# 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

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

## 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<br>--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<br>--68 --69<br>--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<br>--68 --69<br>--86 | White painted or clear lacquered GGL window with an electrical window opener, main operated. |
| GGL Solar | GGL -K-- -0--30 | --66 --67<br>--68 --69<br>--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<br>--68 | White painted or clear lacquered side-hinged window for vertical extension with handle on the side sash |
| VFB | VFB -K-- -0-- | --66 --67<br>--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 | $W/(m^2K)$ |
| 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


**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, version 1.3.

**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**
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**EN 12208**
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**EN 14351-1**
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**Candidate list**
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**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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