

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	VELUX Group
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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VELUX polyurethane (PUR) roof windows (triple glazing configuration)

VELUX Group

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EPD
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General Information

<p>VELUX Group</p> <hr/> <p>Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-VEL-20220033-CBE3-EN</p>	<p>VELUX PUR roof window (triple glazing configuration)</p> <hr/> <p>Owner of the declaration VELUX Group Adalsvej 99 2970 Hørsholm</p> <hr/> <p>Declared product / declared unit The declared unit is a PUR roof window of one square meter (m²) with triple glazing configuration. The declared unit is based on the configuration of a standard size window measuring 1.23 m * 1.48 m.</p>
<p>This declaration is based on the product category rules: Windows and doors , 01.2021 (PCR checked and approved by the SVR)</p> <hr/> <p>Issue date 24.05.2022</p> <hr/> <p>Valid to 23.05.2027</p>	<p>Scope: The EPD is a representative EPD covering VELUX PUR roof windows as specified in more detail in the product description. The products are manufactured by the VELUX Group at production sites in different locations in Europe for sale throughout Europe.</p> <p>The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.</p> <p>The EPD was created according to the specifications of <i>EN 15804+A2</i>. In the following, the standard will be simplified as <i>EN 15804</i>.</p>
<p></p> <hr/> <p>Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)</p> <p></p> <hr/> <p>Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.)</p>	<p>Verification</p> <p>The standard <i>EN 15804</i> serves as the core PCR</p> <p>Independent verification of the declaration and data according to <i>ISO 14025:2011</i></p> <p><input type="checkbox"/> internally <input checked="" type="checkbox"/> externally</p> <p></p> <hr/> <p>Juliane Franze (Independent verifier)</p>

Product

Product description/Product definition

The VELUX polyurethane (PUR) roof windows are skylight window products for sale in the European market. The product family covers a range of product varieties as specified in the table on page 3. All the windows have a PUR frame/sash with a wooden core. Some windows can be opened (venting), while others cannot be opened (fixed). Some of the window varieties can be used in conjunction with electronic devices for automatic opening and closing, while other windows are opened and closed manually. The calculations are based on the representative window type named GPU. In the LCA, the GPU was

assessed to be a conservative choice for a representative window type.

The glass panes are with triple glazing and different glass configurations are covered by the EPD. The glass thickness ranges from 10 to 13 mm. The glass panes have cavities filled with Krypton or Argon gas. The EPD is based on an average of the included glazing unit configurations.

Only the window modules are included, which means that any applied electronics, additional equipment, engines etc. are not part of the EPD.

Window type		Glazing options	Description	
GPU		GPU -K-- 0--	--66, --67, --68, --69, --86	White lacquered top-hung window with manual bottom operation, ventilation flap and integrated handlebar along the top sash and pivot-hinge for cleaning.
GTU		GTU -K-- 0--	--66	White lacquered top-hung window for rescue opening with manual bottom operation like GPU, but with gas springs in order to enable extra opening height and additional handles on the side sash.
GPU Integra Solar		GPU -K-- 0--21	--66, --67 --68, --69	White lacquered GPU window with remote operation – mains motor.
VKU		VKU Y-- 0--	--81	White lacquered top-hung window with manual bottom operation, ventilation flap and integrated handlebar along the top sash and pivot-hinge for cleaning.
GXU		GXU -K-- 0--	--66	White lacquered manual side-opening window with ventilation flap along top sash and handle bar in the side.
GGU		GGU -K-- 0--	--66, --67, --68, --69, --86	White lacquered pivot-hinged window with manual top operation and ventilation flap with integrated handlebar along the top sash.
GGU Integra Mains		GGU -K-- 0--21	--66, --67, --68, --69, --86	White lacquered GGU window with remote operation – mains motor.
GGU Integra Solar		GGU -K-- 0--30	--66, --67, --68, --69, --86	White lacquered GGU window with remote operation – mains motor.
GLU		GLU -K-- 0--	--61, --64	White lacquered top-hung window with manual bottom operation, ventilation flap and integrated handlebar along the top sash and pivot-hinge for cleaning.
GLU-B		GLU -K-- 0--B	--61, --64	White lacquered manual bottom operation window, with ventilation slats and handle on bottom sash.
VU		VU Y-- 0--	--81	White lacquered pivot-hinged window with manual top operation and ventilation flap with integrated handlebar along the top sash.
VIU		VIU -K-- 0--	--66, --68	White lacquered vertical extension fixed window.
GIU		GIU -K-- 0--	--66, --68	White lacquered sloped extension fixed window.

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration EN 14351-1:2006+A2:2016, Windows and doors - Product standard, performance characteristics - Part 1: Windows and external

pedestrian doorsets. For the application and use, the respective national provisions apply.

Application

VELUX PUR roof windows are used in renovation and new build. Either installed as a single window or in a combination of multiple windows.

Technical Data

The Declaration of Performance including relevant technical specifications and test methods/test standards can be downloaded from the website www.velux.com/ce.

The performance values are specific for each PUR roof window variant covered by the EPD.

The declared values in the table relate to the reference product incl. an average pane. For other covered product variants, specific values can be selected at the bottom of the above-mentioned download page.

Constructional data (Reference product GPU incl. pane variant 66. For other variation, see velux.com/ce)

Name	Value	Unit
Fire resistance class § 4.4.1	D-s2.d2	class
Air permeability , § 4.14	4	class
Resistance to wind load, § 4.2 (for window width >1140 mm or height > 1398 mm no performance is determined)	C3	class
Resistance to snow loads, § 4.3	4 mm toughened - 13 mm - 3 mm heat strengthened - 13 mm - 6.8 mm laminated float	mm
Watertightness, § 4.5	E900	class
Impact resistance, § 4.7 (for window width <550 mm or height <778 mm no performance is determined)	3	class
Load-bearing capacity of safety devices, § 4.8	test is passed	-
Acoustic performance, § 4.11	37 (-2; -4)	-
Thermal transmittance, § 4.12 , 90 degree installation acc. to EN 10077-1/2	1,0	W/(m ²)K
Solar factor, § 4.13	0.44	-
Light transmittance, § 4.13	0.62	-

Product performance data in accordance with *DS/EN 14351-1:2006+A2:2016*, Windows and doors - Product

LCA: Calculation rules

Declared Unit

Multiple product dimensions are represented by this EPD as specified in the product description.

The declared unit is 1 m² window calculated based on one representative window module measuring 1.23 m * 1.48 m (reference window based on *EN 14351-1*) with triple glazed window panes.

Declared unit

Name	Value	Unit
conversion factor [Mass/Declared Unit]	50	-
Declared unit	1	m ²

standard, performance characteristics - Part 1: Windows and external pedestrian doorsets.

Base materials/Ancillary materials

Name	Value	Unit
Glazing unit	55	%
PUR/wooden frame	23	%
Galvanized steel components	17	%
Other materials	5	%

This product/article/at least one partial article contains substances listed in the *candidate list* (date: 07.03.2022) exceeding 0.1 percentage by mass: **NO**.

Recycled content

Name	Value	Unit
Glass	5	%
PUR	0	%
Steel	20	%
Aluminum	50	%

Reference service life

No reference service life (RSL) is defined for the roof windows because the use stage modules are not included in the EPD.

A data quality and a sensitivity analysis shows that the results are robust with regards to data quality and appropriateness. There is low variability of production processes and product variations have a limited influence on the results.

System boundary

Type of EPD: Cradle to gate - with options. The following life cycle phases were considered:

Product stage:

- A1 - Raw material supply: extraction and processing, production of the pre-products (e.g. laminated glass, brackets, sealant...) and packaging components (primarily cardboard)
- A2 - Transport: Transport of pre-products and packaging components to the manufacturing sites
- A3 - Manufacturing: The PUR profiles and the panes are produced internally at VELUX production sites. Subsequently, the final production and assembly of the windows take place, which involves shortening of profiles, drilling of holes, clamping and glueing, mounting of gaskets, brackets, panes etc. as well as stacking on pallets.
- C2 - Transport: transport of window materials to incineration and recycling
- C3 - Waste processing: sorting of glass waste, incineration of plastic and rubber parts
- C4 - Disposal: disposal of all materials

End of life stage:

- C1 - De-construction/demolition: de-construction of the window with the use of an electric screwdriver

Benefits and loads beyond the system boundaries:

- D - Reuse, recovery and recycling potential: benefits from plastic incineration processes and material recycling of metal and glass.

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

The background database used is *GaBi LCA software and database*, version 10.6.0.110.

LCA: Scenarios and additional technical information

Characteristic product properties

Information on biogenic Carbon

6.9 kg of wood is used in the core window frames and 3.1 kg of cardboard packaging is used per declared unit.

Information describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	3.6	kg C
Biogenic carbon content in accompanying packaging	2.5	kg C

The construction process stage and the use stage modules are not declared. However, the quantity of packaging generated in module A5 is declared as scenario information.

Installation into the building (A5)

Name	Value	Unit
Cardboard packaging for waste treatment	3.1	kg
Plastic packaging (primarily EPS) for waste treatment	0.3	kg

End of life (C1-C4)

Name	Value	Unit
Collected as mixed construction waste	50	kg
Recycling	18	kg

Energy recovery	13	kg
Landfilling	19	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

The recycling efficiency for all materials is maximum 90 % in accordance with *EN 17213*. This means that only 90 % of the recycled materials substitute primary materials. Secondary materials in the windows do not substitute primary materials in the end-of-life scenario. The recycled glass is used as container glass in the end-of-life scenario.

Name	Value	Unit
Glass recycled	30	%
Metal recycled	95	%
Plastic incinerated with energy recovery	95	%

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	ND	ND	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² Roof windows with triple glazing

Core Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ -Eq.]	1.27E+2	3.37E+0	1.57E+1	1.84E-3	1.49E-1	2.73E+1	1.14E+0	-3.87E+1
GWP-fossil	[kg CO ₂ -Eq.]	1.45E+2	3.34E+0	1.31E+1	1.82E-3	1.48E-1	1.50E+1	3.82E-1	-3.86E+1
GWP-biogenic	[kg CO ₂ -Eq.]	-1.87E+1	-4.26E-3	2.52E+0	1.55E-5	-1.89E-4	1.24E+1	7.52E-1	-6.88E-2
GWP-luluc	[kg CO ₂ -Eq.]	1.03E-1	2.73E-2	1.85E-2	2.58E-6	1.21E-3	6.33E-4	1.29E-3	-1.46E-2
ODP	[kg CFC11-Eq.]	2.97E-6	4.26E-16	6.46E-11	4.36E-17	1.89E-17	7.26E-9	1.19E-15	-1.07E-13
AP	[mol H ⁺ -Eq.]	5.47E-1	1.07E-2	3.94E-2	3.79E-6	4.77E-4	4.99E-3	2.35E-3	-1.33E-1
EP-freshwater	[kg P _r -Eq.]	8.33E-3	9.91E-6	1.36E-4	4.88E-9	4.40E-7	1.81E-5	7.30E-6	-2.44E-5
EP-marine	[kg N-Eq.]	1.05E-1	4.96E-3	1.25E-2	9.00E-7	2.20E-4	1.76E-3	6.68E-4	-2.81E-2
EP-terrestrial	[mol N-Eq.]	1.18E+0	5.54E-2	1.27E-1	9.44E-6	2.46E-3	2.42E-2	7.23E-3	-3.11E-1
POCP	[kg NMVOC-Eq.]	3.25E-1	9.67E-3	3.41E-2	2.44E-6	4.29E-4	4.77E-3	2.12E-3	-7.57E-2
ADPE	[kg Sb-Eq.]	2.39E-3	2.54E-7	3.88E-6	5.35E-10	1.13E-8	2.78E-7	3.35E-8	-2.39E-5
ADPF	[MJ]	2.18E+3	4.44E+1	2.03E+2	3.24E-2	1.97E+0	8.71E+0	5.13E+0	-4.93E+2
WDP	[m ³ world-Eq deprived]	1.29E+1	2.90E-2	1.25E+0	2.92E-4	1.29E-3	2.82E+0	3.19E-2	-2.56E+0

Caption: GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² Roof windows with triple glazing

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	[MJ]	2.34E+2	2.48E+0	1.04E+2	1.49E-2	1.10E-1	1.15E+2	5.82E-1	-9.49E+1
PERM	[MJ]	1.22E+2	0.00E+0	6.21E+1	0.00E+0	0.00E+0	-1.14E+2	0.00E+0	0.00E+0
PERT	[MJ]	3.55E+2	2.48E+0	1.66E+2	1.49E-2	1.10E-1	1.67E+0	5.82E-1	-9.49E+1
PENRE	[MJ]	1.98E+3	4.45E+1	1.89E+2	3.24E-2	1.97E+0	1.48E+2	5.13E+0	-4.94E+2
PENRM	[MJ]	2.08E+2	0.00E+0	1.44E+1	0.00E+0	0.00E+0	-1.40E+2	0.00E+0	0.00E+0
PENRT	[MJ]	2.19E+3	4.45E+1	2.03E+2	3.24E-2	1.97E+0	8.71E+0	5.13E+0	-4.94E+2
SM	[kg]	6.54E+0	0.00E+0	1.37E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m ³]	6.97E-1	2.84E-3	7.95E-2	1.45E-5	1.26E-4	6.66E-2	1.01E-3	-2.05E-1

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA - WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m² Roof windows with triple glazing

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	[kg]	3.87E-3	2.24E-9	2.73E-4	8.56E-12	9.95E-11	1.45E-9	5.63E-10	-6.01E-8
NHWD	[kg]	5.72E+0	6.61E-3	5.03E-1	2.30E-5	2.93E-4	2.03E+1	1.85E+1	-3.41E+0
RWD	[kg]	3.72E-2	5.38E-5	1.61E-2	4.82E-6	2.39E-6	3.50E-4	4.78E-5	-2.19E-2
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	2.89E-2	0.00E+0	2.00E+0	0.00E+0	0.00E+0	1.77E+1	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.27E+1	0.00E+0	0.00E+0
EEE	[MJ]	4.13E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.99E+1
EET	[MJ]	6.03E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.07E+1

Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

**RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 m2 Roof windows with triple glazing**

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
PM	[Disease Incidence]	6.38E-6	5.80E-8	4.50E-7	3.19E-11	2.58E-9	3.94E-8	2.72E-8	-1.30E-6
IRP	[kBq U235-Eq.]	8.49E+0	7.70E-3	1.90E+0	7.91E-4	3.42E-4	5.93E-2	5.42E-3	-3.98E+0
ETP-fw	[CTUe]	2.34E+3	3.21E+1	1.22E+2	1.36E-2	1.43E+0	5.20E+0	3.51E+0	-2.03E+2
HTP-c	[CTUh]	1.68E-6	6.48E-10	6.14E-9	3.86E-13	2.88E-11	2.98E-10	3.46E-10	-2.76E-8
HTP-nc	[CTUh]	2.56E-6	3.81E-8	5.52E-7	1.45E-11	1.69E-9	2.30E-8	3.76E-8	-3.04E-7
SQP	[-]	1.57E+3	1.53E+1	8.34E+2	1.02E-2	6.77E-1	3.05E+0	1.03E+0	-3.44E+1
Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index								

Disclaimer 1 – for the indicator IRP. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and (from) some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators ADPE, ADPF, WDP, ETP-fw, HTP-c, HTP-nc, SQP. The results of this 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.

References

IBU PCR Part A

IBU PCR Part A: Institut Bauen und Umwelt e.V., Product Category Rules for Building-Related Products and Services. Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019.

IBU PCR Part B

IBU PCR Part B: Institut Bauen und Umwelt e.V., Requirements on the EPD for Windows and doors, version 1.4: 2021.

IBU 2021

IBU 2021 Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V. Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021. www.ibu-epd.com.

EN 13501-1

EN 13501-1 EN13501-1, 2018: Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

ISO 14025

DIN EN ISO 14025:2011-10, Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

EN 14351-1

EN 14351-1:2006+A2:2016, Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets.

EN 15804

EN 15804+A2+AC:2021, Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products.

EN 17213

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

ECHA Candidate list

EHCA Candidate list of substances of very high concern: status 07.03.2022

ISO 10077-1

ISO 10077-1:2017, Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 1: General.

ISO 10077-2

ISO 10077-2:2017, Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 2: Numerical method for frames.

GaBi LCA software and database

The LCA modelling software is GaBi program version 9.5.2.49 with corresponding databases from Sphera Solutions GmbH. Documentation hyperlink www.gabi-software.com/support/gabi.

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