epd-norge
Global program operatør

Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

Tunn LT LED G2

The Norwegian EPD Foundation

Owner of the declaration:
DEFA Lighting AS

Product:
Tunn LT LED G2

Declared unit:
1 pcs

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

Program operator:
The Norwegian EPD Foundation

Declaration number:

NEPD-7084-6479-EN

Registration number:

NEPD-7084-6479-EN

Issue date: 08.07.2024

Valid to: 08.07.2029

EPD software:
LCAno EPD generator ID: 376100

General information

Product

Tunn LT LED G2

Program operator:

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Phone: +47 977 22 020
web: www.epd-norge.no

Declaration number:

NEPD-7084-6479-EN

This declaration is based on Product Category Rules:

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

Statement of liability:

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

Declared unit:

1 pcs Tunn LT LED G2

Declared unit with option:

A1,A2,A3,A4,A5,B6,C1,C2,C3,C4,D

Functional unit:

I pcs Tunn LT LED G2, manufactured, installed, used in tunnel 25 years including waste treatment at end-of-life.

General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD-Norway's guidelines for verification and approval requiring that tools are i) integrated into the company's environmental management system, ii) the procedures for use of the EPD tool are approved by EPD-Norway, and iii) the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools

Verification of EPD tool:

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

Third party verifier:

Vito D'Incognito, Take Care International

(no signature required)

Owner of the declaration:

DEFA Lighting AS
Contact person:
Phone:
e-mail: peter.beus@defa.com

Manufacturer:

DEFA Lighting AS
Slependveien 108
1396 Billingstad, Norway

Place of production:

DEFA Technology Production Site (China
Wuxi
214000 Jiangsu, China

Management system:

Organisation no:

931732099

Issue date:

08.07.2024

Valid to:

08.07.2029

Year of study:

2022

Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2021.09, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway.

Developer of EPD: Peter Beus

Reviewer of company-specific input data and EPD: Magne Bjorklund

Approved:

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:

Tunnel Light for Low Traffic road tunnels inner zone - 30W - 230V IP 66, Class 1. Body in stainless steel AISI 316L, painted in RAL 7035 (light grey). All electrical components are installed inside the body. No need for external connection box. No external heat zink makes the top of the fitting flat and easy to clean.

Tempered flat glass. The fitting is supplied with electronic LED driver, automatic circuit breaker and breathing filter as standard. Function protected version (UPS) is supplied with ceramic terminal block.

Product specification

Materials	kg	%
Electronic - Connector	0,13	1,68
Electronic - LED chip	0,00	0,02
Electronic - LED driver	0,20	2,58
Electronic - Printed wiring board	0,04	0,52
Electronic - Resistor	0,00	0,00
Electronic - Wire	0,26	3,36
Electronic component	0,20	2,58
Glass - Tempered	1,55	20,02
Metal	0,01	0,09
Metal - Aluminium wrought alloy	0,60	7,75
Metal - Brass	0,04	0,47
Metal - Copper	0,00	0,00
Metal - Stainless steel	4,00	51,67
Packaging - PET Film	0,00	0,00
Plastic - Plexiglass (PMMA)	0,06	0,78
Plastic - Polyamide	0,00	0,05
Plastic - Polyester	0,00	0,00
Plastic - Polyethylene terephthalate (PET)	0,02	0,26
Plastic - Teflon	0,06	0,78
Rubber, synthetic	0,14	1,84
Silicon products	0,43	5,55
Total	7,74	100,00

Packaging	kg	%
Packaging - Cardboard	0,62	100,00
Total incl. packaging	8,36	100,00

Technical data:

Link to product data on Web page:
https://www.defa.com/product/tunn-lt/

Market:

Nordic

Reference service life, product

100 000t (15 -25 years). Estimated based on the characteristic of the product and the intended application.

Reference service life, building or construction works

100 years.

LCA: Calculation rules

Declared unit:

1 pcs Tunn LT LED G2

Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) can be excluded. These cut-off criteria do not apply for hazardous materials and substances.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

Data quality:

Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases. The data quality of the raw materials in A1 is presented in the table below.

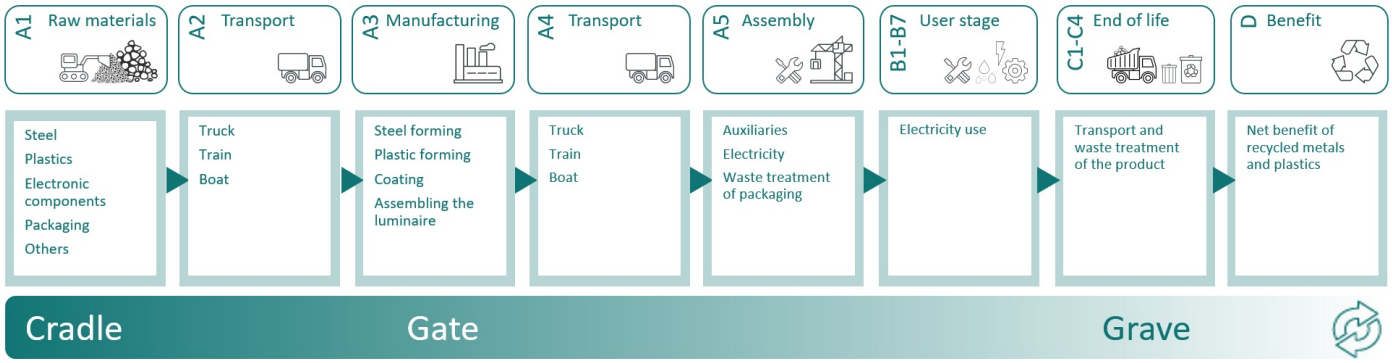
Materials	Source	Data quality	Year
Electronic - Connector	ecoinvent 3.6	Database	2019
Electronic - LED chip	Scholand et al. (2012) + Ecoinvent 3.6	Scientific literature + database	2017
Electronic - LED driver	Product composition + ecoinvent 3.6	Supplier data + database	2019
Electronic - Printed wiring board	ecoinvent 3.6	Database	2019
Electronic - Resistor	ecoinvent 3.6	Database	2019
Electronic - Wire	Material composition + ecoinvent 3.6	Supplier data + database	2019
Electronic component	Ecoinvent 3.6	Database + Supplier Information	2019
Glass - Tempered	Ecoinvent 3.6	Database	2019
Metal	Ecoinvent 3.6	Database	2019
Metal - Aluminium wrought alloy	Modified ecoinvent 3.6	Supplier data + database	2019
Metal - Brass	ecoinvent 3.6	Database	2019
Metal - Copper	ecoinvent 3.6	Database	2019
Metal - Stainless steel	Modified ecoinvent 3.6	Database	2019
Packaging - Cardboard	Modified ecoinvent 3.6	Database	2019
Packaging - PET Film	ecoinvent 3.6	Database	2019
Plastic - Plexiglass (PMMA)	ecoinvent 3.6	Database	2019
Plastic - Polyamide	ecoinvent 3.6	Database	2019
Plastic - Polyamide	Ecoinvent 3.6	Database + Supplier Information	2019
Plastic - Polyester	Ecoinvent 3.6	Database	2019
Plastic - Polyethylene terephthalate (PET)	ecoinvent 3.6	Database	2019
Plastic - Teflon	Ecoinvent 3.6	Database	2019
Rubber, synthetic	ecoinvent 3.6	Database	2019
Silicon products	ecoinvent 3.6	Database	2019

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MND	MND	MND	X	MND	X	X	X	X	X

System boundary:

The analysis is a cradle-to-grave study made for one luminaire manufactured , installed and used in a tunnel over the lifetime. Modules A1-A5 are included in the analysis. It includes the extraction and production of raw materials, transportation to the factory, the production process itself, transportation to market and installation of the product. B6 is the operational energy usage based on a normal use. C1-C4, D are mandatory modules which include end of life treatment of materials and the benefits from recycling.



Additional technical information:

LCA: Scenarios and additional technical information

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

The following information describe the scenarios :

Module A4 = Transport assumes truck (140km) and ship (21000km) from China to Norway warehouse. Warehouse to Customer is considered 300km as an average for Nordic customers.

Module B6 = The operational energy use of the luminaire is calculated based on the methodology provided in IBU PCR Part B for luminaires, lamps, and components for luminaires. The energy consumption model for luminaire used in the PCR follows the application scenarios developed in EN 15193:2007. To calculate the electricity use of the luminaire, the following scenario parameters have been applied:

- Active power of the luminaire (Pa) = 30 Watt
- Passive power of the luminaire (Pp) = 0 Watt
- Daylight time usage (tD) = 0 hours
- Non-daylight time usage (tN) = 8.760 hours
- Standard year time (ty) = 8.760 hours
- The occupancy dependency factor (FO) = 1 (factor, no unit)
- The daylight dependency factor (FD) = 1 (factor, no unit)
- The product specific constant illuminance factor (FCP) = 1 (factor, no unit)
- The non-daylight dimming factor (FN) = 1 (factor, no unit)
- The application specific empiric lifetime of the luminaire in years (a) = 15-25 years (corresponding to the reference service life of the product).

Module C2 = Average transport distance from project site to waste treatment facility = 85 Km

Modules C3 and C4 = Waste treatment of the product follows the default values provided in EN 50693, Product Category Rules for life cycle assessments of electronic and electrical products and systems, table G.4. This table specified how different types of raw materials used in A1 will likely be treated during the end-of-life of the product. Waste treatments in C3 include material recycling and incineration with and without energy recovery and fly ash extraction. Disposal in C4 consist of landfilling of different waste fractions and of ashes.

Module D = The recyclability of metals, plastics, and electronic components allows the producers a credit for the net scrap that is produced at the end of a product's life. The benefits from recycling of net scrap are described in formula from EN 15804:2012+A2:2019. Substitution of heat and electricity generated by the incineration with energy recovery of plastic insulation and other parts is also calculated in module D.

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Ship, Freight, Transoceanic (km)	65,0 %	21000	0,003	l/tkm	63,00
Truck, 16-32 tonnes, EURO 5 (km) - World	38,8 %	140	0,045	l/tkm	6,30
Truck, 7.5-16 tonnes, EURO 6 (km) - Europe	35,4 %	300	0,056	l/tkm	16,80
Truck, 7.5-16 tonnes, EURO 6 (km) - Europe	35,4 %	30	0,056	l/tkm	1,68

Assembly (A5)	Unit	Value			
Waste, packaging, corrugated board box, 0 % recycled, to average treatment (kg) - A5, inkl. 85 km transp.	kg	0,62			
Waste, packaging, plastic film (PET), to average treatment (kg) - A5, incl. 85 km transp.	kg	0,00			

Operational energy (B6)	Unit	Value			
Electricity, Nordic (kWh)	kWh/DU	3942,00			

Transport to waste processing (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Truck, 7.5-16 tonnes, EURO 6 (km) - Europe	35,4 %	85	0,056	l/tkm	4,76

Waste processing (C3)	Unit	Value			
Aluminium to recycling (kg)	kg	0,42			
Copper to recycling (kg)	kg	0,12			
Glass to recycling (kg) - C3	kg	0,93			
Non-ferrous metal to recycling (kg)	kg	0,02			
Steel to recycling (kg)	kg	3,36			
Waste treatment of plastic mixture, incineration with energy recovery and fly ash extraction (kg)	kg	0,43			
Waste treatment of polyvinylchloride (PVC), incineration with energy recovery and fly ash extraction (kg)	kg	0,06			
Waste treatment per kg electronics scrap from LED plate, without components, recycling of copper - C3 (kg)	kg	0,02			
Waste treatment per kg electronics scrap from PWB, with components, recycling of metals C3 (kg)	kg	0,05			
Waste treatment per kg used electronic cable, manual seperation (kg)	kg	0,26			
Waste treatment per kg used electronic components, manual seperation (kg)	kg	0,53			
Waste treatment per kg used PWB, shredding and separation - C3 (kg)	kg	0,15			

Disposal (C4)	Unit	Value			
Landfilling of aluminium (kg)	kg	0,18			
Landfilling of ashes from incineration of Plastic mixture, process per kg ashes and residues (kg)	kg	0,01			
Landfilling of ashes from incineration of Polyvinylchloride (PVC), process per kg ashes and residues (kg)	kg	0,01			
Landfilling of copper (kg)	kg	0,08			
Landfilling of glass (kg) - C4	kg	0,62			
Landfilling of hazardous waste (kg)	kg	0,07			
Landfilling of non-ferrous metal (kg)	kg	0,01			
Landfilling of non-hazardous waste (kg)	kg	0,01			
Landfilling of plastic mixture (kg)	kg	0,49			
Landfilling of steel (kg)	kg	0,84			

Benefits and loads beyond the system boundaries (D)	Unit	Value			
Substitution of copper with net scrap from PWB, without components (kg)	kg	0,00			
Substitution of electricity, in Norway (MJ)	MJ	0,75			
Substitution of primary aluminium with net scrap (kg)	kg	0,42			
Substitution of primary copper with net scrap (kg)	kg	0,12			
Substitution of primary glass with net scrap (kg)	kg	0,93			
Substitution of primary metals with net scrap from PWB, with components (kg)	kg	0,02			
Substitution of primary other non-ferrous metals with net scrap (kg)	kg	0,02			
Substitution of primary steel with net scrap (kg)	kg	3,40			
Substitution of thermal energy, district heating, in Norway (MJ)	MJ	11,39			

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

Environmental impact							
Indicator		**Unit**	A1	A2	A3	A4	A5
	GWP-total	kg CO_2 -eq	1,00E+02	2,10E-01	6,20E+00	2,45E+00	1,06E+00
	GWP-fossil	kg CO_2 -eq	1,00E+02	2,09E-01	6,19E+00	2,45E+00	1,00E-02
	GWP-biogenic	kg CO_2 -eq	-6,70E-02	8,05E-05	1,02E-02	8,06E-04	1,05E+00
	GWP-luluc	kg CO_2 -eq	1,31E-01	7,52E-05	1,99E-03	1,47E-03	3,32E-06
	ODP	kg CFC11 -eq	4,18E-04	4,59E-08	6,15E-08	5,25E-07	2,12E-09
	AP	mol H+ -eq	9,28E-01	8,64E-04	3,34E-02	5,63E-02	4,75E-05
	EP-FreshWater	kg P -eq	1,89E-02	1,93E-06	1,50E-04	1,41E-05	8,24E-08
	EP-Marine	kg N -eq	1,46E-01	2,50E-04	6,60E-03	1,38E-02	1,57E-05
	EP-Terrestial	mol N -eq	1,91E+00	2,76E-03	7,32E-02	1,53E-01	1,70E-04
	POCP	kg NMVOC -eq	4,82E-01	8,44E-04	1,90E-02	4,03E-02	4,89E-05
	ADP-minerals&metals[1]	kg Sb-eq	1,14E-02	5,52E-06	3,80E-05	3,90E-05	2,44E-07
	ADP-fossil[1]	MJ	9,57E+02	3,09E+00	5,61E+01	3,29E+01	1,40E-01
	WDP[1]	m^3	1,43E+03	1,03E+00	7,49E+02	1,57E+01	1,78E-01

Indicator		**Unit**	B6	C1	C2	C3	C4	D
	GWP-total	kg CO_2 -eq	5,74E+02	0,00E+00	1,52E-01	1,27E+00	9,79E-02	-9,80E+00
	GWP-fossil	kg CO_2 -eq	5,35E+02	0,00E+00	1,52E-01	1,26E+00	9,25E-02	-9,69E+00
	GWP-biogenic	kg CO_2 -eq	9,78E+00	0,00E+00	7,04E-05	3,95E-04	5,32E-03	-3,22E-02
	GWP-luluc	kg CO_2 -eq	2,93E+01	0,00E+00	6,58E-05	2,88E-04	1,48E-04	-7,67E-02
	ODP	kg CFC11 -eq	5,79E-05	0,00E+00	3,34E-08	1,27E-08	8,25E-09	-4,81E-03
	AP	mol H+ -eq	2,47E+00	0,00E+00	4,37E-04	8,96E-04	2,69E-04	-1,60E-01
	EP-FreshWater	kg P -eq	3,54E-02	0,00E+00	1,39E-06	6,52E-06	1,13E-06	-1,04E-03
	EP-Marine	kg N -eq	3,90E-01	0,00E+00	8,28E-05	2,28E-04	1,51E-04	-1,37E-02
	EP-Terrestial	mol N -eq	5,24E+00	0,00E+00	9,29E-04	2,46E-03	9,40E-04	-1,67E-01
	POCP	kg NMVOC -eq	1,23E+00	0,00E+00	3,55E-04	6,37E-04	3,13E-04	-5,57E-02
	ADP-minerals&metals[1]	kg Sb-eq	8,32E-03	0,00E+00	5,49E-06	1,03E-06	2,81E-07	-1,77E-03
	ADP-fossil[1]	MJ	1,45E+04	0,00E+00	2,27E+00	1,84E+00	7,55E-01	-1,04E+02
	WDP[1]	m^3	1,12E+06	0,00E+00	2,72E+00	1,31E+01	1,11E+01	-1,97E+03

GWP-total = Global Warming Potential total; GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment: EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Remarks to environmental impacts

Additional environmental impact indicators

Indicator		Unit	A1	A2	A3	A4	A5
	PM	Disease incidence	7,63E-06	1,44E-08	4,36E-07	4,72E-08	7,01E-10
	IRP[2]	kgBq U235 -eq	2,49E+00	1,29E-02	1,12E-01	1,42E-01	6,01E-04
	ETP-fw[1]	CTUe	1,88E+04	2,48E+00	1,76E+02	2,16E+01	1,87E-01
	HTP-c[1]	CTUh	5,22E-07	0,00E+00	2,36E-09	0,00E+00	6,00E-12
	HTP-nc[1]	CTUh	7,79E-06	2,42E-09	8,65E-08	1,06E-08	2,35E-10
	SQP[1]	dimensionless	5,50E+02	2,09E+00	1,32E+01	1,01E+01	9,42E-02

Indicator		Unit	B6	C1	C2	C3	C4	D
	PM	Disease incidence	1,31E-05	0,00E+00	8,53E-09	5,71E-09	4,88E-09	-9,15E-07
	IRP[2]	kgBq U235 -eq	3,30E+02	0,00E+00	9,93E-03	8,41E-03	3,72E-03	-2,70E-01
	ETP-fw[1]	CTUe	1,81E+04	0,00E+00	1,77E+00	1,18E+01	6,90E+02	-1,15E+03
	HTP-c[1]	CTUh	4,22E-07	0,00E+00	0,00E+00	1,03E-09	1,05E-10	-3,61E-08
	HTP-nc[1]	CTUh	1,11E-05	0,00E+00	2,13E-09	6,04E-08	1,24E-09	-4,02E-07
	SQP[1]	dimensionless	1,09E+04	0,00E+00	1,35E+00	3,69E-01	1,87E+00	-2,82E+01

PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Potential Soil Quality Index (dimensionless)

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator
2. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Resource use

Indicator		Unit	A1	A2	A3	A4	A5
	PERE	MJ	1,77E+02	3,46E-02	6,07E+01	3,26E-01	2,31E-03
	PERM	MJ	9,87E+00	0,00E+00	0,00E+00	0,00E+00	-9,87E+00
	PERT	MJ	1,87E+02	3,46E-02	6,07E+01	3,26E-01	-9,87E+00
	PENRE	MJ	9,36E+02	3,09E+00	5,61E+01	3,29E+01	1,40E-01
	PENRM	MJ	2,20E+01	0,00E+00	0,00E+00	0,00E+00	-4,59E-03
	PENRT	MJ	9,58E+02	3,09E+00	5,61E+01	3,29E+01	1,36E-01
	SM	kg	7,96E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	RSF	MJ	3,28E-01	6,90E-04	4,52E-02	9,57E-03	7,67E-05
	NRSF	MJ	3,32E-01	5,72E-03	1,34E-01	7,35E-02	3,16E-04
	FW	m^3	8,87E-01	3,41E-04	4,29E-01	2,48E-03	6,62E-05

Indicator		Unit	B6	C1	C2	C3	C4	D
	PERE	MJ	1,42E+04	0,00E+00	3,87E-02	2,19E-01	1,21E-01	-2,82E+01
	PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	PERT	MJ	1,42E+04	0,00E+00	3,87E-02	2,19E-01	1,21E-01	-2,82E+01
	PENRE	MJ	1,47E+04	0,00E+00	2,27E+00	1,84E+00	7,55E-01	-1,04E+02
	PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	-2,99E+01	0,00E+00	0,00E+00
	PENRT	MJ	1,47E+04	0,00E+00	2,27E+00	-2,80E+01	7,55E-01	-1,04E+02
	SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,60E-03	8,34E-02
	RSF	MJ	1,44E+02	0,00E+00	1,40E-03	4,61E-03	1,37E-03	1,36E-01
	NRSF	MJ	0,00E+00	0,00E+00	5,07E-03	-5,71E-05	1,43E-02	3,66E+00
	FW	m^3	6,47E+01	0,00E+00	2,71E-04	5,74E-03	8,33E-04	-1,29E-01

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = Total use of non renewable primary energy resources; SM = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Waste

Indicator		Unit	A1	A2	A3	A4	A5
	HWD	kg	7,72E-01	2,73E-04	9,95E-03	1,65E-03	0,00E+00
	NHWD	kg	4,25E+01	1,46E-01	8,07E-01	5,38E-01	6,20E-01
	RWD	kg	2,23E-03	2,03E-05	6,84E-05	2,26E-04	0,00E+00

Indicator		Unit	B6	C1	C2	C3	C4	D
	HWD	kg	1,36E+00	0,00E+00	1,26E-04	2,77E-05	1,17E-01	-1,39E-02
	NHWD	kg	8,98E+01	0,00E+00	8,96E-02	3,75E-02	2,25E+00	-3,00E+00
	RWD	kg	1,52E-01	0,00E+00	1,53E-05	1,39E-06	3,36E-06	-2,62E-04

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Output flow

Indicator		Unit	A1	A2	A3	A4	A5
	CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MFR	kg	5,50E-03	0,00E+00	1,22E-02	0,00E+00	5,77E-01
	MER	kg	2,04E-04	0,00E+00	8,54E-03	0,00E+00	8,54E-07
	EEE	MJ	1,48E-03	0,00E+00	5,47E-03	0,00E+00	3,55E-02
	EET	MJ	2,24E-02	0,00E+00	8,28E-02	0,00E+00	5,37E-01

Indicator		Unit	B6	C1	C2	C3	C4	D
	CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MFR	kg	0,00E+00	0,00E+00	0,00E+00	4,85E+00	4,36E-05	-3,26E-03
	MER	kg	0,00E+00	0,00E+00	0,00E+00	4,86E-01	1,07E-06	-4,30E-04
	EEE	MJ	0,00E+00	0,00E+00	0,00E+00	7,17E-01	6,92E-05	-1,05E-03
	EET	MJ	0,00E+00	0,00E+00	0,00E+00	1,09E+01	1,05E-03	-1,59E-02

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

Biogenic Carbon Content

Indicator	Unit	At the factory gate
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	2,87E-01

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

Additional requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

Electricity mix	Source	Amount	Unit
Electricity, China (kWh)	ecoinvent 3.6	1102,91	g CO2-eq/kWh
Electricity, Norway (kWh)	ecoinvent 3.6	24,33	g CO2-eq/kWh

Dangerous substances

The product contains no substances given by the REACH Candidate list.

Indoor environment

Additional Environmental Information

Additional environmental impact indicators required in NPCR Part A for construction products						
Indicator	**Unit**	A1	A2	A3	A4	A5
GWPIOBC	kg CO_2 -eq	1,01E+02	2,10E-01	5,86E+00	2,45E+00	1,00E-02

Indicator	**Unit**	B6	C1	C2	C3	C4	D
GWPIOBC	kg CO_2 -eq	7,78E+02	0,00E+00	1,52E-01	1,27E+00	1,02E-01	-1,13E+01

GWP-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Bibliography

ISO 14025:2010. Environmental labels and declarations - Type III environmental declarations - Principles and procedures. International Organization for Standardization.
ISO 14044:2006. Environmental management - Life cycle assessment - Requirements and guidelines. International Organization for Standardization.
EN 15804:2012+A2:2019. Environmental product declaration - Core rules for the product category of construction products. European Committee for Standardization.
ISO 21930:2017. Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products. International Organization for Standardization.
EN 50693:2019. Product category rules for life cycle assessments of electronic and electrical products and systems. European Committee for Standardization.
Ecoinvent v3, 2019. Allocation, cut-off by classification. Swiss Centre of Life Cycle Inventories.
Iversen et al., (2021). eEPD v2021.09, background information for EPD generator tool system verification, LCA.no. Report number: 07.21. System verification report.
Philis et al., (2022). EPD generator for IBU PCR part B for luminaires, lamps, and components for luminaires, background information for EPD generator application and LCA data, LCA.no. Report number: 04.22. PCR verification report.
EPD Norway (2022). NPCR Part A: Construction products and services. The Norwegian EPD foundation. Version 2.0 published 24.03.2021.
IBU (2017). PCR part B for luminaires, lampes and components for luminaires. Institut Bauen und Umwelt e.V. Version 1.7, published 30.11.2017.

epd-norway Global Program Operator	**Program operator and publisher** The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo, Norway	Phone: +47 977 22 020 e-mail: post@epd-norge.no web: www.epd-norge.no
DEFA Lighting	**Owner of the declaration:** DEFA Lighting AS Slependveien 108, 1396 Billingstad	Phone: e-mail: peter.beus@defa.com web:
LCA.no	**Author of the Life Cycle Assessment** LCA.no AS Dokka 6A, 1671	Phone: +47 916 50 916 e-mail: post@lca.no web: www.lca.no
LCA.no	**Developer of EPD generator** LCA.no AS Dokka 6B,1671 Kråkerøy	Phone: +47 916 50 916 e-mail: post@lca.no web: www.lca.no
ECO PLATFORM EPD VERIFIED	ECO Platform ECO Portal	web: www.eco-platform.org web: ECO Portal