epd-norge
Global program operatør

# Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

## LUN-P300 C2



Glamox

The Norwegian EPD Foundation

**Owner of the declaration:**
Glamox AS

**Product:**
LUN-P300 C2

**Declared unit:**
1 pcs

**This declaration is based on Product Category Rules:**
CEN Standard EN 15804:2012+A2:2019 serves as core PCR
IBU PCR - Part B for luminaires, lamps, and components for luminaires

**Program operator:**
The Norwegian EPD Foundation

**Declaration number:**

**Registration number:**

**Issue date:**

**Valid to:**

**EPD software:**
LCAno EPD generator ID: 94492

## General information

**Product**

LUN-P300 C2

**Owner of the declaration:**

Glamox AS
Contact person: Birger Holo
Phone: +47 97551574
e-mail: birger.holo@glamox.com

**Program operator:**

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Phone: +47 977 22 020
web: www.epd-norge.no

**Manufacturer:**

Glamox AS
Birger Hatlebakks veg 15
6415 Molde, Norway

**Declaration number:**

**Place of production:**

Glamox production site Kirkenær (Norway)
Bruksvegen 7
2260 Kirkenær, Norway

**This declaration is based on Product Category Rules:**

CEN Standard EN 15804:2012+A2:2019 serves as core PCR
IBU PCR - Part B for luminaires, lamps, and components for luminaires

**Management system:**

ISO 9001, ISO 14001; Molde: ATEX, ISO 80079-34 (IECEx), ISO45001, ISO50001; Kirkenær: ISO 13485; Keila: ISO 45001, ISO 50001; Dobczyce: ATEX, ISO 80079-34 (IECEx), Module D 2014/90/EU

**Statement of liability:**

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

**Organisation no:**

912007782

**Declared unit:**

1 pcs LUN-P300 C2

**Issue date:**

**Declared unit with option:**

A1,A2,A3,A4,A5,B6,C1,C2,C3,C4,D

**Valid to:**

**Year of study:**

2022

**Functional unit:**

LUN P300 luminaire manufactured in Glamox Kirkenær. Transport to customer and used according to a specific lighting regime over 15-years lifetime. Including waste treatment at end-of-life.

**Comparability:**

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

**General information on verification of EPD from EPD tools:**

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD-Norway's guidelines for verification and approval requiring that tools are i) integrated into the company's environmental management system, ii) the procedures for use of the EPD tool are approved by EPD-Norway, and iii) the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools

**Development and verification of EPD:**

The declaration is created using EPD tool lca.tools ver EPD2021.09, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway. NEPDT42

Developer of EPD: Jan Arvidsson

Reviewer of company-specific input data and EPD: Björn Lind

**Verification of EPD tool:**

Independent third party verification of the EPD tool, background data and test-EPD in accordance with EPDNorway's procedures and guidelines for verification and approval of EPD tools. Approval number: NEPDT41.

**Approved:**

Third party verifier:

Vito D'Incognito, Take Care International

(no signature required)

## Product

### Product description:

LUN lets you linger in the slow Scandinavian twilight. Its soothing and inviting qualities thoughtfully evoke a sense of tranquility and possibilities.
LUN is designed to recreate the delicate Nordic light.

The pendant takes the form of a sphere. It radiates a soft and diffused light, creating a calm atmosphere of comfort. LUN is available in three different sizes, allowing you to find the perfect fit for any environment.

This environmental product declaration can be used for the following luminaires:
LUP029722 LUN-P300 1000 DALI 830 C2
LUP029723 LUN-P300 1000 DALI 840 C2

### Product specification

Glass dome in 300mm width
Polycarbonate opalic inner diffuser.
DALI driver combined with switch/dim for dimming with regular push button Driver mounted in ceiling cup or as in-track driver for spotlight tracks.

| Materials | kg | % |
|---|---|---|
| Coating materials | 0,01 | 0,22 |
| Electronic - Auxiliaries | 0,00 | 0,11 |
| Electronic - Connector | 0,02 | 0,70 |
| Electronic - LED chip | 0,00 | 0,01 |
| Electronic - LED driver | 0,10 | 4,44 |
| Electronic - LED plate | 0,00 | 0,03 |
| Electronic - Resistor | 0,00 | 0,00 |
| Electronic - Wire | 0,11 | 4,82 |
| Glass - Soda lime | 1,23 | 55,13 |
| Metal - Steel low alloy | 0,12 | 5,23 |
| Plastic - Polyamide | 0,01 | 0,50 |
| Plastic - Polyethylene terephthalate (PET) | 0,00 | 0,02 |
| Tape | 0,00 | 0,04 |
| Metal - Aluminium | 0,50 | 22,57 |
| Metal - Brass | 0,01 | 0,27 |
| Metal - Steel | 0,01 | 0,43 |
| Plastic - Polycarbonate (PC) | 0,12 | 5,47 |
| Total | 2,24 | 100,00 |

| Packaging | kg | % |
|---|---|---|
| Packaging - Cardboard | 1,48 | 99,33 |
| Packaging - Paper | 0,01 | 0,67 |
| Total incl. packaging | 3,73 | 100,00 |

### Technical data:

Please visit the product page on our website for more technical information.

### Market:

Nordic

### Reference service life, product

15 years lifetime for the installation according to the used scenario.

### Reference service life, building or construction works

60 years. Standard service life for buildings according to PCR Part A of EPD Norway.

## LCA: Calculation rules

### Declared unit:

1 pcs LUN-P300 C2

### Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) can be excluded. These cut-off criteria do not apply for hazardous materials and substances.

### Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

### Data quality:

Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases. The data quality of the raw materials in A1 is presented in the table below.

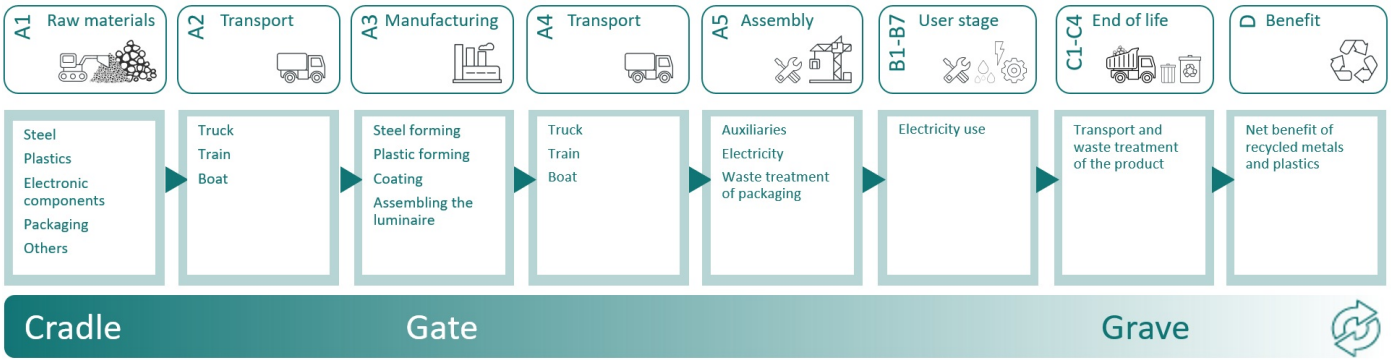
| Materials | Source | Data quality | Year |
|---|---|---|---|
| Coating materials | Ecoinvent 3.6 | Database | 2019 |
| Electronic - Auxiliaries | ecoinvent 3.6 | Supplier data + database | 2019 |
| Electronic - Connector | ecoinvent 3.6 | Database | 2019 |
| Electronic - LED chip | Scholand et al. (2012) + Ecoinvent 3.6 | Scientific literature + database | 2017 |
| Electronic - LED driver | Product composition + ecoinvent 3.6 | Supplier data + database | 2019 |
| Electronic - LED plate | ecoinvent 3.6 | Database | 2019 |
| Electronic - Resistor | ecoinvent 3.6 | Database | 2019 |
| Electronic - Wire | Material composition + ecoinvent 3.6 | Supplier data + database | 2019 |
| Electronic - Wire | Product composition + ecoinvent 3.6 | Supplier data + database | 2019 |
| Glass - Soda lime | Ecoinvent 3.6 | Database | 2019 |
| Metal - Aluminium | ecoinvent 3.6 | Database | 2019 |
| Metal - Aluminium | Modified ecoinvent 3.6 | Database | 2019 |
| Metal - Brass | ecoinvent 3.6 | Database | 2019 |
| Metal - Steel | ecoinvent 3.6 | Database | 2019 |
| Metal - Steel low alloy | Modified ecoinvent 3.6 | Database | 2019 |
| Packaging - Cardboard | ecoinvent 3.6 | Database | 2019 |
| Packaging - Paper | ecoinvent 3.6 | Database | 2019 |
| Plastic - Polyamide | ecoinvent 3.6 | Database | 2019 |
| Plastic - Polycarbonate (PC) | ecoinvent 3.6 | Database | 2019 |
| Plastic - Polyethylene terephthalate (PET) | ecoinvent 3.6 | Database | 2019 |
| Tape | ecoinvent 3.6 | Database | 2019 |

## System boundaries (X=included, MND=module not declared, MNR=module not relevant)

| Product stage | | | Construction installation stage | | Use stage | | | | | | | End of life stage | | | | Beyond the system boundaries |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Raw materials | Transport | Manufacturing | Transport | 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 | X | X | MND | MND | MND | MND | MND | X | MND | X | X | X | X | X |

### System boundary:

The analysis is a cradle-to-grave study of one luminaire manufactured and installed, used according to a specific lighting regime over a specific lifetime, including waste treatment at end-of-life.
A1-A5 includes the extraction and production of raw materials, transportation to the production site, the production process itself, transport to the market and assembly.
B6 is the operational energy use stage of the luminaire based on a scenario.
C1-C4 includes de-installation of the luminaire, average transport between building site and waste treatment facility, waste processing and disposal. Waste treatment of the product follows the default values provided in EN 50693.
D shows the recyclability of metals and plastics, and allows the producers a credit for the net scrap that is produced at the end of a product's life. The benefits from recycling of net scrap are described in formula from EN 15804:2012+A2:2019. Substitution of heat and electricity generated by the incineration with energy recovery of plastic insulation and other parts is also calculated in module D.




### Additional technical information:

Please visit our website www.glamox.com for more technical information.

## LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Module A4: Transport from manufacturing location in Kirkenær to warehouse in Oslo (130 km) + average distribution into the Nordic market (500 km).

Module B6: The operational energy use of the luminaire is calculated based on the methodology provided in IBU PCR Part B for luminaires, lamps, and components for luminaires. The energy consumption model for luminaire used in the PCR follows the application scenarios developed in EN 15193:2007. To calculate the electricity use of the luminaire, the following scenario parameters have been applied:

- User scenario = Office
- Active power of the luminaire (Pa) = 9,3 watt
- Passive power of the luminaire (Pp) = 0,27 watt
- Daylight time usage (tD) = 2250 hours
- Non-daylight time usage (tN) = 250 hours
- Standard year time (ty) = 8760 hours
- The occupancy depency factor (FO) = 1 (factor, no unit)
- The daylight dependency factor (FD) = 0,9 (factor, no unit)
- The product specific constant illuminance factor (FCP) = 1 (factor, no unit)
- The non-daylight dimming factor (FN) = 1 (factor, no unit)
- The application specific empiric lifetime of the luminaire in years (a) = 15 years (corresponding to the reference service life of the product)

Module C2: Average transport to Nordic waste treatment facilities (300km).

Modules C3 and C4: Waste treatment of the product follows the default values provided in EN 50693, Product Category Rules for life cycle assessments of electronic and electrical products and systems, table G.4. This table specified how different types of raw materials used in A1 will likely be treated during the end-of-life of the product. Waste treatments in C3 include material recycling and incineration with and without energy recovery and fly ash extraction. Disposal in C4 consist of landfilling of different waste fractions and of ashes.

Module D: The recyclability of metals, plastics, and electronic components allows the producers a credit for the net scrap that is produced at the end of a product's life. The benefits from recycling of net scrap are described in formula from EN 15804:2012+A2:2019. Substitution of heat and electricity generated by the incineration with energy recovery of plastic insulation and other parts is also calculated in module D.

| Transport from production place to user (A4) | Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) |
|---|---|---|---|---|---|
| Truck, 16-32 tonnes, EURO 5 (km) - Europe | 36,7 % | 630 | 0,044 | l/tkm | 27,72 |

| Assembly (A5) | Unit | Value | | | |
|---|---|---|---|---|---|
| Waste, cardboard and paper, to average treatment - A5 including transport (kg) | kg | 1,48 | | | |

| Operational energy (B6) | Unit | Value | | | |
|---|---|---|---|---|---|
| Electricity, Nordic (kWh) | kWh/DU | 352,84 | | | |

| Transport to waste processing (C2) | Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) |
|---|---|---|---|---|---|
| Truck, over 32 tonnes, EURO 5 (km) - Europe | 53,3 % | 300 | 0,023 | l/tkm | 6,90 |

| Waste processing (C3) | Unit | Value | | | |
|---|---|---|---|---|---|
| Aluminium to recycling (kg) | kg | 0,35 | | | |
| Brass to recycling (kg) | kg | 0,00 | | | |
| Copper to recycling (kg) | kg | 0,04 | | | |
| Glass to recycling (kg) | kg | 0,74 | | | |
| Steel to recycling (kg) | kg | 0,10 | | | |
| Waste treatment of hazardous waste, incineration with fly ash extraction (kg) | kg | 0,01 | | | |
| Waste treatment of plastic mixture, incineration with energy recovery and fly ash extraction (kg) | kg | 0,12 | | | |
| Waste treatment per kg electronics scrap from LED plate, without components, recycling of copper - C3 (kg) | kg | 0,00 | | | |
| Waste treatment per kg electronics scrap from PWB, with components, recycling of metals - C3 (kg) | kg | 0,03 | | | |
| Waste treatment per kg used electronic components, manual seperation (kg) | kg | 0,23 | | | |
| Waste treatment per kg used PWB, shredding and separation - C3 (kg) | kg | 0,07 | | | |

| Disposal (C4) | Unit | Value | | | |
|---|---|---|---|---|---|
| Landfilling of aluminium (kg) | kg | 0,24 | | | |
| Landfilling of ashes from incineration of Hazardous waste, process per kg ashes and residues - C4 (kg) | kg | 0,00 | | | |
| Landfilling of ashes from incineration of Plastic mixture, process per kg ashes and residues (kg) | kg | 0,00 | | | |
| Landfilling of brass (kg) | kg | 0,00 | | | |
| Landfilling of copper (kg) | kg | 0,02 | | | |
| Landfilling of glass (kg) | kg | 0,49 | | | |
| Landfilling of hazardous waste (kg) | kg | 0,03 | | | |
| Landfilling of plastic mixture (kg) | kg | 0,12 | | | |
| Landfilling of steel (kg) | kg | 0,03 | | | |

| Benefits and loads beyond the system boundaries (D) | Unit | Value | | | |
|---|---|---|---|---|---|
| Substitution of copper with net scrap from PWB, without components (kg) | kg | 0,00 | | | |
| Substitution of electricity, in Norway (MJ) | MJ | 0,18 | | | |
| Substitution of primary aluminium with net scrap (kg) | kg | 0,03 | | | |
| Substitution of primary brass with net scrap (kg) | kg | 0,00 | | | |
| Substitution of primary copper with net scrap (kg) | kg | 0,04 | | | |
| Substitution of primary glass with net scrap (kg) | kg | 0,49 | | | |
| Substitution of primary metals with net scrap from PWB, with components (kg) | kg | 0,01 | | | |
| Substitution of primary steel with net scrap (kg) | kg | 0,01 | | | |
| Substitution of thermal energy, district heating, in Norway (MJ) | MJ | 2,76 | | | |

## LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

| Environmental impact | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | | **Unit** | A1 | A2 | A3 | A4 | A5 |
| | GWP-total | kg $CO_2$ -eq | 1,43E+01 | 5,04E-01 | 2,70E+00 | 3,92E-01 | 2,56E+00 |
| | GWP-fossil | kg $CO_2$ -eq | 1,66E+01 | 5,03E-01 | 2,20E+00 | 3,91E-01 | 2,40E-02 |
| | GWP-biogenic | kg $CO_2$ -eq | -2,36E+00 | 1,89E-04 | 4,88E-01 | 1,60E-04 | 2,53E+00 |
| | GWP-luluc | kg $CO_2$ -eq | 2,53E-02 | 2,17E-04 | 1,78E-02 | 1,37E-04 | 7,92E-06 |
| | ODP | kg CFC11 -eq | 1,18E-06 | 1,13E-07 | 1,39E-07 | 8,92E-08 | 5,06E-09 |
| | AP | mol H+ -eq | 1,43E-01 | 5,48E-03 | 1,01E-02 | 1,60E-03 | 1,13E-04 |
| | EP-FreshWater | kg P -eq | 1,50E-03 | 3,50E-06 | 9,45E-05 | 3,07E-06 | 1,97E-07 |
| | EP-Marine | kg N -eq | 1,88E-02 | 1,43E-03 | 2,44E-03 | 4,75E-04 | 3,75E-05 |
| | EP-Terrestial | mol N -eq | 2,13E-01 | 1,58E-02 | 2,45E-02 | 5,25E-03 | 4,06E-04 |
| | POCP | kg NMVOC -eq | 6,52E-02 | 4,35E-03 | 6,80E-03 | 1,61E-03 | 1,17E-04 |
| | ADP-minerals&metals[1] | kg Sb-eq | 3,98E-03 | 1,13E-05 | 5,86E-05 | 1,06E-05 | 5,83E-07 |
| | ADP-fossil[1] | MJ | 2,11E+02 | 7,31E+00 | 1,82E+01 | 5,90E+00 | 3,35E-01 |
| | WDP[1] | $m^3$ | 4,42E+02 | 5,81E+00 | 1,71E+03 | 5,63E+00 | 4,25E-01 |

| **Indicator** | | **Unit** | B6 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| | GWP-total | kg $CO_2$ -eq | 5,14E+01 | 0,00E+00 | 1,02E-01 | 3,36E-01 | 2,72E-02 | -1,45E+00 |
| | GWP-fossil | kg $CO_2$ -eq | 4,79E+01 | 0,00E+00 | 1,02E-01 | 3,35E-01 | 2,72E-02 | -1,43E+00 |
| | GWP-biogenic | kg $CO_2$ -eq | 8,75E-01 | 0,00E+00 | 4,17E-05 | 1,35E-04 | 9,35E-06 | -7,98E-03 |
| | GWP-luluc | kg $CO_2$ -eq | 2,62E+00 | 0,00E+00 | 2,97E-05 | 9,81E-05 | 6,48E-05 | -6,92E-03 |
| | ODP | kg CFC11 -eq | 5,18E-06 | 0,00E+00 | 2,35E-08 | 4,51E-09 | 2,95E-09 | -1,17E-03 |
| | AP | mol H+ -eq | 2,21E-01 | 0,00E+00 | 4,27E-04 | 2,77E-04 | 9,63E-05 | -5,58E-02 |
| | EP-FreshWater | kg P -eq | 3,17E-03 | 0,00E+00 | 7,75E-07 | 2,11E-06 | 4,23E-07 | -3,06E-04 |
| | EP-Marine | kg N -eq | 3,49E-02 | 0,00E+00 | 1,28E-04 | 6,77E-05 | 4,35E-05 | -3,45E-03 |
| | EP-Terrestial | mol N -eq | 4,69E-01 | 0,00E+00 | 1,42E-03 | 7,35E-04 | 3,27E-04 | -4,64E-02 |
| | POCP | kg NMVOC -eq | 1,10E-01 | 0,00E+00 | 4,57E-04 | 1,93E-04 | 1,11E-04 | -1,28E-02 |
| | ADP-minerals&metals[1] | kg Sb-eq | 7,45E-04 | 0,00E+00 | 1,74E-06 | 3,64E-07 | 1,01E-07 | -9,55E-04 |
| | ADP-fossil[1] | MJ | 1,29E+03 | 0,00E+00 | 1,58E+00 | 5,88E-01 | 2,72E-01 | -1,70E+01 |
| | WDP[1] | $m^3$ | 1,00E+05 | 0,00E+00 | 1,21E+00 | 4,27E+00 | 3,00E+00 | -1,80E+02 |

GWP-total = Global Warming Potential total; GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment: EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. 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 experienced with the indicator

### Remarks to environmental impacts

A luminaire is a product that consumes energy during the use phase. Combined with a relatively long expected lifetime and the environmental impact of generating electricity, the use phase (B6) will normally be the most contributing stage to the overall environmental impact of the declared unit. It is important to be aware that the actual calculations of the effect of B6 is particularly sensitive to which use scenario that is chosen and which energy grid mix that is used.

## Additional environmental impact indicators

| Indicator | | Unit | A1 | A2 | A3 | A4 | A5 |
|---|---|---|---|---|---|---|---|
| | PM | Disease incidence | 1,07E-06 | 2,76E-08 | 2,67E-07 | 2,82E-08 | 1,67E-09 |
| | IRP[2] | kgBq U235 -eq | 5,16E-01 | 3,18E-02 | 2,19E-01 | 2,58E-02 | 1,43E-03 |
| | ETP-fw[1] | CTUe | 1,19E+03 | 5,15E+00 | 8,47E+01 | 4,35E+00 | 4,47E-01 |
| | HTP-c[1] | CTUh | 2,55E-08 | 0,00E+00 | 3,21E-09 | 0,00E+00 | 1,30E-11 |
| | HTP-nc[1] | CTUh | 1,20E-06 | 4,61E-09 | 9,14E-08 | 4,70E-09 | 5,61E-10 |
| | SQP[1] | dimensionless | 1,15E+02 | 4,18E+00 | 4,79E+01 | 4,07E+00 | 2,25E-01 |

| Indicator | | Unit | B6 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| | PM | Disease incidence | 1,17E-06 | 0,00E+00 | 8,95E-09 | 1,91E-09 | 1,79E-09 | -1,77E-07 |
| | IRP[2] | kgBq U235 -eq | 2,95E+01 | 0,00E+00 | 6,91E-03 | 2,77E-03 | 1,20E-03 | -5,69E-02 |
| | ETP-fw[1] | CTUe | 1,62E+03 | 0,00E+00 | 1,16E+00 | 1,65E+00 | 1,82E+02 | -3,91E+02 |
| | HTP-c[1] | CTUh | 3,78E-08 | 0,00E+00 | 0,00E+00 | 5,73E-10 | 4,10E-11 | -3,92E-09 |
| | HTP-nc[1] | CTUh | 9,94E-07 | 0,00E+00 | 1,12E-09 | 3,30E-08 | 4,19E-10 | -2,50E-07 |
| | SQP[1] | dimensionless | 9,75E+02 | 0,00E+00 | 1,81E+00 | 1,34E-01 | 7,22E-01 | -1,09E+01 |

PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Potential Soil Quality Index (dimensionless)

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. 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 experienced with the indicator
2. 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 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.

| Resource use | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | | **Unit** | A1 | A2 | A3 | A4 | A5 |
| | PERE | MJ | 1,44E+01 | 9,18E-02 | 1,59E+02 | 8,33E-02 | 5,52E-03 |
| | PERM | MJ | 1,23E+01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | -1,25E+01 |
| | PERT | MJ | 2,67E+01 | 9,18E-02 | 1,59E+02 | 8,33E-02 | -1,25E+01 |
| | PENRE | MJ | 2,05E+02 | 7,31E+00 | 1,82E+01 | 5,90E+00 | 3,35E-01 |
| | PENRM | MJ | 6,43E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | PENRT | MJ | 2,11E+02 | 7,31E+00 | 4,45E+01 | 5,90E+00 | 3,35E-01 |
| | SM | kg | 1,16E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | RSF | MJ | 3,23E-01 | 3,17E-03 | 1,06E-01 | 2,98E-03 | 1,83E-04 |
| | NRSF | MJ | 2,86E-02 | 1,39E-02 | 2,50E+00 | 1,06E-02 | 7,54E-04 |
| | FW | $m^3$ | 1,38E-01 | 6,88E-04 | 9,52E-01 | 6,22E-04 | 1,58E-04 |

| **Indicator** | | **Unit** | B6 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| | PERE | MJ | 1,27E+03 | 0,00E+00 | 1,99E-02 | 7,46E-02 | 4,34E-02 | -3,93E+00 |
| | PERM | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | PERT | MJ | 1,27E+03 | 0,00E+00 | 1,99E-02 | 7,46E-02 | 4,34E-02 | -3,93E+00 |
| | PENRE | MJ | 1,31E+03 | 0,00E+00 | 1,58E+00 | 5,89E-01 | 2,72E-01 | -1,70E+01 |
| | PENRM | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | -7,21E+00 | 0,00E+00 | 0,00E+00 |
| | PENRT | MJ | 1,31E+03 | 0,00E+00 | 1,58E+00 | -6,62E+00 | 2,72E-01 | -1,70E+01 |
| | SM | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 2,19E-03 | 2,44E-02 |
| | RSF | MJ | 1,29E+01 | 0,00E+00 | 6,96E-04 | 1,48E-03 | 3,92E-04 | 2,03E-03 |
| | NRSF | MJ | 0,00E+00 | 0,00E+00 | 2,33E-03 | -3,26E-05 | 6,22E-03 | -6,08E-02 |
| | FW | $m^3$ | 5,79E+00 | 0,00E+00 | 1,80E-04 | 6,83E-04 | 2,87E-04 | -1,87E-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 materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

## End of life - Waste

| Indicator | | Unit | A1 | A2 | A3 | A4 | A5 |
|---|---|---|---|---|---|---|---|
| | HWD | kg | 1,17E-01 | 3,60E-04 | 4,86E-01 | 3,01E-04 | 0,00E+00 |
| | NHWD | kg | 2,36E+00 | 2,79E-01 | 3,69E+00 | 2,82E-01 | 1,48E+00 |
| | RWD | kg | 4,66E-04 | 5,01E-05 | 1,27E-04 | 4,02E-05 | 0,00E+00 |

| Indicator | | Unit | B6 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| | HWD | kg | 1,21E-01 | 0,00E+00 | 8,65E-05 | 1,61E-05 | 4,42E-02 | -3,63E-03 |
| | NHWD | kg | 8,04E+00 | 0,00E+00 | 1,38E-01 | 2,67E-02 | 9,09E-01 | -2,58E-01 |
| | RWD | kg | 1,36E-02 | 0,00E+00 | 1,08E-05 | 7,98E-07 | 8,57E-07 | -5,66E-05 |

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

## End of life - Output flow

| Indicator | | Unit | A1 | A2 | A3 | A4 | A5 |
|---|---|---|---|---|---|---|---|
| | CRU | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | MFR | kg | 9,43E-04 | 0,00E+00 | 3,33E+00 | 0,00E+00 | 1,38E+00 |
| | MER | kg | 3,58E-05 | 0,00E+00 | 3,61E-05 | 0,00E+00 | 1,04E-01 |
| | EEE | MJ | 2,59E-04 | 0,00E+00 | 1,24E+00 | 0,00E+00 | 8,47E-02 |
| | EET | MJ | 3,92E-03 | 0,00E+00 | 1,88E+01 | 0,00E+00 | 1,28E+00 |

| Indicator | | Unit | B6 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| | CRU | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | MFR | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 1,24E+00 | 1,32E-05 | -1,01E-03 |
| | MER | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 1,22E-01 | 3,74E-05 | -1,33E-04 |
| | EEE | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 1,80E-01 | 3,46E-04 | -3,45E-04 |
| | EET | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 2,72E+00 | 5,23E-03 | -5,22E-03 |

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

## Biogenic Carbon Content

| Indicator | Unit | At the factory gate |
|---|---|---|
| Biogenic carbon content in product | kg C | 0,00E+00 |
| Biogenic carbon content in accompanying packaging | kg C | 6,90E-01 |

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO2

## Additional requirements

### Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

| Electricity mix | Source | Amount | Unit |
|---|---|---|---|
| Electricity, Norway (kWh) | ecoinvent 3.6 | 24,33 | g CO2-eq/kWh |

### Dangerous substances

The product contains no substances given by the REACH Candidate list.

### Indoor environment

Not relevant

## Additional Environmental Information

| Additional environmental impact indicators required in NPCR Part A for construction products | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | A1 | A2 | A3 | A4 | A5 | |
| GWPIOBC | kg $CO_2$ -eq | 1,68E+01 | 5,03E-01 | 2,23E+00 | 3,92E-01 | 2,40E-02 | |

| **Indicator** | **Unit** | B6 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| GWPIOBC | kg $CO_2$ -eq | 6,97E+01 | 0,00E+00 | 1,02E-01 | 3,36E-01 | 7,95E-03 | -1,40E+00 |

GWP-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

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| Glamox | **Owner of the declaration:**<br>Glamox AS<br>Birger Hatlebakks veg 15, 6415 Molde | Phone: +47 97551574<br>e-mail: birger.holo@glamox.com<br>web: https://www.glamox.com |
| LCA.no | **Author of the Life Cycle Assessment**<br>LCA.no AS<br>Dokka 6A, 1671 Kråkerøy | Phone: +47 916 50 916<br>e-mail: post@lca.no<br>web: www.lca.no |
| LCA.no | **Developer of EPD generator**<br>LCA.no AS<br>Dokka 6A, 1671 Kråkerøy | Phone: +47 916 50 916<br>e-mail: post@lca.no<br>web: www.lca.no |
| ECO PLATFORM EPD VERIFIED | ECO Platform<br>ECO Portal | web: www.eco-platform.org<br>web: ECO Portal |