epd-global
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# Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

## Kanby LED Controller - Narrow Body - SmartScan



EPD-Global

**Owner of the declaration:**
Thorlux Lighting

**Product:**
Kanby LED Controller - Narrow Body - SmartScan

**Declared unit:**
1 pcs

**This declaration is based on Product Category Rules:**
CEN Standard EN 15804:2012+A2:2019 and EN 50693 :2019 serves as core PCR
IBU PCR - Part B for luminaires, lamps, and components for luminaires

**Program operator:**
EPD-Global

**Declaration number:**

**Issue date:**

**Valid to:**

**EPD software:**
LCAno EPD generator ID: 1811945

## General information

**Product**

Kanby LED Controller - Narrow Body - SmartScan

**Owner of the declaration:**

Thorlux Lighting
Contact person: Jake Morris
Phone: 01527 586 665
e-mail: jake.morris@thorlux.co.uk

**Program operator:**

EPD-Global
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Phone: +47 977 22 020
web: www.epd-global.com

**Manufacturer:**

Thorlux Lighting

**Declaration number:**

**Place of production:**

Thorlux Lighting
Merse Rd
B98 9HH Redditch, United Kingdom

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

CEN Standard EN 15804:2012+A2:2019 and EN 50693 :2019 serves as core PCR
IBU PCR - Part B for luminaires, lamps, and components for luminaires

**Management system:**

ISO 9001:2015; ISO 14001:2015; ISO/IEC 27001:2022; ISO 45001:2018

**Statement of liability:**

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

**Organisation no:**

00317886

**Declared unit:**

1 pcs Kanby LED Controller - Narrow Body - SmartScan

**Issue date:**

**Declared unit with option:**

A1, A2, A3, A4, A5, B1, B2, B3, B4, B5, B6, B7, C1, C2, C3, C4, D

**Valid to:**

**Year of study:**

2025

**Functional unit:**

Provide lighting that delivers an outgoing artificial luminous flux of 5,860 lumens during a reference lifetime of 100,000 hours

**Comparability:**

EPDs of construction products may not be comparable if they do not comply with EN 15804 and are not viewed 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-Global'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-Global, and iii) the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Global's General Programme Instructions for further information on EPD tools

**Development and verification of EPD:**

The declaration is created using EPD generator v2025.09, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD-Global.

Developer of EPD: Jake Morris

Reviewer of company-specific input data and EPD: Dominik Opielka

**Verification of EPD tool:**

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

**Approved:**

Third party verifier:

Andrea Arntzen Nistad, Asplan Viak

(no signature required)

## Product

### Product description:

LED controller luminaires
Kanby LED Controller is a long-life, surface-mounted linear LED luminaire, ideal for lighting school classrooms, corridors, healthcare buildings and retail and storage areas.

The steel-bodied Thorlux Kanby LED Controller is an ideal replacement for obsolete T5 fluorescent solutions, offering significantly increased luminaire efficacy and lower power consumption.

Part of the tried-and-tested Kanby range from Thorlux Lighting.

Applications: retail sales floor, storage areas, classrooms, toilets, corridors, healthcare buildings, and data centres.

### Product specification

| Materials | kg | % |
|---|---|---|
| Cellulose | 0.00012 | 0.003588 |
| Electronic - LED driver | 0.2656 | 7.94 |
| Electronic - Printed wiring board | 0.1584 | 4.74 |
| Electronic - Wire | 0.0209 | 0.6249 |
| Electronic component | 0.0018 | 0.05382 |
| Electronics | 0.0184 | 0.5501 |
| Metal - Steel | 0.02504 | 0.7486 |
| Metal - Steel low alloy | 2.38 | 71.13 |
| Plastic - Polyamide | 0.03488 | 1.04 |
| Plastic - Polycarbonate (PC) | 0.4403 | 13.16 |
| Thermoplastic elastomers (TPE) | 0.00008 | 0.002392 |
| Total | 3.34 | 100.00 |

| Packaging | kg | % |
|---|---|---|
| Packaging - Cardboard | 0.3584 | 100.00 |
| Total incl. packaging | 3.70 | 100.00 |

### Technical data:

https://www.thorlux.co.uk/products/kanby-led-controller

### Market:

United Kingdom

### Reference service life, product

20 Years

### Reference service life, building or construction works

Not Relevant

## LCA: Calculation rules

### Declared unit:

1 pcs Kanby LED Controller - Narrow Body - SmartScan

### 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 are 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 |
|---|---|---|---|
| Cellulose | ecoinvent 3.10.1 | Database | 2023 |
| Electronic - LED driver | Ecoinvent 3.10.1 | Database | 2023 |
| Electronic - Printed wiring board | ecoinvent 3.10.1 | Database | 2023 |
| Electronic - Wire | Product composition + ecoinvent 3.10.1 | Supplier data + database | 2023 |
| Electronic component | ecoinvent 3.10.1 | | 2023 |
| Electronics | ecoinvent 3.10.1 | Database | 2023 |
| Metal - Steel | ecoinvent 3.10.1 | Database | 2023 |
| Metal - Steel low alloy | ecoinvent 3.10.1 | Database | 2023 |
| Packaging - Cardboard | ecoinvent 3.10.1 | Database | 2023 |
| Plastic - Polyamide | ecoinvent 3.10.1 | Database | 2023 |
| Plastic - Polycarbonate (PC) | ecoinvent 3.10.1 | Database | 2023 |
| Plastic - Polycarbonate (PC) | Modified ecoinvent 3.10.1 | Database | 2023 |
| Thermoplastic elastomers (TPE) | ecoinvent 3.10.1 | Database | 2023 |

## 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 | X | X | X | X | X | X | X | X | X | X | X | X |

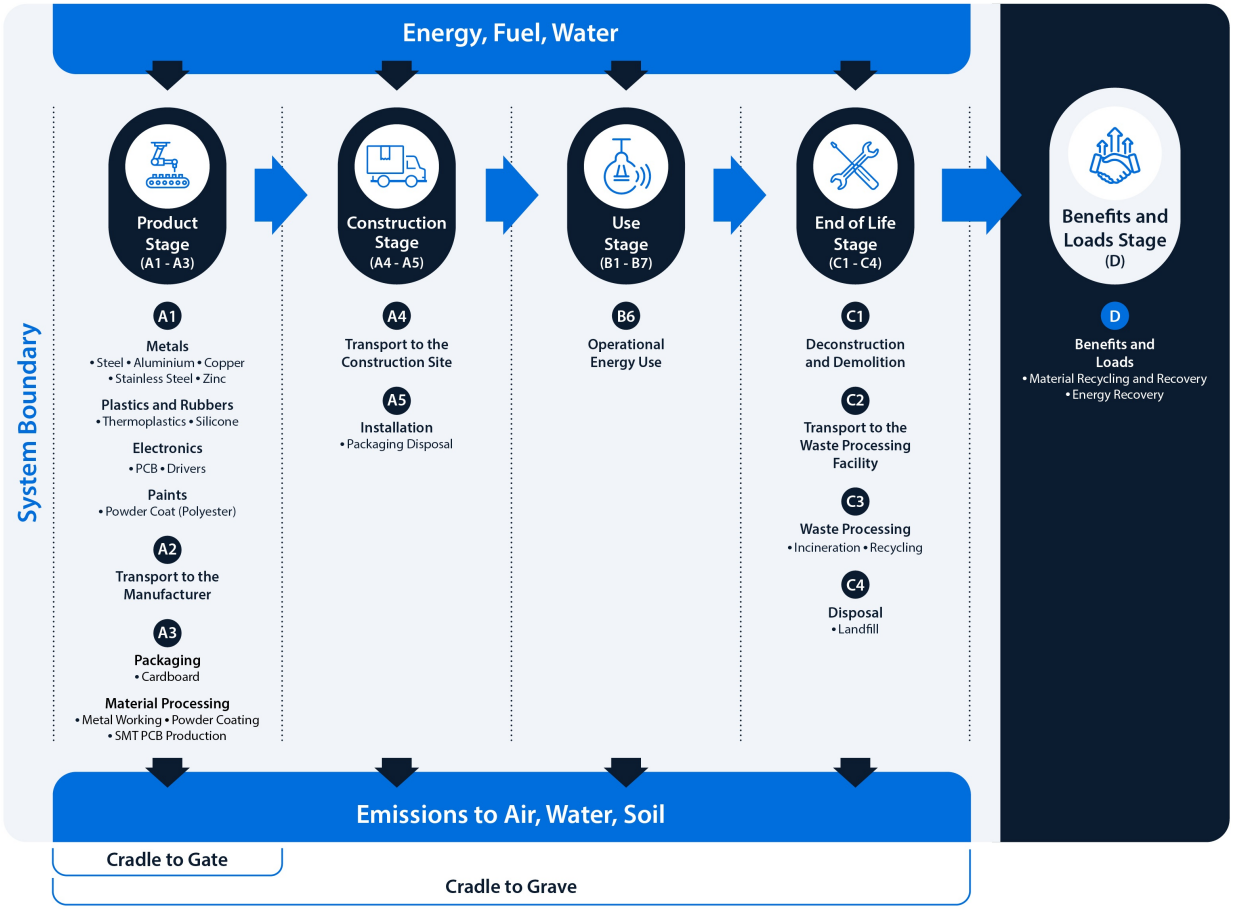
### System boundary:

MANUFACTURING AND PACKAGING (A1-A3)
The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials.

TRANSPORT AND INSTALLATION (A4-A5)
Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

PRODUCT USE AND MAINTENANCE (B1-B7)
Modules B1-B5 and B7 are mandatory. However, the impacts are "0" in most of the cases, as these impacts fall below the cut-off threshold. Module B6 is declared based on the RSL, the characteristics of the luminaire/lamp, and the luminaire/lamp application.

PRODUCT END OF LIFE (C1-C4, D)
The product should be collected and recycled in accordance with the waste of electrics and electronic equipment (WEEE) regulations. Manual disassembly of major parts is required. All end-of-life scenarios have been modelled in accordance with EN 50693 EOL 16022023.




### Additional technical information:

## LCA: Scenarios and additional technical information

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

Module A4 = Transportation by truck from factory in Redditch to customer in UK.
Modules A5 = Installation is done in UK. Packaging of the product is FSC-certified cardboard.

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 = Education
Total power consumption of the luminaire (P) = 43.70 watt
Active power of the luminaire (Pa) = 43 watt
Passive power of the luminaire = 0.70 watt
Daylight time usage (tD) = 1,800 hours
Non-daylight time usage (tN) = 200 hours
Standard year time (ty) = 8,760 hours
The occupancy dependency factor (FO) = 0.90
The daylight dependency factor (FD) = 0.80
The application specific empiric lifetime (a) = 20 years

Module C1 = The de-installation of the luminaire is done by manual labor, with the help of electrical machines. Portable electrical devices (e.g., drill) usually have low energy requirements, falling under the cut-off-criterion of 1% and is therefore neglected.

Module C2 = Transportation from building site to the waste treatment facility with an average distance of 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 specifies 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 consists 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 6 (km) | 38.8 % | 300.00 | 0.044 | l/tkm | 13.20 |

| Assembly (A5) | Unit | Value | | | |
|---|---|---|---|---|---|
| Waste, packaging, cardboard and paper, to average treatment (kg) - A5, incl. 85 km transp. | kg | 0.3584 | | | |

| Operational energy (B6) | Unit | Value | | | |
|---|---|---|---|---|---|
| Electricity, UK residual mix (kWh) | kWh | 846.18 | | | |

| De-construction demolition (C1) | Unit | Value | | | |
|---|---|---|---|---|---|
| Landfilling of hazardous waste (kg) | kg | 0.0018 | | | |
| Waste treatment per kg used electronic components, manual seperation (kg) | kg | 0.2656 | | | |

| Transport to waste processing (C2) | Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) |
|---|---|---|---|---|---|
| Truck, 16-32 tonnes, EURO 6 (km) | 38.8 % | 300.00 | 0.044 | l/tkm | 13.20 |

| Waste processing (C3) | Unit | Value | | | |
|---|---|---|---|---|---|
| Waste treatment per kg used PWB, shredding and separation - C3 (kg) | kg | 0.2884 | | | |
| Waste treatment per kg electronics scrap from PWB, with components, recycling of metals C3 (kg) | kg | 0.1442 | | | |
| Waste municipal solid waste \| treatment of municipal solid waste, municipal incineration FAE (kg) | kg | 0.0001 | | | |
| Steel to recycling (kg) | kg | 0.836 | | | |
| Waste plastic, mixture \| treatment of waste plastic, mixture, municipal incineration FAE (kg) | kg | 0.2429 | | | |
| Waste treatment per kg used electronic cable, manual seperation (kg) | kg | 0.0209 | | | |
| Waste treatment of plastic mixture, incineration with energy recovery and fly ash extraction (kg) | kg | 0.007315 | | | |
| Copper to recycling (kg) | kg | 0.003762 | | | |
| Waste plastic, mixture \| treatment of waste plastic, mixture, sanitary landfill (kg) | kg | 0.005312 | | | |

| Disposal (C4) | Unit | Value | | | |
|---|---|---|---|---|---|
| Landfilling of hazardous waste (kg) | kg | 0.1442 | | | |
| Waste inert waste \| treatment of inert waste, sanitary landfill (kg) - RER | kg | 0.0001 | | | |
| Landfilling of steel (kg) | kg | 0.5095 | | | |
| Waste plastic, mixture \| treatment of waste plastic, mixture, sanitary landfill (kg) | kg | 0.2376 | | | |
| Landfilling of plastic mixture (kg) | kg | 0.007315 | | | |
| Landfilling of copper (kg) | kg | 0.002508 | | | |

| Benefits and loads beyond the system boundaries (D) | Unit | Value | | | |
|---|---|---|---|---|---|
| Substitution of primary metals with net scrap from PWB, with components (kg) | kg | 0.04239 | | | |
| Substitution of electricity, in Norway (MJ) | MJ | 0.0001156 | | | |
| Substitution of thermal energy, district heating, in Norway (MJ) | MJ | 0.000239 | | | |
| Substitution of primary steel with net scrap (kg) | kg | 2.07 | | | |
| Substitution of primary copper with net scrap (kg) | kg | 0.0003992 | | | |

## 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 | B1 | B2 | B3 |
| | GWP-total | kg $CO_2$ -eq | 2.17E+01 | 1.60E-01 | 2.40E+00 | 2.11E-01 | 4.90E-01 | 0 | 0 | 0 |
| | GWP-fossil | kg $CO_2$ -eq | 2.20E+01 | 1.60E-01 | 1.48E+00 | 2.11E-01 | 6.60E-03 | 0 | 0 | 0 |
| | GWP-biogenic | kg $CO_2$ -eq | -3.28E-01 | 9.63E-05 | 9.11E-01 | 1.63E-04 | 4.84E-01 | 0 | 0 | 0 |
| | GWP-luluc | kg $CO_2$ -eq | 3.84E-02 | 6.41E-05 | 3.56E-04 | 7.57E-05 | 2.22E-06 | 0 | 0 | 0 |
| | ODP | kg CFC11 -eq | 4.04E-07 | 2.47E-09 | 5.56E-08 | 4.44E-09 | 1.31E-10 | 0 | 0 | 0 |
| | AP | mol H+ -eq | 1.52E-01 | 1.48E-03 | 3.48E-03 | 4.39E-04 | 2.48E-05 | 0 | 0 | 0 |
| | EP-FreshWater | kg P -eq | 1.92E-02 | 9.09E-06 | 1.72E-04 | 1.42E-05 | 4.71E-07 | 0 | 0 | 0 |
| | EP-Marine | kg N -eq | 2.68E-02 | 3.68E-04 | 7.13E-04 | 1.05E-04 | 9.66E-06 | 0 | 0 | 0 |
| | EP-Terrestial | mol N -eq | 2.93E-01 | 4.07E-03 | 7.13E-03 | 1.14E-03 | 9.74E-05 | 0 | 0 | 0 |
| | POCP | kg NMVOC -eq | 9.51E-02 | 1.33E-03 | 3.52E-03 | 7.30E-04 | 3.64E-05 | 0 | 0 | 0 |
| | ADP-minerals&metals[1] | kg Sb-eq | 3.90E-03 | 4.24E-07 | 1.28E-05 | 7.02E-07 | 2.13E-08 | 0 | 0 | 0 |
| | ADP-fossil[1] | MJ | 2.97E+02 | 2.17E+00 | 2.10E+01 | 2.97E+00 | 8.74E-02 | 0 | 0 | 0 |
| | WDP[1] | $m^3$ | 8.59E+00 | 9.52E-03 | 1.47E-01 | 1.47E-02 | 2.24E-03 | 0 | 0 | 0 |

| **Indicator** | | **Unit** | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | GWP-total | kg $CO_2$ -eq | 0 | 0 | 3.83E+02 | 0 | 3.53E-02 | 2.11E-01 | 7.56E-01 | 6.34E-02 | -3.50E+00 |
| | GWP-fossil | kg $CO_2$ -eq | 0 | 0 | 3.83E+02 | 0 | 3.51E-02 | 2.11E-01 | 7.55E-01 | 6.33E-02 | -3.48E+00 |
| | GWP-biogenic | kg $CO_2$ -eq | 0 | 0 | 2.55E-01 | 0 | 1.31E-04 | 1.63E-04 | 6.09E-04 | 2.11E-05 | -2.28E-02 |
| | GWP-luluc | kg $CO_2$ -eq | 0 | 0 | 4.05E-02 | 0 | 7.08E-05 | 7.57E-05 | 2.37E-04 | 1.52E-04 | -5.81E-03 |
| | ODP | kg CFC11 -eq | 0 | 0 | 1.95E-05 | 0 | 2.43E-10 | 4.44E-09 | 1.16E-09 | 5.17E-10 | -1.35E-07 |
| | AP | mol H+ -eq | 0 | 0 | 1.02E+00 | 0 | 1.81E-04 | 4.39E-04 | 5.24E-04 | 1.86E-04 | -1.51E-01 |
| | EP-FreshWater | kg P -eq | 0 | 0 | 3.95E-02 | 0 | 1.59E-05 | 1.42E-05 | 1.42E-05 | 1.18E-05 | -8.12E-03 |
| | EP-Marine | kg N -eq | 0 | 0 | 2.24E-01 | 0 | 3.45E-05 | 1.05E-04 | 1.69E-04 | 5.61E-04 | -8.70E-03 |
| | EP-Terrestial | mol N -eq | 0 | 0 | 2.32E+00 | 0 | 3.50E-04 | 1.14E-03 | 1.53E-03 | 5.70E-04 | -1.11E-01 |
| | POCP | kg NMVOC -eq | 0 | 0 | 7.67E-01 | 0 | 1.04E-04 | 7.30E-04 | 5.08E-04 | 2.12E-04 | -3.35E-02 |
| | ADP-minerals&metals[1] | kg Sb-eq | 0 | 0 | 3.51E-03 | 0 | 1.99E-07 | 7.02E-07 | 5.43E-07 | 8.28E-08 | -2.53E-03 |
| | ADP-fossil[1] | MJ | 0 | 0 | 8.72E+03 | 0 | 4.54E-01 | 2.97E+00 | 1.10E+00 | 5.76E-01 | -4.76E+01 |
| | WDP[1] | $m^3$ | 0 | 0 | 6.27E+01 | 0 | 8.87E-03 | 1.47E-02 | 5.89E-02 | 1.49E-02 | -1.85E+00 |

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"

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

The LCA results in the EPD are calculated using a specific methodological approach for accounting energy resources, see the additional requirements section for more information. In this EPD the following approach was used: Location-based approach. Market-based approach.

A mixture of market and location based approaches for electricity has been used in the development of this EPD.
Thorlux Lighting purchases renewable power with Guarantees of Origin as well as producing electricity through onsite PV panels. The guarantees of origin fall under the category of market-based and the onsite PV generation is listed under location-based electricity.

## Additional environmental impact indicators

| Indicator | | Unit | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 |
|---|---|---|---|---|---|---|---|---|---|---|
| | PM | Disease incidence | 1.51E-06 | 8.52E-09 | 2.82E-08 | 1.56E-08 | 5.08E-10 | 0 | 0 | 0 |
| | IRP[2] | kgBq U235 -eq | 2.14E+00 | 2.33E-03 | 1.92E-02 | 3.83E-03 | 1.23E-04 | 0 | 0 | 0 |
| | ETP-fw[1] | CTUe | 4.78E+02 | 2.55E-01 | 2.90E+00 | 3.95E-01 | 5.81E-02 | 0 | 0 | 0 |
| | HTP-c[1] | CTUh | 3.19E-08 | 0.00E+00 | 3.38E-10 | 0.00E+00 | 1.00E-12 | 0 | 0 | 0 |
| | HTP-nc[1] | CTUh | 6.82E-07 | 1.24E-09 | 1.25E-08 | 2.22E-09 | 1.18E-10 | 0 | 0 | 0 |
| | SQP[1] | dimensionless | 1.28E+02 | 1.02E+00 | 2.76E+00 | 1.79E+00 | 5.05E-02 | 0 | 0 | 0 |

| Indicator | | Unit | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PM | Disease incidence | 0 | 0 | 4.31E-06 | 0 | 1.58E-09 | 1.56E-08 | 3.79E-09 | 4.16E-09 | -4.15E-07 |
| | IRP[2] | kgBq U235 -eq | 0 | 0 | 2.40E+02 | 0 | 4.74E-03 | 3.83E-03 | 5.04E-03 | 1.80E-03 | -5.25E-01 |
| | ETP-fw[1] | CTUe | 0 | 0 | 5.77E+02 | 0 | 9.42E-02 | 3.95E-01 | 1.55E+00 | 3.39E+01 | -1.75E+02 |
| | HTP-c[1] | CTUh | 0 | 0 | 7.45E-08 | 0 | 6.00E-12 | 0.00E+00 | 7.08E-10 | 3.80E-11 | -9.25E-09 |
| | HTP-nc[1] | CTUh | 0 | 0 | 3.36E-06 | 0 | 3.36E-10 | 2.22E-09 | 5.11E-09 | 6.95E-10 | -3.27E-07 |
| | SQP[1] | dimensionless | 0 | 0 | 8.13E+02 | 0 | 8.88E-02 | 1.79E+00 | 3.64E-01 | 1.07E+00 | -3.10E+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"

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 | B1 | B2 | B3 |
|---|---|---|---|---|---|---|---|---|---|---|
| | PERE | MJ | 3.46E+01 | 3.24E-02 | 6.34E+00 | 5.19E-02 | 1.72E-03 | 0 | 0 | 0 |
| | PERM | MJ | 3.93E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -3.93E+00 | 0 | 0 | 0 |
| | PERT | MJ | 3.85E+01 | 3.24E-02 | 6.34E+00 | 5.19E-02 | -3.93E+00 | 0 | 0 | 0 |
| | PENRE | MJ | 2.82E+02 | 2.17E+00 | 2.10E+01 | 2.97E+00 | 8.74E-02 | 0 | 0 | 0 |
| | PENRM | MJ | 1.48E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -2.23E-01 | 0 | 0 | 0 |
| | PENRT | MJ | 2.97E+02 | 2.17E+00 | 2.10E+01 | 2.97E+00 | -1.36E-01 | 0 | 0 | 0 |
| | SM | kg | 4.43E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 |
| | RSF | MJ | 7.85E-02 | 1.00E-05 | 5.09E+00 | 1.74E-05 | 6.17E-07 | 0 | 0 | 0 |
| | NRSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 |
| | FW | $m^3$ | 2.24E-01 | 2.57E-04 | 8.71E-03 | 4.04E-04 | 4.04E-05 | 0 | 0 | 0 |

| Indicator | | Unit | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PERE | MJ | 0 | 0 | 2.85E+02 | 0 | 6.94E-02 | 5.19E-02 | 1.31E-01 | 1.35E-01 | -7.00E+00 |
| | PERM | MJ | 0 | 0 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | PERT | MJ | 0 | 0 | 2.85E+02 | 0 | 6.94E-02 | 5.19E-02 | 1.31E-01 | 1.35E-01 | -7.00E+00 |
| | PENRE | MJ | 0 | 0 | 8.72E+03 | 0 | 4.54E-01 | 2.97E+00 | 1.10E+00 | 5.76E-01 | -4.76E+01 |
| | PENRM | MJ | 0 | 0 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | -1.46E+01 | 0.00E+00 | 0.00E+00 |
| | PENRT | MJ | 0 | 0 | 8.72E+03 | 0 | 4.54E-01 | 2.97E+00 | -1.35E+01 | 5.76E-01 | -4.76E+01 |
| | SM | kg | 0 | 0 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -2.34E+00 |
| | RSF | MJ | 0 | 0 | 4.88E-03 | 0 | 6.77E-07 | 1.74E-05 | 5.38E-05 | 2.30E-05 | -4.66E-04 |
| | NRSF | MJ | 0 | 0 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -7.22E-06 |
| | FW | $m^3$ | 0 | 0 | 1.50E+00 | 0 | 2.48E-04 | 4.04E-04 | 1.20E-03 | 1.95E-04 | -5.23E-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"

## End of life - Waste

| Indicator | | Unit | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 |
|---|---|---|---|---|---|---|---|---|---|---|
| | HWD | kg | 4.16E+00 | 3.04E-03 | 5.85E-02 | 4.31E-03 | 1.19E-04 | 0 | 0 | 0 |
| | NHWD | kg | 7.02E+01 | 5.90E-02 | 5.66E-01 | 9.10E-02 | 2.76E-02 | 0 | 0 | 0 |
| | RWD | kg | 5.03E-04 | 2.84E-06 | 4.56E-06 | 9.51E-07 | 2.62E-08 | 0 | 0 | 0 |

| Indicator | | Unit | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | HWD | kg | 0 | 0 | 1.01E+01 | 0 | 4.82E-03 | 4.31E-03 | 9.37E-04 | 1.44E-01 | -1.23E+00 |
| | NHWD | kg | 0 | 0 | 2.13E+02 | 0 | 7.62E-02 | 9.10E-02 | 5.66E-01 | 7.57E-01 | -1.55E+01 |
| | RWD | kg | 0 | 0 | 5.04E-02 | 0 | 1.16E-06 | 9.51E-07 | 5.23E-07 | 0.00E+00 | -1.33E-04 |

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"

## End of life - Output flow

| Indicator | | Unit | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 |
|---|---|---|---|---|---|---|---|---|---|---|
| | CRU | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 |
| | MFR | kg | 4.30E-03 | 0.00E+00 | 6.16E-01 | 0.00E+00 | 3.33E-01 | 0 | 0 | 0 |
| | MER | kg | 6.15E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 |
| | EEE | MJ | 2.69E-03 | 0.00E+00 | 1.75E-04 | 0.00E+00 | 4.43E-06 | 0 | 0 | 0 |
| | EET | MJ | 9.57E-04 | 0.00E+00 | 1.26E-04 | 0.00E+00 | 4.31E-06 | 0 | 0 | 0 |

| Indicator | | Unit | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CRU | kg | 0 | 0 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | MFR | kg | 0 | 0 | 0.00E+00 | 0 | 3.55E-05 | 0.00E+00 | 8.40E-01 | 0.00E+00 | 0.00E+00 |
| | MER | kg | 0 | 0 | 0.00E+00 | 0 | 2.18E-08 | 0.00E+00 | 2.50E-01 | 0.00E+00 | 0.00E+00 |
| | EEE | MJ | 0 | 0 | 0.00E+00 | 0 | 4.25E-04 | 0.00E+00 | 2.13E-04 | 1.06E-04 | 0.00E+00 |
| | EET | MJ | 0 | 0 | 0.00E+00 | 0 | 2.91E-05 | 0.00E+00 | 1.66E-04 | 2.55E-04 | 0.00E+00 |

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"

## Biogenic Carbon Content

| Indicator | Unit | At the factory gate |
|---|---|---|
| Biogenic carbon content in product | kg C | 5.52E-05 |
| Biogenic carbon content in accompanying packaging | kg C | 1.32E-01 |

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

## Additional requirements

### Transparent reporting of energy

The EPD presents environmental impact categories in the main results tables using a specific methodological approach for accounting energy resources. To ensure transparency and support informed interpretation, the table below explains the implications of the chosen methodology. It illustrates the GWP-total for energy resources used in the manufacturing stage, comparing the location-based and market-based approaches. In this EPD the following approach was used in main result tables: Location-based approach. Market-based approach.

| Electricity mix | Source | Amount | Unit | GWPtotal [kg CO2/Unit] | SUM [kg CO2] |
|---|---|---|---|---|---|
| **Location-based approach.** | | | | | |
| Electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, panel, mounted (kWh)\| electricity, low voltage - GB - ecoinvent 3.10.1 | ecoinvent 3.10.1 | 6.88E-01 | kWh | 8.04E-02 | 5.53E-02 |
| Electricity, United Kingdom, low voltage | ecoinvent 3.10.1 | 2.03E+00 | kWh | 2.61E-01 | 5.30E-01 |
| **Market-based approach.** | | | | | |
| Electricity with GoO, low voltage (61.3% biomass/38.2% wind/0.4% solar) (kWh) - GB - ecoinvent 3.11 | ecoinvent 3.11 | 2.03E+00 | kWh | 5.40E-01 | 1.10E+00 |
| Electricity, United Kingdom, low voltage, residual mix | ecoinvent 3.10 | 6.88E-01 | kWh | 4.53E-01 | 3.12E-01 |

"Reading example: 9.0 E-03 = 9.0*10-3 = 0.009"

### Dangerous substances

The product contains substances given by the REACH Candidate list that are less than 0,1 % by weight.

### 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 | B1 | B2 | B3 |
| GWPIOBC | kg $CO_2$ -eq | 2.21E+01 | 1.60E-01 | 1.52E+00 | 2.11E-01 | 6.61E-03 | 0 | 0 | 0 |

| **Indicator** | **Unit** | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| GWPIOBC | kg $CO_2$ -eq | 0 | 0 | 3.83E+02 | 0 | 3.53E-02 | 2.11E-01 | 7.55E-01 | 6.34E-02 | -3.49E+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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