Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Calumma™ XS MC

from

ROBE lighting s.r.o.

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0017196
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products (EN 15804+A2) (1.3.4)
PCR review was conducted by: The Technical Committee of the International EPD® System. The review panel may be contacted via info@environdec.com
Life Cycle Assessment (LCA)
LCA accountability: LCA Studio s.r.o. Ing. Kamila Sirotná, prof. Ing. Vladimír Kočí, Ph.D.,MBA, Ing. et Ing. Tatiana Trecáková, PhD. Šárecká 1962/5, 16000 Prague 6, Czech Republic www.lcastudio.cz
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: prof. Ing. Silvia Vilčeková, PhD., Silcert, s.r.o. Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: ROBE lighting s.r.o.

Contact: Jan Vrána, jan.vrana@robe.cz

Description of the organisation:

ROBE is among the world's leading moving light manufacturers, recognised for its innovation, quality engineering and dedication to the very highest production values.

The company is based in the Czech Republic and all processes involved in making the luminaires is undertaken locally in a 75.000 square metre premises. Currently ROBE employs over 900 skilled staff worldwide.

Robe has wholly-owned subsidiaries in six key markets – the U.S., U.K., Middle East, Singapore (Asia Pacific), France and Germany - and a highly proactive and talented regional sales management team which helps oversee and co-ordinate the worldwide distribution network covering over 100 countries.

ROBE's moving and LED lights can be found everywhere. They are working and installed on stages and in concert halls, in theatres and all types of other venues; they are lighting all genres of performance from music to TV to drama and opera; appearing on a myriad of diverse events as well as at theme park attractions and entering the specialist worlds of architectural and environmental illumination.

The company is very proud of its independence and private ownership. This ensures the business remains agile, efficient, decisive and focussed on producing genuinely creative tools for an imaginative and exciting industry that constantly pushes boundaries.

ROBE Green initiative

ROBE is a global company that pursues a proactive policy of sustainable trading and business practices where possible, and takes its responsibility to employees, the community, and the planet very seriously. The company has focused on this approach to its development and growth since it was founded in 1994. Since then, it has been committed to ensuring that both its production processes and products are genuinely greener and more environmentally friendly.

The interest in bringing innovative and emerging technologies to the market can be traced back to the company's roots. The "Think of the Future Consider Nature" marketing campaign was one of many memorable early brand activations from the last decade, highlighting a philosophy at the heart of ROBE's operation.

From the very beginning, we proudly renovated old industrial premises instead of building on a Greenfield site. The company is based in the Czech Republic and all processes involved in making the luminaires are undertaken locally in a 75.000 square metre premises consisting of a reconstructed brownfield.

ROBE Products Are Designed To Last

Product longevity for resource conservation - ROBE products are designed to last and offer long-term reliability, engineered and built for continuity between generations of 'industry standard' luminaires, applying sustainability across ROBE's entire portfolio.

Making every product as versatile as possible ensures maximization of the invested resources and energy with each one working on as many different events as possible during its lifespan.

Making products maintainable

Most recently, ROBE was the first company to develop a fully 'TRANSFERABLE' LED light engine for professional stage lighting products, making the exchange of the engine a simple procedure that can be

carried out in just a few minutes. This “TE™” technology is born from real practical experience and several years of development. It ushers in a new mindset, as well as improving the overall quality of LED lighting and boosting its longevity and relevance.

Product-related or management system-related certifications:

- UL 1573 Stage and Studio Luminaires and Connector Strips,
- CSA C22.2#166 Stage and Studio Luminaires,
- Directive 2014/30/EU,
- Directive 2014/35/EU,
- EN 60598-1 Luminaires - Part 1: General requirements and tests,
- EN 60598-2-17 Luminaires - Part 2-17: Particular requirements - Luminaires for stage lighting, television and film studios (outdoor and indoor),
- EN 55032 Electromagnetic compatibility of multimedia equipment - Emission Requirements,
- EN 55035 Electromagnetic compatibility of multimedia equipment - Immunity requirements,
- EN 61000-3-2 Electromagnetic compatibility (EMC). Part 3-2: Limits. Limits for harmonic current emissions,
- EN 61000-3-3 Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection,
- EN 62471 Photobiological safety of lamps and lamps systems.

Name and location of production site(s):

ROBE lighting s.r.o. has two production sites:

- Valašské Meziříčí, Czech Republic
- Karviná, Czech Republic

The luminary is produced in Valašské Meziříčí production facility.

Product information

Product name: Calumma™ XS MC

Product identification: Calumma™ XS MC

Product description:

Using a single high-power, multi-chip LED inside a compact, elegant, and durable housing, the smallest Calumma is a great choice for many different lighting applications. Complementing both outdoor environments and interior designs, its wide range of beam angles, LED chip colour variant options and accessories make the Calumma XS MC an ideal, extra small lighting solution for any architectural design.

Lumen output & Light source:

- LED provides light output up to 331 lm (@RGBW).
- Multiple LED colour variants.
- No light spills.
- Perfectly homogenised light output with efficacy up to 33 lm/w.

Design & Durability:

- Lightweight, compact and durable housing.
- High-pressure die cast aluminium.
- IP67 and IK10

- Supported with a 5 year warranty.

Projected Lumen Maintenance: L90B10 >90.000 hrs, Ta = 25°C / 77°F

UN CPC code: 46539 Other electric lamps and lighting fittings (including lamps and lighting fittings of a kind used for lighting public open spaces or thorough-fares), UN CPC Ver 2.1

Other codes for product classification:

NACE/CPA = 27.40 Manufacture of electric lighting equipment

ANZSIC = 2432 Electric Lighting Equipment Manufacturing

Geographical scope: Czech Republic, Europe, Global

LCA information

Functional unit / declared unit: 1 piece of luminary

Reference service life: 90 000 hours

Time representativeness: Site specific data from producer are based on 1 year average for process data (reference year 2023). Time scope less than 10-years were applied for background data. Time scope less than 2-years were applied for specific data.

Database(s) and LCA software used: LCA for Experts (Sphere), databases Sphere and ecoinvent 3.9

Description of system boundaries: The system boundary is Cradle to grave and module D according to EN 15804+A2. It covers the production of raw materials, all relevant transport down to factory gate, manufacturing by ROBE, transport to installation site, installation, operational energy of use of luminaire, transport of deconstructed material, waste processing and disposal of used product. The review framework comprises the following details:

- Raw materials acquisition and transport,
- Further processing of raw materials,
- Production operations,
- Energy and water consumption,
- Waste management,
- Packaging of the final product for delivery,
- Transport to the customer,
- Installation of the device,
- Operational energy use of the device,
- Repairs of the device during service time,
- Deconstruction of od the device,
- Transport and waste processing,
- Waste incineration with energy recovery, production of recyclable materials.

Modules B1, B2, B4, B5 and B7 are included in the study, but their value is 0 or was evaluated as negligible.

More information:

Cut off rules: The cut-off criterion was chosen based on the used PCR. According to the used PCR, more than 99 % of flows were included.

Allocations:

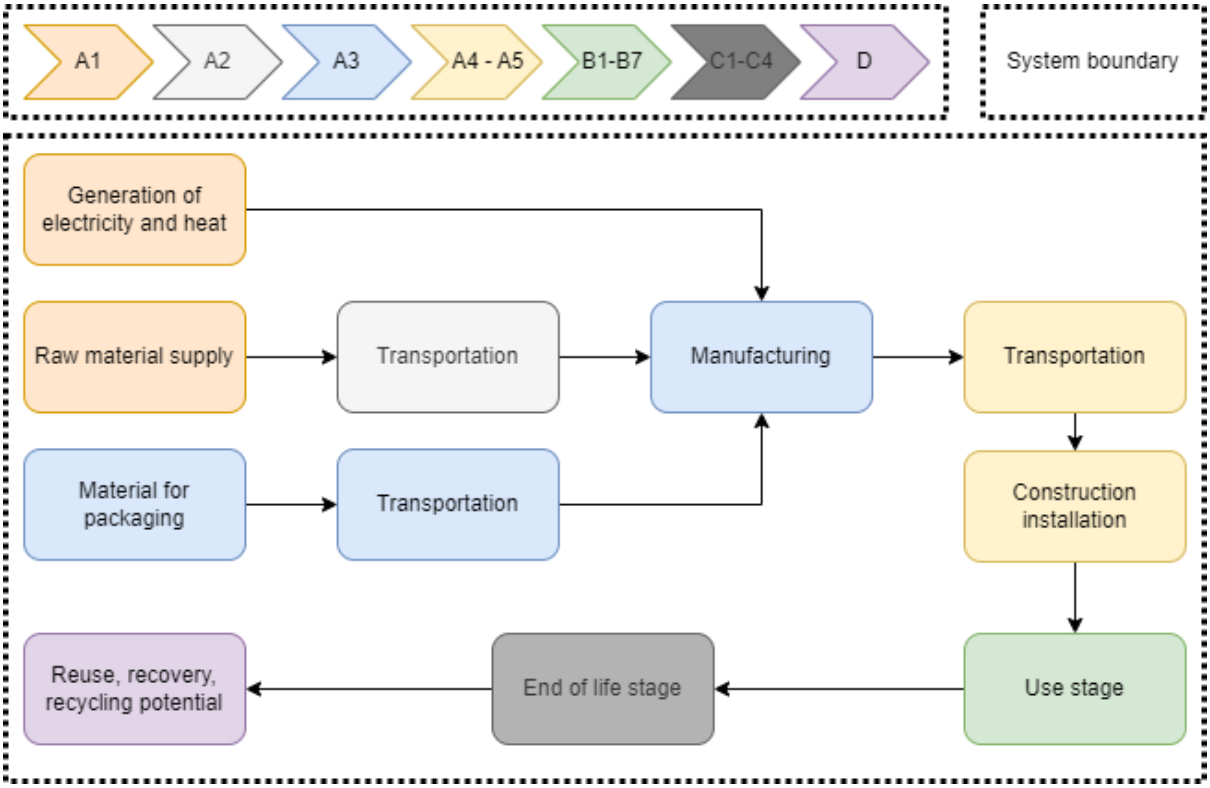
All materials and energy flows were modelled based on real tracked consumption of material and production bilances of energies. For subcontractors, data about their consumption of materials and energies for the particular operation were included as well. VOC emissions were allocated based on the

weight of the final product across the whole production. No secondary fuels or materials are used in production. Generic process data for production of input materials and components were used.

Electricity consumption: Generation of electricity consumed within ROBE lighting s.r.o. production was based on the Czech residual electricity grid mix. GWP-GHG indicator of the used residual electricity grid mix is 0,643 kg CO2 eq./kWh.

Characterisation factors: Characterisation factors are based on Environmental Footprint 3.1. (EF 3.1).

System diagram:



Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	GLO	GLO	CZ	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO
Specific data used	47,7%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%					-	-	-	-	-	-	-	-	-	-	-	-

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Plastics	0,05	0	0
Steel	0,02	0	0
Other metals	0,47	0	0
Electro	0,06	0	0
Others	0,04	0	0
TOTAL	0,63	0	0
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
Steel	0,001	0,7%	0
Cardboard	0,17	80,4%	0,38
EPS	0,04	18,9%	0
TOTAL	0,21	100%	0,31

Dangerous substances from the candidate list of SVHC for Authorisation	EC No.	CAS No.	Weight-% per functional or declared unit
No substances from the SVHC list to report.			

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

Results per 1 piece of Calumma™ XS MC											
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B3**	**B6**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	2,09E+01	5,21E-01	1,16E-01	1,07E-02	4,49E+02	1,50E-02	5,56E-03	2,45E-01	2,22E-03	-3,78E+00
GWP-biogenic	kg CO_2 eq.	-2,02E-01	3,90E-04	2,70E-01	5,55E-05	1,01E-01	3,38E-06	0,00E+00	5,27E-06	3,63E-04	-8,23E-03
GWP-luluc	kg CO_2 eq.	1,41E-02	1,02E-04	7,91E-06	1,96E-05	6,71E-02	2,24E-06	9,19E-05	1,84E-05	2,21E-06	-9,79E-04
GWP-total	kg CO_2 eq.	2,07E+01	5,21E-01	3,86E-01	1,08E-02	4,49E+02	1,50E-02	5,65E-03	2,45E-01	2,58E-03	-3,79E+00
ODP	kg CFC 11 eq.	3,21E-07	5,46E-14	1,95E-13	6,04E-10	4,93E-09	1,64E-13	5,51E-16	1,51E-13	7,50E-11	-2,46E-11
AP	mol H^+ eq.	9,89E-02	2,02E-03	6,45E-05	7,45E-05	1,05E+00	3,50E-05	7,40E-06	8,02E-05	9,58E-06	-1,50E-02
EP-freshwater	kg P eq.	9,33E-03	1,23E-07	1,54E-08	1,51E-05	2,35E-04	7,83E-09	2,34E-08	2,24E-08	1,14E-09	-4,82E-06
EP-marine	kg N eq.	1,71E-02	9,10E-04	1,55E-05	1,49E-05	1,76E-01	5,86E-06	2,68E-06	2,16E-05	4,13E-06	-3,30E-03
EP-terrestrial	mol N eq.	1,86E-01	9,97E-03	1,98E-04	1,60E-04	1,88E+00	6,28E-05	3,19E-05	3,01E-04	4,49E-05	-3,59E-02
POCP	kg NMVOC eq.	5,27E-02	2,65E-03	4,39E-05	4,41E-05	5,24E-01	1,75E-05	6,99E-06	6,03E-05	1,12E-05	-9,48E-03
ADP-minerals&metals*	kg Sb eq.	2,48E-03	1,32E-08	1,02E-09	4,29E-06	2,12E-05	7,08E-10	4,66E-10	1,15E-09	-1,29E-08	-4,72E-05
ADP-fossil*	MJ	3,27E+02	6,85E+00	3,42E-01	1,67E-01	8,33E+03	2,78E-01	7,14E-02	3,15E-01	2,63E-02	-4,59E+01
WDP*	m^3	3,75E+00	1,15E-03	1,78E-02	3,41E-03	2,56E+01	8,55E-04	8,15E-05	2,52E-02	4,17E-03	-5,95E-01

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Acronyms: **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

Additional mandatory and voluntary impact category indicators

Results per 1 piece of Calumma™ XS MC											
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B3**	**B6**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	2,09E+01	5,21E-01	1,16E-01	1,07E-02	4,49E+02	1,50E-02	5,65E-03	2,45E-01	2,22E-03	-3,78E+00
Particulate matter	Disease incidences	9,02E-07	8,23E-09	5,74E-10	5,42E-10	9,78E-06	3,26E-10	7,72E-11	8,02E-10	9,94E-11	-2,72E-07
Ionising radiation, human health	kBq U235 eq.	2,05E+00	1,33E-03	5,74E-03	1,49E-03	1,61E+02	5,36E-03	1,29E-05	3,17E-03	2,52E-05	-2,93E-01
Ecotoxicity fresh water	CTUe	2,22E+02	5,08E+00	6,54E-02	3,18E-01	8,30E+02	2,77E-02	5,25E-02	1,34E-01	1,12E-02	-1,35E+01
Human toxicity, cancer	CTUh	5,11E-08	9,18E-11	3,41E-12	8,87E-12	4,42E-08	1,47E-12	1,05E-12	7,09E-12	1,04E-13	-2,63E-09
Human toxicity, non-cancer	CTUh	5,38E-07	2,89E-09	1,79E-10	4,14E-10	1,59E-06	5,32E-11	4,69E-11	8,74E-10	2,39E-11	-3,26E-08
Land Use	Pt	1,12E+02	5,99E-02	4,38E-02	4,89E-02	7,97E+02	2,66E-02	3,53E-02	4,93E-02	1,34E-03	-8,77E+00

Resource use indicators

Results per 1 piece of Calumma™ XS MC											
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B3**	**B6**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	5,45E+01	4,59E-02	5,64E-02	1,63E-02	1,19E+03	3,95E-02	6,04E-03	5,80E-02	-7,24E-06	-2,52E+01
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	5,45E+01	4,59E-02	5,64E-02	1,63E-02	1,19E+03	3,95E-02	6,04E-03	5,80E-02	-7,24E-06	-2,52E+01
PENRE	MJ	3,27E+02	6,85E+00	3,42E-01	1,67E-01	8,33E+03	2,78E-01	7,14E-02	3,15E-01	2,63E-02	-4,59E+01
PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	3,27E+02	6,85E+00	3,42E-01	1,67E-01	8,33E+03	2,78E-01	7,14E-02	3,15E-01	2,63E-02	-4,59E+01

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

SM	kg	5,56E-04	5,56E-04	1,11E-03	0,00E+00	2,22E-03	3,89E-03	7,22E-03	1,33E-02	2,44E-02	4,50E-02
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	1,43E-01	5,10E-05	4,57E-04	8,12E-05	1,67E+00	5,57E-05	6,78E-06	6,21E-04	9,74E-05	-1,79E-02

Acronyms: **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 re-sources; **SM** = Use of secondary material; **RSF** = Use of renewable secondary fuels; **NRSF** = Use of non-renewable secondary fuels; **FW** = Use of net fresh water

Waste indicators

Results per 1 piece of Calumma™ XS MC											
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B3**	**B6**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	1,81E-05	2,27E-10	7,51E-11	2,05E-12	1,18E-06	3,93E-11	2,31E-12	1,04E-10	1,21E-12	-2,73E-08
Non-hazardous waste disposed	kg	2,03E+00	6,66E-04	1,10E-02	3,59E-06	2,06E+00	6,87E-05	1,11E-05	3,23E-02	2,47E-02	-1,46E+00
Radioactive waste disposed	kg	1,97E-02	9,36E-06	3,85E-05	1,87E-06	1,08E+00	3,59E-05	9,23E-08	2,20E-05	1,27E-06	-2,75E-03

Output flow indicators

Results per 1 piece of Calumma™ XS MC											
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B3**	**B6**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	6,37E-02	0,00E+00	1,71E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,91E-01	0,00E+00	0,00E+00
Materials for energy recovery	kg	3,28E-03	0,00E+00	8,25E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,04E-01	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,97E-01
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,04E+00

Additional environmental information

If it is necessary to calculate the results to mass of product (incl. packaging) in 1 kg, the conversion factor is 1,19.

References

General Programme Instructions of the International EPD® System. Version 5.0.0.
Product Category Rules (PCR): PCR 2019:14 Construction products (EN 15804+A2) (1.3.4)
ISO 14020:2000 Environmental labels and declarations — General principles, 2000-09
ISO 14025: EN ISO 14025:2006-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures
ISO 14040:2006 Environmental management — Life cycle assessment — Principles and framework, 2006-07
ISO 14044:2006 Environmental management — Life cycle assessment — Requirements and guidelines, 2006-07
EN 15804+A2:2019/AC:2021 European Committee for Standardization: Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products, 2021
Ecoinvent: www.ecoinvent.org, ecoinvent database 3.9.
Sphera: software LCA for Experts. 2023, Sphera solutions, www.sphera.com

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