To whom it may concern,

Based on the Product Category Rules Requirements on the Environmental Product Declarations (EPD) for Windows and Doors, version 1.4: 2021, VELUX has created separate EPDs for the windows and the electrical motors/devices connected to the windows.

This documentation has been prepared to facilitate the consolidation of two EPDs to accommodate the electric and solar roof window variants as single units.

The provided kg CO2 eq./m^2 values represent the cumulative values derived from the relevant EPDs outlined in subsequent sections.

It should be noted that the scaling factor also includes the weight of the motor. However, in reality, the motor does not scale in the same way as the window. Testing has shown that this does not significantly affect the CO2 results.

Ugne Krikstanaite

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ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	VELUX Group
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-VEL-20230510-CBJ2-EN
Issue date	11.03.2024
Valid to	10.03.2029

VELUX wooden roof windows (triple glazing configuration)

VELUX Group

Institut Bauen und Umwelt e.V.

www.ibu-epd.com | https://epd-online.com

ECO PLATFORM EPD VERIFIED

General Information

VELUX Group

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-VEL-20230510-CBJ2-EN

This declaration is based on the product category rules:

Windows and doors , 01.08.2021
(PCR checked and approved by the SVR)

Issue date

11.03.2024

Valid to

10.03.2029

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

VELUX wooden roof windows (triple glazing configuration)

Owner of the declaration

VELUX Group
Ådalsvej 99
2970 Hørsholm
Denmark

Declared product / declared unit

The declared unit is a wooden roof window of 1 m^2 with triple glazing configuration (3-layer). The declared unit is based on the size 1.34 m x 1.40 m (UK08), which is the closest available size to the standard size 1.23 m x 1.48 m (DS/EN 17213:2020).

Scope:

The EPD is a representative EPD covering VELUX wooden 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. The windows' production take place in Poland, Denmark, France and Germany.
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.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Dr.-Ing. Nikolay Minkov,
(Independent verifier)

Product

Product description/Product definition

The VELUX wooden 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 below. All windows have a wooden frame/sash. Some windows can be opened (venting), while others cannot be opened (fixed). In addition, the windows consist of 4 different hinge-functionalities (pivot-hung, top-hung, side-hung, bottom-hung). The handles and handlebars are made of aluminium, while the hinges are made of steel (galvanised, stainless). Some of the window varieties can be used in conjunction with electric or solar window operators for automatic opening and closing, while other windows are opened and closed manually. The calculations are based on the representative window type named GPL. In the LCA, the GPL was assessed to be a conservative choice for a representative window type.

The glass panes are with triple glazing (3-layer glazing unit) 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 gas. The EPD is based on an average of the included glazing unit configurations. The included glazing unit configurations are: 15, 61, 64, 66 (86), 67, 68 and 69.

Only the window modules are included, which means that any applied window operators, installation products, accessories, etc. are not part of the EPD. These are available as separate EPDs, that can be used in combination with this EPD.

Variant	Window type	Glazing options[1]	Description
GPL	 GPL -K-- -0--	--66 --67 --68 --69	White painted or clear lacquered top-hung window with manual bottom operation, ventilation flap and integrated handlebar along the top sash and pivot-hinge for cleaning.
GPL Mains	 GPL -K-- -0--21	--66	White painted or clear lacquered GPL window, with grid-connected electrical window opener.
GTL	 GTL -K-- -0--	--66	White painted or clear lacquered top-hung window for rescue opening with manual bottom operation. Like GPU, but with gas springs to enable extra opening hight and additional handles on the side sash.
GPLS 2-in-1 or 3-in-1	 GPLS --K-- -0--	--66	White painted window, consisting of 2 or 3 window elements in one frame. One element is fixed, and the other element(s) are top-hung similar to GPL.
GGL	 GGL -K-- -0--	--66 --67 --68 --69 --86	White painted or clear lacquered pivot-hinged window with ventilation flap and integrated handlebar along the top sash.
GGL Electric	 GGL -K-- -0--21	--66 --67 --68 --69 --86	White painted or clear lacquered GGL window with an electrical window opener, main operated.
GGL Solar	 GGL -K-- -0--30	--66 --67 --68 --69 --86	White painted or clear lacquered GGL window with an electrical window opener, solar powered.
GBL	 GBL -K-- -0--	--15	Like GGL, but for lower inclinations
GGLS 2-in-1 or 3-in-1	 GGLS ---K--- -0--	--66	White painted window, consisting of 2 or 3 window elements in one frame. One element is fixed, and the other element(s) are pivot-hinged similar to GGL.
GGLS 2-in-1 solar	 GGLS ---K--- -0--	--66	White painted window, consisting of 2 or 3 window elements in one frame. One element is fixed, and the other element(s) are pivot-hinged similar to GGL and equipped with solar powered window operator.
GIL	 GIL -K-- -0--	---66 --68	White painted or clear lacquered fixed window without opening mechanism or ventilation flap.
GLL	 GLL -K-- -0--	--61 --64	Clear lacquered pivot-hinged window with ventilation flap and integrated handlebar along the top sash.
GLL-B	 GLL -K-- -0—B	--61 --64	Clear lacquered pivot-hinged window with ventilation slats at top sash and handle on bottom sash.
VFA	 VFA -K-- -0--	--66 --67 --68	White painted or clear lacquered side-hinged window for vertical extension with handle on the side sash
VFB	 VFB -K-- -0--	--66 --67 --68	Similar to VFA, just with opening to the opposite side.
VFE	 VFE -K-- -0--	--66 --68	White painted or clear lacquered bottom-hinged window for vertical extension with handle on top sash
GXL	 GXL -K-- -0--	--66	White painted or clear lacquered side-hinged window for craftsman exit, with ventilation flap and integrated handle along top sash and handlebar in the side.

[1] 3-layer glazing options: 15, 61, 64, 66 (86), 67, 68, 69

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 wooden 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 standard wooden roof window variant covered by the EPD. The declared values in the table relate to the reference product including the variant GPL with triple-glazed configuration 66 (GPL --66). For other covered product variants, specific values can be selected at the bottom of the above-mentioned download page.

Constructional data

Name	Value	Unit
Reaction to fire	C-s1,d2	class
Air permeability acc. EN 12207	4	class
Resistance to wind load, (for window width >1140 mm or height > 1398 mm no performance is determined)	C3	class
Resistance to snow loads	4 (toughened) - 13 - 3 (heat strengthened) - 13 - 6,8 (laminated float)	mm
Water tightness acc. EN 12208 unprotected / protected	E900	class
Impact resistance (for window width <550 mm or height <778 mm no performance is determined)	3	class
Acoustic performance	37 (-2; -4)	-
Load-bearing capacity of safety devices	passed	-
Thermal transmittance, 90 degree installation acc. to EN 10077-1/2	1.0	W/(m^{2}K)
Solar factor	0.44	-
Light transmittance	0.62	-

Product performance data in accordance with *DS/EN 14351-1:2006+A2:2016*, Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets.

Base materials/Ancillary materials

The main components of the standard wooden roof window are the glazing unit (made of mainly laminated and tempered glass), wooden frames/sashes (made of wood), hinges (made of steel) and handles/handlebars (made of aluminium). The packaging of the products consists of mostly cardboard along with paper inserts and galvanised steel.

Name	Value	Unit
Glazing unit (3-layer)	53	%
Wooden frame/sash	17	%
Steel components (galvanised and stainless)	15	%
Other components (including packaging)	15	%
Recycled content of aluminium	30	%
Recycled content of steel	10	%
Recycled content of glass	12	%

The wooden components (sashes, frames) are produced internally in VELUX facilities, located in Hungary, Poland, and Denmark. VELUX receives sawn pine wood (dried) and processes it (sawing, cutting etc.) into lamellas of different quality. The lamellas are then glued together (lamination) and processed into profiles (cutting them into the correct size, cladding, drilling etc.). For the glazing units, VELUX receives the glazing units components from suppliers and produces the final glazing unit in sites located in Hungary, Denmark, France, and Germany. After their production, the glazing units join the window assembly process. Finally, the frames/sashes, glazing unit, and the rest of the components (delivered by suppliers) are transported to VELUX assembly sites in Poland, Denmark, France and Germany, where they are assembled into the final window product.

This product/article/at least one partial article contains substances listed in the *candidate list (date: 23.08.2023)* exceeding 0.1 percentage by mass: **NO**.

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.

LCA: Calculation rules

Declared Unit

Multiple product dimensions are represented by this EPD as specified in the product description. The declared unit is 1 m^2 wooden roof window calculated based on the size 1.34 m x 1.40 m (UK08), which is the closest available size to the reference window size (1.23 m x 1.48 m based on *EN 14351-1*) with triple glazed window panes. The GPL variant has the largest weight per m2 in the 2-layer glazing product group. Since the frame/sash construction is alike across all variants in the product group, the parts that set the variants apart are primarily the window-operation components, such as hinges, handles and ventilation flaps. These components are to a high degree metal-based, and the worst-case product can thus be identified by the weight of products with similar size and glazing unit. The heavier the product, the larger the content of metal. Therefore, the GPL variant can be considered more representative as worst-case scenario for the whole roof windows group.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	m^2
Grammage	47.64	kg/m^2
Layer thickness (glazing unit)	0.0384	m

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

System boundary

The type of the EPD is "cradle to gate - with options" including the modules C1-C4 and D. 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, sawn pine wood, metal/plastic components, sealants etc.) and sales packaging components (e.g., cardboard).
- A2 - Transport: Transport of pre-products and packaging components to the processing or assembly sites, as well as internal transportation of components between sites.

- A3 - Manufacturing: The wooden frames/sashes and glazing units are produced internally at VELUX production sites. Subsequently, the final production and assembly of the windows takes place, which involves activities such as shortening of profiles, drilling of holes, clamping and glueing, mounting of gaskets, brackets, panes etc.

End of life stage:

- C1 - De-construction/demolition: deconstruction of the window with the use of an electric screwdriver and manual work.
- C2 - Transport: transport of window materials to Material Recovery Facilities (MRF) and then to incineration, landfill or recycling facilities.
- C3 - Waste processing: sorting of waste, recycling (metal and glass waste), incineration (plastic and wood waste) and landfill (metal, glass, wood and plastic waste).
- C4 - Disposal: disposal of all materials

Benefits and loads beyond the system boundaries:

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

For the environmental impact, the use of green electricity was calculated taking into account the residual electricity mix for the remaining electricity. The proportion of the electricity demand covered by green electricity in the total electricity demand is 79.23 %.

Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Europe

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. Average secondary datasets were retrieved from the Managed LCA Content (v2021.2) and Ecoinvent (v3.8) databases.

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

8.02 kg of wood is used in window's frames/sashes and 0.03 kg of paper inlet is used per declared unit. For the packaging, 3.09 kg of cardboard and 0.01 kg of paper insert are used per declared unit.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	3.64	kg C
Biogenic carbon content in accompanying packaging	2.5	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

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.

Scenario information for packaging generated in module A5

Name	Value	Unit
Cardboard packaging for waste treatment	3.09	kg
Paper packaging for waste treatment	0.01	kg
Steel packaging for waste treatment (galvanised)	0.0032	kg

End of life (C1-C4)

Name	Value	Unit
Collected as mixed construction waste	44.48	kg
Recycling	16	kg
Energy recovery	10.73	kg
Landfilling	17.76	kg
Omitted to atmosphere (Krypton gas in glazing unit)	0.055	kg

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

Name	Value	Unit
Wood incinerated	95	%
Plastic incinerated	95	%
Paper incinerated	95	%
Metal recycled	95	%
Glass recycled	30	%

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = 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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m2 VELUX standard wooden roof window

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	9.69E+01	4.14E-01	2.56E+01	1.97E-03	2.71E+00	1.87E+01	1.83E+00	-3.53E+01
GWP-fossil	kg CO_2 eq	1.25E+02	4.11E-01	1.5E+01	1.97E-03	2.66E+00	5.99E+00	2.94E-01	-3.53E+01
GWP-biogenic	kg CO_2 eq	-2.81E+01	-4.68E-04	1.06E+01	1.1E-06	2.87E-02	1.27E+01	1.53E+00	-4.75E-02
GWP-luluc	kg CO_2 eq	8.6E-02	3.29E-03	2.57E-02	3.38E-07	2.2E-02	6.39E-04	7.8E-04	-1.07E-02
ODP	kg CFC11 eq	9.72E-07	8.03E-17	1.45E-09	2.22E-17	5.32E-16	-6.84E-09	1.08E-15	-5.18E-14
AP	mol H^+ eq	5.04E-01	6.54E-04	4.25E-02	3.18E-06	1.62E-02	5.43E-03	2.02E-03	-1.27E-01
EP-freshwater	kg P eq	4.67E-03	1.2E-06	1.44E-04	7.92E-10	8E-06	-1.55E-05	3.41E-06	-1.87E-05
EP-marine	kg N eq	1.05E-01	2.21E-04	1.67E-02	8.43E-07	7.92E-03	2.33E-03	5.52E-04	-2.65E-02
EP-terrestrial	mol N eq	1.18E+00	2.55E-03	1.73E-01	9.03E-06	8.77E-02	2.89E-02	5.92E-03	-2.93E-01
POCP	kg NMVOC eq	2.97E-01	6.02E-04	3.97E-02	2.39E-06	1.47E-02	6.15E-03	1.88E-03	-7.21E-02
ADPE	kg Sb eq	2.12E-03	3.59E-08	1.4E-05	2.44E-10	2.39E-07	-7.53E-08	2.66E-08	-7.15E-06
ADPF	MJ	1.7E+03	5.46E+00	2.25E+02	4.08E-02	3.59E+01	5.6E+00	3.93E+00	-4.23E+02
WDP	m^3 world eq deprived	8.55E+00	3.75E-03	6.94E-01	1.58E-04	2.5E-02	2.08E+00	3.04E-02	-1.95E+00

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 VELUX standard wooden roof window

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	MJ	5.51E+02	3.09E-01	4.3E+02	4.21E-03	2.06E+00	1.04E+00	4.95E-01	-7.37E+01
PERM	MJ	8.34E-02	0	0	0	0	0	0	0
PERT	MJ	5.52E+02	3.09E-01	4.3E+02	4.21E-03	2.06E+00	1.04E+00	4.95E-01	-7.37E+01
PENRE	MJ	1.58E+03	5.48E+00	2.26E+02	4.09E-02	3.6E+01	1.02E+02	3.93E+00	-4.24E+02
PENRM	MJ	1.32E+02	0	-5.09E-01	0	0	-9.62E+01	0	0
PENRT	MJ	1.71E+03	5.48E+00	2.25E+02	4.09E-02	3.6E+01	5.61E+00	3.93E+00	-4.24E+02
SM	kg	3.82E+00	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m^3	5.5E-01	3.54E-04	6.69E-02	9.2E-06	2.36E-03	4.91E-02	9.22E-04	-1.78E-01

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 VELUX standard wooden roof window

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	kg	3.25E-03	2.84E-10	1.26E-06	4.91E-12	1.9E-09	1.08E-09	4.58E-10	-4.07E-08
NHWD	kg	7.71E+00	8.54E-04	3.47E-01	7.68E-06	5.65E-03	9.62E-01	1.72E+01	-3.16E+00
RWD	kg	4.13E-02	9.87E-06	1.09E-02	6.61E-06	6.53E-05	2.6E-04	4.18E-05	-1.65E-02
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	1.77E-02	0	1.66E+01	0	0	1.6E+01	0	0
MER	kg	0	0	0	0	0	1.04E+01	0	0
EEE	MJ	3.51E-02	0	0	0	0	3.28E+01	0	0
EET	MJ	5.13E-02	0	0	0	0	5.98E+01	0	0

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; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m2 VELUX standard wooden roof window

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
PM	Disease incidence	8.56E-06	7.85E-09	4.18E-07	2.9E-11	7.01E-08	3.34E-08	2.45E-08	-1.25E-06
IR	kBq U235 eq	8.41E+00	1.44E-03	1.51E+00	9.66E-04	9.55E-03	3.08E-02	4.64E-03	-3.1E+00
ETP-fw	CTUe	1.99E+03	4.05E+00	6.36E+01	1.25E-02	2.66E+01	2.72E+00	2.54E+00	-1.81E+02
HTP-c	CTUh	6.52E-07	8.18E-11	9.33E-09	2.09E-13	5.38E-10	1.4E-10	3.07E-10	-2.85E-08
HTP-nc	CTUh	2.02E-06	4.24E-09	2.19E-07	1.16E-11	3.3E-08	9.15E-09	3.43E-08	-2.79E-07
SQP	SQP	5.19E+03	1.84E+00	3.76E+02	3.39E-03	1.23E+01	5.58E-01	7.2E-01	-2.09E+01

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 'Potential Human exposure efficiency relative to U235'. 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 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit for humans – cancerogenic', 'Potential comparative toxic unit for humans - not cancerogenic', 'potential soil quality index'. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

The results show that module A1 has the highest impact across all environmental impact indicators (except GWP – biogenic). Module A3 has the second highest impact in most impact indicators due to the energy consumption and the use of residual electricity grid mix. All main components in the windows contribute significantly to some of the environmental indicators, except for wood, which is only significant for the GWP-luluc and WDP indicators. The glass in the glazing units has the highest contribution in most impact categories among all material types. The galvanized steel components contribute significantly to the results due to their high weight contribution to the product. The aluminium components are also significant for the WDP indicator, although the weight of the aluminium components is notably lower in comparison with the galvanized steel components. This is most likely due to the relatively high energy and water consumption in the production of aluminium. It is noted that the production activities at VELUX contribute significantly to the GWP-fossil and ADPF impact indicators therefore, the actual impact contribution of the final wooden components is higher than the impact of upstream processed wood production.

References

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EN 15804:2012+A2:2019+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.

Regulation (EU) No 305/2011
Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products andrepealing Council Directive 89/106/EEC

Candidate list
ECHA Candidate list of substances of very high concern, status 23.08.2023

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.

LCA for Experts (GaBi) LCA software, Managed LCA Content and Ecoinvent databases
The LCA modelling software is LCA for Experts program version 10.7.1 with corresponding databases from Sphera Solutions GmbH (Managed LCA Content) and Ecoinvent. Documentation hyperlink www.gabisoftware. com/support/gabi.

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ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	VELUX Group
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-VEL-20230051-IBA2-EN
Issue date	11.05.2023
Valid to	10.05.2028

Window operator for VELUX pivot hinged windows (KMG 100K) and control system (KUX 110), mains connected

VELUX Group

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

www.ibu-epd.com | https://epd-online.com

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Declaration number

EPD-VEL-20230051-IBA2-EN

This declaration is based on the product category rules:

Drive systems for automatic doors and gates, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

11.05.2023

Valid to

10.05.2028

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Window operator for VELUX pivot hinged windows (KMG 100K) and control system (KUX 110), mains connected

Owner of the declaration

VELUX Group
Ådalsvej 99
2970 Hørsholm
Denmark

Declared product / declared unit

The declared unit is one piece of electrical window operator.

Scope:

The EPD is a specific EPD covering VELUX electrical window operator for the mains connected pivot hinged windows. The operator consists of a chain operator, a rain sensor, a control system and a remote. The products are manufactured by the VELUX Group at a production site in the Czech Republic.
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.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Dr.-Ing. Nikolay Minkov,
(Independent verifier)

Product

Product description/Product definition

EPD covering VELUX electrical window operator for the mains connected pivot hinged windows. The operator consists of a chain operator, a rain sensor, a control system and a remote. The products are manufactured by the VELUX Group at a production site in the Czech Republic.
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 products are in compliance with the *Machinery Directive 2006/42/EC, the Radio Equipment Directive 2014/53/EU* and the *RoHS Directive 2011/65/EU*. A declaration of conformity is available from the manufacturer.

Application

The VELUX electrical window operator is sold separately for retrofitting.

Technical Data

The CE marking for electrical window operators does not specify the need for a Declaration of Performance. Instead, a Declaration of Conformity is required.
The performance values relevant for the product are specified in the table below.

Constructional data

Name	Value	Unit
Protection class	IP 44	class
Voltage	230	V

Base materials/Ancillary materials

Product content

Name	Value	Unit
Other plastic components	34	%
Cables	20	%
Other metal components	16	%
PCBA	6	%
Motor	4	%
Battery	1	%
Other (butyl sealant, epoxy, paper)	18	%

Packaging materials include 0,46 kg cardboard and paper, 0,14 kg polystyren (EPS) and 0,03 kg low density polyethylen (LDPE) per declared unit.

This product/article/at least one partial article contains substances listed in the *candidate list* (date: 08.06.2022) exceeding 0.1 percentage by mass: **NO**.

Reference service life

No reference service life (RSL) is defined for the operators as the use stage modules are not included in the EPD. There is no generally acknowledged or common way to assess the RSL for this type of product. Furthermore, the lifetime of the products depends greatly on the use pattern and environmental conditions in use, which differs for different users and which is difficult to predict at the time of sale.

LCA: Calculation rules

Declared Unit

The declared unit is one piece. This corresponds to an electrical window operator system, including a chain operator, a control system, a rain sensor and a remote.

Name	Value	Unit
Declared unit	1	pce.
Weight	1,93	kg
Conversion factor to kg	0,52	-

Other declared units are allowed if the conversion is shown transparently.

A data quality and a sensitivity analysis show that the results are robust with regard 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. motor suspension, PCB, battery...). Production of packaging: cardboard boxes, paper labels, EPS and plastic film.

A2 - Transport: Transport of pre-products and packaging components to the manufacturing sites.

A3 - Manufacturing: The products are produced/assembled at the VELUX production site, where the finished window operator is ready for shipment.

End of life stage:

C1 - De-construction/demolition: de-construction of the product with the use of manual hand tools.

C2 - Transport: transport of the product to waste treatment including to and from sorting and shredding facilities.

C3 - Waste processing: includes sorting, shredding, incineration and recycling processes.

C4 - Disposal: disposal of all materials

Benefits and loads beyond the system boundaries:

D - Reuse, recovery and recycling potential: benefits from plastic incineration processes and material recycling. End of life includes all activities from when the product reaches the end of its service life and no longer provides any functionality until all materials and components are processed for reuse/recycling/energy recovery or are disposed of.

The applied end-of-life scenario follows the requirements in the PCR Part A, chapter 6.2 regarding complex products, with a combination of recycling, thermal waste treatment and landfilling. 100% of the material is considered in the end-of-life scenario. Generally metals, cables, batteries and polychlorinated biphenyl (PCB)'s are recycled, plastic parts are incinerated with energy recovery and magnets are landfilled.

Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Europe

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 used background software and database is *GaBi (DB version 2021.2)*

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The product does not contain biogenic carbon.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.37	kg C

Assembly (A5)

Name	Value	Unit
Cardboard for recycling	0.46	kg
EPS packaging for incineration	0.14	kg
Plastic packaging for incineration (LDPE)	0.03	kg

No Reference Service Life (RFL) is declared, because the use stage modules are not declared.

End of life (C1-C4)

Name	Value	Unit
Collected separately waste type Electronics	1.9	kg
Recycling	0.89	kg
Energy recovery	1.01	kg
Landfilling	0.03	kg

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

Name	Value	Unit
Replaced materials	0.18	kg
Replaced thermal energy	4.8	MJ
Replaced electricity	2.6	MJ

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = 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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 pcs window operator

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	1.15E+01	4.49E-01	7.33E-01	0	8.85E-03	1.67E+00	1.47E-05	-1.36E+00
GWP-fossil	kg CO_2 eq	1.16E+01	4.48E-01	1.36E+00	0	8.79E-03	1.67E+00	1.51E-05	-1.36E+00
GWP-biogenic	kg CO_2 eq	-1.32E-01	1.89E-04	-6.28E-01	0	-1.12E-05	1.28E-03	-4.39E-07	-5.41E-04
GWP-luluc	kg CO_2 eq	1.62E-02	1.25E-03	1.19E-03	0	7.19E-05	1.79E-04	4.44E-08	-1.54E-03
ODP	kg CFC11 eq	1.37E-09	4.98E-17	1.95E-11	0	1.12E-18	6.17E-09	5.88E-20	-8.13E-15
AP	mol H^+ eq	5.13E-02	1.13E-02	4.07E-03	0	2.75E-05	1.9E-03	1.08E-07	-4.21E-03
EP-freshwater	kg P eq	1.59E-04	5.16E-07	1.56E-05	0	2.61E-08	1.03E-05	2.54E-11	-1.36E-06
EP-marine	kg N eq	8.78E-03	3.09E-03	1.29E-03	0	1.26E-05	8.79E-04	2.8E-08	-7.15E-04
EP-terrestrial	mol N eq	9.27E-02	3.39E-02	1.31E-02	0	1.41E-04	9.69E-03	3.07E-07	-7.7E-03
POCP	kg NMVOC eq	2.77E-02	8.46E-03	3.78E-03	0	2.47E-05	2.25E-03	8.47E-08	-2.13E-03
ADPE	kg Sb eq	8.84E-04	2.04E-08	2.01E-07	0	6.69E-10	2.08E-07	1.43E-12	-4.03E-05
ADPF	MJ	1.77E+02	5.6E+00	2.73E+01	0	1.17E-01	2.48E+00	2.01E-04	-1.9E+01
WDP	m^3 world eq deprived	4.88E+00	1.77E-03	1.67E-01	0	7.63E-05	5.03E-01	1.62E-06	-2.7E-01

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 pcs window operator

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	MJ	2.94E+01	1.25E-01	1.73E+01	0	6.53E-03	7.77E-01	2.7E-05	-4.05E+00
PERM	MJ	0	0	0	0	0	0	0	0
PERT	MJ	2.94E+01	1.25E-01	1.73E+01	0	6.53E-03	7.77E-01	2.7E-05	-4.05E+00
PENRE	MJ	1.53E+02	5.61E+00	1.91E+01	0	1.17E-01	2.01E+01	2.01E-04	-1.9E+01
PENRM	MJ	2.33E+01	0	8.24E+00	0	0	-1.76E+01	0	0
PENRT	MJ	1.77E+02	5.61E+00	2.73E+01	0	1.17E-01	2.48E+00	2.01E-04	-1.9E+01
SM	kg	1.79E-01	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m^3	1.29E-01	1.49E-04	7.85E-03	0	7.47E-06	1.21E-02	4.95E-08	-1.13E-02

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 pcs window operator

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	kg	2.58E-04	1.3E-10	1.35E-04	0	5.9E-12	5.5E-10	2.13E-14	-2.97E-09
NHWD	kg	6.17E-01	6.6E-04	3.61E-02	0	1.74E-05	1.23E-01	1E-03	-5.13E-02
RWD	kg	3.17E-03	6.43E-06	1.33E-03	0	1.42E-07	2.29E-04	2.11E-09	-9.03E-04
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	6.96E-01	0	0
MER	kg	0	0	0	0	0	6.71E-01	0	0
EEE	MJ	0	0	0	0	0	0	0	2.63E+00
EET	MJ	0	0	0	0	0	0	0	4.75E+00

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; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 pcs window operator

Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
PM	Disease incidence	6.66E+01	3.94E+00	9.61E+00	0	8.21E-02	9.99E+00	1.07E-04	-4.29E+00
IR	kBq U235 eq	3.58E+01	6.94E-02	2.41E+01	0	1.59E-03	1.57E+00	6.15E-06	-1.91E+00
ETP-fw	CTUe	4.36E-01	3.58E-02	8.08E-02	0	7.89E-04	5.79E-02	8.69E-07	-4.31E-02
HTP-c	CTUh	2.85E-19	1.33E-21	5.91E-20	0	2.93E-23	5.92E-20	1.85E-25	-2.53E-19
HTP-nc	CTUh	3.83E-09	7.6E-11	1.96E-10	0	1.67E-12	7.89E-10	1.64E-14	-8.92E-10
SQP	SQP	7.45E-08	1.71E-12	9.33E-11	0	3.9E-14	2.74E-11	4.93E-16	-3.85E-10

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 'Potential Human exposure efficiency relative to U235'. 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 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit for humans – cancerogenic', 'Potential comparative toxic unit for humans - not cancerogenic', 'potential soil quality index'. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

References

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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.

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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.

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Regulation (EU) No 305/2011 of the European Parliament and of the Council, 9 March 2011, Laying down harmonised conditions for the marketing of constructional products.

Directive 2011/65/EU
Directive 2011/65/EU of the European Parliament and of the Council, 8 June 2011, on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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Directive 2014/53/EU
Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.

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Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Directive 2006/42/EC
DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery.

Candidate list
Candidate List of substances of very high concern for Authorisation, 08.06.2022.

GaBi LCA software and database
The LCA modelling software is GaBi program version 10.5.1.124 with corresponding databases from Sphera Solutions GmbH. Documentation hyperlink www.gabi-software.com/support/gabi.

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