished product;
- **A2: Raw material transport** from suppliers to manufacturing;
- **A3: Manufacturing** includes direct emissions from the site and the production of energy, fuels, water and packaging materials;
- **A4: Transport to construction;**
- **A5: Construction** – installation of the product into a building and waste treatment of used packaging materials;
- **C1-C4 End of life:** Deconstruction (C1), transport of product to end of life (C2), end of life waste processing for recycling and energy recovery(C3) and the disposal of materials (C4), and;
- **D: Reuse, recycling and recovery potential** outside the system boundaries from material and energy substitution.

15. Cut-off criteria

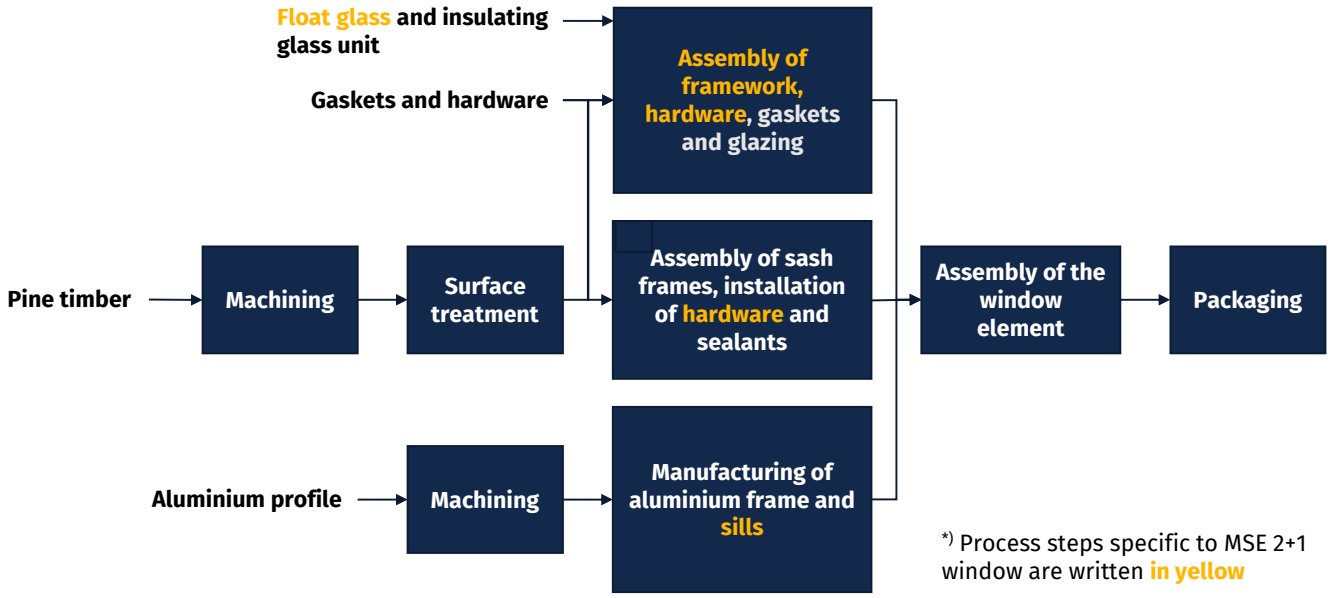
Mass-based cut-off criteria is adhered to. The cut-off rule is reflected in the inputs of the product system studied separately for each module. Flows accounting less than 1% of the overall input mass or energy flows are excluded from the study if appropriate LCI data or even proxy data is not available. The sum of excluded flows should not exceed 5% of the total inflows (by mass or by energy).

The flows knowingly excluded from the study are as follows:

- Capital equipment, infrastructure and employee commute are excluded.
- Glass waste due to human error in the manufacturing of windows presented in this EPD is excluded.

16. Production process

The wooden framework and sashes (MSE 2+1 only) are processed from sawn pine timber, which undergoes machining and surface treatment. Metal hardware are installed to the sashes, which are then assembled, gasketed and glazed. Aluminium profiles are readily treated and coated and thus are only machined on-site before being assembled into the window. Finally, the window products are packaged for shipping. They are stacked on pallets, typically four to five units per pallet, and covered with plastic wrap. Cardboard corner covers may be used to give more protection to the window units during transport.



LIFE CYCLE IMPACT ASSESSMENT

The results of the impact assessment are relative figures and do not predict the effects on the weighted values of the categories, the exceedance limits, safety margins and risks.

17. Core environmental impacts / 1 m^2 MSE 2+1 window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Global warming potential – total (GWP-total)	kg CO_2 eq.	6.36E+01	1.05E+00	4.93E+00	2.63E-02	4.07E-01	1.54E+01	2.49E+01	-4.85E+01
Global warming potential – fossil (GWP-fossil)	kg CO_2 eq.	8.87E+01	1.04E+00	7.64E-01	2.73E-02	4.05E-01	1.47E+01	4.51E+00	-4.89E+01
Global warming potential – biogenic (GWP-biogenic)	kg CO_2 eq.	-2.51E+01	-1.23E-03	4.16E+00	-1.18E-03	-4.80E-04	6.33E-01	2.03E+01	4.08E-01
Global warming potential – land use and land use change (GWP-LULUC)	kg CO_2 eq.	8.84E-02	8.47E-03	1.78E-04	2.14E-04	3.30E-03	2.85E-02	1.04E-03	-3.21E-02
Ozone depletion (ODP)	kg CFC-11 eq.	6.81E-07	2.05E-16	3.13E-13	5.18E-18	7.96E-17	2.65E-08	1.91E-10	-1.09E-06
Acidification (AP)	mol H^+ eq.	5.56E-01	3.40E-03	7.44E-04	1.32E-04	1.49E-03	3.20E-02	8.84E-03	-1.83E-01
Eutrophication – aquatic freshwater (EP-F)	kg P eq.	3.23E-03	3.08E-06	5.12E-07	7.79E-08	1.20E-06	1.15E-04	4.24E-06	-6.48E-03
Eutrophication – aquatic marine (EP-M)	kg N eq.	1.13E-01	1.55E-03	2.47E-04	6.16E-05	6.93E-04	1.02E-02	3.40E-03	-3.52E-02
Eutrophication – terrestrial (EP-T)	mole N eq.	1.26E+00	1.73E-02	3.55E-03	6.82E-04	7.73E-03	1.16E-01	4.14E-02	-3.89E-01
Photochemical ozone formation (POCP)	kg NMVOC eq.	3.84E-01	3.07E-03	6.47E-04	1.73E-04	1.34E-03	2.81E-02	9.49E-03	-1.03E-01
Depletion of abiotic resources – minerals and metals (ADP-M) [1)]	kg Sb eq.	7.42E-04	9.19E-08	1.70E-08	2.32E-09	3.58E-08	9.54E-06	8.42E-08	-1.35E-04
Depletion of abiotic resources – fossil fuels (ADP-F) [1)]	MJ net calorific value	1.28E+03	1.38E+01	1.38E+00	3.49E-01	5.37E+00	2.44E+02	1.05E+01	-7.51E+02
Water use (WDP) [1)]	m^3 world eq. deprived	1.32E+01	9.61E-03	4.97E-01	2.43E-04	3.74E-03	8.96E-01	2.83E+00	-7.03E+00
Disclaimer 1 – The results of the environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.									

Reading example:

1.00E-03 = 0.001

1.00E+03 = 1000

19. Core environmental impacts / 1 m² MEK 3K window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Global warming potential – total (GWP-total)	kg CO_2 eq.	5.87E+01	1.00E+00	5.52E+00	2.49E-02	3.77E-01	1.65E+01	2.03E+01	-4.07E+01
Global warming potential – fossil (GWP-fossil)	kg CO_2 eq.	7.91E+01	9.94E-01	9.73E-01	2.58E-02	3.74E-01	1.58E+01	5.09E+00	-4.12E+01
Global warming potential – biogenic (GWP-biogenic)	kg CO_2 eq.	-2.05E+01	-1.18E-03	4.55E+00	-1.12E-03	-4.44E-04	7.15E-01	1.52E+01	5.59E-01
Global warming potential – land use and land use change (GWP-LULUC)	kg CO_2 eq.	8.45E-02	8.08E-03	1.96E-04	2.03E-04	3.05E-03	3.17E-02	1.08E-03	-3.53E-02
Ozone depletion (ODP)	kg CFC-11 eq.	5.84E-07	1.95E-16	2.58E-13	4.89E-18	7.36E-17	3.00E-08	7.11E-11	-1.35E-06
Acidification (AP)	mol H^+ eq.	4.97E-01	3.24E-03	8.22E-04	1.24E-04	1.38E-03	3.42E-02	6.22E-03	-1.61E-01
Eutrophication – aquatic freshwater (EP-F)	kg P eq.	6.72E-04	2.94E-06	4.58E-07	7.37E-08	1.11E-06	1.29E-04	3.79E-06	-8.01E-03
Eutrophication – aquatic marine (EP-M)	kg N eq.	1.16E-01	1.48E-03	2.71E-04	5.83E-05	6.40E-04	1.09E-02	2.11E-03	-3.31E-02
Eutrophication – terrestrial (EP-T)	mole N eq.	1.31E+00	1.65E-02	3.92E-03	6.45E-04	7.14E-03	1.24E-01	2.66E-02	-3.66E-01
Photochemical ozone formation (POCP)	kg NMVOC eq.	3.76E-01	2.93E-03	7.11E-04	1.63E-04	1.24E-03	3.00E-02	6.10E-03	-9.45E-02
Depletion of abiotic resources – minerals and metals (ADP-M) [1)]	kg Sb eq.	1.70E-04	8.77E-08	1.70E-08	2.20E-09	3.30E-08	1.07E-05	7.30E-08	-1.62E-04
Depletion of abiotic resources – fossil fuels (ADP-F) [1)]	MJ net calorific value	1.20E+03	1.32E+01	1.48E+00	3.30E-01	4.96E+00	2.64E+02	9.16E+00	-6.37E+02
Water use (WDP) [1)]	m^3 world eq. deprived	1.23E+01	9.18E-03	5.56E-01	2.30E-04	3.46E-03	1.00E+00	2.25E+00	-7.97E+00
Disclaimer 1 – The results of the environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.									

20. Additional environmental impacts / 1 m² MSE 2+1 window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidences	4.48E-06	2.09E-08	3.90E-09	1.49E-09	8.23E-09	1.84E-07	5.13E-08	-2.07E-06
Ionizing radiation, human health [2)]	kBq U235 eq.	1.09E+01	3.68E-03	9.51E-03	9.30E-05	1.43E-03	1.78E+00	5.57E-02	-9.81E+00
Ecotoxicity, freshwater [1)]	CTU_e	1.36E+03	1.03E+01	6.09E-01	2.59E-01	3.99E+00	8.69E+01	5.59E+00	-5.80E+02
Human toxicity, cancer [1)]	CTU_h	3.78E-08	2.07E-10	3.64E-11	5.24E-12	8.06E-11	2.82E-09	4.88E-10	-1.66E-08
Human toxicity, non-cancer [1)]	CTU_h	1.59E-06	1.22E-08	1.40E-09	3.15E-10	4.79E-09	1.58E-07	4.16E-08	-3.80E-07
Land Use [1)]	Pt	1.42E+03	4.74E+00	6.12E-01	1.20E-01	1.85E+00	6.77E+01	2.32E+00	-2.00E+02

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Disclaimer 2 – This impact category deals mainly with the eventual impact of low dose ionizing radiation of human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

21. Additional environmental impacts / 1 m² MEK 3K window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidences	3.80E-06	1.99E-08	4.30E-09	1.41E-09	7.60E-09	1.92E-07	4.57E-08	-1.58E-06
Ionizing radiation, human health [2)]	kBq U235 eq.	9.82E+00	3.51E-03	1.04E-02	8.79E-05	1.32E-03	1.93E+00	4.52E-02	-6.59E+00
Ecotoxicity, freshwater [1)]	CTU_e	1.34E+03	9.79E+00	6.70E-01	2.45E-01	3.68E+00	9.62E+01	4.77E+00	-6.25E+02
Human toxicity, cancer [1)]	CTU_h	2.84E-08	1.98E-10	4.00E-11	4.96E-12	7.45E-11	3.07E-09	4.79E-10	-1.48E-08
Human toxicity, non-cancer [1)]	CTU_h	1.32E-06	1.17E-08	1.52E-09	2.97E-10	4.43E-09	1.69E-07	4.32E-08	-3.29E-07
Land Use [1)]	Pt	1.10E+03	4.53E+00	6.02E-01	1.14E-01	1.71E+00	7.48E+01	2.06E+00	-2.19E+02

Disclaimer 1 – The results of the environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

Disclaimer 2 – This impact category deals mainly with the eventual impact of low dose ionizing radiation of human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

22. Use of natural resources / 1 m² MSE 2+1 window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	4.51E+02	7.94E-01	4.20E+01	2.01E-02	3.09E-01	4.16E+01	2.34E+02	-2.00E+02
Use of renewable primary energy resources used as raw materials (PERM)	MJ	2.87E+02	0.00E+00	-4.22E+01	0.00E+00	0.00E+00	0.00E+00	-2.32E+02	0.00E+00
Total use of renewable primary energy resources (PERT)	MJ	7.38E+02	7.94E-01	-1.19E-01	2.01E-02	3.09E-01	4.16E+01	1.65E+00	-2.00E+02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1.30E+03	1.39E+01	1.07E+01	3.51E-01	5.39E+00	2.44E+02	6.05E+01	-7.52E+02
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	6.20E+01	0.00E+00	-9.35E+00	0.00E+00	0.00E+00	0.00E+00	-5.00E+01	0.00E+00
Total use of non-renewable primary energy resources (PENRT)	MJ	1.37E+03	1.39E+01	1.38E+00	3.51E-01	5.39E+00	2.44E+02	1.06E+01	-7.52E+02
Use of secondary materials (SM)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m^3	4.51E+02	7.94E-01	4.20E+01	2.01E-02	3.09E-01	4.16E+01	2.34E+02	-2.00E+02

23. Disposed wastes / 1 m² MSE 2+1 window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	1.58E+00	9.09E-04	1.19E-02	2.30E-05	3.54E-04	7.08E-02	6.67E-02	-4.19E-01
Non-hazardous waste disposed (NHWD)	kg	1.31E-01	7.30E-10	6.93E-09	1.85E-11	2.84E-10	9.18E-08	1.72E-09	-2.59E-07
Radioactive waste disposed (RWD)	kg	1.40E+01	2.17E-03	3.35E-02	5.50E-05	8.46E-04	1.94E-01	1.72E+01	-5.50E+00

24. Output flows / 1 m² MSE 2+1 window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for reuse	kg	7.75E-02	2.51E-05	5.99E-05	6.36E-07	9.78E-06	1.72E-02	3.69E-04	-4.93E-02
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	3.02E+00	0.00E+00	2.47E-02	0.00E+00	0.00E+00	1.04E+01	0.00E+00	0.00E+00
Exported energy, electricity	MJ	1.91E+00	0.00E+00	2.54E+00	0.00E+00	0.00E+00	0.00E+00	1.44E+01	0.00E+00
Exported energy, thermal	MJ	3.02E+00	0.00E+00	7.51E+00	0.00E+00	0.00E+00	0.00E+00	3.94E+01	0.00E+00

25. Use of natural resources / 1 m² MEK 3K window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	2.98E+02	7.58E-01	4.59E+01	1.90E-02	2.86E-01	4.50E+01	1.76E+02	-1.30E+02
Use of renewable primary energy resources used as raw materials (PERM)	MJ	2.27E+02	0.00E+00	-4.59E+01	0.00E+00	0.00E+00	0.00E+00	-1.74E+02	0.00E+00
Total use of renewable primary energy resources (PERT)	MJ	5.25E+02	7.58E-01	-4.01E-02	1.90E-02	2.86E-01	4.50E+01	1.44E+00	-1.30E+02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1.21E+03	1.32E+01	1.37E+01	3.31E-01	4.98E+00	2.64E+02	6.25E+01	-6.37E+02
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	6.83E+01	0.00E+00	-1.22E+01	0.00E+00	0.00E+00	0.00E+00	-5.33E+01	0.00E+00
Total use of non-renewable primary energy resources (PENRT)	MJ	1.28E+03	1.32E+01	1.48E+00	3.31E-01	4.98E+00	2.64E+02	9.16E+00	-6.37E+02
Use of secondary materials (SM)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m^3	1.09E+00	8.68E-04	1.32E-02	2.18E-05	3.27E-04	7.85E-02	5.32E-02	-3.21E-01

26. Disposed wastes / 1 m² MEK 3K window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	2.11E-02	6.97E-10	5.76E-09	1.75E-11	2.63E-10	1.01E-07	1.39E-09	-1.55E-07
Non-hazardous waste disposed (NHWD)	kg	7.15E+00	2.08E-03	3.70E-02	5.20E-05	7.82E-04	1.71E-01	1.92E+01	-2.46E+00
Radioactive waste disposed (RWD)	kg	8.00E-02	2.40E-05	6.53E-05	6.01E-07	9.04E-06	1.89E-02	3.01E-04	-2.98E-02

27. Output flows / 1 m² MEK 3K window

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for reuse (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MFR)	kg	4.37E+00	0.00E+00	2.04E-02	0.00E+00	0.00E+00	9.27E+00	0.00E+00	0.00E+00
Materials for energy recovery (MER)	kg	1.48E+00	0.00E+00	2.82E+00	0.00E+00	0.00E+00	0.00E+00	1.12E+01	0.00E+00
Exported energy, electricity (EEE)	MJ	2.31E+00	0.00E+00	8.51E+00	0.00E+00	0.00E+00	0.00E+00	3.14E+01	0.00E+00
Exported energy, thermal (EET)	MJ	4.29E+00	0.00E+00	1.52E+01	0.00E+00	0.00E+00	0.00E+00	5.64E+01	0.00E+00

OTHER ENVIRONMENTAL INDICATORS

28. Biogenic carbon content / 1 m² window

The windows are partly composed of pine timber and the packaging includes wooden pallets and cardboard. Biogenic carbon content is calculated according to EN 16449.

Parameter	Unit	Quantity, MSE 2+1 window	Quantity, MEK 3K window
Biogenic carbon content in product	kg C	5.6	4.2
Biogenic carbon content in packaging	kg C	1.0	1.1

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

29. Energy in the manufacturing stage

Parameter	Quantity, MSE 2+1 window	Quantity, MEK 3K window	Unit	Data quality
Emission factor of electricity consumed in A3	0.134	0.134	kg CO_2/kWh	Emissions from electricity production are calculated for the average consumption mix at different manufacturers in 2020, based on data from Energy Authority (2020) and GaBi Professional database 2021.
Emission factor of thermal energy consumed in A3	0.012	0.011	kg CO_2/kWh	Emissions from thermal energy production are calculated for the average consumption mix at individual manufacturers in 2020, based on data from Alakangas et al. (2016), Statistics Finland (2021) and GaBi Professional database 2021.

30. Transport to construction

Parameter	Quantity, MSE 2+1 window	Quantity, MEK 3K window	Unit	Data description
Transport distance, truck	353	353	km	Truck, Euro 5, 24.7t payload capacity; Diesel; 61% utilization rate. Commercial one-way transport is assumed.
Transport distance, ship	4	4	km	Container ship, 14000 dwt payload capacity; Heavy fuel oil (1 wt.% S); 71% utilization rate.
Specific emission, truck	0.066		kg CO_2 eq./tkm	Truck, Euro 5, 24.7t payload capacity; 61% utilization rate. Diesel and upstream emissions.
Specific emission, ship	0.012		kg CO_2 eq./tkm	Container ship, 14000 dwt payload capacity; Heavy fuel oil (1 wt.% S); 71% utilization rate. Heavy fuel oil and upstream emissions.

31. End-of-life stage description – module C / 1 m² window

The materials in the studied windows are assumed to be treated as follows: 95 % of wood, surface treatment chemicals and plastics are directed to energy recovery, whilst 5 % end up landfilled; 95 % of aluminium and steel are recycled, while 2.5 % ends up at incineration and 2.5 % at landfill; and 30 % of glass is recycled into foam glass while 70 % is landfilled.

Parameter	Unit	Quantity, MSE 2+1 window	Quantity, MEK 3K window
Collection process	Collected separately, %	59.1 %	51.5 %
	Collected as mixed construction waste, %	40.9 %	48.5 %
Recovery type	kg for reuse	0	0
	kg for recycling	10.4	9.3
	kg for energy recovery	14.5	11.3
Disposal type	kg for final disposal	17.3	19.3
Assumptions for scenario development	Transport by truck (Euro 5, 11.4t payload capacity, 53 % utilization rate): 50 km for materials to landfill and wood to energy recovery, 100 km for other materials to energy recovery and 200 km for materials to recycling.		

32. Other technical information

Not specified for the industry average windows.

33. Additional information

No information is available regarding emissions to soil, water or air.

34. LCA modelling software and data

GaBi version 10.6. is used in LCA modelling. Primary data from 2020 is obtained from the five manufacturers. Best available secondary data from GaBi Professional 2021 and Ecoinvent 3.7.1 (cut-off) databases are used in modelling. As principle, secondary data with maximum 10 years age was used in the modelling when available.

35. Update log

Update January 26, 2026: Error in modelling data is corrected and results are updated. Additional environmental impacts are added. Verification of changes is conducted by third party: Saija Vatanen, Etteplan Finland Oy.

REFERENCES

Standards and PCR

EN 15804:2012 + A2:2019. Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products.

EN 16449:2014. Wood and wood-based products - Calculation of the biogenic carbon content of wood and conversion to carbon dioxide.

EN 17213:2020. Windows and doors - Environmental Product Declarations - Product category rules for windows and pedestrian doorsets.

ISO 14025:2010. Environmental labels and declarations – Type III environmental declarations – Principles and procedures.

The Building Information Foundation RTS (RTS EPD Product Category Rules). Rakennustietosäätiö RTS sr (RTS EPD PCR menetelmäohje 15804:2019)

Bibliography

Alakangas et al. 2016. Suomessa käytettävien polttoaineiden ominaisuuksia [Characteristics of fuels used in Finland].

Energy Authority. 2021. Jäännösjakauma 2020 [Residual grid mix 2020]. Dnro 1568/463/2021.

Statistics Finland. 2021. Fuel classification 2021.

Modelling software & databases

GaBi version 10.6

GaBi Professional database 2021.

Ecoinvent 3.7.1 database (cut-off).