

Owner: Fischer Lighting
No.: MD-20037-EN_rev1
Issued: 04-01-2021
Valid to: 04-01-2026

3rd PARTY VERIFIED

EPD

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | ISO 14025 & EN 15804



Owner of declaration

 Fischer Lighting
 Skjulhøj Allé 46
 2720 Vanløse
 Denmark
 DK37815322

Issued:
 04-01-2021

Valid to:
 04-01-2026

Programme

 EPD Danmark
www.epddanmark.dk


- Industry EPD
 Product EPD

Declared product(s)

This EPD covers four specific lighting systems:

1. Product 1: August
2. Product 2: Natural History - ReUse
3. Product 3: Natural History – coated/sand blasted and new diffuser
4. Product 4: VENUS

The products consist of fixtures, where the existing fixture is reused from another building instead of it being disposed of as waste. The electronics in the existing fixture is replaced and upgraded to LED, and additional components are added.

The four declared products contain the same driver and LED diode type, however they differ in form, size, weight, painting/no-painting, diffuser added/no diffuser added, and whether they include intelligent solutions for lighting control.

Number of declared datasets/product variations: 4

Production site

Greve and Roskilde, Denmark

Product(s) use

Office lighting

Declared or functional unit

1 lighting system used in an office in Denmark for 15 years, in accordance with the reference PCR.

Year of data

2019

Version history:

Revision 1, 16-01-2024: ECO EPD registration withdrawn by EPD owner, logo removed.

Basis of calculation

This EPD is developed in accordance with the European standard EN 15804+A2 and ISO 14025.

Comparability

EPDs of construction products may not be comparable if they do not comply with the requirements in EN 15804. EPD data may not be comparable if the datasets used are not developed in accordance with EN 15804 and if the background systems are not based on the same database.

Validity


This EPD has been verified in accordance with ISO 14025 and is valid for 5 years from the date of issue.

Use

The intended use of an EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings.

EPD type

- Cradle-to-gate with modules C1-C4 and D
 Cradle-to-gate with options, modules C1-C4 and D
 Cradle-to-grave and module D
 Cradle-to-gate
 Cradle-to-gate with options

CEN standard EN 15804 serves as the core PCR
Independent verification of the declaration and data, according to EN ISO 14025
<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Third party verifier:  <hr/> Linda Høiby



 Henrik Fred Larsen
 EPD Danmark

Life cycle stages and modules (MND = module not declared)																	
Product			Construction process		Use							End of life				Beyond the system boundary	
Raw material supply	Transport	Manufacturing	Transport	Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Re-use, recovery and recycling potential	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	MND	X	X	X	X	X

Product information

Product description

The main product components are shown in the table below (unit: grams).

Component	Product 1	Product 2	Product 3	Product 4
Reused steel fixture	628	7625	7625	3910
Funnel/Parabol	555	-	-	-
Diffuser ring	98	-	-	-
Aluminum profile	-	318	318	-
LED board	14	87	87	488
Driver	112	112	112	112
Cooling system/heatsink Alu	170	-	-	-
Optics – lens	29	-	-	-
Diffuser	-	-	316	1522
Coating	-	-	200	-
Other	9	17	17	19
TOTAL	1615	8159	8675	6051

Representativity

This declaration represents the production of four specific lighting systems on the production sites located in Greve and Roskilde. Product-specific bill of materials are based on average values for 2019. Background data are based on primarily GaBi Professional Database and Ecoinvent and data were assessed based on their data quality and representativeness. Some of the upstream generic data used for electronic components were old but were assessed to be the best available data and a conservative estimate of the current situation. The results for end-of-life is for one specific scenario, where 100% of the products are reused in place after use after the life span of 15 years, however, the electronics (LED board and driver) are replaced.

Hazardous substances

The products do not contain substances listed in the "Candidate List of Substances of Very High Concern for authorisation" with a content exceeding 0,1 weight % (<http://echa.europa.eu/candidate-list-table>). Absence of these substances is declared by the producer, Fischer Lighting.

Essential characteristics (CE)

The declared products are in conformity with the essential requirements of the following European Directives and harmonized standards:

Low Voltage Directive (LVD), 2006/95/EC:

- EN 60598-1:2008+A11:2009
- EN 60598-2-5:1998

Electromagnetic Compatibility Directive (EMC), 2004/108/EC:

- EN 55015:2006+A1:2007+A2:2009
- EN 61547:2009
- EN 61547:2009
- EN 61000-3-2:2006+A2:2009
- EN 61000-3-3:2008

Restriction of the use of certain Hazardous Substances in electrical and electronic equipment Directive (RoHS), 2001/65/EC:

- EN 50581:2012

Declaration of performance according to EU regulation 305/2011 is available for all declared product variations.

Further technical information can be obtained by contacting the manufacturer or on the website www.fischer-lighting.com.

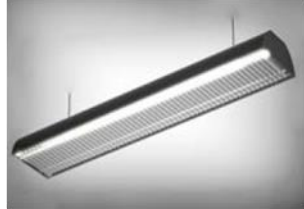
Reference Service Life (RSL)

The scenario used for the service life of the products is 15 years as required by the reference PCR.

Picture of products



Product 1: August



Product 2: Natural History - ReUse



Product 3: Natural History - coated/sand blasted and new diffuser



Product 4: VENUS

LCA background

Declared unit / Functional unit

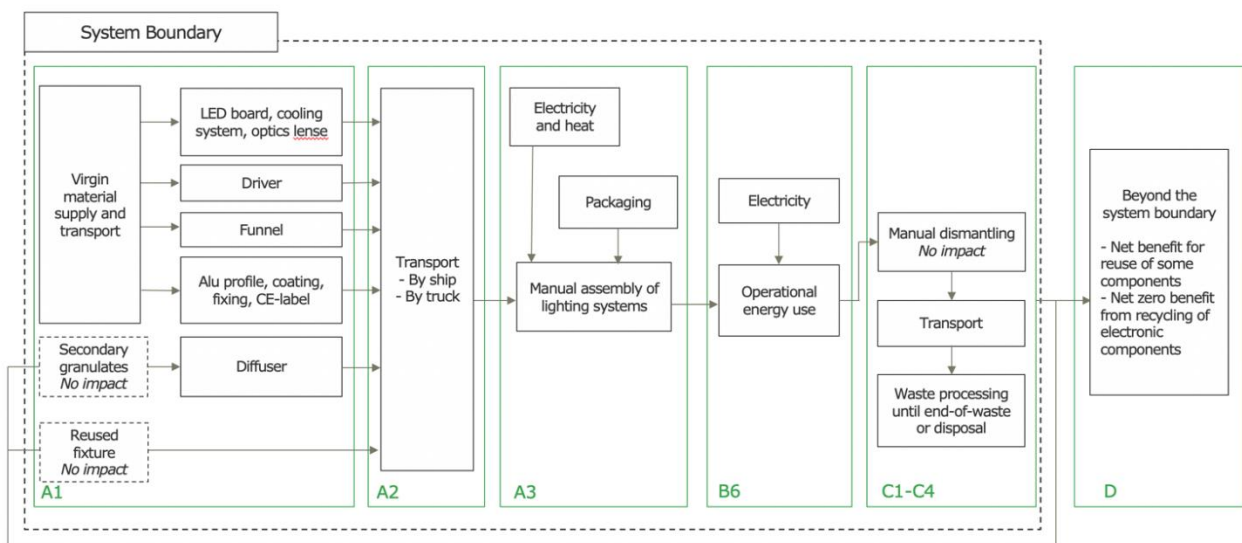
The LCI and LCIA results in this EPD relates to the declared unit 1 lighting system used in an office in Denmark for 15 years

Name	Product 1	Product 2	Product 3	Product 4	Unit
Declared unit	1	1	1	1	lighting system used for 15 years
Conversion factor to 1 kg	1.61	8.14	8.66	6.04	kg/lighting system used for 15 years

PCR

This EPD is developed according to the core rules for the product category of construction products in EN 15804+A2, and PCR Part B: Requirements on the EPD for Luminaires, lamps and components for luminaires, version 1.6.

Flow diagram



System boundary

This EPD is based on a “cradle-to-gate with options, modules C1-C4 and D” LCA, in which 100 weight-% of the product has been accounted for.

The general rules for the exclusion of inputs and outputs follows the requirements in EN 15804+A2, 6.3.5, where the total of neglected input flows per module shall be a maximum of 5 % of energy usage and mass and 1 % of energy usage and mass for unit processes.

Product stage (A1-A3) includes:

- A1 – Raw material supply
- A2 – Transport to manufacturing
- A3 – Manufacturing

The product stage consists of raw material extraction and production, supply of recycled materials, transport to manufacturing, production of packaging, energy, and assembly of the lighting systems. Management of generated waste is included up to the “end-of-waste” state or final disposal.

Raw materials and components originate from different suppliers. The reused fixtures originate from buildings in Denmark. The diffuser is made from secondary materials from upcycled fishnets. The assembly of the lighting systems is performed in Denmark at two different locations. As the assembly process is done by manual labor, only electricity for lighting, machinery, forklifts and hand tools, and heating have been included. Packaging of the final product consists of pallets, pallet frames and cardboard.

Use stage (B1-B7) includes:

- B6 – Operational energy use

The use stage consists of electricity for the lighting systems when they are assumed to be used in an office building in Denmark for 15 years. The electricity use calculation follows the formula provided in the reference PCR. The electricity has been assumed to be the Danish grid consumption mix.

End of life stage (C1-C4) includes:

- C1 – De-construction demolition
- C2 – Transport
- C3 – Waste processing
- C4 – Disposal

The end-of-life stage consists of the transportation and waste management processes to manage the product as waste after the use phase scenario of 15 years life span.

The end-of life scenario is that that 100% of the products are reused in place after use after the life span of 15 years, however, the electronics (LED board and driver) are replaced. The old electronic components were assumed to be collected separately and sent to recycling. The other components were assumed to be reused, thus replacing the need for production of new components (see module D). The generated waste in modules C1-C4 is included up to the “end-of-waste” state or final disposal, with the potential net benefits reported in module D.

The generated waste in modules C1-C4 is included up to the “end-of-waste” state or final disposal, with the potential net benefits reported in module D.

Beyond the system boundary (D) includes:

D – Re-use, recovery and recycling potential

Module D includes reuse, recovery and/or recycling potential, expressed as net impact and benefits, due to reuse, recycling and incineration of materials with energy recovery in modules C1-C4. The reused components made from virgin materials in the product stage, such as the funnel, were assumed to replace similar components from virgin materials. No credit is included for the reused fixture and secondary plastic granulates from fishnets as the net output was zero as the same materials are modelled as inputs to the product stage. No value-correction factor for quality losses was applied for the reused components as they do not deteriorate when used in an indoor environment for 15 years. No credit was included for the recycling of electronic components (LED board and driver).

LCA results

Product 1: August

ENVIRONMENTAL IMPACTS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS								
Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ eq.]	3.21E+01	1.19E+02	0.00E+00	1.93E-04	1.93E-03	0.00E+00	-6,76E+00
GWP-fossil	[kg CO ₂ eq.]	3.57E+01	1.20E+02	0.00E+00	1.90E-04	1.90E-03	0.00E+00	-6,75E+00
GWP-biogenic	[kg CO ₂ eq.]	-3.73E+00	-1.27E+00	0.00E+00	2.06E-06	2.06E-05	0.00E+00	-1,58E-03
GWP-luluc	[kg CO ₂ eq.]	5.74E-02	2.37E-01	0.00E+00	1.55E-06	1.55E-05	0.00E+00	-3,92E-03
ODP	[kg CFC 11 eq.]	2.49E-06	3.06E-12	0.00E+00	3.52E-20	3.52E-19	0.00E+00	-1,85E-07
AP	[mol H ⁺ eq.]	2.39E-01	1.75E-01	0.00E+00	2.22E-07	2.22E-06	0.00E+00	-3,65E-02
EP-freshwater	[kg PO ₄ eq.]	3.88E-02	5.22E-04	0.00E+00	5.84E-10	5.84E-09	0.00E+00	-4,12E-04
EP-marine	[kg N eq.]	4.61E-02	5.74E-02	0.00E+00	6.81E-08	6.81E-07	0.00E+00	-4,96E-03
EP-terrestrial	[mol N eq.]	4.97E-01	5.77E-01	0.00E+00	8.09E-07	8.09E-06	0.00E+00	-5,35E-02
POCP	[kg NMVOC eq.]	1.39E-01	1.42E-01	0.00E+00	1.84E-07	1.84E-06	0.00E+00	-1,58E-02
ADPm ¹	[kg Sb eq.]	1.31E-02	4.96E-05	0.00E+00	1.55E-11	1.55E-10	0.00E+00	-7,53E-05
ADPf ¹	[MJ]	5.28E+02	1.33E+03	0.00E+00	2.56E-03	2.56E-02	0.00E+00	-8,11E+01
WDP ¹	[m ³]	1.37E+01	7.75E+00	0.00E+00	1.87E-06	1.87E-05	0.00E+00	-2,12E+00
Caption	GWP-total = Global Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-biogenic = Global Warming Potential - biogenic; GWP-luluc = Global Warming Potential - land use and land use change; ODP = Ozone Depletion; AP = Acidification; EP-freshwater = Eutrophication – aquatic freshwater; EP-marine = Eutrophication – aquatic marine; EP-terrestrial = Eutrophication – terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential – minerals and metals; ADPf = Abiotic Depletion Potential – fossil fuels; WDP = water use							
Disclaimer	¹ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.							

ADDITIONAL ENVIRONMENTAL IMPACTS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS								
Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
PM	[Disease incidence]	2.90E-06	1.64E-06	0.00E+00	1.47E-12	1.47E-11	0.00E+00	-8,14E-07
IRP ²	[kBq U235 eq.]	3.92E+00	7.76E+00	0.00E+00	6.99E-07	6.99E-06	0.00E+00	-3,30E-01
ETP-fw ¹	[CTUe]	3.29E+03	4.15E+02	0.00E+00	1.92E-03	1.92E-02	0.00E+00	-4,74E+01
HTP-c ¹	[CTUh]	8.27E-07	3.97E-08	0.00E+00	3.96E-14	3.96E-13	0.00E+00	-7,86E-07
HTP-nc ¹	[CTUh]	3.88E-06	8.43E-07	0.00E+00	2.02E-12	2.02E-11	0.00E+00	-1,02E-07
SQP ¹	-	9.53E+02	1.47E+03	0.00E+00	8.99E-04	8.99E-03	0.00E+00	-8,56E+00
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality (dimensionless)							
Disclaimers	¹ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.							
	² This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.							

RESOURCE USE PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
PERE	[MJ]	5.42E+01	2.04E+03	0.00E+00	1.48E-04	1.48E-03	0.00E+00	-8,49E+00
PERM	[MJ]	3.80E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
PERT	[MJ]	9.22E+01	2.04E+03	0.00E+00	1.48E-04	1.48E-03	0.00E+00	-8,49E+00
PENRE	[MJ]	5.24E+02	1.33E+03	0.00E+00	2.57E-03	2.57E-02	0.00E+00	-8,11E+01
PENRM	[MJ]	3.81E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
PENRT	[MJ]	5.28E+02	1.33E+03	0.00E+00	2.57E-03	2.57E-02	0.00E+00	-8,11E+01
SM	[kg]	8.10E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
FW	[m ³]	3.28E-01	9.11E-01	0.00E+00	1.73E-07	1.73E-06	0.00E+00	-5,56E-02
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water							

WASTE CATEGORIES AND OUTPUT FLOWS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
HWD	[kg]	1.56E-06	2.09E-06	0.00E+00	1.19E-10	1.19E-09	0.00E+00	-1,15E-06
NHWD	[kg]	9.07E-01	4.37E+00	0.00E+00	4.07E-07	4.07E-06	0.00E+00	-8,49E-01
RWD	[kg]	1.98E-03	7.32E-02	0.00E+00	4.74E-09	4.74E-08	0.00E+00	-1,06E-03

CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E+00	0.00E+00	0.00E+00
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-01	0.00E+00	0.00E+00
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy							

BIOGENIC CARBON CONTENT PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	At the factory gate
Biogenic carbon content in product	[kg C]	0.00E+00
Biogenic carbon content in accompanying packaging	[kg C]	1.16E+00
Note	1 kg biogenic carbon is equivalent to 44/12 kg of CO ₂	

Product 2: Natural History – ReUse

ENVIRONMENTAL IMPACTS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS								
Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ eq.]	3.53E+01	2.97E+02	0.00E+00	3.02E-04	3.02E-03	0.00E+00	-3,26E+00
GWP-fossil	[kg CO ₂ eq.]	3.92E+01	3.00E+02	0.00E+00	2.96E-04	2.96E-03	0.00E+00	-3,25E+00
GWP-biogenic	[kg CO ₂ eq.]	-3.97E+00	-3.19E+00	0.00E+00	3.23E-06	3.23E-05	0.00E+00	1,54E-03
GWP-luluc	[kg CO ₂ eq.]	6.66E-02	5.91E-01	0.00E+00	2.43E-06	2.43E-05	0.00E+00	-2,65E-03
ODP	[kg CFC 11 eq.]	2.63E-06	7.66E-12	0.00E+00	5.51E-20	5.51E-19	0.00E+00	-4,40E-08
AP	[mol H ⁺ eq.]	2.61E-01	4.38E-01	0.00E+00	3.47E-07	3.47E-06	0.00E+00	-1,59E-02
EP-freshwater	[kg PO ₄ eq.]	4.27E-02	1.30E-03	0.00E+00	9.14E-10	9.14E-09	0.00E+00	-1,40E-04
EP-marine	[kg N eq.]	5.12E-02	1.43E-01	0.00E+00	1.07E-07	1.07E-06	0.00E+00	-2,15E-03
EP-terrestrial	[mol N eq.]	5.47E-01	1.44E+00	0.00E+00	1.26E-06	1.26E-05	0.00E+00	-2,32E-02
POCP	[kg NMVOC eq.]	1.51E-01	3.55E-01	0.00E+00	2.87E-07	2.87E-06	0.00E+00	-6,77E-03
ADPm ¹	[kg Sb eq.]	1.32E-02	1.24E-04	0.00E+00	2.43E-11	2.43E-10	0.00E+00	-1,20E-05
ADPf ¹	[MJ]	5.91E+02	3.32E+03	0.00E+00	4.00E-03	4.00E-02	0.00E+00	-4,32E+01
WDP ¹	[m ³]	1.48E+01	1.94E+01	0.00E+00	2.93E-06	2.93E-05	0.00E+00	-5,52E-01
Caption	GWP-total = Global Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-biogenic = Global Warming Potential - biogenic; GWP-luluc = Global Warming Potential - land use and land use change; ODP = Ozone Depletion; AP = Acidification; EP-freshwater = Eutrophication – aquatic freshwater; EP-marine = Eutrophication – aquatic marine; EP-terrestrial = Eutrophication – terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential – minerals and metals; ADPf = Abiotic Depletion Potential – fossil fuels; WDP = water use							
Disclaimer	¹ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.							

ADDITIONAL ENVIRONMENTAL IMPACTS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS								
Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
PM	[Disease incidence]	2.78E-06	4.10E-06	0.00E+00	2.30E-12	2.30E-11	0.00E+00	-1,71E-07
IRP ²	[kBq U235 eq.]	4.80E+00	1.94E+01	0.00E+00	1.09E-06	1.09E-05	0.00E+00	-5,05E-01
ETP-fw ¹	[CTUe]	3.50E+03	1.04E+03	0.00E+00	3.00E-03	3.00E-02	0.00E+00	-2,32E+01
HTP-c ¹	[CTUh]	2.85E-08	9.92E-08	0.00E+00	6.19E-14	6.19E-13	0.00E+00	-5,24E-09
HTP-nc ¹	[CTUh]	1.34E-06	2.11E-06	0.00E+00	3.16E-12	3.16E-11	0.00E+00	-4,15E-08
SQP ¹	-	1.04E+03	3.66E+03	0.00E+00	1.41E-03	1.41E-02	0.00E+00	-3,62E+00
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality (dimensionless)							
Disclaimers	¹ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.							
	² This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.							

RESOURCE USE PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
PERE	[MJ]	7.11E+01	5.09E+03	0.00E+00	2.32E-04	2.32E-03	0.00E+00	-1,64E+01
PERM	[MJ]	4.06E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
PERT	[MJ]	1.12E+02	5.09E+03	0.00E+00	2.32E-04	2.32E-03	0.00E+00	-1,64E+01
PENRE	[MJ]	5.91E+02	3.32E+03	0.00E+00	4.02E-03	4.02E-02	0.00E+00	-4,32E+01
PENRM	[MJ]	4.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
PENRT	[MJ]	5.91E+02	3.32E+03	0.00E+00	4.02E-03	4.02E-02	0.00E+00	-4,32E+01
SM	[kg]	7.65E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
FW	[m ³]	3.79E-01	2.28E+00	0.00E+00	2.70E-07	2.70E-06	0.00E+00	-4,26E-02
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water							

WASTE CATEGORIES AND OUTPUT FLOWS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
HWD	[kg]	1.21E-06	5.21E-06	0.00E+00	1.86E-10	1.86E-09	0.00E+00	-7,29E-07
NHWD	[kg]	1.05E+00	1.09E+01	0.00E+00	6.37E-07	6.37E-06	0.00E+00	-7,95E-01
RWD	[kg]	3.33E-03	1.83E-01	0.00E+00	7.41E-09	7.41E-08	0.00E+00	-2,32E-03

CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.96E+00	0.00E+00	0.00E+00
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E-01	0.00E+00	0.00E+00
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy							

BIOGENIC CARBON CONTENT PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	At the factory gate
Biogenic carbon content in product	[kg C]	0.00E+00
Biogenic carbon content in accompanying packaging	[kg C]	1.27E+00
Note	1 kg biogenic carbon is equivalent to 44/12 kg of CO ₂	

Product 3: Natural History – coated/sand blasted and new diffuser

ENVIRONMENTAL IMPACTS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS								
Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ eq.]	4.35E+01	2.64E+02	0.00E+00	3.02E-04	3.02E-03	0.00E+00	-1,14E+01
GWP-fossil	[kg CO ₂ eq.]	4.74E+01	2.67E+02	0.00E+00	2.96E-04	2.96E-03	0.00E+00	-1,14E+01
GWP-biogenic	[kg CO ₂ eq.]	-3.93E+00	-2.83E+00	0.00E+00	3.23E-06	3.23E-05	0.00E+00	-3,25E-02
GWP-luluc	[kg CO ₂ eq.]	7.20E-02	5.26E-01	0.00E+00	2.43E-06	2.43E-05	0.00E+00	-7,99E-03
ODP	[kg CFC 11 eq.]	3.75E-06	6.81E-12	0.00E+00	5.51E-20	5.51E-19	0.00E+00	-1,16E-06
AP	[mol H ⁺ eq.]	2.94E-01	3.90E-01	0.00E+00	3.47E-07	3.47E-06	0.00E+00	-4,81E-02
EP-freshwater	[kg PO ₄ eq.]	4.51E-02	1.16E-03	0.00E+00	9.14E-10	9.14E-09	0.00E+00	-2,54E-03
EP-marine	[kg N eq.]	5.60E-02	1.28E-01	0.00E+00	1.07E-07	1.07E-06	0.00E+00	-6,93E-03
EP-terrestrial	[mol N eq.]	5.95E-01	1.28E+00	0.00E+00	1.26E-06	1.26E-05	0.00E+00	-7,15E-02
POCP	[kg NMVOC eq.]	1.68E-01	3.15E-01	0.00E+00	2.87E-07	2.87E-06	0.00E+00	-2,41E-02
ADPm ¹	[kg Sb eq.]	1.33E-02	1.10E-04	0.00E+00	2.43E-11	2.43E-10	0.00E+00	-9,50E-05
ADPf ¹	[MJ]	7.53E+02	2.95E+03	0.00E+00	4.00E-03	4.00E-02	0.00E+00	-2,05E+02
WDP ¹	[m ³]	2.48E+01	1.72E+01	0.00E+00	2.93E-06	2.93E-05	0.00E+00	-1,05E+01
Caption	GWP-total = Global Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-biogenic = Global Warming Potential - biogenic; GWP-luluc = Global Warming Potential - land use and land use change; ODP = Ozone Depletion; AP = Acidification; EP-freshwater = Eutrophication – aquatic freshwater; EP-marine = Eutrophication – aquatic marine; EP-terrestrial = Eutrophication – terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential – minerals and metals; ADPf = Abiotic Depletion Potential – fossil fuels; WDP = water use							
Disclaimer	¹ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.							

ADDITIONAL ENVIRONMENTAL IMPACTS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS								
Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
PM	[Disease incidence]	2.94E-06	3.65E-06	0.00E+00	2.30E-12	2.30E-11	0.00E+00	-3,34E-07
IRP ²	[kBq U235 eq.]	5.99E+00	1.72E+01	0.00E+00	1.09E-06	1.09E-05	0.00E+00	-1,69E+00
ETP-fw ¹	[CTUe]	3.69E+03	9.22E+02	0.00E+00	3.00E-03	3.00E-02	0.00E+00	-2,16E+02
HTP-c ¹	[CTUh]	3.32E-08	8.82E-08	0.00E+00	6.19E-14	6.19E-13	0.00E+00	-9,91E-09
HTP-nc ¹	[CTUh]	1.54E-06	1.87E-06	0.00E+00	3.16E-12	3.16E-11	0.00E+00	-2,47E-07
SQP ¹	-	1.06E+03	3.26E+03	0.00E+00	1.41E-03	1.41E-02	0.00E+00	-2,41E+01
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality (dimensionless)							
Disclaimers	¹ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.							
	² This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.							

RESOURCE USE PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
PERE	[MJ]	8.10E+01	4.52E+03	0.00E+00	2.32E-04	2.32E-03	0.00E+00	-2,63E+01
PERM	[MJ]	4.06E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
PERT	[MJ]	1.22E+02	4.52E+03	0.00E+00	2.32E-04	2.32E-03	0.00E+00	-2,63E+01
PENRE	[MJ]	7.45E+02	2.96E+03	0.00E+00	4.02E-03	4.02E-02	0.00E+00	-2,05E+02
PENRM	[MJ]	7.60E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
PENRT	[MJ]	7.53E+02	2.96E+03	0.00E+00	4.02E-03	4.02E-02	0.00E+00	-2,05E+02
SM	[kg]	7.65E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
FW	[m ³]	6.11E-01	2.03E+00	0.00E+00	2.70E-07	2.70E-06	0.00E+00	-2,75E-01
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water							

WASTE CATEGORIES AND OUTPUT FLOWS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
HWD	[kg]	1.22E-06	4.64E-06	0.00E+00	1.86E-10	1.86E-09	0.00E+00	-7,36E-07
NHWD	[kg]	1.07E+00	9.70E+00	0.00E+00	6.37E-07	6.37E-06	0.00E+00	-8,13E-01
RWD	[kg]	4.00E-03	1.63E-01	0.00E+00	7.41E-09	7.41E-08	0.00E+00	-2,99E-03

CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.48E+00	0.00E+00	0,00E+00
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E-01	0.00E+00	0,00E+00
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
EE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy							

BIOGENIC CARBON CONTENT PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	At the factory gate
Biogenic carbon content in product	[kg C]	0.00E+00
Biogenic carbon content in accompanying packaging	[kg C]	1.27E+00
Note	1 kg biogenic carbon is equivalent to 44/12 kg of CO ₂	

Product 4: VENUS

ENVIRONMENTAL IMPACTS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS								
Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ eq.]	5.01E+01	2.64E+02	0.00E+00	8.90E-04	8.90E-03	0.00E+00	-6.33E+00
GWP-fossil	[kg CO ₂ eq.]	5.47E+01	2.67E+02	0.00E+00	8.73E-04	8.73E-03	0.00E+00	-6.33E+00
GWP-biogenic	[kg CO ₂ eq.]	-4.66E+00	-2.83E+00	0.00E+00	9.50E-06	9.50E-05	0.00E+00	7.03E-03
GWP-luluc	[kg CO ₂ eq.]	7.61E-02	5.26E-01	0.00E+00	7.15E-06	7.15E-05	0.00E+00	-2.87E-03
ODP	[kg CFC 11 eq.]	2.83E-06	6.81E-12	0.00E+00	1.62E-19	1.62E-18	0.00E+00	-1.76E-08
AP	[mol H ⁺ eq.]	3.43E-01	3.90E-01	0.00E+00	1.02E-06	1.02E-05	0.00E+00	-2.17E-02
EP-freshwater	[kg PO ₄ eq.]	4.64E-02	1.16E-03	0.00E+00	2.69E-09	2.69E-08	0.00E+00	-6.02E-04
EP-marine	[kg N eq.]	6.52E-02	1.28E-01	0.00E+00	3.14E-07	3.14E-06	0.00E+00	-3.61E-03
EP-terrestrial	[mol N eq.]	6.92E-01	1.28E+00	0.00E+00	3.72E-06	3.72E-05	0.00E+00	-3.71E-02
POCP	[kg NMVOC eq.]	1.93E-01	3.15E-01	0.00E+00	8.46E-07	8.46E-06	0.00E+00	-1.21E-02
ADPm ¹	[kg Sb eq.]	1.33E-02	1.10E-04	0.00E+00	7.15E-11	7.15E-10	0.00E+00	-1.59E-05
ADPf ¹	[MJ]	8.71E+02	2.95E+03	0.00E+00	1.18E-02	1.18E-01	0.00E+00	-1.83E+02
WDP ¹	[m ³]	5.11E+01	1.72E+01	0.00E+00	8.62E-06	8.62E-05	0.00E+00	-3.35E+01
Caption	GWP-total = Global Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-biogenic = Global Warming Potential - biogenic; GWP-luluc = Global Warming Potential - land use and land use change; ODP = Ozone Depletion; AP = Acidification; EP-freshwater = Eutrophication – aquatic freshwater; EP-marine = Eutrophication – aquatic marine; EP-terrestrial = Eutrophication – terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential – minerals and metals; ADPf = Abiotic Depletion Potential – fossil fuels; WDP = water use							
Disclaimer	¹ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.							

ADDITIONAL ENVIRONMENTAL IMPACTS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS								
Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
PM	[Disease incidence]	4.47E-06	3.65E-06	0.00E+00	6.77E-12	6.77E-11	0.00E+00	-1.91E-07
IRP ²	[kBq U235 eq.]	5.66E+00	1.72E+01	0.00E+00	3.22E-06	3.22E-05	0.00E+00	-7.87E-01
ETP-fw ¹	[CTUe]	4.21E+03	9.22E+02	0.00E+00	8.82E-03	8.82E-02	0.00E+00	-4.60E+02
HTP-c ¹	[CTUh]	1.45E-07	8.82E-08	0.00E+00	1.82E-13	1.82E-12	0.00E+00	-9.94E-09
HTP-nc ¹	[CTUh]	1.51E-05	1.87E-06	0.00E+00	9.30E-12	9.30E-11	0.00E+00	-4.77E-08
SQP ¹	-	1.22E+03	3.26E+03	0.00E+00	4.14E-03	4.14E-02	0.00E+00	-7.89E+00
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality (dimensionless)							
Disclaimers	¹ The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.							
	² This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.							

RESOURCE USE PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
PERE	[MJ]	7.76E+01	4.52E+03	0.00E+00	6.82E-04	6.82E-03	0.00E+00	-1.13E+01
PERM	[MJ]	4.75E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	[MJ]	1.25E+02	4.52E+03	0.00E+00	6.82E-04	6.82E-03	0.00E+00	-1.13E+01
PENRE	[MJ]	8.35E+02	2.96E+03	0.00E+00	1.18E-02	1.18E-01	0.00E+00	-1.83E+02
PENRM	[MJ]	3.67E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	[MJ]	8.72E+02	2.96E+03	0.00E+00	1.18E-02	1.18E-01	0.00E+00	-1.83E+02
SM	[kg]	3.91E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	[m ³]	1.20E+00	2.03E+00	0.00E+00	7.95E-07	7.95E-06	0.00E+00	-7.87E-01
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water							

WASTE CATEGORIES AND OUTPUT FLOWS PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	A1-A3	B6	C1	C2	C3	C4	D
HWD	[kg]	2.35E-06	4.64E-06	0.00E+00	5.48E-10	5.48E-09	0.00E+00	-1.81E-06
NHWD	[kg]	1.72E+00	9.70E+00	0.00E+00	1.88E-06	1.88E-05	0.00E+00	-9.34E-02
RWD	[kg]	4.69E-03	1.63E-01	0.00E+00	2.18E-08	2.18E-07	0.00E+00	-3.34E-03

CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E+00	0.00E+00	0.00E+00
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.80E-01	0.00E+00	0.00E+00
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy							

BIOGENIC CARBON CONTENT PER 1 PIECE OF LIGHTING SYSTEM USED FOR 15 YEARS

Parameter	Unit	At the factory gate
Biogenic carbon content in product	[kg C]	0.00E+00
Biogenic carbon content in accompanying packaging	[kg C]	1.50E+00
Note	1 kg biogenic carbon is equivalent to 44/12 kg of CO ₂	

Additional information

Technical information on scenarios

Reference service life

RSL information	Value	Unit
Reference Service Life (Based on the reference PCR)	15	Years

Use (B1-B7)

Scenario information	Product 1	Product 2	Product 3	Product 4	Unit
B6 Operational energy use					
Electricity use (15 years)	375.0	937.5	833.5	833.5	kWh
Active power	10	25	25	25	W
Passive power	0	0	0.5	0.5	W
Illuminance	Constant	Constant	Constant	Constant	–
Dimmable	No	No	Yes	Yes	–
Presence control	No	No	Yes	Yes	–

End of life (C1-C4)

Scenario information	Product 1	Product 2	Product 3	Product 4	Unit
Collected separately	1.62	8.16	8.68	6.05	kg
Collected with mixed waste	0	0	0	0	kg
For reuse	1.49	7.96	8.48	5.45	kg
For recycling	0.13	0.20	0.20	0.60	kg
For energy recovery	0	0	0	0	kg
For final disposal	0	0	0	0	kg
Assumptions for scenario development	Product reused on site, with new driver and LED board. Electronic components recycled.	Product reused on site, with new driver and LED board. Electronic components recycled.	Product reused on site, with new driver and LED board. Electronic components recycled.	Product reused on site, with new driver and LED board. Electronic components recycled.	–

Re-use, recovery and recycling potential (D)

Scenario information	Product 1	Product 2	Product 3	Product 4	Unit
Funnel/Parabol	0.56	–	–	–	kg
Aluminum profile	–	0.32	0.32	–	kg
Cooling system/ heatsink Alu	0.17	–	–	–	kg
Optics – lens	0.029	–	–	–	kg
Diffuser	–	–	0.32	1.5	kg
Coating	–	–	0.20	–	kg
Other	0.009	0.017	0.017	0.019	kg

Note: the reused steel fixture is not credited in module D as the net output from the product system is zero.

Indoor air

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.

Soil and water

The EPD does not give information on release of dangerous substances to soil and water 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.

References

Publisher	 epddanmark www.epddanmark.dk
Programme operator	Danish Technological Institute Buildings & Environment Gregersensvej DK-2630 Taastrup www.teknologisk.dk
LCA-practitioner	Lise Hvid Horup Sørensen and Kristian Jelse Rambøll A/S Hannemanns Allé 53 DK-2300 København S Denmark Ramboll Sweden AB Vädursgatan 6 SE-412 50 Göteborg Sweden E-mail: lhhs@ramboll.dk
LCA software /background data	GaBi (version 9.2) Generic data are primarily based on life cycle inventory data from GaBi Professional Database 2019 and Ecoinvent version 3.6.
3rd party verifier	Linda Højbye, COWI A/S

General programme instructions

Version 2.0, www.epddanmark.dk

EN 15804

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Project report

Lise Hvid Horup Sørensen and Kristian Jelse. PR-Lighting systems-EN. Dated 2020-12-20

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