



ENVIRONMENTAL PRODUCT DECLARATION

Product name:
LUMENBEAM GRANDE

Distribution site:
Via della Chiesa, 38 Calenzano (FI),
50041 IT T: +39.055.541754 F: +39.055.5417575



In accordance with ISO 14025:2010 and EN 50693:2019

Program Operator	EPDItaly
Publisher	EPDItaly

Declaration Number	EPD LUMENBEAM GRANDE
Registration Number	EPDITALY0374

Issue Date	2022 September 30 Th
Valid to	2027 September 29 Th

1 General information

Owner of the declaration	Exenia s.r.l. Via della Chiesa, 38 50041 Calenzano Firenze Italy
Plants involved in the EPD	Exenia s.r.l. Via della Chiesa, 38 50041 Calenzano Firenze Italy Lumenpulse 1220, Marie-Victorin Blvd. Longueuil, Quebec Canada J4G 2H9
Product identification	LUMENBEAM GRANDE
Product description	Projector for Interior and Exterior Architecture
Program Operator	EPDITALY (www.epditaly.it) Via Gaetano De Castillia 10 - 20124 Milano, Italy
Independent verification	This declaration has been developed in accordance with the EPDItaly Regulations; further information and the Regulations themselves are available on the website: www.epditaly.it EN 50693 is the framework reference for PCRs. Independent verification of the declaration and data according to ISO 14025:2010.
Third Party Verification	Third party independent verification performed by TUV is external in accordance with the EPD Italy standards.
CPC-Based Code	46 "Electrical machinery and apparatus"
Company contact	Daniele Caini Exenia s.r.l. Via della Chiesa, 38 50041 Calenzano Firenze Italy daniele.caini@exenia.eu
Technical support	Ing. Carlo Grassi, Ing. Silvia Verrilli, Dott. Jonatha Trabucco Ing. Roberta Procopio
Comparability	Environmental statements published within the same product category, but from different programs, may not be comparable
Reference documents	This declaration has been developed following the EPD Italy Programme Regulations, available on the website: www.epditaly.it .
Product Category Rules (PCR)	PCR per prodotti e sistemi elettronici ed elettrici: EPDItaly007 (Stand-alone)

2 Company profile

Exenia is a significant player in the professional lighting sector, specialised in the production of LED lighting fixtures for indoor use, suitable for all types of installations, from residential to commercial, from museums to showrooms. A growing company, with an entrepreneurial culture solidly based on the principles of collaboration, transparency, respect, social responsibility, quality, research, innovation, sustainability, design and personalization. Established in 2010, from the decades of experience of its founders in the lighting sector, in December 2015 Exenia became part of the Lumenpulse Group. A stimulating synergy was born within an international network of young and innovative companies that exchange complementary skills in the field of lighting, sharing the cutting-edge technology of the Canadian brand and research laboratories able to offer optical systems among the most sophisticated in the world. In Exenia design and creativity coexist with the most advanced technologies in the lighting industry. The excellence of a refined Italian design blends in with perfect performances and multiple finishes creating collections with a unique design, decorated with a virtually unlimited variety of colours with a natural base. Each product is drawn, designed, assembled, tested, painted and prepared for delivery to the final customer, under conditions that make it possible to compare the different levels of production, in a continuous dialogue between craftsmen, designers and lighting designers.

2.1 Sustainability

Exenia is based on a philosophy of sustainable development, so facilities, equipment, workplaces and operating methods are designed to safeguard the health of workers and the community in which the company operates. The company's establishment is immersed in a green park of 800 square metres where nature becomes a source of inspiration as well as an integral part of design philosophy. Workplaces are designed to create shared, welcoming and relaxed spaces. The plant uses alternative and sustainable energy systems with photovoltaic panels that are capable of meeting 95% of the company's energy needs. A waste disposal policy involves the recycling of all waste materials produced by the chain and its packaging. Latest generation LEDs, with a 10% superior power efficiency for the same power consumption, save energy and reduce CO2 emissions compared to traditional light sources. All paints used are water based, without the use of chemical additives.

2.2 Certifications

Exenia srl, for the Calenzano plant is certified by ISO 9001.



2.3 Distribution and Production plant

The distribution process takes place inside Via della Chiesa, 38 Calenzano (FI), 50041 IT site, allowing the total quality control. The in-house chain and the craftsmanship know-how, of which we can find a solid tradition in Tuscany, have as a natural consequence the possibility to personalise each project in a tailor-made and exclusive manner.



The products LUMENBEAM GRANDE were entirely produced in 1220, Marie-Victorin Blvd. Longueuil, Quebec Canada, J4G 2H9 plant where all the processes take place up to the shipment to the Italian site of Exenia for distribution.

2.4 Company contact

For more information on Exenia's activities or in relation to this environmental product declaration, you can contact: Daniele Caini - Operations Manager – daniele.caini@exenia.eu

Alternatively, you can visit our website: <https://www.exenia.eu/>

3 Scope and type of the EPD

3.1 Functional unit

The functional unit of the LCA product system is the single projector (piece/item) by means of the LUMENBEAM GRANDE series. The associated reference flow is the following:

	LUMENBEAM GRANDE
Reference flow [pieces/item]	1
RSL	87000 87600 hours

3.2 System boundaries

This EPD considers the entire life cycle of the projector manufactured by Exenia. The EPD type is therefore “from cradle to grave” type. In accordance with the EPD Regulations, specifically PCR 007 (Electronic and electrical products and systems), the system boundaries are set with reference to the following stages:

1. Manufacturing stage that includes the “upstream module” (all the relevant supply chain processes) and the “core module” (all the relevant processes related to the assembly of the products and waste recycling processes).
2. Distribution stage
3. Installation Stage
4. Use & Maintenance Stage
5. End-Of-Life Stage and De-Installation

The system boundaries of the product covered by this EPD, together with the main processes that characterize the phases of the life cycle studied, are represented in table 1. The system boundaries are described also taking into account the stages proposed by EN 50693:2019.

3.3 Type of EPD

Product EPD; this declaration relates to a specific product by a specific manufacturer and distributor.

3.4 Geographical scope

The products described in this report is:

Manufacturing: Canada

Product distribution: Italy

Table 1 Modules considered in the assessment, according to the "from cradle to grave" approach.

Manufacturing stage		Distribution	installation	Use and Maintenance	End Life
Upstream	Core	Downstream			
Acquisition of raw material.	Assembly	To distributor	installation	use	Acquisition of raw material.
Transport to manufacturing site	Packaging	Reconditioning at distributor or logistic center	End life treatment of waste	maintenance	Transport to manufacturing site
Component/parts manufacturing	End life treatment of waste	To place of use		End life treatment of waste	Component/parts manufacturing

4 Product description

4.1 Product identification

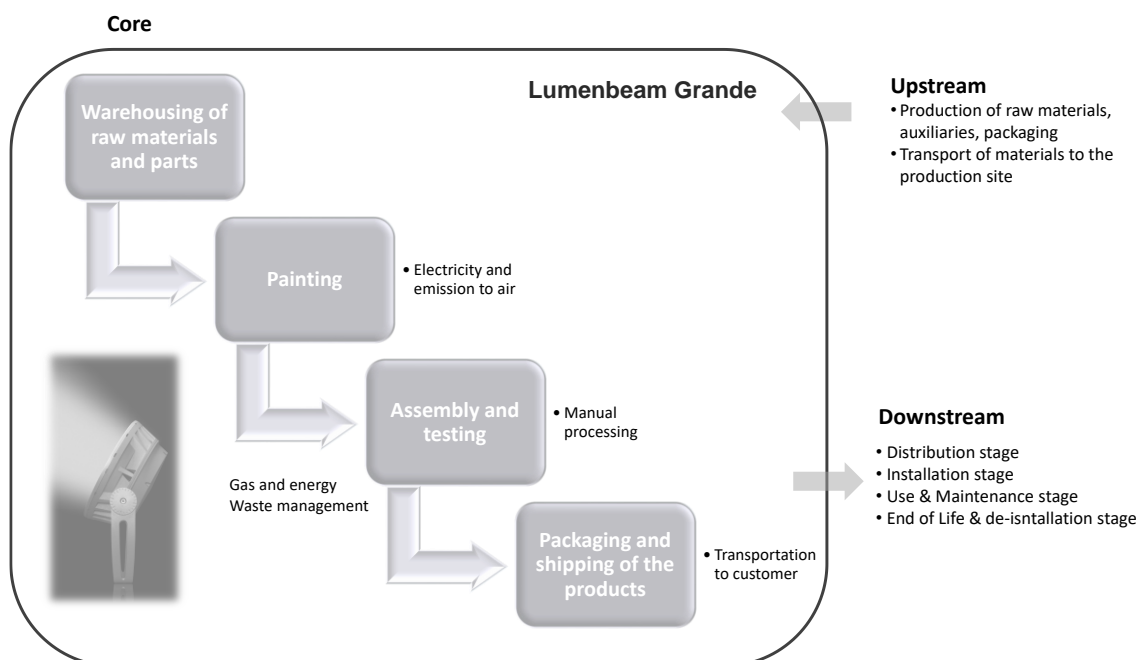
LUMENBEAM GRANDE is an IP66/IK09-rated luminaire for lighting landscapes, trees, columns, monuments, and architectural details. It has numerous options, including optics for flood or accent lighting, colour temperatures and colours, various accessories, spread lenses, and controls. The luminaire also has an anti-corrosion option for use in harsh, chemical, or coastal environments. LUMENBEAM GRANDE complies with the ROHS and REACH standard so that hazardous substances, if present, are within the tolerances indicated in the Standard.



This EPD is related to the Lumenbeam Grande and comprise the following types.

	Lumenbeam Grande DALI	Lumenbeam Grande DIM	Lumenbeam Grande On/off
Teck reference	LBG-240-xxx-xx-xx-xxxx-xx-xxx-DALI-CE-xxx-xx SPLxxx(ENEC)	LBG-240-xxx-xx-xx-xxxx-xx-xxx-DIM-CE-xxx-xx SPLxxx (ENEC)	LBG-240-xxx-xx-xx-xxxx-xx-xxx-NO-CE-xxx-xx SPLxxx (ENEC)
Weight [kg]	10.956	10.956	10.931
Power [W]	100	100	100
Protection Rating	IP66-IK09	IP66-IK09	IP66-IK09
Number of parts	35	35	34

4.2 Life cycle stages



All input and output flows are inventoried for each stage of the life cycle. Flows, materials and energy extracted from the environment and released into it are then combined at each stage to quantify environmental impact indicators.

4.3 Function and application

The Lumenbeam Grande is an IP66/IK09-rated luminaire for lighting landscapes, trees, columns, monuments, and architectural details. It has numerous options, including optics for flood or accent lighting, colour temperatures and colours, various accessories, spread lenses, and controls. The luminaire also has an anti-corrosion option for use in harsh, chemical, or coastal environments.

4.4 Technical data & Characteristics

LUMENBEAM GRANDE	
Dimensions	
control	ON-OFF, DIM, DALI
Power consumption	100 W
Colour and Colour Temperature	2200K, 2700K, 3000K, 3500K, 4000K, 5700K, Red, Green, Blue
Optics	XN (4°), VN (6°), NS (10°), NF (20°), M (30°), FL (40°), WFL (60°), NAS (Narrow Asymmetric), WW (Asymmetric Wallwash)
Optical Option	Linear spread lens horizontal distribution, Linear spread lens vertical distribution
Features - Body finish	Black Sandtex, Bronze Sandtex, Silver Sandtex, Smooth white, Textured Black, Textured Bronze non-metallic, Textured medium Gray, Textured Green, Textured White
Protection Rating	IP66
Insulation Class	Class I - Earth Connection
Certification	EC compliance /ENEC compliance (only for DALI control version)
Housing Material	Low copper content high pressure die-cast aluminium
Yoke Material	Heavy aluminium
Hardware Material	Stainless steel
Light Emission - Distribution	Direct
Materials	Steel, Aluminum, Nylon, Polyurethane, Polycarbonate, Silicone, Glass, PVC, Plyamide, Paint, paper and cardboard for packaging
Notes	All product's components are free to the dangerous substances, or respect the maximum permitted limits, or fall within the granted and permitted exceptions, referred to the European Directive RoHS III 2015/863/UE and to the European Regulamentation REACH nr° 1907/2006.

5 Environmental performances

The environmental performance of the LUMENBEAM GRANDE is shown for 1 piece of lighting apparatus for each module of the LCA performed:

Manufacturing Stage	Upstream
	Core
Distribution stage	Downstream
Installation stage	
Use & Maintenance stage	
End of Life & de-isntallation stage	

The declared environmental indicators include:

- core environmental impacts
- resource use
- waste production
- output flows.

The environmental impact indicators are quantified using the characterisation factors and impact assessment methods specified in EN 15804:2012+A2:2019 as required in EN50693:2019.

LUMENBEAM GRANDE - DIM								
Impact Category	um	UPSTREAM		Distribution	Installation	Use & Maintenance	End of life & de-Installation	Total
		Upstream	Core					
ENVIRONMENTAL IMPACT								
ADP (fossil)	MJ	5.103E+02	2.268E+01	5.168E+02	0.000E+00	1.080E+03	9.963E+00	2.140E+03
ADP (minerals & metals)	kg Sb eq	2.800E-03	8.394E-06	1.340E-05	0.000E+00	5.081E-03	4.341E-06	7.907E-03
AP	mol H+ eq	3.389E-01	4.752E-03	1.892E-01	0.000E+00	7.625E-01	2.772E-03	1.298E+00
EP freshwater	kg P eq	1.868E-02	1.902E-04	6.150E-04	0.000E+00	3.163E-02	7.309E-05	5.119E-02
EP marine	kg N eq	6.234E-02	6.551E-04	6.873E-02	0.000E+00	1.643E-01	7.632E-04	2.968E-01
EP terrestrial	mol N eq	6.744E-01	6.853E-03	7.523E-01	0.000E+00	1.864E+00	8.302E-03	3.306E+00
GWP - GHG	kg CO2 eq	4.925E+01	1.316E+00	3.674E+01	0.000E+00	2.455E+02	7.020E-01	3.335E+02
GWP Biogenic	kg CO2 eq	3.924E+00	7.427E-02	7.951E-02	0.000E+00	7.807E+01	6.754E-03	8.215E+01
GWP Fossil	kg CO2 eq	5.008E+01	1.250E+00	3.690E+01	0.000E+00	1.213E+02	7.086E-01	2.102E+02
GWP Luluc	kg CO2 eq	1.058E-01	9.401E-02	2.341E-03	0.000E+00	1.163E+02	3.961E-04	1.165E+02
GWP Total	kg CO2 eq	4.494E+01	1.219E+00	3.686E+01	0.000E+00	9.644E+01	7.042E-01	1.802E+02
ODP	kg CFC11 eq	2.952E-06	1.610E-07	8.337E-06	0.000E+00	1.203E-05	1.416E-07	2.362E-05
POCP	kg NMVOC eq	1.893E-01	2.725E-03	1.963E-01	0.000E+00	5.111E-01	2.558E-03	9.020E-01
WDP	m3 depriv.	1.856E+01	1.502E+01	6.913E-01	0.000E+00	7.973E+03	5.892E-02	8.008E+03
RESOURCE USE								
FWT	m3	4.835E-02	2.003E-01	2.880E-03	0.000E+00	3.091E-01	1.812E-04	5.608E-01
PENRM	MJ	5.880E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.880E+01	0.000E+00
PENRT	MJ	5.549E+02	2.466E+01	5.191E+02	0.000E+00	2.915E+03	1.012E+01	4.024E+03
PERM	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ	2.066E+02	3.049E+01	1.926E+00	0.000E+00	3.798E+04	1.604E-01	3.822E+04
FW	m3	0.000E+00	2.594E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.594E-03
MS	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
RSF	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NRSF	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRE	MJ	4.961E+02	2.466E+01	5.191E+02	0.000E+00	2.915E+03	6.892E+01	4.024E+03
PERE	MJ	2.066E+02	3.049E+01	1.926E+00	0.000E+00	3.798E+04	1.604E-01	3.822E+04
WASTE PRODUCTION								
HWD	kg	6.039E-03	2.481E-05	1.380E-03	0.000E+00	6.035E-03	2.783E-05	1.351E-02
NHWD	kg	1.031E+02	6.900E-01	1.723E+00	0.000E+00	1.946E+02	4.758E-01	3.006E+02
RWD	kg	1.530E-03	5.995E-05	3.700E-03	0.000E+00	5.535E-02	6.353E-05	6.071E-02
MER	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.156E-01	2.156E-01
MFR	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.233E+01	1.233E+01
CRU	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ETE	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
EEE	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ADDITIONAL								
Ecotoxicity, freshwater	CTUe	1.904E+03	1.747E+01	2.726E+02	0.000E+00	3.893E+03	9.678E+00	6.096E+03
Human toxicity, cancer	CTUh	9.152E-07	1.063E-09	3.838E-09	0.000E+00	2.728E-07	4.018E-10	1.193E-06
Human toxicity, non - cancer	CTUh	1.674E-06	1.026E-08	4.554E-07	0.000E+00	2.475E-06	8.283E-09	4.623E-06
Ionising radiation	kBq U-235 eq	3.403E+00	1.683E-01	2.359E+00	0.000E+00	1.652E+02	4.683E-02	1.712E+02
Land use	Pt	4.555E+01	1.138E+00	6.542E+01	0.000E+00	2.788E+02	4.004E+00	3.949E+02
Particulate matter	disease inc.	4.311E-06	3.439E-08	3.926E-07	0.000E+00	8.604E-06	3.784E-08	1.338E-05

GWP = 100-year global warming potential; ODP = ozone depletion potential in the stratosphere; AP = acidification potential; EP = eutrophication potential; POCP = potential for the formation of photochemical oxidants of tropospheric ozone ADP = potential for depletion of non-fossil abiotic resources; ADPF = potential for depletion of abiotic fossil resources, WDP = Water deprivation potential. PENRE = Use of non-renewable primary energy resources excluding non-renewable primary energy resources used as raw materials; PEARS = Use of renewable primary energy excluding primary renewable energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources as raw materials; PERM = Use of renewable energy resources as raw materials; PENRT = Total use of non-renewable primary energy resources; PERT = Total use of primary renewable energy resources; FW = Use of fresh water; MS = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels. HWD = Hazardous waste disposed of; NHWD = Non-hazardous waste disposed of; RWD = Radioactive waste disposed of; MER = Materials for energy recovery; MFR = Materials for recycling; CRU = Components for reuse; ETE = Thermal energy exported; EEE = Electricity exported.

LUMENBEAM GRANDE - ON-OFF								
Impact Category	um	UPSTREAM		Distribution	Installation	Use & Maintenance	End of life & de-installation	Total
		Upstream	Core					
ENVIRONMENTAL IMPACT								
ADP (fossil)	MJ	5.102E+02	2.268E+01	5.158E+02	0.000E+00	1.080E+03	9.943E+00	2.138E+03
ADP (minerals & metals)	kg Sb eq	2.800E-03	8.394E-06	1.338E-05	0.000E+00	5.081E-03	4.332E-06	7.907E-03
AP	mol H+ eq	3.388E-01	4.752E-03	1.889E-01	0.000E+00	7.625E-01	2.767E-03	1.298E+00
EP freshwater	kg P eq	1.868E-02	1.902E-04	6.138E-04	0.000E+00	3.163E-02	7.295E-05	5.118E-02
EP marine	kg N eq	6.234E-02	6.551E-04	6.860E-02	0.000E+00	1.643E-01	7.617E-04	2.967E-01
EP terrestrial	mol N eq	6.743E-01	6.853E-03	7.508E-01	0.000E+00	1.864E+00	8.286E-03	3.304E+00
GWP - GHG	kg CO2 eq	4.924E+01	1.316E+00	3.667E+01	0.000E+00	2.455E+02	7.006E-01	3.334E+02
GWP Biogenic	kg CO2 eq	3.924E+00	7.427E-02	7.935E-02	0.000E+00	7.807E+01	6.740E-03	8.215E+01
GWP Fossil	kg CO2 eq	5.007E+01	1.250E+00	3.683E+01	0.000E+00	1.213E+02	7.072E-01	2.101E+02
GWP Luluc	kg CO2 eq	1.058E-01	9.401E-02	2.336E-03	0.000E+00	1.163E+02	3.953E-04	1.165E+02
GWP Total	kg CO2 eq	4.494E+01	1.219E+00	3.679E+01	0.000E+00	9.644E+01	7.028E-01	1.801E+02
ODP	kg CFC11 eq	2.949E-06	1.610E-07	8.321E-06	0.000E+00	1.203E-05	1.413E-07	2.360E-05
POCP	kg NMVOC eq	1.893E-01	2.725E-03	1.959E-01	0.000E+00	5.111E-01	2.553E-03	9.016E-01
WDP	m3 depriv.	1.856E+01	1.502E+01	6.899E-01	0.000E+00	7.973E+03	5.880E-02	8.008E+03
RESOURCE USE								
FWT	m3	4.835E-02	2.003E-01	2.874E-03	0.000E+00	3.091E-01	1.809E-04	5.608E-01
PENRM	MJ	5.830E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.830E+01	0.000E+00
PENRT	MJ	5.548E+02	2.466E+01	5.181E+02	0.000E+00	2.915E+03	1.010E+01	4.023E+03
PERM	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ	2.066E+02	3.049E+01	1.922E+00	0.000E+00	3.798E+04	1.601E-01	3.822E+04
FW	m3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.152E-01	2.152E-01
MS	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
RSF	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NRSF	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRE	MJ	4.965E+02	2.466E+01	5.181E+02	0.000E+00	2.915E+03	6.840E+01	4.023E+03
PERE	MJ	2.066E+02	3.049E+01	1.922E+00	0.000E+00	3.798E+04	1.601E-01	3.822E+04
WASTE PRODUCTION								
HWD	kg	6.039E-03	2.481E-05	1.377E-03	0.000E+00	6.035E-03	2.777E-05	1.350E-02
NHWD	kg	1.031E+02	6.900E-01	1.719E+00	0.000E+00	1.946E+02	4.748E-01	3.006E+02
RWD	kg	1.529E-03	5.995E-05	3.692E-03	0.000E+00	5.535E-02	6.341E-05	6.070E-02
MER	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.151E-01	2.151E-01
MFR	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.231E+01	1.231E+01
CRU	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ETE	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
EEE	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ADDITIONAL								
Ecotoxicity, freshwater	CTUe	1.904E+03	1.747E+01	2.720E+02	0.000E+00	3.893E+03	9.658E+00	6.096E+03
Human toxicity, cancer	CTUh	9.152E-07	1.063E-09	3.830E-09	0.000E+00	2.728E-07	4.010E-10	1.193E-06
Human toxicity, non - cancer	CTUh	1.674E-06	1.026E-08	4.545E-07	0.000E+00	2.475E-06	8.267E-09	4.622E-06
Ionising radiation	kBq U-235 eq	3.403E+00	1.683E-01	2.355E+00	0.000E+00	1.652E+02	4.674E-02	1.712E+02
Land use	Pt	4.553E+01	1.138E+00	6.529E+01	0.000E+00	2.788E+02	3.996E+00	3.947E+02
Particulate matter	disease inc.	4.311E-06	3.439E-08	3.918E-07	0.000E+00	8.604E-06	3.776E-08	1.338E-05

GWP = 100-year global warming potential; ODP = ozone depletion potential in the stratosphere; AP = acidification potential; EP = eutrophication potential; POCP = potential for the formation of photochemical oxidants of tropospheric ozone ADP = potential for depletion of non-fossil abiotic resources; ADPF = potential for depletion of abiotic fossil resources, WDP = Water deprivation potential. PENRE = Use of non-renewable primary energy resources excluding non-renewable primary energy resources used as raw materials; PEARS = Use of renewable primary energy excluding primary renewable energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources as raw materials; PERM = Use of renewable energy resources as raw materials; PENRT = Total use of non-renewable primary energy resources; PERT = Total use of primary renewable energy resources; FW = Use of fresh water; MS = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels. HWD = Hazardous waste disposed of; NHWD = Non-hazardous waste disposed of; RWD = Radioactive waste disposed of; MER = Materials for energy recovery; MFR = Materials for recycling; CRU = Components for reuse; ETE = Thermal energy exported; EEE = Electricity exported.

LUMENBEAM GRANDE - DALI								
Impact Category	um	UPSTREAM		Distribution	Installation	Use & Maintenance	End of life & de-Installation	Total
		Upstream	Core					
ENVIRONMENTAL IMPACT								
ADP (fossil)	MJ	5.103E+02	2.268E+01	5.160E+02	0.000E+00	1.080E+03	9.948E+00	2.139E+03
ADP (minerals & metals)	kg Sb eq	2.800E-03	8.394E-06	1.338E-05	0.000E+00	5.081E-03	4.334E-06	7.907E-03
AP	mol H+ eq	3.388E-01	4.752E-03	1.889E-01	0.000E+00	7.625E-01	2.768E-03	1.298E+00
EP freshwater	kg P eq	1.868E-02	1.902E-04	6.140E-04	0.000E+00	3.163E-02	7.298E-05	5.119E-02
EP marine	kg N eq	6.234E-02	6.551E-04	6.863E-02	0.000E+00	1.643E-01	7.621E-04	2.967E-01
EP terrestrial	mol N eq	6.744E-01	6.853E-03	7.511E-01	0.000E+00	1.864E+00	8.290E-03	3.305E+00
GWP - GHG	kg CO2 eq	4.924E+01	1.316E+00	3.669E+01	0.000E+00	2.455E+02	7.009E-01	3.334E+02
GWP Biogenic	kg CO2 eq	3.924E+00	7.427E-02	7.939E-02	0.000E+00	7.807E+01	6.743E-03	8.215E+01
GWP Fossil	kg CO2 eq	5.007E+01	1.250E+00	3.685E+01	0.000E+00	1.213E+02	7.075E-01	2.102E+02
GWP Luluc	kg CO2 eq	1.058E-01	9.401E-02	2.337E-03	0.000E+00	1.163E+02	3.955E-04	1.165E+02
GWP Total	kg CO2 eq	4.494E+01	1.219E+00	3.680E+01	0.000E+00	9.644E+01	7.032E-01	1.801E+02
ODP	kg CFC11 eq	2.950E-06	1.610E-07	8.325E-06	0.000E+00	1.203E-05	1.414E-07	2.361E-05
POCP	kg NMVOC eq	1.893E-01	2.725E-03	1.960E-01	0.000E+00	5.111E-01	2.554E-03	9.017E-01
WDP	m3 depriv.	1.856E+01	1.502E+01	6.903E-01	0.000E+00	7.973E+03	5.883E-02	8.008E+03
RESOURCE USE								
FWT	m3	4.835E-02	2.003E-01	2.876E-03	0.000E+00	3.091E-01	1.810E-04	5.608E-01
PENRM	MJ	5.850E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.850E+01	0.000E+00
PENRT	MJ	5.549E+02	2.466E+01	5.183E+02	0.000E+00	2.915E+03	1.011E+01	4.023E+03
PERM	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ	2.066E+02	3.049E+01	1.923E+00	0.000E+00	3.798E+04	1.602E-01	3.822E+04
FW	m3	0.000E+00	2.594E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.594E-03
MS	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
RSF	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NRSF	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRE	MJ	4.964E+02	2.466E+01	5.183E+02	0.000E+00	2.915E+03	6.861E+01	4.023E+03
PERE	MJ	2.066E+02	3.049E+01	1.923E+00	0.000E+00	3.798E+04	1.602E-01	3.822E+04
WASTE PRODUCTION								
HWD	kg	6.039E-03	2.481E-05	1.377E-03	0.000E+00	6.035E-03	2.779E-05	1.350E-02
NHWD	kg	1.031E+02	6.900E-01	1.720E+00	0.000E+00	1.946E+02	4.751E-01	3.006E+02
RWD	kg	1.530E-03	5.995E-05	3.694E-03	0.000E+00	5.535E-02	6.343E-05	6.070E-02
MER	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.152E-01	2.152E-01
MFR	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.231E+01	1.231E+01
CRU	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ETE	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
EEE	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
ADDITIONAL								
Ecotoxicity, freshwater	CTUe	1.904E+03	1.747E+01	2.721E+02	0.000E+00	3.893E+03	9.663E+00	6.096E+03
Human toxicity, cancer	CTUh	9.152E-07	1.063E-09	3.832E-09	0.000E+00	2.728E-07	4.012E-10	1.193E-06
Human toxicity, non - cancer	CTUh	1.674E-06	1.026E-08	4.547E-07	0.000E+00	2.475E-06	8.271E-09	4.622E-06
Ionising radiation	kBq U-235 eq	3.403E+00	1.683E-01	2.356E+00	0.000E+00	1.652E+02	4.676E-02	1.712E+02
Land use	Pt	4.555E+01	1.138E+00	6.532E+01	0.000E+00	2.788E+02	3.998E+00	3.948E+02
Particulate matter	disease inc.	4.311E-06	3.439E-08	3.920E-07	0.000E+00	8.604E-06	3.778E-08	1.338E-05

GWP = 100-year global warming potential; ODP = ozone depletion potential in the stratosphere; AP = acidification potential; EP = eutrophication potential; POCP = potential for the formation of photochemical oxidants of tropospheric ozone ADP = potential for depletion of non-fossil abiotic resources; ADPF = potential for depletion of abiotic fossil resources, WDP = Water deprivation potential. PENRE = Use of non-renewable primary energy resources excluding non-renewable primary energy resources used as raw materials; PEARS = Use of renewable primary energy excluding primary renewable energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources as raw materials; PERM = Use of renewable energy resources as raw materials; PENRT = Total use of non-renewable primary energy resources; PERT = Total use of primary renewable energy resources; FW = Use of fresh water; MS = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels. HWD = Hazardous waste disposed of; NHWD = Non-hazardous waste disposed of; RWD = Radioactive waste disposed of; MER = Materials for energy recovery; MFR = Materials for recycling; CRU = Components for reuse; ETE = Thermal energy exported; EEE = Electricity exported.

6 LCA calculations

6.1 Reference Service Life (RSL)

An average RSL of 87'600 hours is used for the LCA calculations.

6.2 Exclusions from system boundaries

The construction, maintenance and decommissioning of infrastructures (buildings and machinery) as well as the occupation of industrial land were not considered in the LCA study.

6.3 Cut-off rules

All relevant input and output flows of matter and energy included within the system boundaries were considered. In compliance with the PCR EPD Italy n.007 that refers to the 4.2.3.3 of the EN 50693:2019, the following flows were excluded without any cut-off criteria:

- production, use and disposal of raw materials packaging
- external devices necessary for the installation of the projector itself
- material and energy flows related to dismantling phase, whenever it is reasonable to assume that dismantling is performed by adopting manual tools.

In compliance with the reference PCR, the materials that compose the product and whose mass does not exceed 1% of the total weight of the product itself can be excluded.

In this study it was not necessary to adopt the cut-off criterion of EN 50693 reported in paragraph 4.2.3.3, which allows to exclude input and output flows that account for less than 5% of the total environmental impact of the studied life cycle.

7 Data sources

Primary and site-specific data from records and documentation provided by the Exenia projectors manufacturing plant in CANADA, were used for the foreground processes. The primary data used include: projector composition (BOM material), transport distances for the supply of raw materials, type and amount of material and energy flows in the assembly phase, packaging materials of the finished product and distribution.

For the modeling of the background processes secondary data deriving from international databases (Ecoinvent 3.7) were used. Secondary data are related to the manufacture of projector components, the production of energy carriers used in the product system (electricity in the core and downstream modules), the transportation processes and the waste treatment processes.

7.1 Data quality

The data used in the study were subjected to evaluation in order to determine the overall level of data quality underlying the quantification of the environmental performances. The quality assessment was conducted separately both for primary and secondary data by calculating a Data Quality Rating (DQR). For each primary and secondary data a quality level was assigned related to the following criteria:

- Completeness: all the main flows of matter and energy have been fully quantified and included in the study; the flows excluded from the analysis are identified in the Cut-off rules section.
- Time representativeness: the primary data used refer to the year 2021. The secondary data are taken from the Ecoinvent 3.7.0 environmental database released in 2019.

- Geographic representativeness: primary site-specific data were used for the projector assembly processes; for the secondary data, datasets were selected from databases consistent with the geography of the processes studied, whenever this was known.
- Technological representativeness: the primary data used represent the specific production technology of the product under study. For the secondary data taken from the database, reference was made to the most representative technology for the processes in question, where this is known.

The average data quality level is very good for primary data and good for secondary data.

7.2 Allocations

In the context of multifunctional processes allocation procedures were used in accordance with the provisions of EN 50693: 2019. The main allocations made are:

- energy consumption in the projector assembly phase: the specific consumptions for the product under study were quantified by allocating the aggregate consumption of the site plant Quebec Canada according to the number of products with respect to the total number of the production of the plant.
- water consumption and waste production in the projector assembly phase: allocation of the total production of waste of the site plant of Quebec Canada according to the number of products with respect to the total number of the production of the plant.

7.3 Life Cycle Impact Assessment

The categories used for the analysis of the products impacts under study and the characterization factors used were created in compliance with the environmental indicators of PCR 007 which refers to the standard EN 15804: 2012 + A2: 2019 (Annex C) connected to the EN standard - 50693: 2019.

7.4 Software and Database

The software used for the LCA calculations is OpenLCA. The database used for process modelling is Ecoinvent 3.7.0.

7.5 Distribution scenario

The distribution of the projector from the Exenia production plant to the destination / use site was modelled using a scenario built on the basis of specific and representative Exenia projected data. Within this scenario, a transport by road and average distance is considered, as stated below.

Product	Transportation mode	Distance	Unit
LUMENBEAM GRANDE	Heavy duty truck	300	km

7.6 Use phase scenario

In the use phase, the installed light projectors generate light. During this phase, therefore, there are no inputs/outputs of matter but only consumption of energy – electricity - associated with the operation of the projector.

Product	Hours for endlife	Power	Notes
LUMENBEAM GRANDE	87'600	100	10 years - failure rate 5% for use 24 hr/day

Therefore, within the modelling of this study, the maintenance phase is not evaluated as significant and the related environmental impacts are considered zero.

7.7 End of Life scenario

The End of life scenario is defined on the basis of the following assumptions:

- recovery of the dismissed product (100% of recovered projector)
- dismissed products transportation from the installation site to the waste treatment site: 100 km by truck
- the 94.38% of the end-of-life product is recycled, 1.65% incinerated and landfilled for the remaining 3.97% (source data REPORT ECOLIGHT 2019).

8 Assessment methods

The methodology followed as a reference standard is that of the Life Cycle Assessment, which considers all environmental aspects and potential environmental impacts along the life cycle of the product, from the extraction and transport of raw materials through manufacture and use, up to the end of life.

Functional Unit	1 item for all the products
CUT OFF	Data collection took place for more than 99% of the input flows in terms of mass and energy related to the upstream and core modules. No cut-off criteria were applied to inventory data. In the present study, the impacts deriving from the production of buildings, machinery, equipment, installation devices, materials and energy used for the dismantling of the lighting fixture are not considered.
DATA QUALITY	In the context of this study, almost all the activity data used are primary. The primary data provided by the company are those relating to production materials, production numbers, energy consumption, packaging, auxiliary materials and waste produced. Proxy data does not account for more than 10%. The accuracy, completeness and technological, temporal and geographical representativeness of the data are considered good.
DATA PERIOD	The primary data collected in the context of this study refer to the year 2021.
ALLOCATION	The allocation criteria adopted for the LCA model comply with the reference standards. Most of the primary data used were provided in reference to the functional unit, and only some production phase data were allocated on the basis of production number of parts. The data subject to allocation are, in particular, those relating to energy and resource consumption, waste / processing waste, auxiliary materials.
SCENARIOS	<p>All stages of the life cycle were considered in the study.</p> <p>Manufacturing:</p> <ul style="list-style-type: none"> – extraction of raw materials and production of materials/semi-finished products/ancillary products; – transport of materials; – production of packaging; – manufacture and assembly of the product; – disposal and recycling of production waste. <p>Distribution phase: transport of the finished product to the end customer, in accordance with the distribution scenario is Italy 100%.</p> <p>Installation: This stage was neglected for this products because of the manual operations only. disposal of packaging generated during installation and production of the necessary for operation are considered negligible.</p> <p>Use & Maintenance: In this module, the impacts related to the energy consumed by the products to operate during its entire reference service life was considered.</p> <p>End-of-life & de-installation phase: transport to final treatment plant after de-installation. Distribution and destination of the various material flows to be sent for recycling or disposal.</p>

9 References

1. EPDItaly - Program Regulation version 5.2
2. Product Category Rules (PCR) EPDItaly007 - CORE PCR EN 50693 BASE rev.2, 2020/10/21 - Electronic and electrical products and systems
3. EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and system EN 15804:2012+A2:2019 Sustainability of Construction Works
4. ISO 14020:2000 Environmental labels and declarations-General principles
5. ISO 14025:2010 Environmental labels and declarations-Type III Environmental Declarations-Principles and procedures
6. ISO 14040:2006/AMD 1:2020 Environmental management-Life Cycle Assessment-Principles and framework
7. ISO 14044:2006/AMD 2:2020 Environmental management-Life Cycle Assessment Requirements and guidelines
8. Database Ecoinvent 3.7
9. Software OpenLCA versione 1.11.0