

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

ADONIS IP67

LED Linear™



EPD HUB, EPD number HUB-6825

Published on 27.06.2026, last updated on 27.06.2026, valid until 26.06.2031

Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1.

GENERAL INFORMATION

MANUFACTURER

Manufacturer	LED Linear GmbH
Address	Dr.-Alfred-Herrhausen-Allee 20-22 47228 Duisburg, Germany
Contact details	info@led-linear.com
Website	www.led-linear.com

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR Version 1.2, 24 Mar 2025
Sector	Electrical product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with options, A4-A5, B6, and modules C1-C4, D
EPD author	Anne Krause, LED Linear GmbH
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☒ External verification
EPD verifier VP-055	Vera Durão, as an authorised verifier acting for EPD Hub Limited

This EPD is intended for business-to-business and/or business-to-consumer communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	ADONIS IP67
Place(s) of raw material origin	Europe, Asia
Place of production	Duisburg, Germany
Place(s) of installation and use	Global
Period for data	Jan-Dec 2025
Averaging in EPD	Multiple products
Variation in GWP-fossil for A1-A3 (%)	0.84
GTIN (Global Trade Item Number)	n/a
NOBB (Norwegian Building Product Database)	n/a
A1-A3 Specific data (%)	41.1

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 unit of 1014 mm
Declared unit mass	0.713 kg
Mass of packaging	0.242 kg
GWP-fossil, A1-A3 (kgCO ₂ e)	9.69
GWP-total, A1-A3 (kgCO ₂ e)	9.51
Secondary material, inputs (%)	4.19
Total energy use, A1-A3 (kWh)	42.8
Net freshwater use, A1-A3 (m ³)	0.14

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

LED Linear™ was founded in 2006 and supplies high quality linear LED lighting solutions based on flexible printed circuit boards worldwide. LED Linear™ offers a cost effective, unique modular LED tool kit for interior or exterior linear lighting solutions - from accent and architectural to general lighting - with an ingress protection of up to IP68. Internationally recognized awards and reference projects, including innovative lighting solutions for decorative or architectural applications, prove the high-quality manufacturing philosophy.

LED Linear™ is part of the Fagerhult Group, one of Europe's leading lighting companies, with 12 different brands and 4,100 employees in 27 countries around the world.

PRODUCT DESCRIPTION

Miniaturized design meets architectural scales: Its exceptional integration makes ADONIS IP67 an excellent choice for grazing applications and direct illumination on facades and ceilings.

It is IK08 (general), respectively IK10 (in-ground installation) certified and therefore particularly robust against environmental impacts. The utilized polyurethane makes it highly resistant against salt water and UV-light, it features a 5 times higher chemical resistance, and a 10 times lower water transmission compared to typical silicones for LED applications in the relevant temperature range. The profile comes with a small cross section and is available in three colors.

ADONIS IP67 allows the use of 10° grazing and 30° or 60° general illumination optics as well as opal encapsulation, guaranteeing a targeted illumination. Translucent end caps allow for seamless light lines while solid endcaps eliminate light spills at both ends. It can be freely scaled in length and equipped with a range of light sources - from static white to tunable white and RGBW, coming with an efficiency of up to 130 lm/W and a maximum luminous flux of 4730 lm/m.

It is perfectly suited for the accentuation of structured façades and walls, as well as for highlighting architectural details on buildings, windows and gables.

This study includes all variations of ADONIS IP67, whereas colouring of the luminaire, as well as type of light engine, including power class and emitted light colour do not change the results in environmental impact. Only variation taken into account impacting the result of GWP-fossil for A1-A3 is the variation in optical system with opal encapsulation versus an optical lens with a clear encapsulation (variation of 0.3 %). Differences in power class correlate directly with the result of the use phase in B6.

The reference service life of ADONIS IP67 is 20 years.

Further information can be found at: www.led-linear.com

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	62.51	Europe, Asia
Minerals	0.04	Asia
Fossil materials	37.45	Europe
Bio-based materials	0.00	n/a

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

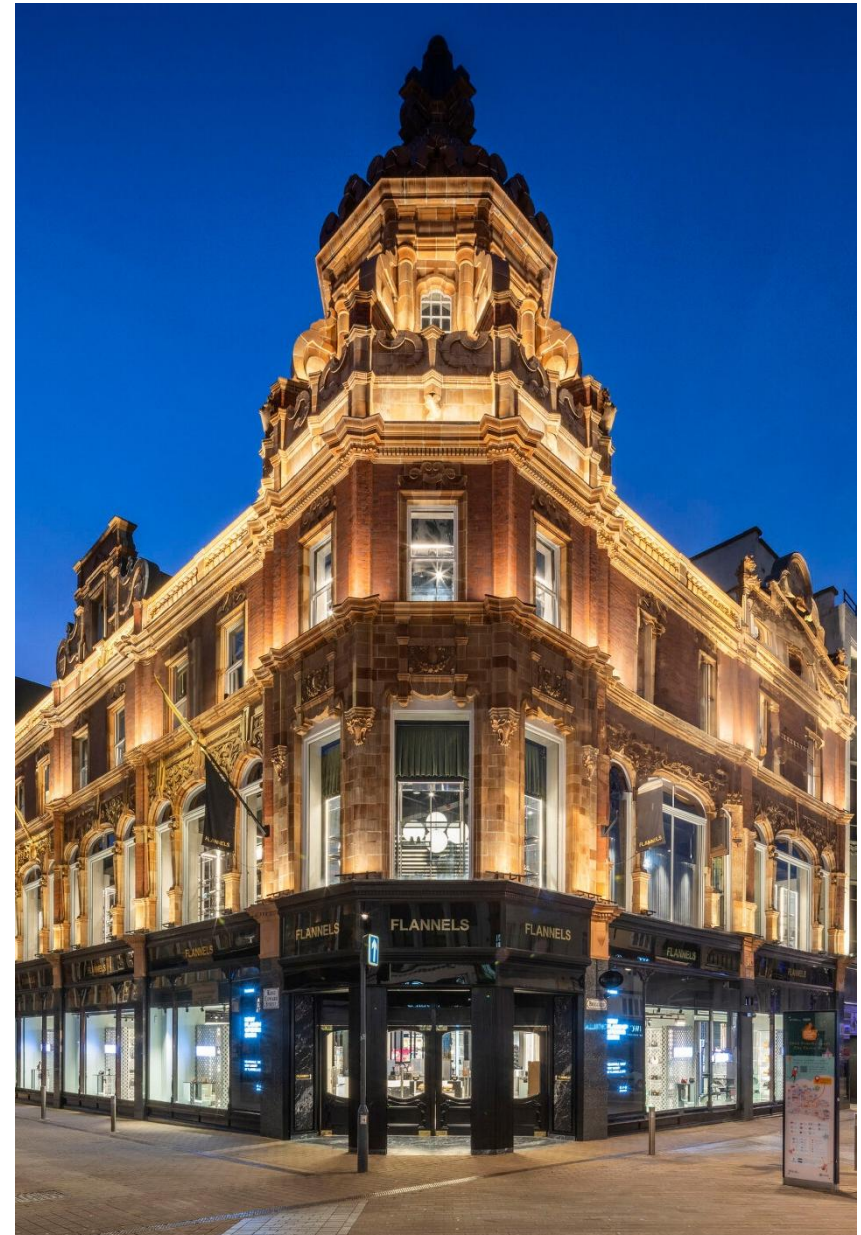
Biogenic carbon content in product, kg C	0.00
Biogenic carbon content in packaging, kg C	0.0669

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 unit of 1014 mm
Mass per declared unit	0.713 kg
Functional unit	Provide lighting that delivers an outgoing artificial luminous flux of 920 lumens during a reference life of 58,400 hours
Reference service life	20 years with 8 hours/day; based on conservative interpretation of lifetime data (L80/B10 > 60,000 hours)

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0.1 % (1000 ppm).



PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage								End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D			
x	x	x	x	x	ND	ND	ND	ND	ND	x	ND	x	x	x	x	x			
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling	

Not declared = ND.

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. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission. A market-based approach is used in modelling the electricity mix utilized in the factory.

The product is made of metals, plastics, and electronic components. The materials are transported to LED Linear's production facility in Duisburg. The transport distances used for the calculations correspond to the distances to the sites of our direct suppliers, taking into account the mode of transport. The aluminium profile is cut to size and the LED tape with the corresponding connectors and plugs is glued in manually.

The luminaire is further assembled by inserting the pre-fitted optical components and endcaps, followed by encapsulation with polyurethane. All manufacturing processes take place on-site in Duisburg.

The finished product is packaged in polyethylene wrapping and corrugated cardboard boxes before being sent to the installation site. Primarily additive manufacturing processes lead to minimal losses, which are taken into account in the calculations. Manufacturing losses and wastes are calculated accordingly and the total amount of waste in kg is allocated to the total annual production in kg. Thus, it is possible to allocate the data according to the weight of the product analysed in this study.

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.

Transportation distance is defined according to the PCR. Average distance of transportation from production plant to building site in Europe is assumed as 3,500 km and the transportation method is assumed to be lorry. For transportation from production plant to building site outside of Europe, the average distance is assumed to be 19,000 km with assumed transportation method by ship plus 1,000 km by lorry. Vehicle capacity utilization volume factor is assumed to be 100 % which means full load. In reality, it may vary but as role of transportation emissions in total results is small, the variety in load is assumed to be negligible. Empty returns are not taken into account as it is assumed that the return trip is used by the transportation company to serve the needs of other clients. Transportation does not cause losses as products are packaged properly. Also, volume capacity utilisation factor is assumed to be 100 % for the nested packaged products. Transportation impacts that occur from delivery of the product cover direct exhaust emissions of fuel, environmental impacts of fuel production, as well as related infrastructure emissions.

Environmental impacts from installation into the building include waste packaging materials (A5) and release of biogenic carbon dioxide from cardboard. It is assumed that the installation waste is collected separately and transported to the waste treatment center. Transportation distance to treatment is assumed as 50 km and the transportation method is assumed to be lorry (C2). According to EN 50693:2019, the sequence of treatment operations occurring to the product shall include de-pollution, fractions separation and preparation (dismantling, crushing, shredding, sorting), recycling, other material recovery, energy recovery and disposal. In this study, the default values from table G.4 of EN 50693 are used for treating materials in different waste treatment methods. The impacts of energy consumption and the used ancillary materials during installation are considered negligible.

PRODUCT USE AND MAINTENANCE (B1-B7)

During the use phase, the product consumes electricity. The calculations are based on the electricity grid mixes (B6) of the averaged locations of operation. Impacts due to electricity production include direct emissions to air, transformation and transmission losses. The service life is assumed to be 20 years with 8 daily operational hours.

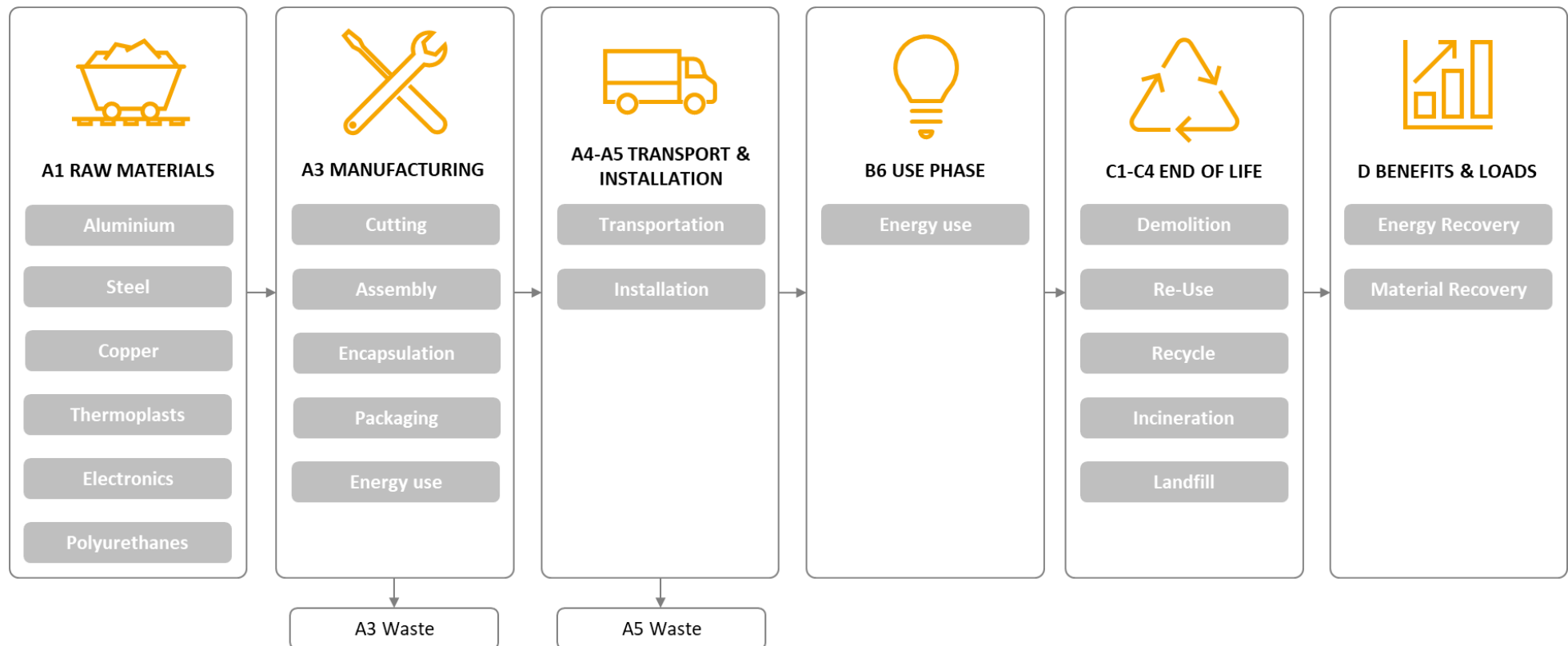
The representative model of ADONIS IP67 regarded in this study has a power consumption of 15 W/m. Possible variants have power consumptions ranging from 4 W/m to 40 W/m, which impacts the energy use in B6.

On average, five of this 24 VDC luminaire are operated by one power supply unit. This assumption was considered as the generic case in this study. No production-related inputs/outputs have been omitted in this study. Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

Consumption of energy and natural resources in demolition process are assumed to be negligible. It is assumed that the waste is collected separately and transported to the waste treatment center. Transportation distance to treatment is assumed as 50 km and the transportation method is assumed to be lorry (C2). According to EN 50693:2019, the sequence of treatment operations occurring to the product shall include de-pollution, fractions separation and preparation (dismantling, crushing, shredding, sorting), recycling, other material recovery, energy recovery and disposal. In this study, the default values from table G.4 of EN 50693 are used for treating materials in different waste treatment methods. Percentages assumed for waste treatment of different materials are: 70 % recycling, 30 % landfill for aluminium, 50 % energy recovery, 50 % landfill for plastics such as PMMA, PVC, and PU, 60 % recycling, 40 % landfill for copper, 40 % recycling, 37 % incineration, and 23 % landfill for PE, 80 % recycling, 20 % landfill for steel, 20 % recycling, 40 % energy recovery, and 40 % landfill for ABS, and 100 % landfill for silica sand. Due to the material and energy recovery potential of parts in the lighting system, the end-of-life product is converted into recycled raw materials, while the energy recovered from incineration displaces electricity and heat production (D). Plastic packaging used during transportation is also incinerated for energy recovery and/or recycled. The benefits and loads of incineration and recycling are included in module D. The benefits of recycling aluminium have only been accounted for in virgin aluminium, not in the recycled content of the raw material.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1 % of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

All industrial processes from raw material acquisition and pre-processing, production, product distribution, installation, use/application of product and end-of-life management are included. For easier modelling and because of lack of accuracy in available modelling resources many constituents under 0.1% of product mass are excluded. These include some additives and fasteners which are present in the product only in very small amounts and have no serious impact on the emissions. Further, water used for cleaning and maintenance of the equipment, transportation and waste streams of the packaging materials used for delivering the raw materials to the factory are omitted since the quantified mass contribution is less than 0.1%. The production of capital equipment, construction activities, and infrastructure, personnel-related activities, energy and water use related to company management and sales activities are excluded.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2.

Upstream process calculations rely on generic data as defined in the Bibliography section.

Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	Physical properties
Ancillary material	Not applicable
Manufacturing energy and waste	Physical properties

This LCA study is conducted in accordance with all methodological considerations, such as performance, system boundaries, data quality, allocation procedures, and decision rules to evaluate inputs and outputs. Allocation used in Ecoinvent 3.6 environmental data sources follow the methodology 'allocation, cut-off by classification'. This methodology is in line with the requirements of the EN 15804-standard. All estimations and assumptions regarding the cut-off criteria and the allocation are declared in the part "Cut-off Criteria" except the estimations/assumptions below:

- Module A2, A4 & C2: Vehicle capacity utilization volume factor is assumed to be 1 which means full load. It may vary but as the role of transportation emission in total results is small, the variety in load is assumed to be negligible. Empty returns are not considered as it is assumed that return trip is used by transportation companies to serve the needs of other clients.

- Module A4: Transportation does not cause losses as products are packaged properly. Also, volume capacity utilization factor is assumed to be 1 for the nested packaged products. Additionally, transportation distances are based on a sales volume-based weighted average and a lorry is the assumed vehicle type used.

- Module B6: The necessary electricity consumption for 20 years is included assuming product is operated daily for 8 hours.

- Module C2: Transportation distance to e-waste handling facility is estimated as 50 km and the transportation method is assumed as lorry.

- Module C3, C4, D: The product undergoes dismantling, and the parts are sorted into metals, plastics, paint and electronics. The waste treatment percentages based on EN 50693 are assumed to be applicable. Module C3 accounts for energy and resource inputs for sorting and treating these waste streams for recycling and incineration with energy recovery. Ash from recycling processes is negligible. The recycled end-of-life materials are assumed to serve as secondary raw materials in manufacturing, while incinerated materials displace the need for electricity and heat production.

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	Multiple products
Grouping method	Based on a representative product
Variation in GWP-fossil for A1-A3, %	0.84

This EPD is product and factory specific.

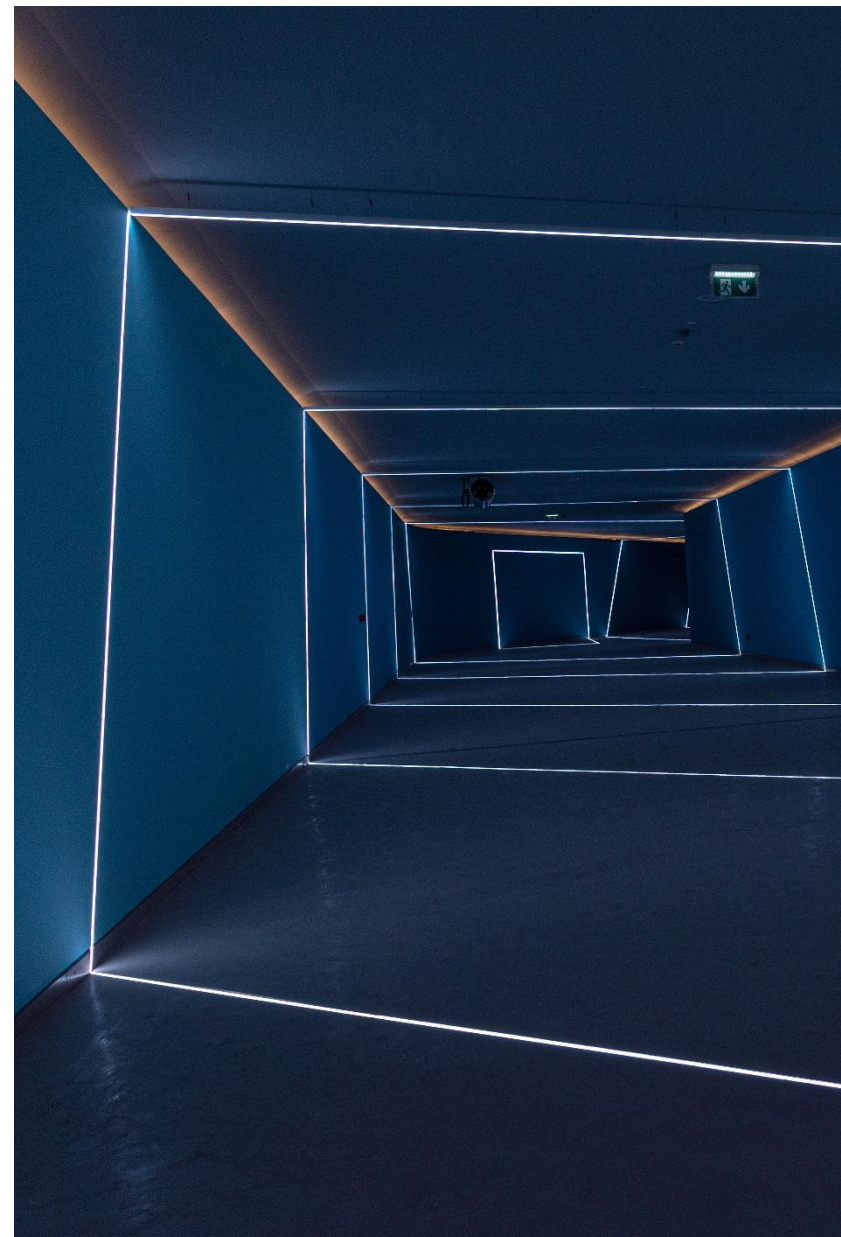
All products of ADONIS IP67 family are represented by this EPD and as representative, ADONIS OL IP67 in 1,014 mm length with a 15 W/m LED tape was chosen. All products represented are manufactured by LED Linear GmbH in Duisburg.

The range of products includes luminaires with either an opal encapsulation or a linear lens with a 10°, 30° or 60° beam angle. An additional glashield embedded in the encapsulation is optional. Mounting variations are using an adjustable arm, recessed installation with an inground frame or surface installation. These constructional differences affect the GWP impact of the raw materials (A1-A3). Maximum deviation from the representative is 0.84 %. Variations in profile color are white, grey, and black. Different light engines are represented with power classes from 4 W/m to 40 W/m and light colors in the ranges of static white (1,800-5,000 K), tunable white (TW) or RGBW. These differences do not affect the raw material composition. The choice of power class affects the energy consumption of the use phase (B6). Regardless of the power class, on average, five of this 24 VDC luminaire are operated by one power supply unit. This assumption was considered as the generic case in this study.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator for EPD Hub V3 and EPD Process Certification v3.2.5. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1/3.11/3.12 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11/3.12 environmental data sources follow the methodology 'allocation, Cut-off, EN 15804+A2'.

- EPD Hub Core Product Category Rules version 1.2, March 2025
- EPD Hub General Program Instructions version 1.3, March 2025
- EN 15804:2012+A2:2019/AC:2021 *Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products*
- EN 50693:2020 *Product category rules for life cycle assessments of electronic and electrical products and systems*
- EN 15941:2024 *Sustainability of construction works - Data quality for environmental assessment of products and construction work - Selection and use of data*
- EN 15942:2011 *Sustainability of construction works - Environmental product declarations - Communication format business-to-business*
- ISO 14025:2006 *Environmental statements and programmes for products - Principles and general requirements*
- ISO 14040:2006 *Environmental management - Life cycle assessment - Principles and framework*
- ISO 14044:2006 *Environmental management - Life cycle assessment - Requirements and guidelines*
- Paper and cardboard packaging waste treatment: EUROSTAT
- Wooden packaging waste treatment: EUROSTAT
- Plastic packaging waste treatment: EUROSTAT



ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ¹⁾	kg CO ₂ e	5,57E+00	1,06E-01	3,84E+00	9,51E+00	1,34E+00	3,00E-01	ND	ND	ND	ND	ND	2,85E+02	ND	0,00E+00	1,81E-02	4,98E-02	3,51E-01	-4,74E+00
GWP – fossil	kg CO ₂ e	5,50E+00	1,06E-01	4,08E+00	9,69E+00	1,34E+00	5,53E-02	ND	ND	ND	ND	ND	2,83E+02	ND	0,00E+00	1,81E-02	4,97E-02	3,51E-01	-4,72E+00
GWP – biogenic	kg CO ₂ e	0,00E+00	0,00E+00	-2,44E-01	-2,44E-01	3,06E-04	2,44E-01	ND	ND	ND	ND	ND	6,41E-01	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWP – LULUC	kg CO ₂ e	6,38E-02	4,37E-05	2,05E-03	6,59E-02	6,06E-04	9,99E-06	ND	ND	ND	ND	ND	8,80E-01	ND	0,00E+00	9,63E-06	3,34E-05	7,59E-06	-1,92E-02
Ozone depletion pot.	kg CFC-11e	9,98E-08	1,97E-09	7,80E-08	1,80E-07	2,34E-08	1,24E-10	ND	ND	ND	ND	ND	4,91E-06	ND	0,00E+00	2,41E-10	2,07E-10	3,24E-10	-1,68E-08
Acidification potential	mol H ⁺ e	3,85E-02	3,24E-04	9,34E-03	4,82E-02	7,30E-03	5,69E-05	ND	ND	ND	ND	ND	1,44E+00	ND	0,00E+00	5,83E-05	1,97E-04	2,33E-04	-3,43E-02
EP-freshwater ²⁾	kg Pe	3,03E-03	8,32E-06	1,72E-03	4,75E-03	1,05E-04	3,04E-06	ND	ND	ND	ND	ND	2,53E-01	ND	0,00E+00	1,66E-06	1,39E-05	2,10E-06	-6,82E-03
EP-marine	kg Ne	5,49E-03	1,03E-04	2,87E-03	8,46E-03	2,04E-03	3,67E-05	ND	ND	ND	ND	ND	2,51E-01	ND	0,00E+00	1,73E-05	2,85E-05	1,76E-03	-5,28E-03
EP-terrestrial	mol Ne	5,17E-02	1,12E-03	2,83E-02	8,12E-02	2,24E-02	1,86E-04	ND	ND	ND	ND	ND	2,18E+00	ND	0,00E+00	1,88E-04	3,16E-04	1,19E-03	-4,61E-02
POCP (“smog”) ³⁾	kg NMVOCe	2,08E-02	4,90E-04	8,67E-03	2,99E-02	8,03E-03	7,02E-05	ND	ND	ND	ND	ND	7,22E-01	ND	0,00E+00	7,57E-05	9,90E-05	3,05E-04	-1,45E-02
ADP-minerals & metals ⁴⁾	kg Sbe	1,52E-04	4,23E-07	4,23E-06	1,57E-04	5,50E-06	7,85E-08	ND	ND	ND	ND	ND	6,33E-04	ND	0,00E+00	7,88E-08	1,23E-06	4,08E-08	-3,88E-05
ADP-fossil resources	MJ	8,79E+01	1,49E+00	5,11E+01	1,41E+02	1,83E+01	1,36E-01	ND	ND	ND	ND	ND	6,70E+03	ND	0,00E+00	2,47E-01	2,88E-01	2,31E-01	-4,54E+01
Water use ⁵⁾	m ³ e depr.	6,06E+00	8,21E-03	3,68E-01	6,44E+00	9,75E-02	3,79E-03	ND	ND	ND	ND	ND	1,74E+02	ND	0,00E+00	1,27E-03	7,02E-03	2,75E-02	-1,18E+00

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO₄e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	3,57E-07	7,35E-09	4,41E-08	4,08E-07	7,49E-08	2,09E-09	ND	ND	ND	ND	ND	5,05E-06	ND	0,00E+00	1,09E-09	3,59E-09	1,37E-09	-2,23E-07
Ionizing radiation ⁶⁾	kBq 1235e	9,53E-01	2,39E-03	4,50E-02	1,00E+00	2,75E-02	2,85E-04	ND	ND	ND	ND	ND	1,87E+02	ND	0,00E+00	2,37E-04	1,27E-03	2,69E-04	-4,81E-02
Ecotoxicity (freshwater)	CTUe	2,54E+02	2,49E-01	2,60E+02	5,15E+02	3,26E+00	2,38E+00	ND	ND	ND	ND	ND	7,07E+02	ND	0,00E+00	5,14E-02	1,76E+00	1,57E+03	-1,08E+02
Human toxicity, cancer	CTUh	8,51E-09	1,90E-11	3,86E-10	8,91E-09	2,49E-10	1,74E-11	ND	ND	ND	ND	ND	5,89E-08	ND	0,00E+00	3,29E-12	1,74E-11	3,23E-11	-2,50E-09
Human tox. non-cancer	CTUh	1,37E-07	9,21E-10	1,87E-08	1,57E-07	1,06E-08	6,18E-10	ND	ND	ND	ND	ND	2,53E-06	ND	0,00E+00	1,50E-10	1,11E-09	1,50E-09	-7,61E-08
SQP7)	-	1,34E+01	8,74E-01	3,08E+01	4,50E+01	7,19E+00	8,83E-02	ND	ND	ND	ND	ND	1,14E+03	ND	0,00E+00	1,04E-01	3,15E-01	2,12E-01	-2,65E+01

6) EN 15804+A2 disclaimer for ionizing radiation, human health. 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; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁸⁾	MJ	2,00E+01	3,18E-02	2,08E+00	2,21E+01	3,85E-01	-3,29E+00	ND	ND	ND	ND	ND	1,57E+03	ND	0,00E+00	4,34E-03	4,25E-02	5,27E-03	-8,63E+00
Renew. PER as material	MJ	0,00E+00	0,00E+00	3,40E+00	3,40E+00	0,00E+00	-3,40E+00	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renew. PER	MJ	2,00E+01	3,18E-02	5,47E+00	2,55E+01	3,85E-01	-6,69E+00	ND	ND	ND	ND	ND	1,57E+03	ND	0,00E+00	4,34E-03	4,25E-02	5,27E-03	-8,63E+00
Non-re. PER as energy	MJ	8,08E+01	1,49E+00	4,99E+01	1,32E+02	1,83E+01	-1,16E+00	ND	ND	ND	ND	ND	6,70E+03	ND	0,00E+00	2,47E-01	2,52E-01	-8,45E+00	-4,54E+01
Non-re. PER as material	MJ	2,61E+00	0,00E+00	1,24E+00	3,84E+00	0,00E+00	-1,24E+00	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	0,00E+00	-1,31E+00	-1,30E+00	0,00E+00
Total use of non-re. PER	MJ	8,34E+01	1,49E+00	5,11E+01	1,36E+02	1,83E+01	-2,39E+00	ND	ND	ND	ND	ND	6,70E+03	ND	0,00E+00	2,47E-01	-1,06E+00	-9,75E+00	-4,54E+01
Secondary materials	kg	2,99E-02	7,65E-04	6,43E-02	9,49E-02	9,86E-03	1,88E-04	ND	ND	ND	ND	ND	7,20E-01	ND	0,00E+00	1,32E-04	2,88E-04	1,01E-04	1,37E-01
Renew. secondary fuels	MJ	2,45E-03	8,61E-06	2,32E-03	4,78E-03	1,06E-04	1,48E-06	ND	ND	ND	ND	ND	2,96E-03	ND	0,00E+00	1,70E-06	8,74E-06	2,82E-06	1,75E-02
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m ³	1,35E-01	2,31E-04	8,25E-03	1,43E-01	2,68E-03	-3,41E-05	ND	ND	ND	ND	ND	5,57E+00	ND	0,00E+00	3,49E-05	1,70E-04	-6,99E-04	-2,72E-02

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	9,00E-01	2,37E-03	3,78E-01	1,28E+00	3,07E-02	1,81E-03	ND	ND	ND	ND	ND	1,53E+01	ND	0,00E+00	5,07E-04	3,99E-03	9,30E-03	-8,04E-01
Non-hazardous waste	kg	1,60E+01	5,35E-02	9,05E+00	2,51E+01	6,74E-01	1,20E-01	ND	ND	ND	ND	ND	1,24E+03	ND	0,00E+00	9,85E-03	1,12E-01	9,95E-01	-3,27E+01
Radioactive waste	kg	2,50E-04	5,97E-07	1,11E-05	2,62E-04	6,87E-06	6,99E-08	ND	ND	ND	ND	ND	4,81E-02	ND	0,00E+00	5,81E-08	3,11E-07	6,69E-08	-1,17E-05

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	3,34E-02	3,34E-02	0,00E+00	1,88E-01	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	0,00E+00	2,56E-01	1,31E-01	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,90E-01	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	1,51E+00	0,00E+00
Exported energy – Electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,22E-01	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	6,37E-01	0,00E+00
Exported energy – Heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,68E-01	ND	ND	ND	ND	ND	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	8,76E-01	0,00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ e	5,56E+00	1,05E-01	4,06E+00	9,73E+00	1,33E+00	8,44E-02	ND	ND	ND	ND	ND	2,84E+02	ND	0,00E+00	1,80E-02	5,00E-02	3,50E-01	-4,71E+00
Ozone depletion Pot.	kg CFC ₁₁ e	8,65E-08	1,57E-09	6,24E-08	1,50E-07	1,86E-08	1,02E-10	ND	ND	ND	ND	ND	4,03E-06	ND	0,00E+00	1,93E-10	1,78E-10	2,72E-10	-1,47E-08
Acidification	kg SO ₂ e	3,29E-02	2,48E-04	7,28E-03	4,04E-02	5,73E-03	4,39E-05	ND	ND	ND	ND	ND	1,23E+00	ND	0,00E+00	4,53E-05	1,66E-04	1,62E-04	-2,94E-02
Eutrophication	kg PO ₄ ³ e	8,11E-03	6,36E-05	3,12E-03	1,13E-02	1,04E-03	2,92E-05	ND	ND	ND	ND	ND	1,67E-01	ND	0,00E+00	1,11E-05	1,94E-05	1,16E-04	-3,83E-03
POCP (“smog”)	kg C ₂ H ₄ e	2,84E-03	2,33E-05	5,79E-04	3,44E-03	4,06E-04	1,14E-05	ND	ND	ND	ND	ND	6,90E-02	ND	0,00E+00	3,97E-06	9,52E-06	1,21E-05	-1,99E-03
ADP-elements	kg Sbe	1,47E-04	4,11E-07	3,97E-06	1,51E-04	5,35E-06	7,66E-08	ND	ND	ND	ND	ND	6,27E-04	ND	0,00E+00	7,65E-08	1,23E-06	3,28E-08	-3,82E-05
ADP-fossil	MJ	7,04E+01	1,45E+00	5,03E+01	1,22E+02	1,79E+01	1,32E-01	ND	ND	ND	ND	ND	3,40E+03	ND	0,00E+00	2,43E-01	2,68E-01	2,27E-01	-4,46E+01

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG ⁹⁾	kg CO ₂ e	5,57E+00	1,06E-01	4,08E+00	9,76E+00	1,34E+00	5,53E-02	ND	ND	ND	ND	ND	2,84E+02	ND	0,00E+00	1,81E-02	4,98E-02	3,51E-01	-4,74E+00

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows – CH₄ fossil, CH₄ biogenic and Dinitrogen monoxide – were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterisation factor for biogenic CO₂ is set to zero.

SCENARIO DOCUMENTATION

DATA SOURCES

Manufacturing energy scenario documentation A3 (Energy data source)

1. Heat and power co-generation, natural gas, 1MW electrical, lean burn, Albania, Ecoinvent, 0.0291 kgCO₂e/MJ
2. Electricity, medium voltage, residual mix, Germany, Ecoinvent, 0.81 kgCO₂e/kWh

Transport scenario documentation A4 (Transport resources data source)

1. Transport, freight, sea, container ship, 19,000 km
2. Transport, freight, lorry 3.5-7.5 metric ton, EURO5, 1,000 km
3. Transport, freight, lorry 3.5-7.5 metric ton, EURO5, 3,500 km

Installation scenario documentation A5 (Waste material data source)

1. Containerboard production, linerboard, 0.21 kg
2. Packaging film production, low density polyethylene, 0.029 kg

Installation scenario documentation A5 (Installation waste data source)

1. Treatment of municipal solid waste, municipal inc., Ecoinvent, 0.019 kg
2. Exported Energy: Electricity, Ecoinvent, 0.12 MJ
3. Exported Energy: Thermal, Ecoinvent, 0.17 MJ
4. Treatment of waste paperboard, unsorted, sorting, Ecoinvent, 0.18 kg
5. Treatment of waste polyethylene, municipal inc., Ecoinvent, 0.0107 kg
6. Treatment of waste polyethylene, sanitary landfill, Ecoinvent, 0.0066 kg
7. Treatment of waste polyethylene, for recycling, unsorted, sorting, Ecoinvent, 0.011 kg
8. Treatment of waste paperboard, sanitary landfill, Ecoinvent, 0.018 kg

Use stage scenario documentation B6 (Energy data source)

1. Market group for electricity, medium voltage (Reference product: electricity, medium voltage), Ecoinvent 3.10.1, 2024, 0.32 kgCo₂e/kWh

End-of-life scenario documentation C1-C4 (Exported energy)

1. Exported Energy: Electricity, Ecoinvent, 0.637 MJ
2. Exported Energy: Thermal, Ecoinvent, 0.876 MJ

TRANSPORT SCENARIO DOCUMENTATION A4

Scenario parameter	Value
Capacity utilization (including empty return) %	100
Bulk density of transported products	n/a
Volume capacity utilization factor	1

INSTALLATION SCENARIO DOCUMENTATION A5

Scenario information	Value
Ancillary materials for installation (specified by material) / kg or other units as appropriate	-
Water use / m ³	-
Other resource use / kg	-
Direct emissions to ambient air, soil and water / kg	-

USE STAGE SCENARIO DOCUMENTATION B6

Scenario information	Value
Ancillary materials specified by material / kg or units as appropriate	-
Power output of equipment / kW	-
Characteristic performance, e.g. energy efficiency, emissions, variation of performance with capacity utilization, etc. / units as appropriate	See product description
Further assumptions for scenario development / units as appropriate	20 years with 8 hours/day

END OF LIFE SCENARIO DOCUMENTATION C1-C4

Scenario information	Value
Collection process – kg collected separately	-
Collection process – kg collected with mixed construction waste	0.646
Recovery process – kg for re-use	-
Recovery process – kg for recycling	0.256
Recovery process – kg for energy recovery	0.074
Disposal (total) – kg for final deposition	0.316
Scenario assumptions, e.g. transportation	50 km by lorry



THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15804+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

Verified tools

Tool verifier: Magaly Gonzalez Vazquez

Tool verification validity: 27 March 2025 - 26 March 2028

Vera Durão, as an authorised verifier acting for EPD Hub Limited

27.06.2026

