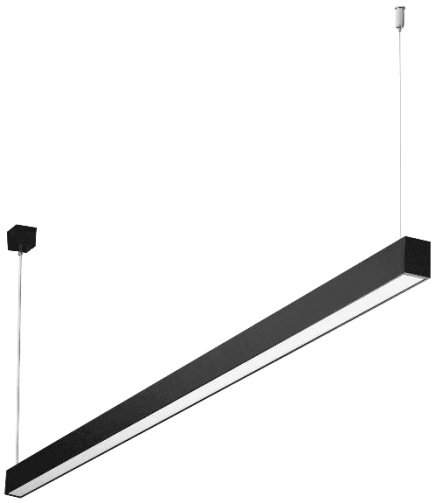
Type III Environmental Product Declaration No. 852/2025

Issuance date: 30.10.2025
Validation: 11.12.2025
Validity date: 30.10.2030

Aluminum luminaires family
ALTEZZO, BARIS, INDUSTRY, LINEA, PLASTER LITE FUTURE



Owner of the EPD:

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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A3 A4-A5, B6, C1-C4 and D modules in accordance with EN 15804+A2 (Cradle-to-Gate with options)
The year of preparing the EPD: 2025
Product standard: EN 62717:2017-11, EN 60598-2-3, EN 62722-2-1
Service Life: 100.000 h
PCR: ITB-PCR A
Declared unit: 1 kg
Reasons for performing LCA: B2B
Representativeness: Polish, European, 2024

MANUFACTURER

Lena Lighting S.A. is one of the leading manufacturers of high-quality lighting systems and lighting fixtures integrated with a light source in the form of an LED panel in EU. Since 2005, the company has been listed on the main market of the Stock Exchange in Poland. The factory is located in Środa Wielkopolska (Poland). As a lighting manufacturer present on the market for many years, company knows everything about lamps and lighting systems: provides research, design light systems, test and produces them. The technologically advanced production base offers a high level of flexibility and operational efficiency. The machinery is adapted to work in a 24/7 system and produces millions of fixtures, and each product coming off the production line strengthens position as one of the leaders in the lighting market in the country and worldwide.

Figure 1 The view of factory located at Środa Wielkopolska

PRODUCTS DESCRIPTION AND APPLICATION

EPD covers aluminum luminaires family: ALTEZZO, BARIS, INDUSTRY, LINEA, PLASTER LITE FUTURE products manufactured by Lena Lighting S.A. at Środa Wielkopolska.

All additional technical information about the product is available on the manufacturer's website and catalogues.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 kg of specific aluminum products (averaged) with usage capacity of 100.000 h, (8h/day). The family of LED lighting includes multiple product types (Figure 1) and is assembled on the manufacturing site of Lena Lighting S.A. This EPD provides also a method to convert the environmental impacts (of 1 kg of average product) to a specific/selected products.

System boundary

The life cycle analysis of the declared products covers “Product Stage” A1-A5, B6, C1-C4+D modules in accordance with EN 15804+2 and ITB PCR A (cradle to gate with options). Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculation. It can be assumed that the total sum of omitted processes does not exceed 2% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Allocation

The allocation rules used for this EPD are based on general ITB’s document PCR A. In the aggregated module A1-A3, material losses in the assembly of the producs in the factory are defined on the averaged specific values for the site.Input and output data from the production is inventoried and allocated to the production on the mass basis. The declaration covers a wide range of products. Their production resources and processing stages are basicly similar, so it is possible to average the production by product weigh so production is averaged for all products. Avoided burden approach is

applied in the use of recycled and/or secondary raw materials, as well as loads and benefits beyond the system boundary from material recycling. No loads and benefits beyond the system boundary from energy recovery from the end of life of the product or packaging is included.

System limits

In the assessment, all available data from production have been considered, i.e. all raw materials/elements used as per assembly process, utilized thermal energy, and electric power consumption. Thus material and energy flows contributing less than 1 % of mass or energy have been considered. It can be assumed that the total sum of neglected processes does not exceed 2 % of energy usage and mass per module A, B, C or D. Machines and facilities required during production are neglected. The production of etiquettes, tape and glue was also not considered.

Modules A1 and A2: *Raw materials supply and transport*

The modules A1 and A2 represent the extraction and processing of raw materials and components and transport to the production site. The mass dominant aluminium housings of the LED street lighting fixtures are imported (train, sea and road freight). The input elements are: steel components, control gear, LED modules, wires, terminal blocks, small plastic components, aluminium, silicone and others (Table 1). For A2 module (transport) European averages for fuel data are applied.

Table 1. Average weight/composition of the representative specific products

Materials	Average model, weight [%]
Steel Components	17.02
Control gear	4.59
LED modules	4.50
Wires	8.99
Terminal blocks	0.78
Small plastic components	0.90
Aluminium	46.64
Silicone	4.68
Carton	11.63
Labels	0.12
Manual (print)	0.10

Module A3: *Production*

The product specific manufacturing process line is presented in Figure 3. Electricity and gas are consumed in the process. Manufacturing of the elements is partly done by international suppliers. The final assembly of the products is implemented by Lena Lighting S.A. in Poland.

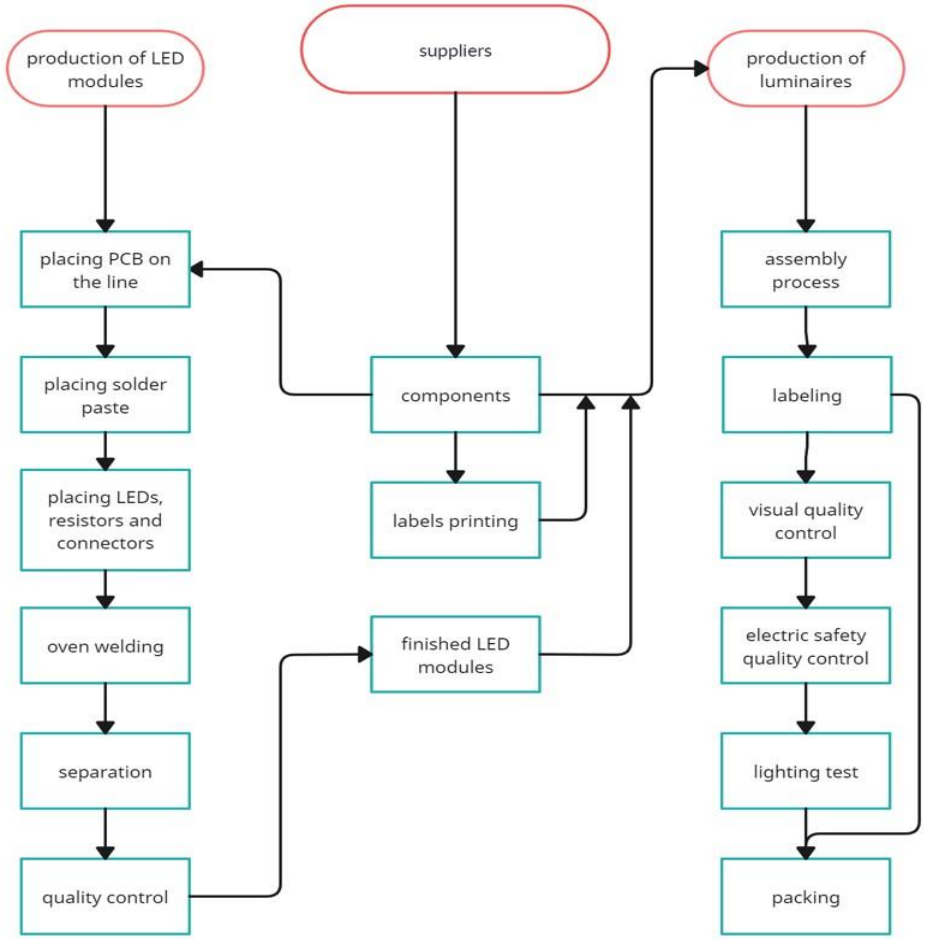

Fig. 3. A basic scheme of the LED luminaire/aluminium product manufacturing process

A4-A5 Construction process stage

For the A4 transport, a transport distance of 100 km with truck is used. Packaging material is sent for either incineration or recycling according to EUROSTAT data for packaging waste. It was assumed that the devices would be installed manually using electric power tools.

Module B6: Use stage

During the use-stage, consumption of electricity is taken into account. Total active time is 100,000 h (17 years, 8 h a day). Correction factors FCP/FD for dimming is 1/1. Electricity Mix is EU (Ecoinvent). The minimal nominal power required to produce light from the supply voltage is used for the calculation. As the EPD includes devices with different luminous flux, the B6 phase interaction values are given for 4 representative flux values: 1000lm, 2000lm, 5000lm, 10000lm. Precise power consumption data for specific lighting solutions (if different) may be calculated separately (see conversion rules).

Modules *C1-C4 and D: End-of-life (EOL)*

The product is obliged to be professionally recycled in accordance with the EU Directive 2012/19/EU on waste of electric and electronic equipment (WEEE). The End of Life scenario is based on a material split and respective recycling rates. In the applied scenario, all electronic parts are assumed mainly to be recycled, plastics may be incinerated, aluminium and steel remelted. The remaining parts are landfilled. The energy required for treatment of materials is included. LED products are disposed by the user (assumed 100% of products is collected). The collected end of life elements are disassembled with electronic parts (like diodes) going to recycling. Non-recycled content is disposed to the municipal waste stream or energy recovery where it undergoes separation, preparation and treatment according to the average European statistics. In the adapted end-of-life scenario, the de-constructed products are transported to recycling plant 50km on > 10t lorry EURO 5. The recycling potential of materials is presented in Table 2. Module D presents credits resulting

from the recycling of metal parts, the electronic elements, and energy recovered. The reused components made from virgin materials in the product stage, such as the diodes or connectors were assumed to replace similar components.

Table 2. End-of-life scenario for the product components

Material	Recycling %	Landfilling %	Energy recovery %
Aluminium	98	2	0
Steel	90	10	0
Plastics	50	25	25
PCB Boards	80	10	10
Diodes	90	10	0
Electronic parts/wires	80	20	0
Other	80	10	10

Electricity at end-of-life (module C) has been modelled using an average Polish electricity mix as the location where the product reaches end-of-life is unknown.

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2024 – 31.12.2024 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Data quality

The data selected for LCA originate from ITB-LCI questionnaires completed by producer. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good. The background data for the processes come from the following resources: database Ecoinvent v.3.11 and KOBIZE (Polish electricity mix and combustion factors for fuels). KOBIZE data is supplemented with Ecoinvent data on the national electricity mix impact where no specific indicator data is provided. Specific (LCI) data quality analysis was a part of the input data verification. The time related quality of the data used is valid (5 years).

Assumptions and estimates

The impacts of the representative of the products were aggregated using weighted average.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN15804+A2. Emission of greenhouse gases was calculated using the IPCC GWP method with a 100-year horizon. Emission of acidifying substances, emission of substances to water contributing to oxygen depletion, emission of gases that contribute to the creation of ground-level ozone, abiotic depletion, and ozone depletion emissions where all calculated with the EF 3.1. method. No mass balance approach was used. Biogenic content less than 5%.

Additional information

Polish electricity mix used is 0.597 kg CO_2/kWh (KOBiZE 2023). European electricity mix used is 0.43 kg CO_2/kWh (Ecoinvent v3.11, RER). The product is compliant with the European Directive 2015/863 of 31 March 2015 on Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic equipment (RoHS) and regulation (EC) No 1907/2006 on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

The EPD does not give information on release of dangerous substances to indoor air because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 kg of the products manufactured by Lena Lighting S.A. The following life cycle modules (Table 3) were included in the analysis. The evaluation results for the specific products are given in Tables 4-7.

Table 3. System boundaries for the environmental characteristic of the LED Modules products.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MD	MD	MD	MD	MD	MND	MND	MND	MND	MND	MD	MND	MD	MD	MD	MD	MD

The method of converting the environmental impact for any specific/selected LED product

The LCA impacts in the Table 4-7 are presented per unit mass of products - 1 kg (averaged for all specific products). In order to convert LCA to a specific product direct product mass should be determined. Then the value of the LCA impact may be found on the proportion of the specific product mass and the impact of 1 kg. The values related to product use and energy consumption for specific product should be converted on the basis of the proportion of the values for the product and the values given in B6 module.

Table 4. Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 kg with specified luminous flux 1000-10000lm)

Indicator	Unit	A1-A3	A4	A5	B6				C1	C2	C3	C4	D
					1000lm	2000lm	5000lm	10000lm					
Global Warming Potential	eq. kg CO_2	1.27E+01	1.67E-02	3.43E+00	2.33E+02	4.66E+02	1.16E+03	2.33E+03	3.43E+00	8.34E-03	4.61E-01	6.26E-03	-3.50E+00
Greenhouse potential - fossil	eq. kg CO_2	1.23E+01	1.66E-02	3.43E+00	2.07E+02	4.15E+02	1.04E+03	2.07E+03	3.43E+00	8.31E-03	3.40E-01	6.25E-03	-2.91E+00
Greenhouse potential - biogenic	eq. kg CO_2	-1.10E-01	5.68E-05	1.00E-04	2.50E+01	5.00E+01	1.25E+02	2.50E+02	1.00E-04	2.84E-05	1.21E-01	4.94E-06	-2.25E-02
Global warming potential - land use and land use change	eq. kg CO_2	5.25E-01	6.52E-06	1.20E-06	4.79E-01	9.58E-01	2.39E+00	4.79E+00	1.20E-06	3.26E-06	9.00E-06	5.69E-07	-5.74E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	6.89E-07	3.85E-09	7.00E-11	1.01E-05	2.02E-05	5.05E-05	1.01E-04	7.00E-11	1.92E-09	6.97E-01	1.21E-10	-1.38E-07
Soil and water acidification potential	eq. mol H+	2.37E+00	6.75E-05	3.80E-05	1.06E+00	2.13E+00	5.32E+00	1.06E+01	3.80E-05	3.37E-05	6.58E-03	6.46E-06	-2.64E-01
Eutrophication potential - freshwater	eq. kg P	3.74E-02	1.12E-06	6.50E-06	2.23E-01	4.47E-01	1.12E+00	2.23E+00	6.50E-06	5.59E-07	3.86E-07	8.42E-08	-2.29E-03
Eutrophication potential - seawater	eq. kg N	2.61E-02	2.04E-05	5.50E-06	2.02E-01	4.04E-01	1.01E+00	2.02E+00	5.50E-06	1.02E-05	4.82E-03	1.41E-05	-3.73E-03
Eutrophication potential - terrestrial	eq. mol N	3.08E-01	2.22E-04	4.65E-05	1.70E+00	3.40E+00	8.51E+00	1.70E+01	4.65E-05	1.11E-04	3.82E-02	2.57E-05	-3.33E-02
Potential for photochemical ozone synthesis	eq. kg NMVOC	8.80E-02	6.80E-05	1.30E-05	4.73E-01	9.47E-01	2.37E+00	4.73E+00	1.30E-05	3.40E-05	9.34E-03	9.79E-06	-9.44E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	8.61E-03	5.89E-08	1.67E-08	4.97E-04	9.94E-04	2.48E-03	4.97E-03	1.67E-08	2.95E-08	1.29E-08	1.86E-09	-2.99E-04
Abiotic depletion potential - fossil fuels	MJ	8.03E+01	2.47E-01	5.80E-02	4.44E+03	8.88E+03	2.22E+04	4.44E+04	5.80E-02	1.23E-01	5.41E-02	1.97E-02	-3.41E+01
Water deprivation potential	eq. m^3	6.49E+00	1.14E-03	1.20E-03	1.18E+02	2.36E+02	5.91E+02	1.18E+03	1.20E-03	5.70E-04	4.46E-03	8.19E-05	-1.44E+00

Table 5. Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 kg with specified luminous flux 1000-10000lm)

Indicator	Unit	A1-A5	B6	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA

Table 6. Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 kg with specified luminous flux 1000-10000lm)

Indicator	Unit	A1-A3	A4	A5	B6				C1	C2	C3	C4	D
					1000lm	2000lm	5000lm	10000lm					
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.47E+01	3.54E-03	4.30E-03	7.77E+02	1.55E+03	3.88E+03	7.77E+03	4.30E-03	1.77E-03	9.92E-04	1.87E-04	-5.53E+00
Consumption of renewable primary energy resources used as raw materials	MJ	3.76E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.47E-01
Total consumption of renewable primary energy resources	MJ	2.85E+01	3.54E-03	4.30E-03	7.77E+02	1.55E+03	3.88E+03	7.77E+03	4.30E-03	1.77E-03	9.92E-04	2.49E-04	-5.72E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.69E+02	2.47E-01	5.82E-02	4.44E+03	8.88E+03	2.22E+04	4.44E+04	5.82E-02	1.23E-01	-6.01E+00	-1.95E+00	-2.98E+01
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.15E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.06E+00	1.96E+00	-4.67E+00
Total consumption of non-renewable primary energy resources	MJ	1.70E+02	2.47E-01	5.82E-02	4.44E+03	8.88E+03	2.22E+04	4.44E+04	5.82E-02	1.23E-01	5.42E-02	1.97E-02	-3.74E+01
Consumption of secondary materials	kg	2.51E-01	8.27E-05	5.30E-06	3.40E-01	6.81E-01	1.70E+00	3.40E+00	5.30E-06	4.14E-05	2.45E-05	6.01E-06	-1.62E-02
Consumption of renew. secondary fuels	MJ	3.99E-02	9.11E-07	2.95E-08	1.76E-03	3.51E-03	8.78E-03	1.76E-02	2.95E-08	4.56E-07	3.32E-07	1.24E-07	-1.29E-03
Consumption of non-renewable secondary fuels	MJ	7.43E-03	0.00E+00	4.70E-05	5.00E+00	9.99E+00	2.50E+01	5.00E+01	4.70E-05	0.00E+00	0.00E+00	0.00E+00	-4.99E-04
Net consumption of freshwater	m3	1.57E-01	3.10E-05	1.58E-05	3.72E+00	7.45E+00	1.86E+01	3.72E+01	1.58E-05	1.55E-05	4.79E-05	-1.77E-04	-3.77E-02

Table 7. Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 kg with specified luminous flux 1000-10000lm)

Indicator	Unit	A1-A3	A4	A5	B6				C1	C2	C3	C4	D
					1000lm	2000lm	5000lm	10000lm					
Hazardous waste	kg	1.36E+00	2.77E-04	6.00E-07	1.54E+01	3.09E+01	7.71E+01	1.54E+02	6.00E-07	1.38E-04	3.88E-09	2.97E-05	-2.36E-01
Non-hazardous waste	kg	2.27E+01	4.92E-03	3.12E-05	1.00E+03	2.00E+03	5.00E+03	1.00E+04	3.12E-05	2.46E-03	1.02E-02	2.48E-01	-5.56E+00
Radioactive waste	kg	4.72E-04	1.84E-08	4.35E-08	6.81E-03	1.36E-02	3.40E-02	6.81E-02	4.35E-08	9.21E-09	2.89E-07	5.10E-08	-2.45E-01
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	6.43E-03	7.64E-07	6.00E-08	3.19E-02	6.37E-02	1.59E-01	3.19E-01	6.00E-08	3.82E-07	3.61E-07	2.25E-07	-1.00E-01
Materials for energy recovery	kg	2.67E-05	6.18E-09	5.25E-10	2.72E-05	5.44E-05	1.36E-04	2.72E-04	5.25E-10	3.09E-09	4.51E-09	1.03E-09	-9.56E-06
Exported Energy	MJ	7.16E-01	0.00E+00	1.73E-04	3.72E+01	7.45E+01	1.86E+02	3.72E+02	1.73E-04	0.00E+00	5.51E-02	2.62E-06	-6.01E-01

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804+A2 and ITB PCR A
Independent verification corresponding to ISO 14025 (sub clause 8.1.3.) ☒ external ☐ internal
External verification of EPD: Halina Prejzner, PhD. Eng. LCI data, audit and verification: Michał Chwedaczuk, M.Sc. Eng. LCA data verification: Michał Piasecki, PhD., D.Sc., Eng.

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (see ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- Ozkan, Elif & Elginoz, Nilay & Germirli Babuna, Fatos. (2018). Life cycle assessment of a printed circuit board manufacturing plant in Turkey. Environmental Science and Pollution Research, 2018
- KOBiZE Wskaźniki emisyjności CO_2, SO_2, NO_x, CO i pyłu całkowitego dla energii elektrycznej. Grudzień 2024
- World Steel Association 2017 Life Cycle inventory methodology report for steel products

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CERTIFICATE № 852/2025
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Aluminum luminaires family

ALTEZZO, BARIS, INDUSTRY, LINEA, PLASTER LITE, FUTURE

Manufacturer:

Lena Lighting S.A.

Kórnicka 52, 63-000 Środa Wielkopolska, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued on 30th October 2025 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, October 2025